

# Instructions-Parts List



## Important Safety Instructions

Read all warnings and instructions in this manual.  
Save these instructions.

## BES 300

311163 rev.D

### Bin Evacuation System

*For use with 300 gallon (1135 liter) bags in bin containers.*


BES Part No.	Maximum Working Fluid Pressure, per pump <i>psi (MPa, bar)</i>	Pump Part No.	Quantity	Pump	Controls
BES1P1	430 (3, 30)	949704	2	FT14 Sanitary Pump	Electronic
BES1P3	430 (3, 30)	949704	2	FT14 Sanitary Pump	Manual
BES2P2	430 (3, 30)	949704	4	FT14 Sanitary Pump	Electronic
BES3P1	120 (0.84, 8.4)	248273	2	3150 Sanitary Husky® Pump, Ball Check	Electronic
BES3P3	120 (0.84, 8.4)	248273	2	3150 Sanitary Husky® Pump, Ball Check	Manual
BES4P3	120 (0.84, 8.4)	248274	2	3150 Sanitary Husky® Pump, Flapper Check	Manual
BES5A1	1000 (7, 70)	949444	2	10:1 Sanitary Bulldog®	Electronic
BES5A3	1000 (7, 70)	949444	2	10:1 Sanitary Bulldog®	Manual
BES6T2	1000 (7, 70)	949444	4	10:1 Sanitary Bulldog®	Electronic
BES6T4	1000 (7, 70)	949444	4	10:1 Sanitary Bulldog®	Manual
BES7A5	2400 (16.8, 168)	246936	2	24:1 King® Ink Pump	Electronic
BES6L2	1000 (7, 70)	949444	4	10:1 Sanitary Bulldog®	Electronic


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## Manual Conventions

### Warning


**WARNING**



**WARNING:** a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Warnings in the instructions usually include a symbol indicating the hazard. Read the general **Warnings** section for additional safety information.

### Caution






<b>CAUTION</b>
<b>CAUTION:</b> a potentially hazardous situation which, if not avoided, may result in property damage or destruction of equipment.

### Note



Additional helpful information.

The following general warnings are related to the safe setup, use, grounding, maintenance and repair of this equipment. Additional more specific warnings may be found throughout the text of this manual where applicable.

 <b>Warning</b>	
	<p><b>FIRE AND EXPLOSION HAZARD</b></p> <p>Flammable fumes, such as solvent and paint fumes, in <b>work area</b> can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> <li>• Use equipment only in well ventilated area.</li> <li>• When flammable liquid is sprayed or used for flushing or cleaning, keep sprayer at least 20 feet (6 m) away from explosive vapors.</li> <li>• Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).</li> <li>• Keep work area free of debris, including solvent, rags and gasoline.</li> <li>• Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.</li> <li>• Ground equipment and conductive objects in work area. See <b>Grounding</b> instructions.</li> <li>• Use only grounded hoses.</li> <li>• Hold gun firmly to side of grounded pail when triggering into pail.</li> <li>• If there is static sparking or you feel a shock, <b>stop operation immediately</b>. Do not use equipment until you identify and correct the problem.</li> <li>• Keep a fire extinguisher in the work area.</li> </ul>
	<p><b>PRESSURIZED EQUIPMENT HAZARD</b></p> <p>Fluid from the gun/dispense valve, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.</p> <ul style="list-style-type: none"> <li>• Follow <b>Pressure Relief Procedure</b> in this manual, when you stop spraying and before cleaning, checking, or servicing equipment.</li> <li>• Tighten all fluid connections before operating the equipment.</li> <li>• Check hoses, tubes, and couplings daily. Replace worn or damaged parts immediately.</li> </ul>
	<p><b>EQUIPMENT MISUSE HAZARD</b></p> <p>Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See <b>Technical Data</b> in all equipment manuals.</li> <li>• Use fluids and solvents that are compatible with equipment wetted parts. See <b>Technical Data</b> in all equipment manuals. Read fluid and solvent manufacturer's warnings.</li> <li>• Check equipment daily. Repair or replace worn or damaged parts immediately.</li> <li>• Do not alter or modify equipment.</li> <li>• For professional use only.</li> <li>• Use equipment only for its intended purpose. Call your Graco 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>• Comply with all applicable safety regulations.</li> </ul>
	<p><b>MOVING PARTS HAZARD</b></p> <p>Moving parts can pinch or amputate fingers and other body parts.</p> <ul style="list-style-type: none"> <li>• Keep clear of moving parts.</li> <li>• Do not operate equipment with protective guards or covers removed.</li> <li>• Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the <b>Pressure Relief Procedure</b> in this manual. Disconnect power or air supply.</li> </ul>

**Warning****TOXIC FLUID OR FUMES HAZARD**

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read MSDS's to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

**PERSONAL PROTECTIVE EQUIPMENT**

You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, inhalation of toxic fumes, burns, and hearing loss. This equipment includes but is not limited to:

- Protective eyewear
- Clothing and respirator as recommended by the fluid and solvent manufacturer
- Gloves
- Hearing protection

# Overview

## Related Publications

- 306916** Bulldog® and King® Pumps  
**307592** Senator® and Quiet Senator® Air Motors  
**308076** FT14 Sanitary and Senator® Pumps  
**308149** Bulldog® and King® Pumps  
**310622** 3150 Sanitary Husky® Pumps

## Operation Overview

The BES 300 evacuates fluids from a 300 gallon (1135 liter) bag in a plywood box or collapsible bin.

The BES 300 consists of a frame, two or four Graco pumps, ram plate with an inflatable seal, ram air cylinder, and a manual or electronic control panel.

## Basic Operation of BES 300

1. The operator places the bin inside the frame.
2. Using the control panel, the operator lowers the ram plate on top of the material.
3. The operator inflates the ram plate seal, applies down pressure to the ram plate, and turns on the pumps.
4. The pumps evacuate the material out of the bin.
5. The operator stops the pumps, deflates the seal, and raises the ram plate out of the bin.
6. The empty bin is removed, another bin is put in place, and the BES 300 is ready to repeat the process.

## System Components (Manual Control)

See FIG. 1.

**A Stainless Steel Frame:** supports the cardboard or collapsible bin.

**B Manual Control Panel:** contains pneumatic controls to regulate the air pressure to pump air motors, ram, and ram plate seal in order to control:

- pump air motor pressure
- pump speed control
- ram up and down pressure
- seal pressure
- turn the pumps on or off
- inflate or deflate the ram plate seal
- raise or lower the ram plate

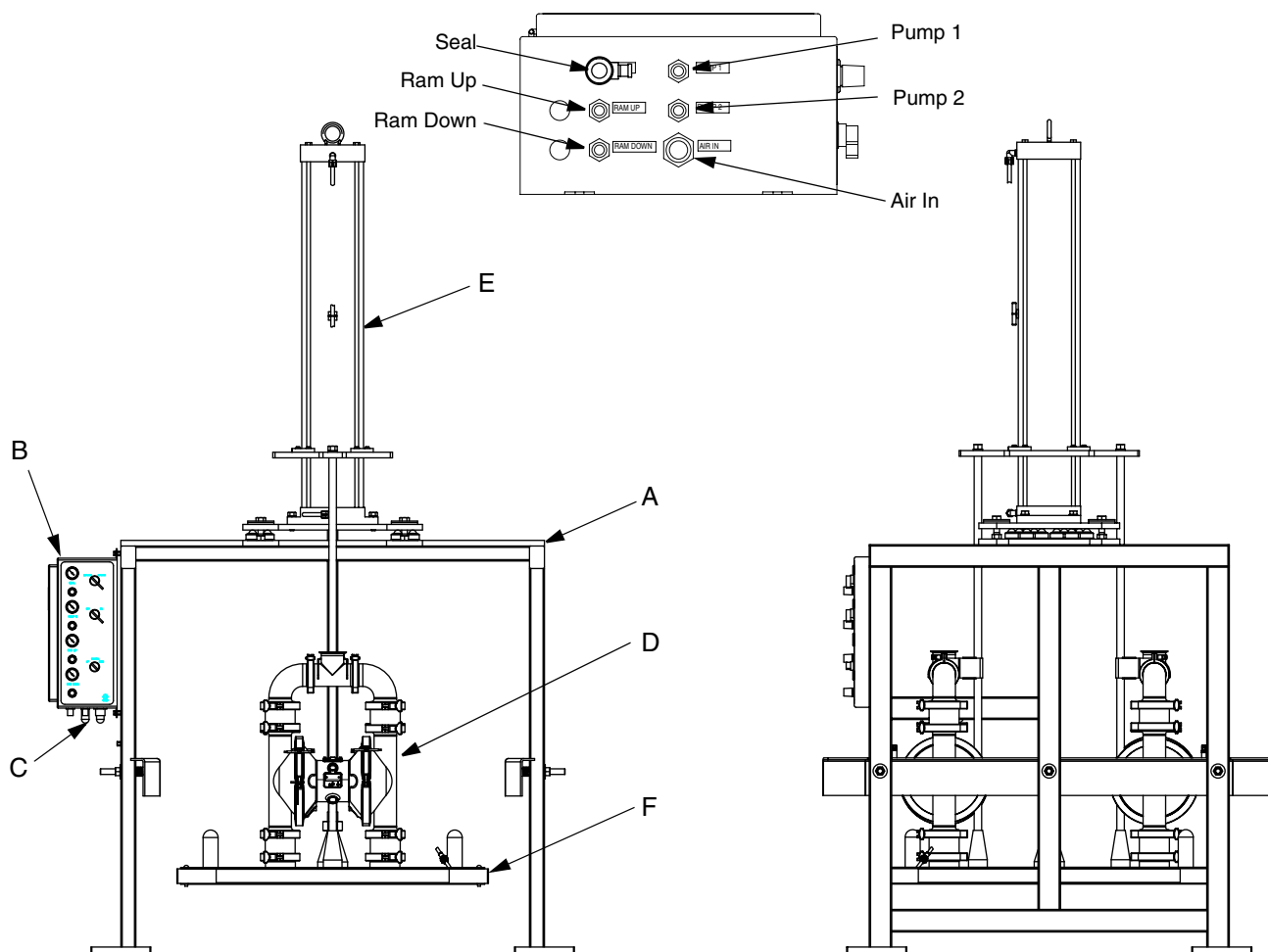
**C Air Shutoff Valve:** shuts off air to the pneumatic control panel (B).

**D Sanitary Pumps:** pump material from the bin to the target application.

**E Air Cylinder:** raises and lowers the pumps and the ram plate in and out of the material container.

**F Ram Plate:** applies an even amount of pressure to the material in the bin. When the ram plate seal is inflated, it creates a seal. The ram plate presses down on the material in the bin to assist the pumps in delivering the material.

**Bottom View of Manual Control Panel (B)**



**FIG. 1: Typical Installation (Manual Control; BES3P3 shown)**

## System Components (Electronic Control)

See FIG. 2.

**A Stainless Steel Frame:** supports the cardboard or collapsible bin.

**B Pneumatic Control Panel:** contains pneumatic controls to regulate the air pressure to pump air motors, ram, and ram plate seal in order to control:

- pump air motor pressure
- pump speed control
- ram up and down pressure
- seal pressure

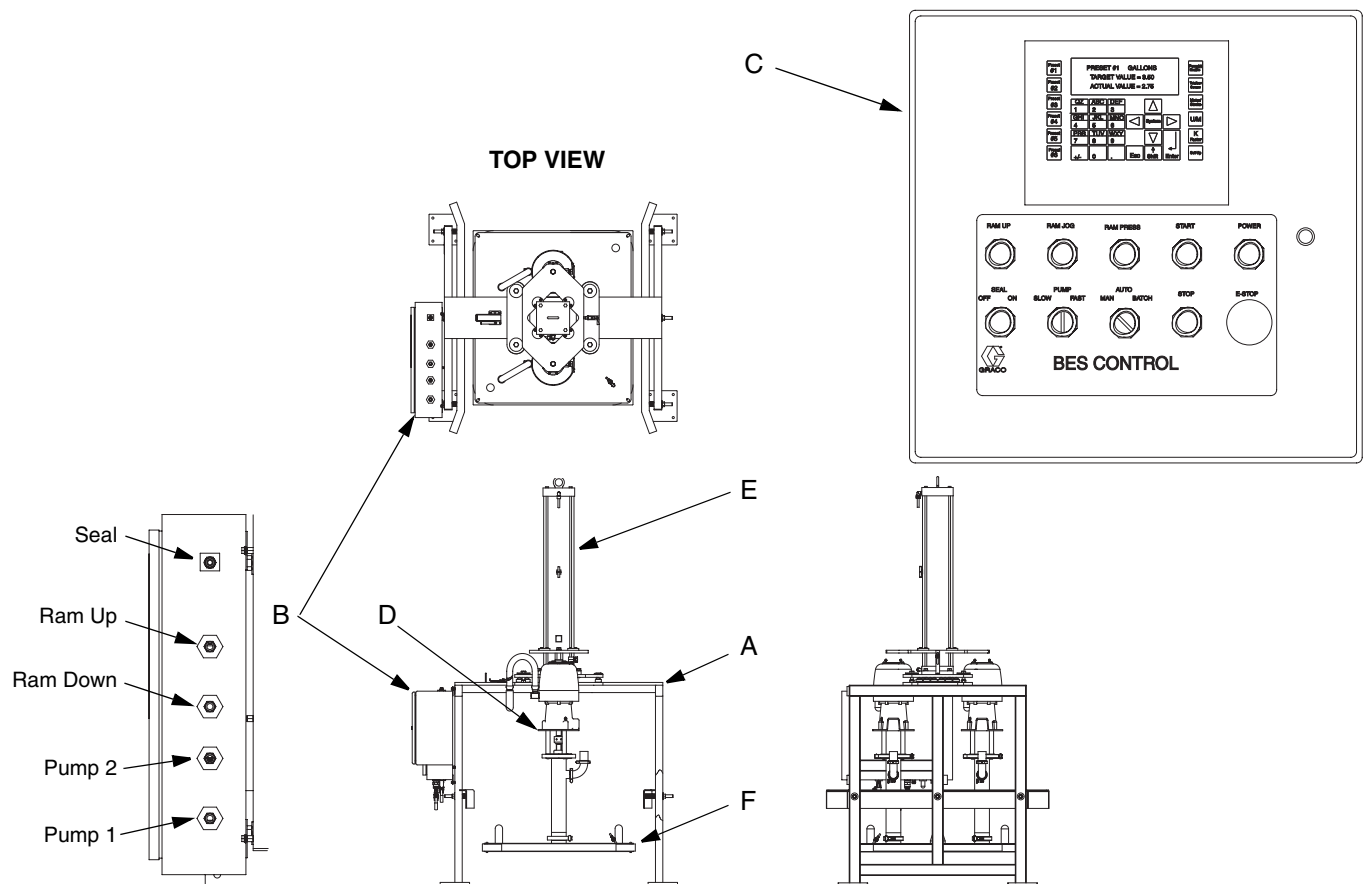
**C Electronic Control Panel:** is connected to the pneumatic control panel with the 24 VDC cable supplied. The panel uses 110 VAC input (20 amp circuit). If a flow meter is used, it must also be connected. The electronic control panel sends signals to:

- turn the pumps on or off
- inflate or deflate the ram plate seal
- raise or lower the ram plate
- turn off the air supply to the ram plate so the ram can slowly lower into the bin

**D Sanitary Pumps:** pump material from the bin to the target application.

**E Air Cylinder:** raises and lowers the pumps and the ram plate in and out of the material container.

**F Ram Plate:** applies an even amount of pressure to the material in the bin. When the ram plate seal is inflated, it creates a seal. The ram plate presses down on the material in the bin to assist the pumps in delivering the material.



**FIG. 2: Typical Installation (Electronic Control; BES1P1 shown)**

# Before Installing

## Uncrating Equipment

### CAUTION

Moving the BES 300 off the pallet without following this uncrating procedure will damage equipment.

Uncrate the BES 300 as follows:

1. Inspect the crate for shipping damage. Contact the carrier if damaged.
2. Remove plywood sides and top of crate.
3. Check the contents for loose or damaged parts.
4. Compare the packing slip against items inside the crate. Immediately call your Graco distributor about any shortages or damage.
5. Remove the band strap holding the cylinder bin to the frame.
6. Remove and unpack the air cylinder bin and pumps (if applicable).



See **Related Publications**, page 5, to become familiar with system components and general operation.

## Location

When selecting a location, make sure the location:

- Is close to where the fluid is being delivered to minimize back pressure and maximize flow rate.
- Provides enough room around the equipment for maintenance.
- Does not interfere with opening the pneumatic control panel door or frame door (on one or both sides). If the frame is rotated 180°, the frame door will open from left to right or from right to left. There are extra holes in the frame to mount the control panel on either side.
- Provides enough room on the right and/or left side of the BES 300 to easily load and unload fluid bins with a forklift or pallet-jack hand truck.

- Provides easy and safe access to the air supply shutoff valves and the pneumatic control panel. Graco recommends a minimum of 3 ft (0.91 m) of open space in front of the panel.
- Provides enough overhead clearance (11 ft, 3.4 m recommended) for installing and servicing the air cylinder and connecting air supply lines to the pneumatic control panel.
- Has a flat, level floor.

## Moving Frame to Location



### WARNING



The frame is shipped with several major components attached and weighs about 2500 lb. (1134 kg). To avoid injury and equipment damage, follow instructions below. Never have one person move or lift the frame. Read warnings, page 3.

- Do not remove the frame from the pallet at this time.
- Use a forklift or hand truck and support devices, such as a hoist, and have an adequate number of personnel to move the frame to the installation site.
- Avoid jarring or tilting the frame while moving it.



- Ensure there is an adequate compressed air supply. Refer to air motor/pump manual for your pump air consumption. About 250-300 scfm at 100 psi (0.7 MPa, 7 bar) is required to operate the pumps at the maximum rate.
- Have all component manuals available for specific component requirements. See **Related Publications**, page 5.
- Ensure that all hoses are properly sized and pressure rated for the system.



# Installation

## Anchoring Frame

The frame must be level in order for the BES 300 to operate properly. If necessary, level the BES 300 using metal shims. Make sure the frame does not wobble.

Anchor the four foot pads to the floor. To prevent the frame from being pushed off the floor, the anchor bolts must be long enough to withstand the 5027 lb. (22.36 kN) of downward force that the air cylinder can exert.

Use the holes in the four base footings as a guide and drill holes for 1/2 in. (13 mm) bolts. Bolt the frame to the floor with anchors.

## Installing Air Cylinder

### WARNING

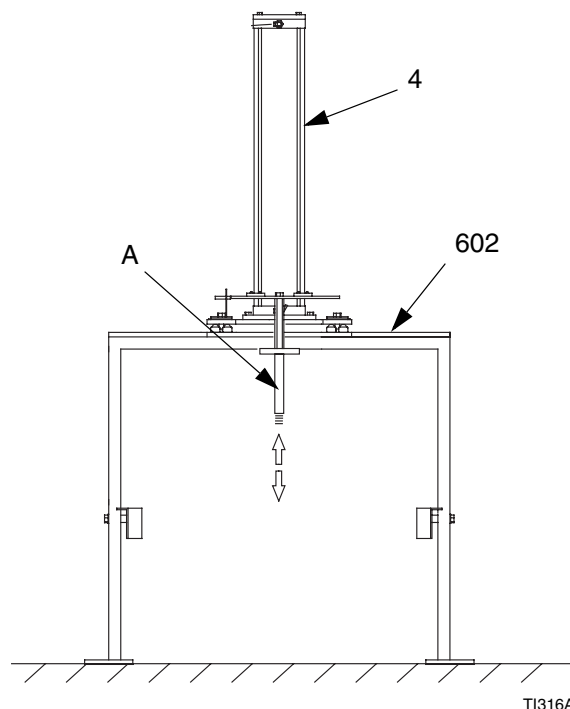


The air cylinder weighs about 130 lb. (59 kg). To avoid injury and equipment damage, follow instructions below. Never have one person move or lift the frame. Read warnings, page 3.



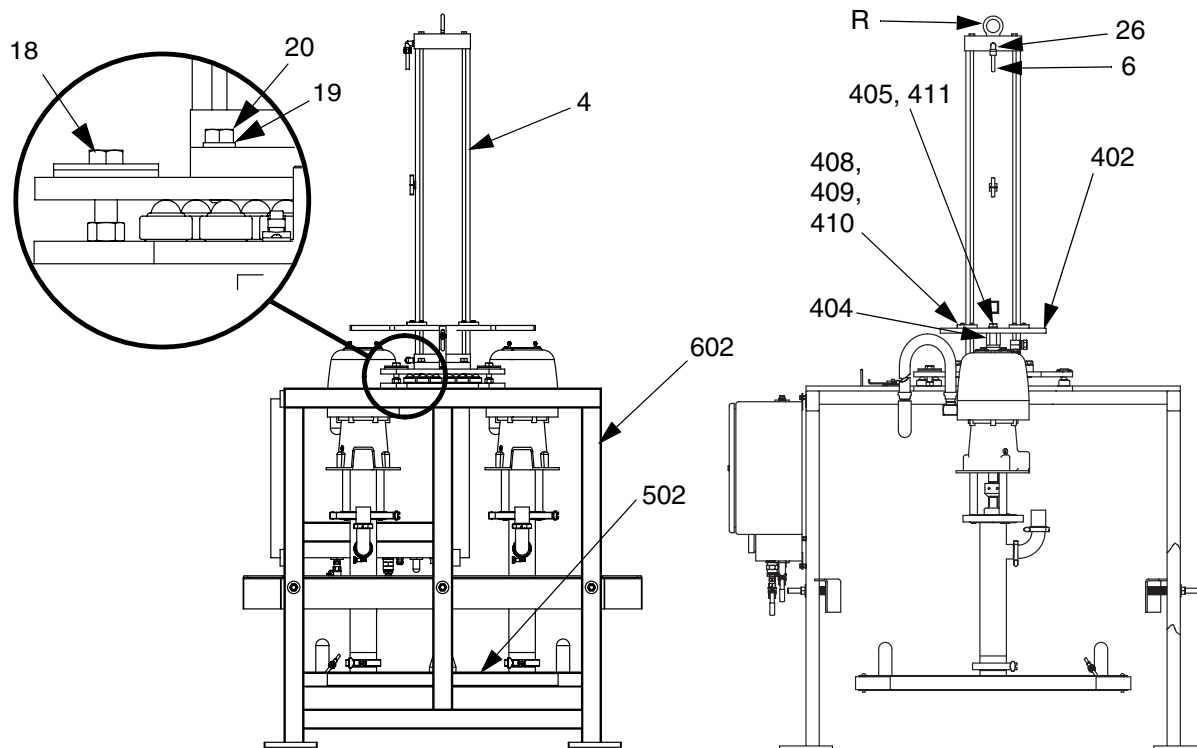
All models do not use the same parts. Refer to parts lists for your model, pages 34-43.

