

LC10B

**Specifications**

Connections:

Threaded: 1 1/2" and 2"

Flanged: 2" to 8"

Union: 4" and 5"

Pressure Rating:

Threaded: 6000 psi

Flanged: Up to ANSI 2500 Class

Union: 1500 psi

Temperature Range:

-50° F to 400° F (Varies by Material Selections)

Pilot Connections: 1/4" NPT

Pilot Max Pressure: Limited by Gauges

Electric Switch Ratings:

SPDT: 15 A @ 125, 250, 480 VAC

DPDT: 10 A @ 125 VAC

**Application**

The LC10 is a liquid level controller. It uses a displacer balanced by a spring to detect the level of a liquid inside a vessel. As the liquid level rises and falls the LC10 gives either an increasing or decreasing output signal using a pneumatic pilot or electric switch.

The LC10 is available with many different options making it an extremely versatile device that can be set up in a variety of ways. Three different pneumatic pilots options are available as well as two electric switch options. Left hand, right hand, and back mount options are available to fit a variety of vessels and piping layouts. Many different connections sizes, arm lengths, displacer sizes and materials make for an endless combination of available models to fit almost any need.

Many of the options of the LC10 are able to be changed right in the field. The pilots can be easily removed from the LC10 making it easy to change them out in the field. The standard LC10 can be swapped from right to left hand or vice versa in the field. The LC10 can also be changed from direct to reverse acting in the field. The displacer and arm can also be easily swapped out at any time or changed from a horizontal to vertical orientation.

LC10/  
LC10S

## Model LC10 Installation

### Installation

#### Arm and Displacer (See Figure 1)

The Arm and Displacer are shipped in the box with the LC10 and will need to be attached before the LC10 is installed into a vessel. Thread the Arm into the Shaft inside the LC10 Body. This can be done inserting the Arm into the hole in the end of the LC10 Body and pushing it in until it can be threaded into the hole in the Shaft located near the back of the Body. The Shaft may need to be rotated slightly until the threaded hole is aligned to the front. For a horizontal arrangement screw the Displacer directly onto the Arm. For a vertical arrangement, attach the Arm followed by the Swivel Assembly, then add the Displacer. If vibration is a concern, Loctite can be added to the Arm threads before installation.

#### Body

For a threaded Body verify that the condition of the threads on the vessel and the LC10 are undamaged and free of debris. Apply pipe compound or Teflon tape to the threads. Insert the Displacer and Arm into the vessel and thread the LC10 onto the vessel.

For a flanged Body LC10 use the correct Gasket and bolts to connect the LC10 to the vessel.

For a union connection be sure to put the Hammer Nut over the Body before threading the LC10 Body into the blind flange. Then put the blind flange on the end of the Weld Neck and thread on and tighten the Hammer Nut.

For any installation make sure that there is enough clearance for the Arm and Displacer to move freely in the vessel without touching the vessel sides or bottom.

#### Pilot/Switch (See Figure 3)

Connect low pressure supply gas to the LC10 Pilot. The 1/4 NPT Pilot connections can be found at the back of the LC10 Case. **CAUTION: Be sure not to exceed the pressure range of the Pilot Gauges. Doing so can damage the gauges and pilot.** The standard Gauges are 0-30 or 0-60 psi.

If installing an LC10 with an Electric Switch, follow the proper electrical codes when making connections and installing conduit. See Figure 2.

