CONTENTS

INTRODUCTION

CAUTION!

*The instructions provided herein should be completely reviewed and understood prior to installing, operating or repairing this equipment. All **ATTENTION, CAUTION, DANGER** and **WARNING** notes must be strictly observed to prevent serious injury or equipment malfunction.*

Scope

This manual includes installation, operation and maintenance information for 1.5 through 6.0-in. Norriseal Series 1001, 1001A, and 1001XL Level Controllers.

Description

The Series 1001, 1001A, and 1001XL Level Controllers are designed for general purpose use in liquid level and interface control applications calling for either modulating (Throttle) or on/off (Snap) pneumatic service and can be direct or reverse acting. Electric switch models are also available.

Norriseal level controllers are equipped standard with horizontal or vertical PVC 1.88 x 12-in. displacers. Displacer options include Acrylic and 316L S.S. materials in various lengths and diameters, including hinged models, to accommodate a wide range of control applications.

The 1001 has a smaller case than the 1001A or 1001XL and has a knurled knob screw type closure. The 1001A and 1001XL have lever latch door closing mechanisms and have a sealed door. The 1001 and 1001A have the case mounted left or right of the body, while the 1001XL is center-back mounted.

CAUTION!

Before disassembly or maintenance, all pressures in this device must be relieved. Failure to relieve pressures may result in personal injury or device damage. The resulting uncontrolled venting or spilling of process fluids may cause personal injury, loss of process control or environmental contamination.

Controller Identification

Controller model numbers are typically 13 positions long (example: 2SM60-SRDA-BG). Refer to Table 1 — Model Designation on page 2 for specific information on the controller nomenclature.

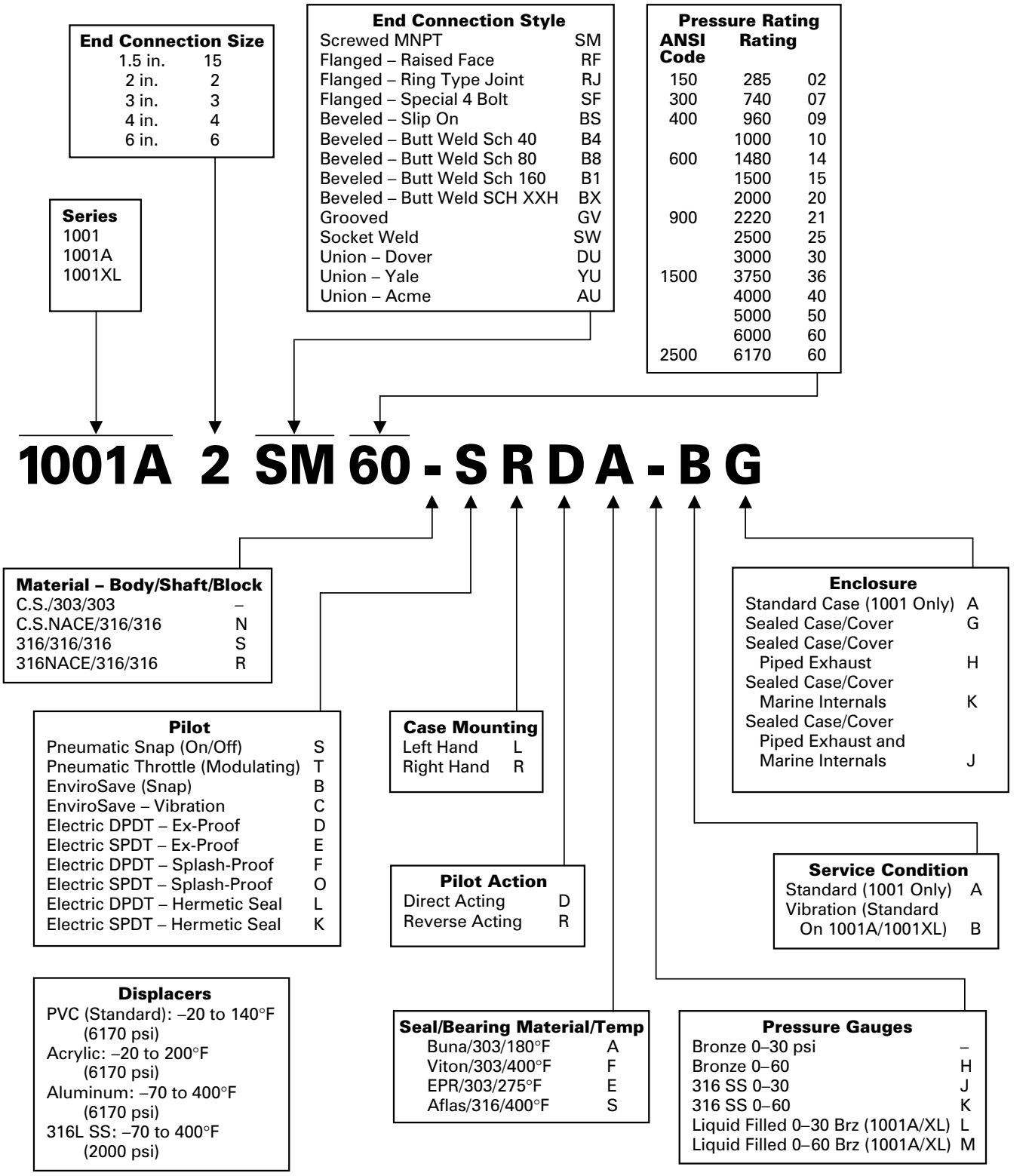
A nameplate attached to the inside of the case by the lower door hinge includes the controller model and serial numbers as well as other information pertinent to the controller assembly, such as supply and output pressures, displacer material and rating, body size and material, ANSI class, and pressure and temperature limits.

