Operation

E-Flo® SP Software

3A6724C

EN

For use with E-Flo SP electric pumps for sealants and adhesives.
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 and in all related manuals before using the equipment. Save all instructions.

PROVEN QUALITY. LEADING TECHNOLOGY.

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Related Manuals

Related manuals in English:

Manual	Description
3A6586	E-Flo SP Electric Booster Pumps
3A6331	E-Flo SP Supply Systems Ram/Tandem
3A6321	ADM Token In-System Programming
3A1244	Graco Control Architecture Module
3A6482	APD20 Advanced Precision Driver

Warnings

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

DANGER

SEVERE ELECTRIC SHOCK HAZARD

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

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

WARNING





SKIN INJECTION HAZARD

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

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


MOVING PARTS HAZARD

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

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

⚠ WARNING

FIRE AND EXPLOSION HAZARD

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

- Use equipment only in well-ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).
- Ground all equipment in the work area. See **Grounding** instructions in your system manual.
- Never spray or flush solvent at high pressure.
- Keep work area free of debris, including solvent, rags and gasoline.
- Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.
- Use only grounded hoses.
- Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are anti-static or conductive.
- **Stop operation immediately** if static sparking occurs or you feel a shock**.** Do not use equipment until you identify and correct the problem.
- Keep a working fire extinguisher in the work area.

EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

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

SPLATTER HAZARD

Hot or toxic fluid can cause serious injury if splashed in the eyes or on skin. During blow off of platen, splatter may occur.

- Use minimum air pressure when removing platen from drum.

⚠ WARNING

TOXIC FLUID OR FUMES HAZARD

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

- Read Safety Data Sheets (SDSs) to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

PERSONAL PROTECTIVE EQUIPMENT

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:

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

Advanced Display Module (ADM)

The ADM display shows graphical and text information related to setup operations.

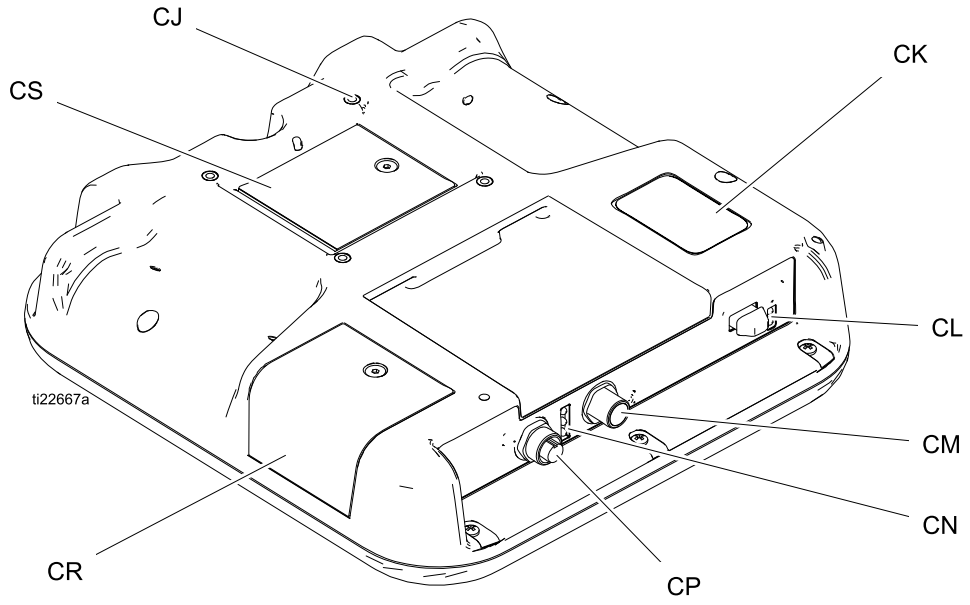
NOTICE

To prevent damage to the buttons, do not press buttons with sharp objects such as pens, plastic cards, or fingernails.

ADM Keys and Indicators

Cause	Solution
 Startup/Shutdown Key and Indicator	Press to startup or shutdown the system.
 Stop	Press to stop all pump processes. This Is not a safety or emergency stop.
 Soft Keys	Press to select the specific screen or operation shown on the display directly next to each key.
 Navigation Keys	• Left/Right Arrows: Use to move from screen to screen. • Up/Down Arrows: Use to move among fields on a screen, items on a drop-down menu, or multiple screens within a function.
Numeric Keypad	Use to input values.
 Cancel	Use to cancel a data entry field.
 Setup	Press to enter or exit Setup mode.
 Enter	Press to choose a field to update, to make a selection, to save a selection or value, to enter a screen, or to acknowledge an event.

ADM Component Identification



Ref.	Description
CJ	Flat Panel Mount (VESA 100)
CK	Model and Serial Number
CL	USB Port and Status LEDs
CM	CAN Cable Connection
CN	Module Status LEDs
CP	Accessory Cable Connection
CR	Token Access Cover
CS	Battery Access Cover

ADM LED Status Descriptions

LED	Conditions	Description
System Status 	Green Solid	Run Mode, System On
	Green Flashing	Setup Mode, System On
	Yellow Solid	Run Mode, System Off
	Yellow Flashing	Setup Mode, System Off
USB Status (CL)	Green Flashing	Data recording in progress
	Yellow Solid	Downloading information to USB
	Green and Yellow Flashing	ADM is busy, USB cannot transfer information when in this mode
ADM Status (CN)	Green Solid	Power applied to module
	Yellow Flashing	Active Communication
	Red Steady Flashing	Software upload from token in progress
	Red Random Flashing or Solid	Module error exists

ADM Display Details

Power Up Screen

The following screen appears when the ADM is powered up. It remains on while the ADM runs through initialization and establishes communication with other modules in the system.

Menu Bar

The menu bar appears at the top of each screen (the following image is only an example).

Date and Time

The date and time are always displayed in one of the following formats. The time is always displayed as a 24-hour clock.

- DD/MM/YY HH:MM
- YY/MM/DD HH:MM
- MM/DD/YY HH:MM

Arrows

The left and right arrows are only visible when screen navigation is allowed.

Screen Menu

The screen menu indicates the currently active screen, which is highlighted. It also indicates the associated screens that are available by scrolling left and right.

System Mode

The current system mode is displayed at the lower left of the menu bar.

Status

The current system status is displayed at the lower right of the menu bar.

Alarm/Deviation

The current system error is displayed in the middle of the menu bar. There are four possibilities.

Icon	Function
No Icon	No information or no error has occurred
	Advisory
	Deviation
	Alarm

Soft Keys

Icons next to the soft keys indicate which mode or action is associated with each soft key. Soft keys that do not have an icon next to them are not active in the current screen.

NOTICE

To prevent damage to the soft key buttons, do not press buttons with sharp objects such as pens, plastic cards, or fingernails.

Navigating the Screens

There are two sets of screens:

The Run screens control operations and display system status and data.

The Setup screens control system parameters and advanced features.

Press  on any Run screen to enter the Setup screens. If the system has a password lock, the Password screen displays. If the system is not locked (password is set to 0000), Pump 1 Setup Screen displays.

Press  on any Setup screen to return to the Run screen.

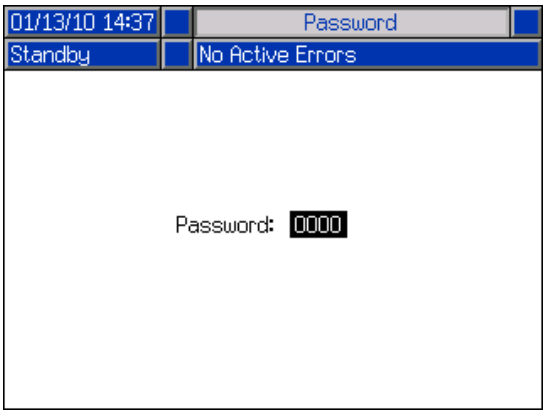
Press the Enter soft key  to activate the editing function on any screen.

Press the Exit soft key  to exit any screen.

Use the other soft keys to select the function adjacent to them.

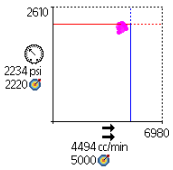
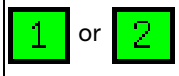
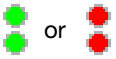
Set Password

Set a password to allow Setup screen access (see **Advanced Setup Screen 1 – Standard ADM Settings** on page 23). Enter any number from 0001 to 9999. To remove the password, enter the current password when prompted and change the password to 0000 in Advanced Setup Screen 1.

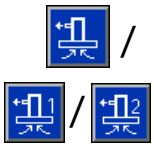
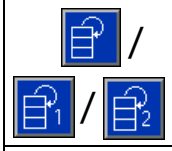
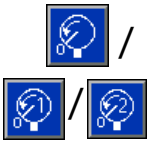


ADM Icons

Icon	Function
	Alarm - See **Troubleshooting**, page 29 for more information.
	Deviation - See **Troubleshooting**, page 29 for more information.
	Advisory - See **Troubleshooting**, page 29 for more information.
	Pressure or Pressure Mode
	Flow Rate or Flow Mode
	Target (either pressure or flow)
    	Pump status - Indicates whether or not an error is active on this pump and the pump status. The three dots above the driver represent increasing levels of readiness and activity. From left to right: • Pump enabled/disabled (green if enabled, amber if disabled) • Pump enabled, off, and not moving • Pump enabled and commanded to drive, but pump is not moving (stalled) • Pump enabled, commanded to drive and moving
	Drum level sensors are not activated
	Drum low sensor activated
	Drum empty sensor activated
	Inlet (bottom) and Outlet (top) Pressure Transducers
	Pump Diving
	Fluid Filter

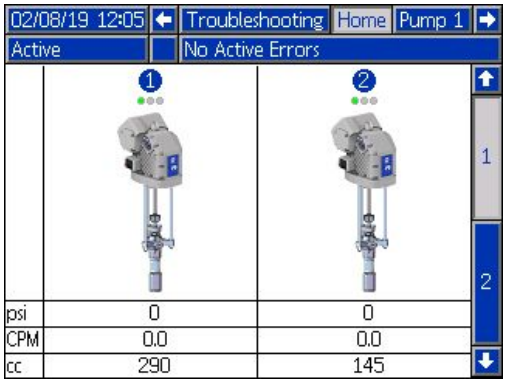
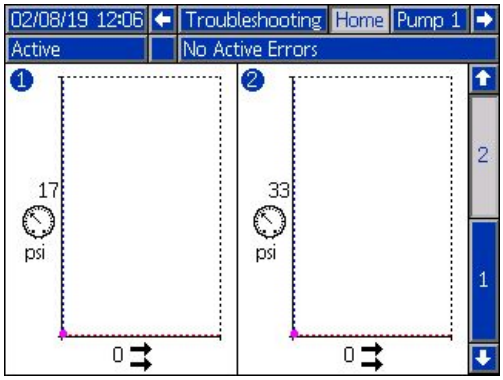
Icon	Function
	Communication Error
	No issues found with parameter or setting value
	Missing or unexpected parameter or setting value
	System is processing request (animated)
	Pump position (animated). The pump coupler will move up and down in real time and indicate the approximate position of the pump. The pump will need to complete one full down stroke upon each power cycle before the position is valid.
	Pressure-Flow Graph Dynamic graph representing the actual pressure, actual flow rate, pressure limit, and flow rate limit. The red line represents the pressure setpoint or limit. The blue line represents the flow rate setpoint or limit. When trending is disabled, a single magenta dot represents the current pressure and flow rate. When trending is enabled, older pressure flow data is kept on the screen and will slowly fade away over the period of about 30 seconds.
	*Tandem system only:* Denotes which pump is active.
	*Tandem system only:* Drum low/empty sensor indicators. If drum low and or empty sensors are installed, these indicators will appear next to each pump. The top circle represents drum low and the bottom circle represents drum empty. When green, the sensor is not activated (fluid level high). When red, the sensor is activated (fluid level low).

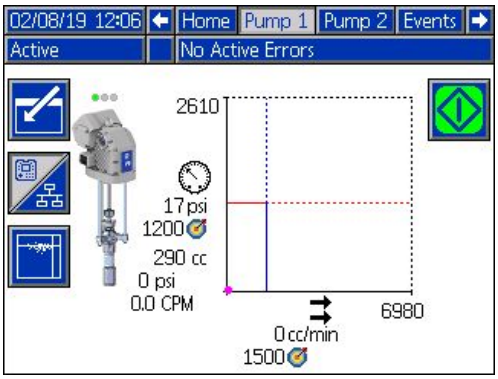
ADM Soft Keys

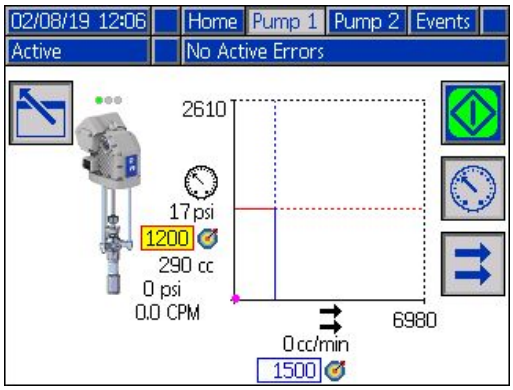
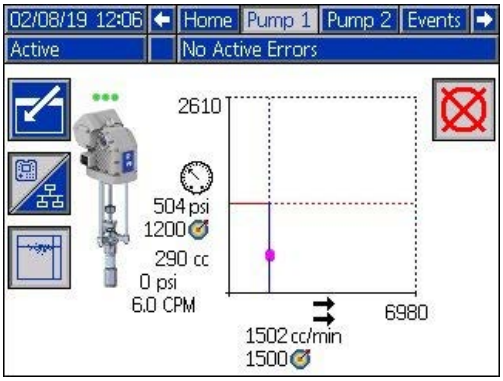
Icon	Function
	**Pump Operation Icon** *Green:* Start Pump
	*Inverted Green:* Stop Pump
	*Red with Border (enabled):* Indicates that pump cannot be started due to alarm.
	*Red with No Border (not enabled):* Indicates that system is not enabled and pump cannot be started.
	*Yellow:* Indicates that pump has an active alarm due to not being primed. Pump can be enabled via prime mode only.
	Local / Remote control toggle
	Pump is locked in remote control via fieldbus interface.
	Enable or disable pressure control (limiting) mode
	Enable or disable flow control (limiting) mode
	*Ram and Tandem systems only* Enter or exit pump priming mode. An “1” or “2” will be present in Tandem systems to indicate which pump will be primed.
	*Ram and Tandem systems only (if equipped with optional fluid solenoid)* Enter or exit drum recirculation mode.
	*Ram and Tandem systems only (if equipped with optional fluid solenoid)* Enter or exit depressurization mode.
	*Tandem systems only* View and toggle the active pump.

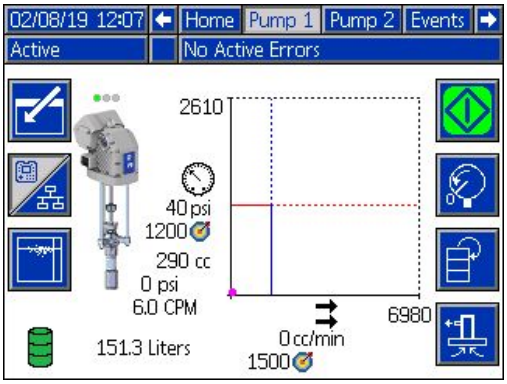
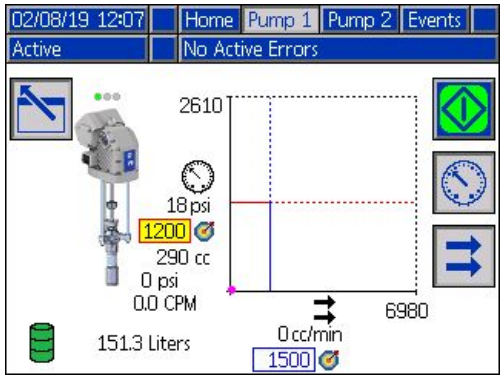
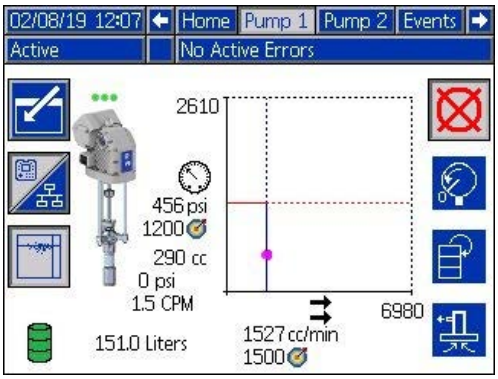
Icon	Function
	Enable or disable trending on the pressure / flow graph.
	Move to the top
	Move upward
	Move downward
	Move to the bottom
	Search
	Troubleshoot selected error
	Previous screen
	Continue
	Calibrate
	Enter or exit manual pump movement mode.
	Reset Cycle Counter
	Toggle between lifetime and resettable
	Enter or exit edit mode for a particular screen

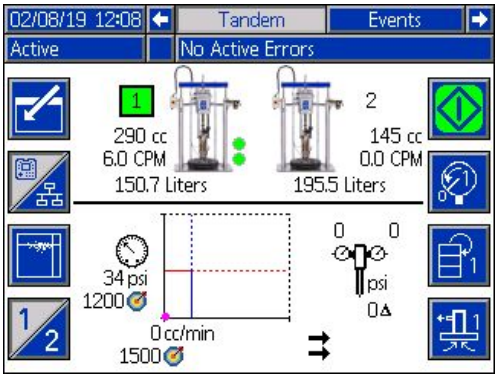
Run Screens

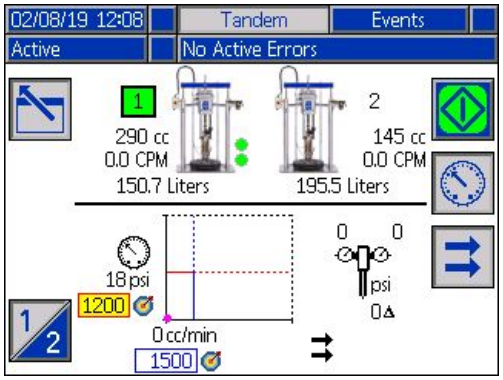
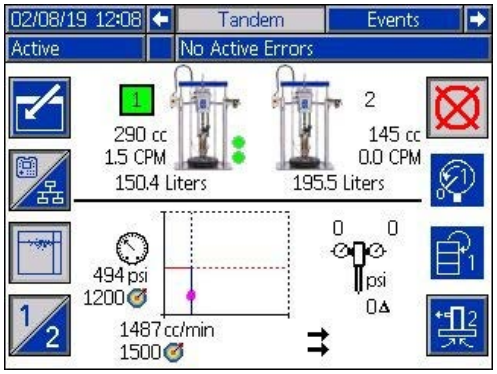
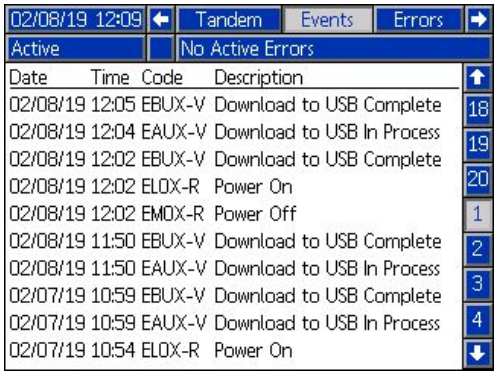
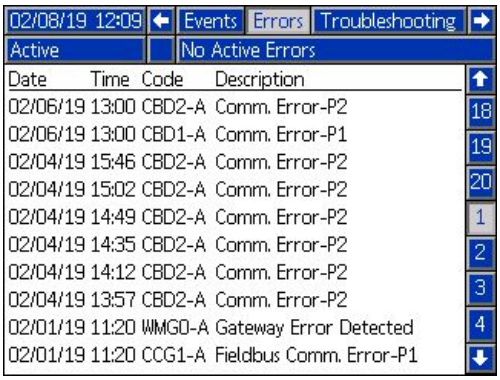
Screen	Description
	**Home Screen 1 (if more than one pump is installed in booster or ram type systems)** The status of each pump is visible along with the maximum allowable pressure, pump cycle rate, and pump lower size. If multiple pumps are installed, the system setup screen must list the correct number of pumps as “installed”.
	**Home Screen 2 (if more than one pump is installed in booster or ram type systems)** The current pressures and flow rates are visible for each pump. Pressure and flow rate units can be selected in the advanced setup screen 2.

