Model 4000 Pressure Controller

Operation, Parts, and Instruction Manual

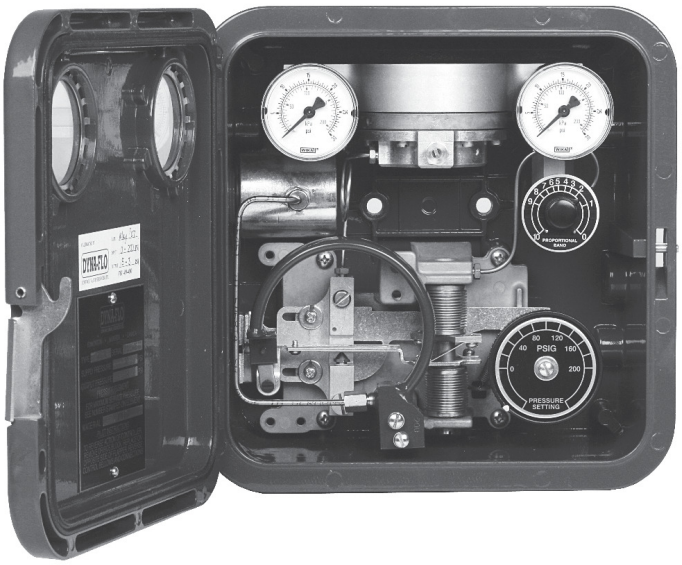


TABLE OF CONTENTS

Phone: 780 • 469 • 4000 Toll Free: 1 • 866 • 396 • 2356 Fax: 780 • 469 • 4035 Website: www.dynaflo.com

NOTICE These instructions are meant to be used with the Dyna-Flo 4000 Series Technical Bulletin as they refer to Figures and Tables therein. If you do not have the Technical Bulletin, contact Dyna-Flo immediately, or visit **www.dynaflo.com**

Each controller is factory checked. Check the calibration for the specific application, before a controller is put into service.

GENERAL

The following instructions are to be thoroughly reviewed and understood prior to installing, operating or performing maintenance on this equipment. Work on this equipment should be done by experienced personnel. Throughout the manual, safety and caution notes appear and must be strictly followed, to prevent serious injury or equipment malfunction.

SCOPE

The controller configuration and construction materials were selected to meet particular pressure, temperature, and process fluid conditions. Some material combinations are limited in their pressure and temperature ranges. Do not apply any other conditions to the controller without first contacting your Dyna-Flo sales office.

This manual is written to be a practical and useful guide maintaining the Dyna-Flo 4000 Series Pressure Controller.

! CAUTION !

To avoid personal injury or installation damage as a result of the sudden release of process pressure or the breaking of parts, do not install the controller assembly where service conditions could exceed the limits stated in this manual or on the equipment nameplates. Use government codes, accepted industry standards and good piping practices to select pressure-relieving equipment for protection of your installation. It is also important to wear the proper protective equipment when performing any installation or maintenance activity.

Table 1

Bourdon Tube - Pressure Range for S31600 (316 SST) Bourdon Tubes

Pressure Range[2]		Maximum Allowable Static Pressure Limit		With Travel Stop (Optional)[3]	
Psig	Bar	Psig	Bar	Psig	Bar
0 to 30	0 to 2	30	2	48	3.3
0 to 60	0 to 4	60	4	96	6.6
0 to 100	0 to 7	100	7	160	11
0 to 200	0 to 14	200	14	280	19
0 to 300	0 to 20	300	20	420	29
0 to 600[1]	0 to 40[1]	600	40	720	50
0 to 1000[1]	0 to 70[1]	1000	70	1200	83
0 to 1500[1]	0 to 100[1]	1500	100	1650	115
0 to 3000	0 to 200	3000	200	3300	230
0 to 5000	0 to 350	5000	350	5500	380
0 to 8000	0 to 550	8000	550	8000	550
0 to 10,000	0 to 700	10,000	700	10,000	700

NOTES: **1** - Bourdon Tubes (Key 41) are also available in N05500 (K-Monel), other materials and ranges are special order.
2 - The Bourdon Tube can be pressurized to the limit above without permanent zero shift.
3 - Pressures shown are with the travel stop set at 110% of the range.

