

Repair-Parts



Reactor® 2 Elite Integrated

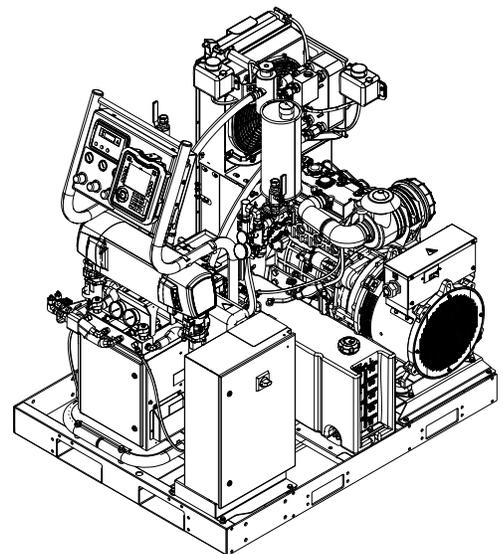
Proportioning System

332637D
EN

Electric, Heated, Integrated Plural Component Proportioning System With Integrated Generator. For spraying polyurethane foam and polyurea coatings. For professional use only. Not approved for use in explosive atmospheres or hazardous locations.



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



PROVEN QUALITY. LEADING TECHNOLOGY.

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Warnings

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

 WARNING	
 	<p>ELECTRIC SHOCK HAZARD</p> <p>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.</p> <ul style="list-style-type: none"> • 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.
	<p>TOXIC FLUID OR FUMES</p> <p>Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.</p> <ul style="list-style-type: none"> • 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.
	<p>CARBON MONOXIDE HAZARD</p> <p>Exhaust contains poisonous carbon monoxide, which is colorless and odorless. Breathing carbon monoxide can cause death.</p> <ul style="list-style-type: none"> • Do not operate in an enclosed area.
	<p>PERSONAL PROTECTIVE EQUIPMENT</p> <p>Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This protective equipment includes but is not limited to:</p> <ul style="list-style-type: none"> • Protective eyewear, and hearing protection. • Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

 <h1 style="margin: 0;">WARNING</h1>	
  	<p>SKIN INJECTION HAZARD</p> <p>High-pressure fluid from gun, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. Get immediate surgical treatment.</p> <ul style="list-style-type: none"> • Do not spray without tip guard and trigger guard installed. • Engage trigger lock when not spraying. • Do not point gun at anyone or at any part of the body. • Do not put your hand over the spray tip. • Do not stop or deflect leaks with your hand, body, glove, or rag. • Follow the Pressure Relief Procedure when you stop spraying 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.
   	<p>FIRE AND EXPLOSION HAZARD</p> <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> • 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. Do not use pail liners unless they are antistatic or conductive. • Stop operation immediately if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem. • Keep a working fire extinguisher in the work area.

 <h1 style="margin: 0;">WARNING</h1>	
  	<p>THERMAL EXPANSION HAZARD</p> <p>Fluids subjected to heat in confined spaces, including hoses, can create a rapid rise in pressure due to the thermal expansion. Over-pressurization can result in equipment rupture and serious injury.</p> <ul style="list-style-type: none"> • Open a valve to relieve the fluid expansion during heating. • Replace hoses proactively at regular intervals based on your operating conditions.
	<p>PRESSURIZED ALUMINUM PARTS HAZARD</p> <p>Use of fluids that are incompatible with aluminum in pressurized equipment can cause serious chemical reaction and equipment rupture. Failure to follow this warning can result in death, serious injury, or property damage.</p> <ul style="list-style-type: none"> • Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents. • Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.
 	<p>PLASTIC PARTS CLEANING SOLVENT HAZARD</p> <p>Many solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.</p> <ul style="list-style-type: none"> • Use only compatible water-based solvents to clean plastic structural or pressure-containing parts. • See Technical Data in this and all other equipment instruction manuals. Read fluid and solvent manufacturer's MSDSs and recommendations.



WARNING



EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.



- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Data** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Data** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- 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.

 <h1 style="margin: 0;">WARNING</h1>	
	<p>BATTERY HAZARD</p> <p>The battery may leak, explode, cause burns, or cause an explosion if mishandled.</p> <ul style="list-style-type: none"> • Only use the battery type specified for use with the equipment. See Technical Data. • Battery maintenance must only be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from battery. • When replacing the battery, use the same lead-acid automotive battery, with 800 CCA minimum, specified for use with the equipment. See Technical Data. • Do not dispose of battery in fire. The battery is capable of exploding. • Follow local ordinances and/or regulations for disposal. • Do not open or mutilate the battery. Released electrolyte has been known to be harmful to the skin and eyes and to be toxic. • Remove watches, rings, or other metal objects. • Only use tools with insulated handles. Do not lay tools or metal parts on top of battery.
 	<p>MOVING PARTS HAZARD</p> <p>Moving parts can pinch, cut or amputate fingers and other body parts.</p> <ul style="list-style-type: none"> • 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.



WARNING



ENTANGLEMENT HAZARD

Rotating parts can cause serious injury.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Do not wear loose clothing, jewelry or long hair while operating equipment.
- 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 is heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

CALIFORNIA PROPOSITION 65

The engine exhaust from this product contains a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

Important Isocyanate Information

Isocyanates (ISO) are catalysts used in two component materials.

Isocyanate Conditions

					
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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

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

Keep Components A and B Separate

					
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Cross-contamination can result in cured material in fluid lines which could cause serious injury or damage equipment. To prevent cross-contamination:

- **Never** interchange component A and component B wetted parts.
- Never use solvent on one side if it has been contaminated from the other side.

Moisture Sensitivity of Isocyanates

Exposure to moisture (such as humidity) will cause ISO to partially cure; forming 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

NOTICE					
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Partially cured ISO will reduce performance and the life of all wetted parts.

- 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 ISO pump wet cup or reservoir (if installed) filled with appropriate lubricant. The lubricant creates a barrier between the ISO and the atmosphere.
- Use only moisture-proof hoses compatible with ISO.
- Never use reclaimed solvents, which may contain moisture. Always keep solvent containers closed when not in use.
- Always lubricate threaded parts with an appropriate lubricant when reassembling.

Foam Resins with 245 fa Blowing Agents

Some foam blowing agents will froth at temperatures above 90°F (33°C) when not under pressure, especially if agitated. To reduce frothing, minimize preheating in a circulation system.

Changing Materials

NOTICE

Changing the material types used in your equipment requires special attention to avoid equipment damage and downtime.

- 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.
- When changing between epoxies and urethanes or polyureas, disassemble and clean all fluid components and change hoses. Epoxies often have amines on the B (hardener) side. Polyureas often have amines on the B (resin) side.

Models

Reactor 2 E-30i Elite

All base systems include fluid inlet pressure and temperature sensors and Graco InSite™. For part numbers, see [Accessories, page 13](#)

Model	No Air Compressor/Dryer		◆With Air Compressor/Dryer	
	E-30i	E-30i with heat	E-30i	E-30i with heat
Base Machine	272079	272080	272089	272090
Maximum Fluid Working Pressure psi (MPa, bar)	2000 (13.8, 138)	2000 (13.8, 138)	2000 (13.8, 138)	2000 (13.8, 138)
Approximate Output per Cycle (A+B) gal. (liter)	0.0272 (0.1034)	0.0272 (0.1034)	0.0272 (0.1034)	0.0272 (0.1034)
Max Flow Rate lb/min (kg/min)	30 (13.5)	30 (13.5)	30 (13.5)	30 (13.5)
Total System Load † (Watts)	7,400	11,600	13,500	17,700
Voltage (phase)	240 VAC (1)	240 VAC (1)	240 VAC (1)	240 VAC (1)
Available Auxiliary Current at Volts, 60 Hz★	52 Amps (240)	35 Amps (240)	22 Amps (240) 9 Amps (120)	5 Amps (240) 9 Amps (120)
Fusion AP Package ✘				
(Gun Part No.)	AP2079 (246102)	AP2080 (246102)	AP2089 (246102)	AP2090 (246102)
Fusion CS Package ✘				
(Gun Part No.)	CS2079 (CS02RD)	CS2080 (CS02RD)	CS2089 (CS02RD)	CS2090 (CS02RD)
Probler P2 Package ✘				
(Gun Part No.)	P22079 (GCP2R2)	P22080 (GCP2R2)	P22089 (GCP2R2)	P22090 (GCP2R2)
Heated Hose 50 ft (15 m)	24K240	24K240	24K240	24K240
Heated Whip Hose 10 ft (3 m)	24Y240	24Y240	24Y240	24Y240

† Total system watts used by system, based on maximum heated hose length of 310 ft (94.5 m) for each unit.

* Full load amps available for auxiliary equipment when all bare-system components are operating at maximum capabilities. Available auxiliary current is based on 310 ft (94.5 m) of heated hose. An additional 3.0 amps (240 VAC) of auxiliary current is available for each 50 ft (15.2 m) section of heated hose that is not used.

Auxiliary current at 120 VAC is available on line 1 (circuit breaker pin 2), line 2 current at 120 VAC is used by the air dryer (circuit breaker pin 4).

★ Available auxiliary current will be less when the engine is de-rated for site altitude. Reduce the Available Auxiliary Current in the chart by 2.5 Amps (240 VAC) per 1000 ft (300 m) elevation increments. If the available auxiliary current is less than zero, the system configuration may not support the full load at that altitude.

◆ Includes Complete Air Compressor/Dryer Kit 24U176.

See [Approvals, page 13](#).

✘ Packages include gun, heated hose, and whip hose.

Reactor 2 E-XP2i Elite

All base systems include fluid inlet pressure and temperature sensors and Graco InSite™. For part numbers, see [Accessories, page 13](#)

Model	No Air Compressor/Dryer	◆With Air Compressor/Dryer
	E-XP2i with heat	E-XP2i with heat
Base Machine	272081	272091
Maximum Fluid Working Pressure psi (MPa, bar)	3500 (24.1, 241)	3500 (24.1, 241)
Approximate Output per Cycle (A+B) gal. (liter)	0.0272 (0.1034)	0.0272 (0.1034)
Max Flow Rate lb/min (kg/min)	30 (13.5)	30 (13.5)
Total System Load † (Watts)	11,600	17,700
Voltage (phase)	240 VAC (1)	240 VAC (1)
Available Auxiliary Current at Volts, 60 Hz★	35 Amps (240)	5 Amps (240) 9 Amps (120)
Fusion AP Package ✖ (Gun Part No.)	AP2081 (246101)	AP2091 (246101)
Probler P2 Package ✖ (Gun Part No.)	P22081 (GCP2R1)	P22091 (GCP2R1)
Heated Hose 50 ft (15 m)	24Y241	24Y241
Heated Whip Hose 10 ft (3 m)	246055	246055

† Total system watts used by system, based on maximum heated hose length of 310 ft (94.5 m) for each unit.

* Full load amps available for auxiliary equipment when all bare-system components are operating at maximum capabilities. Available auxiliary current is based on 310 ft (94.5 m) of heated hose. An additional 3.0 amps (240 VAC) of auxiliary current is available for each 50 ft (15.2 m) section of heated hose that is not used.

Auxiliary current at 120 VAC is available on line 1 (circuit breaker pin 2), line 2 current at 120 VAC is used by the air dryer (circuit breaker pin 4).

★ Available auxiliary current will be less when the engine is de-rated for site altitude. Reduce the Available Auxiliary Current in the chart by 2.5 Amps (240 VAC) per 1000 ft (300 m) elevation increments. If the available auxiliary current is less than zero, the system configuration may not support the full load at that altitude.

◆ Includes Complete Air Compressor/Dryer Kit 24U176.

See [Approvals, page 13](#).

✖ Packages include gun, heated hose, and whip hose.

Approvals

Intertek approvals apply to proportioning systems without hoses.

Model	Proportioning System Approvals:
272079 272089	 <p>Intertek 9902471</p> <p>Conforms to ANSI/UL Std. 73 Certified to CAN/CSA Std. C22.2 No. 68</p> 
272080 272081 272090 272091	 <p>Intertek 9902471</p> <p>Conforms to ANSI/UL Std. 499 Certified to CAN/CSA Std. C22.2 No. 88</p> 

Note

Heated hoses provided with a system or sold individually are not approved by Intertek.

Accessories

Kit Number	Description
15M483	Remote Display Module Protective Covers (10 pack)
15V551	ADM Protective Covers (10 pack)
24K207	Fluid Temperature Sensor (FTS) with RTD
24K333	Fuel Line and Cable Extension Kit
24K336	Hose Rack
24K337	Light Tower Kit
24L911	Pallet Support Kit
24M174	Drum Level Sticks
24U174	Remote Display Module Kit
24U176	Complete Air Compressor Kit
24U177	Feed Pump Shutdown Kit
Cables	
121006	150 ft (45 m) cable (for remote display module)
24N365	RTD Test Cables (to aide resistance measurements)
24N449	50 ft (15 m) CAN cable (for remote display module)

Supplied Manuals

The following manuals are shipped with the Reactor. Refer to these manuals for detailed equipment information.

Manuals are also available at www.graco.com.

Manual	Description
332636	Reactor 2 Elite Integrated Proportioning System, Operation
333093	Reactor 2 Elite Integrated Proportioning System, Startup Instructions
333094	Reactor 2 Elite Integrated Proportioning System, Shutdown Instructions
SEBU8311-02	Perkins® Engine, Repair-Parts <i>Access at www.perkins.com. Go to Service and Support/manuals. Select engine family and type code "GN".</i> <i>Contact Perkins for engine warranty and service.</i>
-	Mecc Alte Self-Regulating Alternator Series NPE, Repair-Parts <i>Access at www.meccalte.com. Select "meccalte" logo / Download / Instruction Manuals. Select NPE instruction manual on page 5. Go to Support and enter serial number for Parts List and Help Videos.</i> <i>Contact Mecc Alte for warranty and service</i>
ST 15825-00	Air Compressor, Operation/Maintenance & Parts list. <i>Access at www.hydrovaneproducts.com. Go to Warranty & Service tab and select "contact us" to request manuals.</i>
33227482	Refrigerated Air Dryer, Instruction manual Access from Service Department (724) 746-1100 or www.spx.com/en/hankison .

Related Manuals

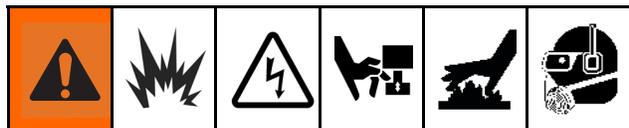
The following manuals are for accessories used with the Reactor.

Component Manuals in English:

Manuals are available at www.graco.com.

System Manuals	
332636	Reactor 2 E-30i and E-XP2i, Operation
Displacement Pump Manual	
309577	Electric Reactor Displacement Pump, Repair-Parts
Feed System Manuals	
309572	Heated Hose, Instructions-Parts
309852	Circulation and Return Tube Kit, Instructions-Parts
309815	Feed Pump Kits, Instructions-Parts
309827	Feed Pump Air Supply Kit, Instructions-Parts
Spray Gun Manuals	
309550	Fusion™ AP Gun
312666	Fusion™ CS Gun
313213	Probler® P2 Gun
Accessory Manuals	
332733	Air Compressor and Air Dryer Kit, Instructions-Parts
332738	Booster Heat Retrofit Kit, Instructions-Parts
332740	Remote Display Module, Instructions-Parts
3A2574	Pallet Support Kit, Instructions-Parts
3A1903	Hose Rack, Instructions-Parts
3A1904	Fuel Tank/Battery Move Kit, Instructions-Parts
3A1905	Feed Pump Shutdown Kit, Instructions-Parts
3A1906	Light Tower Kit, Instructions-Parts

Troubleshooting



Troubleshoot Errors

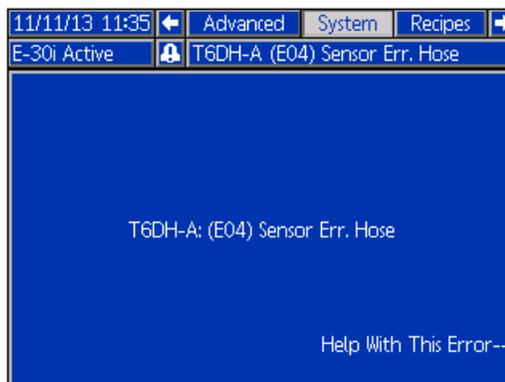
There are three types of errors that can occur. Errors are indicated on the display as well as by the light tower (optional).

Error	Description
Alarms 	A parameter critical to the process has reached a level requiring the system to stop. The alarm needs to be addressed immediately.
Deviations 	A parameter critical to the process has reached a level requiring attention, but not sufficient enough to stop the system at this time.
Advisories 	A parameter that is not immediately critical to the process. The advisory needs attention to prevent more serious issues in the future.

See [Error Codes, page 16](#) see for causes and solutions to each error code.

To troubleshoot the error:

1. Press the soft key next to “Help With This Error” for help with the active error.



2. The QR code screen will be displayed. Scan the QR code with your mobile device to be sent directly to online troubleshooting for the active error code. Otherwise, manually navigate to help.graco.com and search for the active error.



Note

Press  or  to return to the previously displayed screen.

3. If no internet connection is available, see Error Code Troubleshooting in the system repair manual for causes and solutions for each error code.

Error Codes

Error	Location	Type	Description	Cause	Solution
A1NM	MCM		Low Motor Current	Loose/broken connection.	Check for loose wire terminations at MCM motor connector.
				Bad Motor.	Disconnect motor output connector from MCM. Confirm less than 8 ohms resistance between each pair of motor power leads (M1 to M2, M1 to M3, M2 to M3). If any readings greater than 8 ohms, check motor wiring for damage and/or loose terminations.
A4DA	Heater A		High Current A	Short circuit in heater wiring.	Check wiring for touching wires.
				Bad heater.	Confirm resistance of heater. Heater resistance should be 23-26 Ω. If out of tolerance, replace heater.
A4DB	Heater B		High Current B	Short circuit in heater wiring.	Check wiring for touching wires.
				Bad heater.	Confirm resistance of heater. Heater resistance should be 23-26 Ω. If out of tolerance, replace heater.
A4DH	Hose		High Current Hose	Short circuit in hose wiring.	Check continuity of transformer windings. Normal readings are about 0.2Ω on both primary and secondary. If reading is 0Ω replace transformer.
					Check for shorts between the primary winding and the support frame or enclosure.

Error	Location	Type	Description	Cause	Solution
A4NM	MCM		High Motor Current	Short circuit of motor wiring.	Check wiring to the motor to ensure no bare wires are touching and that no wires are shorted to ground.
				Motor will not rotate.	Remove pump gear housings from motor and check that motor shaft rotates freely in direction indicated on motor housing.
				Damaged gear train.	Check pump gear trains for damage and repair or replace as necessary.
				Chemical pump is stuck.	Repair or replace chemical pump.
A7DA	Heater A		Unexpected Current A	Shorted TCM	If error cannot be cleared or regenerates consistently, replace module.
A7DB	Heater B		Unexpected Current B	Shorted TCM	If error cannot be cleared or regenerates consistently, replace module.
A7DH	Hose		Unexpected Current Hose	Shorted TCM	If error cannot be cleared or regenerates consistently, replace module.
A8DA	Heater A		No Current A	Tripped circuit breaker.	Visually check circuit breaker for a tripped condition.
				Loose/broken connection.	Check heater wiring for loose wires.
A8DB	Heater B		No Current B	Tripped circuit breaker.	Visually check circuit breaker for a tripped condition.
				Loose/broken connection.	Check heater wiring for loose wires.
A8DH	Hose		No Current Hose	Tripped circuit breaker.	Visually check circuit breaker for a tripped condition.
				Loose/broken connection.	Check heater wiring for loose wires.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
CACM	MCM		MCM Communication Error	Module does not have software.	Insert a system token into the ADM module and cycle the power. Wait until the upload is complete before removing the token.
				No 24 VDC supply to module.	Green light on each module should be lit. If green light is not lit, check to make sure each CAN cable connection is tight. Verify the power supply is outputting 24 VDC. If not, check power supply wiring. If wiring is okay, replace the power supply.
				Loose or broken CAN cable.	Check the CAN cables running between GCA modules and tighten if needed. If the problem still persists move each cable around the connector and watch the flashing yellow light on the GCA modules. If the yellow light stops flashing, replace the CAN cable.

Error	Location	Type	Description	Cause	Solution
CACT	TCM		TCM Communication Error	Module does not have software.	Insert a system token into the ADM module and cycle the power. Wait until the upload is complete before removing the token.
				No 24 VDC supply to module.	Green light on each module should be lit. If green light is not lit, check to make sure each CAN cable connection is tight. Verify the power supply is outputting 24 VDC. If not, check power supply wiring. If wiring is okay, replace the power supply.
				Loose or broken CAN cable.	Check the CAN cables running between GCA modules and tighten if needed. If the problem still persists move each cable around the connector and watch the flashing yellow light on the GCA modules. If the yellow light stops flashing, replace the CAN cable.
DADX	MCM		Pump Runaway	Flow rate is too large.	Mix chamber too large for system selected. Use mix chamber rated for system.
					Ensure the system has chemical and the feed pumps are operating correctly.
					No material in pumps. Verify pumps are supplying chemical. If necessary, replace or refill drums.
					Inlet ball valves are closed. Open ball valves.
DE0X	MCM		Cycle Switch Error	Faulty or missing cycle switch.	Check wiring between cycle switch and MCM.
				Missing or out of place cycle switch magnet.	Check presence and position of cycle switch magnet on output crank arm.
EAUX	ADM		USB Busy	USB drive has been inserted to the ADM.	Do not remove USB drive until download/upload is complete.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
EVCH	ADM		Manual Hose Mode Enabled	Manual hose mode has been enabled in System Setup screen.	Install a functioning fluid temperature sensor (FTS) on the hose. Manual hose mode will automatically turn off.
EVUX	ADM		USB disabled	USB download/uploads are disabled.	Enable USB download/uploads on the Advanced Setup screen before inserting a USB drive.
F9DX	MCM		High Pressure/Flow Cutback	Mix chamber is too large for set pressure.	Reference the pressure flow curves and select a tip size that is the correct size for the set pressure.
H1MA	Heater A		Low Frequency A	Line frequency is below 55 Hz.	Check frequency. If out of tolerance, see supplied 120/240V alternator manual for repair instructions.
H1MB	Heater B		Low Frequency B	Line frequency is below 55 Hz.	Check frequency. If out of tolerance, see supplied 120/240V alternator manual for repair instructions.
H1MH	Hose		Low Frequency Hose	Line frequency is below 55 Hz.	Check frequency. If out of tolerance, see supplied 120/240V alternator manual for repair instructions.

Error	Location	Type	Description	Cause	Solution
H4MA	Heater A		High Frequency A	Line frequency is above 65 Hz.	Check frequency. If out of tolerance, see supplied 120/240V alternator manual for repair instructions.
H4MB	Heater B		High Frequency B	Line frequency is above 65 Hz.	Check frequency. If out of tolerance, see supplied 120/240V alternator manual for repair instructions.
H4MH	Hose		High Frequency Hose	Line frequency is above 65 Hz.	Check frequency. If out of tolerance, see supplied 120/240V alternator manual for repair instructions.
K8NM	MCM		Locked Rotor Motor	Motor will not rotate.	Remove pump gear housings from motor and check that motor shaft rotates freely in direction indicated on motor housing.
				Damaged gear train.	Check motor/pump gear trains for damage and repair or replace as necessary.
				Chemical pump is stuck.	Repair or replace chemical pump.
L1AX	ADM		Low Chemical Level A	Low material level.	Refill material and update drum level on ADM Maintenance screen. Alarm can be disabled on the System Setup screen.
L1BX	ADM		Low Chemical Level B	Low material level.	Refill material and update drum level on ADM Maintenance screen. Alarm can be disabled on the System Setup screen.
MMUX	USB		Maintenance Due - USB	USB logs have reached a level where data loss will occur if logs are not downloaded.	Insert a USB drive into the ADM and download all logs.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
P0AX	MCM		Pressure Imbalance A High	Pressure difference between A and B material is greater than the defined value.	Ensure material flow is equally restricted on both material lines.
				Pressure imbalance is defined too low.	Ensure that the pressure imbalance value, on the System Setup screen, is at an acceptable maximum pressure to prevent unnecessary alarms and abort dispenses.
				Out of material.	Fill tanks with material
				Fluid leaking from heater inlet rupture disk.	Check if heater and PRESSURE RELIEF/SPRAY valve are plugged. Clear. Replace rupture disk. Do not replace with a pipe plug.
				Feed system defective.	Check feed pump and hoses for blockage. Check that feed pumps have correct air pressure.

Error	Location	Type	Description	Cause	Solution
P0BX	MCM		Pressure Imbalance B High	Pressure difference between A and B material is greater than the defined value.	Ensure material flow is equally restricted on both material lines.
				Pressure imbalance is defined too low.	Ensure that the pressure imbalance value, on the System Setup screen, is at an acceptable maximum pressure to prevent unnecessary alarms and abort dispenses.
				Out of material.	Fill tanks with material
				Fluid leaking from heater inlet rupture disk.	Check if heater and PRESSURE RELIEF/SPRAY valve are plugged. Clear. Replace rupture disk. Do not replace with a pipe plug.
				Feed system defective.	Check feed pump and hoses for blockage. Check that feed pumps have correct air pressure.
P1FA	MCM		Low Inlet Pressure A	Inlet pressure lower than defined value.	Ensure that inlet pressure to the pump is sufficient.
				Value defined too high.	Ensure that the low pressure alarm level defined on the System Setup screen is acceptable.
P1FB	MCM		Low Inlet Pressure B	Inlet pressure lower than defined value.	Ensure that inlet pressure to the pump is sufficient.
				Value defined too high.	Ensure that the low pressure alarm level defined on the System Setup screen is acceptable.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
P2FA	MCM		Low Inlet Pressure A	Inlet pressure lower than defined value.	Ensure that inlet pressure to the pump is sufficient.
				Value defined too high.	Ensure that the low pressure alarm level defined on the System Setup screen is acceptable.
P2FB	MCM		Low Inlet Pressure B	Inlet pressure lower than defined value.	Ensure that inlet pressure to the pump is sufficient.
				Value defined too high.	Ensure that the low pressure alarm level defined on the System Setup screen is acceptable.
P4AX	MCM		High Pressure A	System pressurized before allowing heat to reach setpoint.	Pressure in the hose and pumps will increase as the system heats up. Turn on heat and allow all zones to reach the temperature setpoint before turning on the pumps.
				Bad pressure transducer.	Verify the ADM pressure reading and the analog guages at the manifold.
				E-XP2i system configured as E-30i.	Alarm level is lower for E-30i than for E-XP2i. Ensure dial on MCM is set to position "1" for E-XP2i.
P4BX	MCM		High Pressure B	System pressurized before allowing heat to reach setpoint.	Pressure in the hose and pumps will increase as the system heats up. Turn on heat and allow all zones to reach the temperature setpoint before turning on the pumps.
				Bad pressure transducer.	Verify the ADM pressure reading and the analog guages at the manifold.
				E-XP2i system configured as E-30i.	Alarm level is lower for E-30i than for E-XP2i. Ensure dial on MCM is set to position "1" for E-XP2i.

Error	Location	Type	Description	Cause	Solution
P6AX	MCM		Pressure Sensor Error A	Loose/bad connection.	Check to ensure the pressure transducer is properly installed and all wires are properly connected.
				Bad sensor.	Check if the error follows the transducer. Disconnect transducer cables from the MCM (connectors 6 and 7). Reverse A and B connections and check if the errors follows. If the error follows the transducer, replace the pressure transducer.
P6BX	MCM		Pressure Sensor Error B	Loose/bad connection.	Check to ensure the pressure transducer is properly installed and all wires are properly connected.
				Bad sensor.	Check if the error follows the transducer. Disconnect transducer cables from the MCM (connectors 6 and 7). Reverse A and B connections and check if the errors follows. If the error follows the transducer, replace the pressure transducer.
P6FA	MCM		Pressure Sensor Error Inlet A	Inlet sensors not installed.	If inlet sensors are not installed, inlet sensors should be disabled on the System Setup screen.
				Loose/bad connection.	Check to ensure inlet sensor is properly installed and all wires are properly connected.
				Bad sensor.	Check if the error follows the inlet sensor. Disconnect inlet sensor cables from the MCM (connectors 8 and 9). Reverse A and B connections and check if the errors follows. If the error follows the sensor, replace the inlet sensor.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
P6FB	MCM		Pressure Sensor Error Inlet B	Inlet sensors not installed.	If inlet sensors are not installed, inlet sensors should be disabled on the System Setup screen.
				Loose/bad connection.	Check to ensure inlet sensor is properly installed and all wires are properly connected.
				Bad sensor.	Check if the error follows the inlet sensor. Disconnect inlet sensor cables from the MCM (connectors 8 and 9). Reverse A and B connections and check if the errors follows. If the error follows the sensor, replace the inlet sensor.
P7AX	MCM		Pressure Imbalance A High	Pressure difference between A and B material is greater than the defined value.	Ensure material flow is equally restricted on both material lines.
				Pressure imbalance is defined too low.	Ensure that the pressure imbalance value, on the System Setup screen, is at an acceptable maximum pressure to prevent unnecessary alarms and abort dispenses.
				Out of material.	Fill tanks with material
				Fluid leaking from heater inlet rupture disk.	Check if heater and PRESSURE RELIEF/SPRAY valve are plugged. Clear. Replace rupture disk. Do not replace with a pipe plug.
				Feed system defective.	Check feed pump and hoses for blockage. Check that feed pumps have correct air pressure.

Error	Location	Type	Description	Cause	Solution
P7BX	MCM		Pressure Imbalance B High	Pressure difference between A and B material is greater than the defined value.	Ensure material flow is equally restricted on both material lines.
				Pressure imbalance is defined too low.	Ensure that the pressure imbalance value, on the System Setup screen, is at an acceptable maximum pressure to prevent unnecessary alarms and abort dispenses.
				Out of material.	Fill tanks with material
				Fluid leaking from heater inlet rupture disk.	Check if heater and PRESSURE RELIEF/SPRAY valve are plugged. Clear. Replace rupture disk. Do not replace with a pipe plug.
				Feed system defective.	Check feed pump and hoses for blockage. Check that feed pumps have correct air pressure.
T1DE	Engine Heat Exchanger		Low Temperature Coolant Outlet	Radiator fan will not stop.	Replace fan relay.
				Engine thermostat is stuck closed.	Replace thermostat.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
T2AE	Heat Ex. A		Low Temperature Heat Exchanger A	Coolant circulation pump not working.	Check for 240 VAC on pump. If there is the correct voltage, replace circulation pump.
				Air lock in pump circulation.	Check for coolant flow in sight glass.
				No voltage to coil of valve.	Turn on the manual valve switch (MV), on the load center, to manually turn on the solenoids and see if the temperature rises. If not, check voltage output on J6 connector on the load center and ensure the LEDs are on. Follow Load Center Diagnostic instructions in system repair manual. If necessary, replace the load center board. If voltage is present, measure the resistance of the coil, it should be 12.5 Ω. If coil is open replace coil. If voltage is present, test the coil with screwdriver. The screwdriver should magnetically stick inside the coil. If the screwdriver sticks, then the coil is good. Replace the plunger on valve or replace the complete valve assembly.

Error	Location	Type	Description	Cause	Solution
T2BE	Heat Ex. B		Low Temperature Heat Exchanger B	Coolant circulation pump not working.	Check for 240 VAC on pump. If there is the correct voltage, replace circulation pump.
				Air lock in pump circulation.	Check for coolant flow in sight glass.
				No voltage to coil of valve.	Turn on the manual valve switch (MV), on the load center, to manually turn on the solenoids and see if the temperature rises. If not, check voltage output on J6 connector on the load center and ensure the LEDs are on. Follow Load Center Diagnostic instructions in system repair manual. If necessary, replace the load center board. If voltage is present, measure the resistance of the coil, it should be 12.5 Ω. If coil is open replace coil. If voltage is present, test the coil with screwdriver. The screwdriver should magnetically stick inside the coil. If the screwdriver sticks, then the coil is good. Replace the plunger on valve or replace the complete valve assembly.
T2DA	Heater A		Low Temperature A	Flow is too high at current setpoint.	Use a smaller mix chamber that is rated for the unit in use. If recirculating, decrease flow or decrease temperature setpoint.
				Bad RTD or bad RTD placement against heater.	Swap A and B heater output cables and RTD cables and see if issue follows. If so, replace RTD.
				Bad heater.	Confirm resistance of heater is 23-26.5 Ω. Replace if OL/open loop.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
T2DB	Heater B		Low Temperature B	Flow is too high at current setpoint.	Use a smaller mix chamber that is rated for the unit in use. If recirculating, decrease flow or decrease temperature setpoint.
				Bad RTD or bad RTD placement against heater.	Swap A and B heater output cables and RTD cables and see if issue follows. If so, replace RTD.
				Bad heater.	Confirm resistance of heater is 23-26.5 Ω. Replace if OL/open loop.
T2DE	Heat Exchanger		Low Temperature Coolant Outlet	Radiator fan will not stop.	Replace fan relay.
				Engine thermostat is stuck closed.	Replace thermostat.
T2DH	Hose		Low Temperature Hose	Flow is too high at current setpoint.	Use a smaller mix chamber that is rated for the unit in use. If recirculating, decrease flow or decrease temperature setpoint.
				Cold chemical in unheated portion of system passed hose FTS at startup.	Recirculate heated chemical back to drum in cold conditions before startup.
T2FA	MCM		Low Temperature Inlet A	Inlet fluid temperature is below the defined level.	Recirculate fluid through heaters until inlet fluid temperature is above defined error level.
					Increase the low temperature deviation level on the System Setup screen.
T2FB	MCM		Low Temperature Inlet B	Inlet fluid temperature is below the defined level.	Recirculate fluid through heaters until inlet fluid temperature is above defined error level.
					Increase the low temperature deviation level on the System Setup screen.

Error	Location	Type	Description	Cause	Solution
T3CH	Hose		Hose Cutback	Hose current has been reduced because hose has been drawing current for an extended period.	Hose setpoint higher than A and B setpoints. Decrease hose setpoint.
					Hose FTS is in a colder environment than the rest of the hose. Expose FTS to the same environment as the rest of the hose.
T3CT	TCM		TCM Cutback	High ambient temperature.	Ensure ambient temperature is below 120°F (48°C) before using the system.
				Enclosure fan not operating.	Ensure fan in electrical enclosure is spinning. If it is not, check fan wiring or replace fan.
				Module fan not operating.	If a TCM fan error (WMI0) has occurred, fan inside the module is not working properly. Check TCM fan for debris and clear with forced air if necessary.
T3NM	MCM		MCM Cutback	Motor is operating outside of the pressure flow curve.	The system is running at a lower setpoint to preserve motor life. Run the system at a lower duty cycle or with a smaller mix chamber.
T4AE	Heat Ex. A		High Temperature Heat Exchanger A	Manual valve switch (MV) on load center is in the ON position.	Open cabinet cover and turn switch to the OFF position.
				A or B side control valve solenoid is stuck in the open position.	Debris in valve diaphragm or plunger preventing spring-loaded closed function. Disconnect connector from valve solenoid cable. If temperature does not decrease, rebuild solenoid.
				Short on load center board.	If the blue and red LEDs are on while heat is off, the load center board is bad. See Load Center Diagnostics in the system repair manual.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
T4BE	Heat Ex. B		High Temperature Heat Exchanger B	Manual valve switch (MV) on load center is in the ON position.	Open cabinet cover and turn switch to the OFF position.
				A or B side control valve solenoid is stuck in the open position.	Debris in valve diaphragm or plunger preventing spring-loaded closed function. Disconnect connector from valve solenoid cable. If temperature does not decrease, rebuild solenoid.
				Short on load center board.	If the blue and red LEDs are on while heat is off, the load center board is bad. See Load Center Diagnostics in the system repair manual.
				J6 connector on load center "Heat Valves" location is not centered.	Reconnect J6 connector on load center in centered location.
T4CM	MCM		High Temperature MCM	High ambient temperature.	Ensure ambient temperature is below 120°F (48°C) before using the system.
				Enclosure fan not operating.	Ensure fan in electrical enclosure is spinning. If it is not, check fan wiring or replace fan.
T4CT	TCM		High Temperature TCM	High ambient temperature.	Ensure ambient temperature is below 120°F (48°C) before using the system.
				Enclosure fan not operating.	Ensure fan in electrical enclosure is spinning. If it is not, check fan wiring or replace fan.
				Module fan not operating.	If a TCM fan error (WMI0) has occurred, fan inside the module is not working properly. Check TCM fan for debris and clear with forced air if necessary.

Error	Location	Type	Description	Cause	Solution
T4DA	Heater A		High Temperature A	Bad RTD or bad RTD placement against heater.	Swap A and B heater output cables and RTD cables and see if issue follows. If so, replace RTD.
				Flow too high for temperature setpoint, causing temperature overshoots when gun is de-triggered.	Use a smaller mix chamber that is rated for the unit in use.
T4DB	Heater B		High Temperature B	Bad RTD or bad RTD placement against heater.	Swap A and B heater output cables and RTD cables and see if issue follows. If so, replace RTD.
				Flow too high for temperature setpoint, causing temperature overshoots when gun is de-triggered.	Use a smaller mix chamber that is rated for the unit in use.
T4DE	Heat Exchanger		High Temperature Coolant Outlet	Broken fan.	Check fan relay (K4) and fuse (30 Amp ATO "F3") on load center board. Replace if needed.
				Plugged radiator.	Replace if needed.
				High ambient temperature.	Ensure ambient temperature is below 120°F (48°C) before using the system.
T4DH	Hose		High Temperature Hose	Hose portion exposed to an excessive heat source, like hot sun or coiled hose, can pass fluid more than 27°F (15°C) over hose temperature setting to the FTS.	Shade exposed hose from hot sun or expose FTS to same environment when at rest. Uncoil entire hose before heating to avoid self-heating.
				Setting the A or B setpoint much higher than hose setpoint can cause fluid more than 27°F (15°C) over hose temperature setting to reach the FTS.	Increase hose setpoint so it is closer to A and B setpoints.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
T4EA	Heater A		High Temperature Switch A	Overtemperature switch sensed a fluid temperature above 230°F (110°C).	Heater was delivered too much power, causing the overtemperature switch to open. RTD is not reading properly. After the heater cools down, replace RTD. Switch closes and the error can be cleared when the heater temperature falls below 190°F (87°C).
				Disconnected or loose overtemperature switch cable/connection.	If heater is not actually over temperature, check all wiring and connections between the TCM and the overtemperature switches.
				Overtemperature switch failed in the open position.	Replace overtemperature switch.
T4EB	Heater B		High Temperature Switch B	Overtemperature switch sensed a fluid temperature above 230°F (110°C).	Heater was delivered too much power, causing the overtemperature switch to open. RTD is not reading properly. After the heater cools down, replace RTD. Switch closes and the error can be cleared when the heater temperature falls below 190°F (87°C).
				Disconnected or loose overtemperature switch cable/connection.	If heater is not actually over temperature, check all wiring and connections between the TCM and the overtemperature switches.
				Overtemperature switch failed in the open position.	Replace overtemperature switch.

Error	Location	Type	Description	Cause	Solution
T4NM	MCM		High Temperature Motor	Cooling fan is not operating properly.	Check to see that the motor fan is moving. Measure voltage to fan. There should be 24 VDC. If no voltage is measured, check fan wiring. If the fan has voltage but is not moving, replace fan. If necessary use an air hose to blow out around the fan housings and remove any built-up debris.
				Disconnected or loose motor temperature cable.	Verify wiring between the motor temperature sensor and the MCM.
				High ambient temperature.	Ensure ambient temperature is below 120°F (48°C) before using the system.
				Bad electric motor.	Replace electric motor.
T6AE	Heat Ex. A		Sensor Error Heat Exchanger A	Disconnected or loose RTD cable or connection.	Check all wiring and connection to RTD.
				Bad RTD.	Switch the RTD with another and see if the error message follows the RTD. Replace RTD if the error follows the RTD.
T6BE	Heat Ex. B		Sensor Error Heat Exchanger B	Disconnected or loose RTD cable or connection.	Check all wiring and connection to RTD.
				Bad RTD.	Switch the RTD with another and see if the error message follows the RTD. Replace RTD if the error follows the RTD.
T6DA	Heater A		Sensor Error A	Disconnected or loose RTD cable or connection.	Check all wiring and connection to RTD.
				Bad RTD.	Switch the RTD with another and see if the error message follows the RTD. Replace RTD if the error follows the RTD.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
T6DB	Heater B		Sensor Error B	Disconnected or loose RTD cable or connection.	Check all wiring and connection to RTD.
				Bad RTD.	Switch the RTD with another and see if the error message follows the RTD. Replace RTD if the error follows the RTD.
T6DE	Engine Heat Exchanger		Sensor Error Coolant Outlet	Disconnected or loose RTD cable or connection.	Check all wiring and connection to RTD.
				Bad RTD.	Switch the RTD with another and see if the error message follows the RTD. Replace RTD if the error follows the RTD.
T6DH	Hose		Sensor Error Hose	Disconnected or shorted RTD cable in hose or bad FTS.	Expose each hose RTD connection to check and retighten any loose connector. Measure hose RTD cable and FTS continuity. See Repair Heated Hose, page 87 . Order RTD Test kit 24N365 for measurement. Disconnect hose RTD and use manual hose mode to finish job until repair can be completed.
T6DT	TCM		Sensor Error TCM	Shorted RTD cable in hose or FTS.	Expose each hose RTD connection to check for exposed and shorted RTD wires. Measure hose RTD cable and FTS continuity. See Repair Heated Hose, page 87 . Order RTD Test kit 24N365 for measurement. Disconnect hose RTD and use manual hose mode to finish job until repair can be completed.
				Shorted Heater A or B RTD	If the error still occurs with the hose FTS unplugged, one of the heater RTDs is bad. Unplug the A or B RTD from the TCM. If unplugging an RTD fixes the T6DT error, replace the RTD.

Error	Location	Type	Description	Cause	Solution
T8AE	Heat Ex. A		No Temperature Rise Heat Exchanger A	No coolant flow.	Check coolant level. Check for coolant flow in sight glass. Ensure that circulation pump has 240 VAC. If not, replace the circulation pump.
				Low chemical supply temperature.	Chemical below 32°F(0°C) at startup. Recirculate cold chemical back to drum in cold conditions before spraying.
				System stored below 20°F(-7°C) causing slow coolant valve operation.	Ensure ambient temperature is above 20°F(-7°C) .
				Bad valve solenoid.	Turn on the manual valve switch (MV), on the load center, and see if the valve shifts. If not replace solenoid.
				Bad load center.	Red, blue, and green LEDs should light up on load center board. If not, replace load center.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
T8BE	Heat Ex. B		No Temperature Rise Heat Exchanger B	No coolant flow.	Check coolant level. Check for coolant flow in sight glass. Ensure that circulation pump has 240 VAC. If not, replace the circulation pump.
				Low chemical supply temperature.	Chemical below 32°F(0°C) at startup. Recirculate cold chemical back to drum in cold conditions before spraying.
				System stored below 20°F(-7°C) causing slow coolant valve operation.	Ensure ambient temperature is above 20°F(-7°C) .
				Bad valve solenoid.	Turn on the manual valve switch (MV), on the load center, and see if the valve shifts. If not replace solenoid.
				Bad load center.	Red, blue, and green LEDs should light up on load center board. If not, replace load center.
				J6 connector on load center "Heat Valves" location is not centered.	Reconnect J6 connector on load center in centered location.
T8DA	Heater A		No Temperature Rise A	Bad heater rod.	Measure resistance of heater rod, should be 23-26 Ω. Replace if open.
				Bad RTD or bad RTD placement against heater.	Swap A and B heater output cables and RTD cables and see if issue follows. If so, replace RTD.
				Bad valve solenoid.	Turn on the manual valve switch (MV), on the load center, and see if the valve shifts. If not replace solenoid.
				Started spraying before heater reached operating temperature.	Wait until operating temperature has been reached before spraying or recirculating.

Error	Location	Type	Description	Cause	Solution
T8DB	Heater B		No Temperature Rise B	Bad heater rod.	Measure resistance of heater rod, should be 23-26 Ω. Replace if open.
				Bad RTD or bad RTD placement against heater.	Swap A and B heater output cables and RTD cables and see if issue follows. If so, replace RTD.
				Bad valve solenoid.	Turn on the manual valve switch (MV), on the load center, and see if the valve shifts. If not replace solenoid.
				Started spraying before heater reached operating temperature.	Wait until operating temperature has been reached before spraying or recirculating.
T8DH	Hose		No Temperature Rise Hose	Started spraying before heater reached operating temperature.	Wait until operating temperature has been reached before spraying or recirculating.
V1CM	MCM		Low Voltage MCM	Loose/bad connection or tripped circuit breaker.	Check wiring for loose connection or tripped circuit breaker.
				Low generator line voltage.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC.
V1IT	TCM		Low Voltage CAN	Bad 24 VDC power supply.	Check voltage of power supply. Voltage should be 23-25 VDC. If out of tolerance, replace power supply.
V1MA	TCM		Low Voltage A	Loose connection or tripped circuit breaker.	Check wiring for loose connection or tripped circuit breaker.
				Low generator line voltage.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC.
				High auxiliary inrush current.	Ensure compressor or air drier are set up to be continuous run and sized according to the manual.

Troubleshooting

Error	Location	Type	Description	Cause	Solution
V1MB	TCM		Low Voltage B	Loose connection or tripped circuit breaker.	Check wiring for loose connection or tripped circuit breaker.
				Low generator line voltage.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC.
				High auxiliary inrush current.	Ensure compressor or air drier are set up to be continuous run and sized according to the manual.
V1MH	TCM		Low Voltage Hose	Loose connection or tripped circuit breaker.	Check wiring for loose connection or tripped circuit breaker.
				Low generator line voltage.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC.
				High auxiliary inrush current.	Ensure compressor or air drier are set up to be continuous run and sized according to the manual.
V2IT	TCM		Low Voltage CAN	Bad 24 VDC power supply.	Check voltage of power supply. Voltage should be 23-25 VDC. If out of tolerance, replace power supply.
V3IT	TCM		High Voltage CAN	Bad 24 VDC power supply.	Check voltage of power supply. Voltage should be 23-25 VDC. If out of tolerance, replace power supply.
V4CM	MCM		High Voltage MCM	Incoming line voltage is too high.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC. If voltage is too high, see supplied alternator manual for generator specifics and repair.
V4IT	TCM		High Voltage CAN	Bad 24 VDC power supply.	Check voltage of power supply. Voltage should be 23-25 VDC. If out of tolerance, replace power supply.

Error	Location	Type	Description	Cause	Solution
V4MA	TCM		High Voltage A	Incoming line voltage is too high.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC. If voltage is too high, see supplied alternator manual for generator specifics and repair.
V4MB	TCM		High Voltage B	Incoming line voltage is too high.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC. If voltage is too high, see supplied alternator manual for generator specifics and repair.
V4MH	TCM		High Voltage Hose	Incoming line voltage is too high.	Measure voltage across main power switch (CT01). Voltage should measure between 195 and 264 VAC. If voltage is too high, see supplied alternator manual for generator specifics and repair.
WBC0	MCM		Software Version Error	Incorrect software version.	Insert a system token into the ADM module and cycle the power. Wait until the upload is complete before removing the token.
WMCE	MCM		Load Center Fault	Bad connection between MCM and load center board.	Check connection and cables.
				Bad load center.	Replace load center.
WM10	TCM		TCM Fan Error	Fan inside TCM is not operating properly.	Check for debris in the TCM fan and clear with forced air if necessary.
WSUX	USB		Configuration Error USB	A valid configuration file can't be found for the USB.	Inset a system token into the ADM and cycle power. Wait until the lights on the USB port stop flashing before removing token.
WXUD	ADM		USB Download Error	Log download failed.	Backup and reformat the USB drive. Retry download.
WXUU	ADM		USB Upload Error	Custom language file failed to upload.	Perform normal USB download and use the new disptext.txt file to upload the custom language.

System

See [Supplied Manuals, page 14](#), for air compressor service or warranty contact information.



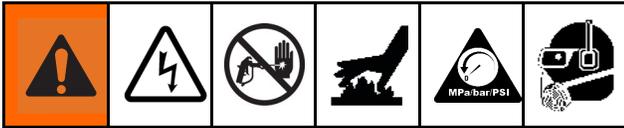
Before performing any troubleshooting procedures:

1. Relieve Pressure. See [Pressure Relief Procedure, page 60](#).
2. Turn main power switch OFF.
3. Allow equipment to cool.

Problem	Cause	Solution
Reactor ADM does not turn on.	No power.	Turn main power switch ON.
		Turn circuit breakers ON, see Repair Circuit Breaker Module, page 77 .
		Check circuit breaker (CB10). See Repair Circuit Breaker Module, page 77 .
Electric motor does not operate.	Loose connections.	Check MCM connections. See Electrical Schematics, page 154 .
	Tripped circuit breaker (CB02).	Reset breaker, see Repair Circuit Breaker Module, page 77 . Check 240VAC at output of breaker.
	Shorted windings.	Replace motor, see Repair Electric Motor, page 76 .
Electric motor runs erratically.	Failed motor bearings.	Replace motor, see Repair Electric Motor, page 76 .

