Repair - Parts

VRM™

313874E

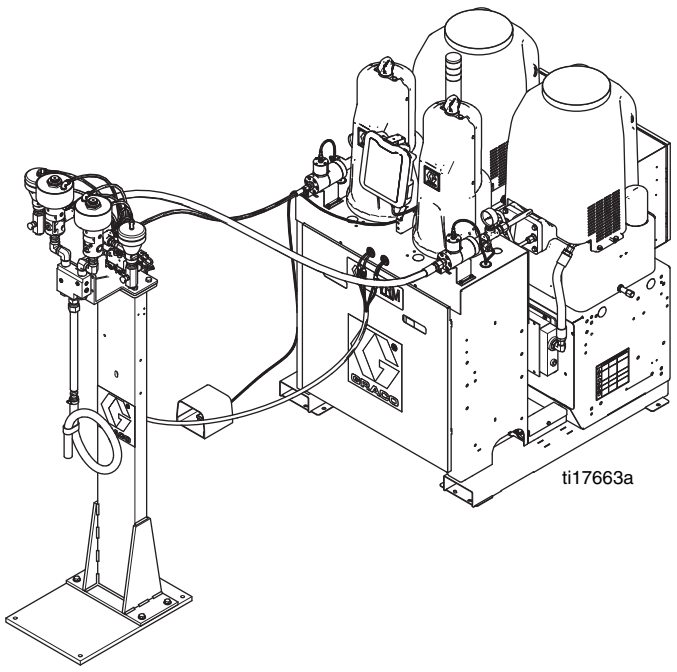
EN

Hydraulic, Plural-component, Variable-Ratio Proportioner. For pouring and dispensing sealants and adhesives. For professional use only.

Not approved for use in European explosive atmosphere locations.

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

See page 4 for model information, including maximum working pressure and approvals.



PROVEN QUALITY. LEADING TECHNOLOGY.

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Related Manuals

Manuals are available at www.graco.com.

Component manuals in U.S. English:

System Manuals	
313873	VRM Setup - Operation
Power Distribution Box Manual	
3A0239	Power Distribution Boxes Instructions-Parts
Pumpline Manuals	
3A0022	U-Cup Dura-Flo™ Lowers
3A0021	Vertical Hydraulic Driver Repair-Parts
Feed System Manuals	
3A1159	VRM Feed Systems
Valve Manuals	
310550	1/2 in. NPT Fluid Port Ball Seat Applicator
310551	3/4 in. NPT Fluid Port Ball Seat Applicator
3A1792	DV Series Dispense Valves

Models

System	CE approved	Full Load Peak Amps Per Phase*	Voltage (phase)	System Watts†	Max Flow Rate◆** lb/min (kg/min)	Approximate Output per Cycle (A+B)** gal. (liter)	Hydraulic Pressure Ratio**	Maximum Fluid Working Pressure ‡ psi (MPa, bar)
24F872		60 A	230 (3)	24,000	66 (30)	1.0 (3.8)	1.63	2000 (14, 138)
24F391		55 A	400 (3)					
24F873	✔	55 A	400 (3)					

* *Full load amps with all devices operating at maximum capabilities. Fuse requirements at various flow rates and mix chamber sizes may be less.*

** *Values are dependent on installed pump size. Values shown are for largest available pump size.*

◆ *Flow rate is independent of frequency 50/60 Hz.*

‡ *If a motor control module is replaced, see* ***Adjust Motor Control Module Selector Switch*** *on page 16 to set the machine to the proper maximum fluid working pressure.*

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 symbol refers to procedure-specific risk. Refer back to these warnings. Additional, product-specific warnings may be found throughout the body of this manual where applicable.

⚠ WARNING

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.

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 MSDSs 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.
- Always wear chemically impermeable gloves when spraying, dispensing, or cleaning equipment.

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:

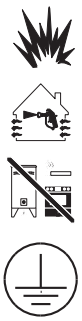
- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

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.

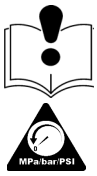
⚠ WARNING



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.



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.

⚠ WARNING

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.

BURN HAZARD

Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

Important Two-Component Material Information

Isocyanate Conditions

Spraying or dispensing materials containing isocyanates creates potentially harmful mists, vapors, and atomized particulates.

Read material manufacturer's warnings and material MSDS to know specific hazards and precautions related to isocyanates.

Prevent inhalation of isocyanate mists, vapors, and atomized particulates by providing sufficient ventilation in the work area. If sufficient ventilation is not available, a supplied-air respirator is required for everyone in the work area.

To prevent contact with isocyanates, appropriate personal protective equipment, including chemically impermeable gloves, boots, aprons, and goggles, is also required for everyone in the work area.

Material Self-ignition

Some materials may become self-igniting if applied too thickly. Read material manufacturer's warnings and material MSDS.

Keep Components A (Red) and B (Blue) Separate

Cross-contamination can result in cured material in fluid lines which could cause serious injury or damage equipment. To prevent cross-contamination of the equipment's wetted parts, **never** interchange component A (Red) and component B (Blue) parts.

Moisture Sensitivity of Isocyanates

Isocyanates (ISO) are catalysts used in two component foam and polyurea coatings. ISO will react with moisture (such as humidity) to form small, hard, abrasive crystals, which become suspended in the fluid. Eventually a film will form on the surface and the ISO will begin to gel, increasing in viscosity. If used, this partially cured ISO will reduce performance and the life of all wetted parts.

NOTE: The amount of film formation and rate of crystallization varies depending on the blend of ISO, the humidity, and the temperature.

To prevent exposing ISO to moisture:

- Always use a sealed container with a desiccant dryer in the vent, or a nitrogen atmosphere. **Never** store ISO in an open container.
- Keep the pump wet cups filled with IsoGuard Select®, part 24F516. The lubricant creates a barrier between the ISO and the atmosphere.
- Use moisture-proof hoses specifically designed for ISO, such as those supplied with your system.
- Never use reclaimed solvents, which may contain moisture. Always keep solvent containers closed when not in use.
- Never use solvent on one side if it has been contaminated from the other side.
- Always lubricate threaded parts with ISO pump oil or grease when reassembling.

Changing Materials

- When changing materials, flush the equipment multiple times to ensure it is thoroughly clean.
- Always clean the fluid inlet strainers after flushing.
- Check with your material manufacturer for chemical compatibility.
- Most materials use ISO on the A (Red) side, but some use ISO on the B (Blue) side. See the following section.

A (Red) and B (Blue) Components

IMPORTANT!

Material suppliers can vary in how they refer to plural component materials.

Be aware that when standing in front of the manifold on proportioner:

- Component A (Red) is on the left side.
- Component B (Blue) is on the right side.

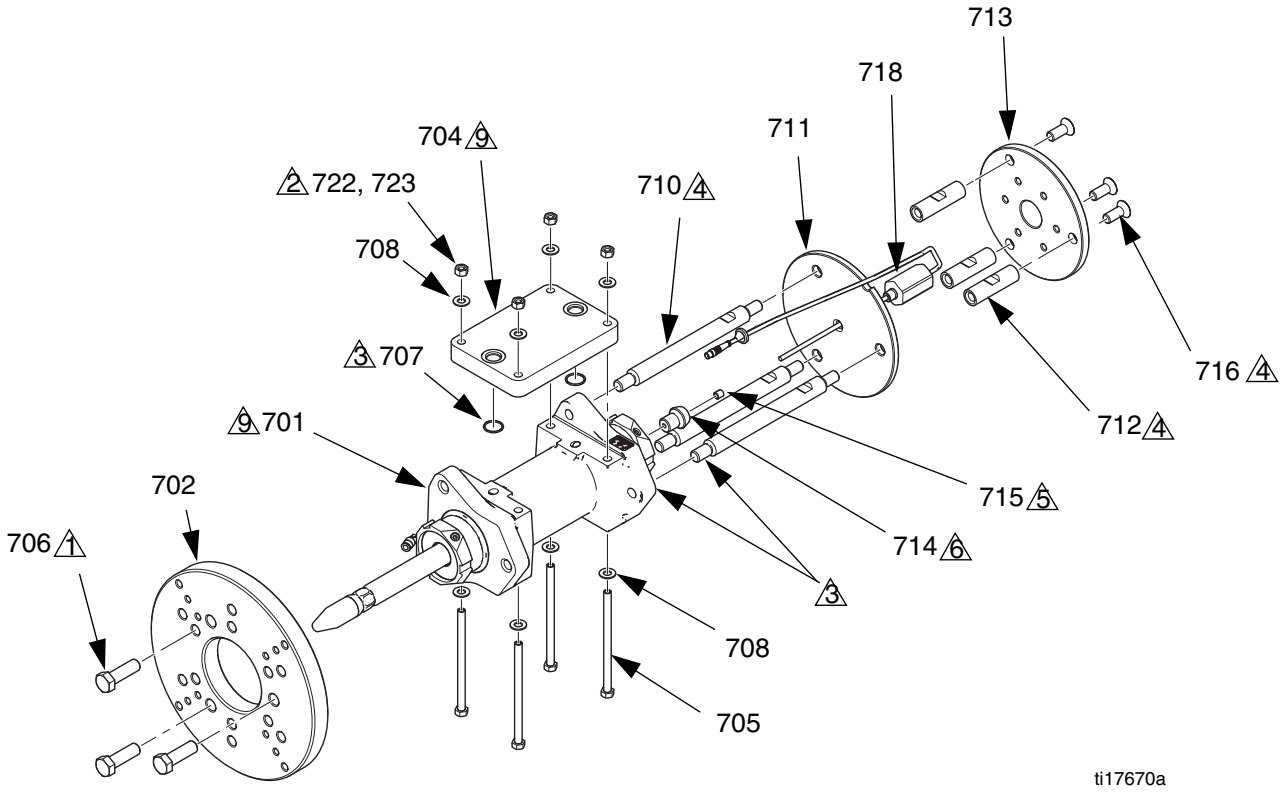
For all machines:

- The A (Red) side is intended for ISO, hardeners, and catalysts.
- The B (Blue) side is intended for polyols, resins, and bases.

NOTE: For machines with material volume ratios other than 1:1, the higher volume side is typically the B (Blue) side.

Repair

Linear Position Sensor Replacement



1 Torque to 100 ft-lb (135 N•m).

2 Torque to 350 in-lb (39.5 N•m).

3 Apply a light coating of lubricant to seals and surfaces specified.

4 Torque to 50-60 ft-lb (68-81 N•m).

5 Apply adhesive to surfaces specified.

6 Torque to 10-12 in-lb (1.1-1.4 N•m).

7 Apply thread sealant to threads.

8 Torque to 30-36 ft-lb (41-49 N•m).

9 Orient ref 701 with date code on casting opposite of 0.25 diameter hole as shown. Ref 704 to be on opposite side of 0.25 diameter hole as shown.

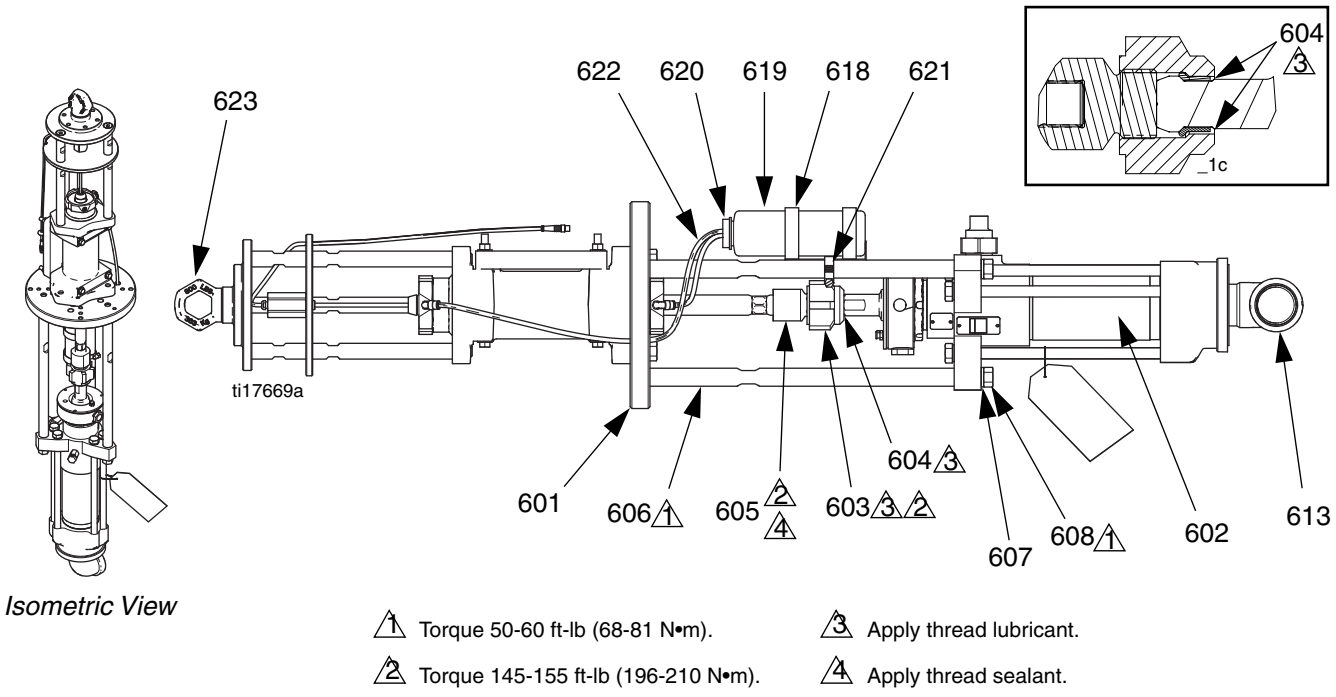
FIG. 1

NOTE: See FIG. 1 for part references.

1. Perform **Shutdown** procedure. See operation manual for procedure.
2. Remove pumpline shield.
3. Insert a large allen wrench through the center of the lift ring (717) then twist to loosen. Remove lift ring.
4. Disconnect linear position sensor cable. Route the cable through the hole in the plate (713) directly above the linear position sensor (718).
5. Use a 1-1/4 in. wrench to loosen the linear position sensor. Remove the linear position sensor.
6. Carefully insert the new linear position sensor through the hole in the plate (713) and into the vertical hydraulic driver. Use a 1-1/4 in. wrench to gently tighten.

Hydraulic Driver Removal

NOTE: This procedure details how to remove the hydraulic driver. Hydraulic driver rebuild information is in the hydraulic driver manual.



Isometric View

FIG. 2

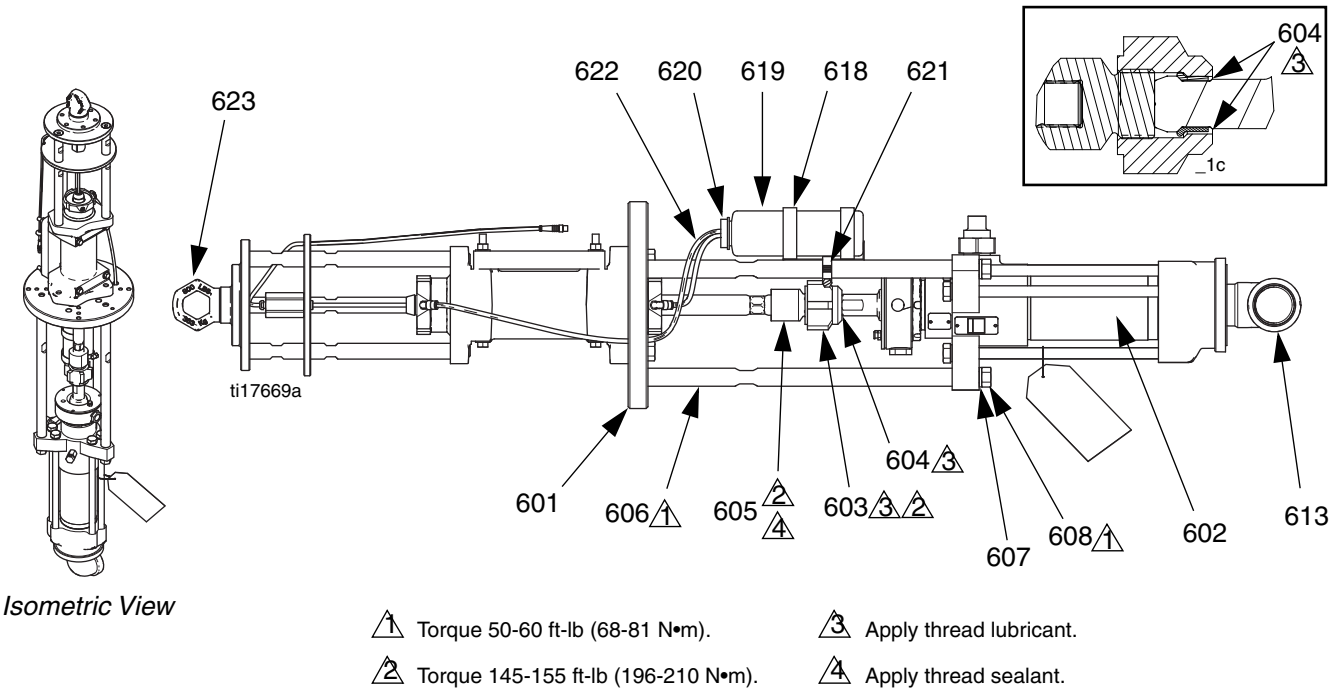
NOTE: See FIG. 1 and FIG. 2 for part references.

