# **Instructions - Parts**



3A8492

# HydroShield<sup>™</sup> Automatic Air-Assisted Batch Waterborne Isolation Systems

Air-assisted 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 Inlet Working Pressure. 3,000 psi (20.7 MPa, 207 bar) Maximum Fluid Outlet Working Pressure.

See page 5 for model information.



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# **Related Manuals**

Manual in English	Description
333013	Pro Xp™ Auto Waterborne AA Spray Gun
309455	Test Fixture, High Voltage Probe, and kV Meter
312782	Air Actuated Dispense Valve
312794	Merkur® Pump Assembly
307273	Fluid Outlet Filter
312783	Color and Catalyst Change Valve Stacks
3A1244	Graco Control Architecture™ Module Programming

# **Isolation System Overview**

## How the Isolation System Works

When using a HydroShield Air-Assisted Batch Waterborne Isolation System, the fluid supply remains grounded. The fluid supply can be any low pressure pump or circulation system. The low pressure fluid supply first fills an internal low pressure pump reservoir, that then feeds into an isolated Merkur AA fluid pump to send high pressure fluid to the gun. After 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 pump automatically refills.

## Spraying Waterborne Fluids Electrostatically

This isolation system and electrostatic air-assisted 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 137.

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 above and in 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	Color change
WABH00	Isolation cabinet for automatic air assist spray.	
WABH02	Isolation cabinet for automatic air assist spray, equipped with color change inlet valves.	1
CE UK CA	<ul> <li>Condition for non-flammability:</li> <li>Models are compliant with CE-EN 50348 when used with fluids that mee</li> <li>Material is classified as non-ignitable as defined by EN 50059: 2018. For more information, see Ignitability of Coating Materials, page 137.</li> </ul>	et the following criteria:

\* 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 126.

# 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 or on warning labels, 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.

$\wedge$	FIRE AND EXPLOSION HAZARD	
	Combustible dust or flammable fumes, such as solvent and paint fumes, in <b>work area</b> can ignite or explode. To help prevent fire and explosion:	
	<ul> <li>Fluids used must meet the appropriate flammability requirements:</li> <li>Material does not sustain burning in accordance with the Standard Test Method for Sustained Burning of Liquid Mixtures, ASTM D4206.</li> <li>CE-EN 50348 Compliant:</li> </ul>	
	Material is classified as non-ignitable as defined by EN 50059: 2018.	
	<ul> <li>Electrostatic equipment must be used only by trained, qualified personnel who understand the requirements of this manual.</li> <li>Stop operation immediately if static sparking occurs or you feel a shock. Do not use</li> </ul>	
	equipment until you identify and correct the problem.	
	<ul> <li>Use and clean equipment only in well ventilated area.</li> </ul>	
Ð	<ul> <li>Interlock the gun air supply to prevent operation unless ventilation air flow is above the minimum required value.</li> </ul>	
	<ul> <li>Only use non-flammable solvents when flushing or cleaning equipment.</li> </ul>	
	<ul> <li>Do not use pail liners unless they are conductive and grounded.</li> </ul>	
	<ul> <li>Always turn the electrostatics off when flushing, cleaning or servicing equipment.</li> </ul>	
	<ul> <li>Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).</li> </ul>	
	• Do not plug or unplug power cords or turn lights on or off when flammable fumes are present.	
	<ul> <li>Keep work area free of debris, including solvent, rags and gasoline.</li> </ul>	
	<ul> <li>Keep a working fire extinguisher in the work area.</li> </ul>	

•	ELECTRIC SHOCK HAZARD
4	This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock:
	<ul> <li>Turn off and disconnect power cord before servicing equipment.</li> <li>Connect only to grounded electrical outlets.</li> <li>Use only 3-wire extension cords.</li> <li>Ensure ground prongs are intact on power and extension cords.</li> <li>Do not expose to rain. Store indoors.</li> <li>Ground all equipment, personnel, object being sprayed, and conductive objects in or close to spray area. See Grounding instructions.</li> <li>All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> <li>Follow the Fluid Voltage Discharge and Grounding 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.</li> <li>Do not touch the gun pozzle or electrode, or come within 4 in (102 mm) of the electrode.</li> </ul>
	<ul> <li>be not toder the gan hozzle of cloud out, of come within 4 m. (roz min) of the cloud out out out out out out out out out out</li></ul>
<b>^</b>	MOVING PARTS HAZARD
	Moving parts can pinch, cut or amputate fingers and other body parts.
	Keep clear of moving parts.
MPa/bar/PSI	<ul> <li>Do not operate equipment with protective guards or covers removed.</li> <li>Equipment can start without warning. Before checking, moving, or servicing equipment, follow the <b>Pressure Relief Procedure</b> and disconnect all power sources.</li> </ul>
$\wedge$	SKIN INJECTION HAZARD
	High-pressure fluid from gun, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. <b>Get immediate surgical treatment.</b>
	<ul> <li>Do not point dispensing device at anyone or at any part of the body.</li> <li>Do not put your hand over the fluid outlet.</li> <li>Do not stop or deflect leaks with your hand, body, glove, or rag.</li> <li>Follow the <b>Pressure Relief Procedure</b> when you stop dispensing and before cleaning, checking, or servicing equipment.</li> <li>Tighten all fluid connections before operating the equipment.</li> <li>Check hoses and couplings daily. Replace worn or damaged parts immediately.</li> </ul>

	EQUIPMENT MISUSE HAZARD
	Misuse can cause death or serious injury.
Li MPa/bar/PS	<ul> <li>Do not operate the unit when fatigued or under the influence of drugs or alcohol.</li> <li>Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Specifications in all equipment manuals.</li> <li>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 a Safety Data Sheets (SDSs) from your distributor or retailer.</li> <li>Do not leave the work area while equipment is energized or under pressure.</li> <li>Turn off all equipment and follow the Pressure Relief Procedure when equipment is not in use.</li> <li>Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.</li> <li>Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.</li> <li>Make sure all equipment is intended purpose. Call your distributor for information.</li> <li>Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.</li> <li>Do not kink or over bend hoses or use hoses to pull equipment.</li> <li>Keep children and animals away from work area.</li> <li>Comply with all applicable safety regulations.</li> </ul>
	PLASTIC PARTS CLEANING SOLVENT HAZARD
	Many solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.
	<ul> <li>Use only compatible water-based solvents to clean plastic structural or pressure-containing parts.</li> </ul>
	• See <b>Technical Specifications</b> in all equipment manuals for materials of construction. Consult the solvent manufacturer for information and recommendations about compatibility.
	TOXIC FLUID OR FUMES
	Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.
	<ul> <li>Read Safety Data Sheets (SDSs) to know the specific hazards of the fluids you are using.</li> <li>Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.</li> </ul>
	PERSONAL PROTECTIVE EQUIPMENT
	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:
	<ul> <li>Protective eyewear and hearing protection.</li> <li>Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.</li> </ul>

# **Component Identification**



ti40466a

Figure 1 Components of the automatic Automatic Air-Assisted Isolation System

Key
-----

ltem	Description
А	Air Inlet
С	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	Merkur AA Fluid Pump
М	Electronics Panel
Ν	Ground Rod and Bleed Resistor
Р	Power Supply
R	Hand-held Grounded Rod
VS	Color Change Valve Stack (on color change enabled systems)
W	Wash Fluid Bottle
Z	Fluid Filter (100 mesh)

# **Typical Installation**



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

Кеу	
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 Wire
HW	Graco Waterborne Fluid Hose
LT	Light Tower
PC	Power Cord

† Required, not supplied.

Optional, not supplied.

# **Optional Multiple Gun Installation**



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.

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

### Optional Multiple Gun Installation

## Figure 3 Key

ltem	Description
HW	Graco Waterborne Fluid Hose
L	Fluid Pressure Regulator
ME	Electrostatic Applicator
MI	Isolated Region
MM	Fluid Manifold

# Installation

# System Requirements



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. See Optional Multiple Gun Installation, page 11.

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



Installing and servicing this equipment requires access to parts which may cause electric shock or other serious injury if work is not performed properly.

- 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 air-assisted waterborne automatic batch system. It is not an actual system design.

