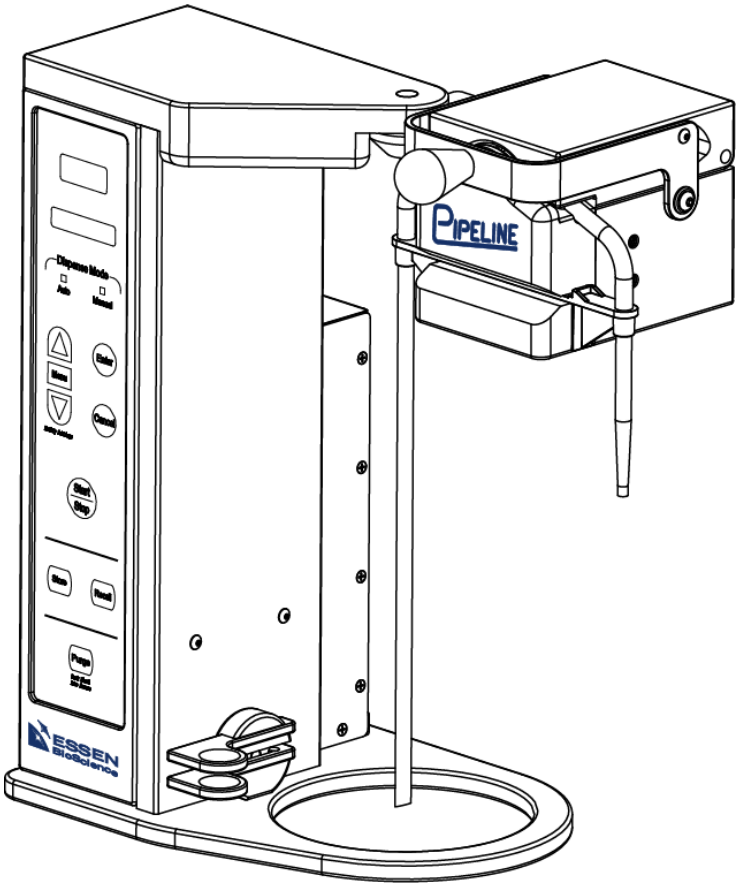
ESSEN BioSCIENCE

Dispenser Operating Instructions

PIPELINE™



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Part # 8400-0001-E

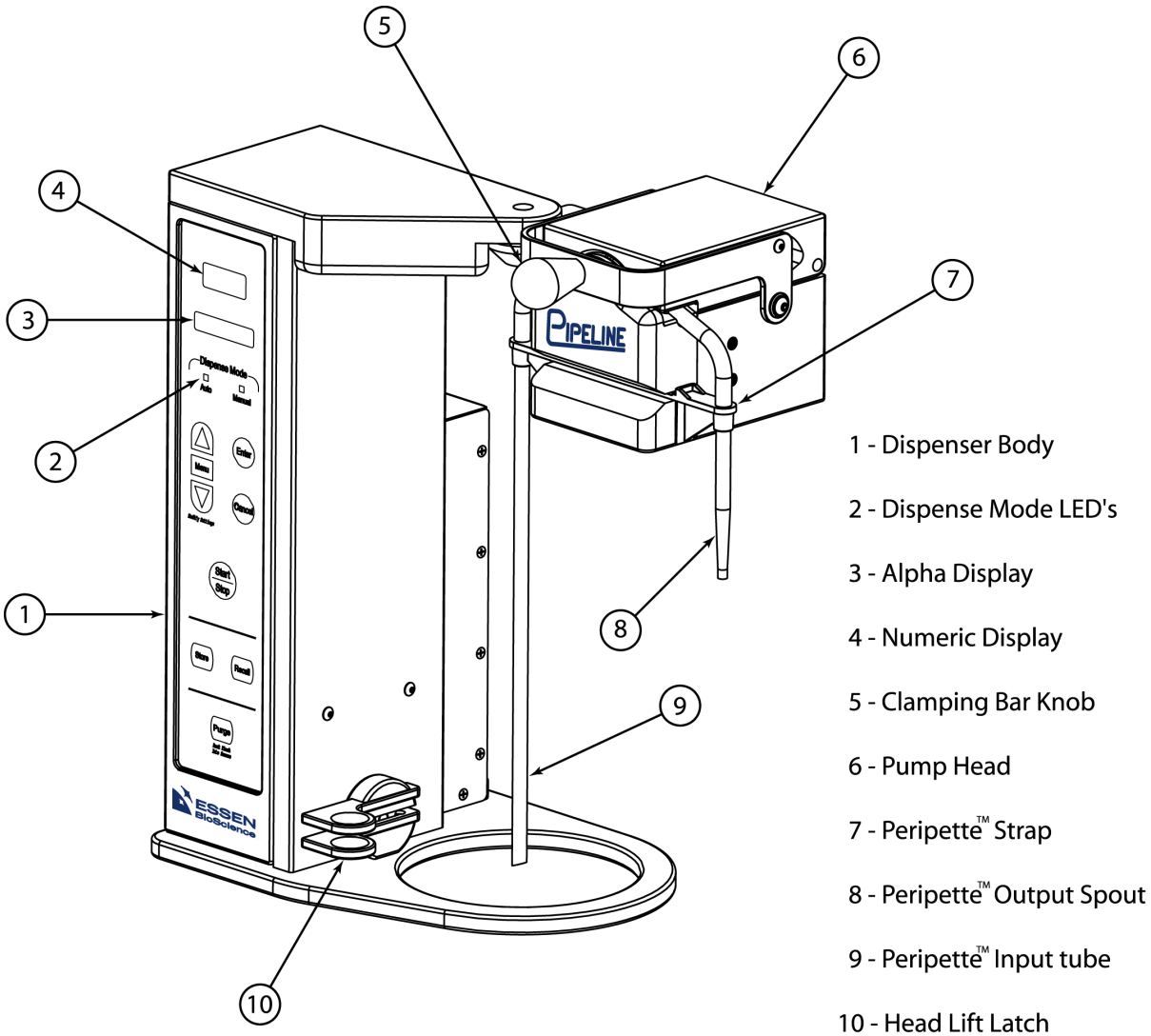

Figure 1 – The Pipeline Dispenser

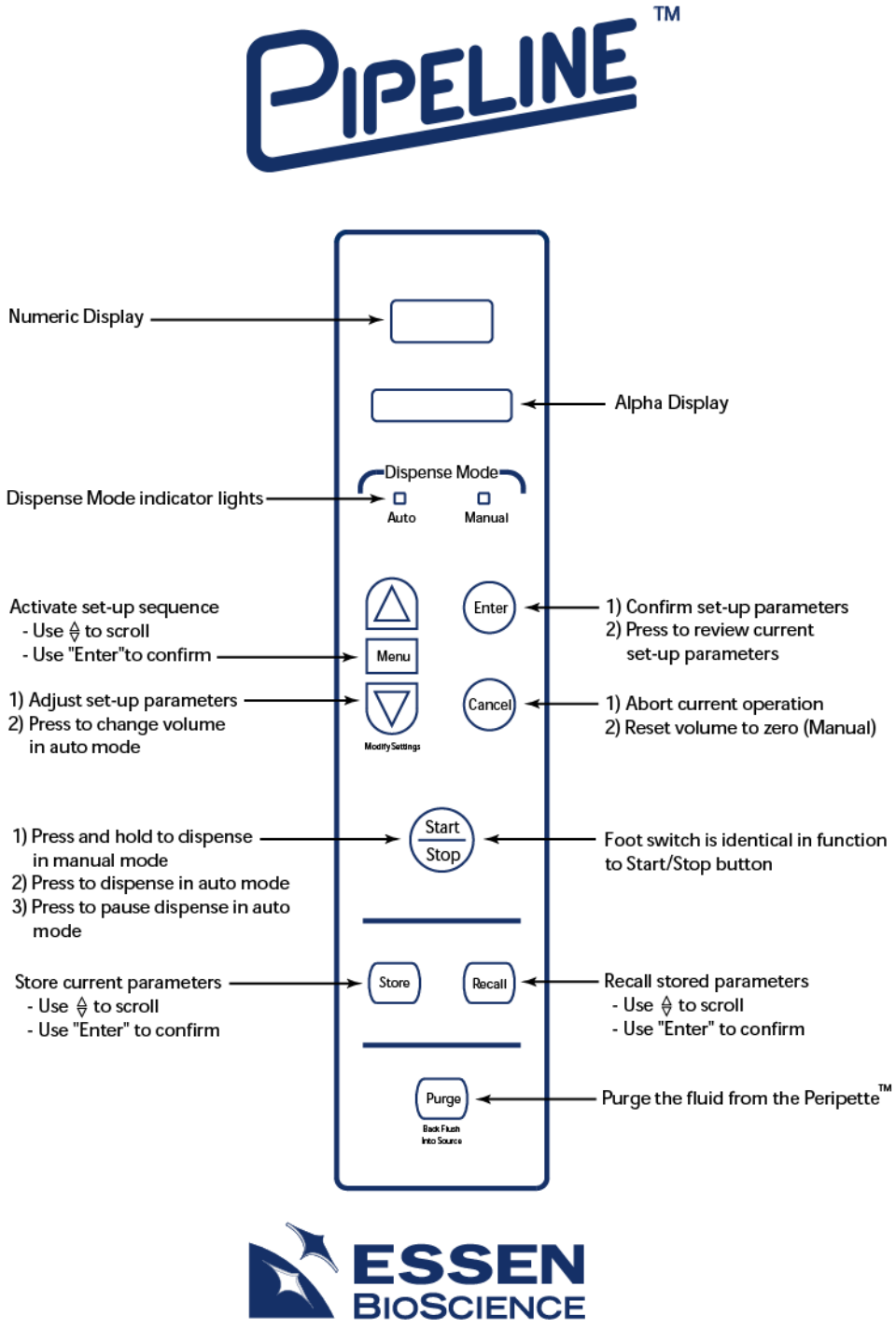

Figure 2 – Display Panel

PIPELINE™

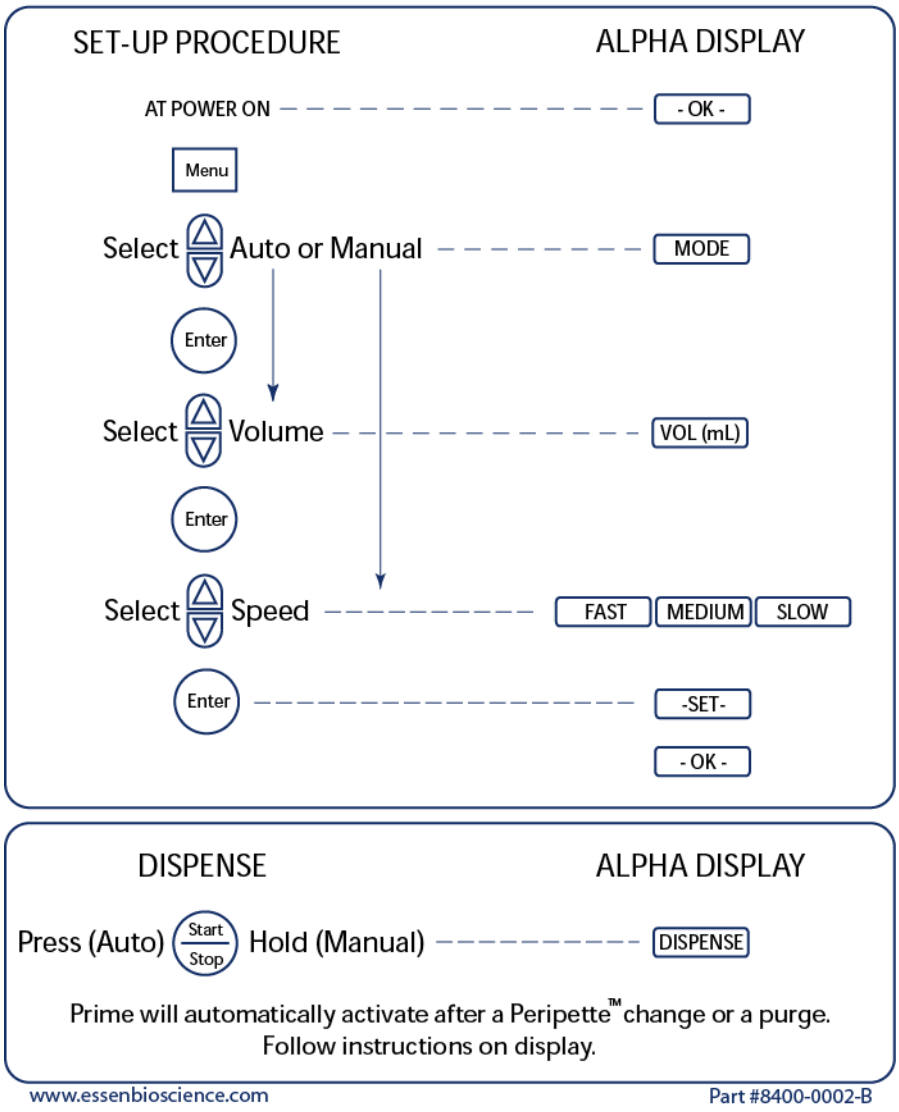

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Figure 3 – Set-up Procedure

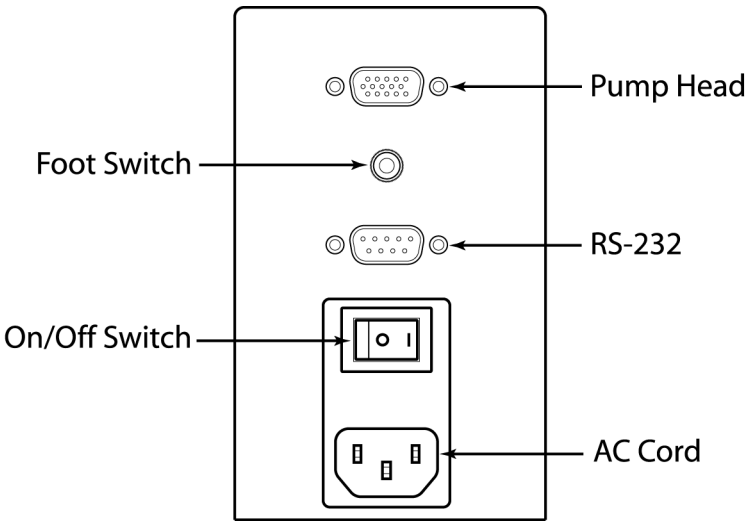

Figure 4 – Back Panel

Warranty

Essen BioScience Inc. (Essen) Pipeline™ product is warranted against defects in material and workmanship for a period of one year following delivery to the Buyer. Essen warrants to its original Buyer only. The Buyer must notify Essen in writing within fifteen (15) days following discovery of the defect. During the warranty period, Essen will, at its option, either repair or replace products that prove to be defective.

For warranty service or repair, this product must be returned to the Essen factory. Buyer shall prepay shipping charges to Essen, and Essen shall pay shipping charges to return the product to the Buyer. However, Buyer shall pay all shipping charges, duties and taxes for products returned to Essen from another country.