USER INSTRUCTIONS

Installation

Operation

Maintenance

3400MD Digital Positioner

FCD LGENIM3404-10

Experience In Motion

FOUNDATION

Contents

1 Terms Concerning Safety 3
2 General Information 3
3 Unpacking and Storage 3
3.1 Unpacking 3
3.2 Storage 3
3.3 Pre-installation Inspection 4
3.4 Label Verification 4
4 Logix 3400*MD* Positioner Overview 5
4.1 Specifications 7
4.2 Positioner Operation 9
4.3 Detailed Sequence of Positioner Operations 10
5 Mounting and Installation 11
5.1 Mounting to Valtek Linear Mark One Valves 11
5.2 Mounting to Standard Valtek Rotary Valves (See Figure 4) 11
5.3 Optional Valtek Rotary Mounting Procedure (See Figure 5) 13
5.4 NAMUR Mounting Option 13
5.5 Tubing Positioner to Actuator 13
6 Wiring and Grounding Guidelines (See Figure 6) 14
6.1 FF Command Input Wiring 14
6.2 Grounding Screw 15
6.3 Segment Compliance Voltage (See Figure 7) 15
6.4 Cable Requirements 15
6.5 Intrinsically Safe Barriers 15
6.6 DD Support 15
7 Startup 16
7.1 Logix 3400*MD* Local Interface Operation 16
7.2 Initial DIP Switch Settings 16
7.3 Description of Configuration DIP Switch Settings 16
7.4 Description of Cal DIP Switch Settings 18
7.5 RE-CAL Operation 18
7.6 Manual Jog Calibration Operation 18
7.7 Local Control of Valve Position 18
7.8 Factory Reset 19
7.9 Logix 3400*MD* Status Condition 19
7.10 Version Number Checking 21
7.11 375 Handheld Communicator 21
7.12 Device Description (DD) Files 21
7.13 Calibration 21
7.13.1 CALIBRATE_FLAGS 21
7.13.2 Control and Tuning 22
7.14 Alerts 23
7.14.1 FINAL_VALUE_CUTOFF 23
7.14.2 Effects of FINAL_VALUE_CUTOFF on Operation 23
7.14.3 Soft Limits 23
7.14.4 Travel Accumulator 23
7.14.5 Cycle Counter 24
7.14.6 Position Deviation 24
7.14.7 Advanced Features 24
7.14.8 Standard vs. Advanced Diagnostics 24
7.14.9 Temperature and Pressure Units 24
7.14.10 Stroke Length 24
7.15 Characterization Retention 24
7.15.1 Initiating a Valve Signature 25
7.15.2 System Preparation 25
7.15.3 Signature Procedure 25
7.16 Step Signature 25
7.16.1 Collection of Stored Signature 25
7.17 Glossary 25
7.18 Transducer Block Parameters 27
8 Maintenance and Repair 35
8.1 Driver Module Assembly 35
8.2 Regulator 38
8.3 Checking or Setting Internal Regulator Pressure 39
8.4 Spool Valve 39
8.5 Spool Valve Cover 40
8.6 Stem Position Sensor 41
8.7 Main PCB Assembly 42
8.8 Pressure Sensor Board 42
8.9 User Interface Board 43
9 Optional Vented Design 44
10 Parts List 45
11 Logix 3400*MD* Spare Parts Kits 46
12 Logix 3400*MD* Mounting Kits 47
12.1 Valtek Mounting Kits 47
12.2 Logix O.E.M. Mounting Kits 48
12.3 NAMUR Accessory Mounting Kit Part Numbers 48
13 Frequently Asked Questions 49
14 How to Order 50
15 Troubleshooting 51

1 Terms Concerning Safety

The safety terms DANGER, WARNING, CAUTION and NOTE are used in these instructions to highlight particular dangers and/or to provide additional information on aspects that may not be readily apparent.

! **DANGER:** Indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.

WARNING: Indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.

WARNING: Substitution of components may impair intrinsic safety.

CAUTION: Indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.

NOTE: indicates and provides additional technical information, which may not be very obvious even to qualified personnel. Compliance with other, not particularly emphasized notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g., in the operating instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.

2 General Information

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Flowserve Valtek Logix® 3400MD digital positioners. Series 3000 is the term used for all the positioners herein; however, specific numbers indicate features specific to model (i.e., Logix 3400 indicates that the positioner has Foundation Fieldbus protocol). See Logix 3400MD Model Number table in this manual for a breakdown of specific model numbers. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating, or performing any maintenance on the valve.

Separate Valtek Flow Control Products Installation, Operation, Maintenance instructions cover the valve (such as IOM 1 or IOM 27) and actuator (such as IOM 2 or IOM 31) portions of the system and other accessories. Refer to the appropriate instructions when this information is needed.

To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be strictly followed. Modifying this product, substituting non-factory parts or using maintenance procedures other than outlined could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties.

WARNING: Standard industry safety practices must be adhered to when working on this or any process control product. Specifically, personal protective and lifting devices must be used as warranted.

3 Unpacking and Storage

3.1 Unpacking

1. While unpacking the Logix 3400MD positioner, check the packing list against the materials received. Lists describing the system and accessories are included in each shipping container.

2. When lifting the system from the shipping container, position lifting straps to avoid damage to mounted accessories. Systems with valves up to six inches may be lifted by actuator lifting ring. On larger systems, lift unit using lifting straps or hooks through the yoke legs and outer end of body.

WARNING: When lifting a valve/actuator assembly with lifting straps, be aware the center of gravity may be above the lifting point. Therefore, support must be given to prevent the valve/actuator from rotating. Failure to do so can cause serious injury to personnel or damage to nearby equipment.

3. In the event of shipping damage, contact the shipper immediately.

4. Should any problems arise, contact a Flowserve Flow Control representative.

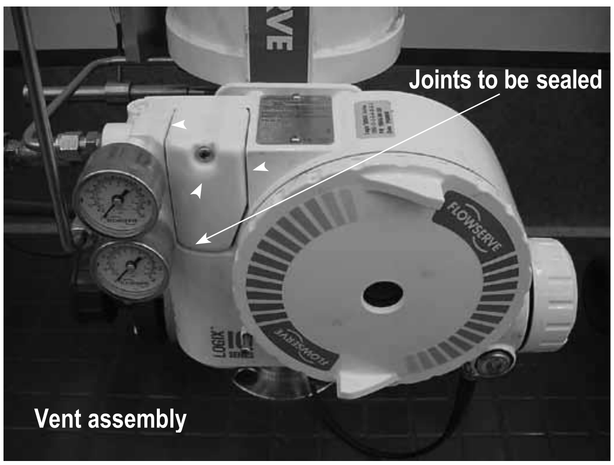
3.2 Storage

Control valve packages (a control valve and its instrumentation) can be safely stored in an enclosed building that affords environmental protection; heating is not required. Control valve packages must be stored on suitable skids, not directly on the floor. The storage location must also be free from flooding, dust, dirt, etc.

Long Term Storage of Logix 3000 series Positioners in Humid Locations

The Logix 3000 series positioners are designed to operate in humid environments when connected to a proper instrument air supply. There are some occasions when valves and positioners are stored at job sites or installed and commissioned and then left without instrument air for months. To make startup easier for units that are left without instrument air and insure that the positioners will be ready to operate,

it is recommended that the vent assembly of the positioner be sealed preferably with a desiccant pouch sealed with the vent assembly.The vent assembly is located in the upper left side of the positioner. The gaps around the assembly as noted by the arrows should be sealed for long term storage.



A small desiccant package as shown can be included under the sealing tape to insure proper protection.

All of the edges around the vent assembly should be sealed similar to the picture below.

The sealing tape and desiccant should be removed when instrument air is permanently applied to the positioner.

3.3 Pre-installation Inspection

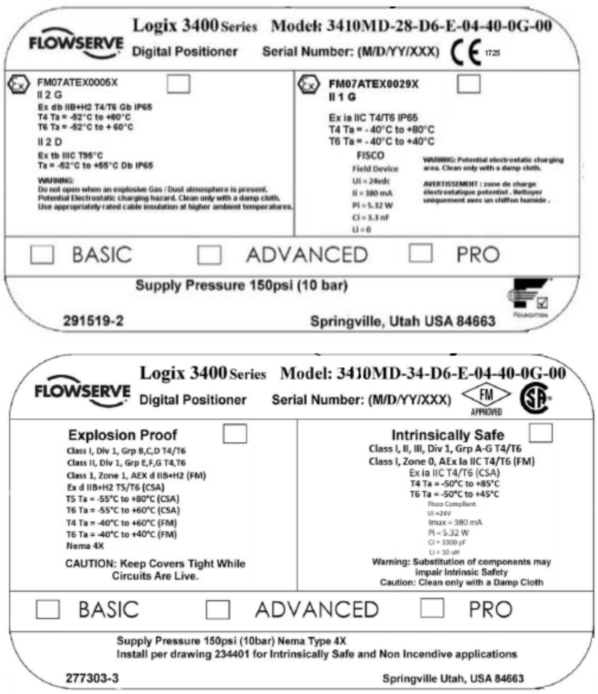
If a valve control package has been stored for more than one year, inspect one actuator by disassembling it per the appropriate Installation, Operation, and Maintenance Instructions (IOM) prior to valve installation. If O-rings are out-of-round, deteriorated, or both, they must be replaced and the actuator rebuilt. All actuators must then be disassembled and inspected. If the actuator O-rings are replaced, complete the following steps:

1. Replace the pressure-balance plug O-rings.
2. Inspect the solenoid and positioner soft goods and replace as necessary.

3.4 Label Verification

Verify the labels match the intended application. See Hazardous Location Information for more details.

Note: The installer should mark the checkbox on the label that is appropriate for the intended use of the Logix 3400.



Certification Labels

4 Logix 3400MD Positioner Overview

The Logix 3400MD digital positioner is a two-wire Foundation Fieldbus compliant digital valve positioner. The positioner is configurable through the local user interface. The Logix 3400MD utilizes the FF protocol to allow two-way remote communications with the positioner. The Logix 3400MD positioner can control both double- and single- acting actuators with linear or rotary mountings. The positioner is completely powered by the FF signal. Startup voltage must be from a FF power supply source.

Figure 1: Logix 3400MD Digital Positioner Schematic (air-to-open configuration)

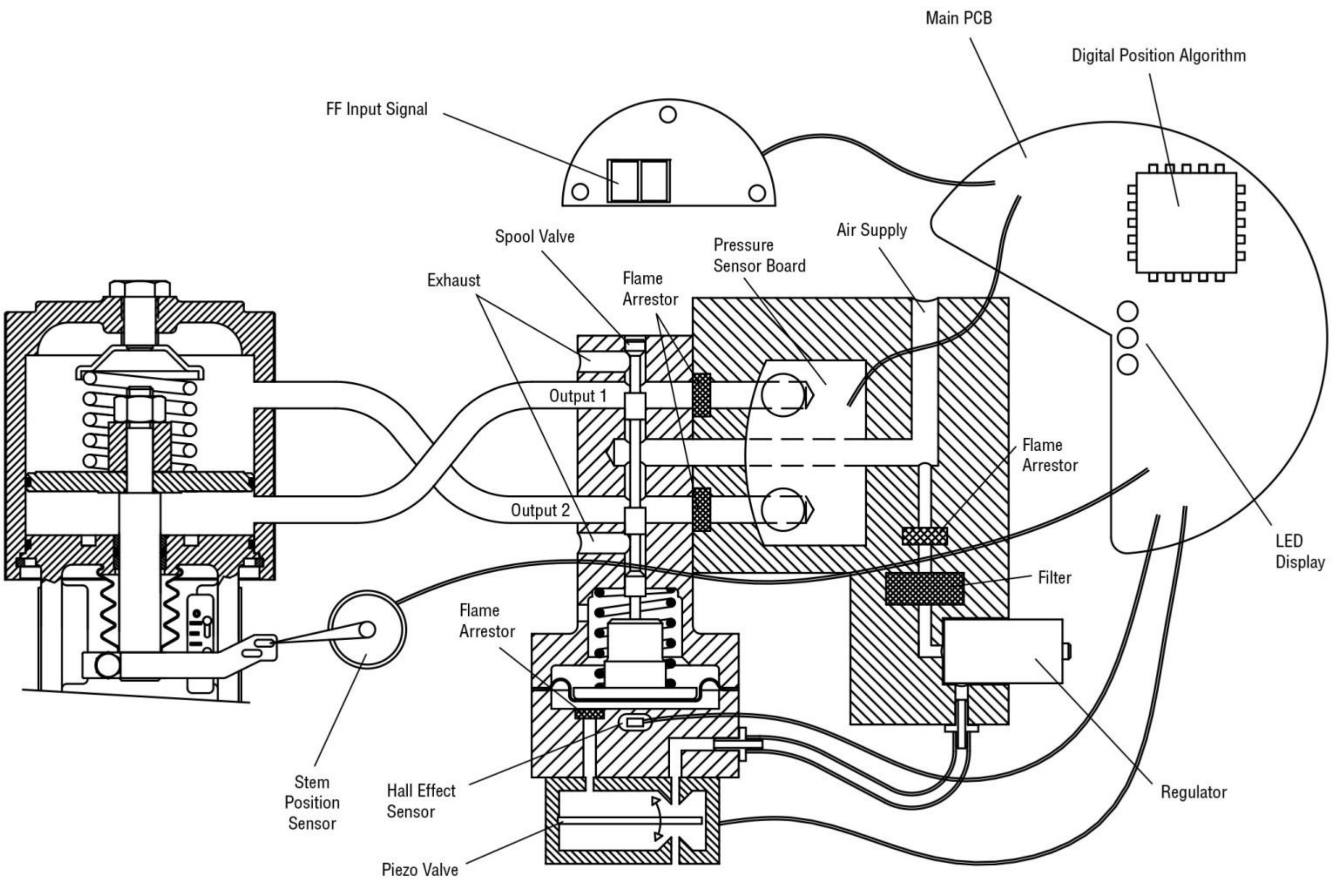
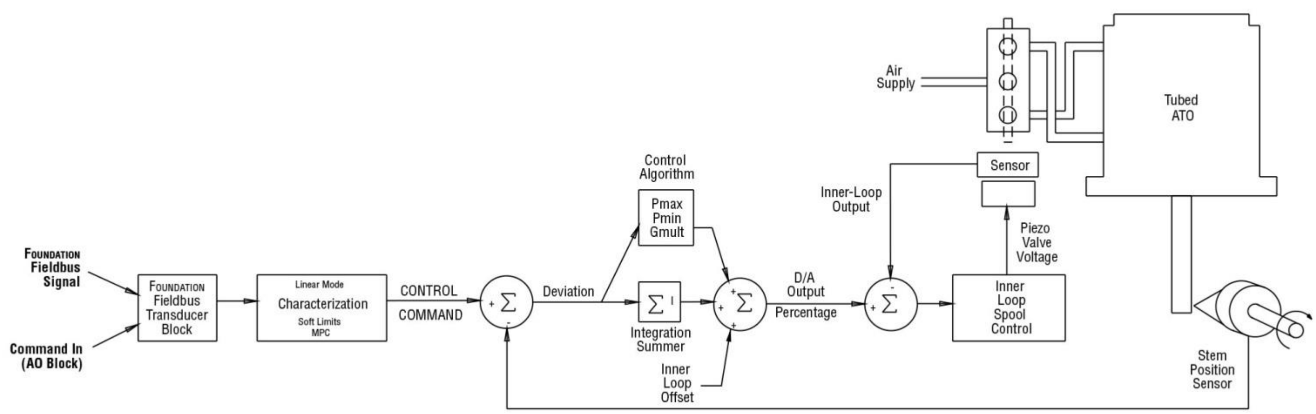


Figure 2: System Positioning Algorithm



4.1 Specifications

Table I: Electrical Specifications

Power Supply	Two-wire, 9 to 32 V DC FF compatible
IS	Fisco compliant
Communications	FF Protocol ITK 5.1
Operating Current	18 mA
Voltage Limits	36.0 VDC 9 to 32 V DC for general use & flameproof applications 9 to 24 V DC for Intrinsically safe applications 9 to 17.5 VDC for Intrinsically safe applications per FISCO requirements
Wire	FF-844 FS1.2 H1 Cable Test Specifications Terminal Lug 12-22 AWG. 0.27 in. max OD, 0.13 min ID. Maximum Torque Rating: 7 in-lbs.

Table II: Environmental Conditions

Operating Temperature Range	Standard	-40° to 185° F (-40° to 85°C)
Transport and Storage Temperature Range	-40° to 185°F (-40° to 85°C)	
Operating Humidity	0 - 100% non-condensing	

**Note: The Logix 3400MD is designed to operate with clean, dry, o free instrument grade air per ISA 7.0.01-1996 or with dry nitrogen, sweet natural gas.*

Table III: Physical Specifications

Housing Material	Cast, powder-painted aluminum, stainless steel
Soft Goods	Buna-N / Florosilicone
Weight	8.3 pounds (3.9 kg) aluminum 20.5 pounds (9.3 kg) stainless steel

Table IV: Positioner Specifications

Deadband	<0.1% Full Span
Repeatability	<0.05% Full Span
Linearity	<0.5% (Rotary), <0.8%, (Linear Valve) Full Span Per ISA 75.25.01-2000
Air Consumption	<0.3 SCFM (0.5 Nm^3/hr) @ 60 psi (4 bar)
Air Supply	30-150 psig (ISA 7.0.0.1 compliant)

Table V: Air Supply Requirements

Dew Point	At least 18^0 F (10^0C) below minimum anticipated ambient temperature
Particulate Matter	Filtered to 5 microns
Oil Content	Less than 1 ppm w/w
Contaminants	Free of all corrosive contaminants

Table VI: Function Blocks

AO	One Analog Output
DI	Two Discrete Inputs
DO	One Discrete Output
PID	One PID Control Function
OS	One Output Splitter
IS	One Input Selector

Hazardous Locations Information

<table>
<tr><th>ATEX</th><th>North America (FM/CSA)</th></tr>
<tr><td>
<u>Flame Proof</u>
FM07ATEX0005
II 2 G
Ex db IIB+H_2 Gb IP65
T4 (Ta = -52˚C to +80C)
T6 (Ta = -52˚C to +60˚C)
II 2 D
Ex tb IIIC T95˚C Db IP65
Ta = -52˚C to +55C

<u>Intrinsically Safe</u>
FM07ATEX0029X
II 1 G
Ex ia IIC T4/T6
T4 (Ta = -52˚C to +80˚C)
T6 (Ta = -52˚C to +40˚C)

II 2 D
Ex ia IIIC T95°C Da
Ta = -52°C to +55°C

Entity Parameters
<u>Fisco Compliant</u>
Vmax = 24V
Imax = 380mA
Pi = 5.32W
Ci = 3.3nF
Li = 0uH

<u>Non-Incendive</u>
FM16ATEX0002X
II 3 G
Ex ic nA IIC
T4 (Ta = -52˚C to +80˚C)
T6 (Ta = -52˚C to +40˚C)
</td><td>
<u>Explosion Proof</u>
Class I, Div 1, Groups B,C,D T4/T6
DIP Class II, III, Div 1 Groups E,F,G T6
Class 1, Zone 1, AEx db IIB+H2
Class 1, Zone 1, Ex db IIB+H2
T4 Tamb = -40˚C to +80C
T6 Tamb = -40˚C to +60˚C
Type 4X

<u>Intrinsically Safe</u>
Class I,II, III, Div 1, Groups A,B,C,D,E,F,G
Class I, Zone 0, AExia IIC
Class I, Zone 0, Ex ia IIC
T4 (Ta = -52˚C to +80˚C)
T6 (Ta = -52˚C to +40˚C)
Type 4X, IP65

Entity Parameters
<u>Fisco Compliant</u>
Vmax = 24V
Imax = 380mA
Pi = 5.32W
Ci = 3.3nF
Li = 0uH

<u>Non-Incendive</u>
Class I, Div 2, Groups A,B,C,D
Class I, Zone 2, AEx ic nA IIC IP65
Class I, Zone 2, Ex ic nA IIC IP65
T4 (Ta = -52˚C to +80˚C)
T6 (Ta = -52˚C to +40˚C)
Type 4X

Barriers Not Required
</td></tr>
<tr><th>IECEx</th><th>InMetro</th></tr>
<tr><td>
<u>Explosion Proof</u>
IECEx FMG 11.0002X
Ex db IIB+H_2 T5, Gb, IP65
T4 (Ta = -52˚C to +80˚C)
T6 (Ta = -52˚C to +60˚C)
Ex tb IIIC T95˚C Db
Ta = -52C to +55C

<u>Intrinsically Safe</u>
IECEx FME 07.0001X
Ex ia IIC T4 Ga
Ex ic nA IIC Gc
T4 (Ta = -52˚C to +80˚C)
T6 (Ta = -52˚C to +40˚C)
Ex ia IIIC T95°C Da
Ta = -52°C to +55°C

Entity Parameters
<u>Fisco Compliant</u>
Vmax = 24V
Imax = 380mA
Pi = 5.32W
Ci = 3.3nF
Li = 0uH
</td><td>
<u>Explosion Proof</u>
TÜV 12.0646
Ex db IIB+H_2 T5 Gb IP65
T5 (Ta = -55˚C to +80˚C)
Ex tb IIIC T95C Db IP65
Ta = -55C to +55C

<u>Instrinsically Safe</u>
TÜV 12.0605
Ex ia IIC T4 Ga IP65
T4 (Ta = -40˚C to +60˚C)

Entity Parameters
<u>Fisco Compliant</u>
Vmax = 24V
Imax = 380mA
Pi = 5.32W
Ci = 3.3nF
Li = 0uH
</td></tr>
</table>

Special Conditions for Safe Use:

1. When used within a Zone 0 location, cast-aluminum (when Enclosure Option b = 0, 2, 3, 4,or 5) enclosures shall be installed in such manner as to prevent the possibility of sparks resulting from friction or impact against the enclosure.
2. To prevent the risk of electrostatic sparking, the equipment's mechanical pressure gauges shall be cleaned only with a damp cloth.
3. Using the box provided on the nameplate, the user shall permanently mark the protection type chosen for the specific installation. Once the type of protection has been marked it shall not be changed.
4. Consult the manufacturer if dimensional information on the flameproof joints is necessary.
5. For equipment configured with Certification Option 28,33 or 34, the user shall, permanently mark the box provided on the nameplate for the protection type chosen for the specific installation. Once the type of protection has been marked it shall not be changed.
6.When used within a dust environment, the cable gland(s) used must be certified for a dust environment.

4.2 Positioner Operation

The Logix 3400MD positioner is an electric feedback instrument. Figure 1 shows a Logix 3400MD positioner installed on a double-acting linear actuator for air-to-open action.

