Instructions-Parts List

SaniForce™

Bin Evacuation System

311163W

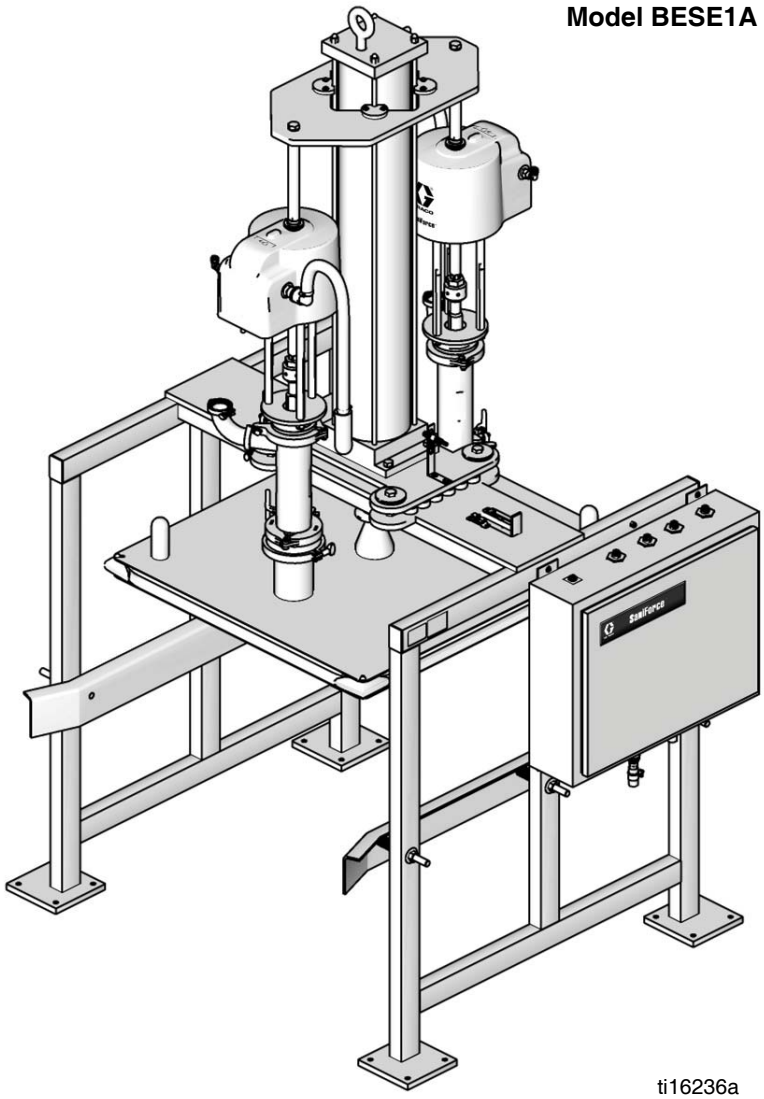
EN

For use with 300 gallon (1135 liter) bags in bin containers. For professional use only. Not approved to European Explosive Atmosphere requirements.

See page 3 for model information, including maximum working pressure and approvals.

Important Safety Instructions
Read all warnings and instructions in this manual. Save these instructions.

Model BESE1A Shown



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Contents

Models

BES Part No.,	Maximum Working Fluid Pressure, per pump *psi (MPa, bar)*	Pump Part No.	Qty.	Pump	Controls	Approvals
BESA7A,	410 (2.8, 28.3)	24G742	2	5:1 SaniForce Pump	Electronic, Micrologix (2)	
BESA7F	410 (2.8, 28.3)	24G742	2	5:1 SaniForce Pump	Electronic Contrologix (2)	
BESB7B	410 (2.8, 28.3)	24G742	4	5:1 SaniForce Pump	Electronic, Micrologix (4)	
BES3A1	120 (0.84, 8.4)	248273	2	3150 SaniForce Pump, Ball Check	Electronic, Micrologix (2)	
BES3P1	120 (0.84, 8.4)	248273	2	3150 SaniForce Pump, Ball Check	Electronic, Micrologix (2)	
BES4A1	120 (0.84, 8.4)	248274	2	3150 SaniForce Pump, Flapper Check	Electronic, Micrologix (2)	
BESE1A	1450 (10.1, 100.4)	24F625	2	12:1 SaniForce Pump	Electronic, Micrologix (2)	
BESF6B	1450 (10.1, 100.4)	24F625	4	12:1 SaniForce Pump	Electronic, Micrologix (4)	
BESF9B	1450 (10.1, 100.4)	24F625	4	12:1 SaniForce Pump	Electronic, Micrologix (4)	
BESA4C	410 (2.8, 28.3)	24G742	2	5:1 SaniForce Pump	Manual (2)	CE
BESA7C	410 (2.8, 28.3)	24G742	2	5:1 SaniForce Pump	Manual (2)	
BESAAC	410 (2.8, 28.3)	24G742	2	5:1 SaniForce Pump	Manual (2)	
BESB7D	410 (2.8, 28.3)	24G742	4	5:1 SaniForce Pump	Manual (4)	
BESCCC	410 (2.8, 28.3)	24P829	2	5:1 SaniForce Pump	Manual (2)	
BES3F3	120 (0.84, 8.4)	24E440	2	3150 SaniForce Pump, 3A Ball Check	Manual (2)	
BES3P3	120 (0.84, 8.4)	248273	2	3150 SaniForcePump, Ball Check	Manual (2)	
BES4P3	120 (0.84, 8.4)	248274	2	3150 SaniForce Pump, Flapper Check	Manual (2)	
BES8B3	120 (0.84, 8.4)	24C124	2	3150 SaniForce Pump, 3A Ball Check	Manual (2)	
BESDBC	650 (4.5, 44.8)	24F942	2	6:1 SaniForce Pump	Manual (2)	
BESE1C	1450 (10.1, 100.4)	24F625	2	12:1 SaniForce Pump	Manual (2)	
BESE5C	1450 (10.1, 100.4)	24F625	2	12:1 SaniForce Pump	Manual (2)	
BESE7C	1450 (10.1, 100.4)	24F625	2	12:1 SaniForce Pump	Manual (2)	
BESEAC	1450 (10.1, 100.4)	24D658	2	12:1 SaniForce Pump	Manual (2)	
BESF6D	1450 (10.1, 100.4)	24F625	4	12:1 SaniForce Pump	Manual (4)	
BESF7D	1450 (10.1, 100.4)	24F625	4	12:1 SaniForce Pump	Manual (4)	
BESF9D	1450 (10.1, 100.4)	24F625	4	12:1 SaniForce Pump	Manual (4)	

Material Certification

Reference: SaniForce Product Family

Issue Date: September 14, 2011

All fluid contact materials in the SaniForce product family are FDA-Compliant and meet the United States Code of Federal Regulations (CFR) Title 21, Section 177 or are of a corrosion resistant grade Stainless Steel. This includes the below product groups:

1. SaniForce 1040, 1590, 2150 Air-Operated Double Diaphragm Pumps
2. SaniForce 1590, 3150 HS Air-0perated Double Diaphragm Pumps
3. SaniForce 1590, 3150 HS 3-A Certified Air-Operated Double Diaphragm Pumps
4. SaniForce 5:1, 6:1 and 12:1 Air-Operated Piston Pumps
5. SaniForce Diaphragm Pump and Piston Pump Drum Unloaders
6. SaniForce Diaphragm Pump and Piston Pump Bin Evacuation Systems

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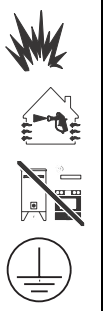
Warnings

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

⚠ Warning



FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in **work area** can ignite or explode. To help prevent fire and explosion:

- Use equipment only in well ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).
- Keep work area free of debris, including solvent, rags and gasoline.
- Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.
- Ground all equipment in the work area. See **Grounding** instructions.
- Use only grounded hoses.
- Hold gun firmly to side of grounded pail when triggering into pail.
- If there is static sparking or you feel a shock, **stop operation immediately.** Do not use equipment until you identify and correct the problem.
- Keep a working fire extinguisher in the work area.

ELECTRIC SHOCK HAZARD

This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.

- Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.
- Connect only to grounded power source.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

SKIN INJECTION HAZARD

High-pressure fluid from dispensing device, 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. **Get immediate surgical treatment.**

- Do not point dispensing device at anyone or at any part of the body.
- Do not put your hand over the fluid outlet.
- Do not stop or deflect leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** when you stop dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check hoses and couplings daily. Replace worn or damaged parts immediately.

⚠ Warning

EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Data** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Data** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure. Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

MOVING PARTS HAZARD

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.

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, hearing loss, inhalation of toxic fumes, and burns. This equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Overview

Operation Overview

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

The SaniForce BES 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 SaniForce BES

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 aligns and centers the bin with the ram plate.
4. The operator inflates the ram plate seal, applies down pressure to the ram plate, and turns on the pumps.
5. The pumps evacuate the material out of the bin.
6. The operator stops the pumps, deflates the seal, and raises the ram plate out of the bin.
7. The empty bin is removed, another bin is put in place, and the SaniForce BES 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

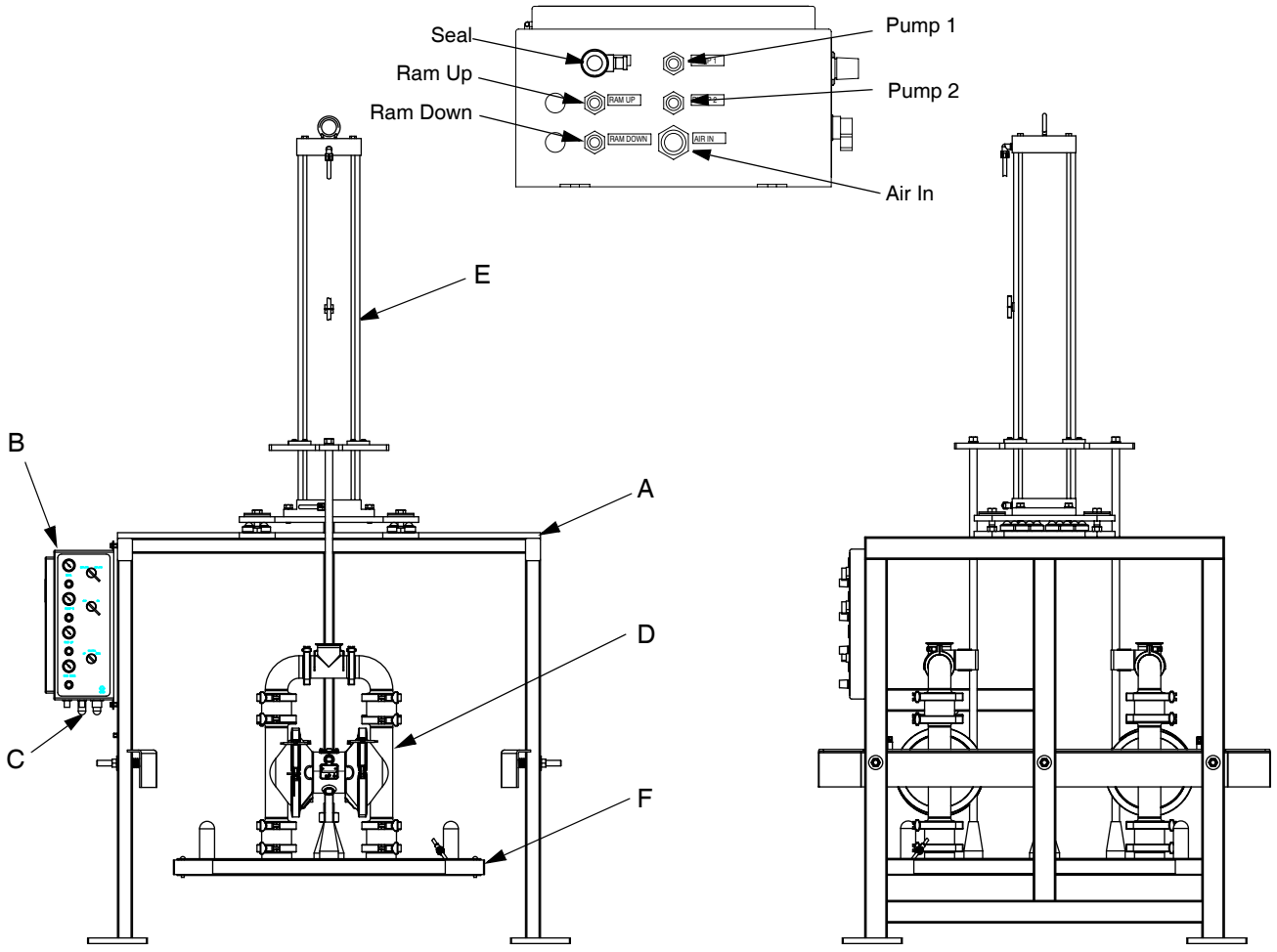


FIG. 1: Typical Installation (Manual Control; BES3P3 shown)

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.

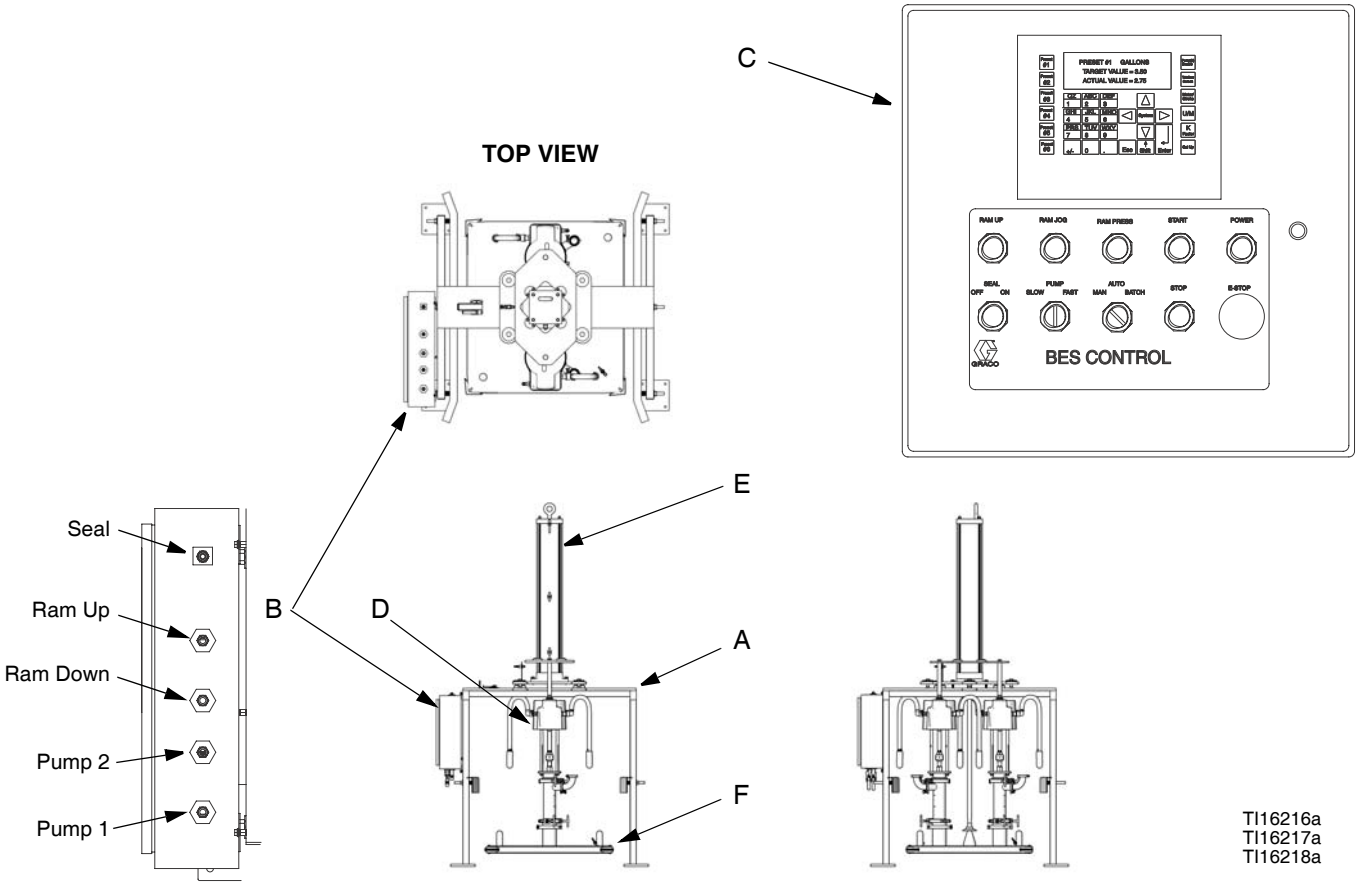


FIG. 2: Typical Installation (Electronic Control; BESA7A shown)

Before Installing

Uncrating Equipment

NOTICE

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

Uncrate the SaniForce BES 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).

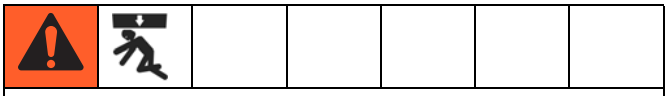
NOTE: See your system component manuals to become familiar with system components and general operation.

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.
- Provides enough room on the right and/or left side of the SaniForce BES 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



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.

- 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.

NOTE:

- 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.
- Ensure that all hoses are properly sized and pressure rated for the system.

Installation

Anchoring Frame

1. Remove bolts holding the frame (602) to the shipping pallet.

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.

2. To lift the system, 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.

3. Remove the pallet and all remaining shipping supports from underneath the frame.

The four base footings of the frame and the bottom of the bin must be level on the same surface in order for the SaniForce BES to operate properly. If necessary, level the SaniForce BES using sanitary 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

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.

NOTE: All models do not use the same parts. Refer to parts lists for your model, pages 35-45.

1. Using a hoist, lift the air cylinder (4) into position on top of the frame (602). See FIG. 3.

2. Lower the air cylinder shaft (A) through the center hole in the frame.

3. Secure the air cylinder (4) to the frame (602) with the screws (20) and washers (19). See FIG. 4.

4. Install the air motor mounting plate (402), slipping plate over the top and down the length of air cylinder (4).

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

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

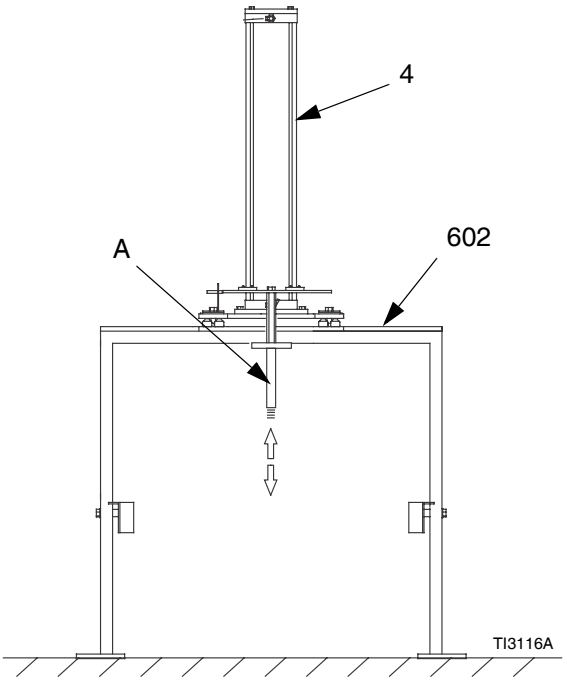


FIG. 3: Air Cylinder Shaft

7. Loosen but do not remove the screws (18) from the frame (602).

8. Supply air to main air inlet on pneumatic control box.

9. Remove the two band straps that hold the ram plate (502) to the shipping pallet. Do not remove the pallet.

10. 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).