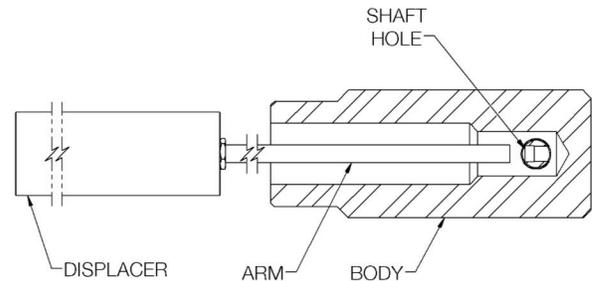


Figure 1

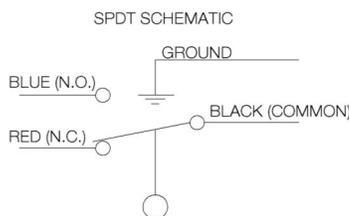


Figure 2

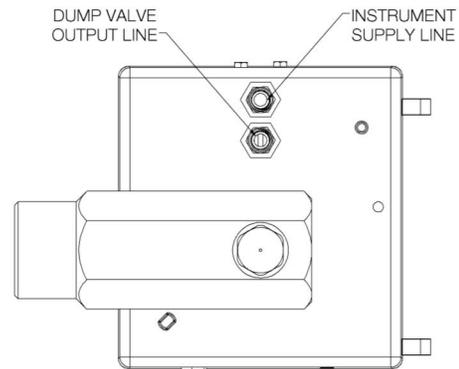


Figure 3

## Model LC10 Operation

### Principles of Operation

The LC10 uses Archimedes' principle in order to detect the level of liquid in a vessel. The Displacer weighs less when submerged in a liquid, because of the buoyant force acting on the Displacer when it is submerged. Since the weight of the Displacer is balanced by the LC10 Spring, the buoyant force from the liquid is enough to lift the Displacer and Arm upward rotating the Level Adjustment Bar. The Level Adjustment Bar pushes on the Torque Bar which acts upon the Fulcrum on the Level Adjustment Bar. The Level Adjustment Bar then pushes the Pilot Pin triggering the Pilot.

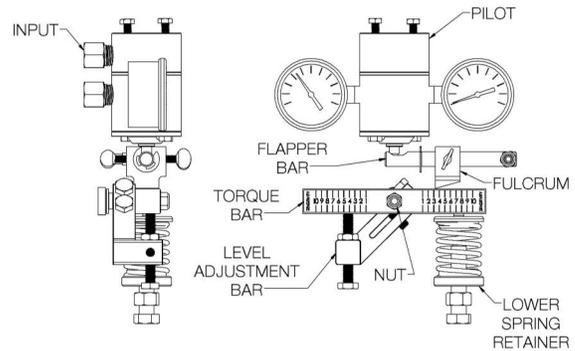


Figure 4

### Level Adjustment

When using an LC10 with a vertical Displacer orientation, the liquid level in the vessel can be adjusted by turning the Lower Spring Retainer as shown in Figure 4. Turning the Lower Spring Retainer changes the amount of load provided by the Spring which in turn changes the amount of support provided to the Displacer's weight. Turning the Lower Spring Retainer clockwise provides less spring load and less offset of the displacers weight. This means that the liquid will have to rise higher on the Displacer in order to lift it and trigger the LC10. Turning the Lower Spring Retainer counter-clockwise provides more spring load meaning the liquid level does not need to rise as high on the Displacer to trigger the LC10. Therefore turning the Lower Spring Retainer clockwise raises the liquid level in the vessel, and turning it counter-clockwise lowers the level.

Note that amount that the level can be adjusted is limited by the length of the Displacer.

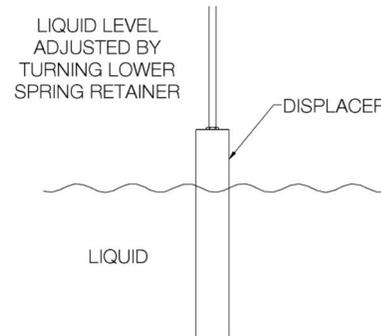


Figure 5

### Direct vs Reverse Acting (See Figure 6)

A direct acting LC10 arrangement will increase the Pilot output as the Displacer is lifted. Reverse acting arrangement will decrease the Pilot output as the Displacer is lifted.

Direct

Reverse

Figure 6

### Sensitivity & Span

The span of the Level Controller is the distance that the level changes between when the Pilot opens and closes. To adjust the span loosen the Thumb Screw located on the Fulcrum. Then slide the Fulcrum along the Flapper Bar. Moving the Fulcrum toward the center of the Case increases the sensitivity of the Displacer to changes in liquid level thereby decreasing the span. Moving the Fulcrum away from the center of the Case decreases the sensitivity and increases the span.

