

HydroShield™ Automatic Air Spray Batch Waterborne Isolation Systems

3A8493A
EN

Air spray system for use with automatic electrostatic applicators when spraying conductive, waterborne fluids that meet at least one of the conditions for non-flammability listed on page 4. To be used in a permanent location. Not approved for use in explosive atmospheres or hazardous (classified) locations. For professional use only.

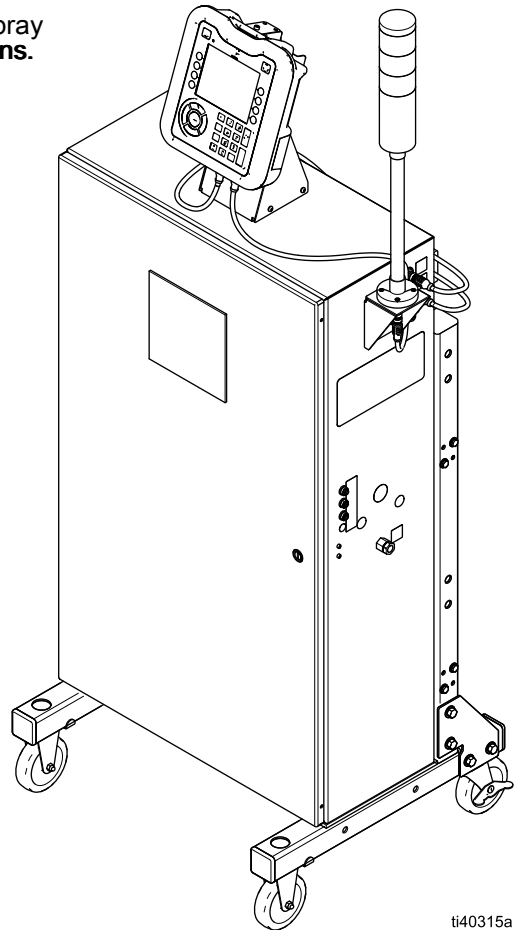


Important Safety Instructions

Read all warnings and instructions in this manual and in the spray gun manual before using the equipment. **Save these instructions.**

*100 psi (0.7 MPa, 7.0 bar) Maximum
Fluid Working Pressure
100 psi (0.7 MPa, 7.0 bar) Maximum Air
Working Pressure*

See page 5 for model information.



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Contents

Related Manuals	3	Clean the Screen Surface	41
Isolation System Overview	4	Update the System Software	41
How the Isolation System Works	4	Run Menus	45
Spraying Waterborne Fluids		Home Screen	45
Electrostatically	4	Events Screen	50
Models	5	Status Screens	50
Warnings	6	Setup Menus	52
Component Identification	9	Presets	52
Typical Installation	10	Purge Screens 1–5	53
Optional Multiple Gun Installation	11	Pump Screens	54
Installation	13	Advanced Screens	55
System Requirements	13	Calibrate Screens	57
Display Warning Signs	13	Maintenance Screens	59
Installation Location	13	System Screen	65
Install the System	13	Maintenance	66
Ventilate the Spray Booth	13	Routine Maintenance	66
Mount the Cabinet	14	Prepare the System for Service	67
Install the Light Tower	15	Check for Fluid Leaks	67
Grounding	16	Replace the Wash Fluid	68
Connect the Hoses	17	Check and Lubricate the Ground Rod	69
Connect the CAN Cables	23	Check the Bleed Resistor	69
Connect the Power Supply	24	Check the Door Switch	69
Install the Optional System Stop Pneumatic		Troubleshooting	70
Input Kit	25	General Troubleshooting	70
Wire the System Stop Digital Input	26	LED Diagnostic Information	74
Install the Optional System Status		Troubleshooting the Control Interface	74
Output	26	Voltage Loss Troubleshooting	75
Wire the Low Paint Digital Output	27	Troubleshooting Color Change Solenoid	
Check the Grounding of the Spray Gun and		Valves	77
Isolation System	28	Error Codes	80
Flush the Equipment Before First Use	28	Repair	89
Operation	29	Prepare the Isolation System for	
Operation Overview	29	Service	89
Fluid Voltage Discharge and Grounding		Service the Isolation Valve	90
Procedure	29	Service the Isolation Fluid Pump	100
Pressure Relief Procedure	30	Service the Electrical Controls	105
Flush the System (Systems without Color		Pneumatic Connections	109
Change)	31	Wiring Connections	110
Flush the System (Color Change Enabled		Color Change: Pneumatic and Wiring	
Systems)	32	Connections	112
Prime the Isolation System	33	Parts	113
Spray with the Isolation System	33	Isolation System	113
Adjust the Gun Fluid Settings	34	25N030 Isolation Valve Parts	119
Shutdown	35	25N031 Isolation Fluid Pump Parts	121
Control Interface	36	Electronic Control Parts	123
Menu Bar	37	Repair Kits and Accessories	125
Soft Key Icons	37	Accessories	125
Navigate the Screen	37	Kit 26B400, Supply Pump	127
Run Screens and Setup Screens	38	Color Change Kit 26B415	128
Control Interface Setup and Maintenance	39	Isolation Valve Kits	132
Enable USB Data	39	Isolation Fluid Pump Kits	134
USB Logs	39	Performance	135
System Configuration Settings File	39	Ignitability of Coating Materials	136
Custom Language File	39	Dimensions	137
Download System Data	40	Technical Specifications	138
Upload System Configuration	41		

California Proposition 65	139	Graco Standard Warranty.....	140
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Related Manuals

Manual in English	Description
312782	Air Actuated Dispense Valve
312783	Color and Catalyst Change Valve Stacks
3A1244	Graco Control Architecture™ Module Programming
333012	Pro Xp™ Auto Waterborne Gun
332992	Pro Xpc™ Auto Gun
333266	Pro Xpc Electrostatic Controller
334452	ProBell® Rotary Applicator
334626	ProBell Hollow Wrist Rotary Applicator
3A3657	ProBell Electrostatic Controller
307212	Stainless Steel, Waterbase Compatible Fluid Pressure Regulators
309455	Test Fixture, High Voltage Probe, and kV Meter

Isolation System Overview

How the Isolation System Works

When using a HydroShield Air Spray Waterborne Isolation System, the fluid supply remains grounded. The fluid supply can be any pump or circulation system. When the isolation system has filled with paint, the isolation valve separates and raises. This allows the fluid inside the isolation system to become electrostatically charged when the gun is triggered. The charged fluid is attracted to the grounded workpiece, wrapping around and evenly coating all surfaces. When the gun trigger is released, the isolation fluid pump automatically refills.

Spraying Waterborne Fluids Electrostatically

This isolation system and electrostatic air spray gun are designed to spray **only** waterborne fluids which meet at least one of the following flammability requirements:

- Material does not sustain burning in accordance with the Standard Test Method for Sustained Burning of Liquid Mixtures, ASTM D4206.

- **CE-EN 50348 Compliant:**

Material is classified as non-ignitable as defined by EN 50059: 2018.



See [Ignitability of Coating Materials, page 136](#).

When an electrostatic gun is connected to a voltage isolation system, all of the fluid in the spray gun, fluid hose, and isolated fluid supply is charged to high voltage, which means that the system has more electrical energy than a solvent-based system. Therefore, only non-flammable fluids (as defined under [Models, page 5](#)) can be sprayed with the system or be used to clean, flush, or purge the system.

Precautions must be taken when using electrostatic waterborne equipment to avoid potential shock hazards. When the spray gun charges the isolated fluid to high voltage, it is similar to charging a capacitor or a battery. The system will store some of the energy while spraying and retain some of that energy after the spray gun is shut off. Because it takes some time for that stored energy to discharge, it is important to read the instructions, including the [Fluid Voltage Discharge and Grounding Procedure, page 29](#), and [Grounding, page 16](#), to understand when you can approach or touch the gun nozzle. The amount of time it takes to discharge the energy depends on the system design. Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#), before approaching the front of the gun.

Models






Must purchase gun and hoses separately.









Part	Description	Fluid regulator	Color change
WABL00	Isolation cabinet for automatic air spray.	✓	—
WABL01	Isolation cabinet for automatic air spray without fluid regulation.	—	—
WABL02	Isolation cabinet for automatic air spray, equipped with color change inlet valves.	✓	✓
WABL03	Isolation cabinet for automatic air spray without fluid regulation, equipped with color change inlet valves.	—	✓
 	Condition for non-flammability: Models are compliant with EN 50348 when used with fluids that meet the following criteria: <ul style="list-style-type: none"> • Material is classified as non-ignitable as defined by EN 50059: 2018. For more information, see Ignitability of Coating Materials, page 136 .		








* Systems with color change inlet valves installed include six fluid valves which allow the use of three colors and purge sequences. These systems are also equipped for dump valve operation. See the color change kit information in [Accessories, page 125](#).

Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

 <h2 style="margin: 0;">WARNING</h2>	
<div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;"></div> <div></div>	<h3>FIRE AND EXPLOSION HAZARD</h3> <p>Combustible dust or flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> Fluids used must meet the appropriate flammability requirements: <ul style="list-style-type: none"> Material does not sustain burning in accordance with the Standard Test Method for Sustained Burning of Liquid Mixtures, ASTM D4206. CE-EN 50348 Compliant: Material is classified as non-ignitable as defined by EN 50059: 2018. Electrostatic equipment must be used only by trained, qualified personnel who understand the requirements of this manual. Stop operation immediately if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem. Check gun resistance, hose resistance, and electrical grounding daily. Use and clean equipment only in well ventilated area. Interlock the gun air supply to prevent operation unless ventilation air flow is above the minimum required value. Only use non-flammable solvents when flushing or cleaning equipment. Only use the red-colored Graco electrically conductive gun air hose with this gun. Do not use black or gray-colored Graco air hoses. Do not use pail liners unless they are conductive and grounded. Always turn the electrostatics off when flushing, cleaning or servicing equipment. Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc). Do not plug or unplug power cords or turn lights on or off when flammable fumes are present. Keep work area free of debris, including solvent, rags and gasoline. Keep a working fire extinguisher in the work area.

 <h1>WARNING</h1>	
 	<p>ELECTRIC SHOCK HAZARD</p> <p>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock:</p> <ul style="list-style-type: none"> • Turn off and disconnect power cord before servicing equipment. • Connect only to grounded electrical outlets. • Use only 3-wire extension cords. • Ensure ground prongs are intact on power and extension cords. • Do not expose to rain. Store indoors. • Ground all equipment, personnel, object being sprayed, and conductive objects in or close to spray area. See Grounding instructions. • All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations. • Follow the Fluid Voltage Discharge and Founding Procedure when instructed to discharge the voltage; before cleaning, flushing, or servicing the system; before approaching the front of the gun; and before opening the isolation enclosure for the isolated fluid supply. • Do not touch the gun nozzle or electrode, or come within 4 in. (102 mm) of the electrode during gun operation. Follow the Fluid Voltage Discharge and Founding Procedure. • Only use the red-colored Graco electrically conductive gun air hose with this gun. Do not use black or gray-colored Graco air hoses. • Do not splice hoses together. Install only one continuous Graco waterborne fluid hose between the isolated fluid supply and the spray gun.
 	<p>MOVING PARTS HAZARD</p> <p>Moving parts can pinch, cut or amputate fingers and other body parts.</p> <ul style="list-style-type: none"> • Keep clear of moving parts. • Do not operate equipment with protective guards or covers removed. • Equipment can start without warning. Before checking, moving, or servicing equipment, follow the Pressure Relief Procedure and disconnect all power sources.
  	<p>PRESSURIZED EQUIPMENT HAZARD</p> <p>Fluid from the equipment, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.</p> <ul style="list-style-type: none"> • Follow the Pressure Relief Procedure when you stop spraying/dispensing and before cleaning, checking, or servicing equipment. • Tighten all fluid connections before operating the equipment. • Check hoses, tubes, and couplings daily. Replace worn or damaged parts immediately.

 <h1>WARNING</h1>	
 	EQUIPMENT MISUSE HAZARD <p>Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> • Do not operate the unit when fatigued or under the influence of drugs or alcohol. • Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Specifications in all equipment manuals. • Use fluids and solvents that are compatible with equipment wetted parts. See Technical Specifications in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) from your distributor or retailer. • Do not leave the work area while equipment is energized or under pressure. • Turn off all equipment and follow the Pressure Relief Procedure when equipment is not in use. • Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only. • Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards. • Make sure all equipment is rated and approved for the environment in which you are using it. • Use equipment only for its intended purpose. Call your distributor for information. • Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces. • Do not kink or over bend hoses or use hoses to pull equipment. • Keep children and animals away from work area. • Comply with all applicable safety regulations.
 	PLASTIC PARTS CLEANING SOLVENT HAZARD <p>Many solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.</p> <ul style="list-style-type: none"> • Use only compatible water-based solvents to clean plastic structural or pressure-containing parts. • See Technical Specifications in all equipment manuals for materials of construction. Consult the solvent manufacturer for information and recommendations about compatibility.
	TOXIC FLUID OR FUMES <p>Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.</p> <ul style="list-style-type: none"> • Read Safety Data Sheets (SDSs) to know the specific hazards of the fluids you are using. • Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.
	PERSONAL PROTECTIVE EQUIPMENT <p>Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This protective equipment includes but is not limited to:</p> <ul style="list-style-type: none"> • Protective eyewear and hearing protection. • Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Component Identification

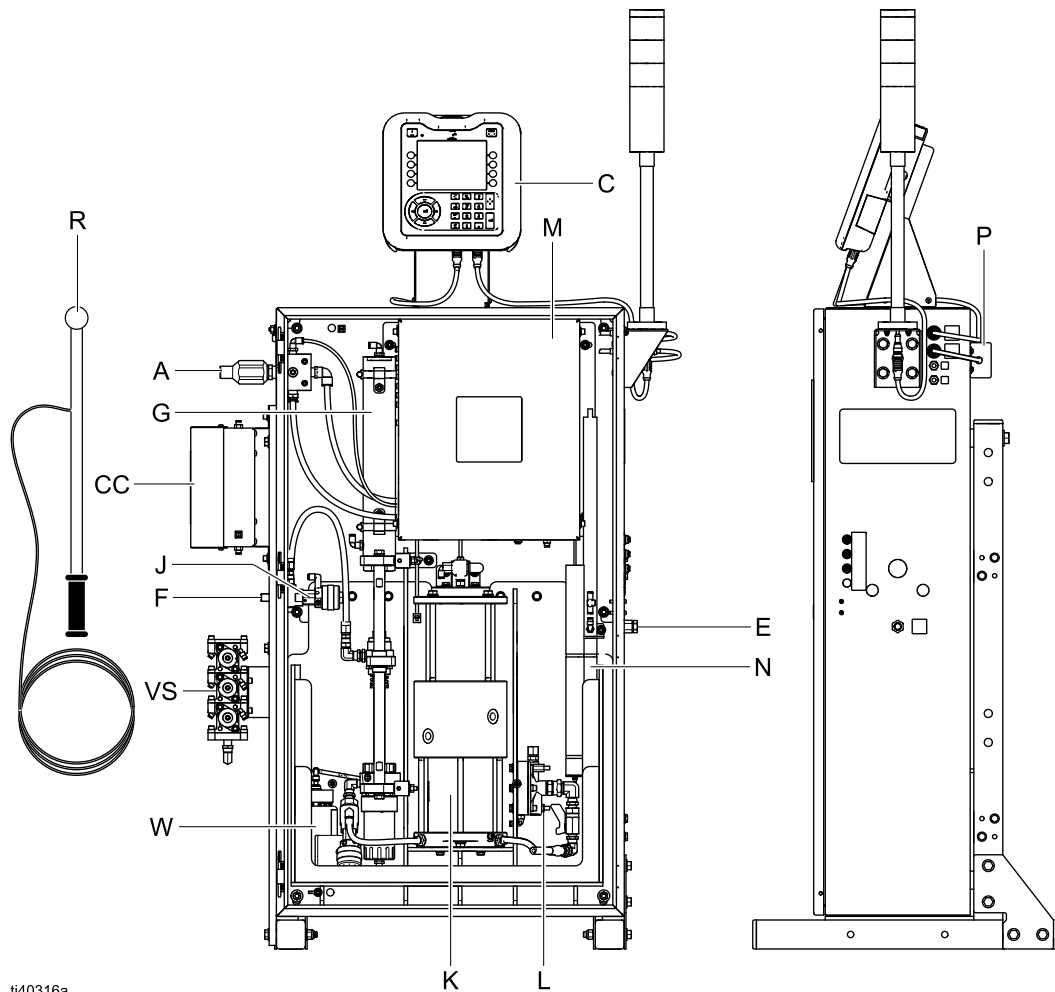


Figure 1 Components of the Automatic Air Spray Isolation System.

Key

Item	Description
A	Air Inlet
C	Control Interface
CC	Color Change Module (on color change enabled systems)
E	Fluid Outlet to Gun
F	Fluid Inlet
G	Isolation Valve
J	Fluid Inlet Valve
K	Isolation Fluid Pump

Item	Description
L	Fluid Pressure Regulator
M	Electronics Panel
N	Ground Rod and Bleed Resistor
P	Power Supply
R	Hand-held Grounded Rod
VS	Color Change Valve Stack (on color change enabled systems)
W	Wash Fluid Bottle

Typical Installation

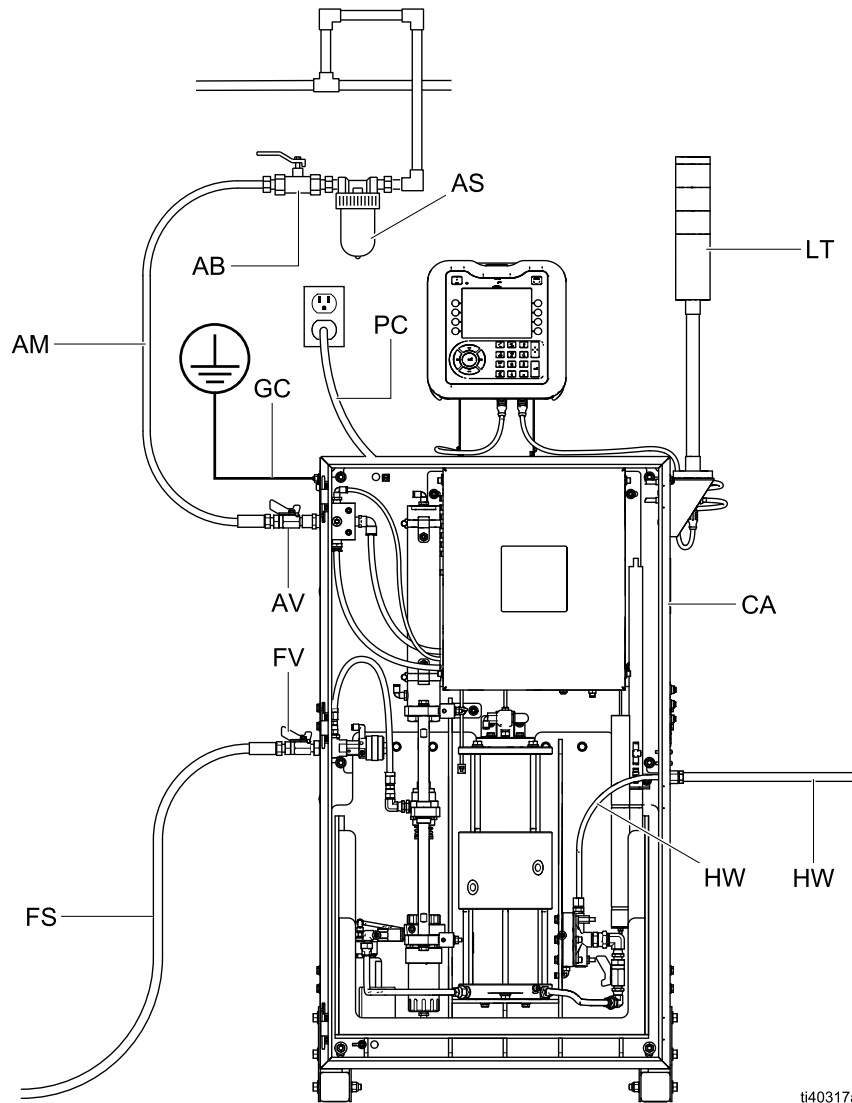


Figure 2 Typical Installation, Automatic Air Spray Batch Waterborne Isolation System, Non-Hazardous Location

Key




Item	Description
AB †	Bleed Type Air Valve
AM †	Main Air Supply Line
AS †	Oil Separator
AV ❖	Air Shut-off Valve
CA	Isolation Cabinet
FS †	Fluid Supply Line
FV ❖	Fluid Shut-off Valve

Item	Description
GC	Ground Lug
HW	Graco Waterborne Fluid Hose
LT	Light Tower
PC	Power Cord

† Required, not supplied.

❖ Optional, not supplied.

Optional Multiple Gun Installation

				
<p>Charged components, such as guns, regulators, and manifolds, may cause electric shock, fire, or explosion. Isolate all charged components and joints in the hose to prevent injury or equipment damage. See System Requirements, page 13.</p>				

The automatic version of the HydroShield can be used with up to 4 applicators (ME). A single waterborne fluid hose (HW) comes out of the system and then splits into individual hoses to each applicator.

Any location where there is a joint in the waterborne fluid hose must be electrically isolated from all grounded objects. Charged components, such as

fluid regulators (L) in the example, should be installed in an enclosure or location that prevents users from coming in contact with charged components any time electrostatics are in use. It is up to the person installing the system to accomplish this.

Minimize the total length of the fluid hose as much as possible. This helps reduce fluid pressure drop to the applicator and lowers the discharge energy of the system.

The HydroShield only has one set of paint trigger and electrostatic inputs and outputs. Connect all paint trigger signal lines together before connecting to the system. The same should be done with the electrostatic request and enable signals. When one applicator is operating, all applicators are assumed to be operating. The same is true regarding charged components as they are all electrically connected by the conductive waterborne fluid.

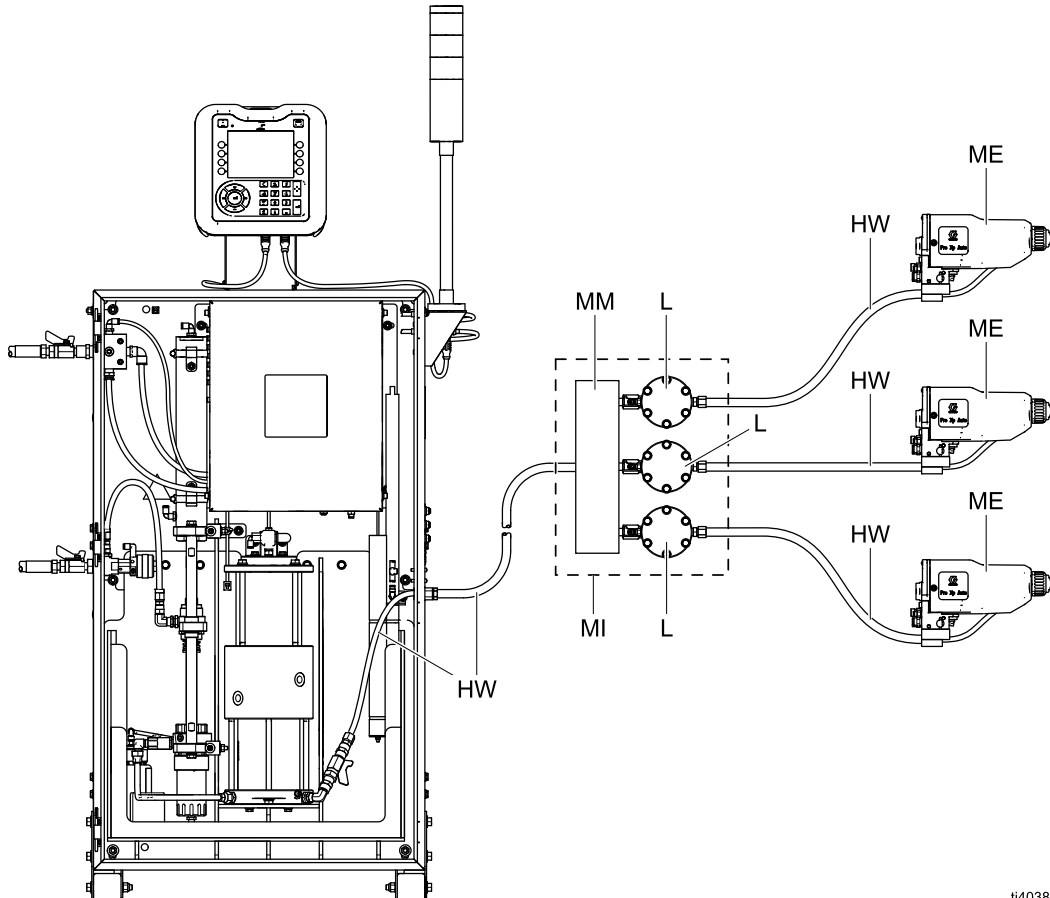


Figure 3 Multiple Gun Installation Example

Key

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Typical Installation

Item	Description
HW	Graco Waterborne Fluid Hose
L	Fluid Pressure Regulator
ME	Electrostatic Applicator

Item	Description
MI	Isolated Region
MM	Fluid Manifold

Installation

System Requirements

				
<p>The use of multiple guns with one isolation cabinet increases the risk of electric shock, fire, or explosion. When one gun is charged all guns are charged. Be sure all guns are in a safe operating zone when voltage is applied.</p>				

The Graco voltage isolation system has the following features:

- An isolation cabinet that prevents persons from making contact with the high voltage components before the system voltage is discharged. All components of the isolation system that are charged to high voltage are contained within the cabinet.
- A bleed resistor that drains off the system voltage when the spray gun is not in use. All metal parts that contact high voltage fluid are electrically connected to the bleed resistor.
- A door switch interlock that automatically discharges the system voltage any time the isolation cabinet door is open.

Note: The Graco warranty and approvals are void if a non-Graco electrostatic spray gun or applicator is connected to the voltage isolation system or if the gun is operated above 60 kV.




Display Warning Signs

Mount warning signs in the spray area where they can easily be seen and read by all operators. Each Graco gun, sold separately, includes a warning sign.

Installation Location






Position the isolation system as close to the spray area as feasible to minimize the hose length to the gun. Minimizing the hose length minimizes the system charge and discharge time. Position the supply pump as close as possible for the fastest fill time. Install in a non-hazardous location.

Install the System

				
<p>Installing and servicing this equipment requires access to parts which may cause electric shock or other serious injury if work is not performed properly.</p> <ul style="list-style-type: none"> • Do not install or service this equipment unless you are trained and qualified. • Comply with all local codes and regulations. 				

The figure in [Typical Installation, page 10](#), shows a typical waterborne automatic batch system. It is not an actual system design.

Ventilate the Spray Booth

				
<p>Do not operate the gun unless ventilating air flow is above the minimum required value. Provide fresh air ventilation to avoid the buildup of flammable or toxic vapors when spraying, flushing, or cleaning the gun. Interlock the gun air and fluid supply to prevent operation unless ventilating air flow is above the minimum required value.</p>				

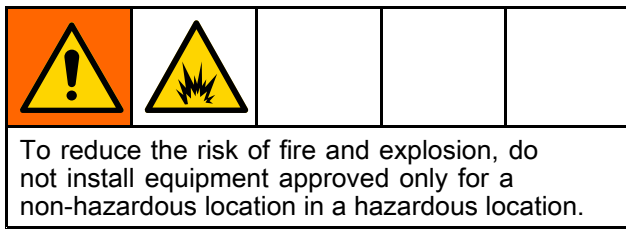
The spray booth must have a ventilation system that reliably collects and removes overspray.

Electrically interlock the gun air and fluid supply with the ventilators to prevent gun operation any time that the ventilation air flow falls below minimum values. Check and follow all local codes and regulations regarding air exhaust velocity requirements. Verify the operation of the interlock at least once a year.

Note

High velocity exhaust air can decrease the operating efficiency of the electrostatic system.

Mount the Cabinet



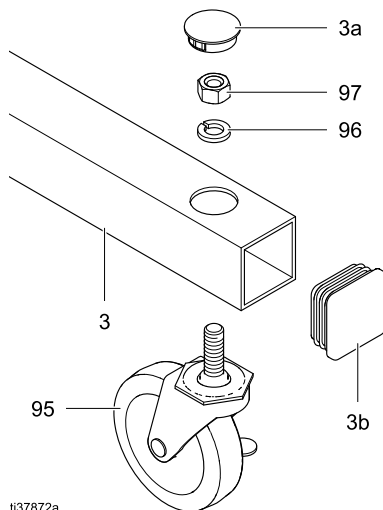
Mount the cabinet on the wheels, on the wall, or on the floor.

Always use proper equipment, such as a forklift, to move or lift the system.

Install the Optional Wheels

Install wheels to help with installation.

1. With two people, remove the system from the pallet.
2. Install the wheels (95), washers (96), and nuts (97). Tighten the nuts securely.
3. Install the end plugs (3a, 3b).
4. When the system is in the desired location, lock all four wheels.



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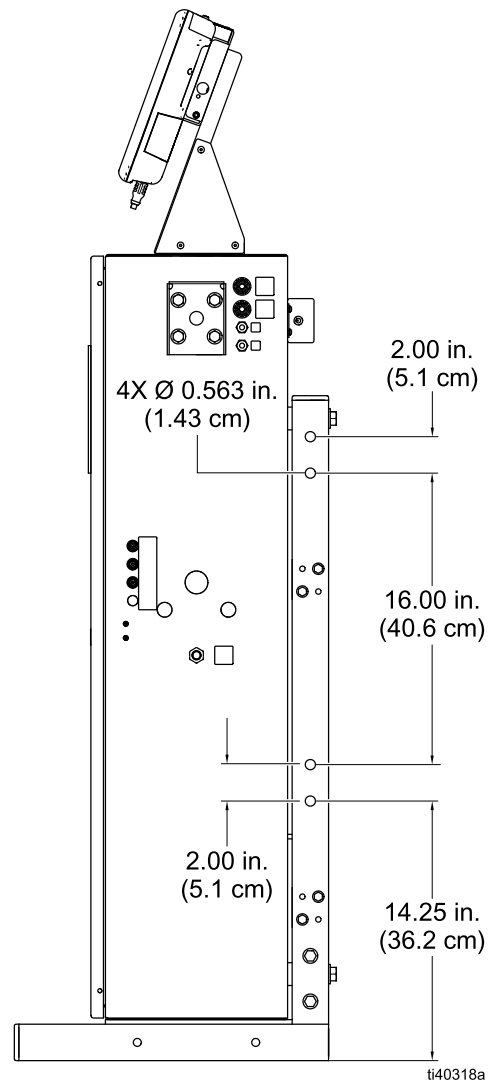
Figure 4 Wheel Mount Parts

Mount on the Wall

Before mounting the isolation cabinet to the wall, make sure that the wall can support the weight of the system. See [Technical Specifications, page 138](#) for the weight.

1. Select and attach the appropriate mounting hardware to the stand.
2. Drill holes into the wall based on the selected hardware.

A mounting hole pattern is provided on each side of the frame.



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Figure 5 Hole Pattern for Wall Mounting

3. With two people, remove the isolation system from the shipping pallet.

4. Remove the feet (3a, 3b, 3c) from the frame.

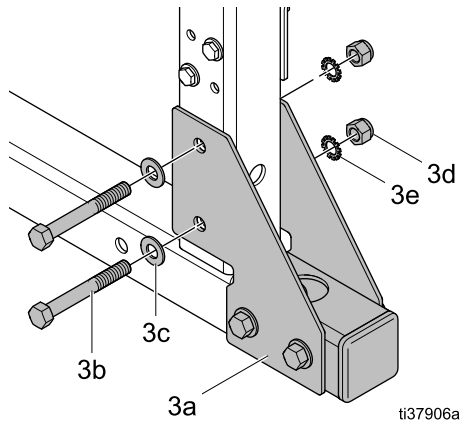


Figure 6 Removing the Frame Feet

5. Secure the system to the wall.

Mount on the Floor

1. Use the bolt pattern to drill holes into the floor.

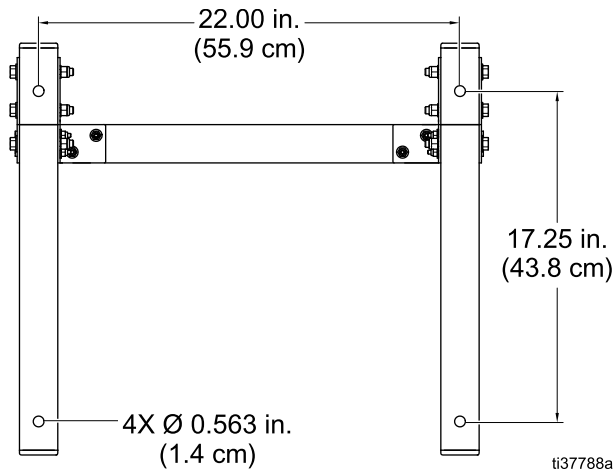


Figure 7 Bolt Pattern for Floor Mounting

2. With two people, remove the isolation system from the shipping pallet.
3. Secure the system to the floor.

Install the Light Tower

The system is equipped with a light tower which indicates how much paint is in the isolation fluid pump (K) as it fills and dispenses.

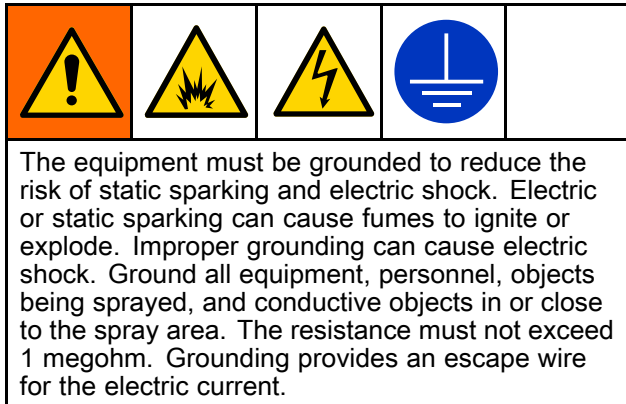
1. Locate the light tower bracket (61) on the isolation cabinet (1). Use screws (66), washers (67), and nuts (68) to mount the light tower (114) onto the light tower bracket (61).

The light tower bracket can be removed from the isolation cabinet and installed in another location. If relocated, make sure that the light tower is installed in a non-hazardous location and that the painter can see it from the spray booth.

Longer extension cables are available. See [Accessories, page 125](#).

2. Connect the light tower CAN cable (114) to the controller (42) fitting so the isolation system can communicate with the light. See [Connect the CAN Cables, page 23](#). Longer cables are available.

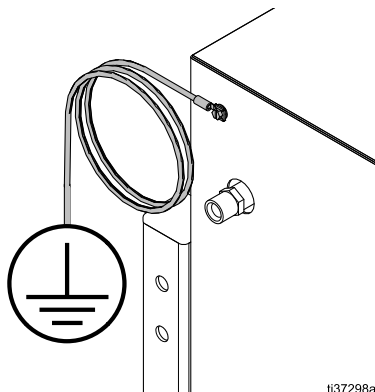
Grounding



When operating the electrostatic gun, any ungrounded objects (such as people, containers, and tools) in the spray location can become electrically charged.

The following are minimum grounding requirements for a basic electrostatic system. Your system may include other equipment or objects which must be grounded. Your system must be connected to a true earth ground. Check ground connections daily. Check your local electrical codes and regulations for detailed grounding instructions.

- **Isolation cabinet:** Connect the system ground wire to a true earth ground. Do not disconnect or tamper with the internal ground wire connections inside the cabinet. For more information, see [Troubleshooting HydroShield Voltage, page 76](#).

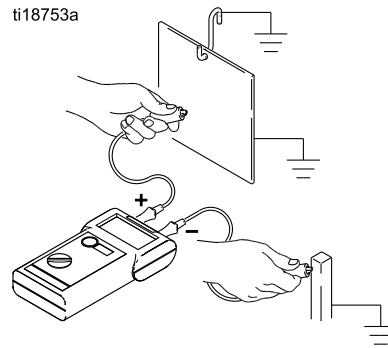


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After grounding the system, check the resistance between the exterior of the isolation cabinet and a true earth ground. The resistance must be less than 100 ohms.

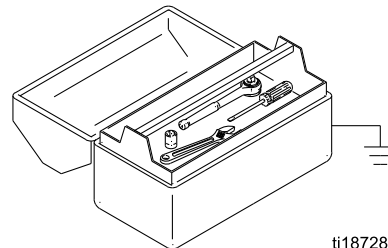
- **Fluid supply:** Ground the fluid supply by connecting a ground wire and clamp. See your fluid supply instruction manual for grounding instructions.

- **Power supply:** The power supply is grounded through the power cord to a grounded outlet.
- **Spray gun:** Ground the gun according to the spray gun instruction manual.
- **Waterborne fluid hose:** The hose must be properly grounded through the conductive layer.
- **Object being sprayed:** Keep the workpiece hangers clean and grounded at all times.



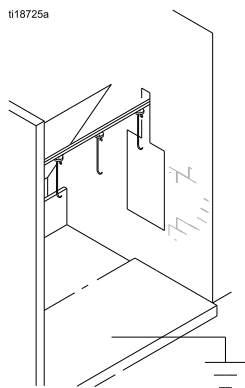
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- **All electrically conductive objects or devices in the spray area:** These items must be properly grounded.

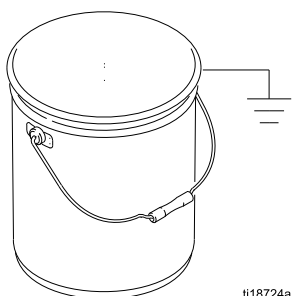


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- **Fluid and waste containers:** Ground all fluid and waste containers in the spray area. Do not use pail liners unless they are conductive and grounded. When flushing the spray gun, the container used to catch the excess fluid must be electrically conductive and grounded.
- **Air compressors:** Ground the equipment according to the manufacturer's recommendations.
- **All air lines:** These must be properly grounded. Use only grounded hoses with a maximum of 100 feet (30.5 m) combined hose length to ensure grounding continuity.
- **Floor of the spray area:** The floor must be electrically conductive and grounded. Do not cover the floor with cardboard or any non-conductive material which would interrupt grounding continuity.



- *All solvent pails:* Use only grounded metal containers, which are conductive. Do not use plastic containers. Use only non-flammable solvents. Do not store more than the quantity needed for one shift.



- All persons entering the spray area must wear shoes having conductive soles such as leather, or wear personal grounding straps. Do not wear shoes with non-conductive soles such as rubber or plastic.

Connect the Hoses

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To reduce the risk of electric shock, install only one continuous Graco waterborne hose between the isolation cabinet and the gun. Do not splice hoses together.

Always use a Graco waterborne fluid hose between the fluid outlet on the isolation cabinet and the gun fluid inlet.

If using multiple guns or a remote mounted fluid regulator make sure the hose connections are electrically isolated and properly discharged before any maintenance is performed.

When setting up the isolation system for the first time, connect the hoses in the following order:

1. Fluid hose from the gun to the isolation cabinet. See [Connect the Fluid Hose from the Gun to the Cabinet, page 18](#).
2. Air hose from the air supply to the isolation cabinet. See [Connect the Air Supply Hose to the Cabinet, page 22](#).
3. Fluid hose from the fluid supply to the isolation cabinet. See [Connect the Fluid Supply Hose to the Cabinet, page 22](#).

Note

- If the fluid hose must pass through the wall of a booth to the isolation cabinet, make sure that the hole through the booth wall does not have sharp edges that could damage the hose.
- The holes in the wall must be large enough to allow the hose fittings to pass through.

Connect the Fluid Hose from the Gun to the Cabinet

1. Blow the waterborne fluid hose out with air and flush with flushing fluid to remove contaminants.
2. Connect the Graco waterborne fluid hose to the gun as described in the spray gun manual. See the spray gun manual for hose information and dimensions.
3. Connect the fluid hose to the fluid pressure regulator inside the isolation cabinet. Before entering the cabinet:
 - a. Follow the [Fluid Voltage Discharge and Grounding Procedure](#), page 29.
 - b. Follow the [Pressure Relief Procedure](#), page 30.
 - c. Open the cabinet and slide the electrostatic shield (12) up to remove.
4. Remove the fluid outlet strain relief ferrule (38) from the strain relief housing.

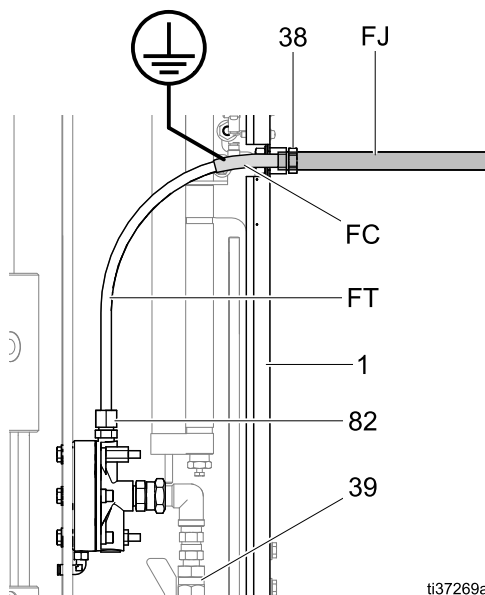


Figure 8 Shielded Hose Connection with Fluid Regulator

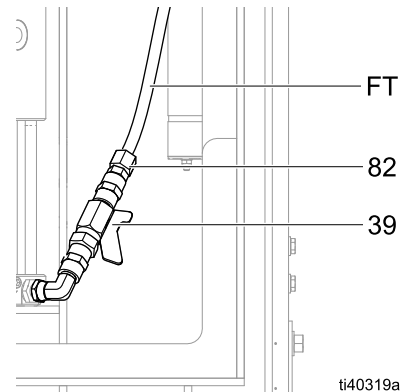


Figure 9 Shielded Hose Connection without Fluid Regulator

5. Slide the strain relief ferrule (38) over the conductive hose layer (FC) until it reaches the abrasion layer (FJ)

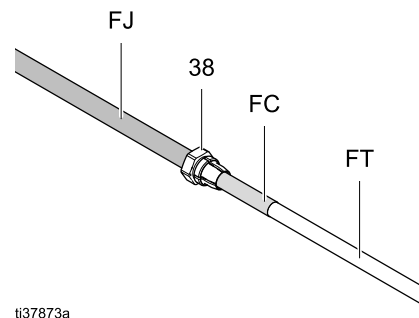


Figure 10 Fitting to Abrasion Layer on Waterborne Fluid Hose

6. In this position, the fitting clamps onto the conductive segment (FC) of the hose when tightened.

<p>Conductive hose layer (FC) must be grounded through its connection to the isolation system's grounded cabinet (CA). To maintain grounding continuity, the conductive hose layer (FC) must be engaged in the ferrule when the strain relief nut is tightened. Failure to properly install the hose in the strain relief could result in an electric shock.</p>				

7. Feed the hose tube (FT) through the strain relief housing into the cabinet until it reaches the tube compression fitting (82) on the fluid regulator or pump outlet fittings. Unscrew the nut portion of the fitting. The nut portion is comprised of 3 pieces (82a, 82b, 82c).