Problem	Cause	Solution
Electric motor cooling fan not working.	Tripped circuit breaker (CB03).	Reset circuit breaker (CB03). Check 240VAC at output of breaker.
	Loose wire.	Check. See Electrical Schematics, page 154.
	Fan blade obstructed.	Remove obstruction.
	Defective fan.	Replace. See Replace Motor Fan, page 82.
Pump output low.	Obstructed fluid hose or gun; fluid hose ID too small.	Open, clear; use hose with larger ID.
	Worn piston valve or intake valve in displacement pump.	See pump manual.
	Pressure setpoint too high.	Reduce setpoint and output will increase.
Fluid leak in pump packing nut area.	Worn throat seals.	Replace. See pump manual.
No pressure on one side.	Fluid leaking from heater inlet rupture disk (372).	Check if heater and PRESSURE RELIEF/SPRAY valve (SA or SB) are plugged. Clear. Replace rupture disk (372) with a new one; do not replace with a pipe plug.
Air compressor does not start.	Tripped circuit breaker (CB04).	Reset circuit breaker (CB04).
	Not wired correctly.	See Electrical Schematics, page 154.
	Compressor starter overheated from rapid multiple start and stop procedures.	Let starter cool down for 2 minutes then press reset on the air compressor electrical enclosure and start.
Air dryer cooling fan not running.	Only runs after hot air flow.	Normal operation.
Air dryer not draining water.	Power not turned on at dryer.	Turn dryer switch ON ().
	No air usage.	Check after air flowing.

Coolant System



Problem	Cause	Solution
Proportioner Coolant Loop		
Air bubbles in sight glass.	Air trapped in heat exchanger coolant.	See Refill Proportioner Coolant Loop, page 68.
	Coolant hoses between the proportioner coolant loop and engine coolant loop were modified and created a high point air pocket.	Ensure coolant hoses have a constant rise in elevation.
	Proportioner coolant loop expansion bottle is empty.	See Refill Proportioner Coolant Loop, page 68.
Heat exchanger coolant flow stopped. No flow in sight glass.	Circulation pump stopped running.	Check circuit breaker. Check voltage.
	Bypass control valve does not open.	Repair or replace valve. See Replace Control Valve, page 94.
Material slowly heats up.	Coolant filter plugged.	Clean or replace filter in filter housing, see Repair Filter Housing Filter, page 96 and order replacement filter kit 24T028.
	A and B control valves are not opening fully.	Repair or replace valve. See Replace Control Valve, page 94.
	System stored below 20°F(-7°C).	Ensure system ambient temperature is above 20°F(-7°C).
Heat exchanger coolant in sight glass is a milky color.	Possible material leaking into coolant.	Drain Proportioner coolant loop. See Drain Coolant, page 66. Check for pressurized material leaks.
A or B material heats up slower than the other.	Control valve opening too slow.	Repair or replace valve. See Replace Control Valve, page 94.
	System stored below 20°F(-7°C).	Ensure system ambient temperature is above 20°F(-7°C).
	Control valve coil failed.	Repair or replace valve coil. See Replace Control Valve, page 94.
A or B material cooling down slower than the other.	Control valve coil not allowing valve to normally close.	Repair or replace valve coil. See Replace Control Valve, page 94.
	Control valve stuck in open position.	Repair valve. See Replace Control Valve, page 94.
	Bad load center.	Replace the load center board. See Replace Load Center, page 80.

Problem	Cause	Solution
Engine Coolant Loop		
Engine coolant does not reach full temperature.	Radiator fan does not shut off.	Check fan relay. Check fan wiring.
	Radiator core becoming plugged.	Replace radiator. See Remove Radiator, page 100 .
	Engine thermostat not opening.	Replace engine thermostat.
Engine temperature normal, but heat exchanger temperature is low or slowly increases.	Coolant level is low in expansion bottle.	Refill Engine Coolant Loop, page 69 .
	No coolant flow in engine coolant loop.	
	Heat exchanger in the engine coolant loop is plugged.	Replace heat exchanger. See Replace Heat Exchangers, page 91 .
Expansion bottle levels are not rising when coolant is heating.	Radiator or heat exchanger bottle cap not opening.	Replace cap.
Coolant level in engine coolant expansion bottle rises too high and too fast.	Expansion bottle cap and radiator cap are switched.	Switch radiator caps. Radiator cap is marked 16 lbs and expansion bottle is marked 8 lbs.
	Spring loaded gasket inside radiator cap does not seal.	Replace radiator cap.
Coolant level in proportioner coolant expansion bottle does not rise when hot.	Expansion bottle cap and radiator cap are switched.	Switch radiator caps. Radiator cap is marked 16 lbs and expansion bottle is marked 8 lbs.
Coolant level in proportioner coolant expansion bottle rises too high and too fast.	Expansion bottle cap stuck open.	Replace expansion bottle cap.
Coolant level dropping in overflow bottle but no visible leaks.	Cap not fully tightened.	Push down and tighten cap past safety latch position.

Hose Heat System



Before performing any troubleshooting procedures:

1. Relieve Pressure. See [Pressure Relief Procedure, page 60](#).
2. Turn main power switch OFF.
3. Allow equipment to cool.

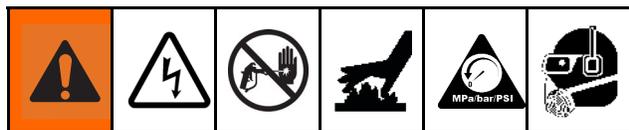
Problem	Cause	Solution
Hose heats but heats slower than usual or it does not reach temperature.	Ambient temperature is too cold.	Use auxiliary hose heat system.
	FTS failed or not installed correctly.	Check FTS, see Check RTD Cables and FTS, page 87 .
Hose does not maintain temperature while spraying.	A and B setpoints too low.	Increase A and B setpoints. Hose is designed to maintain temperature, not to increase it.
	Ambient temperature is too cold.	Increase A and B setpoints to increase fluid temperature and keep it steady.
	Flow too high.	Use smaller mix chamber. Decrease pressure.
	Hose was not fully preheated.	Wait for hose to heat to correct temperature before spraying.
Hose temperature exceeds setpoint.	A and/or B heaters are overheating material.	Check primary heaters for either a RTD problem or a failed element attached to RTD, see Electrical Schematics, page 154 .
	Faulty FTS connections.	Verify that all FTS connections are snug and that pins of connectors are clean. Unplug and re-plug RTD wires, cleaning off any debris.
	Ambient temperature is too high.	Cover hoses or move to a location with a lower ambient temperature.

Problem	Cause	Solution
Erratic hose temperature.	Faulty FTS connections.	Verify that all FTS connections are snug and that pins of connectors are clean. Unplug and re-plug FTS wires along length of hose, cleaning off any debris.
	FTS not installed correctly.	FTS should be installed close to end of hose in same environment as gun. Verify FTS installation, see Repair Fluid Temperature Sensor (FTS), page 88 .
Hose does not heat.	FTS failed.	Check FTS, see Repair Fluid Temperature Sensor (FTS), page 88 .
	FTS not installed correctly.	FTS should be installed close to end of hose in same environment as gun. Verify FTS installation, see Repair Fluid Temperature Sensor (FTS), page 88 .
	Loose hose electrical connections.	Check connections. Repair as necessary.
	Circuit breakers tripped.	Reset breakers (CB20 and CB02), see Repair Circuit Breaker Module, page 77 .
	Hose zone not turned on.	Turn on hose heat zone.
	A and B temperature setpoints too low.	Check. Increase if necessary.
	Failed TCM.	Remove TCM and install a new TCM. New module comes with current software. Update other modules if necessary. See software installation instruction manual.

Troubleshooting

Problem	Cause	Solution
Hoses near Reactor are warm, but hoses downstream are cold.	Shorted connection or failed hose heating element.	With power off, check the hose resistance with and without the whip hose attached. With the whip hose attached, the reading should be less than 3 ohm. Without the whip hose attached, the reading should be OL (open loop). See Check Hose Heat Connectors, page 87 .
Low hose heat.	A and B temperature setpoints too low.	Increase A and B setpoints. Hose designed to maintain temperature, not increase temperature.
	Hose temperature setpoint too low.	Check. Increase if necessary to maintain heat.
	Flow too high.	Use smaller mix chamber. Decrease pressure.
	Low current; FTS not installed.	Install FTS, see operation manual.
	Hose heat zone not turned on long enough to reach setpoint.	Allow hose to heat up, or preheat fluid.
	Loose hose electrical connections.	Check connections. Repair as necessary.
	Ambient temperature is too low	Relocate hoses to a warmer area or increase A and B setpoints.

Booster Heater



Before performing any troubleshooting procedures:

1. Relieve Pressure. See [Pressure Relief Procedure, page 60](#).
2. Turn main power switch OFF.
3. Allow equipment to cool.

Problems

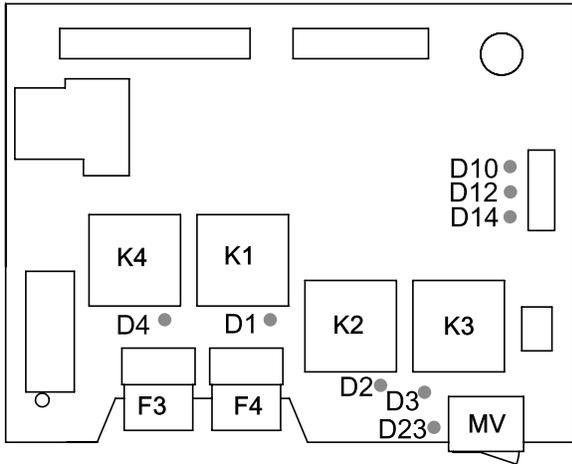
Try the recommended solutions in the order given for each problem, to avoid unnecessary repairs. Also, determine that all circuit breakers, switches, and controls are properly set and wiring is correct before assuming there is a problem.

Problem	Cause	Solution
Booster heater(s) does not heat.	Heat turned off.	Turn on heat zones.
	Temperature control alarm.	Check ADM for error codes.
	Signal failure from RTD.	Signal failure from RTD.
	Failed heater element.	See Replace Heater Element, page 84 .
Control of booster heat is abnormal; high temperature overshoots (T4DA, T4DB) occurs intermittently.	Loose RTD connections.	Examine RTD cables connected to TCM. Confirm RTDs are not plugged into opposite heat zone. Reconnect RTD connectors.
	RTD not contacting heater element.	Loosen ferrule nut, push in RTD so tip contacts heater element. Holding RTD tip against heater element, tighten ferrule nut 1/4 turn past tight.
	Failed heater element.	See Replace Heater Element, page 84 .
	Signal failure from RTD.	See (T4DA, T4DB), Error Codes .

Load Center Diagnostics

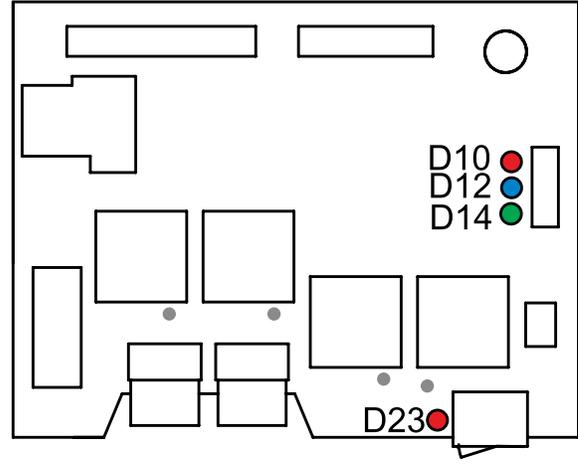
Reference [Replace Load Center Relays and Fuses, page 79](#), and [Electrical Schematics, page 154](#). The LEDs on the load center board are helpful diagnostic tools when troubleshooting problems with the engine. Before referencing the [Engine Troubleshooting, page 53](#), complete the following steps:

1. Identify which LEDs are on and off.



Load Center Component Identification
Figure 1

- F3 Radiator Fan Fuse
- F4 Load Center Power Fuse
- K1 Fuel Relay
- K2 Starter Relay
- K3 Glow Plug Relay
- K4 Radiator Fan Relay
- MV Manual Valve Switch



Manual Valve Switch ON (engine off)
Figure 2

LED	Related Component	Color	ON-State Description
D1	Fuel Shutoff Solenoid	Green	Fuel shutoff solenoid on the engine is open.
D2	Starter	Red	Starter is cranking.
D3	Glow Plugs	Green	Glow plugs are heating.
D4	Radiator Fan	Green	Radiator fan is on.
D10	A Coolant Valve	Red	A-side (red) coolant valve is open.
D12	B Coolant Valve	Blue	B-side (blue) coolant valve is open.
D14	Bypass Coolant Valve	Green	Bypass coolant valve is open.
D23	Manual Valve Switch	Red	Manual valve switch is in the ON position.

- Determine if the LEDs are expected to be in the state observed. Determine if an unlit LED should be on by referring to the LED Expected Operation table.

Note

The starter, fuel shutoff solenoid, glow plugs, and radiator fan operations are sequenced during startup by the Engine Control Module.

LED Expected Operation

LED	ON State
D1	On when fuel is being fed to the engine – from shortly before the starter cranks until the engine is turned off.
D2	On when starter is cranking – from shortly after the Fuel LED lights (beginning approximately 8 seconds after the green start button on the Engine Control Module is pressed) and until shortly after the engine turns over.
D3	On when glow plugs are warming the engine - from when the green start button is pressed on the Engine Control Module until shortly after the engine starts and comes up to speed.
D4	On when radiator fan is running – from shortly before the starter cranks until shortly after the main power switch is turned on, then intermittently thereafter as required by engine temperature. (If the main power switch is left off, the fan will run continuously.)

- If the LEDs light as expected, focus troubleshooting attention to components listed in Table 1. If the LEDs do not light as expected, first focus troubleshooting attention to components listed in Table 2.
- For potential causes and solutions related to the components in Tables 1 and 2, see [Engine Troubleshooting, page 53](#).

Table 1 lists a likely order of potential failures in the load center output-side components.

Table 1 – LEDs Light As Expected

	Fuel (D1)	Starter (D2)	Glow Plugs (D3)	Radiator Fan (D4)
1	Engine Harness (E) and its connections			
2	Engine Fuel Shutoff Solenoid (FD)	Starter Solenoid Relay (CR6)	Glow Plugs Solenoid Relay (CR7)	
3		Engine Starter Motor (ES)		

Table 2 indicates a likely order of potential failures in the load center input-side power, cable, or control components.

Table 2 – LEDs Do Not Light As Expected

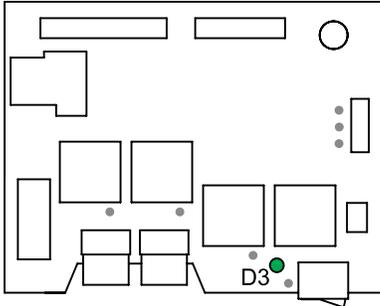
	Fuel (D1)	Starter (D2)	Glow Plugs (D3)	Radiator Fan (D4)
1	Battery			
2	Battery cables and its connections			
3		No D2 LED Disconnect switch ON		
4	Load Center Fuse F4 ("PWR - ATO 20A")			Load Center Fuse F3 ("FAN - ATO 30A")
5	Fusible Link Harness (C) and its connections			
6	Engine Harness (E) and its connections			
7	Engine Control Module Harness (F) and its connections			
8	Load Center Fuel Relay (K1)	Load Center Starter Relay (K2)	Load Center Glow Relay (K3)	Load Center Fan Relay (K4)
9	Load Center Board			
10	Engine Control Module			

Troubleshooting

LED	Description
●	Off
●	On
★	Flashing

LED Sequence for Engine Startup and Operation

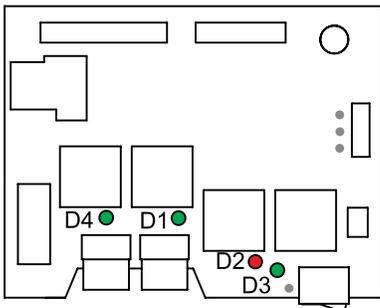
1. After pressing green start button on Engine Control Module, glow plugs start warming engine.



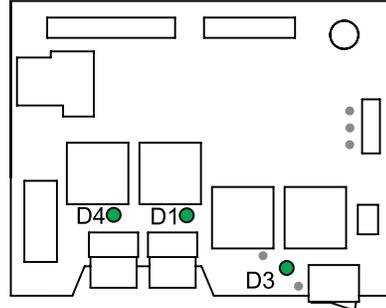
2. Fuel and radiator fan turn on shortly before engine starting; glow plugs continue to warm engine.



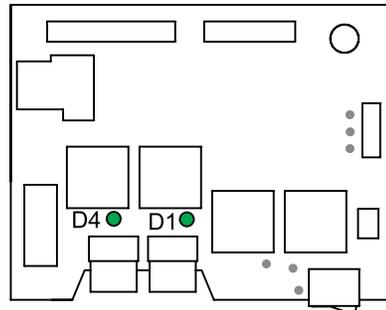
3. Engine starting; fuel, fan, and glow plugs continue to operate.



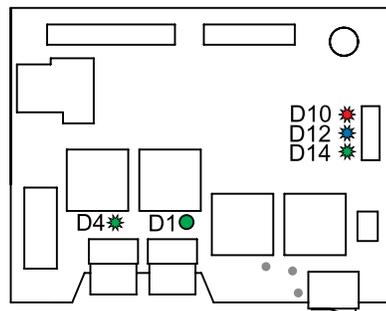
4. Engine starting; glow plugs continue to warm engine.



5. Engine is running; with main power switch off, the radiator fan runs continuously.

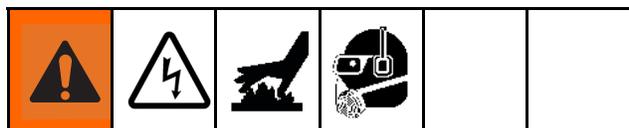


6. Engine is running; electronics take control of and cycle the fan and valves beginning shortly after main power switch is turned on.



Engine

Contact Perkins for diesel engine service or warranty. See [Supplied Manuals, page 14](#).



Problem	Cause	Solution
Engine Control Module does not power up from sleep mode.	Discharged or failed battery.	Verify battery voltage is 11 - 13 volts DC.
		Charge or replace battery as required. See Replace Battery, page 97 .
	Loose or incorrect wiring connections.	Verify wiring connections (including grounds) related to Engine Control Module. Check Engine Harness (E), Engine Control Module Harness (F), Fusible Link Harness (C), and battery cables. See Electrical Schematics, page 154 . Verify voltage is 11 - 13 volts DC from starter to ground.
	Blown Load Center board fuse.	Determine cause of blown fuse F4 "PWR - ATO 20A". Repair issue then replace fuse. See Replace Load Center Relays and Fuses, page 79 .
	Blown fusible link.	Verify continuity through fusible link harness from starter to 12V charge alternator. If required, replace Fusible Link Harness (C). See Electrical Schematics, page 154 . See Repair Fusible Link Harness, page 98 .
	Failed Engine Control Module.	Replace module. See Replace Engine Control Module, page 101 .
Failed Load Center board.	Replace board. See Replace Load Center, page 80 .	

Troubleshooting

Problem	Cause	Solution
Reference Load Center Diagnostics, page 50 .		
Engine does not turn over.	Main power switch on electrical enclosure is in the ON position.	Turn switch to OFF position.
	Discharged or failed battery.	Verify battery voltage is 11 - 13 volts DC.
		Charge or replace battery as required. See Replace Battery, page 97 .
	Loose or corroded battery cable connector.	Verify cable connectors. See Replace Battery, page 97 .
	Loose or incorrect wiring connections.	Verify wiring connections (including grounds) related to starter. Check Engine Harness (E), Engine Control Module Harness (F), Fusible Link Harness (C), Disconnect Check Harness (H), and battery cables. See Electrical Schematics, page 154 . Verify voltage is 11 - 13 volts DC from starter to ground.
	Blown Load Center board fuse.	Determine cause of blown fuse F4 "PWR - ATO 20A". Repair issue then replace fuse. See Replace Load Center Relays and Fuses, page 79 .
	Failed starter relay.	Replace relay K2 located on Load Center board. See Replace Load Center Relays and Fuses, page 79 .
	Failed starter solenoid relay.	Replace solenoid relay CR6 located on side of engine. See Replace Engine Solenoid Relays, page 80 .
	Blown fusible link.	Verify continuity through fusible link harness from starter to solenoid relay CR6. If required, replace Fusible Link Harness (C). See Electrical Schematics, page 154 .
	Failed load center board (242).	Replace board. See Replace Load Center, page 80 .
Failed engine control module (428).	Replace module. See Replace Engine Control Module, page 101 .	
Failed engine starter (ES).	Contact local Perkins distributor for service.	

Problem	Cause	Solution
Reference Load Center Diagnostics, page 50 .		
Engine turns over, but does not start.	Low fuel level.	Refill fuel tank.
	Lost prime.	Ensure fuel tank is at least half full, prime with bulb until fuel is flowing through return line to tank.
	Loose or incorrect wiring connections.	Verify wiring connections (including to grounds) related to engine fuel shutoff solenoid. Check Engine Harness (E), Engine Control Module Harness (F), and Fusible Link Harness (C). See Electrical Schematics, page 154 .
	Blocked air intake.	Replace air filter.
	Blocked exhaust system.	Check that exhaust system is open (rain cap is free to move, no exhaust obstructions or plugging). Remove blockage.
	Blocked fuel filter.	Inspect/replace fuel filter.
	Failed fuel relay.	Replace relay K1 located on Load Center board. See Replace Load Center Relays and Fuses, page 79 .
	Solenoid valve rod stuck in extended position.	Remove valve rod and clean with WD-40.
	Failed engine fuel shutoff solenoid.	Verify engine fuel shutoff solenoid (FD) related wiring according to schematics (see Cause "Loose or incorrect wiring connections", above).
		Contact local Perkins distributor for service.
	Failed glow plug relay.	Replace relay K3 located on Load Center board. See Replace Engine Solenoid Relays, page 80 .
	Failed glow plug solenoid relay.	Replace solenoid relay CR7 located on side of engine. See Replace Engine Solenoid Relays, page 80 .
Failed glow plug assembly.	Verify glow plug related wiring according to schematics (see Cause "Loose or incorrect wiring connections", above).	
	Contact local Perkins distributor for service.	

Troubleshooting

Problem	Cause	Solution
Reference Load Center Diagnostics, page 50 .		
Engine shuts down, Engine Control Module shows no errors.	Loose or incorrect wiring connections.	Verify wiring connections (including grounds) related to engine fuel shutoff solenoid. Check Engine Harness (E), and Engine Control Module Harness (F). See Electrical Schematics, page 154 .
	Failed fuel relay.	Replace relay K1 located on Load Center board. See Replace Load Center Relays and Fuses, page 79 .
	Failed engine fuel shutoff solenoid.	Verify engine fuel shutoff solenoid (FD) related wiring according to schematics (see Cause "Loose or incorrect wiring connections", above).
		Contact local Perkins distributor for service.

Problem	Cause	Solution
Reference Load Center Diagnostics, page 50 .		
Engine shuts down, Engine Control Module shows High Coolant Temperature Shutdown icon. 	Low engine coolant level.	Inspect coolant system for leaks. Repair as necessary and refill system.
	Engine water temperature switch failed or shorted out.	Check for shorts to switch wiring. See Electrical Schematics, page 154 .
	Loose or incorrect wiring connections.	Verify wiring connections (including grounds) related to radiator fan. Check Engine Harness (E), and Engine Control Module Harness (F). See Electrical Schematics, page 154 .
	Blown radiator fan fuse.	Determine cause of blown fuse F3 "FAN - ATO 30A". Repair issue then replace fuse. See Replace Load Center Relays and Fuses, page 79 .
	Failed radiator fan relay.	Replace relay K4 located on Load Center board. See Replace Load Center Relays and Fuses, page 79 .
	Obstructed radiator fan.	Remove obstructions.
	Failed radiator fan.	Replace fan. See Replace Radiator Fan, page 83 .
	Failed engine coolant temperature sensor.	Replace engine coolant temperature sensor located behind radiator connected to MCM port 3. See Replace Engine RTD, page 105 .
	Plugged radiator or coolant system.	Clean or replace radiator. See Remove Radiator, page 100 .
Contact local Perkins distributor for service.		

Troubleshooting

Problem	Cause	Solution
Engine shuts down. Engine Control Module shows Low Oil Pressure Shutdown icon. 	Low oil level.	Check oil level and refill.
	Loose or incorrect wiring connections.	Verify wiring connections (including grounds) related to oil pressure switch. Check Engine Harness (E), and Engine Control Module Harness (F). See Electrical Schematics, page 154 .
	Failed oil pressure switch.	Replace oil pressure switch Contact local Perkins distributor for service.
Engine shuts down. Engine Control Module shows Under Frequency Shutdown icon or Generator Low Voltage Shutdown icon  	Low fuel level.	Refill fuel tank.
	Lost prime.	Ensure fuel tank is at least half full, prime with bulb until fuel is flowing through return line to tank.
	Blocked air intake.	Replace air filter.
	Blocked exhaust system.	Check that exhaust system is open (rain cap is free to move, no exhaust obstructions or plugging). Remove blockage.
	Blocked fuel filter.	Replace fuel filter.
	Generator overloaded.	Confirm auxiliary electrical loads wired into the electrical enclosure by the customer are within the system's available auxiliary power limits.
	Loose or incorrect wiring connections.	Verify wiring connections related to Engine Control Module, Check AC Sense Harness (M). See Electrical Schematics, page 154 .
	Blown voltage sense fuses.	Replace fuses F6 and F7 located in the junction box above the 120/240 V alternator. Use repair kit 24M723.

Graco InSite

Problem	Cause	Solution
No module status LEDs are illuminated.	No power to cellular module.	Turn Reactor power ON.
		Ensure cable is installed between cellular module and power supply and MCM.
Has not identified GPS location (green module status LED flashing).	Still identifying location.	Wait a few minutes for the unit to identify the location.
	Unable to identify location. In a location where GPS lock cannot occur. Buildings and warehouses often prevent GPS locks.	Move system to a location with a clear view of the sky. Use extension cable 16X521 and move cellular module to a location with a clear view of the sky.
Has not established cellular connection (orange module status LED flashing).	Still establishing cellular connection.	Wait a few minutes for the unit to establish the connection.
	Unable to establish cellular connection.	Move system to a location with cellular service to establish cellular connection. Use extension cable 16X521 and move cellular module to a location with a clear view of the sky.
Cannot view data for my unit(s) on website.	Graco InSite unit has not been activated.	Activate unit. See Registering and Activating the Graco InSite section.
Reactor temperature data not displayed on website.	Reactor temperature measurement is not working.	See System troubleshooting section.
Hose zone temperature data not displayed on website.	The RTD is not correctly installed on the hose or is broken.	See RTD repair section.
Reactor pressure data not displayed on website.	Reactor pressure measurement is not working.	See System troubleshooting section.

Pressure Relief Procedure



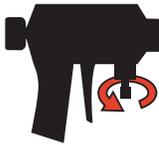
Follow the Pressure Relief Procedure whenever you see this symbol.



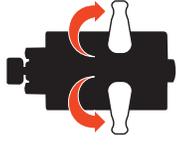
This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing equipment.

The Fusion AP gun is shown.

1. Relieve pressure in gun and perform gun shutdown procedure. See gun manual.
2. Close gun fluid inlet valves A and B.



Fusion



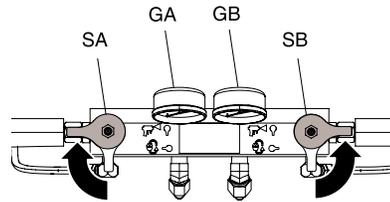
Probler

3. Shut off feed pumps and agitator, if used.

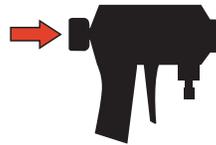
4. Route fluid to waste containers or supply tanks. Turn PRESSURE RELIEF/SPRAY valves (SA, SB) to PRESSURE RELIEF/CIRCULATION



Ensure gauges drop to 0.



5. Engage gun piston safety lock.

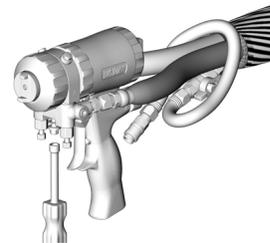


Fusion



Probler

6. Disconnect gun air line and remove gun fluid manifold.



Shutdown



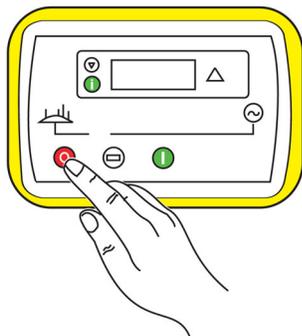
Shutdown system to avoid electric shock. All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop spraying and before cleaning, checking, or servicing equipment.

Immediate Shutdown

NOTICE

To avoid system damage, follow daily shutdown procedure. Use only for immediate shutdown.

For immediate shutdown, press:

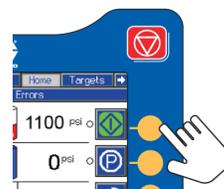


Daily Shutdown

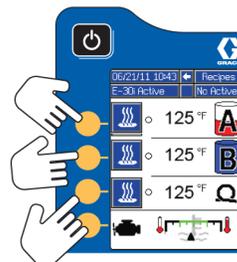
NOTICE

Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

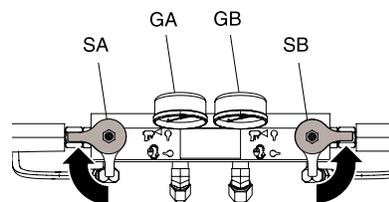
1. Press  to stop the pumps.



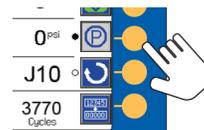
2. Turn off all heat zones.



3. Set PRESSURE RELIEF/SPRAY valves (SA, SB) to PRESSURE RELIEF/CIRCULATION .



4. Relieve pressure. See [Pressure Relief Procedure, page 60](#).
5. Press  to park the Component A Pump. The park operation is complete when green dot goes out. Verify the park operation is complete before moving to next step.

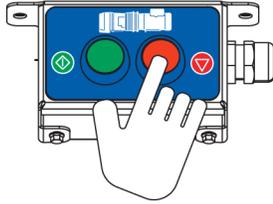


6. Press  to deactivate the system.

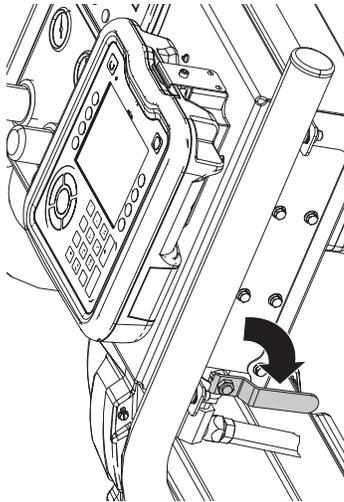


Shutdown

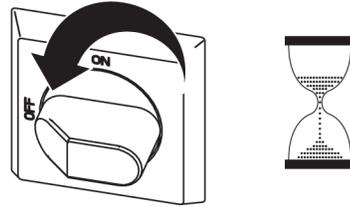
7. Turn off the air compressor, air dryer, and breathing air.



8. Close the main air shutoff valve.



9. Turn main power switch OFF. Allow engine cooling dwell time prior to shutting down the engine.



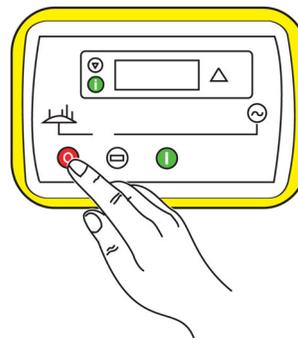
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To prevent electric shock do not remove any shrouds or open the electrical enclosure door. 240 V is still present in the system until the engine has stopped.

NOTICE

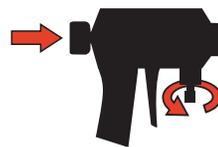
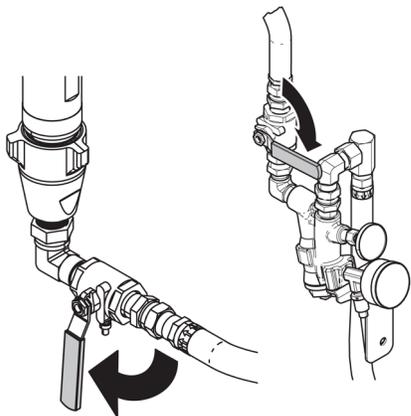
Allow engine cooling dwell time, per manufacturer recommendations, prior to shutdown. Dwell time will help engine properly cool down after running at operating temperature for any period of time. Stopping the engine immediately after running it at full load for an extended period of time can cause the engine to overheat due to the lack of coolant flow. See engine manual.

10. Press to stop the engine.

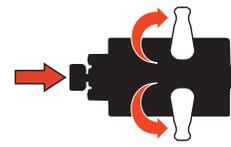


11. Close all fluid supply valves.

12. Engage gun piston safety lock then close fluid inlet valves A and B.



Fusion



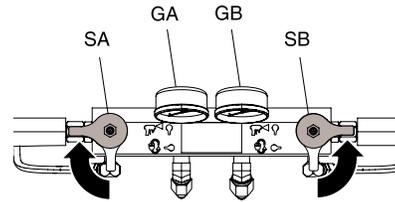
Probler

Flushing

					
<p>To avoid fire and explosion:</p> <ul style="list-style-type: none">• Flush equipment only in a well-ventilated area.• Do not turn on heaters until fluid lines are clear of solvent.• Flush out old fluid with new fluid, or flush out old fluid with a compatible solvent before introducing new fluid.• Use the lowest possible pressure when flushing.• All wetted parts are compatible with common solvents. Use only moisture-free solvents.					

To flush feed hoses, pumps, and heaters separately from heated hoses, set PRESSURE RELIEF/SPRAY valves (SA, SB) to PRESSURE

RELIEF/CIRCULATION . Flush through bleed lines (N).



To flush entire system, circulate through gun fluid manifold (with manifold removed from gun).

To prevent moisture from reacting with isocyanate, always leave the system filled with a moisture-free plasticizer or oil. Do not use water. Never leave the system dry. See [Important Isocyanate Information, page 9](#).

Repair

					
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Repairing this equipment requires access to parts that may cause electric shock or other serious injury if work is not performed properly. Be sure to shut off all power to equipment before repairing.

Before Beginning Repair

NOTICE
Proper system setup, startup, and shutdown procedures are critical to electrical equipment reliability. The following procedures ensure steady voltage. Failure to follow these procedures will cause voltage fluctuations that can damage electrical equipment and void the warranty.

1. Flush if necessary. See [Flushing, page 64](#).
2. See [Shutdown, page 61](#).

Flush Inlet Strainer Screen

					
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The inlet strainers filter out particles that can plug the pump inlet check valves. Inspect the screens daily as part of the startup routine, and clean as required.

Isocyanate can crystallize from moisture contamination or from freezing. If the chemicals used are clean and proper storage, transfer, and operating procedures are followed, there should be minimal contamination of the A-side screen.

Note

Clean the A-side screen only during daily startup. This minimizes moisture contamination by immediately flushing out any isocyanate residue at the start of dispensing operations.

1. Close the fluid inlet valve at the pump inlet and shut off the appropriate feed pump. This prevents material from being pumped while cleaning the screen.
2. Place a container under the strainer base to catch drain off when removing the strainer plug (C).
3. Remove the screen (A) from the strainer manifold. Thoroughly flush the screen with compatible solvent and shake it dry. Inspect the screen. No more than 25% of the mesh should be restricted. If more than 25% of the mesh is blocked, replace the screen. Inspect the gasket (B) and replace as required.
4. Ensure the pipe plug (D) is screwed into the strainer plug (C). Install the strainer plug with the screen (A) and gasket (B) in place and tighten. Do not overtighten. Let the gasket make the seal.
5. Open the fluid inlet valve, ensure that there are no leaks, and wipe the equipment clean. Proceed with operation.

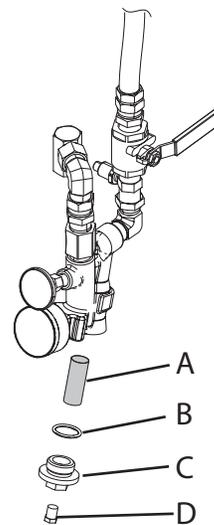


Figure 3

Drain Coolant

<p>To avoid burns, do not perform maintenance on the coolant system until the coolant system has reached ambient temperature.</p>					

Drain coolant from the engine and proportioner coolant loops once a year or if the coolant lines need to be disconnected, in order to install a wall between the generator and proportioner.

1. Perform [Shutdown](#), page 61.
2. Open the cabinet door on the front of the proportioner.
3. Turn on manual valve switch (MV), located on the load center (LC), to manually open the A and B heat exchanger control valves and bypass control valve.

Note

The 12V battery must be connected to operate valves. The load center (LC) LEDs will stay on when the manual valve switch (MV) is in the on position.

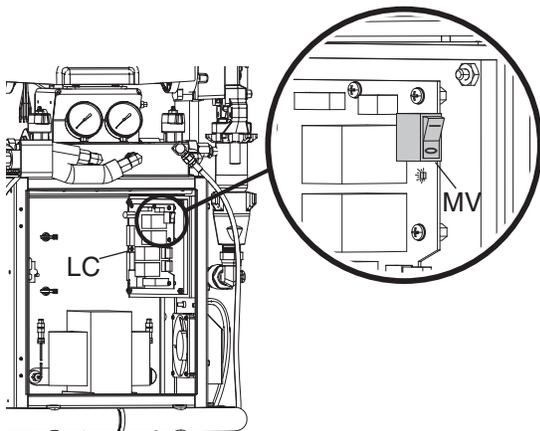
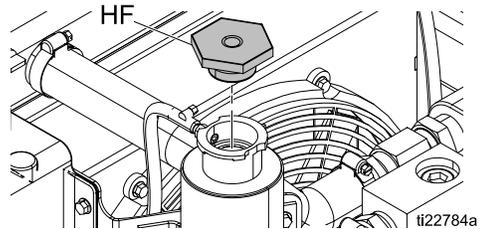


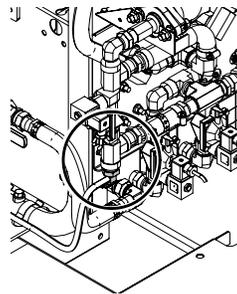
Figure 4

LED Component	LED Color
Manual valve switch (MV)	Red
A Side Control Valve	Red
B Side Control Valve	Blue
Bypass Valve	Green

4. To drain proportioner coolant loop:
 - a. Remove the proportioner coolant loop fill bottle (HF) cap.



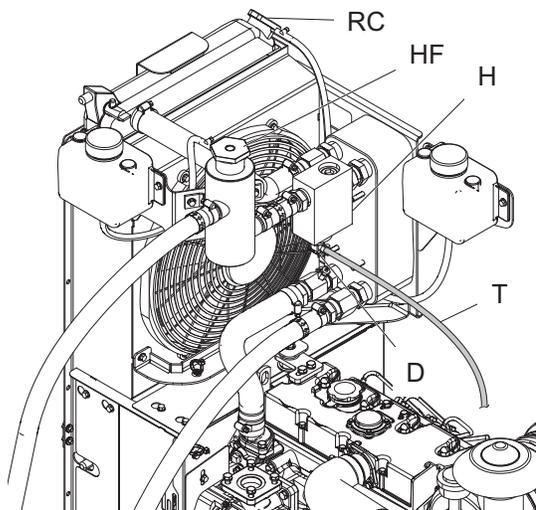
- b. Place the other end of the drain tube in a waste container. Open the drain valve. Drain coolant until coolant is no longer visible in the sight glass.



Proportioner Coolant Loop Drain Valve
Figure 5

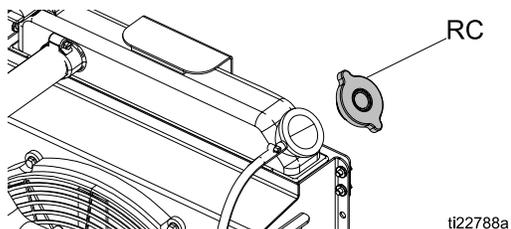
- c. To refill coolant loop, see [Refill Proportioner Coolant Loop](#), page 68.

5. To drain proportioner coolant loop from filter housing. Only available on Series B systems.
 - a. Remove the proportioner coolant loop fill bottle cap (HF).

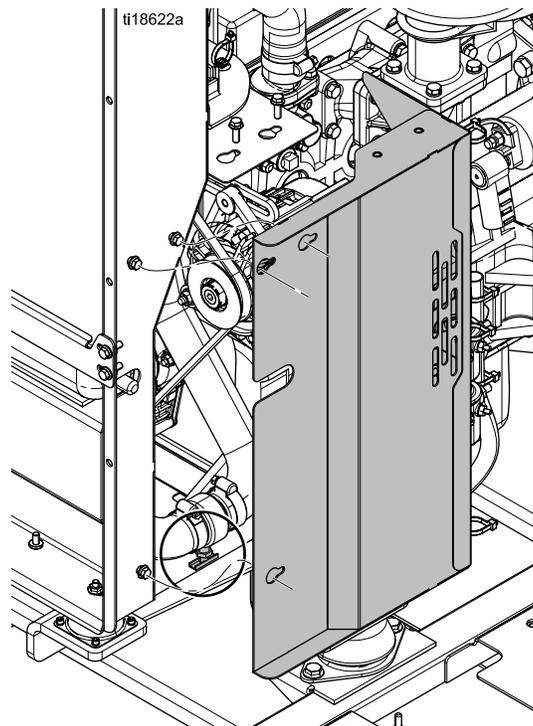


Filter Housing Drain Valve (D)
Figure 6

- b. Place the other end of the filter housing drain tube (T) in a waste container. Open the drain valve (D).
 - c. To refill coolant loop, see [Refill Proportioner Coolant Loop, page 68](#).
6. To drain engine coolant loop:
 - a. Remove the engine coolant loop (RC) cap.



- b. Remove engine guards as shown. Let the guards rest on the engine to access the drain valve.



Engine Coolant Loop Drain Valve
Figure 7

- c. Place a waste container under the drain valve. Open the drain valve and drain coolant.
 - d. To refill coolant loop, see [Refill Engine Coolant Loop, page 69](#).
 - e. Replace engine shrouds. Torque screws to 25 ft-lbs (33.8 N•m).

Refill Proportioner Coolant Loop

Purge air from proportioner coolant loop when it is filled with new coolant or when air enters the coolant system.

Note

It takes about one full warm-up and cool-down cycle to purge air from coolant.

					
<p>To avoid burns, do not perform maintenance on the coolant system until the coolant system has reached ambient temperature.</p>					

Only use coolant solutions that are compatible with the system. See [Coolant Specifications, page 70](#).

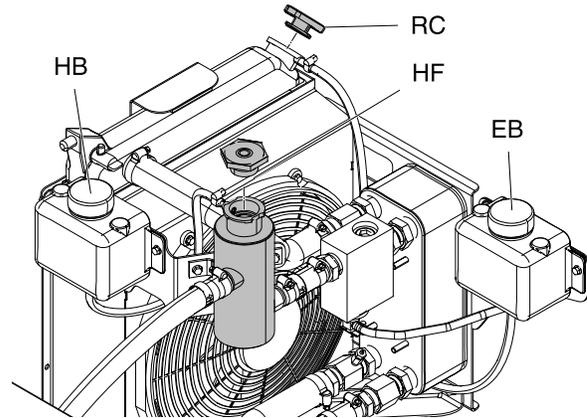
<p>NOTICE</p> <p>Do not refill with drained coolant. Use only fresh, new coolant to avoid contaminants.</p>
--

<p>NOTICE</p> <p>Do not use any “stop leak” additives to prevent plugged filters and small orifices.</p>

1. Before refilling coolant loop, perform steps 1–3 from [Drain Coolant, page 66](#). Drain coolant loop if necessary.

<p>NOTICE</p> <p>To prevent leaks, do not interchange the two caps between the radiator and coolant bottle. The caps have different pressure ratings that affect the overflow.</p>

2. Remove the caps from the metal proportioner coolant loop fill bottle (HF) and expansion bottle (HB). Fill the proportioner coolant loop fill bottle (HF) to the top and add more coolant to expansion bottle (HB) until the coolant is at the cold fill line. See [Coolant Specifications, page 70](#).



Coolant System Bottles
Figure 8

3. Replace cap and tighten past the safety latch position.

4. Press start button  twice on the engine control module.
5. Turn main power switch on.



6. Inspect coolant flow in sight glass (SG) for bubbles and to verify that the coolant is flowing.
7. Inspect coolant loops for leaking fittings or valves.
8. The coolant has reached operating temperature when the radiator fan turns on. When the fan turns on, turn the main power switch off.



9. Press  to stop the generator.
10. After the coolant system temperature lowers to ambient temperature, refill or add coolant to the expansion bottle (HB) cold level indicator line.
11. Turn off manual valve switch (MV) to close the A and B heat exchanger control valves (VA, VB) and bypass control valve (VC).

Note

When the manual valve switch (MV) is in the off position, the load center (LC) LEDs only turn on when the system opens the valves.

12. If necessary, refill or add coolant to the expansion bottle (HB) cold level indicator line. See [Fig 8](#).

Refill Engine Coolant Loop

Refill the engine coolant loop when the coolant is below the cold level line at ambient temperature.

					
To avoid burns, do not perform maintenance on the coolant system until the coolant system has reached ambient temperature.					

Only use coolant solutions that are compatible with the system. See [Coolant Specifications, page 70](#).

NOTICE

Do not refill with drained coolant. Use only fresh, new coolant to avoid contaminants.

NOTICE

Do not use any “stop leak” additives to prevent plugged filters and small orifices.

1. Perform [Shutdown, page 61](#).

NOTICE

To prevent leaks, do not interchange the two caps between the radiator and coolant bottle. The caps have different pressure ratings that affect the overflow.

2. Remove the engine radiator coolant cap (RC) and fill until the coolant reaches the bottom of the neck. See [Fig 8](#). Replace cap. See [Coolant Specifications, page 70](#).
3. Remove the cap from the engine coolant loop bottle (EB) and fill until the coolant is at the hot level. Replace cap.

4. Press start button  twice on the engine control module.
5. Turn main power switch on.



6. Inspect coolant loops for leaking fittings or valves.
7. The coolant has reached operating temperature when the radiator fan turns on. When the fan turns on, turn the main power switch off.



8. Press  to stop the generator.
9. Add more coolant to expansion bottle (EB) after the coolant system temperature lowers to ambient temperature. Repeat until coolant level stays at cold level when at ambient temperature. It may take a few cycles to remove all air out of coolant system.

Coolant Specifications

NOTICE

Do not refill with straight water or tap water. Changing the 50% mix ratio use of tap water will allow fittings to rust.

Only refill the coolant loops with a solution of 50% distilled or soft water and 50% green ethylene glycol antifreeze with a corrosion inhibitor. Do not use common tap water; it contains chlorides and minerals which form scale on the coolant system walls. Do not use any stop leak products. The additives in these products will clog the heat exchanger and fluid valves, decreasing system performance. Use only antifreeze that meets specification ASTM D3306–89, BS658, or AS 2108. A pre-diluted mix is recommended, such as PEAK Ready Use 50/50 Pre-Diluted.

Change Pump Lubricant

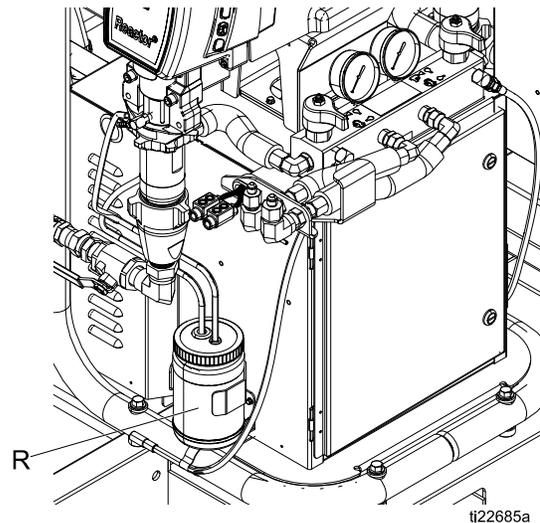
Check the condition of the ISO pump lubricant daily. Change the lubricant if it becomes a gel, its color darkens, or it becomes diluted with isocyanate.

Gel formation is due to moisture absorption by the pump lubricant. The interval between changes depends on the environment in which the equipment is operating. The pump lubrication system minimizes exposure to moisture, but some contamination is still possible.

Lubricant discoloration is due to continual seepage of small amounts of isocyanate past the pump packings during operation. If the packings are operating properly, lubricant replacement due to discoloration should not be necessary more often than every 3 or 4 weeks.

