

## Warranty, Service & Repair

To register your product with the manufacturer, fill out the enclosed warranty card and return it immediately to:

Flowline Inc.  
10500 Humbolt Street  
Los Alamitos, CA 90720.

If for some reason your product must be returned for factory service, contact Flowline Inc. to receive a Material Return Authorization number (MRA) first, providing the following information:

1. Part Number, Serial Number
2. Name and telephone number of someone who can answer technical questions related to the product and its application.
3. Return Shipping Address
4. Brief Description of the Symptom
5. Brief Description of the Application

Once you have received a Material Return Authorization number, ship the product prepaid in its original packing to:

Flowline Factory Service  
MRA \_\_\_\_\_  
10500 Humbolt Street  
Los Alamitos, CA 90720

To avoid delays in processing your repair, write the MRA on the shipping label. Please include the information about the malfunction with your product. This information enables our service technicians to process your repair order as quickly as possible.

# FLOWLINE®

## Thermal Dispersion Flow Switch FT10 Series Owner's Manual



Version 4.0A  
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Manual # FT900001

5/99

## WARRANTY

Flowline warrants to the original purchaser of its products that such products will be free from defects in material and workmanship under normal use and service for a period which is equal to the shorter of one year from the date of purchase of such products or two years from the date of manufacture of such products.

This warranty covers only those components of the products which are non-moving and not subject to normal wear. Moreover, products which are modified or altered, and electrical cables which are cut to length during installation are not covered by this warranty.

FLOWLINE's obligation under this warranty is solely and exclusively limited to the repair or replacement, at FLOWLINE's option, of the products (or components thereof) which FLOWLINE's examination proves to its satisfaction to be defective. FLOWLINE SHALL HAVE NO OBLIGATION FOR CONSEQUENTIAL DAMAGES TO PERSONAL OR REAL PROPERTY, OR FOR INJURY TO ANY PERSON.

This warranty does not apply to products which have been subject to electrical or chemical damage due to improper use, accident, negligence, abuse or misuse. Abuse shall be assumed when indicated by electrical damage to relays, reed switches or other components. The warranty does not apply to products which are damaged during shipment back to FLOWLINE's factory or designated service center or are returned without the original casing on the products. Moreover, this warranty becomes immediately null and void if anyone other than service personnel authorized by Flowline attempts to repair the defective

products.

Products which are thought to be defective must be shipped prepaid and insured to FLOWLINE's factory or a designated service center (the identity and address of which will be provided upon request) within 30 days of the discovery of the defect. Such defective products must be accompanied by proof of the date of purchase.

Flowline further reserves the right to unilaterally wave this warranty and to dispose of any product returned to Flowline where:

- a. There is evidence of a potentially hazardous material present with product.
- b. The product has remained unclaimed at Flowline for longer than 30 days after dutifully requesting disposition of the product.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE OF THIS WARRANTY. This warranty and the obligations and liabilities of Flowline under it are exclusive and instead of, and the original purchaser hereby waives, all other remedies, warranties, guarantees or liabilities, express or implied. EXCLUDED FROM THIS WARRANTY IS THE IMPLIED WARRANTY OF FITNESS OF THE PRODUCTS FOR A PARTICULAR PURPOSE OR USE AND THE IMPLIED WARRANTY OF MERCHANTABILITY OF THE PRODUCTS.

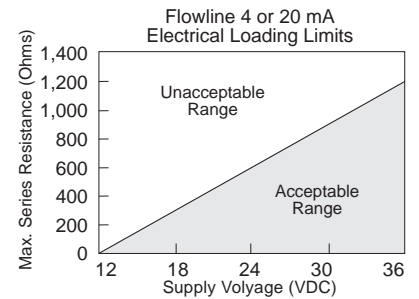
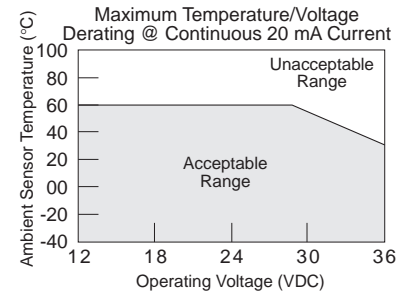
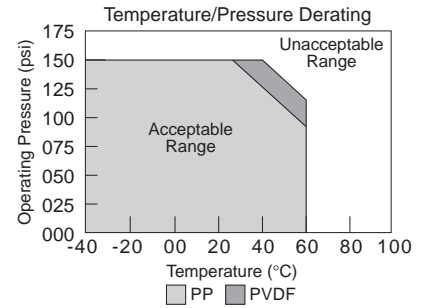
This warranty may not be extended, altered or varied except by a written instrument signed by a duly-authorized officer of Flowline, Inc.

