



MASTERFLEX® 77123-00 and 07525-20

OPERATING MANUAL:
**DIGITAL PUMP
DRIVES**

Model Nos.

07525-20
07525-40
77123-00

A-1299-7328
Edition 01

 Cole-Parmer®

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SAFETY PRECAUTIONS



DANGER: *High voltages exist and are accessible. Use extreme caution when servicing internal components.*



WARNINGS: *Tubing breakage may result in fluid being sprayed from pump. Use appropriate measures to protect operator and equipment.*

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



WARNINGS: *Do not operate the pump drive in a manner not specified in the documentation. Misuse of the pump drive may result in a hazard and may compromise the safety protection built into the pump drive. If the pump drive is damaged, turn it off and not use it until service-trained personnel can check its safety.*

Single-Phase Only. Not to be used with Split-Phase lines.

Main disconnect is accomplished by disconnecting the detachable power supply cord at the appliance coupler or at the main plug. Ensure the power cord is easily accessible and removable, in the event of an emergency, which requires immediate disconnection.

The operator should check the detachable power supply cord condition. The equipment should not be operated if the power supply cord is cracked or broken. Any obvious damage to the enclosure (from a drop or fall) should be checked by service personnel for loose or damaged parts inside.



CAUTIONS: *Power must be disconnected before connecting the external remote control cable to prevent damage to the drive.*

Do not block the rear panel of the pump drive. The power cord must always be easy to disconnect.

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

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.

When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of the system.

SAFETY PRECAUTIONS (continued)

Explanation of Symbols

WARNING: Product Use Limitation



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.



CAUTION: Risk of Danger. Consult Operator's manual for nature of hazard and corrective actions.



CAUTION: Risk of crushing. Keep fingers away from rotor while pump is in operation. Stop pump before loading or unloading tubing.



CAUTION: Risk of electric shock. Consult Operator's manual for nature of hazard and corrective actions.



This product is not designed for, nor intended for use in patient connected applications; including, but not limited to, medical and dental use, and accordingly has not been submitted for FDA approval.

This product is not designed for, nor intended for use in hazardous duty areas as defined by ATEX or the NEC (National Electrical Code); including, but not limited to use with flammable liquids. Consult the factory for products suitable for these types of applications

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Section 1 Introduction

The Digital drive controls the speed of MASTERFLEX® Pump Heads to provide flow rates from 0.00013 to 324 mL/min.

Application Solutions

Advantages of Peristaltic Pumps:

- No seals in contact with the medium pumped.
- No valves to clog.
- Inner surfaces are smooth and easy to clean.
- Fluid contacts only the tubing or tube material.
- Suction lift and priming up to 1.5m water column at sea level.
- Low shearing for handling the most shear sensitive of fluids like latex or fire fighting foam.
- Capable of running dry and pumping fluids with high quantities of entrained air, such as black liquor soap.
- High volumetric efficiency allows operation in metering or dosing applications where high accuracy is required.
- Handle extremely viscous fluids.
- Tubing and tube materials are available that are suitable for food and pharmaceutical use.

General Description

The MASTERFLEX Digital Peristaltic Pump Drive offers flow rate capacities from 0.00013 mL/min to 324 mL/min depending on model and tubing being used. Features include a small footprint, plus non-stainless steel drives that are stackable.

The MASTERFLEX digital pump provides a motor speed repeatability of +/- 0.1 percent to maximize productivity in precision liquid dosing, batch dispensing and filling applications. A turndown ratio up to 3000-to-1, bidirectional flow and self-priming capabilities allow for smooth, seamless operation and an extremely broad flow range within one tubing size.

In addition to high accuracy, precision, repeatability and resolution of speed (or flow rate), the MASTERFLEX drive features an intuitive, man/machine interface with a four-line graphical LCD display providing direct readout of pump speed (rpm), flow rate (user-selected units), number of dispenses, and menu options.

The easy-to-use keypad eliminates setpoint overshoot and provides easy navigation through menu options that include a number of on-screen programming features.

These drives use high precision, no-maintenance brushless motors for improved reliability. This, combined with its high turndown, superior accuracy, and intuitive interface make the MASTERFLEX drives ideally suited where ultra-precise, repeatable flow control is required. The pump accommodates a variety of product fill volumes and batch dispensing profiles, and fluid only contacts the tubing, providing for contamination-free pumping.

MASTERFLEX pumps are self-priming, can operate dry without damage, are suitable for most chemicals and contain no valves or seals. See *Tubing Guides* within this CD.

Section 2 Installation and Setup

Before Starting Drive

- The drive should be mounted on a flat horizontal surface.
- The ambient air temperature should not exceed 104° F (40° C) and adequate air flow should be provided for.

 **CAUTION:** *Do not block the rear panel of the pump drive. The power cord must always be easy to disconnect.*

- Tubing should be clean and routed so that bend radii are at a minimum four (4) times the tube diameter and as short as possible.

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

- Use a tube size of appropriate diameter for the flow rate and viscosity required.
- To maintain the best accuracy of flow rates, re-calibrate tubing regularly. See *Tubing Calibration* section of this manual.
- For tubing selection and compatibility, see *Tubing Selection Guide* within this CD.
- When cleaning or performing maintenance, please remove power from the drive.

 **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.*

 **DANGER:** *High voltages exist and are accessible. Use extreme caution when servicing internal components.*

Section 2

Installation and Setup

Before Starting Drive (continued)



CAUTION: When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of the system.

Section 3 Operation

Turning On the Drive



WARNING: Do not operate the pump drive in a manner not specified in the documentation. Misuse of the pump drive may result in a hazard and may compromise the safety protection built into the pump drive. If the pump drive is damaged, turn it off and not use it until service-trained personnel can check its safety.

1. Plug the power cord into the IEC Connector of the 24V DC desktop power supply. Plug the opposite end of the power cord into an electrical outlet.
2. Plug the barrel connector of the 24V DC desktop power supply into the rear of the pump drive.
3. After plugging in the barrel connector, *Continuous mode of operation* will appear on the LCD screen. (**NOTE:** Each start-up after the initial will revert to the mode of operation screen previously in use.)



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.



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



WARNING: Tubing breakage may result in fluid being sprayed from pump. Use appropriate measures to protect operator and equipment.

Control Panel

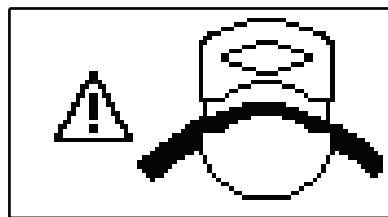


Figure 3-1. Control Panel.

- To navigate all menus on the drive use the (UP key), (DOWN key), (ENTER key), and (BACK key).
- The key located on the top right of the control panel is used to enter or select a highlighted field or option. This key is often referred to as the ENTER key in this manual.
- The key located on the bottom right of the control panel is used to go back to a previously selected highlighted field or screen. This key is often referred to as the BACK key in this manual.
- The key located at the middle right of the control panel is used to start and pause the drive. This key is often referred to as the START/STOP key in this manual.
- The (PRIME) function located at the left of the control panel is activated by pressing and holding the UP and DOWN keys simultaneously. While the keys are pressed, these keys operate the drive at the maximum allowed speed/flow rate and in the direction shown on the display. When released, the drive returns to its original speed or flow rate.

Priming the Pump

1. Open the Pump Head to drive. **NOTE:** On 07525-20 and 07525-40 only, opening the Pump Head while the drive is powered will display a pump open warning. If the drive is running it will stop the drive. Press the start key or activate the START/STOP remote contact to restart the drive.



2. Insert appropriate tubing into Pump Head.
3. Insert tube inlet into supply fluid.
4. Insert tube outlet into desired container.
5. Press and hold the UP and DOWN keys simultaneously, this will activate the prime function on the drive console to prime the pump. Priming will stop when keys are released.



CAUTION: Keep fingers away from rotor while pump is in operation. Stop pump before loading or unloading tubing.

Main Screen

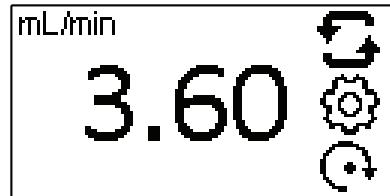
The drive has two different modes of operation—Continuous mode and Copy Dispense mode. The drive also can be controlled directly via the control panel or remotely through input signals to the 25-pin connector on the back panel of the drive. Several primary control functions including starting and stopping the pump, adjusting the rpm/flow rate, and changing pump direction can be performed independently via use of the control panel or through the remote control. This is true for both Continuous and Copy Dispense modes (see the *Remote Control* section following for more details).