1. Perform **Shutdown** and **Pressure Relief Procedure** procedures. See operation manual for procedures.
2. Remove the pump shield.
3. Remove three screws (716). Remove top plate (713).
4. Remove three tie rods (712). Remove plate (711) with linear position sensor (718).
5. Remove three tie rods (710).
6. Loosen the coupling nut (603) to disconnect the actuator and pump rods.
7. Remove the drip fittings connected to the base of the vertical hydraulic actuator.
8. Remove four screws (705) connecting hydraulic driver to vertical actuator housing (704).
9. Remove three screws (706) that connect the bottom plate (702) to the rest of the hydraulic driver.
10. Remove the hydraulic driver (701).
11. See hydraulic driver manual for rebuild information.

NOTE: Install hydraulic driver in reverse order. See notes in the applicable parts illustrations for torque and other specifications.

Dura-Flo Lower Removal

NOTE: This procedure details how to remove the Dura-Flo Lower. Rebuild information is in the Dura-Flo Lower manual.



Isometric View

1 Torque 50-60 ft-lb (68-81 N•m).
2 Torque 145-155 ft-lb (196-210 N•m).
3 Apply thread lubricant.
4 Apply thread sealant.

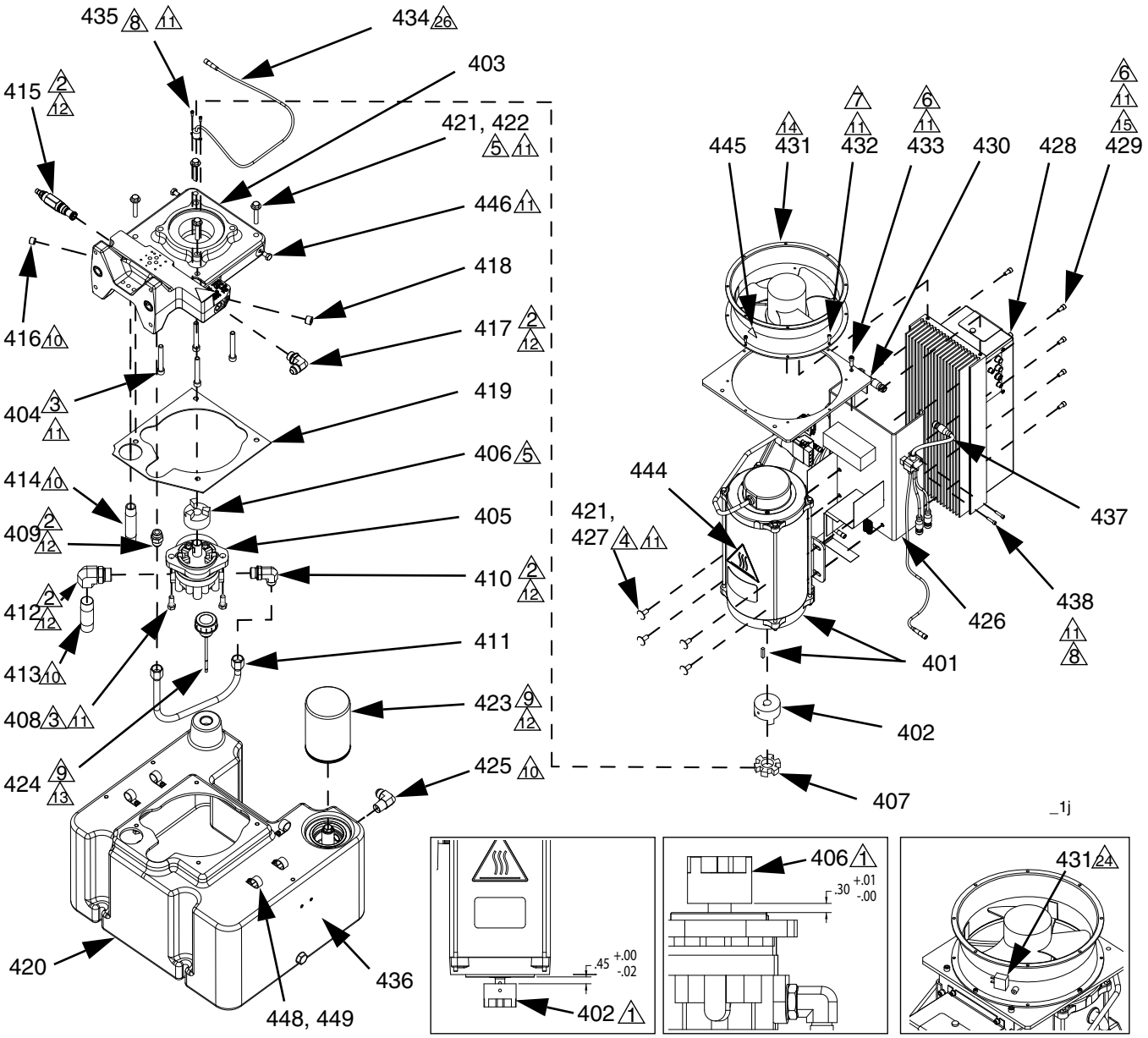
FIG. 3

See FIG. 3 for part references.

1. Perform **Shutdown** and **Pressure Relief Procedure** procedures. See operation manual for procedures.
2. Loosen the coupling nut (603) to disconnect the hydraulic vertical actuator and pump rods.
3. Use a large adjustable wrench to remove the large inlet feed fittings at the base of the Dura-Flo Lowers.
4. Remove three screws (608).
5. Remove Dura-Flo Lower.
6. See Dura-Flo Lower manual for rebuild information.

NOTE: Install Dura-Flow Lower in reverse order. See notes in the applicable parts illustrations for torque and other specifications.

Hydraulic Power Pack Repair



1 Assemble coupler to specified dimensions prior to mounting assembly to housing.

2 Torque to 40 ft-lb (54 N•m).

3 Torque to 35 ft-lb (47 N•m).

4 Torque to 20 ft-lb (27 N•m).

5 Torque to 15 ft-lb (20 N•m).

6 Torque to 10 ft-lb (14 N•m).

7 Torque to 58 in-lb (6.5 N•m).

8 Torque to 34 in-lb (3.8 N•m).

9 Torque 1/4 turn past hand-tight.

10 Apply PTFE tape on installation end only.

11 Apply sealant to threads.

12 Apply light coating of lubricant to seals.

13 Fill reservoir with hydraulic fluid.

14 Orient with airflow arrow pointing toward mounting bracket.

15 Prior to installing Ref. 428 into Ref. 426, install Ref. 429 into Ref. 428 and adjust head 1/8 in. from surface.

24 Align fan plug as shown.

26 Apply thermal lubricant to contact side.

FIG. 4: Hydraulic DC Power Pack

Remove Hydraulic Power Pack Shroud

1. Remove four screws from base of shroud.
2. Lift shroud off of Hydraulic Power Pack.

Install Hydraulic Power Pack Shroud

NOTICE

Do not over-torque any item that threads into the hydraulic tank. This will strip the threads and require tank replacement.

1. Place shroud on top of Hydraulic Power Pack.
2. Install four screws securing shroud to hydraulic tank.

Replace Hydraulic Filter

Filter is located at right rear of hydraulic power pack. See FIG. 4 on page 14.

NOTICE

If any debris falls into the hydraulic tank, the debris must be removed or machine damage will result.

1. Perform **Shutdown** procedure. See operation manual for procedure.
2. Use compressed air to remove any loose debris around the hydraulic filter.
3. Remove new filter from wrapping.
4. Apply a light coat of hydraulic fluid to the o-ring on the face of the hydraulic filter.
5. Being careful not to allow any debris into the hydraulic tank remove old filter from tank then quickly install new filter.

Replace Fan

See FIG. 4 on page 14.

1. Perform **Shutdown** procedure. See operation manual for procedure.
2. **Remove Hydraulic Power Pack Shroud**, see procedure on this page.
3. Remove four screws (432) connecting fan to mounting plate.
4. Remove fan and install new fan.
5. Install four screws (432) connecting fan to Motor and Motor Control Module.
6. **Install Hydraulic Power Pack Shroud**, see procedure on this page.

Remove Motor Control Module

See FIG. 4 on page 14.

1. Perform **Shutdown** procedure. See operation manual for procedure.
2. **Remove Hydraulic Power Pack Shroud**, see procedure on this page.
3. Remove four screws (432) connecting fan to Motor and Motor Control Module. Remove fan and mounting plate.
4. Note the location of each Motor Control Module cable then remove all electrical cables on the left and right sides of the Motor Control Module.
5. Remove six screws (429) securing Motor Control Module in place.
6. Slowly and carefully slide the Motor Control Module up until the cable on the bottom of the Motor Control Module can be accessed and removed. Disconnect the cable.
7. Slide the Motor Control Module up and remove.

Adjust Motor Control Module Selector Switch

NOTICE

If the Motor Control Module is replaced, the selector switch must be set prior to initial startup of the Motor Control Module or damage may occur.

The Motor Control Module uses an 8-position selector switch (S) to set system maximum working pressure. See FIG. 5.

The system must be configured to have a maximum working pressure of 2000 psi (13.8 MPa, 138 bar). Set the selector switch according to the following table.

MCM	Switch Position
B (Blue)	1
A (Red)	2

The selector switch position will be properly set at the factory for new systems. When a motor control module is replaced, the selector switch must be set to the correct setting by the user prior to initial startup.

- Do not install components rated to less than the maximum working pressure. Doing so may lead to overpressurization and ruptured components.
- High-pressure fluid from 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.**

To set the Motor Control Module selector switch:

1. Turn machine power off.
2. Remove the access cover (D). See FIG. 5.
3. Set the selector switch (S).
4. Install access cover (D).

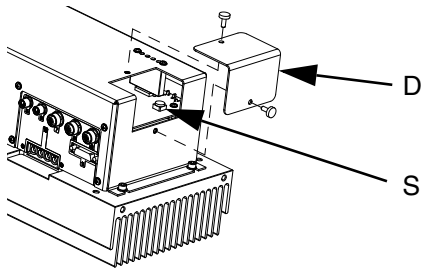


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FIG. 5

Install Motor Control Module

This procedure starts assuming that the old Motor Control Module is removed from the machine. See **Remove Motor Control Module** procedure, see page 15.

See FIG. 4 on page 14.

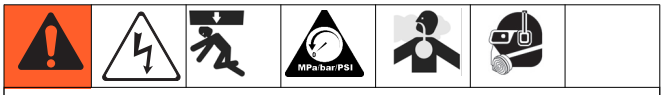
1. Perform **Adjust Motor Control Module Selector Switch** procedure on page 16.

NOTICE

Motor Control Module selector switch position must be set prior to startup of Motor Control Module or damage may occur.

2. Slide the Motor Control Module into the slot.
3. Attach the cable on the bottom of the Motor Control Module.
4. Install the six screws (429) securing Motor Control Module in place.
5. Install electrical cables on left and right sides of the Motor Control Module.
6. Install four screws (432) connecting fan to Motor and Motor Control Module. Install fan and mounting plate.
7. **Install Hydraulic Power Pack Shroud**, see procedure on page 15.

Remove Hydraulic Power Pack



The hydraulic power pack weighs up to 300 lb. To avoid serious injury due the hydraulic power pack falling, secure the hydraulic lift when raising the hydraulic power pack.

NOTICE

If any debris falls into the hydraulic tank, the debris must be removed or machine damage will result.

This procedure removes the hydraulic power pack from the machine as a single unit to enable further disassembly. User must purchase three 5/16-18 eye-bolts capable of holding 300 lb to perform this procedure.

See FIG. 4 on page 14.

1. Perform **Shutdown** procedure. See operation manual for procedure.
2. Perform **Remove Hydraulic Power Pack Shroud**, see procedure on page 15.
3. Perform **Remove Motor Control Module** procedure, see page 15.
4. Remove four screws (705) to disconnect hydraulic vertical actuator from hydraulic power pack. See FIG. 1 on page 10.
5. Disconnect heat exchanger inlet hose and fitting from elbow fitting (417). Disconnect heat exchanger outlet hose and fitting from elbow fitting (425).
6. Remove the two bolts (446) from the fluid housing (403) and replace each with a strong 5/16-18 thread eye-bolt. Install a third strong 5/16-18 eye-bolt as indicated. See FIG. 6. See FIG. 4 on page 14 for full hydraulic power pack view.

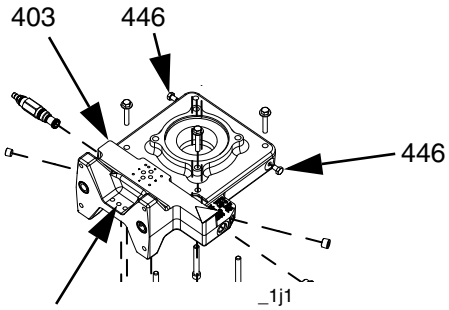


FIG. 6

7. Run a rope through the three eye-bolts and between the motor and the Motor Control Module. Secure to a hydraulic lift.
8. Remove the four bolts (304) and washers (303) securing the tank to the electrical enclosure. See **Power Pack Module** on page 27.
9. Lift the hydraulic power pack and place on a sturdy location capable of supporting up to 300 lb (136 kg).

Install Hydraulic Power Pack

NOTICE

If any debris falls into the hydraulic tank, the debris must be removed or machine damage will result.

NOTICE

Do not over-torque any item that threads into the hydraulic tank. This will strip the threads and require tank replacement.

This procedure assumes the Hydraulic Power Pack has been removed from the machine and is assembled except for the Motor Control Module.

See FIG. 4 on page 14.

1. Run a rope through the three eye-bolts and between the Motor and the Motor Control Module. Secure to a hydraulic lift.
2. Lift the Hydraulic Power Pack and place onto the electronic enclosure.
3. Align the holes with the tank then install finger-tight the four bolts (304) and washers (303) securing the tank to the electrical enclosure. Torque to 10 ft-lb (14 N•m).
4. Remove rope and lift.
5. Remove eye-bolts. Install original bolts (446) into fluid housing (403). See FIG. 6.
6. Perform **Install Motor Control Module** procedure, see page 16.
7. Connect heat exchanger inlet hose and fitting to elbow fitting (417). Connect heat exchanger outlet hose and fitting to elbow fitting located on rear right face of tank. See **Power Pack Module** on page 27.
8. Install four screws (705) to connect hydraulic vertical actuator to hydraulic power pack. See FIG. 1 on page 10.

Replace Tank Gasket, Tank

See FIG. 4 on page 14.

1. Perform **Remove Hydraulic Power Pack** procedure, see page 17.
2. Remove hex head cap screws (422) securing hydraulic housing (403) to tank (420). Carefully remove motor (401) and hydraulic housing assembly from tank.
3. Remove tank gasket. If tank is damaged, replace tank.

NOTICE

Do not over-torque any item that threads into the hydraulic tank. This will strip the threads and require tank replacement.

4. Install thrust washers (421) onto hex head cap screws (422). Apply pipe sealant to threads of screws. Align tank gasket (419), hydraulic housing, and tank (420) then install screws. Torque to 15 ft-lb (20 N•m).
5. Perform **Install Hydraulic Power Pack** procedure, see page 18.

Remove Motor

See FIG. 4 on page 14.

1. Perform **Remove Hydraulic Power Pack** procedure, see page 17.
2. Remove four hex head cap screws (422) securing hydraulic housing (403) and motor (401) to tank (420). Carefully remove motor and hydraulic housing assembly from tank.
3. Remove four hex head cap screws (427) connecting mounting bracket (426) to motor.

4. Remove four socket head cap screws (404) securing motor to hydraulic housing. Carefully remove motor from hydraulic housing.

5. Loosen set screw for motor coupler (402) then remove motor coupler.

Install Motor

See FIG. 4 on page 14.

1. Use four hex head cap screws (427) and thrust washers (421) to install Motor Control Module mounting bracket (426) onto motor (401).

2. Install motor coupler (402) onto motor (401). Coupler must be 0.65-0.67 in. from the face of the motor. Torque motor coupler set screw to 15 ft-lb (20 N•m).

