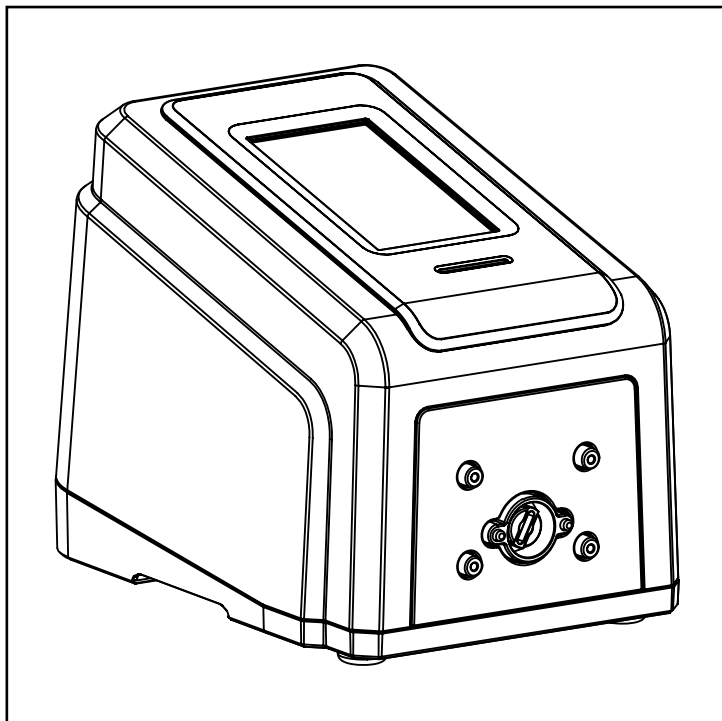




MASTERSENSE™ 7526-10

OPERATING MANUAL:

MASTERSENSE™ L/S® DIGITAL PUMP DRIVES WITH ADVANCED CONNECTIVITY

Model Nos.

7526-10

7526-12

7526-20

7526-22

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PUMP FOR LIQUIDS ORIGINAL INSTRUCTIONS

Table of Contents

SECTION 1: INTRODUCTION.....	1-1
Safe Operation.....	1-1
About the MasterSense™ L/S.....	1-2
Package Contents.....	1-2
Features	1-2
SECTION 2: BASIC SETUP & SETTINGS.....	2-1
Touchscreen Icons.....	2-2
Before Starting the Drive.....	2-3
Switching on the Drive.....	2-3
Settings.....	2-4
Language Settings.....	2-4
Setting the Time.....	2-4
Setting the Date.....	2-5
Display Brightness.....	2-5
Dispense Completion Alerts.....	2-5
Batch Completion Alerts.....	2-5
Analog Output.....	2-5
Device Information.....	2-6
Screen Saver.....	2-6
Device Name.....	2-6
WI-FI Settings.....	2-7
Ethernet Settings.....	2-7
User Management.....	2-8
Pump Head Selection.....	2-9
Auto Start.....	2-10
Priming the Pump Drive.....	2-10
Tube Calibration	2-11
Tube Calibration Screen.....	2-11
SECTION 3: OPERATION.....	3-1
Mode Selection Screen.....	3-1
Continuous Mode.....	3-2
Continuous Mode Run Screen.....	3-2
Continuous Mode Operation.....	3-3
Saving Continuous Mode Settings as a New Program.....	3-4
Time Mode.....	3-5
Time Mode Run Screen.....	3-5
Time Mode Edit Screen.....	3-6
Time Mode Operation.....	3-6
Saving Time Mode Settings as a New Program.....	3-8
Volume Mode	3-9

Volume Mode Run Screen.....	3-9
Volume Mode Edit Screen.....	3-10
Volume Dispense Mode Operation.....	3-10
Anti-Drip.....	3-12
Volume Record.....	3-12
Analog Input Mode.....	3-13
Analog Input Mode Run Screen.....	3-13
Analog Input.....	3-14
Saving Analog Input Mode Settings as a New Program.....	3-15
MasterflexLive™.....	3-16
MasterflexLive™ Run Screen.....	3-16
Custom Program Modes.....	3-18
Adding a New Program: Continuous Mode.....	3-18
Adding a New Program: Time Mode.....	3-18
Adding a New Program: Volume Mode.....	3-19
Adding a New Program: Analog Input Mode.....	3-21
Using Program Modes.....	3-22
Editing a Program.....	3-22
Deleting a Program.....	3-23
SECTION 4: COMMUNICATION SPECIFICATION.....	4-1
Physical Connections.....	4-1
Communications Protocol.....	4-1
Ethernet.....	4-1
Setting up the Masterflex Network Configuration.....	4-2
Masterflex Network Setup.....	4-2
Get Commands.....	4-3
Get Active Connection.....	4-3
Get Brand.....	4-3
Get Model String 1.....	4-3
Get Model String 2.....	4-3
Get Model Type.....	4-4
Get Version.....	4-4
Get Flow Units.....	4-4
Get Flow Rate.....	4-4
Get Direction.....	4-4
Get Flow Rate Range.....	4-5
Get Cumulative Volume.....	4-5
Get Speed in RPM.....	4-5
Get Local Status.....	4-5
Get Volume from Revolutions.....	4-5
Get Revolutions from Volume.....	4-6
Get Tube Size.....	4-6
Get Tube Table Size.....	4-6
Get Tube Label.....	4-6
ASCII Control Codes.....	4-7

Set Commands.....	4-7
Get Pump Status.....	4-7
Set Active Connection.....	4-7
Set Flow Units.....	4-8
Set Flow Rate.....	4-8
Set Direction.....	4-8
Set Tube Size.....	4-8
Set Control Mode.....	4-9
Pump On Continuous.....	4-9
Pump Stop.....	4-9
Clear Total Revolutions Center.....	4-9
Dispense Commands.....	4-10
Start Volume Dispense.....	4-10
Start Time Dispense.....	4-10
Pause Dispense.....	4-10
Resume Dispense.....	4-11
Dispense Status.....	4-11
Command Summary.....	4-12
Input Data.....	4-13
Profibus.....	4-16
SECTION 5: SERVICE & MAINTENANCE.....	5-1
Firmware Updates.....	5-1
Restore Factory Settings.....	5-1
Cleaning the Pump Drive.....	5-2
Accessories.....	5-2
Replacement Parts.....	5-2
Troubleshooting.....	5-3
Error Definitions.....	5-4
DB-25 Electrical Connections.....	5-5
Specifications.....	5-6
Technical Assistance.....	5-8
Product Return.....	5-8
Warranty.....	5-8
Disposal.....	5-8

SECTION 1: INTRODUCTION

SAFE OPERATION

The MasterSense™ L/S Digital Pump Drive with Advanced Connectivity is designed for pumping and dispensing applications in laboratory and process environments. Confirm that the pump drive is operated only in the manner specified in this operating manual and that safe work practices and Good Laboratory Practice (GLP) are followed. Misuse of the pump drive may compromise built-in safety protections and result in injury and/or damage to equipment. Do not operate the pump drive with water on the surface of the touchscreen.

The following Safety Symbols are used in this documentation:

	CAUTION: Risk of Danger. Consult Operating Manual for nature of hazard and corrective actions.
	CAUTION: Risk of crushing. Keep fingers away from the rotor while the pump is in operation. Stop pump before loading or unloading tubing.
	CAUTION: Hot Surface. Do not touch.
	CAUTION: Risk of electric shock. Consult Operating Manual for nature of hazard and corrective actions.

Please observe the following cautions and recommendations:

	CAUTION: Do not operate the pump in a way that exceeds the designed operating and environmental conditions outlined in this operating manual.
	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 pump must be connected to earth ground.
	CAUTION: Turn the drive off before removing or installing tubing. Fingers or loose clothing could get caught in the drive mechanism.
	CAUTION: Do not open or remove the housing while the pump is operating.
	CAUTION: Tubing can tear and burst during operation. It is the responsibility of the customer to take the necessary precautions to avoid injury or damage to equipment.
	CAUTION: It is recommended that any repairs be performed only by an authorized technician. If service and repairs are performed by the customer or by any third party company, Masterflex denies all responsibility.

ABOUT THE MASTERSENSE™ L/S

The MasterSense™ L/S Digital Pump drive with advanced connectivity offers precise flow control and highly accurate fluid dispensing ideal for pumping high viscous and shear-sensitive liquids. These pumps are also ideally suited for use where sterile conditions and purity are required. Toxic and hazardous fluids can be pumped with the proper selection of tubing since the fluid contacts only the tubing and not the pump. All L/S precision drives include a highly accurate, maintenance-free motor and an easy to navigate touchscreen that makes setup and operation easier than ever. The L/S range features Ethernet and Wi-Fi connections for web-based control and monitoring using the MasterflexLive website (see www.masterflex.com), and remote analog input control and monitoring through the pump drive's 25-Pin female connection port.

Package Contents

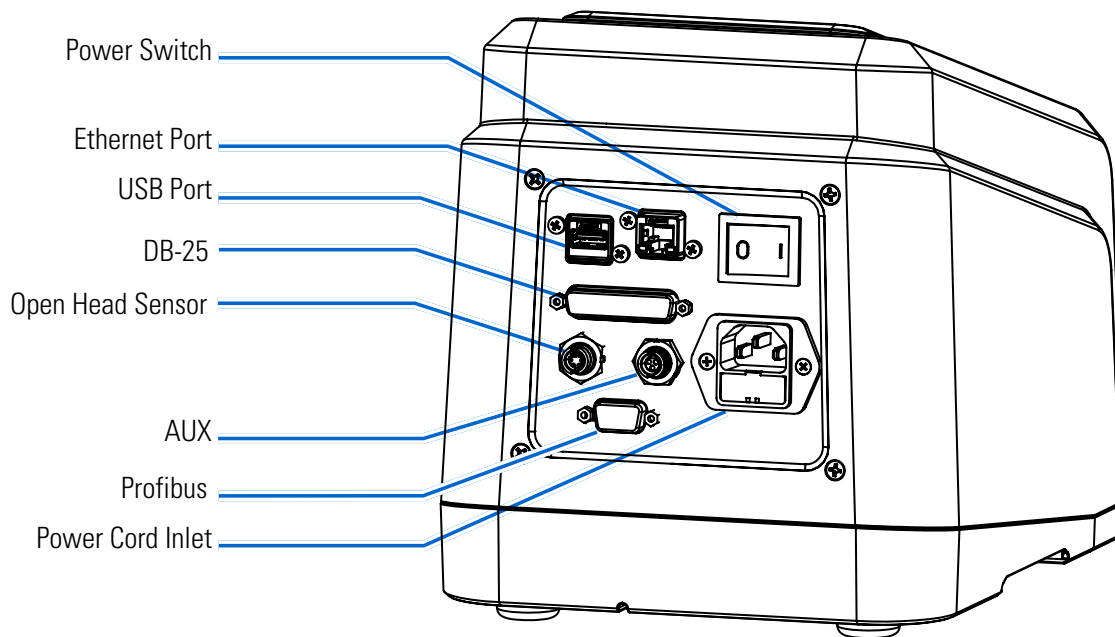
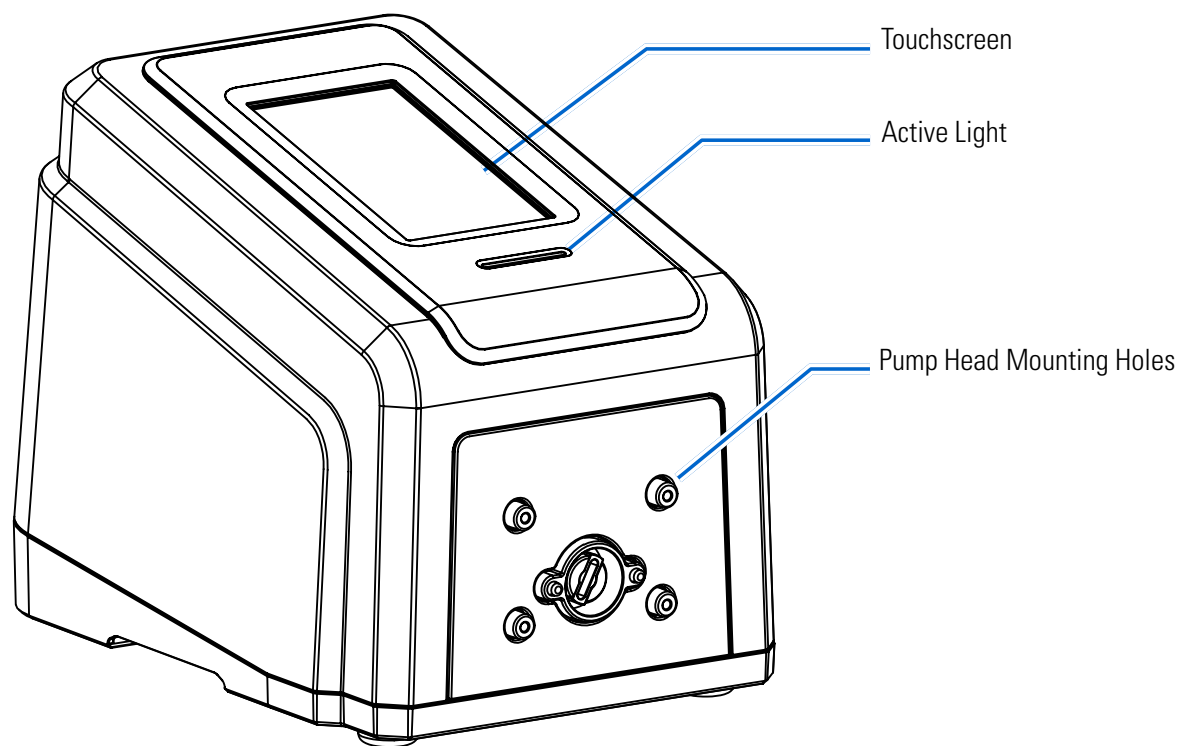
NOTE: Please check the package and its contents for any visible signs of damage. If any damage is found please contact Technical Assistance immediately (see "[Technical Assistance](#)" on page 5-8).