The Logix 3400MD receives power from the two-wire, FF input signal. This positioner utilizes FF communications for the command signal. The command source can be accessed with the Rosemount 375 communicator or other host software.

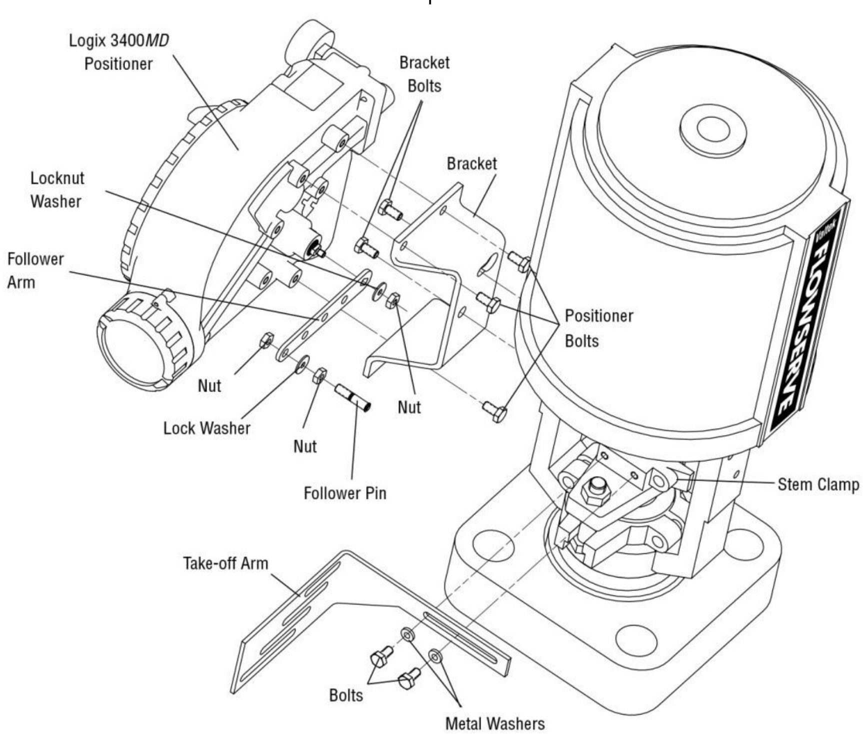
0% is always defined as the valve closed position and 100% is always defined as the valve open position. During stroke calibration, the signals corresponding to 0% and 100% are defined.

The input signal in percent passes through a characterization/ limits modifier block. The positioner no longer uses CAMs or other mechanical means to characterize the output of the positioner. This function is done in software, which allows for in-the-field customer adjustment. The positioner has four basic modes: *Linear, Equal Percent (=%), Quick Open (QO)* and *Custom* characterization. In *Linear* mode, the input signal is passed straight through to the control algorithm in a 1:1 transfer. In *Equal Percent (=%)* mode, the input signal is mapped to a standard 30:1 rangeability =% curve. In *Quick Open* the input signal is mapped to an industry standard quick-open curve. If *Custom* charac- terization is enabled, the input signal is mapped to either a default =% output curve or a custom, user-defined 21-point output curve. The custom user-defined 21-point output curve is defined using a handheld or the Host configuration tool software. In addition, two user-defined features, *Soft Limits* and Final Value Cutoff, may affect the final input signal. The actual command being used to position the stem, after any characterization or user limits have been evaluated, is called the *Control Command*.

The Logix 3400MD uses a two-stage, stem-positioning algorithm. The two stages consist of an inner-loop, spool control and an outer-loop, stem position control. Referring again to Figure 1, a stem position sensor provides a measurement of the stem movement. The *Control Command* is compared against the *Stem Position*. If any deviation exists, the control algorithm sends a signal to the inner-loop control to move the spool up or down, depending upon the deviation. The inner- loop then quickly adjusts the spool position. The actuator pressures change and the stem begins to move. The stem movement reduces the deviation between *Control Command* and *Stem Position*. This process continues until the deviation goes to zero.

The inner-loop controls the position of the spool valve by means of a driver module. The driver module consists of a temperature-compensated hall effect sensor and a piezo valve pressure modulator. The piezo valve pressure modulator controls the air pressure under a

Figure 3: Linear Mark One Control Valve Mounting



diaphragm by means of a piezo beam bender. The piezo beam deflects in response to an applied voltage from the inner-loop electronics. As the voltage to the piezo valve increases, the piezo beam bends, closing off against a nozzle causing the pressure under the diaphragm to increase. As the pressure under the diaphragm increases or decreases, the spool valve moves up or down respectively. The hall effect sensor transmits the position of the spool back to the inner-loop electronics for control purposes.

4.3 Detailed Sequence of Positioner Operations

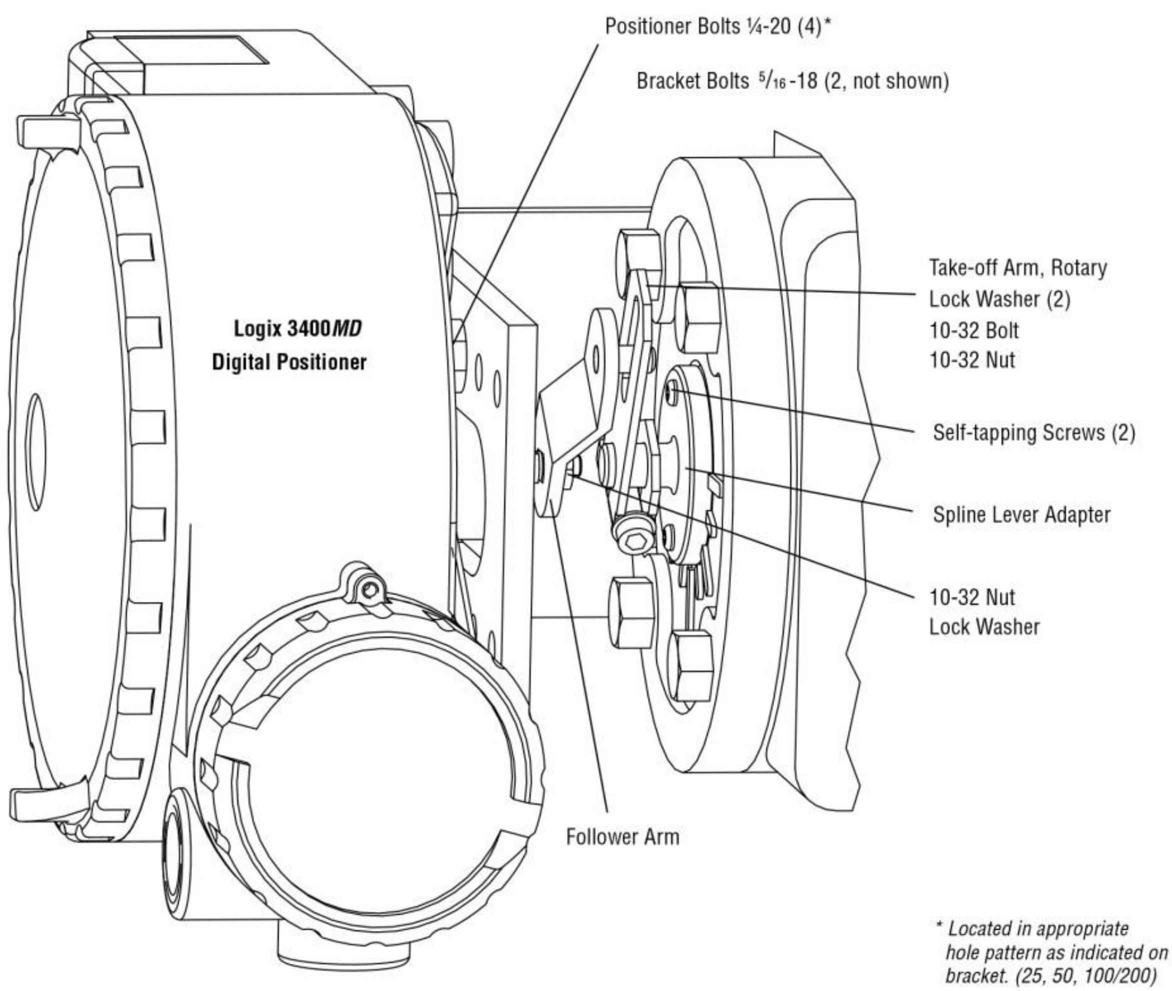
A more detailed example explains the control function. Assume the unit is configured as follows:

- Unit is in *OOS.*
- *Custom* characterization is disabled (therefore characterization is *Linear*).
- No soft limits enabled. No Final Value Cutoff set.
- Valve has zero deviation with a present input command of 50.
- Write to Final_Value to change command.
- Actuator is tubed and positioner is configured air-to-open.

Given these conditions, 50 represents a *Command source* of 50 percent. *Custom characterization* is disabled so the *Command source* is passed 1:1 to the *Control Command*. Since zero deviation exists, the Stem Position is also at 50 percent. With the stem at the desired position, the spool valve will be at a middle position that balances the pressures above and below the piston in the actuator. This is commonly called the *null* or *balanced* spool position.

Assume the input signal changes from 50 to 75. The positioner sees this as a *Command source* of 75 percent. With *Linear characterization*, the *Control Command* becomes 75 percent. Deviation is the difference between *Control Command* and *Stem Position* : Deviation = 75% - 50% = +25%, where 50 percent is the present stem position. With this positive deviation, the control algorithm sends a signal to move to

Figure 4: Standard Rotary Mounting



spool up from its present position. As the spool moves up, the supply air is applied to the bottom of the actuator and air is exhausted from the top of the actuator. This new pressure differential causes the stem to start moving towards the desired position of 75 percent. As the stem moves, the Deviation begins to decrease. The control algorithm begins to reduce the spool opening. This process continues until the Deviation goes to zero. At this point, the spool will be back in its null or balanced position. Stem movement will stop and the desired stem position is now achieved.

One important parameter has not been discussed to this point: Inner loop offset. Referring to Figure 2, a number called Inner loop offset is added to the output of the control algorithm. In order for the spool to remain in its null or balanced position, the control algorithm must output a non-zero spool command. This is the purpose of the Inner loop offset. The value of this number is equivalent to the signal that must be sent to the spool position control to bring it to a null position with zero deviation. This parameter is important for proper control and is optimized and set automatically during stroke calibration.

5 Mounting and Installation

5.1 Mounting to Valtek Linear Mark One Valves

To mount a Logix 3400MD positioner to a Valtek linear Mark One valve, refer to Figure 3 and proceed as outlined below. The following tools are required:

- 9⁄16" open-end wrench (or 1/2" for spud sizes 2.88 and smaller)
- 7⁄16" box wrench
- 3⁄8" open-end wrench

1. Remove washer and nut from follower pin assembly. Insert pin into the appropriate hole in follower arm, based on stroke length. The stroke lengths are stamped next to their corresponding holes in the follower arms. Make sure the unthreaded end of the pin is on the stamped side of the arm. Reinstall lock washer and tighten nut to complete follower arm assembly.

2. Slide the double-D slot in the follower arm assembly over the flats on the position feedback shaft in the back of the positioner. Make sure the arm is pointing toward the customer interface side of the positioner. Slide lock washer over the threads on the shaft and tighten down the nut.

3. Align the bracket with the three outer mounting holes on the positioner. Fasten with 1/4" bolts.

4. Screw one mounting bolt into the hole on the yoke mounting pad nearest the cylinder. Stop when the bolt is approximately 3⁄16" from being flush with mounting pad.

5. Slip the large end of the teardrop shaped mounting hole in the back of the positioner/bracket assembly over the mounting bolt. Slide the small end of the teardrop under the mounting bolt and align the lower mounting hole.

6. Insert the lower mounting bolt and tighten the bolting.

7. Position the take-off arm mounting slot against the stem clamp mounting pad. Apply Loctite 222 to the take-off arm bolting and insert through washers into stem clamp. Leave bolts loose.

8. Slide the appropriate pin slot of the take-off arm, based on stroke length, over the follower arm pin. The appropriate stroke lengths are stamped by each pin slot.

9. Center the take-off arm on the rolling sleeve of the follower pin.

10. Align the take-off arm with the top plane of the stem clamp and tighten bolting. Torque to 120 in-lb.

NOTE: If mounted properly, the follower arm should be horizontal when the valve is at 50% stroke and should move approximately ±30° from horizontal over the full stroke of the valve. If mounted incorrectly, a stroke calibration error will occur and the indicator lights will blink a YRYR or YRRY code indicating the position sensor has gone out of range on one end of travel. Reposition the feedback linkage or rotate the position sensor to correct the error.

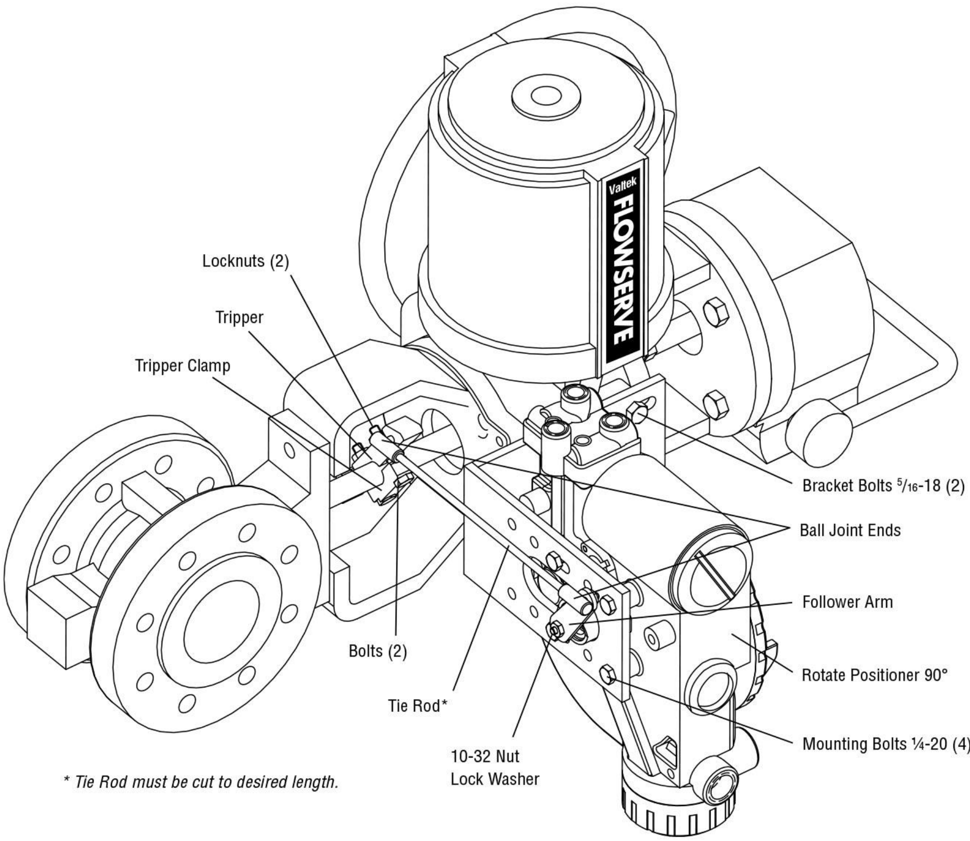
5.2 Mounting to Standard Valtek Rotary Valves (See Figure 4)

The standard rotary mounting applies to Valtek valve/actuator assemblies that do not have mounted volume tanks or handwheels. The standard mounting uses a linkage directly coupled to the valve shaft. This linkage has been designed to allow for minimal misalignment between the positioner and the actuator. The tools required for the following procedure are:

- 5⁄32" Allen wrench
- 1/2" open-end wrench
- 7⁄16" open-end wrench
- 3⁄8" socket with extension
- 3⁄16" nutdriver

1. Fasten the spline lever adapter to the splined lever using two 6 x 1/2" self-tapping screws.

Figure 5: Optional Rotary Mounting



2. Slide the take-off arm assembly onto the spline lever adapter shaft. Insert the screw with star washer through the take-off arm and add the second star washer and nut. Tighten nut with socket so arm is lightly snug on the shaft but still able to rotate. This will be tightened after linkage is correctly oriented.

3. Attach follower arm to positioner feedback shaft using the star washer and 10-32 nut.

NOTE: The arm will point up when feedback shaft is in the free position.

4. Using four 1/4-20 x 1/2" bolts, fasten positioner to universal bracket using appropriate hole pattern (stamped on bracket).

5. Using a 1/2" end wrench and two 5⁄16-18 x 1/2" bolts, attach bracket to actuator transfer case pad. Leave these bolts slightly loose until final adjustments are made.

6. Rotate take-off arm so the follower pin will slide into the slot on the take-off arm. Adjust the bracket position as needed noting the engagement of the follower pin and the take-off arm slot.The pin should extend approximately 1⁄16" past the take-off arm. When properly adjusted, securely tighten the bracketing bolts.

Orienting the Take-off Arm for Final Lock Down

1. Tube the Logix 3400MD positioner to the actuator according to the instructions given in Section 5.5, "Tubing Positioner to Actuator."

2. With supply pressure off, rotate the follower arm in the same direction the shaft would rotate upon a loss of supply pressure. When the mechanical stop of the follower arm (positioner) is reached, rotate back approximately 15 degrees.

3. Hold the take-off arm in place; tighten the screw of the take off arm.

NOTE: The take-off arm should be snug enough to hold the follower arm in place but allow movement when pushed.

4. Connect regulated air supply to appropriate port in manifold.

5. Remove main cover and locate DIP switches and RE-CAL button.

6. Refer to sticker on main board cover and set DIP switches accordingly. (A more detailed explanation of the DIP switch settings is given in Section 7, "Startup.")

7. Press the RE-CAL button for three to four seconds or until the positioner begins to move. The positioner will now perform a stroke calibration.

8. If the calibration was successful the green LED will blink GGGG or GGGY and the valve will be in control mode. Continue with step 9.If calibration failed, as indicated by a YRYR or YRRY blink code, the A/D feedback values were exceeded and the arm must be adjusted away from the positioners limits. Return to step 2 and rotate the arm back approximately 10 degrees.

NOTE: Remember to remove the air supply before re-adjusting take-off arm.

9. Tighten the nut on the take-off arm. The socket head screw of the take-off arm must be tight, about 40 in-lb.

NOTE: If the take-off arm slips, the positioner must be recalibrated.

WARNING: Failure to follow this procedure will result in positioner and/or linkage damage. Check air-action and stroke carefully before lockdown of take-off arm to spline lever adapter.

5.3 Optional Valtek Rotary Mounting Procedure (See Figure 5)

The optional rotary mounting applies to Valtek valve/actuator assemblies that are equipped with mounted volume tanks or handwheels. The optional mounting uses a four-bar linkage coupled to the valve shaft. The following tools are required:

- 3⁄8" open-end wrench
- 7⁄16" open-end wrench
- 1/2" open-end wrench

1. Using a 1/2" open-end wrench and two 5⁄16-18 x 1/2" bolts, attach bracket to actuator transfer case pads. Leave bracket loose to allow for adjustment.

2. Using four 1/4-20 x 1/2" bolts and a 7⁄16" open-end wrench, fasten positioner to universal bracket, using the four-hole pattern that locates the positioner the farthest from the valve. Rotate positioner 90 degrees from normal so gauges are facing upward.

3. Attach follower arm to positioner feedback shaft, using the star washer and 10-32 nut.

4. Attach tripper and tripper clamp to valve shaft using two 1/4-20 bolts and two 1/4-20 locknuts. Leave tripper loose on shaft until final adjustment.

5. Thread ball joint linkage end to tripper and tighten (thread locking compound such as Loctite is recommended to prevent back threading). Adjust the length of tie rod so follower arm and tripper rotate parallel to each other (the rod must be cut to the desired length). Connect the other ball joint end to follower arm using a star washer and a 10-32 nut.

6. Tighten bracket and tripper bolting.

7. Check for proper operation, note direction of rotation.

☠ **WARNING:** If rotating in wrong direction, serious damage will occur to the positioner and/or linkage. Check air action and stroke direction carefully before initiating operation.

5.4 NAMUR Mounting Option

Logix 3200MD is available with a NAMUR output shaft and mounts on an actuator using the ISO F05 holes. Proper alignment of the positioner shaft to the actuator shaft is very important since improper alignment can cause excess wear and friction to the positioner.

5.5 Tubing Positioner to Actuator

The Logix 3400MD digital positioner is insensitive to supply pressure changes and can handle supply pressures from 30 to 150 psig. A supply regulator is recommended if the customer will be using the diagnostic features of the Logix 3400MD but is not required. In applica- tions where the supply pressure is higher than the maximum actuator pressure rating a supply regulator is required to lower the pressure to the actuator's maximum rating (not to be confused with operating range). An air filter is highly recommended for all applications where dirty air is a possibility.

NOTE: The air supply must conform to ISA Standard ISA 7.0.01 (a dew point at least 18°F below ambient temperature, particle size below five microns—one micron recommended—and oil content not to exceed one part per million).

Air-to-open and air-to-close are determined by the actuator tubing, not the software. When air action selection is made during configuration, that selection tells the control which way the actuator has been tubed. The top output port is called Output 1. It should be tubed to the side of the actuator that must receive air to begin the correct action on increasing signal. Verify that tubing is correct prior to a stroke calibration. Proper tubing orientation is critical for the positioner to function correctly and have the proper failure mode. Refer to Figure 1 and follow the instructions below:

Linear Double-acting Actuators

For a linear air-to-open actuator, the Output 1 port of the positioner manifold is tubed to the bottom side of the actuator. The Output 2 port of the positioner manifold is tubed to the top side of the actuator. For a linear air-to-close actuator the above configuration is reversed.

Rotary Double-acting Actuators

For a rotary actuator, the Output 1 port of the positioner manifold is tubed to the bottom side of the actuator. The Output 2 port of the positioner manifold is tubed to the top side of the actuator. This tubing convention is followed regardless of air action. On rotary actuators, the transfer case orientation determines the air action.

Single-acting Actuators

For single-acting actuators, the Output 1 port is always tubed to the pneumatic side of the actuator regardless of air action. The Output 2 port must be plugged.

