Ransburg
A CARLISLE BRAND

# IntelliFlow™ RF2
# Automatic and Manual Systems


Scan the related QR code above for other languages of this RF2 user manual and additional product information.

# CONTENTS

# CONTENTS (cont.)

## OPERATION (cont.)

# SAFETY

## SAFETY PRECAUTIONS

Before operating, maintaining or servicing any electrostatic coating 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.**

**⚠ WARNING**

WARNING!: Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

**⚠ CAUTION**

Caution!: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury or equipment damage.

***NOTICE***

Notice: Indicates information considered important but not hazard related.

To help you recognize this information, we use the following symbols. Please pay particular attention to these sections.

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 associated equipment manuals to reconcile such differences.

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

**⚠ WARNING**

The user **MUST** read and be familiar with the Safety Section in this manual and the 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 **NFPA 33 AND EN 16985 SAFETY STANDARDS, LATEST EDITION,** or 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.

**Repairs may only be performed by personnel authorized by Carlisle Fluid Technologies.**

| AREA<br>Tells where hazards may occur | HAZARDS<br>Tells what the hazard is | SAFEGUARDS<br>Tells how to avoid the hazard |
|---|---|---|
| **Spray Area**<br>  | **Fire Hazard**<br><br>Improper or inadequate operation and maintenance procedures will cause a fire hazard.<br><br>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction. | Fire extinguishing equipment must be present in the spray area and tested periodically.<br><br>Spray areas must be kept clean to prevent the accumulation of combustible residues.<br><br>Smoking must never be allowed in the spray area.<br><br>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing, or maintenance.<br><br>Spray booth ventilation must be kept at the rates required by NFPA 33, EN 16985, country, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.<br><br>Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch (25mm) for every 10KV of output voltage is required at all times.<br><br>Test only in areas free of combustible material.<br><br>Testing may require high voltage to be on, but only as instructed.<br><br>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.<br><br>If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled.<br><br>The paint process and equipment should be set up and operated in accordance with NFPA 33, NEC, OSHA, local, country, and European Health and Safety Norms. |

| AREA<br>Tells where hazards may occur | HAZARDS<br>Tells what the hazard is | SAFEGUARDS<br>Tells how to avoid the hazard |
|---|---|---|
| **Spray Area**<br>  | **Explosion Hazard**<br><br>Improper or inadequate operation and maintenance procedures will cause a fire hazard.<br><br>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation.<br><br>Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction. | Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch (25mm) for every 10KV of output voltage is required at all times.<br><br>Unless specifically approved for use in hazardous locations, all electrical equipment must be located outside or applicable county code hazardous areas, in accordance with NFPA 33.<br><br>Test only in areas free of flammable or combustible materials.<br><br>The current overload sensitivity (if equipped) MUST be set as described in the related section of the equipment manual. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if the current overload sensitivity is not properly set. Frequent power supply shutdown indicates a problem in the system which requires correction.<br><br>Always turn the control panel power off prior to flushing, cleaning, or working on spray system equipment.<br><br>Before turning high voltage on, make sure no objects are within the safe sparking distance.<br><br>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33, EN 16985.<br><br>Have fire extinguishing equipment readily available and tested periodically. |
| **General Use and Maintenance**<br>  | Improper operation or maintenance may create a hazard.<br><br>Personnel must be properly trained in the use of this equipment. | Personnel must be given training in accordance with the requirements of NFPA 33.<br><br>Instructions and safety precautions must be read and understood prior to using this equipment.<br><br>Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA 33, EN Norms and your insurance company requirements. |

| AREA<br>Tells where hazards may occur | HAZARDS<br>Tells what the hazard is | SAFEGUARDS<br>Tells how to avoid the hazard |
|---|---|---|
| **Spray Area / High Voltage Equipment**<br>  | **Electrical Discharge**<br><br>There is a high voltage device that can induce an electrical charge on ungrounded objects which is capable of igniting coating materials.<br><br>Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion. | Parts being sprayed and operators in the spray area must be properly grounded.<br><br>Parts being sprayed must be supported on conveyors or hangers that are properly grounded. The resistance between the part and earth ground must not exceed 1 Meg Ohm. (Refer to NFPA 33, EN 16985).<br><br>Operators must be grounded. Grounding straps on wrists or legs may be used to assure adequate ground contact.<br><br>Footware to be used by operator must comply with EN ISO 20344, resistance not to exceed 100 Meg Ohm. Protective clothing including gloves should comply with EN 1149-5, resistance not to exceed 100 Meg Ohm.<br><br>Operators must not be wearing or carrying any ungrounded metal objects.<br><br>When using an electrostatic handgun, operators must assure contact with the handle of the applicator via conductive gloves or gloves with the palm section cut out.<br><br>NOTE: REFER TO NFPA 33, EN 16985 OR SPECIFIC COUNTRY SAFETY CODES REGARDING PROPER OPERATOR GROUNDING.<br><br>All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded. Grounded conductive flooring must be provided in the spray area.<br><br>Always turn off the power supply prior to flushing, cleaning, or working on spray system equipment or applicable county code.<br><br>Unless specifically approved for use in hazardous locations, all electrical equipment must be located outside or applicable country code, hazardous areas, in accordance with NFPA 33.<br><br>Avoid installing an applicator into a fluid system where the solvent supply is ungrounded.<br><br>Do not touch the applicator electrode while it is energized. |

| AREA<br>Tells where hazards may occur | HAZARDS<br>Tells what the hazard is | SAFEGUARDS<br>Tells how to avoid the hazard |
|---|---|---|
| **Electrical Equipment**<br>  | **Electrical Discharge**<br><br>High voltage equipment is utilized in the process. Arcing in the vicinity of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance.<br><br>Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation.<br><br>Frequent power supply shut-down indicates a problem in the system which requires correction.<br><br>An electrical arc can ignite coating materials and cause a fire or explosion. | Unless specifically approved for use in hazardous locations, the power supply, control cabinet, and all other electrical equipment must be located outside or applicable country codes, hazardous areas in accordance with NFPA 33 and EN 16985.<br><br>Turn the power supply OFF before working on the equipment.<br><br>Test only in areas free of flammable or combustible material.<br><br>Testing may require high voltage to be on, but only as instructed.<br><br>Production should never be done with the safety circuits disabled.<br><br>Before turning the high voltage on, make sure no objects are within the sparking distance. |
| **Toxic Substances**<br>  | **Chemical Hazard**<br><br>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.<br><br>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials. Reference EN 12215 or applicable code.<br><br>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. |

| | |
|---|---|
| **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<br>7250 Hudson Blvd N STE 100,<br>St Paul, MN 55128, USA |
| **This Declaration of Conformity / Incorporation is issued under the sole responsibility of the manufacturer:** | Carlisle Fluid Technolgies Inc<br>7166 4th St. N.<br>Oakdale, MN 55128 USA |
| **Representative authorised to compile the technical file** | Sales and Marketing Director. CFT UK Ltd<br>1 Avenue de Lattre de Tassigny<br>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

X-XXXX-X

**⚠ CAUTION**

Do not operate the RF2 before this section is read.

## ADDITIONAL SAFETY INFORMATION

The RF2 has a main operator panel emergency stop (E-Stop) pushbutton included with the unit. 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 operation resumes.

**⚠ WARNING**

Do not contact, disconnect, or manipulate 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 must be used for electrical work internal to the controller.

If this is not possible for the purpose of diagnosis and troubleshooting during working conditions, then only qualified electrical personnel are to perform the work.

***NOTICE***

During the initial commission of the equipment, and at periodic times throughout the life of the equipment, all fluid fittings must be visually inspected for leaks. Periodically, all pieces of this equipment must be visually inspected for signs of obvious degradation due to chemicals or other conditions 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 prevent possible chemical spillage when personnel are not on site, air and fluid supplies for the equipment must be disabled when the equipment is idled for an extended period of time such as end-of-day shutdown, etc.

Optionally, some sensors, switches, or other ancillary equipment, connected to this equipment may be located in the presence of flammable gases and vapors. All such equipment must be connected through the use of intrinsic-safe or Zener barriers and will be classified as a 'simple apparatus' or themselves be approved for use in these areas.

**Page is intentionally left blank.**

# INTRODUCTION—AUTOMATIC

The IntelliFlow 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 17 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.

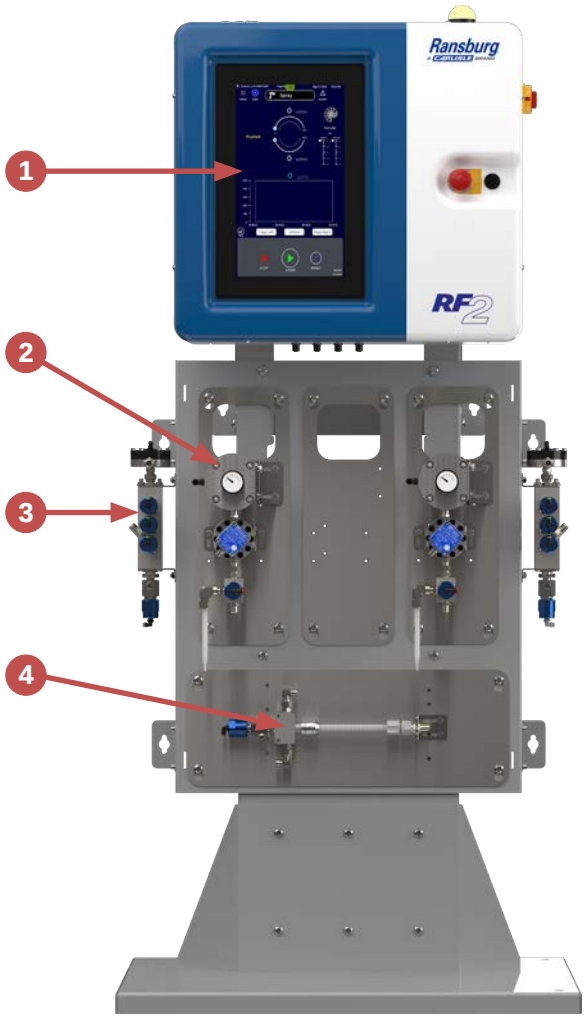
The RF2 can be operated locally, from its included 15-inch touch screen, or it can be easily integrated into an automated process by use of discrete signals for simple systems or by multiple different industrial fieldbus protocols for more advanced control.

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. Fluid Control Module
3. Valve Stacks
4. Mixing Module



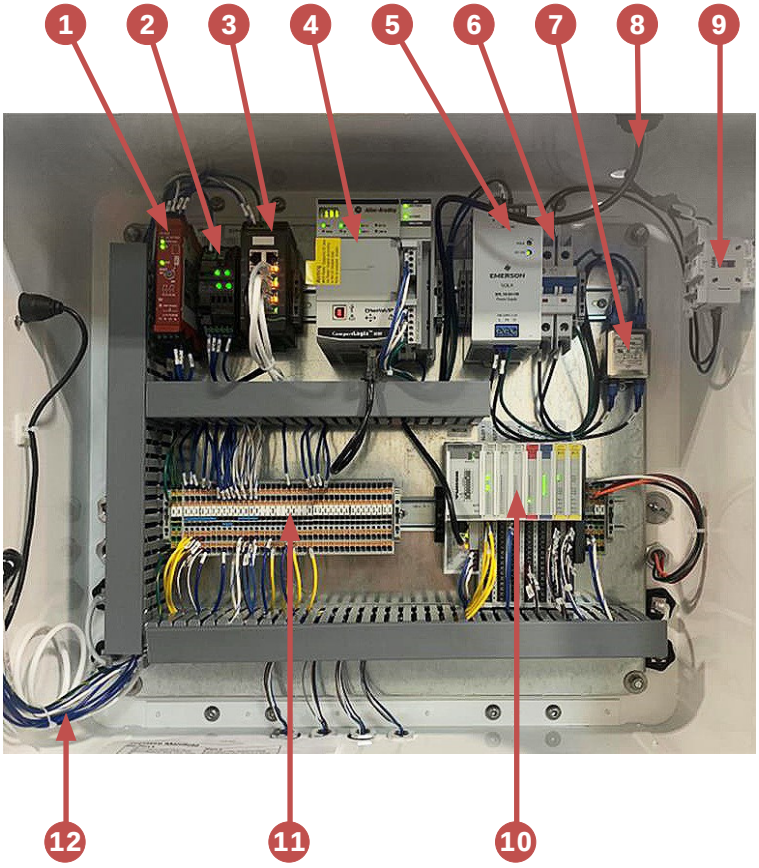
## CONTROL PANEL

### External Components

1. Status Light
2. Main Power Entry
3. Main Power Disconnect Switch
4. Panel Opening Latch
5. Emergency Stop Button
6. HMI

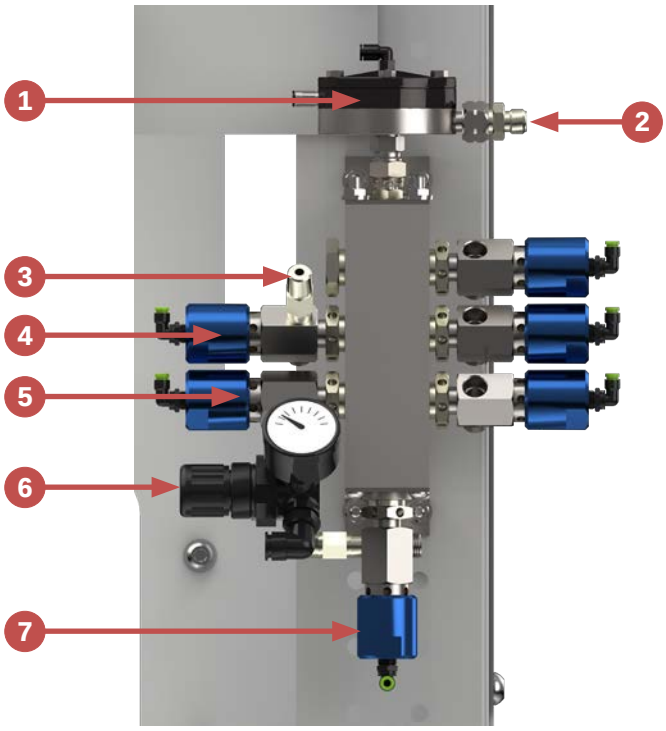

### Internal Components

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. Status Light Connection
9. Main Power Disconnect Switch
10. I/O Block & Terminals
11. Terminal Blocks
12. HMI & E-Stop Button Connection



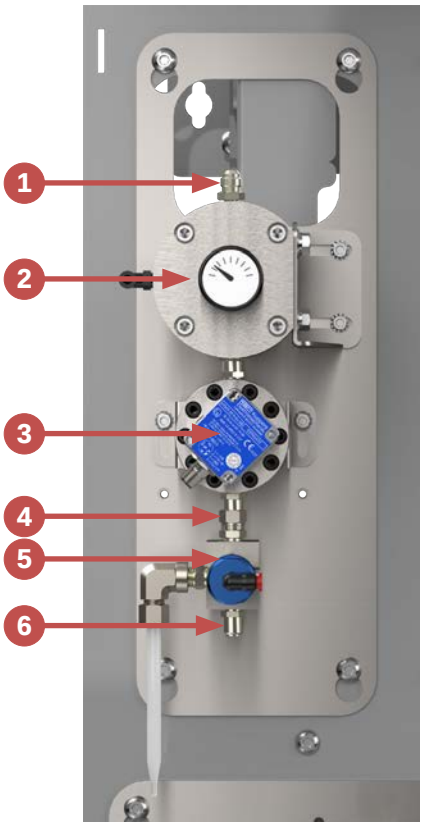
## FLUID COMPONENTS

### Valve Stack




1. Fluid Pressure Regulator (Optional)
2 Fluid Panel Connection
3. Solenoid Connection
4. Fluid Valves
5. Air Push Valve
6. Air Regulator
7. Solvent Flush Valve

### Flow Control Module

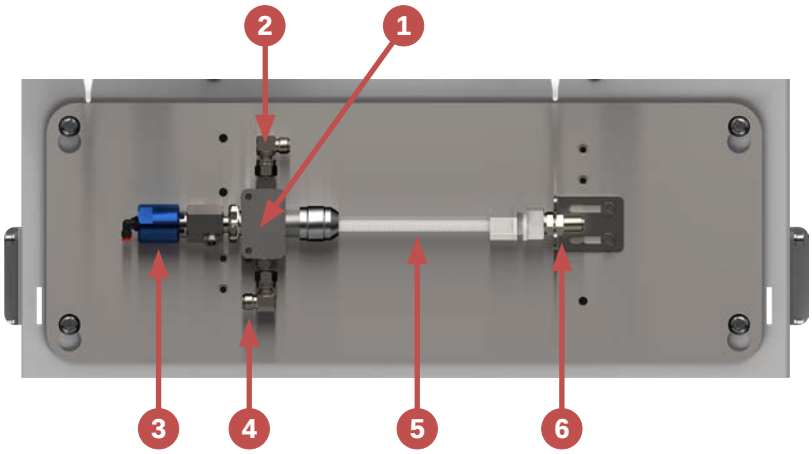



Component A

1. Valve Stack Connection
2. MVR (Material Valve Regulator) w/Air Gauge
3. Flow Meter
4. Control Panel Connection
5. Calibration Block
6. Mix Module Connection

## Mix Module

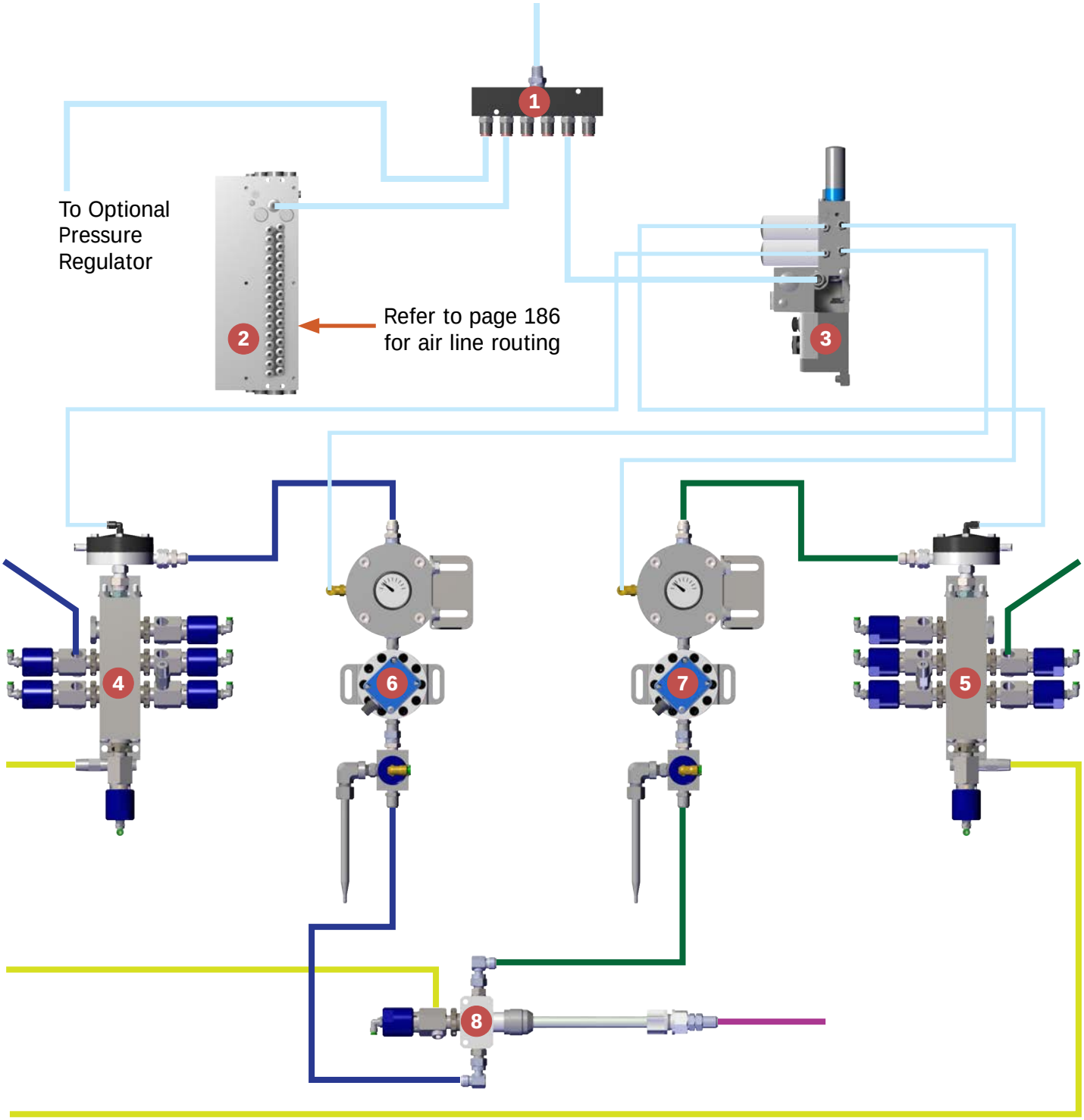
1. Mix Block
2. Flow Control Module A Connection
3. Flush Valve
4. Dispense Pump Connection
5. Static Mix Tube
6. Gun Connection



## RF2 AUTOMATIC SYSTEM CONFIGURATION

- ***Air Hosing***
- ***Solvent Hosing***
- ***Material A Lines***
- ***Material B Lines***
- ***Mixed Material Lines***

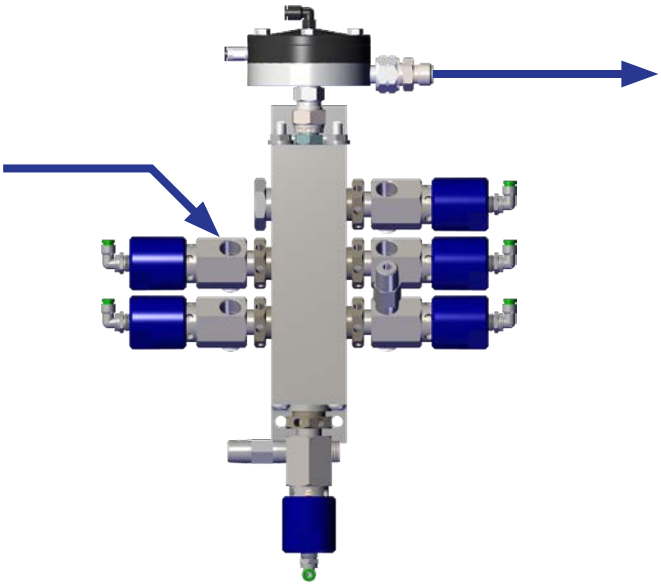
1. Air Manifold
2. Valve Stack Solenoid Manifold
3. Pressure Solenoid Manifold
4. Material A Valve Stack
5. Material B Valve Stack
6. Material A Fluid Panel
7. Material B Fluid Panel
8. Mix Chamber



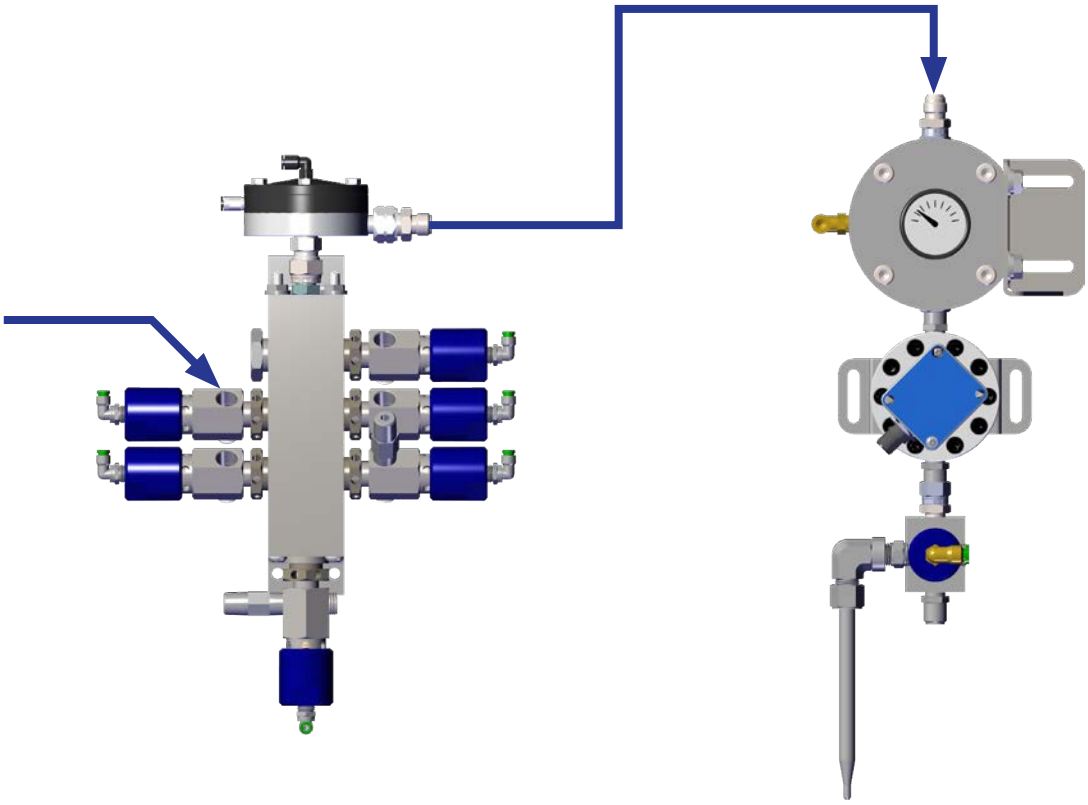
## THEORY OF OPERATION

The RF2's operating principle is as follows:

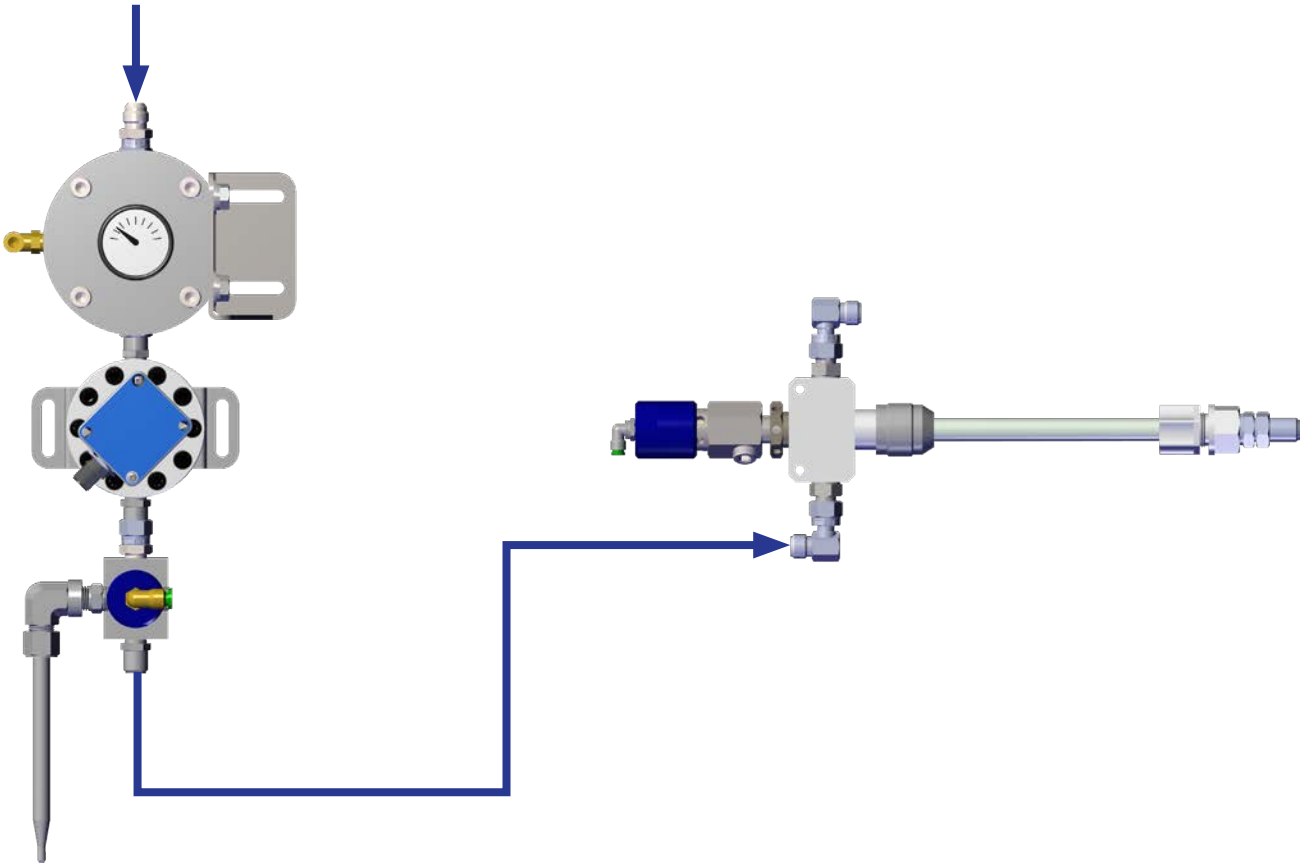
1. The material is fed through the hoses towards the material valves in each stack.
2. If multiple materials of the same type (Resin, Hardener, or Reducer) are used, each valve will control its flow separately.



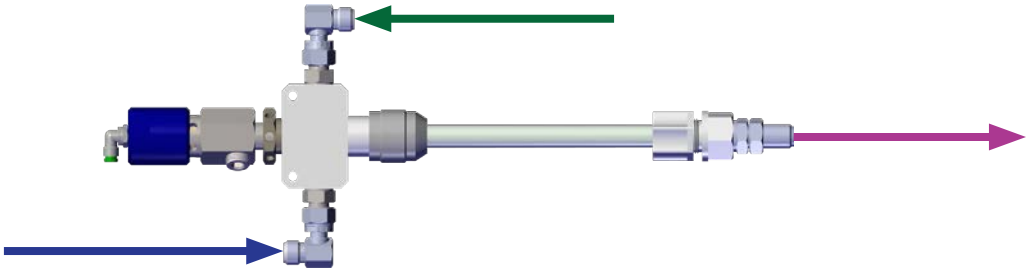
3. The material valves are normally closed. When material flow is needed, the system controller opens the valve via the solenoid addressed to it.



4. The material flows from the valves to the flow control module.
5. The flow meter sends a signal to the control panel to indicate the material's current flow rate.
6. The control panel determines if the flow rate is within specification.
7. The control panel increases or decreases the flow rate of material passed through the MVR until it reaches the desired value.



8. The material flows 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.

**Page is intentionally left blank.**

# INTRODUCTION—AUTOMATIC w/DISPENSE PUMP

The IntelliFlow 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 24 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.

Control and positioning of the dispense pump is precise. An electronically controlled stepper motor with integral linear actuator allow for dispense from 2 cc to 600 cc per minute depending on the chosen dispense pump size.

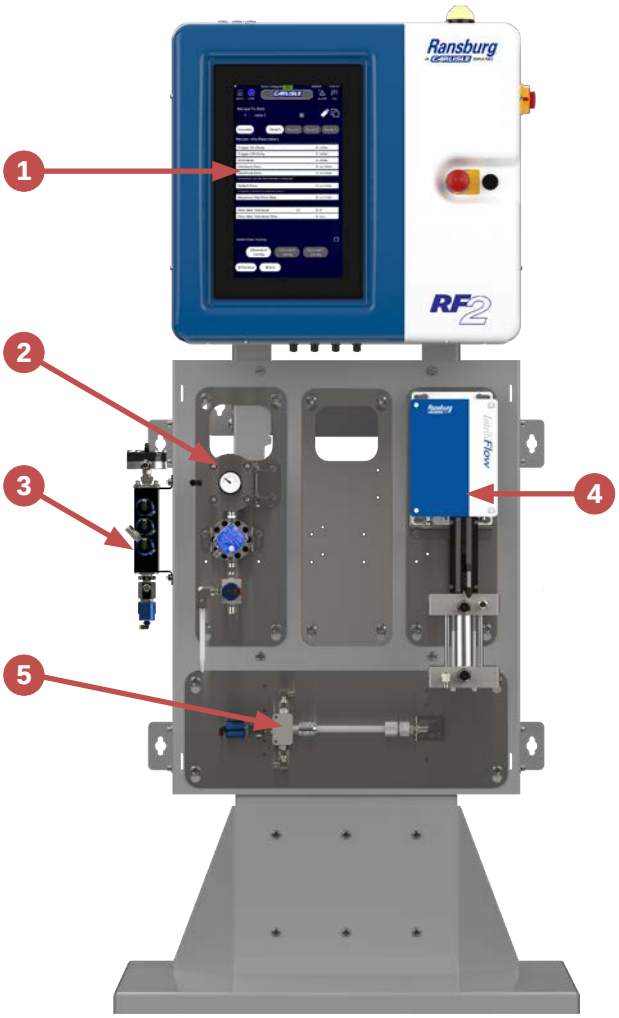
The RF2 can be operated locally, from its included 15-inch touch screen, or it can be easily integrated into an automated process by use of discrete signals for simple systems or by multiple different industrial fieldbus protocols for more advanced control.

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. Fluid Control Module
3. Valve Stacks
4. Dispense Pump
5. Mixing Module



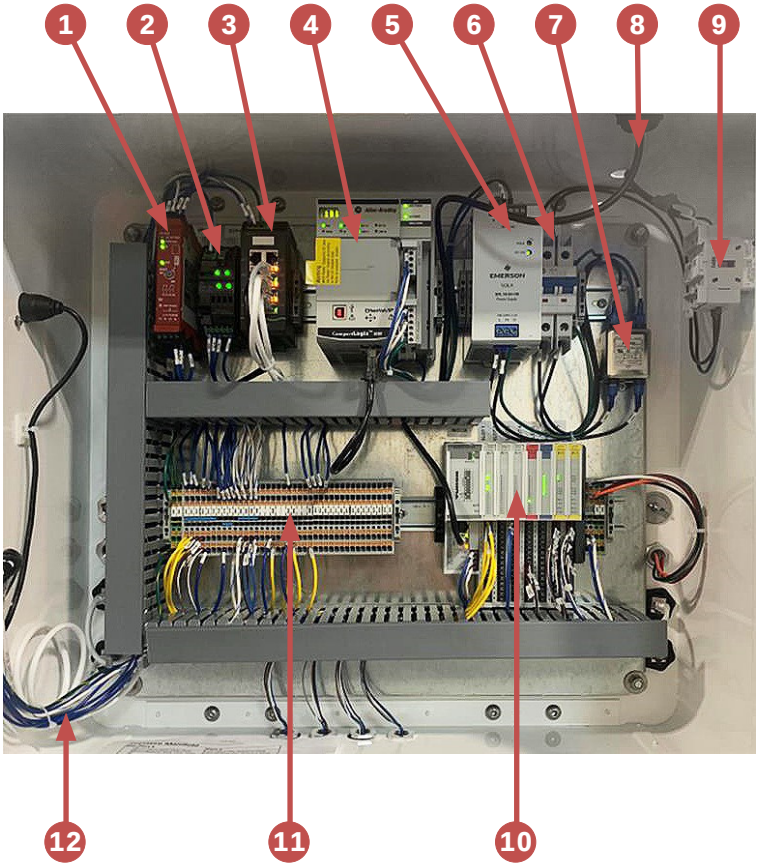
## CONTROL PANEL

### External Components

1. Status Light
2. Main Power Entry
3. Main Power Disconnect Switch
4. Panel Opening Latch
5. Emergency Stop Button
6. HMI

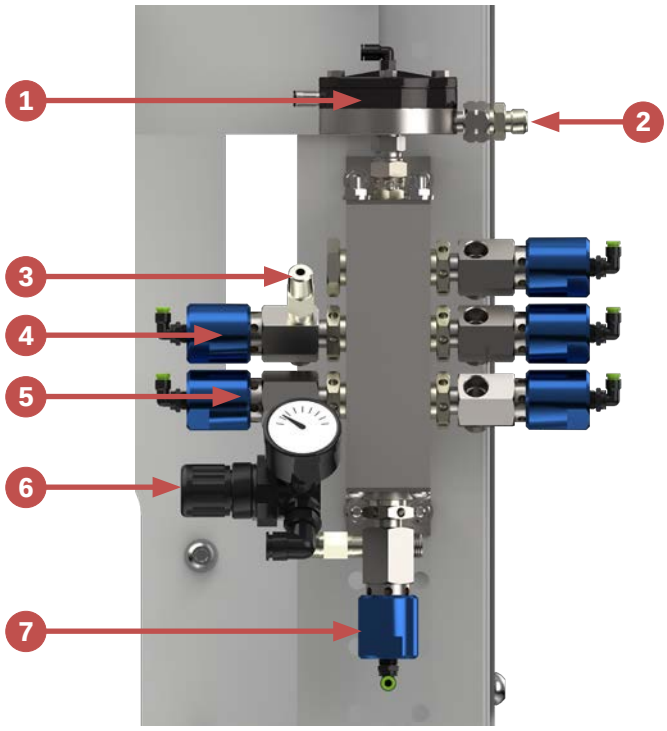

### Internal Components

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. Status Light Connection
9. Main Power Disconnect Switch Connector
10. I/O Block & Terminals
11. Terminal Blocks
12. HMI & E-Stop Button Connection



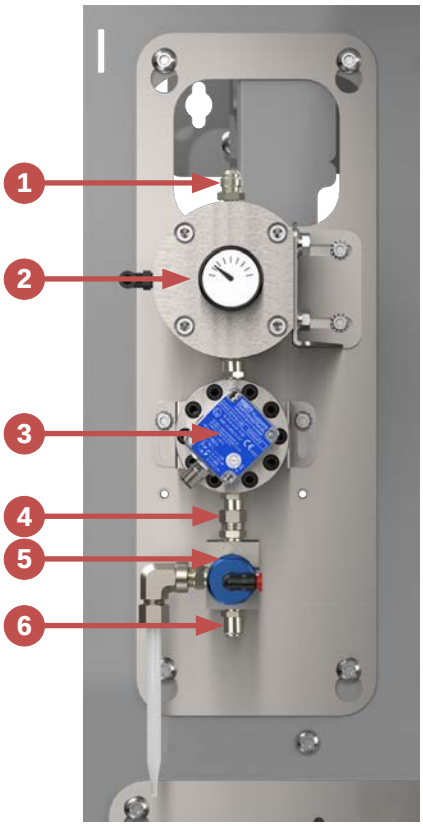
## FLUID COMPONENTS

### Valve Stack




1. Fluid Pressure Regulator (Optional)
2 Fluid Panel Connection
3. Solenoid Connection
4. Fluid Valves
5. Air Push Valve
6. Air Regulator
7. Solvent Flush Valve

### Flow Control Module

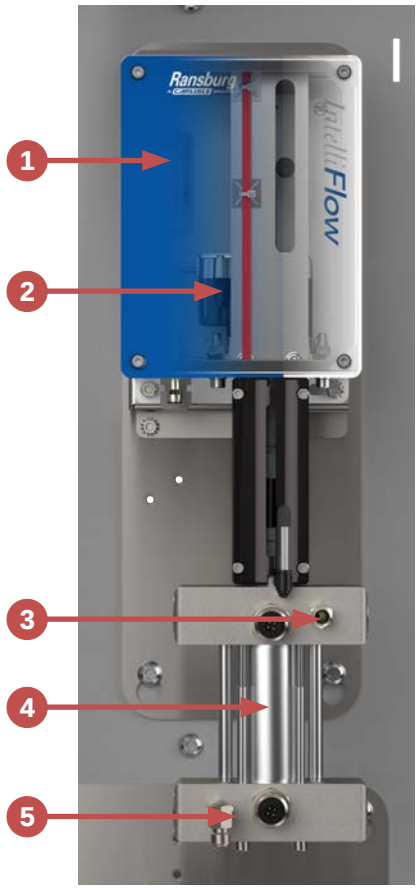



Component A

1. Valve Stack Connection
2. MVR (Material Valve Regulator) w/Air Gauge
3. Flow Meter
4. Control Panel Connection
5. Calibration Block
6. Mix Module Connection

## Dispense Pump Assembly

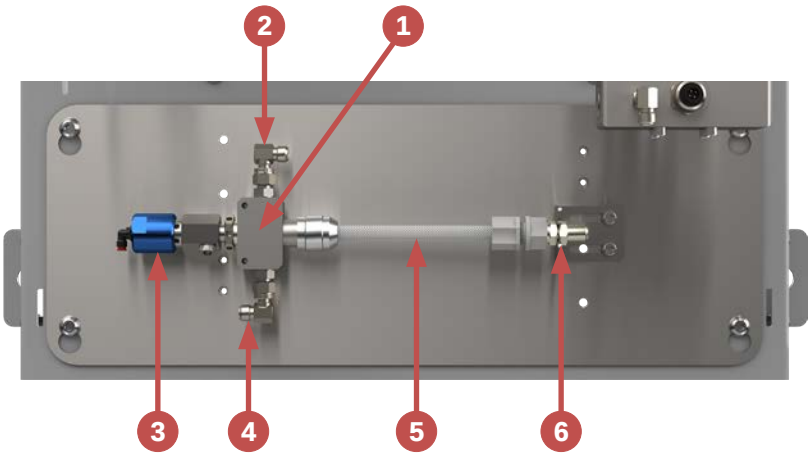
1. Dispense Pump Enclosure
2. Linear Actuator Assembly
3. Material Outlet Connection
4. Dispense Pump (300 cc or 600 cc)
5. Material Inlet Connection




Component B

## Mix Module

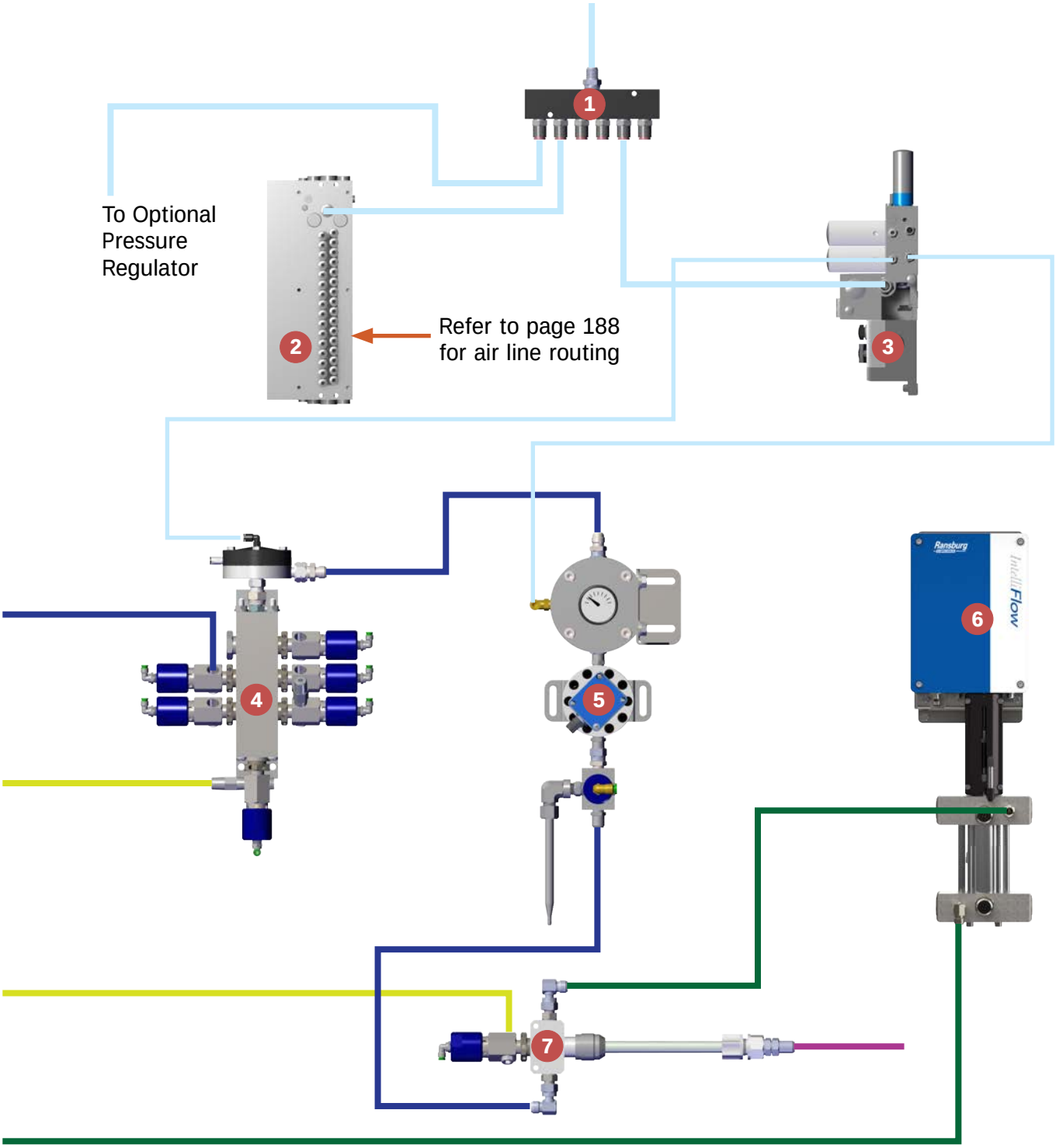
1. Mix Block
2. Flow Control Module A Connection
3. Flush Valve
4. Dispense Pump Connection
5. Static Mix Tube
6. Gun Connection



## RF2 AUTOMATIC SYSTEM w/DISPENSE PUMP CONFIGURATION

- ***Air Hosing***
- ***Solvent Hosing***
- ***Material A Lines***
- ***Material B Lines***
- ***Mixed Material Lines***

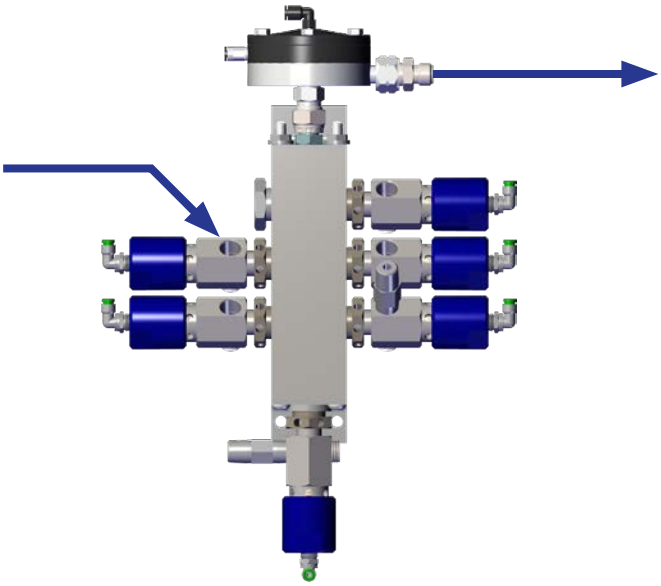
1. Air Manifold
2. Valve Stack Solenoid Manifold
3. Pressure Solenoid Manifold
4. Material A Valve Stack
5. Material A Fluid Panel
6. Dispense Pump
7. Mix Chamber



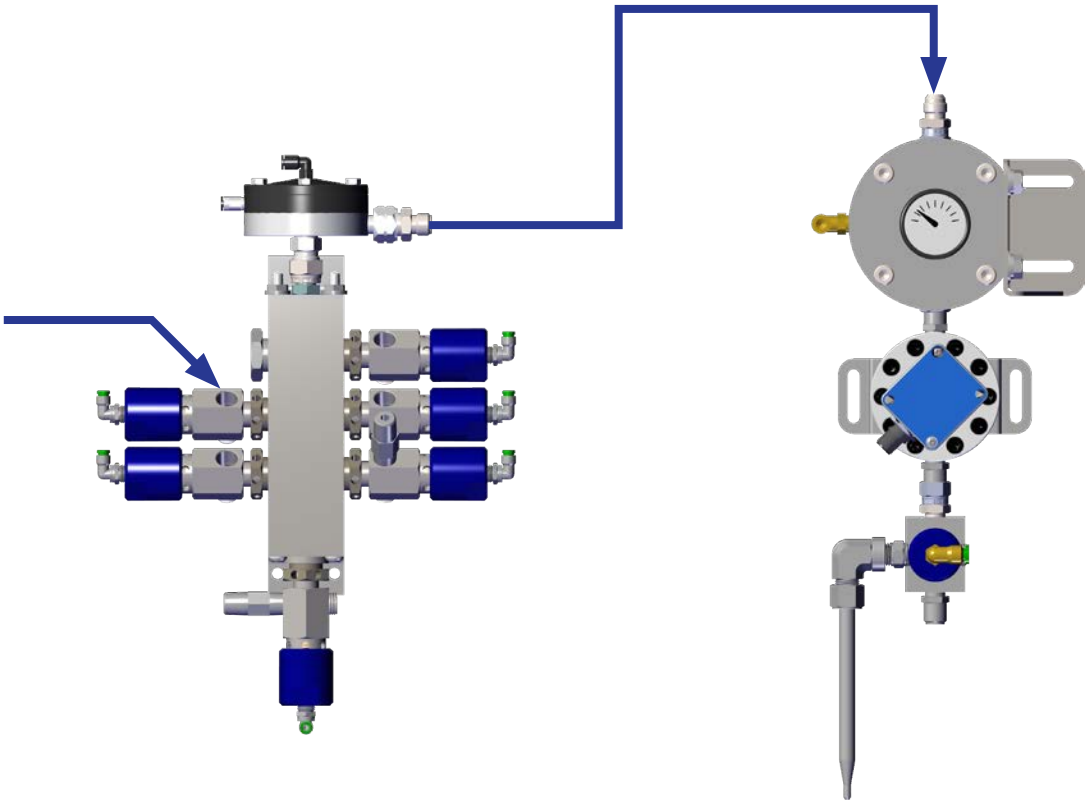
## THEORY OF OPERATION

The RF2's operating principle is as follows:

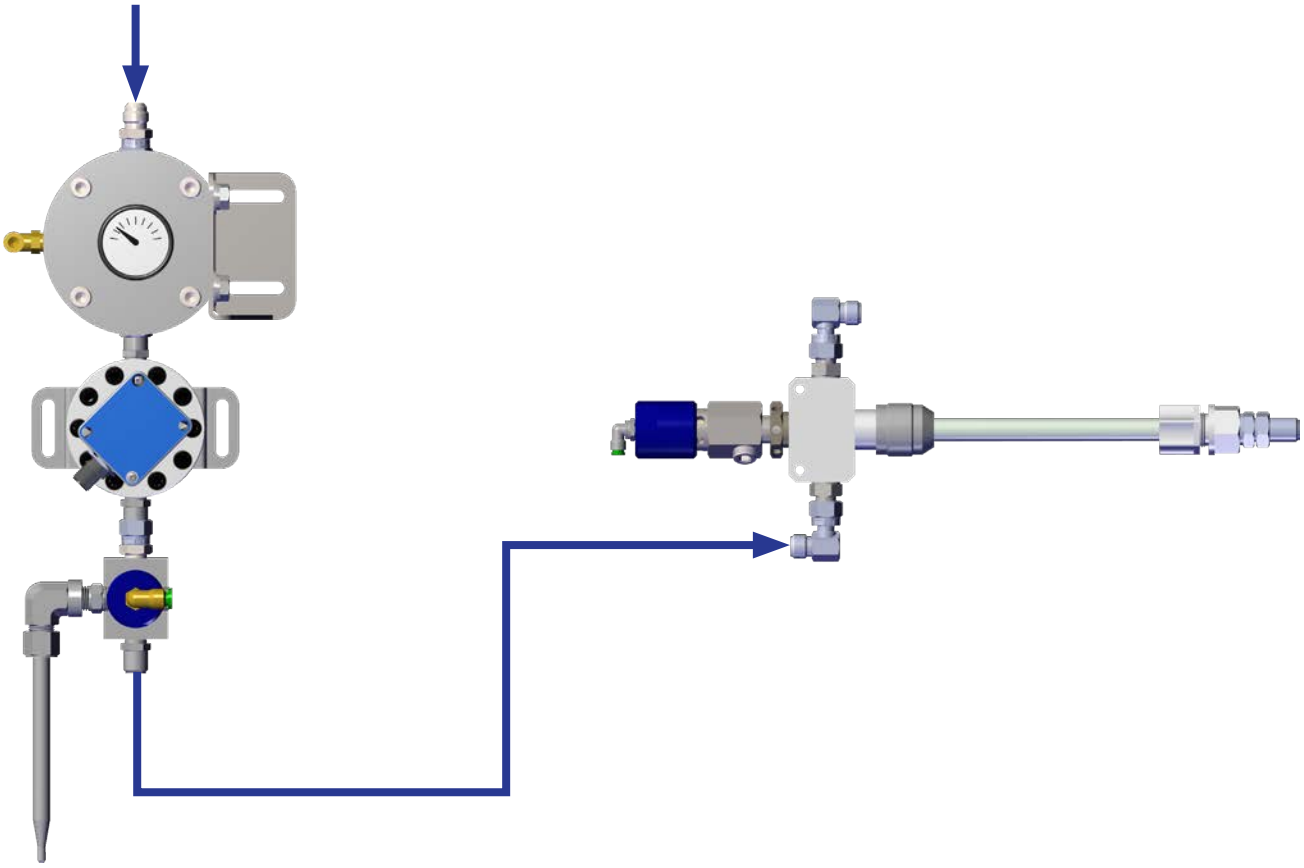
1. The material is fed through the hoses towards the A material valves in each stack.
2. If multiple materials of the same type (Resin, Hardener, or Reducer) are used, each valve will control its flow separately.



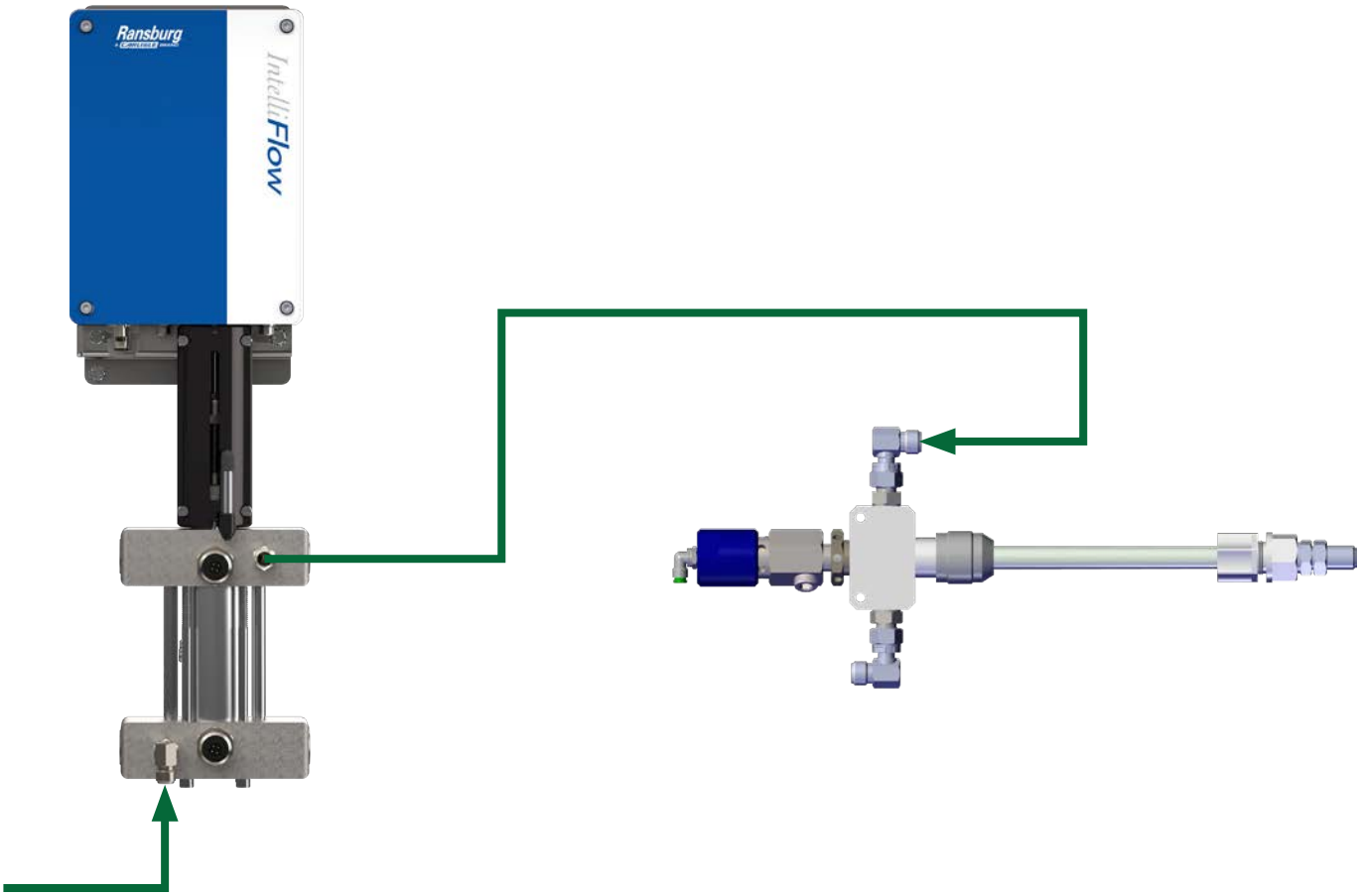
3. The material valves are normally closed. When material flow is needed, the system controller opens the valve via the solenoid addressed to it.



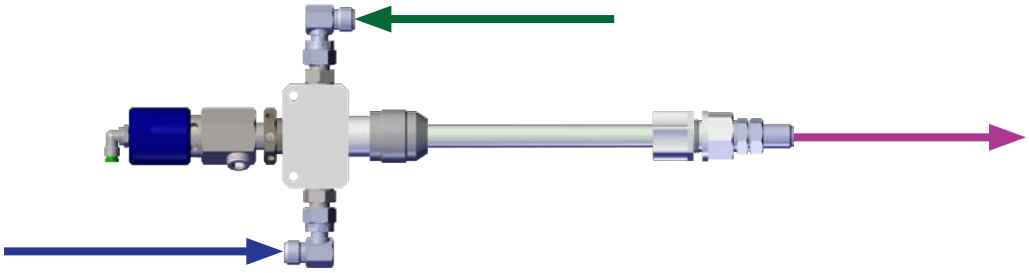
4. The material flows from the valves to the flow control module.
5. The flow meter sends a signal to the control panel to indicate the material's current flow rate.
6. The control panel determines if the flow rate is within specification.
7. The control panel increases or decreases the flow rate of material passed through the MVR until it reaches the desired value.



8. The material flows into the dispense pump from the B material supply.




9. The material flows to the mix manifold where it combines with the second and/or third material.



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

# INTRODUCTION—MANUAL

The IntelliFlow 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 31 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.

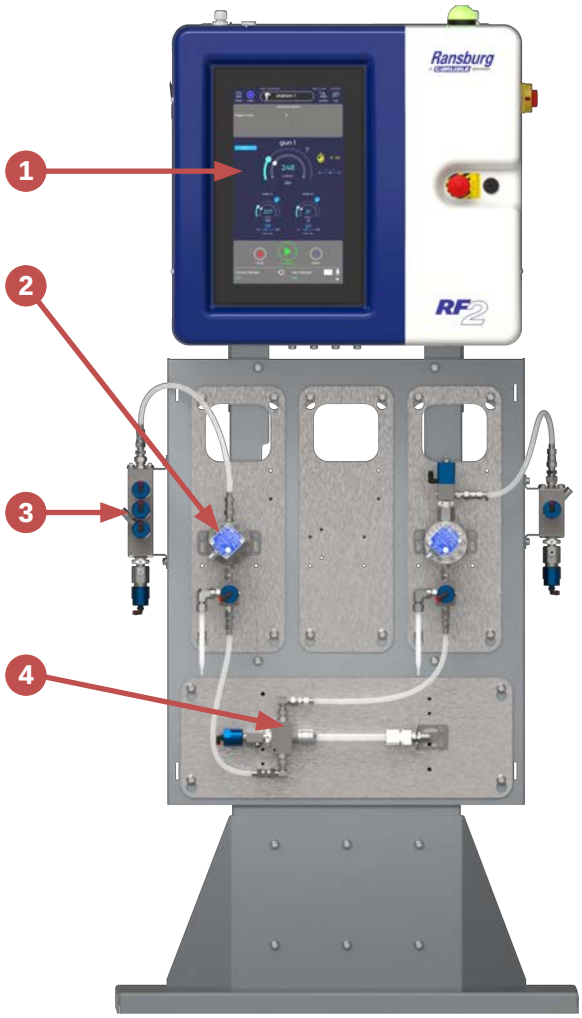
The RF2 can be operated locally, from its included 15-inch touch screen, or it can be easily integrated into an automated process by use of discrete signals for simple systems, or by multiple different industrial fieldbus protocols for more advanced control.

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. Fluid Control Module
3. Valve Stacks
4. Mixing Module



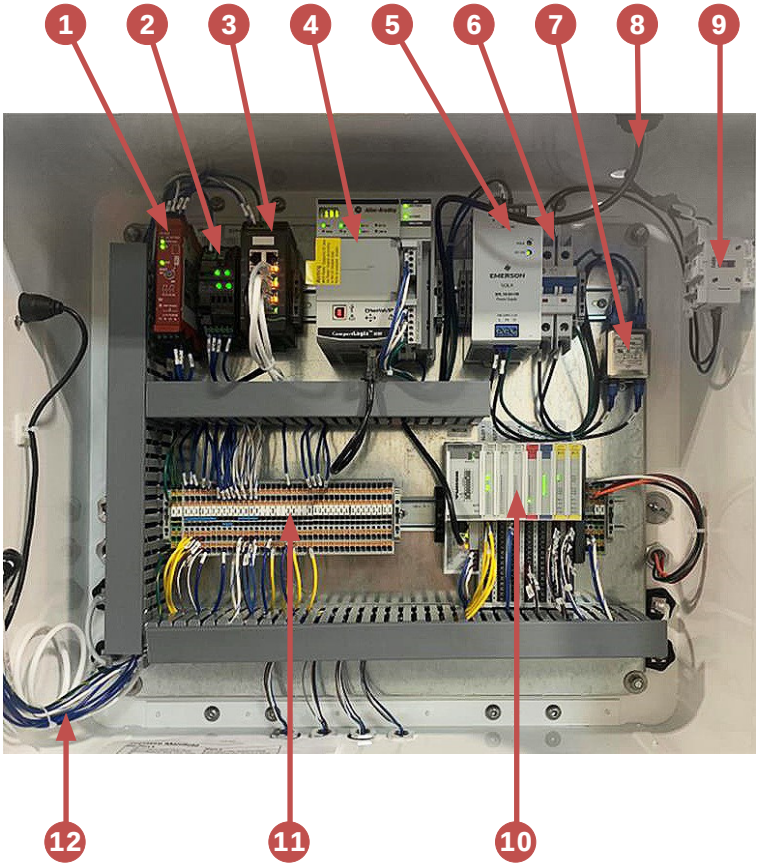
## CONTROL PANEL

### External Components

1. Status Light
2. Main Power Entry
3. Main Power Disconnect Switch
4. Panel Opening Latch
5. Emergency Stop Button
6. HMI

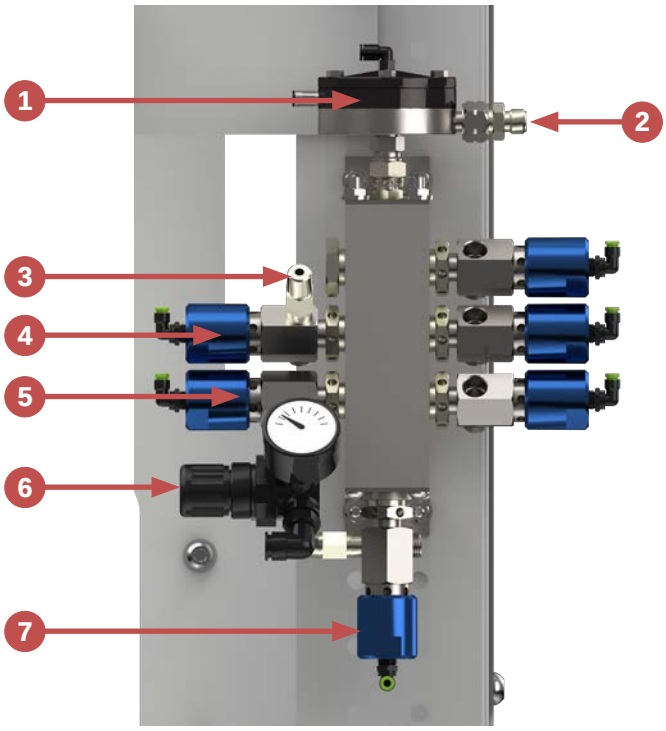

### Internal Components

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. Status Light Connection
9. Main Power Disconnect Switch Connector
10. I/O Block & Terminals
11. Terminal Blocks
12. HMI & E-Stop Button Connection



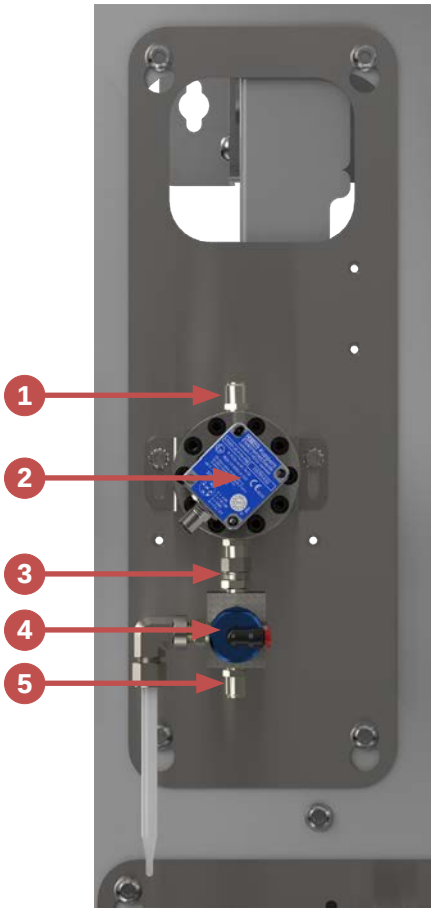
## FLUID COMPONENTS

### Valve Stack




1. Fluid Pressure Regulator (Optional)
2 Fluid Panel Connection
3. Solenoids Connection
4. Fluid Valves
5. Air Push Valve
6. Air Regulator
7. Solvent Flush Valve

### Flow Control Module

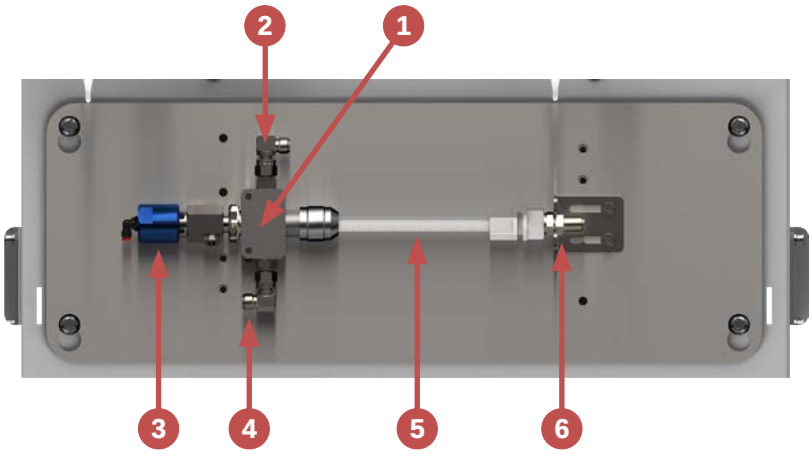



Component A

1. Valve Stack Connection
2. Flow Meter
3. Control Panel Connection
4. Calibration Block
5. Mix Module Connection

## Mix Module

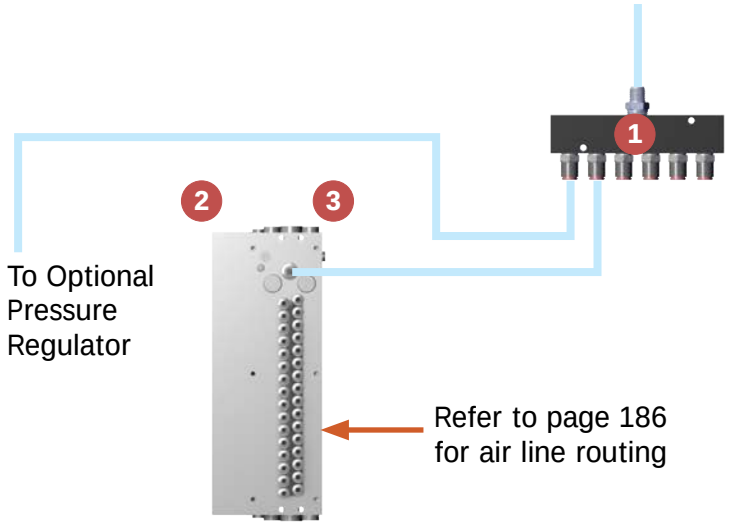
1. Gun Connection
2. Static Mix Tube
3. Mix Block
4. Solvent Flush Valve
5. Flow Control Module Connection
6. Gun Connection

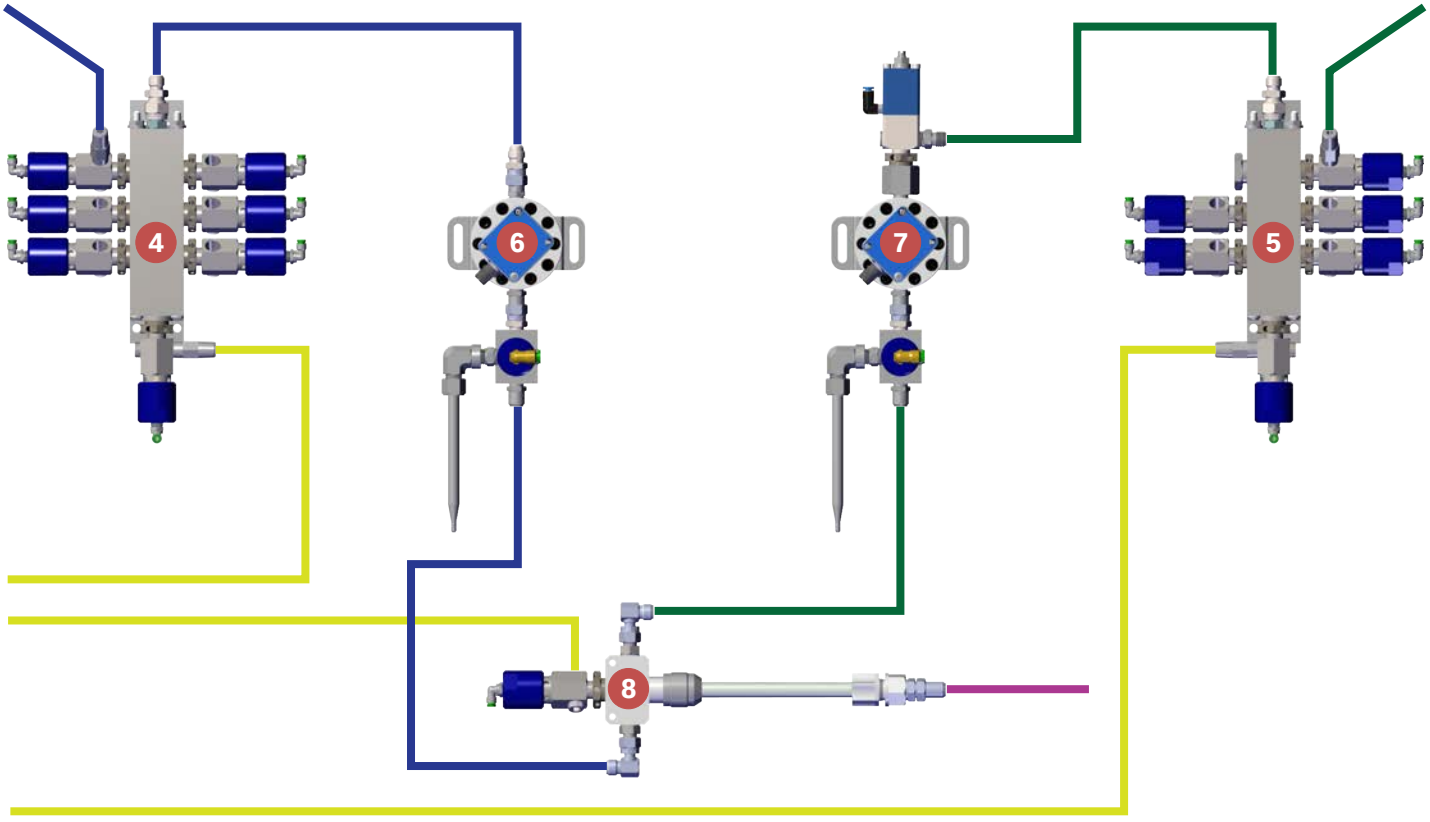


## RF2 MANUAL SYSTEM CONFIGURATION

- ***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



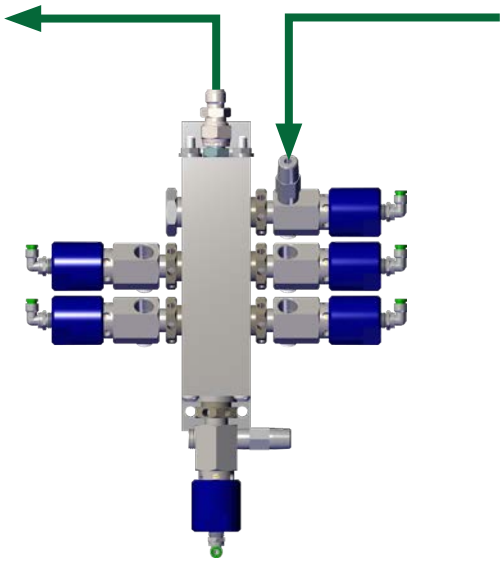
## THEORY OF OPERATION

The RF2's operating principle is as follows:

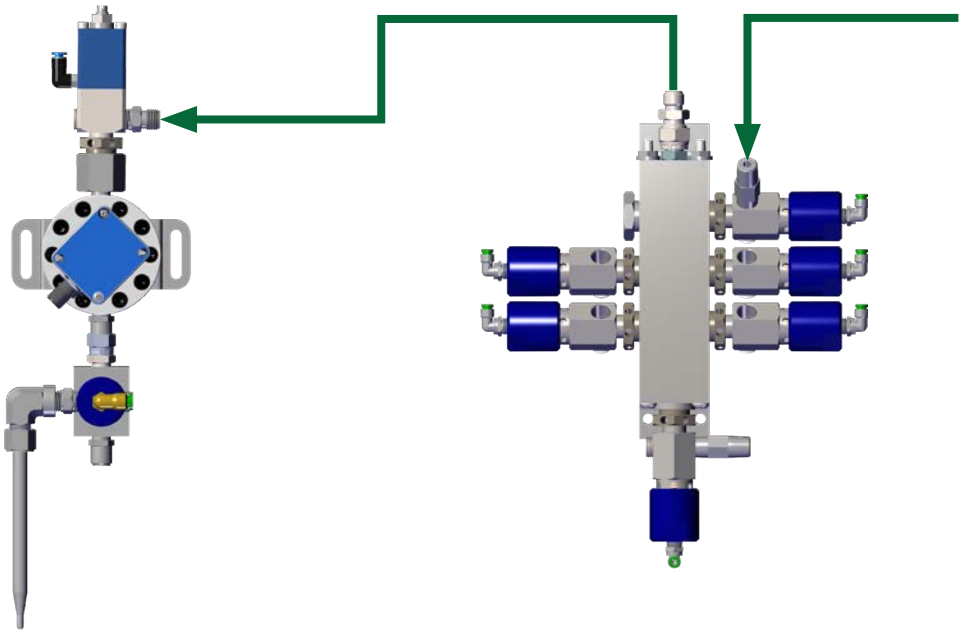
In RF2 manual gun configurations with a pulse valve channel type for the B and/or C components, fluid from the hardener or reducer channels is "dosed" into the mixture in order to accurately control the material ratio. The rate of pulsing and length of each pulse of fluid is regulated in order to achieve the desired ratio.

For optimal performance, the pulse valve will operate at 3Hz rate of fire, and all adjustments by the controller will be through varying the length of each pulse. To achieve this, adjust the pulse valve so the flow through the valve when it is open is at 3Hz rate. Further instructions for adjusting the pulse valve are:

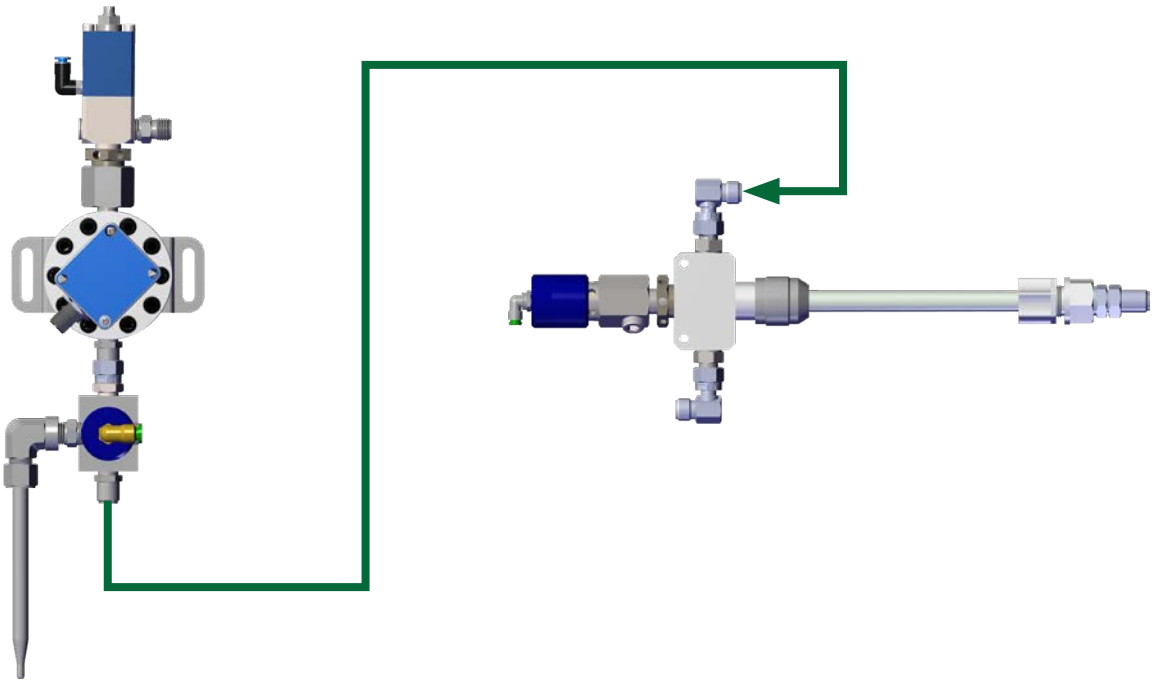
1. The material is fed through the hoses towards the material valves in each stack.
2. If multiple materials of the same type (Resin, Hardener, or Reducer) are used, each valve will control its flow separately.



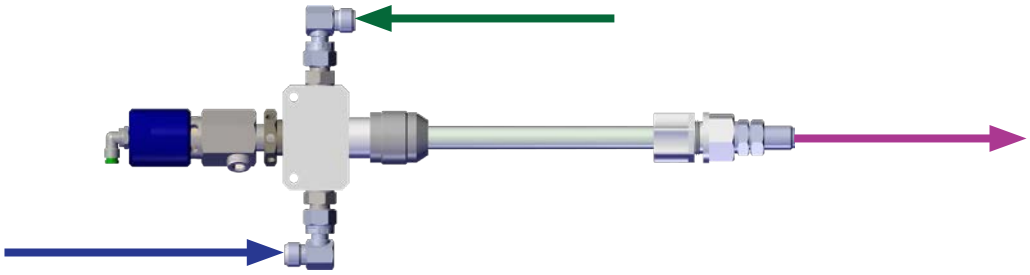
3. The material valves are normally closed. When material flow is needed, the system controller opens the valve via the solenoid addressed to it.



4. The material flows from the valve to the flow meter.
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 pulse valve, 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.

**Page is intentionally left blank.**

# INTRODUCTION—MANUAL w/DISPENSE PUMP

The IntelliFlow 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 38 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.

Control and positioning of the dispense pump is precise. An electronically controlled stepper motor with integral linear actuator allow for dispense from 2 cc to 600 cc per minute depending on the chosen dispense pump size.

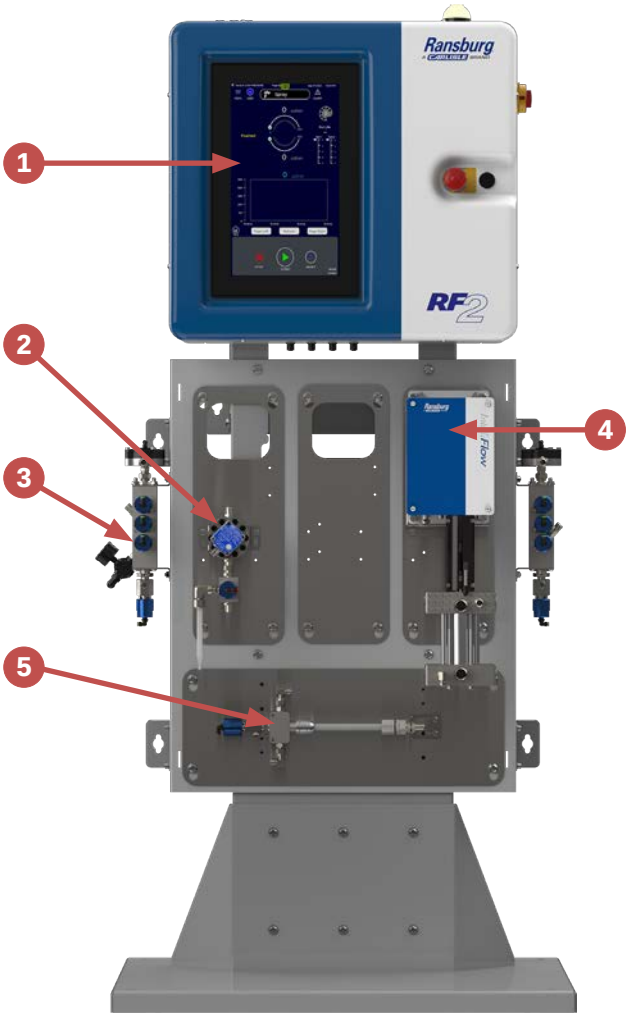
The RF2 can be operated locally, from its included 15-inch touch screen, or it can be easily integrated into an automated process by use of discrete signals for simple systems or by multiple different industrial fieldbus protocols for more advanced control.