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software of interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the products, or improper preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. ESSEN BIOSCIENC INC. SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. ESSEN BIOSCIENCE INC. SHALL NOT BE LIABEL FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Table of Contents

1.0 Getting to Know your Pipeline™ Dispenser

1.1 Introduction

Thank you for choosing the Pipeline™ dispenser from Essen BioScience. Please read through these operating instructions carefully to ensure that you can utilize all features of your dispenser.

1.2 Overview of the Pipeline™ dispenser

The Pipeline™ dispenser in conjunction with the Peripette™ consumable is the ideal device for efficiently transferring sterile fluids. By combining the isolated fluid path advantages of a peristaltic pump with the practical advantages of an easy to change, sterile consumable, the Pipeline provides a fast and efficient approach to standard cell culture dispensing.

The Pipeline is capable of dispensing in two different modes. In the first mode, a user-defined volume of fluid is dispensed per switch activation. This mode is called automatic throughout this manual and is indicated by the “Auto” indicator on the front panel. The second mode dispenses continuously during switch activation and is called “Manual.” In addition, three different dispense speeds (Fast, Medium and Slow) allow for the device to be tailored to the most demanding cell culture applications. The user has the ability to save and recall up to 8 pre-programmed settings. These settings include dispense speed, mode and volume. Any dispense can be initiated by using the *Start/Stop* button on the front panel or by using the foot switch.

The Pipeline provides an RS-232 serial port interface which can be used to set parameters and to initiate dispenses remotely via computer control. This makes the Pipeline a key component in larger automated systems that require the dispensing of sterile fluids.

1.3 Safety has priority

Please note the following directions for safe and problem-free operation of your Pipeline dispenser.

- Read through these operating instructions carefully.

- When moving the Pipeline dispenser the unit should always be fully supported from the base. The pump head assembly is designed to slide during operation and therefore must not be used for lifting.

- It is essential to follow the instructions in Section 2.0 when putting your new dispenser into operation.

- The Pipeline dispenser should be not operated in hazardous areas and should never be used to dispense flammable or otherwise dangerous liquids.

- The unit must only be connected to a receptacle-outlet with a grounding connection.

- Use only the AC power cord supplied with your Pipeline dispenser or an equivalent cord with an IEC-320-C13 standard connector approved for operation at 10 amps and the appropriate voltage for your local power. Also, ensure the local line voltage falls within the range printed on the dispenser.

- Never press the front panel buttons of your dispenser with sharp objects.

- Never open the dispenser. It does not contain any parts that need to be maintained, repaired or changed by the user.