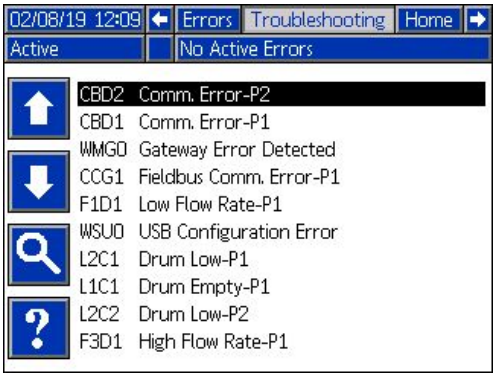
Screen	Description
	**Pump 1 Run Screen (booster)** Home screen for a single pump system. The booster system option can be selected on the system setup screen. A “Pump X” screen will be present for each pump that is installed. When this soft key is displayed, the pump can be controlled locally through the display. When this soft key is displayed the pump is controlled through discrete I/O or fieldbus protocols. Information Displayed: A dynamic graph of target and actual performance for pump outlet pressure and flow. Target pressure and flow are represented by red and blue lines respectively. The actual outlet pressure and flow is shown by the magenta dot. The points will be updated at all times when running, stalled, active, inactive, etc. Trending icon . When not enabled, only the current pressure and flow targets are shown along with the current operating point. When enabled, one can see where the pump has been operating over time. Max pressure achievable with the selected pump is shown at the top of the vertical axis. The minimum pressure is zero. Outlet Pressure target is shown next to the target icon on the vertical axis. It is restricted to values below the max achievable pressure. Pressure is displayed in psi, bar, or MPa. Select options in advanced setup screen 2. Actual outlet pressure is shown below the pressure icon and can be displayed in the same units described under the target pressure. Max flow rate achievable with the selected pump is shown at the end of the horizontal axis. The minimum flow is zero. Outlet flow rate target is shown next to the target icon on the horizontal axis. It is restricted to values below the max achievable flow. Flow rate can be displayed in cc, gal(US), gal(UK), oz(US), oz(UK), Liters, or cycles per minute or second. These options can be selected in the advanced setup screen 2. Actual outlet flow rate is shown below the flow rate icon, and can be displayed in the same units described under the flow rate target. All flow rates are calculated from the specified pump size and assume 100% volume efficiency. Pump Size is shown below the pressure target in cc. Inlet pressure is shown below the pump size in the same units as the outlet pressure. Pressure is only displayed if the inlet pressure sensor is installed (otherwise, it will display as 0). Cycle Rate is shown below the inlet pressure in CPM (cycles per minute). Pump operation icon . See **ADM Soft Keys** on page 11 for a description of this icon. Approximate position of pump / driver rod: The pump coupler moves up and down on the screen as the actual pump coupler does in the physical system based on driver rod position. This can be used to determine whether the pump is moving or stalled. Status of pump / driver is shown above the animated pump / driver icon and is depicted with three dots. The three dots represent increasing levels of readiness / activity from left to right. See the Icons section for description of the status lights. An alarm, deviation, or advisory bell will be shown above the driver if such an event is active. See Icons section.

Screen	Description
	**Pump 1 Run Screen in Edit Mode (Booster)** This screen is used to set the desired pressure and flow rates and enable/disable the pump. The pressure and flow rate targets are set using the numeric entry boxes. Use the arrow keys to navigate between pressure and flow rate targets. Pressure and/or Flow mode are selected using soft keys on the right edge of the screen. In pressure mode  , the maximum flow rate for a given pressure will be maintained. In flow mode  , the maximum pressure for a given flow rate will be maintained. In pressure and flow mode (both soft keys selected), the pressure and flow can be set as desired. **NOTE:** The restriction of the down stream fluid system determines the achievable levels of pressure and flow rate. In this example, the pump is in pressure and flow control modes with targets of 1200 psi and 1500 cc/min.
	**Pump 1 Run Screen (Booster) – Pump On** When the pump operation icon  is inverted green and selected, the pump is commanded to run and there are no active errors. Press the upper right soft key to turn off the pump. Trending is enabled. The magenta dot is continuously placed on the screen, but fades over time. The coupling connecting the driver and pump rods will move up and down on the animation to represent the physical position of the coupling.

Screen	Description
	**Pump 1 Run Screen (Ram)** See **Pump 1 Run Screen (Booster)** section for previously described information available on this screen. The ram system option can be selected on the system setup screen. The  soft key on the right can be pressed to enter or exit depressurization mode. This option is only available when a fluid solenoid is installed. Selecting the button in the state shown would enter depressurization mode. The  soft key on the right can be pressed to enter or exit drum recirculation mode. This option is only available when a fluid solenoid is installed. Selecting the button in the state shown would enter recirculation mode. The  soft key on the right can be pressed to enter or exit priming mode. Selecting the button in the state shown would enter priming mode. The drum animation  alerts you when the drum is low or empty if the respective fluid level sensors are installed. The remaining volume in the drum, shown to the right of the drum, is an estimated quantity and not guaranteed to be correct. This is a rough estimate that can be used predict about when the drums should be changed out. See the Icons section for a description of the drum animation.
	**Pump 1 Run Screen in Edit Mode (Ram)** This screen is similar to the **Pump 1 Run Screen in Edit Mode (Booster**) except the drum icon described in the **Pump 1 Run Screen (ram)** section is included.
	**Pump 1 Run Screen (Ram) – Pump On** This screen is similar to the **Pump 1 Run Screen (Booster) – Pump On** except the drum icon described in the Pump 1 Run Screen (ram) section is included. The depressurization, recirculation, and priming modes are inactive while the pump is on.

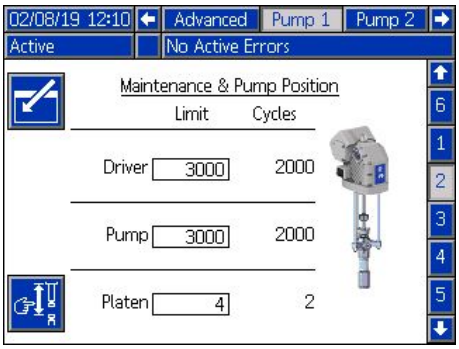
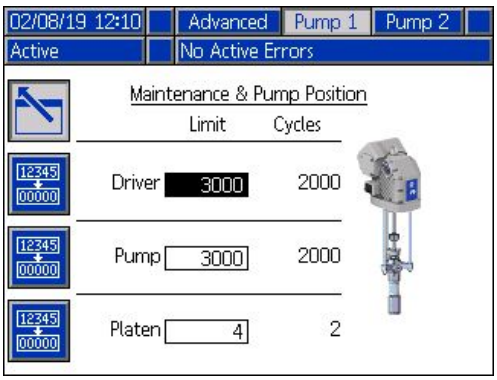
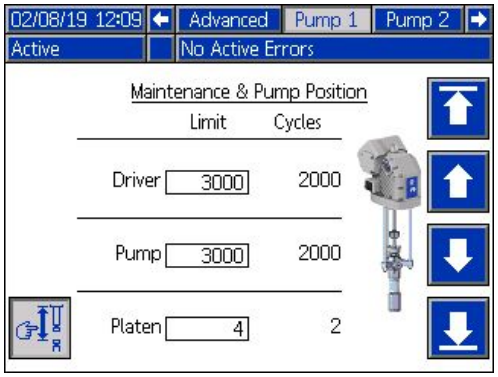
Screen	Description
	**Tandem Run Screen** See the **Pump 1 Run Screen (Ram)** section on page 15 section for previously described information available on this screen. The tandem system option can be selected on the system setup screen. In order for the tandem system to operate properly, two pumps must be installed and operational. The 1/2 soft key on the left is used to switch which pump is “active” (crossover). The 1 or 2 pump must be listed as the active pump before running. The green box around the 1 or 2 pump designations denotes the active pump. The active pump pressure and flow graph will be shown on the bottom half of the screen. The pump lower size, cycles per minute, and estimated remaining drum volume are shown for each pump. Status icons for alarms, deviations, and advisories will display next to the pump that generated the error. See **ADM Icons** on page 10 for description. Indicator lights can appear next to each pump to describe the state of the drum low or empty sensors. See the drum low/empty sensors section in the Icons table for more information. In this example, Pump 1 has the drum low and empty sensor option selected on Pump 1 setup screen 6, but they are not active (drum level high). Pump 2 does not have this option selected on the Pump 2 setup screen 6. **NOTE:** The drum low and empty sensors must be installed for this function to work properly. This option can be selected if they are not installed, but will not function correctly. The maximum allowable pressure and flow rates are not shown on the dynamic pressure and flow graph. The system will still limit entered pressure and flow rate values to their maximum. If a fluid filter is installed and the option is selected in the system setup screen, the fluid filter icon,  will appear next to the pressure and flow graph as shown. The fluid pressure before and after the filter is shown above the icon. The higher pressure reading from connector 6 of either driver is assumed to be upstream of the filter and the lower pressure reading is assumed to be downstream. The difference between the two is shown below the icon and is only valid when both zones are powered up. See **System Setup Screen – Tandem Systems**, page 23, for setting the high and low filter pressure boundaries that will generate an advisory. Depressurization, recirculation, and priming modes can be entered for either Pump 1 or 2. Press the 1/2 soft key to switch between these options for Pump 1 or 2. A crossover cannot be completed while priming is active on either pump. Only one pump can be in priming mode at a time. **NOTE:** Pump priming can be initiated and controlled through the display even when the system is being controlled through automation.

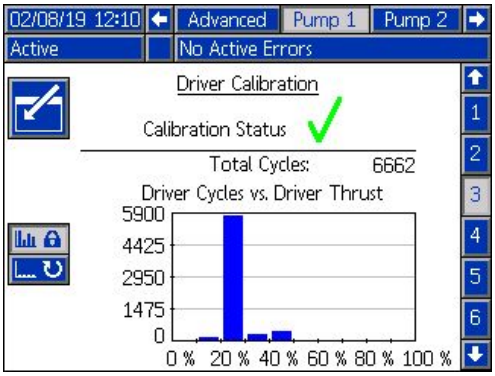
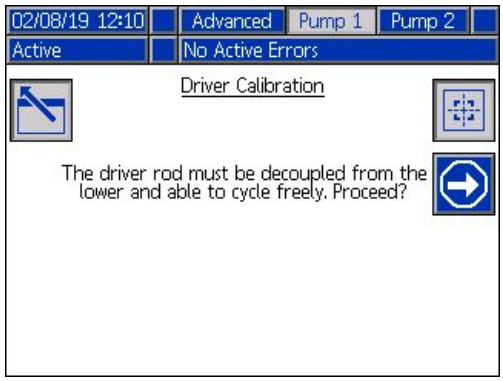
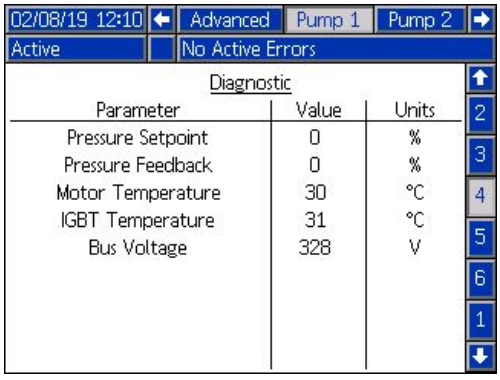
Screen	Description
	**Tandem Run Screen in Edit Mode** See **Pump 1 Run Screen in Edit Mode (Ram)** for previously described information available on this screen. The main difference from the ram screen is the 1/2 soft key can be pressed to crossover between pumps. The pressure and flow targets for each pump can be set on this screen. The entered values will be limited to their achievable maximums. The fluid filter is shown to the right of the pressure and flow graph if installed and selected in the system setup screen.
	**Tandem Run Screen – Pump On** See **Pump 1 Run Screen (Ram)** on page 15 for information available on this screen. Pressing the 1/2 soft key causes crossover between pumps. The system will automatically crossover while running if the active pump produces an alarm. A crossover error will occur if the inactive pump cannot be activated due to an alarm of its own. Depressurization and recirculation mode are not available while the pump is on, but the non-active pump can be primed while the active pump is running. The fluid filter is shown to the right of the pressure and flow graph if installed and selected in the system setup screen.
	**Events Log Screen** This screen shows the date, time, event code, and description of all events that have occurred on the system. There are 20 pages, each holding 10 events. The 200 most recent events are shown. See **Troubleshoot Errors** page 30, for instructions on viewing event code descriptions. All events listed on this screen can be downloaded on a USB flash drive. To download logs, see the **Download Procedure** on page 37.
	**Errors Log Screen** This screen shows the date, time, error code, and description of all errors that have occurred on the system. The 200 most recent errors are shown. See **Troubleshoot Errors** page 30, for instructions on viewing event code descriptions. All errors listed on this screen can be downloaded on a USB flash drive. To download logs, see the **Download Procedure** on page 37.

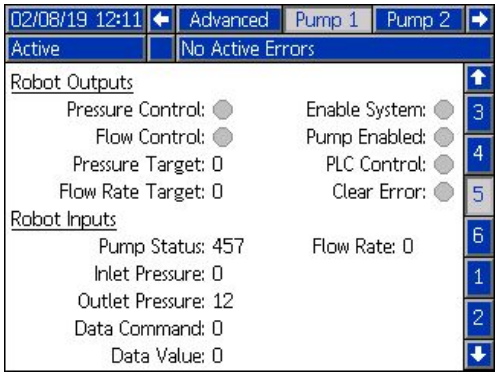
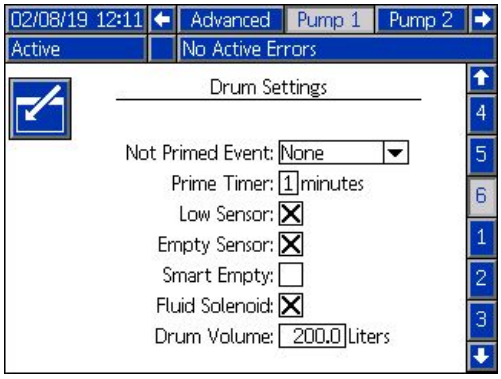
Screen	Description
	**Troubleshooting Screen** This screen displays the last ten errors that occurred on the system. Use the up and down arrows to select an error and press ? to view the QR code for the selected error. Press to access the QR code screen for an error code that is not listed on this screen. See **Troubleshoot Error Codes** on page 31 for more information on error codes.
	**Troubleshooting Screen – QR Codes** To quickly view online help for a given error code, scan the displayed QR code with your smart phone. Alternately, to view online help, search for your error code by visiting: help.graco.com/e-flo-sp-system/ See **Troubleshoot Error Codes** on page 31 for a list of errors and troubleshooting ideas.