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. Fluid Control Module
3. Valve Stacks
4. Dispense Pump
5. Mixing Module



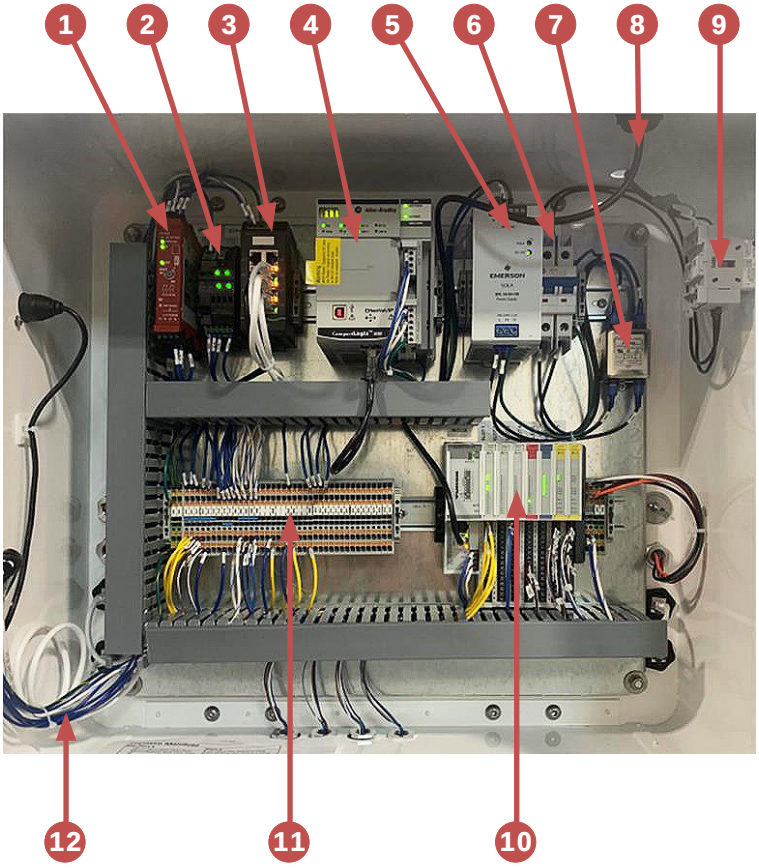
## CONTROL PANEL

### External Components

1. Status Light
2. Main Power Entry
3. Main Power Disconnect Switch
4. Panel Opening Latch
5. Emergency Stop Button
6. HMI

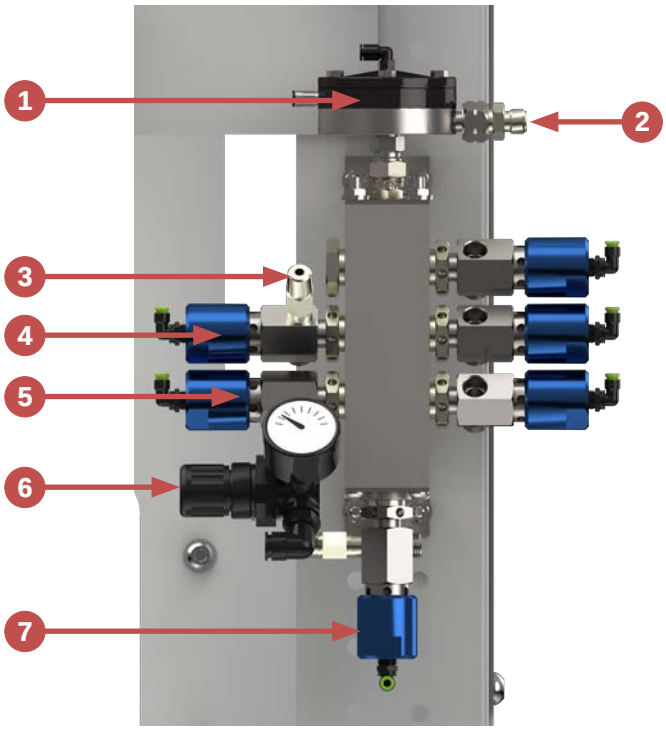

### Internal Components

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. Status Light Connection
9. Main Power Disconnect Switch Connector
10. I/O Block & Terminals
11. Terminal Blocks
12. HMI & E-Stop Button Connection



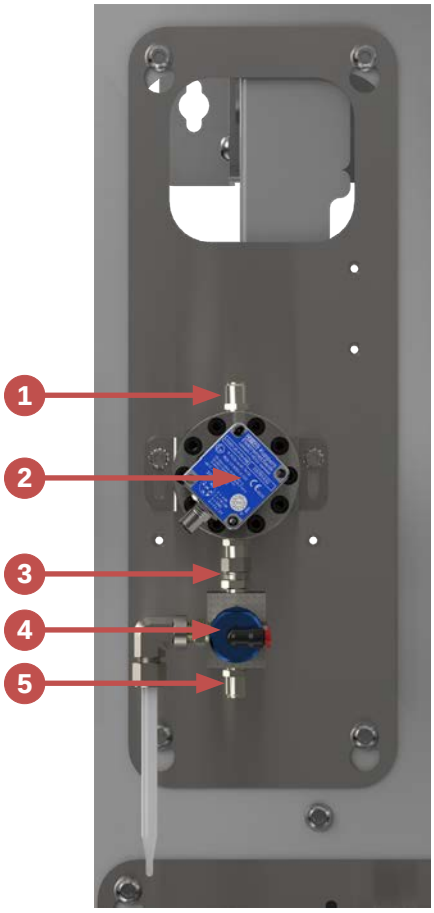
## FLUID COMPONENTS

### Valve Stack




1. Fluid Pressure Regulator (Optional)
2 Fluid Panel Connection
3. Solenoids Connection
4. Fluid Valves
5. Air Push Valve
6. Air Regulator
7. Solvent Flush Valve

### Flow Control Module

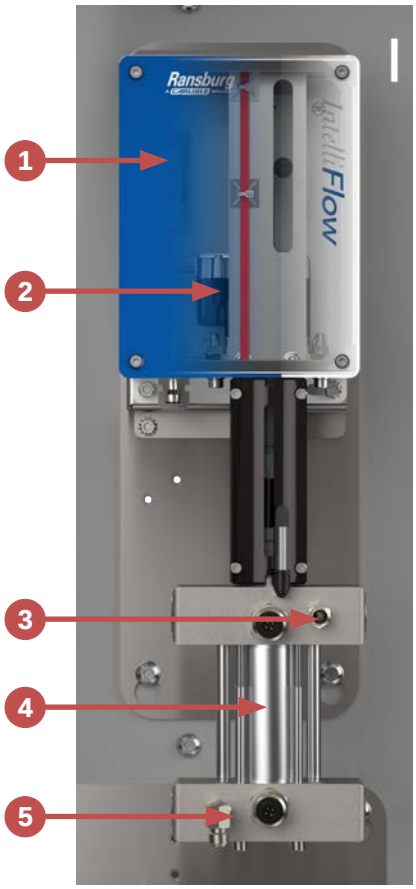



Component A

1. Valve Stack Connection
2. Flow Meter
3. Control Panel Connection
4. Calibration Block
5. Mix Module Connection

## Dispense Pump Assembly

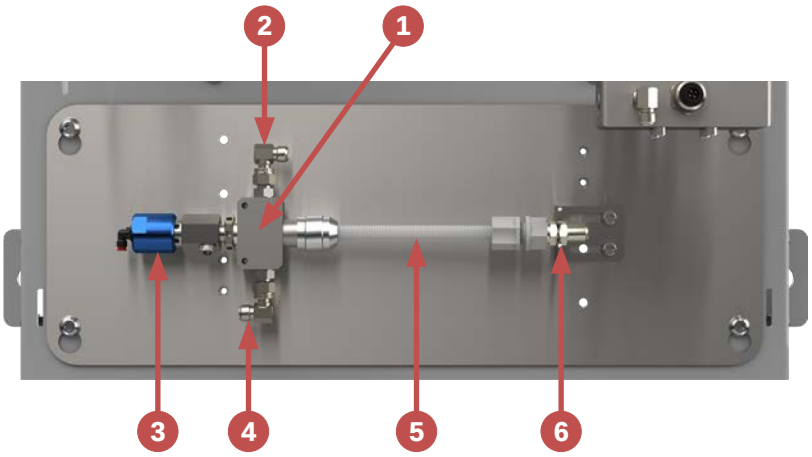
1. Dispense Pump Enclosure
2. Linear Actuator Assembly
3. Material Outlet Connection
4. Dispense Pump (300 cc or 600 cc)
5. Material Inlet Connection




Component B

## Mix Module

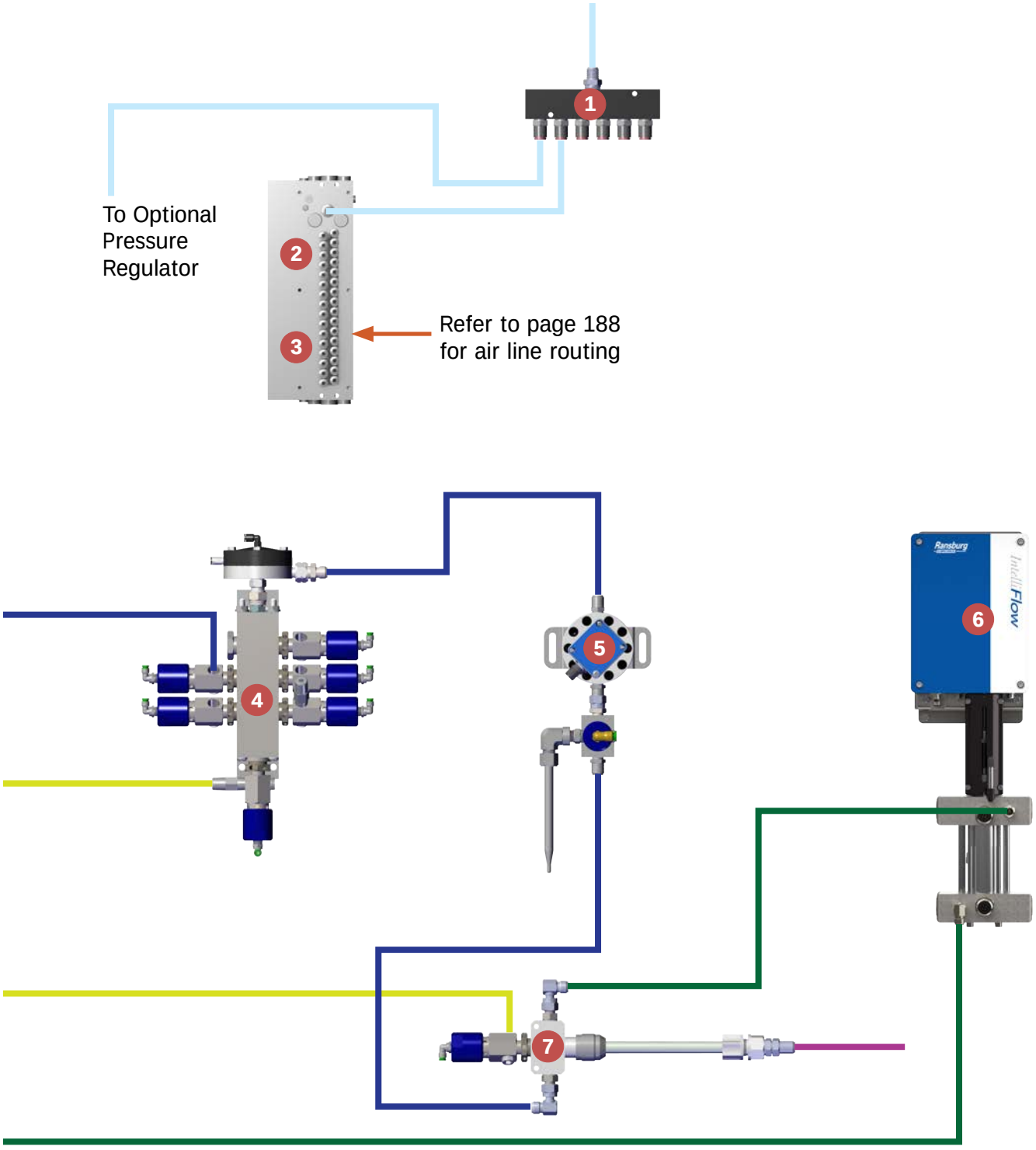
1. Mix Block
2. Flow Control Module A Connection
3. Flush Valve
4. Dispense Pump Connection
5. Static Mix Tube
6. Gun Connection



## RF2 MANUAL SYSTEM w/DISPENSE PUMP CONFIGURATION

- ***Air Hosing***
- ***Solvent Hosing***
- ***Material A Lines***
- ***Material B Lines***
- ***Mixed Material Lines***

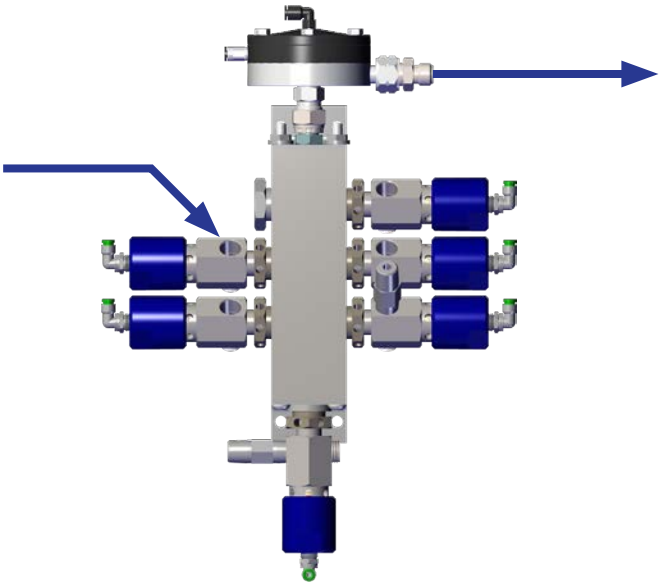
1. Air Manifold
2. Valve Stack Solenoid Manifold
3. Pressure Solenoid Manifold
4. Material A Valve Stack
5. Material A Fluid Panel
6. Dispense Pump
7. Mix Chamber



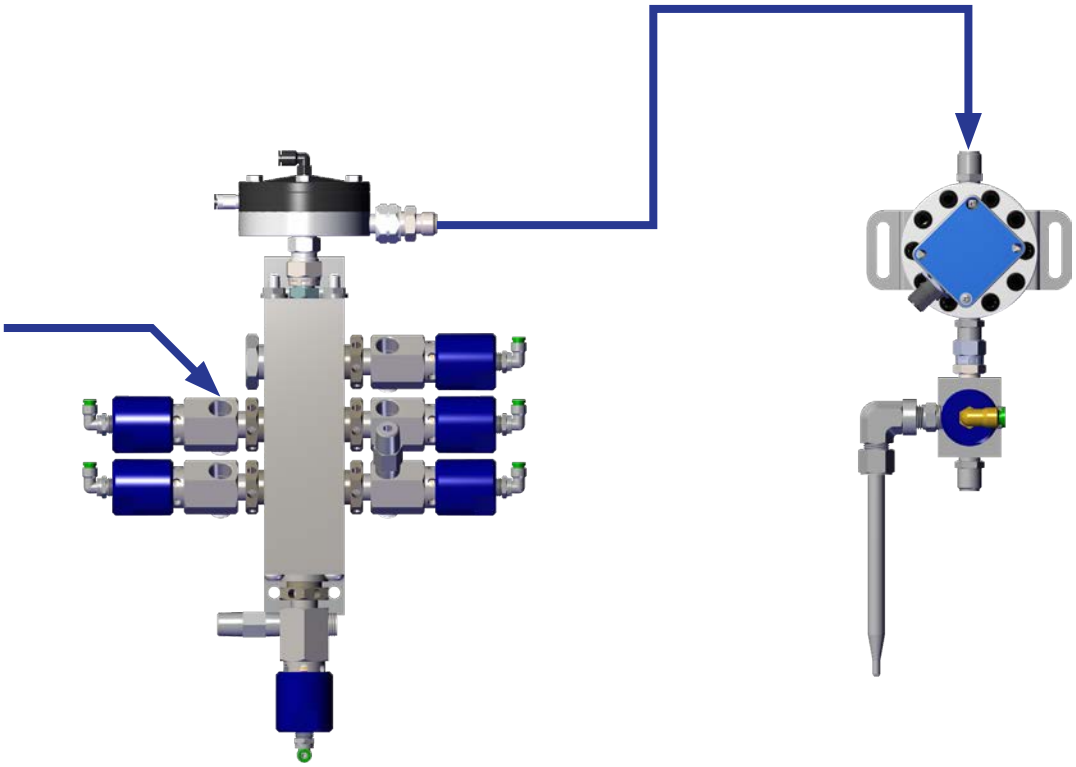
## THEORY OF OPERATION

The RF2's operating principle is as follows:

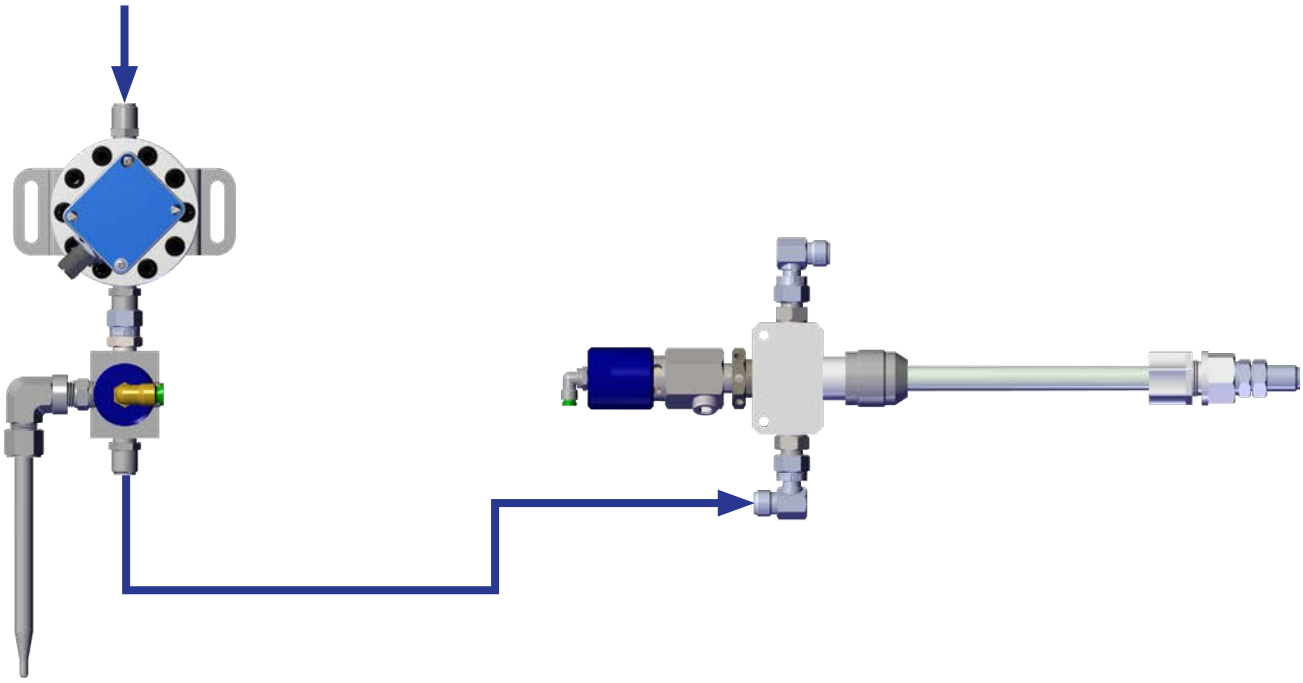
1. The material is fed through the hoses towards the A material valves in each stack.
2. If multiple materials of the same type (Resin, Hardener, or Reducer) are used, each valve will control its flow separately.



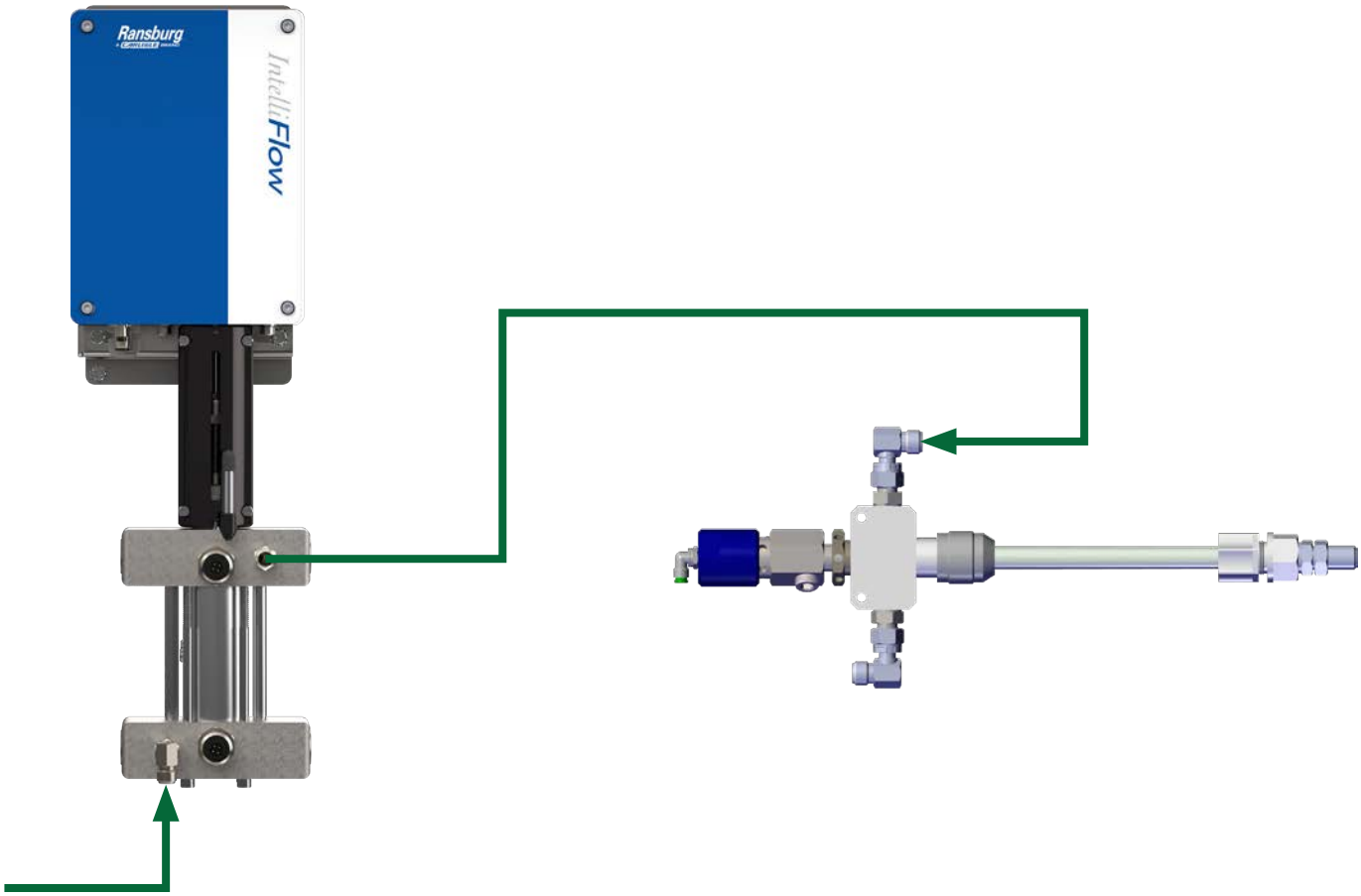
3. The A material valves are normally closed. When material flow is needed, the system controller opens the valve via the solenoid addressed to it.



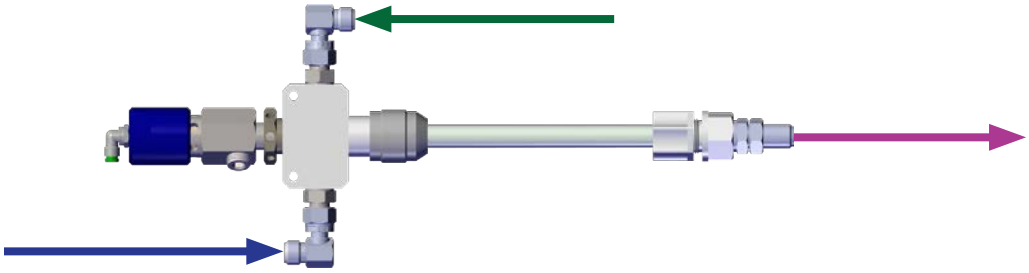
4. The material flows from the valves to the flow control module.
5. The flow meter sends a signal to the control panel to indicate the material's current flow rate.
6. The control panel determines if the flow rate is within specification.
7. The control panel increases or decreases the flow rate of material passed through the MVR until it reaches the desired value.



8. The material flows into the dispense pump from the B material supply.




9. The material flows to the mix manifold where it combines with the second and/or third material.



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

# INTRODUCTION

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 the 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 either (1) discrete signals that are assigned to pneumatic solenoids (up to 128 can be controlled by the RF2 via four separate manifolds) or (2) hardwired digital signals.

Outputs can be configured as several types:

- Color Valve (CCV)–used on a material stack to select different materials. Each CCV output has a number associated with it for the valve number on the color stack.
- Dump–output is used as a dump, which operates much like a trigger. The system expects flow when this is active.
- Flow Control Pulse–used as a flow control method for manual configurations that use a pulsing channel.
- Dispense Pump–dispenses an electronically controlled and precise flow of fluid controlled by a stepper motor with an integrated linear actuator.
- 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.

Assigned to a specific channel.

- Flow Test–used by each channel as an automated calibration port.
- 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. The flow control functionality is stopped.
- Material Select–used on a mix manifold to allow or disallow a material channel from entering the mixed section.
- Pass Through–allows the user to assign a solenoid to a user-defined input, basically giving direct control of the solenoid to external processes.
- Sequence–output used in flush, load, and other fluid sequences.
- Standard–output is active during a sequence but has no particular effect on flow control (examples are solvent and air valves).
- Trigger–starts an applicator
- Unused

## 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.
- Unlatch–opposite of latch example: when the function is activated during a fluid sequence, the output assigned to the process 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 RF2 controller can handle up to four channels.

Channels have multiple possible configurations – options include:

**Flow Control Type**

1. MVR–the channel uses a 0-100psi pressure pilot signal to control an MVR (Material Volume Regulator) to control flow.
2. DR1–the channel uses a 0-100psi pressure pilot signal to control a DR1 pressure regulator to actuate flow.
3. Gear Pump (Future)–the channel uses a gear-pump to actuate flow.
4. Pulse–for manual slave channels only–the channel uses a pulsing valve to regulate the ratio of the mixture–note in manual applications, flow control is carried out by the handgun.
5. Dispense Pump– the channel uses the dispense pump to actuate flow.
6. Feedback Only (Future)–for manual master channels only–no flow regulator is used.

**Feedback Type**

1. Square Wave–a flow meter that produces a quadrature signal is used for reading flow.

**Inlet Pressure Regulation**

1. 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, 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**

1. Unused, 1K, 2K, 3K.

**Control Type**

1. Automatic–an automatic gun is used triggered by an external request of some type. Flow and ratio are controlled.
2. Manual Pulse–a manual gun is controlled using pulse channels to modulate the secondary materials. Only ratio is controlled.

The RF2 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. There can only be two 2k mixers, but there can be 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 to make it a two-applicator controller.

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

RF2 - # # #- # #- # #- #

| Pressure | Automatic/ Manual | Mixing Type | Material A | Material B | Material Compatability |
|---|---|---|---|---|---|
| **L=Low Pressure** | **A=Automatic** | **1=1K** | **1=1 Color (no color valves)** | **1=1 Color (no color valves)** | **S=Standard** |
| **H=High Pressure** | **M=Manual** | **2=2K** | **4=4 Color valves** | **4=4 Color valves** | **C=Isocyanate** |
| NOTE: Use of the Coriolis derates the machine pressure rating to 2900 psi. | | | **7=7 Color valves** | **7=7 Color valves** | |
| | | | **12=12 Color valves** | **12=12 Color valves** | |
| | | | | **DP=Dispense Pump** | |

## TECHNICAL SPECIFICATIONS—MATERIAL A/B VALVE COLOR STACKS

| ITEM | DETAILS |
|---|---|
| Dimensions | Main control console: 24"x 24"x 10"<br>Pneumatic interface panel: 24"x 12"x 9" |
| Weight | 150-250 lb (Depending on added components) |
| Operating temperature | 40˚F to 122˚F (5-50˚C) inside enclosures<br>100˚F (38˚C) maximum ambient temperature |
| Operating humidity | 5% to 85% RH (non condensing) |
| Environmental conditions | Indoor use, pollution degree 2, installation category II |
| 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 | 85-264 VAC<br>0.8A @ 115 VAC, 0.4A @ 230 VAC |
| 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 flow meter 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 10 ms |
| Recipe tables | 250 per station (2 stations available) |
| Wetted parts | 300 & 400 series stainless steel, PTFE, perfluoroelastomer, UHMW polyethylene |

## TECHNICAL SPECIFICATIONS-MATERIAL A COLOR STACK w/DISPENSE PUMP

| ITEM | DETAILS |
|---|---|
| Dimensions | Main control console: 24"x 24"x 10"<br>Pneumatic interface panel: 24"x 12"x 9" |
| Weight | 150-250 lb (Depending on added components) |
| Operating temperature | 40˚F to 122˚F (5-50˚C) inside enclosures<br>100˚F (38˚C) maximum ambient temperature |
| Operating humidity | 5% to 85% RH (non condensing) |
| Environmental conditions | Indoor use, pollution degree 2, installation category II |
| 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 | 85-264 VAC<br>0.8A @ 115 VAC, 0.4A @ 230 VAC |
| 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 flow meter 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 10 ms |
| 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 multiple configurations 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:
    1. 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.
    2. Flush All–programmable sequence number that is run when a "purge all" command is given.
    3. This occurs when a new material is loaded, requiring either a change in catalyst or reducer.
    4. 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 apply to the gun or mixers that are used by the selected station

- 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 no flow command is given by either fieldbus signal or analog input, this flow will be used.
- Sequence High Flow Rate–optional higher flow rate for when "Max Flow" system output is active.
- Flow Rate Tolerance–the percentage error in flow rate for the gun/mixer or any of its channels that is tolerable.
- Flow Rate Tolerance Time–the amount of time that 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 the ratio is measured over before producing a ratio alarm.

## Channel–parameters applied to individual fluid channels used by the selected mixer

- Flow Calibration:
  1. For quadrature flow meters–the number of pulses per liter. There are four pulses per flow- meter cycle, so if a flow meter is rated for 14000 cycles / liter, the pulses per liter = 56000.
  2. For analog flow meters–given in a simple scaling (In High, In Low, Scaled High, Scaled Low)
  3. 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:
  1. 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.
  2. 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.
  3. 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.
  4. For C-band and I-band, a setting of 5-6 will suffice for higher flow rate channels. 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 10 psi is used. Weeping MVRs use a value closer to 20 psi.
- 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.
- Blowoff Time–for manual guns only, this time elapses as the gun trigger is detected (through installed air-flow switches utilizing the Manual Gun/Flux Box interface kit). If the set time elapses before flow is detected, a "No Master Pulses" alarm will occur.
- 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 "spray-shutdown" alarms that 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–defines the description, function type, outputs acted upon. Sequences which use the function are defined here. See more about configuring the fluid system below.
- Sequence–defines the description, whether the sequence is used or not in the system, and global times for "chop air" and "chop solvent." See more about configuring the fluid system below.
- Sequences–defines 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 Unit–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 Flow Meter: 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.
- Local Control: Allows individual functions and solenoid valves to be controlled manually.

# INSTALLATION

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

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.

**⚠ WARNING**

Before making electrical, air, and fluid connections to the RF2, be sure to understand and verify all requirements for installation, including but not limited to: electrical codes, OSHA and NFPA requirements, and all applicable local codes and ordinances.

Read and understand all operating manuals for connected equipment. Do not supply RF2 with higher fluid or air pressures than recommended in the technical specifications section of this manual.

**⚠ WARNING**

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

**⚠ WARNING**

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

**⚠ WARNING**

The equipment is only to be used in the manner specified. If not used in the specified manner the protection provided by the equipment may be impaired.

**⚠ WARNING**

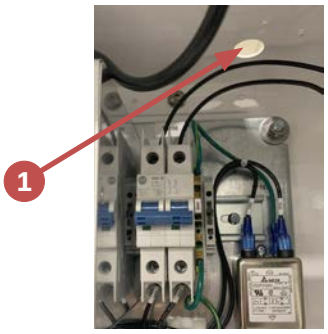
Do not replace the detachable main supply power cord with inadequately rated cords.

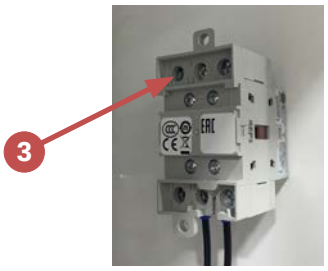
**⚠ WARNING**

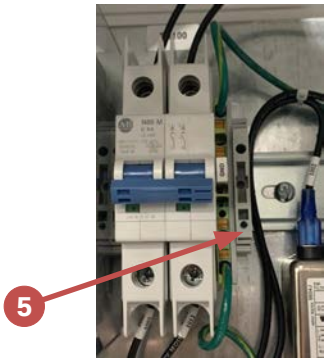
This equipment is intended to be installed outside of classified hazardous areas. There are accessories for this equipment (sold separately) to allow devices such as flowmeters to be installed within the hazardous zone; this should only be done following the instructions provided with those accessories.

## Process

1. Locate the main power entry in the upper right section of the cabinet.
2. Use a plug and insert a wire sized at 16 gauge (minimum) to 10 gauge (maximum) into the slot.
3. Locate the disconnect switch connector inside of the control panel.
4. With a wire, connect the L1 and N lines to the top lugs opposite their secondary connections.
5. Connect a ground wire to the ground block inside the cabinet.




***NOTICE***

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

## PNEUMATICS

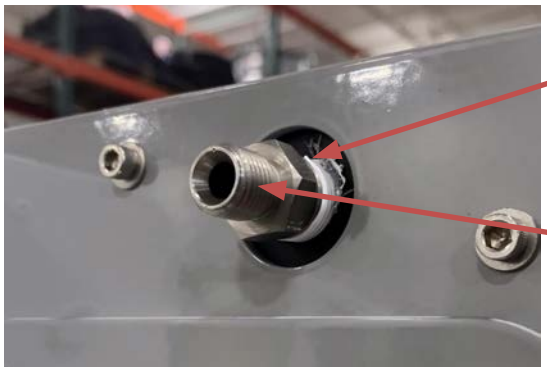
For convenience, all necessary air input connections are centralized in a single manifold, so that incoming air pressure can be managed in one place.

**Always use clean, dry air to operate the RF2.**

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

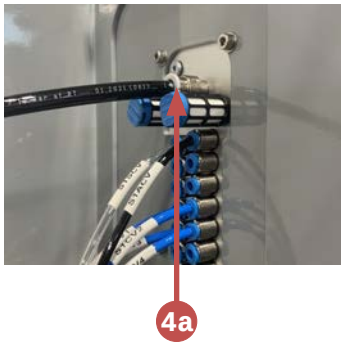
### Pneumatic Connections

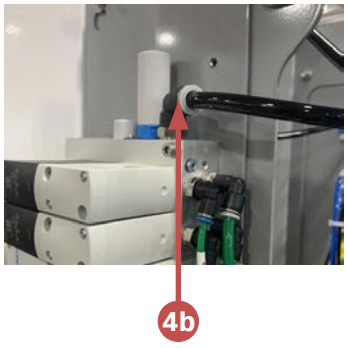
1. Locate the air manifold inlet connection at the topright corner of the system chassis.
2. Attach a 3/8" main air line with 1/4" NPS swivel connection to the main air inlet.

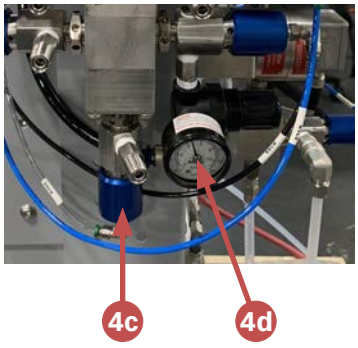



**The following steps may have been completed by the factory before shipment.**

3. On the opposite side of the air inlet, locate the manifold fittings for the interconnected air tubing.
4. 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.

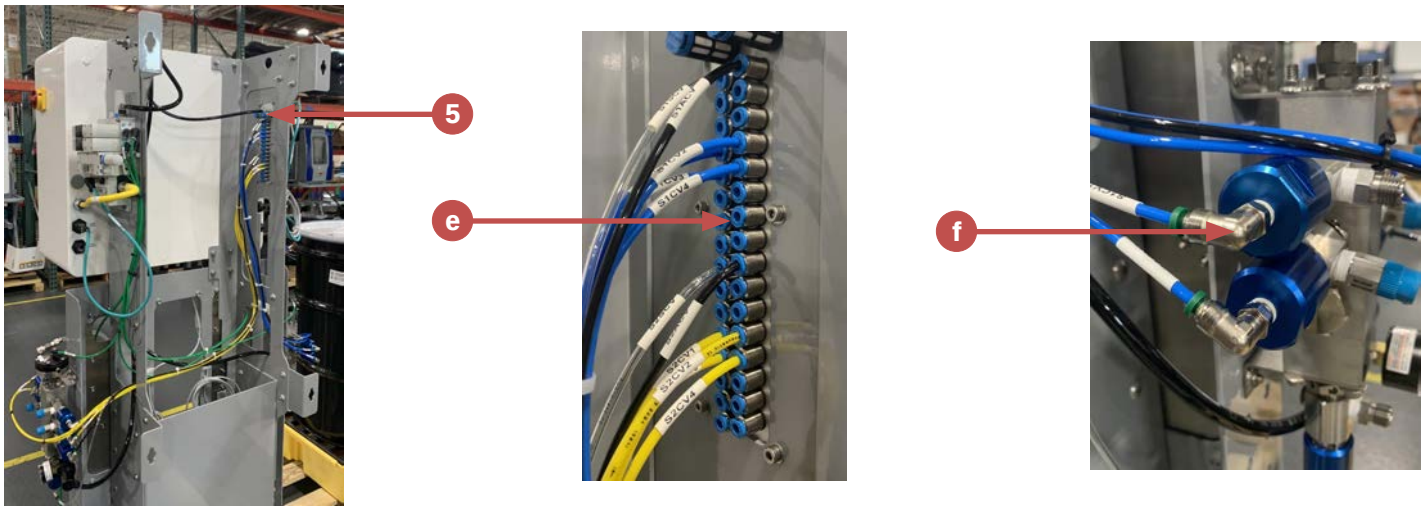



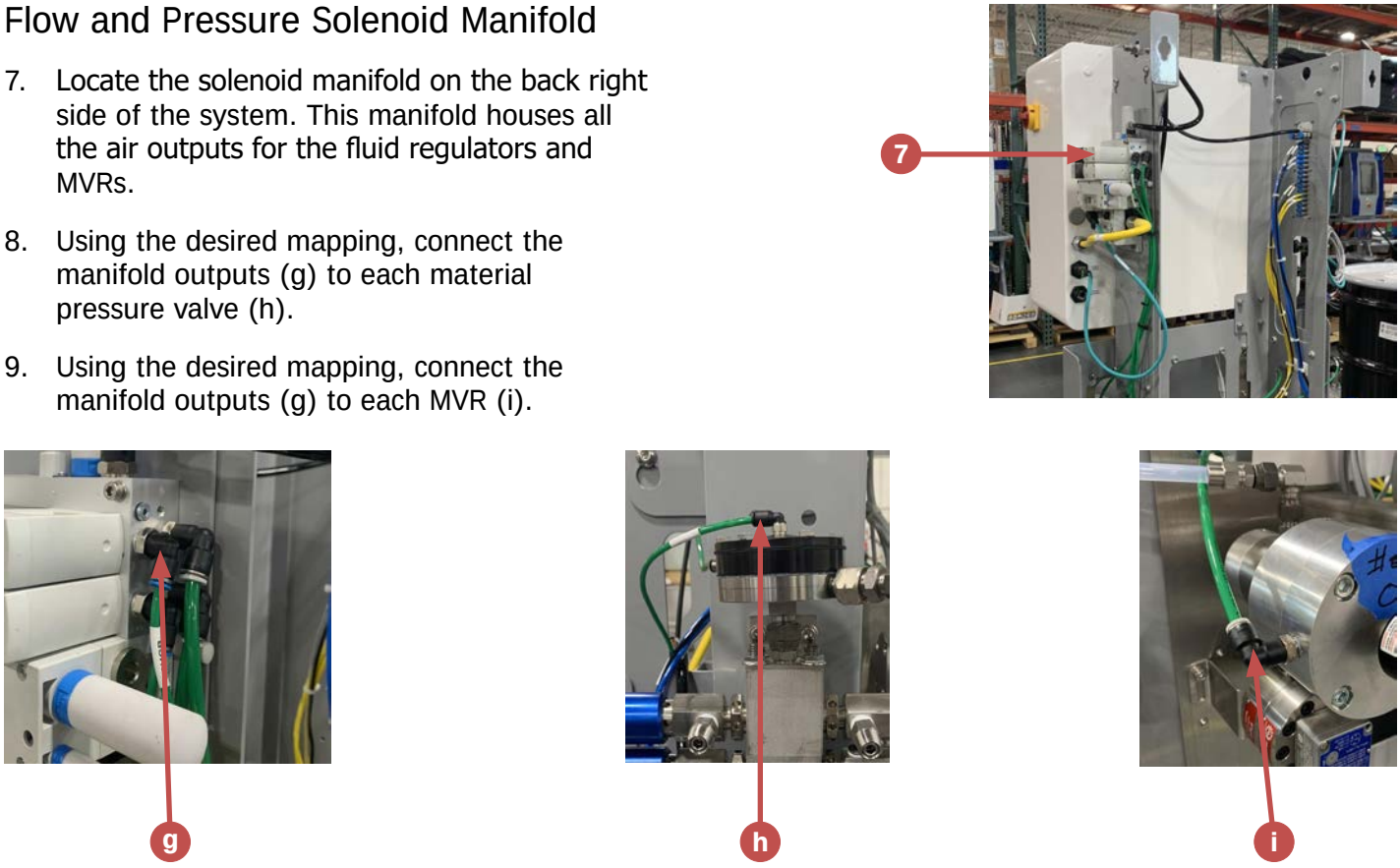
## Resin and Catalyst Solenoid Manifold and Valve Stacks

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).

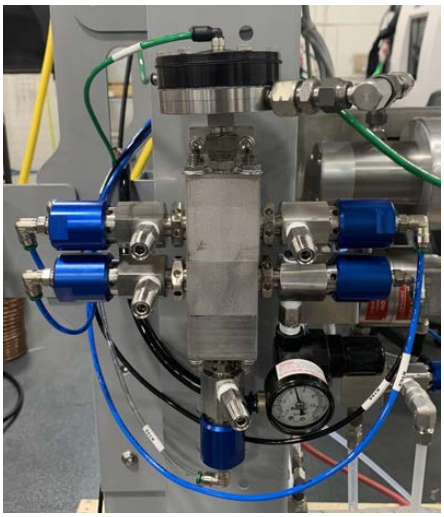


## PAINT MATERIALS

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

*One stack configuration*

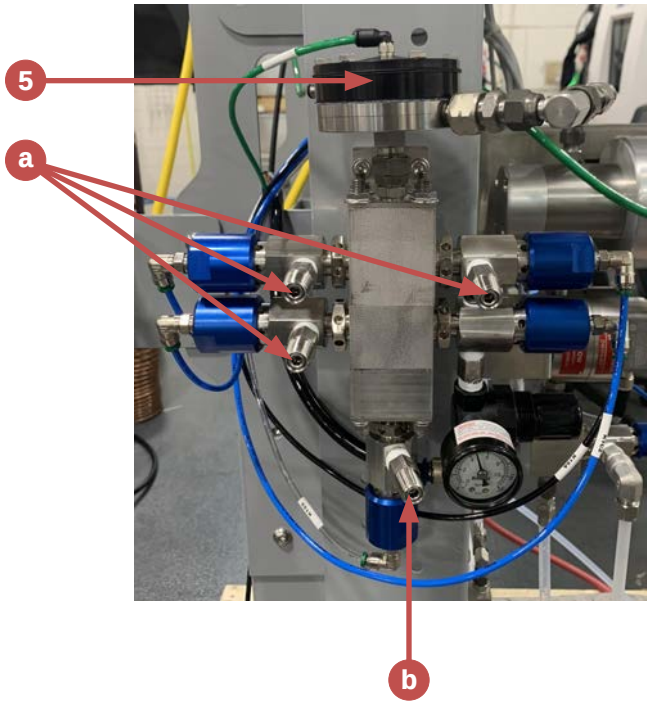


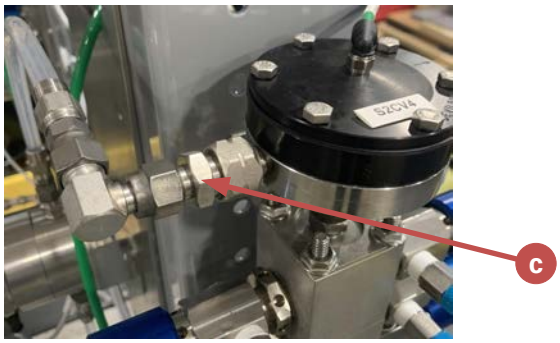
*Two stack configuration*

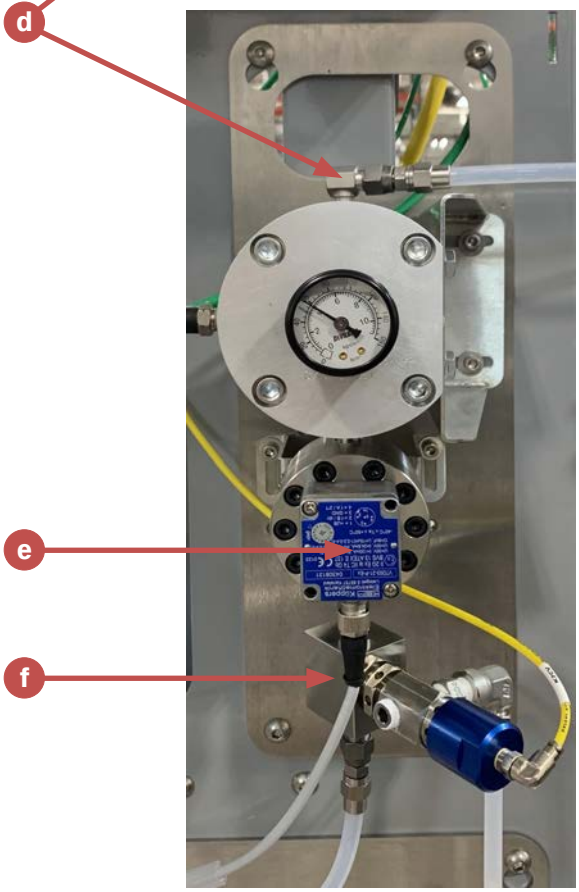
1. Locate the valve stack you want to connect.

   Either side of the system can have two different stacks with one above the other.

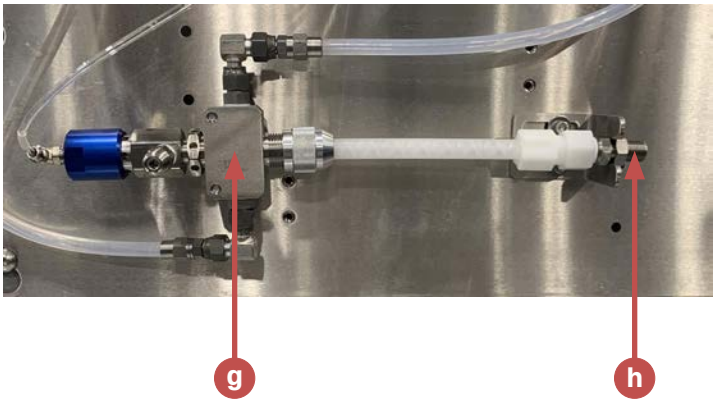
2. Locate each of the material input connections on each valve on the stack (a).
3. Connect your material supply to the material input connection according to your desired mapping. Be careful not to mix different kinds of materials into the same stack. Each material (Resin, Catalyst and Reducer) must 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).



# INSTALLATION OF AIR CUT OFF KIT

The air cut off (ACO) kit is installed when the RF2 system is to be used in manual mode. The ACO kit can be used in conjunction with a gun flush box or on its own. The functions of the ACO kit are (1) to control air flow to prevent solvent atomization when using the flush box and (2) to sense air flow through the gun and send a trigger signal to the controller to enable material flow.

The air cut off kit is capable of controlling the air flow for two guns. The first set of connections, labeled with a 1 on the ACO box, is for gun one. The second set, labeled 2, is for gun two. Installing the second set of connections is unnecessary if only using one gun.

The box consists of three main components:

1. Air cut off valves: disable air flow to the guns when flushing them.
2. Flow switches: used to sense when the operator has opened the spray applicator. The trigger signal is fed to the system controller to enable material flow.
3. Gun-in-box (GIB) pressure switches: used in conjunction with the flush box. They send a signal to the controller when the flush box is closed and the gun is ready for flushing.

## Possible Configurations for Air Cut Off Kit

- 310-3905-S0 (for one gun at standard air flowrate)
- 310-3905-L0 (for one gun at low-volume air flowrate)
- 310-3905-LL (for two guns at low-volume air flowrate)
- 310-3905-SS (for two gun at standard air flowrate)
- 310-3905-SL (for two gun, one at standard and one at low-volume air flowrate)

## Parts Included

1. Air cut off box
2. Air cut off valves and associated fittings
3. 10 ft of 5/32" pneumatic tubing per gun
4. 10 m of M12 cable

## ACO Connections

a. GIB1 (Gun-in-box pressure switch for gun one, 5/32" or 4 mm tube)

b. GIB2 (Gun-in-box pressure switch for gun two, 5/32" or 4 mm tube)

c. M12 cable to controller

d. ACO valve signal gun 1 (5/32" or 4 mm tube)

e. ACO valve signal gun 2 (5/32" or 4 mm tube)

f. Atomization air connection to gun 1 (1/4" NPS male)

g. Atomization air connection to gun 2 (1/4" NPS male)

h. Air supply input for gun 1 (1/4" NPS male)

i. Air supply input for gun 2 (1/4' NPS male)

**⚠ WARNING**

Installation should be performed by a qualified electrician. Improper installation could create a spark, resulting in fire or explosion.

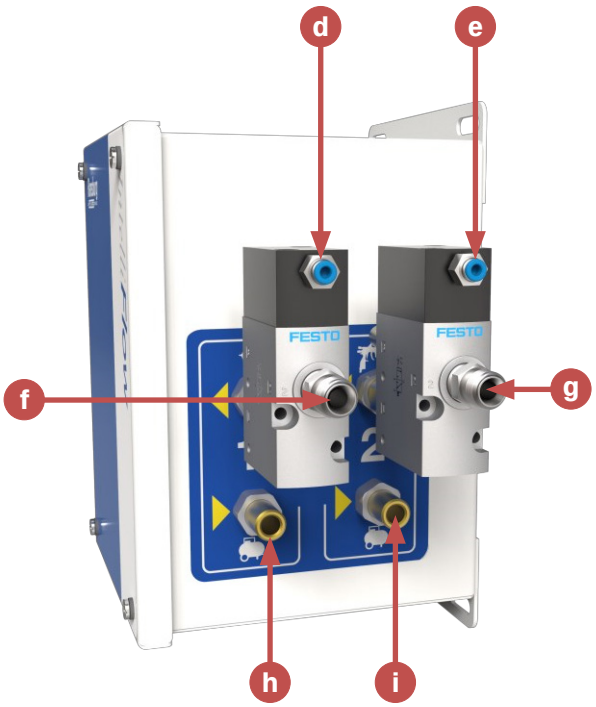
## ACO Kit Installation

1. Mount the ACO box near the RF2 controller in a non-hazardous location.
2. Next, mount the solenoid valves to the air cut off box, as shown.
3. Route 5/32" pneumatic tubing from the air cut off valve (d and e) to port 10 (trigger g1) and port 11 (trigger g2) on the RF2 solenoid outputs.
4. Connect the air supply inlet to the air supply inputs for gun one and/or gun two (h and i).
5. Connect the atomized air to the atomization air connection for gun 1 and/or gun 2 (f and g). The air supplied to the air supply input for gun one (h) will be output in the atomization air connection to gun one (f).
6. Route the M12 cable from the M12 cable connection (c) and into the RF2 enclosure either (1) through an available strain relief or (2) by replacing the hole plug with the strain relief included with the RF2 controller.

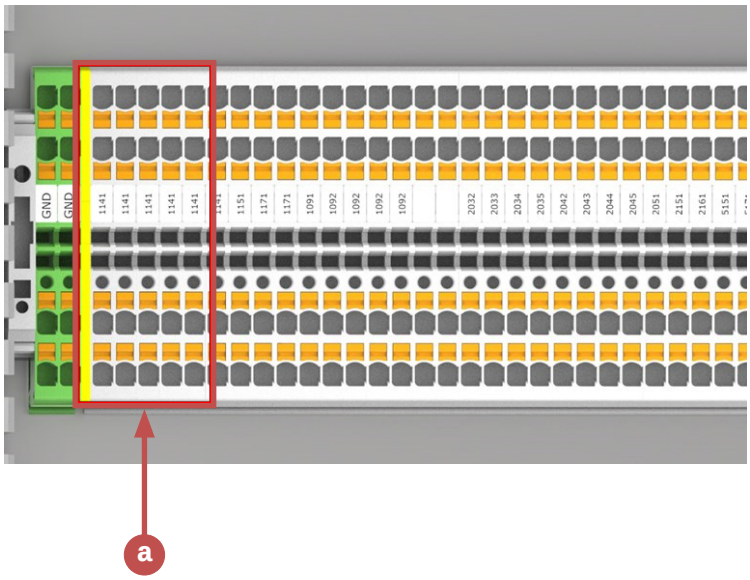
See the next page for terminal connections.

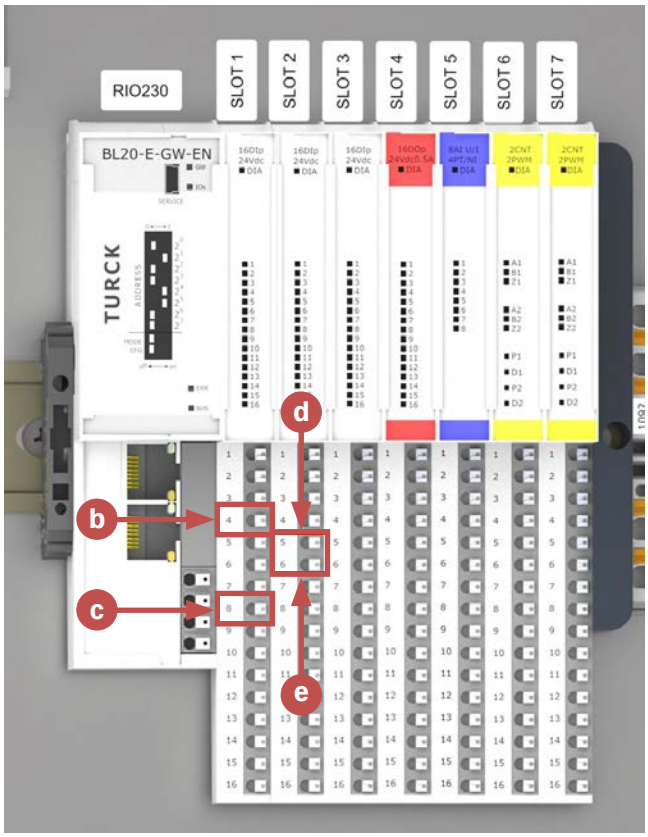
If used with a gun flush box:

7. Route 5/32" tubing from GIB 1 and 2 (a and b) to each respective gun flush box for each gun.

Once the M12 cable from the air cut off box is in the enclosure, connect it to the terminals indicated below.

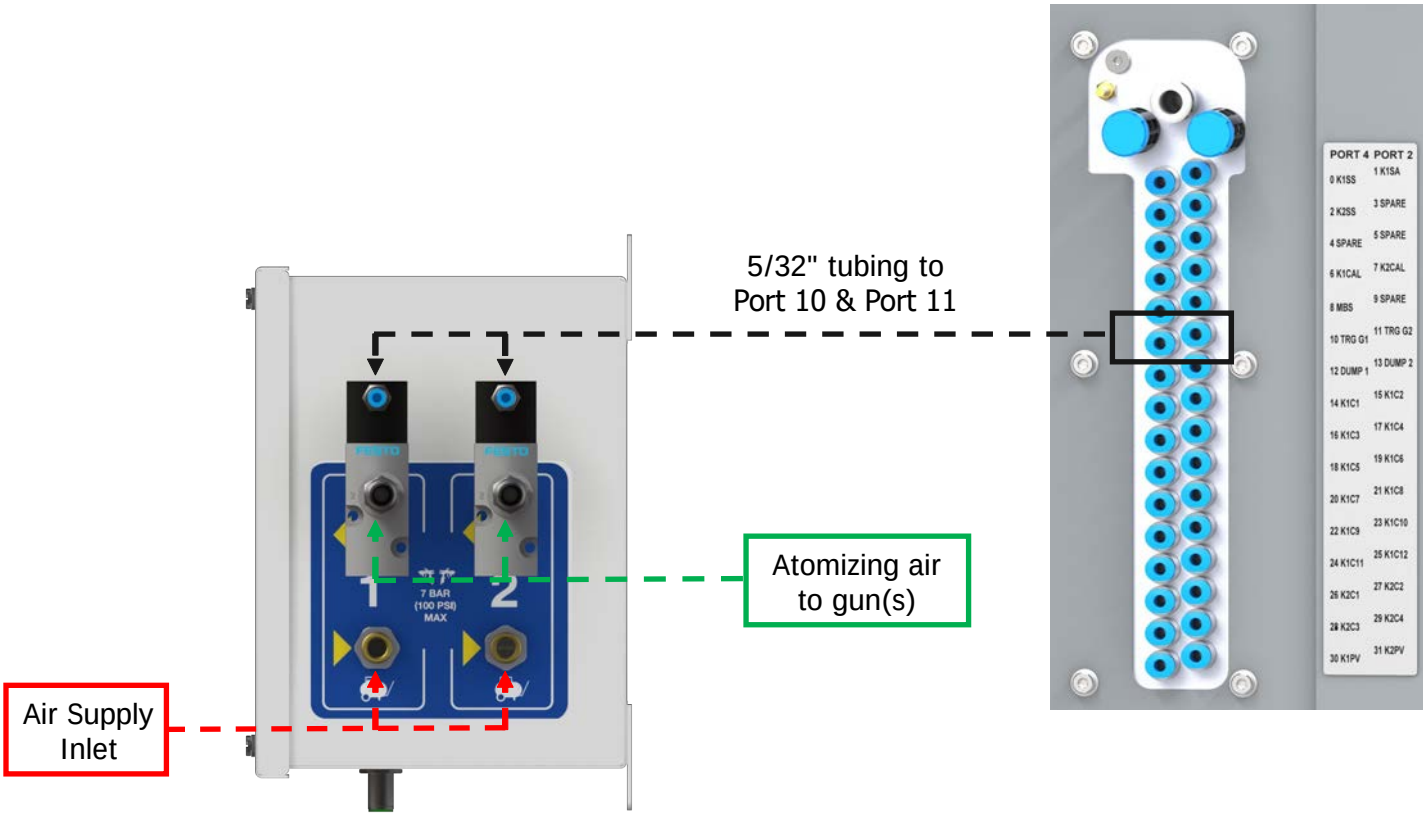


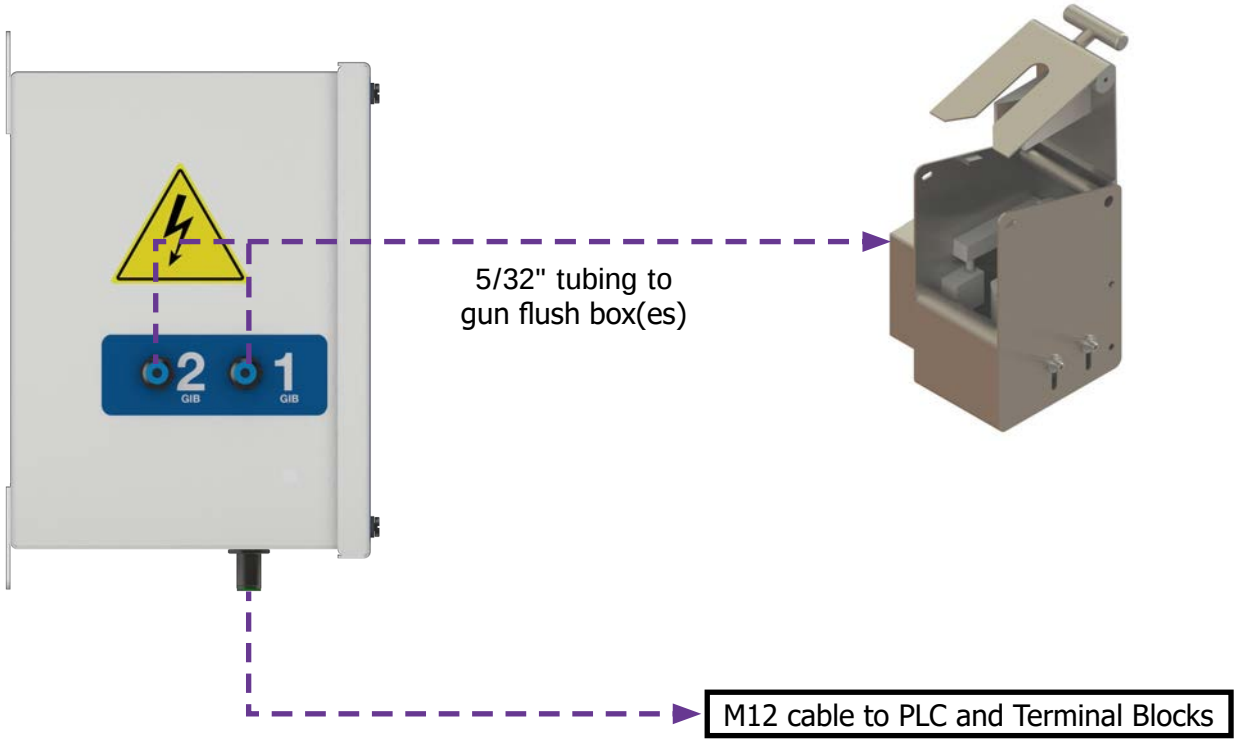




Verify the M12 cable from air cut off box to RF2 connections in the table below.

| ITEM | WIRE COLOR | SIGNAL | PLC and TERMINAL BLOCK-LANDING LOCATION |
|---|---|---|---|
| a | BROWN | 24VDC | TERMINAL BLOCK 1141 |
| b | BLUE | GUN-IN-BOX, GUN 1 | SLOT 1, PIN 4 |
| c | WHITE | GUN-IN-BOX, GUN 2 | SLOT 1, PIN 8 |
| d | GRAY | FLOW SWITCH, GUN 1 | SLOT 2, PIN 5 |
| e | BLACK | FLOW SWITCH, GUN 2 | SLOT 2, PIN 6 |

# Air Cut Off Box Connections Diagram




2
GIB
1
GIB
5/32" tubing to
gun flush box(es)
M12 cable to PLC and Terminal Blocks

## MANUAL VALVE PULSE SETUP

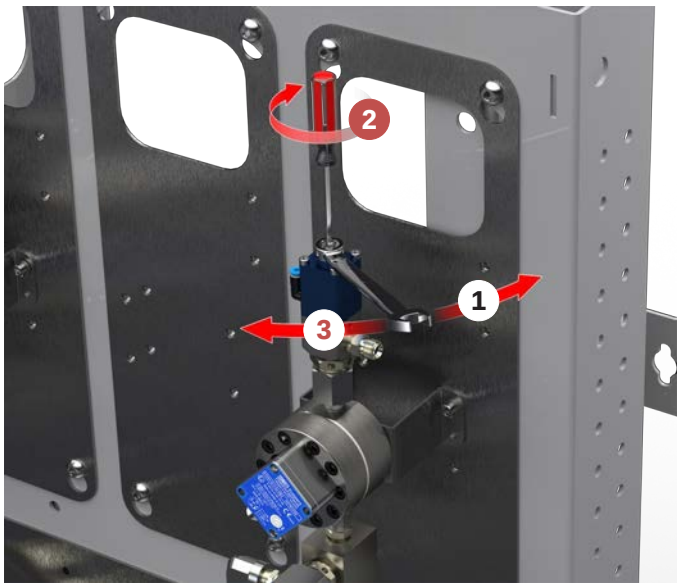
### CCV Pulse Flow Adjustment-Below Range

The correct pulse flow range is in the green zone as shown between the green arrows.

In the image shown at the right, the blue diamond shape is left of the green zone and below range.

The flow must be increased to a specified 50%. Follow the steps below to adjust the valve flow.


1. Use a 13 mm wrench and turn it counterclockwise to loosen the jam nut on the adjustment screw.
2. Turn the adjustment screw clockwise until the blue diamond moves to the center of the green zone range.
3. Turn the wrench clockwise to set the adjustment screw in position.

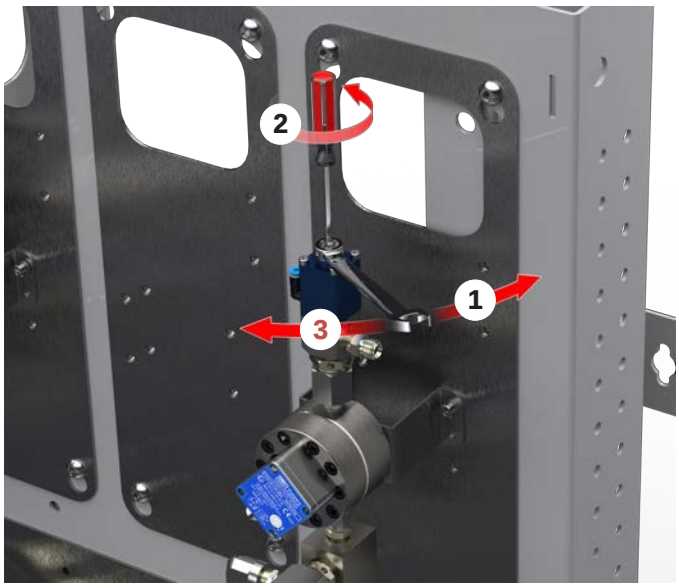


## CCV Pulse Flow Adjustment-Above Range

The correct pulse flow range is in the green zone as shown between the green arrows.

In the image shown at the right, the blue diamond shape is right of the green zone and above range. The flow must be decreased to a specified 50%. Follow the steps below to adjust the valve flow.


1. Use a 13 mm wrench and turn it counterclockwise to loosen the jam nut on the adjustment screw.
2. Turn the adjustment screw counterclockwise until the blue diamond moves to the center of the green zone range.
3. Turn the wrench clockwise to set the adjustment screw in position.

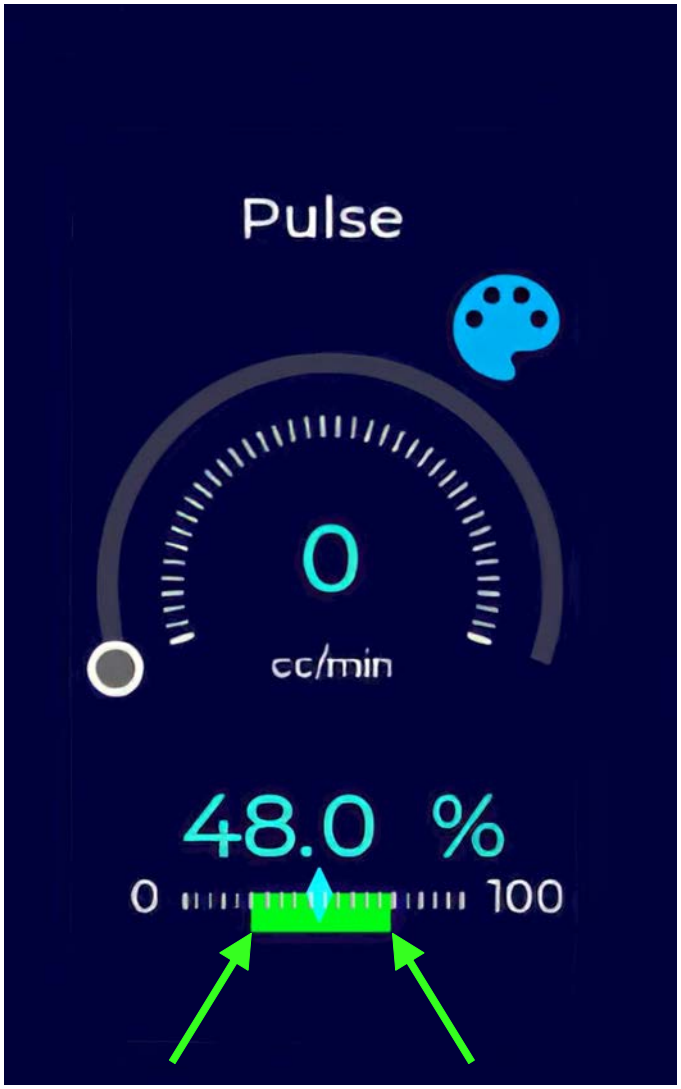


## CCV Pulse Flow Adjustment-In Range

The correct pulse flow range is in the green zone as shown between the green arrows.

In the image shown at the right, the blue diamond shape is in the center of the green zone and is in range. This is the optimal position, and no more adjustment is necessary.

To enable pulse valve flow control, go to page 2 of 4 in the System Configuration menu (discussed on manual page 109). Select "Pulse" for Channel 2.



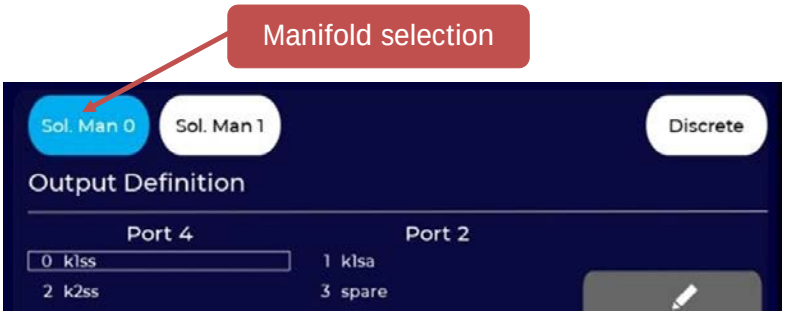
## EXTERNAL AIR CONNECTIONS

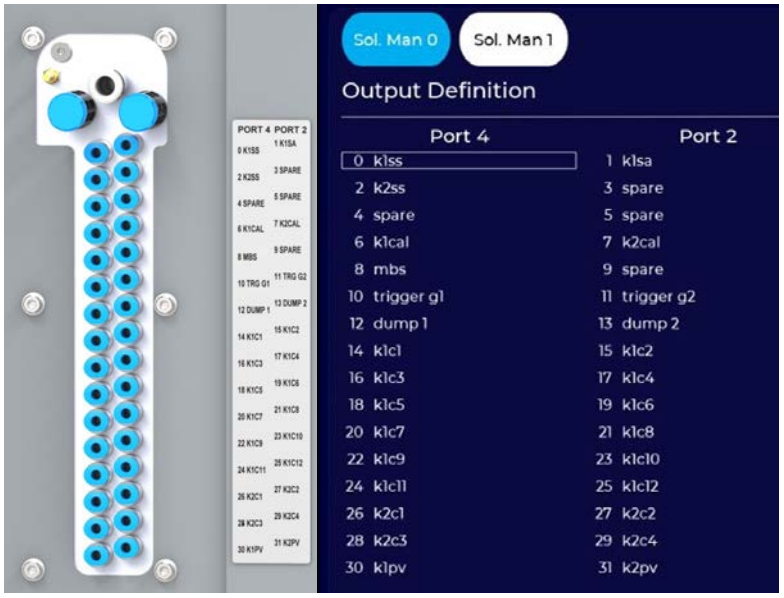
The RF2 can (and in some cases must) control air signals that are external to the RF2; these include gun trigger and dump signals. Every solenoid controlled by the RF2 is programmable, so the individual port location for any signal depends on the programmed location for that signal.

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 for more information).
2. Select the manifold (on the top of the output config menu) to view. Note the RF2 can control up to four solenoid manifolds, but in many cases the system will only be configured for one. Only manifolds that are present will be shown.
3. The list of outputs is 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.




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 in "System Configuration" and "Running the System" sections.

| CCV Output Definition Key | For example: |
|---|---|
| k = Component | k1cal = Component 1 Calibration |
| # = Channel/Component # | k1c3 = Component 1 Color 3 |
| ss = Stack Solvent | k2c3 = Component 2 Color 3 |
| sa = Stack Air | k1pv = Component 1 Pulse Valve |
| c = Color | |
| pv = Pulse Valve | |
| cal = Calibration | |
| mbs = Mix Block Solvent | |

## 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 (Discreet Wiring)

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

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.

| PIN NUMBER | 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 |

| PIN NUMBER | 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 |

| PIN NUMBER | 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) |

| PIN NUMBER | 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 |

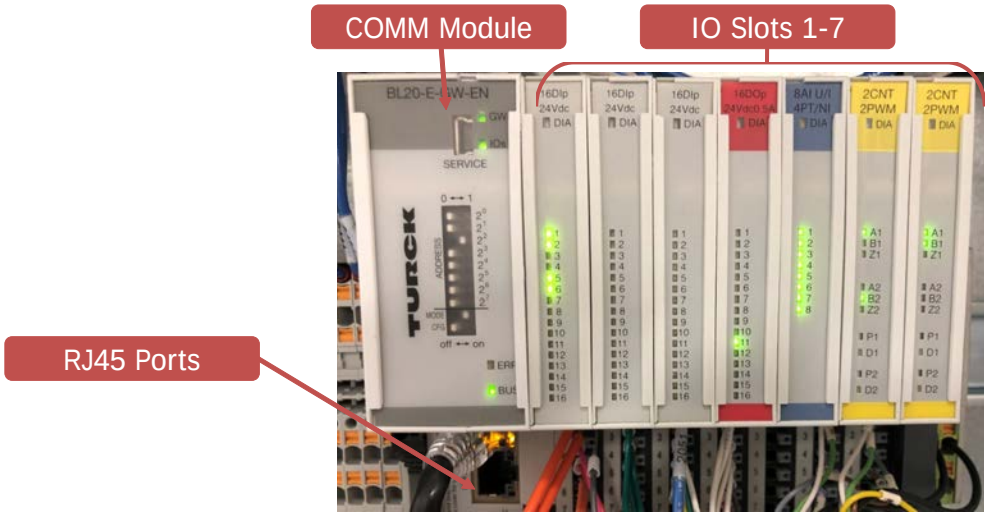
| PIN NUMBER | SLOT 5 (ANALOG INPUTS) |
|---|---|
| 1+, 2- | Programmable Analog Input #1 |
| 3+, 4- | Programmable Analog Input #2 |
| 5+, 6- | Programmable Analog Input #3 |
| 7+, 8- | Programmable Analog Input #4 |
| 9+, 10- | Programmable Analog Input #5 |
| 11+, 12- | Programmable Analog Input #6 |
| 13+, 14- | Programmable Analog Input #7 |
| 15+, 16- | Programmable Analog Input #8 |

| PIN NUMBER | SLOT 6 (HIGH-SPEED COUNTER) |
|---|---|
| 1-5 | Channel #1 Flow Meter |
| 6-10 | Channel #2 Flow Meter |

| PIN NUMBER | SLOT 7 (HIGH-SPEED COUNTER) |
|---|---|
| 1-5 | Channel #3 Flow Meter |
| 6-10 | Channel #4 Flow Meter |

## 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.

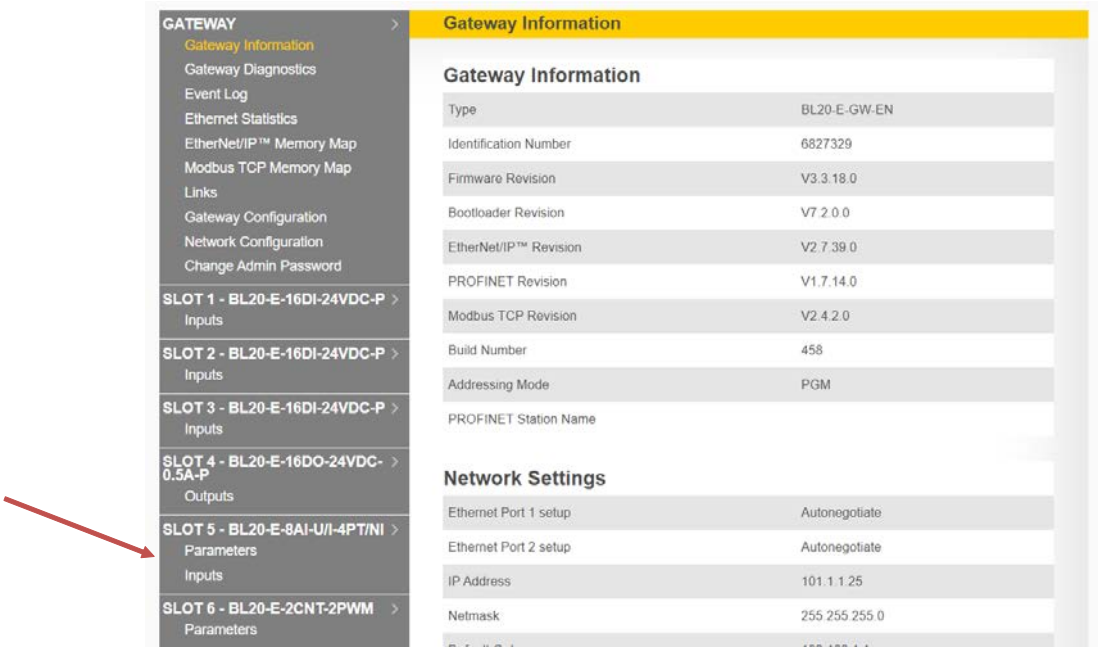
Analog Types available are:

- 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 Flow Meter (Station 1 or 2)–used as a solvent flow meter for verification of a flush, etc.

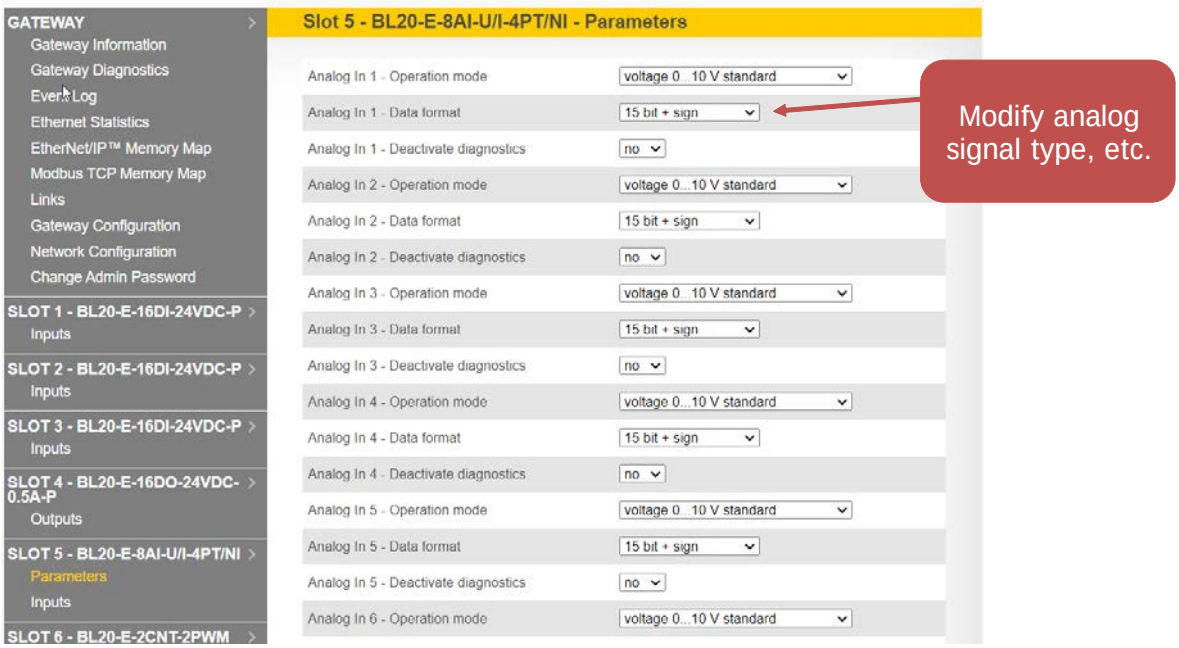
Wiring for the analog signals is done on slot 5, pins (1+, 2- for input 1, 3+, 4- for input 2...). See schematics for more details.

To modify the type of analog input:

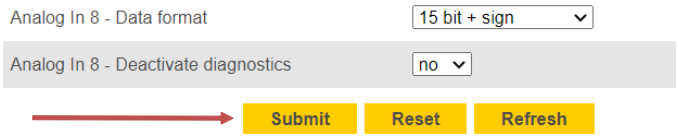
1. Connect a laptop to the open RJ45 port on the Turck I/O Block.
2. Set the laptop IP address to 101.1.1.99
3. Open a web browser, such as Google Chrome, and type 101.1.1.25 in the URL.
4. Log in with the password = "password."
5. Select the analog input module: Slot 5 – BL20-E-8AI-U/I-4PT/NI




6. Modify the channels as necessary. Consult Turck BL20 IO manual for more details.



7. Press the “Submit” button.




**NOTICE**

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. It is recommended to use only two wire current inputs or voltage inputs with the RF2.

## Fieldbus Communications: Ethernet

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

The RF2 uses Ethernet/IP communications protocol in its most basic configuration. 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 that establishes an implicit communications path between the RF2 and some other industrial protocol, such as ProfiNet, Modbus TCP, CC-Link, etc.

Sample codes are available from Carlisle Fluid Technologies. They can be imported into the supervisory PLC to facilitate communications more quickly with the RF2 and provide data structures for the communicated information.

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

## Fieldbus Communications: IP Address Setting (without gateway)

Series 1 RF2 control units use an Allen Bradley–Compact Logix PLC with two separate ethernet networks as the primary 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 prepare the RF2 control:

1. Plug an RJ-45 ethernet cable into an open port on a local ethernet switch (ESW128).
2. Set the Allen Bradley PLC to "PROG" mode.

To set the IP address, download RSLinx Classic software from Rockwell Automation (found online). There is a free version (Lite) available.

**RSLinx Classic version 4.30 or higher must be used.**

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). Refer to the configuration note* if the protocol is not present.
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. The system can be rendered inoperable.**
8. Set the IP address as desired to communicate to the Plant controller and click "OK."

   With these steps completed, set the PLC/IP address back to Run or remote mode.

   **Configuration note:** If RSLinx is not configured to have an ethernet IP driver, do the following:

   a. Select Communications -> "Configure Driver."

   b. In the "Available Driver Types" pulldown, select Ethernet/IP Driver, click "Add New."

   c. Click "OK"–the new driver will be added.

## Fieldbus Communications: IP Address Setting (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.

Select the ethernet IP driver and scan the network (most likely this will be named AB_ETHIP1).

1. Refer to the configuration note* if the protocol is not present.
2. Find the RF2 controller at IP address 101.1.1.20–right click and select module configuration.
3. Select "Port Configuration Tab."
4. Select Network A2.
   **WARNING: Do not modify anything in Network A1. The system can be rendered inoperable.**
5. Set the IP address as desired to communicate to the Plant controller and click "OK."

   With these steps completed, set the PLC/IP address back to Run or remote mode.

   **Configuration note:** If RSLinx is not configured to have an ethernet IP driver, do the following:

   a. Select Communications -> "Configure Driver."

   b. In the "Available Driver Types" pulldown, select Ethernet/IP Driver, click "Add New."

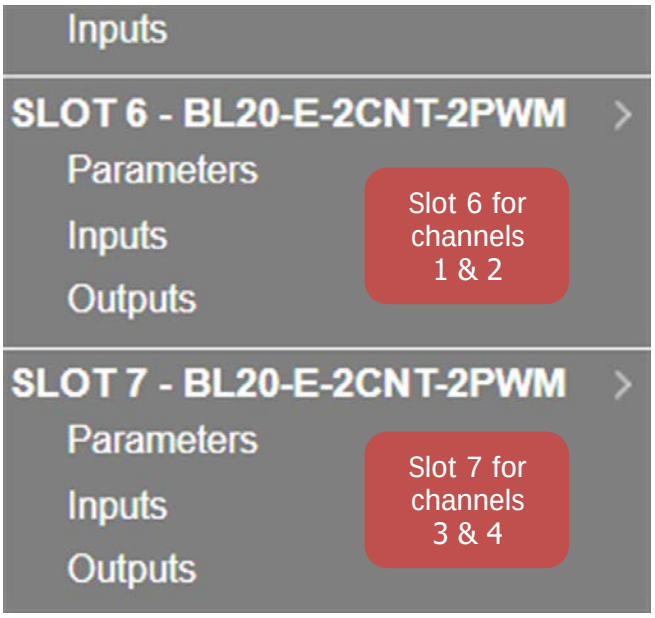
   c. Click "OK"–the new driver will be added.

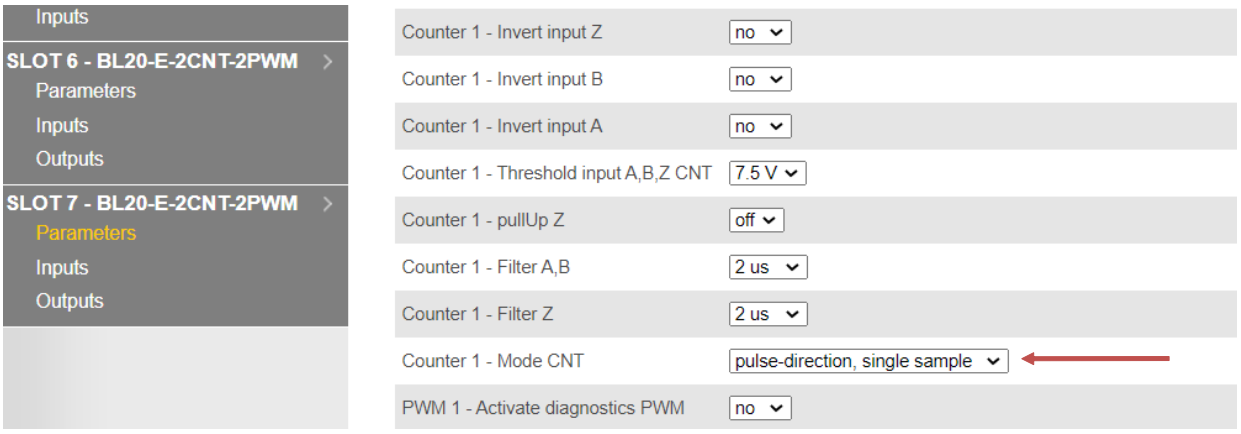
## Configure High-Speed Counter I/O (non-quadrature flow meters)

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.




### *NOTICE*

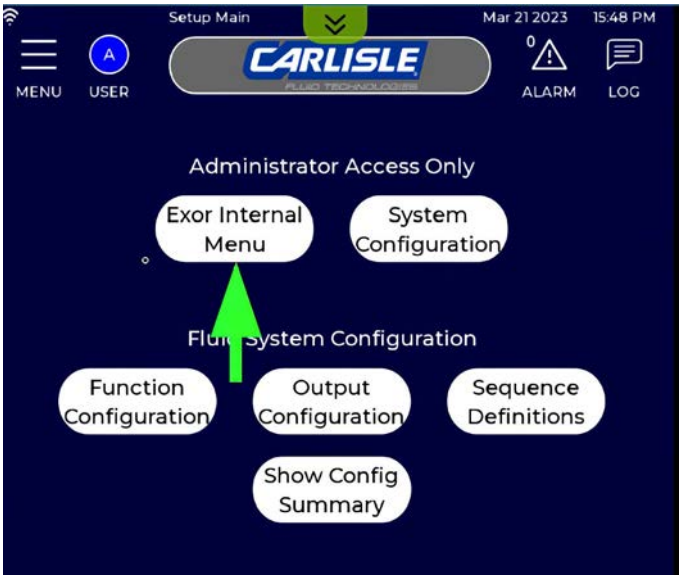
In this mode, for the count direction to be positive, the D2 pin for the channel (pin 2 or 7) must be connected to 24VDC. If the flow meter has directional output, this can be used for direction; otherwise, connect a 24V jumper to the direction pin.

## DISPOSAL INFORMATION

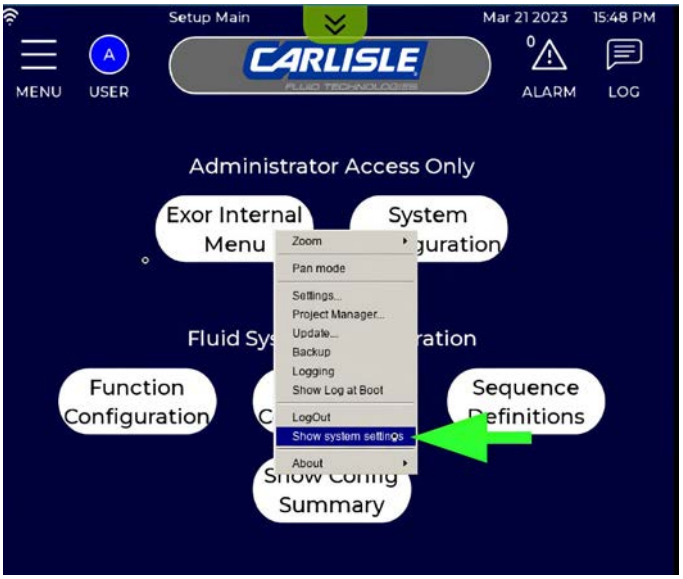
Prior to disposal of this equipment at the end of it’s life cycle, all components containing electronic printed circuit boards (PCBs), sensors, and any wetted parts that may contain hazardous materials should be separated from the unit and recycled/disposed of according to local regulations.

