



**‘SS-2’**  
**PRESSURE SWITCH**  
**OPERATION MANUAL**  
OMP# 4202 – 10/00

The Ruelco “SS-2” pneumatic pressure switch is a three way block and bleed valve that is operated by pressure acting on a piston opposing and adjustable spring force. It functions as either a normally closed or normally open valve depending on through which of the two ports the instrument pressure is supplied. These ports are marked as “HI IN” or “LO IN” on the switch body. The output port, marked “OUT” on the switch body, is the same for either mode of operation. Pressure applied to the sense port will cause the valve to operate.

When the instrument supply pressure is connected to the “HI IN” port, the switch operates as normally open valve and is called a high switch. If sense pressure acting on the piston is at normal levels, it is insufficient to overcome the spring force. The middle O-ring on the spool is positioned between the “LO IN” and the “OUT” port, thus preventing the instrument pressure from passing to the “LO IN” port of the switch body, but allowing it to pass from the “HI IN” port to the “OUT” port. When the pressure acting on the piston becomes large enough to overcome the spring force, the spool shifts and the center O-ring moves between the “HI IN” port and the “OUT” port. Instrument pressure at the “OUT” port and downstream “BLEEDS” to atmosphere thru the “LO IN” port while supply pressure at the “HI IN” port is “BLOCKED” from entering the “OUT” port.

The pressure switch “BLOCK AND BLEED” action is the same when the instrument pressure is connected to the “LO IN” port and the “HI IN” port is left unused. For this mode of operation, the switch acts as normally closed valve and is called a low switch. When normal sense pressure is acting on the piston, the center O-ring on the spool is between the “HI IN” port and the “OUT” port, thus preventing the instrument pressure from passing to the “HI PORT” of the switch body, but allowing it to flow from the “LO IN” port to the “OUT” port of the switch body. When the sense pressure decreases to an abnormal level, the spring force shifts the spool and the middle O-ring on the spool becomes positioned between the “LO IN” port and “OUT” port. Pressure at the “LO IN” port is “BLOCKED” from entering the “OUT” port and pressure at the “OUT” port “BLEEDS” to atmosphere from the “HI IN” port.

Changing the sense pressure value when the switch is used as either a high or low is done by altering the force of the spring, the size of the sense piston diameter or both. Changing the spring force is accomplished by turning the spring cap to increase or decrease the spring compression. The piston diameter is changed by adding or removing o-rings on the piston or changing the piston.

## 2.0 INSTALLATION:

The “SS-2” can be panel mounted (with optional panel mount nut) or supported by piping from the sense port in either vertical or horizontal positions. If the switch is mounted horizontally, it is recommended that the small vent hole in the side of the switch body be oriented in a downward position. This will prevent any debris from accumulating in the spring cavity or above the sense piston.

Proper pipe thread sealant should be used on any pipe fittings threaded into the pressure switch ports. If stainless steel fittings are used, a sealant that will prevent galling is required. The supply gas flowing through the switch body should be filtered and free of large particles. If compressed air is used, it does not have to be lubricated. If natural gas is used as the instrument pressure, then it should contain as little condensate or crude oil as possible. This will extend the life of the seals. When the switch is mounted using the ½” NPT base connection and the instrument pressure ports are not in the desired position after the base connection is adequately tightened, **DO NOT** loosen the body from the base to re-position the ports. Instead, remove the switch and re-make the ½” NPT connection.

## 3.0 DISASSEMBLY (See Spec Sheet)

Tools and materials required for proper disassembly, repair and assembly are as follows:

1. 7/8”, 1” and 1-5/16” open end wrenches or two crescent wrenches of adequate size.
2. Small pliers.

3. For switches using ¼” diameter piston, a ¼” open end wrench or a suitable crescent wrench.
4. High quality silicone base lubricant.
5. An appropriate safety solvent.

