



# **EHC & EHE FF Series Electronic Metering Pump Instruction Manual**

Part of the  **IWAKI WALCHEM Corporation** Family of Products

Five Boynton Road Hopping Brook Park Holliston, MA 01746 USA TEL 508-429-1440 FAX 508-429-1386

WEBSITE: [www.iwakiwalchem.com](http://www.iwakiwalchem.com)

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Five Boynton Road, Holliston, MA 01746 USA  
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Thank you for choosing a Iwaki Walchem EH-FF Series metering pump. This instruction manual deals with the correct installation, operation, maintenance and troubleshooting procedures for the EHC-FF and EHE-FF model metering pumps. Please read through it carefully to ensure the optimum performance, safety and service of your pump.

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## 1.0 INTRODUCTION

### 1.1 Safety and Caution Notes

**WARNING Risk of electrical shock!** This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electrical shock, be certain that it is connected only to a properly grounded, grounding type receptacle.

Connect the pump to a **GROUND**ED outlet providing proper voltage.

- 115 VAC for models with electrical code 1 in the model number
- 230 VAC for models with electrical code 2 in the model number

Disconnect the pump from electrical power source before performing any maintenance.

Depressurize the discharge tubing before disconnecting the tubing or performing any maintenance on the pump.

When working on or around a metering pump, always wear proper protective clothing and equipment as recommended by the supplier of the liquid being pumped.

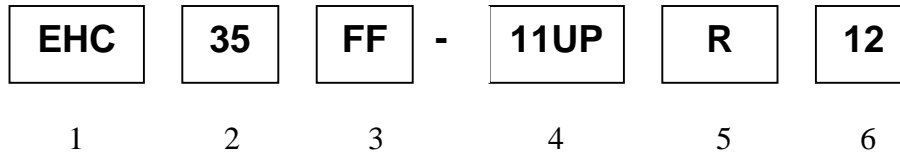
**CAUTION!** This pump has been tested by Underwriters Laboratories Inc. using water only. The suitability of this pump for use with liquids other than water is the responsibility of the user. For liquids other than water, select the best suited liquid end material combination using a chemical compatibility chart.

Avoid areas where ambient temperature exceeds 122°F (50°C) or falls below 32°F (0°C), or where the pump or tubing would be exposed to direct sunlight.

### 1.2 Principle of Operation

The EH series electronic metering pump consists of a pump unit, a drive unit, and a control unit. The drive unit is an electromagnetic solenoid. When the solenoid coil is energized by the control unit the armature shaft moves forward due to the magnetic force of the solenoid. The shaft is attached to a PTFE faced diaphragm which is part of the pump unit. The diaphragm is forced into the pump head cavity decreasing volume and increasing pressure which forces liquid in the pump head out through the discharge check valves. When the solenoid coil is de-energized, a spring returns the armature to its starting position. This action pulls the diaphragm out of the head cavity increasing volume and decreasing pressure. Atmospheric pressure then pushes liquid from the supply tank through the suction check valves to refill the pump head.

### 1.3 Model Code



#### 1 Pump Series

**EHC** Electronic metering pump with external pulse control or manual speed control (adjustable to 360 strokes per minute) and manually adjustable stroke length. (Typical turndown ratio 125:1.)

**EHE** Electronic metering pump with external pulse control or manual speed control (adjustable to 360 strokes per minute) and manually adjustable stroke length. (Typical turndown ratio 1800:1.)

#### 2 Capacity/Pressure Rating

Size	Output Capacity Max		Output Per Stroke mL		Max Pressure		Connection Size I.D. X O.D.
	mL/min	GPH	Min	max	PSI	Mpa	Tube mm
30	270	4.3	0.30	0.75	30	0.2	10 X 12
35	420	6.7	0.46	1.16	30	0.2	10 X 12
55	1250	19.9	0.69	3.47	30	0.2	10 X 12

#### 3 Liquid End

	Pump Head	Connections	Valve	Valve Seat	Diaphragm	Gasket
FF	PTFE	PFA	PTFE	PTFE	EPDM/PTFE	PTFE

#### 4 Voltage/Wiring

**11UP** 115VAC, 50/60 Hz, single phase, with plug

**23UP** 230VAC, 50/60 Hz, single phase, with plug

#### 5 Control Module

**R** - For use on all EHC models, features external pulse and stop capability.

**Y** - For use on all EHC models, features programmable 4-20mA control and external pulse capability with pulse divide and multiply.

**E** - For use on EHE model, features programmable 4-20mA control and external pulse capability with pulse divide and multiply.

#### 6 Connections

	Connection Size, I.D. X O.D. ,Tube in (mm)
12	0.39 X 0.47 (10 X 12)

## 1.4 Specifications

### Operating Conditions

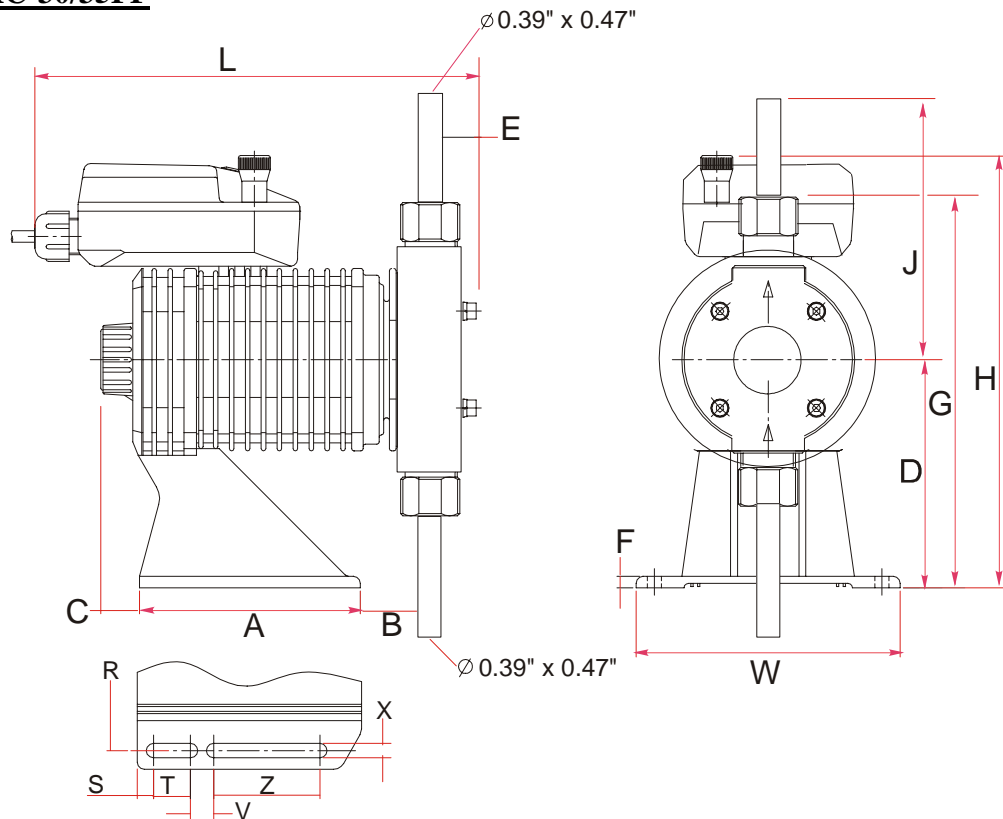
Ambient temperature	32°F to 122°F (0°C to 50°C)
Relative humidity	30% to 90% non-condensing
Liquid Temperature	32 – 140 °F (0 – 60 °C)

