Instructions - Parts

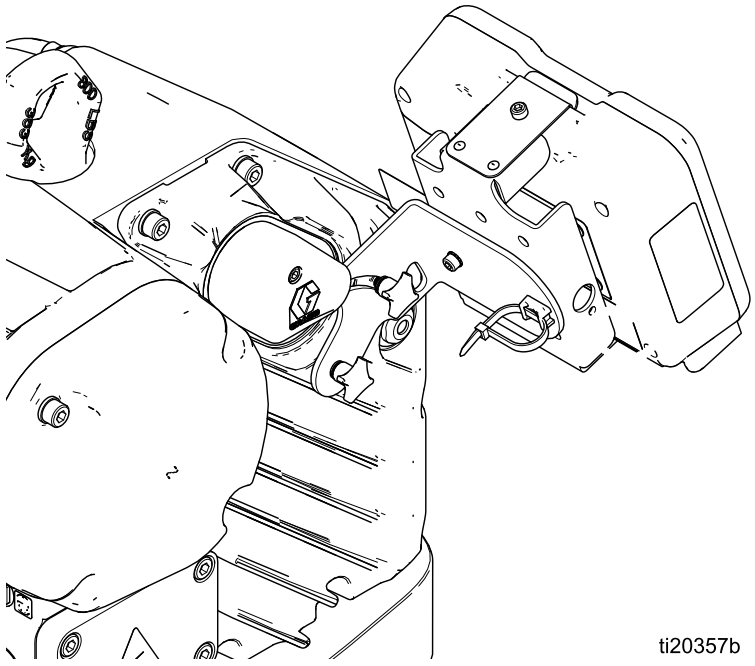
E-Flo®
DC Control Module Kit

3A2527M
EN

User Interface for E-Flo® DC Pumps with an Advanced Motor.
For professional use only.

Important Safety Instructions
Read all warnings and instructions in this manual, the supplied ADCM manual, and the E-Flo DC manuals before using the equipment. **Save these instructions.**

See manual 332013 (supplied) for complete warnings and approvals for 24L097 Advanced Display Control Module (ADCM).



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Related Manuals

Manual in English	Description
3A2526	Instructions-Parts Manual, E-Flo DC Motor
3A2096	Instructions-Parts Manual, E-Flo DC 4-Ball Piston Pumps
332013	Instructions-Parts Manual, for Advanced Display Control Module (ADCM)
3A0539	Instructions-Parts Manual, 4–Ball Lowers
334359	Instructions-Parts Manual, E-Flo DC 2000, 3000, and 4000 Circulation Pumps
3A4030	Instructions, Intelligent Paint Kitchen

Models

Part No.	Series	Description
24P821	B	Display only
24P822	B	Single phase
24X599	B	Single phase (for use with motor models EM0014 and EM0024 only)
17V232	B	Three phase
17V233	B	Three Phase (EM1014 and EM1024 only)

Control Module

The Control Module provides the interface for users to enter selections and view information related to setup and operation.

The screen backlight is factory set to remain on, even without screen activity. See Setup Screen 19, page 22 to set the brightness and backlight timer. Press any key to restore the settings.

Keys are used to input numerical data, enter setup screens, navigate within a screen, scroll through screens, and select setup values.

Installation

Install the Control Module

1. Shut off and lock out power to the motor.
2. For single phase models only, install the jumper connector (5) over the top two terminals of the motor, using the screw (5a). Three phase models do not have a jumper connector.

   NOTE: To connect up to 8 motors together, see Appendix A in the E-Flo DC Motor Manual (3A2526), where the control module is the referenced intrinsically safe (IS) apparatus.

   NOTE: See Appendix C for information about different multi-unit topologies.
3. Assemble the bracket kit (6a-6f) and the holder and tie (11, 12) as shown.
4. Install the module (1) in the bracket (6a), making sure the tabs at the bottom of the bracket engage the slots in the module, and the lip at the top of the bracket holds the module securely in place.
5. Connect the accessory cable (C), using the tie (12) as a strain relief as shown. See Cable Connection, page 5 .
6. Restore power to the motor.

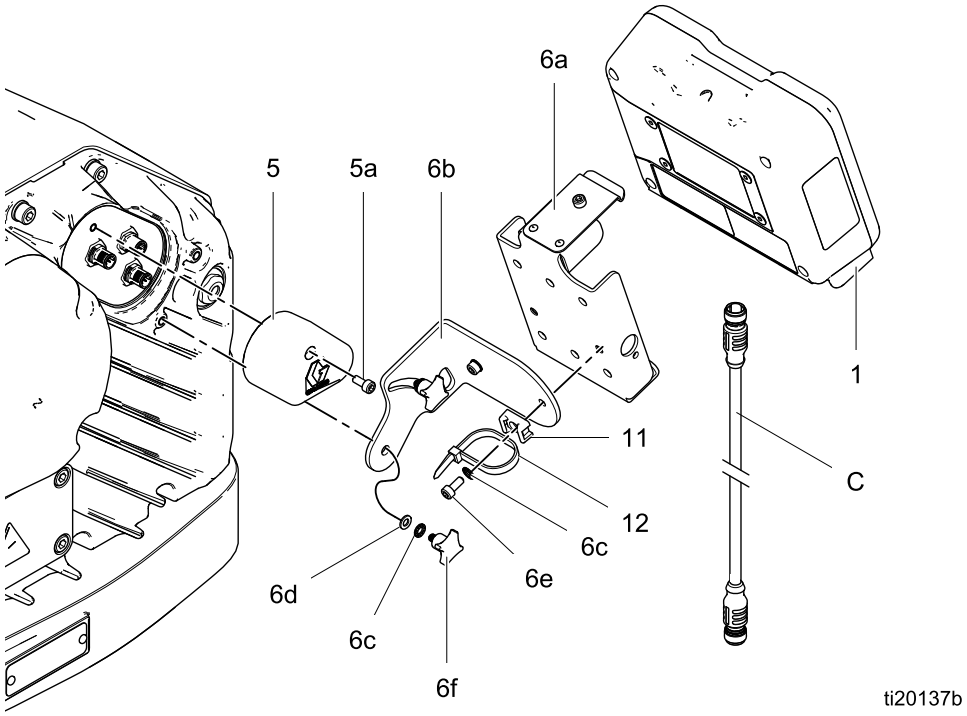


Figure 1 Install the Control Module (Single Phase Model Shown)

Cable Connection

Order an accessory cable (C) from Table 1. Connect the cable to Port 3 on the bottom of the control module (see Fig. 2). Connect the other end to the power terminal (PT) on the motor (see Fig. 3). Connect other cables as described in Table 2.

Table 1 CAN Cables

Cable Part No.	Description
16P911	Intrinsically safe CAN cable, female x female, 3 ft (1 m)
16P912	Intrinsically safe CAN cable, female x female, 25 ft (8 m)

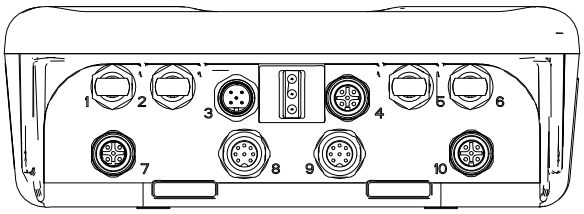


Figure 2 ADCM Connectors

Table 2 ADCM Cable Connections

ADCM Port Number	Connector Purpose
1	Fiber Optic RX - to Fiber Optic Converter Module
2	Fiber Optic TX - to Fiber Optic Converter Module
3	Power and CAN communication
4	• Start/Stop input (pin 2) • Fill pump output (pin 3) • Reed switch input (pin 4) • Agitator halt input (pin 4) • Tank high output (pin 4) • Tank low output (pin 4) • Auxiliary output (pin 4)
5	Fiber Optic RX - to next ADCM
6	Fiber Optic TX - to next ADCM
7	Pressure transducer 1
8	BPR control 4-20mA output
9	Primary Tank Level Monitor
10	Pressure transducer 2

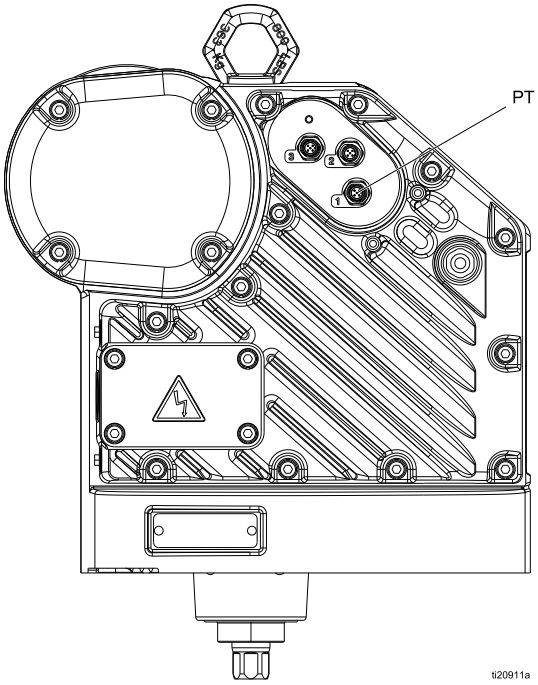


Figure 3 Motor Power Terminal

Operation

Module Screens

The Control Module has two sets of screens: Run and Setup. For detailed information see Run Screens, page 9 , and Setup Screens, page 13.

Press  to toggle between the Run screens and the Setup screens.

Information displayed on the Run and Steup screens corresponds to the Modbus Registers. See Appendix A - Modbus Variable Map, page 35.

NOTE: The screen automatically dims based on the load requirements.

Module Keys

Figure 4 is a view of the control module display and keys. Table 2 explains the function of the membrane keys on the control module. As you move through the screens, you will notice that most information is communicated using icons rather than words to simplify global communication. The detailed screen descriptions in Run Screens, page 9 , and Setup Screens, page 13, explain what each icon represents. The two softkeys are membrane buttons whose function correlates with the screen content to the immediate left of the button.

NOTICE

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

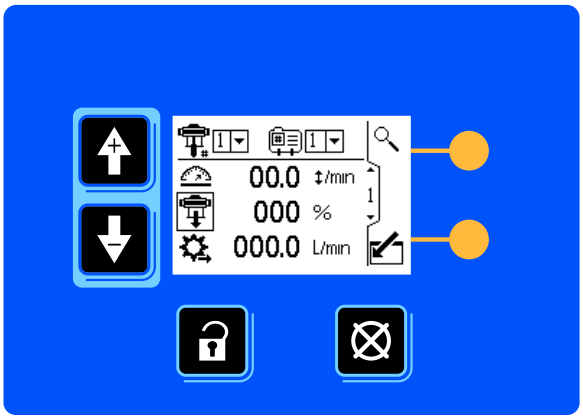


Figure 4 Control Module Keypad and Display

Table 3 Module Keys

Membrane Keys	Softkeys
 **Toggle:** Toggle between the Run screens and Setup screens.	 **Enter Screen:** Highlight data that can be edited. Also changes the function of the Up/Down arrows so they move between data fields on the screen, rather than between screens.
 **Cancel/Error Reset:** Clear the alarm after the cause has been fixed. When there is no alarm to clear, this key sets the active pump's profile to Stop. Also used to cancel the data entered and return to the original data. **NOTE:** The pump stop function can be disabled in Setup Screen 16.	 **Exit Screen:** Exit data editing.
 **Up/Down Arrows:** Move between screens or fields on a screen, or to increase or decrease the numeric values in a field that can be edited.	 **Enter:** Press to activate a field for editing or to accept the highlighted selection on a menu.
 **Softkeys:** Varies by screen. See the Softkeys columns at right.	 **Right:** Move to the right when editing number fields. Press again to accept the entry when all digits are correct.
	 **Reset:** Reset totalizer to zero.
	 **Activate Profile:** This softkey is disabled by default, and only appears on Setup Screens 1–4 if the **Profile Lock** box is checked on Setup Screen 25, page 25. Press to activate the profile just edited.
	 **Search:** Press in Run Screen 1 to make the active pump blink for identification.
	 **Acknowledge:** Press to acknowledge that a software update has concluded.

Screen Navigation and Editing

Refer to this section for instructions on navigating screens, entering information, and making selections.

All Screens

- Use the up and down arrow keys to move between screens.
- Press the enter screen key to enter a screen. The first data field on the screen is highlighted.
- Use the arrow keys to highlight the data that you want to change.
- Press the enter key to edit.
- Press the cancel key to cancel.
- When all data is correct, press the exit screen key to exit the screen. Then use the up and down arrow keys to move to a new screen, or the toggle icon to move between Setup screens and Run screens.

Menu Fields

- Use the up and down arrow keys to highlight the correct choice from the menu.
- Press the enter icon to select.

Number Fields

- The first digit in the field is highlighted. Use the up and down arrow keys to change the number.
- Press the right arrow key to move to the next digit.
- When all digits are correct, press the right arrow key again to accept.

Check Box Fields

A check box field is used to enable or disable features in the software.

- Press the enter key to toggle between a check and an empty box.
- The feature is enabled if a check is in the box.

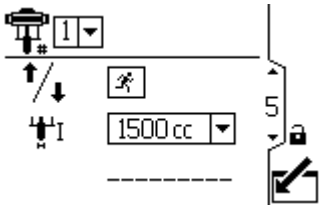
Reset Field

The reset field is used for totalizers. Press the totalizer reset key to reset the field to zero.