Always use only Norriseal replacement parts when servicing level controllers. Please refer to the serial and model numbers when ordering replacement parts.

ISO 9001

NORRISEAL A DOVER COMPANY
P.O. Box 40525, Houston, Texas USA 77240-0525
Tel: 713·466·3552 · Fax: 713·896·7386
www.norriseal.com

TABLE 1 — MODEL DESIGNATION



WARNING!

Maximum allowable pressures for the level controller body and the maximum allowable pressure at the maximum temperature for the level controller are shown on the nameplate mounted in the case. If pressure to the level controller is capable of exceeding these limits, install relief valves or other over-pressure protection devices in the pressure lines.

CAUTION!

When ordered, the controller body, displacer material, and configuration were selected to meet particular pressure, temperature, and fluid conditions. Bodies and displacers are limited in their operating pressure and temperature ranges as well as their ability to resist corrosion. Do not apply any other conditions to the controller without first contacting your Norriseal sales office or your sales representative.

PRINCIPLE OF OPERATION

Force Balance Principle

The operation of the Series 1001, 1001A, and the 1001XL Level Controllers is based on the *Force Balance Principle*. A spring balances the weight of a displacement type sensing element. As liquid rises around the displacer, the amount of force available to the pilot is proportional to the weight of the liquid displaced. The force available is transmitted to the pilot thrust pin through a lever and fulcrum. The higher the level, the greater the force available to the pilot thrust pin.

The control is *direct acting* (rising level increases pilot output) when the pivot point of the lever is on the spring side of the control case. The control is *reverse acting* (rising level decreases pilot output) when the pivot point of the lever is on the opposite side of the control case from the spring.

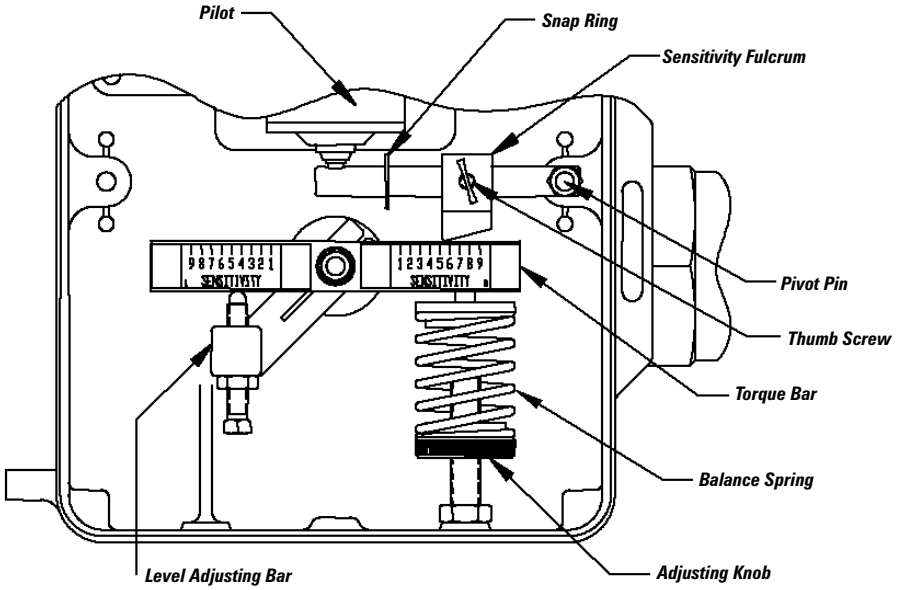


Figure 1 — Direct acting, right hand mount controller

Adjusting Proportional Band

Proportional band is the ratio of used displacer length to total length of displacer. For example, if 6 in. of level change will develop a 3 to 15 psi output signal with a 12-in.-long vertical displacer, the level controller is said to have a 50% proportional band.

By moving the fulcrum closer to the pivot point, the proportional band is increased. Likewise, by moving the fulcrum toward the snap ring decreases the proportional band. A 3 to 15 psi or 6 to 30 psi output signal may be obtained over any portion of the displacer by adjusting the fulcrum.