### Adjustment Range

Recommended stroke length adjustment range	40% to 100%
Recommended frequency adjustment range	0 to 360 strokes per minute

## 1.5 Dimensions

### EHC-30/35FF



Model				A	B	C	D	E	F	G	H	J	L	W
EHC	30/ 35	R	FF	3.82	1.47	0.67	3.94	1.19/ 1.23	0.20	6.61/ 6.69	7.46 (7.95)†	4.65/ 4.72	8.29/8.33 (8.62/8.66) †	4.57

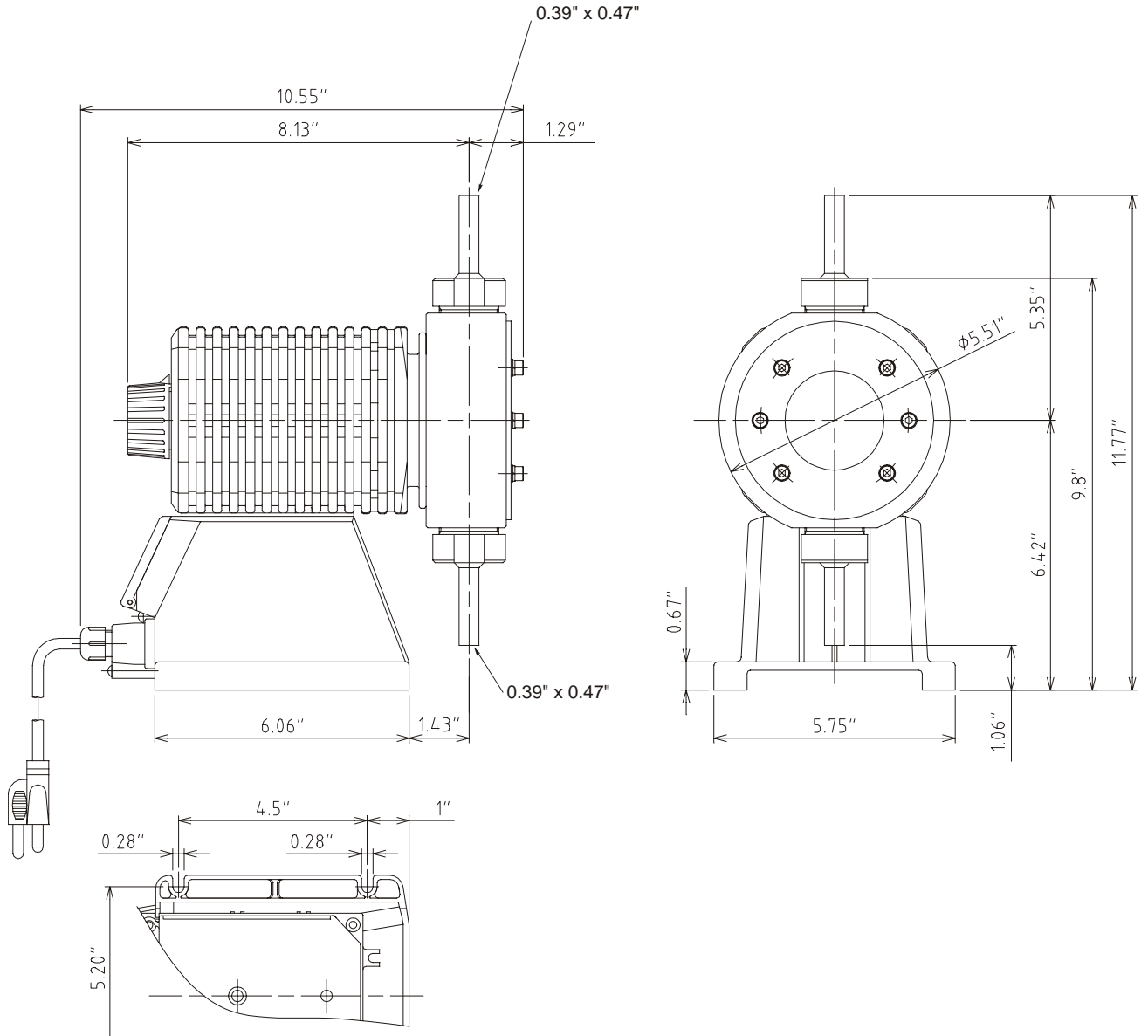
† With Y-Control Module

All dimensions in inches

Mounting Dimensions	R	S	T	V	Z	X

EHC all variations	3.94	0.28	0.63	0.39	1.81	0.24
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**EHE-55FF**



## 2.0 INSTALLATION

### 2.1 Unpacking

Open the shipping carton and inspect contents for damage. If any items are missing or damaged contact your local distributor to arrange for replacement.

### 2.2 Location

Choose a location for the pump that is clean, dry, close to an electrical outlet, and allows convenient access to stroke length control, frequency control, and tubing connections. Avoid areas where ambient temperature exceeds 122°F (50°C) or falls below 32°F (0°C), or where the pump or tubing would be exposed to direct sunlight.

This pump is cord connected and not intended for permanent mounting to a building structure. However, temporary mounting to stabilize the pump during operation may be necessary as long as tools are not required for the installation or removal of the pump.

Flooded suction (mounting the pump below the level of liquid in the supply tank) is strongly recommended, especially when pumping liquids that readily generate gas bubbles. Hydrogen peroxide is a common example of such a liquid. (See Figure 1.)

If flooded suction mounting is not possible, a shelf adjacent to (but not directly above) the supply tank often works well. (See Figure 2.) The supply tank or cover can also be used if it has provisions for mounting a pump. (See Figure 3.) In any case, the total suction lift should not exceed 3.3 ft (1.m).

