

# HFRL and HFRS

3A2175A

EN

**Hydraulic, Plural-Component, Fixed-Ratio Proportioner.  
For pouring and dispensing laminates and silicones.**

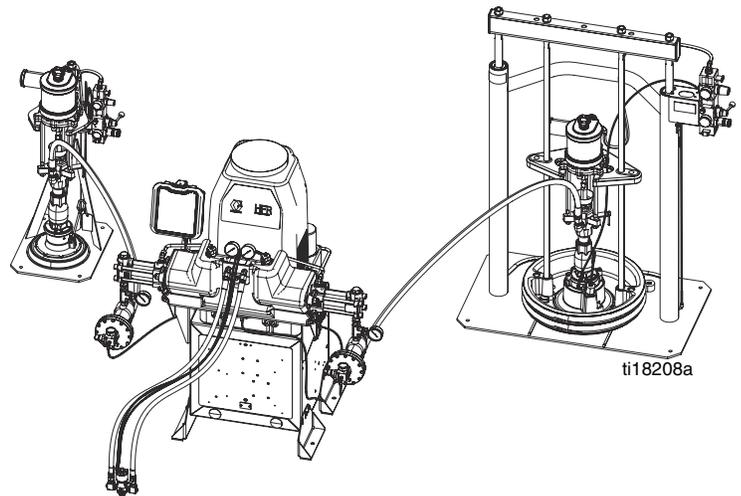
**For professional use only. Not approved for use in explosive atmospheres or hazardous locations.**



**Important Safety Instructions**

Read all warnings and instructions in this manual. Save these instructions.

See page 4 for model information and maximum working pressure.



ti18208a

Patent Pending

Silicone unit shown.

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# Related Manuals

Manuals are available at [www.graco.com](http://www.graco.com).

Component manuals listed below are in English:

<b>System Manuals</b>	
3A2176	HFRL and HFRS Repair-Parts
<b>Pumpline Manuals</b>	
3A0019	Z-Series Chemical Pumps Instructions-Parts
3A0020	HFR Hydraulic Actuator Instructions-Parts
<b>Feed System Manuals for HFRL Systems</b>	
3A0235	Feed Supply Kits Instructions-Parts
<b>Dispense Valve Manuals</b>	
312185	MD2 Valve, Instructions-Parts
<b>Accessory Manuals</b>	
3A1149	HFR Discrete Gateway Module Kits Manual

# Models

## HFR-Laminate (HFRL)

HFRL models are designed for use with low viscosity, unheated urethane laminating adhesives at flow rates of up to 30 cc/sec (4 lb/min).

Full Load Peak Amps Per Phase*	Voltage (phase)	System Watts	Maximum Fluid Working Pressure ‡ psi (MPa, bar)
55 A	230V (1)	12,650	3000
55 A ★	400V (3)		(20.7, 207)

A Pump Size	B Pump Size	cc/stroke	Required cpm@ Flow**	Max Flow † cc/sec (lb/min)	Max Dispense Pressure psi (MPa, bar)**	Ratio	
160	86	246	8	30 (4)	1500 (10, 103)	1.86	
100	86	186	10			1.16	
86	80	166	11			1.08	
80	80	160	12			1.00	
80	65	145	13			1.23	
80	60	140	13			1.33	
80	50	130	14			1.60	
86	40	126	15			2.15	
60	50	110	17			1.20	
65	40	105	18			1.63	
60	40	100	19			1.50	
60	25	85	20			28 (3.7)	2.40
50	30	80	20			26 (3.5)	1.67
50	25	75	20	25 (3.3)	2.00		
50	20	70	20	23 (3.1)	2.50		

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

\*\* Cycle rate should be between 8 and 20 cycles per minute. Max flow rate is determined for continuous service at 120°F (39°C) at stated cpm and pressure. Higher cycle rates are possible at lower temperatures/pressures and intermittent use. Lower cycle rates are possible, but should be tested under application conditions.

† Dispense rate in excess of max flow and pressure may result in a machine shutdown due to elevated temperature of the hydraulic system, resulting in a thermal shutdown (T4H1).

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‡ The maximum fluid working pressure for the base machine without hoses is 3000 psi (20.7 MPa, 207 bar). If hoses rated at less than 3000 psi are installed, the system maximum fluid working pressure becomes the rating of the hoses. If 2000 psi hoses were purchased and installed by Graco, the working pressure for the machine is already setup for the lower 2000 psi (13.8 MPa, 138 bar) working pressure by Graco. If the machine was purchased without hoses and aftermarket hoses rated at or above 3000 psi are to be installed, see instruction manual 3A1276 for the procedure to setup the machine for higher rated hoses. The change in working pressure is made by changing a rotary switch setting in the Motor Control Module. The minimum pressure rating for hoses is 2000 psi. Do not install hoses with a pressure rating lower than 2000 psi.

## HFRL Models

Part Number	Description
HFRL01	HFR for Lamination, 230/1, 1.00:1, 80/80, Carbon Steel
HFRL02	HFR for Lamination, 230/1, 1.08:1, 86/80, Carbon Steel
HFRL03	HFR for Lamination, 230/1, 1.16:1, 100/86, Carbon Steel
HFRL04	HFR for Lamination, 230/1, 1.20:1, 60/50, Carbon Steel
HFRL05	HFR for Lamination, 230/1, 1.23:1, 80/65, Carbon Steel
HFRL06	HFR for Lamination, 230/1, 1.33:1, 80/60, Carbon Steel
HFRL07	HFR for Lamination, 230/1, 1.50:1, 60/40, Carbon Steel
HFRL08	HFR for Lamination, 230/1, 1.60:1, 80/50, Carbon Steel
HFRL09	HFR for Lamination, 230/1, 1.63:1, 65/40, Carbon Steel
HFRL10	HFR for Lamination, 230/1, 1.67:1, 50/30, Carbon Steel
HFRL11	HFR for Lamination, 230/1, 1.86:1, 160/86, Carbon Steel
HFRL12	HFR for Lamination, 230/1, 2.00:1, 50/25, Carbon Steel
HFRL13	HFR for Lamination, 230/1, 2.15:1, 86/40, Carbon Steel
HFRL14	HFR for Lamination, 230/1, 2.40:1, 60/25, Carbon Steel
HFRL15	HFR for Lamination, 230/1, 2.5:1, 50/20, Carbon Steel
HFRL16 ★	HFR for Lamination, 400/3, 1.00:1, 80/80, Carbon Steel
HFRL17 ★	HFR for Lamination, 400/3, 1.08:1, 86/80, Carbon Steel
HFRL18 ★	HFR for Lamination, 400/3, 1.16:1, 100/86, Carbon Steel
HFRL19 ★	HFR for Lamination, 400/3, 1.20:1, 60/50, Carbon Steel
HFRL20 ★	HFR for Lamination, 400/3, 1.23:1, 80/65, Carbon Steel
HFRL21 ★	HFR for Lamination, 400/3, 1.33:1, 80/60, Carbon Steel
HFRL22 ★	HFR for Lamination, 400/3, 1.50:1, 60/40, Carbon Steel

Part Number	Description
HFRL23 ★	HFR for Lamination, 400/3, 1.60:1, 80/50, Carbon Steel
HFRL24 ★	HFR for Lamination, 400/3, 1.63:1, 65/40, Carbon Steel
HFRL25 ★	HFR for Lamination, 400/3, 1.67:1, 50/30, Carbon Steel
HFRL26 ★	HFR for Lamination, 400/3, 1.86:1, 160/86, Carbon Steel
HFRL27 ★	HFR for Lamination, 400/3, 2.00:1, 50/25, Carbon Steel
HFRL28 ★	HFR for Lamination, 400/3, 2.15:1, 86/40, Carbon Steel
HFRL29 ★	HFR for Lamination, 400/3, 2.40:1, 60/25, Carbon Steel
HFRL30 ★	HFR for Lamination, 400/3, 2.5:1, 50/20, Carbon Steel

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## HFR-Silicone (HFRS)

HFRS models are designed for use with high viscosity, unheated silicone adhesives at flow rates of up to 20 cc/sec. The equipment can be ran at up to 20 cycles per minute continuous duty.

Full Load Peak Amps Per Phase*	Voltage (phase)	System Watts	Maximum Fluid Working Pressure ‡ psi (MPa, bar)
55 A	230V (1)	12,650	3000 (20.7, 207)
55 A ★	400V (3)		

A Pump Size	B Pump Size	cc/stroke	Required cpm@ Flow**	Max Flow † cc/sec	Max Dispense Pressure psi (MPa, bar)**	Ratio
15	80	95	11.3-12.5	18-20	2500 (17, 172)	5.33
5	50	55	20	18.3		10.00
5	30	35	20	11.7		6.00
5	20	25	20	8.3		4.00
10	10	20	20	6.7		1.00
5	10	15	20	5		2.00

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

\*\* Cycle rate should be between 8 and 20 cycles per minute. Max flow rate is determined for continuous service at 120°F (39°C) at stated cpm and pressure. Higher cycle rates are possible at lower temperatures/pressures and intermittent use. Lower cycle rates are possible, but should be tested under application conditions.

† Dispense rate in excess of max flow and pressure may result in a machine shutdown due to elevated temperature of the hydraulic system, resulting in a thermal shutdown (T4H1).

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‡ The maximum fluid working pressure for the base machine without hoses is 3000 psi (20.7 MPa, 207 bar). If hoses rated at less than 3000 psi are installed, the system maximum fluid working pressure becomes the rating of the hoses. If 2000 psi hoses were purchased and installed by Graco, the working pressure for the machine is already setup for the lower 2000 psi (13.8 MPa, 138 bar) working pressure by Graco. If the machine was purchased without hoses and aftermarket hoses rated at or above 3000 psi are to be installed, see instruction manual 3A1276 for the procedure to setup the machine for higher rated hoses. The change in working pressure is made by changing a rotary switch setting in the Motor Control Module. The minimum pressure rating for hoses is 2000 psi. Do not install hoses with a pressure rating lower than 2000 psi.

## HFRS Models

Part Number	Description
HFRS01	HFR for Silicone, 230/1, 1:1, Carbon Steel, 55/55 Feed
HFRS02	HFR for Silicone, 230/1, 1:1, Carbon Steel, 5/5 Feed
HFRS03 ★	HFR for Silicone, 400/3, 1:1, Carbon Steel, 55/55 Feed
HFRS04 ★	HFR for Silicone, 400/3, 1:1, Carbon Steel, 5/5 Feed
HFRS05	HFR for Silicone, 230/1, 1:1, Stainless Steel, 55/55 Feed
HFRS06	HFR for Silicone, 230/1, 1:1, Stainless Steel, 5/5 Feed
HFRS07 ★	HFR for Silicone, 400/3, 1:1, Stainless Steel, 55/55 Feed
HFRS08 ★	HFR for Silicone, 400/3, 1:1, Stainless Steel, 5/5 Feed
HFRS09	HFR for Silicone, 230/1, 4:1, Carbon Steel, 55/55 Feed
HFRS10	HFR for Silicone, 230/1, 4:1, Carbon Steel, 55/55 Feed
HFRS11	HFR for Silicone, 230/1, 4:1, Carbon Steel, 5/5 Feed
HFRS12 ★	HFR for Silicone, 400/3, 4:1, Carbon Steel, 55/55 Feed
HFRS13 ★	HFR for Silicone, 400/3, 4:1, Carbon Steel, 55/55 Feed
HFRS14 ★	HFR for Silicone, 400/3, 4:1, Carbon Steel, 5/5 Feed
HFRS15	HFR for Silicone, 230/1, 4:1, Stainless Steel, 55/55 Feed
HFRS16	HFR for Silicone, 230/1, 4:1, Stainless Steel, 55/55 Feed
HFRS17	HFR for Silicone, 230/1, 4:1, Stainless Steel, 5/5 Feed
HFRS18 ★	HFR for Silicone, 400/3, 4:1, Stainless Steel, 55/55 Feed
HFRS19 ★	HFR for Silicone, 400/3, 4:1, Stainless Steel, 55/55 Feed
HFRS20 ★	HFR for Silicone, 400/3, 4:1, Stainless Steel, 5/5 Feed
HFRS21	HFR for Silicone, 230/1, 5.33:1, Carbon Steel, 55/55 Feed
HFRS22	HFR for Silicone, 230/1, 5.33:1, Carbon Steel, 55/55 Feed

Part Number	Description
HFRS23	HFR for Silicone, 230/1, 5.33:1, Carbon Steel, 5/5 Feed
HFRS24 ★	HFR for Silicone, 400/3, 5.33:1, Carbon Steel, 55/55 Feed
HFRS25 ★	HFR for Silicone, 400/3, 5.33:1, Carbon Steel, 55/55 Feed
HFRS26 ★	HFR for Silicone, 400/3, 5.33:1, Carbon Steel, 5/5 Feed
HFRS27	HFR for Silicone, 230/1, 5.33:1, Stainless Steel, 55/55 Feed
HFRS28	HFR for Silicone, 230/1, 5.33:1, Stainless Steel, 55/55 Feed
HFRS29	HFR for Silicone, 230/1, 5.33:1, Stainless Steel, 5/5 Feed
HFRS30 ★	HFR for Silicone, 400/3, 5.33:1, Stainless Steel, 55/55 Feed
HFRS31 ★	HFR for Silicone, 400/3, 5.33:1, Stainless Steel, 55/55 Feed
HFRS32 ★	HFR for Silicone, 400/3, 5.33:1, Stainless Steel, 5/5 Feed
HFRS33	HFR for Silicone, 230/1, 6:1, Carbon Steel, 55/55 Feed
HFRS34	HFR for Silicone, 230/1, 6:1, Carbon Steel, 55/55 Feed
HFRS35	HFR for Silicone, 230/1, 6:1, Carbon Steel, 5/5 Feed
HFRS36 ★	HFR for Silicone, 400/3, 6:1, Carbon Steel, 55/55 Feed
HFRS37 ★	HFR for Silicone, 400/3, 6:1, Carbon Steel, 55/55 Feed
HFRS38 ★	HFR for Silicone, 400/3, 6:1, Carbon Steel, 5/5 Feed
HFRS39	HFR for Silicone, 230/1, 6:1, Stainless Steel, 55/55 Feed
HFRS40	HFR for Silicone, 230/1, 6:1, Stainless Steel, 55/55 Feed
HFRS41	HFR for Silicone, 230/1, 6:1, Stainless Steel, 5/5 Feed
HFRS42 ★	HFR for Silicone, 400/3, 6:1, SS 55/55 Feed
HFRS43 ★	HFR for Silicone, 400/3, 6:1, Stainless Steel, 55/55 Feed
HFRS44 ★	HFR for Silicone, 400/3, 6:1, Stainless Steel, 5/5 Feed

Part Number	Description
HFRS45	HFR for Silicone, 230/1, 10:1, Carbon Steel, 55/55 Feed
HFRS46	HFR for Silicone, 230/1, 10:1, Carbon Steel, 55/5 Feed
HFRS47	HFR for Silicone, 230/1, 10:1, Carbon Steel, 5/5 Feed
HFRS48 ★	HFR for Silicone, 400/3, 10:1, Carbon Steel, 55/55 Feed
HFRS49 ★	HFR for Silicone, 400/3, 10:1, Carbon Steel, 55/5 Feed
HFRS50 ★	HFR for Silicone, 400/3, 10:1, Carbon Steel, 5/5 Feed
HFRS51	HFR for Silicone, 230/1, 10:1, Stainless Steel, 55/55 Feed
HFRS52	HFR for Silicone, 230/1, 10:1, Stainless Steel, 55/5 Feed
HFRS53	HFR for Silicone, 230/1, 10:1, Stainless Steel, 5/5 Feed
HFRS54 ★	HFR for Silicone, 400/3, 10:1, Stainless Steel, 55/55 Feed
HFRS55 ★	HFR for Silicone, 400/3, 10:1, Stainless Steel, 55/5 Feed
HFRS56 ★	HFR for Silicone, 400/3, 10:1, Stainless Steel, 5/5 Feed
HFRS57	HFR for Silicone, 230/1, 1:1, Carbon Steel, No Feed
HFRS58 ★	HFR for Silicone, 400/1, 1:1, Carbon Steel, No Feed
HFRS59	HFR for Silicone, 230/1, 1:1, Stainless Steel, No Feed
HFRS60 ★	HFR for Silicone, 400/3, 1:1, Stainless Steel, No Feed
HFRS61	HFR for Silicone, 230/1, 4:1, Carbon Steel, No Feed
HFRS62 ★	HFR for Silicone, 400/3, 4:1, Carbon Steel, No Feed
HFRS63	HFR for Silicone, 230/1, 4:1, Stainless Steel, No Feed
HFRS64 ★	HFR for Silicone, 400/3, 4:1, Stainless Steel, No Feed
HFRS65	HFR for Silicone, 230/1, 5.33:1, Carbon Steel, No Feed
HFRS66 ★	HFR for Silicone, 400/3, 5.33:1, Carbon Steel, No Feed

Part Number	Description
HFRS67	HFR for Silicone, 230/1, 5.33:1, Stainless Steel, No Feed
HFRS68 ★	HFR for Silicone, 400/3, 5.33:1, Stainless Steel, No Feed
HFRS69	HFR for Silicone, 230/1, 6:1, Carbon Steel, No Feed
HFRS70 ★	HFR for Silicone, 400/3, 6:1, Carbon Steel, No Feed
HFRS71	HFR for Silicone, 230/1, 6:1, Stainless Steel, No Feed
HFRS72 ★	HFR for Silicone, 400/3, 6:1, Stainless Steel, No Feed
HFRS73	HFR for Silicone, 230/1, 10:1, Carbon Steel, No Feed
HFRS74 ★	HFR for Silicone, 400/3, 10:1, Carbon Steel, No Feed
HFRS75	HFR for Silicone, 230/1, 10:1, Stainless Steel, No Feed
HFRS76 ★	HFR for Silicone, 400/3, 10:1, Stainless Steel, No Feed
HFRS77	HFR for Silicone, 230/1, 4:1, Carbon Steel, No Feed
HFRS78 ★	HFR for Silicone, 400/3, 4:1, Carbon Steel, No Feed
HFRS79	HFR for Silicone, 230/1, 4:1, Stainless Steel, No Feed
HFRS80 ★	HFR for Silicone, 400/3, 4:1, Stainless Steel, No Feed
HFRS81	HFR for Silicone, 230/1, 5:1, Carbon Steel, No Feed
HFRS82 ★	HFR for Silicone, 400/3, 5:1, Carbon Steel, No Feed
HFRS83	HFR for Silicone, 230/1, 5:1, Stainless Steel, No Feed
HFRS84 ★	HFR for Silicone, 400/3, 5:1, Stainless Steel, No Feed
HFRS85	HFR for Silicone, 230/1, 6:1, Carbon Steel, No Feed
HFRS86 ★	HFR for Silicone, 400/3, 6:1, Carbon Steel, No Feed
HFRS87	HFR for Silicone, 230/1, 6:1, Stainless Steel, No Feed
HFRS88 ★	HFR for Silicone, 400/3, 6:1, Stainless Steel, No Feed

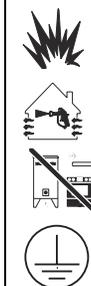
Part Number	Description
HFRS89	HFR for Silicone, 230/1, 10:1, Carbon Steel, No Feed
HFRS90 ★	HFR for Silicone, 400/3, 10:1, Carbon Steel, No Feed
HFRS91	HFR for Silicone, 230/1, 10:1, Stainless Steel, No Feed
HFRS92 ★	HFR for Silicone, 400/3, 10:1, Stainless Steel, No Feed

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

 <b>WARNING</b>	
	<p><b>ELECTRIC SHOCK HAZARD</b></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"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.</li> <li>• Connect only to grounded power source.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> </ul>
	<p><b>TOXIC FLUID OR FUMES HAZARD</b></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"> <li>• Read MSDSs to know the specific hazards of the fluids you are using.</li> <li>• Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.</li> <li>• Always wear chemically impermeable gloves when spraying, dispensing, or cleaning equipment.</li> </ul>
	<p><b>PERSONAL PROTECTIVE EQUIPMENT</b></p> <p>You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This equipment includes but is not limited to:</p> <ul style="list-style-type: none"> <li>• Protective eyewear, and hearing protection.</li> <li>• Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.</li> </ul>
	<p><b>SKIN INJECTION HAZARD</b></p> <p>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. <b>Get immediate surgical treatment.</b></p> <ul style="list-style-type: none"> <li>• Do not point dispensing device at anyone or at any part of the body.</li> <li>• Do not put your hand over the fluid outlet.</li> <li>• Do not stop or deflect leaks with your hand, body, glove, or rag.</li> <li>• Follow the <b>Pressure Relief Procedure</b> when you stop dispensing and before cleaning, checking, or servicing equipment.</li> <li>• Tighten all fluid connections before operating the equipment.</li> <li>• Check hoses and couplings daily. Replace worn or damaged parts immediately.</li> </ul>


**WARNING**
**FIRE AND EXPLOSION HAZARD**

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

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

**PRESSURIZED EQUIPMENT HAZARD**

Fluid from the gun/dispense valve, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.

- 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, tubes, and couplings daily. Replace worn or damaged parts immediately.

**WARNING**



**EQUIPMENT MISUSE HAZARD**

Misuse can cause death or serious injury.

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



**MOVING PARTS HAZARD**

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

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



# Important Two-Component Material Information

## Isocyanate Conditions



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

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

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

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

## Moisture Sensitivity of Isocyanates

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

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

To prevent exposing ISO to moisture:

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

## Material Self-ignition



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

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



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

## Changing Materials

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

## A (Red) and B (Blue) Components

### IMPORTANT!

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

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

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

For all machines:

- The A (Red) side is intended for ISO, hardeners, and catalysts.
- If one of the materials being used is moisture-sensitive, that material should always be in the A (Red) side.
- The B (Blue) side is intended for polyols, resins, and bases.

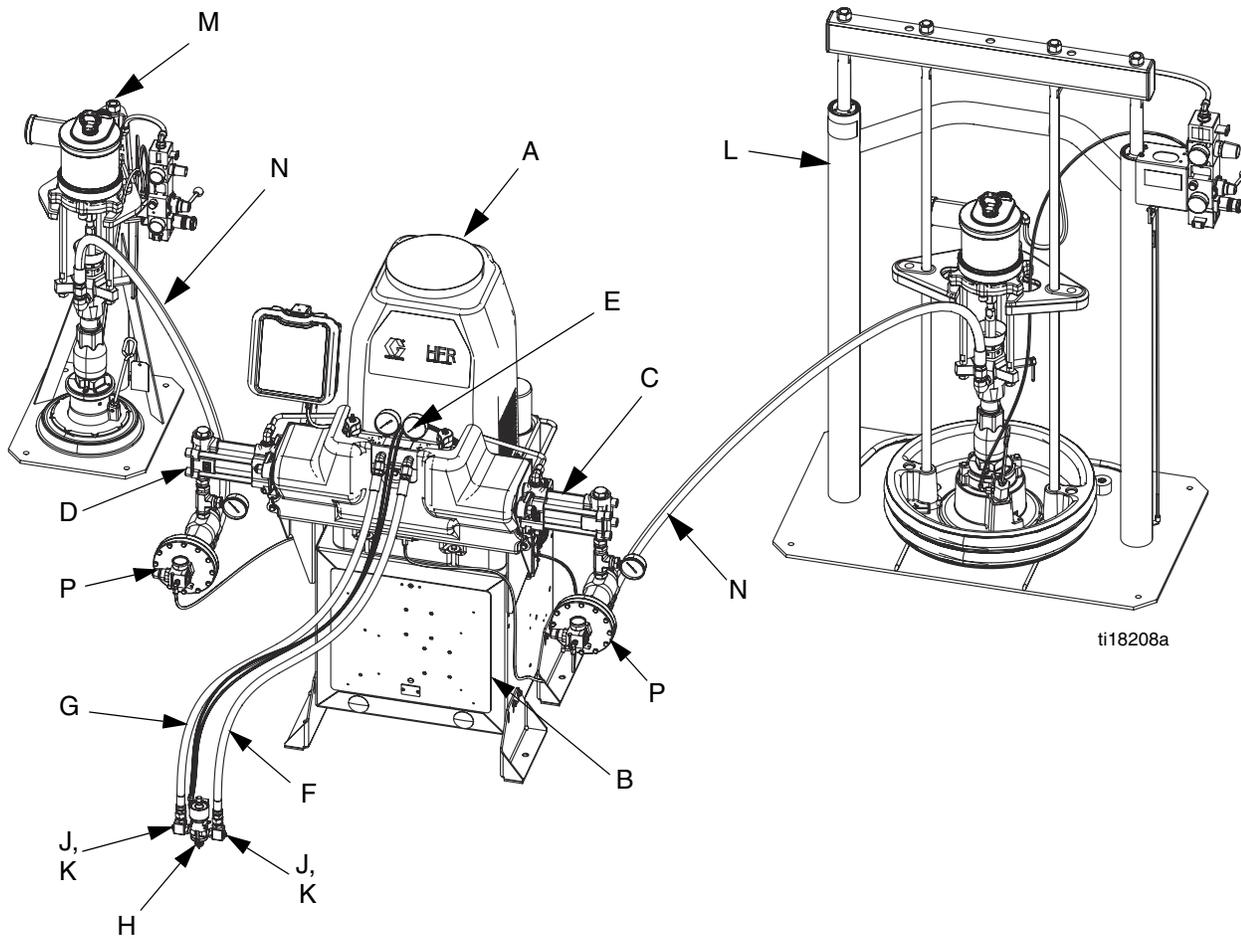
### For HFRS Systems:

The high volume material is typically the ISO and is located on the A (Red) side. Some material chemistries may have an ISO which is the low volume material. The ISO must always be in the A (Red) side containing the Isolube.