SPECIFICATIONS

Models

4000 - Proportional Only Controller
4010 - Proportional-Plus-Reset Controller
4030 - Differential Gap Controller

Output Signal - Pneumatic Pressure Signal

Proportional Only / Proportional-Plus-Reset

- 3 to 15 Psig (0.2 to 1.0 Bar)
- 6 to 30 Psig (0.4 to 2.0 Bar)

Differential Gap

- 0 and 20 Psig (0 and 1.4 Bar)
- 0 and 35 Psig (0 and 2.4 Bar)

Input Signal

Type:

- Gauge Pressure
- Compound Pressure
- Differential Pressure
- Vacuum

Limits:

See Tables 1, 2, & 3.

Pressure Connections

1/4 inch (6 mm) NPT Female.

Supply Pressure Medium

Clean Air or Natural Gas.

Supply Pressure Requirements

See Table 3.

Steady State Air Consumption

See Table 3.

Performance

Repeatability

- 0.5% of sensing element range.

Deadband (Except Differential Gap)

- 0.1% of output span.

Typical Proportional Band Frequency Response at 100%

Output to Positioner Bellows: 9 Hz and 130 degree phase shift with 3 to 15 Psig (0.2 to 1.0 Bar) output to 2 inch³ (33 cm³) bellows.

Output to Actuator: 0.7 Hz and 110 degree phase shift with 113 inch³ (1850 cm³) volume. Actuator at mid-stroke.

Proportional Band Adjustment (Proportional Only / Proportional-Plus-Reset Controller):

3 to 15 Psig (0.2 to 1.0 Bar) - 3 to 100% of the sensing element range.

6 to 30 Psig (0.4 to 2.0 Bar) - 6 to 100% of the sensing element range.

Reset Adjustment (Proportional-Plus-Reset Controller):

Adjustable from 0.01 to 74 minutes per repeat (100 to 0.01 repeats per minute).

Differential Gap Adjustment (Differential Gap Controller):

15% to 100% of sensing element range.

Span Adjustment (Transmitters Only):

6% to 100% of sensing element range.

Zero Adjustment (Transmitters Only):

Continuously adjustable to position span of less than 100% anywhere in the sensing element range.

Ambient Operating Temperature Limits

-40 to 200ºF (-40 to 93ºC).

Ambient Operating Temperature / Pressure Fluctuations

Proportional Only Controller: For a controller set at 100% proportional band, the output pressure can change ±3.0% of sensing element range for every 50ºF (28ºC) of temperature change within a range of -40 to 160ºF (-40 to 71ºC). **NOTE:** The above changes also apply to a transmitter set at 100% span.

Proportional-Plus-Reset Controller: For a controller set at 100% proportional band, the output pressure can change ±2.0% of sensing element range for every 50ºF (28ºC) of temperature change within a range of -40 to 160ºF (-40 to 71ºC).

Casing Pressure Limits

2 Psig (0.14 Bar).

Approximate Weight

12 lb (5.5 Kg).

Dimensions

See Page 26.

Mounting Information

Mounting kits are available for actuator yoke, actuator casing, panel mount, wall mount, and 2” pipe stand mounting. See Figures 16 & 17.

Table 2

Bellows (Key 38) Pressure Ranges and Materials

Pressure Ranges			Maximum Static Pressure Limits			
			Brass Bellows		Stainless Steel Bellows	
			Psig	Bar	Psig	Bar
Gauge Pressure	Compound Pressure	30 inch wc vac. to 30 inch wc (0.075 Bar vac. to 0.075 Bar)	20	1.4	-	-
		15 inHg vac. to 7.5 Psig (0.5 Bar vac. to 0.5 Bar)	40	2.8	100	6.9
		30 inHg vac. to 15 Psig (1.0 Bar vac. to 1.0 Bar)	40	2.8	100	6.9
	Positive Pressure	0 to 60 inch wc (0 to 0.15 Bar)	20	1.4	-	-
		0 to 140 inch wc (0 to 0.35 Bar)	40	2.8	-	-
		0 to 5 Psig (0 to 0.35 Bar)	40	2.8	-	-
		0 to 7.5 Psig (0 to 0.5 Bar)	40	2.8	-	-
		0 to 10 Psig (0 to 0.7 Bar)	40	2.8	-	-
		0 to 15 Psig (0 to 1.0 Bar)	40	2.8	100	6.9
		0 to 20 Psig (0 to 1.4 Bar)	40	2.8	-	-
		0 to 30 Psig (0 to 2.0 Bar)	40	2.8	100	6.9
	Vacuum	0 to 60 inch wc (0 to 0.15)	20	1.4	-	-
		0 to 10 inHg (0 to 0.34 Bar)	40	2.8	-	-
		0 to 30 inHg (0 to 1.0 Bar)	40	2.8	100	6.9
Differential Pressure[1]		0 to 80 inch wc (0 to 0.30 Bar)	20	1.4	-	-
		0 to 10 Psig (0 to 0.7 Bar)	40	2.8	-	-
		0 to 20 Psig (0 to 1.4 Bar)	40	2.8	-	-
		0 to 30 Psig (0 to 2.0 Bar)	-	-	100	6.9

NOTES: Bellows can be pressured to the limits listed above without permanent zero shift.