6 Wiring and Grounding Guidelines

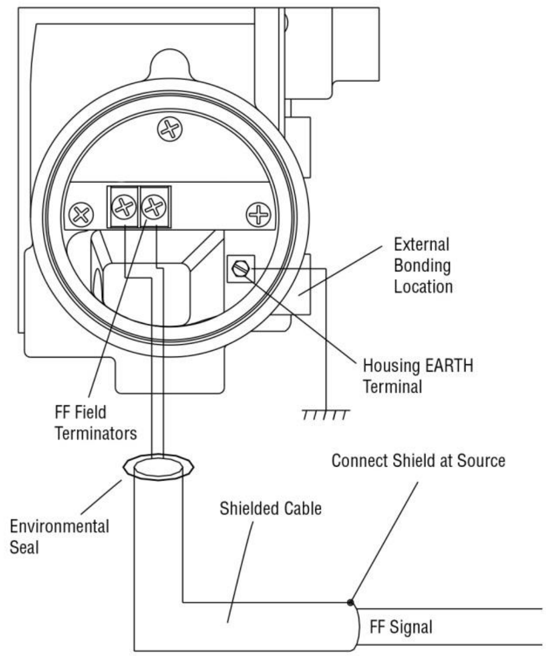
(See Figure 6)

WARNING: *This product has electrical conduit connections in either thread sizes 1/2" NPT or M20 which appear identical but are not interchangeable. Housings with M20 threads are stamped with the letters M20 above the conduit opening. Forcing dissimilar threads together will damage equipment, cause personal injury and void hazardous location certifications. Conduit fittings must match equipment housing threads before installation. If threads do not match, obtain suitable adapters or contact a Flowserve representative.*

WARNING: *Any unused cable entries are to be closed off with appropriately certified blanking devices.*

WARNING: *When using cable glands, ensure that they are appropriately certified.*

Figure 6: Field Termination

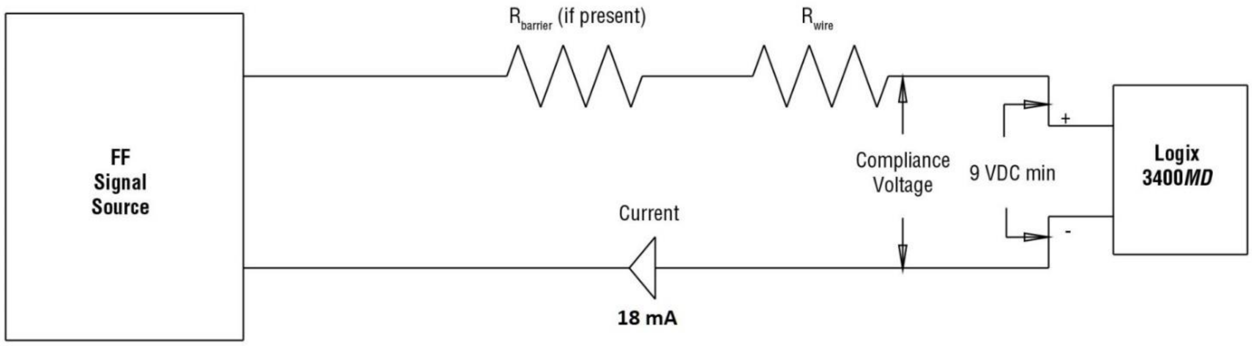


6.1 FF Command Input Wiring

The Logix 3400MD is non-polarity sensitive. Wire FF source to the input terminals (see Figure 6). Minimum operating voltage is 9 VDC.

The FF signal to the Logix 3400MD digital positioner should be in shielded cable. Shields must be tied to a ground at only one end of the cable to provide a place for environmental electrical noise to be removed from the cable. In general, shield wire should be connected at the source. Refer to guidelines in FF AG-140 and FF AG-181 for proper wiring methods.

Figure 7: Compliance Voltage



6.2 Grounding Screw

The green grounding screw, located inside the termination cap, should be used to provide the unit with an adequate and reliable earth ground reference. This ground should be tied to the same ground as the electrical conduit. Additionally, the electrical conduit should be earth grounded at both ends of its run.

WARNING: The green grounding screw must not be used to terminate signal shield wires.

6.3 Segment Compliance Voltage

(See Figure 7)

Output compliance voltage refers to the voltage limit that can be provided by the FF source. A FF system consists of the FF source, wiring resistance, barrier resistance (if present), and the Logix 3400MD positioner voltage. The Logix 3400MD digital positioner requires that the system allows for a 9.0 VDC drop across the positioner at minimum segment voltage. The actual voltage at the terminals varies from 9.0 to 32.0 VDC depending on the FF signal and ambient temperature.

Determine if the segment will support the Logix3400MD digital positioner by performing the following calculation.

Equation 1

Voltage = Compliance Voltage (@ 18 mA) – 18 mA • ($R_{barrier}$ + R_{wire})

Example:

DCS Compliance Voltage = 19 VDC

$R_{barrier}$ = 300 Ω

R_{wire} = 25 Ω

$Current_{max}$ = 18 mA

Voltage = 19 VDC – 0.018 A • (300 Ω + 25 Ω) = 13.15VDC

The voltage 13.15 VDC is greater than the required 9.0 VDC; therefore, this system will support the Logix 3400MD digital positioner.

6.4 Cable Requirements

The Logix 3400MD digital positioner utilizes the FF protocol. This communication signal is superimposed on the supply voltage.

FF rated cable should be used. Refer to H1 wiring specification (FF-844).

6.5 Intrinsically Safe Barriers

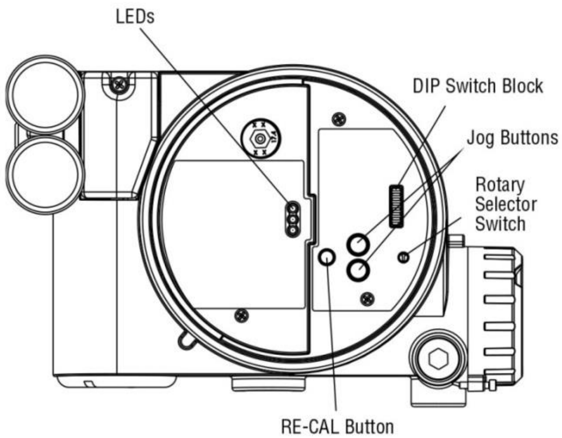
When selecting an intrinsically safe barrier, make sure the barrier is FF compatible. Although the barrier will pass the segment voltage and allow normal positioner operation, if not compatible, it may prevent FF communication.

6.6 DD Support

The DD for the Logix 3400MD can be downloaded from either the flowserve website: www.valvesight.com or the Foundation Fieldbus website: www.Fieldbus.org.

7 Startup

Figure 8: Local User Interface



7.1 Logix 3400MD Local Interface Operation

The Logix 3400MD local user interface (Figure 8) allows the user to configure the basic operation of the positioner, tune the response, and calibrate the positioner without additional tools or configurators. The local interface consists of a RE-CAL button for automatic zero and span setting, along with two jog buttons (▲ and▼) for spanning valve/actuators with no fixed internal stop in the open position. There is also a DIP switch block containing eight switches. Six of the switches are for basic configuration settings and two are for FF options. There is also a rotary selector switch for adjusting the positioner gain settings. For indication of the operational status or alarm conditions there are three LEDs on the local user interface.

7.2 Initial DIP Switch Settings

Before placing the unit in service, set the DIP switches in the Configuration boxes to the desired control options. A detailed descrip- tion of each DIP switch setting follows.

NOTE: The Logix 3400MD positioner reads the DIP switch settings each time the RE-CAL button is pressed. If a FF handheld or Host software is used to configure and then calibrate the positioner, the DIP switches are not read. The auto-tune adjustment switch labeled “GAIN” is always live and can be adjusted at any time.

Transducer block settings will always override the DIP switch settings until the RE-CAL button is pressed.

7.3 Description of Configuration DIP Switch Settings

The first six DIP switches are for basic configuration. The function of each switch is described below.

Air Action
This must be set to match the configuration of the valve/actuator mechanical tubing connection and spring location since these deter- mine the air action of the system.

ATO (air-to-open)
Selecting ATO if increasing output pressure from the positioner is tubed so it will cause the valve to open.

ATC (air-to-close)
Selecting ATC if increasing output pressure from the positioner is tubed so it will cause the valve to close.

Pos. Characterization

Linear Select *Linear* if the actuator position should be directly proportional to the input signal.

Other Select Other if another characteristic is desired, which is set in conjunction with the **Control_Flags** parameter in the transducer block.

Optional Pos. Characterization
If the Pos. Characterization switch is set to Other then the CURVE_ SELECT parameter is active with the following options:

=% The =% option will characterize the actuator response to the input signal based on a standard 30:1 equal percent rangeability curve.

QO Quick open is based on a standard industry quick-open curve.

Custom If *Custom* is selected, the positioner will be characterized to a custom table that must be set-up using a properly configured 475 handheld or other host software. Custom characterization can be thought of as a “soft CAM.” The user can define a characterization curve using 21 points. The control will linearly interpolate between points. Points do not have to be equally spaced in order to allow more defini- tion at critical curve areas. The default values will linearize the output of a valve with an inherent =% characteristic (e.g. ball valves.)

Figure 9: Default Custom Characterization

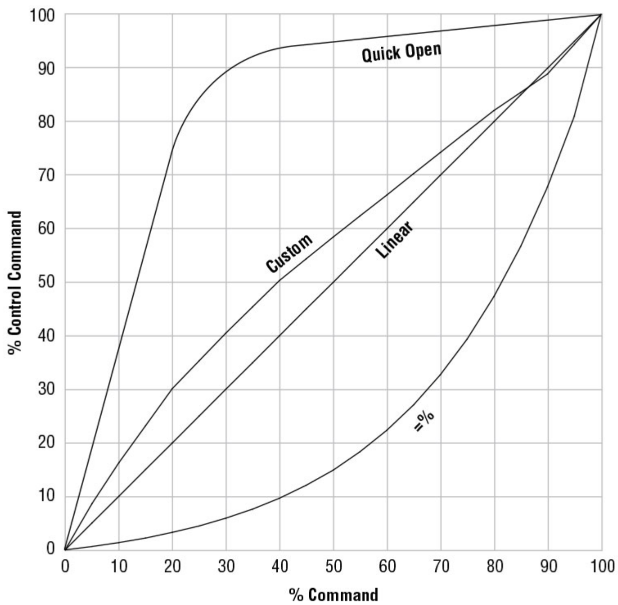


Table VI : Characteristic Curve Data

% Command	% Control Command			
	=%	Linear	Custom	QO
0	0	0	0	0
5	0.62	5	8.66	18.8
10	1.35	10	16.24	37.6
15	2.22	15	23.17	56.4
20	3.25	20	30.11	74.0
25	4.47	25	35.31	84.3
30	5.91	30	40.51	90.0
35	7.63	35	45.42	92.0
40	9.66	40	50.34	93.4
45	12.07	45	54.40	94.2
50	14.92	50	58.47	94.8
55	18.31	55	62.39	95.5
60	22.32	60	66.31	96.0
65	27.08	65	70.27	96.5
70	32.71	70	74.23	97.0
75	39.40	75	78.17	97.5
80	47.32	80	82.11	98.0
85	56.71	85	85.50	98.5
90	67.84	90	88.89	99.0
95	81.03	95	94.45	99.5
100	100.00	100	100.00	100.0

Auto Tune
This switch controls whether the positioner will auto tune itself every time the RE-CAL button is pressed or use preset tuning parameters.

On *On* enables an auto tune feature that will automatically determine the positioner gain settings based on the current position of the adjustable GAIN switch setting and response parameters measured during the last RE-CAL. The GAIN switch is live, meaning the settings can be adjusted at any time by changing the rotary switch position. (Note that there is a small black arrow indicating the selection. The slot in the switch is NOT the indicator.)

Figure 10: Adjustable GAIN Switch

If the adjustable GAIN selector switch is set to “E” with the auto tune switch on, a Flowserve standard response tuning set will be calculated and used based on response parameters measured during the last RECAL.

If the adjustable GAIN selector switch is set to “D”, “C”, “B”, or “A” with the auto tune switch on, progressively lower gain settings will be used based on response parameters measured during the last RECAL.

If the adjustable GAIN selector switch is set to “F”, “G”, or “H” with the auto tune switch on, progressively higher gain settings will be calculated and used based on response parameters measured during the last RECAL.

Off *Off* forces the positioner to use one of the factory preset tuning sets determined by the adjustable GAIN selector switch. Settings “A” through “H” are progressively higher gain predefined tuning sets. The GAIN selector switch is live and can be adjusted at any time to modify the tuning parameters.

NOTE: “E” is the default adjustable GAIN selector switch setting for all actuator sizes. Raising or lowering the gain setting is a function of the positioner/valve response to the control signal, and is not actuator size dependent.

Stability Switch
This switch adjusts the position control algorithm of the positioner for use with low-friction control valves or high-friction automated valves.

Low-Friction Valves Placing the switch to the left optimizes the response for low-friction, high-performance control valves. This setting provides for optimum response times when used with most low-friction control valves.

High-Friction Valves Placing the switch to the right optimizes the response for valves and actuators with high friction levels. This setting slightly slows the response and will normally stop limit cycling that can occur on high-friction valves.

7.4 Description of Cal DIP Switch Settings

The sixth DIP switch selects between two calibration options. The function of the Cal DIP switch is described below.

NOTE: The unit must be in OOS mode before a calibration sequence can begin.

Auto Select *Auto* if the valve/actuator assembly has an internal stop in the open position. In *Auto* mode the positioner will fully *close* the valve and register the 0% position and then *open* the valve to the stop to register the 100% position when performing a self-calibration. See detailed instructions in the next section on how to perform an auto positioner calibration.

Jog Select *Jog* if the valve/actuator assembly has no physical calibration stop in the open position. In the *Jog* mode the positioner will fully close the valve for the 0% position and then wait for the user to set the open position using the Jog buttons labeled with the up and down arrows. See the detailed instructions in Section 7.6 on how to perform a manual calibration using the Jog buttons.

☠ **WARNING:** During the RE-CAL operation the valve may stroke unexpectedly. Notify proper personnel that the valve will stroke, and make sure the valve is properly isolated.

7.5 RE-CAL Operation

NOTE: The unit must be in OOS mode before a calibration sequence can begin.

The RE-CAL button is used to locally initiate a calibration of the positioner. Pressing and holding the RE-CAL button for approximately three seconds will initiate the calibration. If the Config-Switches option is enabled, the settings of all the configuration switches are read and the operation of the positioner adjusted accordingly. A RE-CAL can be aborted at any time by briefly pressing the RE-CAL button and the previous settings will be retained.

If the Quick Calibration switch (be careful not to confuse this with the RE-CAL button) is set to Auto and the valve/actuator assembly has the necessary internal stops the calibration will complete automatically.

While the calibration is in progress you will notice a series of different lights flashing indicating the calibration progress. When the lights return to a sequence that starts with a green light the calibration is complete. An explanation of the various light sequences follows. The initial calibration of extremely large or small actuators may require several calibration attempts. The positioner adapts to the actuator performance and begins each calibration where the last attempt ended. On an initial installation it is recommended that after the first successful calibration that one more calibration be completed for optimum performance.

☠ **WARNING:** When operating using RE-CAL or local control, the valve will not respond to external commands. Notify proper personnel that the valve will not respond to remote command changes, and make sure the valve is properly isolated.

7.6 Manual Jog Calibration Operation

If the Quick Calibration switch is set to Jog, the calibration will initially close the valve then cause a small jump in the valve position. The jog calibration process will only allow the user to manually set the span; zero position is automatically always set at the seat. If an elevated zero is needed a handheld or other PC-based configuration software is required. When performing a jog calibration, the LEDs will flash in a sequence of Y-G-Y-Y (yellow-green-yellow-yellow) which indicates that the user must use the Jog buttons (▲and▼) to manually position the valve to the 100% position. When the stem is properly positioned press both the Jog buttons (▲and▼) simultaneously again to register the 100% position and proceed. No more user actions are required while the calibration process is completed. When the lights return to a sequence that startswith a green light the calibration is complete. An explanation of the various light sequences follows.

7.7 Local Control of Valve Position

Local control of valve position can be achieved from the user interface by holding down both Jog buttons and the RE-CAL button simultaneously for three seconds. While in this mode the LEDs will flash a Y-G-Y-Y (yellow- green-yellow-yellow) sequence. Use the two Jog buttons (▲and▼) to manually control the position of the valve. To exit the local control mode and return to normal operation, briefly press the RE-CAL button.

7.8 Factory Reset

To perform a factory reset, disconnect power, hold the RE-CAL button down, and reconnect power. Performing a factory reset will cause all of the internal variables, including calibration, to be reset to factory defaults. The positioner must be recalibrated after a factory reset. User configured limits, alarm settings, and valve information will also need to be restored.

WARNING: Performing a factory reset may result in the inability to operate the valve until reconfigured properly. Notify proper personnel that the valve may stroke, and make sure the valve is properly isolated.

7.9 Logix 3400MD Status Condition

The blink codes used to convey the status of the Logix 3400MD digital posi- tioner are described in the table below. In general, any sequence starting with a green light flashing first is a normal operating mode and indicates that there are no internal problems. Any sequence starting with a yellow light flashing indicates that the unit is in a special calibration or test mode, or that there was a calibration problem. Any sequence starting with a red light flashing indicates that there is an operational problem with the unit.

Table VII: Status and Conditions

Code	Meaning	Error Code	Sticker Line	Sticker Text
GGGG	Normal Operation	255	1	Normal Operation
GGGY	MPC Active	13	2	Tight shutoff (MPC) active*
GGYG	Local Interface Disabled	14	3	Local Interface Disabled*
GGYY	Digital Command Mode	2	4	Digital Command mode*
GGRR	Squawk Mode	3	5	Squawk mode*
GYGG	Position Upper Limit	11	6	Upper or lower position alert*
GYGG	Position Lower Limit	12		
GYGY	Soft Stop Upper Limit	9	7	Soft stop position reached*
GYGY	Soft Stop Lower Limit	10		
GRGG	Valve Cycles Warning	22	8	Travel or cycle limit reached*
GRGG	Valve Travel Warning	23		
GRGG	Spool Cycles Warning	50		
GRGG	Spool Travel Warning	51		
YGGY	Signature in Progress	5	9	Signature in progress
YGGR	Initializing	0	10	Initialization in progress
YGYG	Stroke Cal in Progress	24	11	Calibration in progress
YGYG	Command Loop Cal in Progress	25		
YGYG	Pressure Cal in Progress	26		
YGYG	Analog Output Cal in Progress	27		
YGYG	Setting Inner Loop Offset	28		
YGYY	Jog Command Mode	4	12	Local jog command mode
YGYR	Jog Calibration Set 100 Position	62	13	Jog cal waiting -> Set 100% pos.
YYGG	Temp. High Warning	32	14	Positioner temp. warning
YYGG	Temp. Low Warning	33		
YYGY	Port 1 Value Out of Range	43	15	Pressure out of range warning
YYGY	Port 2 Value Out of Range	44		
YYGY	Port 1 Range Too Small	45		
YYGY	Port 2 Range Too Small	46		
YYGR	Supply Pressure High Warning	41	16	Supply pressure high warning***
YYYG	Supply Pressure Low Warning	42	17	Supply pressure low warning***
YYYY	Actuation Ratio Warning	16	18	Actuation ratio warning***

Code	Meaning	Error Code	Sticker Line	Sticker Text
YRGG	Spool Sticking Warning	48	19	Pilot relay response warning*
YRRY	Electronic Inability to Fail Safe	39	23	Electronic fail safe warning
YRRR	Pneumatic Inability to Fail Safe	17	24	Pneumatic fail safe warning
YRGY	Friction Low Warning	19	20	Friction low warning*
YRGR	Pneumatic Leak Warning	47	21	Pneumatic leak warning***
YRYG	Friction High Warning	18	22	Friction high warning*
RGGY	Feedback Range Too Small	56	25	Feedback calibration range alarm
RGGY	Position Out of Range 0	57		
RGGY	Position Out of Range 100	58		
RGGR	Inner Loop Offset Time Out	61	26	Inner loop offset time out alarm
RGYG	Non Settle Time Out	60	27	Feedback non-settle time out alarm
RGYY	No Motion Time Out	59	28	Feeback no motion time out alarm**
RGRR	Factory Reset State	1	29	Factory reset state. Recalibrate
RYYG	Supply Pressure Low Alarm	40	30	Supply pressure low alarm***
RRGG	Spool Sticking Alarm	49	31	Pilot relay response alarm*
RRGY	Friction Low Alarm	21	32	Friction low alarm*
RRGR	Friction High Alarm	20	33	Friction high alarm*
RRYG	Piezo Voltage Error	35	34	Piezo voltage alarm***
RRYR	Hall Sensor Upper Position	52	35	Pilot relay position limit alarm**
RRYR	Hall Sensor Lower Position	53		
RRRY	Shunt Voltage Reference Error	34	36	Electronics Error alarm***
RRRY	Watch Dog Time Out	36		
RRRY	NV RAM Checksum Error	37		
RRRG	Loss of Inter PCB Comm	38	27	Loss of Board Communication***
RRRR	Position Deviation Alarm	8	38	Position deviation alarm*

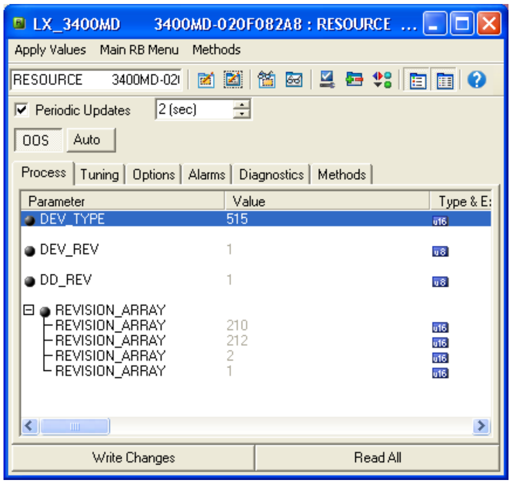
*User Set

**Check Supply

***Circuit Board Problem See IOM

7.10 Version Number Checking

1st Position: FF board firmware version number
2nd Position: Softing Stack version
3rd: Position: Major version of command board
4th: Position: Minor version of command board



.

Note: Position 1 and 2 are scaled by 100. This means that 210 translates to rev 2.10 etc.

7.11 475 Handheld Communicator

The Logix 3400MD Quick Start Guide is available from a Flowserve representative.

The Logix 3400MD digital positioner supports and is supported by the 475 Handheld Communicator. The Device Description (DD) files and the manuals listed below can be obtained from the FF Foundation or from your Flowserve representative. For more information please see the following guides:

- Product Manual for the 475 Communicator.

- Logix 3400MD Digital Positioner Reference Manual.

Diagnostic features such as the signature tests and ramp tests are performed internally. Certain calibration features such as actuator pressure sensor calibrations are performed using the 475 Handheld Communicator or using the Host software.