8. Slide the nut (82a) onto the fluid hose, followed by the front ferrule (82b), and then the back ferrule (82c). The wider side of each ferrule (82b, 82c) faces the nut (82a).

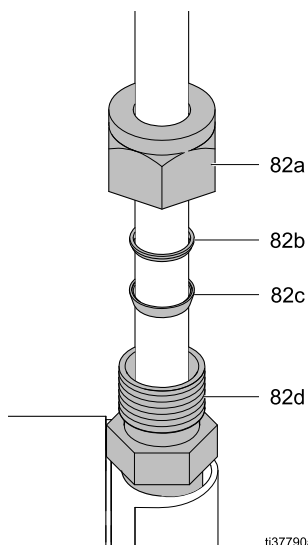


Figure 11 Ferrule Orientation on the Fluid Hose

9. Pull the nut (82a, 82b, 82c) back from the end of the hose. Insert and push the hose (FT) down onto the tube compression fitting (82) until it is fully seated in the fitting body (82d). Use a wrench to tighten the fitting to 55 in-lb (6.2 N•m).
10. Thread the strain relief ferrule (38) into the strain relief housing and tighten to 55 in-lb (6.2 N•m). To avoid cutting the hose, do not overtighten.
11. Make sure that the ball valve (39) is open (handle up) to allow fluid to flow.
12. Reinstall the electrostatic shield (12) inside the cabinet.
13. Close the cabinet door and use a flat blade screwdriver to secure the door shut.

Connect the Paint Trigger Input

The system relies on a pneumatic paint trigger signal to know when to dispense paint. When the paint trigger signal is removed it knows it can begin the refill process.

1. Tap into the paint trigger air line going to the spray gun.
2. Run a 5/32" air line from the spray gun's paint trigger line to the HydroShield.
3. Plug the 5/32" air line into the paint trigger input (PTI) port on the right side of the system.

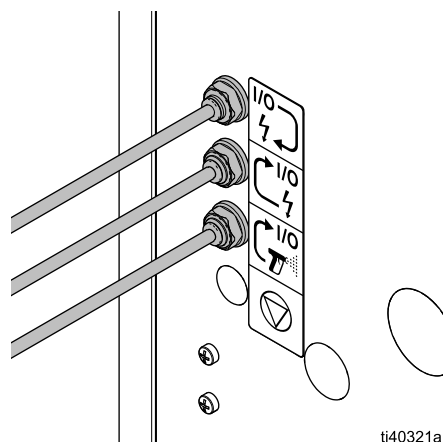


Figure 12 Air Line Connections

Connect the Electrostatic Request Input

The system needs to know when the use of electrostatics is desired. With this signal the system will confirm the request and enable an electrostatic output if Spray mode is active. Connect the signal that would normally enable electrostatics to this input. There are pneumatic and electrical options for this input.

Pneumatic Input

1. Connect a 5/32" air line to the electrostatic request input (ERI) port as shown in [Connect the Paint Trigger Input, page 19](#).
2. Supply air pressure above 70 psi (.5 MPa, 4.8 bar) to activate the input.

Electrical Input

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Run two wires through the I/O port strain relief on the right side of the system.

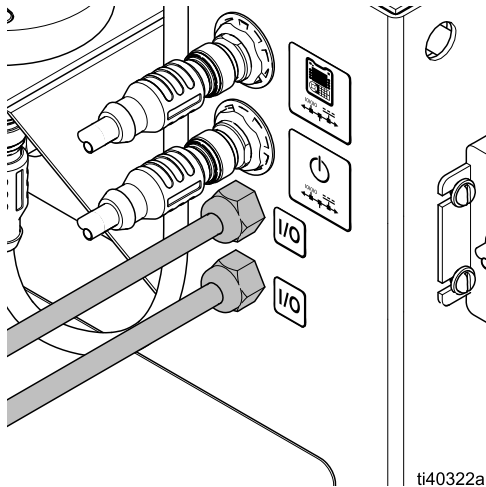
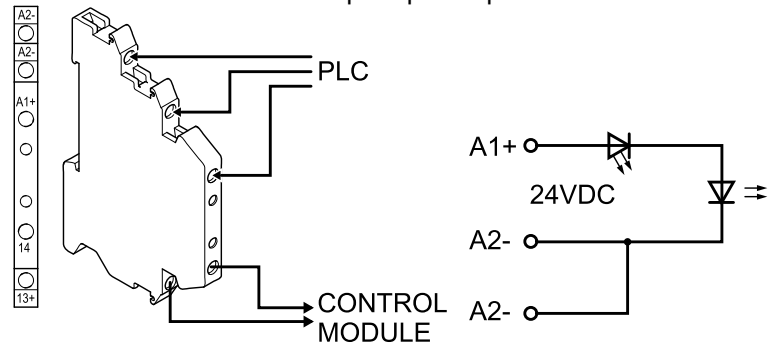


Figure 13 I/O Ports

3. Feed these wires through the top right opening in the electronics control panel.
4. Connect the 24 VDC signal to A1+ and GND to A2- of the electrostatic input optocoupler.



Only one A2- port needs to be connected to GND, as the two ports labeled A2- are connected internally.

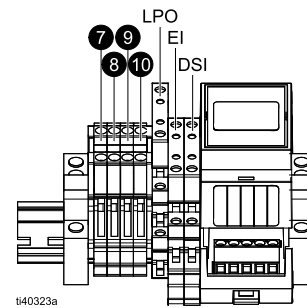


Figure 14 Terminal Block Wiring

LPO: Low Paint Output

EI: Electrostatic Input

DSI: Digital Stop Input

5. Apply 24 VDC to A1+ to activate the input.

Connect the Electrostatic Enable Output

When the electrostatic request input is active and the system is in Spray mode, the electrostatic enable output will be active. This will signal the spray gun to turn on electrostatics. Connect this signal to the device that normally turns on the gun's electrostatics. There are pneumatic and electrical options for this output.

Pneumatic Output

1. Connect a 5/32" air line to the electrostatic enable output (EEO) port on the right side of the cabinet. See [Air Line Connections](#).
2. Run this line to the input of the device that activates electrostatics.

Note

Plug this port if it is not being used. It will be pressurized every time the electrostatic enable output (EEO) port is active even when using the electrical output.

Electrical Output

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Run two wires through the I/O port strain relief on the right side of the system. See [I/O Ports](#).
3. Feed these wires through the top right opening in the electronics control panel.
4. Connect terminal block 7 to the gun's electrostatic controller. When the output is inactive terminal block 7 has 4-5 volts present. When the output is active there is 24V present. See [Terminal Block Wiring](#).
5. Connect terminal block 8 to GND.

Note

When used with Graco electrostatic controllers, terminal block 7 signal voltage is optically isolated at the controller. If using any other controller be sure to use an optocoupler at the input to the device.

NOTICE

To prevent damage to equipment, do not use these terminal blocks without an optocoupler present.

Prepare the Isolation Valve Before the First Use

The isolation system may be shipped with a tie wrap holding the isolation valve (G) in the upmost position to prevent movement. Before operation, remove the tie and fill the wash fluid bottle (W).

1. Use a flat blade screwdriver to open the cabinet.
2. Slide the electrostatic shield (12) up to remove.
3. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
4. If a tie wrap is securing the isolation valve (G), cut and remove the tie.
5. Disconnect the push-to-connect tube from the bottle cap of the wash fluid bottle (W).
6. Lift the sealed wash fluid bottle (W) out of the system. Fill it with clean HydroShield cleansing solution above the minimum line marked on the bottle. Replace it in the cabinet.

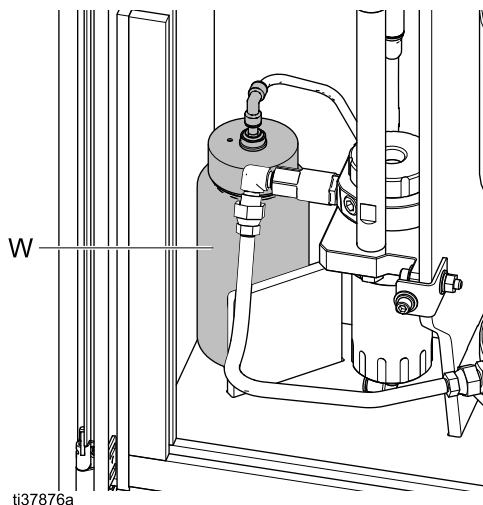


Figure 15 Replacing Wash Fluid Bottle

7. Reconnect the push-to-connect tube to the bottle cap of the wash fluid bottle (W).
8. Replace the isolation valve cover (99) and tighten the top and bottom screws (99a).
9. Reinstall the electrostatic shield (12) inside the cabinet.
10. Close the cabinet door and use a flat blade screwdriver to secure the door shut.

Connect the Air Supply Hose to the Cabinet

Use a wrench to connect the air supply hose between the air supply and the air inlet (A) on the isolation cabinet. The maximum air pressure is 100 psi (0.7 MPa, 7.0 bar). A minimum of 70 psi (0.5 MPa, 5.0 bar) is needed to operate the system.

For best performance use an air supply hose with a minimum inner diameter of 3/8 inch (10 mm). Do not use quick disconnect connectors.

Install a bleed type air valve (AV) near the cabinet to easily turn off the air supply during installation or service.

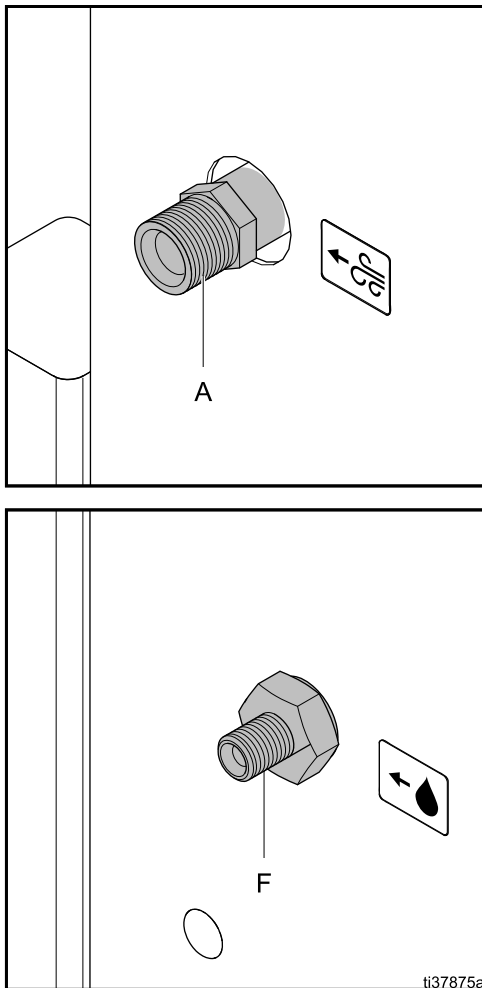


Figure 16 Air and Fluid Inlets

Connect the Fluid Supply Hose to the Cabinet

On systems that are not color change enabled:

Use a wrench to connect the fluid supply hose between the fluid supply and the fluid inlet (F) on the isolation cabinet. The maximum fluid pressure is 100 psi (0.7 MPa, 7.0 bar).

Note

Do not overtighten as this will rotate the inlet valve and cause an issue with the flexible hose on the inside of the cabinet. The valve outlet on the inside of the cabinet should be pointed upward.

Note

For the system to function correctly, the inlet fluid pressure must not exceed the inlet air pressure.

Consider installing a manual fluid shut-off valve (FV) close to the cabinet to easily turn off the fluid supply during installation or service.

On systems that are color change enabled:

Connect the fluid supplies to the inlet color change valves. Ensure that the air line, flush material, and dump hose are connected to the correct color change valves. If the dump valve is not used, plug the fluid port on the dump valve.

Valve Number	Valve Purpose
Valve 1	Air line
Valve 2	Flush material
Valve 3	Dump hose
Valve 4	Color 1
Valve 5	Color 2
Valve 6	Color 3

Connect the CAN Cables

Connect the Control Area Network (CAN) cables to the control interface (42) so that the interface can communicate with the isolation system (1).

1. Connect the power supply CAN cable:
 - a. Locate the CAN cable attached to the power supply (47) on the back of the cabinet.
 - b. Screw the cable into the bottom fitting on the right side of the cabinet, next to the light tower.

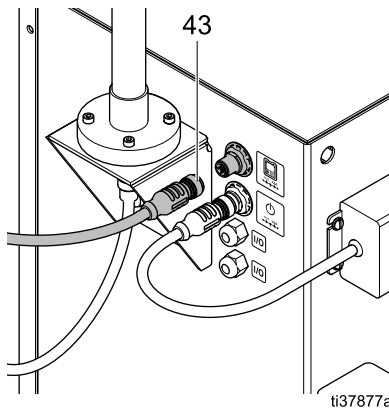


Figure 17 Controller CAN Cable Connections on the Cabinet (no Color Change)

2. The system is equipped with another CAN cable (43) that is used to connect to the control interface:

On systems that are not color change enabled:

- a. Screw one end of the cable (43) into the fitting on the right side of the cabinet.
- b. The bottom of the controller contains two fittings. Screw the other end of the cable (43) into the fitting as shown below.

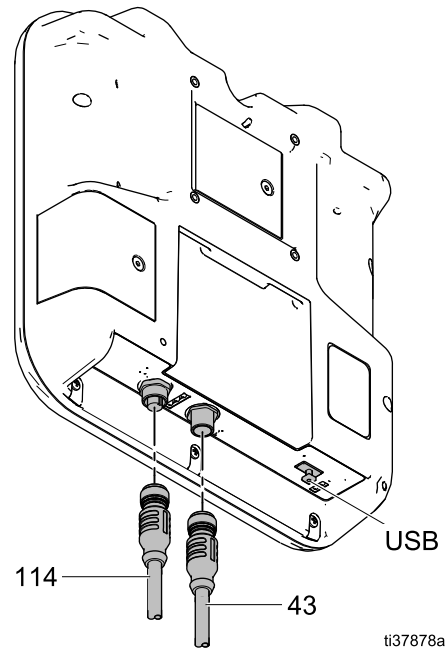


Figure 18 Connections on the Control Interface (Systems without Color Change)

On systems that are color change enabled:

- a. Screw cable (611) into C4 on the color change module. See the parts figure in [Color Change Kit 26B415, page 128](#) and [Color Change: Pneumatic and Wiring Connections, page 112](#).
 - b. Connect C5 from the color change module to the control interface.
3. Insert the controller into the bracket (41) on the top of the cabinet.

To mount the controller in another location, remove bracket (41) from the system and mount it in a convenient location. For information about available alternate length CAN cables, see [Accessories, page 125](#).

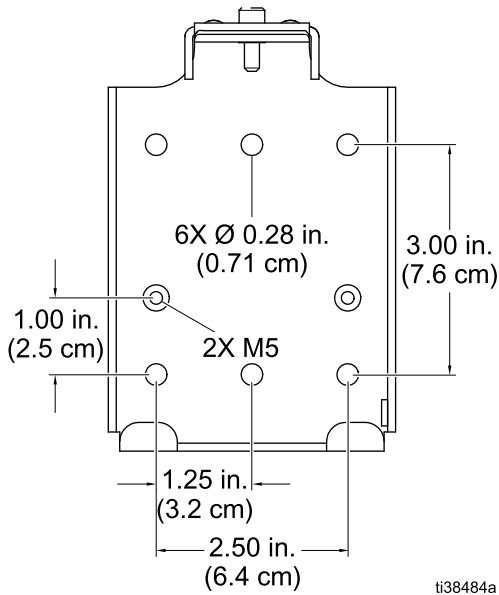


Figure 19 Bracket (41) Mounting Holes

Connect the Power Supply

The power supply (47) with connector (X) is installed at the factory on the back of the isolation cabinet. Power cords with regional plugs are also supplied. Use a supplied power cord or purchase a regional plug separately.

1. Plug the power cord (37) into the power supply connector (X) at the cabinet.
2. Plug the pronged/male end of the power cord (37) into an AC outlet.

When the system is plugged in, the control interface powers up in Off mode.

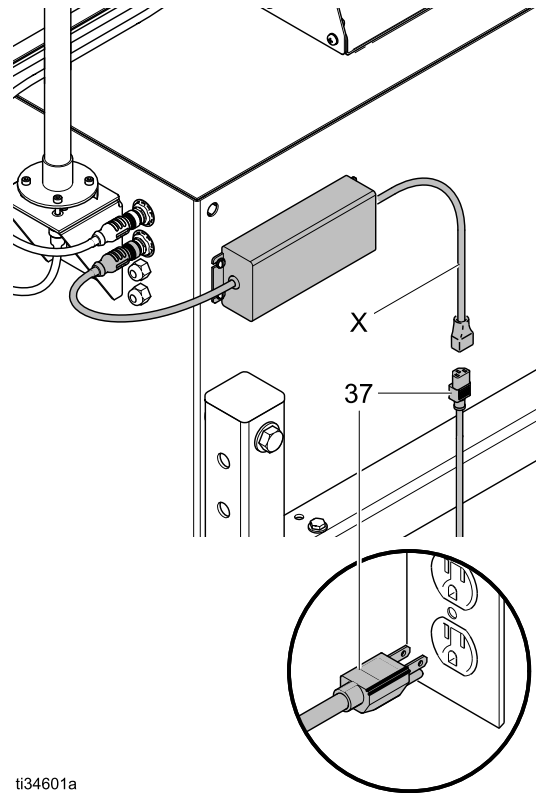


Figure 20 Power Supply Connections


Install the Optional System Stop Pneumatic Input Kit

The optional System Stop Pneumatic Input Kit 26B414 provides a pneumatic means to signal the HydroShield system to stop. This contact is normally open, but turns the system off when activated with a pressure above the set pressure.

If the input is read as CLOSED, it stops system operation and puts the system into Off mode. If the input is read as OPEN, the system operates normally.

The optional System Stop Air input uses a pressure switch to detect the pneumatic signal.

The optional System Stop Air pressure switch does not come pre-installed. Purchase and install kit 26B414 to use the optional System Stop Air input.

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Install two bulkheads in the system. The location is represented by A12 in [Pneumatic Connections, page 109](#). Both locations are labeled with the following red stop symbol :
 - Install one bulkhead into the bottom of the control panel (14).
 - Install one bulkhead on the right side of the cabinet.

3. Mount the air pressure switch to the DIN rail (436) to the right of the other pressure switch(s), as shown in the following figure.

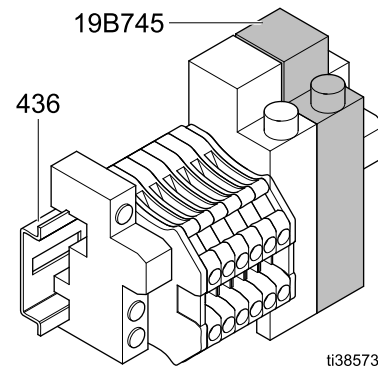


Figure 21 Port Connections for Kit 26B414

4. Remove the wires in the existing terminal blocks and install in the pressure switch ports as shown below:

Pressure Switch Port	Terminal Block
NO	3
COM	4

Air Pressure	System Stop Air State
Less than 70 psi (0.5 MPa, 5.0 bar)	System Stop Air inactive (system run)
Greater than 70 psi (0.5 MPa, 5.0 bar)	System Stop Air activated (system stop)

5. Remove unused terminal blocks after connecting the wires to the pressure switch ports.
6. Connect approximately 1 foot of 5/32" tube from the pressure switch to the bulkhead on the inside of the electronics panel.
7. Connect approximately 2 feet of 5/32" tube from that bulkhead on the electronics panel to the bulkhead on the side of the unit.

Wire the System Stop Digital Input

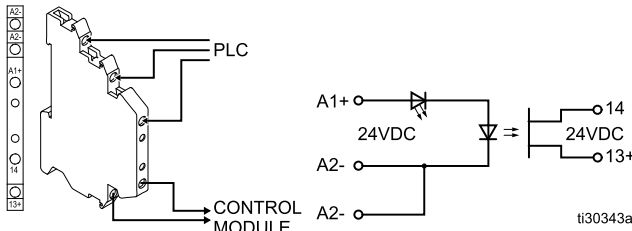
The System Stop Digital input provides a means to signal the HydroShield system to stop. This normally open contact turns the system off when activated. If the input is read as CLOSED, it stops system operation and puts the system into Off mode. If the input is read as OPEN, the system operates normally.

Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service](#), page 105.

The System Stop Digital input uses an optocoupler to protect the HydroShield controls from outside voltages.

Optocoupler Port	Connect to
13+	Control module
14	
A1+	External device or PLC
A2–	

Apply the 24 VDC signal to A1+ and GND to A2–. Only one A2– port needs to be connected to GND, as the two ports labeled A2– are connected internally.



Function	A1+ (relative to A2–)
System Stop: Digital activated (system stop)	24 VDC
System Stop: Digital inactive (system run)	Less than 13.5 VDC

Install the Optional System Status Output

The optional System Status Output provides a means to signal connected devices that the HydroShield is running.

The optional System Status Output optocoupler does not come pre-installed and must be purchased and installed separately. Install kit 24Z226 to use the System Status Output.

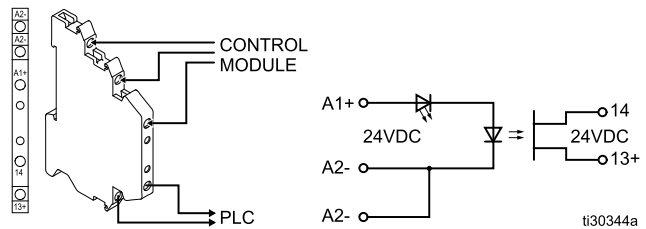
The optional System Status Output is inactive when the system is in Off mode. The optional System Status Output is active in all other operation modes.

The System Status Output uses an optocoupler to protect the HydroShield controls from outside voltages.

- Optocoupler ports A1+ and A2– are wired to the control module.
- Optocoupler ports 13+ and 14 are wired to the external device or PLC.

For active-low signals/sourcing input: Connect GND to 14. Assuming the input signal is at non ground, monitor when 13+ is connected to GND to tell when the System Status output is active.

For active-high signals/sinking input: Connect 24 VDC to 13+. Monitor when 14 is connected to 24 VDC to tell when the System Status Output is active.



Function	A1+ (relative to A2–)	PLC
System Status Output Active	24 VDC	13+ and 14 connected
System Status Output Inactive	Less than 13.5 VDC	13+ and 14 not connected

- Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service](#), page 105.
- Mount the optocoupler (432) to the DIN rail (436) to the right of the other pressure switch(s).

3. Switch the wires over to the new optocoupler ports:

Optocoupler Port	Terminal Block
A1+	5
A2–	6

NOTICE

To prevent damage to equipment, do not use these terminal blocks without an optocoupler present.

4. Remove unused terminal blocks.

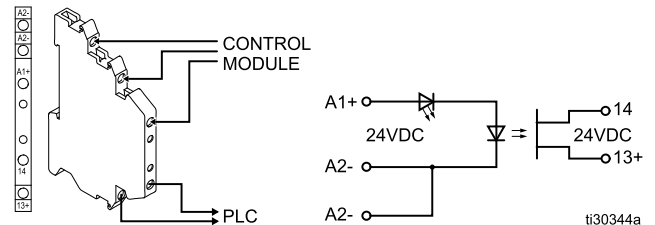
Wire the Low Paint Digital Output

The Low Paint Digital output provides a means to signal when the system is low on paint and when the system has refilled. It is based on the user adjustable "green on" and "red on" light tower settings. The output is active when the red light is on and stays active until the green light turns on. It remains inactive until the reg light turns on again.

Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service](#), page 105.




The System Status Output uses an optocoupler to protect the HydroShield controls from outside voltages.

- Optocoupler ports A1+ and A2– are wired to the control module.
- Optocoupler ports 13+ and 14 are wired to the external device or PLC.



Function	A1+ (relative to A2–)	PLC
Low Paint Output Active	24 VDC	13+ and 14 connected
Low Paint Output Inactive	Less than 13.5 VDC	13+ and 14 not connected

Check the Grounding of the Spray Gun and Isolation System

				
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Megohmmeter Part No. 241079 is not approved for use in a hazardous location. To reduce the risk of sparking, do not use the megohmmeter to check electrical grounding unless:

- The gun has been removed from the hazardous location;
- Or all spraying devices in the hazardous location are turned off, ventilation fans in the hazardous location are operating, and there are no flammable vapors in the location (such as open solvent containers or fumes from spraying).

Failure to follow this warning could cause fire, explosion, and electric shock and result in serious injury.

Graco Part No. 241079 Megohmmeter (AB) is available as an accessory to check that the gun is properly grounded.

1. Have a qualified electrician check the electrical grounding continuity of the spray gun.
2. Turn off the electrostatics.
3. Turn off the air and fluid supply to the gun. Follow the [Pressure Relief Procedure, page 30](#). The fluid hose must be empty.
4. Purge the fluid hose with air, if needed.

5. Follow the spray gun manual to check proper grounding of the spray gun.
6. Use an ohmmeter (or megohmmeter in the ohm range) to measure the resistance between the cabinet ground lug (214) and a true earth ground (CC). The resistance must be less than 100 ohms.

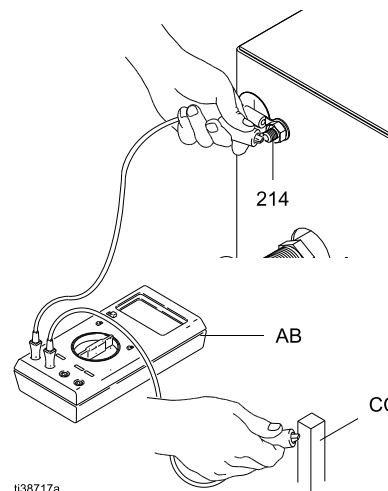



Figure 22 Check the Grounding of the Cabinet

Flush the Equipment Before First Use

The equipment was tested in fluid at the factory. To avoid contaminating your fluid, flush the equipment with flushing fluid before you use the equipment. See [Flush the System \(Systems without Color Change\), page 31](#) or [Flush the System \(Color Change Enabled Systems\), page 32](#).


Operation

Operation Overview


1. Plug in the system. The system powers up and enters Off mode. See [Connect the Power Supply, page 24](#).
2. Verify that the fluid supply and air supply are connected. Press the Power button . The system enters Standby mode.
3. Prime the system. Use the control interface to change the mode to Prime mode. See [Home Screen, page 45](#). Trigger the gun until your material dispenses from the gun.
4. Use the control interface to set the fluid pressure if using a system with a regulator. See [Home Screen, page 45](#).
5. Use the control interface to change the mode to Spray mode. The system begins to fill. See [Home Screen, page 45](#).
6. Request electrostatics and begin to spray.

Note: The system automatically refills when the gun trigger is released, the electrostatic request is disabled, and the fluid level is below the Start Fill setting.



For information about the Start Fill setting, see [Pump Screen 1: Pump Volume, page 54](#).

2. Disable the electrostatic request signal to turn off electrostatics.
3. After the ground rod delay time elapses, the ground rod (N) inside the isolation cabinet lowers and discharges the system. Look at the main system run screen on the control interface to verify that the system is discharged:
 - a. Check that the Ground Rod status indicator shows the ground symbol . See [Run Menus, page 45](#).
 - b. Check that the Voltage Level reading on the control interface reads 0 kV. See [Run Menus, page 45](#).
 - c. Touch the gun electrode to a grounded rod.

Note: If maintenance or service is required inside the isolation cabinet continue with the following steps:





4. Press the Stop button  on the control interface to change to Off mode.
5. Wait one minute before entering the isolation cabinet. Use a flat blade screwdriver to open the cabinet.
6. Use the hand-held grounded rod (R) to dissipate any static discharge in the cabinet before touching any components. Pick up the grounded rod (R) and use it to touch all major components inside the cabinet. For example, use it to touch the isolation fluid pump (K), the fluid pressure regulator (L), and the isolation valve (G) before touching any of the system components with your hands.


Fluid Voltage Discharge and Grounding Procedure

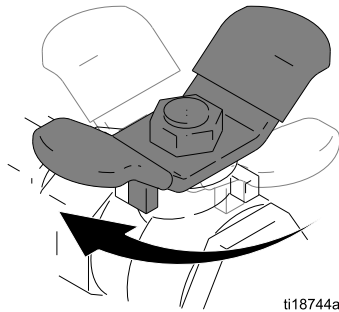
				
<p>The fluid supply is charged with high voltage until the voltage is discharged. Contact with the charged components of the voltage isolation system or spray gun electrode will cause an electric shock. To avoid an electric shock, do not alter or bypass the door switch interlock and follow the Fluid Voltage Discharge and Grounding Procedure:</p> <ul style="list-style-type: none"> • Whenever you are instructed to discharge the voltage • Before cleaning, flushing, or servicing the system equipment • Before approaching the front of the gun • Before opening the isolation cabinet 				

1. Release the gun trigger and turn off electrostatics.

Pressure Relief Procedure

				
<p>This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as splashing in the eyes or on skin or from moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing the equipment.</p>				

1. Release the gun trigger and turn off electrostatics by disabling the electrostatic request signal.
2. Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).
3. Push the Stop button  on the control interface to change to Off mode. See [Control Interface, page 36](#).
4. Turn off the air supply and fluid supply to the system.



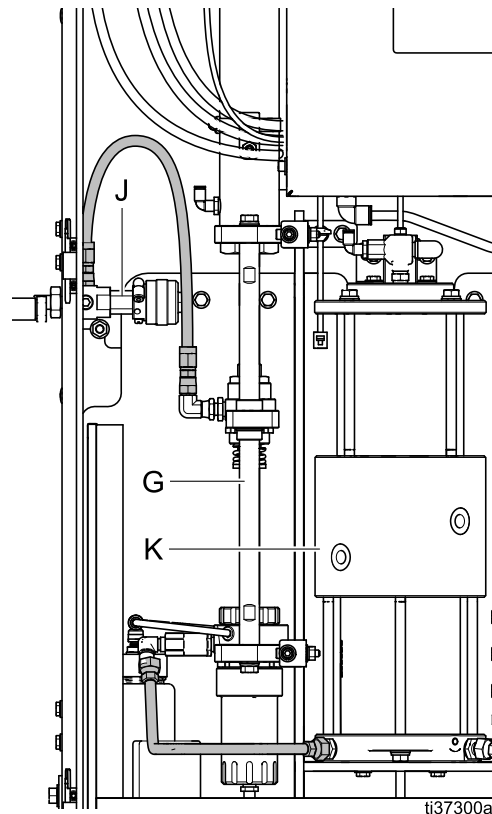
5. Trigger the gun into a grounded metal waste container to relieve the fluid pressure in the gun, the gun fluid hose, and the isolation fluid pump (K).
6. Relieve fluid pressure in the fluid supply unit as instructed in your fluid supply unit manual.

7. If the objective is to shut down and then service the system, relieve any residual pressure in the two flexible fluid lines between the inlet valves (J) and the isolation fluid pump (K).

Note

The contents of the isolation fluid pump (K) may spill into the cabinet at this point. If the pump has been emptied, the volume of fluid in the lines is small and only a small amount of fluid may spill out.

- a. To relieve the fluid pressure between the fluid valve (J) and the isolation valve (G), carefully loosen one of the swivel fittings.
- b. To relieve the fluid pressure between the isolation valve (G) and the isolation fluid pump (K), carefully loosen one of the swivel fittings.



Flush the System (Systems without Color Change)

To flush systems that are color change enabled, follow the steps in [Flush the System \(Color Change Enabled Systems\)](#), page 32.



The components in the isolation system were tested in fluid at the factory. To avoid contaminating your fluid, flush the isolation system with a compatible flushing fluid before you use the equipment.

Flush the system using Purge mode. In Purge mode the system dispenses all of the fluid in the fluid cylinder. To flush the system:

- Use Purge mode to first empty the system of paint.
- Switch to a cleaning fluid to continue to completely fill and empty the isolation fluid pump (K) to flush it clean.
- Press the Do Not Fill button to stop the refill sequence:



1. Release the gun trigger and turn off electrostatics by disabling the electrostatic request signal.
2. Follow the [Fluid Voltage Discharge and Grounding Procedure](#), page 29.
3. Shut off the paint supply to the unit.
4. Use the control interface to change the mode to Purge mode:




5. Trigger the gun until paint stops flowing.
6. Supply compatible cleaning fluid to the system.
7. Deactivate the Do Not Fill button:



8. The system fills until the isolation fluid pump is completely full.

Trigger the gun until the fluid runs clear. When the pump is empty, the fluid will stop coming out of the gun while the pump refills. Continue triggering the gun while the pump refills and the gun will resume flushing once the pump is full.

9. Activate the Do Not Fill button  so that the isolation fluid pump will not refill after it is empty. See [Home Screen](#), page 45.
10. Trigger the gun until the system indicates that the isolation fluid pump is empty.
11. Follow the [Pressure Relief Procedure](#), page 30.

Flush the System (Color Change Enabled Systems)



The components in the isolation system were tested in fluid at the factory. To avoid contaminating your fluid, flush the isolation system with a compatible flushing fluid before you use the equipment.

Flush the system using Purge mode. In Purge mode the system dispenses all of the fluid in the fluid cylinder. To flush the system:

- Use Purge mode to empty the system of paint and then flush it clean.
 - To use a purge sequence, set up a purge profile in advance. For details, see [Purge Screens 1–5, page 53](#).
 - Ensure that the air line, flush material, and dump hose are connected to the correct color change valves.
1. Release the gun trigger and turn off electrostatics by disabling the electrostatic request signal.
 2. Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).
 3. Use the control interface to change the mode to Purge mode:
 4. Continue to flush the system by using either:
 - A purge profile.
 - A manual purge.

To use a purge profile:

1. If using purge profile 1-5, push the flashing Play button on the left side of the screen to run the purge sequence:



2. Trigger the gun until the system completes the purge sequence.
3. After flushing is complete, the system returns to Standby mode.
4. Follow the [Pressure Relief Procedure, page 30](#).

To purge manually:

1. If using a purge profile 0, the system must be manually flushed. On the left side of the screen, three icons appear that activate the dump, flush material, and air inlet valves.
2. *If a dump hose is connected*, activate the Dump valve button:



This pushes all of the material in the system back out the inlet, through the dump valve, and into a waste or reclaim container.

3. After using the Manual Dump valve button or if the dump line is not connected, activate the Flush material button:



4. Trigger the gun to push all of the material in the system out through the gun.
5. After the isolation fluid pump is empty, the system lets in flush material and fills the pump. Once the pump is full, it will pressurize and dispense material out to the gun. Continue this process until clean material exits the spray gun.
6. Press the Flush material button again to deactivate it:



If desired, the system can be left loaded with flush material.

7. Activate the Air button to push the remaining flush material out to the spray gun:





Once the isolation fluid pump is empty, the system allows air through it and out to the spray gun.



8. Release the gun trigger once the system has been sufficiently purged with air.
9. Follow the [Pressure Relief Procedure, page 30](#).


Prime the Isolation System

Use the following steps to load the system with paint, change paint colors, or change from flushing fluid to paint.

1. Enter Prime mode  to empty any flushing fluid or paint without refilling the isolation fluid pump. See [Home Screen, page 45](#).
2. Supply the new paint to the fluid supply hose.
If using a color change equipped system, change the spray preset to one using the desired color or select a new color number if using Preset 0.
3. Check and adjust the gun fluid pressure if necessary. For example, adjust the pressure down to avoid splashing while emptying the paint into a container. Increase the gun fluid pressure to speed up the priming process.
4. Trigger the gun until new paint exits the gun. The time that it takes to prime the system depends on the length of hose and the fluid pressure.
5. Enter Spray mode . The isolation fluid pump automatically fills. See [Home Screen, page 45](#).

Spray with the Isolation System

			
<p>Contact with the charged components of the spray gun will cause an electric shock. Do not touch the gun nozzle or electrode or come within 4 in. (102 mm) of the front of the gun during operation or until performing the Fluid Voltage Discharge and Grounding Procedure, page 29.</p> <p>Follow the Fluid Voltage Discharge and Grounding Procedure, page 29 when you stop spraying and whenever you are instructed to discharge the voltage.</p>			

1. Prime the isolation system. Follow [Prime the Isolation System, page 33](#).
2. Set the gun fluid settings. See [Adjust the Gun Fluid Settings, page 34](#).
3. Put the system into Spray mode .

The isolation fluid pump automatically fills. The light tower indicates the fluid level in the pump as it fills or dispenses.

These set points can be customized in the system settings on Pump Screen 1. See [Pump Screen 1: Pump Volume, page 54](#).

Light	Definition
Green (solid)	The pump is 50% full or more.
Yellow (solid)	The pump is less than 50% full but more than 10% full.
Red (solid)	The pump is less than 10% full.



Note

To enter Spray mode, you must first be in either Prime or Standby mode. You cannot enter Spray mode directly from Purge mode.

If color change is enabled, the system remembers if it still has flush material in the pump. The system will not allow Spray mode to be entered until the pump has been emptied in either Purge or Prime mode.

4. Turn on electrostatics by sending the system the ES request signal.
 - The control interface displays the voltage building in the system.
 - The system raises the ground rod (N) in the cabinet. When the ground rod symbol disappears and the charge symbol appears, the system is capable of building a charge. See [Home Screen, page 45](#).
5. Trigger the gun to begin spraying paint.
6. When the gun trigger is released, the ES request is disabled, and the ground rod delay time has elapsed, the ground rod (N) drops and discharges the system. Release the gun trigger and disable the ES request at any time to refill the system.

Tips:

 - To maintain high voltage between parts only release the gun trigger. This will keep the system charged and ready to dispense paint.
 - To paint without electrostatics do not enable the ES request signal. The system will dispense paint, but remain grounded. This may be beneficial when setting up a spray pattern.
7. When approaching the end of painting, activate the Do Not Fill button . This saves paint by preventing the isolation fluid pump from filling unnecessarily.
8. When finished painting, release the trigger, disable the ES request signal, and put the system in Standby mode .
9. At this point, you may perform any of the following actions:
 - Supply more paint to the system. See [Prime the Isolation System, page 33](#).
 - Flush and clean the system. See [Flush the System \(Systems without Color Change\), page 31](#) or [Flush the System \(Color Change Enabled Systems\), page 32](#).
 - Shut down the system. See [Shutdown, page 35](#).

Adjust the Gun Fluid Settings

This section only applies if the HydroShield is equipped with an internal fluid pressure regulator.

Preset 0 allows operators to change the gun fluid at any time. Preset 0 assumes a manual purge profile.






Use Preset 1 through 99 to configure different gun fluid pressure settings and a purge profile number. To set up a purge profile, see [Purge Screens 1–5, page 53](#).

For example, Preset 1 might use the best pressure settings for black paint, Preset 02 might use the best pressure settings for red paint, and Preset 99 might be set to a higher fluid pressure to perform a quicker flush.

For instructions on creating presets, see [Presets, page 52](#). Refer to the gun setup procedure in your gun manual to select the best gun fluid settings.

To use Preset 0







Preset 0 can be changed by the operator at any time during operation.

1. Press the right arrow  until Home appears on the menu bar.
2. Press the Enter Screen button  to enter the screen to edit the current settings.
3. Use the down arrow  to navigate to the Fluid field.
4. Press the numbers on the keypad to the desired psi value.
5. Press the Enter button  to register the value. The interface automatically advances to the Preset field.
6. Press the Exit Screen button  to exit the screen settings.


Note

If an operator is in Preset 1–99, and then switches to Preset 0, Preset 0 will reflect the previous settings.

To use Preset 1 through 99:

1. Press the right arrow  until Home appears on the menu bar.
2. Press the Enter Screen button  to enter the screen to edit the current settings.
3. Use the up and down arrows   to navigate to the Preset field.
4. Enter the Preset number that you would like to use.
5. Press the Enter button  to register the value.
6. Press the Exit Screen button .

Shutdown

1. Discharge the system voltage. Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).
2. Flush the gun. See [Flush the System \(Systems without Color Change\), page 31](#) or [Flush the System \(Color Change Enabled Systems\), page 32](#).
3. Follow the [Pressure Relief Procedure, page 30](#).
4. Press the Stop button  on the control interface to change to Off mode.

Control Interface

The control interface displays graphical and text information related to setup and spray operations.

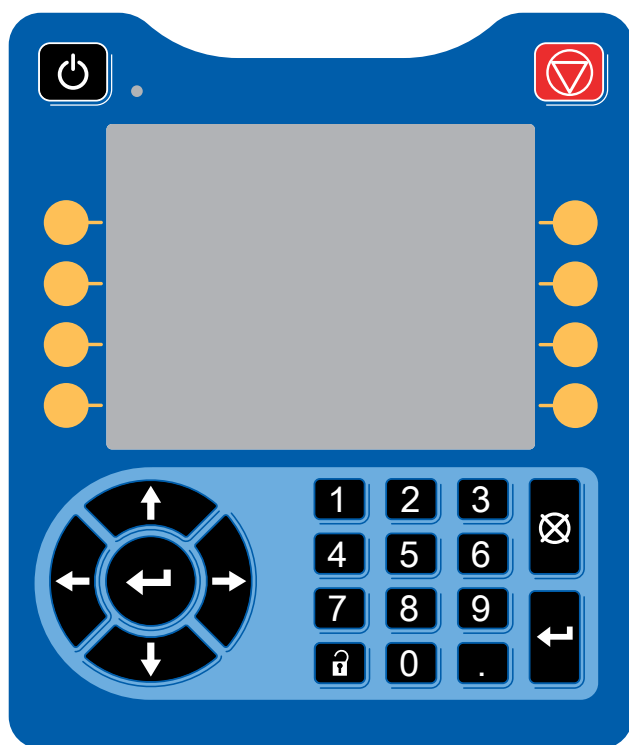
Soft keys are used to input numerical data, enter setup screens, navigate within screens, scroll through screens, and select setup values.