- Pump Drive
- Power Cable
- OHS Cable
- Quick Start Guide
- Flash Drive Containing the Operating Manual

Features

- A 5-inch multi-language touchscreen display providing easy access to user-defined operation parameters and direct readouts of pump operation data, including pump speed, flow rates, flow direction, and batch totals.
- Volume, Time, Continuous, and Analog Input modes for quick and easy operation.
- User selectable dispense volumes, tube diameters, 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 with a turndown ratio greater than 6000:1.
- Easy pump priming and tube calibration.
- L/S models have a maximum speed of 600 RPM and flow rate capacities that range from .001 mL/min through to 3400 mL/min (depending on the model and tubing size selected).

SECTION 2: BASIC SETUP & SETTINGS



TOUCHSCREEN ICONS

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

BEFORE STARTING THE DRIVE

	CAUTION: Do not block the rear panel of the pump drive. The power switch must always be easy to access and the power cord must always be easy to disconnect.
	CAUTION: Turn the drive off before removing or installing tubing. Fingers or loose clothing could get caught in the drive mechanism.
	CAUTION: The power cord set supplied with your pump drive meets the requirements of the country where you purchased the pump drive. If you use the pump drive in another country, you must use a power cord set that meets the requirements of that country.
	CAUTION: To avoid electrical shock, the power cord protective grounding conductor must be connected to ground. Not for operation in wet locations as defined by EN61010-1.

- Ensure the pump drive is mounted on a flat surface.
- Ensure adequate air flow around the pump drive and ensure that the ambient air temperature does not exceed 104° F (40° C).
- Tubing should be clean and routed so that bend radii are at a minimum of four (4) times the outside tube diameter and are as short as possible.
- Use the appropriate tube diameter for the required flow rate and viscosity.
- Recalibrate tubing regularly to maintain the best flow rate accuracy (for further information see "[Tube Calibration](#)" on page 2-11).
- For tubing selection and compatibility go to www.masterflex.com.
- Unplug the pump drive's power cable from the mains power outlet when cleaning or performing maintenance on the drive.

SWITCHING ON THE DRIVE

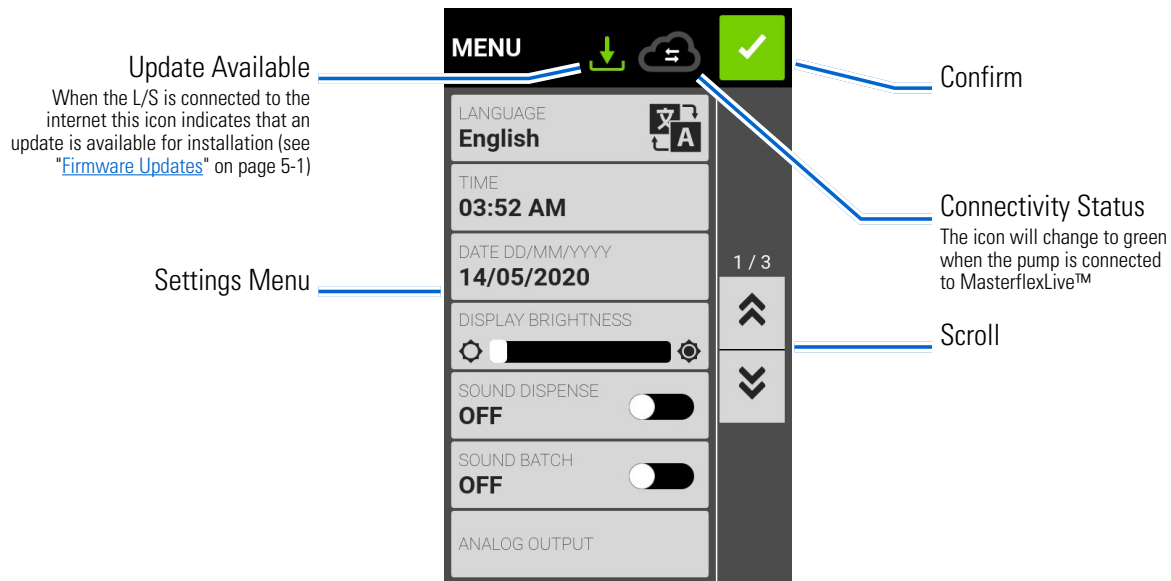
1. Plug in and securely fasten the supplied power cable to the IEC Connector located at the rear of the drive.
2. Plug the opposite end of the power cable into a mains power outlet.
3. Switch the drive on using the power switch located at the rear of the drive. **NOTE:** The drive takes approximately two minutes to complete start-up.

NOTE:

- On the initial start-up the Language Settings Screen will be displayed. A language must be selected before pump operation (for further information see "[Language Settings](#)" on page 2-4).
- If User Management is enabled you may be prompted for a username and password (for further information see "[User Management](#)" on page 2-8).
- Following the initial start-up all subsequent start-ups will revert to the mode of operation screen previously in use.
- After 30 minutes of inactivity the L/S will enter sleep mode and the display will turn off. Tapping the touchscreen will reactivate the drive. To enable (default) or disable the screen saver see "[Screen Saver](#)" on page 2-6.

SETTINGS

The Settings Screen allows access to basic configuration settings. The Settings Screen is accessed by tapping **SETTINGS**  from any of the mode screens. **NOTE:** If User Management is enabled only users with authorization can access the Settings Screen (for further information see "[User Management](#)" on page 2-8).



Language Settings

The L/S Digital Pump Drive can display Chinese, English, French, German, Italian, Japanese, and Spanish languages. The default display language is English.

To change the display language:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. Tap **LANGUAGE**.
3. Select the desired language from the available list.
4. Tap **CONFIRM**  to save the new language selection.

Setting the Time

To change the time:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. Tap **TIME**.
3. Select either 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**  to discard changes.

Setting the Date

To change the date:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
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  to discard changes.

Display Brightness

To adjust the display brightness:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. Use the DISPLAY BRIGHTNESS slider to adjust the touchscreen brightness to the desired level.

Dispense Completion Alerts

When Sound Dispense is enabled a short beep will sound at the completion of each pump dispense.

To enable or disable the dispense completion alert:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. Tap the SOUND DISPENSE toggle to select either ON or OFF.

Batch Completion Alerts

When Sound Batch is enabled a single long beep will sound at the completion of each batch cycle.

To enable or disable the batch cycle completion alert:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. Tap the SOUND BATCH toggle to select either ON or OFF.

Analog Output

The L/S supports and controls analog output through the pump drive's 25-pin connection or (for further information see).

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. Tap ANALOG OUTPUT. The Analog Output Screen will be displayed.
3. Tap to select the desired analog output type from the available list.
4. If using either ANALOG: VOLTAGE or ANALOG: CURRENT:
 - a. Tap EDIT . The Analog: Voltage Edit Screen or Analog: Current Edit Screen will be displayed.
 - b. Select the desired current or voltage operating range from the available list.
 - c. Tap CONFIRM  to save or CANCEL  to discard changes. The Analog Output Screen will be displayed.
5. Tap CONFIRM .

Device Information

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 from the Device Information Screen.

To access the Device Information Screen:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate DEVICE INFORMATION.
3. Tap DEVICE INFORMATION. The Device Information Screen will be displayed.

See also "[Firmware Updates](#)" on page 5-1, and "[Restore Factory Settings](#)" on page 5-1.

Screen Saver

The L/S has a screen saver to help extend the display life of the touchscreen. After 30 minutes of inactivity the L/S will enter sleep mode and the display will turn off. Tapping the touchscreen will reactivate the drive.

To enable or disable the screen saver:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate SCREEN SAVER.
3. Tap the SCREEN SAVER toggle to select either ON or OFF.

Device Name

Individual names can be assigned to each L/S Digital Pump Drive to make identification easier when using more than one pump.

To assign a pump drive name:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate DEVICE NAME.
3. Tap DEVICE NAME. The Device Name Screen will be displayed.
4. Enter the desired pump name using the onscreen keypad (up to 8 characters).
5. Tap CONFIRM  to save or CANCEL  to discard changes.

Wi-Fi Settings

The L/S can connect to a network using Wi-Fi and Ethernet connections.

NOTE:

- The Ethernet connection will take priority if both Wi-Fi and Ethernet are used simultaneously.
- The L/S supports WEP, WPA, WPA2, and None (open) Wi-Fi security protocols.

To select a Wi-Fi network:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. **SCROLL**  through the Settings Screen pages to locate **WIFI SETTINGS**.
3. Tap **WIFI SETTINGS**. The Wi-Fi Settings Screen will be displayed.
4. If required, tap the **WIFI** toggle to select either **ON** or **OFF**.
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** to cancel.
8. Tap **CONFIRM**  to return to the Settings Screen.

To remove a Wi-Fi network:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. **SCROLL**  through the Settings Screen pages to locate **WIFI SETTINGS**.
3. Tap **WIFI SETTINGS**. The WIFI Settings Screen will be displayed.
4. Locate the desired Wi-Fi network and tap **REMOVE WIFI** .
5. Tap **REMOVE** to remove the network or **CANCEL** to discard changes.
6. Tap **CONFIRM**  to return to the Settings Screen.

Ethernet Settings

The L/S can connect to a network using Wi-Fi and Ethernet connections.

NOTE:

- Confirm that the Ethernet cable is securely attached to the Ethernet port at the rear of the pump drive.
- The Ethernet connection will take priority if both Wi-Fi and Ethernet are used simultaneously.

To configure Ethernet settings:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. **SCROLL**  through the Settings Screen pages to locate **ETHERNET SETTINGS**.
3. Tap **ETHERNET SETTINGS**. The Ethernet Settings Screen will be displayed.
4. Tap **DHCP** to automatically configure IP settings or **STATIC** to manually edit settings using the onscreen keypad.
5. Tap **CONFIRM**  to save or **CANCEL**  to discard changes.

User Management

The L/S allows user access to be controlled using configurable permission levels.

Default permissions:

- USER: Able to use basic pump drive functions and run programs.
- SUPER USER: Same level of access as USER but with the ability to create and modify programs.
- ADMIN: Full administrative access to the drive.

User and Super User permission levels can be configured to allow access to different Settings Menu items.

Default ADMIN username and password:

When switching on User Management for the first time, or following a factory reset, you will be prompted for a username and password. You must log in using the below default ADMIN user account details to access user management settings.

Default username: **admin**

Default password: **changeme1234**

It is recommended that the default password be changed after logging in (see **Editing an existing user** below for information on changing user passwords).

Configuring user level permissions:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages 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 or CANCEL  to discard any changes.

Adding a new user:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate USER MANAGEMENT.
3. If required, tap the USER MANAGEMENT toggle to select ON.
4. Tap MODIFY USER.
5. Tap NEW USER .
6. Tap USERNAME and enter the new username using the onscreen keypad.
7. Tap PASSWORD and enter the desired password using the onscreen keypad. **NOTE:** The password must be at least six characters long.
8. Tap the required PERMISSION LEVEL. **NOTE:** There must always be at least one ADMIN user.
9. Tap CONFIRM  to save or CANCEL  to discard any changes.

Deleting a user:

NOTE: There must always be at least one ADMIN user. ADMIN users cannot delete their own user profile.

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate USER MANAGEMENT.
3. Tap MODIFY USER.
4. Locate the desired username from the available list and then tap the DELETE USER  icon located next to the username.
5. Tap DELETE to delete user or CANCEL to cancel.

Editing an existing user:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate USER MANAGEMENT.
3. Tap MODIFY USER.
4. Select the desired username.
5. Edit as required.
6. Tap CONFIRM  to save or CANCEL  to discard any changes.