Adjusting Level

The spring is used to balance the weight of the displacer. As level increases, the weight of the displacer decreases. The spring tension increases and is transmitted to the

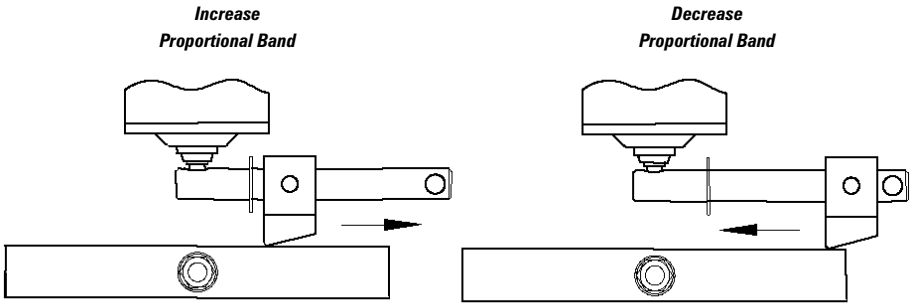


Figure 2 — Adjusting proportional band

P.O. Box 40525, Houston, Texas USA 77240-0525
Tel: 713·466·3552 · Fax: 713·896·7386
www.norriseal.com

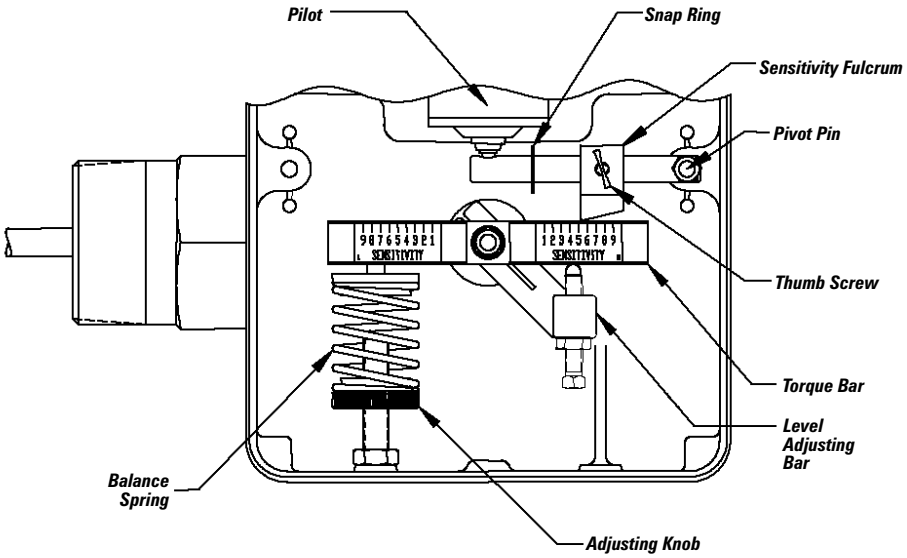


Figure 3 — Reverse acting, left hand mount controller

pilot thrust pin through the lever and fulcrum.

By increasing tension on the spring, a lower level is sensed. By decreasing tension on the spring, a higher level is required to produce the same force as before.

Spring compression can be reduced to a point where a hydrocarbon liquid level will rise above the displacer without transmitting enough force to the pilot to produce an output. If properly adjusted, water, with a higher specific gravity, will rise to the displacer resulting in a change in weight of the displacer. This will produce an output, thus sensing the interface level of water and hydrocarbon. This wide range of control makes liquid interface sensing possible.

PILOT OPERATION

As described in Principle of Operation, force from the balance spring is transmitted via the lever and fulcrum to the thrust pin of the pilot.

Snap, Relief, and Envirosave™ Pilots

These pilots have two seats. The upper seat (D) is sealed by a ball (A). On Snap pilots (see Figure 4), the ball seat is a metal seat and on the Relief and Envirosave pilots, there is an elastomeric seat ensuring zero-leakage seals. The upper seat controls supply air and the ball is held in the closed position by the supply air pressure. When mechanical force upward from the thrust pin (B) is sufficient to overcome supply air pressure holding the ball to the seat, the ball snaps upward, supply air flows downward and out the output port (H), and the lower port is sealed by the spherical end of the thrust pin preventing supply air from escaping.

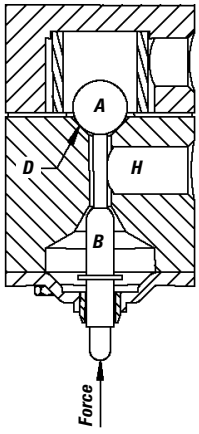


Figure 4 — Snap pilot

As the upward force on the thrust pin is decreased to a point where supply air pressure overcomes the upward force, the ball once again seals the supply air and simultaneously opens the lower exhaust port venting gas from the control valve actuator.

On the Relief pilot, the passage between the supply air and the output port is significantly larger permitting supply air to exit the output port at a faster rate.

Throttle Pilot

The Throttle pilot (see Figure 5) also has two seats to admit supply gas and exhaust "used" gas. A diaphragm (E) is used to sense pressure/force feedback and a spring assists closing pressure on the thrust pin. The Throttle pilot is operationally similar to the Snap pilot except that the output pressure is proportional to the mechanical force applied to the thrust pin (C). As the thrust pin force changes, the pilot seeks to maintain equilibrium by either decreasing (exhausting) output loading pressure or increasing output loading pressure. Supply air does not flow when the loading pressures of the pilot are balanced.

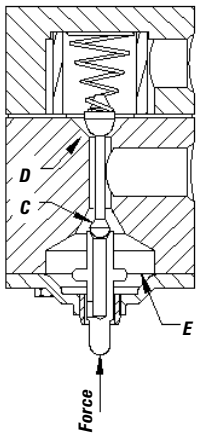


Figure 5 — Throttle pilot

Electric Pilot Switches

Two standard switches are available: SPDT (Single Pole Double Throw) and DPDT (Double Pole Double Throw) in Splash-Proof, Explosion-Proof, or Hermetically Sealed configurations.