### For HFRL Systems:

The high volume material will always be the B (Blue) side. Typical Installation

# Typical HFRS System

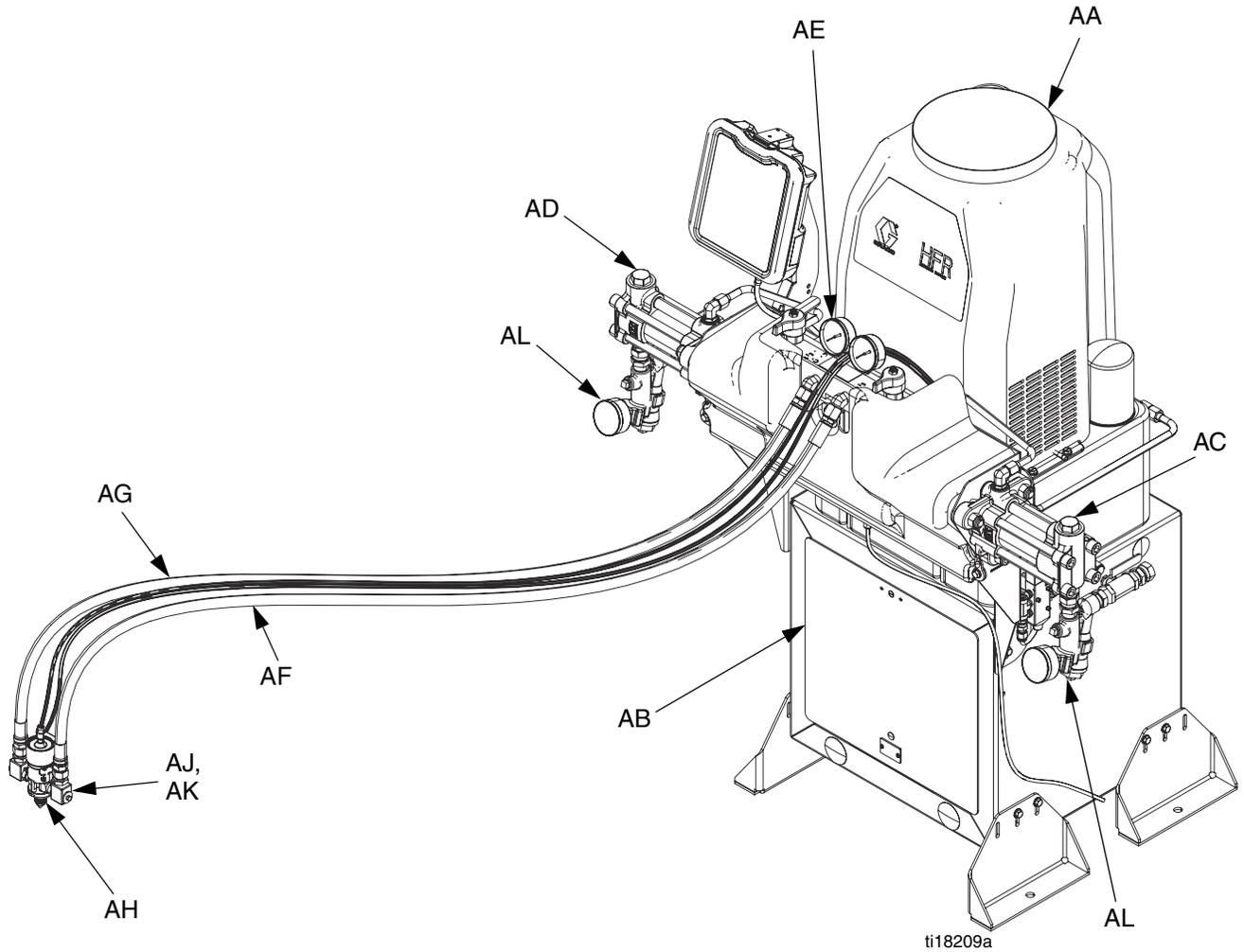


**FIG. 1: HFR Silicone System**

**Key:**

- |   |                     |   |                     |
|---|---------------------|---|---------------------|
| A | HFR Unit (Silicone) | H | Dispense Gun        |
| B | Power Module        | J | Orifice Block       |
| C | B "Blue" Pump       | K | Orifice, 1/4"       |
| D | A "Red" Pump        | L | Supply Unit, B Side |
| E | Outlet Module       | M | Supply Unit, A Side |
| F | B Hose Kit          | N | Supply Hose         |
| G | A Hose Kit          | P | Inlet Regulator     |

# Typical HFRL System



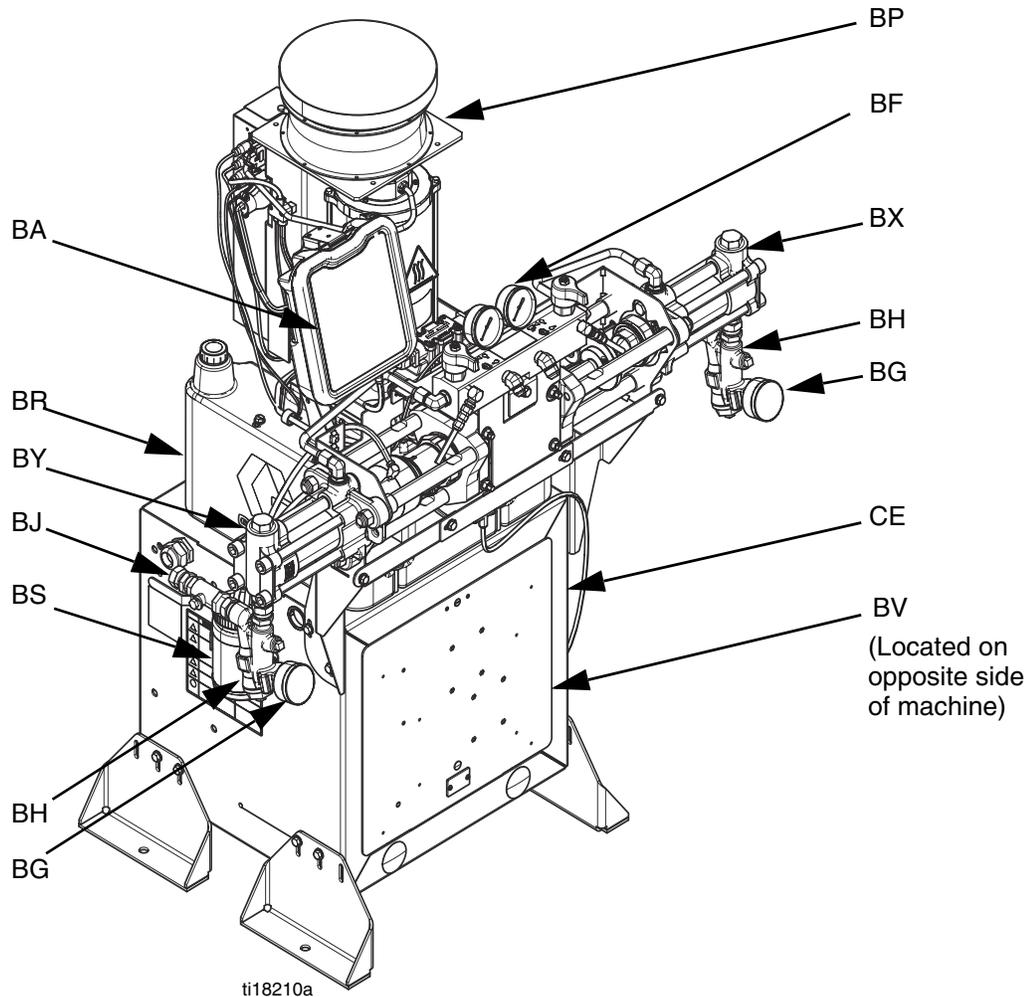
**FIG. 2: HFR Laminar System**

**Key:**

- AA HFR Unit (Laminator)
- AB Power Module
- AC B "Blue" Pump
- AD A "Red" Pump
- AE Outlet Module
- AF B Hose Kit
- AG A Hose Kit

- AH Dispense Gun
- AJ Orifice Block
- AK Orifice, 1/4"
- AL Inlet Assembly
- AM Isolube Kit (not shown)

# Component Identification

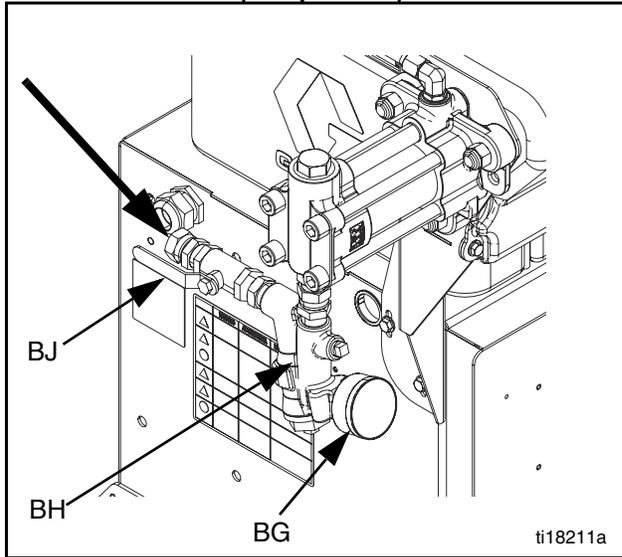


**FIG. 3: Component Identification, shown with shrouds removed**

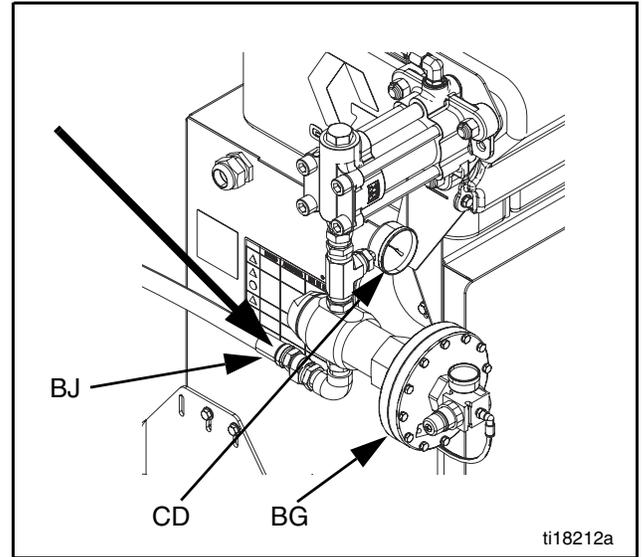
**Key for FIG. 4.**

- |  |  |
|--|--|
| <p>BA Advanced Display Module (see page 24)</p> <p>BB Component A (Red) Pressure Relief Outlet</p> <p>BC Component B (Blue) Pressure Relief Outlet</p> <p>BD Component A (Red) Fluid Manifold Inlet (on left side of manifold block)</p> <p>BE Component B (Blue) Fluid Manifold Inlet</p> <p>BF HFR Fluid Manifold</p> <p>BG Feed Inlet Pressure Gauge</p> <p>BH Feed Inlet Strainer (standard filter size is 20 mesh)</p> <p>BJ Feed Inlet Valve (A (Red) side shown)</p> <p>BK Component A (Red) Outlet Pressure Gauge</p> <p>BL Component B (Blue) Outlet Pressure Gauge</p> <p>BM Component A (Red) Hose Connection (from feed to gun or mix head)</p> <p>BN Component B (Blue) Hose Connection (from feed to gun or mix head)</p> <p>BP Hydraulic Power Pack Assembly</p> <p>BR Hydraulic Tank</p> | <p>BS IsoGuard™ Select Fluid Reservoir (included on all HFRL, available separately as kit 24M154 for HFRS)</p> <p>BT Pumpline Linear Sensor</p> <p>BU Motor Control Module, see page 22</p> <p>BV Main Power Switch</p> <p>BW Component A (Red) Pump</p> <p>BX Component B (Blue) Pump</p> <p>BY Power Distribution Box</p> <p>BZ Component A (Red) PRESSURE RELIEF/DISPENSE Valve</p> <p>CA Component B (Blue) PRESSURE RELIEF/DISPENSE Valve</p> <p>CB Component A (Red) Pressure Transducer</p> <p>CC Component B (Blue) Pressure Transducer</p> <p>CD Material Pressure Regulator Component A (Red)</p> <p>CE Power Distribution Box</p> |
|--|--|

**HFRL Material Inlet  
(250 psi Max)**

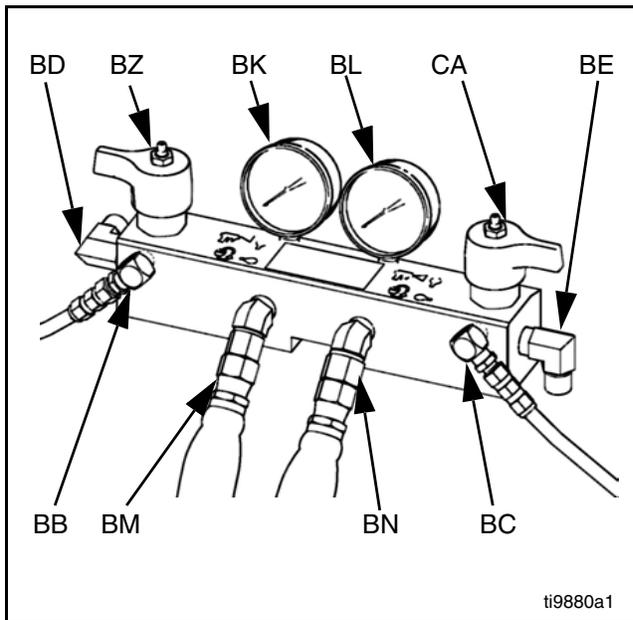


**HFRS Material Inlet  
(3000 psi Max)**

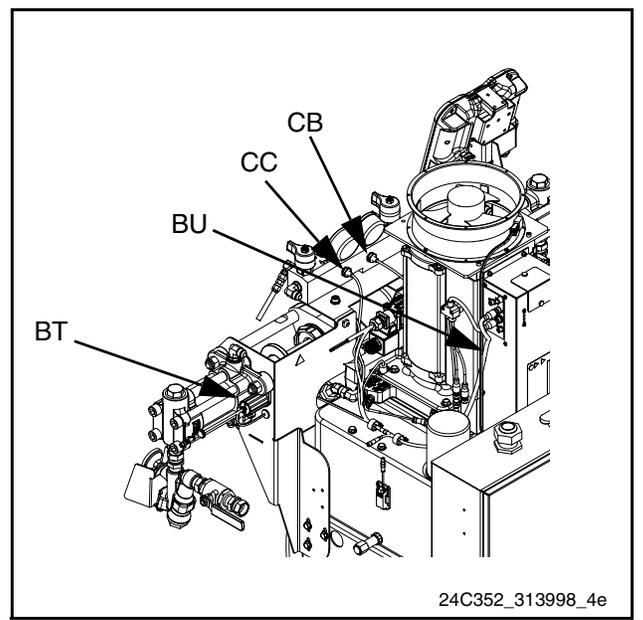


BJ

**Fluid Manifold (FM) Detail**



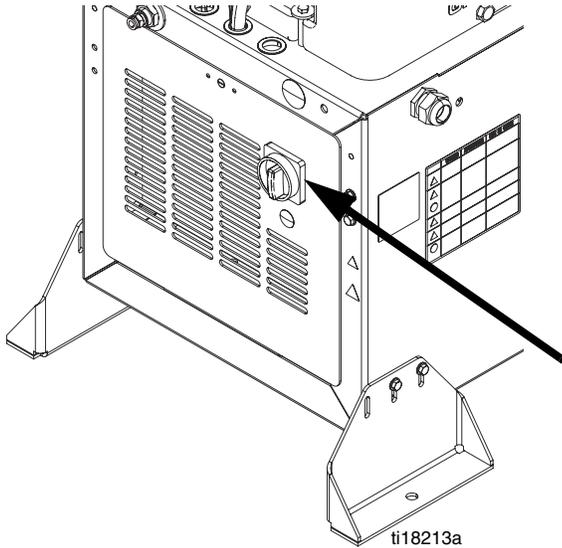
**Rear View**



**FIG. 4: Component Identification, shown with shrouds removed**

## Main Power Switch

Located on rear of machine.



The main power switch turns power ON



and

OFF

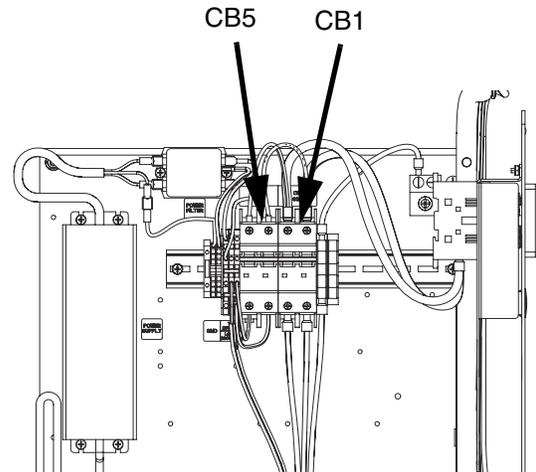
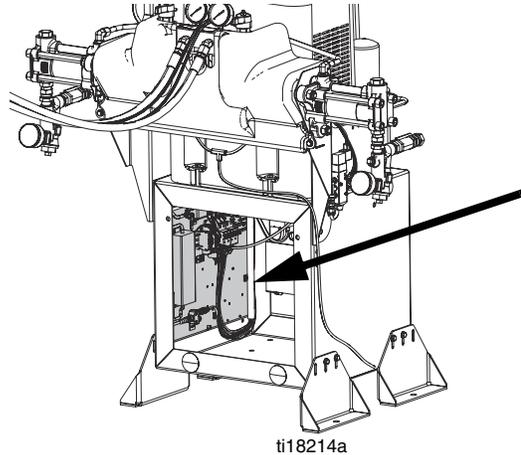


. The main power switch does not turn pumps on.

## Circuit Breakers

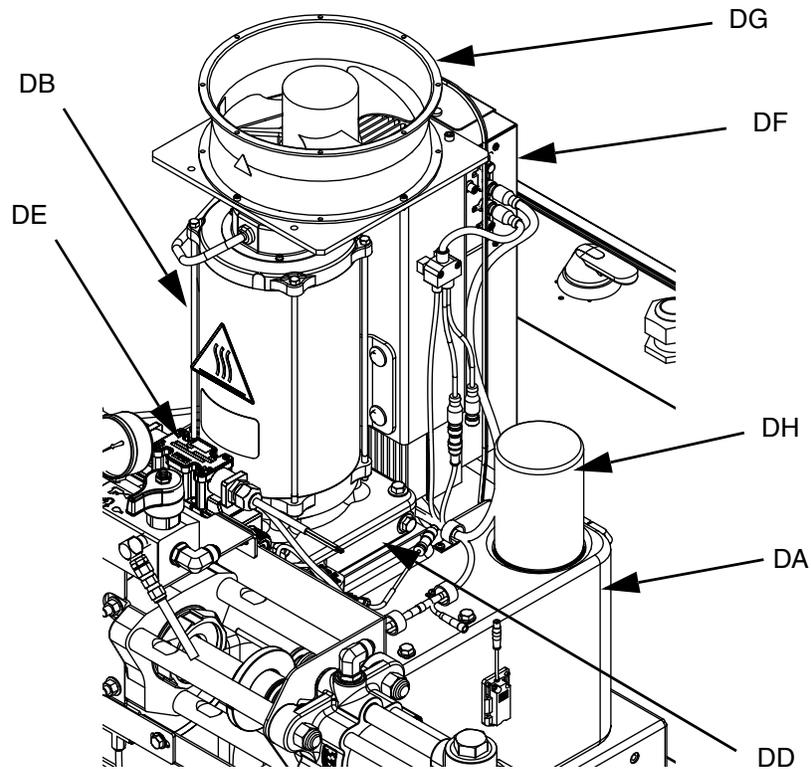


The circuit breakers are located on the panel assembly mounted directly behind the disconnect switch panel on the right side of the enclosure. For more information about items on the power distribution panel, see manual 3A2176



Ref.	230V/ 1 phase, 400V/ 3 phase	Component
CB1	63A	Motor Control Module
CB5	5A	Miscellaneous

## Hydraulic Power Pack



24C352 31399R 2a

**FIG. 5**

**Key:**

DA 8 Gallon Hydraulic Oil Reservoir (see **Accessories** on page 91 for specifications)  
 DB Electric Motor  
 DC Dipstick (not shown, located at rear left of hydraulic tank)  
 DD Hydraulic Housing

DE Directional Valve  
 DF Motor Control Module (see page 22)  
 DG Fan  
 DH Filter  
 DJ Shroud (not shown, removed for clarity)

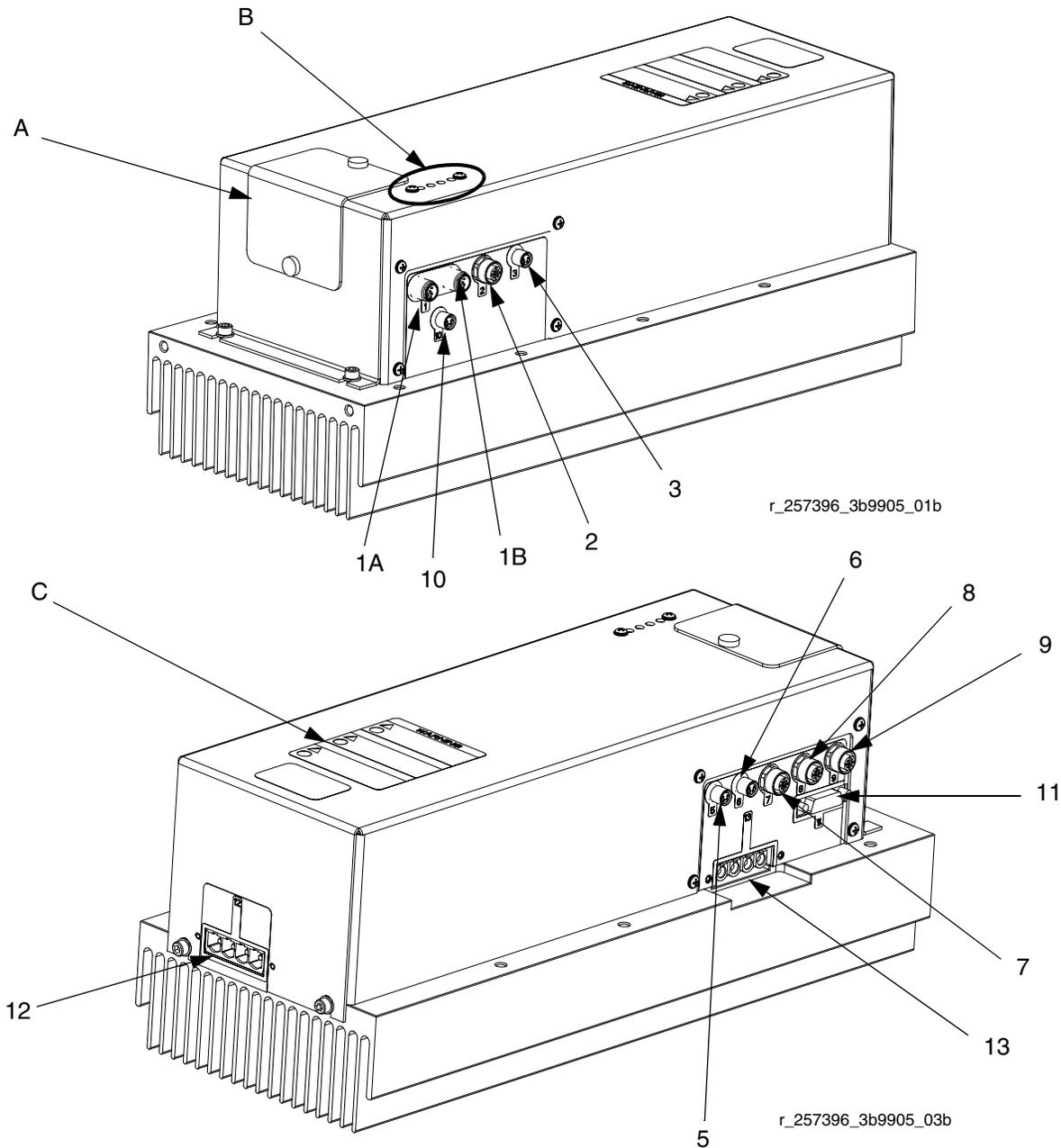
## Motor Control Module (MCM)

**NOTICE**

If the Motor Control Module is replaced, the selector switch must be set prior to initial startup of the Motor Control Module or damage may occur. See HFR Repair manual for details, see **Related Manuals** on page 3.

For MCM location, see reference MA in FIG. 4 on page 19. When installed, the end of the MCM with the power input connection (12) faces down and the end with the access cover (A) faces up.

The Motor Control Module uses an 8-position selector switch to set the system maximum working pressure.

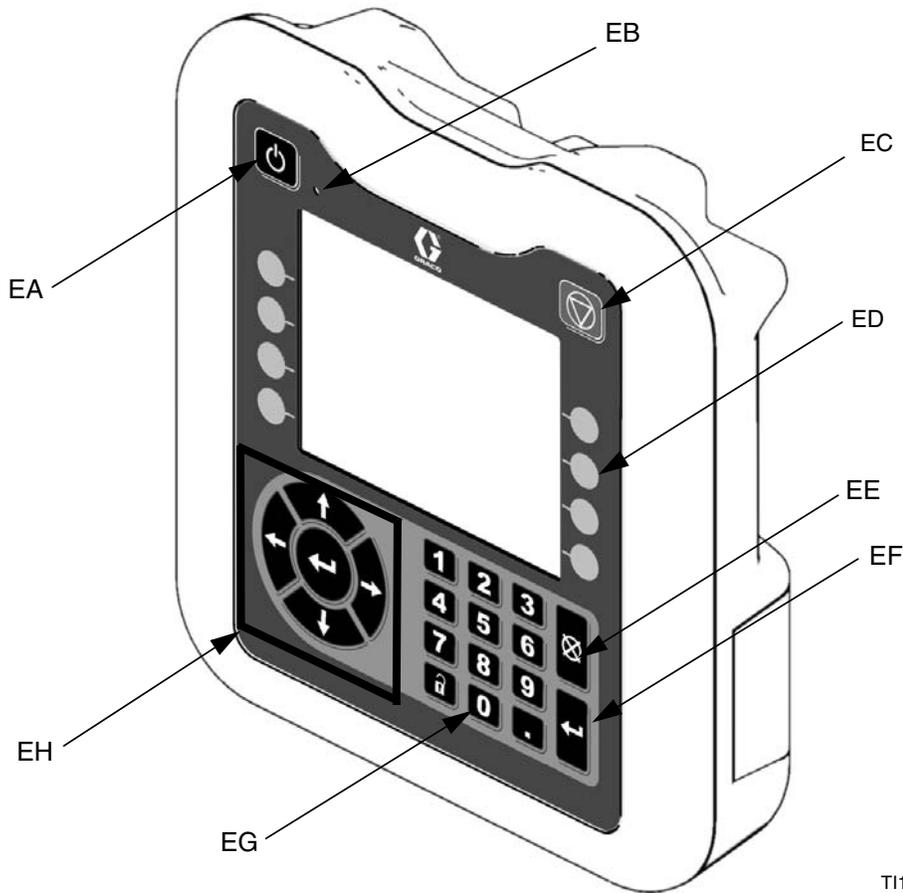


**FIG. 6: MCM Component Identification**

<b>Ref</b>	<b>Description</b>
A	Access Cover
B	LEDs
C	Warning Label
1A, 1B	CAN Connections
2	Three-way Splitter to: Oil Low Level Sensor, Dispense Valve Solenoid, and Footswitch
3	Oil Temperature Sensor
5	Electric Motor Temperature Sensor
6	LVDT
7	Three-way Splitter to: Hydraulic Directional Valve, Oil Overtemperature Switch
8	Pressure Transducer B (Blue) side
9	Pressure Transducer A (Red) side
10	Not used
11	Motor Position Sensor
12	MCM Power Input Connection
13	Motor Power Connection

# Advanced Display Module (ADM)

## User Interface



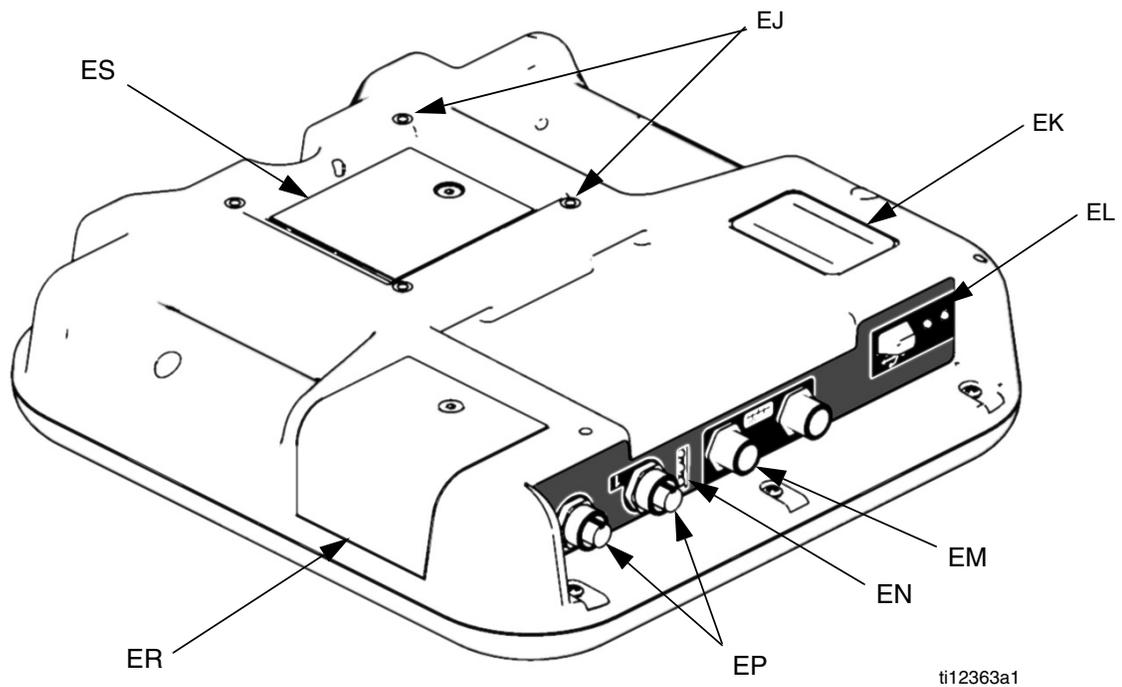
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FIG. 7: ADM Component Identification - Front

### Buttons

Callout	Button	Function
EA	System enable/disable	Enables/disables system. When system is disabled, temperature control and dispense operation are disabled.
EB	System Status Indicator Light	Displays system status. See <b>System Status Indicator (CB) Conditions</b> on page 25 for details.
EC	Stop	Stop all system processes. Is not a safety or emergency stop.

