

BES 300

309526 Rev.D

Bin Evacuation System

For 300 gallon (1135 liter) bag in bin containers

100 psi (0.7 MPa, 7 bar) Maximum Air Input Pressure

BES Part No.	Maximum Working Fluid Pressure <i>psi (MPa, bar)</i>	Pump Part No.	Quantity	Pump
234375	2400 (16.8, 168)	246936	2	24:1 King® Pumps
687110	1000 (7, 70)	949444	4	10:1 Sanitary Bulldog®
687257	430 (3, 30)	949704	2	FT14 Sanitary Pump
988327*	1000 (7, 70)	949444	2	10:1 Sanitary Bulldog®

* 988327 is available with flow meter option. Flow meter to be supplied by outside supplier.



Read warnings and instructions.

PROVEN QUALITY. LEADING TECHNOLOGY.

Contents

Manual Conventions	2	Troubleshooting	25
Warning 3		Service	26
Overview	5	Before Servicing	26
Operation Overview	5	Replacing Air Filter Element	26
System Components	6	Replacing Low Limit Switch	27
Before Installing	8	Replacing Cylinder Bearing	27
Uncrating Equipment	8	Replacing Ram Plate Seal or Corner Seals ...	27
Location	8	Electronic Control Panel Service	27
Moving Frame to Location	8	Parts	28
Installation	9	Part No. 687110	28
Anchoring Frame	9	Part No. 687257	30
Installing Air Cylinder	9	Part No. 988327	32
Connecting Pneumatic Control Panel Air Lines	11	Part No. 234375	34
Connecting Pump Output Hoses	12	Part No. 570193	36
Installing Electronic Control Panel	13	Part No. 949949	40
Grounding	14	Part No. 949948	42
Checking Resistance	14	Part No. 965705	44
System Overview	15	Electrical Schematic	46
Prepare the Operator	15	Part No. 949948	46
Pump Operation Modes	15	Part No. 965705	47
Electronic Control Panel	16	Pneumatic Diagram	48
Low Limit Switch	18	Part No. 570193	48
Setting Air Pressures	18	Part No. 949949	49
Pressure Relief Procedure	19	Dimensions	50
Initial Startup	19	Part No. 949948	50
Standard Operation	22	Part No. 965705	51
System Shutdown	22	Technical Data	52
Maintenance	23	Related Publications	52
Air Motor Icing	23	Notes	53
Preventive Maintenance	23	Graco Standard Warranty	54
Flushing the System	23	Graco Information	54
Cleaning Pumps	24		
Cleaning Ram Plate and Seal	24		

Manual Conventions

Warning

WARNING

A warning alerts you to the possibility of serious injury or death if you do not follow the instructions.

Symbols, such as fire and explosion (shown), alert you to a specific hazard and direct you to read the indicated hazard warnings (pages 3-4) for detailed information.

Caution

CAUTION

A caution alerts you to the possibility of damage to or destruction of equipment if you do not follow instructions.

Note

A note indicates additional helpful information.


WARNING
**INJECTION HAZARD**

If high-pressure fluid from gun, hose leaks, or ruptured components pierces skin, it might look like just a cut, but it is a serious injury that can result in amputation or death. **Get immediate medical attention.** Fluid splashed in the eyes or on skin can also cause serious injury.

- Follow **Pressure Relief Procedure**, page 19, when you stop operation, and before cleaning, checking, or servicing equipment.
- Do not point spray gun at anyone; put hand, fingers, or a rag over spray tip; or stop or deflect leaks with your hand, body, glove or rag.
- Use lowest possible pressure when flushing, priming, or troubleshooting.
- Check hoses, tubes, and couplings daily for loose fittings, wear, or damage. If damaged, replace entire hose. Tighten fluid connections.
- Fluid hoses must have spring guards at both ends to help avoid rupture from kinks or bends near couplings.

**FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD**

Solvent and paint fumes can ignite or explode. To help prevent fire and explosion:

- Use equipment only in well ventilated area.
- Eliminate all ignition sources in spray area; such as pilot lights, cigarettes and plastic drop cloths (static arc hazard). Do not plug or unplug power cords or turn lights on or off when flammable fumes are present.
- Keep the equipment operation area free of debris, including solvent, rags, and gasoline.
- Ground the equipment, paint and solvent pails, and dispense only into grounded, conductive containers. See page 14.
- Use only electrically conductive hoses.
- If there is static sparking or you feel an electric shock, **stop operation immediately.** Do not use equipment until you identify and correct the problem.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.
- Turn off and disconnect power at the main switch before disconnecting any cables and before servicing equipment.
- Avoid spilling liquids onto electrical components

**MOVING PARTS HAZARD**

Moving parts can pinch or amputate fingers and other body parts. Pressurized equipment can start accidentally and cause serious injury.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Before checking or servicing equipment, follow the **Pressure Relief Procedure** on page 19. Disconnect air supply.
- When raising or lowering the ram plate, keep hands and body away from ram plate and bin lip.
- Locate electronic control panel so operator has an unobstructed view of the BES 300 to avoid starting equipment when other personnel could be injured.

**TOXIC FLUID HAZARD**

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

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.


WARNING
**EQUIPMENT MISUSE HAZARD**

Misuse can cause serious injury or death.



- For professional use only.
- Use equipment only for its intended purpose. Call your Graco distributor for information.
- Read manuals, warnings, tags, and labels before operating equipment. Follow instructions.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not alter or modify equipment. Use only Graco parts and accessories.
- 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.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Comply with all applicable safety regulations.
- Do not lift equipment by the air motor lift ring if the total equipment weight exceeds 550 lb. (250 kg).

**PERSONAL PROTECTIVE EQUIPMENT**

You must wear proper protective equipment when operating, servicing, or when in the operating area of the equipment. This includes but is not limited to:



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

Overview

Operation Overview

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

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

Basic Operation of BES 300

1. The operator places the bin inside the frame.
2. Using the electronic 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, which run briefly at slow speed, then switch to fast.
4. The displacement pumps evacuate the material out of the bin until they reach the “low limit”, which was preset during installation. The pumps then switch to slow speed.
5. The operator stops the pumps, deflates the seal, and raises the ram plate out of the bin.



Each step can be controlled by the operator or the system can do them automatically after the START button is pressed.

6. The empty bin is removed, another bin is put in place, and the BES 300 is ready to repeat the process.

System Components

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

E Air Filter: the 3/4 npt, 40 micron filter connects between shutoff valve (C) and air supply line that connects to the control panel (B). The air supply line supplies air to two separate air lines that feed air to the pumps.

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

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

H 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.

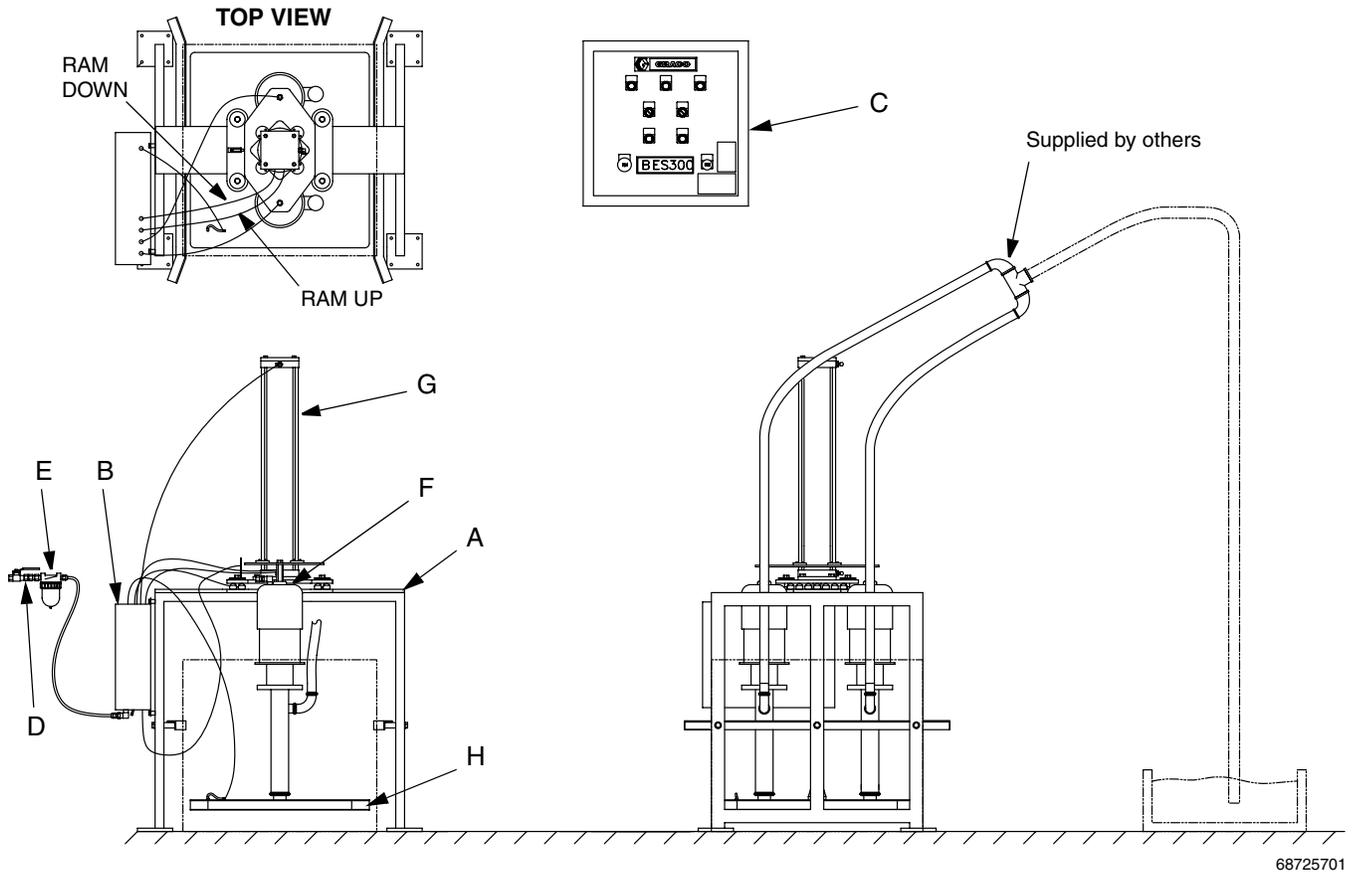


FIG. 1: Typical Installation (687257 shown)

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.
7. Remove electronic control panel.



See **Overview**, 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 feet (0.91 m) of open space in front of the panel.
- Provides clear electrical control panel visibility.
- 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.

- 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 page 52.
 - 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" (13 mm) bolts. Bolt the frame to the floor with anchors.

Installing Air Cylinder

WARNING

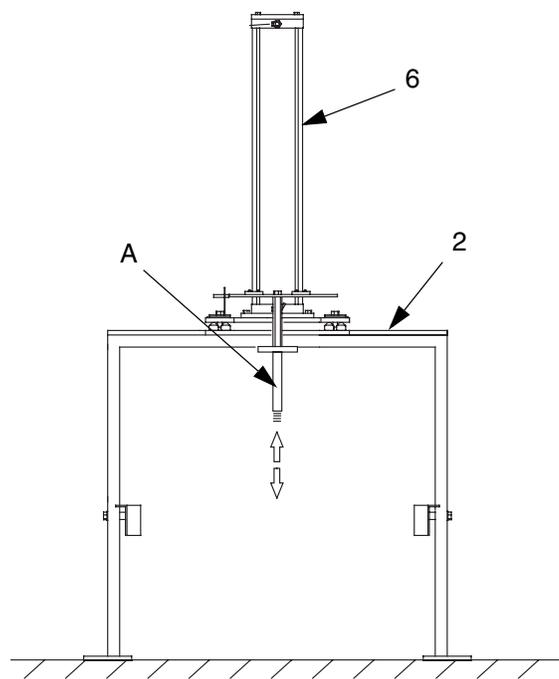


The air cylinder weighs about 130 lb. (59 kg). To avoid injury and equipment damage, follow instructions below. Never have one person move or lift the frame.



Part no. 988327 shown in FIG. 3. All models do not use the same parts. Refer to parts drawing for your model. See **Parts**, page 28.

1. Remove the nuts (13) and washers (19) attached to the pump mounting rods (35), and remove the air motor mounting plate (5). See FIG. 3.
2. Using a hoist, lift the air cylinder (6) into position on top of the frame (2). See FIG. 2.
3. Lower the air cylinder shaft (A) through the center hole in the frame.
4. Secure the air cylinder (6) to the frame (2) with the screws (15). See FIG. 3.



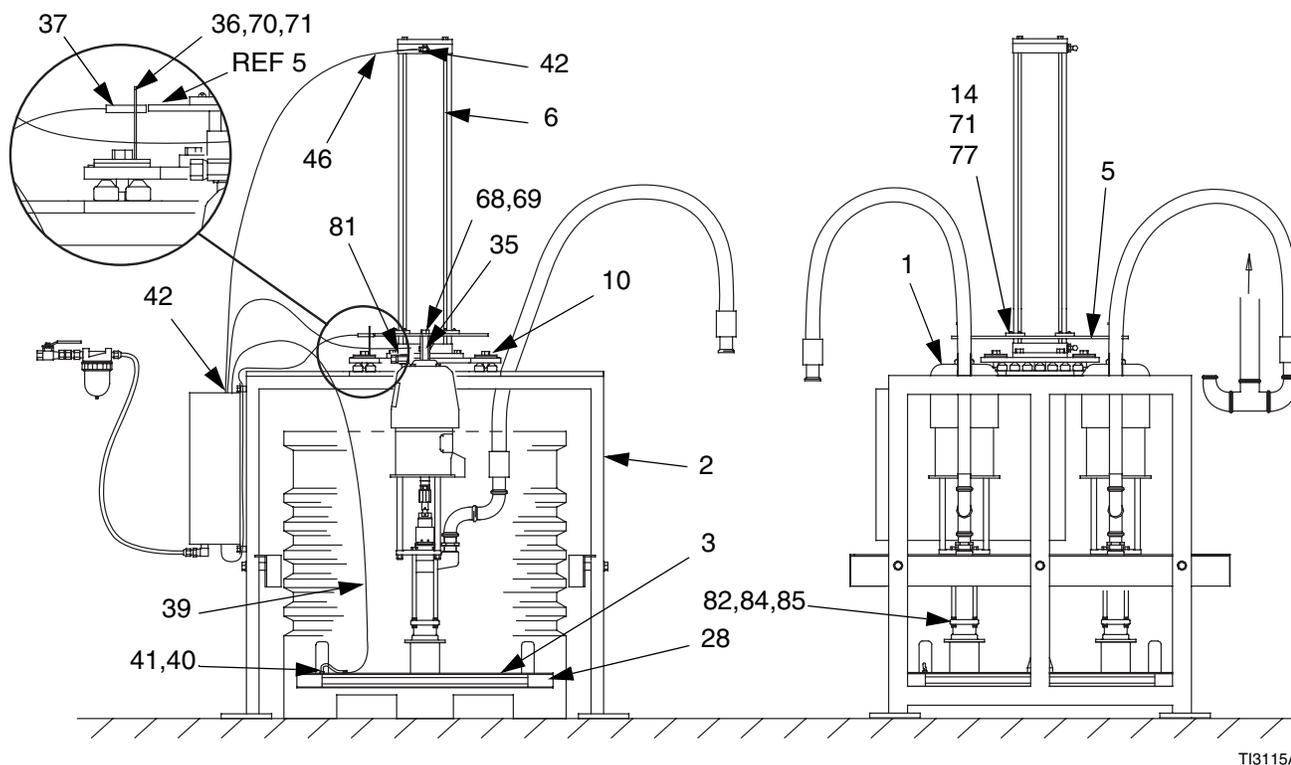
TI1316A

FIG. 2: Air Cylinder Shaft

5. Remove the screws (10) from the frame (2).
6. Remove the two band straps that hold the ram plate (3) to the shipping pallet. Do not remove the pallet.
7. Apply a compatible grease to the cylinder shaft threads to avoid damaging them. Align and screw the air cylinder shaft (A) into the ram plate (3). If the shaft does not thread properly, do not force it. Re-check alignment of plate (3).



The ram low limit bracket (36) must be installed on the same side as the low limit switch (37). The two holes on the left-hand side of the air motor mounting plate (5) must face the back of the pneumatic control panel.



TI3115A

FIG. 3: Part No. 988327 shown

8. Uncrate and mount pumps to ram plate (3), with outlets facing away from pneumatic control panel. Secure pumps to plate using the following gaskets and hardware:

Part No. 687110 and 988327: gasket (82), screws (85), and washers (84)

Part No. 687257: gasket (30), tri-clamp (29)

9. Reinstall air motor mounting plate (5), slipping plate over the top and down the length of air cylinder (6).

10. Install low limit switch bracket (36), using screws (70) and washers (71). Install low limit switch (37) to bracket (36).

11. Install cylinder guide bearings (14) on top of the air motor mounting plate (5):

Part No. 687110 and 687257: use screws (83) and washers (71).

Part No. 988327: use screws (77) and washers (71).

-  The open arch in the cylinder guide bearings (14) fits around tie rods on the air cylinder (6).