1. Remove the screws (405) and washers (411) attached to the motor mounting rods (404), and remove the air motor mounting plate (402). See FIG. 4.
2. Using a hoist, lift the air cylinder (4) into position on top of the frame (602). See FIG. 3.
3. Lower the air cylinder shaft (A) through the center hole in the frame.
4. Secure the air cylinder (4) to the frame (602) with the screws (20) and washers (19). See FIG. 4.




**FIG. 3: Air Cylinder Shaft**

5. Loosen but do not remove the screws (18) from the frame (602).
6. Remove the two band straps that hold the ram plate (502) to the shipping pallet. Do not remove the pallet.
7. Apply sanitary grease (36, supplied) to the cylinder shaft threads to avoid damaging them. Align and screw the air cylinder shaft (A) into the ram plate (502). See FIG. 3. If the shaft does not thread properly, do not force it. Re-check alignment of plate (502).



**FIG. 4: Air Motor Mounting Plate (BES1P1 shown)**

8. Uncrate and mount pumps to the ram plate (502), with outlets facing away from pneumatic control panel. Secure pumps to plate using the following gaskets and hardware:
  - **Part No. BES6xx and BES5xx:** gasket (415), screws (406), and washers (407)
  - **Part No. BES1xx and BES2xx:** gasket (407), tri-clamp (406)
  - **Part No. BES3xx and BES4xx:** gasket (407), tri-clamp (406)
  - **Part No. BES7xx:** screws (406), clamps (407), and gasket (415)
9. For part numbers BES3xx and BES4xx install the two connecting rods (404) to the ram plates.
10. Reinstall the air motor mounting plate (402), slipping plate over the top and down the length of air cylinder (4).
11. Install cylinder guide bearings (408) on top of the air motor mounting plate (402), using screws (409) and washers (410).

 The open arch in the cylinder guide bearings (408) fits around tie rods on the air cylinder (4).

12. Using tubing (6), connect the cylinder upper air supply line to the upper 1/2 in. elbow (26).

13. Using tubing (6), connect the cylinder lower air supply line to the 1/2 in. lower elbow (26).
14. Using tubing (6), connect pneumatic control panel to air motor air inlet.
15. Remove bolts holding the frame (602) to the shipping pallet.

**WARNING**



The overall system weighs about 2400-3400 lb. (1089-1542 kg). To avoid injury and equipment damage, follow instructions below. Never have one person move or lift the frame.

16. To lift the system, use the lift ring (R) on the air cylinder with an overhead hoist, or use the top joists on the frame with a forklift. Have an adequate number of personnel to lift or move the unit; avoid jarring or tilting it.
17. Remove the pallet and all remaining shipping supports from underneath the frame.

# Connecting Pump Output Hoses

- See **Related Publications**, page 5, for air motor/pump instruction manual numbers.
- The output hose(s) (supplied by others) should already be installed, with riggings and supports, and ready for connection to the 2 in. tri-clamp (412, supplied on some systems). See FIG. 5.
- Make sure the output hose(s) are sized and pressure-rated for the system. Use only electrically conductive hoses with spring guards on both ends.

The fluid hoses must move freely, without kinking, when the pumps move up and down.

The two pump AODD and the King ink pump systems do not include a hose, clamps, or gaskets on the outlet side.

## Two Pump System Includes:

Description	Qty
2 in. (51 mm) tri-clamp sanitary clamps (412)	4 or 6
2 in. (51 mm) tri-clamp sanitary gaskets (413)	4 or 6

## Four Pump System Includes:

Description	Qty
2 in. (51 mm) tri-clamp sanitary clamps (412)	8 or 12
2 in. (51 mm) tri-clamp sanitary gaskets (413)	8 or 12

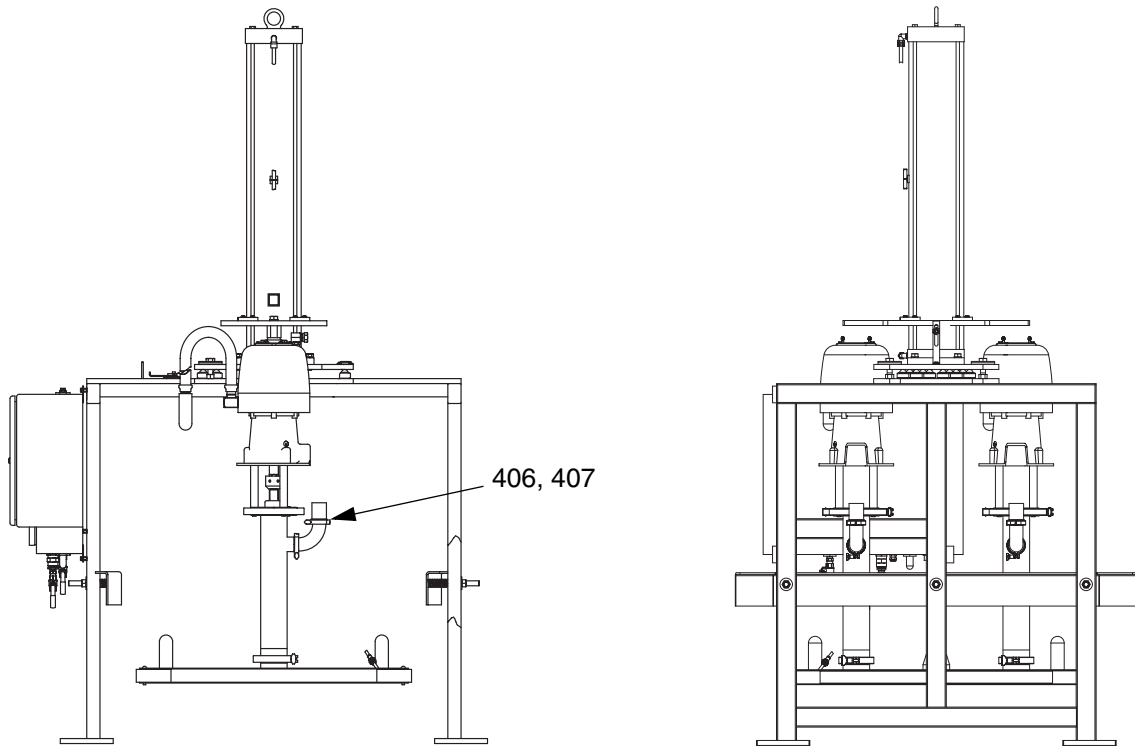



FIG. 5: Connect pump outlet hoses (BES1P1 shown)

## Grounding

**⚠ WARNING**

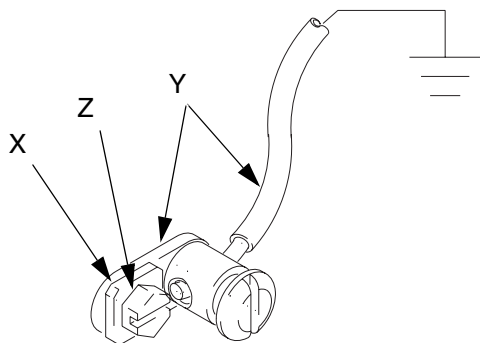


The system must be properly grounded. Read warnings, page 3. Follow the instructions below.

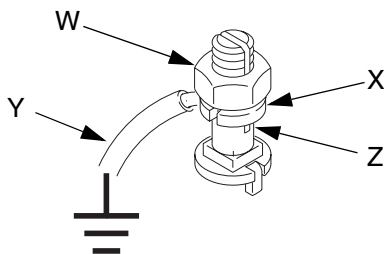
**Pump:** use the ground wire and clamp (supplied). There are two styles of grounding connections on pump air motors.

**If you have ground screw shown in FIG. 6,** you need to order part no. 222011 ground wire, ring terminal, and clamp assembly (Y). To install 222011, remove the ground screw (Z) and insert it through the eye of ring terminal (X), then tighten ground screw back into air motor as shown in FIG. 6. Connect the other end of the wire to a true earth ground.

**If you have ground screw shown in FIG. 7,** loosen the grounding lug locknut (W) and washer (X). Insert one end of the ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. Connect the other end of the wire to a true earth ground. Order 237569 ground wire and clamp assembly.



**FIG. 6: Ground Screw**



**FIG. 7: Ground Screw**

**Air and fluid hoses:** use only electrically conductive hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity. Check the electrical resistance of your air and fluid hoses. If the total resistance to ground exceeds 29 megohms, replace the hose immediately.

**Air compressor:** follow manufacturer's recommendations.

**Dispense valve:** ground through connection to a properly grounded fluid hose and pump.

**Fluid supply container:** follow your local code.

**Solvent pails used when flushing:** follow your local code. Use only conductive, metal pails, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.

**To maintain grounding continuity when flushing or relieving pressure:** hold a metal part of the dispense valve firmly to the side of a grounded metal pail, then trigger the gun/valve.

## Checking Resistance

Have a qualified electrician check the resistance between each pump and true earth ground. Resistance must be less than 0.25 ohms. If the resistance is greater, a different ground site may be required. Do not operate the system until you correct the problem.

## Prepare the Operator

Anyone operating the equipment must be trained to safely operate all system components and properly handle fluids used. Operators must read all instruction manuals, tags, and labels before operating equipment.

# Manual Stop (all models)

## WARNING



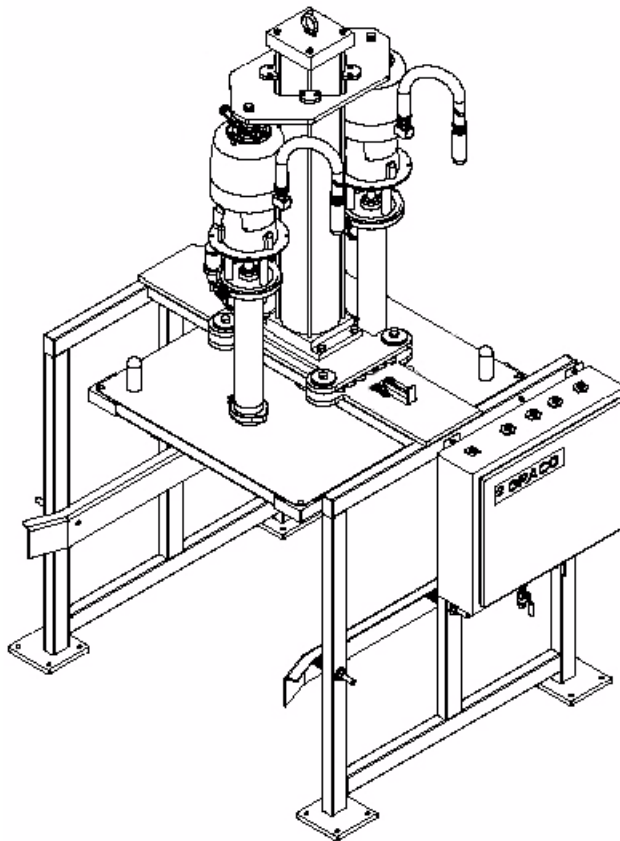
The overall system weighs about 2400-3400 lb. (1089-1542 kg). To avoid injury, always set manual stop latch to closed position when working under the plate.

## Engaging

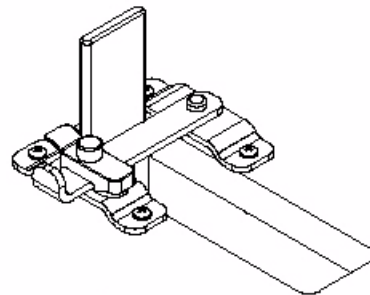
1. Raise plate until it stops at the top.
2. Set latch to closed position. See FIG. 8.

## Disengaging

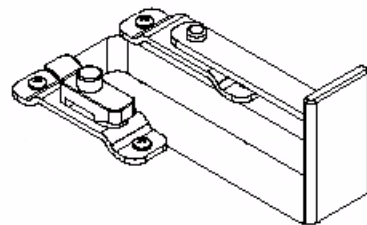
1. Make sure plate is raised all the way up (not resting on stop).
2. Move latch to open position. See FIG. 8.



**Closed Position**



**Open Position**



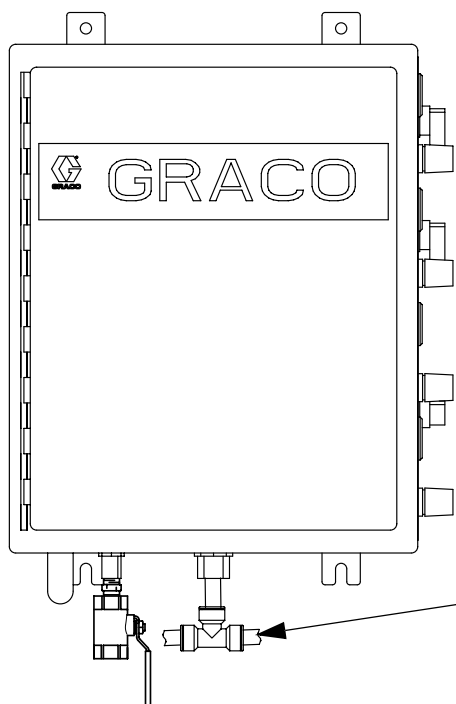
**FIG. 8. Manual Stop (BES1P1 shown)**

# Manual Control System

## Part No. 15E523 Manual Control

See FIG. 9.

Ref. Key	Switch/Button Name	Operation
A	Seal Inflate On/Off	Switch to ON to inflate ram plate seal. Switch to OFF to deflate ram plate seal.
B	Ram Plate Seal Pressure Gauge	Displays Ram plate seal pressure.
C	Ram Plate Seal Regulator	Adjust to raise or lower ram plate seal pressure.
D	Pump On/Off	Switch to ON to run the pumps. Switch to OFF to stop the pumps.
E	Pump Pressure Gauge	Displays current pump pressure.
F	Pump Pressure Regulator	Adjust to raise or lower pump inlet air pressure.
G	Ram Directional Switch	Switch to UP to raise the ram plate. Switch to DOWN to apply ram pressure to the material. Switch to NEUTRAL to hold the position of the ram plate.
H	Ram Up Pressure Gauge	Displays Ram Up operation pressure.
J	Ram Up Regulator	Adjust to raise or lower ram up pressure.
K	Ram Down Pressure Gauge	Displays Ram Down operation pressure.
L	Ram Down Regulator	Adjust to raise or lower ram down pressure.



Tee is used on four pump systems only

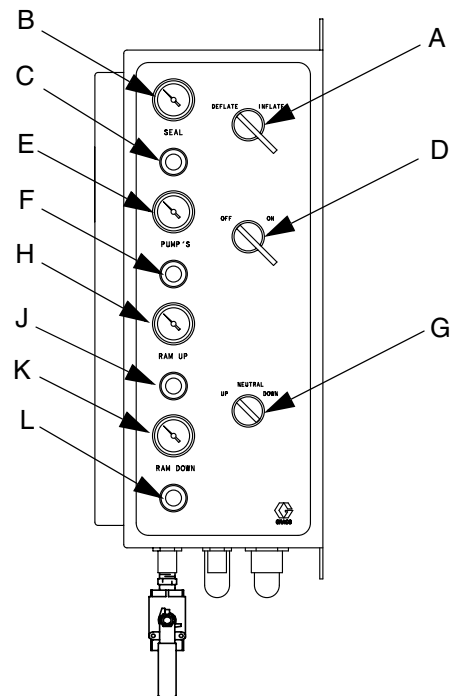


FIG. 9: Part No. 15E523 Manual Control

## Pressure Relief Procedure

### WARNING



Read warnings, page 3, and follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve pressure
- stop operation
- check, clean, or service any of the equipment

1. To turn off the pumps move pump switch to OFF.
2. Shut off the air to the pumps by closing the bleed-type air shutoff valve on the pumps' air supply line, or disconnect the air line.
3. Open all system fluid drain valves that are downstream of the pumps.

## Initial Startup

### WARNING



When raising or lowering the ram plate, keep hands and body away from ram plate and bin lip. Read warnings, page 3.

This procedure takes you through the settings, adjustments, and other steps that must be completed before the system is ready for daily operation.

1. Fill all the pumps packing nut/wet cups 1/3 full with a compatible lubricant if applicable. Refer to your pump manual for details. Do not use Graco Throat Seal Lubricant with a sanitary application.
2. Turn on the air to the pneumatic control panel.
3. Turn **SEAL INFLATE** to OFF.
4. Open the air shutoff valves for the pneumatic controls and pumps.
5. Open the pneumatic control panel door. Check for air leaks.
6. The equipment was tested with water. Flush the system before loading material. See page 27.
7. Follow **Loading the Bin** procedure, page 16.

8. Set the ram down air regulator to 30 psi (207 kPa, 2.1 bar). Adjust as needed.
9. Adjust the pump regulator as needed.



### Pump Cavitation

Pump cavitation occurs when the pump cylinder does not fully load with material on the up stroke and an air pocket forms in the material after the pump changeover. If pump cavitation occurs, increase the ram down air pressure.

10. Adjust the seal vacuum pump air regulator to 15 psi (103 kPa, 1.0 bar).
11. Deflate the seal.
12. Press the RAM UP button. If the ram does not raise, increase the ram up air regulator pressure.
13. Verify the seal is completely deflated after the ram plate exits the bin. If it is not, deflate the seal.
14. When adjustments are complete, close the pneumatic control panel door.
15. Follow **Unloading the Bin** procedure, page 16.
16. The system is now ready for standard operation. See page 15.

## Setting Air Pressures

Each system function has an associated air pressure. Air pressure regulators are located on the pneumatic control panel. Set initial air pressures as shown in the table below. Make adjustments as needed during operation. See FIG. 9.

Ref. Key	Function	Regulator Setting psi (kPa, bar)
B	SEAL INFLATE	15 (103, 1.0)
H	RAM UP	30 (207, 2.1)
K	RAM DOWN	30 (207, 2.1)
E	PUMP	50 (345, 3.4)

# Standard Operation

## Loading the Bin

### WARNING



When raising or lowering the ram plate, keep hands and body away from ram plate and bin lip. Read warnings, page 3.

When raising and lowering the ram plate, make sure there are no objects obstructing the unit.

1. Open the air shutoff valves for the air controls and pumps.
2. On the control panel, switch to the RAM UP position. If the ram does not elevate, increase the ram up air regulator pressure on the pneumatic control panel.
3. Move the bin in front of the frame.
4. Remove the lid from the fluid bin to expose the fluid bag. If present, open the outer plastic bag and pull it up over the sides of the bin, exposing the aseptic inner bag.
5. Make sure the bag is taut and secure it in place.
6. Secure the bag sides by using clamps (37) and tubes (38). See FIG. 10.
7. **Initial Startup Only:** The frame has spring-loaded guides to stabilize the bin. Adjust the guides equally with the screws on all four sides of the bin. Leave enough space between guides and bin to allow for removal of the bin.
8. Make sure the corner seals (21) are in place.
9. Use corners(39) to help guide the plate. See FIG. 10.
10. Switch to the Ram Down position.

### WARNING



When raising or lowering the ram plate, keep hands and body away from ram plate and bin lip. Read warnings, page 3.

11. Use the ram plate handles to center the ram plate inside the bin. Be careful not to pinch the inflatable seal when it enters the bin.

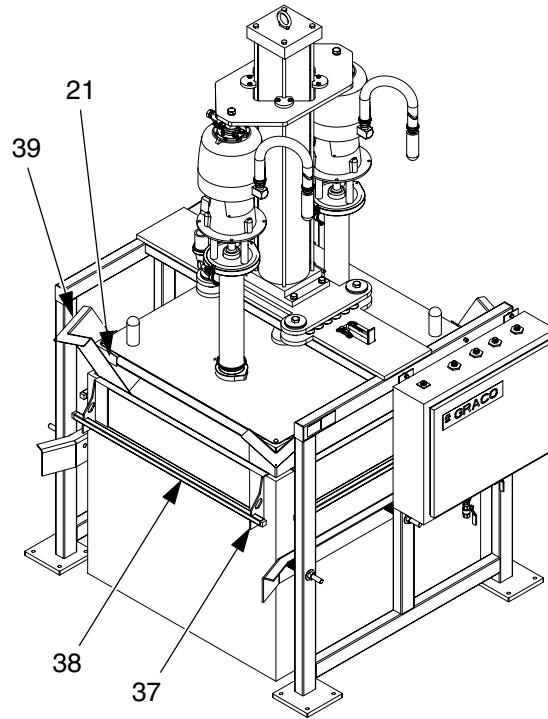


FIG. 10

## Unloading the Bin

When raising and lowering the ram plate, make sure there are no objects obstructing the unit.

1. Follow the **Pressure Relief Procedure**, page 15.
2. Ensure seal is deflated and ram is raised.
3. Unload the bin from the frame.

## System Shutdown

Follow the **Pressure Relief Procedure**, page 15.