- If the Pipeline dispenser is not used in the manner as described in this manual, provided protections may be impaired.

Your Pipeline dispenser is of rugged construction, but it is still a precision instrument. If you treat it with the appropriate care, it will reward you with many years of trouble-free operation. Should you have problems with your dispenser which require service, please contact:

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2.0 Putting the Dispenser into Operation

In this section you will learn how to unpack your new dispenser set it up and prepare it for operation.

2.1 Unpacking and checking the dispenser

Open the shipping box and check the shipment for completeness. You should find the following items:

- Pipeline dispenser
- Peripette
- AC power cord (US version only)
- Foot switch with cable
- Dispenser Operating instructions
- Certificate of Compliance
- Quick Reference Card

Lift and carry the dispenser to its selected location, supporting its full weight by the base. **Do not lift the dispenser by the dispenser body or pump head.**

Store all parts of the packaging in a safe place. This packaging is reusable and guarantees the best possible protection when transporting your dispenser.

2.2 Selecting or changing the location

Your dispenser is a precision instrument. Select an optimum operating location, and it will reward you with high accuracy and dependability.

- Select a firm, level, vibration-free location.
- Avoid extreme temperature fluctuations.

2.3 Connecting AC power supply

Connect the AC power cord to the power entry module located on the rear panel of your dispenser *(Figure 4)* and then to a grounded receptacle. Be sure that the power cord is readily accessible so that the power can be disconnected if necessary. Ensure that the AC power cord can never come into contact with liquids!

2.4 Connecting the foot switch

The Pipeline is supplied with a foot switch that can be used for initiating dispenses while keeping one hand free. Position the foot switch in an area where it does not pose a tripping hazard and is unlikely to be accidentally actuated. The small, circular plug at the end of the foot switch cord should be plugged into the circular receptacle labeled “foot switch” on the rear panel of the Pipeline dispenser. **Never plug in the foot switch while the dispenser is on.** Once installed, the foot switch can be substituted for pushing the *Start/Stop* button in any operation described in this manual.

2.5 Pump head position

The pump head on the Pipeline dispenser is designed to pivot around the input spout of the Peripette. This allows the output spout to be positioned for convenient access without the need to move the dispenser base or the source bottle. There are three preset positions with the head at 45, 90 and 135 relative to the base. These detent positions provide head stability that simplify the installation and removal of the Peripette™.

When the dispenser is not in use, the head can be rotated completely behind the dispenser body to minimize the bench or hood space used.

3.0 Dispensing Made Simple

This section contains step-by-step instructions for setting up the dispenser and performing dispenses in each of the two operating modes.

3.1 Switching the dispenser on and off

To switch the dispenser on or off, press the power switch. It is located on the rear of the body just above the power cord (*Figure 4)*. After power-up, the numerical display should read “0.0” and the alpha display should contain the “-OK-” message. If these messages do not appear, verify that the unit is plugged into an AC outlet with the appropriate voltage.

3.2 Loading the Peripette™

To load the Peripette, first open the pump head by fully raising the clamping bar knob. Then grasp the Peripette with the input tube toward the display panel. Slide the flexible tube over the pump head rollers at a slight downward angle and push the strap into the pump head slot. The strap will snap into place when fully seated. Refer to Figure 1 for the correct orientation of a loaded Peripette.

Ensure that the Peripette flexible tube is centered on the pump head rollers and in line with the clamping saddles.

3.3 Clamping the pump head

Close the pump head by pulling down on the clamping bar knob until it locks into its closed position. The pump head is designed to be used with the Peripette only. Clamping with any other types of tubing may affect the performance of the instrument

3.4 Positioning the source container

Squeeze the head lift latch *(Figure 1)* and move the pump head to its highest position.

Place a source container under the Peripette input tube, squeeze the head lift latch and lower the pump head until the input tube is touching the bottom of the source container. The pump-head position may vary with the type and size of the source container.

3.5 Priming the Peripette™

The priming process is required each time after the pump head is opened or the Peripette is replaced. The Peripette is primed by running the pump in manual mode until all air bubbles have been removed. Sensors in the pump head will detect when a new Peripette is installed and will automatically place the Pipeline in manual mode when the *Start/Stop* button is pressed.

The sequence described below is used to prime a newly installed Peripette:

1. Priming begins by positioning an empty waste receptacle under the output spout of the Peripette.
2. Press the *Start/Stop* button until the message “HOLD START UNTIL PERIPETTE IS PRIMED, THEN PRESS CANCEL TO EXIT” appears on the alpha display.
3. Press and hold the *Start/Stop* button on the front panel until the Peripette is filled with liquid, and all air bubbles have been flushed.
4. Press the *Cancel* button on the keypad to exit the priming process.