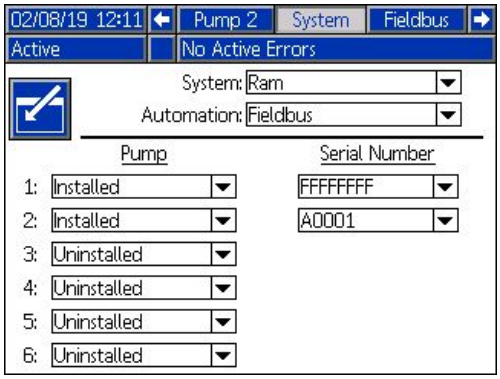
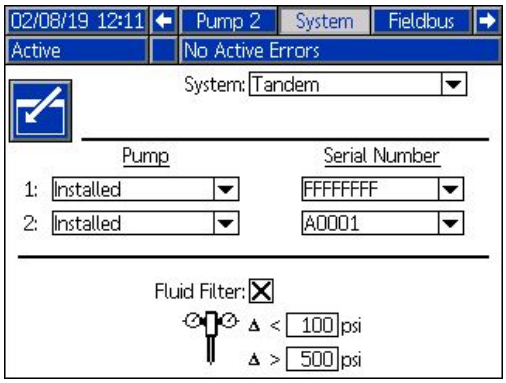
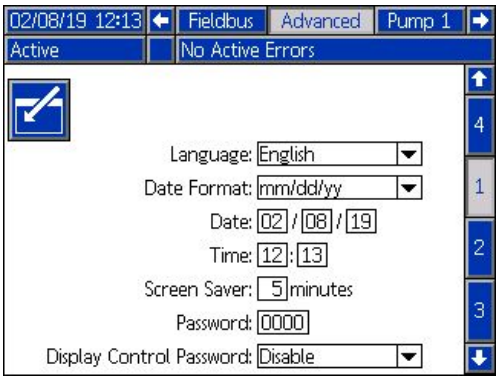
Setup Screens

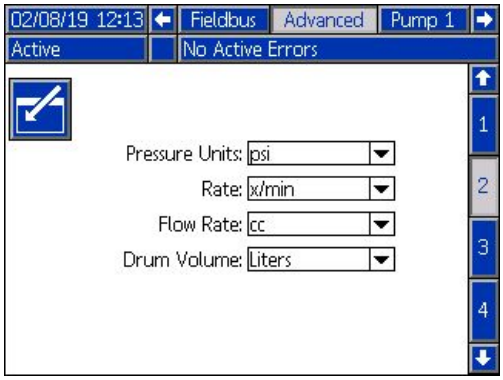
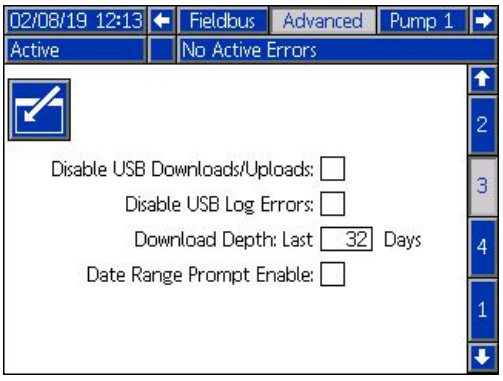
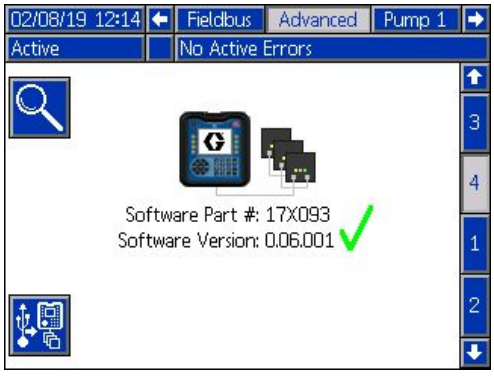
Screen	Description
	Pump Setup Screen 1 – Pump Settings **NOTE:** There is a pump tab for every installed pump in the system. The following errors can be configured and applied depending upon which mode the unit is operating. The errors will be triggered if the limit is exceeded for approximately 5 seconds. Press the  soft key to enter Edit mode prior to changing screens. **Pressure Mode**  : The specified error type (alarm [shutdown], deviation [warn], or none) will be triggered if the pressure is outside of the set-point pressure +/- tolerance range for approximately 5 seconds. For example: With a 5% tolerance, the pressure must be within 95 - 105% of the target pressure. If the pressure was outside of this range for 5 seconds or longer, an error could be triggered. **Flow Mode**  : The specified error type (alarm [shutdown], deviation [warn], or none) will be triggered if the flow rate is outside of the set-point flow +/- tolerance range for approximately 5 seconds. For example: With a 10% tolerance, the flow rate must be within 90 - 110% of the target flow rate. Tolerances have a range of 0 - 99% (0 disables the error). Tolerance is set to 0% and “None” by default. **Pump Diving Sensitivity**  : The specified error type (alarm [shutdown], deviation [warn], or none) will be triggered if pump diving is detected. The sensitivity value ranges from 0 – 99 with 99 being extremely sensitive to pump diving. Set the pump diving sensitivity lower if an unusual number of pump diving errors are generated. **Pump Type**: Select the pump lower type from the drop down menu options. **Pump Volume**: Enter the volume of the pump lower in cc. **Pressure Transducer Type**: Select this box if a flush-mount transducer is installed. If a standard issue pressure transducer is installed, leave this box unchecked. **Pressure Transducer Offsets**  : Allows for the inlet (bottom) and outlet (top) transducers to be zeroed out. In edit mode, the  soft key appears and automatically zeros out the readings +/- 145 psi (10 bar, 0.1 MPa) only. See step 5 of **Pump Setup Screen 1** on page 25 for more detail on setting pressure transducer offsets.

Screen	Description
	**Pump Setup Screen 2 – Maintenance and Pump Position** This screen shows the number of cycles and maintenance limit for the driver and pump. An advisory event will notify the user/robot that maintenance is due when the number of cycles exceeds the limit. This could be used for tracking oil or gear life. For ram and tandem systems, the number of drum changes and limit is shown. An advisory event will notify the user/robot to change the platen seals when the number of cycles exceeds the limit. Setting the limit to zero disables the specific maintenance reminder.
	**Pump Setup Screen 2 – Edit Mode** Pressing the soft key next to the corresponding cycle reset counter  icon resets the cycle count for the driver, pump, and/or platen. Reset the counter after maintenance is completed.
	**Pump Setup Screen 2 – Manual Pump Movement Mode** The soft keys on the right move the driver rod. A “medium” force and relatively slow speed will be used, similar to what is used during the calibration. sequence. Pressing the  soft key enters manual pump movement mode. Pressing and releasing the  soft key moves the driver rod to the top. Pressing and holding the  soft key moves the driver rod up. The driver rod will move up as long as the button is held. Pressing and holding the  soft key moves the driver rod down. The driver rod will move down as long as the button is held. Pressing and releasing the  soft key moves the driver rod all the way to the bottom. **NOTE:** The soft keys on the right are only available if the driver is calibrated and not already in use.

Screen	Description
	**Pump Setup Screen 3 – Driver Calibration and Usage Histogram** This screen shows the driver calibration status and the driver usage histogram. A ✓ denotes the driver is calibrated and ready to operate. A ✗ means the driver must be calibrated before operation. See **Pump Setup Screen 3 – Driver Calibration** on page 21 for instructions on driver calibration. The histogram shows the driver cycles in several bins of output force as a percentage of maximum force. This visualizes how hard the driver has been run in its lifetime. Cycles in bins toward the 100% end of the horizontal axis denote cycles that occurred when the output force of the driver was high. Pressing the soft key switches between a histogram displaying the total lifetime cycles and the cycles since last reset. When in edit mode, pressing the soft key on the right resets the histogram.
	**Pump Setup Screen 3 – Driver Calibration** When in edit mode, pressing the soft key displays the driver calibration screen. Pressing the soft key will begin driver calibration. See your driver manual for calibration instructions.
	**Pump Setup Screen 4 - Diagnostic** The diagnostic screen displays the values of key parameters that can be useful in troubleshooting issues. **Pressure Set-point:** Percentage of target driver thrust. **Pressure Feedback:** Percentage of actual driver thrust. **Motor Temperature:** This is the temperature of the motor. If this value is too high, it will generate an alarm and shut down the pump. **IGBT Temperature:** This is the temperature inside the driver casing on the control board. If this value is too high, it will generate an alarm and shut down the pump. **Bus Voltage:** This is the DC voltage of the driver bus

Screen	Description
	**Pump Setup Screen 5 – Automation Inputs/Outputs** This screen shows automation inputs/outputs. The robot outputs section shows the commands that can be sent by the robot. The icon means the robot has not sent that specific command. The icon means the robot has sent the command The robot inputs section shows the values that are being sent from the pump to the robot. This can be used for troubleshooting to identify what the robot is seeing.
	**Pump Setup Screen 6 – Drum Settings** Ram and tandem systems only. Must be in edit mode to change any of the settings. **Not Primed Event:** The specified error type (alarm [shutdown], deviation [warn], or none) is triggered when a drum is replaced and the pump has not yet been primed. If alarm is selected, the pump must be primed after replacing a drum before returning to normal operation. **Prime Timer:** Enter the length of the pump priming. Between 1 - 9 minutes. **Low Sensor:** Enables/disables the drum low deviation. The drum low level sensor must be installed to function properly. **Empty Sensor:** Enables/disables the drum empty alarm. The drum empty sensor must be installed to function properly. **Smart Empty:** Enables/disables the “smart” drum empty alarm. Incorporates multiple events to determine when the drum is empty to minimize material waste. The drum empty sensor must be installed to function properly. Pump diving sensitivity is critical to the Smart Empty function. If an empty drum is being detected early, decrease pump diving sensitivity. If empty drum detection is late, increase pump diving sensitivity. **Fluid Solenoid:** Enables/disables additional features that require a fluid solenoid. The fluid solenoid must be installed to function properly. **Drum Volume:** Enter the average volume of material available in drums. This will provide an estimate to how much material is left in drums based on pump lower size and cycle rate (estimate shown on run screen).

Screen	Description
	**System Setup Screen – Booster and Ram Systems** **System:** Select which type of system (booster, ram, or tandem) to configure. Changing the system type will reset all of the pumps in the system. **Automation:** Select how the pump will be controlled (via the fieldbus, or discrete I/O). You can configure up to 6 different pumps and select the zone to which they are configured. The serial number for each pump will be listed as the serial number printed on the driver ID tag. By default, the pumps will configure themselves in ascending alphanumeric order based on the serial number. As a backup to the driver serial number, the serial number of the control board will be displayed instead. The serial numbers for the control boards are also displayed in the detailed software status screens.
	**System Setup Screen – Tandem Systems** **System:** Select which type of system (booster, ram, or tandem) to configure. You must configure two different pumps and select the zone to which they are configured. The serial number for each pump will be listed as the serial number printed on the driver ID tag. By default, the pumps will configure themselves in ascending alphanumeric order based on the serial number. As a backup to the driver serial number, the serial number of the control board will be displayed instead. The serial numbers for the control boards are also displayed in the detailed software status screens. **Fluid Filter:** Enables/disables additional features that require a fluid filter. The fluid filter must be installed for proper function. Set the bounds for when the low and high filter pressure advisory events will be generated. Setting bounds to 0 disables low and high filter advisory events.
	**Advanced Setup Screen 1 – Standard ADM Settings** Set the language, date format, date, time, screen saver time, and password in edit mode as necessary. Set “Display Control Password” to enable while a password is also set, to prevent switching into local/display control mode without first entering a password. Setting the password to “0000” disables the password feature.

Screen	Description
	**Advanced Setup Screen 2 – Unit Settings** Must be in edit mode to change unit settings. **Pressure units:** Choose between psi, bar, and MPa. **Rate units:** Choose between rates of x/min and x/sec. **Flow Rate units:** Choose between cc, gal(US), gal(UK), oz(US), oz(UK), liters, cycles. **Drum Volume units:** Choose between cc, gal(US), gal(UK), oz(US), oz(UK), liters, cycles.
	**Advanced Setup Screen 3 – USB Log Settings** Must be in edit mode to change USB log settings. **Disable USB Downloads/Uploads:** Enables/disables option to disable automatic USB downloads/uploads upon insertion of a USB drive. **Disable USB Log Errors:** Enables/disables option to disable any USB log errors from appearing on the ADM. **Download Depth:** Enter the number of days included in USB data log downloads. USB data is overwritten when the logs fill. **Date Range Prompt Enable:** Enables/disables option to be prompted a time frame to download data from when the USB download is enabled and a USB drive is inserted.
	**Advanced Setup Screen 4 – Software** This screen can be used to view the version of software used in the system. Additionally, this screen is used to update the system software using a USB drive with the latest software and a Graco black token. See Graco ADM Token In-System Programming manual for a detailed description of this screen.

Pump and Driver Settings

To prevent personal injury from pressurized fluid such as skin injection or splashing fluid, make sure that all components in your system are rated to the maximum pressure the system is capable of attaining. All components must be rated for maximum pressure even if the pump is operated below maximum pressure.

NOTICE

To prevent damage to buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails.

NOTICE

To prevent damage to components in the system, all components must be rated to the maximum pressure the system is capable of attaining.

The ADM setup screen provides settings that help to ensure proper operation and maintenance of the system. These functions can be performed when the ADM is either in Active or System OFF mode. The settings in the pump setup screens are specific to each pump and must be enabled for each pump individually.

1. Provide power to the system to turn on the ADM.
2. While at the Run Home screen, press the ADM lock/setup button to access the setup screens. If necessary, use the left and right arrow keys on the directional keypad to navigate to Pump 1 on the menu bar.

Pump Setup Screen 1

Select the soft key next to the  icon to enable the functions on the screen.

Use the directional keypad to move between selections, the numeric keypad to enter values and the enter key to open drop down menus and confirm selections.

The settings available of this screen can be set for each pump installed in the system.

1. Navigate to the pressure mode  percentage box using the arrow keys. This percentage sets the level at which a high or low pressure alarm or deviation will be generated. For example, setting this value to 10% means a high or low pressure alarm or deviation will occur if the pressure rises or falls 10% above or below the target pressure set on the run screen. Enter the desired percentage and press the enter key (setting the percentage to 0% disables the event). Set the error type to alarm, deviation, or none (disables the event). Use the right arrow key to get to the error type box. Press the enter key to display the available error types, select the desired type using the arrow keys, and press the enter key once the correct type is highlighted.

   NOTE: Alarm will send an error message and shutdown the system. Deviation sends a warning message but the system continues to operate. If Alarm or Deviation is selected, an error message is sent when the pressure is outside of the designated tolerance range for five seconds or longer.

2. Use the arrow keys to highlight the flow mode  percentage box. The percentage sets the level at which a high or low flow alarm or deviation will be generated. Enter the desired percentage and select the error type following the same instructions mentioned in Step 1.
3. Use the arrow key to highlight the pump diving  sensitivity box. This value dictates how sensitive the pump is to detecting a pump diving error. Increase or decrease this value as desired and select the error type following the same instructions mentioned in Step 1. The default setting should be appropriate for most applications.
4. Verify the pump type is correct. If needed, select the correct pump type from the drop down menu.
5. Verify the pump volume is correct. If needed, enter the correct pump size in cc.
6. Verify the pressure transducer type is correct. If a standard pressure transducer is installed, the box should NOT be checked. If a flush-mount pressure transducer is installed, the box should be checked.
7. Pressure transducers are calibrated at the factory, but calibration may be necessary after extended use. The outlet transducer offset is listed above the inlet transducer offset. Ideally, the pressure transducers should be removed, clear of any material, and in air when attempting calibration. Any residual pressure can throw off the calibration.

Pressing the  soft key will automatically set the offsets to the negative of the value being read by the pressure transducers.

The offsets can also be set manually by selecting “+” or “-” from the Offset drop down boxes and then entering the appropriate offset pressure rating. This can be used to adjust the pressure transducer to a non-zero value. For example, if the outlet pressure is known to be 1000 psi, but the transducer is reading 1010 psi. The offset can be set to -10 and the reading will be adjusted to show 1000 psi instead of 1010 psi.

Pump Setup Screen 2

1. Use the arrow and enter keys to set the driver maintenance limit to a desired number of cycles. The pump will produce an advisory to complete scheduled maintenance when the driver exceeds this number of cycles. Remember to press the  soft key to reset the cycle count after maintenance is performed.
2. Repeat step one for the pump and platen maintenance limits as desired.

Pump Setup Screen 3

1. If the  icon appears next to calibration status, the driver must be calibrated. In edit mode, press the  soft key.
2. See your driver manual for calibration instructions. Pressing  will begin calibration.

Pump Setup Screen 6 (Ram and Tandem Systems Only)

1. Navigate to the Not Primed Event select box. Use the enter key to select the desired error type as alarm, deviation, or none. This determines the error type generated after a drum is changed. If set to alarm, the pump must be primed before continuing normal operation.
2. Enter the desired priming length in minutes in the Prime Timer box.
3. If a low drum level sensor is installed, press the enter key over the Low Sensor box to place an “X” in the box. An “X” denotes the sensor is installed and a low level deviation will be generated when the sensor is triggered. Leave the box empty if no low level deviation is desired.
4. If an empty drum sensor is installed, press the enter key over the Empty Sensor box to place an “X” in the box. An “X” denotes the sensor is installed and an empty alarm will be generated when the sensor is triggered. Leave the box empty if no empty alarm is desired.
5. If an empty drum sensor is installed, the Smart Empty feature can be enabled. This alarm is generated from multiple indicators to better determine when the drum is empty and reduce material waste from changing a drum too early. If desired, use the enter key to place an “X” in the Smart Empty box. **NOTE:** See **Pump Setup Screen 6 – Drum Settings** on page 22 for comments on the pump diving sensitivity.
6. If a fluid solenoid is installed, use the enter key to place an “X” in the Fluid Solenoid box. **NOTE:** The pressure target will be capped at a maximum of 5000 psi (34.4 MPa, 344 bar) if this setting is enabled.
7. Enter the average volume of material contained within drums in the Drum Volume box using the keypad and enter button. This will provide an estimate of remaining drum volume on the run screen.

Advanced Setup Screen 1

1. Set the Language, Date Format, Date, Time, and Screen Saver time as desired.
2. Enable a password if desired. If the Display Control Password is enabled, a password will be required to switch from remote to local control of the system on the run screen. Note, a password of 0000 means the password function is disabled.