Figure 1  
Shelf Mount

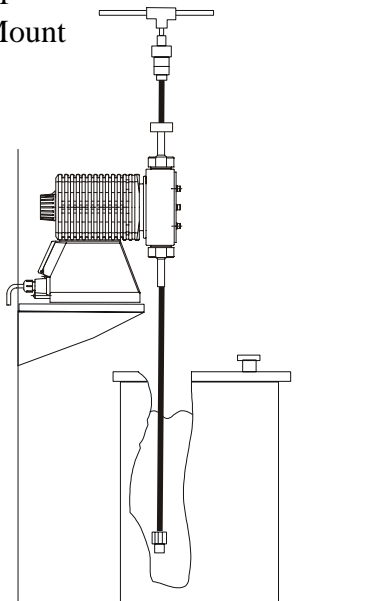
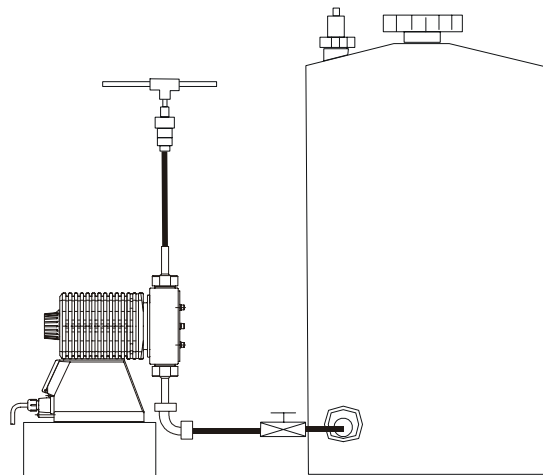


Figure 2  
Flooded Suction





### 2.3 Installing Back Pressure/Anti-syphon Valve

It is recommended for all EH-FF installations that a back pressure/anti-siphon valve be used to ensure pump accuracy and repeatability.

The back pressure/anti-siphon valve acts to create back pressure when pumping into atmosphere or low pressure applications. It also prevents siphoning through the pump when the supply level is above the installed unit.

**IMPORTANT:** Always install the injection/back pressure valve at the end of the discharge tubing to prevent over-pumping in atmospheric or low pressure situations.

### 2.4 Electrical

**WARNING: Risk of electrical shock!** This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electrical shock, be certain that it is connected only to a properly grounded, grounding type receptacle.

Connect the pump power cord to a **GROUND**ED outlet supplying proper voltage. Avoid branch circuits that also supply power to heavy machinery or other equipment that could generate electrical interference.

## 3.0 OPERATION

### 3.1 Priming

#### R-Module

Install the pump as described above. With the pump turned on, set stroke length at 100% and frequency at 100%. Liquid should move through the suction tubing and into the pump head. When liquid enters the discharge tubing at the pump head set frequency to 0% to stop the pump. Adjust frequency and stroke length as necessary.

#### Y/E-Module

Install the pump as described above. With the pump plugged in but not pumping, set stroke length at 100% and frequency at 360 (use the ▲ or ▼ buttons as necessary to adjust the frequency). Push the **START/STOP** button to start the pump. *As soon as* liquid enters the discharge tubing at the pump head, push the **START/STOP** button again to stop the pump. Adjust stroke length, controller configuration as necessary.

If the pump does not self prime, remove the check valve housing on the discharge and suction sides to make sure the valve cartridges and gaskets are in correct positions (see Section 4.2). Remove and shake cartridges to make sure ball is loose inside. Wetting cartridges before re-installing will help in priming. Temporarily flooding pump suction is recommended to ensure pump head is sufficiently wetted for subsequent priming.

Note: Suction tubing arrangement and priming height may affect pump dispense accuracy.

### 3.2 Adjustment

#### A. Pumps using the 'R' Control Module

The pump will operate best with the stroke length at 100%. If less than full output is required, set the frequency to the approximate percentage of maximum desired.

Example: Model EHC35FF-11UPR12 has maximum output of 420 ml/min.  
Desired output is 210 ml/min.  $210 \div 420 = 0.5$  or 50%, so set frequency knob at 50.

For outputs less than 2% of maximum it will be necessary to also reduce the stroke length. (Minimum recommended stroke length is 40%.)

### B. Pumps using the 'Y' Control Module

The pump will operate best with the stroke length at 100%. If less than full output is required, set the frequency to the desired strokes per minute using the UP and DOWN arrow keys.

Example: Model EHC35FF-11UPY12 has maximum output of 420 ml/min.  
Desired output is 210 ml/min.  $210 \div 420 = 0.5$  or 50%, so set frequency to  $0.5 \times 360 = 180$  spm by pushing the UP or DOWN arrow key.

For very low outputs it will be necessary to also reduce the stroke length.  
(Minimum recommended stroke length is 40%.)

### C. Pumps using the 'E' Control Module

The pump will operate best with the stroke length at 100%. If less than full output is required, set the frequency to the desired percentage of maximum.

Example: Model EHE55FF-11UPE12 has maximum output of 1250 ml/min.  
Desired output is 900 ml/min.  $900 \div 1250 = 0.72$  or 72%, so set frequency to  $0.72 \times 360 = 263$  spm by pushing the UP or DOWN arrow key.

For very low outputs it will be necessary to also reduce the stroke length.  
(Minimum recommended stroke length is 40%.)

## 3.3 Calibration

If exact output calibration is required, first prime and adjust the pump as above. Then connect a calibration column to the suction side of the pump. Turn the pump on for one minute and read the amount of liquid pumped from the column. Adjust the frequency up or down as necessary and check the output again. When the desired output is reached, disconnect the calibration column and reconnect the suction tubing. (See Figure 8.)

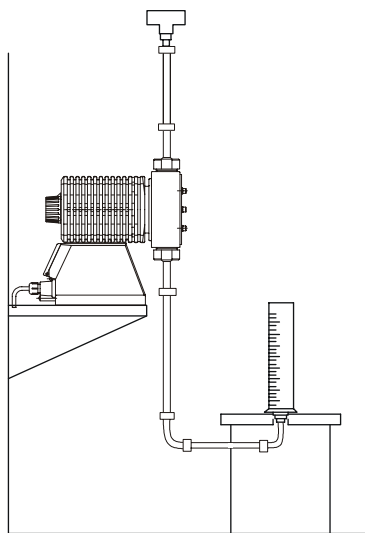


Figure 8 Calibration

### 3.4 External Control

#### A. Pumps using the 'R' Control Module

For pulse proportional external control of pump frequency, connect the control signal leads to terminals 4 (positive) and 6 (common) inside the control module. The input signal should not exceed 360 pulses per minute (See Figure 9). The external circuit should be capable of switching 10 VDC at 2 mA with a pulse width of 10 ms to 100 ms (for R & E modules, 50 ms to 100 ms for Y modules).

In order for the pump to operate properly in External Mode, the frequency knob must be set fully counter clockwise so it points to the "E". (See Figure 10.)

