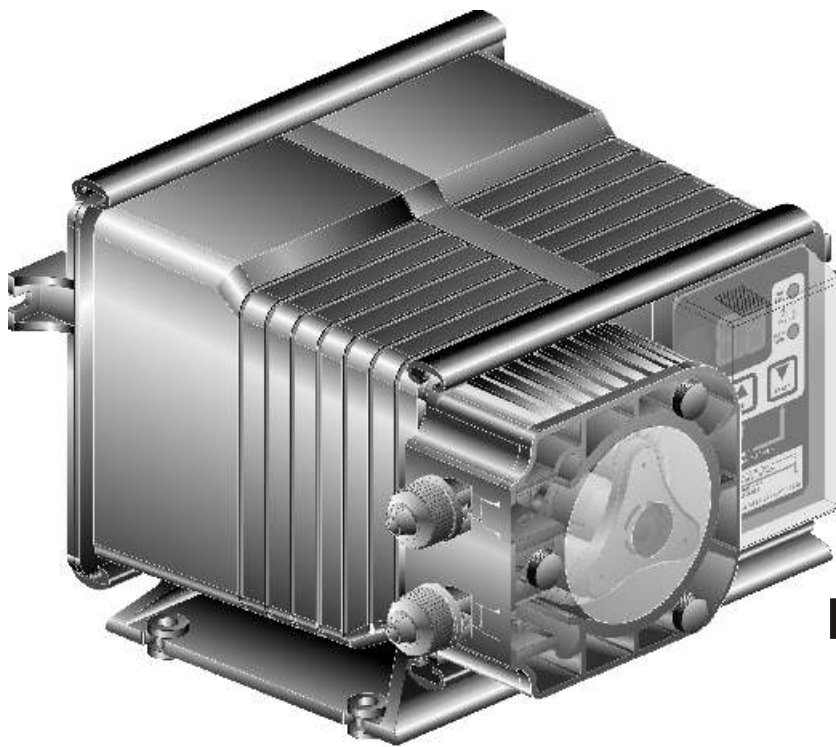# User's Guide

FPUDVS2000 SERIES

Digital Variable Speed Peristaltic Injector Pump
With external signal inputs
Operating Manual

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ΩΞOMEGA®

TABLE OF CONTENTS

1.0   Introduction

Congratulations on purchasing the pump variable speed Peristaltic Metering Pump. The pump is designed to inject chemicals into piping systems. The pump has been tested by NSF International for use with 12 ½% Sodium Hypochlorite. The pump is equipped with external input control circuitry which allows the pumps output to be externally controlled by either a 4-20mA input signal, a 0-10V DC input signal or a pulsed frequency input signal.

2.0   Specifications

Maximum Working Pressure	100 psig / 6.9 bar*
Maximum Fluid Temperature	130° F / 54°C
Ambient Temperature Range	14 to 110°F / -10 to 43°C
Duty Cycle	Continuous
Maximum Solids	50% by volume
Maximum Viscosity	5,000 Centipoise
Maximum Suction Lift	up to 30 ft. water
Power Requirements	115V60Hz, 220V50Hz, 230V60Hz
Shipping Dimensions	18" x 14" x 10"
Shipping Weight	14 lb.

3.0   Features

- Peristaltic Pump Tube does not require valves.
- High outlet pressure capability of 100 psig.*
- High inlet suction lift capability of 30 feet.
- Tube Failure Detection (TFD) system (patent pending).
- Quick-Disconnect inlet and outlet fittings available.
- Easy servicing.

- Digital electronic feed rate control.
- Pump Tube failure warning timer.
- 20:1 adjustment turn down ratio.
- Corrosion proof Valox housing.
- Tamper resistant electronic control panel cover.
- Output verification sensor system.

- Includes suction tube strainer, tube weight, suction tubing, discharge tubing and injection fitting with internal back-flow check valve and mounting hardware.
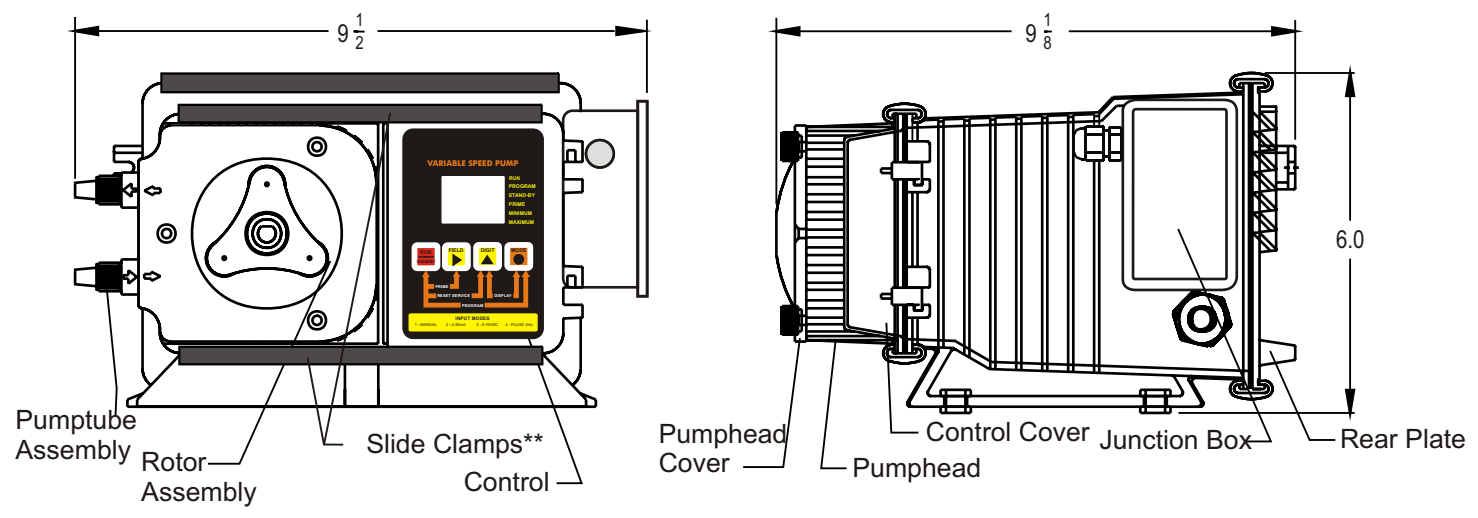
*   Most models.
**   Slide both top & bottom clamps to the left only far enough to open the control cover.

FIG. 3.0 PARTS LOCATOR DRAWING

4.0   How To Install the pump

**CAUTION: PROPER EYE AND SKIN PROTECTION MUST BE WORN WHEN
INSTALLING AND SERVICING THE FPUDVS2000**

*Note: All diagrams are strictly for guideline purposes only. Always consult an expert before installing the pump into specialized systems.
The pump should be **serviced by qualified persons only.***

4.1   Mounting Location

Choose an area located near the chemical supply tank, chemical injection point and electrical supply. Although the pump is designed to withstand outdoor conditions, a cool, dry, well ventilated location is recommended. Install the pump where it can be easily serviced.

- Mount the pump to a secure surface or wall using the enclosed hardware. Wall mount to a solid surface only. Mounting to drywall with anchors is not recommended.

- Keep the outlet (discharge) tubing as short as possible. Longer tubing increases the back pressure at the pump tube.

- Do not mount the pump directly over your chemical container. Chemical fumes may damage the unit. Mount the pump off to the side or at a lower level than the chemical container.

- Mounting the pump lower than the chemical container will gravity feed the chemical into the pump. This "flooded suction" installation can reduce the time required to prime the pump. Install a shut-off valve, pinch clamp or other means to halt the gravity feed to the pump during servicing.

- Your solution tank should be sturdy. Keep the tank covered to reduce fumes.

- Be sure your installation does not constitute a cross connection with the drinking water supply. Check your local plumbing codes.