Depending on the type of material, it may be best to deflate the seal and raise the ram plate out of the material or keep the ram plate lowered in the bin. Some materials dry and harden when exposed to air. Cover materials when they are not being used.



# Electronic Control System

## Connecting Pneumatic Control Panel Air Lines

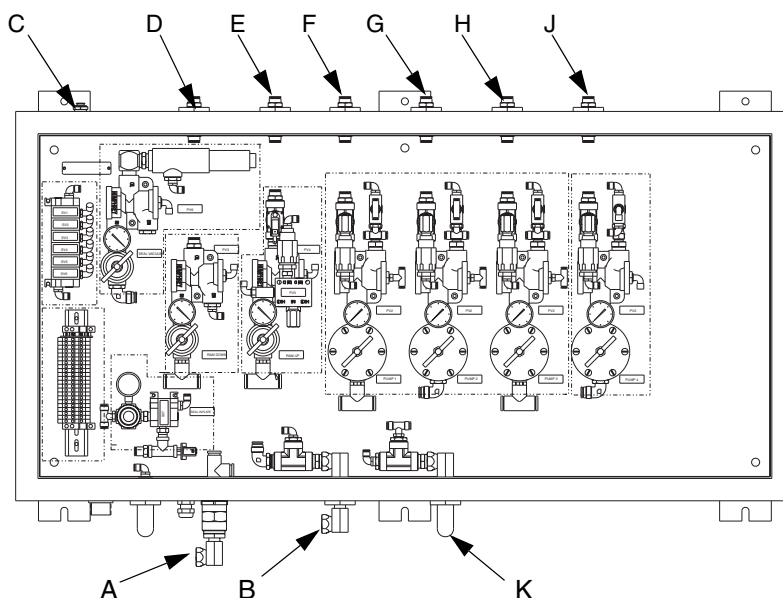
Air supply to panel must be filtered, dry and capable of delivering a minimum of 100 scfm at 100 psi (0.7 MPa, 7 bar). Refer to the table below and the **Pneumatic Diagrams**, pages 54 and 55, to make the top and bottom panel connections.

Ref. Key	Origin	Destination	
	Top Panel Connections	Component Connections	Function
C	Seal Air Supply	Ram Plate Seal	Inflates ram plate seal.
D	Cylinder Upper Air Supply	Upper Port On Air Cylinder	Applies down force on ram plate when RAM PRESS is selected.
E	Cylinder Lower Air Supply	Lower Port On Air Cylinder	Applies up force on ram plate when RAM UP is selected.
F	Pump 1 Air Supply	Pump 1	Supplies air to pump 1.*
G	Pump 2 Air Supply	Pump 2	Supplies air to pump 2.*
H	Pump 3 Air Supply	Pump 3	Supplies air to pump 3.*
J	Pump 4 Air Supply	Pump 4	Supplies air to pump 4.*
	Bottom Panel Connections	Pneumatic Source Connections	
B	Air Controls Air Inlet — 1/2 in. npt(f)	Air Controls Air Supply Line	Supplies air to open and close air valves.
A	Pumps Air Inlet — 1 in. npt(f)	Pumps Air Supply Line	Supplies input air pressure to pumps.
K	Exhaust ( <i>no air line connection is needed</i> )	Air Controls Exhaust Line	Connects to a muffler that expels pressurized air from system when ram plate is raised or seal deflated.

\* Pump air valves open when PUMP SLOW or PUMP FAST (SV1 or SV2) are activated.

### Key:

- A Pumps 1-4 Air Supply
- B Control Box Air Supply
- C Seal Air
- D Ram Down Air
- E Ram Up Air
- F Pump 1 Air
- G Pump 2 Air
- H Pump 3 Air
- J Pump 4 Air
- K Exhaust Muffler



570193\_1

FIG. 11: Air Control Panel (570193, 4 pump shown)

# Installing Electronic Control Panel

## WARNING



Locate the electronic control panel so the operator has an unobstructed view of the BES 300 to avoid starting equipment when other personnel could be injured. Read warnings, page 3.

Mount the electronic control panel in a level, vertical position on a sturdy surface. Make sure there is enough room to open the enclosure door.

Connect 110 VAC (20 amp) power to the POWER IN cable connector. The 110 VAC line must be rigidly piped.

Connect 24 VDC cable between the electronic and pneumatic control panels.

If a flow meter is used, its cable must also be connected to the electronic control panel. Contact the flow meter supplier for installation information.

**Table 1: Flow Meter Wiring Guide**

Pin	Wire	Number	Operation
A	RED	9	LINE
B	BLACK	10	COM
C	BROWN	13	PROX SWITCH
D	BLACK	14	PS1
E	BLUE	23	PS2
F	BLACK	24	SV1
G	WHITE	25	SV2
H	BLACK	26	SV3
I	GREEN	27	SV4
J	BLACK	28	SV5
K	YELLOW	29	SV6
L	BLACK	30	SV7

## Discrete Devices 110 VAC

### Manual Push Buttons

Emergency Stop  
Power

### Manual Selector Switches

Seal Inflate  
Pump Slow  
Pump Fast

### Digital Inputs 24 VDC

Ram Jog  
Ram Up  
Start  
Stop

High Speed Counter . . . .	Flow meter sensor
Ram Low . . . . .	Proximity switch 1
Seal Inflate . . . . .	PSI switch 1

### Standard Functions

Start . . . . .	Initiates pumping cycle*
Stop . . . . .	Activates seal deflate**
Seal Inflate . . . . .	Activates seal deflate*
Seal Deflate . . . . .	Activates seal deflate*
Ram Up. . . . .	Initiates ram up*
Ram Jog . . . . .	Activates ram jog*
Ram Press . . . . .	Initiates ram press*
Pump Slow . . . . .	Activates pumps in slow mode*
Pump Fast. . . . .	Initiates pumps in fast mode*

### Digital Outputs 24 VDC

Pumps 1 and 2 On Slow .	Solenoid 1
Pumps 1 and 2 Fast . . .	Solenoid 2
Ram Press . . . . .	Solenoid 3
Ram Up	Solenoid 4
Ram Jog	Solenoid 5
Seal Off (vacuum pump on). . . . .	Solenoid 6
Seal On. . . . .	Solenoid 7
Optional Remote Output .	Energized during a pump cycle

\* Normally open

\*\* Normally closed

## Part No. 15E582 Electronic Control Panel

Ref. Key	Switch/Button Name	Operation
A	SEAL INFLATE	Press to inflate ram plate seal
B	RAM JOG	Press button to slowly lower ram (by exhausting ram up air pressure). Generally used when guiding ram plate into bin or making system adjustments.
C	RAM UP	Press button to raise ram.
D	RAM PRESS	Press button to lower ram onto material using air pressure.
E	STOP	Press button to stop operation of the pumps, ram and automatic cycle.*
F	PUMP SPEED SWITCH	Turn switch to select the pump speed.
G	MODE SELECTOR SWITCH	Turn switch to select the ram operation mode.
H	EMERGENCY STOP	Press button to immediately shut off air to the system and stop operation.*
J	START	Press button to begin operation.
K	POWER	Press button to enable power to the electronic control panel.

\*The air cylinder will stabilize in its current position.

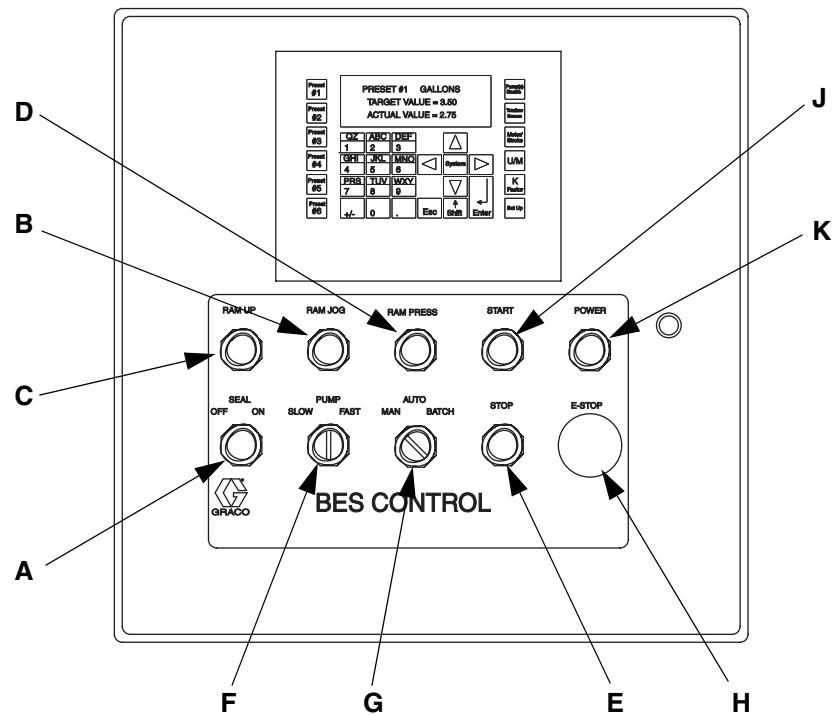


FIG. 12: Part No. 15E582 Electronic Control

## Proximity Switch

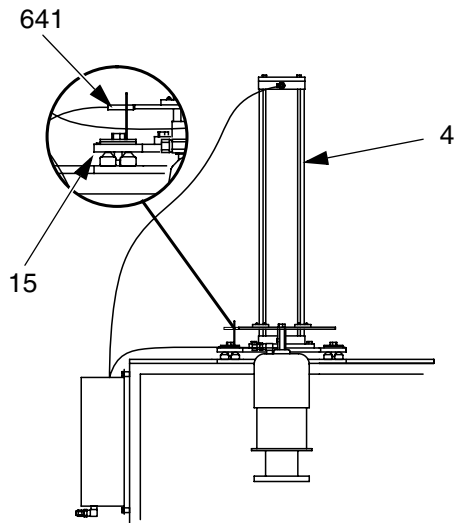
The low limit proximity switch (641) is located near the air cylinder (mounting plate (15) and can be adjusted to operate at different levels in the bin. See FIG. 13.

The pumps operate in fast mode until the ram plate reaches the low limit. The proximity switch changes the pumps to the slow mode operation for a user selected amount of time, after which the pumps stop, the seal deflates, and the ram raises.

The system timer controls how long the pumps run at slow speed at the end of bin evacuation. After the time elapses, the controller stops the pumps, deflates the seal, and raises the ram up.



See **Setting the Bin Empty Timer** and **Setting the Vacuum Pump Timer**, page 22, for additional information on adjusting the proximity switch and system timer.



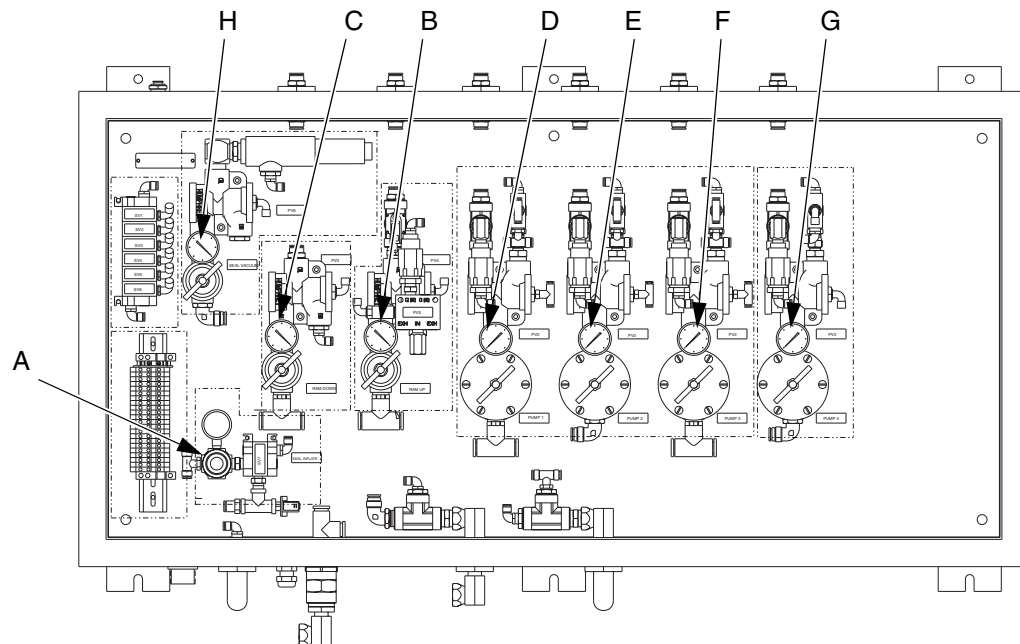
**FIG. 13: Proximity Switch**

## Setting Air Pressures

Each system function has an associated air pressure. Air pressure regulators are located in the pneumatic control bin. Set initial air pressures as shown in the table below. Make adjustments as needed during operation. See FIG. 14.

Ref.	Function	Regulator Setting psi (kPa, bar)
A	SEAL INFLATE	15 (103, 1.0)
B	RAM UP	30 (207, 2.1)
C	RAM DOWN	30 (207, 2.1)
D	PUMP 1	50 (345, 3.4)
E	PUMP 2	50 (345, 3.4)
F	*PUMP 3	50 (345, 3.4)
G	*PUMP 4	50 (345, 3.4)
H	SEAL VACUUM	20 (138, 1.4)

\* Four pump systems only.



570193\_1

FIG. 14: Part No 570193, 4 pump shown

## Pressure Relief Procedure

### WARNING



Read warnings, page 3, and follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve pressure
- stop operation
- check, clean, or service any of the equipment

1. Press the STOP button to turn off the pumps.
2. Shut off the air to the pumps by closing the bleed-type air shutoff valve on the pumps' air supply line, or disconnect the air line.
3. Open all system fluid drain valves that are downstream of the pumps.

## Initial Startup

This procedure takes you through the settings, adjustments and other steps that must be completed before the system is ready for daily operation.



Press STOP button at any time to stop the system. See FIG. 12.

1. **If applicable**, fill all the pumps packing nut/wet cups 1/3 full with a compatible lubricant. Refer to your pump manual for details. Do not use Graco Throat Seal Lubricant with a sanitary application.
2. Press POWER button to turn on power to electronic control panel.
3. Turn SEAL to OFF.
4. Open the air shutoff valves for the pneumatic controls and pumps.
5. Open the pneumatic control panel door. Check for air leaks.
6. The equipment was tested with fluid. Flush the system before loading material. See page 27.
7. Follow **Loading the Bin** procedure, page 25.

## Setting the Pump Slow Timer

The pump slow timer controls the amount of time that the pumps will operate at the slow speed for priming the pumps. This timer will be active when the plate is in the bin, the control is set to AUTO, the seal is inflated and the ram is pressurized down.

1. Press the Timer key to access the timer screens. Continue to toggle the key until the *PUMP SLOW TIMER* screen appears.
2. Press the Enter key to enable numerical entry.
3. Enter the desired set point - Minimum Value: 000, Maximum Value: 999. Example (300 = 30 sec).
4. Press the Enter key a second time to accept the value.

## Setting the Bin Empty Timer

The bin empty timer controls the amount of time the pumps operate at the slow speed for emptying the bin. This timer will be activated when the ram is in AUTO mode and the proximity switch has been tripped.

1. Press the Timer key to access the timer screens. Continue to toggle the key until the *BIN EMPTY TIMER* screen appears.
2. Press the Enter key to enable numerical entry.
3. Enter the desired set point - Minimum Value: 000, Maximum Value: 999. Example (300 = 30 sec).
4. Press the Enter key a second time to accept the value.

## Setting the Vacuum Pump Timer

The vacuum pump timer controls the amount of time the vacuum pump operates to assist the deflation of the seal. This timer will be activated when the ram is in AUTO mode and the proximity switch has been tripped.

1. Press the Timer key to access the timer screens. Continue to toggle the key until the *VACUUM PUMP TIMER* screen appears.
2. Press the Enter key to enable numerical entry.
3. Enter the desired set point - Minimum Value: 000, Maximum Value: 999. Example (300 = 30 sec).
4. Press the Enter key a second time to accept the value.

## Batch Mode Setup

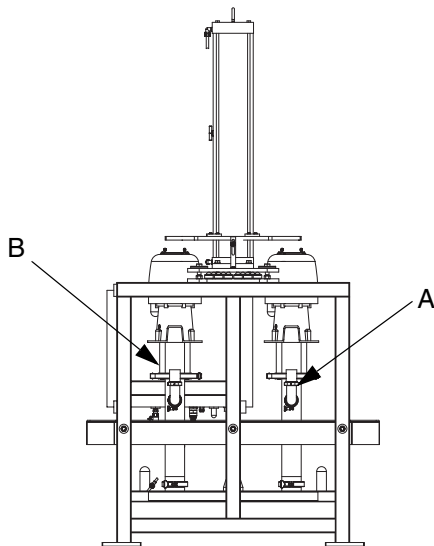
The electrical control cabinet is designed to operate optional batching functions. The batch mode will allow the user to control the operation of the ram unit flow meter output or pump stroke monitors. Additional equipment is required to operate in either of the batch modes. The batch mode is factory set to "BATCHING DISABLED".

1. Press the **Meter/Stroke** key to access the **BATCH INPUT TYPE** screen.
2. Press the **+/-** key to scroll through the batch input types. Three options are available:
  - BATCHING DISABLED
  - FLOW METER ENABLED
  - STROKE COUNT ENABLED

## Flow Meter Batch Control Setup

The ram unit will provide closed loop batch control of the process. This type of control requires a pulse output from a flow meter (i.e. gear, mass flow, etc.).

1. Install the flow meter (A) in the outbound fluid stream.
2. Refer to the electrical schematic for part no. 15E582 on page 56. Install the flow meter input to terminal L1. Power for the meter can be obtained from the power supply terminals:
  - +24Vdc - wire #2040
  - VDC Common - wire #2042



**FIG. 15: Flow Meter and Pump Proximity Sensors**

3. Press the **Meter/Stroke** key to access the **BATCH INPUT TYPE** screen.
4. Press the **+/-** key to scroll through the batch input types until the **FLOW METER ENABLED** screen appears.
5. Set the flow meter K-Factor.
  - a. Press and hold the **K Factor** key for 3 seconds.
  - b. Press the **Enter** key to enable numerical entry.
  - c. Enter the desired set point.
  - d. Minimum Value: 0.000
  - e. Maximum Value: 9.999
  - f. Press the **Enter** key a second time to accept the value.
6. Change the units of Measure.
  - a. Press the **UOM** key.
  - b. Press the **+/-** key to change the units of measure. Available options include OZs, QUARTS, GALLONS, CCs, or LITERS. The desired **UOM** is shown on the batch preset screens.
7. Change Batch target values.
  - a. Press the **Preset #1** key.
  - b. Press the **Enter** key to enable numerical entry.
  - c. Enter the desired set point:
 

Minimum Value: 000000

Maximum Value: 999999
  - d. Press the **Enter** key a second time to accept the value.
  - e. Repeat steps 1 - 4 for additional presets.

## Stroke Count Batch Control Setup

The ram unit will provide closed loop batch control of the process. This type of control requires pump proximity sensors to monitor the cycles of each pump in the system.

1. Mount pump proximity sensors (B) and bracketry onto pump tie rods. See FIG. 15.
2. Refer to the electrical schematic (sheet #2, page 57). Install the pump proximity sensor input(s) to their respective terminals. Power for the devices can be obtained from the power supply terminals:
  - +24Vdc - wire #2040
  - VDC Common - wire #2042

3. Press the **Meter/Stroke** key to access the **BATCH INPUT TYPE** screen.
4. Press the **+/-** key to scroll through the batch input types until the **STROKE COUNT ENABLED** screen appears. The desired UOM is shown on the batch preset screens.
5. Change the Units of Measure.
  - a. Press the **UOM** key.
  - b. Press the **+/-** key to change the units of measure. Available options include OZs, QUARTS, GALLONS, CCs, or LITERS. The desired **UOM** is shown on the batch preset screens.
6. Change Batch target values.
  - a. Press the **Preset #1** key.
  - b. Press the **Enter** key to enable numerical entry.
  - c. Enter the desired set point.  
 Minimum Value: 000000  
 Maximum Value: 999999
  - d. Press the **Enter** key a second time to accept the value.
  - e. Repeat steps 1 - 4 for additional presets.

## Setting Flow Meter K-Factors

The accuracy of the batching mode volume reporting depends on precise adjustment of the K-factor(s). The control unit uses the K-factor(s) to calculate the volume dispensed. If the set value is not correct, the system still delivers accurate and repeatable flow rates; however, the reported value may not be correct.

## Verifying Flow Meter Calibration

Most materials are compressible. Since the flow meter is measuring the material under pressure, the actual volume of material dispensed may vary slightly from the measured volume, due to this compressibility. If the K-factor is not correct, the displayed volume will not be accurate.

Follow this procedure to calibrate the flow meter during initial setup and on a routine basis to check for flow meter wear.

### Method 1 - Using a gram scale

1. Obtain a beaker, 500 cc or larger, and measure the mass of the empty beaker.
2. Manually dispense material into the beaker. Hold the beaker so that the stream of material is submerged in the captured material. This is to minimize air entrapment in the container.
3. Record the volume dispensed on the Run screen and the flow meter K-factor.
4. Calculate the actual volume dispensed.
5. Calculate the new flow meter K-factor.
6. Enter the new K-factor.
7. Repeat the procedure to verify the new K-factor.

### Method 2 - Without using a gram scale, visual measurement

1. Obtain a beaker, 500 cc or larger with measurement increments.
2. Manually dispense material into the beaker. Hold the beaker so that the stream of material is submerged in the captured material. This is to minimize air entrapment in the container.
3. Record the volume dispensed on the Run screen and the flow meter K-factor from the Setup screen.
4. Settle the material into the beaker and view the actual volume dispensed.
5. Calculate the new flow meter K-factor.
6. Enter the new K-factor.
7. Repeat the procedure to verify the new K-factor.

fluid mass (g)


density (g/cc) = measure volume (cc)

K-factor (new) = displayed volume (cc) x K-factor (old)  
 measure volume (cc)

K-factor (new) = displayed volume (cc) x K-factor (old)  
 dispensed volume (cc)



## Standard Operation

 When raising and lowering the ram plate, make sure there are no objects obstructing the unit.