# SPECIFICATIONS

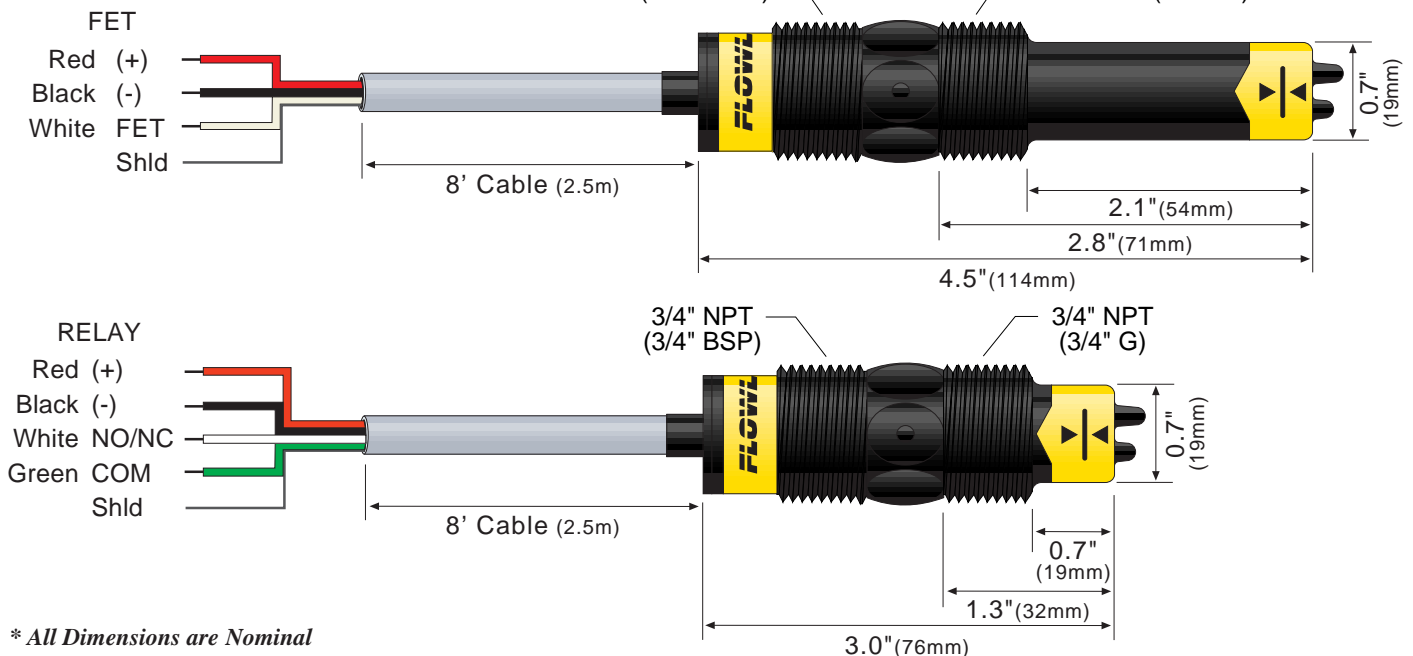
## Step One

Set point range: .04 - 3 fps (.012 to .91 mps)  
 Factory set point: .2 fps (.06 mps)  
 Set point drift : 0.5% of set point  
 Repeatability: ±5% of set point at const. temperature  
 Response time: 1-10 seconds  
 Viscosity Range: 1 - 300 centipoise  
 Supply Voltage: 12 - 36 VDC  
 Consumption: Relay: 70 mA  
                   FET: 50 mA  
 Relay rating: 60 VDC/VAC @ 1A  
 FET rating: 36 VDC @ 100 mA  
 Switch output: Selectable, NO or NC states  
 Set point adjustment: Potentiometer  
 Indication: LED for flow status  
 Fluid temperature: F: 32 - 140°  
                           C: 0 - 60°C  
 Pressure range: 150 psi (10 bar) @ 25°C, derated @ 1.667  
                           psi (.113 bar) per °C above 25°C.  
 Sensor material: Polypropylene/Ryton® or  
                           Polyvinylidene Fluoride  
 Sensor rating: NEMA 4X (IP 65)  
 Mounting thread: 3/4" NPT (3/4" G)  
 Mounting gasket: Viton (3/4") metric only  
 Cable type: 8 ft. (2.5 m), 4-wire (relay) or 3-wire (FET),  
                   22 gauge with ground, shield and PP or PFA  
                   jacket  
 CE compliance: EN 50082-2 immunity  
                           EN 55011 emission

Flow Switch - Liquid	
<b>FT10 -</b>	
<b>Sensor Material</b>	1 - PP 5 - PVDF
<b>Sensor Length</b>	3 - Short 4 - Long
<b>Mounting Thread</b>	0 - 3/4" NPT 2 - 3/4" G
<b>Switch Output</b>	2 - FET, N-Channel 3 - FET, P-Channel 5 - Relay



## Dimensions



## SAFETY PRECAUTIONS

### Step Two

#### **About this Manual:**

PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on all models of thermal dispersion flow switches from Flowline: FT10-\_\_\_\_. Please refer to the part number located on the switch label to verify the exact model which you have purchased.

#### **User's Responsibility for Safety:**

Flowline manufactures a wide range of liquid level and flow technologies. While each of these technologies is designed to operate in a wide variety of applications, it is the user's responsibility to select a technology that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

#### **Proper Installation and Handling:**

Because this is an electrically operated device, only properly-trained staff should install and/or repair this product. Use a proper sealant with all installations. *Note: Always install the Viton gasket with all versions of the FT10-\_\_2\_\_. The G threaded version will not seal unless the gasket is properly installed.* Never overtighten the sensor within the fitting, beyond a maximum of 80 inch-pounds torque. Always check for leaks prior to system start-up.