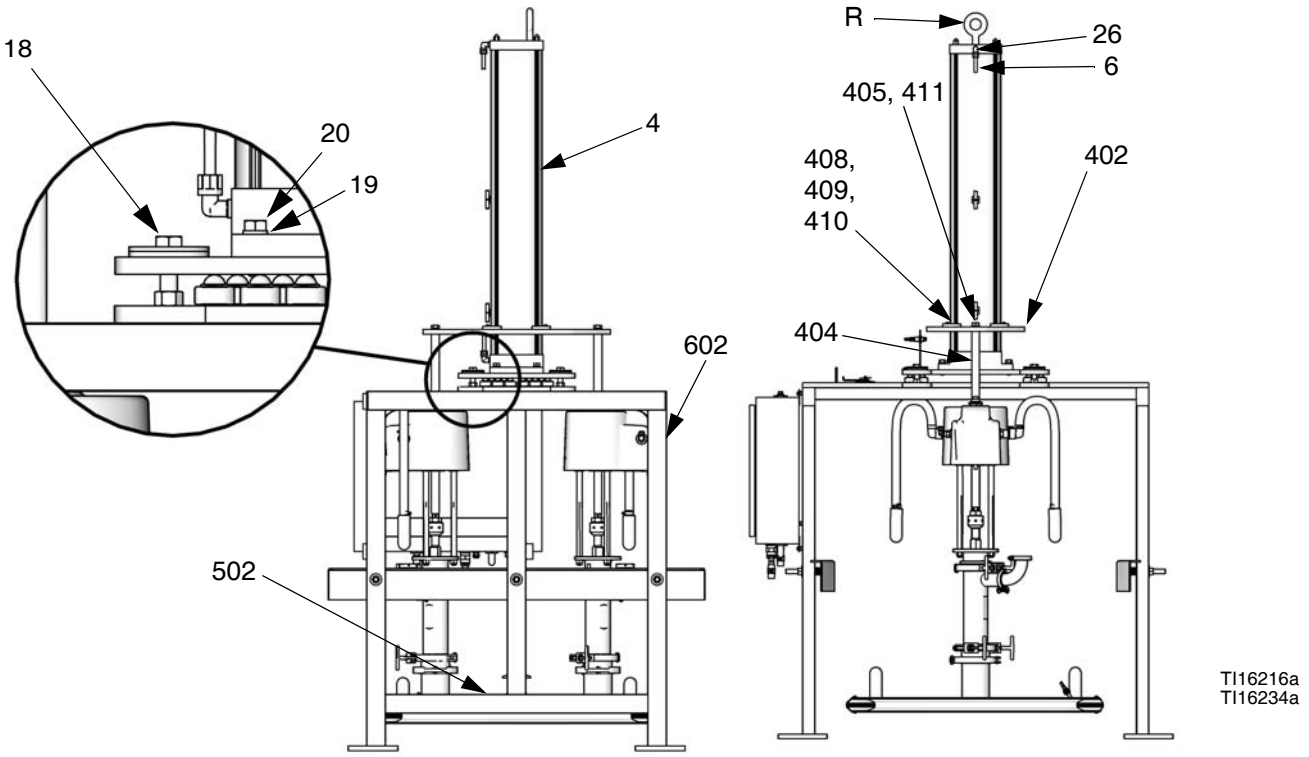


FIG. 4: Air Motor Mounting Plate (BESA7A shown)

11. 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. BESFxx and BESExx:** gasket (415), screws (406), and washers (407)
    - **Part No. BESAxx, BESBxx, BESCxx, and BESDxx:** 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)
12. For part numbers BES3xx, BES8xx, and BES4xx install the two connecting rods (404) to the ram plates. Secure with screws (405) and washers (411).
13. Install cylinder guide bearings (408) on top of the air motor mounting plate (402), using screws (409) and washers (410).

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

14. Tighten lock nuts (7).
15. Using tubing (6), connect pneumatic control panel to air motor air inlets.
16. On the control panel, switch to the RAM UP position. Raise the ram and set the manual stop latch to Engage position. See page 15. Remove the pallet and any other shipping material.

Connecting Pump Output Hoses

NOTE:

- 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 systems do not include a hose, clamps, or gaskets on the outlet side.

Two Pump System Includes:

BESAxx, BESBxx, BESCxx, BESExx, BESFxx	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
BESDxx	
1.5 in (38 mm) tri-clamp sanitary clamps (412)	4
1.5 in (38 mm) tri-clamp sanitary gaskets (413)	4

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

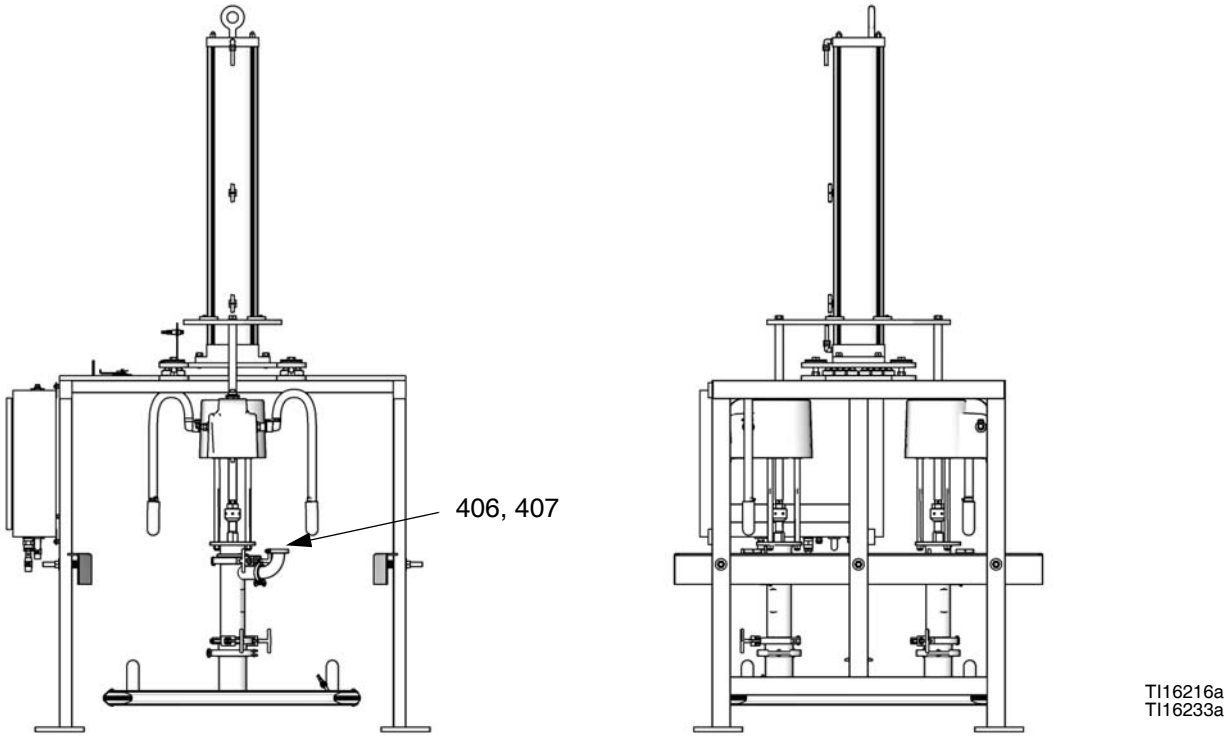


FIG. 5: Connect pump outlet hoses (BESA7A shown)

Grounding

The equipment must be grounded. Grounding reduces the risk of static and electric shock by providing an escape wire for the electrical current due to static build up or in the event of a short circuit.

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.

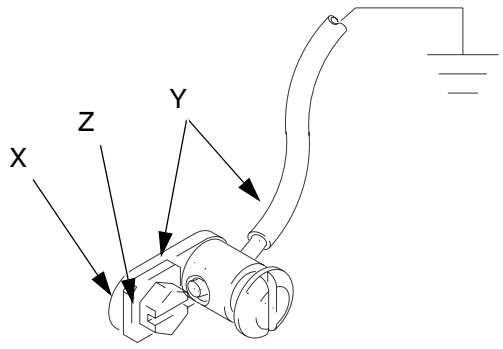


FIG. 6: Ground Screw

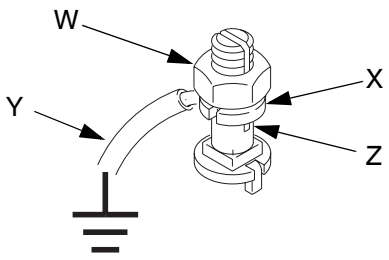


FIG. 7: Ground Screw

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)

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

Engaging

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

Lockout

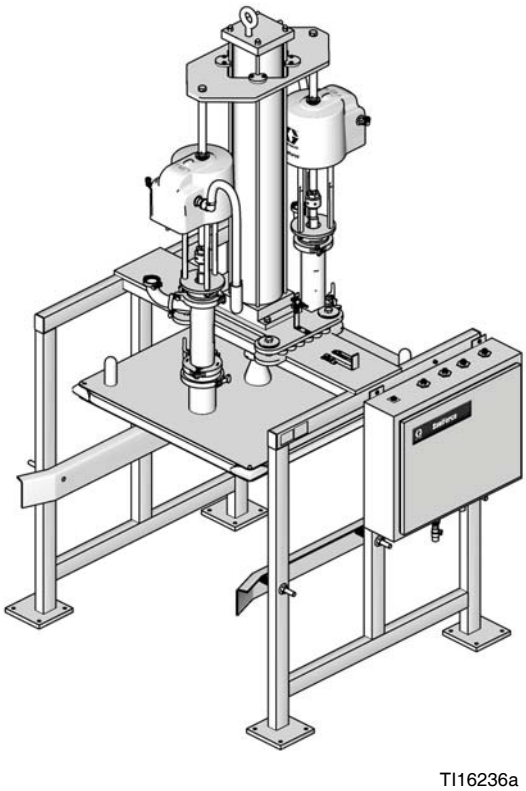
A lockout has been provided to lock the plate in the raised position.

1. Engage the manual stop. See **Engaging**.
2. Insert a padlock through the hole in the handle and the mating piece on the frame.

NOTE: Follow any national and state lockout/tagout codes and local regulations.

Disengaging

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



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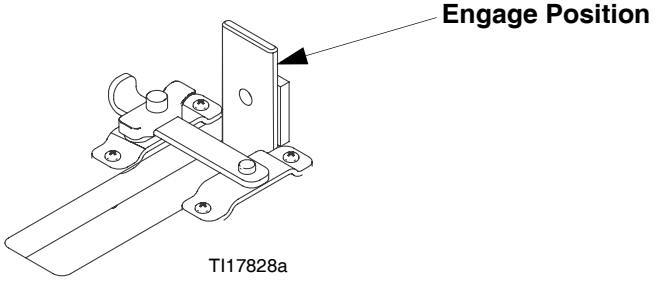

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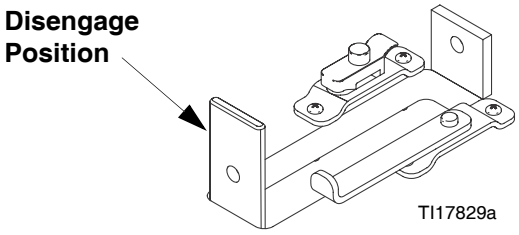

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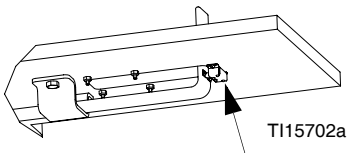

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Lock Position
Move latch until tab snaps into roller grab mounted under frame.

FIG. 8. Manual Stop (BESA7A 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.

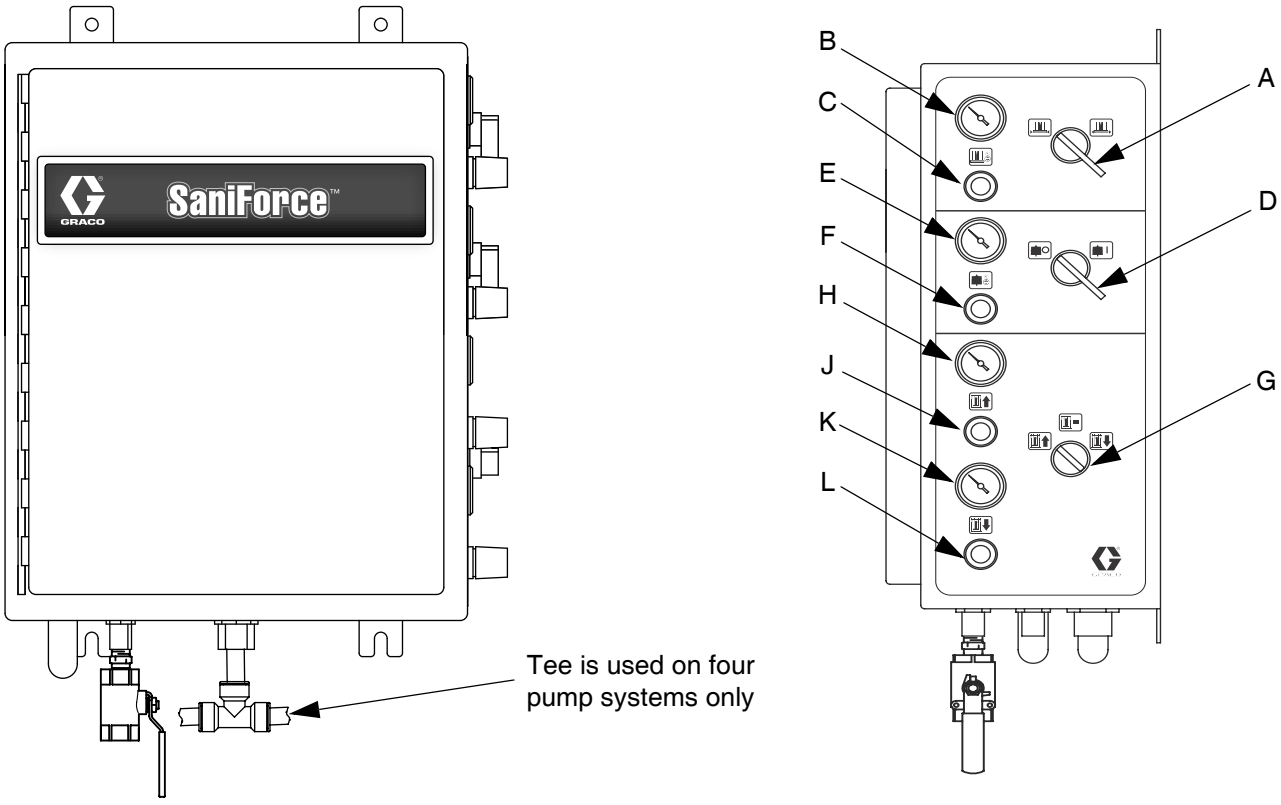


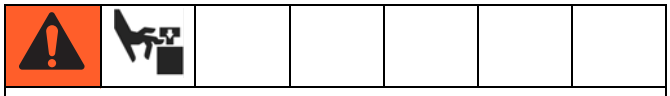
FIG. 9: Part No. 15E523 Manual Control

Pressure Relief Procedure

Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury from injection, splashing or moving parts. Relieve pressure when you stop pumping and before cleaning, checking, or servicing 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



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

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 28.
7. Follow **Loading the Bin** procedure, page 18.
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.

NOTE: 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 18.
16. The system is now ready for standard operation. See page 17.

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	7 (48, 0.5) Max: 15 (103, 1.0)
H	RAM UP	30 (207, 2.1)
K	RAM DOWN	30 (207, 2.1)
E	PUMP	50 (345, 3.4)

*A pressure relief regulator is required when a control system other than a Graco control panel is used.

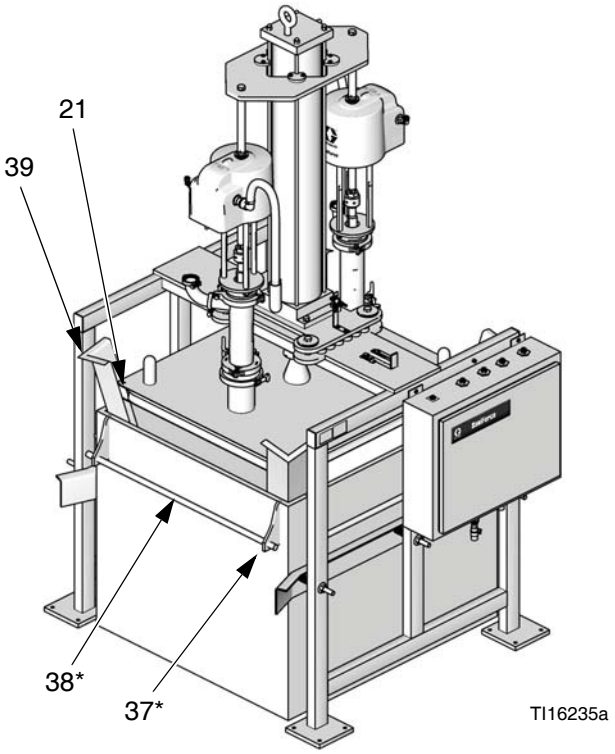
Standard Operation

Loading the Bin

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

NOTE: 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. Load the bin of material into the center of the frame. Center the bin with the ram plate.
8. **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.
9. Make sure the corner seals (21) are in place.
10. Use corners (39) to help guide the plate. See FIG. 10.
11. Switch to the Ram Down position
12. 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.



** Not used with BESCCC.*

FIG. 10

Unloading the Bin

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

1. Follow the **Pressure Relief Procedure**, page 17.
2. Ensure seal is deflated and ram is raised.
3. Unload the bin from the frame.

System Shutdown

Follow the **Pressure Relief Procedure**, page 17.

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 57 and 58, 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 *(no air line connection is needed)*	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

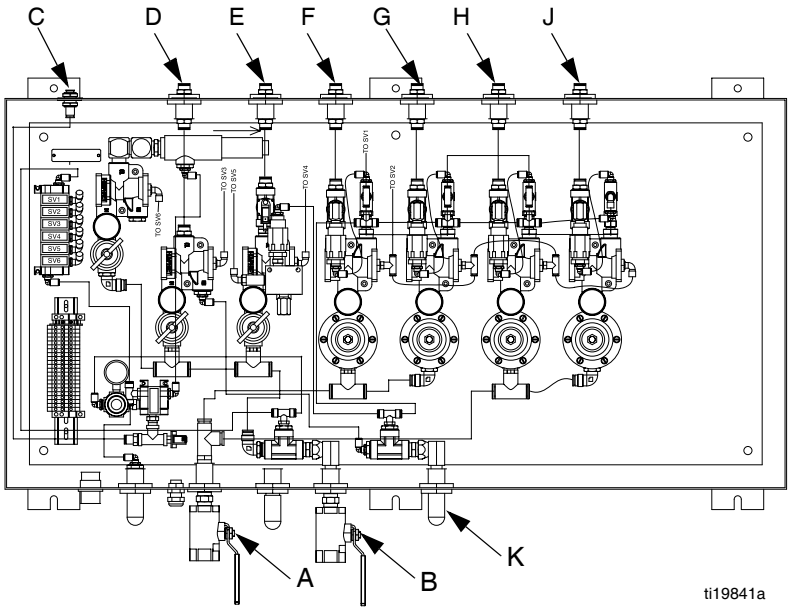


FIG. 11: Air Control Panel (570193, 4 pump shown)

Installing Electronic Control Panel

- Locate the electronic control panel so the operator has an unobstructed view of the SaniForce BES to avoid starting equipment when other personnel could be injured.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

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.

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. 15H145 and 15J902 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.

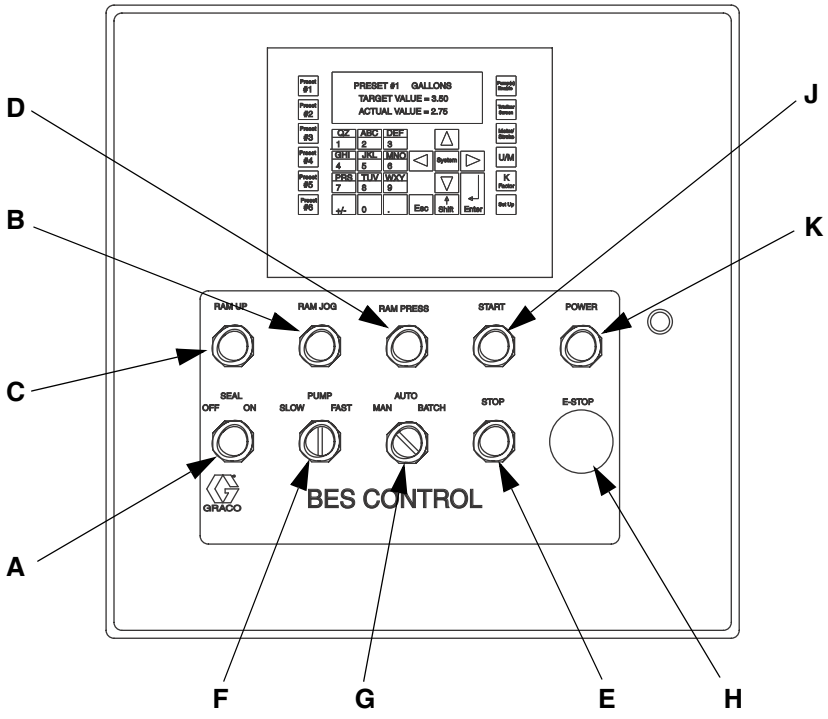


FIG. 12: Part No. 15H145 and 15J902 Electronic Control

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.

