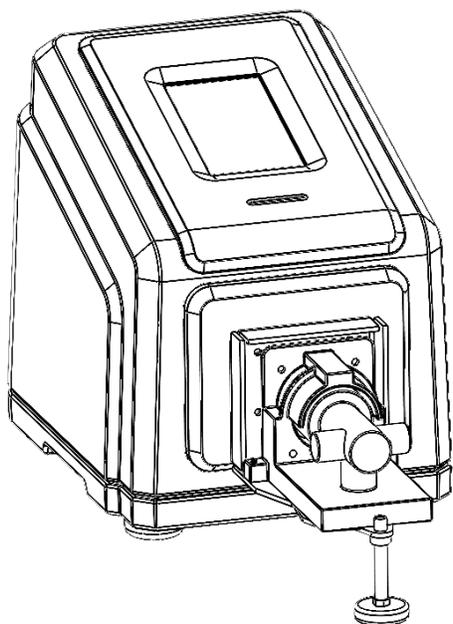


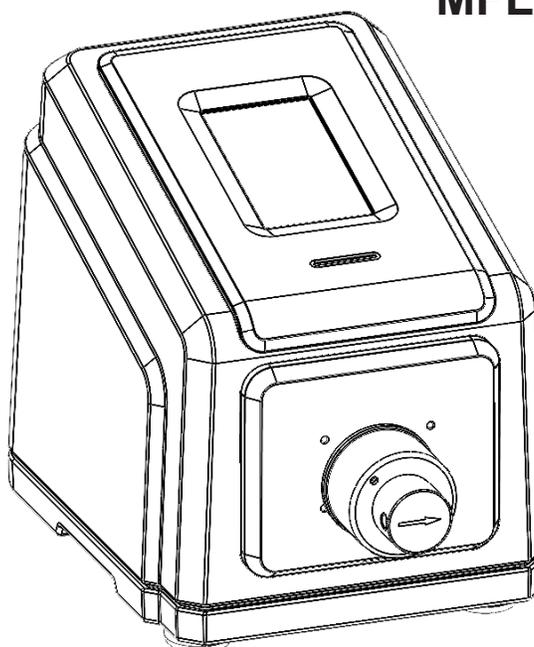
MASTERFLEX[®]

MasterSense[™] Piston & Gear Process Pump-Drives Operating Manual

Model Nos.
MFLX07576-60
MFLX07576-50



MASTERFLEX PISTON PUMP
MFLX07576-60



MASTERFLEX GEAR PUMP
MFLX07576-50

A-1299-7525
Edition 01

MASTERFLEX[®]

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PUMPS FOR LIQUIDS ORIGINAL INSTRUCTIONS

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Section 1: Introduction

Safe Operation

The Masterflex MasterSense Piston & Gear Process Pump-Drives with advanced connectivity are designed for pumping and dispensing applications in laboratory and process environments.

Verify the pump-drive is only operated in a manner specified in this operating manual and that safe work practices followed along with utilizing built-in safety protections to prevent injury as well as damage to equipment.

Observe the following cautions and recommendations

	CAUTION: Do not operate the pump-drive with water on the touchscreen.
	CAUTION: Risk of danger. Consult operating manual for nature of hazard and corrective actions.
	CAUTION: Hot surface. Do not touch.
	CAUTION: Risk of electric shock. Consult this operating manual throughout for the nature of hazards and corrective actions.
	CAUTION: Do not operate the pump in a way that exceeds the designed operating and environmental conditions outlined in this operating manual.
	CAUTION: Do not exceed specified maximum differential pressure for the pump head.
	CAUTION: The pump must not be used as a medical device, in explosion-proof chambers, or in the presence of flammable gases or fumes.
	CAUTION: The circuit between the mains power supply and the drive must be connected to earth ground.
	CAUTION: Do not handle the pump before the pump is turned off and disconnected from the main power supply.
	CAUTION: The drive must be turned off before removing the pump head.

(Table continues on next page)

Safe Operation (CONT.)

	CAUTION: Do not open or remove the pump housing while the pump is operating.
	CAUTION: Tubing can tear and burst during operation. It is the responsibility of the operator to take all necessary precautions to avoid injury or damage to equipment.
	CAUTION: It is recommended that any repairs performed only by an authorized technician. If service and repairs are performed by the customer, or any third party company, Masterflex denies all responsibility.

Media Containing Particles Recommendations

Piston Pumps

- It is recommended that the pump head be rinsed after every pumping process to prevent the piston from seizing due to remaining particles (especially after pumping media containing salts and proteins).
- Do not pump media containing particles that exceed a diameter of 0.8 mm.
- Piston fractures are not covered by the pump-drive warranty.

Gear Pumps

	CAUTION: Do not use gear pumps to pump liquids containing particles. Even the smallest particles can have an abrasive effect that can damage or destroy a gear pump within a few seconds.
---	--

Corrosive Liquids Recommendation

Corrosive liquids may eventually produce leak paths around the sealing surfaces of the pump head. It is recommended to regularly inspect the pump head for leaks.

Dry Running Recommendations

- Prior to operation, it is recommended that the pump head is filled with the liquid to be pumped.
- While priming, ensure the pump does not run dry for more than 15 seconds.

Pump Against Pressure Recommendation

The Masterflex MasterSense Piston & Gear Process Pump-Drive systems can be used for continuous operation at a maximum differential pressure of 6.9 bars.

FYI: See the pump head documentation shipped with your pump-drive for maximum pressure capabilities.

About MasterSense Piston & Gear Process Pump-Drives

All Masterflex MasterSense precision drives include a highly accurate, maintenance-free motor and an simple to navigate touchscreen that makes setup and operation easy. The MasterSense data range features EtherNet and Wi-Fi connections for web-based monitoring through the pump-drive's 31-pin input connection port (visit <http://www.avantorsciences.com/masterflex>, search the pump-drive **Model Number** for details).

Package Contents

Verify the following contents have arrived in the shipped box:

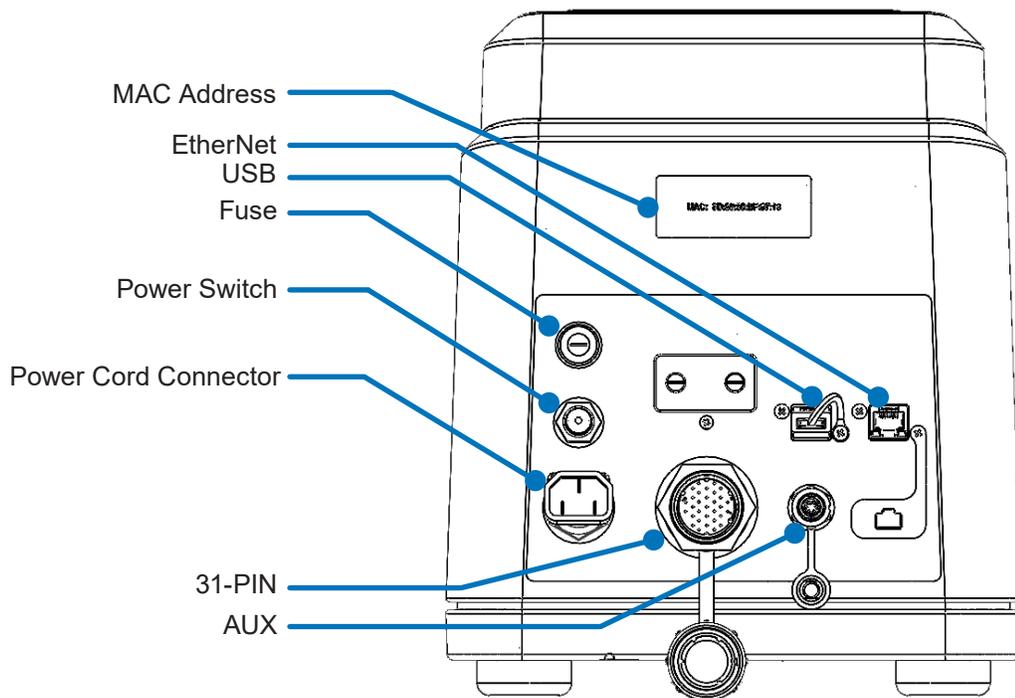
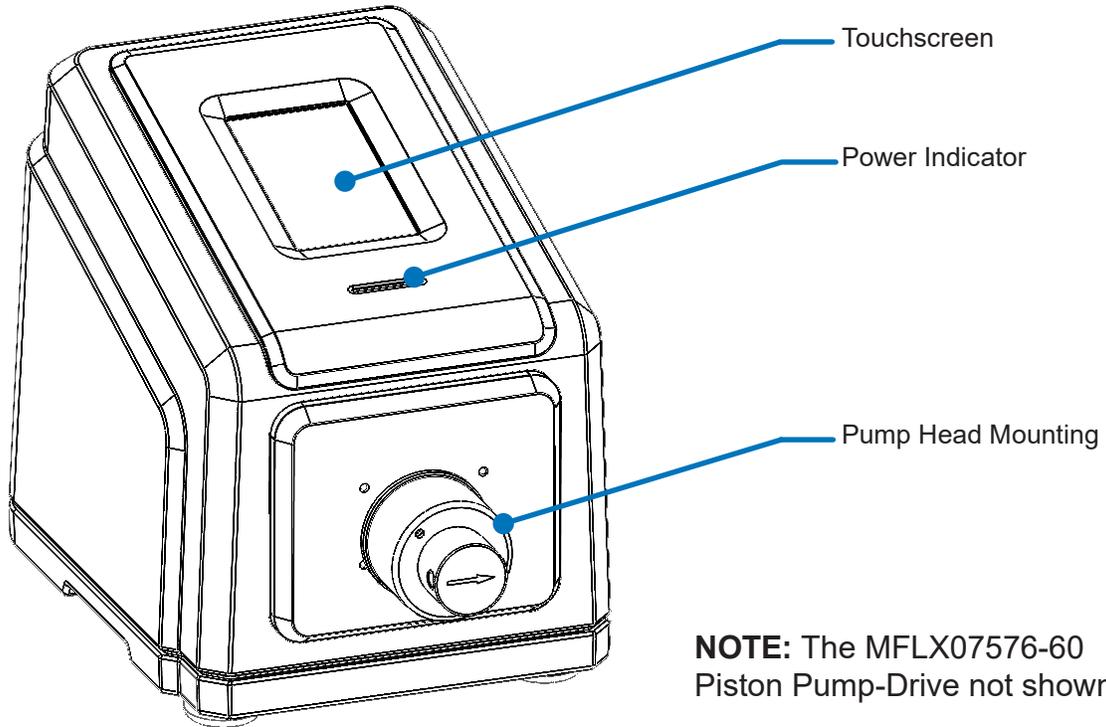
- Pump-drive.
- Quick Start Guide.

NOTE: Check the pump-drive packaging and its contents for any visible signs of damage. If any damage is found, immediately contact Masterflex Technical Support. See “Technical Support” last page.

Pump-Drive Features

- A 5-inch multi-language touchscreen provides easy access to user-defined operation parameters and direct readouts of pump operations data, including pump speed, flow rates, flow direction, batch totals, and more (see next page for details).
- Volume, Time, Continuous, and Analog Input modes provide easy and effective operation.
- User selectable dispense volumes, pump heads, flow rates, pump speeds, and run times.
- Easy user management with three levels of access: ADMIN, SUPER USER, and USER.
- Wi-Fi and EtherNet connectivity.
- Brushless maintenance-free motor offering $\pm 0.1\%$ speed control accuracy.
- Easy pump and tube priming.
- Masterflex MasterSense models have a maximum speed of 1800 RPM or 6000 RPM and flow rate capacities ranging from .001 mL/min to 3400 mL/min (depending on model and pump head selected).

Section 2: Basic Setup & Settings



Touchscreen Icons

	Analog User Mode		New User
	Calibrate		Pause
	Calibrate Complete		Prime
	Clockwise		Program
	Confirm		Ramp Down
	Connectivity Status		Ramp Up
	Continuous Mode		Record Volume
	Counterclockwise		Reset
	Delete		Screen Lock
	Display Brightness		Settings
	Edit		Start
	Language		Stop
	Logout		Time Mode
	New Program		Update Available
			Volume Mode
			Cancel

Before Starting the Drive

	CAUTION: Do not block the rear panel of the pump-drive. The power switch must always be within easy access, the power cord easy to disconnect.
	CAUTION: The supplied pump-drive power cord meets the requirements of the country where the pump-drive was purchased. If the pump-drive is used in another country, the power cord set must meet that country's requirements.
	CAUTION: To avoid electrical shock, the power cord protective grounding conductor must be connected to ground. Do not operate in wet locations per EN61010-1.

Gear Pump Considerations

- Verify the pump-drive is mounted on a flat surface.
- Verify adequate air flow around the pump-drive and ensure that the ambient air temperature does not exceed 104°F (40°C).
- Use the appropriate tube inlet and outlet diameter for the required flow rate and viscosity.
- Using smaller ID tubing (Series GA ¼" ID, Series GJ ¼" ID, Series GB ¼" ID) will increase the load on the pump, resulting in lower flow and/or pressure conditions; cavitation/decoupling are potential outcomes.
- General recommendations for maximum performance is to use low viscosity fluids (under 100 cps) and motor speeds under 3450 rpm.
- Unplug the pump-drive's power cable from the mains power outlet when cleaning.

Starting the Drive

1. Plug in and securely fasten the supplied power cable to the power connector located on the rear of the drive.
2. Plug the opposite end of the power cable into a mains power outlet.
3. Turn the drive on using the power switch located on the rear of the drive; the drive takes some two minutes to complete a start-up.

NOTES

- On initial start-up the Language Settings screen will be displayed. A language must be selected before the pump can be operated (see "Setting Languages" page 12)
- If User Management is enabled operators will be prompted for a username and password.
- Following initial start-up, subsequent start-ups will revert to the mode of operation last displayed.
- After 30 minutes of inactivity the touchscreen enters sleep mode and turns off. Tapping the touchscreen reactivates it and the drive. To enable (default) or disable screen saver see "Screen Saver" (page 20) for details.

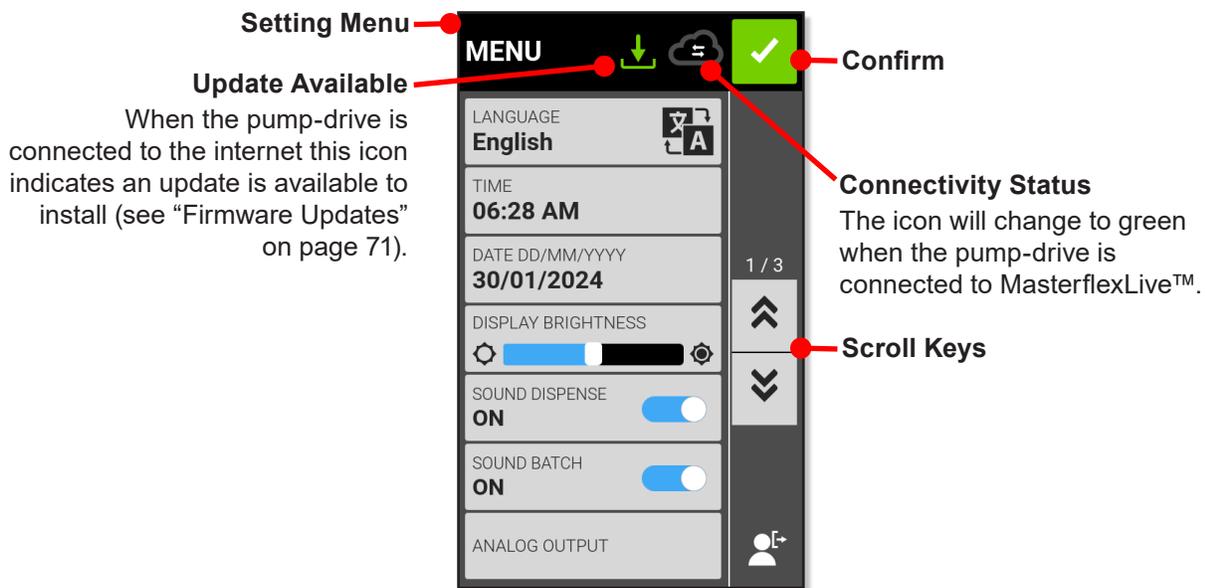
Settings



Settings

The Settings screen allows access to basic configuration settings. The Settings screen is accessed by tapping SETTINGS on any mode screen.

NOTE: Enabling the User Management feature restricts pump drives usage to only users with authorization, not just the Settings screen (for details see “User Management” page 25).



Setting Language



Settings



Confirm

Changing Displayed Touchscreen Language

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. Tap LANGUAGE.
3. Tap a desired language from the list.
4. Tap CONFIRM to save the new language selection.



Setting Time



Settings



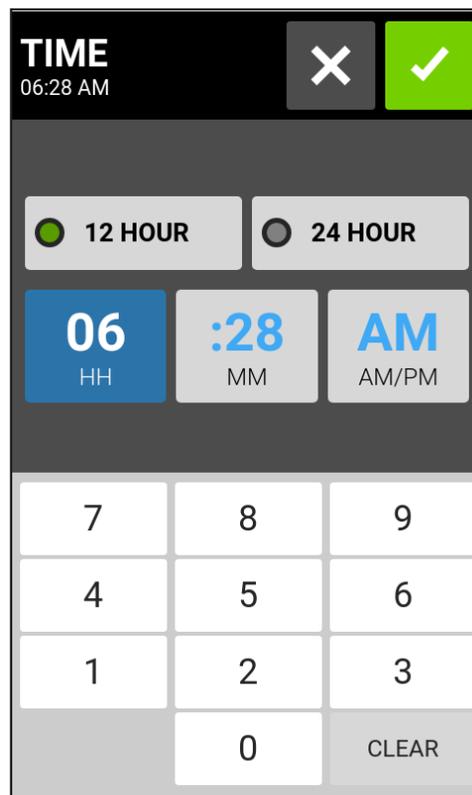
Confirm

Cancel

Setting or Changing Time

Allows an operator to set the time and its format (HH/MM 12 HR or HH/MM 24 HR).

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. Tap TIME.
3. Tap 12-HOUR or 24-HOUR time.
4. Tap HH to select hours and enter the desired time using the onscreen keypad.
5. Tap MM to select minutes and enter the desired time using the onscreen keypad.
6. If using 12-HOUR time, tap AM/PM to select either AM or PM.
7. Tap CONFIRM to save (or CANCEL discarding changes).



Setting Date



Settings



Confirm

Cancel

Setting or Changing a Date

Allows an operator to set the date and its format (MM/DD/YYYY or DD/MM/YYYY).

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. Tap DATE.
3. Select the desired date format (either month/day/year or day/month/year).
4. Tap the desired MONTH, DAY or YEAR field to select and then enter the date using the onscreen keypad.
5. Tap CONFIRM to save (or CANCEL discarding changes).