Most information is communicated using icons to simplify global communication. The soft keys are membrane buttons whose function correlates with the screen content to the immediate left or right of the

button. 

NOTICE

To prevent damage to the soft key buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails.



Soft Key	Function
	Power When the system is in Off mode, press to activate the system. This button puts the system into Standby mode.
Stop 	Stop Press to stop the system immediately. This button puts the system into Off mode and turns off air and fluid to the gun.
	Navigation Left/Right Arrows: Use to move from screen to screen. Up/Down Arrows: Use to move among the fields on a screen, to move through the items on a drop down menu, or to move among multiple screens within a function.
	Keypad Use to input values.
	Cancel Use to cancel a data entry field. The cancel button cannot be used to acknowledge events. (See the description for the Enter soft key.)
	Setup To unlock the Setup menus, press Setup. If a password is configured, enter the password. (Default: 0000.) See Advanced Screen 1, page 55 . To exit the Setup menus, press unlock again.
	Enter Press to choose a field to update, to make a selection, to save a selection or value, to enter a screen, or to acknowledge an event.

Menu Bar

The menu bar appears at the top of each screen.



Date and Time: The date and time are always displayed in one of the following formats.

- DD/MM/YY HH:MM
- MM/DD/YY HH:MM
- YY/MM/DD HH:MM

The time is always displayed as a 24-hour clock. Set the time in the following Setup menu:

[Advanced Screen 1, page 55.](#)

Arrows: The left and right arrows indicate screen navigation.

Screen Menu: The screen menu indicates the currently active screen, which is highlighted. It also indicates the associated screens that are available by scrolling left and right. For example, Home or Calibrate.

System Mode: The current system mode is displayed at the left of the menu bar. There are five modes: Off, Standby, Prime, Spray, and Purge.

Error Status: If there is an active system error, one of the following icons displays in the middle of the menu bar: Advisory, Deviation, or Alarm.

If no icon displays, the system has no information or no error has occurred.

Icon	Function	Description
	Advisory	Informational
	Deviation	Important, no system shutdown
	Alarm	Very important, system shutdown

Soft Key Icons

NOTICE

To prevent damage to the soft key buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails.



Blue icons indicate that a button is not available.



Gray icons with a green outline indicate that the button is active or selected.



Blue icons with a gray outline show that the button is available, but not active or selected.

Navigate the Screen

To edit the information on a screen press the Enter

Screen key

To advance to the next screen, press the down arrow



Press the Exit Screen button to exit the screen settings.

To enable a check box, navigate to the box for the item and press the Enter button . To clear the box, press the Enter button again.

Use the up and down arrows to navigate through the screen.

To reset the cycle count to 0 in the In the Maintenance screens, press the Count Reset button for one second.


Run Screens and Setup Screens

The control interface uses two sets of screens:

- The Run screens control spraying operations and display system status and data.
 - Home (See [Home Screen, page 45.](#))
 - Status (See [Status Screens, page 50.](#))
 - Events (See [Events Screen, page 50.](#))
- The Setup screens control system parameters and advanced features.
 - Advanced (See [Advanced Screens, page 55.](#))
 - Maintenance (See [Maintenance Screens, page 59.](#))

- Calibrate (See [Calibrate Screens, page 57.](#))
- System (See [System Screen, page 65.](#))
- Pumps (See [Pump Screens, page 54.](#))
- Presets (See [Presets, page 52.](#))
- Purge (See [Purge Screens 1–5, page 53.](#))



Press unlock  on any Run screen to enter the Setup screens. If the system has a password lock, the Password screen displays. If the system is not locked (password is set to 0000), the System screen displays.

Press unlock on any Setup screen to return to the Status screen.

Control Interface Setup and Maintenance

Enable USB Data

If the system is configured with USB capability, be sure to check (enable) the box for Enable USB Downloads/Uploads on [Advanced Screen 3, page 56](#). All files downloaded from the USB are put in a DOWNLOAD folder on the drive.

For example: "E:\GRACO\12345678\DOWNLOAD\"

The 8-digit numeric folder name matches the 8-digit serial number on the control interface. When downloading from multiple controllers, there is one sub-folder in the GRACO folder for each control interface.

USB Logs

During operation, the control interface stores system and performance related information to memory in the form of log files. It maintains two types of log files: an event log and system logs. To retrieve log files, see [Download System Data, page 40](#).

Event Log

The event log file name is 1-EVENT.CSV and is stored in the DOWNLOAD folder.

The event log maintains a record of the last 1,000 events. Each event record in the log file contains the date and time the event occurred, the event type, event code, and event description.

System Log

The system log file name is 2-SYSTEM.CSV and is stored in the DOWNLOAD folder.

The system log maintains a record of all control interface modules connected to the system. Each event record in the log file contains the date, time, software part number, and software version.

System Configuration Settings File

The system configuration settings file name is SETTINGS.TXT and is stored in the DOWNLOAD folder.

A system configuration settings file automatically downloads each time a USB flash drive is inserted. Use this file to back up system settings for future recovery or to easily replicate settings across multiple systems. For instructions on how to use this file, see [Upload System Configuration, page 41](#).

For the location of the USB port on the control module, see [Connect the CAN Cables, page 23](#).

Retrieve the SETTINGS.TXT file after all system settings are set as desired. Store the file for future use as a backup in case the settings are changed and need to be quickly changed back to the desired setup.

Note

- System settings may not be compatible between different versions of the software.
- Do not modify the contents of this file.

Custom Language File

The custom language file name is DISPTXT.TXT and is stored in the DOWNLOAD folder.

A custom language file automatically downloads each time a USB flash drive is inserted. If desired, use this file to create a user-defined set of custom language strings to be displayed within the control interface.

The control interface is able to display the following Unicode characters. For characters outside of this set, the system displays the Unicode replacement character, which appears as a white question mark inside of a black diamond.

- U+0020 - U+007E (Basic Latin)
- U+00A1 - U+00FF (Latin-1 Supplement)
- U+0100 - U+017F (Latin Extended-A)
- U+0386 - U+03CE (Greek)
- U+0400 - U+045F (Cyrillic)

Create Custom Language Strings

The custom language file is a tab-delimited text file that contains two columns. The first column consists of a list of strings in the language selected at the time of download. The second column can be used to enter the custom language strings. If a custom language was previously installed, this column contains the custom strings, otherwise the second column is blank.

Modify the second column of the custom language file as needed and follow the [Upload System Configuration, page 41](#), to install the file.

The format of the custom language file is critical. The following rules must be followed in order for the installation process to succeed.

- The file name must be DISPTXT.TXT.
- The file format must be a tab-delimited text file using Unicode (UTF-16) character representation.
- The file must contain only two columns, with columns separated by a single tab character.
- Do not add or remove rows to the file.
- Do not change the order of the rows.
- Define a custom string for each row in the second column.

Download System Data

1. Insert the USB flash drive into the USB Port. See [Connect the CAN Cables, page 23](#).
2. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete. A pop-up is present until the transfer is complete if it is not acknowledged.
3. Remove the USB flash drive from the USB port.
4. Insert the USB flash drive into the USB port of computer.
5. The USB flash drive window automatically opens. If it does not, open USB flash drive from within Windows® Explorer.
6. Open the Graco folder.
7. Open the system folder. If downloading data from more than one system, there is more than one folder. Each folder is labeled with the corresponding serial number of the control interface. (The serial number is on the back of the control interface.)
8. Open the DOWNLOAD folder.
9. Open the LOG FILES folder labeled with the highest number. The highest number indicates the most recent data download.
10. Open the log file. Log files open in Microsoft® Excel® by default as long as the program is installed. However, they can also be opened in any text editor or Microsoft Word.

Note: All USB logs are saved in Unicode (UTF-16) format. If opening the log file in Microsoft Word, select Unicode encoding.

Upload System Configuration

Use this procedure to install a system configuration file and/or a custom language file.

1. If necessary, follow [Download System Data, page 40](#), to automatically generate the proper folder structure on the USB flash drive.
2. Insert the USB flash drive into the USB port of computer.
3. The USB flash drive window automatically opens. If it does not, open the USB flash drive from within Windows Explorer.
4. Open the Graco folder.
5. Open the system folder. If working with more than one system, there is more than one folder within the Graco folder. Each folder is labeled with the corresponding serial number of the control interface. (The serial number is on the back of the control interface.)
6. If installing the system configuration settings file, place the SETTINGS.TXT file into the UPLOAD folder.
7. If installing the custom language file, place the DISPTXT.TXT file into the UPLOAD folder.
8. Remove the USB flash drive from the computer.
9. Install the USB flash drive into the USB port on the control interface.
10. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete.
11. Remove the USB flash drive from the USB port.

Note: If the custom language file was installed, users can select a different language from the Language drop-down menu in the Advanced Setup Screen 1. See [Advanced Screen 1, page 55](#).

Clean the Screen Surface

Use any alcohol-based household cleaner, such as glass cleaner, to clean the control interface.

Update the System Software

A new HydroShield system includes a control interface that is pre-programmed to operate the HydroShield system. If the control interface is replaced, a Graco black software update token (17Z578) is included, which contains the latest software. Use the token to program the replacement control interface, as described in 3A1244. See [Related Manuals, page 3](#).

The token uses Token In-System Programming, which provides the capability to transfer software updates from a USB drive to the token. With this feature, you can obtain the software updates online, download them to a USB drive, and transfer them directly to the token instead of waiting for a new software update token to be shipped.

If you already have a Graco black software update token, you can use it to update the HydroShield system software.

Note

This process is for Graco black tokens only, not Graco blue tokens.

Note

All update files must have either file extension *.GTI (software update files) or *.GMI (gateway map files). A maximum of 14 files can be present in the \Graco\Software\ folder.

To update the software on the isolation system:

- Download the latest software version for the system from the Graco website. Follow the steps in [Obtain Software Updates, page 41](#).
- Transfer the software to the control interface. Follow the steps in [Transfer Software from USB to System, page 42](#).

Obtain Software Updates

Use a computer with internet access to obtain software updates for the system.

1. Insert a USB drive into a USB port on your computer.
2. Open an internet browser and go to help.graco.com.
3. Navigate to the desired software update.

4. Save the GTI software update file to the \GRACO\SOFTWARE\ folder on the USB drive.

To automatically create the SOFTWARE folder on the USB drive, insert the USB into the control interface and press the soft key next to the



Software Update icon on Advanced Screen 4. See [Advanced Screen 4, page 56](#).

Note

Limit the number of software update files in the folder on the USB to 14. The software on the control interface can only display the first 14 updates found.

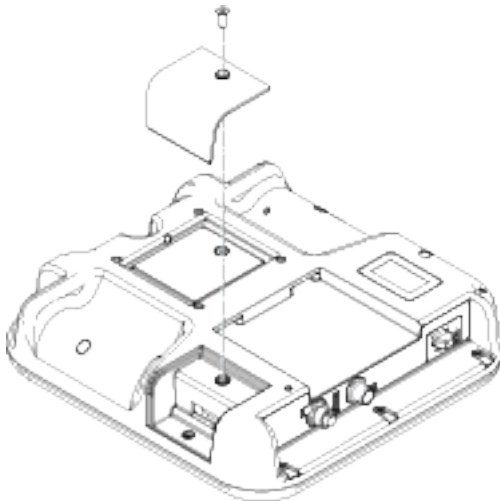
5. After the software is downloaded to the USB drive, exit the browser and remove the USB drive from the computer.

Transfer Software from USB to System

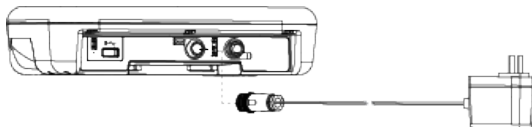
After downloading a system software update to a USB drive, use this procedure to transfer the update from the USB drive to the control interface.

Prepare the control interface to receive the software:

1. Place the control interface face down on a flat surface and remove the token access cover.



2. Turn the control interface face up.
3. Supply electrical power to the control interface using either system power or Power Supply Kit 24F672, which is available separately. The control interface starts and is ready for use when power is supplied.



Transfer the software to the system:

1. Navigate to Advanced Screen 4. See [Advanced Screen 4, page 56](#). Press the soft key



next to the icon. Follow the on-screen prompts on the Software Update Start screen.

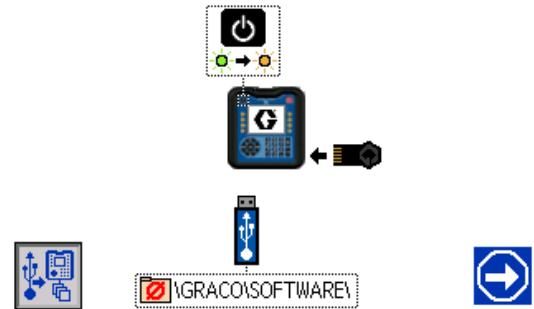


Figure 23 Software Update Start Screen

2. Consider whether to disable the upload/download options:



Pressing the soft key next to the icon disables the upload/download options for USB logs, system settings, and custom language files. Upload/download options are disabled when the



icon appears gray

Note

Disabling the upload/download options allows for a faster software transfer procedure. However, a factory reset to default settings is possible during the software transfer procedure. Graco recommends that upload/download options remain enabled if any data logs, system settings, and custom language files are critical. Upload/download options are enabled when the icon



appears blue



Press the soft key next to the icon to exit the USB update screen.

3. Press the Power button  to turn off the system.

Note

If power is cycled while a token is present, the system tries to load the software that is currently loaded on the token. If you insert a token that contains older software, do not cycle power and inadvertently load the old software. Depending on the age of the software, it may not be possible to reprogram a token.

4. Insert a black update token into the slot where the cover was removed.

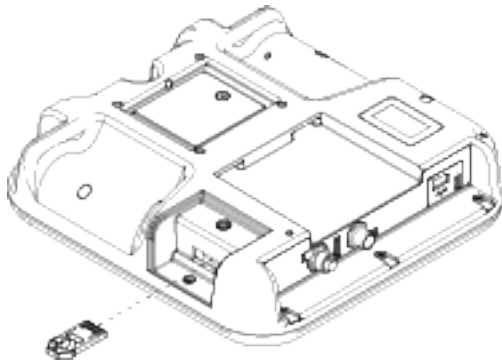


Figure 24 Insert Token

5. Insert the USB drive that contains the updated software into the USB interface slot.

A warning may flash on the screen signaling that a USB download is occurring. Wait for the warning to indicate that the USB download is

complete. Press the Enter key  to return to the Software Update Start screen.

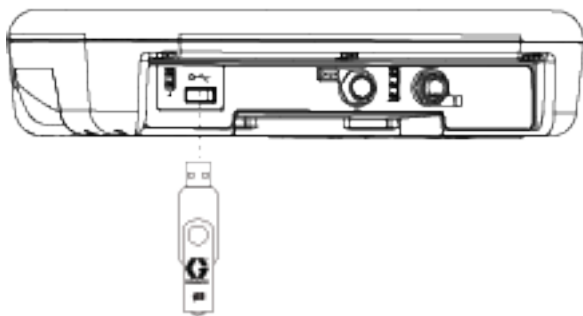



Figure 25 Insert USB Drive


An hour glass   displays while the USB drive prepares for the software transfer process. If this process takes more than a couple of minutes, remove the USB drive and try again.

The following message is displayed if no compatible software files are found on the USB


drive:  GRACO\SOFTWARE\

6. When the process is ready to begin, the screen automatically transitions to the USB Software Update screen.

- On the left side of the screen, use the drop-down box to select the software update file from the USB drive. The software part number and version for each update is listed beneath the file.

Press the Enter key  to change the selection on the USB drive. A drop-down menu displays the available software update files (up to 14 files).

Use the keypad arrows to highlight the desired

update, and then press Enter  to select the update.

- On the right side of the screen, the current software part number and version on the token is listed.

07/02/20 09:03	Maint.	Advanced	System
Off	EQUO: USB Idle		

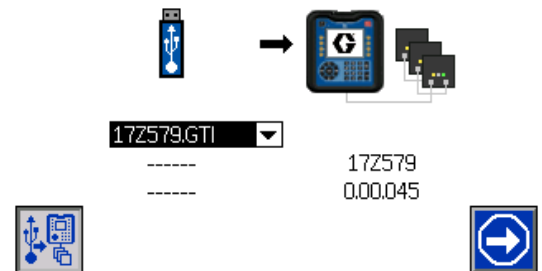


Figure 26 USB Software Update Screen

7. Press the soft key next to the Continue icon to begin the software transfer.



In the following example, software version 0.01.002 of the 17X093 software will be copied from the USB drive and will overwrite version 0.01.001 of 17X083 on the token.

The progress of writing the software update to the token can take several minutes to complete. Leave the USB drive and token inserted while the transfer is in progress. The control interface buttons are not functional during this time.

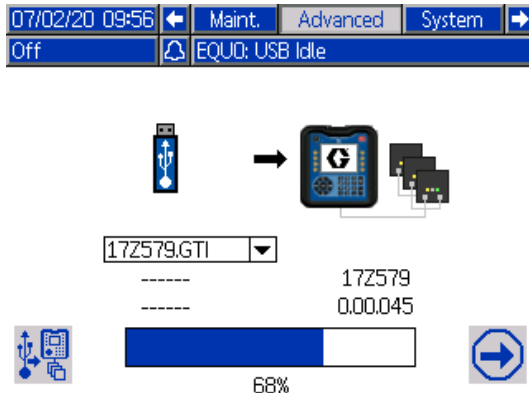


Figure 27 Software Transfer Process

8. When the transfer is complete, the progress bar is solid blue and the progress is 100%. Remove the USB drive and token from the control interface.

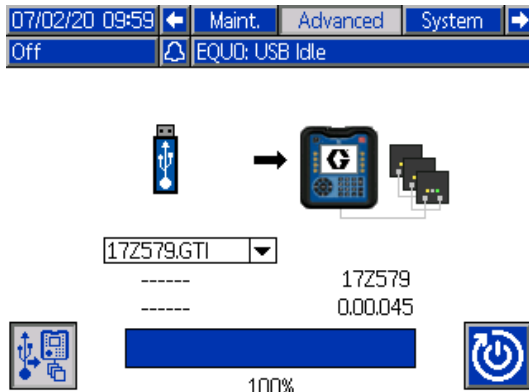


Figure 28 Software Transfer Complete

9. After the transfer is complete, press the soft key



next to the icon to automatically reset the control interface to load software. Refer to manual 3A1244 for step-by-step instructions on how to update the software version of Graco Control Architecture Modules. See [Related Manuals, page 3](#).

Note

The system must be manually reset to load a *.GMI file. Follow your system manual to load a new version of the gateway map.

10. If the software update transfer fails, the progress bar turns red and no percentage is shown. Make sure the token and USB are inserted correctly (not loose) and retry the procedure. Do not remove the USB drive or token until the transfer process is complete. Press the soft key next to



to reattempt a software transfer.

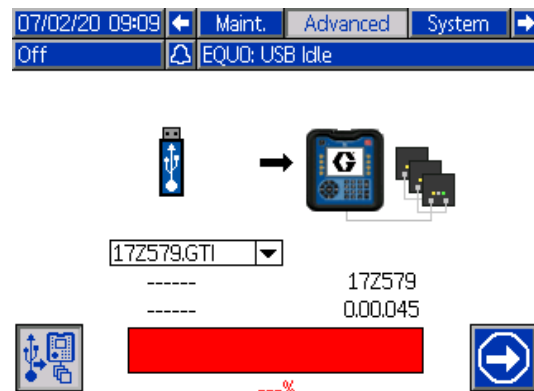


Figure 29 Software Transfer Not Completed

When the software transfer is completed successfully, the control interface powers up as normal. You can repeat the procedure with another token if needed.



Run Menus



Home Screen

The Home screen is the primary screen that the operator uses while painting. When the system is powered, it enters Off mode.

The operator must first select Standby mode for painting. The available settings vary depending on whether color change is enabled on the system. After Standby is selected, the operator can select the Prime, Purge, or Spray buttons.

Table 1 Key to System Modes

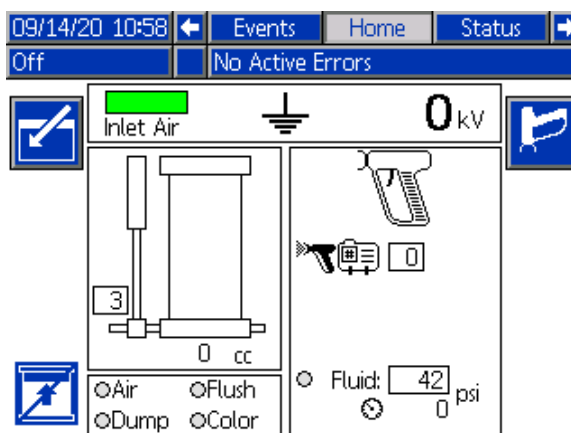
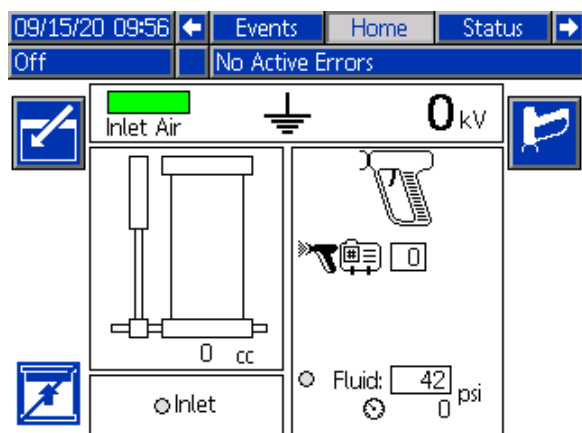
Soft Key	Function
	<p>Standby</p> <p>Press to put the system into Standby mode. Standby mode is used to prepare the system for operation or for a break in operation, such as a shift change. All fluid valves are closed and all air valves are off. The isolation valve (G) is in the down (bottom) position.</p> <p>In Standby mode, the system verifies that there is inlet air supply and that the minimum required 70 psi (0.5 MPa, 4.8 bar) air pressure is supplied to the system.</p>
	<p>Prime</p> <p>Press to enter Prime mode. Prime mode is used to load the system with new material. The volume in the isolation fluid pump (K) is minimized. The system stays grounded.</p>

Soft Key	Function
	<p>Purge</p> <p>Press to enter Purge mode. Purge mode is used for flushing the system or changing colors. The isolation fluid pump (K) fills and dispenses, but the system stays grounded.</p> <p>In Purge mode with color change enabled, the buttons that are available vary depending on whether the operator is in Preset 0 or is using a purge profile:</p> <ul style="list-style-type: none"> • Preset 0 presents buttons for the operator to perform a manual purge. • Purge profiles present a play button for the purge profile to automatically perform a preconfigured purge sequence. <p>See Home Screen in Purge Mode, page 49.</p>
	<p>Spray</p> <p>Press to enter mode. Spray mode is used for painting. As soon as the system enters Spray mode, the isolation fluid pump (K) begins to fill.</p> <p>When the gun is triggered to spray, the isolation valve (G) raises and the pump is pressurized. When the ES request input is active the ground rod (N) raises to allow the system to build voltage.</p> <p>When both the gun trigger is released and the ES request input is disabled the isolation valve (G) and the ground rod (N) lower. The system discharges and the pump begins to refill.</p> <p>To enter Spray mode, you must first be in either Prime or Standby mode. You cannot enter Spray mode directly from Purge mode.</p> <p>In Spray mode, the menu bar displays the following:</p> <ul style="list-style-type: none"> • Fill when the pump is filling. • Ready when the pump is full and the system is waiting for a gun trigger. • Dispense when the gun is triggered for spraying and/or the ES request input is active.

Home Screen Without Color Change

Home Screen With Color Change Enabled

Off Mode



Standby Mode

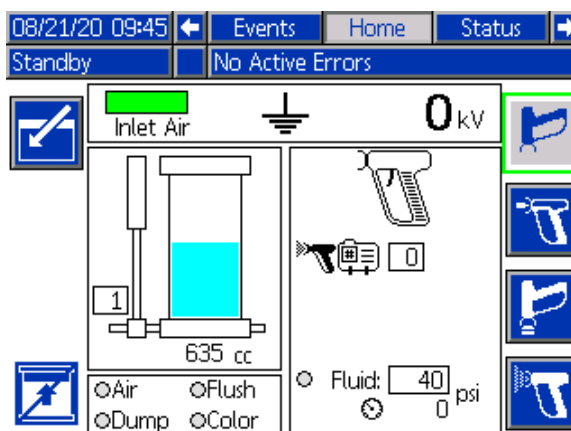
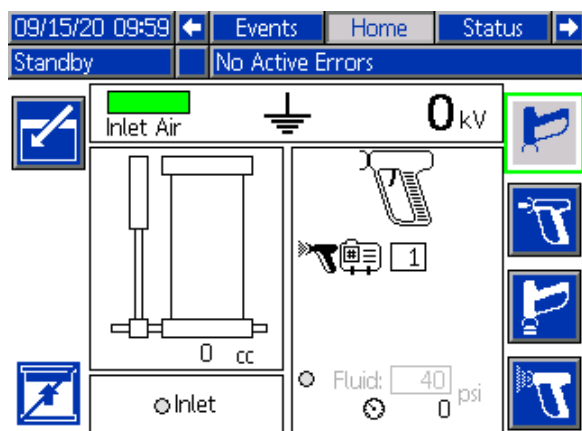


























Table 2 Key to Home Screen with and without Color Change Enabled

Key or Field	Description
	Enter Screen Press to enter a screen for editing. Highlighted data or fields can be changed by the operator. Use up or down arrows to move among the data fields.
	Exit Screen Press to exit a screen after editing.

Key or Field	Description
	<p>Do Not Fill</p> <p>Activate Do Not Fill to prevent the isolation fluid pump from refilling when the trigger is released and the ES request signal is disabled. Do Not Fill is commonly used at the end of a paint job. Once the pump is empty, the system waits until another mode is selected.</p> <p>Do Not Fill mode is useful in the following situations:</p> <p>While in Spray mode:</p> <ul style="list-style-type: none"> • The operator is getting close to the end of the shift and doesn't want paint to sit in the pump. • The remaining number of parts to spray won't require another full pump of paint. • The paint color will be changing soon. <p>While in Purge mode (without color change enabled):</p> <ul style="list-style-type: none"> • The operator is done spraying and is dispensing the last of the paint in the pump through the gun. Once the pump is empty, the operator can easily switch the fluid supply hose to cleaning fluid.
	<p>Inlet air</p> <p>A green inlet air status bar indicates the inlet air supply pressure is above the minimum required 70 psi (0.5 MPa, 4.8 bar).</p> <p>Red indicates the system cannot run because the required air pressure is not detected.</p>
	<p>Ground rod</p> <p>A ground rod icon indicates that the ground rod (N) is down and the system is discharging.</p> <p>A charge icon  indicates that the ground rod is up and the system is capable of holding a charge.</p>
	<p>Volt Level</p> <p>Displays the system voltage level.</p>
 	<p>Fluid Level</p> <p>Displays the fluid level of the isolation fluid pump.</p> <ul style="list-style-type: none"> • 0%  (Empty) • 50%  • 100%  (Full) <p>With color change enabled, the icon displays the fluid level of the isolation fluid pump and the paint color being used. The color on the pump indicates the pump contents:</p> <ul style="list-style-type: none"> • Aqua/cyan color = Unknown fluid; usually flush fluid. • Dark blue = Paint; the paint number appears to the left of the icon. • Gray = Air; used when flushing the system.
	<p>Spray Preset</p> <p>Enter a spray preset number to set the gun fluid pressure. The spray gun symbol indicates that the number is a spray preset number:</p> <p></p> <p>To configure Preset 1 through 99, see Adjust the Gun Fluid Settings, page 34.</p> <p>Preset 0 allows the operator to change the settings at any time during operation.</p>

Key or Field	Description
  	<p>Purge Profile</p> <p>Enter a purge profile number to purge the system automatically. (Available on color change enabled systems only.) The purge gun symbol indicates that the number is a purge profile number:</p>  <p>To configure a purge sequence, see Purge Screens 1–5, page 53.</p>
  	<p>Gun Fluid Pressure</p> <p>Set the fluid pressure for the gun. If the dot is filled, fluid pressure to the gun is active. The actual fluid pressure displays below the rectangle.</p> <p>This field will not be present if a remote mount fluid pressure regulator is being used and Fluid V/P is not selected in the setup menu.</p>
    	<p>Valve Indicators</p> <p>A green circle indicates which valve is active when the system is in use. A gray circle indicates the valve is off.</p>

Home Screen in Purge Mode

Home Screen With Color Change Enabled

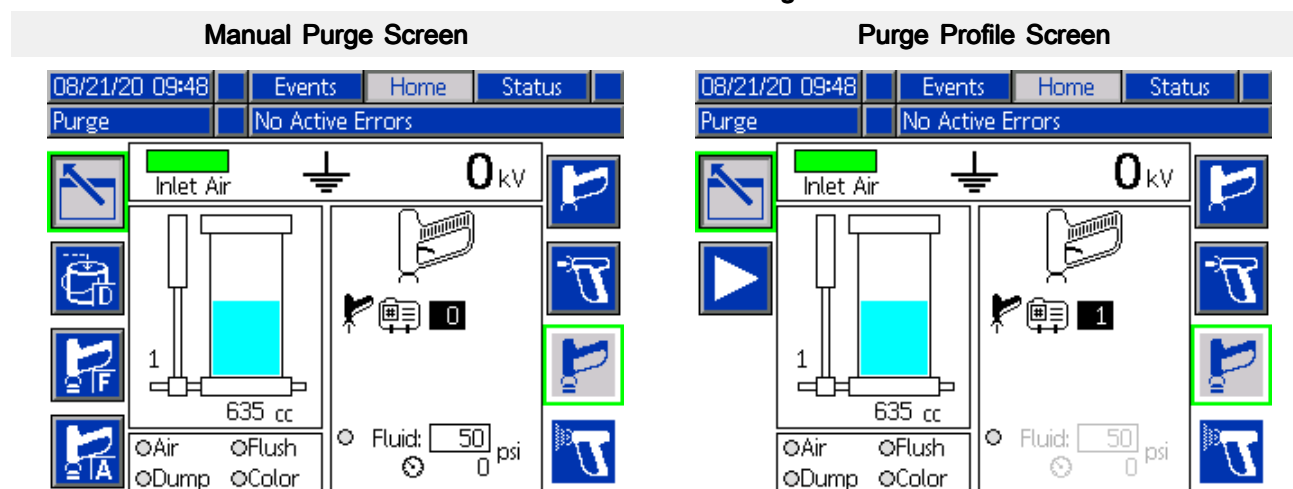






Table 3 Key to Home Screen in Purge Mode

Soft Key or Field	Description
	Manual Dump Press to manually dump the contents of the isolation fluid pump out the dump valve. If the pump is empty, the button will not activate. Press the button again to stop dumping.
	Manual Flush Press to continually empty and refill the isolation fluid pump. Use to flush the system clean. Press the button again to stop flushing.
	Manual Air Press to manually push air through the fluid lines out to the gun. The isolation fluid pump must be empty before the system lets air in. Press the button again to stop pushing air.
	Play Purge If a purge profile is entered, press the play button to begin the purge sequence.

Events Screen

Use the Events screen to view the last 99 status messages generated by the isolation system. Click the up and down arrows on the right of the screen to scroll through the messages.

Each message line includes the date, the time, and the status code. See [Error Codes](#), page 80.


06/23/21 20:00	←	Status	Events	Home	→
Standby		No Active Errors			
06/23/21 19:58	N611-A	Shuttle Timeout Bottom			↑
06/23/21 19:55	EQU0-V	USB Idle			3
06/23/21 19:55	EQU1-R	Sys. Settings Downloaded			
06/23/21 19:55	EQU3-R	Custom Lang. Downloaded			
06/23/21 19:55	EQU5-R	Logs Downloaded			1
06/23/21 19:54	EAUX-V	USB Busy			
06/23/21 19:54	EL00-R	System Power On			
06/23/21 19:54	EM00-R	System Power Off			2
06/23/21 19:50	N611-A	Shuttle Timeout Bottom			
06/23/21 19:43	EQU0-V	USB Idle			↓

Status Screens

The Status screens display a summary of the input signals that are monitored by the system and the solenoids that drive system activity. The screens are for information and troubleshooting purposes.

Status Screen 1

The Status screens display a summary of the input signals that are monitored by the system and the solenoids that drive system activity. The Status screens are for information and troubleshooting purposes.

03/13/20 16:00	←	Home	Status	Events	→
Standby		No Active Errors			
	Inputs		Solenoids		
<input type="radio"/>	System Stop: Air		<input checked="" type="checkbox"/>	Shuttle Down	
<input type="radio"/>	System Stop: Digital		<input type="checkbox"/>	Shuttle Up	
<input checked="" type="radio"/>	Inlet Air		<input type="checkbox"/>	Shuttle Eject	
<input type="radio"/>	Shuttle Top		<input type="checkbox"/>	Shuttle Fluid In	
<input checked="" type="radio"/>	Shuttle Bottom		<input type="checkbox"/>	Pump Fluid In	
<input type="radio"/>	Gun Flush Box		<input type="checkbox"/>	Pump Pressure	
<input type="radio"/>	Fluid Trigger		<input type="checkbox"/>	Ground Rod	
			<input type="checkbox"/>	Gun Flush Box	
			<input checked="" type="checkbox"/>	System Status	

Inputs

Inputs are signals that the system acts on. When the status circle next to the input appears yellow, the sensor is activated.

- **System Stop: Air:** The external pneumatic input that tells the system to stop. The system stop pneumatic input is available only when the optional System Stop Pneumatic Input Kit 26B414 is installed. To install, see [Install the Optional System Stop Pneumatic Input Kit](#), page 25.
- **System Stop: Digital:** The external electrical input that tells the system to stop. The system stop digital input is available only when the optional Optocoupler Kit 24Z226 is installed. To install, see [Install the Optional System Status Output](#), page 26.
- **Inlet Air:** Indicates the minimum required air pressure 70 psi (0.5 MPa, 4.8 bar) is detected.
- **Shuttle Top:** The sensor that indicates that the isolation valve is in the top position.
- **Shuttle Bottom:** The sensor that indicates that the isolation valve is in the bottom position.
- **Gun Flush Box:** The sensor that indicates that the gun flush box is closed. Not used on automatic systems.
- **Fluid Trigger:** The air flow switch that indicates that the gun is triggered. Not used on automatic systems.

Solenoids

Electrical to pneumatic actuators that drive system activity.

- **Shuttle Down:** Drives the isolation valve down and open for filling.
- **Shuttle Up:** Drives the isolation valve up and closed for isolating the charged fluid.
- **Shuttle Eject:** From the down position, ejects the isolation valve up from the seat.
- **Shuttle Fluid In:** Opens the fluid valve near the system fluid inlet.
- **Pump Fluid In:** Opens the fluid valve near the isolation fluid pump fluid inlet when it is present.

This fluid valve is not present in standard systems. Purchase a conversion kit to replace a spring check valve with a pneumatically activated fluid inlet valve.

- **Pump Pressure:** Activates the air pressure to the isolation fluid pump.
- **Ground Rod:** Activates (raises) the ground rod to allow the system to build a charge.
- **Gun Flush Box:** Activates the gun trigger in the gun flush box. Not used on automatic systems.
- **System Status:** Indicates to the system that it is okay to spray.

Status Screen 2

Status screen 2 displays the current status of the solenoids that drive activity for the color change valves.

08/21/20 09:49 Home Status Events

Standby No Active Errors

Solenoid Valve/ Function

<input checked="" type="checkbox"/> 1 / Air	<input type="checkbox"/> 14 / Color 7
<input type="checkbox"/> 10 / Flush	<input type="checkbox"/> 6 / Color 8
<input type="checkbox"/> 2 / Dump	<input type="checkbox"/> 15 / Color 9
<input type="checkbox"/> 11 / Color 1	<input type="checkbox"/> 7 / Color 10
<input type="checkbox"/> 3 / Color 2	<input type="checkbox"/> 16 / Color 11
<input type="checkbox"/> 12 / Color 3	<input type="checkbox"/> 8 / Color 12
<input type="checkbox"/> 4 / Color 4	<input type="checkbox"/> 17 / Color 13
<input type="checkbox"/> 13 / Color 5	<input type="checkbox"/> 9 / Color 14
<input type="checkbox"/> 5 / Color 6	<input type="checkbox"/> 18 / Color 15

2

1

The screen lists the solenoid valve number and the function of the valve. A checked box indicates that the solenoid is activated.

Solenoid Valve / Function	Description
1 / Air	Solenoid 1 controls the air valve (default).
10 / Flush	Solenoid 10 controls the flush valve (default).
2 / Dump	Solenoid 2 controls the dump valve (default).
Valves 3–9 and 11–18 / Color 1 through 15	Solenoids 3–9 and 11–18 control valves for color material 1–15.

Status Screen 3

Status screen 3 displays the inputs and outputs related to automatic system operation.

06/23/21 20:00 Home Status Events

Standby No Active Errors

Inputs	Outputs
<input checked="" type="radio"/> ES Request	<input type="checkbox"/> ES Enable
<input checked="" type="radio"/> Paint Trigger	<input checked="" type="checkbox"/> Low Paint

2

3

1

Inputs

Inputs are signals that the system acts on. When the status circle next to the input appears yellow, the sensor is activated.

- **ES Request:** External pneumatic and electrical signal that tells the system the use of electrostatics is desired.
- **Paint Trigger:** External pneumatic input that tells the system the gun is triggered.

Outputs

Outputs are signals the system sends out to drive other actions.

- **ES Enable:** External pneumatic and electrical signal that is sent to a voltage controller to turn on electrostatics.
- **Low Paint:** Electrical signal that closes the contacts in an optocoupler when the internal paint supply is low and is disabled when the paint supply is full.

Setup Menus

To unlock the Setup menus, press the Setup key



If a password is configured, enter the password. (Default: 0000.) To configure a password, see [Advanced Screen 1, page 55](#).

To exit the Setup menus and return to the Home screen, press the Setup key .

To edit the information on a screen press the Enter Screen key .

Presets

Use this screen to preconfigure spray settings for different fluids, parts, and scenarios.

For information about using Preset 0-99, see [Adjust the Gun Fluid Settings, page 34](#).

Preset: The number assigned to this set of spray parameters, paint color, and purge sequence.

Fluid: Fluid pressure delivered through the gun.

Color: Indicate a color number to associate with this preset.

Purge: Indicate a custom purge sequence as configured in a Purge screen. See [Purge Screens 1–5, page 53](#).

Custom Fill: Check the box to customize when the pump fills and when the light tower indicates material levels in the pump. Leave the box unchecked to use the global pump settings in Pump Screen 1. See [Pump Screen 1: Pump Volume, page 54](#).

Purge Screens 1–5

Use the Purge screens to configure up to 5 purge profiles. Customize each purge profile to best suit different fluids.

The screenshot shows the 'Purge: 1' screen with the following settings:

- Timeout: 0 sec
- Fluid: 50 psi
- Dump Enable: ☒
- Air Push: 0 sec
- Flush Push: 0 sec
- Refill Cycles: 1
- Flush Dump: 0 sec
- Chop: ☒
- Air Chop: 2.0 sec
- Flush Chop: 2.0 sec
- Total Chop: 10.0
- Final Push: Flush (dropdown menu)
- Final Push: 0 sec

Navigation buttons at the top: 06/28/21 17:21, Presets, Purge, Calibrate, Maint. A status bar at the bottom shows 'Off' and 'No Active Errors'. A vertical sidebar on the right contains numbered buttons 1 through 5, with '1' currently selected.

Purge: Assign a number to the purge profile.

The purge profile number can be used:

- In the Home screen when in Purge mode. See [Home Screen, page 45](#).
- In the Presets screen to associate a purge profile with a paint color. See [Presets, page 52](#).

Timeout: The number of seconds that the system waits for action before it indicates that there is a problem completing the purge profile. The timeout should be set long enough to complete the refill cycles. Enter 0 to disable the timeout.

Fluid: Set the fluid pressure for the fluid to exit the system during this purge profile.

The remaining settings define the actions in the purge sequence:

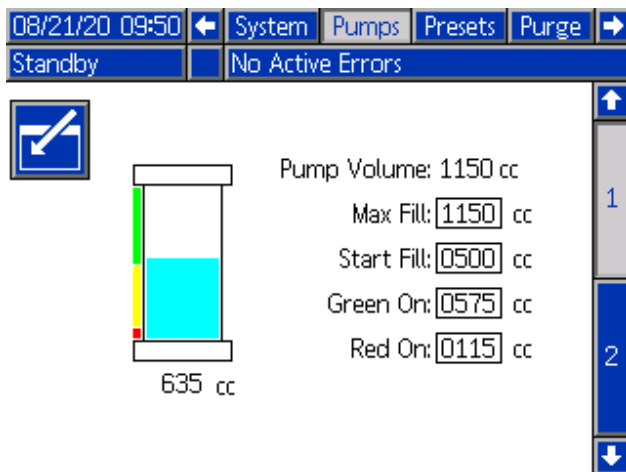
1	Dump Enable:	Check this box if the dump valve is connected to a hose that empties into a waste container. If the dump valve is not connected to a hose, be sure to clear this box, or the remaining contents from the pump will spill out of the system.
2	Air Push:	After the pump is empty, the number of seconds that air pushes through the system. Enter 0 to skip the air push.
3	Flush Push:	The number of seconds that flush fluid pushes through the system. Enter 0 to skip the flush push.
4	Refill Cycles:	The number of times to empty and refill the pump. Enter 0 to skip the refill cycles.
5	Flush Dump:	Enter the number of seconds to open both the flush material valve and the dump valve. This cleans the dump valve line.
6	Chop:	Check this box to add a flush period of alternating fluid and air to the purge sequence. <ul style="list-style-type: none"> • Air Chop: The number of seconds for the air interval. • Flush Chop: The number of seconds for the fluid interval. • Total Chop: The total number of seconds that the air and fluid will alternate through the system.
7	Final Push:	Select the last action of the purge sequence: <ul style="list-style-type: none"> • None: Perform no final action. The purge is complete after the Refill Cycles or the Chop has completed. • Air: Push air through the system for a number of seconds. • Flush: Push flush fluid the system for a number of seconds.