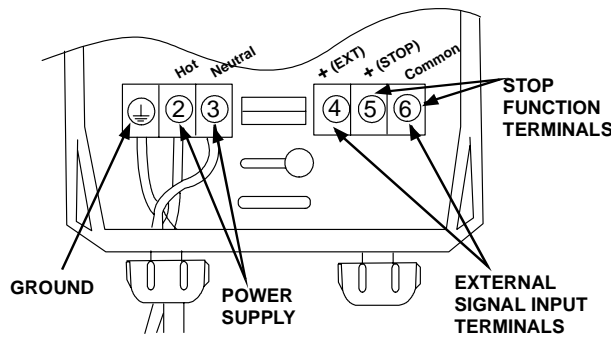


Figure 9

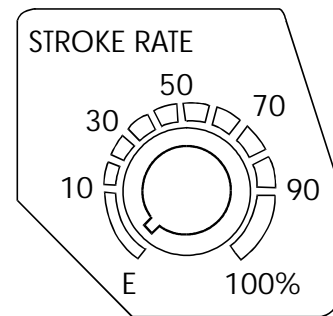
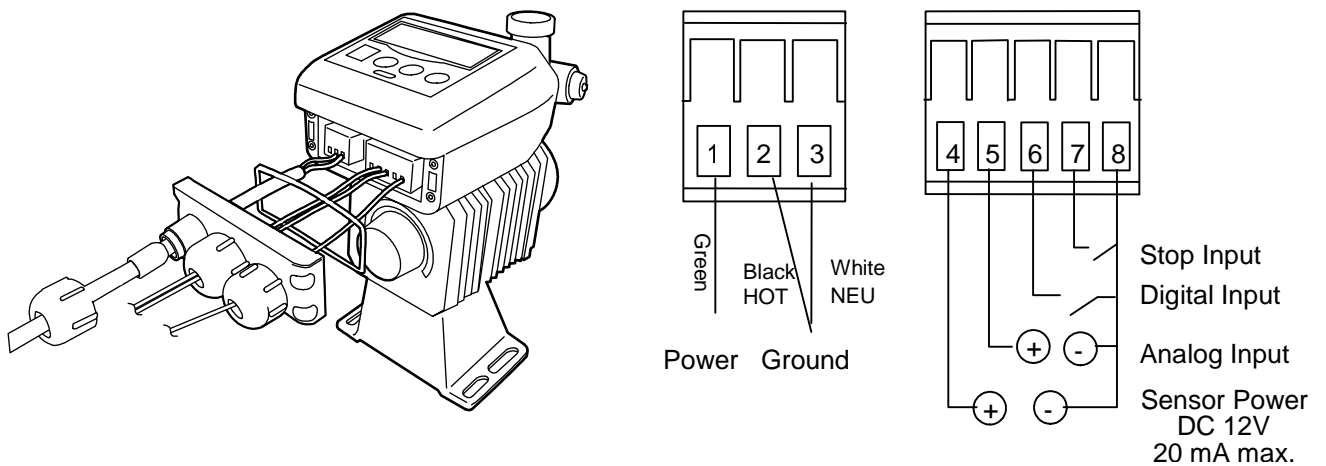
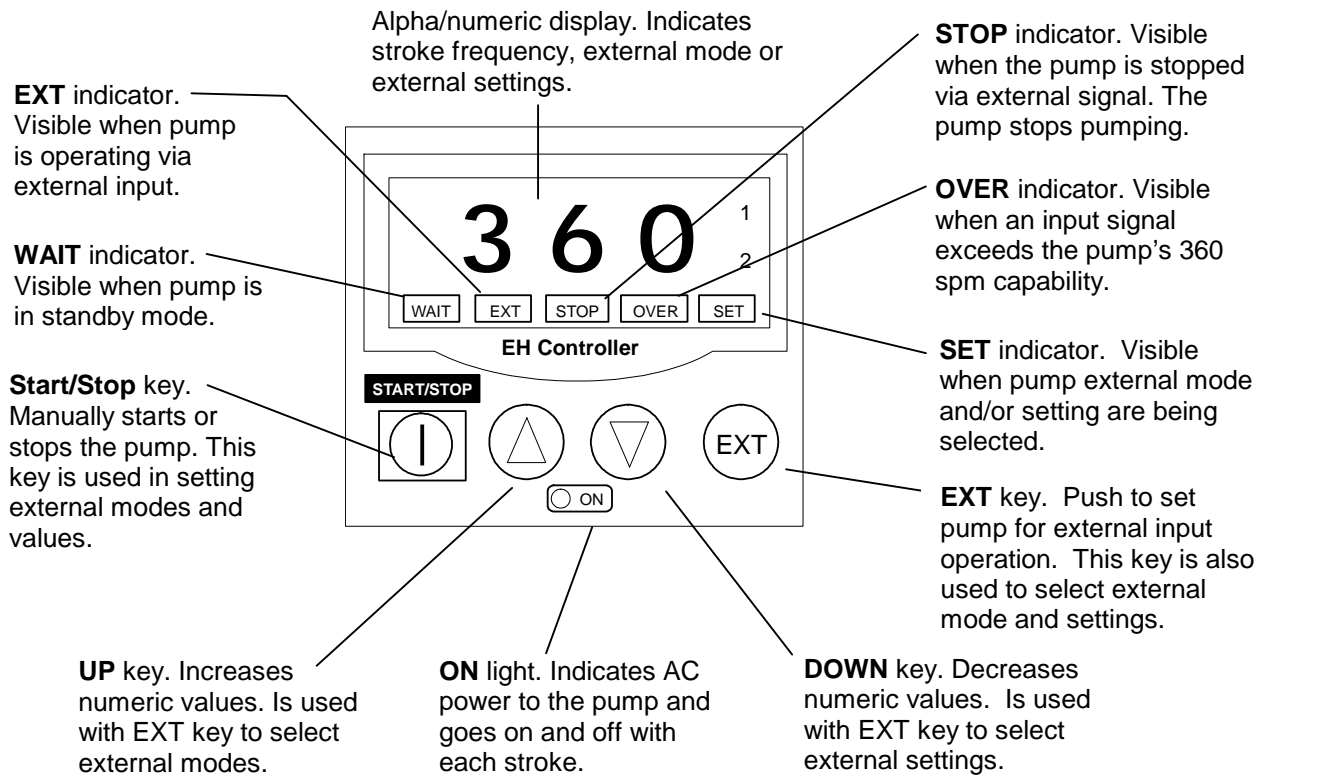


Figure 10

## B. Pumps using the 'Y' Control Module

The EH-Y Series is able to operate in both digital and analog external modes. An external stop function is also available.