CONTINUOUS MODE  is the default pumping mode. The pump will operate continuously at the set rpm (or flow rate) unless the drive is either stopped or the flow rate/rpm is changed by the user. Refer to *Continuous Mode* in this manual.

COPY DISPENSE MODE  allows for dispensing at specific volume intervals. (Example...repetitively filling vials with the same volume by a single press of a button, foot switch or dispensing wand.) Each dispense can be started either via the Enter Key  on the control panel or through the Start/Stop contact on the back of the drive (see *Remote Control* section following). The Off Time feature further allows for a continuous dispensing pattern by which a specific off time interval between each dispense can be set. Thus a continuous Dispense-Off Time-Dispense- Off Time cycle is created. An additional feature of the Copy Dispense mode is Batch Count (0000/0015). This allows you to set a limit to the number of dispenses the pump will deliver before stopping. Once the count limit is achieved, the batch count will have to be reset to zero to continue pumping. Please note that batch count can be set to infinity (∞) to allow for continuous dispense cycling. Refer to *Copy Dispense Mode* in this manual.

SETTINGS  Mode settings menu

PUMP DIRECTION  Select the direction of the pump flow. The icon will rotate when the pump is running.

**Continuous Mode
Screen**

Stopped



Running

Figure 3-2. Flow Rate Screens.**FLOW RATE:** Set the flow rate in flow unit listed at the top of the screen.**(NOTE:** To change flow unit, see *Flow Unit*.) When the entire rate field is highlighted, press . The digits can be navigated individually using the or arrows; switch between digits by using the key. After selecting an optimal flow rate, press again to validate. Press the key to exit.

Continuous Mode Screen (continued)

Display Legend: Below is a screenshot of the screen display for the drive in Continuous Mode. An explanation of the information on the screen follows.

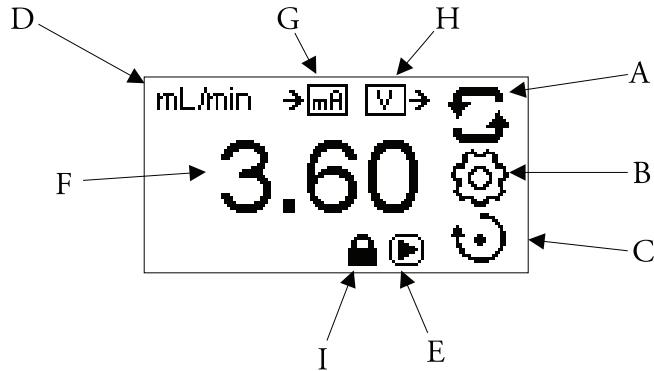


Figure 3-3. Continuous Mode Screen.

- A. **Mode Display:** Current operating mode in which the drive will operate. Pressing ENTER key when highlighted will cycle through the different operation modes.
- B. **Settings :** Pressing the ENTER key on this icon goes to the Settings Menu. The Settings Menu contains all the functions for Continuous Mode, which includes: Flow Units, Tubing Size, Remote Control, and Keypad Lockout. The Settings Menu also provides access to tubing calibration and sounds.
- C. **Flow Direction :** Pressing the ENTER key on this icon toggles between clockwise and counterclockwise flow direction. This icon will rotate when the pump is running.
- D. **Flow Units:** *Informative only.* **NOTE:** Flow units are available in Continuous Mode only.
- E. **Play :** *Informative only.* This icon will display when the pump is running
- F. **Flow Rate:** The center digits show the flow rate of the drive in the unit of measure selected.
- G. **Remote Input or :** *Informative only.* Voltage input or Current input will display when turned on in the settings menu.
- H. **Remote Output or :** *Informative only.* Voltage output or Current output will display when turned on in the settings menu.
- I. **Keypad Lockout :** *Informative only.* This icon will display when the keypad lockout is turned on in the setting menu. Locking the keypad will prevent someone from changing the settings on the drive.

Settings Menu

Both operation mode screens contain a SETTINGS icon that gives quick access to the SETTINGS Menu. The exact options that can be accessed through the SETTINGS Menu will depend on the operating mode currently in use:

1. **Selecting the SETTINGS Menu:** In any of the operating modes, use the UP/DOWN or ENTER key to select the SETTINGS icon from the mode operation screen.
2. **Navigating the SETTINGS Menu:** Use the UP/DOWN keys to highlight desired setting and press ENTER.

A breakdown of the setting features common to all modes follows. Other settings are related to the specific operating mode currently in use.

Flow Unit: Select desired flow unit to be displayed. Pressing the ENTER key on this screen goes to the Flow Unit selection screen. **NOTE:** When switching to Copy Dispense Mode, flow rate adjustments are displayed in RPM only.

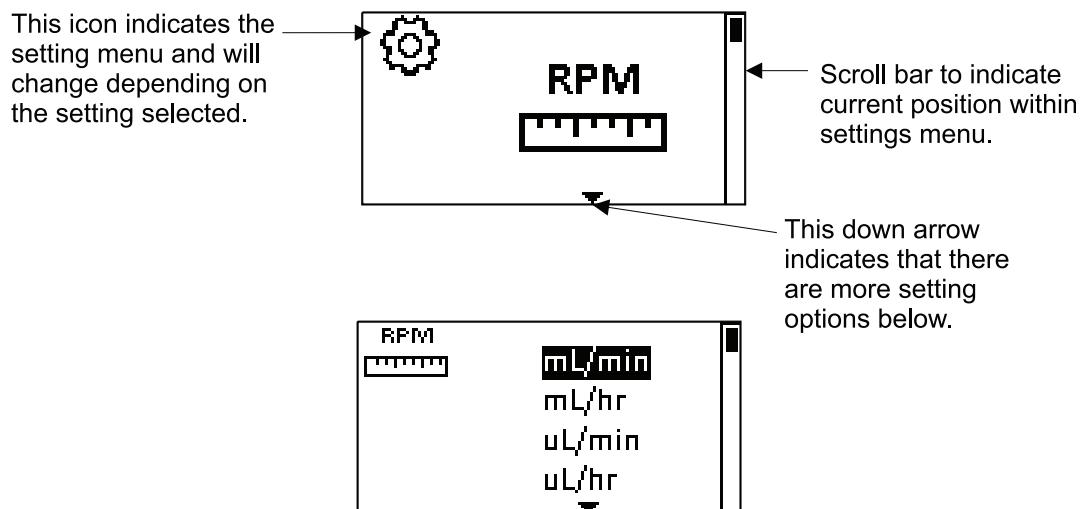


Figure 3-4. Flow Unit Selection Screens.

Settings Menu (continued)

Tubing Size: and its Maximum Flow Rate are displayed. Select desired tubing size by using the UP/DOWN keys to highlight the size tubing installed in the pump head and press ENTER.

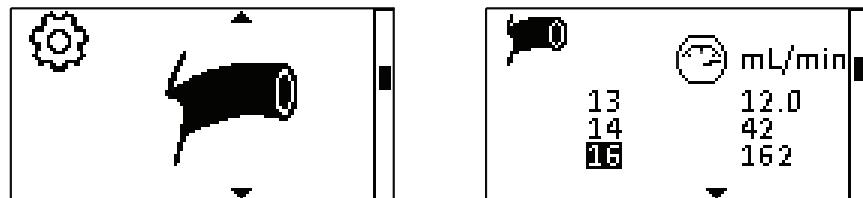


Figure 3-5. Tubing Size Selection Screens.

Settings Menu (continued)

Tubing Calibration: Calibrate the tubing (if precision is required).

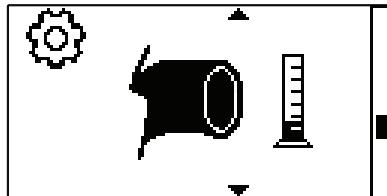


Figure 3-6. Tubing Calibration Selection Screen.

The drive comes preset with flow values based on the tubing ID and pump head selected. PLEASE NOTE that the preset values assume the pump is dispensing water with no back pressure. Every batch of tubing can have a slight variation in ID and wall thickness. MASTERFLEX® tubing is manufactured to tight tolerances and is required for warranty and provides optimal pumping performance and accuracy. Different pumping conditions including fluid viscosity, specific gravity, back pressure, suction lift, and temperature can reduce pumping performance. As a tubing wears, and precision is required, periodic calibration is recommended.