To change pump lubricant:

1. Follow [Pressure Relief Procedure](#), page 60.
2. Lift the lubricant reservoir (R) out of the bracket and remove the container from the cap. Holding the cap over a suitable container, remove the check valve and allow the lubricant to drain. Reattach the check valve to the inlet hose.
3. Drain the reservoir and flush it with clean lubricant.
4. When the reservoir is flushed clean, fill with fresh lubricant.
5. Thread the reservoir onto the cap assembly and place it in the bracket.
6. The lubrication system is ready for operation. No priming is required.



Pump Lubrication System
Figure 9

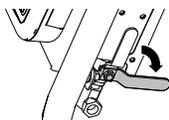
Remove Pump

					
<p>Pump rod and connecting rod move during operation. Moving parts can cause serious injury such as pinching or amputation. Keep hands and fingers away from connecting rod during operation.</p>					

Note

See manual 309577 for pump repair instructions.

1. Press  to stop the pumps.
2. Turn off heat zones.
3. Flush pump.
4. Press  to park the Component A Pump.
5. Press  to deactivate the system.
6. Turn off the air compressor, air dryer, and breathing air.
7. Close the main air shutoff valve.



8. Turn main power switch off.

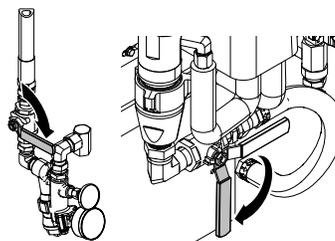


					
<p>To prevent electric shock do not remove any shrouds or open the electrical enclosure door. 240 V is still present in the system until the engine has stopped.</p>					

9. Allow engine dwell time.

NOTICE
<p>Allow engine dwell time, per manufacturer recommendations, prior to shutdown. Dwell time will help engine cool down after running at operating temperature for any period of time.</p>

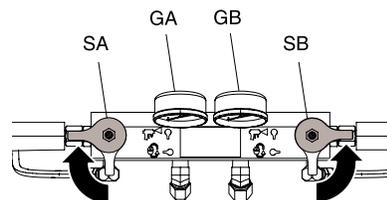
10. Press  on the engine control module.
11. Open air compressor bleed valve to relieve pressure and remove water from tank.
12. Shut off both feed pumps. Close all fluid supply valves.



13. Route fluid to waste containers or supply tanks. Turn PRESSURE RELIEF/SPRAY valves (SA, SB) to PRESSURE RELIEF/CIRCULATION



. Ensure gauges drop to 0.



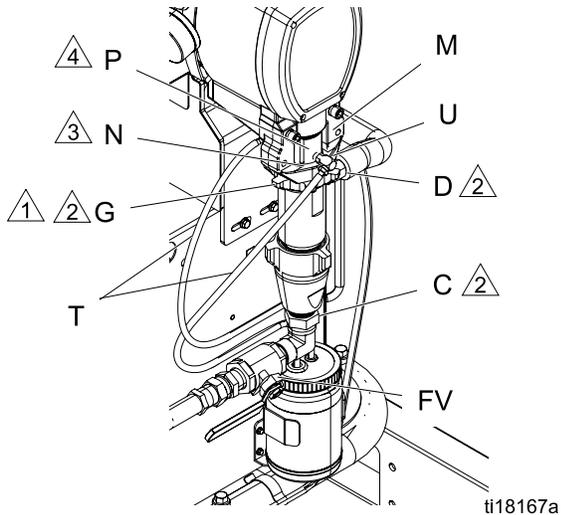
Note

Use drop cloth or rags to protect Reactor and surrounding areas from spills.

Note

Steps 14–16 apply to pump A. To disconnect pump B, go to steps 17 and 18.

14. Disconnect fittings at fluid inlet (C) and outlet (D). Also disconnect steel outlet tube from heater inlet.
15. Disconnect tubes (T). Remove both tube fittings (U) from wet-cup.
16. Loosen locknut (G) by hitting firmly with a non-sparking hammer. Unscrew pump far enough to expose rod retaining pin. Push retaining wire clip up. Push pin out. Continue unscrewing pump.



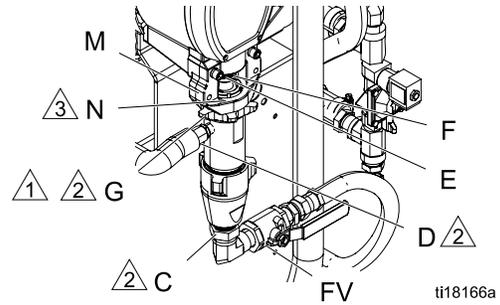
Pump A
Figure 10

- 1 Flat side faces up.
- 2 Lubricate threads with ISO oil or grease.
- 3 Pump top threads must be nearly flush with bearing face (N).

Note

Steps 17 and 18 apply to pump B.

17. Disconnect fluid inlet (C) and outlet (D). Also disconnect steel outlet tube from heater inlet.
18. Push retaining wire clip (E) up. Push pin (F) out. Loosen locknut (G) by hitting firmly with a non-sparking hammer. Unscrew pump.



Pump B
Figure 11

- 1 Flat side faces up.
- 2 Lubricate threads with ISO oil or grease.
- 3 Pump top threads must be nearly flush with bearing face (N).

Install Pump

Note

Steps 1–5 apply to pump B. To reconnect pump A, proceed to step 6.

1. Ensure locknut (G) is screwed on pump with flat side up. Screw pump into bearing housing (M) until pin holes align. Push pin (F) in. Pull retaining wire clip (E) down. See Fig. 11, page 54 for view and assembly notes.
2. Continue screwing pump into housing until fluid outlet (D) is aligned with steel tube and top threads are +/- 1/16 in. (2 mm) of bearing face (N).
3. Tighten locknut (G) by hitting firmly with a non-sparking hammer.
4. Reconnect fluid inlet (C) and outlet (D).
5. Go to step 13.

Note

Steps 6–12 apply to pump A only.

6. Ensure star-shaped locknut (G) is screwed on pump with flat side up. Carefully twist and extend displacement rod 2 in. (51 mm) above wet-cup.
7. Start threading pump into bearing housing (M). When pin holes align, insert pin. Pull retaining wire clip down.
8. Continue threading pump into bearing housing (M) until top threads are +/- 1/16 in. (2 mm) of bearing face (N). Ensure that barbed fittings at wet-cup flush ports are accessible.

9. Connect component A outlet tube loosely at pump and at heater. Line up tube, then tighten fittings securely.
10. Tighten star-shaped locknut (G) by hitting firmly with a non-sparking hammer.
11. Apply thin film of TSL to barbed fittings. Using two hands, support tubes (T) while pushing straight onto barbed fittings. Secure each tube with a wire tie between two barbs.

Note

Do not let tubes kink or buckle.

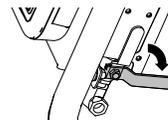
12. Reconnect fluid inlet (C).
13. Purge air and prime the system. See Reactor operation manual.

Repair Drive Housing

Removal

1. Press  to stop the pumps.
2. Turn off heat zones.
3. Flush pump.

4. Press  to park the Component A Pump.
5. Press  to deactivate the system.
6. Turn off the air compressor, air dryer, and breathing air.
7. Close the main air shutoff valve.



8. Turn main power switch off.



				
<p>To prevent electric shock do not remove any shrouds or open the electrical enclosure door. 240 V is still present in the system until the engine has stopped.</p>				

- Allow engine dwell time.

NOTICE

Allow engine dwell time, per manufacturer recommendations, prior to shutdown. Dwell time will help engine cool down after running at operating temperature for any period of time.

- Press  on the engine control module.
- Open air compressor bleed valve to relieve pressure and remove water from tank.
- Perform [Pressure Relief Procedure, page 60](#).
- Remove screws (294) and motor shield (293), see [Fig. 12](#).

Note

Examine bearing housing (303) and connecting rod (305). If these parts need replacing, first remove the pump (315), see [Remove Pump, page 71](#).

- Remove cover (74) and screws (75).
- Remove cycle switch (321) from A side drive housing. Remove screws (322) and cycle switch (321).
- Disconnect pump inlet and outlet lines. Remove screws (313), washers (314), and bearing housing (303).

NOTICE

Do not drop gear cluster (304) when removing drive housing (302). Gear cluster may stay engaged in motor front end bell (R) or drive housing.

- Remove screws (312) and pull drive housing (302) off motor (301).

Note

The A side drive housing includes cycle counter switch (321). Switch wire connects to port #12 on the MCM.

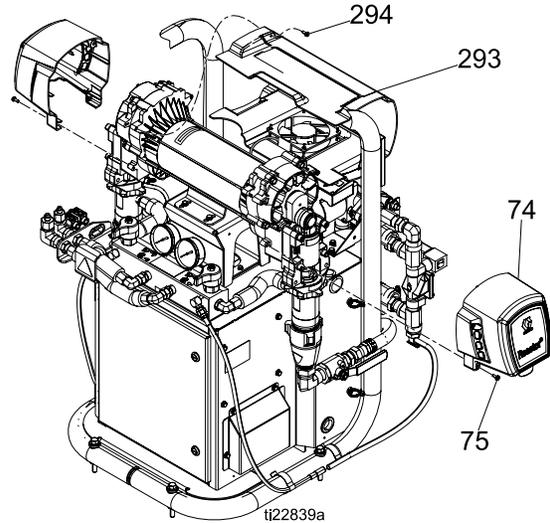


Figure 12

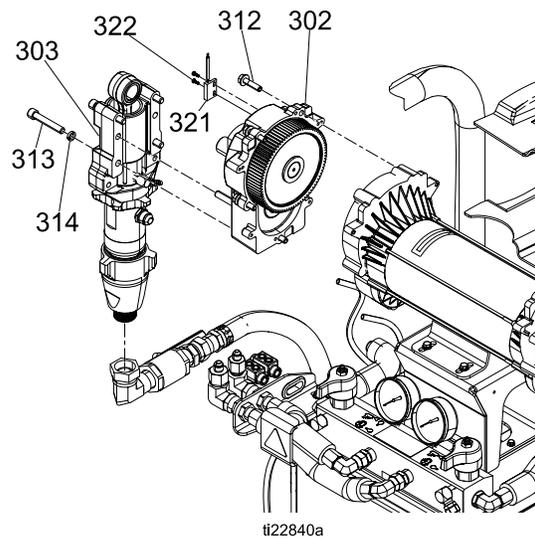


Figure 13

Installation

- Apply grease liberally to washers (307, 308, 318), all gears, and inside drive housing (302).
- Install one bronze washer (308) in drive housing, then install steel washers (307, 318) as shown.
- Install second bronze washer (308) on gear cluster (304) and insert gear cluster in drive housing.

Note

Drive housing crankshaft must be in line with crankshaft at other end of motor. See [Fig. 13, page 56](#).

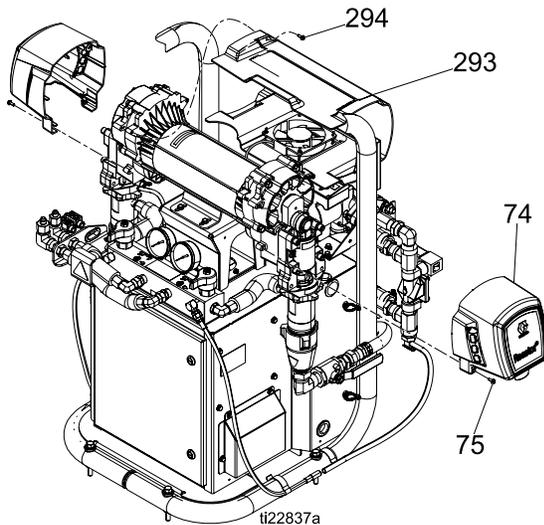
Repair Electric Motor

Removal

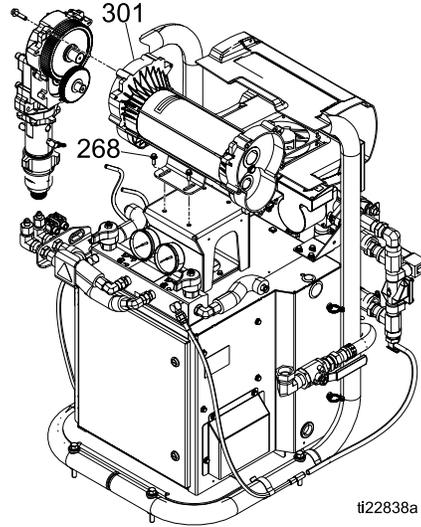
NOTICE

Be careful not to drop or damage the motor. The motor is heavy and may require two people to lift.

1. Remove drive housing and pump assemblies. See [Repair Drive Housing, page 73](#).
2. Disconnect electric motor (301) power cable from port #15 on the MCM.
3. Remove screws (294) and motor shield (293). Rest motor shroud assembly behind the motor without straining the fan power cable.



4. Disconnect over temperature cable from port #2 on MCM. Cut tie wraps around harness to remove cable.
5. Remove four screws (268) holding motor (301) to bracket. Lift motor off unit.



Installation

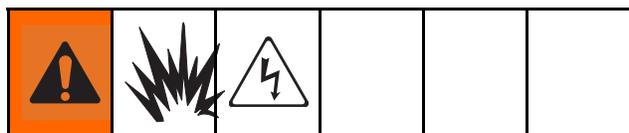
1. Place motor on unit. Thread motor cables into conduit as before. See [Electrical Schematics, page 154](#).
2. Fasten motor (301) with screws (268) until screws are fully threaded in mounting bracket. Do not tighten screws until drive housing and pumps are connected to the motor.

Note

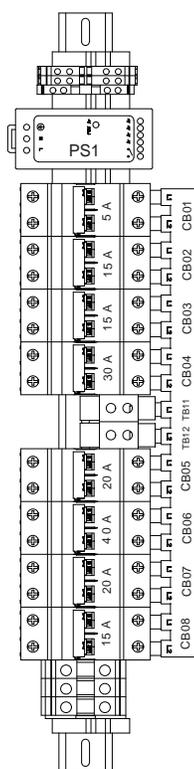
If necessary, loosen screws (268) to align the motor (301) with side brackets.

3. Install drive housing and pump assemblies, see [Installation, page 74](#).
4. Route motor (301) power cable from motor through top port into Reactor cart, through back port out of the Reactor, through cord grip (518), and into the electrical enclosure. Connect to port #15 on MCM. Use tie wraps to secure power cable to other cables on pallet.
5. Install drive housing covers and motor cover.
6. Return to service.

Repair Circuit Breaker Module



1. See [Before Beginning Repair, page 65](#).
2. Using an ohmmeter, check for continuity across circuit breaker (left to right). If no continuity, trip breaker, reset, and retest. If still no continuity, replace breaker as follows:
 - a. Refer to [Electrical Schematics, page 154](#), and tables on next page.
 - b. Follow Shutdown instructions. See [Shutdown, page 61](#).
 - c. Refer to circuit breaker identification table and electrical diagrams in Reactor repair manual.
 - d. Loosen four screws connecting wires and bus bar to circuit breaker that will be replaced. Disconnect wires.
 - e. Pull locking tab out 1/4 in. (6mm) and pull circuit breaker away from the din rail. Install new circuit breaker. Insert wires and tighten down all screws.

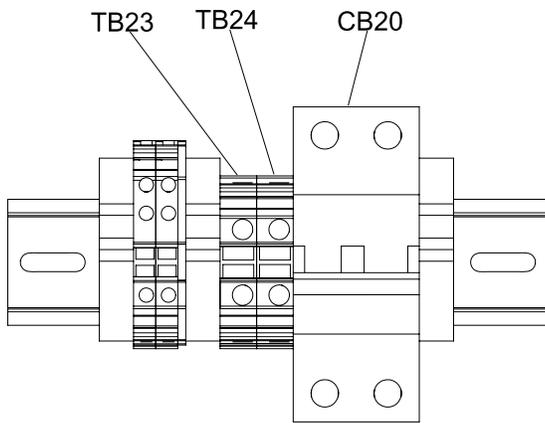


Circuit Breakers
Figure 15

Ref.	Size	Component
CB01	5 A	Power Supply, Fan, Coolant Pump
CB02	15 A	Boost Heat A
CB03	15 A	Boost Heat B

Ref.	Size	Component
CB04	30 A	Hose Heat
CB05	20 A	Motor Control
CB06*	40 A	Air Compressor/Open
CB07*	20 A	Open
CB08*	15 A	Air Dryer/Open

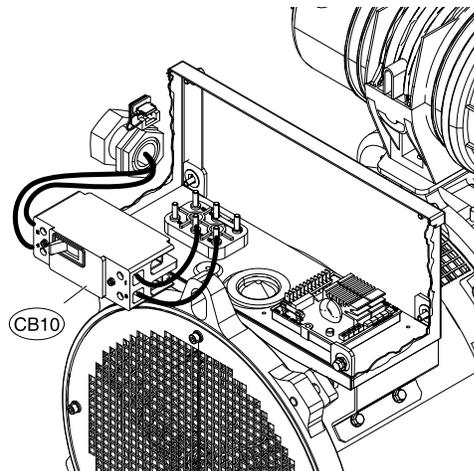
Repair



ti23039a

Circuit Breakers Inside Cabinet
Figure 16

Ref.	Size	Component
CB20	50 A	Heated Hose



Circuit Breakers Inside Alternator Assembly
Figure 17

Ref.	Size	Component
CB10	90 A	120/240V Alternator

Replace Load Center Relays and Fuses

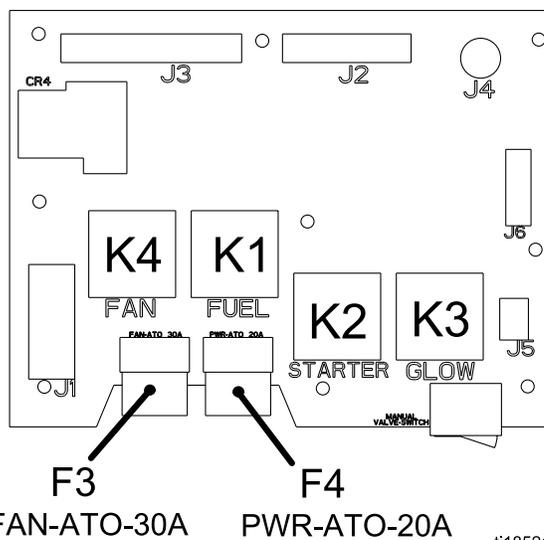


1. Disconnect the negative lug from the negative post of the battery. See [Replace Battery, page 97](#).
2. Remove the bad relay or fuse from the load center (242) and install a new relay or fuse. See [Fig. 18](#).
3. Connect battery cable. See [Replace Battery, page 97](#).

Relay and Fuse Identification Table

See [Load Center Wiring Diagram, page 163](#).

Repair Kit	Ref	Component
24L958	K1	Fuel Relay
	K2	Starter Relay
	K3	Glow Plug Relay
	K4	Fan Relay
24L959	F3 FAN-ATO - 30A	Fuse for load center relay K4 and radiator fan.
	F4 PWR-ATO - 20A	Fuse for load center relays K1, K2, K3 and their related components; Engine Control Module power; and coolant valve control.



Load Center Relay and Fuse Identification
Figure 18

ti18521a

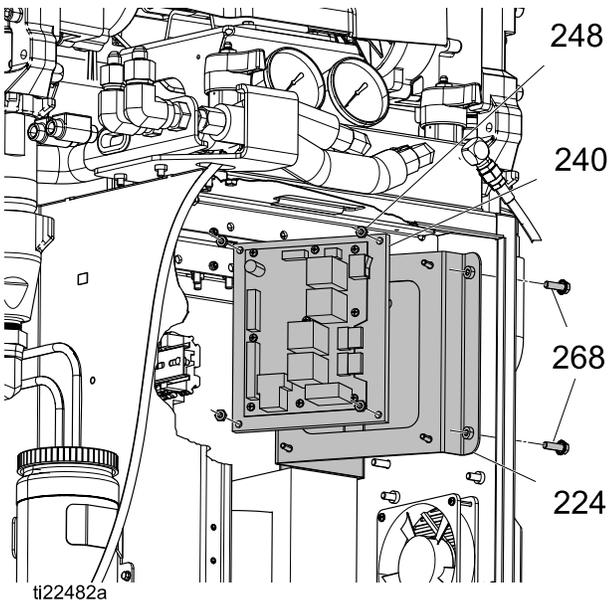
Replace Load Center



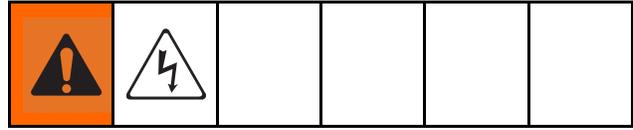
NOTICE

Before handling board, put on a static conductive wrist strap to protect against static discharge which can damage board. Follow instructions provided with wrist strap.

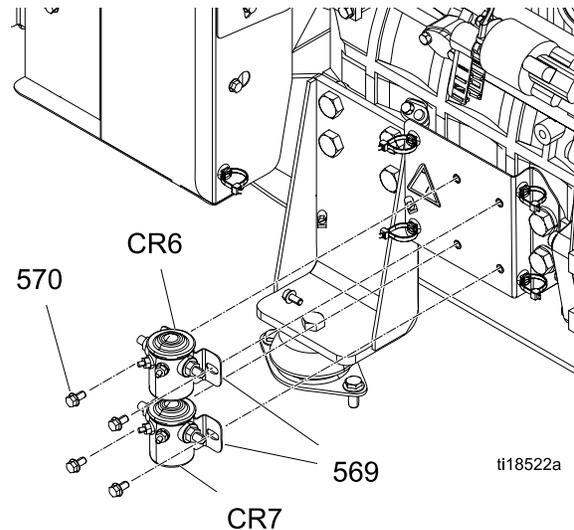
1. Perform [Shutdown](#), page 61.
2. Disconnect the negative lug from the negative post of the battery. See [Replace Battery](#), page 97
3. Disconnect all connectors. See [Load Center Wiring Diagram](#), page 163.
4. Remove four nuts (248), and load center (240).
5. Install new load center (240) and reconnect all connectors. See [Load Center Wiring Diagram](#), page 163.
6. Connect battery cable. See [Replace Battery](#), page 97.



Replace Engine Solenoid Relays



1. Perform [Shutdown](#), page 61.
2. Disconnect the negative lug from the negative post of the battery. See [Replace Battery](#), page 97.
3. Remove two bolts (570) and solenoid relay (569). The starter solenoid relay (CR6) is above the glow plug solenoid relay (CR7).
4. Disconnect cables from the old relay and connect to the new relay. See [Load Center Wiring Diagram](#), page 163.



Starter (top) and Glow Plug (bottom) Solenoid Relays
Figure 19

Replace Fluid Inlet Sensor

1. Perform [Shutdown](#), page 61.
2. Perform [Pressure Relief Procedure](#), page 60.
3. Disconnect inlet sensor cable from the fluid inlet assembly. Inspect cable for damage and replace if necessary. See [Electrical Schematics](#), page 154.

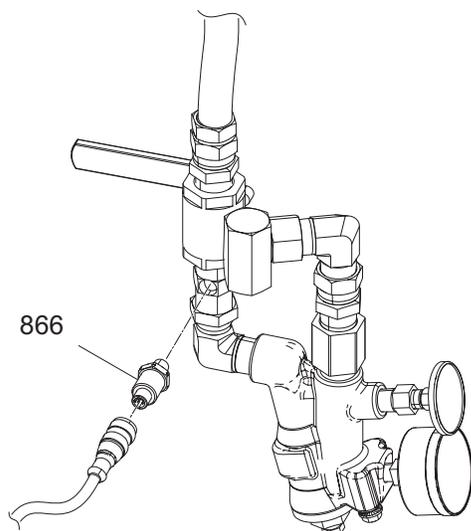


Figure 20 Fluid Inlet Sensor

4. To replace sensor cable:
 - a. Open wire bundle and remove sensor cable.
 - b. Cut any wire ties and disconnect from MCM. See [Electrical Schematics](#), page 154.

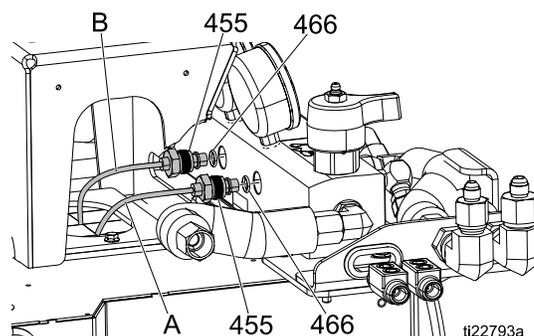
NOTICE

To prevent damage to cable, route and secure cable in wire bundle and wire ties as before.

5. Replace sensor (866).

Replace Pressure Transducers

1. Perform [Shutdown](#), page 61.
2. Perform [Pressure Relief Procedure](#), page 60.
3. Disconnect transducer cables (455) from #6 and #7 connectors on the MCM. Reverse A and B connections and check if error code P6AX or P6BX follows the transducer. See [Error Codes](#).
4. If transducer fails test, thread cable through top of cabinet. Note path as cable must be replaced in same way.
5. Install o-ring (466) on new transducer (455).
6. Install transducer in manifold. Mark end of cable with tape (red=transducer A, blue=transducer B).
7. Route cable into cabinet and thread into bundle as before.
8. Connect A side pressure transducer cable to MCM port #6. Connect B side pressure transducer cable to MCM port #7.



Replace Fans

					
<p>Shutdown system to avoid electric shock. To avoid burns, do not perform maintenance on the fan until the system has reached ambient temperature.</p>					

Replace Motor Fan

1. Perform [Shutdown, page 61](#).
2. Remove eight screws (75) and covers (74).
3. Remove four screws (294) and cover (293).
4. Refer to [Electrical Schematics, page 154](#). Check connections of all wires going to terminal blocks TB21 and TB22. Verify that all screws are tight. Using a voltmeter, check for 24 volts DC across TB21(+) and TB22(-). Replace cable (22), if zero volts are read. If volts are correct and fan doesn't spin, replace fan.
5. Remove nuts (292) and fan (212).
6. Install new fan (212) in reverse order.

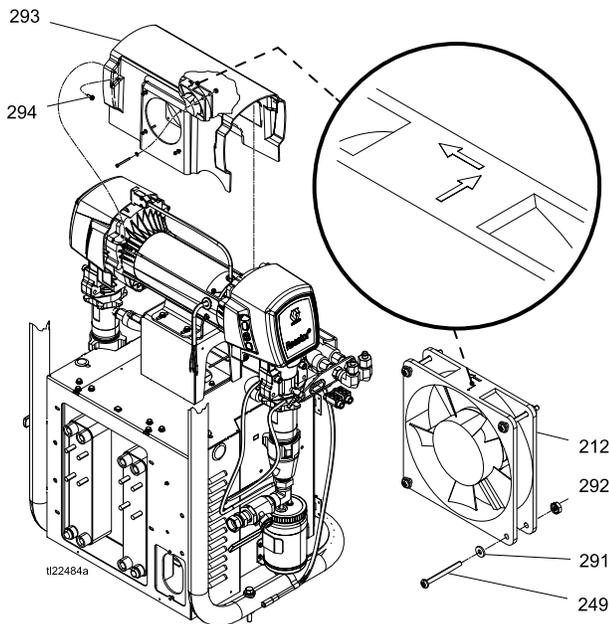


Figure 21

Replace Proportioner Module Fan

1. Perform [Shutdown, page 61](#).
2. Remove cabinet panel (70).
3. Refer to [Electrical Schematics, page 154](#). Check connections of all wires going to terminal blocks TB21 and TB22. Verify that all screws are tight. Using a voltmeter, check for 24 volts DC across TB21(+) and TB22(-). Replace cable (22), if zero volts are read. If volts are correct and fan doesn't spin, replace fan.
4. Remove fan (212).
5. Install new fan (212) in reverse order of disassembly.

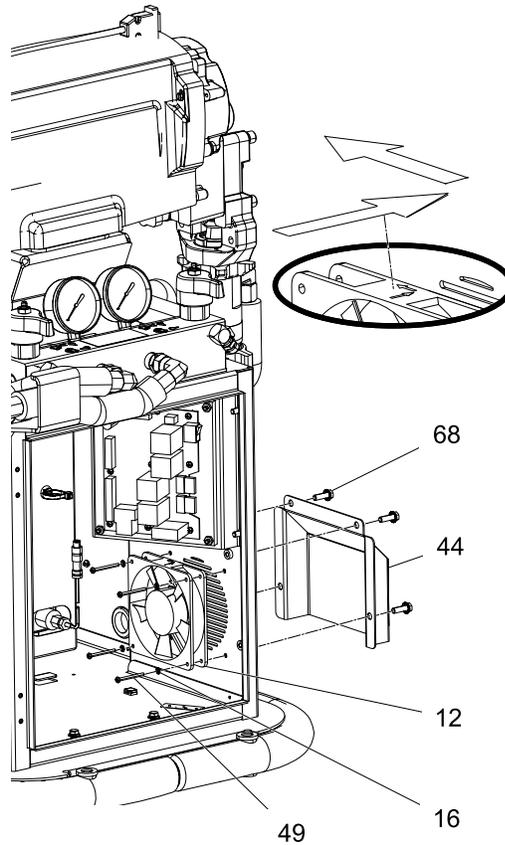


Figure 22

Replace Radiator Fan

1. Perform [Shutdown, page 61](#).
2. Remove four screws (605) and disconnect power cable (PC).
3. Install new fan (605) to radiator bracket (601) with screws (605).

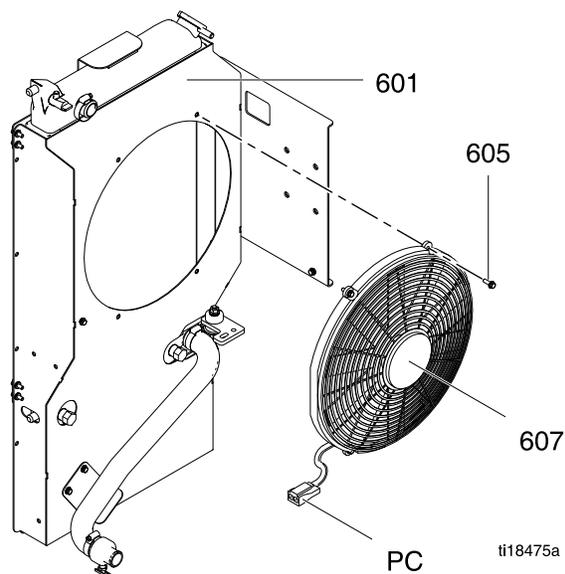


Figure 23

Replace Electrical Enclosure Fan

1. Perform [Shutdown, page 61](#).
2. Open electrical enclosure door (502). Loosen four nuts (558) and remove fan (561).
3. Refer to [Electrical Schematics, page 154](#). Check connections of all wires going to terminal blocks TB13, TB14, and power supply PS1. Verify that all screws are tight. Using a voltmeter, check for 24 volts DC across TB13(+) and TB14(-). Replace power supply PS1 (515), if zero volts are read. If volts are correct and fan doesn't spin, replace fan.
4. Install new fan (561) in reverse order of disassembly so that the fan blows out of the electrical enclosure.

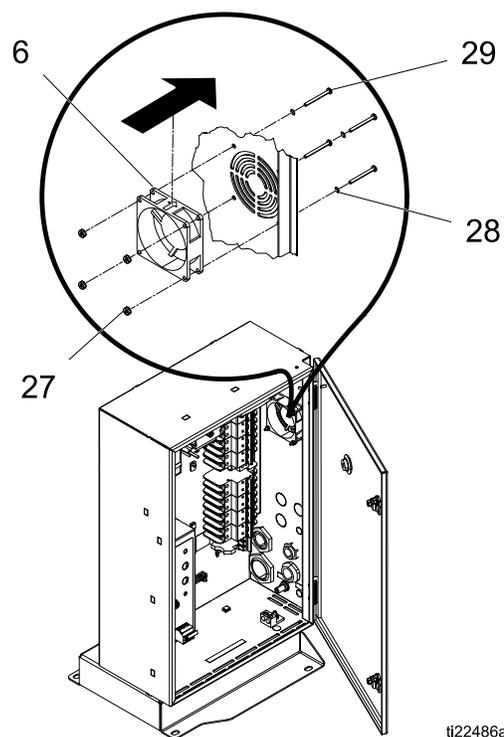


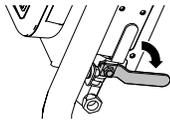
Figure 24

Repair Booster Heater

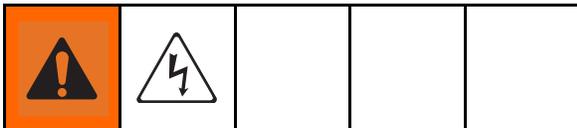
Replace Heater Element



1. Press  to stop the pumps.
2. Turn off heat zones.
3. Flush pump.
4. Press  to park the Component A Pump.
5. Press  to deactivate the system.
6. Turn off the air compressor, air dryer, and breathing air.
7. Close the main air shutoff valve.



8. Turn main power switch off.



To prevent electric shock do not remove any shrouds or open the electrical enclosure door. 240 V is still present in the system until the engine has stopped.

9. Allow engine dwell time.

NOTICE

Allow engine dwell time, per manufacturer recommendations, prior to shutdown. Dwell time will help engine cool down after running at operating temperature for any period of time.

10. Press  on the engine control module.
11. Open air compressor bleed valve to relieve pressure and remove water from tank.
12. Perform [Pressure Relief Procedure, page 60](#).
13. Wait for heater to cool.
14. Remove heater shroud (266).
15. Disconnect heater element wires from heater wire connector. Test with ohmmeter.

Total Heater Wattage	Element	Ohms
4,000	2000	23-26.5

Note

The A-side heater element is located in the booster heater end nearest the B-side pump and the B-side heater element is located near the A-side pump.

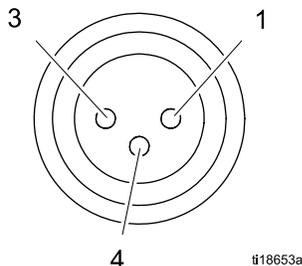
16. To remove heater element, first remove RTD (360) to avoid damage. See step 7, [Replace RTD, page 85](#).
17. Remove heater element (357) from housing (351). Be careful not to spill any fluid left in housing. See [Fig. 25](#).
18. Inspect element. It should be relatively smooth and shiny. If there is a crusted, burnt, ash-like material adhered to element or sheath shows pitting marks, replace element.
19. Install new heater element (357), holding mixer (359) so it does not block RTD port (P).
20. Reinstall RTD (360), [Replace RTD, page 85](#).
21. Reconnect heater element leadwires to heater wire connector.
22. Replace heater shroud (266).

Line Voltage

The heater outputs its rated wattage at 240 VAC. Low line voltage will reduce power available and the heater will not perform at full capacity.

Repair Overtemperature Switch

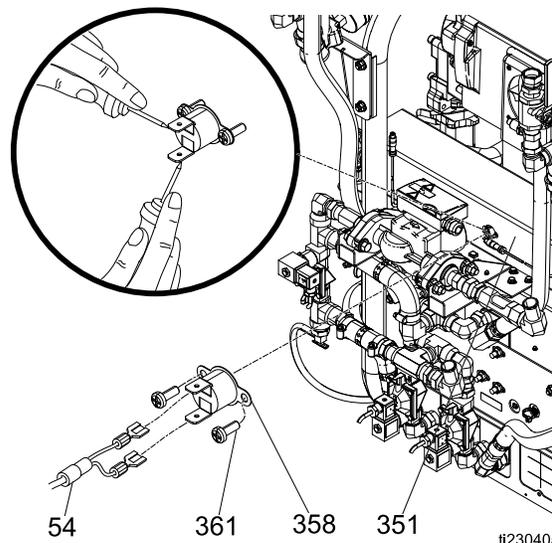
1. Perform [Shutdown, page 61](#).
2. Wait for booster heater to cool.
3. Remove heater shroud.
4. Verify blue wire and brown/black wires from cable (54) "HTR-OT" are connected to overtemperature switch (358). See [Electrical Schematics, page 154](#).
5. Disconnect overtemperature switch (358) from cable (54). Test across quick connect terminals with an ohmmeter.
 - a. If the resistance is **not** approximately 0 ohms, the overtemperature switch needs to be replaced. Go to step 6.
 - b. If the resistance is approximately 0 ohms, test the cable to ensure it is not cut or open. Reconnect the overtemperature switch and cable. Disconnect the cable from the overtemperature port on the TCM. Test from pin 1 to pin 3 and pin 1 to pin 4 on cable (54) "HTR-OT". Resistance should be approximately 0 ohms.



Note

The cable may have failed if one or both of the readings is above approximately 0 ohms. If the readings is approximately 0 ohms, then there may have been a bad connector/connection causing the problem.

6. If switch fails test, remove screws. Discard failed switch. Apply a thin layer of thermal compound 110009, install new switch in same location on housing (351), and secure with screws (361). Reconnect cables.

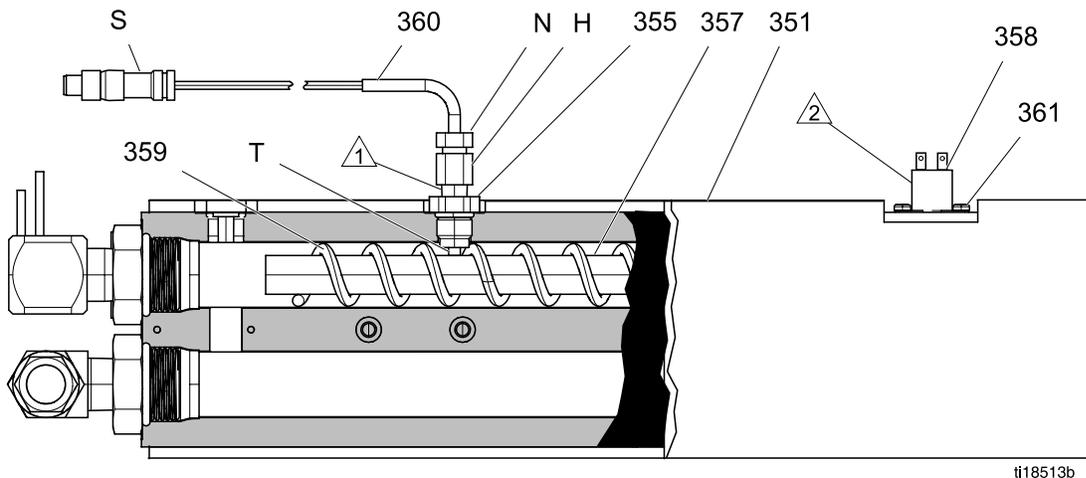


Replace RTD

1. Perform [Shutdown, page 61](#).
2. Wait for heater to cool.
3. Remove heater shroud (266) and heater guards (299, 300).
4. B Side RTD:
 - a. Follow "HT-RTD-B" RTD cable (360) and open split loom about 18 in. (457.2 mm) away from the heater attachment. Disconnect "HT-RTD-B TCM" and "HT-RTD-B" connectors. See [Electrical Schematics, page 154](#).
 - b. Visually inspect "HT-RTD-B" connector and replace extension cable (58) if necessary. Continue to next step if the extension cable connector is not damaged.
 - c. Visually inspect "TCM-A HT-RTD-B" connection to TCM. Continue to next step to replace RTD (360).
5. A side RTD:
 - a. Follow "HT-RTD-A" RTD cable (360) and open split loom about 18 in. (457.2 mm) away from the heater attachment. Disconnect "HT-RTD-A TCM" and "HT-RTD-A" connectors. See [Electrical Schematics, page 154](#).
 - b. Visually inspect "HT-RTD-A" connector and replace extension cable (58) if necessary. Continue to next step if the extension cable connector is not damaged.
 - c. Visually inspect "TCM-A HT-RTD-A" connection to TCM. Continue to next step to replace RTD (360).

Repair

6. Loosen ferrule nut (N). Remove RTD (360) from heater housing (351), then remove RTD housing (H). Do not remove the adapter (355) unless necessary. If adapter must be removed, ensure that mixer (359) is out of the way when replacing the adapter.
7. Replace RTD (360).
 - a. Apply PTFE tape and thread sealant to male pipe threads and tighten RTD housing (H) into adapter (355).
 - b. Push in RTD (360) so tip contacts heater element (357).
 - c. Holding RTD (360) against heater element, tighten ferrule nut (N) 3/4 turn past finger-tight.
8. Route wires (S) as before through split loom and reconnect RTD cable (360) to the B side extension cable (71) or the A side extension cable (58).
9. Replace heater shroud and heater guards.
10. Follow startup instructions in the operation manual. Turn on A and B heat simultaneously to test. Temperatures should rise at same rate. If one is low, loosen ferrule nut (N) and tighten RTD housing (H) to ensure RTD tip contacts element (357) when ferrule nut (N) is retightened.



ti18513b

Figure 25

Repair Heated Hose

Refer to the heated hose manual 309572 for hose replacement parts.

Check Hose Heat Connectors

1. Perform [Shutdown, page 61](#).

Note

Whip hose must be connected.

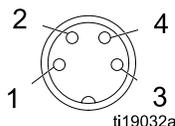
2. Disconnect hose connector (V) at Reactor, see [Fig. 26](#).
3. Using an ohmmeter, check between the connectors (V). There should be continuity.
4. If hose fails test, retest at each length of hose, including whip hose, until failure is isolated.

Check RTD Cables and FTS

1. Perform [Shutdown, page 61](#).
2. Disconnect RTD cable (C) at Reactor.
3. Test with an ohmmeter between pins of cable connector C.

Note

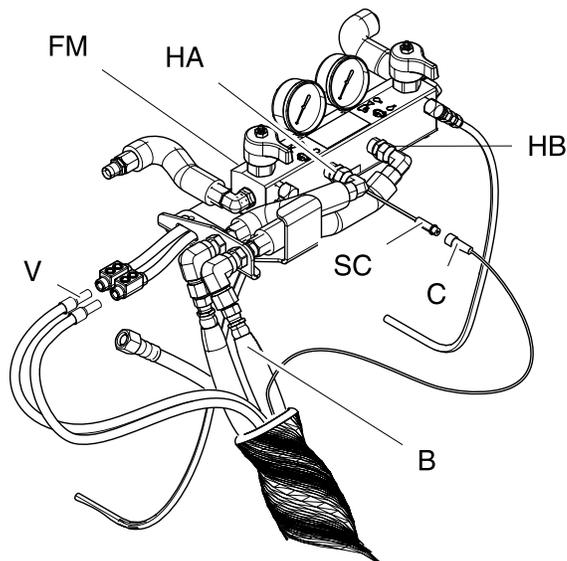
Do not touch outer ring with test probe.



Pins	Result
3 to 1	approximately 1090 ohms
3 to 4	approximately 1090 ohms
1 to 4	0.2 - 0.4 ohms
2 to any	infinity (open)

4. Retest at each length of hose, including whip hose, until failure is located.

5. If the FTS is not reading properly at the end of the hose, connect FTS directly to RTD cable (C) at the manifold.
6. If the FTS reads properly at the manifold but not at the end of the hose, check cable (C) connections. Verify they are tight.



Heated Hose
Figure 26

Note

To assist in taking readings, order RTD Test Kit 24N365. Kit includes two cables: one cable with a compatible female M8 connector and another cable with a male M8 connector. Both cables have stripped wire at the other end for easy test probe access.

Pins / Wire Color	Result
3 to 1 / brown to blue	approximately 1090 ohms
3 to 4 / blue to black	approximately 1090 ohms
1 to 4 / brown to black	0.2 - 0.4 ohms
2 to any / N/A	infinity (open)

Repair Fluid Temperature Sensor (FTS)

Installation

The Fluid Temperature Sensor (FTS) is supplied with the system. Install FTS between main hose and whip hose. See Heated Hose manual 309572 for instructions.

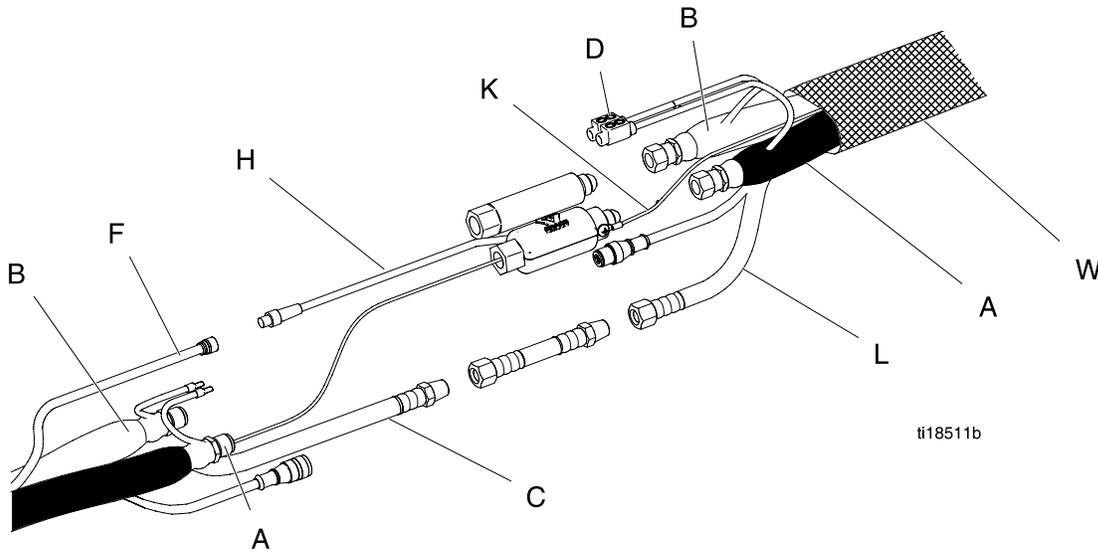


Figure 27

Test/Removal

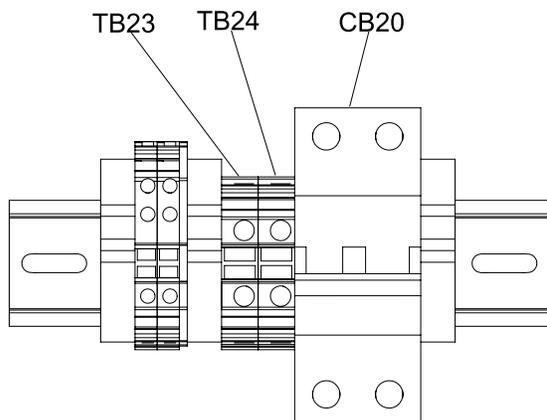
1. Perform [Shutdown](#), page 61.
 2. Remove tape and protective covering from FTS. Disconnect hose cable (F).
 3. If FTS is not reading properly at the end of the hose, see [Check RTD Cables and FTS](#), page 87.
 4. If FTS fails, replace FTS.
- a. Disconnect air hoses (C,L) and electrical connectors (D).
 - b. Disconnect FTS from whip hose (W) and fluid hoses (A, B).
 - c. Remove ground wire (K) from ground screw on underside of FTS.
 - d. Remove FTS probe (H) from component A (ISO) side of hose.

Transformer Primary Check

1. See [Shutdown, page 61](#).
2. Locate the two smaller (10 AWG) wires, labeled 1 and 2, coming out of transformer. Trace these wires back to terminal blocks TB23 and TB24. Use an ohmmeter to test for continuity between two wires; there should be continuity.

Transformer Secondary Check

1. See [Shutdown, page 61](#).
2. Locate the two larger (6 AWG) wires, labeled 3 and 4, coming out of transformer. Trace these wires back to circuit breaker CB20 (906). Open the circuit breaker to turn the color indicator on the circuit breaker GREEN. Use an ohmmeter to test for continuity between two transformer wires in circuit breaker terminals 1 and 3; there should be continuity.
3. Close the circuit breaker CB20 (906).



ti23039a

Figure 28

4. Confirm main power switch is off before starting generator.



5. Start the generator.

Press start button  twice on the engine control module. The controller will automatically sequence glow plug warming and crank operations. Allow engine to reach full operating speed.

Note

Engine will not start if main power switch is in the on position.

6. Turn main power switch on.



7. Press  to turn on hose heat zone.

				
<p>This equipment is used with heated fluid which can cause equipment surfaces to become very hot. To avoid severe burns:</p> <ul style="list-style-type: none"> • Do not touch hot fluid or equipment. • Allow equipment to cool completely before touching it. • Wear gloves if fluid temperature exceeds 110°F (43°C). • Do not turn on hose heat without fluid in hoses. 				

				
<p>Thermal expansion can cause overpressurization, resulting in equipment rupture and serious injury, including fluid injection. Do not pressurize system when preheating hose.</p>				

Repair

- To verify voltage on the secondary leads of the transformer, measure between the terminals 2 and 4 on CB20. This will verify the circuit breaker is working properly.