Callout	Button	Function
ED	Soft Keys	Defined by application using ADM.
EE	Cancel	Cancel a selection or number entry while in the process of entering a number or making a selection.
EF	Enter	Acknowledge changing a value or making a selection.
EG	Lock/Setup	Toggle between run and setup screens. If setup screens are password protected, button toggles between run and password entry screen.
EH	Navigation	Navigate within a screen or to a new screen.



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**FIG. 8: ADM Component Identification - Rear**

**Key:**

- EJ Flat Panel Mount
- EK Model Number
- EL USB Module Interface
- EM CAN Cable Connections

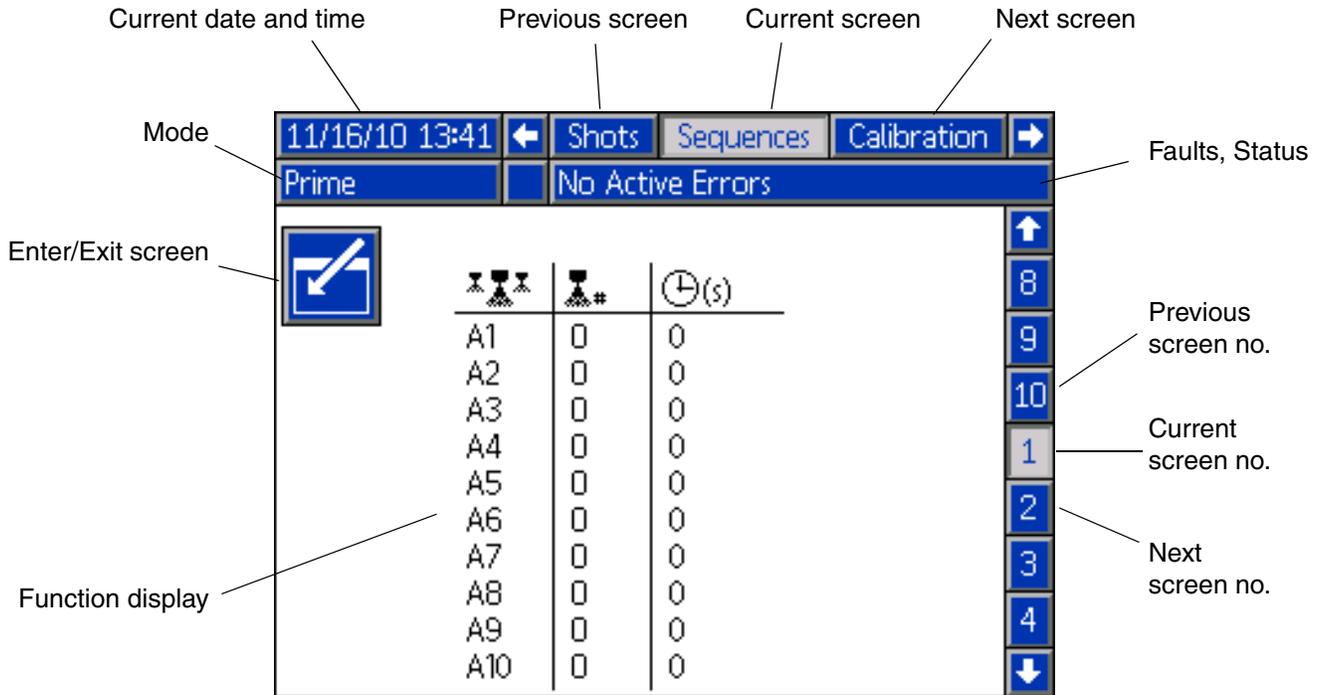
- EN Module Status LEDs
- EP Accessory Cable Connections
- ER Token Access Cover
- ES Battery Access Cover

**System Status Indicator (CB) 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

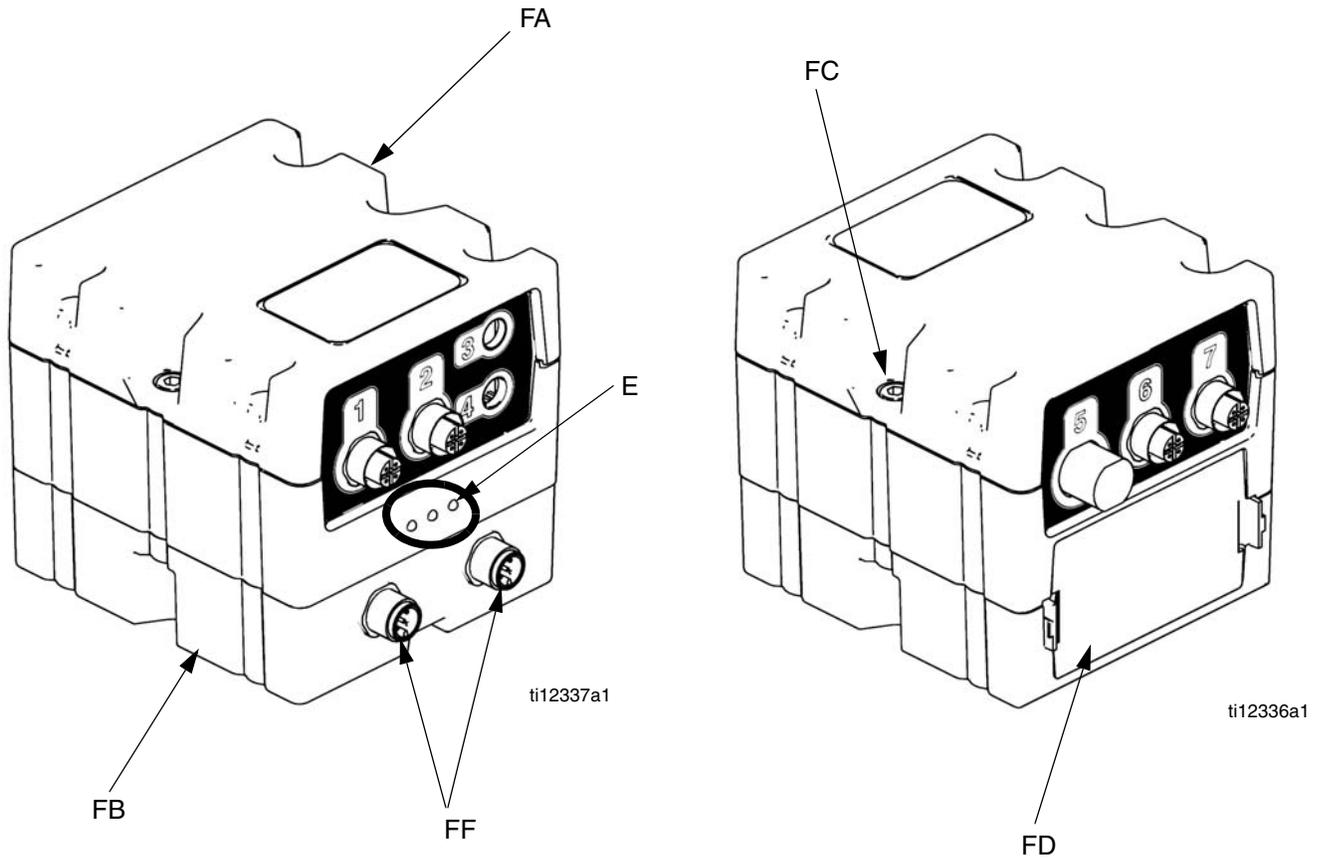
## Main Display Components

The following figure calls out the navigational, status, and general informational components of each screen. For details regarding the user interface display see **Advanced Display Module (ADM) Operation**, page 55.



**FIG. 9: Main Display Components**

## Fluid Control Module (FCM)



**FIG. 10**

**Key:**

- FA Fluid Control Module
- FB Base
- FC Module Connection Screws
- FD Access Cover
- FE Module Status LEDs
- FF CAN Connectors

## **Dispense Valve Overview**

The HFRL and HFRS systems will be provided exclusively with MD2 dispense valves.

The MD2 dispense valve is an example of a solenoid controlled dispense valve. When the trigger is pulled the signal requests the dispense to start. When the machine sees the signal, fluid rises to dispensing pressure and the valve is opened to begin dispensing. When the trigger is released, the solenoid signals that the dispense is finished.

# Setup

Perform this setup procedure to secure all necessary machine connections for machine operation.

## 1. Locate HFR.

- a. Locate HFR on a level surface. See **Dimensions** on page 94 for space requirements.
- b. Do not expose HFR to rain.

<b>NOTICE</b>
To avoid machine damage and personal injury, ensure the machine is securely strapped to the pallet to prevent tipping before lifting.

## 2. Electrical requirements. See Models on page 4 for detailed electrical requirements information.

						
Installing this equipment requires access to parts which may cause electric shock or other serious injury if work is not performed properly. Have a qualified electrician connect power and ground to main power switch terminals, see step 3 in this setup procedure. All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.						

## 3. Connect electrical cord.

						
---	---	---	--	--	--	--

**NOTE:** See **Power Line Voltage Surges** information on page 30.

**NOTE:** Power cord is not supplied. See the following table.

**Table 1: Power Cord Requirements**

Model	Cord Requirements AWG (mm <sup>2</sup> )
230V, 1 phase	6 (13.3), 2 wire + ground
400V, 3 phase	6 (13.3), 4 wire + ground †

† Residual Current Device (RCD) must be rated at

300 mA if installed.

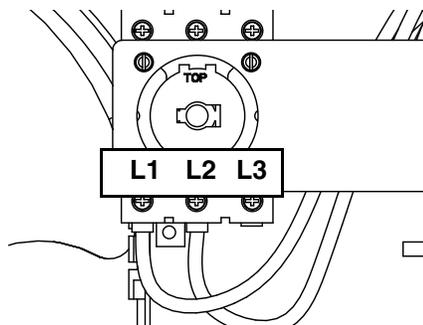
### Electrical Cord Wires by Model

- 230V, 1 phase: L1, L2, GND
- 400V, 3 phase: L1, L2, L3, N, GND

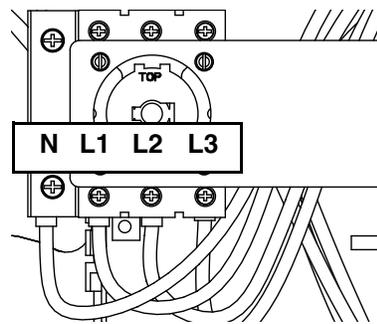
Use 5/32 or 4 mm hex allen wrench to connect the two or three power leads to L1, L2, and L3, as applicable. Connect green to ground (GND).

### Electrical Cord Wires by Model

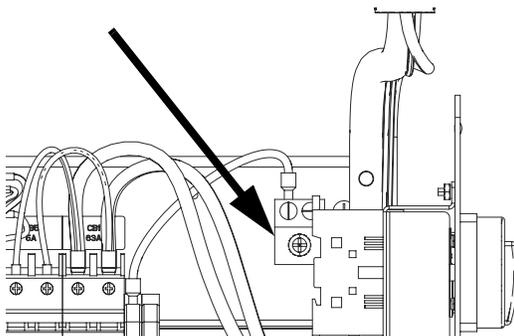
- 230V, 1 phase: L1, L2, (L3 - No Connection), GND
- 400V, 3 phase: L1, L2, L3, N, GND



**FIG. 11: 230V, 1 phase shown**



**FIG. 12: 400V, 3 phase shown**



**FIG. 13: Grounding Lug**

## Power Line Voltage Surges

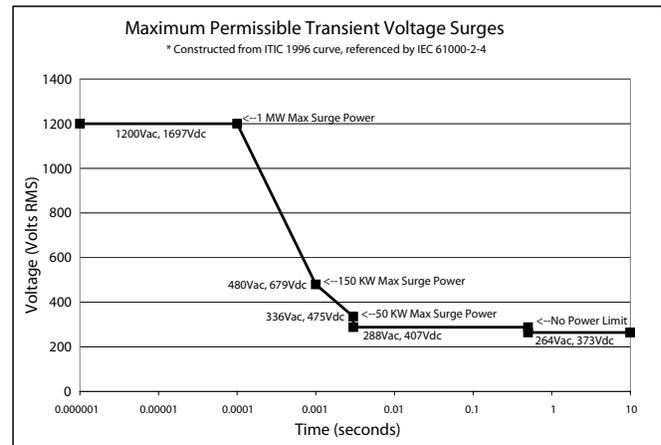
Power conversion equipment can be sensitive to voltage fluctuations on incoming power. The Motor Control Module falls under the category of power conversion equipment because energy is stored on a capacitive bus and then modulated to control a brushless motor. Engineered design takes this into account and withstands a wide range of conditions, but it is possible for supplied power to occasionally fall outside the tolerable range in industrial plants with high-amperage reactive pulsed loads such as welding equipment. If the tolerable range is exceeded, an overvoltage condition is flagged and the system will shut down in an alarm state to protect itself and alert the user of unstable power. Excessive or repeated overvoltage may permanently damage hardware.

The MAX-HOLD feature on a multimeter can be used to determine peak DC voltage on the line. DC is the proper setting, as opposed to AC, because peak voltage is the critical parameter that affects the DC voltage level stored on the capacitive bus in power conversion equipment. Reading should not regularly exceed approximately 400VDC to avoid tripping the 420VDC alarm level in the Motor Control Module. If power quality is suspect, power conditioning or isolation of the device(s) causing poor power quality is recommended. Consult a qualified electrician if there are any concerns about the available power supply.

### Power Line Test Steps with Multimeter

- a. Set multimeter to "DC voltage".
- b. Connect multimeter probes to supplied power line.
- c. Press "Min Max" successively to show the peak positive and negative DC voltages.
- d. Confirm readings do not exceed 400VDC (Motor Control Module alarm issued at 420VDC).

The chart below shows the permissible magnitude and duration of temporary over-voltage events:



#### 4. Connect regulator assemblies (If Equipped)

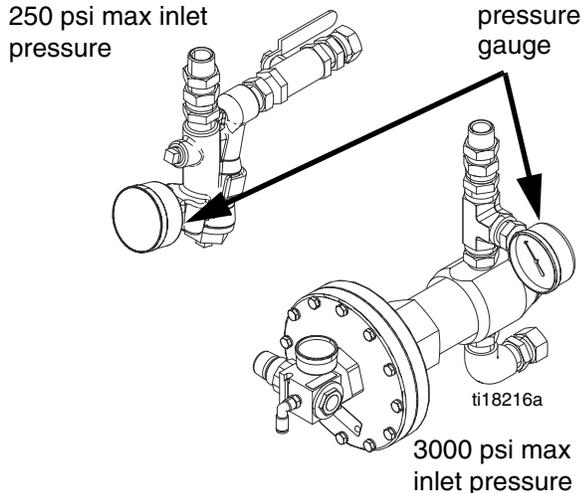
**NOTE:** Systems equipped with a fluid regulator on the material inlet will not be fully assembled due to shipping. The regulator assembly will be detached and boxed separately.

- Attach the male nipple located on the regulator assembly to the female swivel located on the end of the pump assembly.
- Connect the air tube to the tee fitting on the power valve assembly located on the right side of the machine.

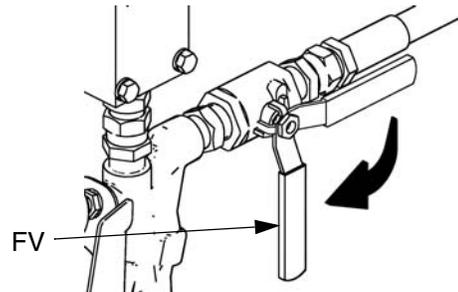
#### 5. Connect feed pumps (HFRL)

- Install feed pumps in component A (Red) and B (Blue) supply drums. See FIG. 1 and FIG. 4, pages 16 and 19.

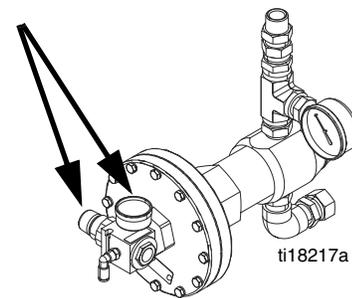
**NOTE:** A minimum feed pressure of 50 psi (0.35 MPa, 3.5 bar) is required at both feed inlet pressure gauges (FP). Maintain A (Red) and B (Blue) feed pressures within 10% of each other.



- Ensure A (Red) and B (Blue) inlet valves (FV) are closed.



- Adjust the fluid pressure regulator so the pressure gauge reads zero.



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

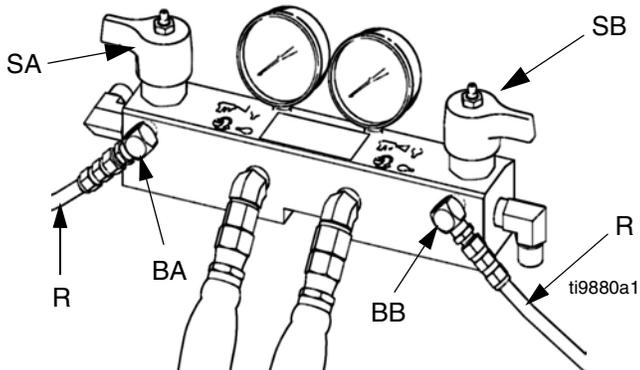
- Connect and tighten component B (Blue) supply hose to the 3/4 npt(f) swivel on the component B (Blue) inlet assembly.
- Connect and tighten component A (Red) supply hose to the 3/4 NPT(f) swivel on the component A (Red) inlet assembly.

### 6. Connect pressure relief lines (R)

						
---	---	--	--	--	--	--

Do not install shutoffs downstream of the PRESSURE RELIEF/DISPENSE valve outlets (BA, BB). The valves function as overpressure relief valves when set to DISPENSE . Lines must be open so valves can automatically relieve pressure when machine is operating. If circulating fluid back to the supply drums, use high pressure hose rated to withstand the maximum working pressure of this equipment.

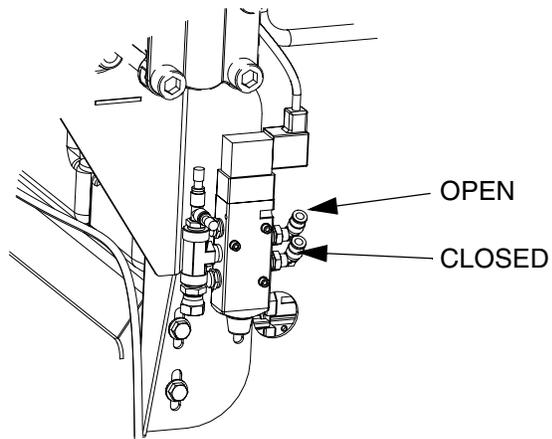
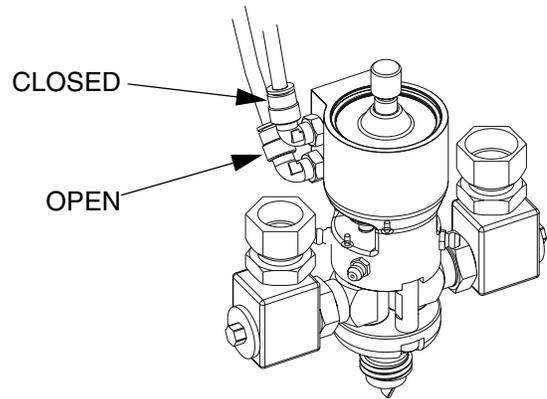
- a. **Recommended:** Connect high pressure hose (R) to relief fittings (BA, BB) of both PRESSURE RELIEF/DISPENSE valves. Secure supplied bleed tubes (N) in grounded, sealed waste containers (H). See Fig. 1, page 16.



### 7. Connect hose

- a. Turn main power OFF .
- b. Assemble fluid supply hose sections and whip hose.
- c. Connect A (Red) and B (Blue) hoses to A (Red) and B (Blue) outlets on HFR fluid manifold (FM). Hoses are color coded: red for component A, blue for component B. Fittings are sized to prevent connection errors.

### 8. Connect air tubes from solenoid valve to MD2.



**NOTICE**  
To avoid improper machine operation, ensure the open and close ports of the MD2 are connected to the proper open and close ports of the valve.

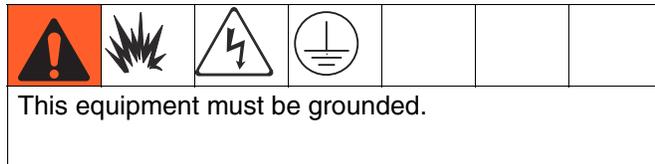
- a. Route the airlines following the material hoses.

## 9. Connect whip hose to MD2 valve component A (Red) and component B (Blue) fluid inlets.

## 10. Pressure check hose

Pressure check hoses for leaks. If no leaks, secure the hoses and airlines together to protect from damage.

## 11. Ground system



- HFR*: grounded through power cord. See step 3 on page 29.
- Fluid supply containers*: follow your local code.
- Object being dispensed*: follow your local code.
- Solvent pails used when flushing*: follow your local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.
- To maintain grounding continuity when flushing or relieving pressure*, hold a metal part of dispense gun firmly to the side of a grounded metal pail, then trigger gun.

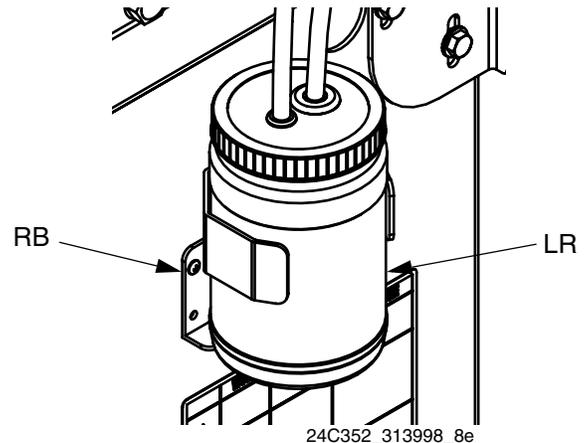
## 12. Check hydraulic fluid level

Hydraulic reservoir is filled at the factory. Check fluid level before operating the first time, and weekly thereafter. See **Accessories** on page 91 for specifications.

## 13. IsoGuard Select Fluid system setup (Not included on HFRS models)

**Component A (Red) Pump:** Fill IsoGuard Select reservoir (LR) with IsoGuard Select fluid (provided by Graco).

- Lift the reservoir (LR) out of the bracket (RB) and remove the container from the cap.



- Fill with fresh fluid. Thread the reservoir onto the cap assembly and place it in the bracket (RB).
- Push the supply tube approximately 1/3 of the way into the reservoir. The supply tube is the tube with the check valve with an arrow pointing in the direction of flow towards the IsoGuard Select fluid cylinder.
- Push the return tube into the reservoir until it reaches the bottom. The return tube is the tube with the check valve with an arrow pointing in the direction of flow away from the IsoGuard Select fluid cylinder.

**NOTE:** The return tube must reach the bottom of the reservoir to ensure that isocyanate crystals will settle to the bottom and not be siphoned into the supply tube and returned to the pump.

## 14. Prime IsoGuard Select fluid cylinder

The IsoGuard Select fluid cylinder must be primed when replacing IsoGuard Select fluid. See **IsoGuard Select™ System** on page 47 for instructions.

### 15. Install dispense valve



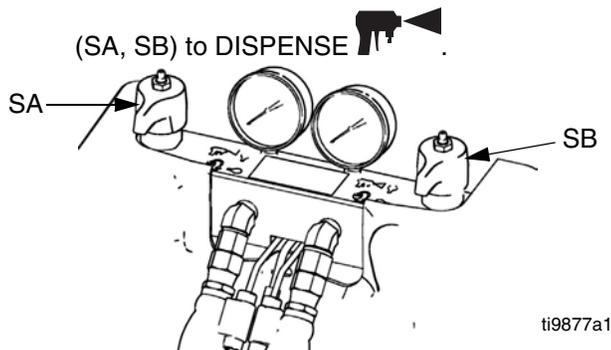
- Navigate to System Screen 2 and select the MD2 dispense valve from the “Dispense Valve” drop down menu. See **System Screen 2** on page 62.
- Set pressure relief valves (SA, SB) to RELIEF.
- If dispense valve has a trigger safety lock, engage the trigger safety lock.



**LOCKED**

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- Connect gun to machine. Verify gun is ready for operation. See appropriate gun manual listed in **Related Manuals** on page 3 for detailed instructions.
- Verify airline is connected to the dispense valve then open bleed-type master air line valve.
- Set PRESSURE RELIEF/DISPENSE valves



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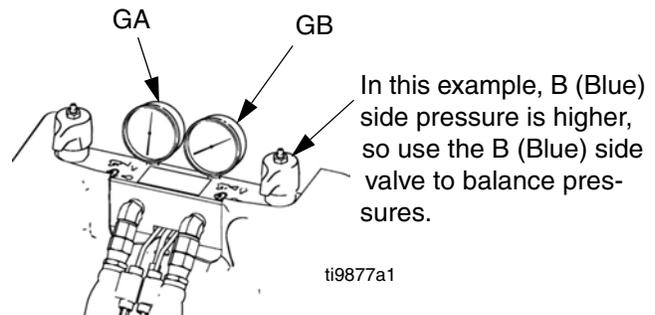
- Press  to enable system. LED should be solid green.
- Check fluid pressure display and adjust as necessary.

- If equipped, check fluid pressure gauges (GA, GB) to ensure proper pressure balance. If imbalanced, reduce pressure of higher component by **slightly** turning PRESSURE RELIEF/DISPENSE valve for that component toward PRESSURE RELIEF/CIRCULATION



, until gauges show balanced pressures.

**NOTE:** For systems without gauges, pressures can be monitored on the home screen of the ADM.



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- If dispense valve has a trigger safety lock, disengage the trigger safety lock.



**UNLOCKED**

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- Perform mix ratio test using two tared cups. Weigh the cups and divide the weights to verify the mix ratio by weight. See Ratio Checking section in the dispense valve manual for more information.
- Equipment is ready to dispense.

# Operation

## Startup

Do not operate HFR without all covers and shrouds in place.						

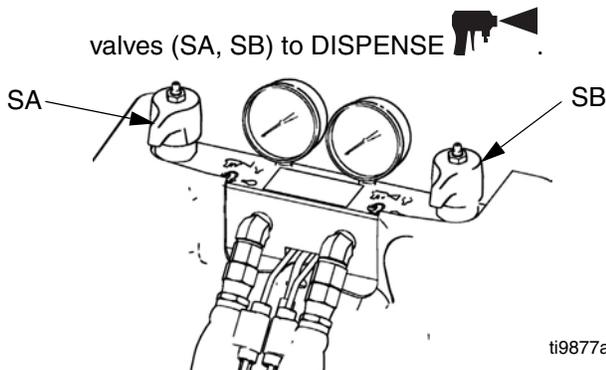
### 1. Use feed pumps to load fluid

**NOTE:** The HFR is tested with oil at the factory. Flush out the oil with a compatible solvent before dispensing. See **Flushing** on page 39.