DATE
30/01/2024

MM/DD/YYYY DD/MM/YYYY

30 DD **01** MM **2024** YYYY

7	8	9
4	5	6
1	2	3
	0	CLEAR

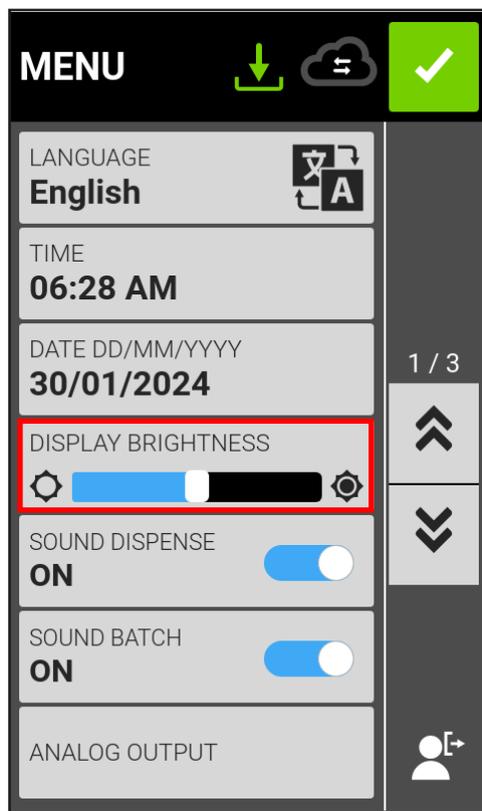
Setting Touchscreen Brightness



Settings

Changing Touchscreen Display Brightness

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. Use the **DISPLAY BRIGHTNESS** slider to adjust touchscreen brightness to a desired level.



Setting Sound Dispense Completion Alerts



Settings

At completion of each pump dispense a short beep can sound.

Enabling or Disabling a Dispense Completion Alert

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. Tap the SOUND DISPENSE toggle to select ON or OFF.



Setting Sound Batch Cycle Completion Alerts

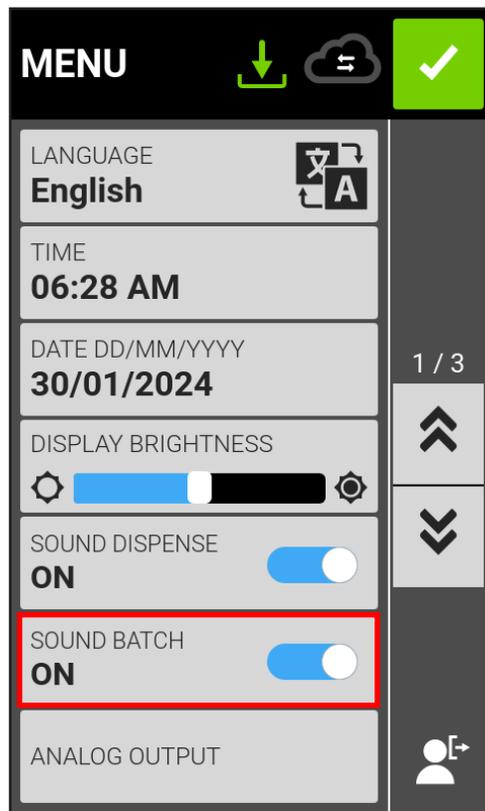


Settings

At completion of each batch cycle a short beep can sound.

Enabling or Disabling a Batch Cycle Completion Alert

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. Tap the **SOUND BATCH** toggle to select **ON** or **OFF**.



Setting Analog Output



Settings



Confirm

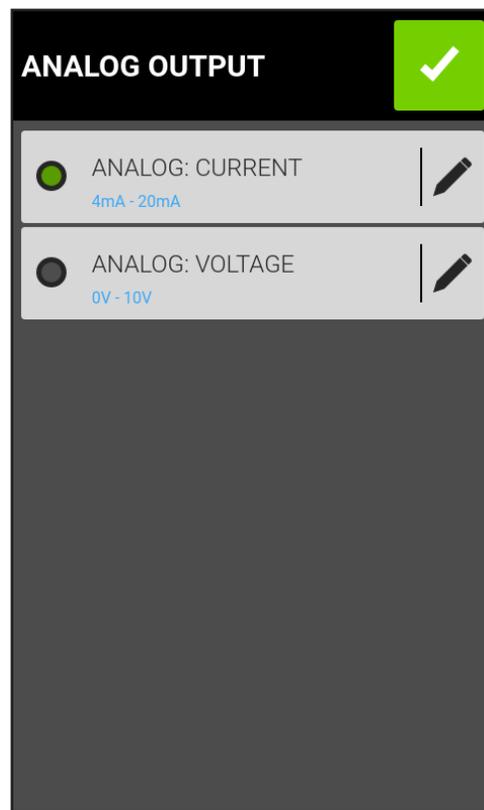
Cancel



Edit

The touchscreens supports and controls analog output through the pump-drive's 31-pin connection (see page 83 for details).

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. Tap ANALOG OUTPUT—the Analog Output screen displays.
3. Tap to select the desired analog output type from the available list.
4. Tap to choose ANALOG/VOLTAGE, or ANALOG/CURRENT:
5. Tap EDIT. The Analog Voltage Edit Screen or Analog Current Edit Screen displays.
6. Select the desired current or voltage operating range from the available list.
7. Tap CONFIRM (tap CANCEL discarding changes)—the Analog Output screen displays.
8. Tap CONFIRM.



Setting Device Information



Settings



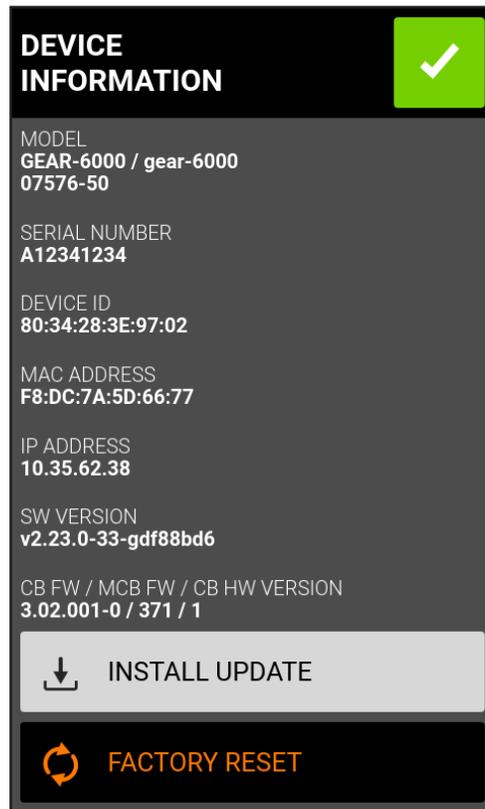
Scroll

The Device Information screen provides pump-drive details such as MAC address, IP address, software version, build date, and firmware version. Factory reset and updates are also accessed on the Device Information screen.

Accessing Device Information

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. **SCROLL** through the Settings screens to locate **DEVICE INFORMATION**.
3. Tap **DEVICE INFORMATION**—the Device Information screen displays.

See also “Firmware Updates” page 80, and “Restore Factory Settings” page 81.



Setting Screen Saver



Settings



Scroll

The screen saver helps extend touchscreen display life. After 30 minutes of inactivity the pump-drive enters sleep mode and its touchscreen display turns off. Tap on the touchscreen to reactivate its display as well as the drive.

Enabling or Disabling Screen Saver

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. **SCROLL** through the Settings screens to locate **SCREEN SAVER**.
3. Tap **SCREEN SAVER** toggle to select either **ON** or **OFF**.



Setting Device Name



Individual names can be assigned to each pump-drive to make identification easier when using more than one pump.

Assigning a Pump-drive Name

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. **SCROLL** through the Settings screens to locate **DEVICE NAME**.
3. Tap **DEVICE NAME**—the Device Name screen displays.
4. Enter a desired pump name using the onscreen keypad (up to 8 characters).
5. Tap **CONFIRM** to save changes (or **CANCEL** discarding changes).



Setting Wi-Fi



Settings



Scroll



Confirm

Cancel

The pump-drive can connect to a network using Wi-Fi connections.

NOTES

- The EtherNet connection takes priority if both Wi-Fi and EtherNet are used simultaneously.
- The supports WEP, WPA, WPA2, and None (open) Wi-Fi security protocols.

See next page for procedures



Setting Wi-Fi (Cont.)

Selecting a Wi-Fi Network

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. **SCROLL** the Settings screens to locate **WIFI SETTINGS**.
3. Tap **WIFI SETTINGS**—the Wi-Fi Setting screen displays.
4. Tap the **WIFI** toggle to select **ON**.
5. Tap the desired Wi-Fi network from the available list.
6. If required, enter the network **PASSWORD** using the onscreen keypad.
7. Tap **CONNECT** to join the network (or **CANCEL**).
8. Tap **CONFIRM** to return to the Settings screen.

Removing a Wi-Fi Network

1. Tap **SETTINGS** on any mode screen—the Settings screen displays.
2. **SCROLL** the Settings screens to locate **WIFI SETTINGS**.
3. Tap **WIFI SETTINGS**—the Wi-Fi Setting screen displays.
4. If required, tap the **WIFI** toggle to select **ON** (or **OFF**).
5. Tap the desired Wi-Fi network from the available list.
6. Locate the desired Wi-Fi network and tap **REMOVE WIFI**.
7. Tap **REMOVE** to delete the network (or **CANCEL** to discard changes).
8. Tap **CONFIRM** to return to the Settings screen.



Setting an EtherNet Connection



Settings



Scroll



Confirm

Cancel

The pump-drive can connect to a network using EtherNet connections. An operator has the option to select DHCP (default) to automatically configure IP settings, or STATIC for manual to configure IP settings.

NOTES

- Verify the EtherNet cable is securely attached to the EtherNet port on the back of the pump-drive.
 - The EtherNet connection takes priority if both Wi-Fi and EtherNet are used simultaneously.
1. Tap SETTINGS on any mode screen—the Settings screen displays.
 2. SCROLL the Settings screens to locate EtherNet SETTINGS.
 3. Tap EtherNet SETTINGS—the EtherNet Setting screen displays.
 4. Tap DHCP to automatically configure IP settings or STATIC to manually edit settings using the onscreen keypad.
 5. Tap CONFIRM to save changes (or CANCEL discarding changes).

ETHERNET SETTINGS		X	✓
<input type="radio"/> DHCP	<input checked="" type="radio"/> STATIC		
IP ADDRESS 10.35.62.38	DNS 1 8.8.8.8		
SUBNET MASK 255.255.255.0	DNS 2 10.25.62.253		
ROUTER 10.35.62.253			
7	8	9	
4	5	6	
1	2	3	
.	0	CLEAR	

User Management, Permission Levels

This feature allows controlled user access using configurable permission levels

Preliminary Things to Know

Default Permissions

- USER: operates basic pump-drive functions and run programs.
- SUPER USER: same as USER but can create and modify programs.
- ADMIN: full administrative drive access.

Default ADMIN Username and Password

When starting User Management for the first time to set user permission levels, or following a factory reset, an operator will be prompted for a username and password.

It is *required* to enter the following first-time default text:

Default username: **admin**

Default password: **123456**

It is recommended to change the default password after logging in (see “Modifying Users” which follows on the next page).



Settings



Scroll



Confirm

Cancel

Configuring User Level Permissions

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. SCROLL the Settings screens to locate USER MANAGEMENT.
3. If required, tap the USER MANAGEMENT toggle to select ON.
4. Tap MODIFY USER.
5. Tap ACCESS LEVELS.
6. Tap USER or SUPERUSER.
7. Select the desired settings menu items to be included in the user level.
8. Tap CONFIRM to save changes (or CANCEL discarding changes).

User Management, Permission Levels (Cont.)



Adding a New User

With User Management enabled and the “Settings” menu displayed on the touchscreen, do the following.

1. Navigate to and tap MODIFY USER.
2. Tap NEW USER.
3. Fill out the following fields:
4. Enter a Username (duplicates are not allowed).
5. Enter a Password (min. 6 characters).
6. Enter Permission level (there must be at least one ADMIN user existing at all time).
7. Tap CONFIRM to save changes (or CANCEL to discard).



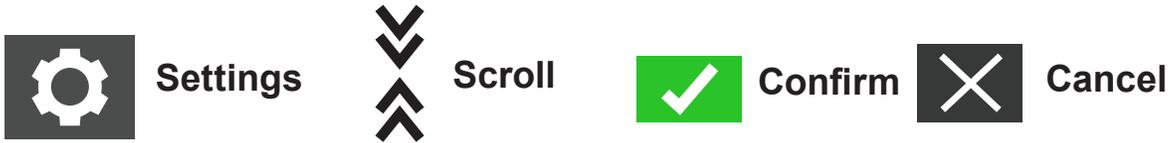
NOTE: ADMIN users cannot delete their own user profile.

Deleting Users

With User Management enabled and the “Settings” menu is being displayed on the touchscreen, do the following.

1. Navigate to and tap MODIFY USER.
2. Locate the desired user from list.
3. Tap DELETE icon to delete user.

Setting Pump Head Selection



After changing a pump head, the new pump head must be selected from the Pump Head Settings screen.

Selecting a New Pump Head

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. SCROLL the Settings screens to locate PUMP HEAD.
3. Tap PUMP HEAD—the Pump Head Settings screen displays.
4. Select the desired pump head from the list of available options.
5. Tap CONFIRM to save (or CANCEL returning to the Settings screen).
6. Tap CONFIRM to exit the Settings screen and return to the previous mode screen.

Setting Auto Start



The pump drive has an auto-start capability that allows the pump-drive to resume pumping operations when power is restored.

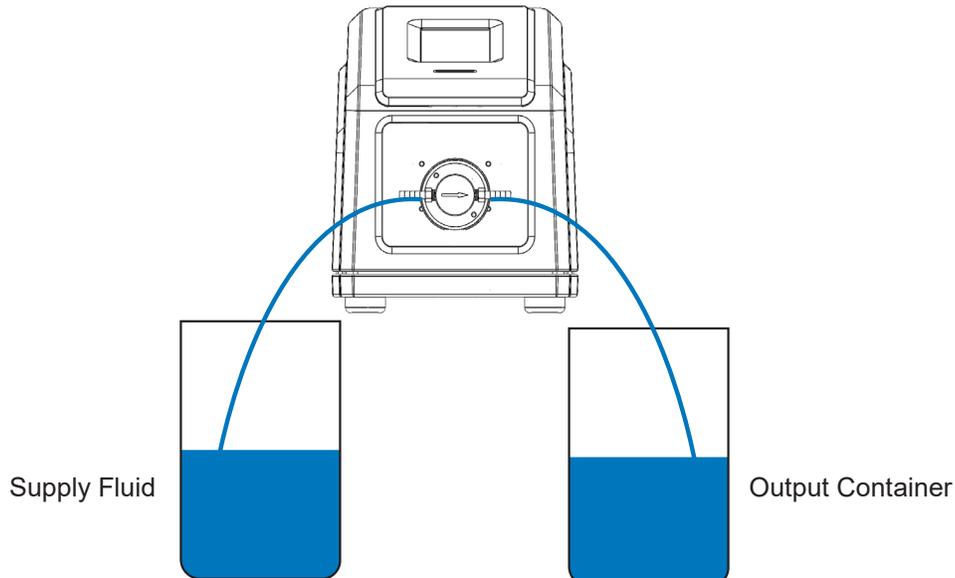
Enabling Auto Start:

1. Tap SETTINGS on any mode screen—the Settings screen displays.
2. SCROLL the Settings screens to locate AUTO START.
3. Tap AUTO START toggle to select ON or OFF.

Priming the Pump-Drive

It is recommended to prime the pump-drive before using it. Priming the pump draws fluid through the tubing eliminating air pockets.

Example Flow Setup



Priming a Pump-drive



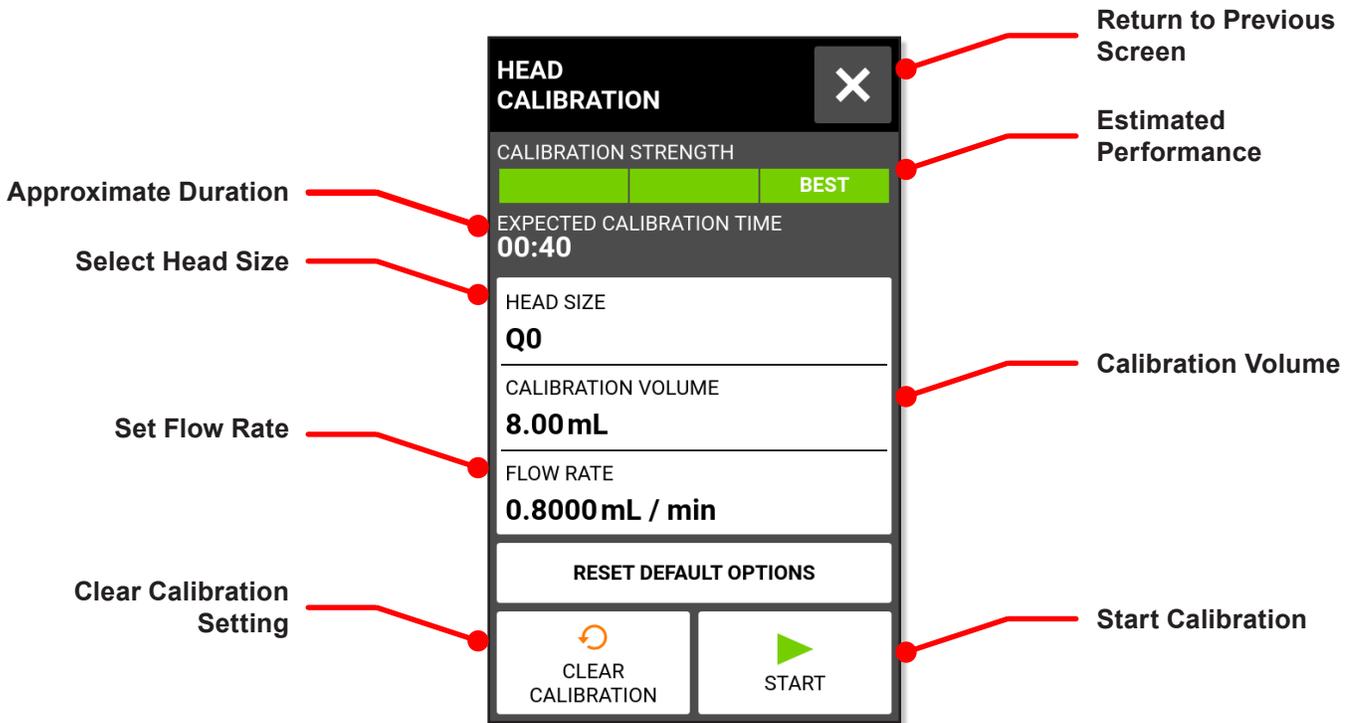
Prime

1. Connect tubing to the pump head (for details see supplied documentation in the product shipping package).
2. Insert the tube inlet into the supply fluid.
3. Insert the tube outlet into an appropriate output container.
4. Turn the drive on using the power switch located on the rear of the drive.
NOTE: If “User Management” is enabled, user will be prompted for username and password (see “User Management” page 25).
5. Navigate to the Continuous, Time, or Volume Mode screens.
6. Press-and-hold the PRIME icon until there are no bubbles visible in the tubing. Priming stops when the PRIME icon is released.

Pump Head Calibration

To ensure accurate dispensing of fluids, it is recommended that the pump head be calibrated whenever fluid, flow rate, tubing, or a pump head are changed. Head Calibration can be accessed from the Continuous, Time, or Volume mode edit screens.