Pump Screens

Use the Pump screens to enter volume information about the isolation fluid pump and to manually purge the system in the event of a problem.

Pump Screen 1: Pump Volume

Use this screen to enter global settings for volume information about the isolation fluid pump and how the light tower indicates material levels in the pump. To configure different pump settings for specific paint colors, set those as part of a Preset. See [Presets, page 52](#).



Pump Volume: The total volume capacity of the pump in cubic centimeters.

Max Fill: The pump will not fill past this volume, as set by the user.

Start Fill: The system will not begin to fill until the pump volume drops below this volume, as set by the user. Setting this appropriately may help avoid delays and unnecessary refills.

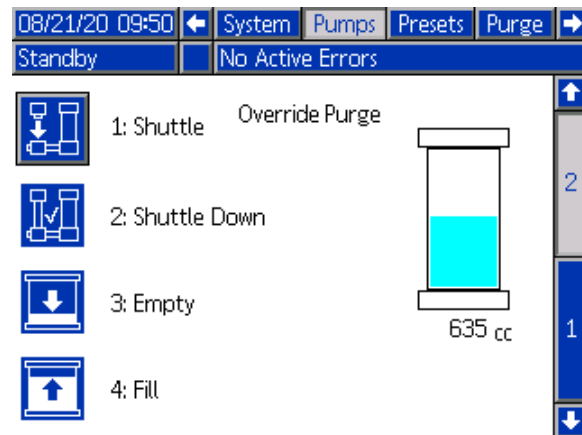
Green On: The light tower turns green when the pump volume is above the Green On setting. The light tower turns yellow when it is between the Green On and Red On settings.

Red On: The light tower turns red when the pump volume is below the Red On setting.

Pump Screen 2: Override Purge

Use this screen in troubleshooting situations to empty the isolation fluid pump and manually purge the system. This screen allows operators to override the isolation valve sensors (103) that detect the shuttle position, as well as the linear sensors (321) on the isolation fluid pump that detect the full and empty pump status.

Open the cabinet and then follow the sequence on this screen to manually empty and refill the pump.



Open the cabinet and then follow the sequence on this screen to manually empty and refill the pump.

1: Shuttle: Press to enter Standby mode. Press again to drive the shuttle down.

2: Shuttle Down: Check inside the cabinet to make sure that the shuttle is down. Press Shuttle Down to confirm that the shuttle is in the down position.

3: Empty: Press and then trigger the gun to empty the pump of fluid.


4: Fill: Press to fill the pump. To clean the pump, make sure that a hose supplying cleaning fluid is connected.

If desired, press Empty and Fill again until clean fluid comes out of the gun.

Now that the system is purged, continue troubleshooting the issue.

Advanced Screens

To edit the information on a screen press the Enter

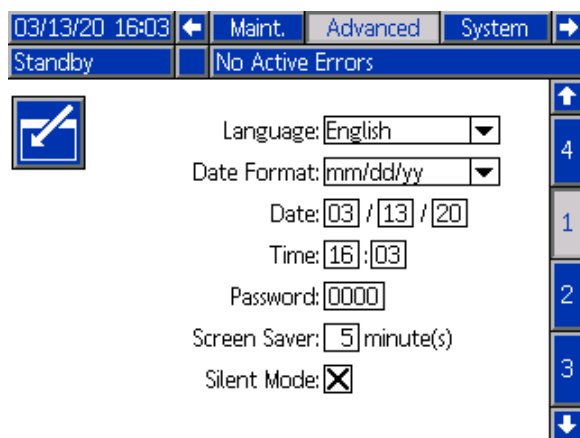
Screen key .

To advance to the next Advanced screen, press the

down arrow .


Advanced Screen 1

Use this screen to set user preferences.



03/13/20 16:03 ← Maint. Advanced System →

Standby No Active Errors



Language: English ▼

Date Format: mm/dd/yy ▼

Date: 03 / 13 / 20

Time: 16 : 03

Password: 0000

Screen Saver: 5 minute(s)

Silent Mode: ☒

1 2 3 4

Language: Select the desired language.

Date Format: Select the desired date format.

Date: Enter today's date using the number keypad.

Time: Enter the correct local time (24-hour clock) using the number keypad.

Note

The time does not update automatically for local adjustments, such as daylight savings time.

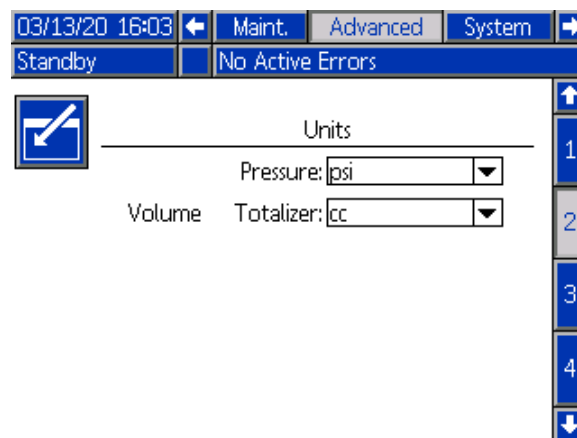
Password: The default password is 0000. Use the number keypad to set a password, if desired, for entry into the Setup screens. To disable password protection, set the password to 0000.

Screen Saver: Use the number keypad to set the period of time that the screen remains backlit if no button is pressed.

Silent Mode: Check this box so the control interface does not beep every time a button is pressed or when events are active.


Advanced Screen 2

Use this screen to select the pressure units for the system.



03/13/20 16:03 ← Maint. Advanced System →

Standby No Active Errors



Units

Pressure: psi ▼

Volume Totalizer: cc ▼

1 2 3 4

Pressure: Select between: (Default) psi, bar, MPa

Volume Totalizer: Select between: (Default) cc, L, Oz, gal

Advanced Screen 3

Use the settings on this screen to enable the system to send or receive data via USB.

03/13/20 16:03 | Maint. | Advanced | System |

Standby | No Active Errors

Enable USB Downloads/Uploads: ☒

Download Depth: Last days

Log 90% Full Advisory Enabled: ☒

Navigation buttons: 2, 3, 4, 1, Down arrow

Enable USB Downloads/Uploads: Check this box to enable USB download and upload of system information. When enabled, the Download Depth field becomes active.

Download Depth: Enter the number of days for which data retrieval is allowed. For example, to retrieve data for the previous week, enter 7.

Log 90% Full Advisory Enabled: When enabled (default), the system issues an advisory when the memory log becomes 90% full. At that point or before, perform a download to avoid loss of data. See [Download System Data, page 40](#).

For information about troubleshooting messages related to the Advanced screens, see [Error Codes, page 80](#).

Advanced Screen 4

Use this screen to update the software part numbers and versions for the system components. Refer to this screen when contacting a Graco distributor for technical assistance.

06/23/21 20:07 | Maint. | Advanced | System |

Standby | No Active Errors

Software Part #: 172579

Software Version: 1.09.001

Navigation buttons: 3, 4, 1, 2, Down arrow

Press the soft key next to the magnifying glass



to display system software details for each module.

06/23/21 20:07 | Maint. | Advanced | System |

Standby | No Active Errors

Software Part #: 172579

Software Version: 1.09.001

Module	Software Part #	Software Version
Advanced Display	172583	1.09.001
USB Configuration	172609	1.09.001
Fluid Plate 1	172581	1.09.001

Navigation buttons: Left arrow, Right arrow

• A green check mark indicates that all modules are current with the system version.

• A red cross mark indicates that one or more of the modules contain software versions that differ from what is expected. If this is the case, a red box flashes around the magnifying glass. The software that is mismatched is highlighted in light red.

Scroll to the right to display more information about the system. The column header for the serial number

of the module is shown as

06/23/21 20:07 | Maint. | Advanced | System |

Standby | No Active Errors

Software Part #: 172579

Software Version: 1.09.001

Module	Software Version	
Advanced Display	1.09.001	00173742
USB Configuration	1.09.001	-----
Fluid Plate 1	1.09.001	00058757

Navigation buttons: Left arrow, Right arrow

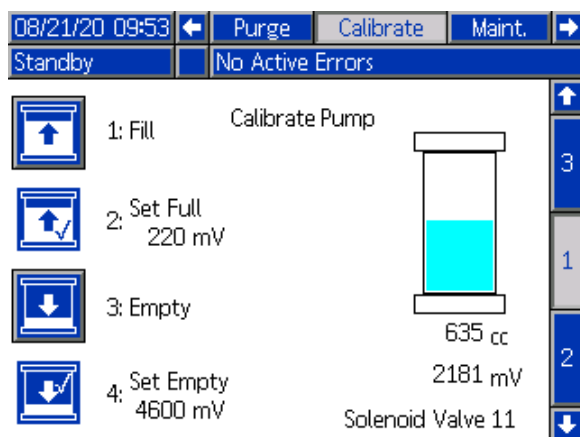
Press the magnifying glass to return to the previous screen.

To update the system software, follow the procedure in [Update the System Software, page 41](#).

Calibrate Screens

Calibrate 1: Calibrate Pump

Use the Calibrate 1 screen to calibrate the linear position sensor in the isolation fluid pump. Calibration determines the full and empty limits of the pump to ensure accurate volume and performance. Calibrate the pump after the pump is removed for service or after new system software is loaded. Follow the steps in [Calibrate the Pump, page 57](#).



Calibrate the Pump

Before calibrating the isolation fluid pump, be sure that air and fluid are being supplied to the system. Put the system into Standby mode.

1. Press the Fill button. This allows fluid into the system and begins to fill the pump. In the lower right corner of the screen, the pump volume indicator increases and the corresponding number of millivolts (mV) decreases.
2. When the pump volume and mV values stop changing, the pump is full. Press the Set Full button. The stored mV value also displays next to the button. The system returns to Standby mode.
3. Press the Empty button. This pressurizes the pump and sends fluid to the spray gun.

Note

The fluid pressure will be whatever the active preset is currently set to. It may be desirable to turn it down. Changing to Preset 0 and setting the desired pressure is the quickest way to accomplish this.

Trigger the gun to dispense fluid. In the lower right corner of the screen, the pump volume indicator decreases and the corresponding mV value increases.

The screen lists the solenoid valve that the system will use to feed fluid into the system in a color change equipped system. The valve corresponds to the color selected for the current preset.

4. When fluid stops flowing out of the gun, release the trigger. Press the Set Empty button. The stored mV value also displays next to the button. The system returns to Standby mode.

Calibrate 2: Fluid

Use the Calibrate 2 screen to adjust the calibration value of the fluid. (Default value is 1000 mV.)

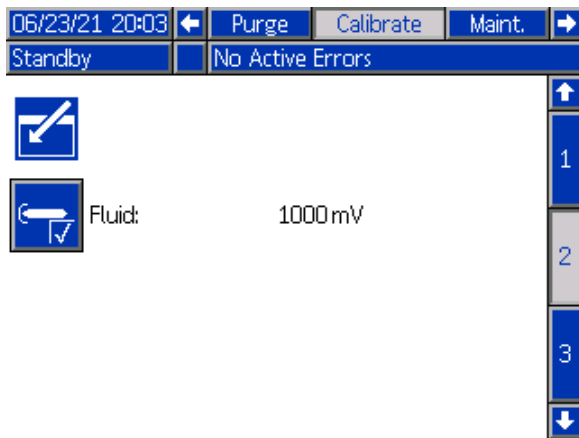
Calibrate the fluid:

- When the actual fluid pressure does not match the target value on the Home screen and it seems like it should. [Home Screen, page 45](#).

For example, when the system is in Prime mode and the gun is not triggered, both target and actual values should be the same.

- After replacing the electro/pneumatic regulator (V2P) (415).
- After replacing the V2P cable.

Follow the steps in [Calibrate the Fluid, page 58](#).



Fluid: Current fluid pressure in mV for calibration purposes.

Calibrate the Fluid

Before calibrating the fluid, be sure that no air pressure is present in the system.

- Perform the zero clear steps described within [Replace an Electro/pneumatic \(V2P\) Regulator, page 105](#).
- On the Calibrate 2 screen, select Fluid:

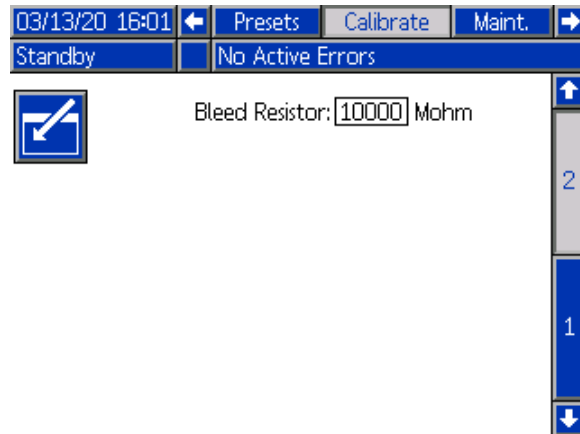


Resume system use.

Calibrate 3: Bleed Resistor

Use the Calibrate 2 screen to adjust the calibration value of the bleed resistor. (Default value is 10000 Mohms.) Follow the [Calibrate the Bleed Resistor, page 58](#).

Adjusting the value changes the kV display on the Home screen.



Bleed Resistor: The resistor that is used to slowly discharge the system, providing a path to ground when the system is charged.

Note

All systems are shipped with the value set at 10,000 Mohm. A new bleed resistor displays accurate system voltage.

Calibrate the Bleed Resistor

- With the bleed resistor (24) removed from the system, measure the resistance across the bleed resistor. See [Check the Bleed Resistor, page 69](#).
- Use the keypad to enter the measured value. Only values between 9,000 and 11,000 Mohm are allowable.
- Reinstall the bleed resistor into the system.
- Reattach the wire from the fluid pressure regulator (21) to the bleed resistor (24) and the bleed resistor to the ground rod (18).
- Make sure the wire coming out of the top of the bleed resistor is plugged back into the kV board (428) inside the electronics control panel.
- After the reassembly is complete, check the continuity between the fluid pressure regulator, bleed resistor, and ground rod.

Maintenance Screens

Maintenance 1: Maintenance Due

Use the Maintenance Due screen to set maintenance reminders for system components. When the cycle counters for each item reach these set values, an advisory is displayed on the screen.

Isolation Valve: The number of times the isolation valve shuttle has moved.

Isolation Valve Seal: The number of times the seals in the housing have been engaged.

Wash Fluid: The number of times the wash fluid has been moved through the isolation valve.

Volume: The total volume (cc) of fluid dispensed by the isolation fluid pump between maintenance events. This value does not account for material that is pushed through the system in Prime mode.

Pump: The number of times the isolation fluid pump has dispensed fluid.

Pump: The number of days that have passed since the last stall test was completed successfully. See [Pump Stall Test Procedure, page 60](#).

Solenoid Valve: The number of times the solenoid valves have been activated. (All of the solenoids listed in Status screens 1 and 2. See [Status Screens, page 50](#).)

Maintenance 2: Pump Stall Test

Use the Pump Stall Test screen to test the isolation fluid pump for internal and external fluid leaks. During the Pump Stall Test, the pump position is held for 60 seconds while the system looks for leaks.

Pump Stall Test Procedure

Before stall testing the isolation fluid pump, be sure that air and fluid are supplied to the system.

Prime the system to make sure that there is no air in the pump. Put the system into Standby mode.

1. Press the Fill button. The system automatically fills.

Be sure the gun trigger is released. During the test, the fluid line pressurizes to the active preset value.
2. Press the Stall Test button. The isolation fluid pump pressurizes and the system monitors the linear sensor to look for leaks with the pump at the top of the pump stroke. The screen displays the text, "Stall Test" and "Test In Progress."

The test takes about 1 minute to complete. If the test is successful, a confirmation displays on the screen. The system returns to Standby.
3. Press the Spray button. Dispense between 700-1000 cc so that the pump is about 1/4 full.
4. Be sure the gun trigger is released and press the Stall Test button. The system is now tested with the pump near the bottom of the pump stroke.






The test takes about 1 minute to complete. If the test is successful, a confirmation displays on the screen. The system returns to Standby.

Note

In addition to the HydroShield, this test checks the hose connections and gun. If the test fails, repeat the test with the ball valve on the inlet to the fluid pressure regulator in the closed position. The test will only check the isolation fluid pump and connections inside the HydroShield.

Maintenance 3: Shuttle Valve Resets and Test

View the isolation valve actuation counts, reset those counts, and test the valves. When the status circle next to the item appears yellow, the sensor is activated.

03/13/20 16:02		Calibrate	Maint.	Advanced
Standby		No Active Errors		
Shuttle Valve Resets and Test				
	Shuttle Down	2 cycles	<input checked="" type="checkbox"/>	
	Shuttle Up	0 cycles	<input type="checkbox"/>	
	Shuttle Eject	2 cycles	<input type="checkbox"/>	

Shuttle Down: The valve that is used to drive the shuttle down, towards the bottom of its movement or stroke.

Shuttle Up: The valve that is used to drive the shuttle up, towards the top of its movement or stroke.

Shuttle Eject: The valve that is used to eject the shuttle from its seal, before moving the shuttle up.

Note

To ensure proper operation of the isolation valve, the system only allows these valves to be turned on in a specific order.

Maintenance 4: Fluid Valve Resets and Test

View fluid valve actuation counts, reset those counts, and test the valves.

03/13/20 16:02		← Calibrate Maint. Advanced →	
Standby		No Active Errors	
Fluid Valve Resets and Test			
1	2	3	4
5	6	7	↓
12345 ↑ 00000	Shuttle Fluid In	3 cycles	<input type="checkbox"/>
12345 ↑ 00000	Pump Fluid In	3 cycles	<input type="checkbox"/>
12345 ↑ 00000	Pump Pressure	0 cycles	<input type="checkbox"/>

Shuttle Fluid In: The fluid valve near the system fluid inlet.

Pump Fluid In: The fluid valve near the fluid inlet on the isolation fluid pump. (Not present in WABL00, WABL01.)

Pump Pressure: The valve that supplies air pressure to the isolation fluid pump.

Maintenance 5: Misc Valve Resets and Test

Use this screen to view system valve actuation counts for the ground rod and gun flush box, reset those counts, and test the solenoid valves.

03/13/20 16:02		← Calibrate Maint. Advanced →	
Standby		No Active Errors	
Misc Valve Resets and Test			
1	2	3	4
5	6	7	8
12345 ↑ 00000	Ground Rod	0 cycles	<input type="checkbox"/>
12345 ↑ 00000	Gun Flush Box	0 cycles	

Ground Rod: Activates (raises) the ground rod to allow the system to build a charge. Use this option to perform ground rod maintenance. See the steps in [Check and Lubricate the Ground Rod, page 69](#).

Note

The ground rod activates (raises) only if the pneumatic door switch is closed.

Unchecked box: The system is grounded.

Checked box: The system is ungrounded.

Gun Flush Box: Activates the gun trigger to the gun flush box. Not applicable to automatic gun systems.

Maintenance 6: Output Resets and Test

Use this screen to view system output counts, reset those counts, and test the output. Install kit 24Z226 to use this feature.

For details, see
[Install the Optional System Status Output, page 26.](#)

Output Resets and Test			
System Status	3 cycles	<input checked="" type="checkbox"/>	
ES Enable	0 cycles	<input type="checkbox"/>	
Low Paint	6 cycles	<input checked="" type="checkbox"/>	

System Status: The system status output, which tells an external device if the system has an error or is off.

Unchecked box: Output off; indicates a system error or the system is off.

Checked box: Output on; indicates that the system is ready or active.

ES Enable: The ES enable output, which sends out a pneumatic and electrical signal used to turn on electrostatics.

Low Paint: The low paint output which makes an electrical connection to signal that the system is low on paint.

Maintenance 7: Isolation Valve Maintenance

Use this screen to view isolation valve actuation counts and reset those counts. The counters are useful to monitor solenoid, air cylinder, or bearings use.

The cycles increase each time the isolation valve engages. Each item can be reset at different times, based on maintenance schedules.

Isolation Valve Maintenance		
Isolation Valve	132 cycles	
Isolation Valve Seal	211 cycles	
Wash Fluid	181 cycles	

Isolation Valve: Monitors each time the isolation valve engages.

Isolation Valve Seal: Monitors the life of the fluid seals in the isolation valve assembly.

Wash Fluid: Monitors the life of the wash fluid. The wash fluid keeps the isolation valve seal clear from material.

Maintenance 8: Pump Maintenance

View information about maintaining the isolation fluid pump, including cycles and calendar days since the last stall test.

Pump: Dispense cycles since the last maintenance event.

Total Volume: The total volume of fluid dispensed by the system, based on pump cycles. The total does not include material pushed through the system in Prime mode.

Pump Stall Test: Refers to the pump stall test. This count is cleared automatically when a pump stall test is completed. Follow the [Pump Stall Test Procedure, page 60](#).

Maintenance 9: V/P

Use the V/P (Voltage to Pressure) screen to test the function of the electro/pneumatic regulator (415) and determine whether fluid pressure is being supplied to the gun.

Fluid: Check the box for the V/P to deliver a test fluid pressure when the fluid is actuated.

Maintenance 10: Color Change Valves Reset and Test

View the color change valve actuation counts, reset those counts, and test the valves.

1 / Air: Cycles for solenoid 1, the air valve.

10 / Flush: Cycles for solenoid 10, the flush valve.

2 / Dump: Cycles for solenoid 2, the dump valve.

Maintenance 11: Color Change Valves Reset and Test

View the color change valve actuation counts, reset those counts, and test the valves.


11 / Color 1: Cycles for solenoid 11, the valve for color 1.

3 / Color 2: Cycles for solenoid 3, the valve for color 2.

12 / Color 3: Cycles for solenoid 12, the valve for color 3.

Maintenance 12: Color Change Valves Reset and Test

View the color change valve actuation counts, reset those counts, and test the valves.

08/21/20 09:55		←	Calibrate	Maint.	Advanced	→
Standby		No Active Errors				
		Color Change Valves Reset and Test				↑
4 / Color 4		cycles				9
13 / Color 5		cycles				10
5 / Color 6		cycles				11
						12
						13
						14
						15
						↓


4 / Color 4: Cycles for solenoid 4, the valve for color 4.

13 / Color 5: Cycles for solenoid 13, the valve for color 5.

5 / Color 6: Cycles for solenoid 5, the valve for color 6.

Maintenance 14: Color Change Valves Reset and Test

View the color change valve actuation counts, reset those counts, and test the valves.

08/21/20 09:55		←	Calibrate	Maint.	Advanced	→
Standby		No Active Errors				
		Color Change Valves Reset and Test				↑
7 / Color 10		cycles				11
16 / Color 11		cycles				12
8 / Color 12		cycles				13
						14
						15
						1
						2
						↓


7 / Color 10: Cycles for solenoid 7, the valve for color 10.

16 / Color 11: Cycles for solenoid 16, the valve for color 11.

8 / Color 12: Cycles for solenoid 8, the valve for color 12.

Maintenance 13: Color Change Valves Reset and Test

View the color change valve actuation counts, reset those counts, and test the valves.

08/21/20 09:55		←	Calibrate	Maint.	Advanced	→
Standby		No Active Errors				
		Color Change Valves Reset and Test				↑
14 / Color 7		cycles				10
6 / Color 8		cycles				11
15 / Color 9		cycles				12
						13
						14
						15
						1
						↓


14 / Color 7: Cycles for solenoid 14, the valve for color 7.

6 / Color 8: Cycles for solenoid 6, the valve for color 8.

15 / Color 9: Cycles for solenoid 15, the valve for color 9.

Maintenance 15: Color Change Valves Reset and Test

View the color change valve actuation counts, reset those counts, and test the valves.

08/21/20 09:56		←	Calibrate	Maint.	Advanced	→
Standby		No Active Errors				
		Color Change Valves Reset and Test				↑
17 / Color 13		cycles				12
9 / Color 14		cycles				13
18 / Color 15		cycles				14
						15
						1
						2
						3
						↓

17 / Color 13: Cycles for solenoid 17, the valve for color 13.


9 / Color 14: Cycles for solenoid 9, the valve for color 14.

18 / Color 15: Cycles for solenoid 18, the valve for color 15.

System Screen

06/23/21 20:00 Advanced System Pumps

Standby No Active Errors

 Pump Ratio: 1 : 1

Gun Flush Box: ☐

Fill Start Delay: 03 sec

Ground Rod Delay: 03 sec

Color Change: ☒ 03 Colors

Dump Enable: ☒

Restart System: ☐

Auto: ☒ ☒ Fluid V/P

Pump Ratio: The relationship between the air pressure supplied and the resulting fluid pressure. Choose 30:1 or 15:1 depending on the size of the Merkur AA fluid pump ratio in the system.

Gun Flush Box: Not applicable for automatic systems.

Fill Start Delay: The number of seconds after the gun trigger is released before the isolation valve lowers and the system begins to fill.

Note

This function only applies when the electrostatic request signal is not active. If electrostatics are on the system will not try to fill.

Ground Rod Delay: The number of seconds after electrostatics are disabled before the ground rod lowers and instantly discharges the system.

System Discharge and Fill Example: If the Fill Start Delay is set to 7 seconds and the Ground Rod Delay is set to 5 seconds:

1. The gun trigger is released and the electrostatic request signal is disabled.
2. Fill Start Delay (7) and Ground Rod Delay (5) begin at the same time.
3. After 5 seconds, the ground rod lowers and discharges the system.
4. Two seconds later the isolation valve lowers and the system begins to fill.

The discharge time prior to the ground lowering depends on the gun type and hose length.

Color Change: Select to enable color change capability.

Colors: Select the number of colors the system will use. A system with six color change valves allows 3 colors. A system with 18 color change valves allows 15 colors.








Dump Enable: Select this box if the dump valve connects to a hose that empties into a waste container. Always connect a dump valve to a hose. Excess fluid will spill out of the system if the dump valve is not connected.

Restart System: Select this box to restart the entire system. Use this setting to start a token software update without manually cycling the power.

Auto: Select when using an automatic system with automatic guns.

Fluid V/P: Select Auto, then select Fluid V/P to use the built-in fluid pressure regulator depending on the HydroShield model. Disable if using a HydroShield without built-in fluid pressure regulator. This box must be checked when using a high pressure system.

Maintenance

Servicing this equipment requires access to parts which may cause electric shock or other serious injury if work is not performed properly. Moving parts, such as the isolation valve, can cut or amputate fingers.

- Do not service this equipment unless you are trained and qualified.
- To reduce the risk of injury, follow the [Pressure Relief Procedure, page 30](#) before checking, servicing, or repairing any part of the system and whenever you are instructed to relieve the pressure.
- Comply with all local codes and regulations.

To reduce the risk of fire, explosion, or electric shock, before flushing or servicing the system:

- Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#) before flushing, checking, or servicing the system and whenever you are instructed to discharge the voltage.
- Clean all parts with a non-flammable fluid as defined under [Models, page 5](#).
- Do not touch the gun nozzle or come within 4 in. (102 mm) of the nozzle during gun operation or until you perform the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).

Routine Maintenance


Before performing any maintenance task, prepare the system for service. Follow the [Prepare the System for Service, page 67](#).

Table 4 Service Interval Chart

Maintenance Task	Daily	Weekly
Flush the system regularly. Follow the steps in Flush the System (Systems without Color Change), page 31 or Flush the System (Color Change Enabled Systems), page 32 . Flush before changing fluids, before fluid can dry in the equipment, at the end of the day, before storing equipment, before repairing equipment.	✓	
Check for fluid leaks. Follow the steps in Check for Fluid Leaks, page 67 .	✓	
Wipe off any build-up off of the isolation valve components.	✓	
Check the level of the wash fluid to make sure that it is above the minimum line marked on the wash fluid bottle. Fill or replace, if necessary. Follow the Replace the Wash Fluid, page 68 .	✓	
Clean the gun. See your gun manual.	✓	

Maintenance Task	Daily	Weekly
Perform a pump stall test. Follow the Pump Stall Test Procedure, page 60 . Perform task any time fluid is seen at the weep holes on the isolation fluid pump, or any time the pump is serviced.		✓
Check the bleed resistor. Follow the steps in Check the Bleed Resistor, page 69 .		

Prepare the System for Service

1. Discharge the voltage in the system. Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).
2. Flush the system. See [Flush the System \(Systems without Color Change\), page 31](#) or [Flush the System \(Color Change Enabled Systems\), page 32](#).
3. Relieve the pressure in the system. Follow the [Pressure Relief Procedure, page 30](#).
4. Press the Stop button  on the control interface and unplug the power cord (Y).
5. Service the component or perform the maintenance task.

Check for Fluid Leaks

Check for fluid leaks daily.

NOTICE

Any fluid leaking or pooling inside the system can cause low system voltage or arcing that damages system components. Clean and dry leaks.

1. Prepare the isolation system for service. Follow the steps in [Prepare the Isolation System for Service, page 89](#).
2. Use a flat blade screwdriver to open the isolation cabinet door.
3. Slide the electrostatic shield (12) up to remove.
4. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).

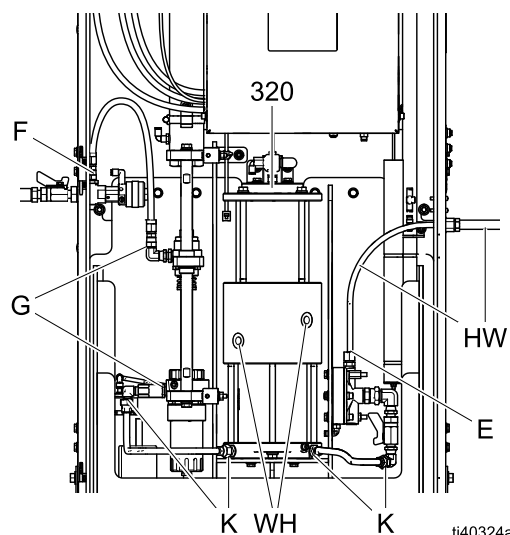
5. Inspect the following locations in the isolation cabinet:

- Connection to the fluid outlet hose (E).
- Inlet valve (F).
- Isolation valve (G).
- Wipe any build-up off of the isolation valve components (211, 222).

NOTICE

Fluid build-up on the isolation valve components can cause seal damage that results in fluid leaks.

- Check the level of the wash fluid. The level should be above the minimum line marked on the wash fluid bottle. Leaking isolation valve seals can cause the wash fluid level to change.
- Connections to the isolation fluid pump (K).
- Fluid weep hole (WH). If the fluid seal has broken, fluid eventually fills up behind the piston and causes fluid to leak out of the weep hole on the left.



ti40324a

Figure 30 Inspect for Fluid Leaks

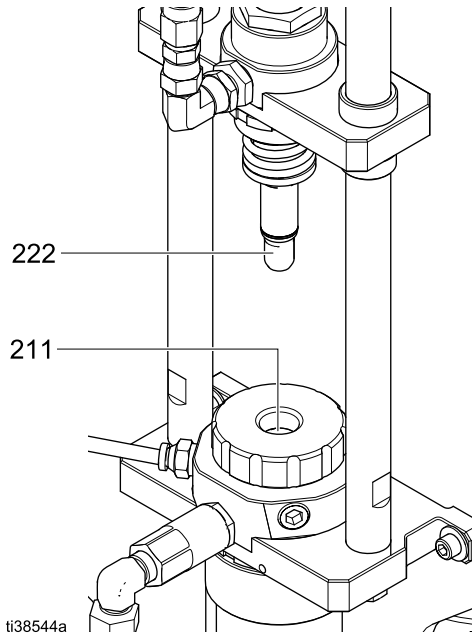


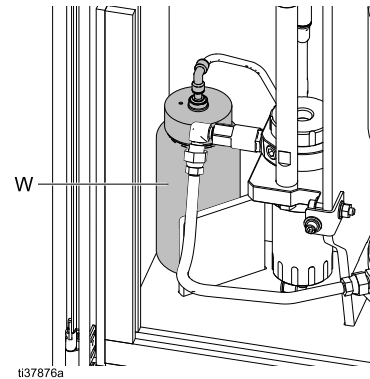
Figure 31 Wipe Off Isolation Valve Components

6. Inspect the fluid hose (HW). Check for any leakage or bulges in the outer cover which may indicate an internal leak.
7. Inspect the gun for fluid leaks. See your gun manual.

Replace the Wash Fluid

Check the wash fluid bottle level. If the level changes, service the isolation valve seals.

1. Prepare the isolation system for service. Follow the [Prepare the Isolation System for Service](#), page 89.
2. Use a flat blade screwdriver to open the cabinet.
3. Slide the electrostatic shield (12) up to remove.
4. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
5. Disconnect the push-to-connect tube from the bottle cap of the wash fluid bottle (W).
6. Lift the sealed wash fluid bottle (W) out of the system. Fill it with clean HydroShield cleansing solution above the minimum line marked on the bottle. Replace it in the cabinet.



7. Reconnect the push-to-connect tube to the bottle cap of the wash fluid bottle (W).
8. Replace the isolation valve cover (99) and tighten the top and bottom screws (99a).
9. Reinstall the electrostatic shield (12) inside the cabinet.
10. Close the cabinet door and use a flat blade screwdriver to secure the door shut.

Check and Lubricate the Ground Rod

1. Check the ground rod (18):
 - a. Use Maintenance screen 5 to raise and lower the ground rod. See [Maintenance 5: Misc Valve Resets and Test, page 61](#).
 - b. Activate the ground rod to raise it and deactivate it to lower it several times. Listen for the sound of the ground rod making contact when raising and lowering. In both cases, the ground rod should fully retract or extend in less than 2 seconds.
2. If the ground rod takes more than 2 seconds to fully retract or extend, use the following steps to lubricate the cylinder.
3. Relieve pressure in the system. Follow the [Pressure Relief Procedure, page 30](#).
4. Slide the electrostatic shield (12) up to remove.
5. Lubricate the ground rod (18):
 - a. Clip the tie straps that hold the bleed resistor (24) and ground rod together.
 - b. Remove the two screws (124), lock washers (22), flat washers (19), and spacers (123) that hold the ground rod to the back panel.
 - c. Tip the ground rod forward and put 5 drops of lubricating oil in the small air exhaust hole at the top of the cylinder.
 - d. To reassemble, tip the ground rod back into the cabinet. Reattach the screws (124), lock washers (22), flat washers (19), and spacers (123). Fasten new tie straps around the bleed resistor and ground rod.
 - e. This process may move the wires at the bottom of the components. After the reassembly is complete, check the continuity between the fluid pressure regulator, bleed resistor, and ground rod.
6. Reinstall the electrostatic shield (12) inside the cabinet.
7. Close the enclosure doors and reapply pressure to the system.
8. Repeat step 1. Activate the cylinder 10 times and then verify that the cylinder speed is less than 2 seconds.

Check the Bleed Resistor

The bleed resistor (24) is used to help discharge the system voltage and to measure system performance. If the displayed voltage appears to be inaccurate, use the following procedure to check the resistance value of the bleed resistor.

Use megohmmeter Part No. 241079 (AB) and an applied voltage of 500 V.



1. Prepare the isolation system for service. See [Prepare the Isolation System for Service, page 89](#).
2. Use a flat blade screwdriver to open the isolation cabinet door.
3. Slide the electrostatic shield (12) up to remove.
4. Follow the wire from the top of the bleed resistor (24) to the kV board (428) and loosen the terminal screw to remove the wire.
5. Attach the positive lead of the megohmmeter to the wire and touch the negative lead to the threaded stud at the bottom end of the bleed resistor (24).
6. Measure the resistance. The resistance should be between 9 and 11 Gigohms.
 - If the value is inside the range, then calibrate the bleed resistor. Follow the procedure in [Calibrate the Bleed Resistor, page 58](#).
 - If the value is lower than 9 Gigohm or higher than 11 Gigohm, then replace the resistor.
7. Reattach the wire in the terminal screw.
8. Reinstall the electrostatic shield (12) inside the cabinet.
9. Close the cabinet door and use a flat blade screwdriver to secure the door shut.




Check the Door Switch

A door switch interlock automatically discharges the system voltage any time the door on the isolation cabinet (1) is open. Use this procedure to determine whether the door switch is working properly.

1. Navigate to Maintenance screen 5 and activate the grounding rod (N). See [Maintenance 5: Misc Valve Resets and Test, page 61](#).
2. Manually depress the door switch. If you hear the ground rod retract and extend within a few seconds, the door switch is working properly.



Troubleshooting

				
<p>Installing and servicing this equipment requires access to parts which may cause an electric shock or other serious injury if the work is not performed properly. Do not install or repair this equipment unless you are trained and qualified.</p> <p>Follow the Fluid Voltage Discharge and Grounding Procedure, page 29 before checking or servicing the system and whenever you are instructed to discharge the voltage.</p>				

				
<p>To reduce the risk of an injury, follow the Pressure Relief Procedure, page 30 whenever you are instructed to relieve the pressure.</p>				

General Troubleshooting

Problem	Diagnosis	Solution
Prime		
The system does not prime.	Incorrect mode.	<ol style="list-style-type: none"> 1. Change to Prime mode. 2. Trigger the gun. 3. Turn on the fluid supply and check the incoming fluid pressure.
	Inlet valve is off or stuck.	<p>Test the inlet valve using Maintenance screen 5 as described in Maintenance 5: Misc Valve Resets and Test, page 61.</p> <p>Service the solenoid valve or fluid valve. See Replace a Solenoid Valve, page 105.</p>
	The isolation fluid pump is not calibrated and is not showing as being empty.	Calibrate the pump and try Prime mode again. See Calibrate the Pump, page 57 .
	The fluid pressure supplied to the system is too low.	Increase the supply fluid pressure. Maximum is 100 psi (0.7 MPa, 7.0 bar).
	The fluid pressure to the gun is set to zero or very low.	Adjust the gun fluid pressure setting.
Fluid leaks appear.	Seals are worn or there are loose connections.	See Check for Fluid Leaks, page 67 to locate and correct.

Problem	Diagnosis	Solution
Spray		
The system does not fill.	The system thinks the gun is triggered or electrostatics are being requested. Either the PT input or the ES input is active.	Make sure that both the paint trigger signal and the ES request signal are inactive.
	The Do Not Fill button  is activated.	Deactivate the Do Not Fill button  on the Home Screen. See Home Screen, page 45 .
	The system is in the wrong mode.	Change to Spray mode.
	The Fill Start Delay setting is long.	Change the Fill Start Delay value as described in System Screen, page 65 .
	The isolation valve does not travel or engage.	Test the isolation valve and travel. See Maintenance 3: Shuttle Valve Resets and Test, page 60 .
	Max Fill setting or Start Fill setting is not accurate.	Adjust Max Fill and Start Fill settings, as described in Pump Screen 1: Pump Volume, page 54 .
	Inlet valve is off or stuck.	Test valve using Maintenance screen 4. See Maintenance 4: Fluid Valve Resets and Test, page 61 . Service the solenoid valve or the fluid valve. See Replace a Solenoid Valve, page 105 .
	The isolation valve is blocked.	See Service the Isolation Valve, page 90 .
	The check valve is blocked.	See Service the Isolation Valve, page 90 .
System is slow to fill.	The Fill Start Delay setting is long.	Change the Fill Start Delay value as described in System Screen, page 65 .
	Low incoming fluid pressure.	Check incoming fluid pressure during the fill. Limit fluid pressure drop in the supply during fill by limiting supply hose length or increasing supply hose diameters. Turn the fluid pressure up as high as possible without exceeding the maximum limit: 100 psi (0.7 MPa, 7.0 bar).
	Material viscosity is high.	Manage incoming material viscosity.

Problem	Diagnosis	Solution
The system does not spray.	<ol style="list-style-type: none"> 1. The system is not in Spray mode. 2. The isolation fluid pump is empty and there is no material to spray. 3. The fluid pressure is too low or zero. 4. The ball valve (39) at the fluid pressure regulator (21) is closed. 5. The paint trigger signal is not being recognized. 	<ol style="list-style-type: none"> 1. Change to Spray mode. 2. Give the system time to fill before trying to paint. 3. Increase the gun fluid pressure on the Home screen or Preset screen. 4. Open the manual ball valve (39) attached to the fluid pressure regulator (21). 5. Be sure the paint trigger input is getting at least 70 psi. If this does not correct the issue, check the pressure switch and wiring in the electronics control panel. <p>Note</p> <p>Check the Status screen to see if the system detects the gun trigger. See Status Screen 1, page 50.</p>
Air is in the fluid.	Entering Spray mode before the system is primed.	Enter Spray mode after priming the system.
Improper spray pattern or gun operation problem.	Issue with spray gun setup or maintenance.	Refer to your gun manual.
No fluid when gun is triggered (or wrong fluid pressure).	System is in Standby mode.	Change to Prime, Purge, or Spray mode.
	Issue with the regulator that sends air to drive the fluid pressure regulator (21).	<ul style="list-style-type: none"> • Set the gun fluid pressure on the Home screen or Preset screen. • Check the electro/pneumatic regulator (V2P) (415) function using Maintenance screen 9. See Maintenance 9: V/P, page 63.
	Fluid pressure regulator (21) is not operating properly.	Service the fluid pressure regulator. See Remove the Fluid Regulator , page 104 .
Poor wrap.	Low spraying voltage.	Increase the voltage setting for the gun.
	Issue with spray gun setup or maintenance.	Refer to your gun manual.