Initial Setup

NOTE: Before creating the pump profiles in Setup Screens 1 through 4, you must set up the system parameters in Setup Screens 5 through 25, as follows.

1. Press the lock icon to enter the Setup screens. Setup Screen 1 appears.
2. Scroll to Setup Screen 5.



3. See Setup Screen 5, page 16, and select the lower used in your system.
4. Continue setting the system parameters on Setup Screen 6, page 17 through Setup Screen 25, page 25.
5. Scroll to Setup Screen 1. Establish the profiles for each pump. See Setup Screen 1, page 13 through Setup Screen 4, page 15.

Run Screens

The Run screens display current target values and performance for a selected pump and profile. Any alarms display in the sidebar at the right of the screen. Screens 7–10 and 11–14 display a log of the last 20 alarms for the active pump.

The active pump and profile may be changed in Run Screens 1, 2, and 3.

Run Screen 1

This screen displays information for a selected pump and profile. A box around an icon indicates which mode the active pump and profile is running (pressure or flow).

Figure 5 Run Screen 1

Run Screen 1 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Select the profile (1 to 4) from the menu. Select the stop option  from the menu to stop the pump.
	Displays the current pump speed in cycles per minute.
	Displays the current pump pressure as a percentage. If a transducer is used, this icon is replaced by the pressure icon. To set up a pressure transducer, see Setup Screen 8, page 17 and Setup Screen 9, page 18.
	Displays current flow rate in units as selected in Setup Screen 18, page 22.
	Signals the active pump to blink code 9 for identification.

Run Screen 2

This screen displays information for controlling an electric agitator using the supervisor to pass on the control set point to a Variable Frequency Drive (VFD), also known as an inverter.

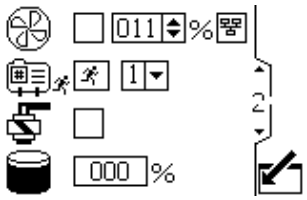


Figure 6 Run Screen 2

Run Screen 2 Key	
	Select this box and set the speed setpoint for the agitator from 0–100%.
	Select this box to put agitator control in local only mode. Setpoint and Enable/Disable requests from PLC/Supervisor will be ignored.
	Select this box and hold the softkey to manually run the pump in the selected profile. This feature allows the user to run the motor past the tank level low alarm to empty the tank.
	Select this box and hold the softkey button to manually control the fill pump solenoid output.
	Current primary tank volume in percent. The field is populated with data only when the tank sensor is enabled. See Setup Screen 19, page 22.

Run Screen 3

This screen displays pressure settings for the active pump and profile. Pressure can be measured in psi, bar, and MPa.

NOTE: Some fields are grayed out, depending on setup selections.

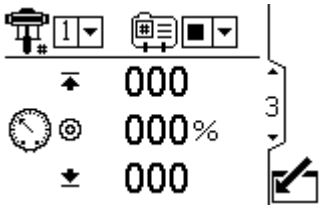


Figure 7 Run Screen 3, Shown in Pressure Mode

Run Screen 3 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Select the profile (1 to 4) from the menu. Select the stop option ■ from the menu to stop the pump.
	Displays the maximum fluid pressure as selected in Setup Screen 2, page 14. See Setup Screen 4, page 15 to set or disable the pressure alarms.
	Displays the target pressure as selected in Setup Screen 2, page 14.
	Displays the minimum fluid pressure as selected in Setup Screen 2, page 14. See Setup Screen 4, page 15 to set or disable the pressure alarms.

Run Screen 4

This screen displays fluid flow settings for the active pump and profile. Fluid flow can be measures in liters per minute, gallons per minute, cc per minute, oz per minute, or cycles per minute.

NOTE: Some fields are grayed out, depending on setup selections.

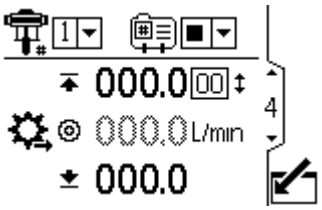


Figure 8 Run Screen 4, Shown in Pressure Mode

Run Screen 4 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Select the profile (1 to 4) from the menu. Select the stop option  from the menu to stop the pump.
	Displays the maximum flow rate and maximum cycle rate as selected in Setup Screen 3, page 15. See Setup Screen 4, page 15 to set or disable the flow alarms.
	Displays the target flow rate as selected in Setup Screen 3, page 15.
	Displays the minimum flow rate as selected in Setup Screen 3, page 15. See Setup Screen 4, page 15 to set or disable the flow alarms.

Run Screen 5

This screen displays the current pressure readings of transducers 1 and 2. Pressure can be displayed as psi, bar, or MPa. See Setup Screen 23, page 24.

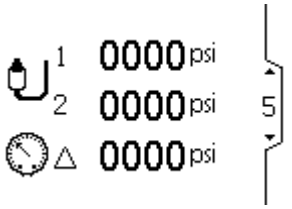


Figure 9 Run Screen 5

Run Screen 5 Key	
	Displays the pressure of transducer 1.
	Displays the pressure of transducer 2.
	Displays the pressure difference between transducer 1 and transducer 2.

Run Screen 6

This screen displays volume information about the tank: the volume dispensed and the remaining volume. The volume can be displayed as liters or gallons. See Setup Screen 25, page 25.

NOTES:

- The screen number may differ, depending on the features that are enabled.
- This screen appears only when the auxiliary input is configured for the reed switch on Setup Screen 19: ↕

  See Setup Screen 19, page 22.

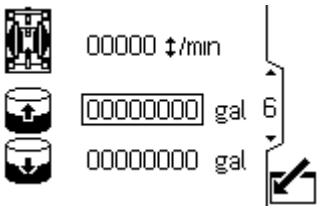


Figure 10 Run Screen 6

Run Screen 6 Key	
	Displays the current cycle rate.
	Displays an estimate of the volume dispensed out of this tank since the last reset event. To reset the volume dispensed: 1. Press the bottom right softkey to enter the screen: 2. Press the top right softkey to reset the volume dispensed to 0: The volume remaining sets to the volume entered on Setup Screen 16. (See Setup Screen 16, page 20.) 3. Press the bottom right softkey to exit the screen:
	Displays an estimate of the remaining volume in the secondary tank, based on the last reset event.

Run Screens 7–10

Run Screens 7–10 display a log of the last 20 alarms, with date and time.

The currently active pump is displayed in a box at the top left of the screen.

For error codes, see Error Code Troubleshooting, page 26.

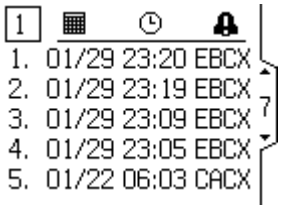


Figure 11 Run Screen 7

Setup Screens

Use the Setup screens for pump settings and accessory features. See Screen Navigation and Editing, page 8 for information on how to make selections and enter data.

Inactive fields are grayed out on a screen.

NOTE: Before setting up profiles on Setup Screens 1–4, perform the initial setup on Setup Screens 5–25 to establish the configuration for your system and affect the displayed data.

Setup Screen 1

Use this screen to set the operating mode for a selected pump and profile.

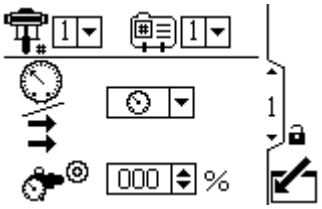


Figure 12 Setup Screen 1

Setup Screen 1 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **Note** Three phase systems do not support multiple pumps.
	Select the profile (1 to 4) from the menu.
	Select the operating mode (force/pressure, flow, or hybrid) from the menu. • In force/pressure mode, the motor adjusts the pump speed to maintain the fluid pressure percentage set on Setup Screen 2. If the flow limit is reached before the target pressure, the unit stops driving to the pressure (if set as an alarm). • In flow mode, the motor maintains a constant speed to maintain the target flow rate set on Setup Screen 3, regardless of the fluid pressure, up to the pump's maximum working pressure. • In hybrid mode, the motor behaves the same as in force/pressure mode, very quickly adjusting speed to maintain the outlet force/pressure. In addition the BPR controller is actively managed and gradually adjusted to bring the flow rate toward the target. **Note** The hybrid mode selection is only available on three phase motor systems

	If the system is equipped with a back pressure regulator (BPR), set the target air pressure to the BPR from 0 to 100 percent (approximately 1 to 100 psi). Leave the field set to 000 for a system with no BPR. This value represents the percentage that is closed on the BPR. If the value is greater than zero but there is no BPR system, the L6CA error code appears. **Note** If you selected Hybrid Mode as the Operating Mode, you cannot set the target air pressure because the system automatically controls the BPR setting.
	This softkey is disabled by default, and only appears if the **Profile Lock** box is checked on Setup Screen 25, page 25. Press to activate the profile that you just edited.

Setup Screen 2

Use this screen to set the maximum, target, and minimum force/fluid pressure for a selected pump and profile. In force/pressure mode, you can set a target force/fluid pressure. In flow mode, you can set a maximum force/fluid pressure. In either force/pressure or flow mode, you can set a minimum pressure. See Setup Screen 4, page 15, to specify how the system will respond if the pump begins to operate outside of the set boundaries.

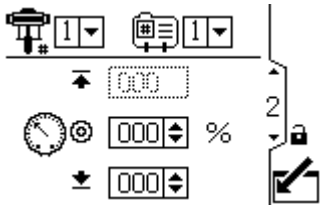


Figure 13 Setup Screen 2

Setup Screen 2 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Select the profile (1 to 4) from the menu.
	Set the maximum pump fluid force/pressure, as a percentage of the maximum pressure of your pump.
	In force/pressure mode, set the force/fluid pressure target as a percentage of the maximum pressure of your pump. This field is not used in flow mode. **NOTE:** If closed loop pressure is enabled, the target pressure is displayed as a pressure value (psi, bar, MPa) rather than a percentage of maximum pressure. See Setup Screen 8, page 17 to enable closed loop pressure control.
	Optionally, set a minimum pump force/fluid pressure, as a percentage of the maximum force/fluid pressure of your pump.
	This softkey is disabled by default, and only appears if the **Profile Lock** box is checked on Setup Screen 25, page 25. Press to activate the profile that you just edited.

Setup Screen 3

Use this screen to set your flow rate settings for a selected pump and profile. In pressure mode, you will set a maximum flow rate. In flow mode, you will set a target flow rate. In either pressure or flow mode, a minimum flow rate may be set. See Setup Screen 4 to specify how the system will respond if the pump begins to operate outside of the set boundaries.

NOTE: With flow rate units of cc/min, the maximum value that can be displayed is 9999. If the field displays ####, the saved value is out of range. Go to Setup Screen 18, page 22 and change the flow rate to a larger unit. Return to this screen and reduce the setting to a lower value that will be within the display's range, then reset the flow rate units to cc/min.

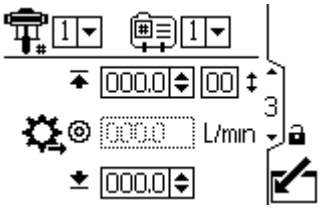


Figure 14 Setup Screen 3

Setup Screen 3 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Select the profile (1 to 4) from the menu.
	In flow mode, set a target flow rate. This field is not used in pressure mode.
	In pressure mode, set the maximum flow rate. The software calculates the number of pump cycles needed to achieve that flow rate. This field is not used in flow mode. **NOTE:** If the profile does not have a maximum flow rate setting, the motor will not run and error code WSC_ appears.
	Optionally, set a minimum flow rate.
	This softkey is disabled by default, and only appears if the **Profile Lock** box is checked on Setup Screen 25, page 25. Press to activate the profile that you just edited.

Setup Screen 4

Use this screen to specify how the system responds if the pump begins to operate outside of the pressure and flow settings established on Setup Screen 2 and Setup Screen 3. The operating mode (pressure or flow, set on Setup Screen 1) determines which fields are active.

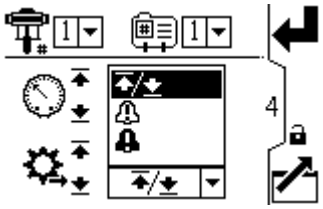


Figure 15 Alarm Preference Menu

- / **Limit:** The pump continues to run and issues no alert.
  - Maximum pressure set to Limit: The system reduces the flow if necessary to prevent the pressure from exceeding the limit.
  - Maximum flow set to Limit: The system reduces the pressure if necessary to prevent the flow from exceeding the limit.
  - Minimum pressure or flow set to Limit: The system takes no action. Use this setting for no minimum pressure or flow setting.
  - Pressure limit errors include P1I_, P2I_, P3I_, and P4I_.
  - Flow rate errors include K1D_, K2D_, K3D_, and K4D_.
- **Deviation:** The system alerts you to the problem, but the pump may continue to run past the maximum or minimum settings for five seconds until the system's absolute pressure or flow boundaries are reached.
- **Alarm:** The system alerts you to the alarm cause and shuts down the pump.

NOTE: Alert trigger time varies based on how far active measurements are from their set limits.