Calibration is performed by running the drive for a specific interval and rpm and correcting for the volume actually dispensed. To perform the calibration you will need an accurate way to measure the fluid being dispensed. A graduated cylinder can be used, but if the specific gravity or density of the fluid is known a balance is recommended for the best accuracy.

1. Insert appropriate tubing into Pump Head.
2. Insert tube inlet into supply fluid.
3. Insert tube outlet into desired container. Container should be a graduated cylinder; or a container placed on a balance may be used for increased accuracy.
If using a balance, an acceptable weight to volume conversion for water is 1 gram = 1 mL.
4. Turn on drive by connecting power to the rear of the drive.
5. Go to the Mode Settings Menu by selecting the SETTINGS icon and pressing the ENTER key. Use the UP and DOWN keys to highlight TUBING CAL icon in the Settings Menu and press the ENTER key.

Settings Menu (continued)

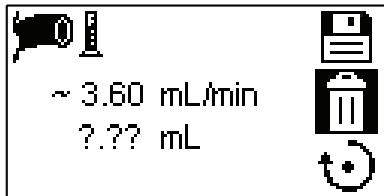


Figure 3-7. Tubing Calibration Screen.

6. Set the drive for the desired flow direction and flow rate. *Note that these settings are retained and transferred to other mode screens when entering or leaving the TUBING CALIBRATION screen.*
 - The flow direction is set using the UP/DOWN keys to highlight the directional arrow. Pressing ENTER will toggle the rotation arrow between CW and CCW.
 - Select tube size. See *Tubing Size* in the SETTINGS Menu.
 - The estimated flow rate is set using the UP/DOWN keys to highlight the flow rate field. Press ENTER to select the digit to be changed. Use the UP/DOWN keys to adjust the flow rate value. Press ENTER to validate and move to the next digit to be changed. Press BACK key to exit access to the flow rate field. The drive will adjust this flow rate after calibration is complete.
7. Press and hold UP and DOWN keys simultaneously on the control panel to prime the pump. Priming will stop when keys are released.
8. Place a measuring container at the pump outlet. Press the START/STOP key to start pumping at the desired flow rate. The drive will continue to run until the START/STOP key is pressed again.
9. Upon completion of the desired dispense amount, the calibration volume field (???.mL) will be highlighted. Press the ENTER key and adjust the calibration volume to the measured quantity. Press ENTER to select the digit to be changed. Use the UP/DOWN keys to enter the measured volume. Press ENTER to validate and move to the next digit to be changed. Press BACK key to exit access to the calibration volume field. Use the UP/DOWN keys to highlight the SAVE icon (clipboard) and press ENTER. The estimated flow rate will update and the tilde (~) will disappear, indicating a measured flow rate. A warning symbol (triangle with a line through it) will appear if the minimum desired pump revolutions for accuracy is not met. Clear the tubing calibration and re-calibrate using a larger dispense amount.
10. Clear the tubing calibration by using the UP/DOWN keys to highlight the delete icon (trash can) and press ENTER.

Global Options Menu

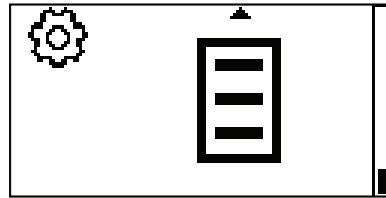
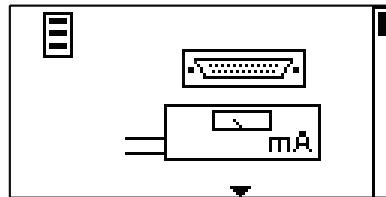


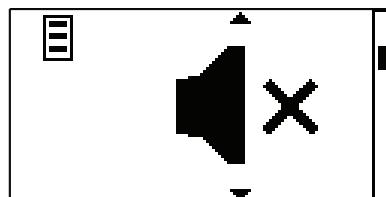
Figure 3-8. Global Options Menu Screen.

In the Global Options Menu the user can setup the Remote Control current inputs and outputs or voltage input and outputs, Sounds, activate the Keypad Lockout, adjust the Display Contrast, turn on the Autostart, or return the drive to its default settings.

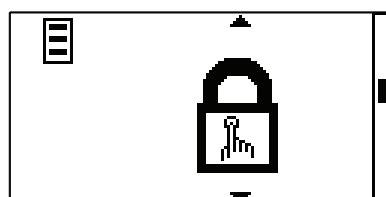
REMOTE CONTROL: Allows the drive to be controlled with a remote voltage or current source and enable the voltage or current output for a given flow. See *Remote Control*.



SOUNDS: Select a beep for keypad, end of dispenses, and batches. See *Sounds*.

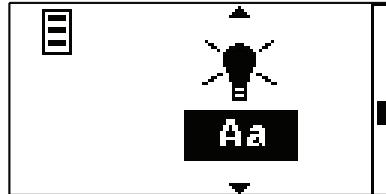


KEYPAD LOCKOUT: Allows for the keypad to be locked and unlocked. See *Keypad Lockout*.

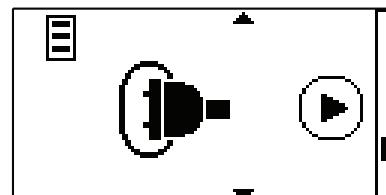


Global Options Menu (continued)

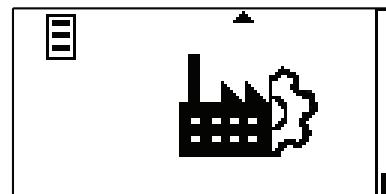
DISPLAY CONTRAST: Allows the contrast of the display to be adjusted. See *Display Contrast*.



AUTOSTART: Allows the drive to restart when power is applied. By default the drive will not restart when power is applied. See *Autostart*.



DEFAULT SETTINGS: Allows the drive to be reset to factory settings. See *Default Settings*.



Remote Control Menu

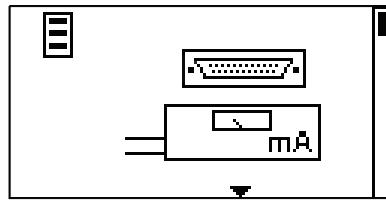
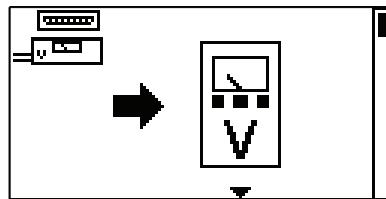


Figure 3-9. Remote Control Menu Screens.

NAVIGATION: From the GLOBAL OPTIONS MENU select the REMOTE CONTROL screen, shown above, and press ENTER.



Remote Control Voltage Input Menu

VOLTAGE INPUT: This allows the user to input a voltage signal to control the flow. Press ENTER on this screen to access the Voltage input activation screen. By default the input is deactivated .

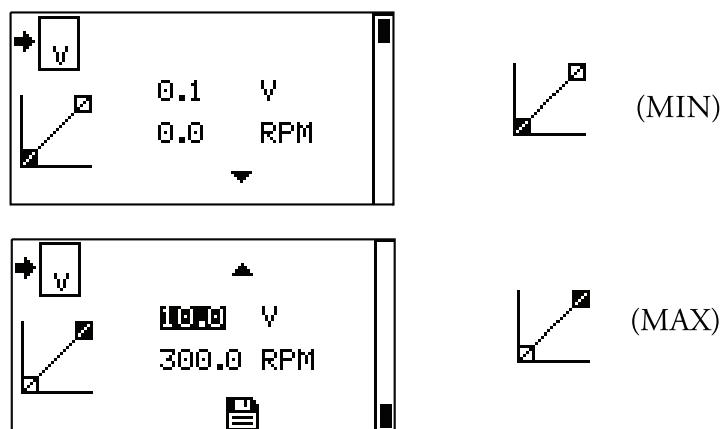


Using the UP and DOWN arrows on the control panel, highlight the icon to activate, and press ENTER. A check mark will move next to it.