NORRISEAL™ A DOVER COMPANY
P.O. Box 40525, Houston, Texas USA 77240-0525
Tel: 713·466·3552 · Fax: 713·896·7386
www.norriseal.com

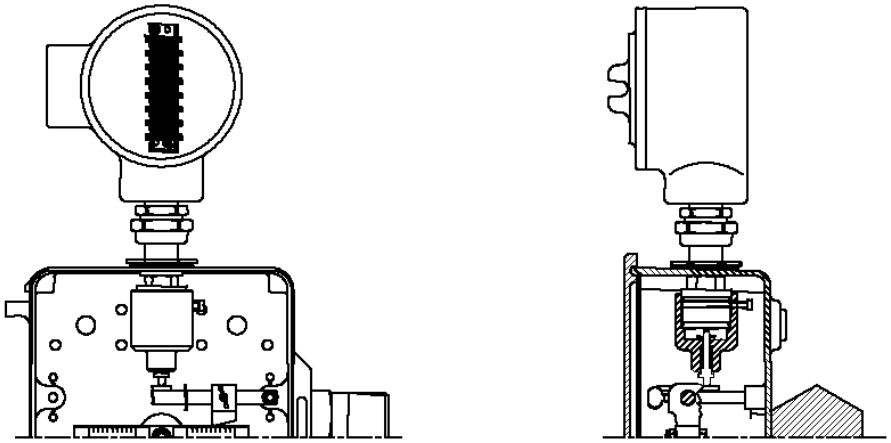


Figure 6 — Hermetically sealed electric switch

Hermetically Sealed switch pilots are terminated in a junction box UL listed Class I, Div. 1, Groups C & D and Class II, Div. 1, Groups E, F, & G. The switches themselves are hermetically sealed for hazardous locations listed UL and CSA Class I, Div. 1, Groups A, B, C, & D and Class II, Div. 1, Groups E, F, & G.

Explosion-Proof switch pilots listed by UL and CSA for use in hazardous locations Class I, Div. 1, Groups C & D and Class II, Div. 1, Groups E, F, & G. A switch listed for Class I, Div. 1, Group B is available. CSA requires the following statement for Class I, Group B:

CAUTION!

To prevent the emission of hot particles, joint surfaces must be thoroughly cleaned before closing cover.

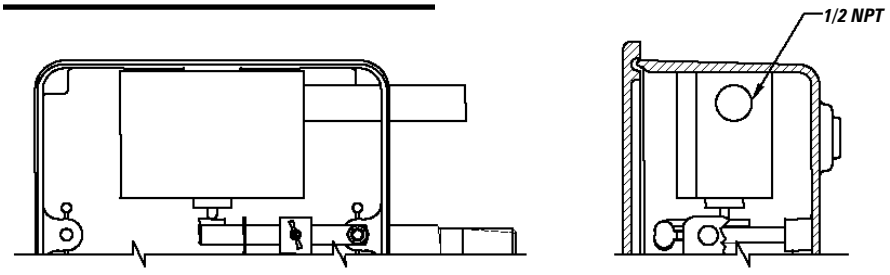


Figure 7 — Explosion-proof electric switch

1.0 LEVEL CONTROLLER INSTALLATION AND START-UP

CAUTION!

When making connection to the vessel, observe all safety requirements of the area where the work is being done. Be especially careful of pressure vessels.

WARNING!

Turn off and lock out all electrical power before beginning installation.

DANGER!

Special attention is required for level controllers with the electric switch option. Install approved conduit seals within 18 in. (0.5 M) of the enclosure as required by National and Canadian Electrical Codes. Serious personal injury and/or property damage can result if seals are not installed.

CAUTION!

Install a conduit seal with a drain loop or other means to prevent condensate from entering the enclosure. Failure to do so will allow moisture to enter the enclosure. This can cause equipment damage or malfunction.

CAUTION!

Be sure that all wiring and conduit conforms to the requirements of the National Electric Code and any enforcing agencies having jurisdiction over the installation. Be sure that special conditions, such as areas having explosion hazards, are given full consideration.

1. After unpacking the controller, visually inspect the unit for any evidence of shipping damage. Shipping damage claims must be filed with the carrier who handled the package(s). Remove any foreign material that may have collected during crating and shipment. Remove the flange or thread protectors from the body end connection.
2. Insure that screwed and gasket surfaces on both the controller and the vessel are free of any foreign materials.
3. The controller normally ships in 3 or 4 pieces: the controller body/case assembly, the displacer, the displacer arm, and, for vertical installations, the swivel. For this

reason some field assembly is required. Insert the displacer arm in the opening in the controller body. Carefully align the displacer arm in the body shaft and screw the arm into the shaft. If this is a vertical installation, screw the swivel onto the free end of the displacer arm. Screw the displacer either into the free end of the displacer arm (horizontal application) or the free end of the swivel (vertical application).

4. Install the controller using good piping practice. For flanged bodies, use a suitable gasket between the body and vessel flanges. For threaded (NPT) bodies, use TFE tape or pipe thread sealant on external pipe threads.

CAUTION!

The Bodies are rated ANSI 150, 300, 600, 900, 1500 or 2500 class. Do not install the level controller in a system where the working pressures can exceed those marked on the nameplate.