Setup Screen 4 Key	
	To enable the pressure alarm: • Line 1 (Pressure Maximum): Select **Limit**, **Deviation**, or **Alarm**. For runaway control, set the maximum flow to **Alarm**. If the flow rate exceeds the maximum entered on Setup Screen 3 for five seconds, an alarm symbol appears on the screen and the pump shuts down. • Line 2 (Pressure Minimum): Select **Limit**, **Deviation**, or **Alarm**. To detect a plugged filter or pipe, set the minimum flow to **Deviation**. If the flow rate drops below the minimum entered on Setup Screen 3, a deviation symbol appears on the screen to warn you to take action. The pump continues to run.
	To enable the flow rate alarm: • Line 3 (Flow Maximum): Select **Limit**, **Deviation**, or **Alarm**. To prevent the connected equipment from excessive pressure, set the maximum pressure to Limit. • Line 4 (Flow Minimum): Select **Limit**, **Deviation**, or **Alarm**. For runaway control, set the minimum pressure to **Alarm**. If a hose bursts, the pump does not change speed, but the back pressure falls. When the pressure falls below the minimum entered on Setup Screen 2, an Alarm symbol appears on the screen and the pump shuts down. To detect a plugged filter or pipe, set the maximum pressure to **Deviation**. When the pressure exceeds the maximum entered on Setup Screen 2, a Deviation symbol appears on the screen to warn you to take action. The pump continues to run.
	This softkey is disabled by default, and only appears if the **Profile Lock** box is checked on Setup Screen 23, page 24. Press to activate the profile that you just edited.

Setup Screen 5

Use this screen to set the lower pump size (cc) of each pump. The default is blank; select the correct lower size, or custom. If custom is selected, enter the size of the lower in cc. This screen also activates jog mode, allowing you to position the motor/pump shaft for connection or disconnection.

NOTE: The motor will limit its pressure output when the selected lower is 750cc, to prevent exceeding the pressure rating of the lower.

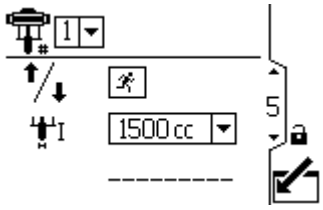


Figure 16 Setup Screen 5

Setup Screen 5 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Select to enable jog mode. Use the arrow keys to move the motor or pump shaft up or down.
	Select the correct pump lower size from the menu. The default is blank. If custom is selected, a field opens for you to input the size of the lower in cc. • Supply pumps – 145 cc – 180 cc – 220 cc – 290 cc • Circ pumps – 750 cc* – 1000 cc – 1500 cc – 2000 cc – 2500 cc * When 750 cc is selected, the maximum force is capped to 75% to prevent over pressurizing the pump.

Setup Screen 6

Use this screen to view the grand totalizer value and to set or reset the batch totalizer.

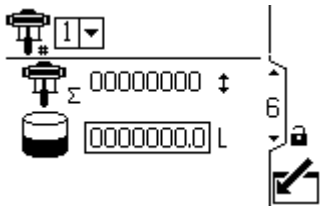


Figure 17 Setup Screen 6

Setup Screen 6 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Displays the current grand total of pump cycles. This field cannot be reset.
	Displays the batch total in selected volume units.
	Resets the batch totalizer to zero.

Setup Screen 7

Use this screen to set the maintenance interval (in cycles) for each pump. The screen also displays the current cycle count. Error code MND_ appears when the counter reaches 0 (zero).

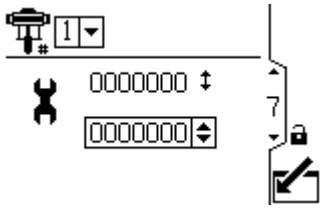


Figure 18 Setup Screen 7

Setup Screen 7 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
	Set the maintenance interval (in cycles) for each pump.

Setup Screen 8

Use this screen to set up the pressure for transducer 1. Selecting a transducer and a pump activates closed loop pressure control.

NOTE: Closed loop pressure control requires the transducer to be installed near the pump outlet.

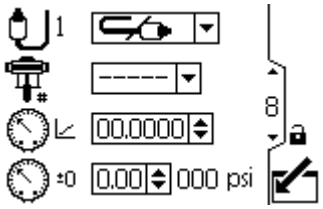


Figure 19 Setup Screen 8

Setup Screen 8 Key	
	Select from the menu options (500 psi or 5000 psi) to enable the transducer.
	This option enables closed loop pressure control and assigns the transducer to a pump. • For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. • For three phase pumps, select pump 1.
	Enter the calibration scale factor from the transducer label.
	Enter the calibration offset value from the transducer label.
000 psi	Displays the current transducer reading.

Setup Screen 9

Use this screen to set up the pressure for transducer 2. The typical application is monitoring BPR fluid pressure.

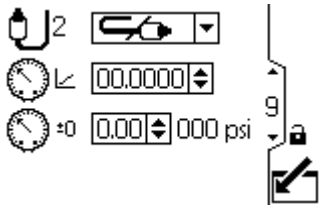


Figure 20 Setup Screen 9

Setup Screen 9 Key	
	Select from the menu options (500 psi or 5000 psi) to enable the transducer.
	Enter the calibration scale factor from the transducer label.
±0	Enter the calibration offset value from the transducer label.
000 psi	Displays the current transducer reading.

Setup Screen 10

Use this screen to specify how the system responds if the system pressure begins to operate outside of the system settings.

Pressure transducer 2 monitors the pressure at the BPR.

Delta pressure monitors the difference between the pump outlet and the BPR.

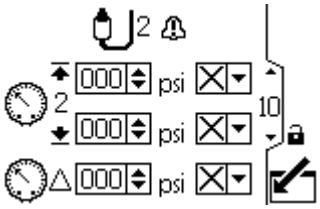


Figure 21 Setup Screen 10

The following events can appear:

- ☒ **No event:** The pump continues to run and issues no alert.
- **Deviation:** The system alerts the user to the problem, but the pump may continue to run past the maximum or minimum settings for five seconds until the system's absolute pressure or flow boundaries are reached.
- **Alarm:** The system alerts you to the alarm cause and shuts down the pump.

Setup Screen 10 Key	
000 psi 2 000 psi	Maximum and minimum pressure. Can be configured as no event, deviation, or alarm.
△ 000 psi	Pressure difference between transducer 1 and 2.

Setup Screens 11 and 12

These screens are auto-populated by the software. Screen 11 displays the serial numbers of motors 1–4, and Screen 12 displays the serial numbers of motors 5–8.

NOTES:

- The screen numbers may differ, depending on the features that are enabled.
- Changing the pump order will shift every other pump up one position. For example, if AD00001 is changed to be pump 4, AD00002 will become pump 1, AD00003 will become pump 2, and so on.

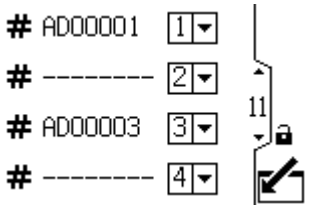


Figure 22 Setup Screens 11 and 12 (Screen 11 shown)

Setup Screens 13 and 14

These screens are auto-populated by the software. Screen 13 displays the software version numbers of motors 1–4, and Screen 14 displays the software version numbers of motors 5–8.

NOTE: The screen numbers may differ, depending on the features that are enabled.

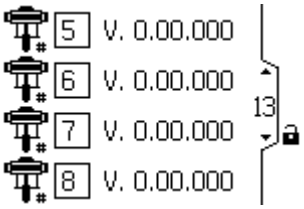


Figure 23 Setup Screens 13 and 14 (Screen 13 shown)

Setup Screen 15

Use this screen to set your modbus preferences.

NOTES:

- The screen number may differ, depending on the features that are enabled.
- The following are fixed modbus settings, which cannot be set or changed by the user: Data Bits: 8, Stop Bits: 2, Parity: None

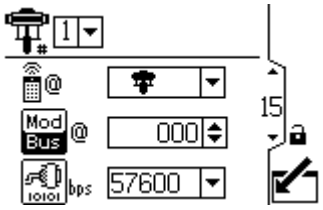


Figure 24 Setup Screen 15

Setup Screen 15 Key	
	For systems with multiple pumps and one display, select the pump (1 to 8) from the menu. **NOTE:** Three phase systems do not support multiple pumps.
@	Select local or remote from the menu. This setting applies to the selected pump only. Local mode allows you to view changes over the modbus network, but you cannot make changes over the modbus network. Remote mode allows you to both view and change information over the modbus network.
Mod Bus @	Enter or change the Modbus node ID. The value is between 1 and 246. Each pump requires a unique node ID, which identifies that pump if more than one pump is connected to the display.
bps	Select the serial port baud rate from the menu. This is a system-wide setting. • 38400 kbps • 57600 kbps (default) • 115200 kbps

Setup Screen 16

Use this screen to configure and control the tank fill feature and Intelligent Paint Kitchen peripherals.

NOTES:

- The screen number may differ, depending on the features that are enabled.
- The alert trigger time varies based on how far active measurements are from their set limits.

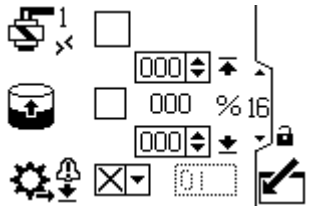


Figure 25 Setup Screen 16

Setup Screen 16 Key	
	Select this box to manually activate the fill solenoid output on port 4, pin 3.
	Select this box to enable the tank to automatically fill. You can then set the fill levels. When the tank level reaches this % level, the fill solenoid turns off. This value cannot be higher than the level below. When the tank level reaches this % level, the fill solenoid turns on. This value cannot be lower than the level above.
	Configure the low fill pump flow notification for a deviation or an alarm and set the time-out value in seconds. If a 1% level change is not detected with the timeout period in seconds, the system takes action based on the event type.

Setup Screen 17

Use this screen to monitor, set up, and control the Intelligent Paint Kitchen peripherals. For more information, see the Set Up Peripherals section of the Intelligent Paint Kitchen manual 3A4030.

NOTES:

- The screen number may differ, depending on the features that are enabled.
- The second field varies, depending on the menu selection in the first field.

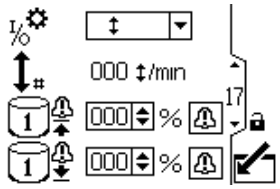


Figure 26 Setup Screen 17, Reed Switch Option Shown

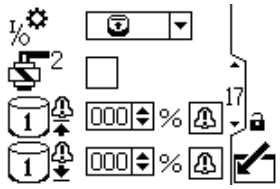


Figure 27 Setup Screen 17, Manual Control Option Shown

Setup Screen 17 Key	
	Select the connected peripheral from the menu.
	Configures Port 4 pin 4 as an input to allow a reed switch to be connected. The current reed switch cycle rate appears next to the cycle rate icon in cycles per minute.
	Configures Port 4 pin 4 as an input to allow a pressure switch to be connected. If the drum cover is lifted while this configuration is properly connected, the agitator shuts down. The current input status appears in the agitator status field . **NOTE:** A Supervisor Module is required for this function.
	Configures Port 4 pin 4 as an output to allow for the connected device to receive an alarm when the level of the Primary Tank is above the value that is defined in the Primary Tank High field 000 %. This value is a percentage of the total level of the Primary Tank.
	Configures Port 4 pin 4 as an output to allow for the connected device to receive an alarm when the level of the Primary Tank is below the value that is defined in the Primary Tank Low field 000 %. This value is a percentage of the total level of the Primary Tank
	Configures Port 4 pin 4 as an output to allow for another solenoid to be connected and controlled from the device. Select the manual output box 2 ☐ ☒ and hold the button to control the auxiliary solenoid manually. After you release the button, the manual activation is terminated.
	The External Tank Fill option configures Port 4 pin 4 as an output the same as the one above. This option also ties the Tank High Alarm, as configured below, to this output such that the ADCM leaves it alone for external control until the tank level goes above the set point. After the tank level is above the set point, the output is forced off.

	The Tank High Alarm allows for the connected device to receive an alarm when the level of the primary tank is above the value that is defined in this field. If the value is set to 0, the event is disabled.
	The Tank Low Alarm allows for the connected device to receive an alarm when the level of the primary tank is below the value that is defined in this field. If the value is set to 0, the event is disabled.
	An event can be configured as a deviation or an alarm. In the event of an alarm, the pump shuts off and the agitator turns off.

Setup Screen 18

Use this screen to set the stroke displacement volume and flow rate units of the fill pump that is connected to the cycle switch input.

NOTE: This screen is grayed out unless the auxiliary input is selected on Setup Screen 17. See Setup Screen 17, page 21.

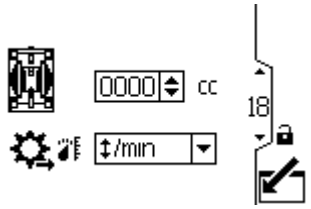


Figure 28 Setup Screen 18

Setup Screen 18 Key	
	The stroke displacement: enter the volume per cycle in cubic centimeters.
	Select the flow rate units to display on the run screen: • cycles/min • cc/min • liters/min • gallons/min

Setup Screen 19

Use this screen to configure the full volume of the secondary tank, and the points at which the user is notified that the tank is nearing empty and empty.

NOTE: This screen is grayed out unless the auxiliary input is selected on Setup Screen 17. See Setup Screen 17, page 21.

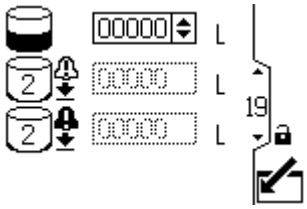


Figure 29 Setup Screen 19

Setup Screen 19 Key	
	Enter the full fluid volume of the secondary tank.
	Enter the fluid volume at which point the user is notified that the secondary tank is nearing empty. When the current volume is less than or equal to this value, the system generates an L2B0 event.
	Enter the fluid volume at which point the user is notified that the secondary tank is empty. When the current volume is less than or equal to this value, the system generates an L1B0 event.