3. Install spider coupler (407) into motor coupler.

4. Use four socket head cap screws (404) to attach hydraulic housing (403) to motor. Be sure to align teeth of gear coupler with the teeth of the motor coupler. Apply pipe sealant to threads of screws. Torque to 35 ft lb (47 N•m).

NOTICE

Do not over-torque any item that threads into the hydraulic tank. This will strip the threads and require tank replacement.

5. Install thrust washers (421) onto hex head cap screws (422). Apply pipe sealant to threads of screws. Align tank gasket (419), hydraulic housing, and tank (420) then install screws. Torque to 15 ft-lb (20 N•m).

6. Perform **Install Hydraulic Power Pack** procedure, see page 18.

Remove Hydraulic Gear Pump

See FIG. 4 on page 14.

1. Perform **Remove Hydraulic Power Pack** procedure, see page 17.

2. Remove hex head cap screws (422) securing hydraulic housing (403) to tank. Carefully remove motor (401) and hydraulic housing assembly.

3. Remove tube (411).

4. Remove elbow fittings (410, 412) from gear pump (405).

5. Remove two hex head cap screws (408) securing gear pump to hydraulic housing.

6. Remove spider coupler (407).

7. Loosen set screw for gear coupler (406) then remove gear coupler from gear pump.

Install Hydraulic Gear Pump

See FIG. 4 on page 14.

1. Install gear coupler (406) onto gear pump (405). Coupler must be 0.12 to 0.13 in. from the face of the gear pump. Torque gear coupler set screw to 15 ft-lb (20 N•m).

2. Install spider coupler (407) into gear coupler.

3. Use two hex head cap screws (408) to attach gear pump to hydraulic housing. Be sure to align teeth of gear coupler with the teeth of the motor coupler. Torque screws to 35 ft-lb (47 N•m).

4. Apply a light coat of lubricant to seals of elbow fittings (410, 412). Install elbow fittings into gear pump. See FIG. 4 on page 14. for fitting alignment. Torque both fittings to 40 ft-lb (54 N•m).

5. Apply a light coating of lubricant to seals of tube (411). Install tube (411) onto elbow fitting (410) and straight fitting (409). Hand-tighten then use wrench to tighten 90 degrees further.

NOTICE

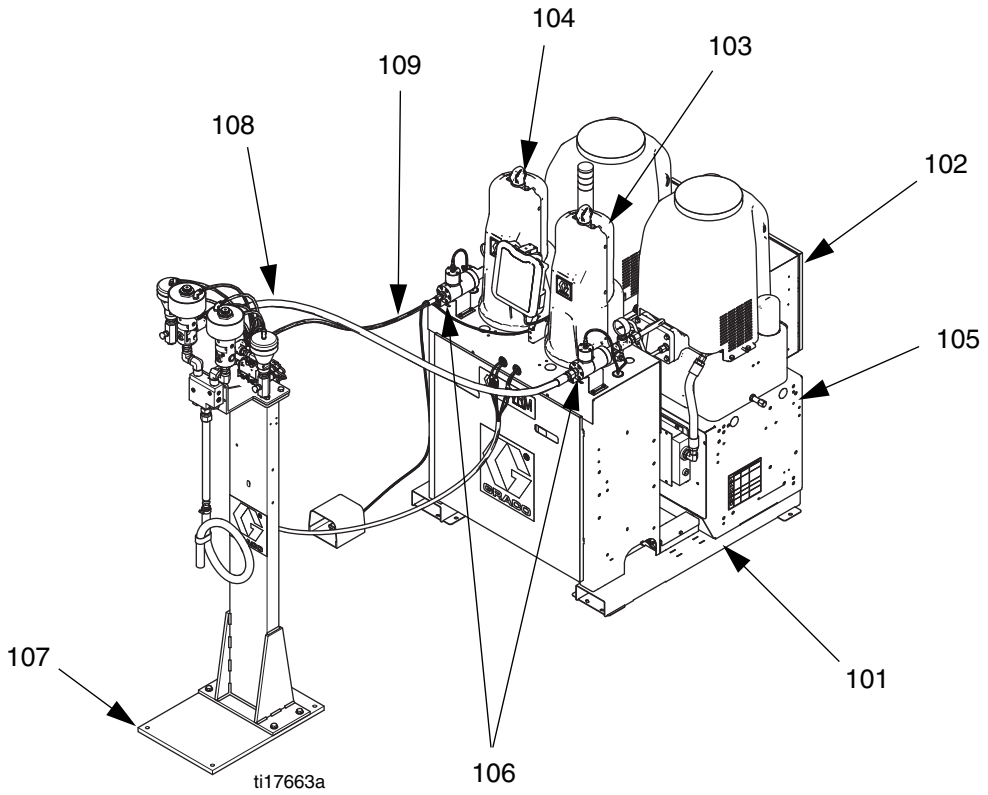
Do not over-torque any item that threads into the hydraulic tank. This will strip the threads and require tank replacement.

6. Install thrust washers (421) onto hex head cap screws (422). Apply pipe sealant to threads of screws. Align tank gasket (419), hydraulic housing, and tank (420) then install screws. Torque to 15 ft-lb (20 N•m).

7. Perform **Install Hydraulic Power Pack** procedure, see page 18.

Parts

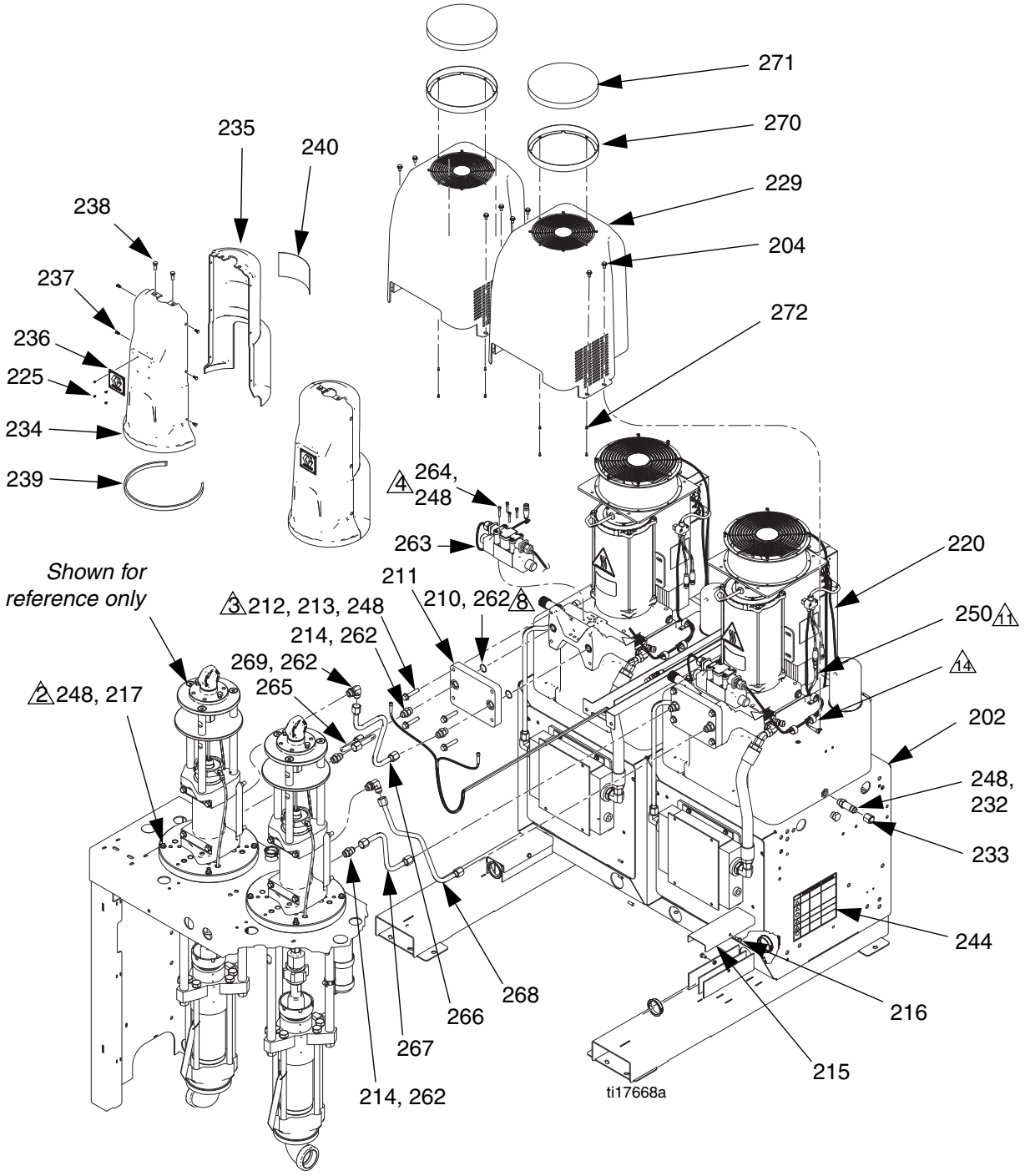
Systems, 24F391, 24F872, 24F873



Ref	Part	Description	Quantity		
			24F872, SYSTEM, 230v	24F391, SYSTEM, 400v	24F873, SYSTEM, 400v CE
101	24C168	BASE, var ratio, bare	1	1	1
102	---	MODULE, power distribution box, 400v, 3-phase, base, non-CE		1	
	---	MODULE, power distribution box, 230v, 3-phase	1		
	---	MODULE, power distribution box, 400v, 3-phase			1
103	---	PUMP, vertical driver, 580SS	1	1	1
104	---	PUMP, vertical driver, 430SS	1	1	1
105	---	MODULE, electric, panels	1	1	1
106	---	MODULE, flow meter	1	1	1
107	---	APPLICATOR, mast mount	1	1	1
108	24F726	HOSE, 3/4 ID, 180 in. long, female/male	1	1	1
109	24F951	HOSE, 1/4 ID, 180 in. long, female/male	1	1	1

--- Not for sale.

Machine Base, 24C168



2 Torque to 150 in-lb (16.9 N•m).

3 Torque to 300 in-lb (33.9 N•m).

4 Torque to 62 in-lb (7.0 N•m).

5 Connect ref 252 to port 10 on each motor control module.

7 Apply thread sealant to pipe threads.

8 Apply thin coating of lubricant to seals.

10 Connection point for footswitch, ref 260.

11 Route ref 250 through wireway and connect to B (Blue) high volume MCM port 2B.

14 Route power cable of ref 263 through wire loops and secure with wire ties on heat panel. Route communication cables through wire loops.