12. Connect the cylinder upper air supply line (46) to the upper 1/2" elbow (42).

13. Connect the cylinder lower air supply line (46) to the 1/2" lower elbow (42).

14. Connect air lines to pumps (1) air motors.

Part No. 687110 and 687257: install 1/2" tubing from pneumatic control panel to air motor air inlet.

Part No. 988327: install union adapter (81) and connect hose (22) to air motor air inlet and pneumatic control panel.

15. Remove bolts holding the frame (2) 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. Use the top joists on the frame to lift the system 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 Pneumatic Control Panel Air Lines

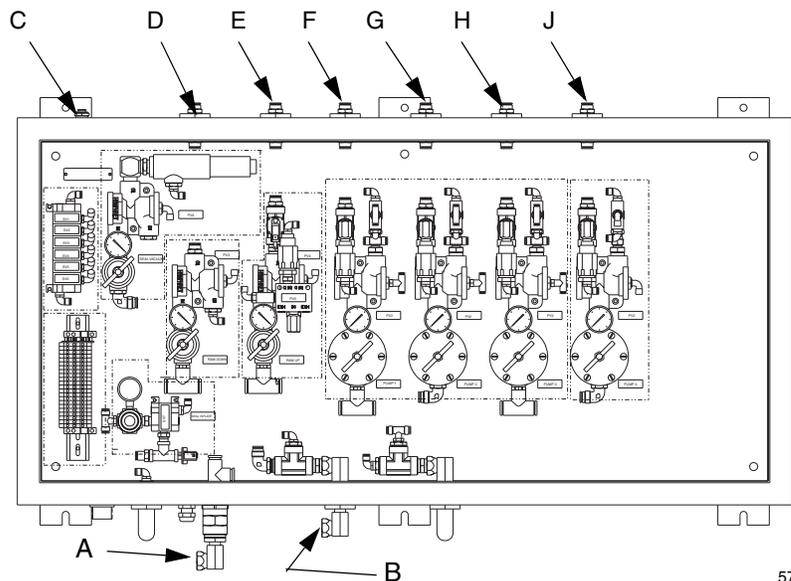
The air supply to the panel must be filtered, dry and capable of delivering a minimum of 100 scfm at 100 psi (0.7 MPa, 7 bar). Refer to the table below and the **Pneumatic Diagram**, page 48, to make the top and bottom panel connections.

Fig. ___ Ref. No.	Origin	Destination	
	Top Panel Connections	Component Connections	Function
1	Seal Air Supply	Ram Plate Seal	Inflates ram plate seal.
2	Cylinder Upper Air Supply	Upper Port On Air Cylinder	Applies down force on ram plate when RAM PRESS is selected.
3	Cylinder Lower Air Supply	Lower Port On Air Cylinder	Applies up force on ram plate when RAM UP is selected.
4	Pump 1 Air Supply	Pump 1	Supplies air to pump 1.*
5	Pump 2 Air Supply	Pump 2	Supplies air to pump 2.*
6	Pump 3 Air Supply	Pump 3	Supplies air to pump 3.*
7	Pump 4 Air Supply	Pump 4	Supplies air to pump 4.*
	Bottom Panel Connections	Pneumatic Source Connections	
8	Air Controls Air Inlet — 1/2" npt(f)	Air Controls Air Supply Line	Supplies air to open and close air valves.
9	Pumps Air Inlet — 1" npt(f)	Pumps Air Supply Line	Supplies input air pressure to pumps.
10	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



570193_1

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

Connecting Pump Output Hoses

- See **Related Publications**, page 52, for air motor/pump instruction manual numbers.
- The output hose(s) (K - supplied by others) should already be installed, with riggings and supports, and ready for connection to the 10 ft. (3.05 m) hoses (20) supplied.
- Make sure the output hose(s) (K) are sized and pressure-rated for the system. Use only electrically conductive hoses with spring guards on both ends.

Connect the pump fluid hoses (20) between the pump outlet ports and the output hose(s) (K).

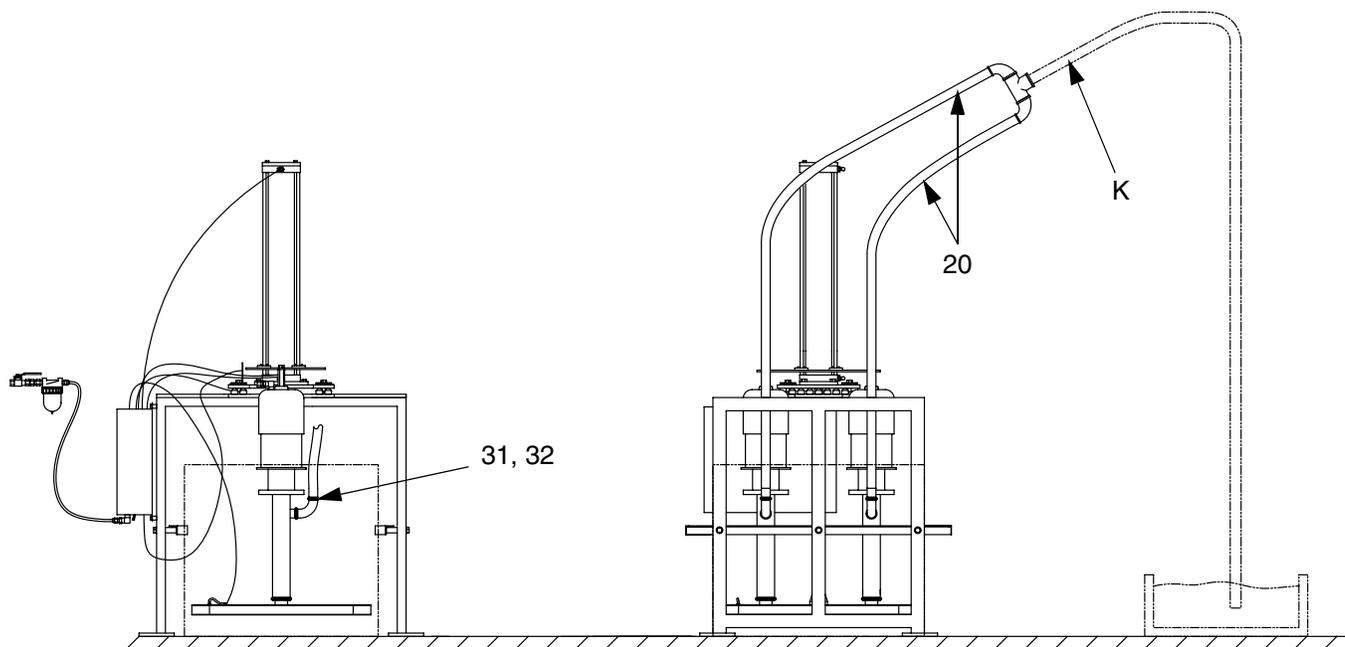
- The fluid hoses must move freely, without kinking, when the pumps move up and down.

Two Pump System Includes:

Description	Quantity
2" (51mm) ID x 10 ft. (3.05 m) sanitary discharge hose (20)	2
2" (51mm) tri-clamp sanitary clamps (31)	4
2" (51mm) tri-clamp sanitary gaskets (32)	4

Four Pump System Includes:

Description	Quantity
2" (51mm) ID x 10 ft. (3.05 m) sanitary discharge hose	4
2" (51mm) tri-clamp sanitary clamps (31)	8
2" (51mm) tri-clamp sanitary gaskets (32)	8



68725701

FIG. 5: Connect pump outlet hoses (687257 shown)

Installing Electronic Control Panel

WARNING



Read warnings, page 3. 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.

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.

See the **Part No. 965705** for your control panel model, page 46 or 47.

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

Part No. 949948

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	Low level 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

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 (V) 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 (Z) 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.

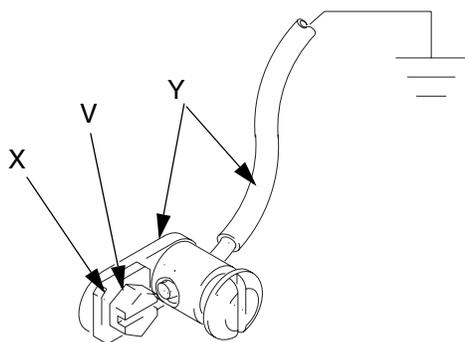


FIG. 6: Ground Screw

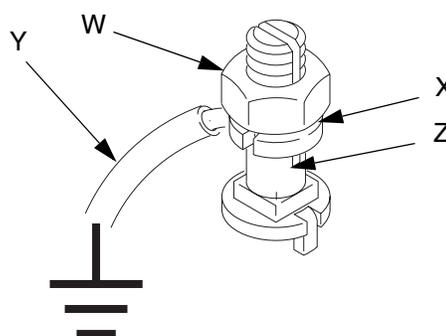


FIG. 7 Ground Screw

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.

System Overview

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.

Pump Operation Modes

The pumps have 2 operating modes:

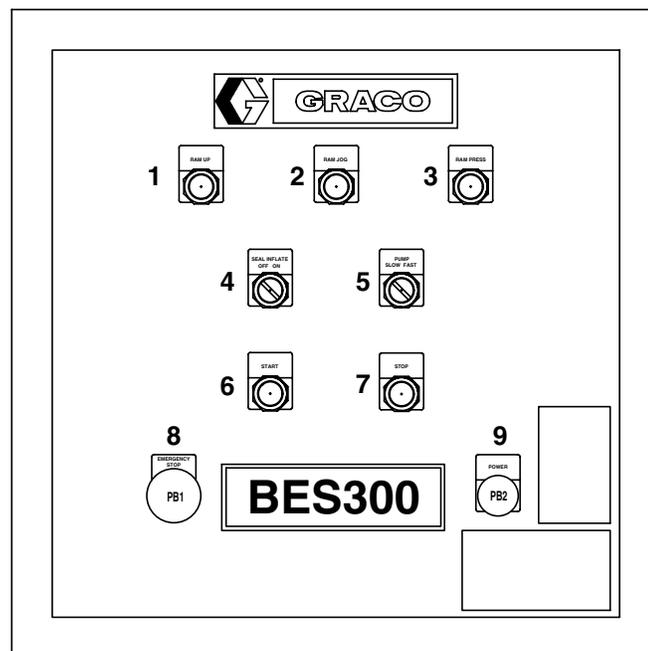
- **Slow mode** — pumps automatically operate in slow mode for 5-10 seconds when they are started up and again when pumps reach low limit setting.
- **Fast mode** — pumps switch to fast mode when the slow speed timer setting elapses. Pumps are usually running in fast mode unless they are stopped and restarted or have reached the low limit setting.

Electronic Control Panel

Part No. 949948

Ref. No.	Switch/Button Name	Operation
1	RAM UP	Press button to raise ram.
2	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.
3	RAM PRESS	Press button to apply ram pressure once plate is jogged into place (onto material).
4	SEAL INFLATE OFF/ON	Switch to ON to inflate ram plate seal. Switch to OFF to deflate ram plate seal.
5	PUMP SLOW/FAST	Switch to SLOW to run pumps in slow mode. Used to prime pump. Switch to FAST to run pumps in fast mode.
6	START	Press button to start the automatic operation of the pumps, ram, and inflatable seal.
7	STOP	Press button to stop operation of the pumps, ram, and automatic cycle.*
8	EMERGENCY STOP	Press button to immediately shut off air to the system and stop operation.*
9	POWER	Press button to turn on electronic control panel.

*The air cylinder will stabilize in its current position.



94994803

FIG. 8: Part No. 949948

Part No. 965705

Ref. No.	Switch/Button Name	Operation
1	SEAL INFLATE	Press to inflate ram plate seal
2	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.
3	RAM UP	Press button to raise ram.
4	RAM PRESS	Press button to lower ram onto material using air pressure.
5	STOP	Press button to stop operation of the pumps, ram and automatic cycle.*
6	PUMP SLOW	Press to run pumps in slow mode.
7	PUMP FAST	Press to run pumps in fast mode.
8	EMERGENCY STOP	Press button to immediately shut off air to the system and stop operation.*
9	REMOTE START OFF/ON	Turn switch to ON to allow remote operation of system (typically used with tandem system). Turn switch to OFF to inactivate remote operation.
10	POWER	Press button to turn on electronic control panel.

*The air cylinder will stabilize in its current position.

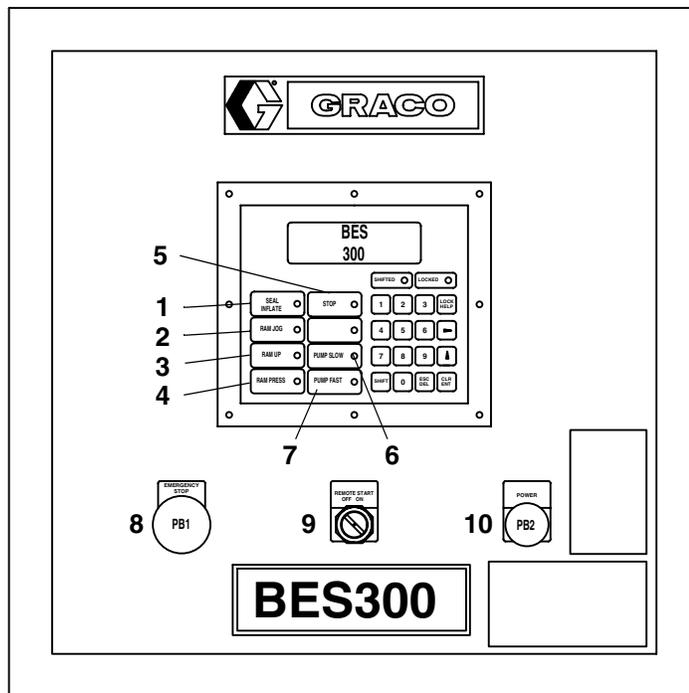


FIG. 9: Part No. 965705

96570501

Low Limit Switch

The low limit switch (37) is located near the air cylinder (6) base and can be adjusted to operate at different levels in the bin. See FIG. 10.

The pumps operate in fast mode until the ram plate reaches the low limit. The low limit switch changes the pumps to the slow mode operation for 2 minutes, after which the pumps stop, the seal deflates, and the ram raises.

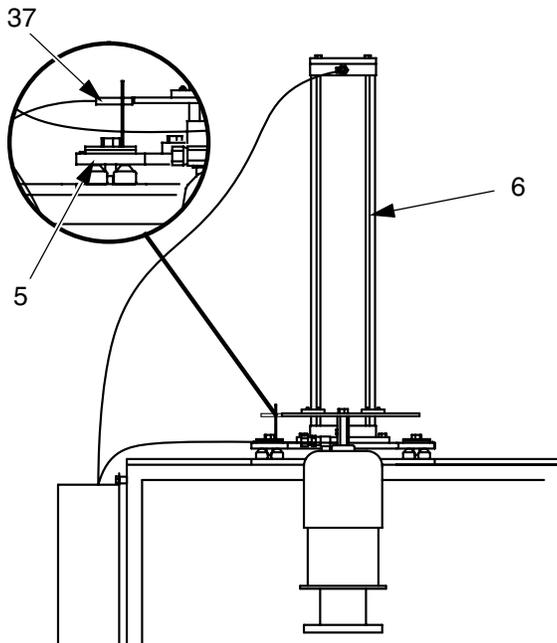


FIG. 10

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 **Initial Startup**, page 19, for additional information on adjusting the low limit 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. 11.

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)

* Model 687110 only.

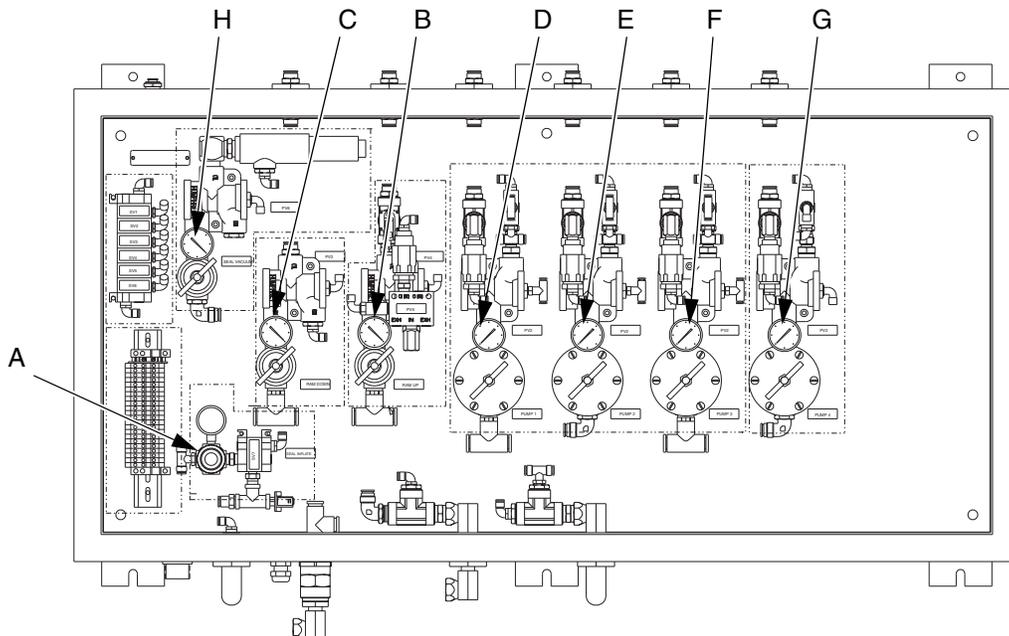


FIG. 11: Part No 570193, 4 pump, shown

570193_1

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.
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.