Pump Head Calibration Screen



Gear Pump Calibration

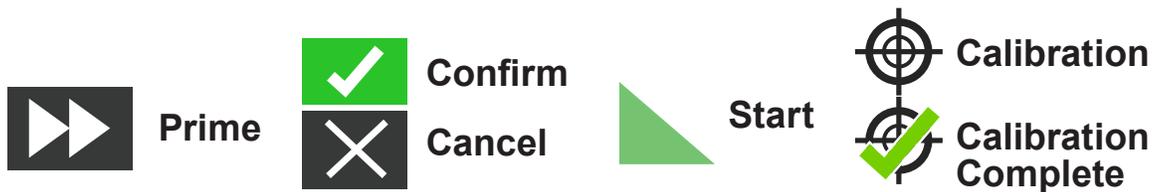
General Preparation

- Verify the pump head is correctly mounted to the pump-drive (see “Mounting a Gear Pump” for details, page 89).
- Verify tubing adapters are attached to the pump head.
- Verify appropriate transfer tubing is attached to the tubing adapters and fastened with tubing clamps.
- Verify all fluids and containers are ready and adequate.

Procedure continues on next page

Gear Pump Calibration (Cont.)

Calibrating the Pump Head



1. Insert the inlet tube into supply fluid.
2. Insert the outlet tube into an output container.
NOTE: The container should be graduated, place it on a scale for increased accuracy. If using a scale, an acceptable weight-to-volume conversion for water is: 1 gram = 1 mL.
3. Turn the drive on using the power switch located on the back of the drive.
NOTE: If “User Management” is enabled, user will be prompted for username and pass word.(see “User Management” page 25).
4. Navigate to the Continuous, Time, or Volume Mode screens.
5. Press-and-hold the PRIME icon, priming will stop when the PRIME icon is released.
6. Tap CALIBRATE on the Continuous Mode screen, the Volume Mode screen, or the Time Mode screen—the Pump Head Calibration screen displays.
7. Tap HEAD SIZE—the Head Size screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL discarding changes returning to previous screen).
 - Tap CALIBRATION VOLUME—the Calibration Volume screen displays.
 - Enter the desired calibration volume using the onscreen keypad.
NOTE: The default volume or greater will ensure the best calibration.
8. Tap CONFIRM to save (or CANCEL discarding changes returning to previous screen).
9. Tap FLOW RATE—the Calibration Flow Rate screen displays.
 - Enter the desired flow rate using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL discarding changes returning to previous screen).
NOTE: The pump-drive will adjust the displayed flow rate after calibration is complete.
10. Tap START to begin calibration.
NOTE: Calibration progress displays on the touchscreen.
11. When calibration is complete, use the onscreen keypad to enter the measured volume of fluid from the tube outlet container.
12. Tap CONFIRM to complete calibration returning to the previous mode screen. The Calibrate Complete icon displays indicating calibration is completed for the current pump head size, tube volume, and flow rate.

Gear Pump Calibration (Cont.)

Calibrating the Pump Head (Cont.)

NOTES

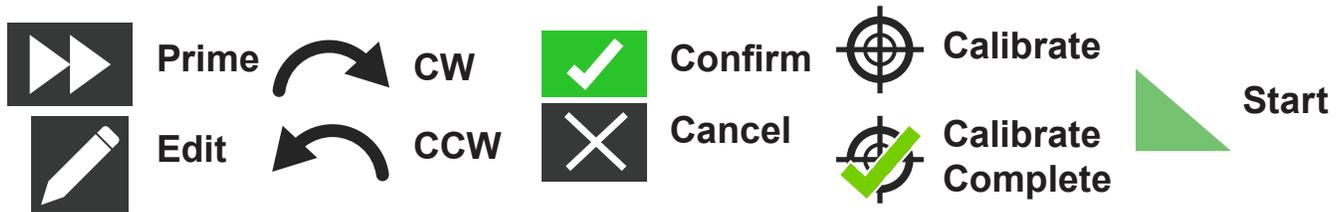
- The estimated accuracy for the selected calibration settings is shown in the Calibration Strength bar on the Pump Head Calibration screen. Calibration accuracy can be improved by using a larger calibration volume and/or altering the flow rate.
- For the best accuracy, calibration should be performed at the anticipated flow rate.
- Steps 6 through 12 (previous page 30) can be repeated as necessary to optimize the accuracy of pump head calibration.
- Calibration settings are retained and transferred to other mode screens when entering or leaving the Pump Head Calibration screen.
- If the pump-drive is stopped during calibration that calibration will be discarded and the previous mode screen displays.
- Calibration time at the maximum allowable flow rate (default max flow rate) is approximately 10 seconds. Calibration time at the minimum allowable flow rate (approximately 4% of the maximum flow rate) is 4 minutes.
- Minimum and maximum flow rates will change after calibration due to a recalculation of the volume of fluid per pump revolutions.
- Empty the output container before restarting the procedure.

Piston Pump Calibration

General Preparation

- Verify the pump head is correctly mounted to the drive.
- Verify the appropriate transfer tubing has been attached to the pump head.
- Verify supply fluid and output containers are ready.

Calibrating the Pump Head

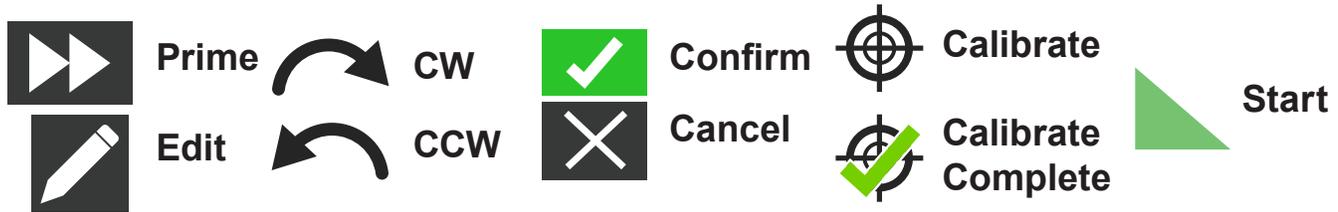


1. Insert the tube inlet into the supply fluid.
2. Insert the tube outlet into a suitable container.
NOTE: The output container should be graduated or placed on a scale for increased accuracy. If using a scale, an acceptable weight to volume conversion for water is:
1 gram = 1 mL.
3. Turn on the drive on using the power switch located on the back of the drive.
NOTE: If “User Management” is enabled, user will be prompted for username and password.(see “User Management” page 25).
4. Navigate to the Continuous, Time, or Volume Mode screens.
5. Tap DIRECTION to select either clockwise or counterclockwise flow direction.
6. Press-and-hold PRIME to prime the pump. Priming will stop when PRIME is released.
7. Adjust the pump head zero point (for details see supplied documentation in product shipping package).
8. Tap CALIBRATE on the Continuous Mode screen, the Volume Mode screen, or the Time Mode screen—the Pump Head Calibration screen displays.
9. Tap HEAD SIZE—the Head Size screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to previous screen).
10. Tap CALIBRATION VOLUME—the Calibration Volume screen displays.
 - Enter the desired calibration volume using the onscreen keypad.**NOTE:** The default calibration volume settings or greater will ensure the best calibration.
 - Tap CONFIRM to save (or CANCEL returning to previous screen).

Procedure continues of next page

Piston Pump Calibration (Cont.)

Calibrating the Pump Head (Cont.)



11. Tap FLOW RATE—the Calibration Flow Rate screen displays.
12. Enter the desired flow rate using the onscreen keypad.
13. Tap CONFIRM to save (or CANCEL returning to previous screen).
NOTE: The touchscreen will adjust the displayed flow rate after calibration is complete.
14. Tap START to begin calibration.
NOTE: Calibration progress displays on the touchscreen.
15. When calibration is complete, use the onscreen keypad to enter the measured volume of fluid from the tube outlet container.
16. Tap CONFIRM to complete calibration and return to the previous mode screen. The Calibrate Complete icon displays to indicate calibration is completed for the current pump head size, tube volume, and flow rate.

NOTES

- The estimated accuracy for the selected calibration settings is shown in the Calibration Strength bar on the Pump Head Calibration screen. Calibration accuracy can be improved by using a larger calibration volume and/or altering the flow rate.
- For the best accuracy, calibration should be performed at the anticipated flow rate.
- Calibration settings are retained and transferred to other mode screens when entering or exiting the Pump Head Calibration screen.
- If the drive is stopped during calibration the calibration will be discarded and the previous mode screen displays.
- Empty the output container before restarting the procedure.
- Calibration time at the maximum allowable flow rate (default max flow rate) is approximately 10 seconds. Calibration time at the minimum allowable flow rate (approximately 4% of the maximum flow rate) is 4 minutes.
- Minimum and maximum flow rates will change after calibration due to a recalculation of the volume of fluid per pump revolutions.
- Steps 8 through 14 (pages 32, 33) can be repeated as necessary to optimize the accuracy of the pump head calibration.

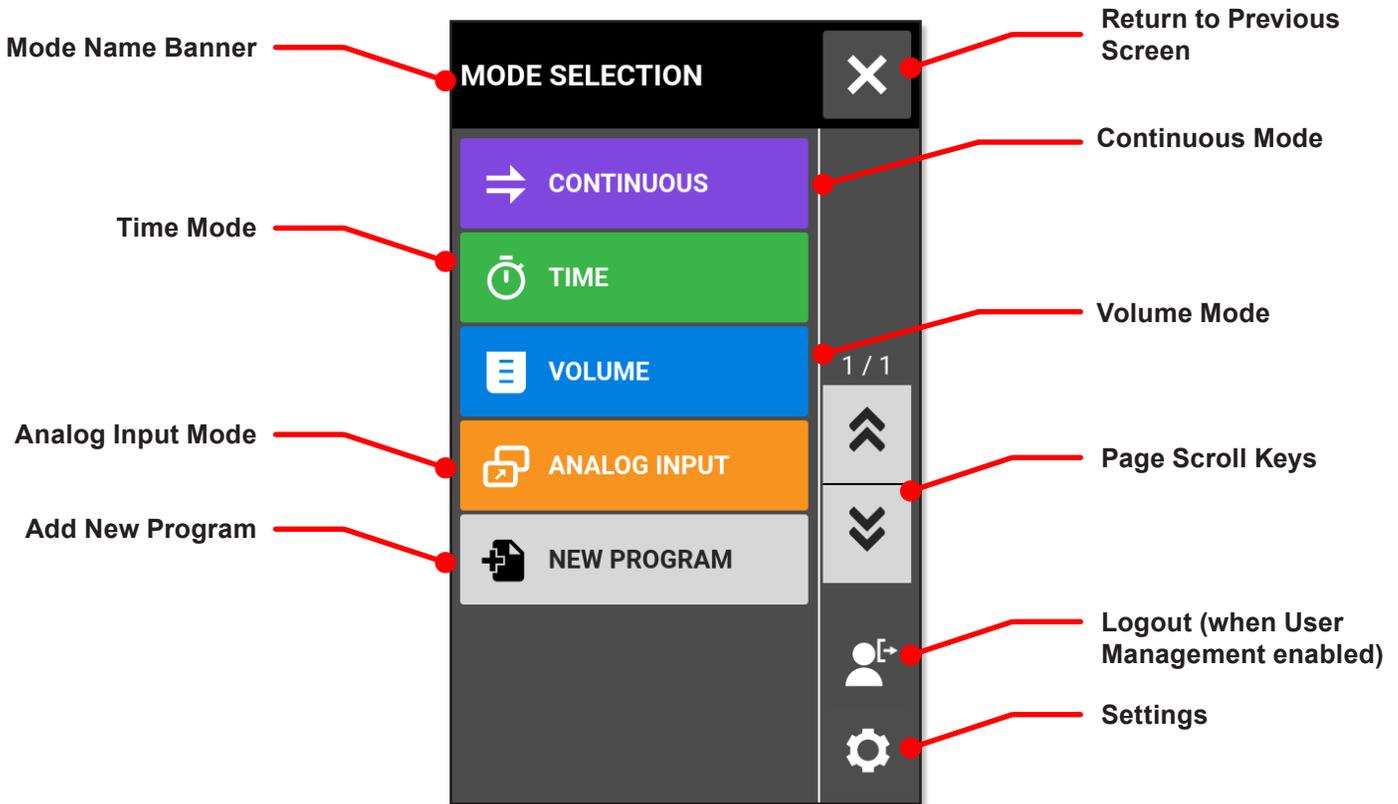
Section 3: Operations

	WARNING: Tube breakage may result in fluid being sprayed from the pump. Use appropriate measures to protect operators and equipment.
	CAUTION: Hot surface. Do not touch.
	CAUTION: To avoid electrical shock, the power cord protective grounding conductor must be connected to ground. Do not operate in wet locations per EN61010-1.

NOTES

- It is recommended that the pump head be rinsed after every pumping process to prevent the piston from seizing due to remaining particles (especially after pumping media containing salts and proteins).
- Do not pump media containing particles that exceed a diameter of 0.8 mm.
- Piston fractures are not covered by the pump-drive warranty.
- Do not use gear pumps to pump liquids containing particles. Even the smallest particles has an abrasive effect that can damage or destroy a gear pump within a few seconds.
- Corrosive liquids may eventually produce leak paths around the sealing surfaces of the pump head. The pump head should be regularly inspected for leaks.
- Before operating the pump it is recommended that the pump head be filled with liquid.
- While priming, verify the pump does not run dry for more than 15 seconds.

Mode Selection Screen



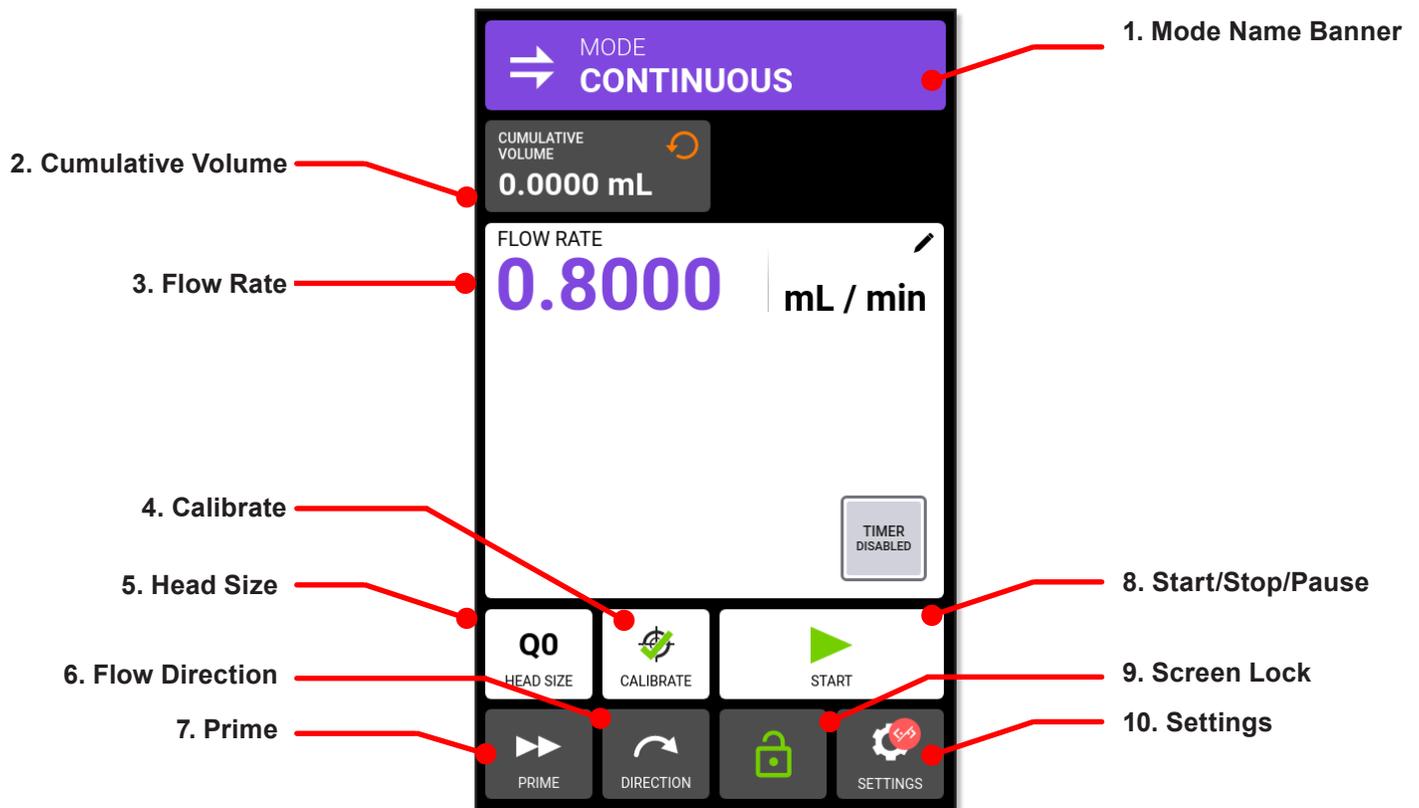
The Mode Selection screen allows access to the pump-drive's basic operation modes: CONTINUOUS, TIME, VOLUME, and ANALOG INPUT, as well as the NEW PROGRAM screen and USER DEFINED PROGRAMS.

The Mode Selection screen can be accessed from any of the mode screens by tapping the MODE NAME BANNER.

Tap a desired mode or program to access an individual mode or program screens.

Continuous Mode

In Continuous Mode the pump-drive will operate at a selected rpm and/or flow rate until stopped by the operator. The Continuous Mode Run screen is accessed by selecting CONTINUOUS on the Mode Selection screen (see previous page).



Procedure starts on next page

Continuous Mode (Cont.)

Continuous Mode Run Screen



1. **MODE NAME BANNER.** Tap Mode Name Banner returning to Mode Selection screen (see previous page for numbering references).
2. **CUMULATIVE VOLUME.** Displays the current cumulative volume of fluid that has been pumped. To reset the cumulative volume, tap the “CUMULATIVE VOLUME” reset icon and “CONFIRM” on the following pop-up message.
3. **FLOW RATE.** Displays the current flow rate in the unit of measurement selected by the user. Tap to access the Flow Rate screen.
4. **CALIBRATE.** Tap to access the Calibration screen. Once calibration has been completed for the current pump head size the Calibration Complete icon displays (see above).
5. **HEAD SIZE.** Tap to display connected pump head size.
6. **FLOW DIRECTION.** Tap DIRECTION to select clockwise or counterclockwise (see above).
NOTE: Flow Direction is unavailable on single direction gear pumps and will be grayed out.
7. **PRIME.** Press-and-hold to the Prime icon (see above) to pump-drive (for details see “Priming the Pump-Drive” page 28).
8. **START/STOP.** Tap START to begin operation. Once operation begins STOP displays.
9. **SCREEN LOCK.** To lock the screen, tap the “UNLOCK” icon and a pop-up message will displays asking the operator to confirm. To unlock the screen, tap the “LOCK” icon to lock the screen, then press-and-hold LOCKED until the icon changes to UNLOCKED.
10. **SETTINGS.** Tap to access the Settings screen (for details see “Settings” page 11).

Continuous Mode Operation



General Preparation

- Verify the correct tubing is securely attached to the pump head.
- Verify all fluids and containers are ready.
- Turn on the drive using the power switch located on the rear of the drive.
NOTE: If User Levels is enabled you may be prompted for a username and password (for details see “User Management” page 25). The touchscreen display will revert to the previously used operation mode.
- Verify that the pump head has been calibrated by checking that Calibration Complete icon is displayed on the Continuous Mode Run screen.
- If required, prime the pump (for details see “Priming the Pump-Drive” on page 28).