7.12 Device Description (DD) Files

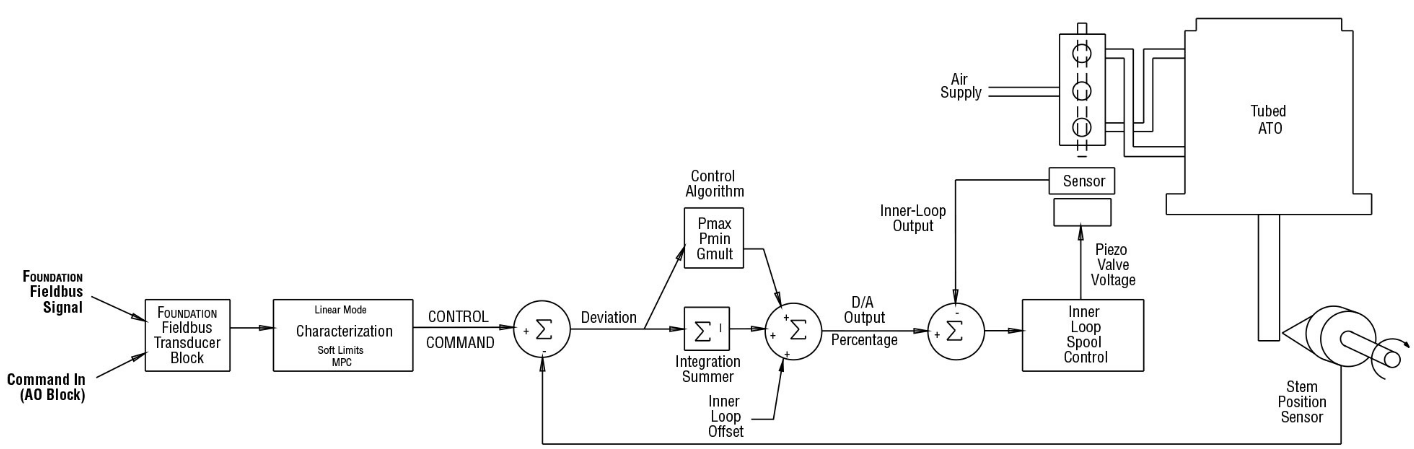
The DD files for the Logix 3400MD can be downloaded from the Flowserve website, http://www.valvesight.com, or the Foundation Fieldbus website, www.fieldbus.org

7.13 Calibration

7.13.1 CALIBRATE_FLAGS

Perform a stroke only calibration
Selecting this option will cause only a stroke calibration to happen

Figure 11: Logix 3400 Block Diagram



Automatically calibrate Actuator and Pressure sensors
Selecting this option will cause the 3400MD to perform all the calibrations needed for the full diagnostic functionality of the 3420MD Pro model. These include a stroke calibration, pressure sensor calibration, and an actuator/valve friction calibration.

7.13.2 Control and Tuning

Setting P + I Parameters
Using the Host configurator, you can set individual tuning parameters. A few key points are mentioned below. (See Figure 11.)

GAIN_UPPER, GAIN_LOWER, and GAIN_MULT: These three parameters are related by the following formula.

Proportional Gain =

Maximum Gain - | deviation | x Gain Multiplier

If Proportional Gain < Minimum Gain, then Proportional Gain = Minimum Gain

This algorithm allows for quicker response to smaller steps yet stable control for large steps. Setting the gain multiplier to zero and max gain = min gain results in a typical fixed proportional gain.

The higher the gain multiplier, the larger the required deviation before the gain increases. Default values upon initiating a RESET to factory defaults (under LOAD_EE_DEFAULTS) are maximum gain = 2.0, minimum gain= 1.0, and gain multiplier= 0.05. These values will allow stable control on all Valtek control product actuator sizes.

Integral Gain (IGAIN): The integral gain is primarily for deviations due to temperature drift within the inner loop spool control. The factory default value is 10. Although higher numbers can speed the time it takes to reach zero deviation, it can add overshoot if too large. It is recommended that maximum and minimum gains be adjusted while leaving integral gain fixed at 10. Integration is disabled below a stem position of 3 percent and above a stem position of 97 percent. This is to prevent integration windup from calibration shifts due to lower pressure or a damaged seat that may prevent fully closing the valve.

Integration Summer: The integral summer within the Logix 3400MD digital positioner is clamped at +20 percent and -20 percent. If the integration summer is fixed at +20 percent or -20 percent, it usually indicates a control problem. Some reasons for a clamped integration summer are listed below:

- Stroke calibration incorrect.
- Any failure which prevents stem position movement: stuck spool, handwheel override, low pressure.
- Incorrect inner loop offset.
- Loss of air supply on a fail in place actuator.

Writing a zero to integral gain (IGAIN) will clear the integral summer. The integral gain can then be returned to its original value.

Inner loop offset (IL_OFFSET): Three control numbers are summed to drive the inner loop spool position control: proportional gain, integral summer, and inner-loop offset.

Inner-loop offset is the parameter that holds the spool in the ‘null’ or ‘balance’ position with a control deviation of zero. This value is written by the positioner during stroke calibration and is a function of the mechanical and electrical spool sensing tolerances. However, if it becomes necessary to replace the driver module assembly or the software RESET calibration constants has been performed, it may be necessary to adjust this value. The method below should be used to adjust inner-loop offset.

Or simply perform a new stroke calibration.

From the fieldbus configurator:

- Set transducer block to OOS
  - Enable Diagnostic Variable access in TEST_MODE
  - Send a 50 percent command.
  - Set integral to zero.
  - Locate the DAC_PERCENT
  - Write this percentage value to IL_OFFSET
  - Write original value to Integral

These tuning sets can be used to obtain initial values for Flowserve products and comparable actuator sizes. The user may need to adjust this tuning to achieve optimal performance for a particular application.

Table VIII: Factory Tuning Sets

Mfg.	Tuning Set	GAIN_ LOWER	GAIN_ UPPER	GAIN_ MULT	Igain	Comparable Size (in²)
Valtek	VFactory_A	1.0	2.0	0.05	10	25
	VFactory_B	1.0	2.5	0.05	10	50
	VFactory_C	2.0	3.0	0.05	10	100
	VFactory_D	4.0	5.0	0.05	10	200
	VFactory_E	4.0	7.0	0.05	10	300
	Trooper 48	0.4	0.5	0.05	25	31
	Trooper 49	3.0	4.0	0.05	10	77.5
Kammer	Trooper 48	0.4	0.5	0.05	25	31
	Trooper 49	3.0	4.0	0.05	10	77.5
Automax	R1	0.3	0.5	0.05	10	3 to 5
	R2	1.0	1.5	0.05	10	9 to 12
	R3	1.3	2.0	0.05	10	16 to 19
	R4	2.0	2.5	0.05	10	27 to 37
	R5	2.5	3.6	0.05	10	48 to 75
	R6	4.0	5.0	0.05	10	109

7.14 Alerts

7.14.1 FINAL_VALUE_CUTOFF

The FINAL_VALUE_CUTOFF or tight shutoff feature of the Logix3400MD digital positioner allows the user to control the level at which the command signal causes full actuator saturation in the closed or open position.

This feature can be used to guarantee actuator saturation in the closed or open position or prevent throttling around the seat at small command signal levels. To enable, use configuration to apply the desired FINAL_VALUE_CUTOFF threshold.

NOTE: The positioner automatically adds a 1 percent hysteresis value to the FINAL_VALUE_CUTOFF_LO setting to prevent jumping in and out of saturation when the command is close to the setting.

7.14.2 Effects of FINAL_VALUE_CUTOFF on Operation

With the FINAL_VALUE_CUTOFF_LO set at 5 percent the positioner will operate as follows: Assume that the present command signal is at 50 percent. If the command signal is decreased, the positioner will follow the command until it reaches 5 percent.

At 5 percent, full actuator saturation will occur. The actuator will maintain full saturation below 5 percent command signal. Now, as the command increases, the positioner will remain saturated until the command reaches 6 percent (remember the 1 percent hysteresis value added by the positioner). At this point, the stem position will follow the command signal.

If the FINAL_VALUE_CUTOFF_LO is set to 3 percent but the valve will not go below 10 percent, STOP_LO_POS may be enabled. The lower soft limit must be less than or equal to 0 percent in order for the FINAL_VALUE_CUTOFF_LO to become active.

If soft stops are active (ie: STOP_LO_POS = 0 or STOP_HI_POS = 100) FINAL_VALUE_CUTOFF is disabled.

7.14.3 Soft Limits

Unlike position alerts, soft limits prevent the stem position from going below or above the configured limits. If the command signal is trying to drive the position past one of the limits, the yellow LED will blink but the stem position will remain at the set limit.

7.14.4 Travel Accumulator

The travel accumulator is equivalent to a car odometer and sums the total valve movement. Using the user defined stroke length and travel dead-band, the Logix 3400MD digital positioner keeps a running total of valve movement. When the positioner first powers up, high and low dead-band limits are calculated around the present position. When the stem position exceeds the travel dead-band, the movement from the center of the deadband region to the new position is calculated and added to the travel accumulator. From this new position, deadband high and low limits are again calculated.

Example: The Logix 3400MD digital positioner has a default dead- band configuration of 20 percent. The valve has a 4 inch linear stroke. When the valve first powers up, the command signal is 50 percent. The unit will calculate a high travel threshold of 70 percent (50 percent present position plus 20 percent dead-band) and a low travel threshold of 30 percent (50 percent present position minus 20 percent dead-band). As long as the stem position remains greater than 30 percent and less than 70 percent, no additions are made to the travel accumulator. Now, assume the stem position moves to 80 percent that is outside the present dead-band. The Logix 3400MD digital positioner calculates the stem movement and adds this number to the travel accumulator.

80 percent (present position) - 50 percent (previous) =
30 percent movement x 4-inch stroke = 1.2 inches

So, 1.2 inches is added to the travel accumulator. New dead-band thresholds of 100 percent (80 percent present position plus 20 percent dead-band) and 60 percent (80 percent present position minus 20 percent dead-band) are calculated. This process continues as the stem position moves throughout its stroke range.

7.14.5 Cycle Counter

The cycle counter is another means of monitoring valve travel. Unlike the travel accumulator, the stem position must do two things to count as a cycle: exceed the cycle counter dead-band and change direction. A cycle counter limit can also be written into the positioner. If this limit is exceeded, the yellow LED will blink.

7.14.6 Position Deviation

If the stem position differs from the control command by a certain amount for a given length of time, the yellow LED will blink to signify excess deviation. The trip point and settling times are set from the transducer function block.

7.14.7 Advanced and Features

NOTE: These features can be activated for full diagnostic functionality of the system. These are contained in the transducer blocks. Refer to the Installation and Reference Manual for a more detailed explanation.

7.14.8 Standard vs. Advanced Diagnostics

Advanced diagnostics models add top, bottom, and supply pressure sensors. This allows for diagnostic functionalities such as loss of pressure, advanced signatures, etc. Pro diagnostics adds the full compliment of diagnostic features offered by the Logix 3400MD.

7.14.9 Temperature and Pressure Units

The desired temperature and pressure units can be set during configu- ration. Once set, all readings will be displayed in the desired units.

7.14.10 Stroke Length

Stroke length is used by the travel accumulator. When the stroke length and units are set, the length is used to determine the total travel accumulated. The travel accumulator will have the units associated with stroke.

EXAMPLE: Stroke length is set to four inches. If the valve is moved from 0 percent to 100 percent, four inches will be added to the travel accumulator. The travel accumulator units will be inches. If Stroke length is 90 degrees for a rotary, the travel accumulator will now have units of degree. A 0 percent to 100 percent stroke will add 90 to the travel accumulator.

NOTE: Stroke length is for information only and is not used during calibration.

Table IX: Transducer Block Characterization Parameters

Parameter	Description	Value - Meaning	Comments
MODE_BLK	The operating mode of the transducer block	Auto - Auto (target mode)	The transducer block must be out of service before characterization can be edited or changed
		OOS - Out of Service	
CURVE_ SELECT	Selects the characterization curve type when the DIP switch is set to 'Other'. This parameter is inactive when the DIP switch is selected to 'Linear'.	0 - Equal Percent	Sets the charac- terization to equal percent mode.
		1 - Quick Open	Sets the character- ization to quick open mode.
		2 - Custom	Sets the character- ization to use the curve fit param- eters CURVEX and CURVEY.
USER_ INTERFACE_ ACTIVE	Software version of the physical DIP switches. The parameters can be changed either in the parameter or at the device via the DIP switches.	1 - Air Action 2 - Characterization Linear 3 - Rotary Actuator Gain	Select 1=ATO or 0=ATC Select 1=Linear or 0=Other Three bits of the prameter reflect the value selected on the Rotary Actuator Gan switch as follows: A=111, B=011, C=101, D=001 E=110, F=010, G=100, H=000
CURVEX	Numeric X value array for custom point. (1 x 21 array points)	X-axis value for custom stroke characterization point. Range –10 to 110	Pair each X-value with corresponding Y-value to define the desired point. Values must be in ascending (or equal) order.
CURVEY	Numeric Y value array for custom point. (1 x 21 array points)	Y-axis value for custom stroke characterization point. Range –10 to 110	

7.15 Characterization Retention

Once a custom curve has been loaded into the Logix 3400MD digital positioner's memory it is retained in the EPROM until it is either edited or replaced. Turning Custom Characterization Active on or off now selects between a linear response (off), or the new custom curve (on). If either of the other two factory curves is selected it will overwrite the custom curve in RAM only. The custom user-defined curve will automatically be activated again when the factory curve is deselected.

7.15.1 Initiating a Valve Signature

A feature of the Logix 3400MD positioner is the ability to capture and store a valve diagnostic signature. A signature is the collected data response of the valve to a predefined set of operating conditions. This stored data can later be uploaded to the host system for analysis of potential problems. By comparing a baseline signature, when the valve is new, to subsequent signatures at later times, a rate of change can be tracked which can help predict possible faults in the valve before they happen. This is called 'predictive maintenance'. It is important to note that the purpose of the positioner is to act as the data acquisition device for the signature. Analysis of the data is not done on the device, but in the supervisory system.

NOTE: Signature data is lost if the positioner is reset or if the power is cycled

7.15.2 System Preparation

WARNING: By definition, the collection of the signature requires the unmanaged operation of the positioner. Therefore, the process must be in a safe operating mode where unexpected movement of the valve will not cause a hazardous condition.

Before a valve signature can be run, the Transducer Block must Out-of- Service (OOS).

7.15.3 Signature Procedure

The following steps are an example of how to initiate a ramp signature capture.

1. Make sure the process is in safe condition and notify the control room that the valve will temporarily be taken off-line.
2. Verify preparedness to proceed.
3. Put the Transducer block MODE_BLK OOS
4. Set SIG_START to desired value.
5. Set SIG_STOP to desired value.
6. Set SAMPLE_TIME to desired value (typically 0.3).
7. Set SIG_RATE to desired value (typically 20).
8. In SIG_FLAGS select; RUN_RAMP.
9. In SIG_FLAGS, select RUN/BEGIN_SIG.
10. Write values to the Logix 3400MD digital positioner.
11. The valve will stroke to the beginning position, as defined by SIG_START and will begin ramping to the desired ending position, as defined by SIG_STOP.

    Notice that the valve will move and FINAL_POSITION_VALUE will change.
12. SIG_FLAGS indicates SIG COMPLETE.
13. Return the MODE_BLK to auto.
14. Notify control room the valve is back on-line. The stored signature will remain in the Logix 3400MD digital positioner RAM until the either the unit is powered down, or another signature is taken which overwrites the previous one.

7.16 Step Signature

If a step signature was desired, simply do not select STEP_RAMP in SIG_FLAGS, and then set the SIG_HOLD prior to selecting RUN/ BEGIN_SIG.

NOTE: SIG_RATE has no effect on Step Signature.

7.16.1 Collection of Stored Signature

The collection of the stored signature is accomplished by the host system. It is not part of the device. See host system programming. A simple utility using National Instruments NI-FBUS is available from Flowserve for retrieving a signature file.

The parameters SIG_DATA1 – SIG_DATA26 can be populated with the full signature data by writing a non-zero value to the SIG_INDEX parameter.

The retrieved file is stored in a text format that can be imported into other programs for plotting and analysis. Contact Flowserve for more details.

7.17 Glossary

A/D Also called ADC. Analog-to-digital converter. An A/D converts an analog signal into an integer count. This integer count is then used by the microcontroller to process sensor information such as position, pressure, and temperature.

D/A Also called DAC. Digital-to-analog converter. A D/A converts an integer count into an analog output signal. The D/A is used to take a number from the microcontroller and command an external device such as a pressure modulator.

DTM (Device Type Manager) Provides a GUI interface for the user to easily view and analyze the status of the valve and positioner.

EEPROM (Electrically Erasable Programmable Read Only Memory) A device that retains data even when power is lost. Electrically erasable means that data can be changed. EEPROM have a limited number of times data can be rewritten (typically 100,000 to 1,000,000 writes).

Micro-controller In addition to an integral CPU (microprocessor), the micro-controller has built in memory and I/O functions such as A/D and D/A. Microprocessor Semiconductor device capable of performing calculations, data transfer, and logic decisions. Also referred to as CPU (Central Processing Unit).

Protocol A set of rules governing how communications messages are sent and received.

Resolution Resolution is a number which indicates the smallest measurement which can be made. You will often see analog-to-digital (A/D) converters referred to as a 10-bit A/D or a 12-bit A/D. 10-bit and 12-bit are terms which indicate the total number of integer counts which can be used to measure a sensor or other input. To determine the total integer count, raise 2 to the power of the number of bits.

Example: 12-bit A/D

Total integer number = 2

Number of Bits = 212= 4096

Resolution is the measurement range divided by the maximum integer number. Example: A valve has a 2-inch stroke and a 12-bit A/D is used to measure position. Resolution = Stroke/(Maximum Integer for 12-bit) = 2 inch/4096 = 0.000488 inches Sampling Taking readings at periodic time intervals.

Serial Channel Channel that carries serial transmission. Serial transmission is a method of sending information from one device to another. One bit is sent after another in a single stream.

7.18 Transducer Block Parameters

Table X: Transducer Block Parameters

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
Fieldbus Standard Parameters									
0	BLK_DATA	ALL	RECORD	N/A	N/A	N/A	N/A	SRW	Foundation Fieldbus Defined Parameter
1	ST_REV	ALL	UNSIGNED 16	N/A	N/A	N/A	N/A	SR	Foundation Fieldbus Defined Parameter
2	TAG_DESC	ALL	OCTET_ STRING	N/A	N/A	N/A	N/A	SRW	Foundation Fieldbus Defined Parameter
3	STRATEGY	ALL	UNSIGNED 16	N/A	N/A	N/A	N/A	SRW	Foundation Fieldbus Defined Parameter
4	ALERT_KEY	ALL	UNSIGNED 8	N/A	N/A	N/A	N/A	SRW	Foundation Fieldbus Defined Parameter
5	MODE_BLK	ALL	RECORD	N/A	N/A	N/A	N/A	SRW	Foundation Fieldbus Defined Parameter
6	BLOCK_ERR	ALL	BIT_STRING	N/A	N/A	N/A	N/A	R	Foundation Fieldbus Defined Parameter
7	UPDATE_EVT	ALL	RECORD	N/A	N/A	N/A	N/A	RW	Foundation Fieldbus Defined Parameter
8	BLOCK_ALM	ALL	RECORD	N/A	N/A	N/A	N/A	RW	Foundation Fieldbus Defined Parameter
9	TRANSDUCER_ DIRECTORY	ALL	ARRAY	N/A	N/A	N/A	N/A	NR	Foundation Fieldbus Defined Parameter
10	TRANSDUCER_TYPE	ALL	UNSIGNED 16	N/A	N/A	N/A	N/A	NR	Foundation Fieldbus Defined Parameter
11	XD_ERROR	ALL	UNSIGNED 8	N/A	N/A	N/A	N/A	R	Foundation Fieldbus Defined Parameter
12	COLLECTION_ DIRECTORY	ALL	ARRAY	N/A	N/A	N/A	N/A	NR	Foundation Fieldbus Defined Parameter
Control: Position Control Parameters									
13	FINAL_VALUE	XDTB_MAIN	FLOAT_S	3	S_INT	/100	CM_Digital	NRW	Command Input, Remote Digital Control, %
14	WORKING_SP	XDTB_MAIN	FLOAT	7	S_INT	/100	CM_Pct_Target	RW	Command Input, Actual Target, %
15	FINAL_POSITION VALUE	XDTB_MAIN	FLOAT_S	10	S_INT	/100	FB_Pct	NR	Control, FB, Valve Stem Position, %
20	DEVIATION_VALUE	XDTB_MAIN	FLOAT	12	S_INT	/100	Dev_Instant	R	Control, FB, Valve Stem Deviation, %
23	DEVIATION_EFFORT	XDTB_TECH	FLOAT	14	S_INT	/100	Dev_Sum	R	Control, DAC %, Deviation Term
24	PRESS_CTRL_ EFFORT	XDTB_TECH	FLOAT	15	S_INT	/100	PS_Sum	R	Control, DAC %, Pressure Control Term
25	INTEGRAL_EFFORT	XDTB_TECH	FLOAT	16	S_INT	/100	Integral_Sum	R	Control, DAC %, Integral Term
26	SPOOL_OFFSET	XDTB_TECH	FLOAT	17	S_INT	/100	IL_Offset	RW	Calibration, DAC %, ILO Value @ 50%
27	SPOOL_COMMAND	XDTB_TECH	FLOAT	18	S_INT	/100	IL_Cmd	RW	Control, DAC %, Total Effort