-  Press STOP button at any time to stop the system.
- Steps in gray boxes are for Part No. 965705 only.

1. 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. **Part No. 949948 only** — Turn SEAL INFLATE to OFF. Go to step 4.

Part No 965705 only

Allow the controller time to start up and display the main screen.

GRACO BES 300 MENU
METER REPORT SETUP

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 23.
7. Follow **Loading the Bin** procedure, page 22.
8. **Part No. 949948 only** — Go to step 10, page 21.

Part No. 965705 only

9. METER should be blinking on the main screen, indicating it is ready for selection.

No Flow Meter

- a. To run in automatic mode, press ENT key.
- b. Target/Run screen appears.

TARGET 0000 LBS RUN
ACTUAL 0000 LBS EXIT

- c. Press arrow → key to select RUN and press ENT key.
- d. Go to step 10, page 21.

Part No. 965705 - With Flow Meter

Typically used in tomato past applications.



Also see the flow meter instruction manual.

- a. In startup screen, press arrow → key until SETUP is selected and press ENT.

GRACO BES 300 MENU
METER REPORT **SETUP**

- b. Enter password, which is 1129. Press ENT.

ENTER PASSWORD
1129 EXIT

- c. Press arrow → to select EXIT and press ENT.
d. The following screen appears. To select LBS or GAL, press SHIFT then ENT.

ENG UNITS = LBS EXIT
K FACTOR = 84.6 NEXT

- e. Press ENT to select K factor field. Enter K factor then press ENT.
f. Press arrow → to select NEXT and press ENT.
g. Press arrow → key to move to NTSS value field. Enter your NTSS value and press ENT.

NTSS = 39.0% EXIT
LBS/GAL = 1.0 NEXT

- h. Enter LBS/GAL value, then press ENT.
i. Press arrow → to move to NEXT and press ENT.

- j. Press arrow → key to move to M value field. Enter M value and press ENT.

LBS/GAL = M*NTSS+B EXIT
M = 02.02 B = 372 NEXT

- k. Enter B value and press ENT.
l. The system is now ready to operate with the flow meter.

To go to main screen and begin operation, press arrow → to move to EXIT and press ENT. Go to step r, page 21.

To adjust your slow pump cycle at the beginning or end of the bin evacuation, press arrow → to move to NEXT and press ENT.



Editing the slow pump cycle adjusts the system timer, which controls how long the pumps run at slow speed at the beginning and end of bin evacuation.

END = time to run in slow mode to evacuate material at bottom of bin.

START = time to run in slow mode to prime pumps.

- m. Press arrow → key to move to TIME value field. Enter value and press ENT.

SLOWPUMP@ END EXIT
TIME = 120.00 NEXT

- n. Press arrow → to move to NEXT and press ENT.
o. Press arrow → key to move to TIME value field. Enter value and press ENT.

SLOWPUMP@ START EXIT
TIME = 010.00 NEXT

- p. Press arrow → to move to NEXT and press ENT.

Part No. 965705 With Flow Meter (continued)

- q. METER should be blinking on the main screen, indicating it is ready for selection.

GRACO BES 300 MENU
METER REPORT SETUP

- r. To run in automatic mode, press ENT key.
- s. Target/Run screen appears. TARGET value must be greater than ACTUAL value to operate properly.

TARGET 1000 LBS RUN
ACTUAL 0000 LBS EXIT

- t. Press ENT key to activate TARGET field and enter the desired value.
- u. Press arrow → to select RUN and press ENT.

10. Adjust the ram down air regulator to 50 psi (0.34 MPa, 3.4 bar).

11. On the electronic control panel:
949948 — Turn PUMP to SLOW.
965705 — Press PUMP SLOW button.

12. Adjust the slow speed regulator for each pump to complete 1 cycle in 10 seconds.

-  All pumps must operate at the same cycles per minute rate to prevent the bin from evacuating unevenly.

13. The pumps automatically switch to fast mode after the slow speed timer setting elapses.

14. Adjust the fast speed regulator for each pump 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.

15. Adjust the low limit switch to activate at the desired level. Recommend 1/4" (6.35 mm) space between switch and plate (5).

-  During standard operation, the pumps switch from fast to slow mode when the low limit setting is reached. The pumps operate in slow mode for 2 minutes, then stop, the seal deflates, and the ram raises.

All 965705 Units

When the low limit switch is activated the following message displays.

.....BOTTOM OF BIN.....
.....RAM WILL COME UP.....

16. Adjust the seal vacuum pump air regulator to 20 psi (138 kPa, 1.4 bar).

17. Deflate the seal.

18. Press the RAM UP button. If the ram does not raise, increase the ram up air regulator pressure.

19. Verify the seal (27) is completely deflated after the ram plate exits the bin. If it is not, deflate the seal.

20. When adjustments are complete, close the pneumatic control panel door.

21. Follow **Unloading the Bin** procedure, page 22.

22. The system is now ready for standard operation. See page 22.

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. Make sure the bag is taut and secure it in place.
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 are in place.
9. 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.

10. 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. **Part No. 949948 only** — Press START button.

Part No. 965705

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

TARGET 1000 LBS RUN
 ACTUAL 0000 LBS EXIT

Press arrow → to select RUN and press ENT.

Both Models

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 19.
2. Ensure seal is deflated and ram is raised.
3. Unload the bin from the frame.

System Shutdown

Follow the **Pressure Relief Procedure**, page 19.

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 14.

- 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 22.



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 22.
4. Operate the pumps at low pressure to remove excess solvent.
5. Follow the **Pressure Relief Procedure**, page 19.

Cleaning Pumps

1. Follow the **Pressure Relief Procedure**, page 19.
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 19.
Keep the air supply to the ram open.

2. Raise the ram plate.
3. Remove the inflatable seal and corner seals from the ram plate.
4. Clean the seals and ram plate with a compatible cleaning fluid.
5. Apply a generous amount of lubricant to the ram plate channel and seals.
6. 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"> Deflate seal. 949948: Turn SEAL INFLATE to OFF. 965705: Press SEAL INFLATE and ensure red indicator light is off. Press RAM UP button. 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.	<ul style="list-style-type: none"> 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.
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.
	Low limit setting for slow pump speed at end of bin evacuation needs adjustment.	Adjust low limit setting.
	Slow pump speed regulators set too low.	Adjust air pressure. See step 12, page 21.
System does not operate in automatic mode.	Ram set pressure switch (PS2) is not functioning correctly.	Replace switch.
	Low limit switch needs adjustment.	Adjust low limit switch.

Service

 Part no. 988327 shown in FIG. 12. All models do not use the same parts. Refer to parts drawing for your model. See **Parts**, page 28.

Before Servicing

WARNING



Never stand or work under the ram plate. See warnings, page 3.

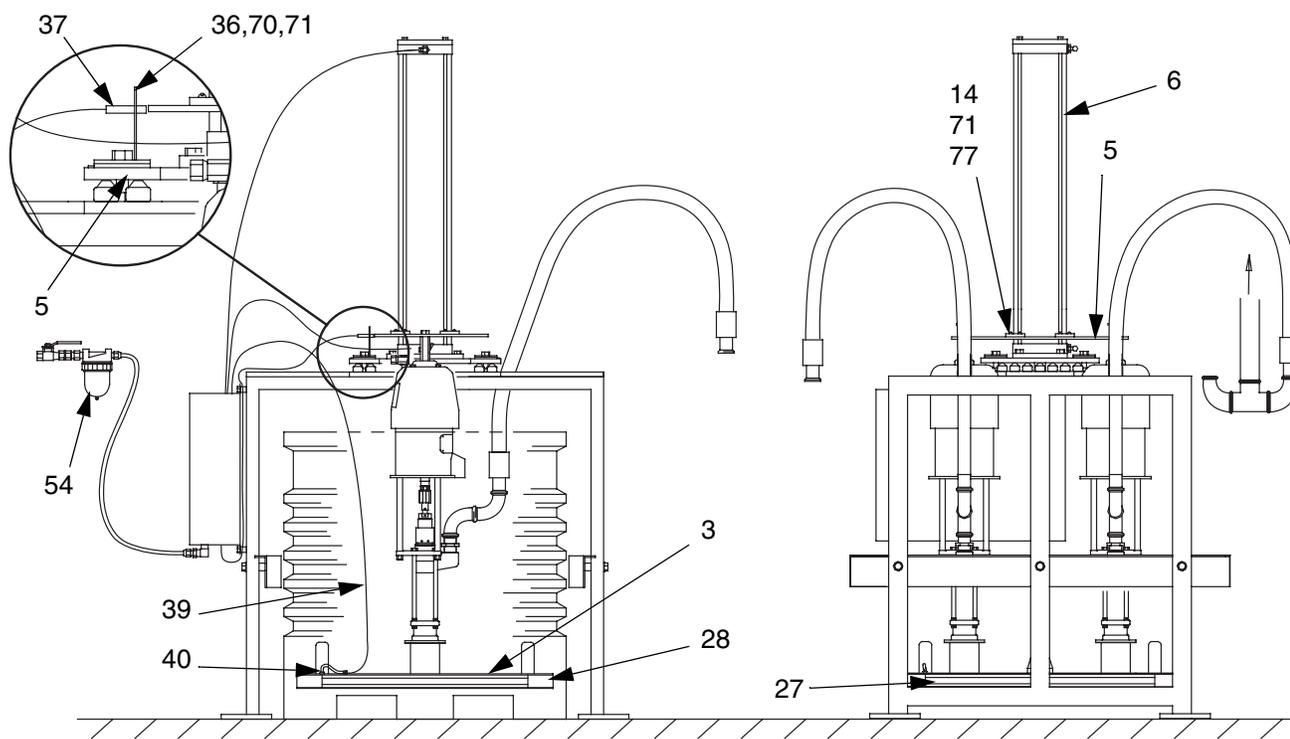
WARNING




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.



T113115A

FIG. 12: Part No. 988327 shown

2. Follow the **Pressure Relief Procedure**, page 19.
3. Lower the ram plate and deflate the seal
4. Shut off the air supply and electrical power to the system.

Replacing Air Filter Element

1. Follow the **Pressure Relief Procedure**, page 19.
2. Unscrew the air filter (54) sight glass.
3. Replace the air filter element with a new 40 micron filter element.
4. Clean the sight glass and reinstall it.
5. Open the air supply line to the pneumatic control panel.
6. Check for air leakage around the filter; tighten as needed.

Replacing Low Limit Switch

1. Follow the **Before Servicing** procedure, above.
2. Mark the lower limit switch (37) position on its bracket (36) to ensure the new switch is installed the same. Refer to FIG. 12.



Recommend 1/4" (6.35 mm) space between switch and plate (5).

3. Disconnect the cable from the switch (37).
4. Remove the two screws (70), lock washers (71) and switch (37).
5. Secure the new switch (37) to the bracket (36) with the screws (70) and lock washers (71).
6. Reconnect the cable.
7. Restart the system and verify the switch operates correctly.

Replacing Cylinder Bearing

CAUTION

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

1. Follow the **Before Servicing** procedure, page 26.
2. Remove cylinder guide bearings (14) on top of the air motor mounting plate (5):

Part No. 687110 and 687257: remove screws (83) and washers (71).

Part No. 988327: remove screws (77) and washers (71).
3. Install cylinder guide bearings (14) on top of the air motor mounting plate (5):

Part No. 687110 and 687257: use screws (83) and washers (71).

Part No. 988327: use screws (77) and washers (71).



The open arch in the cylinder guide bearings (14) fits around tie rods on the air cylinder (6).

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

1. Follow the **Before Servicing** procedure, page 26.
2. **If you are only replacing the corner seals (28) and not the ram plate seal (27),** remove the rivet 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 (27), remove the rivets, then remove all 4 corner seals (28). Check the corner seals for damage and replace if necessary.

3. Disconnect the tube fitting (40) from the seal air supply tube (39).
4. Remove the ram plate seal (27), using a blunt-end tool to avoid damaging the seal. Carefully disengaging the air stem from the hole in the ram plate (3).
5. Insert the air stem of the new seal (27) into the ram plate (3) hole. To avoid puncturing the new seal, carefully slide the seal in place around the ram plate.
6. Install the four corner seals (28) with rivets.
7. Connect the air supply tube (39) to the tube fitting (40).
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.

Electronic Control Panel Service

WARNING



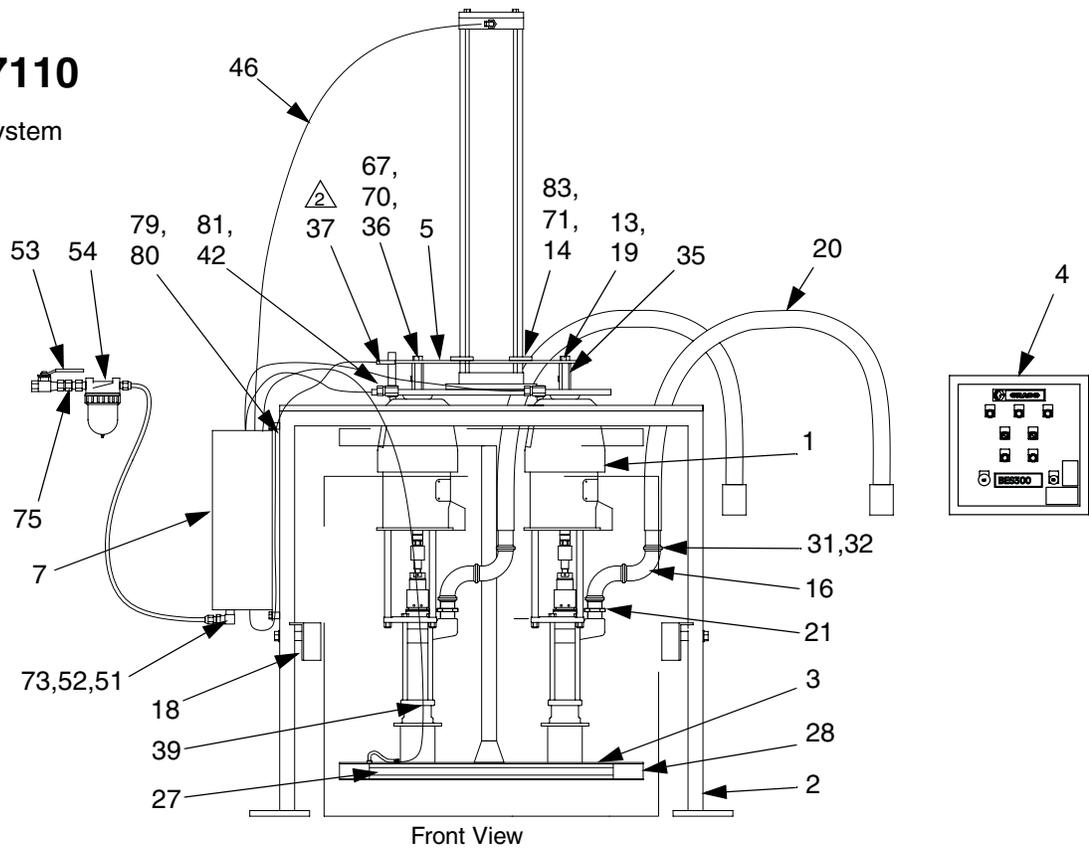
Read warnings, page 3.