## RF2 CLOUD SETUP

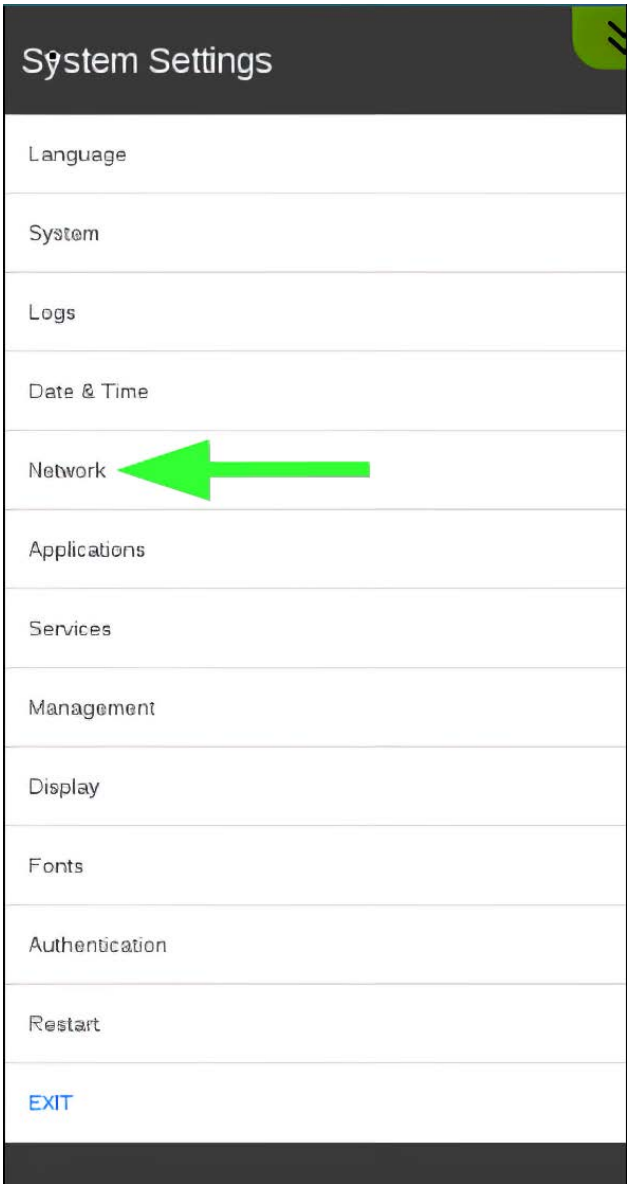
1. Login to "admin" user.
2. Select Menu > Setup > Exor Internal Menu.



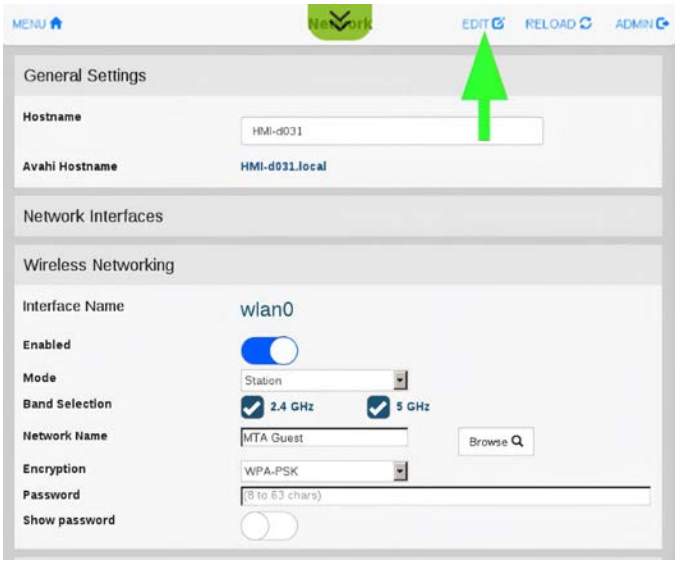

3. Select > Show system settings.



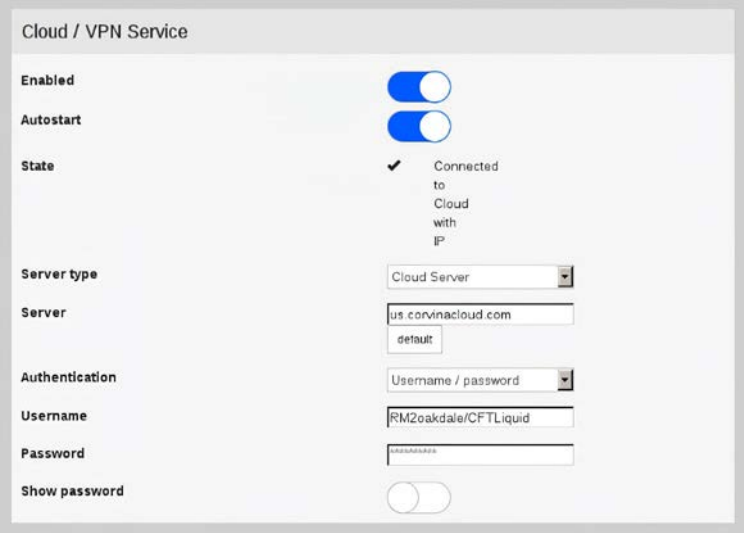
4. Select "Network."



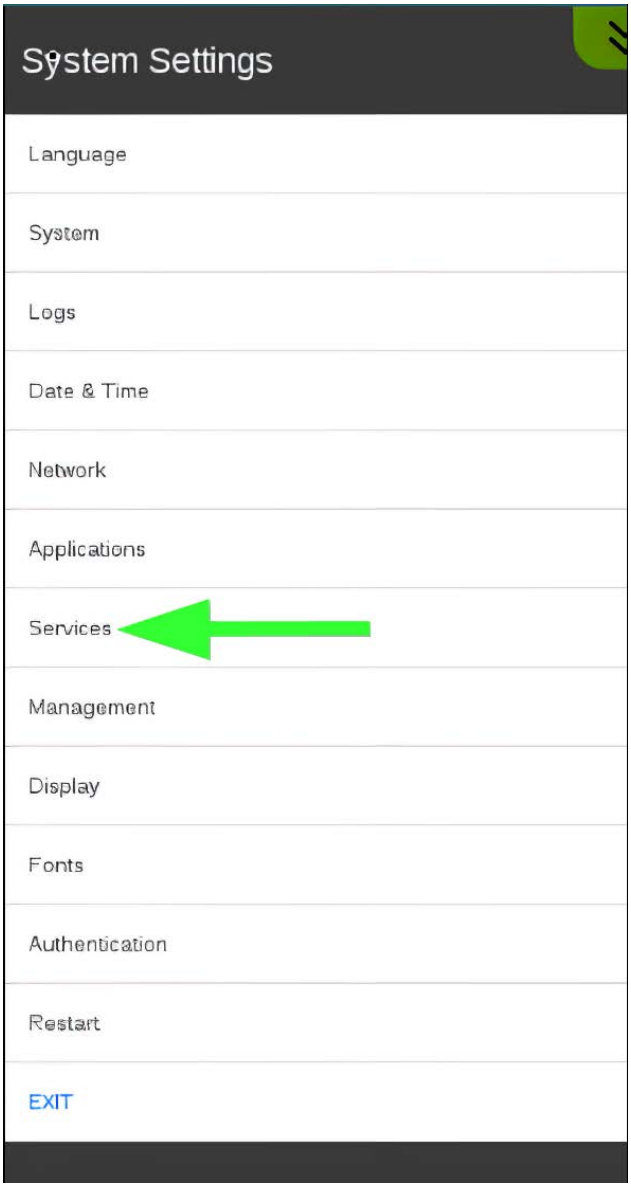

5. Select "Edit."



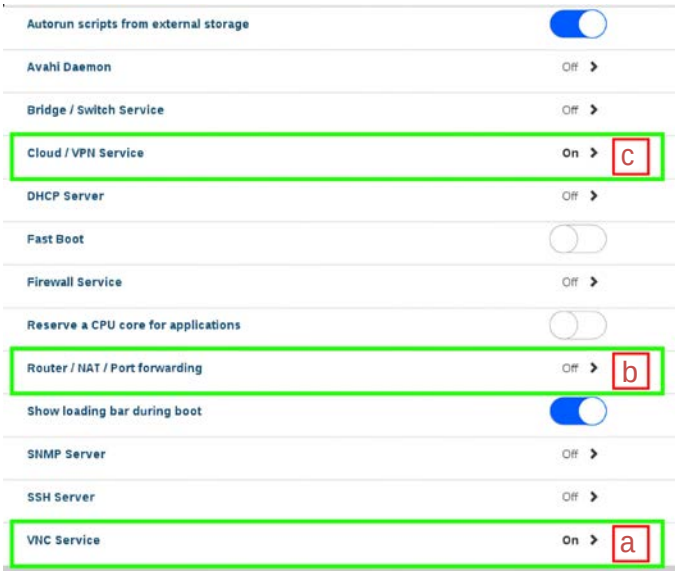
6. Enter Network and network password. Click "Save."




7. Click "Menu" at the top left. Select "Services."



8. Enable these three (3) services:
   a. VNC Service
   b. Router/NAT/Port Forwarding
   c. Cloud/VPN Service




9. In "Cloud/VPN" verify the following settings:

   Server: us.corvinacloud.com

   Username: RF2-machineserialnumber/ organization

   Example: RF2-1234/CFTLiquid

   Password: paint123$

**Page is intentionally left blank.**

# OPERATION

## POWERING UP THE SYSTEM

Before system start-up, make sure the main power has been correctly installed. See the section on electric installation for more details.

To start-up:

1. On the right hand 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 show on the screen to access the "Main Menu."

2. On the start-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 start-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" is set.

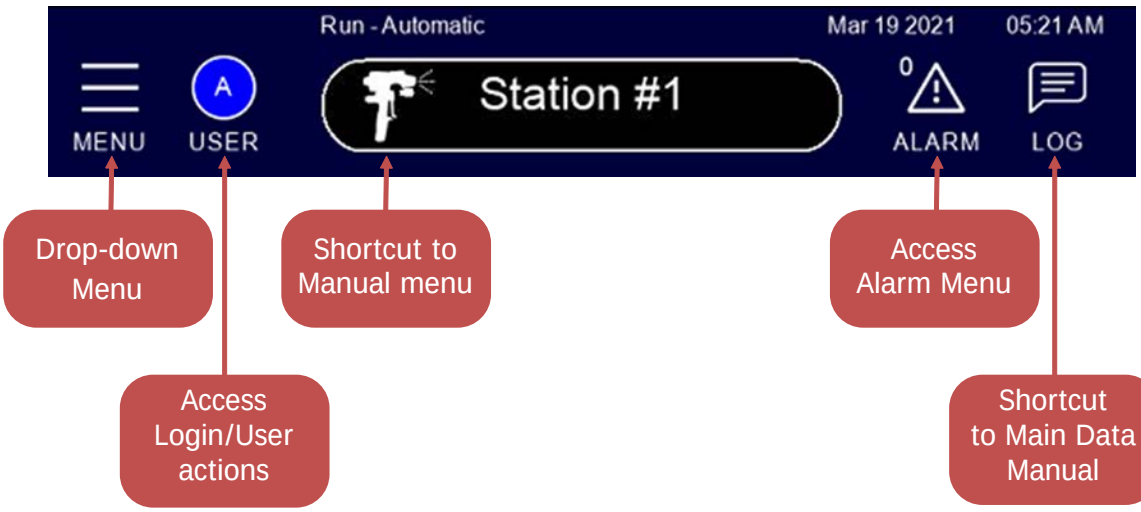
   c. Open the "System Configuration Menu" if the system is not configured.

**NOTICE**

If the system is not configured, refer to the configuration section of this manual to proceed.

## 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.



Press the "Menu" button to open a drop-down menu to access other menus.

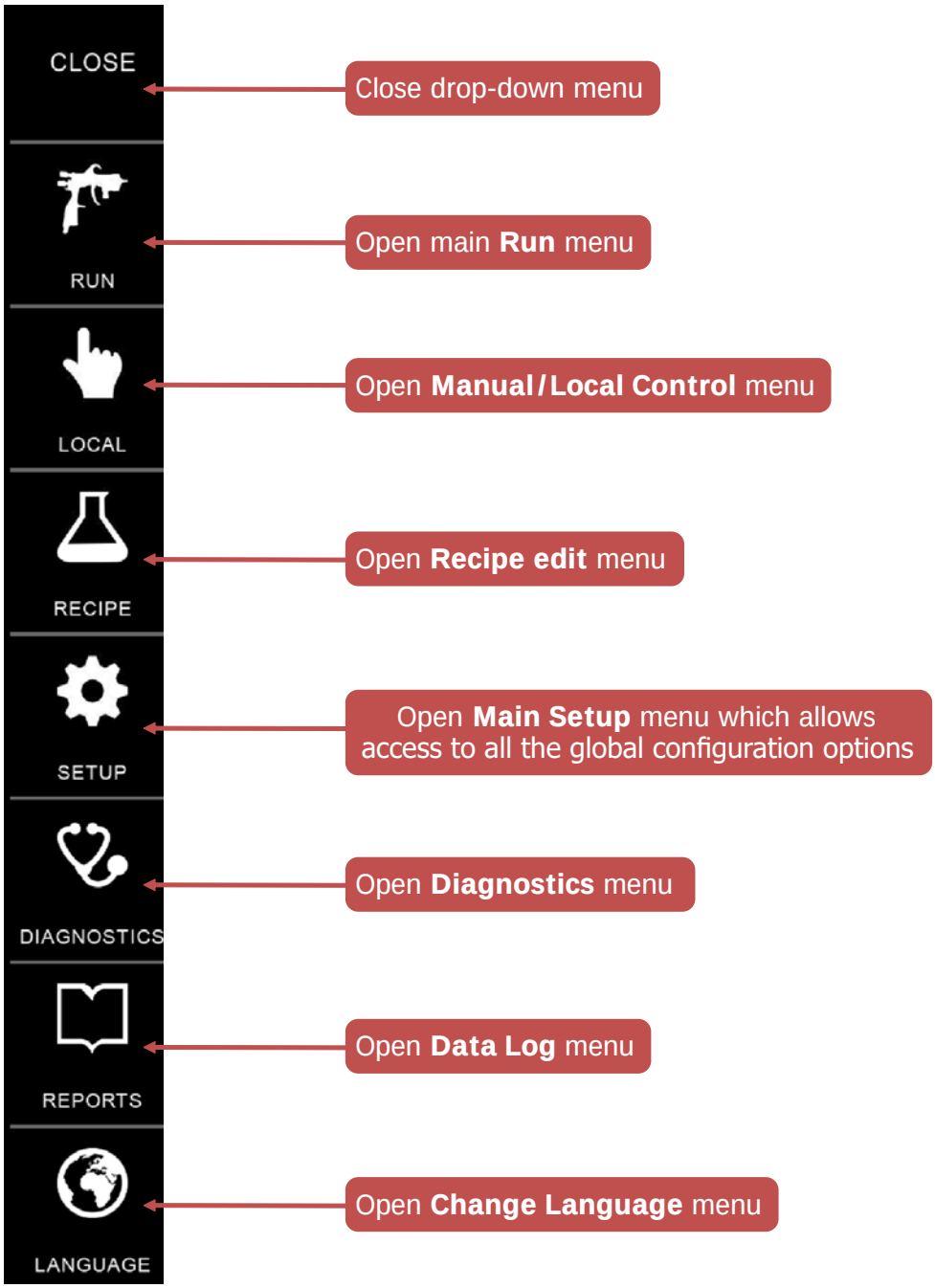
Press "User" to open a dialog menu to log-in, log-out, and access other functionality available to the administrator.

Press "Alarm" to open the alarm status/history menu.

Press "Log" to open the main data-logging menu.

## Drop-Down Menu

Available options on the drop-down menu are shown below. Access to specific functions is limited by the administrator for designated 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 user's language from the list (b) to the right.

**NOTICE**

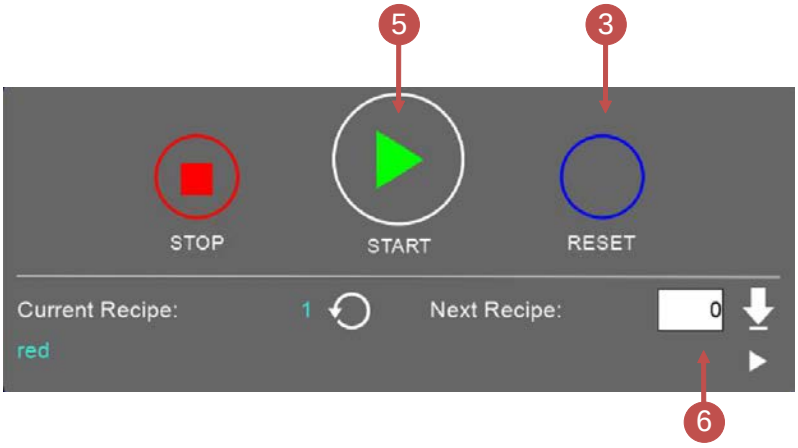
Some objects are not part of this run-time project. These include, for example, user-editable fields: station, gun, channel, and output names, as well as some menus like Exor's internal HMI menus. These cannot be translated in run-time and will remain the same regardless of the selected user's language.


## 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. Make sure 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 try further troubleshooting as necessary.
4. If the RF2 has been configured for two stations, select the applicable station.
5. Press the "Start" button to place the station in run-state. The text will change to show "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 before it runs the load sequence. Then it runs the appropriate sequences to load material. When this happens, the bottom of the Run menu will show the load sequence. All Start/Stop/Reset and recipe-select functionality will be unavailable during this time.

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

## Editing Recipes

Select "Recipe" from the drop-down menu to view or change recipe parameters.

The "Materials" section of the recipe menus will open. At the top of this other recipe menus, "Mix/Guns" will be available if configured in the selected station or greyed out if they are not configured.

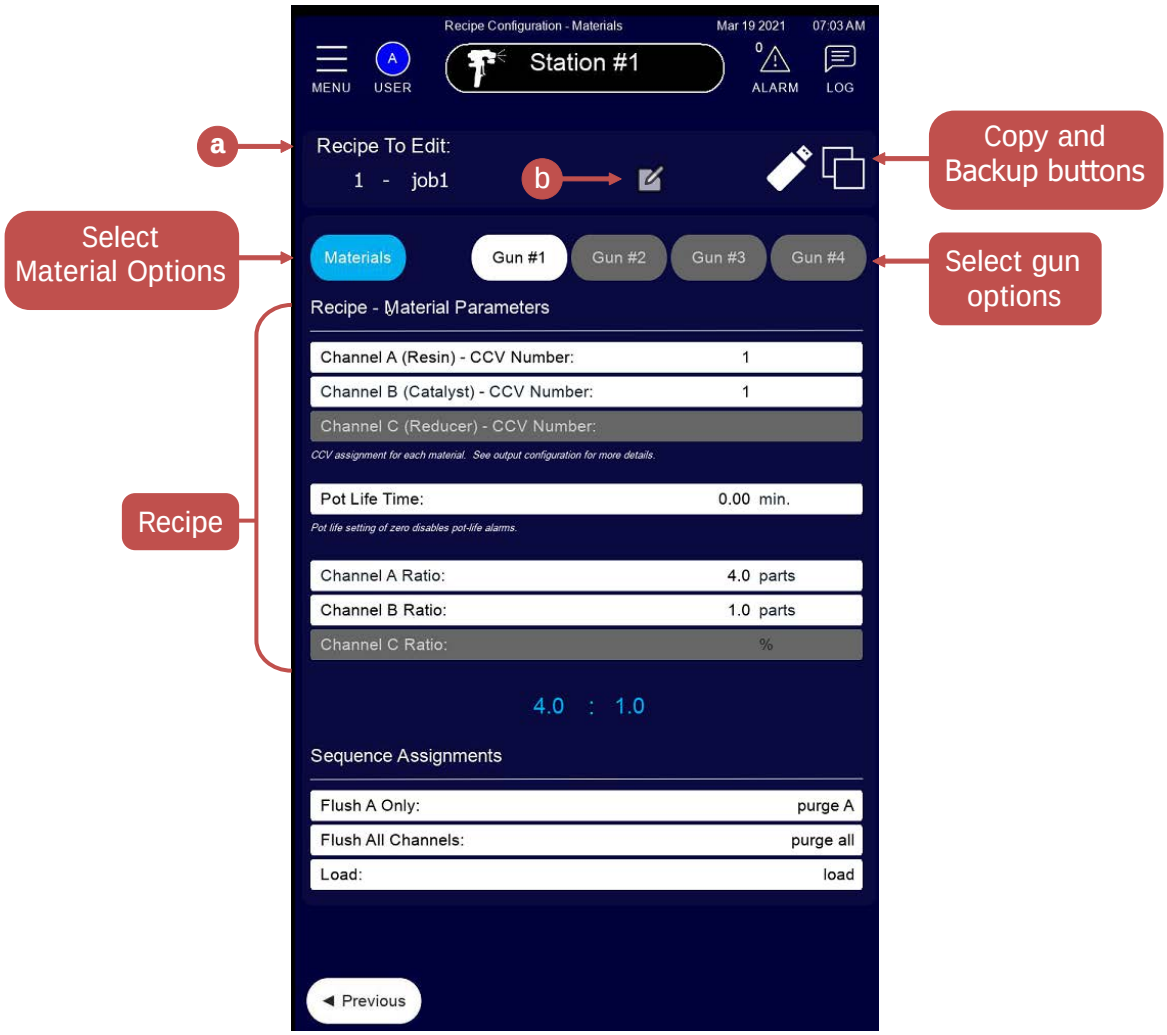
Access to channel-recipe data is located at the bottom of the "Mix/Gun" recipe menus. It will be available based on the number of channels configured for the selected Gun/Mixer. Channel A, B, or C will navigate to the settings page for the physical channels 1-4, but depends on which channel is configured for each Gun/Mix channel.

To select a recipe to change, press the field that shows the "Recipe to Edit" (a). It will open a pop-up dialog to show selections from the list of recipes. Use the arrow buttons to scroll through the list. There are 250 recipes available per station.

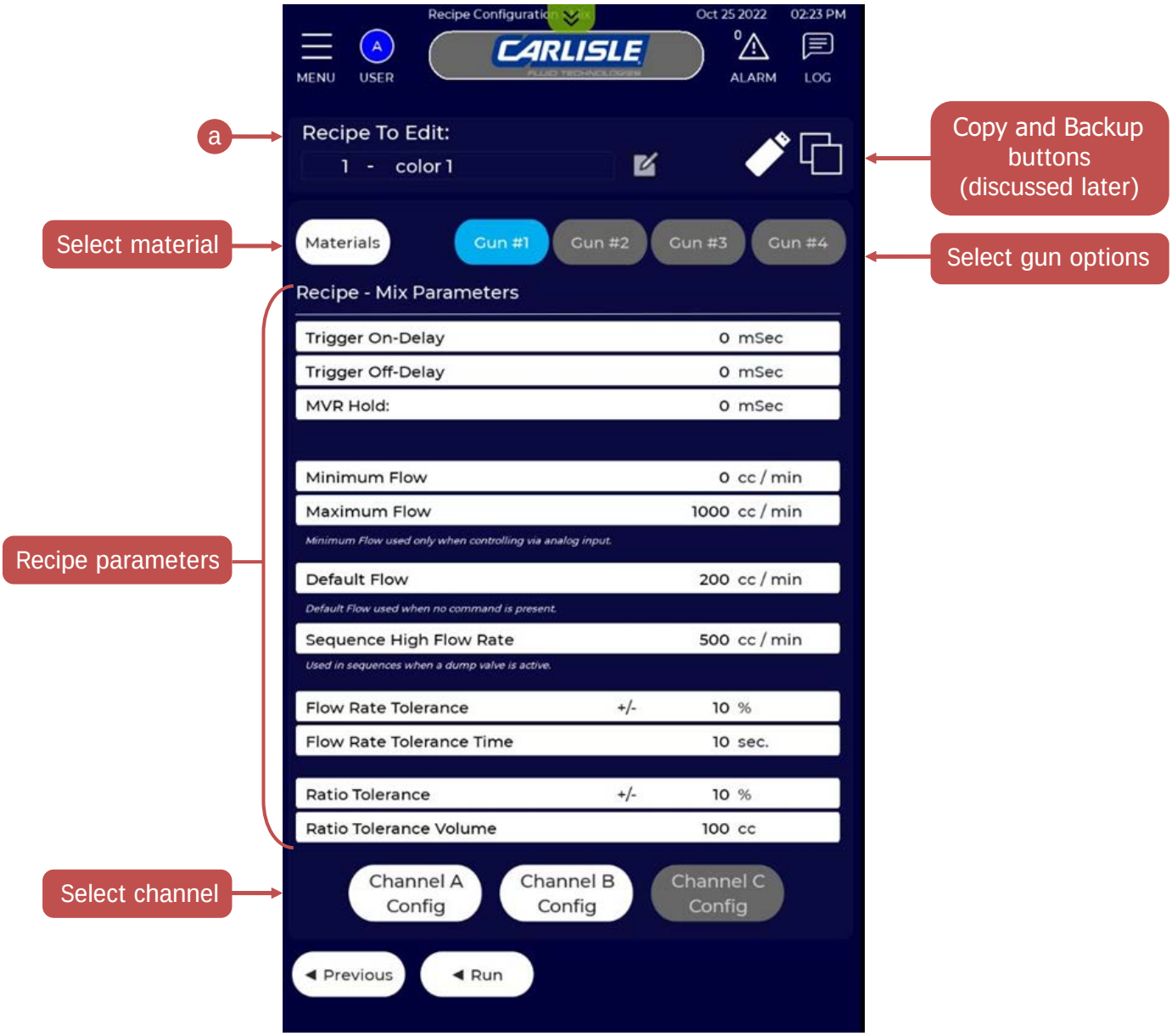
To change the selected recipe's description, press the "Write" (b) icon next to the current recipe description to open the dialog.

Screens will show differently when the materials, guns/mixers, or channels within a recipe are changed.

## Material Editing Screen:



## Gun/Mixer Editing Screen



## Channel Editing Screen


## *NOTICE*

Access to the calibration settings for the flow meter opens the calibration dialog and lets the calibration process occur.

## Copying Recipes

Press the "Copy" icon near the top of the recipe edit menu to open the copy dialog. From this menu, choose the "Source" recipe and the destination locations (1-250) that represent the available 250 recipe data registers in the selected channel. Multiple destinations can be chosen at the same time but can cause longer process times.

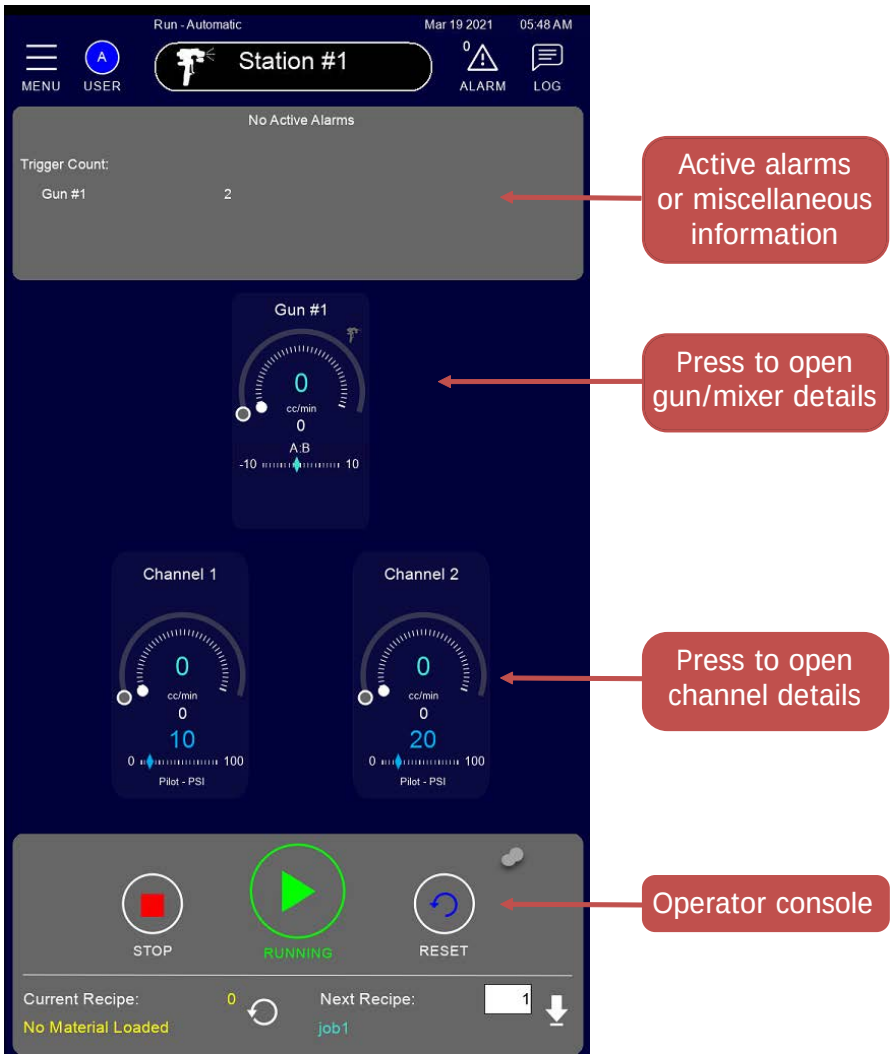
When the source and destination fields are set, press the "Copy" button to make a copy of all data from the source recipe to each destination location in the range. Make sure to add a "#" to each description.

## Operate the System (manually or locally)

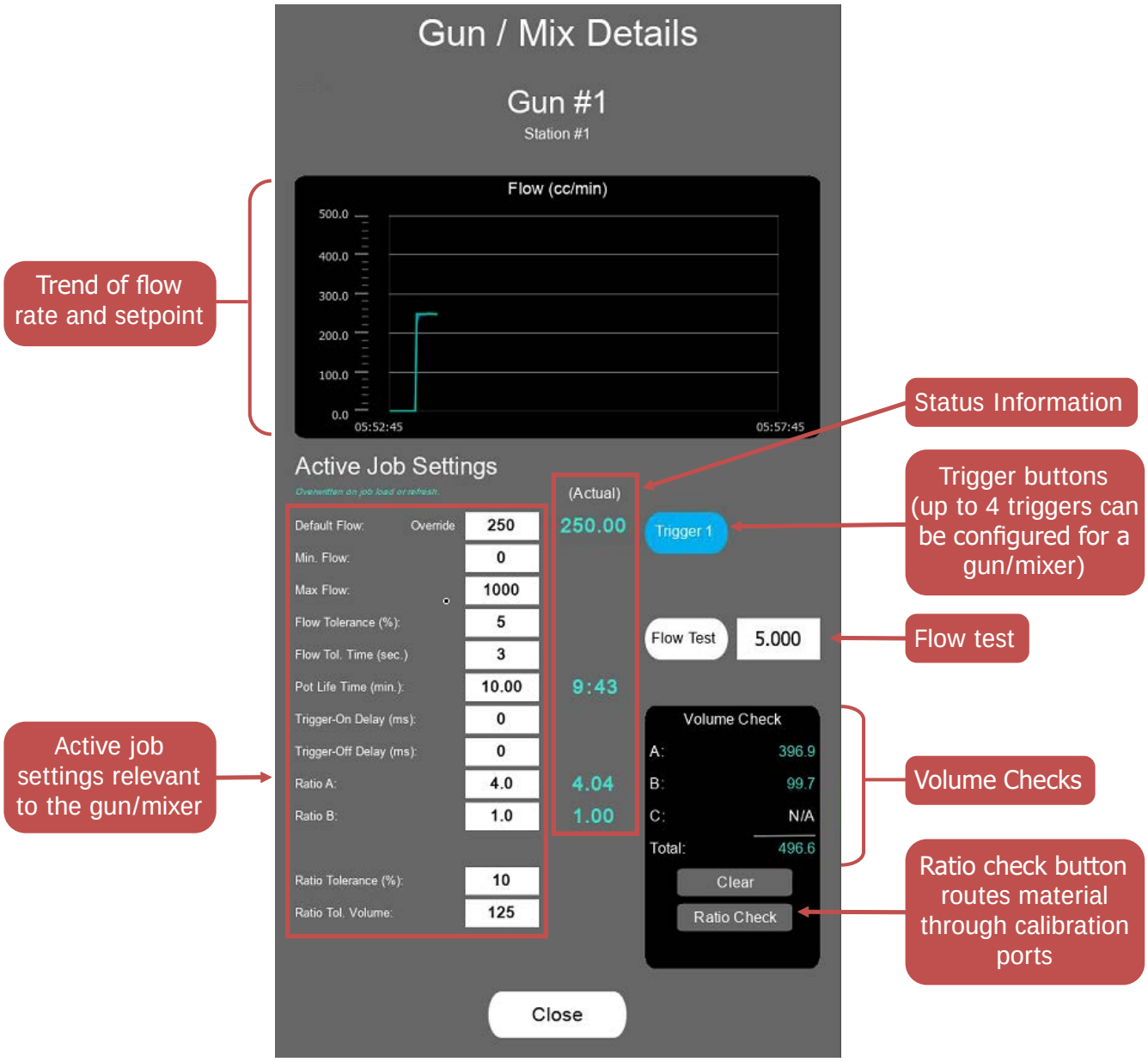
Though the RF2 will most commonly be put into a process that receives automatic commands, such as trigger, flow rates, and load recipes/materials, it can also be operated from the local interface.

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

1. Navigate to the Run Menu.
2. Select the station you wish to control if the RF2 is configured as a multi-station controller.
3. Press the "Gun/Mix" panel for the unit you wish to control. A pop-up dialog box will show the details of the selected gun or mixer.



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




Note: One of these positions is the default flow rate for the recipe. If operated from the interface, it is recommended to press the override button to let this position take precedence over auxiliary positions. Those auxiliary positions can come to the RF2 from 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 that start the applicators assigned to the gun/mixer. Press the trigger button to toggle the trigger between active and inactive. If multiple triggers are on during the same time, the flow rate for the gun/mixer will be the command multiplied by the number of triggers currently on.

6. When the "Flow Test" button is pressed, it can start and set "Trigger 1" for a given period.

7. The status information for the gun/mixer is shown throughout the display.

## NOTICE

Only assigned triggers to the gun/mixer will be visible on this menu.
In most cases only one will be configured.

The volume check shows the run totals for all materials in cc or mL. Press the "Clear" button to reset the totals when not triggered.

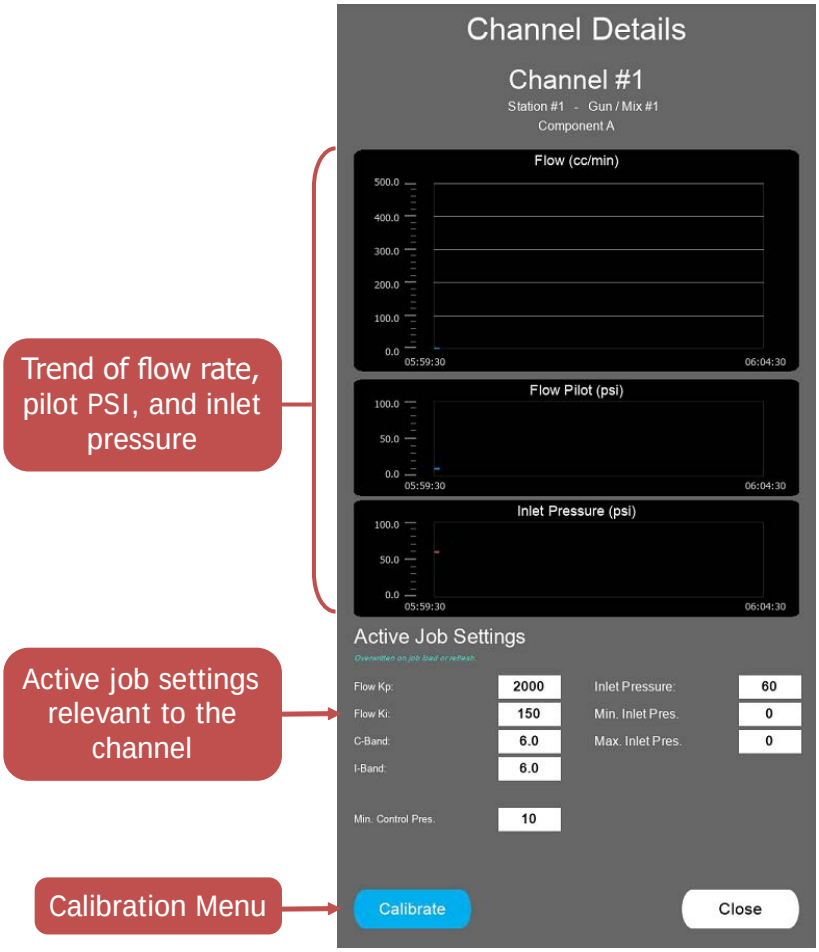
The "Ratio Check" button will cause the material to be moved from the gun trigger to the calibration test ports for all configured materials. It lets the user position beakers under the ports to catch the material, do a quick flow check on all materials, and compare them to the calculated volumes.

## Channel Menu

From the Run Menu, press any of the "Channel" panels shown to open a pop-up dialog with status and active settings for that channel.

If the user has permission, they can change the active recipe parameters. Without permission, the values will be view-only.

Status information is shown throughout the display.



## Alarms Menu

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

Press the icon to open the following menu.

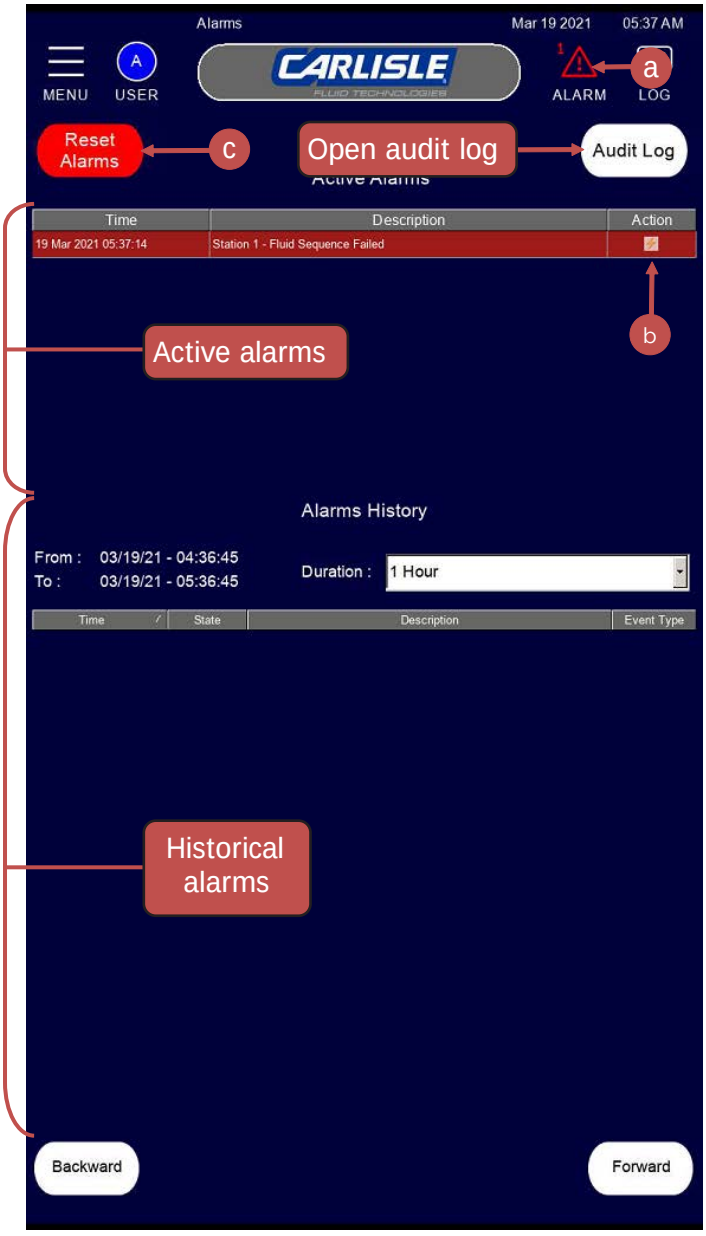
On the Alarm menu, the top list shows active alarms, and the bottom list shows historical alarms.

For more alarm details:

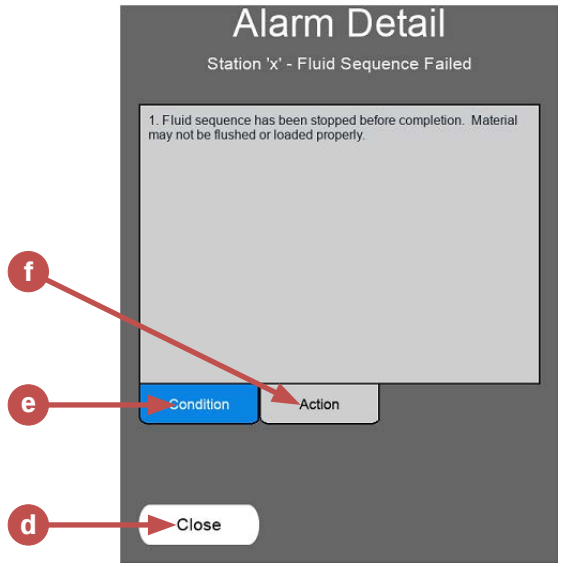
1. The right side of any row in the active alarms list that contains an alarm is a button under the "Action" column (b).
2. Press this button to open a pop-up dialog that explains the condition and gives some actions.
3. Active Alarms: If an alarm is active, it will be listed in the top list on the Alarm Menu.
4. Historical Alarms: In the historical alarms list, the duration of the list can be selected through the drop-down combo box. Press the "Backward" and "Forward" buttons to scroll up and down through the list.

To reset an active alarm:

1. 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.



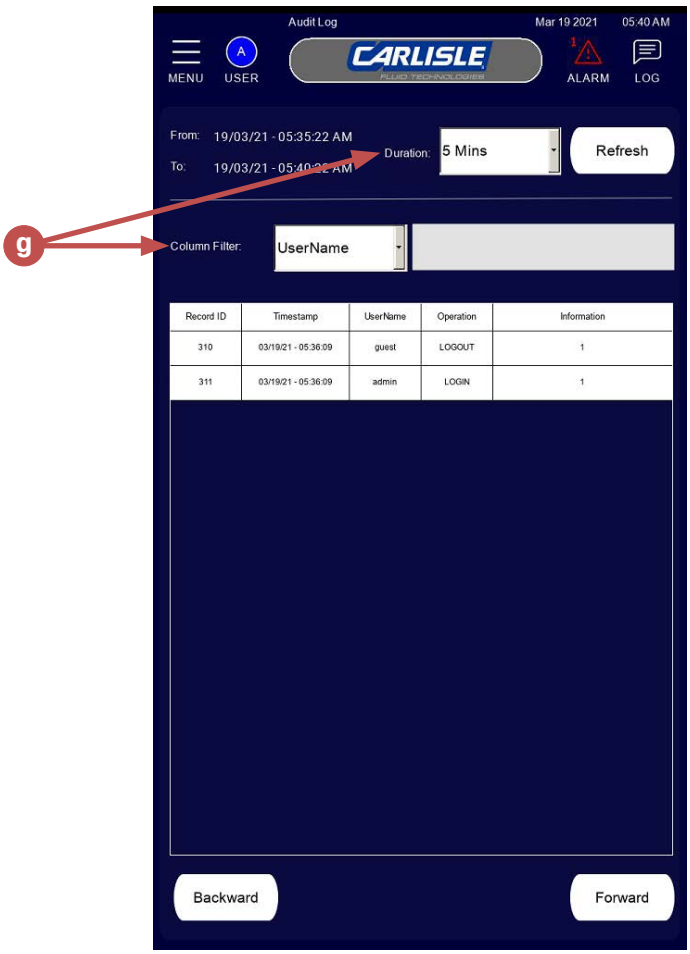
2. In the alarm detail pop-up menu, press "Close" (d) to exit the menu, "Condition" (e) to see the list of conditions that may cause the indicated alarm, and "Action" (f) to see a list of potential corrective actions.




## Audit Log

On the top-right of the Alarm menu, the "Audit Log" button will open a menu and show the 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.

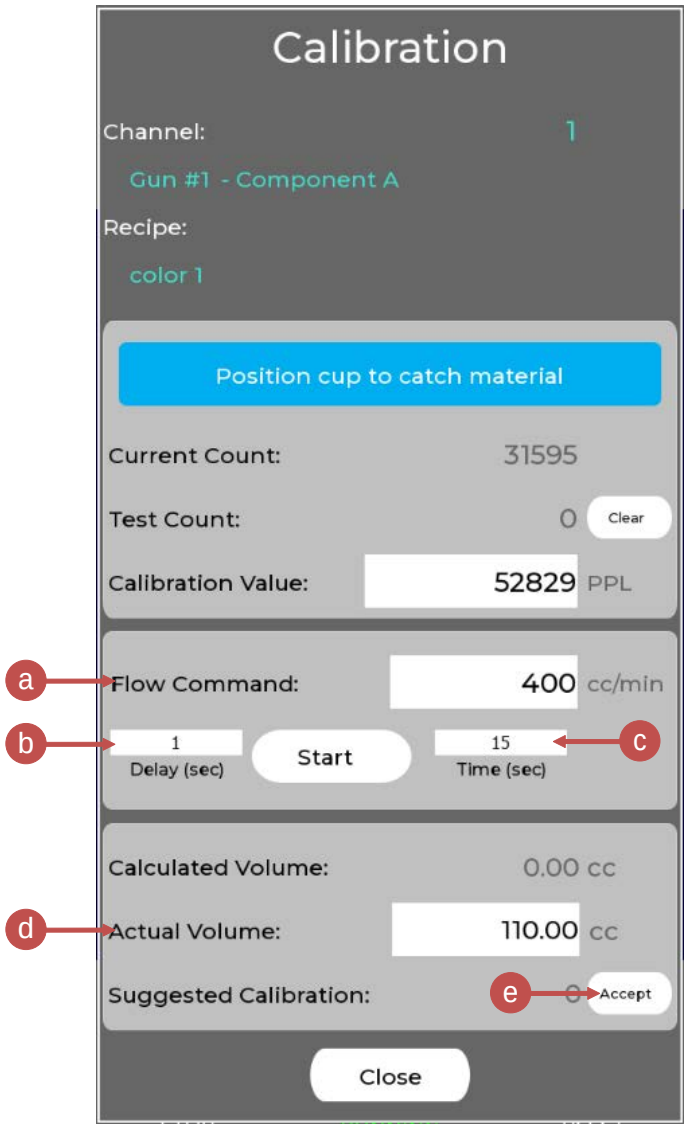
To calibrate a square wave flow meter:

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

**NOTICE**

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

3. Place a cup under the calibration port for the channel being calibrated.
4. Set a flow pilot command (a)–this will be the command given to the flow-control device during the calibration process. 100-200 cc/min is the recommended start 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 when the mode icon button (a) at the top of the menu bar is pressed. This function is not available from every menu.

The Local Fluid Control menu (shown below) lets individual functions and outputs operate for maintenance and troubleshooting purposes.


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

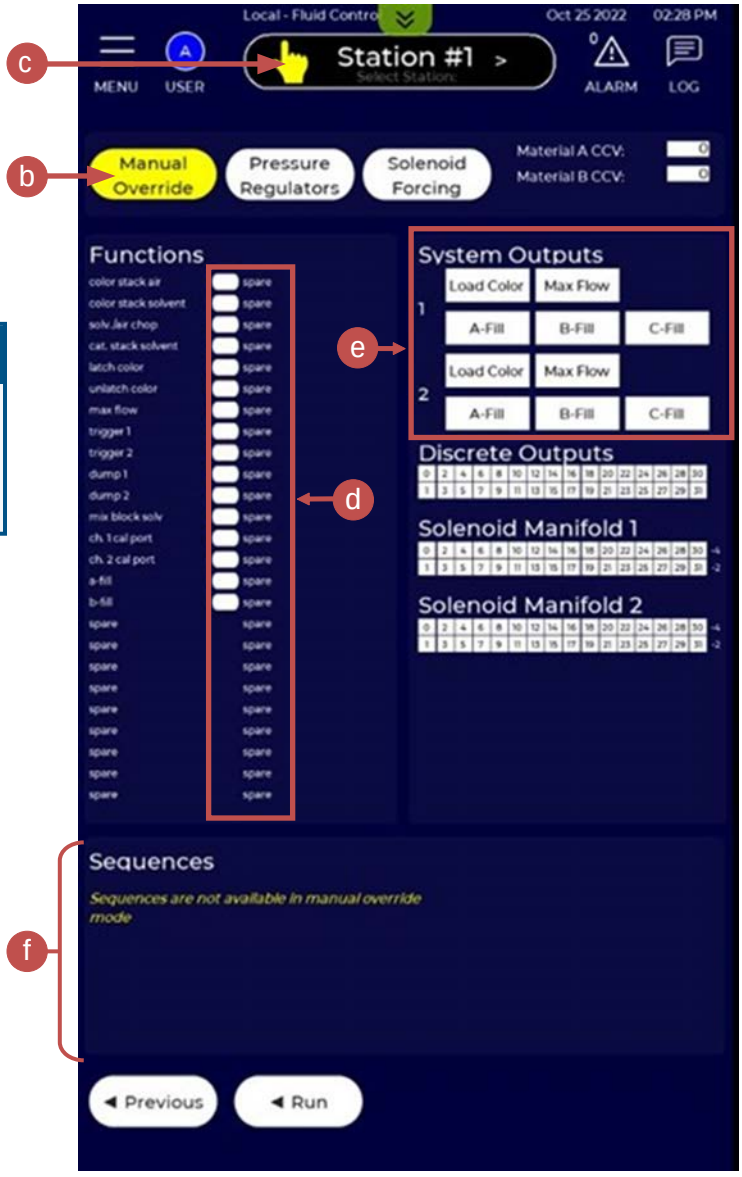
Press the button (d) to the right of any listed function and its corresponding output will activate as if the function is activated in sequence. The output status is shown to the right of the page (e).

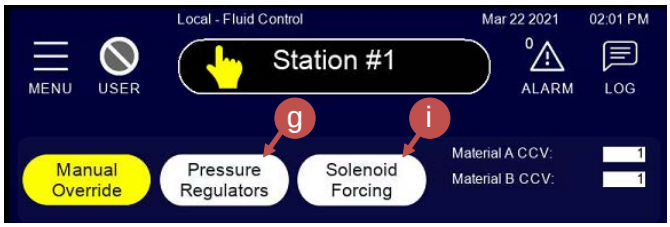
**NOTICE**

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

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

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

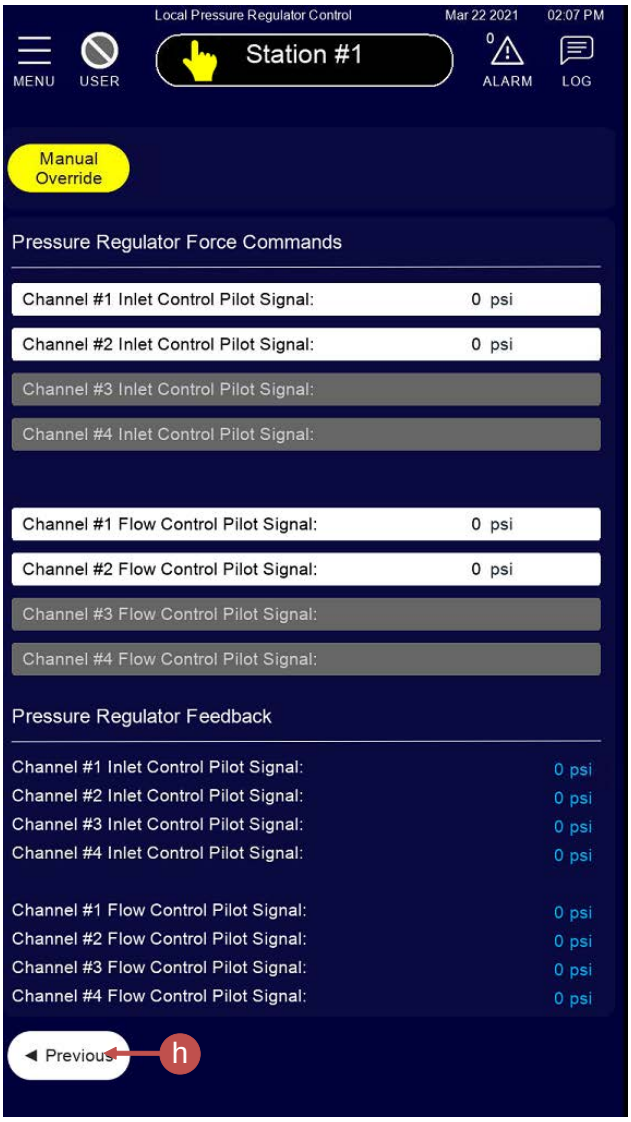





Press the "Pressure Regulators" button (g) on the Local Fluid Control menu to open the menu shown below.

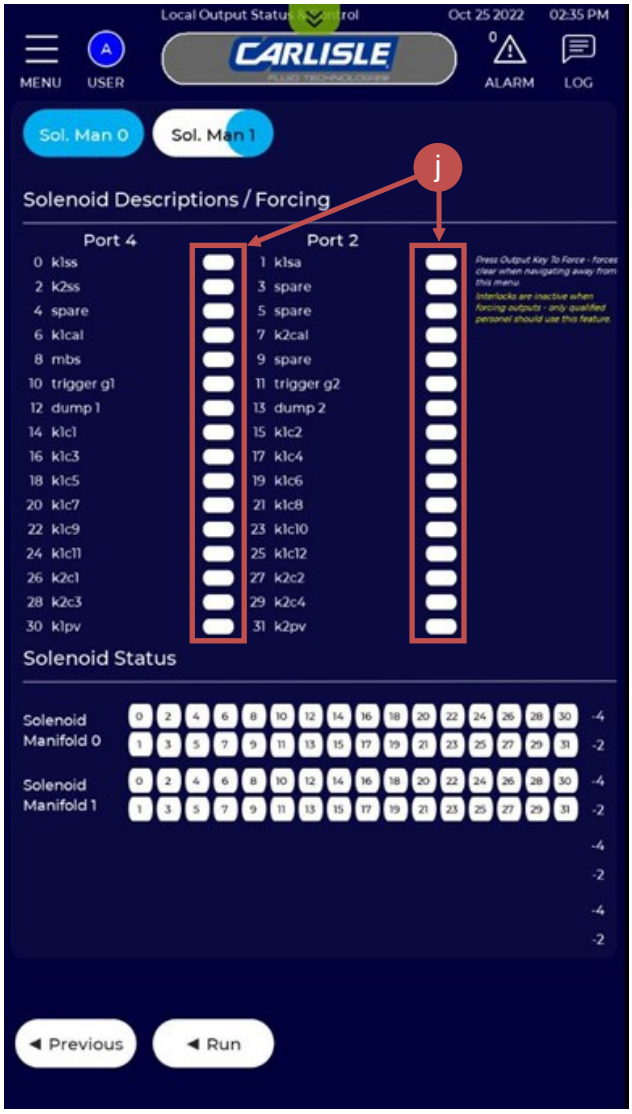
From this menu, manual override mode can be activated and deactivated, and all configured pressure regulators can be operated manually.

Press the "Previous" button (h) to return to the Local Fluid Control Menu.




Press the "Solenoid Forcing" button (i) from the Local Fluid Control Menu to open the menu shown on the right. This menu is only available if manual override is selected.

From this menu, each installed solenoid is forced on or off when the button (j) to the right of the output descriptions is pressed.




**⚠ WARNING**

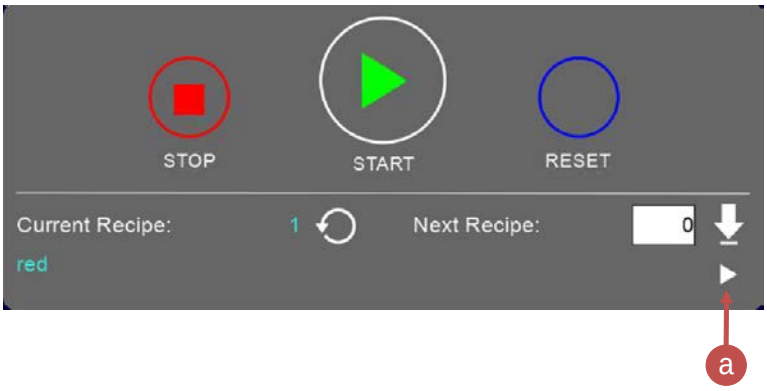
Output interlocks are not observed in this mode.

## 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.


**⚠ CAUTION**

Always shut down the RF2 with solvent-loaded (color 0) flushed fluid lines.
Residual air or paint in the system may cause clogs or stuck system components.

## ADMINISTRATOR FUNCTIONS

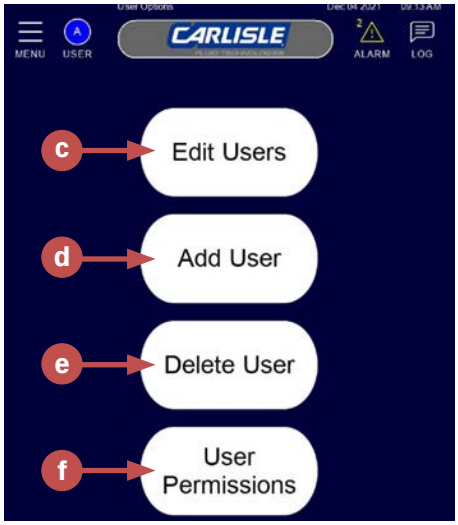
Users that are members of the "admin" group can access functions not available to other users and to modify access for other users.

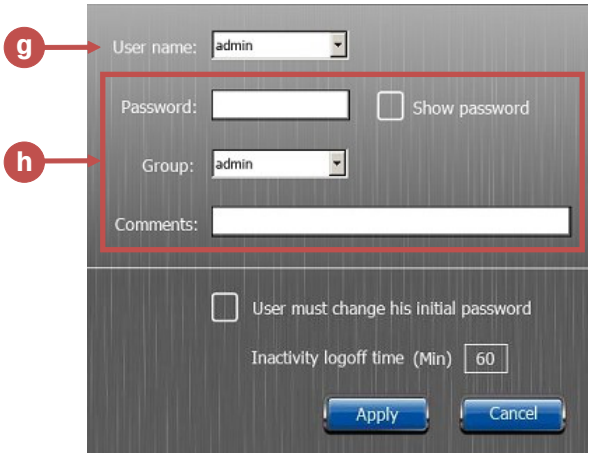
### User Options

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).

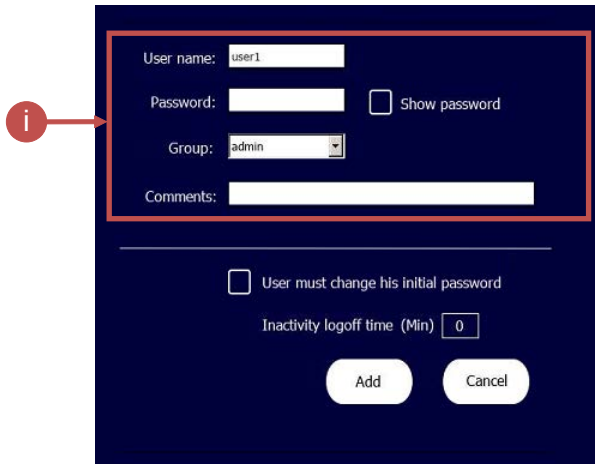
This includes user-group assignment.

## 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.

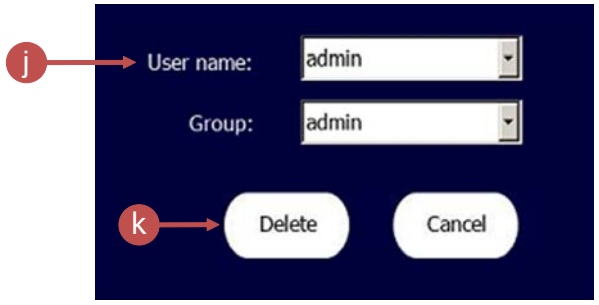



## Delete User

To delete a user, enter the Delete User menu.

Select the user (j) you want to delete.

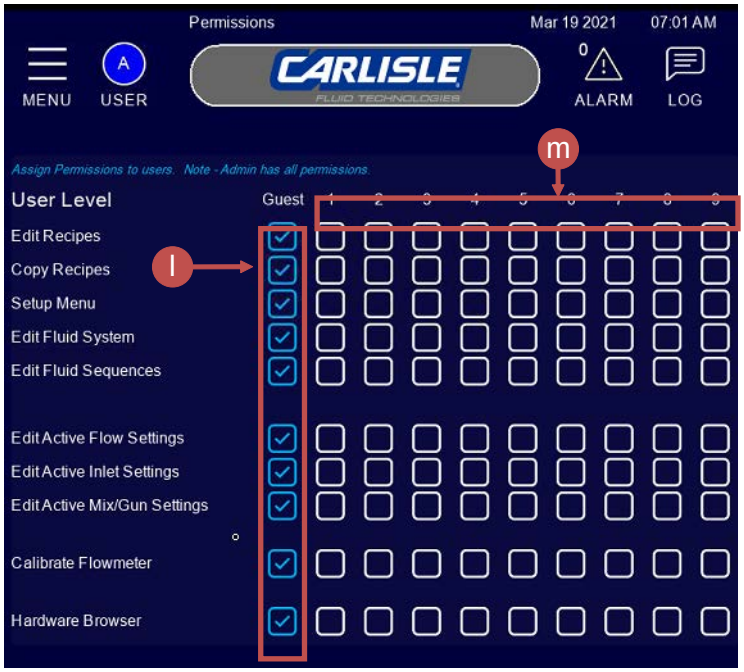
Click on delete (k).




## 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).

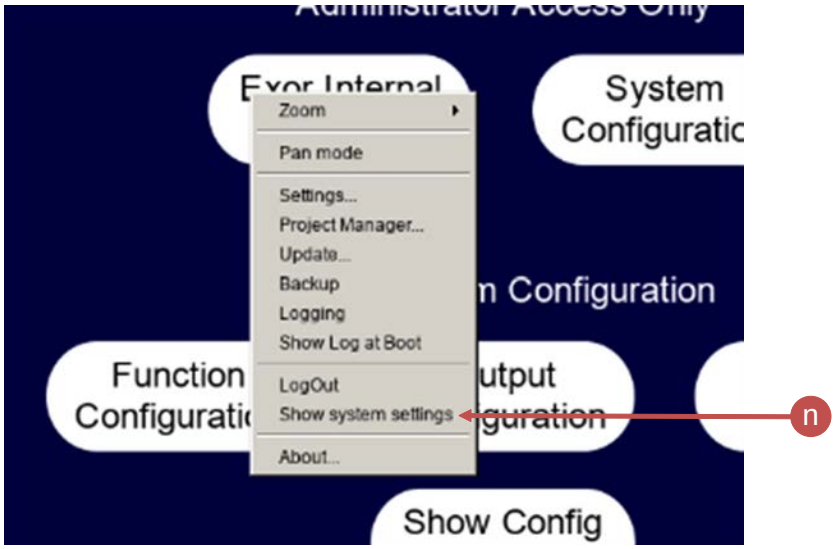


## Disabling Cloud Access

Although the cloud access feature of the RF2 is an appropriate manner to allow diagnosis, troubleshooting and updates to the equipment, some customers may not want to use this type of service.

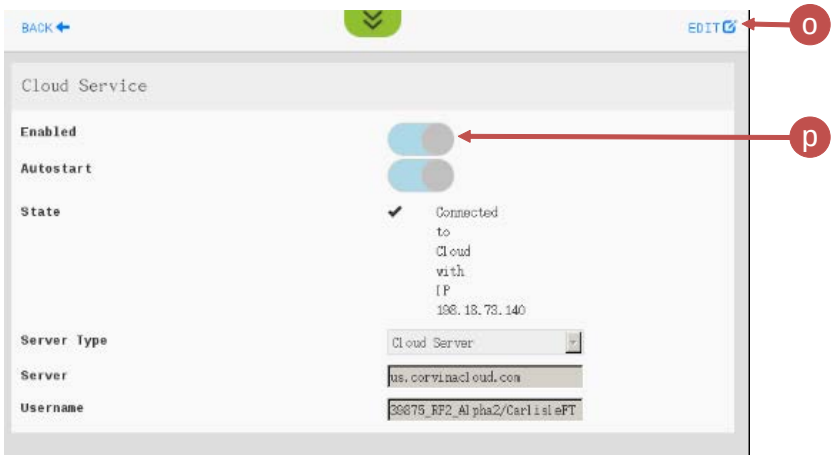
Access to the RF2 via Exor's Corvina Cloud service can be disabled in two ways:

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**

Possible malicious actors who may access to the RF2 via the cloud service could 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.

## Flushing Recommendations

| Name | Suggested Initial Setting | Description |
|---|---|---|
| First Flush | AIR | Air or Solvent to initially flush fluid lines. |
| First Flush Time | 15 seconds | Duration of first flush. This flush is used to move paint out of the system before attempting to "clean" with the chop process. |
| Air Chop Time | 1 second | Duration of each air burst in the chop process |
| Solvent Chop Time | 1 second | Duration of solvent burst in the chop process |
| Chop Duration | 30 seconds | Total duration of chop process. |
| Last Flush Time | 20 seconds | Duration of last solvent flush - should be timed to minimize solvent waste but still completely load the fluid lines with solvent. |

The following factors will influence the choices listed above:

- **Worst case flushing** - Always set up the flush parameters using the most viscous/worst case resin material.
- **Flushing air and solvent pressure** - Higher pressures may reduce the time needed to flush the system, but can create significant spitting from the spray gun during the process.
- **Material viscosity** - Viscous materials move more slowly and may require additional time to be purged from the system.
- **Hose volume/ length** - Longer fluid lines encompass a larger volume and may require a longer flush time. Pressure drop through a longer hose or smaller diameter hose will affect the time required to purge paint and clean the system.
- **Spray gun tip size** - Small tips may restrict flow during a flush.

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

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

# STARTUP GUIDE

Use the following pages as a quick reference to make electrical, air, and fluid connections to the RF2 and begin operation. Familiarize with the configuration of the machine and any options or accessories attached. Return to the User Interface Guide section of this manual for information on configuration and settings.

## Startup Checklist

Verify the frame is secured to the ground or wall and that all components are mounted securely to the enclosure, fluid panel or mast. Check that all cables for flow meter, flow sensor and any other electrical components are connected. Connect the enclosure ground stud to earth ground.

Verify all energy sources are de-energized. Inspect for loose wires anywhere inside the enclosure. Do not attempt to operate with loose wiring. Refer to the Maintenance section for wiring diagrams. After wiring verification, it is safe to plug in the system to a proper grounded AC receptacle. Verify all CCV signal lines are properly connected. See the Configuration section for reference.

## Air Connections

Connect the external air connections before use (see below). For more information, see Pneumatics section.

1. Regulated air supply to the solenoid manifold.
2. Regulated air supply to both guns on control enclosure. For atomizing, typically 20-75 psi [1.3 - 5 bar.
3. Regulated air supply to the color stack flushing air (if the system is equipped with gun flush boxes)
4. Regulated air supply to gun flush box(es) "air" connection.
5. Flush Box Trigger signals:
    a. Gun Flush Box #1: Connect to ACO GUN 1 Port (Without gun flush box, this signal is plumbed to the Atomizing Air Cutoff valve).
    b. Gun Flush Box #2: Connect to ACO GUN 2 Port (Without gun flush box, this signal is plumbed to the Atomizing Air Cutoff valve).
6. Gun In box signal lines to Gun 1 and Gun 2 Pressure switch inputs.
7. "Air Cutoff" signals from Gun flush box to the Atomizing Air Cutoff pilot signals (Note, without a flush box, this signal is fed from the ACO GUN 1 or 2 ports. Fluid Connections.

Perform the following fluid connections before use. For more information, go the Paint Material section of this manual. Oil Reservoirs should be filled with pump packing lube supplied with the system.

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

## Startup Procedure

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

### Startup for systems without gun flush boxes

1. Make sure all compressed air and fluid sources are connected to the RF2 and energized.
2. Turn the AC lock out switch to the on position. Select the PRIME button on the dropdown menu.
3. With atomizing air off for this step, trigger the spray gun into a grounded metal waste container. Press the dispense pump enable button and allow the pump to stroke for at least 2 full cycles (typically about 30 seconds), allowing all air to be removed from the inner chambers.
4. Press dispense pump enable again to stop. Release gun trigger.
5. Make sure Color 0 shows in the display box and press Resin enable to open the solvent valve. Trigger the gun until solvent is loaded in the fluid lines.
6. Repeat the Resin load process for all system colors to Make sure functionality and to clear air from the fluid lines. After each color has been loaded into the fluid lines, be sure to load with solvent (color 0) so that the inner passageways remain clean and all air is removed.
7. Return to the Home screen by pressing the Spray Button in the dropdown menu button.
8. Press the Settings button on the dropdown menu. Proceed through each page and enter the desired values. Refer to User Interface Guide for more information about each screen.
9. Verify the Pot Life Check Volume (cc) setting is correct for the fluid line setup. Refer to the Hose Size table below.
10. For each color used in the system, an initial calibration must be performed to maintain a proper mixed ratio.
11. Open the Color screen and load the desired color.
12. After the completion of the color load energize atomizing air and spray.
13. When spraying is complete, shut off atomizing air and perform a color change or flush as required.

### Startup for systems with gun flush boxes

1. Make sure all compressed air and fluid sources are connected to the RF2 and energized.
2. Turn the AC lock out to the on position. Select the PRIME button on the dropdown menu.
3. Place the spray gun in the gun box and close the lid.
4. Press dispense pump enable and allow the pump to cycle for about 30 seconds to prime the pump and hardener line to the mix manifold. Press again when the pump is primed and no air bubbles are visible in the fluid line leading to the mix manifold.
5. Make sure color 0 shows in the display box and press Resin enable to prime solvent. Press again when solvent is visible downstream from the mix manifold.
6. Repeat this process for the remaining paint colors. Follow up this prime process with a color 0 (solvent) prime again to clear resin from the lines and mix manifold.
7. Press the Spray button in the Dropdown menu.
8. Press the Settings button in the Home screen menu. Proceed through each page and enter the desired values. Refer to User Interface Guide for more information about each screen.
9. Verify Pot Life Check Volume (cc) using the chart below.
10. For each color used in the system, an initial calibration must be performed to maintain a proper mixed ratio.
11. Press the Color button on the dropdown menu and load the desired color.
12. Remove the gun from the gun box, close the gun box lid, and spray.

When spraying is complete, place the gun in the gun box and close the lid. Perform a color change or flush as required.

| Hose Size | 15 ft | 25 ft | 50 ft | 75 ft | 100 ft |
|---|---|---|---|---|---|
| 1/4” ID est. volume | 225 cc | 325 cc | 600 cc | 875 cc | 1150 cc |
| 1/4” ID est. volume | 400 cc | 625 cc | 1200 cc | 1775 cc | 2350 cc |

## DAILY OPERATIONS

Daily use of the RF2 system involves several procedures. Understanding how the system works and knowing the properties of the paint materials in use is the best way to Make sure continuous use with few alarms and repairs. Study the procedures and tips below to better understand the function of the system. Refer to the Maintenance section of this manual to review maintenance schedules and repair procedures.

### Daily Start-Up Procedure

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

1. Make sure all fluid and air connections on the system are tight and secure. Make sure fluid supply is adequate for duration of operations.
2. Check all valves on the system for fluid supply leaks. Correct if necessary.
3. Connect regulated pressurized air to the system and open. Maintain 75psi (5 bar) minimum at all times to the enclosure main air inlet.
4. Energize fluid supplies and open valves supplying RF2 with resin(s), hardener, and solvent.
5. Connect power and turn the power switch to the "On" position.
6. Navigate to the Alarms History page. Verify no alarms have occurred recently. If an alarm has occurred, verify that the problem has been resolved.
7. Load the desired color. Go to Loading a Color section for additional detail.
8. Verify Inlet and Outlet hardener pressures are correct for the application, and that the Inlet Pressure is 2-5% higher than the Outlet.
9. If using a gun flush box, remove the gun from the box and begin to spray. If not using a gun box, turn on atomizing air and begin to spray.
10. Fine tune gun settings for the application (flow rate, atomizing air pressure, fan control). Remember that changing the resin pressure to adjust flow rate at the spray gun should be followed by a matching change to the hardener pressure to maintain the 2 to 5% higher target inlet pressure.

**⚠ CAUTION**

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

## Loading a Color

1. Follow steps 1 through 8 of the Daily Start-Up Procedure section before proceeding.
2. Go to the Home screen and Make sure atomizing air is turned off. For systems with gun flush boxes, place the gun in the box and close the lid.
3. Press the Color button on the dropdown menu to access the Color Change screen.
4. Enter the color number desired, and press 1 GUN GO or 2 GUN GO to load the color to one or both guns respectively. If not using a flush box, trigger the gun into a grounded metal waste container. When loading a color if the current color is 0, the fluid lines will not be flushed, since it is assumed there is no material in the lines following the End of Day Flushing Procedure.
5. The color should be loaded and ready to spray. If adjustments need to be made to the flush sequence, go to Flushing Setup. If an alarm occurs, correct the problem and restart the procedure.

**NOTICE**

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

The spray gun(s) are not in the Gun Box(es).

The Gun Box lids are not closed.

## Color Change Procedure

1. To change colors, the initial color must be loaded per Loading a Color procedure.
2. Press the Color button on the dropdown menu to access the Color Change screen.
3. Enter the color number desired, and press 1 GUN GO or 2 GUN GO to load the color. The system will proceed to flush the gun(s) in sequence and then load the desired color at the mix ratio for that color.

The color selected will be loaded, completing the color change procedure. Enable atomizing air to start spraying. If an ACO valve is installed it will enable atomizing air after the gun air delay time has passed.

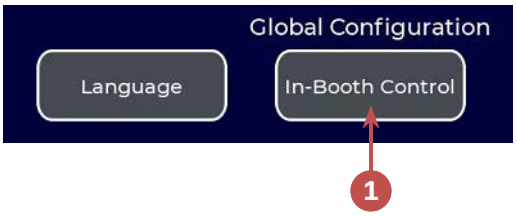
## NOTICE

The Remote Color Change Box is an optional purchase compatible with this system.

The color-change controller is connected through an Intrinsic Barrier (Zener Barrier) located outside the hazardous area to the RF2 device.

Instructions for installation of the remote color change box are included with it.

## In-Booth Control—Remote Color Change Box Configuration




Press the In-Booth Control button (1) to open the Remote Color Change Box Configuration screen.

To calibrate the optional Remote Color Change selector box.

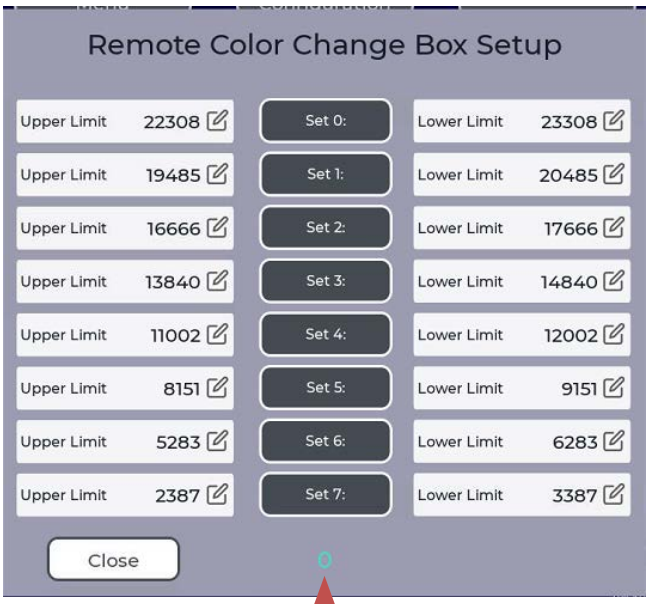
Each "color" (0-7) selector switch can be set. Press "Set X" when an analog value is present.

Retrieve an analog value and ask someone to set the selector switch on the remote selector box when in this menu. A level of 500 below and above the measured value will be set.

Alternatively, the levels can be manually set. Enter the choices in the associated fields.

## NOTICE

This button (1) is visible only if 'Remote CC Selector' is enabled in System Configuration.




Digital value of the analog input readiing from the Remote Color Change box


Select Color 0 (Purge), or 1-7 (Colors 1-7)

Alarm Indicator

When alarm is present, press and hold to clear and restart, otherwise pressing this will initiate a color change to the color selected.

## System Depressurization Process

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

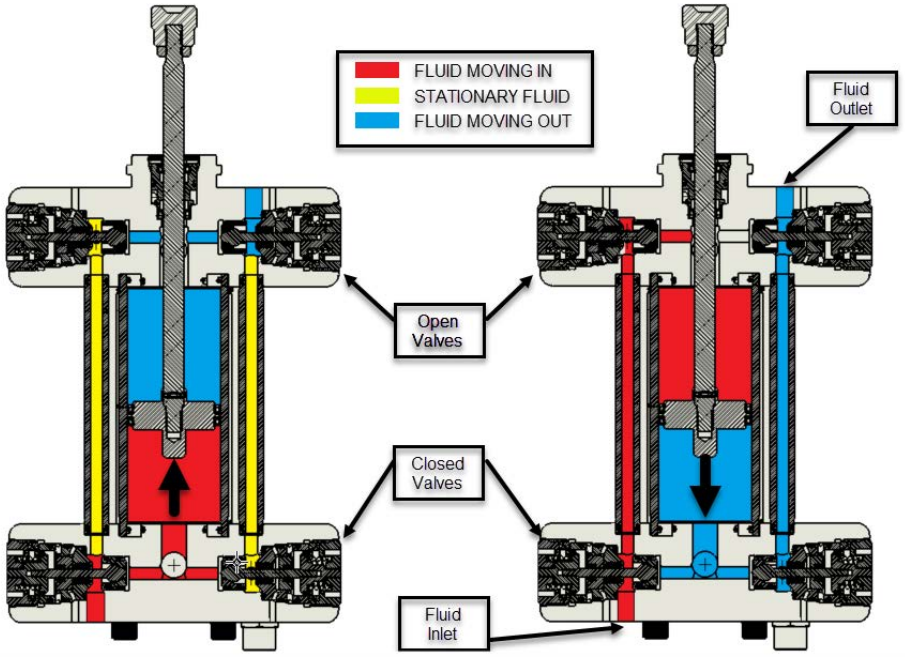
## DISPENSE PUMP OPERATION

Material is delivered to be mixed by a piston and cylinder dispense pump. An inlet and an outlet valve on each end of the pump control the material flow. When the piston moves down, the bottom inlet valve is closed, and the bottom outlet valve is open. As the piston moves down, the material in the cylinder below the piston is dispensed through the bottom outlet valve.

Also, as the piston moves down, the top outlet valve is closed, and the top inlet is open. This action lets material get drawn into the top of the cylinder above the piston. When the piston reaches the bottom of its stroke, the valve settings and the piston direction reverse. This action causes the material in the top of the cylinder to be dispensed and the bottom to be filled.

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

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

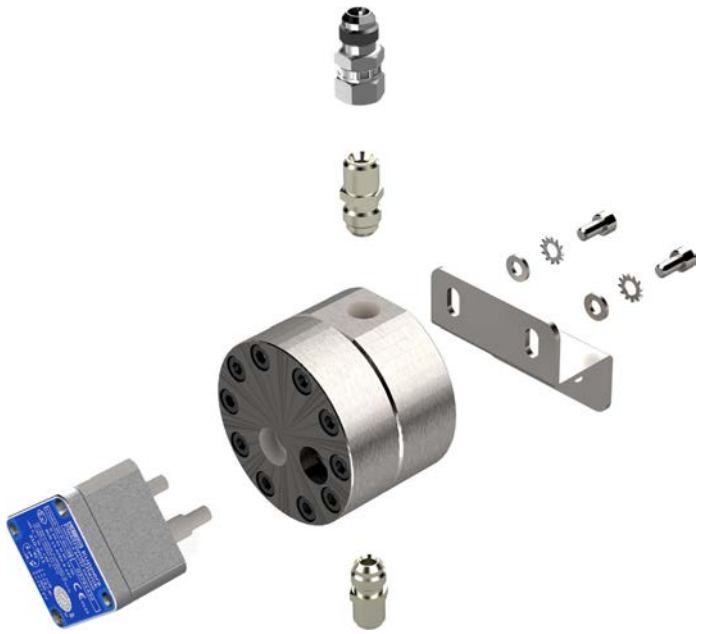



**NOTICE**

The 300 cc and 600 cc versions of the dispense pump operate in the same manner.

## FLOW METER

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



### Flow Meter Do:

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

### Flow Meter Do Not:

- Run the meter dry or spin the gears for a prolonged time with air only.
- Leave the meter to sit or stagnate with air or water inside the flow meter.
- Let the meter dangle by the cable.
- Let the meter drop onto the floor.

### Flow Meter Calibration

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

## Flow Meter Calibration

For the best accuracy in ratio performance of the RF2, it is necessary to calibrate the flowmeter per the material that is being used.

The calibration menu can be reached through the recipe menu and allows a quick check of the material volume dispensed versus what is calculated.

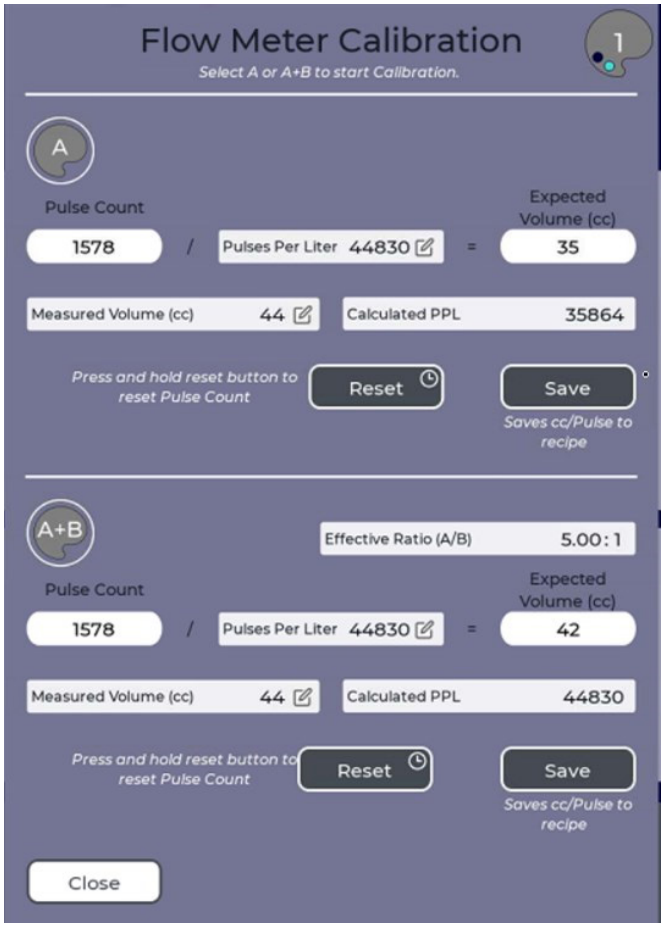
The currently loaded recipe is indicated at the top right of this pop-up-menu.

In "A" calibration mode, the pump will not cycle. Only resin material will flow when the gun is triggered. Press and hold "Reset" and the pulse count will be set to zero.

Next trigger the gun into a measuring cup and enter the measured volume. The pulse count and expected volume will be compared to the measured volume and will suggest a calculated PPL (pulses-per-liter) calibration value for the flow meter. Pressing the "Save" button will save this value to the recipe of the material that is currently loaded.

In "A+B" calibration mode, the pump will operate and the measured volume will include both A and B materials according to the ratio.

If there is a problem with the catalyst pump, it will be detectable if the A+B volume is consistently incorrect, while the A volume is consistently correct.




**NOTICE**

During active calibration, the atomizing air to the gun will be disabled. If using a Gun Flush Box, make sure the lid stays open to turn off atomization air.

**NOTICE**

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

## SETUP

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

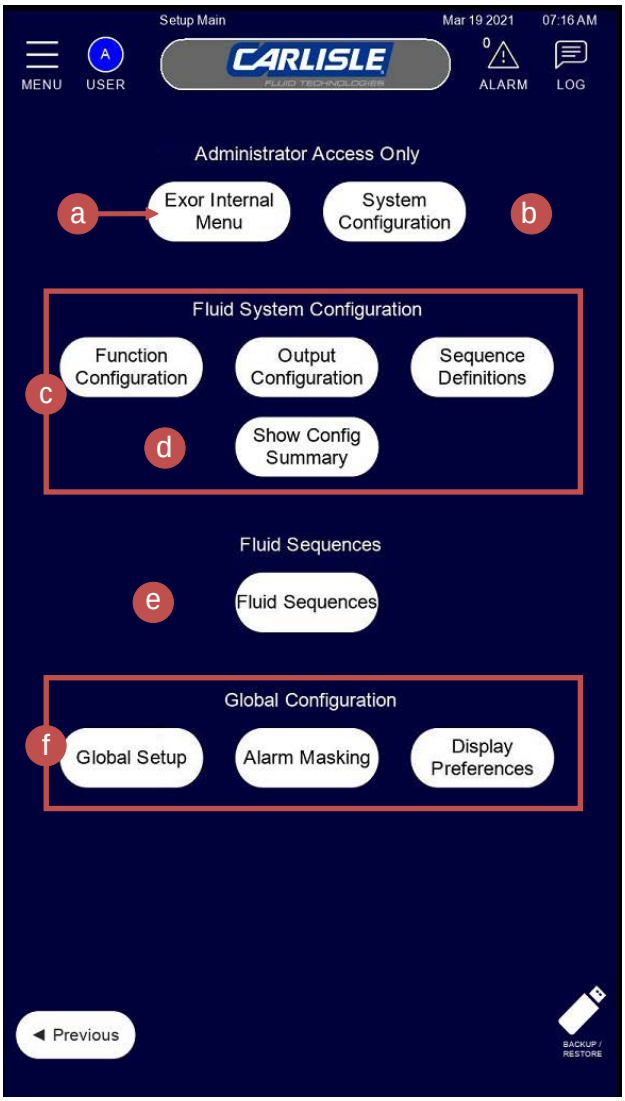
On the main setup page, the top two selections are available only to administrators. These are "Exor Internal Menu" (a) that opens a pop-up dialog to allow internal settings for the Exor operator interface to be modified, and "System Configuration" (b) that opens the system configuration menu.