Pump Head Selection

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

To select a new pump head:

1. Tap SETTINGS  from any of the mode screens. The Settings Screen will be displayed.
2. SCROLL  through the Settings Screen pages to locate PUMP HEAD.
3. Tap PUMP HEAD. The Pump Head Settings Screen will be displayed.
4. Select the desired pump head from the list of available options.
5. Tap CONFIRM  to save or CANCEL  to discard any changes and return to the Settings Screen.
6. Tap CONFIRM to exit the Settings Screen and return to the previous mode screen.

NOTE: Once the new pump head has been selected, ensure that the appropriate tubing has been selected.

To select a tube size:

1. Tap SIZE from any of the mode screens. The Tube Size Screen will be displayed.
2. Select the desired tube size from the list of available options. **NOTE:** Only tube sizes compatible with the selected pump head will be displayed.
3. Tap CONFIRM  to save or CANCEL  to discard changes and return to the mode run screen.

Auto Start

The L/S has an auto start that will resume pump operation when power is restored after a power outage.

To enable auto start:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. **SCROLL**  through the Settings Screen pages to locate **AUTO START**.
3. Tap the **AUTO START** toggle to select either **ON** or **OFF**.

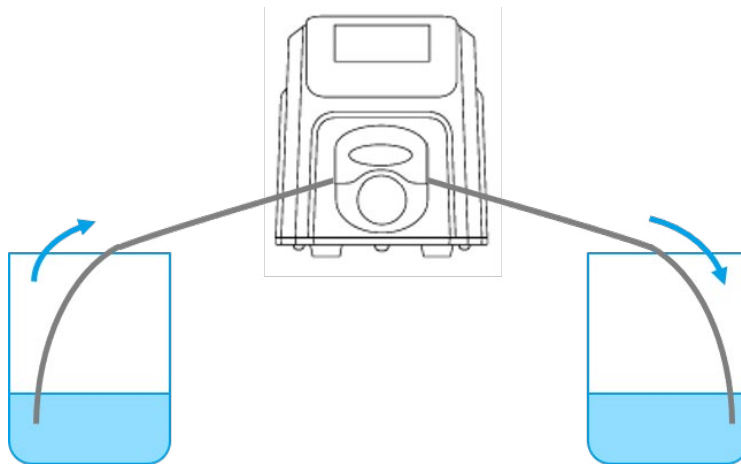
PRIMING THE PUMP DRIVE

It is recommended that you prime the pump drive before use. Priming the pump draws fluid through the tubing and eliminates air pockets from the system.



CAUTION: Turn the drive off before removing or installing tubing. Fingers or loose clothing could get caught in the drive mechanism.

Example Flow System



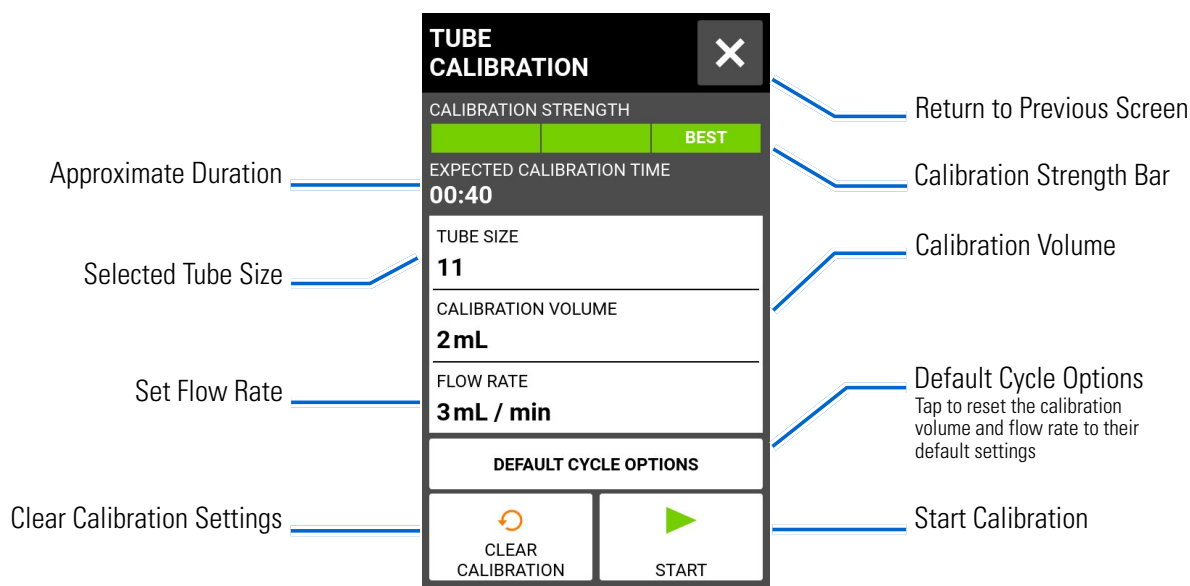
To prime the pump drive:

1. Insert the tubing into the pump head (refer to the pump head user manual for further information).
2. Insert the tube inlet into the supply fluid.
3. Insert the tube outlet into an appropriate container.
4. Switch the drive on using the power switch located at the rear of the drive. NOTE: If Manage User is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8).
5. Navigate to the Continuous, Time or Volume Mode screens.
6. Press and hold **PRIME**  until there are no bubbles visible in the tubing. Priming will stop when **PRIME**  is released.

TUBE CALIBRATION

To ensure accurate dispensing of fluids, tube calibration should be performed whenever fluids, flow rate or tubing is changed. Tube calibration can be accessed from the Continuous Mode Run Screen or from either of the Volume or Time Mode Edit screens.

Tube Calibration Screen



General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).
- Confirm all fluids and containers are ready.

To calibrate tubing:

1. Insert the tube inlet into the supply fluid.
2. Insert the tube outlet into a suitable container. **NOTE:** The container should be placed on a scale for increased accuracy. If using a scale, an acceptable weight to volume conversion for water is: 1 g = 1 mL.
3. Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8).
4. Navigate to the Continuous, Time or Volume Mode screens.
5. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.

6. If required, Tap START ► and allow the pump to run for approximately 20-30 minutes. This step is recommended to properly condition new tubing and to increase calibration accuracy. **NOTE:** If required, the pump can be run dry while conditioning the tube.
7. Press and hold PRIME ►► to prime the pump. Priming will stop when PRIME ►► is released.
8. Tap SIZE from the Continuous Mode Screen or tap EDIT ✎ and then SIZE if either the Volume or Time Mode Screen is displayed. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM ✓ to save or CANCEL ✕ to discard changes and return to previous screen.
9. Tap CALIBRATE ⊕. The Tube Calibration Screen will be displayed.
10. Tap CALIBRATION VOLUME. The Calibration Volume Screen will be displayed.
 - a. Enter the desired calibration volume using the onscreen keypad. **NOTE:** The default volume or greater will ensure the best calibration.
 - b. Tap CONFIRM ✓ to save or CANCEL ✕ to discard changes and return to the previous screen.
11. Tap FLOW RATE. The Calibration Flow Rate Screen will be displayed.
 - a. Enter the desired flow rate using the onscreen keypad.
 - b. Tap CONFIRM ✓ to save or CANCEL ✕ to discard changes and return to the previous screen.
NOTE: The drive will adjust the displayed flow rate after calibration is complete.
12. Tap START ► to begin calibration. **NOTE:** Calibration progress will be displayed on the touchscreen.
13. When calibration is complete use the onscreen keypad to enter the measured volume of fluid from the tube outlet container.
14. Tap CONFIRM ✓ to complete calibration and return to the previous mode screen. Calibration Complete ✓ should now be displayed to indicate that calibration has been completed for the current tube size, tube volume, and flow rate.

NOTE:

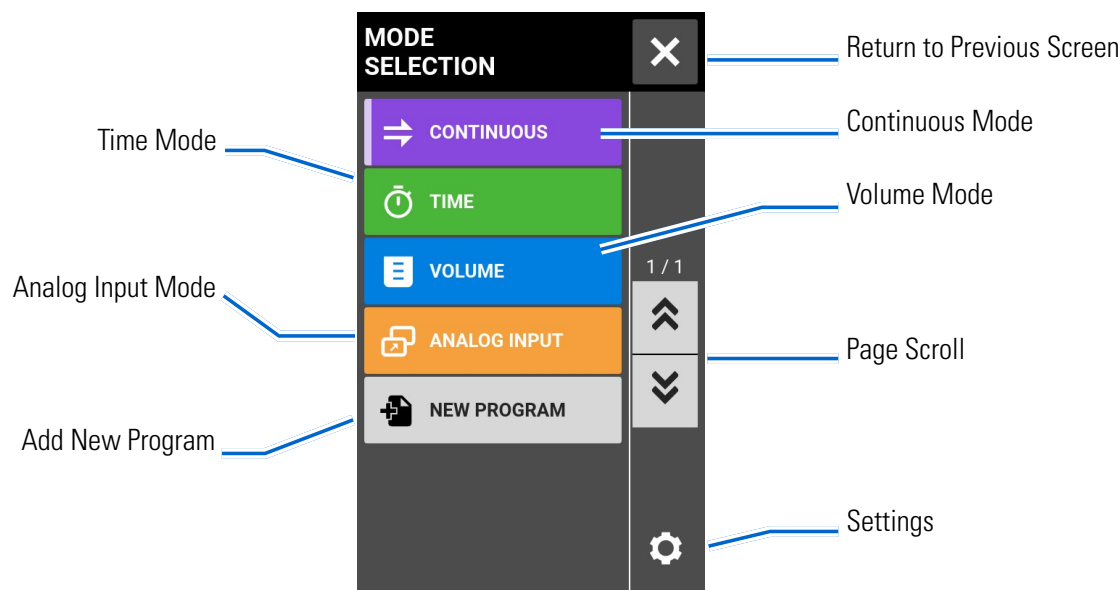
- The estimated accuracy for the selected calibration settings is shown in the Calibration Strength Bar on the Tube Calibration Screen. Calibration accuracy can be improved by using a larger calibration volume and/or altering the flow rate.
- Calibration settings are retained and transferred to other mode screens when entering or leaving the Tube Calibration Screen.
- If the drive is stopped during calibration the calibration will be discarded and the previous mode screen will be displayed. Empty the 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 revolution.
- The best results are obtained after tubing has been run in the pump for approximately 20-30 minutes.
- Steps 9–14 can be repeated as necessary to optimize the accuracy of the tubing calibration.

SECTION 3: OPERATION

	WARNING: Tube breakage may result in fluid being sprayed from the pump. Use appropriate measures to protect operator and equipment.
	CAUTION: Keep fingers away from the rotor while the pump is in operation. Stop the pump before loading or unloading tubing.
	CAUTION: Hot Surface. Do not touch.
	CAUTION: To avoid electrical shock, the power cord protective grounding conductor must be connected to ground. Not for operation in wet locations as defined by EN61010-1.

MODE SELECTION SCREEN

The Mode Selection Screen allows access to the drive’s four 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.



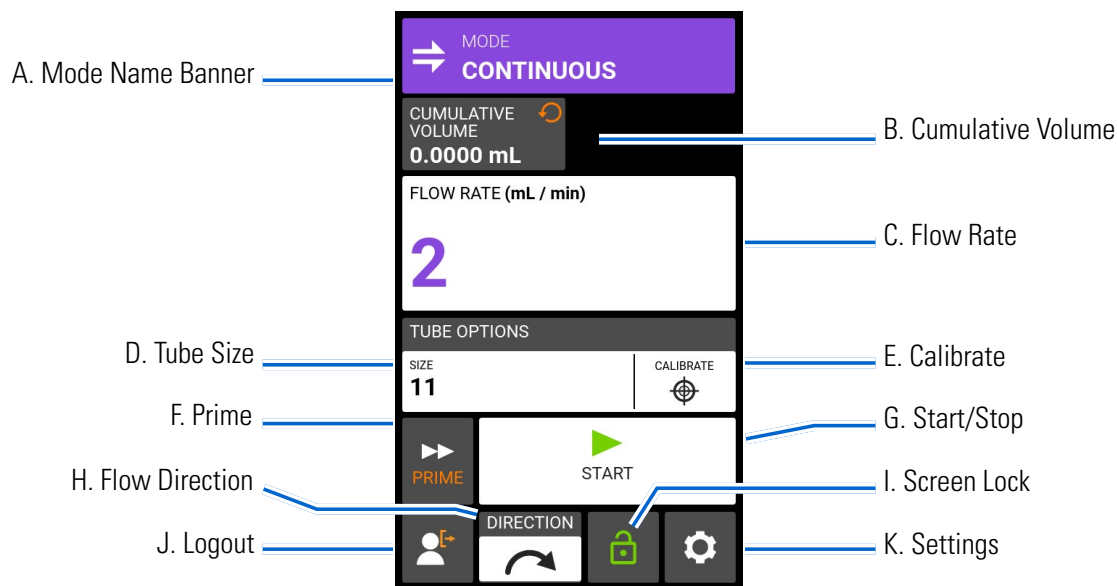
Tap the desired mode or program to access individual mode or program screens.