# Ventilate the Spray Booth



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.

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



non-hazardous location in a hazardous location.

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.



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 140 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.





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.

 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 126.

2. Connect the .4m CAN extension cable to the light tower CAN cable (114).

NOTE: Use extension cable 121226.

 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 22. Longer cables are available.

# Grounding



The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Ground all equipment, personnel, objects being sprayed, and conductive objects in or close to the spray area. The resistance must not exceed 1 megohm. Grounding provides an escape wire for the electric current.

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 77.



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 directly connected to the fluid supply inside the system.
- *Object being sprayed:* Keep the workpiece hangers clean and grounded at all times.



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



- 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**



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 make sure the hose connections are electrically isolated and properly discharged before any maintenance is performed.

If using multiple guns or a remote mounted fluid regulator then 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 .
- 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. 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. Slide the electrostatic shield (82) up to remove, and then slide the electrostatic shield (12) to the left to remove.
- 4. Loosen the strain relief nut at the hose inlet end (101c).
- 5. Slide the other end of the hose through the hole in the side of the isolated enclosure (CA). Connect the swivel (101h) to the fluid outlet of the pump.
- 6. Secure the hose to the side of the enclosure with the bracket (101j). A bolt (S) assembles through the hole in the bracket and screws into the side of the enclosure. Set screw (101m) can be loosened to rotate the bracket if needed.

7. Tighten the strain relief nut (101c) and set screw (101m).







Figure 9 Hose Connection at Enclosure

### **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 10 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 (.48 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 106.
- 2. Run two wires through the I/O port strain relief on the right side of the system.



Figure 11 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.



LPO: Low Paint Output

EI: Electrostatic Input

DSI: Digital Stop Input Figure 12 Terminal Block Wiring

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

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 \_\_\_\_\_o14 device that normally turns on the gun's electrostatics. 24VDC \_\_\_\_\_o13+ \_\_\_\_o13+

## **Pneumatic Output**

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- Connect a 5/32" air line to the electrostatic enable output (EEO) port on the right side of the cabinet. See Connect the Paint Trigger Input, page 19 figure.
- 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**

- Prepare the electrical controls for service. Follow the steps in Prepare the Electrical Controls for Service, page 106.
- 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.
- 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 (82) 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 13 Replacing Wash Fluid Reservoir

- 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 (82) 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 14 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. 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 right fitting on the right side of the cabinet below the light tower.



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Figure 15 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 16 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 Components, page 129 and Color Change: Pneumatic and Wiring Connections, page 114.
- 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 126.





# **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 power cord with a 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.





## 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 106.
- Install two bulkheads in the system. The location is represented by A12 in Pneumatic Connections, page 110. 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.
- 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 19 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
СОМ	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 106.

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
A2-	or PLC

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

- 1. Prepare the electrical controls for service. Follow the steps in Prepare the Electrical Controls for Service, page 106.
- 2. 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 106.

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



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 and air hose.
- 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.

 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 20 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. 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 spraying.

### 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.

# Fluid Voltage Discharge and Grounding Procedure



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:** 

- 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.
- 2. Disable the electrostatic request signal to turn off electrostatics.
- 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 the grounded rod (R).

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

- 4. Press the Stop button 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 Merkur AA fluid pump (L), and the isolation valve (G) before touching any of the system components with your hands.

## **Pressure Relief Procedure**



Follow the Pressure Relief Procedure whenever you see this symbol.



- 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.
- 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 fluid pump in the isolation system

- 6. Relieve fluid pressure in the fluid supply unit as instructed in your fluid supply unit manual.
- 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.



To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure. To avoid serious injury from pressurized fluid, such as skin injection, do not put your hand in front of the spray tip when installing or removing the spray tip and tip guard.

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. Follow the Pressure Relief Procedure, page 30.
- 4. Shut off the paint supply to the unit.
- Use the control interface to change the fluid pressure to the lowest possible value to avoid splashing.
- 6. Remove the air cap and spray tip. See the spray gun manual.
- 7. Use the control interface to put the system into Standby. Then change the mode to Purge mode:



- Trigger the gun into a grounded metal pail until paint stops flowing. Use the lowest possible pressure to avoid splashing.
- 9. Supply compatible cleaning fluid to the system.
- 10. Deactivate the Do Not Fill button:



11. 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.

- 12. Activate the Do Not Fill button so that the isolation fluid pump will not refill after it is empty. See Home Screen, page 45.
- 13. Trigger the gun until the system indicates that the isolation fluid pump is empty.
- 14. Follow the Pressure Relief Procedure, page 30.

# Flush the System (Color Change Enabled Systems)



To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure. To avoid serious injury from pressurized fluid, such as skin injection, do not put your hand in front of the spray tip when removing the spray tip and air cap.

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. Follow the Pressure Relief Procedure, page 30.
- 4. Remove the air cap and spray tip. See the spray gun manual.
- 5. Use the control interface to put the system into Standby. Then change the mode to Purge mode:



- 6. Continue to flush the system by using either:
  - · A purge profile
  - · A manual purge

#### Note

When flushing without a spray tip installed, use the lowest possible fluid pressure to avoid splashing.

#### 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 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.

- 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 <u>U</u>. The isolation fluid pump automatically fills. See Home Screen, page 45.

## Spray with the Isolation System



- 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 35.
- 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 and 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 뵏

- 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

Preset 0 allows operators to change the gun fluid pressure 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 **t** to navigate to the Fluid field.
- 4. Press the numbers on the keypad to the desired psi value.
- 5. Press the Enter button **t** 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 it 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.
- 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 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
C	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
1 2 3 4 5 6 7 8 9 0 .	Use to input values.
	Cancel
Ø	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
ł	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.

01/21/20 19:04	l/20 19:04 🗲 🛛 N		Advanced	System	
Off	$\square$	No Active	Errors		

**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		
$ \subset $	Advisory	Informational		
Ţ.	Deviation	Important, no system shutdown		
4	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.

Use the up and down arrows 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 66.)
- 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 22.

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 DISPTEXT.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 DISPTEXT.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 22.
- 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.
- The USB flash drive window automatically opens. If it does not, open USB flash drive from within Windows<sup>®</sup> 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.
- Open the LOG FILES folder labeled with the highest number. The highest number indicates the most recent data download.
- Open the log file. Log files open in Microsoft<sup>®</sup> Excel<sup>®</sup> 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.

- 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 DISPTEXT.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 **b**icon. Follow the on-screen prompts on the Software Update Start screen.



Figure 21 Software Update Start Screen

Consider whether to disable the upload/download options:



Pressing the soft key next to the with 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 **to** icol 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 22 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.



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

drive:

- 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.



Figure 24 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.

07/02/20 09:56	÷	Maint.	Advanced	System	
Off	5	EQUD: US	B Idle		
	_				



Figure 25 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 26 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 27 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
	Standby
$\mathbf{L}$	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.
	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.
	Prime
$\mathcal{T}^{\star}$	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.