#### **Material Compatibility:**

The FT10 series switch is available in two different wetted materials. Models FT10-1\_\_ are made of PP (Polypropylene, a polyolefin) with a Ryton® (Polyphenylene Sulfide) tip. Models FT10-5\_\_ are made of PVDF (Polyvinylidene Fluoride). Make sure that the model which you have selected is compatible with the application liquids. To determine the chemical compatibility between the flow switch and its application liquids, refer to the Compass Corrosion Guide, available from Compass Publications (telephone: 619-589-9636).

#### **Temperature and Pressure:**

The FT10 series flow switch is designed for use in application temperatures up to 60°C (140° F), and for use at pressures up to 150 psi (10 bar) @ 25°C., derated @ 1.667 psi (.113 bar) per °C. above 25°C.

#### **Wiring and Electrical:**

The supply voltage used to power the FT10 series flow switch should never exceed a maximum of 36 volts DC and a minimum of 12 volts DC. Electrical wiring of the flow switch should be performed in accordance with all applicable national, state, and local codes.

#### **Flammable, Explosive and Hazardous Applications:**

The FT10 series flow switch should not be used within flammable or explosive applications. In hazardous applications, use redundant measurement and control points, each having a different sensing technology.

#### **WARNING**

The flow switch tips have a thin plastic wall which may be damaged if dropped or installed improperly.

The FT10 flow switch is designed for use in liquid. For best results, avoid installing the FT10 where bubbles are present or where the tips of the switch may be out of the liquid.

Note: Always install the Viton gasket with all versions of the FT10-\_\_2\_\_. The G threaded version will not seal unless the gasket is properly installed.

## INTRODUCTION

### Step Three

#### **Technology:**

The thermal dispersion flow switch measures liquid temperature to determine changes in flow velocity. As liquid flows across the sensing tips, the temperature is reduced proportionately as a function of the flow rate. When a temperature or velocity shift reaches the user defined set point, the switch changes state indicating the appropriate flow condition (flow or no-flow).