Floor Mount

Drill .156 Dia. (5/32)
For Self-Tap Screw
#10 X 1" Phillips Steel
4 Places

7-5/8"

3-1/2"

7-3/8"

Wall Mount

Drill .156 Dia. (5/32)
For Self-Tap Screw
#10 X 1" Phillips Steel
2 Places

8-3/16"

Note: For wall-mounting, recommend drill & thread into
solid wood only.
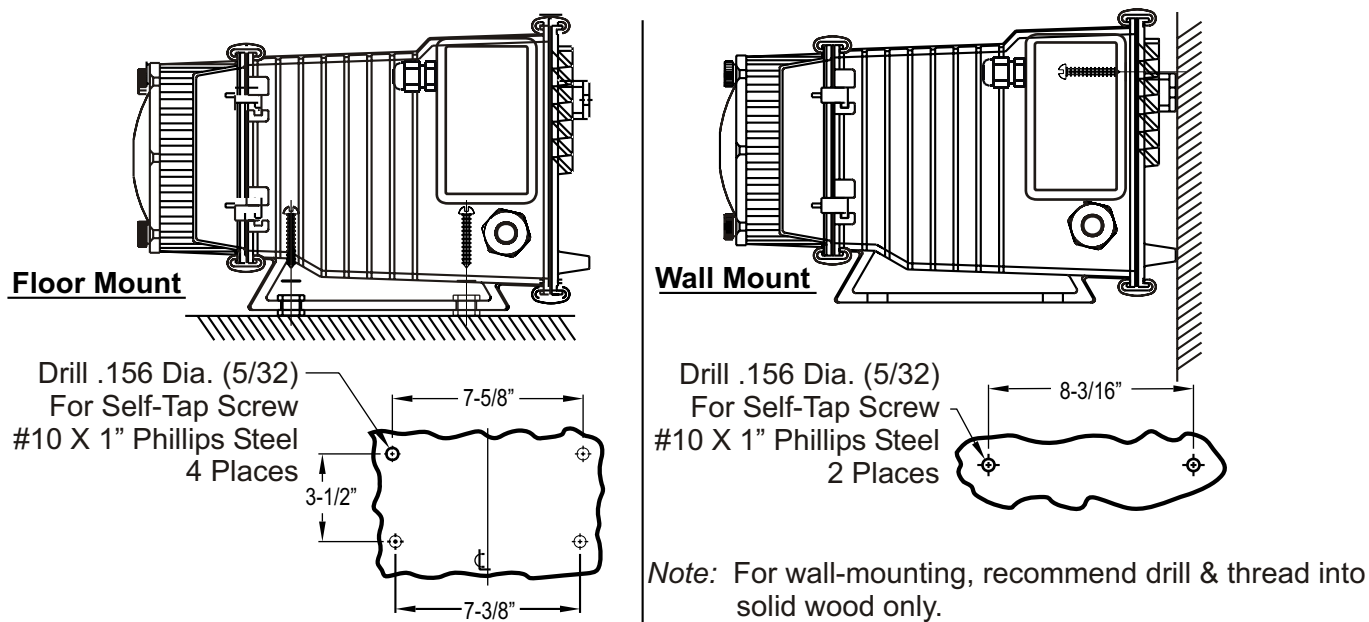
FIG. 4.0 INJECTOR MOUNTING

1. Strainer
2. Circulation Pump
3. Filter
4. Heater
5. Check Valve

6. Flowmeter
7. Injector
8. Solution Tank
9. Injection Fitting
10. Return Line
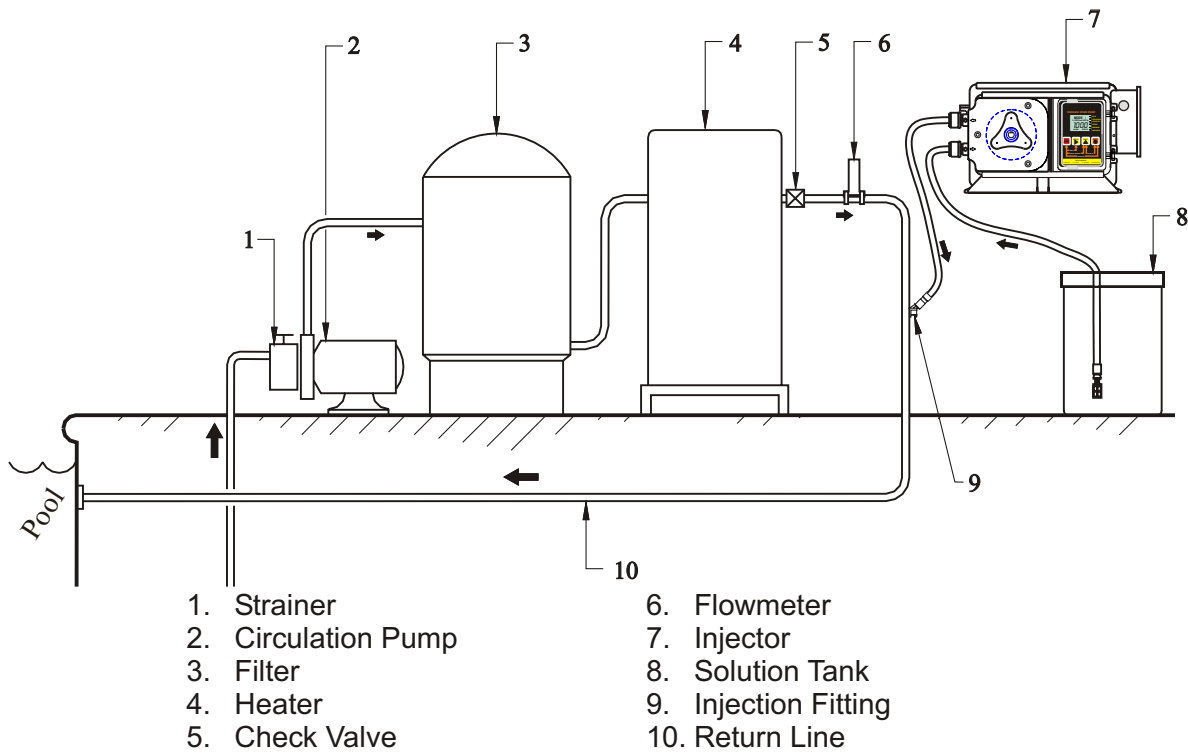
FIG. 4.1 SWIMMING POOL INSTALLATION

Discharge Tube

Suction Tube

Chemical Container

¼" & ½" NPT Injector
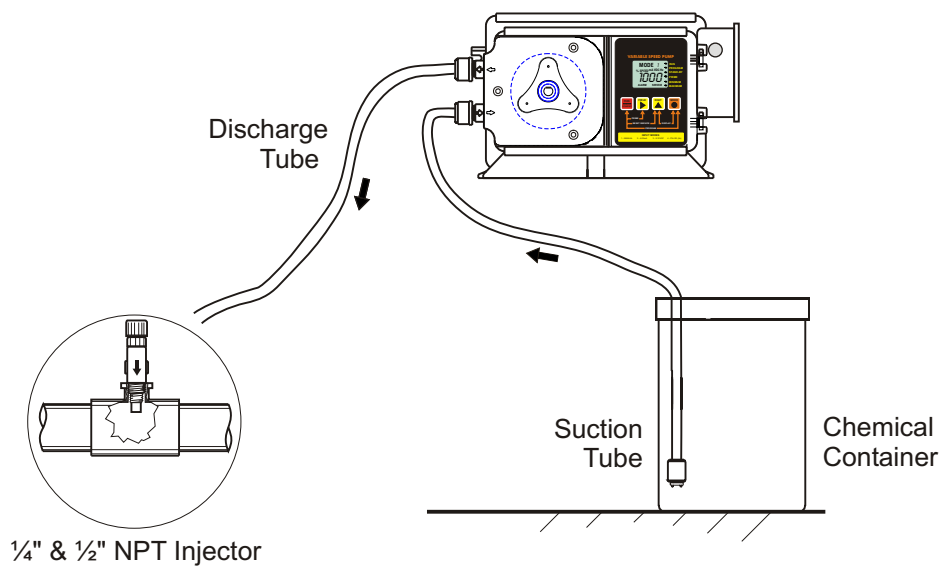
FIG. 4.2 TYPICAL INSTALLATION

4.2   Electrical Connections

4.2.1   Input Power Connections -

Be certain to connect the pump to the proper supply voltage. Using the incorrect voltage will damage the pump and may result in injury. The voltage requirement is printed on the pump serial label.

WARNING-RISK OF ELECTRICAL SHOCK

Jumper pins on the circuit board are factory preset for the correct voltage. See Fig. 4.4, page 7 for details.