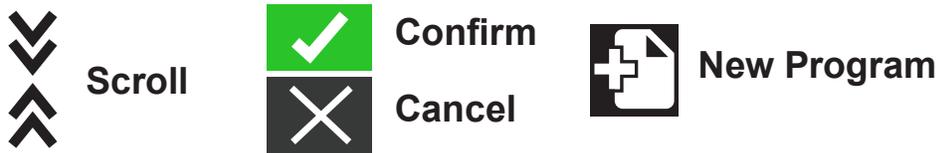
Operating the Pump in Continuous Mode

1. Tap CONTINUOUS on the Mode Selection screen—Continuous Mode Run screen displays.
2. If required, to reset the cumulative volume, tap the “CUMULATIVE VOLUME” reset icon and “CONFIRM” on the following pop-up message.
3. Select the desired flow rate and flow units:
 - Tap FLOW RATE to access the Flow Rate screen.
 - Tap UNITS to access the Flow Units screen, select desired flow unit from the list.
 - Tap CONFIRM to save (or CANCEL returning to Flow Rate screen).
 - Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to Continuous Mode screen).
4. Tap HEAD OPTIONS—the Head Options screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to Continuous Mode Run screen).
5. If required, tap CALIBRATE to calibrate the pump-drive for the selected pump head and flow rate (for details see supplied documentation in product shipping package).
6. Tap DIRECTION to select either clockwise or counterclockwise flow direction.
NOTE: Flow Direction is unavailable on single direction gear pumps and will be grayed out.
7. Tap START. The drive begins operation at the flow rate and direction shown.
8. Tap STOP. The drive will stop operation.
NOTE: In Continuous Mode the drive will continue to operate at the displayed flow rate and direction until stopped.

Saving Continuous Mode Setting as a New Program

Changes made to mode parameters can be saved as a new program for easier access to frequently used settings.

NOTE: If User Levels is enabled only users with authorization can create and modify programs (for details see “User Management” page 25).



Saving Mode Parameters to a New Program

1. If required, edit the Continuous Mode settings as desired.
2. Tap MODE NAME BANNER to return to the Mode Selection screen.
3. Tap NEW PROGRAM.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL to display additional pages.
4. Tap CONTINUOUS. The Continuous New Program screen displays with the last settings used in the Continuous Mode.
5. Tap NEW PROGRAM. If required, delete the characters using the back arrow on the on screen keypad and then enter the desired program name (up to 8 characters).
6. Tap CONFIRM to save (or CANCEL to delete).

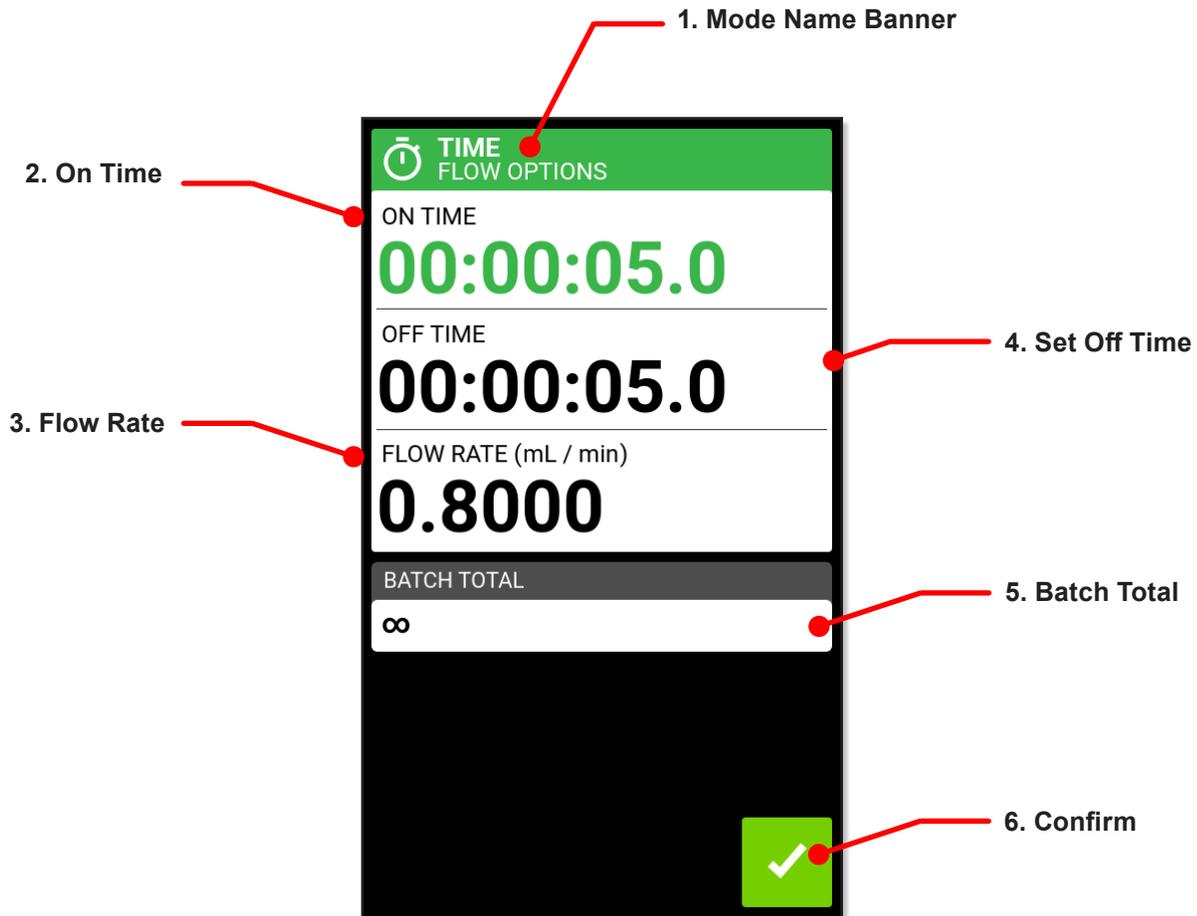
NOTES:

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL displays additional pages.

Time Mode

In Time Mode the pump-drive will operate at a selected rpm and/or flow rate for a selected time and/or batch total. When a selected time or batch total is completed, the pump stops automatically.

Time Mode Run Screen



Procedure starts on next page

Time Mode (Cont.)

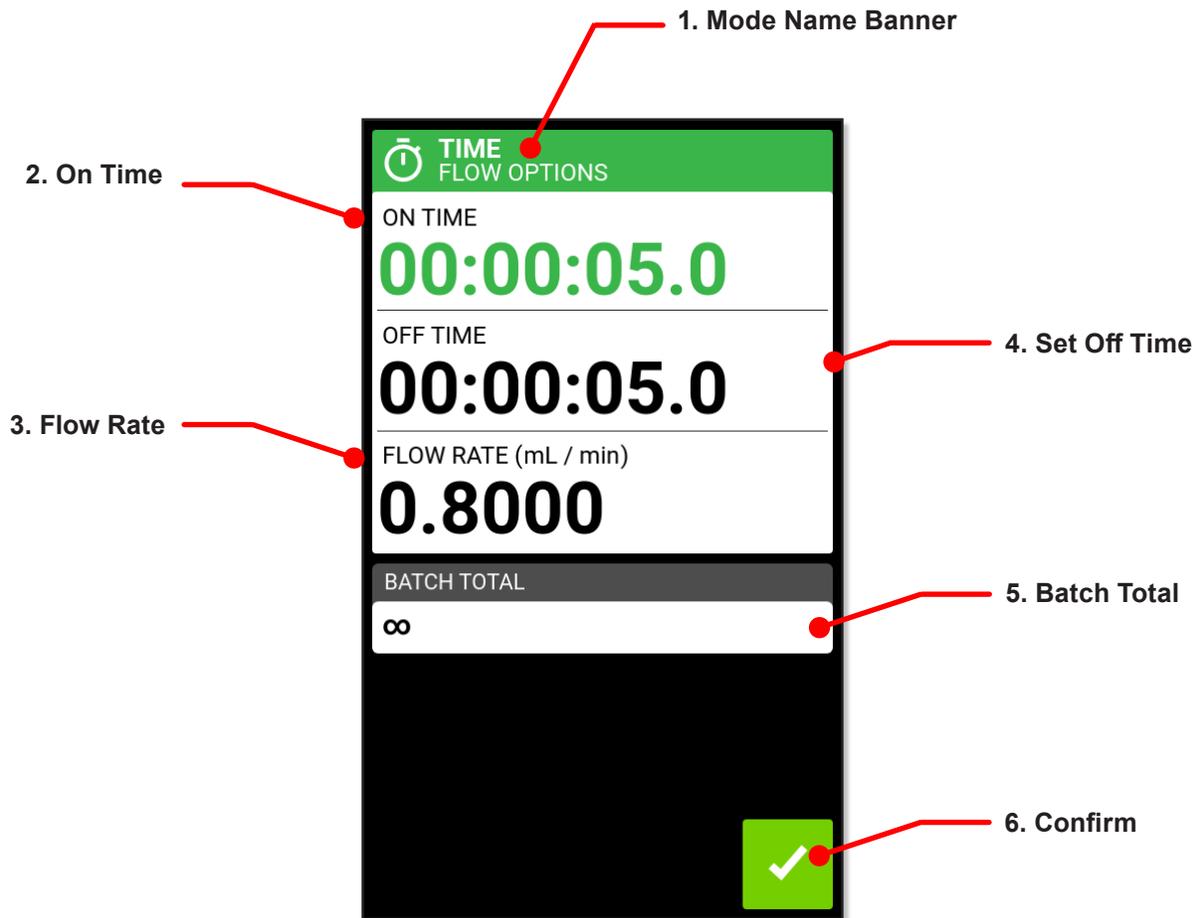
Time Mode Run Screen (Cont.)



1. **MODE NAME BANNER.** Tap the Mode Name Banner to return to Mode Selection screen (see previous page 40 for numbering references).
2. **ON TIME (COUNTER).** Displays a countdown of the set dispense time during operation.
3. **FLOW RATE.** Displays current flow rate in the unit of measurement selected by the operator.
4. **SET OFF TIME.** Displays the set duration of time the pump pauses between each dispense operation.
5. **BATCH TOTAL.** Displays the number of dispenses completed in a current batch. To reset the batch total press-and-hold **BATCH RESET** until the display changes to zero.
6. **CONFIRM.** Tap to set the values displayed.

Time Mode (Cont.)

Time Mode Edit Screen



Time Mode Operation



General Preparation

- Verify the correct transfer tubing is securely attached to the pump head.
- Verify all fluids and output containers are ready.
- Turn on the drive on using the power switch located at the rear of the drive.
NOTE: If “User Management” is enabled, user will be prompted for username and pass word.(see “User Management” page 25).
- Verify that the pump head has been calibrated by checking that Calibration Complete displays on the Time Mode Edit screen (for details see “Pump Head Calibration” page 29).
- If required, prime the pump (for details see “Priming the Pump” on page 28).

Time Mode (Cont.)

Time Mode Operation (Cont.)



Operating the Pump in Time Mode

1. Tap TIME from the Mode Selection screen—the Time Mode Run screen displays.
2. Tap EDIT to access the Time Mode Edit screen.
3. Tap ON TIME to set the amount of time for each pump operation—the On Time Edit screen displays.
 - Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Time Mode Edit screen).
4. Tap OFF TIME to set the amount of time the pump pauses between operations—the On Time Edit screen displays.

NOTE: If the off time is set to zero the pump-drive will require a start input (from either the touchscreen or a remote input to start the next dispense).

 - Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Time Mode Edit screen).
5. Tap FLOW RATE—the Flow Rate Edit screen displays.
 - Tap UNITS to access the Flow Units screen and select the desired flow unit from the available list.
 - Tap CONFIRM to save (or CANCEL returning to the previous screen).
 - Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Time Mode Edit screen).
6. Tap HEAD OPTIONS—the Head Options screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to the Time Mode Edit screen).

Procedure continues on next page

Time Mode Operation (Cont.)



Operating the Pump in Time Mode (Cont.)

7. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle—the Batch Total screen displays.
8. Enter the desired number of dispenses in a batch using the onscreen keypad.
NOTE: If required, tap INFINITE to select an infinite number of dispense cycles. If INFINITE is selected, the pump will run continuously.
9. Tap CONFIRM to save (or CANCEL returning to the Time Mode Edit screen).
10. Tap CONFIRM to return to the Time Dispense Mode Run screen.
11. Tap DIRECTION to select either clockwise or counterclockwise flow direction.
NOTE: Flow Direction is unavailable on single direction gear pumps and will be grayed out.
12. Tap START. The pump will now operate until the batch total is completed or until PAUSE or STOP are tapped.
13. If required, adjustments can be made to any of the Time Mode settings during operation.
14. To make any adjustments tap STOP and then repeat steps 2 through 9 (pages 43–44).
15. Tap CONTINUE to complete the pump operation once the desired changes have been made.

Saving Time Mode Setting as a New Program

Changes made to mode parameters can be saved as a new program for easier access to frequently used settings.

NOTE: If User Levels is enabled only users with authorization can create and modify programs (for details see “User Management” page 25).



Scroll



New Program



Confirm

Cancel

Saving Mode Parameters to a New Program

1. If required, edit the Time Mode settings as desired.
2. Tap MODE NAME BANNER to return to the Mode Selection screen.
3. Tap NEW PROGRAM.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.
4. Tap CONTINUOUS. The Continuous New Program screen displays with the last settings used in the Continuous Mode.
5. Tap NEW PROGRAM. If required, delete the characters using the back arrow on the on screen keypad and then enter the desired program name (up to 8 characters).
6. Tap CONFIRM to save (or CANCEL to delete).

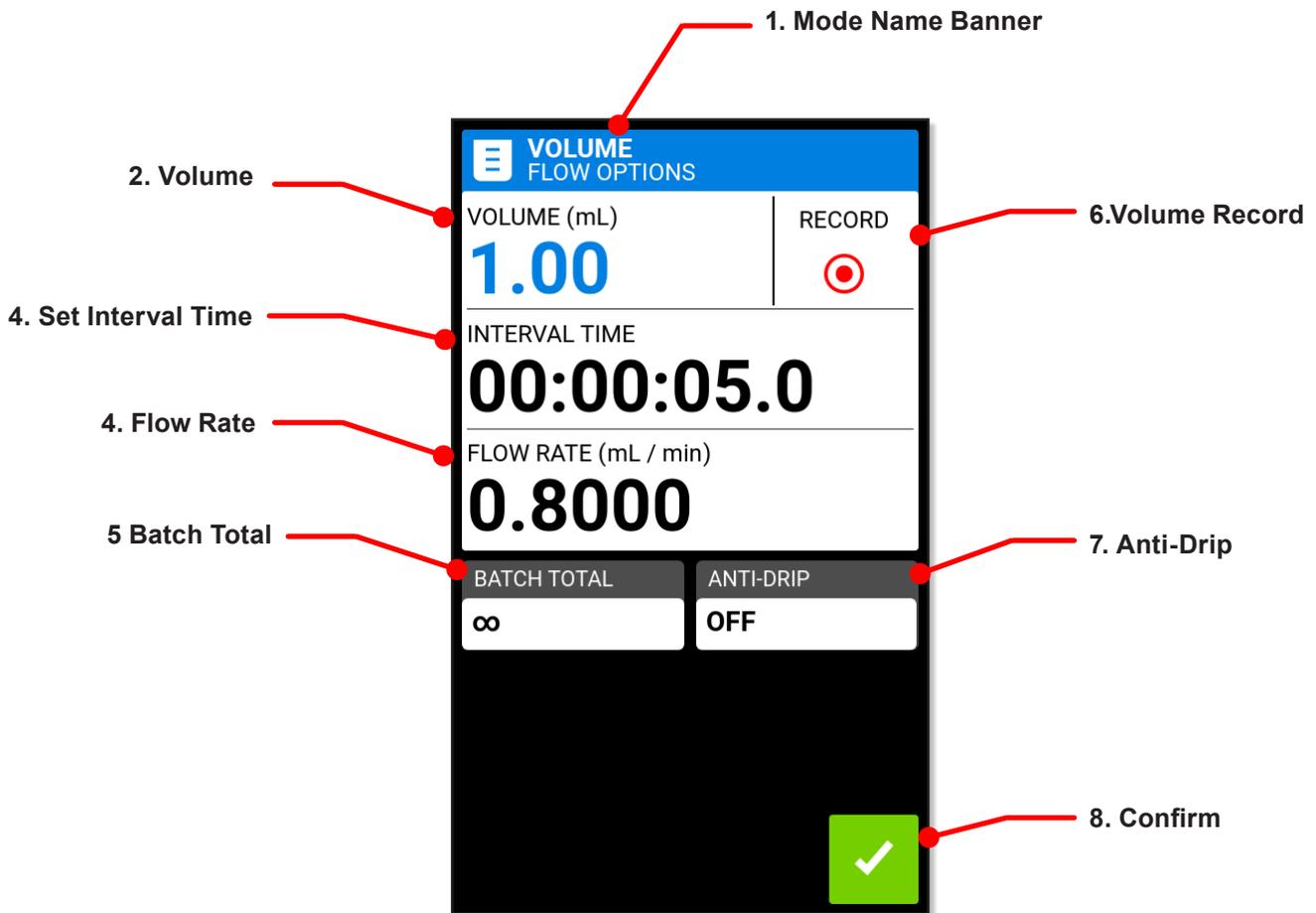
NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

Volume Mode

In Volume Mode the pump will operate at a selected rpm and/or flow rate for a selected time and/or batch total. When completed the pump stops automatically.

Volume Mode Run Screen



Procedure starts on next page

Volume Mode (Cont.)