### 3.1 PARTIAL DISASSEMBLY

#### A) Spring Removal

- 3.1.1) If the switch is installed in an operating instrument system, it is not necessary to remove any instrument supply or sense pressure. If the unit is a high switch, it will trip when changing the spring; if it is a low switch, then it will not. So precautions should be taken to avoid any unwanted reactions in the instrumentation system.
- 3.1.2) To obtain access to the spring, (Item 2) rotate the lock ring (Item 4) clockwise to loosen it from the spring cap (Item 1).
- 3.1.3) Rotate the spring cap (Item 1) counterclockwise until it is disengaged from the switch body (Item 8).
- 3.1.4) Remove the spring from its cavity in the switch body. If the parts tube (Item 3) is inside the spring, care should be taken not to lose it.
- 3.1.5) Follow the procedures in repair and assembly section (steps 4.1.4

& 4.1.5) of this manual to re-install the spring.

## **B) Piston Removal**

3.1.6) If the switch is panel mounted, it is not necessary to remove it from the panel. It will be necessary to disconnect any piping or tubing from the base that would prevent the base from being removed. When the switch is supported by the ½” NPT connection on its base (Item 12) disconnect any piping or tubing from the switch body that would prevent its removal from the switch base.

**CAUTION:** Be sure that all instrument or sense pressures are completely bled to zero before disconnecting any piping or tubing.

3.1.7) Use the appropriate wrenches to hold and loosen the base from the switch body. Unthread the base completely from the switch body.

3.1.8) Use the small pliers and grip the raised ridge on top of the piston (Item 11) and pull it from the switch base (Item 12).

3.1.9) If the ¼” diameter piston (Item 14) is installed and must be removed from the large piston, use the proper wrench to hold the ¼” diameter piston and grip the large piston with the pliers with the pliers at the small diameter above the groove for the 5” piston O-ring (Item 13). Rotate either one counterclockwise to loosen and separate the piston.

3.1.10) Remove the installed O-ring from the piston.

3.1.11) If the .187” piston (Item 25) is installed, remove the sleeve (Item 23) and piston. A teflon backup and cup seal should also be removed and changed if necessary.

3.1.12) Procedures for re-installing the piston O-rings are in the repair and assembly procedure section of this manual.

## **3.2 FULL DISASSEMBLY**

**NOTE:** Use the following instructions to completely disassemble the pilot for repair and cleaning. **CAUTION:** Be sure that all instrument or sense pressures are completely bled to zero before disconnecting any piping or tubing.

3.2.1) Follow the procedures stated under partial disassembly to remove the spring and pistons

3.2.2) Remove the spool (Item 10) from the switch body. If it is necessary, use the small pliers and grip the large end of the spool.

3.2.3) The seals on the shaft may now be replaced as per instructions given in the repair and assembly section of this manual.

## **4.0 REPAIR AND ASSEMBLY (See product data sheet for replacement part numbers).**

4.1) Remove the seals from the spool and piston.