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
28	BACKOFF_EFFORT	XDTB_TECH	FLOAT	20	S_LONG	NO	Hall_Sum	R	Status, memory Backoff, Control Term Value
29	SPOOL_POSITION	XDTB_TECH	FLOAT	21	S_INT	/100	Hall_Pct	R	Status, Memory Backoff, Relay Instant Position
30	SPOOL_EFFORT	XDTB_TECH	FLOAT	22	S_INT	/100	reserved for spool effort	R	Status, Memory Backoff, Relay Instant Position
31	PIEZO_OFFSET	XDTB_TECH	FLOAT	24	S_INT	/100	Pzv_Null	R	Status, Piezo, Output Percent @ Null
32	PEIZO_COMMAND	XDTB_TECH	FLOAT	25	S_INT	/100	Pzv_Cmd	R	Status, Piezo, Output Voltage in Percent
21	PRESSURE_SUPPLY	XDTB_MAIN	FLOAT	27	U_LONG	/100	PS_Supply_Press	R	Supply Pressure in User Units (Only active in Advanced or Pro Models)
22	PRESSURE_PORT_A	XDTB_MAIN	FLOAT	28	S_INT	/100	PS1_Pct	R	Port A Pressure in User Units (Only active in Advanced or Pro Models)
23	PRESSURE_PORT_B	XDTB_MAIN	FLOAT	29	S_INT	/100	PS2_pct	R	Port B Pressure in User Units (Only Active in Advanced or Pro Models)
79	PRESSURE_ DIFFERENTIAL	XDTB_MD	FLOAT	30	S_INT	/100	PS_Delta_Pct	R	Status, Pressure, Delta, Port 1-Port 2
101	FINAL_VALUE_ RANGE	XDTB_MAIN	RECORD	N/A	N/A	N/A	N/A	SRW	Used to limit the command position received from the AO block. FB Only Parameter.
Control: Configuration & Gain Parameters									
107	CONTROL_CONFIG	XDTB_MAIN	BIT_STRING	38	U_CHAR	NO	Control_Config	NRW	Setup, Valve Configuration (Std/Adv, DA/SA, etc.)
87	CURVE_SELECT	XDTB_TECH	UNSIGNED 8	39	U_CHAR	NO	Curve_Select	SRW	Select Characterization type when the Characterization DIP switch is set to 'Other'
28	P_GAIN	XDTB_MAIN	FLOAT	40	S_INT	/100	PGain_Max	SRW	Setup, Gain Proportional, Maximum
35	P_GAIN_EFFECTIVE	XDTB_TECH	FLOAT	41	S_INT	/100	Pgain_Instant	R	Control, Gain, Proportional, Instantaneous
36	P_GAIN_MULT	XDTB_TECH	FLOAT	42	S_INT	/1000	PGain_Mult	SRW	Setup, Gain, Proportional, Multiplier
29	I_GAIN	XDTB_MAIN	INTEGER 16	44	S_INT	NO	IGAIN	SRW	Setup, Gain, Integral
30	D_GAIN	XDTB_MAIN	UNSIGNED 16	46	U_INT	NO	DT_Gain_Max	SRW	Setup, Gain, Derivitive, Basic
37	D_GAIN_EFFECTIVE	XDTB_TECH	UNSIGNED 16	47	U_INT	NO	DT_Gain_Cur	R	Status, Gain, Derivitive, Instantaneous
38	D_GAIN_FILTER	XDTB_TECH	UNSIGNED 16	48	S_INT	NO	DT_Depth	SRW	Setup, Gain, Derivitive, Depth
31	PRESS_CTRL_ GAIN_MAX	XDTB_MAIN	FLOAT	50	S_INT	/10	PS_Gain_Max	SRW	Setup, Pressure Control, Gain, Basic
39	PRESS_CTRL_ GAIN_EFFECTIVE	XDTB_TECH	FLOAT	51	S_INT	/10	PS_Gain_Cur	R	Status, Pressure Control, Gain, Instantaneous
40	PRESS_CTRL_ GAIN_MULT	XDTB_TECH	FLOAT	52	S_INT	/100	PS_Mult	SRW	Setup, Pressure Control, Gain, Multiplier
41	PRESS_CTRL_SP	XDTB_TACH	FLOAT	53	S_INT	NO	PS_Target	SRW	Status Pressure Control, Target Differential

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
32	PRESS_CTRL_ WINDOW	XDTB_MAIN	FLOAT	54	S_INT	/100	PS_Window	SRW	Setup, Pressure Control, Window Size
33	FINAL_VALUE_ CUTOFF_HI	XDTB_MAIN	FLOAT	59	S_INT	/100	MAXcutoff	SRW	Setup, MPC, Tight Shutoff Threshold, Open
34	FINAL_VALUE_ CUTOFF_LO	XDTB_MAIN	FLOAT	60	S_INT	/100	MINcutoff	SRW	Setup, MPC, Tight Shutoff Threshold, Closed
42	FINAL_VALUE_ CUTOFF_ HYSTERESIS	XDTB_TECH	FLOAT	61	S_INT	/100	MPChyst	SRW	Setup, MPC, Tight Shutoff Hysteresis
35	STOP_HI_POS	XDTB_MAIN	FLOAT	62	S_INT	/100	SoftStopHigh	SRW	Setup, Soft Stop Limit, Upper
36	STOP_LO_POS	XDTB_MAIN	FLOAT	63	S_INT	/100	SoftStopLow	SRW	Setup, Soft Stop Limit, Lower
37	STROKE_TIME_ OPEN_LIM	XDTB_MAIN	FLOAT_S	64	U_INT	NO	StrokeOpenTime	NRW	Setup, Stroke Delay Time, Opening
38	STROKE_TIME_ CLOSE_LIM	XDTB_MAIN	FLOAT_S	65	U_INT	NO	StrokeCloseTime	NRW	Setup, Stroke Delay Time, Closing
43	CURVE_X	XDTB_TECH	FLOAT	66	S_INT	/100	CURVEx [1-11]	SRW	Setup, SW Characterization, X-Axis, Points 1-11
43	CURVE_X	XDTB_TECH	FLOAT	67	S_INT	/100	CURVEx [12-21]	SRW	Setup, SW Characterization, X-Axis, Points 12-21
44	CURVE_Y	XDTB_TECH	FLOAT	68	S_INT	/100	CURVEy [1-11]	SRW	Setup, SW Characterization, Y-Axis, Points 1-11
44	CURVE_Y	XDTB_TECH	FLOAT	69	S_INT	/100	CURVEy [12-21]	SRW	Setup, SW Characterization, Y-Axis, Points 12-21
Control: Calibration Parameters									
25	CALIBRATE	XDTB_MAIN	UNSIGNED 8	33	U_CHAR	NO	Cal_State	RW	Test, Calibration, Mode Setting
45	STROKE_TIME_CAL	XDTB_TECH	FLOAT	70	U_INT	/100	StrokeTime	R	Calibration, Measured Stroke Time
46	STROKE_TIME_ DOWN	XDTB_TECH	FLOAT	71	U_INT	/100	StrokeTimeDn	R	Calibration, Measured Stroke Time
47	STROKE_TIME_UP	XDTB_TECH	FLOAT	72	U_INT	/100	StrokeTimeUp	R	Calibration, Measured Stroke Time
48	HALL_DOWN	XDTB_TECH	UNSIGNED 16	75	U_INT	NO	Hall_Down	SRW	Calibration, Hall Sensor, A/D Counts, Down Position
49	HALL_UP	XDTB_TECH	UNSIGNED 16	76	U_INT	NO	Hall_Up	SRW	Calibration, Hall Sensor, A/D Counts, Up Position
50	HALL_RANGE	XDTB_TECH	UNSIGNED 16	77	U_INT	NO	Hall_Range	SRW	Calibration, FB, Valve Stem, A/D Counts, Range
51	HALL_AD_cOUNT	XDTB_TECH	UNSIGNED 16	78	AD_REG	NO	Hall_Instant	R	Status, Hall Sensor, A/D Counts, Instantaneous
52	HALL_NULL_PCT	XDTB_TECH	UNSIGNED 16	79	S_INT	NO	Hall_Null	SRW	Calibration, Hall Sensor, A/D Counts, Null Position
53	FB_ZERO	XDTB_TECH	UNSIGNED 16	80	U_INT	NO	FB_Zero	SRW	Caliberation, FB, Valve Stem, A/D Counts, @Zero%

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
54	HOURS_SINCE_RESET	XDTB_MAIN	FLOAT	138	U_LONG	/10	Reset_Hours	R	Status, System, Time Elapsed, Mem Reset
55	HOURS_LIFETIME	XDTB_MAIN	FLOAT	139	U_LONG	/10	Lifetime_Hours	R	Status, System, Time Elapsed, Lifetime
86	ERROR_HIST	XDTB_TECH	ARRAY	140	U_CHAR	NO	ErrorHist [16]	R	History of the last error/blink codes
Signature Parameters									
56	SIG_START	XDTB_MAIN	FLOAT	142	S_INT	/100	SIGstart	NRW	Config, Signature, Starting Command in %
57	SIG_STOP	XDTB_MAIN	FLOAT	143	S_INT	/100	SIGstop	NRW	Config, Signature, Stopping Command in %
58	SIG_RATE	XDTB_MAIN	FLOAT	144	U_INT	/100	SIGtime	NRW	Time that a Signature takes to complete a ramp cycle
59	SIG_HOLD	XDTB_MAIN	FLOAT	145	U_INT	/100	SIGhold	NRW	Time to continue to log signature data after reaching SIG_STOP
61	SIG_FLAGS	XDTB_MAIN	BIT_STRING	146	U_CHAR	NO	SIGflags	NRW	Signture status and command flags
60	SIG_INDEX	XDTB_MAIN	UNSIGNED 16	147	U_INT	NO	ReadSigIndex	NRW	Index into the Signature Data Array
88-113	SIG_DATAn	XDTB_TECH	ARRAY	148	S_INT [24]	/100	SigData	R	Signature Data Array
System Setup & Special Diagnostics Parameters									
33	USER_INTERFACE_ INSTANT	XDTB_TECH	BIT_STRING	36	U_INT	NO	UI_Instant	R	Curent hardware DIP switch and GAIN control seetings - not applied to control algorythms.
34	USER_INTERFACE_ ACTIVE	XDTB_TECH	BIT_STRING	37	U_INT	NO	UI_Saved	RW	Setup button and DIP switch setting currently applied to control algorythms
24	TEST_MODE	XDTB_MAIN	BIT_STRING	32	U_CHAR	NO	control_ disable_flg	RW	Turns on and off spceial diagnostic capabilities
62	TRAVEL_ACCUM_UNITS	XDTB_MAIN	UNSIGNED 8	150	U_CHAR	NO	TravelUnits	SRW	Setup, Units, Travel Distance
63	PRESSURE_UNITS	XDTB_MAIN	UNSIGNED 8	151	U_CHAR	NO	PressUnits	SRW	Setup, Units, Pressure
64	INTERNAL_TEMP_UNITS	XDTB_MAIN	UNSIGNED 8	152	U_CHAR	NO	TempUnits	SRW	Setup, Units, Temperature
65	XD_FSTATE_OPT	XDTB_MAIN	UNSIGNED 8	153	U_CHAR	NO	Fail_mode	SRW	
66	ELECTRONICS_SN	XDTB_MAIN	VISIBLE_ STRING	155	U_CHAR	NO	ESN [8]	NR	Electronics Serial Number, used for initial PD tag
67	SOFTWARE_VER_MAJOR	XDTB_MAIN	UNSIGNED 16	156	U_INT	NO	ESR_Major	NR	Software Revision Major
68	SOFTWARE_VER_MINOR	XDTB_MAIN	UNSIGNED 16	157	U_INT	NO	ESR_Minor	NR	Software Revision Minor
69	SOFTWARE_DATE_CODE	XDTB_MAIN	VISIBLE_ STRING	158	STRING	NO	ESR_Build [6]	SRW	Embedded Software Revision Date Stamp
73	FB_POSITION_FILTER	XDTB_TECH	UNSIGNED 16	162	U_INT	NO	FB_Depth	SRW	Setup, Dampening, Position, Depth
75	LOAD_EE_DEFAULTS	XDTB_TECH	UNSIGNED 8	173	U_CHAR	NO	EEmode	RW	Test, FRAM, Mode Setting
System Setup & Special Diagnostc Fieldbus Only Parameters									

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
109	MAIN_BLOCK_TEST	XDTB_MAIN	ARRAY	N/A	N/A	N/A	N/A	R	Diagnostic Use Only
111	MAIN_EXEC_DELAY	XDTB_MAIN	UNSIGNED 16	N/A	N/A	N/A	N/A	SRW	Diagnostic Use Only
80	MD_BLOCK_TEST	XDTB_MD	ARRAY	N/A	N/A	N/A	N/A	R	Diagnostic Use Only
81	MD_EXEC_DELAY	XDTB_MD	UNSIGNED 16	N/A	N/A	N/A	N/A	SRW	Diagnostic Use Only
83-91	TREND_DATA_n	XDTB_MD	ARRAY	N/A	N/A	N/A	N/A	R	Trend Data
75	NVRAM_WRITE_CYCLES	XDTB_TECH	UNSIGNED 32	N/A	N/A	N/A	N/A	NR	Number of cycles that NVRAM has been written to
76	GENERIC_PARAMETER	XDTB_TECH	GENERIC_S	N/A	N/A	N/A	N/A	RW	Used for reading and writing data to control board registers
77	SPI_TEST_RCV	XDTB_TECH	ARRAY	N/A	N/A	N/A	N/A	R	Diagnostic Use Only
78	SPI_TEST_TX	XDTB_TECH	ARRAY	N/A	N/A	N/A	N/A	R	Diagnostic Use Only
79	TECH_BLOCK_TEST	XDTB_TECH	ARRAY	N/A	N/A	N/A	N/A	R	Diagnostic Use Only
80	TECH_EXEC_DELAY	XDTB_TECH	UNSIGNED 16	N/A	N/A	N/A	N/A	SRW	Diagnostic Use Only
81	LX_SPI_STATUS_FLAGS	XDTB_TECH	BIT_STRING	N/A	N/A	N/A	N/A	NR	Status of Fieldbus SPI communications with controller board
82	SUPPLY_PRESSURE_PCT	XDTB_TECH	FLOAT	N/A	N/A	N/A	N/A	R	Supply Pressure in Percent (Only active in Advanced or Pro Models)
83	PORT_A_PRESSURE_PCT	XDTB_TECH	FLOAT	N/A	N/A	N/A	N/A	R	Port A Pressure in Percent (Only active in Advanced or Pro Models)
84	PORT_B_PRESSURE_PCT	XDTB_TECH	FLOAT	N/A	N/A	N/A	N/A	R	Port B Pressure in Percent (Only active in Advanced or Pro Models)
User Information Parameters									
95	ACT_AREA	XDTB_MAIN	FLOAT	209	U_INT	/10	ACTarea	NRW	Actuator Area
70	VALVE_MAN_ID	XDTB_MAIN	UNSIGNED 8	210	U_CHAR	NO	VALVEman	NRW	User Info, Valve, Manufacturer
72	VALVE_TYPE	XDTB_MAIN	UNSIGNED 8	211	U_CHAR	NO	VALVEtype	NRW	User Info, Valve, Type
73	VALVE_SIZE	XDTB_MAIN	UNSIGNED 8	212	U_CHAR	NO	VALVEsize	NRW	User Info, Valve, Size
74	VALVE_CLASS	XDTB_MAIN	UNSIGNED 8	213	U_CHAR	NO	VALVEclass	NRW	User Info, Valve, Pressure Class Rating
75	VALVE_ENDCON	XDTB_MAIN	UNSIGNED 8	214	U_CHAR	NO	VALVEendcon	NRW	User Info, Valve, End Connection
76	VALVE_BODYMAT	XDTB_MAIN	UNSIGNED 8	215	U_CHAR	NO	VALVEbodymat	NRW	User Info, Valve, Body Material
77	VALVE_PACKTYPE	XDTB_MAIN	UNSIGNED 8	216	U_CHAR	NO	VALVEpacktype	NRW	User Info, Valve, Packing Type
78	LEAK_CLASS	XDTB_MAIN	UNSIGNED 8	217	U_CHAR	NO	LEAKclass	NRW	User Info, Valve, Shutoff Leakage Class
79	VALVE_FLAGES	XDTB_MAIN	UNSIGNED 8	218	U_CHAR	NO	VALVEflags	NRW	User Info, Valve, Configuration (Flow Direction)
80	VALVE_TRIMMAT	XDTB_MAIN	UNSIGNED 8	219	U_CHAR	NO	VALVEtrimmat	NRW	User Info, Vlave, Trim Material
81	VALVE_TRIMCHAR	XDTB_MAIN	UNSIGNED 8	220	U_CHAR	NO	VALVEtrimchar	NRW	User Info, Valve, Trim Characteristic
82	VALVE_TRIMTYPE	XDTB_MAIN	UNSIGNED 8	221	U_CHAR	NO	VALVEtrimtype	NRW	User Info, Valve, Trim Type

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner Register	Type	Fix Pt Rd	Variable Name	R/W	Description
83	VALVE TRIMNO	XDTB_MAIN	UNSIGNED 8	222	U_CHAR	NO	VALVEtrimno	NRW	User Info, Valve, Trim Diameter
84	VALVE SN	XDTB_MAIN	VISIBLE_ STRING	223	STRING	NO	VALVEsn	NRW	User Info, Valve, Serial Number
85	STEM DIAM	XDTB_MAIN	FLOAT	224	FLOAT	NO	STEMdiam	NRW	User Info, Valve, Stem/Shaft Diameter
86	RATED TRAVEL	XDTB_MAIN	FLOAT	225	FLOAT	NO	RATEDtrav	NRW	User Info, Valve, Rated Travel
87	INLET PRESS	XDTB_MAIN	FLOAT	226	FLOAT	NO	INLETpress	NRW	User Info, Valve, Upstream Pressure
88	OUTLET PRESS	XDTB_MAIN	FLOAT	227	FLOAT	NO	OUTLETpress	NRW	User Info, Valve, Downstream Pressure
89	ACT_MAN_ID	XDTB_MAIN	UNSIGNED 8	228	U_CHAR	NO	ACTman	NRW	User Info, Actuator, Manufacturer
90	ACT_FAIL_ACTION	XDTB_MAIN	UNSIGNED 8	N/A	N/A	N/A	N/A	NRW	For Future Use
91	ACT_MODEL_NUM	XDTB_MAIN	VISIBLE_ STRING	N/A	N/A	N/A	N/A	NRW	For Future Use
92	ACT_SN	XDTB_MAIN	VISIBLE_ STRING	231	U_CHAR	NO	ACTsn	NRW	User Info, Actuator Serial Number
93	ACT_TYPE	XDTB_MAIN	UNSIGNED 8	232	U_CHAR	NO	ACTtype	NRW	User Info, Actuator, Type
94	ACT_SIZE	XDTB_MAIN	UNSIGNED 8	233	U_CHAR	NO	ACTsize	NRW	User Info, Actuator, Size
95	ACT_AREA	XDTB_MAIN	FLOAT	209	U_INT	/10	ACTarea	NRW	Actuator Area
96	SPRING_TYPE	XDTB_MAIN	UNSIGNED 8	234	U_CHAR	NO	SPRINGtype	NRW	User Info, Actuator, Spring Type: single, dual, etc.
97	PO_DATE	XDTB_MAIN	VISIBLE_ STRING	235	STRING	NO	PO_dta	NRW	User Info, Purchase Order Date
98	INSTALL_DATE	XDTB_MAIN	VISIBLE_ STRING	236	STRING	NO	INSTALL_date	NRW	User Info, Install Date
71	VALVE_MODEL_NUM	XDTB_MAIN	VISIBLE_ STRING	N/A	N/A	N/A	N/A	NRW	User Info, Valve Model Number
99	MFG_PHONE	XDTB_MAIN	VISIBLE_ STRING	N/A	N/A	N/A	N/A	NRW	User Info, Manufacturer Phone Number
100	PUR_ORDER_NUM	XDTB_MAIN	VISIBLE_ STRING	N/A	N/A	N/A	N/A	NRW	User Info, Purchase Order Number
102	XD_CAL_LOC	XDTB_MAIN	VISIBLE_ STRING	N/A	N/A	N/A	N/A	SRW	User Info, Calibration Location
104	XD_CAL_WHO	XDTB_MAIN	VISIBLE_ STRING	N/A	N/A	N/A	N/A	SRW	User Info, Calibration done by
Divide Mode and Status Parameter									
13	DIAGNOSTICS_LEVEL	XDTB_MD	UNSIGNED 8	258	U_CHAR	NO	LD_MD_MODE	R	Is this an LD or an MD Device
16	CONTROLLER_STATE_ STATUS	XDTB_MAIN	BIT_STRING	260	U_CHAR	NO	Mode_Status	R	Status, Alarm, Mode Flags
18	POSITIONER_STATUS	XDTB_MAIN	BIT_STRING	261	U_CHAR	NO	Positioner_Status	R	Status, Alarm, Positioner Flags
14	MECHANICAL_STATUS	XDTB_MD	BIT_STRING	262	U_CHAR	NO	Mechanical_Status	R	Status, Alarm, Mechanical Flags
26	CALIBRATION_STATUS	XDTB_MAIN	BIT_STRING	263	U_CHAR	NO	Calibration_ Status	R	Status, Alarm, Calibration Flags
13	ELECTRONIC_STATUS	XDTB_TECH	BIT_STRING	264	U_CHAR	NO	Electronic_ Status	R	Status, Alarm, Electronic Flags

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
21	PRESSURE_STATUS	XDTB_TECH	BIT_STRING	265	U_CHAR	NO	Pressure_Status	R	Status, Alarm, Pressure Flags
15	INNERLOOP_STATUS	XDTB_TECH	BIT_STRING	266	U_CHAR	NO	Inner Loop_Status	R	Status, Alarm, Inner Loop Flags
17	OUTERLOOP_STATUS	XDTB_TECH	BIT_STRING	267	U_CHAR	NO	Outer Loop_Status	R	Status, Alarm, Outer Loop Flags
19	CONFIGURATION_STATUS	XDTB_TECH	BIT_STRING	269	U_CHAR	NO	Configuration_ Status	R	Status, Alarm, Configuation Flags
17	CONTROLLER_STATE_ MASK	XDTB_MAIN	BIT_STRING	270	U_CHAR	NO	Mode_Mask	NRW	Status, Alarm, Mode Flags
19	POSITIONER_MASK	XDTB_MAIN	BIT_STRING	271	U_CHAR	NO	Positioner_Mask	NRW	Status, Alarm, Positioner Flags
15	MECHANICAL_MASK	XDTB_MD	BIT_STRING	272	U_CHAR	NO	Mechanical_ Mask	NRW	Status, Alarm, Mechanical Flags
14	ELECTRONIC_MASK	XDTB_TECH	BIT_STRING	274	U_CHAR	NO	Electronic_Mask	NRW	Status, Alarm, Electronic Flags
22	PRESSURE_MASK	XDTB_TECH	BIT_STRING	275	U_CHAR	NO	Pressure_Mask	NRW	Status, Alarm, Pressure Flags
16	INNERLOOP_MASK	XDTB_TECH	BIT_STRING	276	U_CHAR	NO	Inner Loop_Mask	NRW	Status, Alarm, Inner Loop Flags
18	OUTERLOOP_MASK	XDTB_TECH	BIT_STRING	277	U_CHAR	NO	Outer Loop_Mask	NRW	Status, Alarm, Outer Loop Flags
20	CONFIGURATION_MASK	XDTB_TECH	BIT_STRING	279	U_CHAR	NO	Configuration_ Mask	NRW	Status, Alarm, Configuration Flags
113	BLINK_CODE	XDTB_MAIN	UNSIGNED 8	283	U_CHAR	NO	Blink_Code	R	LED Status Blink Code
Pro Mode Parameters									
24	PST_TIME_BREAKAWAY	XDTB_MD	FLOAT	285	U_INT	/100	PST_ TimeBreakaway	NR	Partial Stroke Test breakaway time
25	PST_PRESSURE_DIFF	XDTB_MD	FLOAT	286	U_INT	/100	PST_ PressureDiff	R	Partial Stroke Test Pressure Differential
26	PST_TIME_TO_TARGET	XDTB_MD	FLOAT	287	U_INT	/100	PST_ TimeToTarget	NR	Partial Stroke Test Time to Target
27	PST_RESULT	XDTB_MD	UNSIGNED 8	288	U_CHAR	NO	PST_Result	R	Partial Stroke Test Result (Pass or Fail)
28	PST_TIME_LIMIT	XDTB_MD	FLOAT	289	U_INT	/100	PST_TimeLimit	RW	Partial Stroke Test Time Limit
29	ACTUATOR_RATIO	XDTB_MD	FLOAT	290	U_INT	/100	Actuation_Ratio	RW	Actuation Ratio In Percent
30	ACTUATION_RATIO_ HIGH_START_LIMIT	XDTB_MD	FLOAT	291	U_INT	/100	AR_HighStart Limit	RW	Actuation Ratio High Start Limit
31	ACTUATION_RATIO_ HIGH_END_LIMIT	XDTB_MD	FLOAT	292	U_INT	/100	AR_HighEnd Limit	RW	Actuation Ratio High End Limit
32	ACTUATION_RATIO_ PERCENT_YELLOW	XDTB_MD	FLOAT	293	U_INT	/100	AR_Percent Yellow	NR	Actuation Ration Percent Yellow
50	SPOOL_RESPONSE_TIME	XDTB_MD	FLOAT	295	U_INT	NO	Spool_Time_86	NR	Spool Response Time
51	SPOOL_START_LIMIT	XDTB_MD	FLOAT	296	U_INT	NO	SS_LowLimit	NRW	Spool Start Limit
52	SPOOL_END_LIMIT	XDTB_MD	FLOAT	297	U_INT	NO	SS_highLimit	NRW	Spool End Limit
53	SPOOL_PERCENT	XDTB_MD	FLOAT	298	U_INT	/100	SS_pctYellow	R	Spool Percent Yellow