1 The over-range limit for the bellows is a differential pressure equal to the maximum allowable static pressure limit.

Table 3

Supply Pressure Requirements

Output Signal Range				Normal Operating Supply Pressure		Maximum Allowable Supply Pressure		Steady-State Air Consumption SCFH (Standard Cubic Feet Per Hour)			
Throttling		On / Off						Proportional Band Set to 5		Proportional Band Set to 0 or 10	
Psig	Bar	Psig	Bar	Psig	Bar	Psig	Bar	Min.	Max.	Min.	Max.
3 - 15	0.2 - 1.0	0 - 20	0 - 1.4	20	1.4	40	2.8	10	34	2	30
6 - 30	0.4 - 2.0	0 - 35	0 - 2.4	35	2.4	40	2.8	10	34	5	6

NOTES: Damage may occur if pressure exceeds the limits listed above.

UNPACKING CONTROLLER FROM SHIPPING CONTAINER

Check the packing list against materials received, while unpacking the controller. The Packing List describes controller and accessories in each shipping container.

INSTALLATION

WARNING

Refer to the General and Scope sections of this Manual (See Page 2) prior to beginning Installation.

Controller Mounting

(Reference Figures 16 & 17)

NOTE

For standard installation of the 4000 controller, the case is mounted vertically with the bottom of the controller parallel to the ground (See Figure 17). If the controller is to be mounted in any other orientation, it is advised that the vent (Key 32) be positioned to face downward.

Controllers are typically factory mounted to valve and actuator assemblies. If a controller has been ordered separately, please contact Dyna-Flo Control Valve Services for mounting kit ordering information.

Actuator Mounting

Yoke Mounted

1 With the proper controller/actuator mounting kit, attach the mounting spacer (Key 109) and mounting bracket (Key 106) to the controller using the machine screw (Key 104), lock washer (Key 103), and hex nut (Key 102).

2 Mount the controller/mounting bracket assembly to the actuator yoke with the cap screws (Key 100). **NOTE:** Some actuator designs may require additional mounting spacers between the yoke and the mounting bracket.

Casing Mounted

1 With the proper controller/actuator mounting kit, attach the mounting spacer (Key 109) and mounting bracket (Key 105) to the controller using the machine screw (Key 104), lock washer (Key 103), and hex nut (Key 102).

2 Remove two actuator casing cap screws from the actuator casing in the desired mounting location. Mount the controller/bracket assembly to the actuator casing using the removed cap screws and their hex nuts. **NOTE:** Some models of actuator may require longer casing cap screws to secure the mounting bracket, consult Dyna-Flo Control Valve Services.

Panel Mounting

1 Using the dimensions shown in Figure 16, cut a hole in the panel surface.

2 Remove the vent (Key 32), and cap screws (Key 99) and brackets (Key 107) if attached to the controller.

3 Insert the controller into the cut hole in the panel, attach the brackets (Key 107) using the cap screws (Key 99). Tighten the cap screws evenly in order to draw the controller case snugly against the panel.

4 Re-install the vent (Key 32) or remote venting if required. See Remote Venting on Page 6.

Pipestand Mounting

1 With the proper controller/actuator mounting kit, attach the mounting spacer (Key 109) and mounting bracket (Key 108) to the controller using the machine screw (Key 104), lock washer (Key 103), and hex nut (Key 102).

2 Using the pipe mounting clamps (Key 110) attach the controller/mounting bracket assembly to a 2" (nominal) pipe.

Wall Mounting

1 Using the dimensions shown in Figure 16, drill four holes into the wall. Drill extra holes in the wall to accommodate any tubing that may be run through the wall.

2 Using the 4 cap screws (Key 99), mount the bracket (Key 107) to the controller. **NOTE:** If there are cap screws in the bracket, remove them.

3 Mount the bracket/controller assembly to the wall using appropriate bolts or screws.

INSTALLATION
(Continued)

Air Piping

Piping or tubing for the 4000 Pressure Controller should be either 1/4" (6 mm) or 3/8" (10 mm). All pressure connection ports utilize a 1/4" NPT female connection. Always follow good piping practices when installing piping or tubing, installing all required line vents, valves, drains, seals, and filters.