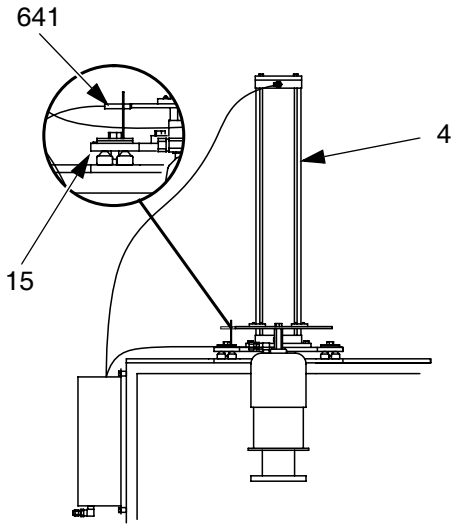


FIG. 13: Proximity Switch

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.

NOTE: See **Setting the Bin Empty Timer** and **Setting the Vacuum Pump Timer**, page 24, for additional information on adjusting the proximity switch and system timer.

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) (Max.)
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.*

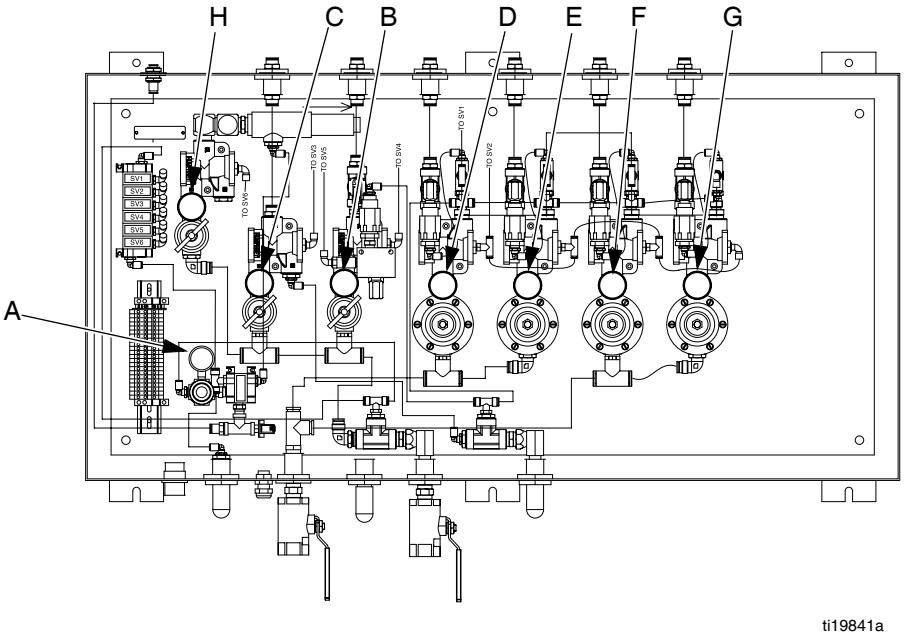


FIG. 14: Part No 570193, 4 pump shown

Pressure Relief Procedure

Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury from injection, splashing or moving parts. Relieve pressure when you stop pumping and before cleaning, checking, or servicing 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.

NOTE: 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 28.
7. Follow **Loading the Bin** procedure, page 26.

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”. Refer to Electrical Control Box manual.

Standard Operation

NOTE: 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. 15.

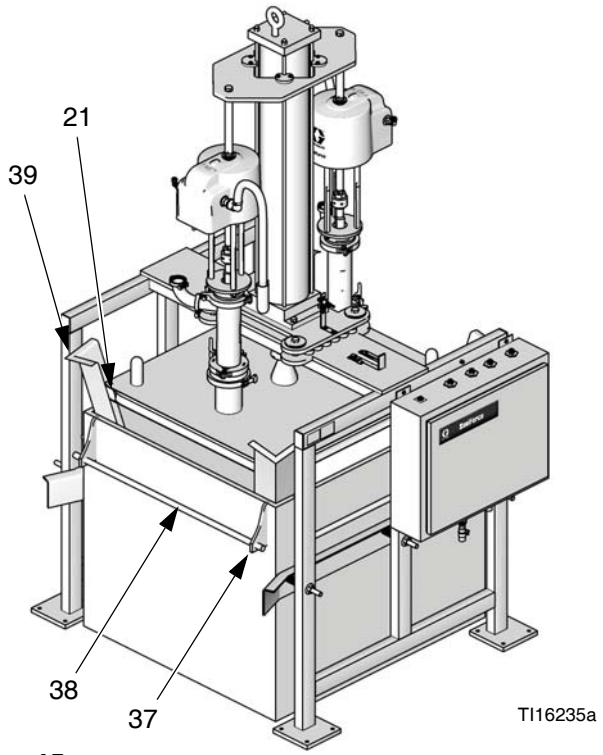
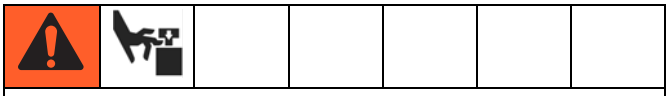


FIG. 15

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. 15.
10. Press the RAM JOG button.

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



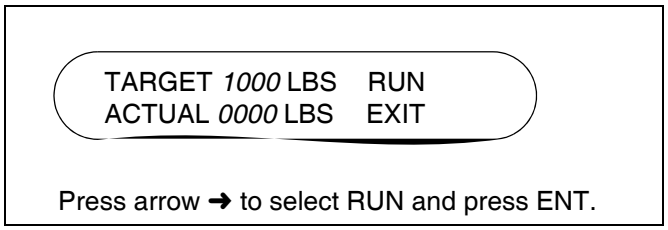
When raising or lowering the ram plate, keep hands and body away from ram plate and bin lip.

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.

NOTE: 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 raises.

Unloading the Bin

1. Follow the **Pressure Relief Procedure**, page 24.
2. Ensure seal is deflated and ram is raised.
3. Unload the bin from the frame.

System Shutdown

Follow the **Pressure Relief Procedure**, page 24.

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.

NOTICE

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

- 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 18 or page 27.

NOTE: 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 18 or page 27.
4. Operate the pumps at low pressure to remove excess solvent.
5. Follow the **Pressure Relief Procedure**, page 17 or page 24.

Cleaning Pumps

1. Follow the **Pressure Relief Procedure**, page 17 or page 24.
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 17 or page 24. Keep the air supply to the ram open.
2. Raise the ram plate.

To avoid injury, always set manual stop latch to Engage position when working under the plate.

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.

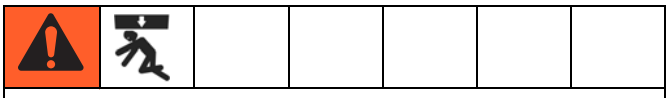
Troubleshooting

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.	1. Deflate seal. Turn SEAL INFLATE to OFF. 2. Switch to RAM UP position. When it is raised, check for obstructions in bin or quality of seal.
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.	• Check SEAL and RAM DOWN pressures and adjust until you have a quality seal. • Refer to troubleshooting in pump manual.
	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. Do not over-pressurize the seal.
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

NOTE: See FIG. 16. All models do not use the same parts. Refer to parts drawing for your model.

Before Servicing



To avoid injury, always set manual stop latch to Engage position when working under the plate.

1. Remove the bin from the frame.
2. Follow the **Pressure Relief Procedure**, page 17 or page 24.
3. Lower the ram plate and deflate the seal.
4. Shut off the air supply to the system.

Replacing Cylinder Bearing (All Models)

NOTICE

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

See FIG. 16.

1. Follow the **Before Servicing** procedure, page 31.
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).

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

4. Repeat steps 2-3 as needed to replace additional cylinder bearings.
5. Raise and lower the ram plate to check the bearings.

Replacing Ram Plate Seal or Corner Seals (All Models)

See FIG. 16.

1. Follow the **Before Servicing** procedure, page 31.

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.

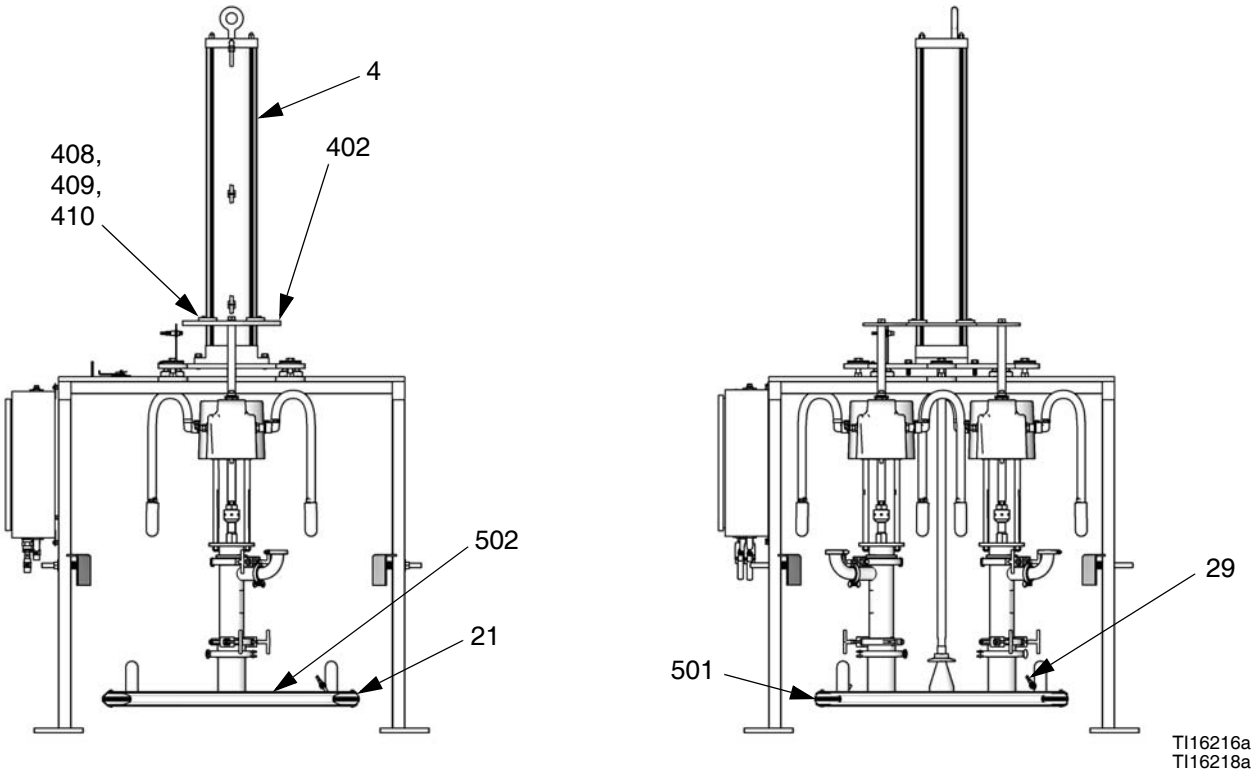


FIG. 16: Repair (BESA7A Shown)

Replacing Proximity Switch (Electronic Control Models Only)

See FIG. 17.

1. Follow the **Before Servicing** procedure, page 31.
2. Mark the proximity switch (641) position on its bracket (B) to ensure the new switch is installed the same. Refer to FIG. 17.

NOTE: Graco recommends 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.

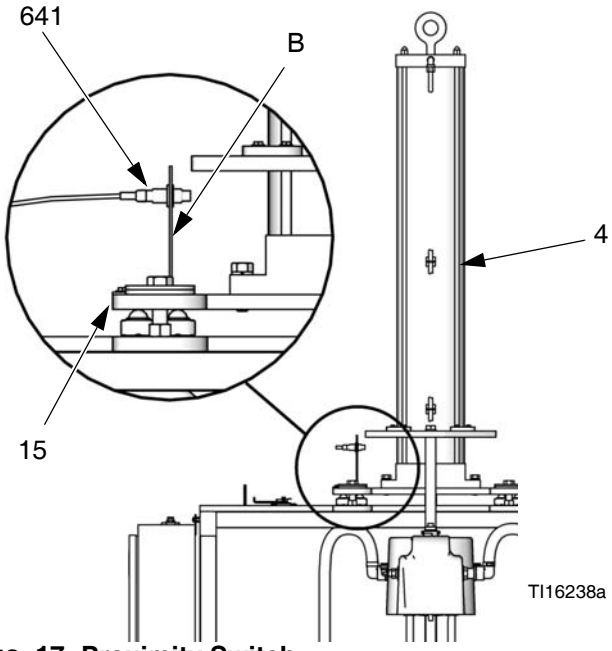
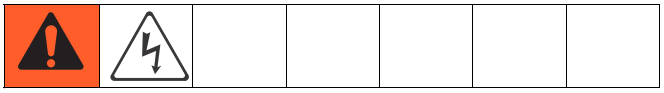


FIG. 17: Proximity Switch

Electronic Control Panel Service (Electronic Control Models Only)



Follow the **Before Servicing** procedure, page 31. Consult a qualified electrician to service the control panel.

SaniForce BES Pump Matrices

To determine the Model No. of your Bin Evacuation System from the following matrices, 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 38-55.

3150 AODD Pumps

Bin Evacuation System	Pump Module (see pages 38-45)		Plate (see page 46)		Controls/Frame (see pages 46-56)	
B E S	**3**	SaniForce 3150 Ball Check, 2 pumps	**A**	Arena	**1**	Electronic Controls, Allen-Bradley Micrologix, 2 Pumps
	4	SaniForce 3150 Flapper Check, 2 pumps	**B**	Pallecon	**3**	Manual Controls, 2 Pumps
	8	SaniForce 3150, 3A, Ball Check, 2 pumps	**F**	GoodPak MB5		
			P	Plywood		

Available Configurations*

Model	Pump	Plate	Controls/Frame
BES3P1	3150 Ball Check	Plywood	Electronic
BES3P3	3150 Ball Check	Plywood	Manual
BES4P3	3150 Flapper Check	Plywood	Manual
BES3A1	3150 Ball Check	Arena	Electronic
BES4A1	3150 Flapper Check	Arena	Electronic
BES8B3	3150 3A Ball Check	Pallecon	Manual
BES3F3	3150 3A Ball Check	GoodPak MB5	Manual

* *Contact your Graco distributor if you require a configuration that is not listed.*

Piston Pumps

Bin Evacuation System	Pump Module (see pages 38-45)		Plate (see page 46)		Controls/Frame (see pages 46-56)	
B E S	**A**	5:1 SaniForce, Double Ball, 2 pumps	**1**	330 Arena Bin	**A**	Electronic Controls, Allen-Bradley Micrologix, 2 Pumps
	B	5:1 SaniForce Double Ball, 4 pumps	**3**	Chep	**B**	Electronic Controls, Allen-Bradley Micrologix, 4 Pumps
	C	5:1 SaniForce Priming Piston, 2 pumps	**4**	Ceva Pallecon, 2 pumps, 5:1	**C**	Manual Controls, 2 Pumps
	D	6:1 SaniForce Priming Piston, 2 pumps	**5**	Ceva Pallecon, 2 pumps, 12:1	**D**	Manual Controls, 4 Pumps
	E	12:1 SaniForce Priming Piston, 2 pumps	**6**	Arena Bin, 4 pumps	**F**	Electronic Controls, Allen-Bradley Contrologix, 2 Pumps
	F	12:1 SaniForce Priming Piston, 4 pumps	**7**	Plywood		
			9	TNT		
			A	Caliber 315 Buckhorn Bin, 2 pumps		
			B	Goodpack MB5 Bin, 2 pumps		
			C	KC Bin		

Available Configurations*

Model	Pump	Plate	Controls/Frame
BESA4C	5:1, 2 pumps	Ceva Pallecon	Manual
BESAAC	5:1, 2 pumps	Buckhorn	Manual
BESA7A	5:1, 2 pumps	Plywood	Electronic, Micrologix
BESA7C	5:1, 2 pumps	Plywood	Manual
BESA7F	5:1, 2 pumps	Plywood	Electronic, Contrologix
BESB7B	5:1, 4 pumps	Plywood	Electronic, Micrologix
BESB7D	5:1, 4 pumps	Plywood	Manual
BESCCC	5:1, 2 pumps	KC Bin	Manual
BESDBC	6:1, 2 pumps	Goodpack MB5	Manual
BESE1A	12:1, 2 pumps	Arena	Electronic, Micrologix
BESE1C	12:1, 2 pumps	Arena	Manual
BESE5C	12:1, 2 pumps	Ceva Pallecon	Manual
BESE7C	12:1, 2 pumps	Plywood	Manual
BESEAC	12:1, 2 pumps	Buckhorn	Manual
BESF6B	12:1, 4 pumps	Arena	Electronic, Micrologix
BESF6D	12:1, 4 pumps	Arena	Manual
BESF7D	12:1, 4 pumps	Plywood	Manual
BESF9B	12:1, 4 pumps	TNT	Electronic, Micrologix
BESF9D	12:1, 4 pumps	TNT	Manual

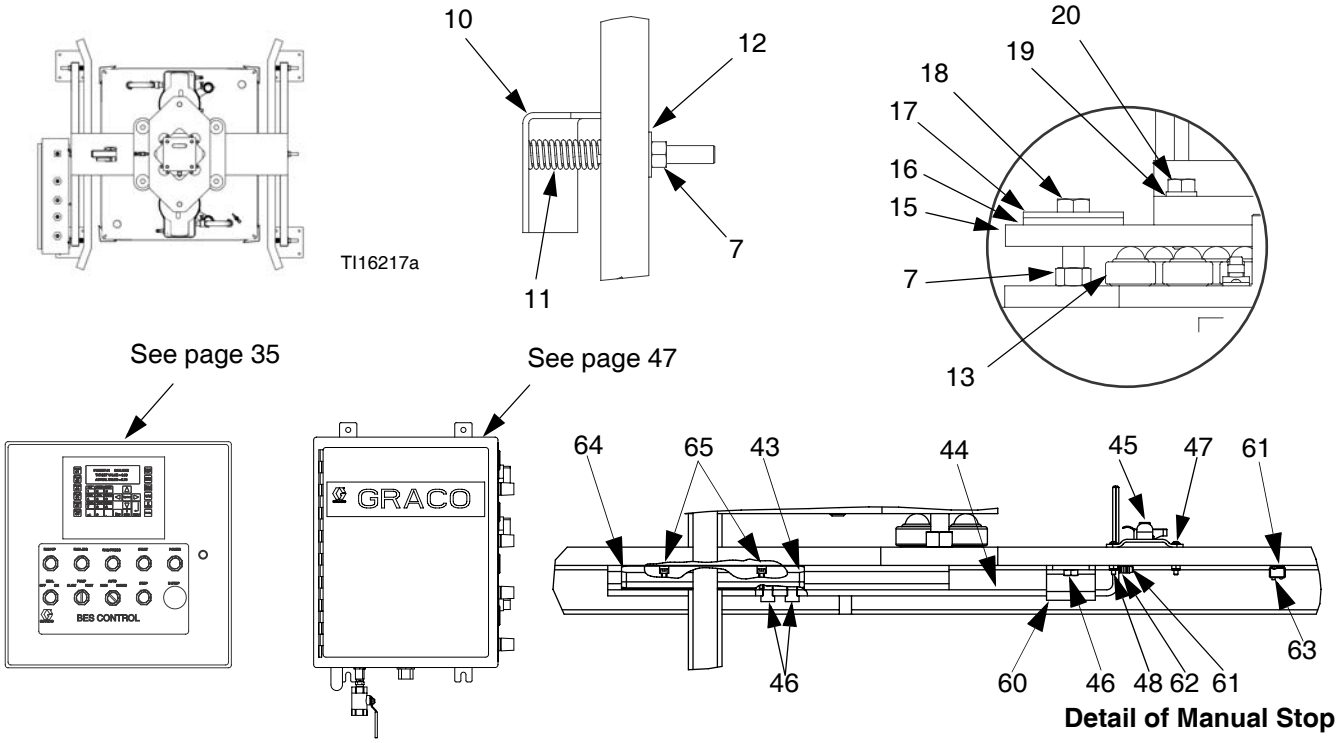
* *Contact your Graco distributor if you require a configuration that is not listed.*