5. Connect instrument air to the controller supply connection on the back of the controller. The supply and output connections are clearly marked. On the 1001 controller, it is the upper connection. On the 1001A and 1001XL controllers, it is the connection on the right when looking at the rear of the controller case. Connect the control valve signal line to the output connection.

6. Open the case and rock the torque bar by hand to verify the displacer arm moves freely and is NOT resting against the vessel nozzle or other obstruction. The arm must be reasonably centered in the connection opening, parallel to the ground. If necessary, turn the adjusting knob under the Balance Spring to position the arm in the center of the connection opening.

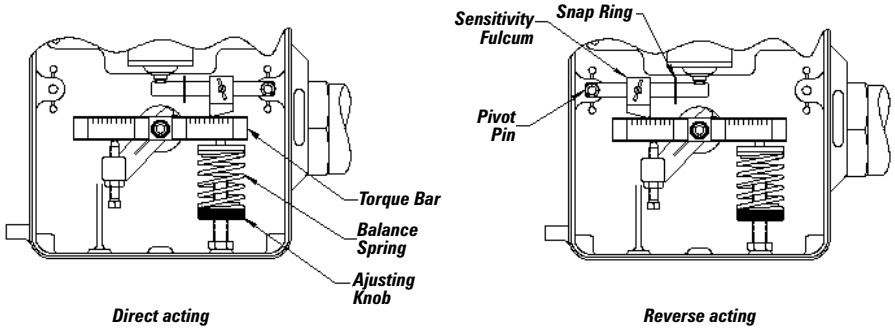


Figure 8 — How to make level adjustments

1.1 LEVEL ADJUSTMENT

NOTE: All controllers are factory preset for average level and sensitivity.

1. With the displacer arm centered in the vessel nozzle as described in paragraph 1.0, Step 6, to lower the level, turn the adjusting knob under the Balance Spring CLOCKWISE to increase compression on the Balance Spring (decrease level). To raise the level, turn the knob COUNTER-CLOCKWISE to decrease compression on the Balance Spring (increase level).

2. Adjust the proportional band (dump span) by first loosening the thumb screw on the Sensitivity Fulcrum. Slide the fulcrum along the Flapper Bar toward the snap ring (toward the pilot) to DECREASE proportional band and INCREASE SENSITIVITY. Slide the fulcrum along the Flapper Bar away from the snap ring (away from the pilot) to INCREASE proportional band and DECREASE SENSITIVITY. Tighten the thumb screw on the Sensitivity Fulcrum when the proper span is selected.

1.2 LIQUID LEVEL INTERFACE

NOTE: All controllers are factory preset for average level and sensitivity.

1. Set the Sensitivity Fulcrum ¼ in. from the snap ring, reduce the spring tension slowly by turning the adjusting knob COUNTER-CLOCKWISE, and let the UPPER fluid rise to submerge the displacer. Fine tune after the displacer is fully submerged in the UPPER fluid by slowly increasing spring tension (turning adjusting knob CLOCKWISE) until an output signal is obtained. Then back the tension off slowly (turning adjusting knob COUNTER-CLOCKWISE) until the output signal pressure returns to zero.

2. Let the lower fluid rise until the desired interface level is reached. Fine tune by slowly increasing spring tension (turning adjusting knob CLOCKWISE) until an output signal is obtained. Then back the tension off the Balance Spring slowly (turning adjusting knob COUNTER-CLOCKWISE) until the output signal pressure returns to zero.

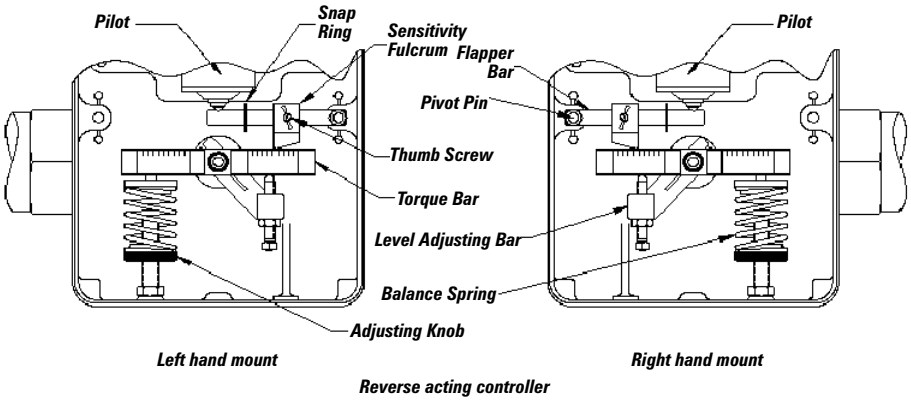


Figure 9 — How to make level adjustments

3. If a longer dump span is desired, move the fulcrum farther away from the snap ring and repeat the above procedure.

2.0 LEVEL CONTROLLER MAINTENANCE

WARNING!

Before attempting any repairs, isolate the controller from the system and make sure that all pressure is released from the controller body. Shut off and vent supply and output (signal air) lines to the controller. On electric pilots, disconnect all power to the controller.

1. Isolate the controller from the process.
2. Shut off the output and supply lines to the controller. If the pilot is electric, turn off and lock out all electrical power to the controller.
3. Release the process pressure.

