STH/Q SET UP INSTRUCTIONS

FOR ADDITIONAL REFERENCES SEE H431 AND Q431

ISO 9001

SAFETY INSTRUCTIONS

Before using any Fluid Metering, Inc. product read the following safety instructions as well as specific product specifications and operating instructions.

Warning! Fire, electrical shock or explosion may occur if used near combustibles explosive atmosphere, corrosive air, wet environment or submerged in fluid.

- Disconnect electrical power before checking pump for any problems.
- Connect motor, speed controllers, or any other electrical devices based on Fluid Metering Inc. specifications. Any unauthorized work performed on the product by the purchaser or by third parties can impair product functionality and thereby relieves Fluid Metering, Inc. of all warranty claims or liability for any misuse that will cause damage to product and/or injury to the individual.
- Power cables and leads should not be bent, pulled or inserted by excessive force. Otherwise there is a threat of electrical shock or fire.
- Replace any inline fuses only with fuse rating as specified by Fluid Metering, Inc.
- When pump/drive is under operation, never point discharge tubing into face or touch any rotating components of pump. In a power down thermal overload cut-in condition, unplug or turn off power to pump. Always allow a cool down period before restarting: otherwise, injury or damage may occur.
- For 30 seconds after power is removed from pump/drive: do not touch any output terminals. Electrical shock may occur because of residual voltage.

Caution! Fire, electrical shock, injury and damage may occur if not used in accordance with Fluid Metering, Inc. specifications and operation instructions.

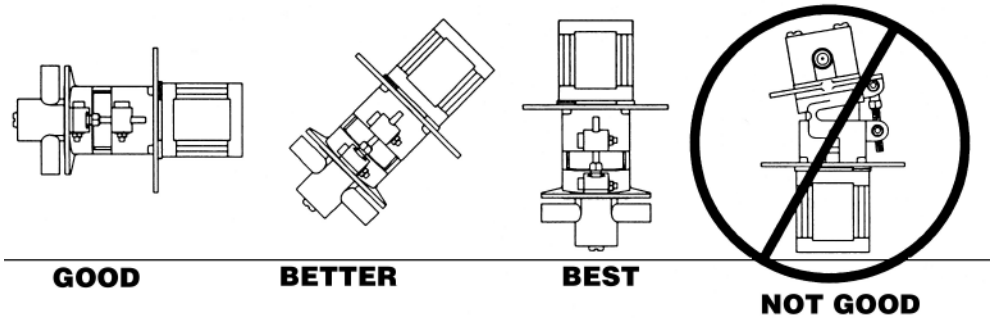
- Do not put wet fingers into power outlet of unit.
- Do not operate with wet hands.
- Do not operate drive assemblies that require a hard mount (to be bolted down) unless they are mounted per Fluid Metering, Inc. specifications, if not injury may occur and/or damage to unit.
- Do not touch any rotating pump or motor components: injury may occur.
- Do not run pump dry, unless designed for that service. Running dry is harmful to the pump, and will cause excessive heating due to internal friction.
- Check pump rotation and inlet/outlet pump port orientation before connecting power to pump. If not injury may occur.
- When pulling out cords from outlets do not pull cord, grasp plug to prevent plug damage or electrical shock.
- Fluid Metering, Inc. Drive Motors become HOT and can cause a burn. **DO NOT TOUCH!**

REQUIRED TOOLS:

1. Analytical Pan Balance
2. Hex Key Driver for Adjusting Stroke Length:
   STH: 3/32" Hex Driver
   STQ: 7/32" Hex Driver
3. A removable wicking thread lock (loctite 290)

1.0 PUMP MOUNTING: For optimum pump performance it is recommended that your FMI pump be mounted in a vertical position with the pump head down in a 6:00 o'clock position and the motor at 12:00 o'clock. This orientation will allow air bubbles that enter the pumping chamber to directly exit through buoyancy assistance. **Figure A**

Figure A



2.0 GENERAL SET-UP

2.1 Setting Dispense Stroke Rate

Strokes Per Minute (spm): For fluids of 500cps viscosity or less a stroke rate of 120-350 spm max is ideal. For fluids with greater than 500cps a slower rate is recommended.