1. Follow the **Before Servicing** procedure, page 26.
2. Consult a qualified electrician to service the control panel.

Parts

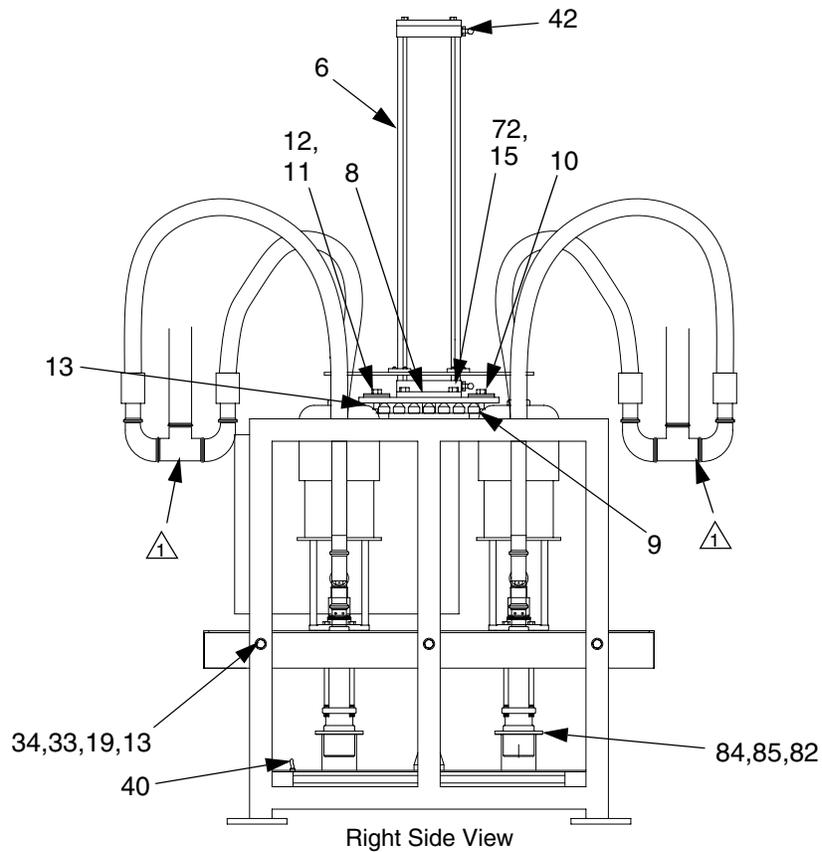
Part No. 687110

4 Pump BES 300 System



Supplied by others

Refer to FIG. 12



6871102B

Part No. 687110

4 Pump BES 300 System

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	949444	PUMP, 10:1 Sanitary Bulldog; see manual 306916	4	35	625903	ROD, mounting, motor	4
2	570192	FRAME	1	36	625677	BRACKET, switch	1
3	570191	PLATE, ram	1	37	514670	SWITCH, low limit	1
4	949948	CONTROL PANEL, electronic; see page 42	1	39	590385	TUBE, poly-flo; 3/8" OD; 15 ft. (4.57 m)	*
5	626656	PLATE, mounting, motor	1	40	115743	FITTING; 3/8" to 1/4" tube	1
6**	15D492	CYLINDER, air, SST	1	42	512684	ELBOW; 1/2" tube x 1/2-14 npt	6
7	570193	CONTROL PANEL, pneumatic; see page 36	1	46	590570	TUBE, polyethylene; 1/2" OD; 30 ft. (9.14 m)	*
8	626655	PLATE, mounting, air cylinder	1	51	113344	SWIVEL; 1/2 npt x 3/4 npsm	1
9	551274	CASTER	18	52	214951	HOSE; 3/4 x 1/2 npt; 25 ft. (7.62 m)	1
10	514331	SCREW; 3/4-10 x 3.15"	4	53	107141	VALVE, ball, self-relieving; 3/4 npt	1
11	625596	WASHER	4	54	106150	FILTER, air; 3/4 npt	1
12	625595	BEARING, thrust; PTFE	4	57	626046	CORNER, bin (not shown)	4
13	514334	NUT; 3/4-10	14	67	102024	WASHER, lock	2
14	625752	BEARING, cylinder guide	4	70	102235	SCREW; 1/4-20 UNC-2A	2
15	513386	SCREW; 5/8-11 x 2"	4	71	170772	WASHER	8
16	513490	ELBOW	8	72	551363	WASHER, lock	4
18	626520	GUIDE, bin	2	73	160327	ADAPTER, 90°; 3/4 npsm x 3/4 nptf	1
19	514332	WASHER	16	75	160032	NIPPLE; 3/4 npt	2
20†	552175	HOSE, sanitary; 2" ID; 10 ft. (3.05 m)	4	79	104034	WASHER	6
21	514887	ADAPTER; 2" tri-clamp x 1.5 nptm	4	80	109477	SCREW; 5/16-18 x 3/4"	4
27†	116464	SEAL, inflatable	1	81	502033	BUSHING; 3/4 x 1/2 npt	4
28†	551065	SEAL, corner	4	82	601809	GASKET	4
31	500984	CLAMP; 2" tri-clamp	12	83	104119	SCREW; 1/4-20 UNC-2A	8
32†	512332	GASKET; 2" S-clamp; buna-N	12	84	103975	WASHER, lock	16
33	514594	ROD; 3/4-10 x 8"	6	85	102471	SCREW; 3/8-16 UNC x 1"	16
34	514819	SPRING	6				

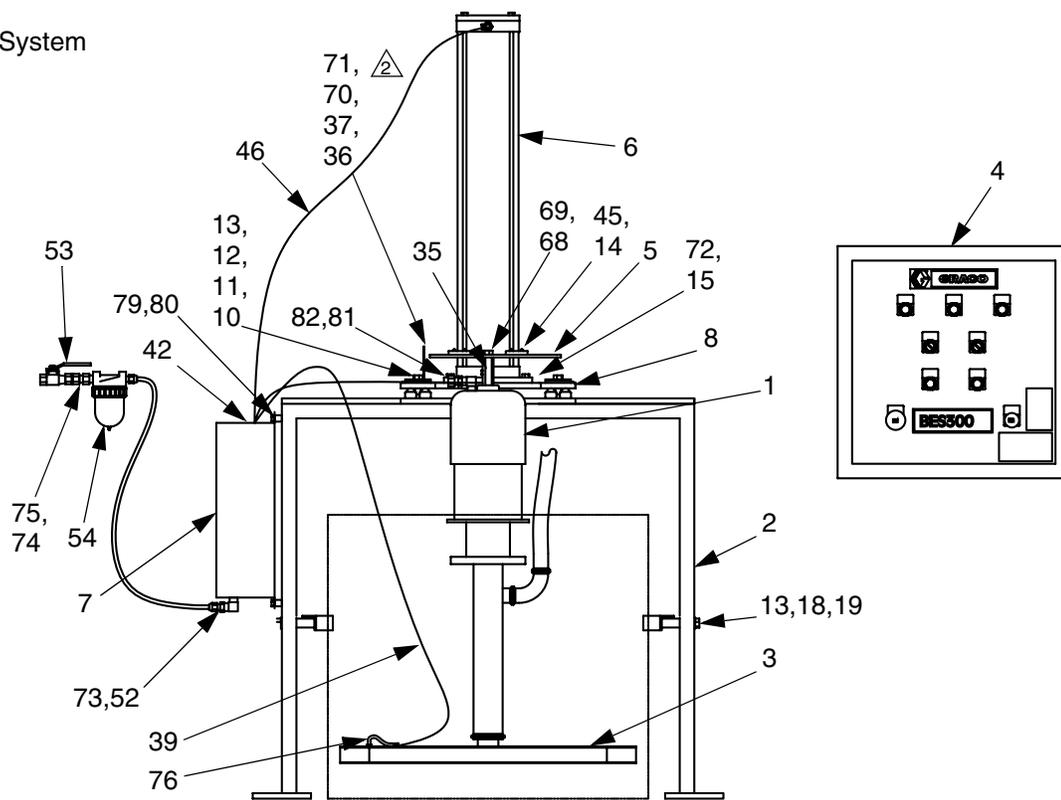
* Bulk tubing

† Recommended spare parts

** Air Cylinder repair kit is 15D519

Part No. 687257

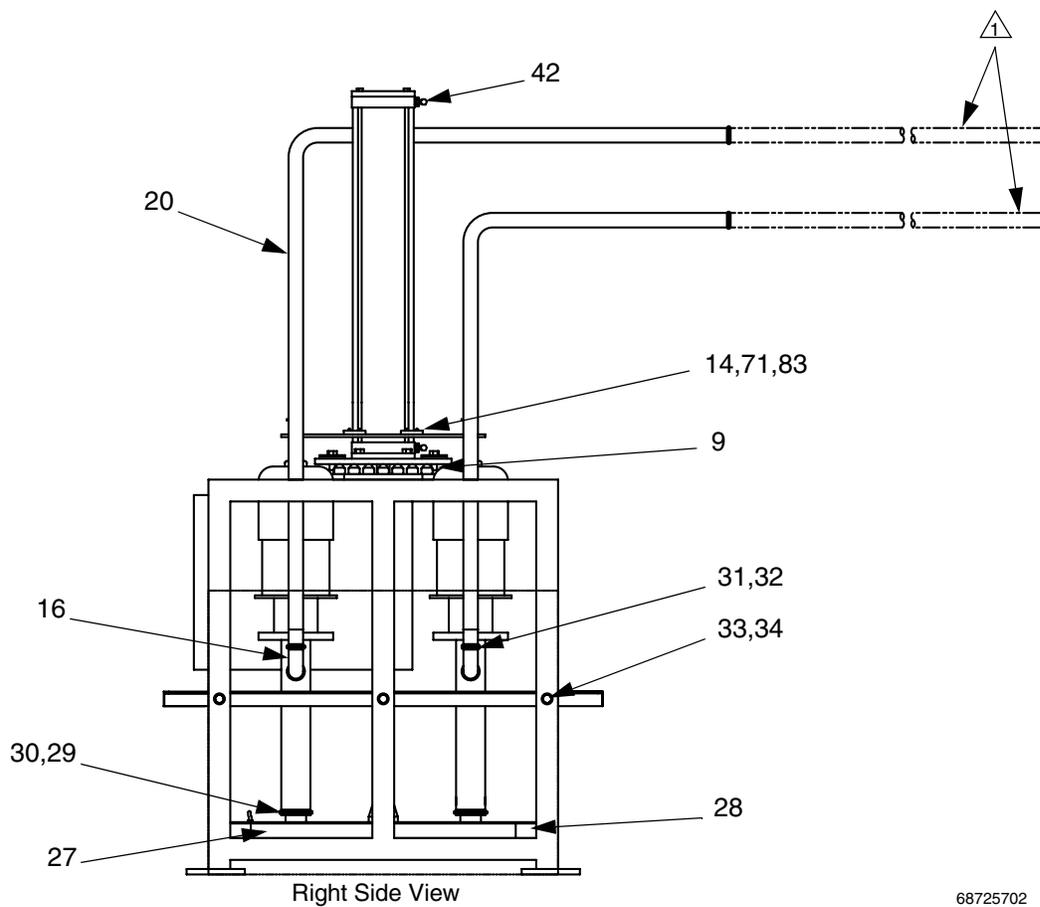
2 Pump BES 300 System



Front View

⚠ Supplied by others

Ⓜ Refer to FIG. 12



Right Side View

68725702

Part No. 687257

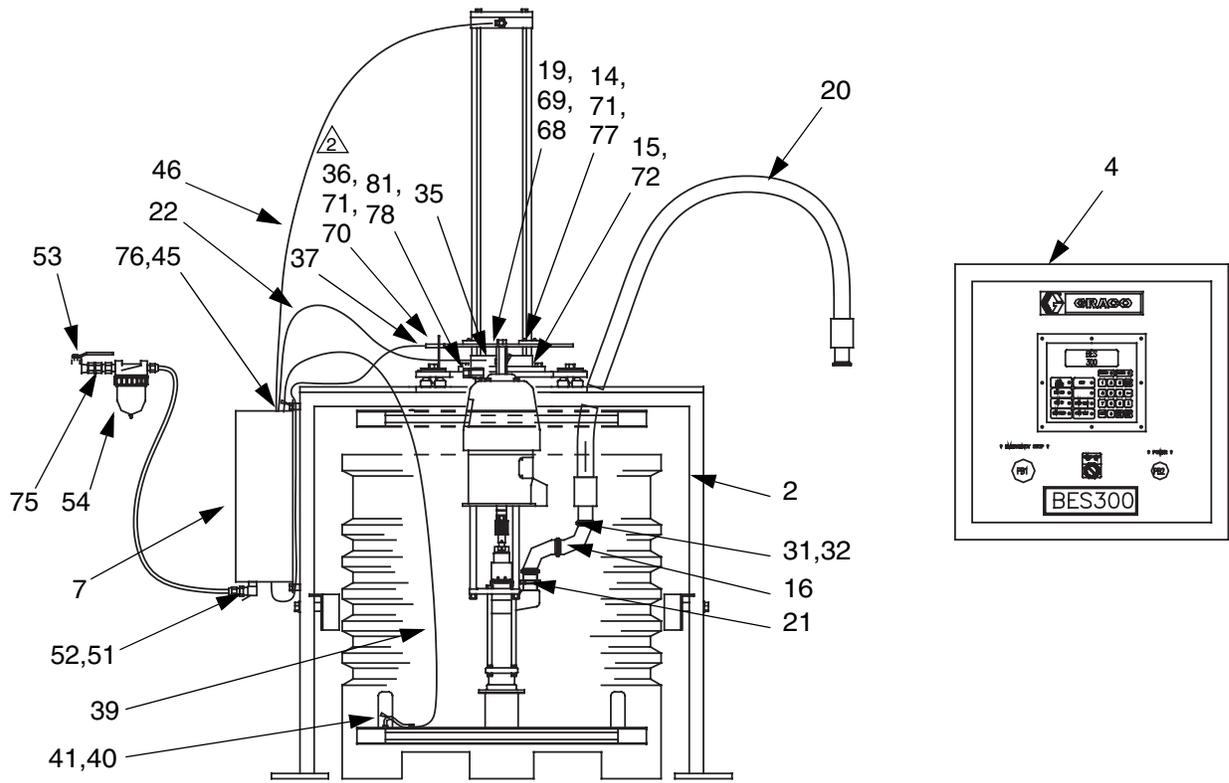
2 Pump BES 300 System

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	949704	PUMP, Sanitary FT14; see manual 308076 for pump and 307592 for air motor	2	35	626051	ROD, mounting, motor	2
2	949675	FRAME	1	36	625677	BRACKET, switch	1
3	949417	PLATE, ram	1	37	514670	SWITCH, low limit	1
4	949948	CONTROL PANEL, electronic; see page 42	1	39	590385	TUBE, poly-flo; 3/8" OD; 10 ft. (3.05 m)	*
5	626136	PLATE, mounting, motor	1	42	512684	ELBOW; 1/2" tube x 1/2-14 npt	8
6**	15D492	CYLINDER, air, SST	1	45	501630	SCREW; 5/16-18 UNC-2A x 3/4"	4
7	949949	CONTROL PANEL, pneumatic; see page 40	1	46	590570	TUBE, polyethylene; 1/2" OD; 25 ft. (7.62 m)	*
8	625747	PLATE, mounting, air cylinder	1	47	949412	CLAMP, bag (not shown)	4
9	551274	CASTER	22	48	625988	TUBE, wand (not shown)	4
10	514331	SCREW; 3/4-10 x 3.15"	4	52	214951	HOSE; 3/4 x 1/2 npt; 25 ft. (7.62 m)	1
11	625596	WASHER	4	53	107141	VALVE, ball, self-relieving; 3/4 npt	1
12	625595	BEARING, thrust; PTFE	4	54	106150	FILTER, air; 3/4 npt	1
13	514334	NUT; 3/4-10	12	57	626046	CORNER, bin (not shown)	4
14	625752	BEARING, cylinder guide	4	68	551365	SCREW; 3/4-10 x 2"	2
15	513386	SCREW; 5/8-11 x 2"	4	69	551364	WASHER, lock	2
16	513490	ELBOW	2	70	102235	SCREW; 1/4-20 UNC-2A x 1/2"	2
18	626520	GUIDE, bin	2	71	170772	WASHER	10
19	514332	WASHER	12	72	551363	WASHER, lock	4
20†	552175	HOSE, sanitary; 2" ID; 10 ft. (3.05 m)	2	73	160327	ADAPTER, 90°; 3/4 npsm x 3/4 nptf	1
27†	514984	SEAL, inflatable	1	74	156172	SWIVEL; 3/4 nps x 3/4 npt	1
28†	551065	SEAL, corner	4	75	160032	NIPPLE; 3/4 npt	2
29	510490	TRI-CLAMP; 4"	2	76	598449	BULKHEAD; 3/8" tube	1
30	513548	GASKET; 4" tri-clamp; buna-N	2	79	104034	WASHER	4
31	500984	TRI-CLAMP; 2"	4	80	109477	SCREW; 5/16-18 UNC-2A x 1/2"	4
32	512332	GASKET; 2" S-clamp; buna-N	4	81	502033	BUSHING; 1/2 npt(f) x 3/4 npt(m)	2
33	514594	ROD; 3/4-10 x 8"	6	82	156684	ADAPTER, 1/2 npt	2
34	514819	SPRING	6	83	104119	SCREW; 1/4-20 UNC-2A x 0.875"	8