Soft Key	Function
	Purge
$\mathbf{D}_{\mathbf{n}}$	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.
	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:
	<ul> <li>Preset 0 presents buttons for the operator to perform a manual purge.</li> </ul>
	<ul> <li>Purge profiles present a play button for the purge profile to automatically perform a pre-configured purge sequence.</li> </ul>
	See Home Screen in Purge Mode, page 49.
	Spray
$\mathcal{T}$	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.
	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.
	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.
	To enter Spray mode, you must first be in either Prime or Standby mode. You cannot enter Spray mode directly from Purge mode.
	In Spray mode, the menu bar displays the following:
	<ul> <li>Fill when the pump is filling.</li> </ul>
	<ul> <li>Ready when the pump is full and the system is waiting for a gun trigger.</li> </ul>
	<ul> <li>Dispense when the gun is triggered for spraying and/or the ES request input is active.</li> </ul>



### 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
Z	Press to exit a screen after editing.

Key or Field	Description
	Do Not Fill
	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.
	Do Not Fill mode is useful in the following situations:
	While in Spray mode:
	• The operator is getting close to the end of the shift and doesn't want paint to sit in the pump.
	<ul> <li>The remaining number of parts to spray won't require another full pump of paint.</li> </ul>
	The paint color will be changing soon.
	While in Purge mode (without color change enabled):
	<ul> <li>The operator is done spraying and is dispensing the last of the paint in the pump through the gun.</li> <li>Once the pump is empty, the operator can easily switch the fluid supply hose to cleaning fluid.</li> </ul>
	Inlet air
Inlet Air	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).
	Red indicates the system cannot run because the required air pressure is not detected.
_	Ground rod
	A ground rod icon indicates that the ground rod (N) is down and the system is discharging.
	A charge icon 7 indicates that the ground rod is up and the system is capable of holding a charge.
	Volt Level
OkV	Displays the system voltage level.
	Fluid Level
	Displays the fluid level of the isolation fluid pump.
	• 0% 🗆 (Empty)
	• 50% 🗖
	• 100% 🗖 (Full)
ΠΞ	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:
	<ul> <li>Aqua/cyan color = Unknown fluid; usually flush fluid.</li> </ul>
	<ul> <li>Dark blue = Paint; the paint number appears to the left of the icon.</li> </ul>
	Gray = Air; used when flushing the system.
	Spray Preset
» <b>7</b> ē	Enter a spray preset number to set the gun fluid pressure. The spray gun symbol indicates that the number is a spray preset number:
	To configure Preset 1 through 99, see Adjust the Gun Fluid Settings, page 35.
	Preset 0 allows the operator to change the settings at any time during operation.

Key or Field	Description
	Purge Profile
r 🕮 🗖	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:
	To configure a purge sequence, see Purge Screens 1–5, page 53.
	Gun Fluid Pressure
© Fluid: <u>40</u> psi ⊙ 35 psi	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.
	Valve Indicators
⊙Inlet	A green circle indicates which valve is active when the system is in use. A gray circle indicates
0Air 0Flush 0Dump 0Color	the valve is off.

### 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
<b>P</b>	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.
Ĵ	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.
<b>≦</b> TF	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.
E IA	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 81.

06/23/21	. 20:00			Status	Events	Home	•
Standby			No	Active E	rrors		
	<u> </u>	_	<u>}</u>				Î
06/23/21	19:58	N611	A	Shuttle	Timeout Bot	ttom	
06/23/21	19:55	EQUC	)-V	USB Idle			3
06/23/21	19:55	EQU1	L-R	Sys. Sett	ings Downlo	aded	
06/23/21	19:55	EQU3	3-R	Custom	Lang, Downl	oaded	
06/23/21	19:55	EQU5	5-R	Logs Do	wnloaded		1
06/23/21	19:54	EAU)	(-V	USB Bus	У		
06/23/21	19:54	ELOO	I-R	System F	ower On		
06/23/21	19:54	EMOC	)-R	System F	ower Off		2
06/23/21	19:50	N611	A	Shuttle	Timeout Boi	ttom	
06/23/21	19:43	EQUC	)-V	USB Idle			Ŧ
				1			

# **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		ome	- 0	Status	Events	⇒		
Standby			No <i>i</i>	Active B	irro	ors		
		Inp	uts			So	olenoids	
	⊖ Systen	n St	i Stop: Air		$\geq$	🔀 Shuttle Down		
	🖣 🗢 System Stop: 🛛 Digital					Shuttle	eUp	
	OInlet Air					Shuttle Eject		
	● Shuttle Top					Shuttle Fluid In		
	O Shuttl	e Bi	ottor	m		Pump	Fluid In	
	🖲 Gun F	lush	ı Box	(		Pump	Pressure	
	● Fluid Trigger				Groun	d Rod		
					Gun Fl	ush Box		
					$\geq$	System	n 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 24.
- 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	$\mathbf{\mathbf{f}}$	Home	Sta	itus	Ev	ents 👘	Ð
Standby	N	o Active B	Errors				
	Sole	noid Valv	/e/ Fu	nction			î
1/	Air			14 / Co	olor	7	
10 /	Flush			67C	olor	8	
21	Dump			15 / Ce	olor	9	2
11 /	Color	1		77C	olor	10	
3/	Color	2		16 / Co	olor	11	
12 /	Color	3		87C	olor	12	
4/	Color	4		17 / Co	olor	13	1
13 /	Color	5		97C	olor	14	
5/	Color	6		18 / Co	olor	15	
							÷

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 I	Errors			
	Inputs ©ES Request ©Paint Trigger			Ou DEC Enc	Outputs		
¥				Low Pa	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 35.

08/21/20	09:50	•	Pumps	Presets	Purge	Calibrate	•	
Standby			No Acti	ve Errors				
			Preset	: 1			ſ	
				Cus	stom Fill	:	97	
					Max Fill	: [1150] cc		
	Fluid: 500 psi Star					: Fill: 0500 cc		
	Color	:[]	L	G	Green On: <u>0575</u> c			
	Purge	:0			Red On	: <mark>0115</mark> cc	2	
							4	
							Ŧ	

**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.

08/21/20 09:52	Presets	Purge Calibrate Maint.				
Standby	No Active	e Errors				
ĸ	Purge:	1	t			
Timeout	: 0 sec	 Chop: 🗙	4			
Fluid: 500 psi Air Chop: 2.0 se						
Dump Enable	: 🗌	Flush Chop: 2.0 sec	1			
Air Push	: O sec	Total Chop: 10.0 sec				
Flush Push	: O sec	Final Push: 🛛 Flush 💌	2			
Refill Cycles	:1	Final Push: 0 sec	3			
			Ŧ			

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.
		Air Chop: The number of seconds for the air interval.
		Flush Chop: The number of seconds for the fluid interval.
		• <b>Total Chop:</b> 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:
		• <b>None</b> : 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.



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.



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	t	Maint.	Advanced	System	₽		
Standby		No Active	Errors				
					î		
					2		
Enable USB Downloads/Uploads: 🔀							
Log 90% Full Advisory Enabled: 🔀							
					Ŧ		

**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 81.

# 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.



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 Acti	ve Errors				
Software Part #: 17Z579 Software Version: 1.09.001						
Module	2	Software Part #	Software Version			
Advanced Display		17Z583	1.09.001			
USB Configuration	n	17Z609	1.09.001			
Fluid Plate 1		17Z581	1.09.001			

	•

- A green check mark v 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	1 20:07		Maint.	Advanced	System	
Standby			No Active	Errors		
Software Part #: 172579 Software Version: 1.09.001						
	Module			Software		
	MUQQU	2		Version		
Advanced	Display	-		Version 1.09.001	00173742	
Advanced USB Cont	d Display figuratio	n		Version 1.09.001 1.09.001	00173742	



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.

- 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 trigger 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. At this point, the Merkur AA fluid pump will keep cycling until the Set Empty button is pushed. Press the Set Empty button. The stored mV value also displays next to the button. The system returns to Standby mode.

#### NOTICE

Press the Set Empty button as soon as fluid stops flowing out of the gun to prevent the Merkur AA fluid pump from running while empty.

## 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.

06/23/21 20:03	÷	Purge	Calibrate	Maint.	Þ	
Standby		No Active	Errors			
		100	0 m) (		<ul><li>↑</li></ul>	
ruia:	1000 mV					
					3	
					Ŧ	

**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 107.
- 2. 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.

03/13/20-16	SO1 •	•	Presets	Calibrate	Maint.	₽
Standby			No Active B	rrors		
		Bl	eed Resistor	::[10000] Moh	m	2
						1
						÷

**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

- 1. With the bleed resistor (24) removed from the system, measure the resistance across the bleed resistor. See Check the Bleed Resistor, page 70.
- 2. Use the keypad to enter the measured value. Only values between 9,000 and 11,000 Mohm are allowable.
- 3. 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).
- 5. 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.
- 6. 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.

08/21/20	09:53	←	Calibrate	Maint.		Advanced		€
Standby			No Active I	Errors				
			Maintena	nce Due			1	ì
								13
		ISO	lation valv	°		cycles	1	4
	Isola	tior	n Valve Sea	l	0	cycles	1	15
	Wash Fluid 0 cycles							1
	Volume 0 cc							2
	Pump 0 cycles							2
Pump 0 days							ŀ	-
		Sol	enoid Valv		 	cycles	Ŀ	4
		500	enolu valv	=	0	cycles	R	÷

**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.

#### Note

The fluid pressure down stream of the Merkur AA fluid pump 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.