### Loading the Bin

1. Open the air shutoff valves for the air controls and pumps.
2. On the electronic control panel, press the RAM UP button. If the ram does not elevate, increase the ram up air regulator pressure in the pneumatic control panel.
3. Move the bin in front of the frame.
4. Remove the lid from the fluid bin to expose the fluid bag. If present, open the outer plastic bag and pull it up over the sides of the bin, exposing the aseptic inner bag.
5. Secure the bag sides by using clamps (37) and tubes (38). See FIG. 16.

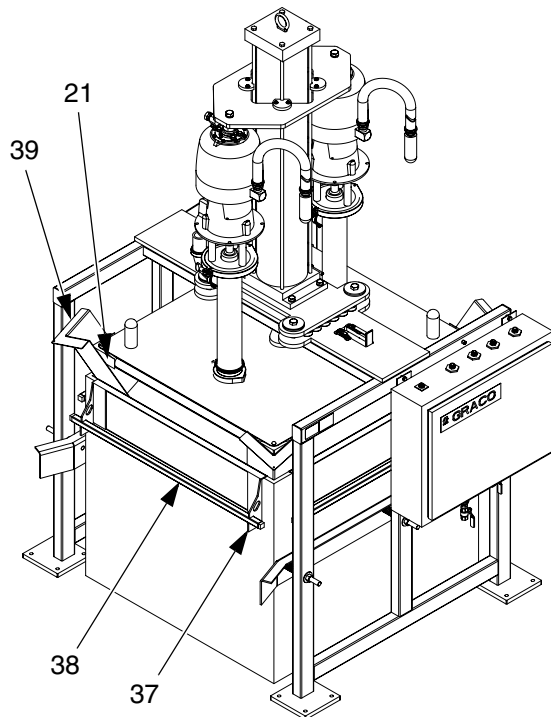



FIG. 16

6. Load the bin of material into the center of the frame.
7. **Initial Startup Only:** The frame has spring-loaded guides to stabilize the bin. Adjust the guides equally

with the screws on all four sides of the bin. Leave enough space between guides and bin to allow for removal of the bin.

8. Make sure the corner seals (21) are in place.
9. Use corners (39) to help guide the plate. See FIG. 16.
10. Press the RAM JOG button.

 It can take 5-15 seconds for the ram plate to start lowering.



### WARNING



When raising or lowering the ram plate, keep hands and body away from ram plate and bin lip. Read warnings, page 3.

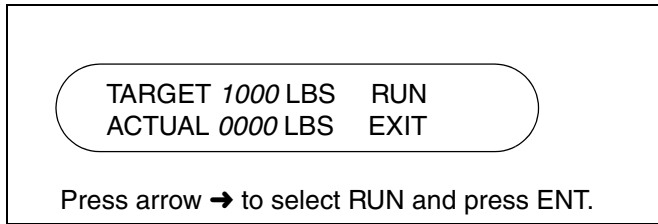
11. Use the ram plate handles to center the ram plate inside the bin. Be careful not to pinch the inflatable seal when it enters the bin.



The ram plate stops when it contacts the material.

## Automatic Evacuation of the Bin

1. On the Operator Interface, select TARGET/ACTUAL RUN screen.



2. Ram plate seal inflates.
3. Ram down air pressure is applied and pumps start in slow mode, then switches to fast mode.
4. When the low limit setting is reached, the pumps switch to slow mode for 2 minutes and then stop.
5. The ram plate seal deflates and the ram is raised.

## Unloading the Bin

1. Follow the **Pressure Relief Procedure**, page 22.
2. Ensure seal is deflated and ram is raised.
3. Unload the bin from the frame.

## System Shutdown

Follow the **Pressure Relief Procedure**, page 22.

Depending on the type of material, it may be best to deflate the seal and raise the ram plate out of the material or keep the ram plate lowered in the bin. Some materials dry and harden when exposed to air. Cover materials when they are not being used.

# Maintenance

## Air Motor Icing

Air motor icing occurs when moisture in the compressed air collects in the air motor and freezes, causing the motor to stall. If icing occurs with any of the pumps, shut off the air supply to all pumps and allow the ice to thaw.

### CAUTION

Operating the system without all the pumps functioning can damage the system.

To minimize icing:

- Reduce the moisture in your compressed air by using an air dryer or filter, which traps water.
- Main air line should slope slightly downward so water collects and can be drained at the end of the line.
- Plumb a drop line from the top of each main air line. Install an automatic drain or drain valve at the bottom of each drop.
- Ensure air motor exhaust tube is outside of a refrigerated area.

## Preventive Maintenance

Your system operating conditions determine how often maintenance is required. Record when and what kind of maintenance is needed to create a maintenance schedule.

## Flushing the System



### WARNING



Read warnings, page 3. Follow **Grounding** instructions, page 12.

- The equipment was tested with water. Flush the system before loading material.

- Flush regularly to avoid having material dry and build up and possibly contaminate new material or cause blockages.
- Flush at the lowest pressure possible. Check connectors for leaks and tighten them if necessary.

To flush the system:

1. Load a bin containing water, compatible solvent, or cleaning solution that can dissolve the material and clean the system. Follow the procedure for **Loading the Bin**, page 16 or page 25.



Use solvent that is compatible with the equipment wetted parts and the material you will dispense. See Technical Data in your pump manual for wetted parts and consult your material supplier.

2. Operate the pumps and circulate the cleaning fluid through the system for about 1-2 minutes or until the equipment is clean.
3. Remove the bin of cleaning fluid from the frame. Follow the procedure for **Unloading the Bin**, page 16 or page 26.
4. Operate the pumps at low pressure to remove excess solvent.
5. Follow the **Pressure Relief Procedure**, page 15 or page 22.

## Cleaning Pumps

1. Follow the **Pressure Relief Procedure**, page 15 or page 22.
2. Remove pumps from plate and frame.
3. See the pump manual for maintenance and service procedures.

## Cleaning Ram Plate and Seal

1. Follow the **Pressure Relief Procedure**, page 15 or page 22. Keep the air supply to the ram open.
2. Raise the ram plate.



### WARNING



Never stand or work under the ram plate without engaging the manual stop. See page 13.

3. Engage the manual stop.
4. Remove the inflatable seal and corner seals from the ram plate.
5. Clean the seals and ram plate with a compatible cleaning fluid.
6. Apply a generous amount of lubricant to the ram plate channel and seals.
7. Install the inflatable seal and corner seals on the ram plate. Position the inflatable seal so that the seal bottom is angled into the ram plate channel.

# Troubleshooting

Problem	Cause	Solution
Ram plate will not raise or lower.	Air pressure to the ram is too low.	Increase RAM UP air pressure.
	Ram plate is stuck in bin.	<ol style="list-style-type: none"> <li>1. Deflate seal. Turn SEAL INFLATE to OFF.</li> <li>2. Switch to RAM UP position. When it is raised, check for obstructions in bin or quality of seal.</li> </ol>
Pump(s) will not operate.	Air pressure to the pump(s) is too low.	Increase PUMP air pressure to a minimum of 30 psi (207 kPa, 2.1 bar). Refer to pump manual.
Pumps will not prime or are cavitating.	Ram plate is not in contact with material.	<ul style="list-style-type: none"> <li>• Check SEAL and RAM DOWN pressures and adjust until you have a quality seal.</li> <li>• Refer to troubleshooting in pump manual.</li> </ul>
	Material bag was sucked into pump.	Shut off air to pumps, deflate seal, and raise ram to clear pump intake.
Premature seal wear.	SEAL and RAM DOWN air pressures are too high.	Adjust SEAL and RAM DOWN air pressures until you have proper seal and pump operation.
Material leaking past seal.	RAM DOWN air pressure is too high.	Reduce RAM DOWN pressure while ensuring pumps are operating properly.
	Container bag is not pulled taut or clamped for smooth bin walls.	Pull bag tight and secure in place.
	Corner seals are not in place.	Install corner seals.
Too much material left in bottom of bin.	Container bag is bunched up at bottom of bin	Reduce seal pressure while ensuring there is still a good seal.

# Service



See FIG. 17. All models do not use the same parts. Refer to parts drawing for your model.

## Before Servicing



### WARNING



Never stand or work under the ram plate without engaging the manual stop. See page 13.



### WARNING



Read warnings, page 3, and follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve pressure
- stop operation
- check, clean, or service any of the equipment

1. Remove the bin from the frame.
2. Follow the **Pressure Relief Procedure**, page 15 or page 22.
3. Lower the ram plate and deflate the seal.
4. Shut off the air supply to the system.

## Replacing Cylinder Bearing (All Models)

### CAUTION

To avoid damaging equipment, replace each bearing individually. Do not remove all four bearings at the same time.

See FIG. 17.

1. Follow the **Before Servicing** procedure, page 30.
2. Remove screws (409) and washers (410), then take cylinder guide bearings (408) off the air motor mounting plate (402).
3. Install cylinder guide bearings (408) on top of the air motor mounting plate (402), using screws (409) and washers (410).
4. Repeat steps 2-3 as needed to replace additional cylinder bearings.
5. Raise and lower the ram plate to check the bearings.



The open arch in the cylinder guide bearings (408) fits around tie rods on the air cylinder (4).

## Replacing Ram Plate Seal or Corner Seals (All Models)

See FIG. 17.

1. Follow the **Before Servicing** procedure, page 30.
2. **If you are only replacing the corner seals (21) and not the ram plate seal (501)**, remove the rivet (22) and replace each corner seal individually. Do not remove all 4 corner seals at the same time or the ram plate seal may move out of place. Be careful not to puncture the ram plate seal. Skip to step 8.
- If you are replacing the ram plate seal (501)**, remove the rivets (22), then remove all 4 corner seals (21). Check the corner seals for damage and replace if necessary.
3. Disconnect the tube fitting (29) from the seal air supply tube (14).
4. Remove the ram plate seal (501), using a blunt-end tool to avoid damaging the seal. Carefully disengage the air stem from the hole in the ram plate (502).
5. Insert the air stem of the new seal (501) into the ram plate (502) hole. To avoid puncturing the new seal, carefully slide the seal in place around the ram plate.
6. Install the four corner seals (21) with rivets (22).
7. Connect the air supply tube (14) to the tube fitting (29).
8. Check operation by inflating and deflating the seal. Check for air leaks. After loading a bin of material into the frame, check whether material leaks around the ram plate and seals.

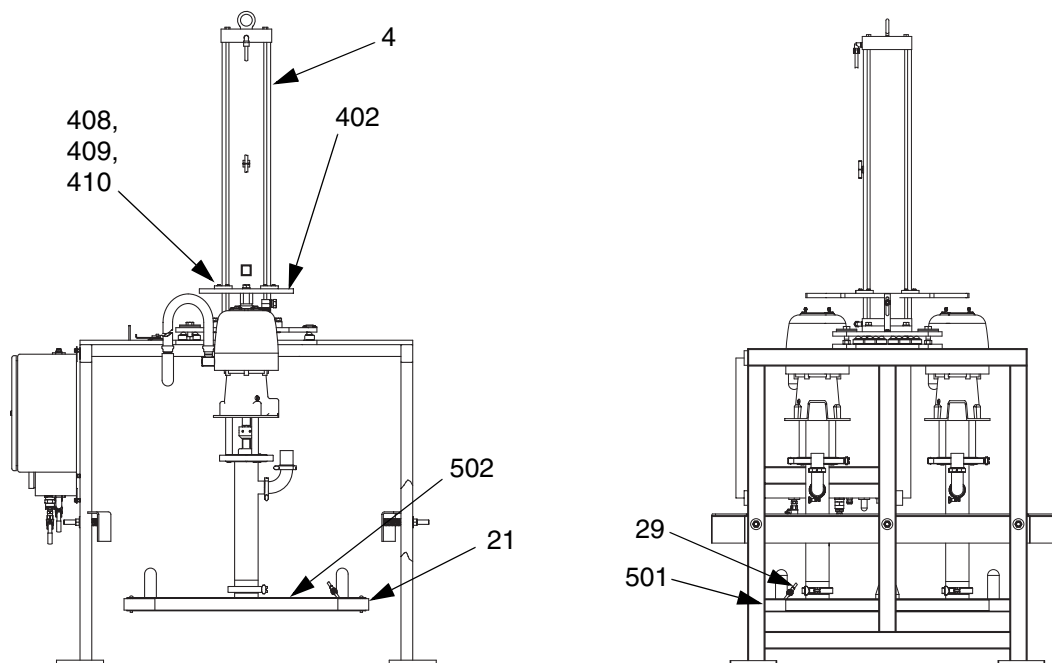



FIG. 17: Repair (BES1P1 Shown)

## Replacing Proximity Switch (Electronic Control Models Only)

See FIG. 18.

1. Follow the **Before Servicing** procedure, page 30.
2. Mark the proximity switch (641) position on its bracket (B) to ensure the new switch is installed the same. Refer to FIG. 18.

 Recommend 1/4 in. (6.35 mm) space between switch and plate (15).

3. Disconnect the cable from the switch (641).
4. Remove the two screws, lock washers, and the switch.
5. Secure the new switch to the bracket (B) with the screws and lock washers.
6. Reconnect the cable.
7. Restart the system and verify the switch operates correctly.

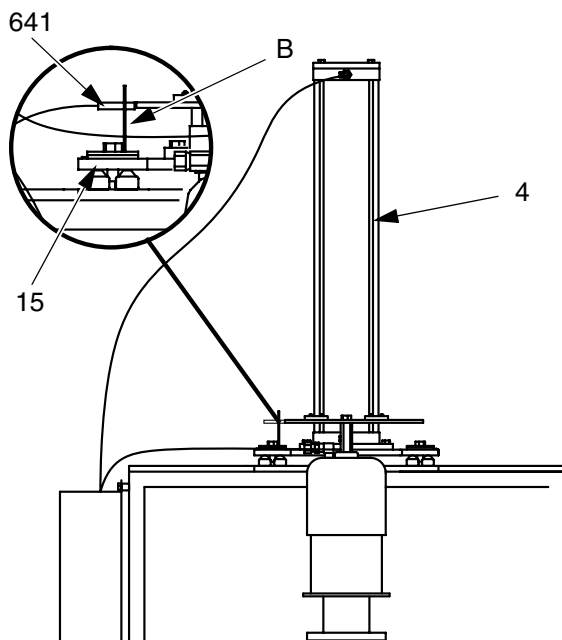


FIG. 18: Proximity Switch

## Electronic Control Panel Service (Electronic Control Models Only)

### WARNING



Read warnings, page 3.

Follow the **Before Servicing** procedure, page 30. Consult a qualified electrician to service the control panel.





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# BES 300 Matrix

To determine the Model No. of your Bin Evacuation System from the following matrix, select the six digits which describe your system, working from left to right. The first three digits are always B E S, designating Bin Evacuation System. The remaining three digits designate pump, plate, and controls used. To order replacement parts, refer to the parts lists on pages 36-52.

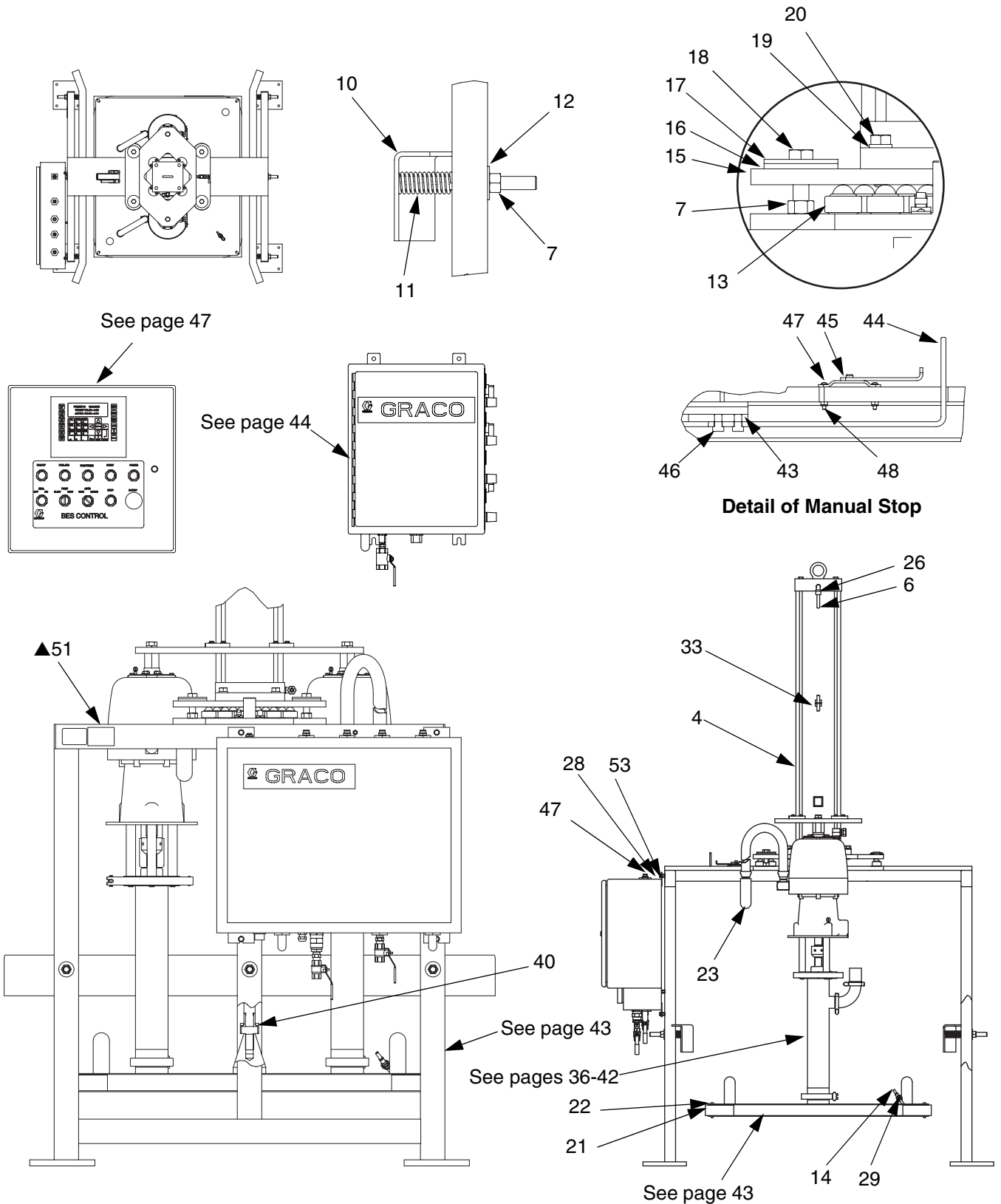
Bin Evacuation System	Pump Module (see pages 36-42)	Plate (see page 43)	Controls/Frame (see pages 43-53)
<b>B E S</b>	<b>1</b> (FT14 Double Ball Sanitary Pump, qty 2)	<b>A</b> (Arena)	<b>1</b> (Electronic Controls, Two Pumps)
	<b>2</b> (FT14 Double Ball Sanitary Pump, qty 4)	<b>P</b> (Plywood)	<b>2</b> (Electronic Controls, Four Pumps)
	<b>3</b> (3150 Ball Check Sanitary Husky Pump, qty 2)	<b>C</b> (Chep)	<b>3</b> (Manual Controls, Two Pumps)
	<b>4</b> (3150 Flapper Check Sanitary Husky Pump, qty 2)	<b>T</b> (TNT)	<b>4</b> (Manual Controls, Four Pumps)
	<b>5</b> (10:1 Sanitary Bulldog Pump, qty 2)	<b>S</b> (Special)	<b>5</b> (Electronic Controls, Carbon Steel Frame, Two Pumps)
	<b>6</b> (10:1 Sanitary Bulldog Pump, qty 4)		
	<b>7</b> (24:1 King Ink Pump, qty 2)		
	<b>8</b> (not used)		
	<b>9</b> (not used)		

## BES 300 Common Parts

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
4	15D492	CYLINDER, air; sst	1	22	551691	RIVET; 3/8 in. x 2-1/2 in.; sst	4
6	590570	TUBE, polyethylene; 1/2 in. (35 ft) OD	*	28	107542	WASHER, lock, spring	4
7	514334	NUT; 3/4-10; Nylock	10	33	C78216	CLAMP, ty-rap	2
8	103473	STRAP, tie, wire (not shown)	12	36	111265	LUBRICANT, tube (not shown)	2
9	103546	STRAP, tie, wire (not shown)	3	37	949412	CLAMP, bag (not shown)	4
10	626520	GUIDE, box side	2	38	625988	TUBE, wand (not shown)	4
11	514819	SPRING, coil; sst	6	39	626046	BIN, corner (not shown)	4
12	514332	WASHER; 3/4 in.; sst; 1.875 in.	6	40	249064	COUPLING	1
13	551274	CASTER; sst; 125#; 1.75 in.	22	43	15G111	SUPPORT, stop	1
14	590385	TUBE, poly-flo (10 ft)	*	44	15G112	HANDLE, stop	1
15	625747	PLATE, mounting, air cylinder	1	45	15G113	LATCH, stop	1
16	625595	BEARING, thrust; PTFE	4	46	15D008	BOLT; 3/8-16; sst	2
17	625596	WASHER, thrust; sst	4	47	15F979	SCREW, pan hd, phillips	7
18	514331	SCREW, cap, hex head	4	48	15F988	NUT, lock, hex	4
19	551363	WASHER, lock; 5/8 in.; sst	4	51▲	C14043	LABEL, warning	1
20	513386	SCREW, cap, hex head	4	53	104034	WASHER	4
21	15F205	SEAL, corner	4				

