

EFR

3A6165E

Electric Fixed-Ratio Proportioner

EN

For use with two-component sealant and adhesive materials. For professional use only.

Not approved for use in explosive atmospheres or hazardous locations.

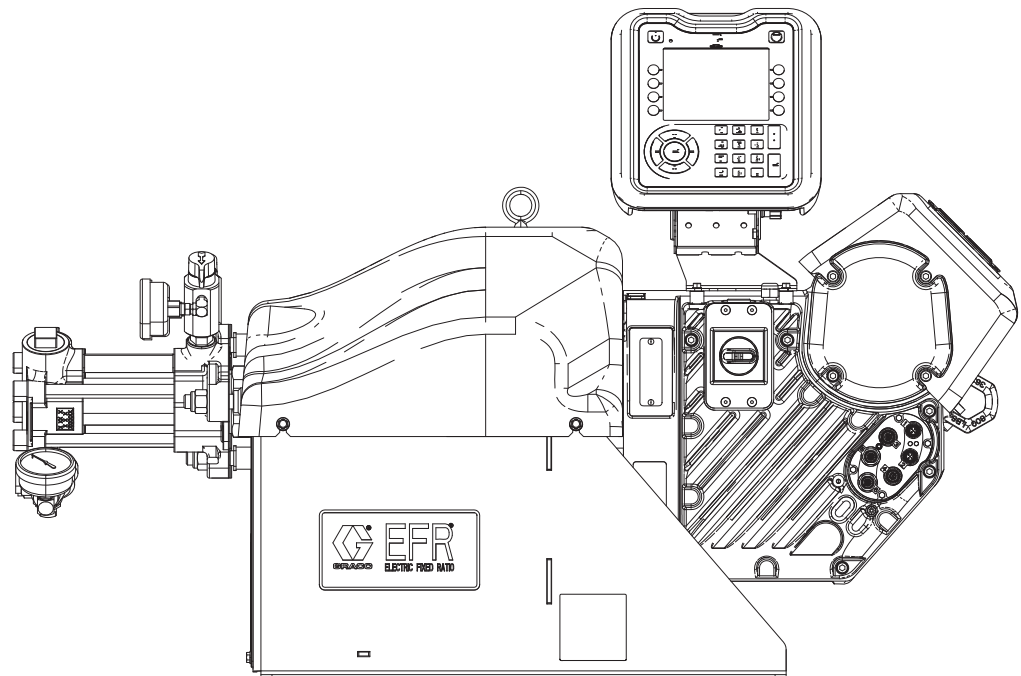
*2000 psi (13.8 MPa, 138 bar) Maximum Fluid Inlet Pressure
3500 psi (24.1 MPa, 241 bar) Maximum Fluid Outlet Pressure*

See page 3 for model information.



Important Safety Instructions

Read all warnings and instructions in this manual and in related manuals before using the equipment. Save these instructions.



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Related Manuals

Manual	Description
3A0019	Z-Series Chemical Pumps Instructions-Parts
3A6482	APD20 Advanced Precision Driver Instructions
312185	MD2 Valve Instructions-Parts
3A6338	Communications Gateway Module Installation Kit Instructions-Parts
3A6394	Z-Series Chemical Pumps High Wear Instructions-Parts
3A6321	ADM Token In-System Programming Instructions

Models

Use the following matrix to determine the 8-digit system part number.

NOTE: To order replacement parts, see the **Parts** section on page 31. The digits in the matrix do not correspond to the Ref. Nos. in the **Parts** drawings and lists.

EFR (First, Second and Third Digits)	Digit 4		Digit 5		Digit 6		Digit 7		Digit 8	
System Designator	Voltage Options		Control Options		A Side Pump		B Side Pump		Material Options	
EFR (Electric Fixed-Ratio Proportioner)	2	240V	A	ADM	A	5 cc	A	5 cc	C	Carbon and Stainless Steel
	4	480V			B	10 cc	B	10 cc	S	Stainless Steel
					C	15 cc	C	15 cc		
					D	20 cc	D	20 cc		
					E	25 cc	E	25 cc		
					F	30 cc	F	30 cc		
					G	35 cc	G	35 cc		
					H	40 cc	H	40 cc		
					I	45 cc	I	45 cc		
					J	50 cc	J	50 cc		
					K	60 cc	K	60 cc		
					L	65 cc	L	65 cc		
					M	70 cc	M	70 cc		
					N	75 cc	N	75 cc		
					O	80 cc	O	80 cc		
					P	86 cc	P	86 cc		
					Q	90 cc	Q	90 cc		
					R	100 cc	R	100 cc		
					S	105 cc	S	105 cc		
					T	120 cc	T	120 cc		
					U	140 cc	U	140 cc		
					V	150 cc	V	150 cc		
					W	160 cc	W	160 cc		
					X*	No Pump	X*	No Pump		
					1+	10 cc High-Wear	1+	10 cc High-Wear		
					2+	20 cc High-Wear	2+	20 cc High-Wear		
				4+	40 cc High-Wear	4+	40 cc High-Wear			
				8+	80 cc High-Wear	8+	80 cc High-Wear			
				9+	100 cc High-Wear	9+	100 cc High-Wear			

* An EFR may be configured without pumps by designating "X" for both pump selections. Material selection is required to specify the fittings shipped with the system. Pumps can be purchased and assembled separately before placing the system into service. See the Z-Series Chemical Pumps Instructions-Parts manual.

+ EFR configurations with High-Wear pumps are only available with stainless steel material options, and cannot be selected in combination with standard EFR pumps.

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.



DANGER



SEVERE ELECTRIC SHOCK HAZARD

This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

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

! WARNING



SKIN INJECTION HAZARD

High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. **Get immediate surgical treatment.**



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



FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in **work area** can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. To help prevent fire and explosion:

- Use equipment only in well-ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).
- Ground all equipment in the work area. See **Grounding** instructions.
- Never spray or flush solvent at high pressure.
- 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.
- Use only grounded hoses.
- **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.



TOXIC FLUID OR FUMES HAZARD

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

- Read Safety Data Sheets (SDSs) 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.



WARNING



MOVING PARTS HAZARD

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

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



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 Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) from distributor or retailer.
- 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.






PERSONAL PROTECTIVE EQUIPMENT

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. Protective equipment includes but is not limited to:

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

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

				
<p>Cross-contamination can result in cured material in fluid lines which could cause serious injury or damage equipment. To prevent cross-contamination:</p> <ul style="list-style-type: none"> • Never interchange component A (red) and component B (Blue) wetted parts. • Never use solvent on one side if it has been contaminated from the other side. 				

Changing Materials

NOTICE
<p>Changing the material types used in your equipment requires special attention to avoid equipment damage and downtime.</p> <ul style="list-style-type: none"> • When changing materials, flush the equipment multiple times to ensure it is thoroughly clean. • Check with your material manufacturer for chemical compatibility.

A (Red) and B (Blue) Components

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

For all machines:

- The A (Red) side is intended for hardeners and catalysts.
- The B (Blue) side is intended for polyols, resins, and bases. Regardless of the configuration of material used, the high volume material must be in the B (Blue) side.

Component Identification

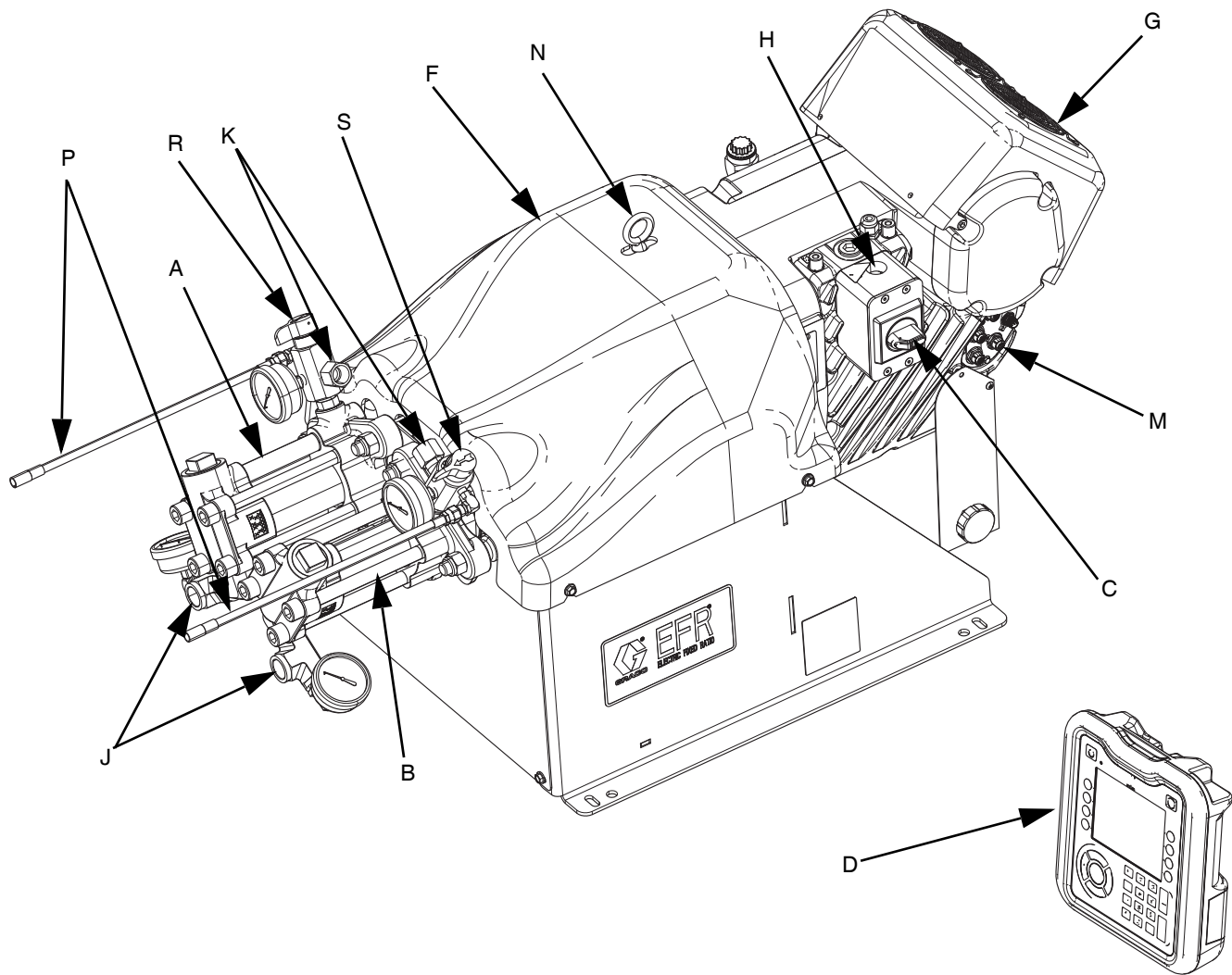


FIG. 1: Component Identification

Key:

- A A Pump
- B B Pump
- C Power Disconnect Switch
- D Advanced Display Module (ADM)
- F Pump Yoke Shroud
- G Electric Driver
- H Incoming Power Connection
- J Pump Inlets
- K Pump Outlets
- M Driver Communication and I/O Connectors

- N Lift Ring
- P Pressure Relief Drain Tubes
- R A-Side Outlet Drain/Relief Valve*
- S B-Side Outlet Drain/Relief Valve*

* *Required components supplied with the system. EFR systems configured without pumps are provided with drain/relief valves, which must be installed after the pumps are assembled, but before placing the system into service.*

Typical Installation

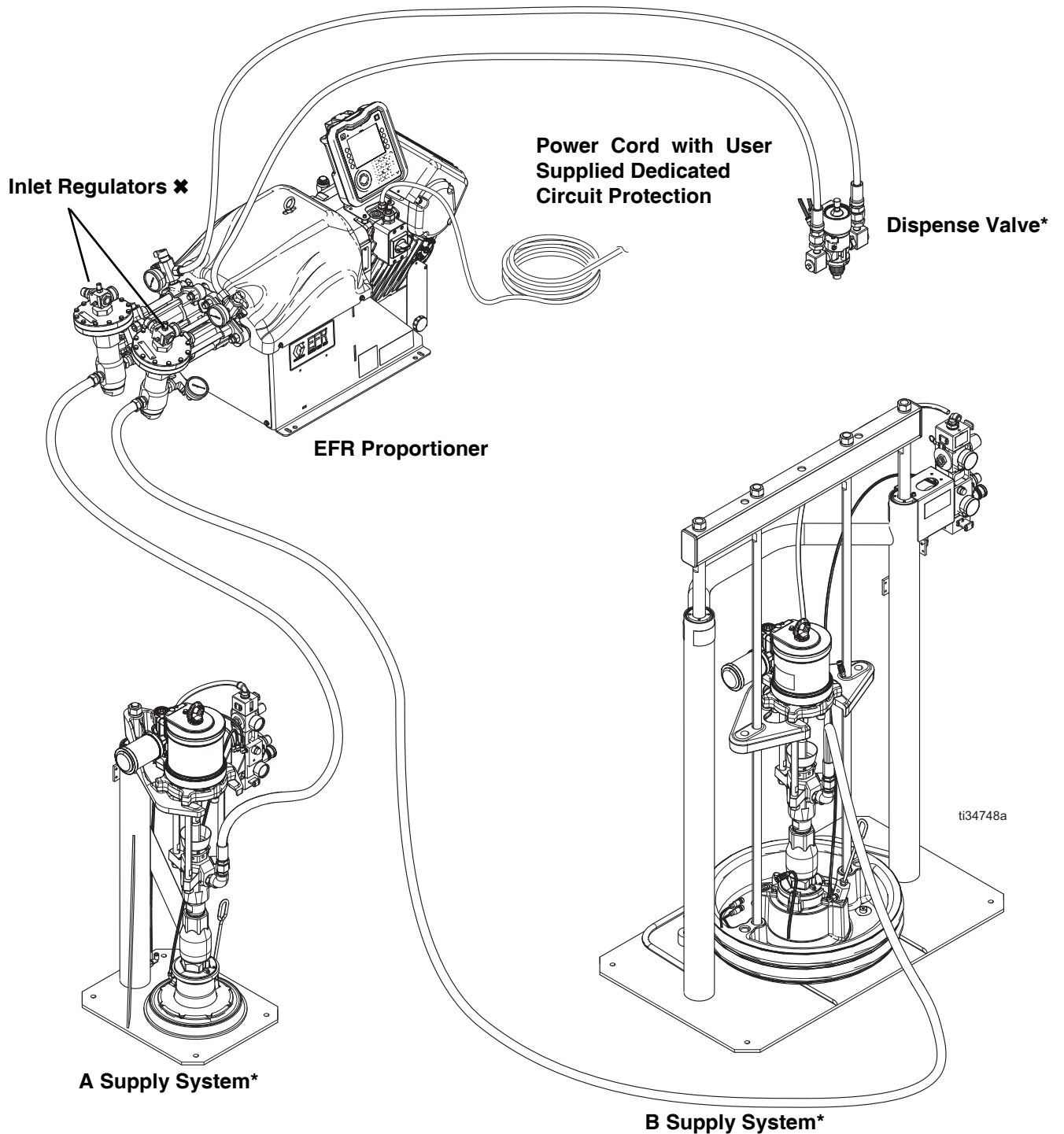


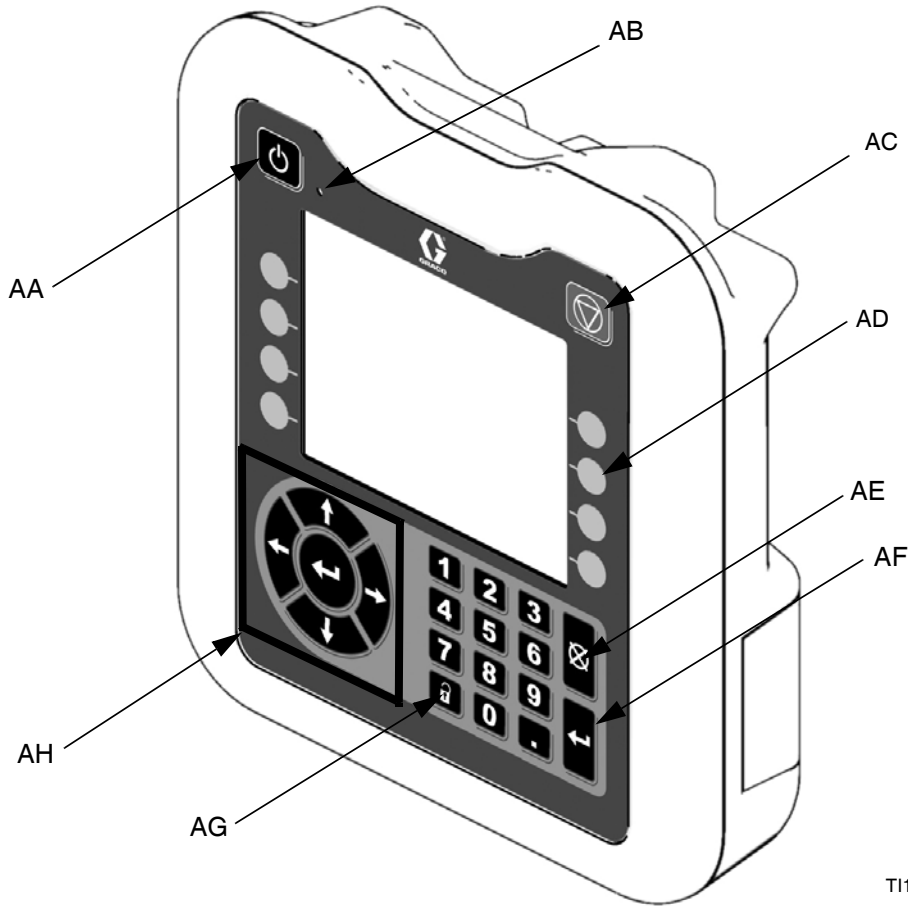
FIG. 2: Typical Installation

* Required accessories not supplied with the proportioner.

✘ Optional accessories not supplied with the proportioner.

Advanced Display Module (ADM)

User Interface



TI12362a1

FIG. 3: ADM Component Identification - Front

Buttons

Callout	Button	Function
AA	System enable/disable	Enables/disables system. When system is disabled, temperature control and dispense operation are disabled.
AB	System Status Indicator Light	Displays system status. See System Status Indicator (AB) Conditions on page 11 for details.
AC	Stop	Stop all system processes. Is not a safety or emergency stop.

Callout	Button	Function
AD	Soft Keys	Defined by application using ADM.
AE	Cancel	Cancel a selection or number entry while in the process of entering a number or making a selection.
AF	Enter	Acknowledge changing a value or making a selection.
AG	Lock/Set up	Toggle between run and setup screens. If setup screens are password protected, button toggles between run and password entry screen.
AH	Navigation	Navigate within a screen or to a new screen.

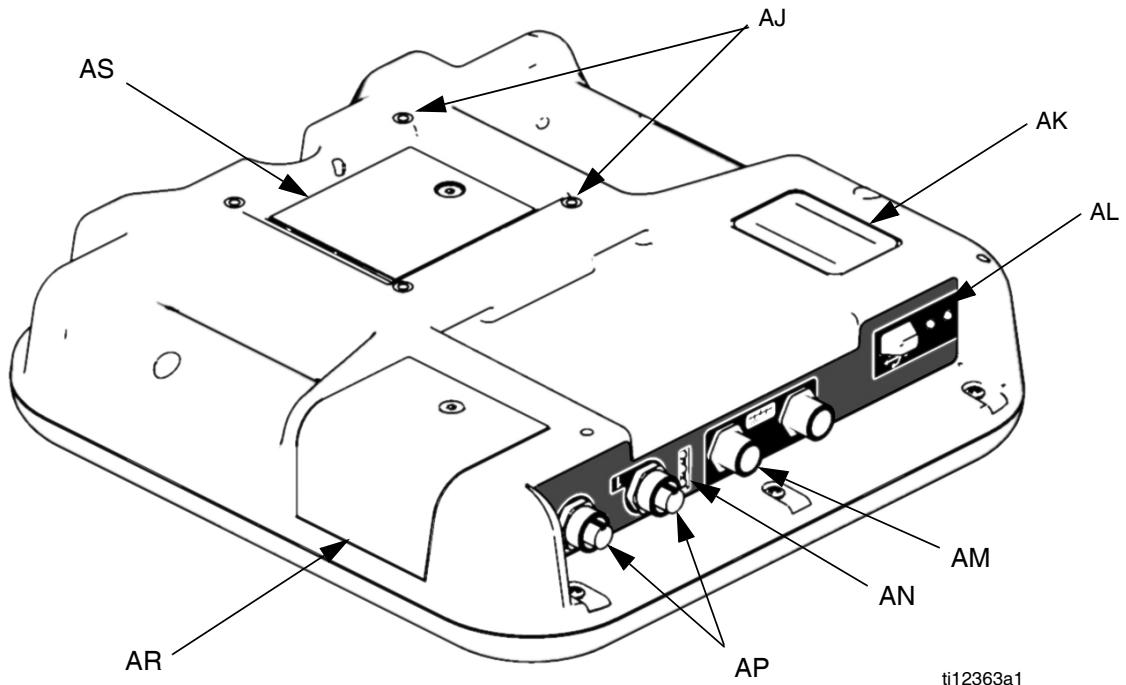


FIG. 4: ADM Component Identification - Rear

Key:

- AJ Flat Panel Mount
- AK Model Number
- AL USB Module Interface
- AM CAN Cable Connections
- AN Module Status LEDs
- AP Accessory Cable Connections
- AR Token Access Cover
- AS Battery Access Cover

System Status Indicator (AB) Conditions

- Green Solid** - Run Mode, System On
- Green Flashing** - Setup Mode, System On
- Yellow Solid** - Run Mode, System Off
- Yellow Flashing** - Setup Mode, System Off



ADM Module Status LEDs (AN) Conditions

Module Status LED Signal	Description
Green on	System is powered up.
Yellow on	Communication in progress.
Red solid	ADM hardware failure.
Red flashing	Uploading software.