Model	Secondary Voltage
310 ft	90 Vac*
210 ft	62 Vac*

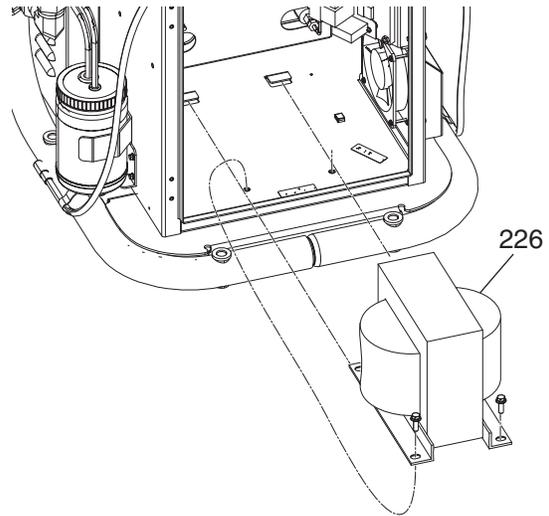
* For 240 Vac line voltage.

- See the Diagnostic Run Screen on the ADM. The Diagnostic Run Screen displays the incoming (240 Vac) to the TCM "Hose Voltage" and the hose current. The diagnostic screen will show if the circuit breaker has been tripped for the incoming power to the TCM.

11/11/13 11:31 ◀ Job Data Diagnostic Home ▶		
E-30i Active		No Active Errors
<u>Hx A Chem.</u>	<u>Hx B Chem.</u>	<u>CPM</u>
86 °F	87 °F	0
<u>Boost A Chem.</u>	<u>Boost E Chem.</u>	<u>Hose Chemical</u>
79 °F	79 °F	68 °F
<u>Boost A Current</u>	<u>Boost B Current</u>	<u>Hose Current</u>
0 A	0 A	0 A
<u>TCM PCB</u>		
71 °F		
<u>Pressure A</u>	<u>Pressure B</u>	<u>Hose Voltage</u>
0 psi	0 psi	242 V
<u>MCM Bus</u>	<u>Coolant Outlet</u>	<u>Total Cycles</u>
344 V	20C °F	24159

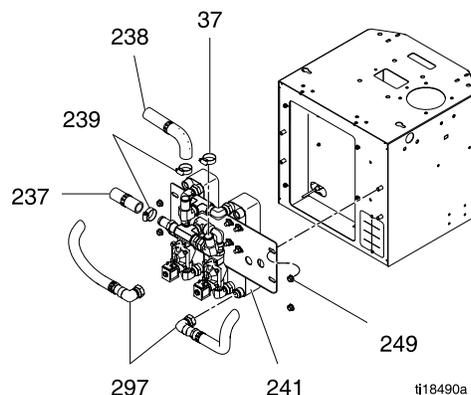
Replace Transformer

- Perform [Shutdown, page 61](#).
- Open Reactor cabinet.
- Remove bolts holding transformer (226) to cabinet floor.
- Disconnect the transformer wires. See [Reactor Cabinet Wiring Diagram, page 162](#).
- Remove transformer (226) from cabinet.
- Install new transformer (226) in reverse order.



Replace Heat Exchangers

1. If a wall is installed between the generator and the proportioner, remove the proportioner from the pallet. See [Remove Proportioner, page 102](#).
2. Perform [Flushing, page 64](#).
3. Perform [Shutdown, page 61](#).
4. Perform [Drain Coolant, page 66](#).
5. For proportioner heat exchangers:
 - a. Remove fuel tank. See [Remove Fuel Tank, page 96](#).
 - b. Disconnect both RTD connectors (284). See [Replace Heat Exchanger RTD, page 93](#).
 - c. Disconnect A and B material lines from swivel fittings (297).

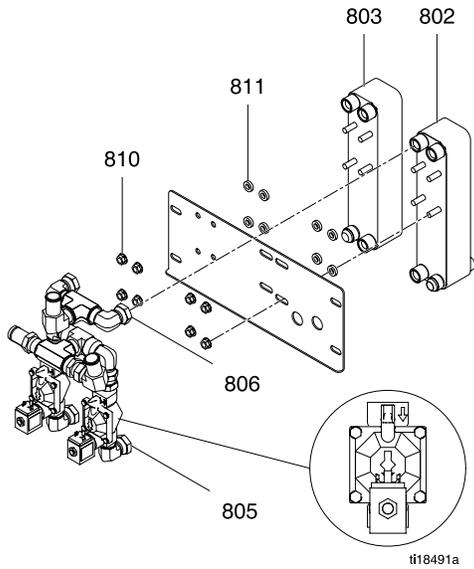


Proportioner Heat Exchangers
Figure 29

- d. Disconnect hose clamps (37, 239) from heat exchanger assembly (241).
- e. Remove four nuts (249) and the heat exchanger assembly (241). Pull heat exchanger assembly out of coolant hoses.
- f. Install a new heat exchanger assembly (241) by following the removal steps in reverse order. Orient control valves as shown. Continue to next step to remove heat exchangers (802) or (803).

Repair

- g. Disconnect two swivel fittings (805) and swivel fittings on heat exchanger outlet (806) from the heat exchangers (802, 803).

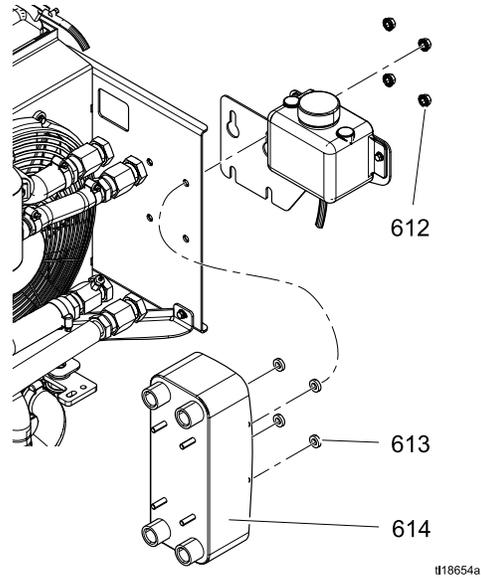


Proportioner Heat Exchangers
Figure 30

- h. Remove four nuts (810) and washers (811) for replacing heat exchangers (802) or (803).

- 6. For the engine heat exchanger:

- a. Disconnect swivel fittings (617) and (618) from heat exchanger (614).
- b. Remove nuts (612), washers (613), and heat exchanger (614). Set expansion bottle and bracket aside.
- c. Install new heat exchanger (614) in reverse order by following the removal steps in reverse order.



Engine Heat Exchanger
Figure 31

Replace Heat Exchanger RTD

1. Perform [Shutdown](#), page 61.
2. Remove Reactor cabinet cover.
3. Disconnect RTD from CAN cable.

NOTICE

ISO and RES will release when either RTD is removed from the heat exchangers. To prevent damage to load center and other electronics, protect all electronics from chemicals released from the heat exchanger RTD ports.

4. Remove compression fitting (272) from the back of the heat exchanger with RTD (273) attached.

The RTD probe cannot be removed from the compression nut.

NOTICE

To ensure accurate temperature readings, only use RTD Kit 24L972.

5. Tighten compression fitting (272) on RTD sheath (273).
6. Apply thread sealant to compression fitting pipe threads (272) and install in heat exchanger.
7. Connect new RTD to extension cable (71).

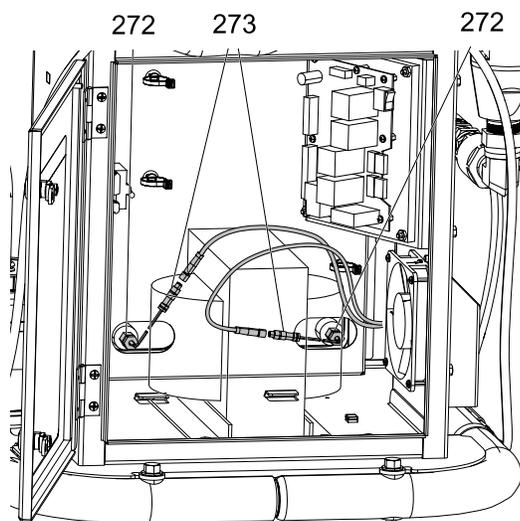


Figure 32

Replace Control Valve

Follow these instructions to replace a control valve solenoid coil or remove the component A control valve, component B control valve, or the bypass control valve.

1. Perform [Shutdown, page 61](#).
2. Drain coolant from the proportioner coolant loop. See [Drain Coolant, page 66](#).
3. To repair the control valve, remove the four nuts (VN) and washers (VW). Remove the front of the control valve, diaphragm, and gaskets. Purchase Valve Repair Kit 125774. For complete installation instructions see the Control Valve Kits manual 3A1932.
4. To remove the solenoid coil (SC), loosen connector screw and disconnect the coolant valve harness (D). Remove the nut (SN) and washer (SW) from coil. Purchase Valve Coil Replacement Kit 125787. For complete installation instructions see the Control Valve Kits manual 3A1932.

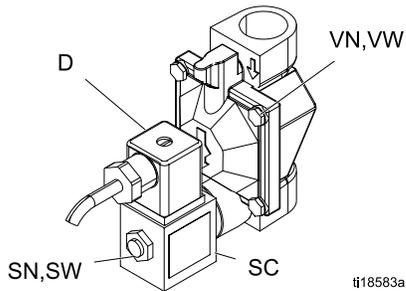
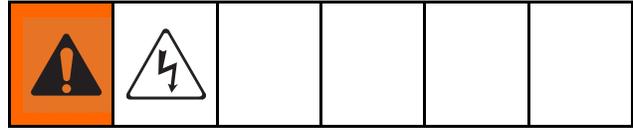


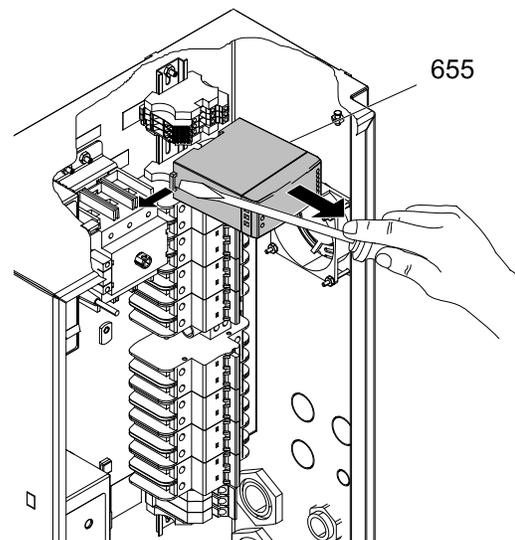
Figure 33

ti18583a

Replace Power Supply

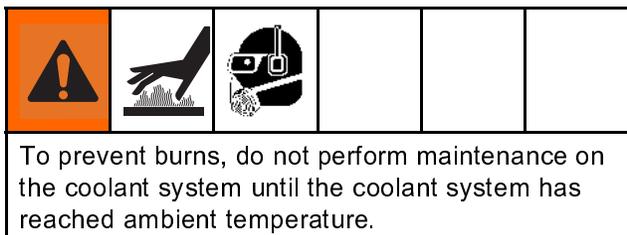


1. Perform [Shutdown, page 61](#).
2. Disconnect power supply (655) from circuit breaker CB01 and terminal blocks TB13 through TB15. See [Electrical Schematics, page 154](#).
3. Insert a flat head screw driver in the mounting tab on the bottom of the power supply (655) to remove from the din rail.



4. Install new power supply (655) in reverse order.

Replace Circulation Pump



1. Perform [Shutdown](#), page 61.
2. Perform [Drain Coolant](#), page 66.
3. If a wall is installed and the circulation pump can not be accessed, remove the proportioner. See [Remove Proportioner](#), page 102.
4. Disconnect pump fittings (234) from swivel fitting (275).
5. Remove pump cover (C).
6. Press in tabs to disconnect power wires (W).
7. Remove four outside nuts (254). Hold on to the pump flanges (234) and remove the circulation pump (233). Remove four inside nuts (254) to remove flanges from the pump.
8. Place o-rings, supplied with the new circulation pump (233), between the pump and the flange fittings (234). Insert screws (255) through the pump and flange fittings (234) and tighten four nuts on screws (255).
9. Place circulation pump (233) on brackets (223) so that coolant will flow towards the sight glass. Install four nuts (254) on screws (255).
10. Connect power wires to pump and replace cover. See [Reactor Cabinet Wiring Diagram](#), page 162.
11. Connect flange fittings (234) to swivel on the elbow flange fitting (234) and fitting (275).

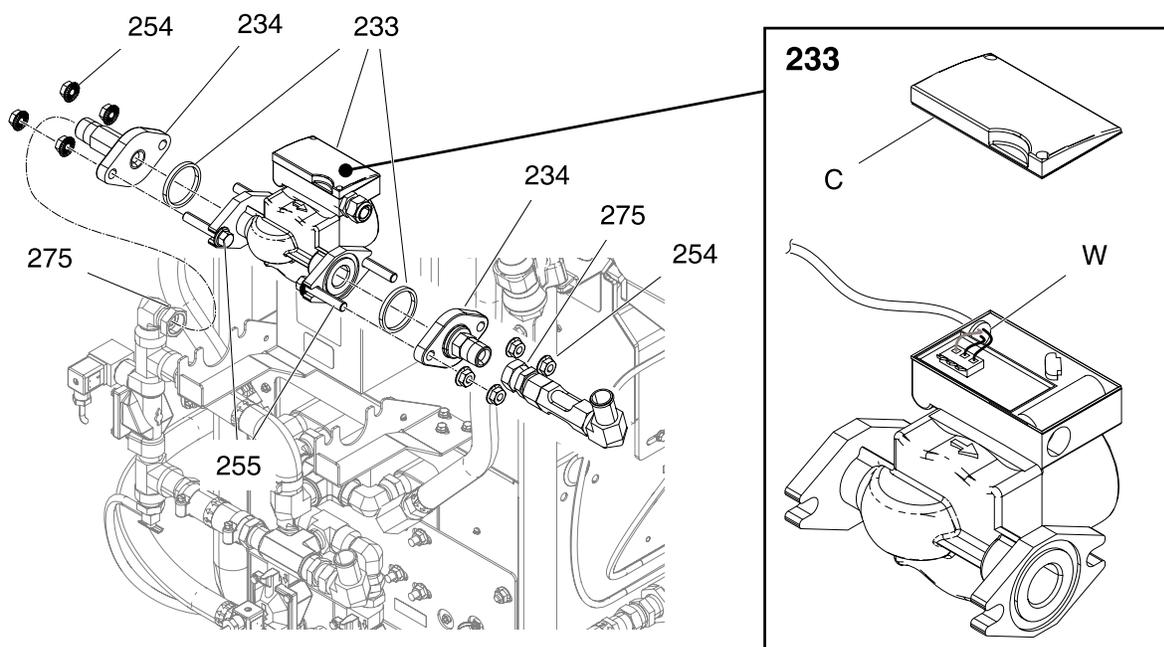
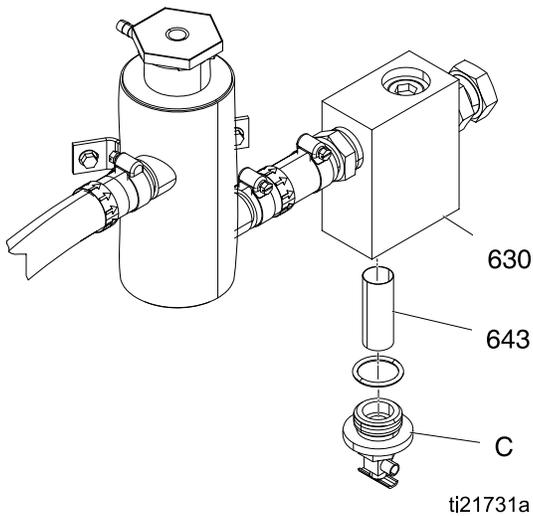


Figure 34

t118518a

Repair Filter Housing Filter

1. Drain the proportioner coolant loop. See [Drain Coolant, page 66](#).
2. Remove cap (C) and filter (643) from filter housing (630).
3. Pull out filter (643). Brush out filter and replace if necessary.
4. Insert filter (643) into cap (C) and tighten cap into filter housing (630).



Remove Fuel Tank

1. Perform [Shutdown, page 61](#).
2. Disconnect fuel lines (38, 39). Keep elevated or plug to prevent siphoning.
3. Remove screws (24) and clamps (30).
4. Slide the fuel tank off the B side of the pallet.
5. Inspect for any damage.
6. Slide fuel tank on to pallet and secure to pallet with screws (24) and clamps (30). Reconnect fuel lines (38, 39).
7. Squeeze prime bulb (P) to prime engine. Press the prime bulb repeatedly until fuel begins to return to the fuel tank.

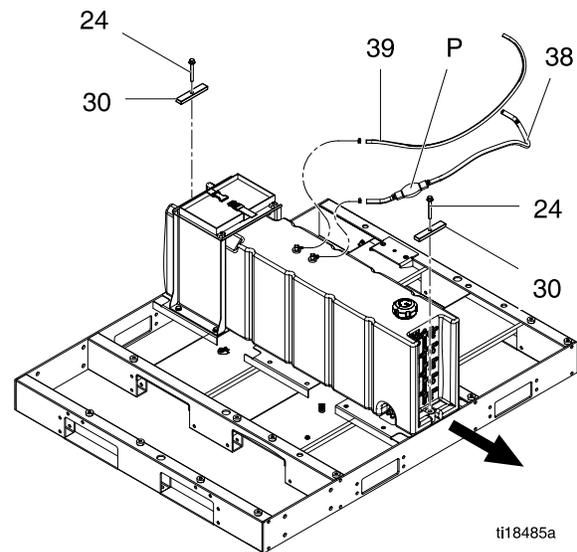


Figure 35

Replace Battery

					
<p>Improper battery installation or maintenance may result in electric shock, chemical burns, or explosion. Battery maintenance must only be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.</p>					

See [Technical Specifications, page 175](#) for battery requirements and recommended battery size.

1. Remove plastic caps (PC) from battery terminals and disconnect battery cables from battery.
2. Disconnect strap and remove battery.
3. Place new battery on bracket and secure with strap.
4. Reconnect battery cables and cover battery terminals with plastic caps (PC). Ensure red

black cable is connected to the positive (+) battery post. Connect black cable to the negative (-) battery post.

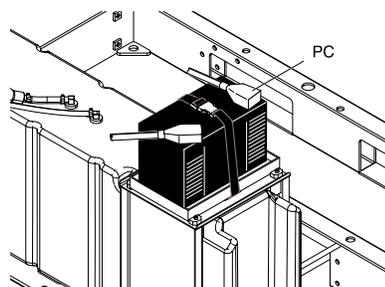


Figure 36

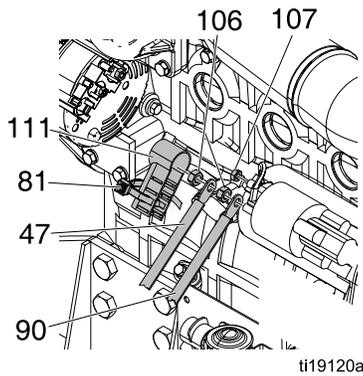
NOTICE

Always connect the red battery cable to battery positive (+) terminal and the black battery cable to the battery negative (-) terminal. Failure to properly connect the battery cable to the battery will damage the fusible link harness. Do not bypass the fusible link when damaged. The fusible link prevents damage to other system components.

Repair Fusible Link Harness

Follow this procedure to replace fuses inside the fusible link harness (90). See [Electrical Schematics, page 154](#), for fusible link harness connections and wire identification.

1. Perform [Shutdown, page 61](#).
2. Disconnect battery from system.
3. Determine which fuse (F8, F9) needs to be replaced.
 - a. Cut cable tie (81) and remove red insulator cap (111) over the positive stud on the engine starter. Remove the outside nut (106) and red battery cable (47). Disconnect fusible link harness (90) ring terminal from the engine starter.

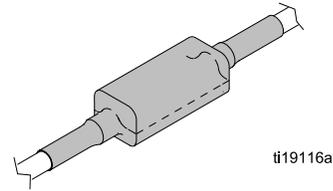


- b. Using a multimeter, measure continuity through the harness ring terminals. See Table 1.
 - c. If one of the two wire paths measures "open", then the fuse (F8, F9) in that path is blown and needs to be replaced.

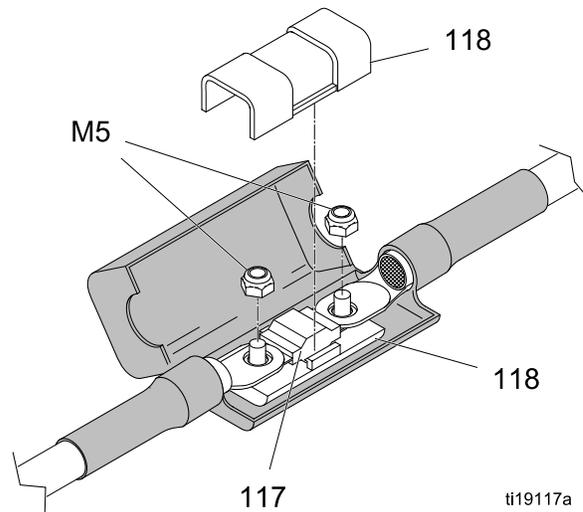
Table 1 Fusible Link Harness Connections

Fuse (117)	Wire No.	Ring Terminal Location	Wire No.	Ring Terminal Location
F8	C010 and C030	Engine starter positive power lug	C020	12 V charge alternator B+ terminal
F9	C010 and C030	Engine starter positive power lug	C040	Starter solenoid relay (CR6)
			C050	Glow plug solenoid relay (CR7)

4. Remove fusible link harness (90) from engine.
5. Carefully cut open heat shrink encasing the fuse holder along lines shown.



6. Pull away heat shrink. Squeeze the fuse holder cover and disconnect from base latches. If latches break off, replace entire fuse holder with fuse holder (118) shipped loose with the system.



7. Remove two M5 nuts from fuse holder base.
8. Replace blown 60 amp fuse in the fuse holder base with new fuse (117). New fuse (117) is shipped loose with the system.

9. Replace M5 nuts over fuse and ring terminals. Torque to 44 in.-lbs (5 N•m).
10. Connect fuse holder cover to fuse holder base. Wrap entire fuse holder and heat shrink 3–4 times with tape (44).

NOTICE

Ensure tape entirely covers heat shrink. Failure to seal the cut heat shrink with tape may allow fluid to contact fusible link and damage the fusible link.

11. Connect fusible link harness (90) and battery cable to engine starter with nuts (106). Secure to solenoid relay bracket with cable ties (81), shipped loose with system.
12. Snap the cap insulator (111) over the red battery cable (47). Position the red cap insulator so that the stud is not exposed.

13. Insert cable tie (81) through cap insulator (111) and tighten to the red battery cable (47). Ensure that the stud is not exposed.
14. Reconnect black battery cable to the negative (-) battery terminal and the red battery cable to the positive (+) battery terminal.

NOTICE

Always connect the red battery cable to battery positive (+) terminal and the black battery cable to the battery negative (-) terminal. Failure to properly connect the battery cable to the battery will damage the fusible link harness. Do not bypass the fusible link when damaged. The fusible link prevents damage to other system components.

Remove Radiator

NOTICE

Do not damage fins on radiator. Damaged radiator fins will result in poor radiator performance or cause a coolant leak.

1. Drain the engine coolant loop. Follow [Drain Coolant, page 66](#).
2. Remove radiator air exhaust duct, if used.
3. Remove screws (17) and back panel (8).

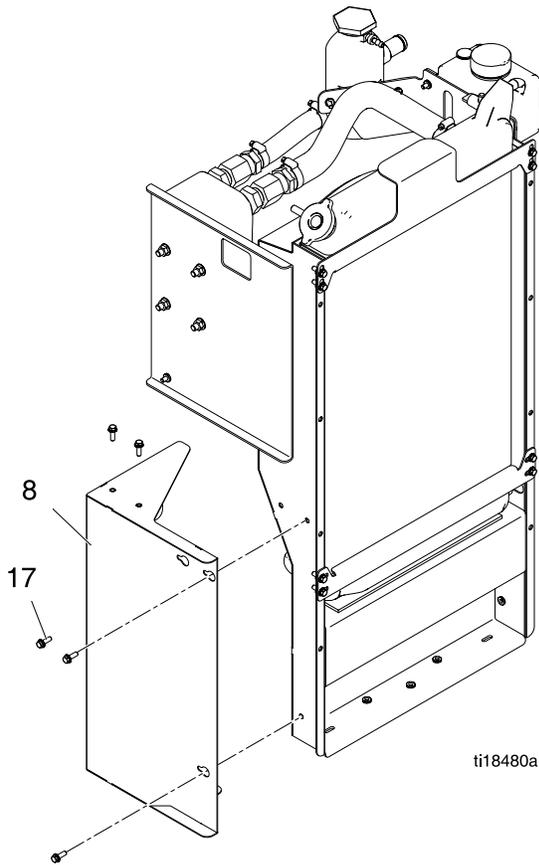


Figure 37

4. Remove eight screws (605), top bracket (604), and bottom bracket (606).
5. Loosen hose clamps (622) and coolant hose from radiator (603) inlet and outlet.
6. Carefully swing the bottom of the radiator (603) away from the engine and lift out of cover (601).

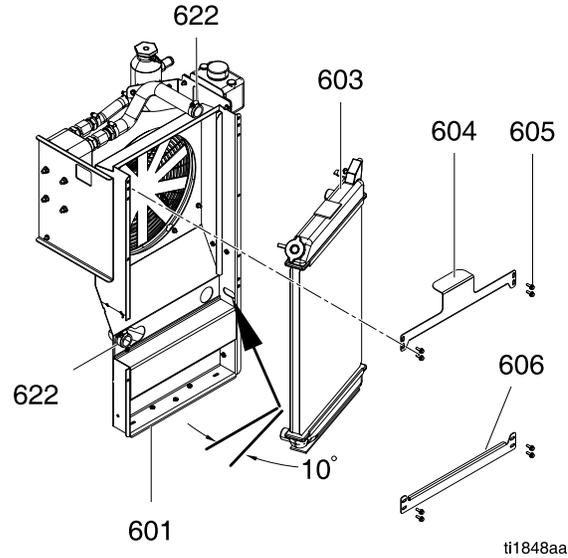


Figure 38

7. Inspect radiator for any obstructions. Replace or have serviced, if necessary.
8. Install new radiator assembly in reverse order.
9. Follow [Refill Engine Coolant Loop, page 69](#).

Replace Advanced Display Module (ADM)

1. Loosen screw in bracket (402). Lift up on bracket (402) and remove ADM (27).
2. Disconnect CAN cable (57).
3. Inspect ADM for damage. Replace if necessary.

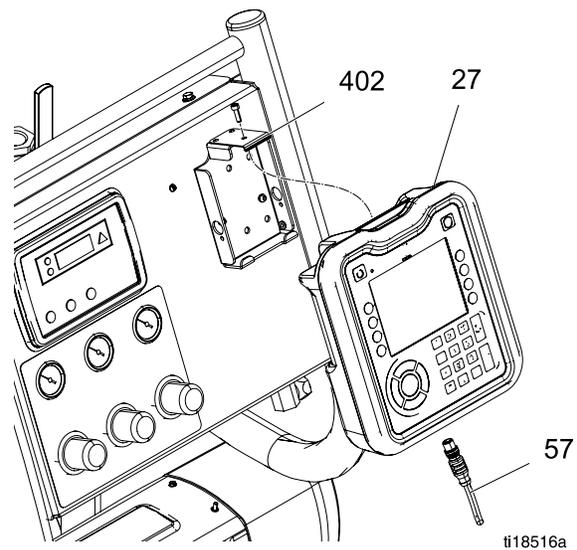


Figure 39

Replace Engine Control Module

1. Perform [Shutdown](#), page 61.
2. Remove two top screws (17) and loosen the two side screws to lower the back panel (28).
3. Disconnect harness (M) and harness (F) connectors from the back of the engine control module (428). See [Engine Control Module Wiring Diagram](#), page 164
4. Loosen engine control module mounting screws and remove the engine control module (428).
5. Install new engine control module (428) in air control panel. Secure clips in place and tighten mounting screws.
6. Connect all wire harnesses and close the back panel with two screws (17).

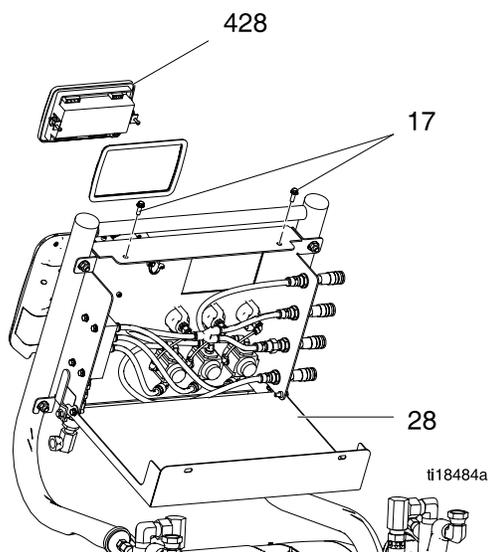
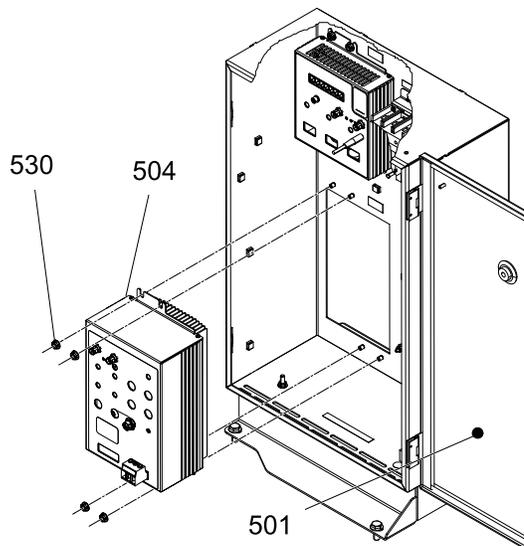


Figure 40

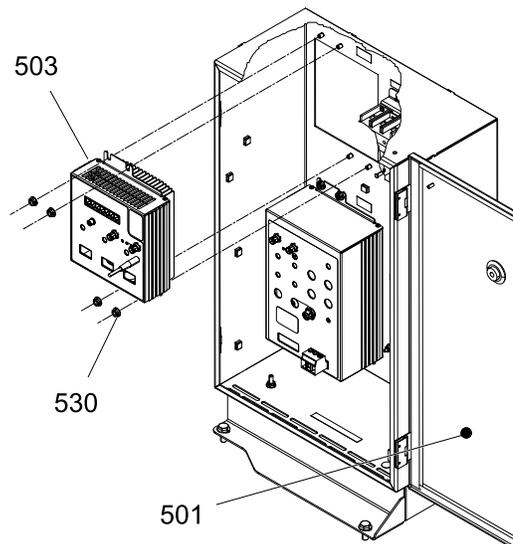
Replace Motor Control Module (MCM)

1. Perform [Shutdown](#), page 61.
2. Disconnect connectors from MCM (504). Disconnect two power cables. See [Electrical Schematics](#), page 154.
3. Remove nuts (530) and MCM (504).
4. Set rotary switch. 0= E-30i and 1= E-XP2i.
5. Connect cables to MCM. See [Electrical Schematics](#), page 154.



Replace Temperature Control Module (TCM)

1. Perform [Shutdown](#), page 61.
2. Open electrical enclosure door (501).
3. Disconnect all connectors from the TCM (503).
4. Remove four nuts (530) and TCM (503).
5. Install new TCM module (503). Reassemble parts in reverse order.



Remove Proportioner

Only remove the proportioner from the pallet to repair the heat exchangers or coolant valves between the proportioner and generator.

<p>The back of the proportioner could slide off of the pallet and support brackets during removal and installation. Never remove the proportioner from the system pallet alone. Always use two or more people and supports.</p>					

1. Perform [Shutdown](#), page 61.
2. Drain the proportioner coolant loop. See [Drain Coolant](#), page 66.
3. Place an empty pallet in front of the proportioner (23) and center the pallet cross beam with the proportioner.

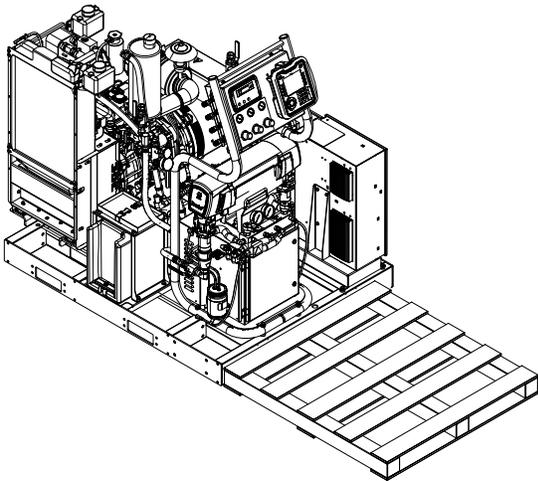


Figure 41

4. Loosen the coolant clamps (37) and disconnect the proportioner coolant outlet and inlet coolant lines (36).

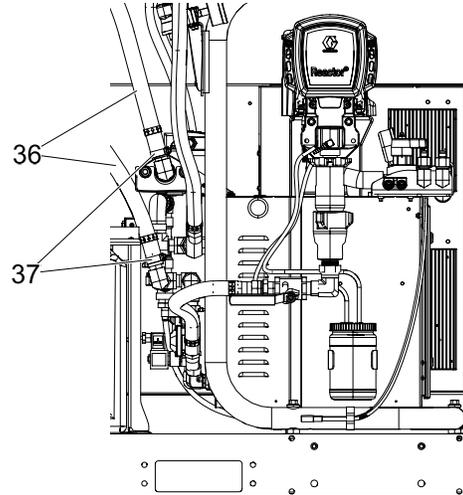


Figure 42

5. Cut the cable tie that secures the wire harnesses behind the A side of the proportioner (23) to the pallet (1).
6. Disconnect engine wire harness E connectors (49) from J1 and J2 from the load center (242). See [Load Center Wiring Diagram](#), page 163. Cut engine harness cable ties inside the proportioner cabinet and pull out the backside of the cabinet.
7. Disconnect the engine coolant temperature cable (59).

Note

The cable connections will be almost under the fuel tank mounting location. If necessary, remove fuel tank or access the connector from other side of wall.

8. If a wall is installed between the proportioner (23) and generator continue to step 9. See [Remove Fuel Tank](#), page 96, if the fuel tank (29) is mounted on the pallet (1).

- Loosen the front two mounting screws (24) and remove the back two mounting screws (24).

<p>The back of the proportioner could slide off of the pallet and support brackets during removal and installation. Never remove the proportioner from the system pallet alone. Always use two or more people and supports.</p>				

- Use 6 in. x 6 in. x 11 in. pieces of wood (S1, S2, S3, and S4) to support the proportioner during the removal and installation process.

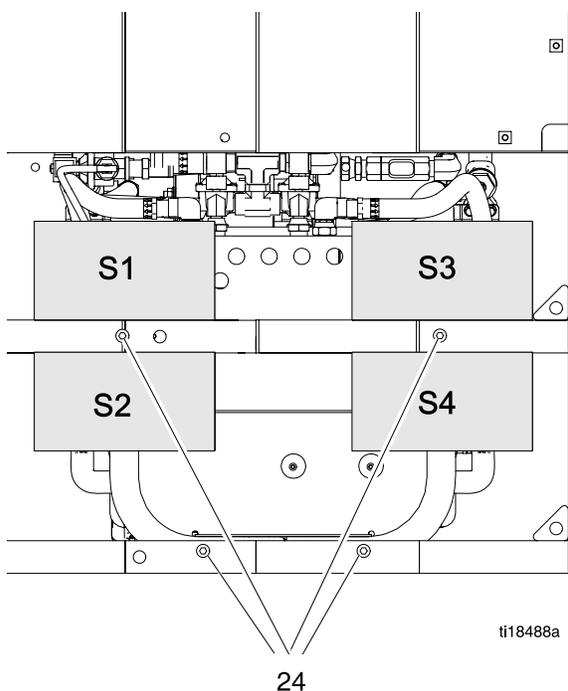


Figure 43

- Place two supports near both sides of the front of the proportioner (23) . Have one person carefully tip the proportioner forward and the other person center the four supports under both sides of the proportioner frame.
- Have one person hold the proportioner in place and the other remove the two front mounting screws (24).

NOTICE
<p>Do not strain wire harness between proportioner and electrical enclosure to prevent damage to connectors.</p>

- Carefully slide the proportioner (23) off the pallet support brackets and on to the wood supports. Continue to slide the proportioner off the front of the pallet until there is enough space to service the backside components.
- Secure the proportioner frame to the empty pallet you positioned on the floor with c-clamps.

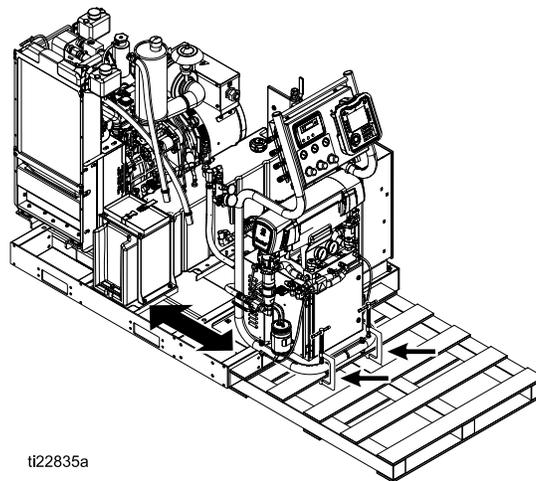


Figure 44

Repair

15. The proportioner is ready for servicing.
16. To install the proportioner (23) on the pallet (1), ensure the wood proportioner frame supports, inside the proportioner pallet (1), are aligned with both sides of the proportioner frame.
17. Guide cables behind the proportioner (23) when sliding the proportioner back to the mounting position. Secure the proportioner frame to the pallet with four mounting screws (924). Torque to 40 ft-lbs (54 N•m).
18. Route the engine wire harness E connectors (49) through the back of the proportioner (23) and connect wire harness connectors to J1 and J2 connectors on the load center (242). Reconnect engine coolant temperature cable (59).
19. Secure all harnesses to pallet and inside cabinet with cable ties.

Repair Engine

Contact your nearest Perkins distributor for repair and maintenance.

Replace Engine RTD

1. Perform [Shutdown, page 61](#).
2. Drain the engine coolant loop. See [Drain Coolant, page 66](#).
3. Disconnect RTD cable (632) from extension cable (59).
4. Remove compression fitting (619) and RTD (632) from the fitting. The RTD probe (632) cannot be removed from the compression nut (619).
5. Apply anaerobic sealant to compression fitting threads (619) and install in fitting at a 30° angle.

Note

To prevent poor heating performance, use RTD Kit 24L974.

6. Connect new RTD cable (632) to extension cable (59).
7. Refill the engine coolant loop. See [Refill Engine Coolant Loop, page 69](#).

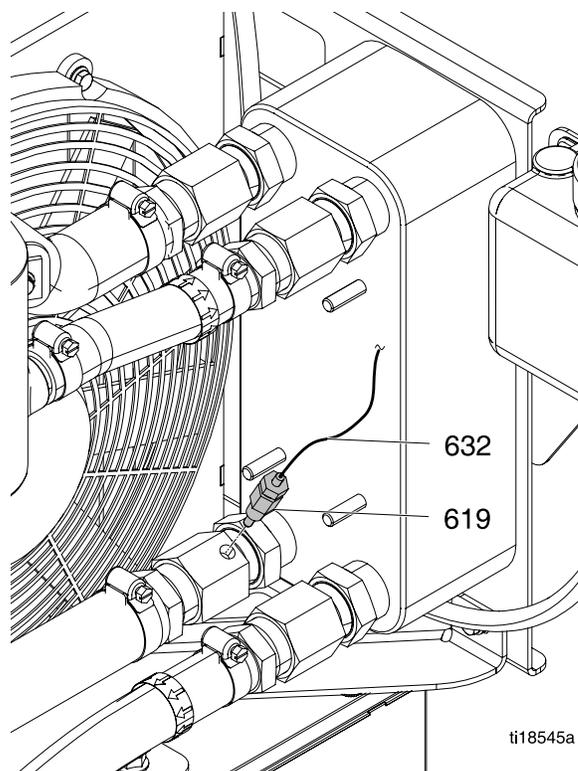


Figure 45

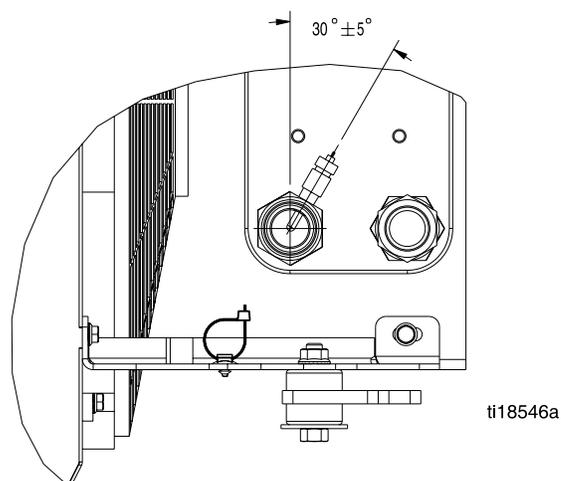


Figure 46

12V Charge Alternator

Contact your nearest Perkins distributor for repair and maintenance.

Parts

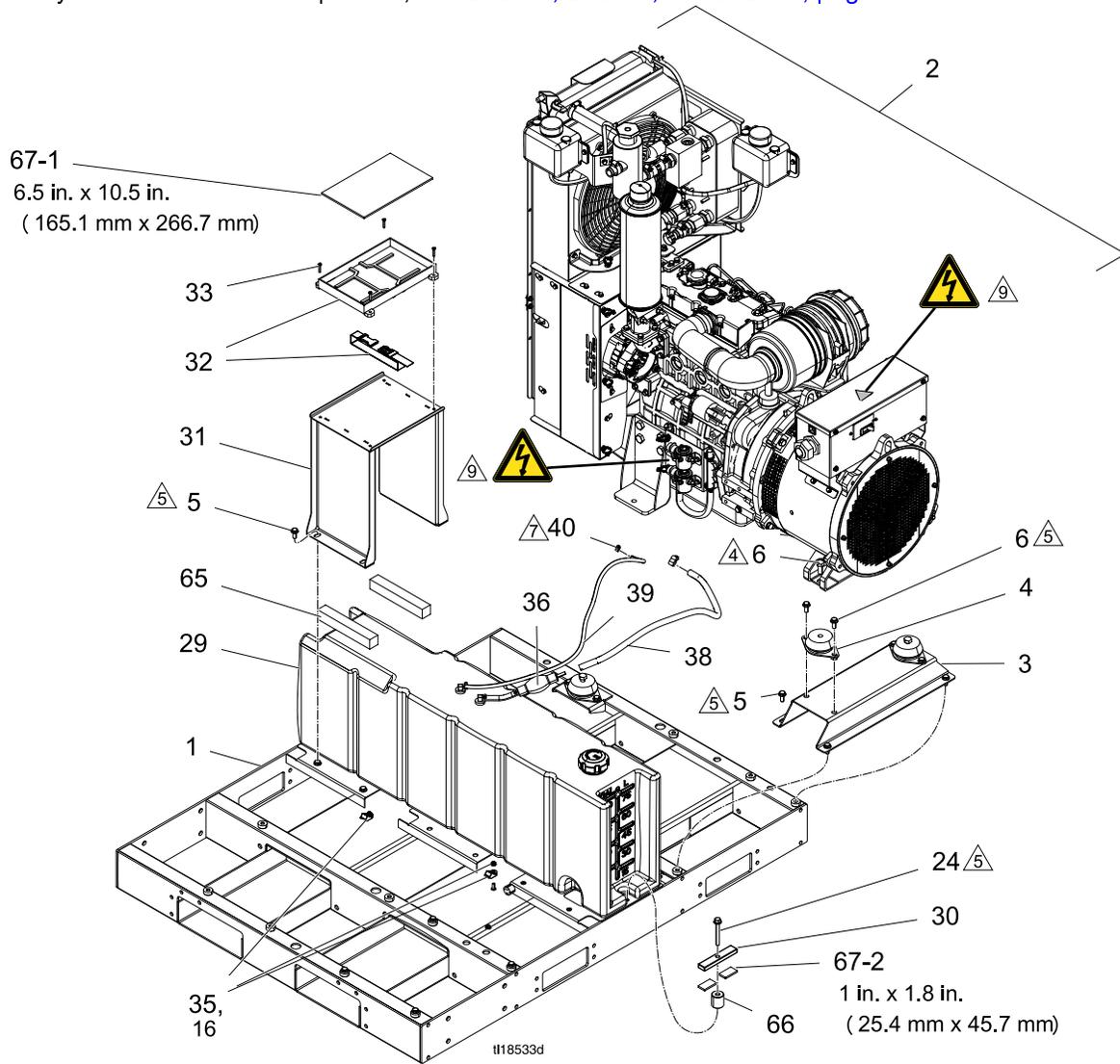
Systems

272079, E-30i

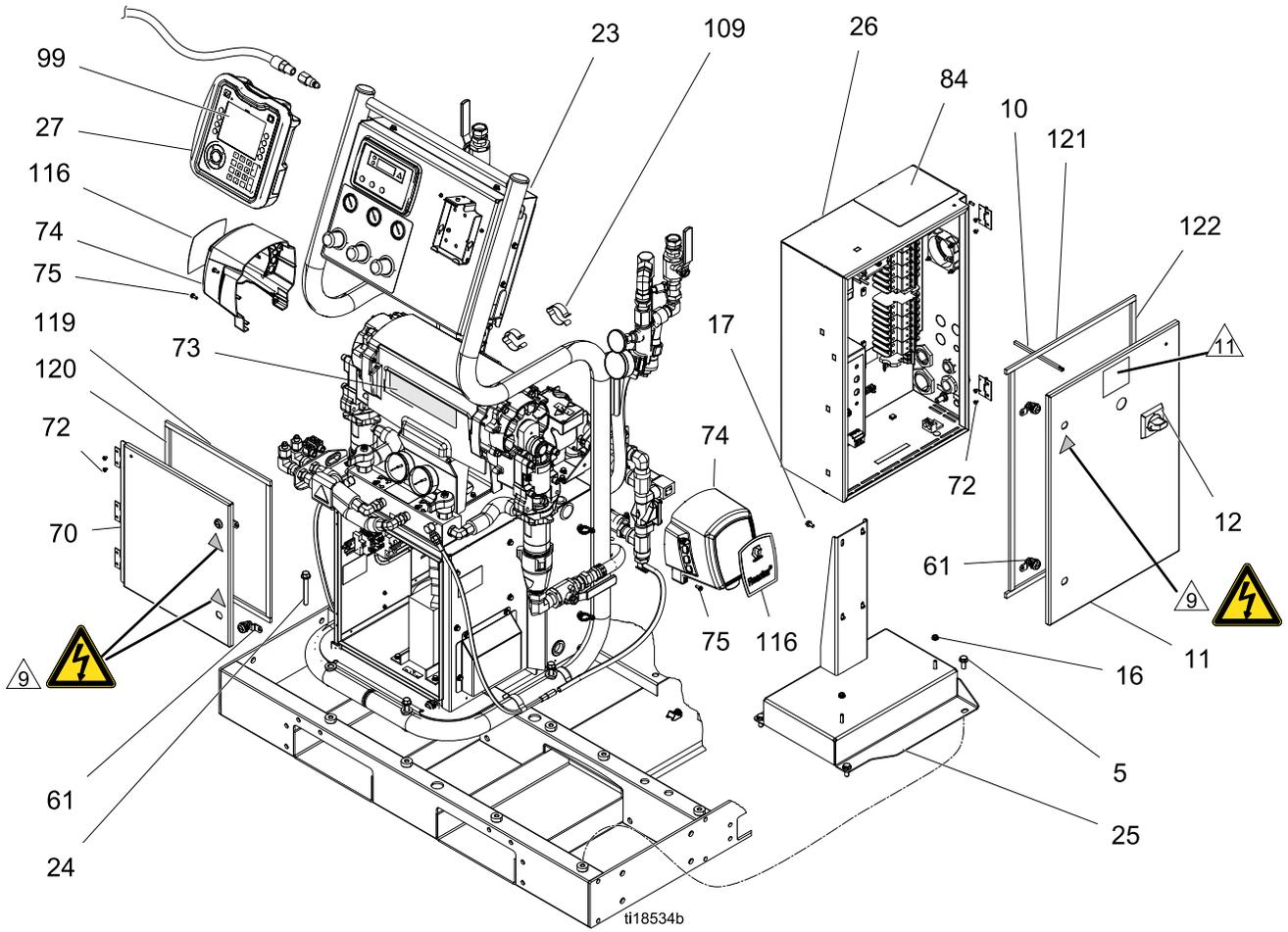
272080. E-30i with Booster Heat

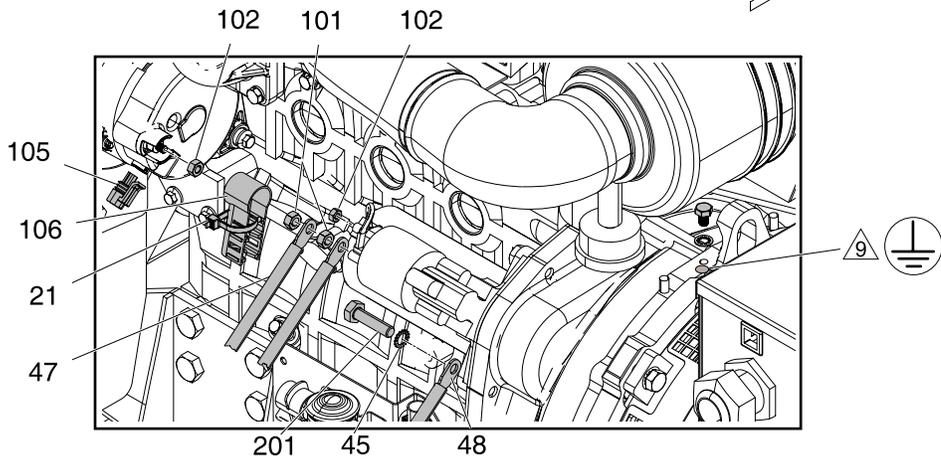
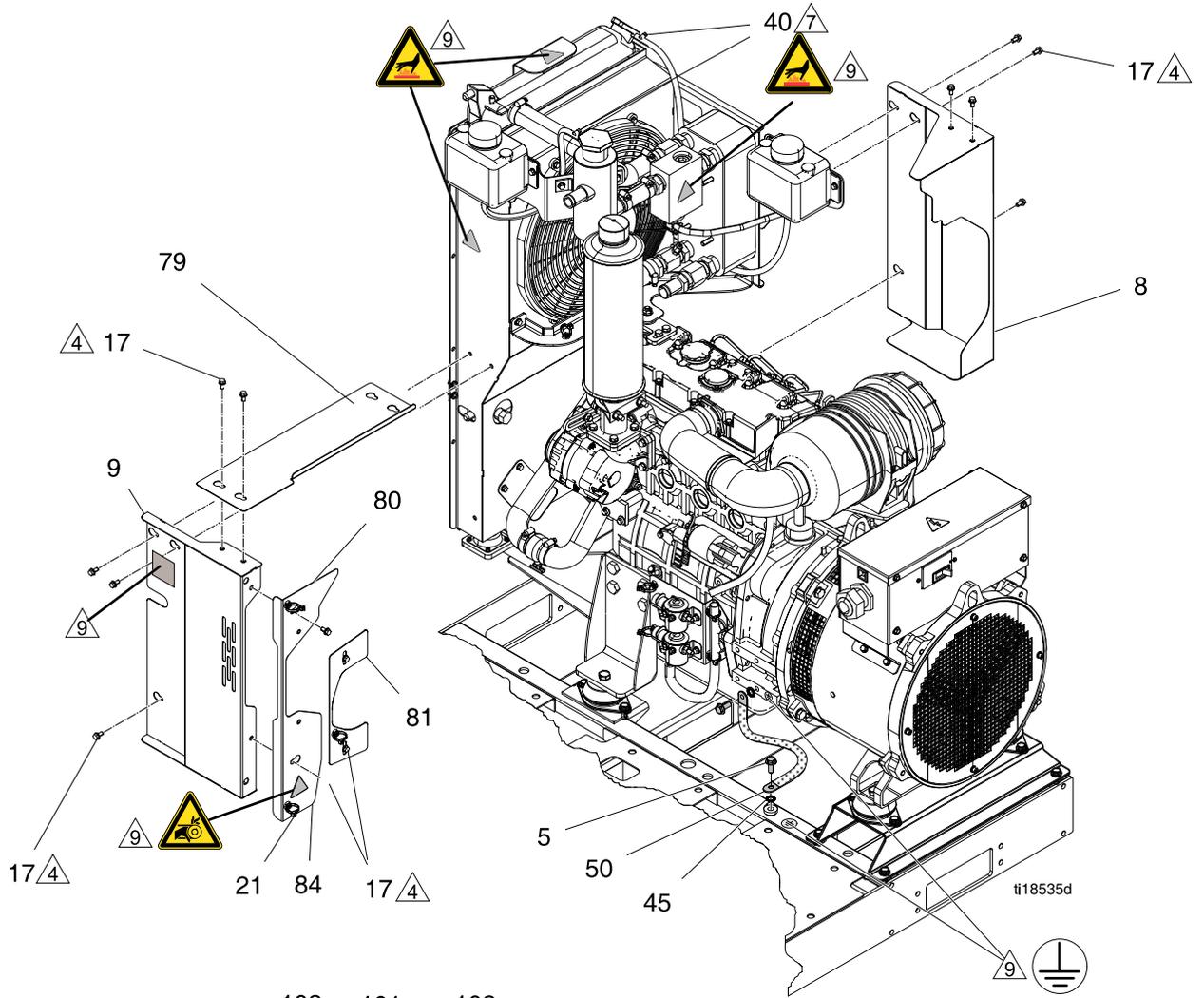
272081, E-XP2i with Booster Heat