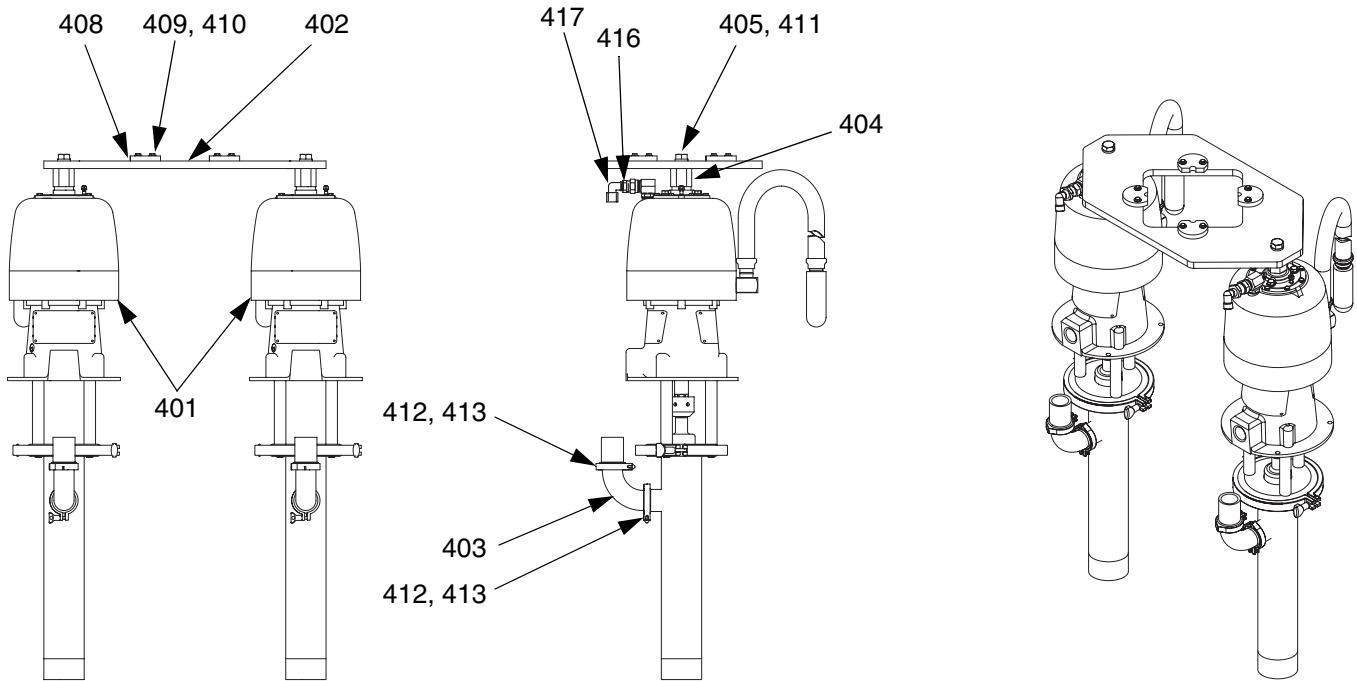
▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

# **BES 300 Common Parts (BES1P1 shown)**



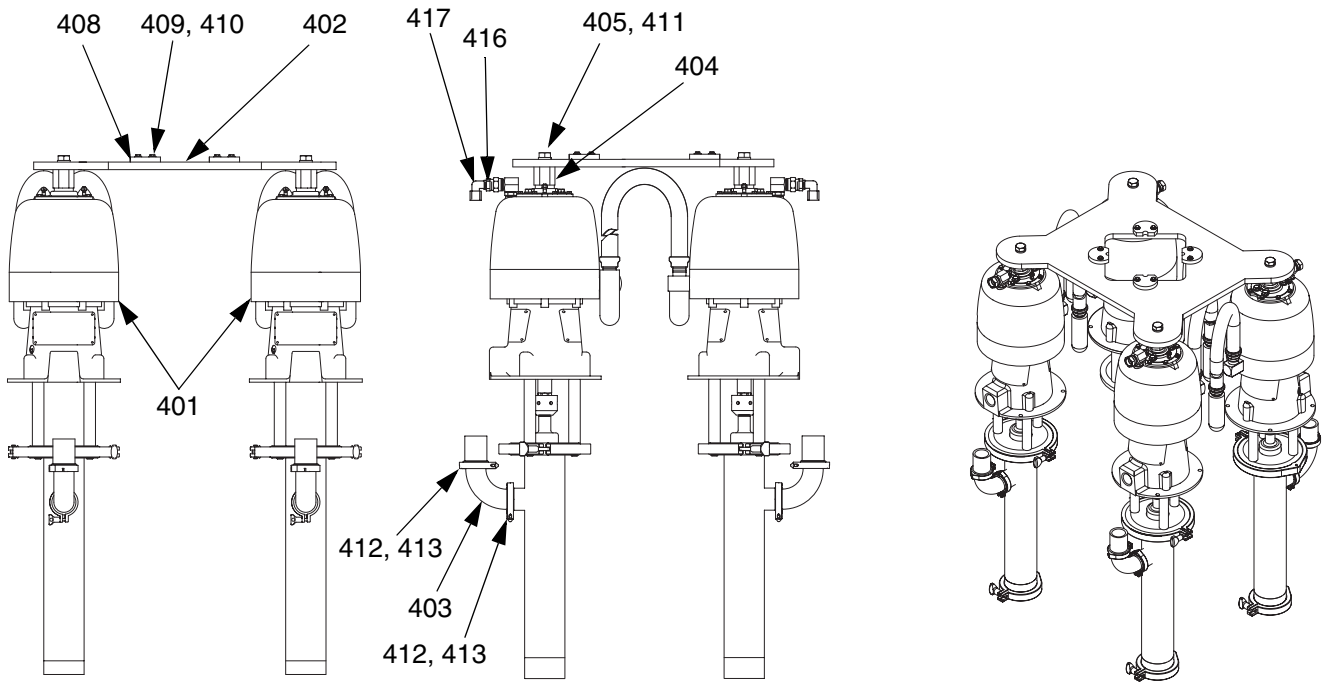
# Pump Modules

## Part No. 249486 FT-14 Sanitary Pump Module (2 Pumps)



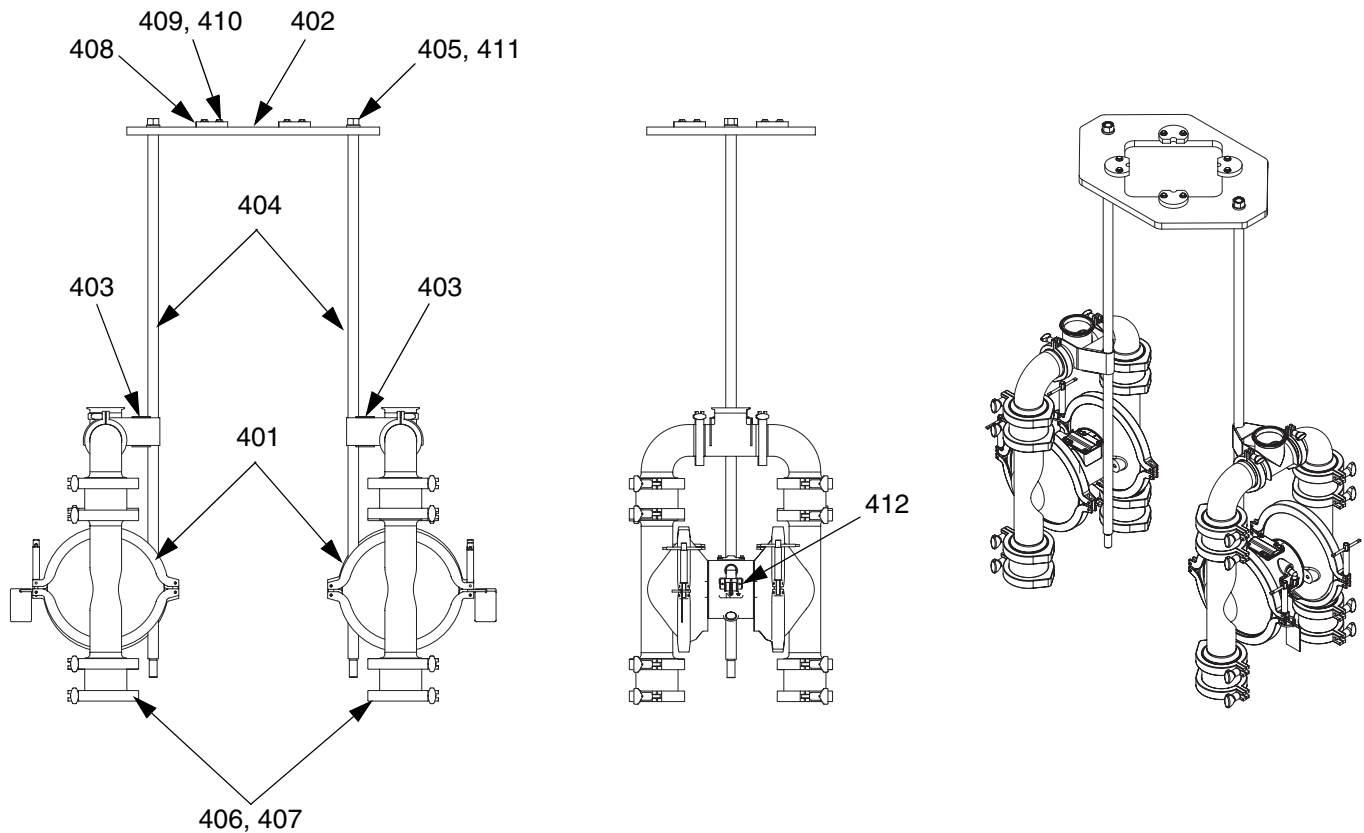
Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
401	949704	PUMP, FT-14 sanitary; see 308076	2	408	625752	BEARING, cylinder guide	4
402	626136	PLATE, motor mount	1	409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
403	513490	ELBOW; 2 in.; sst	2	410	170772	WASHER, plain	8
404	626051	ROD, motor mount	2	411	551364	WASHER, lock; 3/4 in.; sst	2
405	551365	SCREW, hex hd; 3/4-10 x 2 in.	2	412	500984	CLAMP, 2 in. tri-clamp	4
				413	512332	GASKET, S-clamp; buna-N	4
				416	502033	BUSHING, pipe; 1/2 npt(f) x 3/4 npt(m); sst	2
				417	512684	ELBOW; 1/2 npt(m) x 1/2 in. (13 mm) OD tube, nylon	2

Part No. 249487 FT-14 Sanitary Pump Module (4 Pumps)



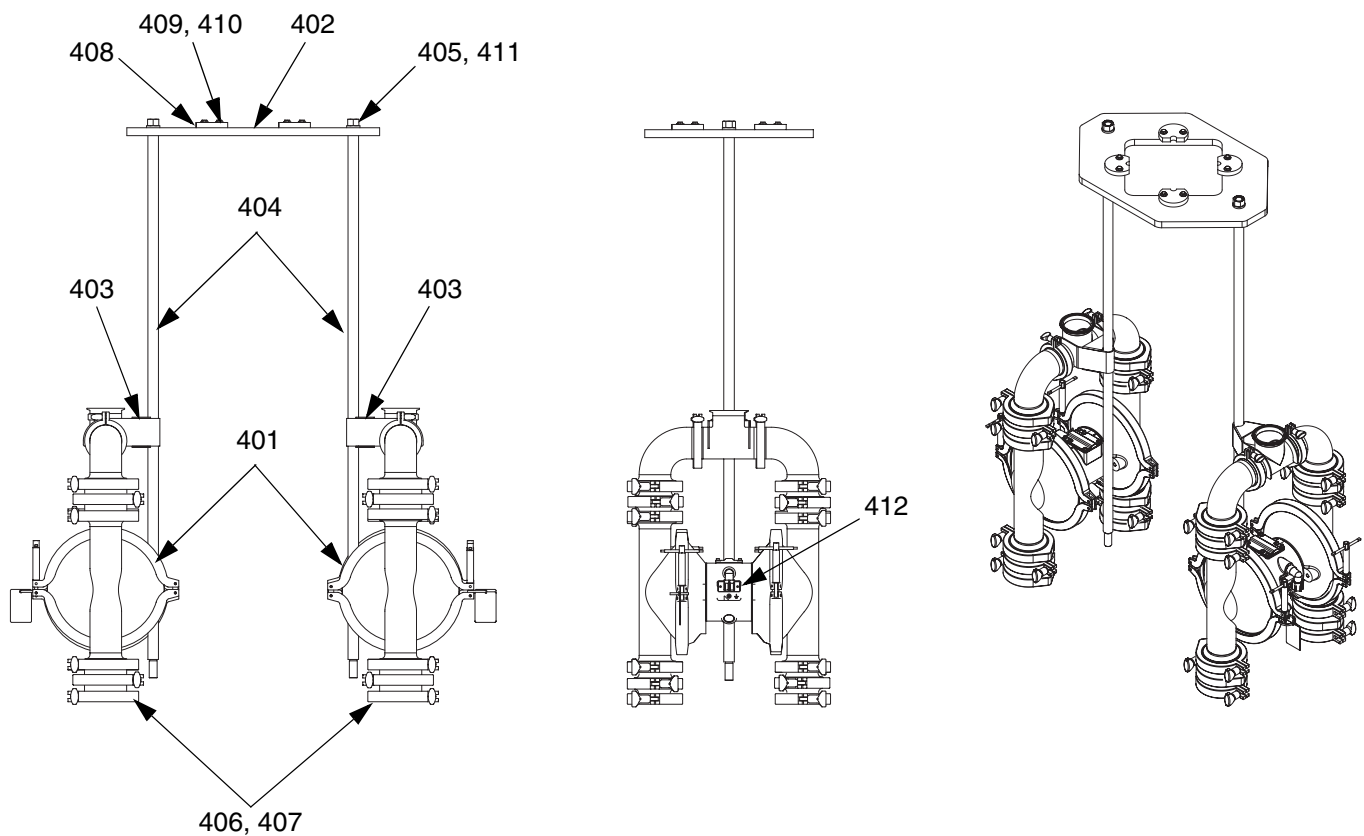
Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
401	949704	PUMP, FT-14 sanitary; see 308076	4	408	625752	BEARING, cylinder guide	4
402	626656	PLATE, motor mount	1	409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
403	513490	ELBOW; 2 in.; sst	4	410	170772	WASHER, plain	8
404	626051	ROD, motor mount	4	411	551364	WASHER, lock; 3/4 in.; sst	4
405	551365	SCREW, hex hd; 3/4-10 x 2 in.	4	412	500984	CLAMP, 2 in. tri-clamp	8
				413	512332	GASKET, S-clamp; buna-N	8
				416	502033	BUSHING, pipe; 1/2 npt(f) x 3/4 npt(m); sst	4
				417	512684	ELBOW; 1/2 npt(m) x 1/2 in. (13 mm) OD tube, nylon	4

## Part No. 249488 3150 Sanitary Husky Ball Check Module (2 Pumps)



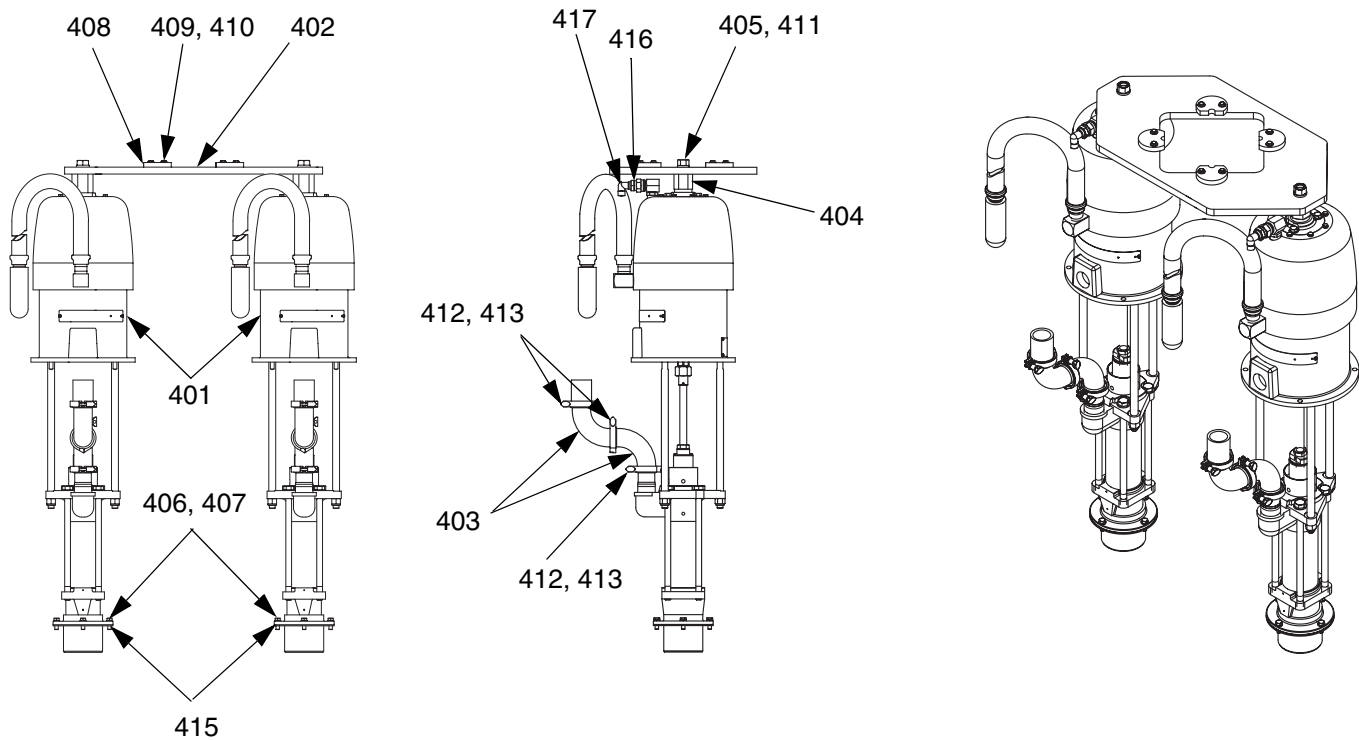
Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
401	248273	PUMP, sanitary Husky, ball check; see 310622	2	408	625752	BEARING, cylinder guide	4
402	15E473	PLATE, guide	1	409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
403	15E477	SUPPORT, pump	2	410	170772	WASHER, plain	8
404	15E472	ROD, tie	2	411	551364	WASHER, lock; 3/4 in.; sst	2
405	514334	NUT, 3/4-10 Nylock	4	412	512684	ELBOW; 1/2-14 npt(m) x 1/2 in. (13 mm) OD; nylon	2
406	510490	TRI-CLAMP, 4 in.	2				
407	513548	GASKET, tri-clamp	2				

Part No. 249489 3150 Sanitary Husky Flapper Check Module  
(2 Pumps)



Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
401	248274	PUMP, sanitary Husky, flapper check; see 310622	2	408	625752	BEARING, cylinder guide	4
402	15E473	PLATE, guide	1	409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
403	15E477	SUPPORT, pump	2	410	170772	WASHER, plain	8
404	15E472	ROD, tie	2	411	551364	WASHER, lock; 3/4 in.; sst	2
405	514334	NUT, 3/4-10 Nylock	4	412	512684	ELBOW; 1/2-14 npt(m) x 1/2 in. (13 mm) OD; nylon	2
406	510490	TRI-CLAMP, 4 in.	2				
407	513548	GASKET, tri-clamp	2				

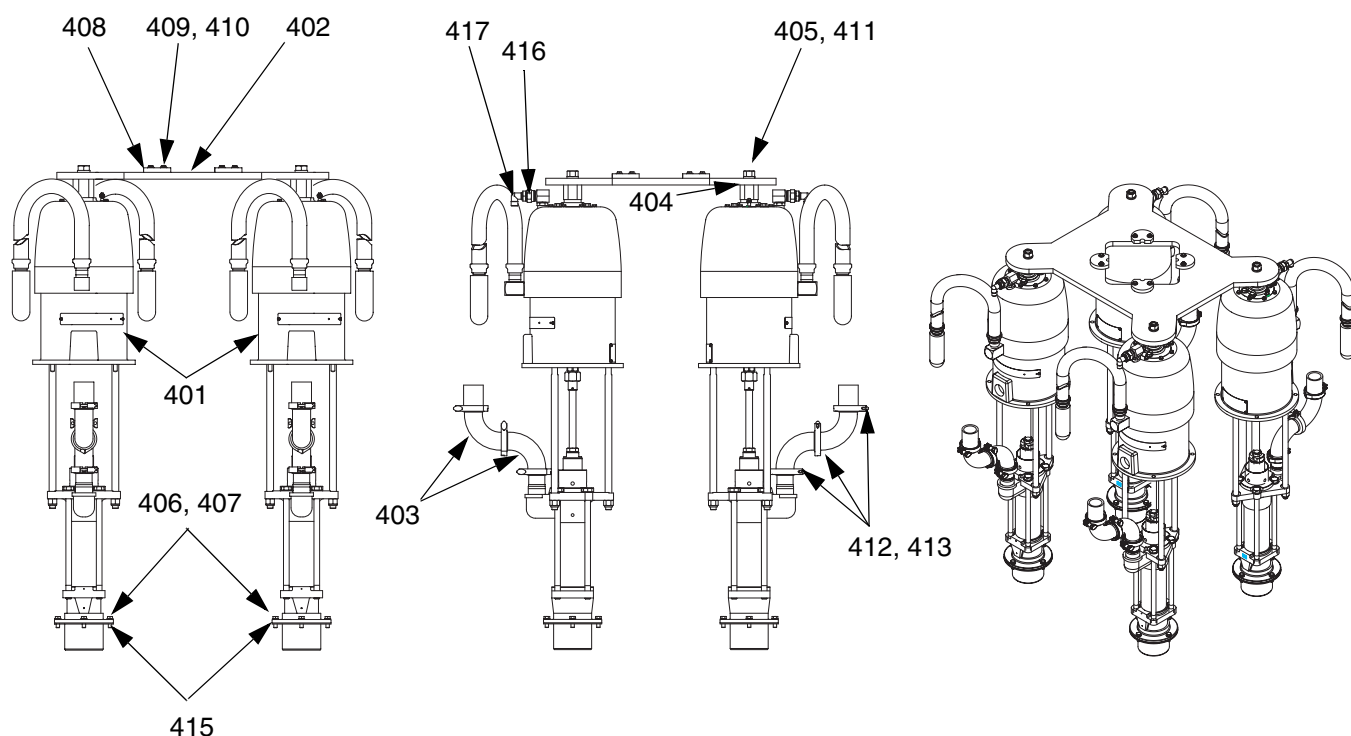
## Part No. 249490 10:1 Sanitary Bulldog Module (2 Pumps)



Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
401	949444	PUMP, Bulldog sanitary; see 306916	2	408	625752	BEARING, cylinder guide	4
402	626136	PLATE, motor mount	1	409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
403	513490	ELBOW; 2 in.; sst	4	410	170772	WASHER, plain	8
404	625903	ROD, motor mount	2	411	551364	WASHER, lock; 3/4 in.; sst	2
405	514334	NUT, 3/4-10 Nylock	2	412	500984	CLAMP, 2 in. tri-clamp	6
406	102471	SCREW, cap hex head	8	413	512332	GASKET, S-clamp; buna-N	6
407	103975	WASHER, lock	8	415	601809	GASKET, sanitary, ram	2
				416	502033	BUSHING, pipe; 1/2 npt(f) x 3/4 npt(m); sst	2
				417	512684	ELBOW; 1/2 npt(m) x 1/2 in. (13 mm) OD tube, nylon	2

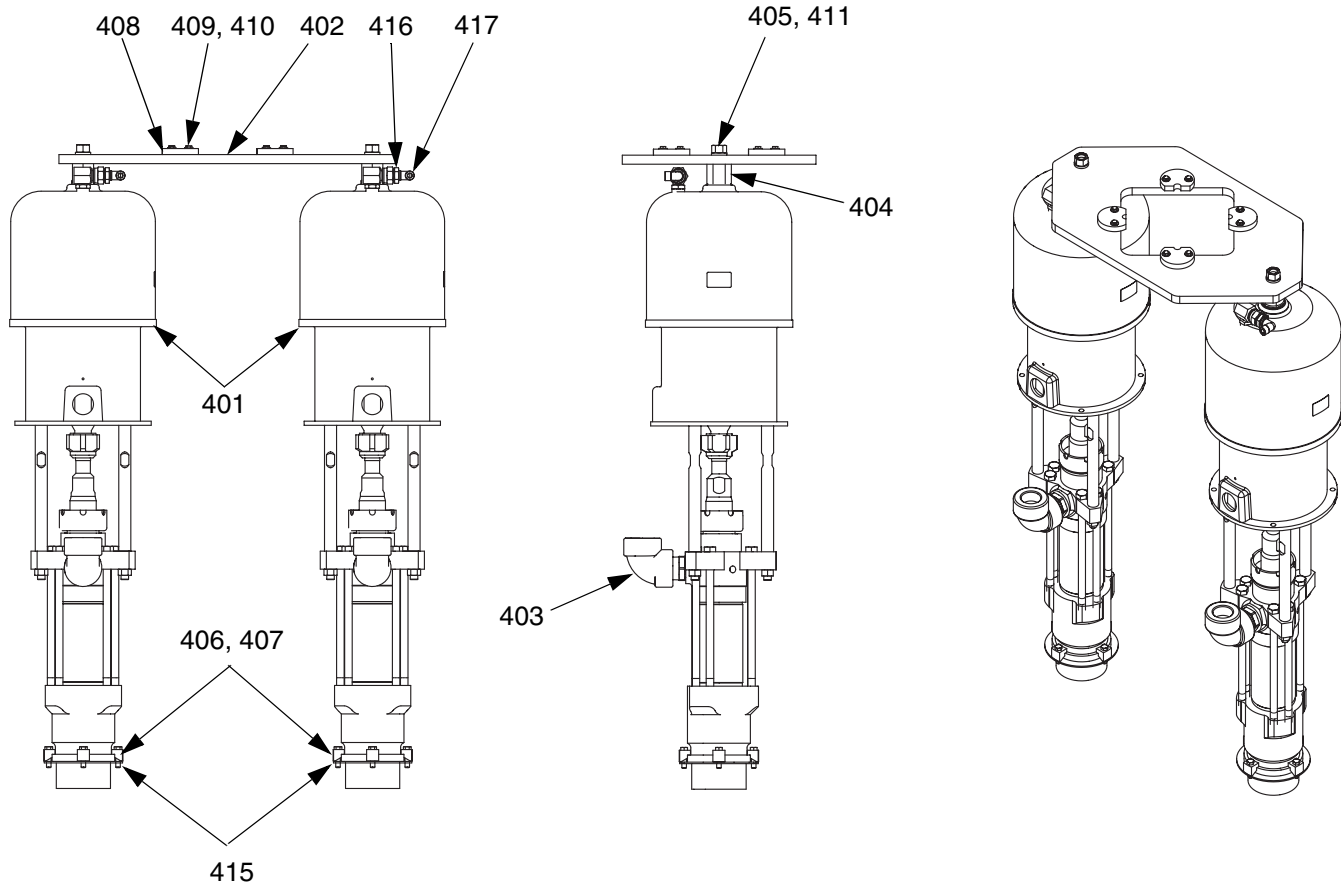


## Part No. 249491 10:1 Sanitary Bulldog Module (4 Pumps)



Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
401	949444	PUMP, Bulldog sanitary; see 306916	2	408	625752	BEARING, cylinder guide	4
402	626656	PLATE, motor mount	1	409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
403	513490	ELBOW; 2 in.; sst	8	410	170772	WASHER, plain	8
404	625903	ROD, motor mount	4	411	551364	WASHER, lock; 3/4 in.; sst	4
405	514334	NUT, 3/4-10 Nylock	4	412	500984	CLAMP, 2 in. tri-clamp	12
406	102471	SCREW, cap hex head	16	413	512332	GASKET, S-clamp; buna-N	12
407	103975	WASHER, lock	16	415	601809	GASKET, sanitary, ram	4
				416	502033	BUSHING, pipe; 1/2 npt(f) x 3/4 npt(m); sst	4
				417	512684	ELBOW; 1/2 npt(m) x 1/2 in. (13 mm) OD tube, nylon	4

## Part No. 249492 24:1 King Ink Pump Module (2 Pumps)



Ref. No.	Part No.	Description
401	246936	PUMP, King 24:1; see 308149
402	626136	PLATE, motor mount
403	115129	ELBOW; 1-1/2 in. npt (fbe)
404	625903	ROD, motor mount
405	514334	NUT, 3/4-10 Nylock
406	102637	SCREW, cap hex head; 3/8-16 x 1-1/2 in.
407	276025	CLAMP

Ref. No.	Part No.	Description	Qty.
408	625752	BEARING, cylinder guide	4
409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
410	170772	WASHER, plain	8
411	551364	WASHER, lock; 3/4 in.; sst	2
415	601809	GASKET, sanitary, ram	2
416	502033	BUSHING, pipe; 1/2 npt(f) x 3/4 npt(m); sst	2
417	512684	ELBOW; 1/2 npt(m) x 1/2 in. (13 mm) OD tube, nylon	2

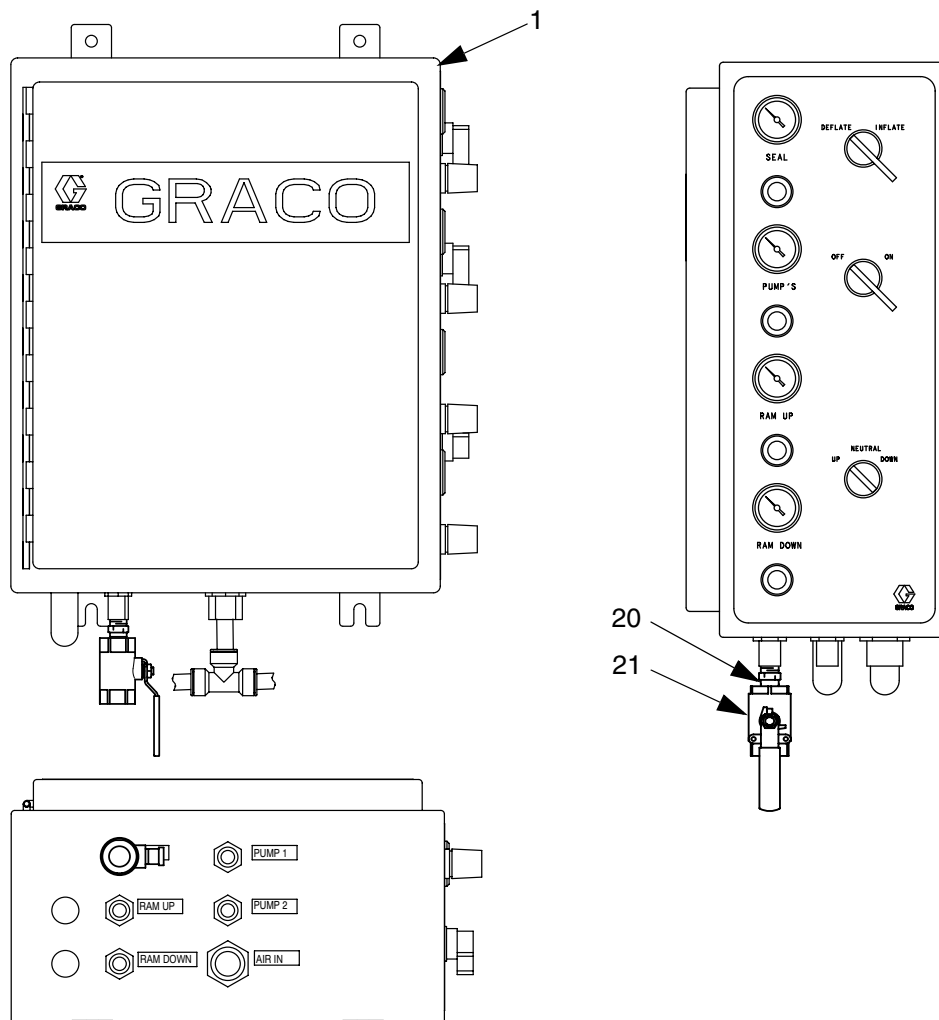
## Plate

Ref. No.	Part No.	Description	Qty.
501	514984	SEAL, inflatable; 49.0 in. ID; BES1P1, BES1P3, BES2P2, BES3P1, BES3P3, and BES4P3	1
	551413	SEAL, inflatable; EPDM; 48.4 in. ID; BES5A1, BES5A3, and BES7A5	1
	116464	SEAL, inflatable; EPDM; 45.2 in. ID; BES6T2 and BES6T4	1
502	949417	PLATE, plywood, two FT-14 Pumps; BES1P1 and BES1P3	1
	15F873	PLATE, plywood, four FT-14 Pumps; BES2P2	1
	15E348	PLATE, plywood, Husky Pump; BES3P1, BES3P3, and BES4P3	1
	949884	PLATE, Arena; BES5A1, BES5A3, and BES7A5	1
	570191	PLATE; TNT; BES6T2 and BES6T4	1

## Controls/Frame

Ref. No.	Part No.	Description	Qty.
602	15E339	FRAME; BES1P1, BES1P3, BES3P1, BES3P3, BES4P3, BES5A1, BES5A3, and BES6T4	1
	570192	FRAME; BES2P2 and BES6T2	1
	949675	FRAME; BES7A5	1
603	949949	PNEUMATIC CONTROL PANEL; BES1P1, BES3P1, BES5A1, and BES7A5; see page 48	1
	15E523	MANUAL CONTROL PANEL; BES1P3, BES3P3, BES4P3, BES5A3, and BES6T4; see page 44	1
	570193	PNEUMATIC CONTROL PANEL; BES2P2 and BES6T2; see page 50	1
624	15E582	ELECTRONIC CONTROL; BES1P1, BES2P2, BES3P1, BES5A1, BES6T2, and BES7A5 only; see page 47	1
631	513226	TEE; BES6T4 only	1
641	249493	PROXIMITY SWITCH; BES1P1, BES2P2, BES3P1, BES5A1, BES6T2, and BES7A5 only	1

## Part No. 15E523 Manual Control

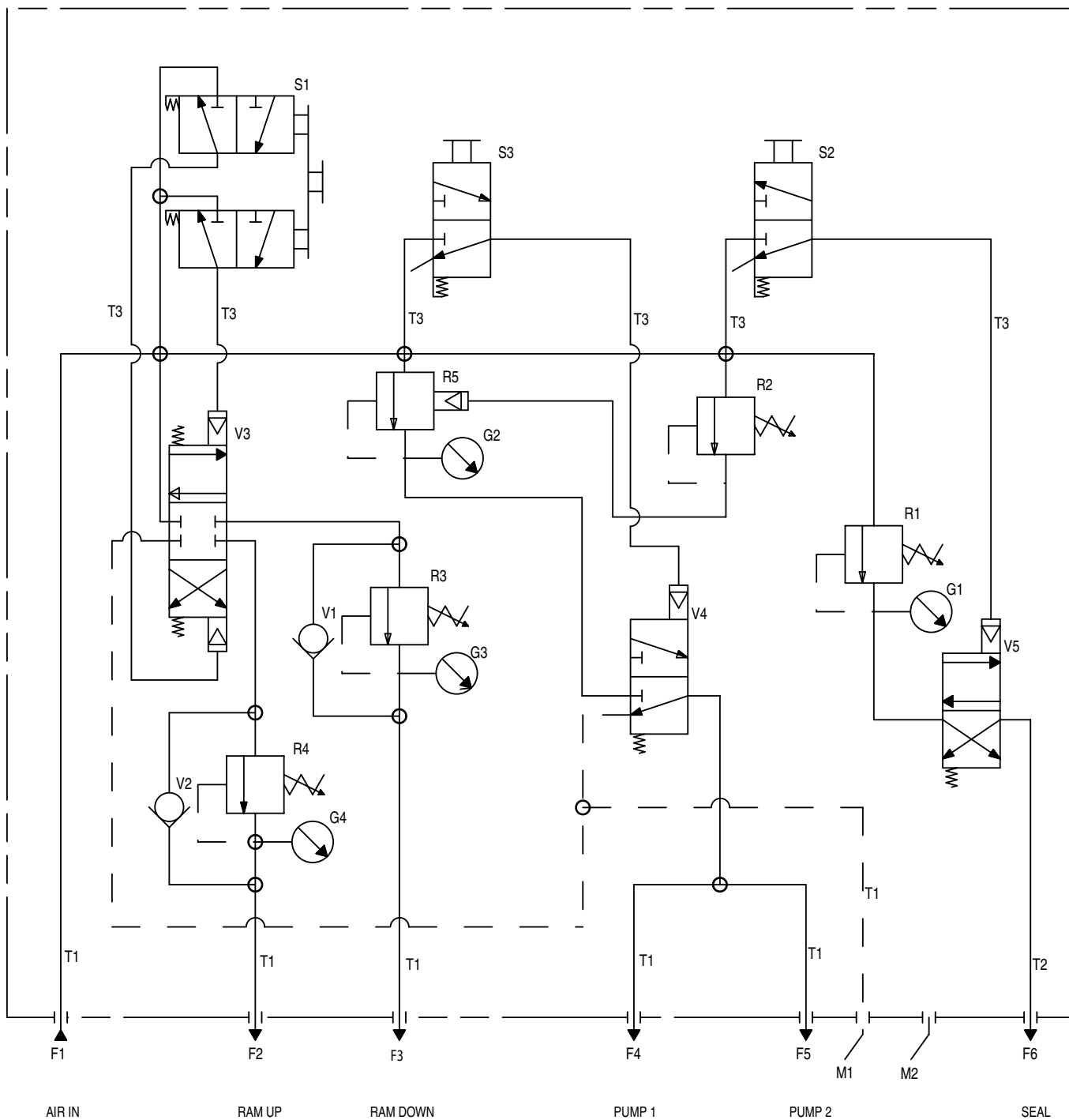


Ref. No.	Part No.	Description	Qty.
1		ENCLOSURE, with back panel	1
3	15E563	LABEL, instructions (not shown)	1
4	512896	REGULATOR (not shown)	4
5		GAUGE, 160 PSI (not shown)	4
6		VALVE, check 3/8 in. (not shown)	2
7		VALVE, air pilot, 3 position (not shown)	1
8		VALVE, air pilot operated (not shown)	1
9		SWITCH, 3 position (not shown)	1
10		REGULATOR (not shown)	1
11		VALVE, air pilot operated (not shown)	1

Ref. No.	Part No.	Description	Qty.
12		SWITCH, pneumatic, 2 position (not shown)	2
13		FITTING, bulkhead, 3/4 in. NPT (not shown)	1
14		FITTING, bulkhead, 3/8 in. tube (not shown)	1
15		FITTING, bulkhead, 1/2 in. tube (not shown)	2
16		MUFFLER, 1/2 in. NPT (not shown)	2
17		TUBE, 1/2 in. O.D. (not shown)	AR
18		TIUBE, 3/8 in. O.D. (not shown)	AR
19		TUBE, 5/32 in. O.D. (not shown)	AR
20		FITTING, nipple, hex	1
21		VALVE, ball; sst	1

# Part No. 15E523 Manual Control, Pneumatic Diagram

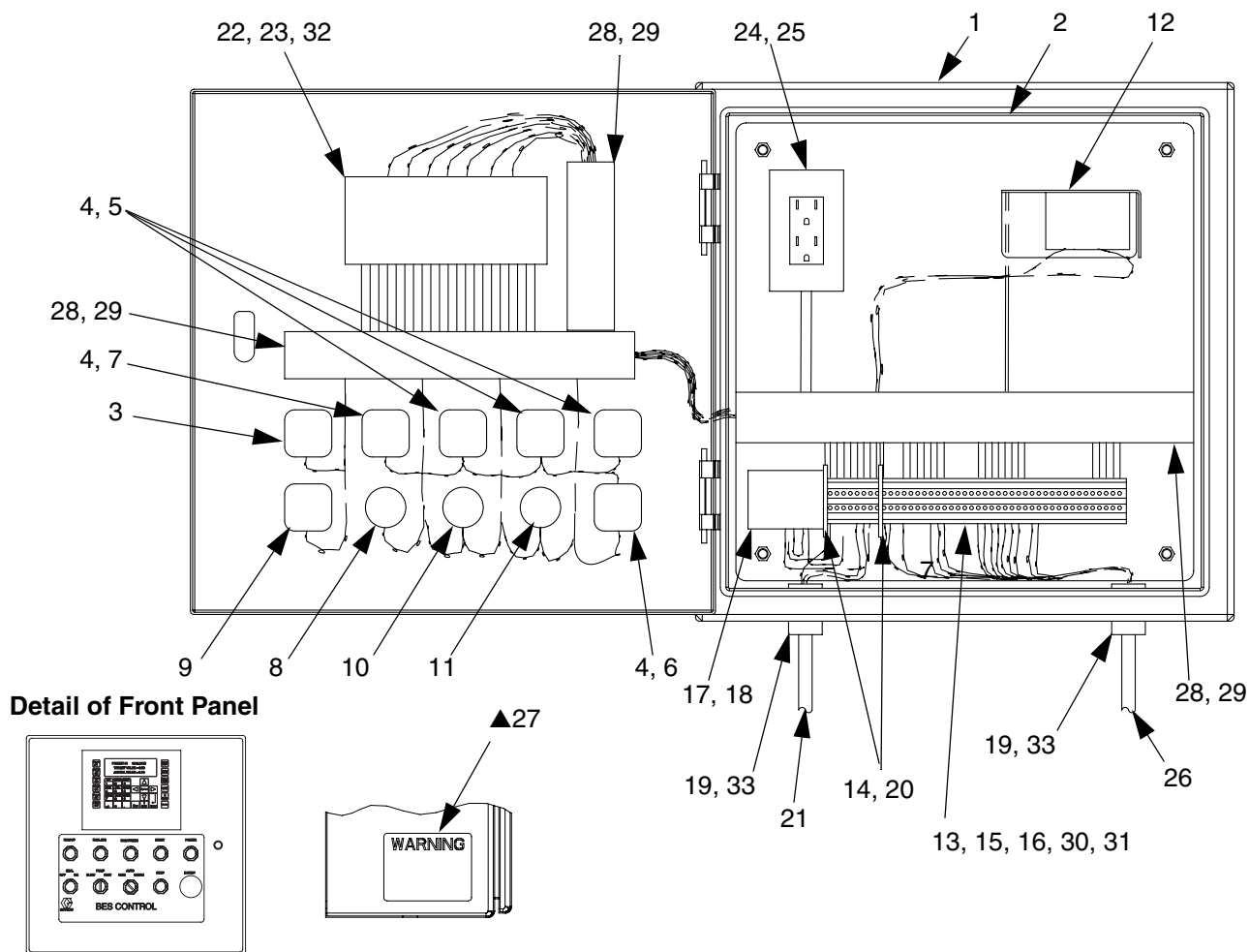
## SCHEMATIC





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## Part No. 15E582 Electronic Control