Problem	Diagnosis	Solution
Low or no spraying voltage.	<ul style="list-style-type: none"> The ground rod (18) is not raising. The isolation valve (227) is not raising. The components or cabinet (9) is dirty. The electrostatic shield (12) is not in place. 	See Voltage Loss Troubleshooting, page 75 .
	The ES request input does not recognize a signal and does not raise the ground rod.	Use the Status screen to see whether the system detects the ES request input. See Status Screen 1, page 50 and Status Screen 3, page 51 .
	Incorrect voltage level display	<p>Check system voltage using a probe (236003).</p> <p>Calibrate the bleed resistor as described in Calibrate the Bleed Resistor, page 58.</p> <p>Check or replace the kV board as described in Replace a kV Board, page 105.</p>
Voltage is still present at the gun after the trigger is released.	Ground Rod Delay setting.	Adjust the Ground Rod Delay setting on the System screen. See System Screen, page 65 .
	The ground rod (18) does not lower.	Follow the procedure in Check and Lubricate the Ground Rod, page 69 .
	The ES request input is still active.	Remove the ES request input signal.
Voltage is still present at the gun after following the Fluid Voltage Discharge and Grounding Procedure, page 29 .	Air pocket in the fluid line leaves fluid isolated near the gun.	Determine cause and correct. Purge air from the fluid line.
	Issue with the door switch.	Check the door switch as described in Check the Door Switch, page 69 .
Paint goes backward toward the paint supply.	Faulty inlet valve and check valve.	<p>With the shuttle down, test the Shuttle Fluid In, Pump Fluid In, and Pump Pressure valves individually on Maintenance Screen 4. If fluid is in valves at the same time as there is pump pressure, this can result in fluid back-flowing if a check valve is not present.</p> <p>See Maintenance 4: Fluid Valve Resets and Test, page 61.</p> <p>Check for a leaky check valve.</p>

Problem	Diagnosis	Solution
Other issues		
Paint build-up on the isolation valve stem.	<ol style="list-style-type: none"> 1. Dirty wash fluid can no longer clean properly. 2. The U-cup seals are not wiping the isolation valve stem clean. 3. The isolation valve stem (222) o-ring is not sealing fully. 	<ol style="list-style-type: none"> 1. Follow the steps in Replace the Wash Fluid, page 68. 2. Replace wash fluid U-cups as seen in repair section. 3. Replace the isolation valve stem o-ring as described in Replace the Isolation Valve Stem O-rings, page 96.

LED Diagnostic Information

The following LED signals, diagnoses, and solutions apply to the control interface.

LED Status Signal	Diagnosis	Solution
Green on	The system is powered up.	—
Yellow	Internal communication is in progress.	—
Red solid	Hardware failure.	Replace module.
Red flashing fast	Software is uploading.	—
Red flashing slow	Token error	Remove token and upload the software token again.
Red flashes three times, pauses, and then repeats	Invalid rotary switch position (FCM and CGM only)	Change the rotary switch position on the control module (inside the air or speed controller) to a valid position, and then restart the system.

Troubleshooting the Control Interface

Problem	Cause	Solution
The control interface is not on.	Power is not on.	Turn power supply on.
	Loose or disconnected CAN cable.	Tighten or connect CAN cable.
The control interface has power but does not function.	Hardware failure.	Replace.
Red module status LED stays on constantly even after power cycle.	Hardware failure.	Replace.

Voltage Loss Troubleshooting

Normal spraying voltage for a system is 45-55 kV. The system voltage is lower than the rated voltage due to spraying current demands and normal isolation system losses.

A loss of spraying voltage can be caused by a problem with the spray gun, the fluid hose, or the voltage isolation system, since all of the system components are electrically connected through the conductive, waterborne fluid.

Note

It is important to keep the inside of the isolation cabinet clean. If the exterior of the isolation fluid pump (K), the isolation valve connecting rods (225), or plastic walls of the cabinet (9) are dirty, voltage will be lost along those paths.

1. Check the isolation system for fluid leaks as described in [Check for Fluid Leaks, page 67](#).
2. Check for connections between high voltage components and grounded components within the isolation system. The figure in [Troubleshooting HydroShield Voltage, page 76](#) identifies the high voltage, the isolation, and the grounded components.
3. Verify that the inlet air supply pressure is above the minimum required 70 psi (0.5 MPa, 4.8 bar) and the inlet air status bar is green. The air inlet field appears on the Home screen. See [Home Screen, page 45](#).
4. Dispense enough fluid to expel any air pockets from the fluid line.
5. Verify that the electrostatic shield (12) is in place, and then close and latch the cabinet door.
6. Put the system in Spray mode. Enable electrostatics by activating the ES request input signal. Look at the Volt Level display on the Home screen to see the spraying voltage. Under normal conditions, the spraying voltage should be between 45 and 55 kV. If the display shows 0 kV then continue with the next step. If the voltage is above 0 but lower than expected, continue with step 10.

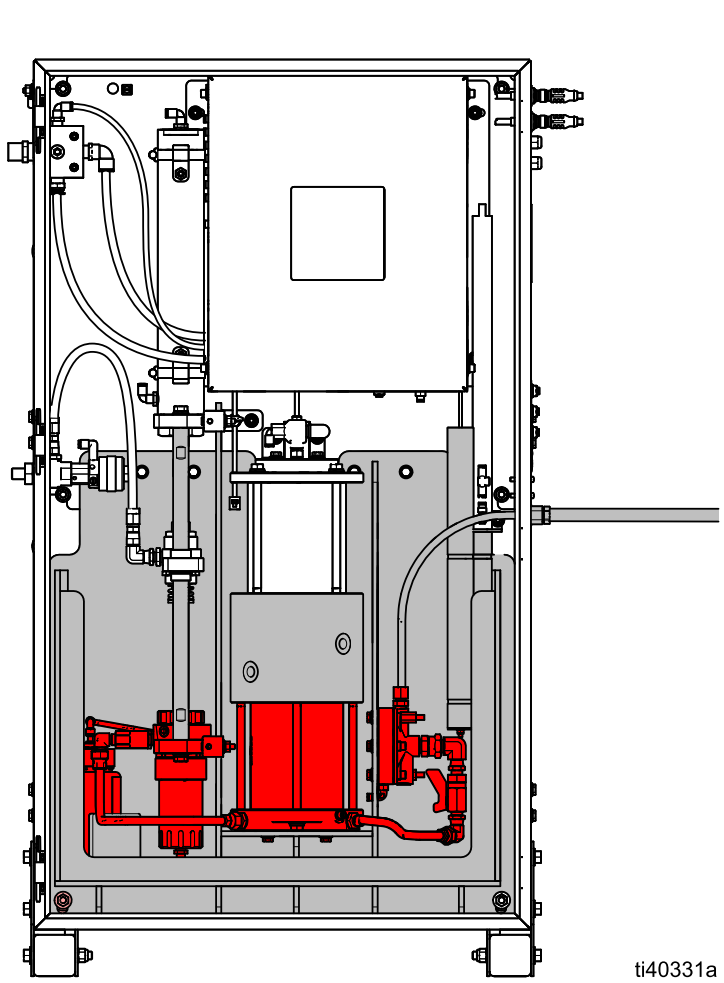
7. If the system is completely shorted out (0 kV) the fault may be with the mechanical operation of the isolation valve, grounding rod, or door switch. Open the cabinet door and go to the maintenance screens on the control interface.
 - Activate the shuttle down and shuttle up valves and verify that the shuttle travels up and down smoothly. See [Maintenance 3: Shuttle Valve Resets and Test, page 60](#) to activate the shuttle.
 - Activate the ground rod and make sure the cylinder is retracting fully. (See [Maintenance 5: Misc Valve Resets and Test, page 61](#).) If both cylinders are working properly, then continue with the next step.

Note

For the ground rod to activate, either the cabinet door must be closed or the door switch must be manually switched.

8. Verify that the door switch is working properly. Follow the procedure in [Check the Door Switch, page 69](#).
9. If the kV is low, verify the accuracy of the kV meter. Use a high voltage measurement probe to measure the kV at the spray gun electrode. The readings should be within a few kV. If they are not, proceed to the next step.
10. Leakage internal to the isolation fluid pump could also cause voltage loss. Check the pump weep holes (WH) in the middle housing (307) for fluid leaks. Service the pump if needed.
11. If voltage is still low, retest the gun and hose.

Troubleshooting HydroShield Voltage

<p>Grounded components:</p> <ul style="list-style-type: none"> • The cabinet. • All the parts mounted in the top half of the cabinet. • The top of the isolation valve. • The fluid inlet valve and hose. • The air section of the isolation fluid pump. • The air cylinder of the ground rod. • The top of the bleed resistor. • The shield of the fluid hose. 	 <p>ti40331a</p>
<p>Isolation components:</p> <ul style="list-style-type: none"> • The tie rods of the isolation valve. • The middle section of the isolation fluid pump. • The body of the bleed resistor. • The body of the ground rod. • The plastic enclosure and stand. • The electrostatic shield that slides in the front. • The waterborne fluid hose. 	
<p>All the fluid components are high voltage:</p> <ul style="list-style-type: none"> • The wash fluid bottle. • The bottom of the isolation valve. • The bottom of the isolation fluid pump. • The fluid hoses. • The ball valve and fluid regulator. • The bottom of the bleed resistor. • The ground rod. 	

Grounded components: unshaded

Isolation components: gray

High voltage: red/dark

Troubleshooting Color Change Solenoid Valves

All color change solenoid valves may be exercised individually for diagnostic purposes through the control interface starting with Maintenance screen 10.

Cause	Solution
1. Air regulator pressure set too high or too low.	Check that air pressure is at least 85 psi (0.6 MPa, 6.0 bar). Do not go above 100 psi (0.7 MPa, 7.0 bar).
2. Air or electrical lines damaged or connections are loose.	Visually inspect air and electrical lines for kinks, damage, or loose connections. Service or replace as needed.
3. Solenoid failure.	<p>Check the applicable solenoid's LED; see Color Change Board, page 78. If lit, proceed with the following checks. If not lit, go to Cause 4.</p> <p>Remove the connector for the applicable solenoid and measure voltage across the pins on the board:</p> <ul style="list-style-type: none"> • In a non-hazardous location, replace the solenoid if voltage is 24 Vdc. <p>Test the valves as explained under the maintenance screens. Valves should open and close quickly. If the valves actuate slowly, it could be caused by:</p> <ul style="list-style-type: none"> • Air pressure to the valve actuators is too low. See Cause 1. • Solenoid is clogged. Make sure the air supply has a 5 micron filter installed. • Something is restricting the solenoid or tubing. Check for air output from the air line for the corresponding solenoid when the valve is actuated. Clear the restriction.
4. Control board or cable failure.	<p>If there is no voltage across the pins on the board or it is less than 9 Vdc, check LEDs D8, D9, and D10. If they are lit and functioning properly, or other solenoids in the module are working properly, replace the color change board.</p> <p>If D9 is not lit:</p> <ul style="list-style-type: none"> • Verify the condition of the fuse (F1) and replace if necessary. See Replace the Color Change Board Fuse, page 106. • Check if the cable is disconnected or damaged. <p>If D8 is not blinking:</p> <ul style="list-style-type: none"> • Cycle the system power. • Check if the cable is disconnected or damaged. <p>If D10 is not occasionally blinking:</p> <ul style="list-style-type: none"> • Check if the cable is disconnected or damaged.

To avoid electrical component damage, remove all system power before plugging any connectors.



3A8493A

Table 5 Color Change Board Diagnostics

Component or Indicator	Description	Diagnosis
D8	LED (green)	Blinks (heartbeat) during normal operation.
D9	LED (green)	Turns on when power is supplied to the board.
D10	LED (yellow)	Turns on when board is communicating with electronic control.
D27–D39, D41, D43–D46	LED (green)	Turn on when a signal is sent to actuate the related solenoid valve.
F1	Fuse, .500 A, 125 V	Used on the 25D312 board. This board is used in the electronics control (14) and the color change control module 25D313-25D327.

Error Codes

System errors alert the operator of a problem in the system. When any error occurs:

- Error buzzer sounds (unless operating in silent mode).
- An error popup screen displays the active error code.
- The Status bar displays the active error code.

The error is saved in the error or event log.

There are four types of error: Alarm, Deviation, Advisory, and Record.

If an **Alarm** occurs, operation stops and an error is recorded in the system.

A **Deviation** records an error in the system but does not shut down the equipment. The deviation must be acknowledged by the user.

An **Advisory** records an event in the system and clears itself after 60 seconds.

A **Record** saves relevant system events in the background. This information can be reviewed on the Error Log Screen.

To Clear Error and Restart

When a deviation or alarm occurs, be sure to determine the error code before resetting it. Go to the Events Screen to view the last 200 errors, with date and time stamps. See [Events Screen, page 50](#).

If an alarm has occurred, correct the cause before resuming operation.

To acknowledge a deviation or clear an alarm, press



Table 6 Control Interface Errors

Code	Type	Name	Description	Solution
EVUX	Advisory	USB Disabled	User installed a USB device in the USB port when USB downloads were disabled.	Go to Advanced Screen 3 and check the field for Enable USB Downloads/Uploads, as described in Advanced Screen 3, page 56 .
WN0X	Alarm	Key Token ErrorAdm	User installed incompatible token.	Remove the key token. Repeat the process with a compatible key token.
WSUX	Advisory	USB Configuration Error	USB configuration file does not match expected; checked on startup.	Reinstall software. Follow the steps in Update the System Software, page 41 .
WXUU	Advisory	USB Upload Error	User installed an incompatible USB device in the Control Interface USB port.	Repeat the process with a compatible USB device.
WXUD		USB Download Error		
WX00	Alarm	Software Error	An unexpected software error has occurred.	Call Graco technical support.

Table 7 Communications Errors

Code	Type	Name	Description	Solution
CAD1	Alarm	Communication Error Fluid Panel	The control interface has lost communication with the fluid panel or FCM cube.	<ul style="list-style-type: none"> • Verify the CAN connection on the system. See Connect the CAN Cables, page 23. • Verify the CAN connection on the FCM cube (412). • The FCM has an incorrect CAN ID. • Check the status LEDs on the FCM cube (412). • Cycle power off and on.
CAC1	Alarm	Communication Error Solenoid Controller	The control interface has lost communication with the solenoid controller.	<ul style="list-style-type: none"> • Verify the CAN connection on the system. See Connect the CAN Cables, page 23. • Verify the CAN connection on the solenoid controller board. • The solenoid controller board has an incorrect CAN ID. • Check the status LEDs on the solenoid controller board. • Cycle the power off and on.
CDD0	Alarm	Duplicate Fluid Panel	The system detects multiple fluid panels set to the same identifier.	<ul style="list-style-type: none"> • The fluid panel FCM has the same CAN ID as another module. • Adjust the selector switch on the control module. See Adjusting Selector Switch in manual 3A3954.
CDC0	Alarm	Duplicate Solenoid Controller	The system detects multiple solenoid controllers set to the same identifier.	<ul style="list-style-type: none"> • The solenoid controller has the same CAN ID as another module. • Adjust the selector switches on the solenoid controller board.
CAO1	Alarm	Communication Error Logic Controller	The system has lost communication with the control interface.	<ul style="list-style-type: none"> • Verify the CAN connection on the bottom of the control interface. • Check the status LEDs on the control interface. See LED Diagnostic Information, page 74.

Code	Type	Name	Description	Solution
CAC2	Alarm	Communication Error Solenoid Controller	The control interface has lost communication with the solenoid controller that is responsible for color change.	<ul style="list-style-type: none"> • Verify CAN connection on the system. • Verify CAN connection on the solenoid controller board. • Check status LEDs on solenoid controller board. • Cycle the power. • Adjust the selector switches on the solenoid controller board.
CDC1	Alarm	Duplicate Solenoid Controller	The system detects multiple solenoid controllers set to the same identifier.	<ul style="list-style-type: none"> • The solenoid controller has the same CAN ID as another module. • Adjust the selector switches on the solenoid controller board.

Table 8 HydroShield Errors

Code	Type	Name	Description	Solution
SIL0	Alarm	Pneumatic System Stop Activated	The system has been stopped using the pneumatic system stop input.	<ul style="list-style-type: none"> • Verify the wiring of the pneumatic system stop pressure switch. • Verify the integrated system installation intended to stop the HydroShield system.
SIL1	Alarm	Digital System Stop Activated	The system has been stopped using the digital system stop input.	<ul style="list-style-type: none"> • Verify the wiring of the pneumatic system stop optocoupler. • Verify the integrated system installation intended to stop the HydroShield system.
P6FX	Alarm	Inlet Air Removed	The system no longer detects inlet air.	Verify that the inlet air pressure is greater than 70 psi (0.5 MPa, 4.8 bar), that air flow is sufficient, and that the wiring on the pressure switch is connected.
PJ11	Alarm	Linear Sensor Failure	Linear sensor is not connected or is reading outside calibrated values.	<ul style="list-style-type: none"> • Verify that the linear sensor is connected. • Calibrate the linear sensor.
P611	Alarm	Gun Air V2P Feedback Error	System cannot detect feedback from air V2P.	<ul style="list-style-type: none"> • Verify that the air V2P is connected. • Verify that the air V2P has power.
P613	Alarm	Fluid V2P Feedback Error	System cannot detect feedback from fluid V2P.	<ul style="list-style-type: none"> • Verify that the fluid V2P is connected. • Verify that the fluid V2P has power.

Code	Type	Name	Description	Solution
N611	Alarm	Isolation Valve Timeout	Isolation valve was not detected in the expected position.	<ul style="list-style-type: none"> • Verify that the isolation valve moves using Maintenance 3: Shuttle Valve Resets and Test, page 60. • Verify that the top sensor is detected using the . • Verify that the bottom sensor is detected using . • Verify that the sensors are connected.
N612	Alarm	Shuttle Top Timeout	Isolation valve was not detected in the expected position.	<ul style="list-style-type: none"> • Verify that the isolation valve moves using the Maintenance screen. • Verify that the top sensor is detected using the Status screen. • Verify that the bottom sensor is detected using the Status screen. • Verify that the sensors are connected.
F7P0	Alarm	Invalid Air Flow	Gun airflow is detected when it should be off.	<ul style="list-style-type: none"> • Determine if there is an air leak in the system. • Check the air flow switch. • Check Air V/P. • Contact Graco technical support.
SGD1	Alarm	Gun Flush Box Open	The gun flush box was left open when the system was trying to attempt a purge.	Close the gun flush box.

Table 9 Calibration Events

Code	Type	Name	Description	Solution
ENA1	Advisory	Linear Sensor Full Calibrated	System successfully calibrated Linear Sensor full reading.	Not applicable.
ENA2	Advisory	Linear Sensor Empty Calibrated	System successfully calibrated Linear Sensor empty reading.	Not applicable.
P511	Alarm	V/P Cal Failed Air	V/P calibration failed for the Air V/P	<ul style="list-style-type: none"> • Check V2P connections. • Verify V2P operation • Contact Graco technical support.
P513	Alarm	V/P Cal Failed Fluid	V/P Calibration failed for the Fluid V/P	<ul style="list-style-type: none"> • Check V2P connections. • Verify V2P operation • Contact Graco technical support.
EN11	Advisory	V/P Cal Air	Air V/P Calibration successful	Not applicable.
EN13	Advisory	V/P Cal Fluid	Fluid V/P Calibration successful	Not applicable.

Table 10 Maintenance Events

Code	Type	Name	Description	Solution
ENT1	Advisory	Stall Test Pass	System successfully completed a stall test.	Not applicable.
DF01	Advisory	Stall Test Full Fail	System failed the full stall test; did not stall when pump is full.	<ul style="list-style-type: none"> Check the system for leaks as described in Check for Fluid Leaks, page 67. Repeat the test as described in Maintenance 2: Pump Stall Test, page 59.
DG01	Advisory	Stall Test Empty Fail	System failed the empty stall test; did not stall when pump is near empty.	
MAD1	Advisory	Maint. Due Pump Volume	Maintenance is due on pump (volume).	<p>Perform maintenance and clear the associated maintenance counter.</p> <p>Stall test maintenance requires that a stall test be completed.</p> <p>For all maintenance counters, see Maintenance Screens, page 59.</p>
MAP1	Advisory	Maint. Due Pump Cycle	Maintenance is due on pump (cycle).	
MAT1	Advisory	Maint. Due Pump Stall Test	Maintenance is due on pump (stall test).	
MJ11	Advisory	Maint. Due Valve Shuttle Down	Maintenance is due on shuttle down valve.	
MJ21	Advisory	Maint. Due Valve Shuttle Up	Maintenance is due on shuttle up valve.	
MJ31	Advisory	Maint. Due Valve Shuttle Eject	Maintenance is due on shuttle eject valve.	
MJ41	Advisory	Maint. Due Valve Shuttle Fluid Inlet	Maintenance is due on shuttle fluid inlet valve.	
MJ51	Advisory	Maint. Due Valve Pump Fluid Inlet	Maintenance is due on pump fluid inlet valve.	
MJ61	Advisory	Maint. Due Valve Pump Pressure	Maintenance is due on pump pressure valve.	
MJ7X	Advisory	Maint. Due Valve Ground Rod	Maintenance is due on ground rod valve.	
MJ8X	Advisory	Maint. Due Valve GFB	Maintenance is due on the gun flush box.	
MJ91	Advisory	Maint. Due Valve ES Enable	Maintenance is due for the ES Enable valve.	
MCP1	Advisory	Maint. Due Isolation Valve	Maintenance is due on the isolation valve.	
MCD1	Advisory	Maint. Due Isolation Valve Seal	Maintenance is due on the isolation valve seal.	

Code	Type	Name	Description	Solution
MCS1	Advisory	Maint. Due Isolation Valve Wash Fluid	Maintenance is due on the isolation valve wash fluid.	
MEF#	Advisory	Maint. Valve Inlet X	Maintenance is due on color change valve x.	

Table 11 System Events

Code	Type	Name	Description	Solution
EL00	Record	System Power On	Record of power cycle (ON).	Not applicable.
EM00	Record	System Power Off	Record of power cycle (OFF).	Not applicable.
EC00	Record	Setup Value(s) Changed	Record of changing setup variables	Not applicable.
ES00	Advisory	Factory Defaults	Record of system settings being reset to factory defaults	Not applicable.
EB00	Record	Stop Button Pressed	Record of stop button press.	Not applicable.
WN0X	Alarm	Key Token Error	User installed incompatible key token.	Remove key token. Repeat process with compatible key token. Follow the steps in Update the System Software, page 41 .
WX00	Alarm	Software Errors	An unexpected software error has occurred.	Call Graco technical support.
WE00	Advisory	Ground Rod Failure	Hydroshield detects electrostatic voltage when the ground rod is down.	Check ground rod operation.








Table 12 USB Events

Code	Type	Name	Description	Solution
EAUX	Advisory	USB Busy	USB drive is inserted, download is in progress.	Not applicable.
EVUX	Advisory	USB Disabled	User installed a USB device in the USB port when USB downloads were disabled.	The configuration of the system is blocking data transfer. Go to Advanced Screen 3 and check the field for Enable USB Downloads/Uploads, as described in Advanced Screen 3, page 56 .
EBUX	Record	USB Drive Removed	USB drive was removed while downloading or uploading.	Configuration parameter on system is enabled to generate this advisory. Complete download to ensure no data is lost.
MMUX	Advisory	Maint. USB Logs Full	USB memory is more than 90% full.	Complete download to ensure no data is lost.
WSUX	Advisory	USB Config. Err.	USB configuration file does not match expected; checked on startup.	A software update was not completed successfully. Reinstall the software.
EQU0	Advisory	USB Idle	USB download completed, drive may be removed.	Remove the USB device.
EQU1	Record	USB Sys. Settings Downloaded	Settings were downloaded to USB drive.	Not applicable.
EQU2	Record	USB Sys. Settings Uploaded	Settings were uploaded to USB drive.	Not applicable.
EQU3	Record	USB Custom Lang. Downloaded	Custom language was downloaded to USB drive	Not applicable.
EQU4	Record	USB Custom Lang. Uploaded	Custom language was uploaded to USB drive.	Not applicable.
EQU5	Record	USB Logs Downloaded	Data logs were downloaded to USB drive.	Not applicable.
WXUD	Advisory	USB Download Err.	User installed an incompatible USB device in the USB port.	Repeat the process with a compatible USB device.
WXUU	Advisory	USB Upload Err.		

Table 13 Color Change Events

Code	Type	Name	Description	Solution
WSF0	Advisory	Rejected Inlet Change	User is unable to change color/inlet valve during operation and is notified via an advisory.	Changing of Color value is not allowed in Spray mode. Change to Off, Standby or Prime to change colors.
WSCX	Advisory	Invalid Presets	User decreases the number of color change valves, creating invalid presets. In this error code, the last digit X means system.	Confirm that the number of color valves is correct, and then correct presets with invalid colors See System Screen, page 65 and Presets, page 52 .
WSC0	Advisory	Invalid Preset Selected	User has invalid presets due to changing the number of color change valves and selects an invalid preset.	The color setting for the current preset is not correct. Confirm that the number of colors valves for the system matches the system setting, confirm that the current preset has the correct color setting. See System Screen, page 65 and Presets, page 52 .
WS##	Record	Invalid Preset ##	User has invalid presets due to changing the number of color change valves and selects an invalid preset. Records in which preset is invalid, ## is the Preset number.	Confirm that the number of color valves is correct, and then correct the presets that contain invalid colors. See System Screen, page 65 and Presets, page 52 .
WSFX	Alarm	Invalid Inlet Valve	User decreased the number of color change valves during system operation, resulting in an invalid selected inlet valve. In this error code, X means system.	Confirm that the number of color valves is correct, and then correct the presets that contain invalid colors. See System Screen, page 65 and Presets, page 52 .
L7F0	Advisory	Flush Fluid In Pump	Flush Fluid is still in the pump when entering Spray Mode.	Empty out the flush fluid from the pump then go back into Spray Mode.
DE00	Alarm	Purge Timeout	Pump volume did not change before the timeout expired.	Determine why the pump volume was not changing and restart the purge sequence. See Purge Screens 1–5, page 53 .

Repair

Servicing this equipment requires access to parts which may cause electric shock or other serious injury if work is not performed properly. Moving parts, such as the isolation valve, can cut or amputate fingers.


- Do not service this equipment unless you are trained and qualified.
- To reduce the risk of injury, follow the [Pressure Relief Procedure, page 30](#) before checking, servicing, or repairing any part of the system and whenever you are instructed to relieve the pressure.
- Comply with all local codes and regulations.

To reduce the risk of fire, explosion, or electric shock, before flushing or servicing the system:

- Follow the [Fluid Voltage Discharge and Grounding Procedure, page 29](#) before flushing, checking, or servicing the system and whenever you are instructed to discharge the voltage.
- Clean all parts with a non-flammable fluid as defined under [Models, page 5](#).
- Do not touch the gun nozzle or come within 4 in. (102 mm) of the nozzle during gun operation or until you perform the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).

Prepare the Isolation System for Service

Before servicing any component inside the isolation cabinet, perform the following steps:

1. Discharge voltage in the system. Follow all of the steps in the [Fluid Voltage Discharge and Grounding Procedure, page 29](#).
2. Flush the system. See [Flush the System \(Systems without Color Change\), page 31](#) or [Flush the System \(Color Change Enabled Systems\), page 32](#).
3. Relieve pressure in the system. Follow the [Pressure Relief Procedure, page 30](#).
4. Press the Stop button  on the control interface and unplug the power cord (Y).
5. Service the component.

Service the Isolation Valve

Remove the Isolation Valve from the Cabinet

Use this procedure to remove the entire isolation valve (15) from the isolation cabinet for service.

1. Prepare the isolation system for service. See [Prepare the Isolation System for Service, page 89](#).
2. Use a flat blade screwdriver to open the isolation cabinet door.
3. Slide the electrostatic shield (12) up to remove.
4. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
5. Remove the isolation fluid pump for better access to the isolation valve mounting. Follow the steps in [Remove the Isolation Fluid Pump from the Cabinet, page 100](#).
6. Disconnect the wash fluid bottle (69).
7. Before removing the two sensors from the isolation valve, mark the location of each as a guide when reassembling.
8. Remove the sensors from the isolation valve:
 - a. Loosen the top clamp (101) and slide sensor bracket (102) free of the clamp.
 - b. Loosen the bottom clamp (101) and slide sensor bracket (102) free of the clamp.
9. Disconnect the three push-to-connect air line fittings (239) to the isolation valve: top, middle, bottom.
10. Remove the two fluid lines from the isolation valve:
 - a. Inlet npsm fitting (72).
 - b. Outlet hose (84) that connects to the outlet elbow (71). The outlet hose can also be removed from the isolation fluid pump (K).
11. Disconnect the isolation valve from the cabinet stand (9). On opposing sides of the cabinet stand, use a 3/16 inch Allen wrench and a 7/16 inch wrench to remove:
 - a. The front top and bottom hex nuts (23), lock washers (22), and flat washers (19) on the isolation valve cover bracket (98).
 - b. The back top and bottom hex nuts (23), lock washers (22), and flat washers (19).
12. Lift the isolation valve out of the cabinet.

Reinstall the Isolation Valve into the Cabinet

Use this procedure to reinstall the entire isolation valve (227) into the isolation cabinet after servicing.

NOTICE

Any fluid leaking or pooling inside the cabinet can cause the system's voltage to lower below normal operating voltage. Low system voltage can cause arcing that damages system components. Before reassembling, clean the cabinet of residual fluid.

1. Attach the isolation valve to the top of the cabinet stand (9):
 - a. Insert the two screws (54) through flat washers (19), the top block mount (224), and then insert into the top two holes of the cabinet stand (9).
 - b. Thread the washer (19), lock washer (22), and hex nut (23) onto the back screw.
 - c. The front screw (54) also holds the top bracket for the isolation valve cover (99). Slide the bracket (98) onto the front screw, followed by the washer (19), lock washer (22), and hex nut (23).

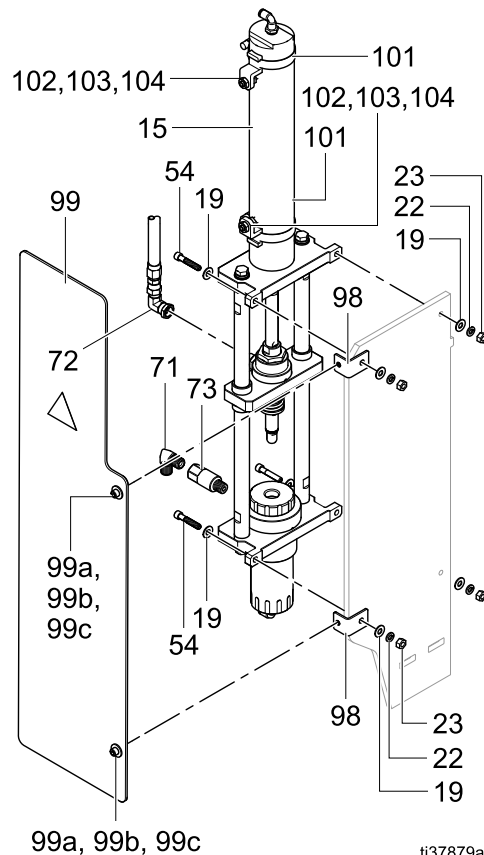


Figure 33 Attach Isolation Valve to Cabinet Stand

2. Attach the isolation valve to the bottom of the cabinet stand (9):
 - a. Insert the two screws (54) through flat washers (19), the base housing (201), and then insert into the bottom two holes of the cabinet stand (9).
 - b. Thread the washer (19), lock washer (22), and hex nut (23) onto the back screw.
 - c. The front screw also holds the bottom bracket for the isolation valve cover (99). Slide the bracket (98) onto the front screw, followed by the washer (19), lock washer (22), and hex nut (23).

Tighten all 4 screws after they are installed.

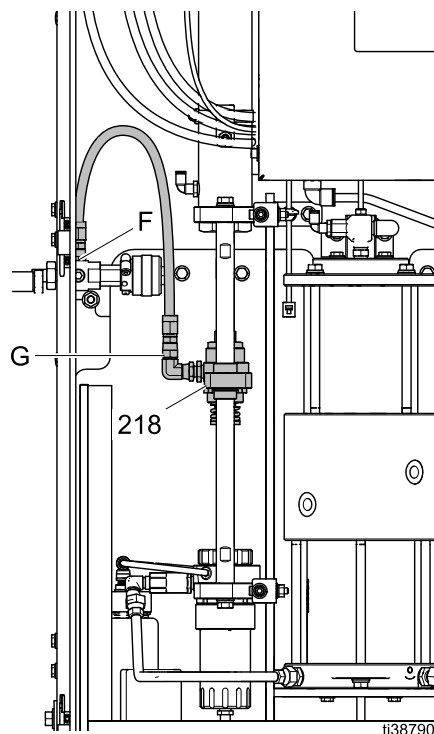
3. Attach the inlet fluid tube, using one wrench to orient the elbow fitting (72) and one wrench to tighten it to the housing (218).
4. If the outlet fluid fitting and/or the check valve were removed, reinstall using thread sealant. Position the outlet so that it is pointed down and slightly forward.

NOTICE

Incorrect orientation of the fluid components can cause the system voltage to drop below normal operating voltage. Low system electrostatic voltage can cause arcing that damages system components. Orient the check valve to maintain air space between the fluid hose and other components.

5. Place the two clamps (101) over the top of the air cylinder (227) and attach the top sensor to the top clamp and the bottom sensor to the bottom clamp.
6. If the sensor positions were indicated during disassembly, attach the clamps into position. If the position was not indicated, follow the steps in [Adjust the Isolation Valve Sensors, page 92](#).
7. Fill the wash fluid bottle (W) with HydroShield cleansing solution above the minimum line marked on the bottle. Replace it in the cabinet. Reconnect the tube (91).
8. Reconnect the three push-to-connect air line fittings (239) to the isolation valve: top, middle, bottom. For connection details, see [Pneumatic Connections, page 109](#).

9. Before enclosing the isolation valve in the isolation valve cover (99), ensure that the isolation valve shuttle (218) has a clear path to travel up and down:
 - Make sure that there are no air lines or cables in the path of the shuttle.
 - Make sure that the flexible hose between the inlet valve (F) and the isolation valve (G) is not curled or hanging in the path of the shuttle. If necessary, loosen the fittings at each end, hold the hose in place as shown below, and retighten the fittings to ensure that the hose doesn't rub on anything.



10. Replace the isolation valve cover (99) and tighten the top and bottom screws (99a).
11. Reinstall the electrostatic shield (12) inside the cabinet.
12. Close the cabinet door and use a flat blade screwdriver to secure the door shut.

Adjust the Isolation Valve Sensors

When disassembling the isolation valve, you may have indicated the positions of the top and bottom valve sensors. If the positions were not indicated, use this procedure to determine the positions of the sensors.

1. Loosen nuts (104) and position the sensor (103) so that the face touches the air cylinder body. Tighten nuts (104).
2. Determine the location of the top sensor:
 - a. On the control interface, enter Off mode. Navigate to the Status menu.
 - b. Raise the isolation valve to the top position.
 - c. Position the sensor and watch the Status menu. When the Shuttle Top circle changes from gray to yellow, attach the clamp in that position.
3. Determine the location of the bottom sensor:
 - a. On the control interface, enter Standby mode. Standby mode drives the isolation valve to the bottom position.
 - b. Position the sensor and watch the Status menu. When the Shuttle Bottom circle changes from gray to yellow, attach the clamp in that position.

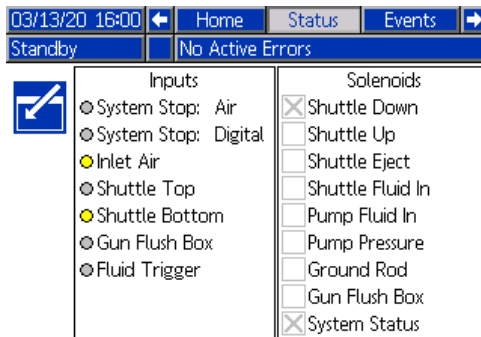


Figure 34 Isolation Valve Sensor Position on Status Menu

Replace an Isolation Valve Sensor

The isolation valve sensor can be replaced while the isolation valve is in the cabinet or while it is removed for service.

1. Remove the sensors from the isolation valve:
 - a. Loosen the top clamp (101) and slide sensor bracket (102) free of the clamp.
 - b. Loosen the bottom clamp (101) and slide sensor bracket (102) free of the clamp.
2. Disconnect the sensor wires from the splitter cable (447) inside the electronic control. See [Wiring Connections, page 110](#).
3. Install the replacement sensor (103) or sensor assembly kit 26B102.
4. Connect sensor wires to splitter cable (447) inside the electronic control. See [Wiring Connections, page 110](#).
5. Adjust the isolation valve sensors.

Disassemble the Isolation Valve Components

Use this procedure to disassemble the air cylinder (227), block mount (224), connecting rods (225), shuttle housing (218), and base housing (201).

1. Prepare the isolation system for service. See [Prepare the Isolation System for Service, page 89](#).
2. Remove the isolation valve from the cabinet. See [Remove the Isolation Valve from the Cabinet, page 90](#).
3. Disconnect the two connecting rods (225) from the base housing (201):
 - a. Grip the flats of a connecting rod with an adjustable wrench. On the opposing side of the base housing, use an adjustable wrench to remove the screw (233), lock washer (237), and flat washer (232).
 - b. Remove the second connecting rod from the base housing.

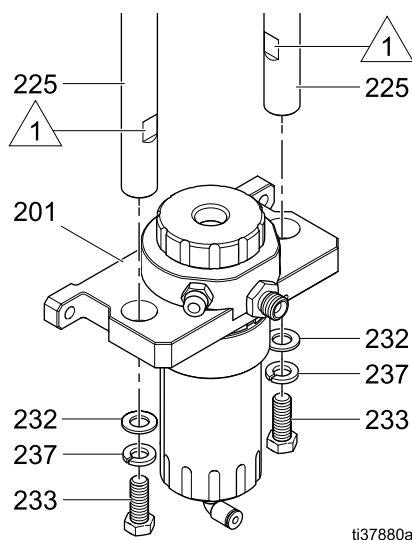


Figure 35 Rods Near the Base Housing

4. Slide the entire base housing (201) off of the connecting rods.
5. Disconnect the two connecting rods (225) from the block mount (224):
 - a. Grip the flats of a connecting rod with an adjustable wrench. On the other side of the block mount, use an adjustable wrench to remove the screw (233), lock washer (237), and washer (232). Pull the connecting rod out through the shuttle housing (218).
 - b. Remove the second connecting rod from the block mount.

6. Replace the two shuttle bearings (223) in the shuttle housing (218).
 - a. Remove the o-ring (231) on the underside of the shuttle housing and pull the bearing out through the top.
 - b. Insert a new shuttle bearing (223) into the shuttle housing through the top, with the o-ring groove pointing down, away from the air cylinder (227). Slide a new o-ring (231) into the groove to hold the shuttle bearing in place.
 - c. Remove and replace the second shuttle bearing (223).
7. Disconnect the shuttle housing (218) assembly from the air cylinder (227):
 - a. Locate the flat section on the air cylinder shaft and the flat on the collar.
 - b. Grip each flat section with an adjustable wrench and turn in opposing directions to loosen the air cylinder shaft.

Note

Be careful not to scratch the air cylinder rod when extracting and handling.

- c. Turn the cylinder rod until the shuttle housing (218) assembly is removed.
8. Disassemble the shuttle housing (218) assembly.
 - a. Use an adjustable wrench to loosen, and then remove, the retaining nut (235).
 - b. Separate the retaining nut (235) and the coupler (234).
 - c. Remove the wave washer (236) from inside the shuttle housing (218).

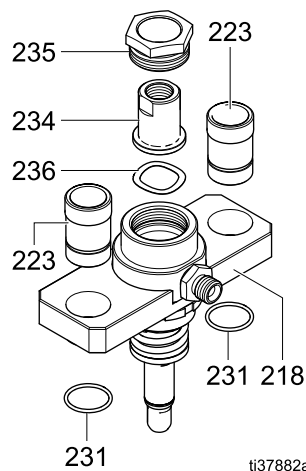


Figure 36 Shuttle Housing Components

9. Reassemble the shuttle housing (218) assembly:
 - a. Replace the wave washer (236).
 - b. Slide the coupler (234) through the retaining nut (235). Apply medium strength thread lock to the retaining nut threads.
 - c. Screw the retaining nut (235) into the shuttle housing (218). Tighten the nut with an adjustable wrench.
10. Disassemble the air cylinder (227) from the block mount (224):
 - a. Place the retaining nut (229) at the bottom of the air cylinder in a vise.
 - b. Use a wrench on the flats on the top of the air cylinder (227) to turn the cylinder until the retaining nut is loose. Remove the nut and block mount (224).

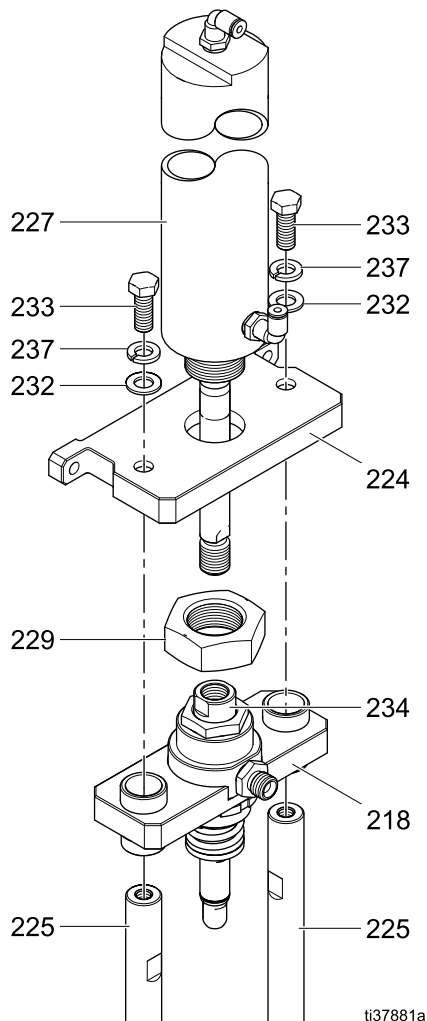


Figure 37 Isolation Valve Components

Reassemble the Isolation Valve Components

Use this procedure to reassemble the air cylinder (227), block mount (224), connecting rods (225), shuttle housing (218), and base housing (201).

Perform this procedure on a flat surface so that the components are aligned. Misaligned components could result in performance issues.