Setup Screen 20

Use this screen to set up the input scaling (radar level sensor) for 4–20mA devices and turn on the current loop (Port 8 and Port 9 of the ADCM).

NOTE: The screen number may differ, depending on the features that are enabled.

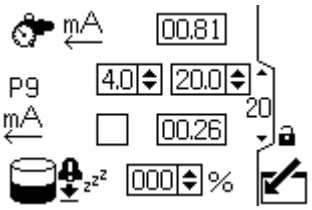


Figure 30 Setup Screen 20

Setup Screen 20 Key	
mA	Monitor the back pressure regulator mA output.
P9	Set the value for P9 (Port 9) between 4 and 20.
mA	Select this box to turn on the 4-20mA supply. Set the numerical values for the scaling ceiling for 4-20mA signal.
	Set the tank leakage set point. When the pump is put into off production, the system captures the current tank level. If, at any time, the current tank level drops by the percentage indicated here, a leakage alarm will trigger and stop the pump. If the value is set to 0%, the leakage alarm is disabled. See Setup Screen 22, page 24.

Setup Screen 21

This screen is for enabling a modbus communications alarm and disabling the Stop Pump function of the Cancel key.

NOTE: The screen number may differ, depending on the features that are enabled.

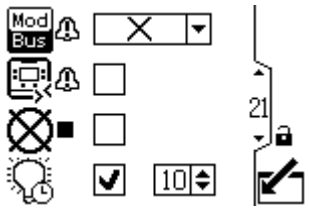


Figure 31 Setup Screen 21

Setup Screen 21 Key	
Mod Bus	Select the modbus alarm type: × None Deviation Alarm
	Select this box to make CAN communication a deviation that does not shut down the pump.
	Select this box to disable the Stop Pump function of the Reset/Cancel key.
	Enable or disable the backlight and set the time-out value in minutes.

Setup Screen 22

Use this screen to enable or disable the run/stop switch and auto restart.

NOTE: The screen number may differ, depending on the features that are enabled.

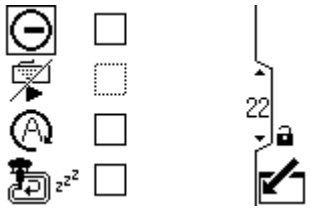
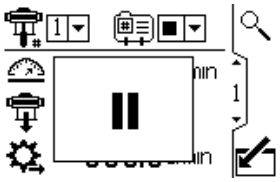
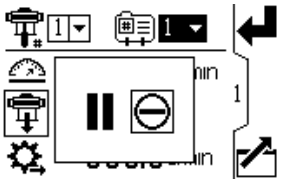


Figure 32 Setup Screen 22

Setup Screen 22 Key	
	Enable or disable the run/stop switch. The default setting is disabled. See Run/Stop Switch Kit in Accessories, page 32. When enabled, this configuration allows the run/stop switch to pause the pump while in a profile. When the run/stop switch is active, the following pop-up appears: 
	Disable the remote start function over modbus. When enabled along with the run/stop switch, you must toggle the run/stop switch when going from profile 0 (stopped) to run before the pump can start. When the run/stop switch is active, the following pop-up appears: 
	Enable or disable auto restart. The default setting is disabled. If enabled, the unit resumes operation at the profile that was set before the unit was turned off.
	Enable the off production profile mode. This feature turns profile 4 into the off production profile. When profile 4 is active, the fill pump is disabled and the current primary tank level is recorded. If the primary tank level drops more than the configurable leakage level percentage, the system triggers the alarm and shuts off the pump. The tank leakage set point is configured in Setup Screen 20. (See Setup Screen 20, page 23.)

Setup Screen 23

Use this screen to set the units for pressure, totals, and flow.

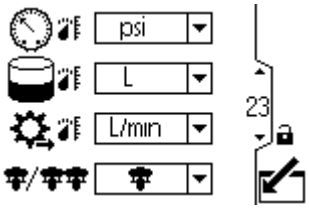


Figure 33 Setup Screen 23

Setup Screen 23 Key	
	Select the pressure units: • psi • bar (default) • MPa
	Select the volume units: • liters (default) • gallons • cc
	Select the flow rate units: • L/min (default) • gpm • cc/min • oz/min • cycles/min
	Select the system mode (single or x2). If you are in single mode but connected to x2 or in x2 mode but connected to single, error code WNNX appears.

Setup Screen 24

Use this screen to set your date format, date, time, or force a restart of the system when updating the software (update token inserted into the display). After the software update is completed successfully, the token must be removed prior to selecting the Acknowledge key or power cycling the display. If an update was concluded and the token is not removed, pressing the Acknowledge key restarts the update process.

NOTES:

- The screen number may differ, depending on the features that are enabled.
- Refer to Appendix C - Control Module Programming, page 55 for instructions on software updating. Software update is disruptive to all pumps connected to the display. All pumps attached to the display must not be pumping material when the software update is initiated.

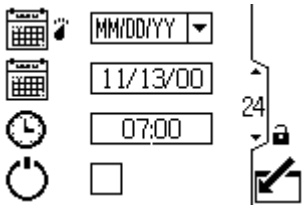


Figure 34 Setup Screen 24

Setup Screen 24 Key	
	Select your preferred date format from the menu. • MM/DD/YY • DD/MM/YY (default) • YY/MM/DD
	Set the correct date.
	Set the correct time.
	Perform a soft restart of the system.

Setup Screen 25

Use this screen to enter a password that will be required to access the Setup screens. This screen also displays the software version.

NOTE: The screen number may differ, depending on the features that are enabled.

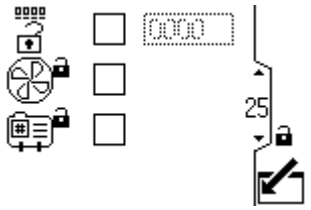


Figure 35 Setup Screen 25

Setup Screen 25 Key	
	Enter the 4–digit password.
	Check the box to lock out the agitator field in the Run screens.
	Check the box to lock out the profile field on the Run screens.

Error Code Troubleshooting

Error codes can take three forms:

- Alarm : alerts you to the alarm cause and shuts down the pump.
- Deviation : alerts you to the problem, but pump may continue to run past the set limits until the system's absolute limits are reached.
- Advisory : information only. Pump will continue to operate.

Notes about the following error codes:

- On Advanced motors, flow (K codes) and pressure (P codes) can be designated as alarms or deviations. See Setup Screen 4, page 15.
- "X" means the code is associated with the display only.
- "_" in the code is a placeholder for the number of the pump where the event occurred.
- The blink code is displayed using the power indicator on the motor. The blink code given below indicates the sequence. For example, blink code 1–2 indicates 1 blink, then 2 blinks; the sequence then repeats.
- A blink code of 9 is not an error code, but an indicator of which pump is active (softkey has been pushed, see Run Screen 1, page 9).

Display Code	Applicable Motor	Blink Code	Alarm or Deviation	Description
None	Basic	6	Alarm	The Mode Select knob is set between Pressure and Flow . Set the knob to the mode you want.
None	Basic and Advanced	9	None	A blink code of 9 is not an error code, but an indicator of which pump is active.
A4N_	Basic and Advanced	6	Alarm	The motor current exceeded 13A or the hardware overcurrent tripped at 20A.
A5N_	Basic and Advanced	4–6	Alarm	Internal hardware current calibration. Replace electronics. **NOTE:** 3 phase motor only.
CAC_	Advanced	None	Alarm	Display detects a loss of CAN communication. Flashing alarm appears on the display, and the blink code occurs.
CAD_	Advanced	2–3	Alarm	Unit detects a loss of CAN communication. This alarm is only logged. No flashing alarm appears on the display, but the blink code does occur.
C3G_	Advanced	None	Deviation	Display detects a loss of modbus communication when modbus deviation is enabled on Setup Screen 16.
C4G_	Advanced	None	Alarm	Display detects a loss of modbus communication when modbus alarm is enabled on Setup Screen 16.
CBN_	Basic and Advanced	2–4	Deviation	Temporary circuit board communication failure.
CCC_	Advanced	3–7	Alarm	No display was detected at startup. **NOTE:** 3 phase motor only.
CCN_	Basic and Advanced	3–6	Alarm	Circuit board communication failure.
END_	Basic and Advanced	5–6	Advisory	A calibration of the encoder and stroke range is in progress.

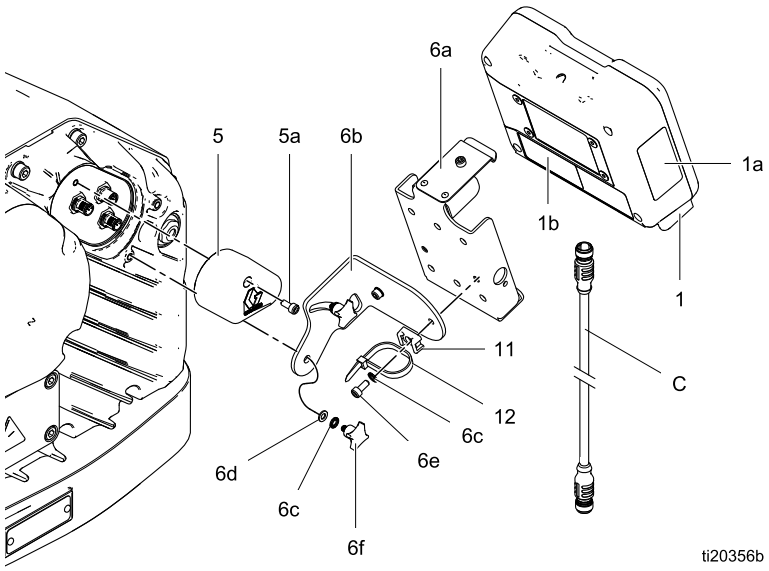
Display Code	Applicable Motor	Blink Code	Alarm or Deviation	Description
ENDC	Advanced	None	Advisory	Calibration of the encoder and stroke range was successfully completed.
ENN_	Advanced	None	Advisory	Dual lower system calibration completed successfully.
E5D_	Basic and Advanced	1–7	Deviation	Calibrate encoder failure.
E5F_	Advanced	None	Advisory	Dual lower system calibration error. System running too rapidly to perform calibration.
E5N_	Basic and Advanced	2–7	Deviation	Calibrate stroke failed.
E5S_	Advanced	None	Advisory	Dual lower system calibration stopped or interrupted.
E5U_	Advanced	None	Advisory	Dual lower system calibration unsteady. System could not determine optimum setting.
EBC_	Advanced	None	Advisory	Run/Stop switch in Stop position (closed).
ELD_	Basic and Advanced	4–7	Advisory	Startup event record.
ELI_	Basic and Advanced	4–5	Deviation	Deviation hot board reset.
ERR_	Basic and Advanced	2–5	Deviation	Deviation software error.
F1F0	Advanced	None	Alarm	Fill pump flow not detected. The primary tank level has not increased with the no flow timeout window and the no flow timeout event is set to alarm.
F2F0	Advanced	None	Deviation	Fill pump flow not detected. The primary tank level has not increased with the no flow timeout window and the no flow timeout event is set to deviation.
K1D_	Advanced	1–2	Alarm	Flow is below minimum limit.
K2D_	Advanced	None	Deviation	Flow is below minimum limit.
K3D_	Advanced	None	Deviation	Flow exceeds maximum target; also indicates pump runaway condition exists.
K4D_	Basic and Advanced	1	Alarm	Flow exceeds maximum target; also indicates pump runaway condition exists.
L1A0	Advanced	None	Alarm	Primary tank current level is below the primary tank alarm set point.
L1AF	Advanced	None	Alarm	While the system was in off production mode, the current tank level dropped below the leakage alarm percentage.
L1BX	Advanced	None	Alarm	The estimated remaining volume in the secondary tank is below the alarm level. The value is calculated as total tank volume subtracted from fill pump counter calculated dispensed volume.
L2A0	Advanced	None	Deviation	The primary tank current level is below the primary tank deviation set point.

Display Code	Applicable Motor	Blink Code	Alarm or Deviation	Description
L2BX	Advanced	None	Deviation	The estimated remaining volume in the secondary tank is below the deviation level. The value is calculated as total tank volume subtracted from fill pump counter calculated dispensed volume.
L3A0	Advanced	None	Deviation	The primary tank current level is above the primary tank deviation set point.
L4A0	Advanced	None	Alarm	The primary tank level is above the primary tank level high alarm set point.
L6CA	Advanced	None	Deviation	Port 8 is enabled and the current draw is less than 4 mA. The BPR is requesting a value greater than 0%. Verify that the device is connected.
L6CB	Advanced	None	Deviation	Port 9 is enabled and the current draw is less than 4 mA. Verify that the device is connected.
MND_	Advanced	None	Advisory	Maintenance counter is enabled and countdown reached zero (0).
P1CB	Advanced	None	Alarm	Pressure transducer 2 pressure is below the alarm set point.
P1D_	Advanced	None	Deviation	Unbalanced load. Dual Lower system — P1D1 = Motor 1 is requiring less force to hold speed; pump lower may need service. P1D2 = Motor 2 is requiring less force than motor 1 to hold speed.
P9D_	Advanced	None	Deviation	Major unbalanced load — see P1D_ (P9D_ is higher magnitude)
P1I_	Advanced	1–3	Alarm	Pressure is below minimum limit.
P2I_	Advanced	None	Deviation	Pressure is below minimum limit.
P2CB	Advanced	None	Deviation	Pressure transducer 2 pressure is below the deviation set point.
P3CB	Advanced	None	Deviation	Pressure transducer 2 pressure is above the deviation set point.
P3I_	Advanced	None	Deviation	Pressure exceeds maximum target.
P4CB	Advanced	None	Alarm	Pressure transducer 2 pressure is above the alarm set point.
P4I_	Advanced	1–4	Alarm	Pressure exceeds maximum target.
P5DX	Advanced	None	Deviation	More than one pump is assigned to a transducer. The assignment for that transducer is automatically cleared under this condition. User must reassign.
P6CA or **P6CB**	Advanced	None	Deviation	For units without closed loop pressure control: Transducer (A or B) is enabled but not detected.
P6D_	Advanced	1–6	Alarm	For units with closed loop pressure control: Transducer is enabled but not detected.
P7C_	Advanced	None	Deviation	Pressure difference between transducer 1 and transducer 2 is greater than the deviation set point.
P9C_	Advanced	None	Alarm	Pressure difference between transducer 1 and transducer 2 is greater than the alarm set point.
T2D_	Basic and Advanced	3–5	Alarm	Internal thermistor disconnected or motor temperature is below 0° C (32° F).