It will be necessary to expel a small amount of fluid in the process of removing all of the bubbles, but this can usually be kept to a minimum (2 or 3 mL).

3.6 Setting dispense parameters

There are two modes of operation used to perform dispenses with the Pipeline. These are automatic or “Auto” mode and the “Manual” mode.

In automatic mode, a preset volume of fluid is dispensed each time the *Start/Stop* button is pressed. As an automatic dispense progresses, the numerical display will count down, indicating how much fluid remains to be dispensed. The dispense can be paused at any time with a second press of the *Start/Stop* button. At this point, the user will be asked if he/she wishes to resume the dispense. To continue, simply press the *Stop/Start* button. To abort, press the *Cancel* button. After the dispense is complete, the numerical display will return to the preset volume and the Pipeline will be ready for a new dispense.

Setting the volume parameter is only meaningful when the Pipeline is used in the automatic mode. When in the manual mode, the volume parameter is bypassed. All volumes are entered into the Pipeline in units of milliliters (mL). When setting a volume between 0 and 100 mL, the resolution shown on the numerical display is 0.1 mL. Above 100 mL the resolution changes to 1 mL.

In manual mode, the pump will run as long as the *Start/Stop* button is pressed and will stop when the button is released. The numerical display will indicate how much total fluid has been delivered. The user can press *Start/Stop* multiple times to incrementally dispense as desired. To reset the numerical display to zero press the *Cancel* button.

The Pipeline has three dispense speeds that are displayed as “slow,” “medium” and “fast.” These correspond roughly to 4, 6 and 8 mL/sec. The user should choose the slower speeds for liquids that tend to foam or when dispensing into small containers where spattering may be a problem.

The directions for setting the mode, volume and speed are as follows *(Figure 3)*:

1. Press the *Menu* button on the front panel to enter the set up menu.
2. Press the ▲ and ▼ buttons until the desired dispense mode (Auto or Manual) is indicated by the blinking light.
3. Press the *Enter* button on the front panel to accept the displayed mode.
4. Press the ▲ and ▼ buttons until the desired volume (mL) is displayed. Note: Volume parameter is bypassed in manual mode.
5. Press *Enter* button on the front panel to accept the displayed volume.
6. Press the ▲ and ▼ buttons until the desired speed (*slow, medium* and *fast*) is displayed.
7. Press *Enter* button on the front panel to accept the displayed dispense speed.
8. The alpha display will read -SET- to indicate a successful update of the parameters.

Note: Once set; review the current parameters by pressing the *Enter* button on the front panel.

3.7 Dispensing fluid

Now that the dispenser is configured, simply place the dispense receptacle under the output tube of the Peripette and press the *Start/Stop* button on the keypad.

Remember: Depressing the foot switch can always be substituted for the *Start/Stop* button.

3.8 Removing or replacing the source bottle

In certain instances, the user may need to replace an empty source bottle, without the need to install a new Peripette. To replace the source bottle, the Peripette must first be purged of any fluid. Pressing the *Purge* button runs the pump at a fixed volume in reverse. After purging, simply squeeze the head lift latch and move the pump head to its highest position. Remove or replace the old bottle and reposition the pump head. The Peripette will need to be primed again as described in section 3.5, at which time it is ready for operation.

Note: Care should be taken not to overuse a Peripette, as this can produce volume errors outside of the listed specifications. See section 5 for more information on maintaining performance.

3.9 Removing the Peripette™

To remove a Peripette, follow the directions above for purging and removing the source bottle. Position the pump head in the down position. Next release the Peripette from the pump head by lifting the clamping bar knob. Gently pull the Peripette straight out by holding on to the strap with both hands at the top of the input tube and output spout.

4.0 Special Functions

This section explains how to store, recall and review set up parameters.

4.1 Memory functions

The Pipeline dispenser has eight user accessible memory locations that can be used for storing and recalling setup parameters. The settings that can be saved are mode, volume and speed.

4.1.1 Storing parameters

With the dispenser parameters set in the desired configuration, simply follow the steps described below to store the current settings.

1. Press the *Store* button on the front panel.
2. Press the ▲ and ▼ buttons to select the desired memory location. These locations are called “M1” through “M8” on the display. Pressing the *Store* button again at this point will review all the current stored parameters for the displayed memory location.
3. Press the *Enter* button to complete the store operation.

