

**VIKING
PUMP**

VIKING PUMP

Duplex Fuel Oil Packages

Field Start-Up Guide

Bulletin: UDF400
Issued: 2-Oct-06

Before arriving on job site, make sure you have:

- ☐ A copy of the approved drawing or certified print of the Duplex Fuel Oil Pump Package
- ☐ A copy of the approved drawing of the Control Panel.
- ☐ Read all of the instructions, notes, and suggestions in this bulletin to become familiar with the start-up procedures. If you have any questions or require clarification please contact our systems specialist, Humberto Da Silva, P.Eng. at (905) 542-8906 ext. 204 (or North America toll free at 1-888-845-7867 ext. 0 and asked to be transferred)

When you arrive at the site confirm the following:

- ☐ Check the name plate rating on the Control Panel and compare with the incoming voltage and motor ratings.
- ☐ The compound gauge should be located on the pump suction or in the suction header (depending on pump size and duplex package configuration layout).
- ☐ The pressure gauge should be on the discharge of the pump or in the discharge header (depending on pump size and duplex package configuration layout).
- ☐ Examine the suction header and confirm that the arrow cast into suction strainer points toward the pump suction.
- ☐ Confirm the sales order number stamped on the serial number plate matches the packing slip. The serial number plate is typically located on the base plate of the unit.
- ☐ On the control panel confirm the voltage, phase, horsepower, certifications and part number stamped on the serial number plate located on the door of the panel match the specifications. Do not open the panel door.

Observations to be made on site:**General Installation**

- ☐ The package should be anchor to the ground to prevent movement. If the unit is mounted on a shelf it should be properly bolted.
- ☐ All piping (suction, discharge and relief return lines) should be externally supported to prevent pipe stresses being transferred to the unit. Ideally flexible connections should be used.

Suction Piping

- ☐ If possible follow the suction pipe to the supply tank. The suction line should go around obstacles instead of over them. This is to prevent air lock (the system will not prime if the suction line is air locked).
- ☐ If there are any valves on the suction line they should be in the open position.
- ☐ With long suction pipe there should be a hand operated pump to evacuate the air from the suction line. This pump should be piped parallel to the duplex package.
- ☐ The relief valves piping can not be piped back into the suction piping. Both valves can be piped to a common pipe. But that pipe has to be piped back to the supply tank. There should not be any other valves in this line. If there is any they should be always in the open position.

Discharge Piping

- ☐ The discharge will be piped into a day tank or directly into the diesel generator or boiler depending on the installation.
- ☐ If possible follow the discharge pipe. If there are any valves on the discharge line they should be in the open position.
- ☐ Take a look at the day tank. There should be the line from the duplex pump unit, overflow and floats.