Display Code	Applicable Motor	Blink Code	Alarm or Deviation	Description
T3D_	Basic and Advanced	5	Deviation	Motor over temperature. Motor will throttle itself to stay below 85° C (185° F) internally.
T4D_	Basic and Advanced	4–6	Alarm	Motor over temperature. Motor will throttle itself to stay below 85° C (185° F) internally.
V1I_	Basic and Advanced	2	Alarm	Brown out; voltage supplied to motor is too low.
V2I_	Basic and Advanced	None	Deviation	Brown out; voltage supplied to motor is too low.
V1M_	Basic and Advanced	2–6	Alarm	AC power is lost.
V3I_	Basic and Advanced	None	Deviation	Voltage supplied to motor is too high.
V4I_	Basic and Advanced	3	Alarm	Voltage supplied to motor is too high.
V9M_	Basic and Advanced	7	Alarm	Low supply voltage detected at start up.
WCW_	Advanced	None	Alarm	System type mismatch; motor is an E-Flo DC dual lower system and the display configuration does not match. Change the display's system type on the Setup Units screen (screen 15).
WMC_	Basic and Advanced	4–5	Alarm	Internal software error.
WNC_	Basic and Advanced	3–4	Alarm	Software versions do not match.
WNN_	Advanced	None	Alarm	System type mismatch; motor is an E-Flo DC single lower system and the display configuration does not match. Change the display's system type on the Setup Units screen (screen 12 in dual lower mode).
WSC_	Advanced	None	Deviation	Profile is set to 0 pressure or 0 flow.
WSD_	Advanced	1–5	Alarm	Invalid lower size; occurs if the unit is operated before setting up the lower size.
WXD_	Basic and Advanced	4	Alarm	An internal circuit board hardware failure is detected.

Parts

24P822 Control Module Kit (Single Phase, Side Mount)



Ref	Part	Description	Qty
1	24P821	DISPLAY KIT, control module; includes item 1a; see manual 332013 for approvals information about the bare ADCM module	1
1a▲	16P265	LABEL, warning, English	1
1b▲	16P265	LABEL, warning, French	1
1c▲	16P265	LABEL, warning, Spanish (shipped loose)	1
5	24N910	CONNECTOR, jumper; includes item 5a	1
5a	— — —	SCREW, cap, socket head; M5 x 40 mm	1
6	24P823	BRACKET KIT, control module; includes items 6a-6f	1

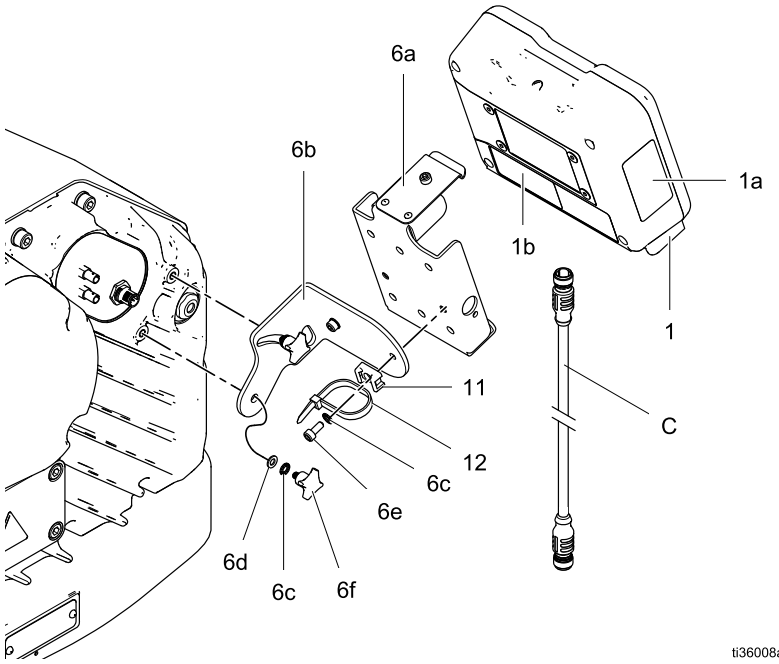
Ref	Part	Description	Qty
6a	— — —	BRACKET, control module	1
6b	— — —	BRACKET, mounting	1
6c	— — —	LOCKWASHER, external tooth; M5	4
6d	— — —	WASHER; M5	2
6e	— — —	SCREW, cap, socket head; M5 x 12 mm	2
6f	— — —	KNOB; M5 x 0.8	2
11	— — —	HOLDER, tie	1
12	— — —	STRAP, tie	1

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

Items marked — — — are not available separately.

Cable (C) is shown for reference but is not included in the kit. Order specified length separately. See Cable Connection, page 5 .

17V232 Control Module Kit (Three Phase, Side Mount)



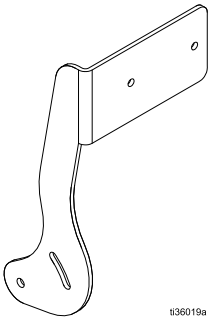
Ref	Part	Description	Qty
1	— — —	DISPLAY KIT, control module; includes item 1a; see manual 332013 for approvals information about the bare ADCM module	1
1a▲	— — —	LABEL	1
1b▲	16P265	LABEL, warning, French	1
6	24P823	BRACKET KIT, control module; includes items 6a-6f	1
6a*	— — —	BRACKET, control module	1
6b	— — —	BRACKET, mounting	1
6c	— — —	LOCKWASHER, external tooth; M5	4
6d	— — —	WASHER; M5	2
6e	— — —	SCREW, cap, socket head; M5 x 12 mm	2
6f	— — —	KNOB; M5 x 0.8	2
11	— — —	STRAP, tie wiring	1
12	— — —	HOLDER, tie	1
17	— — —	TOKEN, GCA, upgrade, E-Flo DC (not shown)	1

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

Items marked — — — are not available separately.

Cable (C) is shown for reference but is not included in the kit. Order specified length separately. See Cable Connection, page 5 .

17W754 Top Mount Bracket Kit



Accessories

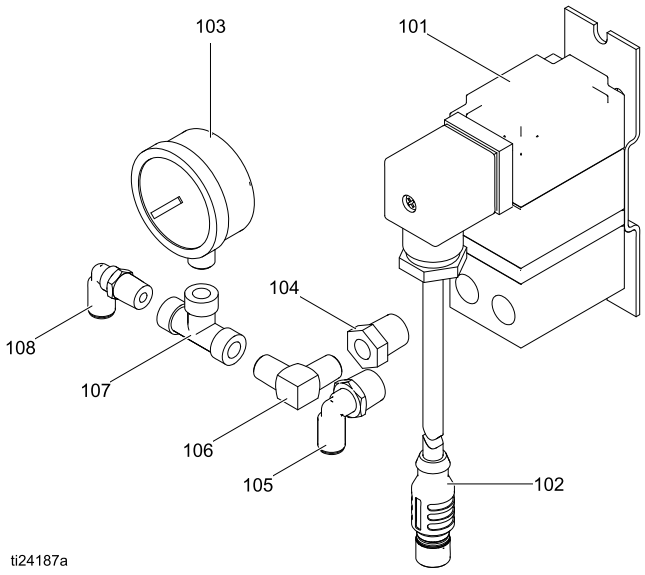
NOTE: Parts for kits in the following table are not sold separately.

Part	Kit
25D293 25D294	Radar Sensor Kit
17S640	Auxiliary Solenoid Kit
24Z671	Tank Fill Kit
241405 24A032	Reed Switch Counter Kit
17B160	Fiber Optic Cables KM172
17T898	Fiber Optic Cables KM173

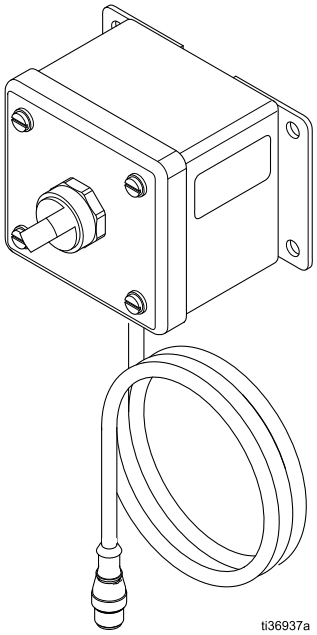
BPR Controller Kit 24V001

Ref	Part	Description	Qty
101	— — —	TRANSDUCER, miniature	1
102	— — —	CABLE, F/C, I.S., 8 M	1
103	110436	GAUGE, pressure, air	1
104	100030	BUSHING	1
105	198178	ELBOW	1
106	110207	ELBOW	1
107	C19466	TEE	1
108	198171	ELBOW	1

— — — *Parts not sold separately.*



Run/Stop Switch Kit 16U729



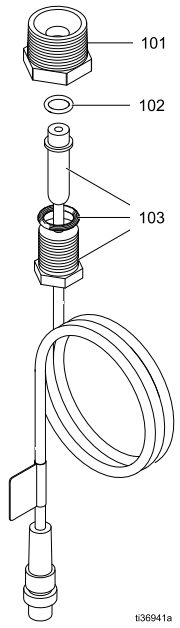
Technical Specifications for 16U729

Run/Stop Switch Kit 16U729	US	Metric
Switch Ratings:		
Voltage	24 VDC	
Current	10 A	
Power	240 W maximum	
Ambient Temperature	–13°-122°F	–25°-50°C
EX Ratings:		
Classification	"Simple Apparatus" in accordance with UL/EN/IEC 60079-11, clause 5.7 Class I, Div 1: Group D T4 **II 1 G** Ex ia IIA T4 Ga	
Parameters	Ui = 17.9V Ii = 217 mA Pi = 937 mW Ci = 1200 pF Li = 6.8 uH Li/Ri = 7.4 uH/Ohm	

Pressure Transducer Kit for 4-ball pumps 24R050, Pressure Transducer Kit for 2-ball pumps 24Y245

Ref	Description	24R050 Part	24Y245 Part	Qty
101	ADAPTER, fitting, pressure sensor	16U440		1
102	PACKING, o-ring	119348		1
103	SENSOR, pressure, fluid outlet	16P289	15M669	1

— — — *Parts not sold separately.*



Technical Specifications for 24R050 and 24Y245

Pressure Transducer Kits 24R050, 24Y245	US	Metric
Electrical Ratings:		
Voltage	5 VDC	
Full Scale sensitivity	20.00 mV/V	
Span At Max pressure	100mV	
Ambient Temperature	32°-140°F	0°-60°C
EX Ratings:		
Classification	"Simple Apparatus" in accordance with UL/EN/IEC 60079-11, clause 5.7 Class I, Div 1: Group D T4 **II 1 G** Ex ia IIA T4 Ga	
Parameters	Ui = 17.9V Ii = 73 mA Pi = 1.3 W Ci = 900 pF Li = 1.7 uH Li/Ri = 6.6 uH/Ohm	

Appendix A - Modbus Variable Map

To communicate through fiber optics with the E-Flo DC Control Module, reference the appropriate hardware as shown in manual 332356. That manual indicates various options for connecting fiber optic cables from the control module to the non-hazardous area. The following table lists Modbus registers available to a PC or PLC located in the non-hazardous area.

Table 4 shows the registers needed for basic operation, monitoring, and alarm control features. Tables 5 and 6 provide bit definitions as needed for certain registers. Table 7 shows the units and how to convert the register value to a unit value.

Reference the Modbus communication settings selected in Setup Screen 15, page 19.