FLOWLINE's sophisticated electronics convert the temperature shift into a signal which indicates whether a flow or no-flow condition occurs. Depending on how the sensor is wired, this signal may be either a three-wire FET switch, (NPN or PNP), that can be wired for normally open or normally closed circuits, or a 4-wire relay with a 1A relay output that also can be wired for normally open or normally closed circuits.

FLOWLINE's FT10 series have no moving parts to clog or foul, making them suitable for a variety of applications, including non-coating and non-scaling liquids. The FT10 series directly measure mass flow and can operate over a broad range of liquids from 0.4 to 1.2 specific gravity, 1 to 300 cp.

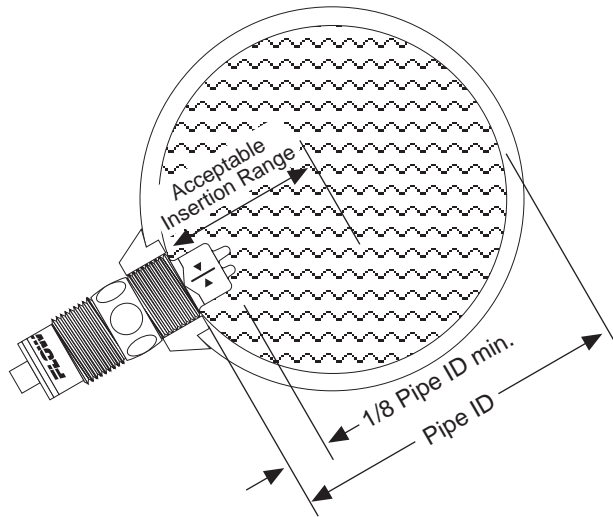
#### **Initialization Sequence:**

Powering up the FT10 is different in water and in air. When the flow switch is powered up while submersed, the FT10 will immediately indicate flow before switching to its correct state. When the flow switch is powered up while in air, the FT10 will immediately indicate no-flow before indicating its correct state. A time delay may be used to eliminate this initialization sequence. Flowline's thermal dispersion relay controllers feature a 0 to 60 second time delay for your convenience.

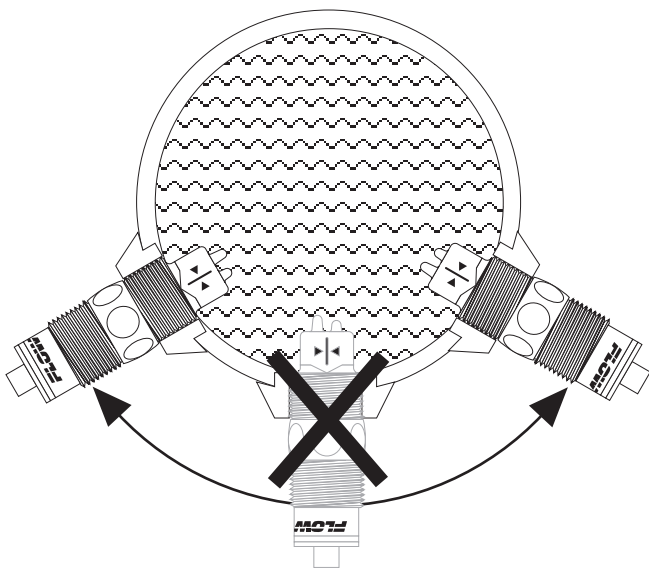
# INSTALLATION

## Step Four

The FT10 series flow switch when installed must always be in contact with the liquid being measured. The FT10 switch features a 3/4" NPT threads which will allow it to be used with various types of pipe fittings. Be sure to check the insertion depth of the flow switch in the fitting after it is installed. See the diagram below for the recommended insertion depth.



When using any type of fitting, the orientation as well as the insertion depth of the flow switch in the pipe is critical. See the diagram below for the recommended orientation depth.



### ⚠ WARNING ⚠

The flow switch tips have a thin plastic wall which may be damaged if dropped or installed improperly.