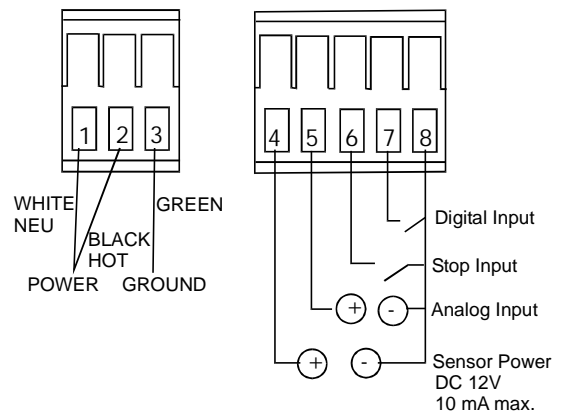
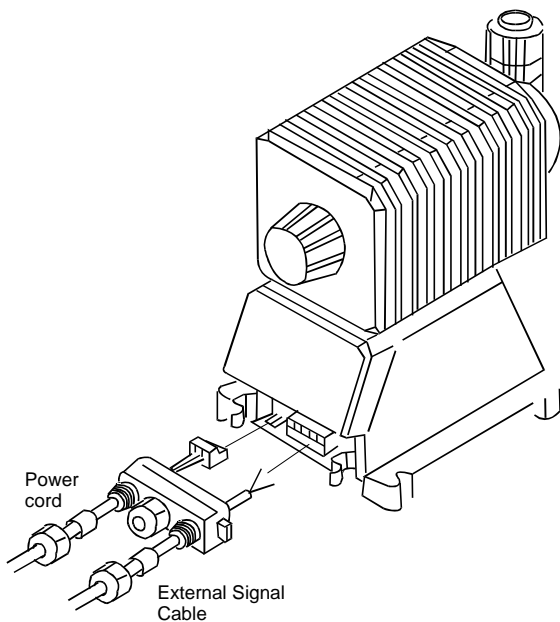
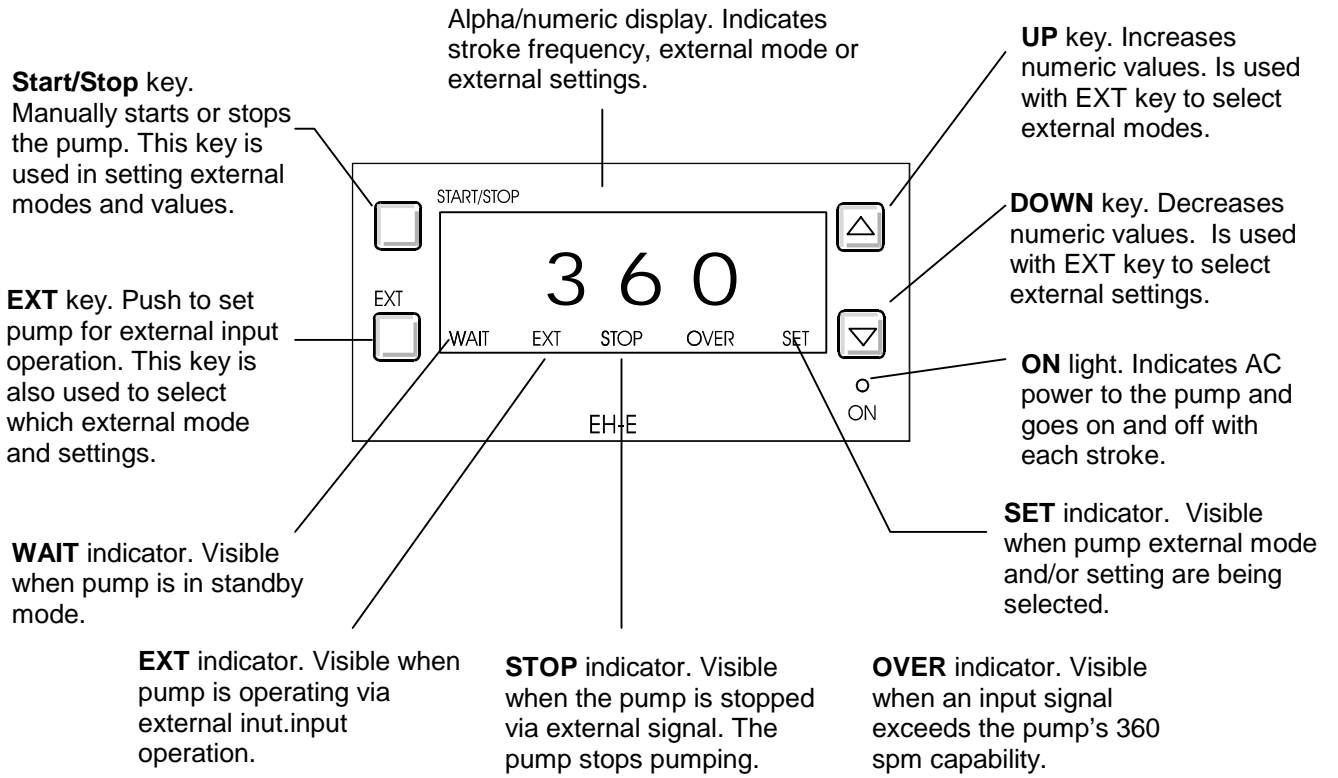
### Display/Keypad Overview



## C. Pumps using the 'E' Control Module

The EHE Series is able to operate in both digital and analog external modes. An external stop function is also available.