USB Module Status LEDs (AL) Conditions

Module Status LED Signal	Description
Green flashing	System is powered up.
Yellow on	Downloading information to USB
Green/Yellow Flashing	ADM is busy, USB cannot transfer information when in this mode

Installation

				
All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.				

Grounding

				
The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.				

EFR: grounded through the power cord (customer supplied).

Fluid supply containers: follow local code.

Object being dispensed: follow local code.

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

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

Power Requirements

The system requires a dedicated circuit protected with a circuit breaker.

Voltage	Phase	Hz	Current
200-240 VAC	1	50/60	20 A
400-480 VAC	1	50/60	10 A

Connect Power

- Cut power cord wires to the following lengths:
 - Ground wire - 6.5 inches (16.5 cm)
 - Power wires - 3.0 inches (7.6 cm)
 - Add ferrules as necessary. See FIG. 5.

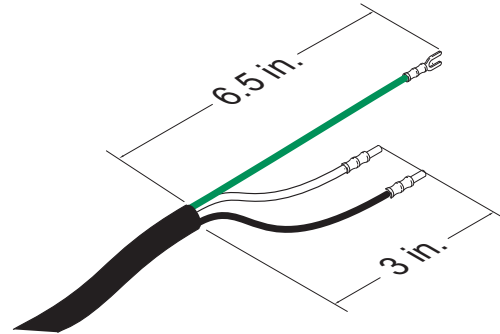


FIG. 5: Power Cord

- Remove the four screws to separate the junction box cover (BA) and disconnect switch (C) from the junction box (BB) on the electrical driver.

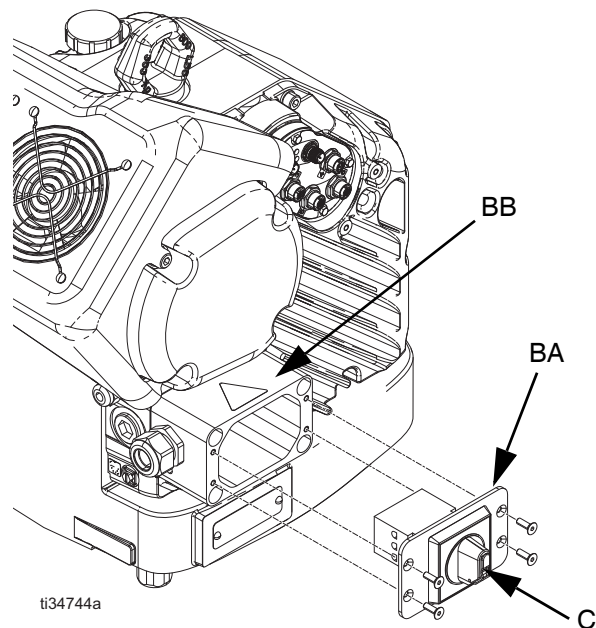


FIG. 6: Remove Junction Box Cover

NOTE: Inside the junction box, power wires are pre-installed to terminals 2T1 and 4T2 on the disconnect block. Refer to FIG. 7 for the terminal locations.

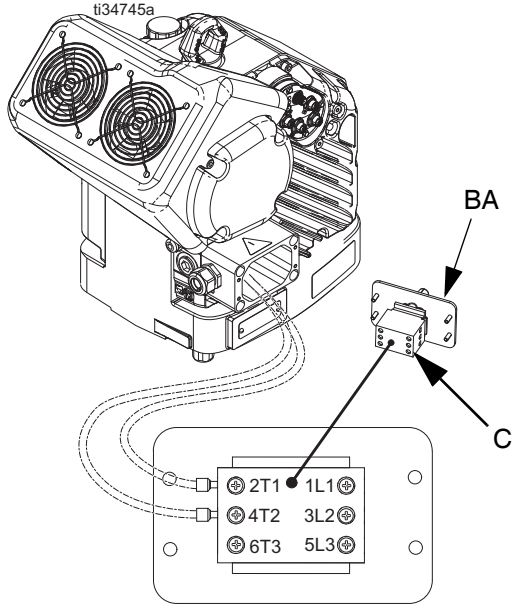


FIG. 7: Terminal Connections

3. Insert the power cord through the cord grip and into the junction box.

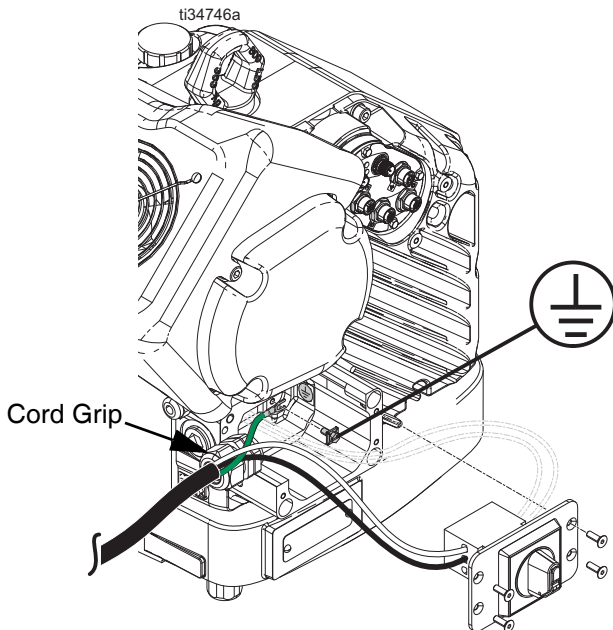


FIG. 8: Connect Power

4. Attach the ground wire to the ground terminal inside the junction box as shown in FIG. 8.
5. Refer to FIG. 7 and connect the wires from the power cord into terminals 1L1 and 2L2.

NOTE: For 480V systems, a step-down transformer is factory-installed between the power disconnect switch and the electric driver. See **Wiring Diagrams** on page 54.

NOTE: Do not attach the ground wire to the grounding lug locknut on the outside of the electric driver. See **Grounding** on page 12.

6. Place the power wires into the open area on either side of the power disconnect switch (C) as space permits.
7. Reinstall the junction box cover (BA) and disconnect switch (C) using the four screws removed in step 2.

NOTICE

Make sure all wires are routed correctly before installation. If wires get pinched when the screws are tightened, damage will occur.

8. Tighten the cord grip to securely hold the power cord in the junction box.

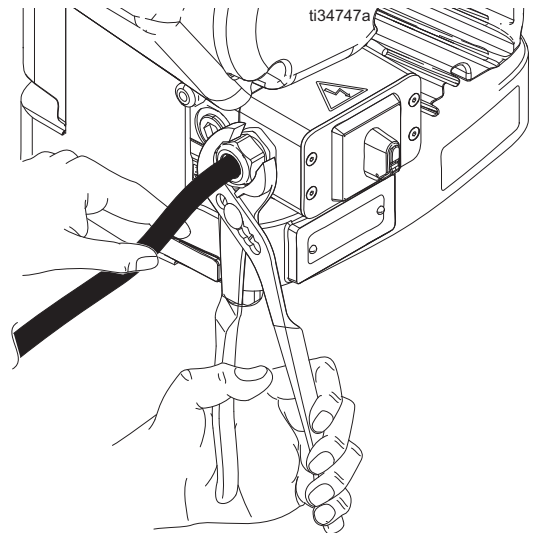


FIG. 9: Tighten Cord Grip

Install Vented Oil Cap Before Using Equipment

The driver gear-box is shipped from the factory pre-filled with oil. The temporary unvented cap (PX) prevents oil leaks during shipment. This temporary cap must be replaced with the vented oil cap (PY), supplied with the equipment, before use.

NOTE: Prior to use, check oil level. Oil level should be half way up the sight glass.

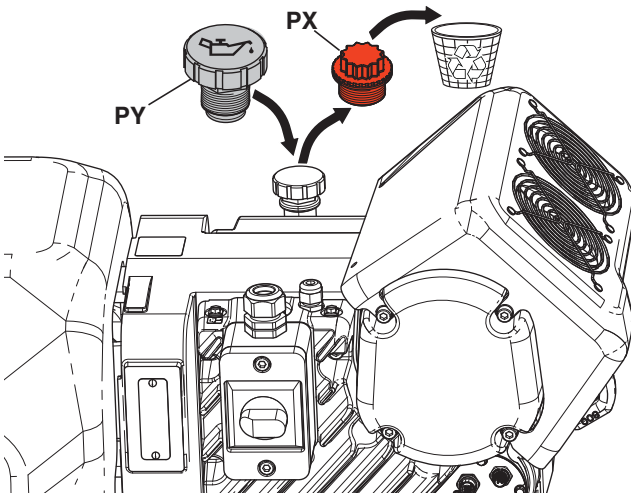


Fig. 10: Unvented and Vented Oil Caps

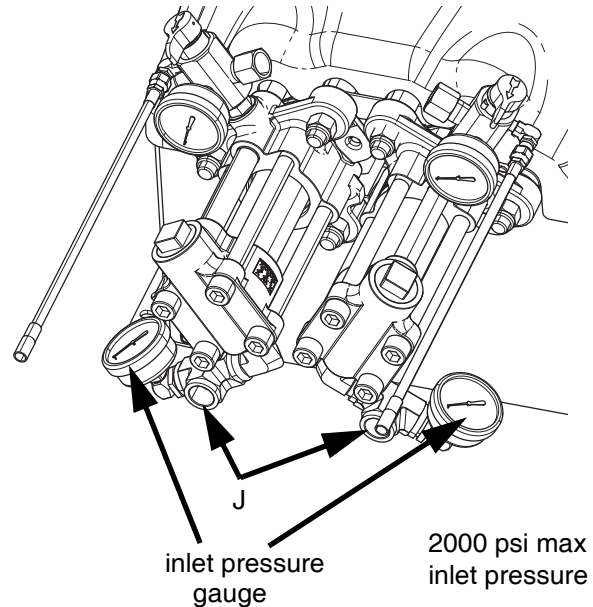
Setup

After placing the EFR in the desired area of operation:

NOTE: Make sure the EFR is placed on a level surface. See **Dimensions** on page 55 for space requirements.

1. Anchor the EFR to a fixed mounting location. See **Dimensions** on page 55.
2. Follow steps a through d to install pumps ordered separately for EFR systems configured without pumps. If the EFR is already configured with pumps, proceed to step 3.
 - a. Adjust the electric driver position to the correct ratio of the pumps selected. See **Check Driver and Yoke Position** and **Change Driver and Yoke Position** on page 18.
 - b. Install inlet fittings (provided with the EFR) onto the A and B pumps purchased separately. See **Parts** on page 31.
 - c. Install the pumps onto the EFR. See **Parts** on page 31. The B pump (larger volume) should be located on the side of the driver electrical connections. Use spring clamps (106) (provided with pumps) to couple the pump to yoke adapters (216).
 - d. Install adapters (107) into the pump outlets, then install outlet manifold assemblies (108, 109) and drain tubes (112).
3. If applicable, assemble and connect the fluid inlet regulators to the EFR fluid inlets (J). See **Inlet Regulator Kits** on page 36.

4. Connect the supply systems.
 - a. Install feed pumps for component A (Red) and B (Blue) supply drums. See **FIG. 2**, page 9.

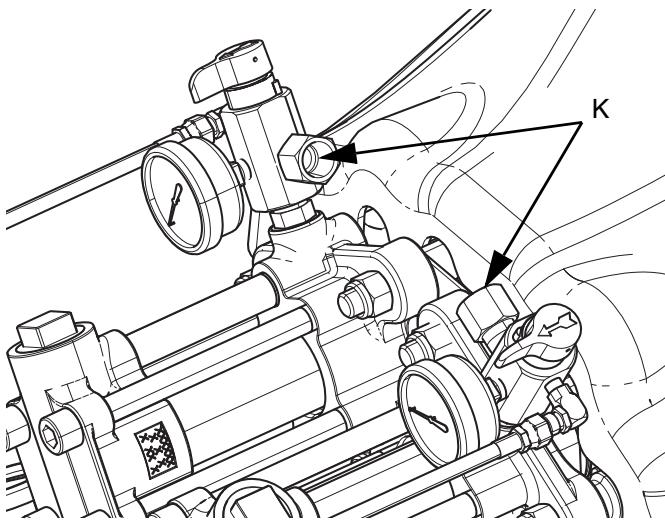


- b. Ensure the supply systems and, if applicable, the inlet regulators are off or set to zero pressure before connecting.

NOTE: Supply hoses from feed pumps should be 3/4 in. (19 mm) ID minimum.

- c. Assemble, connect and tighten the component B (Blue) inlet hose to the B-pump inlet (J).
- d. Assemble, connect and tighten the component A (Red) inlet hose to the A-pump inlet (J).

5. Attach the fluid outlet hoses to the pump outlets (K). Adapter fittings may be required, see **Outlet Fittings** on page 36.



6. Connect the outlet hoses to the dispense valve. Refer to your dispense valve component manual for complete installation instructions.
7. Pressure check the hoses. If there are no leaks, secure the outlet hoses together to protect them from damage.

Flushing



To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure.

- 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 fluid components are compatible with common solvents.
- To flush the entire system, circulate through the dispense valve and drain valve.

Driver and Yoke Position

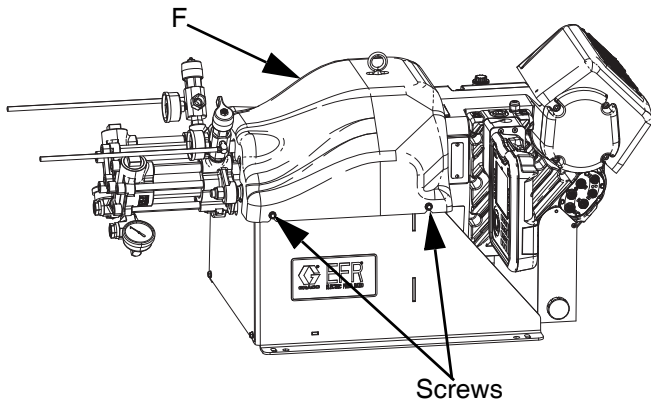


The driver and yoke position must be set for the volume mix ratio of the system.

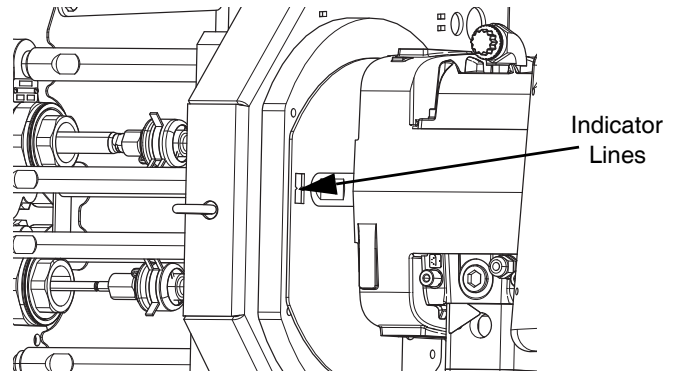
NOTE: The mix ratio is only determined by the size of the two pumps installed. Changing the driver and yoke position does not directly change the mix ratio, but it is required to balance the pressure between the two pumps.

Check Driver and Yoke Position

1. Turn the power disconnect switch (C) to the OFF position.
2. Perform the **Pressure Relief Procedure** on page 20.
3. Loosen the four screws and remove the pump yoke shroud (F).



4. Verify the correct pumps are mounted for your mix ratio by volume. Divide the displacement of the B-side pump by the displacement of the A-side pump (B/A) to calculate the volume ratio.



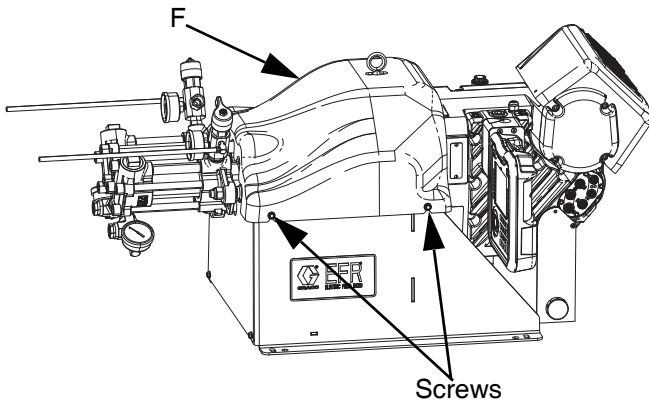
5. Verify the driver position is adjusted correctly for that mix ratio. If not, perform the following **Change Driver and Yoke Position** procedure.

NOTE: There are numbered indicator lines on the driver mounting plate and on the pump yoke that show the ratio adjustment.

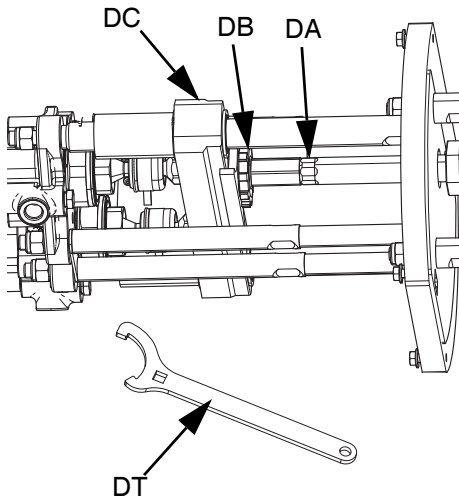
Change Driver and Yoke Position

There are specific driver positions for each mix ratio setting. To adjust the position of the electric driver:

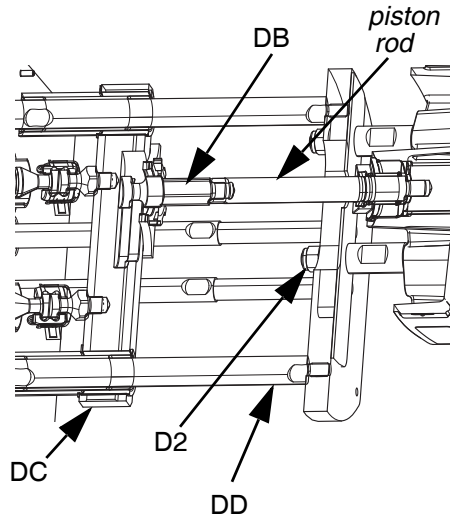
1. Turn the power disconnect switch (C) to the OFF position.
2. Perform the **Pressure Relief Procedure** on page 20.
3. Loosen the four screws and remove the pump yoke shroud (F).



4. Place a wrench on the adapter rod (DA), then use the supplied tool (DT) to loosen the serrated yoke nut (DB) above the yoke (DC).



5. Loosen the three nuts (D2) below the driver tie rods.



6. Grab the output shaft and slide the position of the driver until the indicator lines are aligned with your ratio.

NOTICE

Do not hit tie rods (DD) with a steel hammer. Damage to the electric driver base may result.

7. Tighten the three nuts (D2) and yoke nut (DB).
8. Use the supplied tool (DT) to tighten the yoke nut, then install the pump yoke shroud (F).