2.2 Fluidics:

Inlet (Suction) Tubing: To avoid cavitation use the most resilient tubing possible with the largest inside diameter (I.D.)

Outlet (Dispense) Tubing: For best dispense performance use rigid Teflon tubing (to reduce peristaltic action) with an equal or smaller I.D. than the inlet (suction) tubing.

2.3 Step Motors:
FMI ST pumps are supplied with a 17 or a 23 frame Motors.
For wiring diagram and detailed motor specifications go to the literature section of our website at www.fluidmetering.com/literature.html

2.4 Rotational Sensor: FMI STH and STQ standard pumps are supplied with an LED rotational sensor. For wiring diagram and sensor details see **Figure F .**

2.4.1 For sensor use with FMI SCST-01 Step Motor Controller. See SCST-01 instructions.

2.5 STH Pump Homing: Best dispensing performance of the pump is obtained by proper set up of the start/stop position of the piston relative to the intake port of the pump housing.
Positioning of the piston flat so that it directly faces the inlet port is termed “homing”.
The images below show the home position for a pump which has been set up to turn clockwise.
In this case the inlet port is on the left.
If a particular application calls for the inlet port to be on the right, the pump will be programmed to turn counterclockwise and the figures bellow must be reversed.

Home Position

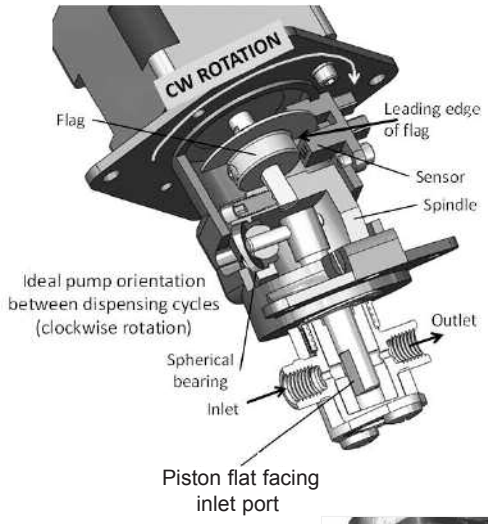


Figure 1

2.6 Park Position: Preventive maintenance steps in order to minimize the possibility of a frozen pump or seize condition are as follows:

a) Always completely flush out the pump with water if it will be in an idle (non-operating mode) for an extended period of time.

b) During shut down leave the pump’s fluid circuit wet with flush water.

c) The piston position should extend all the way towards the bottom of the liner. This is known as the PARK position.

Correct programming of pump motion to achieve the PARK position involves the following sequence (assuming clockwise rotation for operation).

Step #1 The FMI pump stops (any location).

Step #2 While monitoring sensor signal, instruct motor to turn clockwise while looking for the leading edge of the flag (see figure 2 below).