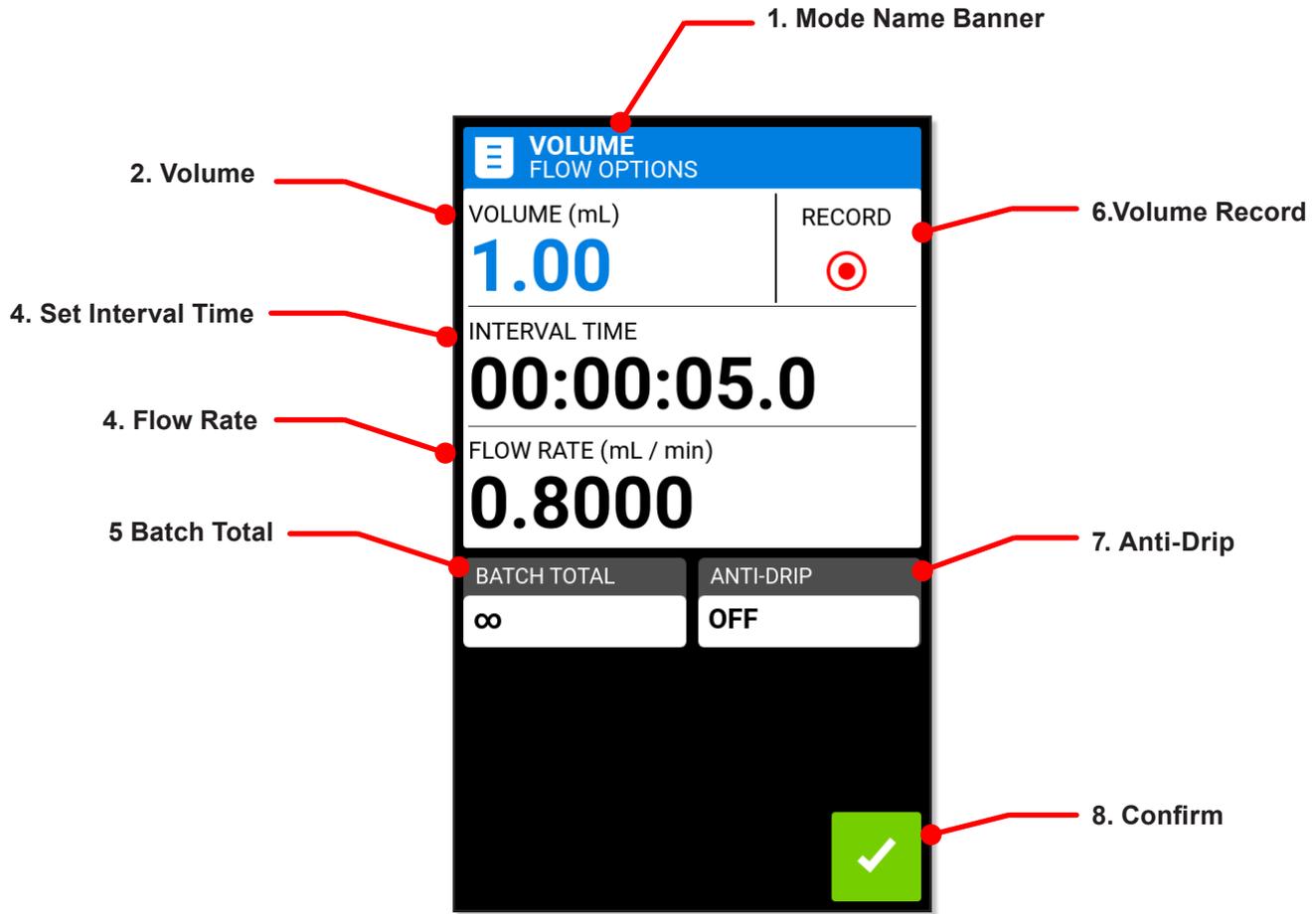


Volume Mode Run Screen (Cont.)

1. MODE NAME BANNER. Tap the Mode Name Banner returning to Mode Selection screen .
2. VOLUME. Displays the current volume of fluid that is being pumped.
3. SET INTERVAL TIME. Displays the set time the pump pauses between dispenses.
4. FLOW RATE. Displays the current flow rate in the unit of measurement selected.
5. BATCH TOTAL. Displays the number of dispenses that have been completed in the current batch. To reset the batch total: Press-and-hold (BATCH) RESET until the display changes to zero.
6. VOLUME RECORD. Tap to record unknown fluid volumes.
7. ANTI-DRIP. Tap to minimize drips after fluid has been dispensed.
8. CONFIRM. Tap to set the values displayed.

Volume Mode (Cont.)

Volume Mode Edit Screen



Volume Dispense Mode Operation



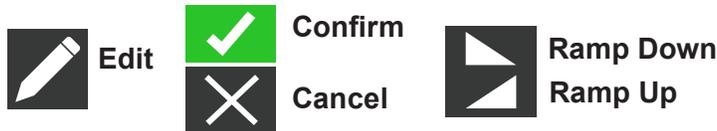
General Preparation

- Verify the correct transfer tubing is securely attached to the pump head.
- Verify all fluids and output containers are ready.
- Turn on the drive on using the power switch located at the back of the drive.
NOTE: If User Levels is enabled you may be prompted for a username and password (for details see “User Management” page 25). The touchscreen display will revert to the previously used operation mode.
- Verify that the pump head has been calibrated by checking that Calibration Complete displays on the Main screen (for details see “Pump Head Calibration” page 29).
- If required, prime the pump (for details see “Priming the Pump” page 28).

Procedure begins on next page

Volume Mode (Cont.)

Volume Dispense Mode Operation (Cont.)



Operating the Pump in Volume Mode

1. Tap VOLUME from the Mode Selection screen—the Volume Mode Run screen displays.
2. Tap EDIT to access the Volume Mode Edit screen.
3. Tap VOLUME—the Dispense Volume Screen displays.
 - Tap VOLUME and enter the desired volume using the onscreen keypad.
NOTE: If the volume of fluid is unknown the pump-drive can record fluid dispense volumes (for details see “Volume Record” on page 46).
 - Tap RAMP UP to set the time the pump takes to reach full flow rate (between 0 and 60 seconds) using the onscreen keypad.
 - Tap RAMP DOWN to set the time the pump takes to stop at the end of each dispense operation (between 0 and 60 seconds) using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to Volume Mode Edit screen).
4. Tap INTERVAL TIME to set the amount of time the pump will pause between each operation—the Interval Time screen displays.
NOTE: If the interval time is set to 0 (zero) the pump-drive will require a start input (from either the touchscreen or a wired input) to start the next dispense.
 - Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Volume Mode Edit screen).
5. Tap FLOW RATE—the Flow Rate Edit screen displays.
 - Tap UNITS to access the Flow Units screen and select the desired flow unit from the available list.
 - Tap CONFIRM to save (or CANCEL returning to previous screen).
 - Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Volume Mode Edit screen).

Procedure continues on next page

Volume Mode (Cont.)

Volume Dispense Mode Operation (Cont.)



Operating the Pump in Volume Mode (Cont.)

6. Tap HEAD OPTIONS—the Head Options screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to the Volume Mode Edit screen).
7. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle—the Batch Total screen displays.
 - Enter the desired number of dispenses in a batch using the onscreen keypad.
 - NOTE:** If required, tap INFINITE to select an infinite number of dispense cycles. If INFINITE is selected the pump will run continuously.
 - Tap CONFIRM to save (or CANCEL returning to the Volume Mode Edit screen).
8. If required, tap ANTI-DRIP—the Anti-Drip screen displays (for details see “Anti-Drip” on page 52).
 - NOTE:** Anti-Drip is unavailable on gear pumps.
 - Tap ON or OFF to enable or disable the Anti-Drip feature.
 - If enabled, enter the desired degrees of reverse rotation using the onscreen keypad.
 - NOTE:** Typical values range from 5 to 45 degrees.
 - Tap CONFIRM to save (or CANCEL returning to the Volume Mode Edit screen).
9. Tap CONFIRM to return to the Volume Mode Run screen.
10. Tap DIRECTION to select either clockwise or counterclockwise flow direction (see above).
 - NOTE:** Flow Direction is unavailable on single direction gear pumps and will be grayed out.
11. Tap START. The pump will now operate until the batch total is completed or until PAUSE or STOP is tapped.
12. If required, adjustments can be made to any of the Volume Mode settings during operation. To make any adjustments:
 - Tap STOP and then repeat steps 2 through 10 (pages 49–50).
 - Tap CONTINUE to complete the pump operation once the desired changes have been made.

Volume Mode (Cont.)

Saving Volume Mode Setting as a New Program

Changes made to mode parameters can be saved as a new program for easier access to frequently used settings.

NOTE: if User Levels is enabled only users with authorization can create and modify programs (for details see “User Management” page 25).



Saving Mode Parameters to a New Program

1. If required, edit the Volume Mode settings as desired.
2. Tap MODE NAME BANNER to return to the Mode Selection screen.
3. Tap NEW PROGRAM.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.
4. Tap VOLUME. The Volume New Program screen displays with the last settings used in the Volume Mode.
5. Tap PROGRAM 1. If required, delete the characters using the back arrow on the onscreen keypad and then enter the desired program name (up to 8 characters).
6. Tap CONFIRM to save (or CANCEL to delete).

NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

Volume Mode (Cont.)

Anti-Drip



The Anti-Drip feature minimizes drips after fluid has been dispensed by reversing the pump direction to draw fluid back from the end of the tubing. Fluid drip can be caused by numerous factors including tube size, tube orientation, and fluid viscosity.

NOTE: Anti-Drip is unavailable on gear pumps.

Enabling or Disabling the Anti-Drip Feature

1. Tap VOLUME on the Mode Selection screen—the Volume Mode screen displays.
2. Tap EDIT.
3. Tap ANTI-DRIP—the Anti-Drip screen displays.
4. Tap ON or OFF to enable or disable ANTI-DRIP.
5. If enabled, enter the desired degrees of reverse rotation using the onscreen keypad.
NOTE: Typical values range from 5 to 45 degrees.
6. Tap CONFIRM to save (or CANCEL returning to the Volume Mode screen).

Volume Record

The Volume Record feature can be used to record unknown fluid volumes.

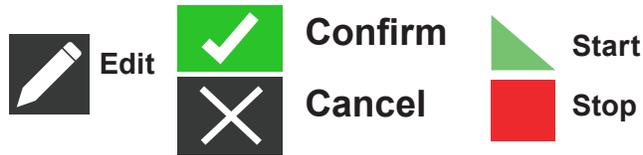


General Preparation

- Verify the correct transfer tubing is securely attached to the pump head.
- Verify all fluids and output containers are ready.
- Turn on the drive on using the power switch located on the rear of the drive.
NOTE: If User Levels is enabled you may be prompted for a username and password (for details see “User Management” page 25). The touchscreen display will revert to the previously used operation mode.
- Verify that the pump head has been calibrated by checking that Calibration Complete icon is displayed on the Main screen (for details see “Pump Head Calibration” on page 29).
- If required, prime the pump (for details see “Priming the Pump” page 28).

Volume Mode (Cont.)

Volume Record (Cont.)



Recording a Fluid Volume

1. Tap VOLUME from the Mode Selection screen—the Volume Mode Run screen displays.
2. Tap EDIT to access the Volume Mode Edit screen.
3. Tap RECORD—the Record Dispense screen displays.
4. Tap FLOW RATE to make adjustments to the flow rate—the Flow Rate screen displays.
 - Tap FLOW to enter the desired flow rate using the onscreen keypad.
 - Tap UNITS to enter the desired flow rate units using the onscreen keypad.
 - Tap CONFIRM to save returning to the Record Dispense screen.
5. Tap START. The drive begins pumping operation while recording the fluid volume.
6. If required, adjustments can be made to flow rate during operation. To make adjustments:
 - Tap STOP and then repeat steps 4, 5 above.
 - Tap START to complete the pump operation once the desired changes have been made.

NOTE: If required, tap STOP and then CANCEL to discard recording and return to the Volume Mode Edit screen.
7. Tap STOP when the desired volume of fluid has been pumped. The recorded dispense volume will now be displayed under VOLUME.
8. Tap CONFIRM to save (or CANCEL to discard recording returning to Volume Mode Edit screen). If saved, the recorded dispense volume will now be displayed under VOLUME.
9. Tap CONFIRM—the Volume Mode Run screen displays.

Analog Input Mode



CAUTION: Power must be turned off before connecting the external analog control cable to prevent damage to the drive.

Masterflex MasterSense pump-drives support and control analog input using suitable equipment through the pump-drive's 31-PIN connection port. Analog input can be used in place of, or in addition to, MasterflexLive™. (See also "31-PIN Electrical Connections" page 82.)

Analog Input Mode Run Screen

The Analog Input Mode Run screen displays on the touchscreen during analog input operation. The screen displays currently selected operation dispense settings from an external remote control device (ex. process controller). The Analog Input Mode Run screen is accessed by selecting ANALOG INPUT from the Mode Selection screen.



Procedure starts on next page

Analog Input Mode (Cont.)

Analog Input Mode Run Screen (Cont.)



1. **MODE NAME BANNER.** It displays the Mode Name as well as the currently selected input type (ANALOG CURRENT or ANALOG VOLTAGE). Tap the Mode Name Banner to return to the Mode Selection screen.
2. **FLOW DIRECTION.** Tap **DIRECTION** to select either clockwise or counterclockwise flow direction (see above).
NOTE: Flow Direction is unavailable on single direction gear pumps and will be grayed out.
3. **PRIME.** Press-and-hold the Prime icon to prime the pump-drive (for details see “Priming the Pump” page 28).
4. **START/STOP.** During operation, the display will change from **START** to **STOP**.
5. **SCREEN LOCK.** Tap to **LOCK**, tap again to **UNLOCK**. When tapping **UNLOCK** an operator will be prompted with a pop-up message to **CONFIRM**..

Analog Input Mode (Cont.)

Analog Input (Cont.)

General Preparation

- Verify the correct transfer tubing is securely attached to the pump head.
- Verify all fluids and output containers are ready.
- Turn on the drive on using the power switch located at the rear of the drive.
NOTE: If User Levels is enabled you may be prompted for a username and password (for details see “User Management” page 25). The touchscreen display will revert to the previously used operation mode.
- Verify that the pump head has been calibrated by checking that Calibration Complete is displayed on the Analog Input mode edit screen (for details see “Pump Head Calibration” on page 29).
- If required, prime the pump (for details see “Priming the Pump” page 28).
- Confirm that the pump-drive is connected to the appropriate equipment through the drive’s 31-PIN connection port (for details see “31-PIN Electrical Connections” page 82).



Operating Analog Input Control and Monitoring

1. Tap ANALOG INPUT on the Mode Selection screen—the Analog Input Mode Run screen displays.
2. Tap EDIT—the Analog Input Mode Edit screen display.
3. Tap the desired analog input type from the available list.
4. If using either ANALOG VOLTAGE or ANALOG CURRENT:
 - Select the desired current or voltage operating range from the available list.
 - Tap CONFIRM to save (or CANCEL returning to the previous screen).

NOTE: Tap STOP on the pump-drive touchscreen to override the remote control device and immediately stop the pump operation.

NOTE: If locked, the screen will need to be unlocked before the pump operation can be stopped.

Analog Input Mode (Cont.)

Saving Analog Input Mode Setting as a New Program

Changes made to mode parameters can be saved as a new program for easier access to frequently used settings.

NOTE: If User Levels is enabled only users with authorization can create and modify programs (for details see “User Management” page 25).



Saving Mode Parameters to a New Program

1. If required, edit the Analog Input Mode settings as desired.
2. Tap MODE NAME BANNER to return to the Mode Selection screen.
3. Tap NEW PROGRAM.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.
4. Tap ANALOG INPUT. The Analog Input New Program screen displays with the last settings used in the Analog Input Mode.
5. Tap PROGRAM 1. If required, delete the characters using the back arrow on the onscreen keypad and then enter the desired program name (up to 8 characters).
6. Tap CONFIRM to save, or DELETE to cancel.

NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

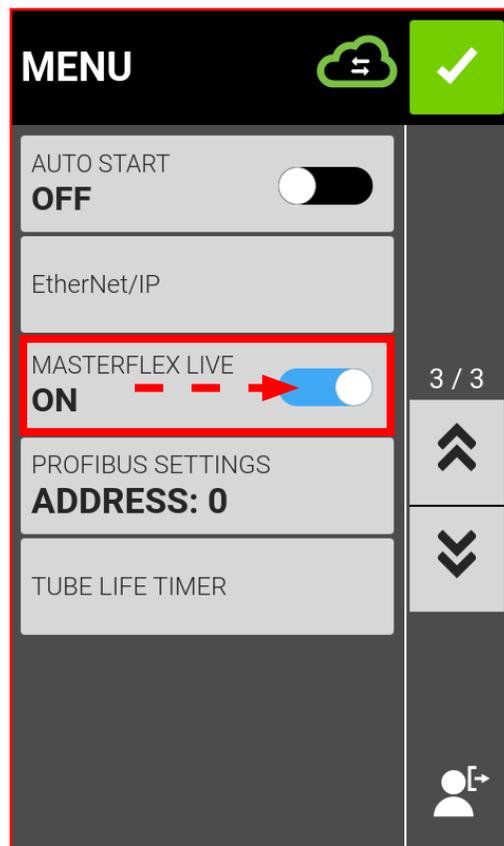
MasterflexLive

Masterflex MasterSense Piston & Gear Process Pump-Drives can be monitored through the MasterflexLive website using an EtherNet or Wi-Fi connection. MasterflexLive can be accessed from any suitable digital device connected to the internet, such as a laptop, tablet, smartphone, or desktop computer. (See www.avantorsciences.com/masterflex, search “**MasterflexLive.**”)

- On the Menu screen tap the “MASTERFLEXLIVE” toggle to ON (see below).

NOTE: The touchscreen does not change in any way from when the pump-drive is connected to MasterflexLive.

- Move to the Continuous, Time, or Volume screens to display the currently selected operation dispense settings.



Procedure starts on next page

MasterflexLive Run Screen



General Preparation

- Verify the correct transfer tubing is securely attached to the pump head.
- Verify all fluids and output containers are ready.
- Turn on the drive on using the power switch located at the rear of the drive.
NOTE: If User Levels is enabled you may be prompted for a username and password (for details see “User Management” page 25). The touchscreen display will revert to the previously used operation mode.
- Verify that the pump head has been calibrated by checking that Calibration Complete icon is displayed on the Time Mode Edit screen.
- If required, prime the pump (for details see “Priming the Pump” on page 28).
- Confirm that the pump-drive is connected to the internet via an active Wi-Fi or EtherNet connection.
- Confirm the laptop, tablet, smartphone, or desktop computer being used is connected to the internet.

Connecting to MasterflexLive™

1. Go to www.avantorsciences.com/masterflex and enter “MasterflexLive” into the search bar.
2. Select “Live” or “Register” (far right) to log in or create a new account.
3. Follow the onscreen prompts to add your MasterSense Piston & Gear Process Pump-drive.
NOTE: The Pump-drive ID is the MAC Address on the back panel and the Device Model Number are listed under “Device Information” screen.
4. Select the desired pump-drive from the list of available devices—the MasterflexLive Web App Run screen displays.



Stop



Locked



Unlocked

NOTES

- Once the pump-drive is connected to MasterflexLive™ the pump-drive can be monitored from the MasterflexLive™ Web App Run screen.
- Tap STOP on the pump-drive touchscreen to stop the pump operation.
NOTE: If locked, the screen will need to be unlocked before the pump operation can be stopped.

Custom Program Modes

Custom programs allow users to create easily accessible programs for frequently used pump mode settings.

NOTE: If User Levels is enabled only users with authorization can create and modify programs (for details see “User Management” on page 18).

Adding a New Program: Continuous Mode

Adding a New Continuous Mode Program



1. Tap NEW PROGRAM on the Mode Selection screen—the New Program screen displays.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.
2. Tap CONTINUOUS—the Continuous New Program screen displays.
3. Tap PROGRAM1. If required, delete the characters using the back arrow on the onscreen keypad and then enter the desired program name (up to 8 characters).
4. Select the desired flow rate and flow units:
 - Tap FLOW RATE to access the Flow Rate screen.
 - Tap UNITS to access the Flow Units screen and select the desired flow unit from the available list.
 - Tap CONFIRM to save, (or CANCEL returning to the Flow Rate screen).
 - Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Continuous New Program screen).
5. Tap HEAD OPTIONS—the Head Options screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to the Continuous New Program screen).
6. Tap CONFIRM to save (CANCEL discarding changes).

NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

Custom Program Modes (Cont.)