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
16	VALVE_TRAVEL_ DISTANCE	XDTB_MD	FLOAT	301	U_LONG	/100	ValveTravel Distance	R	Valve Travel Distance
17	VALVE_TRAVEL_HIGH_ START	XDTB_MD	FLOAT	302	U_LONG	/100	ValveTravelHigh Start	RW	Valve Travel High Start
18	VALVE_TRAVEL_HIGH_ END	XDTB_MD	FLOAT	303	U_LONG	/100	ValveTravelHigh End	RW	Valve Travel High End
19	VALVE_TRAVEL_ PERCENT_YELLOW	XDTB_MD	FLOAT	304	U_INT	/100	ValveTravel PercentYellow	NR	Valve Travel Percent Yellow
20	VALVE_CYCLE_COUNT	XDTB_MD	USNIGNED 32	305	U_LONG	NO	ValveCycle Count	R	Valve Cycle Count
21	VALVE_CYCLE_HIGH_ START	XDTB_MD	UNSIGNED 32	306	U_LONG	NO	ValveCycleHigh Start	RW	Valve Cycle High Start
22	VALVE_CYCLE_HIGH_ END	XDTB_MD	UNSIGNED 32	307	U_LONG	NO	ValveCycleHigh End	RW	Valve Cycle High End
23	VALVE_CYCLE_ PERCENT_YELLOW	XDTB_MD	FLOAT	308	U_INT	/100	ValveCycle PercentYellow	NR	Valve Cycle Percent Yellow
40	SPOOL_TRAVEL_ PERCENT	XDTB_MD	FLOAT	311	U_LONG	/100	SpoolTravel	R	Spool Travel in Percent
38	SPOOL_TRAVEL_HIGH_ START_LIMIT	XDTB_MD	FLOAT	312	U_LONG	/100	ST_HighStart Limit	RW	Spool Travel High Start Limit
39	SPOOL_TRAVEL_HIGH_ END_lIMIT	XDTB_MD	FLOAT	313	U_LONG	/100	ST_HighEnd Limit	RW	Spool Travel High End Limit
41	SPOOL_TRAVEL_ PERCENT_YELLOW	XDTB_MD	FLOAT	314	U_INT	/100	ST_pctYellow	NR	Spool Travel Percent Yellow
35	SPOOL_CYCLES	XDTB_MD	UNSIGNED 32	315	U_LONG	NO	SpoolCycles	NR	Spool Cycles
33	SPOOL_CYCLE_HIGH_ START_LIMIT	XDTB_MD	UNSIGNED 32	216	U_LONG	NO	SC_HighStart Limit	RW	Spool Cycle High Start Limit
34	SPOOL_CYCLE_HIGH_ END_LIMIT	XDTB_MD	UNSIGNED 32	317	U_LONG	NO	SC_HighEnd Limit	RW	Spool Cycle High End Limit
37	SPOOL_CYCLE_ PERCENT_YELLO	XDTB_MD	FLOAT	318	U_INT	/100	SC_pct_Yellow	NR	Spool Cycle Percent Yellow
36	CYCLE_TRAVEL_RESET	XDTB_MD	BIT_STRING	319	U_CHAR	NO	SpoolCycle TravelReset	RW	Reset Bits to reset the Spool Cycle and the Spool Travel Parameters
42	TREND_STATE	XDTB_MD	UNSIGNED 8	321	U_CHAR	NO	TrendLock	RW	Trending State
43	TREND_INDEX	XDTB_MD	UNSIGNED 8	322	U_CHAR	NO	TTIndex	RW	Index into the Trending Data Array
44	TREND_DATE	XDTB_MD	UNSIGNED 8	323	U_CHAR	NO	DateTimeStamp	R	Reserved for Future Use
83-91	TREND_DATA_n	XDTB_MD	ARRAY	324	ARRAY	NO	TrendData	R	Trending Data Array
58	FORCE_OF_PRESSURE	XDTB_MD	INTEGER 16	331	S_INT	NO	Fp	R	Force of Pressure
59	FORCE_SPRING	XDTB_MD	INTEGER 16	332	S_INT	NO	Fs	R	Spring Force
60	FORCE_ACTUATOR	XDTB_MD	INTEGER 16	334	S_INT	NO	Fa	R	Actuator Force
61	DEVIATION_TIMES_ EFFECTIVE_GAIN	XDTB_MD	INTEGER 16	335	S_INT	NO	Dev_Sum	R	Sumation of Deviation

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
54	PNEUMATIC_LEAK	XDTB_MD	FLOAT	341	FLOAT	NO	Leak	NR	Pneumatic Leak Detected
55	PNEUMATIC_LEAK_START	XDTB_MD	FLOAT	342	FLOAT	NO	LK_lowLimit	NRW	Penumatic Leak Start
56	PNEUMATIC_LEAK_END	XDTB_MD	FLOAT	343	FLOAT	NO	LK_highLimit	NRW	Pneumatic Leak End
57	PNEUMATIC_LEAK_PERCENT_YELLOW	XDTB_MD	FLOAT	344	U_INT	/100	LK_pctYellow	NR	Pneumatic Leak Percent Yellow
62	WORST_VALVE_HEALTH	XDTB_MD	FLOAT	346	U_INT	/100	Worst_ValvePct	R	Valve Health
63	WORST_ACTUATOR_HEALTH	XDTB_MD	FLOAT	347	U_INT	/100	Worst_ActurPct	R	Actuator Health
64	WORST_POSITIONER_HEALTH	XDTB_MD	FLOAT	348	U_INT	/100	Worst_PosnrPct	R	Positioner Health
65	WORST_CONTROL_HEALTH	XDTB_MD	FLOAT	349	U_INT	/100	Worst_CntrlPct	R	Control Health
66	SUPPLY_PRESSURE_HIGH_START_LIMIT	XDTB_MD	FLOAT	353	U_INT	/100	PS_HighStart Limit	RW	Supply Pressure High Start Limit
67	SUPPLY_PRESSURE_LOW_START_LIMIT	XDTB_MD	FLOAT	354	U_INT	/100	PS_LowStart Limit	RW	Supply Pressure Low Start Limit
68	SUPPLY_PRESSURE_LOW_END_LIMIT	XDTB_MD	FLOAT	355	U_INT	/100	PS_LowEnd Limit	RW	Supply Pressure Low End Limit
69	SUPPLY_PRESSURE_HIGH_PERCENT	XDTB_MD	FLOAT	356	U_INT	/100	PS_HighPct Yellow	NR	Supply Pressure High Percent
70	SUPPLY_PRESSURE_LOW_PERCENT	XDTB_MD	FLOAT	357	U_INT	/100	PS_LowPct Yellow	NR	Supply Pressure Low Percent
82	FRICTION_UNITS	XDTB_MD	UNSIGNED 8	360	U_CHAR	NO	FRICTION_UNITS	RW	Units used to display friction in
71	FRICTION	XDTB_MD	INTEGER16	362	S_INT	NO	FrContAll	R	Friction
72	FRICTION_STARTING	XDTB_MD	INTEGER16	363	U_INT	NO	StartingFriction	R	Starting Friction
73	FRICTION_HIGH_START_LIMIT	XDTB_MD	INTEGER 16	364	U_INT	NO	FR_HighStart Limit	RW	Friction High Start Limit
74	FRICTION_HIGH_END_LIMIT	XDTB_MD	INTEGER 16	365	U_INT	NO	FR_HighEnd Limit	RW	Friction High End Limit
75	FRICTION_LOW_START_LIMIT	XDTB_MD	INTEGER 16	366	U_INT	NO	FR_LowStart Limit	RW	Friction Low Start Limit
76	FRICTION_LOW_END_LIMIT	XDTB_MD	INTEGER 16	367	U_INT	NO	FR_LowEnd Limit	RW	Friction Low End Limit
77	FRICTION_HIGH_PERCENT_YELLOW	XDTB_MD	FLOAT	368	U_INT	/100	FR_HighPct Yellow	NR	Friction High Percent Yellow
78	FRICTION_LOW_PERCENT_YELLOW	XDTB_MD	FLOAT	369	U_INT	/100	FR_LowPct Yellow	NR	Friction Low Percent Yellow
Logix Data Accessible Only Through Generic Parms									
N/A	N/A	N/A	N/A	4	S_INT	/100	CM_Jog	N/A	Command Input, Local Jog Control, %

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
N/A	N/A	N/A	N/A	5	S_INT	/100	CM_Sig	N/A	Command Input, Signature Test, %
N/A	N/A	N/A	N/A	6	S_INT	/100	CM_Pct_Final	N/A	Command Input, Final Value, %
N/A	N/A	N/A	N/A	19	U_CHAR	NO	control_ disable_fld	N/A	For Future Use
N/A	N/A	N/A	N/A	161	S_INT	NO	JogStep	N/A	Config, Jog Cal, Initial Step Size
N/A	N/A	N/A	N/A	163	U_INT	NO	ILtries	N/A	Test, Calibration, ILO Attempts on Previous Cal
N/A	N/A	N/A	N/A	164	U_INT	/100	DropOutDelay	N/A	Config, AI Command, Dropout Filter Delay
N/A	N/A	N/A	N/A	165	U_INT	NO	BootUp_Delay	N/A	Config, Power-Good Delay
N/A	N/A	N/A	N/A	166	S_INT	NO	FB_Cos_Offset	N/A	Config, Cosine Linearization Offset
N/A	N/A	N/A	N/A	167	U_CHAR	/100	LedTimeOn	N/A	Config, LED Blinks, Time-On
N/A	N/A	N/A	N/A	168	U_CHAR	/100	LedTimeOff	N/A	Config, LED Blinks, Time-Off
N/A	N/A	N/A	N/A	169	U)CHAR	NO	PageNum	N/A	For Future Use
N/A	N/A	N/A	N/A	171	U_INT	NO	SPI_Cur	N/A	Test, SPI Bus, Current Software Master
N/A	N/A	N/A	N/A	174	U_INT	NO	temp_unit	N/A	Test, FRAM, Delay Before Saving
N/A	N/A	N/A	N/A	175	U_CHAR	NO	EEchksum	N/A	Test, FRAM, Checksum Value
N/A	N/A	N/A	N/A	176	U_CHAR	NO	ReadyFlag	N/A	Test, System, Used internally by the OS Scheduler
N/A	N/A	N/A	N/A	177	U_INT	NO	NoSupplyCnt	N/A	Test, Piezo, Force Memory Pulse to Active
N/A	N/A	N/A	N/A	178	U_INT	NO	ef_crc	N/A	For Future Use
N/A	N/A	N/A	N/A	179	U_CHAR	NO	ef_result	N/A	For Future Use
N/A	N/A	N/A	N/A	180	AD_REG	NO	ADC12MEM0	N/A	Test, A/D Counts, Stem Position, Conditioned
N/A	N/A	N/A	N/A	181	AD_REG	NO	ADC12MEM1	N/A	Test, A/D Counts, Loop Current
N/A	N/A	N/A	N/A	182	AD_REG	NO	ADC12MEM2	N/A	Test, A/D Counts, Pressure, Multiplexed
N/A	N/A	N/A	N/A	183	AD_REG	NO	ADC12MEM3	N/A	Test, A/D Counts, Hall Sensor, Conditioned
N/A	N/A	N/A	N/A	184	AD_REG	NO	ADC12MEM4	N/A	Test, A/D Counts, Shunt Regulator Volts
N/A	N/A	N/A	N/A	185	AD_REG	NO	ADC12MEM5	N/A	Test, A/D Counts, Piezo Volts
N/A	N/A	N/A	N/A	186	AD_REG	NO	ADC12MEM6	N/A	Test, A/D Counts, Hall Sensor, Raw
N/A	N/A	N/A	N/A	187	AD_REG	NO	ADC12MEM7	N/A	Test, A/D Counts Step Position, Raw
N/A	N/A	N/A	N/A	188	AD_REG	NO	ADC12MEM8	N/A	For Future Use
N/A	N/A	N/A	N/A	190	U_CHAR	NO	P0IN_	N/A	Test, Direct I/O, Port 0
N/A	N/A	N/A	N/A	191	U_CHAR	NO	P1IN_	N/A	Test, Direct I/O, Port 1

Fieldbus Block Index	Fieldbus Variable Name	Transducer Block	Fieldbus Datatypes	Logix Positioner				R/W	Description
				Register	Type	Fix Pt Rd	Variable Name		
N/A	N/A	N/A	N/A	192	U_CHAR	NO	P2IN_	N/A	Test, Direct I/O, Port 2
N/A	N/A	N/A	N/A	193	U_CHAR	NO	P3IN_	N/A	Test, Direct I/O, Port 3
N/A	N/A	N/A	N/A	194	U_CHAR	NO	P4IN_	N/A	Test, Direct I/O, Port 4
N/A	N/A	N/A	N/A	195	U_CHAR	NO	P5IN_	N/A	Test, Direct I/O, Port 5
N/A	N/A	N/A	N/A	196	U_CHAR	NO	P6IN_	N/A	Test, Direct I/O, Port 6
N/A	N/A	N/A	N/A	197	U_CHAR	NO	P7IN_	N/A	Test, Direct I/0, Port 7
N/A	N/A	N/A	N/A	198	U_CHAR	NO	P8IN_	N/A	Test, Direct I/O Port 8
Parameters reserved for Future Use									
108	MISC_CONFIG	XDTB_MAIN	BIT_STRING	160	U_CHAR	NO	Misc_Config	NRW	Reserved Flags for Future Use
46	RESERVED	XDTB_MD	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
47	RESERVED	XDTB_MD	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
48	RESERVED	XDTB_MD	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
49	RESERVED	XDTB_MD	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
45	RESERVED	XDTB_MD	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
27	RESERVED	XDTB_MAIN	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
39	RESERVED	XDTB_MAIN	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
105	RESERVED	XDTB_MAIN	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
106	RESERVED	XDTB_MAIN	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
110	RESERVED	XDTB_MAIN	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use
112	RESERVED	XDTB_MAIN	FLOAT	N/A	N/A	N/A	N/A	RW	Reserved for Future Use

Definitions:

XDTB_MAIN - Main Transducer Block - Contains parameters used mostly for command.

XDTB_TECH - Technician Transducer Block - Contains diagnostics and uncommon setup parameters

XDTB_MD - MD Transducer Block - Contains the PRO diagnostic parameters

R - Parameter is Readable

W - Parameter is Writeable

N - Parameter is Non-Volatile

S - Parameter is Static as defined by the Fieldbus

Specification. N/A - Not ApplicableXDTB_TECH - Technician

Transducer Block -
Contains diagnostic and uncommon setup parameters.

XDTB_MD - MD Transducer Block - Contains the PRO diagnostic parameters.

R - Paramater is Readable

W - Parameter is Writable

N - Parameter is Non-Volatile

S - Paramter is Static as defined by the Fieldbus Specification

N/A - Not Applicable

8 Maintenance and Repair

8.1 Driver Module Assembly

The driver module assembly moves the spool valve by means of a differential pressure across its diaphragm. Air is routed to the driver module from the regulator through a flexible hose. A barbed fitting connects the flexible hose to the driver module assembly. Wires from the driver module assembly connect the hall effect sensor and the piezo valve modulator to the main PCB assembly.

Driver Module Assembly Replacement

To replace the driver module assembly, refer to Figures 12-16 and 22 and proceed as outlined below. The following tools are required:

- Flat plate or bar about ⅛” thick
- Phillips screwdriver
- 1/4” nutdriver

WARNING: Observe precautions for handling electrostatically sensitive devices.

Figure 12: Driver Module Assembly

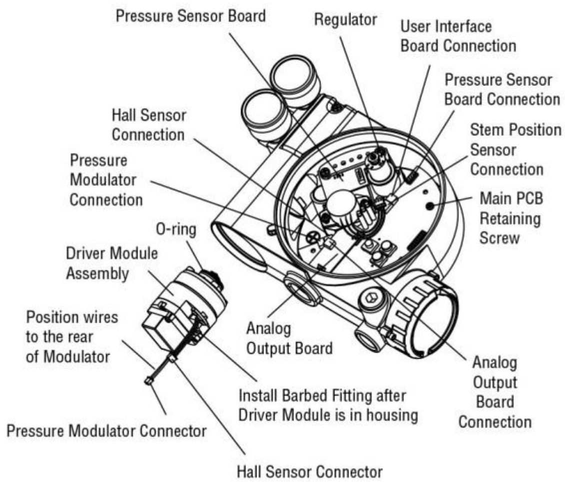
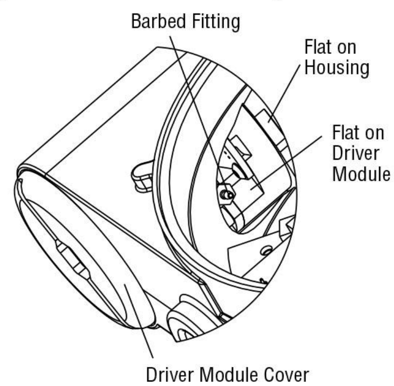
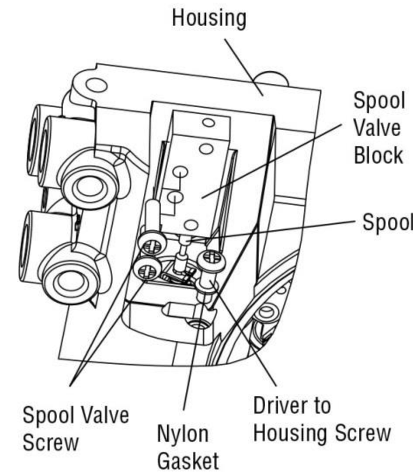


Figure 13: Spool Valve Cover Assembly



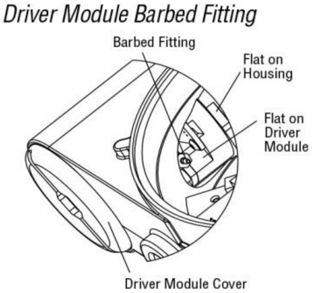
1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the driver module cover (Figure 15), using a flat bar or plate in the slot to turn the cover.
4. Remove the spool valve cover by removing the screw and sliding the cover assembly backwards until the tab is clear of the slot (Figure 13). The sheet metal cap, hydrophobic filter, and O-ring should be removed with the spool valve cover. It is not necessary to take these parts out of the spool valve cover.
5. Being careful not to lose the nylon washer, remove the Phillips-head screw that attaches the driver module to the main housing (Figure 14).

Figure 14: Spool and Block



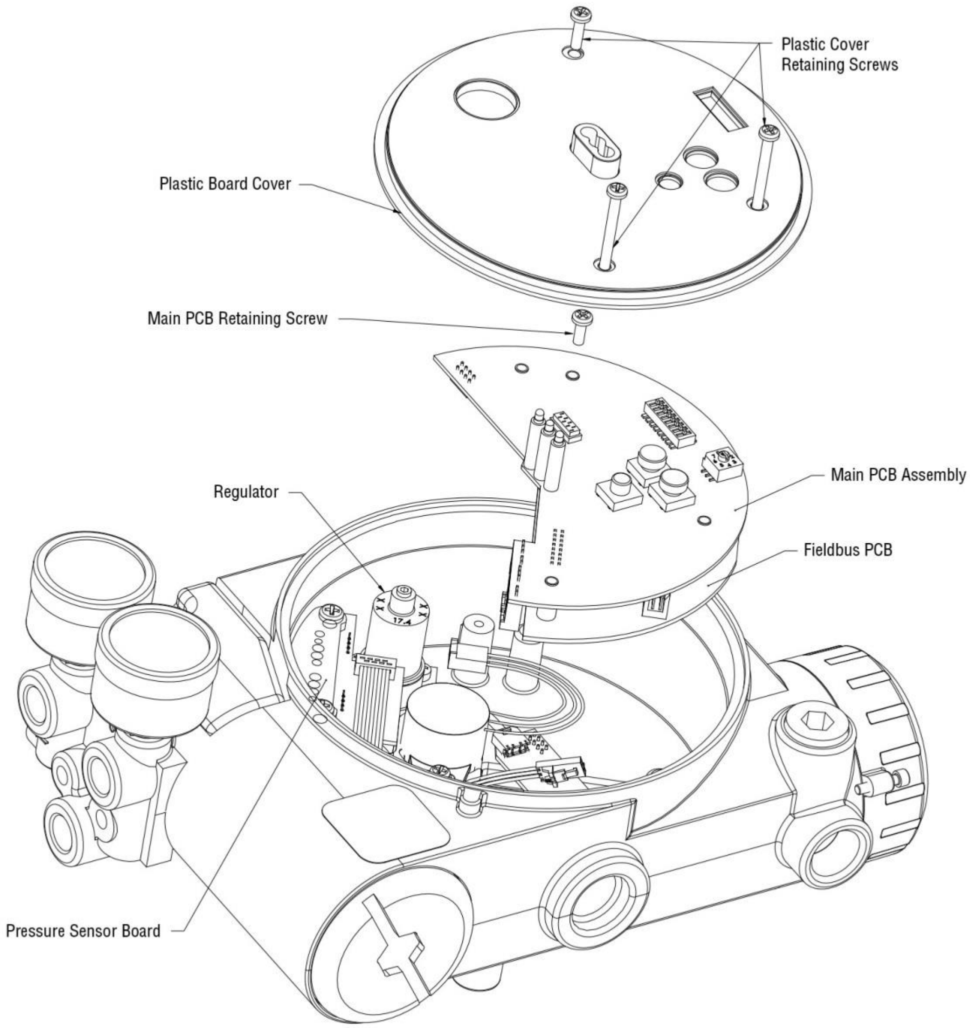
Warning: Spool (extending from the driver module assembly) is easily damaged. Use extreme caution when handling spool and spool valve block. Do not handle the spool by the machined portions of spool. The tolerances between the block and spool are extremely tight. Contamination in the block or on the spool may cause the spool to hang.