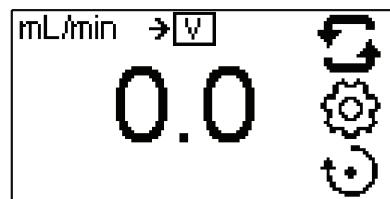


Remote Control Voltage Input Menu (continued)

This will take you to the setpoint screen. The user has an option to adjust the minimum and maximum setpoints for voltage and RPM. The setpoints being edited will be blinking on the slope. To change which setpoint to edit use the UP or DOWN to select screen. By default the minimum (MIN) voltage is set to 0.1V DC and the RPM is set to 0.0. The maximum (MAX) is set to 10.0V DC and the RPM is set to maximum. The scaling can be inverted, if necessary. After both setpoints have been adjusted, save both setpoints from the upper setpoint setting screen by highlighting the save icon and pressing ENTER.

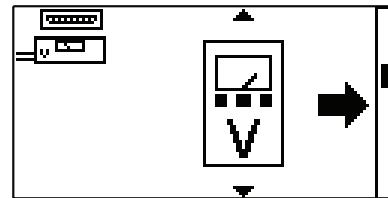


To confirm VOLTAGE INPUT MODE is ON, press the BACK key until the CONTINUOUS PUMP MODE screen appears. The Voltage input icon will be displayed.

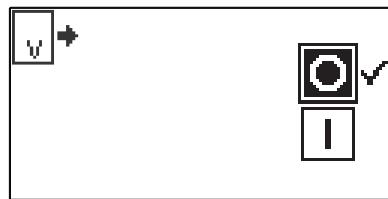


NOTE: When Voltage Input is selected the drive will not start until the VOLTAGE INPUT is ON and in CONTINUOUS PUMP MODE.

Remote Control Voltage Output Menu



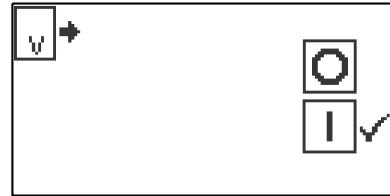
VOLTAGE OUTPUT: This allows the user to adjust the voltage output for a given flow. Press ENTER to Voltage output activation screen. By default the output is deactivated



Using the UP and DOWN arrows on the control panel, highlight the

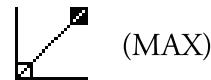
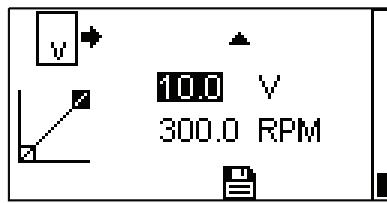
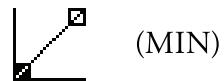
icon to activate, and press ENTER. A check mark

will move next to it.

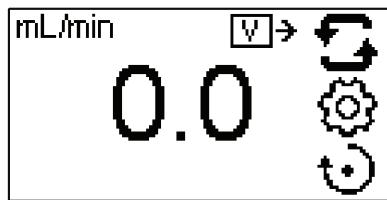


Remote Control Voltage Output Menu (continued)

This will take you to the setpoint screen. The user has an option to adjust the minimum and maximum setpoints for voltage and RPM. The setpoints being edited will be blinking on the slope. To change which setpoint to edit use the UP or DOWN to select screen. By default the minimum (MIN) voltage is set to 1V DC and the RPM is set to 0.0. The maximum (MAX) is set to 10.0V DC and the RPM is set to maximum. The scaling can be inverted, if necessary. The voltage is linear between these two points. After both setpoints have been adjusted, save both setpoints from the upper setpoint setting screen by highlighting the save icon and pressing ENTER.



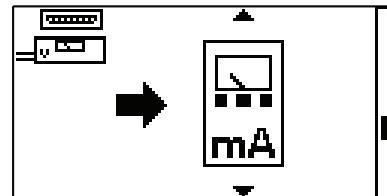
To confirm VOLTAGE OUTPUT MODE is ON, press the BACK key until the CONTINUOUS PUMP MODE screen appears. The Voltage output icon will be displayed.



NOTE: When Voltage Output is selected the drive will not start until the VOLTAGE OUTPUT is ON and in CONTINUOUS PUMP MODE.

NOTE: The Voltage Output indicates the Running Command Speed. Use the Motor Running relay (normally open) to indicate if pump is running.

Remote Control Current Input Menu



CURRENT INPUT: This allows the user to input a current signal to control the flow. Press ENTER to Current input activation screen. By default the input is deactivated



Using the UP and DOWN arrows on the control panel, highlight the

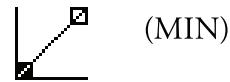
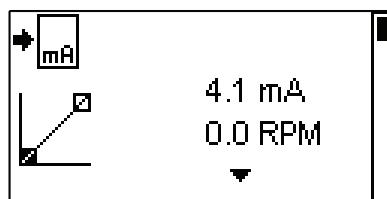
icon to activate, and press ENTER. A check mark

will move next to it.

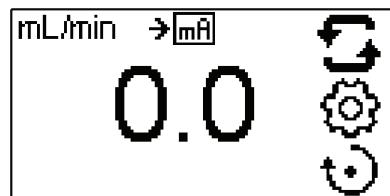


Remote Control Current Input Menu (continued)

This allows the user to input a current signal to control the RPM. The user has an option to adjust the minimum, maximum and middle set points for current and RPM. By default the minimum (MIN) current is set to 4.1 mA and the RPM is set to 0.0. The maximum (MAX) is set to 20.0 mA and the RPM is set to maximum. The scaling can be inverted, if necessary. The RPM is linear between these two points. After both setpoints have been adjusted, save both setpoints from the upper setpoint setting screen by highlighting the save icon and pressing ENTER.

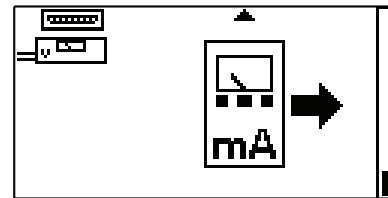


To confirm CURRENT INPUT MODE is ON, press the BACK key until the CONTINUOUS PUMP MODE screen appears. The Current input icon will be displayed.

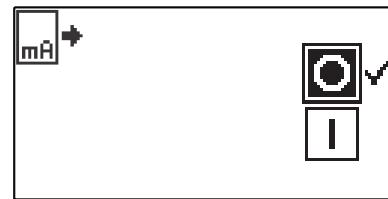


NOTE: When Current Input is selected the drive will not start until the CURRENT INPUT is ON and in CONTINUOUS PUMP MODE.

Remote Control Current Output Menu



CURRENT OUTPUT: This allows the user to adjust the current output for a given flow. Press ENTER to Current output activation screen. By default the output is deactivated

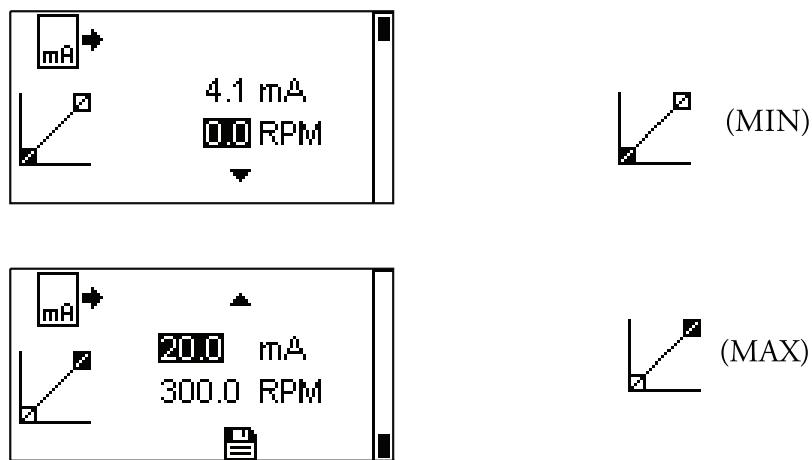


Using the UP and DOWN arrows on the control panel, highlight the icon to activate, and press ENTER. A check mark will move next to it.

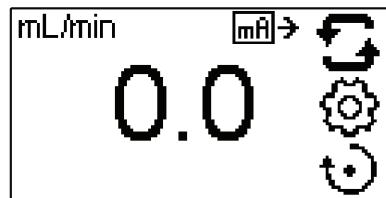


Remote Control Current Output Menu (continued)

This will take you to the setpoint screen. The user has an option to adjust the minimum and maximum setpoints for current and RPM. The setpoints being edited will be blinking on the slope. To change which setpoint to edit use the UP or DOWN to select screen. By default the minimum (MIN) RPM is set to 0.0 and the current is set to 4.1 mA. The maximum is set to maximum (MAX) RPM and the current is set to 20.0 mA. The scaling can be inverted, if necessary. The current is linear between these two points. After both setpoints have been adjusted, save both setpoints from the upper setpoint setting screen by highlighting the save icon and pressing ENTER.