Adding a New Program: Time Mode

Adding a New Time Mode Program



1. Tap NEW PROGRAM on the Mode Selection screen—the New Program Screen displays.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL to view additional pages.
2. Tap TIME—the Time New Program Screen displays.
3. Tap PROGRAM. If required, delete the characters using the back arrow on the onscreen keypad and then enter the desired program name (up to 8 characters).
4. Tap ON TIME to set the amount of time for each pump operation—the On Time Edit screen displays.
 - Tap HR, MIN, SEC, or TENTHS and enter the desired time using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Time New Program screen).
 - Tap OFF TIME to set the amount of time the pump will pause between each operation. The Off Time Edit Screen displays.
NOTE: If the off time is set to 0 (zero) the pump-drive will require a start input (from either the touchscreen or a remote input to start the next dispense).
 - Tap HR, MIN, SEC, or TENTHS and enter the desired time using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Time New Program screen).
 - Tap FLOW RATE—the Flow Rate Edit screen displays.
 - Tap UNITS to access the Flow Units screen and select the desired flow unit from the available list.
 - Tap CONFIRM to save (or CANCEL returning to the previous screen).
 - Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Time New Program screen).

Procedure starts on next page

Custom Program Modes (Cont.)

Adding a New Program: Time Mode (Cont.)

Adding a New Time Mode Program (Cont.)



5. Tap HEAD OPTIONS—the Head Options screen displays.
6. Select the desired pump head size from the list of available options.
7. Tap CONFIRM to save (or CANCEL returning to the Time New Program screen).
8. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle—the Batch Total screen will be displayed.
9. Enter the desired number of dispenses in a batch using the onscreen keypad.
NOTE: If required, tap INFINITE to select an infinite number of dispense cycles. If infinite is selected, the pump will run continuously.
10. Tap CONFIRM to save (or CANCEL returning to the Time New Program screen).
11. Tap CONFIRM to save (or CANCEL discarding changes).

NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

Custom Program Modes (Cont.)

Adding a New Program: Volume Mode

Adding a New Volume Mode Program

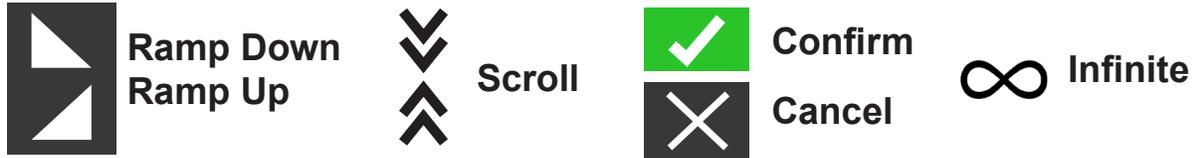


1. Tap NEW PROGRAM from the Mode Selection screen—the New Program screen displays.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.
2. Tap VOLUME—the Volume New Program screen displays.
3. Tap PROGRAM1. If required, delete the characters using the back arrow on the onscreen keypad and then enter the desired program name (up to 8 characters).
4. Tap VOLUME—the Dispense Volume screen displays.
 - Tap VOLUME and enter the desired volume using the onscreen keypad.
NOTE: If the fluid volumes unknown the pump-drive can record fluid dispense volumes.
 - Tap RAMP UP to set the time the pump takes to reach full flow rate (between 0 and 60 seconds) using the onscreen keypad.
 - Tap RAMP DOWN to set the time the pump takes to stop at the end of each dispense operation (between 0 and 60 seconds) using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Volume New Program screen).
 - Tap INTERVAL TIME to set the amount of time the pump will pause between each operation—the Interval Time screen displays.
NOTE: If the interval time is set to 0 (zero) the pump-drive will require a start input (from either the touchscreen or a remote input to start the next dispense.
 - Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - Tap CONFIRM to save (or CANCEL returning to the Volume New Program screen).

Custom Program Modes (Cont.)

Adding a New Program: Volume Mode (Cont.)

To add a new Volume Mode Program (Cont.)



5. Tap FLOW RATE—the Flow Rate Edit screen displays.
6. Tap UNITS to access the Flow Units screen and select the desired flow unit from the available list.
7. Tap CONFIRM to save (or CANCEL returning to the previous screen).
8. Tap FLOW and enter the desired flow rate using the onscreen keypad.
9. Tap CONFIRM to save (or CANCEL returning to the Volume New Program screen).
10. Tap HEAD OPTIONS—the Head Options Screen displays.
11. Select the desired pump head size from the list of available options.
12. Tap CONFIRM to save (or CANCEL returning to the Volume New Program screen).
13. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle—the Batch Total screen displays.
14. Enter the desired number of dispenses in a batch using the onscreen keypad.
NOTE: If required, tap INFINITE to select an infinite number of dispense cycles. If infinite is selected, the pump will run continuously.
15. Tap CONFIRM to save (or CANCEL returning to the Volume New Program screen).
16. If required, tap ANTI-DRIP. The Anti-Drip Screen will be displayed (for details see “Anti-Drip” page 46).
NOTE: Anti-Drip is unavailable on gear pumps.
17. Tap ON or OFF to enable or disable the Anti-Drip feature.
18. If enabled, enter the desired degrees of reverse rotation using the onscreen keypad.
NOTE: Typical values range from 5 to 45 degrees.
19. Tap CONFIRM to save (or CANCEL returning to the Volume New Program screen).
20. Tap CONFIRM to save (or CANCEL discarding changes).

Custom Program Modes (Cont.)

Adding a New Program: Volume Mode (Cont.)

To add a new Volume Mode Program (Cont.)



Ramp Down
Ramp Up



Scroll



Confirm

Cancel



Infinite

NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

Custom Program Modes (Cont.)

Adding a New Program: Analog Input Mode

Adding a New Analog Input Mode Program



1. Tap NEW PROGRAM from the Mode Selection screen—the New Program screen displays.

NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.

2. Tap ANALOG INPUT—the New Program screen displays.

NOTE: If NEW PROGRAM is not displayed on the Mode Selection screen tap SCROLL KEYS to display additional pages.

3. Tap PROGRAM1. If required, delete the characters using the back arrow on the onscreen keypad and then enter the desired program name (up to 8 characters).
4. Tap INPUT—the Analog Type screen displays.
5. Tap the desired analog type from the available list.
6. If using either ANALOG VOLTAGE or ANALOG CURRENT:
 - Select the desired current or voltage operating range from the available list.
 - Tap CONFIRM to save (or CANCEL returning the Analog Input New Program screen),
7. Tap HEAD OPTIONS—the Head Options Screen displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to the Analog Input New Program screen).
8. Tap CONFIRM to save (or CANCEL discarding changes).

NOTES

- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection screen.
- If there are multiple programs tapping SCROLL KEYS displays additional pages.

Custom Program Modes (Cont.)

Using Program Modes

Custom programs will appear in alphabetical order at the bottom of the Mode Selection Screen. If there are multiple programs tapping SCROLL KEYS will display additional pages.



General Preparation

- Verify the correct transfer tubing is securely attached to the pump head.
- Verify all fluids and output containers are ready.
- Turn on the drive on using the power switch located on the rear of the drive.
NOTE: If User Levels is enabled you may be prompted for a username and password (for details see “User Management” page 25). The touchscreen display will revert to the previously used operation mode.
- Verify that the pump head has been calibrated by checking that Calibration Complete icon is displayed on the Analog Input Mode edit screen (for details see “Pump Head Calibration” on page 29).
- If required, prime the pump (for details see “Priming the Pump” on page 28).



To use a program:

1. Select a program from the Mode Selection screen—the Program Run screen displays.
2. Tap START to begin pump-drive operation using the displayed program settings.
3. If required, tap PAUSE or STOP during operation.
NOTE: The pump cannot be paused during Continuous Mode operation.



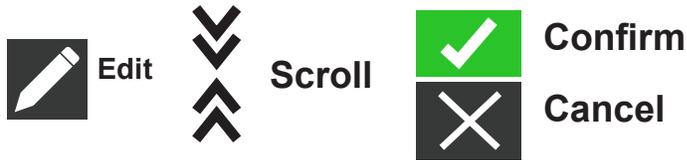
NOTES

- Tap INFORMATION to view the selected program’s settings.
- Individual settings cannot be edited from the Program Run screen.

Custom Program Modes (Cont.)

Editing a Program

NOTE: If User Levels is enabled only users with authorization can create and modify programs (for detail see “User Management” page 25).



Editing Procedure

1. Tap EDIT located next to the desired program name on the Mode Selection screen.
NOTE: If there are multiple programs, tap SCROLL KEYS to display additional pages)—the Program Edit screen displays.
2. Edit the settings for the selected mode as desired. For instructions on editing individual mode settings see:
 - “Adding a New Program: Continuous Mode” page 30.
 - “Adding a New Program: Time Mode” page 34.
 - “Adding a New Program: Volume Mode” page 40.
 - “Adding a New Program: Analog Input Mode” page 48.**NOTE:** Once the individual mode settings have been edited and saved the Program Edit screen displays.
3. Tap CONFIRM to save (or CANCEL returning to the Mode Selection screen).

Custom Program Modes (Cont.)

Editing a Program (Cont.)

NOTE: If User Levels is enabled only users with authorization can create and modify programs (for detail see “User Management” page 25).



Edit



Scroll



Delete



Cancel

Deleting a Program

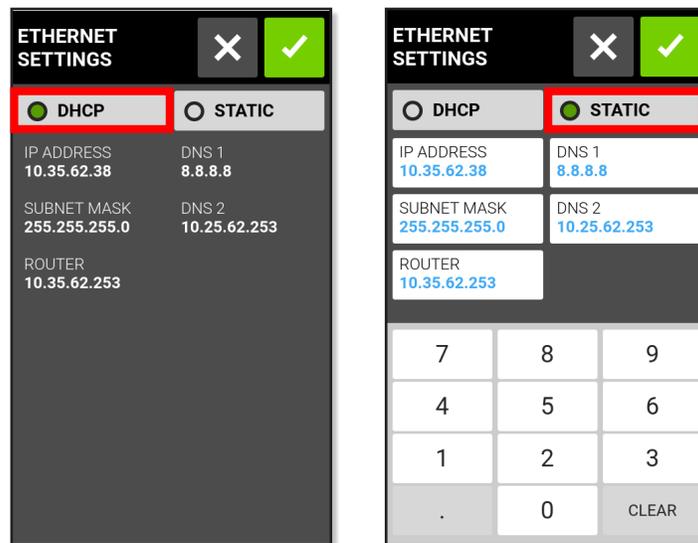
1. Tap EDIT located next to the desired program name on the Mode Selection screen
NOTE: If there are multiple programs tap SCROLL KEYS to display additional pages—the Program Edit screen displays.
2. Tap DELETE to delete the program returning the Mode Selection screen (or CANCEL returning to the previous screen).

Section 4: Communications Specifications

EtherNet/IP™ Mode

In EtherNet/IP mode, the pump can be operated in Continuous, Volume, or Time modes. Pump-drives are equipped with EtherNet/IP for real-time control via a Programmable Logic Controller (PLC). The Electronic Data Sheet (.EDS) command file is available for download from the ODVA (Organisme de Developpement de la Vallee de l'Artibonite) English language website at <https://www.odva.org>.

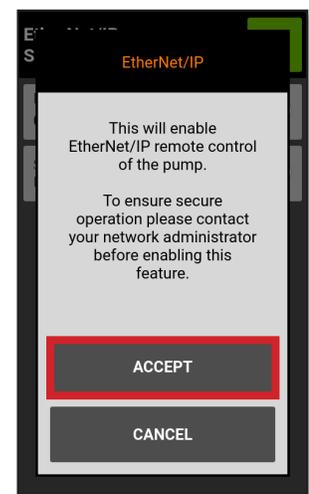
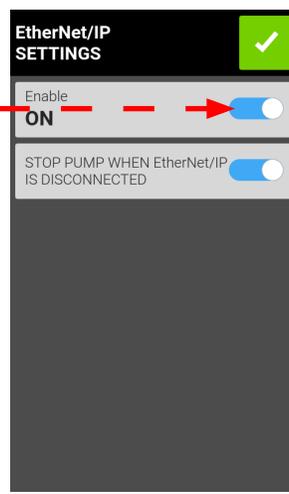
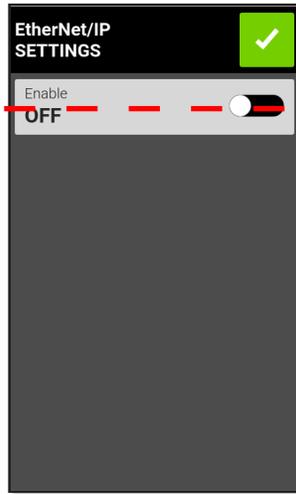
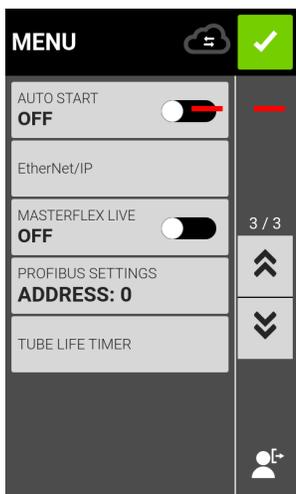
Verify that your pump-drive and PLC, along with an operator's computer, are all connected to the same network. Also, verify the computer's IP address is within the subnet mask range of the PLC and the pump-drive. The default addressing method for the pump-drive is Dynamic Host Configuration Protocol (DHCP), see Figures 1 below. A static IP address may be assigned through the EtherNet settings menu (see below).



Figures 1

Enabling EtherNet/IP Mode

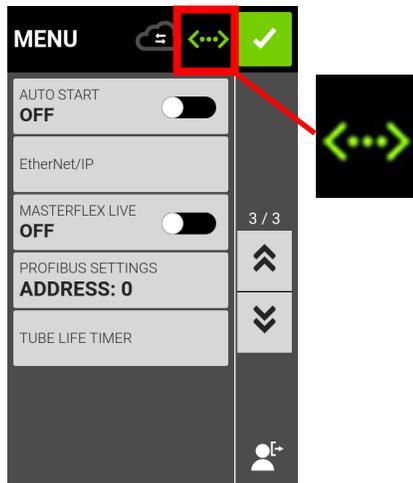
- On the Menu touchscreen tap the EtherNet/IP switch moving it from OFF to ON (see Figures 2 below).
- The EtherNet message screen displays, tap its “Accept” button (see Figure 3 below).



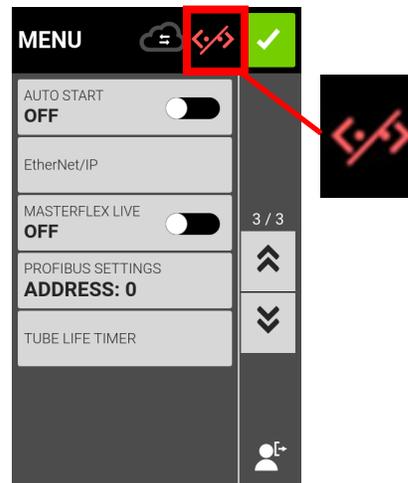
Figures 2

Figure 3

Successful Connection



Unsuccessful Connection



EtherNet/IP™ Mode (Cont.)

Once the EtherNet/IP has been enabled and configured (see Figure 4 below), an operator is able to view the pump-drive from a PLC. To enable remote control, configure the pump-drive from a PLC using the bit “Pump1:O.Toggle_Remote_Local_Control_1_to_0.”

NOTE: The bit changes state from local to remote on a 1-to-0 transition. Once enabled, the EtherNet/IP banner will appear at the top of the pump-drive screen (see below).



Figure 4

EtherNet/IP™ Input Data

Input data: 56 Bytes of Input Data from Pump to Master

Bytes	Data Type	Description
0—3	32-bit INT	<u>Pump Status</u> Bit 0: Status OK Bit 1: Pump Running Bit 2: Dispense Running Bit 3: Tube Uncalibrated Bit 4: Head Open Bit 5: Reserved Bit 6: Flow Direction CCW Bit 7: Remote Control Bit 8—31: Reserved
4	BYTE	Dispense Mode
5	BYTE	Tube Size
6	BYTE	Flow Units
7	BYTE	Reserved Pad
8—11	FLOAT	Cumulative Volume
12—15	FLOAT	Remaining Dispense Volume
16—19	FLOAT	Remaining Dispense On Seconds
20—23	FLOAT	Remaining Dispense Off Seconds
24—27	32- bit INT	Batch Count Current
28—31	32- bit INT	Batch Count Total
32—35	FLOAT	Minimum Flow Rate
36 - 39	FLOAT	Current Flow Rate
40—43	FLOAT	Maximum Flow Rate
44—45	16- bit INT	Remaining Dispense On Time Days
46	BYTE	Remaining Dispense On Time Hours
47	BYTE	Remaining Dispense On Time Minutes
48	BYTE	Remaining Dispense On Time Seconds
49	BYTE	Remaining Dispense On Time Tenths
50—51	16- bit INT	Remaining Dispense Off Time Days
52	BYTE	Remaining Dispense Off Time Hours
53	BYTE	Remaining Dispense Off Time Minutes
54	BYTE	Remaining Dispense Off Time Seconds
55	BYTE	Remaining Dispense Off Time Tenths

EtherNet/IP™ Output Data

Input data: 28 Bytes of Output Data from Pump to Master

Bytes	Data Type	Description
0	BYTE	<u>Pump Control</u> Bit 0: Run/Pause (1 = RUN; 0 = PAUSE) Bit 1: Stop and Reset Dispense (1 to 0 transition) Bit 2: Toggle Remote/Local Control (1 to 0 transition) Bit 3: Clear Cumulative Volume (1 to 0 transition) Bit 4: Reserved Bit 5: Reserved Bit 6: Set Flow Direction CCW (1 = CCW, 0 = CW) Bit 7: Reserved
1	BYTE	Reserved Pad
2	BYTE	Reserved Pad
3	BYTE	Reserved Pad
4	BYTE	Set Dispense Mode (0 = CONT, 1 = TIME, 2 = VOL)
5	BYTE	Reserved Pad
6	BYTE	Set Flow Units (see Table 3)
7	BYTE	Reserved pad
8 - 11	FLOAT	Set Flow Rate
12 - 15	FLOAT	Set Dispense Volume
16 - 19	FLOAT	Set Dispense On Seconds
20 - 23	FLOAT	Set Dispense Off Seconds
24 - 27	32-bit INT	Set Batch Count Total (0 = infinite)

Masterflex Flow Units Correlations

Index	1800 & 6000 RPM
1	mL/min
2	mL/hr
3	L/min
4	L/hr
5	L/day
6	µL/min
7	µL/hr
8	gal/min
9	gal/hr
10	gal/day
11	oz/min
12	oz/hr
13	cum/hr
14	RPM
15	%

Profibus

In Profibus mode the pump-drive will operate remotely in Continuous, Volume, or Time mode.

Profibus Mode

Verify the operator computer and the PLC are both connected to a network switch. Also, verify the pump can send/receive ping commands from the computer. Verify the process control is running and connect to the network.

Connect the 31-PIN Profibus cable to the pump-drive's side connector, or to the Profibus connector, either on the Profibus module, or on the process controller itself.

Profibus Settings



Settings



Scroll

NOTE: Verify the pump-drive is connected to the PLC and is in Profibus mode.

Selecting Profibus Settings

1. Tap SETTINGS.
2. The MENU screen displays (see Figure 5 below).
3. Scroll down to page 3/3 and access PROFIBUS SETTINGS.
4. Once a field is selected enter the PROFIBUS SETTINGS screen (see Figure 6 below). Assign the Profibus address as a value in between 1 and 126. (The default Profibus address is 7.)
5. Verify the pump-drive and the PLC user interface are configured for the same address; confirm by pressing the green Confirm checkmark at the top of the screen.