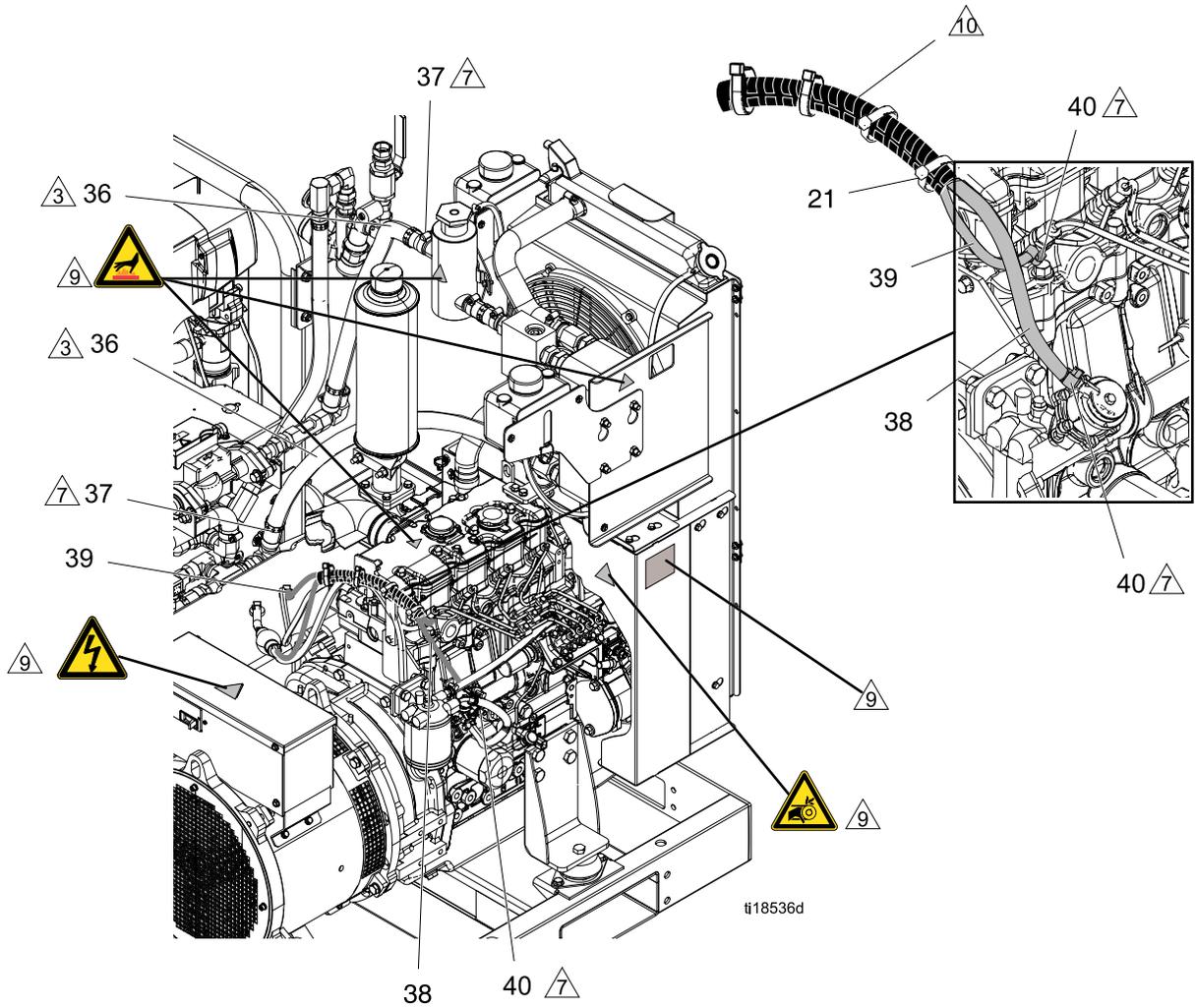
For systems with an air compressor, see [272089, 272090, and 272091, page 115.](#)



Parts







-  Apply anaerobic sealant to all non-swiveling pipe threads.
-  Apply lubrication to all push-on hoses prior to assembly.
-  Torque to 25 ft.-lbs (33.8 N•m).
-  Torque to 40 ft.-lbs (54 N•m).
-  Torque to 15–20 in.-lbs (1.7–2 N•m).

-  Torque to 25 in.-lbs (2.8 N•m).
-  Safety and warning labels are from label sheet (55).
-  Bundle fuel lines above engine, inside flexible plastic split conduit, with cable ties (81) to avoid direct contact.

Ref	Part	Description	Quantity		
			272079	272080	272081
1	24J658	BASE, pallet	1	1	1
2	---	GENERATOR, diesel, 22kw; see 22 kW Diesel Generator, page 141	1	1	1
3	16H732	SUPPORT, generator	1	1	1
4	24L953	KIT, isolator (4 pack)	1	1	1
5	111192	SCREW, cap flange hd; 0.875 in. (22 mm), 3/8-16	20	20	20
6	105324	SCREW, cap, hex hd; 1.2 in (30 mm), M12 x 1.75	4	4	4
7	16U131	GROMMET, tube	1		
8	16H898	GUARD, engine, right	1	1	1
9	16H894	GUARD, engine, left	1	1	1
10	125677	ROD, connecting, on/off	1	1	1
11	16X025	DOOR, electrical enclosure	1	1	1
12	16K893	HANDLE, selector, on/off	1	1	1
14●	123656	CABLE, 5pin, male/female (matrix)	1	1	1
16	115942	NUT, hex, flange head; 1/4-20	4	4	4
17	113161	SCREW, flanged, hex hd; 0.5 in. (13 mm), 1/4-20	18	18	18
18●	16W131	CABLE, m12 5p, fem - male, 3.0m	2	2	2
19●	24T051	CABLE, m8 4p (f) to m12 8p (m); 3.0 m	1	1	1
20●	24T198	HARNESS, ac, power, reactor cart	1	1	1
21	125625	TIE, cable, fir tree	5	5	5
22●	24T241	CABLE, power, 24v, integ reactor	1	1	1
23	---	PROPORTIONER, E-30i, (230v, 1ph), see Proportioners, page 121	1		
	---	PROPORTIONER, E-30i, (4.0kw, 230v, 1ph), see Proportioners, page 121		1	
	---	PROPORTIONER, E-xp2i, (4.0kw, 230v, 1ph), see Proportioners, page 121			1
24	125626	SCREW, hex hd, flanged; 3 in. (76 mm), 3/8-16	6	6	6
25	16V420	BRACKET, mounting	1	1	1
26	---	ENCLOSURE, electrical, see Electrical Enclosure, page 139	1	1	1
27	24U854	MODULE, GCA, ADM	1	1	1
29	24K390	TANK, fuel, see Fuel Tank, page 148	1	1	1
30	16J889	BRACKET, support, fuel tank	2	2	2
31	24J690	SUPPORT, battery	1	1	1
32	125166	TRAY, battery	1	1	1
33	107251	SCREW, pan hd; 1 in. (25.4 mm), #10-24	4	4	4

Parts

Ref	Part	Description	Quantity		
			272079	272080	272081
34✖	24M174	STICKS, level, A and B side, 55 gal. (208 l)	1	1	1
35	16K214	HOLDER, cable, tie	4	4	4
36a*	---	HOSE, coolant, 1 in. ID; 2.66 ft (0.81 m)	1	1	1
36b*	---	HOSE, coolant, 1 in. ID; 2.92 ft (0.89 m)	1	1	1
37*	125370	CLAMP, hose, dia. 11/16-1-1/2 in.	4	4	4
38	---	HOSE, fuel, 5/16 in.; 3.33 long	1	1	1
39	---	HOSE, fuel, 3/16 in.	4	4	4
40*	125163	CLAMP, hose, 7/32-5/8 in.	6	6	6
43✖	206995	FLUID, TSL™, 1 qt.	2	2	2
44✖	106569	TAPE, electrical	1	1	1
45	100639	WASHER, lock	3	3	3
46●	127286	CABLE, cordset, reverse key, .5m	2	2	2
47●❖	16K232	CABLE, battery, 30 in. (762 mm), red	1	1	1
48●❖	16K233	CABLE, battery, 30 in. (762 mm), black	1	1	1
49●	16K301	HARNESS, dc, diesel, engine	1	1	1
50	125751	CABLE, grounding, braided, engine	1	1	1
51●	16Y518	HARNESS, AC, sense, genset control	1	1	1
52●	125753	CABLE, AC, power, 240v alternator	1	1	1
53●	16K299	HARNESS, dc, disconnect check	1	1	1
54●	24T242	CABLE, over-temp, single reactor		1	1
	24U109	CABLE, over-temp, switch short	1		
55▲	16K939	LABEL, safety, system, multi	1	1	1
56	16X154	LABEL, Graco InSite	1	1	1
57●	121002	CABLE, can, female / female 1.5m	1	1	1
58●	125358	CABLE, m8, 4-pin, mf, .5meter, mold		1	1
59●	122837	CABLE, m8, 4-pin, mf, 3m, molded	2	2	2
60●	123652	CABLE, can, male / female 3.5m	1	1	1
61	16W596	LATCH, door	4	4	4
62●	24T199	CABLE, control module, heater		2	2
65	16K362	FOAM, support block	2	2	2
66	16K363	SPACER, fuel tank	2	2	2
67	16H910	GASKET, radiator isolation	1	1	1
69	16W245	DOOR, cabinet	1	1	1
70✖	24K207	KIT, FTS, RTD, single hose; see heated hose manual	1	1	1
71●	125357	CABLE, m8, 4-pin, mf, 1meter, molded	3	4	4

Ref	Part	Description	Quantity		
			272079	272080	272081
72	108290	SCREW, mach, binding hd; 1/4 in., #8-32	4	4	4
73	16W216	LABEL, E-30i, elite	1	1	
	16W217	LABEL, E-XP2i, elite			1
74◆	287292	COVER, drive, plastic	2	2	2
75◆	118444	SCREW, mach, slot hex wash hd; 1/2 in. x #10-24	8	8	8
76	190774	BLANK, label, kit	2	2	2
77✖	125871	TIE, cable, 7.50 in.	40	40	40
78	125844	CONDUIT, flexible, non-metalic	7	10.33	10.33
79	16M317	GUARD, engine, top	1	1	1
80	16M319	GUARD, alternator, mount	1	1	1
81	16M321	GUARD, alternator, plate	1	1	1
82✖	333093	QUICK GUIDE, startup	1	1	1
83✖	333094	QUICK GUIDE, shutdown	1	1	1
84▲	15G280	LABEL, safety, warning, multiple	1	1	1
85●	16K172	HARNESS, dc, link, fusible	1	1	1
86●	125754	CABLE, AC, alternator breaker, blk	1	1	1
87●	125755	CABLE, AC, alternator breaker, red	1	1	1
88●	125822	CABLE, AC, alternator, n to gnd, wh	1	1	1
89	16K297	HARNESS, DC, genset controller	1	1	1
90	- - -	LABEL, cable, self-lam, top level	1	1	1
91	- - -	KIT, label	2	2	2
93●	120448	SUPPRESSOR, box snap, ferrite	1	1	1
94●	125835	CLIP, ferrite bead	3	3	3
95●	125839	CLIP, ferrite bead	1	1	1
97	109124	HOSE, coupled, 48 in	1	1	1
98	169970	FITTING, airline; 1/4-18 NPT (m)	3	3	3
99	15V551	SHIELD, membrane, ADM (10 pack)	1	1	1
101	105329	NUT, hex; M8 x 1.25	2	2	2
102	114816	NUT, hex; M6 x 1	3	3	3
103	100186	WASHER, lock, internal tooth	1	1	1
104	15V909	SCREW, 1/2 in. (12 mm), M8 x 1.25	1	1	1
105+	110911	NUT, hex; M5 x 0.8	1	1	1
106	126054	INSULATOR, cap	1	1	1
109	186494	CLIP, spring	2	2	2
113	169967	FITTING, line air; 1/4-18 NPT (f)	1	1	1

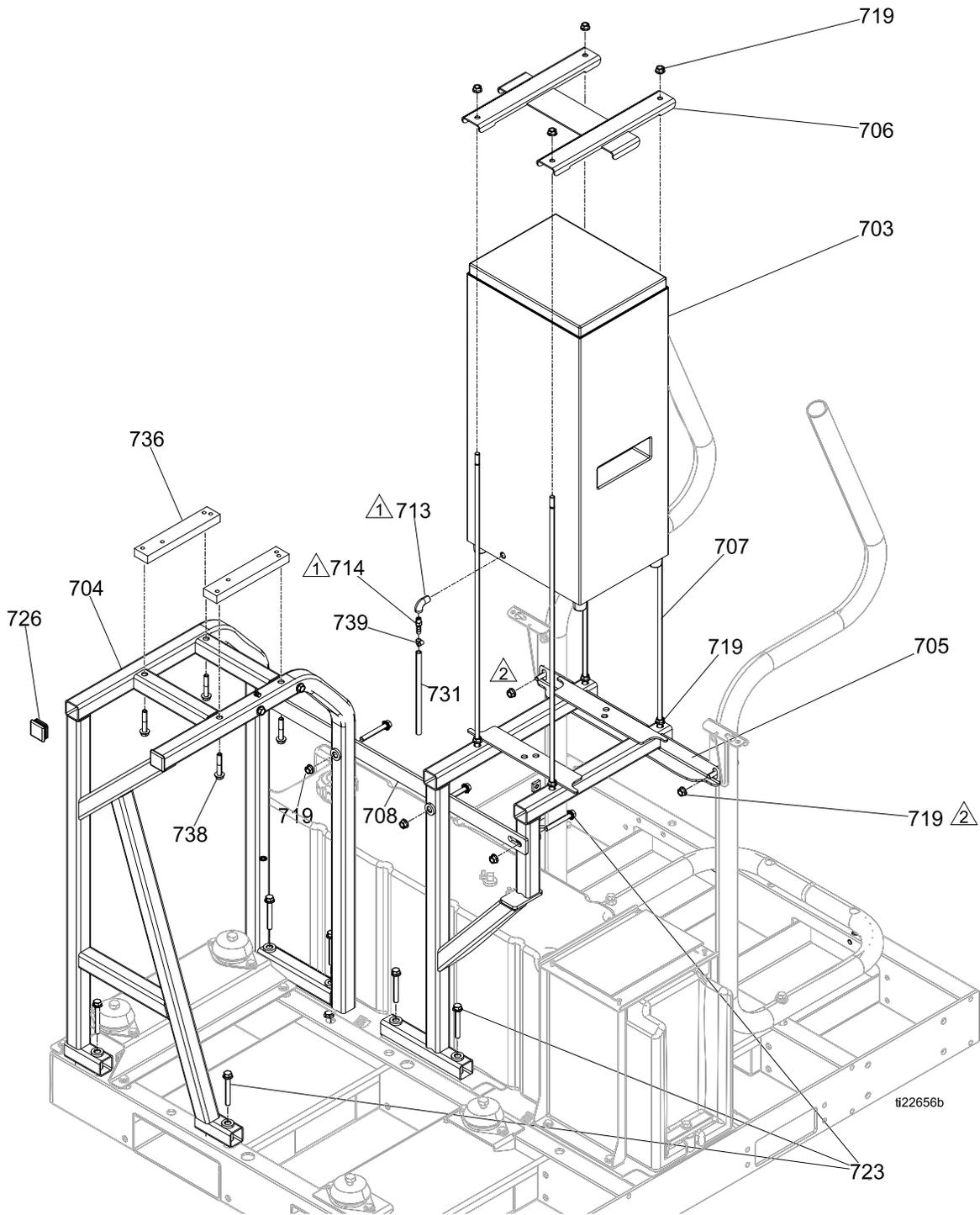
Parts

Ref	Part	Description	Quantity		
			272079	272080	272081
114✘	16P405	FUSE, bolt-down, 60A	1	1	1
115✘	16P406	HOLDER, fuse, bolt-down	1	1	1
116	16W213	LABEL, Reactor	2	2	2
117	16D576	LABEL, made in USA	1	1	1
118	113505	NUT, keps, hex hd	2	2	2
119	16X121	GASKET, door	2	2	2
120	16X122	GASKET, door	2	2	2
121	16X123	GASKET, door	2	2	2
122	16X124	GASKET, door	2	2	2
123	117777	HOLDER, vinyl shop ticket	1	1	1
124✘	16Y509	CORE, ferrite, snap-on; 0.76 ID	2	2	2
125✘	16Y516	CORE, ferrite, snap-on; 0.394 ID	1	1	1

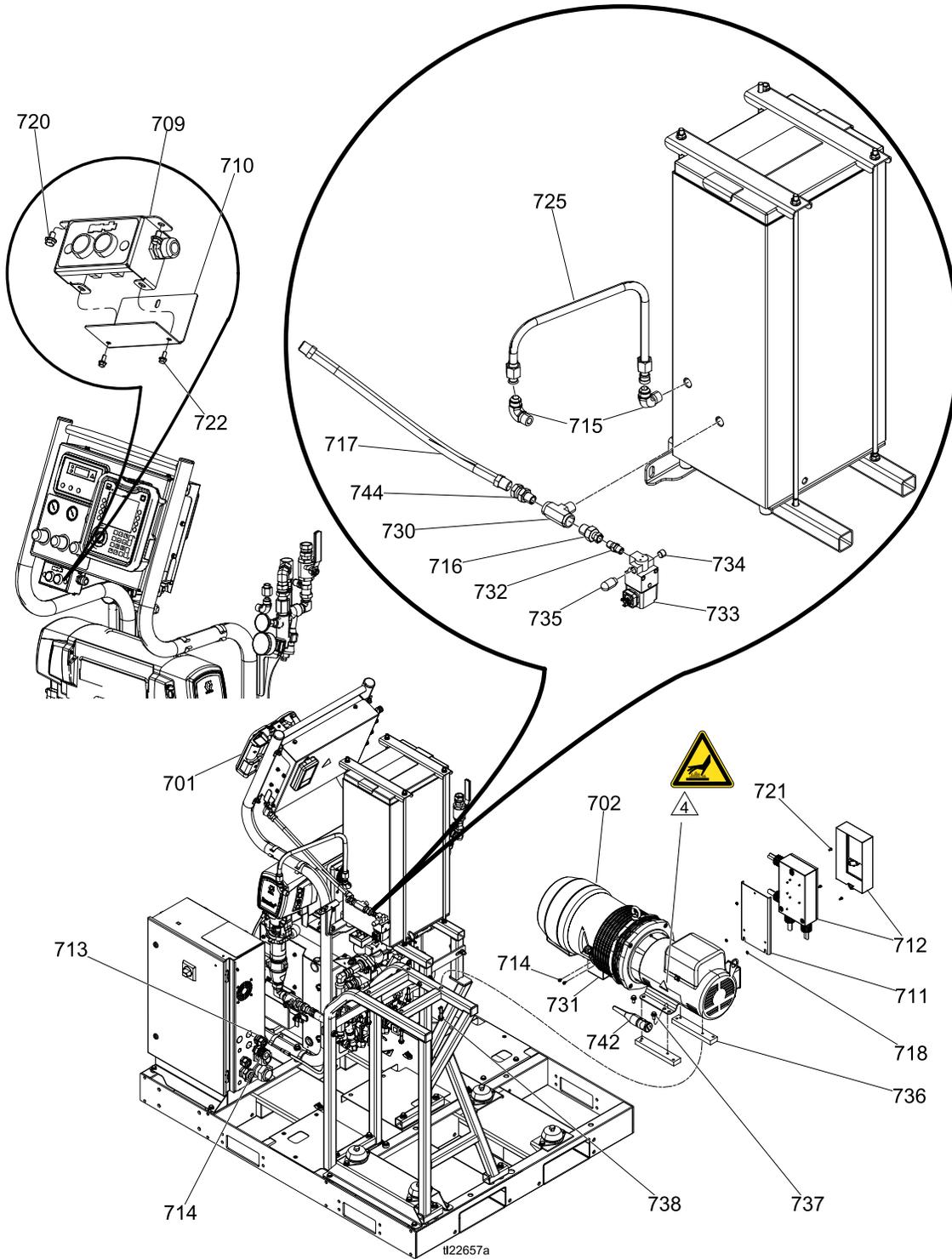
- ▲ Replacement Warning labels, signs, tags, and cards are available at no cost.
- See [Electrical Schematics, page 154](#).
- ❖ Included in Battery Cable Kit 24L962.
- * Included in Complete Coolant Hose Kit 24L939. See [Complete Coolant Hose Kit, page 131](#).

- ✘ Not shown.
- ◆ Cover Repair Kit includes four screws.
- + Nut only used on 3-post alternator style. Not used on connector-style alternator.

272089, E-30i with Air Compressor
272090. E-30i with Booster Heat and Air Compressor
272091, E-XP2i with Booster Heat and Air Compressor



Parts

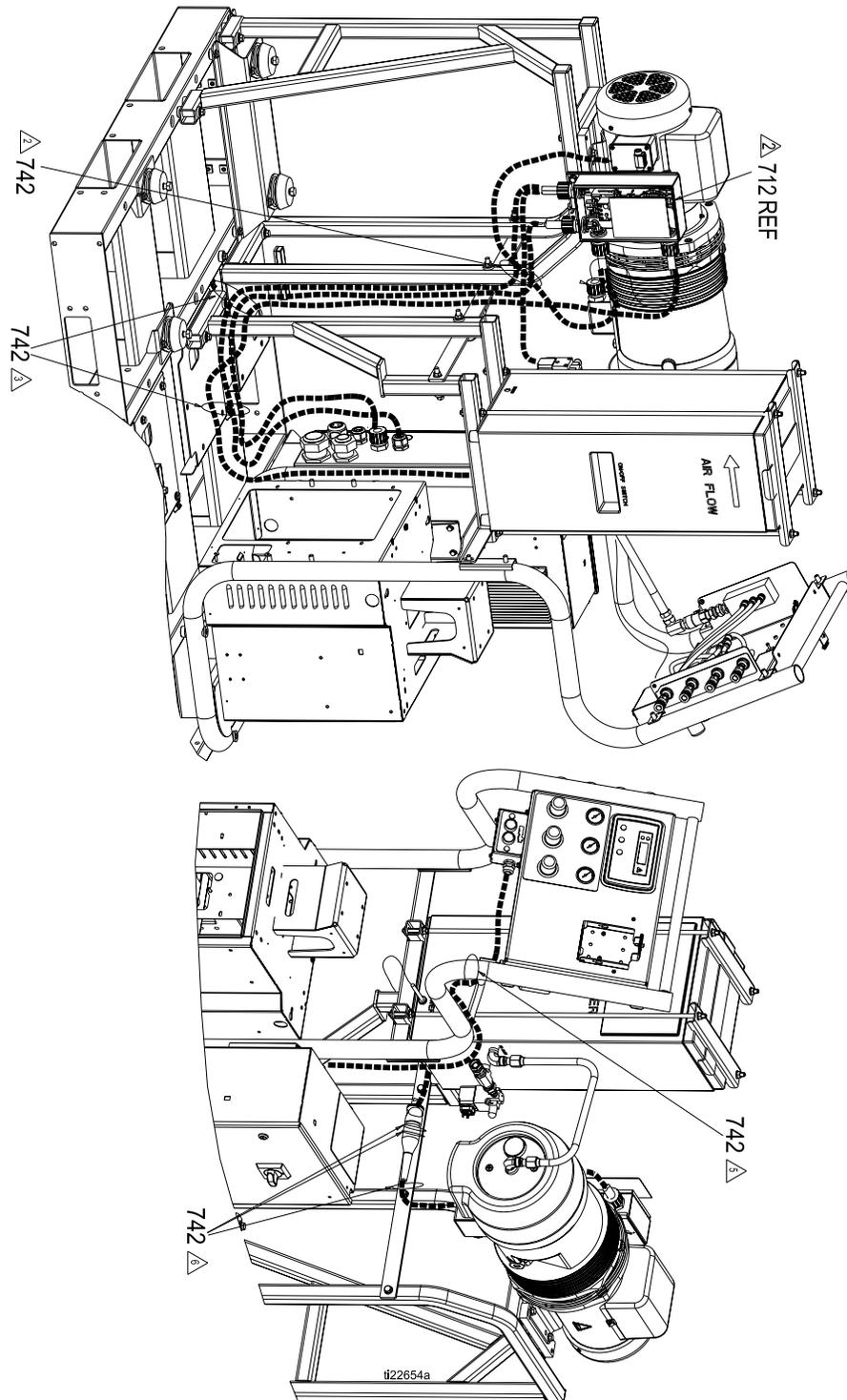


Apply anaerobic sealant to all non-swiveling pipe threads.



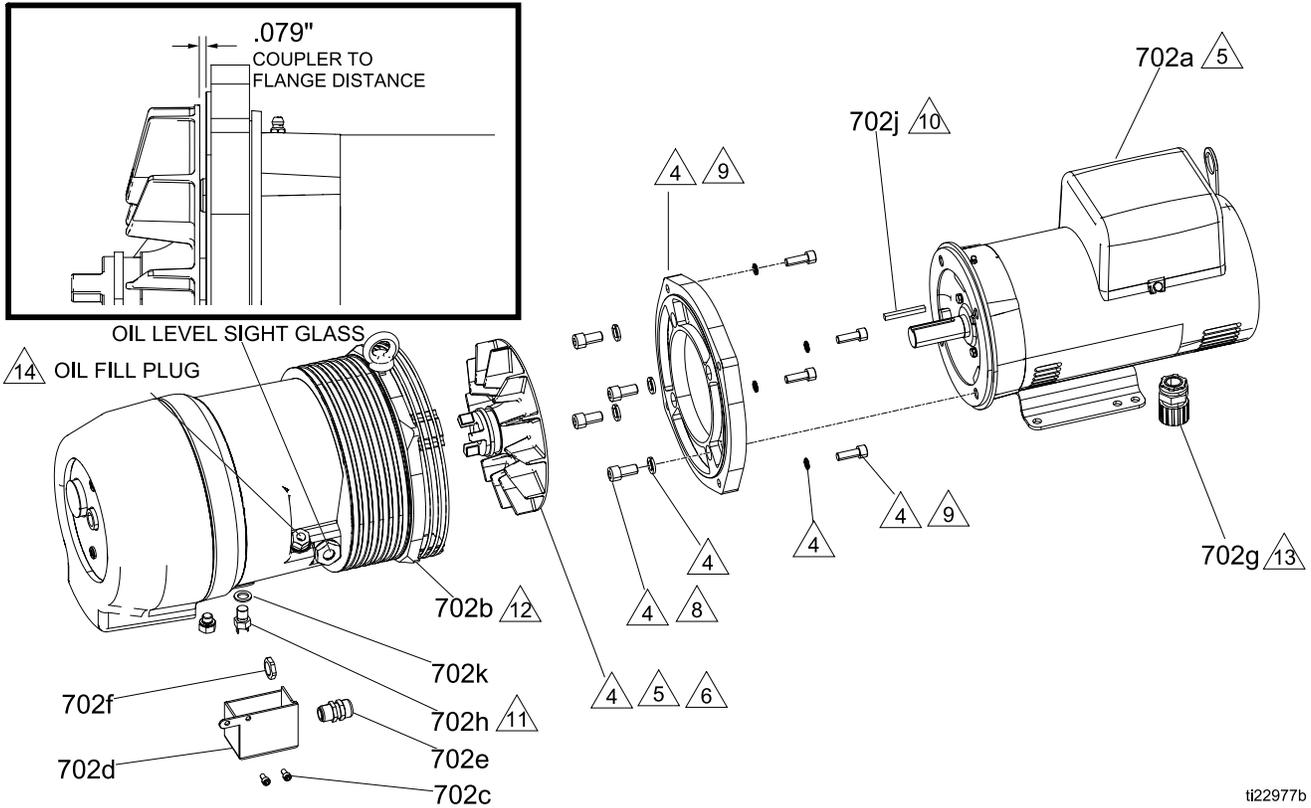
Use from safety label (55) or (283).

Cable Routing



- 2 Do not allow cables from starter box to touch engine. Secure all cables with cable ties (742) to frame approximately where shown every 6–12 in. as needed.
- 3 Secure with cable ties (742) to pallet tie downs where shown.

Parts



ti22977b

- 4** Parts included with compressor (702b)
- 5** Coupler supplied with compressor (702b) needs to be pressed on to (motor (702a) as shown in detail view.
- 6** Torque to 20 ft.-lbs (27 N•m).
- 8** Torque to 34 ft.-lbs (46 N•m).
- 9** Torque to 36 ft.-lbs (43 N•m).
- 10** Discard key supplied with motor and replace with key (702j).

- 11** Discard plug supplied on compressor and install thermal switch (702h).
- 12** Discard lift ring to install flange.
- 13** Discard steel washer on (702g) before assembly.
- 14** Use only Hydrovane Fluid Force Red 2000 or CompAir CS-300 compressor oil. Fill to top of fill plug opening. One gallon container, Part No. 17A101, is available as an accessory.

Ref	Part	Description	Quantity		
			272089	272090	272091
701*	272079	Reactor, E-30i	1		
	272080	Reactor, E-30i with heat		1	
	272081	Reactor, E-XP2i with heat			1

* For parts, see [272079](#), [272080](#), and [272081](#), page 107.

Air Compressor Parts

All air compressor parts are included in the Air Compressor Accessory Kit. See [Accessories](#), page 13.

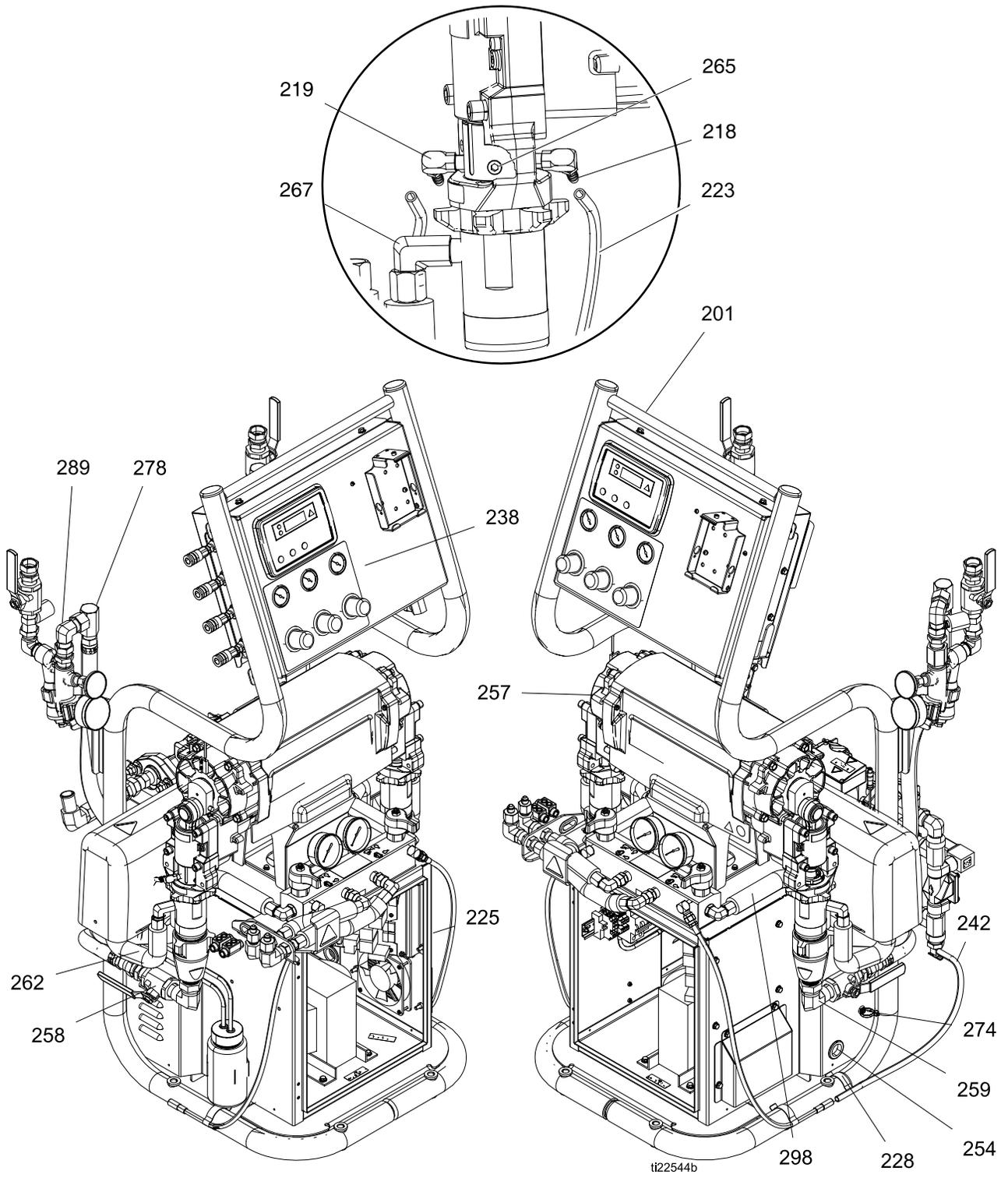
Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
702	16Y567	COMPRESSOR, tankless, 5 hp; includes 702a-702k	1	716	15E511	FITTING, union, swivel 1/2 x 1/4	1
702a	127364	MOTOR, 5 hp	1	717	218093	HOSE, coupled; 1/2-14 npt, 22 in. (559 mm)	1
702b	- - -	COMPRESSOR, tankless	1	718	113505	NUT, keps, hex hd; #10	3
702c	107530	SCREW, cap, sch, hex	2	719	112958	NUT, hex, flanged; 3/8-16	12
702d	16X024	COVER overload switch	1	720	119865	SCREW, mach, hex serrated; 0.375 in. x 1/4-20	2
702e	260067	FITTING, strain relief, 1/2 npt	1	721	101577	SCREW, cap, hex hd; 0.375 in. x #10-24	3
702f	117625	NUT, locking	1	722	125856	SCREW, serrated flange; 0.375 in. x #8-32	3
702g	16M826	CORD, grip, 3/4 in.	1	723	121488	SCREW, hex hd, flanged; 2.75 in. x 3/8-16	10
702h	16Y809	SWITCH, thermal overload	1	724	113504	NUT, keps, hex hd	2
702j	16C282	KEY, square, 1/4	1	725	16X402	TUBE, compressor - air dryer	1
702k	127581	WASHER, bonded seal	1	726	111218	CAP, tube, square	2
703	127298	DRYER, air	1	730	125644	FITTING, branch tee, 1/2 npt	1
704	16W780	FRAME, air compressor	1	731	17A346	HOSE, rubber 5/16 in.; 6 ft (1.8 m)	1
705	16W685	FRAME, air dryer	1	732	156971	FITTING, nipple, short; 1/4-18 npt x 1/4-18 npt	1
706	16W689	BRACKET, clamp	1	733	16X520	VALVE, air, 3-way, din	1
707	16W843	ROD, threaded, 3/8-16	4	734	C19264	PLUG, pipe plug 1/4 in.	1
708	16W713	STRAP, frame connector	1	735	512910	MUFFLER, polyethylene 1/4 in." npt	1
709	24T849	ENCLOSURE, switch box	1	736	16X808	BRACKET, motor mount	2
710	16W577	ENCLOSURE, rear	1	737	112395	SCREW, cap, flng hd; 3/4 in. x 3/8-16	4
711	16W565	BRACKET, electrical box	1	738	111194	SCREW, cap flang hd; 2 in. x 3/8-16	6
712	24U083	STARTER, motor, reactor	1				
713	112538	FITTING, elbow, street, 90	1				
714	127108	FITTING, barbed 5/16 ID x 1/8 NPT	1				
715	C20679	FITTING, elbow; 1/2-14 npt x 7/8 un	2				

Parts

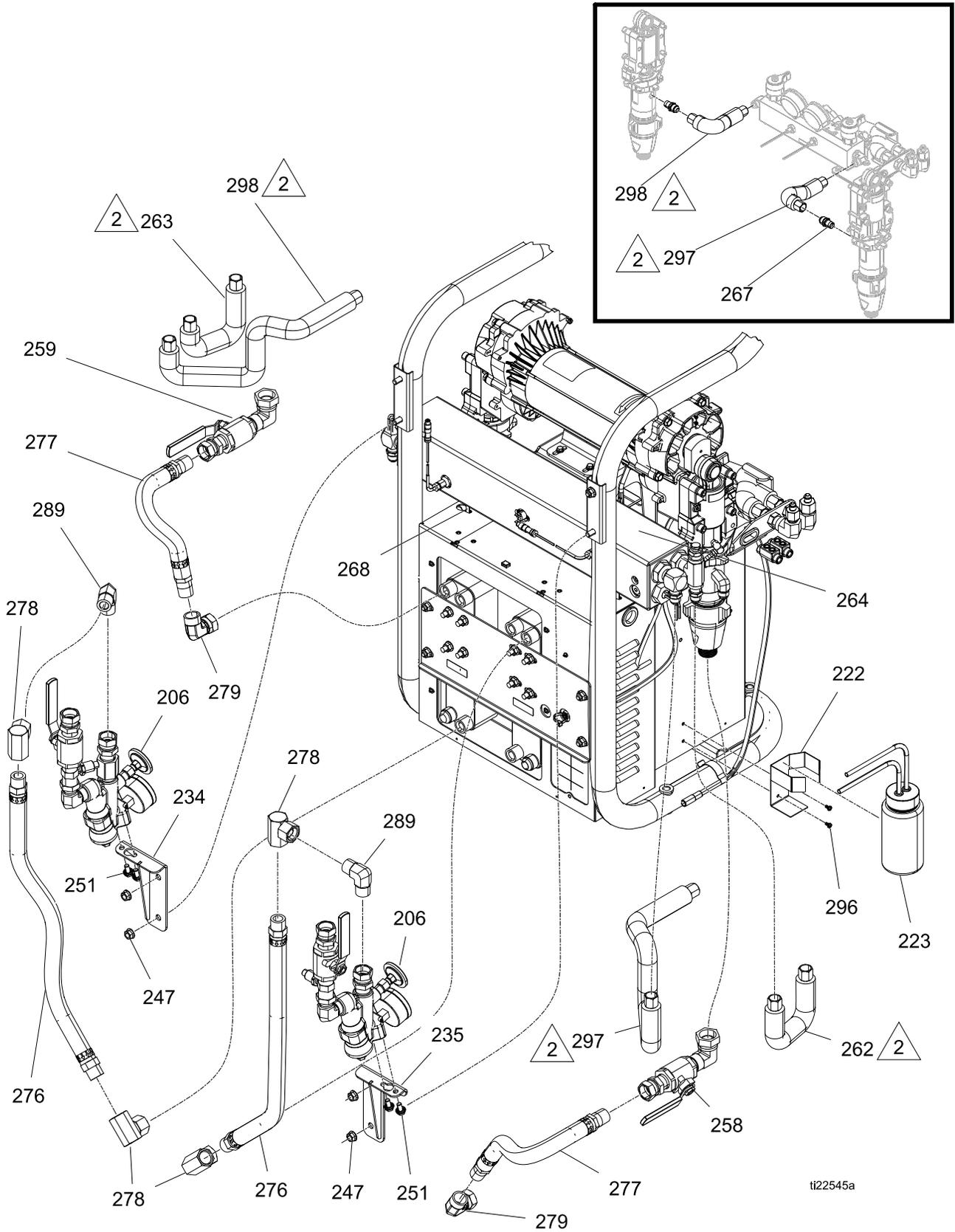
Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
739	125163	CLAMP, hose, 7/32 in. – 5/8 in.		743▲	189285	LABEL, hot surface	1
740	16Y488	NUT, wire, #14-#6 awg	2	744	190451	UNION, adapter	1
741	106569	TAPE, electrical	1	745	125871	TIE, cable, 7.5 in.	3
742	261105	TIE, cable, 14 in.	10				

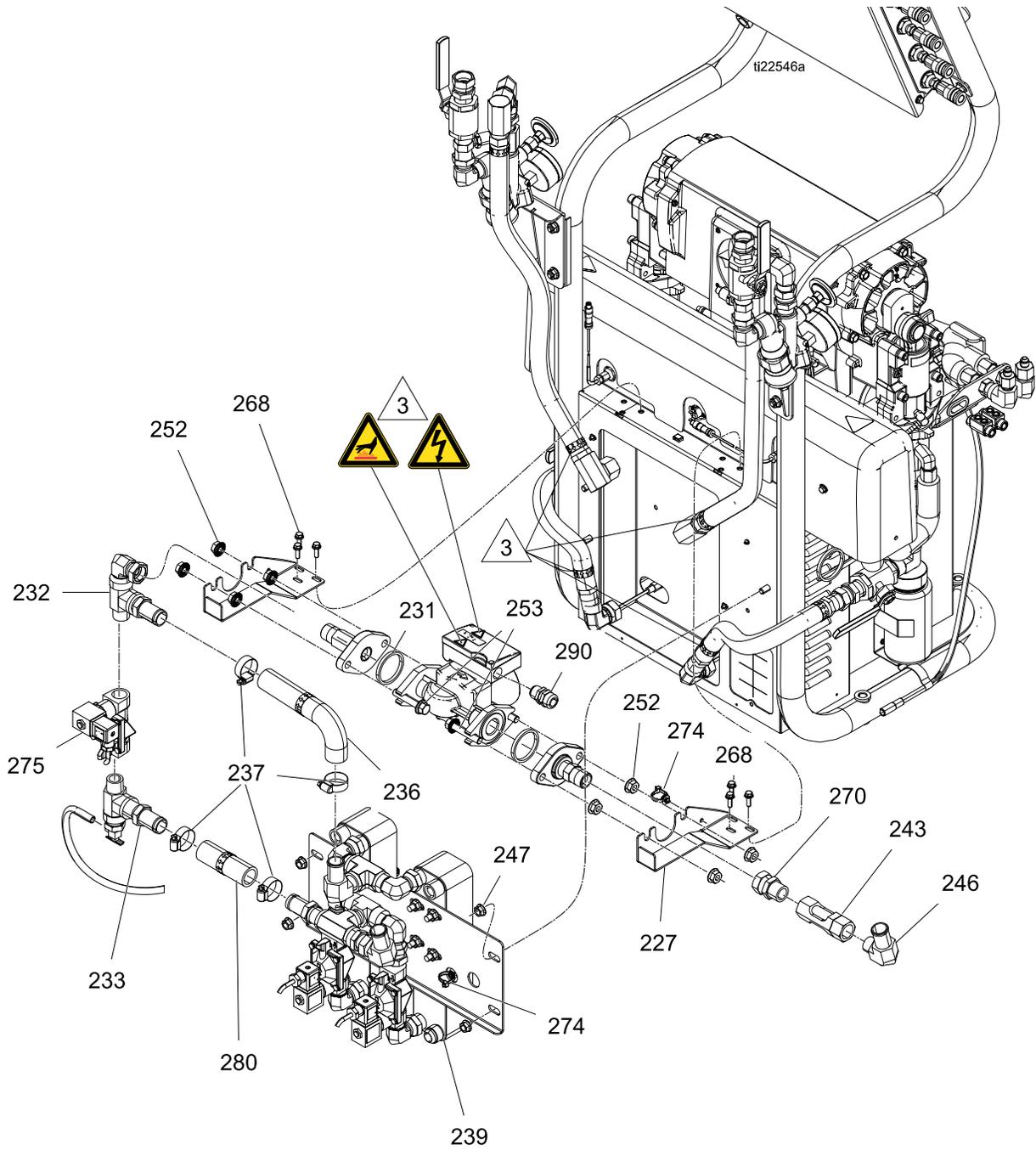
▲ *Replacement Warning labels, signs, tags, and cards are available at no cost.*