- 4.2) Clean all parts using an appropriate safety solvent.
- 4.3) Inspect the spool for any major damage such as burrs or nicks on its outside diameter. Also inspect it for straightness. Replace the spool (Item 10) if damaged.
- 4.4) Examine the polished bores of the switch body (Item 8) and base (Item 12) for gouges and rough surfaces. Be sure that all heavy dirt deposits have been removed. Replace any damaged pieces.
- 4.5) Replacement seals from an authentic **RUELCO REPAIR KIT** is recommended to ensure proper switch performance.
- 4.6) Install new seals on the spool and lightly lubricate the seals and spool. **CAUTION:** Do not leave excessive lubricant on the spool. Doing so may prevent the switch from operating.
- 4.7) Verify the required switch range from the **Range Selection Chart** on the specification sheet 4XXXX-12-95.
- 4.8) Install the required O-ring on the large piston. **CAUTION:** Do not install more than one O-ring on the large piston. If the 1/4" diameter piston (Item 14) is to be used, there should be no O-rings installed on the large piston. If a seal is to be installed on the large piston, do not re-install the 1/4" diameter piston on the large piston even if the O-rings have been removed. Place it in the parts tube (Item 3) for further use.
- 4.9) When replacing seals on the optional 1/4" diameter piston, install the back-up (Item 15) in the piston groove first. Be sure that the angle cut ends of the back-up overlap to form a flat surface. Slide the back-up towards the large piston and install the O-ring (Item 16). **CAUTION:** If using the 1/4" diameter piston, be sure that all seals on the large piston are removed. Failure to do so will prevent the switch from operating.
- 4.10) Lightly lubricate the piston seals and piston. **DO NOT** over lubricate or the switch performance may be adversely affected.
- 4.11) Install the spool completely into the switch body. Move it in and out of the body approximately 1/4" to check that it moves freely.
- 4.12) Install the piston fully into the switch base (Item 12) and grip the raised edge on the piston with the small pliers and move the piston back and forth in the base to verify that it moves freely.
- 4.13) If using the .187" piston make sure when replacing the cup seal that the lips of the seal face towards the sense pressure port. The Teflon backup should rest on top of the cup seal. Lightly lubricate the piston, then replace both piston and sleeve into the base.

- 4.14) Thread the switch base into the switch body and firmly tighten using the appropriate wrenches.
- 4.15) Install the lock ring onto the switch body and place the spring plate into the body cavity. NOTE: If the switch is panel mounted, install it into the panel and secure with a panel mounting ring prior to installing the lock ring (Item 4) and spring plate (Item 6).
- 4.16) Install the spring into the switch body. **CAUTION:** Verify that the spring is the proper color for the range required as shown on the **Range Selection Chart** on the specification sheet 4XXX-12-95.
- 4.17) Place the parts tube inside the spring and thread the spring cap onto the switch body. Adjust the switch operation as per user requirements and methods.

## 5.0 RECOMMENDED MAINTENANCE

### PROCEDURE

- 5.1) Test Switch Trip Pressure
- 5.2) Disassembly, inspect and lubricate
- 5.3) Replace all seals

### MAINTENANCE

- Every 30 days
- Yearly or as required
- Every two years or as required

## 6.0 TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	RECOMMENDED ACTION
1) Switch does not operate when high or low trip pressures are exceeded during testing or normal operation.	A) Switch adjustment tampered with.	Re-adjust switch per operating requirements.
	B) Debris plugging sensor body (Item 8) ports.	Dis-assemble switch as per procedure in section 3.0 and clean switch body. Clean instrument system filters.
	C) Spring (Item 2) malfunction.	Remove the spring cap (Item 1) and inspect spring (Item 2) for damage. Replace if necessary.
	D) Debris plugging the sense port (Item 12) or the piston (Items 11 or 14).	Remove base and piston as per procedure in section 3.0 and clean switch body. Begin cleaning on a regular basis.
	E) More than one O- ring installed on the piston.	Remove extra O-rings.
	F) Spool seals (Item 7) and/or piston seal (Item 9, 13 or 16) swollen.	Dis-assemble as per procedures in section 3.0 and 4.0. Try better filtration to keep condensate out of supply gas.
2) Gas or liquid leaking from small hole below adjustment plug.	A) Damaged spool O- ring (Item 7).	Dis-assemble and repair as per procedure in section 3.0 and 4.0.
3) Gas or liquid leaking from small hole above switch base.	A) Damaged spool O- ring or piston O-ring.	Dis-assemble and repair as per procedure in section 3.0 and 4.0.
4) Deadband and set point repeatability are larger than switch specifications.	A) Switch O-rings dry.	Follow procedures in section 3.0 and 4.0 to dis-assemble the switch, lubricate all seals and re- assemble.
	B) Cause E for problem #1.	Same as problem #1.
	C) Cause F for problem #1.	Same as problem #1.