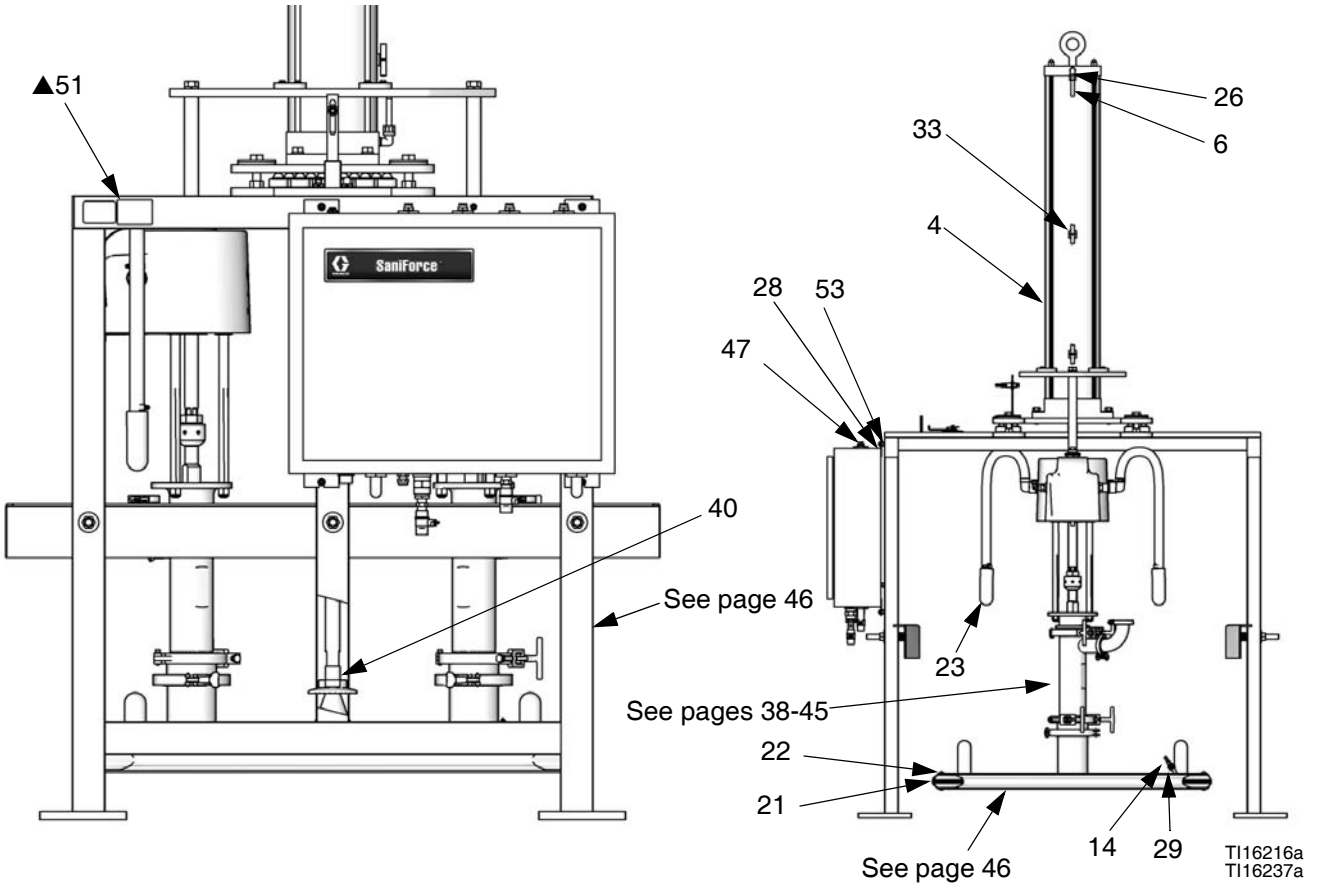
SaniForce BES Common Parts

Ref. No.	Part No.	Description	Qty.
4	15K301	CYLINDER, air; sst	1
6	590570	TUBE, polyethylene; 1/2 in. (35 ft) OD	*
7	514334	NUT; 3/4-10; Nylock	10
8	103473	STRAP, tie, wire (not shown)	12
9	103546	STRAP, tie, wire (not shown)	3
10	626520	GUIDE, box side	2
11	514819	SPRING, coil; sst	6
12	514332	WASHER; 3/4 in.; sst; 1.875 in.	12
13	551274	CASTER; sst; 125#; 1.75 in.	22
14	590385	TUBE, poly-flo (10 ft)	*
16	625595	BEARING, thrust; PTFE	4
17	625596	WASHER, thrust; sst	4
18	514331	SCREW, cap, hex head	4
19	551363	WASHER, lock; 5/8 in.; sst	4
20	513386	SCREW, cap, hex head	4
21	15F205	SEAL, corner	4
22	551691	RIVET; 3/8 in. x 2-1/2 in.; sst	4
26	512684	FITTING, elbow, tube	2
28	107542	WASHER, lock, spring	4
29	112944	SCREW, cap	7
32	070303	LUBRICANT GREASE	1
33	C78216	CLAMP, ty-rap	2
36	111265	LUBRICANT, tube (not shown)	2
37	949412	CLAMP, bag (not shown); *not used with BESCCC*	4
38	625988	TUBE, wand (not shown); *not used with BESCCC*	4
39	626046	BIN, corner (not shown)	4
40	249064	COUPLING	1
43	16D911	SUPPORT, stop	1
44	15G112	HANDLE, stop	1
45	15G113	LATCH, stop	1
46	15D008	BOLT; 3/8-16; sst	2
47	15F979	SCREW, pan hd, phillips	4
48	15F988	NUT, lock, hex	4
51▲	C14043	LABEL, warning	1
53	104034	WASHER	4
60	16D899	SUPPORT, stop handle	1
61	16D895	CATCH, grab	1
62	16D913	SCREW, panhead	2
63	16D914	SCREW, fillister head	2
64	16D912	SPACER, stop	2
65	113003	SCREW, sockethead	4

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

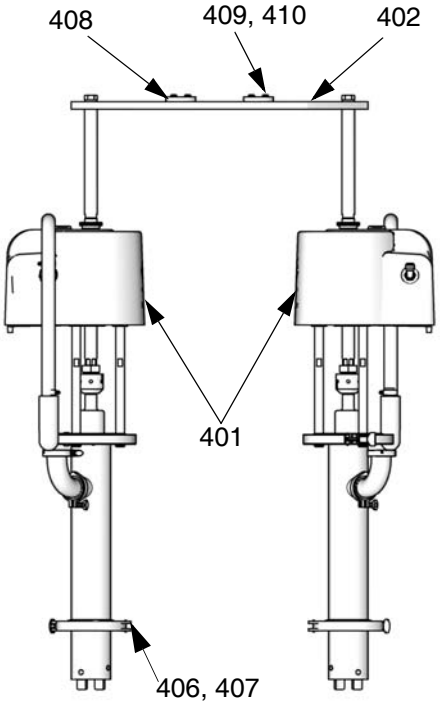
SaniForce BES Common Parts (BESA7A shown)



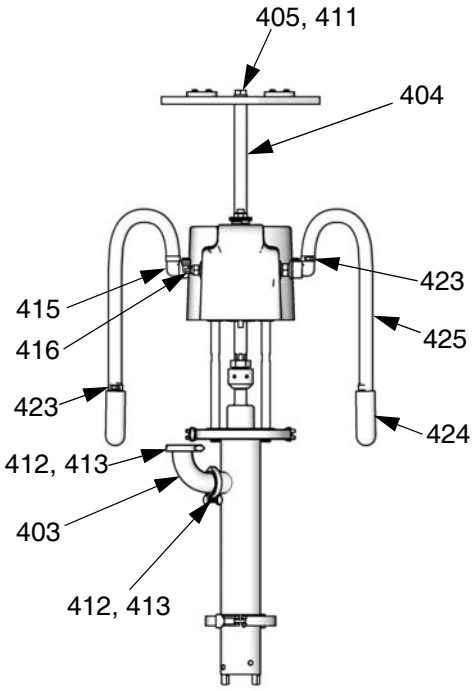


Pump Modules

Models 24G560 and 24G968, 5:1 SaniForce Double Ball Pump Module (2 Pumps)



TI16539a



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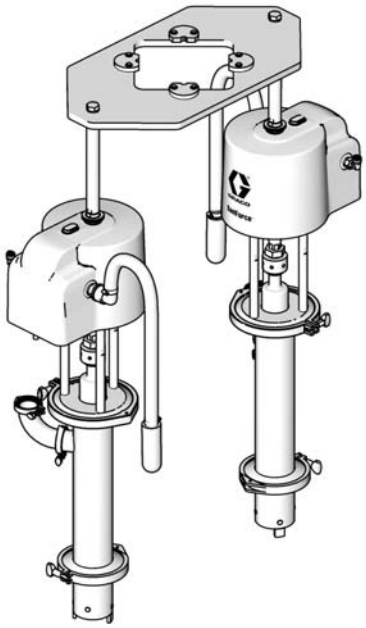
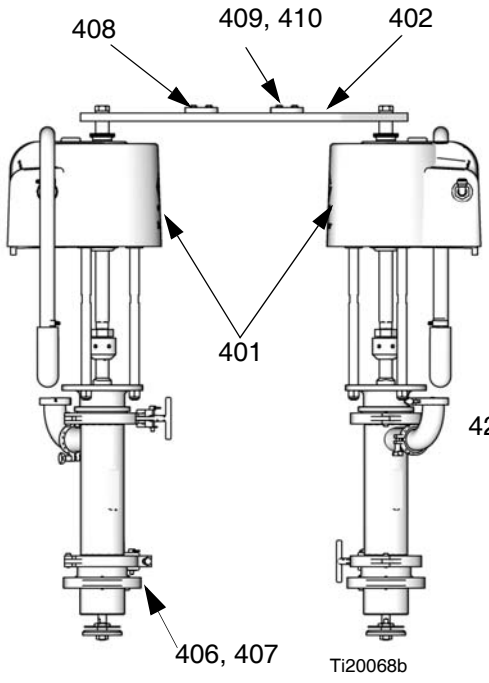
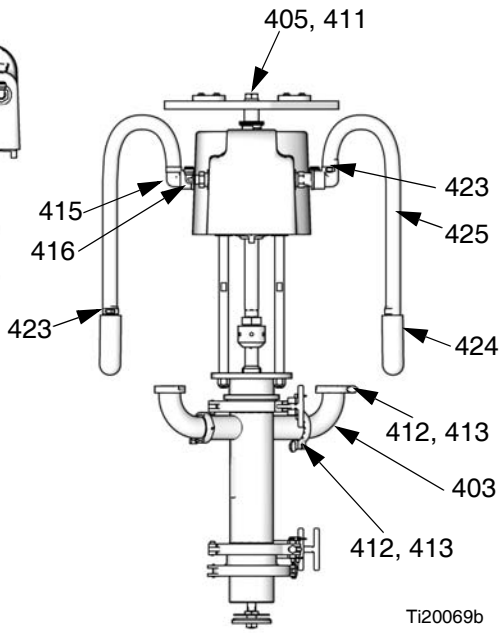

TI16540a

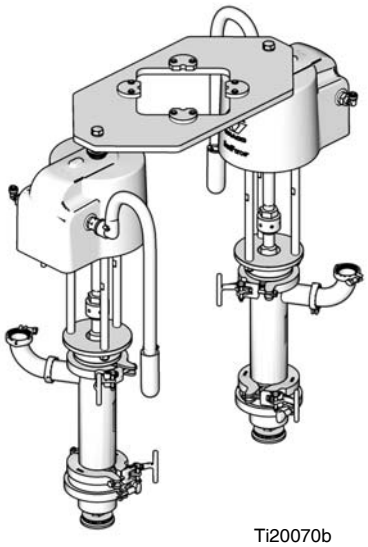
Ref. No.	Part No.	Description	Qty.
401	24G742	PUMP, 5:1 SaniForce; see manual 3A0734	2
402	16E388	PLATE, motor mount	1
403	513490	ELBOW; 2 in.; sst	2
404		ROD, motor mount	2
	16G494	Used on Model BESA4_	
	16G208	Used on Models BESA7_	
405	551365	SCREW, hex hd; 3/4-10 x 2 in.	2
406	16D246	GASKET, 6 in.	2
407	16D245	CLAMP, 6 in.	2
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

Ref. No.	Part No.	Description	Qty.
412	500984	CLAMP, 2 in. tri-clamp	4
413	512332	GASKET, S-clamp; buna-N	4
414	-----	CLAMP, for air motor drain hose (not shown)	2
415	16F384	FITTING, air inlet, 1/2 np x 1/2 ptc	2
416	16A942	FITTING, exhaust hose	2
423	101818	CLAMP, hose	4
424	512914	MUFFLER, polyethylene, 1 in. npt	2
425	-----	HOSE, exhaust, 6 ft.	2
426	-----	HOSE, air motor drain, 6 ft. (not shown)	2

Model 24P829, 5:1 SaniForce Priming Piston Pump Module (2 Pumps)



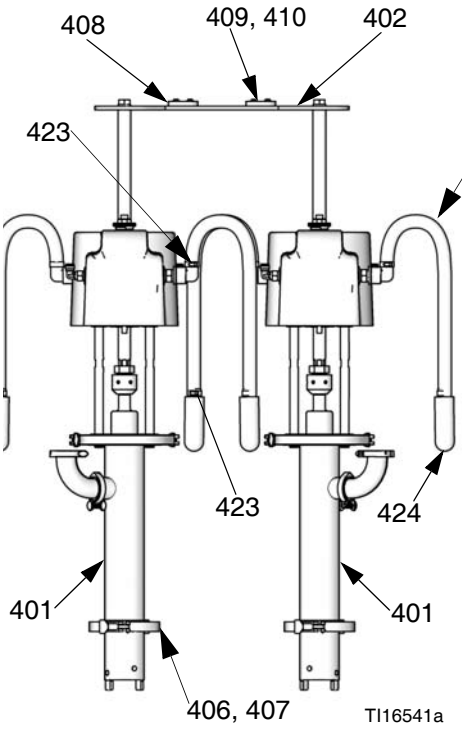


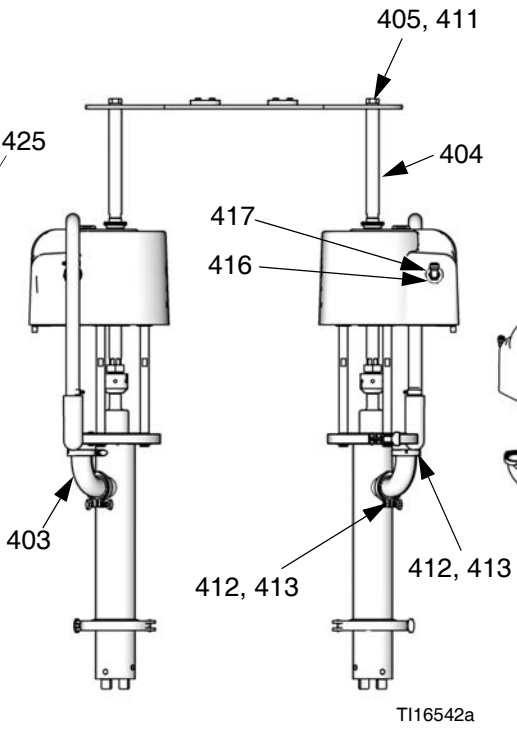


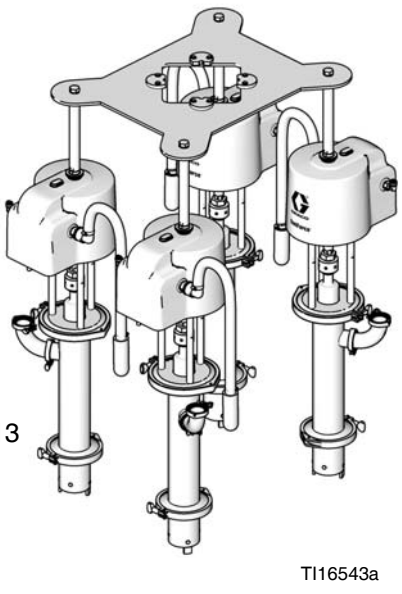
Ref. No.	Part No.	Description	Qty.
401	24R233	PUMP, 5:1 SaniForce; see manual 3A0734	2
402	16E388	PLATE, motor mount	1
403	513490	ELBOW; 2 in.; sst	2
405	551365	SCREW, hex hd; 3/4-10 x 2 in.	2
406	16D246	GASKET, 6 in.	2
407	16D245	CLAMP, 6 in.	2
408	625752	BEARING, cylinder guide	4
409	104119	SCREW, 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

Ref. No.	Part No.	Description	Qty.
412	500984	CLAMP, 2 in. tri-clamp	4
413	512332	GASKET, S-clamp; buna-N	4
414	-----	CLAMP, for air motor drain hose (not shown)	2
415	16F384	FITTING, air inlet, 1/2 np x 1/2 ptc	2
416	16A942	FITTING, exhaust hose	2
423	101818	CLAMP, hose	4
424	512914	MUFFLER, polyethylene, 1 in. npt	2
425	-----	HOSE, exhaust, 6 ft.	2
426	-----	HOSE, air motor drain, 6 ft. (not shown)	2

Model 24G561, 5:1 SaniForce Double Ball Pump Module (4 Pumps)



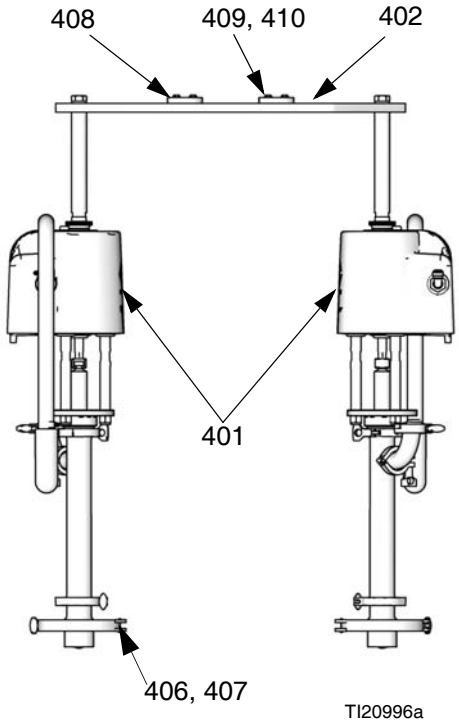




Ref.	Part No.	Description	Qty.
401	24G742	PUMP, 5:1 SaniForce; see manual 3A0734	4
402	16G201	PLATE, motor mount	1
403	513490	ELBOW; 2 in.; sst	4
404	16G208	ROD, motor mount	4
405	551365	SCREW, hex hd; 3/4-10 x 2 in.	4
406	16D246	GASKET, 6 in.	4
407	16D245	CLAMP, 6 in.	4
408	625752	BEARING, cylinder 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	4

Ref.	Part No.	Description	Qty.
412	500984	CLAMP, 2 in. tri-clamp	8
413	512332	GASKET, S-clamp; buna-N	8
414	-----	CLAMP, for air motor drain hose (not shown)	4
415	16F384	FITTING, air inlet, 1/2 np x 1/2 ptc	4
416	16A942	FITTING, exhaust hose	4
423	101818	CLAMP, hose	8
424	512914	MUFFLER, polyethylene, 1 in. npt	4
425	-----	HOSE, exhaust, 6 ft.	4
426	-----	HOSE, air motor drain, 6 ft. (not shown)	4

Model 24P815, 6:1 SaniForce Priming Piston Pump Module (2 Pumps)



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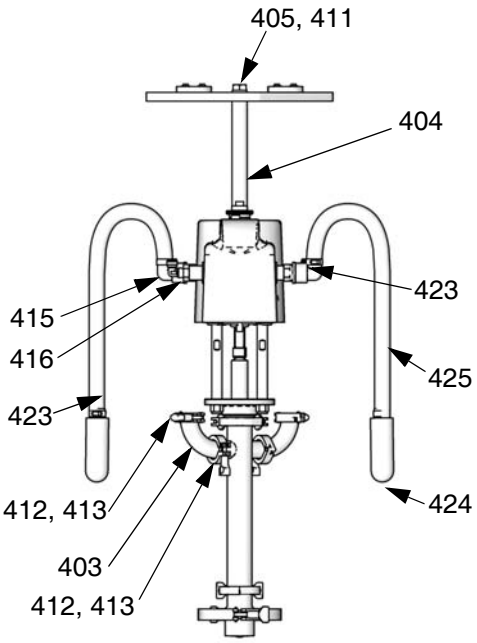

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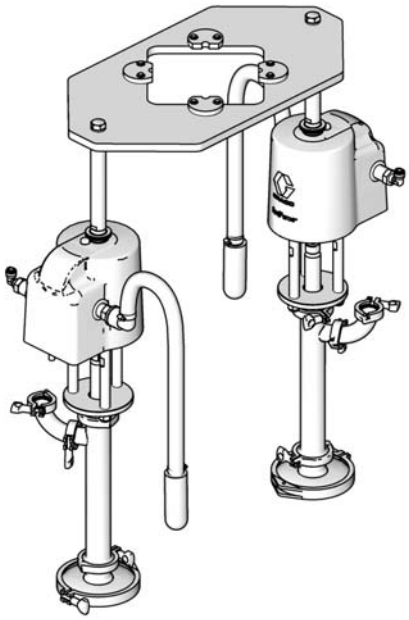