FIG. 7: Machine Base, 1 of 2

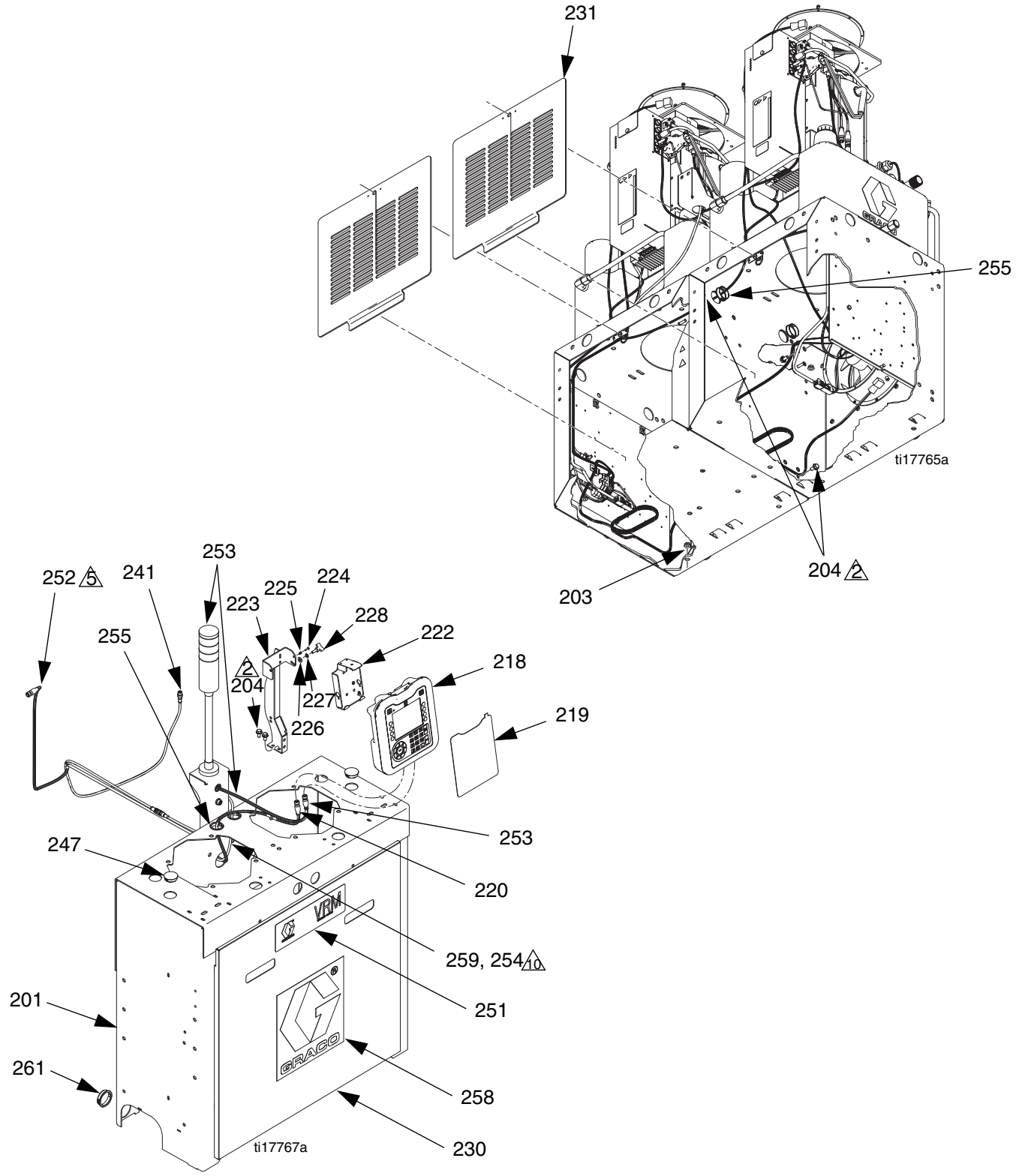


FIG. 8: Machine Base, 2 of 2

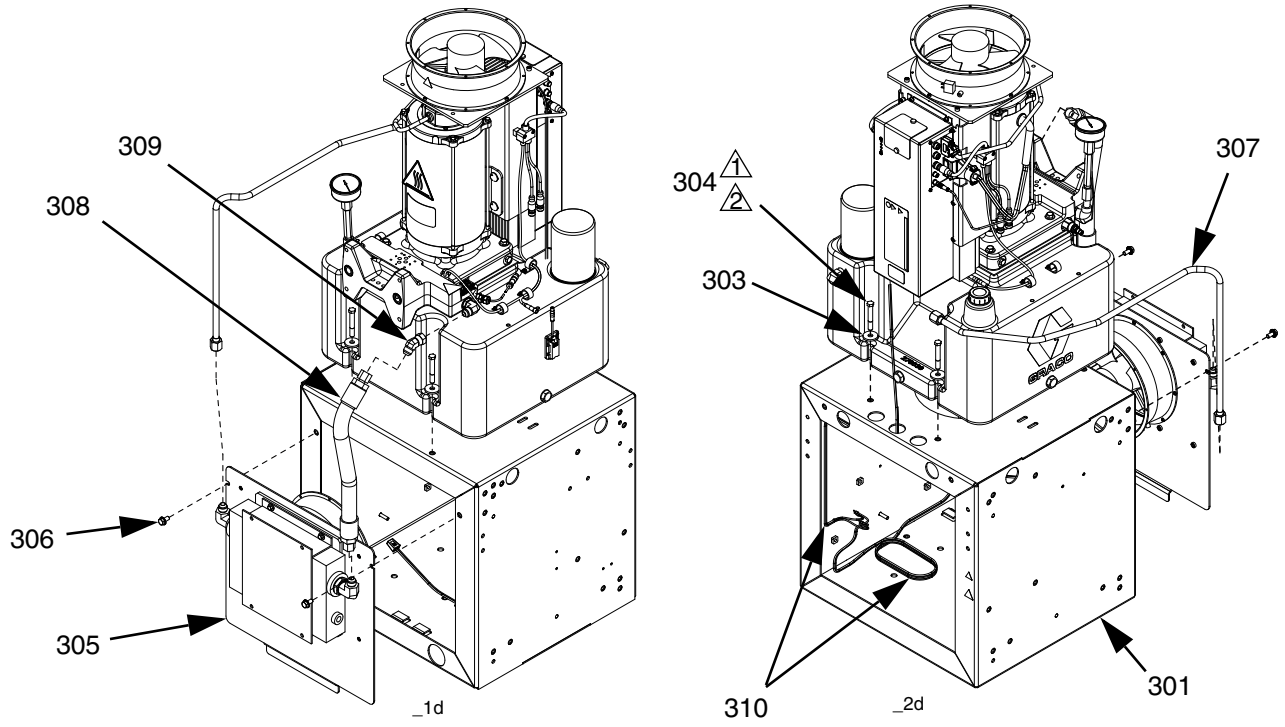
Ref	Part	Description	Qty
201	---	FRAME, pump, dual, vertical	1
202	---	MODULE, power pack, enclosure	2
203	110996	NUT, hex, flange head	4
204	111800	SCREW, cap, hex head	14
210	103413	PACKING, o-ring	4
211	---	PLATE, hydraulic adapter	2
212	111803	SCREW, cap, hex head	8
213	100731	WASHER	8
214	121309	FITTING, adapter, SAE-ORB x JIC	6
215	---	COVER, wireway	2
216	100333	SCREW, cap, hex head	4
217	110837	SCREW, flange, hex	8
218	24E451	MODULE, GCA, ADM	1
219	15V551	SHIELD, membrane, ADM	0.1
220	121003	CABLE, can, female / female 3.0 m	1
222	255235	BRACKET, mounting, assembly	1
223	24E647	BRACKET, adm mounting	1
224	---	RIVET, aluminum	2
225	120060	CLIP, speed, tubular	10
226	110755	WASHER, plain	1
227	100016	WASHER, lock	1
228	121253	KNOB, display adjustment	1
229	24B855	COVER, assembly	2
230	---	COVER, pump, front	1
231	---	COVER, enclosure, slotted	2
232	122970	FITTING, adapter, JIC(08) x SAE(08)	2
233	123140	FITTING, cap, 1/2 JIC	2
234	---	COVER, front, driver	2
235	---	COVER, back, driver	2
236	---	PLATE, name, valve cover	2
237	123347	CLIP, tree, removable	12
238	123942	FASTENER, screw, cap, hex head	4
239	---	STRIP, polyurethane foam	6
240▲	15F674	LABEL, safety, motor	2
241	24E896	CABLE, M8, 4-pin, male/female, 2 m	2
243	16C779	LABEL, identification, electronics	1
244▲	15M511	LABEL, warning, English, Spanish, French	1
245	---	FLUID, hydraulic	18
246	---	SEALANT, pipe	1
247	---	PLUG, hole, 1.5 in. dia	2
248	---	SEALANT, anaerobic	1
250	124344	CABLE, GCA, M12-5pin, male/female, 1.0 m	1
251	16E779	LABEL, VRM, metering system	1
252	124476	CABLE, M8, 4-pin, male/male, 3 m	1
253	255468	KIT, accessory, light tower	1
254	---	BUSHING, wire protector, 0.875 dia	1
255	---	BUSHING, wire protector, snap-in	4
256	24F516	FLUID, IGS™	1
258	16G195	LABEL	1
259	121581	HARNESS, I/O, M12 x M12	1
261	124128	BUSHING, wire protector, snap-in	4
262	---	LUBRICANT, grease	1
263	123313	VALVE, directional, hydraulic	2
264	123366	SCREW, socket head cap, 10-24 x 1.125	8
265	16H782	TUBE, hydraulic	1
266	16H783	TUBE, hydraulic	1
267	16H785	TUBE, hydraulic	1
268	16H784	TUBE, hydraulic	1
269	121312	FITTING, elbow, SAE x JIC	2
270	16G251	HOUSING, filter	2
271	16G252	FILTER, air	2
272	15U075	SCREW, cap, 8-32 x 0.37	8
273†	---	SOFTWARE	1

--- Not for sale.

† To install or update software, purchase software upgrade token 16G365.

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

Power Pack Module



1 Torque to 10 ft-lb (14 N•m).

2 Apply sealant to threads.

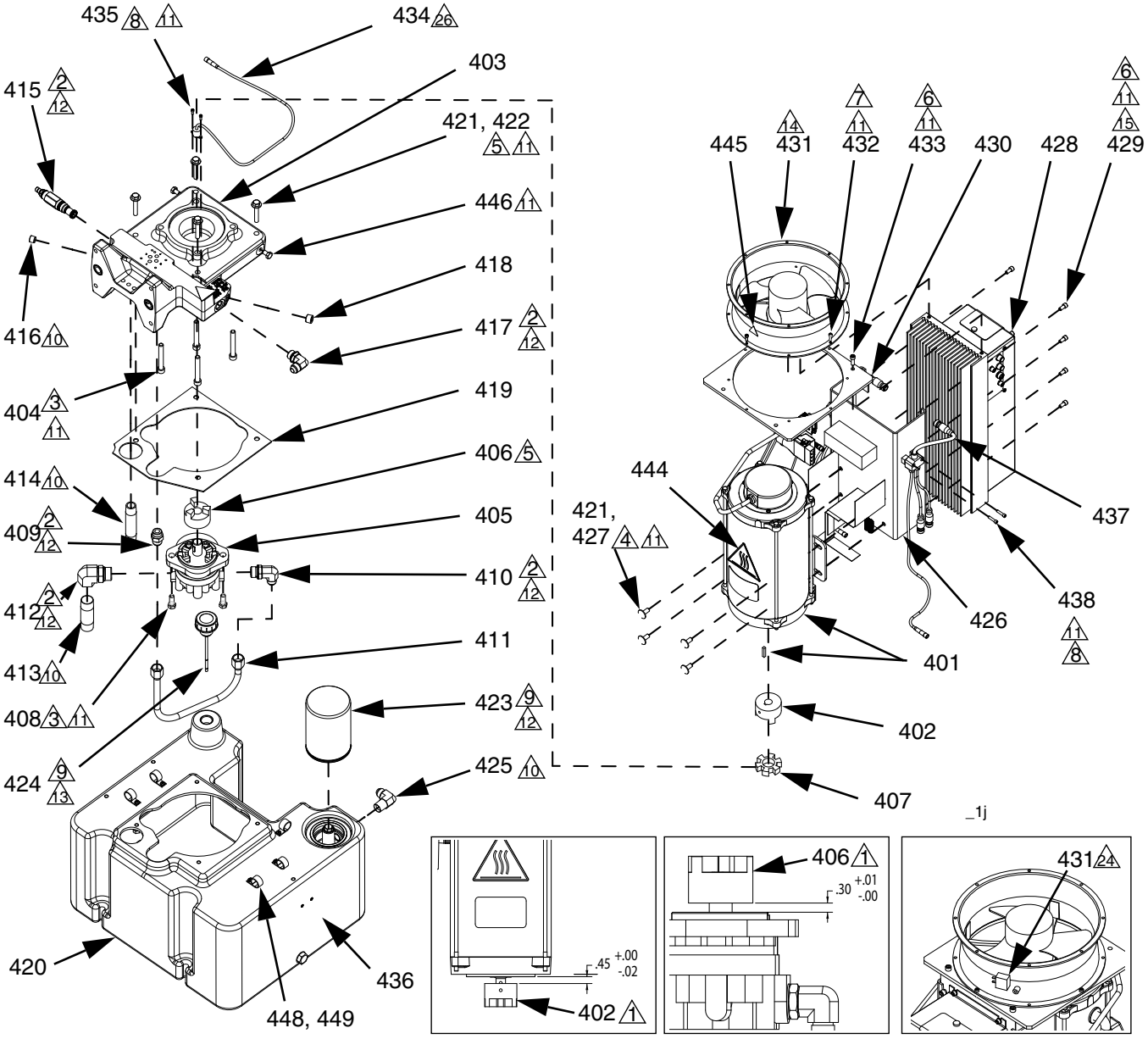
Ref	Part	Description	Qty
301	---	ENCLOSURE, frame	1
302	---	MODULE, hydraulic power	1
303	U90205	WASHER, flat, 3/8, 0.41 x 1.25 x 0.13	4
304	802277	SCREW, machine	4
305	---	COVER, enclosure, heat exchanger	1
306	111800	SCREW, cap, button head	2
307	15Y935	TUBE, heat exchanger, outlet	1
308	24C621	HOSE, heat exchanger, inlet	1
309	123528	FITTING, elbow, swivel, 45, JIC08, female/male	1
310	24C518	CORD, fan, heat exchanger, MCM	2
311	---	SEALANT, anaerobic	1
312▲	189930	LABEL, caution, electric shock (not shown)	1
313▲	15H108	LABEL, pinch point (not shown)	1

--- Not for sale.

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

Power Pack Module Sub-Assemblies

Hydraulic DC Power Pack Module



1. Assemble coupler to specified dimensions prior to mounting assembly to housing.
2. Torque to 40 ft-lb (54 N•m).
3. Torque to 35 ft-lb (47 N•m).
4. Torque to 20 ft-lb (27 N•m).
5. Torque to 15 ft-lb (20 N•m).
6. Torque to 10 ft-lb (14 N•m).
7. Torque to 58 in-lb (6.5 N•m).
8. Torque to 34 in-lb (3.8 N•m).
9. Torque 1/4 turn past hand-tight.
10. Apply PTFE tape on installation end only.
11. Apply sealant to threads.
12. Apply light coating of lubricant to seals.
13. Fill reservoir with hydraulic fluid.
14. Orient with airflow arrow pointing toward mounting bracket.
15. Prior to installing Ref. 428 into Ref. 426, install Ref. 429 into Ref.428 and adjust head 1/8 in. from surface.
24. Align fan plug as shown.
26. Apply thermal lubricant to contact side.

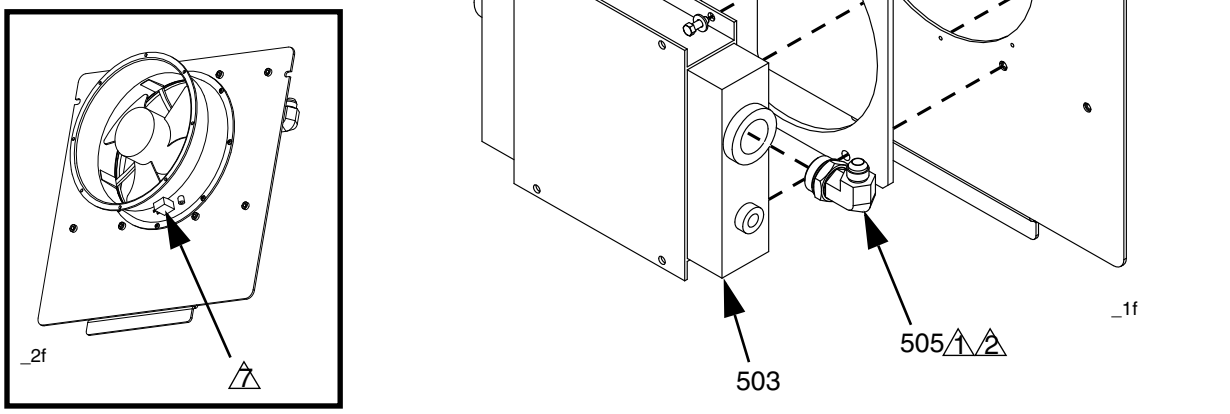
FIG. 9: Hydraulic DC Power Pack

Ref	Part	Description	Qty
401	---	MOTOR, power connector, assembly	1
402	16A951	COUPLER, motor	1
403	---	HOUSING, machined, hydraulic	1
404	123338	SCREW, socket head cap, 3/8-16 x 2.75	4
405	---	PUMP, gear, hydraulic, H39	1
406	16A952	COUPLER, pump	1
407	16A953	COUPLER, spider	1
408	123942	SCREW, cap, hex head	2
409	15T939	FITTING, straight, JIC8 x SAE8	1
410	122520	FITTING, elbow, male, SAE x JIC	1
411	---	TUBE, pump to tube outlet	1
412	122606	FITTING, elbow, male, female	1
413	115597	NIPPLE	1
414	101353	FITTING, nipple, pipe	1
415	122527	VALVE, relief	1
416	100721	PLUG, pipe	1
417	121312	FITTING, elbow, SAE x JIC	1
418	101754	PLUG, pipe	1
419	---	GASKET, housing, to, tank	1
420	---	RESERVOIR, assembly, 8 gallon	1
421	101971	WASHER, thrust	4
422	111302	SCREW, cap, hex head	4
423	15J937	FILTER, oil, 18-23 psi bypass	1
424	116915	CAP, breather filler	1
425	121486	FITTING, elbow, male, 1/2 JIC x 1/2 NPT	1
426	15Y912	BRACKET, MCM mounting	1
427	100057	SCREW, cap hex head	4
428	257396	MODULE, motor control	1
429	101550	SCREW, cap	7
430	---	PLATE, mounting, fan	1
431	122301	FAN, 220V	1
432	112310	SCREW, cap	8
433	100644	SCREW, cap	2
434	123367	HARNESS, M8 x thermal switch, 4-pin	1
435	102410	SCREW, socket head cap	1
436	---	FLUID, hydraulic (gallon)	8
437	123303	HARNESS, M12	2
438	295709	SCREW, socket head	4
439	---	LUBRICANT, grease	1
440	---	SEALANT, pipe	1
441	---	SEALANT, pipe	1
443▲	189285	LABEL, caution	1
444▲	121208	LABEL, hot surface	1
445▲	15H108	LABEL, pinch point	1
446	109468	SCREW, cap, hex head	2
447	---	LUBRICANT, thermal	1
448	123601	CLAMP, wire, harness, nylon, 3/4	5
449	103833	SCREW, mach	5

--- *Not for sale.*

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

Heat Exchanger Assembly

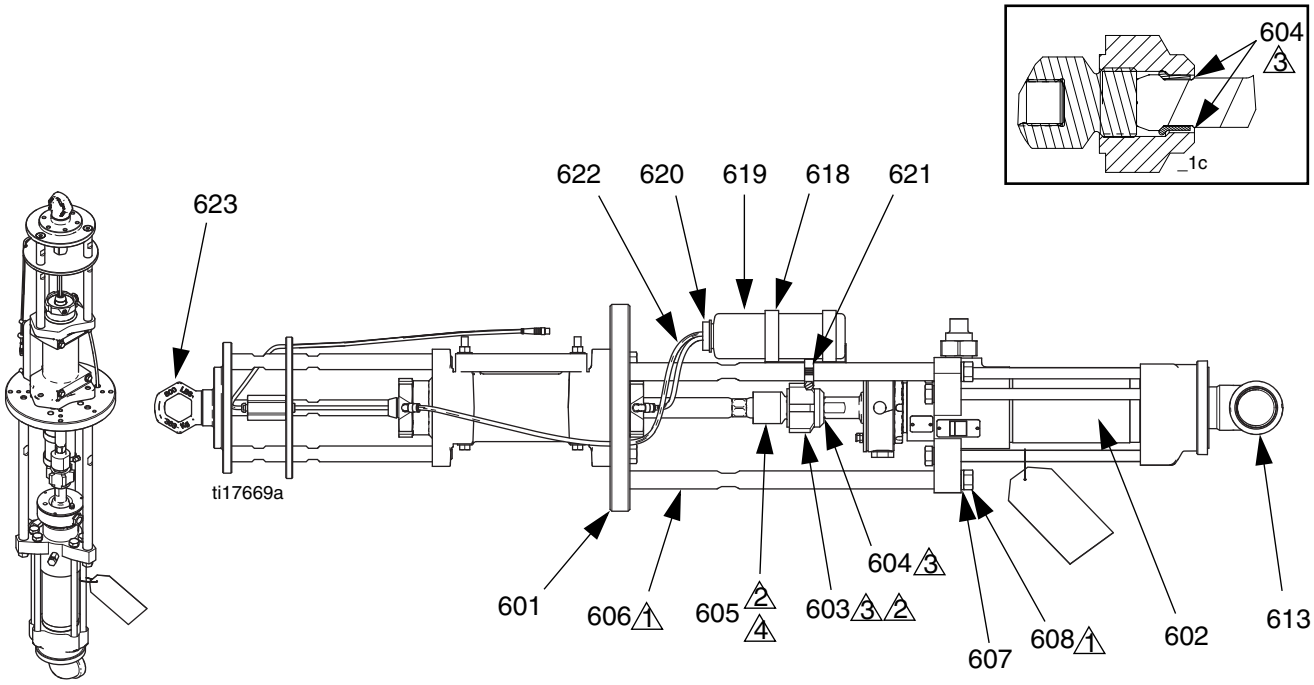


1. Torque to 65 ft-lb (88 N•m).
2. Apply lubricant to o-rings before assembling.
3. Torque to 8 ft-lb (11 N•m).
4. Torque to 2.5 ft-lb (3.4 N•m).
5. Apply sealant to threads.
6. Orient fan with airflow arrow pointing toward cover.
7. Align fan plug as shown.