Proportioners

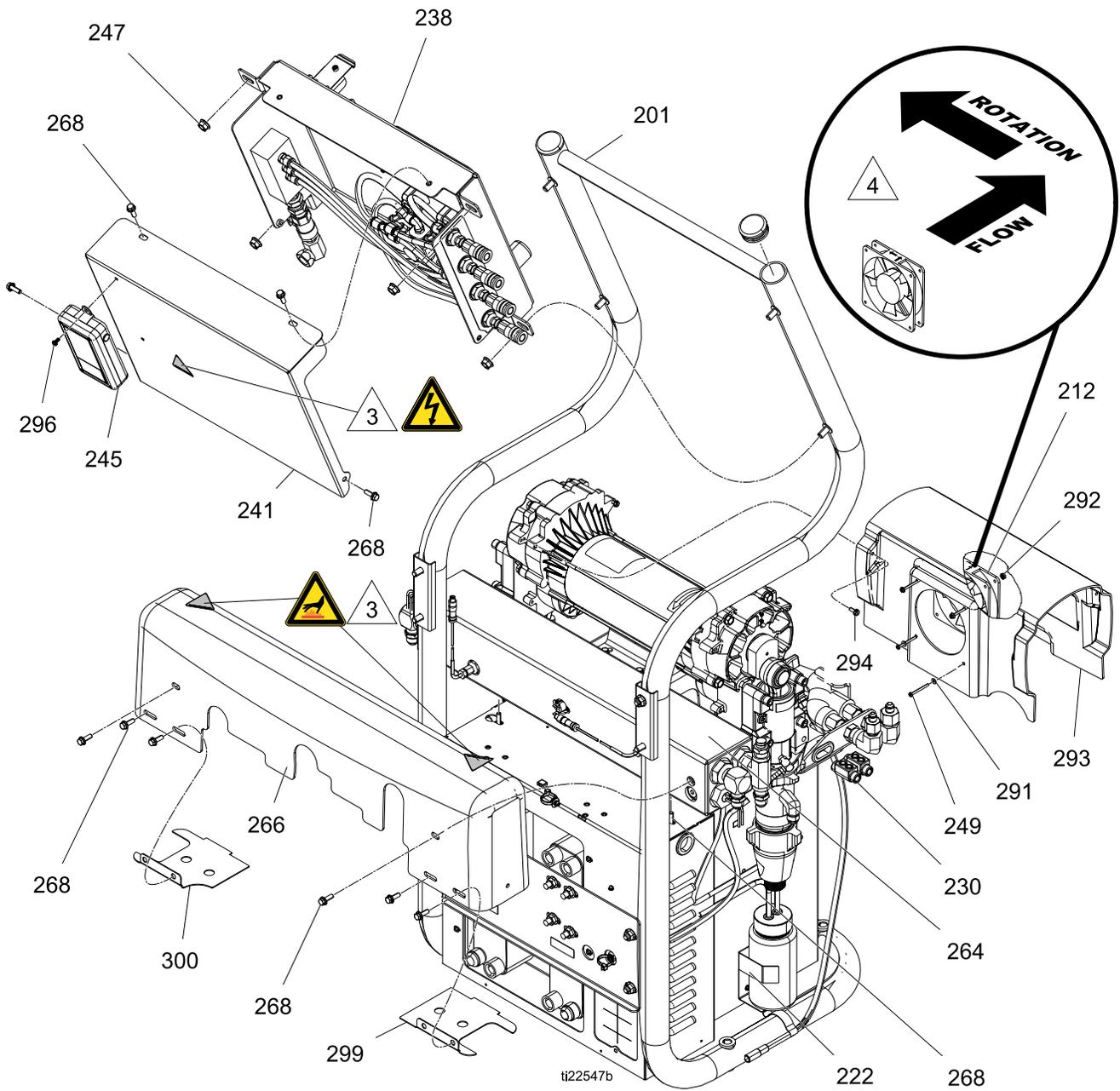


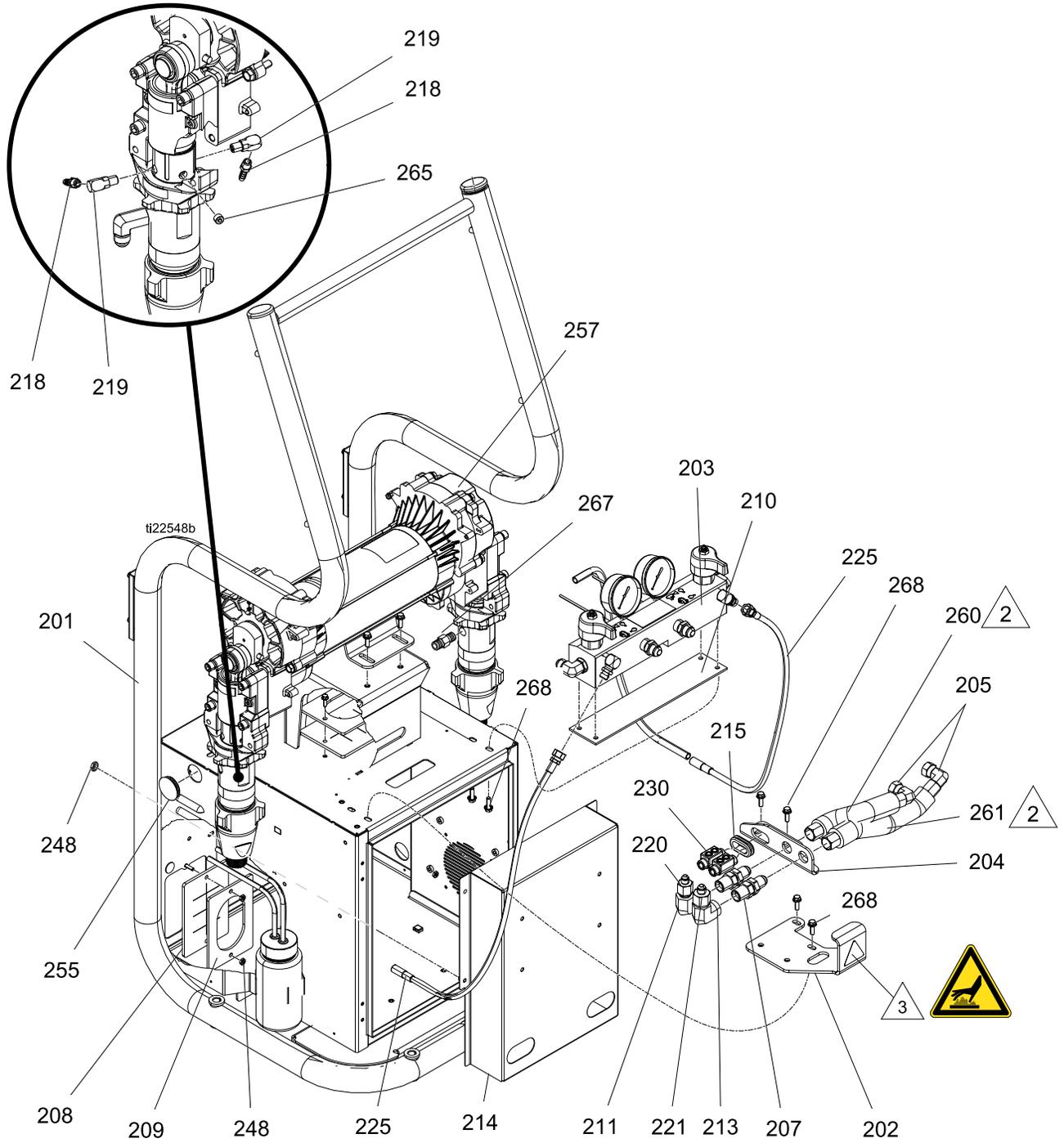
Parts



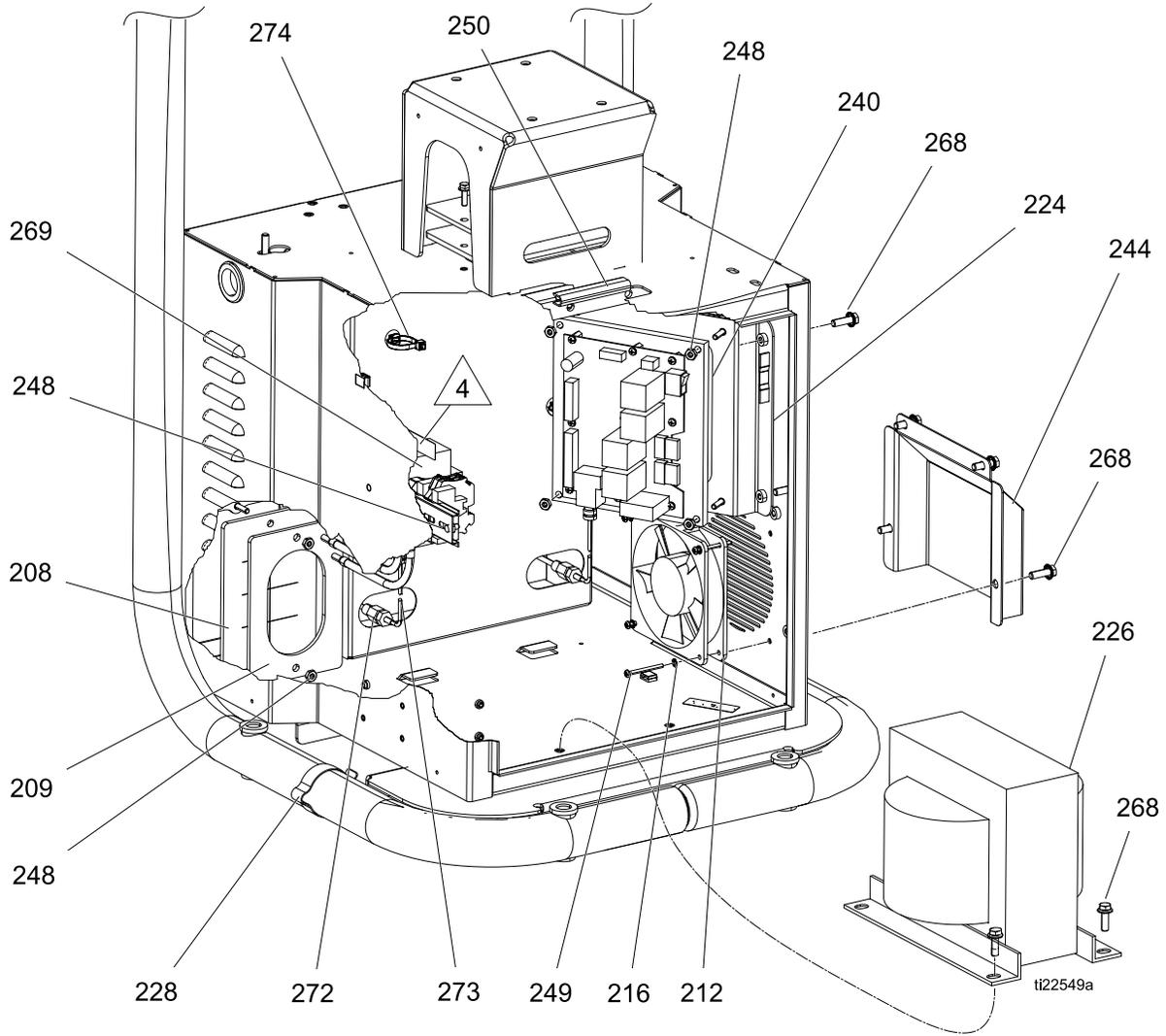


Parts





Parts



1 Apply anaerobic polyacrylate pipe sealant to all non-swiveling pipe threads.

2 Apply grease to tube fitting threads. Torque to 43 ft-lbs (58 N•m).

3 Safety and warning labels are from label sheet (283).

4 Fan air flow towards motor.

Ref	Part	Description	Quantity		
			E-30i	E-30i with Booster Heat	E-XP2i with Booster Heat
201	- - -	FRAME	1	1	1
202	16W233	BRACKET, tube guard	1	1	1
203	24T870	MANIFOLD, fluid	1	1	1
204	16W235	BRACKET, tube mount	1	1	1
205	16W608	FITTING, elbow 8jic swivel x 8jicm	2	2	2
206	24V143	KIT, assembly, pair, inlet	1	1	1
207	16W611	FITTING, bulk hd 1/2 nptm x 8 jicm	2	2	2
208	15H189	BOOT, wire feed through	2	2	2
209	15G816	COVER, plate, wire way	2	2	2
210	15B456	GASKET, manifold	1	1	1
211	16W609	FITTING, elbow 1/2 nptf x 8 jicm	1	1	1
212	24R756	FAN, cooling, 120 mm, 24 vdc	2	2	2
213	16W610	FITTING, elbow 1/2 nptf x 10 jicm	1	1	1
214	16J758	COVER, heat exchanger	1	1	1
215	16W648	GROMMET, rubber, 1.0 ID x 1.5 OD	1	1	1
216	103181	WASHER, lock ext	4	4	4
217	112125	PLUG, tube	2	2	2
218	116746	FITTING, barbed, plated; 1/8-27 npt x 1/4 in. I.D. hose	2	2	2
219	191892	FITTING, elbow, street, 90°; 1/8 npt	2	2	2
220	117502	FITTING, reducer #5 x #8 (JIC)	1	1	1
221	117677	FITTING, reducer #6 x #10 (JIC)	1	1	1
222	16X531	BRACKET, reservoir, lube	1	1	1
223	246995	RESERVOIR, bottle, assembly	1	1	1
224	16W183	BRACKET, load center	1	1	1
225	16W043	TUBE, pressure relief	2	2	2
226	15K742	TRANSFORMER, 4090 va, 230/90	1	1	1
227	16H761	BRACKET, mounting, pump	2	2	2
228	186494	CLIP, spring	3	3	3
229	255716	KIT, heater wire connector		1	1
230	261821	CONNECTOR, wire, 6 AWG	2	2	2

Parts

Ref	Part	Description	Quantity		
			E-30i	E-30i with Booster Heat	E-XP2i with Booster Heat
231	24L915	PUMP, centrifugal, circulation	1	1	1
232	24J699	KIT, fitting, pump	1	1	1
233	24K286	KIT, fitting, drain	1	1	1
234	16W191	BRACKET, strainer, left	1	1	1
235	16W193	BRACKET, strainer, right	1	1	1
236	125170	HOSE, formed, 1 in. ID, lower	1	1	1
237*	125371	CLAMP, hose, dia. 3/4-1-3/4 in.	4	4	4
238	24K385	PANEL, air control	1	1	1
239	24K381	EXCHANGER, heat, assembly	1	1	1
240★	24L957	BOARD, load center	1	1	1
241	16H880	COVER, air panel	1	1	1
242*	- - -	HOSE, rubber, 5/16 in.	2	2	2
243●	- - -	INDICATOR, flow, sight	1	1	1
244	16W184	COVER, fan	1	1	1
245	16X118	MODULE, cellular, GPS	1	1	1
246	125477	FITTING, 1 in. beaded barb x 3/4 nptm	1	1	1
247	112958	NUT, hex, flanged	12	12	12
248	113505	NUT, keps, hex hd	13	13	13
249	117683	SCREW, mach, phil pan hd; 1.5 in. x #6-32	8	8	8
250	126033	TRIM, edge; 0.33 ft (0.1 m)	1	1	1
251	111800	SCREW, cap, hex hd; 0.625 in. x 5/16-18	4	4	4
252	125943	NUT, serrated flange; 7/16-14	8	8	8
253	125944	SCREW, serrated flange; 2.25 in. x 7/16-14	4	4	4
254	114269	GROMMET, rubber	1	3	3
255	126043	PLUG, cap, 1.25 diameter hole	2		
256	126044	PLUG, cap, .75 diameter hole	2		
257	24V152	PROPORTIONER, module, E-30i, no heat; see Dual Zone 4.0 Kw Fluid Heater	1	1	
	24V153	PROPORTIONER, module, E-XP2i; see Dual Zone 4.0 Kw Fluid Heater			1
258-1❖	- - -	FITTING, A side, inlet, E-30	1	1	
258-2❖	- - -	FITTING, A side, inlet, E-XP2			1
259-3❖	- - -	FITTING, B side, inlet, E-30	1	1	
259-4❖	- - -	FITTING, B side, inlet, E-XP2			1
260	16W206	TUBE, A-side, hose outlet	1	1	1
261	16W207	TUBE, B-side, hose outlet	1	1	1

Ref	Part	Description	Quantity		
			E-30i	E-30i with Booster Heat	E-XP2i with Booster Heat
262	16W199	TUBE, A-side, inlet		1	1
263	16W202	TUBE, B-side, inlet		1	1
264	24V145	HEATER, assy, 4.0kw, hybrid, 2 zone; see Dual Zone 4.0 Kw Fluid Heater		1	1
265	104765	PLUG, pipe, headless	2	2	2
266	16K361	COVER, horizontal heater		1	1
267	121311	FITTING, connector, 3/8-18 npt x 1/2 jic	2		
	125643	FITTING, elbow, 3/8 npt x #8 jic		2	2
268	113796	SCREW, flanged, hex hd; 3/4 in. x 1/4-20	32	40	40
269	24T059	MODULE, breaker, hose, int reactor	1	1	1
270●	157785	FITTING, swivel; 3/-14 nps x 3/4-14 npt	1	1	1
271	16K646	HARNESS, dc, valve, coolant	1	1	1
272◆	---	FITTING, compression, 1/8 npt, ss	2	2	2
273◆	---	SENSOR, RTD, 1 kohm, 4 pin, 4.25 in.	2	2	2
274	125625	TIE, cable, fir tree	9	9	9
275*	24L916	VALVE, solenoid, 3/4 npt, 12 VDC	1	1	1
276	16K312	HOSE, coupled, 26 in. (660 mm)	2	2	2
277	16K311	HOSE, coupled, 18 in. (457 mm)	2	2	2
278	156589	FITTING, union, adapter, 90°; 3/4 nptf x 3/4 npsm, 1.25 in.	4	4	4
279	125535	FITTING, #12 jic swivel x 3/4 npt(m)	2	2	2
280*	---	HOSE, coolant, 1 in. ID, bulk; 0.33 ft. (0.1 m)	1	1	1
281	115836	GUARD, finger	1	1	1
282	125857	SCREW, serrated flange, hex hd; .625 in. #10-24	2	2	2
283▲	16W612	LABEL, safety	1	1	1
284	198586	CONDUIT, corrugated	1	1	1
287✘	261843	FLUID, oxide inhibitor	1	1	1
288✘	125871	TIE, cable, 7.50 in.	8	8	8
289	295847	FITTING, elbow, 90°, 3/4 npt	2	2	2
290	260067	FITTING, strain relief, 1/2 npt	1	1	1
291	151395	WASHER, flat	4	4	4
292	127278	NUT, keps, hex; #6-32	4	4	4
293	16W765	COVER, motor	1	1	1

Parts

Ref	Part	Description	Quantity		
			E-30i	E-30i with Booster Heat	E-XP2i with Booster Heat
294	118444	SCREW, mach, slot hex wash hd; 1/2 in. x #10-24	4	4	4
295	194337	WIRE, grounding, door	1	1	1
296	16X129	SCREW, mach, phillips, tooth washer, .375 in. x #8-32	4	4	4
297	16W201	TUBE, A-side, outlet		1	1
	16W204	TUBE, A-side, outlet	1		
298	16W203	TUBE, B-side, outlet		1	1
	16W205	TUBE, B-side, outlet	1		
299	17A064	GUARD, heater, A-side		1	1
300	17A066	GUARD, heater, B-side		1	1

- ▲ Replacement Warning labels, signs, tags, and cards are available at no cost.
- ★ Purchase Relay Repair Kit 24L958; includes four relays. Purchase Fuse Repair Kit 24L959; includes two fuses..
- * Order 125774 Valve Repair Kit to replace all internal valve parts. Order 125787 Coil Repair Kit to replace coil.
- ◆ Included in RTD Repair Kit 24L972.

- Included in Sight Glass Kit 24L921.
- * Included in Complete Coolant Hose Kit 24L939. See [Complete Coolant Hose Kit, page 131](#)
- ❖ Included in Pump Inlet Assembly Kit. See [Pump Inlet Assembly Kits, page 131](#).
- + See [Electrical Schematics, page 154](#).
- ✘ Not shown.

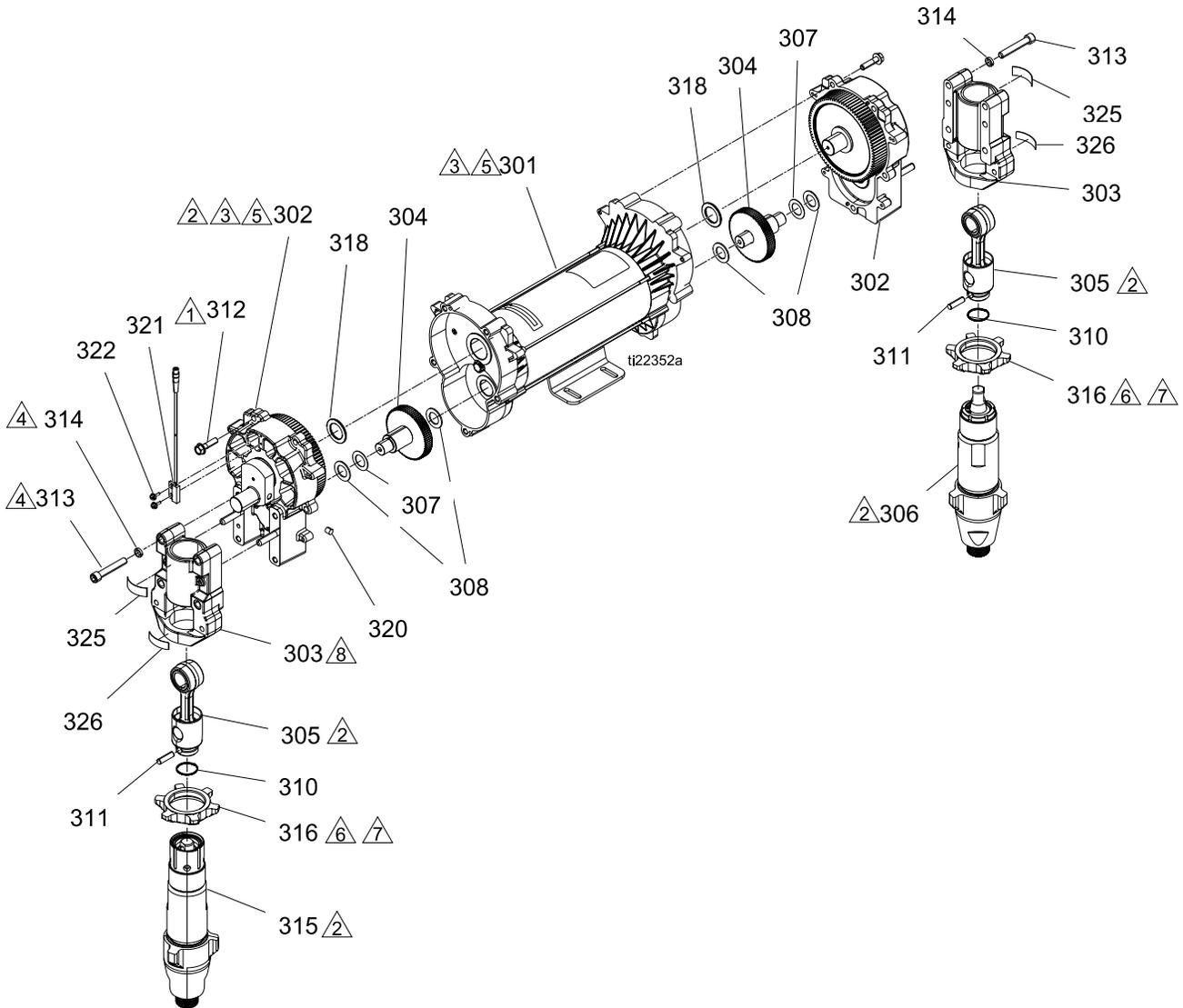
Pump Inlet Assembly Kits

Description	Kit	Includes:		
E-30i A Side	24L926	258-1	277	279
E-30i B Side	24L927	259-3	277	279
E-XP2i A Side	24L928	258-2	277	279
E-XP2i B Side	24L929	259-4	277	279
Qty:		1	1	1

Complete Coolant Hose Kit, 24L939

Ref	Description	Qty.
Systems		
36a	HOSE, coolant, 1 in. ID, 2.66 ft (0.81 m)	1
36b	HOSE, coolant, 1 in. ID, 2.92 ft (0.89 m)	1
37	CLAMP, hose, dia. 11/16-1-1/2 in.	2
40	CLAMP, hose, 7/32-5/8 in.	6
Proportioners, page 121		
237	CLAMP, hose, dia. 3/4-1-3/4 in.	4
242	HOSE, rubber, 5/16 in., 1 ft (0.3 m)	2
280	HOSE, coolant, 1 in. ID, 0.33 ft (0.1 m)	1
22 kW Diesel Generator		
562	CLAMP, hose, dia. 3/4-1-3/4 in.	1
Radiator		
620	HOSE, formed, 1-1/4 upper radiator	1
621	HOSE, coolant, 1 in. ID; 6 in. (152.4 mm)	1
622	CLAMP, hose, dia. 3/4-1-3/4 in.	4
623	CLAMP, hose, dia. 11/16-1-1/2 in.	2
627	HOSE, formed, 1-1/4 lower radiator	1
628	HOSE, 1 in. ID; 0.271 ft (0.08 m)	1
629	HOSE, 5/16 in. ID; 1.5 ft (0.5 m)	1
640	HOSE, formed, 1-1/4 upper engine	1
641	CLAMP, hose 7/32 in. - 5/8 in.	4
642	HOSE, formed, 1-1/4 lower engine	1

Proportioner Module
24V152, Module for E-30i
24V153, Module for EXP2i



- 1 Torque to 190–120 in-lbs (21–24 N•m).
- 2 Lubricate threads with ISO oil or grease. Assemble pump cylinders flush to one full thread under-flush of housing surface.
- 3 Apply grease to all gear teeth proportionally, motor pinion and drive housing.
- 4 Torque to 20–30 ft-lbs (27–40.6 N•m).
- 5 Crankshaft must be in line with crankshaft at other end of motor.
- 6 Torque to 70–80 ft-lbs (95–108 N•m).
- 7 Flat side faces up.

Ref	Part	Description	Quantity	
			24V152	24V153
301	24U051	MOTOR, brushless, double ended, 2 hp	1	1
302	24M008	HOUSING, drive, mark vii	2	2
303	257355	HOUSING, bearing	2	
	245927	HOUSING, bearing		2
304◆	287290	KIT, repair, gear	2	2
305●	241279	KIT, rod, connecting	2	2
306★	245971	PUMP, displacement, B		1
	245972	PUMP, displacement, A	1	
307◆	114699	WASHER, thrust; copper colored	2	2
308◆	114672	WASHER, thrust; steel colored	4	4
310●	183169	SPRING, retaining	2	2
311	183210	PIN, str, hdls	2	2
312	15C753	SCREW, mach, hex wash hd	10	10
313	114666	SCREW, cap, socket head	8	8
314	106115	WASHER, lock (hi-collar)	8	8
315★	246831	PUMP, displacement, A		1
	246832	PUMP, displacement, A	1	
316	193394	NUT, retaining	2	
	193031	NUT, retaining		2
318	116192	WASHER, thrust	2	2
320	116618	MAGNET	1	1
321	24T878	SWITCH, reed, m8 4-pin	1	1
322	127301	SCREW, hxhd, thd cut, 4-40 x .375	2	2
325	187437	LABEL, torque	2	2
326▲	192840	LABEL, warning	2	2

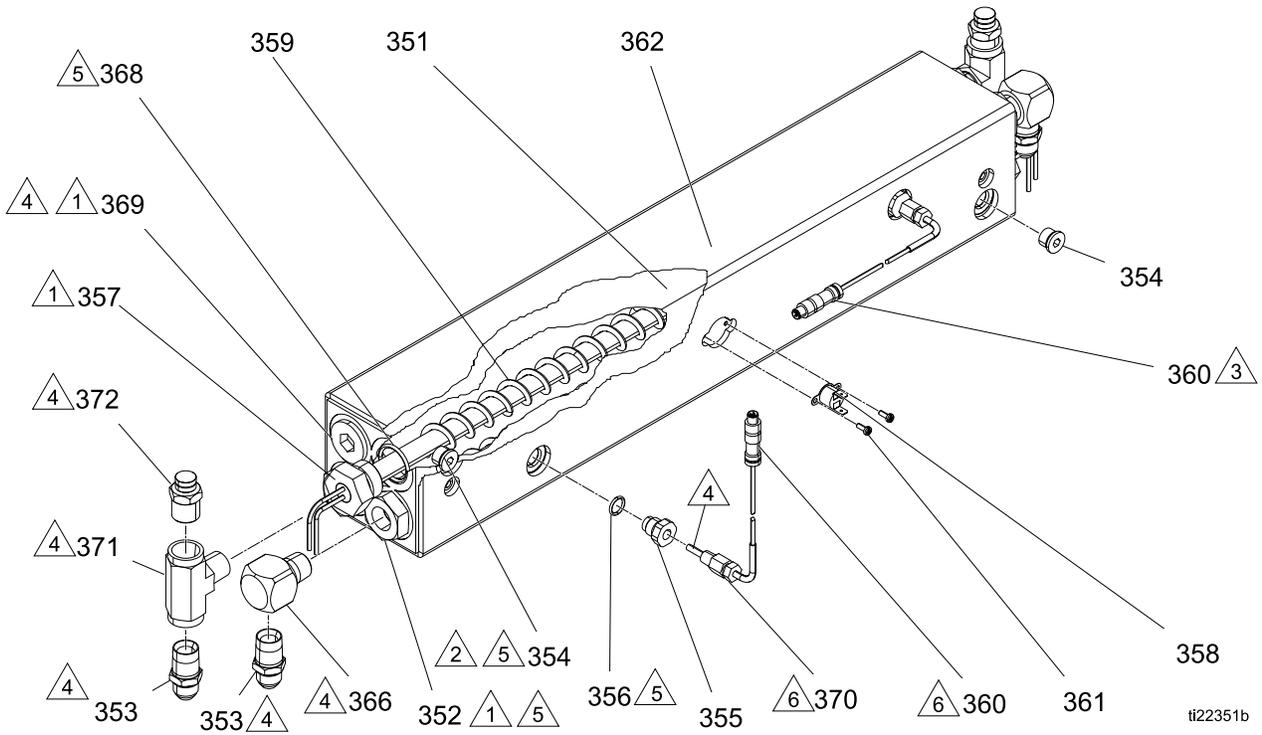
▲ Replacement Warning labels, signs, tags, and cards are available at no cost.

★ See Pump Repair manual 309577 for repair kits.

● Spring (310) included in 241279 Connecting Rod Kit.

◆ Gear Repair Kit includes washers (307) and (308).

Dual Zone 4.0 Kw Fluid Heater 24V145



ti22351b

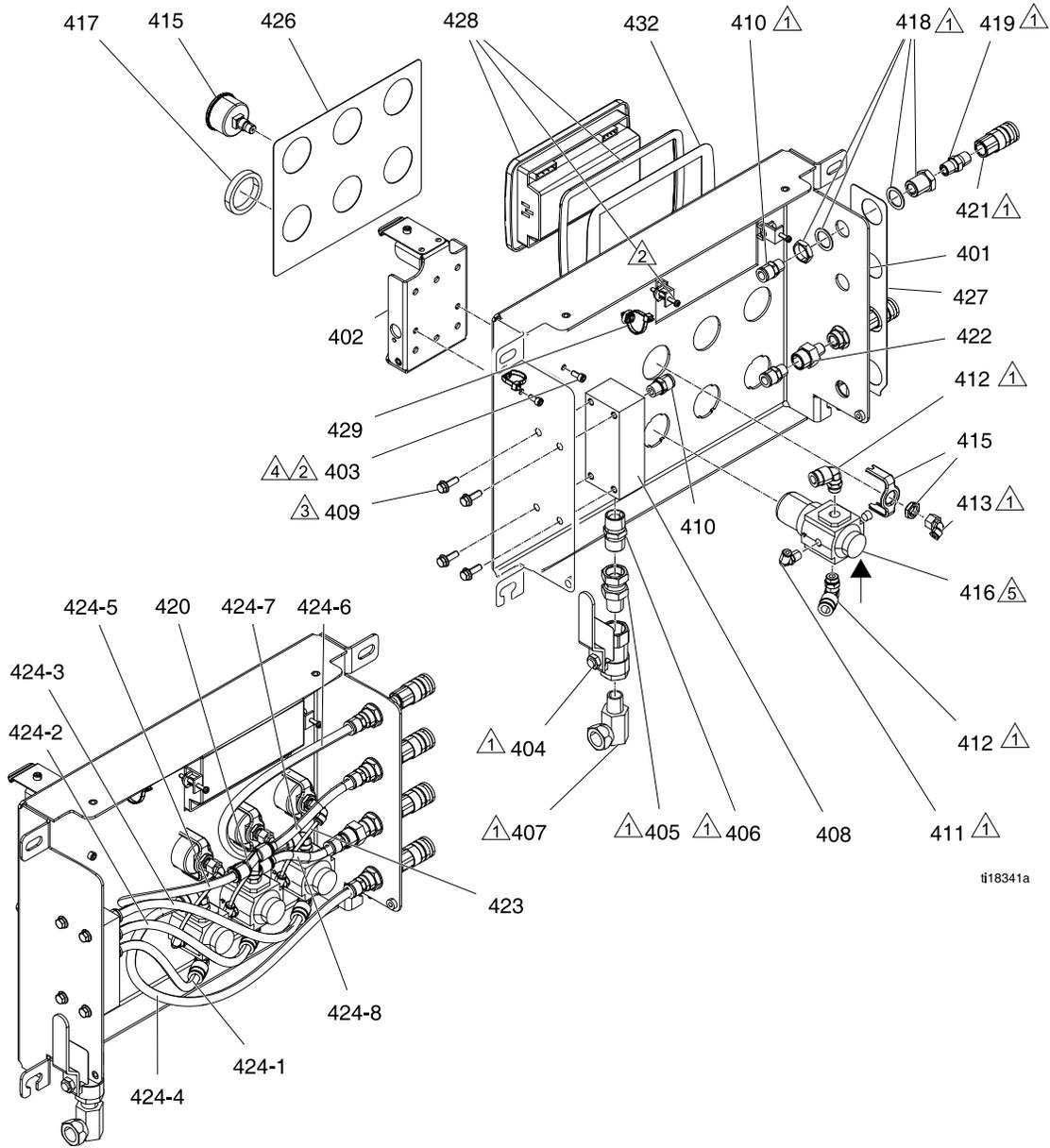
- 1 Torque to 120 ft-lbs (163 N•m).
- 2 Torque to 23 ft-lbs (31 N•m).
- 3 Apply thermal paste.
- 4 Apply pipe sealant and PTFE tape to all non-swiveling threads and threads without o-rings.
- 5 Apply lithium grease lubricant to o-rings before assembling in block (1).
- 6 Remove tape from probe tip and Orientate sensor as shown. Insert probe until it bottoms on heating element. Tighten ferrule on sensor probe one turn past finger tight or 16 ft-lbs. (21.6 N•m).

24V145

Ref	Part	Description	Qty	Ref	Part	Description	Qty
351	15M878	BLOCK, horizontal	1	361	124131	SCREW, machined, pan hd, 0.375 in. (9.5 mm), #6-32	2
352	15H302	REDUCER, #14 SAE x 1/2-14 NPT(f)	4	362	15M177	INSULATOR, foam, heater, horizontal	1
353	121319	ADAPTER, 1/2-14 NPT x #8 JIC	4	366	158683	ELBOW, 90°, 1/2-14 NPT x 1/2-14 NPT	2
354	15H304	PLUG, 9/16 SAE	2	368	124132	O-RING, fluoroelastomer	4
355	15H306	ADAPTER, 9/16-18 x 1/8-27 NPT(f)	2	369	15H305	PLUG, hollow hex 1-3/16 SAE	2
356	120336	O-RING, packing	2	370*	-	COMPRESSION, 1/8 NPT, SST	2
357	17A092	HEATER, immersion, (2000W, 230V)	1	371	125644	BRANCH TEE, 1/2 NPT	2
358	15B137	SWITCH, over temperature	1	372	248187	KIT, rupture disc assembly	2
359	15B135	MIXER, immersion heater	2				
360*	-	SENSOR, RTD, 1 kohm, 90°, 4 pin, tip	2				

* Included in 24L973 Heater RTD Repair Kit.

Air Control Panel



i18341a

-  Apply pipe sealant to all non-swiveling pipe threads.
-  Apply anaerobic thread sealant to threads.
-  Torque to 25 +/- 2 ft-lbs (34 N•m)

-  Torque to 10 +/- 2 ft-lbs (14 N•m)
-  See parts illustration for air flow direction.

Ref	Part	Description	Qty	Ref	Part	Description	Qty
401	16H452	BRACKET, air control	1	405	190451	UNION, adapter, 1/2 NPT x 1/2 NPSM	1
402	277853	BRACKET, mounting, booth control	1	406	158491	NIPPLE, 1/2-14 NPT	1
403	117026	SCREW, SHCS, 0.5 in. (12 mm), M5 x 0.8	2	407	155470	SWIVEL, union, 90°, 1/2-14 NPSM x 1/2-14 NPT	1
404	113331	VALVE, ball, vented, 1/2 in.	1	408	16H482	MANIFOLD, 1/2 NPT x 1/4 NPT	1

Ref	Part	Description	Qty	Ref	Part	Description	Qty
409	113796	SCREW, flanged, hex hd, 0.75 in. (19 mm), 1/4–20	4	420	125539	UNION, Y, 3/8 OD tubing	1
410	122161	FITTING, air, 1/4 NPT x 3/8 OD	7	421	114558	COUPLER, line, air, 1/4–18 NPT	4
411	124287	FITTING, adapter, 1/2 npt(m) x #8 JIC(m), ms	3	422	16H531	FITTING, flow control, 1/4–18 NPT	1
412	115841	FITTING, elbow, 1/4 NPT(f) x 3/8 OD	6	423	—	TUBE, nylon, round, black	1
413	15T498	FITTING, 90°, swivel, 5/32 OD x 1/8 NPT(f)	3	424	—	HOSE, nylon, 250 psi; see identification table	9
415	116257	GAUGE, pressure, 0–160 psi (0–1 MPa, 0–11 bar)	3	426	16K325	LABEL, instructions	1
416	116513	REGULATOR, air	3	427	16K326	LABEL, instructions	1
417	116514	NUT, regulator, plastic	3	428	24M665	MODULE, engine controller	1
418	104641	BULKHEAD, 1 in. (25.4 mm), 3/4–20 x 1/4–18 NPT	4	429	125625	TIE, cable, fir tree	2
419	156971	NIPPLE, short, 1/4–18 NPT	4	432	16K940	LABEL	1

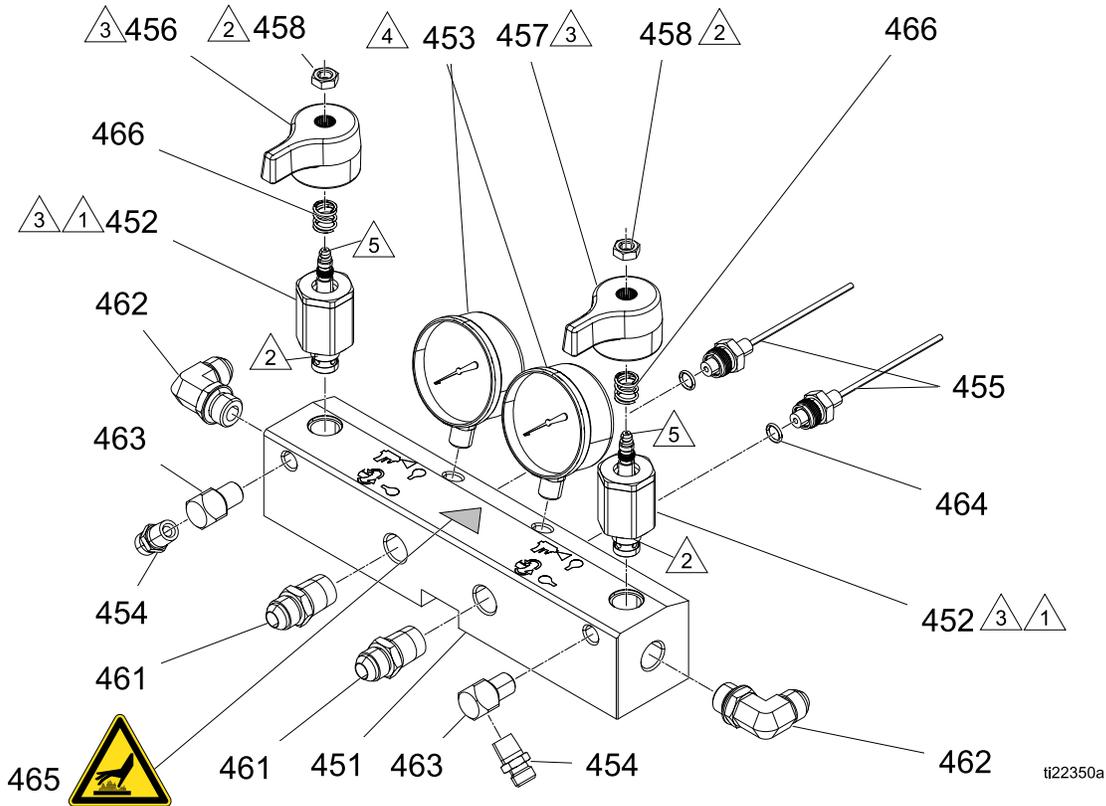
▲ Replacement Warning labels, signs, tags, and cards are available at no cost.

★ Included in Tubing Repair Kit 24M650.

424 Identification Table

Ref	Length in. (mm)	Qty.
424-1	11 (279.4)	1
424-2	13.5 (342.9)	1
424-3	16.5 (419.1)	1
424-4	16 (406.4)	1
424-5	16.5 (419.1)	1
424-6	15 (381)	1
424-7	6.5 (165.1)	1
424-8	5.5 (139.7)	1
423	4 (101.6)	3

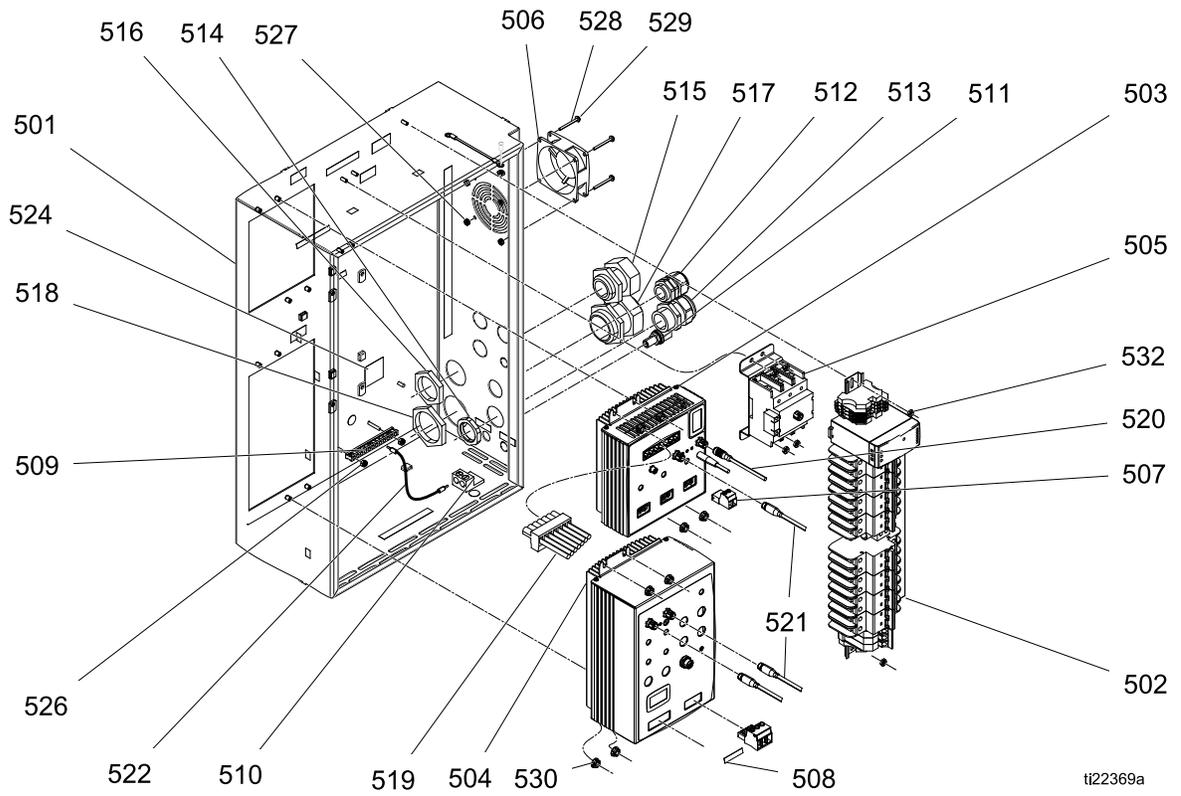
Fluid Manifold 24T870



- Torque to 355–395 in.-lbs (40–44.6 N•m)
- Apply sealant (113500) to threads.
- Valve must be closed with handle position as shown on drawing.
- Apply PTFE tape and thread sealant to gauge threads.
- Apply grease on valve.
- ** Apply PTFE tape or thread sealant to tapered threads.