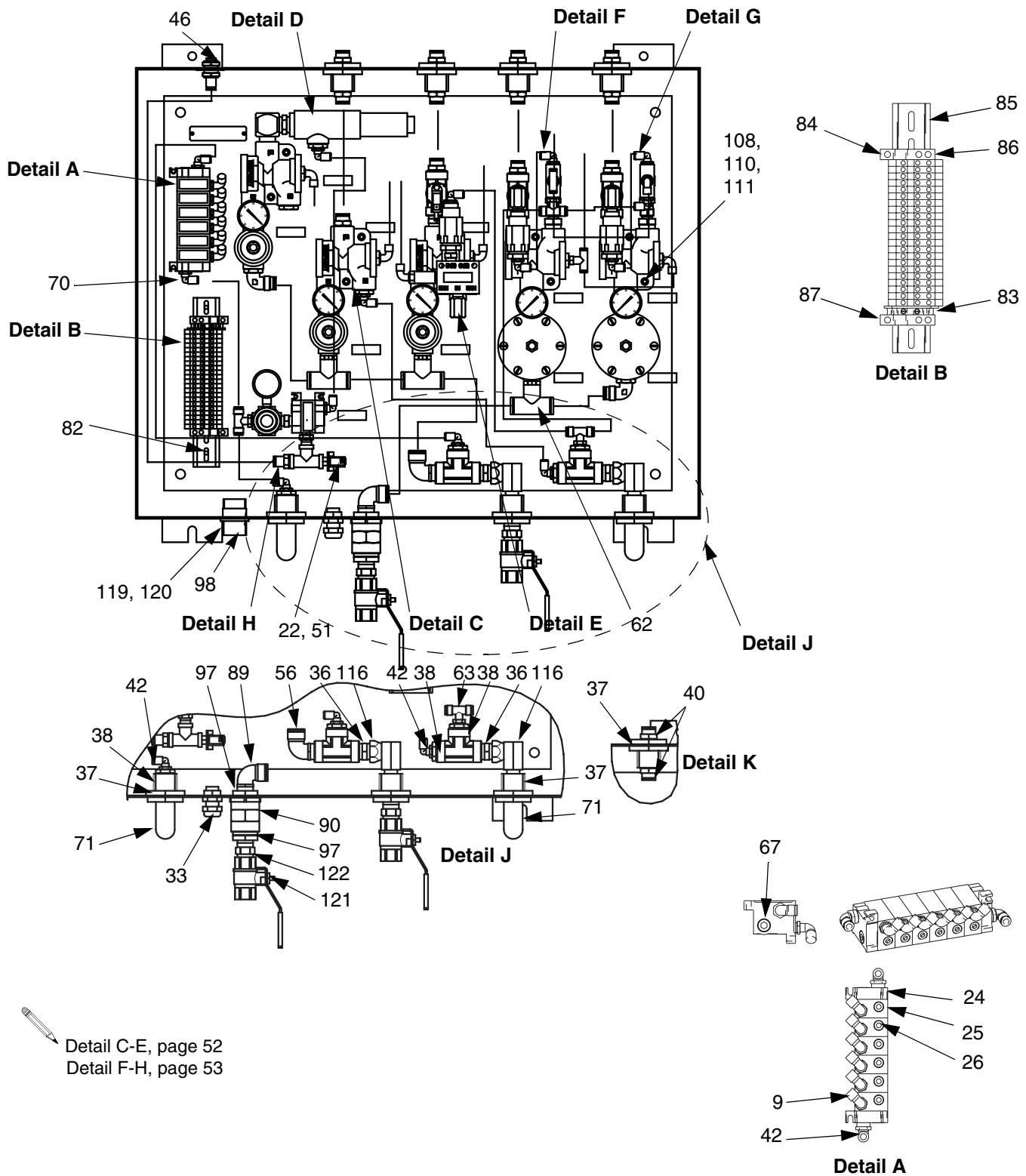


Ref. No.	Part No.	Description	Qty.
1		ENCLOSURE, control	1
2		PANEL, sub	1
3		PUSHBUTTON, lighted, green; 110 Vac	1
4		PUSHBUTTON, lighted, green; 24 Vdc	5
5		CAP, lens, green	3
6		CAP, lens, amber	1
7		CAP, lens, blue	1
8		PUSHBUTTON, red	1
9		PUSHBUTTON	1
10		SWITCH, 3 position	1
11		SWITCH, 3 position	1
12	514539	POWER SUPPLY; 24 Vdc; 2.4 A	1
13		DIN RAIL; 35 mm	1.5 ft
14	514556	TERMINAL, fused; 5 mm x 20 mm	2
15	112445	COVER, end, terminal	2
16	112442	TERMINAL, electrical	50

Ref. No.	Part No.	Description	Qty.
17		RELAY, control; 120 Vac	1
18		BASE, relay, 11 pin	1
19	110515	CORD, grip	2
20		FUSE; 2.5 A; 20 mm	2
21	102518	CORD, electrical	1
22		CONTROL, operator interface	1
23		MODULE, I/O; 8 Vdc in, 8 Vdc out	1
24		RECEPTACLE, electrical	1
25		BOX, duplex, electrical	1
26		CABLE, multi-conductor, shielded	50
27▲	198705	LABEL, warning	1
28		DUCT, wire	4 ft
29		COVER, duct, wire	4 ft
30	112443	TERMINAL, electrical, ground	1
31	112446	CLAMP, end, terminal, electrical	2
32		MODULE, I/O; 16 Vdc in, 12 Vdc out	1
33		CONNECTOR, 14 pin	2

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

# Part No. 949949, 2 Pump Pneumatic Control Panel



Detail C-E, page 52  
Detail F-H, page 53

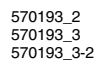
949949\_2



## Part No. 949949, 2 Pump Pneumatic Control Panel

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
9	598140	FITTING, elbow; 5/32 in. tube x 1/8 npt(m)	8	66	501014	ACTUATOR, air; 1/8 npt	3
10	598095	TUBE, nylon; 5/32 in. OD	*	67	100721	PLUG, pipe; 1/4 nptf	11
11	590385	TUBE, poly-flo; 3/8 in. OD	*	68	156823	UNION, swivel; 1/4 npt	2
22	514019	CONNECTOR, terminal	4	69	598141	FITTING, tee, air; 5/32 x 1/8 npt	2
24	514711	KIT, end plate	2	70	103831	SCREW; 10-32 UNF	4
25	514676	VALVE, air; 24 VDC; 4-way stack	7	71	512912	MUFFLER, polyethylene	2
26	104765	PLUG, pipe	7	72	158683	ELBOW, 90°; 1/2 x 1/2 npt	1
27	513937	SWITCH, pressure	2	73	551143	PUMP, vacuum	1
28	110318	REGULATOR, air; 1/4 npt	1	74	100737	PLUG, pipe; 1/2 nptf	1
29	110319	GAUGE, air pressure; 1/8 npt	1	76	156971	NIPPLE, short	1
30	104267	REGULATOR, air; 0-125 psi	3	77	590570	TUBE, polyethylene; 1/2 in. OD	*
31	108190	GAUGE, air pressure	5	78	590332	TUBE, poly-flo; 1/4 OD	*
32	503080	VALVE, air flow control	3	79	104984	PIPE, tee; 1/4 nptf	1
33	513795	CONNECTOR, cord	1	80	598447	FITTING, tube; 3/8 in. tube x 1/4 npt	1
34	103475	TEE, pipe; 1/2 nptf	5	81	206197	REGULATOR, air; 0-125 psi	2
35	172124	NIPPLE, regulator; 3/8 x 1/2 npt	5	82	106389	SCREW; 10-32 UNF	2
36	158491	FITTING, nipple; 1/2 npt	6	83	112445	COVER, end terminal	1
37	512905	FITTING, bulkhead; 1/2 npt	7	84	112446	BLOCK, clamp end	2
38	100206	BUSHING, pipe; 1/2 x 1/4 npt	7	85	514014	RAIL, mounting	1
39	100730	BUSHING; 3/8 x 1/8 npt	5	86	112444	BLOCK, terminal, 2 conductor	22
40	114111	FITTING, connector; 1/2 in. tube x 1/2 nptf	12	87	112443	BLOCK, terminal, ground	1
42	C19391	FITTING, elbow; 1/4 in. tube x 1/4 nptm	14	88	105430	NUT, seal	1
46	598449	BULKHEAD, union	1	90	166629	COUPLING	1
51	513420	WIRE, 18 AWG; blue	*	92	214956	HOSE, air; 3/4 npt; 2 ft (0.61 m)	2
52	626399	ENCLOSURE	1	94	158586	FITTING, bushing; 3/4 x 1 in. npt	1
55	104632	VALVE, piloted	5	97	100380	BUSHING, pipe	2
56	114110	FITTING, elbow, swivel; 1/2 in. tube x 1/2 nptf	4	98	513884	SOCKET, 14-contact	1
59	162449	FITTING, reducing nipple	5	108	105171	SCREW; 1/4-20 UNC-2A	10
60	155541	UNION, swivel, 90°; 1/4 npt x 1/4 npsm	3	110	100527	WASHER	10
61	100840	ELBOW, street; 1/4 npt(m) x 1/4 npt(f)	1	111	626141	SPACER, pilot valve	10
62	599248	FITTING, tee; 1/2 in. tube x 1/2 nptm	3	112	100030	BUSHING; 1/8 x 1/4 npt	2
63	599246	FITTING, tee; 1/4 in. tube x 1/4 npt	3	115	151519	NIPPLE, reducing; 1/8 x 1/4 npt	1
65	510220	VALVE, air, 4-way; 1/4 npt	3	116	155470	UNION, swivel, 90°; 1/2 npt x 1/2 npsm	2
				117	100055	SCREW, drive; #6	2
				119	514023	SCREW; 4-40 UNC	4
				120	514024	NUT; 4-40 UNC	4
				121	512484	VALVE, ball; sst	2
				122	114572	FITTING, nipple, hex	2

\* Bulk tubing/wire

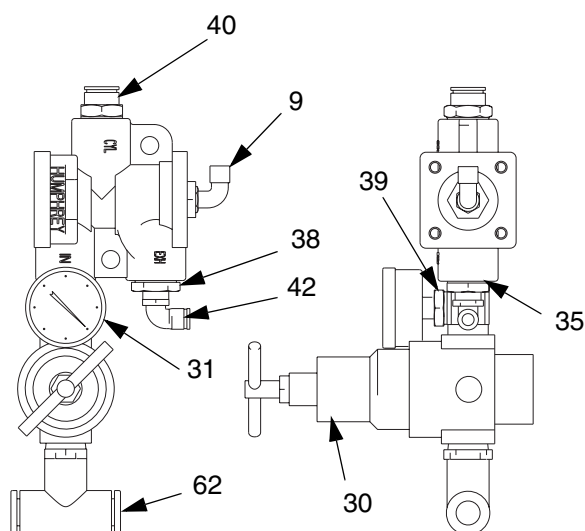


## Part No. 570193, 4 Pump Pneumatic Control Panel

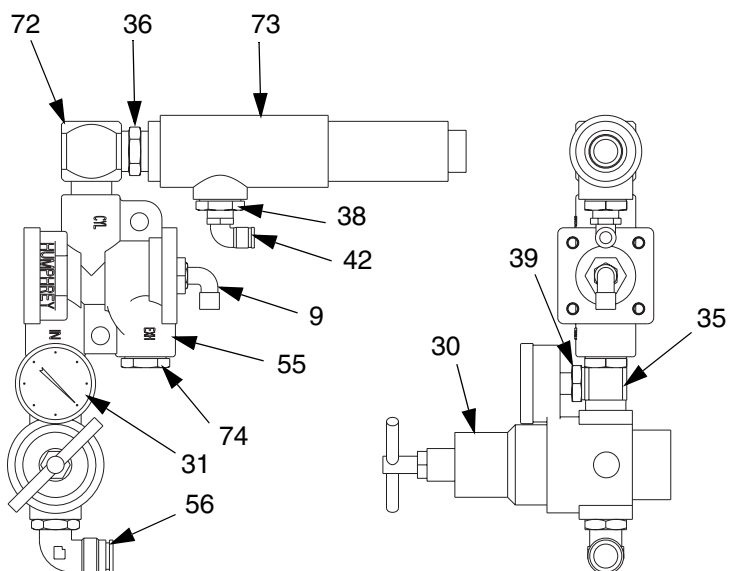
Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
9	598140	FITTING, elbow; 5/32 in. tube x 1/8 npt(m)	12	65	510220	VALVE, air, 4-way; 1/4 npt	5
10	598095	TUBE, nylon; 5/32 in. OD	*	66	501014	ACTUATOR, air; 1/8 npt	5
11	590385	TUBE, poly-flo; 3/8 in. OD	*	67	100721	PLUG, pipe; 1/4 nptf	15
22	514019	CONNECTOR, terminal	4	68	156823	UNION, swivel; 1/4 npt	5
24	514711	KIT, end plate	2	69	598141	FITTING, tee, air; 5/32 x 1/8 npt	6
25	514676	VALVE, air; 24 VDC; 4-way stack	7	70	103831	SCREW; 10-32 UNF	4
26	104765	PLUG, pipe	7	71	512912	MUFFLER, polyethylene	2
27	513937	SWITCH, pressure	2	72	158683	ELBOW, 90°; 1/2 x 1/2 npt	1
28	110318	REGULATOR, air; 1/4 npt	1	73	551143	PUMP, vacuum	1
29	110319	GAUGE, air pressure; 1/8 npt	1	74	100737	PLUG, pipe; 1/2 nptf	1
30	104267	REGULATOR, air; 0-125 psi	3	76	156971	NIPPLE, short	2
31	108190	GAUGE, air pressure	7	77	590570	TUBE, polyethylene; 1/2 in. OD	*
32	503080	VALVE, air flow control	5	78	590332	TUBE, poly-flo; 1/4 OD	*
33	513795	CONNECTOR, cord	1	79	104984	PIPE, tee; 1/4 nptf	1
34	103475	TEE, pipe; 1/2 nptf	7	80	598447	FITTING, tube; 3/8 in. tube x 1/4 npt	1
35	172124	NIPPLE, regulator; 3/8 x 1/2 npt	7	81	206197	REGULATOR, air; 0-125 psi	4
36	158491	FITTING, nipple; 1/2 npt	8	85	514014	RAIL, mounting	1
37	512905	FITTING, bulkhead; 1/2 npt	9	86	112444	BLOCK, terminal, 2 conductor	22
38	100206	BUSHING, pipe; 1/2 x 1/4 npt	7	87	112443	BLOCK, terminal, ground	1
39	100730	BUSHING; 3/8 x 1/8 npt	7	88	105430	NUT, seal	1
40	114111	FITTING, connector; 1/2 in. tube x 1/2 nptf	18	89	551966	FITTING, tee; 1/2 tube x 1/2 npt	1
42	C19391	FITTING, elbow; 1/4 in. tube x 1/4 nptm	18	90	166629	COUPLING	1
46	598449	BULKHEAD, union	1	92	214956	HOSE, air; 3/4 npt; 2 ft (0.61 m)	2
51	513420	WIRE, 18 AWG; blue	*	93	160327	UNION, adapter, 90°; 3/4 npsm x 3/4 nptf	1
52	626658	ENCLOSURE	1	94	158586	FITTING, bushing; 3/4 x 1 in. npt	1
55	104632	VALVE, piloted	7	97	100380	BUSHING, pipe	2
56	114110	FITTING, elbow, swivel; 1/2 in. tube x 1/2 nptf	4	98	513884	SOCKET, 14-contact	1
59	162449	FITTING, reducing nipple	9	108	105171	SCREW; 1/4-20 UNC-2A	14
60	155541	UNION, swivel, 90°; 1/4 npt x 1/4 npsm	5	110	100527	WASHER	14
61	100840	ELBOW, street; 1/4 npt(m) x 1/4 npt(f)	1	111	626141	SPACER, pilot valve	14
62	599248	FITTING, tee; 1/2 in. tube x 1/2 nptm	4	112	100030	BUSHING; 1/8 x 1/4 npt	2
63	599246	FITTING, tee; 1/4 in. tube x 1/4 npt	5	115	151519	NIPPLE, reducing; 1/8 x 1/4 npt	1
				116	155470	UNION, swivel, 90°; 1/2 npt x 1/2 npsm	2
				119	514023	SCREW; 4-40 UNC	4
				120	514024	NUT; 4-40 UNC	4
				121	512484	VALVE, ball; sst	2
				122	114572	FITTING, nipple, hex	2

\* Bulk tubing/wire

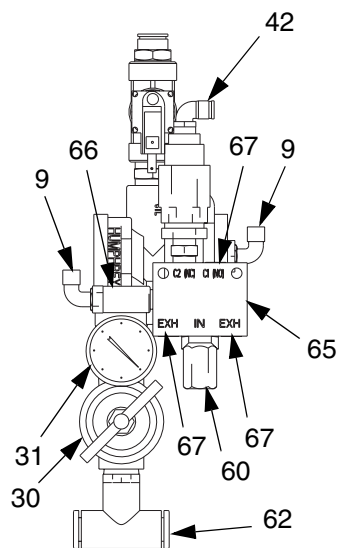
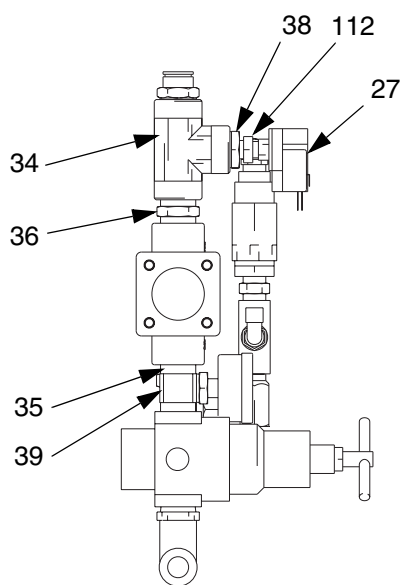
# Common Parts for 570193 and 949949 Pneumatic Control Panels



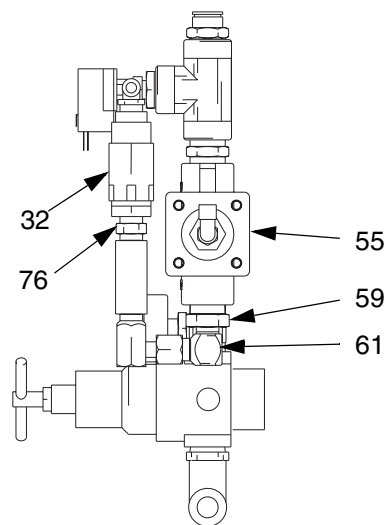
Detail C



Detail D

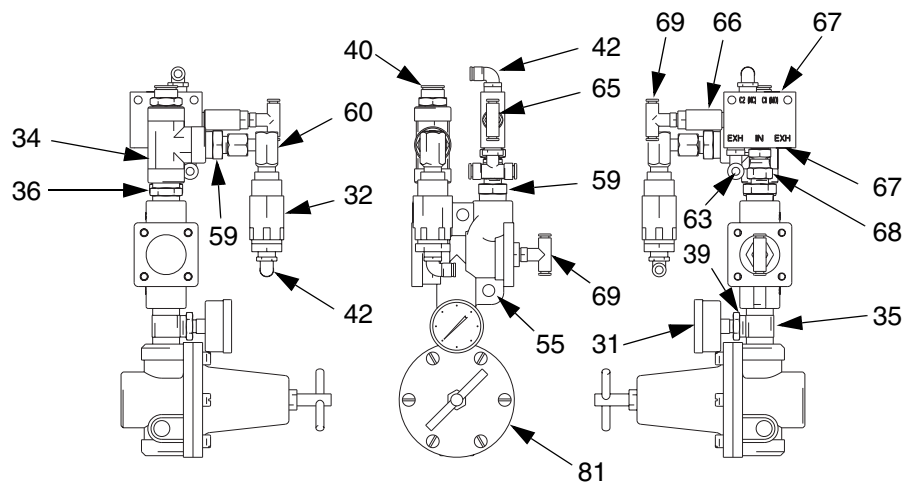


Detail E

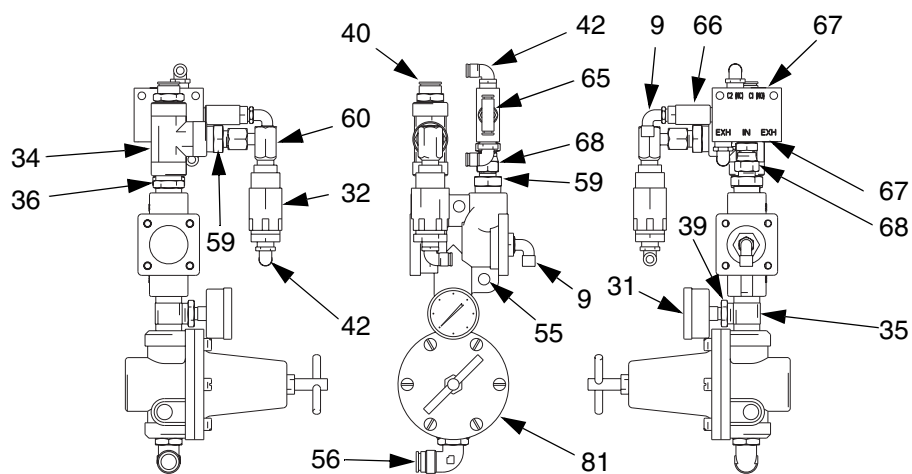


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570193\_4-2  
570193\_5

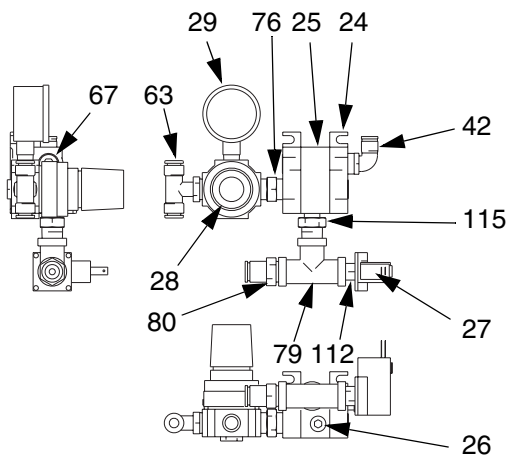
# Common Parts for 570193 and 949949 Pneumatic Control Panels