The pump is supplied with a ground wire conductor and a grounding type attachment plug (power cord). To reduce the risk of electric shock, be certain that the power cord is connected only to a properly grounded, grounding type receptacle.

Note: When in doubt regarding your electrical installation, contact a licensed electrician.

4.2.2   External Input Signal Connections -

The pump will accept any one of three different types of external input signals; 4-20 mA, 0-10 VDC, or frequency. The 4-20mA and 0-10 VDC loops must be powered. Two types of frequency inputs, AC sine waves (magnetic coils type outputs) and Digital Square waves (Hall Effect signals, contact closures), are acceptable. A jumper plug located on the circuit board is factory pre-set for AC sine wave signals, the jumper must be re-positioned when digital square wave signals are being used. (See Fig. 4.4, page 7, "Hz input jumper settings")

All wiring connections are to be made inside of the junction box located on the side of the pump. A liquid-tite connector is supplied and should be used for the external signal cable. The signal input wires are color coded to the type of signal being used.

INPUT SIGNAL TYPE	POSITIVE WIRE COLOR	NEGATIVE WIRE COLOR
4-20 mA	BLUE (non-powered)	BLACK
0-10 V DC	ORANGE (non-powered)	BLACK
AC sine wave, Digital square wave	WHITE	BLACK

FIG. 4.3 WIRING CHART - INPUT SIGNAL WIRE COLORS

SIGNAL INPUT MODES / FUNCTIONS & WIRING COLOR CODES

INPUT MODE / FUNCTION	WIRES REQUIRED
MANUAL	NO CONNECTIONS
4-20 mA	**BLUE (+)** & **BLACK (-)**
0-10 VDC	**ORANGE (+)** & **BLACK (-)**
FREQUENCY	**WHITE (+)** & **BLACK (-)**
ALARM RELAY	**PURPLE** & **PURPLE**
FLOW VERIFICATION SENSOR (Digital square waves)	**RED (+** 20VDC) & **BLACK (-)** & **YELLOW** (signal)
MOTOR ON SIGNAL	**BROWN (+)** & **BLACK (-)**

EXTERNAL INPUT CABLE
ACCEPTABLE CABLE JACKET RANGE:
.118 - .255 INCH
.(ϕ 3,0 - 6,5 MM)

RED (+20VDC)
BLACK (Ground)
BLUE (4-20 mA input)
ORANGE (0-10 VDC input)
WHITE (frequency input)
YELLOW (verification sensor input)
BROWN (motor-on contact output)
PURPLE X2 (alarm relay contacts)

JUNCTION BOX

LIQUID-TIGHT CONNECTOR

ALARM OUTPUT (CONTACT CLOSURE)
connect 2-conductor plug to either normally open (NO) (factory default) or normally closed (NC) side of receptacle.
1 AMP MAX @ 125VAC (24VDC)

TUBE FAILURE SENSOR PROBE INPUT
Connect 2-conductor plug to receptacle.
2 Grey wires connect to pump head sensors.

Hz INPUT JUMPER SETTINGS
Located under connector

AC sine waves
Jumper Not Installed (open - factory default)

Digital square waves
Jumper Installed

INPUT SIGNAL CONNECTOR
7 wire bundle

AC LINE VOLTAGE SETTINGS

230 VAC
One Jumper Installed on center position (ends open)

115 VAC
Two Jumpers Installed on end positions (no open pins)

220 110 110

THERMAL SWITCH
.187 push tab connectors
2 conductors

TS

1 AMP 250VAC

PROTECTOR FUSE
1 Amp, 250 Volt AC
(Littlefuse #239001 or Equivalent)

NO NC PROBE

MOTOR RED (+) | MOTOR BLACK (-) | AC LINE NEUTRAL | AC LINE HOT

RED (+)
BLACK (-)
Ground (green)

DC MOTOR

Hot
Common
Earth Ground (green)

AC Input Power

FIG. 4.4 WIRING DIAGRAM - CIRCUIT BOARD

4.3 How To Install the Tubing and Fittings

CAUTION: PROPER EYE AND SKIN PROTECTION MUST BE WORN WHEN INSTALLING AND SERVICING THE FPUDVS2000

4.3.1 Inlet Tubing - Locate the inlet fitting of the Pump Tube, see fig 4.6. Remove the tube nut. Push the clear PVC suction tubing onto the compression barb of the fitting. Use the tube nut to secure the tube. Hand tighten only.

4.3.2 Strainer -Trim the inlet end of the suction tubing so that the strainer will rest approximately two inches from the bottom of the solution tank. This will prevent sediment from clogging the strainer. Slip the ceramic weight over the end of the suction tube. Press the strainer into the end of the tube. Secure the ceramic weight to the strainer. Drop the strainer into the solution tank.

4.3.3 Outlet Tubing - Locate the outlet fitting of the Pump Tube, see fig 4.6. Remove the tube nut. Push the opaque outlet (discharge) tubing onto the compression barb of the fitting. Use the tube nut to secure the tube. Hand tighten only. Trim the other end of the outlet tube leaving only enough slack to connect it to the injection/check valve fitting. Increasing the outlet tube length increases the pressure at the pump tube, particularly with viscous fluids.

Tubing Suction 3/8"

Ceramic Weight FPU2000-CW

Foot Strainer # 90002-200

FIG. 4.5

Keep the outlet tube as short as possible.

4.3.4 Injection/Check Valve Fitting Installation - The Injection/Check valve fitting is designed to install directly into either 1/4" or 1/2" female pipe threads. This fitting will require periodic cleaning, especially when injecting fluids that calcify such as sodium hypochlorite. These lime deposits and other build ups can clog the fitting increasing the back pressure and interfering with the check valve operation. See section 7.0.

Outlet Adapter   Pump Head

Inlet Adapter   **FIG. 4.6**

Install the Injection/Check valve directly into the piping system. Do not use a pipe stud with a tee for insertion of the injection valve. The solution must inject directly into the flow stream.
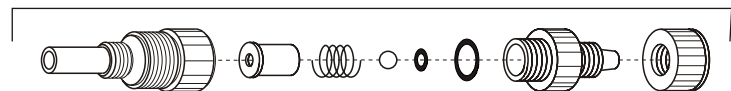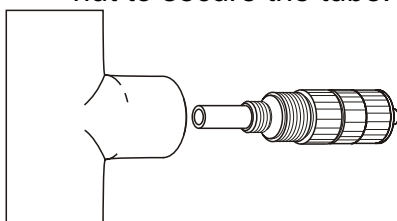
Use Teflon thread sealing tape on the pipe threads. Push the opaque outlet (discharge) tubing onto the compression barb of the Injection/Check valve fitting. Use the tube nut to secure the tube. Hand tighten only.
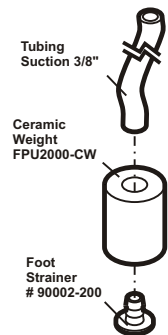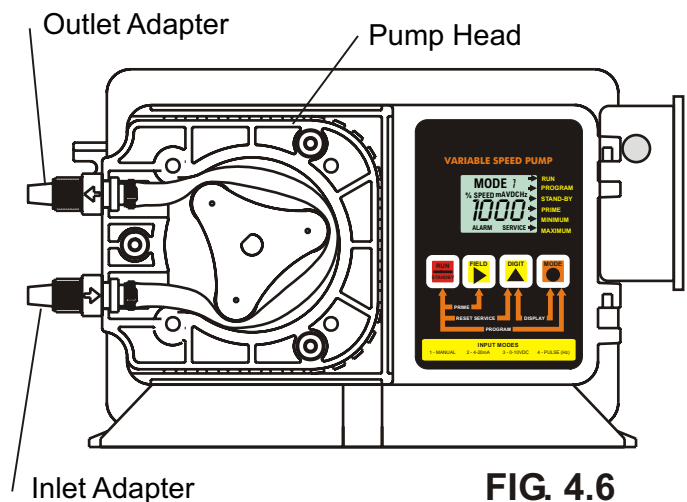
EXPLODED VIEW

FIG. 4.7 INJECTION FITTING INSTALLATION AND EXPLODED VIEW

5.0   How To Operate The Pump

5.1   Description of Pump Output Adjustment Controls -

Open the control panel door by sliding the upper and lower slide clamps to the left. FIG. 5.2

- **RUN/STANDBY** Button -
  - ✄ Press to start and stop the pump. The *ARROW* next to the word RUN will light when in the run mode. The *ARROW* next to the word STAND-BY will blink when in the stand-by mode.
  - ✄ Press to clear *ALARM.*
  - ✄ When pressed with the FIELD Button, initiates a 99 second prime cycle which temporarily overrides the mode setting and runs the pump motor at 100% speed. The *ARROW* next to the word PRIME will blink.
  - ✄ When pressed with the DIGIT button, resets the 500 hour service warning timer to zero.
  - ✄ When pressed with the MODE button, initiates the programming mode. The *ARROW* next to the word PROGRAM will blink.