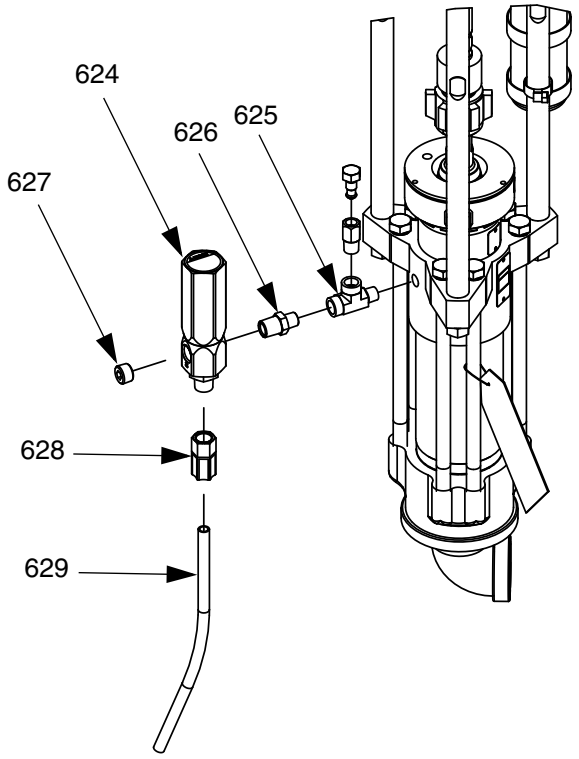
Ref	Part	Description	Qty
501	---	COVER, enclosure, heat exchanger	1
502	---	GASKET, fan, mounting	1
503	122300	EXCHANGER, heat, M-4	1
504	122301	FAN, 220V	1
505	122842	FITTING, elbow, SAE x JIC	2
506	15U075	SCREW, cap, button head, 8-32 x 0.37	8
507	110755	WASHER, plain	4
508	100022	SCREW, cap, hex head	4
510	---	LUBRICANT, thread	1
511	---	SEALANT, anaerobic	1

--- Not for sale.

Vertical Driver Pumps



Isometric View



1 Torque 50-60 ft-lb (68-81 N•m).

2 Torque 145-155 ft-lb (196-210 N•m).

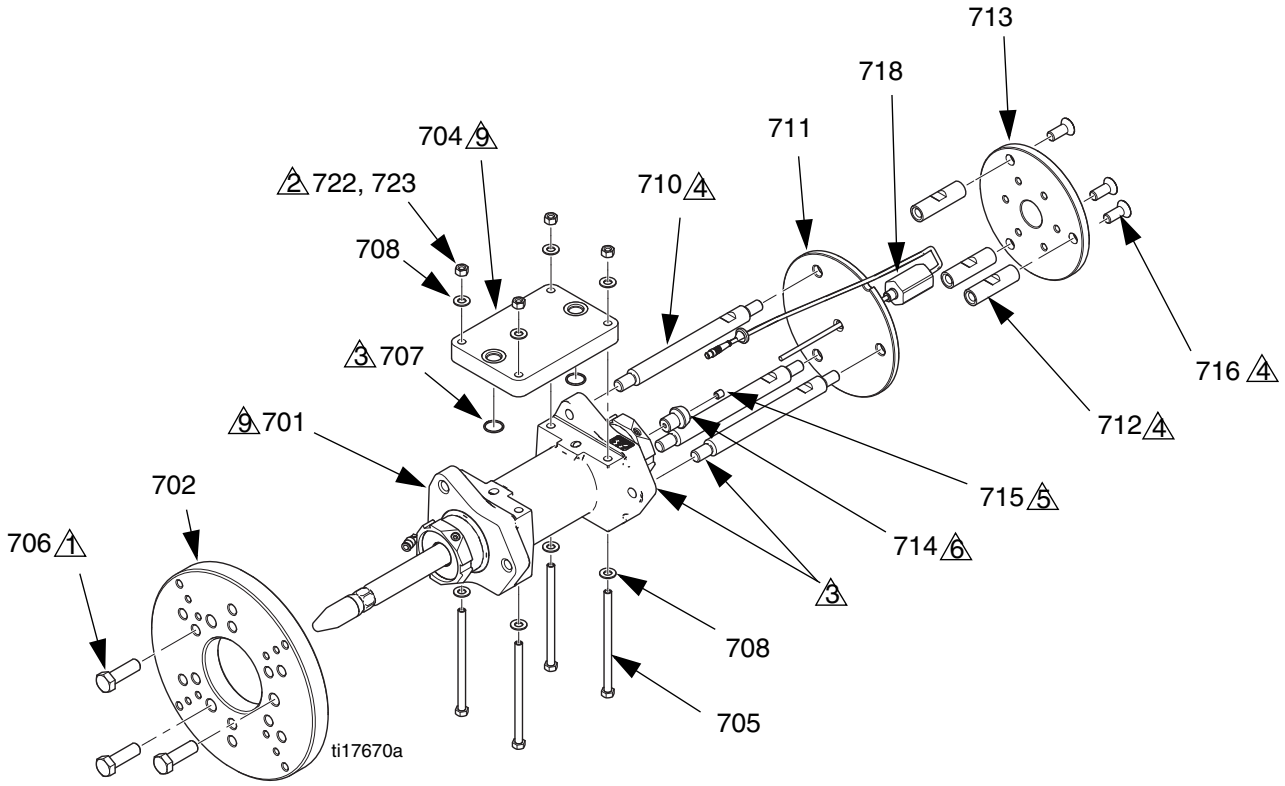
3 Apply thread lubricant.

4 Apply thread sealant.

Ref	Part	Description	Quantity	
			PUMP, vertical driver, 430SS	PUMP, vertical driver, 580SS
601	---	ACTUATOR, vertical, hydraulic	1	1
602	L430S2	LOWER, u-cup, 430cc, enclosed	1	
602	L580S2	LOWER, u-cup, 580cc, enclosed		1
603	184096	NUT, coupling	1	1
604	184130	COLLAR, coupling	2	2
605	15Y798	ADAPTER, female thread	1	1
606	---	ROD, tie	3	3
607	108098	WASHER, lock, spring	3	3
608	106166	NUT, machine, hex	3	3
613	124146	FITTING, elbow, 90, 2 npt, male/female	1	1
614	---	LUBRICANT, thread	1	1
615	---	SEALANT, anaerobic	1	1
616	---	SEALANT, pipe	1	1
617	184278	TOOL, wrench, packing nut	1	1
618	236272	HOLDER, bottle	1	1
619	112279	BOTTLE	1	1
620	189221	CAP	1	1
621	103927	CLAMP, hose	1	1
622	---	TUBE, nylon	45	45
623	15F931	RING, lift	1	1
624	237063	VALVE, relief	1	1
625	108673	TEE, street	1	1
626	123724	FITTING, nipple, hex, 1/2 NPT x 3/8 NPT	1	1
627	103778	PLUG, pipe	1	1
628	113187	CONNECTOR, female, tube	1	1
629	---	TUBE, polyethylene, 1/2” OD	1	1

--- Not for sale.

Hydraulic Vertical Actuator



1 Torque to 100 ft-lb (135 N•m).

2 Torque to 350 in-lb (39.5 N•m).

3 Apply a light coating of lubricant to seals and surfaces specified.

4 Torque to 50-60 ft-lb (68-81 N•m).

5 Apply adhesive to surfaces specified.

6 Torque to 10-12 in-lb (1.1-1.4 N•m).

7 Apply thread sealant to threads.

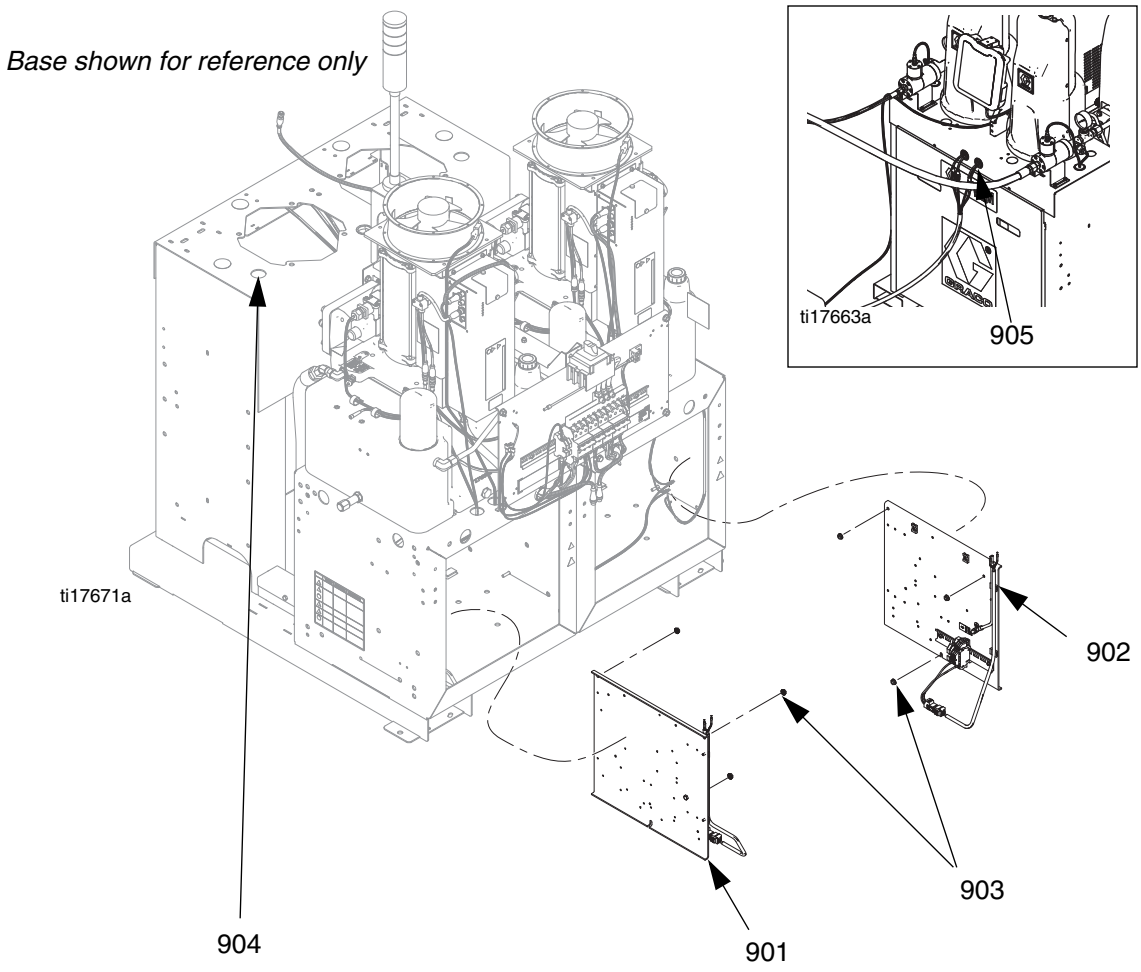
8 Torque to 30-36 ft-lb (41-49 N•m).

9 Orient ref 701 with date code on casting opposite of 0.25 diameter hole as shown. Ref 704 to be on opposite side of 0.25 diameter hole as shown.

Ref	Part	Description	Qty
701	257909	DRIVER, hydraulic, vertical, 4.75 in. stroke	1
702	---	PLATE, base	1
704	16E938	HOUSING, vertical, actuator	1
705	15J889	SCREW, hex	4
706	113820	SCREW, cap, hex head	3
707	103413	PACKING, o-ring	2
708	100731	WASHER	4
710	15Y715	ROD, tie, 10 in. long	3
711	15Y756	PLATE, mounting	1
712	15Y726	ROD, tie, 3 in. long	3
713	15Y745	PLATE, top, 7.25 diameter	1
714	16D023	HOUSING, magnet	1
715	15G747	MAGNET, linear sensor	1
716	122988	SCREW, cap, socket, flat	3
718	258669	SENSOR	1
719	---	LUBRICANT, grease	1
720	---	ADHESIVE, retaining	1
722	100307	NUT, hex	4
723	---	SEALANT, anaerobic	1

--- *Not for sale.*

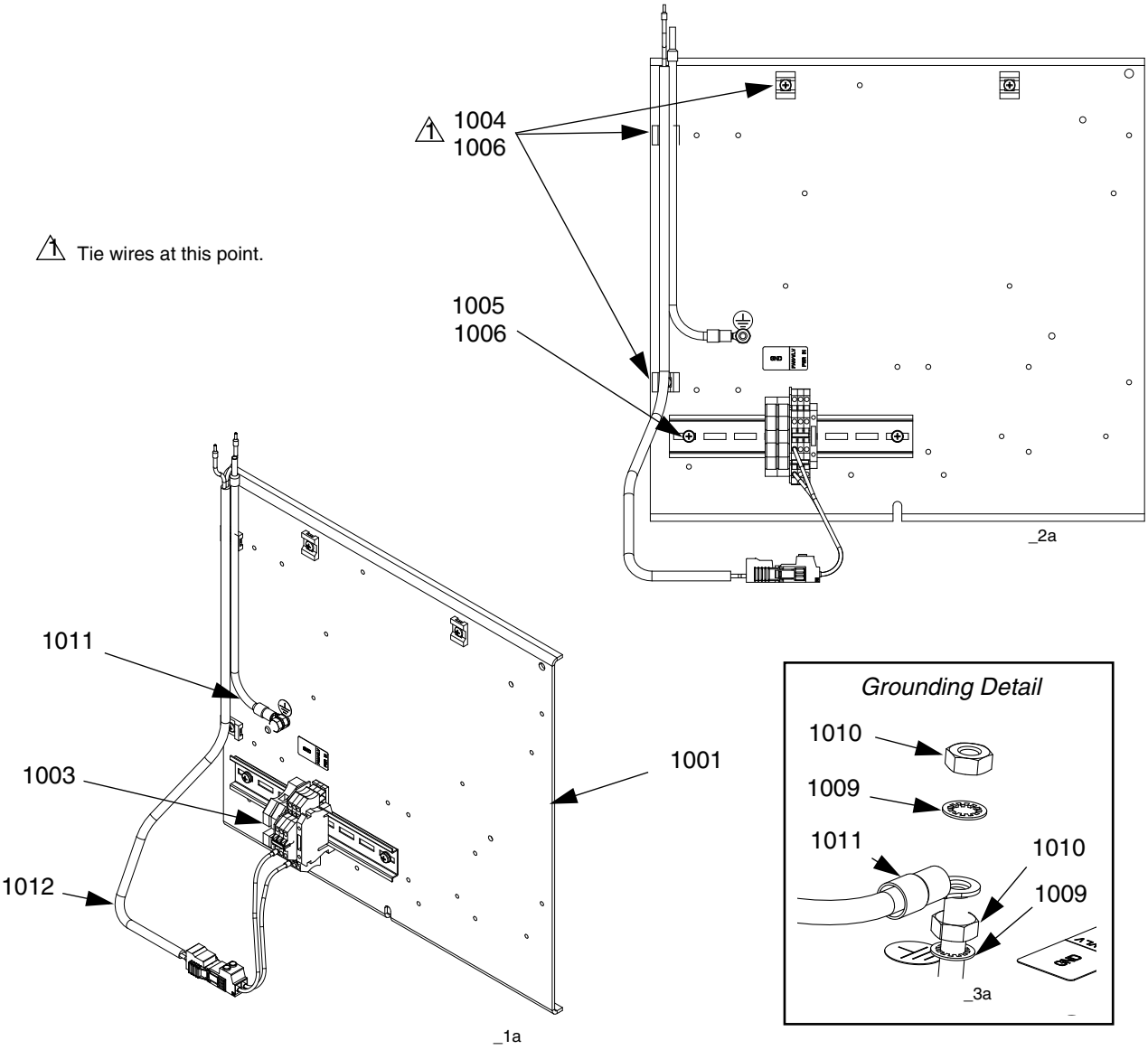
Electrical Panels



Ref	Part	Description	Qty
901	---	MODULE, panel, power, no heat, high volume	1
902	---	MODULE, panel, power, no heat, low volume	1
903	115942	NUT, hex, flange head	6
904	---	PLUG, hole, 1.5 in. diameter	2
905	---	BUSHING, wire protector, snap-in	2
906	24E900	CABLE, 5-pin, male/female (not shown)	3