- Check that all machine connections are setup. See **Setup** procedure, page 29.
- Verify both feed supply systems and the HFR are connected to an air supply.
- Verify the machine is ON.
- If applicable, check that inlet screens are clean before daily startup, see page 46.

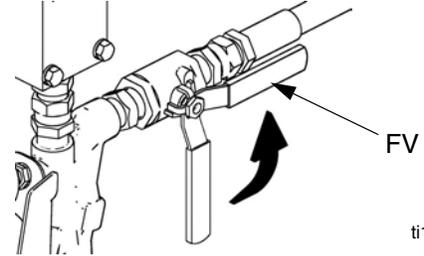
**NOTE:** There are no inlet screens on systems equipped with fluid pressure regulators.

- If equipped, check level and condition of ISO lube daily, see **IsoGuard Select™ System** on page 47.
- Turn both PRESSURE RELIEF/DISPENSE valves (SA, SB) to DISPENSE



- Start feed pumps.

- Open fluid inlet valves (FV), if equipped. Check for leaks.



ti10002a1

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

- Prime material regulators with fluid. Refer to **Adjusting Material Inlet Pressure Using the Material Regulator** on page 40.
- Use feed pumps to load system.
- Hold MD2 valve nose piece, without a mixer installed, over two grounded waste containers. Leave mixer off and trigger gun until both fluids flow freely from the nose piece without any air.
- To prime the pump, cycle the pump a few times or until air-free fluid dispenses.

## 2. Calibrate HFR

The HFR calibration procedure is a two step process. The first step, Learn Mode, must be performed whenever the pump line is rebuilt or if any other maintenance is performed that may affect the mechanical tolerances in the pump line. If the machine does not appear to be utilizing the full extent of the pump stroke, or if the machine appears to be contacting the end of the hydraulic cylinder, follow the Learn Mode procedure. The Learn Mode procedure will teach the system the mechanical limits of travel.

### Learn Mode Procedure:

- a. Navigate to the Calibration screen.
- b. Place a waste container below the dispense valve. The next steps will cause the machine to dispense material.



- c. Press the go right button  and then the dispense button . The pump will travel to the right most extreme position.
- d. After the pump stops moving, press the go left button  and then press the dispense button . The pump will travel to the left most extreme position.
- e. After the pump stops moving, press the continue button  to go on to the next step in the calibration process or the page back button  to return to the main Calibration screen.

**NOTE:** During this process, the system learned the mechanical limits of travel. If the pump did not reach both the left and right extreme limits for any reason, repeat the procedure.

If the system is to be used in a Time or Volume Dispense Mode, system calibration is complete after the Learn Mode procedure described above. However, if the system is to be used in Weight Dispense mode and the application requires that the dispense amount be accurate and consistent then the weight calibration procedure below must be followed.

### Weight Calibration Procedure:

**NOTE:** Only perform Weight Calibration procedure if the system will be run in Weight Dispense mode.

The Weight Calibration procedure must be run with the system production-ready. Orifice sizes and hose lengths must be finalized, material should be at temperature and any conditioning zones that will be on during production should be turned on. Any variation in system setup between when this procedure is run and the production environment will result in a decrease in system dispense accuracy.

- a. Navigate to the Weight Calibration screen .
- b. Navigate to the Cal. Setpoint text box then enter the desired set point (pressure or flow, based on selected Control Mode).
- c. Press .
- d. Put a waste container under the dispense valve.
- e. Press  or the footswitch to start the system characterization process. The pump will start to operate at the entered setpoint until it learns the proper control parameters, then repeat the process at 60% of that value. When it is complete, the  icon will change back to .
- f. Press  again to deactivate.
- g. Select the Cal. Point 1 of 2 text box under the scale graphic.
- h. With a waste container under the dispense valve, press  or the footswitch to dispense a Cal. 1 shot. Discard the dispensed material.

- i. Select the Cal. 1 Shot Average field then press  to erase the value.
- j. Select the Cal. Point 1 of 2 text box.
- k. Press  or the footswitch to dispense a Cal. 1 shot.
- l. Weight the material dispensed and enter the weight in the text box.
- m. Repeat the previous two steps three more times. The logic will automatically average the readings and provide the result in the second text box in the row.
- n. Select the Cal. Point 2 of 2 text box under the scale graphic.
- o. Press  or the footswitch to dispense a Cal. 2 shot.
- p. Weight the dispensed material and enter the weight in the text box.
- q. Repeat the previous two steps three more times. The logic will automatically average the readings and provide the result in the second text box in the row.
- r. Press .

The system is now able to dispense accurate material amounts for the setpoint provided during the process. If a weight dispense operation uses a setpoint significantly different from the setpoint used in during calibration an advisory will be provided to inform the user that the dispense accuracy may be degraded.

**3. Set system control and dispense modes:** See **System Screen 1** on page 61.

**4. Set pump sizes:** See **System Screen 1** on page 61.

**5. Define Shot Recipes**

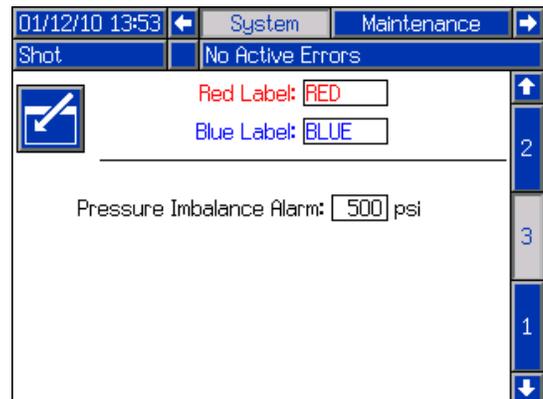
- a. Navigate to the Shots screen.
- b. Press  to enter the screen.
- c. Use the directional keypad to navigate to the shot detail column for the desired shot number.
- d. Type the desired setting for that item then press .
- e. Repeat the previous two steps for all desired shot numbers.

**6. Change pressure imbalance setting (optional)**

The pressure imbalance function detects conditions that can cause off-ratio dispense, such as loss of feed pressure/supply, pump seal failure, clogged fluid inlet filter, or a fluid leak.

The pressure imbalance default is factory-set at 500 psi (3.4 MPa, 34 bar). For tighter ratio error detection, select a lower value. For looser detection or to avoid nuisance alarms, input a higher value.

- a. Navigate to System Screen 3.
- b. Press  to enter the screen.
- c. Navigate to the pressure imbalance field.
- d. Type the desired pressure imbalance setting then press Enter .



## Shutdown



1. Park pumps.

a. From the Home screen, press  and select Standby mode.

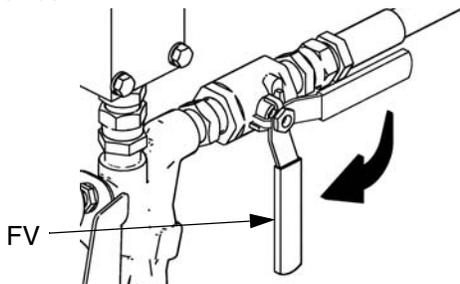
b. Press . Material will dispense. Pump will park automatically. Once pump is parked, pump will stop moving.

**If a dispense gun with a trigger is installed,** pulling the trigger will begin a park operation. Material will dispense.

2. Press the enable/disable key on the ADM  to disable the ADM.

3. Turn main power switch (MP) to OFF position.

4. Close A (Red) and B (Blue) fluid supply valves (FV), if equipped, or remove fluid pressure at supply device.



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5. Perform **Pressure Relief Procedure** on page 38.

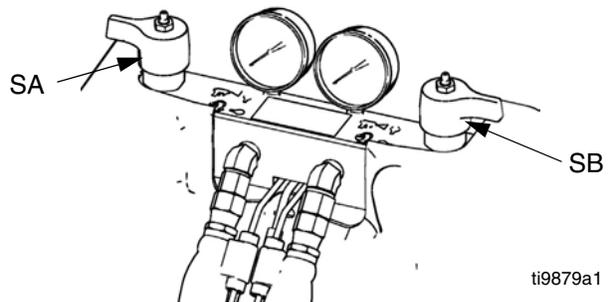
6. Shut down feed pumps as required. See feed pump manual.

## Pressure Relief Procedure



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

2. Turn PRESSURE RELIEF/DISPENSE valves (SA, SB) to PRESSURE RELIEF/CIRCULATION . Route fluid to waste containers or supply tanks. Ensure gauges drop to 0.



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3. **For models with an dispense valve with a safety lock,** engage gun safety lock.

4. Relieve pressure in dispense valve. See dispense valve manual.

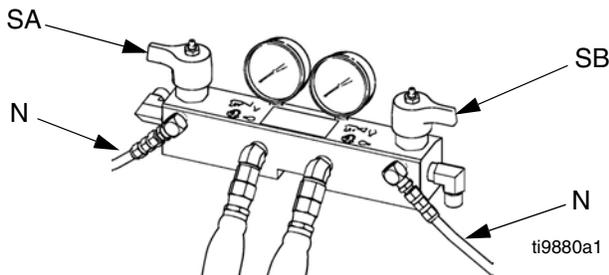
# Flushing

						
<p>Flush equipment only in a well-ventilated area. Do not dispense flammable fluids. Do not turn on heaters while flushing with flammable solvents.</p>						

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

- 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. Use only moisture-free solvents. See **Accessories** on page 91 for list of wetted components to verify compatibility of solvent with wetted materials. See solvent manufacturers information for material compatibility.
- To flush feed hoses, pumps, and heaters separately from heated hoses, set PRESSURE RELIEF/DIS-PENSE 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 dry or filled with a moisture-free plasticizer or oil. Do not use water. See **Important Two-Component Material Information** on page 14.
- *Solvent pails used when flushing:* follow your local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.

## Adjusting Material Inlet Pressure Using the Material Regulator



### NOTICE

Care must be taken when applying pressure to systems equipped with a material pressure regulator on the inlet assembly. Read both operation and service manuals for the pump/ram supply system and the material pressure regulator prior to loading material to the HFR system.

Use the following procedure to adjust the material pressure to the system. 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 the air pressure is provided to the material regulators and that the air gauge on both regulators are functioning properly.
2. Adjust the air pressure on both material regulators so that there is no air pressure on them and that the regulator pressure gauge reads zero.
3. Verify that the material supply pump does not provide material pressure in excess of 3000 psi (21 MPa, 207 bar).

### NOTICE

Although the material regulator itself is rated for 5000 psi (35 MPa, 345 bar), the assembly provided is only rated for do not exceed 3000 psi (21 MPa, 207 bar)

4. Verify that there is no pressure in the material supply pump.
5. Connect the feed hose from material supply system to the inlet assembly and make sure all fittings are fluid tight.
6. Gradually increase the air pressure to the supply pump to provide no more than 3000 psi (21 MPa, 207 bar) material pressure to the inlet regulator assembly.
7. Place a container at the outlet of the relief lines from the manifold assembly and secure the lines in place.

8. Place the pressure relief valve on the manifold into the recirculation position.
9. Slowly increase the air pressure on the material regulator to allow material to flow though the pump and out the bleed hose. The required material pressure will vary depending on the material viscosity and flow rate.
10. Once material is flowing from the bleed hose, slowly decrease pressure on the material regulator until flow stops.
11. Gradually increase pressure to the material regulator until material begins to flow again
12. When material begins to flow out of the bleed port, close the pressure relief valve.

**NOTE:** Record the material 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 HFR pumps.

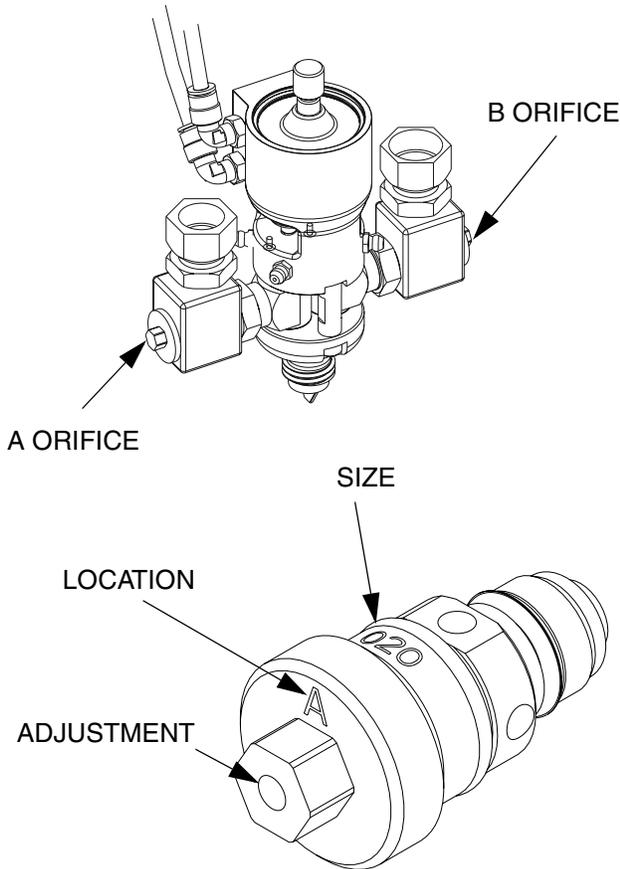
### NOTICE

The material 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 38.

## Pressure Balancing Using the Orifice Valve Assemblies



The MD2 valve for HFRL and HFRS systems is provided with orifice valve blocks on both of the inlet ports. The orifice blocks are assembled at the factory with no orifices installed. An orifice kit is provided with a range of orifice sizes to balance pressures. The orifice size is etched on the side of the orifice body and there are two orifices provided in each size. One of the orifices in each size will be stamped on the hex end with an "A". Use the orifices stamped with the "A" in the RED side orifice block. The orifices with no letter etched on the hex end are to be used on the BLUE side.



Orifices can be installed in one or both orifice blocks as a tool to increase the outlet pressure in the corresponding material hose. The orifice valves are equipped with a needle valve that can be adjusted with the provided allen wrench.

1. Before installing, insert the allen wrench into the hex end of the orifice valve to adjust the needle position.
2. Verify the needle valve is in the fully open position by turning counter-clockwise until rotation stops. After installation, the needle valve can be turned clockwise to further increase pressure.

**NOTE:** Always run the material first at the desired flow rate with no orifice valves installed to evaluate the dispense pressures generated for each material.

**NOTE:** Appropriate orifice valve selection is essentially done by trial. The following can help determine if it is necessary to increase the outlet pressure and help select an orifice.

- a. The outlet pressure for heavy-paste viscosity materials should be at least 2 times higher than the z-pump feed pressure (as determined by the material pressure regulator). Max outlet pressure is equal to 3000 psi (21 MPa, 207 bar) and the feed pressure should be below 1500 psi (10 MPa, 103 bar).
  - b. The outlet pressure for lower viscosity-flowable materials should be 3-4 times higher than the z-pump feed pressure. Dispense pressures for this viscosity range should be in the 750 psi (5 MPa, 52 bar) to 1000 psi (7 MPa, 69 bar) range.
  - c. The outlet pressures of both material hoses should be as close as possible to each other and within a suggested range of 10%. See **System Screen 3**, page 63.
3. Install orifice valves only if the outlet pressure needs to be increased. See **Maintenance** starting on page 43 for details.
  4. If rule a and b above are met by both materials, install an orifice valve in the lower pressure side, only if required to balance the outlet pressures.
  5. If neither rule a or rule above are met by either material, install an orifice valve in both orifice blocks to raise the pressure and allow pressure balancing.

**NOTE:** In general, the flow area ratio of the orifice valves should be equal to the material ratio, but it will also be influenced by differences between "A" and "B" material viscosities and flow characteristics. For flow-able materials, start with a smaller orifice combination to increase pressure. For heavy viscosity, paste materials, start with a larger orifice combination. It is desirable for the orifice to do the majority of the pressure adjustment, as this will result in the most stable system. Adjustments of the needle valve (if used) will require periodic adjustment.

**NOTICE**

Not properly maintaining the pressure differential between inlet and dispense pressures may cause inconsistent pump output. Adjust the needle valves periodically to maintain pressures.

Available Orifice Flow Area Ratios																	
Dia- meter	0.016	0.020*	0.024	0.028	0.031*	0.035	0.039	0.042	0.047*	0.052	0.055	0.060*	0.063	0.067*	0.073	0.086*	Flowrate Increases as Diameter Increases=>
<b>0.016</b>	1.0	1.6	2.3	3.1	3.8	4.8	5.9	6.9	8.6	10.6	11.8	14.1	15.5	17.5	20.8	28.9	
<b>0.020*</b>	1.6	1.0	1.4	2.0	2.4	3.1	3.8	4.4	5.5	6.8	7.6	9.0	9.9	11.2	13.3	18.5	
<b>0.024</b>	2.3	1.4	1.0	1.4	1.7	2.1	2.6	3.1	3.8	4.7	5.3	6.3	6.9	7.8	9.3	12.8	
<b>0.028</b>	3.1	2.0	1.4	1.0	1.2	1.6	1.9	2.3	2.8	3.4	3.9	4.6	5.1	5.7	6.8	9.4	
<b>0.031*</b>	3.8	2.4	1.7	1.2	1.0	1.3	1.6	1.8	2.3	2.8	3.1	3.7	4.1	4.7	5.5	7.7	
<b>0.035</b>	4.8	3.1	2.1	1.6	1.3	1.0	1.2	1.4	1.8	2.2	2.5	2.9	3.2	3.7	4.4	6.0	
<b>0.039</b>	5.9	3.8	2.6	1.9	1.6	1.2	1.0	1.2	1.5	1.8	2.0	2.4	2.6	3.0	3.5	4.9	
<b>0.042</b>	6.9	4.4	3.1	2.3	1.8	1.4	1.2	1.0	1.3	1.5	1.7	2.0	2.3	2.5	3.0	4.2	
<b>0.047*</b>	8.6	5.5	3.8	2.8	2.3	1.8	1.5	1.3	1.0	1.2	1.4	1.6	1.8	2.0	2.4	3.3	
<b>0.052</b>	10.6	6.8	4.7	3.4	2.8	2.2	1.8	1.5	1.2	1.0	1.1	1.3	1.5	1.7	2.0	2.7	
<b>0.055</b>	11.8	7.6	5.3	3.9	3.1	2.5	2.0	1.7	1.4	1.1	1.0	1.2	1.3	1.5	1.8	2.4	
<b>0.060*</b>	14.1	9.0	6.3	4.6	3.7	2.9	2.4	2.0	1.6	1.3	1.2	1.0	1.1	1.2	1.5	2.1	
<b>0.063</b>	15.5	9.9	6.9	5.1	4.1	3.2	2.6	2.3	1.8	1.5	1.3	1.1	1.0	1.1	1.3	1.9	
<b>0.067*</b>	17.5	11.2	7.8	5.7	4.7	3.7	3.0	2.5	2.0	1.7	1.5	1.2	1.1	1.0	1.2	1.6	
<b>0.073</b>	20.8	13.3	9.3	6.8	5.5	4.4	3.5	3.0	2.4	2.0	1.8	1.5	1.3	1.2	1.0	1.4	
<b>0.086*</b>	28.9	18.5	12.8	9.4	7.7	6.0	4.9	4.2	3.3	2.7	2.4	2.1	1.9	1.6	1.4	1.0	
<b>Flowrate Increases as Diameter Increases =&gt;</b>																	

\* Item included in kit 24E250

# Maintenance



Task	Schedule
Change break-in oil in a new unit	After first 250 hours of operation or within 3 months, whichever comes first
Inspect hydraulic and fluid lines for leaks	Daily
If equipped, inspect fluid inlet strainer screens, page 46	Daily
If equipped, inspect IsoGuard Select™ fluid level and condition, refill or replace as needed, page 47	Daily
Check hydraulic fluid level	Weekly
Grease circulation valves with Fusion grease (117773)	Weekly
Verify operation of air drying system to prevent isocyanate crystallization	Weekly
Inspect air filter (part 24H018), clean or replace as necessary,	Daily
Use compressed air to remove dust buildup on control boards, fan, motor (under shield), and hydraulic oil coolers	Monthly
Clean up all hydraulic leaks; identify and repair cause of leak	As needed
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

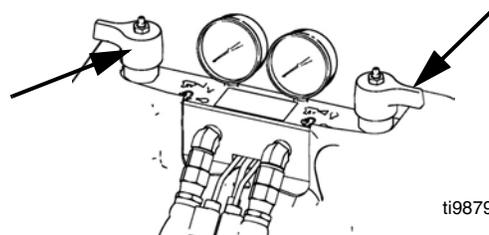
## Change Break-in Oil

After initial break-in, see Table 5 for recommended frequency of oil changes.

**Table 2: Frequency of Oil Changes**

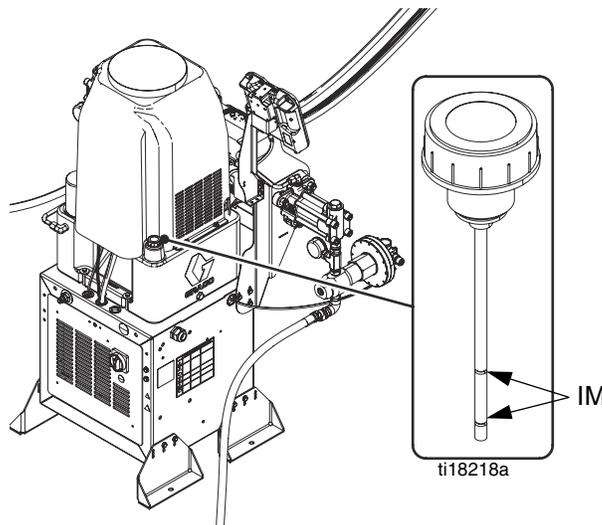
Ambient Temperature	Recommended Frequency
0 to 90°F (-17 to 32°C)	1000 hours or 12 months, whichever comes first
90°F and above (32°C and above)	500 hours or 6 months, whichever comes first

## Grease Circulation Valves With Fusion Grease (117773)



## Check Hydraulic Fluid Level

Check hydraulic fluid level on dipstick. Fluid level must be between indent marks (IM) on dipstick. Refill as required with approved hydraulic fluid; see **Accessories** on page 91. If fluid is dark in color, change fluid and filter.



## Advanced Display Module (ADM)



### Replace Battery

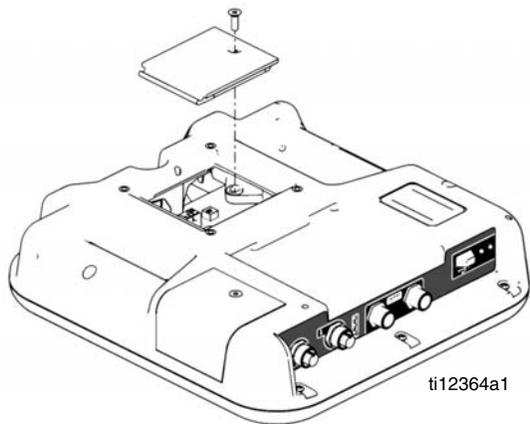
A lithium battery maintains the ADM clock when power is not connected.

To replace the battery:

1. Disconnect power to the ADM.

**NOTE:** This can be done by removing the CAN cable from the bottom of the ADM.

2. Remove rear access panel.



3. Remove the old battery and replace with a new CR2032 battery.
4. Properly dispose the old lithium battery according to local codes.
5. Replace rear access panel.
6. Connect the power to the ADM and reset the clock through **Advanced Screen 1**. Refer to **Appendix B - ADM Setup Screens Overview** for more detail.

### Install Upgrade Token

To install software upgrades:

1. Use software token 16H821. See Graco Control Architecture™ Module Programming manual for instructions.

**NOTE: Upgrade all modules in the system to the software version on the token, even if you are replacing only one or two modules. Different software versions may not be compatible.**

**All data in the module (System Settings, USB Logs, Recipes, Maintenance Counters) may be reset to factory default settings. Download all settings and user preferences to a USB before the upgrade, for ease of restoring them following the upgrade.**

**The latest software version for each system can be found at [www.graco.com](http://www.graco.com).**

### Cleaning

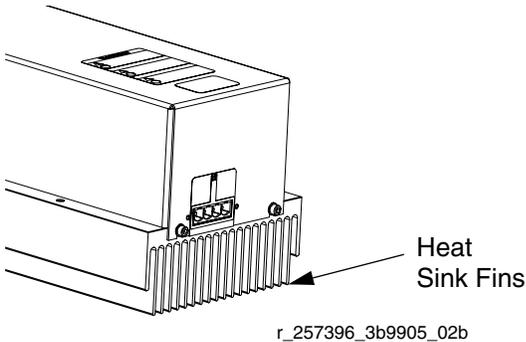
Use any alcohol-based household cleaner, such as glass cleaner, to clean the ADM. Spray on the rag then wipe ADM. Do not directly spray the ADM.

## Motor Control Module (MCM)



Keep heat sink fins clean at all times. Clean them using compressed air.

**NOTE:** Do not use conductive cleaning solvents on the module.



**FIG. 14: Clean Heat Sink Fins**

## Install Upgrade Token

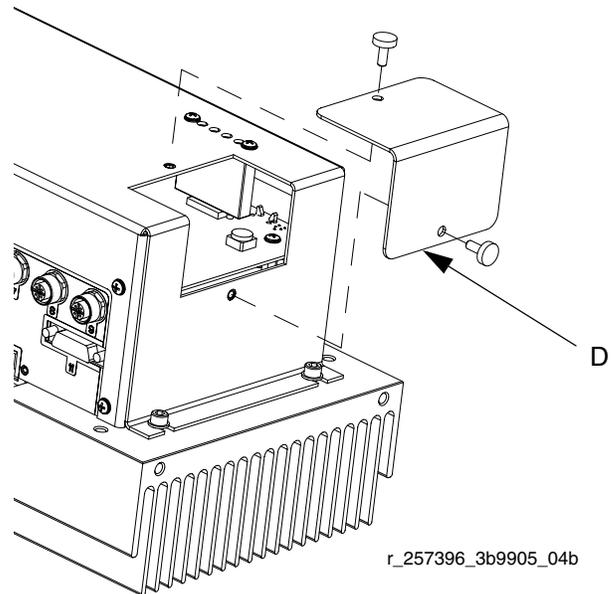
**NOTE:** The MCM connection to the system is temporarily disabled during the installation of upgrade tokens.

1. Use software token 16H821. See Graco Control Architecture™ Module Programming manual for instructions.

**NOTE:** Upgrade all modules in the system to the software version on the token, even if you are replacing only one or two modules. Different software versions may not be compatible.

**All data in the module (System Settings, USB Logs, Recipes, Maintenance Counters) may be reset to factory default settings. Download all settings and user preferences to a USB before the upgrade, for ease of restoring them following the upgrade.**

**The latest software version for each system can be found at [www.graco.com](http://www.graco.com).**



**FIG. 15: Remove Access Cover**

## Fluid Control Module (FCM)



### Install Upgrade and Key Tokens

**NOTE:** FCM connection to system is temporarily disabled during the installation of upgrade or key tokens.

1. Use software token 16H821. See Graco Control Architecture™ Module Programming manual for instructions.

**NOTE:** Upgrade all modules in the system to the software version on the token, even if you are replacing only one or two modules. Different software versions may not be compatible.

All data in the module (System Settings, USB Logs, Recipes, Maintenance Counters) may be reset to factory default settings. Download all settings and user preferences to a USB before the upgrade, for ease of restoring them following the upgrade.

The latest software version for each system can be found at [www.graco.com](http://www.graco.com).