Ref	Part	Description	Qty	Ref	Part	Description	Qty
451	255228	MANIFOLD, fluid	1	462	121312	ELBOW, male, 3/4 SAE x 1/2 JIC	1
452★	247824	KIT, valve, cartridge, drain	2	463	100840	ELBOW, street, 1/4–18 npt x 1/4–18 npt	1
452a★	158674	O-RING, BUNA-N	1	464	111457	O-RING, PTFE	2
452b★	247779	SEAL, seat, valve	1	465	189285	LABEL, hot surface	1
453	102814	GAUGE, press, fluid	2	▲			
454	162453	FITTING, 1/4 NPSM X 1/4 NPT	2	466	150829	SPRING, compression	2
455	15M669	SENSOR, pressure, fluid outlet	2	▲	Replacement Warning labels, signs, tags, and cards are available at no cost.		
456	247788	HANDLE, red	1	★	Included in the following complete valve kits: ISO Valve Kit (left/red) handle 255149. Resin Valve Kit (right/blue handle) 255150. Valve Set Kit (both handles and grease gun) 255148.		
457	247789	HANDLE, blue	1				
458	112309	NUT, hex, jam	2				
461	124287	FITTING, adapter, 7/8, 1/2–1/4 nptm x #8 JIC					

Electrical Enclosure



ti22369a

Electrical Enclosure

Ref.	Part	Description	Qty.	Ref.	Part	Description	Qty.
501	- - -	ENCLOSURE, electrical, power	1	517	127253	BUSHING, strain relief, m50 thread	1
502	24T061	MODULE, BREAKER, integr reactor	1	518	127254	NUT, strain relief, m50 thread	1
503	24U855	MODULE, TCM	1	519	24T174	HARNESSE, control box	1
504	24U832	MODULE, MCM	1	520	24R735	CABLE, CAN power, m12 fem, pigtail	1
505	24T060	MODULE, disconnect	1	521	121000	CABLE, CAN, female / female 0.5m	2
506	24R757	FAN, COOLING, 80MM, 24VDC	1	522	125859	WIRE, chassis, ground	1
507	24R754	CONNECTOR, power, male, 2 pin	1	523	194337	WIRE, grounding, door	1
508	123143	CONNECTOR, power, male, 4 pin	1	524	16W456	LABEL, identification	1
509	122313	BAR, ground, kit	1	526	109466	NUT, lock hex	2
510	117666	TERMINAL, ground	1	527	127278	NUT, keps, hex	4
511	121612	CONNECTOR, thru, m12, mx	1	528	151395	WASHER, flat	4
512	121603	GRIP, cord, .51-.71, 3/4	1	529	117683	SCREW, mach, phil pan hd	4
513	126881	BUSHING, strain relief	1	530	115942	NUT, hex, flange head	8
514	126891	NUT, bushing	1	531	103473	STRAP, tie, wire	8
515	120858	BUSHING, strain relief, m40 thread	1	532	113505	NUT, keps, hex hd	7
516	120859	NUT, strain relief, m40 thread	1				

See *Electrical Schematics, page 154.*

✘ *Not shown.*

22kW Diesel Generator

Ref	Part	Description	Qty.	Ref	Part	Description	Qty.
551	—	ENGINE, diesel, Perkins	1	572	24L965	CIRCUIT, breaker, 90A	1
552	24R079	ALTERNATOR, 22 kw, diesel engine	1	572a		SCREW	2
556	16J883	BRACKET, engine mount, left	1	572b		WASHER	2
557	16J884	BRACKET, engine mount, right	1	572c		NUT	2
558	125532	SCREW, M14 hex head x 30 mm	10	575	125631	BUSHING, cable, lay-in strain relief	1
559	16H904	ENCLOSURE, alternator, front	1	576	120858	BUSHING, strain relief, M40 thread	1
560	16H906	ENCLOSURE, alternator, front	1	577	125625	TIE, cable, fir tree	4
562	125371	CLAMP, hose, dia. 3/4-1-3/4 in.	1	579	120859	NUT, strain relief, M40 thread	1
*				580	—	See Radiator	1
563	125394	ISOLATOR, mount, radiator, bottom	2	581	120736	SCREW, hex flange hd, M6 x 1	2
564	100079	WASHER, lock, spring	8	582	115942	NUT, hex, flange head	2
565	106245	SCREW, cap, sch, 0.625 in. (16 mm) x #8-32	8	583■	—	MUFFLER, 2 in. (50.8 mm) exhaust	1
568	16J799	BRACKET, engine relay	1	584■	125161	CLAMP, muffler	1
569	24L963	KIT, relay, solenoid, 12v, intermittent	2	586	104572	WASHER, lock spring	2
570	113161	SCREW, flanged, hex hd, 1/2 in. x 1/4-20	4	587	105328	SCREW, cap, hex hd, M8 x 1.25	2

■ *Included in Muffler Kit 24L943.*

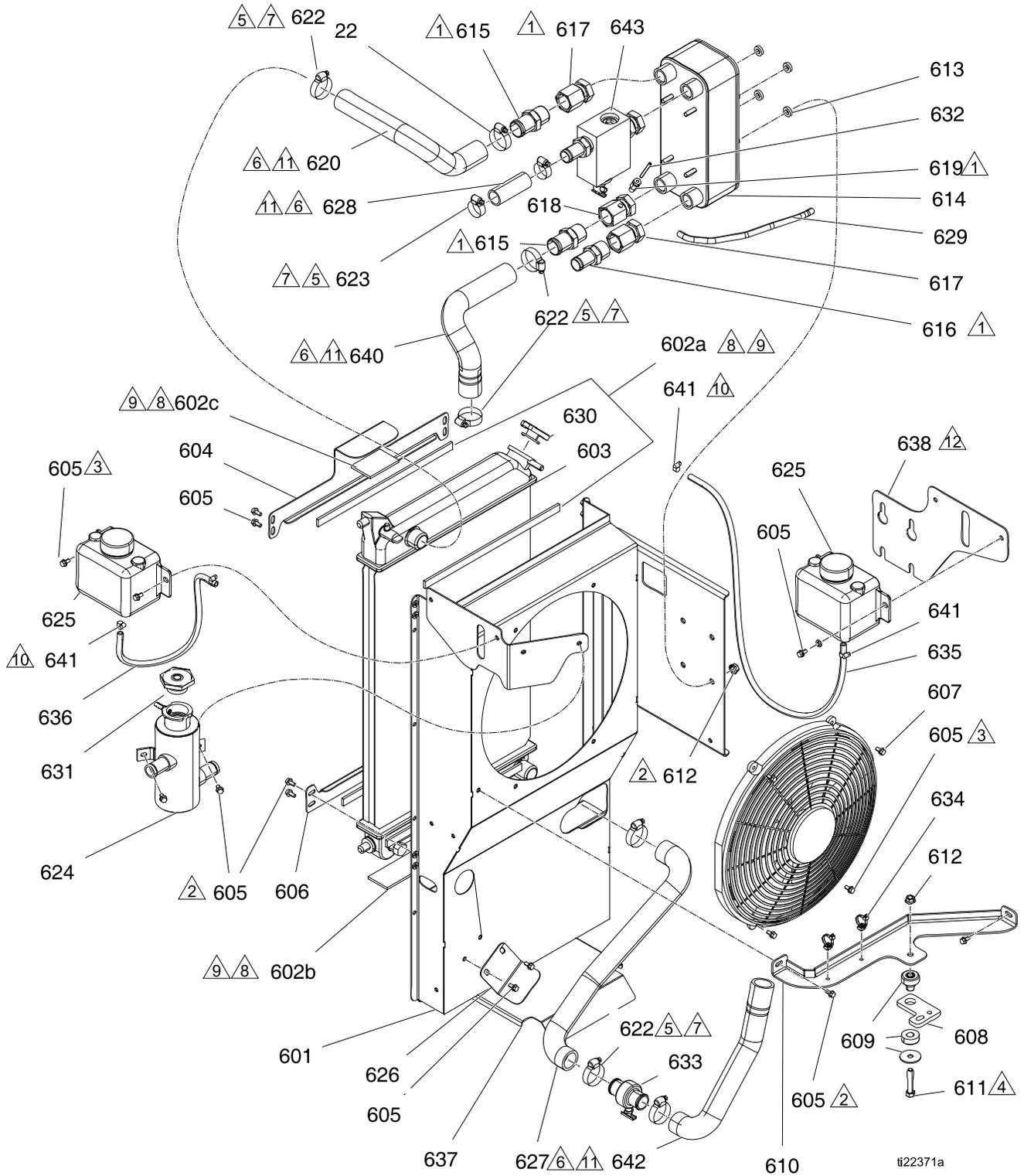
* *Included in Complete Coolant Hose Kit 24L939.*

See [Complete Coolant Hose Kit, page 131.](#)

Replace fuses F6 and F7 located in the junction box above the 120/240 V alternator. Use Fuse Replacement Kit 24M723.

Radiator

See assembly notes on next page.



Parts

- △1 Apply pipe sealant to all non-swiveling pipe threads.
- △2 Torque to 25 +/- 2 ft-lbs (34 N•m).
- △3 Torque to 10 +/- 2 ft-lbs (14 N•m).
- △4 Torque to 40 +/- 2 ft-lbs (54 N•m).
- △5 Torque to 15–20 in.-lbs (1.7–2 N•m).
- △6 Install rubber hose onto bead barb fitting to 0.13 in. (3.3 mm) maximum from hex.
- △7 Locate and install edge of hose clamp 0.38 in. (9.6 mm) maximum from the end of rubber hose.

- △8 Secure adhesive side of gasket to parts opposing radiator, not radiator.
- △9 See parts list for length.
- △10 Torque to 25 in.-lbs (2.8 N•m).
- △11 Apply lubrication to all press-on hoses prior to assembly.
- △12 Loosen all four nuts to approximately 0.18 in. (4.5 mm) from mounting plate. Place bracket (638) over nuts and slide down under flange of nuts until it stops. Re-torque nuts to 25 ft-lbs (33.8 N•m).

Ref	Part	Description	Qty
601	16H872	COVER, radiator mount	1
602	16H910	GASKET, radiator isolation; see 602a-602c	1
602a	—	GASKET, radiator isolation; 14 in. (355.6 mm), 0.63 in. dia.	4
602b	—	GASKET, radiator isolation; 14 in. (355.6 mm), 2 in. dia.	1
602c	—	GASKET, radiator isolation; 3 in. (76.2 mm), 2 in. dia.	1
603❖	—	RADIATOR	1
604	16H868	BRACKET, top	1
605●	113161	SCREW, flanged, hex hd; 1/4–20 x 1/2 in. (13 mm)	20
606	16H870	BRACKET, bottom	1
607	16H717	FAN, 16 in., 12V	1
608	16K156	BRACKET, plate	1
609■	125579	ISOLATOR, mount, radiator, top	1
610	16H876	BRACKET, support	1
611■	111803	SCREW, cap, hex hd; 3/8–16 x 2 in. (50.8 mm)	1
612■	112958	NUT, hex, flanged	5
613	16J741	WASHER, nylon, 30% glass .750 OD	4
614◆	—	EXCHANGER, heat	1

Ref	Part	Description	Qty
615◆	125356	FITTING, 1 in. NPT X 1.25 barbed hose	2
616◆	125139	FITTING, barb, beaded hose	2
617◆	158383	FITTING, union, adapter, straight	3
618◆	125171	FITTING, modified, union	1
619*	—	FITTING, compression, 1/8 NPT, SST	1
620*	125359	HOSE, formed, 1 1/4 upper radiator	1
621*	16T800	HOSE, coolant, 1 in. ID; 6 in. (152.4 mm)	1
622◆	125371	CLAMP, hose, dia. 3/4-1-3/4 in.	4
623◆	125370	CLAMP, hose, dia. 11/16-1-1/2 in.	2
624●	—	TANK, aluminum, coolant	1
625	125204	BOTTLE, overflow	2
626	16H901	BRACKET, hose support	1
627	125360	HOSE, formed, 1 1/4 lower radiator	1
628★	16W156	HOSE, coolant, 1 in. ID; 0.271 ft (0.08 m)	1
629★	16W155	HOSE, rubber, 5/16 in. 1.5 ft (0.5 m)	1

Ref	Part	Description	Qty	Ref	Part	Description	Qty
630❖	—	CAP, radiator; 16 psi (110 kPa, 1.1 bar)	1	637	16M323	GUARD, engine bottom	1
631●	24L967	CAP, pressure, coolant, 8-10 psi (55-70 kPa, 0.5-0.7 bar)	1	638	16M141	BRACKET, overflow bottle	1
632*	—	SENSOR, RTD 1 K OHM	1	640*	125361	HOSE, formed, 1-1/4 upper engine	1
633	125175	COUPLING, hose, drain	1	641*	125163	CLAMP, hose 7/32 in. - 5/8in.	4
634	125625	TIE, cable, fir tree	2	642*	125382	HOSE, formed, 1-1/4 lower engine	1
635	16N580	HOSE, rubber, 5/16 in., 3.33 ft (1 m)	1	643★	—	HOUSING, filter	1
636	16N581	HOSE, rubber, 5/16 in., 1.25 ft (0.4 m)	1				

◆ included in Heat Exchanger Kit 24L946.

❖ Included in Radiator Repair Kit 24L937.

● Included in Coolant Bottle Repair Kit 24L942.

■ Included in Radiator Isolator Kit 24L945.

★ Included in Filter Housing Kit 24T027. Order 24T028 for replacement filter screen (40 mesh).

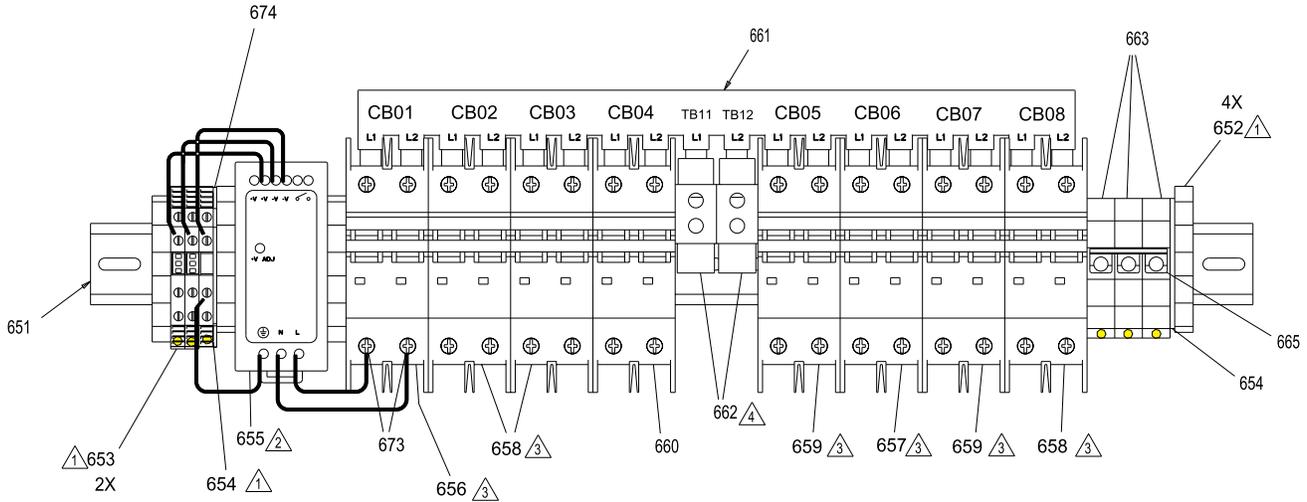
* Included in RTD Sensor Kit 24L974.

* Included in Complete Coolant Hose Kit 24L939. See [Complete Coolant Hose Kit, page 131](#).

Circuit Breaker Modules

24T061, Din Rail Circuit Breaker Assembly

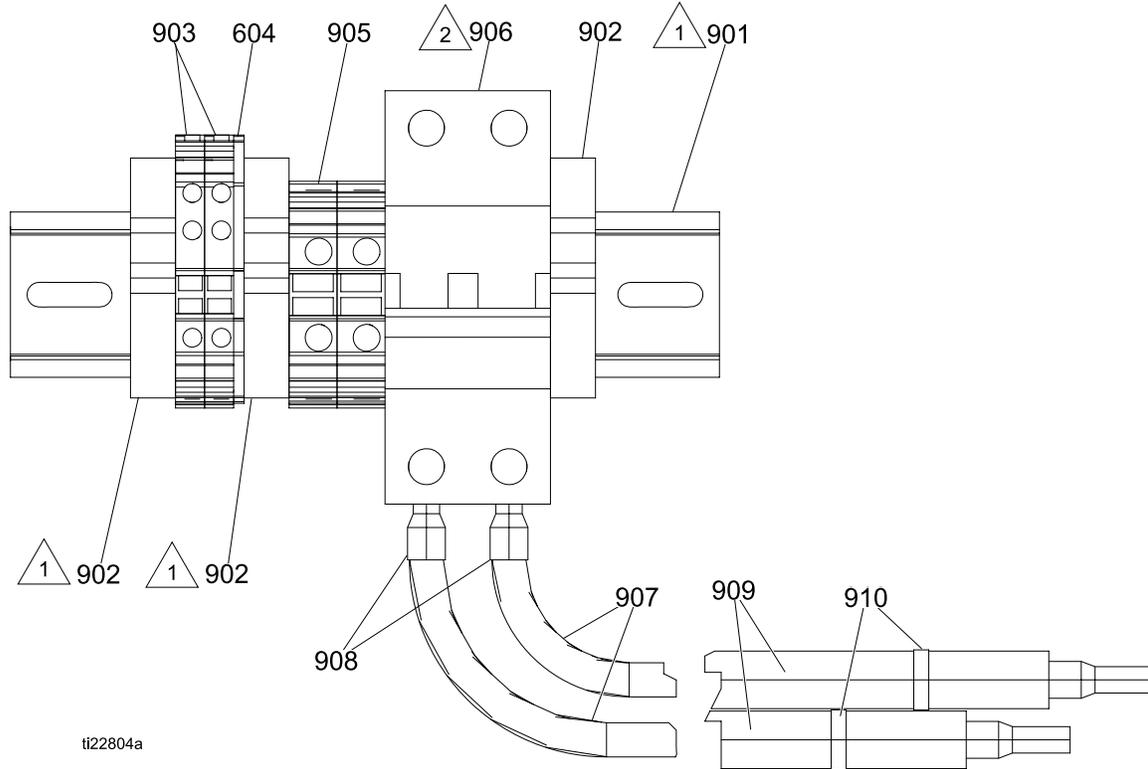
See [Electrical Schematics](#), page 154.



- Torque to 5-8 in.-lbs (0.6-1 N•m)
- Torque to 4-5 in.-lbs (0.5-0.6 N•m)
- Torque to 23-26 in.-lbs (2.6-3 N•m)

Ref	Part	Description	Qty	Ref	Part	Description	Qty
652	120838	BLOCK, clamp end	4	660	17A316	CIRCUIT, breaker, 2P, 30A, UL489	1
653	24R723	BLOCK, terminal, quad M4, ABB	2	661	24V851	BAR, 18 pos, power buss	1
654	24R722	BLOCK, terminal pe, quad, ABB	1	662	24V852	BAR, bus, connector	2
655	126453	POWER supply, 24V	1	663	127302	BLOCK, terminal, 12.2 mm, 2 wire	3
656	17A310	CIRCUIT, breaker, 2P, 5A, UL489	1	664	127303	BLOCK, terminal, cover	1
657	17A317	CIRCUIT, breaker, 2P, 40A, UL489	1	665	127304	BLOCK, terminal, jumper, 3 position	1
658	17A313	CIRCUIT, breaker, 2P, 15A, UL489	3	674	127308	BLOCK, terminal	1
659	17A314	CIRCUIT, breaker, 2P, 20A, UL489	2				

24T059, Transformer and Fan Circuit Breaker Module



ti22804a



Torque to 5-8 in.-lbs (0.6-1 N•m)

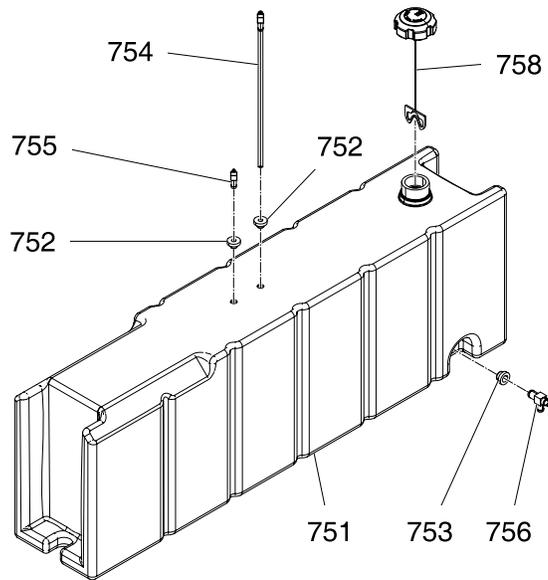


Torque to 23-26 in.-lbs (2.6-3 N•m)

See [Electrical Schematics, page 154](#).

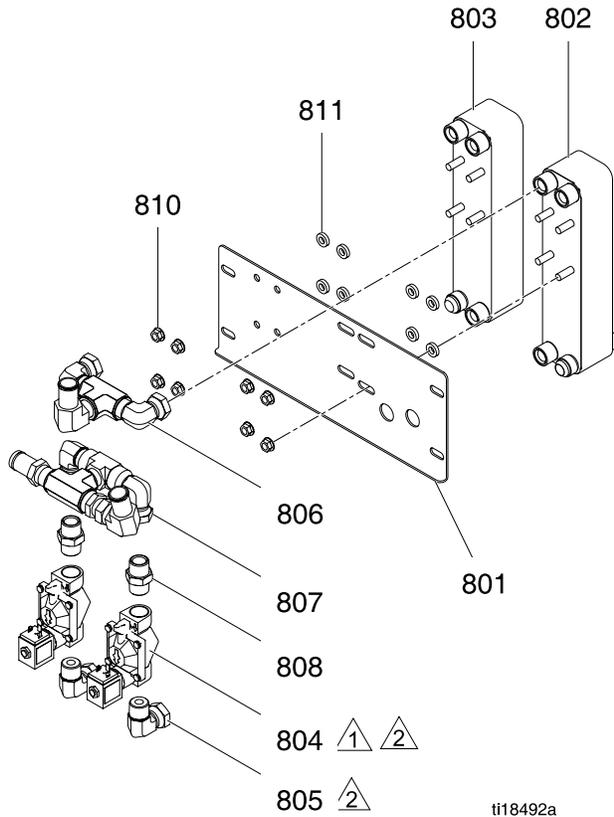
Ref	Part	Description	Qty	Ref	Part	Description	Qty
901	- - -	DIN RAIL	1	906	24L960	CIRCUIT, breaker, 50 AMP, 2 pole	1
902	125667	TERMINAL, stop, end	3	907	- - -	WIRE, cu, electrical, 8 AWG, black	8
903	126818	BLOCK, terminal 3-wire	2	908	- - -	FERRULE, wire, 8 AWG	4
904	126817	COVER, end	1				
905	125815	TERMINAL, block, feed thru	2				

Fuel Tank 24K390



Ref	Part	Description	Qty	Ref	Part	Description	Qty
751	-	TANK, fuel	1	755	125648	FITTING, 3/16 barbed	1
752	125645	GROMMET, tank	2	756	125649	VALVE, drain	1
753	125646	GROMMET, tank	1	758	24L955	CAP, fuel	1
754	125647	FITTING, suction, assy	1				

Heat Exchanger Assembly



Ensure flow direction arrows on solenoids valves (804) are pointing down.

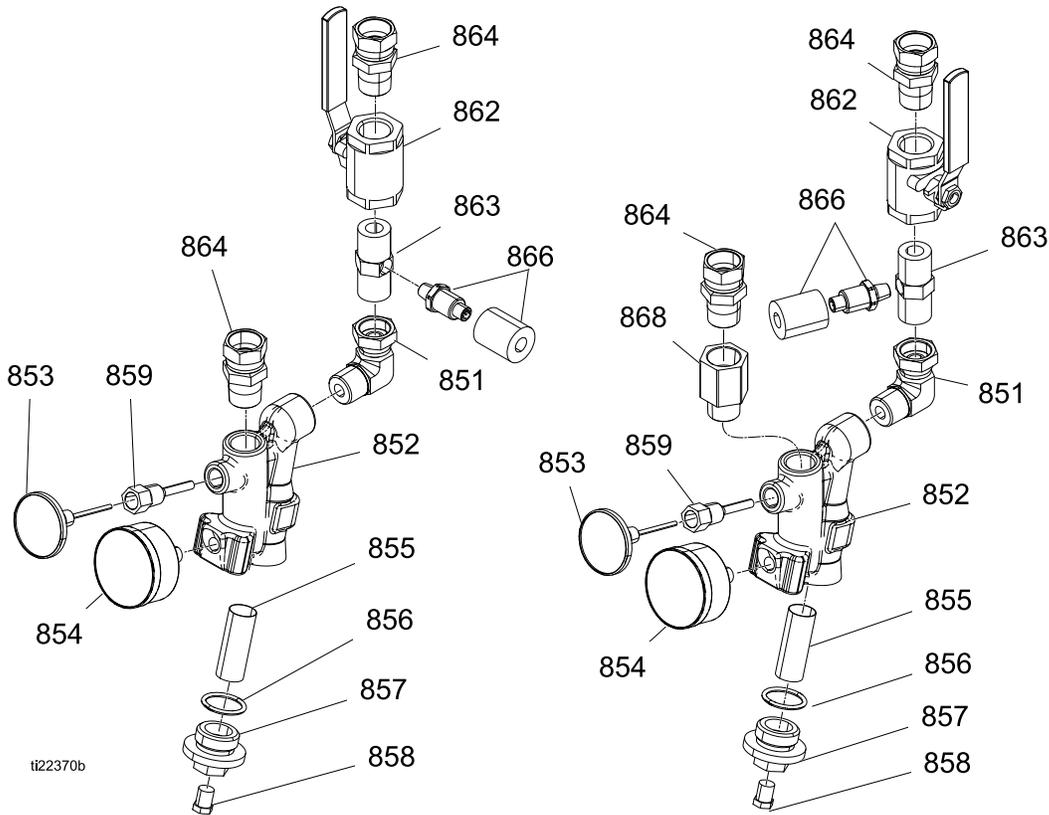


Apply anaerobic pipe sealant to all non-swiveling fittings before assembling.

Ref	Part	Description	Qty	Ref	Part	Description	Qty
801	16H759	BRACKET, heat exchanger	1	806	24J702	KIT, FITTING, outlet, heat exchanger	1
802	24L917	EXCHANGER, heat, side A	1	807	24J703	KIT, fitting, inlet, heat exchanger	1
803	24L918	EXCHANGER, heat, side B	1	808	C20487	NIPPLE, hex	2
804*	24L916	VALVE, solenoid, 3/4 NPT, 12 VDC	2	810	112958	NUT, hex, flanged	8
805	160327	UNION ADAPTER, 90°	2	811	16J741	WASHER, nylon, 30% glass, 3/4 OD	8

* Order 125774 Valve Repair Kit to replace all internal valve parts.
Order 125787 Coil Repair Kit to replace coil.

Fluid Inlet Kit 24V143



Apply sealant to all tapered pipe threads. Apply sealant to female threads. Apply to at least the first four threads and approximately 1/4 turn wide.



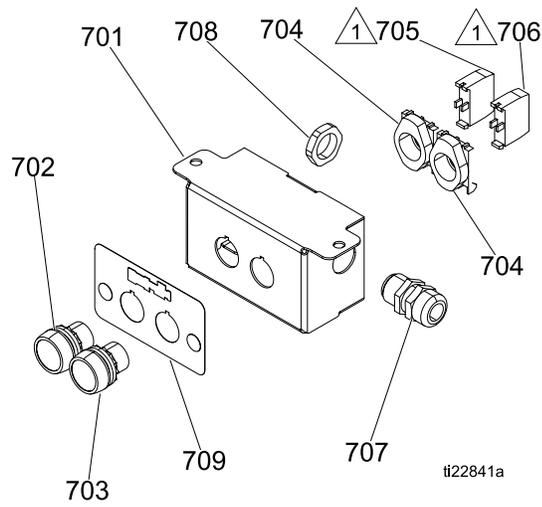
Apply thermal paste to the stem of dial before assembling into housing.

Ref	Part	Description	Qty	Ref	Part	Description	Qty
851	160327	UNION ADAPTER, 90°	2	859	15D757	HOUSING, thermometer, VISCON HP	2
852	16W714	MANIFOLD, strainer, WYE, inlet	2	862	624545	VALVE, BALL 3/4 NPT	2
853	24U852	THERMOMETER, dial	2	863	624545	FITTING, tee, 3/4 run x 1/4(f)	2
854	24U853	GAUGE, pressure, fluid	2	864	118459	FITTING, union, swivel	4
855★	—	FILTER, replacement, 20 mesh	2	866	24U851	TRANSDUCER, pressure, temperature	1
856★	C20203	GASKET, Y-strainer, inlet	2	868	16W954	FITTING, adapter, 3/4 NPT(m) x 3/4 NPT(f)	1
857	16V879	PLUG, Y-strainer, , inlet	2				
858	555808	PLUG, pipe	2				

* *Optional 80 mesh filter 255082 (2 pack)*

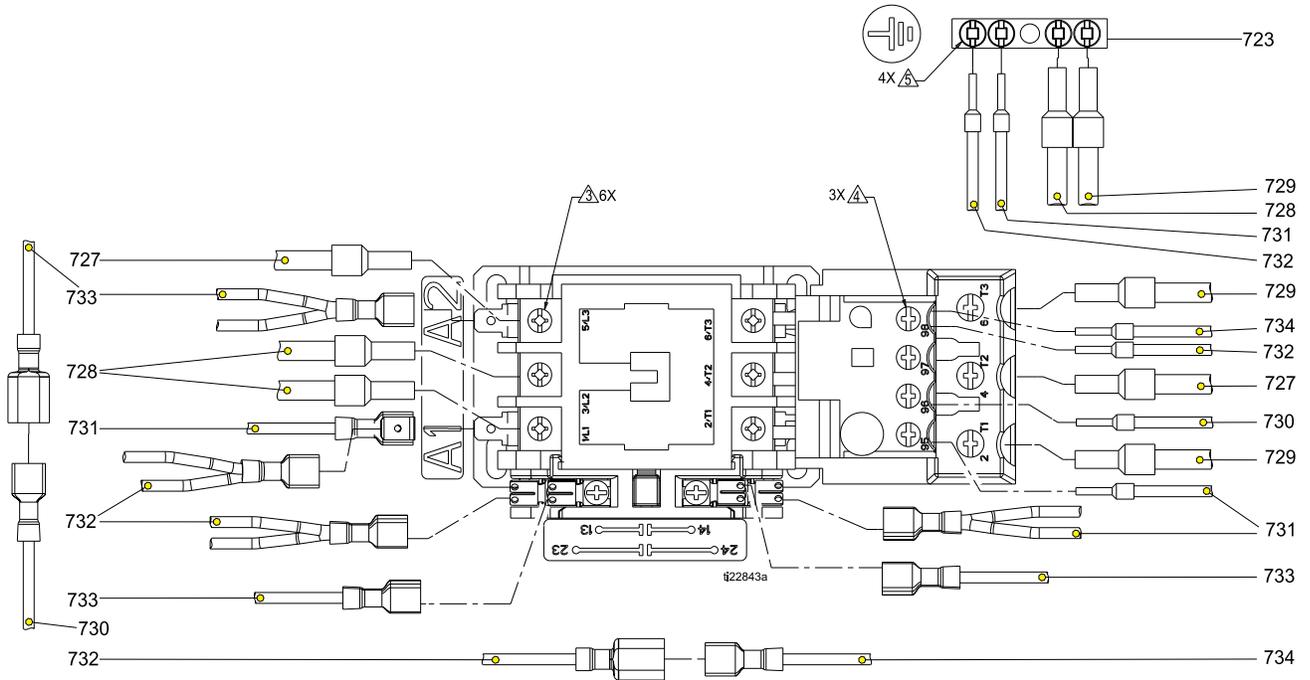
★ *Included in Inlet Filter and Seal Kit 24V020 (20 mesh, 2 pack).*

Switch Box Enclosure



Assemble switch blocks as shown.

Ref	Part	Description	Qty	Ref	Part	Description	Qty
701	16W575	ENCLOSURE, front	1	706	120495	BLOCK, switch, N.C.	1
702	121618	SWITCH, start, push button, green	1	707	260067	FITTING, strain relief, 1/2 npt	1
703	121619	SWITCH, stop, push button, red	1	708	117625	NUT, locking	1
704	120493	LATCH, mounting	2	709	16W614	LABEL	1
705	120494	BLOCK, switch, N.O.	1				



 Torque to 38–42 in.-lbs (4.3–4.7 N•m).

 Torque to 18–22 in.-lbs (2–2.5 N•m).

 Torque to 28–32 in.-lbs (3.1–3.6 N•m).

Ref	Part	Description	Qty	Ref	Part	Description	Qty
721	24U081	STARTER, int. reactor, 3 phase	1	728	24U080	CABLE, air compressor breaker	1
722	24U082	CONTACT, aux, two no switches	1	729	24U079	CABLE, air compressor	1
723	119257	CONNECTOR, bar, ground	1	730	16X011	CABLE, over temperature, compressor	1
724	555582	SCREW, soc hd cap, #10	1	731	24U078	CABLE, dryer, breaker	1
725	555629	WASHER, #10, external tooth lock	1	732	16X012	CABLE, power, dryer	1
726	16M826	CORD, grip, 3/4 in.	4	733	24U076	CABLE, start-stop	1
727	16X009	CABLE, shunt	1	734	16X010	CABLE, pressure vent	1
				735▲	16X422	LABEL	1

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

Electrical Schematics

Harness Identification

All wire harnesses are identified by a letter. The first letter on each wire in a wire harness corresponds with the wire harness. Use the table below to identify the wire harness, system component connections, and wiring diagram page number(s). The wiring diagram will show every wire included.

Harness Identifier	Ref	Part	System Components	Wiring Diagram
C	(90)	24L964	Engine	Engine, page 165
D	(280)	16K646	Load Center Coolant Valves	Load Center, page 163 Coolant Valve Wiring Diagram, page 163
E	(49)	16K301	Engine Load center	Engine, page 165 Load Center, page 163
F	(94)	16K297	Load Center Engine Engine Control Module	Load Center, page 163 Engine, page 165 Engine Control Module, page 164
H	(53)	16K299	Load Center Electrical Enclosure	Load Center, page 163 Electrical Enclosure, page 156
K	(52)	125753	Alternator Enclosure Electrical Enclosure MCM	Alternator Enclosure, page 166 Electrical Enclosure, page 156 MCM Wiring Diagram, page 158
M	(51)	125752	Alternator Enclosure Engine Control Module	Alternator Enclosure, page 166 Engine Control Module, page 164
N	(54)	125756	Reactor Electrical Enclosure MCM	Reactor, page 162 Electrical Enclosure, page 156
P	(519)	24T174	Electrical Enclosure	Electrical Enclosure, page 156

Engine Harness Wire Color Code

This table refers to Engine Harness E (49), Engine Control Module Harness F (94), and Disconnect Check Harness H (53).

Color	Purpose
Red	Battery Positive (Lines Always Energized)
Black/White	Engine Load Grounds
Orange	Starter
White	Glow Plugs
Gray	Fuel Shutoff Solenoid (FD)

Color	Purpose
Violet	Radiator Fan
Black/Yellow	Monitoring Grounds
Brown	Oil Pressure Switch
Dark Blue	Water Temperature

Wire Label Identification Code

The plastic wire wrap labels applied to many of the cables in the system use a code that indicates both the near-end and far-end connections made with the labeled wire. The first half of the code describes the module and port that the near-end of the cable connects to. The second half of the code describes where the far-end of the cable connects. For example, "MCM-2 MOTOR-OT" denotes that the connector nearest the label connects to the MCM port #2 ("MCM-2" is MCM port #2) and the far-end connects to the motor overtemperature sensor ("MOTOR-OT" is Motor Overtemperature Sensor). This code is used throughout the wiring schematics on the following pages.

Circuit Breaker Identification

Ref.	Size	Component
CB01	5 A	Power Supply, Fan, Coolant Circulation Pump
CB02	15 A	Boost Heat A
CB03	15 A	Boost Heat B
CB04	30 A	Hose Heat Primary
CB05	20 A	Motor Control
CB06	40 A	Air Compressor
		Open

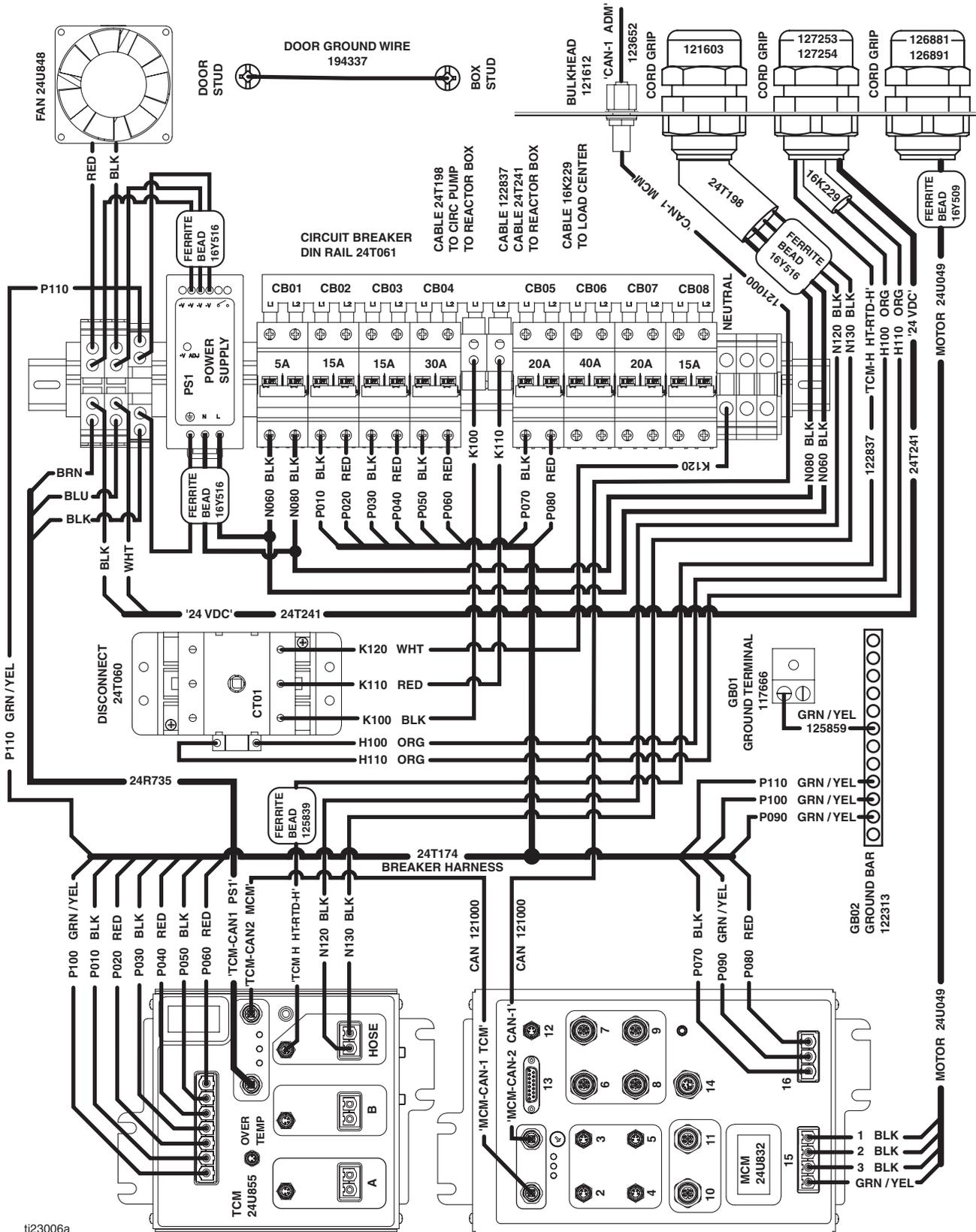
Ref.	Size	Component
CB07	20 A	Open
CB08	15 A	Air Dryer
		Open
CB20	50 A	Hose Heat Secondary

Available Circuit Breakers

Part	Amps
17C190	1
17C191	3
17A310	5
17A311	10
17A313	15
17A314	20

Part	Amps
17A315	25
17A316	30
17A317	40
17A318	50
17C192	63

Electrical Enclosure Wiring Diagram



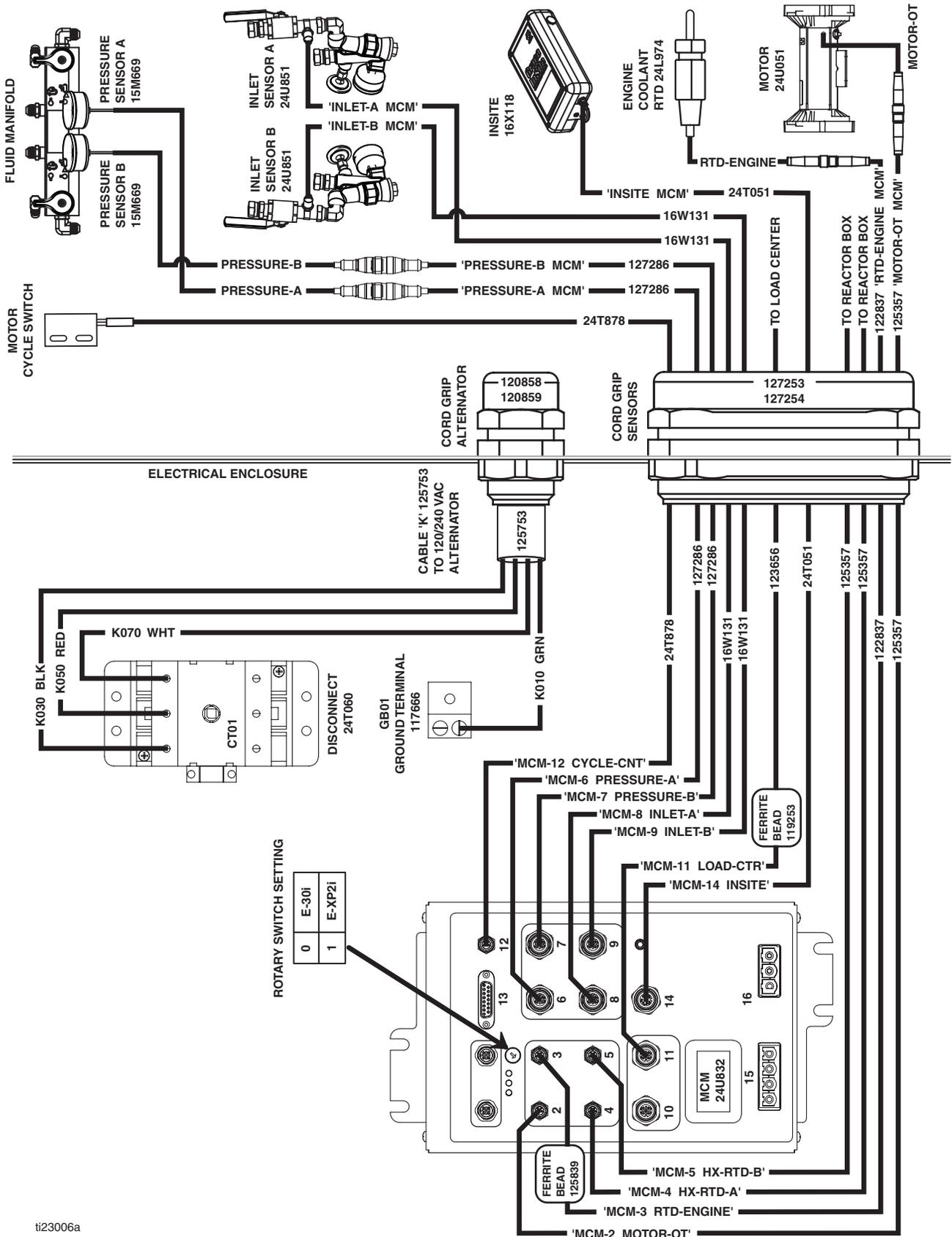
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MCM Cable Routing

Item	End 1	End 2	Part
MCM-CAN-1 TCM	MCM-CAN-1	TCM-CAN-2	121000
MCM-CAN-2 CAN-1	MCM-CAN-2	Electrical Enclosure CAN-1 Bulkhead	121000
MCM-2 MOTOR-OT	MCM Port 2	Motor Overtemperature Switch	125357
MCM-3 RTD-ENGINE	MCM Port 3	Engine RTD Sensor	122837
MCM-4 HX-RTD-A	MCM Port 4	Heat Exchanger RTD A	125357
MCM-5 HX-RTD-B	MCM Port 5	Heat Exchanger RTD B	125357
MCM-6 PRES-SURE-A	MCM Port 6	Fluid Manifold Pressure Sensor A	127286

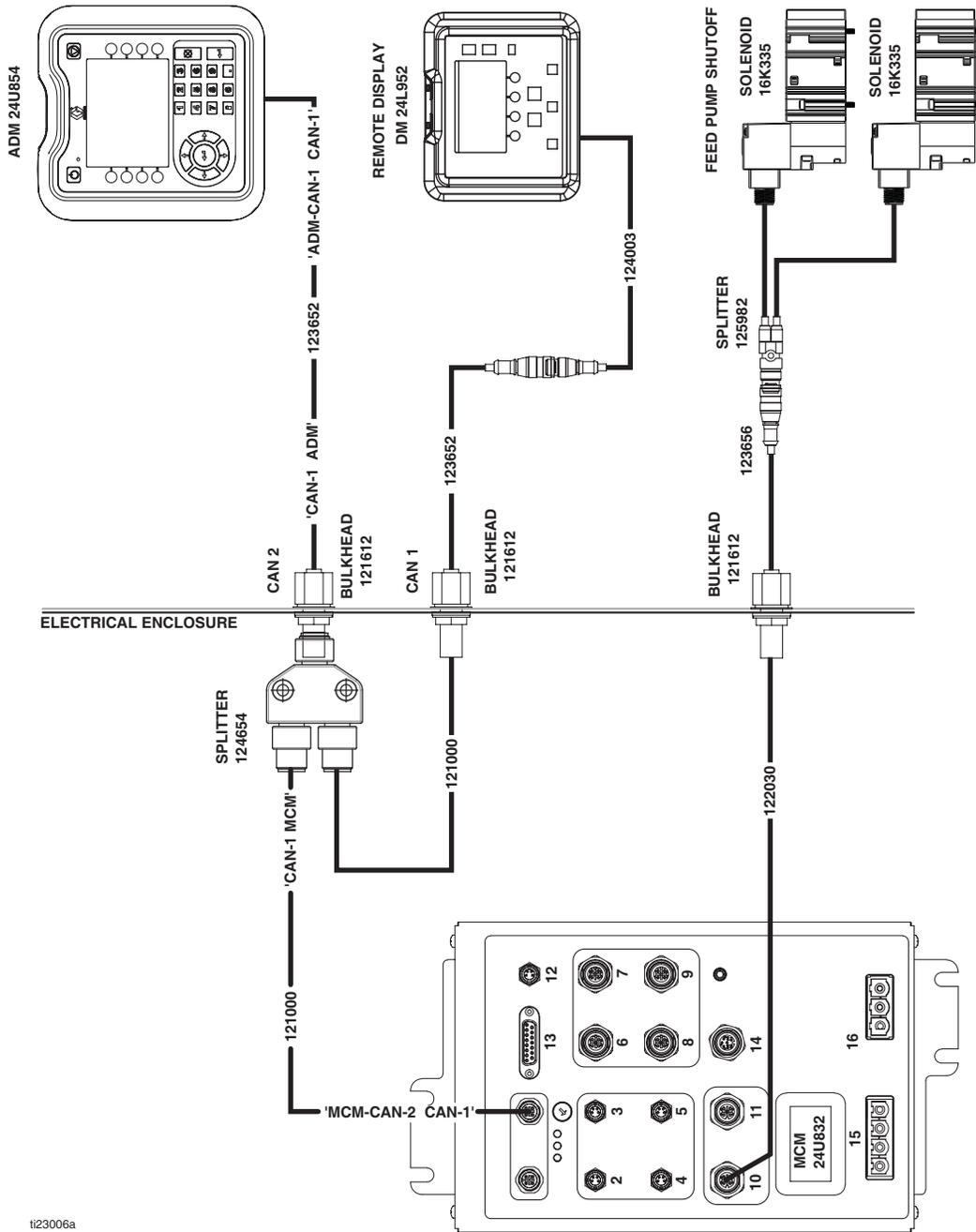
Item	End 1	End 2	Part
MCM-7 PRES-SURE-B	MCM Port 7	Fluid Manifold Pressure Sensor B	127286
MCM-8 INLET-A	MCM Port 8	Temperature and Pressure Inlet Sensor A	16W131
MCM-9 INLET-B	MCM Port 9	Temperature and Pressure Inlet Sensor B	16W131
	MCM Port 10	Optional Feed Pump Shut Off Solenoids	122030
MCM-11 LOAD-CTR	MCM Port 11	Load Center	123656
MCM-12 CYCLE-CNT	MCM Port 12	Fluid Motor Cycle Counter	24T878
MCM-14 INSITE	MCM Port 14	InSite Module	24T051

MCM Wiring Diagram



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Optional Remote Display Module and Feed Pump Kit Wiring Diagram



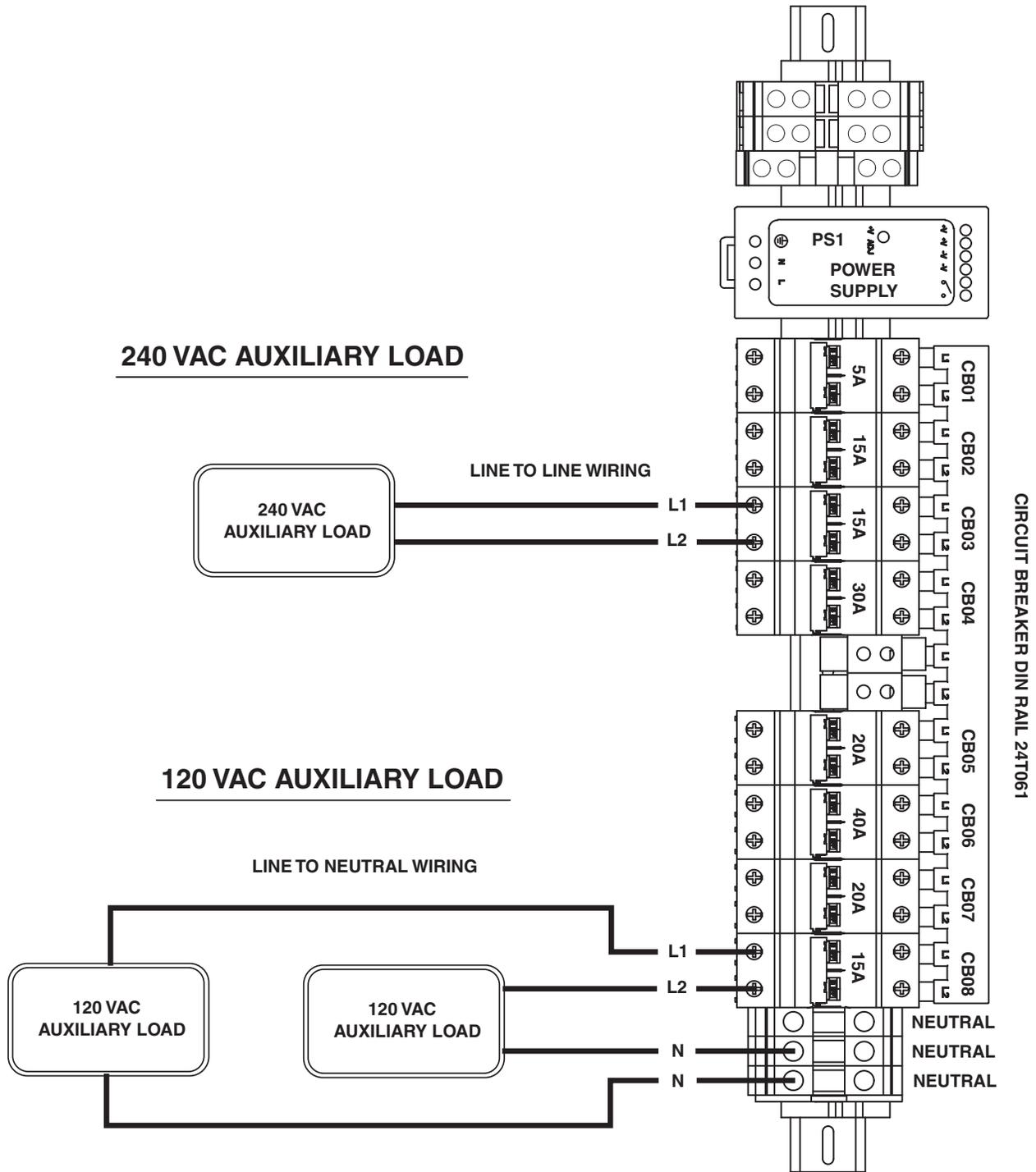
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Rotary switch setting: E-30i = 0 E-XP2i = 1
 See Cable Routing Table on page 157.