 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 fluid pressure set to 0. This will prevent high pressure from going to the gun and help determine if the leak is within the system or not.

# 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.



**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 📢	<ul> <li>Calibra</li> </ul>	ate 🚺	/laint.	Advanced	•			
Standby	andby No Active Errors								
	F	iluid Valve	Resets	and Te	st	<ul> <li>↑</li> <li>1</li> <li>0</li> </ul>			
12345 00000	Shuttle	: Fluid In	3	cycles		3			
12345 00000	Pump	Fluid In	3	cycles		5			
12345 00000	Pump	Pressure	0	cycles		7			

**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 WABH00.)

**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	÷	Calibra	te	Maint.	Advanced	Ð
Standby			No Activ	/e Erro	ors		
		Mis	sc Valve I	Resets	and Te	st	<ul><li>↑</li><li>2</li></ul>
12345 00000	Gr	oun	id Rod	0	cycles		3 4 5
12345 00000	Gun	Flu	sh Box	0	cycles		6
							8

**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.



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.

09/14/20	11:08	÷	Calibrate		Maint.	Advanced	➡		
Standby No Active Errors									
Isolation Valve Maintenance									
							5		
12345 00000	Isolation Valve 132 cycles								
12345 00000	Isolation Valve Seal 211 cycles						7 8		
12345	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.

09/14/20 1	.1:08 🗲	Calibrate	Maint.	Advanced			
Standby		No Active	Errors				
Pump Maintenance							
					6		
12345 00000		Pump	1 cycl	es	7		
12345	Total	Volume	1150 cc		9		
					10		
	Pump S	Stall Test	3 day	s	11		
					Ŧ		

**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.

06/23/21 20:05 Standby	<ul> <li>Calibrate</li> <li>No Active Er</li> </ul>	Maint. Trors	Adv	vanced	<b> </b> →
	V/P				↑
			Fluid		7 8 9 10 11 12 ↓

**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.

08/21/20	09:55	÷	Calibrate	Maint.	Ad	vanced	•
Standby			No Active Er	rrors			
	Coli	or C	ihange Valve	ıs Reset ar	nd Te	≥st	<ul> <li>↑</li> <li>7</li> <li>0</li> </ul>
12345 00000		1/	Air	О сус	les		9
12345 00000	1	LO /	Flush	О сус	les		11 12
12345 00000		27	Dump	О сус	les		13

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.

08/21/20 09:55		Calibrate	Maint.	Ad	vanced	₽
Standby	1	No Active Er	rrors			
	or Ch	ange Valve	k Reket ar	nd Te	oct	ſ
	01 01		s neset a			8
						9
12345	11/0	Color 1	О сус	les		10
						11
12345	370	Color 2	CYC	les		12
00000						13
12345	1270	Color 3	CVC	les		14
00000			-			Ŧ

**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.



**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 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 Er	rrors		
Colo	or Cł	hange Valve	s Reset ar	nd Test	<b>1</b> 0
					11
					12
1	.470	Color 7	CYC	les	12
					13
	670	Color 8	CYC	les	14
					15
1	570	Color 9	CYC	les	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 14: Color Change Valves Reset and Test

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



**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 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	Ð	Calibrate	Maint.	Advanced	
Standby			No Active Er	rrors		
	Cole	or C	banga Valva	r Parat ar	od Tort	Î
	COU	51 0	a lai ige valve	s Reset al	iu rest	12
						13
	1	77	Color 13	cyc	les	14
						15
		97	Color 14	CYC	les	1
						2
	1	.87	Color 15	cyc	les	3
						ł

**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



**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 29before 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 68.

#### 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 68.	~	
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 69.	~	
Clean the gun. See your gun manual.	~	
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 70.		
For maintenance of the Merkur AA fluid pump, reference manual 312794. See Related Manuals, page 3.		

# 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 the system's voltage to lower below normal operating voltage. Low system voltage can cause arcing that damages system components. Clean and dry leaks.

- Prepare the isolation system for service. Follow the steps in Prepare the Isolation System for Service, page 90.
- 2. Use a flat blade screwdriver to open the isolation cabinet door.
- 3. Slide the electrostatic shield (82) up to remove.
- 4. Slide the electrostatic shield (12) to the left to remove.
- 5. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
- 6. Inspect the following locations in the isolation cabinet:
  - Connection to the fluid outlet hose (E) and the hose connection to the fluid filter (131) inside the AA system.
  - 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) and the inlet at the bottom of the Merkur AA fluid pump (L).
- 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.



Figure 28 Inspect for Fluid Leaks



Figure 29 Wipe Off Isolation Valve Components

- Inspect the fluid hose (HW). Check for any leakage or bulges in the outer cover which may indicate an internal leak.
- 8. 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 90.
- 2. Use a flat blade screwdriver to open the cabinet.
- 3. Slide the electrostatic shield (82) up to remove.
- 4. Slide the electrostatic shield (12) to the left to remove.
- 5. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
- 6. Disconnect the push-to-connect tube from the bottle cap of the wash fluid bottle (W).
- 7. 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.



- 8. Reconnect the push-to-connect tube to the bottle cap of the wash fluid bottle (W).
- 9. Replace the isolation valve cover (99) and tighten the top and bottom screws (99a).
- 10. Verify that the electrostatic shields (12 and 82) are in place, and then close and latch the cabinet door.

# 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.
- 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 (82) up to remove.
- 5. Slide the electrostatic shield (12) to the left to remove.
- 6. 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.
- 7. Reinstall electrostatic shields (12 and 82) inside the cabinet.
- 8. Close the enclosure doors and reapply pressure to the system.
- 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 90.
- 2. Use a flat blade screwdriver to open the isolation cabinet door.
- 3. Slide the electrostatic shield (82) up to remove.
- 4. Slide the electrostatic shield (12) to the left to remove.
- 5. 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.
- 6. Attach the positive lead of the megohmeter to the wire and touch the negative lead to the threaded stud at the bottom end of the bleed resistor (24).
- 7. 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.
- 8. Reattach the wire in the terminal screw.
- 9. Reinstall electrostatic shields (12 and 82) inside the cabinet.
- 10. 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



- 1. Follow the Pressure Relief Procedure, page 30 before checking or repairing the system.
- 2. Check all possible problems and causes before disassembling the system.

# **General Troubleshooting**

Problem	Diagnosis	Solution					
Prime							
The system does not prime.	Incorrect mode.	1. Change to Prime mode.					
		2. Trigger the gun.					
		<ol> <li>Turn on the fluid supply and check the incoming fluid pressure.</li> </ol>					
	Inlet valve is off or stuck.	Test the inlet valve using Main- tenance screen 5 as described in Maintenance 5: Misc Valve Resets and Test, page 61.					
		Service the solenoid valve or fluid valve. See Replace a Solenoid Valve, page 106.					
	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 68 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 66.	
	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 Main- tenance 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 106.	
	The isolation valve is blocked.	See Service the Isolation Valve, page 91.	
	The check valve is blocked.	See Service the Isolation Valve, page 91.	
System is slow to fill.	The Fill Start Delay setting is long.	Change the Fill Start Delay value as described in System Screen, page 66.	
	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> <li>The system is not in Spray mode.</li> <li>The isolation fluid pump is empty and there is no material to spray.</li> <li>The fluid pressure is too low or zero.</li> <li>The paint trigger signal is not being recognized.</li> </ol>	<ol> <li>Change to Spray mode.</li> <li>Give the system time to fill before trying to paint.</li> <li>Increase the gun fluid pressure on the Home screen or Preset screen.</li> <li>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.</li> <li>Note</li> <li>Check the Status screen to see if the system detects the gun trigger. See Status Screen 1, page 50.</li> </ol>	
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 high pressure pump (75).	<ul> <li>Set the gun fluid pressure on the Home screen or Preset screen.</li> <li>Check the electro/pneumatic regulator (V2P) (415) function using Maintenance screen 9. See Maintenance 9: V/P, page 63.</li> </ul>	
Poor wrap.	Low spraying voltage.	Increase the air pressure or the voltage setting for the gun.	
	Issue with spray gun setup or maintenance.	Refer to your gun manual.	
Low or no spraying voltage.	<ul> <li>The ground rod (18) is not raising.</li> <li>The isolation valve (227) is not raising.</li> <li>The components or cabinet (9) is dirty.</li> <li>The electrostatic shields (12 and 82) are not in place.</li> </ul>	See Voltage Loss Troubleshooting, page 76.	
	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	