- **FIELD** Button -
  - ✄ In the programming mode, selects the digit to be changed.
  - ✄ When pressed with the DIGIT button, initiates the Flow Verification Sensor feature and allows programming the alarm delay from 1-256 seconds.

- **DIGIT** Button -
  - ✄ In the programming mode, increases the selected digit.
  - ✄ When pressed with the MODE Button, toggles the display from % motor speed to input signal value.

- **MODE** Button -

  - ✄ Used to select one of four operating modes.
  - **Mode 1** - Manual Adjustment (external input disabled)
  - **Mode 2** - 4-20mA input
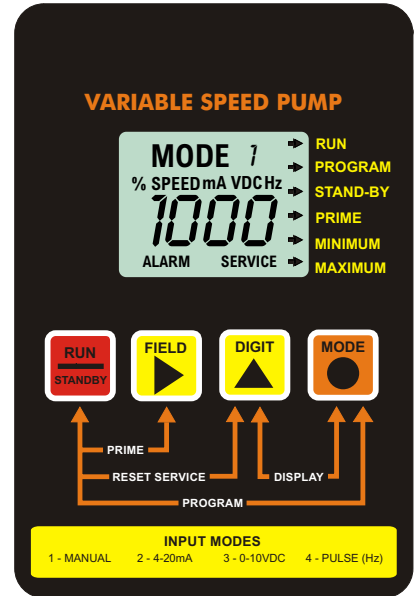 - **Mode 3** - 0-10VDC input
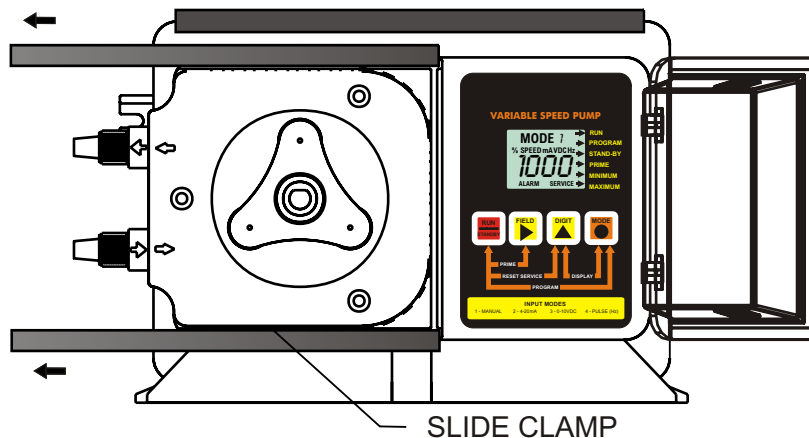 - **Mode 4** - Frequency (Hz) input

FIG. 5.1

FIG. 5.2

Slide both top & bottom clamps to the left only far enough (as shown) to open the control cover

5.2   OPERATING MODE 1 - Output adjusted manually -
In this mode, the pump's motor speed is adjusted manually using the front panel touch pad. The motor speed can be adjusted from 0-100%. To adjust the speed:

- � *Set the pump for mode 1*. Press the MODE button until *MODE 1* is shown on the LCD display. The *%SPEED* icon will light. The large *3-DIGIT LCD* will indicate the currently programmed percentage of speed.
- ✂ *Enter the programming mode.* At the same time, press the RUN/STANDBY button and the MODE button. A blinking *ARROW* will point to the word PROGRAM indicating the program mode has been activated.
- ✂ Press the FIELD button to select the digit to program. The digit will blink when selected.
- ✂ Press the DIGIT button to change the selected digit.
- ✂ Repeat until all digits are programmed.
- ✂ To exit the programming mode, press the RUN/STANDBY button and the MODE button at the same time. The arrow next to the word PROGRAM will disappear.
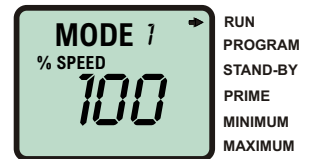
✓ **NOTE:** If while in the program mode no buttons are pressed within 20 seconds, the circuitry will automatically return to the run mode, without saving changes.

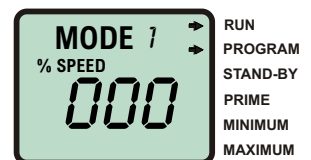✓ **5.3   OPERATING MODE 2 - Output adjusted by 4-20 mA input signal**
In this mode, the pump's motor speed is adjusted automatically based on the value of the 4-20 mA input signal. Any motor speed can be assigned to either the minimum or maximum milliamp input values. However, **the programmed minimum mA value must be less than the programmed maximum mA value.** The **ALARM** and **SERVICE** icons will blink if the programming is in error. To assign the minimum and maximum motor speed and the minimum and maximum mA input signal values:

- ✂ *Set the pump for mode 2*. Press the MODE button until *MODE 2* is shown on the LCD display. The *%SPEED* or *mA* icon will light depending on the current display setting. The large *3-DIGIT LCD* will indicate the current motor speed or the current mA input value.
- ✂ *Enter the programming mode.* At the same time, press the RUN/STANDBY and MODE buttons. A blinking *ARROW* will point to the word PROGRAM indicating the program mode is activated. A blinking *ARROW* will point to the word MINIMUM indicating the minimum value is ready to be programmed. The *% SPEED* icon will blink indicating the percentage of speed is ready to be programmed.
- ✂ *Enter the motor speed at the minimum mA input signal value.* Press the FIELD button to select the digit to program. The digit will blink when selected.
- ✂ Press the DIGIT button to change the selected digit.
- ✂ Repeat until all digits are programmed.
- ✂ Press the mode button. The *% SPEED* icon will stop blinking and the *mA* icon will blink indicating the minimum mA value is ready to be programmed. The currently programmed minimum value is shown on the *3-DIGIT LCD*.
- ✂ *Enter the minimum mA input signal value.* Note: this value must be

RUN MODE 1

MODE 1
% SPEED
100
→ RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

PROGRAM MODE 1
constant speed % setting

MODE 1
% SPEED
000
→ RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

RUN MODE 2

MODE 2
mA
04.0
→ RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

PROGRAM MODE 2
% speed at the minimum input

MODE 2
% SPEED
000
→ RUN
PROGRAM
STAND-BY
PRIME
MINIMUM →
MAXIMUM

PROGRAM MODE 2
minimum input value

MODE 2
mA
04.0
→ RUN
PROGRAM
STAND-BY
PRIME →
MINIMUM
MAXIMUM
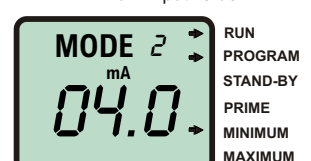
less than the maximum mA input signal value. Press the FIELD button to select the digit to program. The digit will blink when selected.