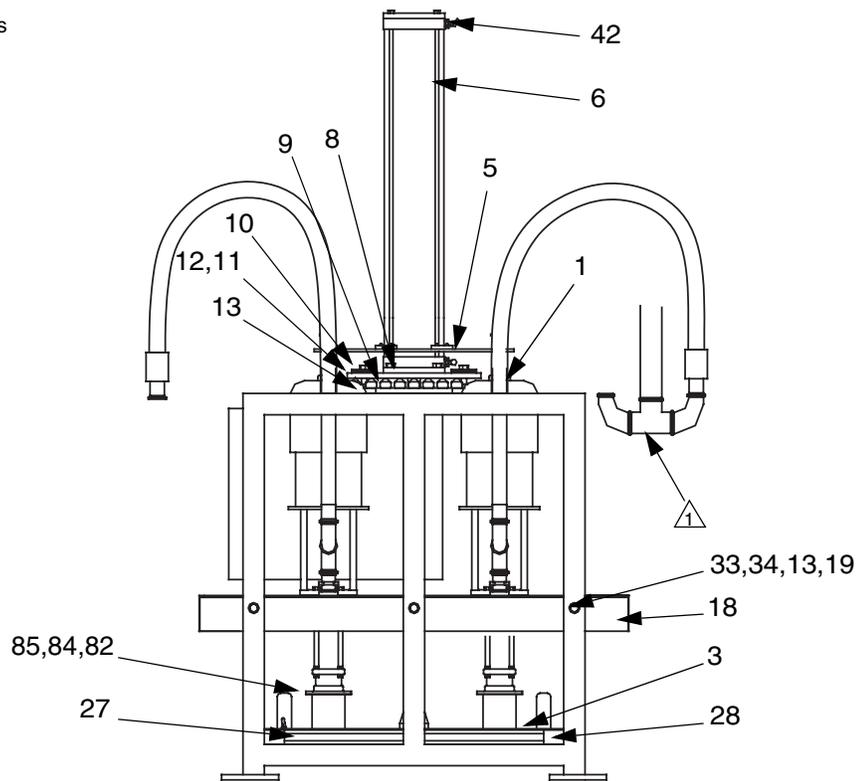
* Bulk tubing

† Recommended spare parts

** Air Cylinder repair kit is 15D519



-  Supplied by others
-  Refer to FIG. 12



988327B

Part No. 988327

2 Pump BES 300 System, with flow meter option

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	949444	PUMP, 10:1 Sanitary Bulldog; see manual 306916	2	36	625677	BRACKET, switch	1
2	949675	FRAME	1	37	514670	SWITCH, low limit	1
3	949884	PLATE, ram	1	39	590385	TUBE, poly-flo; 3/4" OD; 15 ft. (4.57 m)	*
4	965705	CONTROL PANEL, electronic; see page 44	1	40	608789	FITTING; 3/8" tube x 1/4 npt(m)	1
5	626136	PLATE, mounting, motor	1	41	608786	FITTING; 3/8" tube x 1/4 npt(f); nylon	1
6**	15D492	CYLINDER, air, SST	1	42	512684	ELBOW; 1/2" tube x 1/2-14 npt	8
7	949949	CONTROL PANEL, pneumatic; see page 40	1	45	109477	SCREW; 5/16-18 UNC-2A	4
8	625747	PLATE, mounting, air cylinder	1	46	590570	TUBE, polyethylene; 1/2" OD; 25 ft. (7.62 m)	*
9	551274	CASTER	22	51	113344	SWIVEL; 1/2 npt x 3/4 npsm	1
10	514331	SCREW; 3/4-10 x 3.15	4	52	214951	HOSE; 3/4 x 1/2 npt; 25 ft. (7.62 m)	1
11	625596	WASHER	4	53	107141	VALVE, ball, self-relieving; 3/4 npt	1
12	625595	BEARING, thrust; PTFE	4	54	106150	FILTER, air; 3/4 npt	1
13	514334	NUT; 3/4-10	12	57	626046	CORNER, bin (not shown)	4
14	625752	BEARING, cylinder guide	4	68	551365	SCREW; 3/4-10 x 2"	2
15	513386	SCREW; 5/8-11 x 2"	4	69	551364	WASHER, lock	2
16	513490	ELBOW	4	70	102235	SCREW; 1/4-20 UNC-2A	2
18	626520	GUIDE, bin	2	71	170772	WASHER	10
19	514332	WASHER	12	72	551363	WASHER, lock	4
20†	552175	HOSE, sanitary; 2" ID; 10 ft. (3.05 m)	2	74	156172	SWIVEL; 3/4 nps x 3/4 npt	1
21	514887	ADAPTER; 2" tri-clamp	2	75	160032	NIPPLE; 3/4 npt	1
22	214950	HOSE; 3/4 npt(m) x 1/2 npt(m); 6 ft. (1.83 m)	2	76	104034	WASHER	4
27†	551413	SEAL, inflatable	1	77	104119	SCREW; 1/4-20 UNC-2A	8
28†	551065	SEAL, corner	4	78	502033	BUSHING; 1/2 npt(f) x 3/4 npt(m)	2
31	500984	TRI-CLAMP; 2"	12	81	156684	ADAPTER; 1/2-14 npt	2
32	512332	GASKET; 2" S-clamp; buna-N	12	82	601809	GASKET	2
33	514594	ROD; 3/4-10 x 8"	6	84	103975	WASHER, lock	8
34	514819	SPRING	6	85	102471	SCREW; 3/8-16 UNC x 1"	8
35	625903	ROD, mounting, motor	2				

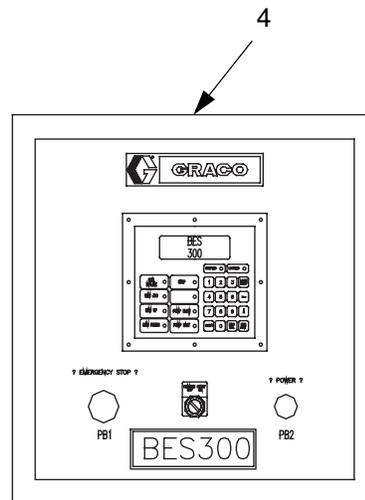
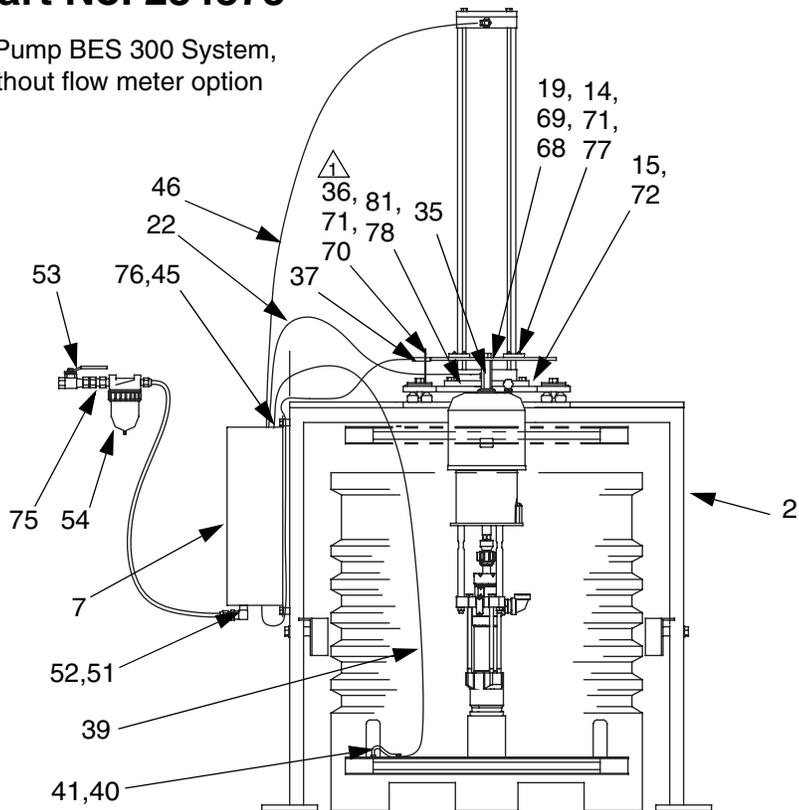
* Bulk tubing

† Recommended spare parts

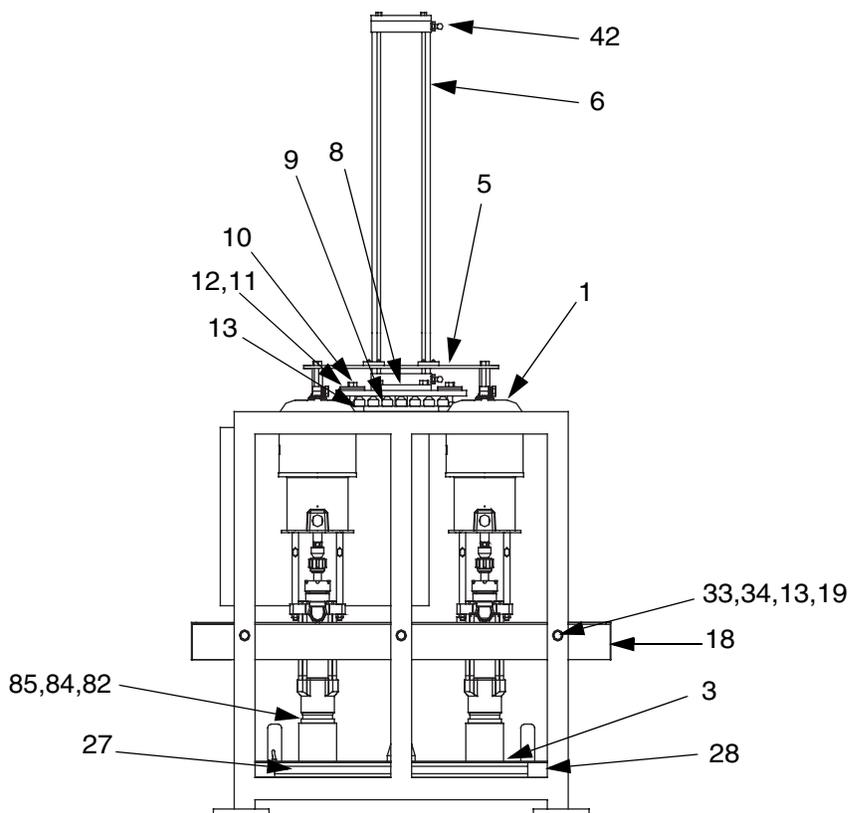
.** Air Cylinder repair kit is 15D519

Part No. 234375

2 Pump BES 300 System,
without flow meter option



Refer to FIG. 12



Part No. 234375

2 Pump BES 300 System, without flow meter option

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	246936	PUMP, 24:1 King; see manual 308149	2	41	608786	FITTING; 3/8" tube x 1/4 npt(f); nylon	1
2	949675	FRAME	1	42	512684	ELBOW; 1/2" tube x 1/2-14 npt	8
3	949884	PLATE, ram	1	45	109477	SCREW; 5/16-18 UNC-2A	4
4	965705	CONTROL PANEL, electronic; see page 44	1	46	590570	TUBE, polyethylene; 1/2" OD; 25 ft. (7.62 m)	*
5	626136	PLATE, mounting, motor	1	51	113344	SWIVEL; 1/2 npt x 3/4 npsm	1
6**	15D492	CYLINDER, air, SST	1	52	214951	HOSE; 3/4 x 1/2 npt; 25 ft. (7.62 m)	1
7	949949	CONTROL PANEL, pneumatic; see page 40	1	53	107141	VALVE, ball, self-relieving; 3/4 npt	1
8	625747	PLATE, mounting, air cylinder	1	54	106150	FILTER, air; 3/4 npt	1
9	551274	CASTER	22	57	626046	CORNER, bin (not shown)	4
10	514331	SCREW; 3/4-10 x 3.15	4	68	551365	SCREW; 3/4-10 x 2"	2
11	625596	WASHER	4	69	551364	WASHER, lock	2
12	625595	BEARING, thrust; PTFE	4	70	102235	SCREW; 1/4-20 UNC-2A	2
13	514334	NUT; 3/4-10	12	71	170772	WASHER	10
14	625752	BEARING, cylinder guide	4	72	551363	WASHER, lock	4
15	513386	SCREW; 5/8-11 x 2"	4	74	156172	SWIVEL; 3/4 nps x 3/4 npt	1
18	626520	GUIDE, bin	2	75	160032	NIPPLE; 3/4 npt	1
19	514332	WASHER	12	76	104034	WASHER	4
22	214950	HOSE; 3/4 npt(m) x 1/2 npt(m); 6 ft. (1.83 m)	2	77	104119	SCREW; 1/4-20 UNC-2A	8
27†	551413	SEAL, inflatable	1	78	502033	BUSHING; 1/2 npt(f) x 3/4 npt(m)	2
28†	551065	SEAL, corner	4	81	156684	ADAPTER; 1/2-14 npt	2
33	514594	ROD; 3/4-10 x 8"	6	82	601809	GASKET	2
34	514819	SPRING	6	84	103975	WASHER, lock	8
35	625903	ROD, mounting, motor	2	85	102471	SCREW; 3/8-16 UNC x 1"	8
36	625677	BRACKET, switch	1				
37	514670	SWITCH, low limit	1				
39	590385	TUBE, poly-flo; 3/4" OD; 15 ft. (4.57 m)	*				
40	608789	FITTING; 3/8" tube x 1/4 npt(m)	1				

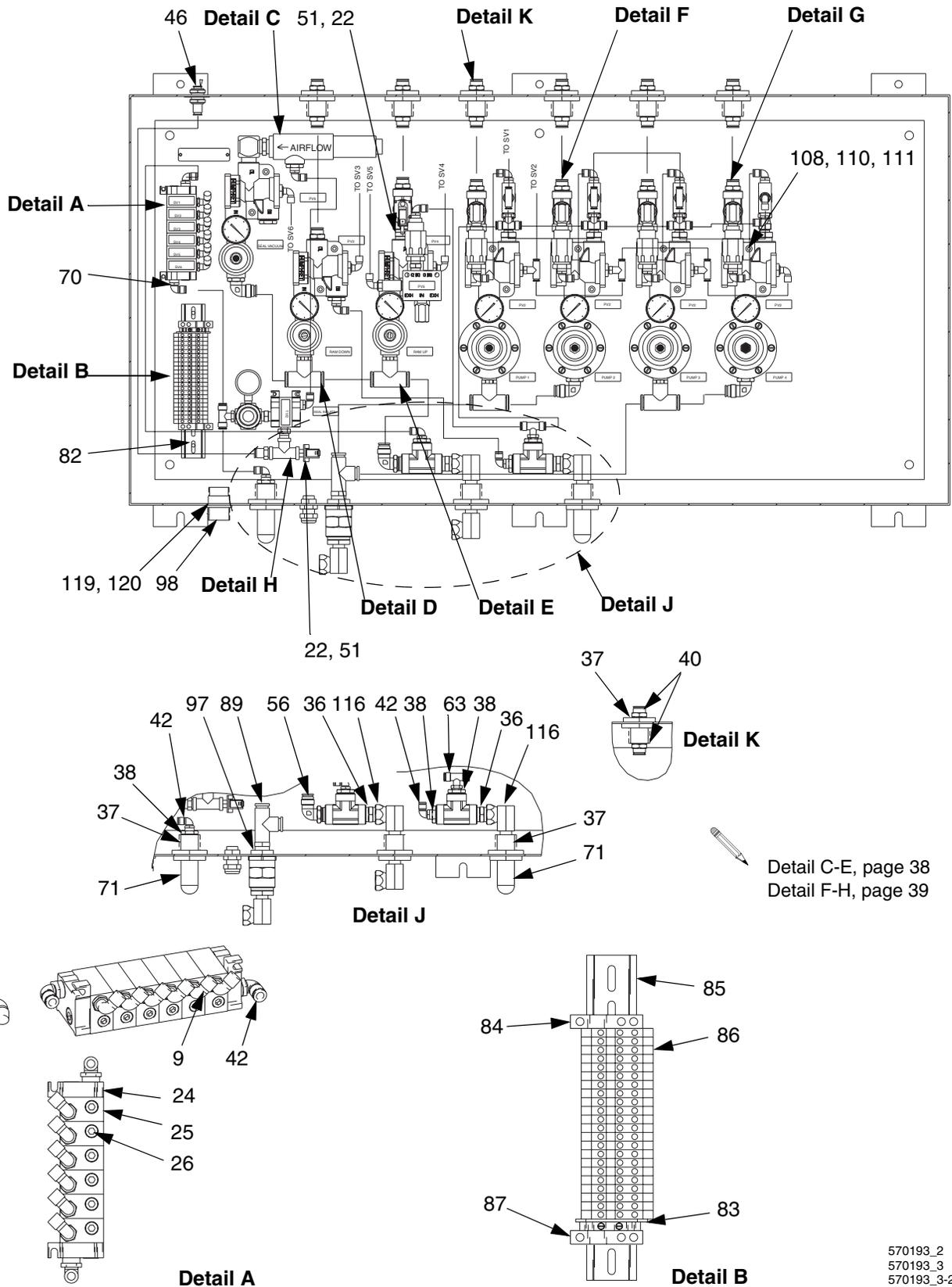
* Bulk tubing

† Recommended spare parts

** Air Cylinder repair kit is 15D519

Part No. 570193

4 Pump Pneumatic Control Panel

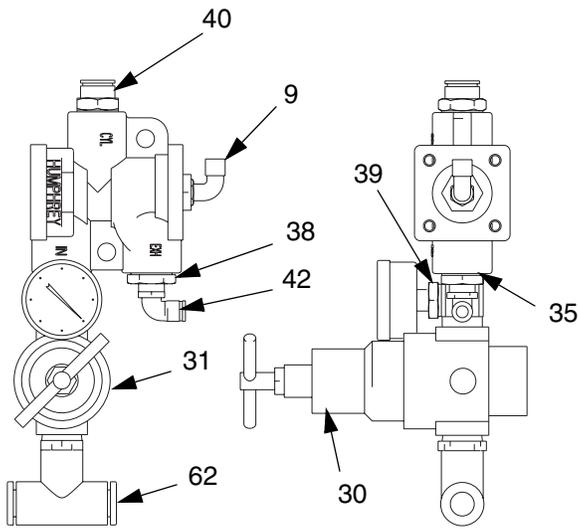


Part No. 570193

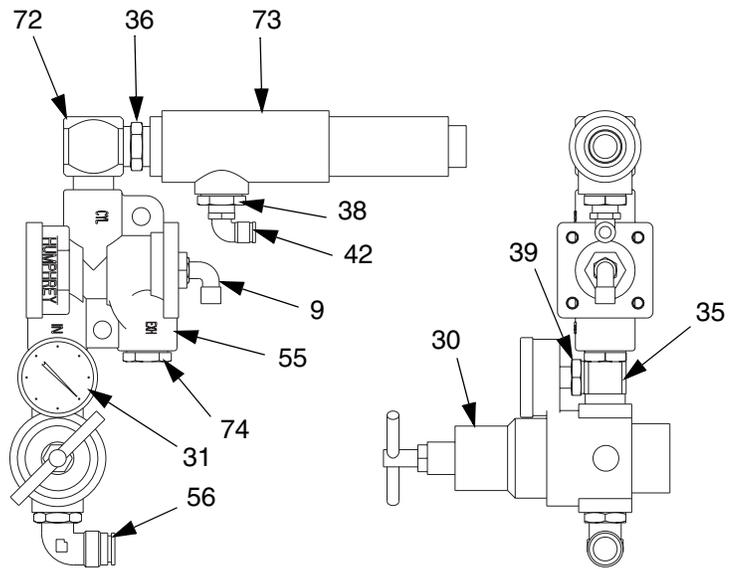
4 Pump Pneumatic Control Panel

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
9	598140	FITTING, elbow; 5/32" tube x 1/8 npt(m)	12	65	510220	VALVE, air, 4-way; 1/4 npt	5
10	598095	TUBE, nylon; 5/32" OD	*	66	501014	ACTUATOR, air; 1/8 npt	5
11	590385	TUBE, poly-flo; 3/8" 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" 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" 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" tube x 1/2 nptf	18	89	551966	FITTING, tee; 1/2 tube x 1/2 npt	1
42	C19391	FITTING, elbow; 1/4" 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" npt	1
55	104632	VALVE, piloted	7	97	100380	BUSHING, pipe	2
56	114110	FITTING, elbow, swivel; 1/2" 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" tube x 1/2 nptm	4	112	100030	BUSHING; 1/8 x 1/4 npt	2
63	599246	FITTING, tee; 1/4" 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	4
				119	514023	SCREW; 4-40 UNC	4
				120	514024	NUT; 4-40 UNC	4