The next group of selections involve setting up the "Fluid System" (c) which involves setting up outputs, functions, and overall sequence definitions and settings.

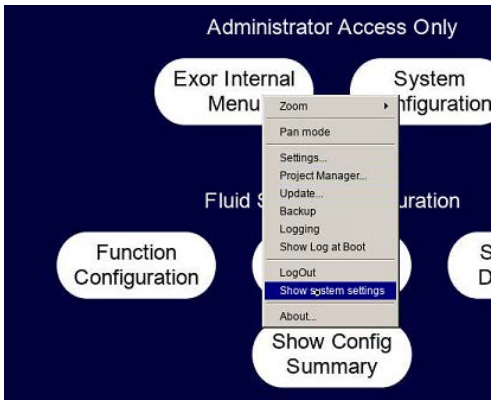
These selections are access-controlled by the administrator. The "Show Config Summary" (d) button will open a page showing an overview of the system configuration.

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.



## 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.

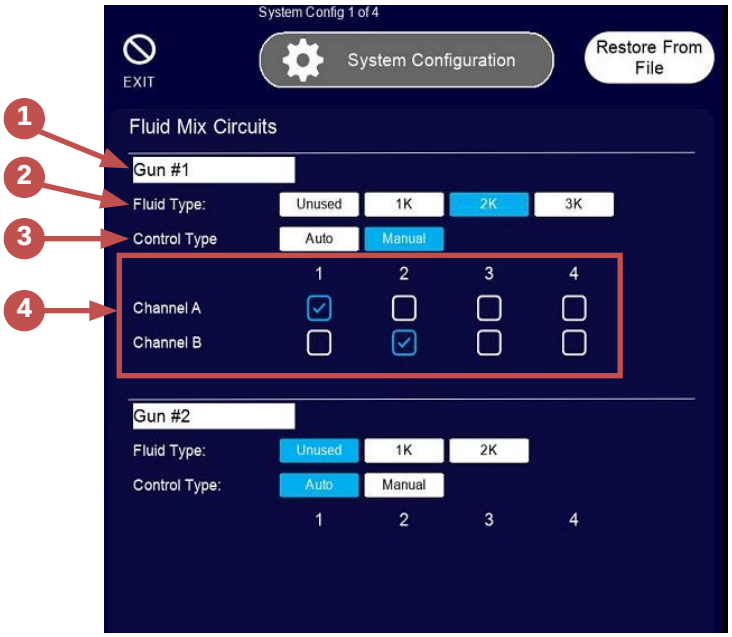
## System Configuration

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:

1. **Description**: Each unit can be named, and the name will be displayed on the main menus and will be what is used for referencing the gun/mixer.
2. **Fluid Type**: Unused, 1, 2, or 3 component fluids.
3. **Control Type**: Auto, Manual Pulse (Future), Manual Analog (Future).
4. **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.

### *NOTICE*

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.

### *NOTICE*

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

## Channels

Press "Next" to open 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.

1. Definitions for each channel.
2. 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.

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

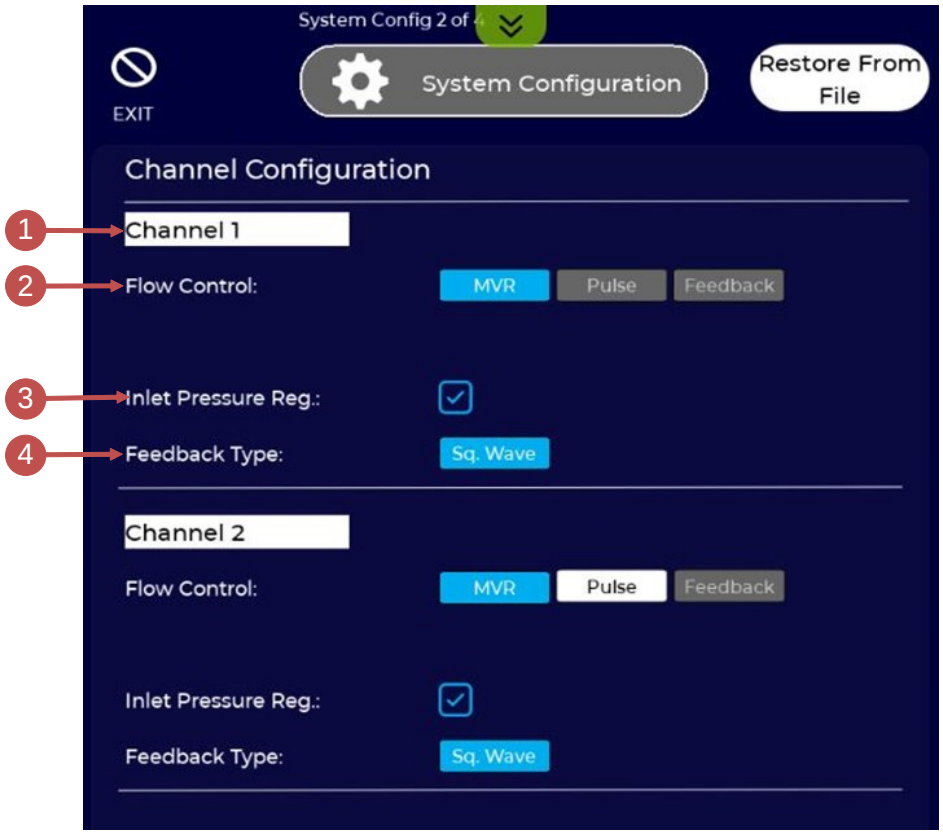
   a. MVR: A Material Volume Regulator is used to control flow.

   b. Pulse: Fluid flow is controlled by a pulsing valve. This option is only available for secondary (B or C) channels in a gun/mixer.

   c. Feedback Only: Flow is not controlled by the RF2 such as with a manual gun. This option is only available for manual systems on the master channel (A).

3. Inlet Pressure Regulation: Select if a pressure regulator is to be used with a flow control device.
4. Feedback Type:

   a. Square Wave: Flow feedback is given by the flow meter pulse connected to a High-Speed-Counter input on the I/O block.

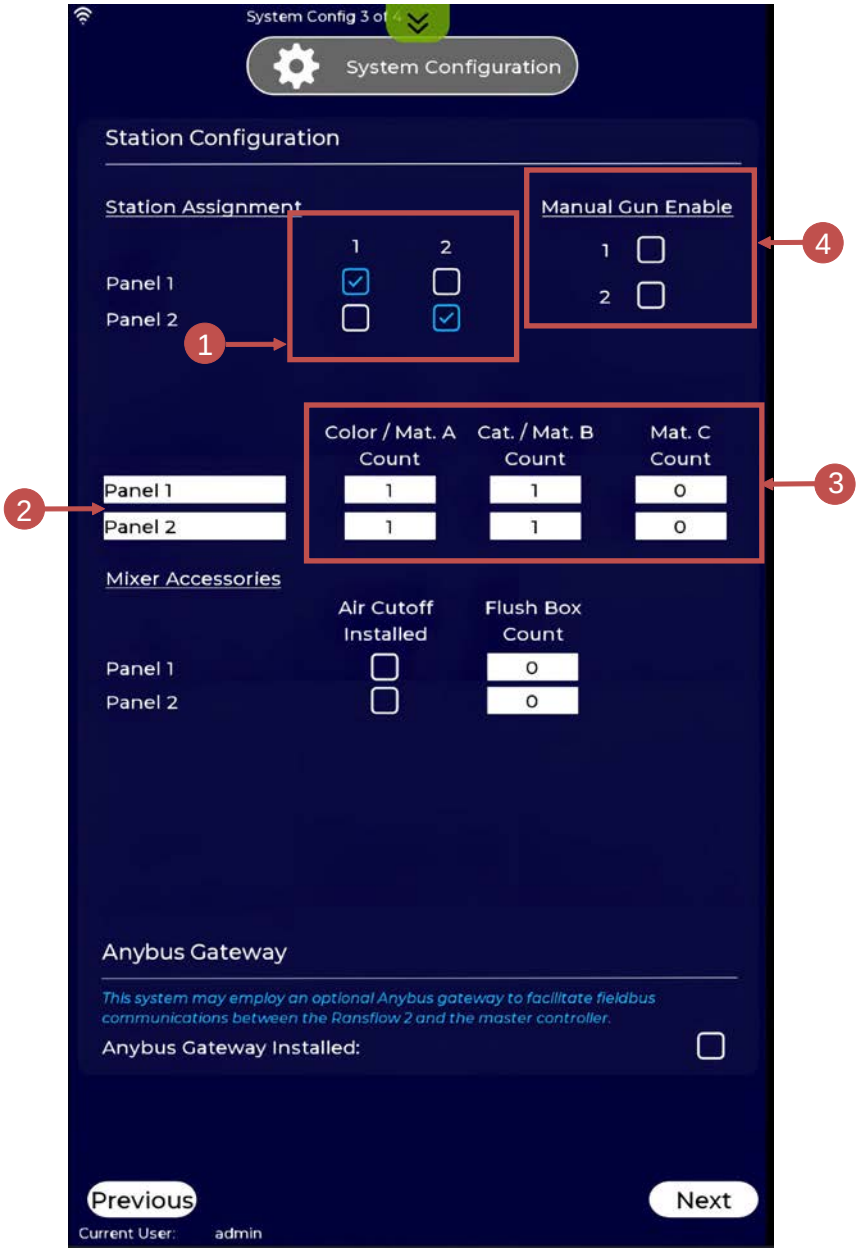


## Stations and AnyBus Gateways

Press the "Next" button to open the next system configuration menu, for further configuration.

Station definitions include:

1. Station assignments: Each gun/mixer configured can be assigned to either panel #1 or 2.
2. Description: Description of each station that is used to reference stations throughout the operator interface.
3. Material Counts: For each channel, the amount of solenoid valves available for materials.
4. Manual Gun Enable: Enables manual gun for either station #1 or 2.

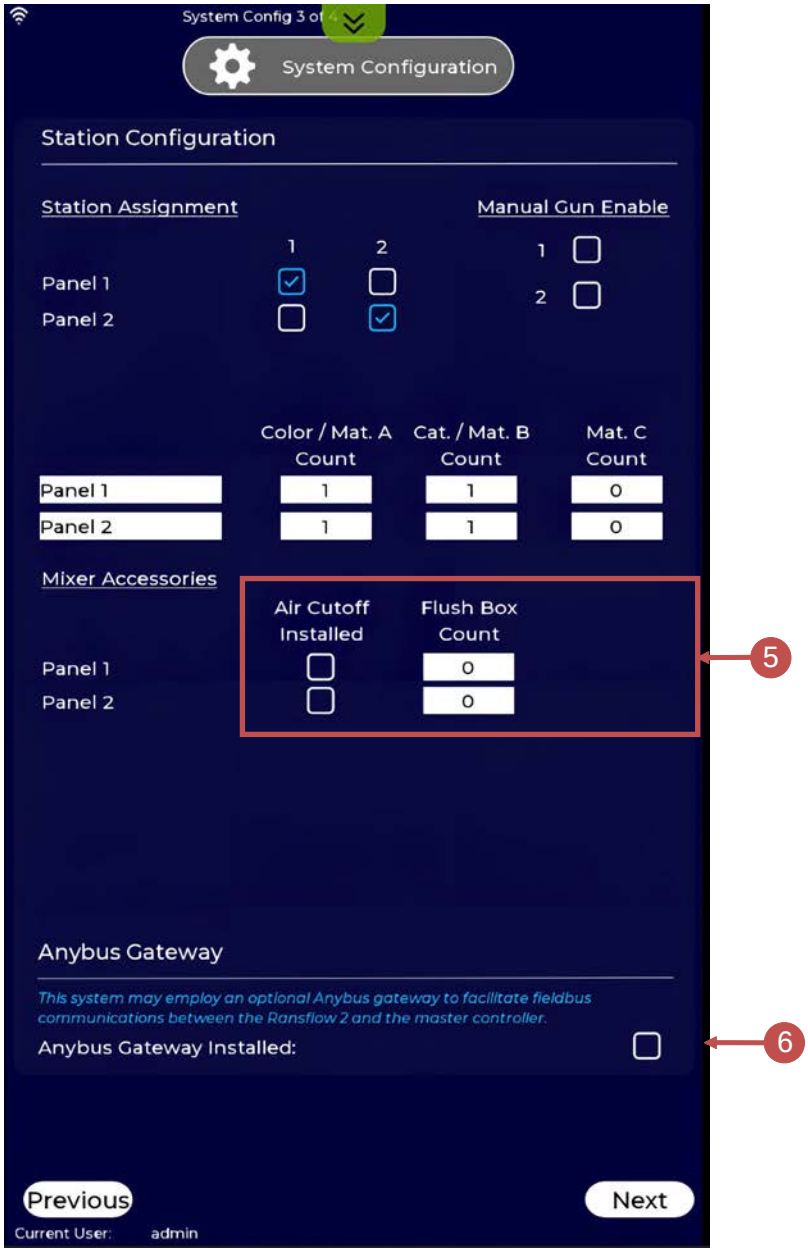


5. Mixer Accessories: Enables the configuration of two new options:

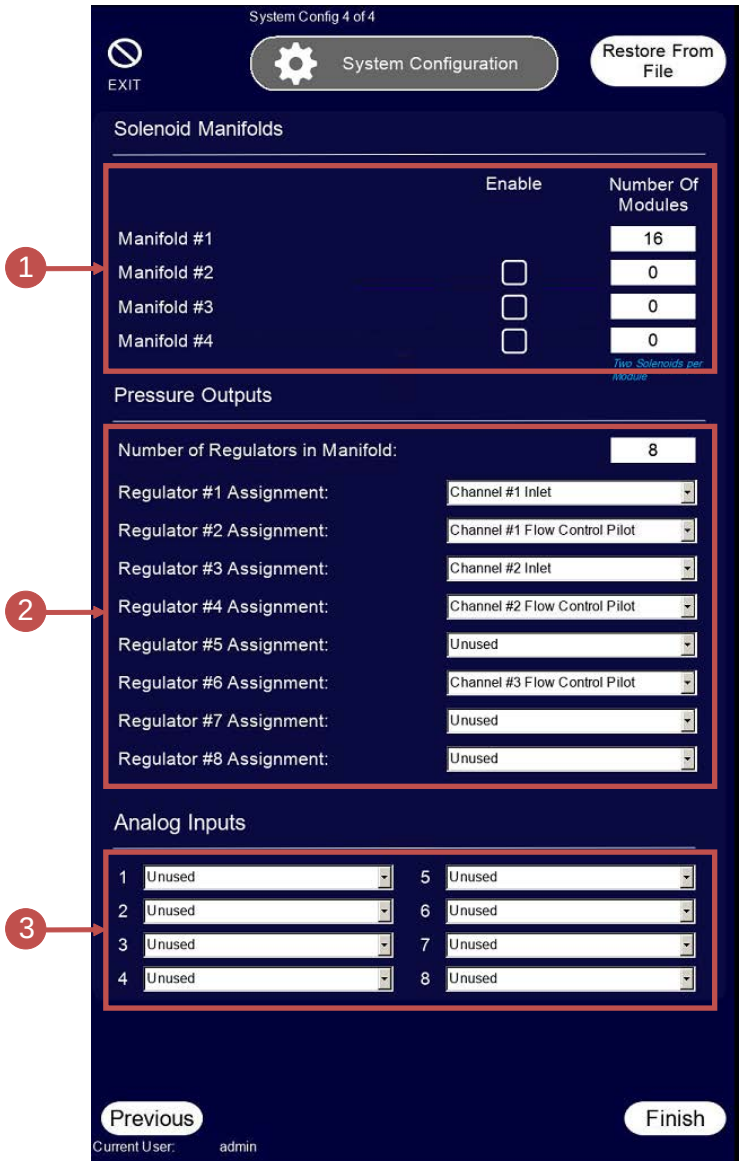
   a. Air Cutoff Installed–Check this box when an air cut-off box is installed on a mixer that does not use one or more flush boxes. When enabled, the trigger 1 (one) and trigger 2 (two) outputs of the corresponding mixer will be turned on and off when the assigned station is started or stopped. The trigger outputs are plumbed to the air cut-off box solenoids to disable the atomization air for each gun. When a flush box is installed, the flush box controls the air cut-off. When the Flush box is set, the count to a value greater than 0 will disable this option. This option does not affect mixers configured for auto mode.

   b. Flush Box Count–Set this field to match the number of flush boxes connected to a mixer. This option does not affect mixers configured for auto mode.

6. AnyBus Gateway: If the HMS AnyBus gateway is used for communications with supervisory processes, this box (6) must be selected.



## Solenoid Manifolds, Pressure/ Regulators, and Analog Outputs




Press the "Next" button to open the next system configuration menu, for further configuration.

1. 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.

2. 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.

   a. 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.

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

   a. Unused: The analog input is not used by the RF2.

   b. Gun/Mix 1-4 Flow Command: Used as the flow command from an external/ supervisory process (PLC or Robot, etc.).

   c. Channel 1-4 Inlet Pressure: For gear-pump flow actuators, the inlet pressure feedback from an installed sensor.

   d. Channel 1-4 Outlet Pressure: For gear-pump flow actuators, the outlet pressure feedback from an installed sensor.

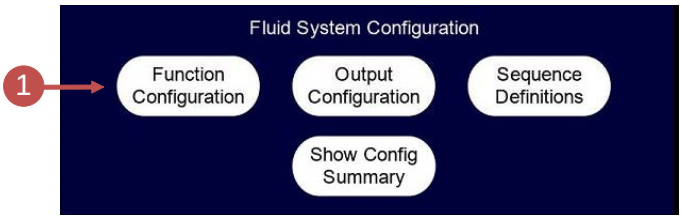
   e. Channel 1-4 Analog Feedback: Analog input is connected to an analog type flow meter for the channel.

   f. Station 1-2 Solvent Flow Meter Feedback: Analog input is connected to a solvent flow meter which is used to verify that enough solvent was used per sequence.

Press the "Finish" button to save the system configuration parameters and reboot the RF2.

## Function Configuration

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

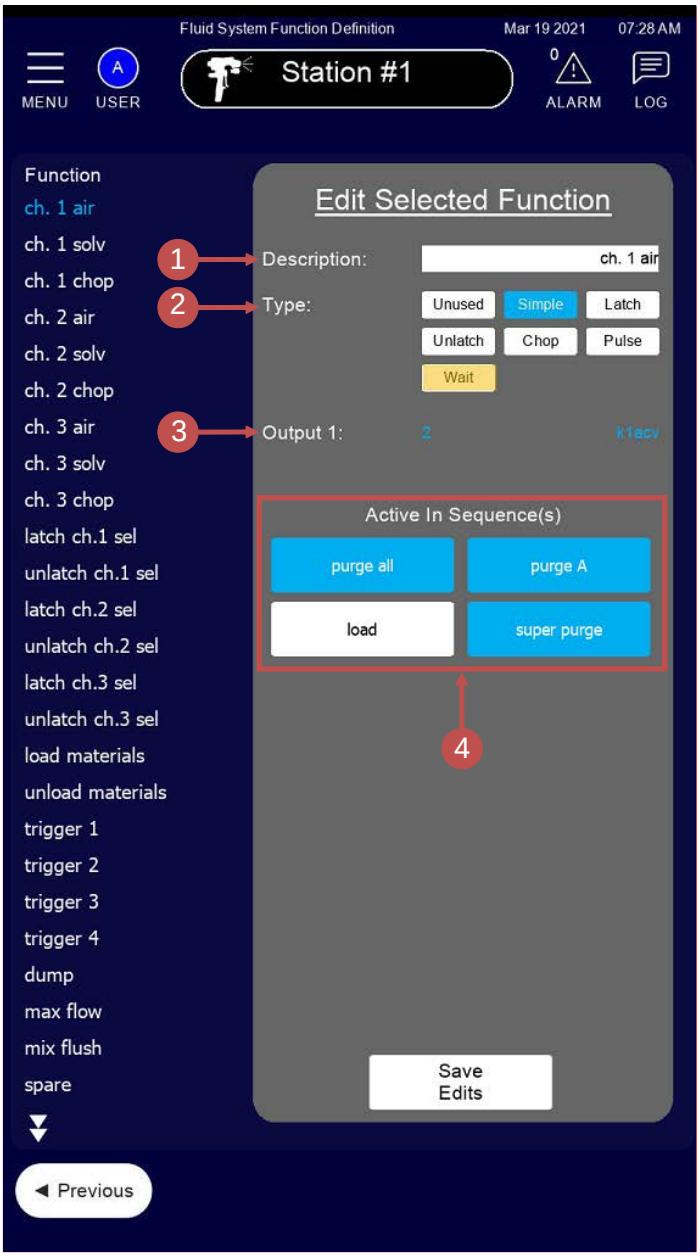



In this menu, the functions can be selected along the left side of the menu. There are fifty functions available per station, pressing the arrow keys toward the bottom of the function list will page up and down.

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 can get changed are:

1. Description: Description of the function selected–often this mirrors the output it works on.
2. Type: Type of function. For more information, consult the section System Configuration–Terminology–Functions
3. Output 1:
   a. For simple, latch, unlatch and pulse types–this is the output that is acted on when the function becomes active.
   b. For chop type functions, this is the first output that is active when the two outputs are toggled.
4. Active in Sequences: Select all sequences for the selected function to be used.

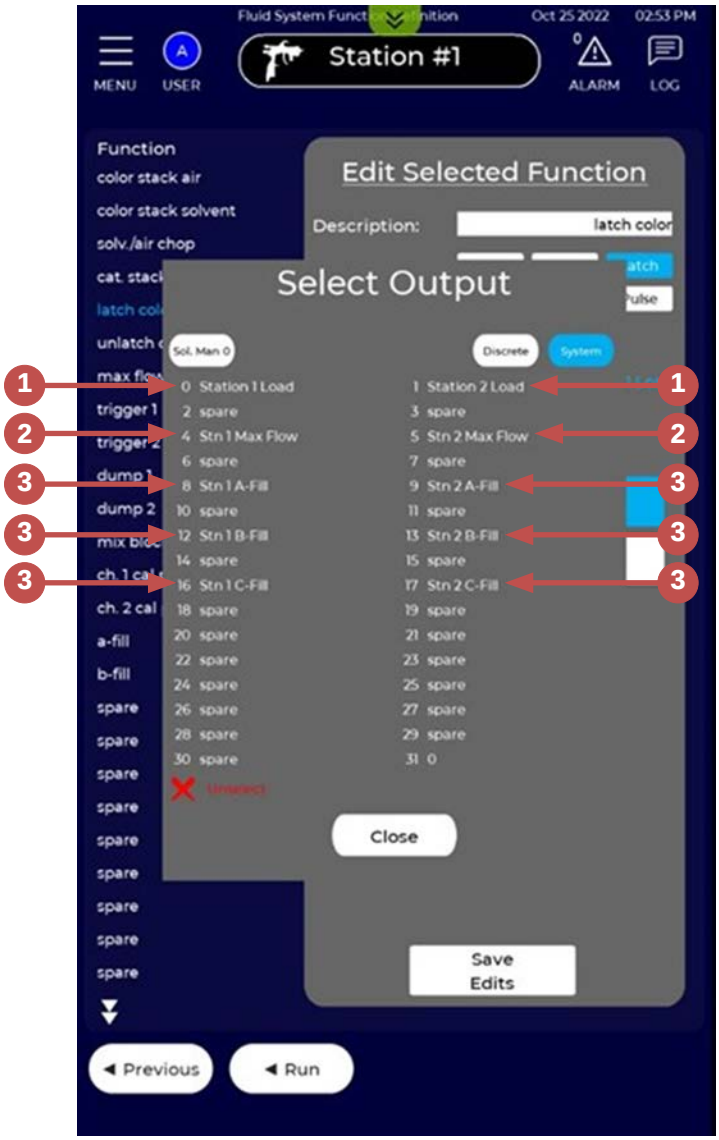


## System Outputs

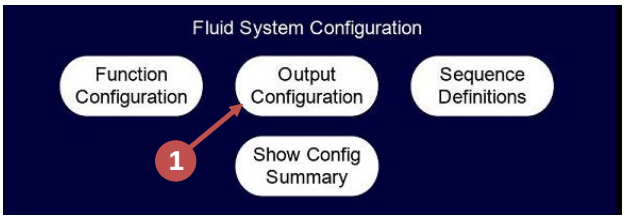
System outputs are predefined outputs used internally to the system to activate certain features, etc. Just like configured outputs, these are called by functions.

Options available are:

1. Station "x" Load–when active, the material valve(s) for the selected recipe for the station will be active.
2. Stn "x" Max Flow–when active (to be used during a load sequence), the flow command for the Gun/ Mixer will be the recipe defined "Sequence High Flow Rate." Materials will mix on ratio at this rate instead of the "Default Flow Rate."
3. Stn "x" A,B, or C Fill–when active the A, B, or C channel for the station will be forced to 100% open. This is typically used by purging operations or for quickly loading material to the flow meter.



## Output Configuration

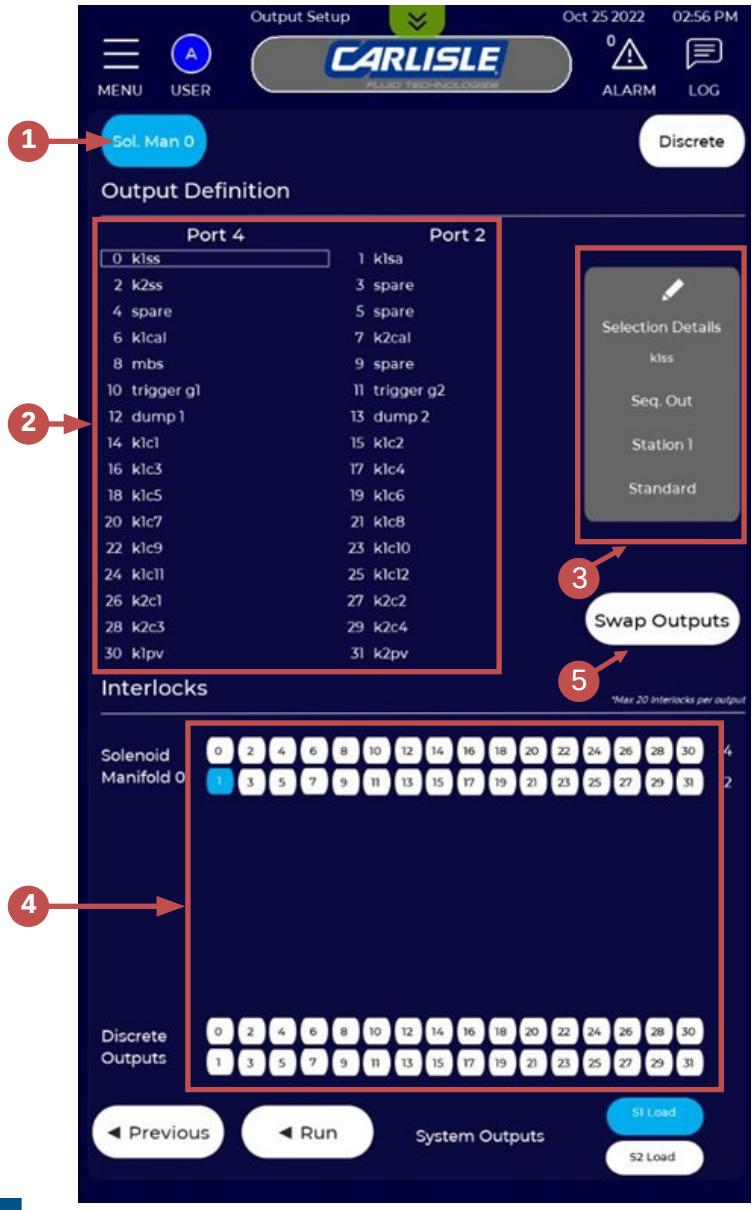



To access this menu, press the "Function Configuration" button (1) in the Setup Main Menu.

1. Along the top of this menu, the various solenoid manifolds that are installed in the system, and the discrete (hardwired) outputs can be selected. Only manifolds that are installed will be visible for selection.
2. Selecting a manifold causes the list of solenoids in the manifold 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.
3. Selecting one of the outputs will cause the Selection Details to the right side of the menu to be updated.
4. Select the interlocks to be updated. To modify the output details, press the area showing the selection details–this will open a pop-up dialog menu (see on next page).

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.

5. Swap Outputs: This button opens the swap outputs configuration screen seen on the next page.




## NOTICE

System outputs that can be interlocked to the S1 or S2 load identify a material valve set to on and–for example–interlocked with solvent or air signals. As a result, it is not necessary to interlock various CCV outputs from one to the other because the RF2 can only operate one CCV output number at a time.

## Output Configuration (cont.)

Parameters to be modified in the "Configure Output" pop-up menu are:

1. 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.
2. Output Type Selection: Refer to page 45 for more information about the different output types in the section–System Configuration-Terminology–Outputs.

3/4. Output ID: Depending on the type selection, different values will be asked for:

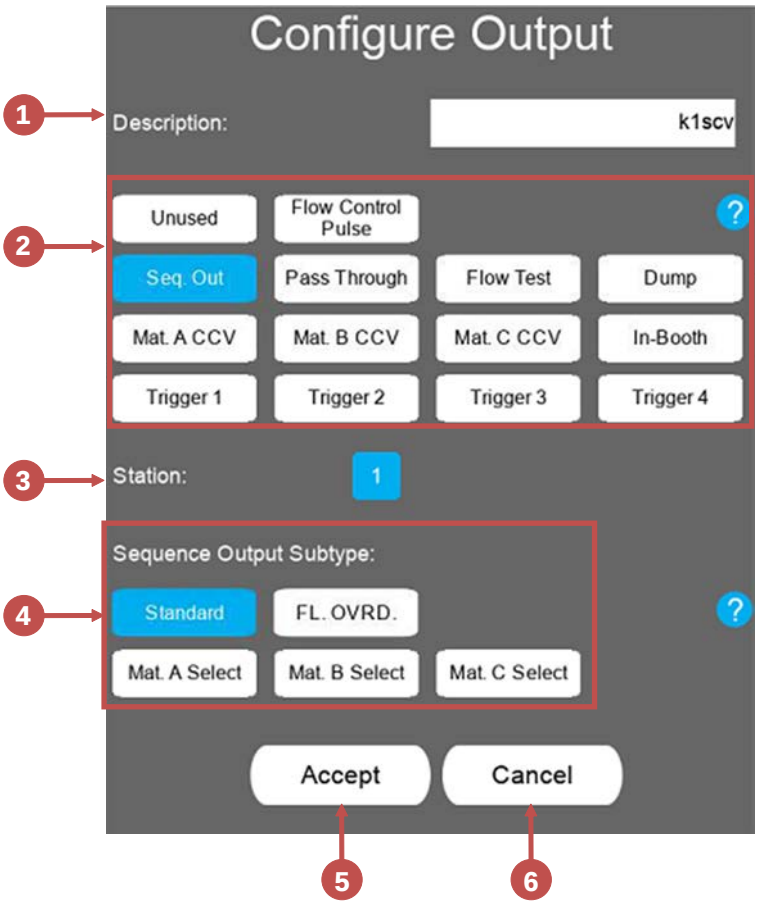
   a. Station Number: For Sequence Output or Material CCV output types, this represents the station that the output is assigned to.

   b. Mix/Gun Number: For Trigger output types, this represents the gun or mixer that the output is assigned to.

   c. Channel Number: For "Flow Test" output types, this is the channel that the output is assigned to.

   d. Input Number: For "Pass Through" output types, this is the input ID that will affect the output.

5. Press the "Accept" button to set the configured parameters.
6. Press the "Cancel" button to stop the reconfiguration procedure.

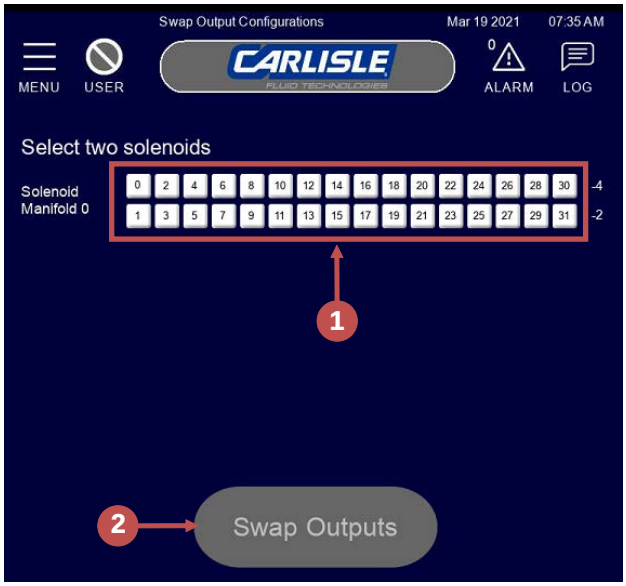



## Swap Outputs

1. Select any two outputs to swap their configuration assignments.
2. Press the "Swap Outputs" button to complete the output swap procedure.

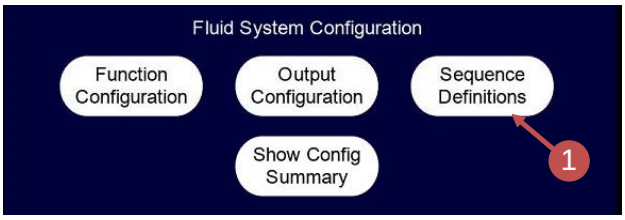
**NOTICE**

When two outputs are swapped, their respective interlocks are also swapped over. If they are part of a sequence function, the function definition is also automatically updated.

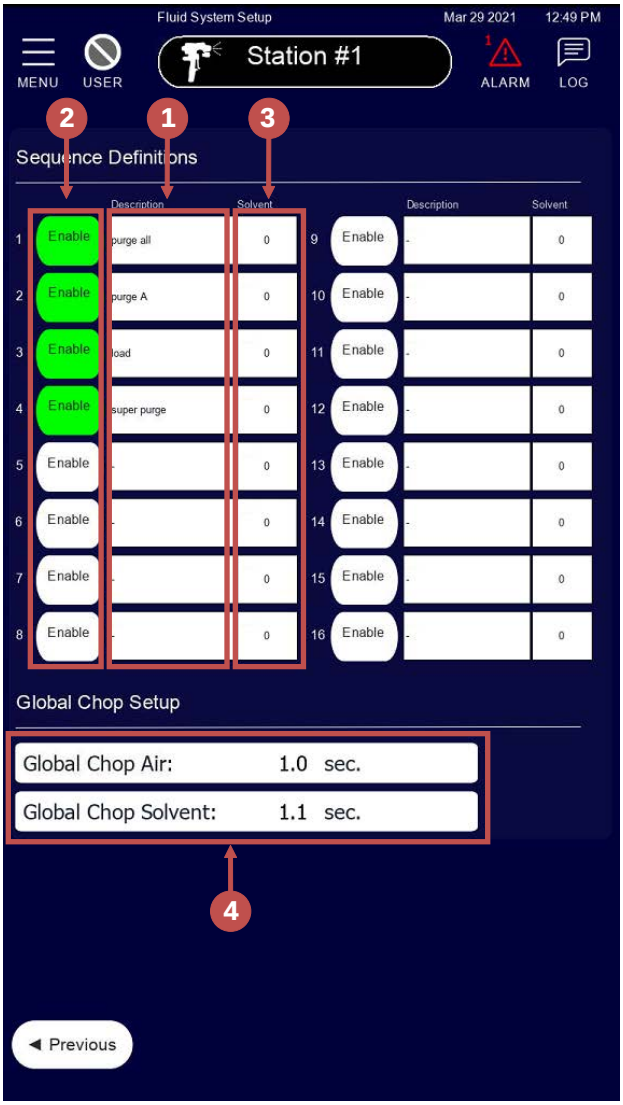


## Sequence Definitions

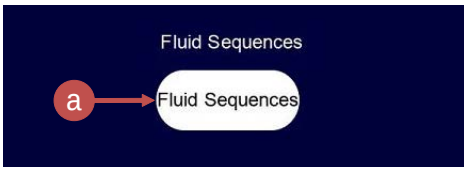
To access this menu, press the "Sequence Definitions" button (1) in the Setup Main Menu.




1. Up to sixteen programmable sequences can be given names
2. Programmable sequences can be enabled or disabled depending on whether they are necessary for the user's process.
3. If a solvent flow meter is used for the station, enter a "solvent-check" value which will be compared to the actual solvent used during a fluid sequence do generate an alarm if not met.
4. Additionally, global values for chop timing (air and solvent on times) are programmed here.

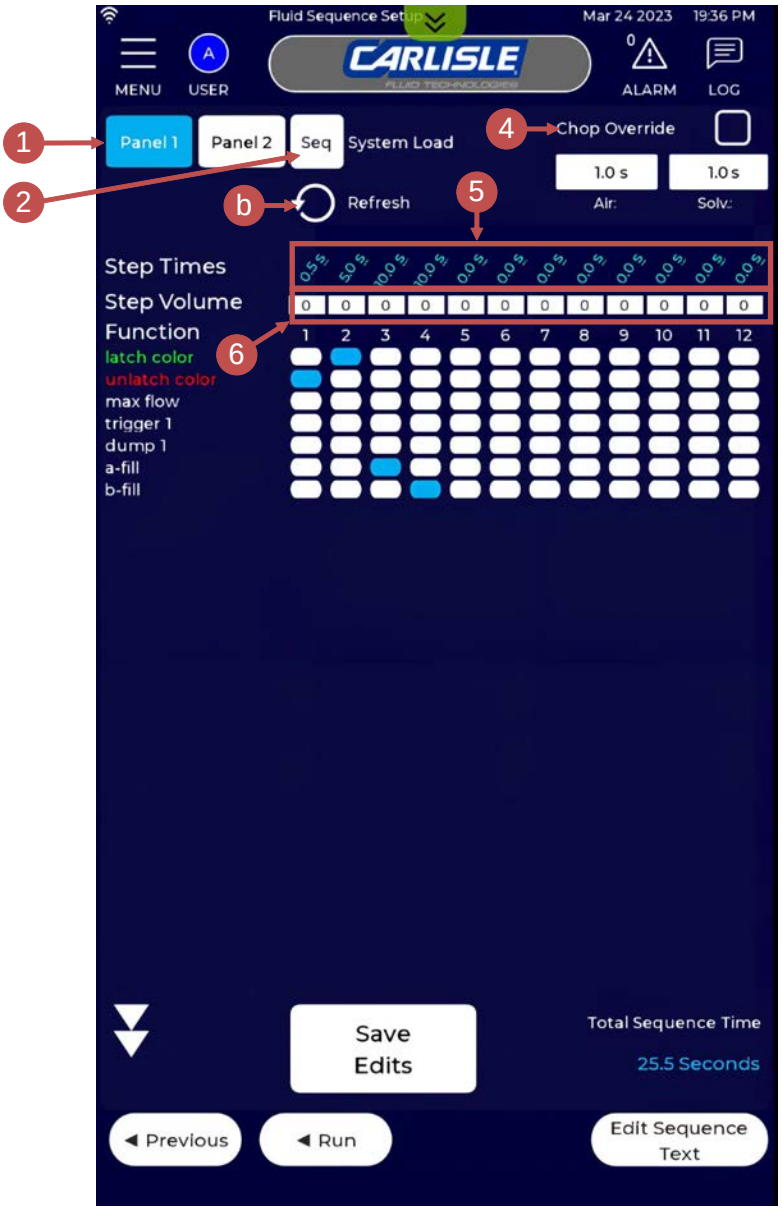


## Fluid Sequences




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.

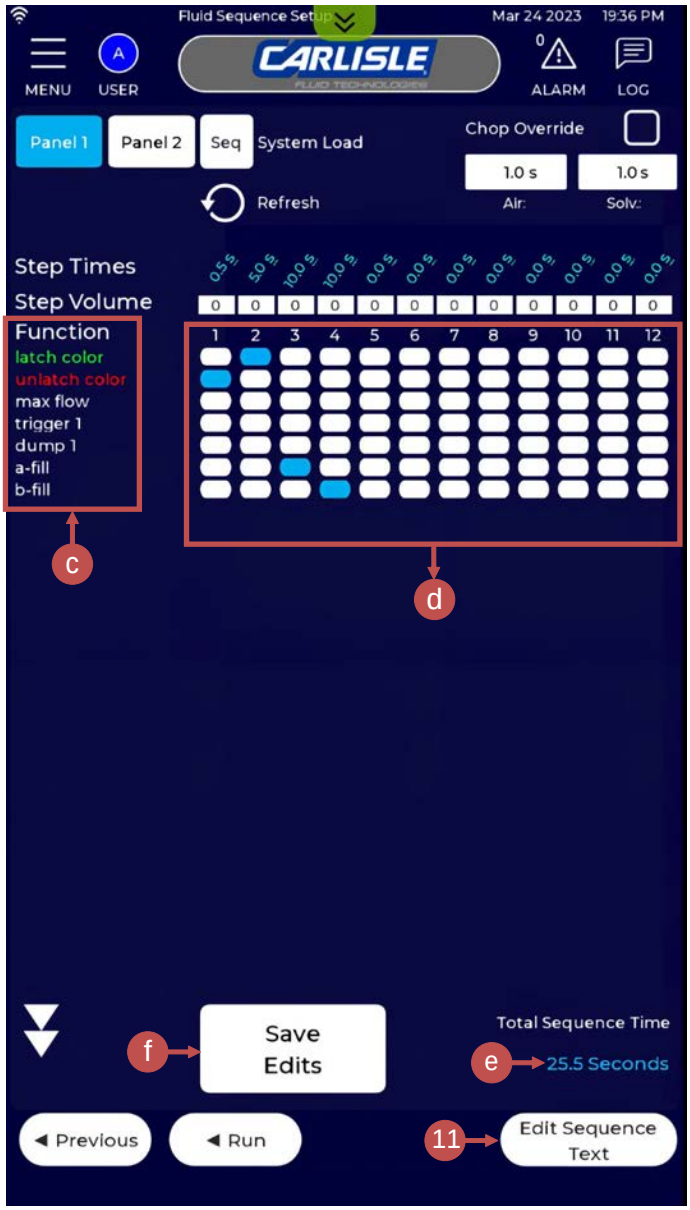
To change a sequence:




1. Select the panel by pressing "Panel 1" or "Panel 2" buttons. The selected panel will be highlighted.
2. Select the Sequence to edit by pressing the "Seq" button or the description to its right. This will open a pop-up dialog which will allow the sequence to be selected from the list of available sequence definitions.
3. When the panel 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. Step Volume: The minimum volume that must flow during each step before the next step. The step volume is measured as the total sum of all mixers configured for the current station; configure the sequence to ensure the calculated volume follows the desired flow path.

   For the sequence to progress to the next step, both the Step Time AND the Step Volume values must be met. The system will wait until enough volume has flowed through the system or until the Step time has passed, whichever takes longer.

7. The list of functions (c) that are used in the selected sequence will be shown.
8. 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.
9. The total sequence time (e) is shown near the bottom of the page.
10. When finished with edits, press "Save Edits" (f) to store them in memory so that they can be used.
11. Edit Sequence Text: Opens the sequence step description editor window.



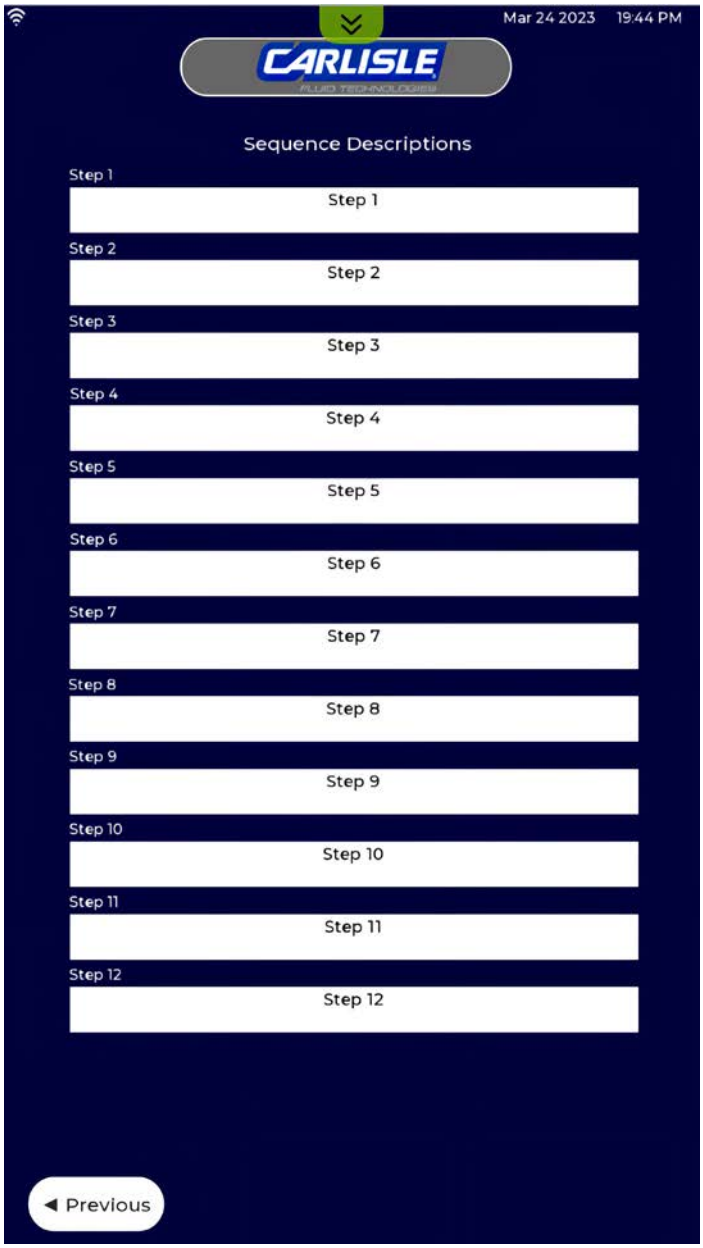
12. Sequence Descriptions: The sequence description editor lets the user add user-defined text that is displayed for each step of a sequence. Each sequence has its own set of 12 user-defined strings. The default values (g) are shown below.

The text fields on the sequence description editor page are the same as the field on the sequence run window. The text entered on this page will also appear on the sequence run window.

The sequence descriptions are not enabled until the user enters the sequence descriptions window and saves their changes.

## *NOTICE*

The user text entered on this page will not be translated when the system language is changed.



## 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.

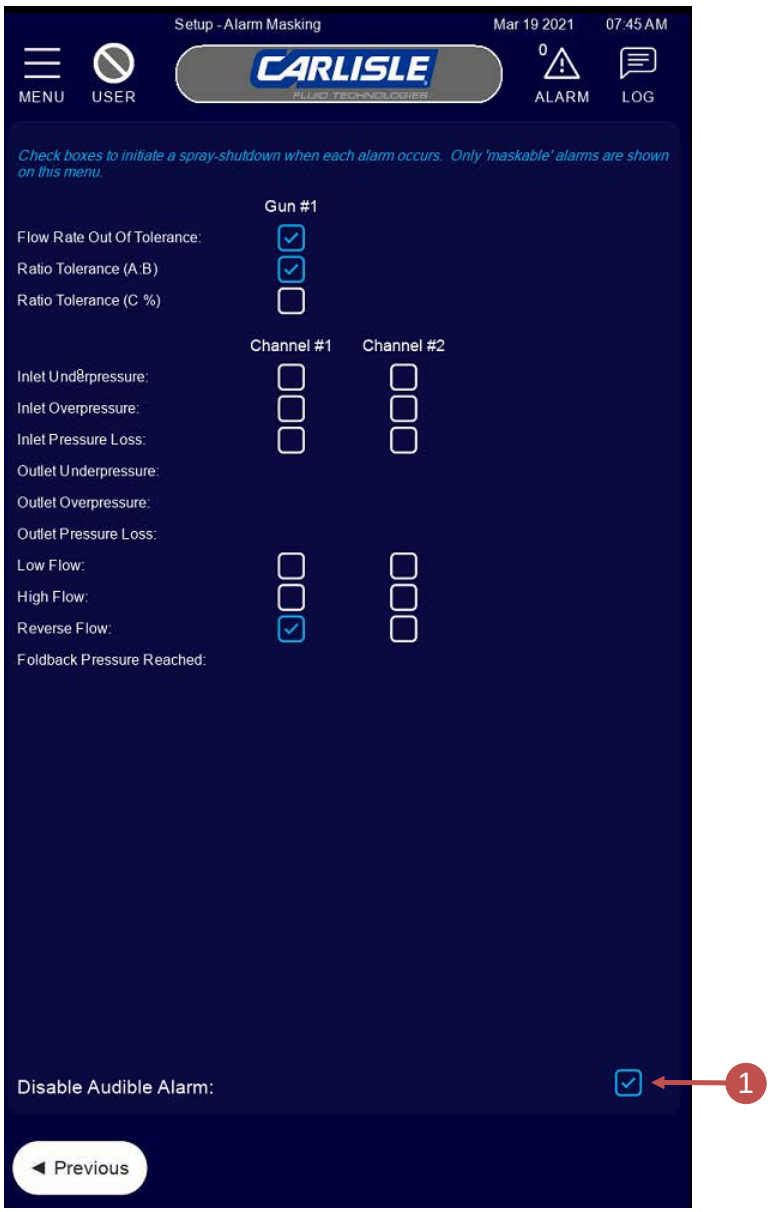
More information about the various parameters is given in "Process Configuration"–Global parameters.


## 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.

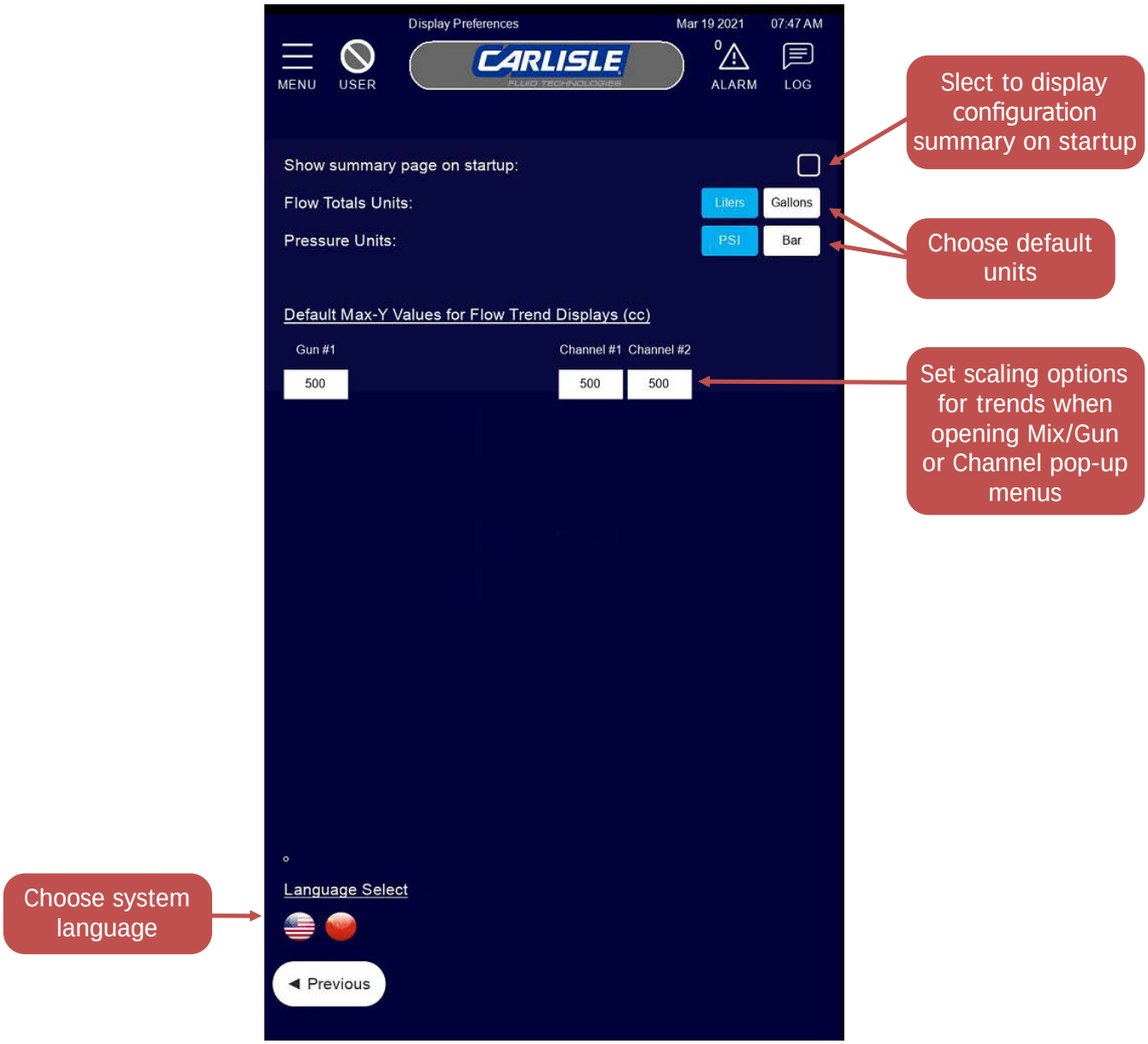
Not all available alarms are shown here, as some alarms will always result in spray shutdowns or warnings.

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, to include language and unit of measure selections.

## 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 (a) provided on the left side of the control enclosure. 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. When pressed, any of these stored .CSV file with the contained information is selected. The "All System Data" row (e) will store ALL system information.

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

## Restore Data

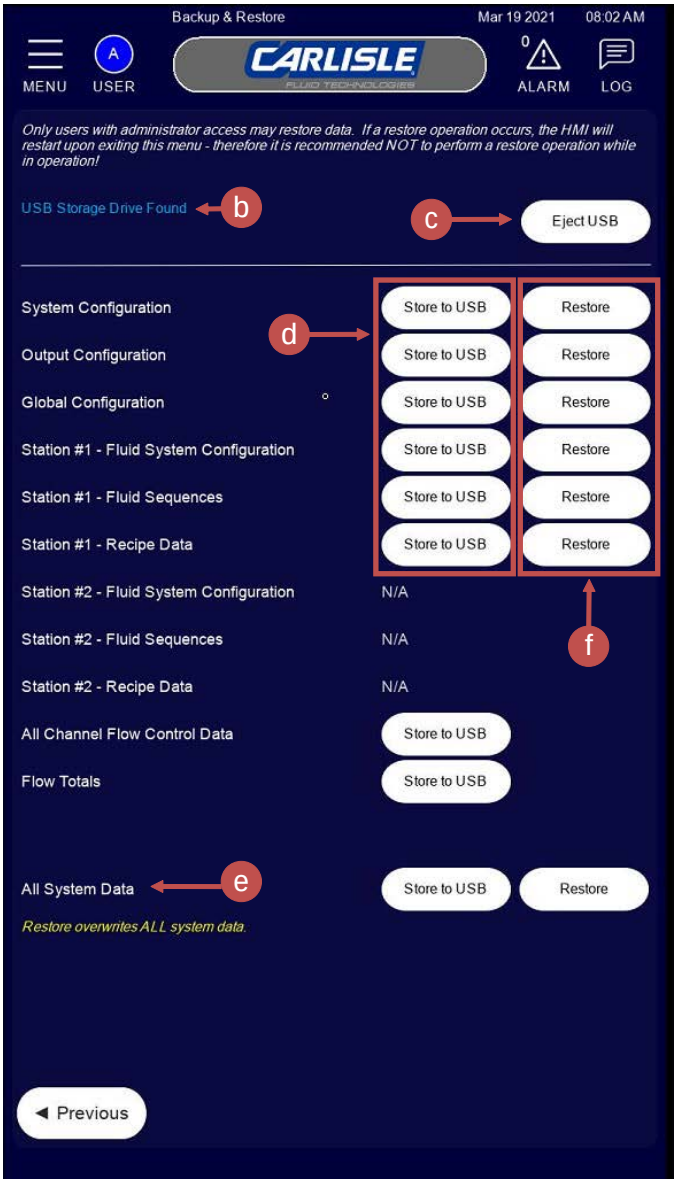
Press the "Restore" button (f) on any row to open a file dialog to access the operator interface's file system (including the USB drive and SD Card), etc. to look for the appropriate .CSV file.

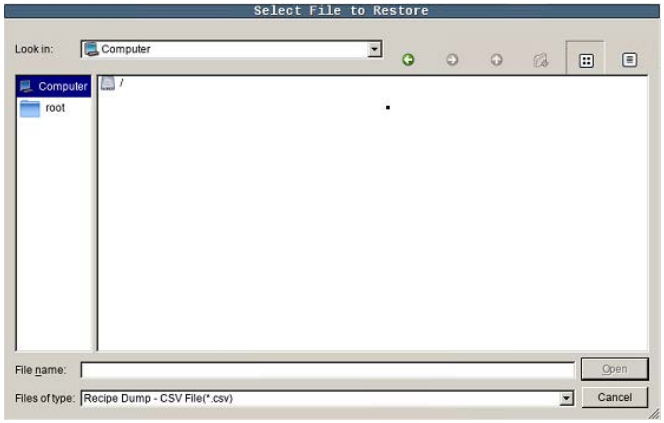
The file restore dialog can be resized.

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.



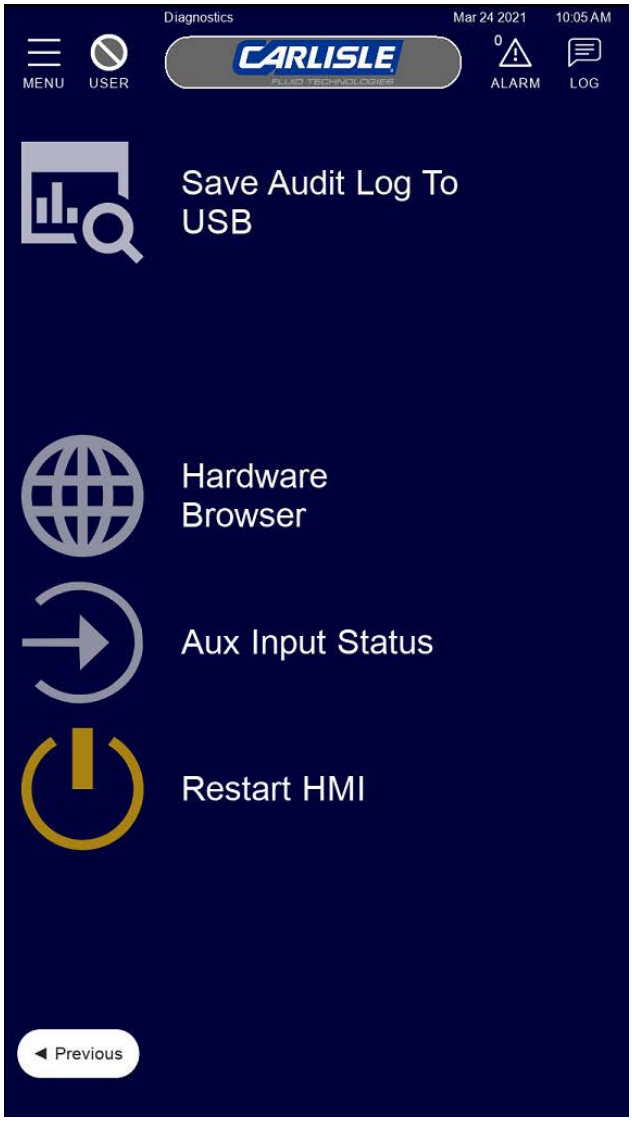



# DIAGNOSTICS

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.



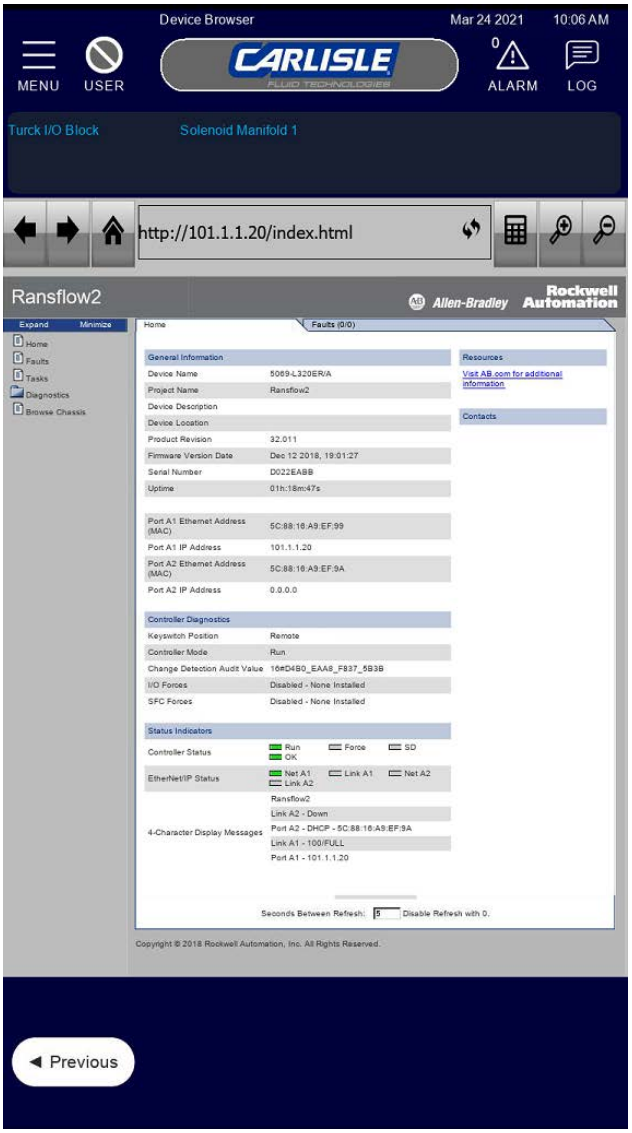

**NOTICE**

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.

## Hardware Browser

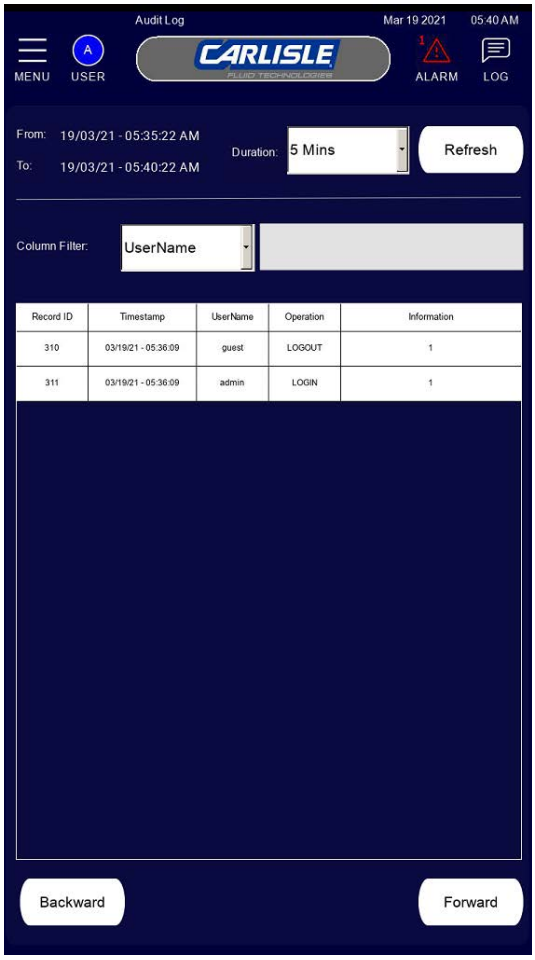
Some of the ethernet-enabled devices that are used by the RF2 have built-in web pages that allow for further diagnosis. The Exor operator interface that is used by the RF2 has a browser that allows viewing of those pages.

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.



## 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.



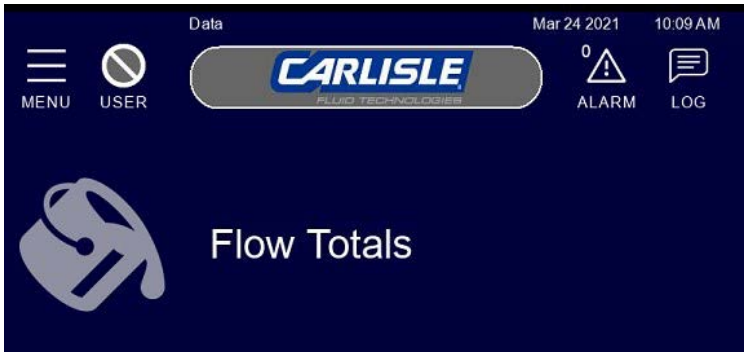

## Restart HMI

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:



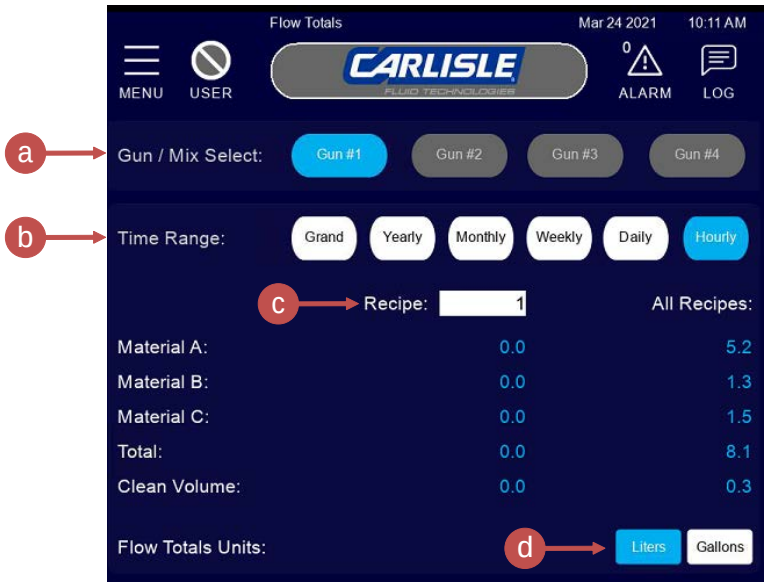

### Flow Totals

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.

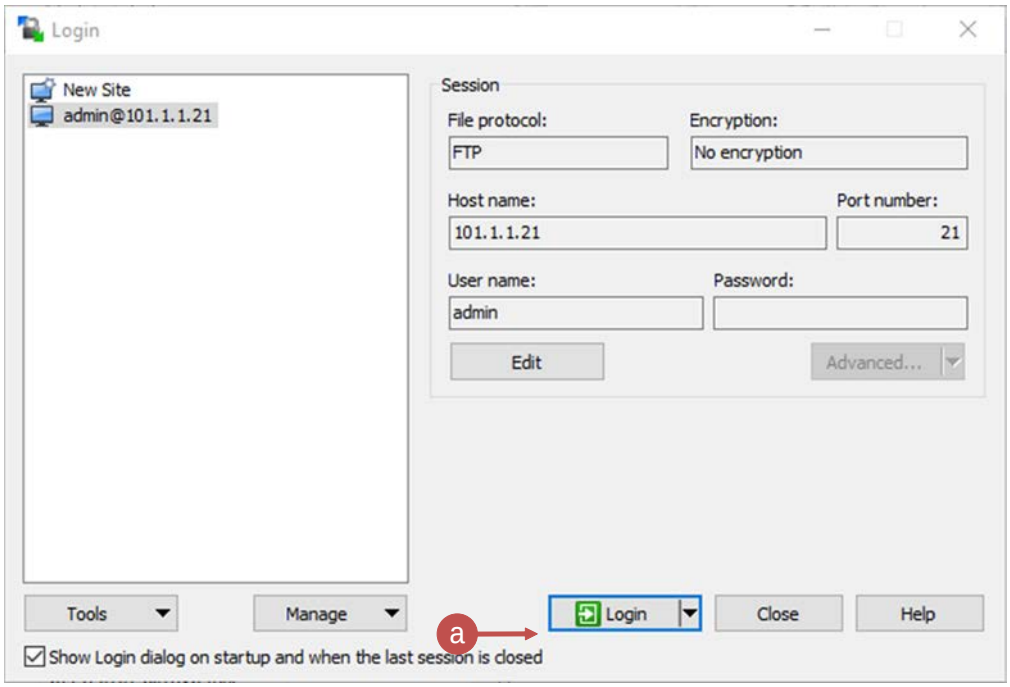
More information about connecting the RF2 to fieldbus can be found earlier in this manual starting on page 66 and in the Appendix starting on page 189.



## File Access Via FTP

Files stored on the operator interface, including daily archives of system settings, alarm logs, etc. can be accessed via FTP if a computer is connected to 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.

**NOTICE**

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

## MULTI-COLOR STATUS LIGHT FUNCTIONS

The status/stack light is found on the top of the exterior of the RF2 control panel. The light will change color and/or flash depending on the status of the RF2. Each light function is defined below.

| LIGHT | FUNCTION |
|---|---|
| Green—Solid | Machine is in "RUN" state, and no trigger signal is present on any stations. |
| Green—Flashing | Machine is in "RUN" state, and trigger signal is present on one or more stations. |
| Red—Solid | Machine fault is present. |
| Yellow—Solid | Warning indication, No fault is currently present. |
| Blue—Solid | Pot life is nearing expiration. |
| White—Solid | Machine stopped idle state, no system warnings or faults. |
| White—Flashing | Exor (HMI) Communication Timeout, no system warnings or faults. |
| Light Cyan—Solid | Machine is running in an active sequence state. |

# MAINTENANCE

## REGULAR MAINTENANCE PROCEDURES AND RECOMMENDATIONS

### Material Purge

After a job is completed, remember to thoroughly purge the system. Failure to do so can cause clogs, leaks, or cross-contamination of colors and material when the system is disassembled.

### Regular Inspection

Continuous use or lack of use of the system can cause a system malfunction. Do regular interval system inspections as shown at the 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 |

## TOP LEVEL PART NUMBERING

310-C ## - ###

| Comms |
|---|
| **0=No Gateway** |
| **1=Ethernet IP** |
| **2=Profient** |
| **3=DeviceNet** |
| **4=CCLink** |
| **5=EtherCat** |

| Wireless |
|---|
| **0=None** |
| **1=WiFi** |
| **2=Cellular** |
| **3=Wifi + Cellular** |

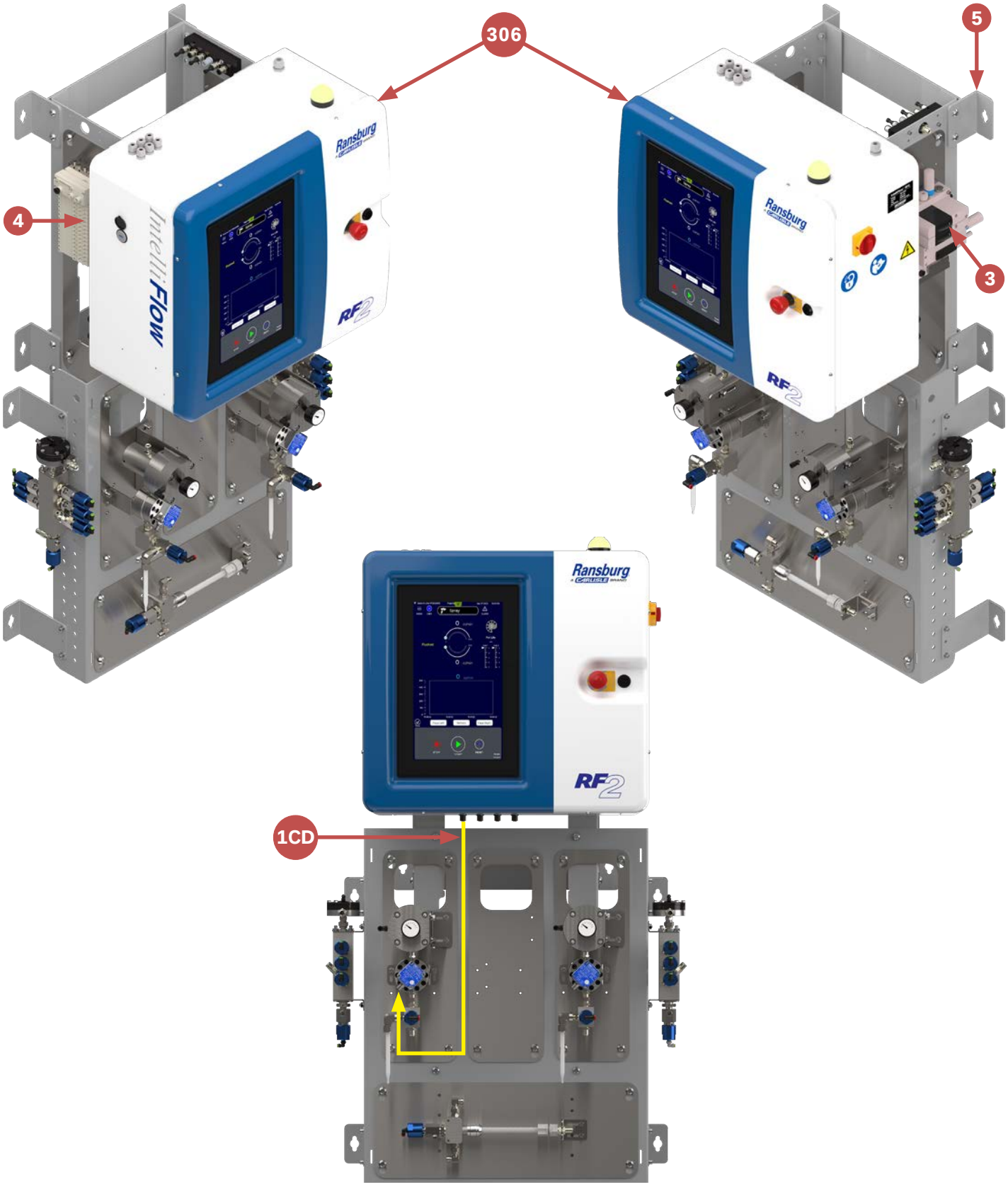
| Number of Automatic MVR/ DR1 Channels |
|---|
| **0=None** |
| **2=2 Channels** |
| **4=4 Channels** |

| Number of Manual Pulse Channels |
|---|
| **0=None** |
| **2=2 Channels** |
| **4=4 Channels** |

| Number of Solenoid Manifolds |
|---|
| **1=1 Manifold (32 Solenoids)** |
| **2=2 Manifolds (64 Solenoids)** |
| **3=3 Manifolds (96 Solenoids)** |
| **4=4 Manifolds (128 Solenoids)** |

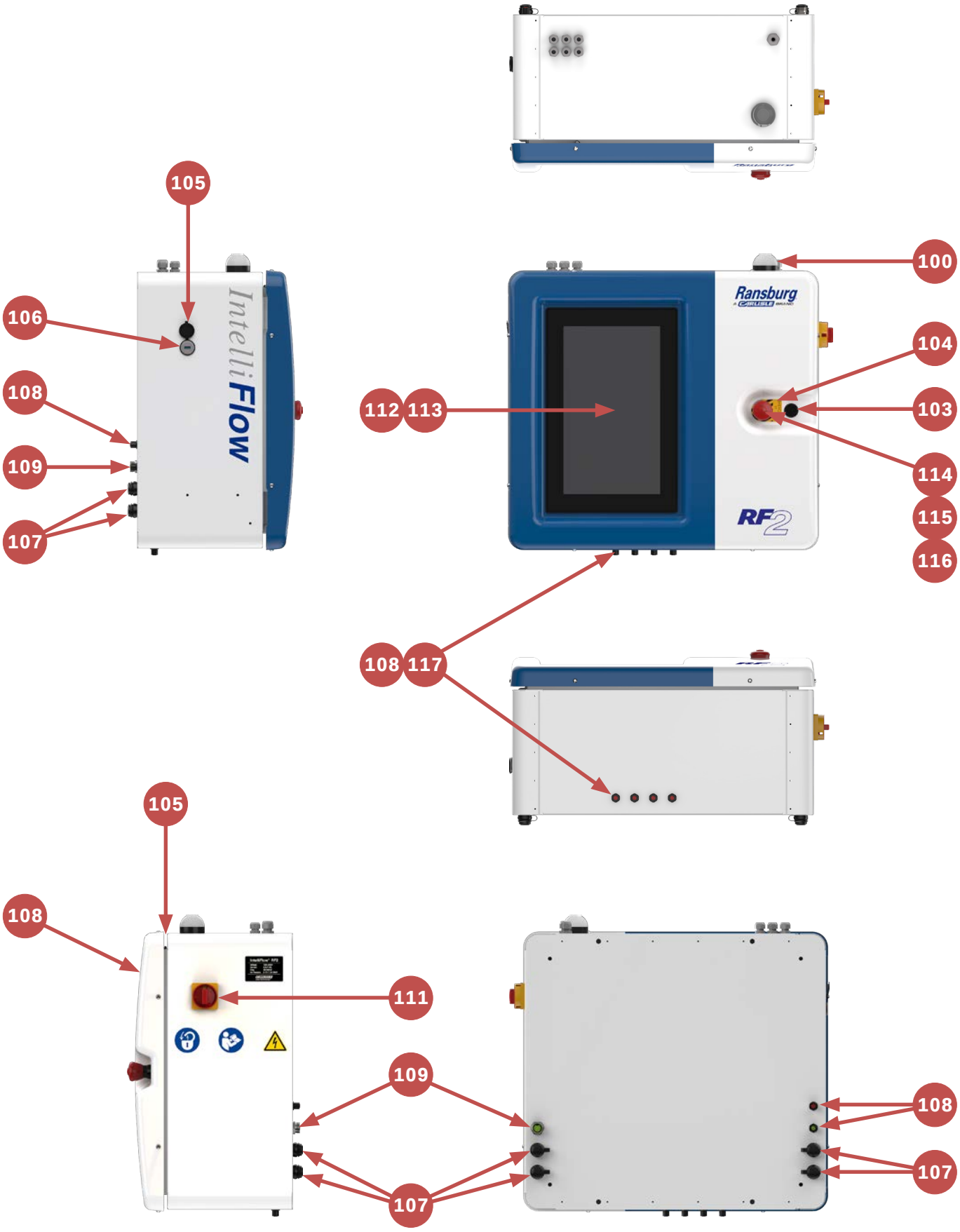
# COMPONENT VIEWS & SPARE PARTS

## RF2 CONTROLLER



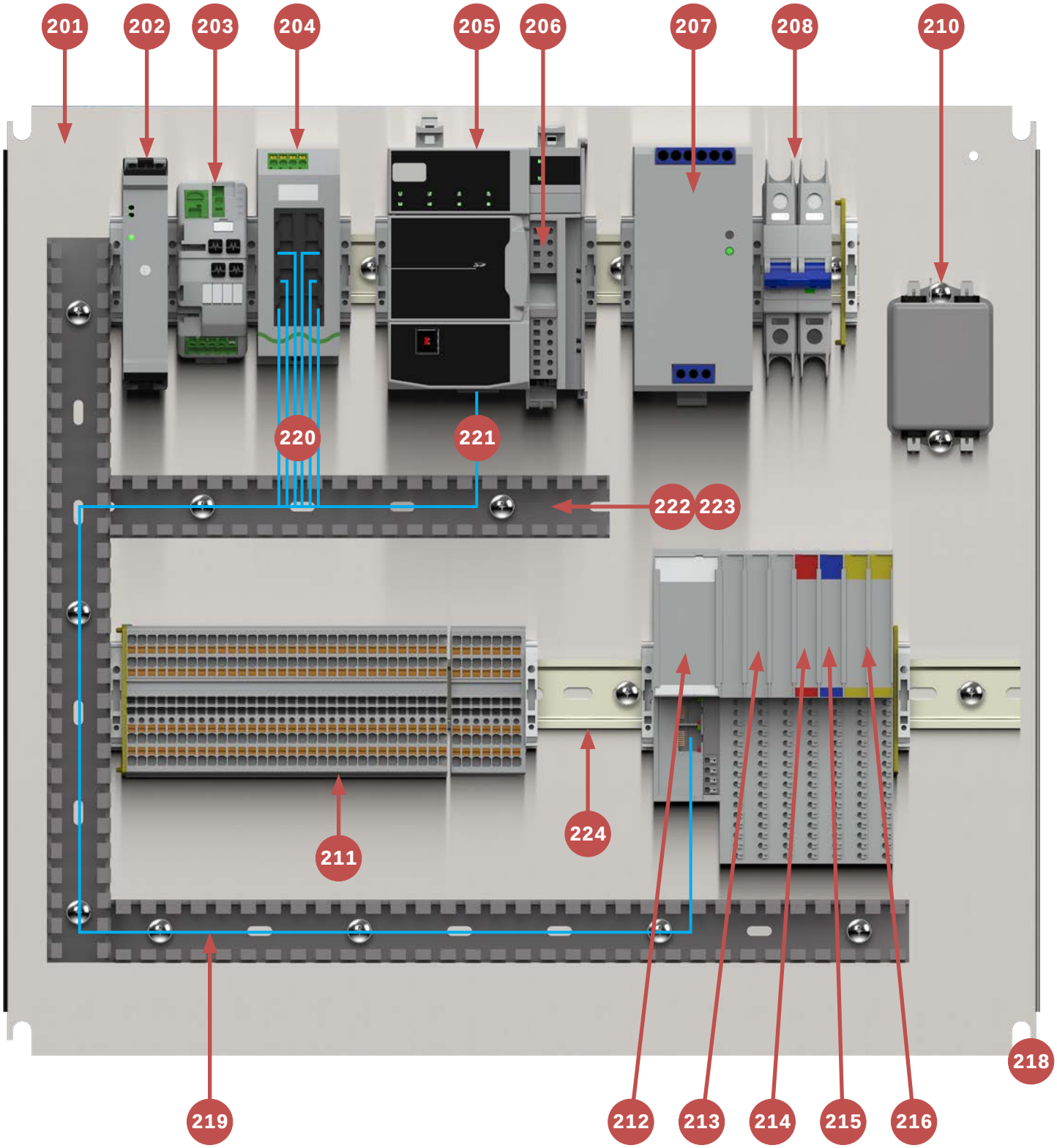
| RF2 CONTROLLER-TOP LEVEL | | | |
|---|---|---|---|
| **Item** | **QTY** | **Part No.** | **Description** |
| 1 | 1 | 310-5000 | Control Enclosure |
| 1CD | * See 1CD | – | Flow meter cables for different channel counts |
| 3 | * See Table 3 | 310-3940 | Pressure Regulator |
| 4 | * See Table 4 | 310-3960 | Solenoids |
| 5 | – | 310-2010 | Mounting Bracket |
| 6 | – | – | Cover-Pressure Regulators |
| 7 | – | – | Cover-Solenoids |
| **FLOW METER OPTIONS (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 |
| Z | 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 |
| **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 |
| **WIRELESS COMMUNICATION 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



| 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 Decal |
| 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, |
| 111 | 1 | 240-5159 | LOAD SWITCH, 16A, FRONT/DOOR, W/ ACTUATOR |
| 112 | 1 | 310-4002 | HMI, EX SERIES, 15", W/ CODESYS |
| 113 | 1 | – | SD CARD, 32GB, CDW P/N 3052120, MFG P/N SDSDB-032G-A46 |
| 114 | 1 | 310-5166 | Non-Illuminated Mushroom Operators, Twist to Release, 40 mm, |
| 115 | 1 | 310-4102 | 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) |