Advanced Setup Screen 2

1. Select desired units for Pressure, Rate, Flow Rate, and Drum Volume.
2. To enable Discrete Display Control, press the enter key over the check box to mark it with an X. Leave the box empty if Discrete Display Control will not be used.

Advanced Setup Screen 3

1. USB downloads automatically begin when a USB drive is inserted. To disable this feature, use the enter key to place an “X” in the Disable USB Downloads/Uploads box.
2. If you do not want USB log errors to be generated on the ADM, use the enter key to place an “X” in the Disable USB Log Errors box.
3. Set the desired download depth using the keypad and enter key to enter the desired number of days. This specifies how many days’ worth of pump data will be kept in the USB logs. Once the logs fill up, the oldest recording will be overwritten.
4. To enable a date range of data to download upon insertion of a USB drive, use the enter key to place an “X” in the Date Range Prompt Enable box

System Setup Screen

1. Use the enter key to select the desired system type in the System box if needed.
2. If using external discrete I/O to control the pump, change the setting in the Automation box to Discrete using the Enter key.
3. Verify the pumps in the system are installed and the proper serial number is listed.
4. If a using a Tandem system and a fluid filter is installed, use the enter key to place an “X” in the Fluid Filter box. Use the keypad and enter key to enter the desired high and low filter pressure differences at which to generate a high or low filter pressure advisory.

   NOTE: The pressure target will be capped at a maximum of 5000 psi (34.4 MPa, 344 bar) if this setting is enabled.

Connect Light Tower Accessory

1. Order the 255468 Light Tower Accessory as a diagnostic indicator for the E-Flo SP system.
2. Connect the cable from the light tower to the digital I/O port on the ADM.

Signal	Description
Green	No errors
Yellow	An advisory exists
Yellow flashing	A deviation exists
Red solid	An alarm exists.

NOTE: See **Troubleshooting**, page 29, for error definitions.

Pump Load Sharing

Please note the following load sharing restrictions:

- Load sharing is enabled only after software version 1.10.005. Please update the software from help.graco.com. See the specific link below.

  https://help.graco.com/en/software-history/e-flo-sp-software-change-history.html#root-responsivegrid-slab-slab-parsys-accordionlist_1046909021-accordion1648841610051-par-accordionlist-accordion1648841726085

  https://help.graco.com/en/software-history/e-flo-sp-software-change-history.html#root-responsivegrid-slab-slab-parsys-accordionlist_1046909021-accordion1648841610051-par-accordionlist-accordion1648841726085

- Load sharing only works in pressure mode. It does not work in combined mode or flow mode.
- Load sharing is only available on a group of two or more booster pumps, with a maximum of six.
- Load sharing is not available on rams.

What It Is

The Load Sharing feature within the E-Flo SP Booster pump is a feature to ensure the sharing of the work (pump pressure) between the available E-Flo SP pumps within the connected to the system of pumps. The purpose is for E-Flo SP booster pumps within a system to work (pump) at a similar level while maintaining a specified system pressure. The Load Sharing feature controls all pumps within the system to do the same amount of work. The Load Sharing feature will overcome common situations that would prevent a pneumatic pump from working evenly, situations such as tight packings, hose restriction and piping layouts.

How It Works

Each E-Flo SP booster pump communicates to the system of booster pumps (up to 6). Each E-Flo SP booster knows how all others are performing. When one pump is doing less work or more work, the entire system compensates through a closed loop control algorithm. The pumps sense if one has been taken off line or if one is added to the system and adjusts real time accordingly. The adjustment of each pump on the system happens slowly in order to maintain stability to the process, each added or removed E-Flo SP booster will take a few seconds to catch up to the other pumps.

Benefits

Maintenance:

- By sharing the load of the sealer system, all pumps do the same amount of work. This allows pumps to be rebuilt on a set schedule/downturn since they will all have the same amount of usage.

Higher system flow rate:

- Sharing the load allows all of the pumps online to do work toward maximum system flow rate. When pneumatics are used, one pump will always run faster than the others, due to improper loading. Load sharing effectively allows all pumps to hit the maximum cycle rate simultaneously.

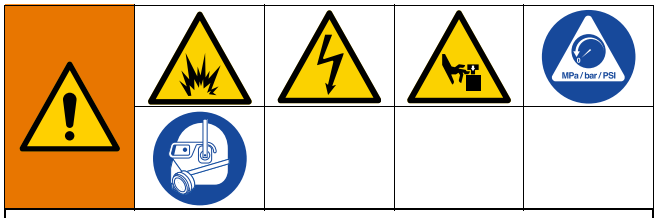
Ability to change out pumps:

- Load sharing grants the ability to swap out a worn pump while all others are running. Example: In a three-pump booster system, removing one pump will cause the other two pumps to pick up the load, provided there is enough headroom on the cycle rate.

Greater performance than pneumatic pumps:

- Able to integrate with the PLC or robot to monitor and control.
- Much more efficient than pneumatics.
- Easier to size the booster system.
- Ability to monitor the number of cycles on a pump in order to perform downturn maintenance.

Troubleshooting



REMOTE SYSTEM ACTIVATION HAZARD

To avoid injury due to remote machine operation, perform the steps below before troubleshooting. This will prevent commands sent from the fieldbus or display module from actuating the driver/pump.

1. Relieve pressure for pump or ram in need of service. Perform the Pressure Relief Procedure in your system manual.
2. Disconnect power to the pump or ram in need of service. See your system manual for complete instructions.

Error Codes and Troubleshooting

See **Troubleshoot Error Codes** table on page 31, or visit help.graco.com/e-flo-sp-system/ for causes and solutions to each error code.

Errors

View Errors

When an error occurs, the error information screen displays the active error code and description.

The error code, alarm bell, and active errors will scroll in the status bar. Error codes are stored in the error log and displayed on the Error and Troubleshooting screens on the ADM.

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

Alarms are indicated by  . This condition indicates a a parameter critical to the process has reached a level requiring the system to stop. The alarm needs to be addressed immediately.

Deviations are indicated by  . This condition indicates a parameter critical to the process has reached a level requiring attention, but not sufficient enough to stop the system at this time.

Advisories are indicated by  . This condition indicates a parameter that is not immediately critical to the process. The advisory needs attention to prevent more serious issues in the future.

To diagnose the active error, see **Troubleshoot Errors** on page 30.

Troubleshoot Errors

To troubleshoot the error:

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

   NOTE: Press ↵ or ⊗ to return to the previously displayed screen.

2. The QR code screen will be displayed. Scan the QR code with your smart phone to be sent directly to online troubleshooting for the active error code. You can also navigate to help.graco.com/e-flo-sp-system/ for causes and solutions to each error code.

3. If no internet connection is available, call Graco Technical Assistance.

Troubleshoot Error Codes

Error	Location	Type	Error Name	Error Description	Cause	Solution
A4D_	Driver	Alarm	High Motor Current P_	Motor current exceeds maximum allowed value	Encoder malfunction	Calibrate encoder. If this fails, then replace encoders.
					Pump Diving: A pressure imbalance between the up and down stroke of the pump is causing the pump to dive with excessive speed.	Pump diving may occur when the pump runs out of material while spraying at high pressure. Verify that material is being properly fed to the pump. Pressure from the hose could flow back into the pump on the down stroke. Verify that the check valve is installed and is properly working.
					Motor not able to rotate	Check that motor shaft rotates freely.
A4N_	Driver	Alarm	High Motor Current P_	Motor current exceeds maximum allowed value	Encoder malfunction	Calibrate encoder. If this fails, then replace encoders.
					Pump Diving: A pressure imbalance between the up and down stroke of the pump is causing the pump to dive with excessive speed.	Pump diving may occur when the pump runs out of material while spraying at high pressure. Verify that material is being properly fed to the pump. Pressure from the hose could flow back into the pump on the down stroke. Verify that the check valve is installed and is properly working.
					Motor not able to rotate	Check that motor shaft rotates freely.
CAC_	ADM	Alarm	Communication Error P_	Communication lost between ADM and pump	No 24 VDC power supply to ADM Cross threaded CAN cable.	Reconnect or replace CAN cable connecting driver and ADM. If CAN connection good, check 24V power supply wiring in driver. Disconnect AC power to pump before checking power supply. Yellow LED on driver connector board should be flashing.
						CAN cables carry 24 V DC power and communication between modules. A cross threaded CAN cable connector may cause problems with communication and/or power to modules. Carefully check for cross threaded CAN connections on the ADM and driver. Yellow LED on driver connector board should be flashing.

Error	Location	Type	Error Name	Error Description	Cause	Solution
CBD_	Driver	Alarm	Communication Error P_	Communication lost between pump and ADM	No AC power to driver.	Verify pump is turned on by confirming disconnect switch is in the ON position. Yellow LED on driver connector board should be flashing.
					AC disconnect switch broken	Disconnect pump from AC power. Check wiring to switch. If wiring is good, replace the AC disconnect switch.
					Faulty driver control board	Replace driver electronics cover.
CCD_	Driver	Alarm	Duplicate Module P_	Multiple pumps using same pump ID	Two or more pumps have the same pump ID	Update the pumps displaying the error to the latest software available on help.graco.com.
CCG_	Gateway	Alarm	Fieldbus Comm. Error P_	No communication with the fieldbus	The automation gateway lost communication with the automation controller	Restore communications.
CCN_	Driver	Alarm	Control Board P_	Communication lost between driver hot and cold boards	Software update failure	If software updates to the hot or cold driver boards fail before completion, then they will not be able to communicate. Update software to the latest available on help.graco.com.
					Cold board disconnected from hot board	Disconnect pump from AC power. Verify the cold board is securely fastened on the spacers above the hot board.
					Faulty driver control board	Replace driver electronics cover.
DB1_ DB2_	Pump	Alarm or Deviation (user selectable)	Pump Not Primed P_	Pump has not been primed since last empty drum	Replacing an empty drum with a new one	After replacing an empty drum, the pump must be primed before returning to operation (if alarm selected). Go to the pump run screen and push the lower right soft key to begin the priming sequence, then press the upper right soft key. Set the priming time in the setup screens. If deviation selected, prime pump if desired or clear deviation and return to normal pump operation.
DD3_ DD4_	Pump	Alarm or Deviation (user selectable)	Pump Diving P_	Pump diving detected	Flow to pump inlet restricted	Check inlet valve is open or check inlet supply system for clogs
DKC_	Pump	Alarm	Crossover Error P_	Crossover error in tandem system	Second pump is in error state when crossover takes place	Clear the error on the second pump.

Error	Location	Type	Error Name	Error Description	Cause	Solution
EAUX	ADM	Advisory	Download to USB In Process	Information is currently being downloaded to USB	Download to USB initiated	No action necessary. Self-clearing
EBUX	ADM	Advisory	Download to USB Complete	Download to USB is complete	All requested information has finished downloading to USB	No action necessary. Self-clearing
EC0X	ADM	Record Only	Setup Values Changed	A setting in the setup screen was changed	A setting in the setup screens was changed	No action necessary if changes were desired.
EL0X	ADM	Record Only	Power On	The ADM was powered on	The ADM was powered on	No action necessary.
EM0X	ADM	Record Only	Power Off	The ADM was powered off	The ADM was powered off	No action necessary.
EVUX	ADM	Advisory	USB Disabled	USB downloads/uploads are disabled	USB download/upload was attempted, but USB activity is disabled within the setup screen	Advisory will clear when USB drive is removed. Enable USB downloads/uploads in setup screen if desired and reinsert USB drive.
F1D_ F2D_	Pump	Alarm or Deviation (user selectable)	Low Flow Rate P_	Measured flow rate less than desired flow rate minus tolerance	Fluid supply too low to achieve desired flow rate	Increase fluid pressure to reach desired rate.
					Clog in fluid supply system	Check hose and other components in fluid supply system for clogs.
					No material supply	Replace drum and prime pump if desired.
					Incorrect flow tolerance	Enter correct flow tolerance percentage in setup screen.
F3D_ F4D_	Pump	Alarm or Deviation (user selectable)	High Flow Rate P_	Measured flow rate greater than desired flow rate plus tolerance	Incorrect flow tolerance	Enter correct flow tolerance percentage in setup screen.
L1C_	Pump	Alarm	Drum Empty P_	Drum is empty	Drum is empty and needs to be replaced	Replace drum and prime pump if desired.
					Drum level sensor is disconnected	Verify level sensor is connected. Replace sensor if connection is good.
L2C_	Pump	Deviation	Drum Empty P_	Drum level is low	Fluid level in drum is low. Consider replacing soon	Clear deviation and return to normal pump operation.
					Drum level sensor is disconnected	Verify level sensor is connected. Replace sensor if connection is good.

Error	Location	Type	Error Name	Error Description	Cause	Solution
MMUX	ADM	Advisory	USB Log 90% Full	One or more USB log is 90% full.	Data in the jobs or events log has not been downloaded recently and logs are nearly full.	Download the data or disable USB errors.
MAD_	Pump	Advisory	Maint. Due Pump P_	Maintenance due for pump	The number of pump cycles since last reset has exceeded the maintenance limit set	Perform desired maintenance and reset the pump cycles in the setup screen.
MBD_	Pump	Advisory	Maint. Due Driver P_	Maintenance due for driver	The number of driver cycles since last reset has exceeded the maintenance limit set	Perform desired maintenance and reset the driver cycles in the setup screen.
MLC_	Pump	Advisory	Rebuild Platen Seals P_	Maintenance due for platen seals	The number of replaced drums since last cycles reset has exceeded the maintenance limit set	Rebuild the platen seals if desired and reset the platen cycles in the setup screen.
MG2_	Pump	Advisory	Low Filter Pressure P_	Low filter pressure drop detected	The filter has an opening in it	Replace the fluid filter.
MG3_	Pump	Advisory	High Filter Pressure P_	High filter pressure drop detected	There is a clog in the manifold	Clean out the manifold to reduce the pressure.
P1C_ P2C_	Pump	Alarm or Deviation (user selectable)	Low Pressure P_	Measured outlet pressure less than desired outlet pressure minus tolerance	Incorrect pressure tolerance	Enter correct pressure tolerance percentage in setup screen.
					Failed pressure transducer	Check transducer, replace if failed
					No or insufficient material flow	Increase material flow
P4C_ P3C_	Pump	Alarm or Deviation (user selectable)	High Pressure P_	Measured outlet pressure greater than desired outlet pressure plus tolerance	Incorrect pressure tolerance	Enter correct pressure tolerance percentage in setup screen.
					Failed pressure transducer	Check transducer, replace if failed
					Clog in fluid supply system	Check hose and other components in fluid supply system for clogs.
P6D_	Pump	Deviation	Outlet Pressure Sensor P_	Outlet pressure transducer not connected	The outlet pressure transducer is not connected or faulty	Verify outlet pressure transducer is installed and/or connected correctly. Replace if necessary.
T2D1	Driver	Deviation	Motor Temperature Sensor P_	Motor temperature thermistor disconnected	The motor temperature thermistor is not connected or faulty	Verify motor temperature thermistor is installed and/or connected correctly. Replace if necessary.

Error	Location	Type	Error Name	Error Description	Cause	Solution
T3D1	Driver	Deviation	Temperature Cutback P_	Current supplied to motor is being reduced in order to lower driver temperature	The control board temperature inside the driver is too high	Ensure ambient temperature is below 120F (48C). Ensure the enclosure fans are working properly.
					Enclosure fan not operating	Verify fan is spinning. If it is not, disconnect pump from AC power and check fan wiring or replace fan.
T4C1	Driver	Alarm	High Controls Temperature P_	Temperature of the control board is too hot	The control board temperature inside the driver is too high	Ensure ambient temperature is below 120F (48C).
					Enclosure fan not operating	Verify fan is spinning. If it is not, disconnect pump from AC power and check fan wiring or replace fan.
T4C1	Driver	Alarm	High Motor Temperature P_	Temperature of the motor is too hot	The motor temperature inside the driver is too high	Ensure ambient temperature is below 120F (48C).
					Enclosure fan not operating	Verify fan is spinning. If it is not, disconnect pump from AC power and check fan wiring or replace fan.
V1M_	Driver	Alarm	Low Voltage P_	Supplied bus voltage is below minimum acceptable limit	Transformer faulty	Check output voltage of transformer to verify it is within acceptable input limits.
					Incorrect line voltage	Check line voltage to verify it is as expected (230V, 480V, etc.)
V4M_	Driver	Alarm	High Voltage P_	Supplied bus voltage is above maximum acceptable limit	Transformer faulty	Check output voltage of transformer to verify it is within acceptable input limits.
					Incorrect line voltage	Check line voltage to verify it is as expected (230V, 480V, etc.)
WBD_	Driver	Alarm	Encoder Hardware P_	Encoder or hall sensor disconnected or failed to commutate motor	Encoder disconnected or faulty	Disconnect pump from AC power. Verify encoder cable is properly connected. If so, recalibrate encoder. If this fails, replace encoder.
WMC_	Driver	Alarm	Control Board P_	Control board reset due to an exception in software	Invalid software state	Cycle the power to the pump to reset the driver software. If this doesn't work, update software to the latest available on help.graco.com.
WMG 0	Gateway	Alarm	Gateway Error Detected	Gateway error detected; includes any error not covered by a more specific error	---	---

Error	Location	Type	Error Name	Error Description	Cause	Solution
WMN_	Driver	Alarm	Software Mismatch P_	Software mismatch detected in the motor control board	Hot board and cold board have different software versions	Update the driver control board software to the latest available on help.graco.com.
WNG0	Gateway	Alarm	Gateway Map Error	Missing or invalid gateway map	Missing or invalid gateway map	Install map in gateway.
WSC_	Driver	Deviation	Encoder Calibration P_	Encoder calibration information not found	Encoder not calibrated before or calibration information deleted	Perform encoder calibration through the setup screens of the ADM.
WSU0	ADM	Alarm	USB Configuration Error	USB configuration file not detected	USB configuration file not loaded or was deleted	Update software to the latest available on help.graco.com.