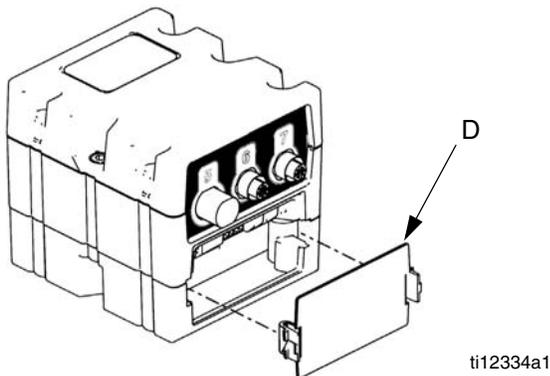


FIG. 16

## Fluid Inlet Strainer Screen

(Not included on HFRS systems)



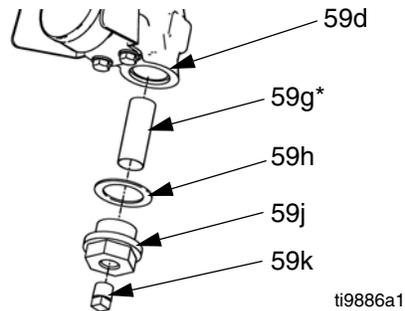
The inlet strainers filter out particles that can plug the pump inlet check valves. Inspect the screens daily as part of the startup routine, and clean as required. The standard strainer is 20 mesh.

Use clean chemicals and follow proper storage, transfer, and operating procedures, to minimize 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. Perform **Pressure Relief Procedure** on page 38.
2. 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.
3. Place a container under the strainer manifold (59d) to catch fluid. Remove the strainer plug (59j).
4. Remove the screen (59g) from the strainer manifold. Thoroughly flush the screen with compatible solvent and shake it dry. Inspect the screen. If more than 25% of the mesh is blocked, replace the screen. Inspect the gasket (59h) and replace as required.
5. Ensure the pipe plug (59k) is screwed into the strainer plug (59j). Install the strainer plug with the screen (59g) and gasket (59h) in place and tighten. Do not overtighten. Let the gasket make the seal.

6. Open the fluid inlet valve, ensure that there are no leaks, and wipe the equipment clean. Proceed with operation.



**FIG. 17. Fluid Inlet Strainer**

## IsoGuard Select™ System

(Not included on HFERS systems)



**NOTE:** The IsoGuard Select system is included on all HFRL systems. It is available separately for HFERS systems as kit 24M154.

Check the condition of the A (Red) pump IsoGuard Select fluid daily. Change the fluid if it becomes a gel, its color darkens, or it becomes diluted with isocyanate.

Gel formation is due to moisture absorption by the pump IsoGuard Select fluid. 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.

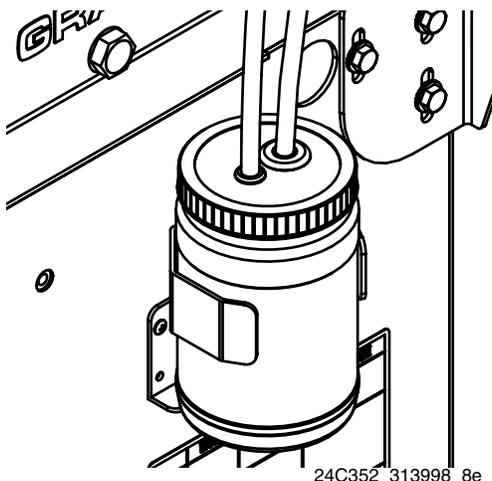
Fluid discoloration is due to continual seepage of small amounts of isocyanate past the pump packings during operation. If the packings are operating properly, IsoGuard Select fluid replacement due to discoloration should not be necessary more often than every 3 or 4 weeks.

To change pump IsoGuard Select fluid:

1. Perform **Pressure Relief Procedure** on page 38.
2. Remove fittings from IsoGuard Select fluid cylinder inlet and outlet ports. Keep supply tube (ST), return tube (RT), and leak management tube (LT) connected to the fittings.
3. Carefully place ends of tubes with fittings still connected into an empty pail to drain IsoGuard Select fluid.
4. Lift the IsoGuard Select fluid reservoir (LR) out of the bracket (RB) and remove the container from the cap. Holding the cap over a suitable container, remove the inlet check valve and allow the IsoGuard Select fluid to drain. Reattach the check valve to the inlet hose. See FIG. 18.
5. Drain the reservoir and flush it with clean IsoGuard Select fluid.
6. When the reservoir is flushed clean, fill with fresh IsoGuard Select fluid.

7. Thread the reservoir onto the cap assembly and place it in the bracket (RB).
8. Push the supply tube (ST) approximately 1/3 of the way into the reservoir.
9. Push the return tube (RT) into the reservoir until it reaches the bottom.

**NOTE:** The return tube must reach the bottom of the reservoir, to ensure that isocyanate crystals will settle to the bottom and not be siphoned into the supply tube and returned to the pump.



**FIG. 18: IsoGuard Select Fluid System**

### Prime IsoGuard Select Fluid Cylinder

Ensure that the IsoGuard Select fluid cylinder outlet faces upward for air to exhaust.

1. Install IsoGuard Select fluid cylinder inlet fitting and inlet tube into bottom of cylinder. The inlet tube is the tube with a check valve installed in it which points in the direction of flow towards the IsoGuard Select fluid cylinder.
2. Install IsoGuard Select fluid cylinder outlet fitting and outlet tube into top of cylinder. The outlet tube is the tube with a check valve installed in it which points in the direction of flow away from the IsoGuard Select fluid cylinder.
3. Remove check valve from end of outlet tube.
4. Use funnel to pour IsoGuard Select fluid into tube to fill cylinder.
5. With check valve arrow pointing away from the IsoGuard Select fluid cylinder, install check valve in end of outlet tube.
6. Install tubes into reservoir and install reservoir into holder.

### Clean Orifice Valves

Only for MD2 Valve using Orifice Block Kit 24E505 and an orifice.

**NOTE:** 24E505 does not come with an orifice.

1. Follow **Pressure Relief Procedure** in MD2 valve manual.
2. Use 5/16 in. nut driver to remove orifices.

**NOTICE**

To prevent cross-contamination of the orifices, do not interchange A component and B component parts. The A component orifice is marked with an A.

3. Remove cap from orifice.
4. Remove needle from orifice. Thoroughly inspect all o-rings and replace if necessary.
5. If necessary, use drill bit that is the same size as the orifice to drill out the orifice. Orifice size is marked on the orifice.
6. Liberally lubricate all o-rings.
7. Reassemble in reverse order. Torque orifices into fluid housing to 20-30 in-lb (2.26-3.39 N•m).

# Troubleshooting



Before performing any troubleshooting procedure:

1. Perform **Pressure Relief Procedure** on page 38.
2. Turn main power OFF.
3. Allow equipment to cool.

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.

## Light Tower (Optional)

Signal	Description
Green on only	System is powered up and there are no error conditions present
Yellow on	An advisory exists
Red flashing	A deviation exists
Red on	The system is shut down due to an alarm occurring.

Errors include advisories, deviations, or alarms, so green will only be on when none of these occur. A yellow light can be on at the same time as red (flashing or solid on) when an advisory exists at the same time as a deviation or alarm.

## Common Problems

Problem	Cause	Solution
<b>General</b>		
Display Module completely dark	No Power	Verify AC Power switch is ON
	Thrown Breaker	Check Machines Breakers and Reset
	Loose Connection	Tighten 5-pin cable on Advanced Display Module
	Bad Display Module	Replace Advanced Display Module
No or incorrect amount of material dispensed from either side	Ball Valve closed (if Installed)	Open tank ball valve.
	Tank Empty	Add fluid
	Tank Clogged	Clean tank
	Air In Material	Prime the machine
Significant material leaking from pump seal	Pump shaft worn and/or shaft seal worn	Remove 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 calibration	Run calibration
	Check valve malfunction	Remove check valve; clean or replace as necessary
	Piston worn or broken	Replace Piston
<b>Proportioning System</b>		
Proportioning pump does not hold pressure when stalled	Pump piston or intake valve leaking	<ol style="list-style-type: none"> <li>1. Observe gauges to determine which pump is losing pressure.</li> <li>2. Determine in which direction the pump has stalled by observing which directional valve indicator light is on.</li> <li>3. Repair the valve.</li> </ol>

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Material imbalance.	Inadequate flow from pump; cavitation	Increase fluid supply to proportioning pump: <ul style="list-style-type: none"> <li>• Use 2:1 supply pump</li> <li>• Use minimum 3/4 in. (19 mm) ID supply hose, as short as practical</li> </ul>
		Fluid is too thick. Consult your material supplier for the recommended fluid temperature to maintain a viscosity of 250 to 1500 centipoise.
		Clean inlet strainer screen
		Worn pump inlet valve ball/seat or gasket
	Pressure relief/circulation valve leaking back to supply	Remove return line and determine if flow is present while in SPRAY mode
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 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 3A0019
	Inadequate feed pump pressure	Check feed pump pressure and adjust to 100 psi (0.7 MPa, 7 bar) minimum
<b>Power Supply System</b>		
No power received from DC power supply	Defective power supply	Check circuit breaker. Check power supply. Replace power supply.
No power to MCM, heat zones, or tanks	Circuit breaker is tripping	Check circuit breaker for tripping and defects. Diagnose cause of circuit breaker tripping before resetting it. Replace defective parts if required.

## ADM Troubleshooting

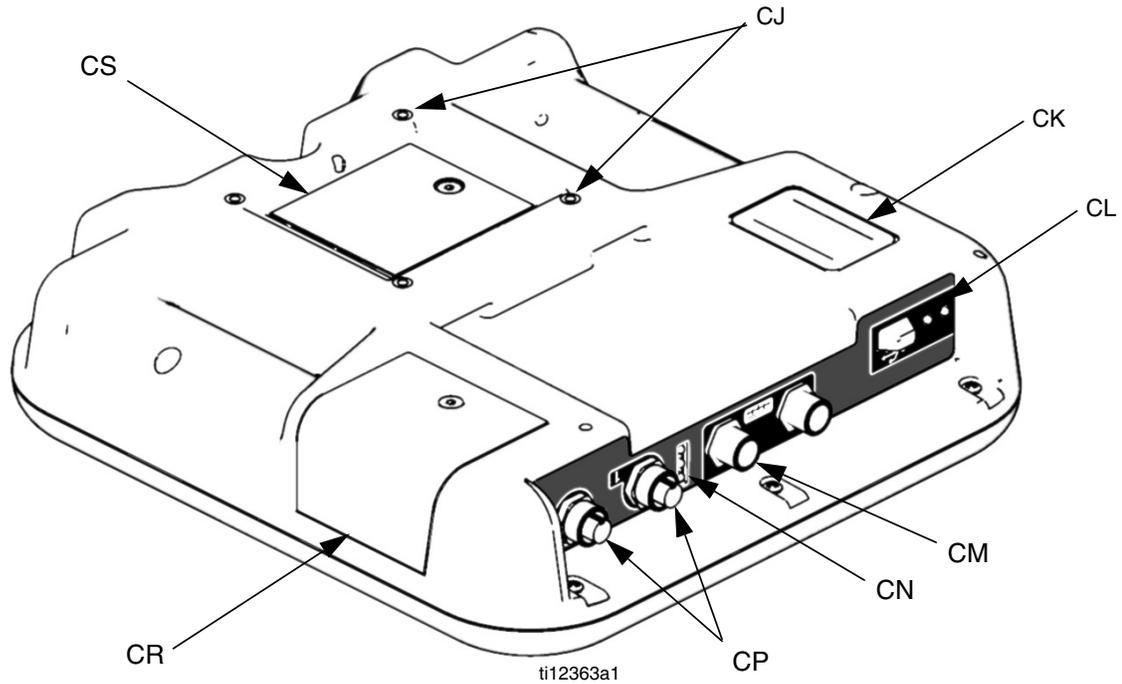


FIG. 19: ADM Component Identification - Rear

### ADM Module Status LEDs (CN) 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 (CL) 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

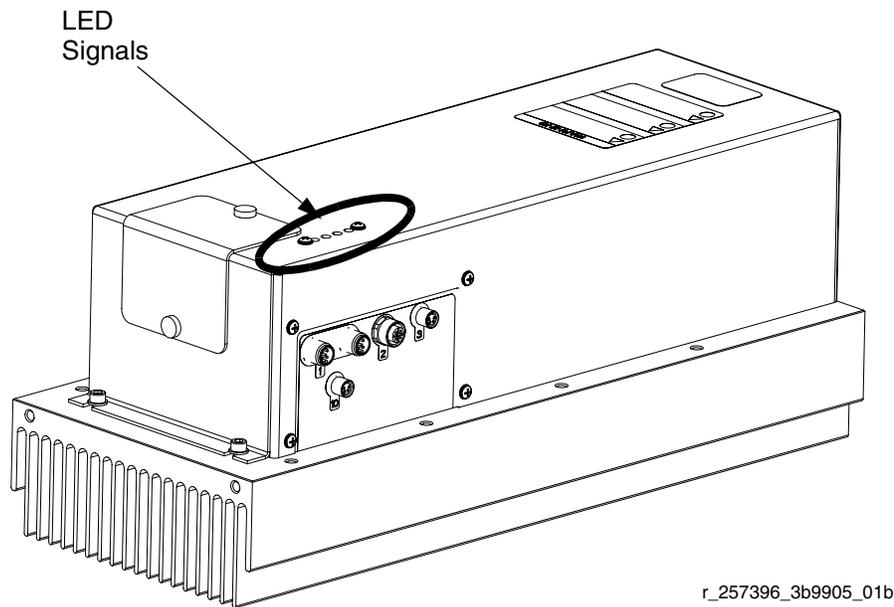
# Motor Control Module

For MCM location, see reference MA in FIG. 4 on page 19.

## Diagnostic Information

**Table 3: LED Status Signal**

Module Status LED Signal	Description
Green on	System is powered up.
Yellow on	Internal communication in progress.
Red solid	MCM hardware failure. Replace MCM.
Red flashing fast	Uploading software.
Red flashing slow	Token error. Remove token and upload software token again.

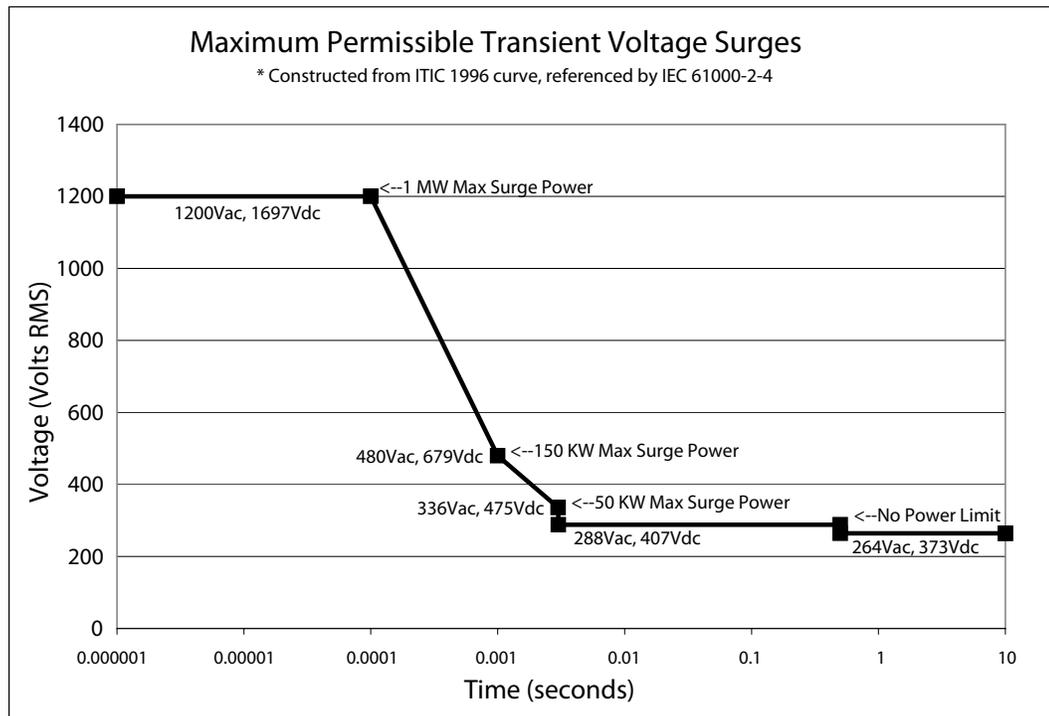


r\_257396\_3b9905\_01b

**FIG. 20: LED Signals**

## Acceptable Size and Duration of Power Line Voltage Fluctuations

The Motor Control Module is designed to withstand voltage fluctuations from the incoming power supply. If the incoming power supply goes outside of the tolerable range, an over-voltage condition is flagged and the system shuts down in an alarm state. Excessive or repeated over-voltage may permanently damage hardware. The chart below shows the permissible magnitude and duration of temporary over-voltage events. Consult a qualified electrician if there are any concerns about the available power supply.



## Fluid Control Module

### Diagnostic Information

Module Status LED Signal	Diagnosis
Green on	System is powered up
Yellow	Internal communication in progress
Red solid	FCM hardware failure. Replace FCM.
Red flashing fast	Uploading software
Red flashing slow	Token error. Remove token and upload software token again.

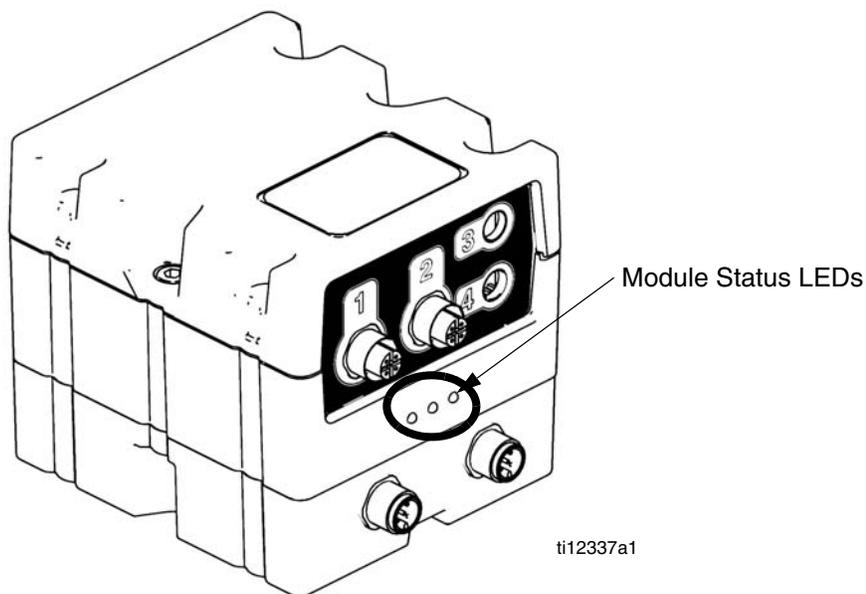


FIG. 21:

# Advanced Display Module (ADM) Operation

When main power is turned on by turning the main power switch (MP) 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 (CB) is illuminated green, see FIG. 7 on page 24. If the System Status Indicator Light is not green, press the ADM Power On/Off (CA)

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

If the machine is in the Disabled mode screen press



repeatedly to select a different operating mode.

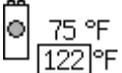
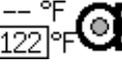
Perform the following tasks to fully setup your system.

1. Set general system settings. See **Advanced Screen 1**, page 67.
2. Set units of measure. See **Advanced Screen 2**, page 67.
3. Enable/disable system features. See **Advanced Screen 3**, page 67.
4. Define control mode, dispense mode, and pump information. See **System Screen 1**, page 61.
5. Define dispense valve and other system settings. See **System Screen 2**, page 62.
6. Define labels and other system settings. See **System Screen 3**, page 63.
7. **If L-Head is installed**, define L-Head control details. See **Mix Head Operating Details Screen**, page 62.
8. Define level sensors and refill settings. See **Supply Screen**, page 64.
9. **If Night mode will be used**, define Night mode settings. See **Conditioning Screen 3**, page 66.
10. Calibrate machine. See **Calibration Screen, Main**, page 60.
11. Define shots. See **Shots Screen**, page 59.
12. Define sequences. See **Sequences Screen**, page 59.
13. If desired, view/reset counters. See **Maintenance Screen**, page 64.

## Appendix A - ADM Icons Overview

Icon	Function
	Access Learn Mode Calibration screen
	Access Weight Calibration and Material Specific Gravity Entry screen
	Pump Graphic
	<b>Calibration Screen, Learn Mode:</b> Move pump  <b>All other screens:</b> Begin Dispense
	Stop Dispense
	Press to enter the Conditioning Control screen
	Select left direction
	Select right direction
	Proceed to next step in calibration procedure
	Back to main calibration screen
	Run MCM Learn Mode
	Erase Individual Data
	Erase All Data
	Abort Changing the Label
	Backspace
	Turn on or off the highlighted zone.
	Turn on or off all zones.

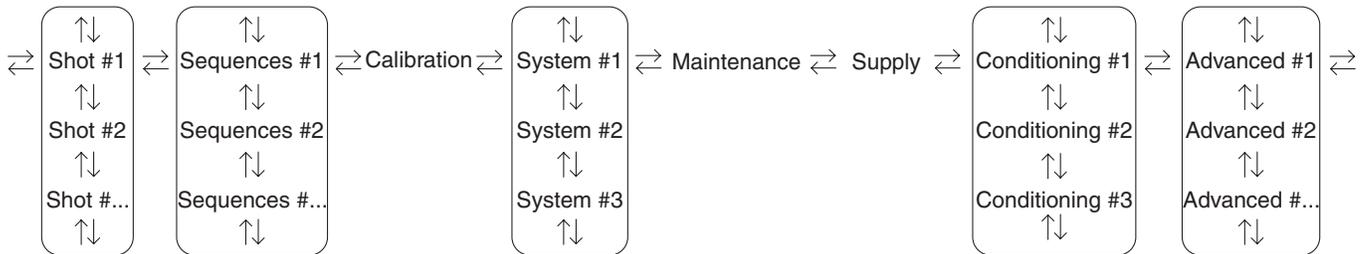
Icon	Function
	Select mode
	Move L-Head Cleanout Rod
	<b>With a mix head installed:</b> Turns on the mix head hydraulics and puts the machine in low pressure circulation.  Press a second time to turn off instigated system action.
	Edit Operator Dispense Setting
	Lock Dispense Valve Closed (Press to lock the valved closed during a dispense. Used to circulate through the material manifold back to the tank (the Pressure Relief/Dispense Valves will need to be in the relief position).
	Open, Close Valve
	A (Red) and B (Blue) refill button (Press to start/abort refill)
 OR	Jump in to select sequence letter and position.
	Skip the next shot in selected sequence. Only available when the system is not dispensing.
	Abort sequence and reset to first valid position
	Set system in park (icon will be selected when system is parked)

Icon	Function
	Tank Blanket Heater
	Primary Heater
	Heated Hose
	Chiller
	Current and setpoint temperature for primary heater. Not displayed if heat zone is not enabled.
	Current and setpoint temperatures for heated hose. Not displayed if heat zone is not enabled.
	Current and setpoint temperatures for tank blanket. Not displayed if heat zone is not enabled.
	Current and setpoint temperatures for chiller. Not displayed if heat zone is not enabled.
	Shot Number
	Sequence Position
	Pressure
	Flow
	Cycles
	Time (Duration)
	Volume
	Amount of material moved through pump (volume tracking)
	Weight
	Average weight for the calibration point

# Appendix B - ADM Setup Screens Overview

The ADM will start in the Run screens at the “Home” screen. From the Run screens, press  to access the Setup screens. If the Setup screens password is turned on, use the ADM keypad to enter the password then press .

From the Setup screens, press  to access the Run screens. For Run screens information, see **Appendix C - ADM Run Screens Overview** on page 68. FIG. 22 shows the flow of the Setup screens.



**FIG. 22: Setup Screens Navigation Diagram**

### Shots Screen

This screen allows the user to edit shot definitions. The contents of this screen change based on the Dispense and Control Mode selections. Shots may be defined by pressure or flow rate depending upon the Control Mode selection and by time (duration), volume, or weight depending upon the Dispense Mode selection. See System Screen #1 for Control and Dispense Mode options. See **Home Screen, Shot Mode** on page 69 for information on how to use predefined shots.

**NOTE:** 100 shot definition are available across ten pages.

To edit a shot definition:

1. Press the Enter screen button  then use the arrow keys to navigate to the desired value.
2. Type the new value then press the Enter button  to accept the new value.

01/12/10 12:48			
← Advanced Shots Sequences →			
Shot No Active Errors			
		⊙(psi)	⊖(s)
1	500	5.00	
2	100	5.00	
3	200	3.00	
4	0	0.00	
5	0	0.00	
6	0	0.00	
7	0	0.00	
8	0	0.00	
9	0	0.00	
10	0	0.00	

### Sequences Screen

This screen allows the user to edit sequence information. The contents of this screen change based on the Dispense and Control Mode selections.

Dispense detail is shown as volume, time, or weight depending on which Dispense Mode is selected. See **System Screen 1** on page 61 for Dispense Mode options. See **Home Screen, Sequence Mode** on page 70 for information on how to use predefined sequences.

**NOTE:** 5 sequences with 20 positions each are available across 10 pages.

To edit a sequence:

1. Press the Enter screen button  then use the arrow keys to navigate to the desired value.
2. Type the new value then press the Enter button  to accept the new value.

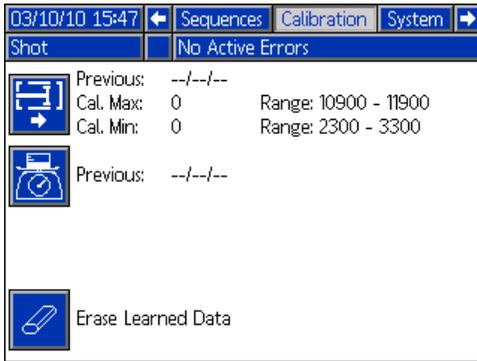
11/15/10 13:41			
← Shots Sequences Calibration →			
Prime No Active Errors			
			⊖(s)
A1	0	0	
A2	0	0	
A3	0	0	
A4	0	0	
A5	0	0	
A6	0	0	
A7	0	0	
A8	0	0	
A9	0	0	
A10	0	0	

### Calibration Screen, Main

This screen shows calibration information for the system and provides access to other calibration screens. See **Calibrate HFR** on page 36 for how to use the calibration screens to calibrate the machine.

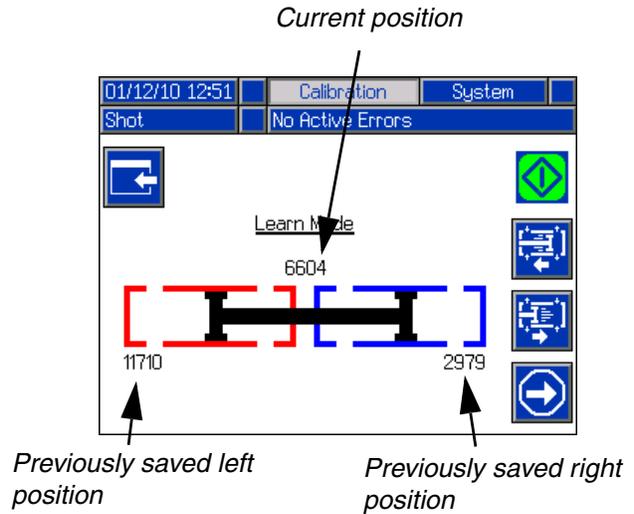
The date next to each key represents the last time that calibration was performed.

The “Cal. Min” and “Cal. Max” values are the system recognized extreme ends of piston travel. See **Calibration Screen, Learn Mode**.



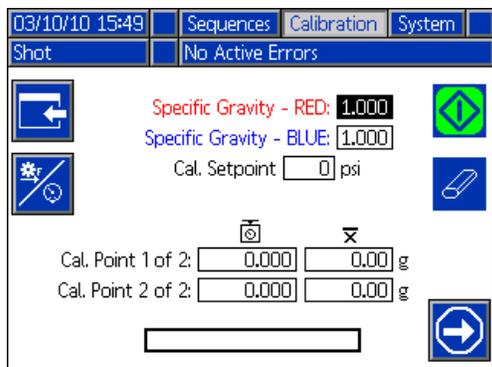
### Calibration Screen, Learn Mode

This screen allows the user to calibrate piston position. The piston can be moved to the left and right to obtain the full range of motion. See **Calibrate HFR** on page 36 for how to use this screen to calibrate the machine.