Flag Edge Approaching Sensor

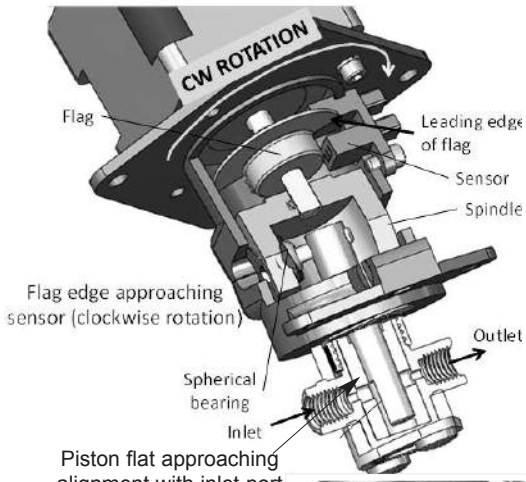
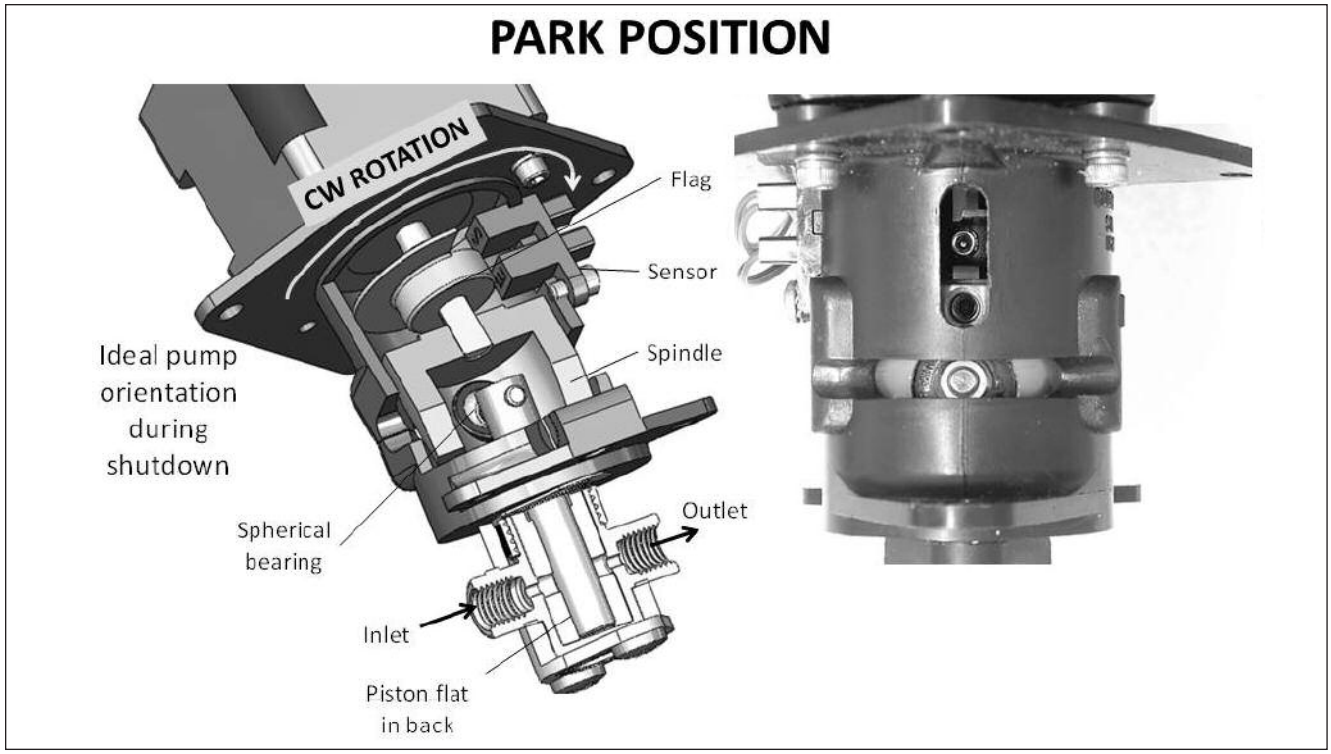


Figure 2

Step #3 Next rotate Counter Clockwise 90 Degrees the pump is now PARKED.



The design of FMI Pumps is unique throughout the world. Having no valves and only one moving part, "the piston" makes this design very special. No valves means that our ceramic pistons and cylinders must be matched to extremely close fits so that stroke to stroke accuracy is maintained.
This precision fit requires some general maintenance rules.
When a pump is allowed to sit idle and dry out, these dried precipitate can form in the piston/cylinder clearance and cause a pump seizure condition. Upon system power up, this seizure can result in either no flow or at worst a broken piston. So we recommend the above procedure.

We do not live in a perfect world and accidents do happen. If your pump seizes try the following procedures: With the pump in an instrument:

1) Cycle the pump in a back and forth motion (clockwise and counter clockwise rotation) at a slow speed in a high torque mode.