Table 4 Modbus Registers

Modbus Register	Variable	Register Access	Size	Notes/Units
Date Time Read Only				
403100	Hour	Read Only	16 Bit	0-23
403101	Minute	Read Only	16 Bit	0-59
403102	Second	Read Only	16 Bit	
403103	Year	Read Only	16 Bit	00-99
403104	Month	Read Only	16 Bit	1-12
403105	Day	Read Only	16 Bit	1-31
Display Alarms Read Only				
403106	Display Alarms Upper Word	Read Only	16 Bit	See Table 5 for bit definitions.
403107	Display Alarms Lower Word	Read Only	16 Bit	
Display Configuration				
403200	Hour	Read / Write	16 Bit	0-23
403201	Minute	Read / Write	16 Bit	0-59
403202	Second	Read / Write	16 Bit	
403203	Year	Read / Write	16 Bit	00-99
403204	Month	Read / Write	16 Bit	1-12
403205	Day	Read / Write	16 Bit	1-31
403206	Display Password	Read / Write	16 Bit	0000-9999
403207	Display Date Format	Read / Write	16 Bit	0 = MM/DD/YY 1 = DD/MM/YY 2 = YY/MM/DD
403208	Pressure Units	Read / Write	16 Bit	0 = Psi 1 = bar 2 = Mpa

Modbus Register	Variable	Register Access	Size	Notes/Units
403209	Volume Units	Read / Write	16 Bit	0 = Liters 1 = Gallons
403210	Flow Units	Read / Write	16 Bit	0 = Liter/min 1 = Gallons/min 2 = cc/min 3 = oz/min 4 = Cycles / min
403211	Profile Lock	Read / Write	16 Bit	0 = Disable Profile Lock 1 = Enable Profile Lock
403212	Transducer 1 Type	Read / Write	16 Bit	0 = None 1 = 500 psi (34.4 Bar, 3.44 MPa) 2 = 5000 psi (344.7 Bar, 34.74 MPa)
403213	Transducer 1 Assigned	Read / Write	16 Bit	0 - 1
403214	Transducer 1 Scale	Read / Write (Reads ignored)	16 Bit	Integer Value (0 - 65535)
403215		Read / Write (Reads ignored)	16 Bit	Decimal Value (0 - 65535)
403216	Transducer 1 Offset	Read / Write (Reads ignored)	16 Bit	Integer Value (0 - 65535)
403217		Read / Write (Reads ignored)	16 Bit	Decimal Value (0 - 65535)
403218	Transducer 2 Type	Read / Write	16 Bit	0 = None 1 = 500 psi (34.4 Bar, 3.44 MPa) 2 = 5000 psi (344.7 Bar, 34.74 MPa)
403219	Reserved	Read / Write	16 Bit	
403220	Transducer 2 Scale	Read / Write (Reads ignored)	16 Bit	Integer Value (0 - 65535)
403221		Read / Write (Reads ignored)	16 Bit	Decimal Value (0 - 65535)

Modbus Register	Variable	Register Access	Size	Notes/Units
403222	Transducer 2 Offset	Read / Write (Reads ignored)	16 Bit	Integer Value (0 - 65535)
403223		Read / Write (Reads ignored)	16 Bit	Decimal Value (0 - 65535)
403224	Remote Start Enable	Read / Write	16 Bit	0 = Disabled 1 = Enabled
403225	Fill Solenoid Out	Read / Write	16 Bit	
403226	Reserved	Read / Write	16 Bit	
403227	Reed Switch Count	Read / Write	16 Bit	0 - 65535 Cycle count
403228	Reserved	Read / Write	16 Bit	
403229	Reserved	Read / Write	16 Bit	
403230	Reserved	Read / Write (Reads ignored)	16 Bit	
403231	Primary Tank Level	Read / Write (Reads ignored)	16 Bit	0 - 100 %
403232	Configurable IO Type	Read / Write	16 Bit	0 = Reed Switch Count (Aux In) 1 = Agitator Halt (Aux In) 2 = High Level Primary (Aux Out) 3 = Low Level Primary (Aux Out) 4 = PLC (Aux Out) 5 = PLC External Fill (Aux Out) L3A0/L4A0 automatically turn off Aux Out
403233	Agitator Halt Status	Read / Write (Reads ignored)	16 Bit	0 = Agitator Halt Switch Not Active 1= Agitator Halt Switch Active
403234	Accessory Solenoid Out	Read / Write	16 Bit	0 = Disabled, 1 = Enabled

Modbus Register	Variable	Register Access	Size	Notes/Units
Pump Status				
404100	Pump Status Bits	Read / Write	16 Bit	bit 0 = Pump trying to move bit 1 = Pump actually moving bit 2 = Active Alarm bit 3 = Active Deviation bit 4 = Active Advisory bit 5 = Setup Modified (Registers 6141-6159) bit 6 = Reserved/unused bit 7 = Run Status bit 8 = Profile 1 Modified bit 9 = Profile 2 Modified bit 10 = Profile 3 Modified bit 11 = Profile 4 Modified bit 12 = Tank Events
404101	Current Speed	Read Only	16 Bit	10 = 1.0 cycle/min
404102	Current Flow Rate	Read Only	16 Bit	10 = 1.0 L/Min 10 = 1.0 Gal/Min 1 = 1 cc/min 1 = 1 oz/min 10 = 1.0 CPM
404103	Current Force	Read Only	16 Bit	0 - 100%
404104	Current Pump Outlet Pressure	Read Only	16 Bit	1 = 1 psi 10 = 1.0 Bar 100 = 1.00 Mpa
404105	Current BPR Pressure	Read Only	16 Bit	
404106	Batch Total High Word	Read Only	16 Bit	Volume units, see Table 7.
404107	Batch Total Low Word	Read Only	16 Bit	
404108	Grand Total High Word	Read Only	16 Bit	Pump cycles, see Table 7.
404109	Grand Total Low Word	Read Only	16 Bit	
404110	Maintenance Total High Word	Read Only	16 Bit	
404111	Maintenance Total Low Word	Read Only	16 Bit	
404112	Pump Events 1 — High Word	Read Only	16 Bit	Pump events, Table 5.
404113	Pump Events 1 — Low Word	Read Only	16 Bit	

Modbus Register	Variable	Register Access	Size	Notes/Units
404114	Display Events — High Word	Read Only	16 Bit	Display events, Table 5.
404115	Display Events — Low Word	Read Only	16 Bit	
404116	Pump Events 2 — High Word	Read Only	16 Bit	Pump events, Table 5.
404117	Pump Events 2 — Low Word	Read Only	16 Bit	
404118	System Type	Read Only	16 Bit	0 = Single lower, 1 = Dual lower
404119	Run/Stop Switch State	Read Only	16 Bit	0 = Switch closed (Stop State) 1 = Switch open (Run State)

Software Versions				
404120	Software Version Cold Major	Read Only	16 Bit	0 - 9
404121	Software Version Cold Minor	Read Only	16 Bit	0 - 99
404122	Software Version Cold Build	Read Only	16 Bit	0 - 999
404123	Software Version Hot Major	Read Only	16 Bit	0 - 9
404124	Software Version Hot Minor	Read Only	16 Bit	0 - 99
404125	Software Version Hot Build	Read Only	16 Bit	0 - 999
404126	Display Version Major	Read Only	16 Bit	0 - 9
404127	Display Version Minor	Read Only	16 Bit	0 - 99
404128	Display Version Build	Read Only	16 Bit	0 - 999
404129	Pump Serial Number 1 — Low Word	Read Only	16 Bit	Characters 0-3 ASCII
404130	Pump Serial Number 1 — High Word	Read Only	16 Bit	Characters 4-6 ASCII
404131	Pump Serial Number 2 — Low Word	Read Only	16 Bit	Characters 0-3 ASCII
404132	Pump Serial Number 2 — High Word	Read Only	16 Bit	Characters 4-6 ASCII
404133*	Grand Total High Word	Read Only	16 Bit	Pump cycles, see Table 7.
404134*	Grand Total Low Word	Read Only	16 Bit	
404135*	Active Alarms 1 — High Word	Read Only	16 Bit	Pump events, Table 5.
404136*	Active Alarms 1 — Low Word	Read Only	16 Bit	
404137*	Active Alarms 2 — High Word	Read Only	16 Bit	
404138*	Active Alarms 2 — Low Word	Read Only	16 Bit	
404139*	Maintenance Total High Word	Read Only	16 Bit	Pump cycles, see Table 7.
404140*	Maintenance Total Low Word	Read Only	16 Bit	
404141*	Pump 2 Serial Number 1 — Low Word	Read Only	16 Bit	Characters 0-3 ASCII
404142*	Pump 2 Serial Number 1 — High Word	Read Only	16 Bit	Characters 4-6 ASCII
404143*	Pump 2 Serial Number 2 — Low Word	Read Only	16 Bit	Characters 0-3 ASCII

Modbus Register	Variable	Register Access	Size	Notes/Units
404144*	Pump 2 Serial Number 2 — High Word	Read Only	16 Bit	Characters 4-6 ASCII
* Exists only on dual lower systems.				

Extended Modbus Variables The registers shown in this section are intended for advanced integration solutions, where the user desires full control of the system by the PLC. For optimal communication latency, it is recommended that only the registers which will be monitored and changed on a regular basis be mapped and the remaining parameters be configured with the display.				
Active Profile				
404150	Pressure/Force Minimum	Read Only	16 Bit	Force and Pressure units, see Table 7.
404151	Pressure/Force Target	Read Only	16 Bit	
404152	Pressure/Force Maximum	Read Only	16 Bit	
404153	Flow Rate Minimum	Read Only	16 Bit	Flow units, see Table 7.
404154	Flow Rate Target	Read Only	16 Bit	
404155	Flow Rate Maximum	Read Only	16 Bit	
404156	Mode	Read Only	16 Bit	0 = Pressure, 1 = Flow, 2 = Hybrid (3 Phase Motors Only)
404157	BPR Closed Percent	Read Only	16 Bit	0 - 100 (Approximately 1-100 psi, see manual 332142 for information on BPR control kit)
404158	Pressure/Force Minimum Event Type	Read Only	16 Bit	0 = Limit, 1 = Deviation, 2 = Alarm
404159	Pressure/Force Maximum Event Type	Read Only	16 Bit	
404160	Flow Rate Minimum Event Type	Read Only	16 Bit	
404161	Flow Rate Maximum Event Type	Read Only	16 Bit	

Integration Setup Block This section contains system-level control variables that may need to be monitored or controlled on occasion (infrequently).				
404200	Local/Remote Control	Read / Write	16 Bit	0 = local, 1 = remote/PLC
404201	Active Profile Number	Read / Write	16 Bit	0 = stopped, 1, 2, 3, 4
404202	Pump Control Bitfield	Read / Write	16 Bit	See Table 6 for bit definitions.
404203	Maintenance Interval High Word	Read / Write	16 Bit	Pump cycles, see Table 7.
404204	Maintenance Interval Low Word	Read / Write	16 Bit	

Modbus Register	Variable	Register Access	Size	Notes/Units
404205	Transducer 1 type	Read / Write	16 Bit	0 = None 1 = 500 psi (3.44 mPa, 34.47 bar) 2 = 5000 psi (34.47 mPa, 344.74 bar) 3 = 5 psi (34.5 kPa, 0.345 bar) Tank level sensor
404206	Transducer 2 type	Read / Write	16 Bit	
404207	Closed Loop Enable Transducer 1	Read / Write	16 Bit	0 = Not Enabled, 1 = Enabled (**Note:** only 1 transducer can be enabled for closed loop control)
404208	Closed Loop Enable Transducer 2	Read / Write	16 Bit	
404209	Reserved	Read / Write	16 Bit	N/A
404210	Pump Lower Type	Read / Write	16 Bit	0 = Invalid/Not configured 1 = 145 cc 2 = 180 cc 3 = 220 cc 4 = 290 cc 5 = 750 cc 6 = 1000 cc 7 = 1500 cc 8 = 2000 cc 9 = 2500 cc
404211	Pump Lower Size	Read / Write	16 Bit	Actual lower size in cc (0 - 65535 cc)
404212	Agitator Speed	Read / Write	16 Bit	0-100%
404213	Agitator Enable	Read / Write	16 Bit	0 = Disable, 1 = Enable
404214	BPR % Closed Stop Profile	Read / Write	16 Bit	0-100% Setting for when the stop profile is active to hold fluid line pressure when the pump is stopped.
404215	Pump 2 Maintenance Interval Upper Word	Read / Write	16 Bit	0 - 65535 cc
404216	Pump 2 Maintenance Interval Lower Word	Read / Write	16 Bit	

Password				
404250	Password Enable	Read / Write	16 Bit	0 = Password disabled, 1 = Password enabled
404251	Profile Lock	Read / Write	16 Bit	0 = Lock disabled, 1 = Lock enabled

Modbus Register	Variable	Register Access	Size	Notes/Units
Profile Setup Blocks Each profile block is a group of 12 registers. The profile (1–4) is the 4th digit (x) in the register number and corresponds with the actual user profile being defined. For example, register 405x00 will represent 405100, 405200, 405300, and 405400.				
405x00	Pressure/Force Minimum	Read / Write	16 Bit	Pressure units, see table 7.
405x01	Pressure/Force Target	Read / Write	16 Bit	Pressure units, see table 7.
405x02	Pressure/Force Maximum	Read / Write	16 Bit	Pressure units, see table 7.
405x03	Flow Minimum	Read / Write	16 Bit	Flow units, see table 7.
405x04	Flow Target	Read / Write	16 Bit	Flow units, see table 7.
405x05	Flow Maximum	Read / Write	16 Bit	Flow units, see table 7.
405x06	Mode Select	Read / Write	16 Bit	0 = Pressure, 1 = Flow, 2 = Hybrid (Only available on three phase systems)
405x07	BPR % Open	Read / Write	16 Bit	Value will be 0-100 (Approximately 1-100 psi, see manual 332142 for information on BPR control kit)
405x08	Pressure/Force Min Alarm Type	Read / Write	16 Bit	0 = Limit, 1 = Deviation, 2 = Alarm
405x09	Pressure/Force Max Alarm Type	Read / Write	16 Bit	0 = Limit, 1 = Deviation, 2 = Alarm
405x10	Flow Minimum Alarm Type	Read / Write	16 Bit	0 = Limit, 1 = Deviation, 2 = Alarm
405x11	Flow Maximum Alarm Type	Read / Write	16 Bit	0 = Limit, 1 = Deviation, 2 = Alarm