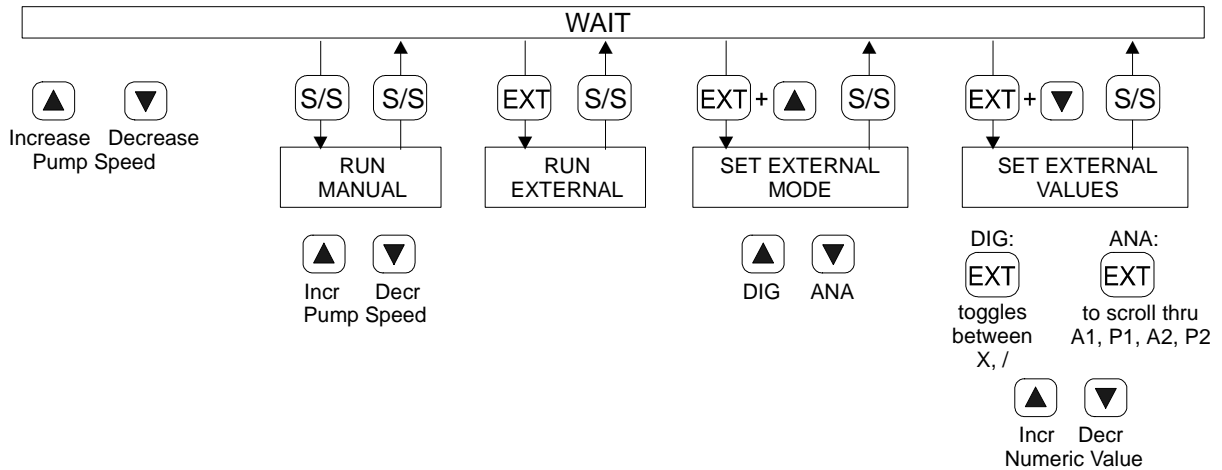
### *Display/Keypad Overview*



## EH-Y/E Quick Reference Guide

S/S = Start/Stop key    
 EXT = External key

From:	Press:	To:		
<b>WAIT</b>	<span style="border: 1px solid black; padding: 2px;">S/S</span>	run in manual mode		
	<span style="border: 1px solid black; padding: 2px;">▼</span>	decrease frequency ( <b>1 to 360</b> spm)		
	<span style="border: 1px solid black; padding: 2px;">▲</span>	increase frequency ( <b>1 to 360</b> spm)		
	<span style="border: 1px solid black; padding: 2px;">EXT</span>	run <b>EXT</b>		
	<span style="border: 1px solid black; padding: 2px;">EXT</span> + <span style="border: 1px solid black; padding: 2px;">▲</span>	<b>SET</b> external mode		
	<span style="border: 1px solid black; padding: 2px;">EXT</span> + <span style="border: 1px solid black; padding: 2px;">▼</span>	<b>SET</b> external values		
Running in manual mode	<span style="border: 1px solid black; padding: 2px;">▲</span>	decrease frequency ( <b>1 to 360</b> spm)		
	<span style="border: 1px solid black; padding: 2px;">▼</span>	increase frequency ( <b>1 to 360</b> spm)		
	<span style="border: 1px solid black; padding: 2px;">S/S</span>	return to <b>WAIT</b>		
Running in <b>EXT</b> mode	<span style="border: 1px solid black; padding: 2px;">S/S</span>	return to <b>WAIT</b>		
<b>SET</b> external mode	<span style="border: 1px solid black; padding: 2px;">▲</span> or <span style="border: 1px solid black; padding: 2px;">▼</span>	Toggles between <b>DIG</b> (multiply or divide) and <b>ANA</b> (milliamp input)		
	<span style="border: 1px solid black; padding: 2px;">S/S</span>	accept data and return to <b>WAIT</b>		
<b>SET</b> external values	<b>DIG</b>	<span style="border: 1px solid black; padding: 2px;">EXT</span>	select / (divide) or <b>X</b> (multiply)	
		<span style="border: 1px solid black; padding: 2px;">▲</span>	increase value ( <b>1 to 999</b> )	
		<span style="border: 1px solid black; padding: 2px;">▼</span>	decrease value ( <b>1 to 999</b> )	
		<span style="border: 1px solid black; padding: 2px;">S/S</span>	accept data and return to <b>WAIT</b>	
	<b>ANA</b>	<b>EXT</b>	scrolls through the following selections: <u>A</u> nalog signal level (point 1) <u>P</u> ump speed (point 1) <u>A</u> nalog signal level (point 2) <u>P</u> ump speed (point 2)	
		<span style="border: 1px solid black; padding: 2px;">▲</span>	increase value (A from 0.00 to 20.0 mA, P from 0 to 360 spm)	
		<span style="border: 1px solid black; padding: 2px;">▼</span>	decrease value (A and P)	
		<span style="border: 1px solid black; padding: 2px;">S/S</span>	accept data and return to <b>WAIT</b>	
		<b>STOP</b>	indicates stop function is asserted	
		<b>OVER</b>	indicates one or more input pulses were received prior to completing action required by previous input pulse. Up to 255 input pulses will be stored in memory.	



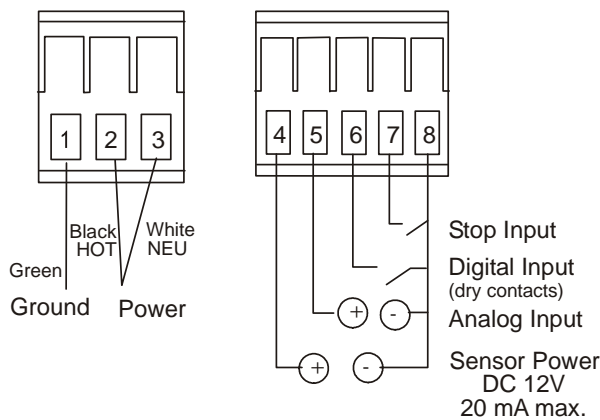
### Digital Mode

In digital mode, the pump accepts a pulse signal from a flowmeter or other instrument. This pulse signal should be in the form of a "dry" contact (no voltage closing contact). The pump can be set to divide pulses by a factor of 1 to 999; or in multiply mode, 1 input pulse can produce 1 to 999 pump strokes.

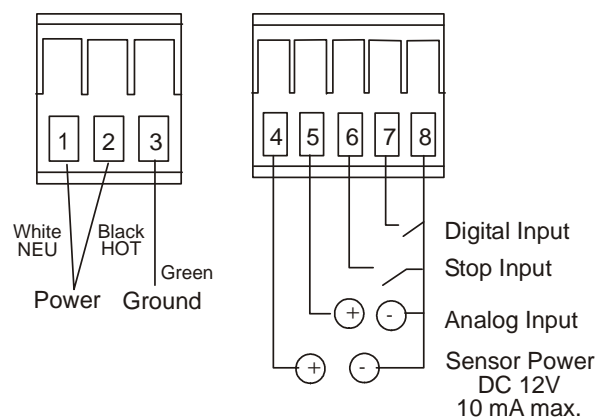
### Connecting a digital input device

Disconnect AC power to the pump. Remove the four screws from the terminal block cover and remove the cover. Remove the cord nut and bushing from the terminal block cover. Remove the terminal block from the connector. Slide the nut and bushing over the external control cable and insert the cable through the terminal block cover. Strip 1/4" insulation from conductors. See schematic below for connections for Y-Module or E-Module control unit.

#### Y-Module



#### E-Module





## Sensor Power

### Y-Module

The control circuit of the Y Module has the ability to provide 12 VDC at up to 20 mA to power a Hall effect sensor or similar device.

Connect the sensor power leads to terminal 4 (positive) and terminal 8 (negative) of the terminal block.

### E-Module

The control circuit of the EHE series has the ability to provide 12 VDC at up to 10 mA to power a Hall effect sensor or similar device.

Connect the sensor power leads to terminal 4 (positive) and terminal 8 (negative) of the terminal block.

## Settings


Start with pump in the **WAIT** state. If it is not currently in wait, press **START/STOP** once.

### 1. Set it to digital mode


Press  and **EXT** simultaneously.

The **SET** indicator is highlighted and DIG (digital) or ANA (analog) will be displayed.



If DIG is displayed, press **START/STOP** to accept that mode. You will be returned to the **WAIT** state.

If ANA is displayed, press  to change to **DIG** and then press **START/STOP** to enter that choice. You will be returned to the **WAIT** state.