- ⌗ Press the DIGIT button to change the selected digit.
- ⌗ Press the mode button. The *Ma* icon will stop blinking and the *% SPEED* icon will blink. The *ARROW* next to the word MAXIMUM will blink indicating the maximum value is ready to be programmed. The currently programmed maximum motor speed value is shown on the *3-DIGIT LCD*.
- ⌗ *Enter the motor speed at the maximum mA input signal value.* Press the FIELD button to select the digit to program. The digit will blink when selected.
- ⌗ Press the DIGIT button to change the selected digit.
- ⌗ Repeat until all digits are programmed.
- ⌗ Press the mode button. The *% SPEED* icon will stop blinking and the *mA* icon will blink indicating the maximum mA value is ready to be programmed. The currently programmed maximum value is shown on the *3-DIGIT LCD*.
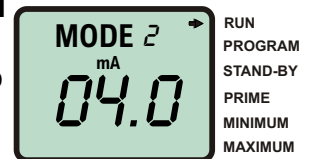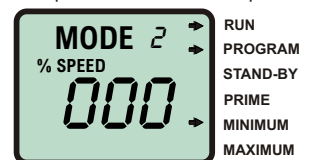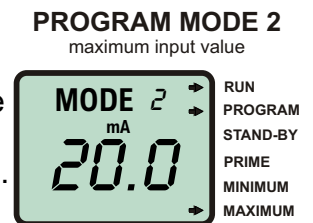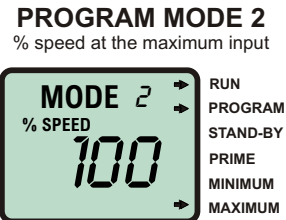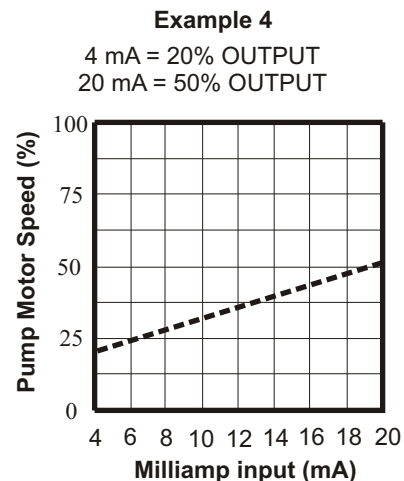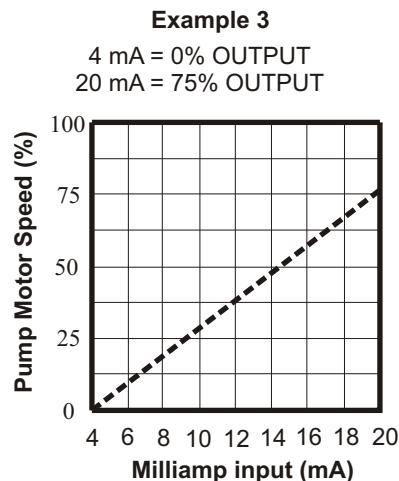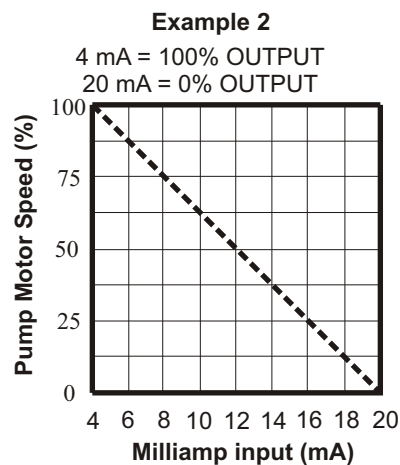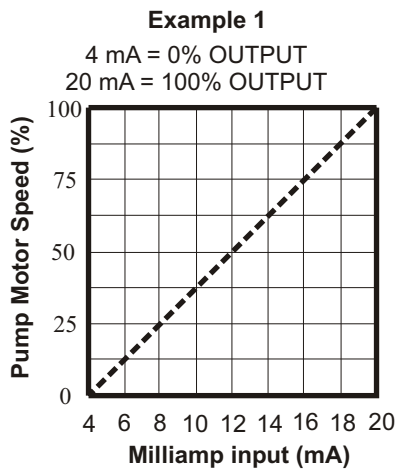- ⌗ *Enter the maximum mA input signal value.* Note: this value must be greater than the minimum mA input signal value. Press the FIELD button to select the digit to program. The digit will blink when selected..
- ⌗ Press the DIGIT button to change the selected digit.
- ⌗ Repeat until all digits are programmed.
- ⌗ Press the mode button. Programming is complete.
- ⌗ To exit the programming mode, press the RUN/STANDBY button and

PROGRAM MODE 2
% speed at the maximum input

MODE 2	→ RUN
% SPEED	→ PROGRAM
	→ STAND-BY
100	→ PRIME
	→ MINIMUM
	→ MAXIMUM

PROGRAM MODE 2
maximum input value

MODE 2	→ RUN
mA	→ PROGRAM
	→ STAND-BY
20.0	→ PRIME
	→ MINIMUM
	→ MAXIMUM

MODE 2 PROGRAMMING EXAMPLES

Example 1
4 mA = 0% OUTPUT
20 mA = 100% OUTPUT

Example 2
4 mA = 100% OUTPUT
20 mA = 0% OUTPUT

Example 3
4 mA = 0% OUTPUT
20 mA = 75% OUTPUT

Example 4
4 mA = 20% OUTPUT
20 mA = 50% OUTPUT

5.4   **OPERATING MODE 3 - Output adjusted by 0-10VDC input signal -**
In this mode, the pump's motor speed is adjusted automatically based on the value of the 0-10VDC input signal. Any motor speed can be assigned to either the minimum or maximum DC input signal values. However, **the programmed minimum VDC value must be less than the programmed maximum VDC value.** The **ALARM** and **SERVICE** icons will blink if the programming is in error. To assign the minimum and maximum motor speed and the minimum and maximum VDC input signal values:

⌗   *__Set the pump for mode 3__*. Press the MODE button until ***MODE 3*** is shown on the LCD display. The ***% SPEED*** or ***VDC*** icon will light depending on the current display setting. The large ***3-DIGIT LCD*** will indicate the current motor speed or the VDC input value.

⌗   *__Enter the programming mode.__* At the same time, press the RUN/STANDBY and MODE buttons. A blinking ***ARROW*** will point to the word PROGRAM indicating the program mode is activated. A blinking ***ARROW*** will point to the word MINIMUM indicating the minimum value is ready to be programmed. The ***% SPEED*** icon will blink indicating the percentage of speed is ready to be programmed.

⌗   *__Enter the motor speed at the minimum VDC input signal value.__* Press the FIELD button to select the digit to program. The digit will blink when selected.

⌗   Press the DIGIT button to change the selected digit.

⌗   Repeat until all digits are programmed.

⌗   Press the mode button. The ***% SPEED*** icon will stop blinking and the ***VDC*** icon will blink indicating the minimum VDC value is ready to be programmed. The currently programmed minimum value is shown on the ***3-DIGIT LCD***.

⌗   *__Enter the minimum VDC input signal value.__* Note: this value must be less than the maximum VDC input signal value. Press the FIELD button to select the digit to program. The digit will blink when selected.

⌗   Press the DIGIT button to change the selected digit.

⌗   Repeat until all digits are programmed.

⌗   Press the mode button. The ***VDC*** icon will stop blinking and the ***% SPEED*** icon will blink. The ***ARROW*** next to the word MAXIMUM will blink indicating the maximum value is ready to be programmed. The currently programmed maximum motor speed value is shown on the ***3-DIGIT LCD***.

⌗   *__Enter the motor speed at the maximum VDC input signal value.__* Press the FIELD button to select the digit to program. The digit will blink when selected.

⌗   Press the DIGIT button to change the selected digit.

⌗   Repeat until all digits are programmed.

⌗   Press the mode button. The ***% SPEED*** icon will stop blinking and the ***VDC*** icon will blink indicating the maximum VDC value is ready to be programmed. The currently programmed maximum value is shown on the ***3-DIGIT LCD***.

⌗   *__Enter the maximum VDC input signal value.__* Note: this value must be greater than the minimum VDC input signal value. Press the FIELD button to select the digit to program. The digit will blink when selected.

⌗   Press the DIGIT button to change the selected digit.

⌗   Repeat until all digits are programmed.

⌗   Press the mode button. Programming is complete.

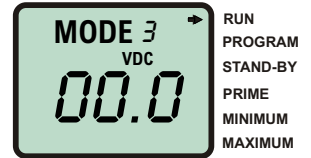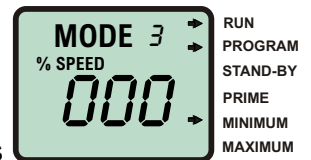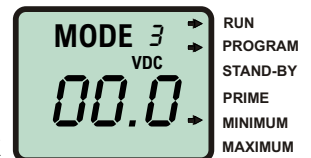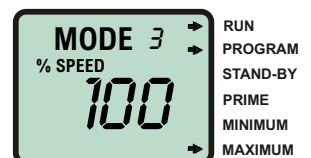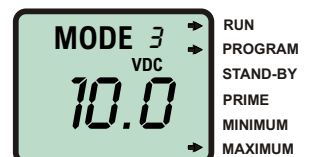⌗   To exit the programming mode, press the RUN/STANDBY button and the MODE button at the same time. The PROGRAM arrow will disappear.