1. Hold the air cylinder (227) so that the air fitting faces forward. Slide the air cylinder through the center of the block mount (224). The block mount should be flat against the cylinder.
2. Apply medium strength, removable thread lock to the threads on the air cylinder (227).
3. Screw the retaining nut (229) onto the air cylinder (227) until it bottoms out. To tighten the nut, place the nut and air cylinder in a vise. Keep the block mount (224) lined up with the air fitting on the cylinder.
4. Use a wrench on the flats on the top of the air cylinder (227) to turn the cylinder until the retaining nut (229) is tight.
5. Apply removable thread lock to the threads on the air cylinder (227) shaft.
6. Assemble the shuttle housing (218) and the air cylinder (227):
 - a. Screw the air cylinder (227) shaft into the shuttle housing (218) assembly until snug.
 - b. To tighten, use a 9/16 inch or adjustable wrench on the flat section on the air cylinder shaft and an adjustable wrench on the shuttle collar. Turn in opposing directions.
7. Attach the connecting rods (225) to the block mount (224):
 - a. Slide a connecting rod through the shuttle housing (218) and secure in the block mount (224) with a screw (233), lock washer (237), and flat washer (232).
 - b. Grip the flats of the connecting rod with an adjustable wrench. On the other side of the block mount, tighten the screw to 120 in. lb. (13.6 N•m).
 - c. Attach the second connecting rod.
8. Slide the entire base housing (201) onto the connecting rods (225).
9. Secure the base housing (201) into the connecting rods (225) with a screw (233), lock washer (237), and flat washer (232).

Note

Be careful not to scratch the air cylinder shaft.

10. Grip the flats of the connecting rod with an adjustable wrench. On the other side of the base housing (201), use an adjustable wrench to tighten the screw to 120 in. lb. (13.6 N•m).

Remove the Isolation Valve Stem

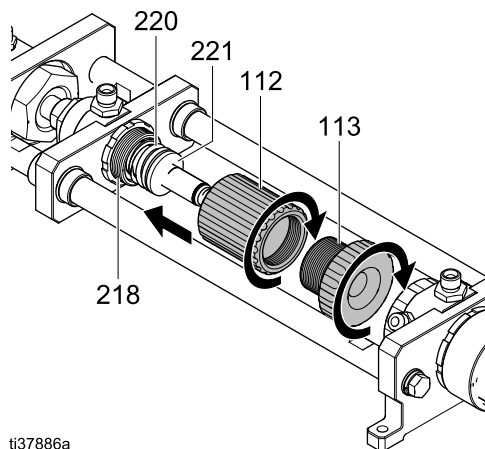
This procedure requires the sleeve tool (112) and stem tool (113). See [Isolation System, page 113](#).

1. Prepare the isolation system for service. See [Prepare the Isolation System for Service, page 89](#).
2. Remove the isolation valve from the cabinet. See [Remove the Isolation Valve from the Cabinet, page 90](#).
3. Place the sleeve tool (112) over the isolation valve sleeve (221) and screw onto the housing (218).
4. Thread the stem tool (113) into the sleeve tool (112) and tighten to interlock.
5. Rotate both tools (112, 113) as one to apply pressure to the spring (220) inside. When both tools are tightened, the valve is opened, allowing the valve stem (222) to come out.
6. Insert a 3/16 inch Allen wrench into the end of the valve stem (222) and turn with moderate force to start.
7. Unscrew until the valve stem (222) can be pulled out.

Note

Be careful not to scratch the valve stem (222) when extracting and handling.

8. Unscrew both tools (112, 113) together until they loosen the spring (220) and come off.
9. Unscrew the stem tool (113) from the sleeve tool (112) and remove the isolation valve sleeve (221) and spring (220).
10. Replace the valve stem o-rings. See [Replace the Isolation Valve Stem O-rings, page 96](#).



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Figure 38 Tools Removing Valve Stem

Replace the Isolation Valve Stem O-rings

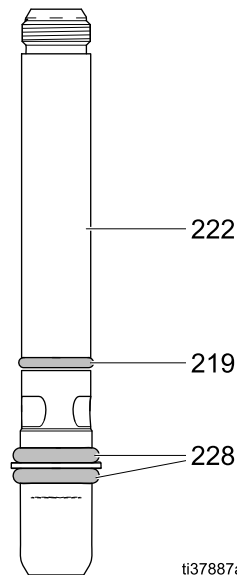
Use this procedure to replace the three o-rings (219, 2 x 228) on the isolation valve stem (222). Replacing these o-rings may be necessary if the isolation valve begins to leak.

1. Remove the three o-rings (219, 2 x 228).

Note

Do not pry the o-rings off of the valve stem. You may need to pinch the o-ring to form a loop and then pull it off. You may also cut each o-ring to remove.

2. Replace the o-rings:
 - a. Roll o-ring (219) over the valve stem (222) threads until it fits into the groove.
 - b. Roll one o-ring (228) over the valve stem (222) threads until it fits into the groove.
 - c. From the other end of the valve stem (222), roll the second o-ring (228) onto the shaft until it fits into the groove.
 - d. Grease all 3 o-rings.



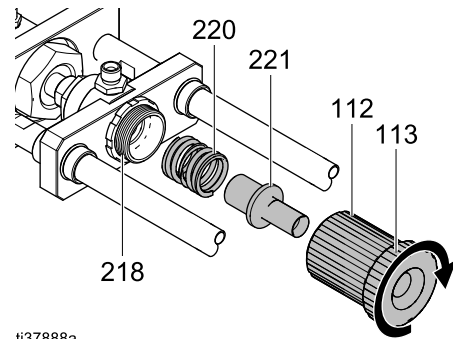
ti37887a

Figure 39 Replacing the Isolation Valve O-rings

3. Inspect the o-ring (219) inside the shuttle housing (218) to make sure that it is still in place. Remove and replace if needed.

4. To reassemble:

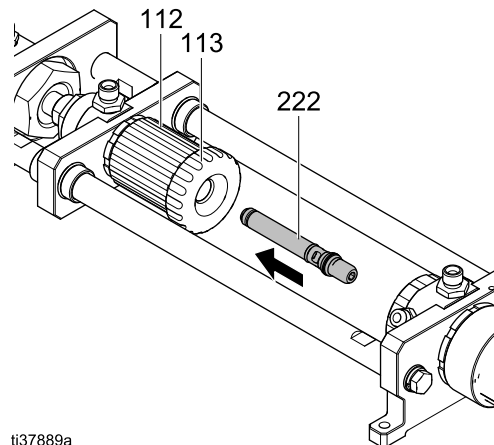
- a. Insert the spring (220) and the sleeve (221) (wider end first) into the sleeve tool (112).



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Figure 40 Reassembling Spring and Sleeve into Tool

- b. Place the stem tool (113) over the sleeve (221) and spring (220) and screw into the sleeve tool (112).
- c. Screw both tools into the shuttle housing (218) until tight.
- d. Grease the threaded end of the valve stem. Slide the threaded end of the valve stem (222) into both tools (112, 113) that are mounted on the shuttle housing (218).



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Figure 41 Inserting Valve Stem into Tools

- e. When the valve stem (222) reaches the threads, insert a 3/16 inch Allen wrench into the end of the valve stem. Torque to 80 in-lb (9 N•m).
5. To remove the tools from the isolation valve, unscrew both tools as one.

Service the Bottom Piston Housing

Use this procedure to replace the seals in the lower piston housing.

1. With the isolation valve lying down, remove the check valve assembly (238), if still connected.
2. Unscrew and remove the bottom housing piston cap (216). The housing includes a spring (215) and o-ring (230). Residual wash fluid may appear.
3. Pull out the piston assembly (211-214 and o-rings).

Note

Be careful not to scratch or drop the piston (211) when extracting and handling.

4. To remove the retaining cap from the piston (211), use an adjustable wrench around the flats at the bottom of the piston shaft (211). Use a 3/8 inch hex wrench inside the retaining cap (214).
5. Once loosened, turn the piston shaft (211) to separate all piston assembly pieces.

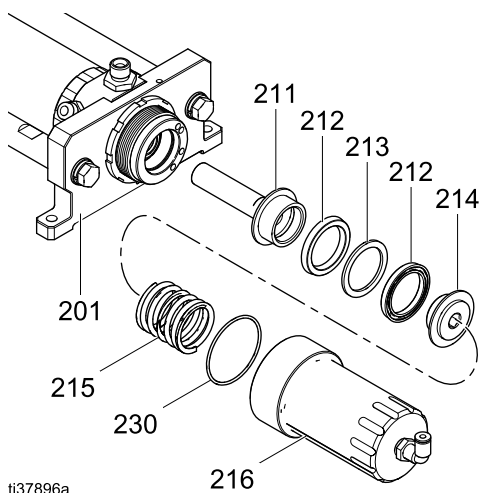


Figure 42 Removing Retaining Cap from Piston

6. Replace the piston seals:
 - a. Place one U-cup (212) onto the piston (211). The U-cup must face the top (shaft of the piston).
 - b. Place the spacer washer (213) next to the U-cup (212).
 - c. Place the other U-cup (212) onto the piston (211). The U-cup must face the bottom (the retaining cap).
 - d. Use medium strength thread lock on the retaining cap (214).
 - e. Screw the retaining cap (214) into the piston (211).
 - f. To tighten, use an adjustable wrench around the flats at the bottom of the piston shaft (211). Use a 3/8 inch hex wrench inside the retaining cap (214).

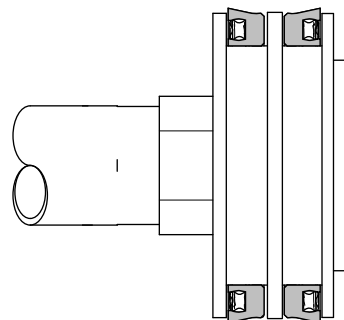


Figure 43 U-cups Facing Opposite Directions

7. Continue disassembling the lower housing:

Use a 15/16 inch socket or wrench to remove the retainer (white) (202) from the housing (201). Be careful not to strip the piece.
8. Remove the retainer (202).
9. Replace the retainer (202) seals:
 - a. Replace the O-ring (208) into the groove next to the threads.
 - b. Replace the U-cup (203) where it sinks into place. The U-cup faces out.
10. Continue disassembling the lower housing:

Remove the U-cup spacer (206) and the packing U-cup (204). Residual paint may appear.

11. To replace the seals in the top housing, see [Service and Reassemble the Top Housing of the Isolation Valve, page 98](#).

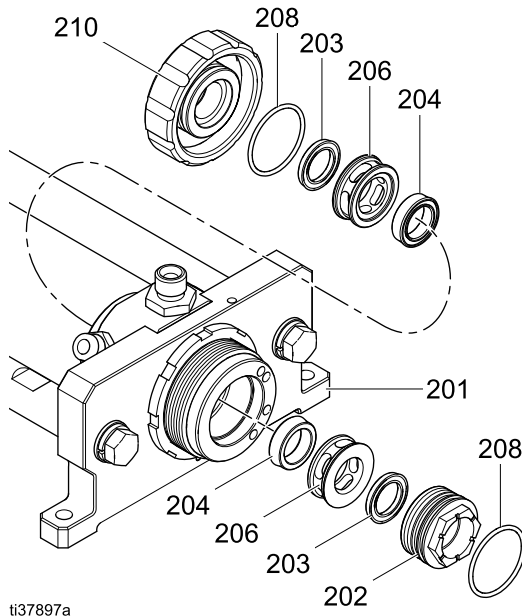


Figure 44 Lower Retainer

Service and Reassemble the Top Housing of the Isolation Valve

Use this procedure to replace the seals in the top piston housing. This procedure also covers reassembling the top piston housing.

1. Disassemble the bottom housing of the isolation valve as described in [Service the Bottom Piston Housing, page 97](#). Remove the piston and spring.
2. Unscrew and remove the top housing piston cap (210). The housing includes a U-cup (203) and an o-ring (208).
3. Replace the o-ring (208) and U-cup (203):
 - a. Replace the o-ring (208) into the groove next to the threads.
 - b. Replace the U-cup (203) where it sinks into place. The U-cup faces outwards in the cap.
4. Remove the U-cup spacer (206) and the packing U-cup (204).
5. Replace the U-cup spacer (206) and the packing U-cup (204):
 - a. On the smaller side of the U-cup spacer (206) is a recessed groove that helps align the packing U-cup (204). Snap or set the packing U-cup (204) into the groove on the U-cup spacer (206).
 - b. Grease around the lip of the seal (204) and pop it, seal side first, into the housing (201).
6. In the cap (210), apply grease to the o-ring (208) and U-cup (204).
7. Screw the cap (210) into the housing and tighten by hand.
8. To complete reassembly, see [Reassemble the Bottom Housing of the Isolation Valve, page 99](#).

Reassemble the Bottom Housing of the Isolation Valve

Use this procedure after replacing the seals in the lower piston housing as described in [Service the Bottom Piston Housing, page 97](#).

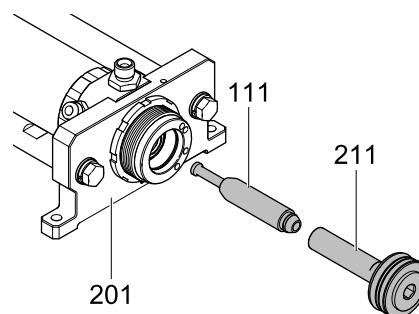
This procedure requires the piston tool (111). See [Isolation System, page 113](#).

NOTICE

Assembly of the piston (211) without the use of the piston tool (111) will damage U-cups within the housing (201).

1. Replace the U-cup spacer (206) and the packing U-cup (204):
 - a. On the smaller side of the U-cup spacer (206) is a recessed groove that helps align the packing U-cup (204). Snap or set the packing U-cup (204) into the groove on the U-cup spacer (206)
 - b. Grease around the lip of the seal (204) and pop, seal side first, into place in the housing (201).
2. Grease around the o-ring (208) and screw into the housing (201). Tighten with a 15/16 inch socket until the retainer (202) bottoms out.
3. Insert the piston tool (111) into the piston (211). Grease the sides of the tool, especially the top, so that it can be pulled past the U-cups in the housing assembly (201) more easily.

4. Together, insert the piston tool (111) and piston (211) into the retainer (202) on the housing (201). Push the piston (211) until the tool comes through the housing (201) and the piston (211) is in place.



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Figure 45 Piston Tool Through Lower Housing

Note

If the piston tool (111) and piston (211) come apart within the housing (201), pull the piston tool (111) through the housing. Pull the piston (211) back out. Join the parts and try again.

5. In the piston cap (216), grease the sides and the o-ring (230).
6. Insert the spring (215) into the piston cap (216).
7. Screw the piston cap (216) onto the housing (201). Push forward to overcome the force of the spring. Tighten until the piston cap (216) bottoms out.

Note

Be careful not to cross threads while assembling.

Service the Isolation Fluid Pump

Remove the Isolation Fluid Pump from the Cabinet

1. Prepare the isolation system for service. See [Prepare the Isolation System for Service, page 89](#).
2. Use a flat blade screwdriver to open the isolation cabinet door.
3. Slide the electrostatic shield (12) up to remove.
4. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
5. Remove the four 3/16 inch hex head screws to open the electronics panel (14).
6. Locate the wire from the pump sensor into the electronics panel. Disconnect the pump sensor (321) from the cable splitter (447). For wiring locations, see [Wiring Connections, page 110](#).

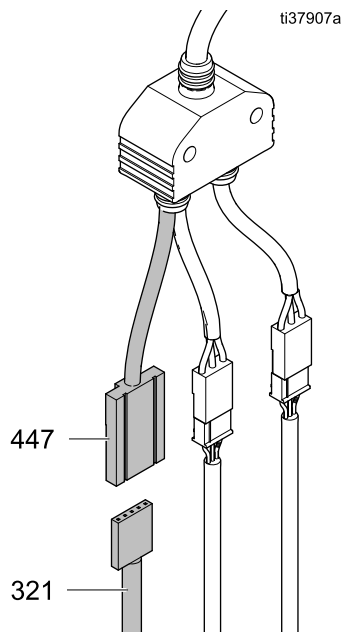


Figure 46 Pump Sensor Connection in Electronics Panel

7. Disconnect the air line from the air fitting (325).

8. Remove the two fluid tubes from the fittings (327) at the base of the pump. Some residual fluid may leak out.
9. A steel bracket (17) holds the pump. To remove the pump, either:
 - Remove the two screws that hold the bracket to the back wall of the cabinet. Use a 3/16 inch socket cap hex head wrench and extension.
 - Remove the two screws that hold the bracket to the pump. Use a 7/16 inch hex head wrench.
10. Remove the two base mounting screws (20), lock washers (22), and washers (19).
11. Lift the pump out of the cabinet.

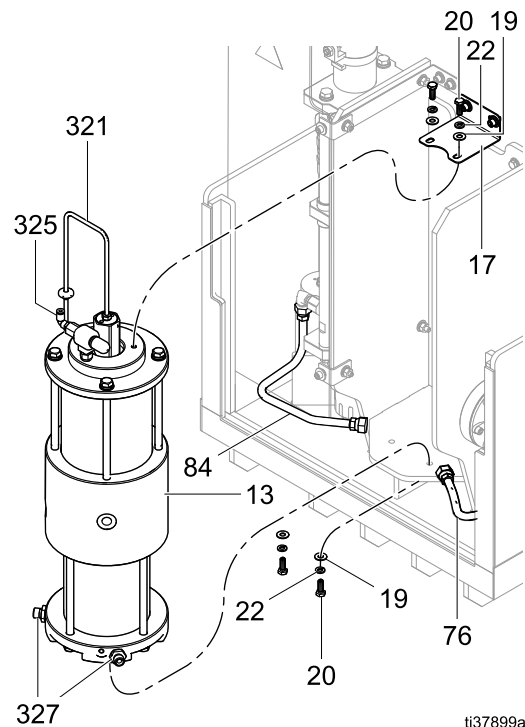


Figure 47 Remove the Isolation Fluid Pump

Reinstall the Isolation Fluid Pump in the Cabinet

NOTICE

Any fluid leaking or pooling inside the cabinet can cause low system voltage or arcing that damages system components. Before reassembling, clean the cabinet of residual fluid.

1. Place the isolation fluid pump into the cabinet.
2. Connect the wire from the linear sensor (321) to the cable splitter (427). For wiring locations, see [Wiring Connections, page 110](#).
3. Reinstall the top mounting screws and bottom mounting screws, then tighten all screws.
4. Reconnect the air line hose. For hose locations, see [Pneumatic Connections, page 109](#).
5. Reconnect and tighten the inlet fluid hose fitting at the bottom left of pump.
6. Reconnect and tighten the outlet fluid hose fitting at the bottom right of pump.
7. Calibrate the pump. Follow the steps in [Calibrate the Pump, page 57](#).
8. Perform a pump stall test. Follow the [Pump Stall Test Procedure, page 60](#).
9. Replace the four 3/16 inch hex head screws to close the electronics panel (14).
10. Replace the isolation valve cover (99) and tighten the top and bottom screws (99a).
11. Reinstall the electrostatic shield (12) inside the cabinet.
12. Close the cabinet door and use a flat blade screwdriver to secure the door shut.

Disassemble the Isolation Fluid Pump

1. Remove the isolation fluid pump from the cabinet. See [Remove the Isolation Fluid Pump from the Cabinet, page 100](#).
2. Lay the pump on its side and unscrew the sensor (321) from the top of the pump. Check the o-ring next to the sensor to make sure it is not cracked.
3. Remove the muffler fitting (323).

4. Disassemble the fluid section of the pump:
 - a. Loosen the four tie rod screws (312) with a socket wrench.
 - b. Sit the pump with the fluid side up and remove the tie rod screws (312).
 - c. Lift up and remove the fluid cover (311) and gasket seal (309).
 - d. Wiggle the cylinder (310) off of the middle housing (307).
 - e. Lay the pump on its side.

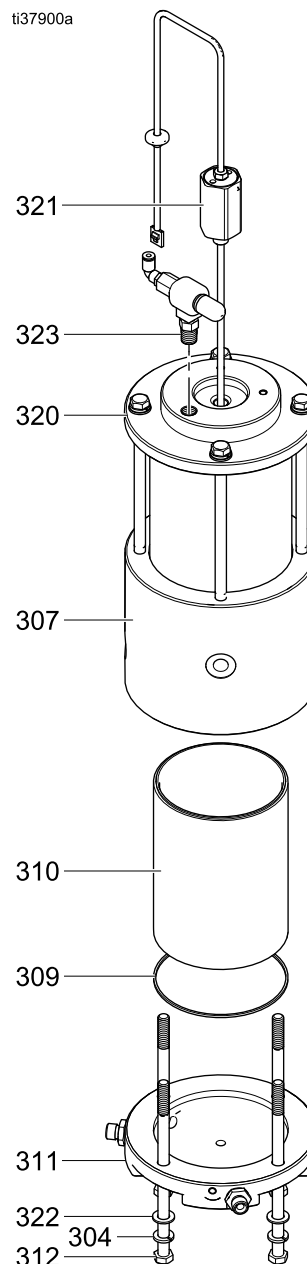


Figure 48 Removing the Fluid Cover

5. Disassemble the air section of the pump:

- a. Loosen the four tie rod screws (312) with a socket wrench and remove.
- b. Remove the air cover (320) and o-ring (318). Inspect the o-ring and replace if the pump has been leaking air.
- c. Wiggle the air cylinder (319) off of the middle housing (307).

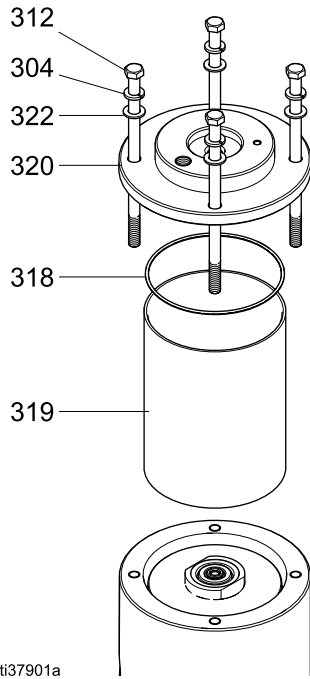


Figure 49 Removing the Air Cover

6. To service the fluid piston (301):

- a. Pry or pick the seal (302) off from the back side of the fluid piston (301) so that the front face of the piston is not damaged. If the front face is damaged, it may not seal completely.
- b. Replace the seal on the fluid piston (301).

7. To service the air piston (316):

- a. Remove the o-ring (317) from the air piston (316).
- b. Apply grease to the o-ring before replacing.

8. To remove the piston rod (305):

- a. On the fluid side, use a 12 inch adjustable wrench on the flats of the piston rod, near the fluid piston (301).
- b. Use a 15 inch adjustable wrench on the flats of the fluid piston (301) to loosen.
- c. Unscrew the fluid piston (301) off of the piston rod (305).
- d. Push the piston rod (305) through the middle housing (307) to remove.

9. To remove the air piston (316) from the piston rod (305):

- a. Use 12 inch wrench on the flats of the piston rod, near the air piston (316).
- b. Use a 15 inch adjustable wrench on the flats of the air piston (316) to loosen.
- c. Unscrew the air piston (316) off of the piston rod (305). Under the air piston is an o-ring (315), magnet holder (313), and magnet (314).

10. If necessary, remove the piston bumpers (308) on each side of the middle housing. Push in one of the three tabs to pop off. The bumpers snap in.

11. To remove and replace the wiper seal (306):

- a. Inside the middle housing (307) on the fluid side, remove the wiper seal (306). Use pliers to grip the seal and pull it out.
- b. When replacing the wiper seal (306), make sure that it is inserted on the fluid side of the middle housing (307). The diameter of the fluid side is slightly smaller than the air side of the housing.
- c. Apply grease to the wiper seal (306) and snap it into the groove in the middle housing (307).

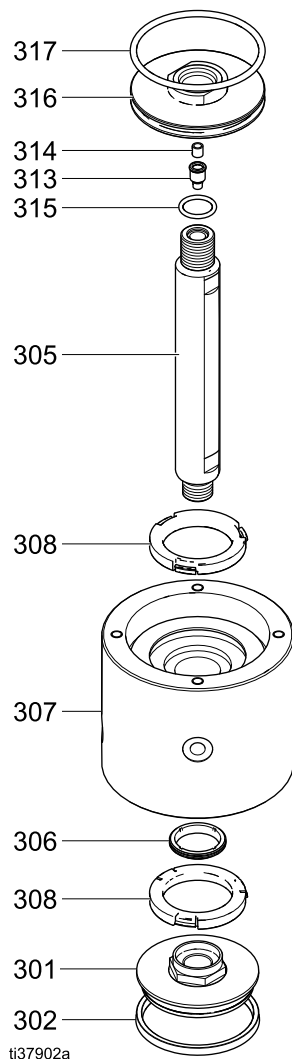


Figure 50 Middle Housing Parts

Reassemble the Isolation Fluid Pump

1. Lay the isolation fluid pump on its side.
2. Grease the wiper seal (306) in the middle housing (307).
3. With the non-sensor end, push the piston rod (305) through the housing (307). The end must go through the air side of the housing. (The air side has the larger diameter.)
4. Assemble the air piston (316):
 - a. Place the o-ring (317) around the air piston (316) and then grease the o-ring.
 - b. Screw the air piston (316) onto the piston rod (305). Tighten with a wrench on the flats of the piston rod (305) and a wrench on the flats of the air piston (316).
 - c. When tightened adequately, the white of the piston rod (305) and the magnet sensor (314), should protrude slightly from the air piston (316).
5. Assemble the fluid piston (301):
 - a. Snap the U-cup seal (302) into place on the fluid piston (301) and then grease the outside of the U-cup seal.
 - b. Screw the fluid piston (301) onto piston rod (305). Tighten with a wrench on the flats of the piston rod (305) and wrench on the flats of the fluid piston (301).
6. Grease the inside of the air cylinder (319) and then wiggle it into place over the air piston (316) and into the middle housing (307).
7. Push the air piston (316) into the middle housing (307) so that the fluid piston (301) extends out of the middle housing.
8. Grease the inside of the fluid cylinder (310) and then place either end over the fluid piston (301). Push it into place into the middle housing (307).
9. With the fluid cylinder (310) up, orient the pump so that you are facing the two weep holes (WH) in the middle housing (307). The holes indicate the front of the system in the isolation cabinet.
10. Place the gasket seal (309) onto the fluid cylinder (310).
11. Place the fluid cover (311) onto the fluid cylinder (310) so that the holes for the fittings line up with the weep holes in the middle housing (307).
12. Spin the tie rod screws (312), lock washer (304), and plain washer (322) into the fluid cover (311). Tighten in a cross pattern only until snug.
13. Lay the pump on its side to tighten the tie rod screws (312) in a cross pattern. Torque to 160 in-lb (18 N•m). Tighten the tie rod screws twice because the plastic pieces relax.

14. With the air cylinder (319) up, place the air cover (320) onto the air cylinder (319). Make sure that o-ring (318) is in place on the cover. Grease the o-ring.
15. Align the air port hole on the air cover with the front of the pump. The hole should align between the fluid port fittings on the fluid cover (311).
16. Spin the tie rod screws (312), lock washer (304), and plain washer (322) into the air cover (320). Tighten in a cross pattern only until snug.
17. Lay the pump on its side to tighten the tie rod screws (312) in a cross pattern. Torque to 160 in-lb (18 N•m).
18. Attach the air valve assembly (323-326) to the air cover (320). Tighten so that the air fitting faces to the left.
19. Grease the o-ring at the base of the linear sensor (321). Insert the sensor (321) into the top of the air cover (320). Screw until tight.

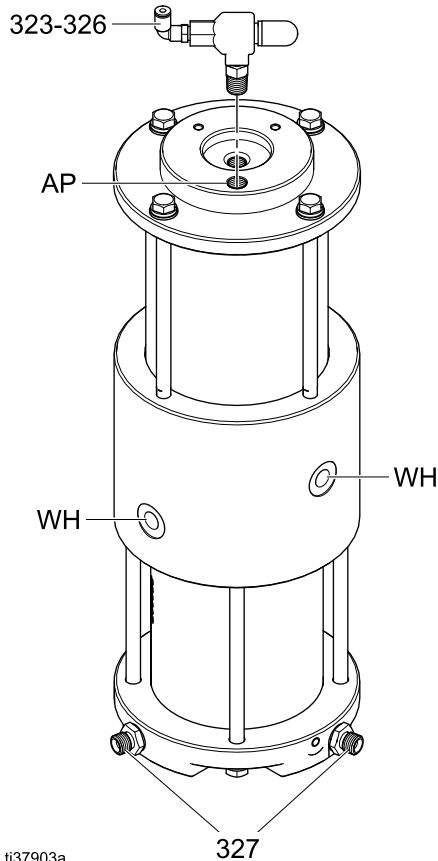


Figure 51 Align Covers with Weep Holes

Remove the Fluid Regulator

Remove the fluid regulator for service. Refer to the fluid pressure regulator instruction manual for information on how to service the regulator. See [Related Manuals, page 3](#).

1. Follow the [Pressure Relief Procedure, page 30](#).
2. Follow the voltage discharge and ground procedure. ([Grounding, page 16](#)).
3. Shut the ball valve (39).
4. Disconnect the fluid line from the elbow fitting (75).
5. Disconnect the fluid hose from the tube compression fitting (82).
6. Disconnect the air line.
7. Disconnect the jump wire from the bleed resistor to the fluid regulator (21).
8. Remove the six hex screws (20), lock washers (22), and flat washers (19) that attach the fluid regulator (21) to the enclosure (9).
9. Remove the fluid regulator (21).

Install the Fluid Regulator

1. Use the six hex screws (20), lock washers (22), and flat washers (19) to reattach the fluid regulator (21) to the enclosure (9).
2. Connect the jump wire from the bleed resistor to the fluid regulator (21). See [Wiring Connections, page 110](#).
3. Connect the air line. See [Pneumatic Connections, page 109](#).
4. Connect the fluid hose to the tube compression fitting (82).
5. Connect the fluid line to the elbow fitting (75).
6. Open the ball valve (39) (handle up).

Service the Electrical Controls

Use the procedures in this section to service components of the electrical controls as needed. The procedures refer to the figures in [Electrical Schematics, page 107](#).

Prepare the Electrical Controls for Service

1. Prepare the isolation system for service. Follow the steps in [Prepare the Isolation System for Service, page 89](#).
2. Remove power from the isolation system.
3. Use a flat blade screwdriver to open the isolation cabinet door.
4. Loosen the cover screws (416) and remove the cover (402).
5. Open the electrical control assembly.

Replace a Solenoid Valve

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Remove the connector (433) from the color change board (403).
3. Disconnect the solenoid wire.
4. Remove the solenoid valve (407) from the manifold (406) by turning it counter clockwise.
5. Install a new solenoid. Lubricate the o-ring.
6. Reconnect the solenoid wire to connector (433). Reinstall connector (433) on the color change board (403). For location details, see [Electrical Schematics, page 107](#).
7. Use Maintenance screens 3-6 to verify the operation of the solenoid.

Replace a kV Board

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Disconnect the wires from the kV board assembly (428).
3. Pull the tab with a screw driver to release the board from the DIN rail (436).
4. Install a new kV board assembly.
5. Snap the board on the DIN rail (436).
6. Reconnect the cable (445) as shown in [Electrical Schematics, page 107](#).
7. Connect the wires to the kV board as shown in [Electrical Schematics, page 107](#).

Replace an Electro/pneumatic (V2P) Regulator

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Disconnect the splitter cable (446).
3. Disconnect the air lines.
4. Remove the screws (408) to remove the regulator bracket (434) and V2P (415) from the panel.
5. Move the regulator bracket (434) and fittings to the new V2P (415).
6. Reinstall the regulator bracket (434) and V2P (415) onto the electronics panel (401).

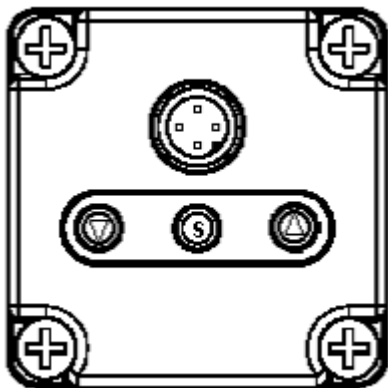
Note

Do not use liquid thread sealant. Use tape instead.

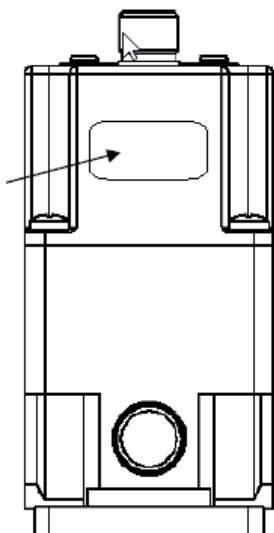
7. Reconnect the air lines as shown in [Pneumatic Connections, page 109](#).

8. Perform the zero clear procedure on the V2P (415):

The top of the V2P (415) contains 3 keys: Down arrow, Set (S), and Up arrow.

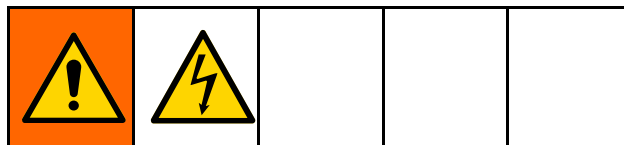


- a. To unlock the keys, press the down arrow key for 2 seconds or more until the screen flashes "Loc."



- b. Press the S key once to unlock the keys. The screen displays "unL" for approximately one second when the keys are unlocked.
- c. Press the S key for 2 seconds or more.
- d. Use the up and down arrow keys to go to "F03." The screen alternatively displays "F03" and "0cL."
- e. Press the S key. The screen flashes "0cL."
- f. Press and hold both the up and down arrows at the same time for approximately 3 seconds. The screen displays "0cL."
- g. After 3 seconds, the zero clear is executed and the screen displays "cLr" briefly. This operation also locks the keys again.

Replace the Color Change Board Fuse



Fuse	Part	Description
F1	17U084	Fuse; 500 mA

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Disconnect electrical power from the system.
3. Remove the electronic controls cover (402).
4. Locate fuse F1 on the color change board. Pull the fuse away from the board.
5. Install the new fuse.
6. Reinstall the cover. Restore electrical power to the system.

Electrical Schematics

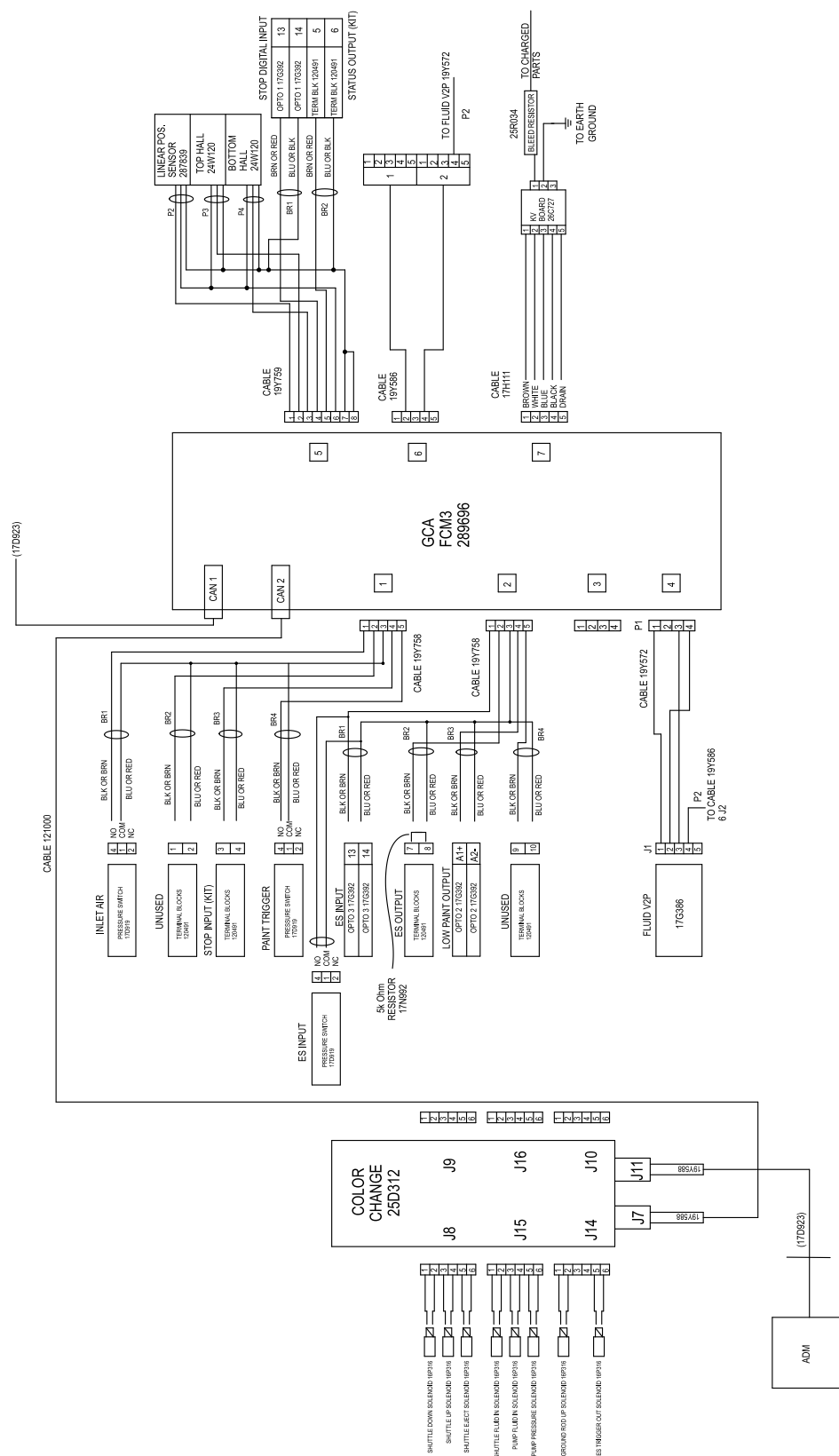


Figure 52 Electrical Schematic for 25E700 Electrical Control (equipped for fluid pressure regulator)

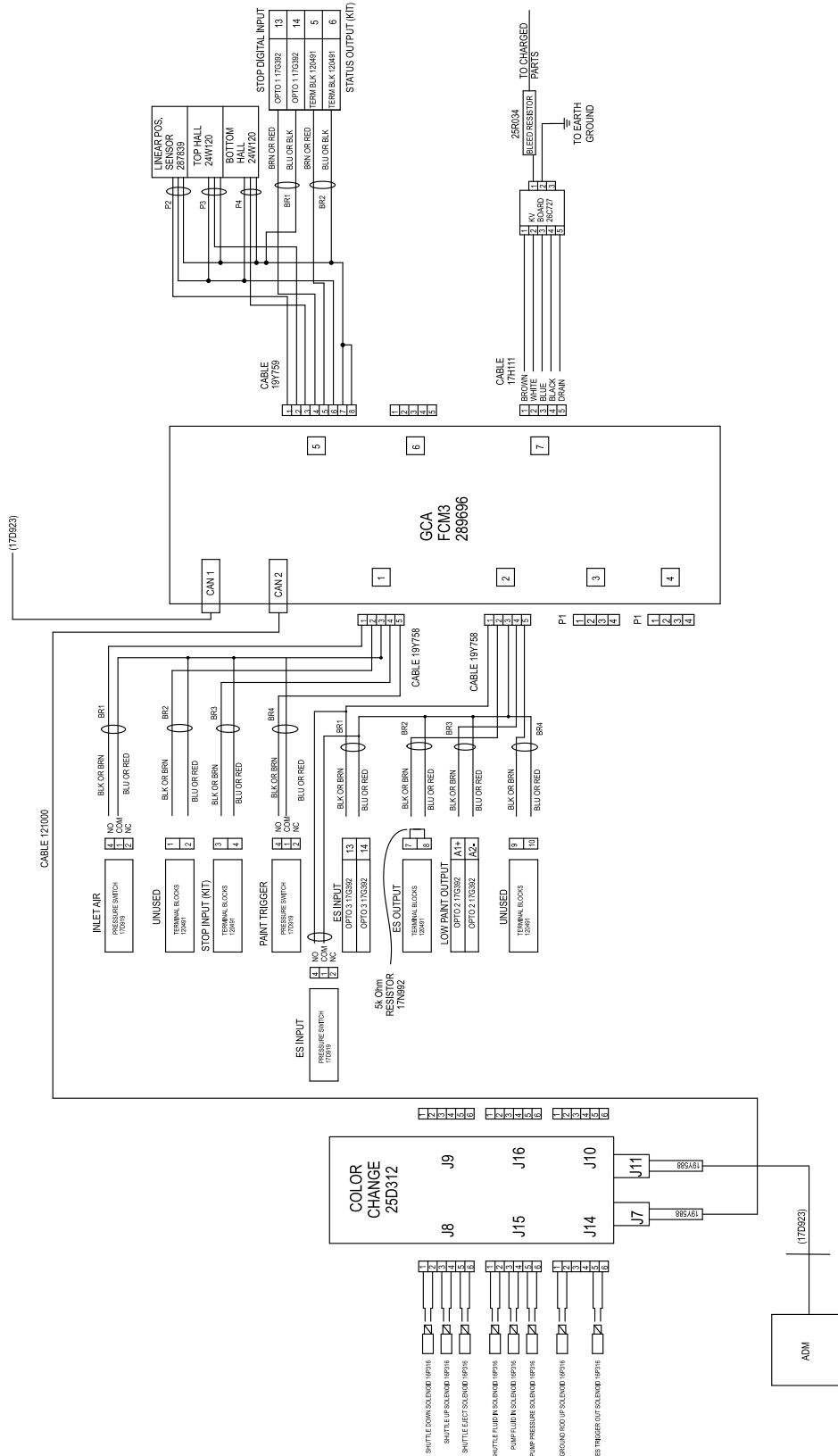
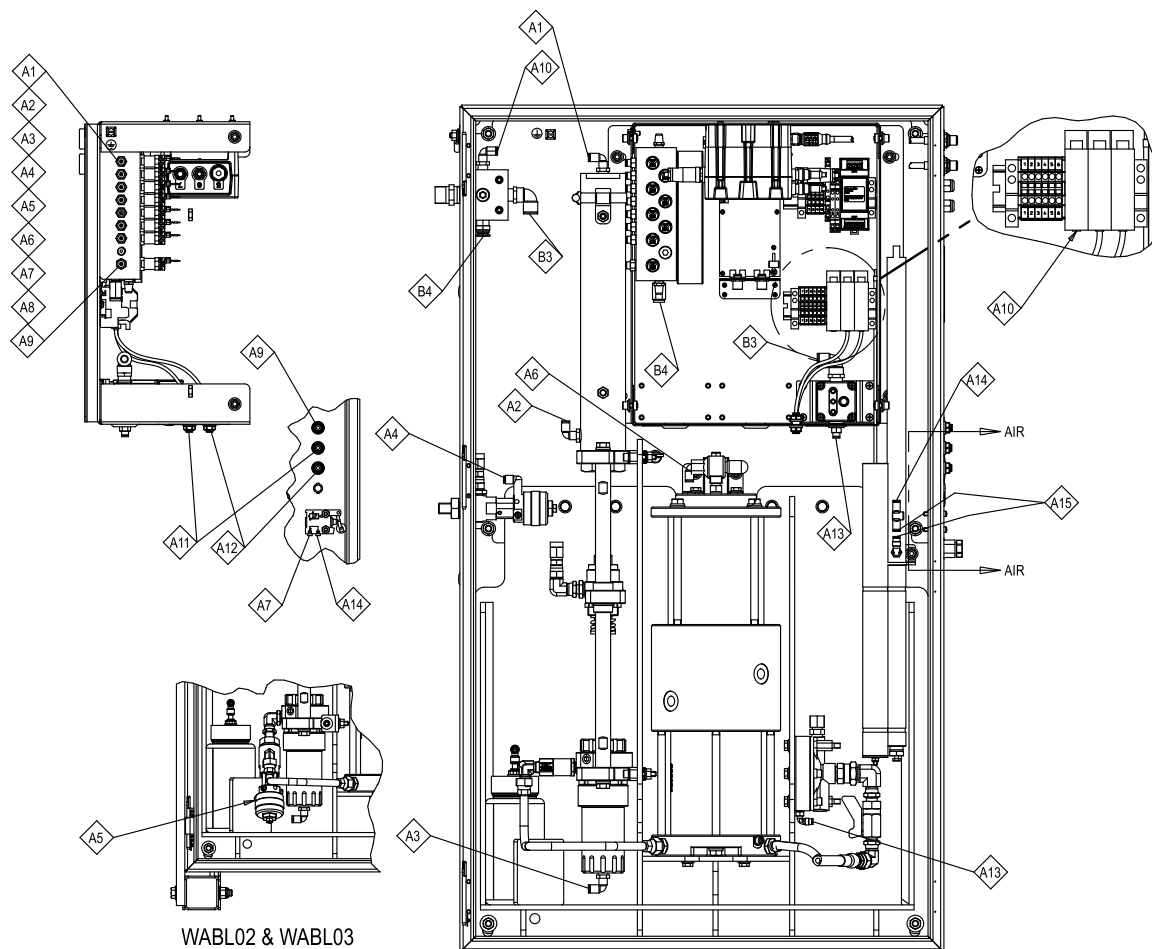


Figure 53 Electrical Schematic for 25E711 Electrical Control (NOT equipped for fluid regulator)

Pneumatic Connections

The numbers in the following figure represent point-to-point connections. For example, A4 connects to A4.