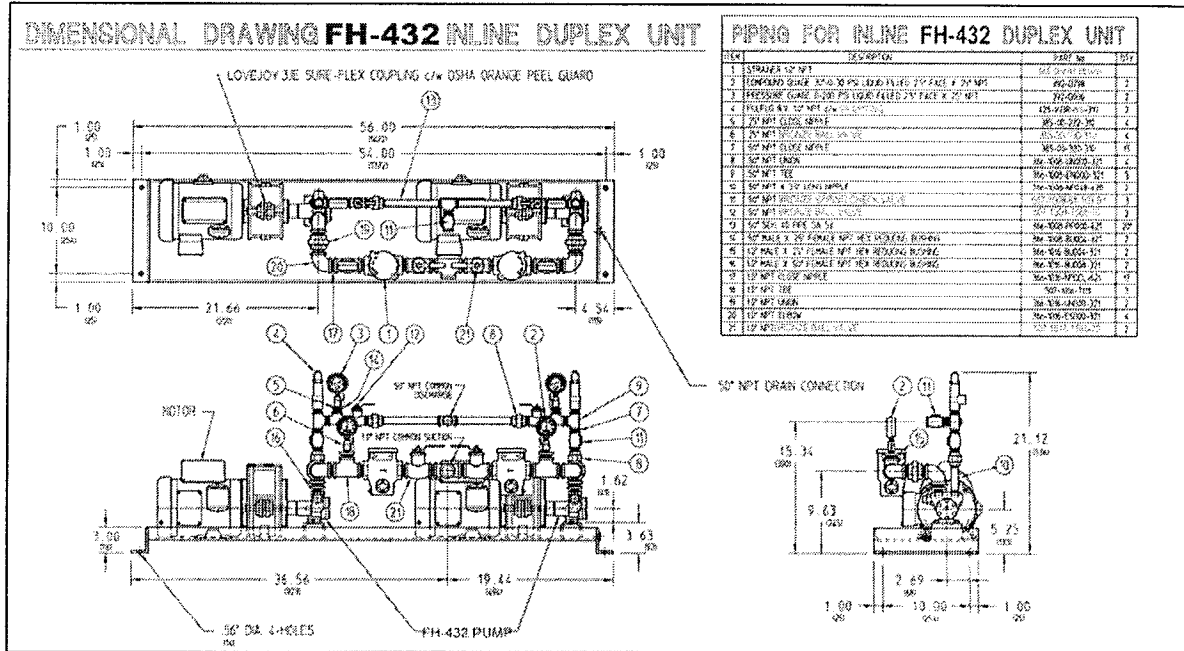


Fig. 1 – Typical F-432 & FH-432 Layout

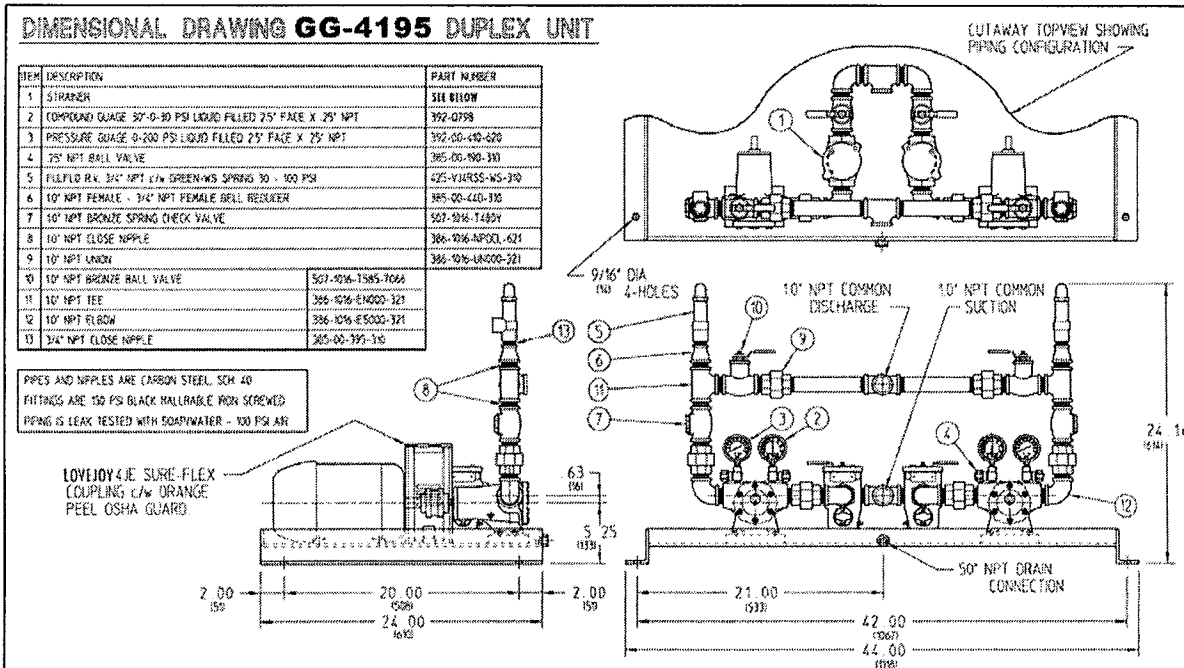


Fig. 2 – Typical Series 4195 & Spur Gear Layout

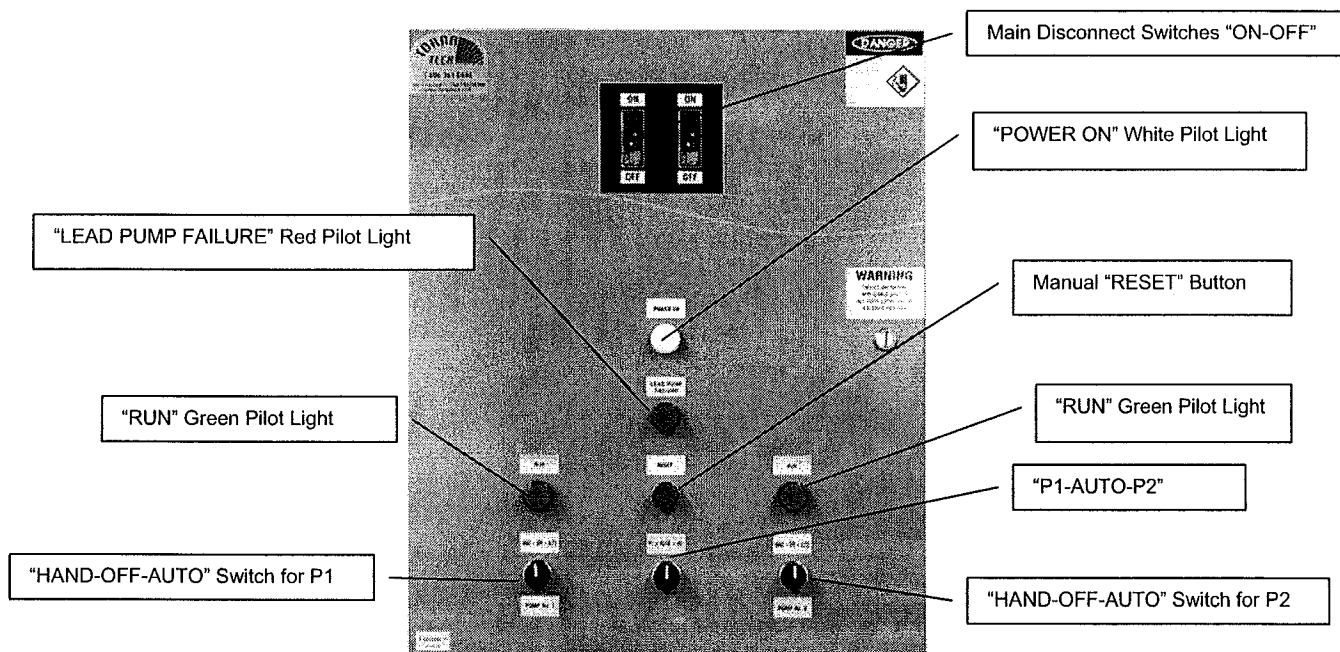


Fig. 3 – Typical Control Panel Cover

Priming the Duplex Fuel Oil Package:

1. On the Control Panel make sure both the Main Disconnect "ON-OFF" switches are in the "OFF" position (power off).
2. Take a look at the suction gauge to see if there is any pressure on the suction line. If there is pressure and the application is not a flooded suction the suction line is pressurized. Carefully remove the drain plug from the basket strainer to release the compressed air.
3. Turn the four ball valves connected to the pressure gauges (suction & discharge gauges) to closed position.
4. Remove the thumbscrew from top of the lid of the basket strainers, rotate the lid counter clockwise until the pin hits and stops, and then remove lid.
5. Open the suction valves.
6. Fill the strainers with diesel (the suction valves should be in open position, as you fill one strainer the liquid level will flow in the other strainer).
7. Reinstall the lid with the tab of the lid just to the left of the boss with the body, rotate the lid clockwise until the holes line up, and reinsert the thumbscrew.
8. Both the suction and discharge ball valves should be in open position.

9. On the Control Panel, turn the "Hand-Off-Auto" selector switches to "Off" position for both P1 and P2.
10. Turn both the Main Disconnect "On-Off" switches to "ON" position (power on).
11. Turn the "P1-Auto-P2" switch to "P1" position.
12. Have some one observe the motor fan for the next operation.
13. For P1 turn "Hand-Off-Auto" selector switch to "Hand" position and P1 will start.
14. After approximate 3 seconds turn the "Hand-Off-Auto" selector switch for P1 back to "Off" position.
15. Confirm that the motor fan had spun in the proper rotation. If the motors are not rotating properly have an electrician switch the motor leads and check again the rotation of the motors.
16. Repeat steps 11 to 15 for P2.
17. Turn the four ball valves connected to the pressure gauges (suction & discharge gauges) to the open position.
18. For P1 turn "Hand-Off-Auto" selector switch to "Hand" position and P1 will start.
19. Observe the suction compound gauge; it should start pulling a vacuum. The discharge gauge will read 0 psi. Run P1 for no more than 2 minutes then turn it off. Place you hand on the pump (around the seal area) and if it starts heating up, turn off the pump to prevent mechanical seal failure.
20. When the pumps are primed and pumping the discharge gauge will show a positive pressure.

NOTE: If the suction line is long you may have to refill the basket strainer again. Before this is done the suction valves will have to be in the closed position, other wise the vacuum will be lost. Then alternate running P1 and P2 in manual mode.

NOTE: Some local codes specify a anti-siphon valve to be installed on the suction line. It is usually installed close to the main supply tank. In some cases this valve will prevent the pumps from priming. If the pumps don't prime after a few attempts ask the contractor to loosen the spring in the anti-siphon valve and then after the pumps are primed the spring can be set in order to meet local codes.