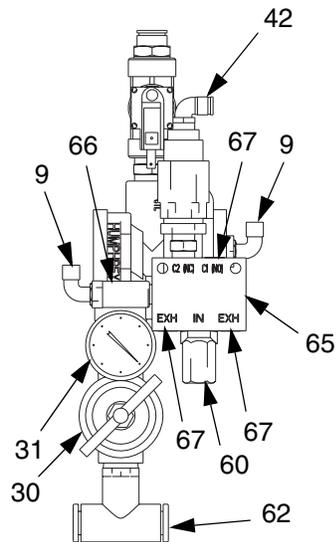
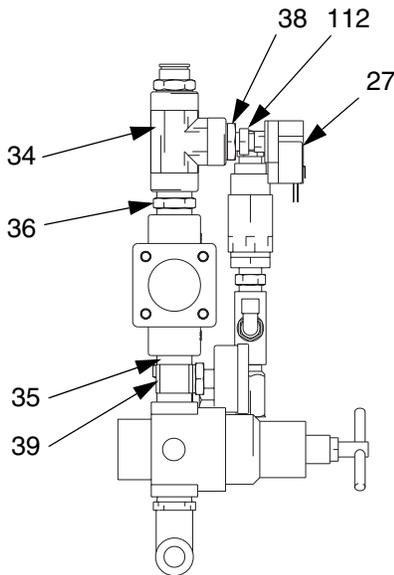
* Bulk tubing/wire



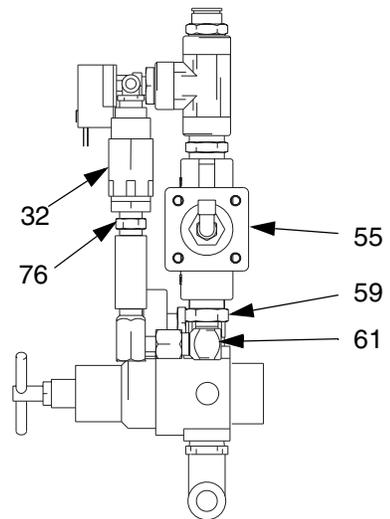
Detail C

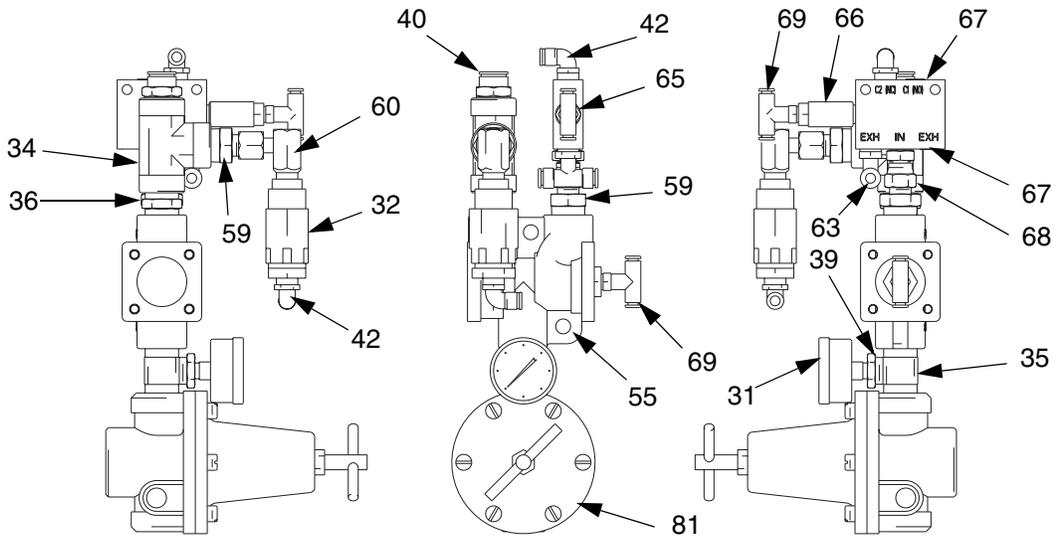


Detail D

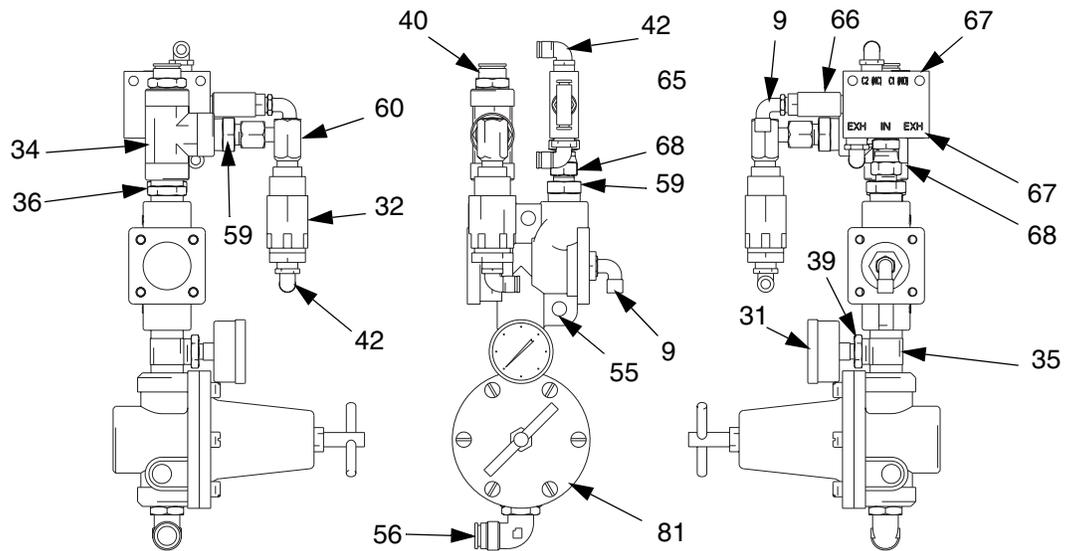


Detail E

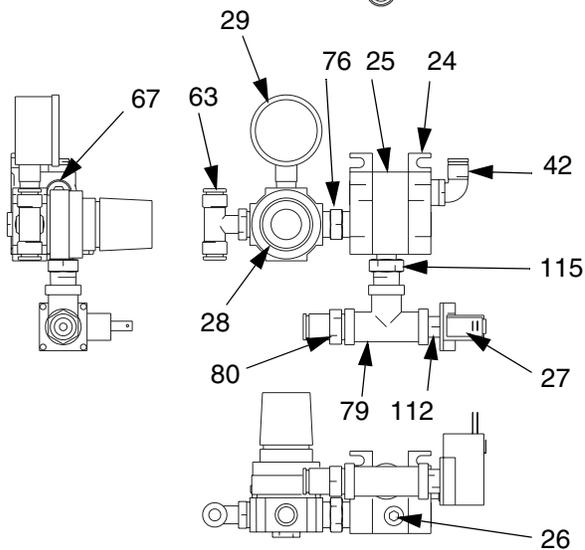




Detail F



Detail G

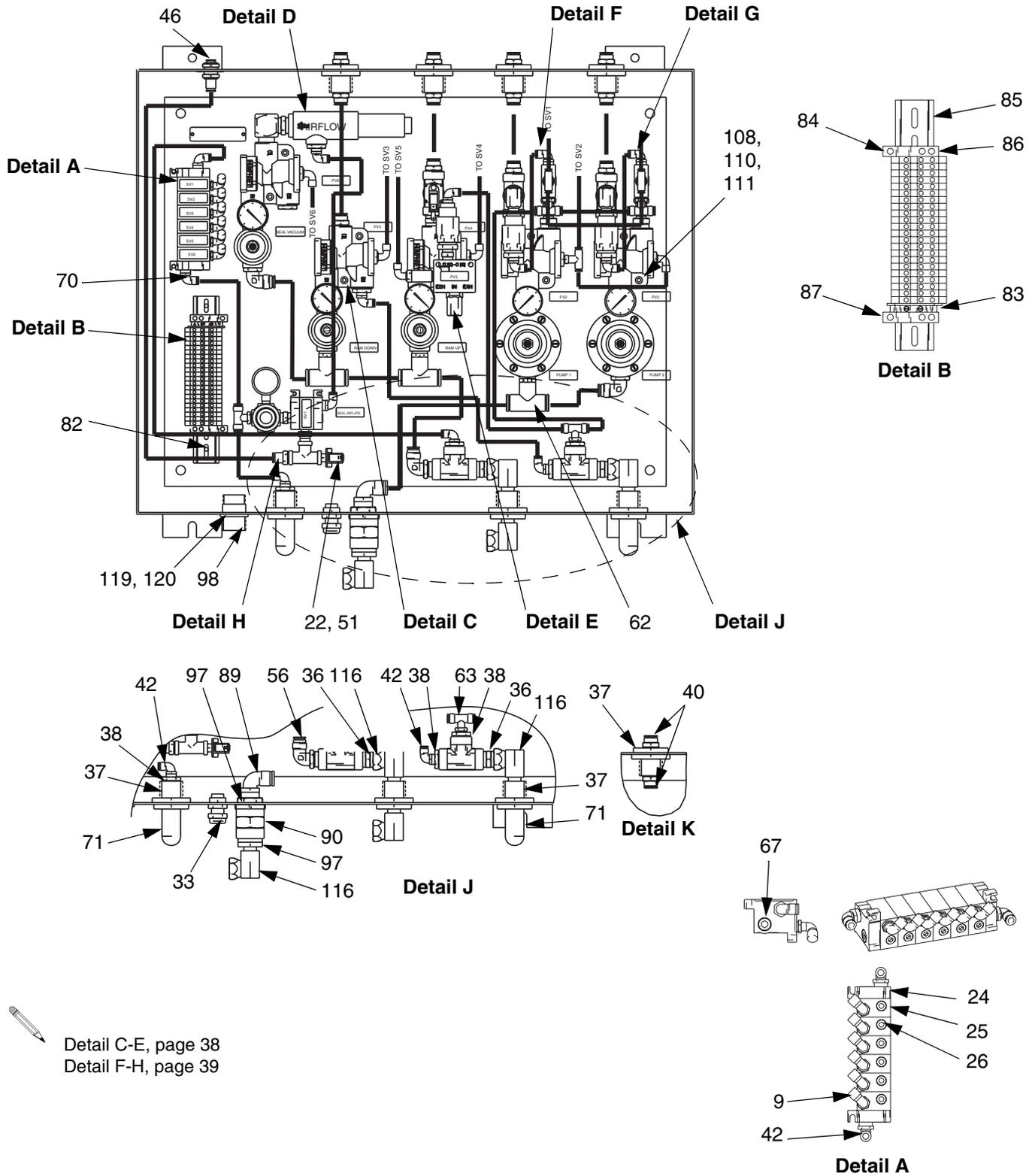


Detail H

570193_6
570193_7
570193_8

Part No. 949949

2 Pump Pneumatic Control Panel



Detail C-E, page 38
Detail F-H, page 39

949949_2
570193_3-2
570193_3-1

Part No. 949949

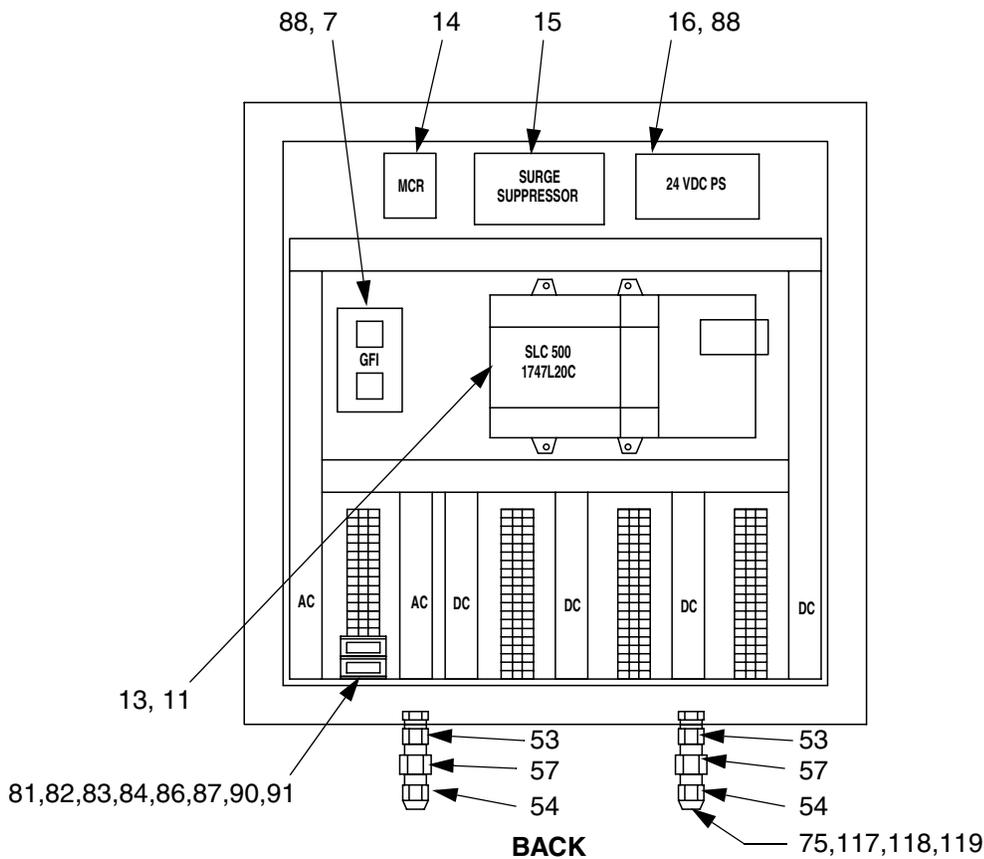
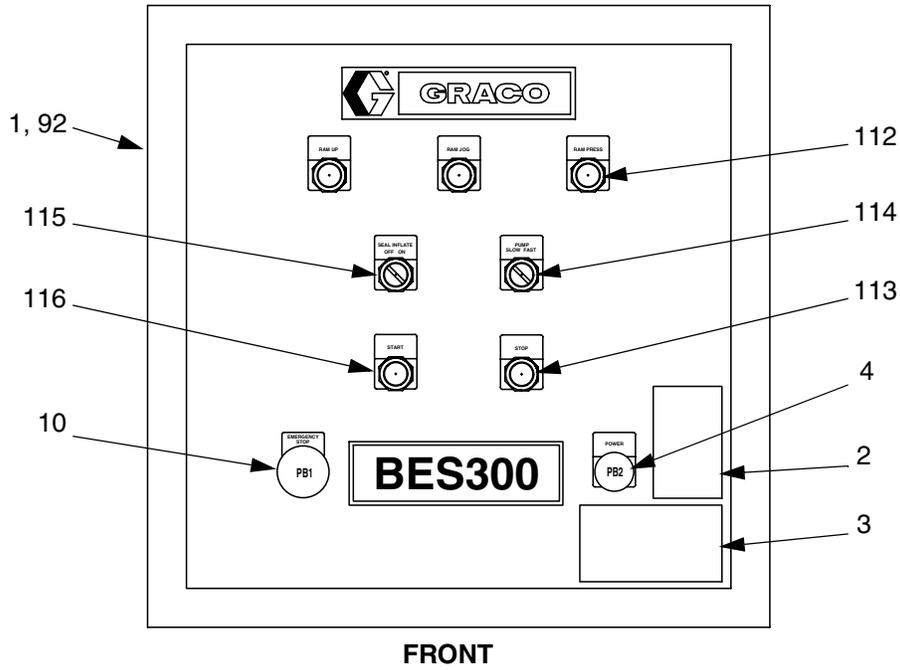
2 Pump Pneumatic Control Panel