Figure 15: Driver Module Barbed Fitting



6. Remove the spool valve block by removing the two Phillips-head screws and carefully sliding the block off the spool (Figure 14).
7. Carefully remove the spool by sliding the end of the spool out of the connection clip. Excessive force may bend spool.
8. Remove the main cover.
9. Remove the plastic board cover by removing the three retaining screws (see Figure 16).
10. Disconnect the flexible tubing from the barbed fitting at the driver module assembly (see Figure 15).
11. Use the 1/4" nutdriver to remove the barbed fitting from the driver module assembly.
12. Unplug the two wiring connections that link the driver module assembly to the main PCB assembly.

Figure 16: Main PCB Assembly



13. Feed the two wires on the driver module back into the driver module compartment so that they stick out the driver module opening (see Figure 12). This will allow the driver module to thread out without tangling or cutting the wires.

14. Grasp the base of the driver module and turn it counterclockwise to remove. After it is threaded out, carefully retract the driver module from the housing.

15. Remove the barbed fitting from the side of the new driver module using the 1/4” nutdriver.

16. Verify that the O-ring is in place on the top of the new driver module. Lay the wires back along the side of the driver module as shown in Figure 12 and hold the wires in position by hand.

17. Gently insert the driver module into the driver module compart- ment in the housing. Turn the driver module clockwise to thread it into the housing. Continue rotating the driver module until it bottoms out.

18. Once the driver module has bottomed out so that the threads are fully engaged, rotate the driver module counter clockwise until the flat on the driver module and the flat on the housing are aligned. This will align the screw hole for the next step.

19. Verify that the nylon gasket is in the counter bore in the driver module retaining screw hole as shown in Figure 14.

20. Insert a driver-to-housing screw into the driver housing through the counterbored hole in positioner main housing. Tighten with a Phillips screwdriver.

21. Reach through the main compartment into the driver module compartment of the positioner and install the barbed fitting on the side of the driver module using the 1/4" nutdriver.

NOTE: Do not mix the barbed fitting with those from older Logix positioners. Older models contain orifices that will not work in the Logix 3400MD model. Orifices are brass-colored, barbed fittings are silver-colored.

22. Reconnect the flexible tube coming from the regulator to the barbed fitting.

23. Feed the driver module wires into the main chamber of the housing, and connect them to the main PCB Assembly.

24. Verify that the three O-rings are in the counterbores on the machined platform where the spool valve block is to be placed (Figure 22).

25. Carefully slide the spool into the connecting clip on the top of the driver module assembly.

26. Carefully slide the block over the spool, using the machined surface of the housing base as a register (Figure 14). Slide the block toward the driver module until the two retaining holes line up with the threaded holes in the base.

27. Install two spool-valve screws and tighten securely with a Phillips screwdriver (see Figure 14).

28. Slide the spool valve cover assembly over the spool valve until the tang engages into the housing slot. Install spool valve cover screw and tighten securely (see Figure 13).

29. Install the plastic board cover. Insert the three retaining screw through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten (see Figure 16).

30. Reconnect power and air supply to the positioner and perform a stroke calibration.

31. Reinstall all covers.

8.2 Regulator

The regulator reduces the pressure of the incoming supply air to a level that the driver module can use.

Replacing Regulator

To replace the regulator, refer to Figures 12 and 16 and proceed as outlined below. The following tools are required:

- Phillips screwdriver
- 1/4" nutdriver

WARNING: Observe precautions for handling electrostatically sensitive devices.

1. Make sure valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the main cover.
4. Remove the plastic board cover by removing the three retaining screws (see Figure 16).
5. Remove the retaining screw from the main PCB assembly.
6. Remove the five wire connections from the main PCB assembly and lift the main PCB out of the housing.
7. Remove the four screws from the regulator base. Verify that as regulator is removed, the O-ring and filter remain in the counter- bore.
8. Remove tubing and barbed fitting from the regulator base.
9. Install barbed fitting and tubing to the new regulator.
10. Verify O-ring and filter are in the counterbore. Install new regulator using 8-32 x 1/2" screws.

NOTE: Do not mix the regulator with those from older Logix positioners. Older models contain regulators with different settings that will not work in the Logix 3400MD model. The regulator pressure setting is printed on the top of the regulator. The Logix 3400MD regulator is set to 17.4 psig.

11. Reinstall the five wire connections.
12. Install the main PCB into the housing. Insert the retaining screw through the board into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten.
13. Install the plastic board cover. Insert the three retaining screws through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten (see Figure 16).
14. Reinstall all covers.

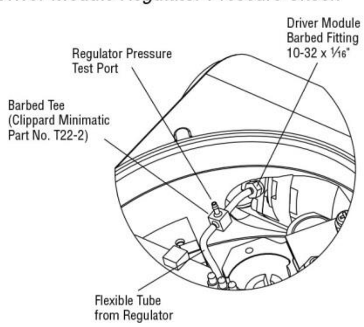
8.3 Checking or Setting Internal Regulator Pressure

To check or set the internal regulator pressure, refer to Figure 17 and proceed as outlined below. The tools and equipment used in the next procedure are from indicated vendors. The following tools are required:

- Calibrated pressure gauge (0 to 30 psi)
- 1/16" flexible tubing
- Barbed Tee (Clippard Minimatic part number T22-2 or equivalent)
- 3/32" Allen wrench
- 3/8" open-end wrench

☠ **WARNING:** Observe precautions for handling electrostatically sensitive devices.

Figure 17: Driver Module Regulator Pressure Check



1. Make sure the valve is bypassed or in a safe condition.
2. Remove the main cover.
3. Remove the plastic board cover by removing the three retaining screws.
4. Remove the 1/16" flexible tubing from the barbed fitting on the side of the driver module.
5. Obtain a barbed tee and two pieces of 1/16" flexible tubing, a few inches in length each.
6. Position the barbed tee between the internal regulator and the driver module by connecting the 1/16" flexible tubing, found in the positioner, to one side of the barbed tee. Using one of the new flexible tubing pieces, connect the barbed tee to the barbed fitting on the side of the driver module. Connect the remaining port on the barbed tee to a 0 to 30 psi pressure gauge.
7. Reconnect the air supply to the positioner and read the internal regulator pressure on the 0 to 30 psig gauge. The internal pressure should be set to 17.4 ±0.2 psig. If adjustment is needed, loosen the set screw retaining nut on the top of the regulator using the 3/8" open-end wrench. Then adjust the regulator pressure by turning the set screw on the top of the regulator with the 3/32" Allen wrench.
8. Once the regulator pressure is set, tighten the set screw retaining nut on the top of the regulator, remove the air supply to the positioner, remove the barbed tee, and reconnect the flexible tubing from the regulator to the barbed fitting on the side of the driver module.
9. Install the plastic board cover. Insert the three retaining screws through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten (see Figure 16).
10. Reinstall all covers.

8.4 Spool Valve

The spool valve routes the supply air to one side of the actuator while venting the opposite side (see Figure 1). The position of the spool valve is controlled by the driver module.

Replacing the Spool Valve

To replace the spool valve, refer to Figures 12, 14 and 21 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the spool valve cover by removing the screw and sliding the cover assembly backwards until the tab is clear of the slot. It is not necessary to remove the sheet metal cap, hydrophobic filter, or O-ring from this assembly (Figure 18).

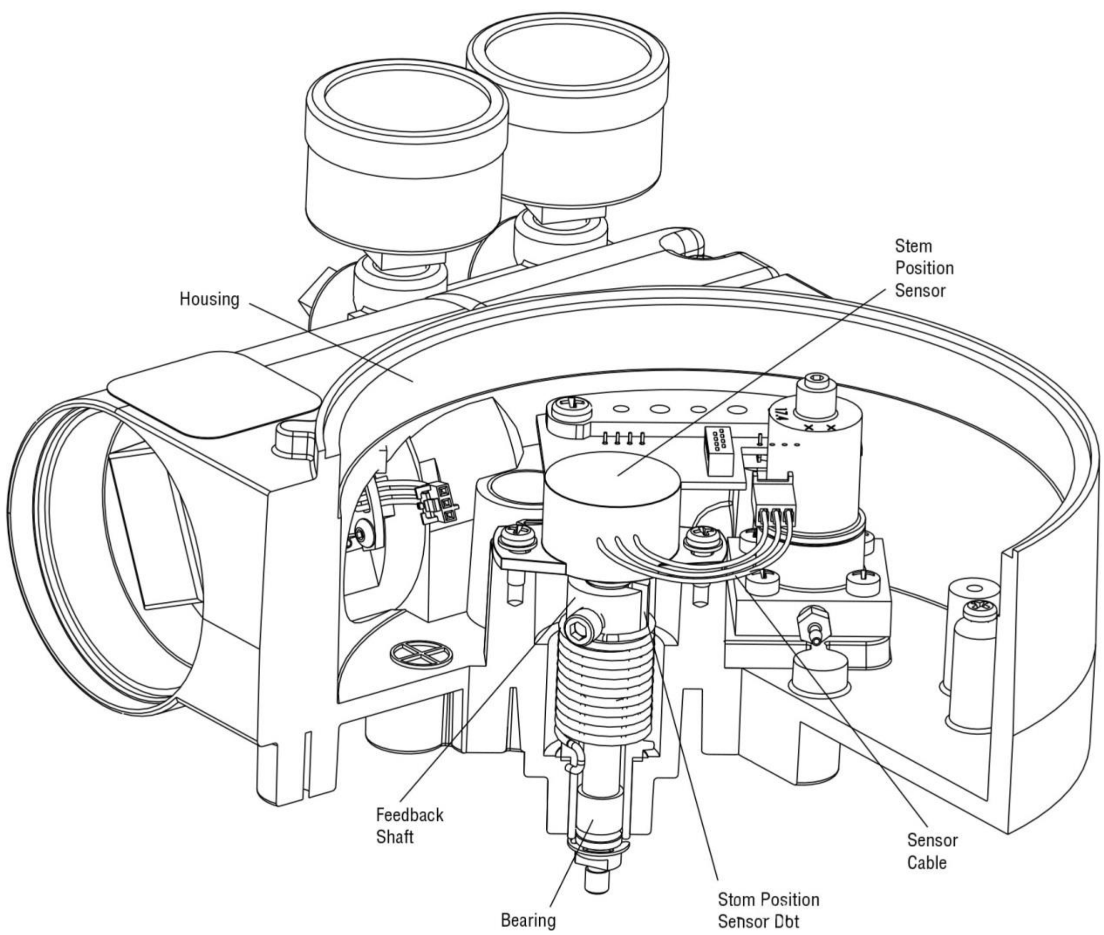
☠ **WARNING:** The spool (extending from the driver module assembly) is easily damaged. Use extreme caution when handling spool and spool valve block. Do not handle the spool by the machined portions of spool. The toler- ances between the block and spool are extremely tight. Contamination in the block or on the spool may cause the spool to hang.

4. Remove the spool valve block by removing the two Phillips-head screws and carefully sliding the block off the spool (Figure 14).
5. Carefully remove spool by sliding end of spool out of connecting clip. Excessive force may bend the spool.
6. Verify that the three O-rings are in the counterbores on

the machined platform where the new spool valve block is to be placed (Figure 22).

7. Carefully slide the spool into the connecting clip of the driver module assembly.
8. Carefully slide the block over the spool, using the machined surface of the housing base as a register (Figure 14). Slide the block toward the driver module until the two retaining holes line up with the threaded holes in the base.
9. Install two spool valve screws and tighten securely with a Phillips screwdriver (see Figure 14).
10. Slide the spool valve cover assembly over the spool valve until the tang engages into the housing slot. Install the spool valve cover screw and tighten securely (see Figure 13).
11. Reconnect power and air supply to the positioner and perform a stroke calibration.

Figure 19: Stem Position Sensor Orientation



8.5 Spool Valve Cover

The spool valve cover incorporates a hydrophobic filter element in a two-piece cover. This protects the spool valve chamber from dirt and moisture and provides a low back pressure vent for exhaust air from the spool valve.

Replacing Filter in Spool Valve Cover

To replace the filter in the spool valve cover, refer to Figures 13 and 18 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

1. Remove the spool cover by removing the screw and sliding the cover assembly backwards until the tab is clear of the slot. The sheet metal cover may be removed and cleaned with a brush or by blowing out with compressed air (Figure 13).

2. Remove the O-ring from around the hydrophobic filter element and set aside (Figure 18).

3. Remove the molded filter element by pulling it straight out of the chamber cover vent piece.

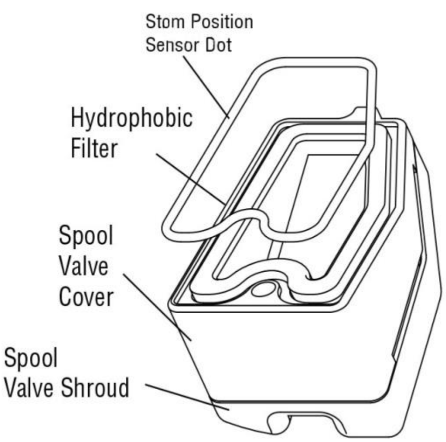
4. Install O-ring into base of chamber cover vent piece as shown in Figure 18.

5. Place new molded filter element into the chamber cover vent piece. This filter element provides part of the track to secure the O-ring installed in the last step.

6. Place spool valve shroud onto spool valve cover.

7. Place the spool valve cover assembly in place by setting it on the ramp and sliding it until the tab seats in the slot (Figures 13 and 18) and secure with a 8-32 screw.

Figure 18: Spool Valve Cover Assembly



8.6 Stem Position Sensor

The position feedback assembly transmits valve positions information to the processor. This is accomplished by means of a rotary position sensor that connects to the valve stem through a feedback linkage. To provide for accurate tracking of the pin in the slot, the follower arm is biased against one side of the slot with a rotary spring. This spring also automatically moves the position feedback assembly to its limit in the unlikely event of failure of any component in the linkage.

Stem Position Sensor Replacement

To replace the stem position sensor, refer to Figure 16, 19 and 22 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

WARNING: Observe precautions for handling electrostatically sensitive devices.

1. Make sure the valve is bypassed or in a safe condition.

2. Disconnect the power and air supply to the unit.

3. Remove the main cover.

4. Remove the plastic board cover by removing the three retaining screws (see Figure 16).

5. Disconnect the position sensor wires from the main PCB assembly.

6. Remove the two rotary position sensor-retaining screws and lift the sensor out of the housing.

7. Turn the new position sensor shaft until the dot on the side of the shaft is aligned with the wires on the side of the position sensor (Figure 19).

8. Insert the position sensor into the shaft with the wires pointing toward the main PCB assembly. Turn the position sensor clockwise until bolting slots align with the housing screw holes and the wires on the sensor protrude over the main PCB assembly.

NOTE: Do not mix the position sensor with those from older Logix positioners. Older models contain sensors with different ranges that will not work in the Logix 3400MD model. The wires on the Logix 3400MD position sensor are red, white and black.

9. Carefully center the position sensor on the shaft bore, insert and tighten the screws. Do not overtighten.

10. Route the wires along the side of the position sensor and reconnect to the main PCB assembly.

11. Install the plastic board cover. Insert the three retaining screws through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten (see Figure 16).

12. Reinstall all covers.

13. Reconnect power and air supply to the positioner and perform a stroke calibration.

8.7 Main PCB Assembly

The main printed circuit board (PCB) assembly contains the circuit boards and processors that perform control functions of the positioner. The main PCB is to be replaced as a unit. None of the components on the main PCB are serviceable. It consists of a controller board and a Fieldbus communication board.

Replacing Main PCB Assembly
To replace the main PCB assembly, refer to Figure 12 and 16 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

☠ **WARNING:** Observe precautions for handling electrostatically sensitive devices.

1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the main cover.
4. Remove the plastic board cover by removing the three retaining screws (see Figure 16).
5. Remove the retaining screw from the main PCB assembly.
6. Remove the five wire connections from the main PCB assembly and lift the main PCB out of the housing (see Figure 16).
7. Reinstall the five wire connections (see Figure 12) on the new main PCB.
8. Install the new main PCB into the housing. Insert the retaining screw through the board into the threaded boss and tighten, using a Phillips screwdriver. Do not over tighten.
9. Install the plastic board cover. Insert the three retaining screws through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten (see Figure 16).
10. Reinstall all covers.
11. Reconnect power and air supply to the positioner and reconfigure the positioner being sure to perform a stroke calibration.

8.8 Pressure Sensor Board

On advanced model Logix 3400MD positioners, a pressure sensor board is installed in the positioner. The pressure sensor board contains two pressure sensors that measure the pressure on output ports 1 and 2. The main PCB electronics automatically senses the presence of the pressure sensor board. If present, the actuator pressure sensors are used in the positioner control algorithm to enhance valve stability. For optimal performance, the actuator pressure sensors need to be calibrated. The actuator pressure sensor calibration is performed using a 375 Handheld Communicator or Host configuration software.

In the standard model, the pressure sensor board is replaced by a plate that plugs the actuator pressure sensor ports. This plate can be replaced by a pressure sensor board to field-upgrade a standard model to an advanced model.

Removing the Pressure Sensor Board (Advanced Model)
To replace the pressure sensor board, refer to Figures 12, 16 and 21 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

☠ **WARNING:** Observe precautions for handling electrostatically sensitive devices.

1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the main cover.
4. Remove the plastic board cover by removing the three retaining screws (see Figure 16).
5. Disconnect the ribbon cable on the pressure sensor board from the PCB assembly (see Figure 12). Lifting the main board may make this easier.
6. Remove the two screws holding the pressure sensor board to the housing. Lift the metal stiffener plate off the pressure sensor board and set aside for future use.
7. Remove the pressure sensor board.

Removing the Pressure Sensor Plug Plate (Standard Model)
To upgrade a standard model to an advanced model, the pressure sensor plug plate must be removed and replaced by a pressure sensor board. The main PCB electronics automatically senses the presence of the pressure sensor board. If present, the actuator pressure sensors are used in the positioner control algorithm to enhance valve stability. For optimal performance, the actuator pressure sensors need to be

calibrated. The actuator pressure sensor calibration is performed using a Handheld Communicator or host configuration software. To upgrade a standard model to an advanced model, refer to Figures 12, 16 and 21 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the main cover.
4. Remove the plastic board cover by removing the three retaining screws (see Figure 16).
5. Remove the two screws holding the pressure sensor plug plate to the housing. Lift the metal stiffener plate off the pressure sensor plug plate and set aside for future use.
6. Remove the pressure sensor plug plate and discard.

Installing the Pressure Sensor Board (Advanced Model)

The pressure sensor board is installed on the advanced model only. To install the pressure sensor board, refer to Figures 12, 16 and 22 and proceed as outlined below. The following tools are required:

- Phillips screwdriver
- Torque wrench

WARNING: Observe precautions for handling electrostatic sensitive devices.

1. Verify that the two pressure sensor O-rings (item 15) are in place in the housing.
2. Set the pressure sensor board assembly in place so that the O-rings make contact with the faces of the pressure sensors.
3. Place the metal stiffener plate (item 12) on top of the pressure sensor board over the pressure sensors and align the two holes in the pressure sensor plate with the threaded bosses in the housing.
4. Insert two screws through the stiffener plate and pressure sensor board into the threaded holes in the housing and tighten evenly, to 8 in-lb.
5. Connect the ribbon cable on the pressure sensor board to the main PCB assembly.
6. Install the plastic board cover. Insert the three retaining screws through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten.
7. Reinstall all covers.
8. Reconnect power and air supply to the positioner. Use the Host software or a handheld communicator to perform a pressure sensor calibration.

8.9 User Interface Board

The user interface board provides a connection point inside the explosion-proof housing for all hookups to the positioner.

Replacing the User Interface Board

To replace the user interface board, refer to Figures 6, 12, 16 and 22 and proceed as outlined below. The following tools are required:

- Phillips screwdriver

WARNING: Observe precautions for handling electrostatic sensitive devices.

1. Make sure the valve is bypassed or in a safe condition.
2. Disconnect the power and air supply to the unit.
3. Remove the main cover.
4. Remove the plastic board cover by removing the three retaining screws (see Figure 16).
5. Remove the retaining screw from the main PCB assembly and lift the main PCB out of the housing (see Figure 16). It is not necessary to disconnect all of the wires, only the UI plug.
6. Remove the user interface cover.
7. Disconnect the field wiring from the user interface board terminals and remove the three screws that hold the user interface board in the housing (see Figure 6).supplied from the factory with a fitting installed in the main chamber vent. Connect the necessary tubing/piping to this fitting to route the exhausted natural gas to a safe environment.
8. Remove the user interface board, carefully pulling the wiring through the bore.
9. Verify that the O-ring is in place in the counterbore in the positioner housing, or on the plug on the back of the UI tray
10. Feed the wires on the back of the new user interface board through the passageway into the main chamber of the housing.
11. Set the user interface board in place and secure with three screws (see Figure 6).

12. Reconnect the field wiring to the user interface board terminals.
13. Install the main PCB into the housing. Insert the retaining screw through the board into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten.
14. Install the plastic board cover. Insert the three retaining screws through the plastic cover into the threaded boss and tighten evenly, using a Phillips screwdriver. Do not overtighten (see Figure 16).
15. Reinstall the UI wire connection (see Figure 12).
16. Reinstall all covers.