RUN MODE 3

MODE *3*
VDC
00.0
RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

PROGRAM MODE 3
% speed at the minimum input

MODE *3*
% SPEED
000
RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

PROGRAM MODE 3
minimum input value

MODE *3*
VDC
00.0
RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

PROGRAM MODE 3
% speed at the maximum input

MODE *3*
% SPEED
100
RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

PROGRAM MODE 3
maximum input value

MODE *3*
VDC
10.0
RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

5.5 OPERATING MODE 4 - Output adjusted by frequency (Hz) input signal

In this mode, the pump's motor speed is adjusted automatically based on the frequency (Hz) of the input signal. Any motor speed can be assigned to either the minimum or maximum Hz input signals. However, **the programmed minimum Hz value must be less than the programmed maximum Hz value.** The **ALARM** and **SERVICE** icons will blink if the programming is in error. To assign the minimum and maximum motor speed and the minimum and maximum Hz input signal values:

RUN MODE 4

MODE 4 Hz
000
RUN PROGRAM STAND-BY PRIME MINIMUM MAXIMUM

- �֍ *Set the pump for mode 4.* Press the MODE button until *MODE 4* is shown on the LCD display. The *% SPEED* or *Hz* icon will light depending on the current display setting. The large *3-DIGIT LCD* will indicate the current motor speed or the Hz input value.
- ✖ *Enter the programming mode.* At the same time, press the RUN/STANDBY and MODE buttons. A blinking *ARROW* will point to the word PROGRAM indicating the program mode is activated. A blinking *ARROW* will point to the word MINIMUM indicating the minimum value is ready to be programmed. The *% SPEED* icon will blink indicating the percentage of speed is ready to be programmed.

PROGRAM MODE 4
% speed at the minimum input

MODE 4 % SPEED
000
RUN PROGRAM STAND-BY PRIME MINIMUM MAXIMUM

- ✖ *Enter the motor speed at the minimum Hz input signal value.* Press the FIELD button to select the digit to program. The digit will blink when selected.
- ✖ Press the DIGIT button to change the selected digit.
- ✖ Repeat until all digits are programmed.
- ✖ Press the mode button. The *% SPEED* icon will stop blinking and the *Hz* icon will blink indicating the minimum Hz value is ready to be programmed. The currently programmed minimum value is shown on the *3-DIGIT LCD*.
- ✖ *Enter the minimum Hz input signal value (to the nearest 10 Hz).* Note: this value must be less than the maximum Hz input signal value. Press the FIELD button to select the digit to program. The digit will blink when selected.

PROGRAM MODE 4
minimum input value

MODE 4 Hz
000
RUN PROGRAM STAND-BY PRIME MINIMUM MAXIMUM

- ✖ Press the DIGIT button to change the selected digit.
- ✖ Repeat until all digits are programmed.
- ✖ Press the mode button. The *Hz* icon will stop blinking and the *% SPEED* icon will blink. The *ARROW* next to the word MAXIMUM will blink indicating the maximum value is ready to be programmed. The currently programmed maximum motor speed value is shown on the *3-DIGIT LCD*.
- ✖ *Enter the motor speed at the maximum VDC input signal value.* Press the FIELD button to select the digit to program. The digit will blink when selected.

PROGRAM MODE 4
% speed at the maximum input

MODE 4 % SPEED
82.5
RUN PROGRAM STAND-BY PRIME MINIMUM MAXIMUM

- ✖ Press the DIGIT button to change the selected digit.
- ✖ Repeat until all digits are programmed.
- ✖ Press the mode button. The *% SPEED* icon will stop blinking and the *Hz* icon will blink indicating the maximum Hz value is ready to be programmed. The currently programmed maximum value is shown on the *3-DIGIT LCD*.
- ✖ *Enter the maximum Hz input signal value (to the nearest 10 Hz).* Note: this value must be greater than the minimum Hz input signal value. Press the FIELD button to select the digit to program. The digit will blink when selected.

PROGRAM MODE 4
minimum input value

MODE 4 Hz
620
RUN PROGRAM STAND-BY PRIME MINIMUM MAXIMUM
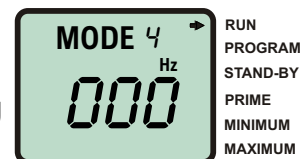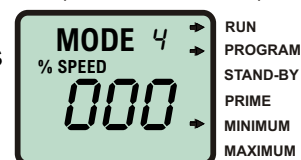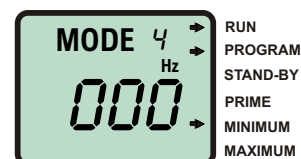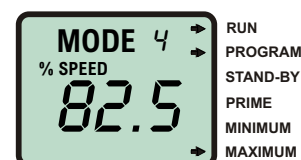
- ✖ Press the DIGIT button to change the selected digit.
- ✖ Repeat until all digits are programmed.
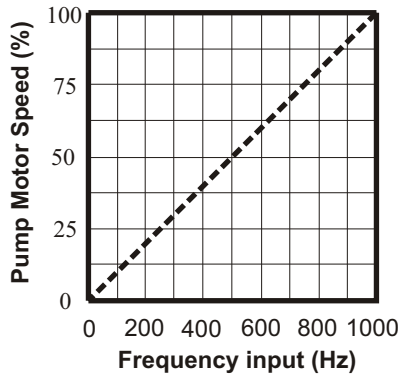- ✖ Press the mode button. Programming is complete.
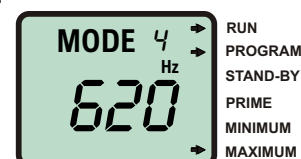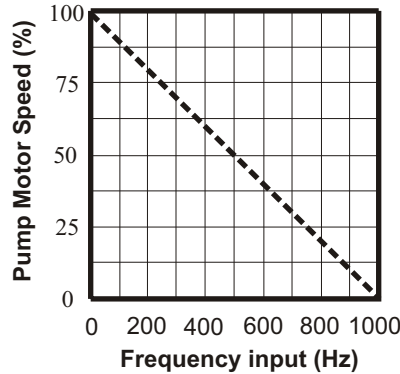
MODE 4 PROGRAMMING EXAMPLES

Example 1
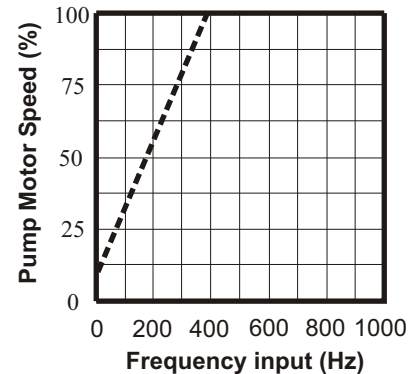0 Hz = 0% OUTPUT
1000 Hz = 100% OUTPUT

Example 2
0 Hz = 100% OUTPUT
1000 Hz = 0% OUTPUT

Example 3
0 Hz = 10% OUTPUT
270 Hz = 75% OUTPUT

6.0   ALARMS -

6.1   Tube Failure Detection System (TFD)

The pump is equipped with a *Tube Failure Detection System* which is designed to stop the pump and provide a contact closure output in the event the pump tube should rupture and chemical enters the pump head. This patent-pending system is capable of detecting the presence of a large number of chemicals including Sodium Hypochlorite (chlorine), Hydrochloric (muriatic) Acid, Sodium Hydroxide, and many others. The system will not be triggered by water (rain, condensation, etc.) or silicone oil (roller and tubing lubricant).
If the system has detected chemical, the pump tube must be replaced and the pump head and roller assembly must be thoroughly cleaned. Press the **RUN/STAND-BY and FIELD** buttons at the same time (prime mode), to remove the pump tube. Thoroughly clean the pump head and roller assembly. Press the **RUN/STAND-BY** button to reset the system.