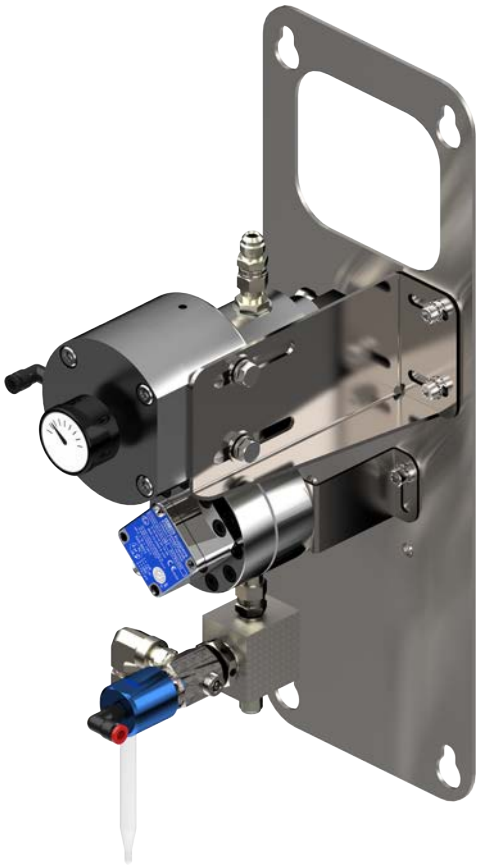
## CONTROL BACKPANEL

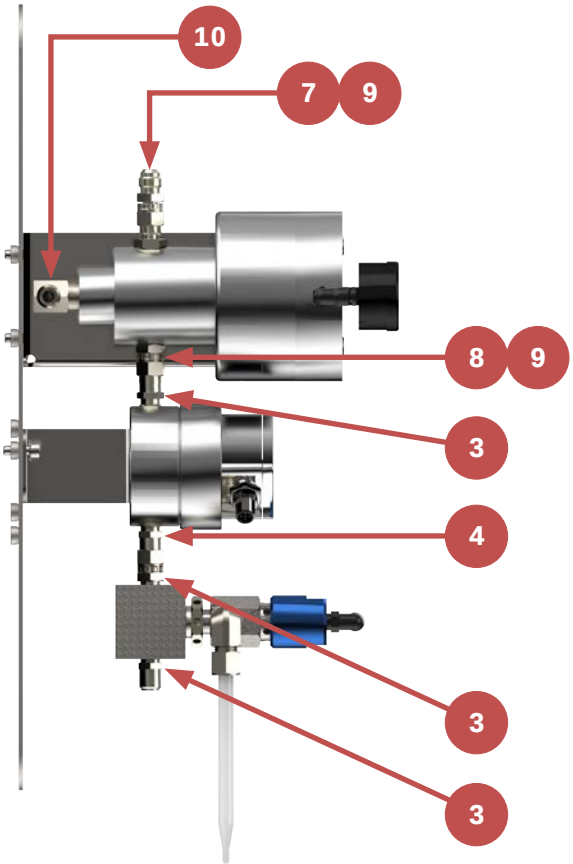


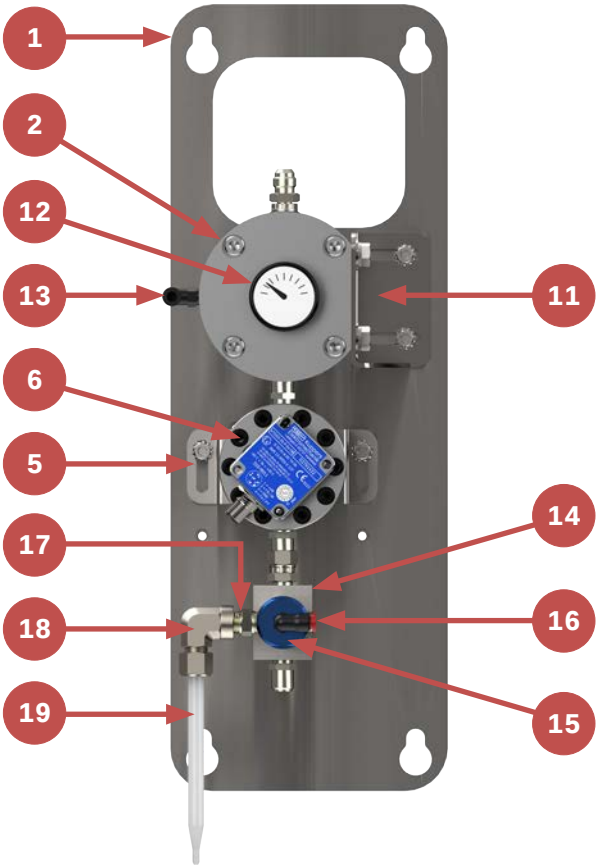
| CONTROL BACKPANEL | | | |
|---|---|---|---|
| **Item** | **QTY** | **Part No.** | **Description** |
| 201 | 1 | – | Electronics Back Panel |
| 202 | 1 | 310-4116 | SAFETY RELAY |
| 203 | 1 | 310-4104 | ELEC CIRC PROT, 4CH, CLASS 2 |
| 204 | 1 | 310-4105 | ETH SWITCH, UNMANAGED, 8PRT |
| 205 | 1 | – | 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 1 x 4", Gray |
| 223 | 4 ft | – | Panduit Cover, 1" Gray |
| 224 | 3 ft | – | DIN Rail, Perforated |

## FLUID MODULE

WEEPING
(See manual No. LN-9112-00 for additional details)



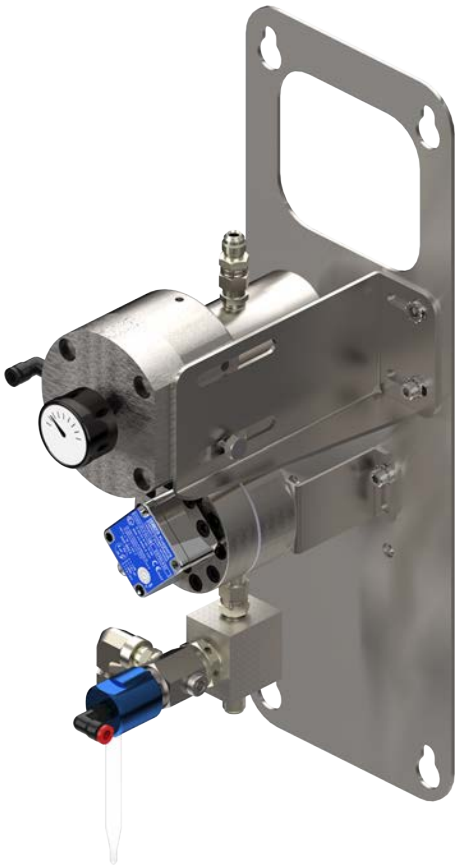


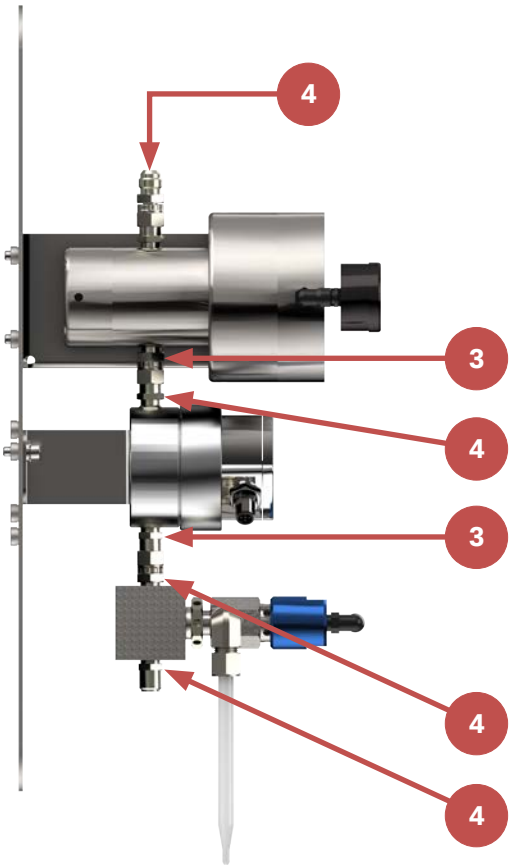



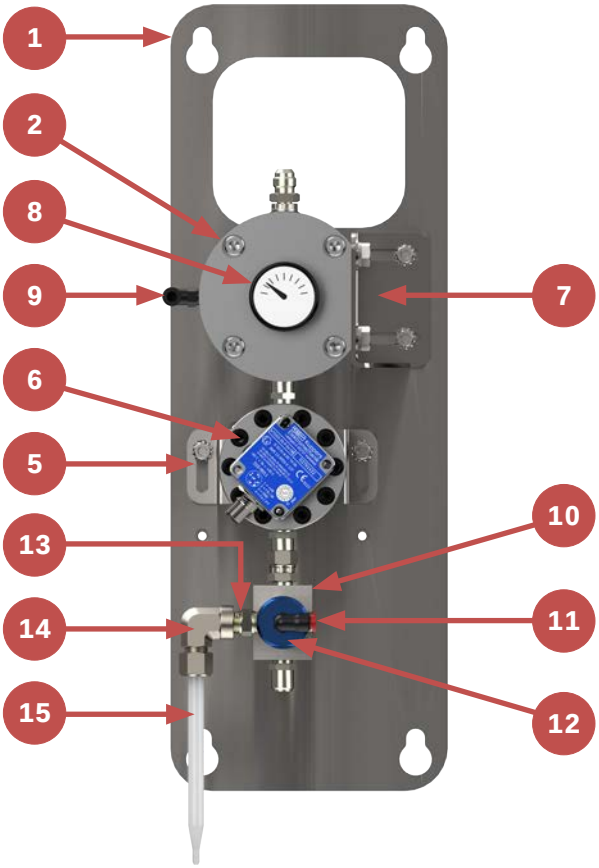
| FLUID MODULE-WEEPING | | | |
|---|---|---|---|
| **Item** | **QTY** | **Part No.** | **Description** |
| 1 | 1 | 310-3301 | FLUID CONTROL PANEL |
| 2 | – | TR-SSMM-147 | 02 WEEPING MVR |
| 2 | – | TR-SSMM-148 | 03 WEEPING MVR |
| 2 | – | TR-SSMM-225 | 04 WEEPING MVR |
| 3 | 3 | 4-6JIC | FITTING, 1/4" NPS (M) x 3/8" JIC (F) |
| 4 | 1 | 4SN-6JIC | FITTING, 1/4" NPS (F) x 3/8" JIC (M) |
| 5 | 1 | 310-2806 | MOUNTING BRACKET |
| 6 | – | 310-9000 | GEAR FLOW METER, DUAL PROBE |
| 6 | – | 310-9001 | GEAR FLOW METER, FIBER OPTIC |
| 6 | – | A13296 | PISTON FLOW METER |
| 7 | 1 | 4-6B | FITTING, 1/4" NPS (M) x 3/8" NPS (M) |
| 8 | 1 | 4SN-6B | FITTING, 1/4" NPS (M) x 3/8" NPS (M) |
| 9 | 2 | TR-100952 | SEAL |
| 10 | 1 | 6T-4-90 | FITTING, ELBOW, 3/8" NPS (M) x 1/4" NPS (M) |
| 11 | 1 | 310-2802 | MVR MOUNTING BRACKET |
| 12 | 1 | GA-338 | 1/8" NPT BACK MOUNT GAUGE (0-160 PSI), 1 1/2" DIA |
| 13 | 1 | JML-14-2T | ELBOW 1/8" NPT (M) x 1/4" ODT |
| 14 | 1 | 310-8200 | CALIBRATION BLOCK |
| 15 | 1 | CCV-503-SS | CCV VALVE |
| 16 | 1 | JML-532-2T | ELBOW 1/8" NPT (M) x 1/4" ODT |
| 17 | 1 | 4T-4T | FITTING, 1/4" NPT (M) x 1/4" NPT (M) |
| 18 | 1 | SSP-6443 | FITTING, ELBOW, 1/4" NPT (M) x 3/8" ODT |
| 19 | 1 | LSMM0059-01 | CALIBRATION TUBE |

## FLUID MODULE

WEEPLESS
(See manual No. LN-9225-00 for additional details)



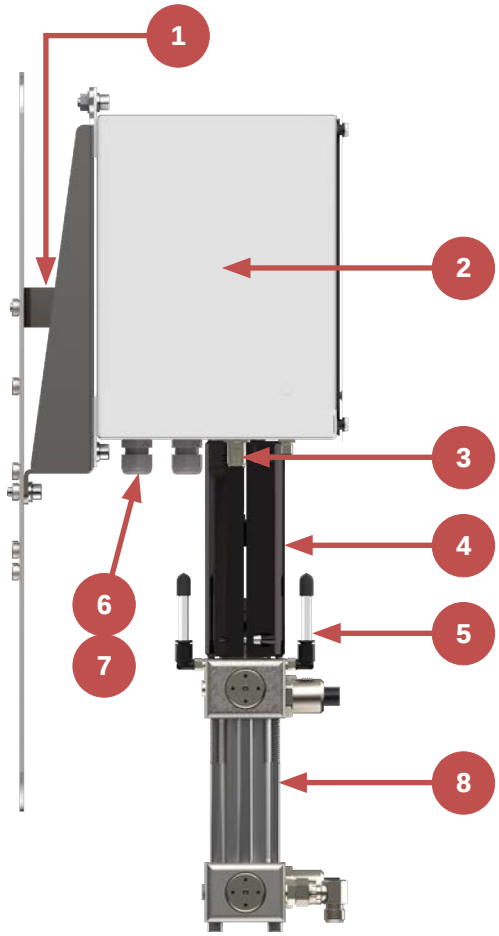


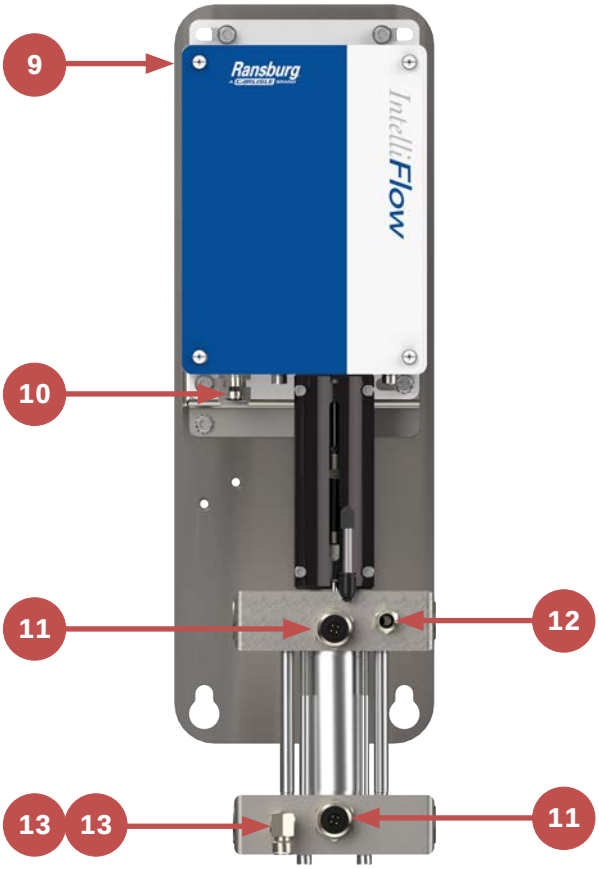



| FLUID MODULE-WEEPLESS | | | |
|---|---|---|---|
| **Item** | **QTY** | **Part No.** | **Description** |
| 1 | 1 | 310-3301 | FLUID CONTROL PANEL |
| 2 | – | 76624-02 | 02 WEEPLESS MVR |
| 2 | – | 76624-03 | 03 WEEPLESS MVR |
| 2 | – | 76624-04 | 04 WEEPLESS MVR |
| 3 | 1 | 4SN-6JIC | FITTING, 1/4"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

## DISPENSE PUMP

300 cc and 600 cc

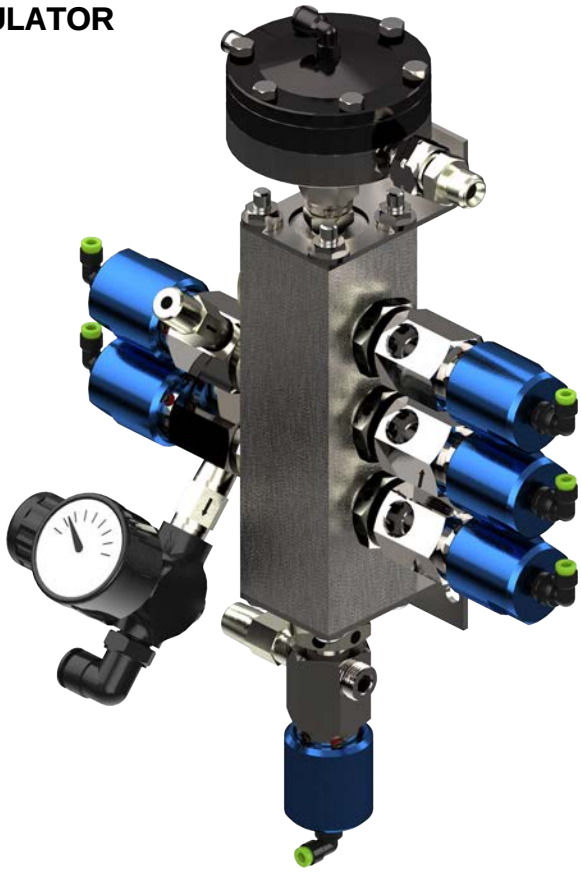



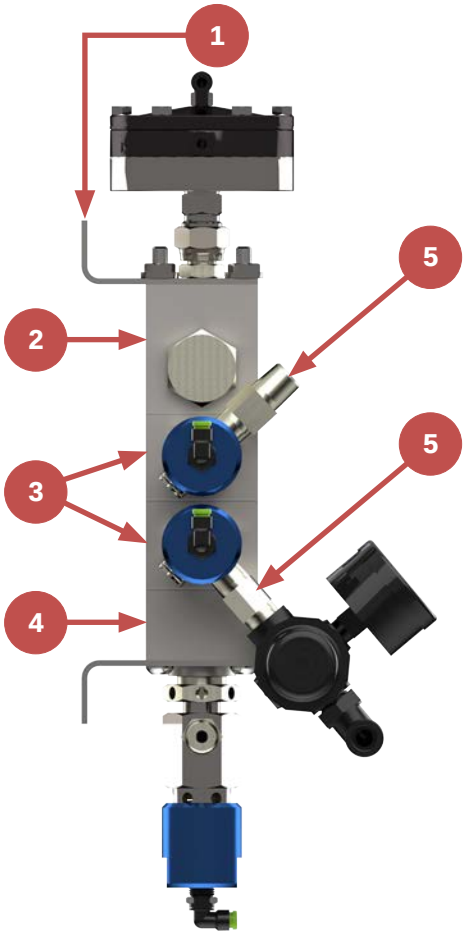



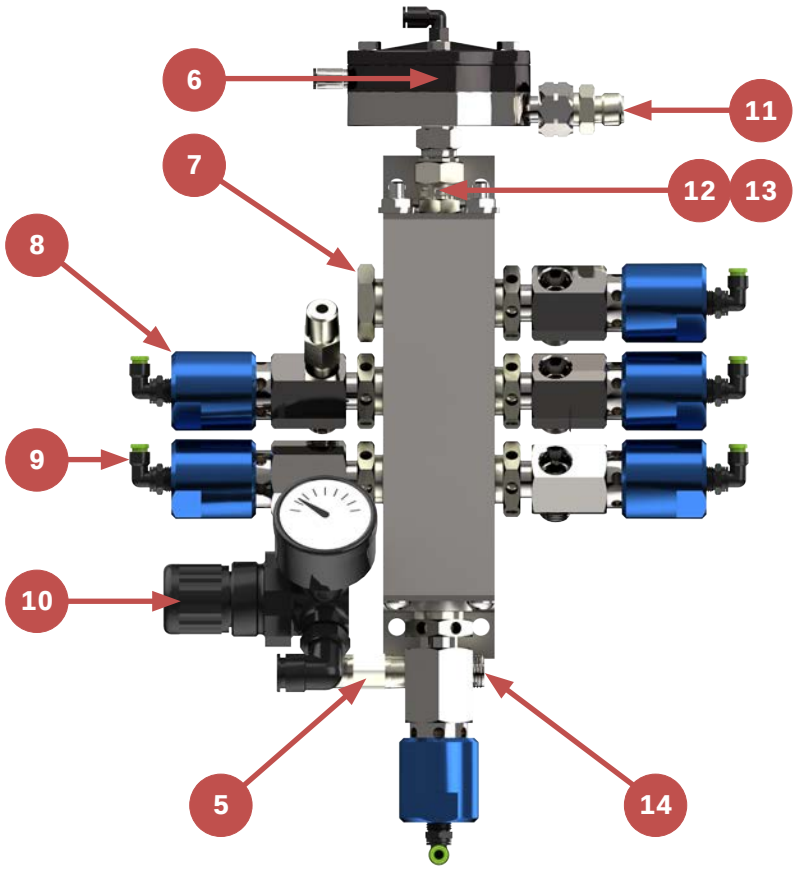
| DISPENSE PUMP | | | |
|---|---|---|---|
| **Item** | **QTY** | **Part No.** | **Description** |
| 1 | 1 | 310-4007 | PUMP ENCLOSURE MOUNT |
| 2 | 1 | 310-4006 | DISPENSE PUMP ENCLOSURE |
| 3 | 1 | 310-4131 | BULKHEAD, M12, 5 PIN, M2L, 1M |
| 4 | 1 | 310-4218 | LINEAR MOTOR ASSEMBLY, RF2 |
| 5 | 2 | 240-3117 | OIL RESEVOIR ASSEMBLY |
| 6 | 2 | 240-5161 | NYLON STRESS RELIEF FITTING, PG9 |
| 7 | 2 | 240-5162 | GRAY NYLON LOCKING NUT, PG9 |
| 8 | 1 | 240-5136-XXX | DISPENSE PUMP (300 cc OR 600 cc) |
| 9 | 1 | 310-3301 | FLUID CONTROL PANEL |
| 10 | 1 | 310-4161 | BULKHEAD, M8, 4 PIN, M2L, 0.5 mm |
| 11 | 2 | 240-5186 | PRESSURE SENSOR, 0-500 psi |
| 12 | 2 | 4T-4 | FITTING, 1/4" NPT(M) X 1/4" NPS(M) |
| 13 | 1 | 4SN-4-90 | ELBOW FITTING, 1/4" NPS (M) x 1/4" NPS (F) |

## COLOR STACK w/OPTIONAL FLUID PRESSURE REGULATOR

Shown with optional Air Pressure Regulator

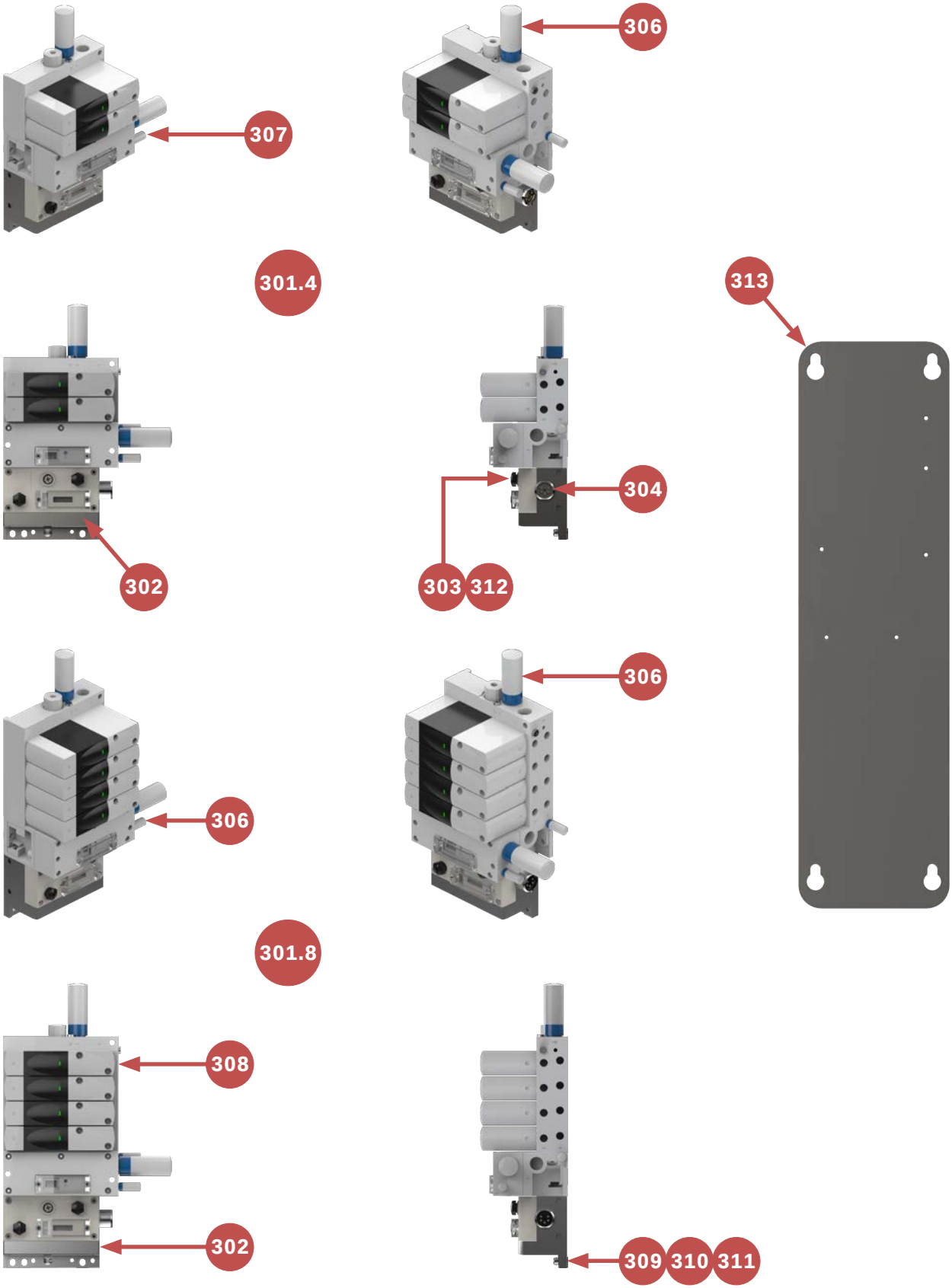




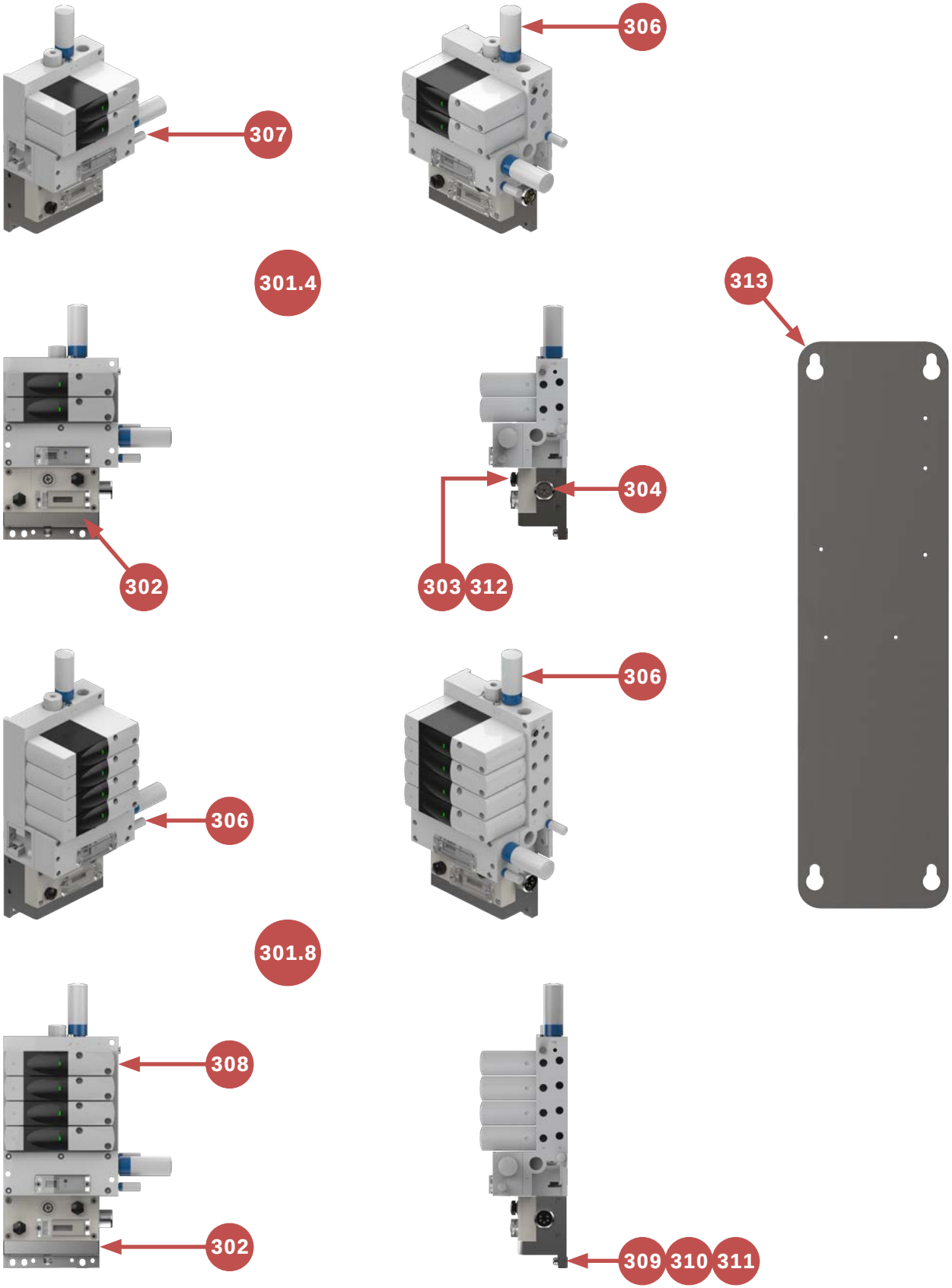
| DISPENSE PUMP | | | |
|---|---|---|---|
| **Item** | **QTY** | **Part No.** | **Description** |
| 1 | 2 | CCV-37 | CCV MANIFOLD BRACKET |
| 2 | 1 | CCV-18-SS | MANIFOLD BLOCK, OUTLET, 303 SS |
| 3 | 2 | CCV-16-SS | MANIFOLD BLOCK, CENTER, 303 SS |
| 4 | 1 | CCV-17-SS | MANIFOLD BLOCK, INLET, 303 SS |
| 5 | 3 | SSV-809 | CHECK VALVE |
| 6 | 1 | HGB-510-R1-CO | HGB FLUID PRESSURE REGULATOR |
| 7 | 1 | CCV-21 | HEX PORT PLUG |
| 8 | N/A | CCV-503-SS | CCV VALVE ASSEMBLY |
| 9 | N/A | 41-FTP-1006 | TUBE ELBOW, 1/8" NPT (M) x 5/32" |
| 10 | 1 | 240-5350-X | AIR PRESSURE REGULATOR |
| 11 | 1 | 4-6 | FITTING, 1/4" NPS (M) x 3/8" NPS (M) |
| 12 | 1 | 375-557-SW CRIMPED | SWIVEL NUT 303 SS |
| 13 | 1 | 6SN-6JIC-C | FITTING, 3/8" SN x 3/8" JIC |
| 14 | 1 | SSP-1421 | PIPE PLUG, 1/4" 316 SS |

## PRESSURE REGULATOR MODULES



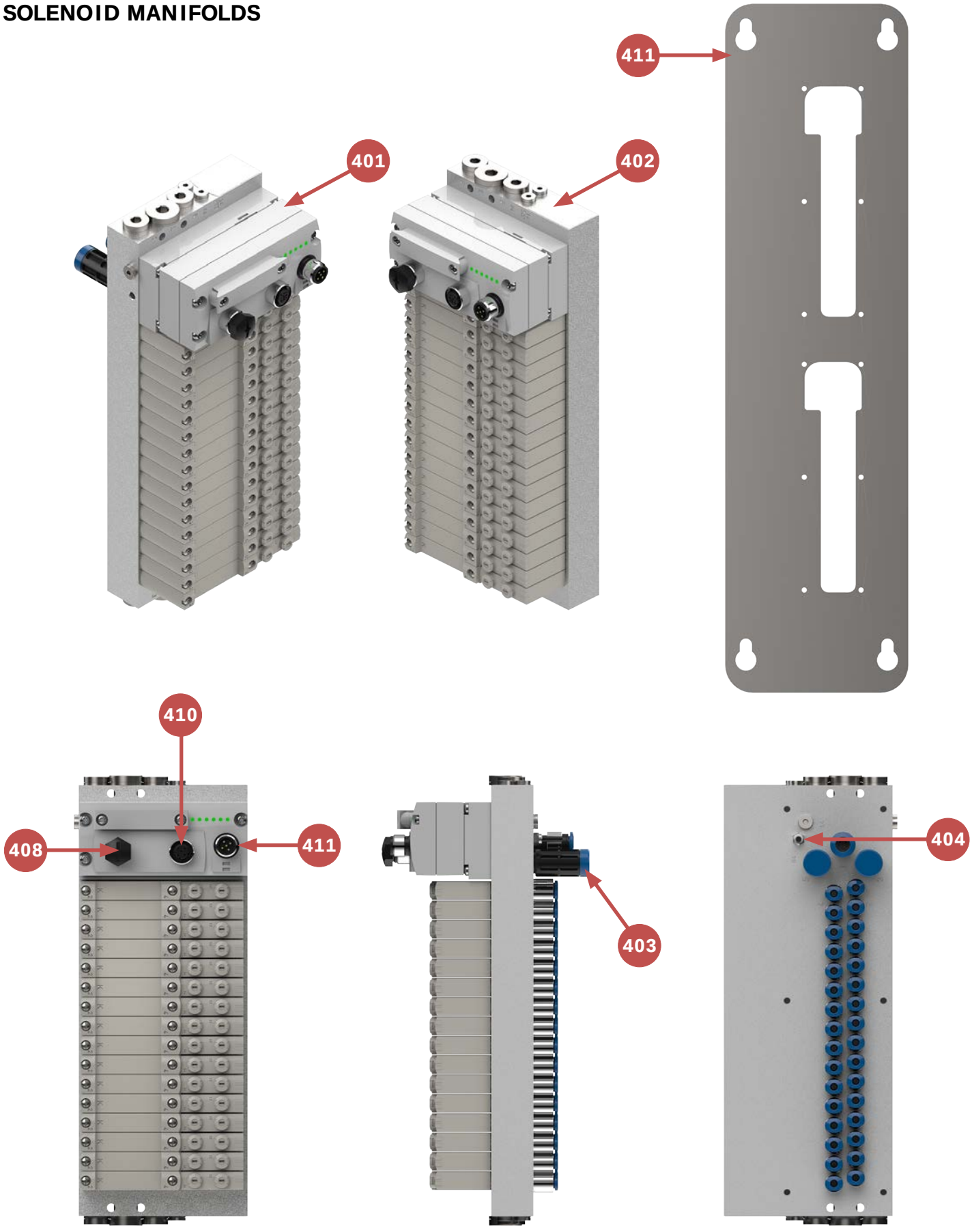
| PRESSURE REGULATOR MODULES | | | | |
|---|---|---|---|---|
| **Code-Top Level Column C** | **Item** | **QTY** | **Part No** | **Description** |
| 0 | – | – | – | – |
| 2 | 301.4 | 1 | 310-3910 | PRESSURE MANIFOLD ASSEMBLY, 4 REGULATORS (VTEM-S1-27-E1-B1-Q10-U-Q6-CC-BAP-2PD) |
| | 302 | Included w/ 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 | Included w/ 310-3911 | UC-3/8 | PNEUMATIC MUFFLER (W/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 - 4 mm Tube VTEM to HGB |
| | 309 | 6 | 20-7028 | VTUG MOUNTING BOLTS |
| | 310 | 6 | 20-7026 | VTUG MOUNTING WASHERS |
| | 311 | 6 | 20-7027 | VTUG MOUNTING TOOTHED WASHERS |
| | 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 | Included 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 | Included w/ manifold | UC-3/8 | PNEUMATIC MUFFLER (W/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 - 4 mm TUBE VTEM to HGB |
| | 309 | 6 | 20-7028 | VTUG MOUNTING BOLTS |
| | 310 | 6 | 20-7026 | VTUG MOUNTING WASHERS |
| | 311 | 6 | 20-7027 | VTUG MOUNTING TOOTHED WASHERS |
| | 313 | 1 | 310-2801 | VTEM MOUNTIN BRACKET |

## PRESSURE REGULATOR MODULES (cont.)

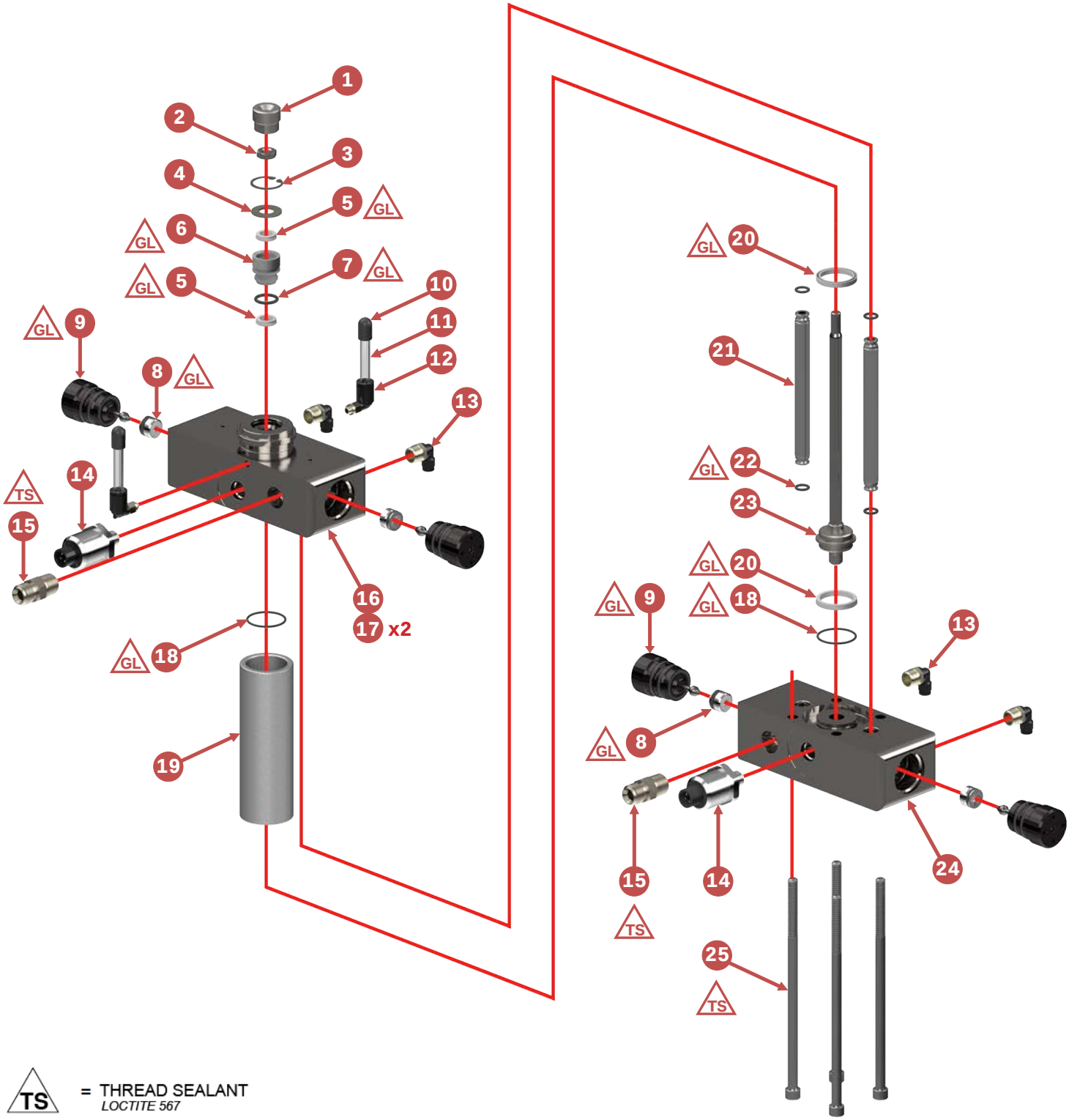


| PRESSURE REGULATOR MODULES (cont.) | | | | |
|---|---|---|---|---|
| **Code-Top LevelColumn C** | **Item** | **QTY** | **Part No** | **Description** |
| 6 | 301.4 | 1 | 310-3910 | PRESSURE MANIFOLD ASSEMBLY, 4 REGULATORS (VTEM-S1-27-E1-B1-Q10-U-Q6-CC-BAP-2PD) |
| | 301.8 | 1 | 310-3911 | PRESSURE MANIFOLD 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 (W/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 - 4 mm TUBE VTEM to HGB |
| | 309 | 12 | 20-7028 | VTUG MOUNTING BOLTS |
| | 310 | 12 | 20-7026 | VTUG MOUNTING WASHERS |
| | 311 | 12 | 20-7027 | VTUG MOUNTING TOOTHED WASHERS |
| | 312 | 1 | 310-4133 | CABLE, CAT 5E, M12, 1M |
| | 313 | 2 | 310-2801 | VTEM MOUNTING BRACKETS |
| 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 (W/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 - 4 mm TUBE VTEM to HGB |
| | 309 | 12 | 20-7028 | VTUG MOUNTING BOLTS |
| | 310 | 12 | 20-7026 | VTUG MOUNTING WASHERS |
| | 311 | 12 | 20-7027 | VTUG MOUNTING TOOTHED WASHERS |
| | 312 | 1 | 310-4133 | CABLE, CAT 5E, M12, 1M |
| | 313 | 2 | 310-2801 | VTEM MOUNTING BRACKET |

## SOLENOID MANIFOLDS



| SOLENOID MANIFOLDS | | | | | | |
|---|---|---|---|---|---|---|
| **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-QH-4SU-16K) |
| 403 | 1 | 2 | 3 | 4 | UC-3/8 | PNEUMATIC MUFFLER (W/310-3920) |
| 404 | 2 | 4 | 6 | 8 | 20-7022 | G1/8 - 4 mm TUBE |
| 405 | 4 | 8 | 12 | 16 | 20-7028 | VTUG MOUNTING BOLTS (M4 20 mm) |
| 406 | 4 | 8 | 12 | 16 | 20-7026 | VTUG MOUNTING WASHERS |
| 407 | 4 | 8 | 12 | 16 | 20-7027 | VTUG MOUNTING TOOTHED WASHERS |
| 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 |




TS = THREAD SEALANT
*LOCTITE 567*

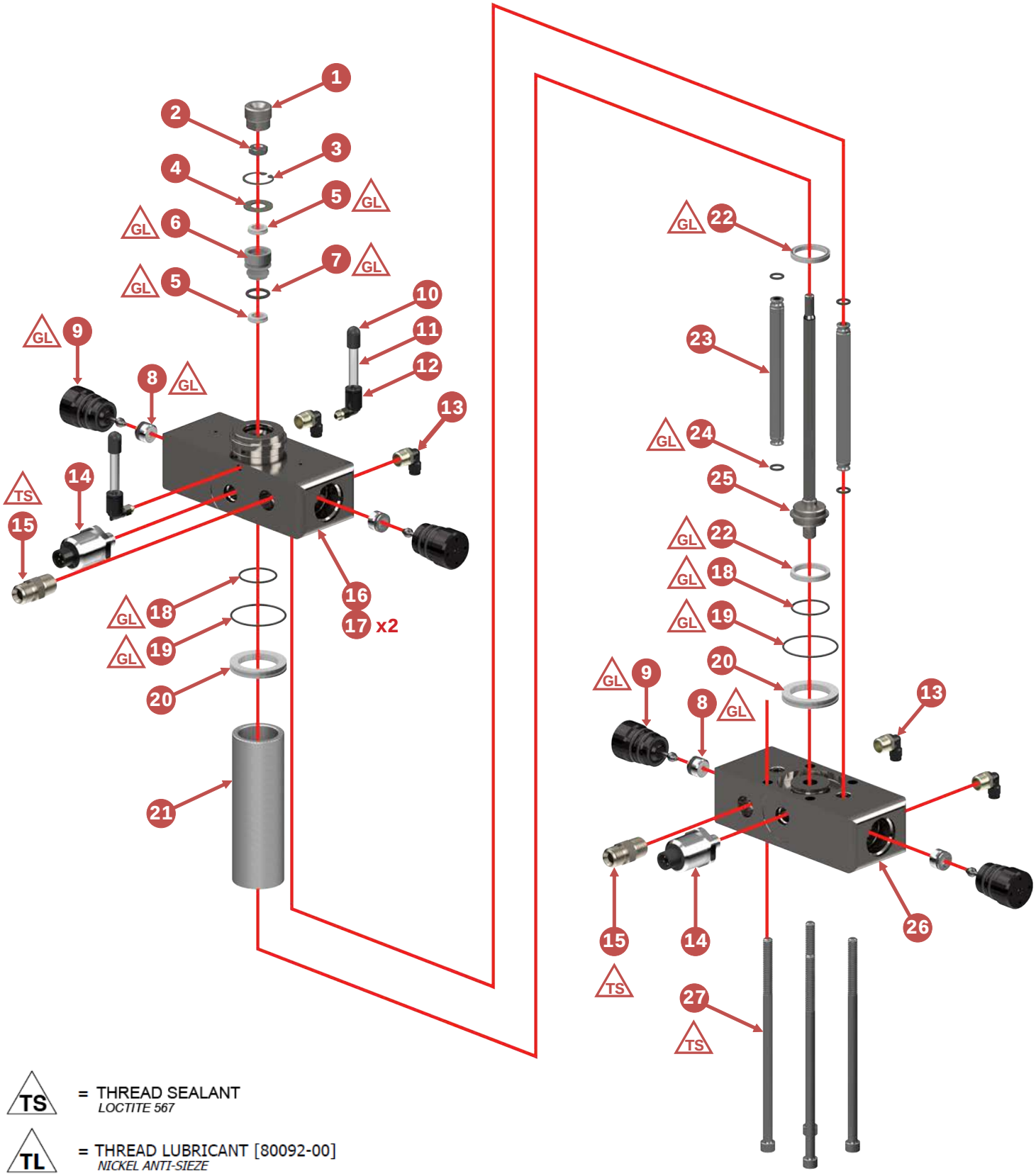
TL = THREAD LUBRICANT [80092-00]
*NICKEL ANTI-SIEZE*

GL = GUN LUBRICANT / OIL [SSL-10]
*DeVILBISS GUN LUBE*

## DISPENSE PUMP-300 cc

| Item | Part No. | Description | Qty. | Notes |
|---|---|---|---|---|
| 1 | 240-3020 | Pump Rod Adapter | 1 | – |
| 2 | 20-6953 | Nut, Hex jam, 1/4"-28 | 1 | – |
| 3 | 237-729 | Snap Ring, Internal | 1 | – |
| 4 | 237-727 | Flat Washer | 1 | – |
| 5 | 240-3211 | Rod Seal | 2 | – |
| 6 | 240-3084 | Holder, Seal | 1 | – |
| 7 | 79001-09 | O-Ring, 2-015, FFKM | 1 | – |
| 8 | 77367-00 | Valve Seat Assembly, MCV | 4 | – |
| 9 | 78949-00 | MCV Valve Assembly | 4 | – |
| 10 | 240-3102 | 1/4" ODT Cap | 2 | – |
| 11 | FEP-0403 | Teflon Paint Hose, 1/4" OD x 3/16" ID, 210 psi wp | 2 | – |
| 12 | 240-3116 | Elbow, 10-32 x 1/4" ODT | 2 | – |
| 13 | JML-532-2T | Male Elbow, 1/8" NPT (M) x 5/32" Tube | 4 | – |
| 14 | 240-5186 | Pressure Sensor, 0-500 psi, M12 4 pin, 4-20MA | 2 | – |
| 15 | 4T-4 | Fitting, 1/4" NPS (M) x 1/4" NPT (M) | 2 | – |
| 16 | 240-5133 | Top Block | 1 | – |
| 17 | 20-4844 | Dowel Pin (not shown), 3/16" DIA x 12 LG, SS | 2 | – |
| 18 | 79001-21 | O-Ring, 2-020, FFKM | 2 | – |
| 19 | 240-3018-300 | 300 cc Cylinder | 1 | – |
| 20 | 240-3212-300 | 300 cc Piston Seal | 2 | – |
| 21 | 240-5135 | Fluid Tube | 2 | – |
| 22 | 79001-05 | O-Ring, 2-010, FFKM | 4 | – |
| 23 | 240-3224-300 | 300 cc Rod and Piston Assembly | 1 | – |
| 24 | 240-5132 | Bottom Block | 1 | – |
| 25 | 7959-176C | Socket Head Cap Screw, 1/4"-20 UNC, 5.5" LG | 4 | 12.25 N•m (9 lb-ft) |
| — | 0114-016099 | Pump Packing Lube, 250mL | 1 | – |

See service manuals 77-2983 for complete assembly instructions.




TS = THREAD SEALANT
*LOCTITE 567*

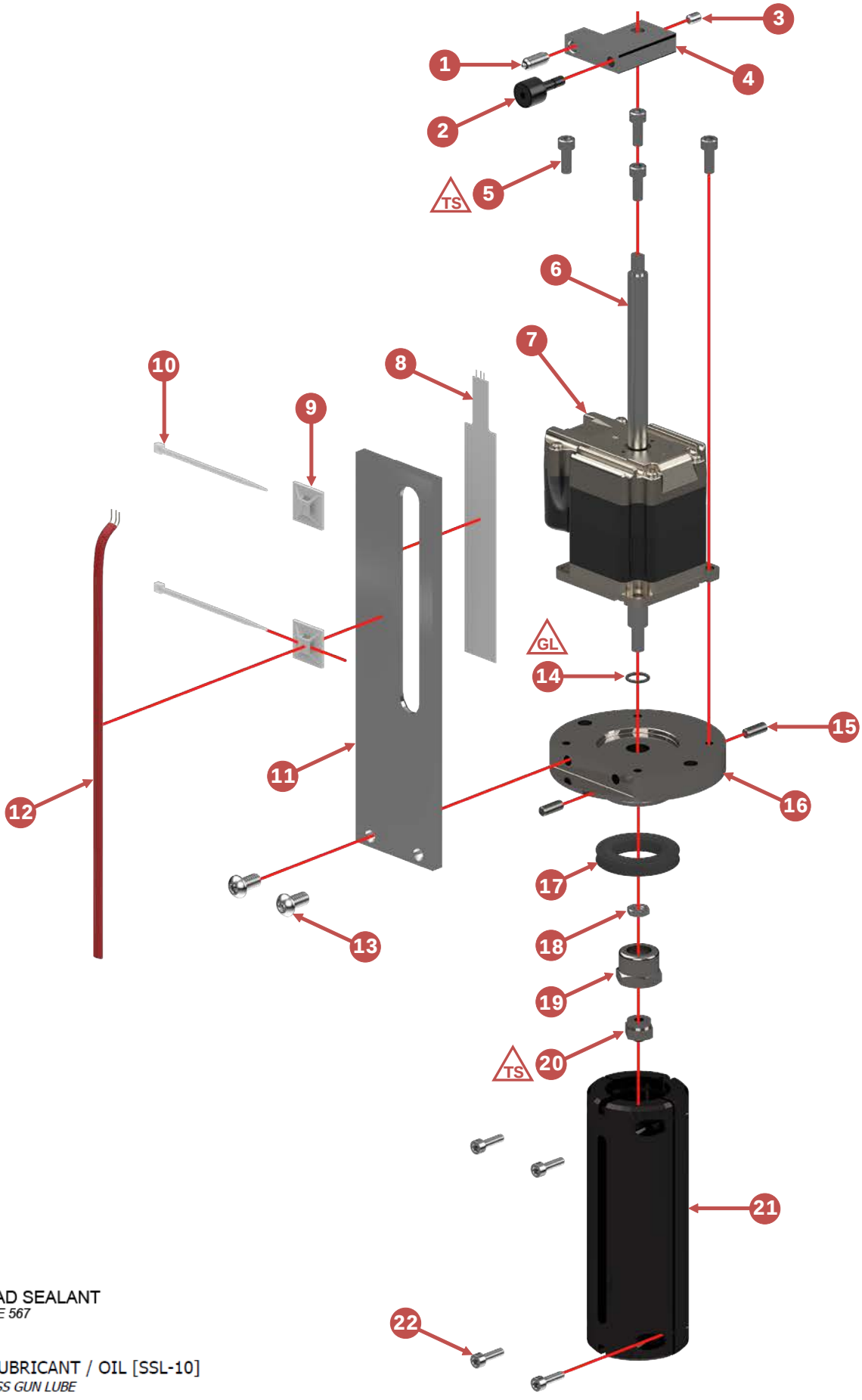
TL = THREAD LUBRICANT [80092-00]
*NICKEL ANTI-SIEZE*

GL = GUN LUBRICANT / OIL [SSL-10]
*DeVILBISS GUN LUBE*

## DISPENSE PUMP-600 cc

| Item | Part No. | Description | Qty. | Notes |
|---|---|---|---|---|
| 1 | 240-3020 | Pump Rod Adapter | 1 | – |
| 2 | 20-6953 | Nut, Hex jam, 1/4"-28 | 1 | – |
| 3 | 237-729 | Snap Ring, Internal | 1 | – |
| 4 | 237-727 | Flat Washer | 1 | – |
| 5 | 240-3211 | Rod Seal | 2 | – |
| 6 | 240-3084 | Holder, Seal | 1 | – |
| 7 | 79001-09 | O-Ring, 2-015, FFKM | 1 | – |
| 8 | 77367-00 | Valve Seat Assembly, MCV | 4 | – |
| 9 | 78949-00 | MCV Valve Assembly | 4 | – |
| 10 | 240-3102 | 1/4" ODT Cap | 2 | – |
| 11 | FEP-0403 | Teflon Paint Hose, 1/4" OD x 3/16" ID, 210 psi wp | 2 | – |
| 12 | 240-3116 | Elbow, 10-32 x 1/4" ODT | 2 | – |
| 13 | JML-532-2T | Male Elbow, 1/8" NPT (M) x 5/32" Tube | 4 | – |
| 14 | 240-5186 | Pressure Sensor, 0-500 psi, M12 4 pin, 4-20MA | 2 | – |
| 15 | 4T-4 | Fitting, 1/4" NPS (M) x 1/4" NPT (M) | 2 | – |
| 16 | 240-5133 | Top Block | 1 | – |
| 17 | 20-4844 | Dowel Pin (not shown), 3/16" DIA x 12 LG, SS | 2 | – |
| 18 | 79001-21 | O-Ring, 2-020, FFKM | 2 | – |
| 19 | 79001-18 | O-Ring, 2-027, FFKM | 2 | – |
| 20 | 240-3022 | Cylinder Adapter | 2 | – |
| 21 | 240-3018-600 | 600 cc Cylinder | 1 | – |
| 22 | 240-3212-600 | 600 cc Piston Seal | 2 | – |
| 23 | 240-5135 | Fluid Tube | 2 | – |
| 24 | 79001-05 | O-Ring, 2-010, FFKM | 4 | – |
| 25 | 240-3224-600 | 600 cc Rod and Piston Assembly | 1 | – |
| 26 | 240-5132 | Bottom Block | 1 | – |
| 27 | 7959-176C | Socket Head Cap Screw, 1/4"-20 UNC, 5.5" LG | 4 | 14.0 N•m (10 lb-ft) |
| — | 0114-016099 | Pump Packing Lube, 250mL | 1 | – |

See service manuals 77-2983 for complete assembly instructions.



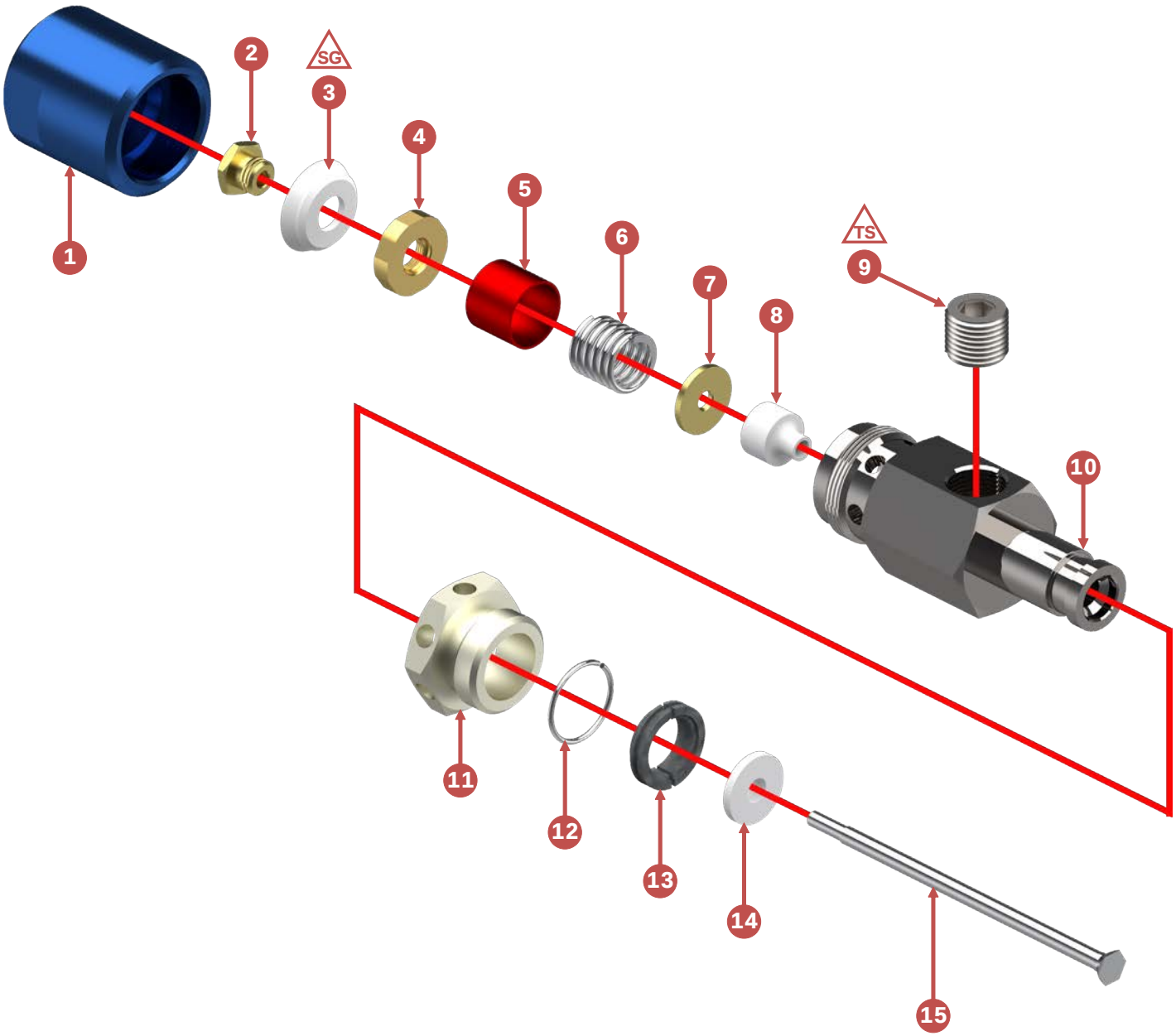

TS = THREAD SEALANT
*LOCTITE 567*

GL = GUN LUBRICANT / OIL [SSL-10]
*DeVILBISS GUN LUBE*

## 24VDC LINEAR MOTOR ASSEMBLY

| Item | Part No. | Description | Qty. | Notes |
|---|---|---|---|---|
| 1 | 240-3027 | Spring Plunger | 1 | Sold as assembly PN 240-3065 |
| 2 | 240-3039 | Track Roller | 1 | |
| 3 | 20-5916 | Set Screw, #10-32 | 1 | |
| 4 | 240-3013 | Pot Wiper Bracket | 1 | |
| 5 | 8212-16F | Socket Head Cap Screw, #10 Zinc Plated | 4 | – |
| 6 | 240-3025 | Linear Screw, 3/8"-12 Acme Threaded Rod, SS | 1 | – |
| 7 | 240-3061-1 | Actuator Motor (w/o linear screw) | 1 | – |
| 8 | 240-3066 | Linear Potentiometer | 1 | Sold as assembly PN 240-3060 |
| 9 | 20827-00 | Cable Tie Mount, Adhesive Backed | 2 | |
| 10 | SSW-7323 | Cable Tie | 2 | |
| 11 | 240-3012 | Potentiometer Bracket | 1 | |
| 12 | N/A | Cable Sweep | 1 | |
| 13 | 77578-16C | Button Head Cap Screw, 1/4"-20 x 1/2", SS | 2 | – |
| 14 | 20-6952 | O-Ring, BUNA-223 | 1 | – |
| 15 | 20-4844 | Dowel Pin, 3/16" DIA x 1/2" LG, SS | 2 | Assembly PN 240-3048 |
| 16 | 240-3048 | Motor Mount | 1 | |
| 17 | N/A | X-Ring, Static Seal, Elastomeric | 1 | – |
| 18 | 20-6953 | Nut, Hex Jam, 1/4"-28 | 1 | – |
| 19 | 102-3327 | Nozzle Cap | 1 | – |
| 20 | 240-3021 | Motor Rod Adapter, Swivel Nut, SS | 1 | – |
| 21 | 240-3014 | Pump Coupling, 6061-T6, 2" OD x 0.375" (1.25" ID) | 1 | – |
| 22 | A12772-01 | Button Head Cap Screw, 1/4" x 1/2", SS | 4 | – |

See service manuals 77-2983 for complete assembly instructions.




d in repair kit KK-5094.
anuals 77-2983 and 77-3117 for complete assembly instructions.

TS = THREAD SEALANT
*LOCTITE 567*

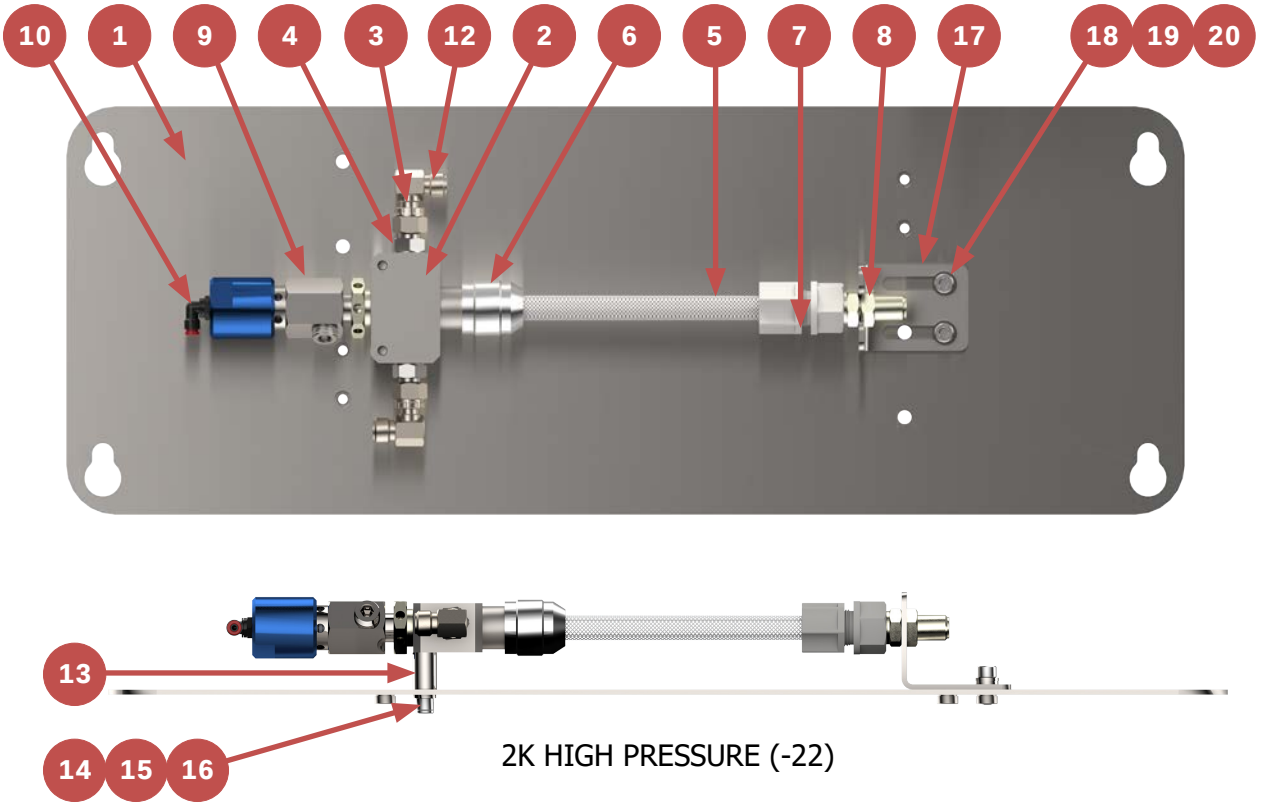
SG = SYNTHETIC GREASE
*PLUNGER SEALING CUP LUBE*

## CCV VALVE ASSEMBLY

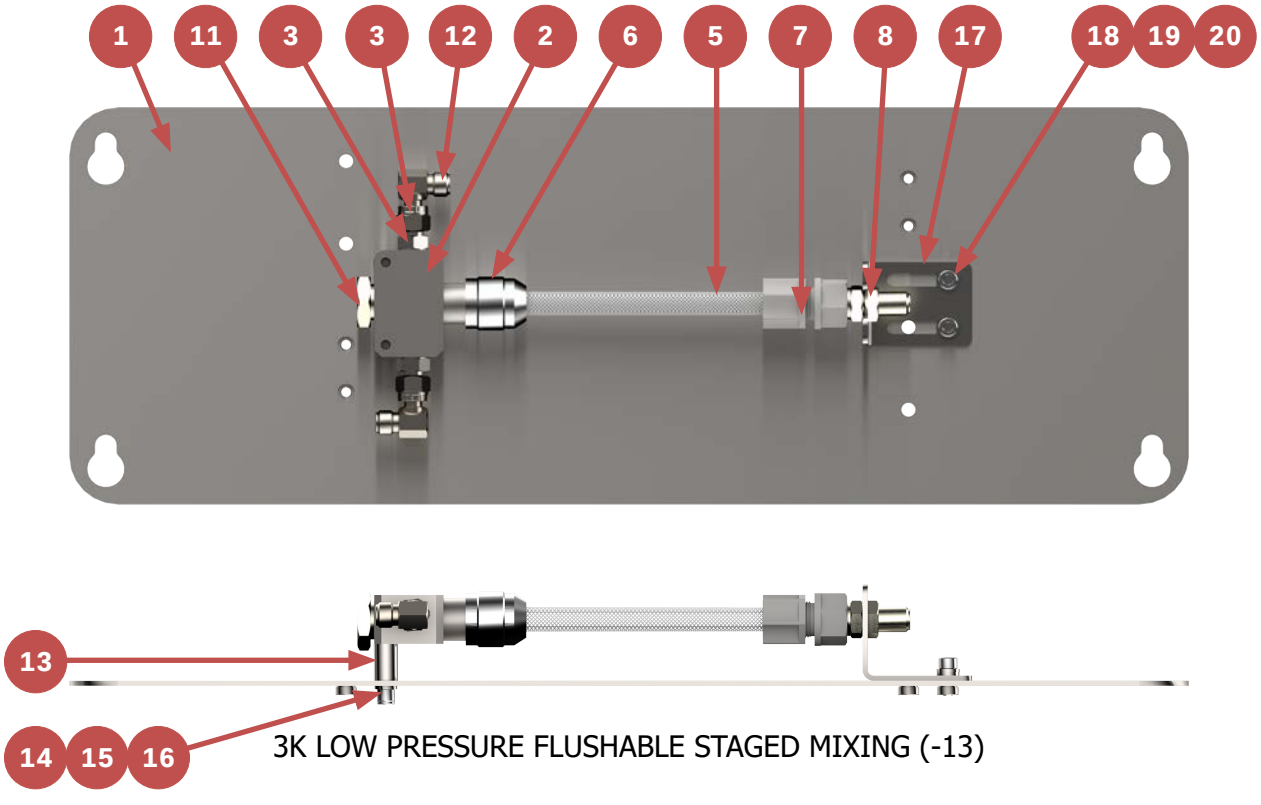
| Item | Part No. | Description | Qty. | Notes |
|---|---|---|---|---|
| 1 | CCV-43-1 | END CAP, ALUMINUM, ANODIZED BLUE | 1 | 8.5-14.0 N•m (75-125 in-ft) |
| 2 | CCV-45 | NUT, CLAMPING, BRASS | 1 | 0.2-0.5 N•m (2-4 in-ft) |
| 3 | VA-246 | CUP, SEALING, TEFLON | 1 | – |
| 4 | CCV-3 | NUT, BRASS | 1 | 1.4-2.0 N•m (12-18 in-ft) |
| 5 | CCV-42 | VALVE INDICATOR, ALUMINUM, ANODIZED RED | 4 | – |
| 6 | CCV-41 | SPRING | 1 | – |
| 7 | CCV-4 | WASHER, FLAT, WASHER | 1 | – |
| 8 | CCV-6 | SEAL, VALVE NEEDLE | 1 | – |
| 9 | SSP-1421 | PIPE PLUG, 1/4" | 2 | – |
| 10 | 240-2039 | VALVE BODY | 2 | – |
| 11 | CCV-13 | SPANNER NUT | 1 | – |
| 12 | 240-2032 | SPRING CLIP | 1 | – |
| 13 | 240-2030 | SPLIT COLLAR | 2 | – |
| 14 | CCV-40 | POPPET SEAT | 1 | – |
| 15 | CCV-39 | STEM | 2 | – |
| – | – | SYNTHETIC GREASE (SUPER LUBE) | 1 | – |
| – | 80092-00 | THREAD LUBRICANT, ANTI-SEIZE | 1 | – |

## FLUID MIX PANEL

2K High Pressure & 3K Low Pressure: Flushable Staged Mixing




2K HIGH PRESSURE (-22)

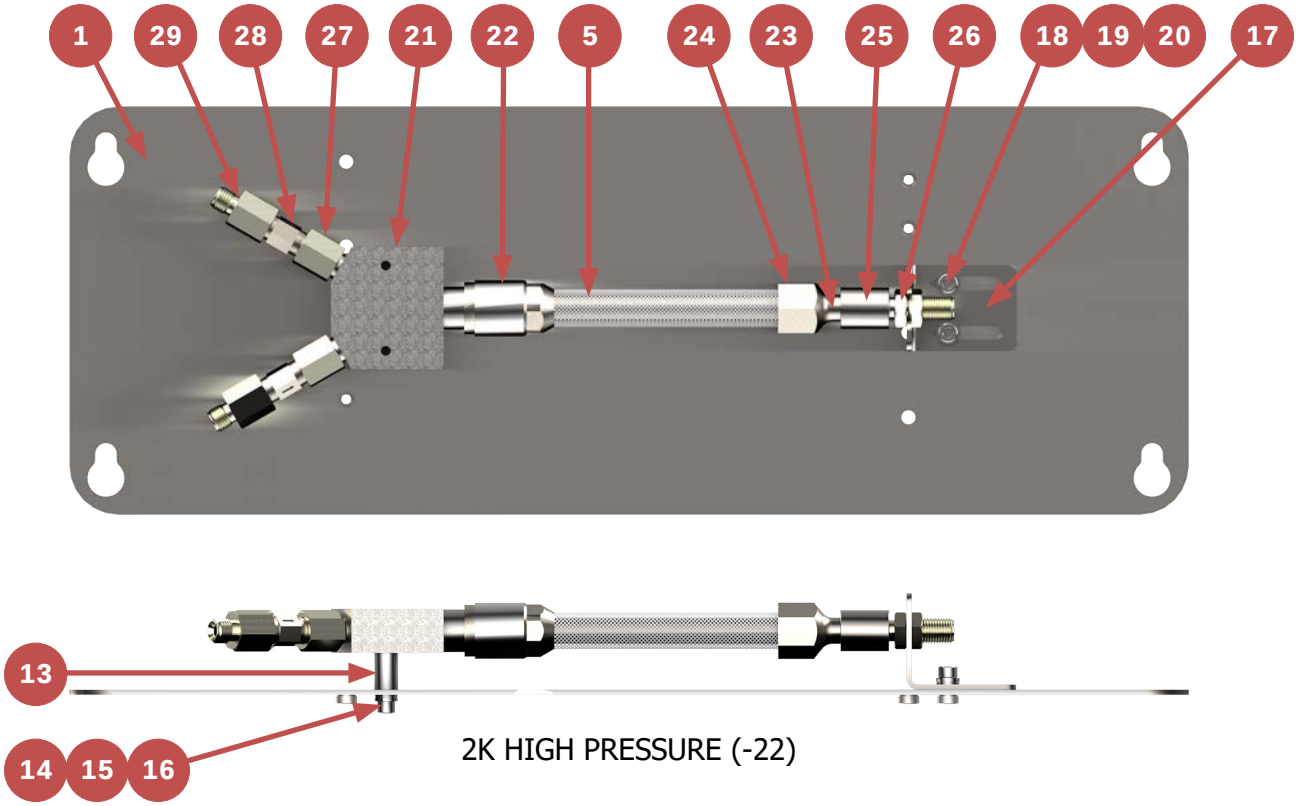



3K LOW PRESSURE FLUSHABLE STAGED MIXING (-13)

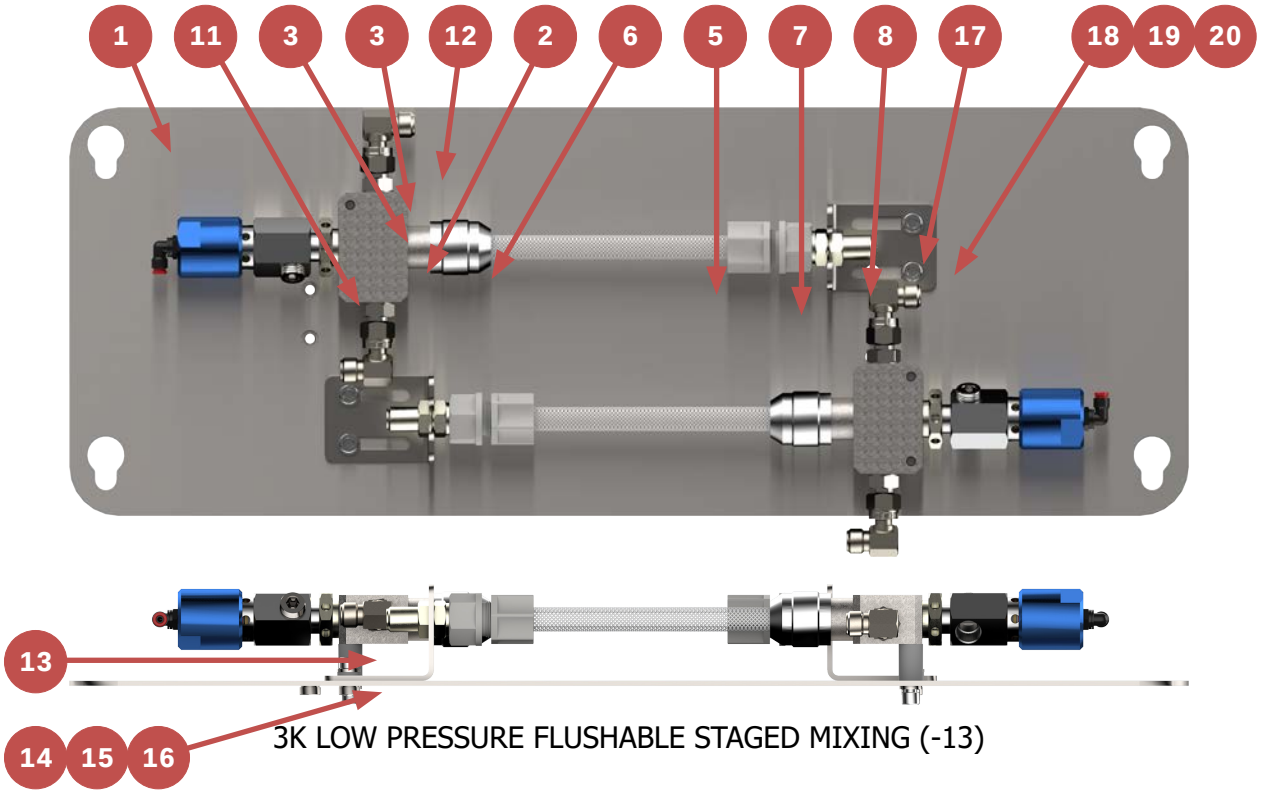
| FLUID MIX PANEL-2K LOW PRESSURE: FLUSHABLE/NON-FLUSHABLE | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Part No.** | **Description** | **2K Low Pressure Flushable (-11)** | **2K Low Pressure Non-Flushable (-11)** | **3K Low Pressure Flushable (-13)** | **2K High Pressure (-22)** |
| 1 | 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 KIT | 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 | FITTING, ELBOW, 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 | – | WASHER, LOCK, 1/4", 18-8 | 2 | 2 | 4 | 2 |
| 16 | – | WASHER, FLAT, 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 | – | WASHER, LOCK, 18-8 | 2 | 2 | 4 | 2 |
| 20 | – | SHCS, M6 x 1, 14MM LG, 18-8 | 2 | 2 | 4 | 2 |

## FLUID MIX PANEL

2K High Pressure & 3K Low Pressure: Flushable Staged Mixing




2K HIGH PRESSURE (-22)




3K LOW PRESSURE FLUSHABLE STAGED MIXING (-13)

| FLUID MIX PANEL-2K LOW PRESSURE (FLUSHABLE/NON-FLUSHABLE) | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Part No.** | **Description** | **2K Low Pressure Flushable (-11)** | **2K Low Pressure Non-Flushable (-11)** | **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 KIT | 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 | FITTING, ELBOW, 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 | – | WASHER, LOCK, 1/4", 18-8 | 2 | 2 | 4 | 2 |
| 16 | – | WASHER, FLAT, 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 | – | WASHER, LOCK, 18-8 | 2 | 2 | 4 | 2 |
| 20 | – | SHCS, M6 x 1, 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 |
| 23 | – | – | – | – | – | 1 |
| 24 | LBAL0023-00 | ADAPTER, FLUID HOSE, HIGH PRESSURE | – | – | – | 1 |
| 25 | 240-3133 | FITTING, 1/4" NPT (M) 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 |

## REPAIR KITS (WEAR ITEMS)

| REPAIR KITS (WEAR ITEMS) | | | | | | |
|---|---|---|---|---|---|---|
| **PN** | **Description** | **Category** | **Auto LP qty.** | **MAN LP qty.** | **Auto HP qty.** | **MAN HP qty.** |
| KK-4841 | CCV Repair Kit, LP | Fluid Panel | 5 | 5 | 0 | 0 |
| 240-2048 | HP CCV Seal Kit, Internal | Fluid Panel | 0 | 0 | 5 | 5 |
| 240-2048 | HP CCV Seal Kit, External | Fluid Panel | 0 | 0 | 5 | 5 |
| 310-9017-K5 | Flow meter Seal Kit, 5 Pack | Fluid Panel | 1 | 1 | 1 | 1 |
| 77052-00 | MVR Repair Kit, Weepless | Fluid Panel | 2 | 0 | 2 | 0 |
| TR-SSMM-151 | Air Diaphragm, MVR Assembly (Weeping Only) | Fluid Panel | 3 | 0 | 0 | 0 |
| 78783-00 | Compression Spring, MVR (Weeping Only) | Fluid Panel | 1 | 0 | 0 | 0 |
| SSG-8125 | O-Ring, PTFE (Weeping Only) | Fluid Panel | 1 | 0 | 0 | 0 |
| 76623-02 | #2 MVR Needle, Weepless | Fluid Panel | A/R | 0 | A/R | 0 |
| 76623-03 | #3 MVR Needle, Weepless | Fluid Panel | A/R | 0 | A/R | 0 |
| 76623-04 | #4 MVR Needle, Weepless | Fluid Panel | A/R | 0 | A/R | 0 |
| TR-SSMM-149 | #2 MVR Needle, Weeping | Fluid Panel | A/R | 0 | 0 | 0 |
| TR-SSMM-150 | #3 MVR Needle, Weeping | Fluid Panel | A/R | 0 | 0 | 0 |
| TR-SSMM-226 | #4 MVR Needle, Weeping | Fluid Panel | A/R | 0 | 0 | 0 |
| 22-280 | Check Valve | Fluid Panel | 4 | 4 | 2 | 2 |
| SSV-809 | Check Valve | Fluid Panel | 2 | 2 | 4 | 4 |
| 240-2062 | Pulse Valve Repair Kit | Fluid Panel | 0 | 2 | 0 | 2 |
| 6-1306 | Repair Kit, HP Fluid Regulator, Manually-Operated | Fluid Panel | 0 | 0 | 2 | 2 |
| LSMM0056-00 | Static Mixer | Fluid Panel | 2 | 2 | 2 | 2 |
| 310-3915 | Pressure Regulator, Individual Replacement | Fluid Panel | 1 | 1 | 0 | 0 |
| 310-3925 | Solenoid Valve, Individual Replacement | Controller | 2 | 2 | 2 | 2 |

## SPARE ASSEMBLIES (RECOMMENDED)

| SPARE ASSEMBLIES (RECOMMENDED) | | | | | | |
|---|---|---|---|---|---|---|
| **PN** | **Description** | **Category** | **Auto LP qty.** | **MAN LP qty.** | **Auto HP qty.** | **MAN HP qty.** |
| CCV-503-SS | CCV Valve, LP | Fluid Panel | 2 | 2 | 0 | 0 |
| 240-2012 | CCV Valve, HP | Fluid Panel | 0 | 0 | 2 | 2 |
| 310-9010 | Flow meter Body | Fluid Panel | 1 | 1 | 1 | 1 |
| 310-9011 | Flow meter Dual Probe Pickup | Fluid Panel | 1 | 1 | 1 | 1 |
| 240-2061 | Pulse Valve Assembly | Fluid Panel | 0 | 1 | 0 | 1 |
| HGB-510-R1-CO | HGB Fluid Regulator, Air-Piloted | Fluid Panel | 1 | 0 | 0 | 0 |
| HGB-609-9-R38 | HGB Fluid Regulator, Manually-Operated | Fluid Panel | 0 | 1 | 0 | 0 |
| 84-420 | Manual Fluid Regulator, HP | Fluid Panel | 0 | 0 | 1 | 1 |
| 76624-02 | MVR Assembly, #2 Weepless | Fluid Panel | A/R | 0 | A/R | 0 |
| 76624-03 | MVR Assembly, #3 Weepless | Fluid Panel | A/R | 0 | A/R | 0 |
| 76624-04 | MVR Assembly, #4 Weepless | Fluid Panel | A/R | 0 | A/R | 0 |
| TR-SSMM-147 | MVR Assembly, #2 Weeping | Fluid Panel | A/R | 0 | 0 | 0 |
| TR-SSMM-148 | MVR Assembly, #3 Weeping | Fluid Panel | A/R | 0 | 0 | 0 |
| TR-SSMM-225 | MVR Assembly, #4 Weeping | Fluid Panel | A/R | 0 | 0 | 0 |
| 78015-00 | Mix Manifold Assembly, LP, With Solvent Flush | Fluid Panel | 1 | 1 | 0 | 0 |
| LBAL0016-00 | Mix Manifold Assembly, HP | Fluid Panel | 0 | 0 | 1 | 1 |

# TROUBLESHOOTING

Although the RF2 is a complex machine, troubleshooting the unit is straightforward, with a few basic steps.