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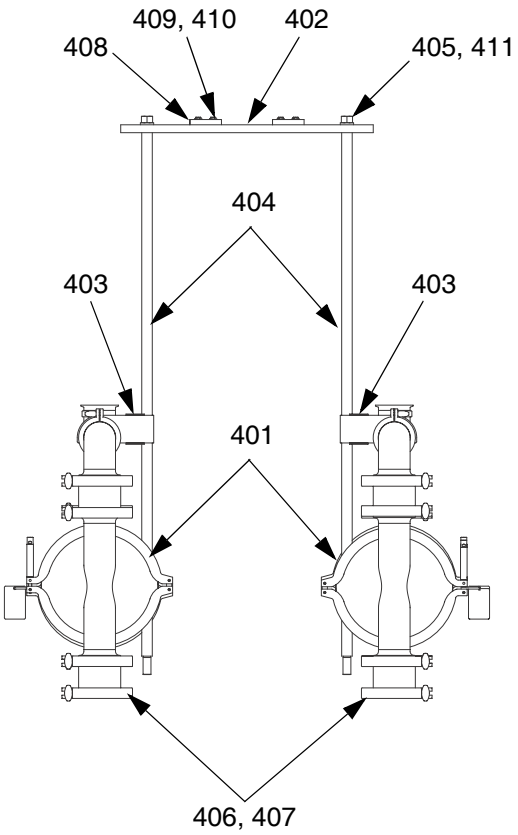
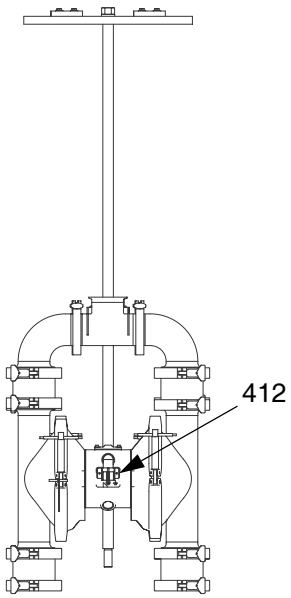
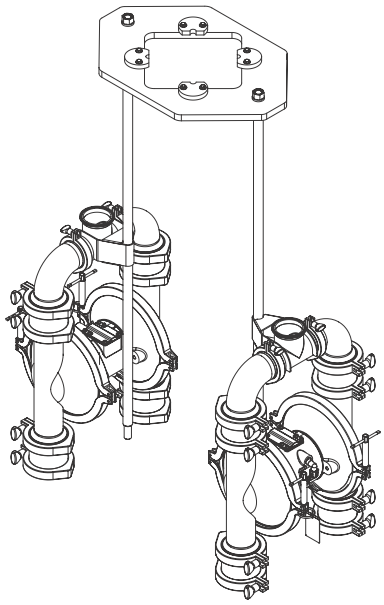
Ref. No.	Part No.	Description	Qty.
401	24D659	PUMP, 6:1 SaniForce; see manual 3A0733	2
402	16E388	PLATE, motor mount	1
403	51A796	ELBOW; 2 in.; sst	2
404	16T894	ROD, motor mount	2
405	551365	SCREW, hex hd; 3/4-10 x 2 in.	2
406	16D246	GASKET, 6 in.	2
407	16D245	CLAMP, 6 in.	2
408	625752	BEARING, cylinder 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

Ref. No.	Part No.	Description	Qty.
412	118598	CLAMP, 1.5 in. tri-clamp	4
413	16D169	GASKET, buna-N	4
414	-----	CLAMP, for air motor drain hose (not shown)	2
415	16F384	FITTING, air inlet, 1/2 np x 1/2 ptc	2
416	16A942	FITTING, exhaust hose	2
423	101818	CLAMP, hose	4
424	512914	MUFFLER, polyethylene, 1 in. npt	2
425	-----	HOSE, exhaust, 6 ft.	2
426	-----	HOSE, air motor drain, 6 ft (not shown)	2

Model 249488, 24E441, and 24C125 3150 SaniForce Ball Check Pump Module (2 Pumps)



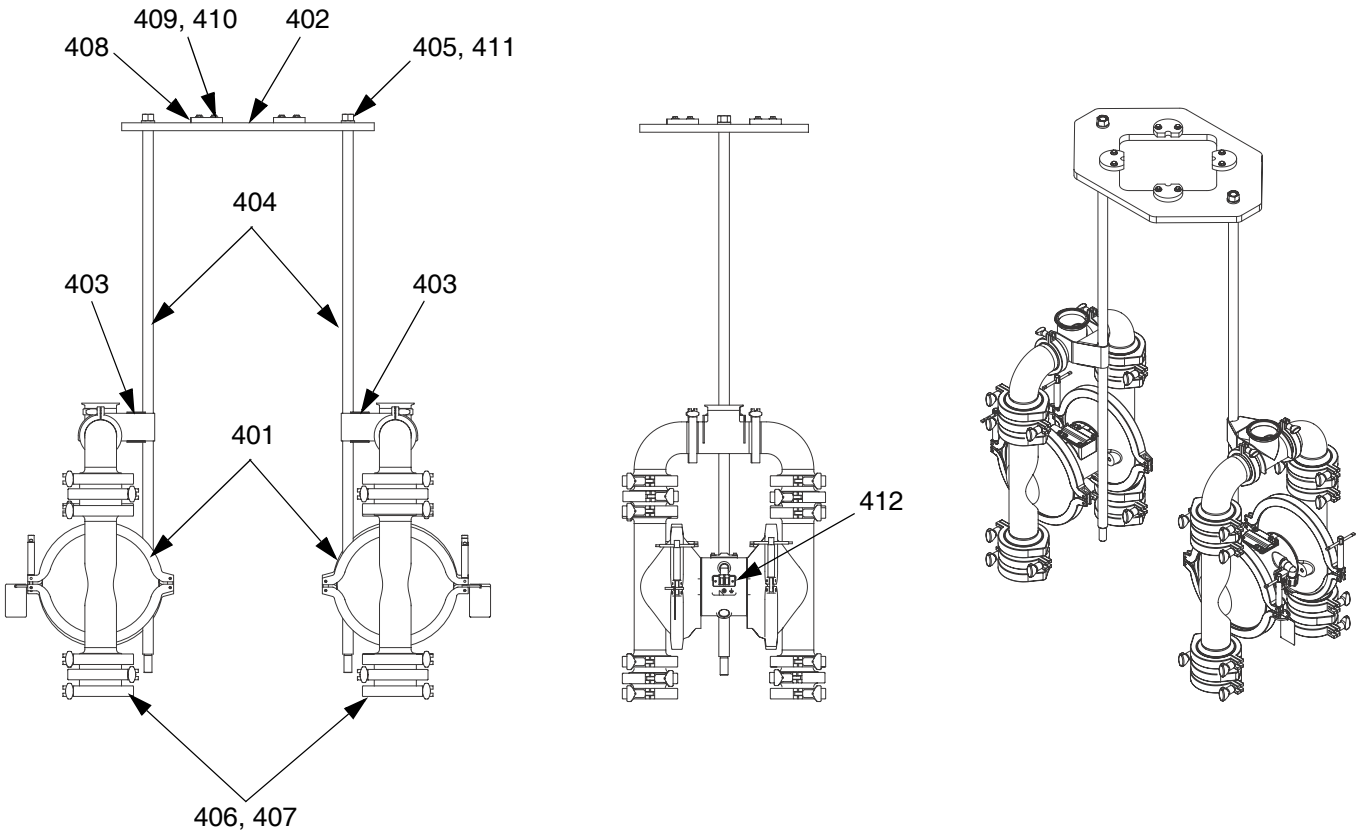




Ref.	Part No.	Description	Qty.
401	248273	PUMP, sanitary SaniForce, ball check; for module 249488, see manual 310622	2
	24E440	PUMP, sanitary SaniForce, ball check; for module 24E441, see manual 310622	2
	24C124	PUMP, sanitary SaniForce, ball check, for module 24C125, see manual 310662	
402	15E473	PLATE, guide; for module 249488 and 24C125	1
	16E157	PLATE, guide; for module 24E441	1
403	15E477	SUPPORT, pump	2
404	15K216	ROD, tie	2
405	551364	ELBOW; 1/2-14 npt(m) x 1/2 in. (13 mm) OD; nylon	2
406	510490	TRI-CLAMP, 4 in.	4
407	15H460	GASKET, tri-clamp	4
408	625752	BEARING, cylinder guide	4

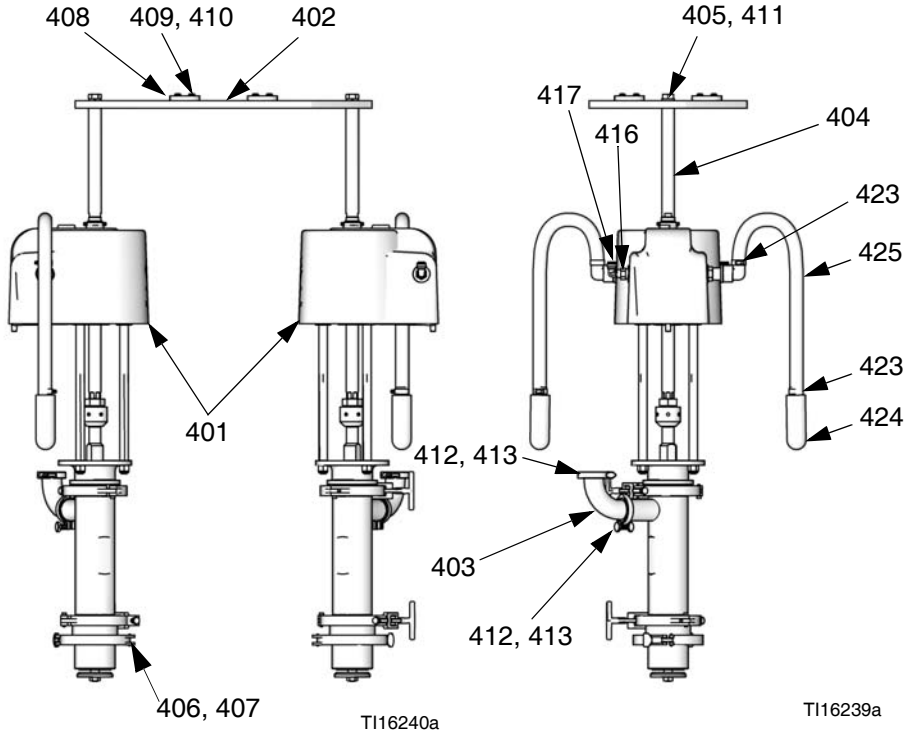
Ref.	Part No.	Description	Qty.
409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8
410	170772	WASHER, plain	8
411	514334	WASHER, lock; 3/4 in.; sst	2
412	512684	NUT, 3/4-10 Nylock	2
414	500263	ELBOW; 3/4-14 npt x 1.5 in. (38 mm), 304 stainless steel	2
415	171439	NIPPLE; 1-11.5 npt x 3/4-14 npt, 303 stainless steel	2
416	551298	COUPLING, hose, 1-1/4 in. (32 mm)	4
417	101818	CLAMP, hose	4
418	512914	MUFFLER, polyethylene, 1 in. npt	2
419	551297	HOSE, 1-1/4 in. (32 mm); 20 in.	2

Model 249489 3150 SaniForce Flapper Check Pump Module (2 Pumps)



Ref.	Part No.	Description	Qty.
401	248274	PUMP, sanitary SaniForce, flapper check; see manual 310622	2
402	15E473	PLATE, guide	1
403	15E477	SUPPORT, pump	2
404	15K216	ROD, tie	2
405	514334	NUT, 3/4-10 Nylock	2
406	510490	TRI-CLAMP, 4 in.	4
407	15H460	GASKET, tri-clamp	4
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
412	512684	ELBOW; 1/2-14 npt(m) x 1/2 in. (13 mm) OD; nylon	2
414	500263	ELBOW; 3/4-14 npt x 1.5 in. (38 mm), 304 stainless steel	2
415	171439	NIPPLE; 1-11.5 npt x 3/4-14 npt, 303 stainless steel	2
416	551298	COUPLING, hose, 1-1/4 in. (32 mm)	4
417	101818	CLAMP, hose	4
418	512914	MUFFLER, polyethylene, 1 in. npt	2
419	551297	HOSE, 1-1/4 in. (32 mm); 20 in.	2

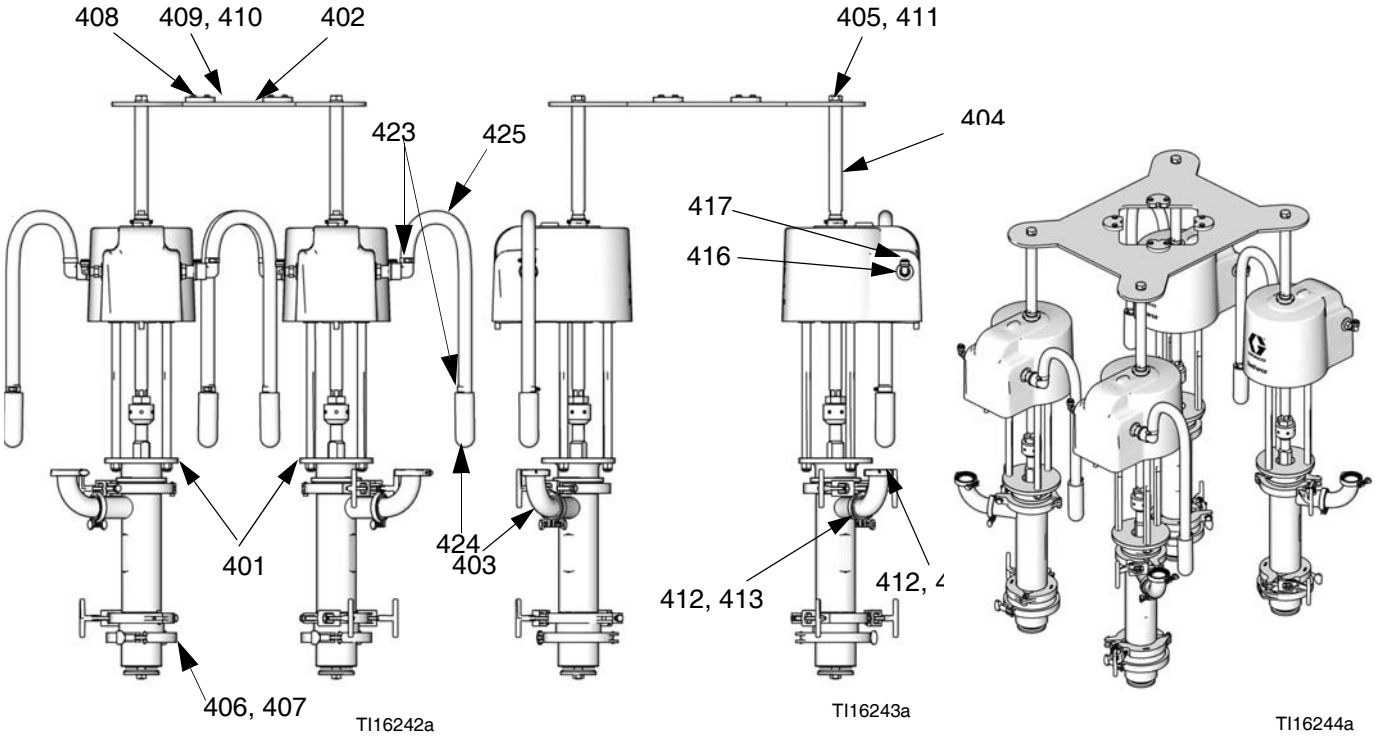
Model 24G564 and 24G969 12:1 SaniForce Priming Piston Pump Module (2 Pumps)



Ref.	Part No.	Description	Qty.
401	24F625	PUMP, 12:1 SaniForce; see manual 3A0735	2
402	16E388	PLATE, motor mount	1
403	513490	ELBOW; 2 in.; sst	2
404		ROD, motor mount	2
	16G208	Model 246564	
	16G494	Model 24G969	
405	551365	SCREW, hex, 3/4-10; sst	2
406	16D246	GASKET, 6 in. Sanitary	2
407	16D245	CLAMP, 6 in. Sanitary	2
408	625752	BEARING, cylinder guide	4
409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8

Ref.	Part No.	Description	Qty.
410	170772	WASHER, plain	8
411	551364	WASHER, lock; 3/4 in.; sst	2
412	500984	CLAMP, 2 in. tri-clamp	4
413	512332	GASKET, S-clamp; buna-N	4
414	-----	CLAMP, for air motor drain hose (not shown)	2
415	16F384	FITTING, air inlet, 1/2 np x 1/2 ptc	2
416	16A942	FITTING, exhaust hose	2
423	101818	CLAMP, hose	4
424	512914	MUFFLER, polyethylene, 1 in. npt	2
425	-----	HOSE, exhaust, 6 ft.	2
426	-----	HOSE, air motor drain, 6 ft. (not shown)	2

Part No. 24G566 and 24G970 12:1 SaniForce Priming Piston Pump Module (4 Pumps)



Ref.	Part No.	Description	Qty.
401	24F625	PUMP, 12:1 SaniForce; see manual 3A0735	4
402	16G201	PLATE, motor mount	1
403	513490	ELBOW; 2 in.; sst	4
404		ROD, motor mount	4
	16G208	Model 24G566	
	16G494	Model 24G970	
405	551365	SCREW, hex, 3/4-10; sst	4
406	16D246	GASKET, 6 in. Sanitary	4
407	16D245	CLAMP, 6 in. Sanitary	4
408	625752	BEARING, cylinder guide	4
409	104119	SCREW, cap, hex head; 1/4-20 x 7/8 in. (22 mm); sst	8

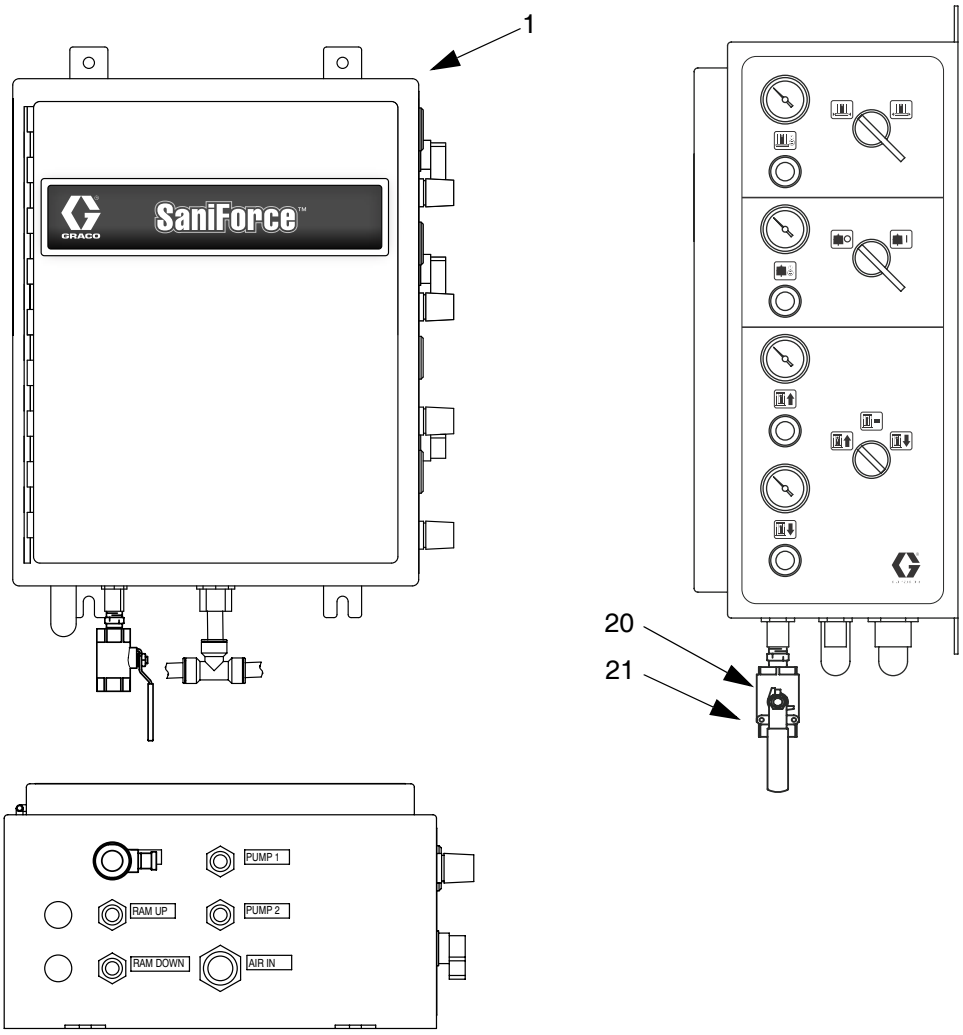
Ref.	Part No.	Description	Qty.
410	170772	WASHER, plain	8
411	551364	WASHER, lock; 3/4 in.; sst	4
412	500984	CLAMP, 2 in. tri-clamp	8
413	512332	GASKET, S-clamp; buna-N	8
414	-----	CLAMP, for air motor drain hose (not shown)	4
415	16F384	FITTING, air inlet, 1/2 np x 1/2 ptc	4
416	16A942	FITTING, exhaust hose	4
423	101818	CLAMP, hose	4
424	512914	MUFFLER, polyethylene, 1 in. npt	4
425	-----	HOSE, exhaust, 6 ft.	4
426	-----	HOSE, air motor drain, 6 ft. (not shown)	4