Operation

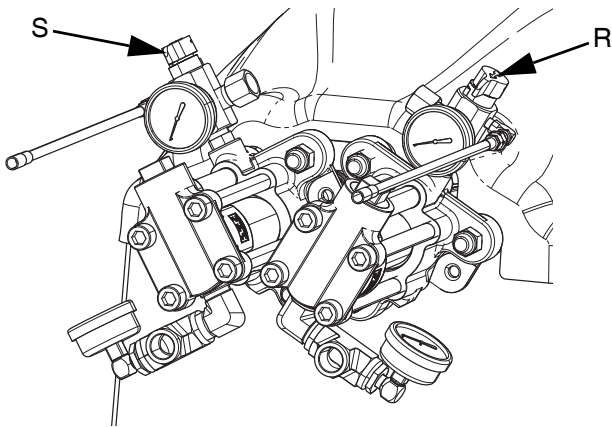


Startup

1. Use the supply systems to load the fluid.

NOTE: The EFR is tested with oil at the factory. Flush out the oil with a compatible solvent before dispensing.

- a. Check that all machine connections are tightened. See **Setup** on page 15.
- b. Verify both feed supply systems are connected to an air supply.
- c. Turn the power disconnect switch (C) to the ON position.
- d. Verify the machine is ON and the system status indicator (AB) is solid green. See **System Status Indicator (AB) Conditions** on page 11.
- e. Turn both PRESSURE RELIEF/DISPENSE valves (R, S) to DISPENSE (pointing toward the outlet pressure gauges).



- f. Start the supply systems. See **Adjust Material Inlet Pressure** on page 21.



Keep Components A and B Separate

Cross-contamination can result in cured material in fluid lines which could damage equipment or cause serious injury if injected or splashed on skin or in eyes. To prevent cross-contamination of the equipment's wetted parts, **never** interchange component A and component B parts.

- g. Use supply systems to load the system.
- h. To prime the pump, cycle the pump a few times or until air-free fluid dispenses. See **Home Screen** on page 38 for instructions on priming the pump through the ADM.




To prevent serious injury from splashing, dispense fluids at a low pressure.


- i. Hold the dispense valve nose piece, without a mixer installed, over two grounded waste containers. Leave the mixer off and trigger the dispense valve until both fluids flow freely from the nose piece without any air.
- j. With the valve closed, install the required mixer on the dispense valve. Refer to your dispense valve manual.

Shutdown




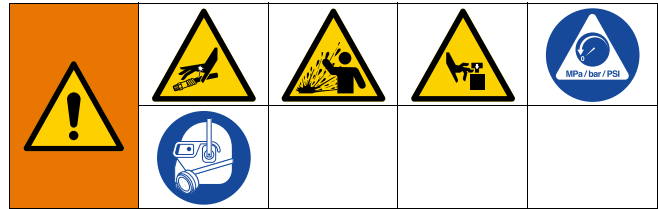
1. Park the pumps.

- a. From the Home screen, press the  icon. Material will dispense. The pump will park automatically. Once the pump is parked, the pump will stop moving.

2. Press the enable/disable key on the ADM  to disable the EFR.
3. Turn the power disconnect switch (C) to the OFF position.
4. Relieve fluid pressure from the supply system. See your appropriate supply system manual for instructions on relieving fluid pressure.
5. Perform the **Pressure Relief Procedure** on page 20.


Pressure Relief Procedure

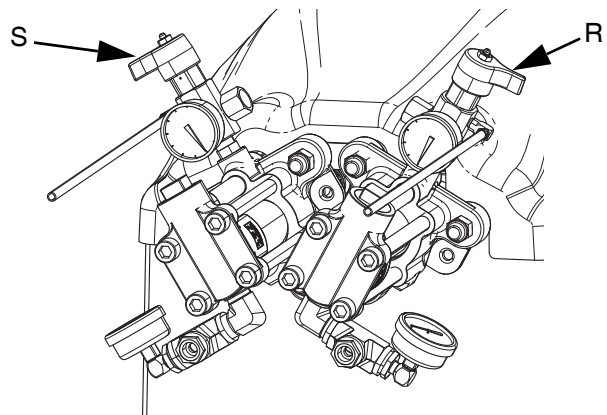
 Follow the Pressure Relief Procedure whenever you see this symbol.



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 the equipment.

NOTE: The fittings on the pressure relief hoses are zinc plated carbon steel. The hoses are cured with sulfur. Check your materials for compatibility with zinc plating and sulfur before reusing any material that passed through them, as it may inhibit curing.

1. Press the enable/disable key on the ADM  to disable the EFR, and verify it is inactive.
2. Relieve pressure and shut off the supply systems. See your appropriate supply system manual.
3. Turn the PRESSURE RELIEF/DISPENSE valves (R, S) to PRESSURE RELIEF/CIRCULATION (pointing toward the drain hoses). Route the fluid to grounded waste containers or supply tanks. Ensure gauges read 0.



4. **For models with a dispense valve with a safety lock,** engage the dispense valve safety lock.

Adjust Material Inlet Pressure



NOTICE

Care must be taken when applying pressure to systems equipped with an inlet pressure regulator on the inlet assembly. Too much pressure could result in a burst hose. Read both operation and service manuals for the pump/ram supply system and the inlet pressure regulator prior to loading material to the EFR system.

Use the following procedure to adjust the fluid pressure to the system inlet. This process assumes that the supply system consisting of a supply pump and outlet hose has already been loaded and primed and is ready to provide material to the pump inlet.

1. Verify that the material supply pump does not provide material pressure in excess of the maximum fluid inlet pressure of 2000 psi (13.8 MPa, 138 bar).
2. Verify that there is no pressure in the material supply pump.
3. If used, verify both fluid inlet regulators are functioning properly. See the regulator component manual for detailed operating instructions.
4. Adjust both inlet regulators (if used) so that there is no air pressure on them and that the regulator pressure gauge reads zero.
5. Place a grounded container at the outlet of the relief lines from the manifold assemblies and secure the lines in place.
6. Turn the pressure relief valves (SA, SB) on the manifold to the drain/recirculation position.
7. Gradually increase the air pressure to the supply pump to provide no more than 2000 psi (13.8 MPa, 138 bar).
8. If a fluid inlet regulator is used, slowly increase the air pressure on the inlet regulator to allow material to flow through the pump and out of the drain hose. The required material pressure will vary depending on the material viscosity and flow rate.
9. Once material is flowing from the drain hose, slowly decrease pressure on the inlet regulator until flow stops.
10. Gradually increase pressure to the inlet regulator until material begins to flow again.
11. When material begins to flow out of the drain port, close the pressure relief valves (SA, SB).

NOTE: Record the pump inlet pressure gauge reading. Use this pressure as a starting point for adjusting the material feed pressure to meet application requirements.

NOTE: As a general rule for high viscosity materials, the dispense pressure must exceed the material inlet pressure by 2 to 3 times. Therefore, if the maximum dispense pressure is 2500 psi (17 MPa, 172 bar), the inlet pressure should be no more than 1250 psi (9 MPa, 86 bar). For lower viscosity, flowable materials, the dispense pressure should exceed the inlet pressure by 3-4 times. Use only enough feed pressure to adequately feed the EFR pumps. The minimum feed pressure is 70 psi (0.48 MPa, 4.83 bar).

12. The inlet pressure regulator is not self relieving. Reducing the material pressure at the regulator will not effect the pressure reading until the accumulated down stream pressure is relieved. Perform **Pressure Relief Procedure** on page 20.

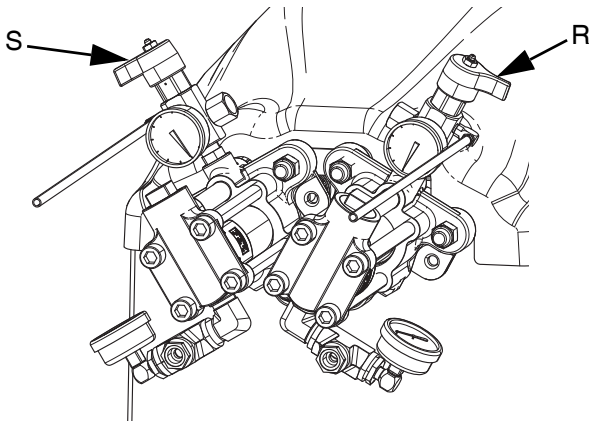
Maintenance



NOTE: See the Maintenance section in your component manuals for maintenance instructions for specific system components. See **Related Manuals** on page 2.

Task	Schedule
Change break-in oil in a new unit	After first 200,000 - 300,000 cycles
Inspect fluid lines for leaks	Daily
Grease circulation valves (S,R) with Fusion® grease (117773)	Weekly
Clean dispense valve mix chamber ports regularly, see dispense valve manual	See dispense valve manual
Clean dispense valve check valve screens, see dispense valve manual	See dispense valve manual

Grease Circulation Valves with Fusion Grease (117773)



Preventative Maintenance Schedule



The operating conditions of your particular system determine how often maintenance is required. Establish a preventative maintenance schedule by recording when and what kind of maintenance is needed, and then determine a regular schedule for checking your system.

Check Oil Level

Check the oil level in sight glass (FC). (See FIG. 11.) The oil level should be near the halfway point of the sight glass when the sprayer is not running. If oil is low, open fill cap (FB) and add Graco Part No. 16W645 ISO 220 silicone-free synthetic EP gear oil. See FIG. 11.

The oil capacity is approximately 2.0 - 2.2 quarts (1.9 - 2.1 liters). **Do not overfill.**

NOTICE

Only use oil with Graco part number 16W645. Any other oil may not lubricate properly and can cause damage to the drive train.

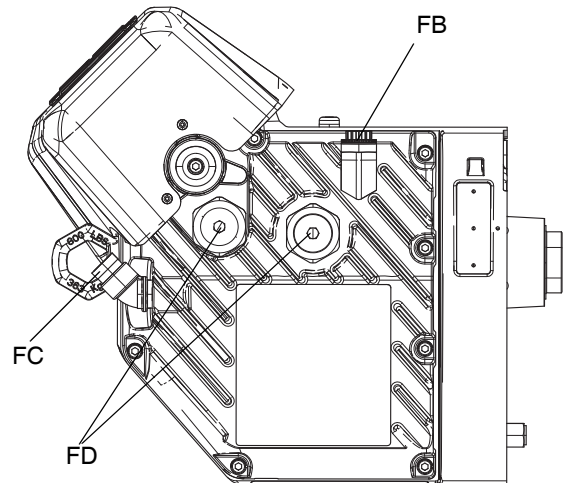
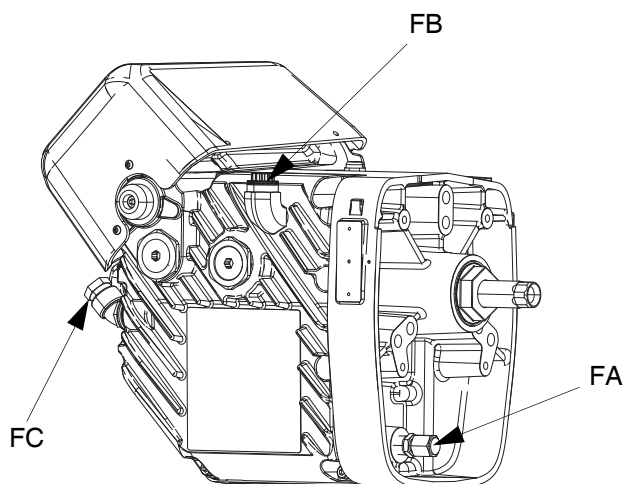


FIG. 11: Sight Glass and Oil Fill Cap

Change the Oil

NOTE: Change the oil after a break-in period of 200,000 to 300,000 cycles. After the break-in period, change the oil once per year.

1. Perform the **Shutdown** procedure on page 20.
2. Place a minimum 2 quart (1.9 liter) container under the oil drain port. Remove the oil drain plug (FA). Allow all oil to drain from the driver.
3. Reinstall the oil drain plug (FA). Torque to 18-23 ft-lb (25-30 N•m).
4. Open the fill cap (FB) and add Graco Part 16W645 ISO 220 silicone-free synthetic EP gear oil. Check the oil level in the sight glass (FC). (See FIG. 11.) Fill until the oil level is near the halfway point of the sight glass. The oil capacity is approximately 2.0 - 2.2 quarts (1.9 - 2.1 liters). **Do not overfill.**
5. Reinstall the fill cap.




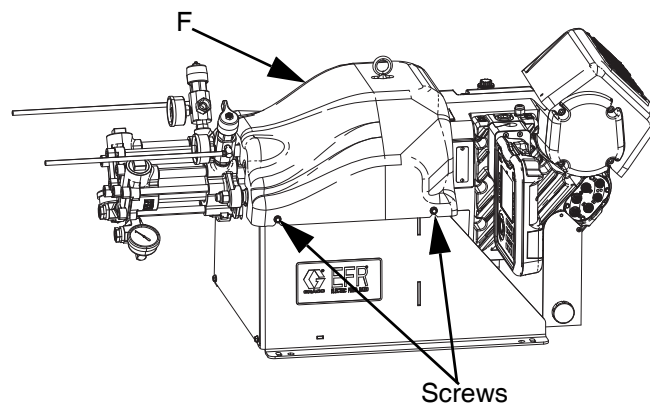
Bearing Pre-Load

See FIG. 11. The bearing pre-loads (FD) are factory set and are not user adjustable. Do not adjust the bearing pre-loads.

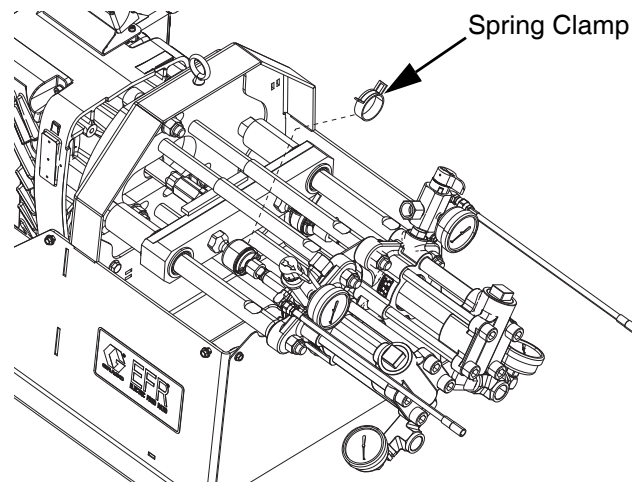
Calibrate the Electric Driver






1. Park the pumps:
 - a. From the Home screen, press the  icon. Material will dispense. The pump will park automatically. Once the pump is parked, the pump will stop moving.
2. Turn the power disconnect switch (C) to the OFF position.
3. Perform the **Pressure Relief Procedure** on page 20.
4. Loosen the four screws and remove the pump yoke shroud (F).



5. Remove the spring clamps coupling the pump to the yoke adapters. The driver will need to cycle freely during the calibration process.



6. Turn the power disconnect switch (C) to the ON position.
7. Navigate to Maintenance Screen 1 on the ADM (see page 44). Press  to enter Calibration mode.
8. Press the  icon to begin calibration. Wait for the calibration process to finish.
 - a. The driver output shaft will cycle back and forth slowly over the course of several minutes.
 - b. Mid-way through the auto-calibration process, the shaft will pause.
 - c. The shaft will cycle five or six times at a faster pace.
9. Verify the calibration process has been completed successfully. Successful calibration is indicated by the green check mark  displayed on the screen.
10. Exit the calibration screen.
11. Use the Jog function to move the yoke in position for coupling the pumps (see page 44).
12. Turn the power disconnect switch (C) to the OFF position.
13. Couple the pumps to the yoke adapter using the spring clamps removed previously.
14. Replace the pump yoke shroud (F).
15. Turn the power disconnect switch (C) to the ON position and resume operation.

ADM - Battery Replacement and Screen Cleaning

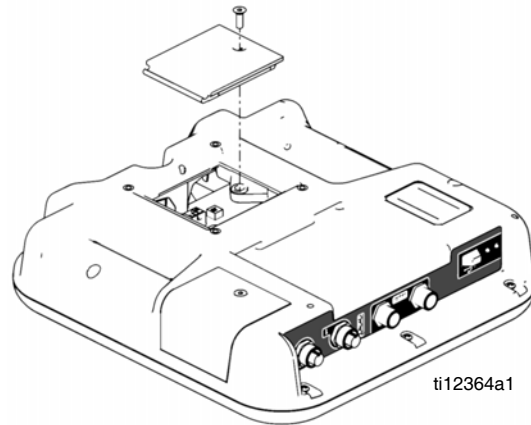


Battery Replacement

A lithium battery maintains the ADM clock when power is not connected.

To replace the battery:

1. Perform the **Shutdown** procedure on page 20.
2. Disconnect power to the ADM. This can be done by removing the CAN cable from the bottom of the ADM.
3. Remove battery access cover.

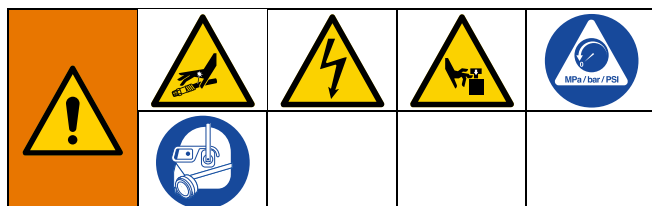


4. Remove the old battery and replace with a new CR2032 battery.
5. Properly dispose the old lithium battery according to local codes.
6. Replace battery access cover.
7. Connect the power to the ADM and reset the clock through **Advanced Screen 1**. See **Advanced Screen 1** on page 43.

Cleaning

Use any alcohol-based household cleaner, such as glass cleaner, to clean the ADM. Spray on the rag then wipe ADM. Do not directly spray the ADM.

Troubleshooting



NOTE: For Online help, visit <http://help.graco.com> for causes and solutions to each error code.

1. Follow **Pressure Relief Procedure**, page 20.
2. Check all possible problems and causes before disassembling.
3. Turn the power disconnect switch OFF.

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
General		
Display Module completely dark	No Power	Verify the power disconnect switch (C) is ON
	Loose Connection	Tighten 5-pin cable on the Advanced Display Module
	Bad Display Module	Replace the Advanced Display Module
No or incorrect amount of material dispensed from either side	Ball Valve closed (if Installed)	Open supply ball valve.
	Supply Empty	Add fluid
	Air in Material	Prime the machine
Significant material leaking from pump seal	Pump shaft worn and/or shaft seal worn	Remove the pump shaft assembly and reinstall read pump rebuild kit
Material dispensed not correct weight	Specific gravity of one or more of the two materials has changed since setup	Check the specific gravity and re-enter in the setup screens
	Check valve malfunction	Remove the check valve; clean or replace as necessary
	Piston worn or broken	Replace the piston
Proportioning System		
Proportioning pump does not hold pressure when stalled	Pump piston or intake valve leaking	<ol style="list-style-type: none"> 1. Observe gauge to determine which pump is losing pressure. 2. Determine in which direction the pump has stalled by observing which directional valve indicator light is on. 3. Repair the valve.

Problem	Cause	Solution
Material imbalance	Inadequate flow from pump;	Increase fluid supply to proportioning pump: <ul style="list-style-type: none"> • Use minimum 3/4 in. (19 mm) ID supply hose, as short as practical
		Clean inlet strainer screen
		Worn pump inlet valve ball/seat or gasket
Erratic pump movement	Pump cavitation	Feed pump pressure is too low. Adjust pressure to maintain 100 psi (0.7 MPa, 7 bar) minimum.
Pump output low	Obstructed fluid hose or dispense valve; fluid hose ID too small	Open, clear; use hose with larger ID.
	Worn piston valve or intake valve in displacement pump	See pump manual 3A0019.
	Inadequate feed pump pressure	Check feed pump pressure and adjust to 100 psi (0.7 MPa, 7 bar) minimum.