The FT10 flow switch is designed for use in liquid. For best results, avoid installing the FT10 where bubbles are present or where the tips of the switch may be out of the liquid.

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# ELECTRICAL

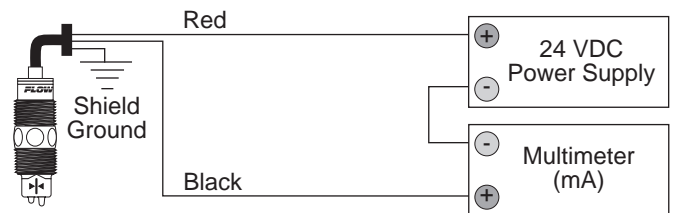
## Step Five

**Supply Voltage:** The supply voltage to the FT10 flow switch should never exceed a maximum of 36 VDC. Flowline controllers have a built-in VDC power supply which provides power to FLOWLINE's flow switches. Alternative controllers and power supplies, with a minimum output of 12 VDC up to a maximum output of 36 VDC, may also be used with the FT10 flow switch.

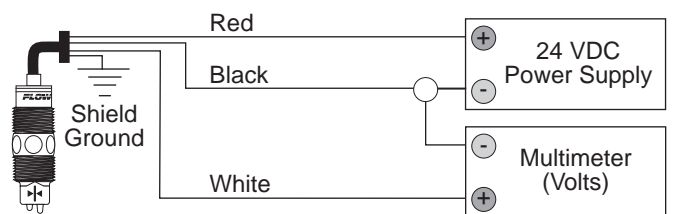
**Cable Length:** Determine the length of cable required between the FT10 flow switch and its point of termination. Allow enough slack to ensure the easy installation, removal and/or maintenance of the flow switch. The cable length may be extended up to a maximum of 1000 feet, using a well-insulated, 20 gauge shielded wire.

**Wire Stripping:** Using a 10 gauge wire stripper, carefully remove the outer layer of insulation from the last 1-1/4" of the flow switch's cable. Unwrap and discard the exposed foil shield from around the signal wires, leaving the drain wire attached if desired. With a 20 gauge wire stripper, remove the last 1/4" of the colored insulation from the signal wires.

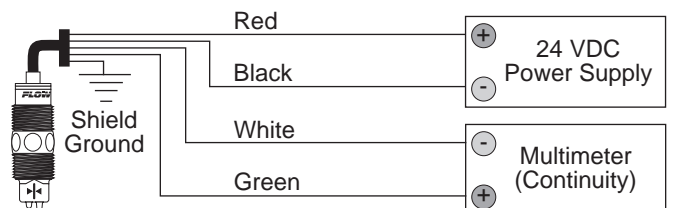
**Signal Outputs (Current Switching):** The standard method used by FLOWLINE controllers; this technology uses only two wires (red and black). The sensor draws 5 mA when it is dry, and 19 mA when wet. NC or NO status must be set by the controller. The White or Green wires are not used.



**Signal Outputs (FET switching):** Allows the sensor to switch a small load on or off directly, using all three wires. Model FT10-\_\_2 is an NPN type switch, which toggle the negative side of the load; model FT10-\_\_3 is a PNP type switch, which toggle the positive side of the load. In both FET models, the NO/NC status is set by the polarity of the voltage feeding the Red and Black wires, and the White wire connects to the load.



**Signal Outputs (Relay switching):** Allows the sensor to switch a small load on or off directly, using an internal 1 A relay (60 VAC/60 VDC). Only model FT10-\_\_5 uses the relay and features 4 wires (Red, Black, White and Green) and a shield wire. The NO/NC status is set by the polarity of the voltage feeding the Red and Black wires. the Green wire is the common for the relay and the White wire is the NO or NC, depending on the polarity of the Red and Black.