Detail F



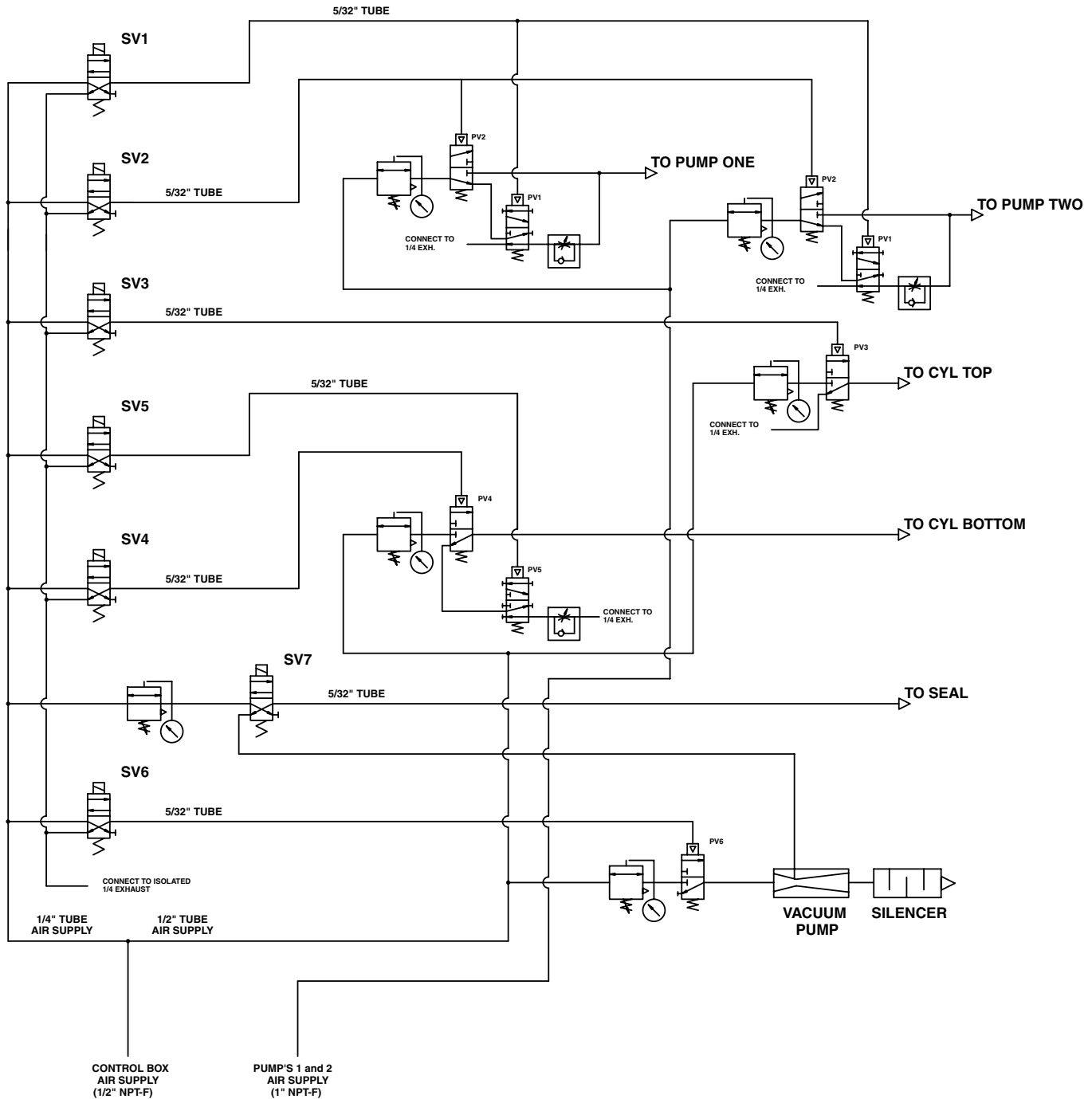
Detail G



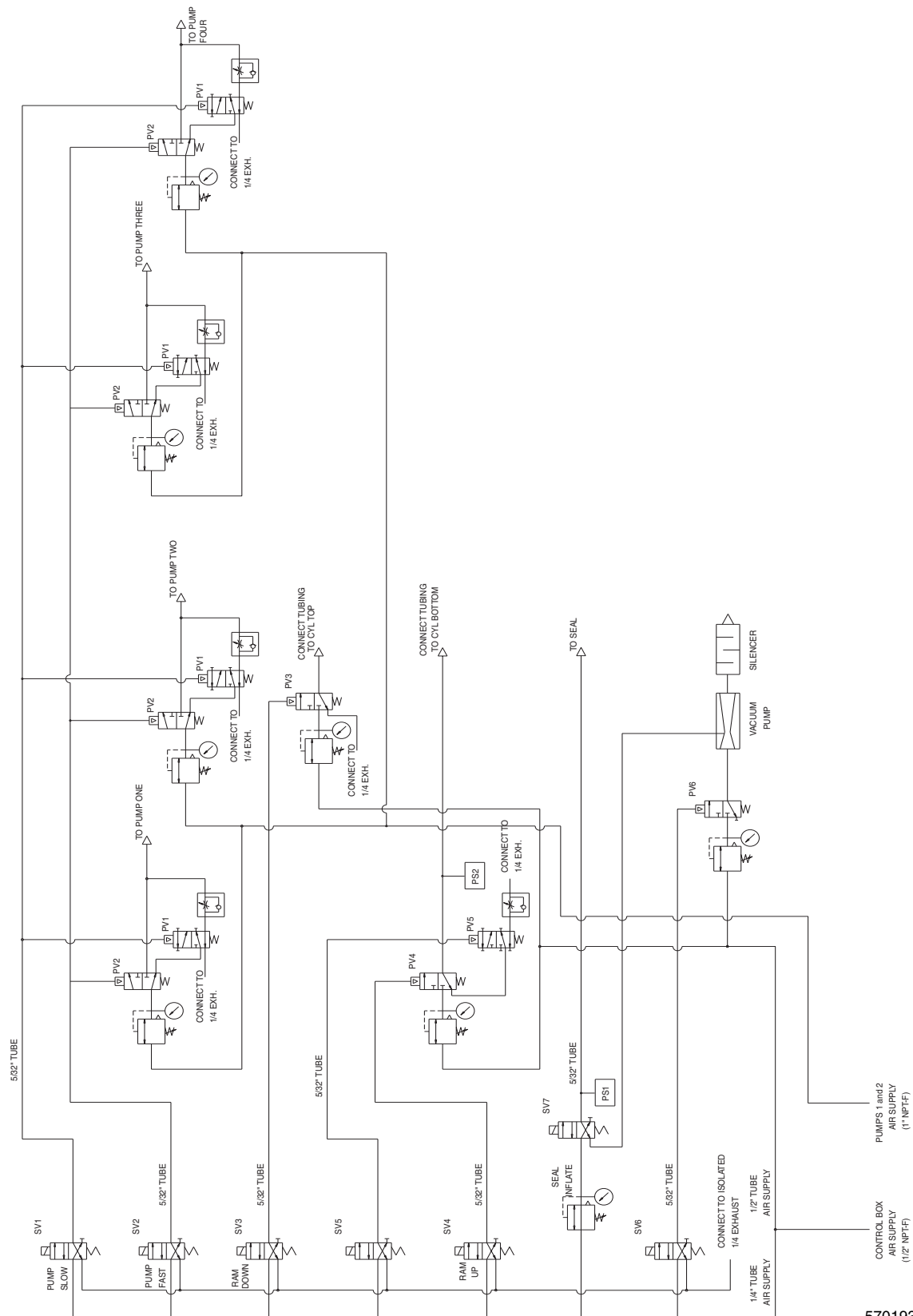
Detail H

570193\_6  
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570193\_8

# Part No. 949949 Pneumatic Control Panel, Pneumatic Diagram



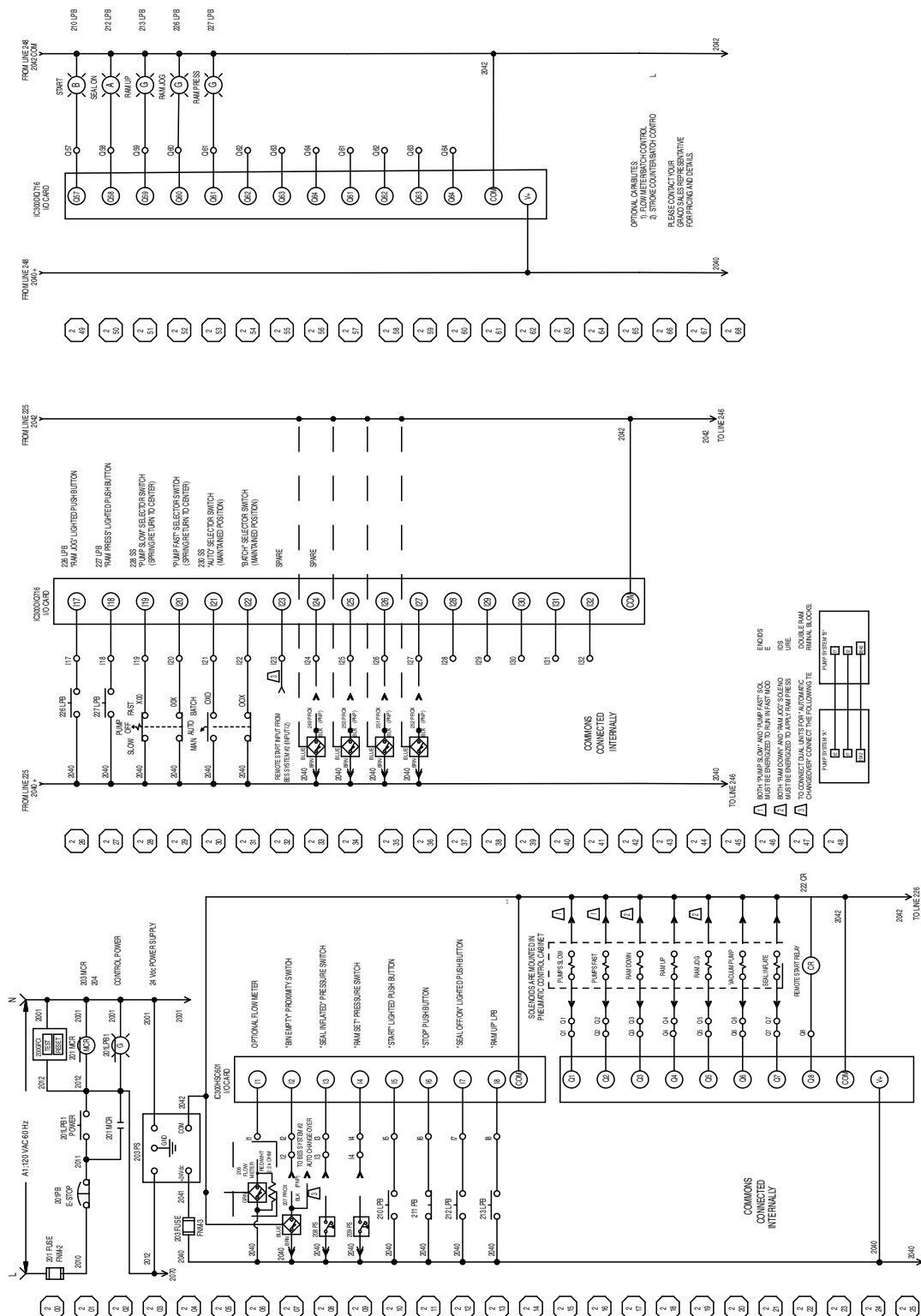
## Part No. 570193 Pneumatic Control Panel, Pneumatic Diagram



570193\_9

# Electrical Schematics

# Part No. 15E582





## Wiring Guide

Electrical Control Cabinet		
Wire No.	Description	Wire Color
2040	+24 Vdc	Black
2042	Common	White
12	Bin Empty Proximity	Orange/red
13	Seal Power Supply	White/red
14	Ram Set Power Supply	Blue
01	Pump Slow Solenoid	Red
02	Pump Fast Solenoid	Green
03	Ram Down Solenoid	Orange
04	Ram Up Solenoid	Black/white
05	Ram Jog Solenoid	White/black
06	Vacuum Pump Solenoid	Green/white
07	Seal Inflate solenoid	Red/black
SP1	Spare	Blue/white
SP2	Spare	Red/white/black
		Shield

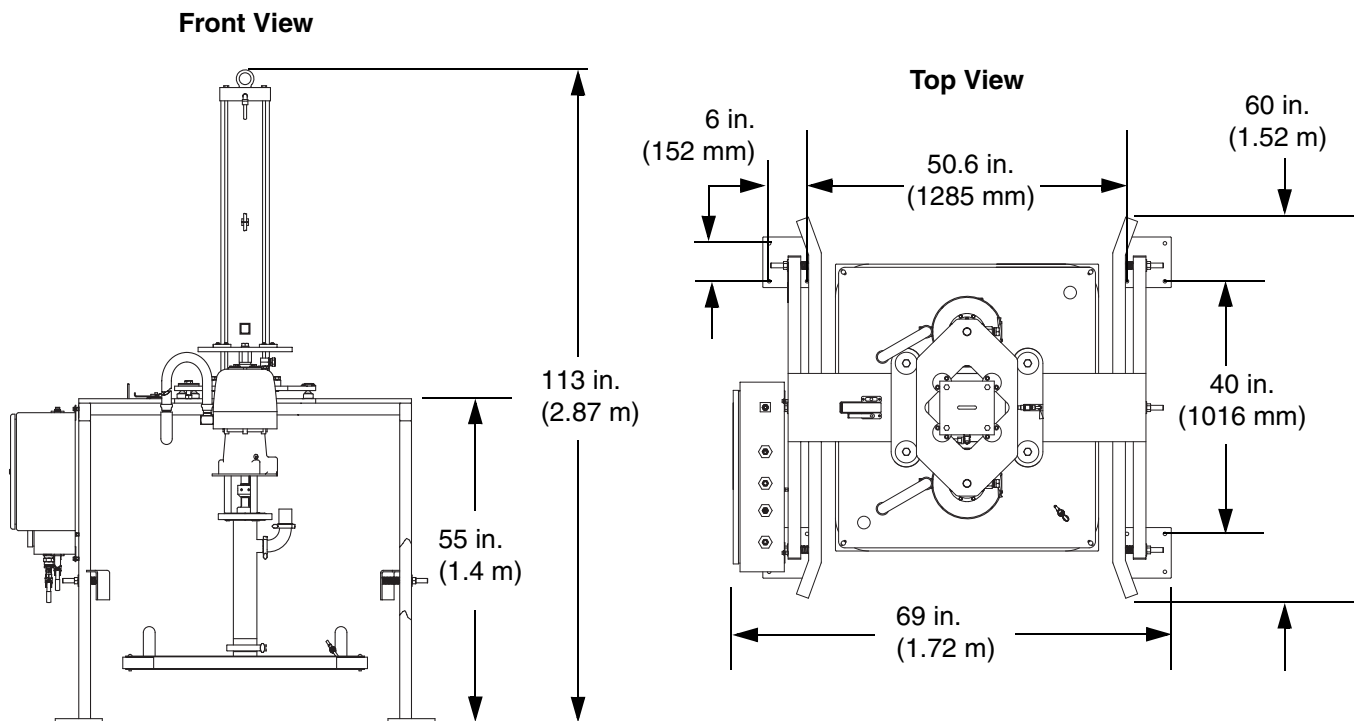
Control Cable

Color Code

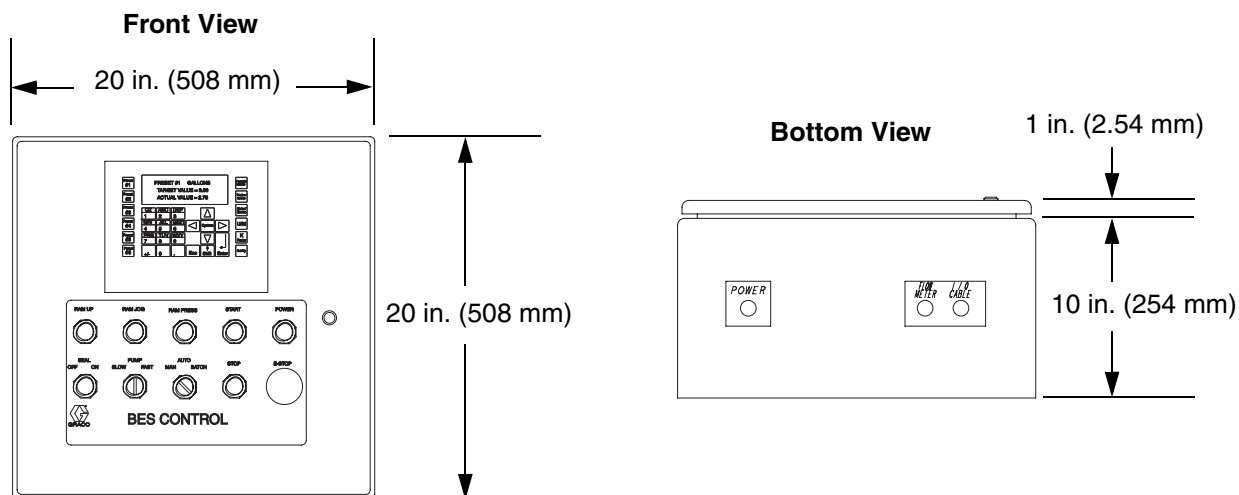
Pneumatic Control Cabinet			
Wire Color	Amphenol No.	Description	Wire No.
Black	A	+24 Vdc	9
White	B	Common	10
Orange/red	D	Bin Empty Proximity	12
White/red	E	Seal Power Supply	13
Blue	F	Ram Set Power Supply	14
Red	G	Pump Slow Solenoid	Q1
Green	H	Pump Fast Solenoid	Q2
Orange	I	Ram Press Solenoid	Q3
Black/white	J	Ram Up Solenoid	Q4
White/black	K	Ram Jog Solenoid	Q5
Green/white	L	Vacuum Pump Solenoid	Q6
Red/black	M	Seal Inflate Solenoid	Q7
Blue/white	C	Spare	SP1
Red/white/black	N	Spare	SP2
Shield			

# Dimensions

## System (BES1P1 Shown)



## 15E582 Electronic Control



# Technical Data

Category	BES 300 Part Nos.						
	BES1xx	BES2xx	BES3xx	BES4xx	BES5xx	BES6xx	BES7xx
Maximum working fluid pressure	430 psi (3 MPa, 30 bar)	430 psi (3 MPa, 30 bar)	120 psi (0.84 MPa, 8.4 bar)	120 psi (0.84 MPa, 8.4 bar)	1000 psi (7 MPa, 70 bar)	1000 psi (7 MPa, 70 bar)	2400 psi (16.8 MPa, 168 bar)
Compressed air requirement	80-100 psi (0.55-0.7 MPa, 5.5-7 bar)	80-100 psi (0.55-0.7 MPa, 5.5-7 bar)	80-120 psi (0.55-0.84 MPa, 5.5-8.4 bar)	80-120 psi (0.55-0.84 MPa, 5.5-8.4 bar)	80-100 psi (0.55-0.7 MPa, 5.5-7 bar)	80-100 psi (0.55-0.7 MPa, 5.5-7 bar)	80-100 psi (0.55-0.7 MPa, 5.5-7 bar)
Pneumatic control panel							
Maximum input air	100 psi (0.7 MPa, 7 bar)	100 psi (0.7 MPa, 7 bar)	120 psi (0.84 MPa, 8.4 bar)	120 psi (0.84 MPa, 8.4 bar)	100 psi (0.7 MPa, 7 bar)	100 psi (0.7 MPa, 7 bar)	100 psi (0.7 MPa, 7 bar)
Air inlet - air controls	3/4 in. npt(f)	3/4 in. npt(f)	3/4 in. npt(f)	3/4 in. npt(f)	3/4 in. npt(f)	3/4 in. npt(f)	3/4 in. npt(f)
Air inlet - pump	1 in. npt(f)	1 in. npt(f)	1/2 in. npt(f)	1/2 in. npt(f)	1 in. npt(f)	1 in. npt(f)	1 in. npt(f)
Fluid displacement	0.23 gal./cycle (each pump)	0.23 gal./cycle (each pump)	1.03 gal./cycle (each pump)	1.03 gal./cycle (each pump)	0.14 gal./cycle (each pump)	0.14 gal./cycle (each pump)	0.125 gal./cycle (each pump)
Flow rate	27.6 gpm @ 60 cpm	54 gpm @ 60 cpm	120 gpm @ 60 cpm	120 gpm @ 60 cpm	34 gpm @ 60 cpm	17 gpm @ 60 cpm	12.5 gpm @ 50 cpm
Pressure ratio	4.3:1	4.3:1	1:1	1:1	10:1	10:1	24:1
Air consumption	~1.8 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)	1.8 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)	~0.8 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)	~0.8 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)	~3.5 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)	~3.5 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)	25.6 scfm per gpm @ 70 psi (0.48 MPa, 4.8 bar) (each pump)
Pump Outlet	2 in. tri-clamp	2 in. tri-clamp	3 in. tri-clamp	3 in. tri-clamp	2 in. tri-clamp	2 in. tri-clamp	1.5 in. npt(m)



Refer to your component manuals (see page 5) for a list of wetted parts and other technical data.

# Graco Standard Warranty

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MM 311163

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