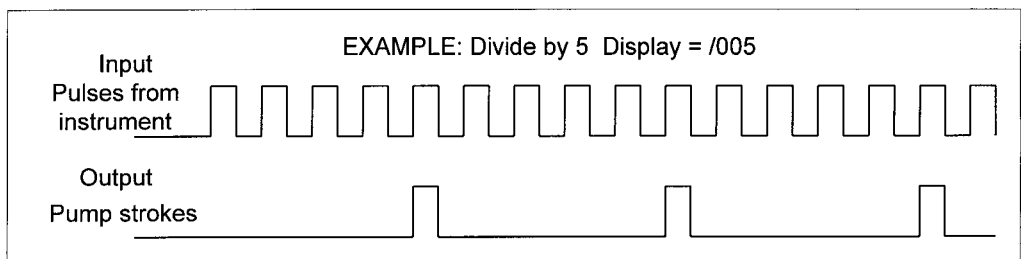
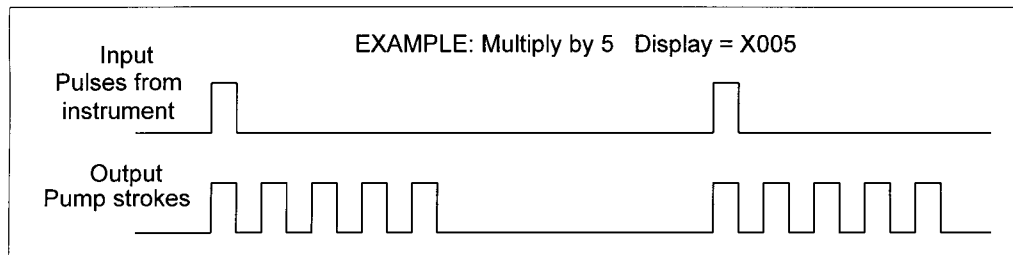
### 2. Set multiply or divide

To set values for digital operation, press **EXT** and  simultaneously. The display will show '/' or 'X' and a number. Now pressing the **EXT** button will alternate between X (multiply) and / (divide).

### 3. Set the value

 or  will increase or decrease the multiplier or divider. Pressing a button once will change the value by one. Holding a button down will continuously increment or decrement the value, slowly at first, then rapidly. Press **START/STOP** to accept values and return to **WAIT**.

Press **EXT** to operate the pump in external mode. The pump will now respond to the incoming pulse signal. The stroke length can be adjusted manually to set the volume pumped per stroke.



### *Analog Mode*

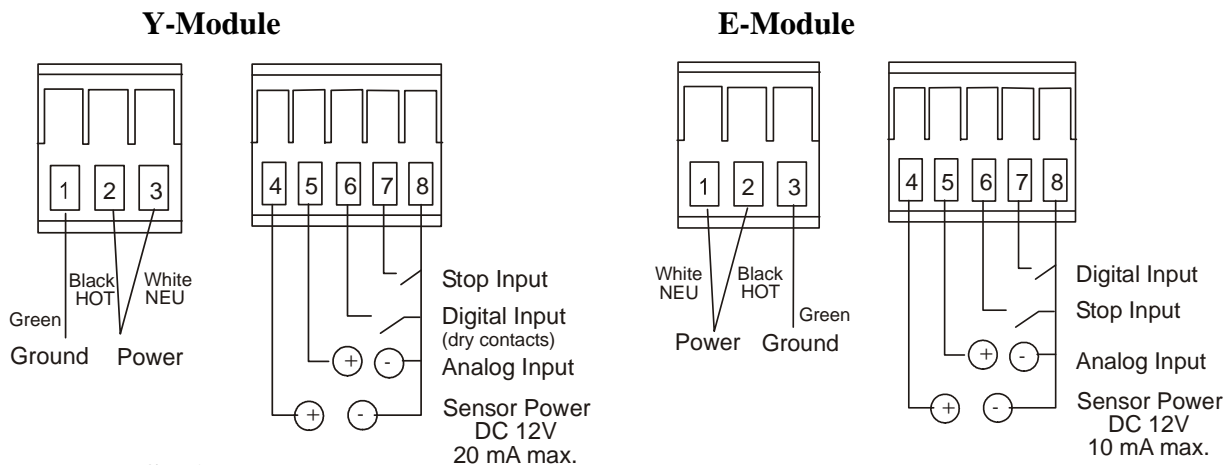
In analog mode the pump will accept a milliamp signal and produce a pump speed proportional to the signal level received. The pump's response can be fine-tuned by variable set points to meet system requirements.

### **Connecting an analog signal device**

Disconnect AC power to the pump. Remove the four screws from the terminal block cover and remove the cover. Remove the cord nut and bushing from the terminal block cover. Remove the terminal block from the connector. Slide the nut and bushing over the external control cable and insert the cable through the terminal block cover.

**Caution:** An open loop signal voltage exceeding 25 VDC will permanently damage the control unit!. If the signal voltage is greater than 25 VDC, power down the signal source prior to connection.

Strip 1/4" insulation from conductors. See schematic below for connections for Y-Module or E-Module control unit.



### Settings

The pump's response to a 4 to 20 milliampere signal can be adjusted to meet almost any need. The adjustment is done by selecting two points. A signal level and a pump speed are entered for each point. These two points determine a straight line and the pump speed resulting from any given signal will be defined by that line. The factory settings for point 1 are 4.0 mA, 0 spm and for point 2 are 20.0 mA, 360 spm. An 'A' in the leftmost position of the display indicates the data shown is Analog signal level. A 'P' indicates Pump speed. The 1 on the right side of the display is highlighted when viewing or changing data for point 1. The 2 is highlighted to indicate data for point 2.

Start with pump in the **WAIT** state. If it is not currently in wait, press **START/STOP** once.


1. Set it to analog mode.

Press  and **EXT** simultaneously.

The **SET** indicator is highlighted and DIG (digital) or ANA (analog) will be displayed.

If ANA is displayed, press **START/STOP** to accept that mode.

You will be returned to the **WAIT** state.

If DIG is displayed, press  to change to ANA and then press **START/STOP** to enter that choice. You will be returned to the **WAIT** state.

2. Set the value

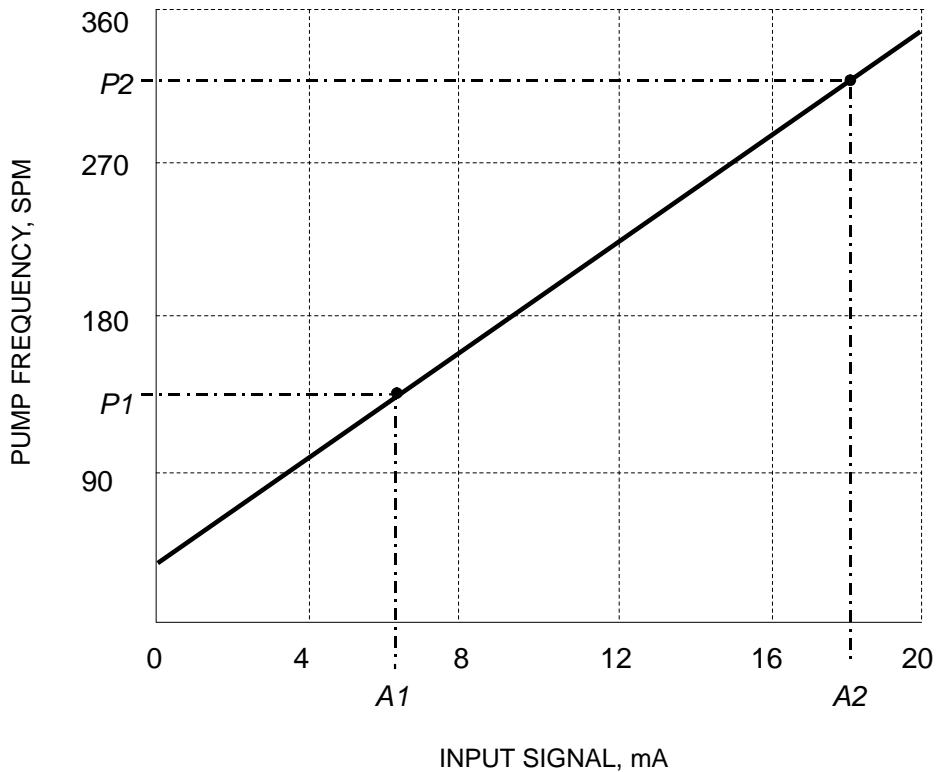
To set values for analog operation, press **EXT** and  $\nabla$  simultaneously. The display will show A04.0 (or some value between 00.0 and 20.0 mA) with the point 1 indicator highlighted. Press  $\blacktriangle$  or  $\blacktriangledown$  to adjust the value to the desired analog signal level for point 1.