To confirm CURRENT OUTPUT MODE is ON, press the BACK key until the CONTINUOUS PUMP MODE screen appears. The Current output icon will be displayed.

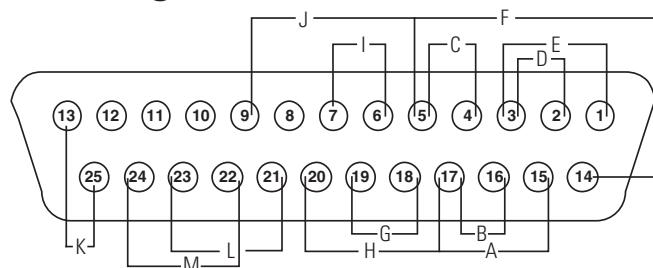


NOTE: When Current Output is selected the drive will not start until the CURRENT OUTPUT is ON and is in CONTINUOUS PUMP MODE.

NOTE: The Current Output indicates the Running Command Speed. Use the Motor Running contacts (normally open) to indicate if pump is running.

DB-25 Pin Configuration with Wiring Scheme

Contact Arrangements



- | | |
|--------------------------|--|
| A. START/STOP | H. PRIME |
| B. CW/CCW | I. MOTOR RUNNING N.O. (1A @ 24V) |
| C. OUTPUT 0-20mA; 4-20mA | J. LOCAL/REMOTE ENABLE |
| D. INPUT 0-20mA; 4-20mA | K. 24V (150mA max.) |
| E. INPUT 0-10V | L. General Alarm N.O. (1A @ 24V) |
| F. OUTPUT 0-10V | M. Local/Remote Indicator (LOCAL N.O.) |
| G. TACH OUTPUT | |

Figure 3-10. DB-25 Pin Configuration with Wiring Scheme.

Pin No. DB-25	Description
1	Speed Control Voltage Input (0-10V)
2	Speed Control Current Input (0-20 mA)
3	Speed Control Input Ground Return
4	Speed Signal Current Output (0-20 mA)
5	Speed Signal Output Ground Reference
6	Motor Running Relay (N.O.)
7	Motor Running, Relay Common
8	Reserved – Not Used
14	Speed Signal Voltage Output (0-10V)
15	Remote Start/Stop Input
16	Remote CW/CCW Input
17	Remote Start/Stop, CW/CCW, Prime, Local/Remote Grnd Ref.
18	Tach Ground Reference
19	Tach Output (open collector)
20	Remote Prime Input
9	Remote Voltage or Current Enabled
10	Reserved – Not Used
11	Reserved – Not Used
12	Reserved – Not Used
21	General Alarm Relay Common
22	Local/Remote Indicator Relay Common
23	General Alarm Relay
24	Local/Remote Indicator Relay
25	Aux 24V + (150 mA)
13	Aux 24V - (150 mA)

NOTE: Pins 5, 13, 17, and 18 are at earth ground, all are suitable for use with START/STOP, PRIME, Direction, Tach, LOCAL/REMOTE, Current and Voltage Outputs.

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

NOTE: Open collector outputs in "low impedance" state are at earth ground and when in "high impedance" state are essentially floating. See *Open Collector* page 3-24.

Remote Control Inputs and Outputs

INPUTS

Remote CW/CCW, Remote Start/Stop, Remote Prime, Remote Current or Voltage Enable:

The remote control inputs work with current sinking outputs (open-collector NPN transistor outputs without passive pull-up resistors) or contact closures to DC common (earth ground). A continuous active low to the Remote Start/Stop **input** causes the drive to run, while a continuous active low to the Remote CW/CCW input causes the drive to run CCW. The motor is brought to a controlled stop before reversing direction. A continuous active low to the Remote Prime input causes the drive to run at full rated speed.

Table 3-1. Remote Control Inputs and Outputs.

CURRENT CLOSED INPUT	1 mA TYP
VOLTAGE OPEN INPUT	3.2V TYP
THRESHOLD CURRENT TO ACTIVATE	0.5 mA TYP

Remote Analog Input:

4-20 mA Input:	250 ohms typical input impedance ref. to signal ground. 4 mA, Stop; 20 mA, Full Speed (Default Settings) 12 Bit Resolution
Overload Capability:	10V or 40 mA max.
0-10V Input:	10 K ohms typical input impedance ref. to signal ground. 0V, Stop; 10V, Full Speed (Default Settings) 12 Bit Resolution

OUTPUTS

4-20 mA Output:	0 to 600 ohms max. load referenced to earth ground. 4 mA, Stop; 20 mA, Full Speed (Default Settings) 12 Bit Resolution
0-10V Output:	1.0 K ohms min. load referenced to earth ground. 0V, Stop; 10V, Full Speed (Default Settings) 12 Bit Resolution
Tach Output:	Open Collector, 1.0A @ 28V DC
Frequency range:	1 to 3000, 50% Duty Cycle. (10 Hz = 1 pump rpm). See <i>Open Collector Output</i> .
Motor Running Output Relay:	Normally Open and Normally Closed when drive is running.
General Alarm Output Relay:	Normally Open, closed when an alarm is displayed.
Local/Remote Indicator Relay:	Normally Open, closed when in remote control mode (Voltage Input or Current Input).
24V DC Aux. Output:	24V DC @ 0.200A

Remote Control Inputs and Outputs (continued)

REMOTE CW/CCW: This input allows the user to change the direction of flow remotely.

REMOTE START/STOP: When the START/STOP **input** is open, the drive can still be started using the START/STOP key, PRIME key, or PRIME input. In remote modes the drive will also run if there is sufficient current or voltage at the input.

Closing the START/STOP **input** will cause the drive to run until the START/STOP **input** opens or the START/STOP key is pressed. In Copy dispense mode, only a momentary START/STOP closure is needed to start the drive. If the drive is already running in one of the dispense modes, a momentary START/STOP closure will stop the drive. In SET COPY MODE, the START/STOP **input** functions the same as in CONTINUOUS MODE; closing it will cause the drive to run until it opens.

REMOTE PRIME: This input allows the user to prime the pump remotely.

REMOTE VOLTAGE or CURRENT INPUT ENABLE: This input enables the user to remotely activate the Voltage or Current input. Enabling this will turn ON the last known input (Voltage or Current) that had been activated from the Remote control menu and saved.

Open Collector Output

The Tachometer output on this drive is an “open collector” type output and cannot be wired in the same manner as relay outputs. An open collector output is not isolated and must be configured differently than a relay output. When the open collector output is active, the output is effectively switched to earth ground and if improperly terminated could result in damage to the drive and/or external equipment.

Recommendation

When connecting to open collector outputs, the output should be connected to a current limiting resistor and then to a positive supply source which is less than 28V DC. Typically this would be connected to a 24V PLC input (see Figure 3-11).

NOTE: when using the 24V supply on the interface connector, current draw must be limited to 150 mA.

NOTE: DO NOT connect 120V supply lines to open collector outputs!

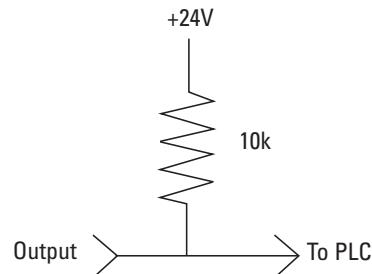


Figure 3-11. Terminating Open Collector Output to a PLC.

Sound Menu

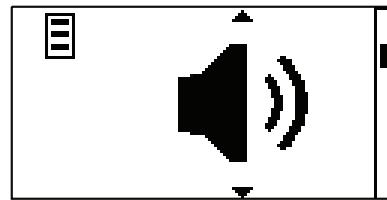
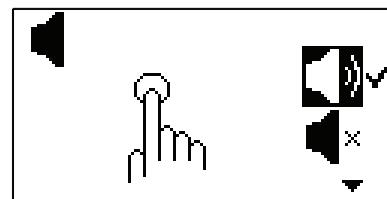
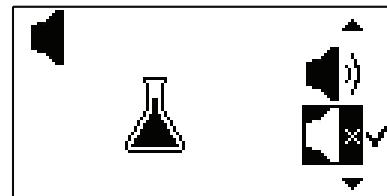


Figure 3-12. Sound Menu Screens.