Controller parts are built to withstand a great deal of wear under normal operating conditions and will rarely need to be repaired. Should repair be necessary, the following sections describe the procedures for disassembling and re-assembling the controller for normal maintenance and troubleshooting.

2.1 LEVEL CONTROLLER PREVENTIVE MAINTENANCE

1. In normal service, O-Rings and the bearings on the main shaft should last for many years. If a leak occurs, replace the O-Rings. Order a Level Seal Kit (LSK) from Norriseal.
2. If the controller is used in high-paraffin service or interface control with a horizontal displacer, remove and inspect the body of the controller after three (3) months of service and check for debris buildup. Future inspection times after initial inspection can be gauged by how much buildup of debris occurred in the initial three (3) months of service.

2.2 LEVEL CONTROLLER DISASSEMBLY

NOTE: These instructions do not apply to the pilot. See Paragraph 2.4 for instructions for removing and/or replacing the pilot.

1. Relax all tension on Balance Spring.
2. Remove the Balance Spring and upper spring retainer.
3. Remove the stud bolt holding the adjusting knob and remove both from the case.
4. Remove the lock nut from the Flapper Bar. Slide the Flapper Bar off of the Pivot Pin. *NOTE: DO NOT remove either Pivot Pin from the case. They are press-fit into the case and not meant to be removed. Do not remove the Sensitivity Fulcrum or the thumb screw.*
5. Remove the lock nut from the torque bar. Slide the torque bar off of the shaft.
6. While holding the Level Adjusting Bar still, loosen the two cap screws until the Level Adjusting Bar is free on the shaft. *NOTE: It is not necessary to remove or adjust the adjusting screw on the Level Adjusting Bar unless converting the case mounting. Slide the Level Adjusting Bar from the shaft. Slide the spacer from the shaft.*
7. Remove the two cap screws holding the case to the body. Remove the case from the body.

2.3 LEVEL CONTROLLER REASSEMBLY

1. Mount the case to the body with two cap screws. Tighten the screws to 6 ft.-lbs.
2. Slide the spacer on the shaft.
3. If the level adjusting screw has been removed or adjusted during disassembly, position the screw so that there is an equal amount of thread showing above and below the Level Adjusting Bar. The cap on the level adjusting

NORRISEAL A DOVER COMPANY
P.O. Box 40525, Houston, Texas USA 77240-0525
Tel: 713·466·3552 · Fax: 713·896·7386
www.norriseal.com

screw will be pointing AWAY from the two cap screws on the shaft end of the Level Adjusting Bar.

4. Slide the Level Adjusting Bar onto the shaft against the spacer with the Level Adjusting Screw OPPOSITE the controller body. Snug, *but do not tighten*, the cap screws that secure the bar to the shaft.
5. Temporarily slide the Torque Bar onto the shaft. Position the Level Adjusting Bar so that the Torque Bar is parallel with the displacer arm when the round tip of the level adjusting screw is touching the Torque Bar.
6. Remove the Torque Bar and tighten the cap screws that secure the Level Adjusting Bar to the shaft, starting with the screw nearest the slotted end of the Level Adjusting Bar, taking care not to overtighten.
7. Slide the Torque Bar back onto the shaft with the counter-sunk hole for the spring retainer facing down. (For left hand mount, the hole is on the left side. For the right hand hole, the hole is on the right side.) Secure the Torque Bar with the lock nut leaving 1/16-in. clearance between the nut and the Torque Bar. *NOTE: DO NOT tighten this nut; the Torque Arm must move freely.*
8. Slide the Flapper Bar onto the Pivot Pin. If converting the case mounting, remove the thumb screw from the Sensitivity Fulcrum and screw it into the opposite side of the Fulcrum. Try to keep the Fulcrum positioned in the same place on the Flapper Bar. Use the left Pivot Pin for left hand mount direct acting or right hand mount reverse acting. Use the right Pivot Pin for right hand mount direct acting or left hand mount reverse acting. Secure the Flapper Bar with the lock nut. *NOTE: DO NOT tighten this nut; the Flapper Bar must move freely.*
9. Install the stud bolt and lower spring retainer in the lower pilot case. The bolt stud will be on the left for left hand mount and on the right for right hand mount.
10. Install the spring and upper spring retainer, centering the retainer pin with the hole in the Torque Bar.

2.4 PILOT REMOVAL/REPLACEMENT

WARNING!

Before attempting any repairs, isolate the controller from the system and make sure that all pressure is released from the controller body. Shut off and vent supply and output (signal air) lines to the controller. On electric pilots, disconnect all power to the controller.

CAUTION!

Pneumatic and Electric Pilot cases are NOT interchangeable. Do not attempt to replace a Pneumatic Pilot with an Electric Pilot or vice versa.

A. Pneumatic Pilots

1. Remove the supply and output lines from the rear of the controller.
2. For the 1001 controller, the pilot is held in place by two cap screws mounted through the top of the case. Remove these cap screws and remove the pilot from the case.
3. For the 1001A and 1001XL controllers, the pilot is held in place by four cap screws in the Pilot Clamp. Remove these four cap screws and remove the pilot from the case.
4. If necessary, rebuild the pilot following the instructions provided in the Pilot Re-build Kit (PRK). Alternately the pilot can be totally replaced. Pilot action may be converted from snap to throttle or vice versa by using a Pilot Conversion Kit (PCK). Use only genuine Norriseal parts kits or pilots.
5. Re-install the pilot by reversing instructions 1 through 3 above. While the Pilot Gasket may not need replacing on the 1001A and 1001XL controllers, replacement is recommended.