Item	Description	Part
A n	5/32 inch tubing	598095
B n	3/8 inch tubing	054134



WABL02 & WABL03

Figure 54 Pneumatic Connections

Table 14 Isolation System Pneumatic Connections Notes

ID	Description
A5	Connects to active fluid valve on valve kit (16A079). Used only for color change enabled systems. See the figure in Color Change: Pneumatic and Wiring Connections, page 112 .
A8	Not used on automatic systems.
	Used only for the optional System Stop Pneumatic Input Kit 26B414. To install the stop kit, follow the steps in Install the Optional System Stop Pneumatic Input Kit, page 25 .

Technical drawing of the E5000 instrument, showing internal components and connection points. The main diagram includes labels E1 through E5. Callout diagrams show details of components C1, C2, C3, D3, D4, D5, D6, D7, and P2, P3, P4. Labels include ADM, CABLE, and 15.

Figure 55 Wiring Connections

Table 15 Wiring Connections

ID	Part	Description
C1	17D923	Bulkhead Cable (59)
C2	121001	CAN Cable (43)
C3	17D923	Bulkhead Cable (59)
C4	121002	CAN Cable (611) (Used only for color change enabled systems. See Color Change: Pneumatic and Wiring Connections , page 112.)
C5		
D3	287839	Pump Sensor Assembly (labeled P2) (447)
D4	24W120	Proximity Sensor (upper; labeled P3) (447)
D5	24W120	Proximity Sensor (lower; labeled P4) (447)

ID	Part	Description
D6	25R034	Bleed Resistor (24)
D7	26C774	Power Supply (47)
E1	Wire (14 gauge)	Green/Yellow (20 in./50.8 cm)
E2		Green/Yellow (5 in./12.7 cm)
E3		Red (6 in./15.2 cm)
E4		Red (10 in./25.4 cm)
E5	17J191	Green/Yellow (81) Note 15: Tuck the ground wire into the corner of the cabinet so that it doesn't interfere with closing the door.

Color Change: Pneumatic and Wiring Connections

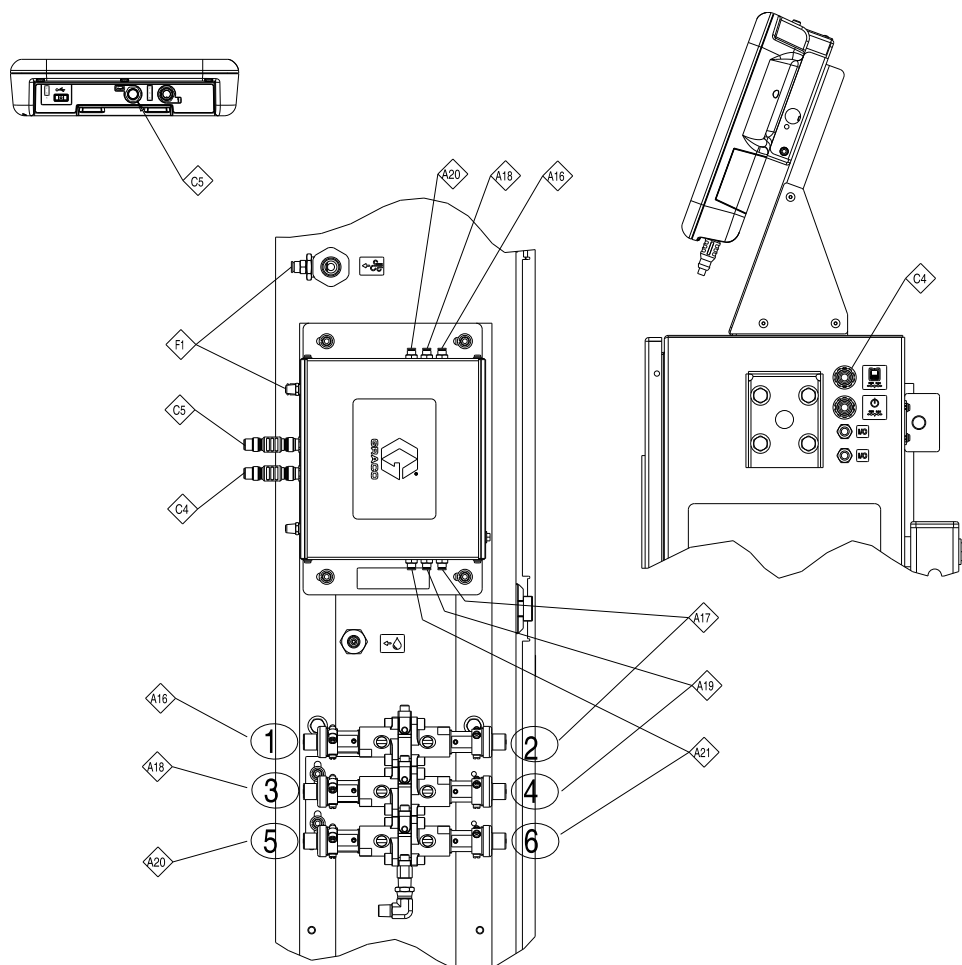


Figure 56 Color Change Module Wiring and Pneumatic Connections

Table 16 Color Change Pneumatic Connections

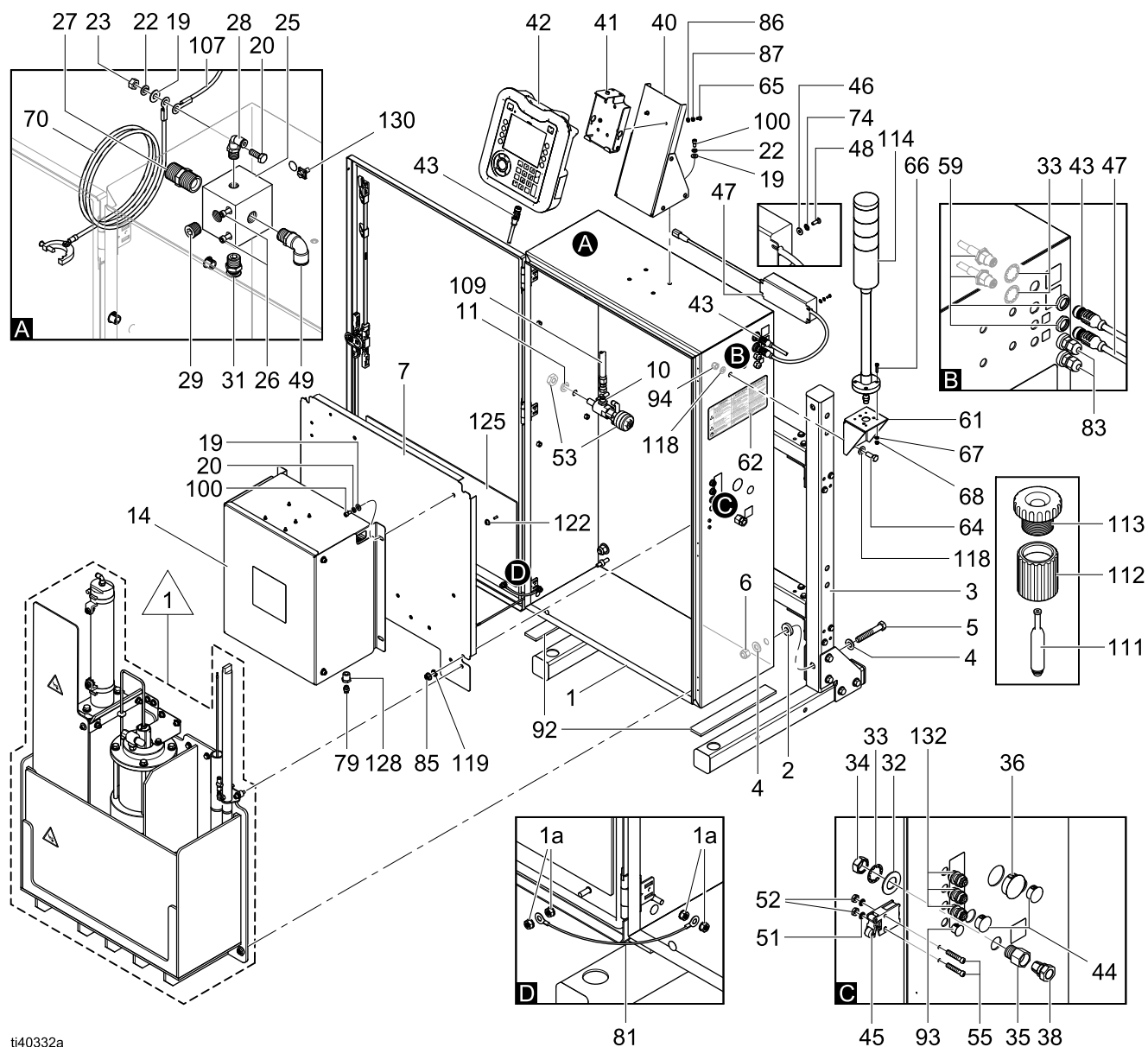
ID	Color Change Module Port	Manifold Valve Stack
A16	1	Valve 1 (Air)
A17	10	Valve 2 (Flush)
A18	2	Valve 3 (Dump)
A19	11	Valve 4 (Color 1)
A20	3	Valve 5 (Color 2)
A21	12	Valve 6 (Color 3)
F1	Air Inlet	System Fitting

Table 17 Color Change Wiring Connections

ID	Part	Description
C4	121002	CAN Cable (611)
C5		

Parts

Isolation System

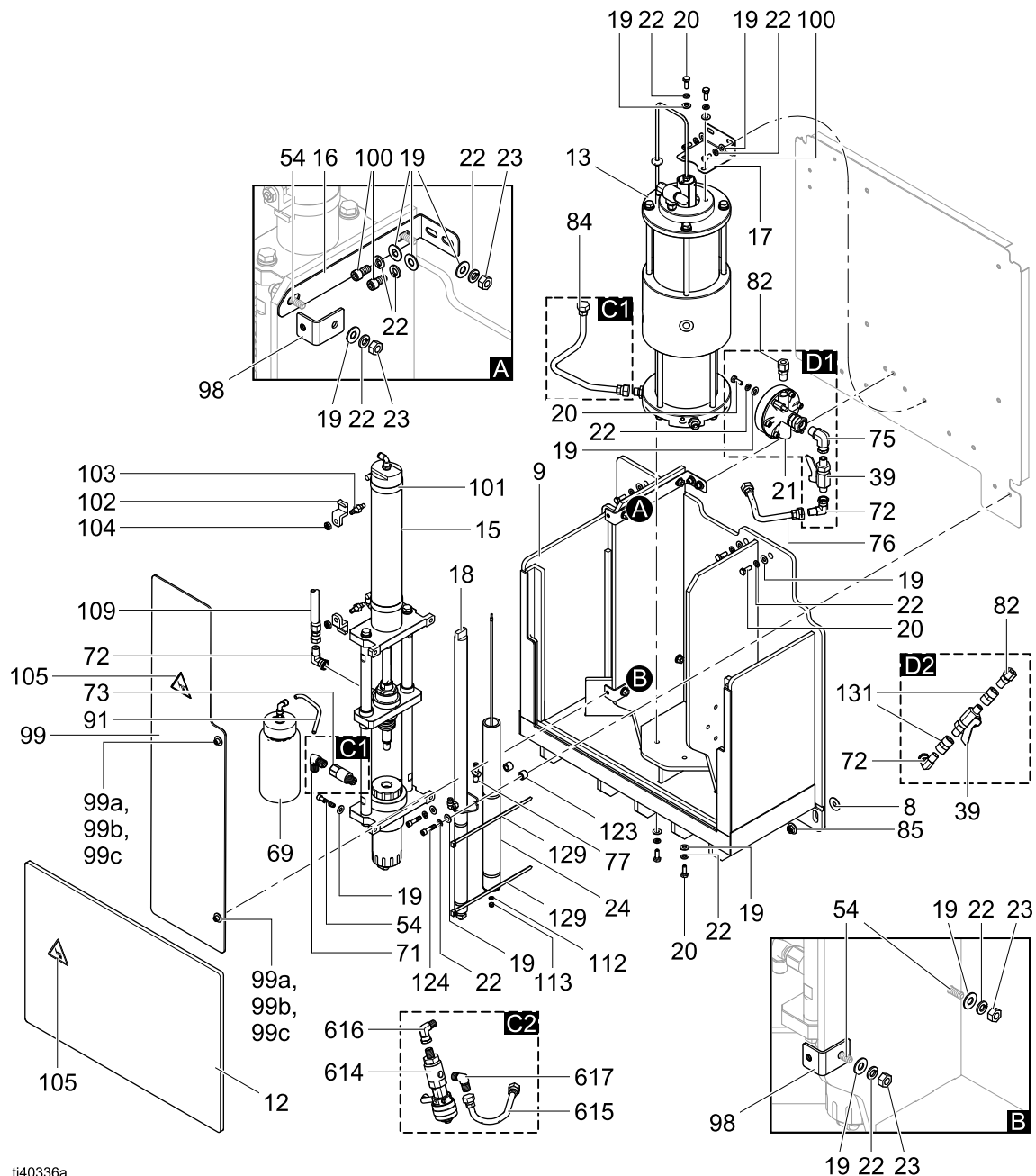


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Figure 57 Isolation Cabinet

1 See [Isolation Cabinet Interior](#) for a detailed view.

* Fittings 79 and 128 are only present on systems with a fluid pressure regulator.



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Figure 58 Isolation Cabinet Interior

Detail **C1** shows the parts that come with a standard system. Replace the **C1** parts with **C2** parts to add color change capability to a standard system. For more information, see [Color Change Kit 26B415, page 128](#).

Detail **C2** shows the parts included with Kit **26B415**.

Detail **D1** shows a system that comes with an internal fluid pressure regulator.

Detail **D2** shows a system that does not come with a fluid pressure regulator installed.

Table 18 Isolation System

Ref.	Part	Description	Qty
1	-----	ENCLOSURE, WATERBORNE, BATCH, LP	1
1a	-----	NUT	4
2	164416	WASHER, FLAT	4
3	-----	FRAME, LP, WATERBORNE	1
4	-----	WASHER, 1/2 INCH PLAIN FLAT	8
5	123999	SCREW, CAP, HEX HEAD	4
6	801020	NUT, LOCK, HEX	4
7	-----	PANEL, ENCLOSURE, WATERBORNE, BATCH	1
8	-----	WASHER, FLAT	2
9	26C920	CABINET, WATERBORNE, STAND	1
10	166846	FITTING, ADAPTER	1
11	108525	WASHER, LOCK, SPRING	1
12	19B670	PLATE, SHIELD, WATERBORNE, BATCH	1
13	25N031	PUMP, WATERBORNE ISOLATION For details, see 25N031 Isolation Fluid Pump Parts, page 121.	1
14	25E700	CONTROL, ELECTRICAL (models WABL00 and WABL02) See Electronic Control Parts, page 123.	1
	25E711	CONTROL, ELECTRICAL (models WABL01 and WABL03)	1
15	25N030	VALVE, WATERBORNE ISOLATION For details, see 25N030 Isolation Valve Parts, page 119.	1
16	19Y100	BRACKET, VALVE, WATERBORNE	1
17	19Y099	BRACKET, PUMP, WATERBORNE	1
18	25P393	ROD, GROUND, WATERBORNE	1
19	115814	WASHER, FLAT, SST (models WABL00 and WABL02)	37
		WASHER, FLAT, SST (models WABL01 and WABL03)	31

Ref.	Part	Description	Qty
20	102023	SCREW, CAP, HEX HD (models WABL00 and WABL02)	15
		SCREW, CAP, HEX HD (WABL01 and WABL03)	9
21	244375	REGULATOR, PRESSURE, FLUID (models WABL00 and WABL02 only)	1
22	104123	WASHER, LOCK, SPRING (models WABL00 and WABL02)	34
		WASHER, LOCK, SPRING (models WABL01 and WABL03)	28
23	112223	NUT, HEX, REGULAR	5
24	25R034	RESISTOR, BLEED, ASSY, ISO SYS	1
25	17D918	MANIFOLD, AIR, SPEED CONTROL	1
26	514930	SCREW, CAP, SKT HD	2
27	158491	FITTING, NIPPLE	1
28	15T937	FITTING, ELBOW, SWIVEL 1/4NPT X 5/32T	1
29	101748	PLUG, PIPE, SST	1
31	15T546	FITTING, STRAIGHT, 3/8 T X 3/8 MNPT	1
32	154636	WASHER, FLAT	1
33	101390	WASHER, LOCK, INTERNAL	3
34	185548	NUT, WATERBASE	1
35	185547	HOUSING, FERRULE, WB	1
36	19C430	PLUG, HOLE DIA 1.094"	1
37	245202	POWER CORD with North America NEMA 5-15 male plug (not shown)	1
	124864	POWER CORD with China/Australia AS/NZS 3112 male plug (not shown)	1
	121056	POWER CORD with Continental Europe CEE 7/7 male plug (not shown)	1
	121057	POWER CORD with U.K. BS 1363 male plug (not shown)	1
38	198663	FERRULE, HOSE, WB	1
39	237528	VALVE, BALL	1
40	26C728	BRACKET, ADM, WATERBORNE	1
41	277853	BRACKET, MOUNTING, BOOTH CONTROL	1
42	26B099	KIT, ADM/Control Interface (Includes ADM and HydroShield software token)	1

Parts

Ref.	Part	Description	Qty
43	121001	CABLE, CAN, FEMALE / FEMALE 1.0M (models WABL00 and WABL01)	1
44	18C027	PLUG, HOLE, .687 INCH	2
45	116172	SWITCH, LIMIT, PNEUMATIC	1
46	151395	WASHER, FLAT	4
47	26B100	POWER SUPPLY, 24VDC, 2.5A, 60W, C13 (includes items 47, 37, 48, 46, 74)	1
48	100518	SCREW, MACH, PNHD	4
49	16F151	FITTING, ELBOW, SWIVEL, 3/8T 3/8NPT	1
51	157021	WASHER, LOCK	2
52	555388	NUT, HEX, MACHINE, 8-32	2
53	16A079	KIT, VALVE, DUMP, ACCESSORY	1
54	19A463	SCREW, CAP, SOCKETHEAD	4
55	114406	SCREW, MACH, FILH	2
57	C50019	RING, TERMINAL	7
59	17D923	CABLE, GCA, M12-5P, M BULKHEAD/F	2
60	598095	TUBE, 5/32 OD, NYLON, 17 FEET (not shown), models WABL00 and WABL01 For connection details, see Pneumatic Connections, page 109	1
		TUBE, 5/32 OD, NYLON, 26 FEET (not shown), models WBL02 and WBL03 For connection details, see Pneumatic Connections, page 109	1
61	16K322	BRACKET, LIGHT TOWER, PAINT	1
62▲	15A682	LABEL, SAFETY	1
64	123942	FASTENER, SCREW, CAP, HEX HD	4
65	106084	SCREW, MACH, PNH	2
69	25P442	BOTTLE, WASH, WATERBORNE	1
70	223547	WIRE, ASSY, 25 FEET	1
71	114342	ELBOW, 1/4-18 NPSM (models WABL00 and WABL01 only)	1
72	17R502	FITTING, ELBOW, SWIVEL, 1/4 NPT-NPSM	2
73	24Y376	VALVE, CHECK, OUTLET, FKM ETP (models WABL00 and WABL01 only)	1

Ref.	Part	Description	Qty
74	103181	WASHER, LOCK EXT	4
75	19Y391	FITTING, ELBOW, SWIVEL (models WABL00 and WABL02 only)	1
76	26B161	HOSE, COUPLED, 6.2 IN., PTFE (models WABL00 and WABL02 only)	1
77	19Y247	VALVE, AIR, QUICK EXHAUST	1
79	114263	FITTING, CONNECTOR, MALE	1
81	17J191	WIRE, GROUND	1
82	110078	FITTING, TUBE FLUID	1
83	111987	CONNECTOR, CORD STRAIN RELIEF	2
84	26B162	HOSE, COUPLED, 10.2 IN., PTFE (models WABL00 and WABL01 only)	1
85	-----	NUT, HEX, FLANGE, M8	2
86	110874	WASHER, FLAT	2
87	111307	WASHER, LOCK, EXTERNAL	2
91	590332	TUBE, POLY-FLO 5/32ID X 1/4OD	1
92	-----	BAR, NEOPRENE STRIP, ADHESIVE	2
93	18C026	PLUG, HOLE, .437" (models WABL00 and WABL01)	5
		PLUG, HOLE, .437" (models WABL02 and WABL03))	1
94	101566	NUT, LOCK	4
95	16F207	CASTER, SWIVEL, WITH BREAK (not shown)	4
96	100018	WASHER, LOCK, SPRING (not shown)	4
97	100321	NUT (not shown)	4
98	19A460	BRACKET, SHIELD	2
99	26C922	PLATE, SHIELD (includes 99a, 99b, 99c, 105)	1
99a	19B478	SCREW, CAPTIVE	2
99b	170772	WASHER, PLAIN	2
99c	10B479	RING, RETAINING	2
100	551903	SCREW, CAP, SCH, 1/4X1/2	13
101	-----	CLAMP, HOSE, SIZE 32 Purchase sensor kit 26B102 (includes 101, 102,103,104)	2
102	-----	BRACKET, SENSOR Purchase sensor kit 26B102 (includes 101, 102,103,104)	2

Ref.	Part	Description	Qty
103	24W120	SENSOR, STROKE POSITION	2
104	19Y538	NUT, HEX, 5/16-24	4
105 ▲	19Y631	LABEL, SAFETY, WARNING, PINCH HAZ	3
107	-----	GROUNDED ROD, HAND HELD	1
109	26B089	HOSE, PAINT, LOW PRESSURE	1
110	054134	TUBE, NYLON, 3/8 INCH, 7 FEET (not shown) For connection details, see Pneumatic Connections, page 109 .	1
111	-----	TOOL, ASSY, PISTON, ISOLATION	1
112	-----	TOOL, ASSY, SLEEVE, ISOLATION	1
113	-----	TOOL, ASSY, STEM, ISOLATION	1
	25B413	KIT, VALVE TOOLS (includes items 111, 112, 113)	1
114	15X472	LIGHT, TOWER, AMBIENT RAM, M12	1
118	100731	WASHER	8

Ref.	Part	Description	Qty
120	25R200	FLUID, CLEANSING, 1 GALLON (not shown)	1
121	16H930	WASHER, #10 FLAT SST (not shown)	1
122	-----	NUT, HEX, THREAD CUTTING	2
123	197449	SPACER	2
124	112222	SCREW, CAP. SCH	2
125	-----	PLATE, DOOR, WATERBORNE	1
126	100639	WASHER, LOCK	4
127	107110	NUT, LOCK (not shown)	1
128	100730	BUSHING, 3/8 NPT X 1/8 NPT	1
129	114958	STRAP, TIE	2
130	116343	SCREW, GROUND	1
131	110336	CONNECTOR, PIPE (models WABL01 and WABL03 only)	2
132	121818	BULKHEAD, TUBE, 5/32	3
C2 ✚	Models WABL02 and WABL03 only. See Color Change Kit 26B415, page 128		

▲ Replacement safety labels, tags, and cards are available at no cost.

Parts labeled ----- are not available separately.

✚ Parts included in Color Change Kit 26B415. Models WABL02 and WABL03 include all kit 26B415 parts and quantities. See [Color Change Kit 26B415, page 128](#).

Notes

[illegible]

25N030 Isolation Valve Parts

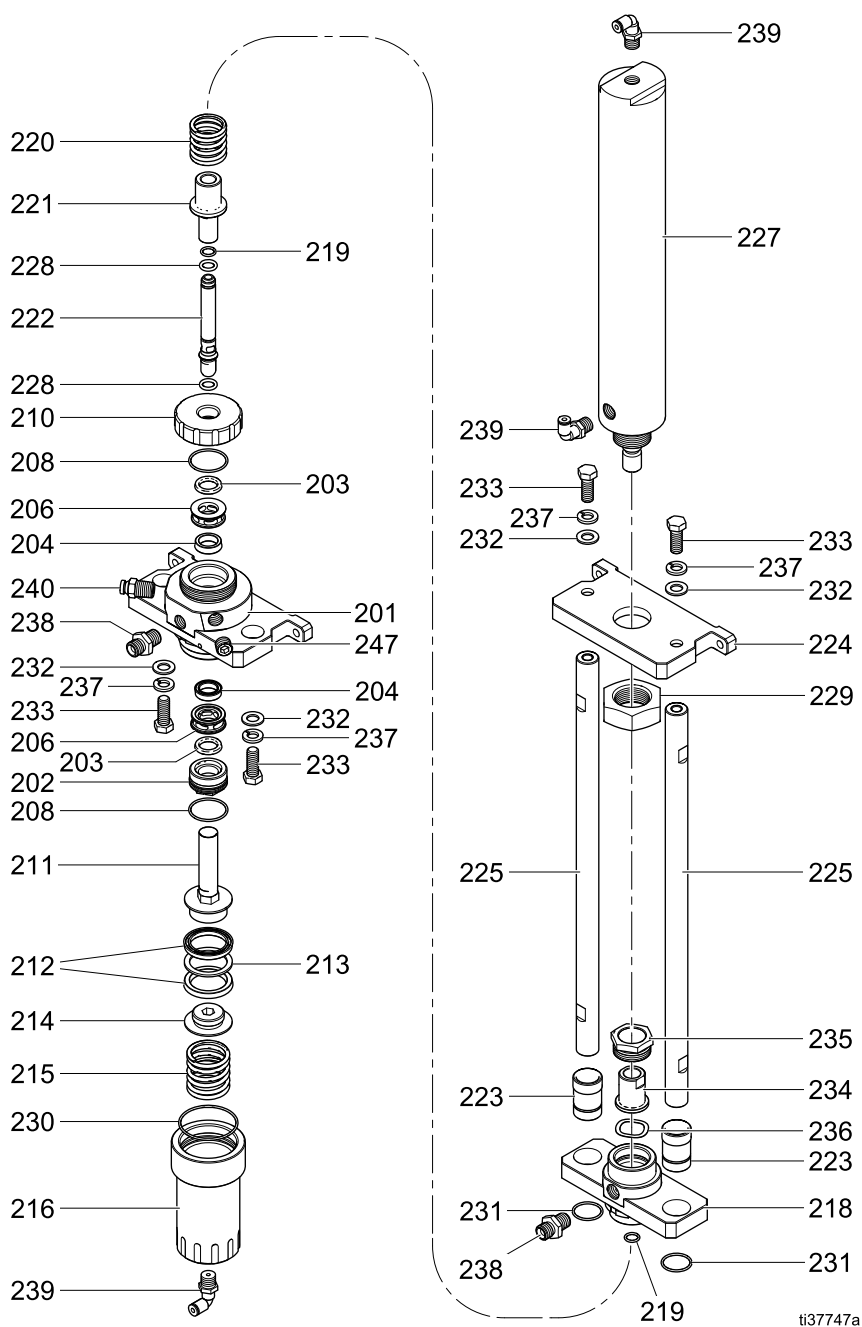


Figure 59 Isolation Valve

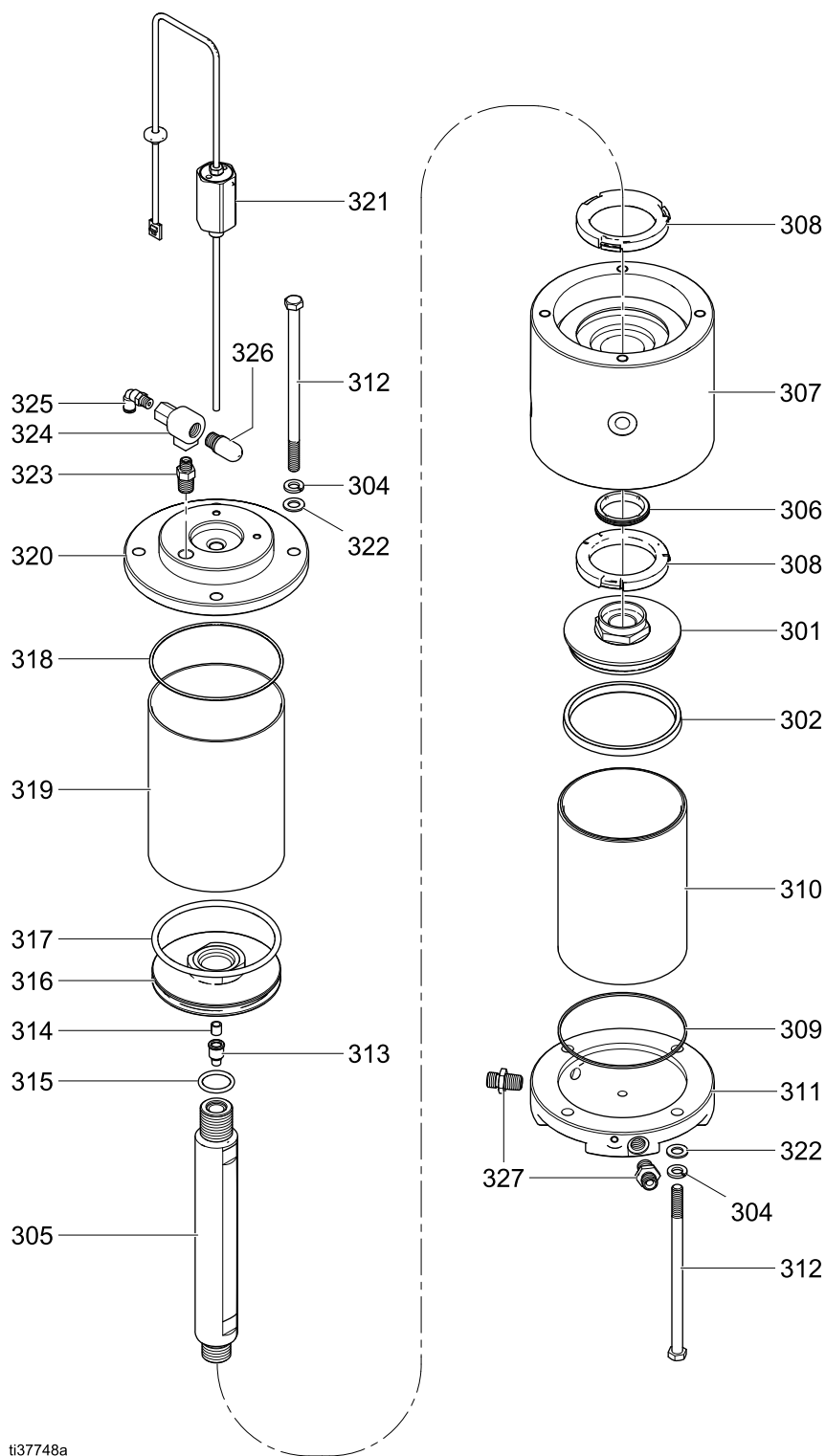
Table 19 Isolation Valve

Ref.	Part	Description	Qty
201	-----	HOUSING, BASE, ISOLATION VALVE	1
202*	19A375	RETAINER, U-CUP, ISOLATION VALVE	1
203*	129597	SEAL, U-CUP, QUAD RING, .625 ID	2
204*	17X743	PACKING, U-CUP	2
205	-----	BLOCK, MOUNT, HOUSING	1
206*	19A376	SPACER, U-CUP, ISOLATION VALVE	2
207	194381	PIN, DOWEL, 1/8	2
208*	18B866	O-RING, #024, FX75	2
209	-----	RING, LOCK, HOUSING, ISOLATION	1
210	-----	CAP, SEAL RETAINER, ISOLATION	1
211	-----	PISTON, ISOLATION VALVE	1
212*	17X745	PACKING, U-CUP, ID 1.25 X OD 1.63	2
213*	19A379	WASHER, BACKUP, ISOLATION VALVE	1
214*	19A380	RETAINER, PISTON, ISOLATION VALVE	1
215	17X746	SPRING, COMPR, 3.25 X OD 1.43	1
216*	-----	CAP, PISTON, ISOLATION VALVE	1
217	-----	BLOCK, MOUNT, SHUTTLE	1
218	-----	HOUSING, SHUTTLE, ISOLATION VALVE	1
219*	111316	PACKING, O-RING	2

Ref.	Part	Description	Qty
220	17Y486	SPRING, COMPR, 2.0 X OD 1.22	1
221*	19A448	SLEEVE, ISOLATION VALVE	1
222	-----	STEM, ISOLATION VALVE	1
223	-----	BEARING, SHUTTLE, ISOLATION VALVE, pack of 2, includes item 231	2
224	-----	BLOCK, MOUNT, AIR CYLINDER	1
225	-----	ROD, CONNECTING, ISOLATION VALVE	2
226	-----	RING, LOCK, SHUTTLE, ISOLATION	1
227	-----	CYLINDER, AIR, ID 2.0 X 10.0 includes item 229 and item 239	2
228*	18B106	O-RING, #109, FX75	2
229	19A526	NUT, RETAINER	1
230*	106258	PACKING, O-RING	1
231	103413	PACKING, O-RING	2
232*	112914	WASHER, PLAIN	4
233*	102471	SCREW, CAP HEX HD	4
234	19A457	COUPLER, ISOLATION VALVE	1
235	19A458	NUT, RETAINING, ISOLATION VALVE	1
236	19A459	WASHER, WAVE SPRING	1
237*	103975	WASHER, LOCK	4
238*	166846	FITTING, ADAPTER	2
239	15T937	FITTING, ELBOW, SWIVEL 1/4NPT X 5/32T	3
240*	116658	FITTING, TUBE, MALE (1/4 NPT)	1
247*	101970	PLUG, PIPE, HDLS	1

* These parts can be ordered as part of a kit. See [Isolation Valve Kits](#), page 132.

25N031 Isolation Fluid Pump Parts



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Figure 60 Isolation Fluid Pump

Table 20 Isolation Fluid Pump

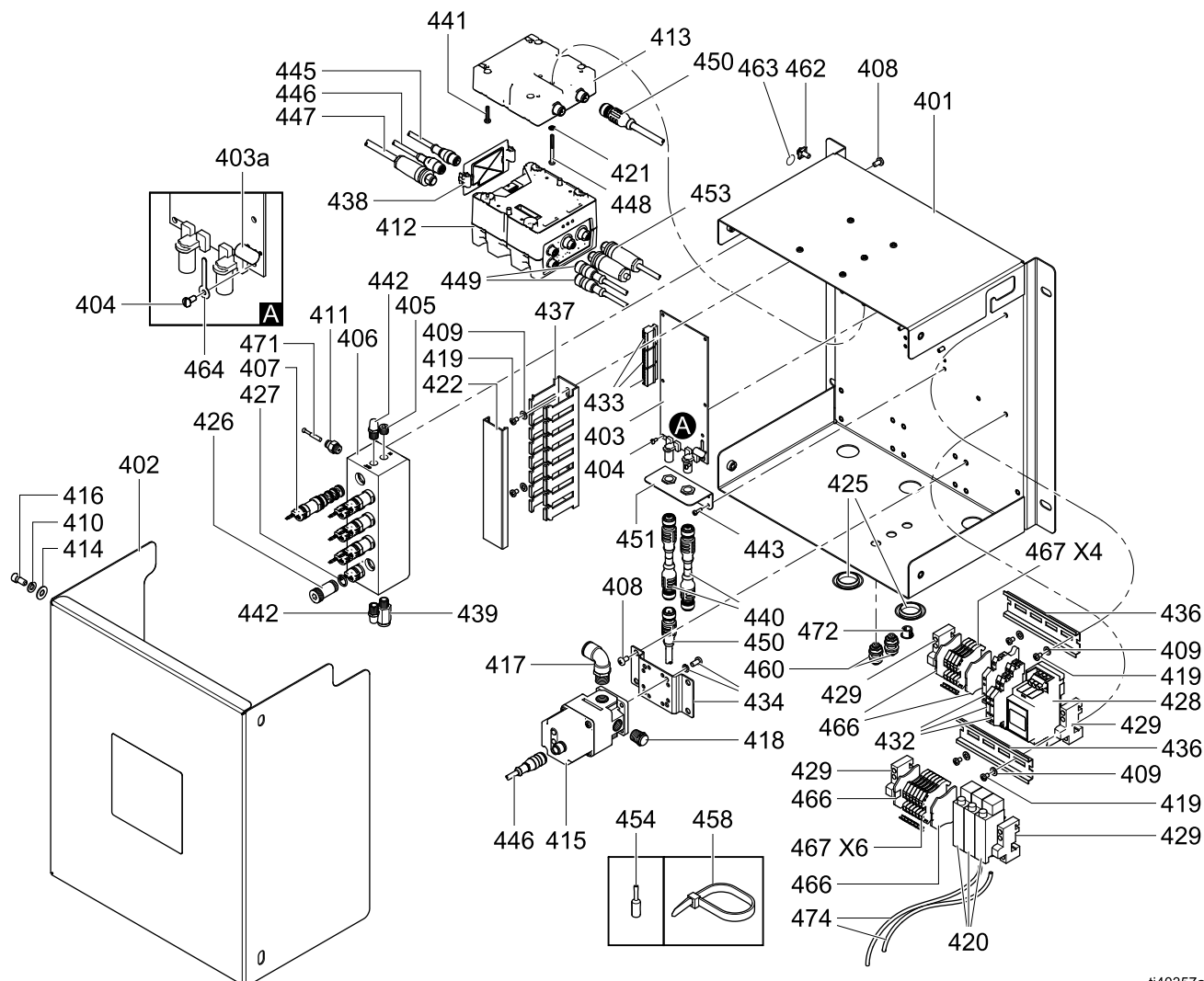
Ref.	Part	Description	Qty
301	19A952	PISTON, FLUID, ISOLATION PUMP	1
302*	19A951	PACKING, U-CUP, 4.08 X .335	1
304*	103975	WASHER, LOCK	8
305	-----	ROD, PISTON, ISOLATION PUMP	1
306*	121130	WIPER, CM200 WETCUP COVER	1
307	-----	HOUSING, MIDDLE, ISOLATION PUMP	1
308*	15U254	BUMPER	2
309*	15G881	SEAL, GASKET, CYLINDER	1
310*	15G882	CYLINDER, PUMP, (CHROME, 2000CC)	1
311	17W719	COVER, FLUID, ISOLATION PUMP	1
312*	17Z471	SCREW, CAP, HEX HD, 3/8-16 X 7"	8
313	-----	HOLDER, MAGNET, SENSOR	1

Ref.	Part	Description	Qty
314*	15G747	MAGNET, LINEAR SENSOR	1
315*	160516	PACKING, O-RING, 214	1
316	-----	PISTON, AIR, ISOLATION PUMP	1
317*	17Z468	O-RING, #346, BUNA-N	1
318*	111624	PACKING, O-RING	1
319*	17X737	CYLINDER, PISTON, 4.5 ID	1
320	-----	COVER, AIR, ISOLATION PUMP	1
321	287839	SENSOR, ASSEMBLY	1
322*	112914	WASHER, PLAIN	8
323	16D939	FITTING, NIPPLE, REDUCING	1
324	104661	VALVE, EXHAUST, QUICK	1
325	15T866	FITTING, ELBOW, SWIVEL, 1/8NPT X 5/32T	1
326	114174	MUFFLER	1
327	166846	FITTING, ADAPTER	2

* These parts can be ordered as part of a kit. See [Isolation Fluid Pump Kits, page 134](#).