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
9	598140	FITTING, elbow; 5/32" tube x 1/8 npt(m)	8	66	501014	ACTUATOR, air; 1/8 npt	3
10	598095	TUBE, nylon; 5/32" OD	*	67	100721	PLUG, pipe; 1/4 nptf	11
11	590385	TUBE, poly-flo; 3/8" 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" 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" 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" tube x 1/2 nptf	12	87	112443	BLOCK, terminal, ground	1
42	C19391	FITTING, elbow; 1/4" 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" npt	1
55	104632	VALVE, piloted	5	97	100380	BUSHING, pipe	2
56	114110	FITTING, elbow, swivel; 1/2" 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" tube x 1/2 nptm	3	112	100030	BUSHING; 1/8 x 1/4 npt	2
63	599246	FITTING, tee; 1/4" 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	4
				117	100055	SCREW, drive; #6	2
				119	514023	SCREW; 4-40 UNC	4
				120	514024	NUT; 4-40 UNC	4

* Bulk tubing/wire

Part No. 949948

Electronic Control Panel, without flow meter option



94994801

Part No. 949948

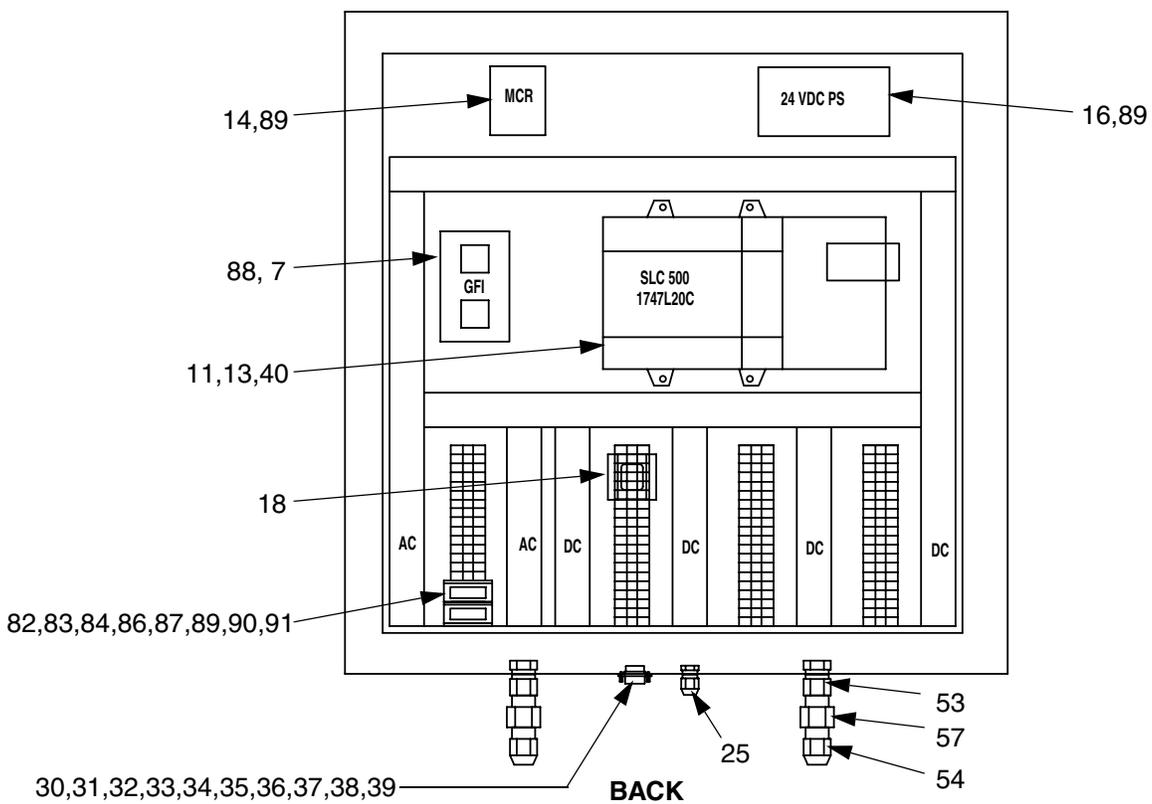
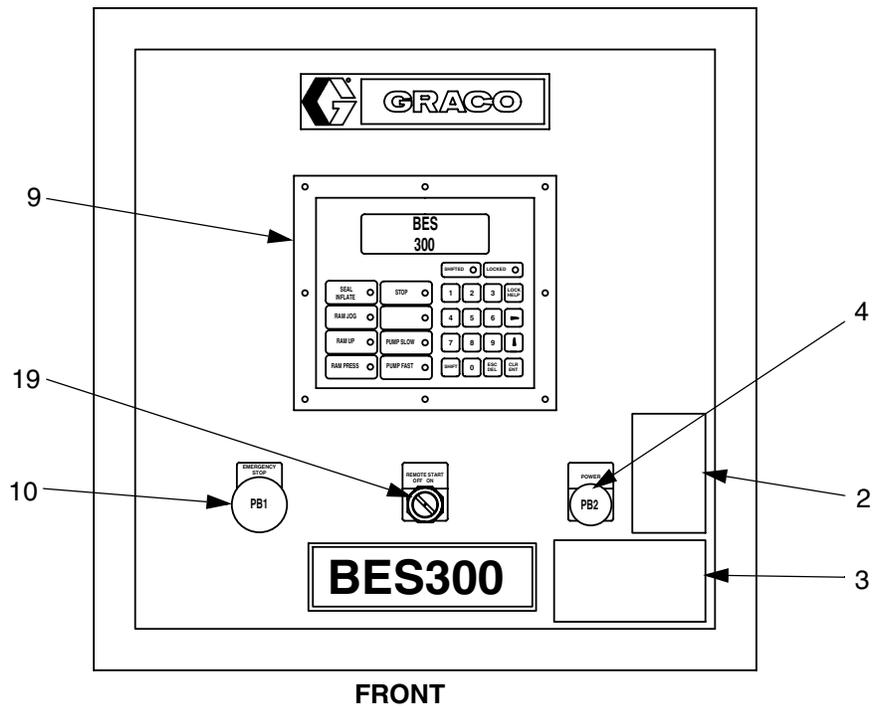
Electronic Control Panel, without flow meter option

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	626398	ENCLOSURE	1	84	514771	END STOP, fuse holder	2
2	513310	INSTRUCTION LABEL	1	86	112444	TERMINAL BLOCK	44
3	513313	WARNING LABEL	1	87	112443	TERMINAL BLOCK, ground	2
4	595756	PILOT LIGHT, green	1	88	103310	SCREW; 8-32 UNC-2A x 1/4"	4
7	514678	CONNECTOR, electronic	1	89	104371	SCREW; 10-32 UNF-3A x 3/8"	12
9	514509	CONTROL, interface	1	90	112446	BLOCK, end clamp	8
10	596060	PUSH BUTTON, red	1	91	112445	COVER, end terminal	4
11	514507	PROCESSOR MODULE	1	92	949983	REPAIR KIT	1
13	513927	EEPROM MODULE	1	112	551356	SWITCH, push button, black	3
14	513211	RELAY, 110 VAC	1	113	551357	SWITCH, push button, red	1
16	513194	POWER SUPPLY, 24 VDC	1	114	551358	SWITCH, 3-position, black	1
53	514679	HUB, CONDUIT; 3/4"	2	115	722557	SWITCH, 2-position (A/B)	1
54	514030	CONNECTOR, cable	2	116	551359	SWITCH, push button, green	1
57	100896	BUSHING, pipe; 3/4-14 x 1/2-14 npt	2	117	513883	PLUG, 14-contact	1
75	548017	CABLE, copper shielded, 14 conductor	*	118	198664	CONNECTOR, step-down clamp; 1-3/16-18 UNEF-2A x 1.187"	1
82	514556	HOLDER, fuse	2	119	198665	BUSHING, clamp	1
83	107578	FUSE, time lag; 250 V; 2.5 A	2				

* Bulk cable

Part No. 965705

Electronic Control Panel, with flow meter option



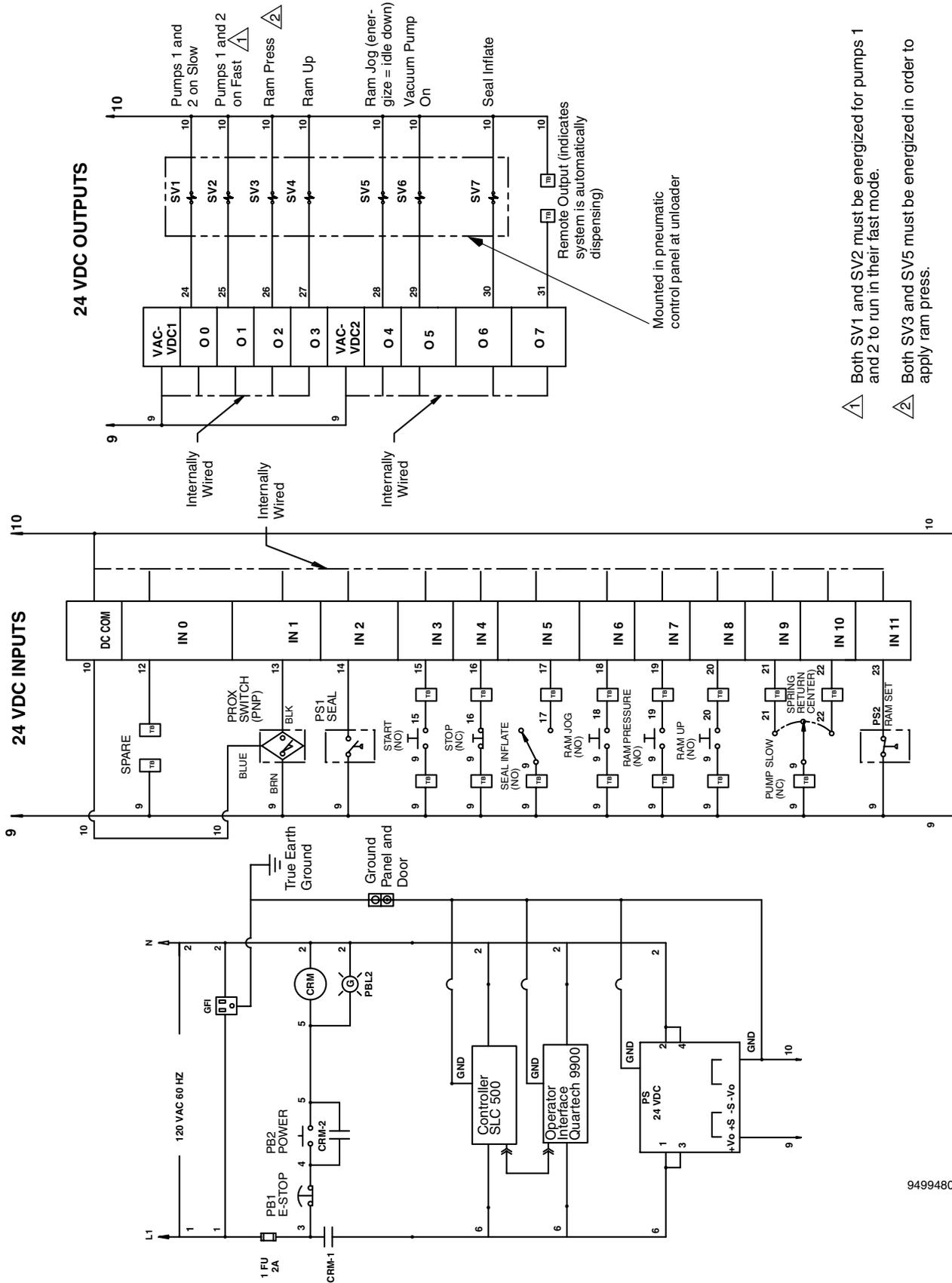
Part No. 965705

Electronic Control Panel, with flow meter option

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	626185	ENCLOSURE	1	40	514550	CABLE, RJ49-D9 pin	1
2	513310	INSTRUCTION LABEL	1	53	514679	HUB, CONDUIT; 3/4"	2
3	513313	WARNING LABEL	1	54	514030	CONNECTOR, cable	2
4	595756	PILOT LIGHT, green	1	57	100896	BUSHING, pipe; 3/4-14 x 1/2-14 npt	2
7	514678	CONNECTOR, electronic	1	75	548017	CABLE, copper shielded, 14 conductor	*
9	514509	CONTROL, interface	1	82	514556	HOLDER, fuse	2
10	596060	PUSH BUTTON, red	1	83	107578	FUSE, time lag; 250 V; 2.5 A	2
11	514507	PROCESSOR MODULE	1	84	514771	END STOP, fuse holder	2
13	513927	EEPROM MODULE	1	86	112442	TERMINAL BLOCK	44
14	513211	RELAY, 110 VAC	1	87	112443	TERMINAL BLOCK, ground	2
16	513194	POWER SUPPLY, 24 VDC	1	88	103310	SCREW; 8-32 UNC-2A x 1/4"	4
18	514832	RELAY, DC	1	89	104371	SCREW; 10-32 UNF-3A x 3/8"	12
19	722557	SWITCH, 2-position	1	90	112446	BLOCK, end clamp	8
25	513795	CONNECTOR, cord	1	91	112445	COVER, end terminal	4
30	100022	SCREW; 1/4-20 UNC-2A x 3/4"	2	92	513883	PLUG, 14-contact	2
31	103831	SCREW; 10-32 UNF x 1/2"	12	93	513916	BUSHING, cable; 0.437 ID	1
32	104029	GROUND CLAMP	1	94	513917	CLAMP, cable; #20	1
33	111655	CONNECTOR, 9-pin male	1	95	198664	CONNECTOR, step-down clamp; 1-3/16-18 UNEF-2A x 1.187"	1
34	111656	CONNECTOR, 9-pin female	1	96	198665	BUSHING, clamp	1
35	111657	PIN, contact	18				
36	111658	SOCKET, pin	18				
37	111647	CABLE, 4 conductor	*				
38	514096	COVER; for 9-pin connector	1	†	Bulk cable		
39	111682	SCREWLOCK, female; 4-40	1				