### Calibration Screen, Specific Gravity

This screen allows the user to enter material specific gravities and perform weight calibration shots. See **Calibrate HFR** on page 36 for how and when to use this screen to calibrate the machine.



### System Screen 1

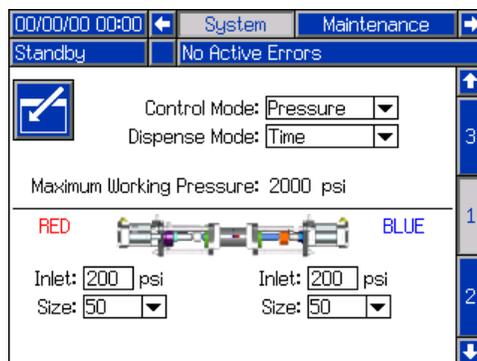
This screen allows the user to set important system settings. Control Mode can be set to Pressure or Flow. With Control Mode set to Pressure, the machine will adjust dispense flow rate in order to maintain the requested pressure. With Control Mode set to Flow, the machine will dispense at a continuous flow rate regardless of pressure fluctuations unless pressure alarm conditions occur.

Dispense Mode can be set to Time, Volume, or Weight. Dispense Mode controls how displayed amounts are measured. If Dispense Mode is set to Weight, then the machine dispenses until the desired weight of material is dispensed. See **Calibrate HFR** on page 36 for more information.

Pump sizes and inlet pressures must be entered on this screen.

If pump sizes and inlet pressures are not entered properly, system performance will be affected. The inlet pressure must be set to the maximum feed pressure that will be seen by that side of the machine.

The maximum working pressure for the machine is displayed on this screen. The maximum working pressure is dependent on the installed hoses and dispense valve. The maximum working pressure is set to the lowest rated system component. If 2000 psi hoses are installed and the maximum working pressure displayed is not 2000 psi, see manual 313998 for instructions to set the maximum working pressure for hoses. If the installed dispense valve rating is below the maximum working pressure shown here, verify the correct dispense valve is selected on System Screen 2.



## System Screen 2

This screen allows the user to set the Gel Timer properties and set which items are installed on the machine.

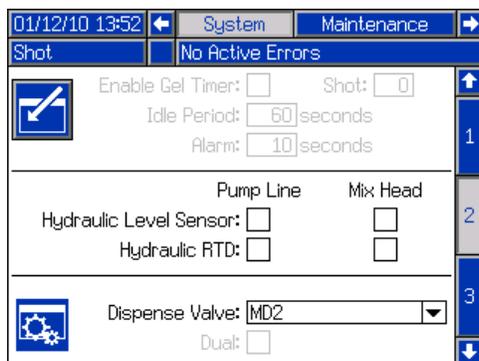
When enabling the Gel Timer, the user must select one of the 100 available shot definitions to use as the Gel Shot. This shot will be dispensed when the Idle Period expires. The Idle Period will begin after a dispense is completed. Any dispense operation in the middle of the timer countdown will reset the Idle Period counter. The system will generate an audible alarm based upon the user Alarm setting. The alarm will sound the user-entered number of seconds before the Idle Period expires.

The hydraulic level sensor and hydraulic RTD for both the pump line and mix head must be marked as enabled when installed in the system. If the sensors are not marked as enabled, they will be ignored by the machine controls.

Select the dispense valve installed in the system. This selection is critical to ensure proper operation of the machine. When a mix head is selected, the Dispense

Valve Details  button will become active. When active, pressing this button will open a screen used to define the mix head operating parameters. See the **Mix Head Operating Details Screen** on page 62.

Selecting the dispense valve will limit the system maximum working pressure to the maximum working pressure of the dispense valve. See **System Screen 1** on page 61.



01/12/10 13:52 System Maintenance

Shot No Active Errors

Enable Gel Timer:  Shot: 0

Idle Period: 60 seconds

Alarm: 10 seconds

	Pump Line	Mix Head
Hydraulic Level Sensor:	<input type="checkbox"/>	<input type="checkbox"/>
Hydraulic RTD:	<input type="checkbox"/>	<input type="checkbox"/>

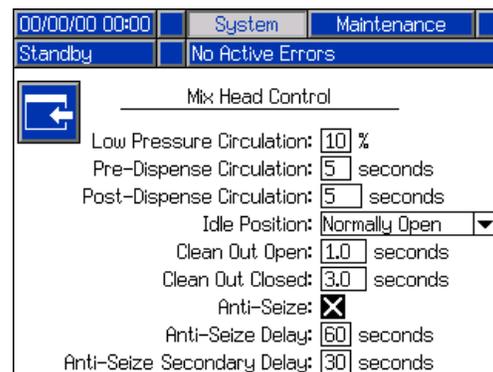
Dispense Valve: MD2

Dual:

## Mix Head Operating Details Screen

This screen allows the user to define the mix head operating parameters.

- **Low Pressure Circulation:** The percentage of set-point at which the system will run during low pressure circulation.
- **Pre-Dispense Circulation:** The time for which the system will circulate at high pressure prior to dispensing when the dispense command is triggered while the system is in low pressure circulation.
- **Post-Dispense Circulation:** The time duration that the system will remain in high pressure circulation after a dispense before dropping into low pressure circulation.
- **Idle Position:** Applies to an L-Head only. The position of the cleanout rod when the mix head is idle.
- **Clean Out Open:** Applies to an L-Head only. The amount of time the cleanout rod will remain open immediately after the completion of a dispense.
- **Clean Out Closed:** Applies to an L-Head in a Normally Open configuration only. The amount of time the cleanout rod will remain closed when it closes after the completion of a dispense (after the clean out open time delay).
- **Anti-Seize Delay:** Applies to an L-Head in a Normally Closed configuration only. After a shot occurs and the cleanout piston closes, the first anti-seize delay will count down then the cleanout piston will open and close to break loose from any curing material. The second anti-seize timer will then begin counting down and the cleanout piston will open and close again to break loose from any remaining curing material. If a shot occurs before both anti-seize timers elapse, the anti-seize timers restart.



00:00/00 00:00 System Maintenance

Standby No Active Errors

Mix Head Control

Low Pressure Circulation: 10 %

Pre-Dispense Circulation: 5 seconds

Post-Dispense Circulation: 5 seconds

Idle Position: Normally Open

Clean Out Open: 1.0 seconds

Clean Out Closed: 3.0 seconds

Anti-Seize:

Anti-Seize Delay: 60 seconds

Anti-Seize Secondary Delay: 30 seconds

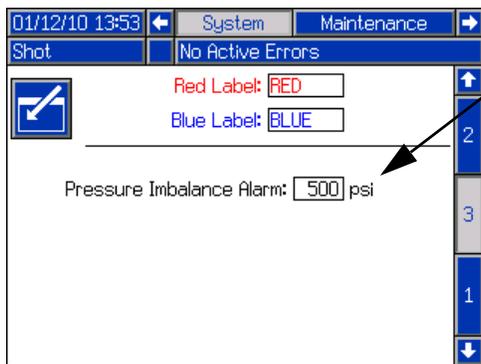
### System Screen 3

This screen allows the user to edit the labels for the A (Red) and B (Blue) sides of the machine. The labels set for the A (Red) and B (Blue) sides of the machine are displayed throughout the screens. Labels are limited to five characters.

To edit a label:

1. Press .
2. To edit the A (Red) label, press . To edit the B (Blue) label, press the down arrow then press . The keyboard will appear on the screen. See **Keyboard Screen** on page 63.
3. Use arrow keys to select the desired letter and press  to accept the letter. To erase all text, press the Eraser softkey. To go back one letter, press the Back Arrow softkey.
4. When finished entering the new label, press the  button twice.

The pressure imbalance setting may be set from this screen. Pressure imbalance is the allowable difference in pressure between the two materials before an alarm is triggered. The input range is 250-2000 psi (2-14 MPa, 17-138 bar).

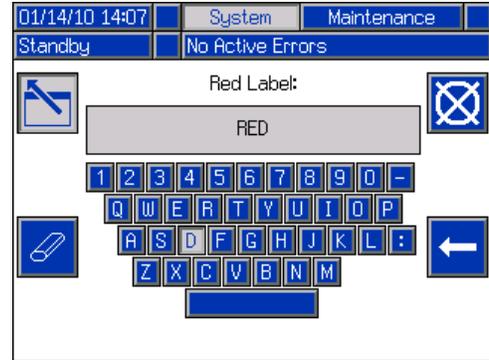


*Pressure Imbalance Setting*

### Keyboard Screen

This screen is used to edit the A (Red) and B (Blue) labels on the ADM. Use arrow keys to select the desired

letter and press  to accept the letter.



### Maintenance Screen

This screen shows shot number and sequence position counters. Press the Enter Screen button and navigate to the drop down box. Press the enter key and scroll to a range of counters to view. Press the enter key again to select the range of counters and display them on the screen.

Counters may be erased individually. Navigate to the counter you want to erase and press the Erase Individual button. Alternatively, each counter displayed on the page may be erased simultaneously by pressing the Erase All button.

01/12/10 12:56		System		Maintenance		Supply	
Shot		No Active Errors					
		Counters: 1 - 20					
	Counter		Counter		Counter		Counter
1	31	11	0				
2	4	12	0				
3	2	13	0				
4	0	14	0				
5	0	15	0				
6	0	16	0				
7	0	17	0				
8	0	18	0				
9	0	19	0				
10	0	20	0				

### Supply Screen

This screen allows the user to specify the operating parameters for off-board, integrated tanks and indicate which positions have level sensors installed. See the Tank Feed Systems manual for information about installing level sensors, see **Related Manuals** on page 3. The user may select from the following refill settings: Disabled, Monitor, Manual, Auto Top-Off, Auto Full-Volume.

**NOTE:** Use the “Disabled” setting if off-board tanks are not installed.

The following describes system operation when each tank mode is selected.

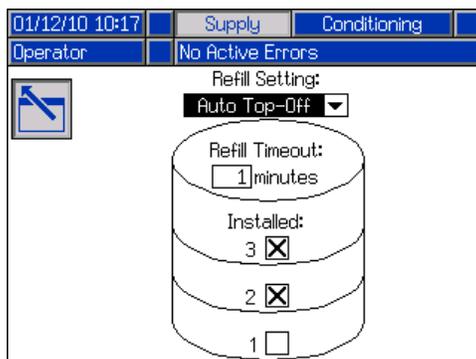
- **Disabled**
  - Disables tank operation
- **Monitor**
  - The top sensor generates a high level deviation and the bottom sensor generates a low level alarm
  - Refill is not supported, no button is provided on the run screens to initiate refill
  - Errors will clear when the corresponding condition clears
- **Manual**
  - The low level sensor will generate a low level alarm
  - A button is provided to the user on the run screens to instigate a manual refill operation at any time
  - Manual refill will run until either the high level sensor sees material, the user aborts the refill via the refill button on the run screens, or the refill time-out expires
  - The low level alarm will clear when the condition clears
- **Auto Top-Off**
  - The low level sensor will generate a low level alarm
  - When the high level sensor does not see material, automatic refill will begin and continue until either the high level sensor sees material or until the refill time-out expires
  - The low level alarm will clear when the condition clears
  - A button is provided to the user on the run screens to instigate an automatic refill operation at any time, this button can also be used to abort a refill operation

- **Auto Full-Volume**
  - The low level sensor will initiate an automatic refill when it does not see material
  - Automatic refill will continue until either the high level sensor sees material or until the refill time-out expires
  - The low level alarm will clear when the condition clears
  - A button is provided to the user on the run screens to instigate an automatic refill operation at any time, this button can also be used to abort a refill operation

If a refill setting other than Disabled is selected, the user must set at least two level sensor locations as installed by checking the check box on the screen. If all three locations are set to installed, the system will default to the Auto-Top Off refill setting and operate as follows:

- The low level sensor will generate a low level alarm.
- The high level sensor will generate a high level deviation and abort any automatic refill operation.
- When the middle sensor is not satisfied, automatic refill will begin and will run until either the middle sensor is satisfied, the high level sensor generates a deviation (if the middle sensor fails), or the refill time-out expires.
- The low level alarm and the high level deviation will clear when the condition clears.
- A button is provided to the user on the Run screens to instigate an automatic refill operation at any time. This button can also be used to abort a refill operation.

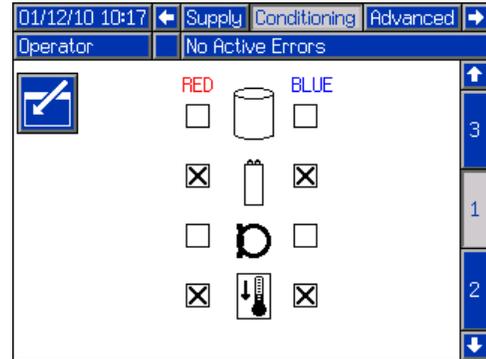
The refill time-out setting may be set by the user as a means to abort the refill in the case of a high level sensor failure. When an automatic refill begins, the time-out counter will begin to count down. If the timer expires before the high level sensor is satisfied, the refill will abort.



### Conditioning Screen 1

This screen allows the user to select which temperature conditioning components are installed in the system.

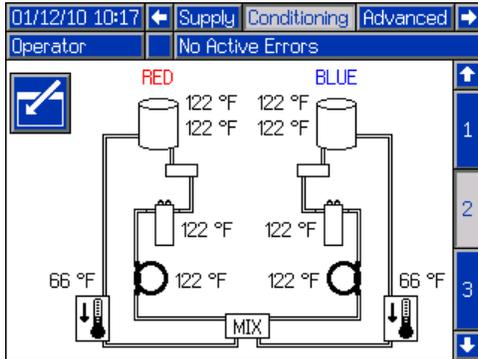
Check the box next to the component type for the appropriate side of the system to indicate that a component is installed. A maximum of four components may be selected.



### Conditioning Screen 2

This screen shows the fluid path for the temperature conditioning components and temperature setpoints for each component.

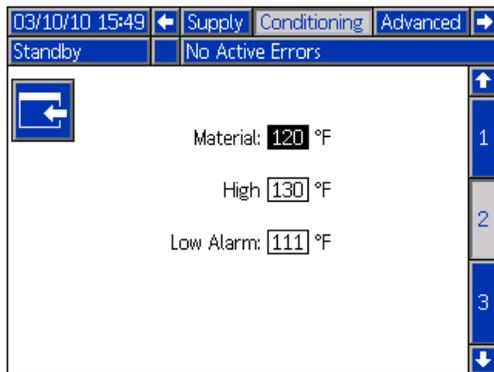
**NOTE:** If tank blanket heaters or inline heaters are installed along with hose heat, the hose heat setting will be limited to at or below the inline or tank heat setting.



**NOTE:** All components are shown installed for reference only. Only 4 components can be installed at one time.

To edit the temperature setpoint and alarms for a particular component:

1. Press the Enter Screen button and navigate to the component you wish to edit.
2. Press the enter key to display the setpoint and alarm values associated with that component.



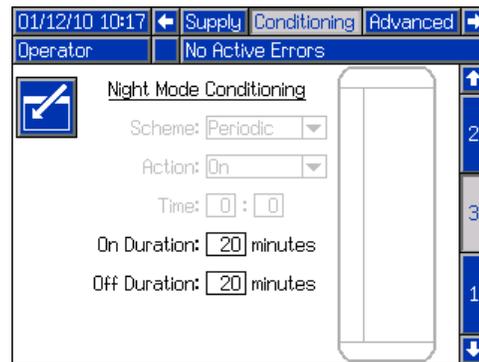
3. Edit the setpoint and alarm values and then press the page back button to return to the previous screen.

### Conditioning Screen 3

This screen allows the user to configure Night Mode operation. In Night Mode, the system will cycle on and off periodically. Press the Enter Screen button and adjust the on and off durations as desired.

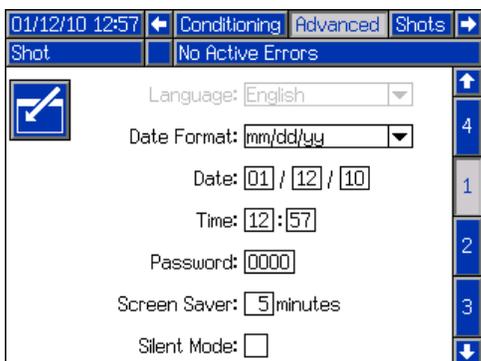
When the system is in Night Mode and in an “On” cycle, the system will circulate in low pressure. The installed conditioning zones will be on and controlling to their respective setpoints. When the system is in Night Mode and in an “Off” cycle, the system will be idle. The system will not be circulating, and the conditioning zones will not be actively controlling temperature. When in Night Mode, supply tanks will not fill.

**NOTE:** Gray fields on this screen are items unavailable at this time. Future product releases will incorporate these features.



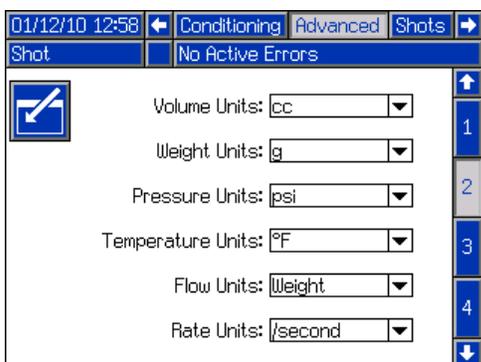
### Advanced Screen 1

This screen allows the user to set the language, date format, current date, time, setup screens password, screen saver delay, and turn on or off silent mode.

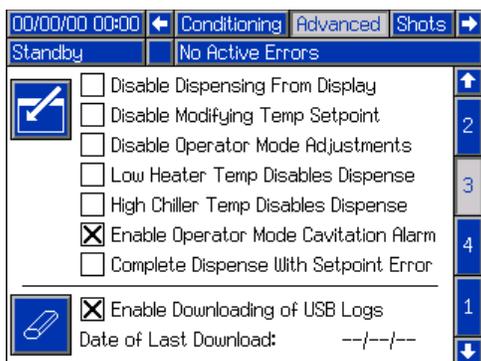


### Advanced Screen 2

This screen allows the user to set the units of measure.



### Advanced Screen 3



This screen allows the user to control the availability of a few key system features.

- **Disable Dispensing:** Check this box to disable dispensing from the ADM. A footswitch, gun trigger, or other external signal will be the only means with which to trigger a dispense.

- **Disable Modifying Temp Setpoint:** Check this box to disable modifying temperature setpoints from the Status run screen.
- **Disable Operator Mode Adjustments:** When this box is checked, the user will not be able to adjust the dispense setpoint in Operator Mode.
- **Low Heater Temp Disables Dispense:** When this box is checked, the system will reject dispense requests on system power up until all enabled heat zones have reached their setpoint.
- **High Chiller Temp Disables Dispense:** When this box is checked, the system will disable dispensing on system power up until all enabled chiller zones have reached their setpoint.
- **Operator Mode Cavitation Alarm:** Check this box to enable cavitation alarms in Operator Mode. Clear this box to disable cavitation alarms in Operator Mode.
- **Enable Downloading of USB Logs:** When this box is checked, USB logs will be automatically downloaded when a USB drive is inserted into the ADM.
- **Complete Dispense with Setpoint Error:** When this box is checked, the shot will continue dispensing even if the system never reaches the desired setpoint.

The screen displays the date of the last USB log download. When downloading logs, only data recorded since the displayed date will be downloaded. To reset the date and force a download of the USB logs in their entirety, press the Erase Single button next to the Date of Last Download label. The next time a USB drive is inserted into the ADM, the complete USB logs will be downloaded. See **Appendix F - USB Operation** on page 85 for a complete explanation.

# Appendix C - ADM Run Screens Overview

Run screens are divided into five major sections: status, errors, events, and maintenance. The following diagram demonstrates the flow of the Run screens beginning with the Home screen.

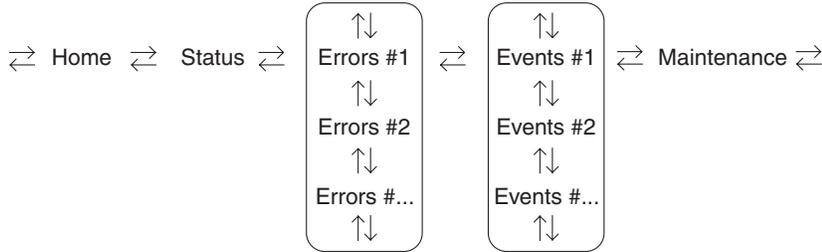
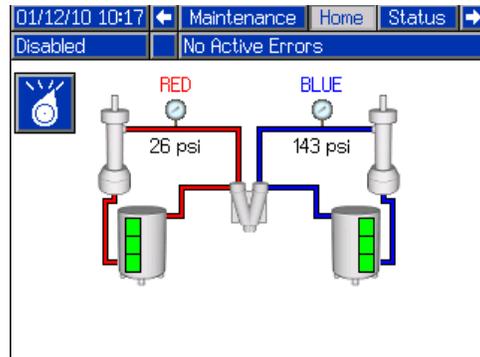


FIG. 23: Run Screens Navigation Diagram

## Home Screen

The Home screen is the first screen that displays in the Run screens. It shows the current fluid pressure on the A (Red) and B (Blue) fluid outlets of the pump and if there are any active errors. If tanks are installed in the system, the fill level is shown on each tank.

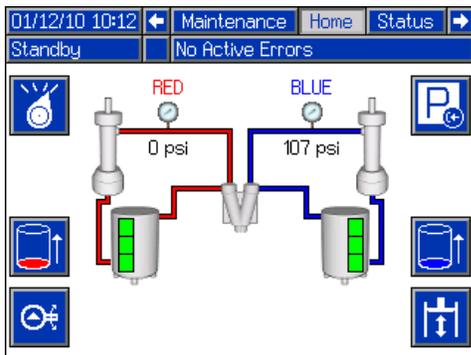
To select an operating mode, press the Select Mode button  repeatedly until the desired mode is shown then press the Enter button  to select the mode. Alternately, press the Select Mode button and use the up and down arrow keys until the desired mode is shown, then press the Enter button  to select the mode. The available operating modes are operator, sequence, shot, standby, night, and disabled.



\* Supply tanks shown for reference only. Your system may not include supply tanks.

### Home Screen, Standby Mode

In Standby Mode, the user can enable heating, park the pumps, refill the tanks, circulate materials.

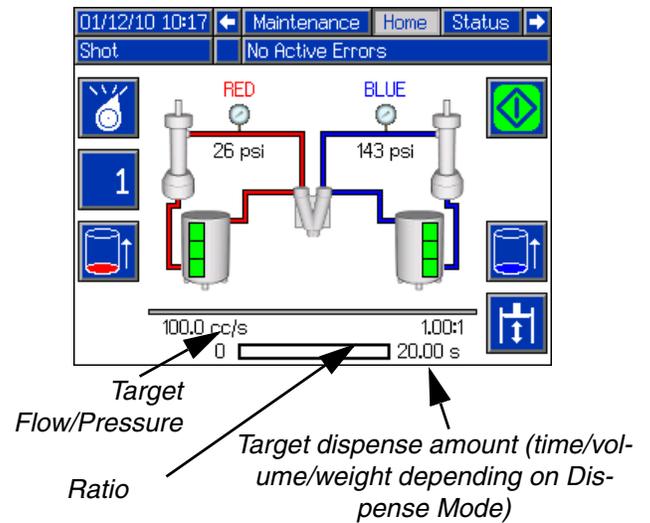


### Home Screen, Shot Mode

This mode allows the user to select one of 100 predefined shot numbers. See **Shots Screen** on page 59 for information about editing shot definitions.

To use a predefined shot:

1. Enter shot mode.
2. Press **1** and use the numeric keypad to enter the desired shot number.
3. Press the Enter button **↵** to select the shot number.
4. Press the dispense button to begin dispensing.

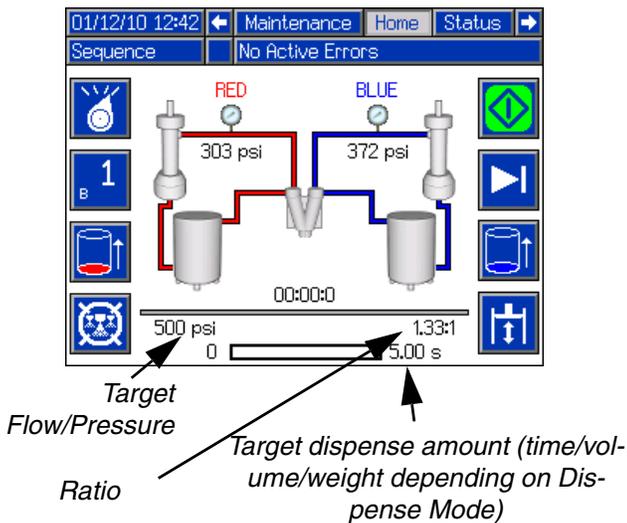


### Home Screen, Sequence Mode

This mode allows the user to select one of five sequences (A-E). The progress bar on the bottom of the screen shows the progress of a shot dispensing from the selected sequence. See **Sequences Screen** on page 59 for information about editing sequence definitions.

To use a predefined sequence:

1. Ensure that the machine is in Sequence Mode.
2. Press the sequence letter/position selection button.
3. Use the left and right arrows to toggle between letter and position selection. When selecting a sequence letter (A-E), use the up and down arrow keys to scroll through the available letters. When selecting a sequence position, type in the desired position with the numeric keypad. The system will reject invalid letter/position selections.
4. Press the enter key to accept the sequence letter/position.
5. Press the Dispense button to begin dispensing.

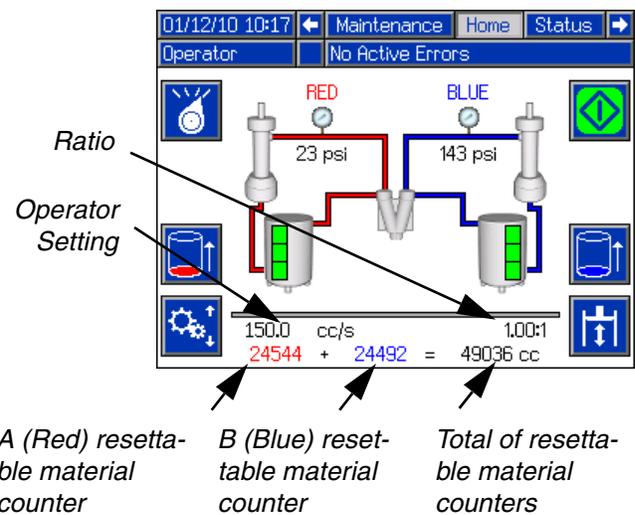


### Home Screen, Operator Mode

This mode allows users to set a pressure or flow rate to dispense material without using predefined shot information. Pressure or flow rate availability is dependent on the Control Mode selection, see **System Screen 2** on page 62.

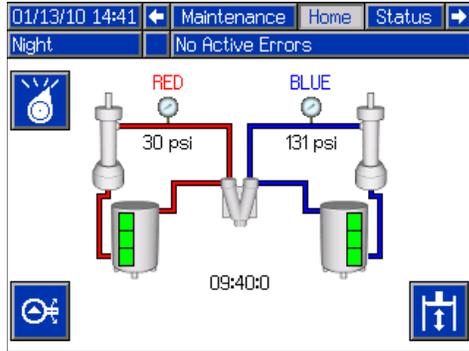
To edit the pressure or flow rate, press the button. The value to change will now be highlighted. Type the new value then press the Enter button to accept it.

The machine will begin dispensing at the set pressure or flow rate when the dispense button is pressed and will stop dispensing when it is pressed again. If a foot switch is installed, the machine will dispense and continue to dispense until the foot switch is released. If the foot switch is used with a Mix Head installed a foot switch press will start the pre-dispense timer and dispense material when the timer expires. Another foot switch press will terminate the dispense and start the post dispense timer.