EFR Error Codes

Error Code	Code Description	Cause	Solution
A4NX	High current motor	Inlet pressure too high, causing retract stroke to require too much torque	Reduce inlet supply pressure.
		Pump sizes too large for motor to drive out the operating pressure	Reduce combined pump size.
			Reduce outlet flow rate or outlet operating pressure.
		Wrong pump sizes programmed into the system	Verify the pump sizes in the setup screen are correct for the pumps installed on the system.
CACA	Comm. Error Advanced Display	System is unable to communicate with Advanced Display Module (ADM)	Verify CAN cable is plugged in
			Remove and reconnect CAN cable, taking care not to cross thread the connector nut.
CACC	Comm. Error Gateway	System is unable to communicate with Communications Gateway Module (CGM)	Verify CAN cable is plugged in
			Remove and reconnect CAN cable, taking care not to cross thread the connector nut.
CACF	Comm. Error Fluid Control Module	System is unable to communicate with Fluid Control Module (FCM)	Verify CAN cable is plugged in
			Remove and reconnect CAN cable, taking care not to cross thread the connector nut.
CACM	Comm. Error Motor Control Module	System is unable to communicate with Motor Control Module (3MCP)	Verify CAN cable is plugged in
			Remove and reconnect CAN cable, taking care not to cross thread the connector nut.
CCCC	Comm. Error Gateway	Automation gateway lost communication with automation controller	Verify fieldbus cable is properly connected.
			Verify host is communicating.
DDDA	Pump Cavitation A	Out of material	Verify A material supply
		Check valve not working properly	Inspect and clean A side check valve. Check for leaking seals or damage to the ball
DDDB	Pump Cavitation B	Out of material	Verify B material supply
		Check valve not working properly	Inspect and clean B side check valve. Check for leaking seals or damage to the ball
DHDA	Leak Detected Outlet A	Pressure leaking from A side while stalled at pressure	Visually inspect the machine and hoses for signs of material leakage.
			Inspect seals in pump and ball check.

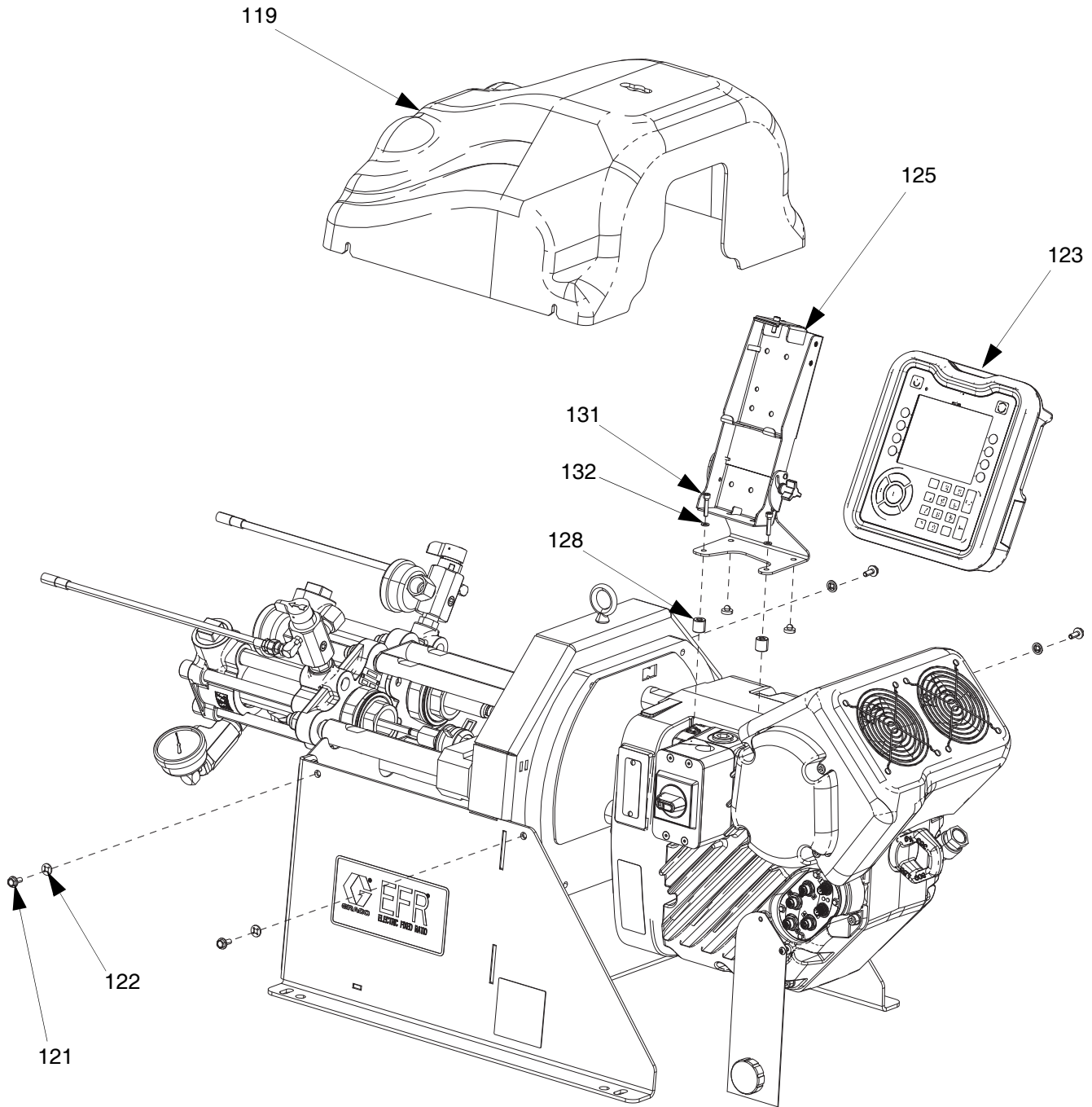
Error Code	Code Description	Cause	Solution
DHDB	Leak Detected Outlet B	Pressure leaking from B side while stalled at pressure	Visually inspect the machine and hoses for signs of material leakage.
			Inspect seals in pump and ball check.
F3NX	Unable to Maintain Flow Rate	Pump is unable to deliver the desired flow rate	Reduce flow rate
			Increase pump sizes
			Measure line voltage. Low line voltage may reduce maximum operating flow rate.
F4NX	Setting Exceeds Max Output	Pump cannot cycle fast enough to achieve the desired flow rate	Reduce flow rate
			Increase pump sizes
P3DA	High Pressure Outlet A	Pressure A exceeds user-defined limit	Inspect for hardened material or obstructions to flow.
			Attempt to purge material at a reduced flow rate.
			Reduce operating pressure by reducing flow rate and/or restriction in the hose and valve.
			Increase user-defined pressure limit
P3DB	High Pressure Outlet B	Pressure B exceeds user-defined limit	Inspect for hardened material or obstructions to flow.
			Attempt to purge material at a reduced flow rate.
			Reduce operating pressure by reducing flow rate and/or restriction in the hose and valve.
			Increase user-defined pressure limit
P4DA	High Pressure Outlet A	Pressure A exceeds system limit	Inspect for hardened material or obstructions to flow.
			Attempt to purge material at a reduced flow rate.
			Reduce operating pressure by reducing flow rate and/or restriction in the hose and valve.
P4DB	High Pressure Outlet B	Pressure B exceeds system limit	Inspect for hardened material or obstructions to flow.
			Attempt to purge material at a reduced flow rate.
			Reduce operating pressure by reducing flow rate and/or restriction in the hose and valve.

Error Code	Code Description	Cause	Solution
P4FA	High Pressure Inlet A	Supply pressure is too high	Reduce inlet supply pressure. Inlet pressure should not exceed 67% of outlet pressure.
		Outlet operating pressure is too low	Increase outlet operating pressure. Outlet pressure should be at least 1.5x inlet pressure.
P4FB	High Pressure Inlet B	Supply pressure is too high	Reduce inlet supply pressure. Inlet pressure should not exceed 67% of outlet pressure.
		Outlet operating pressure is too low	Increase outlet operating pressure. Outlet pressure should be at least 1.5x inlet pressure.
P6DA	Pressure Sensor Error Outlet A	Loose or bad sensor connection to Motor Control Module	Check to make sure that the pressure sensor is properly connected to connector 6 of the Motor Control Module (MCM)
		Faulty sensor	Replace the Pressure Sensor
P6DB	Pressure Sensor Error Outlet B	Loose or bad sensor connection to Motor Control Module	Check to make sure that the pressure sensor is properly connected to connector 5 of the Motor Control Module (MCM)
		Faulty sensor	Replace the Pressure Sensor
P6FA	Pressure Sensor Error Inlet A	Loose or bad sensor connection to Motor Control Module	Check to make sure that the pressure sensor is properly connected to the connector 6 of the Fluid Control Module (FCM).
		Faulty sensor	Replace the Pressure Sensor
P6FB	Pressure Sensor Error Inlet B	Loose or bad sensor connection to Motor Control Module	Check to make sure that the pressure sensor is properly connected to connector 5 of the Fluid Control Module (FCM).
		Faulty sensor	Replace the Pressure Sensor
P7DA	Pressure Imbalance High A	Dispense line is clogged	First try purging fresh material through the system. Then relieve pressure and check for cured material or obstructions in the dispense valve.
		Orifice restrictions sized incorrectly	Adjust orifice restrictions to balance pressure of A and B materials
		Out of material	Verify B material supply
		Pressure imbalance is defined too low	Increase pressure imbalance amount from the Setup screen of the Advanced Display Module (ADM)

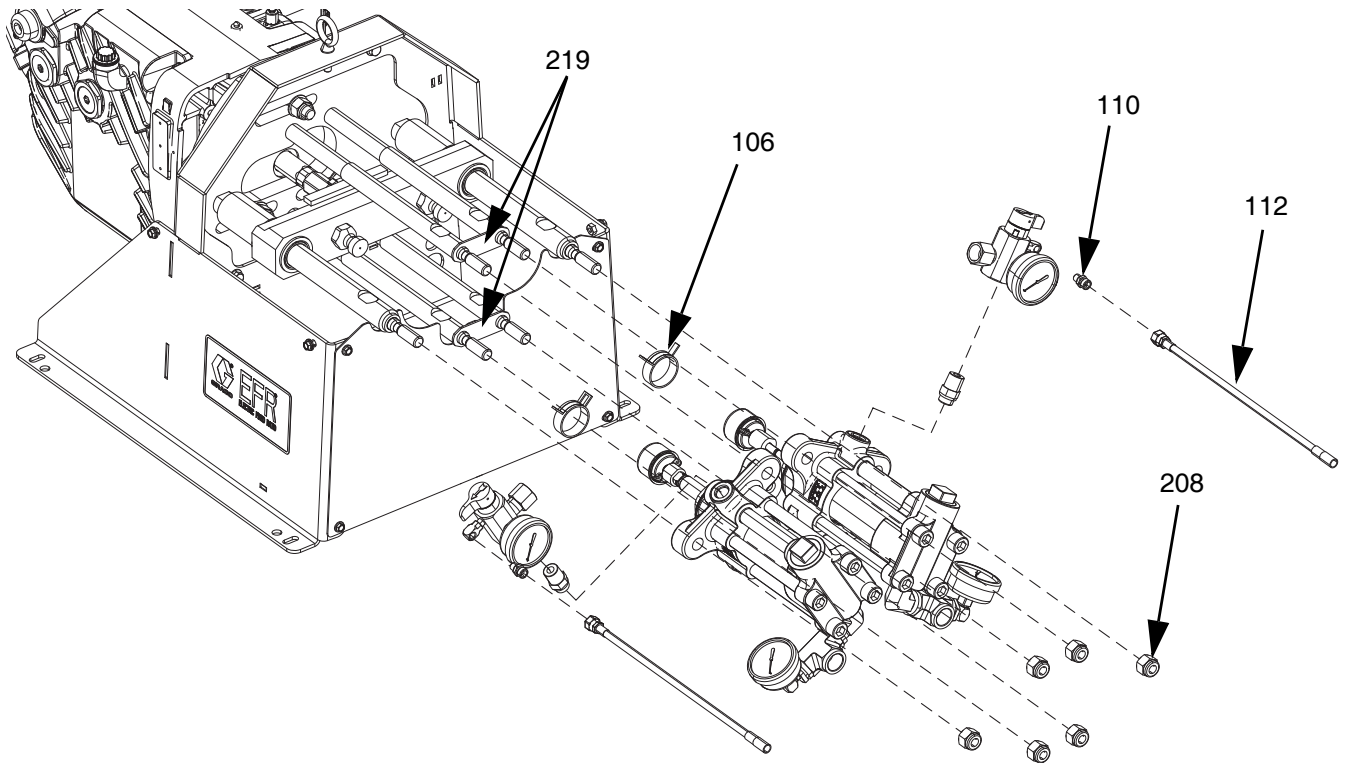
Error Code	Code Description	Cause	Solution
P7DB	Pressure Imbalance High B	Dispense line is clogged	First try purging fresh material through the system. Then relieve pressure and check for cured material or obstructions in the dispense valve.
		Orifice restrictions sized incorrectly	Adjust orifice restrictions to balance pressure of A and B materials
		Out of material	Verify A material supply
		Pressure imbalance is defined too low	Increase pressure imbalance amount from the Setup screen of the Advanced Display Module (ADM)
T4NX	High Temperature Motor	Cooling fans not working properly	Ensure cooling fans are clear of obstructions and operating properly
V1NX	Low Voltage Motor	AC voltage is too low	Check wire connections and verify line voltage is within specification
V4NX	High Voltage Motor	AC voltage is too high	Verify line voltage is within specification
WBNX	Encoder Error Motor	Encoder not plugged in	Ensure encoder connector is fully plugged into the circuit board inside the driver
		Faulty encoder	Replace encoder
WMNX	Controller Fault Motor	Faulty circuit board	Replace motor control circuit board
W5NX	Encoder Calibration Motor	Encoder not calibrated	Calibrate the Encoder from the maintenance screen of the Advanced Display Module (ADM)