## ALARM LIST

The alarm dialog is the first indication that something may be wrong with the RF2 control processes. Below is a list of alarms and troubleshooting steps.

| Alarm Description | Details & Troubleshooting Tips |
|---|---|
| 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.<br><br>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.<br><br>Make sure main air pressure is turned on.<br><br>Press "Reset" button on the main HMI.<br><br>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.<br><br>Power cycle the RF2.<br><br>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.<br><br>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.<br><br>Power cycle the RF2.<br><br>Contact Technical Support. |

| Alarm Description | Details & Troubleshooting Tips |
|---|---|
| Station (x)-Fluid Sequence Failed | The indicated station (x) has experienced a failed (incomplete) fluid sequence.<br>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.<br>Check other alarms that may have occurred in conjunction with this for more detailed cause analysis.<br>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. |
| | Make sure solvent supply is adequate and not restricted.<br>Check Solvent Flow Meter.<br>Check timing of fluid sequence to make sure 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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>Check recipe settings for ratio tolerance.<br>See the alarm-masking instructions to disable the shutdown of the system for this fault. |

| Alarm Description | Details & Troubleshooting Tips |
|---|---|
| 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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>Check recipe settings for flow tolerance.<br>See the alarm-masking instructions to disable the shutdown of the system for this fault. |
| 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.<br>Check for restrictions in the tubing feeding this channel.<br>Check material viscosity for abnormalities.<br>Check settings for low pressure.<br>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).<br>Determine if fluid delivery is ok, fluid pressures are correctly set, etc.<br>Check for restrictions in the tubing downstream from this channel.<br>Check material viscosity for abnormalities.<br>Check settings for high pressure.<br>Check settings for trigger timing.<br>Check pressure sensor scaling / operation. |
| Channel (x)-Inlet Underpressure | The indicated channel (x) has detected low pressure on its inlet pressure sensor (applies only to the gear-pump controlled channels). |
| | Determine if fluid delivery is ok, fluid pressures are correctly set, etc.<br>Check for restrictions in the tubing feeding this channel.<br>Check material viscosity for abnormalities.<br>Check settings for low pressure.<br>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.<br>Check for restrictions in the tubing feeding this channel.<br>Check material viscosity for abnormalities.<br>Check settings for high pressure.<br>Check pressure sensor scaling/operation. |

| Alarm Description | Details & Troubleshooting Tips |
|---|---|
| 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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>Check recipe settings for flow tolerance.<br>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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>Check recipe settings for flow tolerance.<br>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.<br>Check for restrictions in any of the fluid channels.<br>Check material viscosity for abnormalities.<br>Check recipe settings for flow tolerance.<br>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.<br>See the alarm-masking instructions to disable the shutdown of the system for this fault. |
| 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.<br>Check wiring to flow meter.<br>Check trigger timing settings.<br>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 condition 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 pressure 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 pressure sensor scaling/operation. |

| Alarm Description | Details & Troubleshooting Tips |
|---|---|
| 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.).<br>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–DISPENSE PUMP

| Alarm Message | Alarm Condition(s) | Action(s) |
|---|---|---|
| Low Inlet Pressure | Dispense Pump inlet pressure is below the set limit during operation | Confirm material valve is open |
| | | Confirm material pressure is correct and matches the Home screen reading |
| | | Confirm that material is present |
| | | Check Minimum Inlet Pressure setting on System Settings screen |
| | | Confirm valves B1-B4 correctly function |
| | | Confirm solenoids B1 - B4 correctly function |
| | | Confirm the Dispense Pump pressure transducers correctly function |
| High Outlet Pressure | Dispense Pump outlet pressure is above the set limit at anytime | Trigger the spray applicator to relieve pressure |
| | | Confirm the main air inlet pressure into RF2 is 75-100 psi (5-7 bar) |
| | | Confirm valves B1-B4 correctly function |
| | | Confirm solenoids B1-B4 correctly function |
| | | Confirm material pressure is below Maximum Outlet Pressure on the System Settings screen |
| | | Remove and Inspect Static Mixer |
| | | Confirm the Dispense Pump pressure transducers correctly function |
| Material Flow Error | Material flow sensed when system is not sprayiong | Confirm valve AE (Material Enable) is closed |
| | | Check valve AE for leaks |
| | | Confirm fluid panel is not vibrating |
| No Material Flow | No flow is detected through dispense pump flow sensor (if equipped) when dispense pump is running | Confirm material valve is open |
| | | Confirm pressure in the supply line |
| | | Confirm material in the supply line |
| | | Check connection of flow transducer cable |
| | | Confirm valves B1-B4 correctly function. Opposite valves should be open (B1&B3 or B2&B4) |
| | | Confirm solenoids B1-B4 correctly function |
| | | Material sensor (if equipped) out of adjustment. See flow sensor (if equipped) calibration procedure in manual |
| | | Confirm no air leaks to include the spray applicator, air flow switch, and air hoses |
| | | Confirm blow off times are not exceeded |
| | | Confirm valve AE are open when the spray gun is triggered |
| | | Check connections on flow meter |
| | | Check solenoid AE |
| | | Check for low material pressures. Check that the material pressures and regulators operate correctly |

| Alarm Message | Alarm Condition(s) | Action(s) |
|---|---|---|
| Upper Transducer Fault | Improper electrical signal from upper pressure transducer on dispense pump | Check electrical connection and wiring |
| | | Confirm upper pressure transducer on dispense pump correctly functions |
| Lower Transducer Fault | Improper electrical signal from lower pressure transducer on dispense pump | Check electrical connection and wiring |
| | | Confirm upper pressure transducer on dispense pump correctly functions |
| Check Pump | Dispense pump movement does not match potentiometer output | Check for air in all fluid lines |
| | | Confirm valves B1-B4 correctly function. Opposite valves should be open (B1&B3 or B2&B4) |
| | | Confirm solenoids B1-B4 correctly function |
| | | Perform a calibration (pump-setup) procedure |
| | | Inadequate dispense pump inlet pressure. Increase to 5-10% greater than outlet pressure |
| | | A side material flow rate too high |
| | | Confirm wiper is correctly engaged with potentiometer (check diagnostic screen) |
| Upper Balancing Fault | Dispense pump top fluid pressure not balanced at pump direction change | Air in the top of dispense pump. If air is present do a material prime |
| | | Excessive dispense pump inlet pressure. Reduce to 5-10% greater than outlet pressure |
| | | Inadequate dispense pump inlet pressure. Increase to 5-10% greater than outlet pressure |
| | | Confirm pressure transducers correctly function |
| Color Change Fault | Color change sequence has been interrupted | Confirm stop button was not pressed |
| | | Confirm atomization air is not detected during color change |
| High Material Flow Rate | Material flow rate above set limit during operation | Check for air in fluid lines to color valve valves |
| | | Confirm no leaks in fluid lines |
| | | Verify max material flow rate in System Settings |
| | | Adjust fluid pressure/flow to color valve valves to make sure limit is not exceeded |
| Air Flow Detected | Atomization air detected during color change or flush mode | Turn off atomization air during color change or flush |
| | | Check operation of air flow switch(es) |
| EtherCAT Error | An internal error has occurred with PLC communications to the I/O block. | Cycle Power to the RF2. |
| | | Check cables between the HMI and I/O block. |

| Alarm Message | Alarm Condition(s) | Action(s) |
|---|---|---|
| Material Flow Fault | Material flow detected without pump operation | Check material for fluid leaks |
| | | Confirm material valve is open and supply adequate |
| | | Confirm material pressure is correct |
| | | Adjust flow sensor (if equipped) so display returns to red signal after spray applicator trigger stops |
| | | Adjust flow sensor (if equipped) at minimum flow rate so display moves off red signal |
| | | Confirm valves B1-B4 correctly function. Opposite valves should be open (B1&B3 or B2&B4) |
| | | Confirm solenoids B1-B4 correctly function |
| Emergency Stop Button Pressed | Emergency stop button is pressed | Pull out emergency stop button on front of machine |
| | | Press reset button on operator panel |
| Pump Position Sensor Error | Invalid reading from the pump position sensor. | Check sensor for proper operation. |
| Max System Pressure Error | Pressure has been measured that is higher than the rated system pressure. | Check for restrictions after the outlet of the dispense pump for fluid flow blockage. |
| | | Check for leaks in the material circuit. Leaks can prevent flow detection. |
| | | Verify that the maximum system pressure settings in the system configuration are correct. |

## TROUBLESHOOTING—FESTO VTEM PRESSURE REGULATOR MANIFOLD

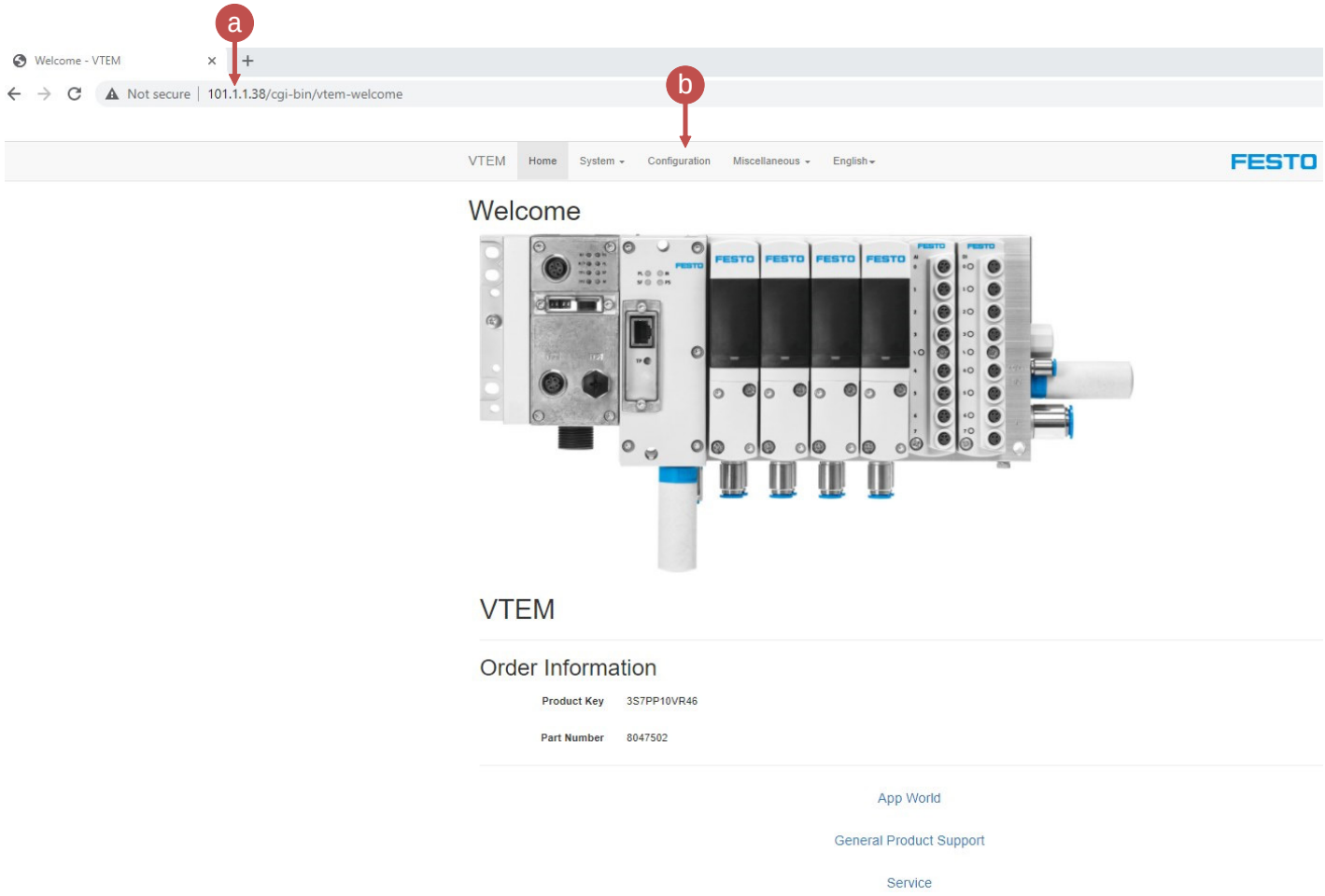
If an issue with the Festo VTEM Pressure regulator manifold occurs, the unit can access more detailed troubleshooting.

First locate the RJ45 port (1) used to configure the VTEM module, then 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).



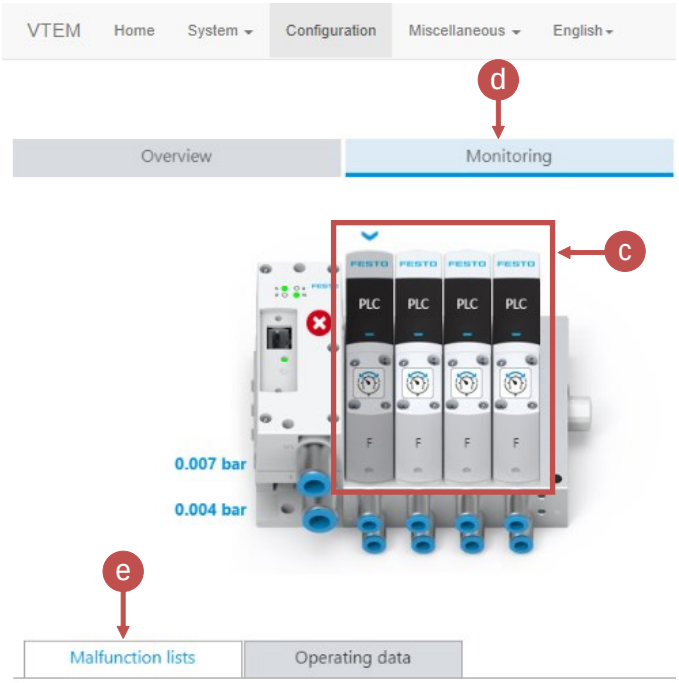
Click on any module to select it (c).

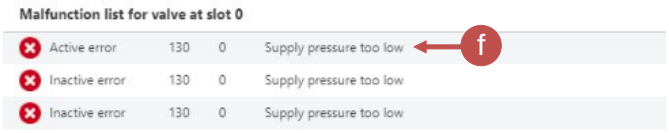
Select the monitor tab (d) to show a list of malfunctions (e).

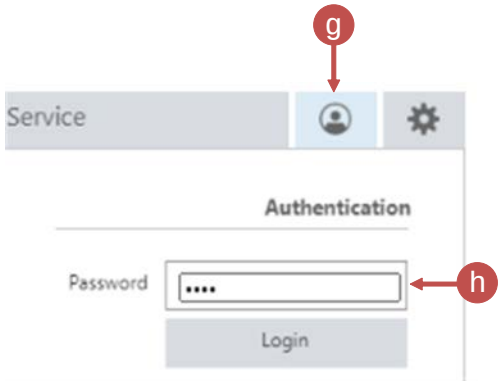
The example below shows that the supply pressure is too low (f).

If the fluid panels for the RF2 are installed too far from the unit, tune the pressure regulators. To do this, press the login key (g) and enter the password (h) to log into the VTEM unit.

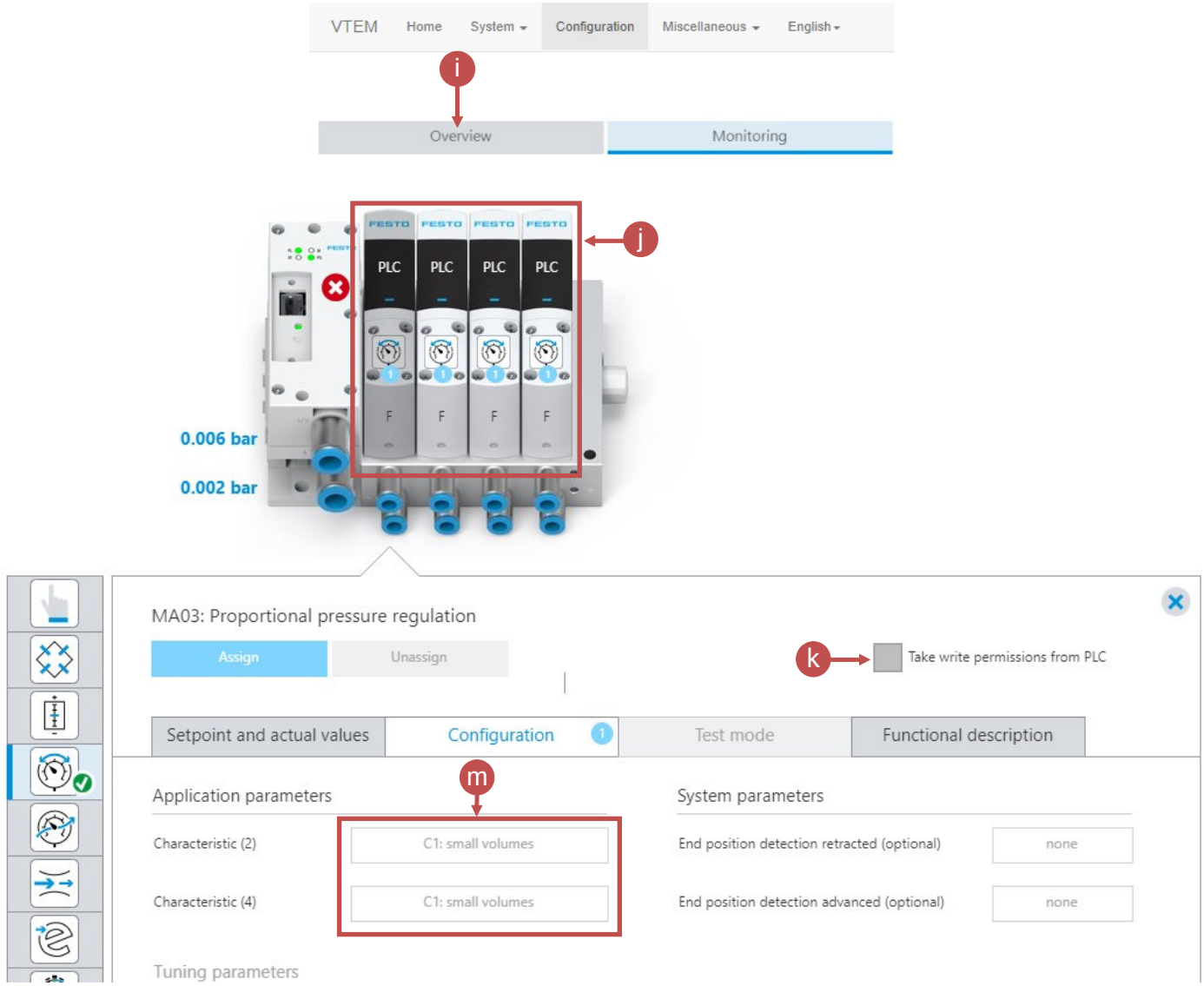
**The factory default password is "vtem." DO NOT change this password.**



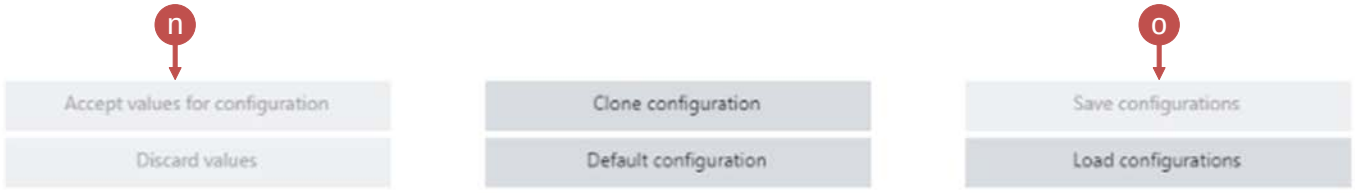



Once logged in, select the overview tab (i) and the module (j) to edit. It is necessary to "Take Write Permissions from the PLC" (k) to make any changes. Changes are not permitted when the PLC is in communication with the VTEM manifold, so the M12 Ethernet cable at the front of the manifold must be unplugged to select the box below.




To change the tune, determine the labeled module port (4 or 2) to be connected to the tube type. Select the small, medium, or large volume setting from the dropdown menu to change the "Characteristic" (m) parameter. Additionally, the regulator can be custom tuned.

When edits are made, select "Accept values for configuration" (n), then press "Save Configurations" (o). If the configuration is not saved, the unit will revert to its earlier settings upon start-up.



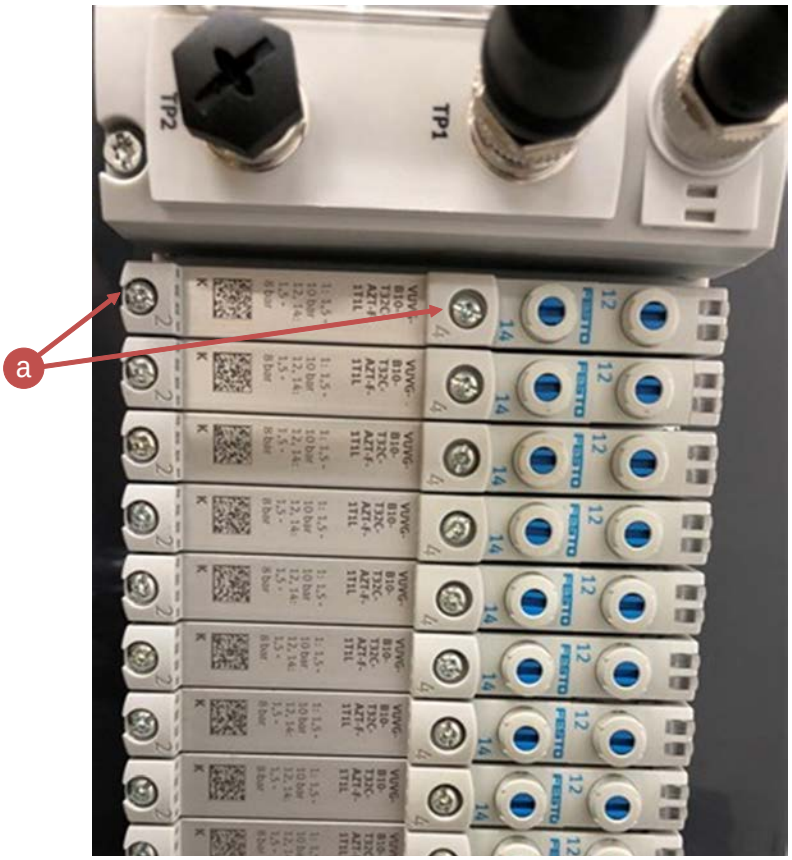
## TROUBLESHOOTING—FESTO VTUG SOLENOID MANIFOLD

To replace a defective pressure regulator module, loosen the bolts on the module, then pull the module directly out. Make sure the new module's gasket is correctly located in its channel, and press it down and into the open slot. Tighten the bolts, but do not tightly squeeze the gasket.

Consult Festo VTEM operations manual for more details.

**⚠ WARNING**

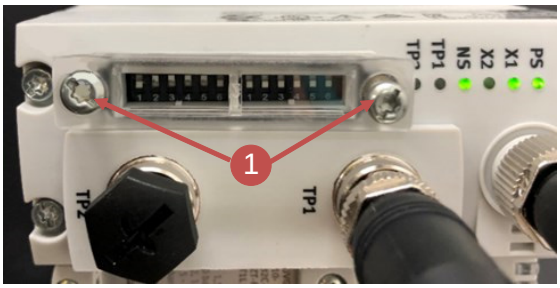
Make sure the air is disconnected before attempting to remove a solenoid module.



- The RF2 can control up to four solenoid modules. These modules can be installed later in the field if not initially installed in the purchased configuration. Each manifold (1-4) must be set to a specific IP address as 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




From left to right.

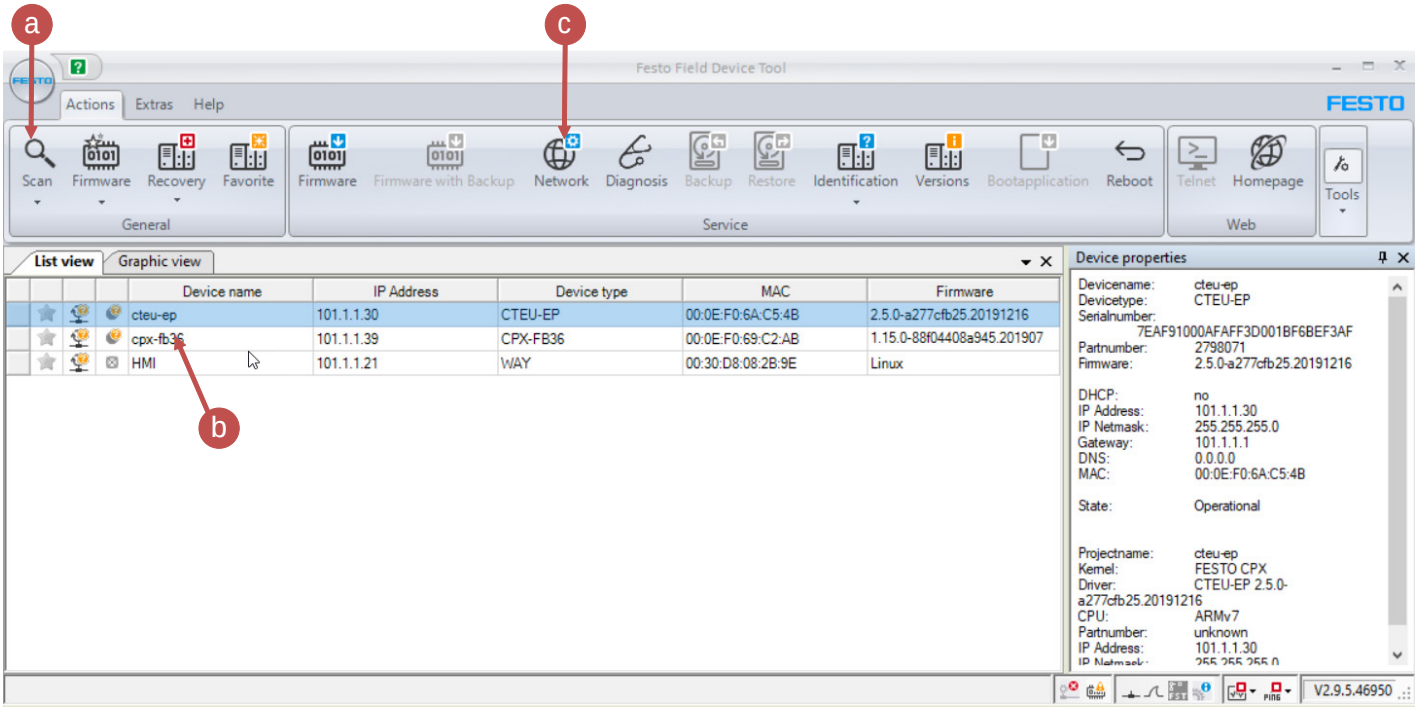
1-1 = least significant bit.

2-2 = most significant bit.

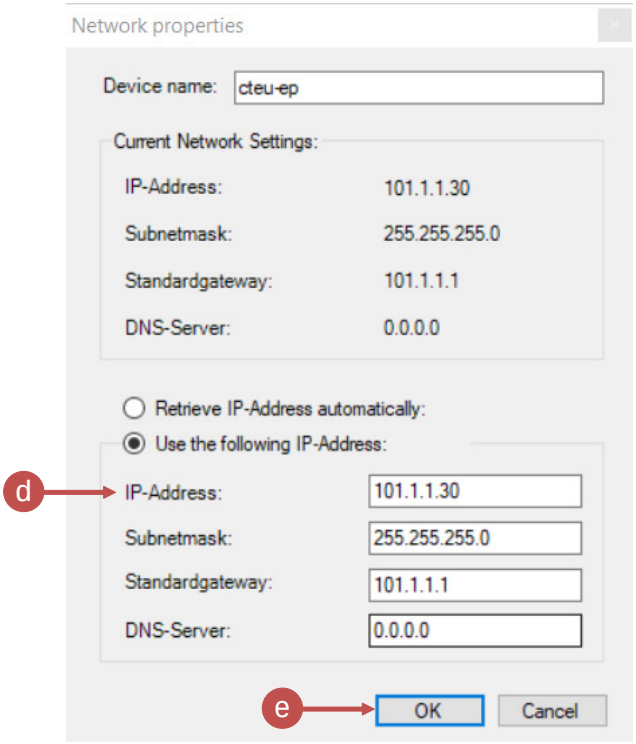
Leave 2-3 – 2-6 at zero.

4. Open "Festo Field Device Tool" software. This can be downloaded from Festo's website.

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.

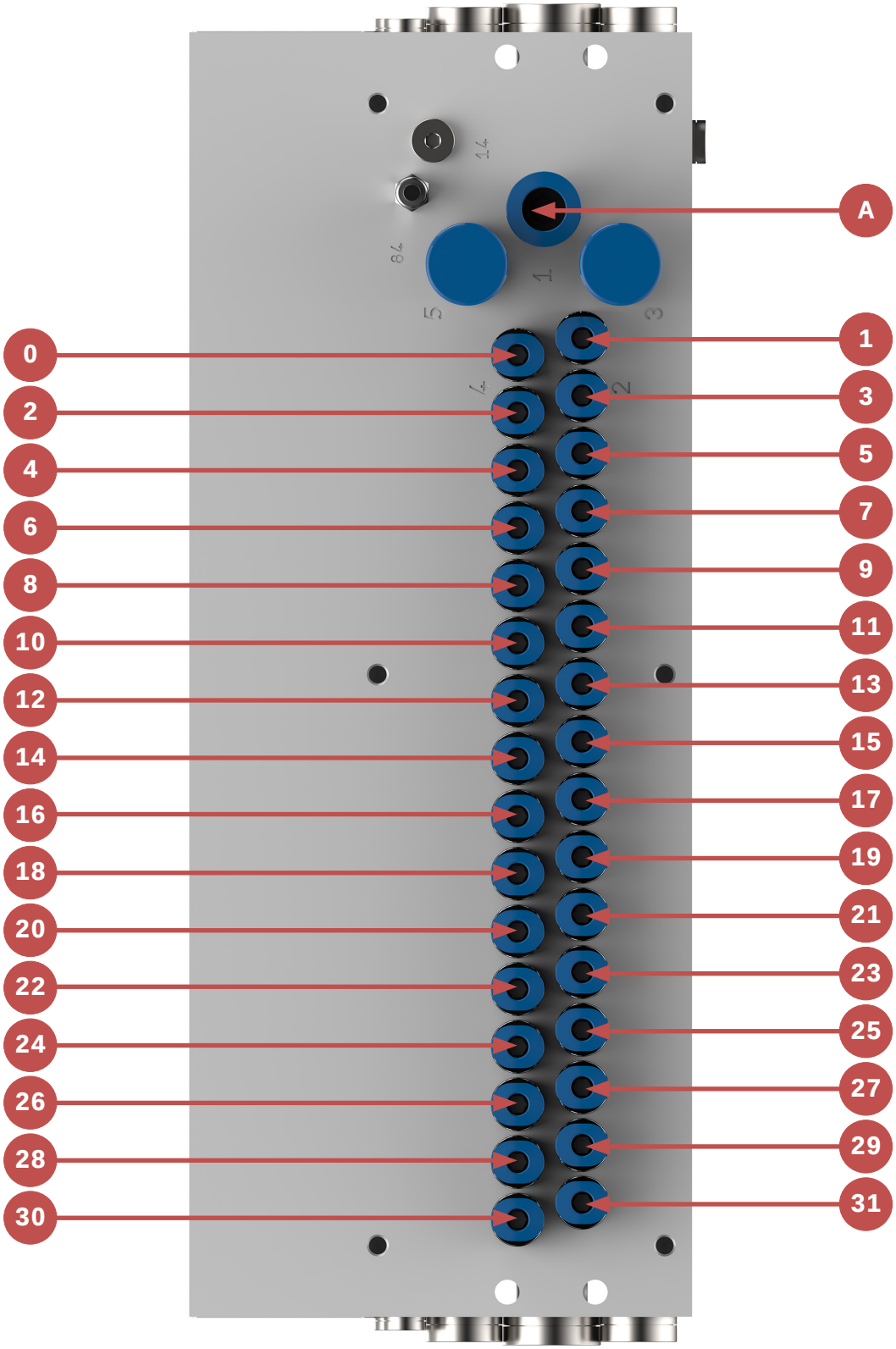
# INTRODUCTION

## DISPENSE PUMP TROUBLESHOOTING

Use this checklist to help identify potential problems with the dispense pump to avoid unnecessary disassembly. If the problem is still not corrected, it may be necessary to remove the dispense pump and clean it thoroughly after flushing it with a solvent. Look for clogged passageways and evidence of fluid leaks.

| Description | Pass / Fail |
|---|---|
| Check that the system is not in an Alarm state. It is possible an Alarm is not allowing the pump to run. | |
| Verify there are no leaks anywhere on the pump fluid end. | |
| Examine the Oil Reservoir. Look for overflowing or hints of hardener/catalyst material in the reservoir. | |
| Check for air in all fluid lines. There must be no air bubbles anywhere. | |
| Visually inspect the threaded actuator rod; look for wear or damage. Check rod for adequate lubrication. | |
| Verify the ball plunger is correctly contacts the linear potentiometer. Observe the center value change on the Dispense Pump Limits screen during the Jog Up or Jog Down movement. | |
| Go to the PRIME screen. Trigger the gun and dispense pump. Confirm valve operation and look for a constant stream of material exiting the gun. | |
| Examine the stepper motor. Verify smooth operation when the pump runs. | |
| Verify Signal 1A and Signal 1B (Top two LEDs on rightmost card of I/O block) light up and flash when material is travelling through the unit. | |

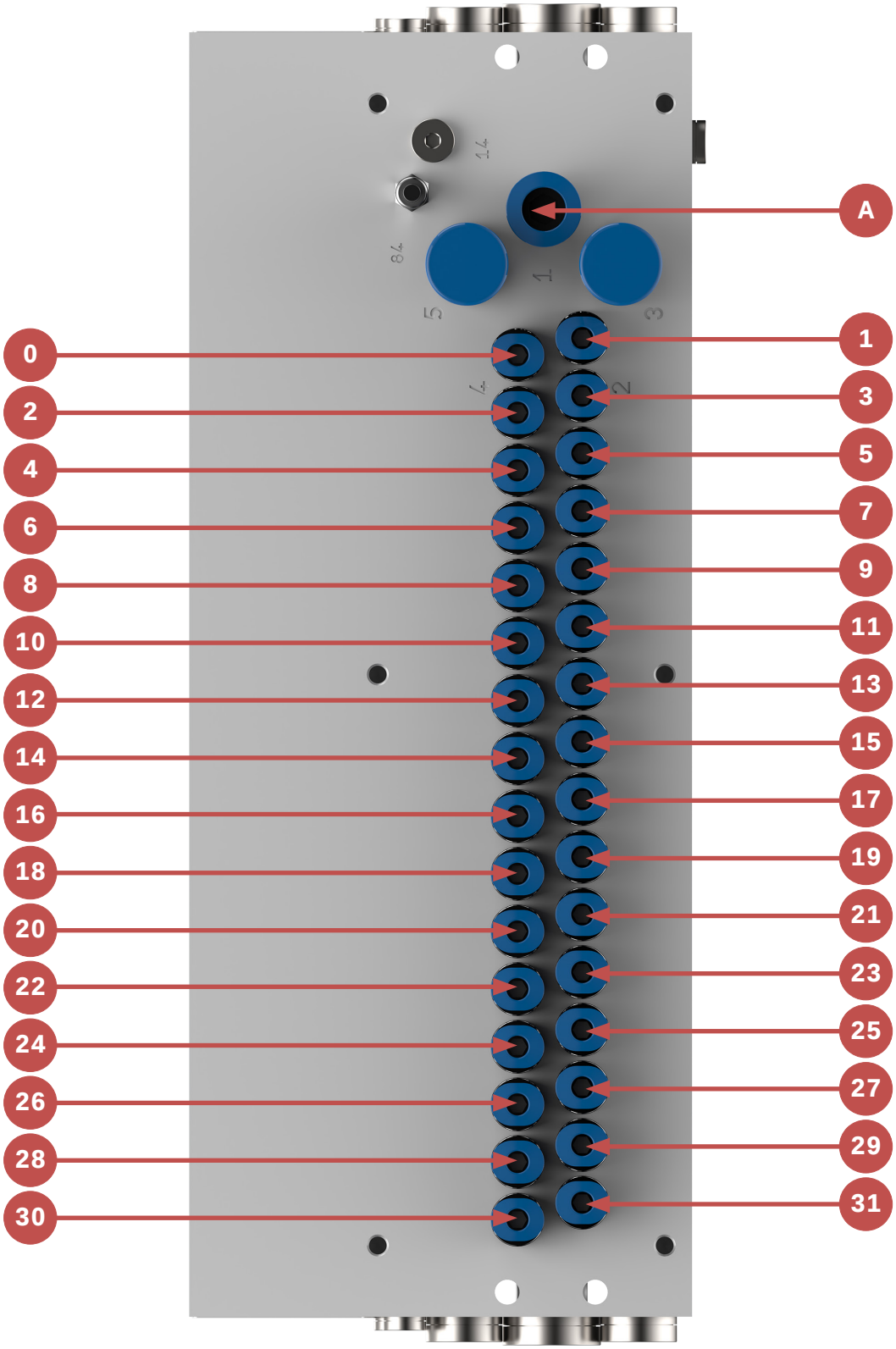
## SOLENOID CONNECTION REFERENCE–COLOR STACK



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

| # | Solenoid | Location | Description | Basic | Optioned |
|---|---|---|---|---|---|
| A | INLET | Air Manifold | Solenoid Main Air Inlet | x | |
| 0 | K1SS | Color Stack 1 | Component 1 Solvent Flush Valve | x | |
| 1 | K1SA | Color Stack 1 | Component 1 Stack Air | x | |
| 2 | K2SS | Color Stack 2 | Component 2 Solvent Flush Valve | x | |
| 3 | SPARE | Empty | — | | |
| 4 | SPARE | Empty | — | | |
| 5 | SPARE | Empty | — | | |
| 6 | K1CAL | CCV Valve | Component 1 Calibration | x | |
| 7 | K2CAL | CCV Valve | Component 2 Calibration | x | |
| 8 | MBS | Fluid Mix Panel | Mix Block Solvent | x | |
| 9 | SPARE | Empty | — | | |
| 10 | TRG G1 | Spray Gun 1 | Gun 1 Trigger | x | |
| 11 | TRG G2 | Spray Gun 2 | Gun 2 Trigger | x | |
| 12 | DUMP 1 | — | — | | |
| 13 | DUMP 2 | — | — | | |
| 14 | K1C1 | Color Stack 1 | Component 1 CCV Color Valve 1 | x | |
| 15 | K1C2 | Color Stack 1 | Component 1 CCV Color Valve 2 | x | |
| 16 | K1C3 | Color Stack 1 | Component 1 CCV Color Valve 3 | x | |
| 17 | K1C4 | Color Stack 1 | Component 1 CCV Color Valve 4 | x | |
| 18 | K1C5 | Color Stack 1 | Component 1 CCV Color Valve 5 | x | |
| 19 | K1C6 | Color Stack 1 | Component 1 CCV Color Valve 6 | x | |
| 20 | K1C7 | Color Stack 1 | Component 1 CCV Color Valve 7 | x | |
| 21 | K1C8 | Color Stack 1 | Component 1 CCV Color Valve 8 | x | |
| 22 | K1C9 | Color Stack 1 | Component 1 CCV Color Valve 9 | x | |
| 23 | K1C10 | Color Stack 1 | Component 1 CCV Color Valve 10 | x | |
| 24 | K1C11 | Color Stack 1 | Component 1 CCV Color Valve 11 | x | |
| 25 | K1C12 | Color Stack 1 | Component 1 CCV Color Valve 12 | x | |
| 26 | K2C1 | Color Stack 2 | Component 2 CCV Color Valve 1 | x | |
| 27 | K2C2 | Color Stack 2 | Component 2 CCV Color Valve 2 | x | |
| 28 | K2C3 | Color Stack 2 | Component 2 CCV Color Valve 3 | x | |
| 29 | K2C4 | Color Stack 2 | Component 2 CCV Color Valve 4 | x | |
| 30 | K1PV | Fluid Module | Component 1 Pulse valve | | x |
| 31 | K2PV | Fluid Module | Component 2 Pulse valve | | x |

## SOLENOID CONNECTION REFERENCE–DISPENSE PUMP



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

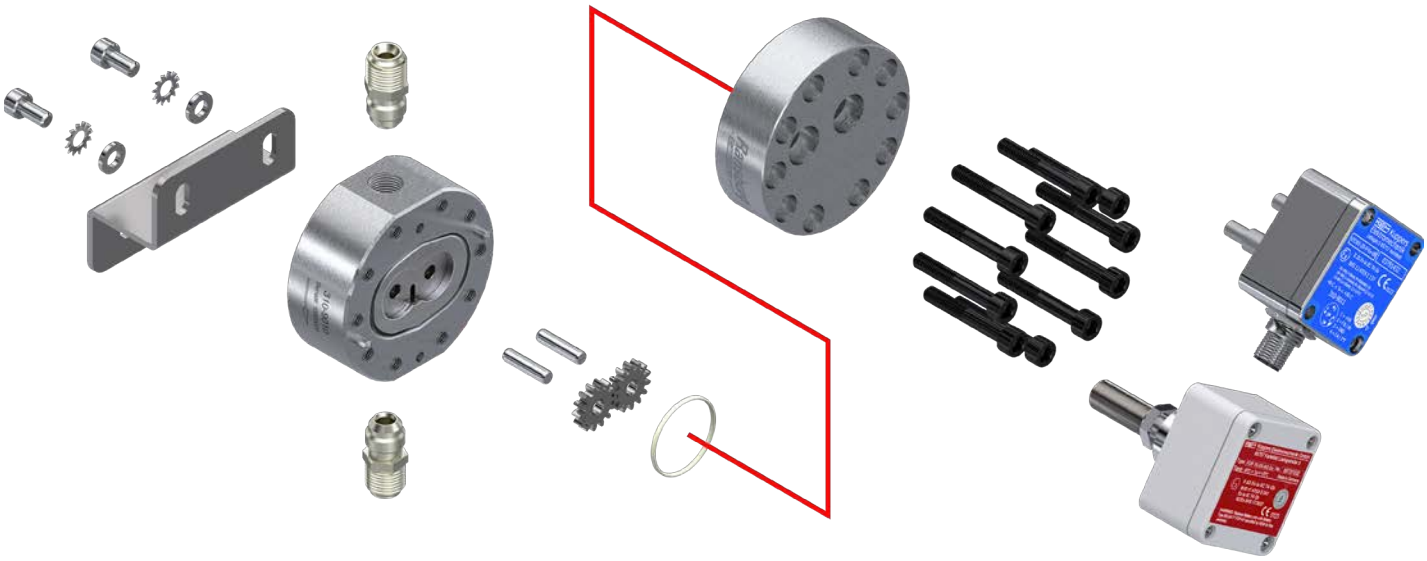
| # | Solenoid | Location | Description | Basic | Optioned |
|---|---|---|---|---|---|
| A | INLET | Air Manifold | Solenoid Main Air Inlet | x | |
| 0 | K1SS | Color Stack 1 | Component 1 Solvent Flush Valve | x | |
| 1 | K1SA | Color Stack 1 | Component 1 Stack Air | x | |
| 2 | K2SS | — | — | | |
| 3 | SPARE | Empty | — | | |
| 4 | SPARE | Empty | — | | |
| 5 | SPARE | Empty | — | | |
| 6 | K1CAL | CCV Valve | Component 1 Calibration | x | |
| 7 | K2CAL | — | — | | |
| 8 | MBS | Fluid Mix Panel | Mix Block Solvent | x | |
| 9 | SPARE | — | — | | |
| 10 | TRG G1 | Spray Gun 1 | Gun 1 Trigger | | x |
| 11 | TRG G2 | Spray Gun 2 | Gun 2 Trigger | | x |
| 12 | DUMP 1 | — | — | | |
| 13 | DUMP 2 | — | — | | |
| 14 | K1C1 | — | — | | |
| 15 | K1C2 | — | — | | |
| 16 | K1C3 | — | — | | |
| 17 | K1C4 | — | — | | |
| 18 | K1C5 | — | — | | |
| 19 | K1C6 | — | — | | |
| 20 | K1C7 | — | — | | |
| 21 | K1C8 | — | — | | |
| 22 | K1C9 | Dispense Pump | Top Inlet | x | |
| 23 | K1C10 | Dispense Pump | Top Outlet | x | |
| 24 | K1C11 | Dispense Pump | Bottom Inlet | x | |
| 25 | K1C12 | Dispense Pump | Bottom Outlet | x | |
| 26 | K2C1 | — | — | | |
| 27 | K2C2 | — | — | | |
| 28 | K2C3 | — | — | | |
| 29 | K2C4 | — | — | | |
| 30 | K1PV | — | — | | |
| 31 | K2PV | — | — | | |

## STANDARD FLOW METER TROUBLESHOOTING

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

Fluid back-up, that is, reverse flow, can cause reacted/catalyzed material to enter the flow meter. The flow meter should be cleaned immediately, before the fluid gels or hardens. Under normal operation the sensors or electrical connections will not require replacement.

To service the flow meter, refer to Flow Meter Service Manual 77-3154.



## MAINTENANCE PROCEDURES

There are no enclosure components which should require cleaning if the enclosure door is kept shut. If material seepage occurs, be sure to correct the problem and maintain a clean work area. To avoid hardening of the paint inside the fluid lines, the system must be cleaned by a complete flushing procedure at the end of operations.

**⚠ WARNING**

Never expose electrical equipment to flammable liquids or gases including solvent fumes.

### Cleaning of Hoses

If GUN 1 and GUN 2 flush sequences are correct the mixed material line(s) will remain clean and ready for the next use. Always finish spraying operations with a color 0 load that removes all air from the fluid lines. If pot life is greatly exceeded, it is recommended the static mixer and mixed material hose be replaced.

### Maintenance of CCV Valve

If a color change valve has not been used for a prolonged period, it is recommended to remove the valve and clean the fluid passages. Paint material may collect inside the valve or manifold passages. If the valve does not operate properly or if fluid leaks occur the valve must be repaired. Check the valve for proper operation regularly.

### Maintenance of CCV Pulse Valve

If a color change valve has not been used for a prolonged period, it is recommended to remove the valve and clean the fluid passages. Paint material may collect inside the valve or manifold passages. If the valve do not operate properly or if fluid leaks occur the valve must be repaired. Check the pulse valve for proper operation regularly.

### Cleaning The Enclosure Exterior and HMI

The control enclosure's exterior painted surfaces must only be cleaned with a soft damp cloth and household cleaners. Cleaning of the touch-screen-display with solvents is not allowed. If contamination of the display is expected, use disposable screen protectors 310-8030.

**⚠ WARNING**

Read and understand all operating manuals for connected equipment. Failure to properly follow the operating instructions could result in severe injury.

## PREVENTIVE MAINTENANCE

The RF2 system requires periodic inspection and regular maintenance. Follow the corresponding table as a guide to perform routine maintenance at suggested intervals. These intervals are recommendations and largely depend on the material being sprayed.

### Daily/Each Shift:

- Make sure mixed material is properly flushed at the end of the shift. Verify there are no air pockets in the fluid lines.
- Identify and correct air and fluid leaks on the system to include the fluid hoses and dispense pump.
- Make sure the spray guns are function correctly and that air does not leak from the air valve.
- Examine the Alarm History and review errors with operator. Verify issues have been corrected.
- Make sure material supplies are filled and pressures are correct.

### Monthly:

- Examine the static mixer assembly at the dispense pump outlet. If the static mix elements are clogged, replace the static mixer as needed. Balancing alarms or an increase in outlet pressure indicates blockage.
- If equipped: Make sure the dispense pump oil reservoir tubes have no hardener or contamination.
- Make sure to keep sufficient lubricant levels at all times.
- Examine all air and fluid lines for kinks, cuts, or wear.
- Perform a calibration to make sure the dispense pump correctly operates.
- Make sure the CCVs are opening and closing properly. Remove valves and clean if needed.
- Make sure all CCV pulse valves can properly open and close. Remove pulse valves and clean if needed.
- Clean, examione, and reassemble the valves.
- Examine fluid hoses for material buildup. Material buildup is common around hose fittings. This can be a source of contamination to finished products. Replace if needed.

### As Needed:

- Rebuild the dispense pump. This is required if there is material leakage from the oil reservoirs, or if the calibration is incorrect or inaccurate.
- Rebuild Color Change Valves – monitor valves for air leaks or slow response time when triggering.
- Rebuild Pulse Valves – monitor the valves for air leakage or slow response time when triggering.
- Examine the dispense pump for excessive wear or buildup of material. Verify smooth dispense pump movement.
- Set limits of the dispense pump/perform calibration.

**NOTICE**

Reactive fluid properties greatly vary. If material blockage occurs to any component, adjust the maintenance schedule accordingly.

# 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):
    - AuxOut1Arr (SINT 496)
    - AuxOut2Arr (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.

**NOTICE**

The examples shown above are Allen Bradley software. Other PLC software can have different methods to accomplish datatype conversions.

Communications Handshake: 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.

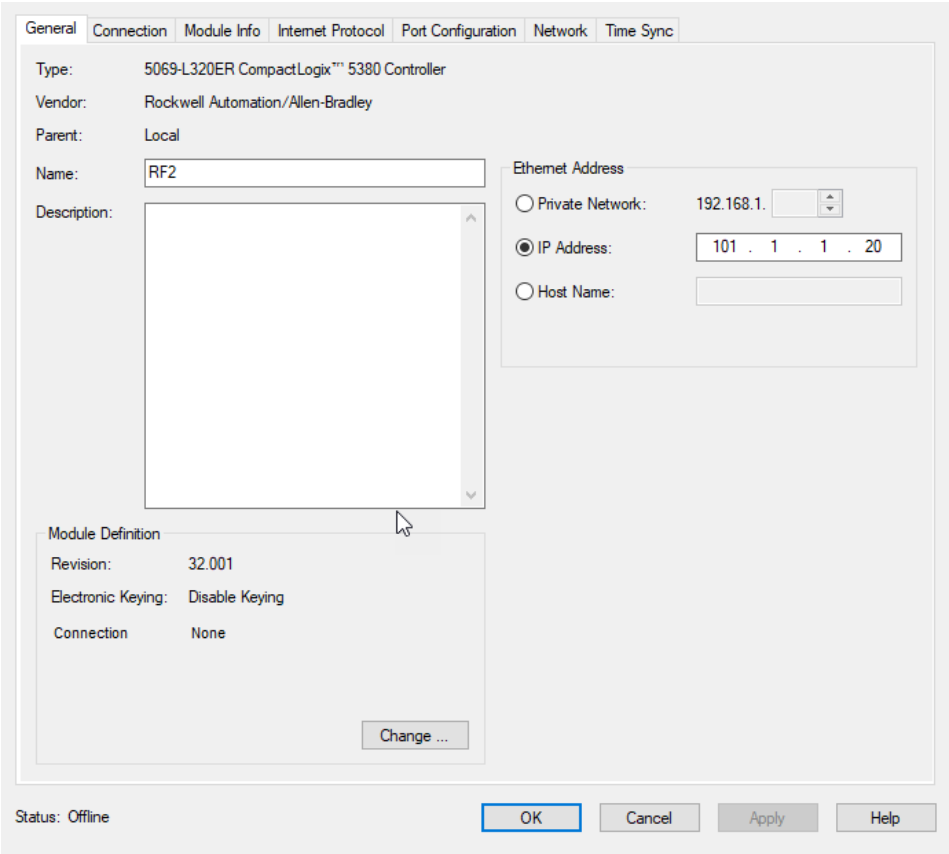
## Direct Access/CIP Communications

If an Allen Bradley Logix PLC is used, or another controller where direct access to the RF2 input and output arrays (AuxInArr, AuxOut1Arr, AuxOut2Arr) 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

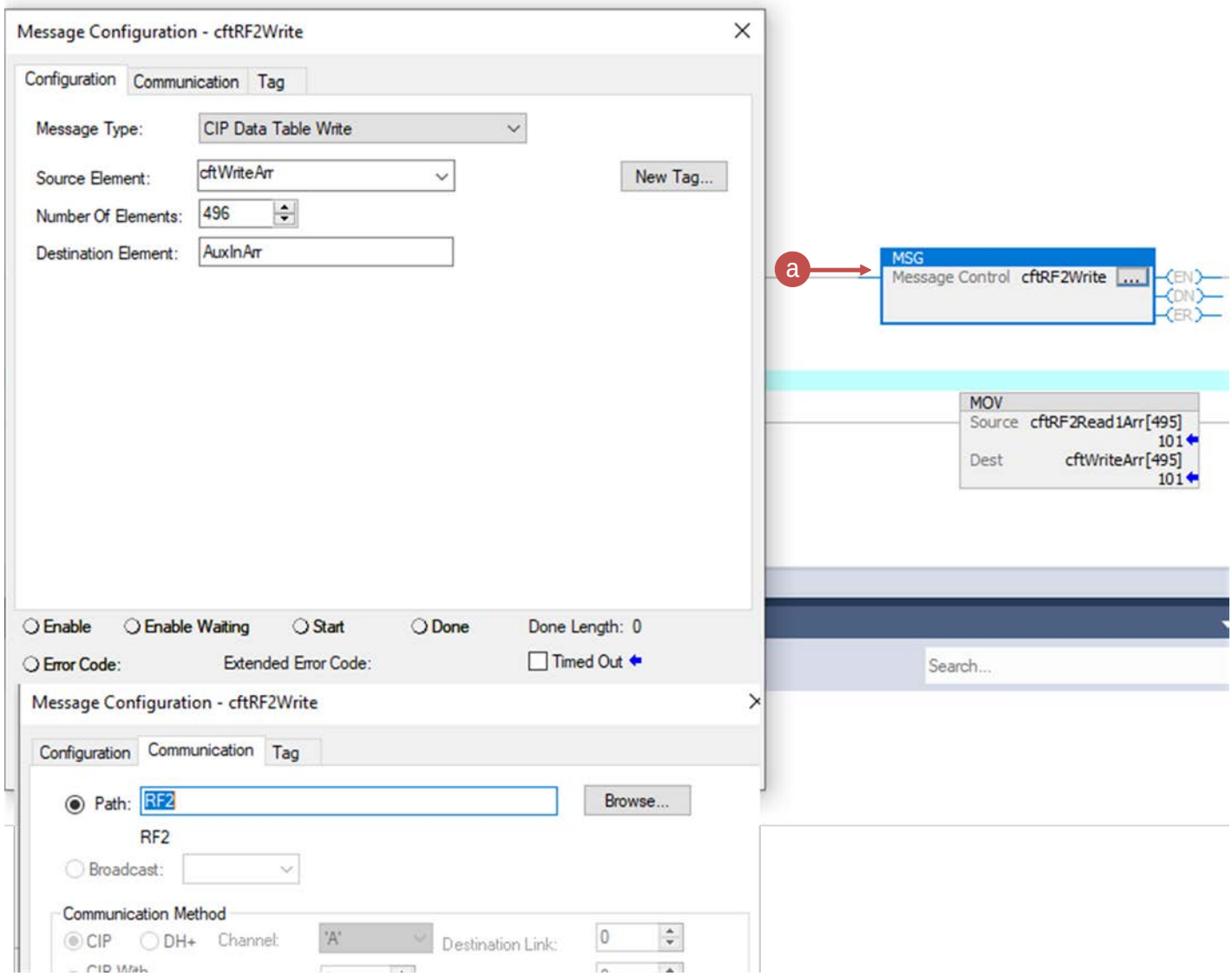
To make the RF2 as flexible as possible in being able to communicate to as many devices as possible, with different IP address configurations, etc. All communications are handled by the master controller, and the RF2 simply contains the tag arrays used for the transfer. Examples of Allen Bradley message setups are shown below.

Note: The code examples below will be put into the master PLC. Other PLCs or systems can use different methods to get the data into the RF2's tag arrays.

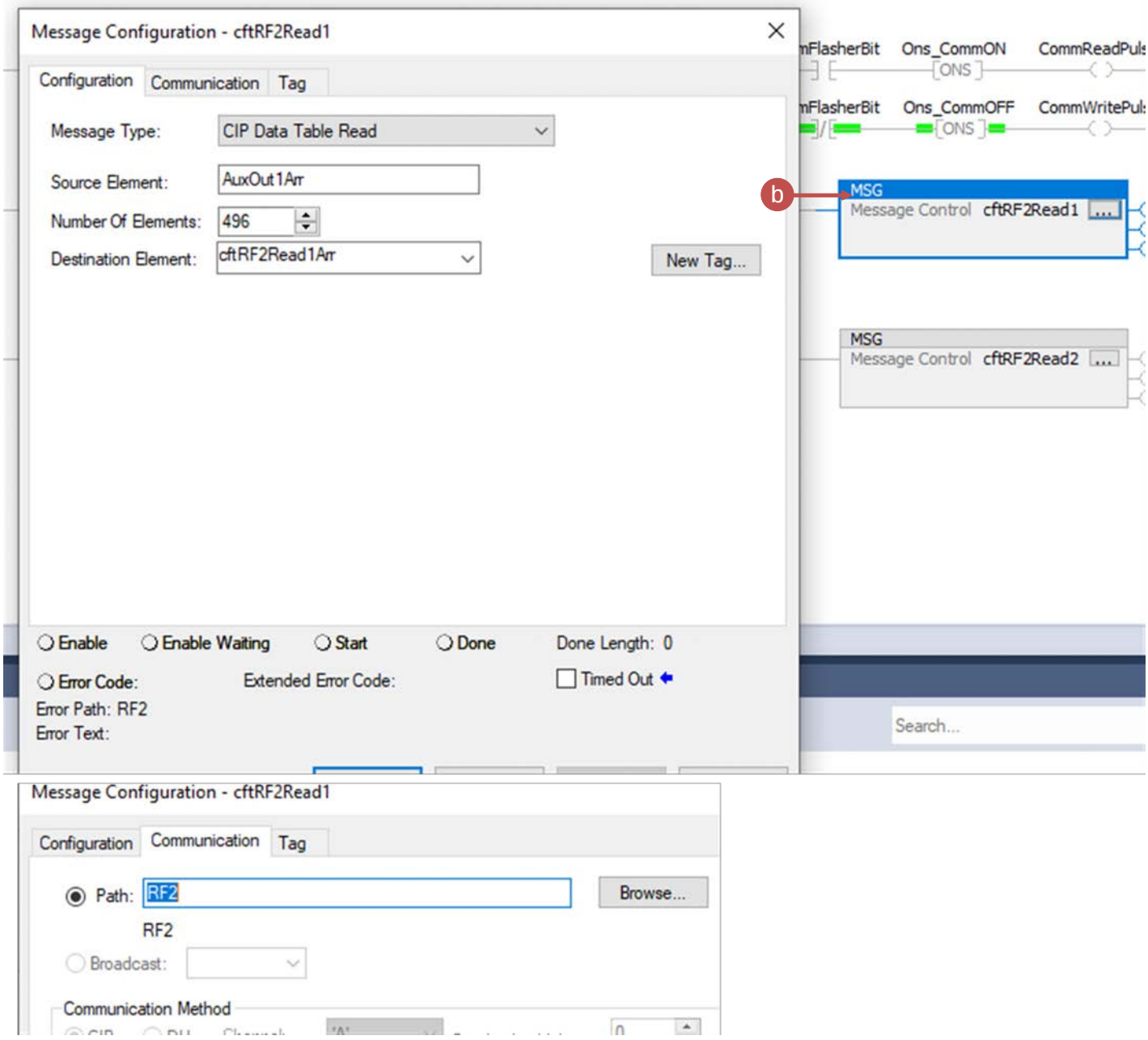



RF2 Node Setup in an Allen Bradley PLC.

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.



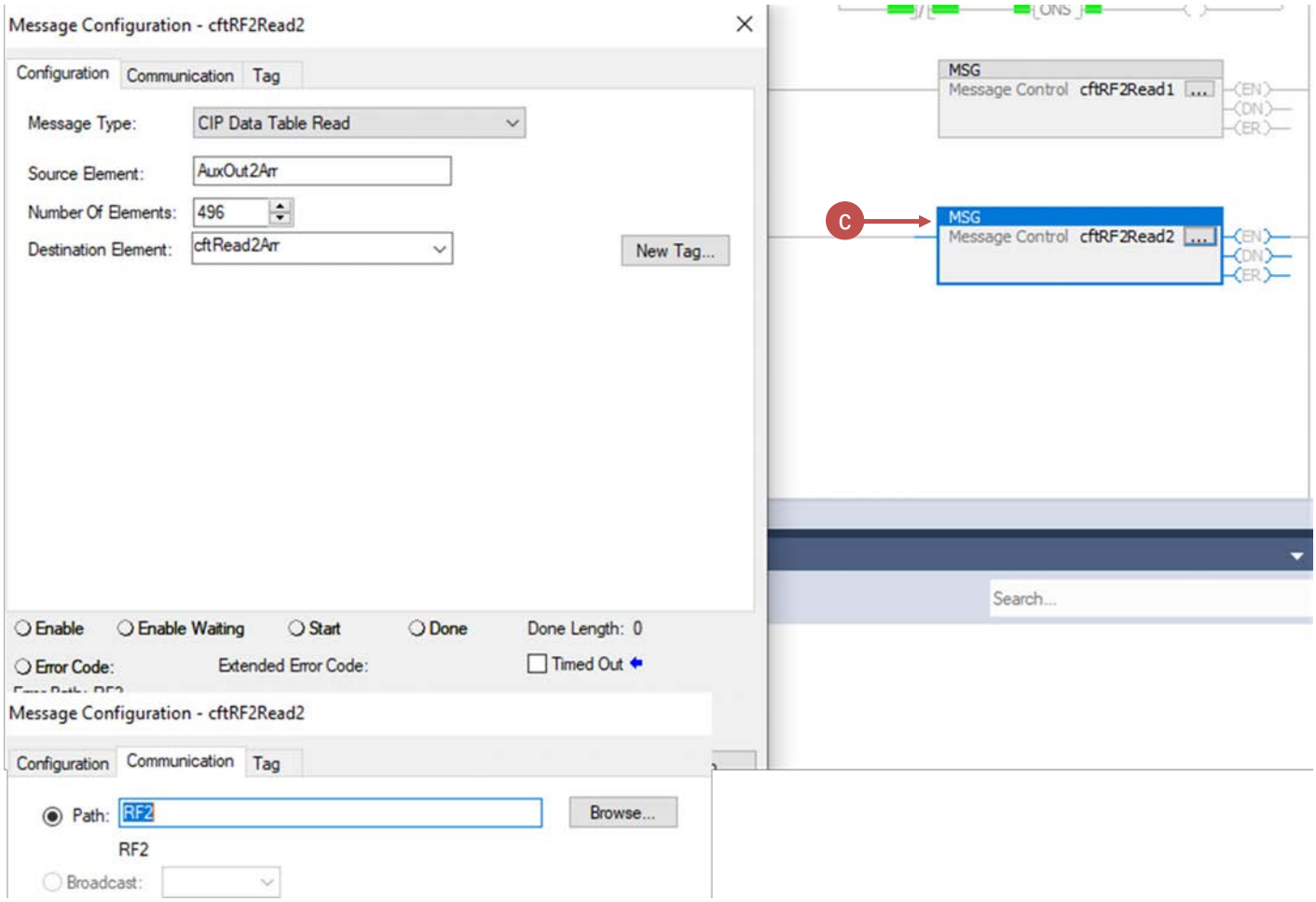

RF2 Input Array (Master PLC Write) (a)







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 Byte | — | 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 Byte | | 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 Byte | — | Reserved |
| 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..64 | 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) |

| RF2 INPUT ARRAY-SINT 496 (cont.) | | | |
|---|---|---|---|
| **Address** | **Length** | **Datatype** | **Description** |
| 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) |
| 89, 90 | 2 Byte | INT | Override Data - Gun/Mix Selected In Byte 82 - Min Flow Command (0-3500) |
| 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 | DINT | 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 |
| 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 |

| RF2 INPUT ARRAY-SINT 496 (cont.) | | | |
|---|---|---|---|
| **Address** | **Length** | **Datatype** | **Description** |
| 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 Byte | — | 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 Byte | — | Reserved |

| SYSTEM CONTROL BYTE 0 ( 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 |

| SYSTEM CONTROL BYTE 0 (BYTE 2,6) | | | |
|---|---|---|---|
| **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. | | | |

| SYSTEM CONTROL BYTE 1 (BYTE 3,7) | | | |
|---|---|---|---|
| **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 BYTE (BYTE 14,17,20,23) | | | |
|---|---|---|---|
| **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) |
| 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 (%) |

| RF2 OUTPUT ARRAY 1-SINT 496 (cont.) | | | |
|---|---|---|---|
| **Address** | **Length** | **Datatype** | **Description** |
| 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 |
| 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 |

| RF2 OUTPUT ARRAY 1-SINT 496 (cont.) | | | |
|---|---|---|---|
| **Address** | **Length** | **Datatype** | **Description** |
| 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 |
| 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 |

| RF2 OUTPUT ARRAY 1-SINT 496 (cont.) | | | |
|---|---|---|---|
| **Address** | **Length** | **Datatype** | **Description** |
| 361..493 | 133 Byte | — | Reserved |
| 494 | 1 Byte | SINT | Output Array Identifier (1=Output Array 1, 2= Output Array 2) -- used with Anybus Gateway Only |

| RF2 OUTPUT ARRAY 2-SINT 496 (Used only to report 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 (%) |
| 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 |

| RF2 OUTPUT ARRAY 2-SINT 496 (Used only to report active recipe values (cont.)) | | | |
|---|---|---|---|
| **Address** | **Length** | **Datatype** | **Description** |
| 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 |
| 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 (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 | Data Stable (Mix/Channel Status Data Stable) |
| 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 (BYTE 2,6) | | | |
|---|---|---|---|
| **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 (BYTE 14,43,72,101) | | | |
|---|---|---|---|
| **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 (BYTE 130,172,214,256) | | | |
|---|---|---|---|
| **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. It is also possible to add the gateway at a later time. 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 below are mapped into the AnyBus tag addresses.

Programming must be done on the side of the customer to copy the data into the correct registers. The input and output sizes in the customer's network must be 496 bytes each.

See user manual for the specific model of AnyBus gateway provided for more information on programming it.

# SCHEMATICS

## TABLE OF CONTENTS

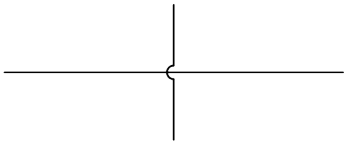
## REVISION LIST

| REVISION LIST | | | |
|---|---|---|---|
| **Version** | **Engineer** | **Date** | **Description** |
| A | SA | 06/01/2020 | DESIGN |
| B | JV | 12/10/2020 | AS BUILT-ALPHA |
| C | JV | 01/25/2021 | DESIGN UPDATES |
| D | JV | 05/26/2021 | PRE-PRODUCTION UPDATES |
| E | JV | 07/27/2021 | UPDATES AFTER EMC TESTING |
| F | JV | 08/23/2021 | AFTER FIRST BETA TEST |
| 1 | JV | 02/03/2022 | PRODUCTION RELEASE |
| J | RDH | 02/13/2023 | UPDATES |

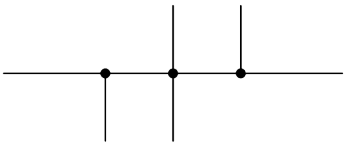
**PRELIMINARY 1**

# LEGEND DESCRIPTIONS
NUMBERING CODE
XX???? = COMPONENT TYPE
??XX?? = SHEET
????XX = COLUMN

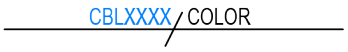
WIRE CROSS



WIRE CONNECTION

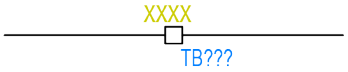


CABLE NUMBER
CORE IDENTIFIER



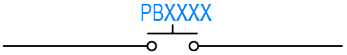

CIRCUIT BREAKER
WITH RATING


TERMINAL BLOCK
WIRE NUMBER

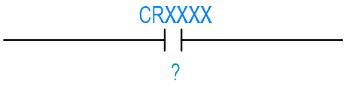



CONTROL
RELAY COIL


PUSHBUTTON
NORMALLY OPEN

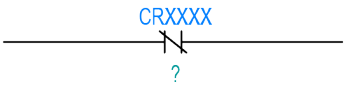



CONTROL
RELAY COIL

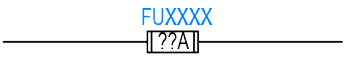



PUSHBUTTON
NORMALLY CLOSED

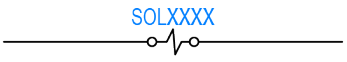

CONTROL
RELAY COIL



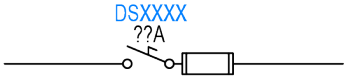

FUSE WITH
RATING




SOLENOID



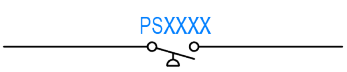

FUSED DISCONNECT
WITH RATING



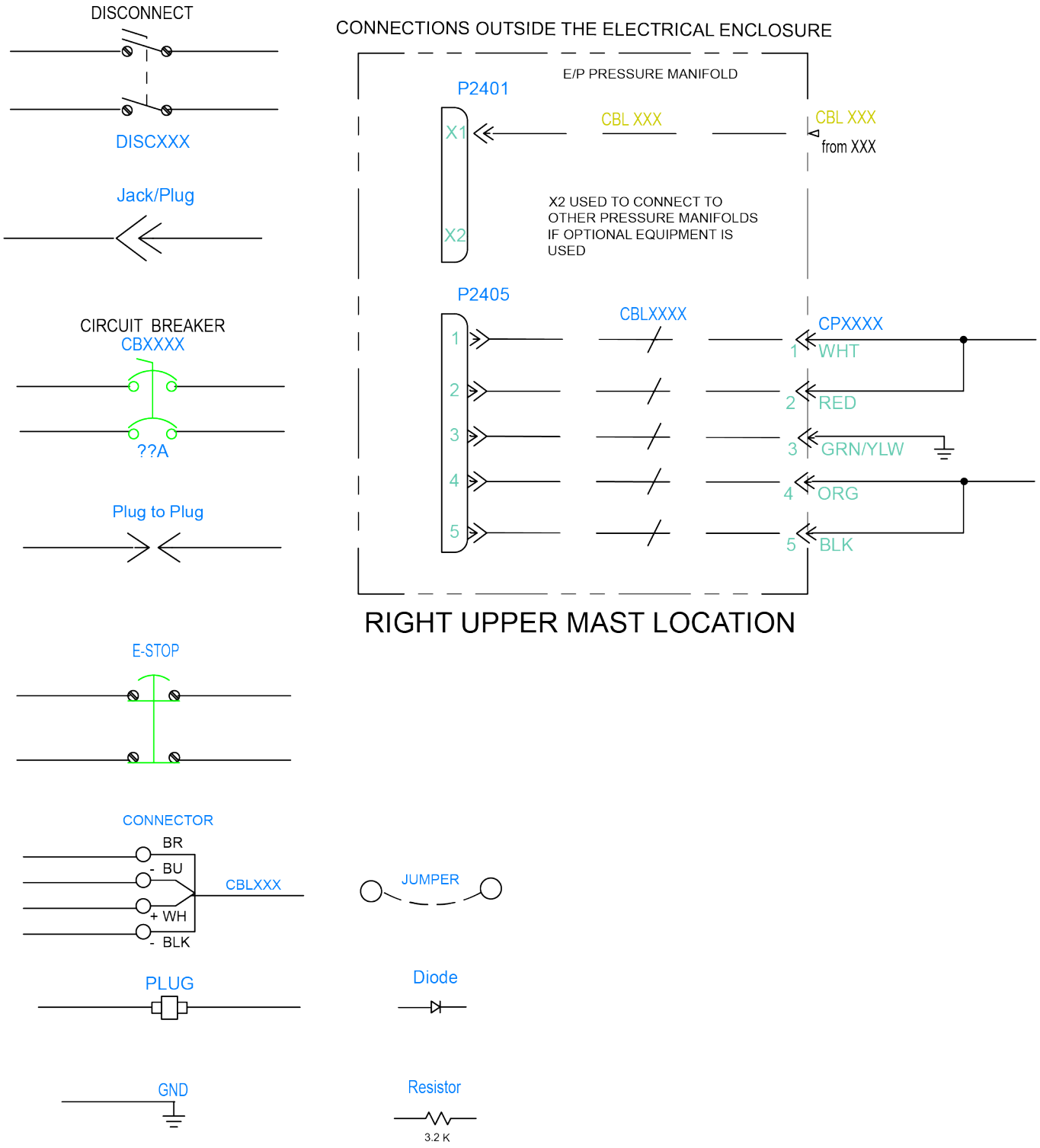

NORMALLY CLOSED
LIMIT SWITCH


NORMALLY OPEN
SELECTOR SWITCH


NORMALLY OPEN
PRESSURE SWITCH



## PRELIMINARY 1 (cont.)



## PRELIMINARY 2

| WIRE COLORS | |
|---|---|
| **Wire Reference** | **Color** |
| BLK | BLACK |
| WHT | WHITE |
| BLU | BLUE |
| RED | RED |
| GRN | GREEN |
| ORG | ORANGE |
| BRN | BROWN |
| YLW | YELLOW |

| FERRULES TO BE USED ON ALL WIRES (UNLESS NOTED) | |
|---|---|
| **Wire Reference** | **Description** |
| BLACK | UNGROUNDED LINE VOLTAGE |
| WHITE | UNGROUNDED DC VOLTAGE |
| WHITE/BLUE | GROUNDED DC COMMON |
| GREEN/YELLOW | GROUND |

| WIRE COLORS | |
|---|---|
| **Wire Reference** | **Color** |
| RED_GRY | RED w/GRAY STRIPE |
| GRY_RED | GRAY w/RED STRIPE |
| WHT_BRN | WHITE w/BROWN STRIPE |
| BRN_WHT | BROWN w/WHITE STRIP |
| WHT_GRY | WHITE w/GRAY STRIPE |
| GRY_WHT | GRAY w/WHITE STRIPE |
| RED_BLU | RED w/BLUE STRIPE |
| BLU_RED | BLUE w/RED STRIPE |
| RED_ORG | RED w/ORANGE STRIPE |
| ORG_RED | ORANGE w/RED STRIPE |
| RED_GRN | RED w/GREEN STRIPE |
| GRN_RED | GREEN w/RED STRIPE |
| BRN_RED | BROWN w/RED STRIPE |
| RED_BRN | RED w/BROWN STRIPE |
| WHT_GRN | WHITE w/GREEN STRIPE |
| GRN_WHT | GREEN w/WHITE STRIPE |
| WHT_BLU | WHITE w/BLUE STRIPE |
| BLU_WHT | BLUE w/ WHITE STRIPE |

## PRELIMINARY 2 (cont.)

| WIRE COLORS (CONT.) | |
|---|---|
| **Wire Reference** | **Color** |
| WHT_ORG | WHITE w/ORANGE STRIPE |
| ORG_WHT | ORANGE w/WHITE STRIPE |
| GRN_YLW | GREEN w/YELLOW STRIPE |

## PRELIMINARY 3

| WIRE GAUGE (UNLESS NOTED) USE MIN 75 DEGREE C COPPER WIRE | | | |
|---|---|---|---|
| **American Wire Gauge (AWG)** | **Diameter (Inches)** | **Cross Sectional Area ($mm^2$)** | **Ampacity (75° C Copper)** |
| 3 | 0.2292 | 26.65 | 100 |
| 4 | 0.2043 | 21.14 | 85 |
| 6 | 0.162 | 13.29 | 65 |
| 8 | 0.1285 | 8.36 | 52 |
| 10 | 0.1019 | 5.26 | 30 |
| 12 | 0.0808 | 3.31 | 20 |
| 14 | 0.0641 | 2.08 | 15 |
| 16 | 0.0508 | 1.31 | 10 |
| 18 | 0.0403 | 0.82 | 7 |

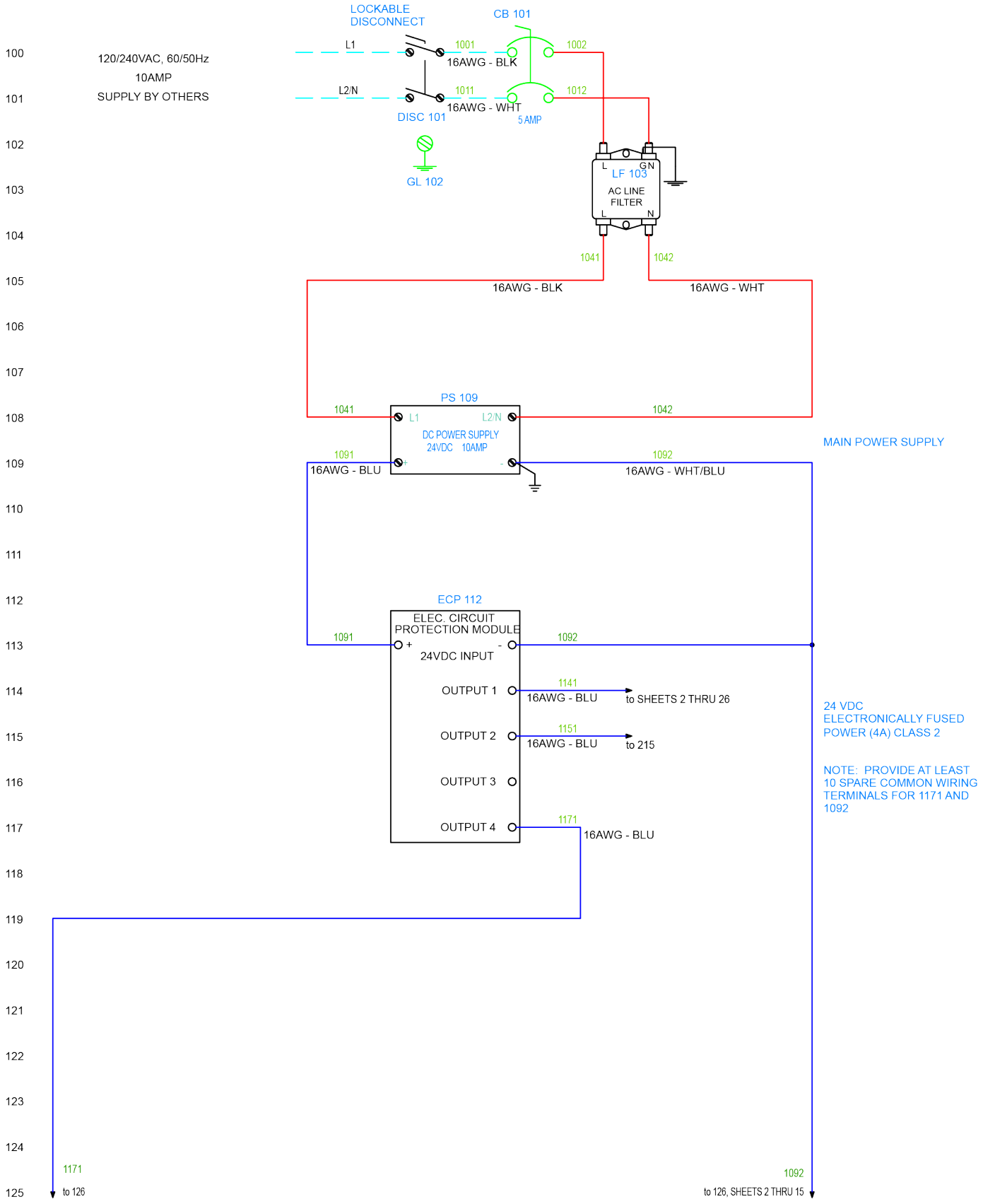
**PRELIMINARY 4**

# RESERVED FOR IEC DOCUMENTATION

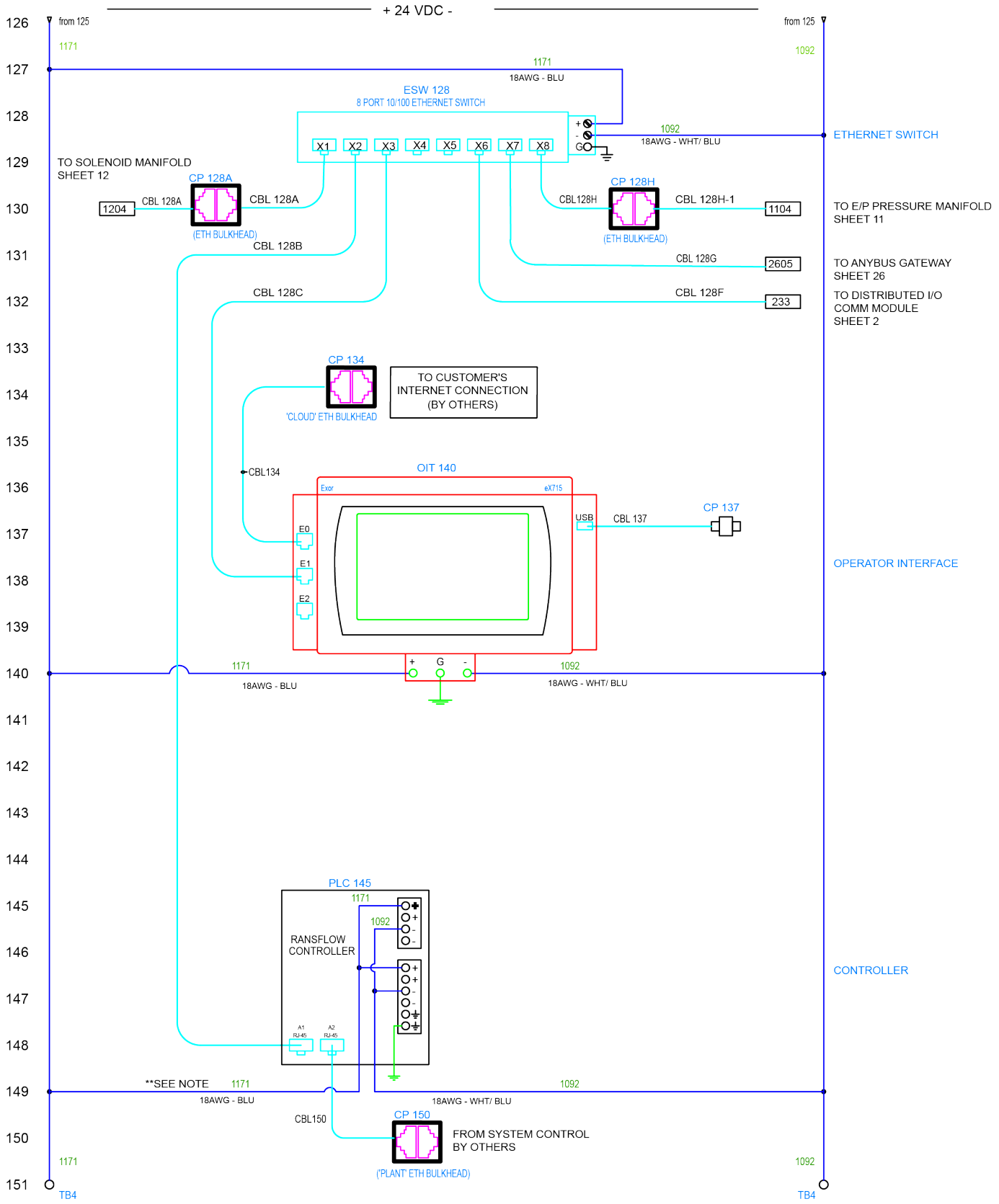
## PRELIMINARY 5

| CABLE LIST | | | |
|---|---|---|---|
| **Cable** | **Cable Type** | **Part** | **Location** |
| CBL 128A | ETHERNET 3FT | 310-4135 | ETHERNET SWITCH X1 TO BULKHEAD |
| CBL 128A-1 | ETHERNET RJ45-M11-90, 1M | 310-4136 | BULKHEAD CP128 TO E/P PRESSURE MANIFOLD X1 |
| CBL 128B | ETHERNET 3FT | 310-4135 | ETHERNET SWITCH X2 TO PLC A1 |
| CBL 128C | ETHERNET 5FT | 310-3134 | ETHERNET SWITCH X3 TO HMI E1 |
| CBL 128F | ETHERNET 3FT | 310-4135 | ETHERNET SWITCH X6 TO RIO230 (TURCK I/O) ETH1 |
| CBL 128G | ETHERNET 3FT | 310-4135 | ETHERNET SWITCH TO ANYBUS GATEWAY X1.1 |
| CBL 128H | ETHERNET 5FT | 310-4134v | ETHERNET SWITCH X8 TO BULKHEAD CP128H |
| CBL 128H-1 | ETHERNET RJ45-M11-90, 1M | 310-4136 | BULKHEAD CP128H YO PRESSURE REGULATOR X1 |
| CBL 134 | ETHERNET 3FT | 310-4135 | HMI E0 TO BULKHEAD CP134 |
| CBL 137 | DUAL PORT USB, 1.5M | 09454521952 | HMI USB TO BULKHEAD/PLUG CP 137 |
| CBL 150 | ETHERNET 5FT | 310-4134 | PLC A2 TO BULKHEAD CP150 |
| CBL 629 | 7 COLOR STACK LIGHT w/ AUDIB | 240-5160 | RIO234 SLOT 4 TO STACK LIGHT |
| CBL 1105 | BULKHEAD CONN; 7/8", 5 POLE | 310-4132 | BULKHEAD TO SOLM 1102 POWER |
| CBL 1203 | CAT 5E, M12, 1M | 310-4133 | SOLM 1203 TP2 TO SOLM 1207 TP1 (OPTIONAL) |
| CBL 1205-1 | M12 5 PIN, 0.3M, 9O° | 310-4148 | BULKHEAD CP1205 TO SOLM 1203 X0 |
| CBL 1207 | CAT 5E, M12, 1M | 310-4133 | SOLM 1207 TP2 TO SOLM 1212 TP1 (OPTIONAL) |
| CBL 1209-1 | BULKHEAD M12 5 PIN | 310-4130 | BULKHEAD 1204 TO SOLM 1207 X0 (OPTIONAL) |
| CBL 1212 | CAT 5E, M12, 1M | 310-4133 | SOLM 1212 TP2 TO SOLM 1217 TP1 (OPTIONAL) |
| CBL 1214-1 | BULKHEAD M12 5 PIN | 310-4130 | BULKHEAD 1214 TO SOLM 1212 X0 (OPTIONAL) |
| CBL 1219-1 | BULKHEAD M12 5 PIN | 310-4130 | BULKHEAD 1219 TO SOLM 1207 X0 (OPTIONAL) |
| CBL 2405-1 | MIN (7/8"), 5P, 2M, F-M | 310-4140 | BULKHEAD CP1105 TO SOLM 1102 P2405 |
| CBL 2609 | ETHERNET 3FT | 310-4135 | ANYBUS X2.1 TO BULKHEAD CP 2609 |

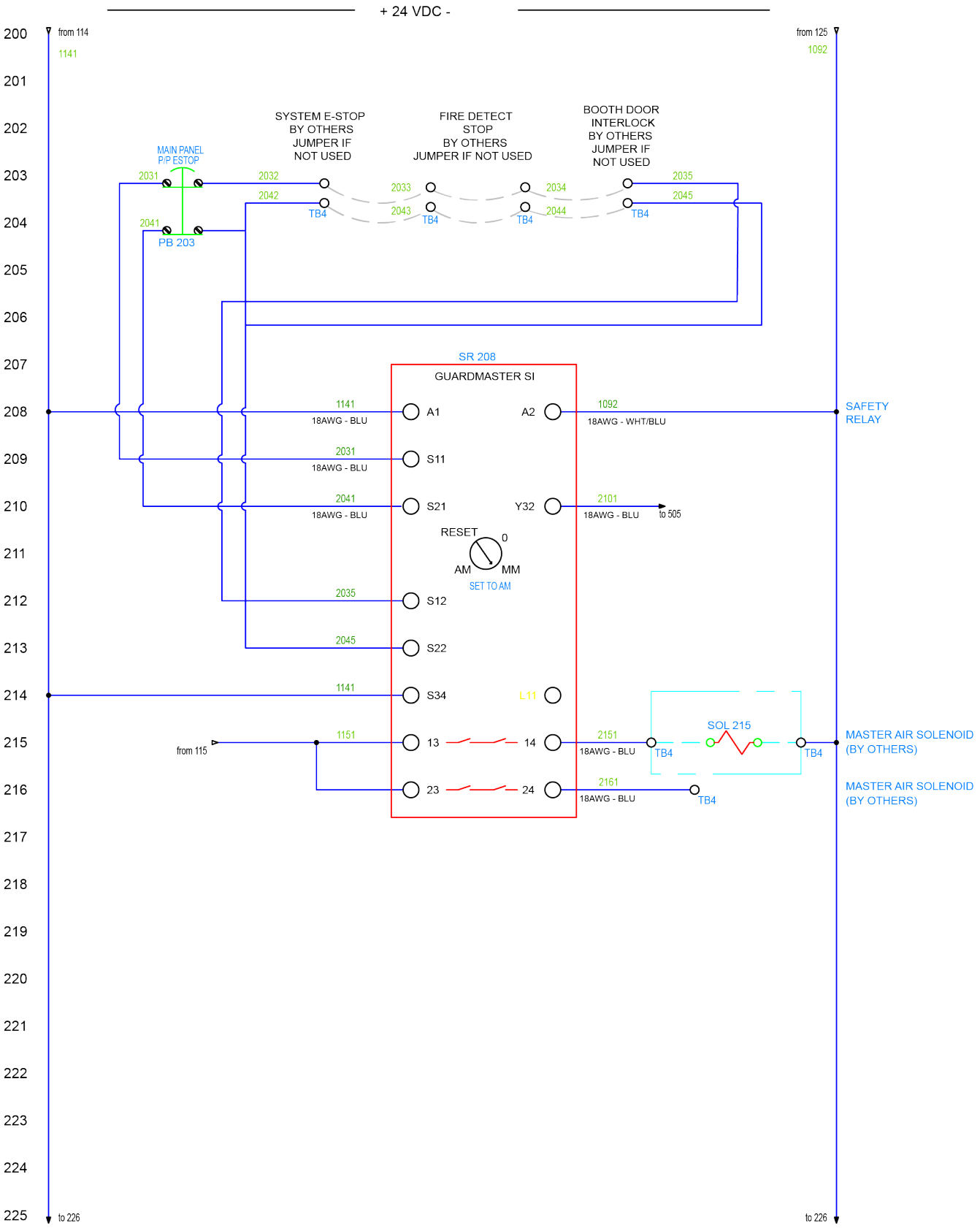
# DRAWING 1


LOCKABLE DISCONNECT
CB 101
L1
L2/N
1001
16AWG - BLK
1002
1011
16AWG - WHT
1012
DISC 101
5 AMP
GL 102
120/240VAC, 60/50Hz
10AMP
SUPPLY BY OTHERS
L
GN
LF 103
AC LINE FILTER
L
N
1041
1042
16AWG - BLK
16AWG - WHT
PS 109
1041
L1
L2/N
1042
DC POWER SUPPLY
24VDC 10AMP
1091
16AWG - BLU
1092
16AWG - WHT/BLU
MAIN POWER SUPPLY
ECP 112
ELEC. CIRCUIT PROTECTION MODULE
1091
+
-
1092
24VDC INPUT
OUTPUT 1
1141
16AWG - BLU
to SHEETS 2 THRU 26
OUTPUT 2
1151
16AWG - BLU
to 215
OUTPUT 3
OUTPUT 4
1171
16AWG - BLU
24 VDC ELECTRONICALLY FUSED POWER (4A) CLASS 2
NOTE: PROVIDE AT LEAST 10 SPARE COMMON WIRING TERMINALS FOR 1171 AND 1092
1171
to 126
1092
to 126, SHEETS 2 THRU 15

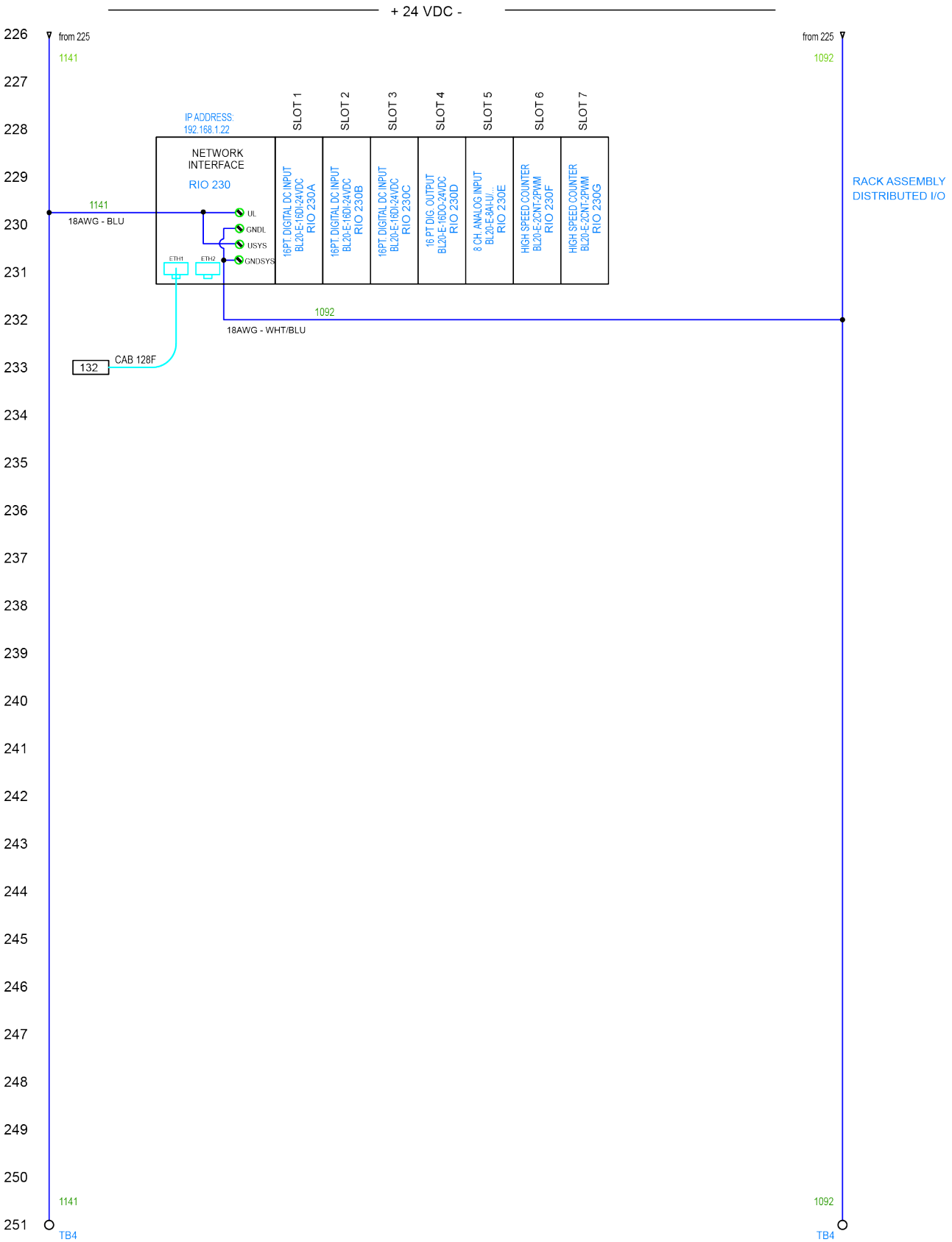
# DRAWING 1 (cont.)