Problem	Diagnosis	Solution			
	Incorrect voltage level display	Check system voltage using a probe (236003).			
		Calibrate the bleed resistor as described in Calibrate the Bleed Resistor, page 58.			
		Check or replace the kV board as described in Replace a kV Board, page 106.			
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 66.			
	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	Air pocket in the fluid line leaves fluid isolated near the gun.	Determine cause and correct. Purge air from the fluid line.			
Grounding Procedure, page 29.	Issue with the door switch.	Check the door switch as described in Check the Door Switch, page 70.			
Paint goes backward toward the paint supply.	Faulty inlet valve and check valve.	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.			
		See Maintenance 4: Fluid Valve Resets and Test, page 61.			
		Check for a leaky check valve.			
Other issues					
Paint build-up on the isolation valve stem.	<ol> <li>Dirty wash fluid can no longer clean properly.</li> </ol>	1. Follow the steps in Replace the Wash Fluid, page 69.			
	2. The U-cup seals are not wiping the isolation valve stem clean.	2. Replace wash fluid U-cups as seen in repair section.			
	<ol> <li>The isolation valve stem (222) o-ring is not sealing fully.</li> </ol>	<ol> <li>Replace the isolation valve stem o-ring as described in Replace the Isolation Valve Stem O-rings, page 96.</li> </ol>			

# LED Diagnostic Information

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.

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

# 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 68.
- Check for connections between high voltage components and grounded components within the isolation system. The figure in <u>Troubleshooting HydroShield Voltage</u>, page 77 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 shields (12 and 82) are in place, and then close and latch the cabinet door.
- Put the system in Spray mode. Enable the electrostatics by activating the ES request input. 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.

- 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 70.
- 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



# 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.	Check the applicable solenoid's LED; see Color Change Board, page 79. If lit, proceed with the following checks. If not lit, go to Cause 4.		
	Remove the connector for the applicable solenoid and measure voltage across the pins on the board:		
	<ul> <li>In a non-hazardous location, replace the solenoid if voltage is 24 Vdc.</li> </ul>		
	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:		
	<ul> <li>Air pressure to the valve actuators is too low. See Cause 1.</li> </ul>		
	• Solenoid is clogged. Make sure the air supply has a 5 micron filter installed.		
	<ul> <li>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.</li> </ul>		
4. Control board or cable failure.	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.		
	If D9 is not lit:		
	<ul> <li>Verify the condition of the fuse (F1) and replace if necessary. See Replace the Color Change Board Fuse, page 108.</li> </ul>		
	<ul> <li>Check if the cable is disconnected or damaged.</li> </ul>		
	If D8 is not blinking:		
	Cycle the system power.		
	<ul> <li>Check if the cable is disconnected or damaged.</li> </ul>		
	If D10 is not occasionally blinking:		
	<ul> <li>Check if the cable is disconnected or damaged.</li> </ul>		

# 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, remove all system power before plugging any connectors.



Figure 30 Color Change Board

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.

# Table 5 Color Change Board Diagnostics

# **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



Code	Туре	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.
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		USB Upload Error	User installed an	
WXUD	Advisory	USB Download Error	device in the Control Interface USB port.	USB device.
WX00	Alarm	Software Error	An unexpected software error has occurred.	Call Graco technical support.

#### Table 6 Control Interface Errors

### Table 7 Communications Errors

Code	Туре	Name	Description	Solution
				<ul> <li>Verify the CAN connection on the system. See Connect the CAN Cables, page 22.</li> </ul>
	Alarm	Communication Error	The control interface has lost	<ul> <li>Verify the CAN connection on the FCM cube (412).</li> </ul>
UAD I	Латт	Fluid Panel	the fluid panel or FCM	• The FCM has an incorrect CAN ID.
			cube.	<ul> <li>Check the status LEDs on the FCM cube (412).</li> </ul>
				Cycle power off and on.
				<ul> <li>Verify the CAN connection on the system. See Connect the CAN Cables, page 22.</li> </ul>
		Communication Error Solenoid Controller	The control interface has lost communication with the solenoid controller.	<ul> <li>Verify the CAN connection on the solenoid controller board.</li> </ul>
CAC1	Alarm			<ul> <li>The solenoid controller board has an incorrect CAN ID.</li> </ul>
				<ul> <li>Check the status LEDs on the solenoid controller board.</li> </ul>
				Cycle the power off and on.
			The system detects multiple fluid panels set to the same identifier.	<ul> <li>The fluid panel FCM has the same CAN ID as another module.</li> </ul>
CDD0	CDD0 Alarm Duplicate Fluid Panel	Duplicate Fluid Panel		<ul> <li>Adjust the selector switch on the control module. See Adjusting Selector Switch in manual 3A3954.</li> </ul>
CDC0	Alorm	Duplicate Solenoid	The system detects multiple solenoid controllers set to the same identifier.	<ul> <li>The solenoid controller has the same CAN ID as another module.</li> </ul>
CDC0	Alam	Controller		<ul> <li>Adjust the selector switches on the solenoid controller board.</li> </ul>
CAO1	Alarm		The system has lost communication with the control interface.	<ul> <li>Verify the CAN connection on the bottom of the control interface.</li> </ul>
		O1 Alarm Communication Error Logic Controller		Check the status LEDs on the con- trol interface. See LED Diagnostic Information, page 75.

Code	Туре	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> <li>Verify CAN connection on the system.</li> </ul>
				<ul> <li>Verify CAN connection on the solenoid controller board.</li> </ul>
	Alarm			<ul> <li>Check status LEDs on solenoid controller board.</li> </ul>
				Cycle the power.
				<ul> <li>Adjust the selector switches on the solenoid controller board.</li> </ul>
CDC1	Alarm	Duplicate Solenoid Controller	The system detects multiple solenoid controllers set to the same identifier.	The solenoid controller has the same CAN ID as another module.
				<ul> <li>Adjust the selector switches on the solenoid controller board.</li> </ul>

### Table 8 HydroShield Errors

Code	Туре	Name	Description	Solution
		Descurrentia Constant	The system has been	<ul> <li>Verify the wiring of the pneumatic system stop pressure switch.</li> </ul>
SILO	Alarm	Stop Activated	stopped using the pneumatic system stop input.	<ul> <li>Verify the integrated system installation intended to stop the HydroShield system.</li> </ul>
		Digital System Stop	The system has been	<ul> <li>Verify the wiring of the pneumatic system stop optocoupler.</li> </ul>
SIL1	Alarm Digital System Stop stopped using the digital system stop input.	<ul> <li>Verify the integrated system installation intended to stop the HydroShield system.</li> </ul>		
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	<ul> <li>Verify that the linear sensor is connected.</li> <li>Calibrate the linear sensor</li> </ul>
				Verify that the air V2P is
P611	Alarm	Alarm Gun Air V2P Feedback Error	System cannot detect feedback from air V2P.	connected.
				• Verify that the air V2P has power.
P613 Ala	Alexes	Fluid V2P Feedback	System cannot detect	<ul> <li>Verify that the fluid V2P is connected.</li> </ul>
	Alarm Error		V2P.	<ul> <li>Verify that the fluid V2P has power.</li> </ul>