USB Data

Download Procedure

NOTE: If log files are not correctly saving to the USB flash drive (for example, missing or empty log files), save the desired data off of the USB flash drive and reformat it before repeating the download procedure.

NOTE: System configuration setting files and custom language files can be modified if the files are in the UPLOAD folder of the USB flash drive. See **System Configuration Settings**, page 38, **Custom Language File**, page 38, and **Upload Procedure** on page 39.

1. Insert the USB flash drive into the USB port.
2. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete.
3. Remove the USB flash drive from the USB port.
4. Re-insert the USB flash drive into the USB port of computer.
5. The USB flash drive window automatically opens. If it does not, open USB flash drive from within Windows® Explorer.
6. Open the GRACO folder.
7. Open the system folder. If downloading data from more than one system, there will be more than one folder. Each folder is labeled with the corresponding serial number of the ADM

   NOTE: The serial number is on back of the ADM.
8. Open the DOWNLOAD folder.
9. Open the DATAxxxx folder.
10. Open the DATAxxxx folder labeled with the highest number. The highest number indicates the most recent data download.
11. Open the log file. Log files open in Microsoft® Excel by default as long as the program is installed. However, they can also be opened in any text editor or Microsoft® Word.

    NOTE: All USB logs are saved in Unicode (UFT-16) format. If opening the log file in Microsoft Word, select Unicode encoding.

USB Logs

NOTE: The ADM can read/write to FAT (File Allocation Table) storage devices. NTFS, used by 32 GB or greater storage devices, is not supported.

During operation, the ADM stores system and performance related information to memory in the form of log files. The ADM maintains six log files:

- Event Log
- Pump X Log
- Cycles Log

Follow the **Download Procedure**, page 37, to retrieve log files.

Each time a USB flash drive is inserted into the ADM USB port, a new folder named DATAxxxx is created. The number at the end of the folder name increases each time a USB flash drive is inserted and data is downloaded or uploaded.

Event Log

The event log file name is 1-EVENT.CSV and is stored in the DATAxxxx folder.

The event log maintains a record of the last 1,000 events and errors. Each event record contains:

- Date of event code
- Time of event code
- Event code
- Event Type
- Event Description

Event codes include both error codes (alarms, deviations, and advisories) and record only events.

PumpX Log

The pump log file name is X-PUMPX.csv and is stored in the DATAxxxx folder. The first X is the log number and the second X is the pump number.

There will be a pump log for every pump installed on the system. Each log maintains seven days worth of run data.

The pump log records the pressure and flow operating points of the pumps at 15 second intervals while the pump is enabled. The parameters recorded in this log are listed below.

- Target Outlet Pressure (bar)
- Actual Outlet Pressure (bar)
- Actual Inlet Pressure (bar)
- Target Flow Rate (cc/min)
- Actual Flow Rate (cc/min)

Cycles Log

The cycles log file name is 8-CYCLES.csv and is stored in the DATAxxxx folder.

The cycles log records driver and pump cycle information for each pump. The parameters recorded in this log are listed below.

- Pump ID
- Driver Lifetime Cycles
- Driver Maintenance Cycles
- Pump Maintenance Cycles
- Platen Maintenance Cycles
- Driver Cycles in 10% increments of Max Output Thrust

System Configuration Settings

The system configuration settings file name is SETTINGS.TXT and is stored in the DOWNLOAD folder.

A system configuration settings file automatically downloads each time a USB flash drive is inserted into the ADM. Use this file to back up system settings for future recovery or to easily replicate settings across multiple systems. Refer to the **Upload Procedure** on page 39 for instructions on how to use this file.

Custom Language File

The custom language file name is DISPTEXT.TXT and is stored in the DOWNLOAD folder.

A custom language file automatically downloads each time a USB flash drive is inserted into the ADM. If desired, use this file to create a user-defined set of custom language strings to be displayed within the ADM.

The system is able to display the following Unicode characters. For characters outside of this set, the system will display the Unicode replacement character, which appears as a white question mark inside of a black diamond.

- U+0020 - U+007E (Basic Latin)
- U+00A1 - U+00FF (Latin-1 Supplement)
- U+0100 - U+017F (Latin Extended-A)
- U+0386 - U+03CE (Greek)
- U+0400 - U+045F (Cyrillic)

Create Custom Language Strings

The custom language file is a tab-delimited text file that contains two columns. The first column consists of a list of strings in the language selected at the time of download. The second column can be used to enter the custom language strings. If a custom language was previously installed, this column contains the custom strings. Otherwise the second column is blank.

Modify the second column of the custom language file as needed and the follow the **Upload Procedure** on page 39 to install the file.

The format of the custom language file is critical. The following rules must be followed in order for the installation process to succeed.

- Define a custom string for each row in the second column.

  NOTE: If the custom language file is used, you must define a custom string for each entry in the DISPTEXT.TXT file. Blank second-column fields will be displayed blank on the ADM.
- The file name must be DISPTEXT.TXT.
- The file format must be a tab-delimited text file using Unicode (UTF-16) character representation.
- The file must contain only two columns, with columns separated by a single tab character.
- Do not add or remove rows to the file.
- Do not change the order of the rows.

Upload Procedure

Use this procedure to install a system configuration file and/or a custom language file.

1. If necessary, follow the **Download Procedure** to automatically generate the proper folder structure on the USB flash drive.
2. Insert USB flash drive into USB port of computer.
3. The USB flash drive window automatically opens. If it does not, open USB flash drive from within Windows Explorer.
4. Open GRACO folder.
5. Open the system folder. If working with more than one system, there will be more than one folder within the GRACO folder. Each folder is labeled with the corresponding serial number of the ADM (the serial number is on the back of the module).
6. If installing the system configuration settings file, place SETTINGS.TXT file into the UPLOAD folder.
7. If installing the custom language file, place DISPTEXT.TXT file into the UPLOAD folder.
8. Remove USB flash drive from the computer.
9. Install USB flash drive into the ADM USB port.
10. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete.
11. Remove USB flash drive from USB port.

    NOTE: If the custom language file was installed, you can select the new language from the Language drop-down menu in **Advanced Setup Screen 1** on page 27.

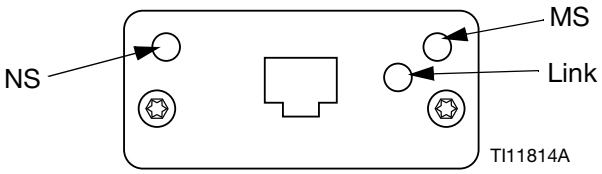
Communications Gateway Module (CGM)

Connection Details

Fieldbus

Connect cables to fieldbus per fieldbus standards.

PROFINET



The Ethernet interface operates at 100M bit, full duplex, as required by PROFINET. The Ethernet interface is auto-polarity sensing and auto-crossover capable.

Network Status (NS)

State	Description	Comments
Off	Off-line	• No power • No connection with IO Controller
Green	On-line, (RUN)	• Connection with IO Controller established • IO Controller with RUN state
Flashing Green	On-line, (STOP)	• Connection with IO Controller established • IO Controller in STOP state

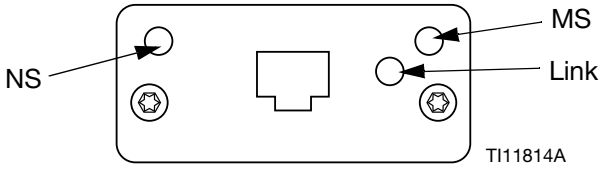
Module Status (MS)

State	Description	Comments
Off	Not initialized	No power or module in “SETUP” or “NW_INIT” state
Green	Normal operation	Diagnostic event(s) present
Flashing Green	Initialized, diagnostic event(s) present	Used by engineering tools to identify node on network
Red	Exception error	Module in state “EXCEPTION”
Red (1 flash)	Configuration error	Expected Identification differs from Real Identification
Red (2 flashes)	IP Address not set	Set IP address via system monitor or DNS server
Red (3 flashes)	Station Name not set	Set Station Name via system monitor
Red (4 flashes)	Major Internal Error	Cycle system power; replace module

Link/Activity (Link)

State	Description
Off	No Link, no communication present
Green	Link established, no communication present
Green, flashing	Link established, communication present

EtherNet/IP



The Ethernet interface operates at 100Mbit, full duplex, as required by PROFINET. The Ethernet interface is auto-polarity sensing and auto-crossover capable.

Network Status (NS)

State	Description
Off	No power or no IP address
Green	On-line, one or more connections established (CIP Class 1 or 3)
Flashing Green	On-line, no connections established
Red	Duplicate IP address, FATAL error
Flashing Red	One or more connections timed out (CIP Class 1 or 3)

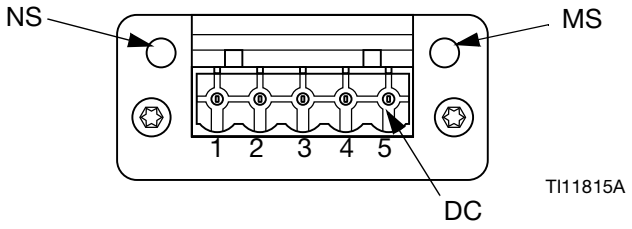
Module Status (MS)

State	Description
Off	No power
Green	Controlled by a Scanner in Run state
Flashing Green	Not configured, or Scanner in Idle state
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Flashing Red	Recoverable fault(s)

LINK/Activity (Link)

State	Description
Off	No link, no activity
Green	Link established
Flashing Green	Activity

DeviceNet



Network Status (NS)

State	Description
Off	Not online / No power
Green	On-line, one or more connections are established
Flashing Green (1 Hz)	On-line, no connections established
Red	Critical link failure
Flashing Red (1 Hz)	One or more connections timed-out
Alternating Red/Green	Self test

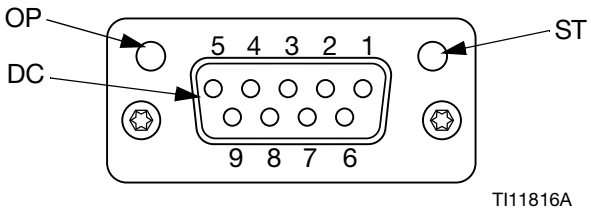
Module Status (MS)

State	Description
Off	No power or not initialized
Green	Initialized
Flashing Green (1 Hz)	Missing or incomplete configuration, device needs commissioning
Red	Unrecoverable Fault(s)
Flashing Red (1 Hz)	Recoverable Fault(s)
Alternating Red/Green	Self test

DeviceNet Connector (DC)

Pin	Signal	Description
1	V-	Negative bus supply voltage
2	CAN_L	CAN low bus line
3	SHIELD	Cable shield
4	CAN_H	CAN high bus line
5	V+	Positive bus supply voltage

PROFIBUS



Operation Mode (OP)

State	Description
Off	Not online / No power
Green	On-line, data exchange
Flashing Green	On-line, clear
Flashing Red (1 flash)	Parameterization error
Flashing Red (2 flashes)	PROFIBUS Configuration error

Status Mode (ST)

State	Description
Off	No power or not initialized
Green	Initialized
Flashing Green	Initialized, diagnostic event(s) present
Red	Exception error

PROFIBUS Connector (DC)

Pin	Signal	Description
1	-	-
2	-	-
3	B Line	Positive RxD/TxD, RS485 level
4	RTS	Request to send
5	GND Bus	Ground (isolated)
6	+5V Bus Output	+5V termination power (isolated)
7	-	-
8	A Line	Negative RxD/TxD, RS485 level
9	-	-
Housing	Cable Shield	Internally connected to the Anybus protective earth via cable shield filters according to the PROFIBUS standard.

Overview

The Communications Gateway Module (CGM) provides a control link between the E-Flo SP system and a selected fieldbus. This provides the means for report monitoring and control by external automation systems.

NOTE: The following system network configuration files are available at help.graco.com.

- EDS file: DeviceNet or Ethernet/IP fieldbus networks
- GSD file: PROFIBUS fieldbus networks
- GSDML: PROFINET fieldbus networks

NOTE: See system manual for CGM installation.

E-Flo SP and PLC Connection Setup

Verify that the PLC parameters are set up correctly, see the Gateway Map table.

NOTE: If the PLC connection parameters are not setup correctly, the connection between the E-Flo SP and PLC will not be made. The standard gateway map is 17X095, and supports 6 pumps with one ADM and one CGM, or 1 tandem system with automatic cross over. There is a smaller map (17Z463) that can be purchased separately. It is for hardware that only supports less than 512bits (64bytes). The smaller 17Z463 map only supports 3 pumps with 1 ADM and 1 CGM, or 1 tandem with automatic cross over.

Gateway Map: 17X095 for 6 Booster/6Ram/1Tandem		**Gateway Map: 17Z463 for 3Booster/3Ram/1Tandem**	
Comm. Format	Data-SINT	Comm. Format	Data-SINT
Input Assembly Instance:	100	Input Assembly Instance:	100
Input Size:	84	Input Size:	42
Output Assembly Instance:	150	Output Assembly Instance:	150
Output Instance Size:	38	Output Instance Size:	20

Available Internal Data

Unless stated otherwise, bytes are stored in each instance in little endian order (byte order within instance: most significant… least significant).

NOTE: Automation Outputs can be watched by the corresponding Automation Inputs to verify that the E-Flo SP received the data.

Output from PLC / In to Graco E-Flo SP

Signal	Data Type	BIT	BYTE	Designator	Map Compatibility
SYS - Data Exchange Command	Integer	0-15	0-1	†	6X,3X
P1 - System Enable Request	Boolean	0	2	‡	6X,3X
P1 - PLC Control Lockout	Boolean	1		‡	6X,3X
P1 - Pump Enable	Boolean	2		‡	6X,3X
P1 - Pressure Control Enable	Boolean	3		‡	6X,3X
P1 - Flow Control Enable	Boolean	4		‡	6X,3X
P1 - Acknowledge / clear error	Boolean	5		‡	6X,3X
P1 - Prime Request	Boolean	6		❖	6X,3X
P1 - Recirculate Request	Boolean	7		†	6X,3X
P1 - Depressurize Request	Boolean	0	3	†	6X,3X
P1 - Cross Over Request	Boolean	1		‡	6X,3X
P1 - {Reserved Bits}	Boolean	2-7			6X,3X
P1 - Pressure Target (xx.x bar)	Integer	0-15	4-5	‡	6X,3X
P1 - Flow Target (xxx cc/min)	Integer	0-15	6-7	‡	6X,3X
P2 (replication of bytes 2-3 above)	Boolean	0-15	8-9	x	6X,3X
P2 - Pressure Target (xx.x bar)	Integer	0-15	10-11	•	6X,3X
P2 - Flow Target (xxx cc/min)	Integer	0-15	12-13	•	6X,3X
P3 (replication of bytes 2-3 above)	Boolean	0-15	14-15	x	6X,3X
P3 - Pressure Target (xx.x bar)	Integer	0-15	16-17	x	6X,3X
P3 - Flow Target (xxx cc/min)	Integer	0-15	18-19	x	6X,3X
P4 (replication of bytes 2-3 above)	Boolean	0-15	20-21	x	6X
P4 - Pressure Target (xx.x bar)	Integer	0-15	22-23	x	6X
P4 - Flow Target (xxx cc/min)	Integer	0-15	24-25	x	6X
P5 (replication of bytes 2-3 above)	Boolean	0-15	26-27	x	6X
P5 - Pressure Target (xx.x bar)	Integer	0-15	28-29	x	6X
P5 - Flow Target (xxx cc/min)	Integer	0-15	30-31	x	6X
P6 (replication of bytes 2-3 above)	Boolean	0-15	32-33	x	6X
P6 - Pressure Target (xx.x bar)	Integer	0-15	34-35	x	6X
P6 - Flow Target (xxx cc/min)	Integer	0-15	36-37	x	6X

‡ - *Applies to the entire system.*

† - *Applies to the active pump.*

❖ - *Applies to the active pump if the active pump is disabled, applies to the inactive pump if the active pump is enabled.*

x - *Not applicable in Tandem systems.*

• - *Used for Purging on Tandem systems.*

3X - *Map 17Z463 support for 3 pumps and Tandem.*

6X - *Map 17X095 support for 6 pumps and Tandem.*

Input to PLC/Out from Graco E-Flo SP

Signal	Data Type	BIT	BYTE	Designator	Map Compatibility
P1 - Heartbeat	Boolean	0	0	†	6X,3X
P1 - PLC Control Lockout Active	Boolean	1		†	6X,3X
P1 - Automation Control ready	Boolean	2		†	6X,3X
SYS - System is enabled	Boolean	3		†	6X,3X
P1 - Pump trying to move	Boolean	4		†	6X,3X
P1 - Pump is actually moving	Boolean	5		†	6X,3X
P1 - No Active alarms	Boolean	6		†	6X,3X
P1 - No Active deviations	Boolean	7		†	6X,3X
P1 - No Active advisories	Boolean	0	1	†	6X,3X
P1 - Prime Active	Boolean	1		†	6X,3X
P1 - Recirculation Active	Boolean	2		†	6X,3X
P1 - Depressurization Active	Boolean	3		†	6X,3X
P1 - Drum Low	Boolean	4		†	6X,3X
P1 - Drum Empty	Boolean	5		†	6X,3X
P1 - Not Primed	Boolean	6		†	6X,3X
P1 - Pump 1 active (Tandem systems only)	Boolean	7		‡	6X,3X
P1 - Data Exchange Active Command	Boolean	0-15	2-3	†	6X,3X
P1 - Actual Pump Flow Rate (xxx cc/min)	Integer	0-15	4-5	†	6X,3X
P1 - Outlet Pressure (xx.x bar)	Integer	0-15	6-7	†	6X,3X
P1 - Inlet Pressure (or filter pressure) (xx.x bar)	Integer	0-15	8-9	†	6X,3X
P1 - Data Exchange Value	Integer	0-31	10-13	†	6X,3X
P2 (replication of bytes 0-1 above)	Boolean	0-15	14-15	◊	6X,3X
P2 - Data Exchange Active Command	Boolean	0-15	16-17	◊	6X,3X
P2 - Actual Pump Flow Rate (xxx cc/min)	Integer	0-15	18-19	◊	6X,3X
P2 - Outlet Pressure (xx.x bar)	Integer	0-15	20-21	◊	6X,3X
P2 - Inlet Pressure (or filter pressure) (xx.x bar)	Integer	0-15	22-23	◊	6X,3X
P2 - Data Exchange Value	Integer	0-31	24-27	◊	6X,3X
P3 (replication of bytes 0-1 above)	Boolean	0-15	28-29	x	6X,3X
P3 - Data Exchange Active Command	Boolean	0-15	30-31	x	6X,3X
P3 - Actual Pump Flow Rate (xxx cc/min)	Integer	0-15	32-33	x	6X,3X
P3 - Outlet Pressure (xx.x bar)	Integer	0-15	34-35	x	6X,3X
P3 - Inlet Pressure (or filter pressure) (xx.x bar)	Integer	0-15	36-37	x	6X,3X
P3 - Data Exchange Value	Integer	0-31	38-41	x	6X,3X
P4 (replication of bytes 0-1 above)	Boolean	0-15	42-43	x	6X
P4 - Data Exchange Active Command	Boolean	0-15	44-45	x	6X
P4 - Actual Pump Flow Rate (xxx cc/min)	Integer	0-15	46-47	x	6X
P4 - Outlet Pressure (xx.x bar)	Integer	0-15	48-49	x	6X
P4 - Inlet Pressure (or filter pressure) (xx.x bar)	Integer	0-15	50-51	x	6X
P4 - Data Exchange Value	Integer	0-31	52-55	x	6X