Inflatable Seal, Plate, Frames, and Controls

Model	Inflatable Seal* (Ref. 501)	Plate (Ref. 502)	Frame (Ref. 602)	Air Controls (Ref. 603)	Electronic Controls (Ref. 624 and 625))	Tee (Ref. 631)	Proximity Switch (Ref. 641)
BESA7A	514984	16E391	15E339	949949	15H145	-----	249493
BESA7F	514984	16E391	15E339	949949	15J902	-----	249493
BESB7B	514984	16E397	570192	570193	15H145	-----	249493
BES3A1	551413	15U256	15E339	949949	15H145	-----	249493
BES3P1	514984	15E348	15E339	949949	15H145	-----	249493
BES4A1	551413	15U256	15E339	949949	15H145	-----	249493
BESE1A	551413	16E393	15E339	949949	15H145	-----	249493
BESF6B	551413	16E395	570192	570193	15H145	-----	249493
BESF9B	116464	16E396	570192	570193	15H145	-----	249493
BESA4C	16A383	16E392	15E339	15E523	-----	-----	-----
BESA7C	514984	16E391	15E339	15E523	-----	-----	-----
BESAAC	514984	16M012	15E339	15E523	-----	-----	-----
BESB7D	514984	16E397	570192	15M343	-----	-----	-----
BESCCC	16A383	16U774	16U789	15E523	-----	-----	-----
BES3F3	16D785	16D808	16D826	15E523	-----	-----	-----
BES3P3	514984	15E348	15E339	15E523	-----	-----	-----
BES4P3	514984	15E348	15E339	15E523	-----	-----	-----
BES8B3	16A383	16A381	15E339	15E523	-----	-----	-----
BESDBC	16D785	16T895	16D826	15E523	-----	-----	-----
BESE1C	551413	16E393	15E339	15E523	-----	-----	-----
BESE5C	16A383	16E392	15E339	15E523	-----	-----	-----
BESE7C	514984	16E391	15E339	15E523	-----	-----	-----
BESEAC	514984	16M042	15E339	15E523	-----	-----	-----
BESF6D	551413	16E395	570192	15M343	-----	513226	-----
BESF7D	514984	16E397	570192	15M343	-----	513226	-----
BESF9D	116464	16E396	15E339	15M343	-----	513226	-----

* Indicates a recommended spare part.

Part No. 15E523, 2 Pump Manual Control Panel

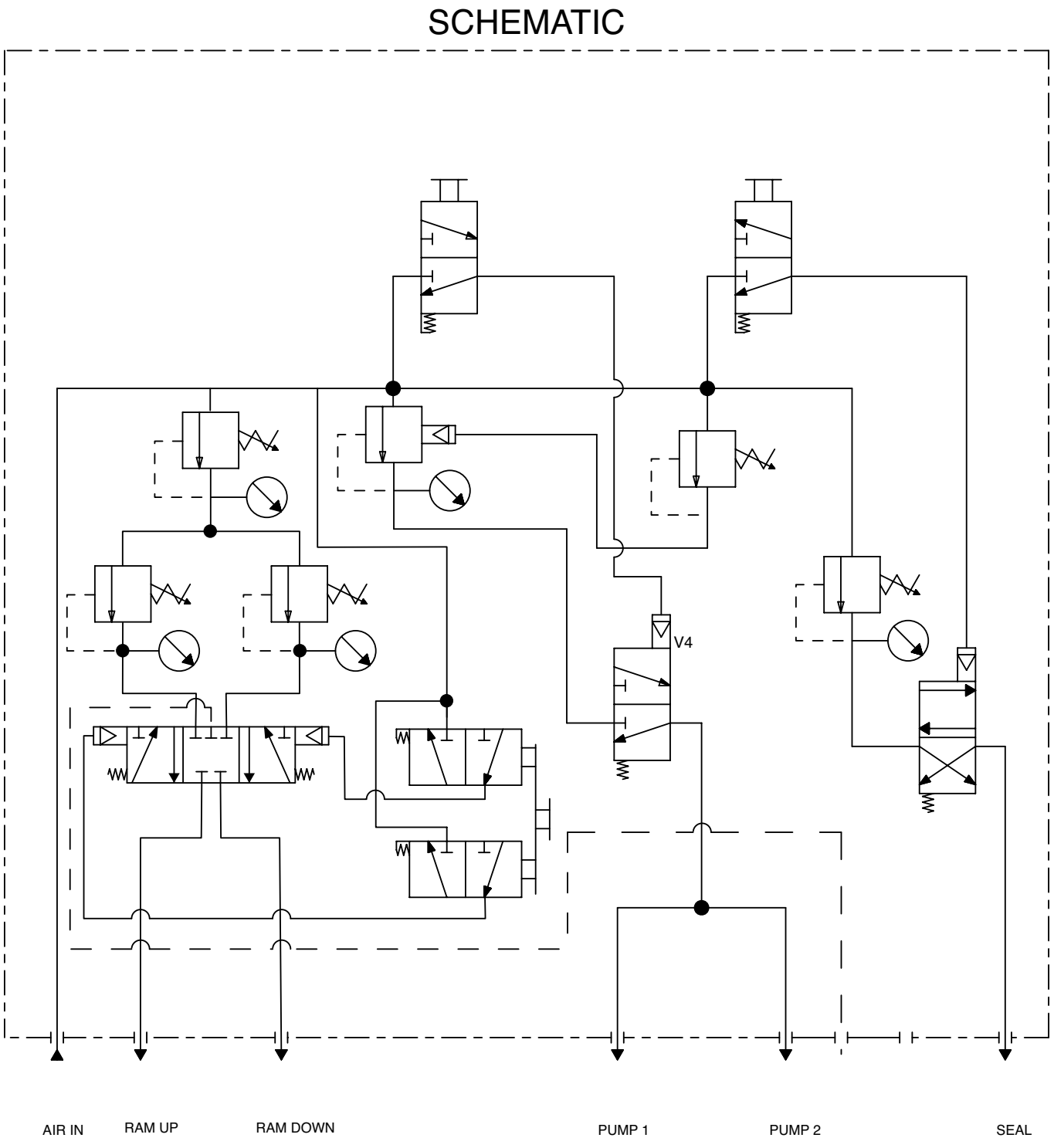


Ref. No.	Part No.	Description	Qty.
1	-----	ENCLOSURE, with back panel	1
2	15E562	LABEL	1
3†	15E563	LABEL, instructions	1
4†	512896	REGULATOR	4
5†	-----	GAUGE, 160 PSI	4
6†	-----	VALVE, check 3/8 in.	2
7†	-----	VALVE, air pilot, 3 position	1
8†	-----	VALVE, air pilot operated	1
9†	-----	SWITCH, 3 position	1
10†	-----	REGULATOR	1
11†	-----	VALVE, air pilot operated	1
12†	-----	SWITCH, pneumatic, 2 position	2
13†	-----	FITTING, bulkhead, 3/4 in. NPT	1
14†	-----	FITTING, bulkhead, 3/8 in. tube	1
15†	-----	FITTING, bulkhead, 1/2 in. tube	2
16†	-----	MUFFLER, 1/2 in. NPT	2
17†	-----	TUBE, 1/2 in. O.D.	AR
18†	-----	TIUBE, 3/8 in. O.D.	AR
19†	-----	TUBE, 5/32 in. O.D.	AR
20	-----	FITTING, nipple, hex	1
21	-----	VALVE, ball; sst	1

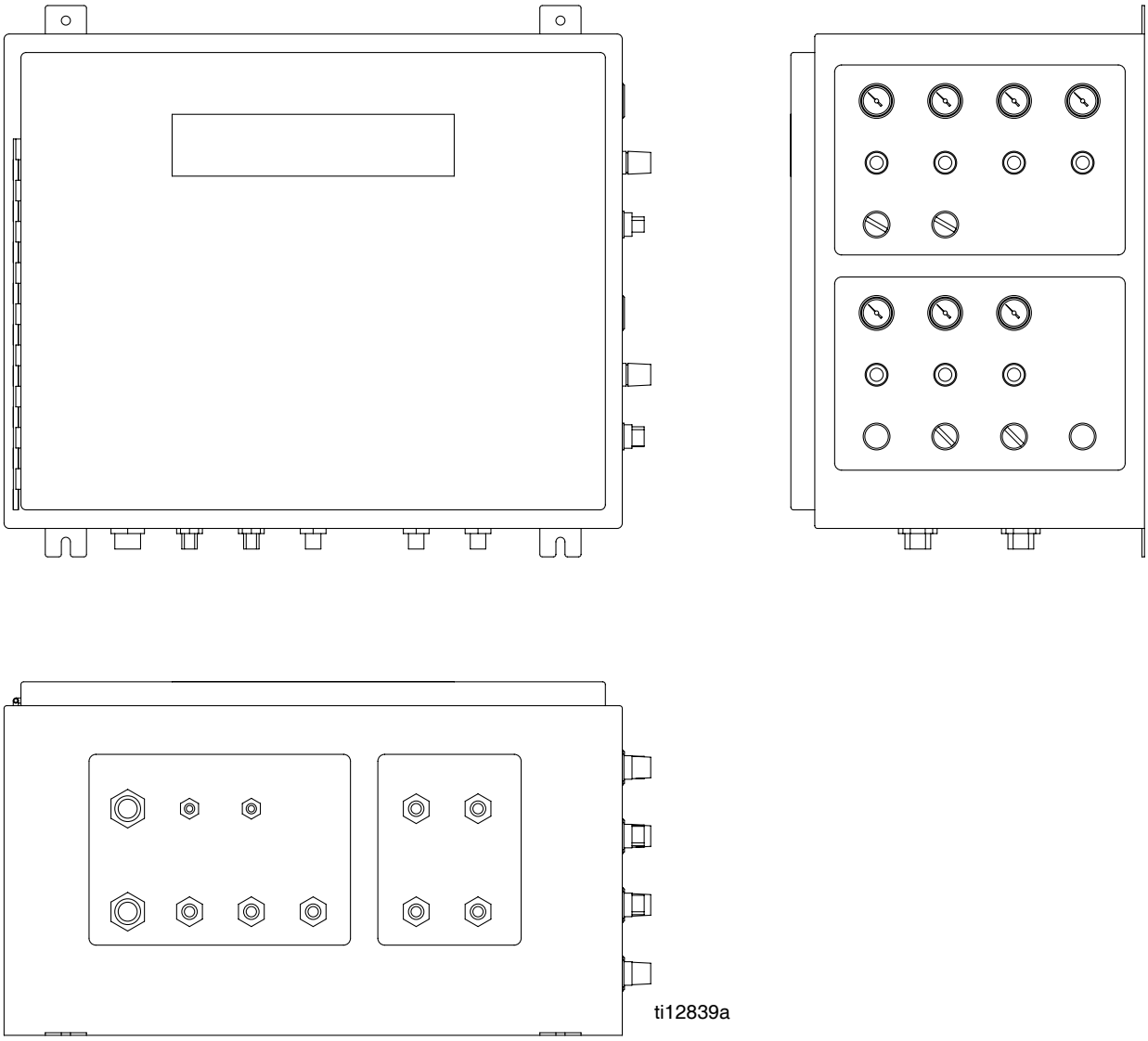
----- Not sold separately

† Not shown

Part No. 15E523, 2 Pump Manual Control Panel, Pneumatic Diagram



Part No. 15M343, 4 Pump Manual Control Panel



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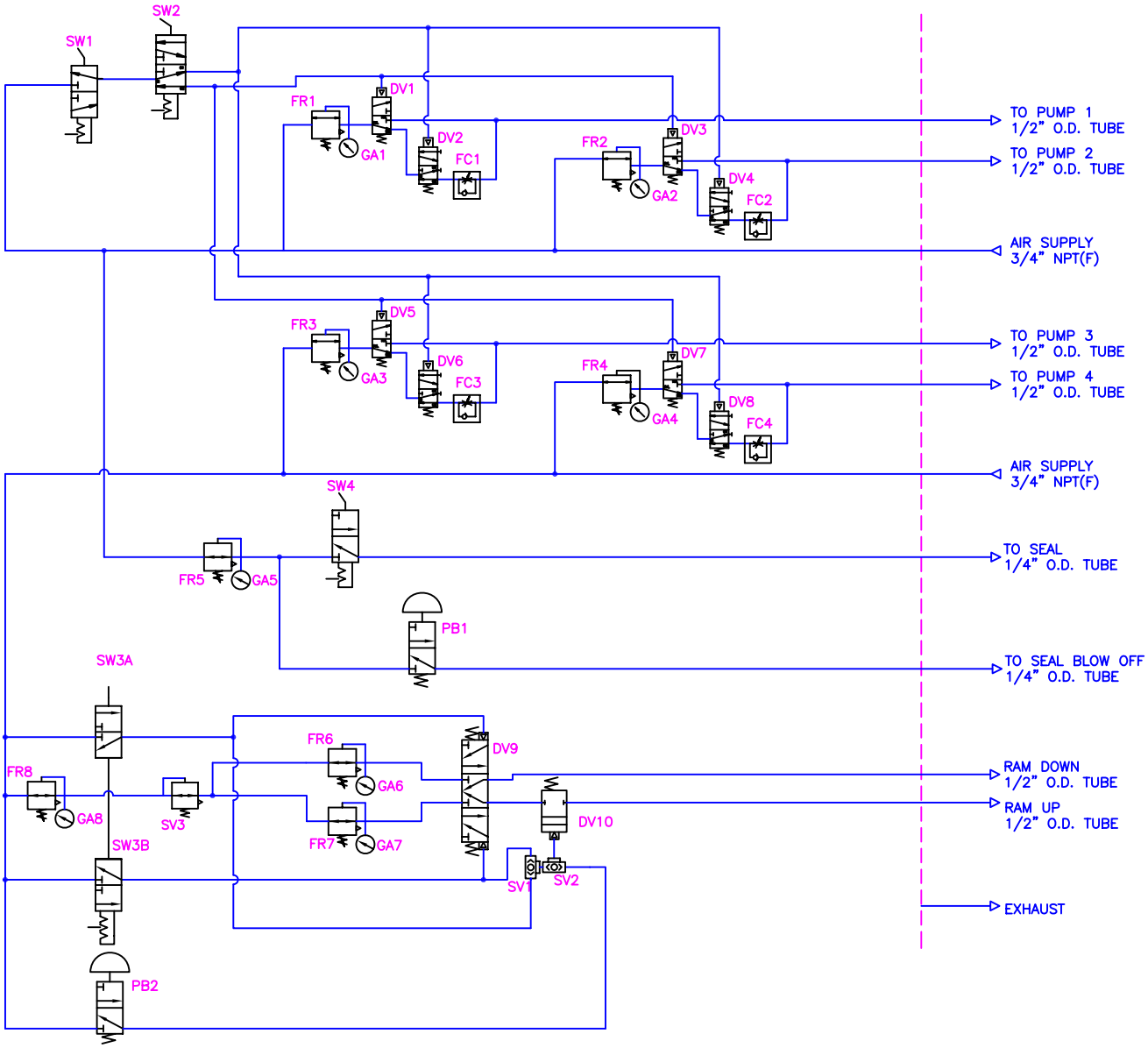
Ref. No.	Part No.	Description
1	-----	ENCLOSURE, control
2	-----	SUBPLATE
3†	-----	REGULATOR, air 1/2 in. ports
4†	-----	REGULATOR, air 0-25 psi
5†	-----	GAUGE, 0-100 psi
6†	-----	GAUGE, 0-30 psi
7†	-----	SWITCH, 3 position
8†	-----	SWITCH, 2 position
9†	-----	PUSH BUTTON, momentary
10†	-----	VALVE, air, 3-way
11†	-----	BRACKET, switch
12†	-----	BULKHEAD, 1/2 npt FBE
13†	-----	BULKHEAD, 1/2 npt(f) x 1/2 tod
14†	-----	BULKHEAD, 1/4 npt fbe
15†	-----	BULKHEAD, brass, 3/4 npt
16†	-----	MUFFLER, 1/2 npt
17†	-----	GAUGE 0-160 psi
18†	-----	VALVE, 2 position, 3 port
19†	15E562	LABEL
20†	15E563	LABEL, instructions (not shown)

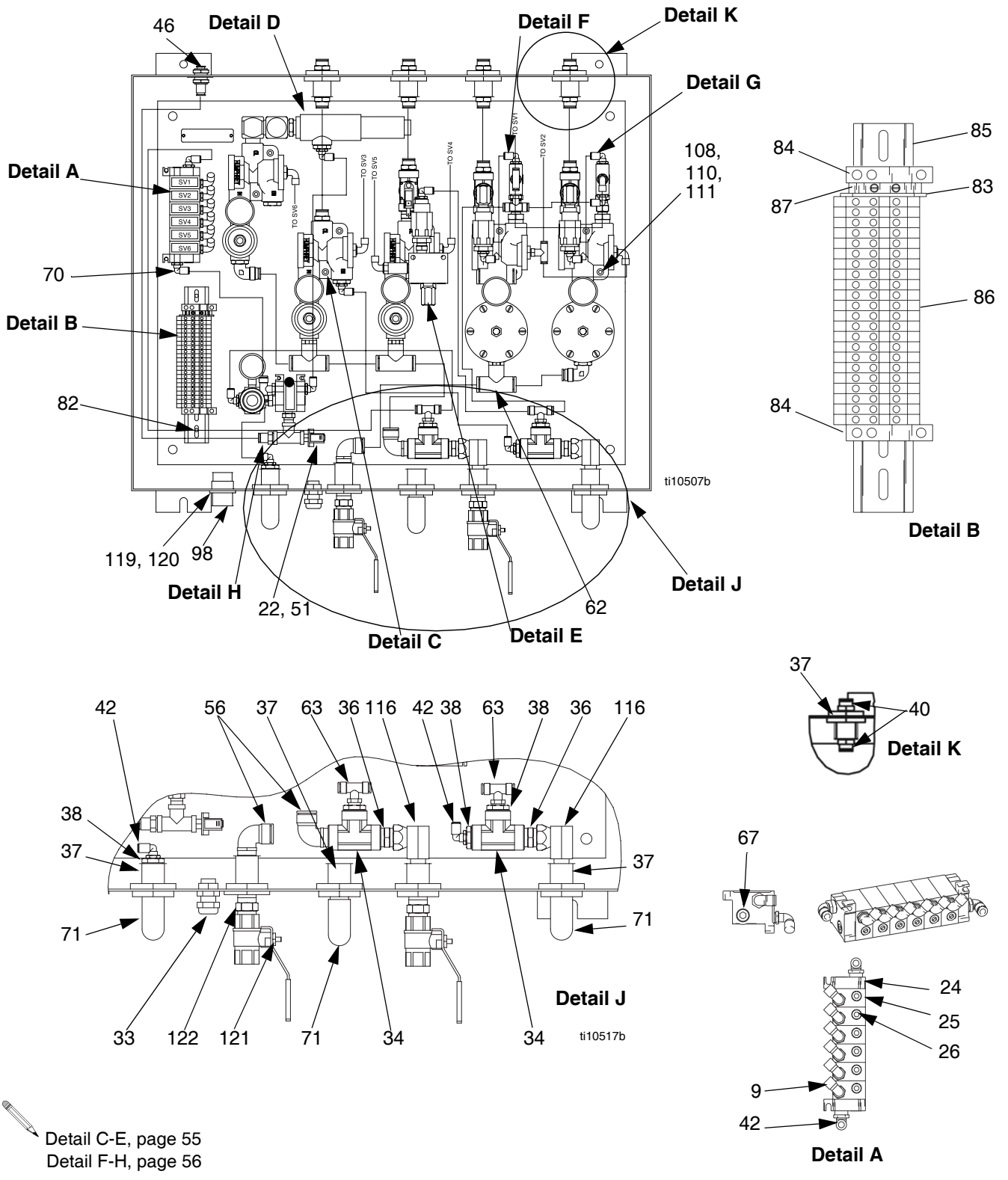
----- Not sold separately.