Event				
405500	Number of Events	Read / Write	16 Bit	0-65535
405501	Requested Event	Read / Write	16 Bit	
405502	Event Number	Read / Write	16 Bit	
405503	Event Year	Read / Write	16 Bit	00-99
405504	Event Month	Read / Write	16 Bit	1-12
405505	Event Day	Read / Write	16 Bit	1-31
405506	Event Hour	Read / Write	16 Bit	0-23
405507	Event Minute	Read / Write	16 Bit	0-59
405508	Event Second	Read / Write	16 Bit	
405509	Event Code	Read / Write	16 Bit	Characters 0-3 ASCII

Modbus Register	Variable	Register Access	Size	Notes/Units
Intelligent Paint Kitchen Registers				
Integration				
406100	Secs Counter	Read Only		0 - 59
406101	Pump Status Bits	Read / Write		bit 0 = Pump trying to move bit 1 = Pump actually moving bit 2 = Active Alarm bit 3 = Active Deviation bit 4 = Active Advisory bit 5 = Setup Modified (Registers 6141-6159) bit 6 = Reserved/unused bit 7 = Run Status bit 8 = Profile 1 Modified bit 9 = Profile 2 Modified bit 10 = Profile 3 Modified bit 11 = Profile 4 Modified bit 12 = Tank Events
406102	Actual Pump Speed	Read Only		Flow units, see Table 7.
406103	Actual Pump Flow Rate	Read Only		
406104	Estimated Pump Force or Pressure	Read Only		0-100
406105	Transducer 1 Pressure	Read Only		Flow units, see Table 7.
406106	Transducer 2 Pressure	Read Only		
406107	ADCM Input Status Bits	Read Only		bit 0 / bit 1: 0 = Stop 1 = Run 2 = Toggle bit 2 = Agitator Halt Status 0 = Not Active, 1 = Active
406108	ADCM Output Bits	Read / Write		Bit 0: Fill Pump 0 = Off, 1 = On Bit 1 = Aux Output 0 = Off, 1 = On
406109	Active Profile Number	Read / Write		0 - 4
406110	Agitator Target	Read / Write		0 - 100%

Modbus Register	Variable	Register Access	Size	Notes/Units
406111	VFD Enable Status	Read / Write		Bit 0: 0 = Off, 1 = On Bit 1: 0 = Local Request, 1 = Remote Request
406112	Actual Tank Level #1 Pct	Read / Write		0 - 100
406113	Agitator Profile Enable	Read / Write		0 = Disabled, 1 = Enabled
406114	Batch Total High Word	Read Only		Volume units, see Table 7.
406115	Batch Total Low Word	Read Only		
406116	Grand Total High Word Pump 1	Read Only		Pump cycles, see Table 7.
406117	Grand Total Low Word Pump 1	Read Only		
406118	Grand Total High Word Pump 2 (x2)	Read Only		
406119	Grand Total Low Word Pump 2 (x2)	Read Only		
406120	Tank Level Freeze Percent	Read Only		0 - 100
406121	Fill Pump Dispense Volume	Read Only		Pump cycles, see Table 7.
406122	Fill Pump Remaining Volume	Read Only		
406123	BPR Target	Read Only		0-100
406124	Reserved	Read Only		N/A
406125	Motor 2 Force – X2 System	Read Only		0 - 100
406126	Reserved	Read Only		N/A
406127	Reserved	Read Only		
406128	Reserved	Read Only		

Intelligent Paint Kitchen Registers Setup				
406129	Pump 1 Alarms High Word	Read Only		Pump events, Table 5.
406130	Pump 1 Alarms Low Word	Read Only		
406131	Display 1 Alarms High Word	Read Only		Display events, Table 5.
406132	Display 1 Alarms Low Word	Read Only		
406133	Pump 1 Alarms 2 High Word	Read Only		Pump events, Table 5.
406134	Pump 1 Alarms 2 Low Word	Read Only		
406135	Pump 2 Alarms High Word	Read Only		
406136	Pump 2 Alarms Low Word	Read Only		
406137	Pump 2 Alarms 2 High Word	Read Only		
406138	Pump 2 Alarms 2 Low Word	Read Only		

Modbus Register	Variable	Register Access	Size	Notes/Units
406139	Pump Control Bitfield	Read / Write		Bit 0 = Clear Alarm Bit 1 = Reset Batch Bit 2 = Reset Maint Counter 1 Bit 3 = Reset Maint Counter 2 Bit 4 = Reset Maint Agitator
406140	Configuration	Read / Write		Bit 0: 0 = Local, 1 = Remote Bit 1: Profile 4 Circ 0 = Standard, 1 = Circ Profile Bit 2: Transducer 1 0 = Disabled, 1 = Enabled Bit 3: Transducer 2 0 = Disabled, 1 = Enabled Bit 4: PrimaryHiAlarmType 0 = Deviation, 1 = Alarm Bit 5: PrimaryLowAlarmType 0 = Deviation, 1 = Alarm Bit 14: Run/Stop Switch 0 = Disable, 1 = Enable Bit 15: Remote Start 0 = Enable, 1 = Disable
406141	System Type	Read Only		0 = Single Lower, 1 = Dual Lower
406142	Pressure Units	Read / Write		0 = Psi, 1 = bar, 2 = Mpa
406143	Volume Units	Read / Write		0 = Liters, 1 = Gallons
406144	Flow Units	Read / Write		0 = Liter/min 1 = Gallons/min 2 = cc/min 3 = oz/min 4 = Cycles / min
406145	Agitator Speed Units	Read / Write		0 = Percent, 1 = Hertz, 2 = RPM

Modbus Register	Variable	Register Access	Size	Notes/Units
406146	Stop Profile BPR % Setting	Read / Write		0-100
406147	Primary Tank Level High Alarm	Read / Write		
406148	Primary Tank Fill Target	Read / Write		
406149	Primary Tank Fill Level	Read / Write		
406150	Primary Tank Level Low Alarm	Read / Write		
406151	Primary Tank Freeze Level Alarm	Read / Write		
406152	TBD	Read / Write		N/A
406153	TBD	Read / Write		
406154	TBD	Read / Write		
406155	Closed Loop Enable Transducer	Read / Write		Bit 0 =Enable/Disable Trans 1 Bit 1 = Enable/Disable Trans 2
406156	Pump Lower Size	Read Only		0-65535 cc
406157	Auxiliary IO Function	Read / Write		0 = Reed Switch Count (Aux In) 1 = Agitator Halt (Aux In) 2 = High Level Primary (Aux Out) 3 = Low Level Primary (Aux Out) 4 = PLC (Aux Out) 5 = PLC External Fill (Aux Out) L3A0/L4A0 automatically turns off Aux Out

See Error Code Troubleshooting, page 26, for a description of each alarm.

Table 5 Alarm Bits

404112 - Pump Events 1 — High Word			
Bit	Event Type	Event Code	Event Name
0	Deviation	T3D1	Over Temperature Deviation
1	—	—	Reserved
2	Alarm	P6D1	Pressure Transducer Missing
3	Deviation	ERR1	Software Error
4	Advisory	MND1	Maintenance Count
5	Alarm	V1M1	AC Power Loss
6	Deviation	T2D1	Low Temperature
7	Alarm	WNC1	Version Mismatch
8	Alarm	CCN1	IPC Communication
9	Alarm	WMC1	Internal Software Error
10	—	—	Reserved
11	Deviation	WSC1	Zero Setting on Active Profile
12	Deviation	END1	Encoder/Stroke range calibration in progress
13	Alarm	A4N1	Over Current
14	Alarm	T4D1	Over Temperature Alarm
15	Alarm	WCW1	Dual Lower System with Display in Single Lower Mode
404113 - Pump Events 1 — Low Word			
Bit	Event Type	Event Code	Event Name
0	Alarm	K1D1	Minimum Speed
1	Deviation	K2D1	Minimum Speed
2	Alarm	K4D1	Maximum Speed
3	Deviation	K3D1	Maximum Speed
4	Alarm	P1I1	Minimum Pressure
5	Deviation	P2I1	Minimum Pressure
6	Alarm	P4I1	Maximum Pressure
7	Deviation	P3I1	Maximum Pressure
8	Alarm	V1I1	Under Voltage
9	Alarm	V4I1	Over Voltage
10	Alarm	V1I1	High Pressure 120V
11	Alarm	CAD1	CAN Communication Pump
12	Deviation	CBN1	Inter Processor Communication Error
13	Alarm	WXD1	Board Hardware
14	Alarm	WSD1	Invalid Lower Size

15	—	—	Reserved
404116 - Pump Events 2 — High Word			
Bit	Event Type	Event Code	Event Name
0	—	—	Reserved
1	—	—	Reserved
2	—	—	Reserved
3	Deviation	CAD_	CAN Communication Error Pump
4	Deviation	E5D_	Encoder Calibration Failed
5	Deviation	E5N_	Stroke Calibration Failed
6	Advisory	ENDC	Encoder/Stroke Range Calibration In Progress
7	Alarm	CCC_	Pump Could Not Find Display During Startup
8	Deviation	ELI_	Unexpected Hot Board Reset
9	Alarm	A5N_	Over Current
10	Advisory	ELD_	Reserved
11	—	—	Reserved
12	—	—	Reserved
13	—	—	Reserved
14	—	—	Reserved
15	—	—	Reserved
404117 - Pump Events 2 — Low Word			
Bit	Event Type	Event Code	Event Name
0	Advisory	E5F_	X2 Calibration Error, Too Fast
1	Advisory	ENN_	X2 Calibration Completed
2	Alarm	WNN_	Single Lower System with Display in Dual Lower Mode
3	—	—	Reserved
4	Advisory	E5S_	Dual Lower System Calibration Stopped or Interrupted
5	Advisory	E5U_	Dual Lower System Calibration Unsteady
6	Alarm	V9M_	Lower Supply Voltage Detected at Startup
7	—	—	Reserved
8	—	—	Reserved
9	—	—	Reserved
10	—	—	Reserved
11	—	—	Reserved
12	—	—	Reserved
13	—	—	Reserved
14	—	—	Reserved
15	—	—	Reserved

404114 - Display Events — High Word			
Bit	Event Type	Event Code	Event Name
0	Deviation	P6C1	Pressure Transducer Error
1	Alarm	L1AF	Primary Tank Freeze Alarm
2	Deviation	P3CB	Pressure Transducer 2 High Deviation
3	Alarm	P4CB	Pressure Transducer 2 High Alarm
4	Deviation	P2CB	Pressure Transducer 2 Low Deviation
5	Alarm	P1CB	Pressure Transducer 2 Low Alarm
6	Deviation	P7CX	Pressure Delta Deviation
7	Alarm	P9CX	Pressure Delta Alarm
8	Deviation	L2BX	Low Secondary Tank
9	Alarm	L1BX	Low Secondary Tank
10	Reserved	—	—
11	Reserved	—	—
12	Reserved	—	—
13	Reserved	—	—
14	Reserved	—	—
15	Reserved	—	—
404115 - Display Events — Low Word			
Bit	Event Type	Event Code	Event Name
0	Alarm	P5D1	Transducer Assignment Conflict
1	Deviation	P1D1	Unbalanced Load
2	Reserved	—	—
3	Deviation	C3GX	Modbus Communications Lost
4	Alarm	C4GX	Modbus Communications Lost
5	Deviation	P9D1	Major Unbalanced Load (x2 System)
6	Advisory	EBCX	Run/Stop Switch Closed
7	Deviation	L3AO	Primary Tank High Deviation
8	Alarm	L4AO	Primary Tank High Alarm
9	Deviation	L2AO	Primary Tank Low Deviation
10	Alarm	L1AO	Primary Tank Low Alarm
11	Deviation	F2FO	No Flow Fill Pump Deviation
12	Alarm	F1FO	No Flow Fill Pump Alarm
13	Deviation	L6CA	Port 8 4 to 20 mA open circuit
14	Alarm	L6CB	Port 9 4 to 20 mA open circuit
15	Alarm	CACX	CAN Communication Alarm

Table 6 Pump Status and Control Bits

404100 - Pump Status Bits	
Bit	Meaning
0	Reads 1 if the pump is trying to move
1	Reads 1 if the pump is actually moving
2	Reads 1 if there are any active alarms
3	Reads 1 if there are any active deviations
4	Reads 1 if there are any active advisories
5	Setup changed
6	Reserved
7	Run/Stop switch closed
8	Profile 1 changed
9	Profile 2 changed
10	Profile 3 changed
11	Profile 4 changed
12	Others reserved for future tank events
404202 - Pump Control Bits	
Bit	Meaning
0	Reads 0 for an active alarm or deviation. Reset to 1 to clear.
1	Set to 1 to reset the batch total
2	Set to 1 to reset the maintenance counter
others	Reserved for future use - only write 0