--- *Not for sale.*

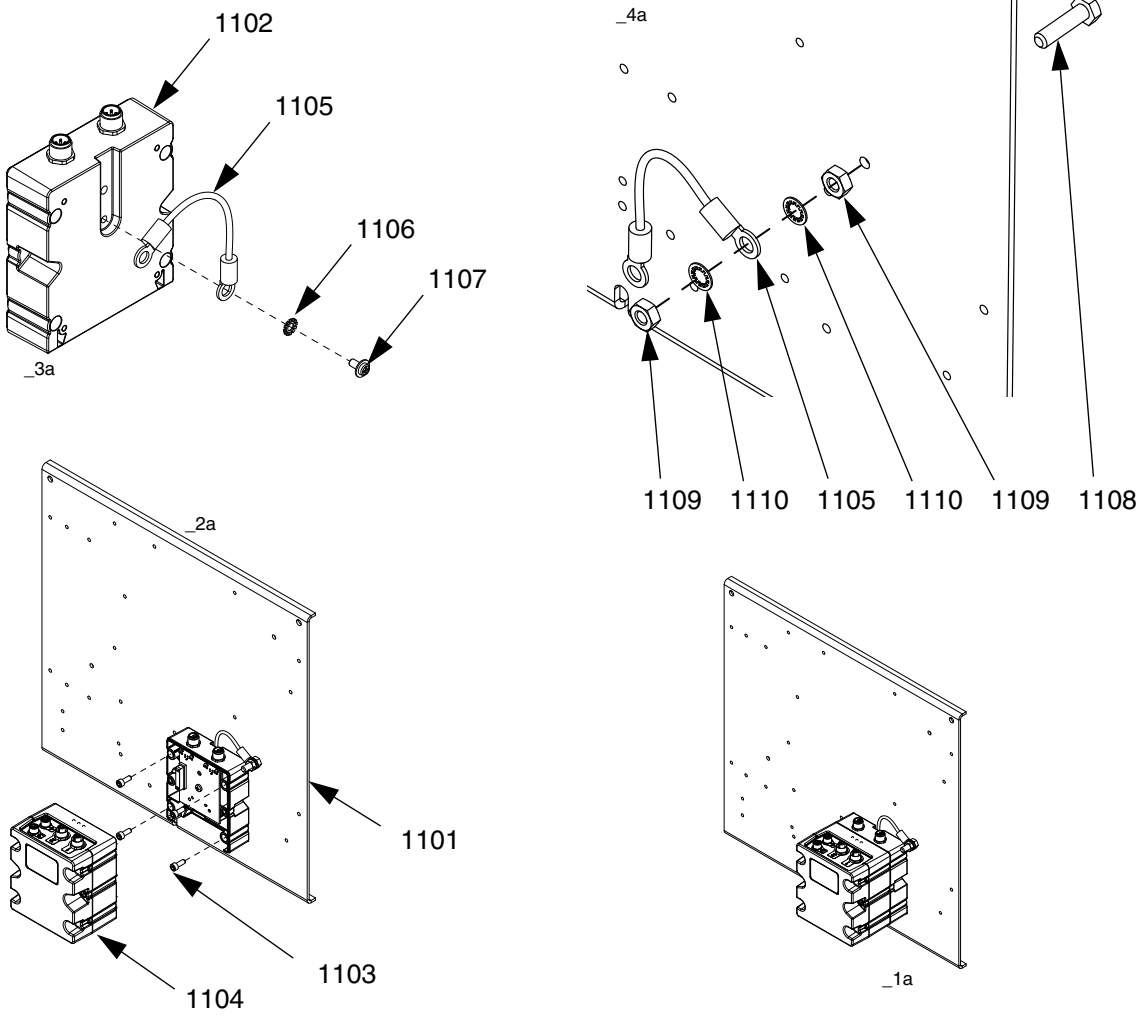
Power Panel



Ref	Part	Description	Qty
1001	---	PANEL, electric, heat	1
1003	---	MODULE, assy, power, no heat, high volume	1
1004	123452	HOLDER, anchor, wire tie, nylon	4
1005	116876	WASHER, flat	2
1006	103833	SCREW, machine	6
1008	100021	SCREW, cap hex head	1
1009	100028	WASHER, lock	2
1010	100015	NUT, hex	2
1011	---	HARNESS, wire, ground, 8AWG	1
1012	24D547	HARNESS, wire, male, 2-pin, 16/2	1

--- Not for sale.

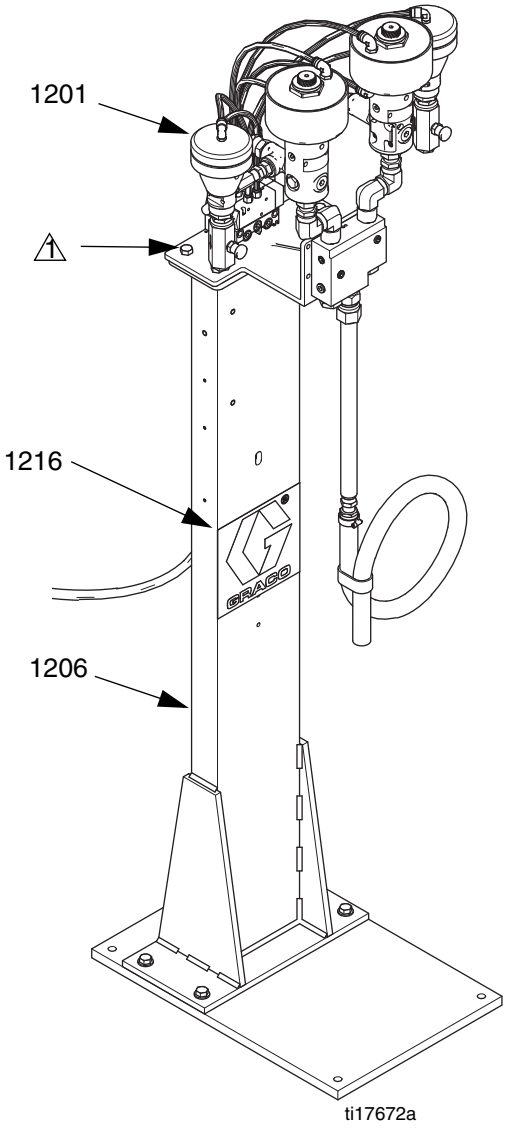
Fluid Control Panel



Ref	Part	Description	Qty
1101	---	PANEL, electric, heat	1
1102	289697	MODULE, cube, GCA, base	1
1103	102598	SCREW, cap, socket head	4
1104	289696	MODULE, GCA, cube, FCM	1
1105	---	HARNESS, wire, ground, terminal, 4 in.	1
1106	102063	WASHER, lock	1
1107	114993	SCREW, machine, pan wash head	1
1108	100021	SCREW, cap hex head	1
1109	100015	NUT, hex	2
1110	100028	WASHER, lock	2
1111	123452	HOLDER, anchor, wire tie (not shown)	4
1112	103833	SCREW, machine (not shown)	4

--- *Not for sale.*

Applicator Assembly



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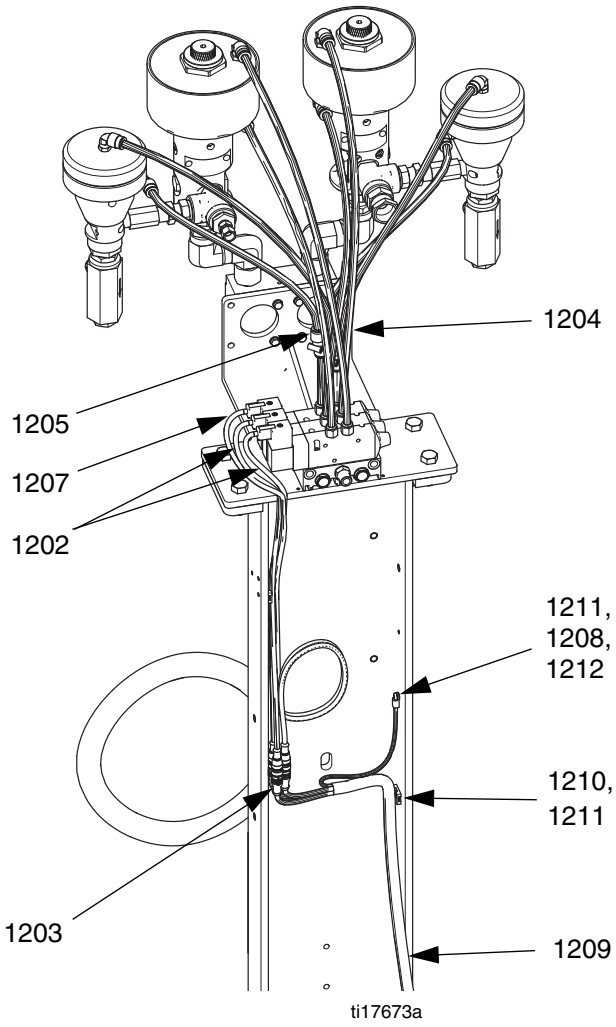


ti17673a

1 Torque to 28 ft-lb (38 N•m).

2 Tie wires here.

3 Use electrical tape (1215) to secure scuff jacket.

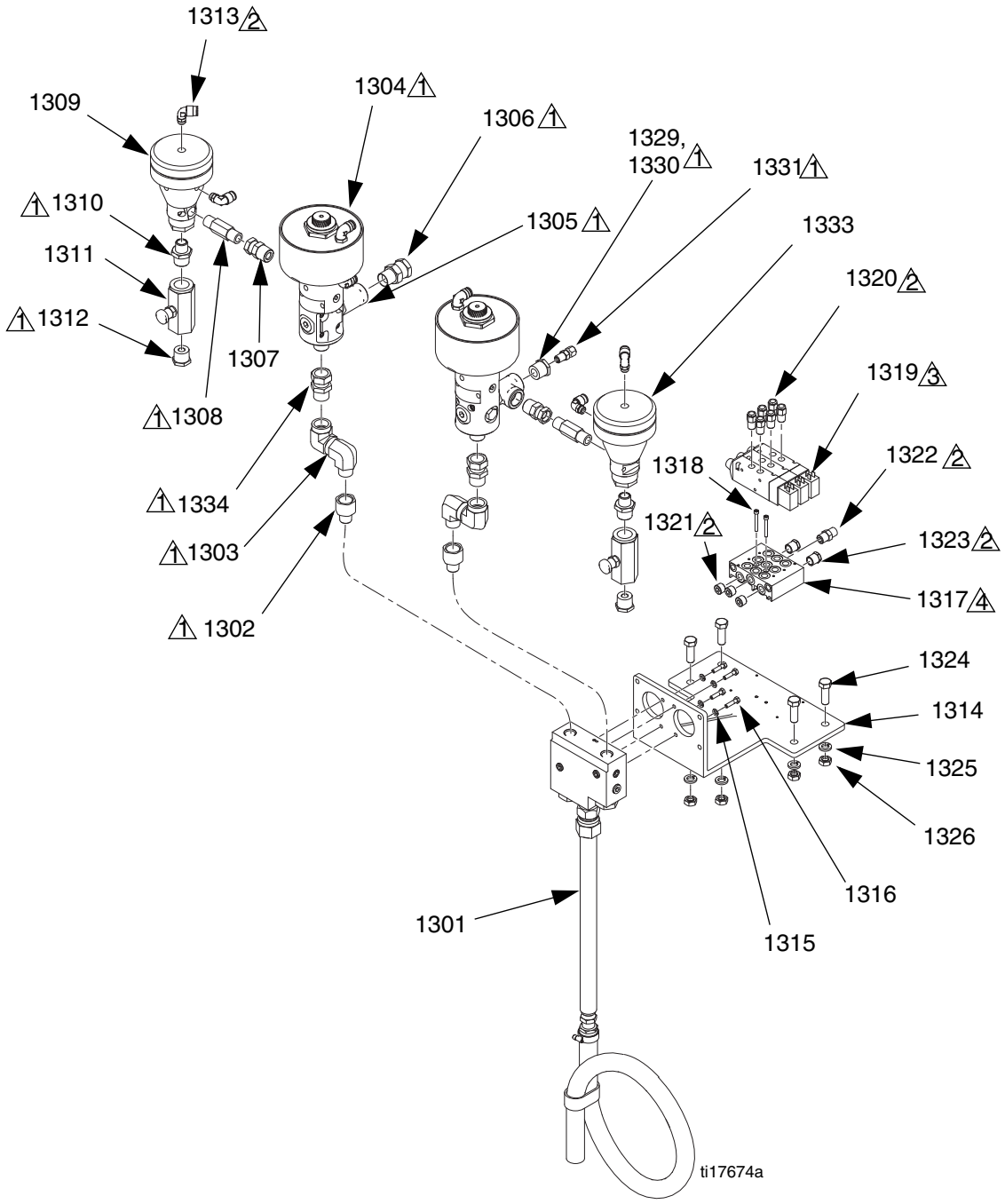
NOTE: Items 1213 and 1214 are used for connecting grounding wire(1208) to the machine base.

Ref	Part	Description	Qty
1201	24F668	MANIFOLD, mix, low viscosity, mast mount, 1/2	1
1202	122955	HARNESS, M12 x mini din	2
1203	123660	CABLE, eurofast, male/female, 6.0 m	3
1204	---	TUBE, polyethylene 0.375 OD	12.1
1205	U70058	FITTING, union, “y”, 3/8 tube	2
1206	---	SUPPORT, mast, floor mounted	1
1207	123395	HARNESS, power valve, tank	1
1208	---	HARNESS, ground, 10AW, 1/4, #10, 24 ft long	1

Ref	Part	Description	Qty
1209	---	GUARD, spiral, 1/2 in.	18
1210	123452	HOLDER, anchor, wire tie, nylon	2
1211	103833	SCREW, machine	3
1212	100718	WASHER	2
1213	100028	WASHER, lock (not shown)	2
1214	100015	NUT, hex (not shown)	2
1215	---	TAPE, electrical, vinyl	1
1216	16G194	LABEL, Graco G	1

--- *Not for sale.*

Mixer Manifold, 24F668



1 Apply pipe sealant to threads.

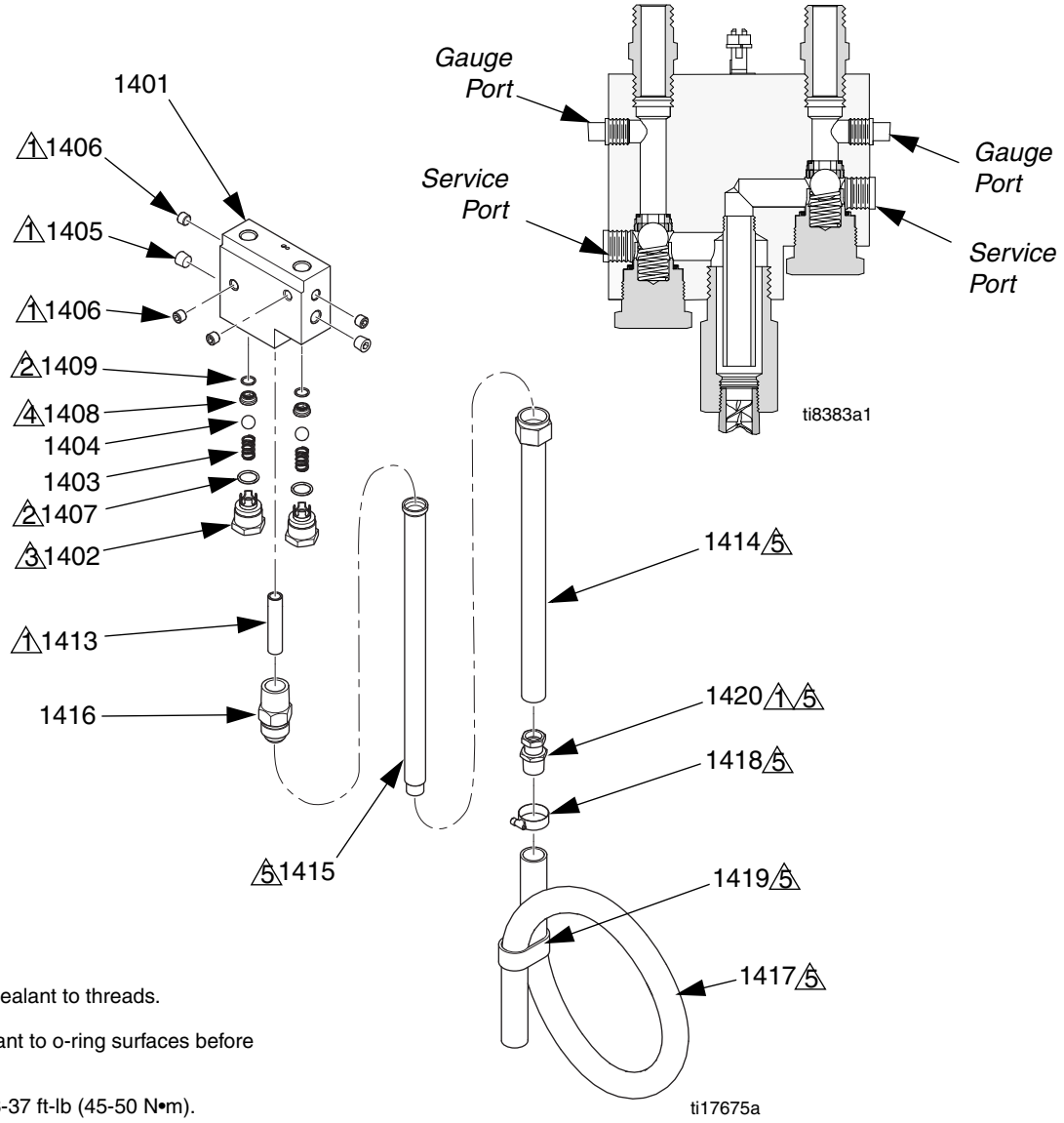
2 Apply PTFE tape to threads.