NOTE: If the installation has a flooded suction, turn the suction and discharge valves to the open position. The suction pressure gauge should show a positive pressure. If it doesn't follow the suction line to the supply tank and see if all the valves are open. If all the valves are open and the pressure gauges don't read a positive pressure there a blockage in the line. The blockage will have to be cleaned before running the pumps.

CONTROL PANEL

- Check the name plate rating of the Control Panel and compare with the incoming line voltage and the motors ratings.
- Adjust overload relay setting to full current rating
- Check that motor protector push actuator(s) is (are) in start position.
- Check that float switches are adjusted to the desired levels
- Check that the controller is properly connected to the pump motors
- If motors are rotating in the proper direction (as checked in steps 10 to 16 under Priming section), and all the above checks out correctly, turn the "Hand-Off-Auto" switches for both P1 and P2 to the "Auto" position.
- Activate float switches manually and test if the pumps start and stop at desired levels.
- Once the level falls below the start lead pump level float switch FL2 (as shown in diagram under Float Controls), the pump motor is energized and the lead pump starts pumping fuel into the tank.
- If the lead pump has failed and the level falls below FL2 start lead pump level float switch, the "Lead Pump Failure" red pilot light is turned on and the lag pump motor is energized so that the lag pump keeps pumping fuel into the fuel tank.
- In order to turn off the "Lead Pump Failure" red pilot light, the manual "Reset" red pushbutton must be pressed.
- Once the level reaches the stop all pumps level float switch FL3, the pump motors are de-energized and the pumps stop.
- If the alternation selector switch "P1-Auto-P2" is in the "Auto" position, the stop all pumps float switch FL3 triggers the alternator and reverses the order of the lead and lag pumps. For example, if P1 was the lead pump before the trigger, P2 will become the lead pump after the trigger.

RELIEF VALVES

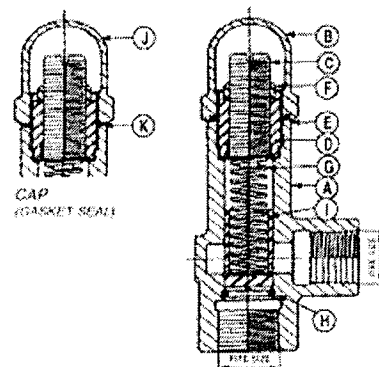
Checking Relief Valves Current Setting

1. With the pump running notice the reading on the discharge pressure gauge.
2. Slowly close the discharge ball valve.
3. Operate only one pump at a time in manual mode.
4. The reading on the discharge pressure gauge will increase.
5. Make a note of the pressure reading when the valve is fully closed; this value is the pressure relief valve setting. It should be approximate 15 to 20 psi greater than the specified pump discharge pressure.
6. Open the discharge valve and turn the pump off.
7. If the pressure relief setting is satisfactory, repeat for the other pump.

Setting the Pressure Relief Valves

1. Turn the "Hand-Off-Auto" switches to "OFF" for both P1 and P2.
2. Remove the cap (item J) of the pressure relief valve for pump P1.
3. Loosen the lock nut (item F)
4. Turn the adjusting screw (item C) clockwise to increase the pressure setting or counterclockwise to decrease the pressure setting
5. Tighten the lock nut (item J)
6. Reinstall the cap (item B) onto the valve.
7. Turn the "Hand-Off-Auto" switch for P1 to "HAND" position.
8. Slowly close the discharge ball valve for P1. If the pressure relief setting is not satisfactory repeat the operation to adjust the adjusting screw.
9. Repeat steps 1 to 8 for pump P2.

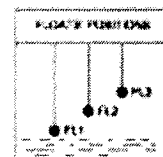
SYM	NAME
A	BODY
B	CAP (GASKET SEAL)
C	ADJUSTING SCREW
D	RETAINER
E	O-RING 1
F	LOCK NUT
G	SPRING 1
H	STOP RING
I	PISTON 1
J	CAP (GASKET SEAL)
K	GASKET 1



FLOAT CONTROLS

The standard duplex control panel contains NC relays to operate three float switches (switches supplied by others) for the day tank. If more than three floats are required, the control panel would have to be ordered with optional NC relays.

The top float (FL3) stops both pumps, the middle float (FL2) starts the lead pump and the bottom float (FL1) starts the lag pump.



FL3 : STOP PUMPS
FL2 : START LEAD PUMP
FL1 : START LAG PUMP

It may not be practical to fill the day tank to test the operation of the panel. A simpler way is to have the electrician simulate the open and closing contacts of the floats to check the operation sequence. This procedure can be used to check the high and low level alarms (if supplied) in the panel. The electrician can check the conductivity of the float (normally open or normally closed) to see if they are the same as specified. In some cases there is no day tank and the pump duplex unit pumps directly into the diesel generator or boiler. The panel will receive the signal from the generator and start the lead pump.

PRESSURE SWITCHES

If the duplex unit is supplied with pressure switches (either single or dual stage) they will be installed on the discharge line. The pressure setting will be factory set, but they are field adjustable.

To simulate a low pressure condition on the discharge line, have the control panel on automatic mode and then close the discharge valve of the pump running. The relief valve will open and the pumping liquid will return to the supply tank. The pump will shut down and a red light will come on the panel, the time will be that is set on the timer.

It is difficult to simulate an actual high pressure shut down. Have the electrician simulate by open or closing the contacts in the control panel.

Field adjustment of the pressure setting can be done by the following:

Single Stage Pressure Switch – Square D – 9012-GNG2

- See UDF400-1 Single Stage Pressure Switch.pdf

Dual Stage Pressure Switch – ASCO – SC10D-TG10A21

- See UDF400-2 Dual Stage Pressure Switch.pdf

FLOW SWITCHES

If the duplex unit is supplied with a flow switch it will be installed on the discharge line. To simulate a low flow condition on the discharge line, have the control panel on automatic mode and then close the discharge valve of the pump running (either P1 or P2). The relief valve will open and the pumping liquid will return to the supply tank. Within a few minutes (usually 1 to 3 minutes) based on the time set on the timer, the control panel will start the other pump and the “Low Flow” Signal red lights (optional equipment required for installation of low flow switch) will light up on the panel.



SQUARE D Instruction Bulletin

UDF400-1 Single Stage Pressure Switch

Industrial Pressure Switches

Type/Tipo/Typ

Class/Classe/Klasse 9012

Adjustable Differential: GNO, GNG, GPO, GPG, GDO, GOG

Non-adjustable Differential: GRO, GRG, GSO, GSG, GTO, GTG

Series B

USE LIMITATIONS

Pressure Ratings

NOTE

If the pressure actuators are exposed to system or surge pressures greater than the maximum pressure rating printed on the device nameplate, leakage from the actuator and/or a change of operating set points may result.