Parts

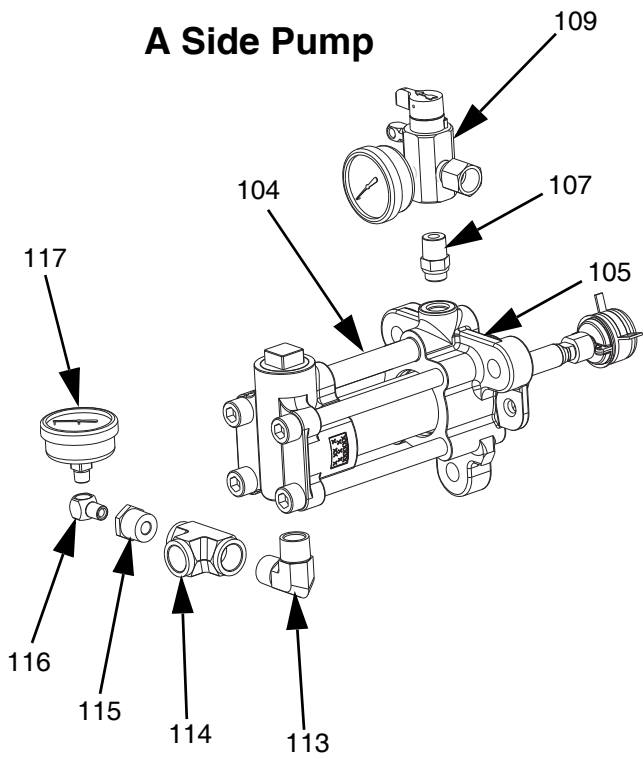
EFR Common System Parts



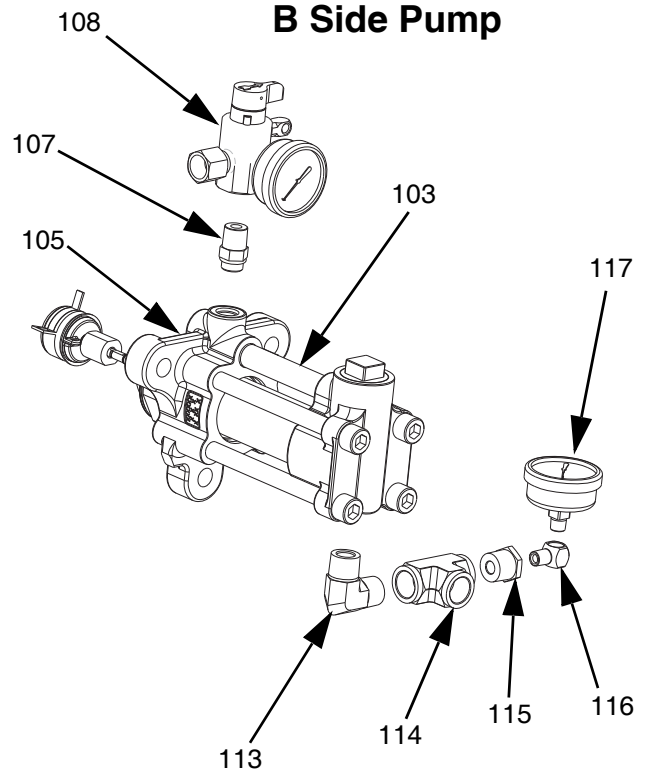
Fluid Section



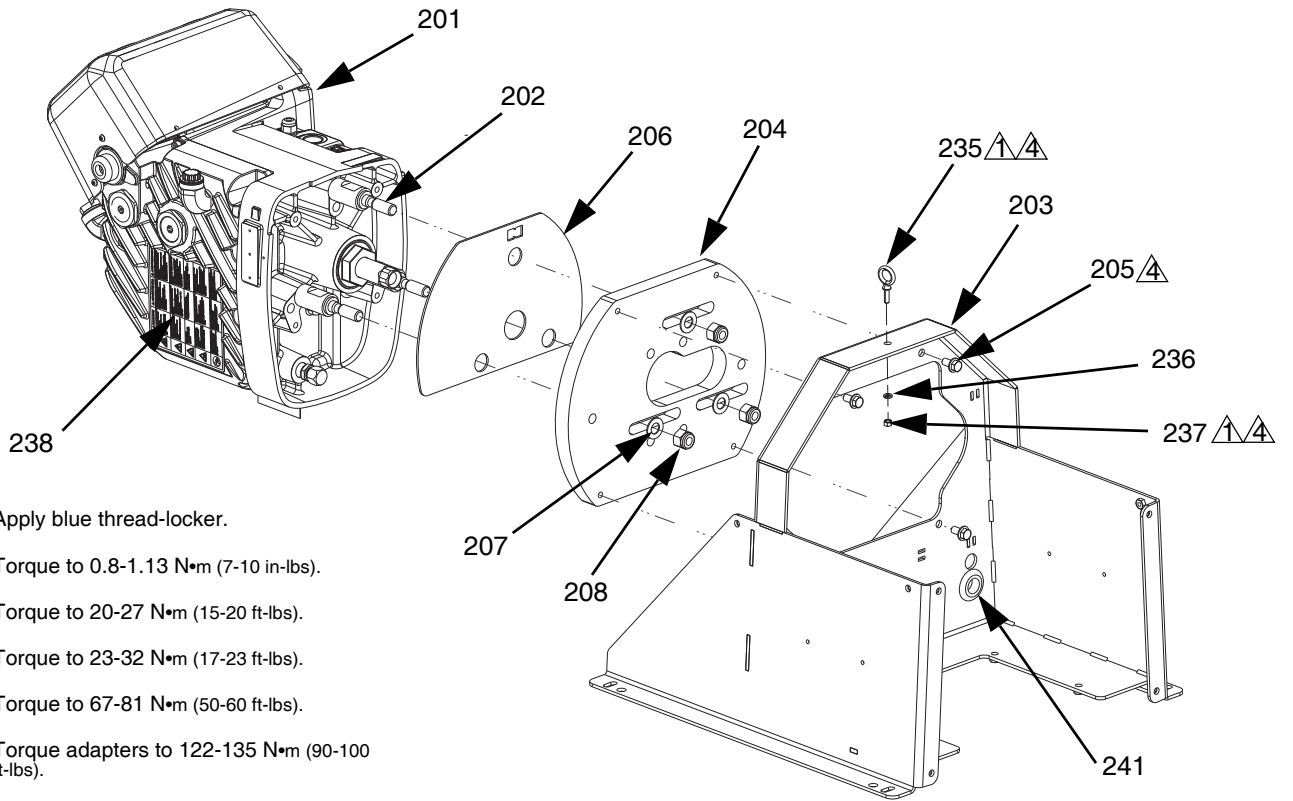
A Side Pump



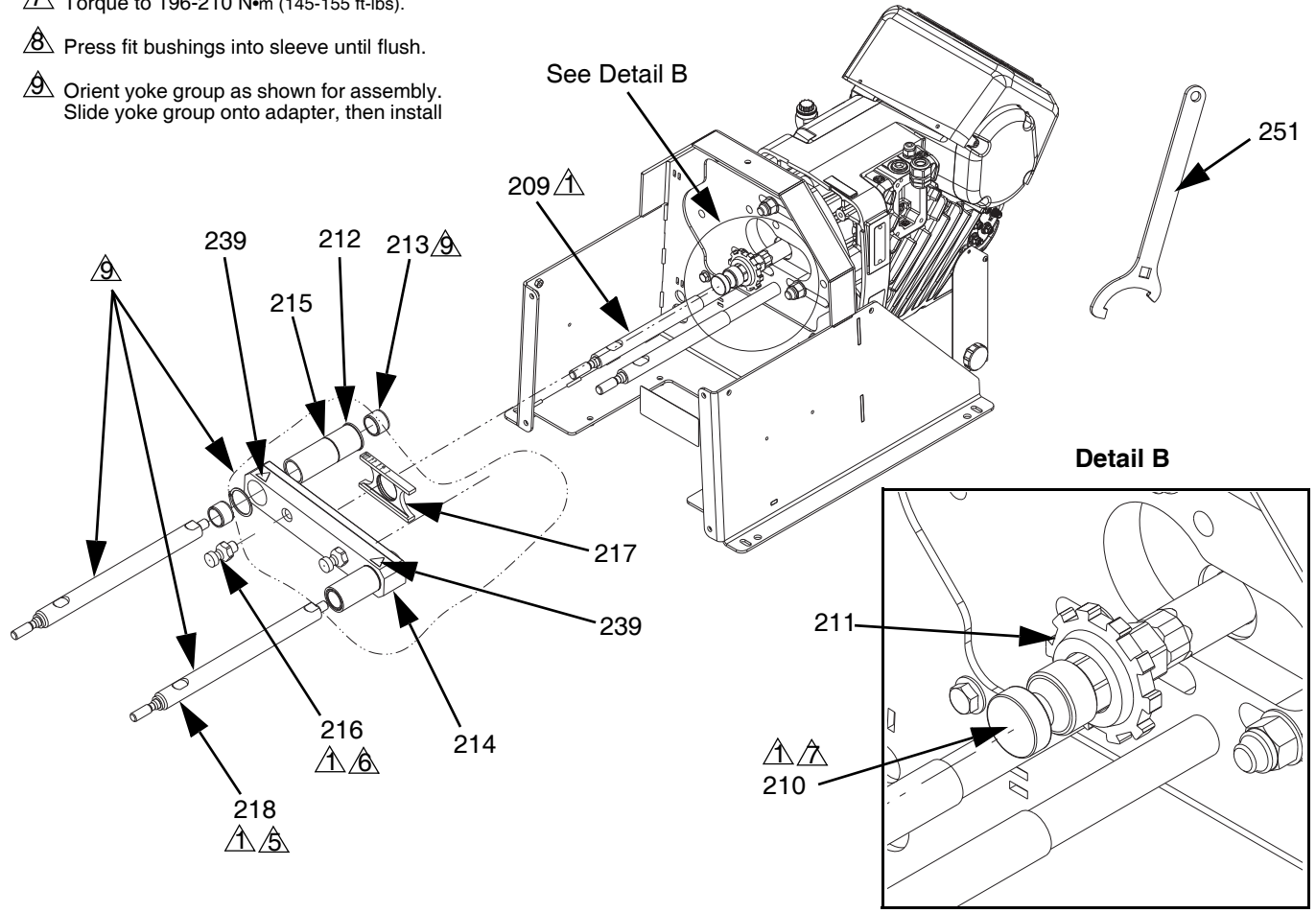
B Side Pump



Driver and Yoke Assembly



- 1 Apply blue thread-locker.
- 2 Torque to 0.8-1.13 N•m (7-10 in-lbs).
- 3 Torque to 20-27 N•m (15-20 ft-lbs).
- 4 Torque to 23-32 N•m (17-23 ft-lbs).
- 5 Torque to 67-81 N•m (50-60 ft-lbs).
- 6 Torque adapters to 122-135 N•m (90-100 ft-lbs).
- 7 Torque to 196-210 N•m (145-155 ft-lbs).
- 8 Press fit bushings into sleeve until flush.
- 9 Orient yoke group as shown for assembly. Slide yoke group onto adapter, then install



Parts Common to All Systems

Ref.	Part	Description	Qty.
103	See Table	LOWER, chemical, SST (B-side)	1
104	See Table	LOWER, chemical, SST (A-side)	1
105	15M669	SENSOR, pressure, fluid outlet	2
106	124078	CLAMP, spring, constant tension	2
112†	16W043	TUBE, pressure relief	2
119	25E100	SHROUD, pump yoke	1
121	114182	SCREW, flange head	4
122	16V153	WASHER, retaining	4
123	26B019	KIT, adm, efr	1
124*	---	CABLE, can	1
125**	26B020	BRACKET, adm (includes 128, 131, and 132)	1
128**	---	SPACER, adm bracket	2
131**	---	SCREW	2
132**	---	WASHER	2
138*	128441	CABLE, gca, m12, 8 pin	1
139*	120997	CABLE, single-ended, m12, 5-pin	1
140*	127068	CABLE, can, 1M	1
201	25N520	DRIVER	1
202	17E535	TIE ROD	3
203	25E099	FRAME	1
204	---	PLATE	1
205	112395	SCREW	4
206	---	RATIO PLATE	1
207	154636	WASHER	3
208	101712	NUT	9
209	262468	ROD, tie, 14.25 long	4
210	16D450	ADAPTER	1
211	16D451	NUT, yoke	1
212	262472	SLEEVE, bearing	2
213	111311	BEARING, plain	4
214	123976	RING, snap, external	2
215	262471	YOKE	1
216	25H392	ADAPTER, pump	2
217	---	RATIO INDICATOR	1
218	262469	ROD, tie, 14.25 long, 1.25 dia	2
219	16E882	STRAP, lowers	2
235	---	BOLT, eye, 3/8-16, 1300 lb	1
236	100133	WASHER, lock, 3/8	1
237	U90126	NUT, hex, 3/8-16	1
238▲	17Y723	LABEL, safety, warning, horizontal	1
239▲	15H108	LABEL, safety, warning, pinch	2
241	16H888	GROMMET, push-in	1
251	15T258	TOOL, spanner wrench	1

Parts That Vary by Material Selection

Ref.	Part		Description	Qty.
	Carbon Steel	Stainless Steel		
107†	123719	131783	FITTING, adapter, ORB x NPT	2
108†	26B018	26B429	MANIFOLD, assy, B-side	1
109†	26B129	26B229	MANIFOLD, assy, A-side	1
110†	191872	191929	FITTING, adapter	2
113†	295847	121116	FITTING, elbow, 3/4 npt	2
114†	801787	113833	FITTING, tee	2
115†	100615	516308	BUSHING	2
116†	100840	166866	FITTING, elbow, 1/4 npt	2
117†	113641	113641	GAUGE	2

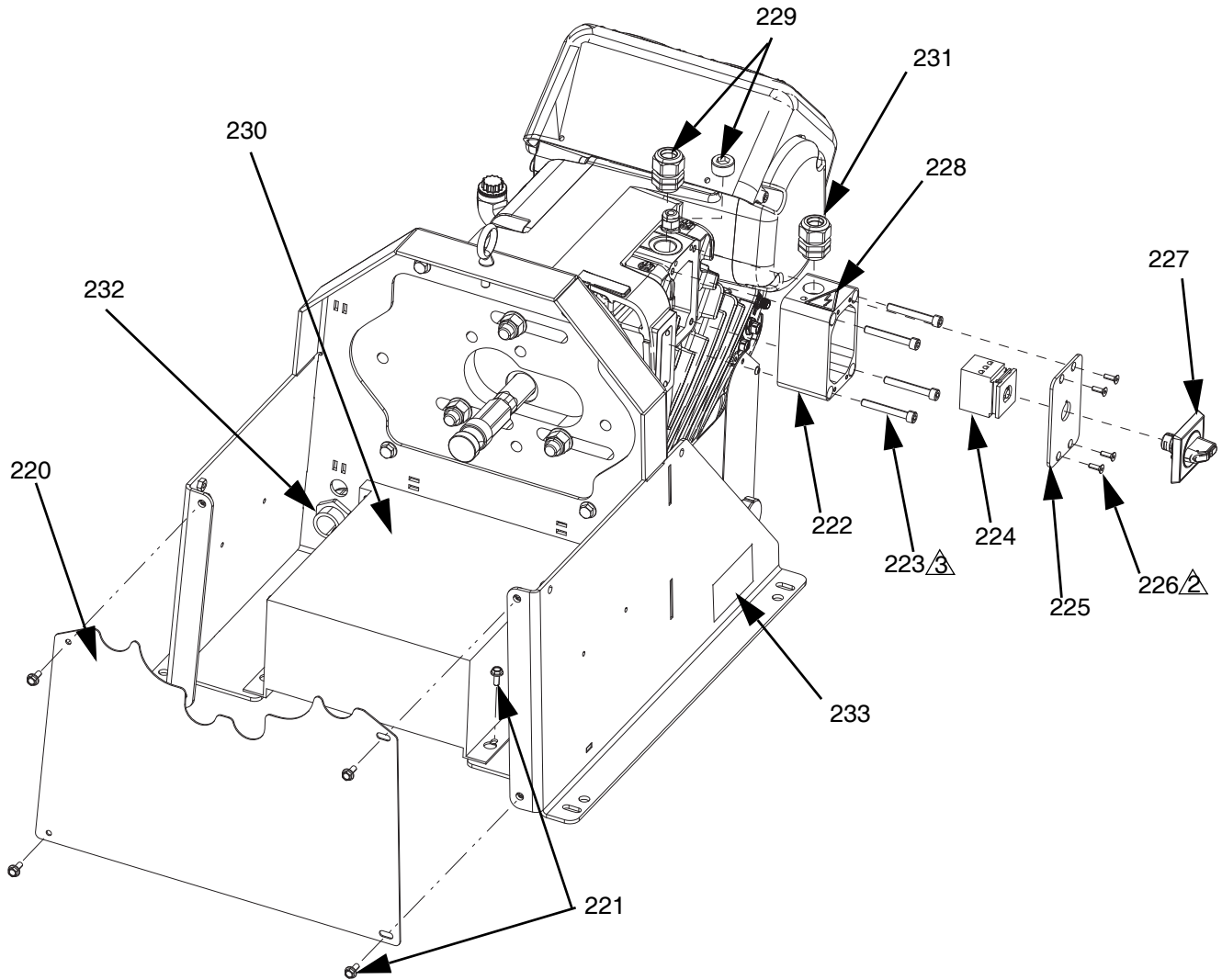
* Not shown

** Included in ADM Bracket Kit 26B019.

† Included in manifold and fittings kit 26B021 (for carbon steel) and 26B022 (for stainless steel).

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

Electrical Assembly



Ref.	Description	240V Systems		480 V Systems	
		Part	Qty.	Part	Qty.
220	COVER, pump, lower	25E103	1	25E103	1
221†	SCREW	114182	4	114182	8
222	JUNCTION BOX	---	1	---	1
223	SCREW	117080	4	117080	4
224	SWITCH, disconnect, 40A	123970	1	123970	1
225	COVER, junction box	---	1	---	1
226	SCREW	113768	4	113768	4
227	KNOB, disconnect, panel	---	1	---	1
228▲	LABEL, caution	189930	1	189930	1
229†	PLUG, headless 3/4 npt	102726	1	---	-
	FITTING, conduit, 3/4 npt	---	-	---	1

Ref.	Description	240V Systems		480 V Systems	
		Part	Qty.	Part	Qty.
230†	TRANSFORMER, 480V	---	-	---	1
231	BUSHING, strain relief, 3/4"	121171	1	121171	1
232†	BUSHING, strain relief, 1"	---	-	126881	1
233▲	LABEL, safety, danger	---	-	25E178	1
240*†	HARNES, transformer, efr	---	-	---	1

* Not shown

† Included in Transformer Kit 26A703

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

Accessories

NOTE: See the MD2 Valve Instructions-Parts manual for more information on mixers and accessories.

Applicator

Part	Description
255179	Valve, Dispense, 1:1, Soft Seats
255180	Valve, Dispense, 1:1, Hard Seats
255181	Valve, Dispense, 10:1, Soft Seats
255182	Valve, Dispense, 10:1, Hard Seats

Dispense Valve Interface Kit

Part	Description
26C485	MD2 Valve Solenoid, with cable

Inlet Regulator Kits

Part	Description
26A704	SS Mastic Regulator Kit with fittings
26A705	CS Mastic Regulator Kit with fittings

Inlet Fittings

Part	Description
157785	3/4-NPT (m) x 3/4-NPS (F) swivel, Steel
C20487	3/4-NPT (m) x 3/4-NPT (m), Steel
124286	3/4-NPT (m) x JIC-08 (m), Steel
15Y934	3/4-NPT (m) x JIC-10 (m), Steel
125661	3/4-NPT (m) x JIC-12 (m), Steel
190724	3/4-NPT (m) x 3/4-NPT (m), Stainless Steel
125296	3/4-NPT (m) x JIC-08 (m), Stainless Steel
15M863	3/4-NPT (m) x JIC-12 (m), Stainless Steel
124315	3/4-NPT (m) x JIC-16 (m), Stainless Steel

Outlet Fittings

Part	Description
158683	90°, 1/2-NPT (m) x 1/2-NPT (f), Steel
100206	1/2-NPT (m) x 1/4-NPT (f), Steel
123094	90°, 1/2-NPT (m) x JIC-08 (m), Steel
127324	1/4-NPT (m) x JIC-04 (m), Steel
125572	1/4-NPT (m) x JIC-05 (m), Steel
16V432	1/2-NPT (m) x JIC-06 (m), Steel
121319	1/2-NPT (m) x JIC-08 (m), Steel
15Y925	1/2-NPT (m) x JIC-10 (m), Steel
166242	90°, 1/2-NPT (m) x 1/2-NPT (f), Stainless Steel
122767	1/2-NPT (m) x 1/4-NPT (f), Stainless Steel
124885	90°, 1/2-NPT (m) x JIC-08 (m), Stainless Steel
124961	1/4-NPT (m) x JIC-04 (m), Stainless Steel
122727	1/4-NPT (m) x JIC-05 (m), Stainless Steel
123597	1/4-NPT (m) x JIC-06 (m), Stainless Steel
16G398	1/2-NPT (m) x JIC-08 (m), Stainless Steel

Additional Accessories

Miscellaneous

Part	Description
121728	Extension Cable for ADM, 4 meter
255244	Foot Switch with Guard and 4 meter Cable
17Z431	4 meter adapter cable for foot switch, 8-pin to 4-pin
120997	4 meter M12 pigtail cable (for valve control or sequence select)
128441	4 meter 8-pin M12 pigtail Integration/Trigger Cable
127948	Splitter cable, 3x 8-pin M12

Communications Gateway Module (CGM)

The EFR Communication Gateway Module allows the user to control an EFR through an external control device such as a PLC. See EFR Communication Gateway Module manual for more information.


Part	Description
25B127	DeviceNet CGM Kit
26A700	EtherNet/IP CGM Kit
26A701	PROFIBUS CGM Kit
26A702	PROFINET CGM Kit

Advanced Display Module (ADM) Operation

When main power is turned on by turning the power disconnect switch (C) to the ON position, the splash screen will be displayed until communication and initialization is complete.



To begin using the ADM, the machine must be on and enabled. To verify the machine is enabled, verify the System Status Indicator Light (AB) is illuminated green, see FIG. 3 on page 10. If the System Status Indicator Light is not green, press the ADM Power On/Off (AA)

button . The System Status Indicator Light will illuminate yellow if the machine is disabled.

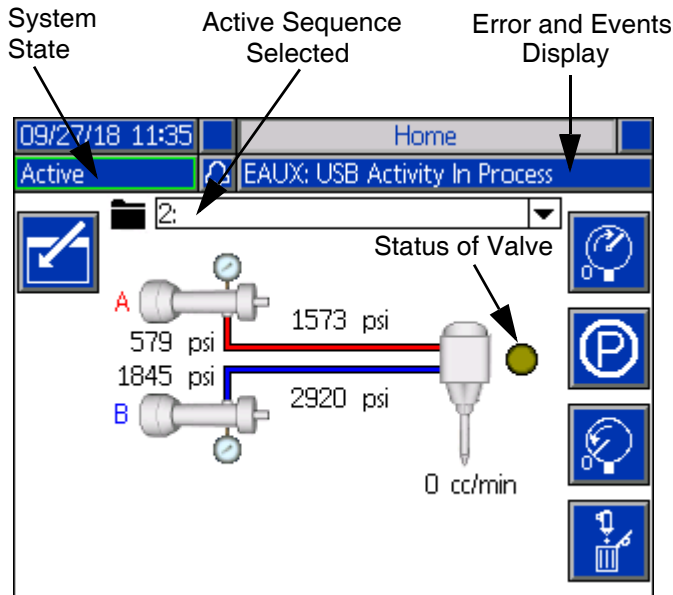
Perform the following tasks to fully setup your system.

1. Set general system settings. See **Advanced Screen 1**, page 43.
2. Set units of measure. See **Setup Screen 1**, page 42.
3. Enable/disable system features. See **Setup Screen 2**, page 43.
4. Define pump information. See **Setup Screen 1**, page 42.
5. Define shots. See **Sequence Definition Screen 1**, page 40.
6. Define sequences. See **Sequence Definition Screen 2**, page 42.
7. If desired, view/reset counters. See **Maintenance Screen 1**, page 44.
8. Enable/disable integration features. See **Integration Screen 1**, page 45.

ADM Screen Overview




Home Screen

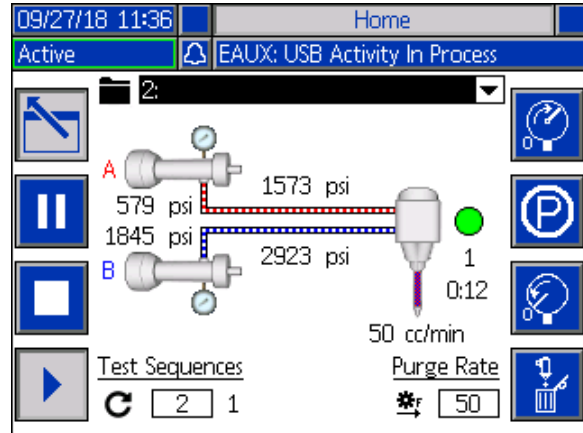


The home screen is the first screen displayed when the ADM is turned on. Here you can monitor the actual flow rate and current fluid pressure on the A and B fluid outlets of the pump.

This screen also displays any active errors or events as well as the active sequence selected.

Pressing the  icon will enter the home screen and allow you to select the active sequence, the number of times a sequence is repeated, and the purge flow.

You can also pause, stop, or start an active sequence once the home screen is entered.

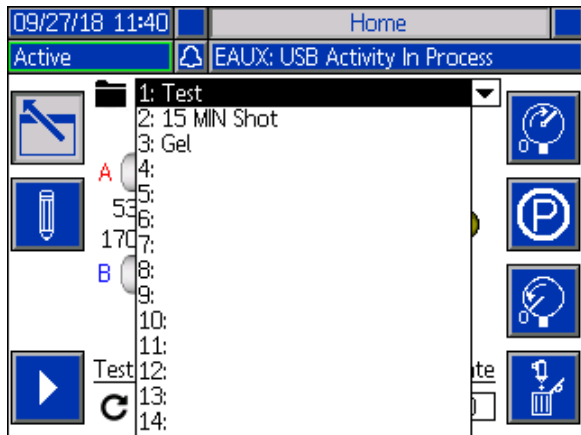
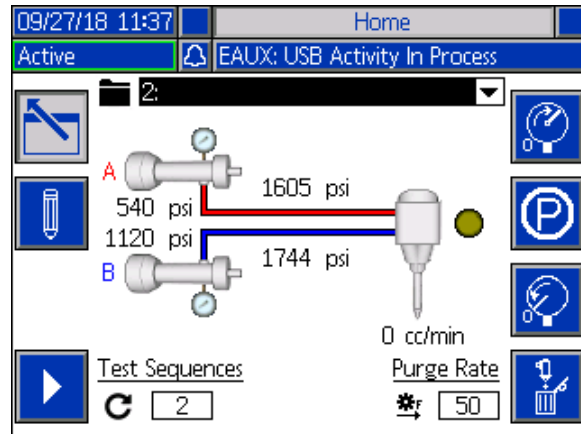


To select a sequence, use the navigation keys to highlight the active sequence bar. Then press the Enter button




to open a drop down menu where the desired sequence can be selected.