FIG. 10: Mixer Manifold, Image 1 of 2

Ref	Part	Description	Qty
1301	24H027	MANIFOLD, mix, low viscosity, 1/2	1
1302	15U426	BUSHING, reducing, 3/4 nptf-1/2nptm	2
1303	122763	FITTING, elbow, straight, 3/4 npt, 90	4
1304	V1M350	VALVE, ball, 3/4 in.	2
1305	123514	FITTING, tee, run, 3/4, male/ female/ female	2
1306	124433	FITTING, swivel, 3/4 npt x 12 JIC, male/female	1
1307	123980	FITTING, swivel, 3/4 x 1/2, male/ female	2
1308	121387	FITTING, nipple, 1/2 npt x 3.0 long	2
1309	918537	APPLICATOR, ball seat, 1/2 port, 60:1	1
1310	166443	NIPPLE, hex	2
1311	U70023	VALVE, needle, 3/4 npt, female	2
1312	15M861	FITTING, reducer, pipe, 3/4 x 1/4	2
1313	121018	FITTING, elbow, male, swivel, 1/4 npt	4
1314	256444	PLATE, mount, mixer	1
1315	100016	WASHER, lock	4
1316	111687	SCREW, cap, hex head	4
1317	---	MANIFOLD, 3-station, air	1
1318	104472	SCREW, cap	2
1319	120900	VALVE, solenoid, 3-way	3
1320	113319	FITTING, air	6
1321	101754	PLUG, pipe	3
1322	123550	FITTING, 3/8 tube x 3/8 npt, female/ male	1
1323	111881	MUFFLER	2
1324	100017	SCREW, cap, hex head	4
1325	100018	WASHER, lock, spring	4
1326	100338	NUT, jam	4
1327	---	SEALANT, pipe	1
1328	---	TAPE, tfe, sealant	1
1329	16F997	BUSHING, 3/4 x 1/4 npt, male/ female	1
1330	16F998	FITTING, plug, 1/4 npt	1
1331	262205	FITTING, swivel, npt x JIC	1
1333	24G466	APPLICATOR, ball seat, 1/2 port, UHMW	1
1334	112268	SWIVEL, union	2

--- *Not for sale.*

Mixer Assembly, 24H027



1 Apply pipe sealant to threads.

2 Apply lubricant to o-ring surfaces before assembly

3 Torque to 33-37 ft-lb (45-50 N•m).

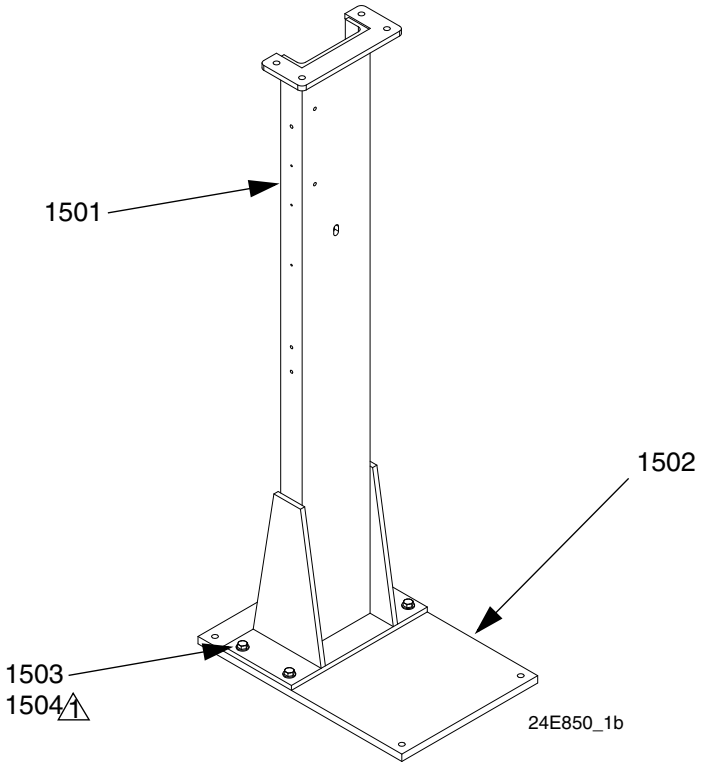
4 Apply thread sealant.

Ref	Part	Description	Qty
1401	192976	MANIFOLD, high pressure	1
1402	192979	VALVE, check	2
1403†	114353	SPRING, compression	2
1404†	108818	BALL	2
1405	101748	PLUG, pipe	2
1406	101970	PLUG, pipe	4
1407†	112973	PACKING, o-ring	2
1408†	240452	SEAT	2
1409†	102982	PACKING, o-ring	2
1410	---	SEALANT, pipe	1
1411	---	LUBRICANT, grease	1
1412	---	SEALANT, anaerobic	1
1413	192977	PIPE, center, mixer manifold	1
1414	124912	SLEEVE, mixer jacket	1
1415	16G560	MIXER, 3/4 x 23	5
1416	16G373	FITTING, adapter, mixer, 1 npt	1
1417	123042	HOSE, vacuum, 1 in. ID	42
1418	110980	CLAMP, hose	1
1419	114271	STRAP, retaining	2
1420	296178	FITTING, union, swivel, 3/4 mpt x 1/2 fpt	1

† *Recommended spare parts. Keep two of each on hand at all times.*

--- *Not for sale.*

Floor Mounted Support

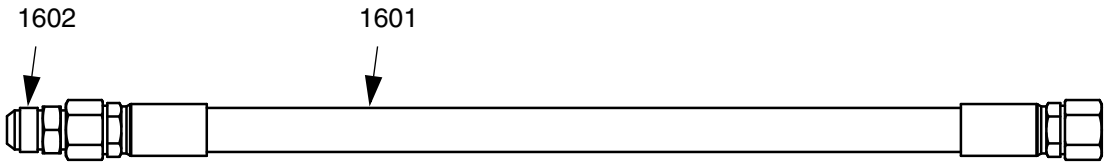


1 Torque to 113 ft-lb (153 N•m).

Ref	Part	Description	Qty
1501	---	PLATE, mating, floor, mast	1
1502	---	BASE, arm, floor mount	1
1503	109570	WASHER, plain	4
1504	100424	SCREW, cap, hex head	4

--- *Not for sale.*

Hoses



24F726 shown

Ref	Part	Description	Quantity	
			24F726, HOSE, 3/4 ID, 180 in. long, female/male	24F951, HOSE, 1/4 ID, 180 in. long, female/male
1601	24F710	HOSE, coupled, 180 in. long, 3/4 iD, 1-1/16 JIC	1	
	24F950	HOSE, coupled, 180 in. long, 1/4 ID, 1/2-20 JIC		1
1602	124435	FITTING, union, 12JIC, male x male	1	
	124726	FITTING, union, JIC05, male x male		1