9 Optional Vented Design

NOTE: See Figures 19 and 20

A standard Logix 3400MD positioner is vented directly to the atmosphere. When supply air is substituted with sweet natural gas, piping must be used to route the exhausted natural gas to a safe environment. This piping system may cause some positioner back pressure in the main chamber (from the modulator and regulator) and spool chamber (from the actuator). Back pressure limitations are described below.

Two chambers must be vented on the Logix 3400MD positioners: the main housing chamber and the spool valve chamber (Figures 20 and 21). The main chamber vent is located on the backside of the positioner (see Figure 20). Vented-design Logix 3400MD positioners are to route the exhausted natural gas to a safe environment. The maximum allowable back pressure in the spool valve chamber is 8 psig (0.55 barg). Pressures greater than 8 psig will cause vented gas to leak past the spool cover O-ring to the atmosphere and will result in overshoot of the positioner. The maximum allowable back pressure from the collection device on the main housing vent is 2.0 psig (0.14 barg). Vent flow rate is 0.5 std ft 3/min (1.4 std liter/min).

The spool valve chamber (see Figure 21) must also be vented through the spool valve cover. Vented-design Logix 3400MD positioners are supplied from the factory with a fitting installed in the spool valve cover (item SKU 179477). Connect the necessary tubing/piping to this fitting

WARNING: The back pressure in the main housing must never rise above 2.0 psig (0.14 barg).

Figure 20: Main Housing Vent

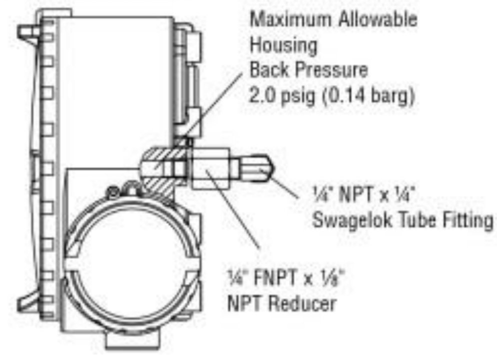
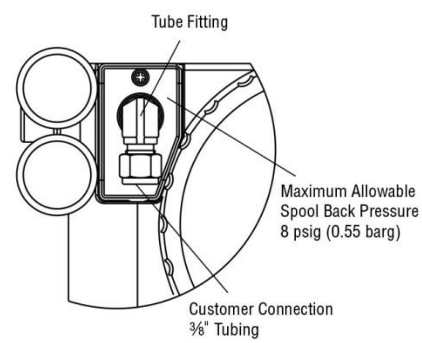


Figure 21: Spool Cover Vent



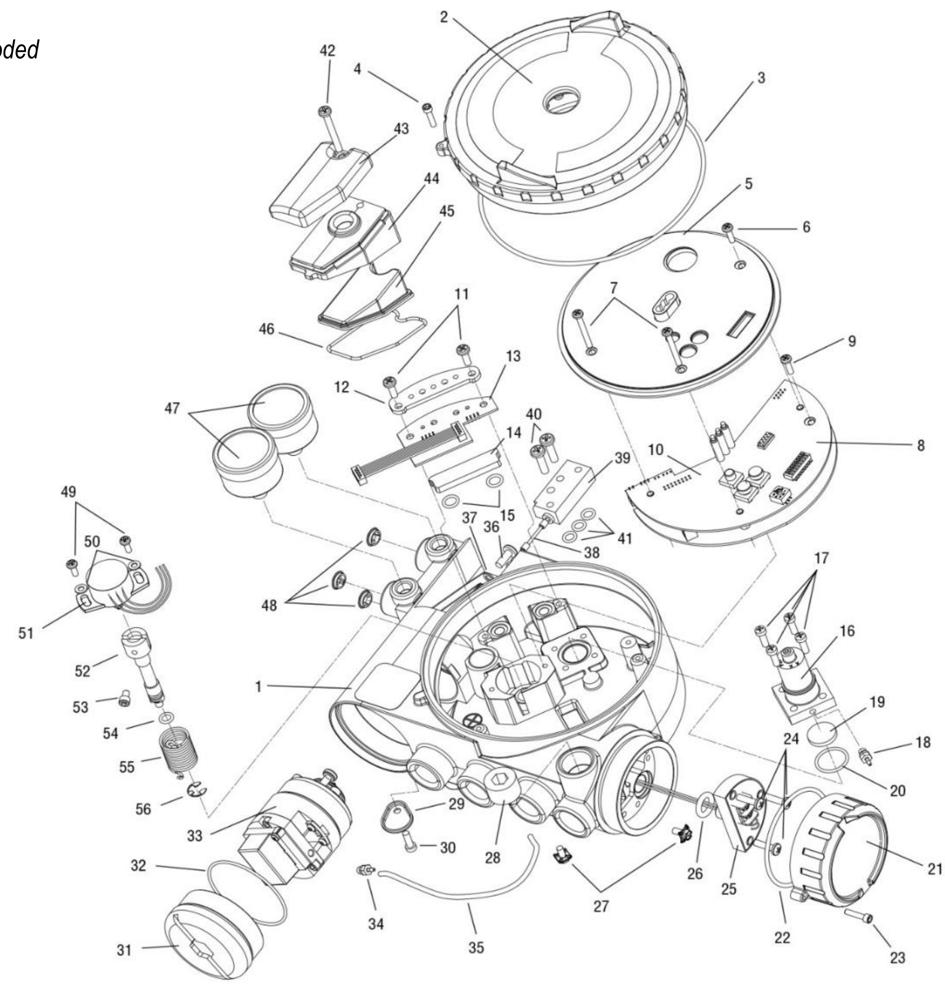


Figure 22: Exploded

10 Parts List

Table XI: Parts

Item No.	Part
1	Housing Logix 3000MD Positioner
2	Main Housing Cover
3	O-ring, Main Housing Cover
4	Screw, Anti-rotation
5	Plastic Main PCB Cover
6	Screw, Main PCB Cover Short (2)
7	Screw, Main PCB Cover Long
8	Main PCB Assembly
9	Screw, Main PCB Assembly Retaining
10	Analog Output Board
11	Screw, Pressure Sensor Board (2)
12	Pressure Sensor Board Stiffener

Item No.	Part
13	Pressure Sensor Board (Advanced Only)
14	Pressure Sensor Plug Plate (Standard Only)
15	O-ring, Pressure Sensor to Housing (2)
16	Pressure Regulator, 5 to 30 psig
17	Screw, Regulator Plate to Housing (4)
18	Hex Barbed Fitting with Captive O-ring
19	Internal Filter
20	O-ring, Interface Plate to Housing Seal
21	Customer Interface Cover
22	O-ring, Customer Interface Cover

Continued on Page 45

Table XI: Parts (continued)

Item No.	Part
23	Screw, Anti-rotation
24	Screw, User Interface Board (3)
25	User Interface Board Potted Assembly
26	O-ring, User Interface Board
27	Grounding Screw (2)
28	Threaded Plug
29	Main Vent Cover
30	Screw, Main Vent Cover
31	Driver Module Cover
32	O-ring, Driver Module Cover
33	Driver Module Assembly
34	Hex Barbed Fitting with Captive O-ring
35	Flexible Tubing
36	Screw, Driver to Housing
37	Nylon Washer
38	Spool Valve
39	Spool Valve Block
40	Screw, Spool Valve to Housing (2)
41	O-ring, Spool Valve (3)
42	Screw, Spool Valve Cover
43	Spool Valve Shroud
44	Spool Valve Cover
45	Hydrophobic Filter, Spool Valve Chamber
46	O-ring, Spool Valve Cover
47	Pressure Gauge, 0-160 psig (2)
48	Air Screen (3)
49	Screw, Position Feedback Potentiometer to Housing (2)
50	Metal Washer (2)
51	Position Feedback Potentiometer
52	Feedback Shaft
53	Screw, Spring to Feedback Shaft
54	O-ring, Feedback Shaft
55	Torsion Spring
56	E-ring

11 Logix 3400*MD* Spare Parts Kits (See Figure 22 for item numbers.)

Table XII: Spare Parts Kits

Item No.	Description	Quantity
Kit 2: Driver Module Assembly -40° to 80°C Kit, P/N 199786.999.000		
16	Pressure Regulator	1
17	Screw, Regulator to Housing	4
33	Driver Module Assembly	1
34	Hex Barbed Fitting w/ Captive O-ring	1
36	Screw, Driver to Housing	1
37	Nylon Washer	1
Kit 3: Spool Assembly Valve Kit, P/N 199787.999.000		
38	Spool	1
39	Spool Valve Block	1
40	Screw, Spool Valve to Housing	2
41	O-ring, Spool Valve	3
Kit 4: Pressure Regulator, P/N 215814.999.000		
16	Pressure Regulator with Captive O-rings	1
17	Screw, Regulator to Housing	4
Kit 5: Soft Goods Kit, P/N 199789.999.000		
3	O-ring, Main Housing Cover	1
15	O-ring, Pressure Sensor to Housing	2
20	O-ring, Regulator to Housing	1
22	O-ring, User Interface Cover	1
26	O-ring, User Interface Board	1
35	Flexible Tube	1
37	Nylon Washer	1
41	O-ring, Spool Valve to Housing	3
45	Hydrophobic Filter, Spool Valve Chamber	1
46	O-ring, Spool Valve Cover	1
54	O-ring, Feedback Shaft	1

Continued on next page

Table XII: Spare Parts Kits (continued)

Item No.	Description	Quantity
Kit 7: Advanced Model Pressure Sensor Board Kit, P/N 199791.999.000		
11	Screw, Pressure Sensor Board	2
13	Pressure Sensor Board	1
15	O-ring, Pressure Sensor to Housing	2
Kit 8: Main PCB Assembly Kit, P/N 277119.999.000		
6	Screw, Main PCB Cover Short	2
7	Screw, Main PCB Cover Long	1
8	Main PCB	1
9	Screw, Main PCB Retaining Screw	1
Kit 9: User Interface Board Kit, P/N 245228.999.000		
24	Screw, User Interface to Housing	3
25	User Interface Board	1
26	O-ring, User Interface Board	1
Kit 10: Position Feedback Potentiometer Kit, P/N 199794.999.000		
49	Screw, Feedback Potentiometer to Housing	2
50	Metal Washer	2
51	Position Feedback Potentiometer	1

12 Logix 3400*MD* Mounting Kits

12.1 Valtek Mounting Kits

Table XIII: Valtek Linear Mounting Kits

Spud	25 in^2		50 in^{2}*		100 – 200 in^2	
	Standard	Handwheel	Standard	Handwheel	Standard	Handwheel
2.00	164432	164433	164434	164433		
2.62			164435	164436	164437 **	164436
2.88					164437	164438
3.38					164439	164440
4.75					164439	164440

* A 50 in^2, 2.00 spud with live loading requires kit number. ** Live-loading is not available on a 100 in^2, 2.62 spud.

Table XIV: Valtek Rotary Mounting Kits[1]

Spud	25 in^2		50 in^{2}*		100 – 200 in^2	
	Standard	Handwheel	Standard	Handwheel	Standard	Handwheel
0.44	135429	135432	135430		135431	
0.63	135429	135437	135430	135433	135431	
0.75	135429	135438	135430	137212	135431	
0.88	135429	135439	135430	137213	135431	135434
1.12	135429		135430	137214	135431	137215
1.50	135429		135430		135431	137216
1.75	135429		135430		135431	137217

* A 50 in^2, 2.00 spud with live loading requires kit number.

1 Standard: All rotary valves with standard accessories (end of shaft mount). Optional: All rotary valves with handwheels or volume tanks (linkage design).

12.2 Logix O.E.M. Mounting Kits

Table XV: Logix O.E.M. Mounting Kits

Brand	Model	Size	Mounting Kit	
Fisher	657 & 667	30	213905	0.5" -1.5" stroke
		34	141410	0.5" -1.5" stroke
		40	141410	0.5" -1.5" stroke
		50	171516	0.5" -1.5" stroke
			171517	2" stroke
		60	171516	0.5" -1.5" stroke
			171517	2" stroke
		70	171518	4" stroke
		80	171519	
	1250	225	173371	
		450	173371	
		675	173371	
	1052	33	171549	Rotary
	657-8	40	173798	
Neles	RC		171512	
	RD		178258	
Foxboro	Slid-Std		173567	
	Linear		178258	
Honeywell	VST-VA3R	17-in. dia.	173798	
	VSL-VA1D	12-in. dia.	173798	
Masonelian (Linear Actuators)	37	9	171721	
		11	171721	
		13	171720	
		18	173382	
		24	173896	
	38	11	173235	
		13	173234	
		15	186070	
		18	173382	
		24	173896	
	71 Domotor	25	173325	
		50	173335	
		100	173336	
	88	6	171722	
		16	173827	
	47	B	173361	
	48	B	173361	
	"D" Domotor	200	175141	
	71-2057AB-D		176179	
	71-40413BD		176251	

Brand	Model	Size	Mounting Kit	
Masonelian (Rotary Actuators)	33	B	173298	
	35	4	141410	
		6	141410	
		7	141410	
	70	10	173298	
Valtek	Trooper		166636	0.75" -1.50" std
Automax	R314		141180	HD
	SNA115		NK313A	
Vangard	37 / 64		175128	
Air Torque	AT Series	AT0 - AT6	Consult factory	
Automax	SNA Series	SNA3 - SNA2000	Consult factory	
	N Series	N250.300	Consult factory	
	R Series	R2 - R5	Consult factory	
Bettis	RPC Series	RP -TPC11000	Consult factory	
	G Series	G2009-M11-G3020-M11	Consult factory	
EL-O-Matic	E Series	E25 - E350	Consult factory	
	P Series	P35 - P4000	Consult factory	
Hytork	XL Series	XL45 - XL4580	Consult factory	
Unitorq	M Series	M20 - M2958	Consult factory	
Worcester	39 Series	2539 - 4239	Consult factory	

**Adjustable mounting kit 173798 may be needed if handwheels are used.*

12.3 NAMUR Accessory Mounting Kit Part Numbers

Use prefix "NK" and choose bracket and bolt options from the following table.

Table XVI: NAMUR Accessory Mounting Kit Part Numbers

Bracket Option	Description
28	20 mm pinion x 80 mm bolt spacing
38	30 mm pinion x 80 mm bolt spacing
313	30 mm pinion x130 mm bolt spacing
513	50 mm pinion x 130 mm bolt spacing
Bolt Option	**Description**
A	10-24 UNC bolting
B	10-32 UNF bolting
L	M5-.8 metric bolting

Example: NK313A, NAMUR Accessory Mounting Kit with 30 mm pinion x 80 mm bolt spacing and 10-24 UNC bolting.

13 Frequently Asked Questions

Q: I set the Final Value Cutoff Low at 5 percent. How will the positioner operate?
A: Assume that the present command signal is at 50 percent. If the command signal is decreased, the positioner will follow the command until it reaches 5 percent. At 5 percent, the spool will be driven fully open or fully closed, depending on the air action of the valve, in order to provide full actuator saturation and tight shutoff. The positioner will maintain full saturation below 5 percent command signal. As the command increases, the positioner will remain saturated until the command reaches 6 percent (there is a 1 percent hysteresis value added by the positioner). At this point, the stem position will follow the command signal. While in Final Value Cutoff, the Logix 3400MD LEDs will blink GGGY.

Q: I have Final Value Cutoff set to 3 percent but the valve will not go below 10 percent.
A: Is a lower soft stop enabled? The lower soft stop must be less than or equal to zero percent in order for the Final Value Cutoff to become active. If a positive lower soft stop is written, this stop will take priority over the Final Value Cutoff feature. When the lower soft stop is reached, the positioner will blink a GYGYs code.

Q: Will soft stops prevent the valve from going to its fail position?
A: No.

Q: What is the difference between a model with Standard diagnostics and a model with Advanced diagnostics?
A: The model with Advanced diagnostics adds top and bottom actuator pressure sensors. This allows for more diagnostic calculations such as loss of pressure, friction, advanced signatures, and troubleshooting. The pressure sensors, if present, are also used in the positioner control algorithm to enhance valve stability.

Q: Can I upgrade from a Standard to an Advanced?
A: Yes. Referencing the IOM, an advanced pressure sensor board assembly can be purchased. Simply replace the pressure sensor plug plate with the advanced pressure sensor board. Perform an actuator pressure calibration.

14 How to Order

Table XVII: How to Order

Selection		Code	Example
		3	3
Protocol	Foundation Fieldbus*	4	4
Diagnostics	Standard Diagnostics*	0	2
	Advanced Diagnostics	1	
	Pro Diagnostics	2	
Housing & Brand	Aluminum, White Paint (Valtek)*	0	0
	Stainless Steel, No Paint (Valtek)	1	
	Aluminum, Black Paint (Automax)	2	
	Aluminum, Food Grade White Paint (Automax)	3	
	Aluminum, Accord (Black Paint)	4	
	Aluminum, Accord (Food-Grade White Paint)	5	
Design Version		MD	MD
Certifications	INMETRO Ex ia IIC T4; Ex d IIB+H2 (South America)	06	
	General Purpose	14	
	ATEX Multiple Protection Mylar Nameplate: Ex db IIB+H2, Ex tb IIIC, Ex ia IIC,IIIC, Ex ic nA IIC	28	
	IECEx Multiple Protection Mylar Nameplate: Ex db IIB+H2, Ex tb IIIC, Ex ia IIC,IIIC, Ex ic nA IIC	33	
	North American Multiple Protection Mylar Nameplate: Explosion proof, Intrinsically Safe, Non-Incendive	34	
	TR CU: Ex d IIB+H2, Ex ia IIC	44	
Shaft/Feedback Shaft	DD 316 SSI Shaft (Valtek Standard)*	D6	D6
	NAMUR 316 SSI (VDI/VDE 3845)	N6	
Conduit Connections/Threaded Connections	1/2" NPT	E	E
	M20	M	
Action	4-way (Double-Acting)	04	04
	3-way (Single-Acting)	03	
	3-way Purge (Single-Acting) not for use with natural gas (used to purge springs side of actuator with instrument air)	3P	
	4-way Vented (Double-Acting)	4V	
	3-way Vented (Single-Acting)	3V	
ITK Profile	ITK 5	50	60
	ITK 6	60	
Gauges	Gauges (Valtek standard)*	0G	0G
	SS with SS internals, psi (bar/kPa)	0S	
	SS with SS internals, psi (kg/cm^2)	KS	
	SS with brass internals, psi (kg/cm^2)	KG	
	No Gauges	0U	
Special Options	None*	00	00
	Remote Mount Feedback (Only available with Certification Option 14)	RM	
	Fail Option Feedback**	SF	

**Indicates Standard Product Configuration*

***Contact factory before specifying this option*

15 Troubleshooting

Table XVIII: Troubleshooting

Failure	Probable Cause	Corrective Action
No LED is blinking	Voltage of supply source is not high enough	Verify that voltage source can supply at least 9 V
	Current draw incorrect	Verify current draw of device (23 mA) and that of other devices on the loop aren't pulling too much current
Erratic communications	Maximum cable length or cable impedance exceeded	Check cable conduction size, length and capacitance. Refer to Section 6.4, "Cable Requirements"
	Improper grounding	Terminate and ground segment properly.
	Interference with I.S. barrier	Must use FF-compatible I.S. barrier
	Host FB card not configured or connected correctly	Check connections and configurations of card
Unit does not respond to Final Value commands	Unit is in Auto mode	Put in OOS mode
	Error occurred during calibration	Check blink codes on positioner and correct calibration error. Recalibrate
Valve position reading is not what is expected	Positioner tubing backwards	Re-tube the actuator
	Stem position sensor mounting is off 180°	Remount position sensor
	Stroke not calibrated	Perform RE-CAL
	Tight shutoff is active	Verify settings using PC or handheld software
	Customer characterization or soft stops active	Verify customer characterization and soft stops
Position is driven fully open or closed and will not respond to command	Stroke not calibrated	Check DIP switch settings and calibrate valve stroke
	Inner-loop hall sensor not connected	Verify hardware connections
	Wrong air action entered in software	Check ATO (Air-to-open) and ATC (Air-to-close) settings. Recalibrate
	Actuator tubing backward	Verify ATO/ATC actuator tubing
	Driver module Electro-pneumatic converter malfunctioning	Replace driver module
	Control parameter inner-loop offset is too high/low	Adjust inner-loop offset and see if proper control resumes
Sticking or hunting operation of the positioner	Contamination of the driver module	Check air supply for proper filtering and meeting ISA specifications ISA-7.0.01. Check the spool valve for contamination
	Control tuning parameters not correct	Adjust gain settings using local gain switch
	Packing friction high	Enable the stability DIP switch on the local interface and recalibrate. If problem persists, enable pressure control with handheld communicator or SoftTools and recalibrate
	Corroded or dirty spool valve	Disassemble and clean spool valve

** Final Value Cutoff*

NOTE: Refer to blink codes for self diagnostics of other errors. See document #VLAIM0046. Refer to Logix 3400/1400 Reference Manual for Fieldbus related troubleshooting.

FCD LGENIM3404-10 3/22 Printed in USA.

To find your local Flowserve representative:

For more information about Flowserve Corporation, visit www.flowserve.com or call USA 1 800 225 6989

Flowserve Headquarters
5215 N. O'Connor Blvd.
Suite 700
Irving, TX 75039
Phone: +1 972 443 6500

Flowserve Corporation
Flow Control
1350 N. Mt. Springs Parkway
Springville, UT 84663
USA
Phone: +1 801 489 8611

Flowserve Essen Gmbh
Manderscheidtstr. 19
45141 Essen
Germany
Phone: +49 (0)201 8919 5

Flowserve (Austria) GmbH
Control Valves - Villach Operation
Kasernengasse 6
9500 Villach
Austria
Phone: +43 (0)4242 41181 0

Flowserve S.A.S.
7, Avenue de la Libération - BP 60
63307 Thiers Cedex
France
Phone: +33 (0)4 73 80 42 66

Flowserve Australia Pty Ltd.
14 Dalmore Drive
Scoresby, Victoria 3179
Australia
Phone: +61 7 32686866

Flowserve Pte Ltd.
12 Tuas Avenue 20
Singapore 638824
Singapore
Phone: +65 6868 4600

China
585, Hanwei Plaza
7 Guanghau Road
Beijing, China 100004
Phone: +86 10 6561 1900

NAF AB
Gelbgjutaregatan 2
SE-581 87 Linköping
Sweden
Phone: +46 (0)13 31 61 00

Flowserve India Controls Pvt. Ltd
Plot #4 1A, E.P.I.P., Whitefield
Bangalore Kamataka
India 560 066
Phone: +91 80 284 10 289

Kämmer Valves INC.
1300 Parkway View Drive
Pittsburgh, PA 15205
USA
Phone: +1 412 787 8803