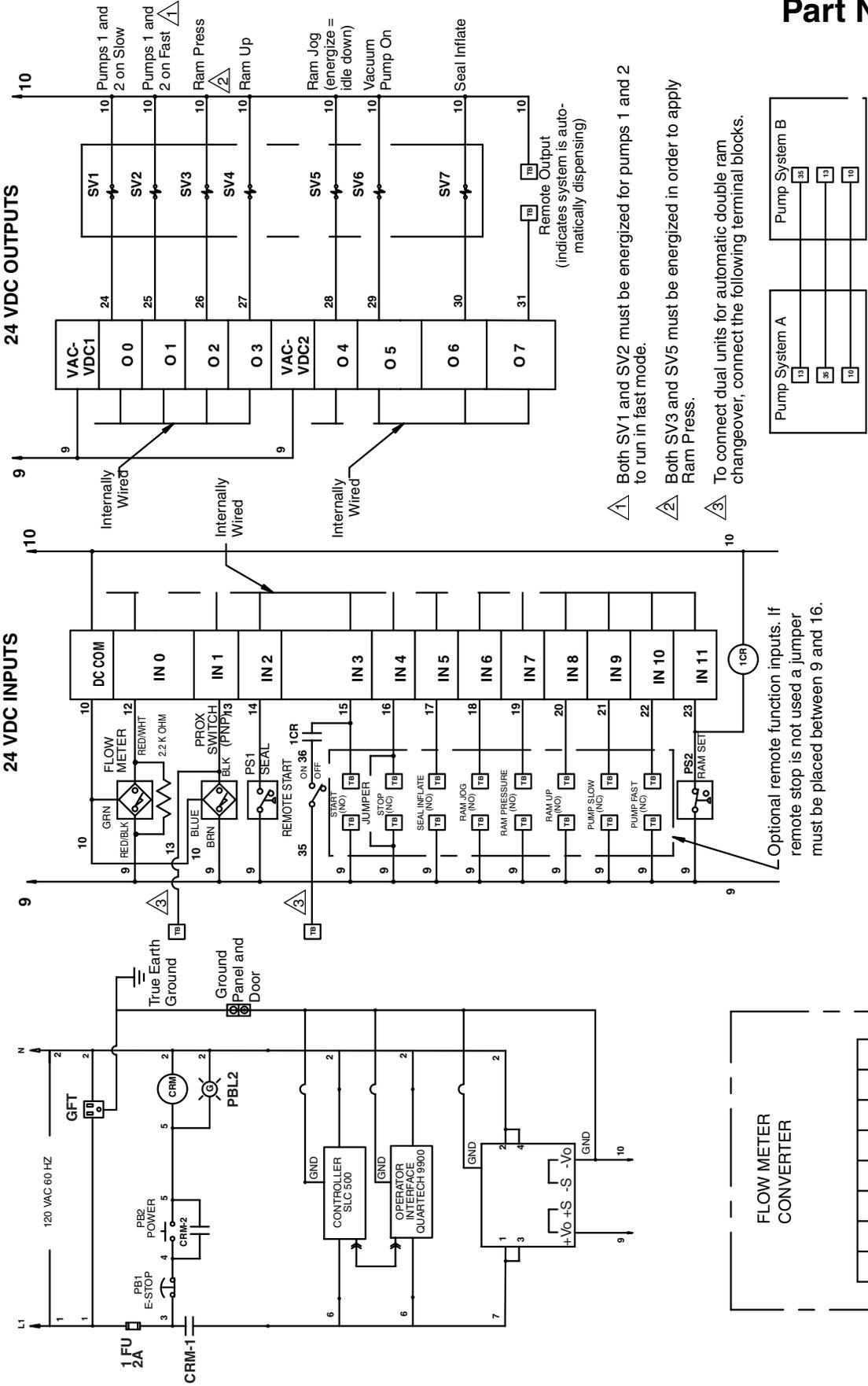
Electrical Schematic

Part No. 949948



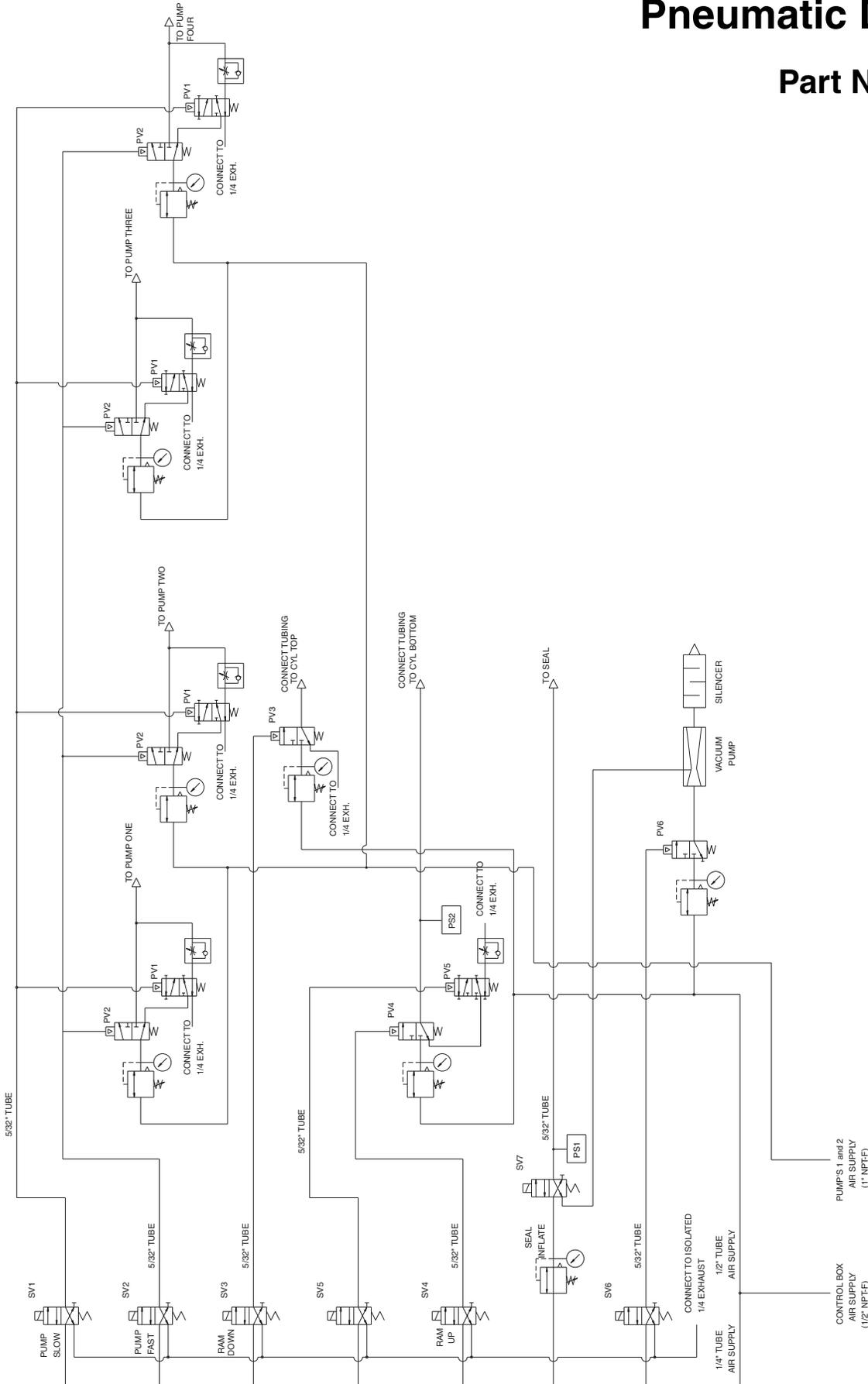
94994802

Part No. 965705

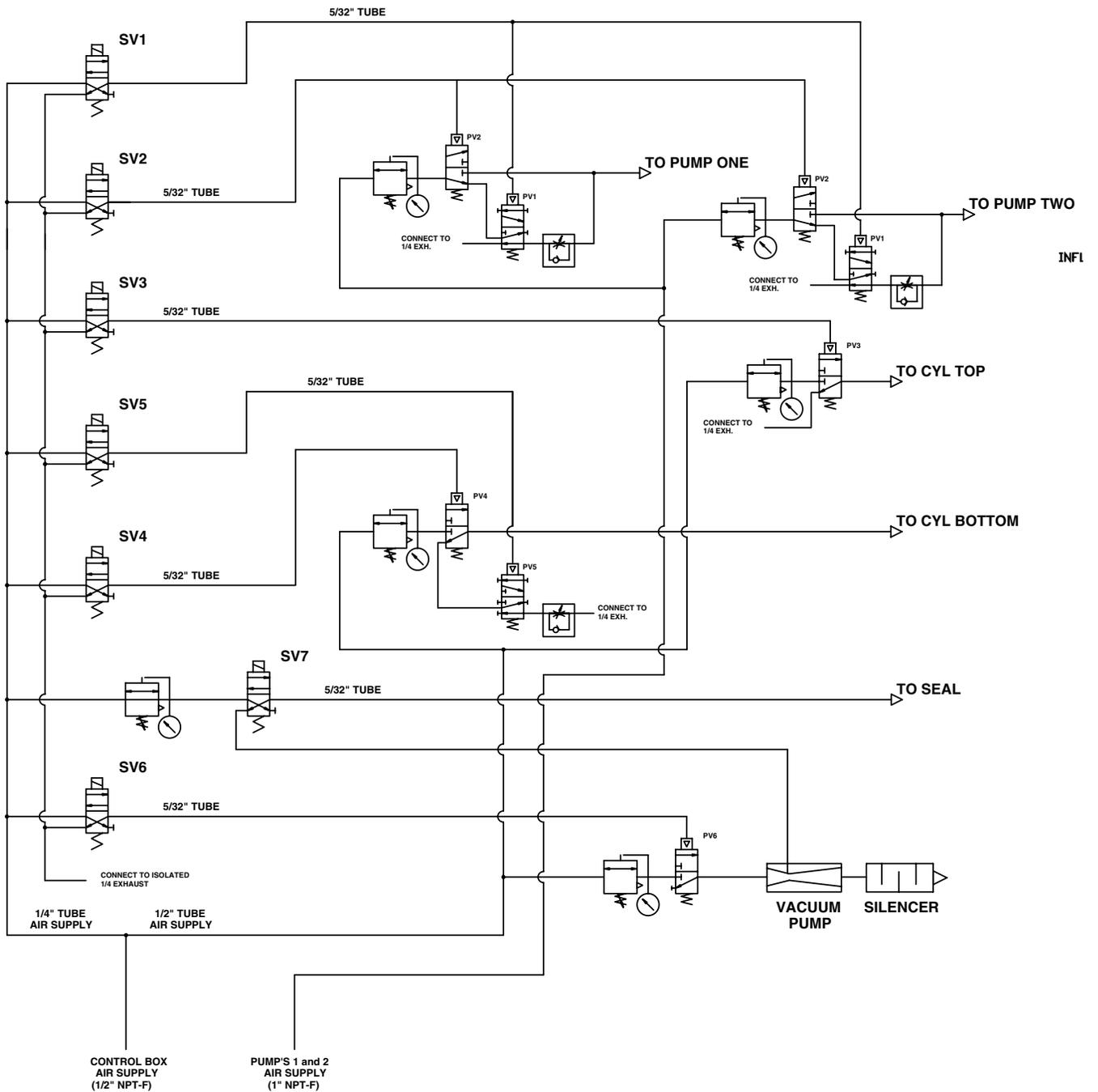


Pneumatic Diagram

Part No. 570193



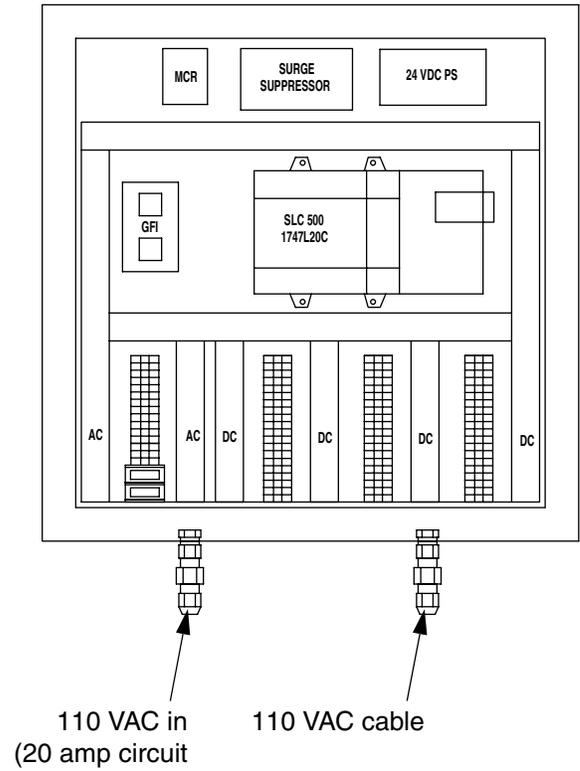
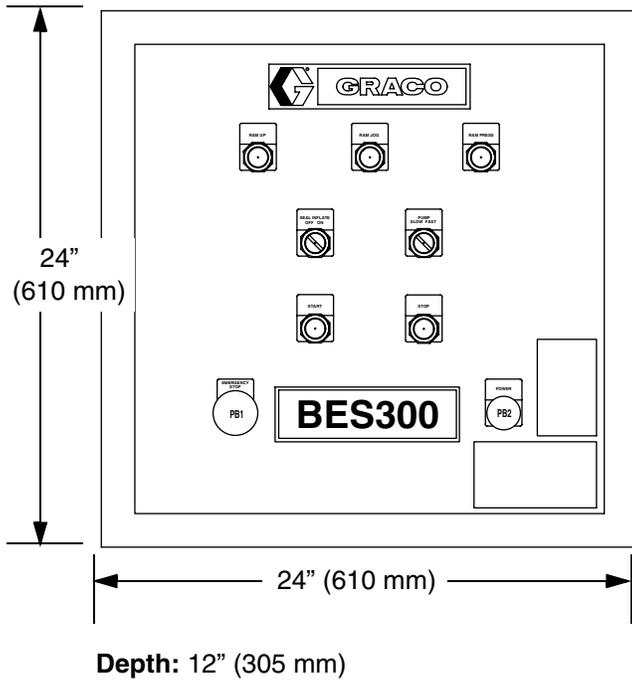
Part No. 949949



94994902

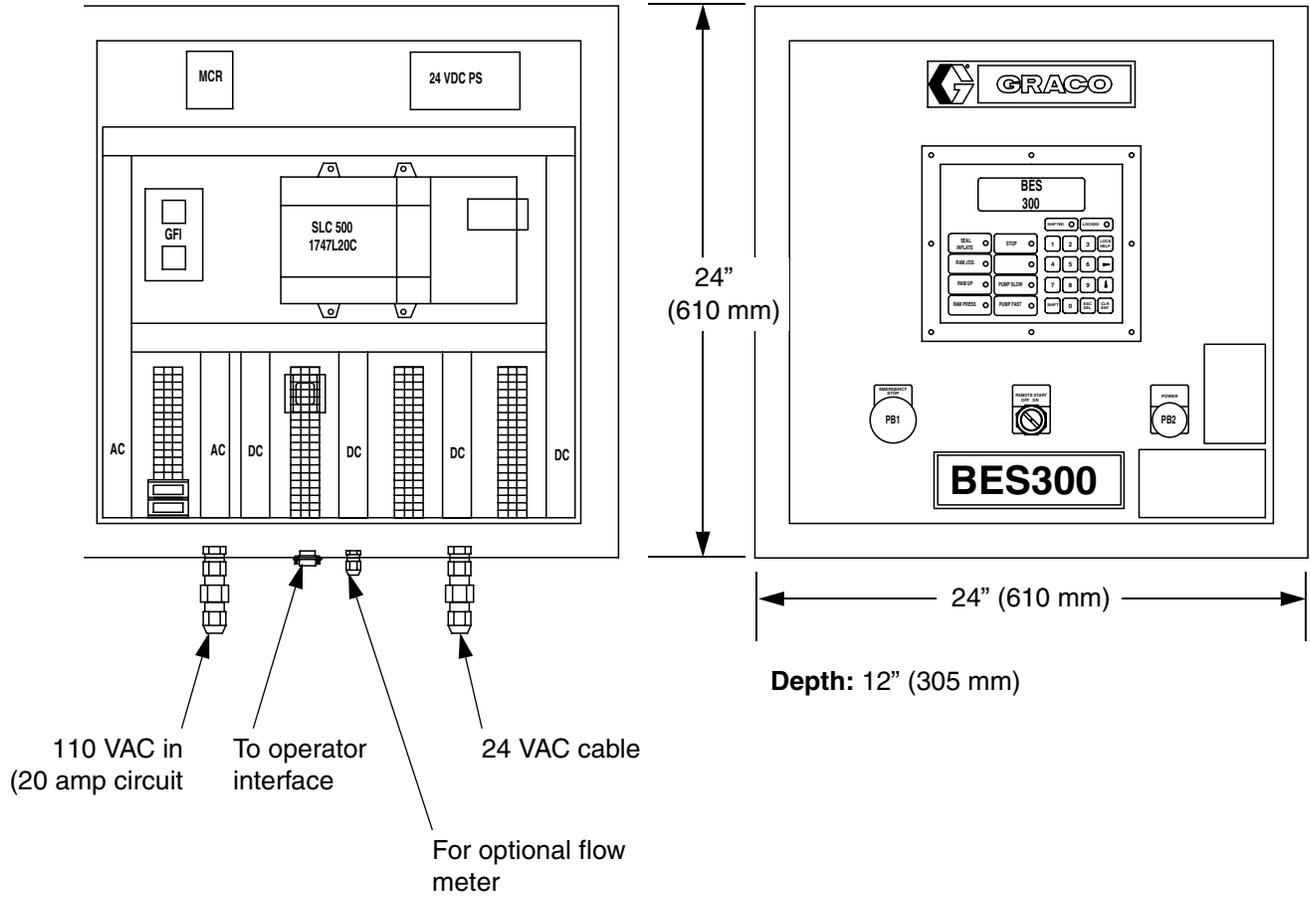
Dimensions

Part No. 949948



94994803

Part No. 965705



96570501

Technical Data

BES 300 Part No.	234375	687110	687257	988327
Maximum Working Fluid Pressure	2400 psi (16.8 MPa, 168 bar)	1000 psi (7 MPa, 70 bar)	430 psi (3 MPa, 30 bar)	1000 psi (7 MPa, 70 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)	80-100 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)	100 psi (0.7 MPa, 7 bar)	100 psi (0.7 MPa, 7 bar)
Air inlet - air controls	3/4 npsm(f)	3/4 npsm(f)	3/4 npt(f)	3/4 npsm(f)
Air inlet - pump	1" npt(f)	1" npt(f)	1" npt(f)	1" npt(f)
Fluid displacement	.125 gal./cycle	.14 gal./cycle (ea. pump)	.46 gal./cycle	.14 gal./cycle (ea. pump)
Flow rate	6.25 GPM @ 50 CPM	8 GPM @ 60 CPM	4-6 GPM @ 60 CPM	17.2 GPM @ 60 CPM
Pressure ratio	24:1	10:1	4.3:1	10:1
Air consumption	25.6 SCFM/gal @ 100 psi (.7 MPa, 7 bar)	13 SCFM/gal. @ 100 psi (0.7 MPa, 7 bar)	1.52 SCFM/CPM @ 70 psi (483 kPa, 4.8 bar)	13 SCFM/gal. @ 100 psi (0.7 MPa, 7 bar)
Pump Outlet	1.5" npt(m)	2" tri-clamp	2" tri-clamp	2" tri-clamp



See your component manuals for a list of wetted parts and other technical data.

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



A series of horizontal lines spanning the width of the page, providing a template for writing notes.

Graco Standard Warranty

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

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

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

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

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

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

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

FOR GRACO CANADA CUSTOMERS

The Parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés, à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

Graco Information

TO PLACE AN ORDER, contact your Graco distributor or call to identify the nearest distributor.

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

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

Graco Headquarters: Minneapolis
International Offices: Belgium, Korea, China, Japan

GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440-1441

www.graco.com

Printed in USA 309526D

03/2003 Rev. 11/2004