Logic Drawings

230V 3 Phase Power Distribution Box

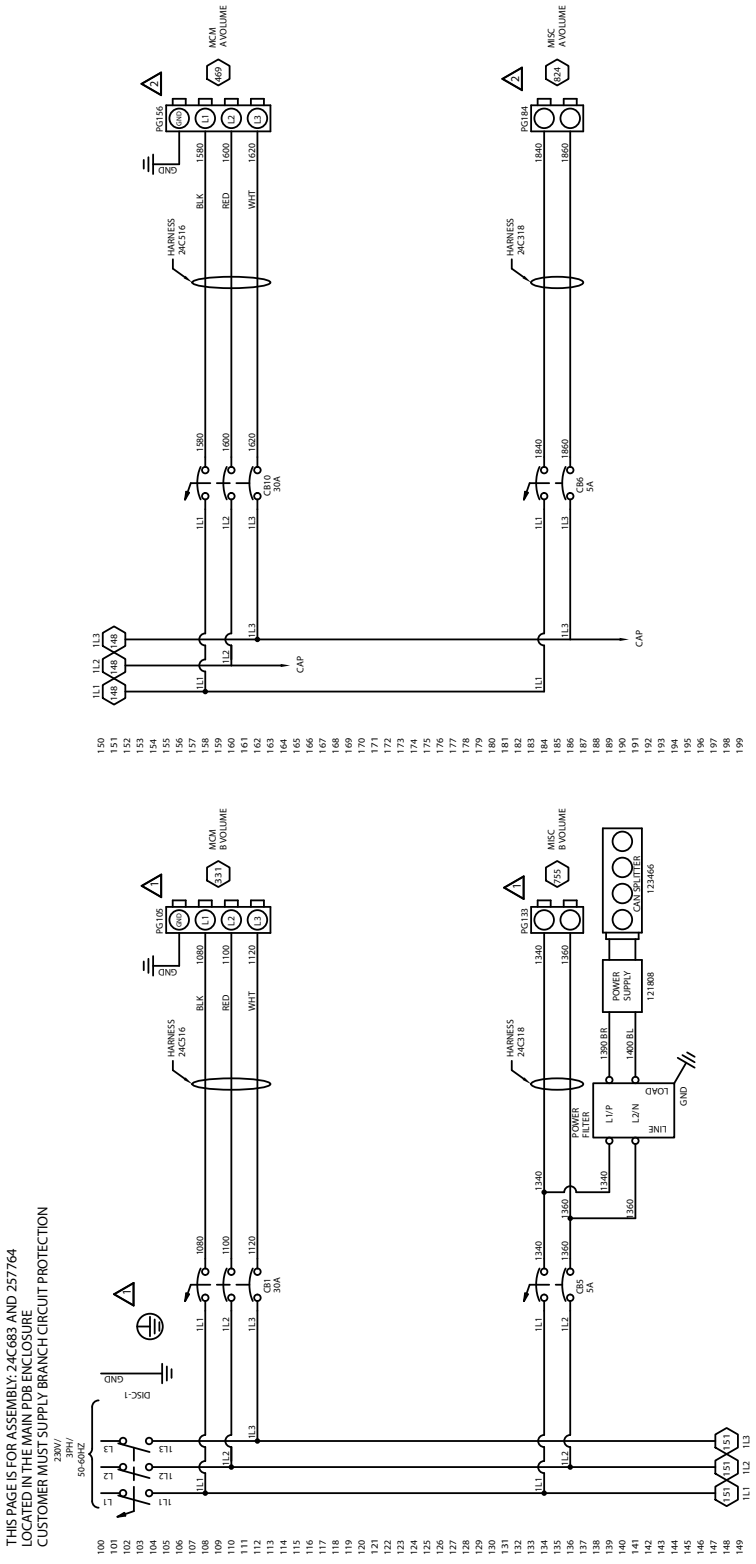


FIG. 11: Logic Drawings, Page 1

400V 3 Phase Power Distribution Box

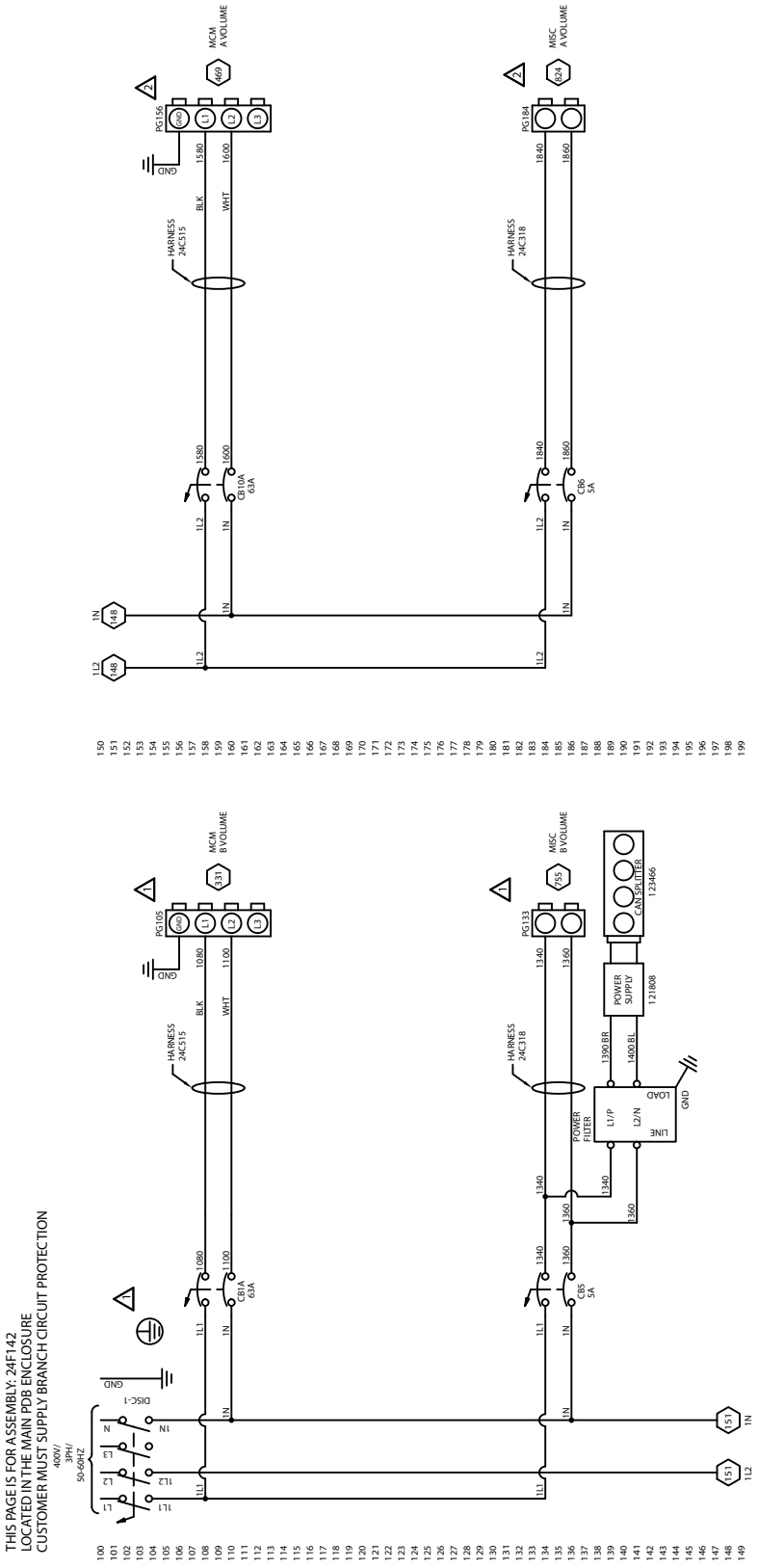


FIG. 12: Logic Drawings, Page 2

B (Blue) Hydraulic Power Pack

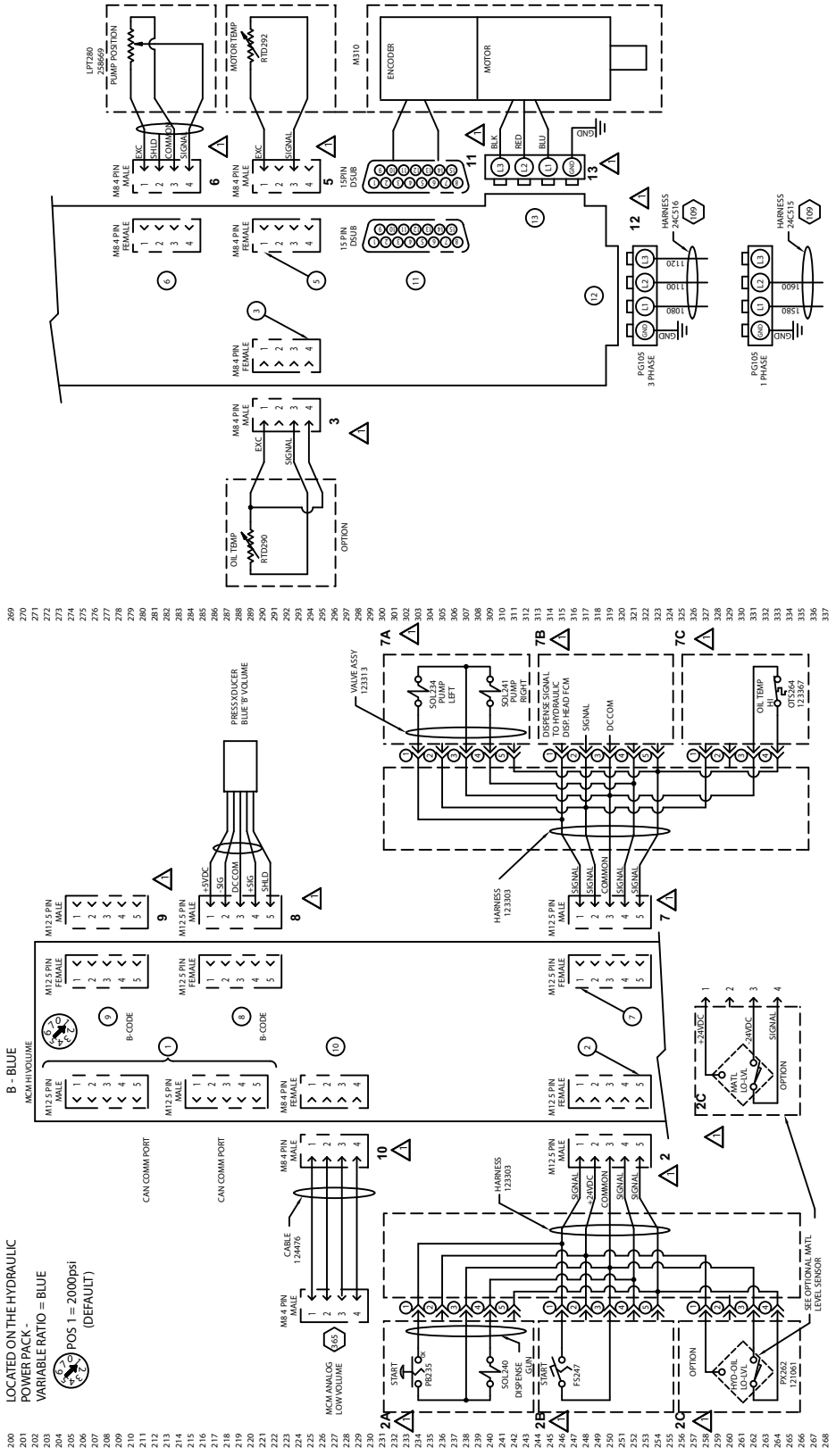


FIG. 13: Logic Drawings, Page 3

A (Red) Hydraulic Power Pack

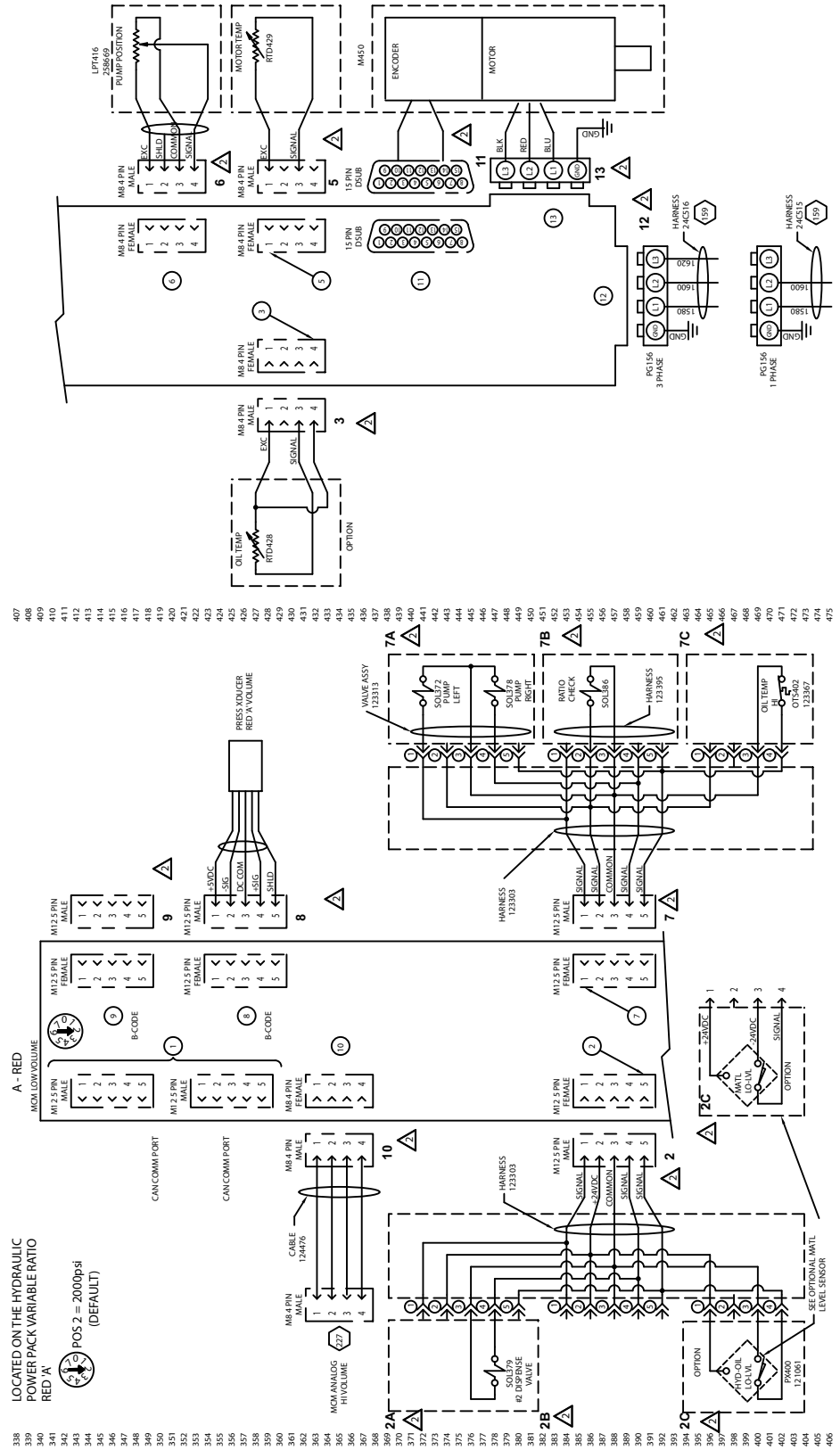


FIG. 14: Logic Drawings, Page 4

Main Enclosure

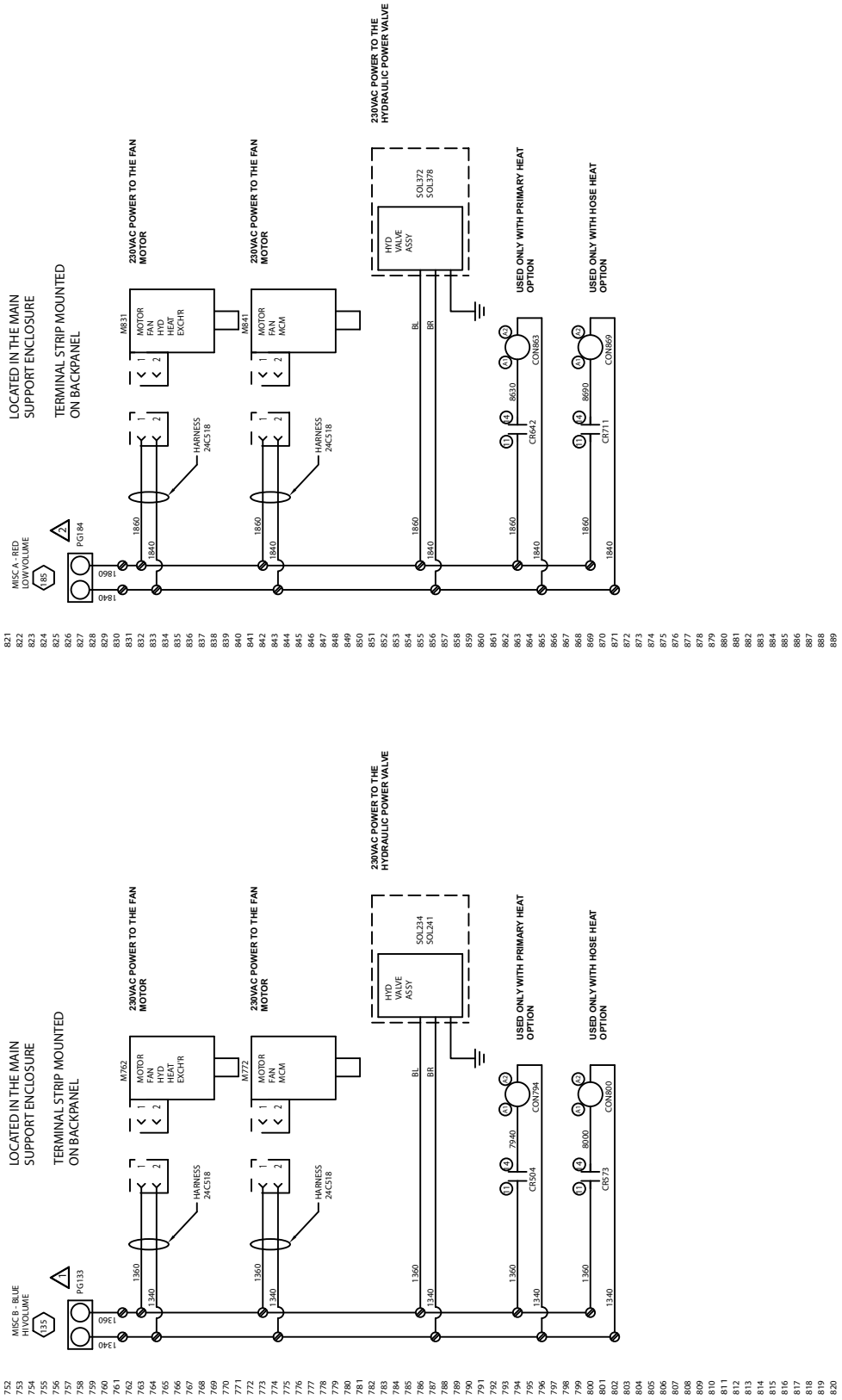


FIG. 15: Schematics, Page 5

B (Blue) Hydraulic Power Pack and Dispense Head Pneumatics

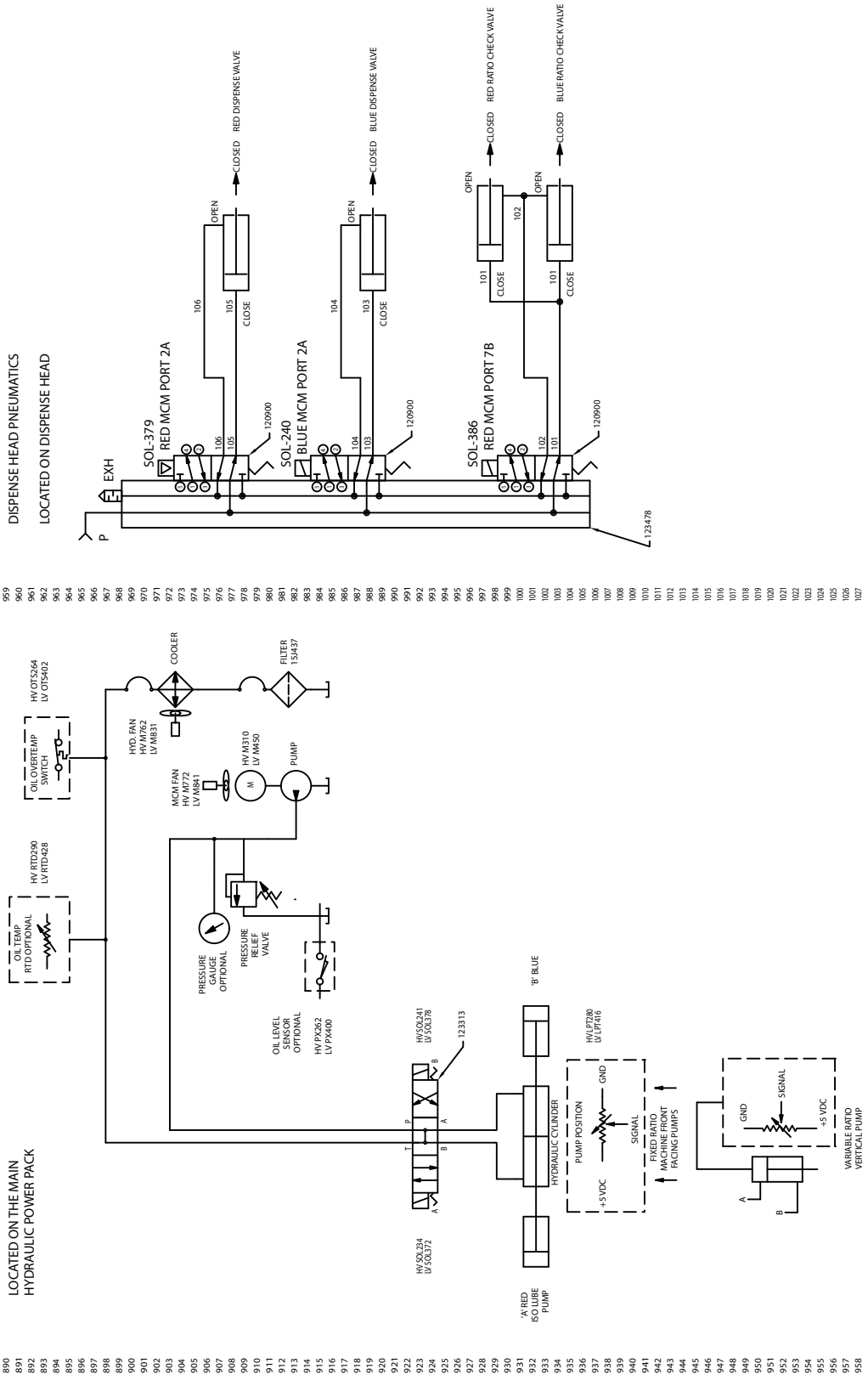


FIG. 16: Schematics, Page 6

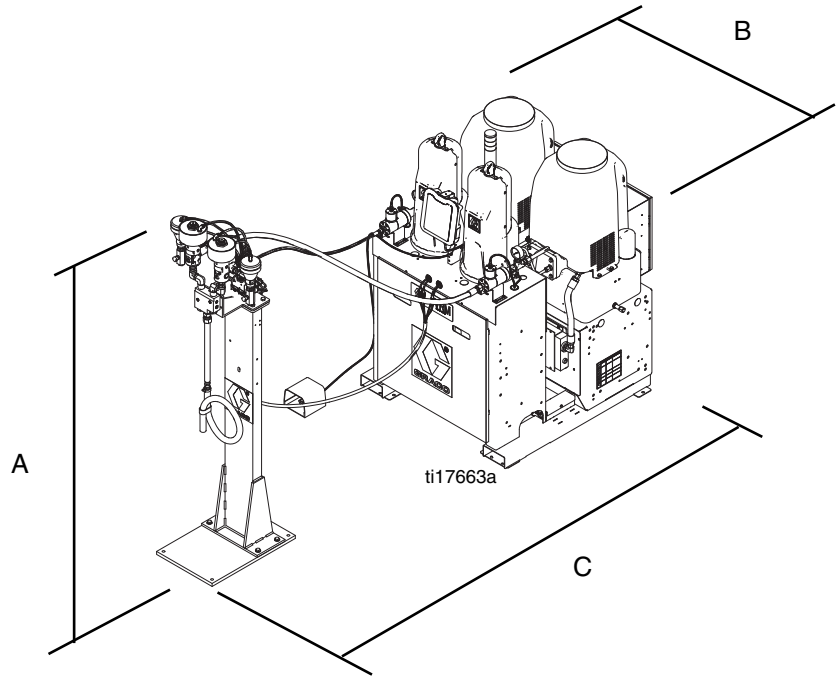
Technical Data

Air Inlet Pressure	85-100 psi (0.59-0.69 MPa, 5.9-6.9 bar)
Wetted Parts	Stainless steel, UHMW
Hydraulic Reservoir Capacity	8 gal. (30 liters) each
Recommended Hydraulic Fluid	Citgo A/W Hydraulic Oil, ISO Grade 46
Weight (varies by machine layout)	1390 lb (630 kg)

Dimensions

The dimensions of the machine vary by machine layout. The distance from the machine base to the dispense stand can be varied significantly because of the hoses.

Ref	in. (mm)
A (Height)	79 (2007)
B (Width)	63 (1600)
C (Depth)	115 (2921)



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