CONTINUOUS MODE

In Continuous Mode the pump will operate at a selected rpm and/or flow rate until stopped by the user.

Continuous Mode Run Screen

The Continuous Mode Run Screen is accessed by selecting CONTINUOUS from the Mode Selection Screen.



- A. MODE NAME BANNER: Tap the Mode Name Banner to return to the Mode Selection Screen.
- B. CUMULATIVE VOLUME: Displays the current cumulative volume of fluid that has been pumped. **To reset the cumulative volume:** Press and hold CUMULATIVE VOLUME RESET  until the display changes to zero.
- C. FLOW RATE: Displays the current flow rate in the unit of measurement selected by the user. Tap to access the Flow Rate Screen.
- D. SIZE: Tap to access the Tube Size Screen.
- E. CALIBRATE: Tap to access the Calibration Screen (for further information see "[Tube Calibration](#)" on page 2-11). Once calibration has been completed for the current tube size Calibration Complete  will be displayed.
- F. PRIME: Press and hold to prime the pump drive (for further information see "[Priming the Pump Drive](#)" on page 2-10).
- G. START/STOP: Tap START to begin operation. Once operation has commenced STOP  will be displayed.
- H. FLOW DIRECTION: Tap DIRECTION to select either clockwise  or counterclockwise .
- I. SCREEN LOCK: Locking the screen disables all touchscreen functions. **To lock the screen:** Press and hold UNLOCKED  until the icon changes to LOCKED  and a red border appears around the screen. **To unlock the screen:** Press and hold LOCKED  until the icon changes to UNLOCKED .
- J. Logout
- K. Settings

- J. LOGOUT: Tap to log out a user. **NOTE:** This option is only available if User Management is enabled in Settings (for further information see "[User Management](#)" on page 2-8).
- K. SETTINGS: Tap to access the Settings Screen (for further information see "[Settings](#)" on page 2-4).

Continuous Mode Operation

General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).
- Confirm all fluids and containers are ready.
- Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8). The touchscreen display will revert to the previously used operation mode.
- Confirm that the tubing has been calibrated by checking that Calibration Complete  is displayed on the Continuous Mode Run Screen (for further information see "[Tube Calibration](#)" on page 2-11).
- If required, prime the pump before operation (for further information see "[Priming the Pump Drive](#)" on page 2-10).

To operate the pump in Continuous Mode:

1. Tap CONTINUOUS from the Mode Selection Screen. The Continuous Mode Run Screen will be displayed.
2. If required, Press and hold CUMULATIVE VOLUME RESET  to reset the display to zero.
3. Select the desired flow rate and flow units:
 - a. Tap FLOW RATE to access the Flow Rate Screen.
 - b. Tap UNITS to access the Flow Units Screen and select the desired flow unit from the available list.
 - c. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Flow Rate Screen.
 - d. Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - e. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Continuous Mode Screen.
4. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Continuous Mode Run Screen.
5. If required, tap CALIBRATE to calibrate the pump for the selected tube and flow rate.
6. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
7. Tap START . The drive will commence operation at the flow rate and direction shown.
8. Tap STOP  when the drive operation is no longer required. **NOTE:** In Continuous Mode the drive will continue to operate at the displayed flow rate and direction until stopped.

Saving Continuous Mode Settings 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 Management is enabled only users with authorization can create and modify programs (for further information see "[User Management](#)" on page 2-8).

To save 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 view additional pages.
4. Tap CONTINUOUS. The Continuous New Program Screen will be displayed with the last settings used in the Continuous Mode.
5. 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).
6. Tap CONFIRM to save or DELETE to cancel.

NOTE:

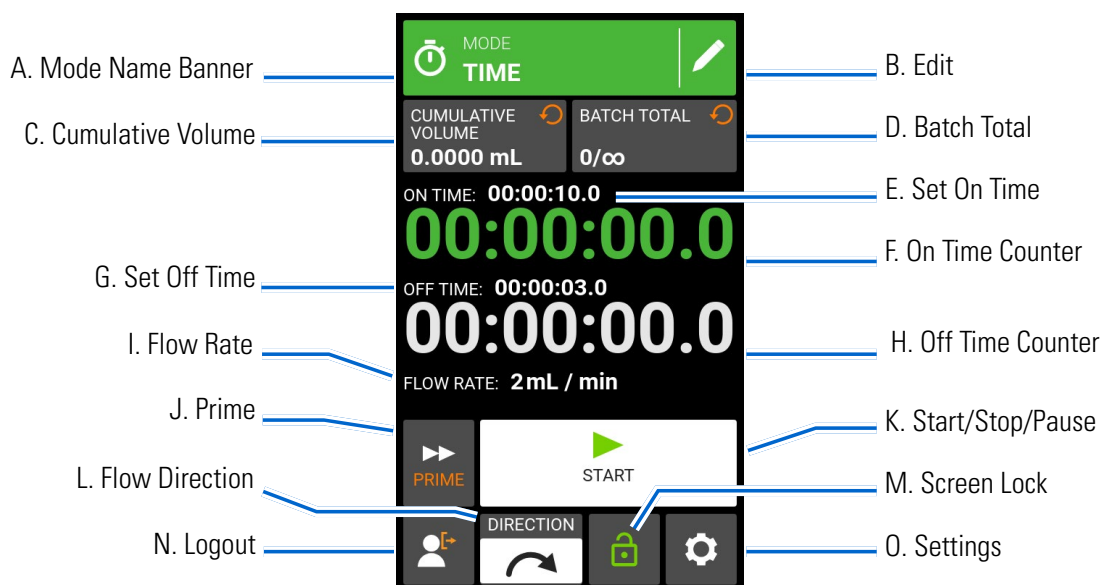
- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection Screen.
- If there are multiple programs tapping SCROLL ▼ will display additional pages.

TIME MODE

In Time Mode the pump will operate at a selected rpm and/or flow rate for a selected time and/or batch total. At the completion of the selected time or batch total the pump will automatically stop.

Time Mode Run Screen

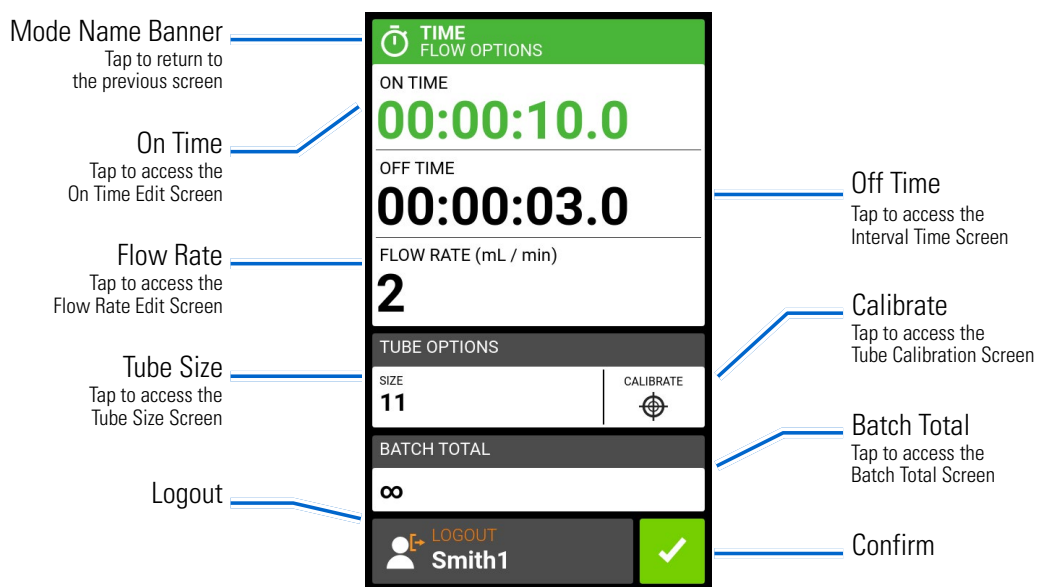
The Time Mode Run Screen is accessed by selecting TIME from the Mode Selection Screen.



- A. **MODE NAME BANNER:** Tap the Mode Name Banner to return to the Mode Selection Screen.
- B. **EDIT:** Tap to access the Time Mode Edit Screen. From the Time Mode Edit Screen changes can be made to flow rate, flow units, tube size, tube calibration, on time, off time, and batch total.
- C. **CUMULATIVE VOLUME:** Displays the current Cumulative Volume of fluid that has been pumped. **To reset the cumulative volume:** Press and hold CUMULATIVE VOLUME RESET  until the display changes to zero.
- D. **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.
- E. **SET ON TIME:** Displays the set dispense operation time.
- F. **ON TIME COUNTER:** Displays a countdown of the set dispense time during operation.
- G. **SET OFF TIME:** Displays the set duration of time the pump pauses between each dispense operation.
- H. **OFF TIME COUNTER:** Displays a countdown of the set off time during operation.
- I. **FLOW RATE:** Displays the current flow rate in the unit of measurement selected by the user.
- J. **PRIME:** Press and hold to prime the pump drive (for further information see "[Priming the Pump Drive](#)" on page 2-10).
- K. **START/STOP/PAUSE:** During operation, the display will change from START  to PAUSE  STOP/RESET .

- L. FLOW DIRECTION: Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
- M. SCREEN LOCK: Locking the screen disables all touchscreen functions. **To lock the screen:** Press and hold UNLOCKED  until the icon changes to LOCKED  and a red border appears around the screen. **To unlock the screen:** Press and hold LOCKED  until the icon changes to UNLOCKED .
- N. LOGOUT: Tap to log out a user. **NOTE:** This option is only available if User Management is enabled in Settings (for further information see "[User Management](#)" on page 2-8).
- O. SETTINGS: Tap to access the Settings Screen (for further information see "[Settings](#)" on page 2-4).

Time Mode Edit Screen



Time Mode Operation

General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).
- Confirm all fluids and containers are ready.
- Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8). The touchscreen display will revert to the previously used operation mode.
- Confirm that the tubing has been calibrated by checking that Calibration Complete  is displayed on the Time Mode Edit Screen (for further information see "[Tube Calibration](#)" on page 2-11).
- If required, prime the pump before operation (for further information see "[Priming the Pump Drive](#)" on page 2-10).

To operate the pump in Time Mode:

1. Tap TIME from the Mode Selection Screen. The Time Mode Run Screen will be displayed.
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 will be displayed.
 - a. Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time Mode Edit Screen.
4. Tap OFF TIME to set the amount of time the pump will pause between each operation. The Off Time Edit Screen will be displayed. **NOTE:** If the off 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.
 - a. Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time Mode Edit Screen.
5. Tap FLOW RATE. The Flow Rate Edit Screen will be displayed.
 - a. Tap UNITS to access the Flow Units Screen and select the desired flow unit from the available list.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the previous screen.
 - c. Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - d. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time Mode Edit Screen.
6. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time Mode Edit Screen.
7. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle. The Batch Total Screen will be displayed.
 - a. 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.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time Mode Edit Screen.
8. Tap CONFIRM  to return to the Time Dispense Mode Run Screen.
9. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
10. Tap START . The pump will now operate until the batch total is completed or until PAUSE  or STOP  is tapped.
11. If required, adjustments can be made to any of the Time Mode option settings during operation. To make any adjustments:
 - a. Tap PAUSE  and then repeat steps 2–9 above.
 - b. Tap CONTINUE  to complete the pump operation once the desired changes have been made.

Saving Time Mode Settings 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 Management is enabled only users with authorization can create and modify programs (for further information see "[User Management](#)" on page 2-8).

To save 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 ▼ to view additional pages.
4. Tap TIME. The Time New Program Screen will be displayed with the last settings used in the Time Mode.
5. 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).
6. Tap CONFIRM to save or DELETE to cancel.