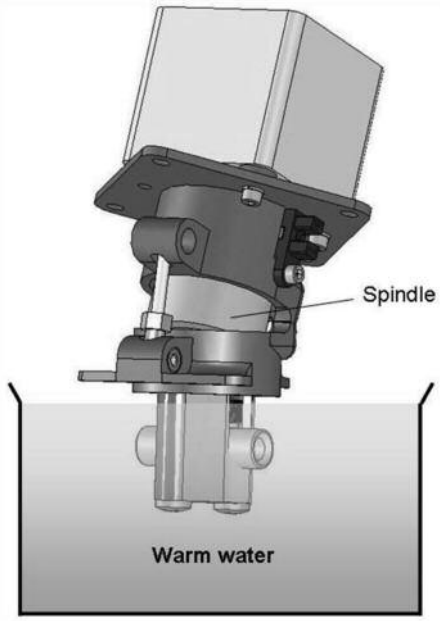
2) Start and stop the pump in an effort to free system.

3) If pump head is accessible try turning the drive spindle back and forth with your index finger and thumb.

2.7 Maintenance
With the Pump/Drive Assembly removed from the instrument but not disassembled (WILL NOT REQUIRE PUMP RECALIBRATION):

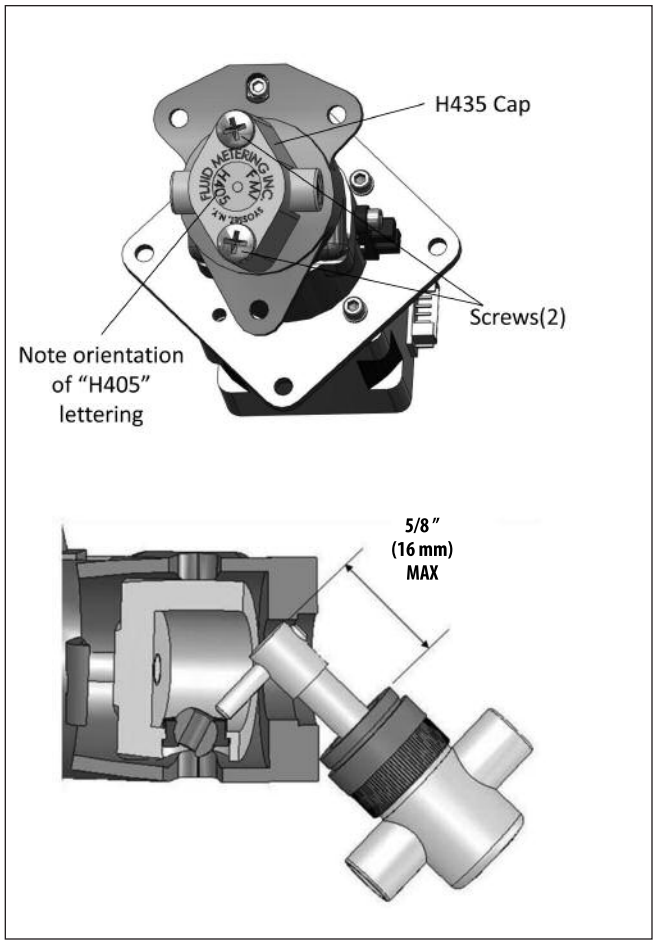
a) Soak the top portion of the pump (PUMP HEAD ONLY) in a warm water bath for at least 20 minutes. Then place your index finger and thumb around the spindle assembly (gold coupling) and gently try to rotate the assembly back and forth in an attempt to loosen up the piston.

CAUTION:
Do not force the assembly free if it is severely frozen as this could result in piston breakage or pump damage.



With the Pump/Drive Assembly removed from the instrument and the piston/cylinder group removed (MAY REQUIRE PUMP RECALIBRATION):

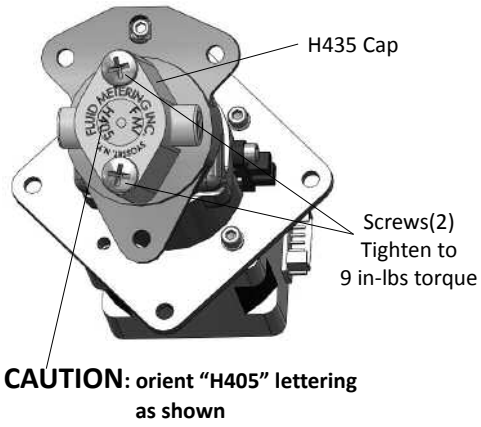
b) If the pump is severely frozen then the piston/cylinder group must be removed from the pump. Remove the (2) screws that secure the H435 Cap to the pump base assembly and carefully remove (twist, tilt & pull) the piston/cylinder group from the pump base assembly.