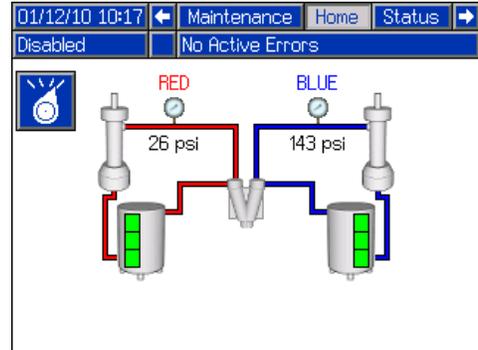
### Home Screen, Night Mode

In Night Mode, the system will cycle on and off periodically. The recirculation on/off cycle begins automatically upon entering Night Mode. See **Conditioning Screen 3** on page 66.



### Home Screen, Disabled Mode

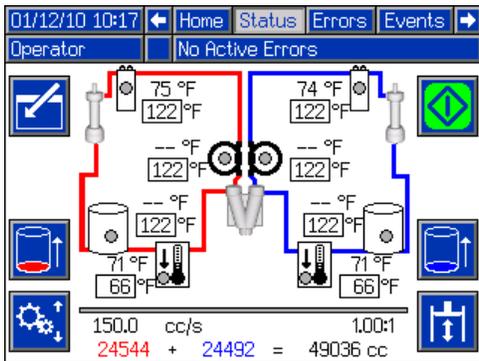
When this mode is selected, the machine will not be able to dispense or condition (heat/cool) material. The setup screens cannot be accessed while in Disabled mode. Use the Select mode button to exit Disabled mode.



## Status Screen

The status screen provides all of the operational functionality of the Home screen except for operating mode selection. Refer to the Home screen and operating mode descriptions for information on this functionality.

In addition to the functionality provided by the Home screen, the Status screen also provides material conditioning information and control.



## Status Screen, Conditioning Control

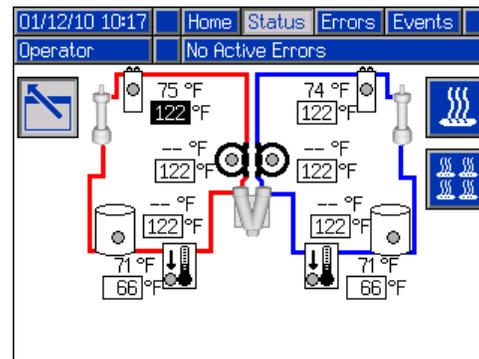
This screen allows users to turn on and off heat zones individually or all at once. The grey circles indicate that a zone is off and green circles indicate that a zone is on. When a zone is on it is actively controlling temperature.

To turn a single zone on/off:

1. Press  to enter the Conditioning Control screen.
2. Use the arrows keys to navigate to the desired zone.
3. Press  to turn the selected zone on. When a zone is on, the button will be selected. Press the button again to turn the zone off.

To turn all zones on/off:

1. Press  to enter the Conditioning Control screen.
2. Press the  to turn on all zones. When all zones are on, the button will be selected. Press the button again to turn all zones off.



*All zones shown for reference. Only four zones may be active at one time.*

### 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.

Refer to the **Troubleshooting** section on page 49 for a detailed description of all of the system errors.

03/10/10 15:34		Status	Errors	Events
Shot		No Active Errors		
Date	Time	Code-Class	Description	
03/09/10	16:35	L122-D:	Blue Low Material Level	3
03/09/10	15:05	CAC3-A:	Comm. Error Red Tank	4
03/09/10	15:05	P6B2-D:	Blue Pressure Sensor Fault	5
03/09/10	15:05	P6A1-D:	Red Pressure Sensor Fault	1
03/09/10	15:05	D6A1-D:	Position Sensor Fault	2
03/09/10	15:05	T4H1-A:	Oil Temp. Shutdown	
03/09/10	15:05	T4N1-A:	Motor Temp. Shutdown	
03/09/10	13:48	L122-D:	Blue Low Material Level	
03/09/10	13:47	L122-D:	Blue Low Material Level	
03/09/10	13:44	L122-D:	Blue Low Material Level	

### 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.

Refer to the **Troubleshooting** section on page 49 for a detailed description of all of the system events.

03/10/10 15:32		Errors	Events	Maintenance
Shot		No Active Errors		
Date	Time	Code-Class	Description	
03/09/10	10:09	EM00-R:	System Powered Off	6
03/08/10	16:14	EQU1-R:	Settings Downloaded	7
03/08/10	16:14	EQU3-R:	Language Downloaded	8
03/08/10	16:14	EQU5-R:	Logs Downloaded	9
03/08/10	16:13	EA00-R:	Disp. Occurred (Shot 2)	10
03/08/10	16:13	EA00-R:	Disp. Occurred (Shot 2)	11
03/08/10	16:13	EA00-R:	Disp. Occurred (Shot 2)	12
03/08/10	16:13	EA00-R:	Disp. Occurred (Shot 2)	
03/08/10	16:13	EA00-R:	Disp. Occurred (Shot 2)	
03/08/10	16:13	EA00-R:	Disp. Occurred (Shot 2)	

### Maintenance Screen 1

This screen displays historical information for each pump in the system. The Batch counters are resettable and count both material usage and pump cycles. The Total counters are not resettable by the user. They also count both material usage and pump cycles. For material usage counters, units are displayed next to the volume/weight indicator icons.

To erase a batch counter, press the Enter Screen button and navigate to the field to be erased. Press the Erase Single button to erase that data point. Alternatively, the Erase All button may be pressed to erase all of the batch data points simultaneously.

01/12/10 12:41		Events	Maintenance	Home
Sequence		No Active Errors		
		RED	BLUE	
Batch				
		475406	519589	
		23737	23737	
Total				
		241650175	270756665	
		26959	26959	

**NOTE:** In a circulation system, the pumpline must be stopped to erase counters.

# Appendix D - ADM Error Codes

Error Code	Error Name	Error Description	Error Type	Cause	Solution		
A4H3	Mix Head Motor Overload			Refer to AC Power Pack manual			
DEH3	Soft Stop Asserted						
MBH3	Low Mix Head Oil Level						
P1H3	Low Accumulator Pressure						
P4H3	High Accumulator Pressure						
T4H3	High Mix Head Oil Temp.						
WDF3	M1 Material Rod Shift Fail						
WDD3	M1 Cleanout Rod Shift Fail						
0500	Invalid Weight Cal. Data	The three point calibration data is invalid, system will operate in weight mode but will attempt to volumetrically calculate weight. This will lead to consistent shots which will be offset for the desired dispense amount.	Deviation	Invalid data	Re-calibrate the machine		
05A1	Invalid Auto Cal. Data	The system will ignore the calibration data gathered and will use information gathered during dispenses	Deviation	Invalid data	If any messages appeared indicating why the calibration failed attempt to fix the problem then re-run the calibration		
A4A6	Red Blanket Overcurrent	An over current was detected on the output	Alarm	Bad heaters	Measure resistance of heater		
A4B5	Blue Blanket Overcurrent		Alarm				
A4A3	Red Inline Overcurrent		Alarm				
A4B1	Blue Inline Overcurrent		Alarm				
A4A2	Red Hose Overcurrent		Alarm				
A4B4	Blue Hose Overcurrent		Alarm				
A4A7	Red Chiller Overcurrent		Alarm			High voltage	Measure voltage across the disconnect switch. Voltage should measure between 190 and 264 Vac.
A4B8	Blue Chiller Overcurrent		Alarm			Shorted Temperature Control Module	If temperature rises for a zone that has been disabled, replace Temperature Control Module
A4H1	Motor Over Current	High current has been detected on a phase and has been shutdown to prevent damage	Alarm	Bad internal wiring of the motor	Replace motor		
				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		
A4M1	Motor Over Current	Too much current is being drawn from the wall	Alarm	Low voltage from the wall during load	Make sure the supply line is properly sized for the load and is above the minimum voltage requirements		

Error Code	Error Name	Error Description	Error Type	Cause	Solution		
A4N1	Motor Over Current	A hardware current fault has occurred causing a system shutdown	Alarm	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 rotor has become locked	Unplug the directional valve (so pressure will not build) and try to move the motor again. If this succeeds then the power pack may need to be replaced. If the motor is still unable to move, the bearings or hydraulic pump have likely failed in the motor and will need to be replaced.		
A7A6	Red Blanket Control Fault	Unexpected current to heater/chiller	Alarm	Shorted Temperature Control Module	If temperature rises for a zone that has been disabled, replace Temperature Control Module		
A7B5	Blue Blanket Control Fault		Alarm				
A7A3	Red Inline Control Fault		Alarm				
A7B1	Blue Inline Control Fault		Alarm				
A7A2	Red Hose Control Fault		Alarm				
A7B4	Blue Hose Control Fault		Alarm				
A7A7	Red Chiller Control Fault		Alarm				
A7B8	Blue Chiller Control Fault		Alarm				
A8A6	No Red Blanket Current	No current to the conditioning zone	Alarm	Tripped circuit breaker	Visually check circuit breaker for a tripped condition		
A8B5	No Blue Blanket Current		Alarm				
A8A3	No Red Inline Current		Alarm				
A8B1	No Blue Inline Current		Alarm				
A8A2	No Red Hose Current		Alarm	Low power	Measure voltage across input terminals on power line filter. Voltage should measure between 190 and 264 Vac		
A8B4	No Blue Hose Current		Alarm				
A8B7	No Red Chiller Current		Alarm			Cable unplugged/loose power	Check for loose or disconnected wires or plugs
A8B8	No Blue Chiller Current		Alarm			Bad heater(s)	Measure resistance of heater(s)
A9C1	Motor Over Current	A software error has occurred commanding too much current	Alarm	Bad Motor Control Module code	Check for MCM software update, load latest MCM software, if problem persists contact Graco		
B9C0	Small Shot Request	The requested dispense amount is below the minimum amount of the system (25% of the combined pump volumes is the minimum)	Deviation	Pumps are defined with the wrong size	On the ADM go into the Setup screens to the System screens then make sure that the pump sizes are defined correctly		
				Requested shot is below the capabilities of the current pump setup	If the user has to be able to take the shot the system must be fitted with smaller pumps		

Appendix D - ADM Error Codes

Error Code	Error Name	Error Description	Error Type	Cause	Solution		
CAC1	Comm. Error Motor	Communication error	Alarm	Loose/broken connection	Check connection		
CAC3	Comm. Error Red Tank		Alarm				
CAC4	Comm. Error Blue Tank		Alarm				
CAC5	Comm. Error Mix Head		Alarm				
CAC6	Comm. Error Mix Head 2		Alarm				
CAC7	Comm. Error Ratio Monitor		Alarm				
CAA6	Comm. Error Red Blanket		Alarm				
CAB5	Comm. Error Blue Blanket		Alarm				
CAA3	Comm. Error Red Inline		Alarm				
CAB1	Comm. Error Blue Inline		Alarm				
CAA2	Comm. Error Red Hose		Alarm				
CAB4	Comm. Error Blue Hose		Alarm			Module not programmed	Program the module
CAA7	Comm. Error Red Chiller		Alarm			Module missing power	Check power supply connection
CAB8	Comm. Error Blue Chiller	Alarm	Module bad	Replace module			
D1A1	Setpoint Not Reached	The set point was not reached and the pump was shutdown	Deviation	Material restriction too high for requested flow	Reduce flow request		
D2A1	Setpoint Not Reached	The set point was not reached	Deviation	Pump cannot reach the requested pressure	Increase restriction in the system		
				Pump cannot reach the requested flow	Decrease restriction in the system		
D3A1	Setpoint Exceeded	The set point was exceeded	Deviation	System underwent a change that caused a large drop in restriction (such as new orifices)	Erase learned System Data, found in the setup screens under calibration		
				No material in pumps	Make sure the material lines are open and have proper feed pressure		
D5A1	Invalid Learn Mode Data	This calibration lets the MCM know where the ends of the pump are. If the data gathered during this process is outside of normal parameters the machine will operate with a greatly reduced stroke.	Deviation	Recalibrate the machine	Rerun the learn mode calibration		
				Loose/bad connection	Check to ensure the pressure transducer is properly installed and all wires are properly connected		
				Bad linear position sensor	Verify pump moves to limits, if problem persists replace linear position sensor		
D6A1	Position Sensor Fault	The linear position sensor is returning data that should not be possible during normal operation	Alarm	Loose/bad connection to linear position sensor	Check to ensure the linear position sensor is properly installed and all wires are properly connected		
				Bad linear position sensor	Replace linear position sensor		
				Linear position sensor may be loose where attached to pump housing	Re-tighten the sensor and re-calibrate the machine		
DDA1	Red Pump Cavitation	Cavitation was detected on the given pump	Deviation	Insufficient material being supplied or insufficient material pressure on feed system	Verify that incoming ball valves are open		
DDB2	Blue Pump Cavitation		Deviation	Debris or packout in the incoming fluid filter	Verify that feed pumps are supplying material		
					Inspect filter for debris of filler packout and clean or replace as necessary		

Error Code	Error Name	Error Description	Error Type	Cause	Solution
DFA1	Pump Not Parked	The pump failed to reach the park position	Deviation	Orifices blocked	Clear blockage
				Hose blocked	Clear or replace hose as necessary
				Dispense valve failed to open	Check to make sure the dispense valve is properly configured and connected to the MCM
DSC0	Pumps Not Defined	The type or size of the Red or Blue material pumps have not been defined	Alarm	Properly setup the system	On the ADM go into the setup screens -> System-> then make sure that the pump type and size are set (not --)
F7D1	Pump Failed to Stall	When the pump tried to stall to pressure the pump traveled more than it should in normal operation (only applies to dead-headed system)	Deviation	Failure of the dispense valve	Ensure the valve has a proper air supply and seals properly. If not, service the valve as necessary.
				Material leak	Visually inspect the machine and hoses for sign of leakage. <b>NOTE:</b> This error will display after 2 full piston strokes so the leak will be substantial.
				Out of material	Fill tanks
L111	Red Low Material Level	Low material level in tanks	Deviation	Tanks low on material	Fill tanks with material
L122	Blue Low Material Level		Deviation	Loose/broken connection	If the tanks appear to have plenty of material check to make sure the level sensor is connected to the proper port and that the cord is not damaged
				Bad level sensor	Replace level sensor
L311	Red High Material Level	High material level in tanks	Deviation	Defective fill valve	If the tanks appear to have plenty of material check to make sure the level sensor is connected to the proper port and that the cord is not damaged
L322	Blue High Material Level		Deviation		
L6A1	Red Auto Refill Timeout	The tank stand has been filing for a time greater than expected	Deviation	No material is actually being fed	Make sure the feed pumps are operating properly
L6B2	Blue Auto Refill Timeout		Deviation	Loose level sensor connection	Check for loose or disconnected wires or plugs
				Bad level sensor	Replace level sensor
MBH1	Low Oil Level	The volume of oil in the tank is below the minimum level needed for the system to properly operate	Alarm	Low oil level	Check oil level and if low add more hydraulic fluid
				Loose/bad connection	Check to ensure the hydraulic oil level sensor is properly connected to the MCM and that the wire has not been damaged
				Bad level sensor	Replace sensor
				Leak in hydraulic driver	Inspect hydraulic driver end seals and early leak detection tubing. Replace seals as necessary and replace lost oil.
				Leak in the hydraulic reservoir, heat exchanger	Inspect the hydraulic reservoir fittings and filter for leaks. Repair or replace as necessary and replace lost oil.
MBN1	Low Motor Performance	The motor magnetism has decreased to the point where performance is greatly reduced	Advisory	Prolonged exposure to heat or high voltage	If error persists and performance can no longer satisfy the user requirements the motor will need to be replaced

Appendix D - ADM Error Codes

Error Code	Error Name	Error Description	Error Type	Cause	Solution
N4A1	Pump Failed to Move	The MCM attempted to move the pump but no movement was detected	Deviation	Motor failure	Visually check to ensure the pump is moving, if not ensure the motor is wired properly
				Hydraulic power pack failure	If motor is moving but pump is not and pressure is not building they hydraulic power pack may need servicing
				Loose/bad connection to the linear position sensor	Check to ensure the linear position sensor is properly connected to the MCM and the wiring has not be damaged
				Failure of the linear position sensor	Replace the linear position sensor
				Motor no longer coupled to hydraulic pump	Reset coupler per specifications and retighten set screws
				Supply tube from hydraulic pump to manifold is loose or broken	Retighten or replace supply tube
				Broken motor shaft	Replace motor
				Over-pressure valve dumping to tank	Verify that no outside forces are stopping the pump from moving, then inspect over-pressure valve for damage or debris
P400	Thermal Pressure Rise	Pressure has risen to an unsafe level due to thermal expansion of materials. All conditioning zones have automatically been turned off.	Deviation	High pressure	Open the dispense valve manually or open the valves to bleed pressure
P4A1	Red Pressure Shutdown	The material pump pressure exceeded the maximum operating pressure as defined in the setup screens	Alarm	Dispense valve failed to open	Check to make sure the dispense valve is properly configured and connected to the MCM
P4B2	Blue Pressure Shutdown			Bad dispense valve	Replace dispense valve
				Restriction in the material lines	Check to ensure there is no blockage
			Alarm	Invalid maximum pressure defined	Make sure the requested pressure is within the max operating pressure, which can be found on the setup screen System 1
				Orifices blocked	Clear blockage
			Hose blocked	Clear blockage or replace hose as necessary	
Dispense valve failed to open	Check to make sure the dispense valve is properly configured and connected to the MCM				
P4D0	Pressure Imbalance		The pressure difference between the Red and Blue material is greater than the defined amount	Alarm	Dispense line is clogged
		Pressure imbalance is defined too low			On the ADM go into the setup screens -> System-> and ensure the pressure imbalance value is the maximum acceptable to prevent unnecessary alarms which will abort dispenses
		Orifice blocks closed off too much on one or both sides			Verify that one or both of the orifice blocks dispense when adjusted to the fully open position then adjust accordingly
		Debris in the orifice block			Relieve system pressure then remove the orifice from the orifice block and inspect for debris in the cavity
		Material fillers may have packed out in an orifice			Relieve system pressure and remove the orifice from the orifice block and inspect for pack out. Clean or replace as necessary.
		Out of material			Fill tanks with material
		Feed system defective			Replace defective item
		P6A1			Red Pressure Sensor Fault
P6B2	Blue Pressure Sensor Fault	Bad sensor	Replace pressure transducer		
		No material in pump	Fill tanks		

Error Code	Error Name	Error Description	Error Type	Cause	Solution		
T1A6	Red Tank Low Fluid Temp.	Fluid temperature is below the defined low alarm limit	Alarm	Tripped circuit breaker	Visually check circuit breaker for a tripped condition		
T1B5	Blue Tank Low Fluid Temp.		Alarm				
T1A3	Red Inline Low Fluid Temp.		Alarm				
T1B1	Blue Inline Low Fluid Temp.		Alarm				
T1A2	Red Hose Low Fluid Temp.		Alarm				
T1B4	Blue Hose Low Fluid Temp.		Alarm			Low power	Measure voltage across input terminals on power line filter. Voltage should measure between 190 and 264 Vac
T1A7	Red Chiller Low Fluid Temp.		Alarm			Cable unplugged/loose power	Check for loose or disconnected wires or plugs
T1B8	Blue Chiller Low Fluid Temp.		Alarm			Bad heater(s)	Measure resistance of heater(s)
T3H1	Oil Temp. Cutback	The hydraulic oil temperature is approaching a level where damage is possible so the Motor Control Module is limiting the output to a safe level	Deviation	No power to fan	Check cord to make sure fan has power		
				Debris is fan or fan grill	Clear debris from fan/fan grill		
				Low air volume from fan	Try to stop fan by lightly pressing on the center with a pencil eraser. If the fan slows down easily it will need to be replaced		
T3N1	Motor Temp. Cutback	Motor temperature is approaching a level where damage is possible so the motor control module is limiting the output to a safe level	Advisory	No power to fan	Check cord to make sure fan has power		
				Debris is fan or fan grill	clear debris from fan/fan grill		
				Low air volume from fan	Try to stop fan by lightly pressing on the center with a pencil eraser. If the fan slows down easily it will need to be replaced		
				Ambient environmental conditions are too hot	Move machine to an area below 120°F		
				Motor/pump coupler may be rubbing on hydraulic pump	Reset coupler per specifications and retighten set screws		
T4B5	Blue Tank High Fluid Temp.	Fluid temperature is above the defined high alarm limit	Alarm	Defective RTD	Replace RTD		
T4A3	Red Inline High Fluid Temp.		Alarm				
T4B1	Blue Inline High Fluid Temp.		Alarm				
T4A2	Red Hose High Fluid Temp.		Alarm				
T4B4	Blue Hose High Fluid Temp.		Alarm				
T4A7	Red Chiller High Fluid Temp.		Alarm			Defective High Power Temperature Control Module	Replace High Power Temperature Control Module
T4B8	Blue Chiller High Fluid Temp.		Alarm			Loose connections	Tighten connections

Appendix D - ADM Error Codes

Error Code	Error Name	Error Description	Error Type	Cause	Solution		
T4C1	Motor Control High Temp.	The temperature the MCM has reached a level where product life will be decreased drastically and has been shutdown for protection	Alarm	No power to fan	Check cord to make sure fan has power		
				Debris is fan or heatsink	Clear debris from fan or heatsink		
				Low air volume from fan	Try to stop fan by lightly pressing on the center with a pencil eraser. If the fan slows down easily it will need to be replaced		
				Motor may be damaged	Replace motor		
T4H1	Oil Temp. Shutdown	The hydraulic oil is at a temperature where performance is impacted significantly and has resulted in a system shutdown	Alarm	No Power to Fan	Check cord to make sure fan has power		
				Debris in fan or fan grill	Clear debris from fan/fan grill		
				Low air volume from fan	Try to stop fan by lightly pressing on the center with a pencil eraser. If the fan slows down easily it will need to be replaced		
T4N1	Motor Temp. Shutdown	Motor temperature is too high and system has been shutdown to prevent possible damage	Alarm	No power to fan	Check cord to make sure fan has power		
				Debris is fan or fan grill	Clear debris from fan/fan grill		
				Low air volume from fan	Try to stop fan by lightly pressing on the center with a pencil eraser. If the fan slows down easily it will need to be replaced		
				Ambient environmental conditions are too hot	Move machine to an area below 120°F		
T6A6	Red Tank RTD Fault	RTD 1 is giving no or invalid data	Alarm	Loose or bad connection	Check RTD wiring		
T6B5	Blue Tank RTD Fault		Alarm				
T6A3	Red Inline RTD Fault		Alarm				
T6B1	Blue Inline RTD Fault		Alarm				
T6A2	Red Hose FTS Fault		Alarm				
T6B4	Blue Hose FTS Fault		Alarm				
T6A7	Red Chiller RTD Fault		Alarm				
T6B8	Blue Chiller RTD Fault		Alarm			Bad RTD	Replace RTD
T6C6	Red Blanket RTD Fault	RTD 2 is giving no or invalid data	Alarm	Loose or bad connection	Check RTD wiring		
T6C5	Blue Blanket RTD Fault		Alarm				
T6C7	Red Chiller RTD Fault		Alarm				
T6C8	Blue Chiller RTD Fault		Alarm			Bad RTD	Replace RTD
T8A6	No Heat Red Tank	No temperature rise	Alarm	Tripped circuit breaker	Visually check circuit breaker for a tripped condition		
T8B5	No Heat Blue Tank		Alarm				
T8A3	No Heat Red Inline		Alarm				
T8B1	No Heat Blue Inline		Alarm			Low Power	Measure voltage across input terminals on power line filter. Voltage should measure between 190 and 264 Vac
T8A2	No Heat Red Hose		Alarm			Cable unplugged/loose power	Check for loose or disconnected wires or plugs
T8B4	No Heat Blue Hose		Alarm			Bad heater(s)	Measure resistance of heater(s)

Error Code	Error Name	Error Description	Error Type	Cause	Solution
T8A7	No Cooling Red Chiller	No temperature decline	Alarm	Tripped circuit breaker	Visually check circuit breaker for a tripped condition
T8B8	No Cooling Blue Chiller		Alarm	Defective cooling valve	Disconnect the valve and measure the voltage across the wires when the chiller is running to ensure 24V is being delivered to the valve. If so, the cooling valve will likely need replacing.
				Chilled water supply off	Turn on chilled water supply
				Loose or bad connection	Check RTD wiring
T9A6	Red Blanket Temp. Cutoff	Heater overtemperature cutoff	Alarm	Defective RTD	Replace RTD
T9B5	Blue Blanket Temp. Cutoff		Alarm		
T9A3	Red Inline Temp. Cutoff		Alarm	Defective High Power Temperature Control Module	Replace High Power Temperature Control Module
T9B1	Blue Inline Temp. Cutoff		Alarm	Loose connections	Tighten connections
T9C6	Red Blanket Ctrl Shutdown	PCB over temperature	Alarm	Overheated Temperature Control Module	Turn conditioning zone off. Wait a few minutes. If the condition does not clear or regenerates consistently, replace heater module
T9C5	Blue Blanket Ctrl Shutdown		Alarm		
T9C3	Red Inline Ctrl Shutdown		Alarm		
T9C1	Blue Inline Ctrl Shutdown		Alarm		
T9C2	Red Hose Ctrl Shutdown		Alarm		
T9C4	Blue Hose Ctrl Shutdown		Alarm		
T9C7	Red Chiller Ctrl Shutdown		Alarm		
T9C8	Blue Chiller Ctrl Shutdown		Alarm		
V1H1	Motor Control Undervoltage	The voltage to the MCM has dropped to a level where performance is greatly affected	Alarm	Tripped circuit breaker Supply lines providing low voltage	Visually check circuit breaker for a tripped condition Check incoming voltage to ensure it is above the minimum operating voltage
V4A6	Red Blanket Overvoltage	High line voltage	Alarm	Incoming line voltage is too high	Measure voltage across disconnect switch. Voltage should measure between 190 and 264 Vac.
V4B5	Blue Blanket Overvoltage		Alarm		
V4A3	Red Inline Overvoltage		Alarm		
V4B1	Blue Inline Overvoltage		Alarm		
V4A2	Red Hose Overvoltage		Alarm		
V4B4	Blue Hose Overvoltage		Alarm		
V4A7	Red Chiller Overvoltage		Alarm		
V4B8	Blue Chiller Overvoltage		Alarm		

Appendix D - ADM Error Codes

Error Code	Error Name	Error Description	Error Type	Cause	Solution						
V4H0	Motor Control Overvoltage	The voltage to the MCM has reached an unsafe level and has been shutdown in an attempt to prevent damage	Alarm	Supply lines providing high voltage	Check incoming voltage to ensure it is below the maximum operating voltage						
W0U0	USB Update Failed	The ADM tried to upload a system settings file but failed	Alarm	System Settings file is corrupt	Replace the system settings file with a backup or new file						
				System Settings file is intended for another system	Ensure that the first line in the settings.txt file contains the text GMS. If not replace the file with the proper system update file.						
WBH1	Motor Encoder Fault	An error has been detected on the motor position sensor	Alarm	Failing sensors	If error persists the motor will need to be replaced						
				Loose connection	Ensure the d-sub connector to the motor is connected and the wiring is intact						
WKH1	High Motor Speed	The motor has reached a speed that should not be reached in normal operation and was shutdown to prevent possible damage	Alarm	No power to directional valve	Make sure the directional valve has power						
				Bad directional valve connection	Make sure the cord to the directional valve is connected to the correct port and the cord is not damaged						
				Directional valve failure	The directional valve will need to be replaced						
				Hydraulic power pack failure	The hydraulic power pack will need repair						
				Defective encoder	Replace encoder						
				Motor no longer coupled to hydraulic pump	Reset coupler per specifications and retighten set screws						
				Supply tube from hydraulic pump to manifold is loose or broken	Retighten or replace supply tube						
WM06 WM05 WM03 WM01 WM02 WM04 WM07 WM08	Red Tank Con. Fault Blue Tank Con. Fault Red Inline Con. Fault Blue Inline Con. Fault Red Hose Con. Fault Blue Hose Con. Fault Red Chiller Con. Fault Blue Chiller Con. Fault	High current to relay 1	Alarm	Broken contactor	Replace contactor						
						WMA6	Red Blanket High Temp.	Alarm	Defective RTD	Replace RTD	
						WMB5	Blue Blanket High Temp.	Tank blanket is above the defined high alarm limit	Alarm	Defective High Power Temperature Control Module	Replace High Power Temperature Control Module
										Loose connections	Tighten connections

Error Code	Error Name	Error Description	Error Type	Cause	Solution
WMC6	Red Tank Con. Fault	Unexpected current to relay 1	Alarm	Shorted module	If temperature is being affected by a zone that has been disabled, replace heat module
WMC5	Blue Tank Con. Fault		Alarm		
WMC3	Red Inline Con. Fault		Alarm		
WMC1	Blue Inline Con. Fault		Alarm		
WMC2	Red Hose Con. Fault		Alarm		
WMC4	Blue Hose Con. Fault		Alarm		
WMC7	Red Chiller Con. Fault		Alarm		
WMC8	Blue Chiller Con. Fault		Alarm		
WMH1	Motor Controller Fault	A general fault has occurred within the MCM	Deviation	Internal hardware failure	Cycle power, if the error persists the MCM will need to be replaced
WSC0	Invalid Setpoint Request	The requested controlling value (pressure or flow) is outside the limits of the system	Deviation	System incorrectly setup	On the ADM go into the setup screens -> System-> and ensure that all pages have properly defined values
				Shot incorrectly defined	Redefine shot with control parameters within the limits of the system
WSD0	Invalid Gel Timer Definition	The shot that was entered for the gel timer is not a valid shot. This must be fixed before the gel timer will function properly	Deviation	Gel timer shot is below the minimum dispense amount or set for a invalid pressure/flow	Select a different shot or modify existing shot data
				The MCM has determined that the gel timer shot will not be able to be executed based parameters entered in the ADM	If you are certain that the shot is within parameters, try running the Learn Mode routine found in the setup screen Calibration. If the error persists, a gel shot with reduced control parameters is required.