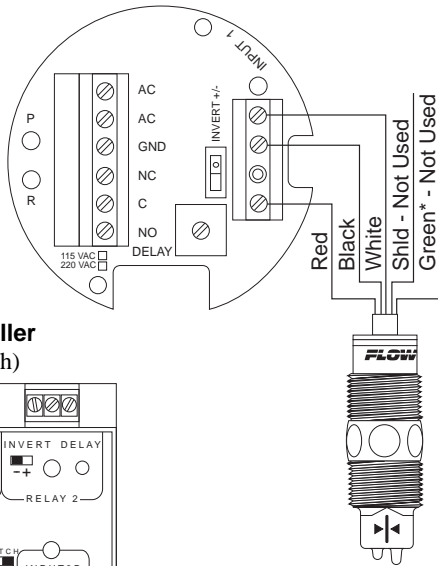


# WIRING

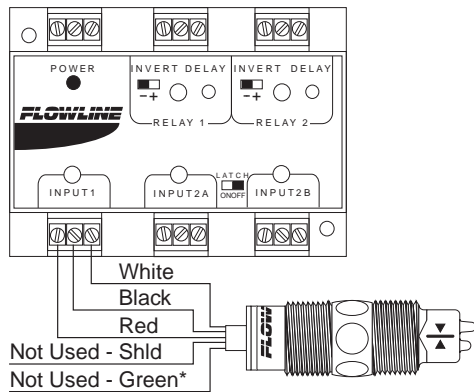
## Step Six

### Models FT10-\_\_2 Only Wiring to a FLOWLINE Controller

#### LC30 Series Controller (N-Channel FET Switch)



#### LC80 Series Controller (N-Channel FET Switch)

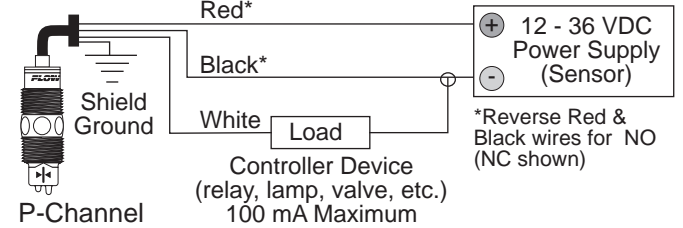
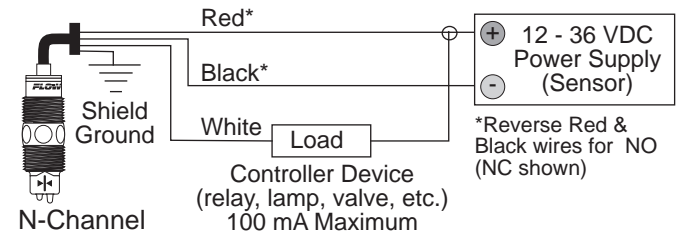


Both controller input LEDs will be amber for no-flow. The input LED will be off for flow. To reverse the switch from normally closed to normally open, reverse the red and black wires.

# WIRING

## Step Seven

### Models FT10-\_\_2 & FT10-\_\_3 Only Wiring direct to a load, NC operation (FET signal output):



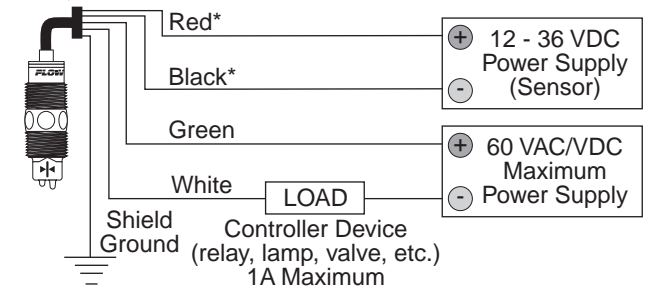
### Wiring direct to load, NO operation (FET outputs only):

This is the same as the wiring for Normally Closed operation, except the polarity of the Red and Black connections to the flow switch is reversed. The other connections remain the same; *the flow switch and device power supplies remain tied in the same polarity as before*. This method will turn the load on during flow condition and turn the load off for no-flow condition.

### Models FT10-\_\_5 Only

### Wiring direct to a load, NO operation (Relay signal output):

Relay Output \*Reverse Red & Black wires for NC (NO shown)



### Wiring direct to load, NO operation (Relay outputs only):

This is the same as the wiring for Normally Closed operation, except the polarity of the Red and Black connections to the flow switch is reversed. The other connections remain the same; *the flow switch and device power supplies remain tied in the same polarity as before*. This method will turn the load on during flow condition and turn the load off for no-flow condition.