NOTE:

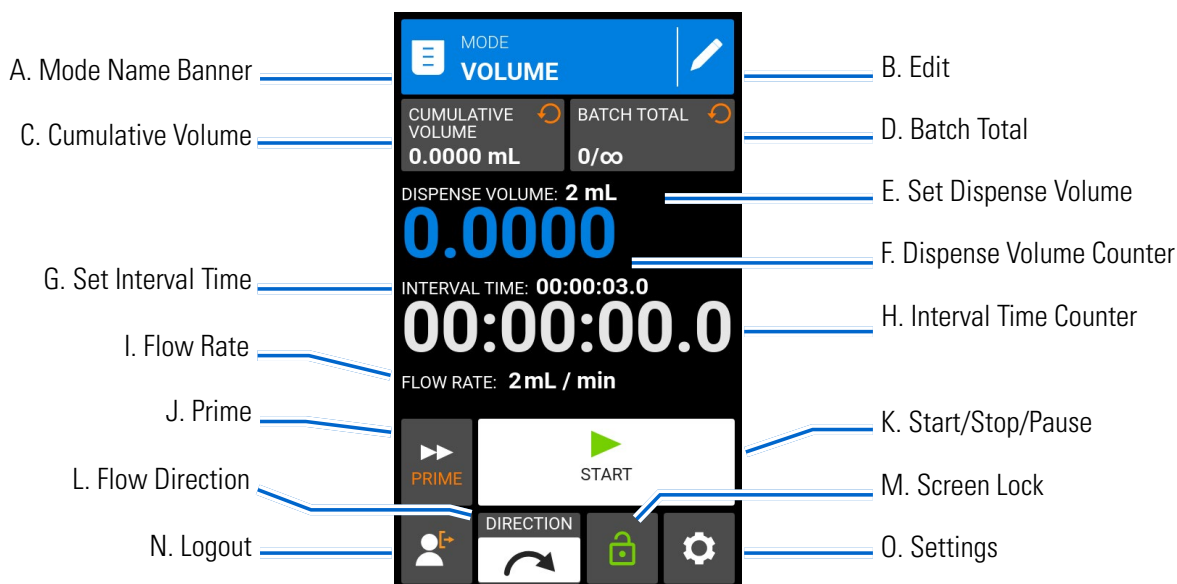
- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection Screen.
- If there are multiple programs tapping SCROLL ▼ will display additional pages.

VOLUME MODE

In Volume Mode the pump will operate at a selected rpm and/or flow rate until a selected volume of fluid has been pumped. When the selected volume has been pumped the drive will automatically stop.

Volume Mode Run Screen

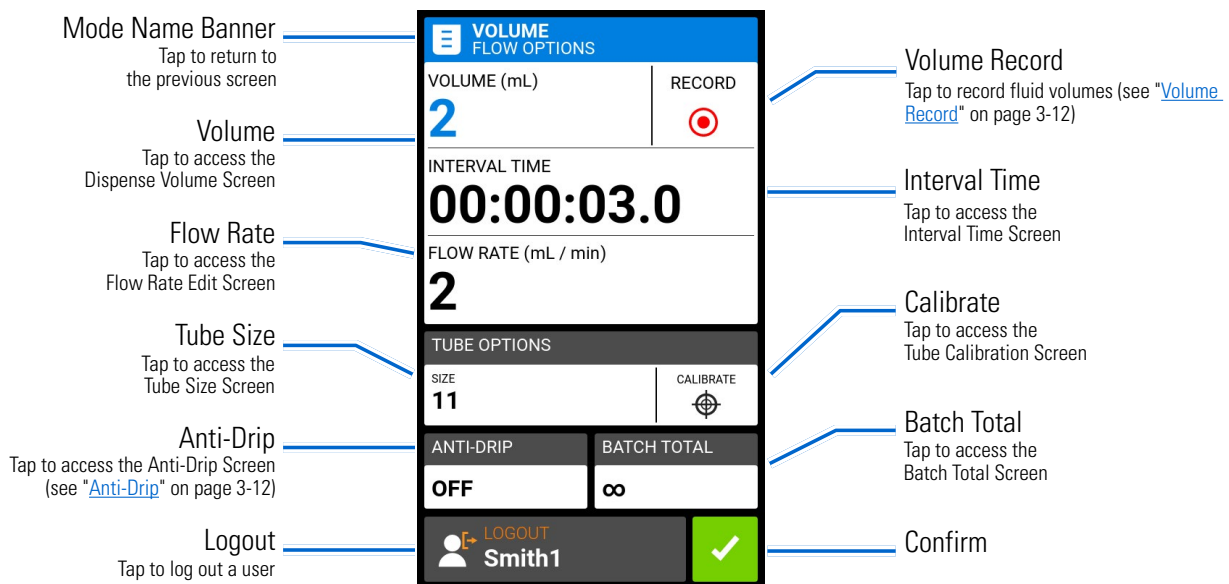
The Volume Mode Run Screen is accessed by selecting VOLUME from the Mode Selection Screen.



- A. **MODE NAME BANNER:** Tap the Mode Name Banner to return to the Mode Selection Screen.
- B. **EDIT:** Tap to access the Volume Mode Edit Screen. From the Volume Mode Edit Screen adjustments can be made to dispense volume, interval time, flow rate, tube options, calibration and batch total. **NOTE:** Edit is inactive during operation.
- C. **CUMULATIVE VOLUME:** Displays the current Cumulative Volume of fluid that has been pumped. **To reset the cumulative volume:** Press and hold CUMULATIVE VOLUME RESET ↻ until the display changes to zero.
- D. **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.
- E. **SET DISPENSE VOLUME:** Displays the selected volume of fluid for dispensing.
- F. **DISPENSE VOLUME COUNTER:** Displays a countdown of the fluid volume during operation.
- G. **SET INTERVAL TIME:** Displays the set time the pump pauses between dispenses.
- H. **INTERVAL TIME COUNTER:** Displays a countdown of the set interval time during operation.
- I. **FLOW RATE:** Displays the current flow rate in the unit of measurement selected by the user.
- J. **PRIME:** Press and hold to prime the pump drive (for further information see "[Priming the Pump Drive](#)" on page 2-10).

- K. **START/STOP/PAUSE:** During operation, the display will change from START ► to PAUSE || STOP/RESET ■.
- L. **FLOW DIRECTION:** Tap DIRECTION to select either clockwise ↻ or counterclockwise ↺ flow direction.
- M. **SCREEN LOCK:** Locking the screen disables all touchscreen functions. **To lock the screen:** Press and hold UNLOCKED 🗝 until the icon changes to LOCKED 🔒 and a red border appears around the screen. **To unlock the screen:** Press and hold LOCKED 🔒 until the icon changes to UNLOCKED 🗝.
- N. **LOGOUT:** Tap to log out a user. **NOTE:** This option is only available if User Management is enabled in Settings (for further information see "[User Management](#)" on page 2-8).
- O. **SETTINGS:** Tap to access the Settings Screen (for further information see "[Settings](#)" on page 2-4).

Volume Mode Edit Screen



Volume Dispense Mode Operation

General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).
- Confirm all fluids and containers are ready.
- Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8). The touchscreen display will revert to the previously used operation mode.
- Confirm that the tubing has been calibrated by checking that Calibration Complete 🔄 is displayed on the Volume Mode Edit Screen (for further information see "[Tube Calibration](#)" on page 2-11).

- If required, prime the pump before operation (for further information see "[Priming the Pump Drive](#)" on page 2-10).

To operate the pump in Volume Mode:

1. Tap VOLUME from the Mode Selection Screen. The Volume Mode Run Screen will be displayed.
2. Tap EDIT  to access the Volume Mode Edit Screen.
3. Tap VOLUME. The Dispense Volume Screen will be displayed.
 - a. 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 further information see "[Volume Record](#)" on page 3-12).
 - b. Tap RAMP UP  to set the time the pump takes to reach full flow rate (between 0 and 60 seconds) using the onscreen keypad.
 - c. 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.
 - d. Tap CONFIRM  to save or CANCEL  to discard changes and return to the 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 will be displayed. **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.
 - a. Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume Mode Edit Screen.
5. Tap FLOW RATE. The Flow Rate Edit Screen will be displayed.
 - a. Tap UNITS to access the Flow Units Screen and select the desired flow unit from the available list.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the previous screen.
 - c. Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - d. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume Mode Edit Screen.
6. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume Mode Edit Screen.
7. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle. The Batch Total Screen will be displayed.
 - a. 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.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume Mode Edit Screen.
8. If required, tap ANTI-DRIP. The Anti-Drip Screen will be displayed (for further information see "[Anti-Drip](#)" on page 3-12).

- a. Tap ON or OFF to enable or disable the Anti-Drip feature.
 - b. If enabled, enter the desired degrees of reverse rotation using the onscreen keypad. **NOTE:** Typical values range from 5 to 45 degrees.
 - c. Tap CONFIRM  to save or CANCEL  to discard changes and return 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.
 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 option settings during operation. To make any adjustments:
 - a. Tap PAUSE  and then repeat steps 2–10 above.
 - b. Tap CONTINUE  to complete the pump operation once the desired changes have been made.

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 the viscosity of the fluid.

To enable or disable the Anti-Drip feature:

1. Tap VOLUME from the Mode Selection Screen. The Volume Mode Screen will be displayed.
2. Tap EDIT .
3. Tap ANTI-DRIP. The Anti-Drip Screen will be displayed.
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  to discard changes and return to the Volume Mode Screen.

Volume Record

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

To record a fluid volume:

1. Tap VOLUME from the Mode Selection Screen. The Volume Mode Run Screen will be displayed.
2. Tap EDIT  to access the Volume Mode Edit Screen.
3. Tap RECORD . The Record Dispense Screen will be displayed.
4. Tap FLOW RATE to make adjustments to the flow rate. The Flow Rate Screen will be displayed.
 - a. Tap FLOW to enter the desired flow rate using the onscreen keypad.
 - b. Tap UNITS to enter the desired flow rate units using the onscreen keypad.
 - c. Tap CONFIRM  to save changes and return to the Record Dispense Screen.

5. Tap START ►. The drive will now begin pump operation while recording the fluid volume.
6. If required, adjustments can be made to flow rate during operation. To make adjustments:
 - a. Tap STOP ■ and then repeat steps 4–6 above.
 - b. 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 and return to the Volume Mode Edit Screen. If saved, the recorded dispense volume will now be displayed under VOLUME.
9. Tap CONFIRM ✓. The Volume Mode Run Screen will be displayed.

ANALOG INPUT MODE

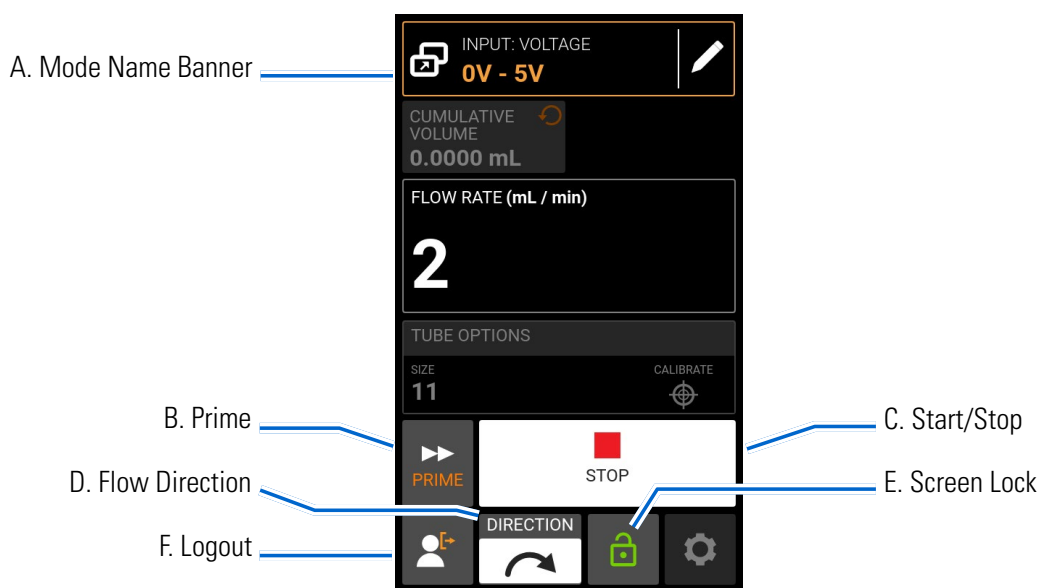


CAUTION: Power must be turned off before connecting the external analog control cable to prevent damage to the drive.

The L/S Digital Pump Drive can be controlled and monitored through the pump drive's 25-Pin female connection port. See www.masterflex.com for more information.

Analog Input Mode Run Screen

The Analog Input Mode Run Screen will be displayed on the pump drive's touchscreen during analog input operation. The screen displays the currently selected operation dispense settings from an external remote control device. The Analog Input Mode Run Screen is accessed by selecting ANALOG INPUT from the Mode Selection Screen.



- A. **MODE NAME BANNER:** 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.
- B. **PRIME:** Press and hold to prime the pump drive (for further information see "[Priming the Pump Drive](#)" on page 2-10).
- C. **START/STOP:** During operation, the display will change from START ► to STOP ■.
- D. **FLOW DIRECTION:** Tap DIRECTION to select either clockwise ↻ or counterclockwise ↺ flow direction.
- E. **SCREEN LOCK:** Locking the screen disables all touchscreen functions. **To lock the screen:** Press and hold UNLOCKED 🔓 until the icon changes to LOCKED 🔒 and a red border appears around the screen. **To unlock the screen:** Press and hold LOCKED 🔒 until the icon changes to UNLOCKED 🔓.
- F. **LOGOUT:** Tap to log out a user. **NOTE:** This option is only available if User Management is enabled in Settings (for further information see "[User Management](#)" on page 2-8).