## Appendix E - System Events

Event Code and String	Triggers
REL00: System Powered On	The System was powered on.
REM00: System Powered Off	The System was powered off.
REB00: Stop Button Pressed	The Red stop button was pressed on the Advanced Display Module.
RECH0: Learn Mode Executed	A learn mode calibration was successfully completed.
RENN0: Automatic Cal. Performed	The system was successfully characterized with the Automatic calibration.
RECA1: Red Material SG Modified	The Red materials specific gravity was modified.
RECB2: Blue Material SG Modified	The Blue materials specific gravity was modified.
RENC1: Cal. Point 1 Weight Entered	A value for the first point in the three point calibration was entered.
RENC2: Cal. Point 2 Weight Entered	A value for the second point in the three point calibration was entered.
RENC4: Cal. Point 1 Weight Erased	The running average for point one of the three point calibration was erased.
RENC5: Cal. Point 2 Weight Erased	The running average for point two of the three point calibration was erased.
REND0: Ratio Check Dispense	A ratio check shot was dispensed from the ratio check calibration screen.
REA00: Disp. Occurred (Shot #)	A dispense has occurred of the given shot number.
REH00: Gel Timer Dispense	The gel timer expired and the system automatically took the gel shot.
RER01: Shot Count Reset	A counter from the shot counters maintenance page was erased
RER02: Seq. Position Count Reset	A counter from the sequence counters maintenance page was erased
RERA1: Red Material Volume Reset	The resettable totalizer for the Red material volume was reset to zero.
RERB1: Blue Material Volume Reset	The resettable totalizer for the Blue material volume was reset to zero.
RERA2: Red Material Weight Reset	The resettable totalizer for the Red material weight was reset to zero.
RERB2: Blue Material Weight Reset	The resettable totalizer for the Blue material weight was reset to zero.
RERA3: Red Cycle Count Reset	The resettable cycle counter for the Red pump was reset to zero.
RERB3: Blue Cycle Count Reset	The resettable cycle counter for the Blue pump was reset to zero.
REQU1: Settings Downloaded	The system settings were successfully transferred from the ADM to a USB drive.
REQU2: Settings Uploaded	The system settings file was successfully transferred from the USB drive to the ADM.

Event Code and String	Triggers
REQU3: Language Downloaded	The custom language file was successfully transferred from the ADM to a USB drive.
REQU4: Language Uploaded	The custom language file was successfully transferred from the USB drive to the ADM.
REQU5: Logs Downloaded	The Error/Event and Shot data logs were successfully transferred from the ADM to a USB drive.
REAR0: Night Mode Recirc On	While in night mode the system has automatically entered a low recirculation mode and attempted to turn on all enabled conditioning zones.
REBR0: Night Mode Recirc Off	While in night mode the system has automatically stopped the low recirculation mode and turned off all conditioning zones.

# Appendix F - USB Operation

## Overview

There are 3 main uses for the USB on a GMS system

- Ability to download a log of the past 50,000 errors and events and a shot log that can contain over 250,000 snapshots of critical dispense information
- Ability to download, modify, and upload custom language files
- Ability to download and upload system configurations
  - This data includes most user selectable and user configurable settings.
  - This data does not include pump counters, error and event logs, shot and sequence counters

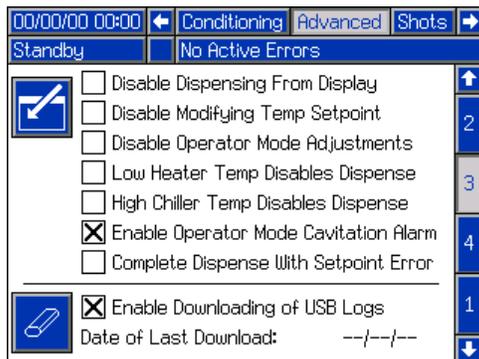
## Download Log Files

If the “Enable Downloading of USB Logs” is checked, the user can use a USB stick-drive to download the log files.

To download the log files, insert a high-quality USB stick-drive into the USB port in the bottom of the ADM. The ADM will automatically begin downloading the log files as well as the custom language file (DISP-TEXT.TXT) and the system settings (SETTINGS.TXT). The status of the download will be shown in the Status bar.

## USB Options

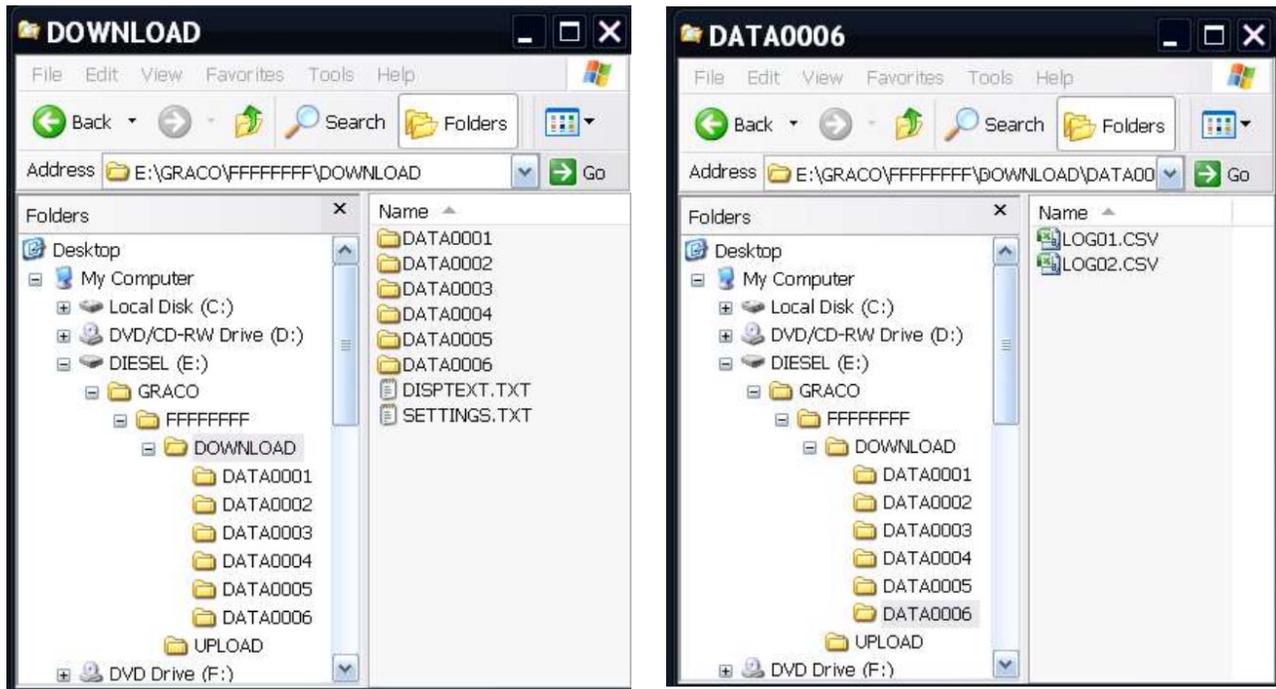
The only options for USB on the ADM are in **Advanced Screen 2**, see page 67.



The first option is a checkbox that enables or disables the downloading of the Error Event and Shot Data log files. The Shot Data log runs during all recirculation, shots, and operator modes.

The second option is the Erase icon which will reset the last download date to a time where all logs can be downloaded, 10/01/09. This will allow the user to download all the USB log entries, which may take over 2 hours if the log files are full. Currently the ADM does not monitor the USB logs and alert the user when data may be overwritten so in order to minimize download times and the risk of losing data it is recommended that the user download the logs every 2 weeks or more often if the machine is used during more than one full shift a day.

## Log Files, Folder Structure



**FIG. 24: DOWNLOAD, DATAxxxx Folders**

Each time a stick-drive is inserted into the ADM USB port, a new folder named DATAxxxx is created. The number at the end of the folder name is incremented each time a stick-drive is inserted and data is downloaded or uploaded. In each DATAxxxx folder there is two log files. They are formatted as .csv (comma separated value) files and can be opened by most text editors or data processing programs such as Excel.

### Example LOG01 File

The LOG01 file is the Errors and Events log file.

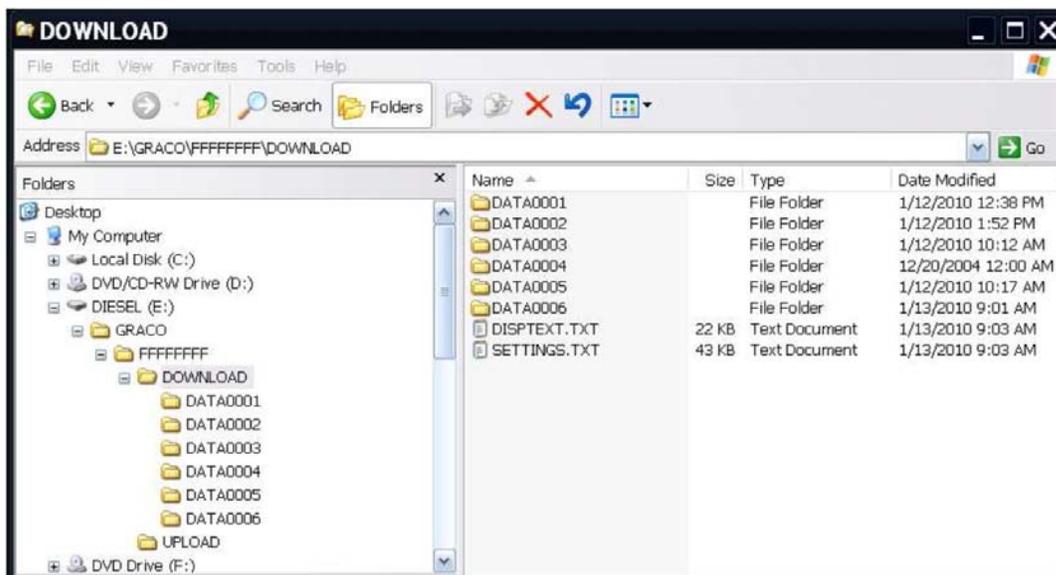
	A	B	C	D	E
1	Error Log				
2	S/N: FFFFFFFF				
3	Software Part Number: 15X467				
4	Revision: 0.08.007				
5	3/23/2010 15:00				
6					
7	Date	Time	Error Log	Event Log	Active Shot Num
8	3/17/2010	17:15:19	-	EQU5-R: Logs Dr-	
9	3/17/2010	17:15:33	-	EQU3-R: Langua-	
10	3/17/2010	17:15:40	-	EQU1-R: Setting-	
11	3/17/2010	17:31:01	CAC1-A: Comm-	-	
12	3/17/2010	17:32:50	-	EM00-R: System-	
13	3/17/2010	17:32:51	-	EL00-R: System-	
14	3/17/2010	17:33:06	T4N1-A: Motor T-	-	

### Example LOG02 File

The LOG02 file is the Shot Data Log file.

	A	B	C	D	E	F	G	H
1	Running Shot Data Log							
2	S/N: FFFFFFFF							
3	Software Part Number: 15X467							
4	Revision: 0.08.007							
5	3/23/2010 15:00							
6								
7	Date	Time	Inline Blue	Hose Blue	Inline Red	Hose Red	Tank Blue	Tank
8	3/18/2010	10:38:12		99.29999				
9	3/18/2010	10:38:29		99.29999				
10	3/18/2010	10:38:39		99.5				
11	3/18/2010	10:38:44		99.29999				
12	3/18/2010	10:38:46		99.29999				
13	3/18/2010	10:38:49		99.29999				
14	3/18/2010	10:38:56		99.29999				
15	3/18/2010	10:39:02		99.29999				
16	3/18/2010	10:39:16		99.29999				
17	3/18/2010	10:39:23		99.29999				
18	3/18/2010	10:39:29		99.29999				
19	3/18/2010	10:39:47		99.09999				
20	3/23/2010	10:03:35	24.89999	19.5	25	19.09999		
21	3/23/2010	10:03:36	24.89999	19.5	25	19.09999		
22	3/23/2010	10:03:49	25.7	19.5	25	19.09999		

## Transfer System Settings



Use the following process to transfer system settings from one machine to another.

1. Insert a high-quality USB stick-drive into the USB port on the system with the settings to be transferred. Once the download is complete the SETTINGS.TXT file will be located in the "DOWNLOAD" folder.

### NOTICE

The user should never attempt to modify the SETTINGS.TXT file in any way. Graco is not responsible for damages caused by an improperly modified setup file.

2. Plug the USB stick-drive into a computer.
3. Navigate to the DOWNLOAD folder.
4. Copy the SETTINGS.TXT file from the DOWNLOAD folder into the UPLOAD folder.
5. Remove the USB stick-drive from the computer and install it into the ADM USB port for the second machine. The software will automatically begin updating.

**NOTE:** Before the update begins the ADM automatically shuts down the system, aborting any in-progress dispensing. When the software is updating the system a pop-up box will appear to inform the user of the update and the system will lock. Once the update is complete the ADM will tell the user to cycle power to apply the updates. Once this box appears it is safe to remove the drive before cycling power.

6. When the software is done updating, remove the USB stick-drive from the ADM USB port and install in a computer.
7. Navigate to the UPLOAD folder and remove the SETTINGS.TXT file.

**NOTE:** Immediately after uploading the settings, remove the SETTINGS.TXT file from the UPLOAD folder to prevent accidental loss of data the next time the USB stick-drive is inserted into the ADM USB port. If there is a SETTINGS.TXT file in the UPLOAD folder when the USB stick-drive is inserted into the ADM USB port the software will try to update the ADM.

## Update Custom Language

Use the following process to customize the text on the ADM. The language file DISPTTEXT.TXT can be modified in Excel but must be saved as a Unicode Text file with the extension .TXT in order for it to properly import.

1. Insert a high-quality USB stick-drive into the USB port on the system with the settings to be transferred. Once the download is complete the DISPTTEXT.TXT file will be located in the "DOWNLOAD" folder.
2. Plug the USB stick-drive into a computer.
3. Navigate to the DOWNLOAD folder.
4. Copy the DISPTTEXT.TXT file from the DOWNLOAD to your computer.
5. Use any data processing software such as Excel to edit the DISPTTEXT.TXT file. When done editing save the file as the "Unicode Text" format. See **Example DISPTTEXT.TXT File** on page 90.
  - a. In the first column, locate the string to change.
  - b. In the second column of the same row, enter the new string.
  - c. Save the file as a Unicode Text file. The name must remain "DISPTTEXT.TXT".
6. Copy the edited DISPTTEXT.TXT file into the UPLOAD folder.
7. Remove the USB stick-drive from the computer and install it into the ADM USB port. The software will automatically begin updating.

**NOTE:** Before the update begins the ADM automatically shuts down the system, aborting any in-progress dispensing. When the software is updating the system a pop-up box will appear to inform the user of the update and the system will lock. Once the update is complete the ADM will tell the user to cycle power to apply the updates. Once this box appears it is safe to remove the drive before cycling power.

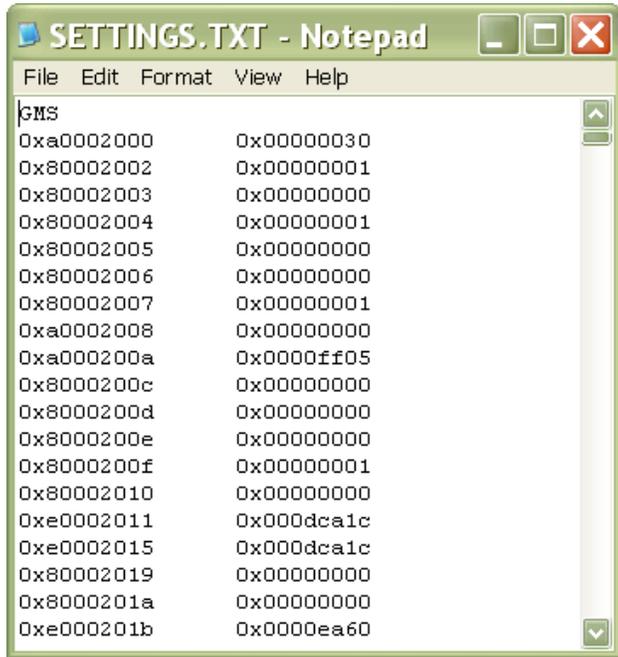
8. When the software is done updating, remove the USB stick-drive from the ADM USB port and install in a computer.
9. Navigate to the UPLOAD folder and remove the DISPTTEXT.TXT file.

**NOTE:** Immediately following uploading the language file, remove the DISPTTEXT.TXT file from the UPLOAD folder to prevent accidental loss of data the next time the USB stick-drive is inserted into the ADM USB port. If there is a DISPTTEXT.TXT file in the UPLOAD folder when the USB stick-drive is inserted into the ADM USB port the software will try to update the ADM.

### Example SETTINGS.TXT File

**NOTICE**

The user should never attempt to modify the SETTINGS.TXT file in any way. Graco is not responsible for damages caused by an improperly modified setup file.



### Example DISPTXT.TXT File

	A	B	C	D
1	English	Custom		
2				
3	1			
4	2			
5	3			
6	4			
7	10			
8	15			
9	20			
10	25			
11	30			
12	40			
13	50			
14	60			
15	80			
16	100			
17	120			
18	145			
19	160			
20	180			

## Accessories

Part No.	Description
24M154	IsoGuard® Select Assembly with 32 oz reservoir (Included on HFRL units)
24F516	IsoGuard® Select Fluid, 6 Quarts
255244	Footswitch with Guard and 4 meter cable

### HFR Discrete Gateway Module (DGM) Kits

**Single DGM Kit, 24F843**

**Dual DGM Kit, 24F844**

**DGM only, 24G830**

The HFR Discrete Gateway Module (DGM) allows the user to control an HFR through an external control device such as a PLC. The DGM operates in conjunction with the existing Advanced Display Module (ADM) such that both devices can be used to control the machine. See HFR Discrete Gateway Module manual 3A1149 for more information.

### Secondary Supply Pump to Create a Tandem Unit (HFRS Equipment Only)

Part No.	Drum/Ram Size gallon (liter)	Type	Displacement	Ratio
24M0028	5 (19)	Carbon Steel	60 cc	20:1
24M0026	55 (208)			
24M0029	5 (19)	Stainless Steel		
24M0027	55 (208)			

# Technical Data

Maximum Fluid Working Pressure . . .	3000 psi (21MPa, 207 bar) See <b>Models</b> starting on page 4 for specific information
Maximum Fluid Temperature . . . . .	120°F (50°C)
Fluid Inlet Pressure at Inlet Fitting:	
HFRL Models . . . . .	50 psi (345 kPa, 3.4 bar) to 250 psi (1.8 MPa, 18 bar)
HFRS Models . . . . .	250 psi (1.8 MPa, 18 bar) to 3000 psi (21 MPa, 207 bar)
HFRS (Regulated Pressure). . . . .	250 psi (1.8 MPa, 18 bar) to 1500 psi (10 MPa, 103 bar)
Fluid Inlets . . . . .	<i>Component A (Red):</i> 3/4 npt(f) <i>Component B (Blue):</i> 3/4 npt(f)
Fluid Outlets on Manifold . . . . .	<i>Component A (Red):</i> 1/2 in. npt(f) <i>Component B (Blue):</i> 1/2 in. npt(f)
Air Inlet. . . . .	1/4 NPS
Air Inlet Pressure . . . . .	40 psi (280 kPa, 2.8 bar) to 100 psi (0.7 MPa, 7 bar)
Fluid Circulation Ports . . . . .	1/4 npsm(m), with plastic tubing, 250 psi (1.8 MPa, 18 bar) maximum
Line Voltage Requirement . . . . .	<i>230V / 1 phase:</i> 195-264V, 50/60 Hz <i>400V / 3 phase:</i> 360-440V, 50/60 Hz
Amperage Requirement. . . . .	See <b>Models</b> on page 4
Sound Power . . . . .	93 dB
Hydraulic reservoir capacity. . . . .	8 gal. (30 liters)
Recommended hydraulic fluid . . . . .	Citgo A/W Hydraulic Oil, ISO Grade 46
Weight . . . . .	634 lb (288 kg) (Not including supply pumps)
Wetted Parts . . . . .	Aluminum, stainless steel, zinc-plated carbon steel, brass, carbide, chrome, fluoroelastomer, PTFE, ultra-high molecular weight polyethylene, chemically resistant o-rings

*All other brand names or marks are used for identification purposes and are trademarks of their respective owners.*

## Motor Control Module Technical Data

### Input Specifications

Input Line Voltage . . . . .	0-264 Vac, line-to-line
Input Line Phasing . . . . .	Single or Three Phase
Input Line Frequency . . . . .	50/60 Hz
Input Current per Phase. . . . .	25A (three-phase), 50A (single-phase)
Maximum Branch Circuit Protection Rating: . . . . .	30A (three-phase), 63A (single-phase)
Short Circuit Current Rating. . . . .	5 kA

### Output Specifications

Output Line Voltage . . . . .	0-264 Vac
Output Line Phasing . . . . .	Three Phase
Output Current . . . . .	0-30A
Output Overload. . . . .	200% for 0.2 seconds

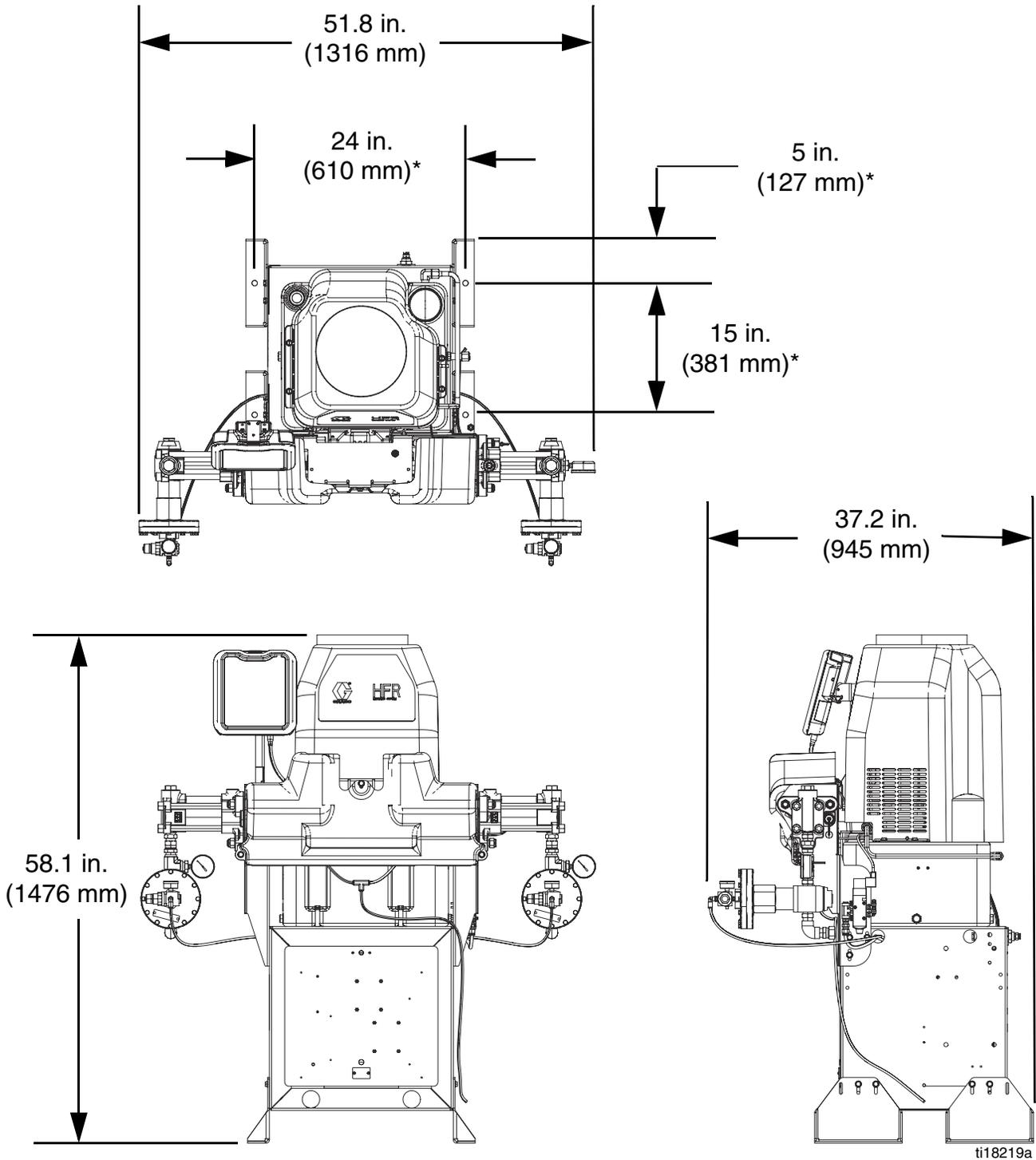
DC Power Supply . . . . .	24 Vdc, Class 2, Graco-provided power supply
Enclosure . . . . .	Type 1
Max Ambient Temperature . . . . .	50°C (122°F)

*Overtemperature protection is provided to protect from motor overload.*

*Current limit, set via the software, is provided as a secondary protection from motor overload.*

*All installations and wiring must comply with NEC and local electrical codes.*

## Dimensions



\* (4) 5/8" diameter anchor locations



# Graco Standard Warranty

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

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

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

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

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

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

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

## **FOR GRACO CANADA CUSTOMERS**

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

# Graco Information

For the latest information about Graco products, visit [www.graco.com](http://www.graco.com).

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

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

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

*Original instructions. This manual contains English. MM 3A2175*

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