Maximum Allowable Pressure is the maximum pressure, including surges, to which an actuator of the pressure switch may be exposed for brief or extended periods of time without altering the performance characteristics of the switch. For types GNO, GNG, GRO, GRG periodic retorquing of actuator mounting screws to 8-10 in-lb is recommended.

NOTE

Pressure on a switch during use should be within the stated range of the switch. For maximum mechanical life, maximum system pressure applied on a continual basis, including surges, should not exceed maximum stated range. The mechanical life of any diaphragm actuated switch will be decreased if pressure exceeds the stated maximum range value. The more frequent the application and the greater the value of excessive pressure, the more diaphragm life will be decreased.

Temperature Ratings

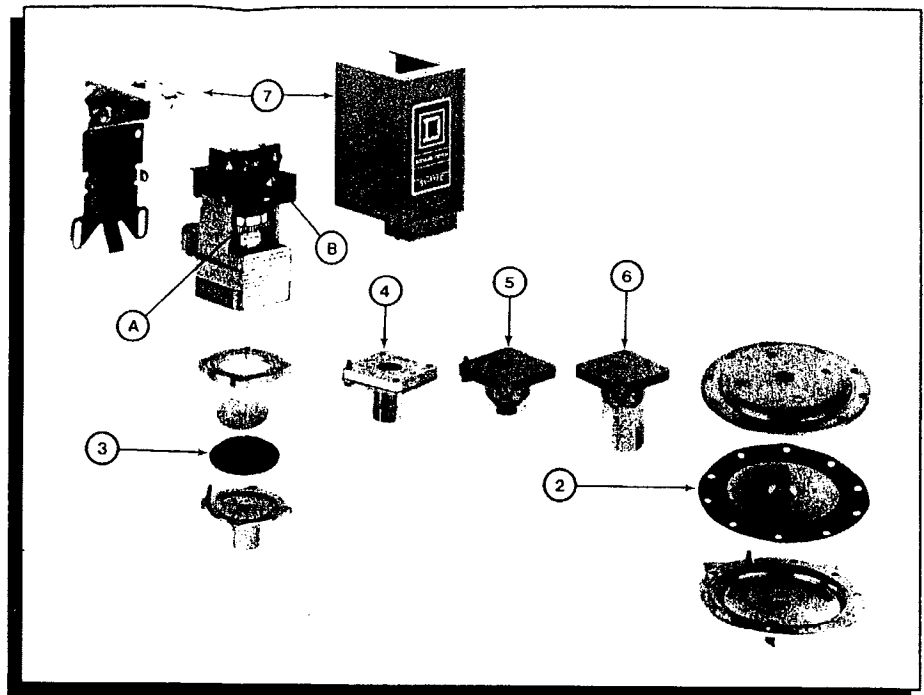
These devices are continuous use rated as below, provided that the media fluid does not freeze and the conditions of application do not give rise to the formation of frost or ice inside the pressure switch.

Table 1

	Ambient		Pressure Media	
	C	F	C	F
Minimum	-25	-10	-25	-10
Maximum	+85	+185	+120	+250

Use on Steam

Do not use directly on steam in excess of 15 psig (1 bar). Indirect use may be accomplished by attaching a minimum of 10 feet of capillary tubing between the steam source and the actuator. Class 9049 A7 is recommended. This permits use on steam up to 250 psig (17 bars) subject to maximum allowable pressure and temperature ratings of the switch.



WARNING

HAZARDOUS VOLTAGE CAN CAUSE SEVERE INJURY OR DEATH

To reduce the hazard of electrical shock always disconnect power from the circuit before installing the pressure switch or exposing the electrical terminals for maintenance.

Per ridurre il pericolo di infortuni da shock elettrico, prima di installare l'interruttore a pressione o primi di accedere ai terminali per manutenzione togliere sempre tensione dal circuito.

Um die Gefahr von Stromschlägen zu mindern, vor Einbau des Druckwachers oder Öffnen des Klemmendackels zu Wartungszwecken die Versorgungsspannung abschalten.

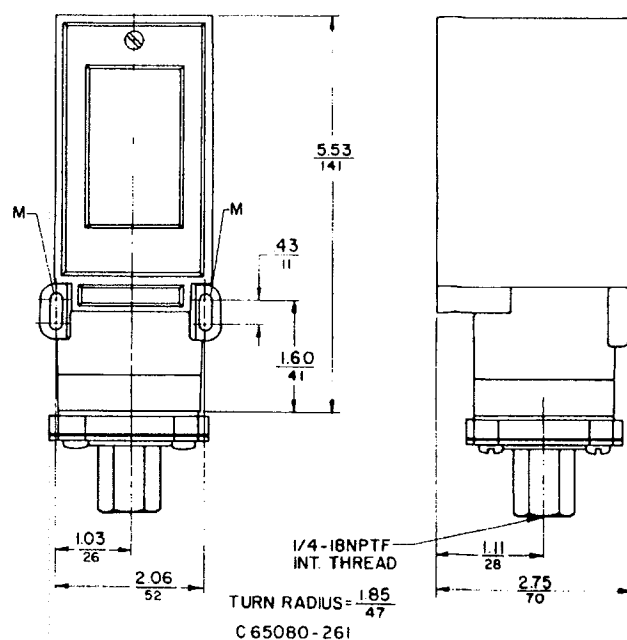
Avant toute intervention sur ce matériel, couper l'alimentation électrique de l'appareil afin d'éviter tout risque d'électrocution.

ANTES de instalar el interruptor a presión o ANTES de exponer las terminales eléctricas para darles mantenimiento, DESCONECTE LA ENERTIA y reduza el peligro de una sobrecarga eléctrica.

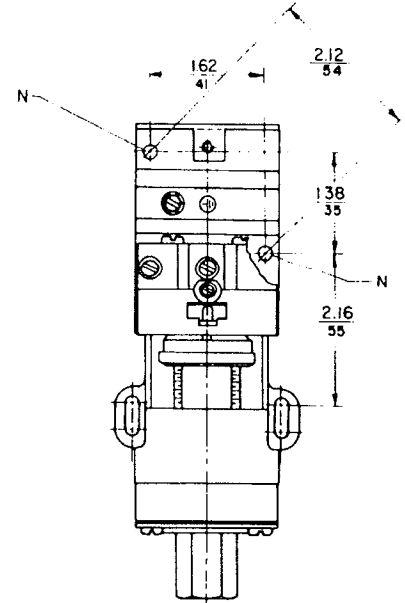
MOUNTING

It is not recommended to mount the switch by its pressure connection only. The holes and slots identified as "M" or "N" are for surface mounting the switch. When connecting the switch to the pressure system piping, turn the switch onto the pipe using a wrench on the hexagonal body of the actuator. Do not apply leverage through the switch housing.