Confirm Chemical Detection -
To determine if your chemical will be detected by the system, remove the pump tube and roller assembly, place a small amount of the chemical in the bottom of the pump head, just enough to cover the sensors, and turn on the pump. If the TFD system detects the chemical, the pump will stop after a five second confirmation period and the *ALARM* icon will light on the display. If the TFD system does not detect the chemical, the pump will continue to run after the confirmation period. Carefully clean the chemical out of the pump head being sure to remove all traces of chemical from the sensor probes. Press the **RUN/STAND-BY** button to clear the alarm condition and restart the pump.

RUN MODE 1

MODE *1*
% SPEED
000
ALARM

RUN
PROGRAM
STAND-BY
PRIME
MINIMUM
MAXIMUM

To Disable the Chemical Detection -
If the TFD system cannot detect your chemical, no further action is necessary. However, if there is a concern about possible false triggering by chemical contaminants, the system can be disabled by un-plugging the sensor probe wires from the circuit board. See Fig. 4.4, page 7 for the sensor probe's plug location on the internal circuit board.

Contact Closure Alarm Output Signal -
A contact closure output is provided with the TFD system. The output can be configured for normally open (factory default) or normally closed operation by properly positioning the connector plug on the circuit board (See fig. 4.4, page 7). The contacts will change states while an alarm condition exists. Two wires (purple), located in the junction box, are provided for connections. 20mA minimum / 1 amp maximum load @ 125V AC /24V DC.
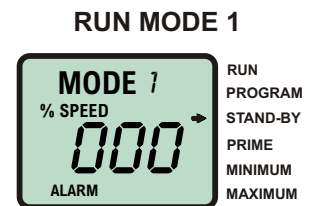
7.0   How to Maintain the Pump

WARNING-RISK OF ELECTRICAL SHOCK

7.1   Routine Inspection and Maintenance

The pump requires very little maintenance. However, the pump and all accessories should be checked weekly. This is especially important when pumping chemicals. Inspect all components for signs of leaking, swelling, cracking, discoloration or corrosion. Replace worn or damaged components immediately.

Cracking, crazing, discoloration and the like during the first week of operation are signs of severe chemical attack. If this occurs, immediately remove the chemical from the pump. Determine which parts are being attacked and replace them with parts that have been manufactured using more suitable materials. The manufacturer does not assume responsibility for damage to the pump that has been caused by chemical attack.

7.2   How to Clean and Lubricate the Pump

The pump will require occasional cleaning and lubricating. The amount will depend on the severity of service.

- ☑ When changing the pump tube assembly, clean the pump head chamber, TFD sensors, roller assembly and pump head cover.
- ☑ The pump head cover bearing may require grease periodically. Apply a small amount of grease (Aeroshell aviation grease #5 or equivalent) when necessary.
- ☑ Silicone oil **ONLY** may be used on the roller assembly and tube assembly.
- ☑ The injection/check valve assembly **must be cleaned** periodically, especially when injecting fluids that calcify such as sodium hypochlorite. These lime deposits and other build ups can clog the fitting increasing the back pressure which can interfere with the check valve operation and possibly damage the fitting and/or the pump. See section 4.3.4. Fig. 4.7.
- ☑ Periodically clean the suction strainer. Fig.4.5.
- ☑ Periodically inspect the air vents located under the motor compartment and on the rear panel. Clean if necessary.

7.3   500 Hour Service Warning Timer

The FPUDVS2000 is equipped with a service warning timer. After 500 hours of accumulated running time, the *SERVICE* icon will light. This is a reminder that the pump tube is nearing its minimum life expectancy and should be replaced. *Your actual tube life will depend on many factors such as the chemical used, back pressure, temperature, viscosity, and motor RPM.*

Simultaneously press the **RUN/STANDBY** and **DIGIT** buttons to reset the service timer to zero. **Note:** Pressing the **FIELD** and **DIGIT** buttons will display the currently accumulated time value.

CAUTION: PINCHING HAZARD, KEEP YOUR FINGERS OUT OF THE PUMP HEAD WHILE CHANGING THE PUMP TUBE.

7.4   How to Replace the Pump Tube

The pump tube assembly will eventually break if not replaced. The tube has been designed for a minimum service life of 500 hours. However, the life of the tube is affected by many factors such as the type of chemical being pumped, the amount of back pressure, the motor RPM, temperature and others. The pump tube assembly must be inspected and replaced regularly.

After replacing the pump tube, press the RUN/STANDBY button and the DIGIT button at the same time to reset the service warning timer.

7.4.1 How to Remove the Old Pump Tube

The pump roller assembly spins in a counter clockwise direction. The pump head inlet (suction) side is located at the bottom of the pump and the outlet (discharge) is located at the top of

the pump head.

7.4.1.1   Release any pressure that may be in the discharge tubing.

7.4.1.2   Disconnect the suction and discharge tubes from the pump tube.

7.4.1.3   Remove the pump head cover.

7.4.1.4   With the pump running, pull the inlet fitting out of the pumphead. Guide the tube counter clockwise away from the rollers. Pull the outlet fitting out of the pump head.

Outlet Adapter   Pump Head
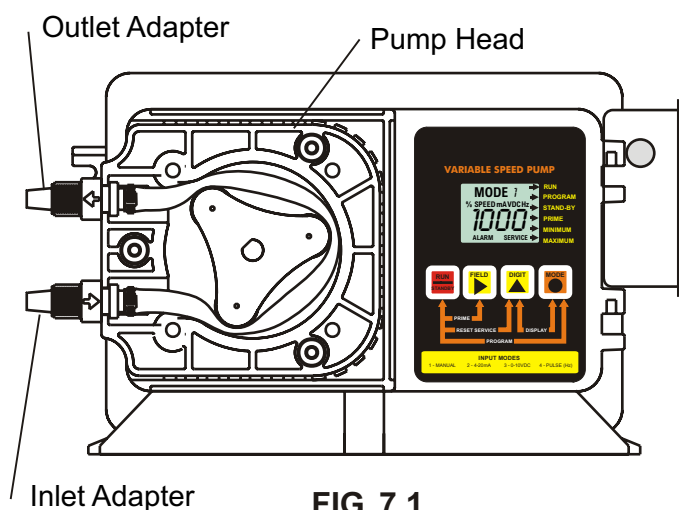
Inlet Adapter   **FIG. 7.1**

7.4.2 How to Install a New Pump Tube

Be sure the pump head chamber is clean and free of any debris. Remove and inspect the roller assembly. Be sure the rollers spin freely. If required, apply a small amount of grease to the pump head cover bearing. Silicone oil **only** may be used on the tubing and rollers. See section 7.2.

6.4.2.1   With the pump running, insert the inlet (suction) side of the Pump Tube fitting into the lower retaining slot in the pump head. Fig. 7.2.

6.4.2.2   **Carefully** guide the Pump Tube into the pump head. Stretch the tube slightly and insert the outlet (discharge) fitting into the upper retaining slot in the pump head. Fig. 7.3.