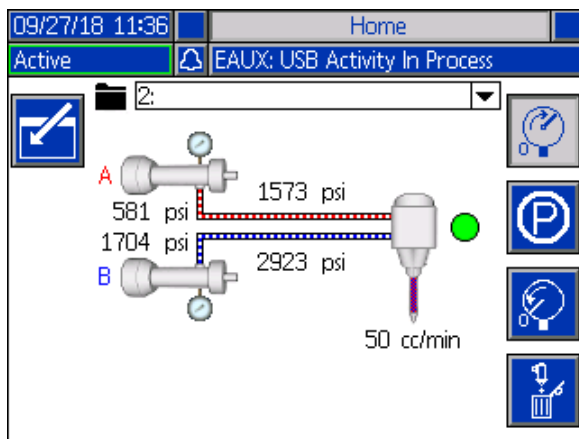
Sequences can also be selected remotely. See *I/O Integration* on page 48.




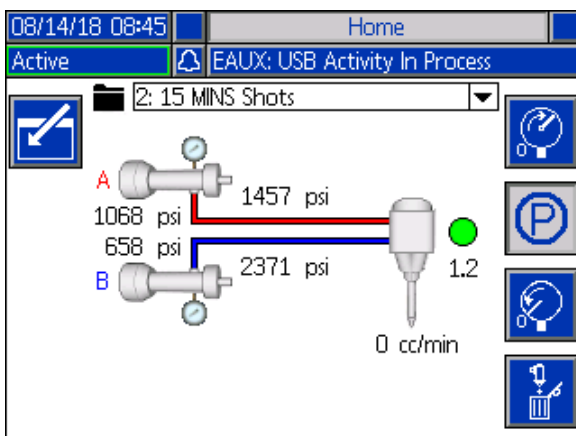
Along the right side of the home screen, there are icons that will allow the user to prime, park, de-pressurize, and purge the unit.


NOTE: The system must be active to access these icons. The only icon that can be selected when the system is inactive is the de-pressurize icon.

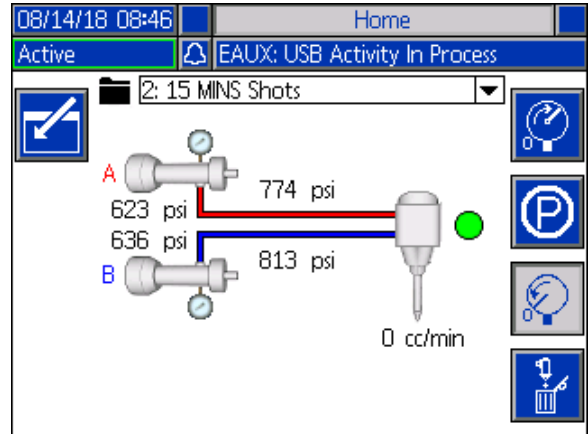
Prime: When pressed, the prime icon  will prime the unit. The sequence that will run when the prime icon is pressed depends on the pressure preset set by the user. See **Setup Screen 2** on page 43 for information on setting the Pressure Preset.





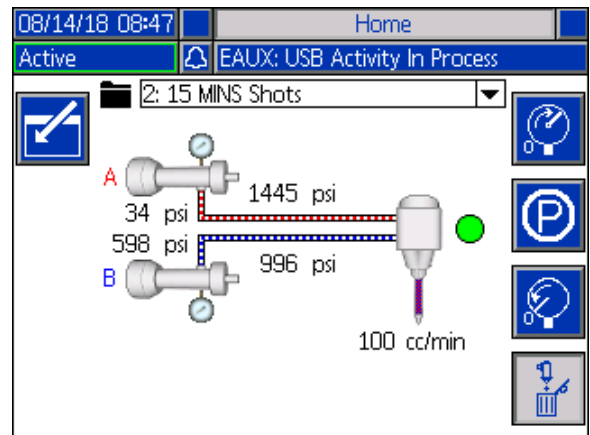
Park: When pressed, the park icon  will park the pumps.



De-Pressurize: When pressed, the de-pressurize icon  will open the dispense valve, which will relieve pressure in the pump lines.




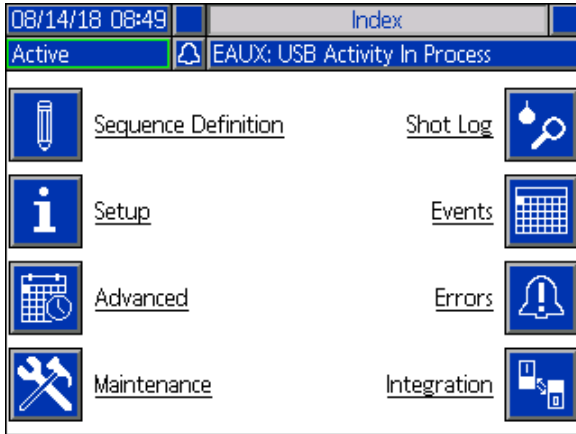
Purge: When pressed, the purge icon  will purge material from the pumps. To stop purging material from the pumps, press the purge icon  again.



Index Menu



From the home screen, press the  button to access the index. This screen provides access to Sequence Definition, Setup, Advanced, Maintenance, Shot Log, Events, Errors, and Integration screens.



Sequence Definition Screen 1

This screen allows users to create and edit sequences. From here, users are able to edit the flow rate, shot size and calibration of individual shot sizes in a selected sequence. There are four options available for the shot size, including operator mode, volume, mass/weight and seconds.

NOTE: If the user selects seconds for the shot size, calibration will no longer be an option for the selected shot size.

NOTE: If the user selects operator mode for the shot size, the EFR will only dispense at the desired flow rate as long as an external trigger source or foot switch is active for that particular shot of the sequence.

NOTE: If the flow rate is set to zero, the EFR will wait for the specified amount of time before performing the next shot size.

New shot sizes can be added to a sequence by pressing



, which will add a new shot size before the shot

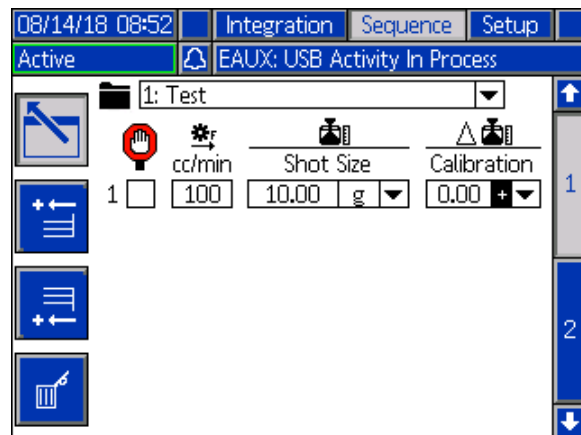
size currently highlighted, or by pressing



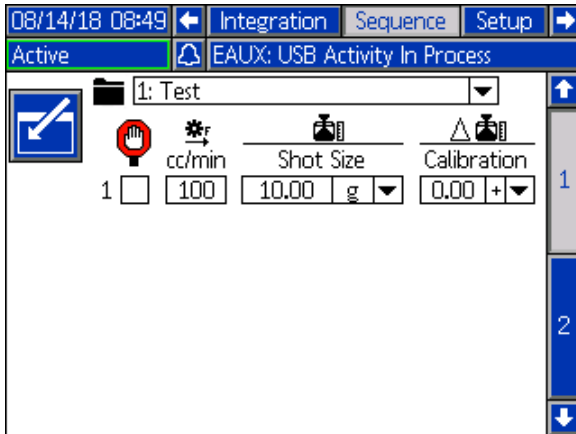
, which will add a new shot size after the shot size currently highlighted. To delete a selected shot size, press the




icon.



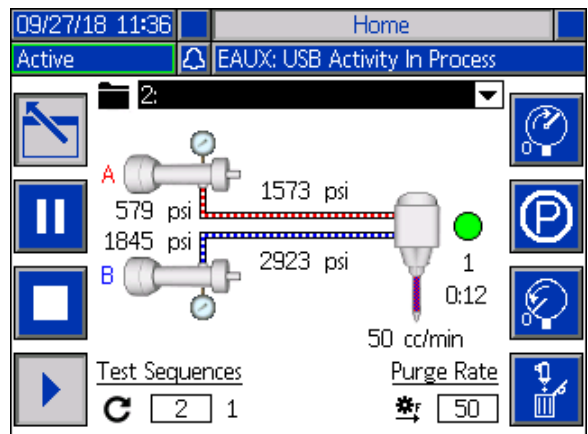
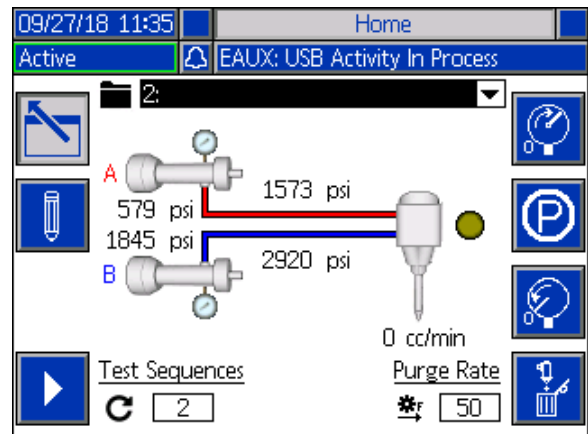
If the box next to a shot size is selected, the user must activate the shot size from an external trigger source, such as a foot switch. Until the trigger signal is received, the EFR will wait before playing the shot size shown beside the selected check box. Once the external trigger is received, the EFR will proceed through the sequence.




If the user enters the home screen while a sequence including a checked shot size is selected as the active

sequence, the user must push the  icon at the bottom of the screen or supply an external trigger signal (e.g. a foot switch or other manual switch) to begin dispensing the sequence. After the sequence is started,

the stop  and pause  icons will appear.



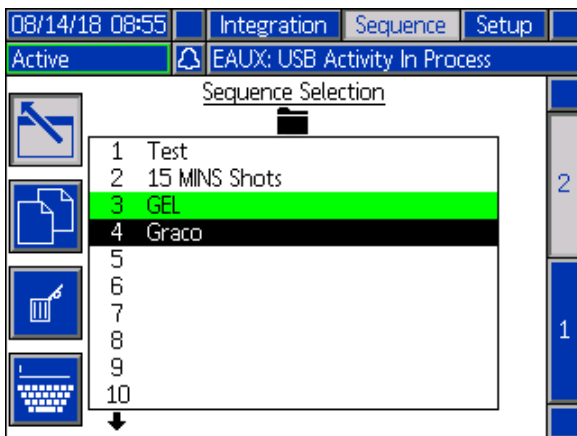
NOTE: If the active sequence does not contain a checked shot size, the unit will start dispensing when


the  icon or an external trigger signal is supplied. The sequence will continue to dispense until finished.

Sequence Definition Screen 2

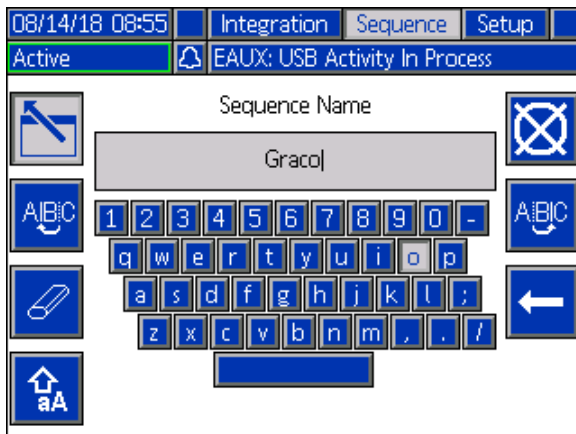
This screen allows the user to copy, delete, and name selected sequences. Use the arrow keys to select a sequence from the list. The sequence selected will be highlighted in green, as shown below.

NOTE: The sequence selected in this screen will also be shown in the Sequence Definition Screen 1, where it can be edited. See **Sequence Definition Screen 1** on page 40.



To name a sequence, press the  icon when the desired sequence is selected. A new screen, shown below, will appear and allow the user to edit the name of the selected sequence. Use the arrow keys to select the

desired letter and press  to accept the letter.



Setup Screen 1

This screen allows the user to change the dispense mode, rate units, pressure units, pressure imbalance alarm, and the pump line, size and specific gravity of the A and B pumps.

Dispense Mode: The dispense mode can be set to either volume or weight. If the dispense mode is set to weight, the flow rate will be displayed in g/min, and if it is set to volume, the flow rate will be displayed in cc/min.

Rate Units: The rate units can be set to minute, second, or hour.

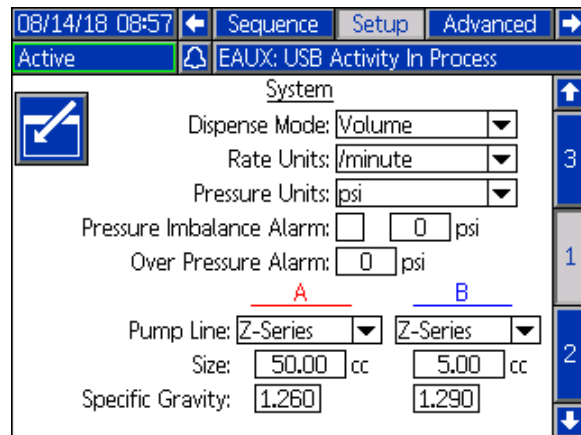
Pressure Units: The pressure units can be set to either psi or bar.

Pressure Imbalance Alarm: When checked, the pressure imbalance alarm will watch the pressure for both A and B pumps. If the pressure difference between pumps is greater than the pressure defined in the alarm box, an alarm will be triggered.

Pump Line: The pump line can currently only be set to Z-Series.

Size: The user can enter the size of the A and B pumps on the unit here.

Specific Gravity: The user can enter the specific gravity of the material being used here.



Setup Screen 2

This screen allows the user to set a Gel Timer and Pressure Preset.

Gel Timer: When enabled, the gel timer prevents material from curing in the mixer. The user can select a sequence to run, as well as the amount of idle time the machine can wait between dispenses. If the system does not dispense again before the set time runs out, the gel timer will dispense the preset sequence.

Enable: Check this box to enable the gel timer.

Idle Period: This is the amount of time the unit will remain idle before beginning to dispense.

Alarm: This is the amount of time the EFR will wait after the idle period has been reached. This allows time for the robot to move into the purge location.

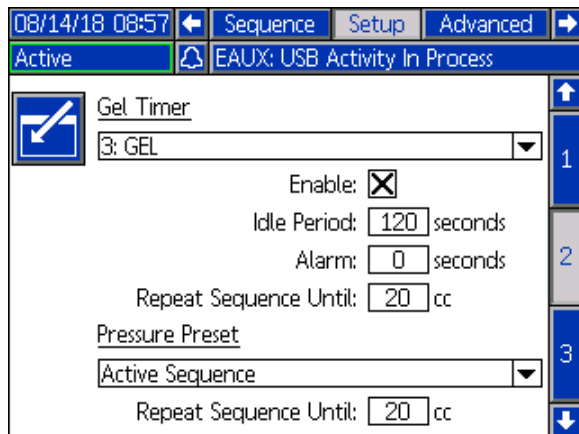
Repeat Until: The selected sequence will be repeated until the specified amount of material has been purged.

Pressure Preset: The pressure preset allows the user to select the sequence that will run when the prime icon



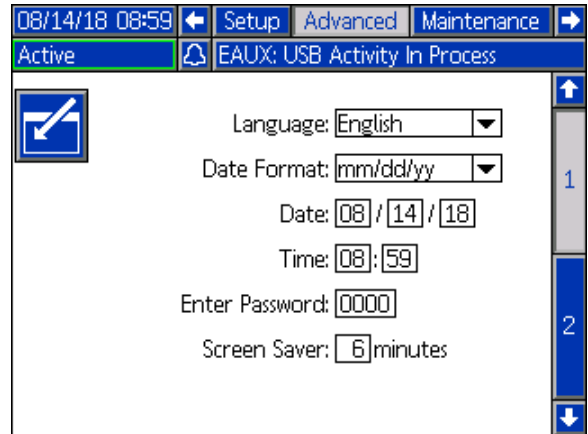
is pressed on the home screen. The user can either select the Active Sequence, which is shown on the home screen, or one of the other sequences listed in the drop down menu for the pressure preset. Running the pressure preset allows the EFR to learn the running pressure and prime the system.

Repeat Until: The selected sequence will be repeated until the specified amount of material is reached during priming.




Advanced Screen 1

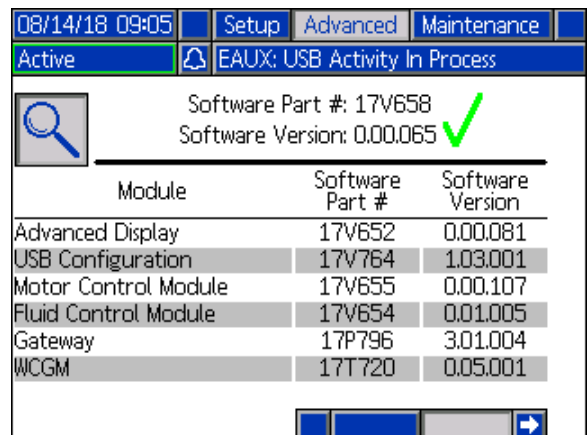
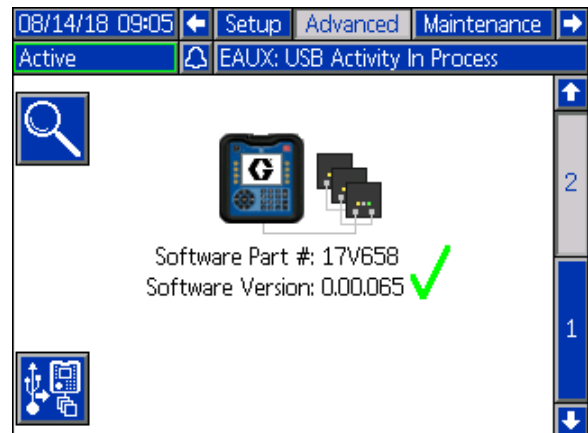
This screen allows the user to change the language, date, and time shown on the ADM. The user can also set up a password and change the screen saver here.



Advanced Screen 2

This screen allows the user to view and upgrade soft-


ware installed on the system. Clicking the  icon will open a new screen that shows what software is currently installed.





Maintenance Screen 1


This screen keeps track of the cycles of the A and B pump, both current and lifetime, as well as the number of times the dispense valve has opened and closed. The user can also jog the pumps from the maintenance screen.

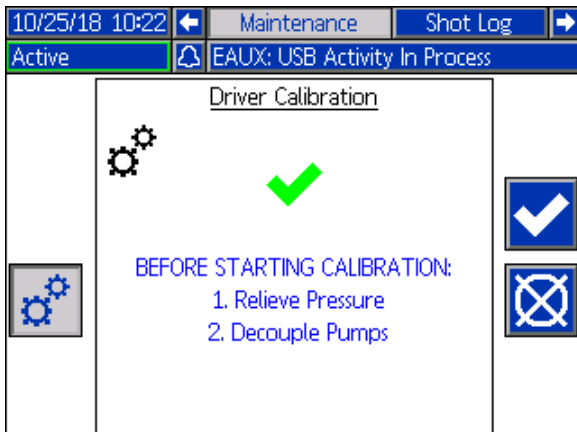
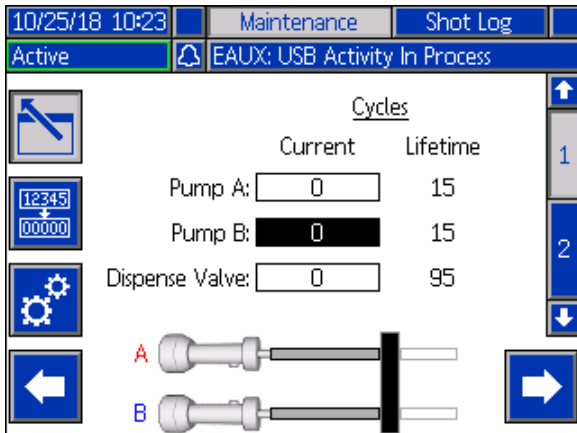
The user can clear the current cycles for the pumps or the dispense valve by highlighting the desired pump (A

or B) or dispense valve and pressing the  icon.

The user can press the arrows at the bottom of the

screen to jog the pumps forward  or backward .

The  icon is used for the calibration of a new motor control board in the electric driver, and should only be pressed when the motor board is replaced or when error W5NX is active.