4.1.2 Recalling parameters

To recall stored parameters, follow the steps show below.

1. Press the *Recall* button on the front panel.
2. Press the ▲ and ▼ buttons to select the desired memory location. These locations are called “M1” through “M8” on the display. While scrolling through the memory locations, the numerical display will indicate the volume stored in the memory and the dispense-mode indicator lights will indicate the stored mode. Pressing the *Recall* button again at this point will review all of the current stored parameters for the displayed memory location.
3. Press the *Enter* button to complete the recall operation.

4.2 Reviewing parameters

Any time the “-OK-“ prompt is displayed, the user can press the *Enter* key to review the current dispenser parameters. The Pipeline will then review the current mode, volume and speed. If the current settings match the parameters stored in memory, the display will also indicate which location (M1-M8) is being used.

5.0 Getting Optimum Performance from your Pipeline™ Dispenser

This section answers two basic questions: First, what kind of accuracy and/or precision can be achieved with the dispenser? And second, what must be done to maintain this performance?

5.1 Understanding the specifications

There are two metrics used to describe the performance of a Pipeline dispenser. These are precision and accuracy, and, specifications of each are given in a table in Section 7 of this manual.

Precision is a measure of the repeatability of dispenses. The statistic that is used to quantify precision is the coefficient of variation (CV). The CV is computed from a collection of measurements using the following formula:

CV = (Standard Deviation)/Mean X 100

The precision specification on your Pipeline dispenser describes how “tight” about the mean the distribution of a set of dispense volumes should be.

The accuracy specification that is described as a typical range is how close this set of dispenses is to the target value. The accuracy range at any volume can be computed from a fixed percentage of the dispense volume plus any additional fixed error.

5.2 Understanding potential sources of error

Understanding the sources of error that collectively impact the stated specifications can help the user avoid conditions that could cause performance outside these specifications.

The Pipeline system itself will turn the pump head with very high precision. Almost all of the errors that limit precision are due to variations in the flexible tube part of the Peripette. As with any peristaltic pump, the amount of fluid moved through the system for each turn of the pump head is affected by several flexible tube parameters. These include inner diameter, wall thickness and a number of other factors that affect how well the tube springs back after being compressed. The tubing used in the Peripette disposable has been designed to minimize errors from these sources.

The precision and accuracy specifications stated in this manual were derived using multiple Peripettes, just as the system would be used in practice. The variations from one Peripette to the next can account for most of the specification. For example, it would not be unusual to perform a series of 25 mL dispenses with a single Peripette and achieve a CV as low as 0.2%. As new individual Peripettes are installed and used, they may all have very low CV's. The volume of the dispenses, however, may average 25.2 for one Peripette and 24.8 for another, so that when the statistics are computed over all Peripettes the CV is closer to the specifications as stated in the table.

Wear of the flexible tube is an issue that must be controlled to achieve results that are within specification. As a Peripette is used, the tube looses its ability to spring back over time. This results in fluid volumes that fall very slowly with use and is referred to as "rundown." To maintain the performance specification, a single Peripette should not be used to pump more than 6 liters of total fluid volume. The Pipeline does not track total fluid volume for each Peripette; it is up to the user to do so. When in doubt, install a new Peripette.

Another factor that limits the tube's ability to spring back is the total time a tube is clamped in the head. As the tube sits clamped in the head, some sections of the tube that must spring back are compressed under a roller. These sections of tube slowly begin to lose the "memory" of their uncompressed state. When a tube is used after a long period of being compressed, dispense volumes can be low. To keep dispenses within specification, a Peripette must not be clamped in the head for more than 8 hours. If a Peripette is to be left on the head during unused periods, it should be purged and unclamped to avoid this "run-down" in volume.

In order to minimize the "run-down" effect described above, the Pipeline dispenser is programmed to round every dispense to the nearest one-sixth turn. This ensures that the rollers are always stopped in a desirable position. One-sixth turn is equivalent to just under 0.2 mL depending on the exact calibration of the individual Pipeline. While making the "run-down" much more manageable, this adds a rounding error of ± 0.12 mL as seen in the accuracy specification. This 0.12 mL is negligible at large volumes but becomes significant at small volumes.

When small volumes of fluid must be dispensed with greater accuracy than the specification predicts, it is still possible to configure your procedures to take advantage of the dispenser's high precision. This is accomplished by testing the dispenser and accounting for the rounding that is done at a given volume and speed. Simply set up the dispenser for the desired dispense volume (1 mL).