Code	Туре	Name	Description	Solution
N611		Isolation Valve Timeout	Isolation valve was not detected in the expected position.	<ul> <li>Verify that the isola- tion valve moves using Maintenance 3: Shuttle Valve Resets and Test, page 60.</li> </ul>
	Alarm			<ul> <li>Verify that the top sensor is detected using Status screen, page 50.</li> </ul>
				<ul> <li>Verify that the bottom sensor is detected using Status screen, page 50.</li> </ul>
				<ul> <li>Verify that the sensors are connected.</li> </ul>
		Shuttle Top Timeout	Isolation valve was not detected in the expected position.	<ul> <li>Verify that the isolation valve moves using the Maintenance screen.</li> </ul>
N612	Alarm			<ul> <li>Verify that the top sensor is detected using the Status screen.</li> </ul>
				<ul> <li>Verify that the bottom sensor is detected using the Status screen.</li> </ul>
				<ul> <li>Verify that the sensors are connected.</li> </ul>
				<ul> <li>Determine if there is an air leak in the system.</li> </ul>
F7P0	Alarm	Invalid Air Flow	detected when it	Check the air flow switch.
			should be off.	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	Туре	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	Check V2P connections.
			for the Air V/P	<ul> <li>Verify V2P operation</li> </ul>
				Contact Graco technical support.
P513	Alarm	V/P Cal Failed Fluid	V/P Calibration failed	Check V2P connections.
			for the Fluid V/P	<ul> <li>Verify V2P operation</li> </ul>
				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	Туре	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> <li>Check the system for leaks as described in Check for Fluid Leaks, page 68.</li> </ul>
DG01	Advisory	Stall Test Empty Fail	System failed the empty stall test; did not stall when pump is near empty.	<ul> <li>Repeat the test as described in Maintenance 2: Pump Stall Test, page 59.</li> </ul>
MAD1	Advisory	Maint. Due Pump Volume	Maintenance is due on pump (volume).	
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.	Perform maintenance and clear the associated maintenance counter.
MJ51	Advisory	Maint. Due Valve Pump Fluid Inlet	Maintenance is due on pump fluid inlet valve.	Stall test maintenance requires that a stall test be completed.
MJ61	Advisory	Maint. Due Valve Pump Pressure	Maintenance is due on pump pressure valve.	Maintenance Screens, page 59.
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	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	Туре	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	Туре	Name	Description	Solution
EL00	Record	System Power On	Record of power cycle (ON).	Not applicable.
EM00	Record	System Power Off	Record of power cycle Not applicable. (OFF).	
EC00	Record	Setup Value(s) Changed	Record of changing 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	Туре	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.	d a USB USB port ownloads d.	
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	Repeat the process with a compatible USB device.	
WXUU	Advisory	USB Upload Err.	device in the USB port.		

# Table 13 Color Change Events

Code	Туре	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.	
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 66 and Presets, page 52.
WS##	Record	Invalid Preset ##	User has invalid presets due to changing the number of color change valves and selects and 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 66 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 66 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.
- 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 90.
- 2. Use a flat blade screwdriver to open the isolation cabinet door.
- 3. Slide the electrostatic shield (82) up to remove.
- 4. Slide the electrostatic shield (12) to the left to remove.
- 5. To remove the isolation valve cover (99), loosen the top and bottom screws (99a).
- 6. 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 101.
- 7. Disconnect the wash fluid bottle (69).
- 8. Before removing the two sensors from the isolation valve, mark the location of each as a guide when reassembling.
- 9. 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.
- 10. Disconnect the three push-to-connect air line fittings (239) to the isolation valve: top, middle, bottom.
- 11. 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).
- 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).
- 13. 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 may cause arcing that damages system components. Clean the cabinet of residual fluid before reassembling.

- 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 31 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's voltage to lower below normal operating voltage. Low system voltage may 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 93.
- 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 110.

- 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 shields (12 and 82) 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.

- 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 32 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 112.
- 3. Install the replacement sensor (103) or sensor assembly kit 26B102.
- Connect sensor wires to splitter cable (447) inside the electronic control. See Wiring Connections, page 112.
- 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 90.
- 2. Remove the isolation valve from the cabinet. See Remove the Isolation Valve from the Cabinet, page 91.

- 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 33 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 34 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 35 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.

#### Note

Be careful not to scratch the air cylinder shaft.

- 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).
- 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 115.

- 1. Prepare the isolation system for service. See Prepare the Isolation System for Service, page 90.
- 2. Remove the isolation valve from the cabinet. See Remove the Isolation Valve from the Cabinet, page 91.
- 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.



Figure 36 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.



Figure 37 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).



Figure 38 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).



Figure 39 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.
- 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.

- 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 40 Removing Retaining Cap from Piston

- 6. Replace the piston seals:
  - 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).



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Figure 41 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.
- 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 99.



Figure 42 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.

- 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 100.

# 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 115.

# 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):
  - 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 43 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).
- 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 90.
- 2. Use a flat blade screwdriver to open the isolation cabinet door.
- 3. Slide the electrostatic shield (82) 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 112.
  - 447 321

Figure 44 Pump Sensor Connection in Electronics Panel

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

- 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 45 Remove the Isolation Fluid Pump

# Reinstall the Isolation Fluid Pump in the Cabinet

# 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. Clean the cabinet of residual fluid before reassembling.

- 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 112.
- 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 110.
- 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 (82) 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 101.
- 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 46 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.
  - 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 47 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 48 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.
  - 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.
- 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).
- 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).
- Attach the air valve assembly (323-326) to the air cover (320). Tighten so that the air fitting faces to the left.
- 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 49 Align Covers with Weep Holes

# Remove the Merkur Pump from the Cabinet

Many Merkur AA fluid pump (75) maintenance and repair steps are possible with the pump in the cabinet. See your Merkur manual for details. Use this procedure to remove the entire Merkur AA fluid pump (75) from the isolation cabinet for service.

- 1. Prepare the isolation system for service. Follow the steps under Prepare the Isolation System for Service, page 90.
- 2. Use a flat blade screwdriver to open the isolation cabinet door.
- 3. Slide the electrostatic shield (82) up to remove.
- 4. Slide the electrostatic shield (12) to the left to remove.
- 5. Disconnect the air supply line from the Merkur air motor.
- 6. Disconnect the fluid hose (84) from the inlet of the inlet fittings on the Merkur AA fluid pump (75).
- 7. Disconnect the fluid hose (116) from the outlet fittings of the fluid filter (131).
- Loosen four nuts (134) holding the pump bracket (21) in the cabinet. Lift the pump and remove to a workbench.

# Reinstall the Merkur Pump in the Cabinet

- With the nuts (134) loosely installed on the captured mounting bolts (133), install the Merkur AA fluid pump (75) with pump bracket (21) by sliding the slots in the bracket over bolts (133). Tighten nuts (124) to secure).
- 2. Connect the fluid hose (116) to the fittings on the fluid filter (131).
- 3. Connect the fluid hose to the inlet fittings on the Merkur AA fluid pump (75).
- 4. Connect the air supply to the Merkur air motor.
- 5. Reinstall electrostatic shields (12 and 82) inside the cabinet.

# 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 109.

# Prepare the Electrical Controls for Service

- 1. Prepare the isolation system for service. Follow of the steps in Prepare the Isolation System for Service, page 90.
- 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 106.
- 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.
- Reconnect the solenoid wire to connector (433). Reinstall connector (433) on the color change board (403). For location details, see Electrical Schematics, page 109.
- 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 106.
- 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 109.
- 7. Connect the wires to the kV board as shown in Electrical Schematics, page 109.

## Replace an Electro/pneumatic (V2P) Regulator

- 1. Prepare the electrical controls for service. Follow the steps in Prepare the Electrical Controls for Service, page 106.
- 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 110.

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.



 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.
- 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 106.
- 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 50 Electrical Schematic for 25E700 Electrical Control

### **Pneumatic Connections**

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

Item Description		Part
А <i>п</i>	5/32 inch tubing	598095
В <i>п</i>	3/8 inch tubing	054134



#### 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 Color Change: Pneumatic and Wiring Connections.
A8	Used only in models equipped with gun flush box capability.
$\bigcirc$	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 24.

### Wiring Connections

The numbers in the following figure represent point-to-point connections. For example, C1 connects to C1.