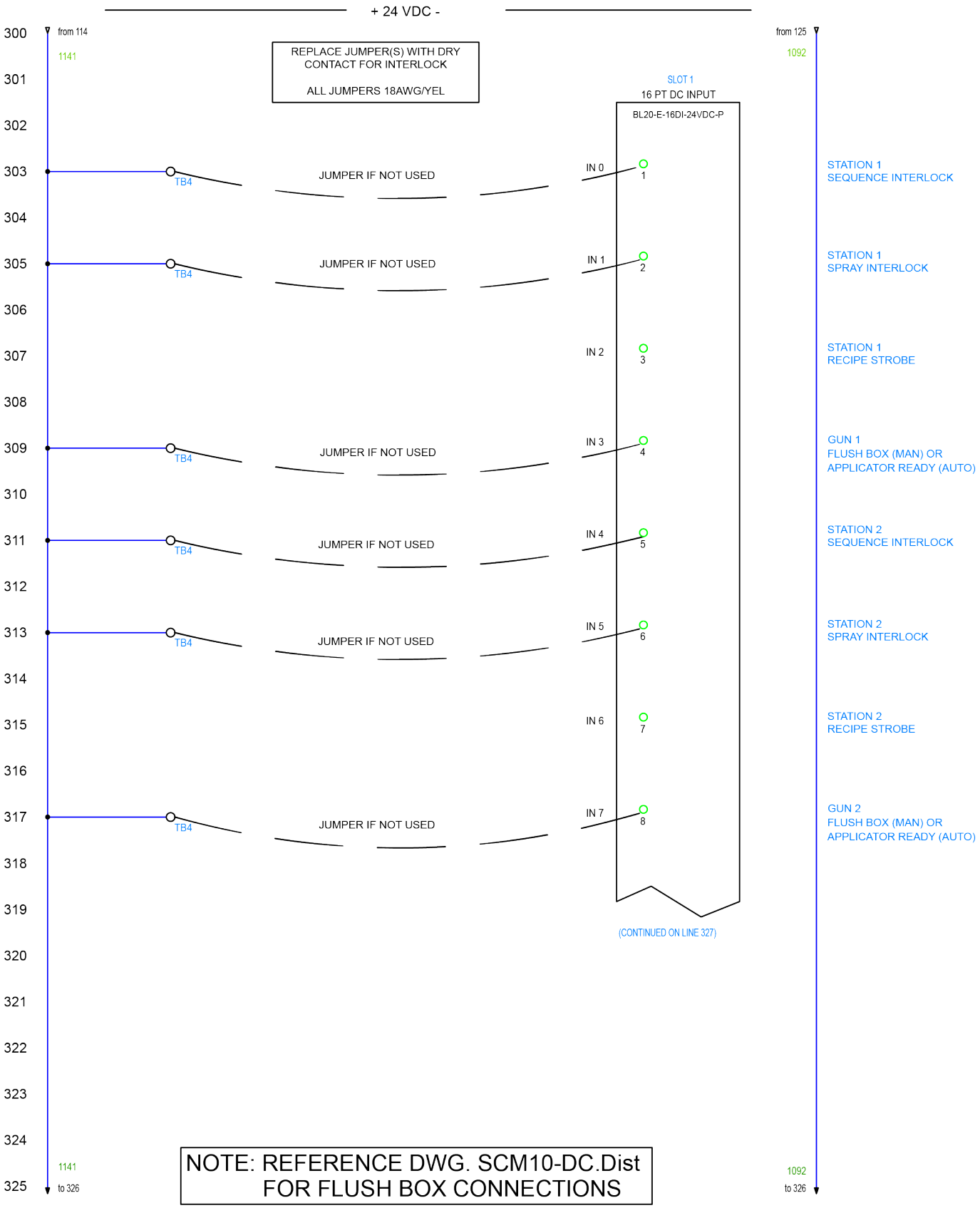
# DRAWING 2


+ 24 VDC -
from 114
1141
from 125
1092
SYSTEM E-STOP
BY OTHERS
JUMPER IF
NOT USED
FIRE DETECT
STOP
BY OTHERS
JUMPER IF NOT USED
BOOTH DOOR
INTERLOCK
BY OTHERS
JUMPER IF
NOT USED
MAIN PANEL
P/P ESTOP
2031
2032
2033
2034
2035
2042
2043
2044
2045
TB4
2041
PB 203
SR 208
GUARDMASTER SI
1141
18AWG - BLU
A1
A2
1092
18AWG - WHT/BLU
SAFETY
RELAY
2031
18AWG - BLU
S11
2041
18AWG - BLU
S21
Y32
2101
18AWG - BLU
to 505
RESET
0
AM
MM
SET TO AM
2035
S12
2045
S22
1141
S34
L11
from 115
1151
13
14
2151
18AWG - BLU
SOL 215
MASTER AIR SOLENOID
(BY OTHERS)
23
24
2161
18AWG - BLU
MASTER AIR SOLENOID
(BY OTHERS)
to 226
to 226

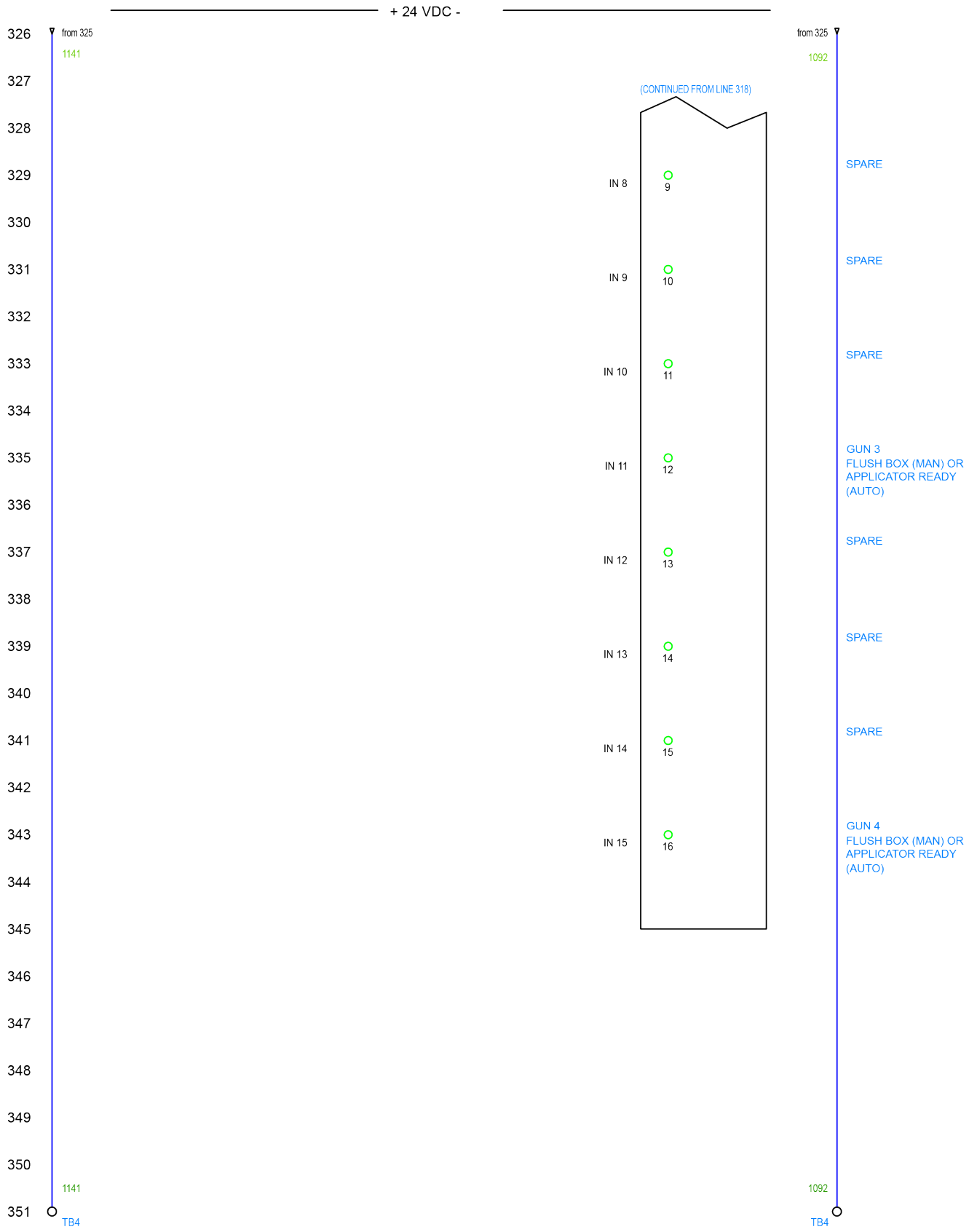
# DRAWING 2 (cont.)



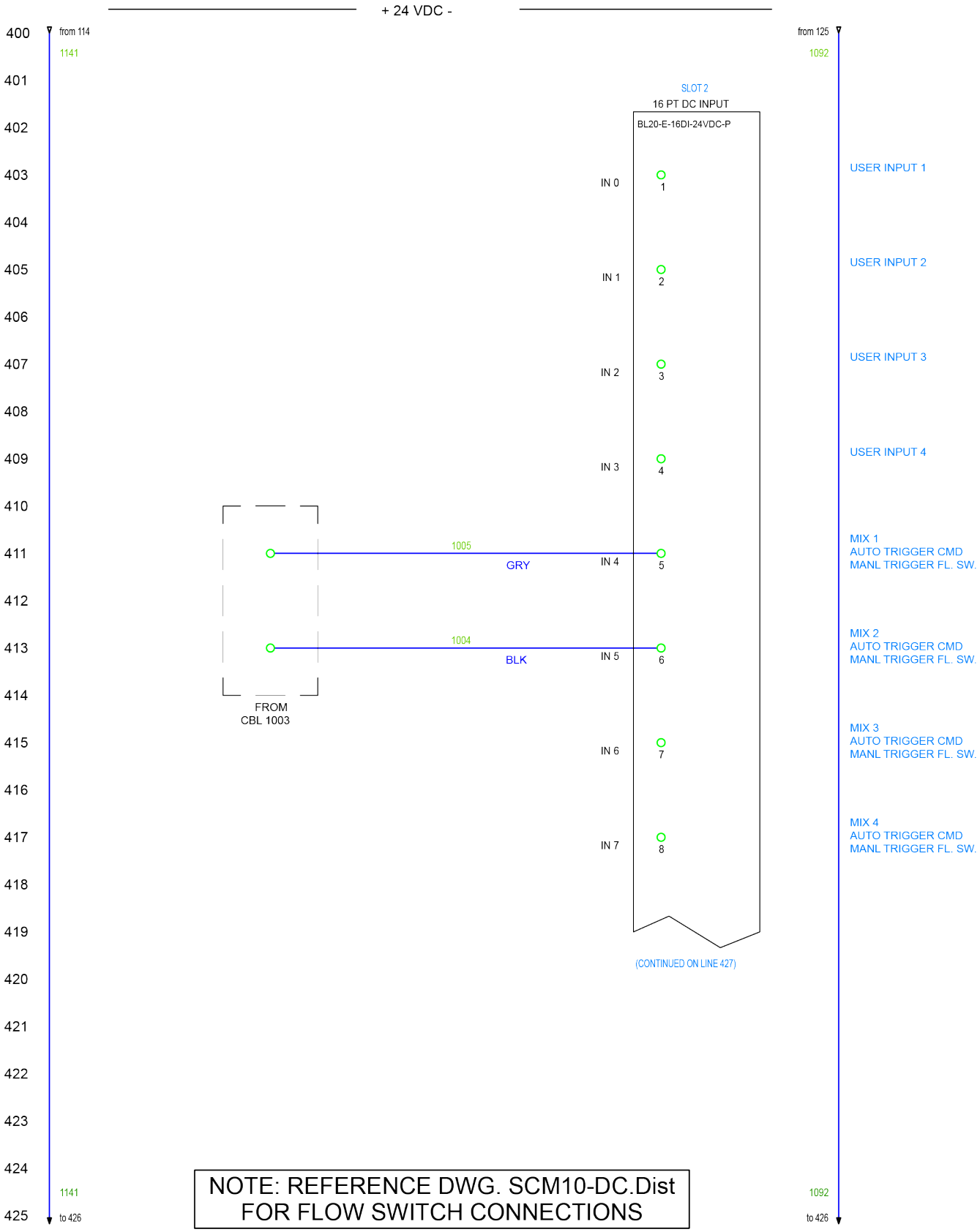
# DRAWING 3


+ 24 VDC -
from 114
1141
REPLACE JUMPER(S) WITH DRY CONTACT FOR INTERLOCK
ALL JUMPERS 18AWG/YEL
SLOT 1
16 PT DC INPUT
BL20-E-16DI-24VDC-P
from 125
1092
TB4
JUMPER IF NOT USED
IN 0
1
STATION 1 SEQUENCE INTERLOCK
IN 1
2
STATION 1 SPRAY INTERLOCK
IN 2
3
STATION 1 RECIPE STROBE
IN 3
4
GUN 1 FLUSH BOX (MAN) OR APPLICATOR READY (AUTO)
IN 4
5
STATION 2 SEQUENCE INTERLOCK
IN 5
6
STATION 2 SPRAY INTERLOCK
IN 6
7
STATION 2 RECIPE STROBE
IN 7
8
GUN 2 FLUSH BOX (MAN) OR APPLICATOR READY (AUTO)
(CONTINUED ON LINE 327)
1141
to 326
1092
to 326
NOTE: REFERENCE DWG. SCM10-DC.Dist FOR FLUSH BOX CONNECTIONS

## DRAWING 3 (cont.)

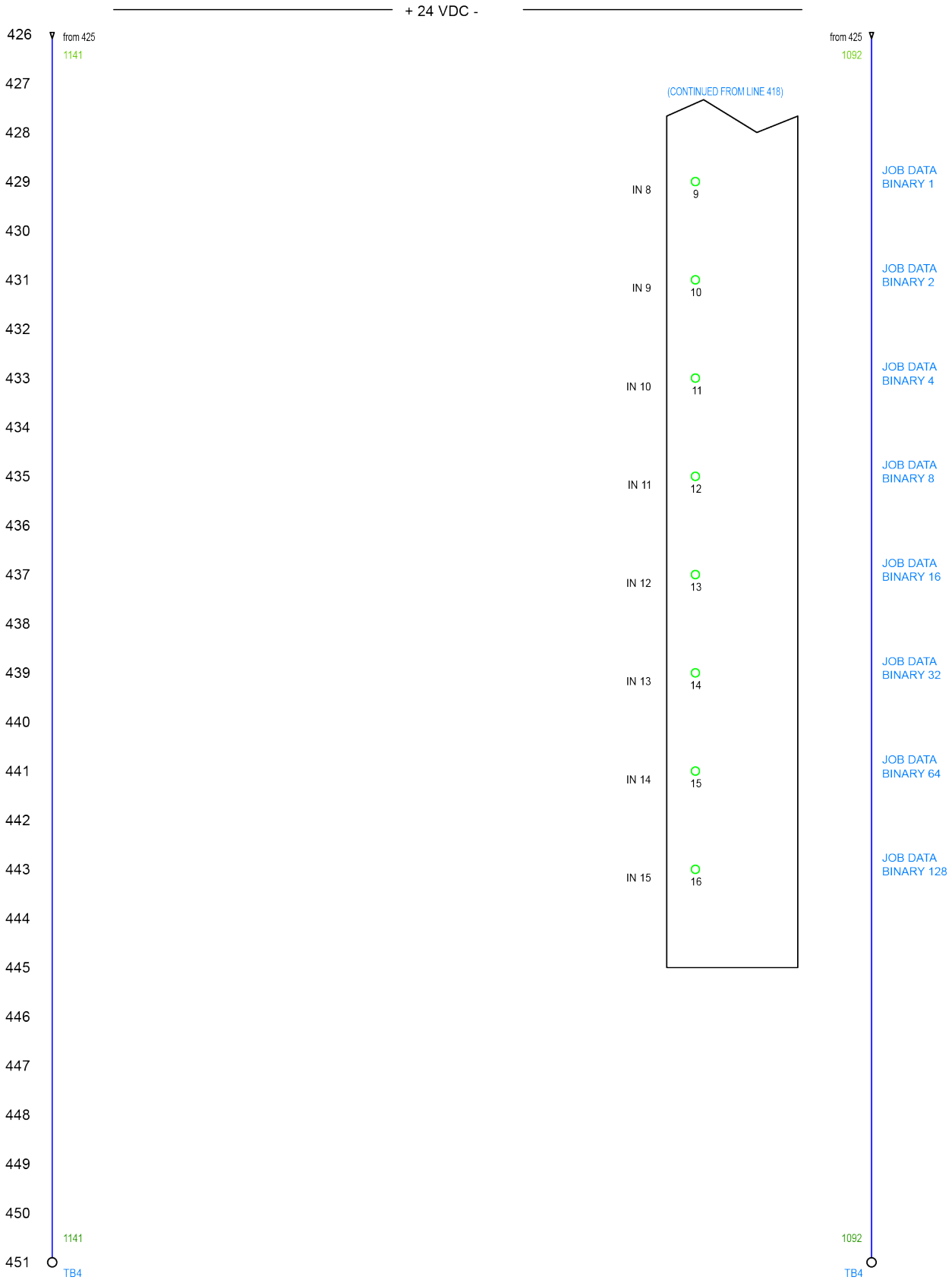


# DRAWING 4

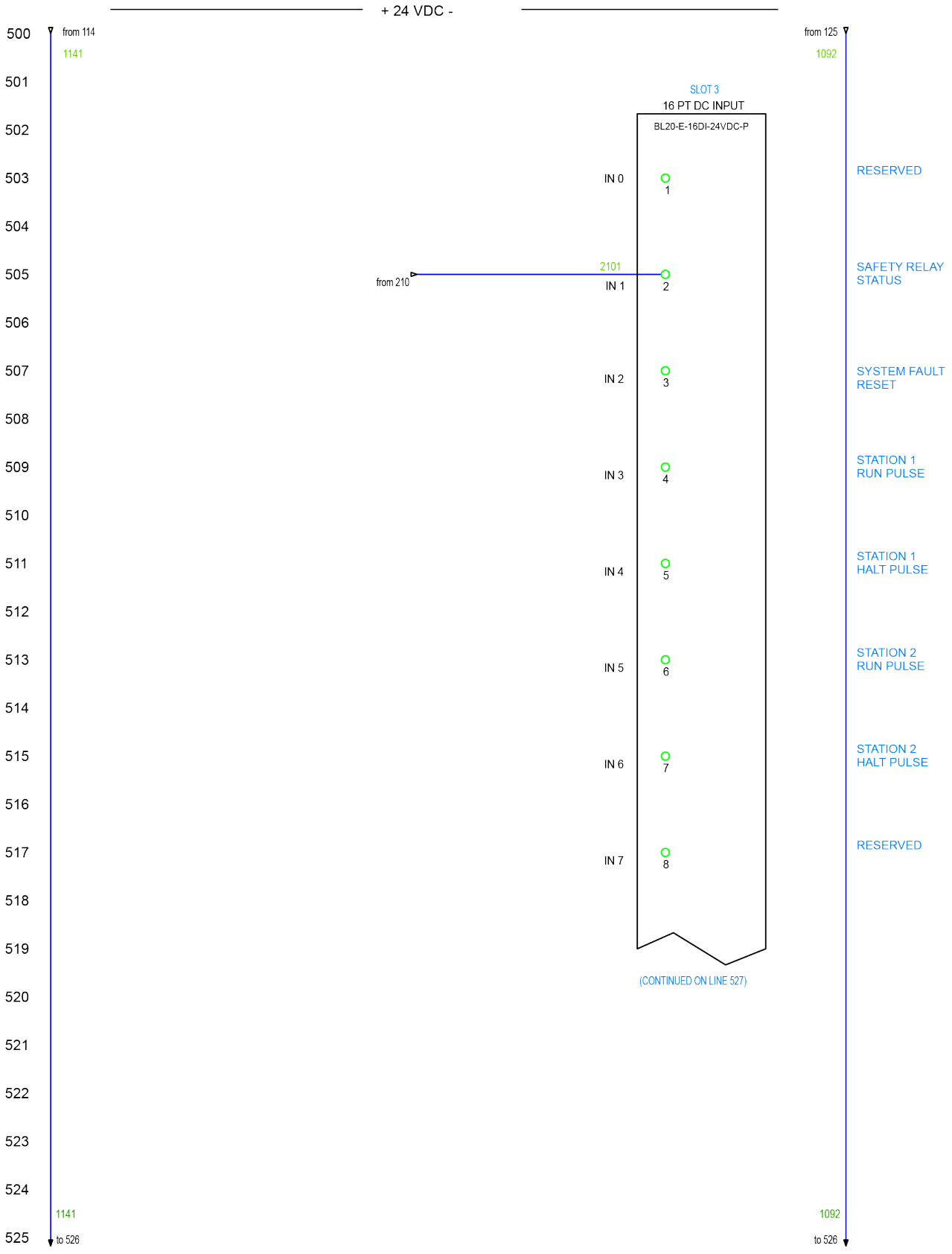



NOTE: REFERENCE DWG. SCM10-DC.Dist
FOR FLOW SWITCH CONNECTIONS

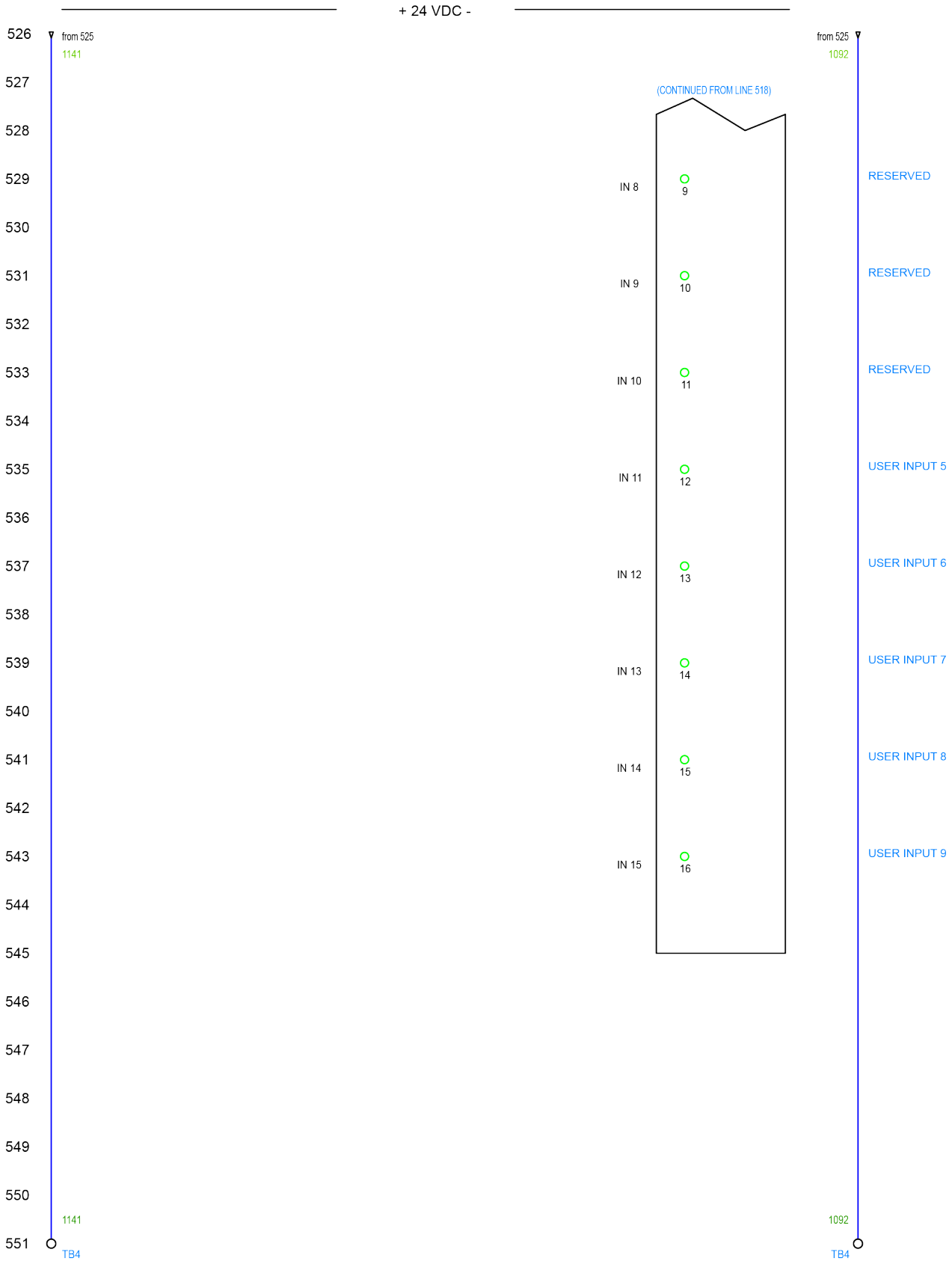
## DRAWING 4 (cont.)



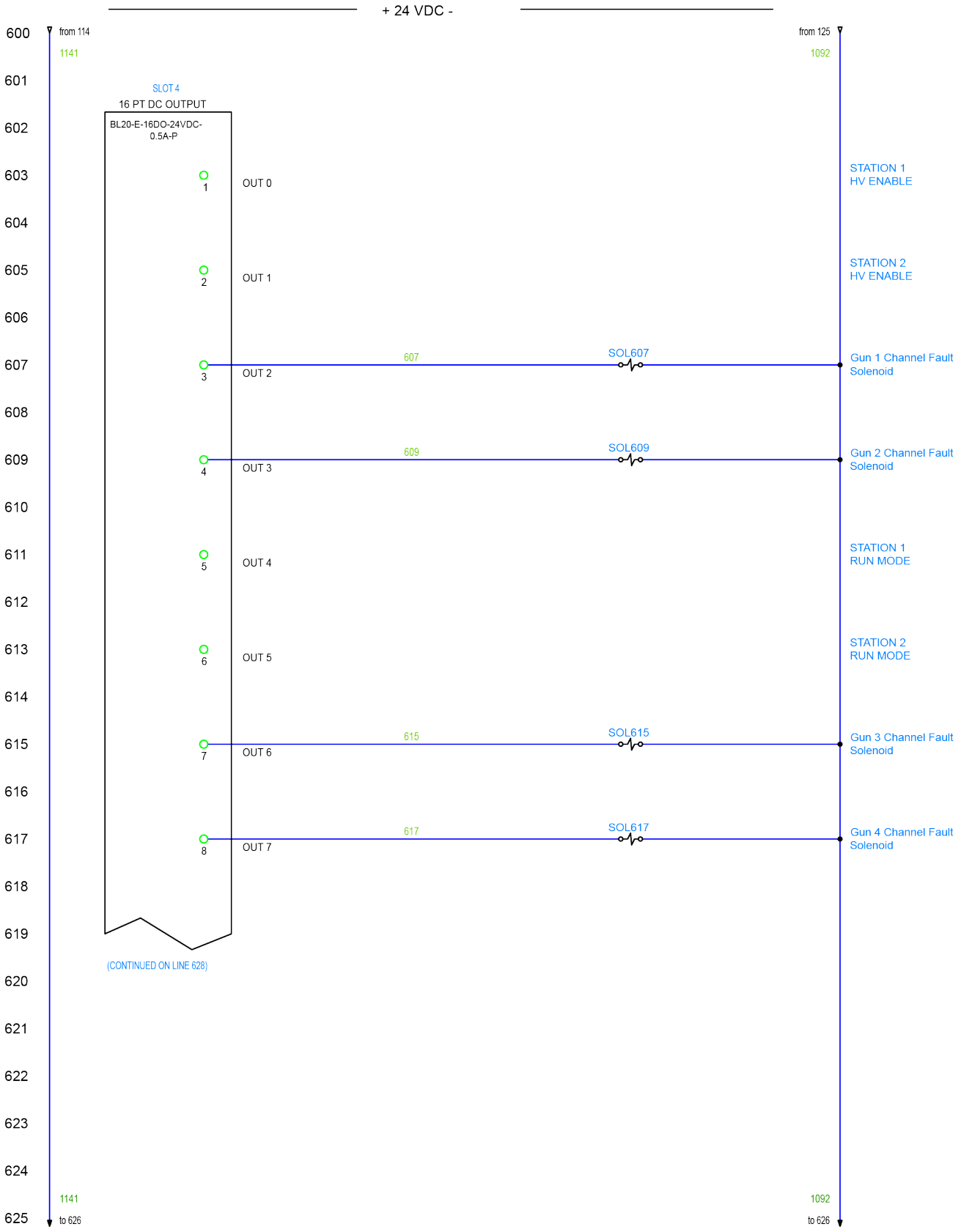
# DRAWING 5


+ 24 VDC -
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
from 114
1141
from 125
1092
SLOT 3
16 PT DC INPUT
BL20-E-16DI-24VDC-P
IN 0
1
RESERVED
2101
from 210
IN 1
2
SAFETY RELAY STATUS
IN 2
3
SYSTEM FAULT RESET
IN 3
4
STATION 1 RUN PULSE
IN 4
5
STATION 1 HALT PULSE
IN 5
6
STATION 2 RUN PULSE
IN 6
7
STATION 2 HALT PULSE
IN 7
8
RESERVED
(CONTINUED ON LINE 527)
1141
to 526
1092
to 526

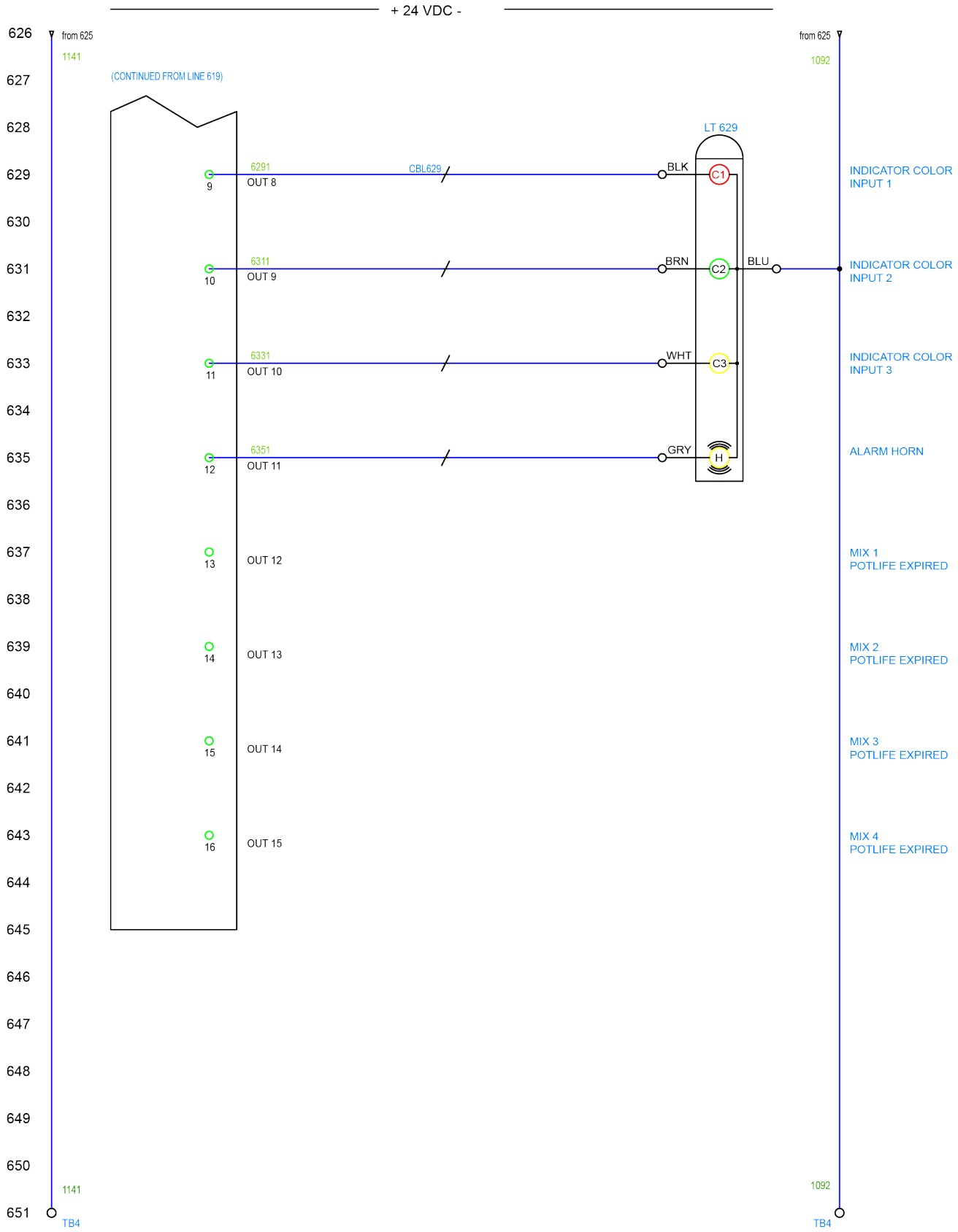
# DRAWING 5 (cont.)



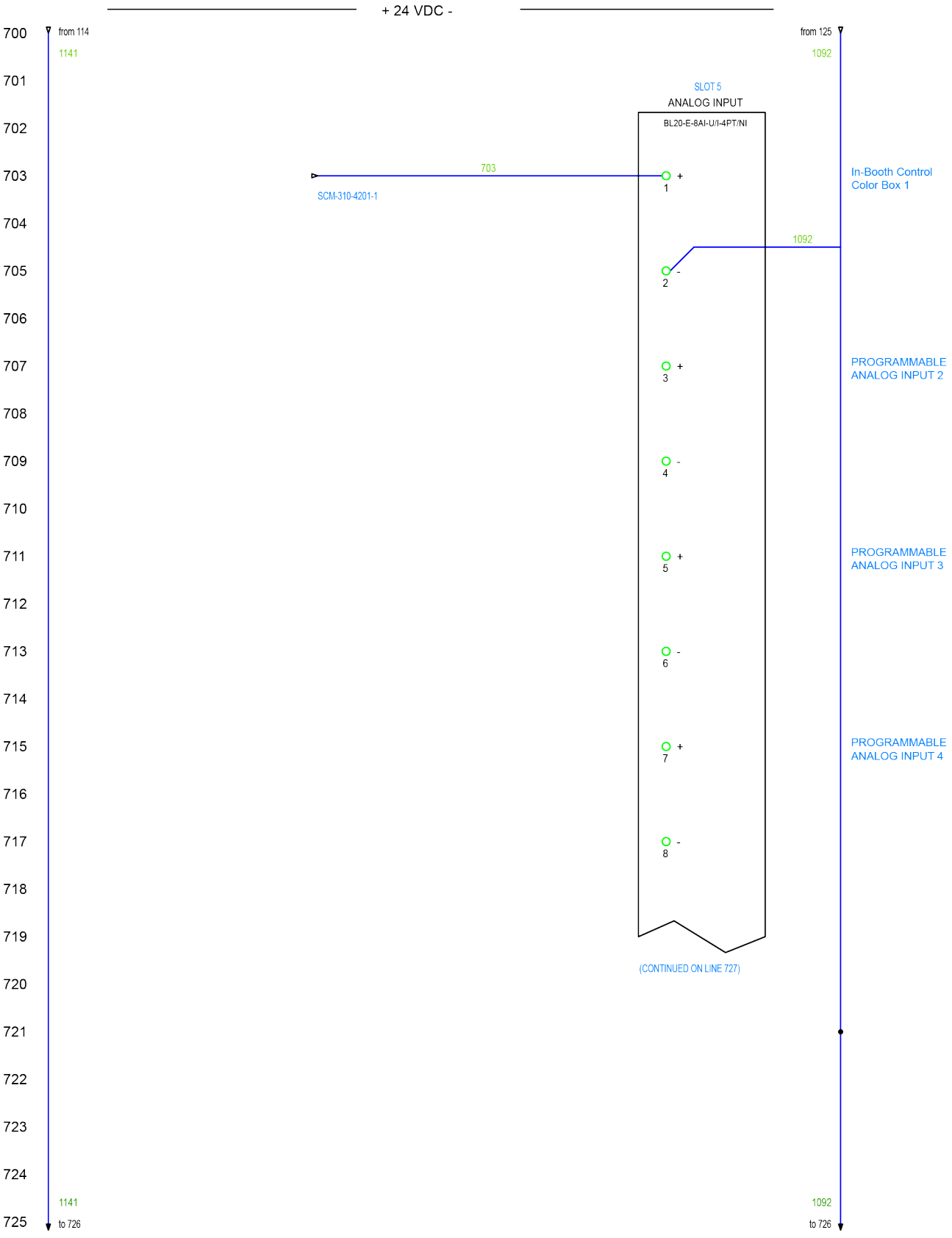
# DRAWING 6


+ 24 VDC -
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
from 114
1141
from 125
1092
SLOT 4
16 PT DC OUTPUT
BL20-E-16DO-24VDC-0.5A-P
1
OUT 0
2
OUT 1
3
OUT 2
4
OUT 3
5
OUT 4
6
OUT 5
7
OUT 6
8
OUT 7
(CONTINUED ON LINE 628)
607
SOL607
609
SOL609
615
SOL615
617
SOL617
STATION 1
HV ENABLE
STATION 2
HV ENABLE
Gun 1 Channel Fault
Solenoid
Gun 2 Channel Fault
Solenoid
STATION 1
RUN MODE
STATION 2
RUN MODE
Gun 3 Channel Fault
Solenoid
Gun 4 Channel Fault
Solenoid
1141
to 626
1092
to 626

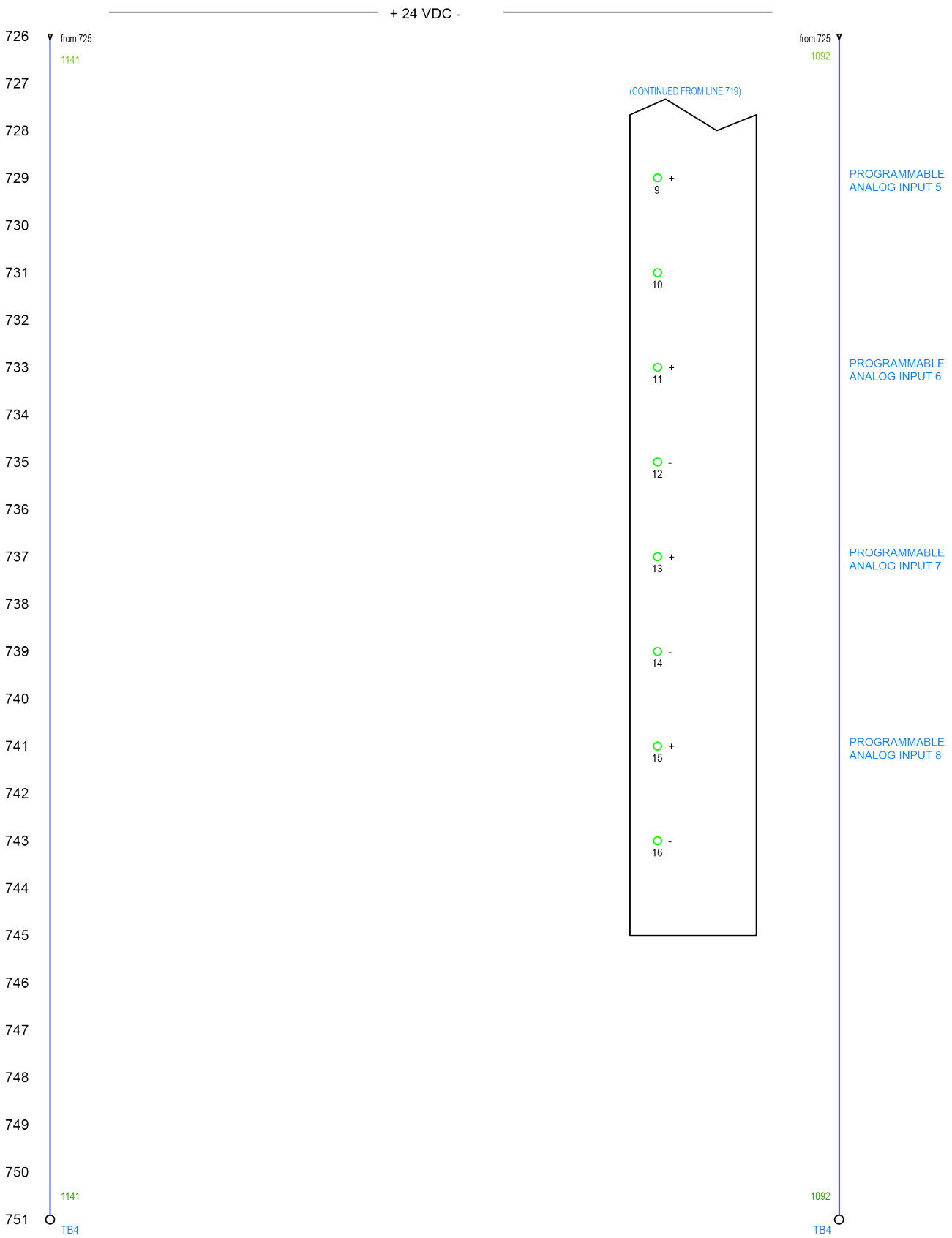
# DRAWING 6 (cont.)



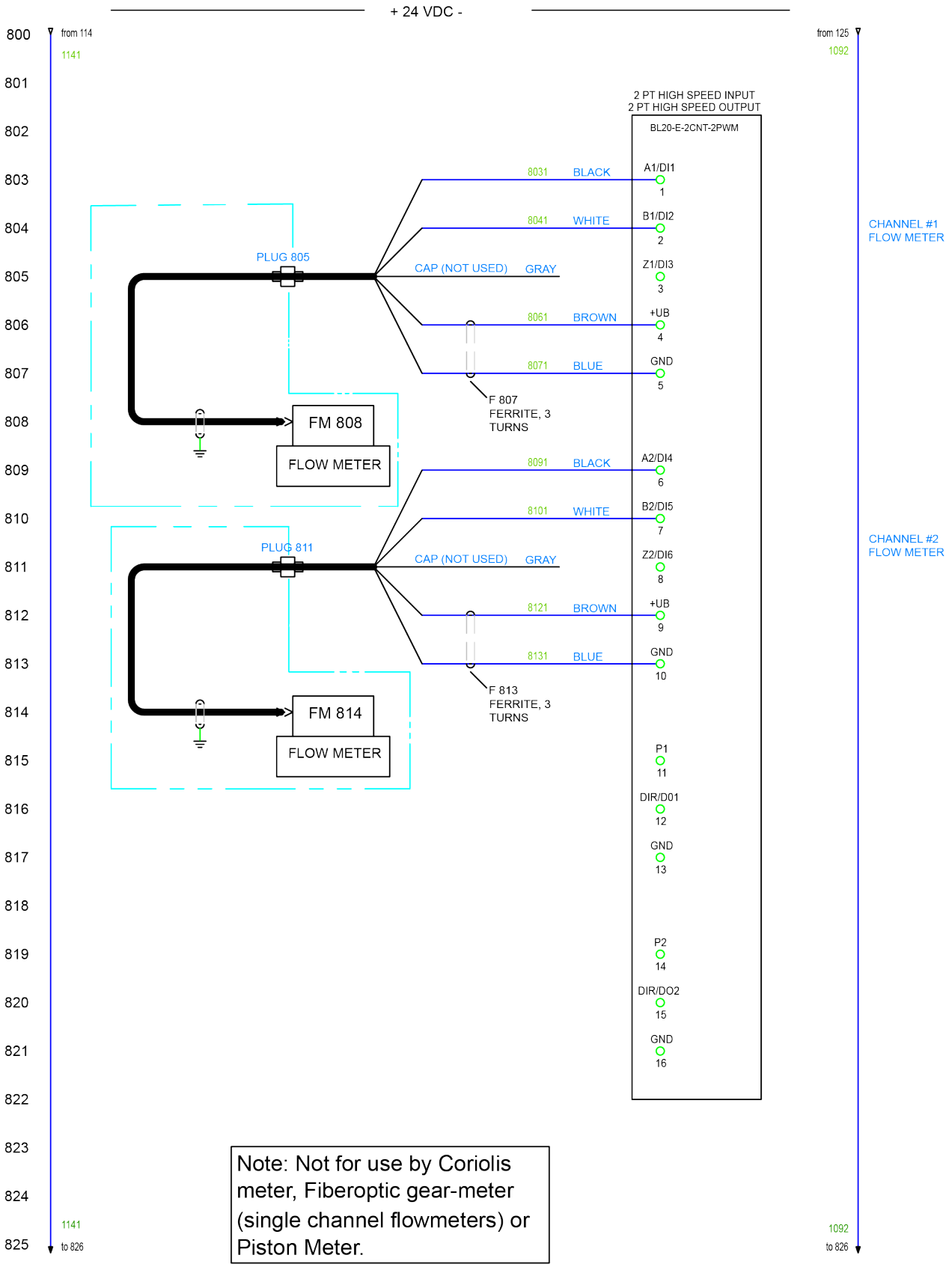
# DRAWING 7


+ 24 VDC -
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
from 114
1141
from 125
1092
SLOT 5
ANALOG INPUT
BL20-E-8AI-U/I-4PT/NI
703
SCM-310-4201-1
+ 1
In-Booth Control Color Box 1
1092
- 2
+ 3
PROGRAMMABLE ANALOG INPUT 2
- 4
+ 5
PROGRAMMABLE ANALOG INPUT 3
- 6
+ 7
PROGRAMMABLE ANALOG INPUT 4
- 8
(CONTINUED ON LINE 727)
1141
to 726
1092
to 726

# DRAWING 7 (cont.)

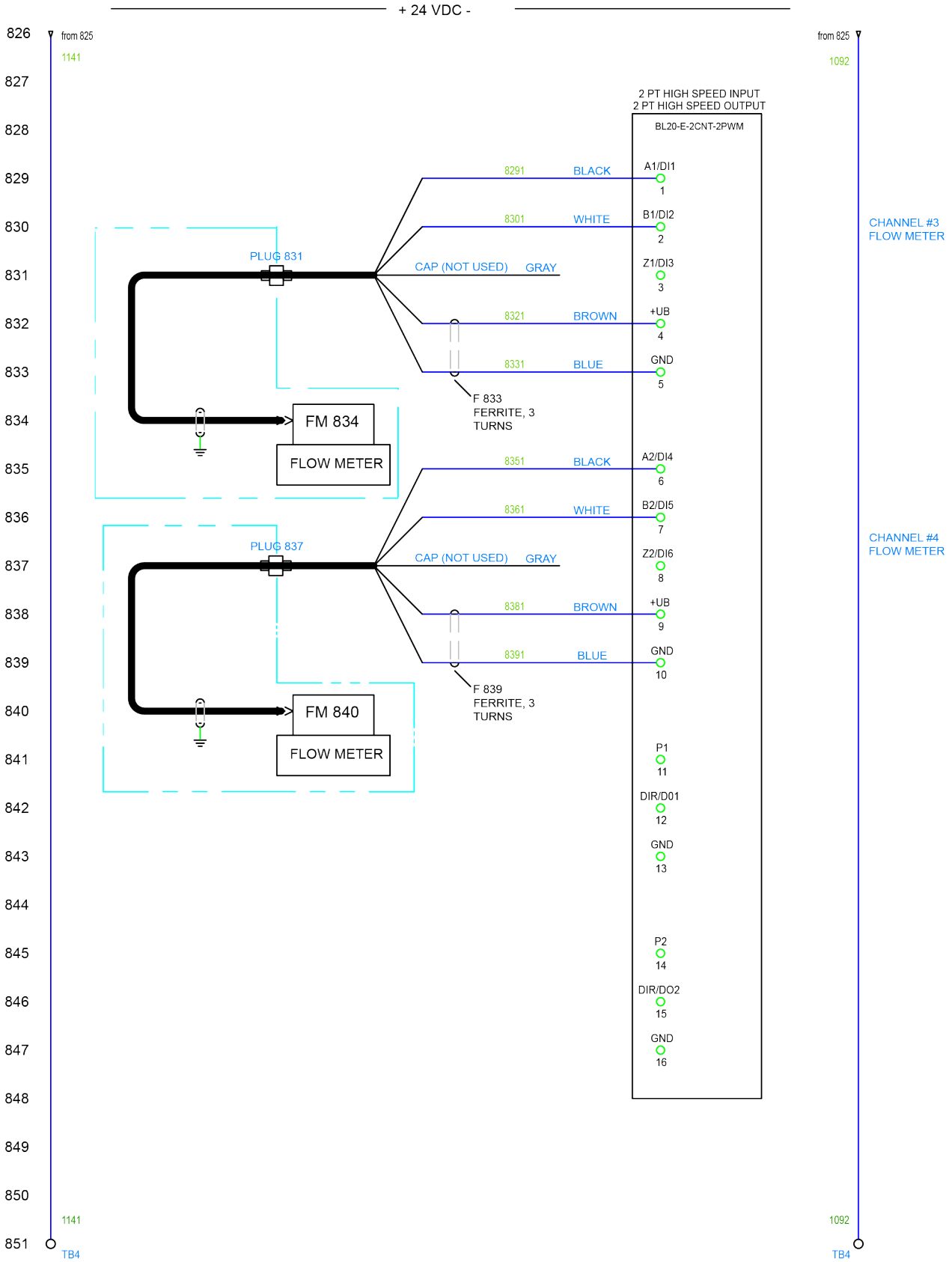


# DRAWING 8

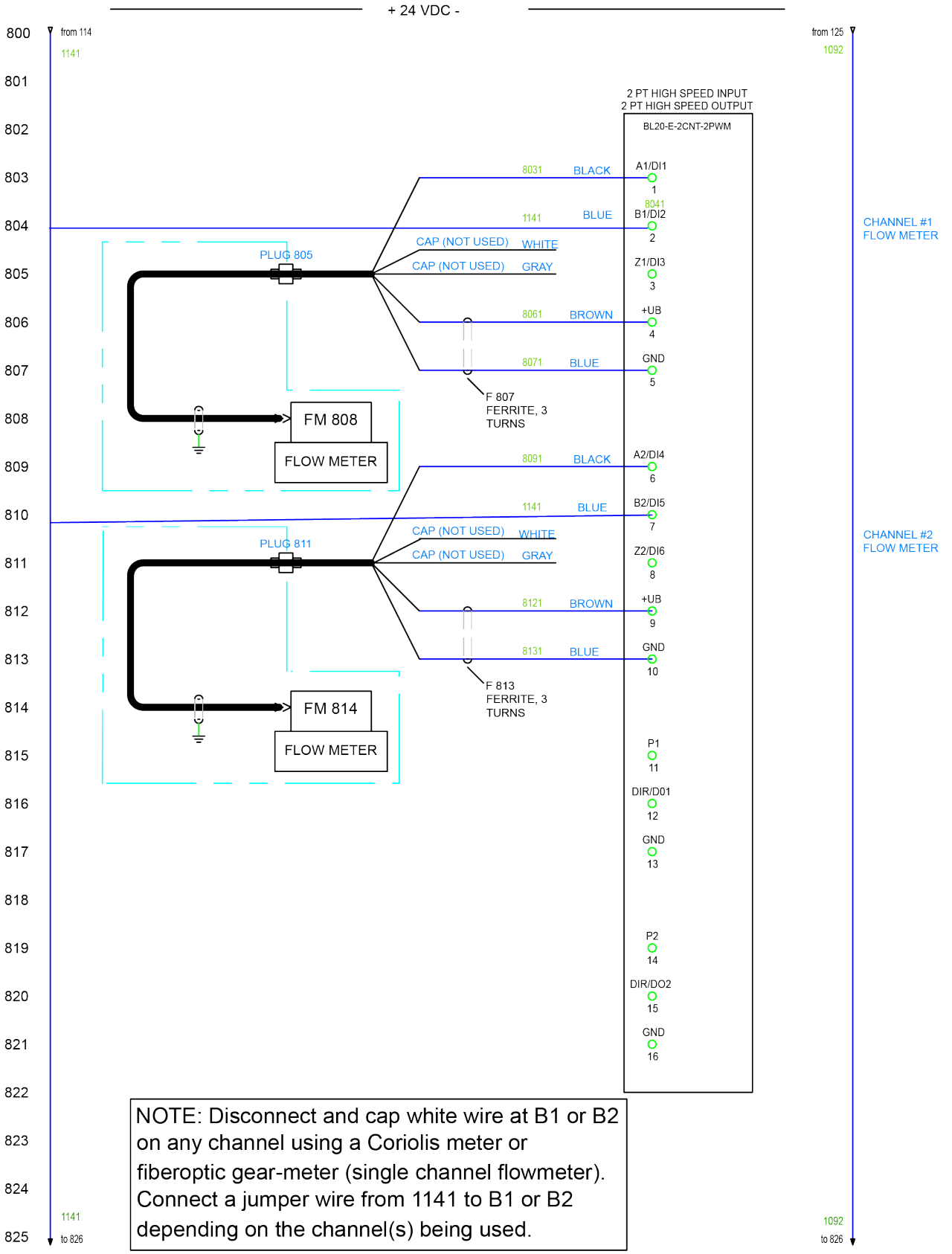



Note: Not for use by Coriolis meter, Fiberoptic gear-meter (single channel flowmeters) or Piston Meter.

# DRAWING 8 (cont.)

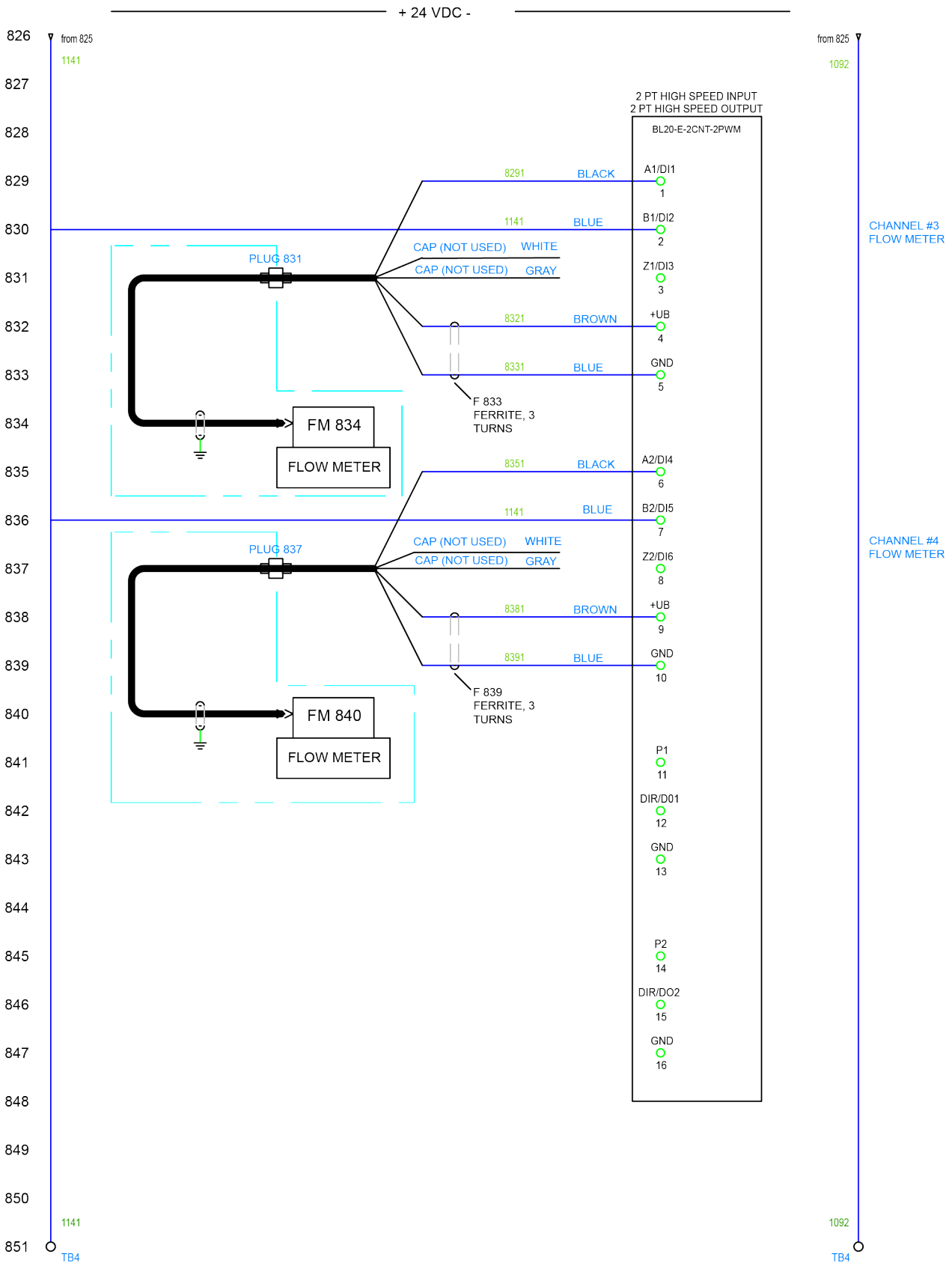


# DRAWING 8B

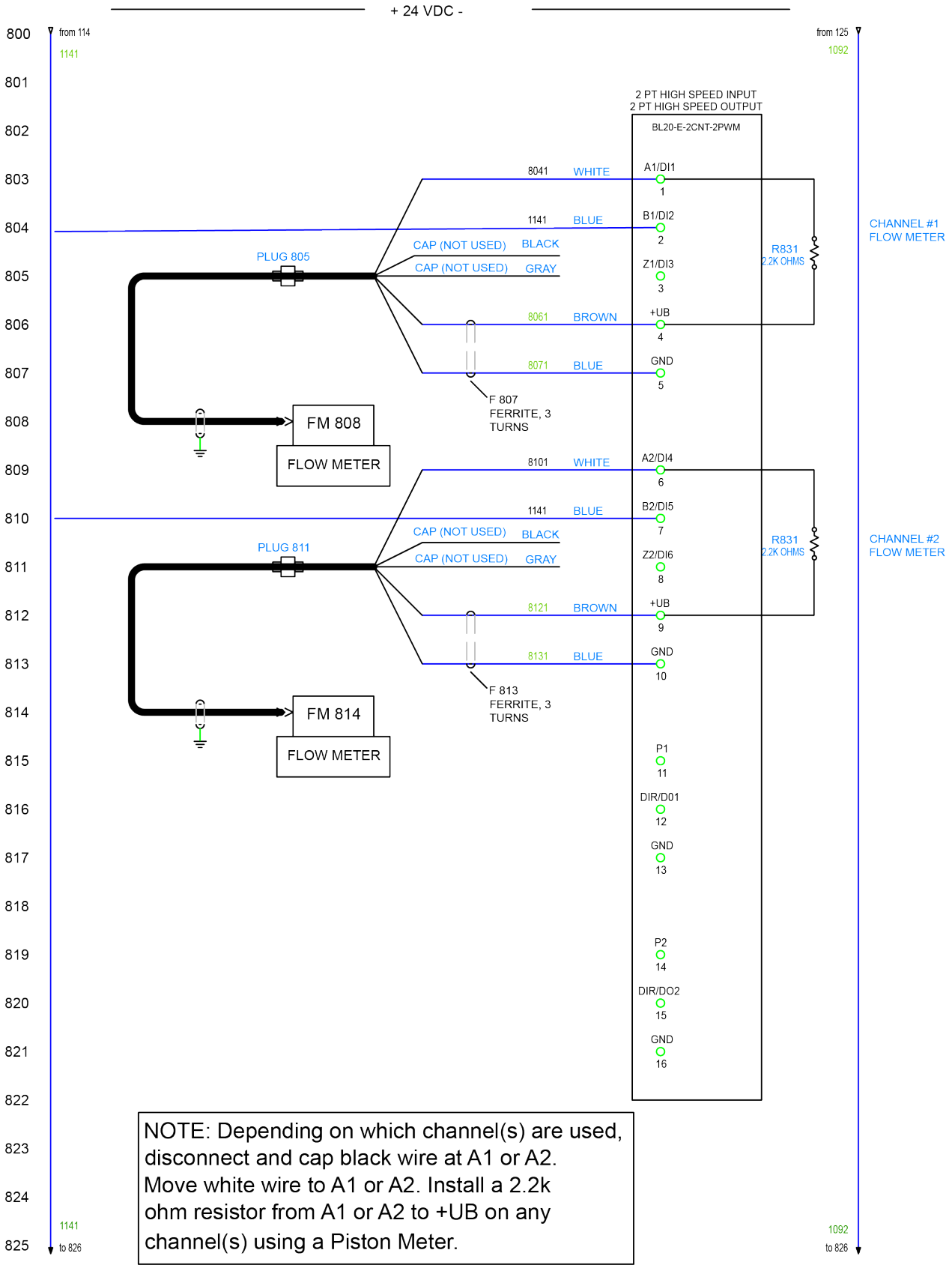



NOTE: Disconnect and cap white wire at B1 or B2 on any channel using a Coriolis meter or fiberoptic gear-meter (single channel flowmeter). Connect a jumper wire from 1141 to B1 or B2 depending on the channel(s) being used.

# DRAWING 8B (cont.)

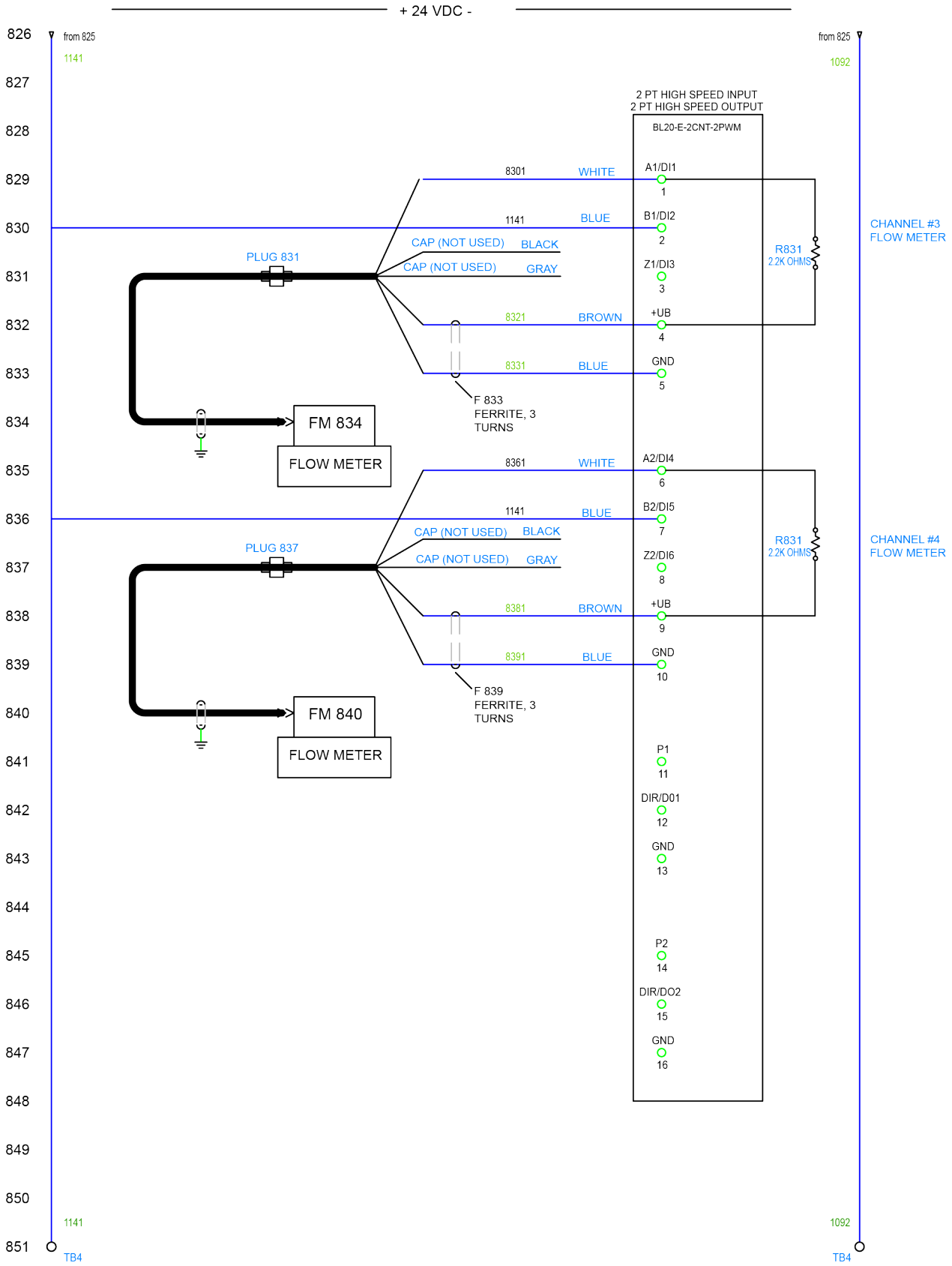


# DRAWING 8C

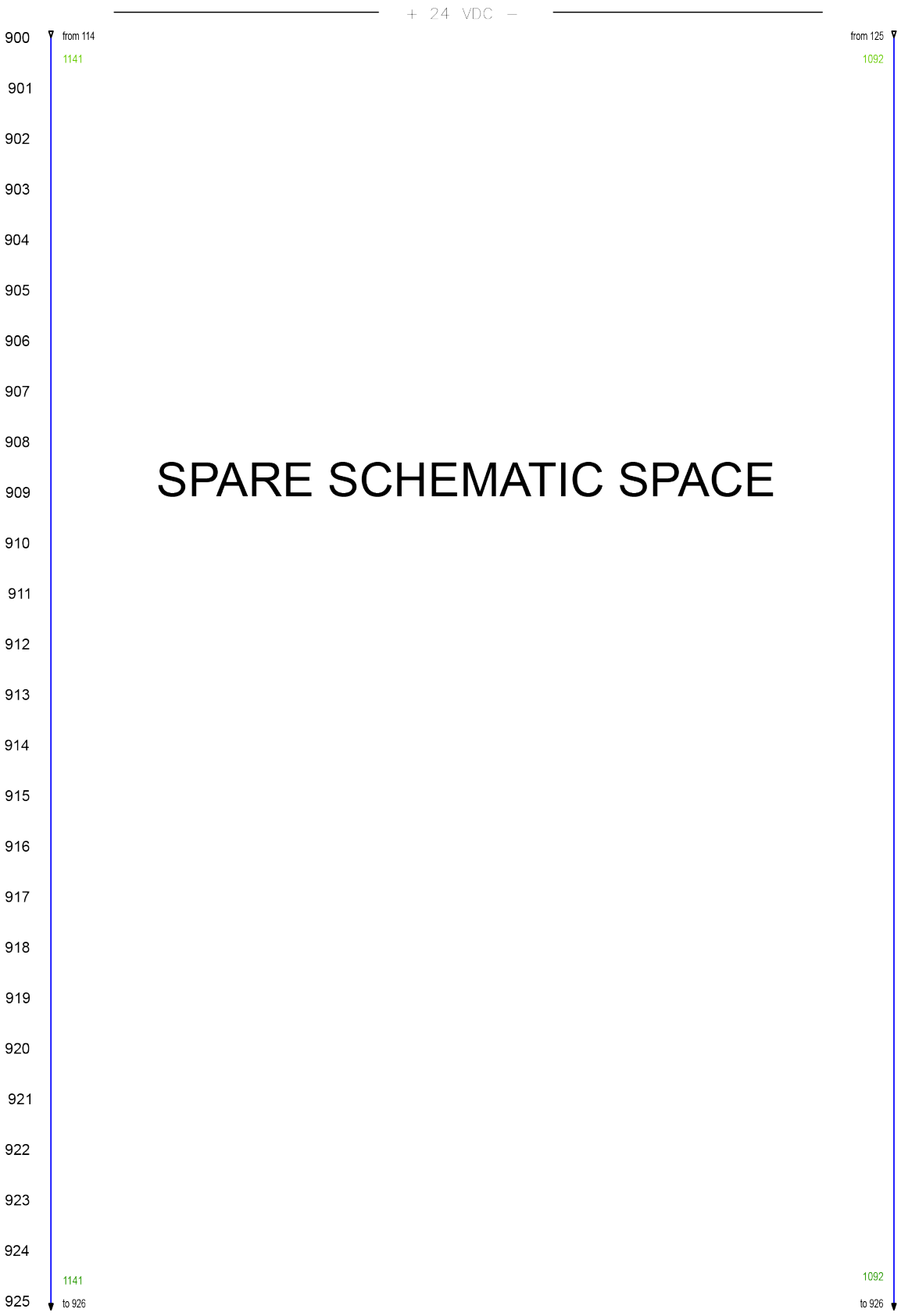



NOTE: Depending on which channel(s) are used, disconnect and cap black wire at A1 or A2. Move white wire to A1 or A2. Install a 2.2k ohm resistor from A1 or A2 to +UB on any channel(s) using a Piston Meter.

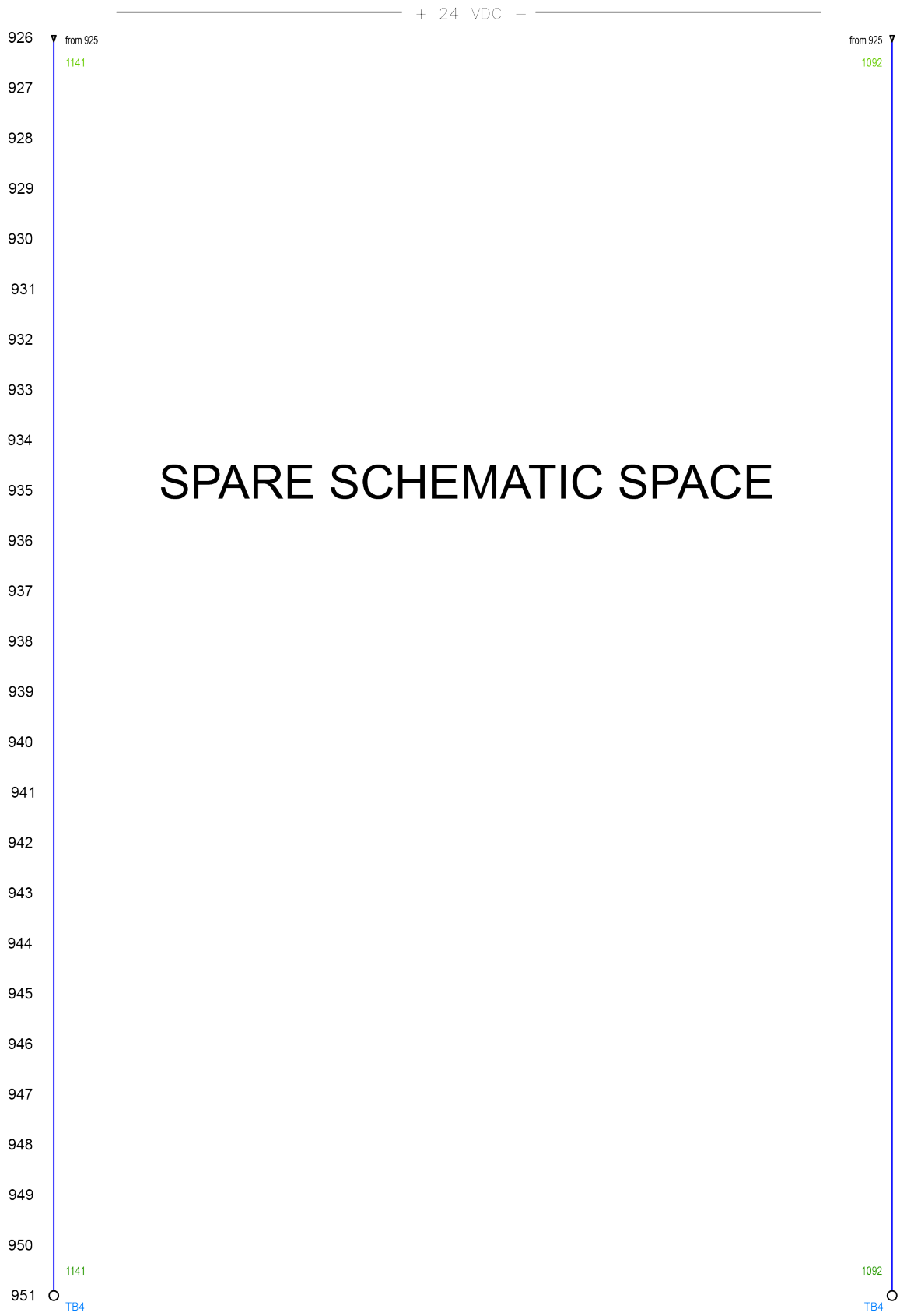
# DRAWING 8C (cont.)



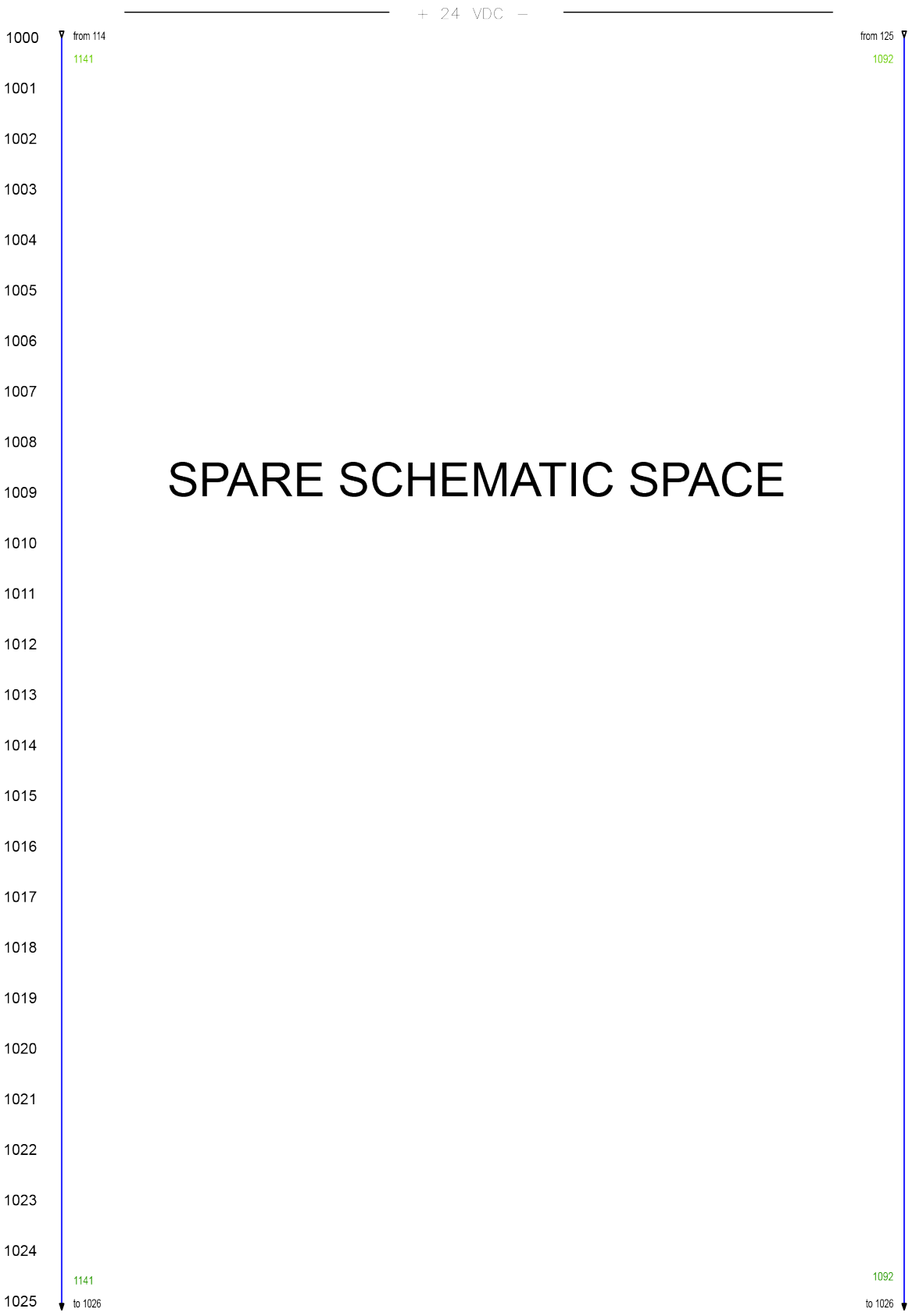
## DRAWING 9


+ 24 VDC –
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
from 114
1141
from 125
1092
SPARE SCHEMATIC SPACE
1141
to 926
1092
to 926

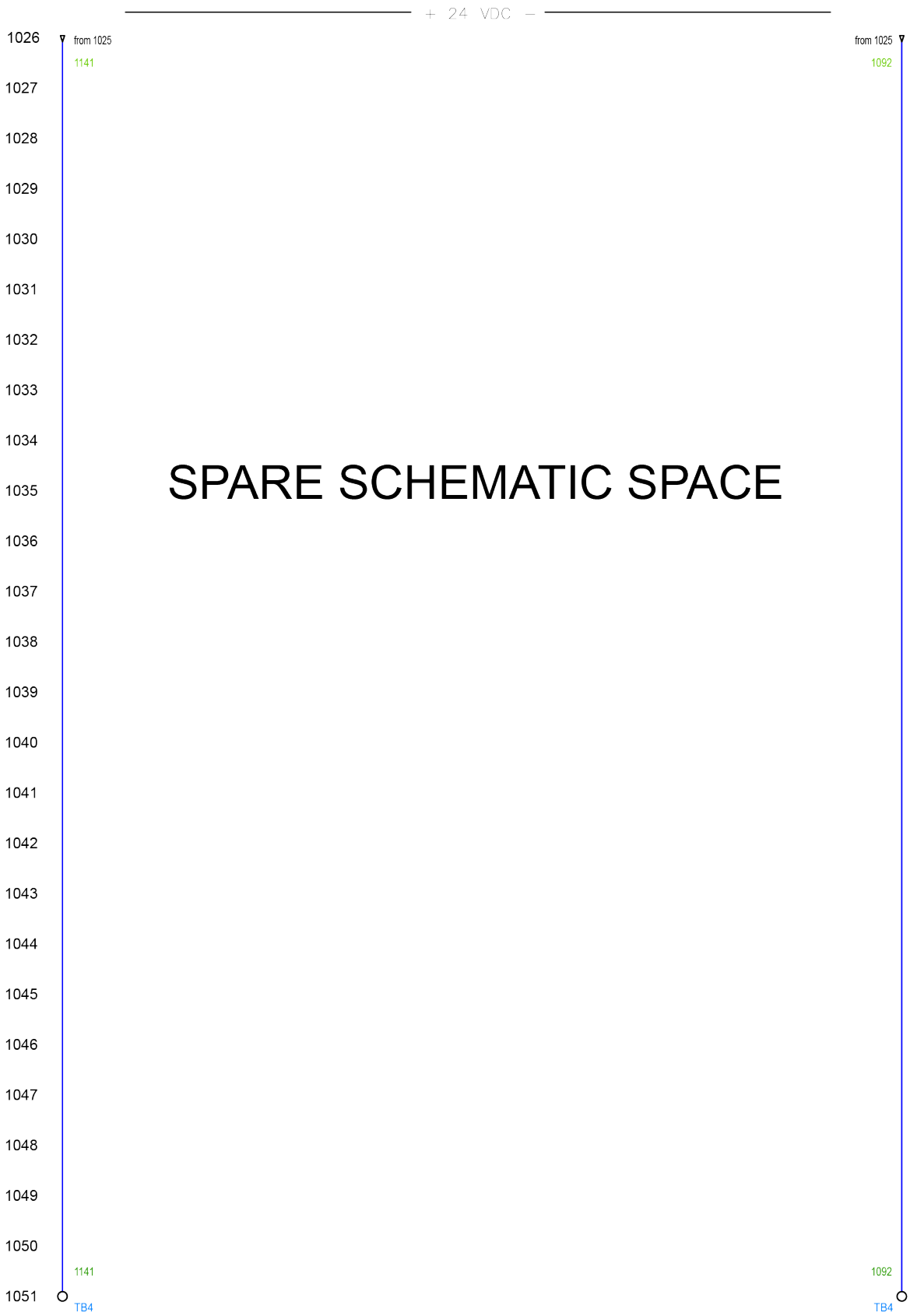
## DRAWING 9 (cont.)