† Not shown

Part No. 15M343, 4 Pump Manual Control Panel, Pneumatic Diagram



Part No. 949949, 2 Pump Pneumatic Control Panel

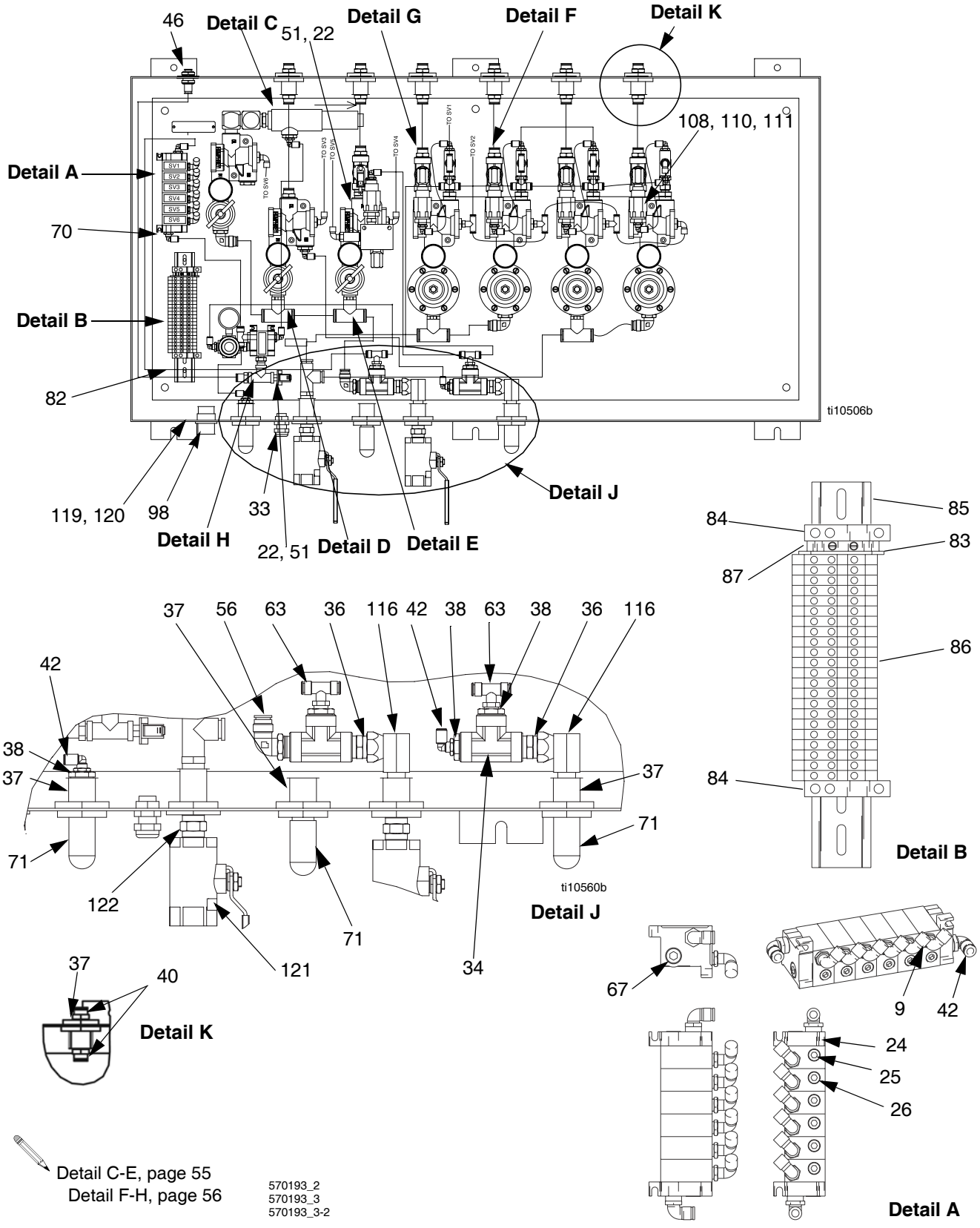


Part No. 949949, 2 Pump Pneumatic Control Panel

Ref. No.	Part No.	Description	Qty.
9	598140	FITTING, elbow; 5/32 in. tube x 1/8 npt(m)	8
10	598095	TUBE, nylon; 5/32 in. OD	*
11	590385	TUBE, poly-flo; 3/8 in. OD	*
22	514019	CONNECTOR, terminal	4
24	514711	KIT, end plate	2
25	514676	VALVE, air; 24 VDC; 4-way stack	7
26	104765	PLUG, pipe	7
27	513937	SWITCH, pressure	2
28	110318	REGULATOR, air; 1/4 npt	1
29	110319	GAUGE, air pressure; 1/8 npt	1
30	104267	REGULATOR, air; 0-125 psi	3
31	108190	GAUGE, air pressure	5
32	503080	VALVE, air flow control	3
33	513795	CONNECTOR, cord	1
34	103475	TEE, pipe; 1/2 nptf	5
35	172124	NIPPLE, regulator; 3/8 x 1/2 npt	5
36	158491	FITTING, nipple;1/2 npt	6
37	512905	FITTING, bulkhead; 1/2 npt	9
38	100206	BUSHING, pipe; 1/2 x 1/4 npt	7
39	100730	BUSHING; 3/8 x 1/8 npt	5
40	114111	FITTING, connector; 1/2 in. tube x 1/2 nptf	12
42	C19391	FITTING, elbow; 1/4 in. tube x 1/4 nptm	14
46	598449	BULKHEAD, union	1
51	513420	WIRE, 18 AWG; blue	*
52	626399	ENCLOSURE	1
55	104632	VALVE, piloted	5
56	114110	FITTING, elbow, swivel; 1/2 in. tube x 1/2 nptf	4
59	162449	FITTING, reducing nipple	5
60	155541	UNION, swivel, 90°; 1/4 npt x 1/4 npsm	3
61	100840	ELBOW, street; 1/4 npt(m) x 1/4 npt(f)	1
62	599248	FITTING, tee; 1/2 in. tube x 1/2 nptm	3
63	599246	FITTING, tee; 1/4 in. tube x 1/4 npt	3
65	510220	VALVE, air, 4-way; 1/4 npt	3
66	501014	ACTUATOR, air; 1/8 npt	3
67	100721	PLUG, pipe; 1/4 nptf	11
68	156823	UNION, swivel; 1/4 npt	2
69	598141	FITTING, tee, air; 5/32 x 1/8 npt	2
70	103831	SCREW; 10-32 UNF	4
71	512912	MUFFLER, polyethylene	3
72	158683	ELBOW, 90°; 1/2 x 1/2 npt	3
73	551143	PUMP, vacuum	1
74	100737	PLUG, pipe; 1/2 nptf	1
76	156971	NIPPLE, short	1
77	590570	TUBE, polyethylene; 1/2 in. OD	*
78	590332	TUBE, poly-flo; 1/4 OD	*
79	104984	PIPE, tee; 1/4 nptf	1
80	598447	FITTING, tube; 3/8 in. tube x 1/4 npt	1
81	206197	REGULATOR, air; 0-125 psi	2
82	106389	SCREW; 10-32 UNF	2
83	112445	COVER, end terminal	1
84	112446	BLOCK, clamp end	2
85	514014	RAIL, mounting	1
86	112444	BLOCK, terminal, 2 conductor	22
87	112443	BLOCK, terminal, ground	1
98	513884	SOCKET, 14-contact	1
108	105171	SCREW; 1/4-20 UNC-2A	10
110	100527	WASHER	10
111	626141	SPACER, pilot valve	10
112	100030	BUSHING; 1/8 x 1/4 npt	2
115	151519	NIPPLE, reducing; 1/8 x 1/4 npt	1
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	114373	FITTING, nipple, hex	2
123	15H252	CONNECTOR, jumper, terminal block	10
124	065161	WIRE, copper elect.	20
125	112512	FERRULE, wire, orange	20
126	15H255	MARKER, terminal block, blank	50
128	112513	FERRULE, wire, white	20

* *Bulk tubing/wire*

Part No. 570193, 4 Pump Pneumatic Control Panel

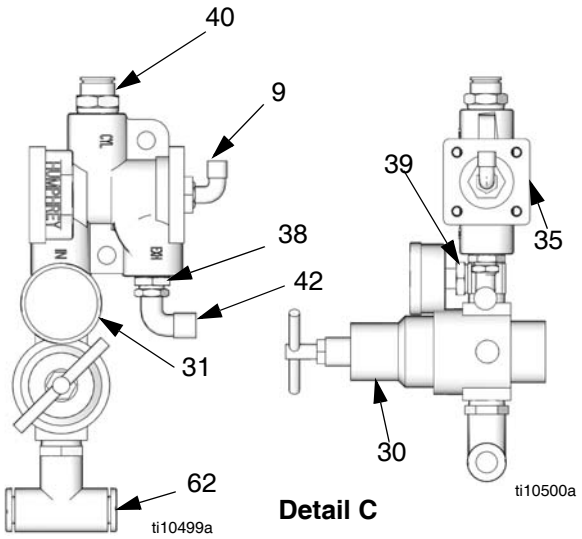


Part No. 570193, 4 Pump Pneumatic Control Panel

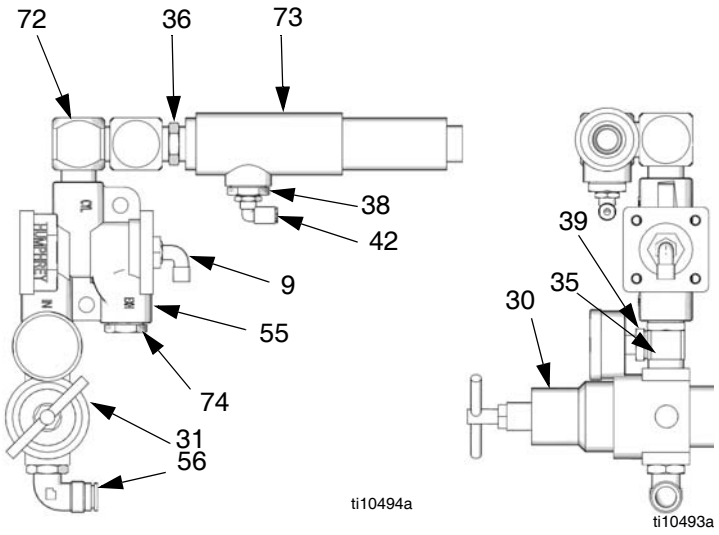
Ref. No.	Part No.	Description	Qty.
9	598140	FITTING, elbow; 5/32 in. tube x 1/8 npt(m)	12
10	598095	TUBE, nylon; 5/32 in. OD	*
11	590385	TUBE, poly-flo; 3/8 in. OD	*
22	514019	CONNECTOR, terminal	4
24	514711	KIT, end plate	2
25	514676	VALVE, air; 24 VDC; 4-way stack	7
26	104765	PLUG, pipe	7
27	513937	SWITCH, pressure	2
28	110318	REGULATOR, air; 1/4 npt	1
29	110319	GAUGE, air pressure; 1/8 npt	1
30	104267	REGULATOR, air; 0-125 psi	3
31	108190	GAUGE, air pressure	7
32	503080	VALVE, air flow control	5
33	513795	CONNECTOR, cord	1
34	103475	TEE, pipe; 1/2 nptf	7
35	172124	NIPPLE, regulator; 3/8 x 1/2 npt	7
36	158491	FITTING, nipple;1/2 npt	8
37	512905	FITTING, bulkhead; 1/2 npt	11
38	100206	BUSHING, pipe; 1/2 x 1/4 npt	7
39	100730	BUSHING; 3/8 x 1/8 npt	7
40	114111	FITTING, connector; 1/2 in. tube x 1/2 nptf	18
42	C19391	FITTING, elbow; 1/4 in. tube x 1/4 nptm	18
46	598449	BULKHEAD, union	1
51	513420	WIRE, 18 AWG; blue	*
52	626658	ENCLOSURE	1
55	104632	VALVE, piloted	7
56	114110	FITTING, elbow, swivel; 1/2 in. tube x 1/2 nptf	4
59	162449	FITTING, reducing nipple	9
60	155541	UNION, swivel, 90°; 1/4 npt x 1/4 npsm	5
61	100840	ELBOW, street; 1/4 npt(m) x 1/4 npt(f)	1
62	599248	FITTING, tee; 1/2 in. tube x 1/2 nptm	4
63	599246	FITTING, tee; 1/4 in. tube x 1/4 npt	5
65	510220	VALVE, air, 4-way; 1/4 npt	5
66	501014	ACTUATOR, air; 1/8 npt	5
67	100721	PLUG, pipe; 1/4 nptf	15
68	156823	UNION, swivel; 1/4 npt	5
69	598141	FITTING, tee, air; 5/32 x 1/8 npt	6
70	103831	SCREW; 10-32 UNF	4
71	512912	MUFFLER, polyethylene	3
72	158683	ELBOW, 90°; 1/2 x 1/2 npt	3
73	551143	PUMP, vacuum	1
74	100737	PLUG, pipe; 1/2 nptf	1
76	156971	NIPPLE, short	2
77	590570	TUBE, polyethylene; 1/2 in. OD	*
78	590332	TUBE, poly-flo; 1/4 OD	*
79	104984	PIPE, tee; 1/4 nptf	1
80	598447	FITTING, tube; 3/8 in. tube x 1/4 npt	1
81	206197	REGULATOR, air; 0-125 psi	4
83	112445	COVER, end terminal	1
84	112446	BLOCK, clamp end	2
85	514014	RAIL, mounting	1
86	112444	BLOCK, terminal, 2 conductor	22
87	112443	BLOCK, terminal, ground	1
89	551966	FITTING, tee; 1/2 tube x 1/2 npt	1
98	513884	SOCKET, 14-contact	1
108	105171	SCREW; 1/4-20 UNC-2A	14
110	100527	WASHER	14
111	626141	SPACER, pilot valve	14
112	100030	BUSHING; 1/8 x 1/4 npt	2
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	114373	FITTING, nipple, hex	2
123	15H252	CONNECTOR, jumper block, blank	10
124	065161	WIRE, copper elect.	20
125	112512	FERRULE, wire, orange	20
126	15H255	MARKER, terminal block, blank	50
127	16F637	EMBLEM, logo	1
128	112513	FERRULE, wire, white	20

** Bulk tubing/wire*

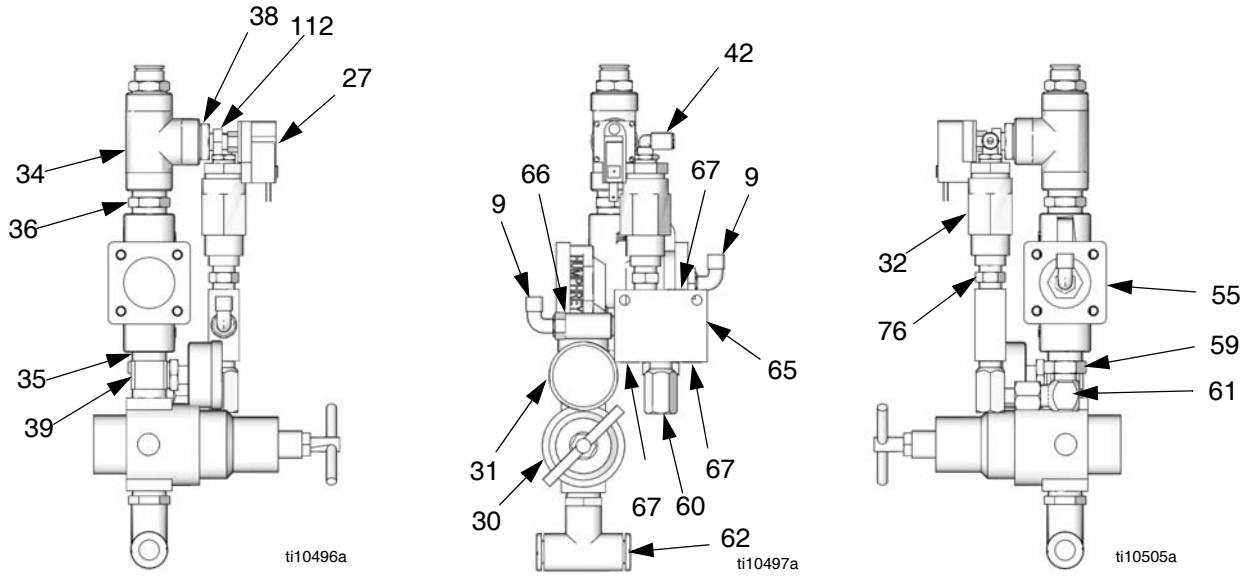
Common Parts for 570193 and 949949 Pneumatic Control Panels



Detail C

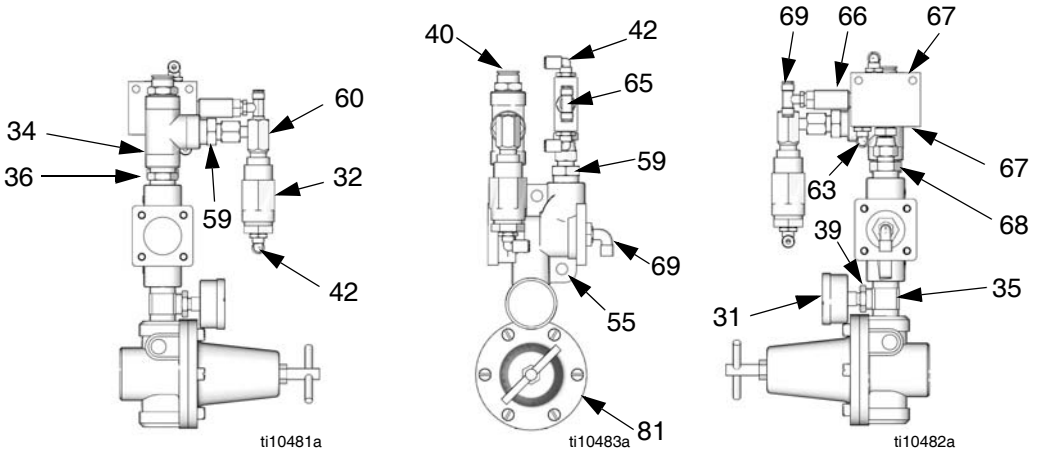


Detail D

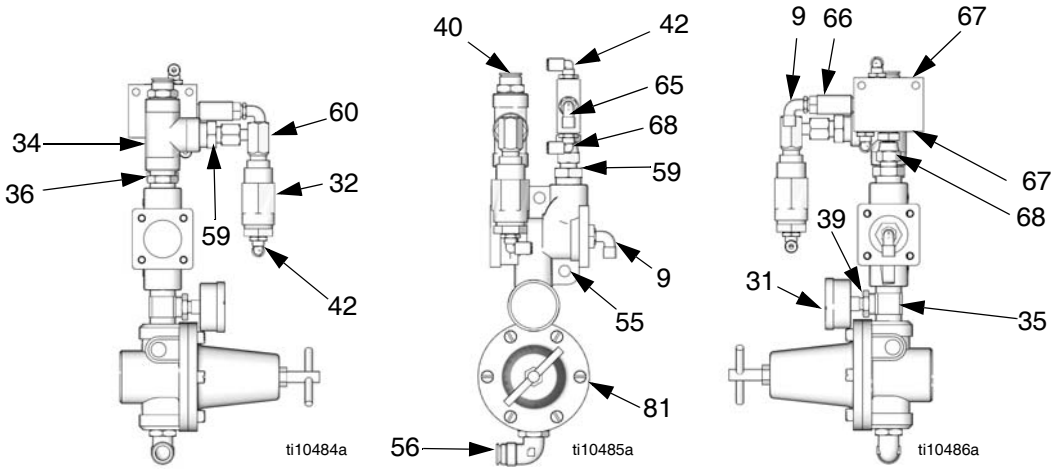


Detail E

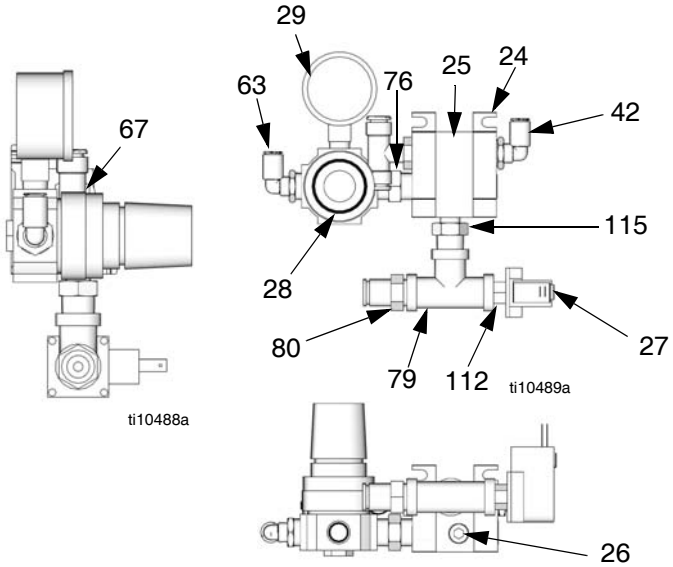
Common Parts for 570193 and 949949 Pneumatic Control Panels