Electronic Control Parts

The following figure shows 25E700.



ti40357a

Figure 61 Electronic Controls

Note

Systems without a fluid pressure regulator use electronics controls 25E711. Panel 25E711 does not have electro/pneumatic regulator 415, its associated hardware, or cables 446 and 449.

Parts

Ref.	Part	Description	Qty
401	-----	PANEL, WATERBORNE, PAINTED	1
402	-----	COVER, ELECTRICAL, WATERBORNE	1
403	25D312	BOARD, CIRCUIT, GCA, CC, IS-TBD	1
403a	17U084	FUSE, 500mA	1
404	112324	SCREW, MACH, PN HD, 4X.25	7
405	100139	PLUG, PIPE 1/8-27 NPTF	1
406	-----	MANIFOLD, COLOR CHANGE CONTROL	1
407	16P316	VALVE, SOLENOID	8
408	103833	SCREW, MACH, CRBH	8
409	110874	WASHER, FLAT	6
410	104123	WASHER, LOCK, SPRING	4
411	114263	FITTING, CONNECTOR, MALE	8
412	289696	MODULE, GCA, CUBE, FCM	1
413	289697	MODULE, GCA, CUBE, BASE	1
414	115814	WASHER, FLAT, SST	4
415	17G386	REGULATOR, ELECTRO/PNEUMATIC, 3/8 INCH NPT	1
416	551903	SCREW, CAP SCH 1/4-20 X 1/2	4
417	16F151	FITTING, ELBOW, SWIVEL, 3/8T 3/8 NPT	1
419	112144	SCREW, MACH, PAN HD	6
420	19B745	SWITCH, PRESSURE	3
421	100272	WASHER, LOCK, #6	1
422	-----	COVER, WIRE, DUCT	0.55
425	-----	PLUG, 1" ID, ROUND, PLASTIC	2
426	16P916	PLUG, MANIFOLD, COLOR CHANGE	1
427	113418	PACKING, O-RING	1
428	25R197	ENCLOSURE, ASSEMBLY, KV BOARD	1
429	112446	BLOCK, CLAMP END	4
432	17G392	BLOCK, TERMINAL, OPTOCOUPLER	3
433	119162	CONNECTOR, PLUG, 6 POSITION	3
434	17D921	BRACKET, REGULATOR	1
436	514014	RAIL, MT (cut to length)	1
437	----	DUCT, WIRE	---
438	277674	ENCLOSURE, CUBE DOOR	1
439	108982	CONNECTOR, TUBE	1

Ref.	Part	Description	Qty
440	19Y588	ADAPTER, CABLE, CAN, IS TO NON-IS	2
441	-----	SCREW, MACH, PAN HD, #6-32 UNC	4
442	C06061	MUFFLER, SINTERED, DIA 1/8	2
443	107388	SCREW, MACH, PNH	4
445	17H111	CABLE, GCA, M12-5P, M/N, 0.5M For detailed information, see Wiring Connections, page 110 .	1
446	19Y586	CABLE, SPLITTER, SNG MALE DBL FE For detailed information, see Wiring Connections, page 110 .	1
447	19Y759	CABLE, SPLITTER, M12-8P For detailed information, see Wiring Connections, page 110 .	1
448	-----	SCREW, MACHINE, PAN, 6-32 X 1-1/2	1
449	19Y572	CABLE, SPLITTER, M12(F) TO M8(M) For detailed information, see Wiring Connections, page 110 .	1
450	121000	CABLE, CAN, FEMALE / FEMALE 0.5M For detailed information, see Wiring Connections, page 110 .	1
451	-----	BRACKET, COLOR CHANGE, WATERBORNE	1
453	19Y758	CABLE, SPLITTER, LEADS, M12-5P	2
454	112512	FERRULE, WIRE ORANGE	21
455	17N992	RESISTOR, 5.1K OHMS. For location, see schematic Electrical Schematic for 25E700 Electrical Control (equipped for fluid pressure regulator)	1
458	102478	STRAP, TIE WIRING	8
460	121818	BULKHEAD, TUBE, 5/32	2
462	116343	SCREW, GROUND	1
463	186620	LABEL, SYMBOL, GROUND	1
464	123691	HOLDER, FUSE	1
466	120490	COVER, END	4
467	120491	BLOCK, TERMINAL	10
471	113279	PLUG, FITTING, TUBE, PUSH-IN	1
472	18C026	PLUG, HOLE, .437"	1
474	598095	TUBE, 5/32 OD, NYLON, 250PSI (26C716 only)	32 in.

Repair Kits and Accessories

Accessories

Grounded Air Hoses for Pro Xp Auto

100 psi (0.7 MPa, 7.0 bar) Maximum Working Pressure

0.315 in. (8 mm) ID; 1/4 npsm(f) x 1/4 npsm(f) left-hand thread

Part	Description
Grounded Air Hose with stainless steel braid ground path (Red)	
235070	25 ft (7.6 m)
235071	36 ft (11 m)
235072	50 ft (15 m)
235073	75 ft (23 m)
235074	100 ft (30.5 m)

Fluid Hoses

100 psi (0.7 MPa, 7.0 bar) Maximum Working Pressure

1/4 in. (6 mm) ID

Applicator	Part	Description
Shielded Waterborne Fluid Hose		
Pro Xp Auto	24W597	25 ft (7.6 m)
	24W598	50 ft (15 m)
Pro Xpc	24S112	25 ft (7.6 m)
	24S113	50 ft (15 m)
ProBell Hollow Wrist	24Z199	36 ft (11 m)
	24Z200	66 ft (20 m)
ProBell Standard*	17L886	36 ft (11 m)
	17L887	66 ft (20 m)
Bulk Hose*	537107	500 ft (152 m)
Unshielded Waterborne Fluid Hose		
Must purchase different bulkhead parts to secure hose to HydroShield. Replace housing (35) with part 15B932 and ferrule (38) with 190863.		
ProBell Hollow Wrist	24Z201	36 ft (11 m)
	24Z202	66 ft (20 m)
ProBell Standard*	17L884	36 ft (11 m)
	17L885	66 ft (20 m)

* Consists of the hose only; does not include fittings.

Light Tower Extension Cables

Part	Description	Qty
124003	CABLE, CAN, MALE/FEMALE, 5 METERS	1
121005	CABLE, CAN, MALE/FEMALE, 15 METERS	1
121006	CABLE, CAN, MALE/FEMALE, 50 METERS	1

CAN Cables for Control Module

Part	Description	Qty
121001	CABLE, CAN, FEMALE / FEMALE, 1 METER Included in the isolation system (43)	1
121002	CABLE, CAN, FEMALE / FEMALE, 1.5 METER	1
19Y641	KIT, SHLD CAN, LF FERRITE, 15 METERS	1
19Y642	KIT, SHLD CAN, LF FERRITE, 40 METERS	1

HydroShield Cleansing Solution

Part	Description	Qty
25R200	FLUID, CLEANSING, 1 GALLON	1

Kit 26B414, System Stop Pneumatic Input Kit

This kit provides a pneumatic means to signal the HydroShield system to stop. Install kit 26B414 to use the optional System Stop: Air input. For details about this input, see [Status Screen 1, page 50](#).

Part	Description	Qty
19B745	SWITCH, PRESSURE	1
598095	TUBE, 5/32 OD, NYLON, 4 FEET	1
121818	BULKHEAD, TUBE, 5/32	2

Kit 24Z226, Optocoupler

This kit is required to use the System Status Output. This feature appears on [Status Screen 1, page 50](#) and [Maintenance 6: Output Resets and Test, page 62](#).

Kit 17Z578, Software Upgrade Token

This kit contains a Graco black software update token with the latest system software. A token is included when a replacement control interface is ordered. To use the token, see [Update the System Software, page 41](#).

Kit 26B400, Supply Pump

This kit contains a Triton 1:1 pump to be assembled to the inlet side of the HydroShield system.

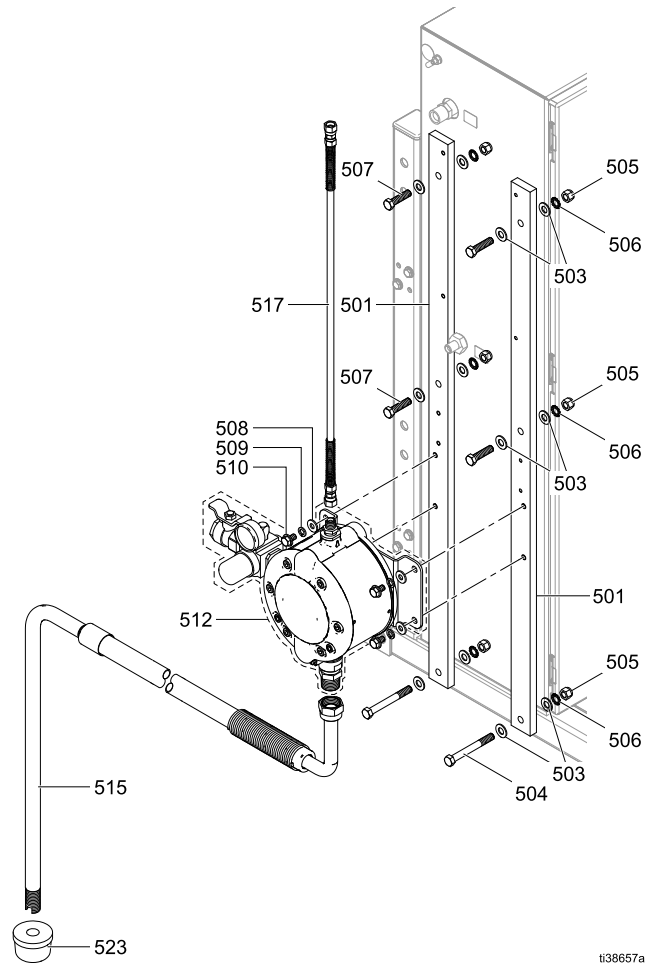


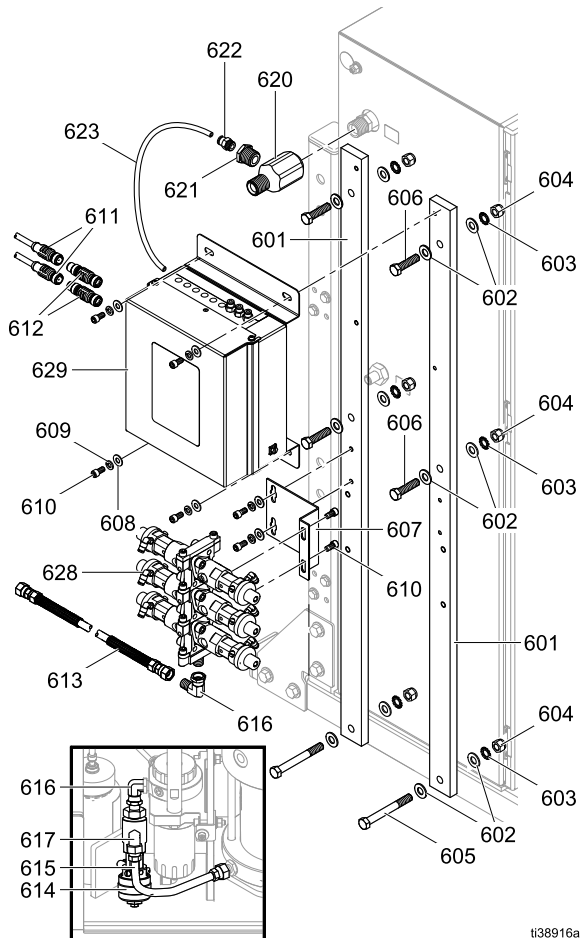
Figure 62 Supply Pump Kit 26B400

Ref.	Part	Description	Qty
501	19Y578	BAR, MOUNTING	2
503	100731	WASHER, 3/8"	12
504	121592	SCREW, CAP, HEX HEAD, 3/8"	2
505	101566	NUT, LOCK, 3/8"	6
506	100639	WASHER, LOCK, 3/8"	6
507	102637	BOLT, HEX HD, 3/8"	4
508	100527	WASHER, PLAIN	4
509	100214	WASHER, LOCK	4
510	111801	SCREW, CAP, HEX HD, 5/16"	4
512	233501	TRITON 1:1 PUMP WITH BRACKET ASSEMBLY	1
	197426	BRACKET, WALL MOUNT	1
	197449	SPACER	2
	17S252	SCREW, CAP, HEX HEAD, 5/16-18	2
	16R882	FITTING, NIPPLE, 3/4	1
	166863	FITTING, NIPPLE, REDUCING	1
	166421	FITTING, PIPE	2
	116513	REGULATOR, AIR	1
	191892	FITTING, ELBOW, STREET, 90 DEG	1
	108190	GAUGE, PRESSURE, AIR	1
	116473	VALVE, VENTED, 2 WAY	1
515	255871	HOSE, SIPHON, ASSEMBLY	1
517	26B162	HOSE, COUPLED, PTFE, 10.2"	1
523	187146	STRAINER, INLET	1

Color Change Kit 26B415

Parts included with Models WABL02 and WABL03 and Kit 26B415.

A color change control module and corresponding valve stack are required to add Kit 26B415 to add color change kit 26B415.



Ref.	Part	Description	Qty
601	-----	BAR, MOUNTING	2
602	100731	WASHER, 3/8"	12
603	100639	WASHER, LOCK, 3/8"	6
604	101566	NUT, LOCK, 3/8"	6
605	121592	SCREW, CAP, HEX HEAD, 3/8"	2
606	-----	SCREW, CAP, 3/8-16 x 1.5"	4
607	15U927	BRACKET, COLOR CHANGE STACK	1
608	115814	WASHER, FLAT, SST	6
609	104123	WASHER, LOCK, SPRING	6
610	551903	SCREW, CAP, SCH, 1/4 X 1/2"	8
611	121002	CABLE, CAN, FEMALE / FEMALE 1.5M	2
612	16T072	ADAPTER, CABLE, CAN, IS TO NON IS	2
613	26B089	HOSE, PAINT, LOW PRESSURE	1
614	16A079	KIT, VALVE, DUMP, ACCESSORY	1
615	25A517	HOSE, COUPLED, .625 FT, PTFE	1
616	17R502	FITTING, ELBOW, SWIVEL, 1/4 NPT-NPSM	2
617	114342	ELBOW, 1/4-18 NPSM	1
620	15R873	FITTING, TEE	1
621	128820	FITTING, BUSHING	1
622	125428	FITTING, CONNECTOR	1
623	054175	TUBE, NYLON, 0.7 FEET	1
628	-----	VALVE STACK (see the following table for color change module/valve stack combinations)	1
629	-----	COLOR CHANGE MODULE (see the following table for color change module/valve stack combinations)	1

Figure 63 Color Change Kit 26B415

Color Change Control Module and Valve Stack Combinations

Max. Colors	Number of Valves	Control Module	Valve Stack
1	4	25D313	256290
3	6	25D315	256292
5	8	25D317	256294
7	10	25D319	256296

Max. Colors	Number of Valves	Control Module	Valve Stack
9	12	25D321	256298
11	14	25D323	256300
13	16	25D325	256302
15	18	25D327	256304

Color Change Module Configuration

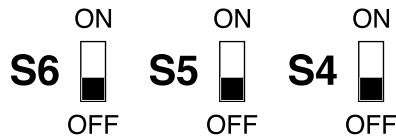
Configure each module according to its designated number, as follows:

NOTICE

To avoid damaging the circuit boards, wear Part No. 112190 grounding strap on your wrist and ground appropriately.

To avoid electrical component damage, disconnect all system power before plugging any connectors.

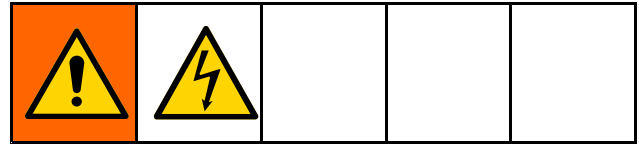
1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Disconnect electrical power from the system.
3. Open the color change module. Locate switches S4, S5, and S6 on the control module board. The switches are shipped in the OFF position.



4. For each module, set the switches to ON or OFF, as shown in the following table.

Non-IS Control Module Switch Settings			
Control Module	S6	S5	S4
Electronic Controls			
Color Change			

Replace the Color Change Board

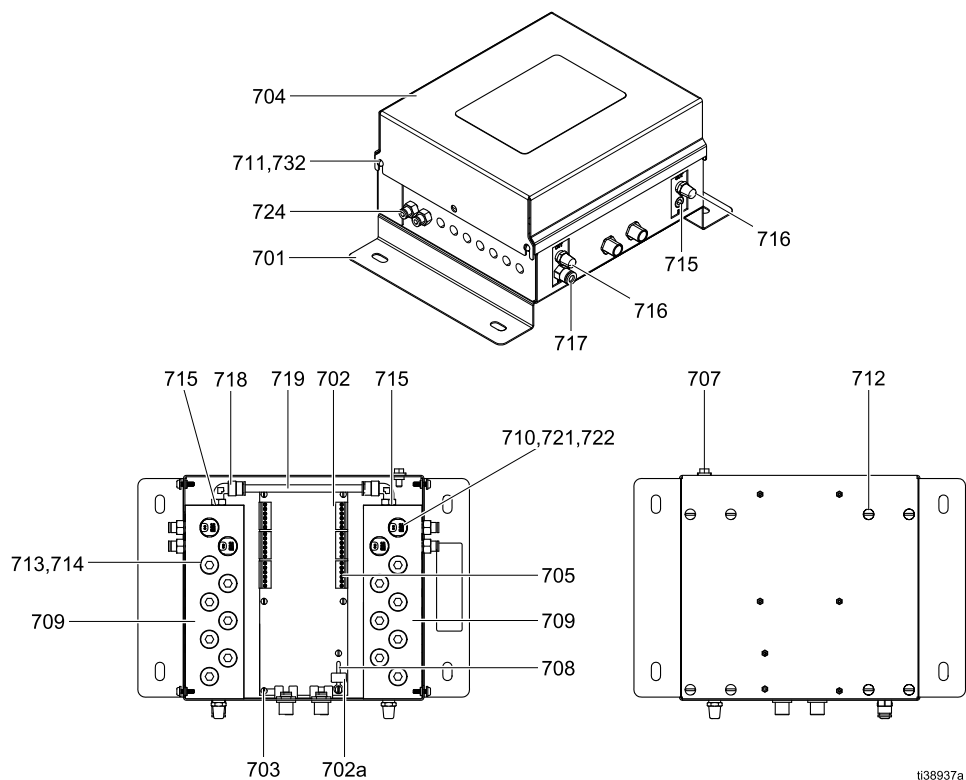


NOTICE

To avoid damaging the circuit boards, wear Part No. 112190 grounding strap on your wrist and ground appropriately.

To avoid electrical component damage, disconnect all system power before plugging any connectors.

1. Prepare the electrical controls for service. Follow the steps in [Prepare the Electrical Controls for Service, page 105](#).
2. Disconnect electrical power from the system.
3. Remove the color change module cover (704).
4. Note where each cable is connected, then disconnect all cables from the color change board connectors.
5. Remove the seven mounting screws (703) and the board (702).
6. Install the new board. Reinstall the screws.
7. Reconnect the cables to the proper connectors, as noted in step 3.
8. Reinstall the cover (704). Restore electrical power to the system.



1138937a

Figure 64 Control Module Repair (Non-IS Module Shown)

Ref.	Part	Description	Qty
701	16P855	PANEL	1
702	25D312	BOARD, circuit; used with 25D313 - 25D327 control modules	1
702a	17U084	FUSE; 500 mA; used with 25D313 - 25D327 control modules	1
703	112324	SCREW, machine, pan head; 4-40 x 0.25 in. (6 mm)	6
704	24T562	COVER	1
705	119162	CONNECTOR, 6-position	★
707	116343	SCREW, ground; M5 x 0.8	1
708	123691	HOLDER, fuse	1
709	24T563	MANIFOLD	2
710	16P316	SOLENOID	★
711	117831	SCREW, machine, pan head; 6-32 x 0.5 in. (13 mm)	4
712	103833	SCREW, machine, pan head; 10-32 x 0.375 in. (10 mm)	8
713	24T565	PLUG; 5/8-32; includes item 314	★

Ref.	Part	Description	Qty
714	113418	O-RING; buna-N	14
715	100139	PLUG, pipe; 1/8 npt	3
716	C06061	MUFFLER	2
717	115671	FITTING, connector; 1/8 npt(m) x 1/4 in. (6 mm) OD tube	1
718	112698	ELBOW; 1/8 npt(m) x 1/4 in. (6 mm) OD tube	2
719	590332	TUBE; polyethylene; 1/4 in. (6 mm) OD	1
720	598095	TUBE; nylon; 5/32 in. (4 mm) OD	1
721	— — —	STRAP, tie	★
722	— — —	FERRULE	★
724	114263	FITTING, connector; 1/8 npt(m) x 5/32 in. (4 mm) OD tube	★
732	151395	WASHER	4

★ See the following table to determine the quantity of each part in your control module kit.

Parts labeled — — — are not available separately.

Non-IS Control Module Part Quantities

Find your module kit number in the left column and the desired reference number in the top row to find the part quantity used in your control module kit.

Module No.	6-Position Connector (705)	Solenoid (710)	Plug (713)	Tie Strap (721)	Ferrule (722)	Connector Fitting (724)
25D313	6	4	14	4	8	4
25D315	6	6	12	4	12	6
25D317	6	8	10	4	16	8
25D319	6	10	8	4	20	10
25D321	6	12	6	4	24	12
25D323	6	14	4	4	28	14
25D325	6	16	2	4	32	16
25D327	6	18	0	4	36	18

Kit 26D031, Color Change Single Valve Add-on

Use when adding a single color valve to a color stack that is already full. Includes color valve, manifold ports, and solenoid.

Kit 26D033, Color Change Valve Replacement

Use when replacing a color valve or adding a single color valve to an open port on the color stack. Includes valve components only.

Kit 26D032, Color Change Double Valve Add-on

Use when adding two color valves to a color stack that is already full. Includes color valves, manifold ports, and solenoids.

Kit 26D034, Color Change Solenoid Replacement

Use when replacing a solenoid in the color valve control module or when adding a single color and using kit 26D033.

Isolation Valve Kits

Kit 26B401, Stem, Sleeve, Piston Replacements

Be careful not to drop or scratch these parts when handling. This kit requires tools 111–113 to install. See [Isolation System, page 113](#).

Ref.	Part	Description	Qty
202	19A375	RETAINER, U-CUP, ISOLATION VALVE	1
203	129597	SEAL, U-CUP, QUAD RING, .625 ID	2
204	17X743	PACKING, U-CUP	2
206	19A376	SPACER, U-CUP, ISOLATION VALVE	2
208	18B866	O-RING, #024, FX75	2
211	-----	PISTON, ISOLATION VALVE	1
212	17X745	PACKING, U-CUP, ID 1.25 X OD 1.63	2
213	19A379	WASHER, BACKUP, ISOLATION VALVE	1
214	19A380	RETAINER, PISTON, ISOLATION VALVE	1
219	111316	PACKING, O-RING	2
221	19A448	SLEEVE, ISOLATION VALVE	1
222	-----	STEM, ISOLATION VALVE	1
228	18B106	O-RING, #109, FX75	2
230	106258	PACKING, O-RING	1

Kit 26B402, Housing Assembly

Ref.	Part	Description	Qty
201	-----	HOUSING, BASE, ISOLATION VALVE	1
205	-----	BLOCK, MOUNT, HOUSING	1
207	19A381	CAP, PISTON, ISOLATION VALVE	1
209	-----	RING, LOCK, HOUSING, ISOLATION	1
232	112914	WASHER, PLAIN	2
233	102471	SCREW, CAP HEX HD	2
237	103975	WASHER, LOCK	2
238	166846	FITTING, ADAPTER	1
240	116658	FITTING, TUBE, MALE (1/4 NPT)	1
247	101970	PLUG, PIPE, HDLS	1
19	115814	WASHER, FLAT, SST	4
22	104123	WASHER, LOCK, SPRING	2
23	112223	NUT, HEX, REGULAR	2
54	19A463	SCREW, CAP, SOCKETHEAD	2

Kit 26B403, Retaining Cap Set

Ref.	Part	Description	Qty
203	129597	SEAL, U-CUP, QUAD RING, .625 ID	1
208	18B866	O-RING, #024, FX75	1
210	-----	CAP, SEAL RETAINER, ISOLATION	1

Kit 26B404, Piston Replacement

Be careful not to drop or scratch these parts when handling. This kit requires tool 111 to install. See [Isolation System, page 113](#).

Ref.	Part	Description	Qty
211	-----	PISTON, ISOLATION VALVE	1
212	17X745	PACKING, U-CUP, ID 1.25 X OD 1.63	2
213	19A379	WASHER, BACKUP, ISOLATION VALVE	1
214	19A380	RETAINER, PISTON, ISOLATION VALVE	1

Kit 26B405, Cap, Piston Retainer

Bottom housing of the isolation valve. To replace, see [Service the Bottom Piston Housing, page 97](#).

Ref.	Part	Description	Qty
216	-----	CAP, PISTON, ISOLATION VALVE	1
230	106258	PACKING, O-RING	1
239	15T937	FITTING, ELBOW, SWIVEL 1/4NPTX5/32T	1

Kit 26B406, Stem Replacement

Be careful not to drop or scratch these parts when handling. This kit requires tools 111–113 to install. See [Isolation System, page 113](#).

Ref.	Part	Description	Qty
219	111316	PACKING, O-RING	2
222	-----	STEM, ISOLATION VALVE	1
228	18B106	O-RING, #109, FX75	2

Kit 26B408, Mount Block Air Cylinder

Ref.	Part	Description	Qty
224	-----	BLOCK, MOUNT, AIR CYLINDER	1
232	112914	WASHER, PLAIN	2
233	102471	SCREW, CAP HEX HD	2
237	103975	WASHER, LOCK	2
19	115814	WASHER, FLAT, SST	4
22	104123	WASHER, LOCK, SPRING	2
23	112223	NUT, HEX, REGULAR	2
54	19A463	SCREW, CAP, SOCKETHEAD	2

Kit 26B409, Connecting Rod

Ref.	Part	Description	Qty
225	-----	ROD, CONNECTING, ISOLATION VALVE	2
232	112914	WASHER, PLAIN	4
233	102471	SCREW, CAP HEX HD	4
237	103975	WASHER, LOCK	4

Kit 26B410, Seal Set for Service to Rebuild

Be careful not to drop or scratch these parts when handling. This kit requires tools 111–113 to install. See [Isolation System, page 113](#).

Ref.	Part	Description	Qty
202	19A375	RETAINER, U-CUP, ISOLATION VALVE	1
203	129597	SEAL, U-CUP, QUAD RING, .625 ID	2
204	17X743	PACKING, U-CUP	2
206	19A376	SPACER, U-CUP, ISOLATION VALVE	2
208	18B866	O-RING, #024, FX75	2
212	17X745	PACKING, U-CUP, ID 1.25 X OD 1.63	2
219	111316	PACKING, O-RING	2
228	18B106	O-RING, #109, FX75	2
230	106258	PACKING, O-RING	1

Kit 26B411, Shuttle Assembly

Ref.	Part	Description	Qty
207	194381	PIN, DOWEL, 1/8-INCH	1
217	-----	BLOCK, MOUNT, SHUTTLE	1
218	-----	HOUSING, SHUTTLE, ISOLATION VALVE	1
219	111316	O-RING, #012, FX75	1
223	-----	BEARING, SHUTTLE	2
226	-----	RING, LOCK, HOUSING	1
231	103413	O-RING, #020, Viton	2
238	166846	FITTING, ADAPTER	1

Kit 26B413, Service Tools

Ref.	Part	Description	Qty
111	-----	TOOL, PISTON	1
112	-----	TOOL, ASSY, SLEEVE	1
113	-----	TOOL, SLEEVE REDUCTION NUT	1

Isolation Fluid Pump Kits

Kit 24A914, Bumpers

Ref.	Part	Description	Qty
308	15U254	BUMPER	2

Kit 26B421, Seal Set for Service to Rebuild

Ref.	Part	Description	Qty
302	19A951	PACKING, U-CUP, 4.08 X .335	1
306	121130	WIPER, CM200 WETCUP COVER	1
309	15G881	SEAL, GASKET, CYLINDER	1
315	160516	PACKING, O-RING, 214	1
317	17Z468	O-RING, #346, BUNA-N	1
318	111624	PACKING, O-RING	1

Kit 26B422, Rod Replacement

The kit comes fully assembled, except for part number 306.

Ref.	Part	Description	Qty
305	-----	ROD, PISTON, ISOLATION PUMP	1
306	121130	WIPER, CM200 WETCUP COVER	1
313	-----	HOLDER, MAGNET, SENSOR	1
314	15G747	MAGNET, LINEAR SENSOR	1
315	160516	PACKING, O-RING, 214	1

Kit 26B423, Fluid Cylinder

Ref.	Part	Description	Qty
309	15G881	SEAL, GASKET, CYLINDER	1
312	15G882	CYLINDER, PUMP, (CHROME, 2000CC)	1

Kit 26B424, Air Cylinder

Ref.	Part	Description	Qty
318	111624	PACKING, O-RING	1
319	17X737	CYLINDER, PISTON, 4.5 ID	1

Kit 26B425, Air Piston

Ref.	Part	Description	Qty
315	160516	PACKING, O-RING, 214	1
316	-----	PISTON, AIR, ISOLATION PUMP	1
317	17Z468	O-RING, #346, BUNA-N	1

Kit 26B426, Bolt Replacement Set

Ref.	Part	Description	Qty
304	103975	WASHER, LOCK	4
312	17Z471	SCREW, CAP, HEX HD, 3/8-16 X 7"	4
322	112914	WASHER, PLAIN	4

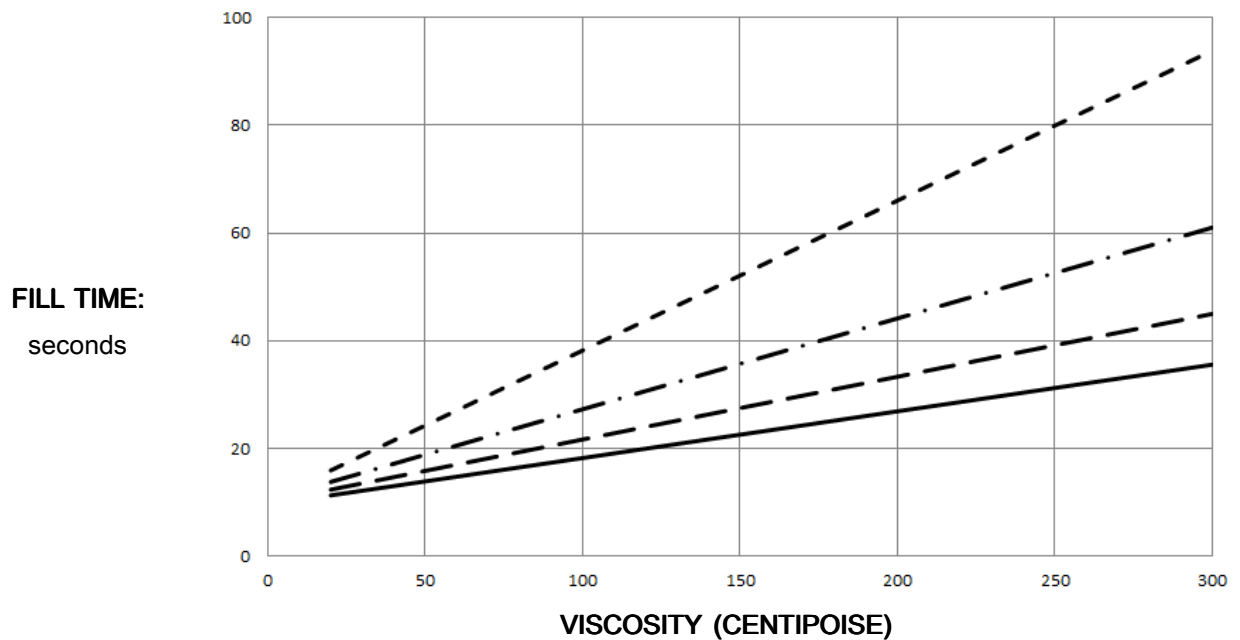
Performance

The following figure shows how long it takes to fill the isolation fluid pump for a range of fluid viscosities.

Dynamic Pressure at Fluid Inlet:

100 psi (.7 MPa, 6.9 bar)	—————
80 psi (.6 MPa, 5.5 bar)	- - - - -
60 psi (.4 MPa, 4.1 bar)	- . - . - .
40 psi (.3 MPa, 2.8 bar)

Table 21 Fill Time Based on Viscosity and Dynamic Inlet Pressure



Ignitability of Coating Materials

Per EN 50059

From the Physikalisch-Technische Bundesanstalt, Braunschweig, Germany, June 26, 2019.

General

The fire and explosion protection of spraying systems can be facilitated considerably when processing coating materials with a low portion of solvents and a high flash point (generally water-based paints), provided that the spray cloud of the coating materials are considered to be non-ignitable. Substantial research has shown that the ignitability of spray clouds depends on the composition of the coating materials made mainly of water, solvents, and solids. The following classification has been established:

Non-ignitable coating materials

Coating materials of this group have the following composition:

$$[\% \text{H}_2\text{O}] > 1, 70 \times [\% \text{LM}] + 0,96 \times [\% \text{ORG}], \text{ (all in \% by weight)}$$

where

H₂O: water;

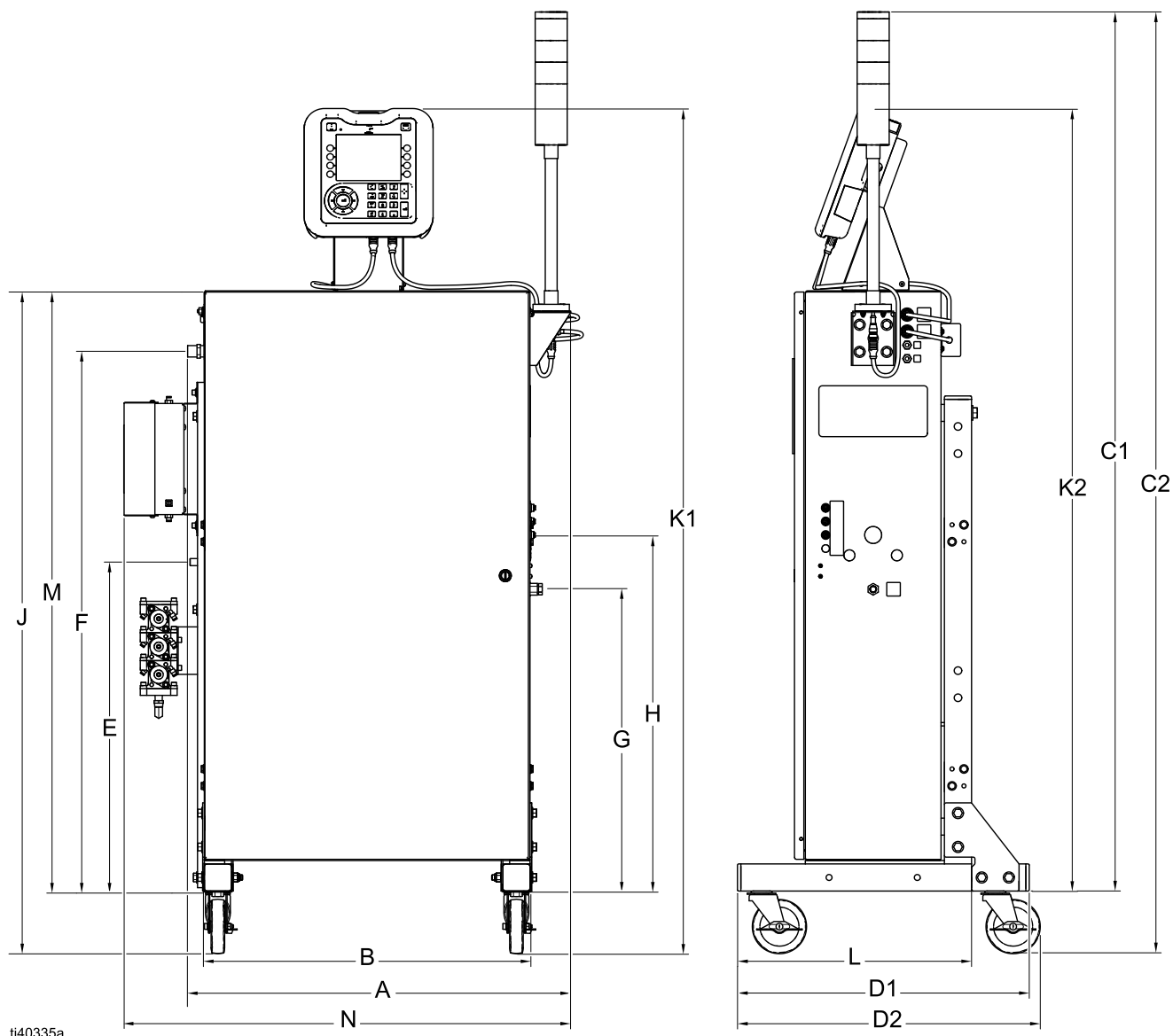
LM: the entire liquid phase, including liquids with flash points above 60 °C and those liquids **not** listed in the safety data sheet, in which case the entire liquid phase is ignitable in the sprayed state;

ORG: solid phase which is ignitable in the sprayed state (ignitable inorganic or ignitable organic solids) including the solids which have an ignitable inorganic or ignitable organic coating.

Non-ignitable coating materials act like water in the liquid phase and in the sprayed state. If the rinsing and thinner liquids correspond to this category, too, no explosion protection is necessary. Coating materials of this group are classified as being non-ignitable liquid coating material.

A fire extinguishing equipment is not required for spraying systems processing coating materials which are classified to be non-ignitable. However, this does not affect the fire protection as a whole. Even these coating materials may resume ignitability after being partially dried. Moreover, water-based coating materials will burn when strongly exposed to a fire which had been initiated by other sources, and thus present a certain fire load.

Dimensions



ti40335a

Reference	U.S.	Metric
A	28.2 in.	71.6 cm
B	24.2 in.	61.5 cm
C1	64.8 in.	164.6 cm
C2	69.4 in.	176.3 cm
D1	21.5 in.	54.6 cm
D2	22.3 in.	56.6 cm
E	28.9 in.	73.4 cm
F	44.4 in.	112.8 cm


Reference	U.S.	Metric
G	26.9 in.	68.3 cm
H	30.9 in.	78.5 cm
J	48.9 in.	124.2 cm
K1	62.3 in.	158.2 cm
K2	55.4 in.	140.7 cm
L	17.3 in.	43.9 cm
M	39.8 in.	101.1 cm
N	33.0 in.	83.8 cm

Technical Specifications

HydroShield Automatic Air Spray Waterborne Isolation System		
	U.S.	Metric
Maximum Fluid Working Pressure	100 psi	0.7 MPa, 7.0 bar
Maximum Fluid Inlet Pressure	100 psi	0.7 MPa, 7.0 bar
Maximum Air Working Pressure	100 psi	0.7 MPa, 7.0 bar
Minimum System Inlet Air Pressure	70 psi	0.48 MPa, 4.8 bar
Maximum System Inlet Air Pressure	100 psi	0.7 MPa, 7.0 bar
Maximum Fluid Operating Temperature	120°F	48°C
Short Circuit Current Output	150 microamperes maximum	
Voltage Output	60 kilovolts maximum	
Sound Power (measured per ISO Standard 9614)	at 70 psi: 83.4 dB(A)	at 0.48 MPa, 4.8 bar: 83.4 dB(A)
Sound Pressure (measured 3.28 ft (1 m) from equipment)	at 70 psi: 73.5 dB(A)	at 0.48 MPa, 4.8 bar: 73.5 dB(A)
Isolation System Air Inlet Fitting	1/2 npt(m)	
Isolation System Fluid Inlet Fitting	1/4 npsm(m)	
Isolation System Fluid Outlet Fitting	3/8 in. O.D. tube for Graco waterborne fluid hose	
Wetted Parts	Gun: Stainless Steel, PEEK, UHMWPE, Fluoroelastomer, Acetal, Nylon, Polyethylene, Tungsten Wire Isolation System: Polyethylene, Stainless Steel, Acetal, Fluoroelastomer, PTFE, UHMWPE, Polyurethane	
Maximum Fluid Conductivity	2000 µS/cm	
Maximum Fluid Hose Length, Maximum Inside Diameter	250 ft., 1/4 in.	76.2 m, 6 mm
Weight	250 lb	113 kg
Ambient temperature range	41°F–122°F	5°C–50°C
System Air Consumption	Range of total air flow under normal spraying conditions: 1 - 3 scfm, 28.3 - 85 l/min	
Power Connection	Straight IEC 320–C13 male connector. Also included: North America NEMA 5-15 male plug China / Australia AS/NZS 3112 male plug Continental Europe CEE 7/7 male plug United Kingdom BS 1363 male plug	
External Power Requirements	100-240VAC, 50-60Hz, 2 amp maximum draw, 15 amp maximum circuit breaker recommended	

California Proposition 65

CALIFORNIA RESIDENTS

 **WARNING:** Cancer and reproductive harm — www.P65warnings.ca.gov.

Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS

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For the latest information about Graco products, visit www.graco.com.
For patent information, see www.graco.com/patents.

To place an order, contact your Graco Distributor or call to identify the nearest distributor.

Phone: 612-623-6921 **or Toll Free:** 1-800-328-0211 **Fax:** 612-378-3505

All written and visual data contained in this document reflects the latest product information available at the time of publication.
Graco reserves the right to make changes at any time without notice.

Original Instructions. This manual contains English. MM 3A8493

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