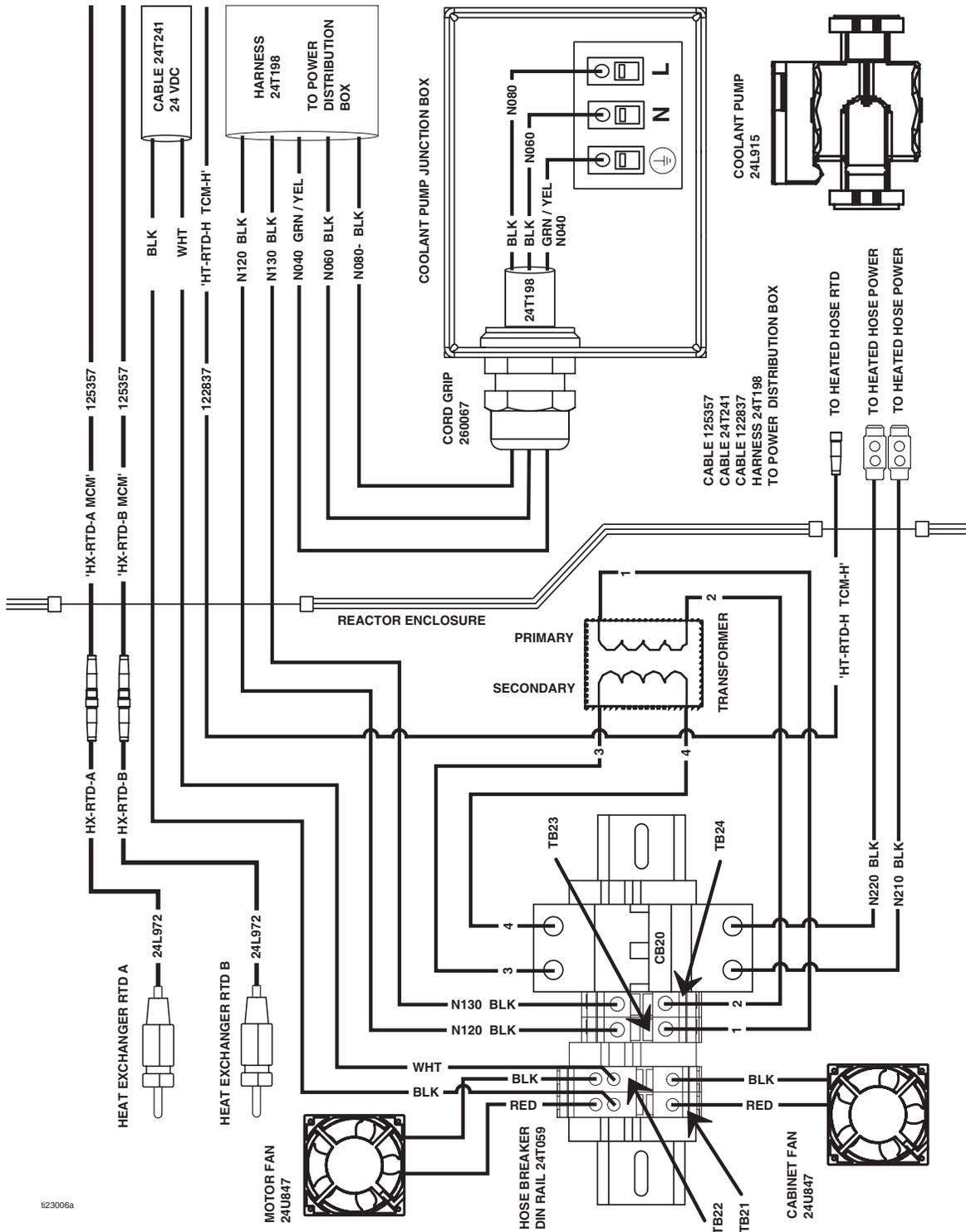
Optional Customer Auxiliary Power Wiring Diagram

See [Circuit Breaker Identification, page 155](#), for circuit breaker identification table and other available circuit breakers. Before making any changes to the standard auxiliary circuit breaker configuration, refer to Circuit Breaker Configuration Options in the Reactor Operation Manual.



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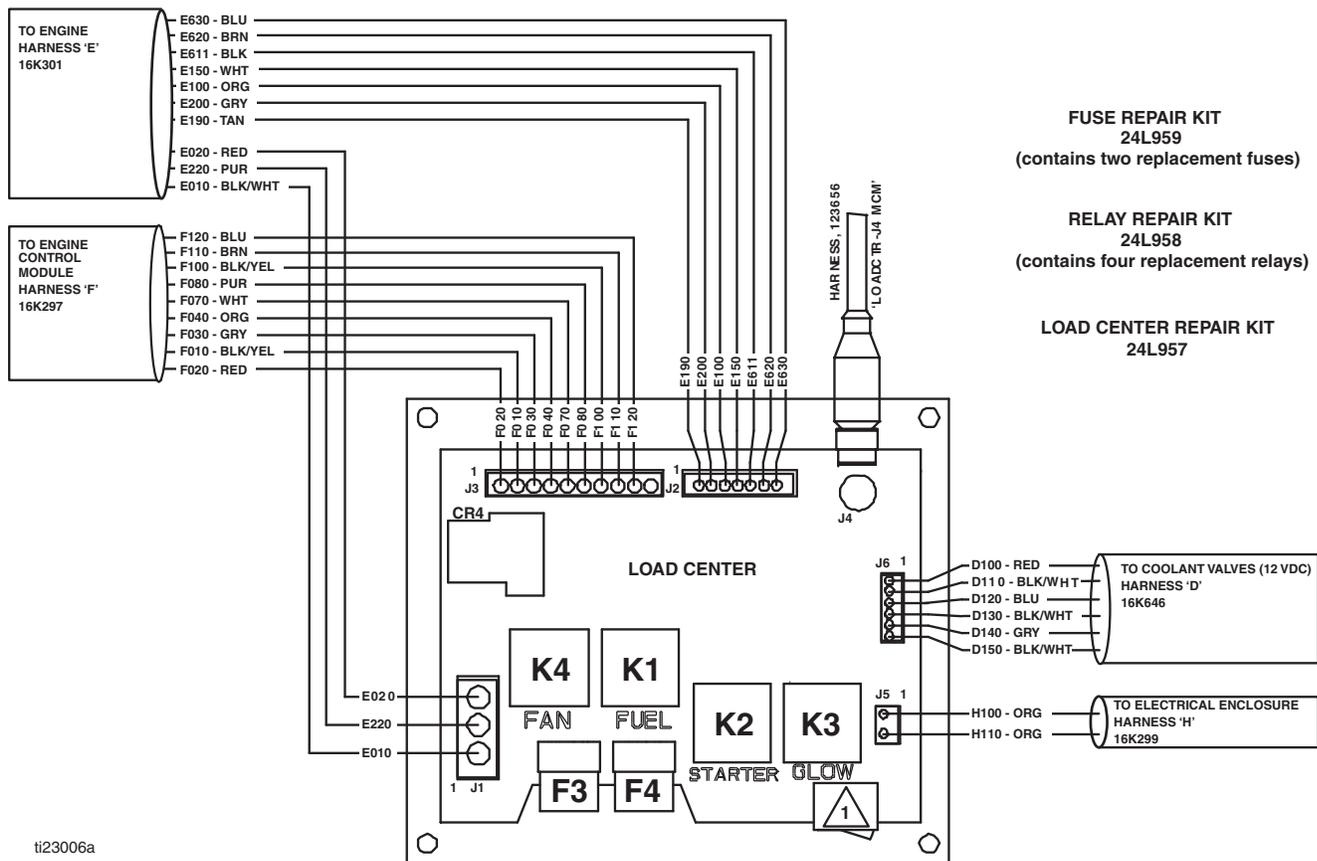
Reactor Cabinet Wiring Diagram



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- 1 Torque thin terminal block connections to 5–7 in.-lbs (0.5–0.8 N•m).
- 2 Torque large terminal block connections to 13–15 in.-lbs (1.4–1.7 N•m).

Load Center Wiring Diagram



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Manual Valve Switch:

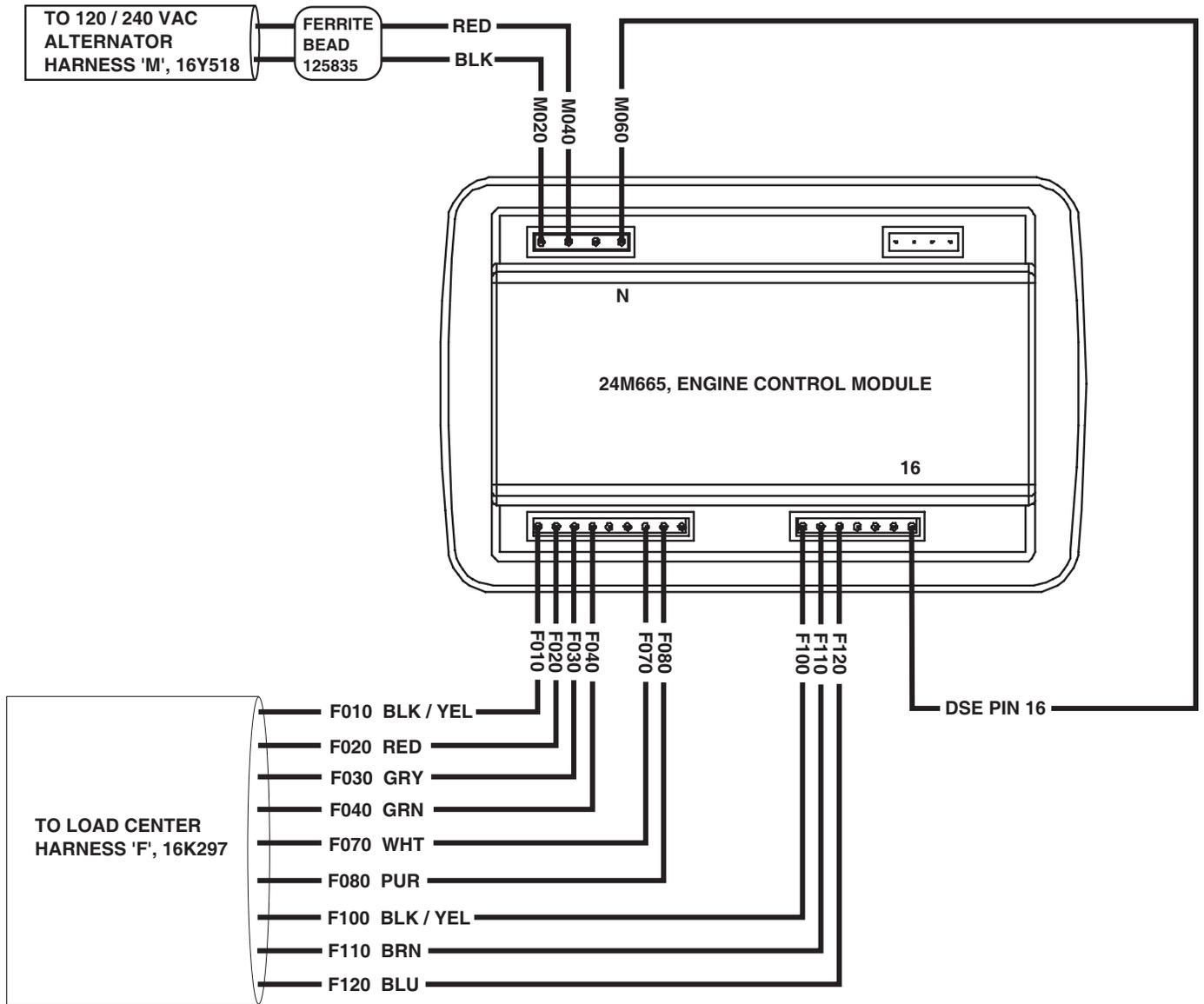
0 — OFF: Automatic Operation

1 — ON: Manual Operation

Coolant Valve (12 VDC) Wiring Diagram

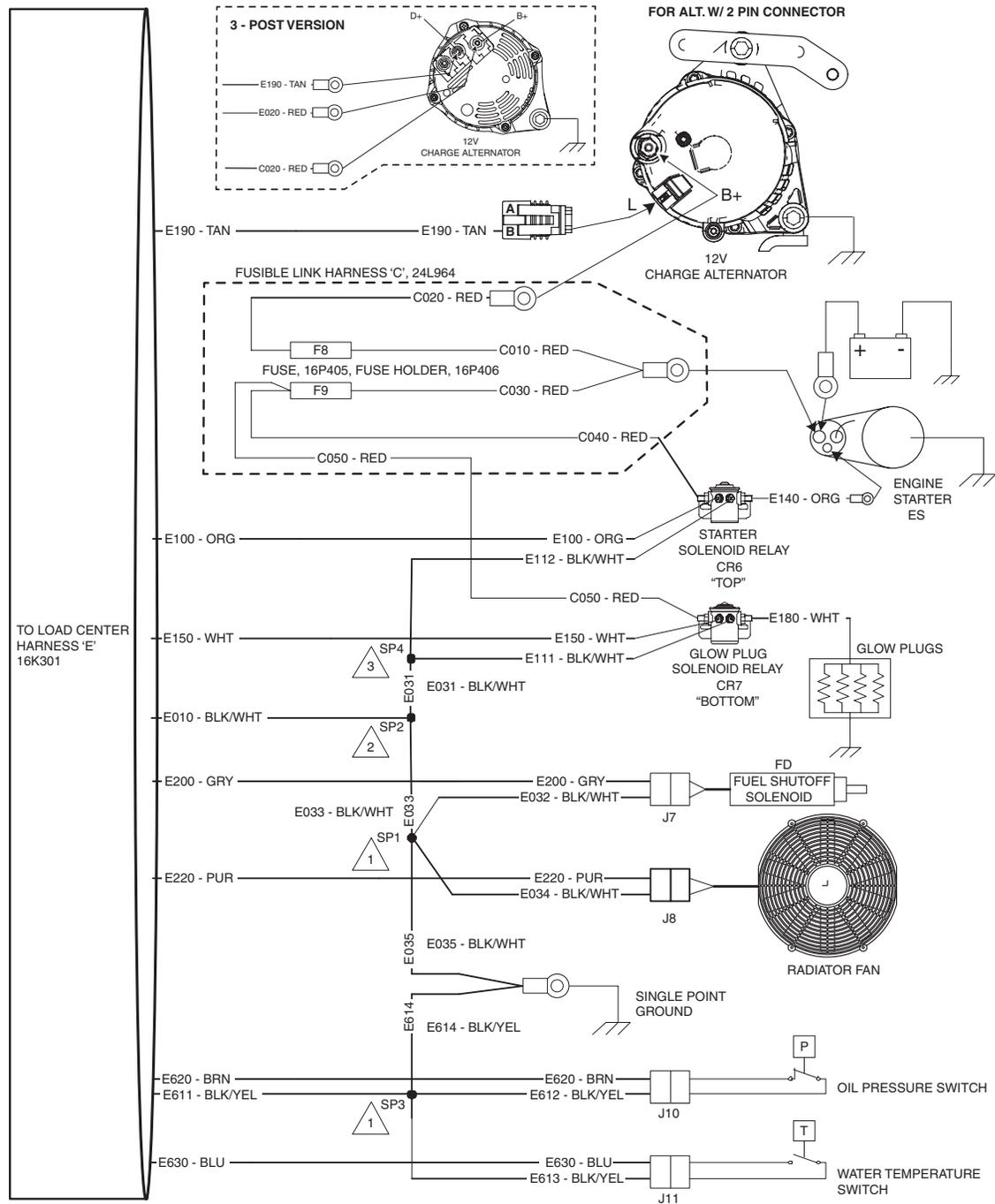
Load Center	Harness D (16K646)	Connection Description	Pin No.	Coolant Valve Connector Pin Designations
J6-6	D150 — BLK/WHT	Bypass valve return	J18-2	
J6-5	D140 — GRY	Bypass valve signal	J18-1	
J6-4	D130 — BLK/WHT	B valve return	J17-2	
J6-3	D120 — BLU	B valve signal	J17-1	
J6-2	D110 — BLK/WHT	A valve return	J16-2	
J6-1	D100 — RED	A valve signal	J16-1	

Engine Control Module Wiring Diagram



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Engine Wiring Diagram



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Splice located inside the 3/4 in. loom above the starter.



Splice located inside the 3/4 in. loom above the panel holding CR6 and CR7, near the white cable tie.

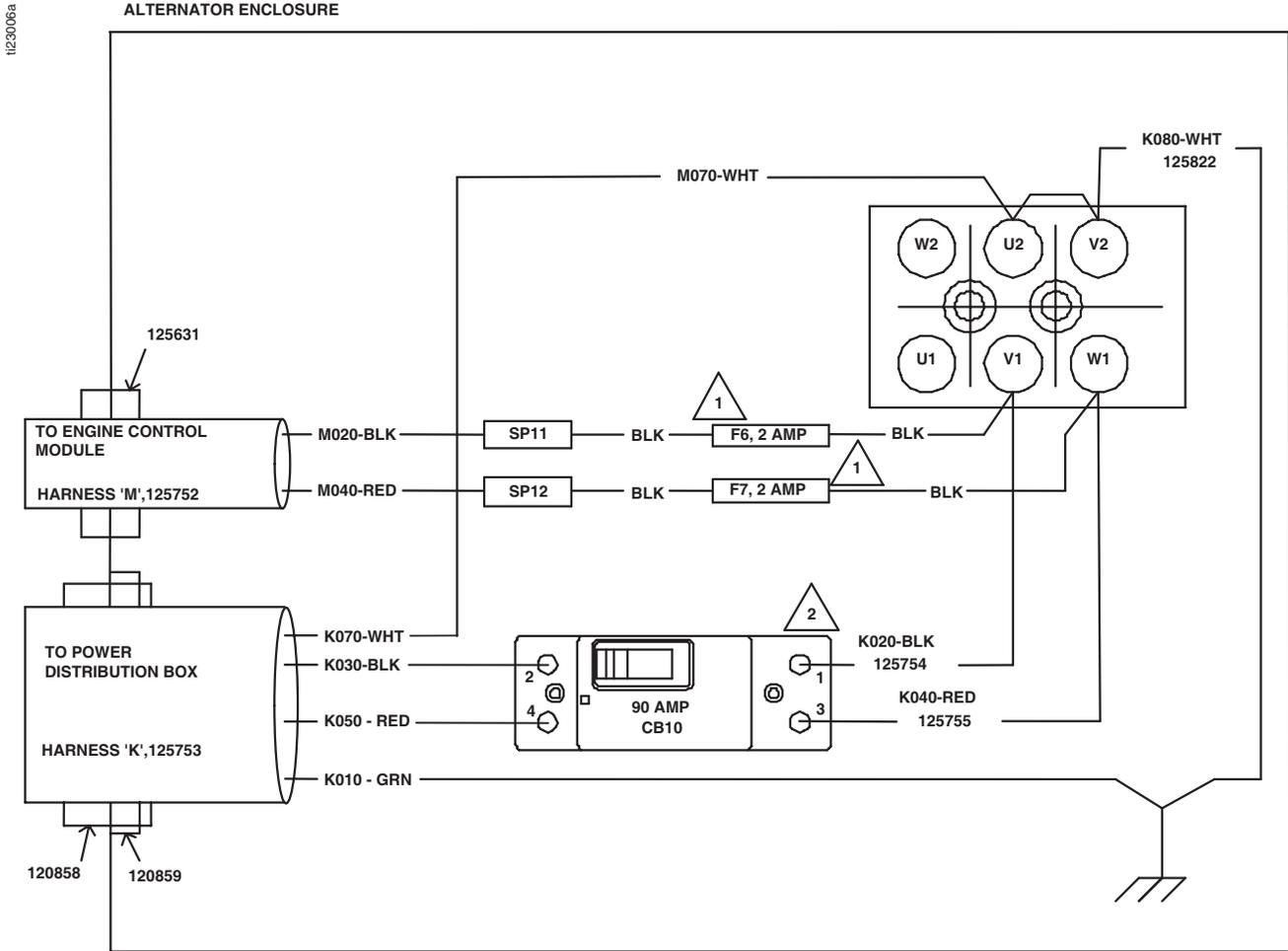


Splice located inside the 3/4 in. loom bottom of the loop, under CR6 and CR7, approximately 6 in. from the main trunk, Engine Harness (E).



See [Repair Fusible Link Harness, page 98](#), for fuse or fuse holder repair.

Alternator Enclosure Wiring Diagram



F6 and F7 Fuse replacement kit, 24M723. (contains two fuses)



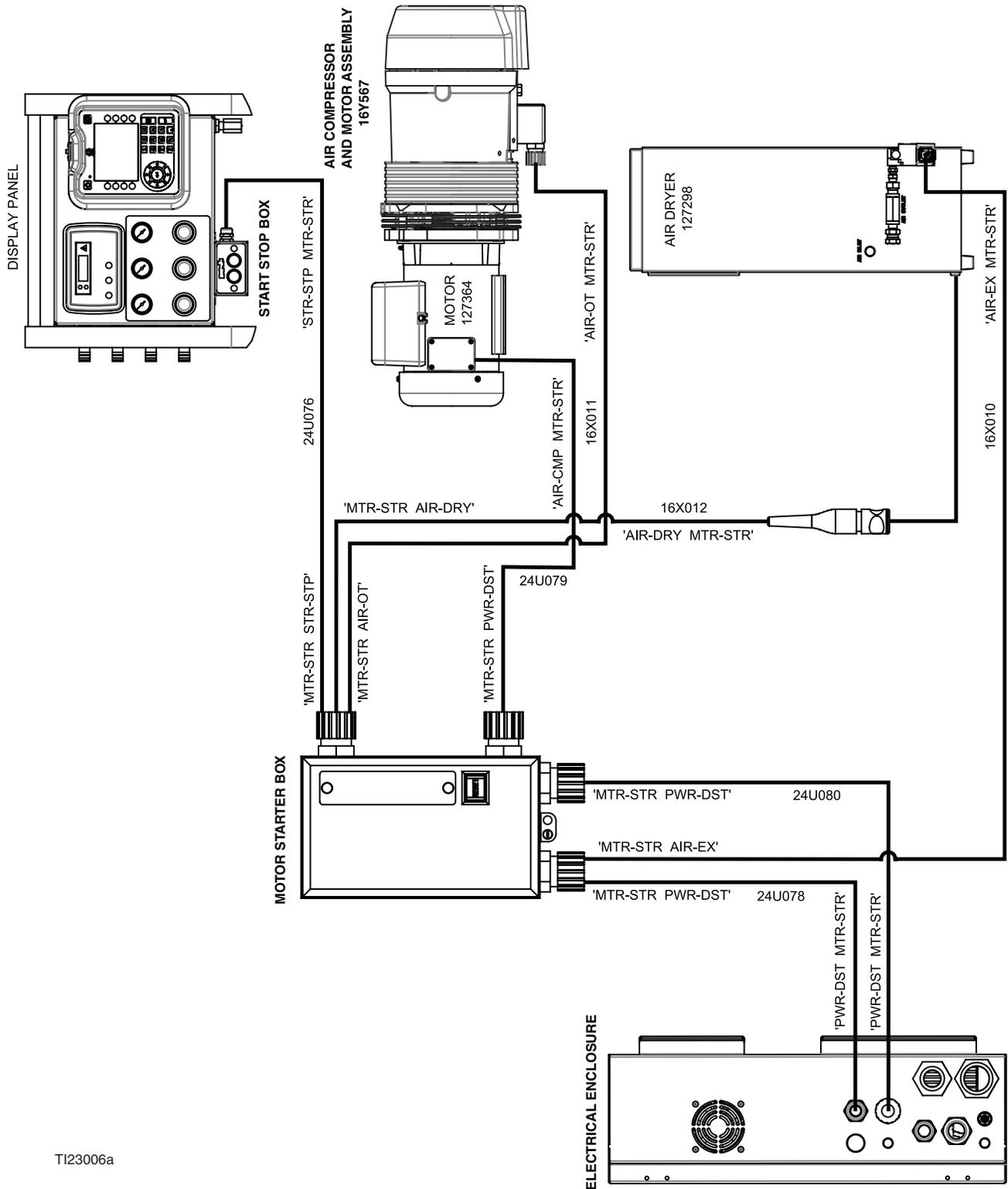
CB10 circuit breaker replacement kit, 24L965.

3. Two ferrite beads (125835), not shown, are located on two bundles of wires from the alternator to the circuit board. These are installed to eliminate electrical interferences and are needed to ensure proper operations.



Torque all four wire connections to 40–42 in.-lbs (4.5–4.7 N•m).

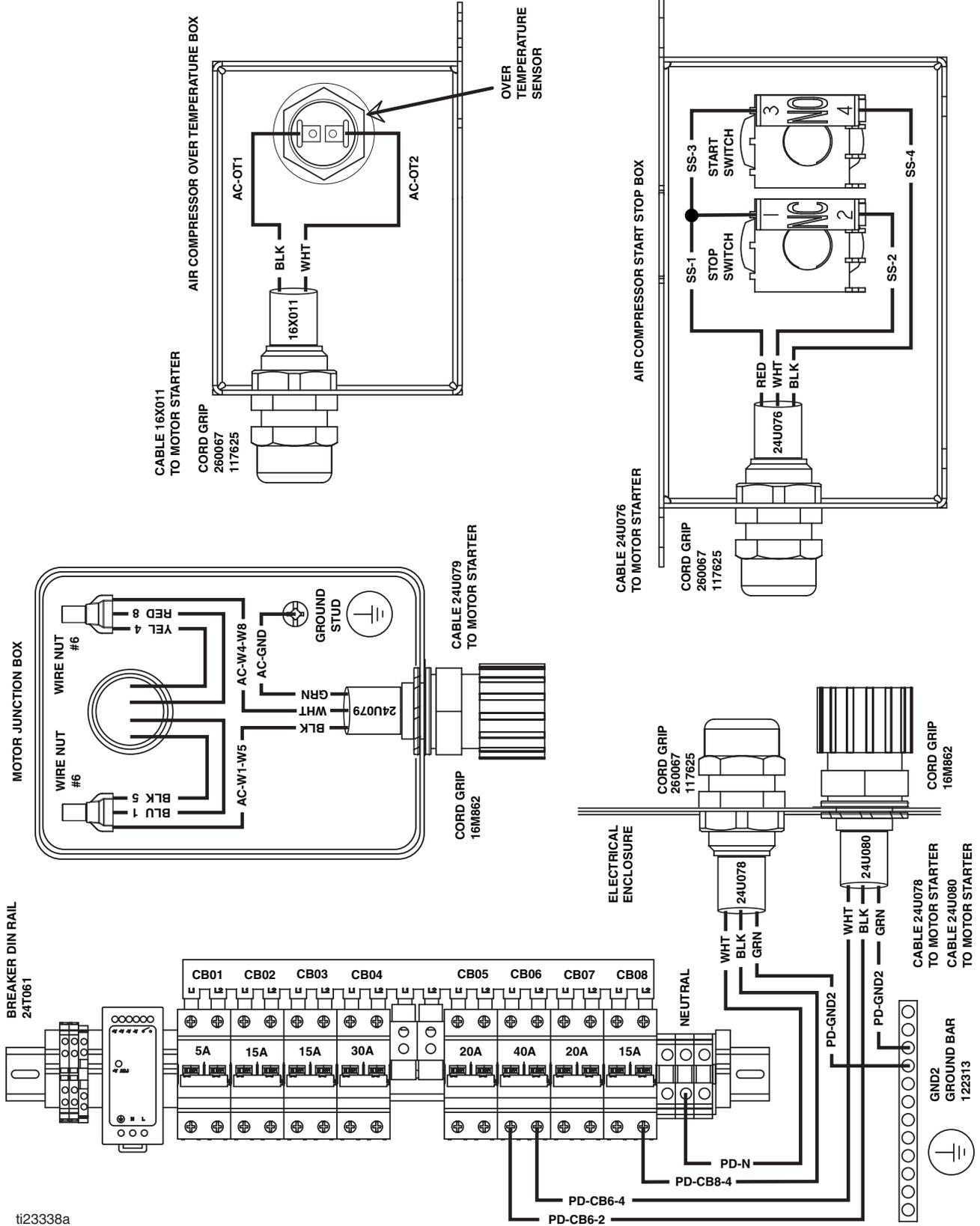
Air Compressor Wiring Diagram



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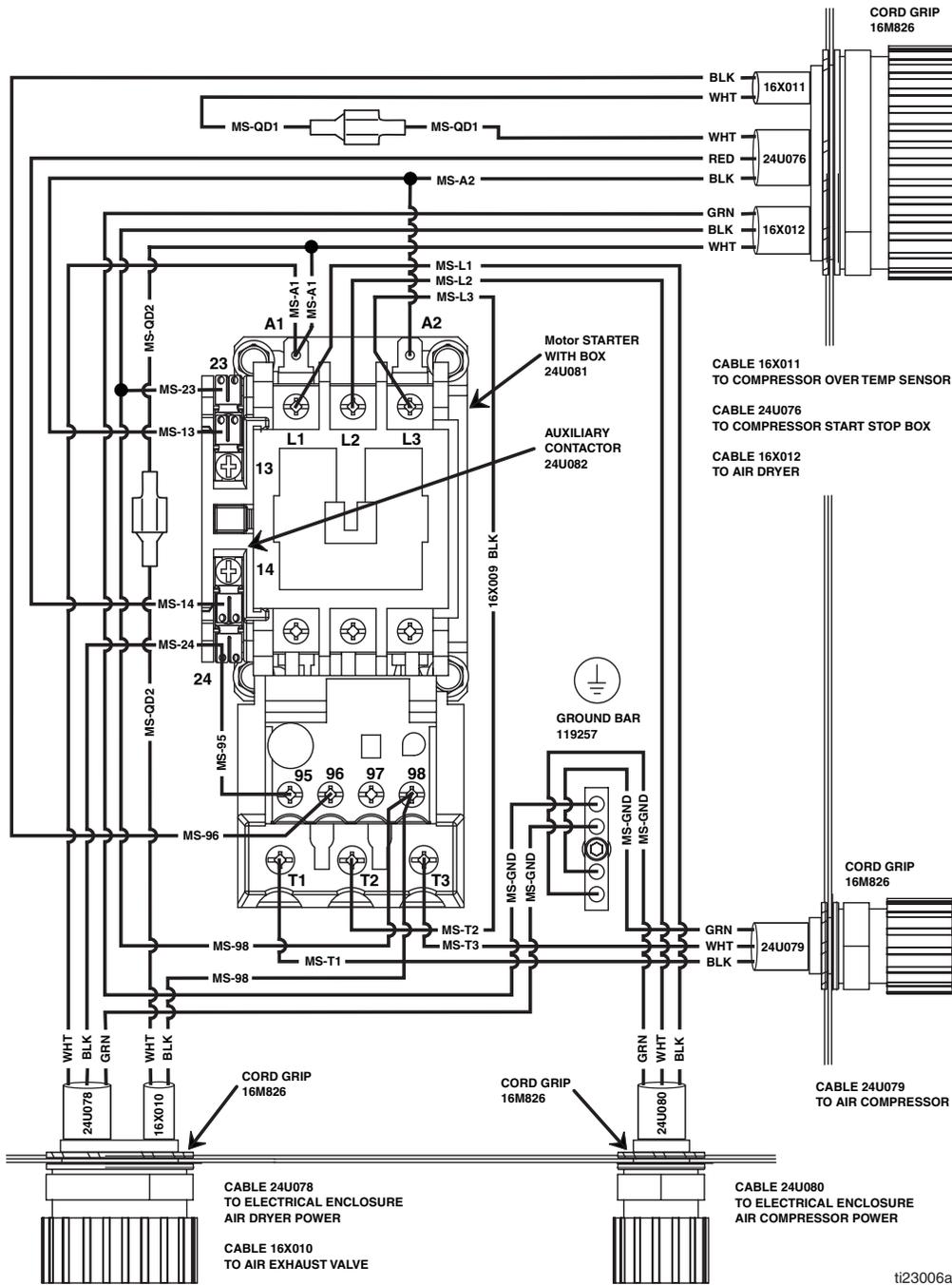
- 1 Tighten all power cable connections to 23–25 in.-lbs (2.6–2.8 N•m).
- 2 Torque all air compressor wire connections to 30–32 in.-lbs (3.4–3.6 N•m).

Air Compressor Junction Boxes



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Motor Starter



Repair and Spare Parts Reference

Recommended Common Spare Parts

Ref	Part	Description	Part of Assembly
70	24K207	Hose FTS (Fluid Temperature Sensor)	Systems
114	16P405	Fusible Link Fuse (Replacement For Fusible Link Harness)	Systems
115	16P406	Fusible Link Fuse Holder (Replacement For Fusible Link Harness)	Systems
240	24L958	Load Center Relay Repair Kit, for load center (4 Relays)	Proportioner
	24L959	Load Center Fuse Repair Kit (2 Fuses)	Proportioner
272 273	24L972	RTD Repair Kit (A or B Heat Exchangers)	Proportioner
275	125774	Coolant Valve Repair Kit (includes diaphragm, seals, and plunger)	Proportioner Heat Exchanger Assembly
	125787	Coolant Valve Solenoid Coil Repair Kit	Proportioner Heat Exchanger Assembly
315	15C852	E-30i Pump Repair Kit	Proportioner Module
	15C851	E-XP2i Pump Repair Kit	Proportioner Module
	246963	E-XP2i Wet Cup Repair Kit	Proportioner Module
	246964	E-30i Wet Cup Repair Kit	Proportioner Module
452	247824	Drain Valve Cartridge	Fluid Manifold
453	102814	Fluid Pressure Gauge	Fluid Manifold
455	15M669	Pressure Sensor	Fluid Manifold
569	24L963	Engine Solenoid Relay Kit	Diesel Generator
572	24L965	90 A Circuit Breaker Kit (For Generator Junction Box)	Diesel Generator
360 370	24L973	RTD Repair Kit (Booster Heater)	Heater
619 632	24L974	RTD Repair Kit (Engine Heat Exchanger)	Radiator
643	24T028	Coolant Filter Kit (one 40 mesh screen)	Radiator
855 856	24V020	Y-Strainer Filter and Gasket Kit, 20 mesh (2 pack)	Fluid Inlet Kit
- - -	24M723	Fuse Replacement Kit (For Generator Junction Box)	Diesel Generator
- - -	24N365	RTD Cable Test Kit (To assist measuring RTDs and RTD cable resistances)	Heated Hose and FTS
- - -	17A101	Compressor Oil (1 gallon)	Air Compressor Systems

Recommended Rebuild Spare Parts

Ref.	Part	Description	Part of Assembly
27	24U854	Advanced Display Module (ADM)	System
504	24U832	Motor Control Module (MCM)	Proportioner
212	24R756	Cooling Fan, Motor and Lower Cabinet	Proportioner
231	24L915	Coolant Circulation Pump	Proportioner
240	24L957	Load Center Repair Kit	Proportioner
275 804	24L916	Coolant Valve (complete)	Proportioner Heat Exchanger Assembly
416	116513	Air Regulator	Air Control Panel
423 424	24M650	Air Control Tubing Repair Kit (includes full length of air control tubing)	Air Control Panel
503	24U855	Temperature Control Module (TCM)	Electrical Enclosure
506	24R757	Cooling Fan, Electrical Enclosure	Electrical Enclosure
656	126125	5A Circuit Breaker	Electrical Enclosure
657	126131	40A Circuit Breaker	Electrical Enclosure
658	126127	15A Circuit Breaker	Electrical Enclosure
659	126128	20A Circuit Breaker	Electrical Enclosure
660	126130	30A Circuit Breaker	Electrical Enclosure
906	24L960	50A Circuit Breaker	Transformer and Fan Circuit Breaker Module
- - -	24L939	Complete Coolant Hose Kit (includes all coolant hoses)	See Complete Coolant Hose Kit in manual

Dimensions

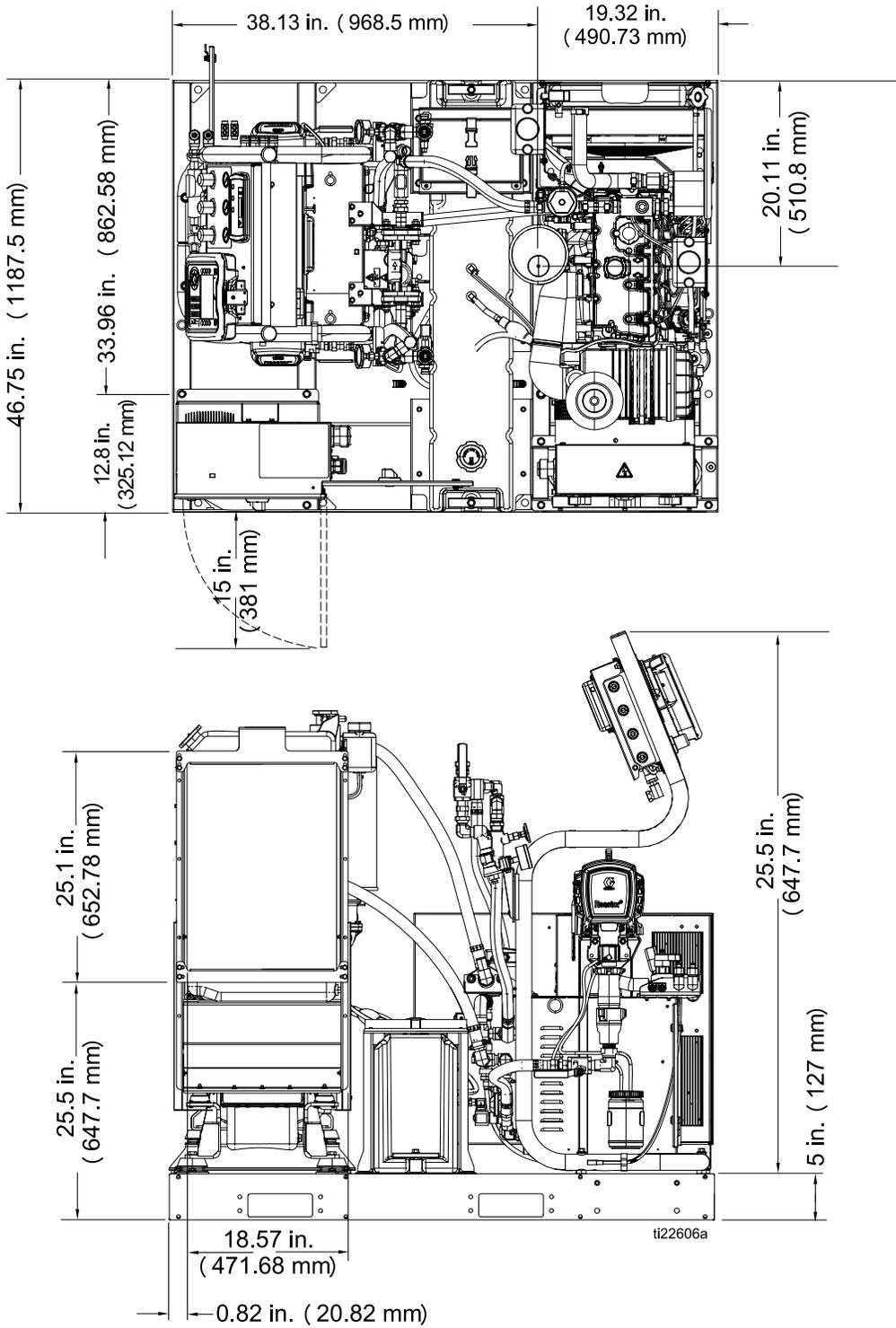


Figure 47

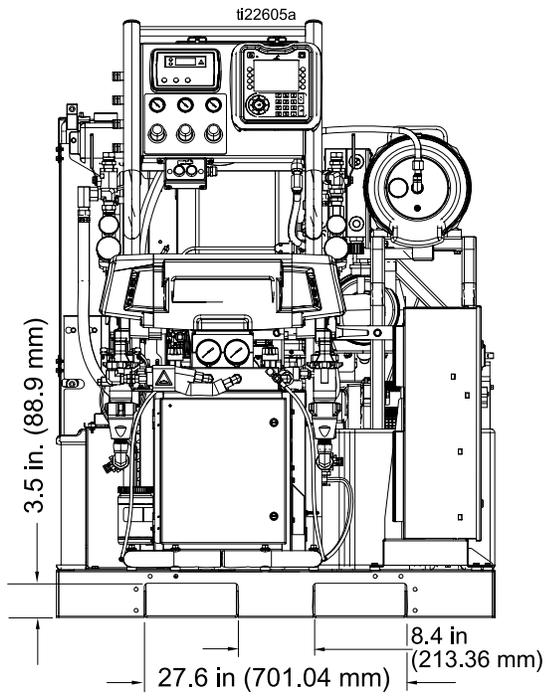


Figure 48

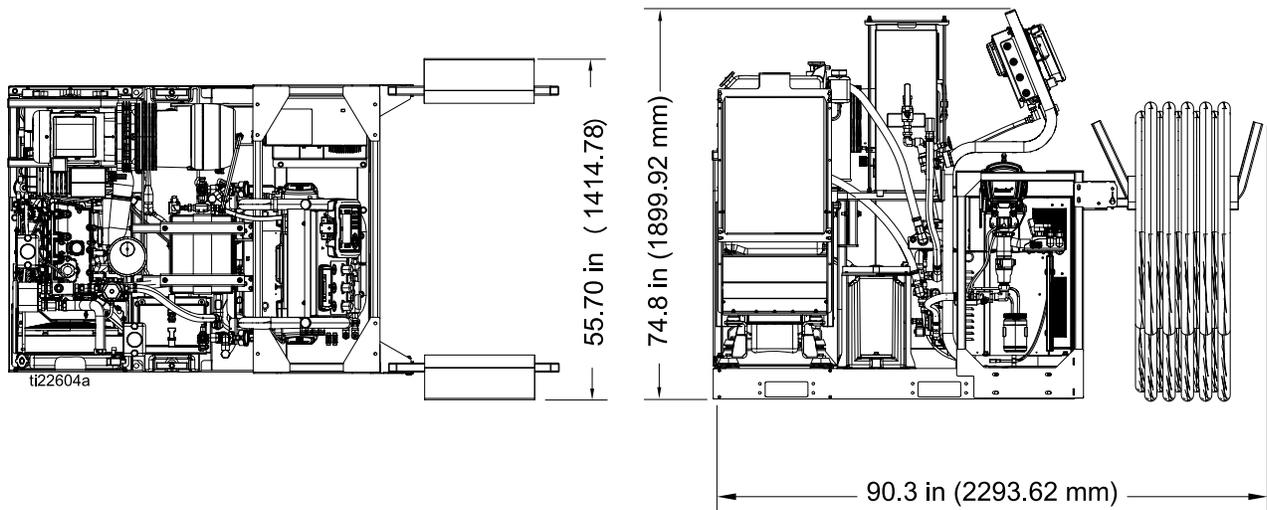


Figure 49

Dimensions

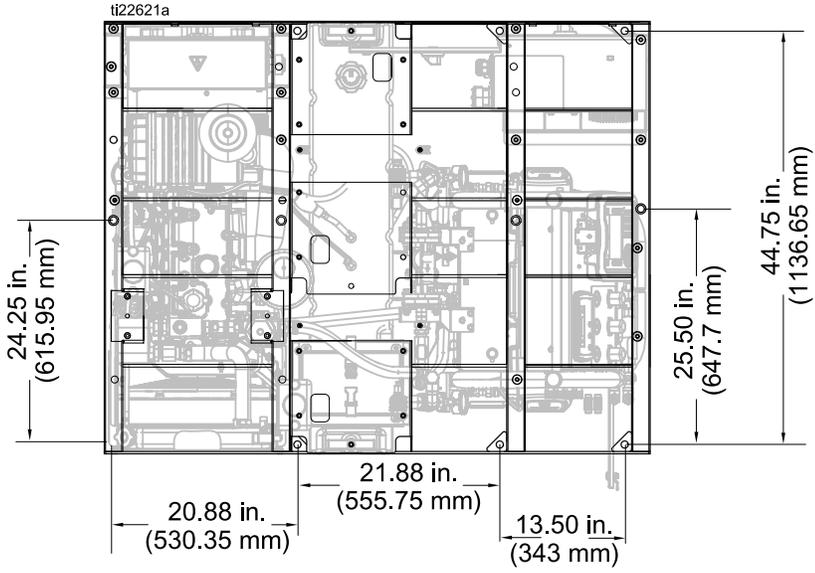


Figure 50 Floor Mount Hole Pattern

Technical Specifications

Reactor 2 Elite Integrated Proportioning Systems		
	U.S.	Metric
Maximum Fluid Working Pressure		
E-30i	2000 psi	14 MPa, 140 bar
E-XP2i	3500 psi	24.1 MPa, 241 bar
Maximum Fluid Temperature		
E-30i	150°F	65°C
E-30i with booster heater	180°F	82°C
E-XP2i	180°F	82°C
Maximum Output		
E-30i	30 lb/min	13.5 kg/min
E-XP2i	2 gpm	7.6 lpm
Maximum Heated Hose Length		
Length	310 ft	94 m
Output per Cycle <i>A and B</i>		
E-30i	0.0272 gal.	0.1034 liter
E-XP2i	0.0203 gal.	0.0771 liter
Operating Ambient Temperature Range		
Temperature	20° to 120°F	-7° to 49°C
Auxiliary Power Available		
Voltage	120 Vac or 240 Vac, 60 Hz	
Engine		
Model	Perkins 404-22G, 2.2 L, 29 HP	
Alternator		
Model	Mecc Alte 22 kW, 240 V, 1 PH, 60 Hz, pancake style	
Battery Requirements		
Voltage	12 Vdc	
Minimum Cold Cranking Amps	800 CCA	
Connection Type	Post Style	

Technical Specifications

Reactor 2 Elite Integrated Proportioning Systems		
	U.S.	Metric
Recommended Battery Size		
BC Group Number	34	
Length	10.25 in.	260 mm
Width	6.81 in.	173 mm
Height	7.88 in.	200 mm
Booster Heater Power		
E-30i	None	
E-30i with booster heat	4000 Watts	
E-XP2i	4000 Watts	
Rotary Vane Air Compressor		
Hydrovane Model V04 (PURS type), continuous run		
Part No.	025CK10	
Pressure	140 psi	0.9 MPa, 9.6 bar)
Specifications	16 cfm	
Required Features	Thermal overload switch	
	Safety Relief Valve	
Motor: Baldor		
Part No.	EL1410-CUS	
Specifications	5 HP, 1735 RPM, 240 V, 1 Phase, OPSB	
Required Features	C face, lift rings,	
Refrigerated Air Dryer		
Hankison Model H1T20		
Specifications	115VAC, 1 Phase, 60 Hz, 22 scfm at 150 psi (1 MPa, 10.3 bar)	
Required Features	Pilot valve unloader	
Noise		
<i>Sound Pressure measured per ISO-9614-2.</i>		
Sound Pressure measured from 3.1 ft (1 m), at 1500 psi (10 MPa, 103 bar), 2 gpm (7.6 lpm)	91.0 dBA	
Fluid Inlets		
Component A (ISO) and Component B (RES)	3/4 NPT(f) with 3/4 NPSM(f) union	
Fluid Outlets		
Component A (ISO)	#8 (1/2 in.) JIC, with #5 (5/16 in.) JIC adapter	

Reactor 2 Elite Integrated Proportioning Systems		
	U.S.	Metric
Component B (RES)	#10 (5/8 in.) JIC, with #6 (3/8 in.) JIC adapter	
Fluid Circulation Ports		
Size	1/4 NPSM(m), with sst braided tubing	
Maximum Pressure	250 psi	1.75 MPa, 17.5 bar
Weight		
E-30i	1750 lb	794 kg
E-30i with compressor and dryer	2200 lb	998 kg
E-30i with booster heat	1800 lb	816 kg
E-30i with booster heat, compressor, and dryer	2250 lb	1021 kg
E-XP2i	1800 lb	816 kg
E-XP2i with compressor and dryer	2200 lb	998 kg
Wetted Parts		
Material	Aluminum, stainless steel, zinc plated carbon steel, brass, carbide, chrome, chemically resistant o-rings, PTFE, ultra-high molecular weight polyethylene	

Graco Extended Warranty for Integrated Reactor® 2 Components

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.

Graco Part Number	Description	Warranty Period
24U050	Electric Motor	36 Months or 3 Million Cycles
24U051	Electric Motor	36 Months or 3 Million Cycles
24U831	Motor Control Module	36 Months or 3 Million Cycles
24U832	Motor Control Module	36 Months or 3 Million Cycles
24U855	Heater Control Module	36 Months or 3 Million Cycles
24U854	Advanced Display Module	36 Months or 3 Million Cycles
All other Reactor 2 parts		12 Months

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.

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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 hereunder must be brought within the latter of two (2) years of the date of sale, or one (1) year the warranty period expires.

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Original Instructions. This manual contains English. MM 332637

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Revision D, July 2014