For type G*O, G*G the standard pressure connection is 1/4-18 NPTF, the dryseal thread should seal against a new external 1/4 NPT thread without the use of sealing tape or compounds. Alternate pressure connections include: Form Z for GNO, GNG, GRO, GRG only which is 1/4-18 NPT external thread, Form Z16 for GNO, GNG, GRO, GRG only is 1/2-14 NPT external and 1/4-18 NPTF internal thread. Form Z18 for all G*O, G*G is 7/16-20 UNF-2A.



Dual Dimensions: **INCHES**
Millimeters



NOTE:
MOUNTING HOLES "N" AND
MOUNTING SLOTS "M" ARE
SIZED FOR #10 MOUNTING
SCREWS.

NOTE

Do not plug the 1/4 inch diameter holes on types GPO, GPG, GSO, GSG.

WIRING

Class 9012 Type G pressure switches are suitable for #12, 14, 16 AWG or 1.0-2.5mm solid or stranded copper wire. Tighten terminal screws to 6-9 in-lbf (0.7-1 Nm). They are not suitable for use with aluminum wire. For enclosed types G*G grounding (earthing) provision is located above the snap switch on the enclosure backplate and is marked \oplus .

The single pole, double throw snap switch contains single break contacts offering one normally open circuit and one normally closed circuit. These circuits are electrically separate but are not for use on circuits of opposite polarity. For proper wiring, refer to the wiring diagram on the snap switch not the terminal identification on the snap switch.

SET POINT ADJUSTMENTS

The pressure switch is set at the factory to the operating point(s) marked on the outside of the mechanism housing. It is good practice to cycle the switch to determine actual operating points before proceeding with readjustment. Refer to the illustration on page 2 for location of adjustment.

Range Adjustment

For non-adjustable differential types GRO, GRG, GSO, GSG, GTO, GTG
The range adjustment may be used to set either set point and completes the adjustment sequence. To increase the operating points; with the switch mounted as shown in the illustration on page 2 and facing the switch, place a flat bladed screwdriver in the slots of range adjustment nut (A) and rotate from right to left.

For adjustable differential types GNO, GNG, GPO, GPG, GQO, GQG
The range adjustment is used to set the decreasing set point and must be made first. This adjustment is made in the same manner as for non-adjustable differential types.

Differential Adjustment

For types GNO, GNG, GPO, GPG, GQO, GQG

An independent adjustment of the set point on increasing pressure is available. This adjustment must be performed after the decreasing pressure set point has been adjusted. Turn adjusting screw (B) clockwise to raise the set point on increasing pressure. The decreasing pressure set point is not affected by this adjustment.

REPLACEMENT PARTS

Note: When ordering any of these replacement parts, Class, Type, and Form of switch on which the replacement is to be used must be specified with the order.

Table 2

Item	Description	Class	Order Type	Form	Used On
2	Diaphragm Assembly	9998	PC 265		GNO, GNG, GRO, GRG-1
3	Diaphragm Assembly	9998	PC 266		GNO, GNG, GRO, GRG-3
		9998	PC 267		GNO, GNG, GRO, GRG-4
4	Diaphragm Assembly	9998	PC 268		GNO, GNG, GRO, GRG-5
		9998	PC 269		GNO, GNG, GRO, GRG-6
5	Diaphragm Actuator Assy	9998	PC 177		GPO, GPG, GSO, GSG-1
		9998	PC 178		GPO, GPG, GSO, GSG-2
6	Piston Actuator Assy	9998	PC 270		GQO, GQG, GTO, GTG-1
		9998	PC 271		GQO, GQG, GTO, GTG-2
		9998	PC 272		GQO, GQG, GTO, GTG-3
		9998	PC 273		GQO, GQG, GTO, GTG-4
7	Enclosure Assembly	9049	UE-1		Converts Type G*O to G*G

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PLEASE NOTE:

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UDF400-2 Dual Stage Pressure Switch

Installation & Maintenance Instructions

ASCO TRIPOINT® SWITCH UNITS

TWO-STAGE DUAL ADJUSTMENT SWITCH UNIT WITH GENERAL PURPOSE.
WATERTIGHT, OR EXPLOSIONPROOF SWITCH ENCLOSURE

SC-SERIES

Form No.V5736R2

DESCRIPTION

The SC-Series Two-Stage Dual Adjustment Switch Units are used with transducer units to make Tripoint Pressure Switches or Temperature Switches. The switch units are made of aluminum alloy and designed for rugged industrial use. The switch units have a general purpose, watertight, or explosionproof enclosure. All wiring terminals, adjustments, and visual scales are accessible from the front of the switch.

The switch may be supplied as a complete unit or with the switch unit and transducer completely assembled. The components may be separate units to be assembled upon installation. There are two electrical snap switches with independently adjustable actuation (set) points, adjustable over the full range of the switch. The reactivation/reset point of each electrical snap switch is fixed with respect to the actuating point setting for that switch. The switch assembly can be mated with a wide selection of pressure or temperature transducers to cover a broad range of pressures, fluids, or temperatures. The switch will control electrical circuits in response to changes in pressure or temperature.

IMPORTANT: These instructions cover the installation and use of this switch on pressure and temperature transducers. Select the paragraphs that apply to your particular installation and application. The word *signal* is used in place of pressure or temperature changes.

INSTALLATION

Check the nameplate for the correct catalog number, pressure range, temperature range, media, and proof pressure or temperature. Never apply incompatible fluids or exceed the pressure or temperature rating of the switch. Installation and inspection to be performed by qualified personnel.

Nameplates are located on cover and on the bottom of the transducer. Check to be sure the third digit in each number is the same. If not, the unit should not be used. (Refer to Figure 3).

IMPORTANT: All internal adjustments have been made at the factory. Any adjustment, alteration or repair to the internal parts of the switch other than stated herein voids all warranties. The signal setting adjustments required are made by the adjusting nut on the outside of the switch.

Temperature Limitations

Ambient temperature limits are -4°F to 210°F (-20°C to 149°C). To determine fluid temperature limitations, see Form No.V5794 for Pressure Transducer catalog numbers and construction materials, then refer to chart below.

TRANSDUCER CONSTRUCTION MATERIALS	RATINGS FLUID TEMPERATURE
BUTYL OR NITROGEN	-4°F to 210°F to 149°F (-20°C)
VITON®	-4°F to 210°F to 250°F (-20°C to 121°C)
316 Stainless Steel	50°F to 41°C to 300°F (149°C)

For steam service, the fluid temperature with a pigtail (siphon tube or condensate loop) installed directly into the transducer will be below 179°F (82°C).