Analog Input



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

The L/S supports and controls analog input using suitable equipment through the pump drive's 25-Pin female connection port. Analog input can be used in place of, or in addition to, MasterflexLive™.

See also "[DB-25 Electrical Connections](#)" on page 5-5.

General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).
- Confirm all fluids and containers are ready.
- Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8). The touchscreen display will revert to the previously used operation mode.
- Confirm that the tubing has been calibrated by checking that Calibration Complete 🌀 is displayed on the Analog Input Mode Run Screen (for further information see "[Tube Calibration](#)" on page 2-11).
- If required, prime the pump before operation (for further information see "[Priming the Pump Drive](#)" on page 2-10).
- Confirm that the pump drive is connected to the appropriate equipment through the drive's DB-25 female connection port.

To operate analog input control and monitoring:

1. Tap ANALOG INPUT from the Mode Selection Screen. The Analog Input Mode Run Screen will be displayed.
2. Tap EDIT . The Analog Input Mode Edit Screen will be displayed.
3. Tap the desired analog input type from the available list.
4. If using either ANALOG: VOLTAGE or ANALOG: CURRENT:
 - a. Select the desired current or voltage operating range from the available list.
 - b. Tap CONFIRM  to save or CANCEL  to cancel and return 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.
- See www.masterflex.com for further information on using analog input remote control and monitoring.

Saving Analog Input Mode Settings as a New Program

Changes made to mode parameters can be saved as a new program for easier access to frequently used mode settings. **NOTE:** If User Management is enabled only users with authorization can create and modify programs (for further information see "[User Management](#)" on page 2-8).

To save 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  to view additional pages.
4. Tap ANALOG INPUT. The Analog Input New Program Screen will be displayed with the last settings used in the Analog Input Mode.
5. 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).
6. Tap CONFIRM to save or DELETE to cancel.

NOTE:

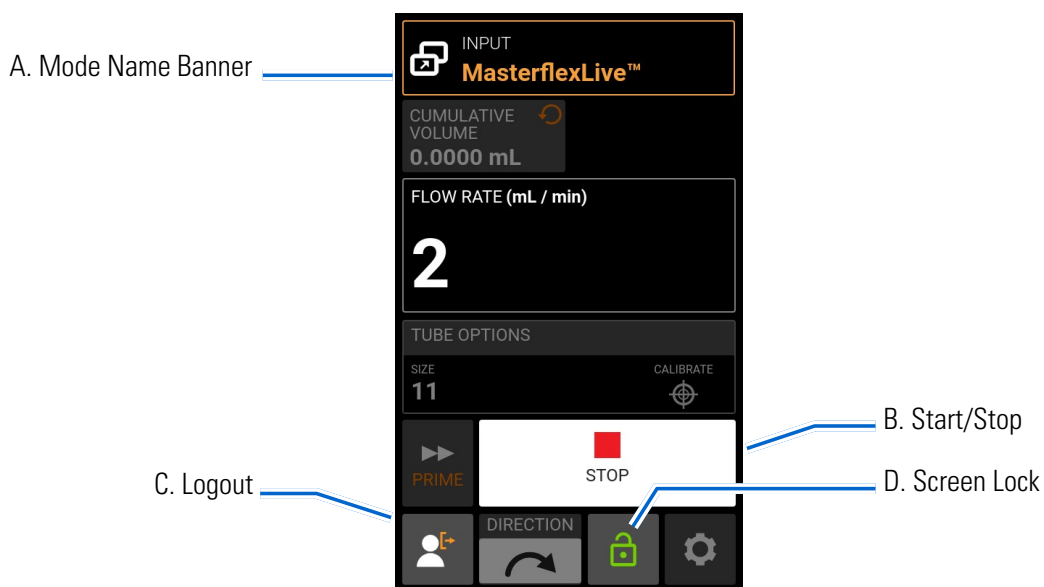
- Once saved, new programs are added in alphabetical order to the bottom of the Mode Selection Screen.
- If there are multiple programs tapping SCROLL  will display additional pages.

MASTERFLEXLIVE™

The L/S Digital Pump Drive can be controlled and 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.masterflex.com for more information.

MasterflexLive™ Run Screen

The MasterflexLive™ Run Screen is only displayed on the pump drive touchscreen while the pump drive is being operated through the MasterflexLive™ website. The screen displays the currently selected operation dispense settings (Continuous, Time or Volume).



- A. **MODE NAME BANNER:** Displays the Mode Name as well as the currently selected input type. Tap the Mode Name Banner to return to the Mode Selection Screen.
- B. **START/STOP:** During operation, the display will change from START ► to STOP ■.
- C. **LOGOUT:** Tap to log out a user. **NOTE:** This option is only available if User Management is enabled in Settings (for further information see "[User Management](#)" on page 2-8).
- D. **SCREEN LOCK:** Locking the screen disables all touchscreen functions. **To lock the screen:** Press and hold UNLOCKED 🔓 until the icon changes to LOCKED 🔒 and a red border appears around the screen. **To unlock the screen:** Press and hold LOCKED 🔒 until the icon changes to UNLOCKED 🔓.

General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).

- Confirm all fluids and containers are ready.
- Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8). The touchscreen display will revert to the previously used operation mode.
- Confirm that the tubing has been calibrated (for further information see "[Tube Calibration](#)" on page 2-11).
- If required, prime the pump before operation (for further information see "[Priming the Pump Drive](#)" on page 2-10).
- Confirm that the pump drive is connected to the internet via an active Wi-Fi or Ethernet connection.
- Confirm the digital device you are using is connected to the internet.

To connect to MasterflexLive™:

1. Open the web browser on your digital device and go to www.masterflex.com.
2. Type **masterflexlive** into the Masterflex website search bar.
3. Follow the onscreen prompts to log in or create a new account.
4. Follow the onscreen prompts to add your L/S pump drive. **NOTE:** The Device ID (listed as the MAC Address) and Device Model Number can be found under "[Device Information](#)" on page 2-6. The MAC Address is also located on a label on the pump drive.
5. Select the desired pump drive from the list of available devices. The MasterflexLive™ Web App Run Screen will be displayed.

NOTE:

- Once the pump drive is connected to MasterflexLive™ the pump drive can be operated and monitored through the MasterflexLive™ Web App Run Screen and adjustments can be made to any of the pump drive settings.
- Tap STOP  on the pump drive touchscreen to immediately 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 Management is enabled only users with authorization can create and modify programs (for further information see "[User Management](#)" on page 2-8).

Adding a New Program: Continuous Mode

To add a new Continuous Mode program:

1. Tap NEW PROGRAM from the Mode Selection Screen. The New Program Screen will be displayed.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection Screen tap SCROLL  to view additional pages.
2. Tap CONTINUOUS. The Continuous New Program Screen will be displayed.
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:
 - a. Tap FLOW RATE to access the Flow Rate Screen.
 - b. Tap UNITS to access the Flow Units Screen and select the desired flow unit from the available list.
 - c. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Flow Rate Screen.
 - d. Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - e. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Continuous New Program Screen.
5. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Continuous New Program Screen.
6. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
7. Tap CONFIRM to save or DELETE to discard changes.

NOTE:

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

Adding a New Program: Time Mode

To add a new Time Mode program:

1. Tap NEW PROGRAM from the Mode Selection Screen. The New Program Screen will be displayed.
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 will be displayed.
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 ON TIME to set the amount of time for each pump operation. The On Time Edit Screen will be displayed.
 - a. Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time New Program Screen.
5. Tap OFF TIME to set the amount of time the pump will pause between each operation. The Off Time Edit Screen will be displayed. **NOTE:** If the off 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.
 - a. Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time New Program Screen.
6. Tap FLOW RATE. The Flow Rate Edit Screen will be displayed.
 - a. Tap UNITS to access the Flow Units Screen and select the desired flow unit from the available list.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the previous screen.
 - c. Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - d. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time New Program Screen.
7. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time New Program Screen.
8. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
9. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle. The Batch Total Screen will be displayed.
 - a. 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.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Time New Program Screen.
10. Tap CONFIRM to save or DELETE to discard changes.

NOTE:

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

Adding a New Program: Volume Mode

To add a new Volume Mode program:

1. Tap NEW PROGRAM from the Mode Selection Screen. The New Program Screen will be displayed. **NOTE:** If NEW PROGRAM is not displayed on the Mode Selection Screen tap SCROLL  to view additional pages.

2. Tap VOLUME. The Volume New Program Screen will be displayed.
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 will be displayed.
 - a. 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 further information see "[Volume Record](#)" on page 3-12).
 - b. Tap RAMP UP  to set the time the pump takes to reach full flow rate (between 0 and 60 seconds) using the onscreen keypad.
 - c. 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.
 - d. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume New Program Screen.
5. Tap INTERVAL TIME to set the amount of time the pump will pause between each operation. The Interval Time Screen will be displayed. **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.
 - a. Tap HR, MIN, SEC or TENTHS and enter the desired time using the onscreen keypad.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume New Program Screen.
6. Tap FLOW RATE. The Flow Rate Edit Screen will be displayed.
 - a. Tap UNITS to access the Flow Units Screen and select the desired flow unit from the available list.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the previous screen.
 - c. Tap FLOW and enter the desired flow rate using the onscreen keypad.
 - d. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume New Program Screen.
7. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume New Program Screen.
8. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
9. Tap BATCH TOTAL to adjust the number of dispenses in each batch cycle. The Batch Total Screen will be displayed.
 - a. 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.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume New Program Screen.
10. If required, tap ANTI-DRIP. The Anti-Drip Screen will be displayed (for further information see "[Anti-Drip](#)" on page 3-12).
 - a. Tap ON or OFF to enable or disable the Anti-Drip feature.

- b. If enabled, enter the desired degrees of reverse rotation using the onscreen keypad. **NOTE:** Typical values range from 5 to 45 degrees.
 - c. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Volume New Program Screen.
11. Tap CONFIRM to save or DELETE to discard changes.

NOTE:

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

Adding a New Program: Analog Input Mode

To add a new Analog Mode program:

1. Tap NEW PROGRAM from the Mode Selection Screen. The New Program Screen will be displayed.
NOTE: If NEW PROGRAM is not displayed on the Mode Selection Screen tap SCROLL  to view additional pages.
2. Tap ANALOG INPUT. The Analog Input New Program Screen will be displayed.
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 will be displayed.
5. Tap the desired analog type from the available list.
6. If using either ANALOG: VOLTAGE or ANALOG: CURRENT:
 - a. Select the desired current or voltage operating range from the available list.
 - b. Tap CONFIRM  to save or CANCEL  to cancel and return to the Analog Input New Program Screen.
7. Tap SIZE. The Tube Size Screen will be displayed.
 - a. Select the desired tube size from the list of available options.
 - b. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Analog Input New Program Screen.
8. Tap DIRECTION to select either clockwise  or counterclockwise  flow direction.
9. Tap CONFIRM to save or DELETE to discard changes.

NOTE:

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

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  will display additional pages.

General Preparation:

- Confirm the correct tubing has been selected and is properly loaded into the pump drive (refer to the pump head user manual for further information).
- Ensure the correct pump head and tube size have been selected (for further information see "[Pump Head Selection](#)" on page 2-9).
- Confirm all fluids and containers are ready.
- Switch the drive on using the power switch located at the rear of the drive. **NOTE:** If User Management is enabled you may be prompted for a username and password (For further information see "[User Management](#)" on page 2-8). The touchscreen display will revert to the previously used operation mode.
- Confirm that the tubing has been calibrated by checking that Calibration Complete  is displayed on the Program Information  Screen (for further information see "[Tube Calibration](#)" on page 2-11).
- If required, prime the pump before operation (for further information see "[Priming the Pump Drive](#)" on page 2-10).

To use a program:

1. Select the desired program from the Mode Selection Screen. The Program Run Screen will be displayed.
2. Tap START  to begin the 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.

NOTE:

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

Editing a Program

NOTE: If User Management is enabled only users with authorization can create and modify programs (for further information see "[User Management](#)" on page 2-8).

To edit 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  to display additional pages). The Program Edit Screen will be displayed.
2. Edit the settings for the selected mode as desired. For instructions on editing individual mode settings see:
 - "[Adding a New Program: Continuous Mode](#)" on page 3-18.
 - "[Adding a New Program: Time Mode](#)" on page 3-18.
 - "[Adding a New Program: Volume Mode](#)" on page 3-19.
 - "[Adding a New Program: Analog Input Mode](#)" on page 3-21.
 - **NOTE:** Once the individual mode settings have been edited and saved the Program Edit Screen will be displayed.
3. Tap CONFIRM  to save or CANCEL  to discard changes and return to the Mode Selection Screen.