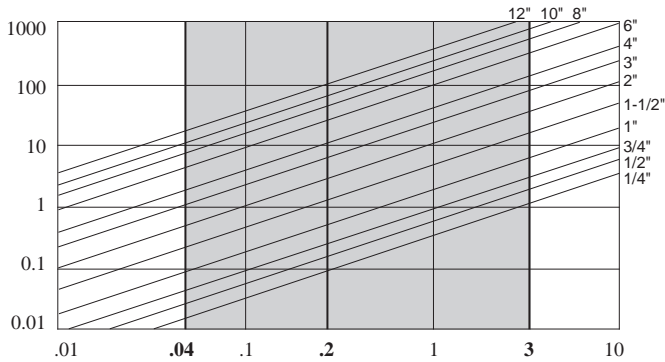
### Normally Closed / Normally Open Operation:

The normal state for the FT10 flow switch is no-flow. For normally closed operations, the flow switch will be closed for no-flow and will be open for flow. For normally open operations, the flow switch will be closed for flow and open for no-flow. Flow and no-flow conditions can be identified by the internal LED. The LED will always be on during no-flow conditions and off during flow conditions.

## CALIBRATION

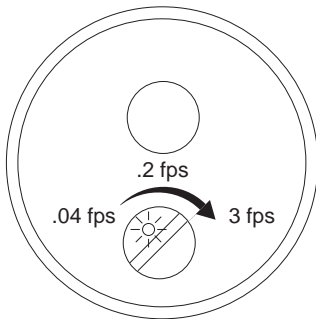
### Step Eight

The FT10 switch set point is factory calibrated at 0.2 fps. To convert feet/sec to GPM, please refer to the chart below.



If the preset factory calibration is not adequate for your application, follow the calibration steps listed below. **Note:** the switch's internal LED will be on when the switch detects no-flow and will off when the switch detects flow.

1. Install the fitting and flow switch as described in the Installation section of this manual. Turn the flow switch and controller power on and adjust the system flow rate to the setting at which the set point is to be set. If the medium to be sensed is likely to be subject to high temperature variations, the flow switch should be set at the highest normal temperature likely to be encountered.
2. Locate the potentiometer knob at the top of the flow switch. The red LED is visible through the potentiometer. (If the LED is on, slowly adjust the potentiometer counterclockwise, with a small flat head screwdriver until the LED turns off.) The adjustment is a single turn 270° potentiometer. The initial response time of the flow switch after adjustment is 1 to 10 seconds. Adjust the potentiometer in slow increments and wait for the response.  
  
If the LED is off, slowly adjust the potentiometer clockwise until the light turns on. Then turn the potentiometer counterclockwise to bring the LED off at a reliable setting. Remember, adjust the potentiometer in slow increments and wait for the response.
3. Verify that the new calibration is correct by lowering the system flow rate below the set point and check to see that the red LED turns on. Then increase the flow rate above the set point and verify that the red LED turns off accordingly.



## MAINTENANCE

### Step Nine

#### General:

The FT10 series sensor has no scheduled maintenance requirement, except to clean off any deposits or scaling from the sensor tip as necessary. It is the responsibility of the user to determine the appropriate maintenance schedule, based on the specific characteristics of the application liquids.

#### Cleaning Procedure:

1. **Power:** Make Sure that all power to the sensor, controller and/or power supply is completely disconnected.
2. **Sensor Removal:** *Make sure that the flow is off and the pressure is down prior to removing the FT10.* Carefully, remove the sensor from the installation. Replace the sensor with a 3/4" NPT plug to insure that liquid does not leak out during this procedure. **Do not re-install the FT10 if the threads are damaged.**
3. **Cleaning the Sensor:** Use a soft bristle brush and mild detergent, carefully wash the FT10 series sensor. Do not use harsh abrasives such as steel wool or sandpaper, which might damage the surface sensor. Do not use incompatible solvents which may damage the sensor's Polypropylene/Ryton® or Polyvinylidene Fluoride plastic body.
4. **Sensor Installation:** Follow the appropriate steps of installation as outlined in the installation section of this manual.