Figure 52 Wiring Connections

ID	Part	Description
C1	17D923	Bulkhead Cable (59)
C2	121002	CAN Cable (43)
C3	17D923	Bulkhead Cable (59)
C4		CAN Cable (611) (Used only
C5	121002	for color change enabled sys- tems. See Color Change: Pneumatic and Wiring Connections, page 114.)
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		Green/Yellow (20 in./50.8 cm)
E2	Wire	Green/Yellow (5 in./12.7 cm)
E3	(14 gauge)	Red (6 in./15.2 cm)
E4	99-)	Red (10 in./25.4 cm)
E5	17J191	Green/Yellow (81)
		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 53 Color Change Module Wiring and 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 16 Color Change Wiring Connections

ID	Part	Description	
C4	121002		
C5	121002		

### Parts

### **Isolation System**



Figure 54 Isolation Cabinet

See Isolation Cabinet Interior for a detailed view.



Figure 55 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 25N031 Isolation Fluid Pump Parts, page 122.

Detail C2 shows the parts included with Kit 26B415.

#### Isolation System

Ref.	Part	Description	Qty
1		ENCLOSURE, WATERBORNE, BATCH, AA	1
1a		NUT	1
1c	116343	SCREW, GROUND	1
2	164416	WASHER, FLAT	4
3		FRAME, WITH CASTERS, WATERBORNE, AA	1
4		WASHER, 1/2 INCH PLAIN FLAT	8
5	123999	BOLT, CAP, HEX HEAD	4
6	801020	NUT, LOCK, HEX	4
7		BRACKET, ELECTRICAL, WATERBORNE	1
8		WASHER, FLAT	5
9	25R222	CABINET, STAND, WATER- BORNE, STAND, AA	1
10	166846	FITTING, ADAPTER	2
11	108525	WASHER, LOCK, SPRING	1
12	25R221	SHIELD, SUB ASSEMBLY, WATERBORNE, AA	1
13	25N031	PUMP, WATERBORNE ISOLATION	1
		See 25N031 Isolation Fluid Pump Parts, page 122	
14	25E700	CONTROL, ELECTRICAL;	1
		See Electronic Control Parts , page 124.	
15	25N030	VALVE, WATERBORNE ISOLATION	1
		For details, see 25N030 Isolation Valve Parts, page 120.	
16	19Y100	BRACKET, VALVE, WATER- BORNE	1
17	19Y099	BRACKET, PUMP, WATERBORNE	1
18	25P393	ROD, GROUND, WATERBORNE	1
19	115814	WASHER, FLAT, SST (WABH00)	32
20	102023	SCREW, CAP, HEX HEAD	10
21	26B428	BRACKET, WATERBORNE, AA	1
		KIT, BRACKET, WATERBORNE, AA (includes items 95, 128, 132, 133, 134)	
22	104123	WASHER, LOCK, SPRING (WABH00)	29
23	112223	NUT, HEX, REGULAR	
24	25R034	RESISTOR, BLEED, ASSY, ISO SYS	1

Ref.	Part	Description	Qty
25	17D918	MANIFOLD, AIR, SPEED CONTROL	1
26	514930	SCREW, CAP, SKT HEAD	2
27	158491	FITTING, NIPPLE, 1/2 NPT	1
28	15T937	FITTING, ELBOW, 1/4 MNPT X 5/32 T	1
29	101748	Q ADAPTER, PLUG, PIPE, SST, 3/8 NPT X 1/4 NPT	1
31	15T546	FITTING, STRAIGHT, 3/8 T X 3/8 MNPT	3
32	197449	SPACER	2
33	101390	WASHER, LOCK, INTERNAL	2
34	113934	FITTING, UNION, SWIVEL	1
35	122767	BUSHING, 1/2 X 1/4 NPT, MF, SS, 6K, 316	1
36	19C430	PLUG, hole, 1.09"	1
40	26C728	BRACKET, ADM, ASSEMBLY, WATERBORNE	1
41	277853	BRACKET, MOUNTING, BOOTH CONTROL	1
42	26B099	KIT, ADM/CONTROL INTERFACE (includes ADM and HydroShield software token)	1
43	121002	CABLE, CAN, FEMALE / FEMALE 1.0M (Model WABH00)	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 46, 47, 48, 74, 129)	1
48	100518	SCREW, MACH, PNHD	4
49	16F151	FITTING, ELBOW, SWIVEL, 3/8 T 3/8 NPT	1
51	157021	WASHER, LOCK	2
52	555388	NUT, HEX, JAM, 8-32	2
53	16A079	KIT, VALVE, DUMP, ACCESSORY (WABH00)	1
54	19A463	SCREW, CAP, SOCKETHEAD	4
55	114406	SCREW, MACH, FILH	2
56	114958	STRAP, TIE	2
57	C50019	TERMINAL, RING	7
59	17D923	CABLE, GCA, M12-5P, M BULKHEAD/F	2

Ref.	Part	Description	Qty
60	598095	TUBE, 5/32 OD, NYLON 17 FEET , 250 PSI (not shown)	1
		For connection details, see Pneumatic Connections, page 110 .	
		TUBE, 5/32 OD, NYLON, 26 FEET, 250 PSI (not shown) (WABH02)	1
		For connection details, see Pneumatic Connections, page 110 .	
61	16K322	BRACKET, LIGHT TOWER, PAINT	1
62▲	15A682	LABEL, SAFETY	1
63	065108	WIRE, CU, ELEC.,14 AWG, BLACK, 1.2 FEET	1.2
64	123942	FASTENER, SCREW, CAP, HEX HEAD	4
65	106084	SCREW, MACH, PNH	2
68		WASHER, #10 FLAT SST	1
69	25P442	BOTTLE, WASH, WATERBORNE	1
70	223547	WIRE, ASSY, 25 FEET	1
71	114342	FITTING, ELBOW, MALE	1
72	17R502	FITTING, ELBOW, SWIVEL, 1/4 NPT-NPSM	2
73	24Y376	VALVE, CHECK, OUTLET, FKM ETP	1
		WABH00 only; not used on color change enabled systems.	
74	103181	WASHER, LOCK EXT	4
75	W30 AAS	PUMP, ASSY, 30:1, 25CC, SS, STD	1
76	26B162	HOSE, COUPLED, 10.2 INCHES, PTFE (WABH00 only)	1
77	19Y247	VALVE, AIR, QUICK EXHAUST	1
79	107110	NUT, LOCK	1
81	17J191	WIRE, GROUND	1
82	26B427	PLATE, WB, SHIELD, AA (includes item 105)	1
83	111987	CONNECTOR, CORD STRAIN RELIEF	2
84	25A721	HOSE, COUPLED, 1.0 FT. PTFE (model WABH00)	2/1
85	19B503	NUT, HEX, FLANGE, M8	5
86	110874	WASHER, FLAT	
87	111307	WASHER, LOCK, EXTERNAL	
92		BAR, NEOPRENE STRIP, ADHESIVE	2

Ref.	Part	Description	
93	18C026	PLUG, HOLE, .437" (model WABH02)	1
		PLUG, HOLE, .437" (modelWABH00)	5
94	101566	NUT, LOCK	4
95	111003	WASHER, FLAT	4
97	112222	SCREW, CAP .SCH	2
98	19A460	BRACKET, SHIELD	2
99	26C922	COVER, ISOLATION VALVE (includes 99a, 99b, 99c, 105)	1
99a	19B478	SCREW, CAPTIVE, SHCS 1/4-20 X .5	2
99b	19B479	RING, RETAINING, PUSH-ON ID .32	2
99c	170772	WASHER	2
100	551903	SCREW, CAP SCH 1/4-20 X 1/2	13
101		CLAMP, HOSE, SIZE 32	2
		Purchase sensor kit 26B102 (includes 101, 102, 103, 104)	
102		BRACKET, SENSOR	2
		Purchase sensor kit 26B102 (includes 101, 102, 103, 104)	
103	24W120	SENSOR, STROKE POSITION	2
104	19Y538	NUT, HEX, 5/16-24	4
105 ▲	19Y631	LABEL, SAFETY, WARNING, PINCH HAZ	2
107	210084	CONDUCTOR, GROUNDING, HAND HELD	1
109	26B089	HOSE, PAINT, LOW PRESSURE	1
110	054134	TUBE, NYLON, 3/8 INCH, 15 FEET (not shown)	15
		For connection details, see Pneumatic Connections, page 110.	
111 �		TOOL, ASSY, PISTON ISOLATION	1
112 �		TOOL, ASSY, SLEEVE ISOLATION	1
113 �		TOOL, ASSY, STEM, ISOLATION	1
114	15X472	LIGHT, TOWER	
121	100731	WASHER	8
122	100639	WASHER, LOCK	4
128	111799	SCREW, CAP, HEX HD	4