ASCO Valves

ASCOELECTRIC limited BRANTFORD, ONTARIO

Assembly of Switch and Transducer Units

IMPORTANT: The switch unit and transducer unit may be provided as a complete assembly or as separate units. If separate units are provided refer to Form No. V5794 for a complete listing of switch unit and transducer unit combinations. Form No.V5794 is provided to ensure that the proper switch unit is assembled to the proper transducer unit. Pay careful attention to exploded views provided in Figure 3 for assembly of switch unit and transducer unit. Proceed in the following manner:

CAUTION: The third digit in the catalog number on both the switch unit and transducer unit must be identical. If not, do not assemble to each other. If the same proceed.

1. Remove special instructions label and switch range scales from transducer unit.
2. For watertight and explosionproof construction place gasket on base of switch unit.
3. Place transducer unit on base of switch unit and assemble. Insert four bolts and torque bolts in a crisscross manner to 80 ± 10 in.-lbs. [9.0 ± 1.1 Nm].
4. Remove backing paper from range scale and install scale on the switch body behind adjusting nut. The scale is slotted to fit over a raised boss on the body. See Figure 1.

Positioning

Switch may be mounted in any position.

Mounting

Figure 1 shows partial view of switch body for mounting dimensions.

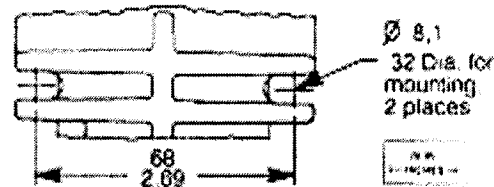


Figure 1. Mounting locations

Piping/Tubing (Pressure Transducer)

Adequate support of piping and proper mounting of switch should be made to avoid excessive shock or vibrations. To minimize the effect of vibration on a switch, mount perpendicular to vibration. Connect piping or tubing to switch at base of transducer. It is recommended that flexible tubing be used whenever possible. Apply pipe compound sparingly to male pipe threads only. If applied to female threads, it may enter the transducer and cause operational difficulty. Avoid pipe strain on switch by properly supporting and aligning piping. When tightening pipe, do not use switch as a lever. Wrenches applied to transducer body or piping are to be located as close as possible to connection point.

IMPORTANT: For steam service, install a condensate loop (pigtail or steam siphon tube) directly into the pressure transducer.

CAUTION: To avoid damage to the transducer body, DO NOT OVERTIGHTEN PIPE CONNECTIONS. If TEFLON® tape, paste or similar lubricant is used, use extra care due to reduced friction.

IMPORTANT: To eliminate undesirable pressure fluctuations in the system, install a surge suppressor.

*DuPont's Registered Trademark

Wiring

Wiring must comply with local codes and the National Electrical Code. All switch enclosures are provided with two 3/4" NPT conduit hubs with one plugged when not in use. It is recommended that a flexible conduit connection be used. If rigid conduit is used, do not consider it or use it as a means of support (mounting). For general purpose and watertight construction, the switch cover is removed by loosening two screws then twisting slightly and lifting. For explosionproof construction, the cover unscrews. When explosionproof cover is replaced, torque cover to 135 ± 10 in.-lbs [10.7 ± 1.1 Nm]. Use No. 14 AWG copper wire rated for 60°C minimum. All switches have a grounding screw and clamp in the enclosure. For factory wired switch, black lead is common, red lead is normally open, blue lead is normally closed, and the green lead wire is a ground.

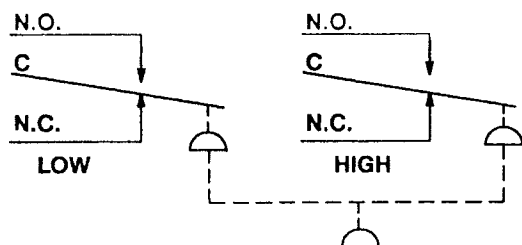
IMPORTANT: Electrical load must be within range stated on nameplate. Failure to stay within the electrical range of the switch rating may result in damage to or premature failure of electrical switch.

CAUTION: Do not exert excessive screw driver force on snap switch when making terminal connections. When connections are made, be sure there is no stress on the wire leads. Either condition may cause malfunction of switch.

ELECTRICAL RATINGS		
Switch Unit	Ratings for Limit Controls and Pressure Operated Switches	Ratings for Industrial Controls and Temperature Indicating and Regulating Equipment
Standard Switch Rating	5 Amps Res., 125/250 VAC 1/8 HP 125 VAC 1/4 HP 250 VAC 0.4 Amp Res., 125 VDC	15 Amps Res., 125 VAC 10 Amps Res., 250 VAC 1/4 HP 125 VAC 1/2 HP 250 VAC 1/2 Amp Res., 125 VDC 1/4 Amp Res., 250 VDC

Schematic

SPDT



INSTALLATION OF TEMPERATURE TRANSDUCERS

Direct Probe

The direct probe (local) temperature transducer is provided with 1/2" NPT connection. When installing, do not use switch unit as a lever for tightening. Use wrenching flats provided at base of transducer for tightening.

Capillary and Bulb

The capillary and bulb (remote) temperature transducers are provided with a length of capillary and a 3/8" diameter sensing bulb.

CAUTION: Do not bend capillary at sharp angles. For proper operation, be sure sensing bulb is completely immersed in fluid and not in contact with heating element or anything that would directly affect the temperature of the fluid being sensed.

Thermal Well (Optional Feature)

A thermal well may be used for capillary and bulb (remote) or direct probe (local) temperature transducers. The thermal well affords protection for the sensing bulb and allows removal of the sensing bulb while maintaining a pressure tight vessel. When installing sensing bulb in thermal well, be sure that it is fully inserted. Where a thermal well already exists, jam nuts may be obtained to adapt the capillary and bulb to the existing thermal well. The existing thermal well must be for a 3/8" diameter sensing bulb.

Union Connector (Optional Feature)

A union connector will allow direct mounting of the sensing bulb in the fluid being controlled. Install union into piping connection before tightening union onto bulb. For maximum performance, the bulb should be inserted in the union connection so that the end of the sensing bulb is even with the end of the union connector nut. Do not apply excessive torque when tightening union connector nut.

Adjustment (Signal Setting) of Two-Stage Dual Adjustment Switch

To make adjustments, (signal setting) a 7/16" wrench and a pressure or temperature gage (within suitable range) are required. If electrical connection (to line of final application) of the switch is not desirable, a battery powered test lamp or ohm meter may be used. Pressure or temperature range scales should be used for initial signal setting. These will be accurate within 5%. Loosen lock ring and turn adjusting nut until red line is even with the desired range. For exact signal setting, proceed as follows:

WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power when making permanent electrical connections to switch.