Deleting a Program

NOTE: If User Management is enabled only users with authorization can delete a program (For further information see "[User Management](#)" on page 2-8).

To delete 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  to display additional pages). The Program Edit Screen will be displayed.
2. Tap DELETE PROGRAM .
3. Tap DELETE to delete the program and return to the Mode Selection Screen or CANCEL to return to the previous screen.

SECTION 4: COMMUNICATION SPECIFICATION

PHYSICAL CONNECTIONS

Pump drives that are equipped with the Advanced Networking & Communication feature through Ethernet physical connections. This connection allows a host computer to communicate with the pump using the communications protocol defined in this description.

Ethernet

The Ethernet port is a 10/100 port, supporting data transfer rates of 10 and 100 Mbit/s. The host computer uses Telnet (TCP port number 23) to establish the connection over the Ethernet port. The MASTERFLEX Network Setup application is used to obtain the pump's IP address. By default, the pump implements a 20 second TCP connection timeout. If the pump does not receive data during this period, it will automatically close the connection. The TCP timeout period can be changed or disabled by using the MASTERFLEX Network Setup application. The browser-based Network Setup can be used as well.

COMMUNICATIONS PROTOCOL

As the master, the host computer issues commands and receives a response from the pump for each command. There are two types of commands, Get and Set. The Get commands are used to obtain information from the pump, while the Set commands are used to change information on the pump or initiate an action. Command and response formats and examples are described below.

SETTING UP THE MASTERFLEX NETWORK CONFIGURATION

The default Internet Protocol (IP) assignment method for the pump is Dynamic Host Configuration Protocol (DHCP). Once connected to a network, the pump will have its IP configuration assigned automatically, with the condition that the network gateway also has DHCP enabled. In this case the pump will immediately begin to update the cloud monitor and the user will be able to see the pump status online as well as set email notifications for that pump. Nothing else needs to be done for this option.

Other than cloud monitoring, the pump will also work on an EtherNet/IP network and over a Telnet connection (port 23). A Telnet connection is useful for running a PC-based pump application over Ethernet. For EtherNet/IP and Telnet, the user must know the pump's IP address. To see or change the pump's IP address or any part of the network configuration, run the MASTERFLEX Network Setup application.

Masterflex Network Setup

This application allows the user to easily modify the pump's network configuration. Follow the instructions below to see or change the configuration.

1. Run the MASTERFLEX Network Setup application.
2. Choose the connection type from the Connection drop-down menu.
 - Ethernet—The pump and the PC that the application runs on must be on the same network.
 - COM Port – The pump and the PC are connected through a USB virtual COM port. Select the COM port that the pump is connected to.
3. Select “Search Pumps”.
4. Identify the appropriate pump by looking for its MAC address in the Pump drop-down list.
 - For a COM port connection, only one pump will be listed.
 - For Ethernet, all pumps that are connected will be listed.
5. For multiple pumps shown in the drop-down list, highlight the desired pump by clicking on it in the list.
6. At this point, the user can make the necessary changes right within the MASTERFLEX Network Setup application. Alternatively, the user can launch the browser-based Setup utility (see the “Browserbased Network Setup” Tool).

GET COMMANDS

These commands are used to obtain specific information from the pump. The pump's response includes the command label and a set of parameters separated by commas.

Get Active Connection

<STX>QXn<CR>

n: 3 = Ethernet

The one possible connection type is Ethernet (TCP). This command is used to determine the active connection.

Example:

[HOST] - <STX>QX<CR>

[PUMP] - <STX>QX3<CR>

In this case, the active connection is Ethernet.

Get Brand

<STX>QB<CR>

Request pump brand.

Example:

[HOST] - <STX>QB<CR>

[PUMP] - <STX>QBMasterflex<CR>

The brand is "Masterflex".

Get Model String 1

<STX>Q1<CR>

Two strings are available that describe the pump model. This is the command to get the first string.

Example:

[HOST] - <STX>Q1<CR>

[PUMP] - <STX>Q16:1 Gear Ratio<CR>

"6:1 Gear Ratio" is model string 1.

Get Model String 2

<STX>Q2<CR>

This command gets the second model string (see Get Model String 1).

Example:

[HOST] - <STX>Q2<CR>

[PUMP] - <STX>Q2Digital<CR>

"Digital" is model string 2.

Get Model Type

<STX>QN<CR>

Request the model type.

Example:

[HOST] - <STX>QN<CR>

[PUMP] - <STX>QN600 RPM Console<CR>

The model type is “600 RPM Console”.

Get Version

<STX>QV<CR>

Request pump firmware version.

Example:

[HOST] - <STX>QV<CR>

[PUMP] - <STX>QVv4.1.6<CR>

The firmware version is “v4.1.6”.

Get Flow Units

<STX>QU<CR>

This command requests the presently selected flow units. The response will be an integer number (starting at 1) representing the flow units, as shown by the following.

<STX>QUx<CR>

x: 1 through N (last flow units)

Example:

[HOST] - <STX>QU<CR>

[PUMP] - <STX>QU14<CR>

Pump flow units set to 14, which is “RPM” for a 600 RPM Console pump.

Get Flow Rate

<STX>QF<CR>

Request flow rate.

Example:

[HOST] - <STX>QF<CR>

[PUMP] - <STX>QF100.0<CR>

Flow rate of 100.0 is returned, with flow units as was determined by the Get Flow Units command.

Get Direction

<STX>QD<CR>

Request direction of pump rotation. The pump will respond with the positive sign (+) if the direction is clockwise or with the negative sign (-) if the direction is counterclockwise.

Example:

[HOST] - <STX>QD<CR>

[PUMP] - <STX>QD-<CR>

In this case, the direction is counterclockwise.

Get Flow Rate Range

<STX>QR<CR>

Request the minimum and maximum flow rate.

Example:

[HOST] - <STX>QR<CR>

[PUMP] - <STX>QR0.1,600.0<CR>

Flow rate range of 0.1 through 600.0 is returned, with flow units as was determined by the Get Flow Units command.

Get Cumulative Volume

<STX>QC<CR>

Request the total volume accumulated since the last time the volume was cleared. This response will also indicate the volume units.

Example:

[HOST] - <STX>QC<CR>

[PUMP] - <STX>QC37.13,mL<CR>

The cumulative volume returned is 37.13 mL.

Get Speed in RPM

<STX>QS<CR>

This command requests the speed in RPM regardless of the flow units setting.

Example:

[HOST] - <STX>QS<CR>

[PUMP] - <STX>QS100.0<CR>

Speed of 100.0 RPM is returned.

Get Local Status

<STX>QL<CR>

With the command, the pump responds with five parameters. These are direction, flow rate, flow units, tube size, and tube calibration status.

Example:

[HOST] - <STX>QL<CR>

[PUMP] - <STX>QL+,21.67,01,02,1<CR>

The pump responds with clockwise direction, flow rate of 21.67, flow units 1, tube size 2, and tube calibration status '1' (uncalibrated tube).

Get Volume from Revolutions

<STX>QO[revs]<CR>

Given number of revolutions, the pump responds with the corresponding volume.

Example:

[HOST] - <STX>QO27.09<CR>

[PUMP] - <STX>QO5.9<CR>

Given total revolutions of 27.09, the pump responds with volume of 5.9.

Get Revolutions from Volume

<STX>QE[volume]<CR>

Given then volume, the pump responds with the corresponding number of revolutions.

Example:

[HOST] - <STX>QE0.36<CR>

[PUMP] - <STX>QE6.00<CR>

Given a volume of 0.36, the pump responds with 6 revolutions.

Get Tube Size

<STX>QTS<CR>

Request presently selected tube size and its calibration status. The first parameter in the response will be an integer number (starting at 1) representing the tube size and the second parameter represents the calibration status of the tube.

<STX>QTSxy<CR>

x: 1 through N (last tube size)

y: 0 for calibrated or 1 for uncalibrated

Example:

[HOST] - <STX>QTS<CR>

[PUMP] - <STX>QTS02,0<CR>

Presently selected tube size is 2 and its calibration status is '0' (calibrated).

Get Tube Table Size

<STX>QTN<CR>

Request the total number of tube sizes available.

Example:

[HOST] - <STX>QTN<CR>

[PUMP] - <STX>QTN15<CR>

Pump indicates 15 separate tube sizes.

Get Tube Label

<STX>QTL[tube size]<CR>

Given the tube size number, the pump returns with a string that is the name of that tube size. This command, in combination with the Get Tube Table Size, can be used to build up a table that lists all the available tubing.

Example:

[HOST] - <STX>QTL14<CR>

[PUMP] - <STX>QTL14,36HPF<CR>

The name of tube size 14 is "36HPF".

Get Pump Status

<STX>PI<CR>

Request pump status data. The pump will respond as follows.

<STX>PIabcde<CR>

a: 0 = local, 1 = remote

b: 0 = Aux Output Off, 1 = Aux Output On

c: 0 = Aux Input Open, 1 = Aux Input Closed

d: 3 = Pump Running, 4 = Pump Stopped, 8 = Open Head, 9 = Error

Example:

[HOST] - <STX>PI<CR>

[PUMP] - <STX>PI00080<CR>

In the pump's response, the '8' indicates pump head open.

ASCII CONTROL CODES

Decimal	Hex	Character
2	02	STX Start of Text (CTRL – B)
6	06	ACK Acknowledge (CTRL – F)
13	0D	CR Carriage Return (CTRL – M)
21	15	NAK Negative Acknowledge (CTRL – U)

SET COMMANDS

These commands modify the pump either by changing a parameter or by initiating a dispense. The pump's response is either an <ACK> or <NAK>. For a command to be successful, it must have been sent over the active connection (see Get Active Connection).

Set Active Connection

<STX>Xn<CR>

n: 3 = Ethernet

This command is used to set the active connection (see Get Active Connection).

Example:

[HOST] - <STX>X3<CR>

[PUMP] - <ACK>

The active connection is set to Ethernet.

Set Flow Units

<STX>SUx<CR>

x: 1 through N (last flow units)

This command selects the flow units.

Example:

[HOST] - <STX>SU1<CR>

[PUMP] - <ACK>

Set pump flow units to 1, which is “mL/min” for a 600 RPM Console pump.

Set Flow Rate

<STX>SF[flow rate]<CR>

This command sets the flow rate.

Example:

[HOST] - <STX>SF12.90<CR>

[PUMP] - <ACK>

Set flow rate to 12.90.

Set Direction

<STX>SDx<CR>

x: ‘+’ = Clockwise, ‘-’ = Counterclockwise

Set direction of pump rotation. The command parameter is the positive sign (+) if the direction is clockwise or the negative sign (-) if the direction is counterclockwise.

Example:

[HOST] - <STX>SD+<CR>

[PUMP] - <ACK>

The direction is set to clockwise.

Set Tube Size

<STX>STS_n<CR>

n: 1 through N (last tube size)

The command parameter will be an integer number (starting at 1) representing the tube size.

Example:

[HOST] - <STX>STS2<CR>

[PUMP] - <ACK>

Set tube size to 2.

Set Control Mode

<STX>Pn<CR>

n: L = Local, R = Remote

This command sets the pump control mode, local or remote.

Example:

[HOST] - <STX>PR<CR>

[PUMP] - <ACK>

Set to remote.

Pump On Continuous

<STX>PG0<CR>

Command pump to run continuously.

Example:

[HOST] - <STX>PG0<CR>

[PUMP] - <ACK>

Pump will respond with <NAK> if command was not successful.

Pump Stop

<STX>PH<CR>

Command pump to stop dispensing.

Example:

[HOST] - <STX>PH<CR>

[PUMP] - <ACK>

Pump will respond with <NAK> if command was not successful.

Clear Total Revolutions Center

<STX>PZ0<CR>

Clear the counter that keeps track of total revolutions.

Example:

[HOST] - <STX>PZ0<CR>

[PUMP] - <ACK>

Pump will respond with <NAK> if command was not successful.

DISPENSE COMMANDS

These commands control and monitor time and volume dispenses.

Start Volume Dispense

<STX>DV_{x,y,n}<CR>

x: volume in revolutions

y: off time in seconds

n: number of cycles (0 = continuous cycles)

This command configures the pump to run a volume dispense. The first parameter defines the amount of volume in revolutions, the second parameter the amount of time in seconds the pump will be off, and the last parameter how many dispenses. The Get Revolutions from Volume command should be used to convert a desired volume into revolutions.

Example:

[HOST] - <STX>DV10,5,100<CR>

[PUMP] - <ACK>

Configure pump to dispense for 10 revolutions, remain off for 5 seconds, and repeat for a total of 100 cycles.