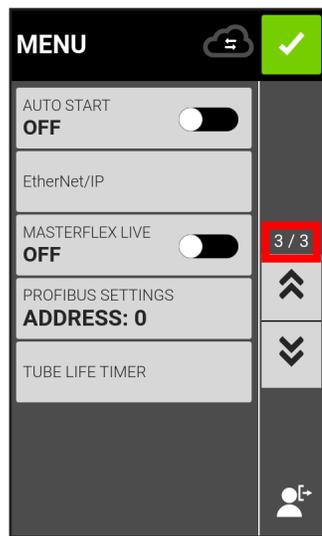


Figure 5

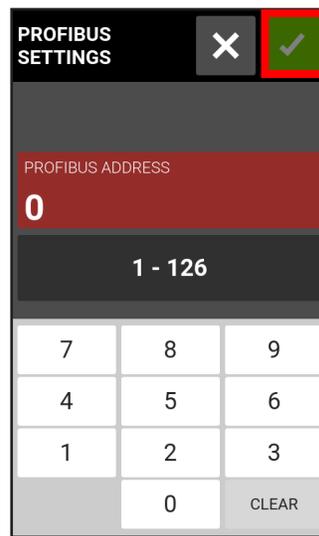


Figure 6

Profibus Data

The MASTERFLEX Pump-drive operates as a DP-V0 Slave.

GSD File: CPMP0FF8.GSD

ID Number: 0FF8 HEX

Default Slave Address: 7

Cyclic Input Data: 56 bytes

Cyclic Output Data: 28 bytes

Table 1 below lists the 56 bytes of cyclic input data, from pump to master.

Cyclic Input (pump → master, 56 bytes)		
Data	Size in Bytes	Data Type
Pump Status	4	unsigned integer
Dispense Mode	1	unsigned integer
Tube Size	1	unsigned integer
Flow Units	1	unsigned integer
Padding (not used)	1	unsigned integer
Cumulative Volume	4	decimal floating-point
Remaining Dispense Volume	4	decimal floating-point
Remaining Dispense On Seconds	4	decimal floating-point
Remaining Dispense Off Seconds	4	decimal floating-point
Current Batch Count	4	unsigned integer
Total Batch Count	4	unsigned integer
Minimum Flow Rate	4	decimal floating-point
Current Flow Rate	4	decimal floating-point
Maximum Flow Rate	4	decimal floating-point
Remaining Dispense On Days	2	unsigned integer
Remaining Dispense On Hours	1	unsigned integer
Remaining Dispense On Minutes	1	unsigned integer
Remaining Dispense On Seconds	1	unsigned integer
Remaining Dispense On Tenths	1	unsigned integer
Remaining Dispense Off Days	2	unsigned integer
Remaining Dispense Off Hours	1	unsigned integer
Remaining Dispense Off Minutes	1	unsigned integer
Remaining Dispense Off Seconds	1	unsigned integer
Remaining Dispense Off Tenths	1	unsigned integer

Profibus Data (Cont.)

NOTE: Converting multi-byte data correctly will depend on the byte order configuration of the master. The 4-byte decimal floating-point values are represented in IEEE-754 floating point format. Pump Status, a 4-byte unsigned integer as shown in **Table 1** (previous page), indicates the pump's operation in separate bits. See **Table 2** below for the description of each bit in Pump Status.

Table 2

Pump Status	
Status OK	bit 0
Pump Running	bit 1
Dispense On	bit 2
Tube Uncalibrated	bit 3
Head Open	bit 4
PROFIBUS Control	bit 5
Flow Direction CCW	bit 6
Remote Control	bit 7

Table 3 below lists the 28 bytes of cyclic output data, from master to pump.

Cyclic Input (pump → master, 28 bytes)		
Data	Size in Bytes	Data Type
Pump Control	4	unsigned integer
Set Dispense Mode	1	unsigned integer
Set Tube Size	1	unsigned integer
Set Flow Units	1	unsigned integer
Padding (not used)	1	unsigned integer
Set Flow Rate	4	decimal floating-point
Set Dispense Volume	4	decimal floating-point
Set Dispense On Seconds	4	decimal floating-point
Set Dispense Off Seconds	4	decimal floating-point
Set Total Batch Count	4	unsigned integer

Pump Control, a 4-byte unsigned integer as shown in **Table 3** above, controls the pump's operation in separate bits. See **Table 4** (next page) for the description of each bit in Pump Control.

Table 4

Pump Control	
Run (1) Pause (0)	bit 0
Stop and Reset Dispense (1 to 0)	bit 1
Toggle Remote/Local Control (1 to 0)	bit 2
Clear Cumulative Volume (1 to 0)	bit 3
Set Flow Direction CCW (1=CCW, 0=CW)	bit 6

A transition on bit 2 of Pump Control will toggle between local and remote control of the pump-drive. For example, if the pump-drive is in local mode, then a 1-to-0 transition will put the pump-drive into PROFIBUS remote control mode; only in this mode can any change in the cyclic output data influence the pump-drive and be reflected in the cyclic input data.

Set Dispense Mode can be one of the following:

- Continuous
- Time Dispense
- Volume Dispense

Set Tube Size and Set Flow Units are integer numbers, beginning with 1. Entered numbers corresponding to the pump-drive's local menu list on the touchscreen interface. For example, if tube size is listed as "13" on the local menu list, then "13" corresponds to a value "1" for Tube Size output value flow units in "gal/hr." The local menu list then corresponds to a value of "9" for the Flow Units output value.

- Set Flow Rate is a decimal floating-point number. This value must be between the Minimum Flow Rate and Maximum Flow Rate values from the input data.
- Set Dispense Volume is the amount of volume that will be dispensed in Volume Dispense Mode.
- Set Dispense On Seconds is the amount of time the pump will dispense in Time Dispense Mode.
- Set Dispense Off Seconds is used for both Time and Volume dispense modes; this sets the amount of time the pump will pause between dispenses.

Serial Communications Mode

In Serial Communications Mode, the pump can be operated in Continuous Mode. IPC pumps-drives are equipped with a USB-A port for real-time control through serial commands using a computer. (See “Analog Input Mode” on page 54 for details.)

NOTE: A USB-A to USB-A serial cable is required if using USB. (See “Accessories” on page 85 for ordering information.)

Serial Communication Ports

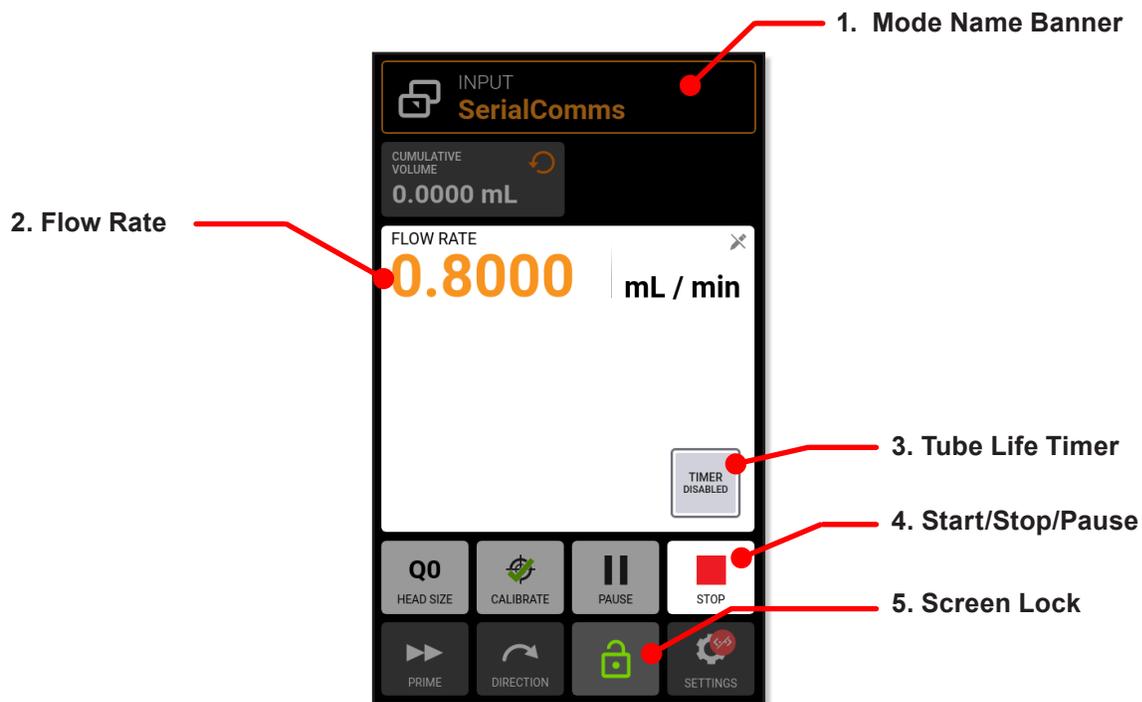


USB-A Port

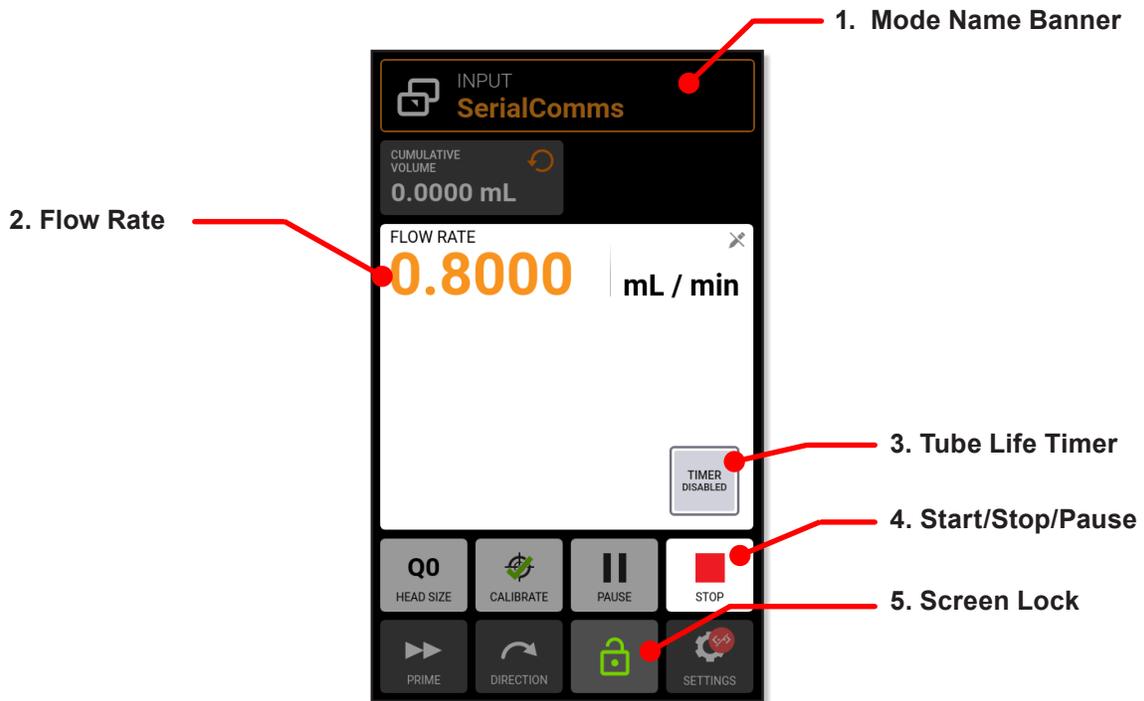
SerialComm Run Screen

The SerialComms Run screen displays on the touchscreen during serial communications input operation. The screen displays the currently selected settings from an external remote control device.

NOTE: Not all touchscreen options are available during Remote Mode operation.



Serial Communications Mode (Cont.)



1. **MODE NAME BANNER.** Displays the currently selected input type.
2. **FLOW RATE.** Displays the current flow rate in the operator-selected unit of measurement.
3. **TUBE LIFE TIMER.** If enabled, the Tube Life Timer displays a countdown timer that tracks operational life of the pump tubes. Tap to access the Tube Life Timer screen.
4. **START/STOP/PAUSE.** During operation, the display will change from START to STOP.
5. **SCREEN LOCK.** Locking the screen disables all touchscreen functions. To lock the screen: tap UNLOCKED. The icon changes to LOCKED. To unlock the screen tap LOCKED and then tap CONFIRM (not shown), the icon changes to UNLOCKED.

Serial Communications Mode (Cont.)

Serial Communication Setup

General Preparation

- Download and install a suitable terminal application, such as PuTTY, onto your computer.
- Verify the pump-drive and computer are connected through either the USB port using a USB-A to USB-A serial cable.
- Verify the computer is configured to send ASCII serial messages at 115200 baud rate.

Setting the Pump-Drive Address

Each command string must begin with the pump-drive address (1-8). It is factory-set at 1 and can be changed using the address change command @ (see the Serial Interface Command Set Table next). The address will be stored permanently (even after the pump has been switched off). The assignment of the address enables the operator to control up to 8 pumps via one interface.

Enabling/Disabling Serial Communications Remote Mode

When not in Serial Communications Remote Mode the pump will only respond to the address set (@) and serial remote mode enable (RE) commands. To enter Serial Communications Remote Mode the control device needs to send the enable command (see the Serial Interface Command Set Table upcoming page 83), this triggers the Serial Communications Mode and the SerialComms Run screen displays on the touchscreen.

Serial Communications Mode (Cont.)

Serial Communication Commands

Command Structure

Example Command	1R20 13
Example Structure	(Address) (Serial Command) (Command Parameter) (ASCII 13 Carriage Return)

The first character of the ASCII serial command string is the address, this is followed by the characters for the serial command (see the Serial Interface Command Set Table next page).

Some commands have an additional parameter following the command character for setting values. The command string is completed by a carriage return (ASCII 13) **13** which initiates the processing of the command. The serial commands settings are at 115200 baud rate, 8 bit, 1 stop bit, no parity.

Serial Communications Mode (Cont.)

Serial Command Interface Table

Command	Function/Description	Example (NOTE: 13's carriage return ASCII 13)	Response	Note
Serial Communications Setup				
@	<ul style="list-style-type: none"> Set serial communications address for pump, from 1 to 8. The default serial address is 1 Each pump must be allocated an individual address, this address is used as the first character in serial commands 	Set current address to 2: @2		
RE_	<ul style="list-style-type: none"> Enable/Disable serial remote mode Toggle serial communications Remote mode, use 1 = enable and 0 = disable after the RE command 	Enable: 1RE1 Disable: 1RE0		
Controlling the Puimp				
H	Start Pump (Response (-) under command G, in case of error message)	1H 13	*	Valid
I	Stop pump dispensing	1I 13	*	
J	Change pump revolution to clockwise direction	1J 13	*	
K	Change pump revolution to counterclockwise direction	1K 13	*	
RC	<ul style="list-style-type: none"> Get current pump status Returns three integers (0,0,0); pump serial address, running status 1 = dispensing and 0 = not dispensing, pump direction 1 = counterclockwise and 0 = clockwise 	1RC 13	1, 0, 1 13 10	
Inquiring and Setting Parameters				
S	Get speed in % of max rotation speed	1S 13	53.2	
S_ _ _ _ (_)	<ul style="list-style-type: none"> Set speed in % of max rotation speed To set a pump speed in percent, enter S followed by 5 digits that represent the percent to one decimal point, ex. 00500 is 50.0% 	1S0063 13	*	XX.X%
R_ _ _ _ (_)	<ul style="list-style-type: none"> Set pump speed in RPM To set a pump speed RPM within the pump range, enter R followed by 3 or more digits that represent the RPM with two decimal points, ex.10000 is 100.00 	1R030050 13	*	Divide by 100 to get the 2 digit decimal => 300.50
R	Get pump speed in RPM	1R 13	4000.12 13 10	

Continued

Serial Communications Mode (Cont.)

Serial Command Interface Table (Cont.)

Command	Function/Description	Example (NOTE: 13 is carriage return ASCII 13)	Response	Note
Serial Communications Setup				
RA	<ul style="list-style-type: none"> Set flow unit index table 00-32 To set a flow rate unit index add the two digit index after the RA command. To get the current index just enter RA See Flow Units Index Correlation Table below 	IRA00 13	*	
RA	Get flow unit return unit index from 00 to 32	1RA 13	01	
RB	Get current cumulative volume in revolutions	1RB 13	4.983 rev 13 10	
:	Get current cumulative volume	1: 13	4.983 ml 13 10	
W	Reset Cumulative Volume	1W 13	*	

Flow Units Index Correlation Table

Index	Gear6000	PistonQ1800
01	mL/min	mL/min
02	mL/hr	mL/hr
03	L/min	L/min
04	L/hr	L/hr
05	L/day	L/day
06	µL/min	µL/min
07	µL/hr	µL/hr
08	gal/min	gal/min
09	gal/hr	gal/hr
10	gal/day	gal/day
11	oz/min	oz/min
12	oz/hr	oz/hr
13	cu m/hr	cu m/hr
14	RPM	RPM
15	%	%

Section 5: Service & Maintenance



CAUTION: Replace the power cord only with one of the same type and rating.



CAUTION: Unplug the pump-drive's power cable from the mains power outlet when cleaning or performing maintenance on the drive.

Firmware Updates



Settings



Scroll



Update
Available

If the pump is connected to the internet, updates can be downloaded directly onto the pump-drive. The pump will update when connected to the internet, either via RJ45 or WI-FI, visit www.avantorsciences.com/masterflex

NOTE: When new updates are available for your device, the update available icon displays at the top of the Settings Menu screen.

Updating

1. Tap **SETTINGS** from any of the mode screens—the Settings screen displays.
2. **SCROLL** through the Settings screen pages to locate **DEVICE INFORMATION**.
3. Tap **DEVICE INFORMATION**—the Device Information screen will be displayed.
4. Tap **CHECK FOR UPDATES** and follow the onscreen prompts.

Installing Updates from a USB Drive

1. Insert the USB drive containing the updates into the pump-drive's USB port.
2. Tap **SETTINGS** on any of the mode screens—the Settings screen displays.
3. **SCROLL** through the Settings screen pages to locate **DEVICE INFORMATION**.
4. Tap **DEVICE INFORMATION**.
5. Tap **CHECK FOR UPDATES** and follow the onscreen prompts.

Restore Factory Settings



Settings



Scroll

NOTE: Factory Reset will erase all settings, including custom programs.

1. Tap **SETTINGS** from any of the mode screens—the Settings screen displays.
2. Scroll through the Settings screen pages to locate **DEVICE INFORMATION**.
3. Tap **DEVICE INFORMATION**.
4. Tap **FACTORY RESET** and follow the onscreen prompts.

Pump Head Cleaning



CAUTION: Unplug the pump-drive's power cable from the mains power outlet when cleaning or performing maintenance on the drive.

- If required, the pump-drive may be wiped clean using a soft cloth lightly moistened with either isopropyl or ethyl alcohol
- Circulate clean water through the pump until the pump run clean.

NOTES

- Care should be taken with the pump-drive's touchscreen to avoid scratching or other wise damaging the surface. Wipe with a soft cloth, do not wipe with dry or abrasive material.
- Do not operate the pump-drive with water on the surface of the touchscreen.
- Any damage caused by improper cleaning is the sole responsibility of the customer.

Accessories and Replacement Parts

To purchase accessories or replacement parts contact the seller of your system.