NAVIGATION: From the GLOBAL OPTIONS MENU select the Sound screen, shown above, and press ENTER.

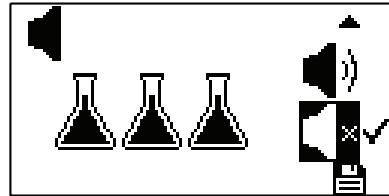


KEY PRESS SOUND: This allows the user to have audio feedback when a key is pressed. By default the sound is deactivated, using the UP and DOWN arrows on the control panel, highlight the speaker icon to activate and press ENTER. A check mark ✓ will move next to it.



DISPENSE SOUND: This allows the user to have audio feedback when a dispense has completed. By default the sound is deactivated, using the UP and DOWN arrows on the control panel, highlight the speaker icon to activate, press ENTER. A check mark ✓ will move next to it.

Sound Menu (continued)



BATCH SOUND: This allows the user to have audio feedback when a batch has completed. By default the sound is deactivated, using the UP and DOWN arrows on the control panel, highlight the  icon to activate and press ENTER. A check mark  will move next to it.

After activating or deactivating sounds, save the sound settings by going to the Batch Sound setting screen and highlighting the save icon at the bottom and pressing ENTER.

Keypad Lockout Menu

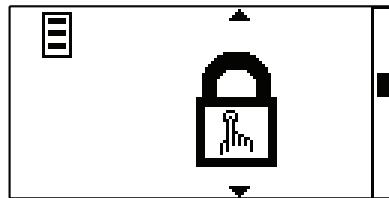
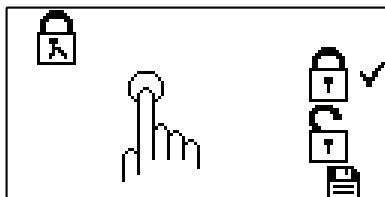


Figure 3-13. Keypad Lockout Menu Screens.

NAVIGATION: From the GLOBAL OPTIONS MENU select the Keypad Lockout screen, shown above, and press ENTER.



KEYPAD LOCKOUT: This allows locking the keypad and preventing someone from changing the settings on the drive. By default the keypad lockout is deactivated, using the UP and DOWN arrows on the control panel, highlight the icon to activate and press ENTER. A check mark will move next to it. The START/STOP key will still function.

Display Contrast Menu

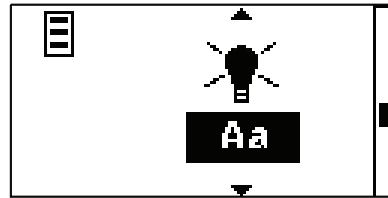
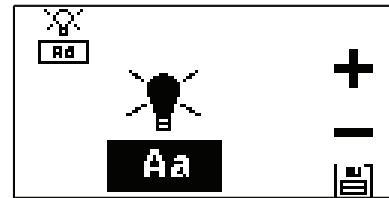


Figure 3-14. Display Contrast Menu Screens.

NAVIGATION: From the GLOBAL OPTIONS MENU select the Display Contrast screen, shown above, and press ENTER.



DISPLAY CONTRAST: This allows the user to adjust the contrast of the display for optimum viewing. By default the display is set for optimum viewing, using the UP and DOWN arrows on the control panel, highlight the **+** icon to increase the contrast or **-** icon to decrease the contrast, then press ENTER.

Autostart Menu

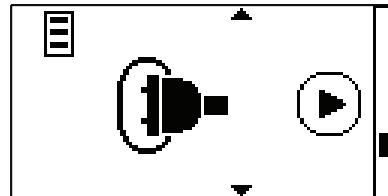
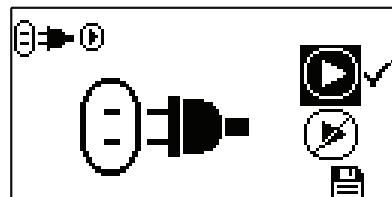


Figure 3-15. Autostart Menu Screens.

NAVIGATION: From the GLOBAL OPTIONS MENU select the Autostart screen, shown above, and press ENTER.

AUTOSTART: By default the drive will not restart when power is applied. To enable this feature select AUTOSTART and then ON. The drive will now restart when power is reapplied. By default the output is deactivated (▶).



Using the UP and DOWN arrows on the control panel, highlight the ▶ icon to activate and press ENTER. A check mark ✓ will move next to it.

Autostart Menu (continued)

The following table shows the drives function when Autostart is used in combination with the Start/Stop input.

Table 3-2. Continuous Mode Operation.

MENU SETTINGS AUTO START	START/STOP INPUT	INTERNAL MODE		mA or V MODE
		Drive State When Powered OFF	Drive Response When Powered ON	Drive Running (sufficient level) When Powered OFF
				Drive Response when Powered ON (sufficient level present)
OFF	OPEN	Started from Front panel Running	Not running	Not running
OFF	OPEN	Not running	Not running	Not running
OFF	CLOSED	Running	Not running	Not running
OFF	CLOSED	Stopped from Front panel	Not running	Not running
ON	OPEN	Started from Front panel Running	Running	Running
ON	OPEN	Not running	Not running	Not running
ON	CLOSED	Running	Running	Running
ON	CLOSED	Stopped from Front panel Not running	Not running	Not running

NOTE: In Continuous Mode when using the START/STOP input the drive is started with a closed contact and stopped when the contacts are opened.

Table 3-3. Copy Mode Operation.

MENU SETTING AUTO START	START/STOP INPUT	Drive State When Powered OFF	Drive Response When Powered ON
			Powered ON
OFF	OPEN	Running	Not running
OFF	OPEN	Not running	Not running
OFF	CLOSED*	Forced run due to Start/Stop CLOSED	Not running
ON	OPEN	Running	Running
ON	OPEN	Not running	Not running
ON	CLOSED*	Forced run due to Start/Stop CLOSED	Running

*** NOTE:** In Copy Mode the drive will start a dispense with a momentary contact closure and stop with a momentary contact closure during both the dispense period and interval period.

Default Settings Menu

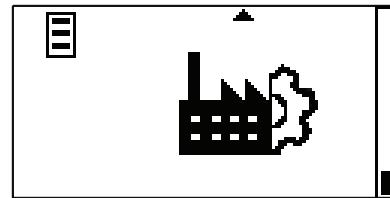
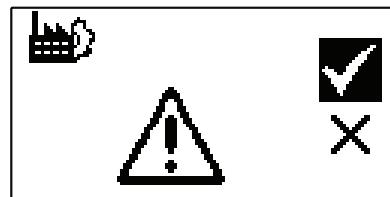


Figure 3-16. Default Settings Menu Screens.

NAVIGATION: From the GLOBAL OPTIONS MENU select the Default Settings screen, shown above, and press ENTER.



DEFAULT SETTINGS: This allows the user to restore the drive back to the factory settings. Highlight the ✓ icon and press ENTER to restore factory settings or X icon or BACK key to cancel.

Copy Mode Screen

Display Legend: Below is a screenshot of the screen display for the drive in Copy Mode. An explanation of the information on the screen follows.

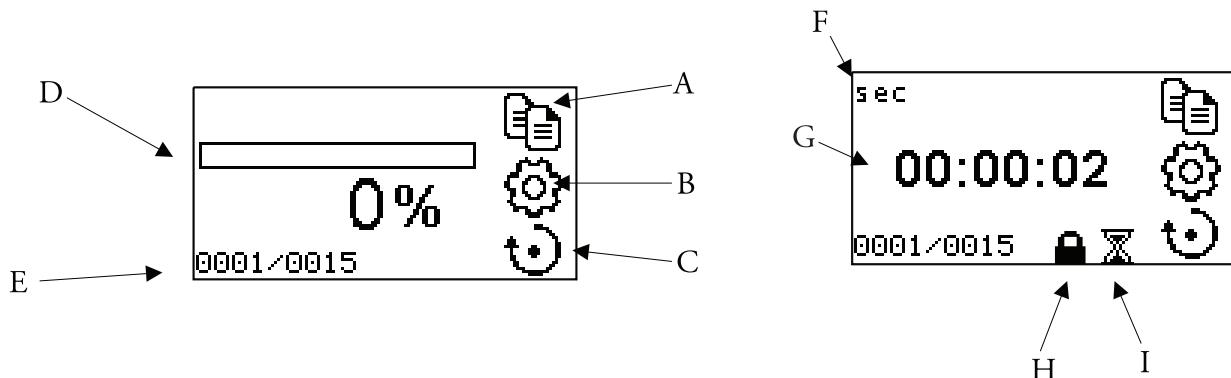


Figure 3-17. Copy Mode Screens.