Adjustment (Signal Setting) of Normally Closed or Normally Open Switch, Increasing Signal (Refer to Figure 2)

1. If the switch is in the line of final application when adjustment (signal setting) is made, be sure switch can be test operated without affecting other equipment.
2. Loosen lock ring on adjustment nut and turn low signal adjustment nut full upwards and high signal adjustment nut full down using a 7/16" wrench.

CAUTION: Adjusting nut will turn easily until it hits a stop. Do not over torque; over torquing may cause internal damage resulting in malfunction.

3. Remove switch cover to gain access to snap switch. See section on Wiring for cover removal.
4. Follow the steps in the chart below to make signal setting:

Adjustment Procedure	NORMALLY CLOSED		NORMALLY OPEN	
	Switch Terminal	Test Lamp On-Off	Switch Terminal	Test Lamp On-Off
1. Starting at zero signal, connect test lamp to common.	NC	On (Closed Circuit)	NO	Off (Open Circuit)
2. Apply desired actuation signal. Then back off signal adjusting nut until switch actuates.	NC	Off (Open Circuit)	NO	On (Closed Circuit)
3. Lower signal to desired reactivation signal.	NC	On (Closed Circuit)	NO	Off (Open Circuit)

5. Cycle between signal settings and make minor adjustments to adjusting nuts as required to achieve the exact signal setting.
6. After setting has been made, make permanent electrical connections.

Adjustment (Signal Setting) of Normally Closed or Normally Open Switch, Decreasing Signal (Refer to Figure 2)

1. If the switch is in the line of final application when adjustment (signal setting) is made, be sure switch can be test operated without affecting other equipment.
2. Loosen lock ring on adjustment nuts and turn low signal adjustment nut full upwards and high signal adjustment nut slightly beyond desired actuation setting using a 7/16" wrench.

⚠ CAUTION: Adjustment nut will turn easily until it hits a stop. Do not over torque; over torquing may cause internal damage resulting in malfunction.

3. Remove switch cover to gain access to snap switch. See section on *Wiring* for cover removal.
4. Follow steps in chart below to make signal setting.

Adjustment Procedure	NORMALLY CLOSED		NORMALLY OPEN	
	Switch Terminal	Test Lamp On-Off	Switch Terminal	Test Lamp On-Off
1. Starting with initial signal above desired actuation setting, connect test lamp to common.	NC	Off (Open Circuit)	NO	On (Closed Circuit)
2. Decrease signal to desired actuation signal. Then advance adjusting nut until switch actuates.	NC	On (Closed Circuit)	NO	Off (Open Circuit)
3. Increase signal to check reactivation signal.	NC	Off (Open Circuit)	NO	On (Closed Circuit)

5. Cycle between actuation and reactivation signals and make minor adjustment to adjusting nuts as required to achieve the exact signal settings.
6. After settings have been made, tighten lock rings and make permanent electrical connections.

Testing of Installation

If the adjustment of the switch has been made outside of the line of final application, the switch should be retested when installed in the line of final application. Follow adjustment instructions. Be sure switch can be test operated without affecting other equipment.

MAINTENANCE

⚠ WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power and depressurize switch unit before inspection or removal.

IMPORTANT: Switch is not field repairable. The switch must be returned to the factory (Automatic Switch Company, Florham Park, New Jersey) or serviced only by an authorized factory representative. Address all service inquiries to Automatic Switch Company, 50-60 Hanover road, Florham Park, New Jersey 07932, Valve Service Department. The only maintenance which may be performed on the two stage dual adjustment switch is changing the setting of the adjusting nut and replacement of the transducer unit. Replacement of transducer should be done only if external leakage is evident.

Preventive Maintenance

- While in service, operate the switch (cycle between desired signals) at least once a month to insure proper operation. If necessary, electrical

wiring and pipe connection should be made so that switch can be test operated without affecting other equipment.

- Periodic inspection of the switch, external surfaces only, should be carried out. Switch should be kept clean and free from paint, foreign matter, corrosion, icing, and freezing conditions.
- Keep the medium entering the transducer as free as possible from dirt and foreign material.

Causes of Improper Operation

Switch will not actuate or actuates and reactuates undesirable

- **Incorrect Electrical Connection:** Check leads to switch. Be sure they are properly connected. Switch is marked NO for Normally Open, NC for Normally Closed and C for Common.
- **Faulty Control Circuit:** Check electrical power supply to switch. Check for loose or blown fuses, open-circuited or grounded wires, loose connections at terminal block or switch. See nameplate for electrical rating and range.
- **Incorrect Pressure:** Check pressure in system with suitable pressure gage. Pressure must be within range specified on nameplate.
- **Incorrect Adjustment:** Check adjustment nut for proper setting. Refer to adjustment instructions.
- **External Leakage:** Check to see that bolts (4) holding transducer to pressure switch are properly torqued to 80 ± 10 in.-lbs [9.0 ± 1.1 Nm]. If bolts are tight and leakage is still evident, replace transducer. Refer to paragraph on *Assembly of Switch Unit and Transducer Unit*.
- **Excessive Vibration or Surges Causing Switch to Actuate and Reactuate:** Check for fluctuations in system and install pressure surge suppressor. Check switch mounting and be sure there is no excessive vibration.
- **Incorrect Temperature:** Check temperature in system with suitable thermometer. Temperature must be within range specified on nameplate. Check location of capillary and bulb for incorrect mounting. Refer to paragraphs on *Installation Of Temperature Transducers*.

If the operation of the switch cannot be corrected by the above means, the entire switch unit should be replaced or an authorized factory representative consulted.

Color Code Identification

When the switch cover is removed, the switch unit may be identified by the color of the sealant used on the locknuts of the snap switch. The color of the sealant will correspond directly to the third digit of the switch catalog number.

Third Digit In Catalog Number	Sealant Color Used On Snap Switch Locknuts
1	Yellow
2	Green
3	Red
4	Blue

Example: If the sealant color on the snap switch was red, this would mean that the third digit in the pressure switch catalog number would be 3, possibly SC30D. It would not be, for example: SC10D, SC20D, or SC40D.

FOR SERVICE REPLACEMENT, OR NEW TRANSDUCER

Consult Factory, or Authorized Factory Representative or Distributors

ORDERING INFORMATION

For Two-Stage Dual Adjustment Switch or New Transducer When Ordering, Specify Catalog Numbers, Fluid, Pressure Range, Temperature Range, Serial Numbers, and Proof Pressure or Rated Overrange Temperature.

NAMEPLATES ARE LOCATED ON SWITCH COVER AND BOTTOM OF TRANSDUCER.