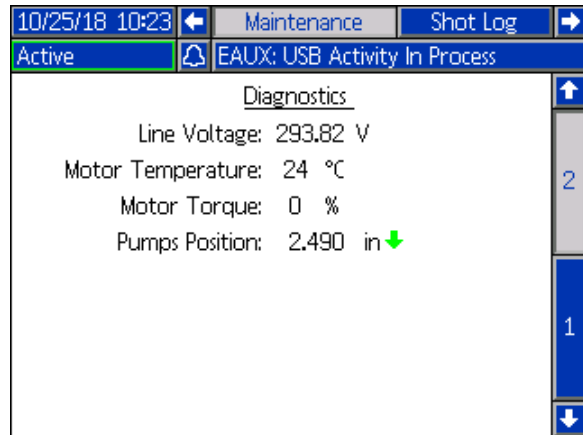
Maintenance Screen 2

This screen allows users to see the line voltage of the incoming AC power, the motor temperature, the percentage of torque on the motor, and the position of the pumps.

The arrow located to the right of the pumps position indicates the direction the pumps are moving. When the arrow is green, the pumps are moving, and when the arrow is red, the system is going through a changeover.

A green arrow pointing up means the pump is moving towards the driver housing, and a green arrow pointing down means the pump is moving towards the pumps.

A red arrow pointing up signifies a top changeover, and a red arrow pointing down signifies a bottom changeover.



Shot Log

This screen shows users a list of all completed shots. Each shot entry includes a date and time stamp, the sequence selected, the amount dispensed, and that start pressures of the A and B pumps.

05/15/18 06:23		Maintenance		Shot Log		Events	
Active		EAUX: USB Activity In Process					
Date	Time	#		A	B		
05/11/18	13:04	8	19.19 cc	2323	2588	psi	66
05/11/18	13:01	8	19.19 cc	2353	2592	psi	67
05/11/18	12:59	8	19.19 cc	2302	2580	psi	1
05/11/18	12:57	8	19.19 cc	2334	2595	psi	2
05/11/18	12:55	8	19.19 cc	2366	2601	psi	3
05/11/18	12:53	8	19.19 cc	2327	2587	psi	4
05/11/18	12:51	8	19.19 cc	2336	2595	psi	5
05/11/18	12:48	8	19.19 cc	2362	2595	psi	6
05/11/18	12:46	8	19.19 cc	2351	2599	psi	7
05/11/18	12:44	8	19.19 cc	2339	2599	psi	8

Events Screens

This screen shows users a list of events that have occurred in the system. Each event includes a description and event code along with a date and time stamp. There are 20 pages, each holding 10 events. The 200 most recent events are shown.

08/14/18 09:09		Shot Log		Events		Errors	
Active		EAUX: USB Activity In Process					
Date	Time	Code	Description				
08/09/18	11:40	EQU3	Custom Lang. Downloaded				7
08/09/18	11:40	EQU1	Sys. Settings Downloaded				8
08/09/18	11:40	EQU5	Logs Downloaded				9
08/09/18	11:38	ELOX	System Power On				10
08/09/18	11:37	EMDX	System Power Off				1
08/09/18	11:35	ELOX	System Power On				2
08/09/18	11:35	EMDX	System Power Off				3

Errors Screens

This screen shows users a list of errors that have occurred in the system. Each error entry includes a description and error code along with a date and time stamp. There are 5 pages, each holding 10 errors. The 50 most recent errors are shown.

08/14/18 09:09		Events		Errors		Integration	
Active		EAUX: USB Activity In Process					
Date	Time	Code	Description				
08/14/18	09:08	EAUX	USB Activity In Process				5
08/14/18	09:02	CACA	Comm. Error Advanced Display				6
08/14/18	08:44	EAUX	USB Activity In Process				7
08/14/18	08:24	EAUX	USB Activity In Process				1
08/14/18	07:43	P4DA	High Pressure Outlet A				2
08/14/18	07:40	P4DA	High Pressure Outlet A				3
08/14/18	07:34	P4DA	High Pressure Outlet A				4
08/14/18	07:33	P4DA	High Pressure Outlet A				5
08/13/18	11:56	CACA	Comm. Error Advanced Display				6
08/13/18	11:41	CACA	Comm. Error Advanced Display				7

Integration Screen 1

This screen allows the user to see when the unit is receiving inputs from a PLC, as well as when the unit is sending outputs to a PLC. Integration inputs must be enabled by checking the box for the EFR to use the signal. If the check box is not checked, the EFR will ignore the signal.

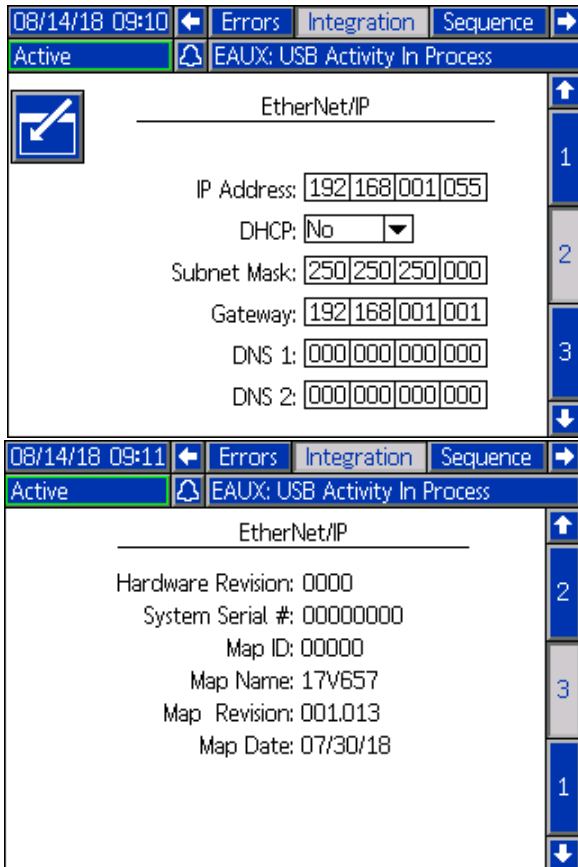
For explanations of each integration pin, see **I/O Integration** on page 48.

08/14/18 09:10		Errors		Integration		Sequence	
Active		EAUX: USB Activity In Process					
Integration Inputs							
<input checked="" type="checkbox"/>	Trigger (4-1):	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<input type="checkbox"/>	Pressure Preset (4-2):	<input type="checkbox"/>	<input checked="" type="checkbox"/>				3
<input type="checkbox"/>	GND (4-3), 5V (4-4):	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<input type="checkbox"/>	System Enable (4-5):	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<input checked="" type="checkbox"/>	Analog Flow Rate (4-6):	<input type="checkbox"/>	5.020 V				1
<input type="checkbox"/>	Sequence Select (ADM):	<input type="checkbox"/>	0000				
Integration Outputs							
<input checked="" type="checkbox"/>	Dispense Valve (3-4):	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				2
<input type="checkbox"/>	System Ready (4-7):	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
<input type="checkbox"/>	Alarm (4-8):	<input type="checkbox"/>	<input checked="" type="checkbox"/>				

Integration Screens 2 and 3

This screen will appear when a CGM is connected.



This screen displays the setup screen for a connected CGM. See the Communications Gateway Module Installation Kit Instructions-Parts manual for more information.




USB Plug-In Screen

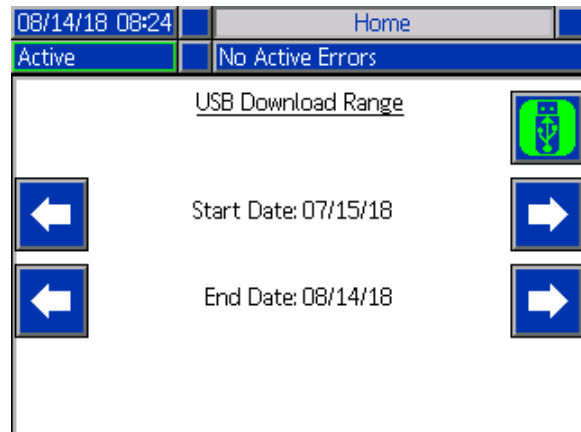
This screen will appear when a USB device is plugged into the ADM.

Here the user can select dates to download data from the ADM to the USB device by pressing the left and right

arrow icons on either side of the screen  .

Once the dates are selected, press the  icon, and the download will begin. Information available to download onto a USB device includes shot log data, errors and events.

If the cancel icon  is pressed, the USB download will be aborted.



Software Update

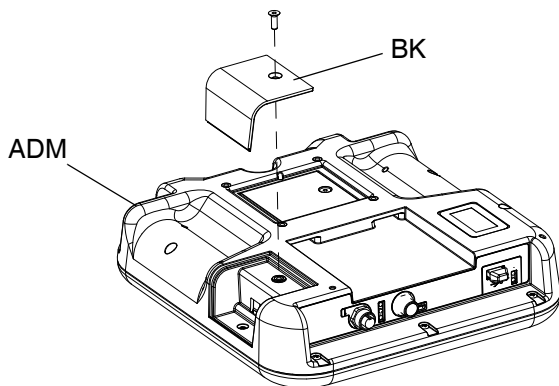
NOTE: If burning your own software token, see the ADM Token Programming manual. See **Related Manuals** on page 2. Otherwise, proceed to **17Y711 Software Update Procedure**.

17Y711 Software Update Procedure

NOTE: A token can be found in the ADM token compartment.

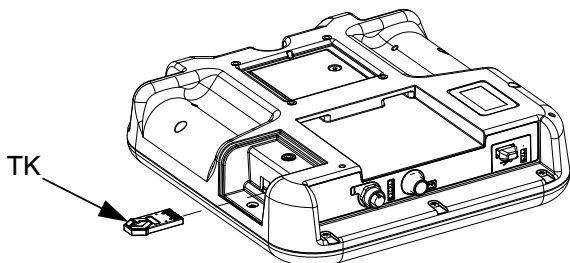
When software is updated on the ADM the software is then automatically updated on all connected modules. A status screen is shown while software is updating to indicate progress.

1. Turn power disconnect switch (C) to the OFF position.
2. Remove ADM from bracket.
3. Remove token access panel (BK).



4. Insert and press EFR software upgrade token (TK, part no. 17Y711) firmly into slot.

NOTE: There is no preferred orientation of token.



5. Turn the power disconnect switch (C) to the ON position.

NOTICE
A status is shown while software is updating to indicate progress. To prevent corrupting the software load, do not remove token until the status screen disappears.

NOTE: When the ADM display turns on, you may see the following screens:

<p>First:</p> <p><i>Software is checking which modules will take the available updates.</i></p>	
<p>Second:</p> <p><i>Status of the update with approximate time until completion.</i></p>	
<p>Third:</p> <p><i>Updates are complete. Icon indicates update success/failure. See the following Icon table.</i></p>	

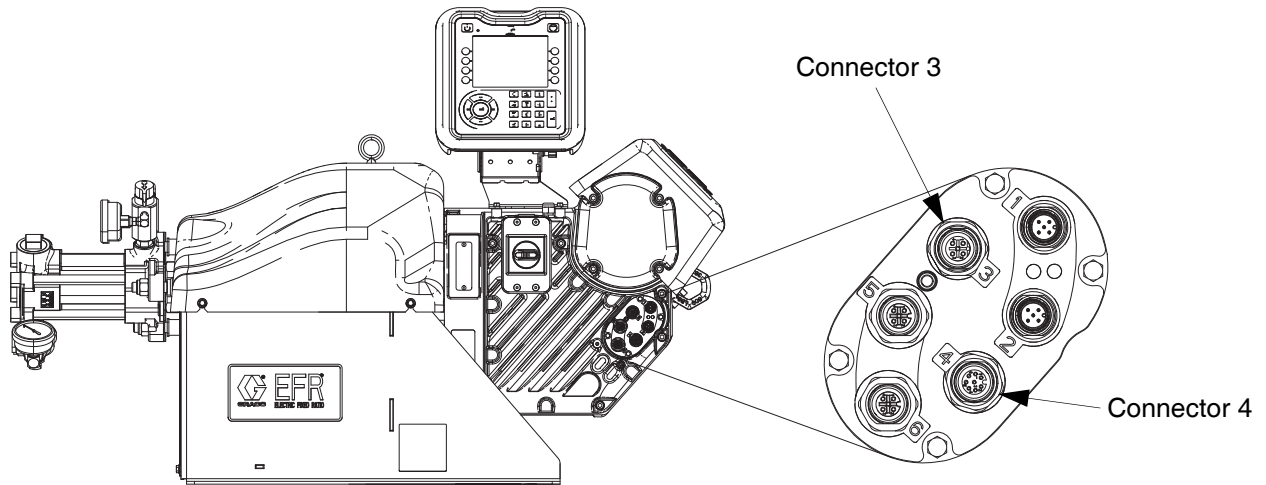
Icon	Description
	Update successful.
	Update unsuccessful.
	Update complete, no changes necessary.
	Modules were updated or didn't require an update; however, one or more modules need to be updated manually with a token.

6. Remove token (TK).
7. Replace token access panel (BK).
8. Install ADM into bracket.
9. Press to continue to EFR operation screens.

I/O Integration

Connector	Pin	Input/Output	Description
3	1	N/A	Not Used
3	2	N/A	Not Used
3	3	N/A	Ground
3	4	Digital Output: <ul style="list-style-type: none"> • 24V is ON • 0V is OFF 	Valve Signal: When this digital output pin is ON, the valve will be open, and when this digital output pin is OFF, the valve will be closed.
3	5	N/A	Not Used
4	1	Digital Input: <ul style="list-style-type: none"> • 5-24V is ON • 0V is OFF 	Trigger Signal: When this digital input pin is pulsed ON by an external source or a foot switch, the EFR system will run the active sequence.
4	2	Digital Input: <ul style="list-style-type: none"> • 5-24V is ON • 0V is OFF 	Pressure Preset (Priming): When this digital input pin is ON, the EFR system will run the pressure preset procedure, and when this digital input pin is OFF, the pressure preset procedure will be stopped.
4	3	N/A	Ground
4	4	N/A	+5V Supply
4	5	Digital Input: <ul style="list-style-type: none"> • 5-24V is ON • 0V is OFF 	System Enable: When this digital input pin is ON, the EFR system will be active, and when this digital input pin is OFF, the EFR system will be inactive.
4	6	Analog Input: <ul style="list-style-type: none"> • 0-10V Analog Range 	Analog Flow Rate: This Analog Flow Rate is only used when a sequence is in operator mode. The flow rate put into the operator mode will correspond to a 10V signal. Then a linear scale is used to scale across the analog range, with 0V being 0 flow. <i>Example:</i> If the operator mode of a sequence step has a flow rate of 100cc/min and the analog flow rate signal of 5V is sent over, the EFR will run at 50 cc/min. 10V is 100cc/min, 7.5V is 75cc/min and 0V is 0cc/min.
4	7	Digital Output: <ul style="list-style-type: none"> • 5-24V is ON • 0V is OFF 	System Ready: This digital output pin will be ON when the EFR system is ready to receive the next command. If the EFR system is dispensing, loading a sequence or the valve is open, the system ready signal will be OFF.
4	8	Digital Output: <ul style="list-style-type: none"> • 5-24V is ON • 0V is OFF 	Alarm Active: This digital output pin will be ON when the EFR system has an active alarm, deviation or advisory. When there are no active alarms, deviations or advisories, the digital output pin will be OFF.

NOTE: The EFR software considers +5V as ON, which means the +5V supply on pin 3 of connector 4 can also be used as an external source to trigger digital input pins ON.




I/O Integration Cable Colors

The following table shows the wire color codes for the M12, 8 pin pigtail cable (128441) supplied with the EFR for I/O integration from EFR connector 4.

Pin	Color
1	White
2	Brown
3	Green
4	Yellow
5	Grey
6	Pink
7	Blue
8	Red

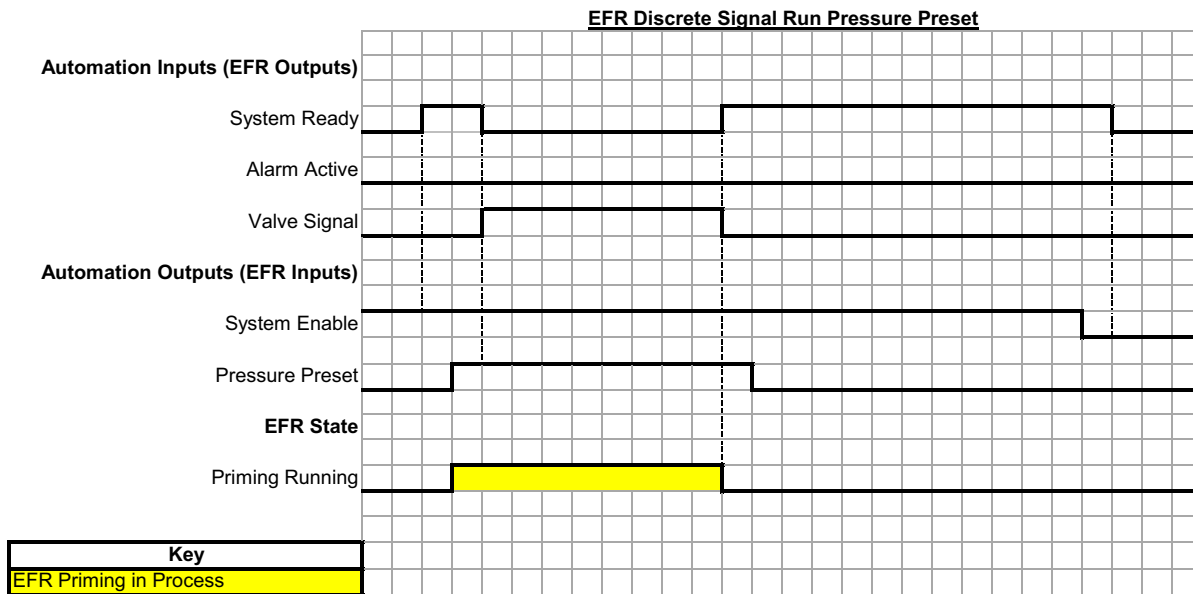
I/O Integration Diagrams

Before any integration signals can be sent over the I/O connection(s), the integration inputs to the EFR must be enabled on Integration Screen 1, and the system must be in the active state. Once the system ready pin is ON, the EFR is ready to receive commands from the PLC.

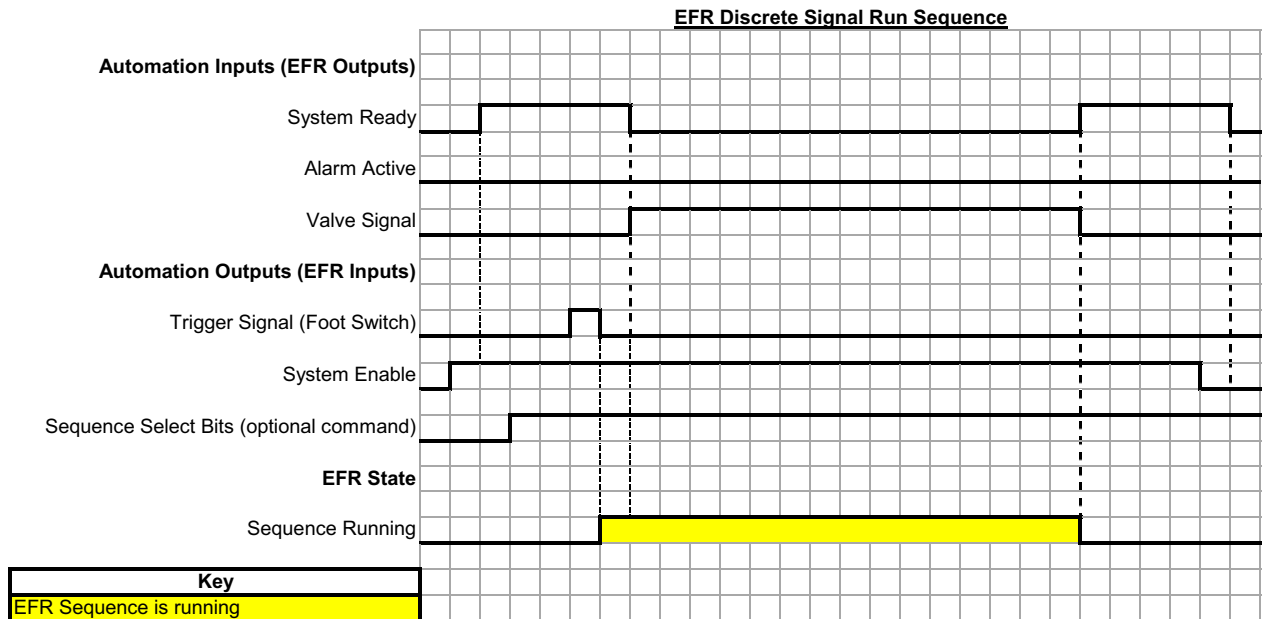
To put the system in the active state, press the  button on the ADM until the ADM LED status turns green, and “Active” is displayed in the upper left corner of the display. The system can also be put into the active state by turning the system enable I/O pin ON.