Table 7 Units

Unit Type	Selectable Units	Units Register	Converting registers to unit values	Register value for 1 unit
Force	Percent	n/a	Force = Register	1 = 1%
Pressure	psi	403208 = 0	Pressure = Register	1 = 1 psi
	Bar	403208 = 1	Pressure = Register/10	10 = 1.0 Bar
	MPa	403208 = 2	Pressure = Register/100	100 = 1.00 Mpa
Speed	Cycles/min	n/a	Speed = Register/10	10 = 1.0 cycle/min
Flow	Liters/min	403210 = 0	Flow = Register/10	10 = 1.0 L/min
	Gallons/min	403210 = 1	Flow = Register/10	10 = 1.0 Gal/min
	cc/min	403210 = 2	Flow = Register	1 = 1 cc/min
	oz/min	403210 = 3	Flow = Register	1 = 1 oz/min
	Cycles/min	403210 = 4	Flow = Register/10	10 = 1.0 cycle/min
Volume=	Liters	403209 = 0	Volume = 1000*High + Low/10	0 (High) / 10 (Low) = 1.0 L
	Gallons	403209 = 1	Volume = 1000*High + Low/10	0 (High) / 10 (Low) = 1.0 Gal
Cycles==	Pump Cycles	n/a	Cycles = 10000*High + Low	0 (High) / 1 (Low) = 1 cycle

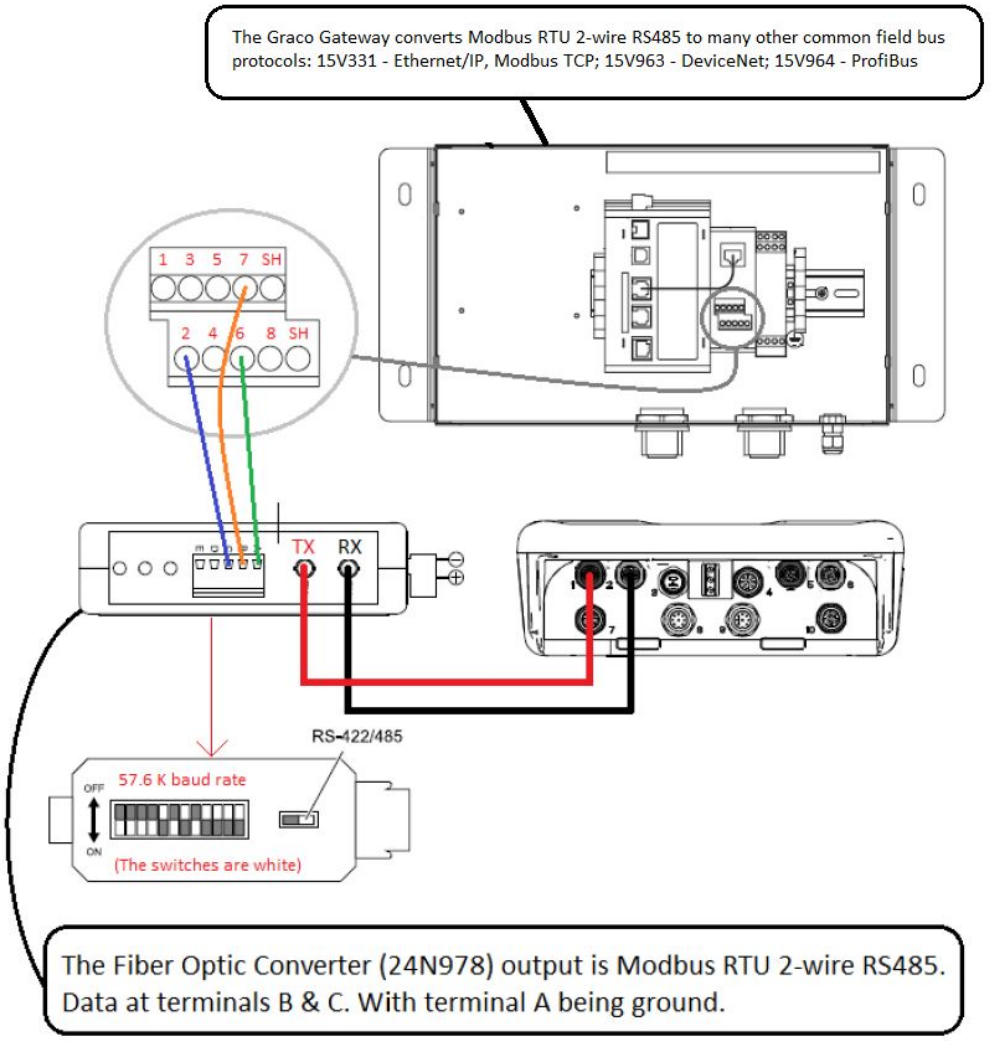
† Example of converting volume register reading to units: If the reading for register 404106 (volume high word) is 12, and the reading for register 404107 (volume low word) is 34, the volume is 12003.4 liters. 12 * 1000 + 34/10 = 12003.4.

†† Example of converting cycles register reading to units: If the reading for register 404108 (cycles high word) is 75, and the reading for register 404109 (cycles low word) is 8000, the volume is 758,000 cycles. 75 * 10000 + 8000 = 758000.

Appendix B - Pump Control from a PLC

This guide shows how to use the information in Appendix A to control a pump remotely from a PLC. The steps progress from basic pump control to more advanced monitoring and alarm control features.

E Flo DC to Graco Gateway Connection Diagram



It is important that you first follow all directions in the Setup Screens to configure your system properly. Test that the pump operates correctly when controlled from the Display. Make sure the display, fiber optics, communication gateway, and PLC are connected properly. Refer to Communication KIt manual. Use Setup Screen 12 to enable remote control and set your modbus preferences.

1. **Enable PLC control:** Set register 404200 to 1.
2. **Run a pump:** Set register 404201. Enter 0 for stopped, 1 to 4 for the profile.
3. **View pump profile:** Read register 404201. This register updates automatically to reflect the actual pump status. If the profile is changed from the display, this register changes as well. If the pump stops due to an alarm, this register will read 0.

4. **View pump status:** Read register 404100 to see the status of the pump. See Appendix A, Table 6, for a description of each bit.
   - Example 1: Register 404100, bit 1, reads 1 if the pump is currently moving.
   - Example 2: Register 404100, bit 2 reads 1 if the pump has an active alarm.
5. **Monitor alarms and deviations:** Read register 404112 to 404115. Each bit in these registers corresponds to an alarm or deviation. See Appendix A, Table 5. I
   - Example 1: Pressure falls below the minimum setting entered on Setup Screen 2. It will show on bit 4 of register 404113 if minimum pressure is set to Alarm, and on bit 5 of register 404113 if minimum pressure is set to Deviation.
   - Example 2: The system is set up for a pressure transducer on Setup Screen 8, but no transducer is detected. It will show on bit 1 of register 404114.
6. **Monitor pump cycle rate, flow rate, and pressure:** Read registers 404101 to 404105. Note that pressure is available only if a pressure transducer is connected to the display. Register 404104 shows the pressure on transducer 1. Register 404105 shows the pressure on transducer 2. See Appendix A, Table 7 for units for these registers.
   - Example 1: If register 404101 reads 75, the pump speed is 7.5 cycles/minute.
   - Example 2: If register 404103 reads 67, the pump is operating at 67 percent pressure.
7. **Reset active alarms and deviations:** Clear the condition that caused the alarm. Set register 404202, bit 0, to 1 to clear the alarm. The pump will be in profile 0 due to the alarm. Set 404201 to the profile to run the pump again.

Application Note 1 - Flow Mode vs. Pressure Mode

In the majority of applications it is desirable to always run in flow mode and allow the back pressure regulator to control the line pressure. This ensures that the material velocity is always at the target for particulate suspension.

- To determine whether or not the pump can be run exclusively in flow mode, test with the maximum flow demand, open up all robot drops and spray guns and so on. Then check the pump outlet pressure to see if the BPR can maintain it. If so, then pressure mode is not needed.
- If the BPR cannot hold the fluid pressure during peak material demand times, then it will be necessary to run pressure mode during production. In this mode the pump will speed up to match demand and hold the target pressure. It will also slow down automatically to maintain pressure when the demand drops.

  Use of this mode likely means switching back and forth between pressure mode and flow mode; pressure mode during production and flow mode in off production. See the following application note for considerations in this scenario.

Application Note 2 - Pump Setpoint transitions

For applications where the flow rate and pressure settings are being changed periodically, such as during off production times, it is important to consider the following:

- When the pump is in pressure mode, it will come to a complete stop at any time if the back pressure in the line is equal to or above the pressure setpoint of the pump.
- Viscosity changes throughout time can increase the back pressure in the line, such that when it is time to switch from flow mode (off production) to pressure mode, the pump will not move, because a new, higher, pressure set point is needed to overcome the increased back pressure.
- We recommend reading the active pressure or force before switching to pressure mode and using that for the new pressure setpoint - Read from register 404103 if the motor is operating without a pressure sensor (ie. Force/% mode).
- Read from register 404104 if the motor is controlling from pressure sensor 1 or register 404105 for pressure sensor 2 - For applications with a pneumatic BPR, the profile BPR setpoint can be used to manage the system through the Graco BPR controller kit (24V001).
- In off production flow mode, register 405107 (405X07 for profile X) can be set to 0 (%) to fully open the BPR This allows the target flow rate to flow with reduced pressure, and therefore lower energy consumption For example:

  Using profile 1, while in off production the pump is set in flow mode (register 405106 = 1) with a flow rate target setting of 8 gallons/minute (30 liters/minute) (register 405104 = 80) and the profile maximum pressure setting was left at the system default. Before switching to pressure mode, save the value of the current pressure from register 404104 (The motor is controlling to the feedback provided by pressure sensor 1) and use that value as the new setting for the pressure target in register 405101. Then set the mode register (405106) to 0 (pressure mode)

NOTE: Using only profile 1 (4 are available) allows you to control the pump with fewer registers mapped. However, to configure multiple profiles, then the above scenario can be applied where 405X01 is the pressure target for profile X, 405X04 is the flow rate target for profile X and so on for the other profile variables.

Appendix C - Control Module Programming

To help prevent fire and explosion, do not connect, download, or remove the token unless the unit is removed from the hazardous (explosive atmosphere) location.

- **All data in the module may be reset to factory default settings.** Record all settings and user preferences before the upgrade, for ease of restoring them following the upgrade.
- The latest software version for each system can be found at www.graco.com.

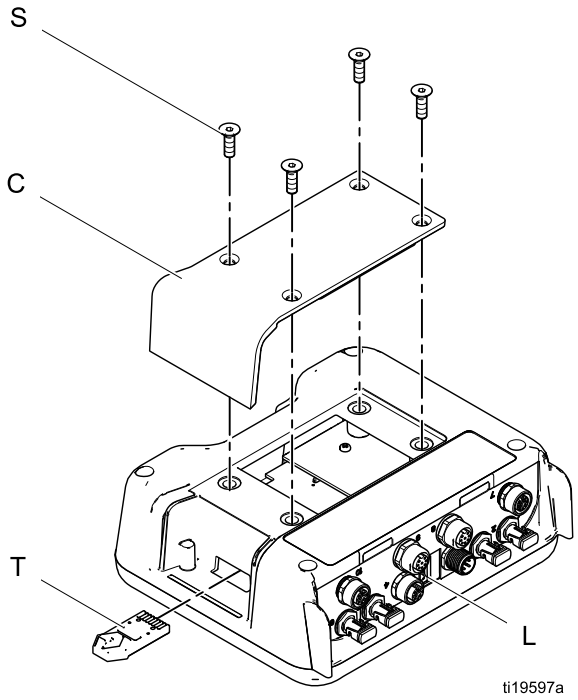
Software Upgrade Instructions

NOTE: If the software on the token is the same version that is already programmed on the module, nothing will happen (including flashing red light). No harm can be done by attempting to program the module multiple times.

1. Remove power from the Graco Control Module by turning off system power.

   NOTE: Alternately, software update can be done without removing power by using the system reset button on Setup Screen 16 (date and time) to initiate the update after token insertion.

2. Remove access cover (C).



3. Insert and press the token (T) firmly into the slot.

   NOTE: Token has no preferred orientation.

4. Supply electrical power to the Graco Control Module.
5. The red indicator light (L) will flash while the software is being loaded on the display. When the software is completely loaded, the red light will turn off.

NOTICE

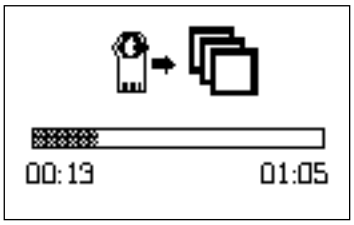
To prevent corrupting the software, do not remove the token, turn off the system power, or disconnect any modules until the status screen indicates that updates are complete.

6. The following screen will be shown when the display turns on.

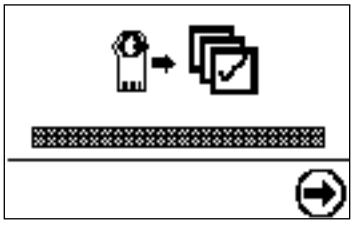
Communications with motors established.

7. Wait for update to complete.

NOTE: The approximate time until completion is shown along bottom of progress bar.



8. Updates are complete. Icon indicates update success or failure. Unless the update was unsuccessful, remove the token (T) from the slot.



Icon	Description
	Update successful
	Update unsuccessful
	Update complete; no change necessary

9. Press  to continue. If the token is still inserted, the remote loading procedure will begin anew. Return to step 5 for step progression if the update restarts.
10. Remove power from the Graco Control Module by turning off system power.
11. If the token is still inserted, remove from the slot.
12. Reinstall the access cover and secure with screws (S).

California Proposition 65

CALIFORNIA RESIDENTS

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

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For patent information, see www.graco.com/patents.

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