c) Soak the piston/cylinder group in warm water for 20 minutes minimum. For quickest results use an ultrasonic bath. Then try to loosen up the assembly by hand - gently rotating the piston back and forth until free.

CAUTION:
Do not pull piston out of cylinder or force the piston as breakage or seal damage will occur.

d) Reassemble the piston/cylinder into the pump base assembly (use FMI Instructions H431) page # 8 section # 22 for more details relative to installing the piston/cylinder assembly.



e) Reinstall H435 Cylinder Cap and apply a suitable thread lock to the screws (Loctite # 425) and secure screws (torque to 9 in-lbs).

f) Rotate the assembly to assure it moves smooth and free. (If not see note #1 below).

g) Check the pump for proper calibration (If out of specification see note #1 below).

Note#1:
Please return complete pump/drive unit to the factory for rework and recalibration

3.0 CALIBRATION AND TESTING

3.1 Flush the system: clean with alcohol or other suitable cleaning/wetting agent before using the hydraulics and pump for the first time. Prime pump with fluids to assure system is free of air bubbles.

3.2 Place pump in the standard "home" position with the piston-flat perpendicular to the inlet port.The inlet port will be on the left when the motor rotates clockwise (see **Figure B** for the STH pump and **Figure C** for the STQ pump).

3.3 Check the pump's dispense volume by cycling the pump for one complete 360° revolution (one complete rotation). Dispense onto an analytical pan balance and observe the volume. **See Figure D.** Readjust as necessary.

REMARK: When dispensing water-like solutions assume 1 ml = 1 gram. A correction factor will be required for other fluids

Note:
Calibration is Factory set and Should not be Changed.