B. Electric Pilots — Explosion Proof

1. ***DISCONNECT THE POWER SUPPLY CIRCUIT BEFORE CONTINUING.***
2. Disconnect the wire leads. Remove the screws holding the basic switch in the case and then the basic switch.
3. Place the replacement switch in the insulator, insert the screws, and place the assembly in the case.
4. Tighten the screws and connect the lead-in wires.
5. Be certain the small compression spring is returned to its position between the top of the basic switch and the internal lever (or above the internal lever in the case of the CCW actuated switches).

NORRISEAL A DOVER COMPANY
P.O. Box 40525, Houston, Texas USA 77240-0525
Tel: 713·466·3552 · Fax: 713·896·7386
www.norriseal.com

C. Electric Pilots — Hermetically Sealed

1. ***DISCONNECT THE POWER SUPPLY CIRCUIT BEFORE CONTINUING.***
2. Disconnect the wire leads. Remove the conduit coupling on the top of the case, then the switch nut, washer and O-ring. Remove the switch. Loosen the four screws retaining the switch adapter and remove the switch adapter.
3. Place the replacement switch in the switch adapter, tighten the screws, and place the assembly in the case.
4. Replace the O-ring, washer and switch nut. Tighten the switch nut, replace and tighten the conduit coupling, and connect the lead-in wires.

2.5 LEVEL CONTROLLER CASE MOUNTING CONVERSION

1. Completely disassemble the controller following the disassembly instructions in Paragraph 2.2.
2. Reassemble the controller following the instructions in Paragraph 2.3. The Level Adjusting Screw will be placed at a 90° angle to that in the original configuration. The thumb screw in the Fulcrum will be screwed into the opposite side of the Fulcrum. The Level Adjusting Bar, Level Adjusting Screw, Fulcrum, Torque Bar, Flapper Bar, Balance Spring and stud bolt will all be on opposite sides of the case from the original configuration.

2.6 LEVEL CONTROLLER PILOT ACTION CONVERSION

1. Relax all tension on the Balance Spring.
2. Remove the lock nut from the Flapper Bar. Slide the Flapper Bar off of the Pivot Pin.
3. Remove the thumb screw from the Sensitivity Fulcrum and replace it in the opposite hole on the Fulcrum from which it was removed.
4. Replace the Flapper Bar on the Pivot Pin on the opposite side of the case, with the thumb screw on the Sensitivity Fulcrum pointing out.
5. Secure the Flapper Bar with the lock nut. *NOTE: DO NOT tighten this nut; the Flapper Bar must move freely.*
6. Adjust the tension on the Balance Spring.

2.7 LEVEL CONTROLLER BODY DISASSEMBLY

1. Remove the body from the controller assembly by following the controller disassembly instructions in Paragraph 2.2.
2. Remove the two bearing blocks (1¼-in. wrench) and the shaft. Remove and discard the O-rings in the body, on the shaft, and in the bearing blocks.

2.8 LEVEL CONTROLLER BODY REASSEMBLY

1. Using new O-rings, install the large O-ring over the threads of the bearing block. Install the new Teflon backup rings in each bearing block, pressing them into place with a 5⁄16-in. diameter rod. Install the new O-rings in each bearing block, pressing them into place with a 5⁄16-in. diameter rod. *NOTE: A light oil applied to the O-rings will assist in the assembly procedure.*

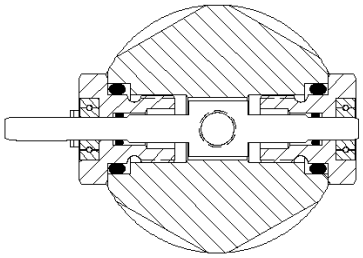


Figure 10 — End-on cutaway view of controller body. As shown, the case would mount to the left of the body.

CAUTION!

If the bearing blocks are removed from the body for any reason, the backup rings and O-rings must be re-packed (pressed into place). It is recommended that new backup rings and new O-rings be used.

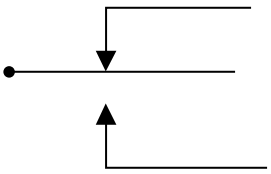
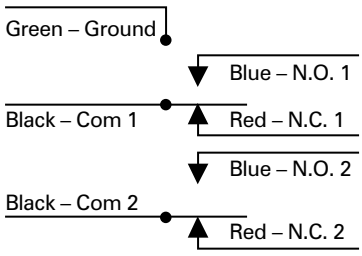
2. Replace the outboard bearing block (with the "hubcap") on the side of the body AWAY from the case mounting bolt holes.
3. Insert the shaft into the body and firmly seat in the outboard bearing.
4. Replace the remaining bearing block on the body and tighten.
5. Reattach the body to the case per Paragraph 2.3, step 1.

3.0 REPAIR KITS

Norriseal provides three repair kits for use in controller maintenance: a Level Seals Kit (LSK), a Pilot Repair Kit (PRK), and a Pilot Conversion Kit (PCK).