Signal	Data Type	BIT	BYTE	Designator	Map Compatibility
P5 (replication of bytes 0-1 above)	Boolean	0-15	56-57	x	6X
P5 - Data Exchange Active Command	Boolean	0-15	58-59	x	6X
P5 - Actual Pump Flow Rate (xxx cc/min)	Integer	0-15	60-61	x	6X
P5 - Outlet Pressure (xx.x bar)	Integer	0-15	62-63	x	6X
P5 - Inlet Pressure (or filter pressure) (xx.x bar)	Integer	0-15	64-65	x	6X
P5 - Data Exchange Value	Integer	0-31	66-69	x	6X
P6 (replication of bytes 0-1 above)	Boolean	0-15	70-71	x	6X
P6 - Data Exchange Active Command	Boolean	0-15	72-73	x	6X
P6 - Actual Pump Flow Rate (xxx cc/min)	Integer	0-15	74-75	x	6X
P6 - Outlet Pressure (xx.x bar)	Integer	0-15	76-77	x	6X
P6 - Inlet Pressure (or filter pressure) (xx.x bar)	Integer	0-15	78-79	x	6X
P6 - Data Exchange Value	Integer	0-31	80-83	x	6X

† - *Conveys the status of the active pump only.*

◊ - *Conveys the status of the inactive pump only.*

‡ - *The status of both pumps are taken into account.*

x - *Not applicable in Tandem systems.*

3X - *Map 17Z463 support for 3 pumps and Tandem.*

6X - *Map 17X095 support for 6 pumps and Tandem.*

Data Exchange

NOTE: Please reference the timing diagrams on the timing of the signals to utilize the Data Exchange.

The Data Exchange is a condensed structure that is used to read a number of different variables in one data location. If multiple are needed they must be cycled through.

The Data Exchange is a method of:

1. Setting “SYS – Data Exchange Command” a 16 bit integer (byte 0-1).
2. Reading - “P1 – Data Exchange Active Command” a 16 bit integer (byte 2-3).
3. Reading - “P1 – Data Exchange Value” a 32 bit integer (byte 10-13).

Example:

How to read the cycle rate on pump 2 through the Data Exchange.

1. Set bytes 0-1 to 9 (base 10).
2. Read bytes 16-7 to ensure that it reads 9 (base 10).
3. Read bytes 24-27 to get the active cycle rate of pump 2.

E-Flo SP Data Exchange

Command Value (base 10 decimal)	Name	Units / Format
0	Active Alarms	Bitfield
1	Active Deviations	Bitfield
2	Active Advisories	Bitfield
3	Pump Position	Percent Stroke (0 = bottom, 100 = top)
4	Driver Lifetime Cycles	Cycles
5	Driver Resettable Cycles	Cycles
6	Pump Resettable Cycles	Cycles
7	Platen Resettable Cycles	Cycles
8	Remaining Drum Volume	cc's
9	Cycle Rate	1/10 CPM
10	Fluid Filter Delta	1/10 bar
11	Driver Cycles by Thrust, 0 - 9% (lifetime)	Cycles
12	Driver Cycles by Thrust, 10 - 19% (lifetime)	Cycles
13	Driver Cycles by Thrust, 20 - 29% (lifetime)	Cycles
14	Driver Cycles by Thrust, 30 - 39% (lifetime)	Cycles
15	Driver Cycles by Thrust, 40 - 49% (lifetime)	Cycles
16	Driver Cycles by Thrust, 50 - 59% (lifetime)	Cycles
17	Driver Cycles by Thrust, 60 - 69% (lifetime)	Cycles
18	Driver Cycles by Thrust, 70 - 79% (lifetime)	Cycles
19	Driver Cycles by Thrust, 80 - 89% (lifetime)	Cycles
20	Driver Cycles by Thrust, 90 - 100% (lifetime)	Cycles
21	Driver Cycles by Thrust, 0 - 9% (since last reset)	Cycles
22	Driver Cycles by Thrust, 10 - 19% (since last reset)	Cycles
23	Driver Cycles by Thrust, 20 - 29% (since last reset)	Cycles
24	Driver Cycles by Thrust, 30 - 39% (since last reset)	Cycles
25	Driver Cycles by Thrust, 40 - 49% (since last reset)	Cycles
26	Driver Cycles by Thrust, 50 - 59% (since last reset)	Cycles
27	Driver Cycles by Thrust, 60 - 69% (since last reset)	Cycles
28	Driver Cycles by Thrust, 70 - 79% (since last reset)	Cycles
29	Driver Cycles by Thrust, 80 - 89% (since last reset)	Cycles
30	Driver Cycles by Thrust, 90 - 100% (since last reset)	Cycles
31	Pressure Target	1/10 bar
32	Flow Target	cc/min

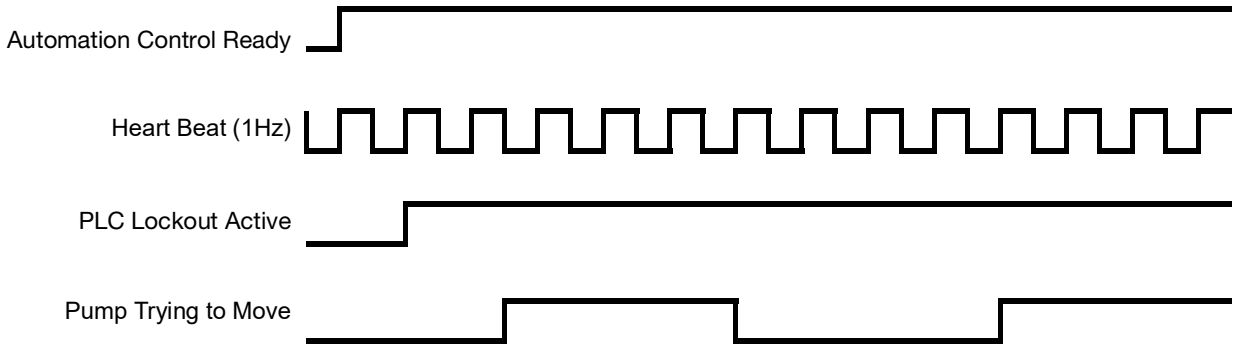
Timing Diagrams

"Automation Control Ready" in the following diagrams represents the following:

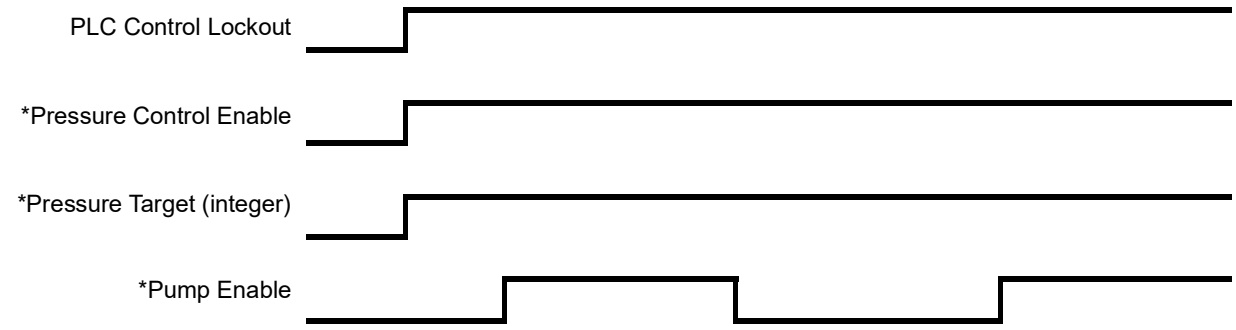
- System is enabled
- No active alarms
- ADM is in "Remote Mode"

Pressure Mode

Automation Inputs (E-Flo SP Outputs)



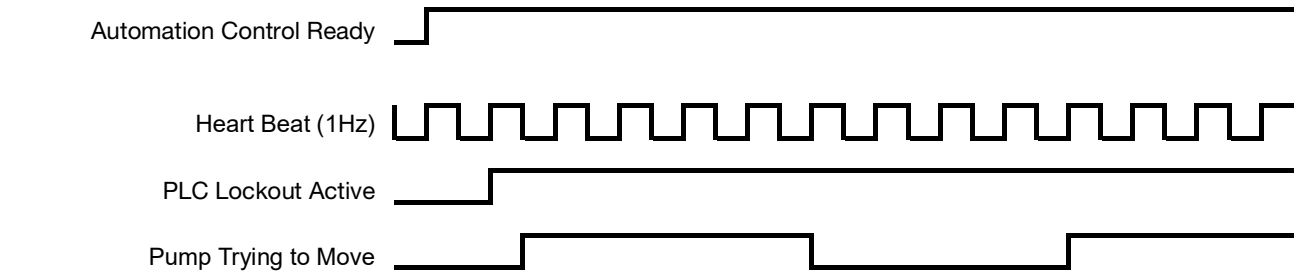
Automation Outputs (E-Flo SP Inputs)



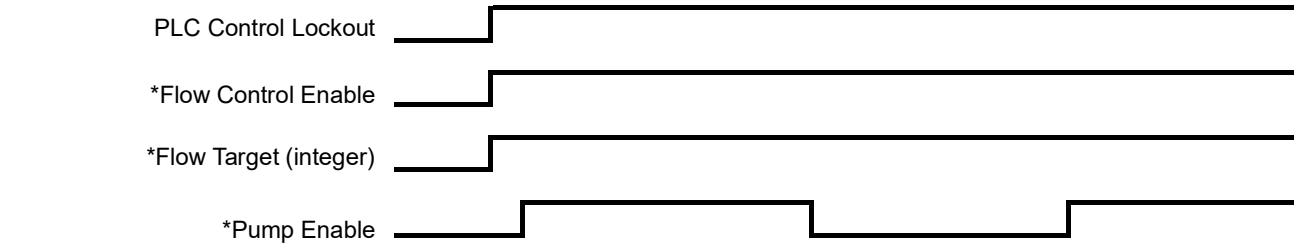
*Can all be enabled at once. Disabling any will stop the pump.

Flow Mode

Automation Inputs (E-Flo SP Outputs)



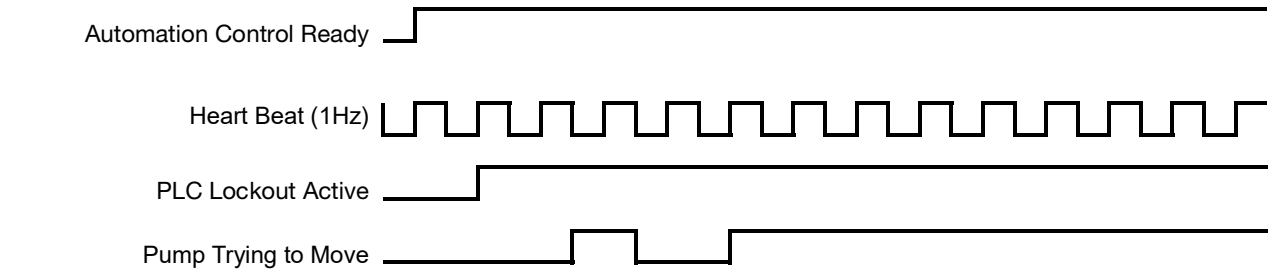
Automation Outputs (E-Flo SP Inputs)



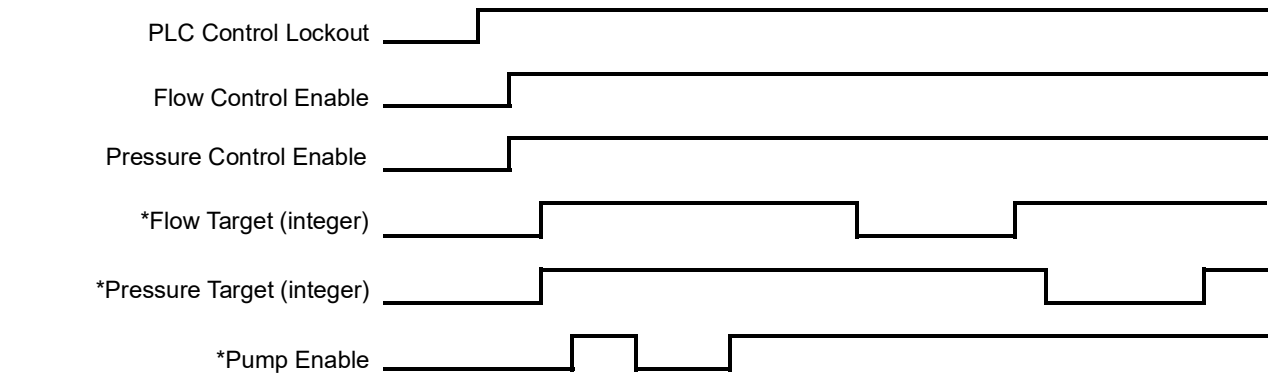
*Can all be enabled at once. Disabling any will stop the pump.

Pressure Flow Combined

Automation Inputs (E-Flo SP Outputs)



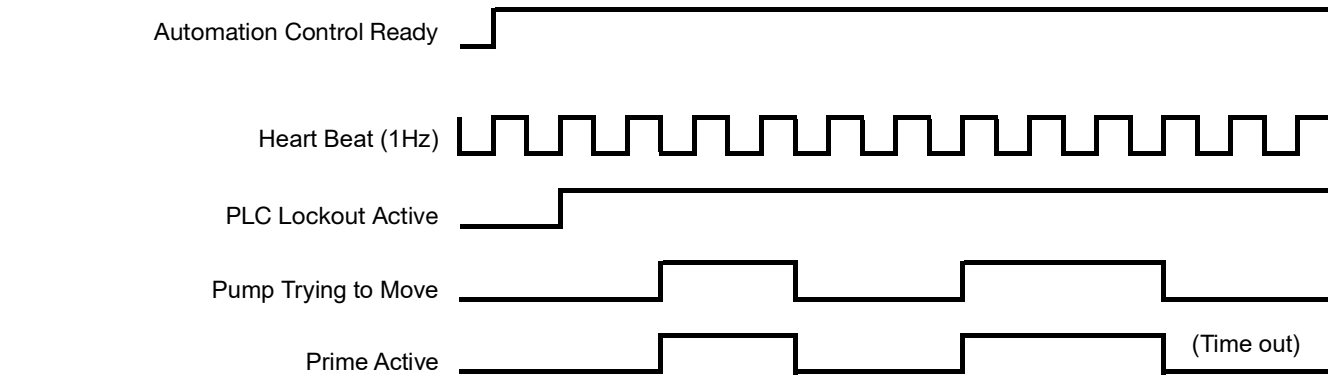
Automation Outputs (E-Flo SP Inputs)



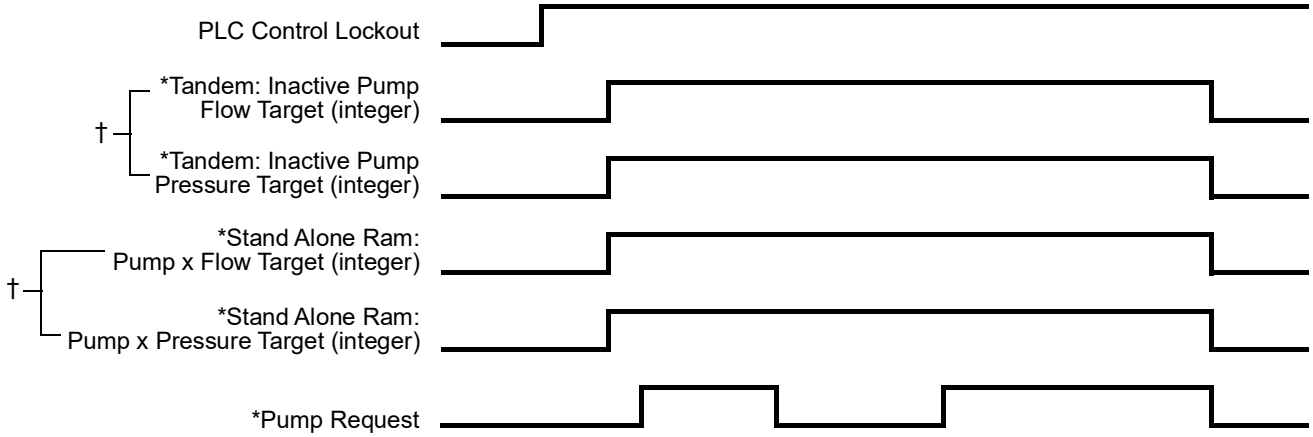
*Can all be enabled at once. Disabling any will stop the pump (must have pressure and/or flow enabled to run).