Ref.	Part	Description	Qty		Ref.	Part	Description	Qty
129	245202	POWER CORD with North America	1		133	107129	BOLT, ROUND HEAD	4
		NEMA 5-15 male plug (not shown)		-	134	17A237	NUT, HEX	4
	124864	<ul> <li>POWER CORD with China/Australia AS/NZS 3112 male plug (not shown)</li> </ul>			140	16F201	CASTER, SWIVEL, WITH BREAK (not shown)	4
	121056	POWER CORD with Continental Europe CEE 7/7 male plug (not			141	100018	WASHER, LOCK, SPRING, 1/2 (not shown)	4
		snown)		-	142	100321	NUT (not shown)	4
	121057	POWER CORD with United Kingdom BS 1363 male plug (not shown)	1		143	121226	CABLE, CAN, MALE/FEMALE, 0.4M not shown)	
130	121818	BULKHEAD, TUBE, 5/32 INCH (not shown)	3		144	25R200	FLUID, CLEANSING, 1 GALLON (not shown)	1
131	26B236	FILTER, FLUID	1		C2†	Color char	nge enabled model WABH02 only.	
132	100214	WASHER, LOCK	4			See Kit 26B415, Color Change, page 129		

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

♦ Included in kit 25B413.

† Parts included in Color Change Kit 26B415. Model WABH02 includes all kit 26B415 parts and quantities .Reference numbers 600-623 are included in color change enabled systems. For an illustration and more information, see Color Change Components, page 129.

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

### 25N030 Isolation Valve Parts



Figure 56 Isolation Valve

#### **Isolation Valve**

Def	Deat	Bassistica	<b>A</b>
Ref.	Рап	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 0D 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
220	17Y486	SPRING, COMPR, 2.0 X OD 1.22	1

Ref.	Part	Description	Qty
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 133.

### 25N031 Isolation Fluid Pump Parts



#### **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 Pump Kits, page 135.

### **Electronic Control Parts**

The following figure shows 25E700.





#### **Electronic Control**

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/PNEU- MATIC, 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

Ref.	Part	Description	Qty
439	108982	CONNECTOR, TUBE	1
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	1
		For detailed information, see Wiring Connections, page 112.	
446	19Y586	CABLE, SPLITTER, SNG MALE DBL FE	1
		For detailed information, see Wiring Connections, page 112.	
447	19Y759	CABLE, SPLITTER, M12-8P	1
		For detailed information, see Wiring Connections, page 112.	
448		SCREW, MACHINE, PAN, 6-32 X 1-1/2	1
449	19Y572	CABLE, SPLITTER, M12(F) TO M8(M)	1
		For detailed information, see Wiring Connections, page 112.	
450	121000	CABLE, CAN, FEMALE / FEMALE 0.5M	1
		For detailed information, see Wiring Connections, page 112.	
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 Electrical Schematics, page 109	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	32 in
		(26C716 only)	

## **Repair Kits and Accessories**

### Accessories

#### Grounded Air Hoses for Pro Xp Auto Spray Gun

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)		

#### CAN Cables for Control Module

Part	Description	Qty
121001	CABLE, CAN, FEMALE / FEMALE, 1 METER	1
	Included in the isolation system (43)	
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

25R200

Description

GALLON

#### Fluid Hoses for Pro Xp Auto Spray Gun

3000 psi (20.7 MPa, 206.8 bar) Maximum Working Pressure

.16 in. (4 mm ID)

Part	Description		
Waterborne	Waterborne Fluid Hose		
24W599	25 ft (7.6 m)		
24W077	50 ft (15 m)		

#### 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

#### Kit 26B414, System Stop Pneumatic Input Kit

FLUID, CLEANSING, 1

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.

Qty

1

Part	Description	Qty
110740	PLUG, PIPE	1
111697	PLUG, PIPE	2
104361	PACKING, O-RING	1
166846	FITTING, ADAPTER	1
167026	STRAINER, MESH SCREEN 100	1
186075	SUPPORT, FILTER	1
185632	BOWL, FILTER	1
171941	SPRING, COMPRESSION	1
185631	HOUSING, FILTER	1
235208	FITTING, UNION, SWIVEL	1

#### Kit 26B236, 100 Mesh Fluid Filter

### Kit 26B400, Supply Pump

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



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 Components**

#### Kit 26B415, Color Change

Converts a standard system to a color change system. Kit includes 30 feet of the 5/32" tubing, (598095). Requires a color change control module and a color change valve stack.



Figure 60	Color Cl	hange	Kit 26B4 <sup>-</sup>	1
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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

<b>Color Change</b>	Control	Module	and	Valve	Stack	Combinations
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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, remove all system power before plugging any connectors.

- Prepare the electrical controls for service. Follow the steps in Prepare the Electrical Controls for Service, page 106.
- 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	ON	ON	ON	
Controls	GFF	GFF	GFF	
Color	ON	ON	ON	
Change	OFF	OFF	GFF	

#### 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, remove 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 106.
- 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.



Figure 61 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

 $\bigstar$  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 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 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 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 115.

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 0D 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 115.

Ref.	Part	Description	Qty
211		PISTON, ISOLATION VALVE	1
212	17X745	PACKING, U-CUP, ID 1.25 X 0D 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 115.

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 115.

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 0D 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

### 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, 0-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 pump in the isolation system 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)	<u> </u>
40 psi (.3 MPa, 2.8 bar)	•••••

Table 17 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:

[% H<sub>2</sub>O] > 1, 70 x [% LM] + 0,96 x [% ORG], (all in % by weight)

where

H<sub>2</sub>O: 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



Reference	U.S.	Metric
А	40.2 in.	102.2 cm
В	36.2 in.	92.1 cm
C1	65.3 in.	165.9 cm
C2	69.9 in.	177.6 cm
D1	23.5 in.	59.7 cm
D2	24.3 in.	61.8 cm
E	24.3 in.	61.6 cm

Reference	U.S.	Metric
F	39.8 in.	101.1 cm
G	35.5 in.	85.1 cm
J	48.9 in.	124.1 cm
K1	63.7 in.	161.9 cm
K2	59.1 in.	150.1 cm
L	19.2 in.	48.9 cm
М	44.3 in.	112.4 cm

## Notes


## **Technical Specifications**

HydroShield Air-Assisted Waterborne Isolation System	U.S.	Metric	
Maximum Fluid Working Pressure	3000 psi	20.7 MPa, 206.8 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 microamp	eres maximum	
Voltage Output	60 kilovolts	s 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	1/4 npsm(m)		
Wetted Parts	Isolation System: Polyethylene, Stainless Steel, Acetal, Fluoroelastomer, PTFE, UHMWPE, Polyurethane, Tungsten carbide with 6% nickel		
Maximum Fluid Conductivity	2000 μS/cm		
Maximum Fluid Hose Length, Maximum Inside Dimension	250 ft, 16 in.	76.2 m, 4 mm	
Weight	322 lb	146 kg	
Ambient temperature range	41°F–122°F	5°C–50°C	
System Air Consumption	Range of total air flow under normal spraying conditions:		
System All Consumption	4-10 scfm, 113-283 lpm		
	Straight IEC 320–C13 male connector. Also included:		
	North America NEMA 5-15 male plug		
Power Connection	China / Australia AS/NZS 3112 male plug		
	Continental Europe CEE 7/7 male plug		
	United Kingdom BS 1363 male plug		
External Power Requirements 100-240 VAC, 50-60 Hz, 2 amp maximum draw, 15 a maximum circuit breaker recommended		mp maximum draw, 15 amp eaker recommended	

## **California Proposition 65**

#### **CALIFORNIA RESIDENTS**

MARNING: Cancer and reproductive harm — www.P65warnings.ca.gov.

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Original Instructions. This manual contains English. MM 3A8492

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