Increasing the span means that a dump valve actuated by the LC10 will stay open longer draining more of the liquid in the vessel before it closes. Decreasing the span close the dump valve sooner draining less fluid.

*Figure 7*

*Figure 8*

*Figure 9*

**Model LC10 Maintenance**

**Setting the LC10**

To set the LC10 first connect an airline to the input of the Pilot. Next, adjust the Lower Spring Retainer so that, when the Arm is in its set position and then lifted, the Flapper Bar triggers the Pilot.

**Mounting Change**

The LC10 is field reversible which is convenient for arrangement changes. To switch the LC10 from left to right or vice versa, first remove the nut holding the Torque Bar and Level Adjustment Bar on the Shaft. Next, remove the Torque Bar and Level Adjustment Bar. The Body is held on by two hex head screws. Remove the screws and rotate the Body to the desired orientation and reinstall the screws to secure the Body. The Level Adjustment Bar will need to be rotated clockwise or counter clockwise depending on the initial setup. The screw will need to be removed from the Level Adjustment Bar and threaded into the correct hole once the Bar has been rotated. The Spring, Upper and Lower Spring Retainer, and Screw will swap to the other side. Put the Level Adjustment Bar and Torque Bar back on the Shaft and use the nut to secure them. Finally, The Fulcrum Assembly will need to be moved to the opposite side. Unscrew the nut holding it on the stud and simply swap to the other side. Reference Figure 11.

**Action Change**

To change an LC10 from reverse to direct or vice versa simply unscrew the nut holding on the Flapper Bar. Remove the Flapper Bar and move it to the other side of the Case. Don't forget to swap the Thumb Screw around to the front. Re-install the nut taking care not to over tighten it. Overtightening the nut will hinder the Flapper Bar from rotating and will cause the unit to malfunction. For best performance the nut should be snugged up against the Flapper Bar then backed off about 1/8 of a turn.

**Body Maintenance (See Figure 12)**

To replace the soft goods in the Body of the LC10 unscrew the nut holding on the Torque Bar and Level Adjustment Bar, remove them from the Shaft, and remove the Body from the Case by unscrewing the two hex head screws. Once the Body is removed, unscrew both Bearing Blocks to reveal the two O-rings and Backup Ring on each side. Remove the old O-rings and Backup Rings and replace them with the new ones provided in the repair kit. Before installing the new O-rings, grease them with multi-purpose synthetic grease for reduced wear and longer life expectancy. Reinstall the Bearing Blocks into the Body and attach it back to the Case securely tightening the two hex head screws. Put the Level Adjustment Bar and Torque Bar back on the Shaft and secure them with the nut.

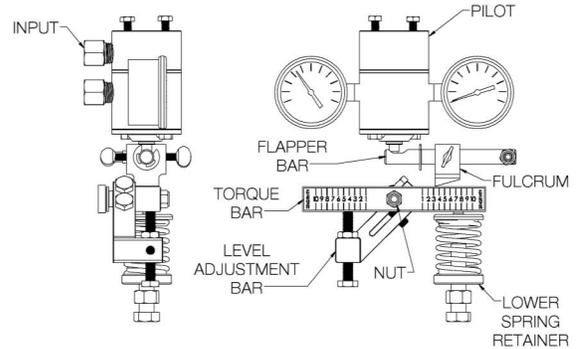


Figure 10

Left Hand Direct

Right Hand Direct

Left Hand Reverse

Right Hand Reverse

Figure 11

Figure 12

## Model LC10 Maintenance Cont.

### Pilot Change

#### Standard Case (See figure 13)

To remove the Pilot, first turn the Lower Spring Retainer all the way to the bottom to relieve the tension on the Spring. Next, unscrew the two screws located on top of the Case. Push down the Torque Bar on the Spring side as far as it will go. This will allow the Pilot to be removed. Put in the new Pilot, and replace the upper screws to hold it to the top of the Case. Make sure that the Flapper Bar is positioned so that the Pilot Pin rests in the slot. The Pilot Pin should be able to move freely in the slot without binding as the Flapper Bar moves up and down .