Once the system is in the active state, dispense commands can be sent over the I/O pins. This can be seen in the diagrams shown below.

NOTE: A 100ms delay is suggested between each I/O signal.

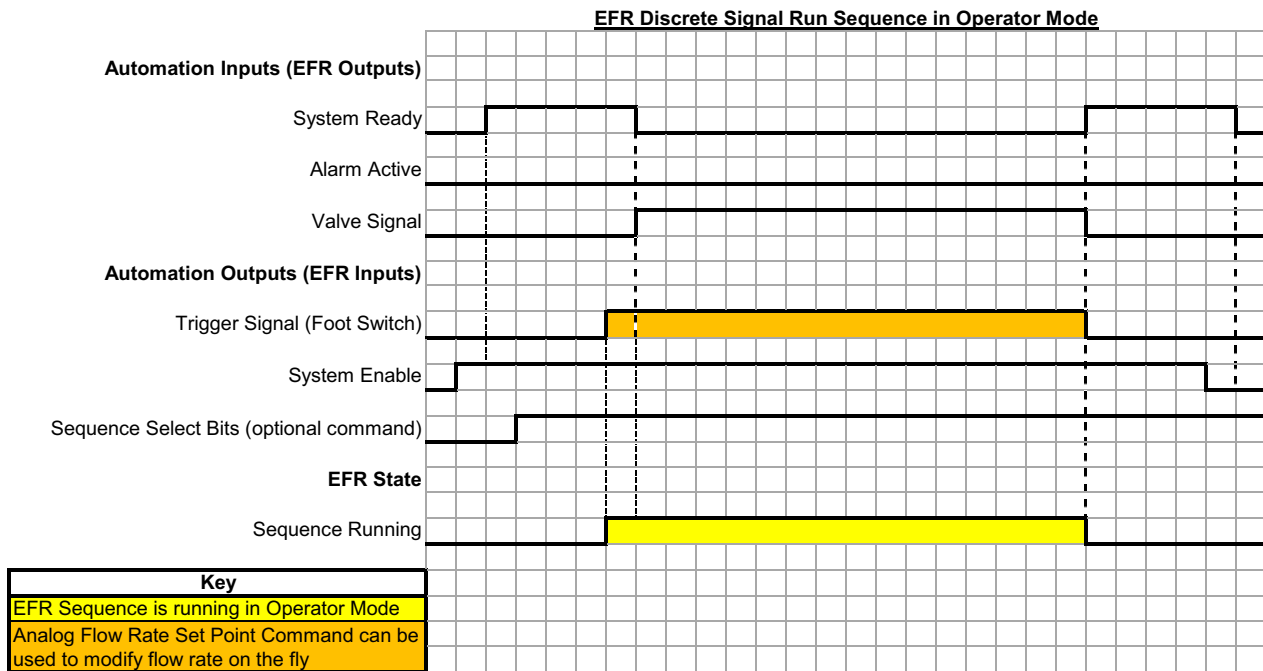


When the pressure preset pin is ON and the system is in the active state, the system will start the priming feature. If the system or pressure preset pin turns OFF, the system will stop the priming feature.



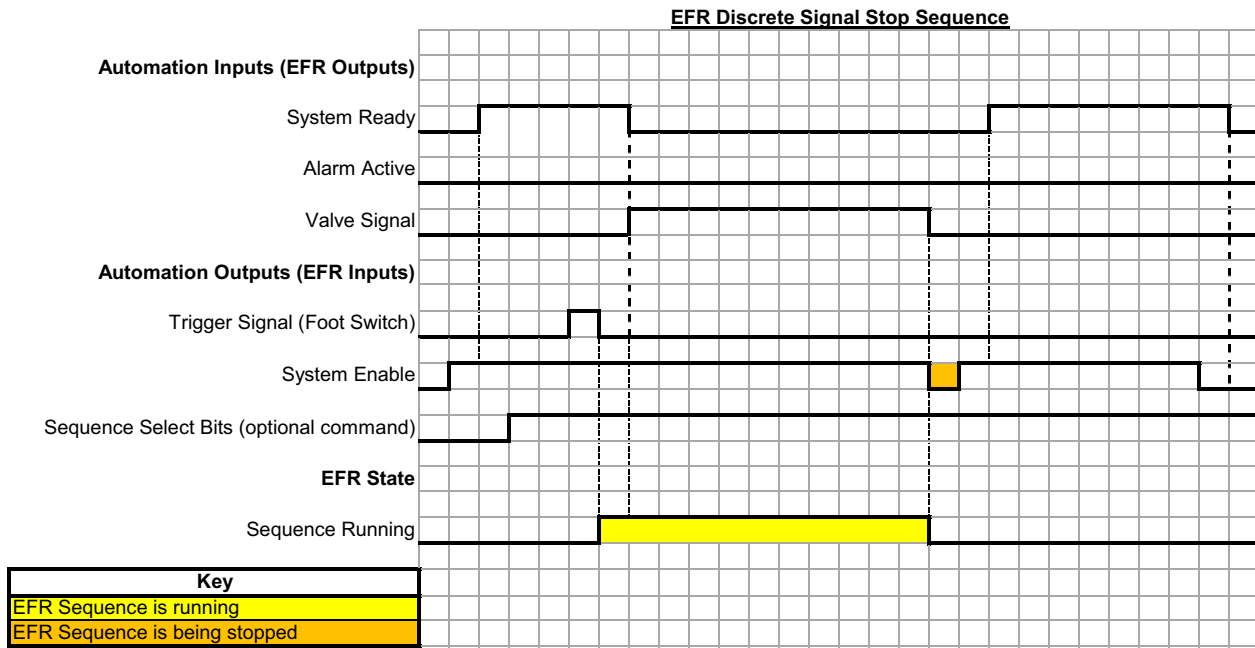
If the sequence is not in operator mode, a pulse on the trigger pin will result in the sequence being played.

Sending the sequence select bits is optional. If the sequence select bits are not sent, the EFR will use the current selected sequence.



If a shot is in operator mode throughout a sequence, the EFR will only dispense that shot if the trigger pin is ON. Once the trigger pin is OFF, the EFR will continue to the next shot in the sequence.

Sending the sequence select bits is optional. If the sequence select bits are not sent, the EFR will use the current selected sequence.



An OFF pulse on the system enable I/O pin will stop the sequence.

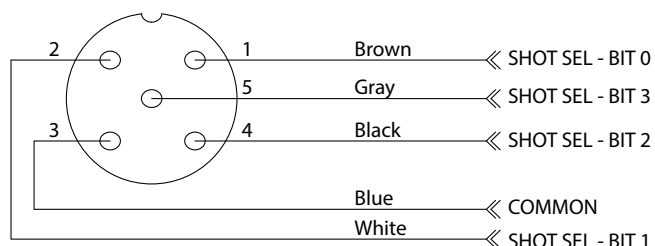
Sending the sequence select bits is optional. If the sequence select bits are not sent, the EFR will use the current selected sequence.

Remote Sequence Selection

The active sequence can be changed using Connector #1 (AP) on the ADM. Selection bits are pulled high by default and must be dropped low to select the desired sequence.

ADM Connector #1 (AP)

NOTE: The view shown looking at the pins on the end of the cable.



Foot Switch Connection

Connect the foot switch (255244) by plugging the 5 pin female connector of cable 17Z431 to the foot switch connector. If the I/O integration cable (128441) is also desired, connect the splitter (127948) to connector 4 of the EFR, then connect the integration cable (128441) and cable 17Z431 to the splitter. If the I/O integration cable is not desired, connect cable 17Z431 to connector 4 of the EFR.

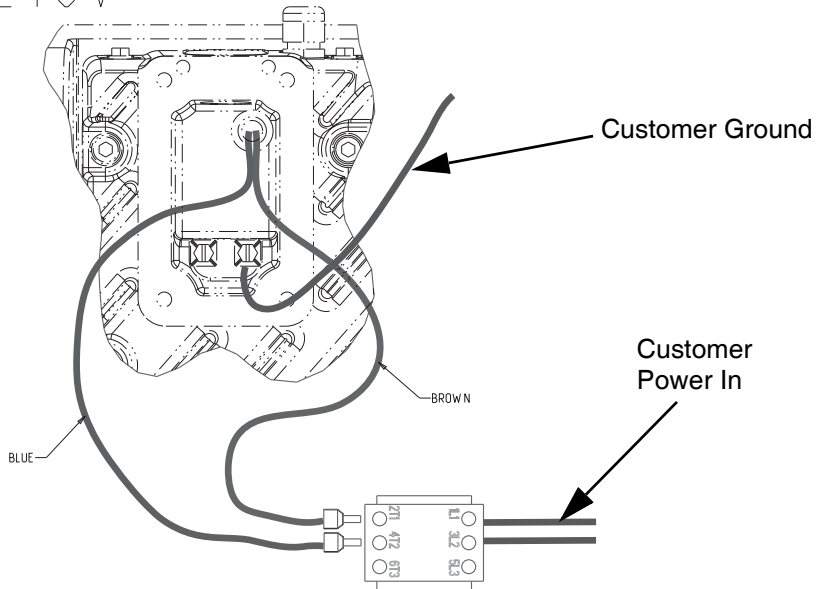
Sequence Number Selected	Sequence Selection BIT0 (Conn. #1, Pin #1)	Sequence Selection BIT1 (Conn. #1, Pin #2)	Sequence Selection BIT2 (Conn. #1, Pin #4)	Sequence Selection BIT3 (Conn. #1, Pin #5)
None / Display Module Selection	High	High	High	High
1	Low	High	High	High
2	High	Low	High	High
3	Low	Low	High	High
4	High	High	Low	High
5	Low	High	Low	High
6	High	Low	Low	High
7	Low	Low	Low	High
8	High	High	High	Low
9	Low	High	High	Low
10	High	Low	High	Low
11	Low	Low	High	Low
12	High	High	Low	Low
13	Low	High	Low	Low
14	High	Low	Low	Low
15	Low	Low	Low	Low

Wiring Diagrams

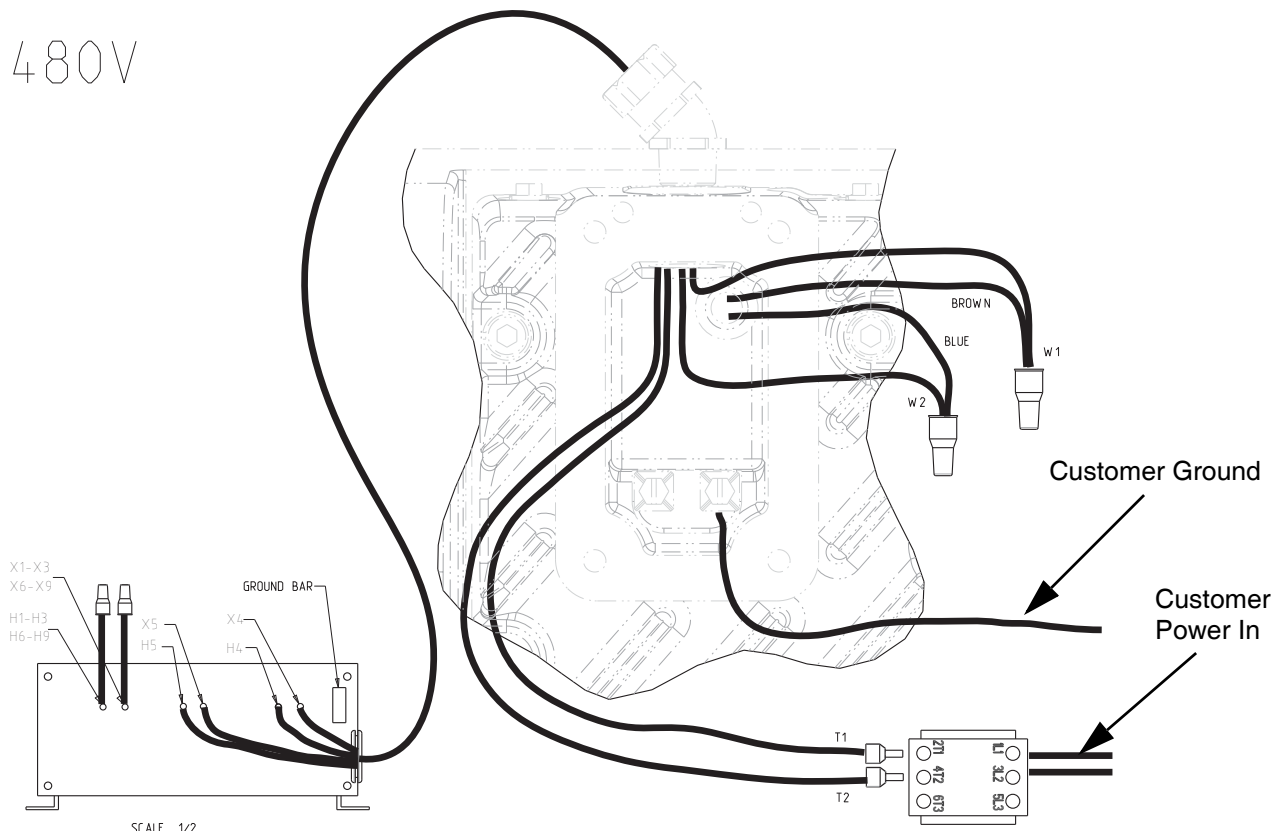
NOTE: See the APD20 Advanced Precision Driver Instructions manual for driver internal wiring.

Power Wiring

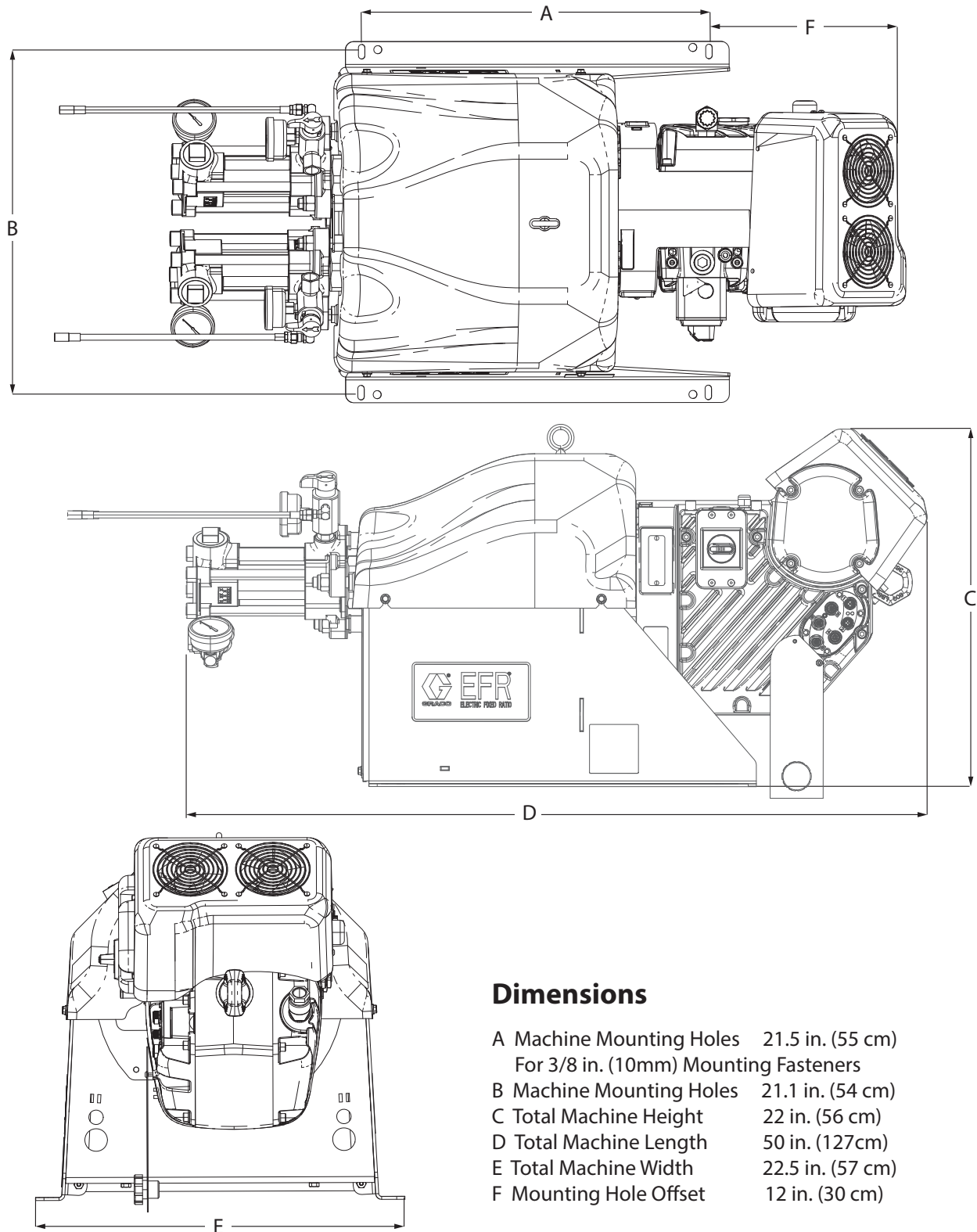
240V



480V



Dimensions



Dimensions

- A Machine Mounting Holes 21.5 in. (55 cm)
For 3/8 in. (10mm) Mounting Fasteners
- B Machine Mounting Holes 21.1 in. (54 cm)
- C Total Machine Height 22 in. (56 cm)
- D Total Machine Length 50 in. (127cm)
- E Total Machine Width 22.5 in. (57 cm)
- F Mounting Hole Offset 12 in. (30 cm)

Technical Specifications

EFR		
	US	Metric
Maximum fluid working pressure ‡	3500 psi	24 MPa, 241 bar
Maximum fluid temperature	120°F	50°C
Fluid circulation ports	1/4 NPS(m)	
Line voltage rating	200-240V, 1ph, 50/60 Hz	
	400-480V, 1ph, 50/60 Hz	
Wetted parts	Stainless steel, zinc-plated carbon steel, brass, tungsten carbide, chrome, fluoroelastomer, PTFE, ultra-high molecular weight polyethylene, silicon nitride	
Weight (not including supply pumps)		
240V systems	320 lbs	145 kg
480V systems	401 lbs	182 kg
Full load amperage		
240V systems	20A	
480V systems	10A	
Fluid inlet pressure at inlet fitting		
Pump Inlet	70 - 2000 psi	0.48 - 13.8 MPa, 4.8 - 138 bar
Fluid Inlets		
Component A	3/4 npt(f)	
Component B	3/4 npt(f)	
Fluid Outlets on Manifolds		
Component A	1/2 npt(f)	
Component B	1/2 npt(f)	
Notes		
<p>‡ The maximum fluid working pressure for the base machine without hoses is 3500 psi (24.1 MPa, 241 bar). If hoses, valves or accessories rated at less than 3500 psi are installed, the system maximum fluid working pressure becomes the rating of the hoses. The minimum pressure rating for hoses is 2000 psi. Do not install hoses with a pressure rating lower than 2000 psi.</p> <p>All other brand names or marks are used for identification purposes and are trademarks of their respective owners.</p>		

Performance				
Combined Displacement (A Pump + B Pump)	Min Shot Size	Min Output Flow	Max Output Flow (20 cycles/min max) *	Max Average Outlet Pressure ‡ **
60 cc	0.3 cc	20 cc/min	1,200 cc/min	3,500 psi (241 bar)
80 cc	0.3 cc	20 cc/min	1,600 cc/min	3,500 psi (241 bar)
100 cc	0.3 cc	20 cc/min	2,000 cc/min	3,500 psi (241 bar)
120 cc	0.3 cc	20 cc/min	2,400 cc/min	3,500 psi (241 bar)
140 cc	0.3 cc	20 cc/min	2,800 cc/min	3,400 psi (235 bar)
160 cc	0.3 cc	20 cc/min	3,200 cc/min	3,000 psi (207 bar)
<p>* Flow may be limited by the amount of pressure generated when using thick materials or with high restriction.</p> <p>** High inlet pressures reduce this value, subtract 2x inlet pressure.</p>				

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Original instructions. This manual contains English. MM 3A6165

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Revision E, May 2019