Prime

Automation Inputs (E-Flo SP Outputs)



Automation Outputs (E-Flo SP Inputs)



*Can all be enabled at once.

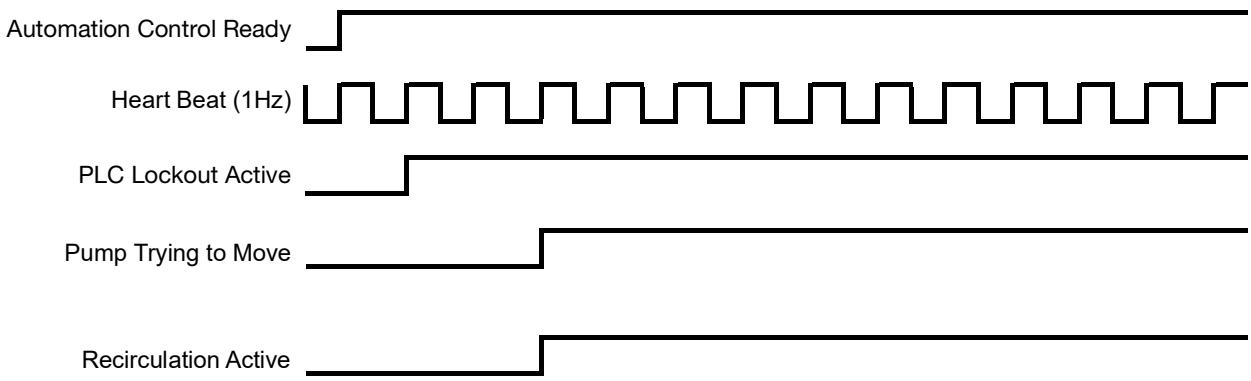
† Both must be enabled.

Recirculate

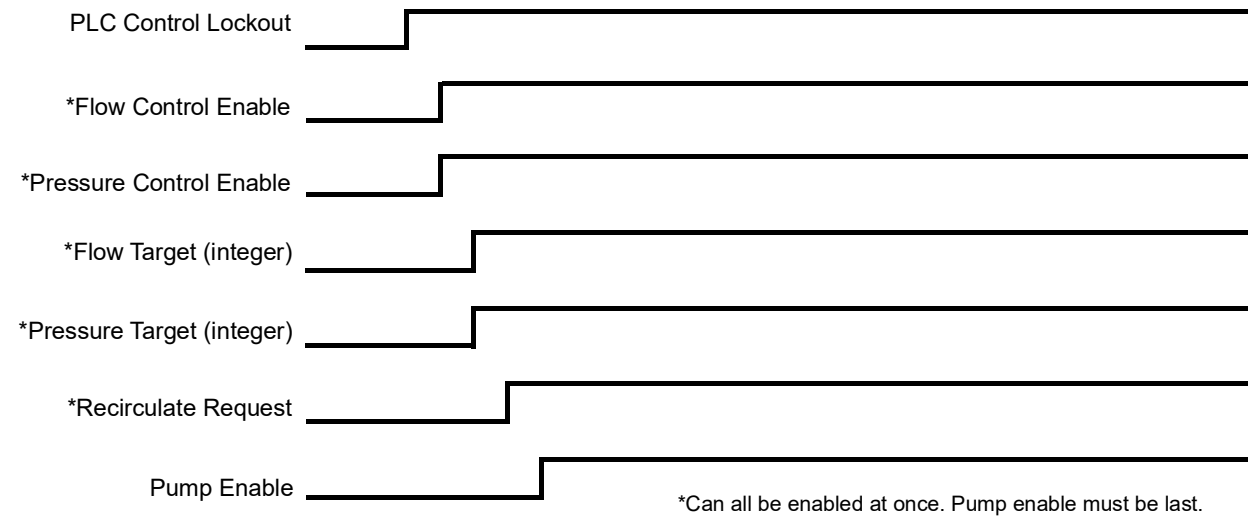
To utilize Recirculate feature:

- Must have a Ram or Tandem system
- Fluid solenoid kit must be installed and enabled on the ADM Setup Screen
- ADM is in “Remote Mode”

Automation Inputs (E-Flo SP Outputs)



Automation Outputs (E-Flo SP Inputs)



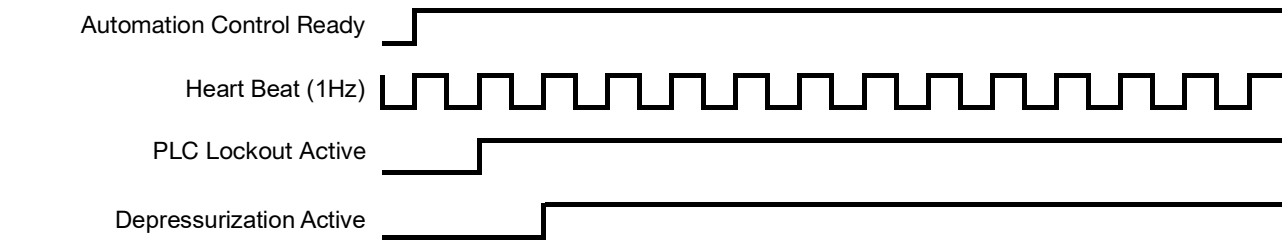
*Can all be enabled at once. Pump enable must be last.

Despressurization

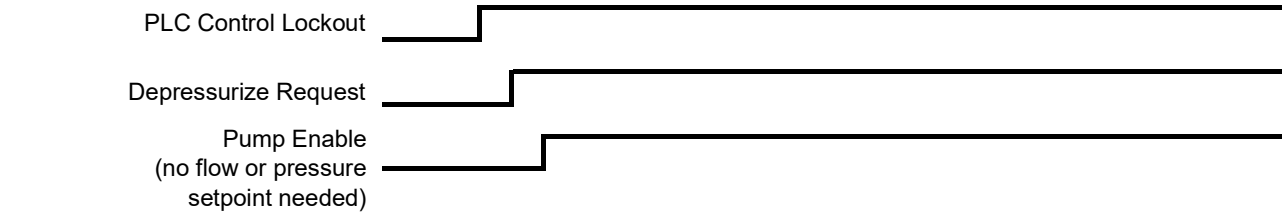
To utilize the Depressurization feature:

- Must have a Ram or Tandem system
- Fluid solenoid kit must be installed and enabled on the ADM Setup Screen
- ADM is in “Remote Mode”
- Pump Crossover, Request, Prime Request, or Recirculation cannot be active

Automation Inputs (E-Flo SP Outputs)

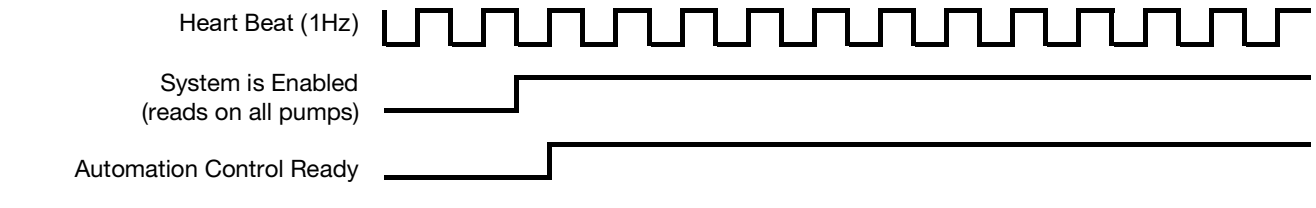


Automation Outputs (E-Flo SP Inputs)



System Enable Request

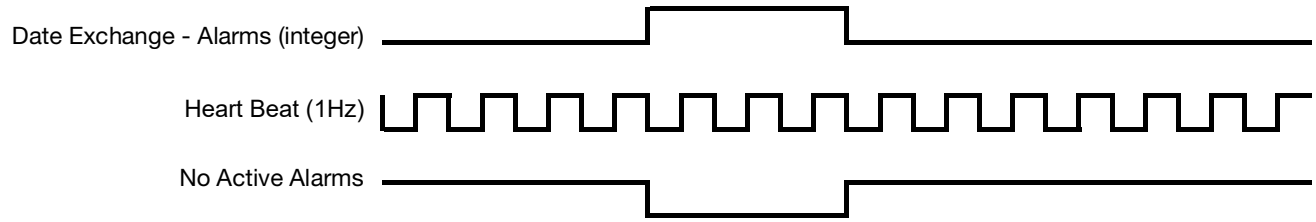
Automation Inputs (E-Flo SP Outputs)



Automation Outputs (E-Flo SP Inputs)

Ack-Clear Error

Automation Inputs (E-Flo SP Outputs)



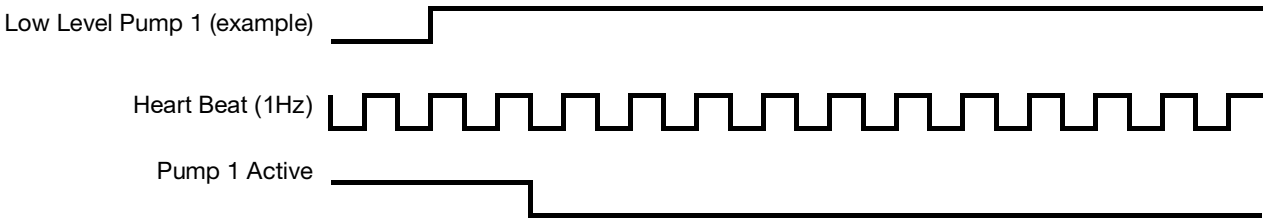
Automation Outputs (E-Flo SP Inputs)

Crossover

To utilize Crossover feature:

- Must have a Tandem system
- ADM is in “Remote Mode”
- Prime Request, Recirculation Request, and Depressurization Request cannot be active

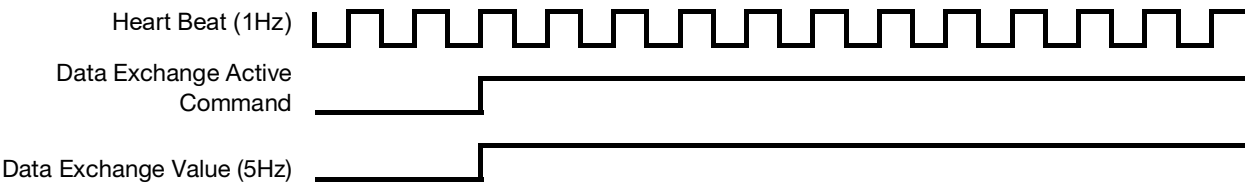
Automation Inputs (E-Flo SP Outputs)



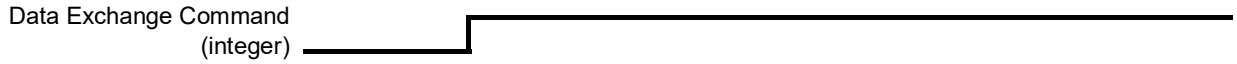
Automation Outputs (E-Flo SP Inputs)

Data Exchange

Automation Inputs (E-Flo SP Outputs)

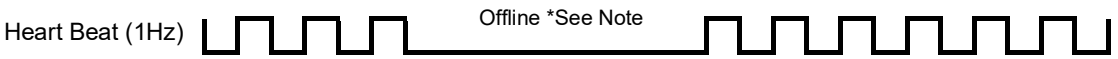


Automation Outputs (E-Flo SP Inputs)

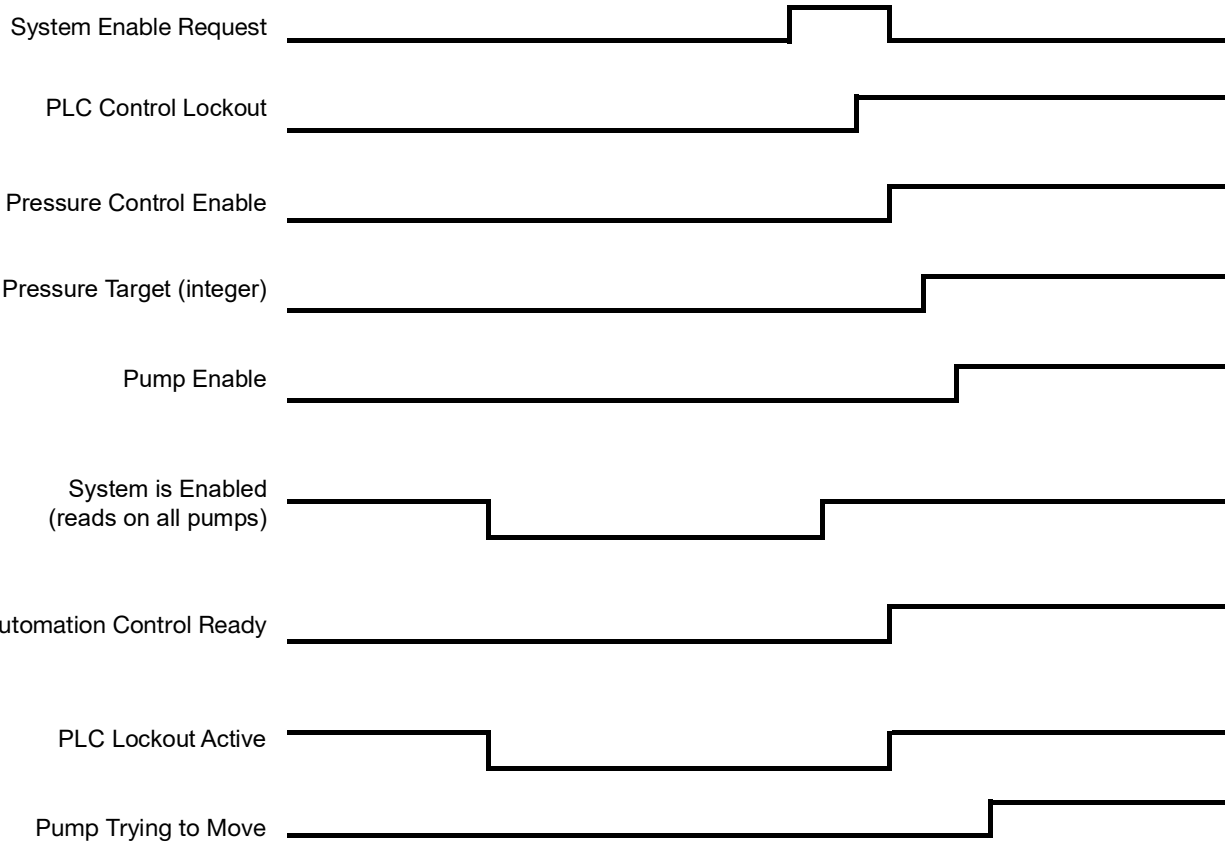


Power Reset

Automation Inputs (E-Flo SP Outputs)



Automation Outputs (E-Flo SP Inputs)



NOTE: The valve will remain in its current state when shut down.
A change in state at 1 Hz should be used to detect power.

Error Code Handling

As indicated in the Available Internal Data section, and the Ack-Clear Internal Data timing diagram, any pump (P1 - P6) error condition (Alarm, Deviation or Advisory) is reported to the controlling PLC using the Data Exchange Interface. As an example, if the PLC wants to know if an active deviation exists for Pump 2, the PLC needs to write a 1 to the PLC output bytes 0 and 1. Then read the P2 - Data Exchange Value (PLC input bytes 24-27) after the P2 - Data Exchange Active Command value equals 1 (requested command). If the value read by the Data Exchange Value equals 0, there are no active deviations for that pump location.

The following actions should be taken if a pump reports a non-zero value.

1. The PLC requested if an alarm condition existed for pump 3, by sending a 0 to PLC output bytes 0 and 1, then reading the P3 - Data exchange Value (PLC input bytes 38-41) after the P3 - Data Exchange Active Command (PLC input bytes 30-31) reported a 0.

2. The P3 pump reports a 514 decimal (0 x 0202 hexadecimal, or base 16) on the P3 - Data Exchange Value location 38-41(Input bytes 38-41).

3. As indicated in the **Active Alarm Descriptions (Data Exchange Command Value = 0)** table on page 57, the 514 reported indicates a V4M_ and a A4D condition (512 + 2 = 514) exists for the P3 pump.

4. To acknowledge and clear the alarm condition, the PLC will need to implement the items outlined in the Ack - Clear Error timing diagram, by activating the Acknowledge / Clear Errors bit for P3 pump (PLC output byte 15, bit 5).

5. The pop-up window for the error conditions will be cleared. If both conditions are removed, the No Active Alarms bit from the P3 pump (E-flo output byte 28 bit 6) will be set back to high and the P3 - Data Exchange Value from the P3 pump will be set to 0. If only the A4D_ condition is cleared, the No Active Alarms bit will remain low, and the data exchange value will change from 514 to 2.