- A. **Mode Display:** Current operating mode in which the drive will operate. Pressing ENTER key when highlighted will cycle between continuous mode and copy mode.
- B. **Settings ☰:** Pressing the ENTER key on this icon goes to the Setup menu. The Setup Menu contains all the functions for Copy Mode, which includes: Flow Rate (RPM only), Copy, Batch Count and Off Time. The Setup menu also provides access to the Global Options Menu.
- C. **Flow Direction ⌂:** Pressing the ENTER key on this icon toggles between clockwise and counterclockwise flow direction.
- D. **Dispense progress bar:** The center progress bar will show the progress and % of the copy dispensed.
- E. **Batch Count: *Informative only.*** Displayed are the number of copies dispensed of the total copies.
- F. **Time unit:** *Informative only.* This icon indicates that you are in the Off Time screen.
- G. **Time: *Informative only.*** This displays the countdown of the Off Time.
- H. **Keypad Lockout 🔒: *Informative only.*** This icon will display when the keypad lockout is turned on in the setting menu. Locking the keypad will prevent someone from changing the settings on the drive.
- I. **Off Time Icon ✘: *Informative only.*** This icon will only display when an Off Time is set.

Settings Menu

Both operation mode screens contain a SETTINGS icon  that gives quick access to the SETTINGS Menu. The exact options that can be accessed through the SETTINGS Menu will depend on the operating mode currently in use:

1. **Selecting the SETTINGS Menu:** In any of the operating modes, use the UP/DOWN or ENTER key to select the SETTINGS icon from the Mode Operation screen.
2. **Navigating the SETTINGS Menu:** Use the UP/DOWN or the ENTER key to select desired setting.

Copy Flow Rate Menu

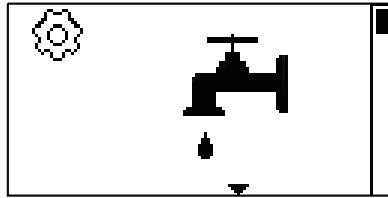
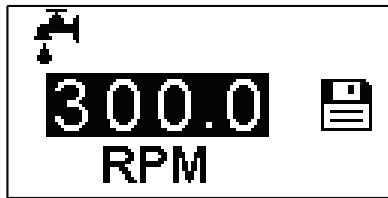


Figure 3-18. Copy Flow Rate Menu Screens.

NAVIGATION: From the SETTINGS MENU select the Flow Rate (RPM only) screen, shown above, and press ENTER.



FLOW RATE (RPM only): When the entire rate field is highlighted, press ENTER. Press and hold the UP or DOWN key to change the RPM. The digits can also be navigated individually using the UP/DOWN arrows; switch between digits by using the ENTER key. After selecting an optimal flow rate, press ENTER again to validate. Press the back key to exit edit mode and save. (**NOTE:** RPM is the only unit available in Copy Mode.)

Set Copy Menu

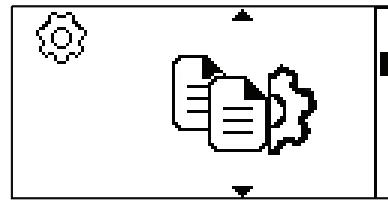
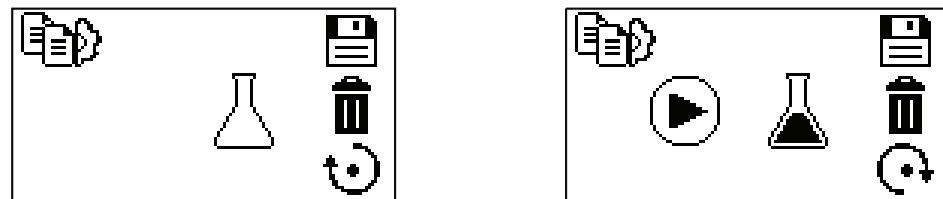


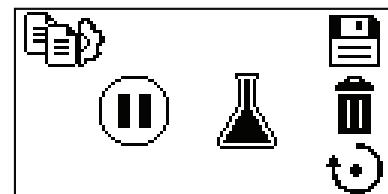
Figure 3-19. Set Copy Menu Screens.

PREPARING TUBING: Insert the tube inlet into the supply fluid. Next, insert the tube outlet into desired container.

FLOW DIRECTION : Pressing the ENTER key with this icon highlighted, toggles between clockwise and counterclockwise flow direction.

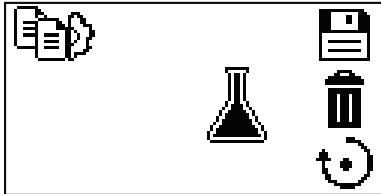


SET COPY: Press the START/RUN key on the control panel to initiate copy. Once the amount of desired fluid is dispensed, press the STOP/PAUSE key .

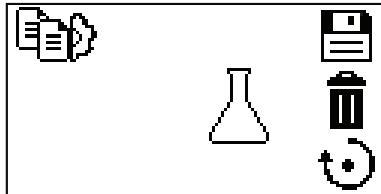


SAVE COPY : Pressing the ENTER key with this icon highlighted will save the copy.

Set Copy Menu (continued)



ADD TO COPY: Pressing the START/RUN key on the control panel when a COPY has been saved, will add to the existing saved COPY.
See *Set Copy*.



DELETE COPY : Pressing the ENTER key with this icon highlighted will delete the copy.

Set Batch Count Menu

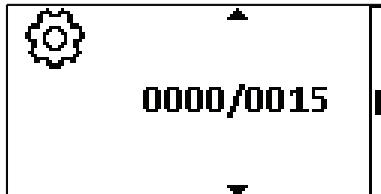
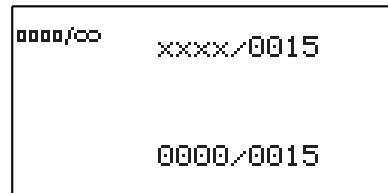
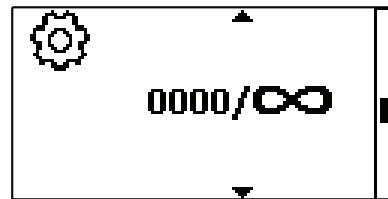


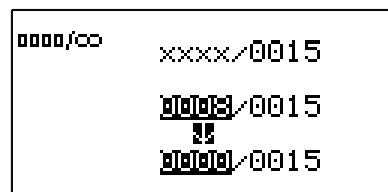
Figure 3-20. Set Batch Count Menu Screens.

NAVIGATION: From the SETTINGS MENU select the Batch Count screen, shown above, and press ENTER.

Set Batch Count Menu (continued)



Using the UP and DOWN arrows on the control panel, highlight the top right number and press ENTER. The digits can be navigated individually using the UP/DOWN arrows; switch between digits by using the ENTER key. After selecting the batch count, press ENTER again to validate. If a batch count is not required, setting it to all 0000 will allow for continuous dispense cycling. This will also change the display icon to infinity (∞). Press the back key to exit.



To reset the batch count, highlight the lower left and press ENTER.

Off Time Menu

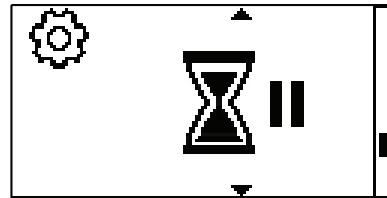


Figure 3-21. Set Off Time Menu Screens.

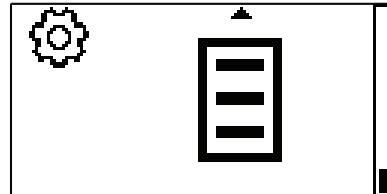
NAVIGATION: From the SETTINGS MENU select the Off Time screen, shown above, and press ENTER.



Using the UP and DOWN arrows on the control panel, highlight the time and press ENTER. The digits can be navigated individually using the UP/DOWN arrows; switch between digits by using the ENTER key. After selecting the Off Time, press ENTER again to validate. Press the back key to exit.