Pump-Drives Accessories

Description	Part Number
USB-A Serial Cable	MFLX78006-90
Remote Cable 31-pin round connector, 7.9 m (25') cable with stripped wire ends	MFLX07575-80
Pressure Sensor 1½"	MFLX07526-80
Pressure Sensor ¼" NPT	MFLX07526-82
MasterSense Single Use Pressure Sensor Kit, 0-60 PSI	MFLX07526-91

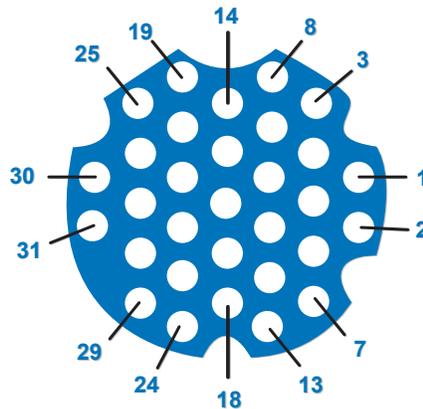
Pump-Drives Replacement Parts

Description	Part Number
Fuse-T3.15A, 5 X 20mm	MFLX77500-25
Replacement Gear Hump Head Mounting Hardware Kit (Gear Drive Only)	MFLX41010-34
Shaft Coupling (Piston Models Only)	MFLX115837

31-PIN Electrical Connections



CAUTION: Power must be turned off before connecting the external analog control cable to prevent damage to the drive.



Contact Arrangements

31-Pin No.	Description	31-Pin No.	Description
1	Speed Control Voltage Input (0–10 V)	13	Motor Running Relay Common
2	Speed Signal Voltage Output (0–10 V)	14	Remote Prime Input
3	Speed Control Current Input (0–20 mA)	15	Open Head Relay Output (N.O.)
4	Remote Start/Stop Input	16	General Alarm Ready Common
5	Speed Control Input Ground Reference	17	Not Used
6	Remote CW/CCW Input	18	Local/Remote Relay Common
7	Speed Signal Current Output (0–20 mA)	19	Open Head Relay Common
8	Remote Start/Stop, CW/CCW, Prime Grnd Ref.	20	General Alarm Relay Output (N.O.)
9	Speed Signal Output Ground Reference	21	Not Used
10	Tach Ground Reference	22	Local/Remote Relay Output (N.O.)
11	Motor Running Relay Output (N.O.)	23–31	Not Used
12	Tach Output (Open Collector)	-	-

Pump Head Replacements

Available A-Mount Gear Pump Heads

Suction Shoe Pump Heads

Part Number	Flow Rate (ml/rev)	Body	Gears	Seals
MFLX07002-14	0.092	316 SS	PPS	PTFE
MFLX07002-25	0.017	316 SS	Graphite	PTFE
MFLX07002-26	0.042	316 SS	Graphite	PTFE
MFLX07002-27	0.084	316 SS	Graphite	PTFE
MFLX07003-02	0.58	316 SS	PPS	Viton® with internal bypass
MFLX07003-04	1.17	316 SS	PPS	Viton® with internal bypass
MFLX73003-14	0.092	316 SS	PEEK	PTFE
MFLX73004-00	0.261	316 SS	PEEK	Viton® with internal bypass
MFLX73004-02	0.58	316 SS	PEEK	Viton® with internal bypass
MFLX73004-04	1.17	316 SS	PEEK	Viton® with internal bypass
MFLX73004-19	0.58	316 SS	PPS	Viton®
MFLX73004-21	1.17	316 SS	PPS	Viton®
MFLX73004-77	0.58	316 SS	PEEK	Viton®

Cavity Pump Heads

Model Number	Flow Rate (ml/rev)	Body	Gears	Seals
MFLX07001-40	0.91	316 SS	PTFE	PTFE with internal bypass
MFLX07001-80	0.64	316 SS	PPS	PTFE with internal bypass
MFLX07002-17	0.32	316 SS	PTFE	PTFE with internal bypass
MFLX07002-23	0.64	316 SS	PTFE	PTFE with internal bypass
MFLX73011-00	0.32	316 SS	PEEK	PTFE
MFLX73011-02	0.32	316 SS	PEEK	PTFE with internal bypass
MFLX73011-08	0.64	316 SS	PEEK	PTFE
MFLX73011-16	0.91	316 SS	PEEK	PTFE
MFLX73011-18	0.91	316 SS	PEEK	PTFE with internal bypass

NOTE: Pump heads with internal bypass are not reversible.

Pump Head Replacements (Cont.)

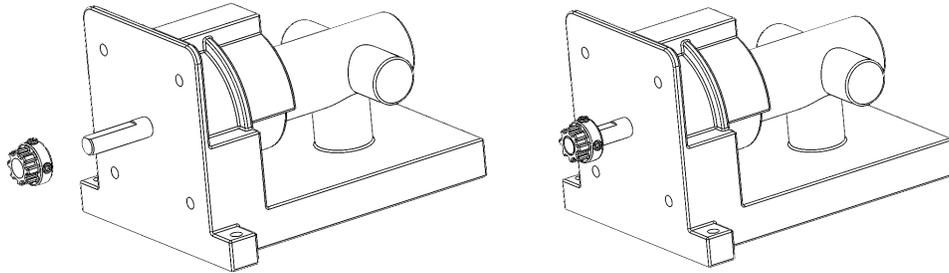
Available Piston Pump Heads: Fluid Metering Inc. (FMI)

Model	Part Number	Stroke Length	Maximum Flow @ 1800 RPM	Mount Type	Material
Q0	MFLX07104-50	3.2 to 80 µl	144 mL/min	Q-type	Stainless/Carbon
Q1	MFLX07104-56	12.8 to 320 µl	576 mL/min	Q-type	Stainless/Ceramic
Q2	MFLX07104-66	28.8 to 720 µl	1296 mL/min	Q-type	Stainless/Ceramic
Q3	MFLX07104-53	51.2 to 1280 µl	2160 mL/min	Q-type	Ceramic/PVDF

Mounting a Ceramic Piston Pump (Cont)

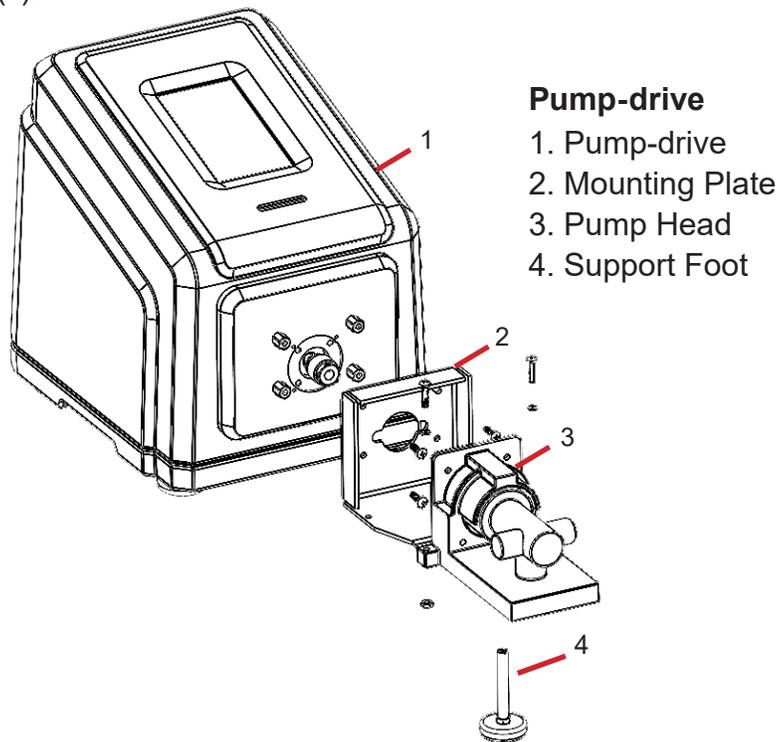
1. Attach the Coupling.

- Place the coupling onto the pump-head shaft and push it on all the way.
NOTE: The Allen screw must be centered on the flat of the pump-head shaft.
- Tighten the coupling (see “2” below bottom) with a 2.5 mm size Allen wrench.



2. Mounting the Pump Head.

1. Coupling hub to be installed flush to end of pump head shaft and tightened.
2. Install mounting plate (2) using (4) #8-32 X 1/2" Lg screws and tighten.
3. Line up coupling hub on pump head with coupling on drive and insert pump head.
4. Using Qty (2) each #8 X 1" Lg screws, insert through pump head flanges and secure with lock washer and nut.
5. Install support foot (4).



Procedure continues on next page

Mounting a Ceramic Piston Pump (Cont)

3. Turning On a New Pump.



Confirm



Cancel

- Plug in the supplied desktop power supply.
- Turn on the drive.
- Navigate to the Continuous, Time, or Volume Mode screens.
- Tap HEAD OPTIONS—the Head Options Screen will be displayed.
- Select the desired pump head size from the list of available options.
- Tap CONFIRM to save (or CANCEL returning to the previous screen).
- Adjust the pump head zero point (for details see pump head documentation shipped with your pump-drive).
- Prime the new pump head (for details see “Priming the Piston Pump” page 28).
- Calibrate the new pump head (for details see “Pump Head Calibration” page 29).
- The new pump head is now ready for operation.

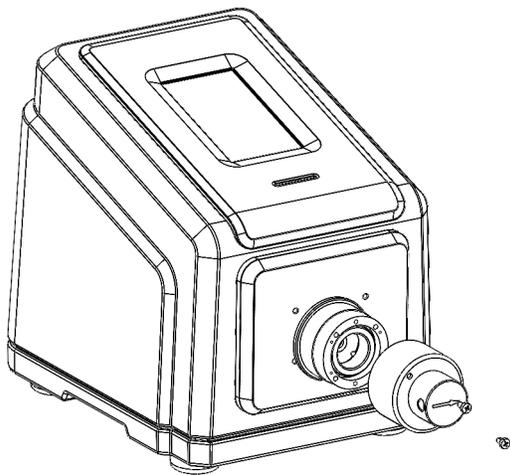
Mounting a Gear Pump



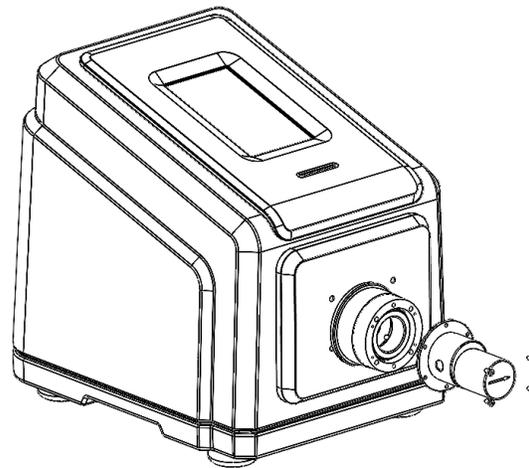
CAUTION: Before mounting a new pump head ensure that the magnet is securely fitted to the drive.

General Preparations and Required Equipment

- Verify the replacement pump head package specifies it is the correct replacement pump head.
- Remove the pump head from its packaging and inspect for any obvious signs of damage.
- Have a Phillips screwdriver size-0 and a 2.5 mm Allen wrench.



A-mount



B-mount

Pump Head Parts

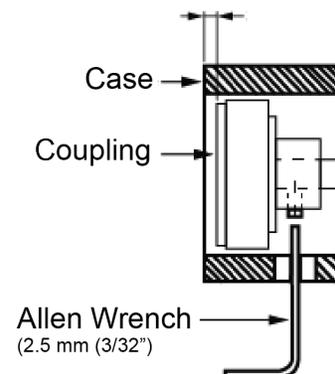
- A. Pump Head
- B. Phillips Flat-Head Machine Screws (4)
- C. Barb Tubing Adapter (2 pieces)
- D. Allen Wrench 2.5 mm (3/32")

Pump-drive

1. Pump-drive
2. Coupling Magnet

NOTES

- Ensure there is a gap of approximately 3 mm between the magnet and the brim of the case.
- During operation the back of the coupling magnet must not touch the pump-drive housing.



Mounting a Gear Pump (Cont)



Confirm



Cancel

3. Plug in the supplied desktop power supply.
4. Turn on the drive.
5. Navigate to the Continuous, Time, or Volume Mode screens.
6. Tap HEAD OPTIONS—the Head Options screen will be displays.
 - Select the desired pump head size from the list of available options.
 - Tap CONFIRM to save (or CANCEL returning to the previous screen).
7. Prime the new pump head (for details see “Priming the Gear Pump” page 28).
8. Calibrate the new pump head (for details see “Gear Pump Calibration” page 29).
9. The new pump head is ready for operation.



CAUTION: Before operating the pump fill the pump with liquid. Avoid dry-running the pump.

Troubleshooting

For issues the following cannot resolve see “Technical Support” on back cover.

Symptom	Cause	Remedy
Motor does not rotate. Display does not light.	No power.	1. Check that the power cord is securely plugged into the drive.
		2. Check that the power cord is plugged into the mains power outlet and that the power is switched on.
		3. Check the power cord for any visible signs of damage and replace if defective.
Pump does not rotate during analog operation. The display does not light up during analog operation.	Defective analog control or setting error.	1. Switch the pump-drive off.
		2. Check that the 31-PIN connection cable is fully inserted into the drive's port.
		3. Switch on the pump-drive.
		4. If the motor still does not rotate, select ANALOG INPUT from the Mode Selection Screen and/or the Settings Screen and verify that the settings are correct.
		5. For further information see “Analog Input Mode” page 54.
Weak calibration strength displayed on the calibration strength bar.	Poor calibration volume and/or flow rate.	Calibration accuracy can be improved by using a larger calibration volume and/or altering the flow rate.

Error Definitions

Error #2: No Encoder Pulses	
Description:	The drive's processor has not received expected encoder feedback.
Actions:	Drive will stop immediately. Verify load is correct and power cycle drive. If error persists see "Technical Support" on page on back cover.
Error #3: Exceeded Average Motor Current Limit	
Description:	Motor is drawing too much current on average for a period of time.
Actions:	Drive will stop immediately. Verify that pump head is not binding and that the load is not above recommended maximum load. If error persists see "Technical Support" on back cover.
Error #4: Exceeded Peak Motor Current	
Description:	Motor is drawing too much current for a short duration of time.
Actions:	Drive will stop immediately. Verify that pump head is not binding and that the load is not above recommended maximum load. If error persists see "Technical Support" on back cover.
Error #5: Communication Watchdog Timeout	
Description:	Internal communications have exceeded allowable time limit.
Actions:	Drive will stop immediately. Power cycle the pump-drive. If error persists see "Technical Support" on back cover.
Error #6: Pump Head Opened During Cal	
Description:	The occlusion bed of the pump is no longer in its closed position, or an internal connection is loose or broken.
Actions:	Drive will stop immediately. Close pump head. If necessary power cycle the pump-drive. If error persists see "Technical Support" on back cover.
Error #7: Motor Over Temperature	
Description:	The pump's temperature sensor has failed or internal temperatures have exceeded limits.
Actions:	Drive will stop immediately. If necessary remove drive from high ambient temperature, decrease load, and verify that there is free airflow around the drive. If error persists see "Technical Support" on back cover.
Error #8: Motor Direction – Leads Incorrect	
Description:	The motor wires are reversed.
Actions:	Drive will stop immediately. Power cycle the pump-drive. If error persists see "Technical Support" on back cover.
Error #9: Over Speed	
Description:	The drive has exceeded commanded speed value.
Actions:	Drive will stop immediately. Verify load is correct and power cycle the pump-drive. If error persists see "Technical Support" on back cover.
Error #10: Encoder Commutation	
Description:	The drive's internal speed sensor is not providing a consistent output.
Actions:	Drive will stop immediately. Verify load is correct and power cycle the pump-drive. If error persists see "Technical Support" on back cover.
Error #11: Cal: Bad Checksum in EEPROM	
Description:	Bad EEPROM checksum for Factory Cal.
Actions:	Error will be cleared after 10 seconds and parameters will be reset to default values. If error persists see "Technical Support" on back cover.

Specifications

OUTPUT		
Speed:	1800/6000 RPM Models	10 to 1800 RPM 10-6000 RPM
Torque Output, Max Continuous:	1800/6000 RPM Models	60 oz-in 6000 RPM
Speed Regulation:	All Models	Line $\pm 0.1\%$ F.S. Load $\pm 0.1\%$ F.S. Drift $\pm 0.1\%$ F.S.
Display:	All Models	800 x 480 LCD w/ LED Backlight
Outputs:	All Models	Voltage speed output (0–10 VDC @ 1 k Ω min) Current speed output (4–20 mA @ 0–600 Ω) Motor running relay (Closed when running, 1 A max @ 24 VDC) General alarm relay (Closed when error is displayed, 1 A @ 24 VDC) Open head relay (Closed when activated, 1 A @ 24 VDC) Tach output (110–3210 Hz, 50% Duty Cycle, 10 Hz per RPM)
INPUT		
Supply Voltage Limits:	All Models	90 to 230 Vrms @ 50/60 Hz (Universal Input)
Max Current:	All Models	2.2 A @ 115 VAC; 1.1 A @ 230 VAC
Inputs:	All Models	Start/Stop, Prime, CW/CCW (Contact closure) Current input (0–20 mA @ 249 Ω ; ± 50 V common mode range) Voltage input (0–10 VDC @ 10 k Ω ; ± 0 V common mode range) RJ45 EtherNet USB, Type A (5 VDC @ 0.5A)

Specifications (Cont.)

CONSTRUCTION		
Dimensions (L x W x H):		11.75" x 9.50" x 11.001" (298 mm x 241 mm x 279 mm)
Weight:		25.6 lbs. (12.02 kg)
Enclosure Rating: Console Models NEMA 4X Indoor Use Only		
ENVIRONMENT		
Operating Temperature:	All Models	0°C to 40°C (32°F to 104°F)
Storage Temperature:	All Models	-25°C to 6°C (-13°F to 149°F)
Humidity (Non-Condensing):	All Models	10% to 90%
Altitude:	All Models	Less than 2000 m
Pollution Degree:	All Models	Pollution Degree 2 (Indoor use, sheltered location)
Chemical Resistance:	All Models	Exposed material is stainless steel, aluminum, thermoplastic
COMPLIANCE		
		UL 61010-1, UL 61010-2-081 US/CAN
	All Models	For CE mark: EN61010-1 Low Voltage Directive EN61326-1 EMC Directive EN50581 RoHS Directive
	Pump Head	EN809 Machinery Directive

Technical Support

If you have any questions about the use of this product for details see supplied documentation in product package or techsupport@masterflex.com

Product Return

Like all pumps, the pump-drive contains components that will wear over time. To limit charges and delays, contact the seller or manufacturer for authorization and shipping instructions before returning the product, either within or outside of the warranty period. When returning the product please state the reason for the return. For your protection, pack the product carefully and insure it against possible damage or loss. Any damages resulting from improper packaging are your responsibility.

Product Warranty Registration

Visit <https://us.vwr.com/cms/masterflex-product-warranty-registration> to register pump-drives. Or, use the QR code below.



Disposal

Retain packaging materials until the product warranty ends. Afterwards discard any packaging materials in an environmentally friendly manner and according to local regulations. Once the useful life of the product has ended, please ensure proper disposal according to local laws. Plastic and electronic components should be disposed of at a recycling facility. Refer to local regulations regarding proper disposal.



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Outside US & Canada 1-847-381-7050

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