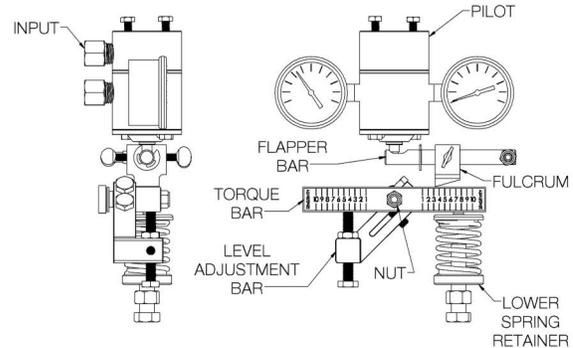


Figure 13

#### Sealed Case (See Figure 14)

To remove the Pilot, first turn the Lower Spring Retainer all the way to the bottom to relieve the tension on the Spring. Next, unbolt the Pilot Plate that covers the front of the Pilot. Push down the Torque Bar on the Spring side as far as it will go. This will allow the Pilot to be removed. Remove the Gasket behind the Pilot. To reassemble replace the Pilot Gasket with a new one and put in the new Pilot. Put the Pilot Plate back on and reinstall the pilot plate screws. Make sure that the Flapper Bar is positioned so that the Pilot Pin rests in the slot. The Pilot Pin should be able to move freely in the slot without binding as the Flapper Bar moves up and down .

Figure 14

### Pilot Repair (See Figure 15)

Remove the two screws holding together the Pilot to expose the components within. When replacing the components, the Gasket needs to be checked so that the orientation of the cutouts match the holes on the Body. Reassemble and test the Pilot with a supply line to check for leaks before installing back into the Case. Mount the Pilot back into the Case with the two screws and make sure the Flapper Bar is positioned correctly on the Pilot Pin.

Figure 15

Model LC10 Maintenance Cont.

Table 1. Trouble Diagnosis

Symptom	Probable Cause(s)	Corrective Action(s)
Air leaking through pneumatic pilot continuously	Snap Pilot: Ball isn't seating properly	Connect an air supply line to the inlet port on the Pilot and actuate the pilot 2-4 times
	Throttle Pilot: Lower pin (peanut) not seating	Connect an air supply line to the inlet port on the Pilot and actuate the pilot 2-4 times.
	Debris on the sealing surfaces	Clean out the inside of the top cap and body of any debris and actuate the pilot 2-4 times with air connected to the inlet port.
	Snap ring not in the groove on the pin	Check to be sure the snap ring is sitting in the groove on the pin.
Pilot output gauge not indicating an output pressure signal on a direct acting controller when the fluid level is above displacer or on a reverse acting controller when the fluid level is below the displacer.	The gasket is not installed properly	Ensure the gasket cutouts match the holes in the body when replacing.
	The spring isn't compressed enough and therefor not applying enough pressure on the torque bar.	Turn the lower spring retainer counter-clockwise until the output pressure signal is indicated on the gauge. Verify when the fluid level falls or rises for direct and reverse acting, respectively.
	The displacer arm is set too low or the displacer is bottoming out on something inside the vessel	Check the displacer arm by moving the level adjustment bar up and down. If the level adjusting bar only moves in one direction it indicates the displacer arm is sitting at either the top or bottom of the vessel connection. If it moves too freely, the displacer is no longer connected to the arm. Re-center the displacer arm in the vessel connection.
Pilot output gauge not indicating an output pressure signal on a direct acting controller when the fluid level is above displacer or on a reverse acting controller when the fluid level is below the displacer.	The spring is compressed too much and therefor applying too much pressure on the torque bar.	Turn the lower spring retainer clockwise until the output pressure signal is relieved on the gauge. Verify when the fluid level falls or rises for direct and reverse acting, respectively.
	The displacer arm is set too high or the displacer is bottoming out on something inside the vessel	Check the displacer arm by moving the level adjustment bar up and down. If the level adjusting bar only moves in one direction it indicates the displacer arm is sitting at either the top or bottom of the vessel connection. If it moves too freely, the displacer is no longer connected to the 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	Debris has accumulated inside the level control body	Remove the controller from service and clean the body with a solvent