ASCO Valves

ASCOLECTRIC limited BRANTFORD, ONTARIO

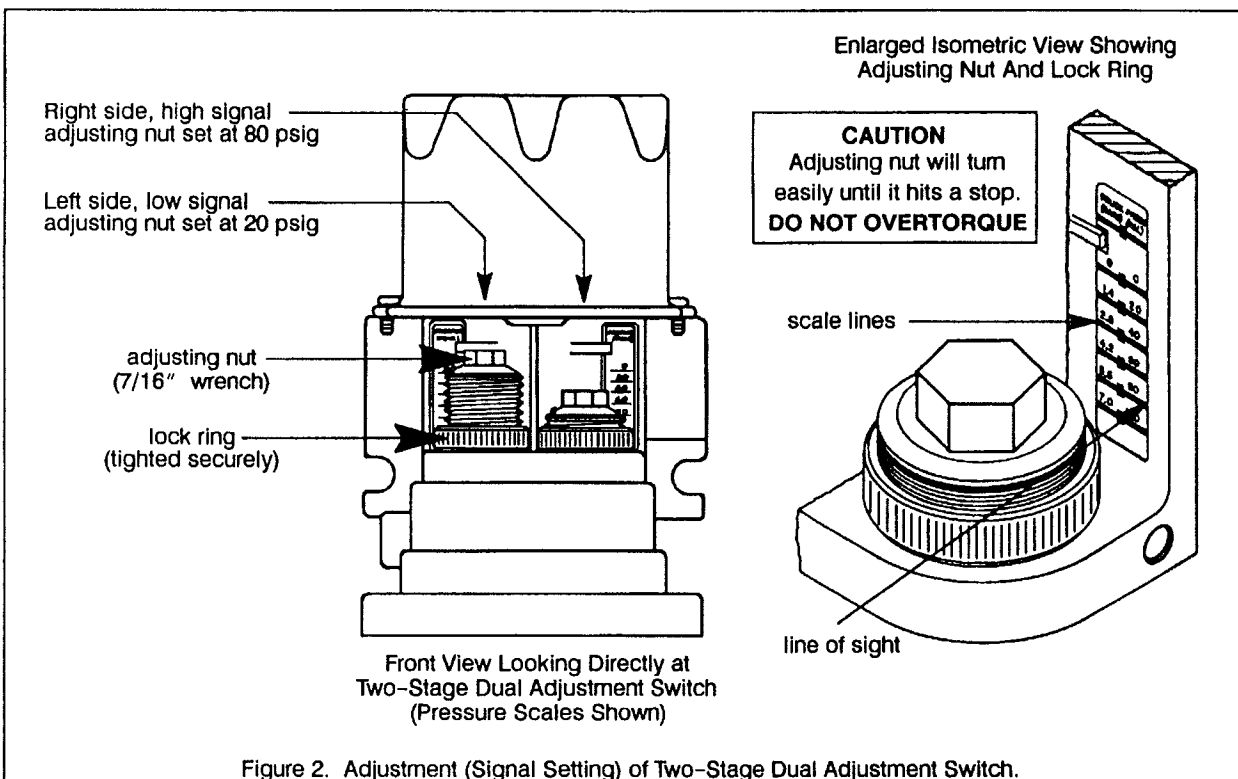


Figure 2. Adjustment (Signal Setting) of Two-Stage Dual Adjustment Switch.

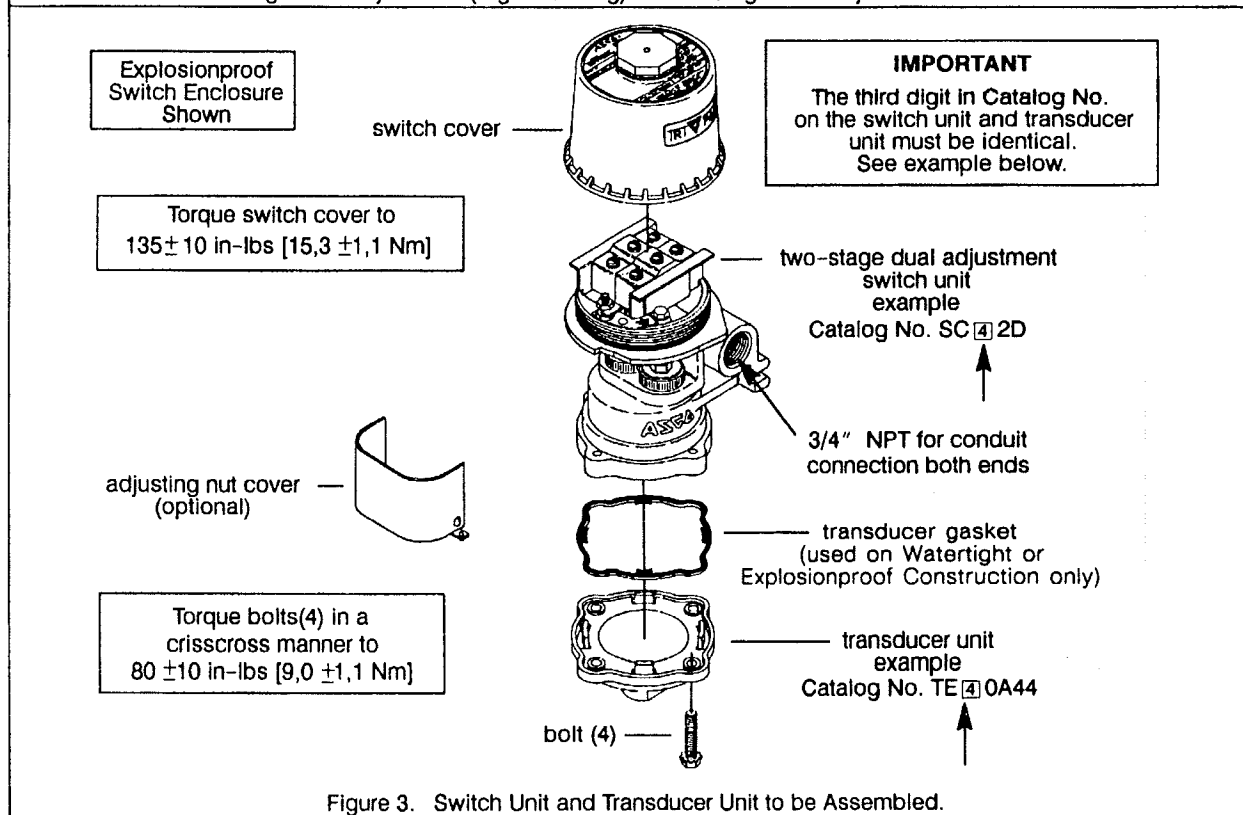


Figure 3. Switch Unit and Transducer Unit to be Assembled.

A S C O Valves