NOTE: Setting it to 00:00:00 will require the START/STOP button on the control panel to initiate each copy.

Global Options Menu



NAVIGATION: From the SETTINGS MENU select the Global Options Menu screen, shown above, and press ENTER. See *Global Options Menu*.

Section 4 Maintenance

Replacement Parts and Accessories



WARNINGS: Main disconnect is accomplished by disconnecting the detachable power supply cord at the appliance coupler or at the main plug. Ensure the power cord is easily accessible and removable, in the event of an emergency, which requires immediate disconnection.

The operator should check the detachable power supply cord condition. The equipment should not be operated if the power supply cord is cracked or broken. Any obvious damage to the enclosure (from a drop or fall) should be checked by service personnel for loose or damaged parts inside.



CAUTIONS: Replace the power cord only with one of the same type and rating. The minimum power ratings are stated on the rear panel.

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.

Description	Part Number
Power Supply, 24V DC output, 90 to 260V AC input	07525-90
Replacement Miniflex™ Single Channel Pump Head	77220-20
Replacement Miniflex Dual Channel Pump Head	77220-30
Replacement Microflex Single Channel Pump Head	77123-80

Cleaning

Keep the drive enclosure clean with mild detergents. Do not immerse or use excessive fluid when cleaning.

Section 5 Troubleshooting

Troubleshooting Chart

Symptom	Cause	Remedy
Motor does not rotate, Display does not light.	No Power.	<ol style="list-style-type: none">1. Check power supply is plugged into unit.2. Check that power supply is plugged into a live line.3. Check connection of power cord.4. Check the line cord for continuity and replace if defective.5. Return for servicing.
Motor does not rotate. Display lights.	Defective Remote Control or Setting Error.	<ol style="list-style-type: none">1. Check that remote cable connector is fully inserted into the receptacle.2. Reapply power.3. If motor still does not rotate, select remote control in Main Menu or Setup Menu and verify settings.4. Return to Mode screen and verify icon shows. Remote Control Mode.5. See <i>Remote Control Mode</i> in this manual for further details.

Error Definitions

Error #2 No Encoder Counts

Description:	The drive has exceeded commanded speed value.
Error Condition(s):	The motor has exceeded the commanded speed value by 20%.
Actions:	Drive will stop immediately. Verify load is correct and power cycle drive. If error persists consult factory.

Error #3: Average Over-Current

Description:	Motor is drawing too much current for a short duration of time.
Error Condition(s):	The motor current is above maximum average current.
Actions:	Drive will stop immediately. Verify that pump head is not binding and that the load is not above recommended maximum load. If error persists consult factory.

Error #6: Power Supply Under Voltage

Description:	The measured DC voltage reported by the drive is too low.
Error Condition(s):	The drive voltage is below minimum supply volts.
Actions:	The pump will stop immediately, check the supply line voltage.
NOTE:	This error when displayed during power down is considered normal and proper. If error persists consult factory.

Error #7: Power Supply Over Voltage

Description:	The measured DC voltage reported by the drive is too high.
Error Condition(s):	The drive voltage is above maximum supply volts.
Actions:	The pump will stop immediately, check the supply line voltage. If error persists consult factory.

Error #9 Motor Overspeed

Description:	The drive has exceeded commanded speed value.
Error Condition(s):	The motor has exceeded the commanded speed value by 20%.
Actions:	Drive will stop immediately. Verify load is correct and power cycle drive. If error persists consult factory.

Error Definitions (continued)

Error #11: Bad EEPROM Checksum (Factory Cal)

Description: Bad EEPROM checksum for Factory Cal.

Error Condition(s): 1) Checksum value in EEPROM does not match calculated value.

2) Data in EEPROM is out of range.

Actions: Error will be cleared after 10 seconds and parameters will be reset to default values. If error persists consult factory.

Section 6 Accessories

Description	Part Number
Footswitch with 6 ft. (1.8m) cable and DB-25 male connector	07523-92
Connector DB-25 male; connector only; use to create own cable	07523-94
Cable assembly, DB-25 male connector and 25-ft (7.9m) cable w/stripped wire ends	07523-95
Dispensing Wand with 6 ft. (1.8m) cable and DB-25 male connector	07523-97

Section 7 Specifications

Output

Speed:	0.1 to 300 rpm
Torque output, Maximum:	90 oz-in (6.5 kg•cm) 270 oz-in Starting
Speed regulation:	Line $\pm 0.1\%$ F.S. Load $\pm 0.1\%$ F.S. Drift $\pm 0.1\%$ F.S.
Display:	128 x 64 LCD w/ LED Backlight
Remote outputs:	Voltage speed output (0–10V DC @ 1 k Ω min) Current speed output (0–20 mA @ 0–600 Ω) Tach output (1 to 3000 Hz, 50% duty cycle, 10 Hz/rpm) Alarm, Local/Remote, Motor running output (N.O. Relay, 1A @ 24V DC)

Input

Supply voltage limits:	24V DC
Current, max.:	1.3A
Remote Inputs:	STOP/START, CW/CCW, PRIME CURRENT/VOLTAGE ENABLE (Contact closure)
	Voltage input (0–10V DC @ 10 k Ω), $\pm 50V$ common mode range
	Current input (0–20 mA or 4–20mA @ 250 Ω), $\pm 50V$ common mode range

Construction

Dimensions (L × W × H):	
Models 07525-20 and 07525-40	Miniflex 9.38 in × 5.5 in × 6.19 in (238 × 140 × 157 mm)
Model 77123-00	Microflex 8.09 in × 5.5 in × 6.19 in (205 × 140 × 157 mm)
Weight:	
Models 07525-20 and 07525-40	Miniflex 4.8 lb (2.2 kg)
Model 77123-00	Microflex 4.5 lb (2.0 kg)
Enclosure Rating:	IP 33 per IEC 60529

Environment

Temperature, Operating:	0° to 40°C (32° to 104°F)
Temperature, Storage:	-25° to 65°C (-13° to 149°F)
Humidity (non-condensing):	10% to 90%
Altitude:	Less than 2000 m
Pollution Degree:	Pollution Degree 2 (Indoor use — lab, office)
Chemical Resistance:	Exposed material is aluminum, ABS plastic and vinyl
Compliance:	(For CE Mark): EN61010-1 (EU Low Voltage Directive) and EN61326 (EU EMC Directive)

Desktop Power Supply

Input:	IEC320 C14 AC Inlet with an input range of 90V AC to 264V AC @ 47-63 Hz, 90W.
Output:	Plug 2.5 mm x 5.5 mm, Center Positive 24V DC
Compliance:	PFC, cUL, UL, TUV, BSMI, CCC, PSE, FCC, CE

Section 8 Warranty, Product Return and Technical Assistance

Warranty

Use only MASTERFLEX precision tubing with MASTERFLEX pumps to ensure optimum performance. Use of other tubing may void applicable warranties.

This product is warranted against defects in material or workmanship, and at the option of the manufacturer or distributor, any defective product will be repaired or replaced at no charge, or the purchase price will be refunded to the purchaser, provided that: (a) the warranty claim is made in writing within the period of time specified on the warranty card, (b) proof of purchase by bill of sale or receipted invoice is submitted concurrently with the claim and shows that the product is within the applicable warranty period, and (c) the purchaser complies with procedures for returns set forth in the general terms and conditions contained in the manufacturer's or distributor's most recent catalog.

This warranty shall not apply to: (a) defects or damage resulting from: (i) misuse of the product, (ii) use of the product in other than its normal and customary manner, (iii) accident or neglect, (iv) improper testing, operation, maintenance, service, repair, installation, or storage, (v) unauthorized alteration or modification, or (b) post-expiration dated materials.

THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER, AND THE MANUFACTURER AND DISTRIBUTOR DISCLAIM ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NO EMPLOYEE, AGENT, OR REPRESENTATIVE OF THE MANUFACTURER OR DISTRIBUTOR IS AUTHORIZED TO BIND THE MANUFACTURER OR DISTRIBUTOR TO ANY OTHER WARRANTY. IN NO EVENT SHALL THE MANUFACTURER OR DISTRIBUTOR BE LIABLE FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES.

The warranty period for this product is two (2) years from date of purchase.

Section 8

Warranty, Product Return and
Technical Assistance

Product Return

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.

Technical Assistance

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



(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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