TABLE 2 — WIRING DIAGRAMS

STANDARD SWITCH

CODE	CIRCUITRY	ELECTRICAL RATING
"E" EX-Q or "O" OP-Q	 Single Pole Double Throw (SPDT)	UL and CSA Listed: 15 amps, 125, 250 or 450 VAC 0.50 amp 125 VDC 0.25 amp 250 VDC
"D" EXD-Q or "F" OPD-Q	 Double Pole Double Throw (DPDT)	UL and CSA Listed: 10 amps, 125 or 250 VAC 0.30 amp 125 VDC 0.15 amp 250 VDC

HERMETICALLY SEALED SWITCH

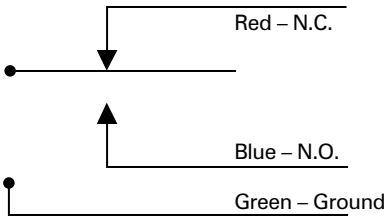
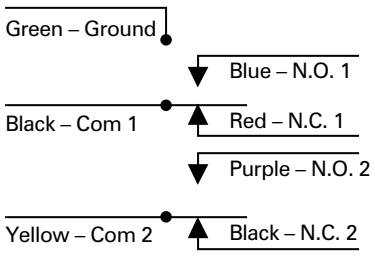
CODE	CIRCUITRY	ELECTRICAL RATING
"K" Hermetic 030	 Single Pole Double Throw (SPDT)	UL, CSA and FM Listed: 11 amps, 125/250 VAC 5 amps Res, 25 VDC 0.50 amps, 125 VDC
"D" EXD-Q or "F" OPD-Q	 Double Pole Double Throw (DPDT)	UL, CSA and FM Listed: 11 amps, 125/250 VAC 5 amps Res, 28 VDC 0.50 amps 125 VDC

TABLE 3 — TROUBLE DIAGNOSIS

TROUBLE	***SYMPTOM POSSIBLE CAUSE***	***CORRECTIVE ACTION***
Pilot output pressure gauge indicates output pressure signal when fluid level is below displacer on a direct acting controller ***OR*** when fluid level is above displacer on a reverse acting controller.	1. Balance Spring is too compressed and puts too much pressure on the Torque Bar. 2. The displacer arm is set too high or the displacer is hitting something inside the vessel.	1. Back off the spring retainer until the output pressure signal goes off. Re-check when the fluid level rises (direct acting) or falls (reverse acting). 2. Check the displacer arm by moving the leveling adjusting bar up and down. If the adjusting bar will move in only one direction, this indicates the displacer arm is riding at either the top or bottom of the vessel connection. If it moves too freely, the displacer has become disconnected from the displacer arm. Re-center the displacer arm in the vessel connection.
Pilot output pressure gauge indicates no output pressure signal when fluid level is above displacer on a direct acting controller ***OR*** when fluid level is below displacer on a reverse acting controller.	1. Balance Spring is insufficiently compressed and doesn't put enough pressure on the Torque Bar. 2. The displacer arm is set too low or the displacer is hitting something inside the vessel.	1. Compress the spring retainer until an output pressure signal is indicated on the output pressure gauge. Re-check when the fluid level falls (direct acting) or rises (reverse acting). 2. Check the displacer arm by moving the leveling adjusting bar up and down. If the adjusting bar will move in only one direction, this indicates the displacer arm is riding at either the top or bottom of the vessel connection. If it moves too freely, the displacer has become disconnected from the displacer arm. Re-center the displacer arm in the vessel connection.
Controller does not repeat at the same fluid level after each dump and sometimes fails to either dump or shut-off. (The torque bar does not bounce back fast when depressed and appears to be hard to move.)	Paraffin or debris has built up inside the level control body.	Remove controller from service and clean out the body with a solvent.
A Pneumatic Pilot bleeds air continuously.	Foreign matter under the ball on a snap control pilot or under the peanut on a throttle control pilot. ***OR*** The tru-arc ring on the snap pilot thrust pin may have been dislocated.	Remove the pilot following the instructions in Paragraph 2.4. Remove the two cap screws from the bottom of the pilot. Clean the pilot thoroughly. If a Snap Pilot, make sure the dimension between the tru-arc ring and the bottom of the pin is ¾ in. If not, gently tap the tru-arc ring into the proper location. Reassemble the pilot.
On interface control, the vessel occasionally loses all fluid or the vessel overflows, especially with temperature change. The displacer arm is free and the displacer is not hitting inside the vessel.	The displacer is not big enough to handle the interface differential. Close specific gravity of two fluids and a temperature change can cause this problem.	Provide exact specific or API gravities of both fluids to Norriseal Engineering for exact sizing of the displacer that should be used.

NORRISEAL™ A DOVER COMPANY

P.O. Box 40525, Houston, Texas USA 77240-0525
Tel: 713·466·3552 · Fax: 713·896·7386
www.norriseal.com

HEADQUARTERS, MANUFACTURING PLANT AND SALES

P.O. Box 40525, Houston, Texas USA 77240-0525
11122 West Little York, Houston, Texas USA 77041-5016
Tel: 713·466·3552 • Fax: 713·896·7386
www.norriseal.com

Due to the continuous improvement at Norriseal, specifications and/or prices are subject to change without notice or obligation.