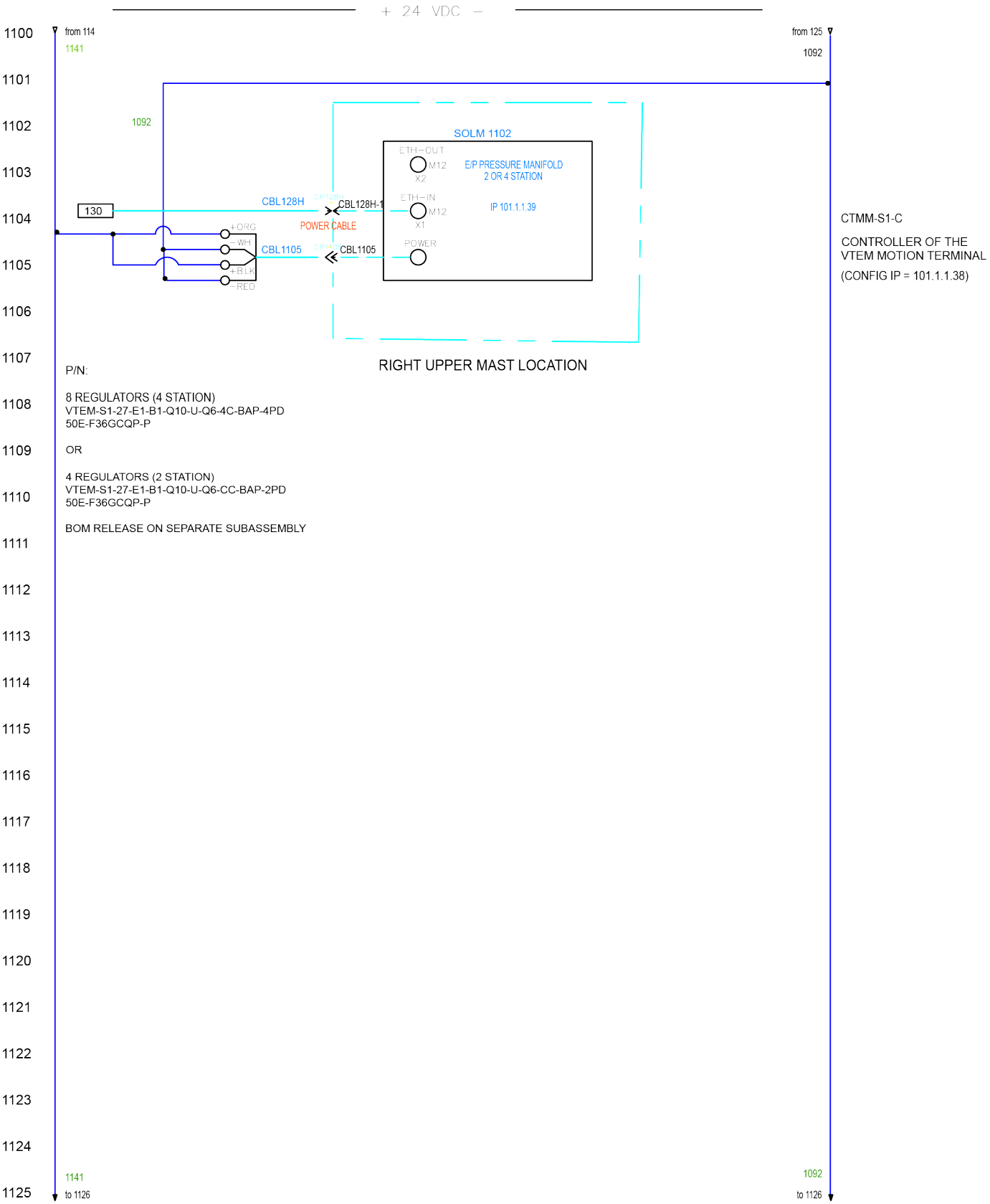
## DRAWING 10


+ 24 VDC –
1000
from 114
1141
from 125
1092
1001
1002
1003
1004
1005
1006
1007
1008
SPARE SCHEMATIC SPACE
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1141
1025
to 1026
1092
to 1026

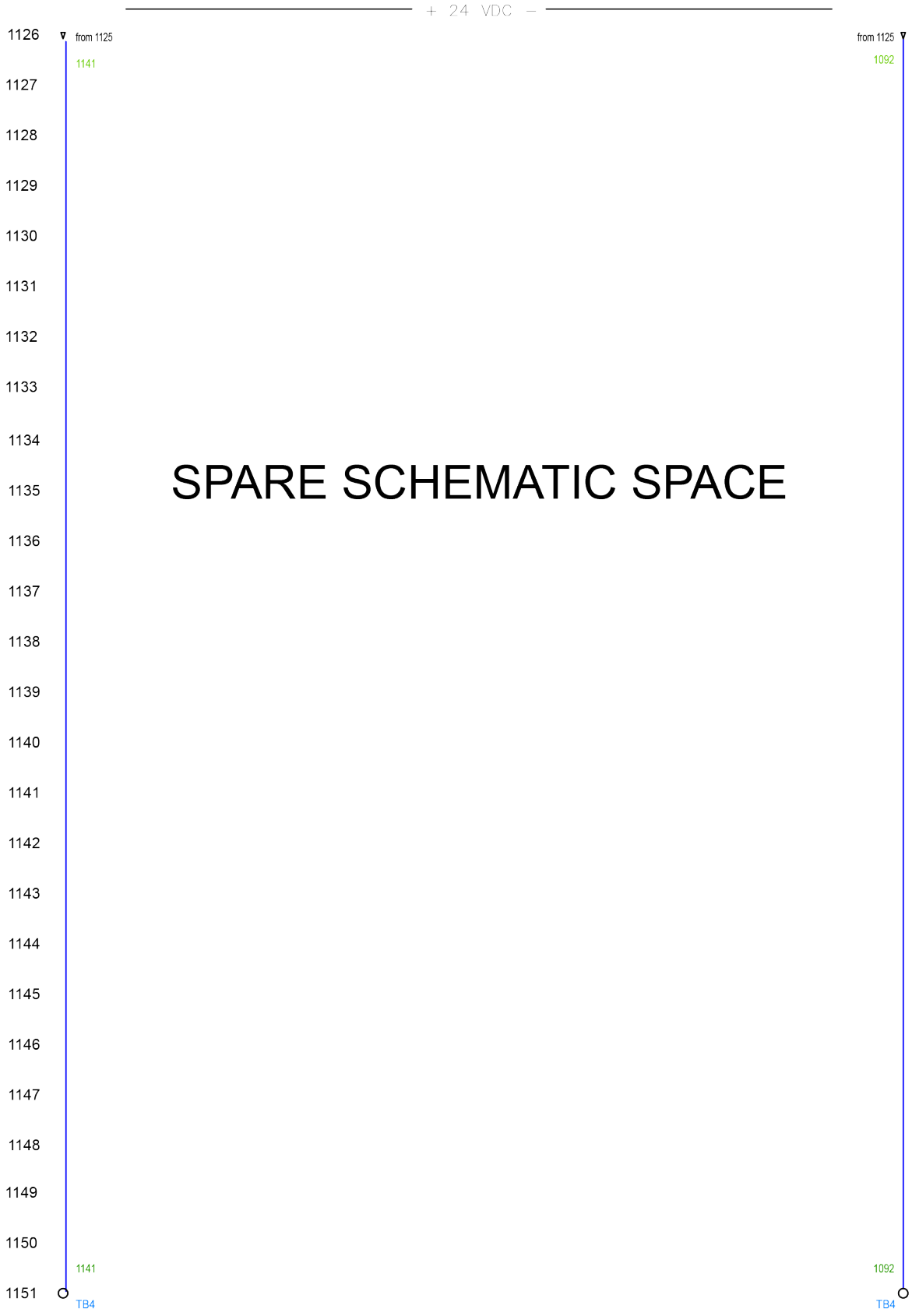
## DRAWING 10 (cont.)



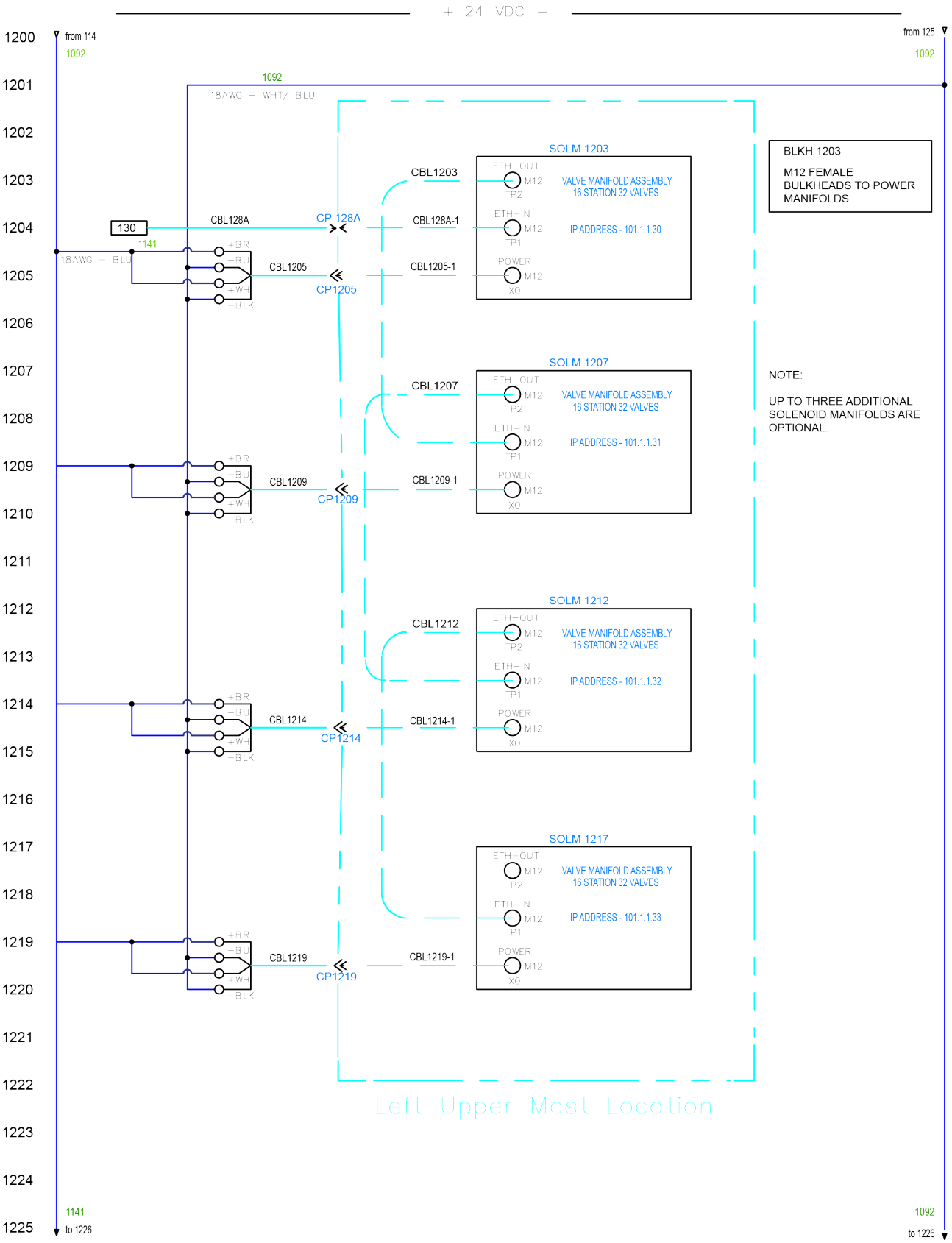
# DRAWING 11


+ 24 VDC –
from 114
1141
from 125
1092
1092
SOLM 1102
ETH–OUT
M12
X2
E/P PRESSURE MANIFOLD
2 OR 4 STATION
ETH–IN
M12
X1
IP 101.1.1.39
POWER
130
CBL128H
CBL128H-1
POWER CABLE
+ORG
– WH
CBL1105
CBL1105
+BLK
–RED
CTMM-S1-C
CONTROLLER OF THE
VTEM MOTION TERMINAL
(CONFIG IP = 101.1.1.38)
RIGHT UPPER MASTER LOCATION
P/N:
8 REGULATORS (4 STATION)
VTEM-S1-27-E1-B1-Q10-U-Q6-4C-BAP-4PD
50E-F36GCQP-P
OR
4 REGULATORS (2 STATION)
VTEM-S1-27-E1-B1-Q10-U-Q6-CC-BAP-2PD
50E-F36GCQP-P
BOM RELEASE ON SEPARATE SUBASSEMBLY
1141
to 1126
1092
to 1126

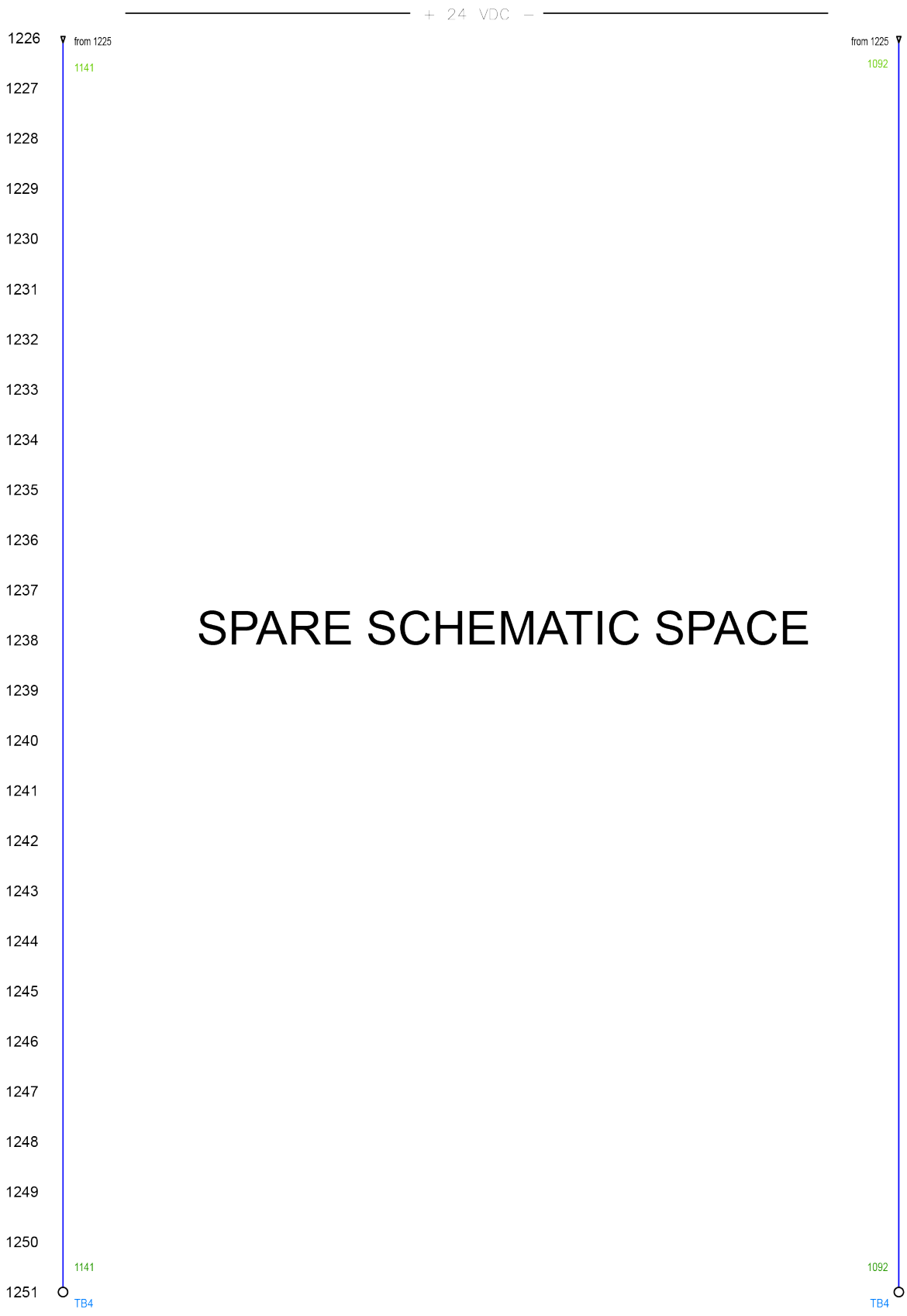
## DRAWING 11 (cont.)



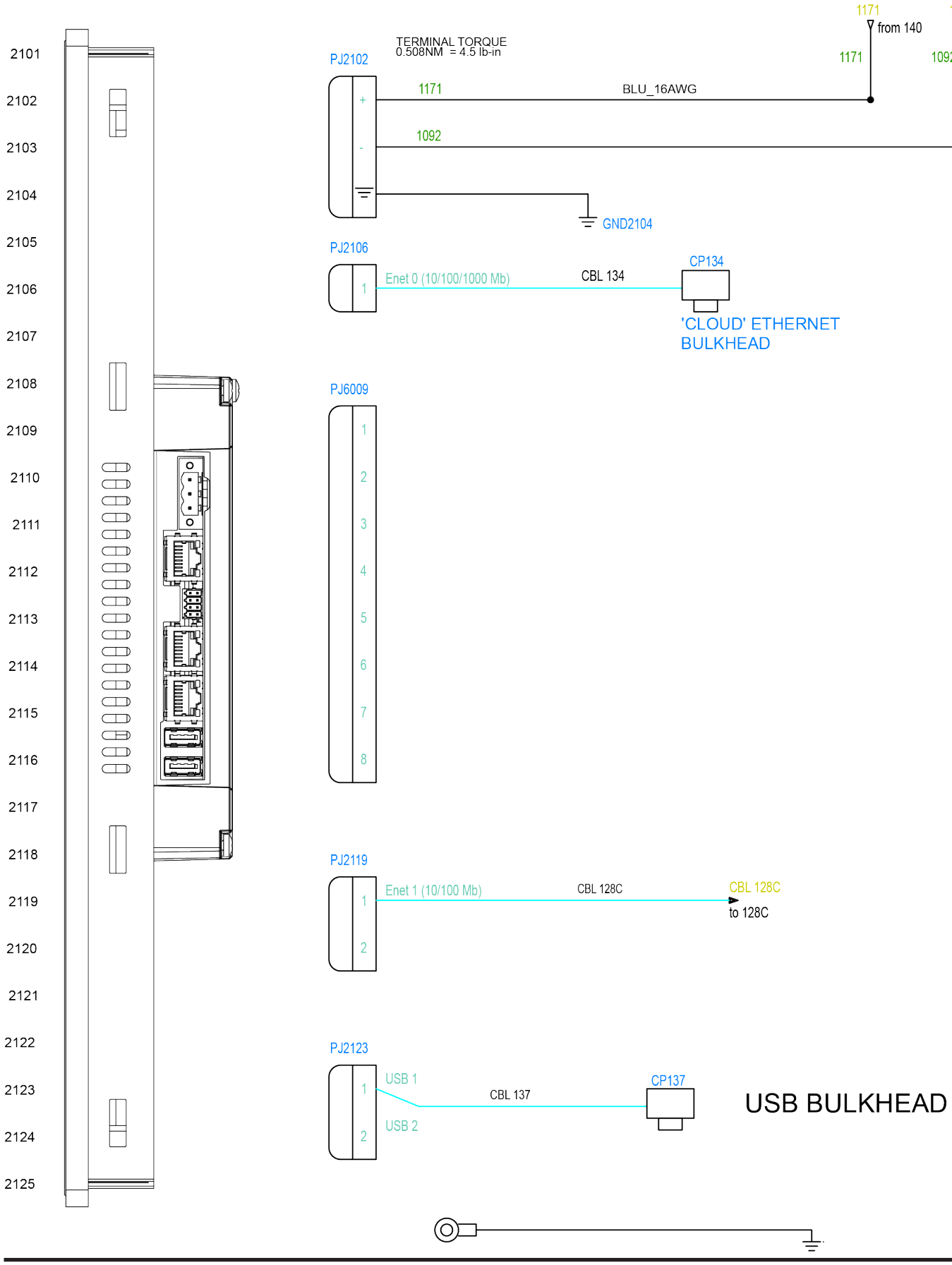
# DRAWING 12


+ 24 VDC –
from 114
1092
from 125
1092
1092
18AWG – WHT/ BLU
SOLM 1203
CBL1203
ETH–OUT
M12
TP2
VALVE MANIFOLD ASSEMBLY
16 STATION 32 VALVES
ETH–IN
M12
TP1
IP ADDRESS - 101.1.1.30
POWER
M12
X0
BLKH 1203
M12 FEMALE
BULKHEADS TO POWER
MANIFOLDS
130
CBL128A
CP 128A
CBL128A-1
1141
18AWG – BLU
+BR
–BU
+WH
–BLK
CBL1205
CP1205
CBL1205-1
SOLM 1207
CBL1207
IP ADDRESS - 101.1.1.31
NOTE:
UP TO THREE ADDITIONAL
SOLENOID MANIFOLDS ARE
OPTIONAL.
CBL1209
CP1209
CBL1209-1
SOLM 1212
CBL1212
IP ADDRESS - 101.1.1.32
CBL1214
CP1214
CBL1214-1
SOLM 1217
CBL1217
IP ADDRESS - 101.1.1.33
CBL1219
CP1219
CBL1219-1
Left Upper Mast Location
1141
to 1226
1092
to 1226

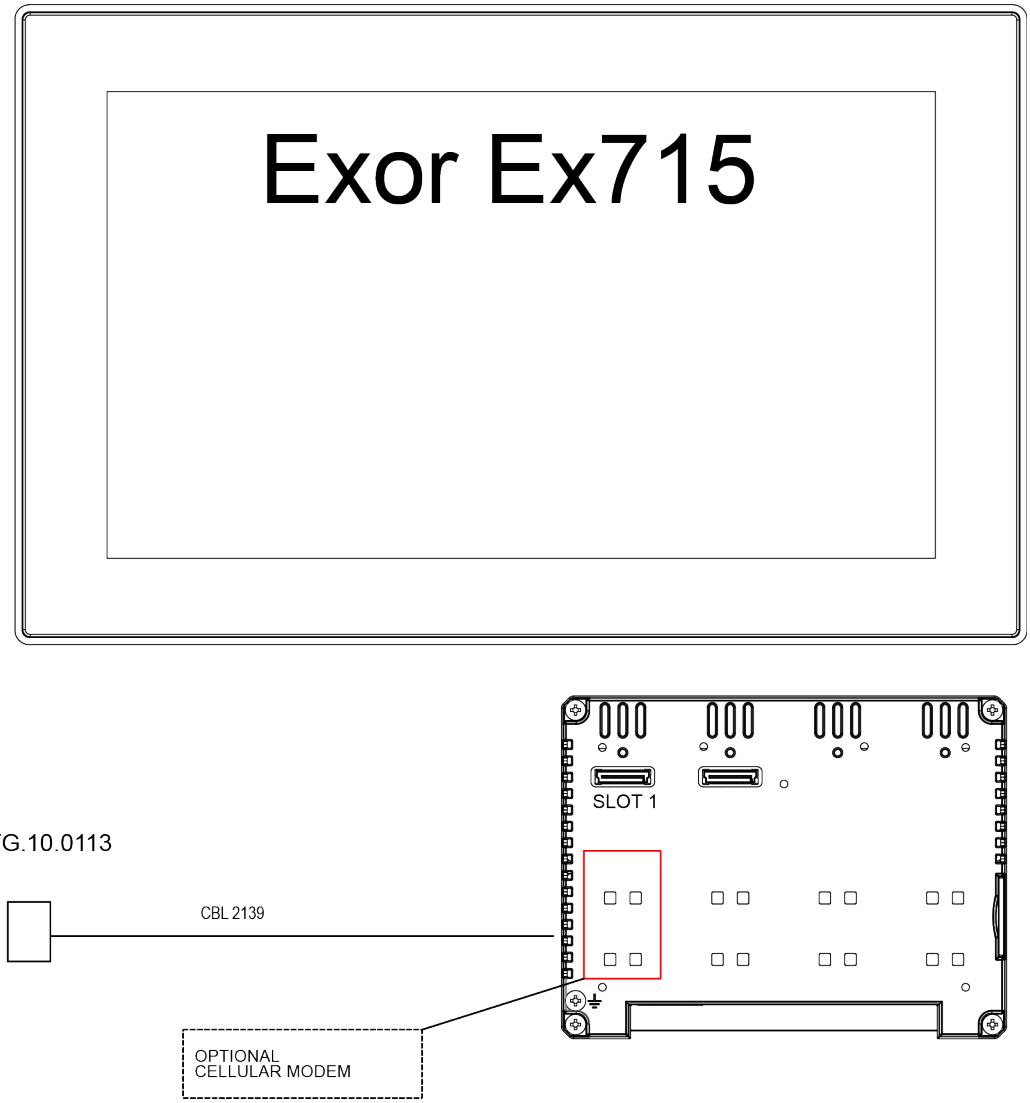
## DRAWING 12 (cont.)



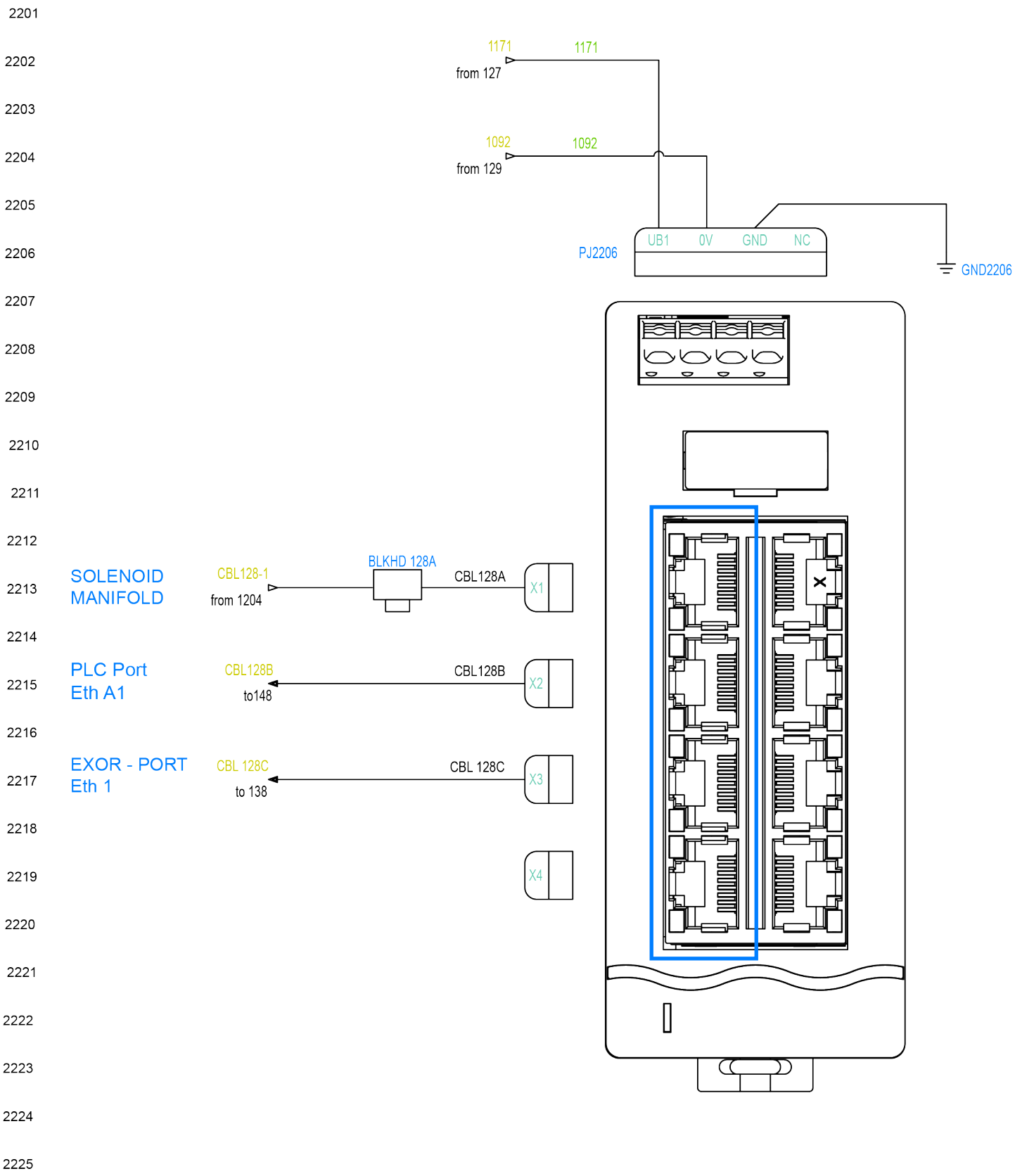
# DRAWING 21


2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
TERMINAL TORQUE
0.508NM = 4.5 lb-in
PJ2102
+
-
1171
1092
BLU_16AWG
1171
from 140
1092
140
1171
1092
GND2104
PJ2106
1
Enet 0 (10/100/1000 Mb)
CBL 134
CP134
'CLOUD' ETHERNET
BULKHEAD
PJ6009
1
2
3
4
5
6
7
8
PJ2119
1
2
Enet 1 (10/100 Mb)
CBL 128C
CBL 128C
to 128C
PJ2123
1
2
USB 1
USB 2
CBL 137
CP137
USB BULKHEAD

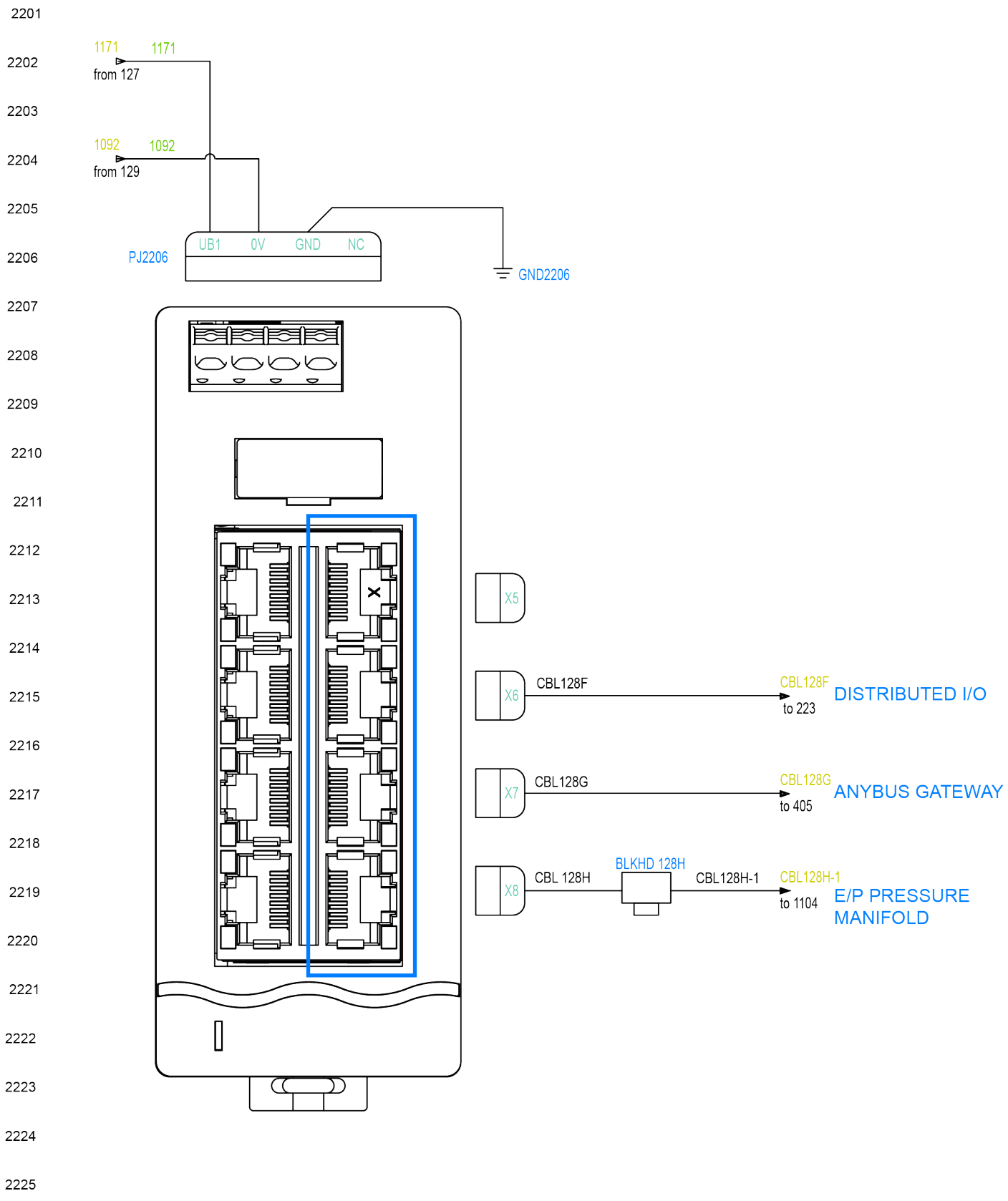
## DRAWING 21 (cont.)



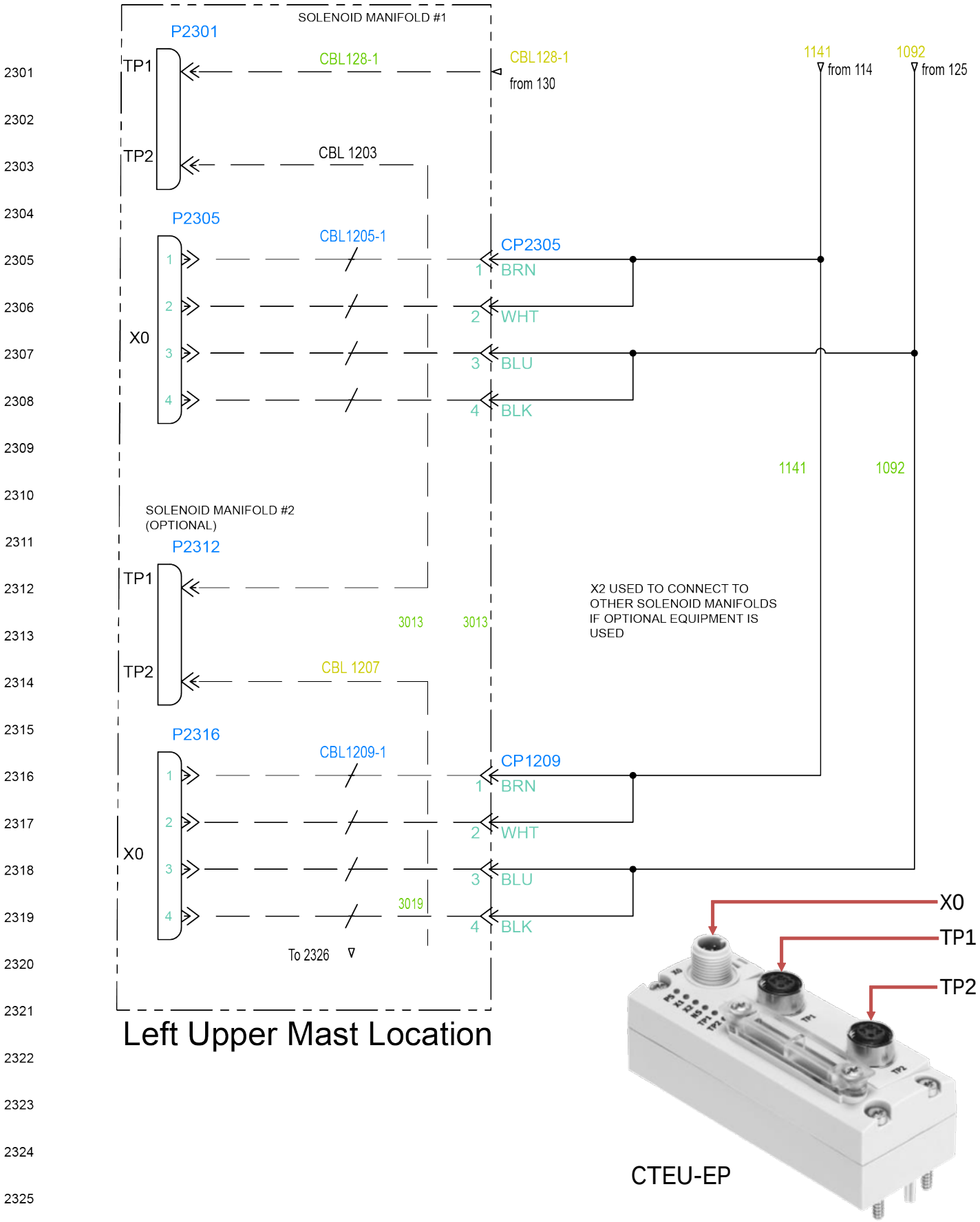
# DRAWING 22


1171
from 127
1171
1092
from 129
1092
PJ2206
UB1
0V
GND
NC
GND2206
SOLENOID MANIFOLD
CBL128-1
from 1204
BLKHD 128A
CBL128A
X1
PLC Port Eth A1
CBL128B
to148
CBL128B
X2
EXOR - PORT Eth 1
CBL 128C
to 138
CBL 128C
X3
X4

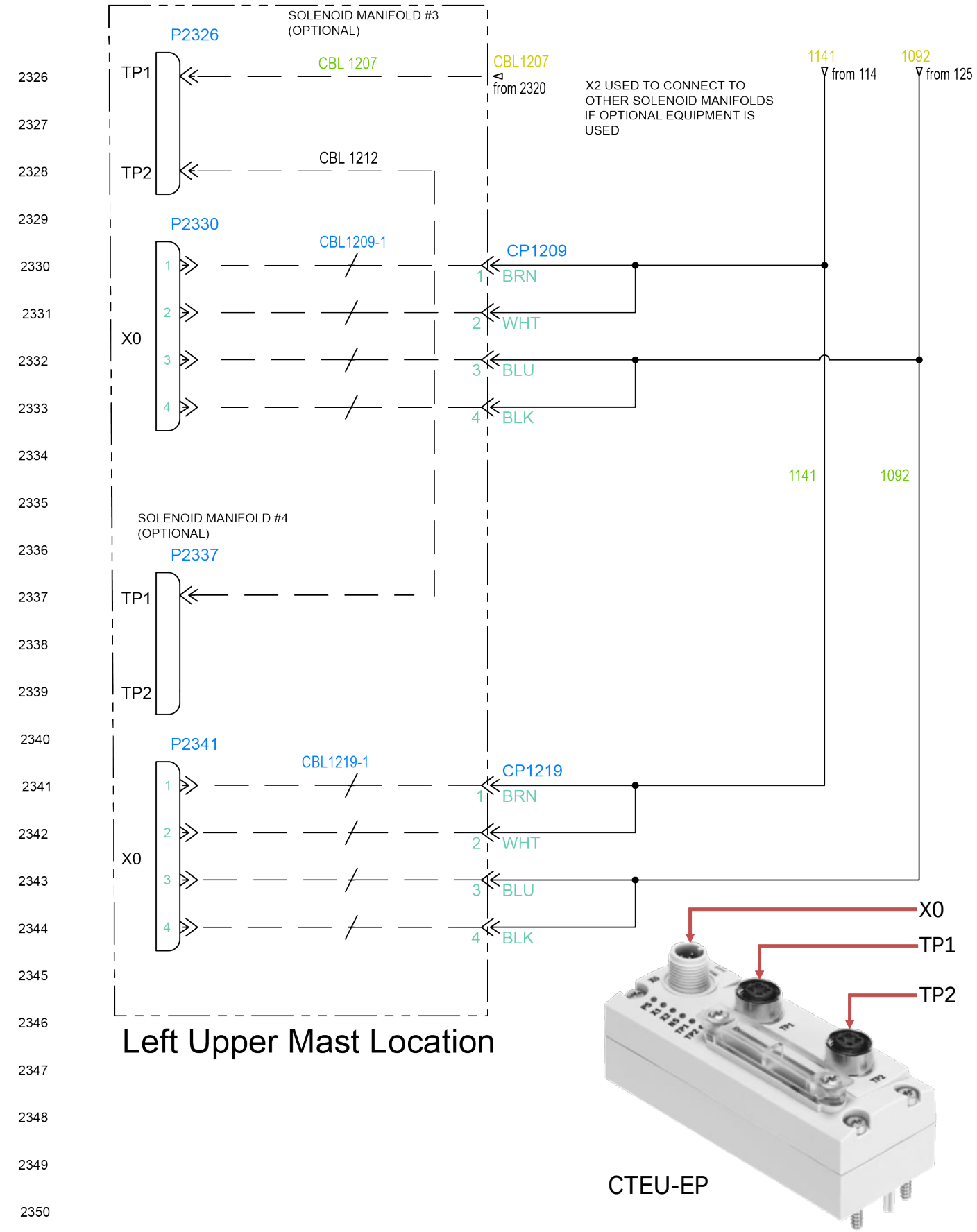
## DRAWING 22 (cont.)



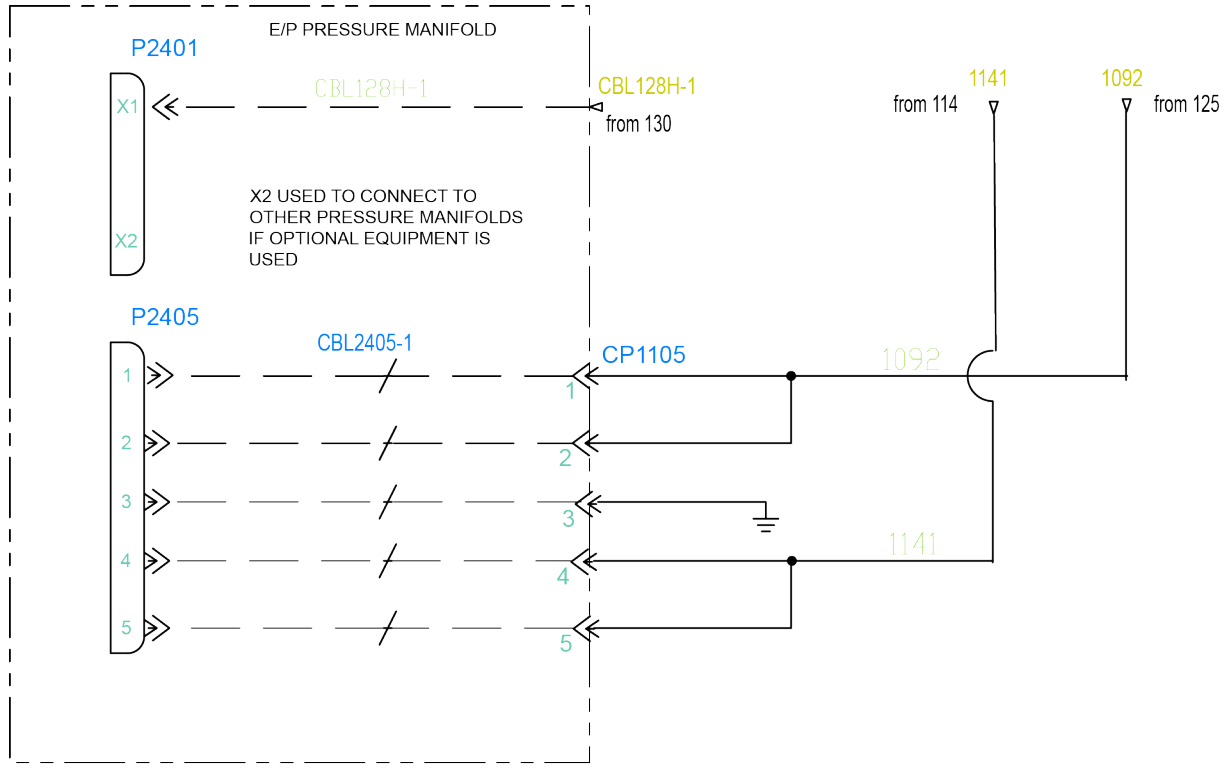
## DRAWING 23


SOLENOID MANIFOLD #1
P2301
TP1
TP2
CBL128-1
CBL128-1
from 130
CBL 1203
1141
from 114
1092
from 125
P2305
CBL1205-1
CP2305
X0
1 BRN
2 WHT
3 BLU
4 BLK
1141
1092
SOLENOID MANIFOLD #2
(OPTIONAL)
P2312
TP1
TP2
3013
3013
CBL 1207
X2 USED TO CONNECT TO
OTHER SOLENOID MANIFOLDS
IF OPTIONAL EQUIPMENT IS
USED
P2316
CBL1209-1
CP1209
X0
1 BRN
2 WHT
3 BLU
4 BLK
3019
To 2326
Left Upper Mast Location
X0
TP1
TP2
CTEU-EP

## DRAWING 23 (cont.)

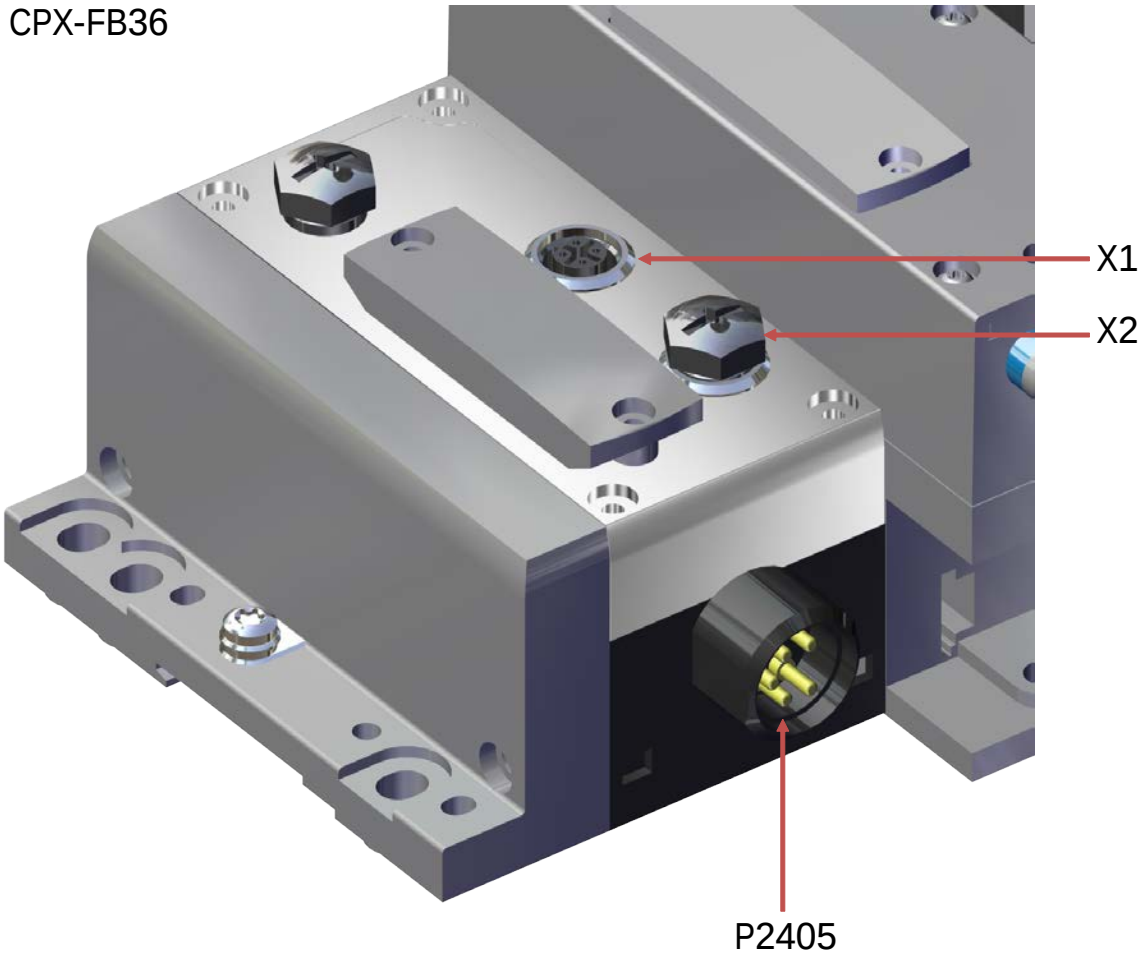


## DRAWING 24

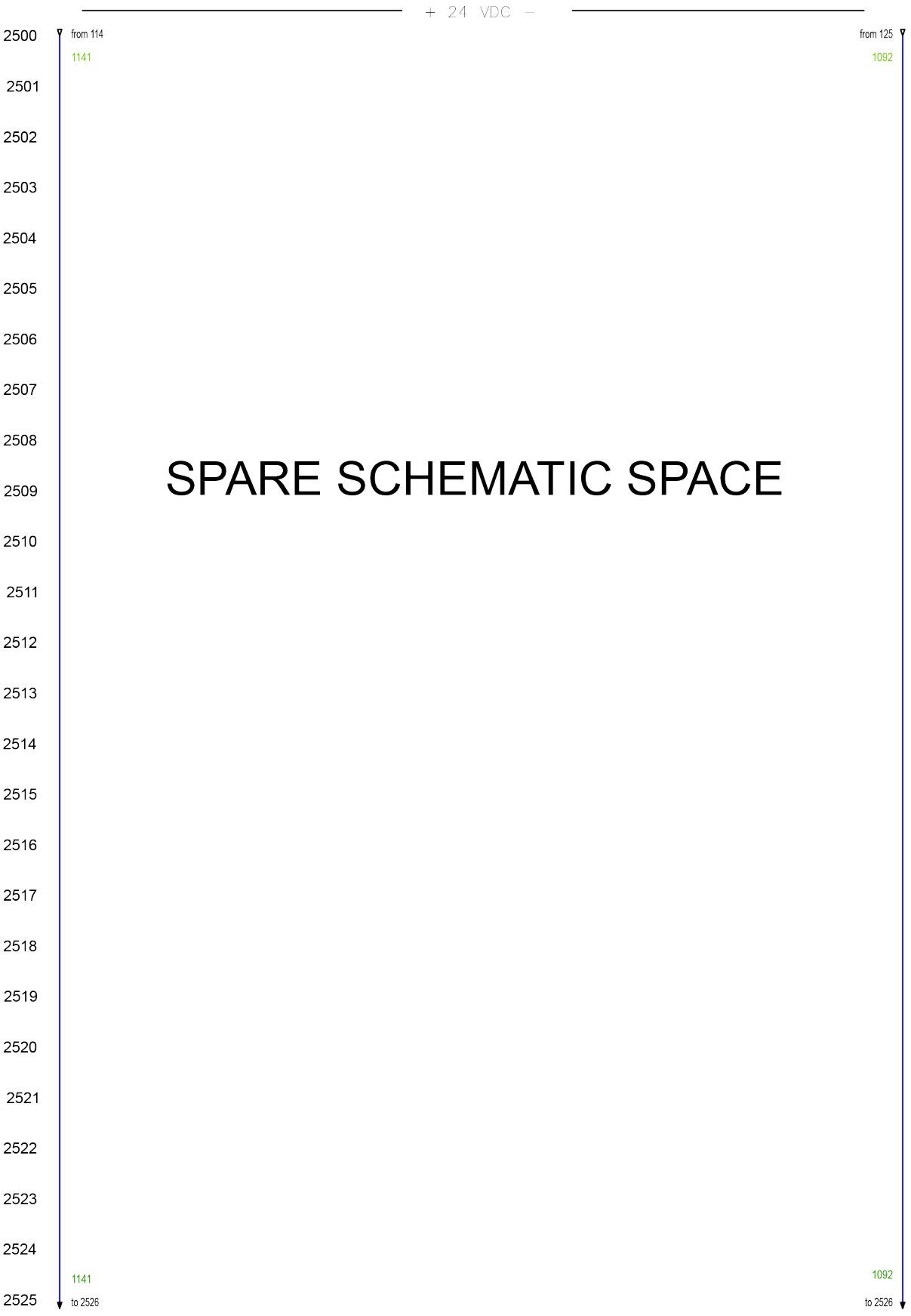



RIGHT UPPER MAST LOCATION

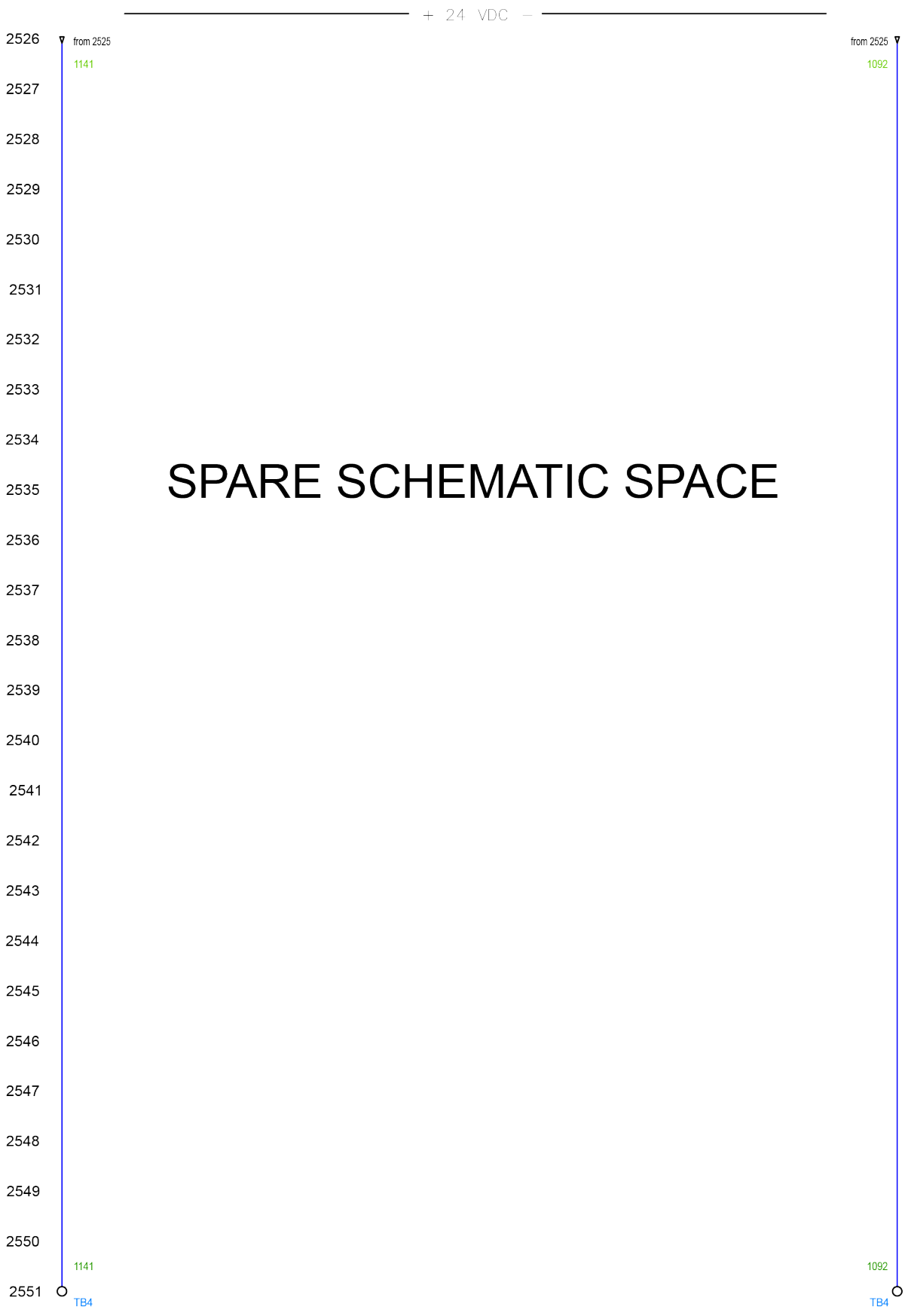
## DRAWING 24 (cont.)



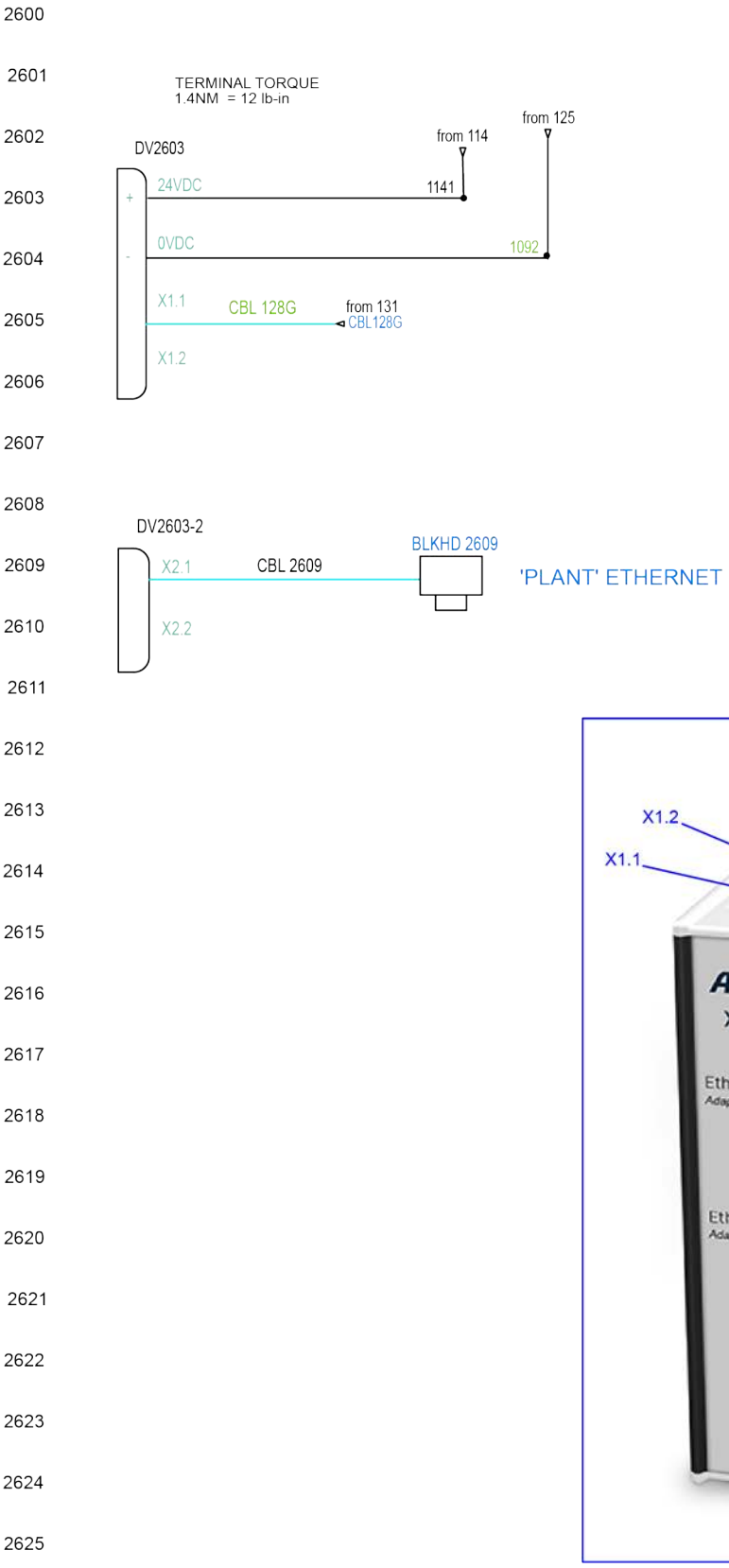
## DRAWING 25


+ 24 VDC –
2500
from 114
1141
from 125
1092
2501
2502
2503
2504
2505
2506
2507
2508
SPARE SCHEMATIC SPACE
2509
2510
2511
2512
2513
2514
2515
2516
2517
2518
2519
2520
2521
2522
2523
2524
1141
2525
to 2526
1092
to 2526

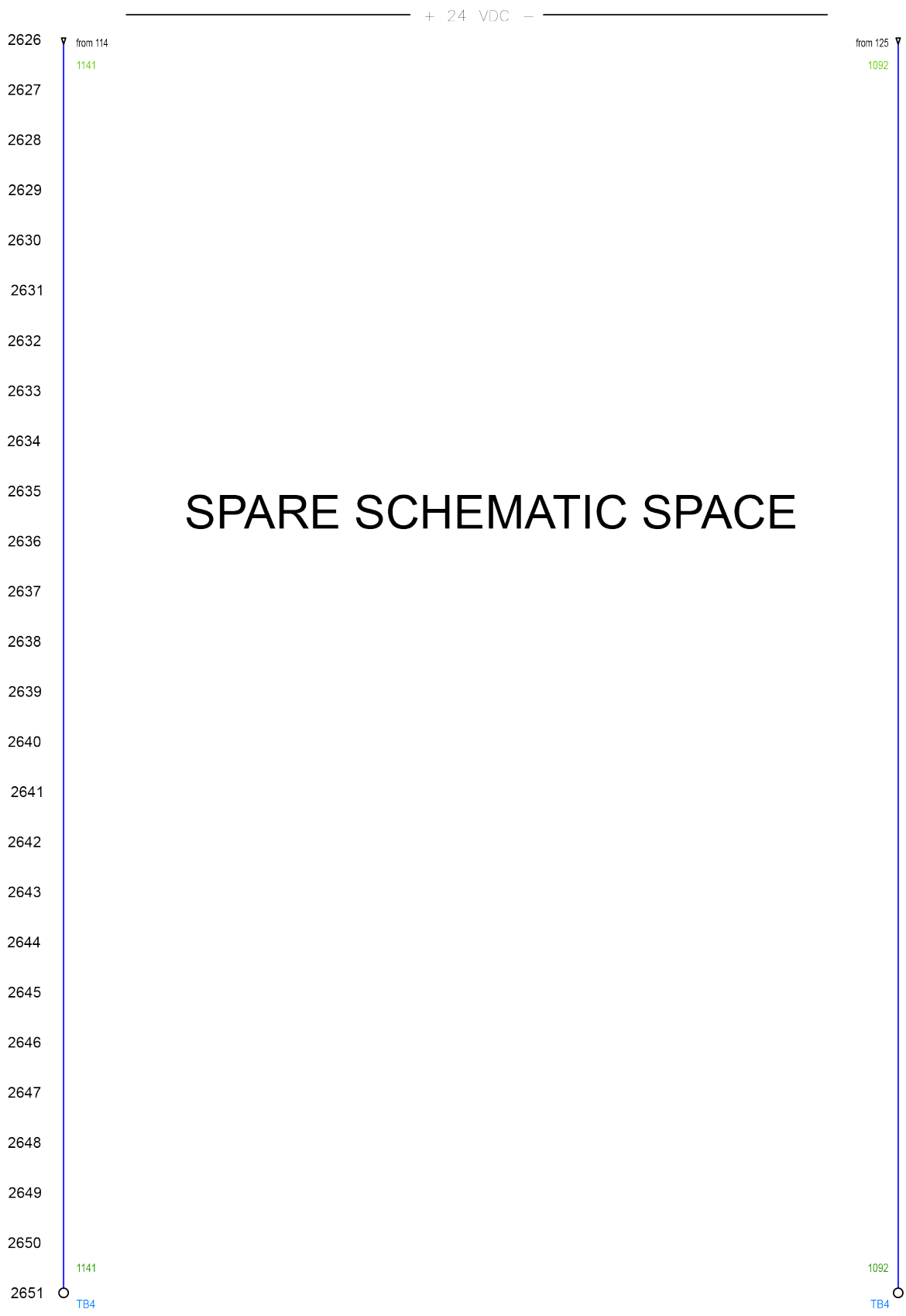
## DRAWING 25 (cont.)



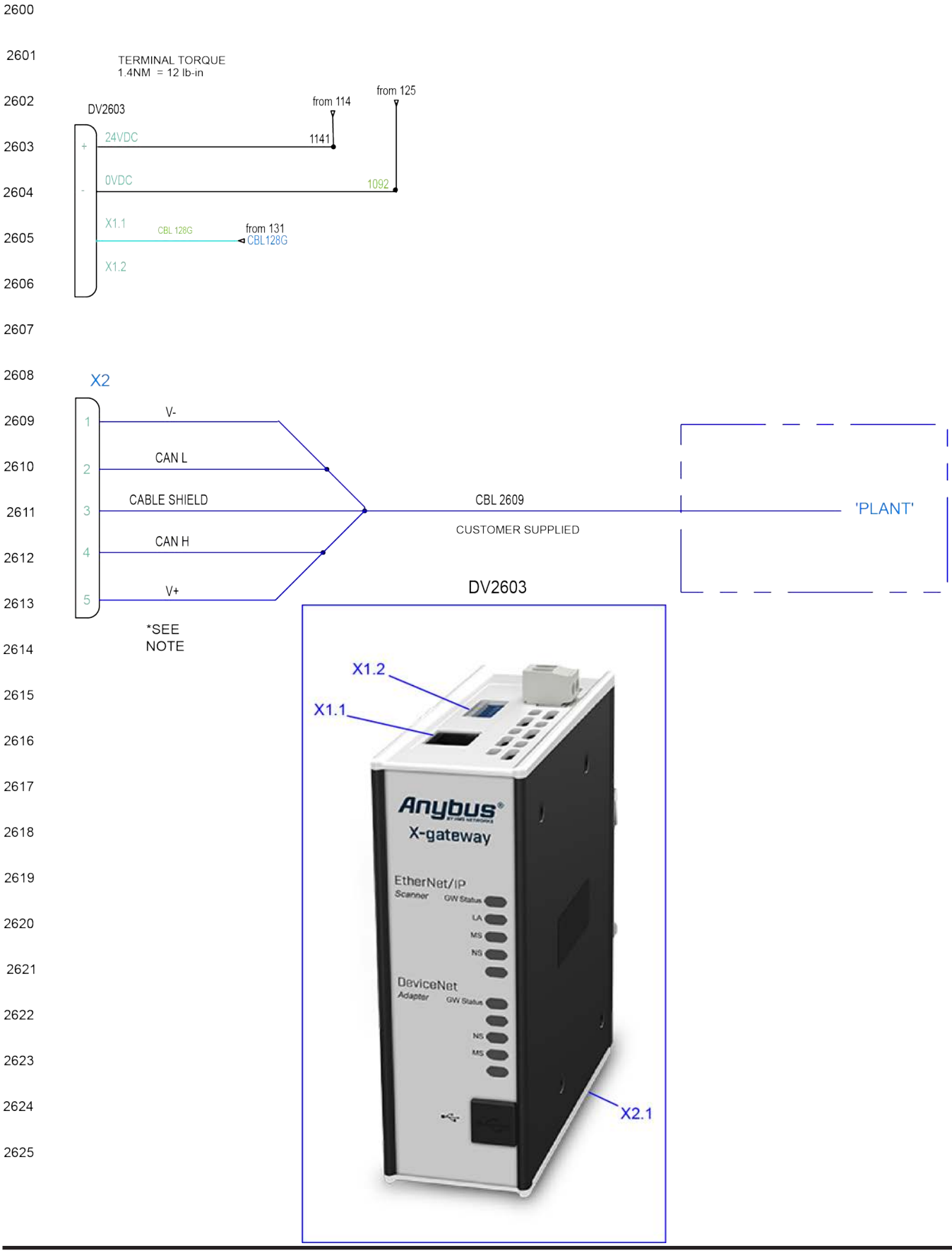
# DRAWING 26


TERMINAL TORQUE
1.4NM = 12 lb-in
DV2603
from 114
from 125
24VDC
1141
0VDC
1092
X1.1
CBL 128G
from 131
CBL128G
X1.2
DV2603-2
BLKHD 2609
X2.1
CBL 2609
'PLANT' ETHERNET
X2.2
DV2603
X1.2
X1.1
Anybus
X-gateway
EtherNet/IP
Adapter
GW Status
Link
MS
NS
ACT
EtherNet/IP
Adapter
GW Status
Link
MS
NS
ACT
X2.1
X2.2

## DRAWING 26 (cont.)

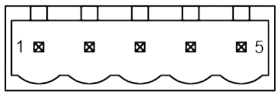


# DRAWING 26B


TERMINAL TORQUE
1.4NM = 12 lb-in
DV2603
from 114
from 125
24VDC
1141
0VDC
1092
X1.1
CBL 128G
from 131
CBL128G
X1.2
X2
V-
CAN L
CABLE SHIELD
CAN H
V+
CBL 2609
CUSTOMER SUPPLIED
'PLANT'
*SEE NOTE
DV2603
X1.2
X1.1
Anybus
X-gateway
EtherNet/IP
Scanner
GW Status
LA
MS
NS
DeviceNet
Adapter
GW Status
NS
MS
X2.1

## DRAWING 26B (cont.)

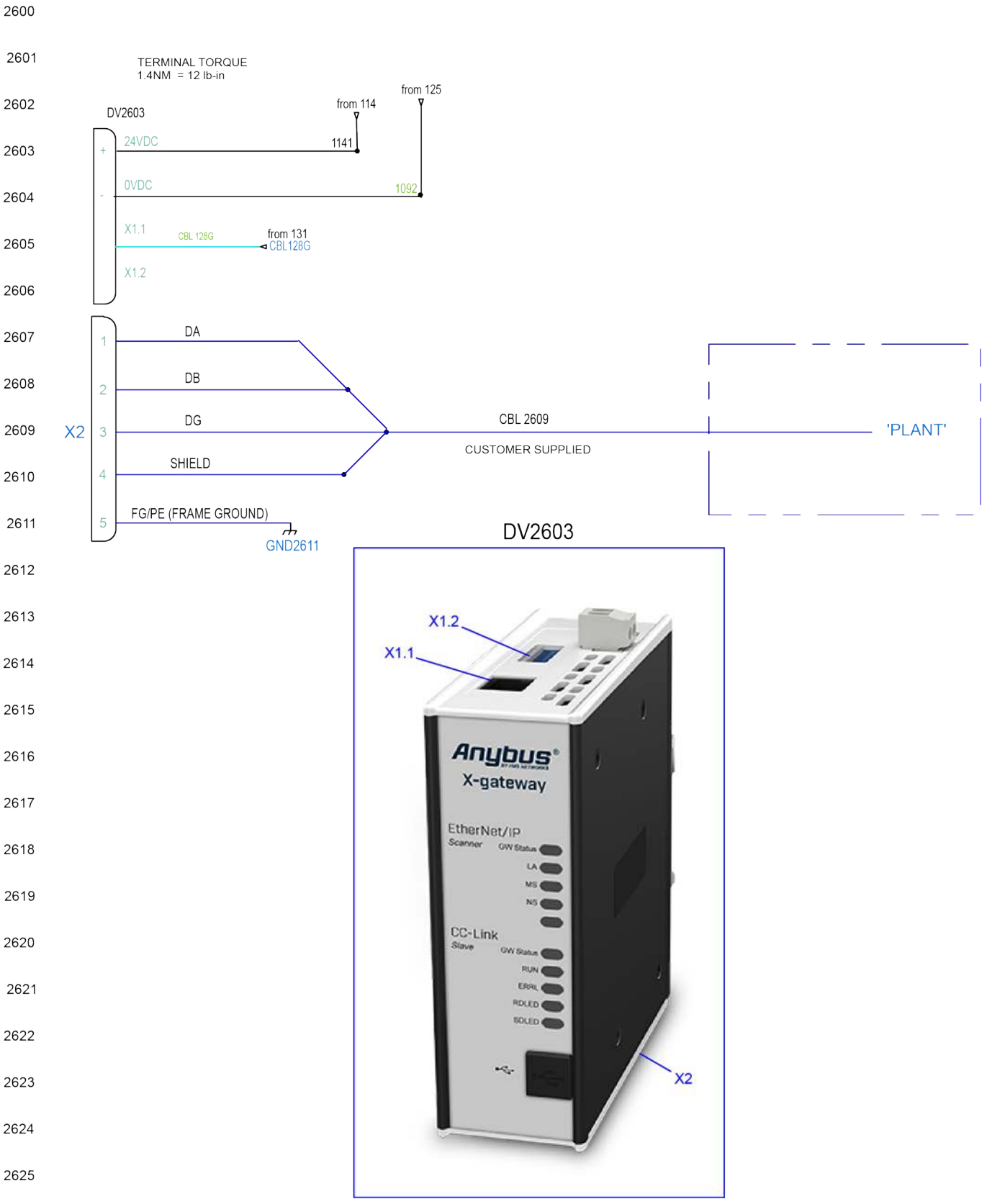

X2 DeviceNet Connector



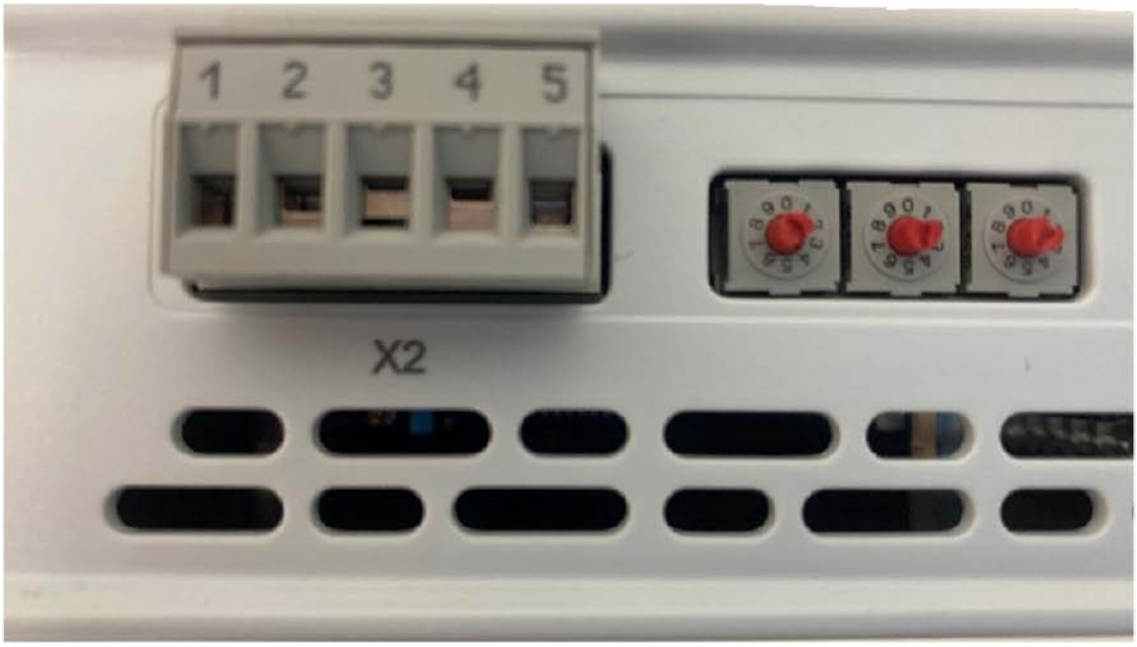

| Pin | Signal |
|---|---|
| 1 | V - |
| 2 | CAN L |
| 3 | Shield |
| 4 | CAN H |
| 5 | V + |

NOTE: A termination resistor of 121 Ohms, 1%, 1/4W must be attached at each end of the DeviceNet cable.
The resistors must be connected to pins 2 (Can L) and pins 5 (V+).

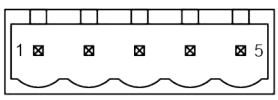
# DRAWING 26C


TERMINAL TORQUE
1.4NM = 12 lb-in
DV2603
from 114
from 125
24VDC
1141
0VDC
1092
X1.1
CBL 128G
from 131
CBL128G
X1.2
DA
DB
DG
SHIELD
FG/PE (FRAME GROUND)
GND2611
X2
CBL 2609
CUSTOMER SUPPLIED
'PLANT'
DV2603
X1.2
X1.1
Anybus
X-gateway
EtherNet/IP
Scanner
GW Status
LA
MS
NS
CC-Link
Slave
GW Status
RUN
ERRL
RDLED
SDLED
X2

## DRAWING 26C (cont.)

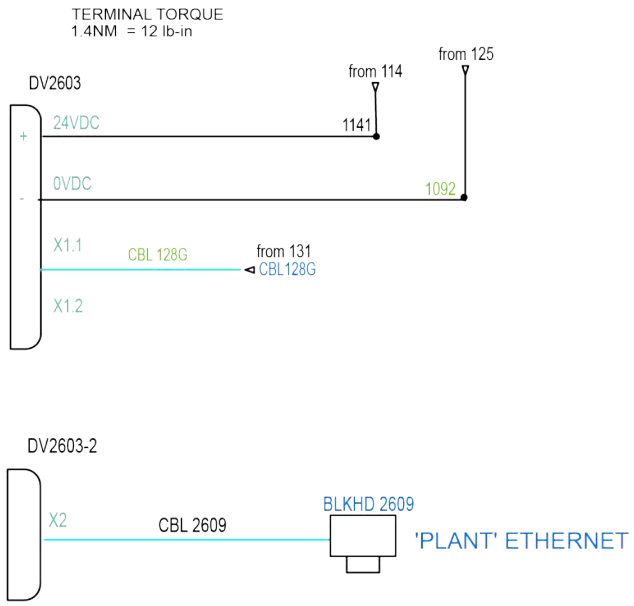



X2 CC-Link Connector



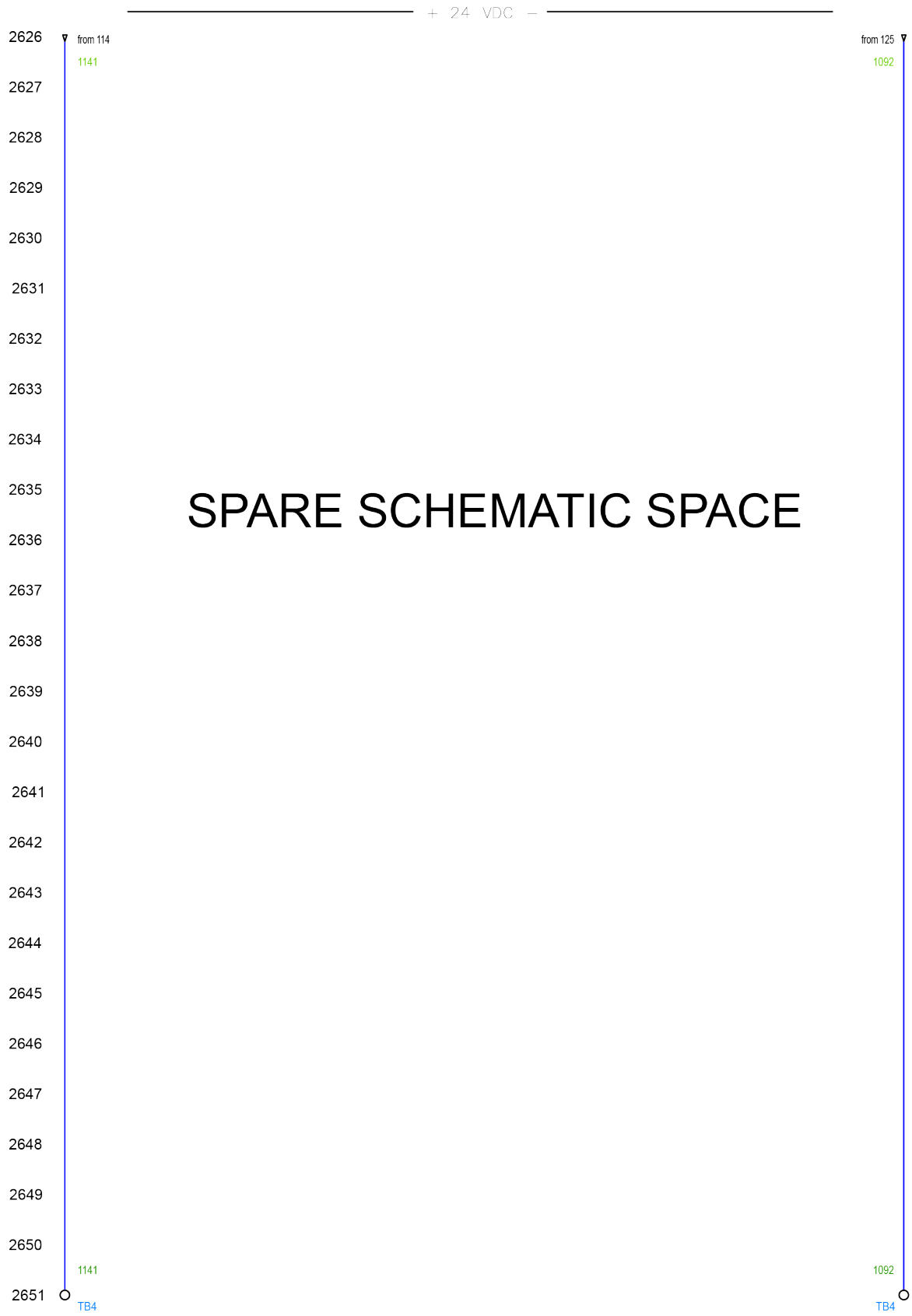

| Pin | Signal |
|---|---|
| 1 | DA (Communication signal) |
| 2 | DB (Communication signal) |
| 3 | DG (Digital Ground) |
| 4 | Shield (Cable shield) |
| 5 | FG/PE (Frame Ground) |

# DRAWING 26D



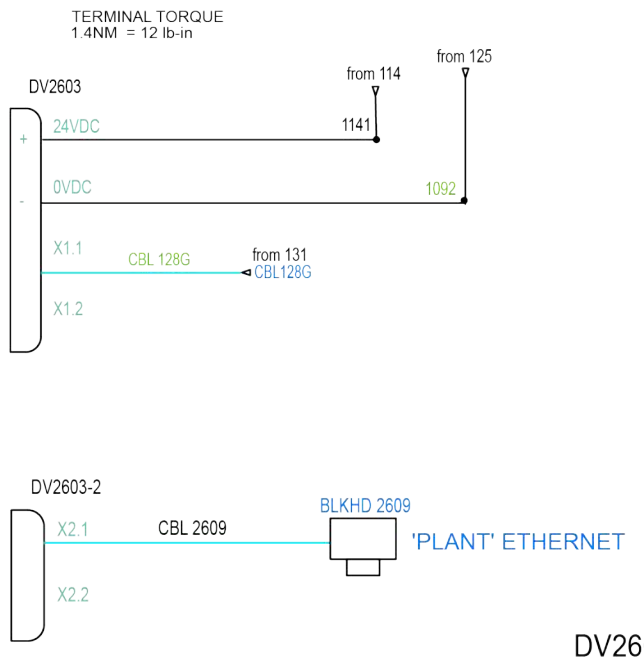

DV2603

## DRAWING 26D (cont.)



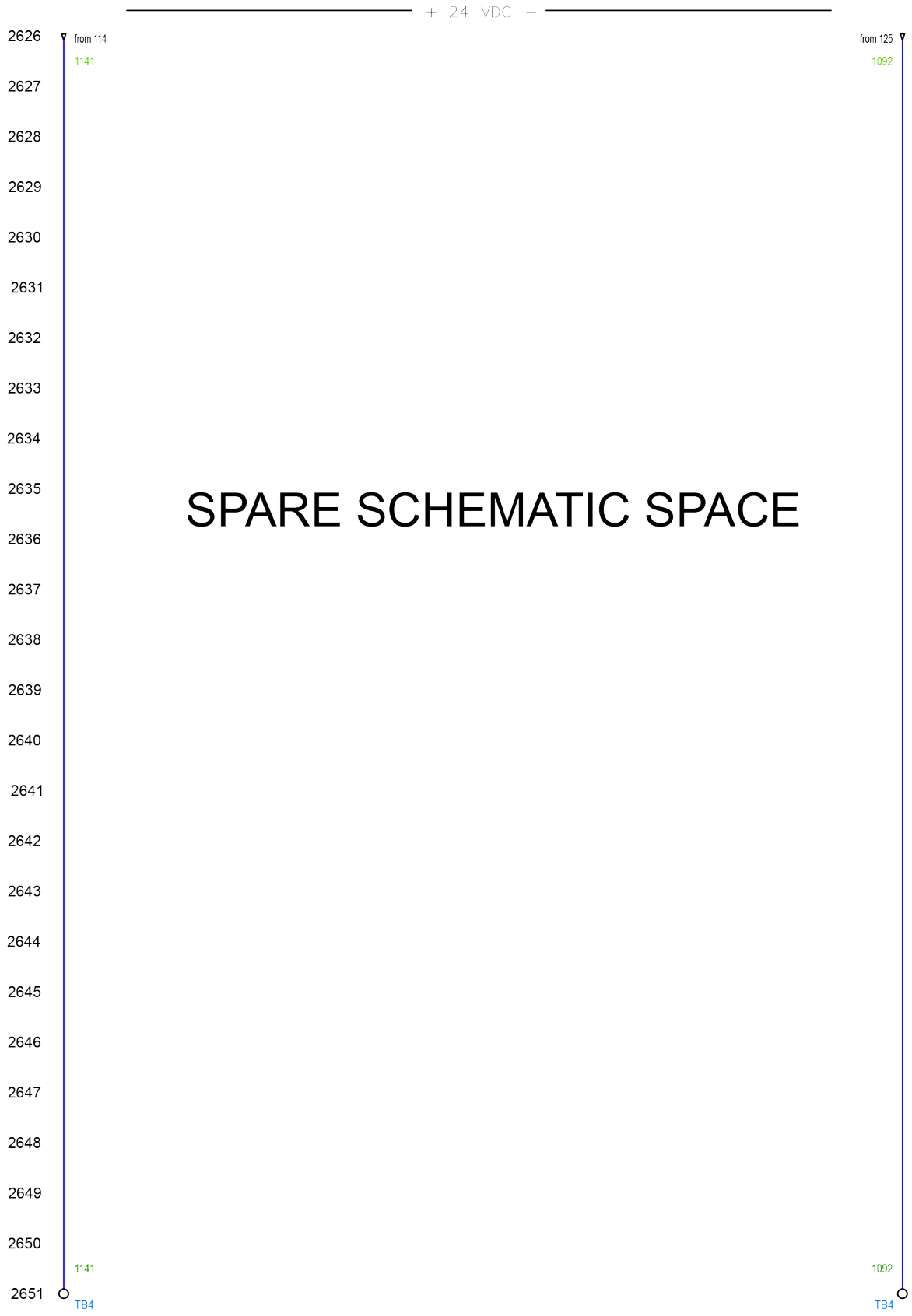

SPARE SCHEMATIC SPACE

# DRAWING 26E




DV2603

## DRAWING 26E (cont.)



## REVISIONS

| Date | Changes | Version |
|---|---|---|
| 10/12/2021 | 1st Draft | R1 |
| 12/20/2022 | Added Rev. H electrical schematics (Appendix section) | R1 |
| 03/13/2023 | Added Rev. J electrical schematics (Appendix section) | R2 |
| 03/23/2023 | Added pulse valve adjustment and Cloud/Internet connection pages | R2 |
| 05/22/2023 | Added pressure limitations due to Coriolis | R3 |
| 06/28/2023 | Corrected Output Array tables (pages 194-204) | R3 |
| 10/16/2023 | Added dispense pump configuration and schematics | R4 |

# 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.

For specific warranty information please contact Carlisle Fluid Technologies.

For technical assistance or to locate an authorized distributor, contact one of our international sales and customer support locations.

| Region | Industrial / Automotive | Automotive Refinishing |
|---|---|---|
| Americas | Tel: 1-800-992-4657<br>Fax: 1-888-246-5732 | Tel: 1-800-445-3988<br>Fax: 1-800-445-6643 |
| Europe, Africa<br>Middle East, India | Tel: +44 (0)1202 571 111<br>Fax: +44 (0)1202 573 488 | |
| China | Tel: +8621-3373 0108<br>Fax: +8621-3373 0308 | |
| Japan | Tel: +81 45 785 6421<br>Fax: +81 45 785 6517 | |
| Australia | Tel: +61 (0) 2 8525 7555<br>Fax: +61 (0) 2 8525 7575 | |

For the latest information about our products, visit www.carlisleft.com.

Carlisle Fluid Technologies is a global leader in innovative finishing technologies.

Carlisle Fluid Technologies reserves the right to modify equipment specifications without prior notice.



CARLISLE FLUID TECHNOLOGIES

16430 North Scottsdale Rd.
Scottsdale, AZ 85254 USA