Then measure the volume of multiple dispenses with several Peripettes and compute an average. As an example, this average may be 0.92 mL. This would be an error of 8%, but you should find that all dispenses at this programmed volume fall within a tight distribution (CV<2.5%) around 0.92 mL. Now it may be possible to adjust your procedure, for example by changing dilution factors, to make 0.92 the desired volume of this reagent.

Each Pipeline dispenser is tested and calibrated at the factory before it is shipped. The calibration consists of numerical constants for each speed that are stored in the system memory. If your Pipeline consistently dispenses high or low it may be that one of these constants is set incorrectly. Remember, measurements must be performed with many Peripettes to establish this variation.

6.0 Inputs and Outputs

There are three labeled input/output (I/O) connectors on the back panel of the Pipeline dispenser. The topmost is the pump head connector. This connector is installed at the factor with tamper-proof screws and should never be removed by the user. **If the Pipeline is used with the pump head cord unplugged, serious damage to the instrument will result.**

The next connector down accepts a plug on the foot switch that is supplied with the system. This input senses a switch closure in the foot switch to initiate dispenses just as if the *Start/Stop* button were depressed on the front panel.

Below the foot-switch connector is an RS-232 serial interface that can be used to connect the dispenser to a controlling computer. A standard 9 pin Serial Cable such as Belkin P/N F2N209-06-T can be used to make the connection. Please contact Essen BioScience for information on connecting and operating through the serial interface.

The power entry module contains a power on/off switch, an IEC-320-C13 power cord receptacle and a fuse drawer. The dispenser is supplied with a power cord for use in the United States. Use only the AC power cord supplied with your Pipeline dispenser or an equivalent grounded cord with an IEC-320-C13 standard connector approved for operation at 10 amps and the appropriate voltage for your local power. Also, ensure the local line voltage falls within the range printed on the dispenser. Use only 5 X 20 mm fuses that are rated for 1.6 Amps at 250V. The fuse should be of the time-delay type.

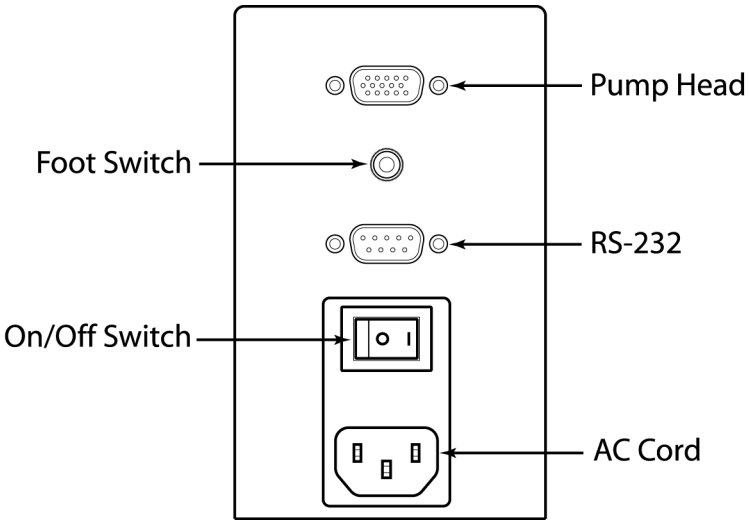

Figure 4 – Back Panel

7.0 Specifications

Dispense Speeds	4, 6 and 8 mL/s approx.
Programmable Volumes 0.1 mL – 99.9 mL 100 mL – 9999 mL	 0.1 mL increments 1.0 mL increments
Memory	8 user presets
Remote Control	RS-232 Serial Foot Switch
Precision 1 mL Dispense ≥ 2 mL Dispense	 CV < 2.5% CV < 2.0%
Accuracy Typical	 ± (2.0% + 0.12 mL)
Source Bottle Max. Base Diameter Max. Height	 4.75” (120mm) 10.5” (266mm)
Power	90-250 VAC 50-60 Hz 1.5 Amp at 120V
Fuses (2)	5 *x* 20 mm 1.6 Amp 250V time-delay
Dimensions (H *x* W *x* D)	14” *x* 11.25” *x* 8.5” 355 *x* 285 *x* 216 mm
Weight	24.5 lbs 9.15 Kg

CE

8.0 Ordering Information

Pipeline™ Dispenser

Configuration	Catalogue Number
Left-Side	4354

Peripette™ Consumable

Package Type	Catalogue Number
Self Pack (qty 50)	4351
Case (qty 600)	4352

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