Start Time Dispense

<STX>DT_{x,y,n}<CR>

x: on time in seconds

y: off time in seconds

n: number of cycles (0 = continuous cycles)

This command configures the pump to run a time dispense. The first parameter defines the amount of time in seconds the pump will be on, the second parameter the amount of time in seconds the pump will be off, and the last parameter how many dispenses.

Example:

[HOST] - <STX>DT20.5,10.1,0<CR>

[PUMP] - <ACK>

Configure pump to dispense for 20.5 seconds, remain off for 5 seconds, and repeat continuously.

Pause Dispense

<STX>DP<CR>

Commands the pump to pause a dispense. This command does not stop the command, meaning that the dispense will resume where it left off if the pump receives the Resume Dispense command.

[HOST] - <STX>DP<CR>

[PUMP] - <ACK>

Pump will respond with <NAK> if command was not successful.

Resume Dispense

<STX>DR<CR>

Commands the pump to resume a previously paused dispense.

[HOST] - <STX>DR<CR>

[PUMP] - <ACK>

Pump will respond with <NAK> if command was not successful.

Dispense Status

<STX>DS<CR>

Commands the pump to respond with dispense status.

The following is the format of the response when the pump is in local mode or is stopped or is running continuously.

<STX>DSan/N<CR>

a: S,C,Y,H

S = stopped/paused

C = continuous dispense

Y = copying (only in local mode)

H = stopped/head open

n: batch count

N: maximum number of cycles (0 for continuous)

The following is the format of the response when the pump is in remote mode and volume dispense is running.

<STX>DSV,a,b,c,n/N

a: P,R

P = dispense paused

R = dispense running

b: 0,1

0 = off part of cycle (next parameter indicates remaining time off)

1 = on part of cycle (next parameter indicates remaining revolutions)

c: remaining time off or remaining volume

n: batch count

N: maximum number of cycles (0 for continuous)

The following is the format of the response when the pump is in remote mode and time dispense is running.

<STX>DST,a,b,c,n/N

a: P,R

P = dispense paused

R = dispense running

b: 0,1

0 = off part of cycle (next parameter indicates remaining time off)

1 = on part of cycle (next parameter indicates remaining time on)

c: remaining time off or remaining time on

n: batch count

N: maximum number of cycles (0 for continuous)

COMMAND SUMMARY

Command Description	Command String
Get Active Connection	<STX>QX<CR>
Get Brand	<STX>QB<CR>
Get Model String 1	<STX>Q1<CR>
Get Model String 2	<STX>Q2<CR>
Get Model Type	<STX>QN<CR>
Get Version	<STX>QV<CR>
Get Flow Units	<STX>QU<CR>
Get Flow Rate	<STX>QF<CR>
Get Direction	<STX>QD<CR>
Get Flow Rate Range	<STX>QR<CR>
Get Cumulative Volume	<STX>QC<CR>
Get Speed in RPM	<STX>QS<CR>
Get Local Status	<STX>QL<CR>
Get Volume from Revolutions	<STX>QO[revs]<CR>
Get Revolutions from Volume	<STX>QE[volume]<CR>
Get Tube Size	<STX>QTS<CR>
Get Tube Table Size	<STX>QTN<CR>
Get Tube Label	<STX>QTL[tube size]<CR>
Get Pump Status	<STX>PI<CR>
Set Active Connection	<STX>Xn<CR>
Set Flow Units	<STX>SUx<CR>
Set Flow Rate	<STX>SF[flow rate]<CR>
Set Direction (CW)	<STX>SD+<CR>
Set Direction (CCW)	<STX>SD-<CR>
Set Tube Size	<STX>STSx<CR>
Set Control Mode (Local)	<STX>PL<CR>
Set Control Mode (Remote)	<STX>PR<CR>
Pump On Continuous	<STX>PG0<CR>
Pump Stop	<STX>PH<CR>
Clear Total Revolutions Counter	<STX>PZ0<CR>
Start Volume Dispense	<STX>DVx,y,n<CR>
Start Time Dispense	<STX>DTx,y,n<CR>
Pause Dispense	<STX>DP<CR>
Resume Dispense	<STX>DR<CR>
Dispense Status	<STX>DS<CR>

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

Output data; 28 bytes of output data from master to pump.

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	Set Tube Size (see Table 4)
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 Correlation Table

Index	600 & 100 RPM L/S
1	mL/min
2	mL/hr
3	L/min
4	L/hr
5	L/day
6	uL/min
7	uL/hr
8	gal/min
9	gal/hr
10	gal/day
11	oz/min
12	oz/hr
13	cum/hr
14	RPM
15	%

Masterflex Tube Size Correlation Table

Index	600 RPM L/S	100 RPM L/S
1	13	13
2	14	14/HP
3	15	15/HP
4	15HPF	15HPF
5	16	16/HP
6	16HPF	16HPF
7	17	17
8	17HPF	17HPF
9	18	18
10	18HPF	18HPF
11	24	24/HP
12	24HPF	24HPF
13	25	25
14	25HPF	25HPF
15	35	35
16	35HPF	35HPF
17	36	36
18	36HPF	36HPF
19	CUSTOM	CUSTOM

NOTE: The 600 RPM and 100 RPM models have the same tube sizes except the 600 RPM model does not have "HP" sizes (14HP, 15HP, 16HP and 24HP).

PROFIBUS

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.

Table 1

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

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 above, 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.

Table 3

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 below 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. For example, if the pump is in local mode, then a 1 to 0 transition will put the pump into PROFIBUS remote control mode. Only in this mode can any change in the cyclic output data influence the pump 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. The numbers correspond to the pump's local menu list in the front panel display interface. For example:

tube size "13" from the local menu list corresponds to the value "1" for the Tube Size output value

flow units "gal/hr" from the local menu list corresponds to the value "9" for the Flow Units output value

Set Flow Rate is a decimal floating-point number. Its 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. It sets the amount of time the pump will pause between dispenses.

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

If the L/S is connected to the internet, updates can be downloaded directly onto the pump drive. **NOTE:** When new updates are available for your device, the update available  icon will be displayed at the top of the Settings Menu Screen.

To update L/S:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
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.

If the L/S is not connected to the internet, updates must be downloaded onto a USB drive before installing onto the pump drive. Visit www.masterflex.com to download the latest updates for your device.

To install updates from a USB drive:

1. Insert the USB drive containing the updates into the pump drive's USB port.
2. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
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

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

To restore the pump to the original factory defaults:

1. Tap **SETTINGS**  from any of the mode screens. The Settings Screen will be displayed.
2. **SCROLL**  through the Settings Screen pages to locate **DEVICE INFORMATION**.
3. Tap **DEVICE INFORMATION**.
4. Tap **FACTORY RESET** and follow the onscreen prompts.

CLEANING THE PUMP DRIVE



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.

NOTE:

- Care should be taken with the pump drive's touchscreen to avoid scratching or otherwise damaging the surface. 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 will be the sole responsibility of the customer.

ACCESSORIES

To purchase accessories or for further information visit www.masterflex.com. The following accessories are available for the L/S Digital Pump Drive:

Description	Part Number
Footswitch w/DB-25 male	07523-92
Connector DB-25 male	07523-94
Cable assembly DB-25 male connector and 25 ft (7.9 m) cable with stripped wire ends	07523-95
Dispensing Wand DB-25	07523-97
Footswitch (NEMA)*	07575-84
Remote Control Cable (NEMA)*, 25-ft (7.62m)	07575-80
Interface Cable DB9M/DB9F	22050-54
Cable USB Type A/Type B M/M	22050-60

REPLACEMENT PARTS

Description	Part Number
Fuse-T3.15A, 5 x 20 mm	77500-25
Gear Service Kit (600 rpm)	07553-06
Gear Only (600 rpm)	07553-09
Gear Service Kit (100 rpm)	07553-08
Replacement Seal Kit (NEMA)8	07575-01
Replacement Gear and Shaft Kit (NEMA)*	07575-02

TROUBLESHOOTING

For further assistance, or for issues that cannot be resolved, see "[Technical Assistance](#)" on page 5-8.

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 25-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 " on page 3-14.
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.
Touchscreen unresponsive.	Wearing thick latex gloves can make the screen less responsive.	Remove gloves before using the touchscreen. NOTE: Consult your company or laboratory safety guidelines before removing any personal protective equipment.

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 Assistance" on page 5-8.

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 Assistance" on page 5-8.

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 Assistance" on page 5-8.

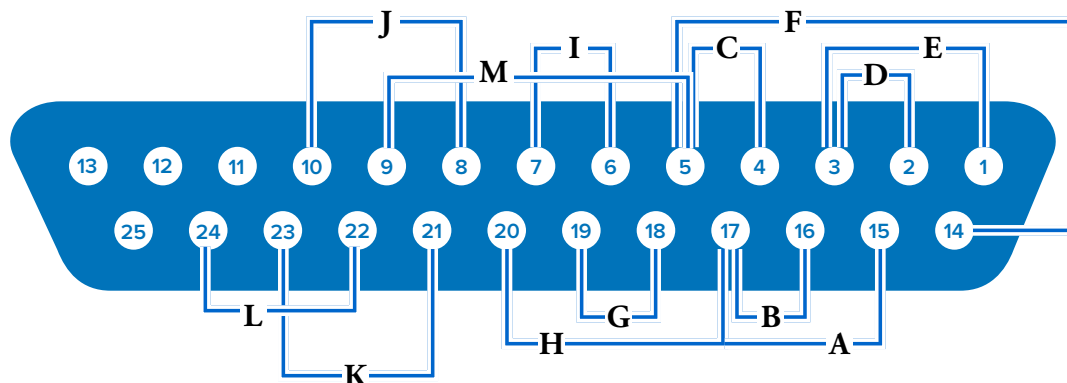
Error #9: Over Speed

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 Assistance" on page 5-8.

DB-25 ELECTRICAL CONNECTIONS



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



Contact Arrangements:

Pin No. DB-25	Description	Pin No. DB-25	Description
1	Speed Control Voltage Input (0–10 V)	14	Speed Signal Voltage Output (0–10 V)
2	Speed Control Current Input (0–20 mA)	15	Start/Stop Input
3	Speed Control Input Reference	16	CW/CCW Input
4	Speed Signal Current Output (0–20 mA)	17	Start/Stop, CW/CCW, Prime Reference
5	Speed Signal Output Reference	18	Tach Output Reference
6	Motor Running Relay Output (N.O.)	19	Tach Output (Open Collector)
7	Motor Running Relay Output Common	20	Prime Input
8	Open Head Sensor Relay Output (N.O.)	21	General Alarm Relay Output Common
9	Local/Remote Input	22	Local/Remote Output Common
10	Open Head Sensor Relay Output Common	23	General Alarm Relay Output (N.O.)
11–13	Not Used	24	Local/Remote Output (N.O.)
		25	Not Used

Wiring Scheme:

A	Start/Stop	G	Tach Output
B	CW/CCW	H	Prime
C	Output (0–20 mA, 4–20 mA)	I	Motor Running (N.O.)
D	Input (0–20 mA, 4–20 mA)	J	Open Head Sensor (N.O.)
E	Input (0–10 V)	K	General Alarm
F	Output (0–10 V)	L	Local/Remote Output (N.O.)
		M	Local/Remote Input

SPECIFICATIONS

OUTPUT

Speed:	100/600 RPM Models	0.02 to 100 RPM 0.01 to 600 RPM
Torque Output, Max Continuous:	100/600 RPM Models	1080 oz-in 100 RPM 540 oz-in 600 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 ; ± 50 V common mode range) RJ45 Ethernet USB, Type A (5 VDC @ 0.5 A)

CONSTRUCTION

Dimensions (L x W x H):	10.12" x 7.62" x 8.51" (258 mm x 194 mm x 216 mm)
Weight:	12.5 lbs. (5.66 kg)

Enclosure Rating:	Console Models	IP33 per IEC 60529
ENVIRONMENT		
Operating Temperature:	All Models	0 °C to 40 °C (32 °F to 104 °F)
Storage Temperature:	All Models	-25 °C to 65 °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		
	All Models	UL 61010-1, UL 61010-2-081 US/CAN For CE mark: EN61010-1, Low Voltage Directive EN61326-1, EMC Directive EN50581, RoHS Directive
	Pump Head	EN809, Machinery Directive

TECHNICAL ASSISTANCE

If you have any questions about the use of this product contact the manufacturer or authorized seller.

PRODUCT RETURN

Like all pumps, the L/S pump drive contains components that will wear over a period of 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.

WARRANTY

Visit www.masterflex.com for warranty information.

DISPOSAL

Please retain packaging materials until the product warranty ends. Afterwards please discard of 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. Please refer to local regulations regarding proper disposal.





US & Canada only

Toll Free 1-800-MASTERFLEX | 1-800-637-3739

Outside US & Canada

1-847-549-7600 | 1-847-381-7050

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