Detail F



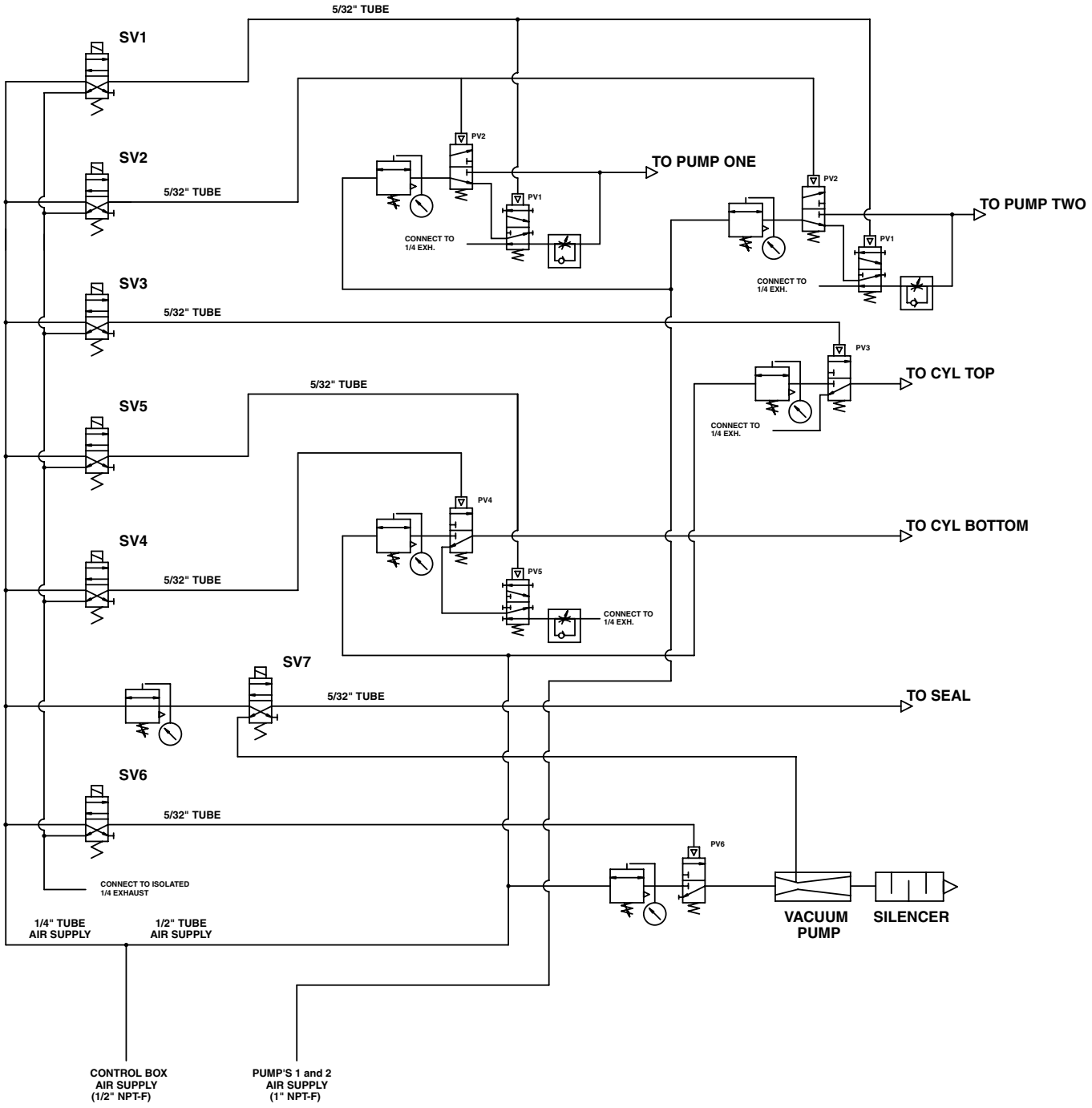
Detail G



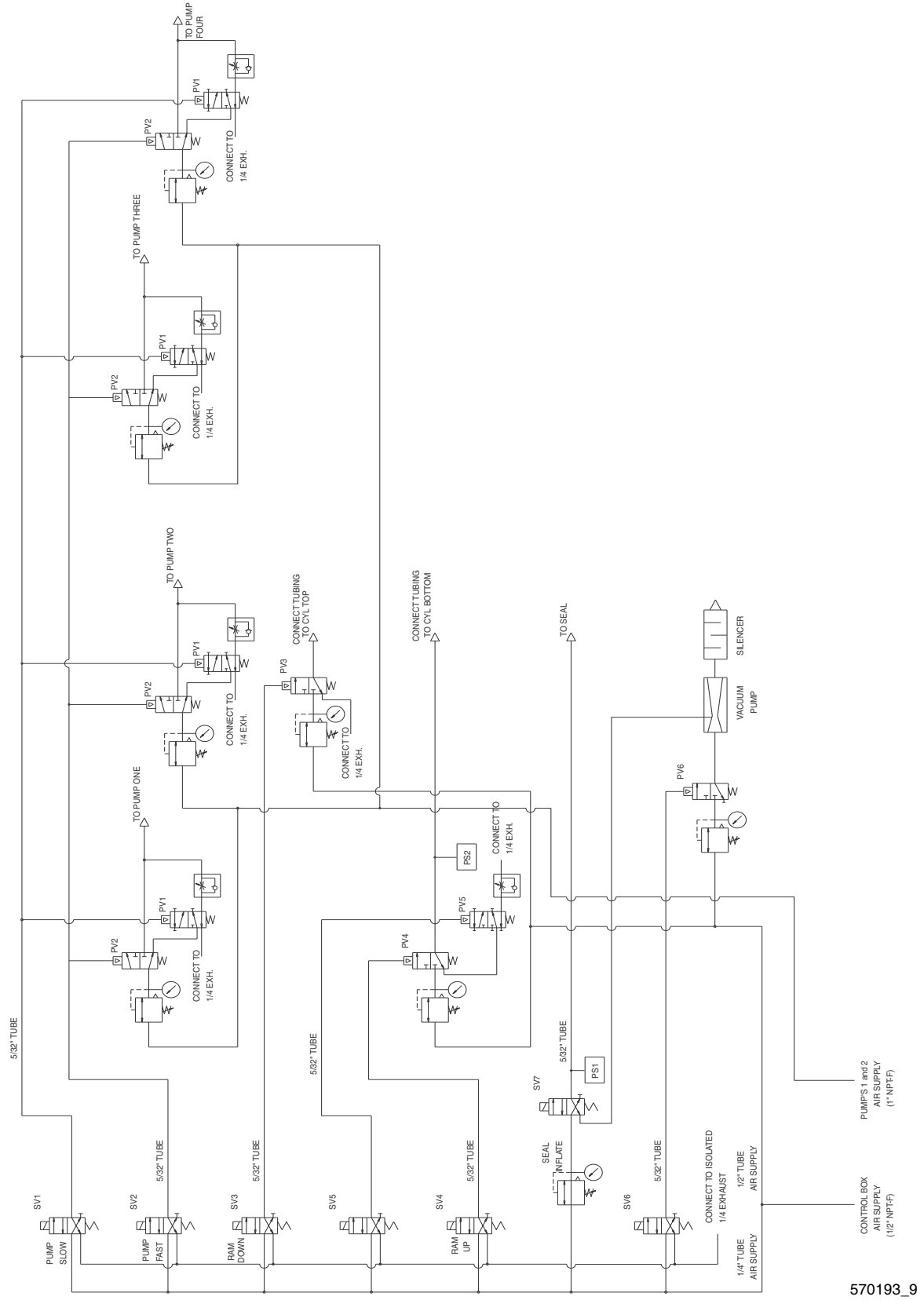
Detail H

ti10491a

Part No. 949949 Pneumatic Control Panel, Pneumatic Diagram



Part No. 570193 Pneumatic Control Panel, Pneumatic Diagram



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
Q1	Pump Slow Solenoid	Red
Q2	Pump Fast Solenoid	Green
Q3	Ram Down Solenoid	Orange
Q4	Ram Up Solenoid	Black/white
Q5	Ram Jog Solenoid	White/black
Q6	Vacuum Pump Solenoid	Green/white
Q7	Seal Inflate solenoid	Red/black
SP1	Spare	Blue/white
SP2	Spare	Red/white/black
		Shield

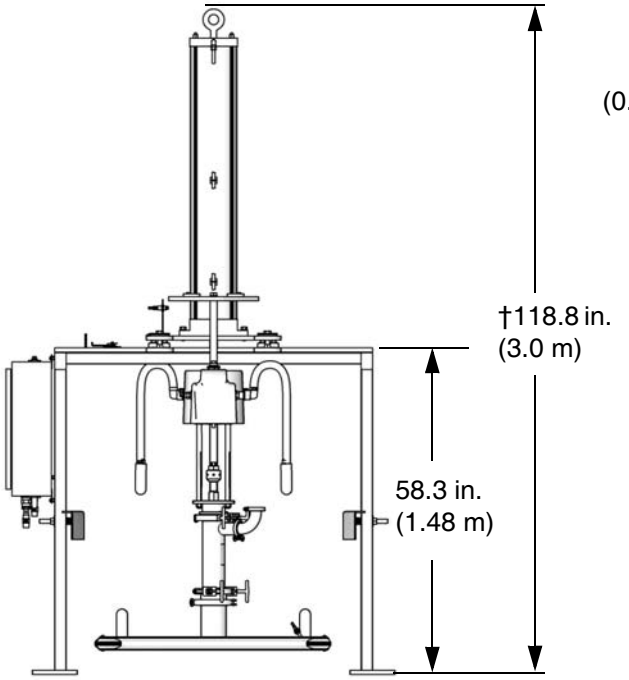
Control Cable Color Code

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			

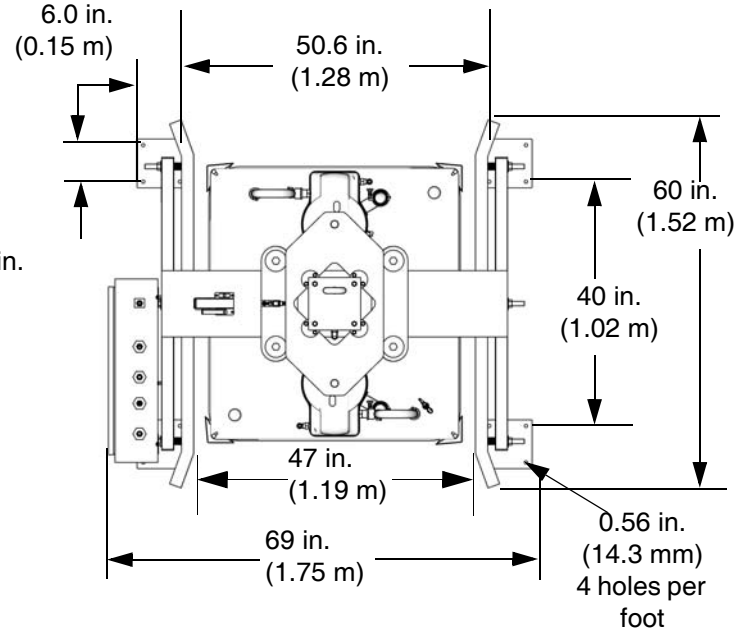
Dimensions

System (BESA7A Shown)

Front View



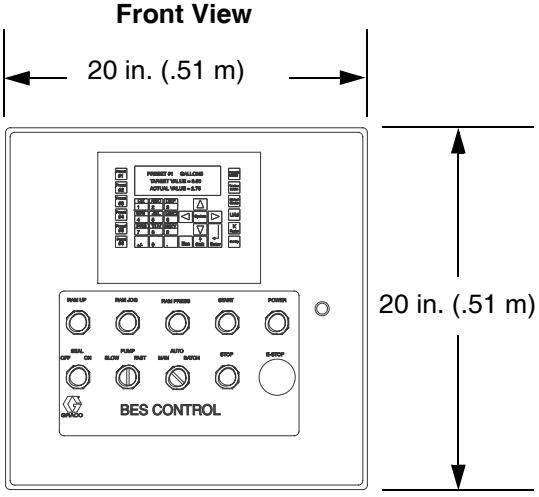
Top View



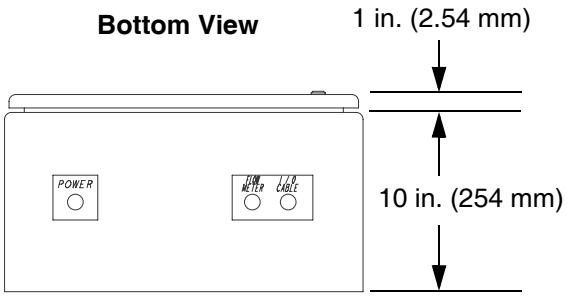
† 121.8 in. (3.1 m) for BESCCC.

15H145 and 15J902 Electronic Control

Front View

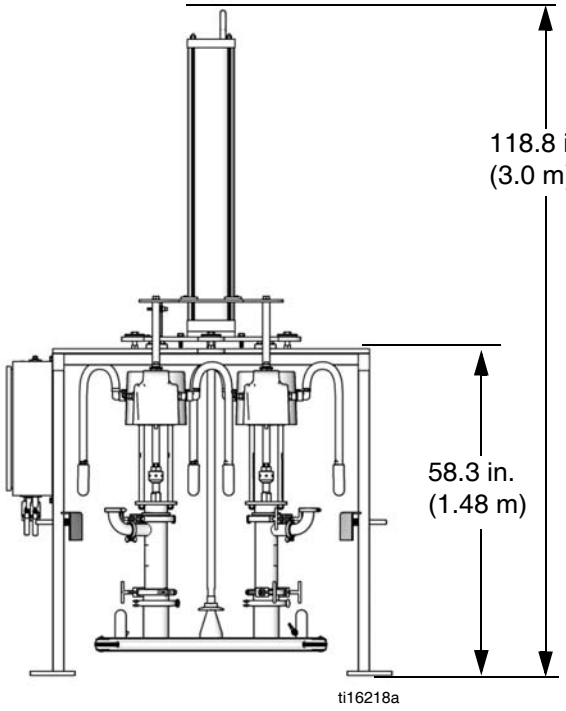


Bottom View

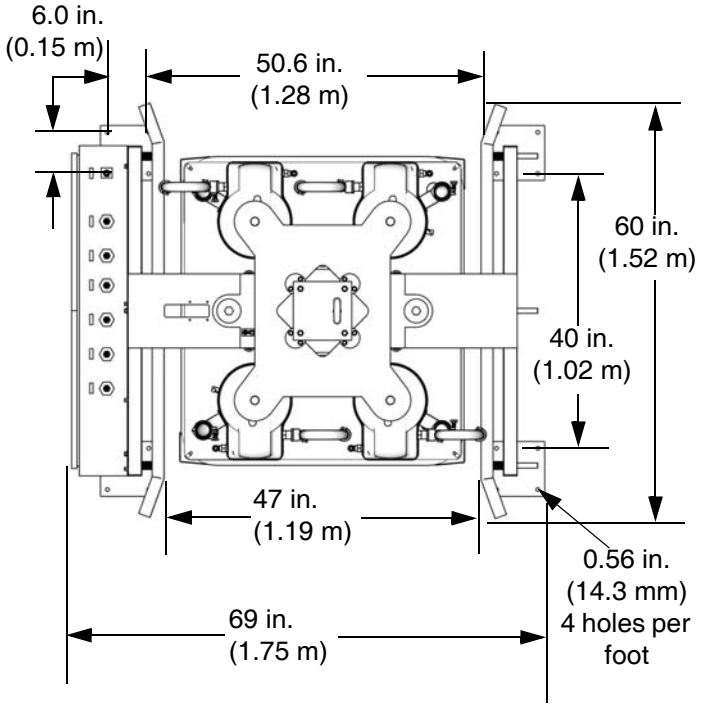


System (BES3F3 Shown)

Front View



Top View



Technical Data

BES3xx, BES4xx, and BES8xx

	U.S.	Metric
Maximum Working Fluid Pressure	120 psi	8.4 bar, 0.84 MPa
Compressed air requirement	80-120 psi	5.5-8.4 bar, 0.55-0.84 MPa
Fluid displacement (each pump)	1.03 gal/cycle	3.9 l/cycle
Flow rate @ 60 cpm	120 gpm	454 lpm
Pressure ratio	1:1	
Air consumption (each pump)	0.8 scfm per gpm @ 70 psi	0.006 m^3/minute per lpm @ 4.8 bar, 0.48 MPa
Pump outlet	3 in tri-clamp	
Sound data	*See your pump manual.*	
Wetted parts	300 Series stainless steel, buna-N, and EPDM on the ram plate and seals. *See your pump manual for additional wetted parts.*	
Pneumatic Control Panel		
Maximum input air pressure	120 psi	8.4 bar, 0.84 MPa
Maximum up/down ram pressure	75 psi	5.2 bar, 0.5 MPa
Air inlet - air controls	3/4 in npt(f)	
Air inlet-pump	1/2 in npt(f)	
Electronic Control Panel		
Maximum input air pressure	120 psi	8.4 bar, 0.84 MPa
Maximum up/down ram pressure	100 psi	7 bar, 0.7 MPa
External power supply	110 VA, 60 Hz, 15 amp maximum circuit breaker required	

BESAxx, BESBxx, BESCxx, BESDxx, BESExx, and BESFxx

	U.S.	Metric
Compressed air requirement	80-100 psi	5.5-7 bar, 0.55-0.7 MPa
Sound data	*See your pump manual.*	
Wetted parts	300 Series stainless steel, buna-N, and EPDM on the ram plate and seals. *See your pump manual for additional wetted parts.*	
Pump Outlet		
BESAxx, BESBxx, BESCxx, BESExx, BESFxx	2 in tri-clamp	
BESDxx	1.5 in tri-clamp	
Maximum Working Fluid Pressure		
BESAxx, BESBxx, and BESCxx	410 psi	28.3 bar, 2.8 MPa
BESDxx	650 psi	44.8 bar, 4.5 MPa
BESExx and BESFxx	1450 psi	100.4 bar, 10.1 MPa
Fluid Displacement (each pump)		
BESAxx, BESBxx, and BESCxx	0.23 gal/cycle	0.87 l/cycle
BESDxx	0.067 gal/cycle	0.25 l/cycle
BESExx and BESFxx	0.14 gal/cycle	0.53 l/cycle
Flow Rate @ 60 cpm		
BESAxx	27.6 gpm	104.5 lpm
BESBxx	54 gpm	204.4 lpm
BESCxx	27.6 gpm	104.5 lpm
BESDxx	8 gpm	30 lpm
BESExx	17 gpm	64.3 lpm
BESFxx	34 gpm	128.7 lpm
Pressure Ratio		
BESAxx, BESBxx, and BESCxx	4.3:1	
BESDxx	6:1	
BESExx and BESFxx	10:1	
Air Consumption (each pump)		
BESAxx, BESBxx, and BESCxx	1.8 scfm per gpm @ 70 psi	0.14 m^3/minute per lpm @ 4.8 bar, 0.48 MPa
BESDxx	6 scfm per gpm @ 70 psi	0.17 m^3/minute per lpm @ 4.8 bar, 0.48 MPa
BESExx and BESFxx	3.5 scfm per gpm @ 70 psi	0.026 m^3/minute per lpm @ 4.8 bar, 0.48 MPa
Pneumatic Control Panel		
Maximum input air pressure	100 psi	7 bar, 00.7 MPa
Maximum up/down ram pressure	75 psi	5.2 bar, 0.5 MPa
Air inlet - air controls	3/4 in npt(f)	
Air inlet-pump	1 in npt(f)	
Electronic Control Panel		
Maximum input air pressure	100 psi	7 bar, 0.7 MPa
Maximum up/down ram pressure	100 psi	7 bar, 0.7 MPa
External power supply	110 VA, 60 Hz, 15 amp maximum circuit breaker required	

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Original instructions. *This manual contains English. MM 311163*

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