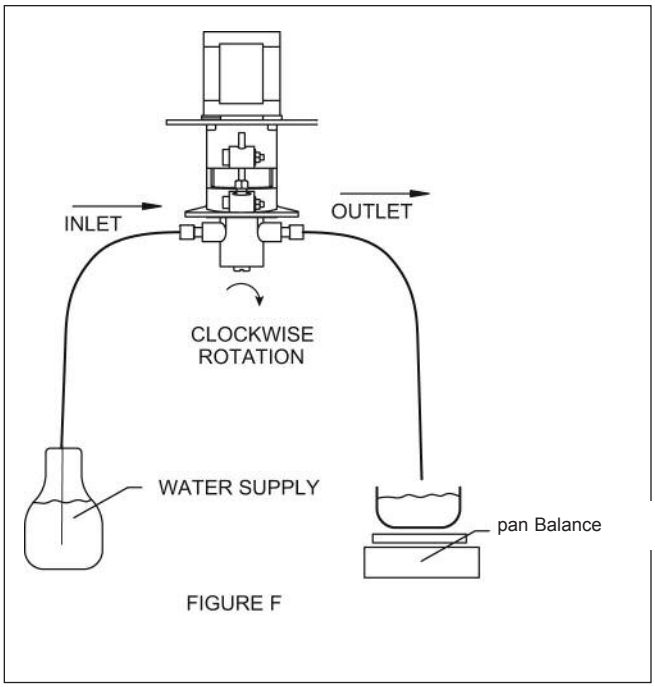


Figure D

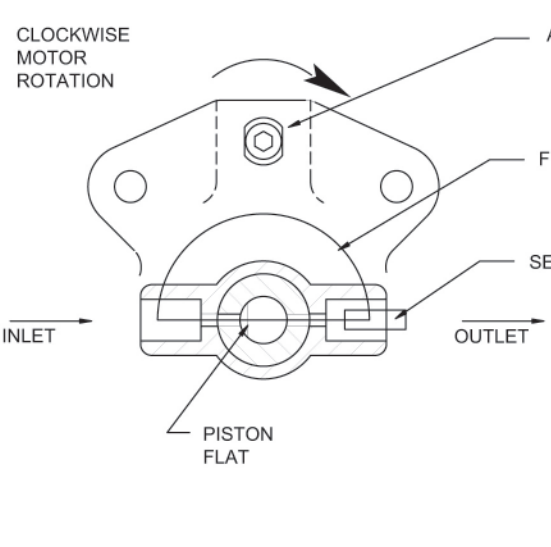


Figure B

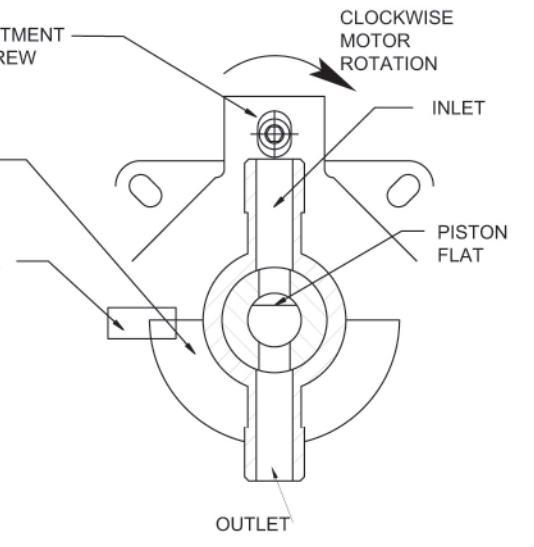


Figure C

3.4 Dispense Volume Values for FMI STH/STQ Pumps:

MODEL	ML/REV MIN	ML/REV MAX
STH00	0.002	0.025
STH0	0.005	0.050
STH1	0.010	0.100
STQ0	0.008	0.080
STQ1	0.032	0.320
STQ2	0.072	0.720
STQ3	0.128	1.280

NOTE: To assure the best performance set the pump displacement volume as large as possible. **FMI pumps are calibrated at the factory to the maximum value.** Both STH and STQ pumps can be factory adjusted down to as little as 10% of the rated flow.

3.5 Adjusting Dispense Volumes:

To fine adjust dispense volumes rotate the stroke length adjustment s crew using the appropriate hex driver (see Required Tools on page 1). To increase the flow, turn the screw counter-clockwise.
To decrease the flow, turn the screw clockwise

CCW=Increase, CW=Decrease.

CAUTION: DO NOT LOOSEN THE HEX LOCK NUT WHEN ADJUSTING THE STROKE RATE. IT IS SET AT THE FACTORY AND SHOULD NOT BE TAMPERED WITH. See Figure E

3.6 Lock setting:

Once the pump is calibrated apply a drop of removable wicking thread lock between the lower pivot pin and the adjustment screw threads.
See Figure E.

3.7 Dispensing Hints:

1) Speed - Optimum results for fluids 500 cps or less is between 120-350 rpm.

2) Cavitation: Use the largest suction tubing you can to avoid cavitation.

3) Splashing can usually be avoided by modifying dispense tip to larger I.D.and/or decreasing dispense speed.

4) Hanging drop at dispense tip can be avoided by:

a) Use of rigid discharge tubing
b) Small dispense tip
c) Increasing speed

5) High viscosity dispensing requires:

a) Large suction tubing
b) Pressurizing suction reservoir

6) Bubbles in discharge

a) Suction fitting leak
b) Cavitation

7) Need Help? Call, fax, or email us… We can help solve almost any fluid control problem.