6.4.2.3   Place the clear cover on the pump head and secure with three screws.

FIG. 7.2

FIG. 7.3

Replacement Parts Drawing

BRUSH KIT

OPTIONAL QUICKCONNECT

PARTS LIST

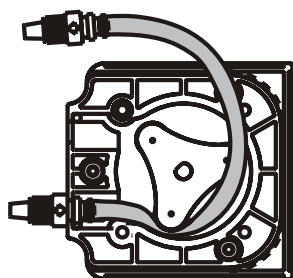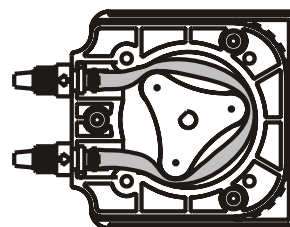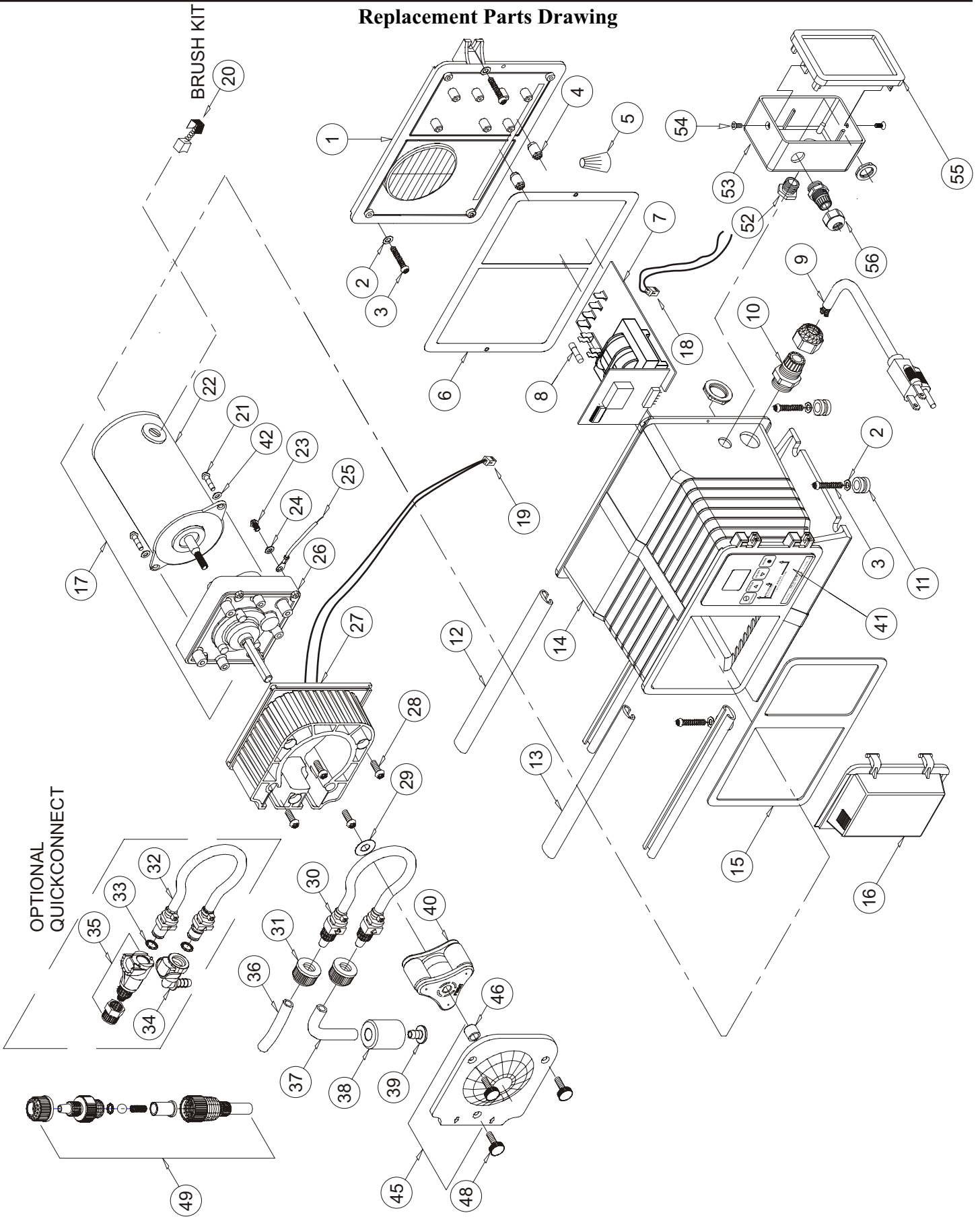| Item	Part No	Description	Qty
1	71000-489	Enclosure Back Plate With Gasket, Valox	1
2	90011-094	Washer, Mounting, #10 Stainless	2
3	90011-091	Mounting Screw, #10 X 1.0" Phillips Steel	4
4	76001-001	Tubing Spacer FPUDVS2000 digital	2
5	90010-036	Wire Nut, Blue	1
6	90006-580	Gasket, Enclosure Back Plate	1
7	A-023N-V-115	Circuit board 115V	1
	A-023N-V-230	Circuit board 220V/230V	1
8	90010-235	Fuse, Circuit Board, 1A 250VAC	1
9	71000-175	Power Cord, 115v60hz, Digital Models	1
	71000-176	Power Cord, 220v50hz, Digital Models	1
	71000-177	Power Cord, 230v60hz, Digital Models	1
10	70000-589	Cord Inlet Bushing	1
11	90003-559	Mounting Feet, Rubber	4
12	76001-000	Slide Clamp, Enclosure Rear	1
13	76000-999	Slide Clamp, Enclosure Front	1
14	76001-253	Enclosure	1
15	90006-579	Gasket, Enclosure Front	1
16	90002-191	Door, Electronic Controls Cover	1
17	70002-250	Gearmotor, 14 Rpm, 24V DC	1
	70002-251	Gearmotor, 30 Rpm, 24V DC	1
	70002-252	Gearmotor, 45 Rpm, 24V DC	1
	70002-253	Gearmotor, 60 Rpm, 24V DC	1
	70002-254	Gearmotor, 125 Rpm, 24V DC	1
18	90010-246	Wire set w/plug, Alarm relay	1
19	90010-245	Wire set w/plug, TFD sensor	1
N/s	90010-247	Wire set w/plug, input signals	1
20	C-1814N-4	Motor Brush kit (2 ea), 24V DC	1
21	90011-023	Screw, Motor, 8-32 x .50	2
22	90010-244	Motor, 24V DC	1
23	90011-024	Screw, Green Ground, 8-32 x .25	1
24	90011-078	Washer, Ground Screw, #8 Star	1
25	90010-222	Wire, Motor ground, Digital Timers, Green	1

Item	Part No	Description	Qty
26	A-008-1	Gearbox, 14 Rpm	1
	A-008-2	Gearbox, 30 Rpm	1
	A-008-3	Gearbox, 45 Rpm	1
	A-008-4	Gearbox, 60 Rpm	1
	A-008-5	Gearbox, 125 Rpm	1
27	76001-488	Pumphead, w/TFD sensors	1
28	C-324N	Screw, Pumphead, 10-32 X .50 Phil Pan Black	4
29	A-031	Spacer, Rotor	1
30	FPU2000-14PTA	Pump Tube, .25 O.D., Compression Barb Type	1
	FPU2000-38PTA	Pump Tube, .37 O.D., Compression Barb Type	1
	FPU2000-716PTA	Pump Tube, .43 O.D., Compression Barb Type	1
31	FPU2000-TN	Nut, Tube Compression Type, .37 O.D. Tubing	2
32	A-002N-4Q	Pump Tube, .25 O.D., Quick-connect W/ O-ring	1
	A-002N-6Q	Pump Tube, .37 O.D., Quick-connect W/ O-ring	1
33	90003-007	O-ring, Quick-connect Pump Tubes, Viton	2
34	90008-299	Adapter, Quick-connect Inlet, .37 O.D. Tube	1
35	90008-300	Adapter, Quick-connect Outlet, .37 O.D. Tube	1
36	C-335-6	Tubing, Outlet, .37 O.D. X 5ft, Polyethylene	1
37	C-334-6	Tubing, Inlet, .37 O.D. X 5ft, Clear PVC	1
38	FPU2000-CW	Weight, Inlet Tubing, Ceramic	1
39	C-342-2	Strainer, Inlet Tube, Polypropylene	1
40	FPU2000-RA	Roller Assembly -4, -6 tubes (white rollers)	1
	FPU2000-716RA	Roller Assembly -7 tubes (black rollers)	1
41	90012-245	Label, front panel controls	1
42	90011-074	Washer, #8 splitlock	2
45	FPU2000-PHB	Cover, Pumphead With Sleeve Bearing	1
46	76001-003	Bearing, Sleeve, Pumphead Cover	1
48	90011-160	Screw, Pumphead Cover, 8-32 X .62 Cap	3
49	FPU1000IF	Injection Valve Assy, .5-.25 MPT X .37OD Tube	2
52	90007-515	Bushing, Junction Box Connector, Alum.	1
53	76001-254	Junction Box	1
54	90011-129	Screw, Cover, 6-32 X .25 Phil Pan SS Black	2
55	71000-133	Cover, Junction Box with Gasket and Label	1
56	90008-199	Connector Liquid-tight	1

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2. Model and serial number of the product under warranty, and
3. Repair Instructions and/or specific Problems relative to the Product.

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1. P.O. Number to cover the COAST of the repair/ calibration.
2. Model and serial number of product, and
3. Repair instructions and/or specific Problems relative to the product

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