Active Alarm Descriptions (Data Exchange Command Value = 0)

Data Exchange Values Bit Assignments	Resultant Value from Bit Assignment (Base 10)	Resultant Value from Bit Assignment (Base 16)	4 Digit Code on ADM	Exchange Value Symbol	Error Description
0	1	1	V1M_	3MCP_ALARM_UNDER_VOLTAGE	Supplied bus voltage is below minimum acceptable limits
1	2	2	V4M_	3MCP_ALARM_OVER_VOLTAGE	Supplied bus voltage is above maximum acceptable limits
2	4	4	T4M_	3MCP_ALARM_MOTOR_TEMPERATURE	Temperature of driver motor is to hot
3	8	8	T4C_	3MCP_ALARM_BOARD_TEMPERATURE	Temperature of the Control PCB is too hot
4	16	10	WBD_	3MCP_ALARM_ENCODER	Encoder or hall sensor not communicating with driver logic
5	32	20	WMN_	3MCP_ALARM_VERSION_MISMATCH	Communication is lost between the 2 micro-controllers in the MCM
6	64	40	CCN_	3MCP_ALARM_IPC_COMMUNICATION	Problem with the MCM hardware
7	128	80	A4N_	3MCP_ALARM_BOARD_HARDWARE	Motor current exceeds maximum allowable limit
8	256	100	WMC_	3MCP_ALARM_BOARD_EXCEPTION	MCM Module reset due to exception in the software
9	512	200	A4D_	3MCP_ALARM_SW_CURRENT_ERROR	Motor current exceeds maximum allowable limit
10	1024	400	DD4_	3MCP_ALARM_PUMP_DIVING	Pump diving detected
11	2048	800	P4C_	3MCP_ALARM_PRESSURE_HIGH	Measure outlet pressure greater than desired amount plus tolerance

Data Exchange Values Bit Assignments	Resultant Value from Bit Assignment (Base 10)	Resultant Value from Bit Assignment (Base 16)	4 Digit Code on ADM	Exchange Value Symbol	Error Description
12	4096	1000	P1C_	3MCP_ALARM_PRESSURE_LOW	Measured outlet pressure less than desired amount minus tolerance
13	8192	2000	F4D_	3MCP_ALARM_FLOW_HIGH	Measure flow greater than desired flow rate plus tolerance
14	16384	4000	F1D_	3MCP_ALARM_FLOW_LOW	Measured flow less than desired flow rate minus tolerance
15	32768	8000	P6D_	3MCP_ALARM_PRESSURE_OUTLET_XDR	Outlet pressure transducer fault or not connected
16	65536	10000	DKC_	3MCP_ALARM_CROSSOVER	Crossover error in tandem system
17	131072	20000	L1C_	3MCP_ALARM_DRUM_EMPTY	Drum is empty
18	262144	40000	DB1_	3MCP_ALARM_NOT_PRIMED	Pump has not been primed since last drum empty
19	524288	80000	CCG_	3MCP_ALARM_FIELDBUS	Not communication with Gateway/Fieldbus module
20	1048576	100000	CAC_	3MCP_ALARM_COMM_ADM	No communication between ADM module and MCM/Pump

Active Deviation Descriptions (Data Exchange Command Value = 1)

Data Exchange Values Bit Assignments	Resultant Value from Bit Assignment (Base 10)	Resultant Value from Bit Assignment (Base 16)	4 Digit code on ADM	Exchange Value Symbol	Error Description
0	1	1	T2D_	3MCP_DEVIATION_LOW_TEMPERATURE	Motor temperature thermistor disconnected
1	2	2	T3D_	3MCP_DEVIATION_OVER_TEMPERATURE	Current supplied to motor reduced to lower electronics temperature
2	4	4	WSC_	3MCP_DEVIATION_ENCODER_CALIBRATION	Encoder calibration information not found
3	8	8	DD3_	3MCP_DEVIATION_PUMP_DIVING	Pump diving detected
4	16	10	P3C_	3MCP_DEVIATION_PRESSURE_HIGH	Measure outlet pressure greater than desired amount plus tolerance
5	32	20	P2C_	3MCP_DEVIATION_PRESSURE_LOW	Measure outlet pressure less than desired amount minus tolerance
6	64	40	F3D_	3MCP_DEVIATION_FLOW_HIGH	Measured flow greater than desired flow rate plus tolerance
7	128	80	F2D_	3MCP_DEVIATION_FLOW_LOW	Measured flow less than desired flow rate minus tolerance
8	265	100	P6D_	3MCP_DEVIATION_PRESSURE_OUTLET_XDR	Outlet pressure transducer not connected
9	512	200	L2C_	3MCP_DEVIATION_DRUM_LOW	Drum material is low
10	1024	400	DB2_	3MCP_DEVIATION_NOT_PRIMED	Pump has not been primed since last empty

Active Advisories Descriptions (Data Exchange Command Value = 2)

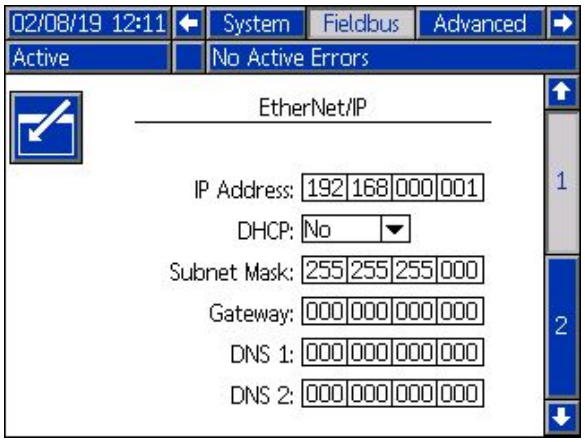
Data Exchange Values Bit Assignments	Resultant Value from Bit Assignment (Base 10)	Resultant Value from Bit Assignment (Base 16)	4 Digit code on ADM	Exchange Value Symbol	Error Description
0	1	1	MBD_	3MCP_ADVISORY_DRIVER_MAINTENANCE	Maintenance due for driver (MCM)
1	2	2	MAD_	3MCP_ADVISORY_PUMP_MAINTENANCE	Maintenance due for pump
2	4	4	MLC_	3MCP_ADVISORY_REBUILD_PLATEN_SEALS	Maintenance due for platen seals
3	8	8	MG2_	3MCP_ADVISORY_FILTER_PRESSURE_DROP_LOW	Low pressure drop detected, replace fluid filter
4	16	10	MG3_	3MCP_ADVISORY_FILTER_PRESSURE_DROP_HIGH	High filter pressure detected, blockage detected

Setup

Gateway Screens

The Gateway screens are used to configure the fieldbus. These screens are shown only if a CGM is correctly installed in your system. See your system manual for proper installation.

1. With the system on and enabled, press  to access the Setup screens.
2. Press the left arrow key twice to navigate to the main Gateway screen.

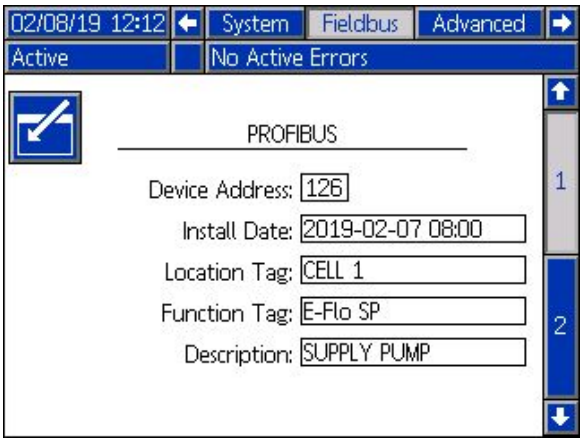


PROFIBUS Fieldbus Screens

These screens are shown only if a PROFIBUS Fieldbus CGM is installed.

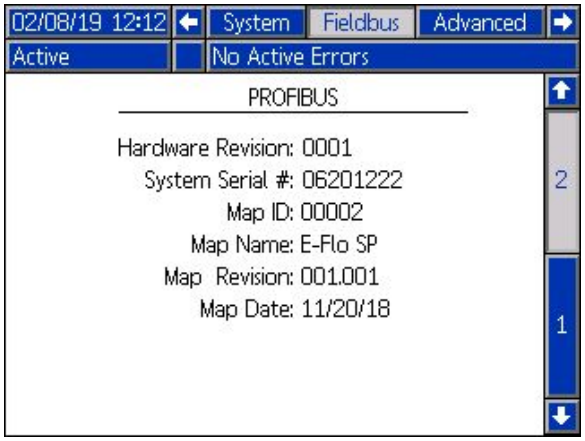
Screen 1

This screen enables the user to set the device address, install date, location tag, function tag, and description.



Screen 2

This screen displays the hardware revision, system serial number, and data map identification information.

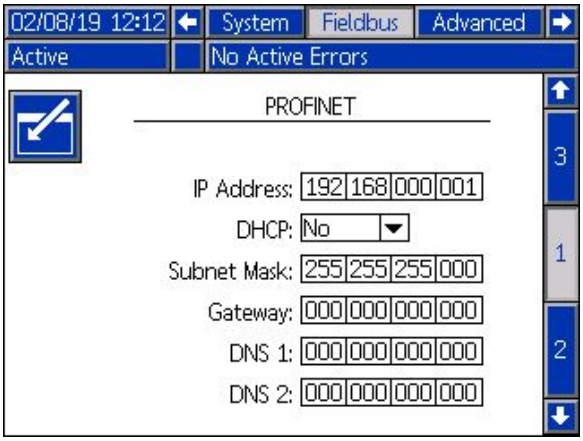


PROFINET Fieldbus Screens

These screens are shown only if a PROFINET Fieldbus CGM is installed.

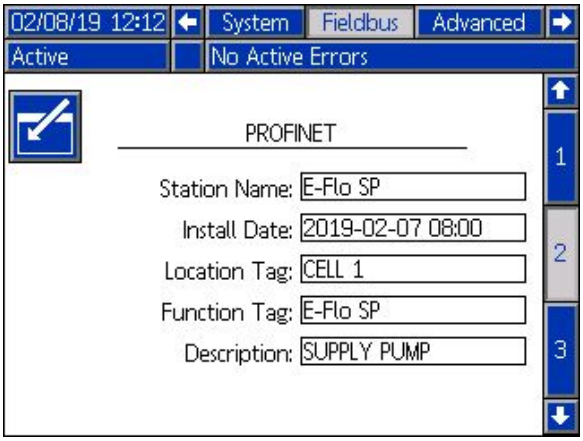
Screen 1

This screen enables the user to set the IP Address, DHCP settings, subnet mask, gateway, and DNS information.



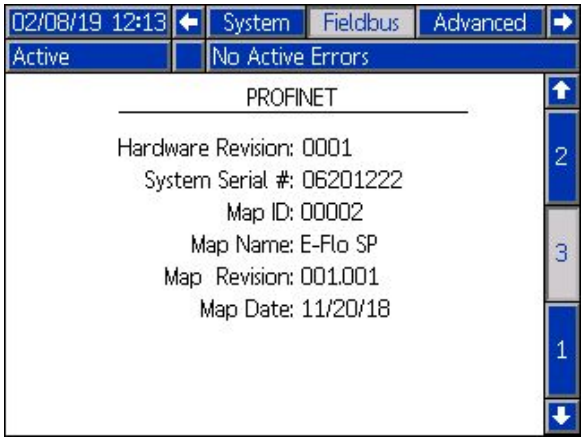
Screen 2

This screen enables the user to set the station name, install date, location tag, function tag, and description.



Screen 3

This screen displays the hardware revision, system serial number, and data map identification information.

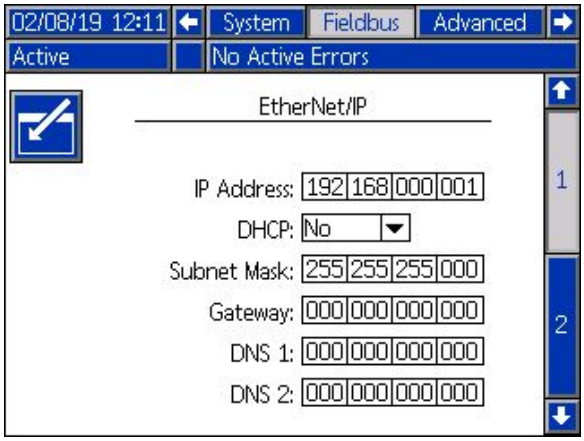


EtherNet/IP Fieldbus Screens

These screens are shown only if an EtherNet/IP Fieldbus CGM is installed.

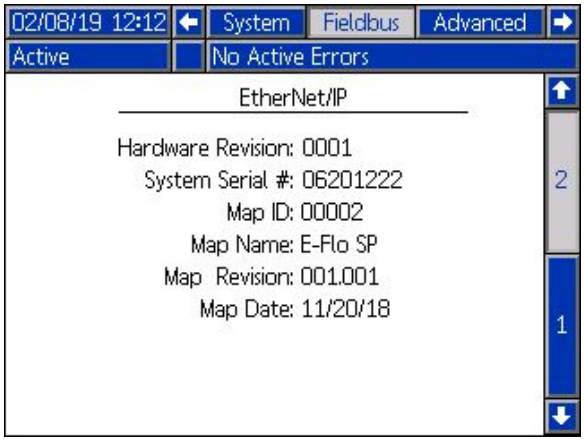
Screen 1

This screen enables the user to set the IP address, DHCP settings, subnet mask, gateway, and DNS information.



Screen 2

This screen displays the hardware revision, system serial number, and data map identification information.



DeviceNet Fieldbus Screen

This screen is shown only if a DeviceNet Fieldbus CGM is installed.

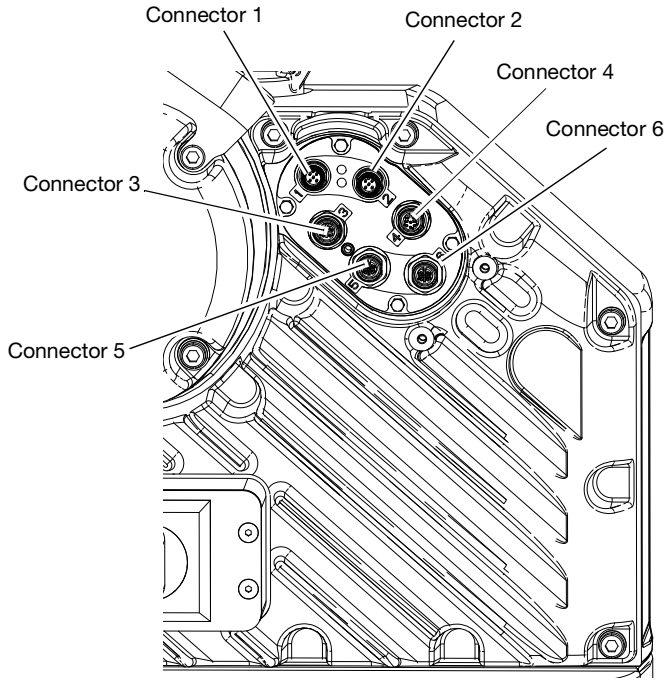
This screen enables the user to set the device address and baud rate, as well as view the hardware revision, system serial number, and data map identification information.

I/O Integration

Connector	Pin	Input/Output	Description
1	-	Communications and 24 Vdc Power	GCA CAN port. Connection to ADM or CGM
2	-	Communications and 24 Vdc Power	GCA CAN port. Connection to ADM or CGM
3	1	24 Vdc Digital Output: - 24V is ON - 0V is OFF	24 V power for Level sensor(s)
	2	24 Vdc Digital Input: - > 4V is ON - < 1V is OFF	Empty Level Sensor Input: When the sensor detects an empty drum, the input pin will be OFF.
	3	Ground / Return	Ground / Return
	4	24 Vdc Digital Input: - > 4V is ON - < 1V is OFF	Low Level Sensor Input: When the sensor detects a low drum, the input pin will be OFF.
	5	Not Used	- - - - -
Booster and Ram System without Fluid Solenoids Installed:			
4	1	0-10 V Analog In	Pressure Command: Analog reading is proportional to the outlet pressure target. A reading of 0V sets outlet pressure to 0. A reading of 10V sets the outlet pressure to the maximum determined by the volume of the pump lower.
	2	0-10 V Analog In	Flow Command: Analog reading is proportional to the outlet flow rate. A reading of 0V sets the flow rate to 0. A reading of 10V sets the flow rate to the maximum determined by the volume of the pump lower and the maximum cycle rate.
	3	Ground / Return	Ground / Return
	4	+5 Vdc Supply	Power
	5	24 Vdc Digital Input: - > 4V is ON - < 1V is OFF	System Enable: When the digital input is ON, the system is active, and when the digital input is OFF, the system is inactive.
	6	24 Vdc Digital Input: - > 4V is ON - < 1V is OFF	Pressure Mode Enable: When the digital input is ON, pressure mode is enabled, and when the digital input is OFF, pressure mode is disabled.
	7	24 Vdc Digital Input: - > 4V is ON - < 1V is OFF	Flow Mode Enable: When the digital input is ON, flow mode is enabled, and when the digital input is OFF, flow mode is disabled.
	8	24 Vdc Digital Output: -24V is ON -0V is OFF	Ready / Fault Detected: When the digital output is ON, the pump is ready for operation, and when the digital output is OFF, the pump is in an error state.
Tandem and Ram System with Fluid Solenoids Installed:			
4	1	Not Used	- - - - -
	2	Not Used	- - - - -
	3	Ground / Return	Ground / Return
	4	Not Used	- - - - -
	5	Not Used	- - - - -
	6	Not Used	- - - - -
	7	24 Vdc Digital Output: -24V is ON -0V is OFF	Solenoid Enable: When the digital output is ON, the fluid solenoid is enabled, and when the digital output is OFF, fluid solenoid is disabled
	8	Not Used	- - - - -
5	-	Analog Differential Input	Outlet Pressure Transducer Port
6	-	Analog Differential Input	Inlet Pressure Transducer Port or either fluid filter pressure transducers in tandem systems.

NOTE: See **Connector Identification** on page 65.

Connector Identification



California Proposition 65

CALIFORNIA RESIDENTS

⚠ **WARNING:** Cancer and reproductive harm – www.P65warnings.ca.gov.

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.

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Original instructions. This manual contains English. MM 3A6724
Graco Headquarters: Minneapolis
International Offices: Belgium, China, Japan, Korea

GRACO INC. AND SUBSIDIARIES • P.O. BOX 1441 • MINNEAPOLIS MN 55440-1441 • USA

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Revision C, November 2022