3.8 SPECIAL MOTORS AND CONTROLLERS

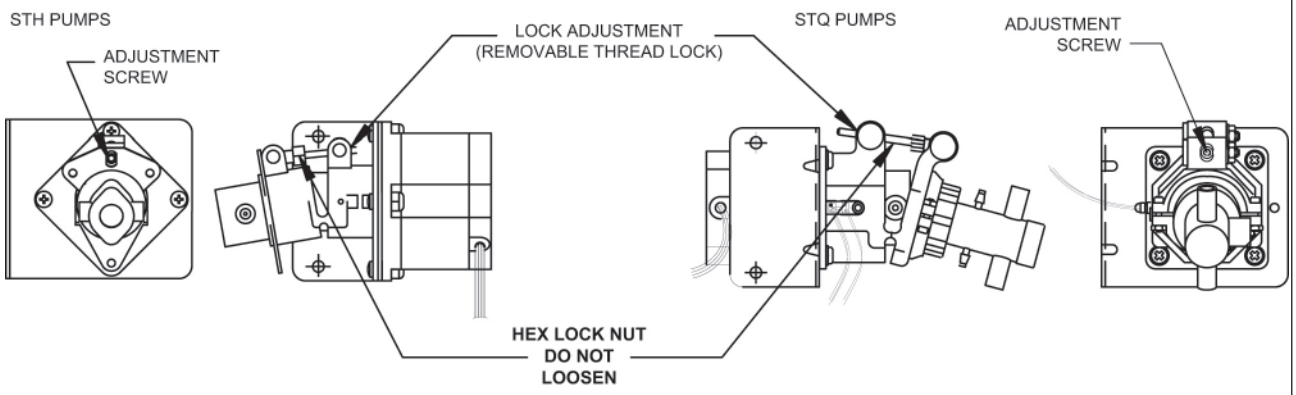
FMI offers a complete variety of stepper motors and stepper motor controllers from simple quick start control to complex application specific stepper motor control. Our standard step motor controllers are:

SCST General Purpose Stepper Motor Control for quick start control of FMI STH and STQ pumps.

ICST Intelligent Stepper Motor Controller which includes an embedded microprocessor for custom programming of FMI stepper motor pumps to meet specific application operations.

IDS 2000 Industrial Dispenser/Pump which includes the SCST and FMI pump head integrally mounted in a rugged stainless steel enclosure.

CAUTION:
DO NOT ATTEMPT TO LOOSEN "LOCK NUT", THIS WILL RESULT IN BREAKING THE ADJUSTMENT SCREW.



NOTE:FOR ADDITIONAL REFERENCES SEE H431 AND Q431

Figure E

Rotational Sensor

Absolute Maximum Rating (T_A=25ºC Unless otherwise noted)

Supply voltage, V (not to exceed 3 sec.).....18 V
Input diode power dissipation.....100 mW (1)
Output power dissipation.....200 mW (2)
Total device power dissipation.....300 mW (3)
Voltage at output lead (open collector output).....35 V
Diode foreword D.C Current.....40 mA
Diode reverse D.C Voltage.....2 V

Note:

1. Derate linearly 2.22mW / ºC above 25ºC

2. Derate linearly 4.44mW / ºC above 25ºC

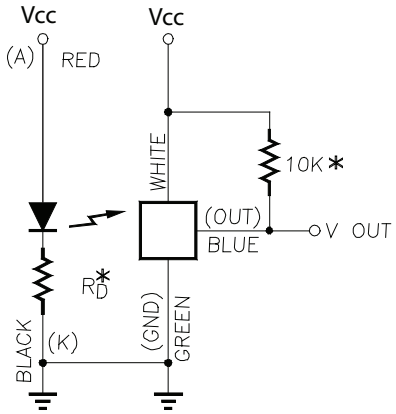
3. Derate linearly 6.66mW / ºC above 25ºC

4. The optical switches are terminated with 24 inches of 26 A.W.G.,UL 1492 wire on each terminal.
   Insulation colors and function are as follows:
   Red-Anode, Black-Cathode, White-Vcc, Blue-Output, Green-Ground

5. Normal application would be used with light source blocked, simulated by I_F=0mA

6. All parameters tested using pulse techniques.

7. Minimum supply voltage is 4.5 VDC



INVERTED OPEN COLLECTOR OUTPUT

* NOT SUPPLIED WITH OPTICAL SENSORS
See suggested Rd values table below.

Suggested R_D Values	
Vcc (VDC)	R_D (Ω)
5	180
12	470
15	620

Figure F