Press **EXT** to display the pump speed for point 1. The display will show P0 (or some value between 0 and 360 spm) with the point 1 indicator highlighted. Press  $\blacktriangle$  or  $\blacktriangledown$  to adjust the value to the desired pump speed for point 1.

Press **EXT** again to display the analog signal level for point 2, which can be adjusted as for point 1. Pressing **EXT** a third time will display the pump speed for point 2m which can be adjusted as for point 1.

Continued pressing of **EXT** key will scroll through the above four parameters for review or adjustment. When settings are as desired, press **START/STOP** to accept the new values and return to **WAIT**.

Press **EXT** to operate the pump in external mode. The pump speed will now be determined by the level of the milliamp signal as shown in the graph. The stroke length can be adjusted manually to set the volume pumped per stroke.



### 3.5 STOP Function

Additionally, the pump can be controlled in start-stop mode. In this mode, AC power is applied continuously and pump operation is stopped by completing the circuit between the positive ‘stop’ and common terminals inside the control module (R Control Module: 5 (positive) and 6 (common), Y Control Module: 7 (positive) and 8 (common), E Module: 6 (positive) 8 (common)). A switch or solid state device capable of switching 10 VDC at 2 mA for the R-Module and 5VDC at 2 mA for the Y/E-Module should be used. Switch closed = pump stopped, switch open = pump running at the speed determined by the frequency knob setting. This feature eliminates the need for a high voltage, high current AC relay to start and stop the pump. (See Figures 9 and 11.)

If using the Y/E Control Module and the pump is operating in external digital mode, any pulses received while the pump is stopped will be saved (up to a maximum of 255). When pump operation resumes, saved pulses will allow the pump to “catch up” by producing the correct number of pump strokes that should have occurred while it was stopped.

### 3.6 AC Power Interruption (Y/E-Control Module)

If AC power is interrupted, the pump will power up as shown below:

<b>State preceding power OFF</b>	<b>State following power ON</b>
WAIT	WAIT
Run Manual	Run Manual
Run external	Run external
Set EXTernal mode	WAIT
Set External values	WAIT

## 4.0 MAINTENANCE



**Caution:** Before working on the pump, disconnect the power cord, depressurize the discharge tubing and drain or flush any residual liquid from the pump head and valves.

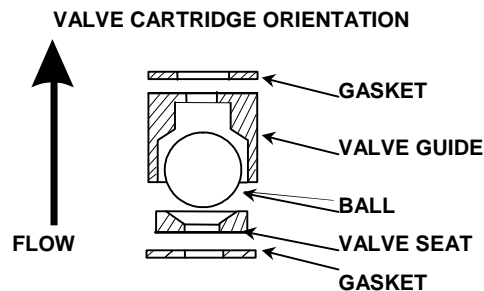
### 4.1 Diaphragm Replacement

Disconnect AC power to the pump and disconnect the suction tubing, discharge tubing, and air vent tubing. Remove the four head bolts with a 4mm or 5mm hex wrench. Turn the stroke length knob fully counter-clockwise. Unscrew the diaphragm and remove its retainer (small disk behind the diaphragm). **CAUTION:** *There may be small brass spacers between the retainer and the armature shaft. These spacers need to be reused when replacing the diaphragm.* Install the new retainer and diaphragm on the shaft. Turn the diaphragm clockwise until it bottoms on the shaft. Replace the pump head and tighten the head bolts to a torque of:

EHC30FF	19 lb-in (2.16 N-m).
EHC35FF	26 lb-in (2.94 N-m)
EHE55FF	22 lb-in (2.55 N-m)

### 4.2 Valve Replacement

Remove the suction and discharge tubing making sure discharge side has been depressurized. Remove the suction fitting, valve cartridge and gaskets. Install the new gaskets and valve cartridge. Refer to Figure below. Tighten the suction fitting. Similarly remove and replace the discharge valve cartridge, o-ring and gasket. For a more detailed drawing, refer to the EHC-FF & EHE-FF Exploded View and Parts List booklet.



Valve Cartridge Orientation

## 5.0 TROUBLESHOOTING

**Caution:** Before working on the pump, disconnect the power cord, depressurize the discharge tubing and drain or flush any residual liquid from the pump head and valves.

<u>Problem</u>	<u>Possible Cause</u>	<u>Corrective Action</u>
<i>Pump does not start</i>	Faulty wiring	Correct wiring
	Improper voltage	Connect to proper voltage source
	Electronic control unit is damaged	Replace control unit
<i>Pump does not prime</i>	Pump stroke length is too short	Operate pump with stroke length set at 100% until primed. Then set stroke length as needed to obtain desired output.
	Air in suction tubing	Reroute suction tubing to eliminate air trap
	Valve gasket is not installed	Install valve gasket
	Valve set assembly direction is wrong.	Reassemble valve set
	Pump is air locked	Open air vent valve
	Suction or discharge valve is clogged with foreign matter	Disassemble, inspect, clean
	Ball stuck to valve seat	Disassemble, inspect, clean
<i>Output fluctuates</i>	Suction or discharge valve is clogged with foreign matter	Disassemble, inspect, clean
	Air is trapped in pump	Open air vent valve
	Overfeeding	Install injection valve or back pressure valve
	Diaphragm is damaged	Replace diaphragm

<b><u>Problem</u></b>	<b><u>Possible Cause</u></b>	<b><u>Corrective Action</u></b>
<i>Liquid leaks</i>	Fitting is loose	Tighten
	Pump head is loose	Tighten pump head bolts Torque: See Section 4.1
	Diaphragm is damaged	Replace diaphragm
	O-ring or valve gasket missing	Install o-ring or valve gasket

## **6.0 SERVICE POLICY**

The EHC-FF and EHE-FF Series electronic metering pumps have a 2-year warranty.

Factory authorized repairs which are received by next-day-air (freight pre-paid) will be returned within 48 hours. Normal priority for returns is two weeks.

Out of warranty repairs are done on a fee basis.