Trapped air in liquid mediums or condensation from gas mediums can affect the performance of the controller. To reduce the possibility of trapping mediums in lines, slope liquid filled lines down towards the controller and gas filled lines upwards toward the controller. Recommended rate of slope is 1" per foot (83 mm per meter).

When using a 4000 controller in combination with a control valve to control pipeline pressure it is advised that the process pressure line be connected in a straight section of pipe approximately 10 pipe diameter lengths from the valve but away from elbows, bends, and areas of abnormal flow fluctuations. Connect the process pressure line downstream of the control valve for pressure-reducing service.
For pressure-relief service, connect the process pressure line upstream of the control valve. A needle valve should be installed in the process pressure line in order to lessen pulsations.

WARNING

Property damage, environmental harm, and personal injury can result from the use of a supply gas other than clean, non-corrosive, oil and moisture free air. The 4000 Pressure Controller vents supply gas through the bottom of the controller, if hazardous or flammable gas is to be used as the supply medium, it may be necessary to install a remote vent line. Always ensure there is adequate ventilation present, and that filters receive regular maintenance when using the 4000 Level Controller.

Supply Pressure

1 Be sure the operating medium supplied to the controller meets the requirements of ISA Standard 7.0.01 and supply pressure requirements (see Page 4). The use of a supply medium that does not meet the requirements of ISA Standard 7.0.01 may damage the controller.

2 It may be necessary to use a regulator to reduce the available supply pressure to normal controller operating levels. Be sure to choose the appropriate regulator for the supply pressure available. See Table 3 for Supply Pressure Requirements.

3 Connect the supply pressure to the 1/4" NPT female SUPPLY port on the relay manifold (Key 89) at the back of the controller case.

4 Connect a line from the 1/4" NPT female OUTPUT port on the back of the controller case to the equipment being operated.

Process Pressure

Controllers that use gauge pressure as the type of input signal will utilize either bellows (Key 38) or a bourdon tube (Key 41) as the sensing element. Two bellows are used to sense differential pressure in a controller using differential pressure as the type of input signal. Setting up process pressure connections to the controller will be affected by the type of input signal.

Gauge Pressure Signal

There are two available connections to the controller pressure block (Key 19), the first connection labeled CONTROL at the back of the case (Key 15) and the second on the side of the case. Controller application will determine which connection should be used.

1 Connect the process piping to the desired control pressure block connection.

2 Using a pipe plug (Key 26) and good piping practices, plug the unused connection.

Differential Pressure Signal

1 Connect the 'low pressure' line to the port located on the side of the case (Key 15).

2 Connect the 'high pressure' line to the CONTROL port located on the back of the case.

Remote Venting

CAUTION

Venting and vent lines should comply with local and regional codes and regulations.

1 Remove the vent (Key 32) if present at the side of the case (Key 15).

INSTALLATION
(Continued)

Air Piping (Continued)

Remote Venting (Continued)

2 Connect a 1/2" diameter pipe to the vent port, make sure the pipe is free of foreign material and protected against foreign material entering the line. The pipe should have an adequate inside diameter and posses as few bends as possible to reduce case pressure.

CALIBRATION

NOTE

All calibration and adjustments must be made with the case cover (Key 3) open. Once calibrations are complete, close the case cover.

Proportional-Only Controller (4000)
(Reference Figures 2, 3, 6, 9, 10, 12, & 13)

Adjustments

Set Point
To increase the set point: Turn the pressure setting knob clockwise (See Figure 13).

To decrease the set point: Turn the dial holder (Key 81) counterclockwise. **NOTE:** With a wide proportional band the dial setting and process pressure can vary significantly.

Proportional Band
Adjust the proportional band by rotating the proportional band knob (Key 16) to the desired setting.
NOTE: Proportional band may be adjusted from 3% to 100% of the nominal sensing element pressure rating. This adjustment determines the amount of change in pressure required to fully stroke the control valve.

Proportional-Only Controller Calibration
The following calibration procedures use a pressure output range of 3 to 15 Psig (0.2 to 1.0 Bar). Values must be adjusted accordingly for a 6 to 30 Psig (0.4 to 2.0 Bar) output range.

1 Connect an appropriate pressure source to the supply pressure regulator. Confirm that the regulator is sending the proper supply pressure (equal to the sensing element range) to the controller. **NOTE:** The controller must be connected Open Loop (output pressure changes must be 'dead ended' into a pressure gauge).

2 Rotate the proportional band knob (Key 16) to 1.5 (15% proportional band).

3 Set the calibration adjuster screws (Key 65) to mid-position in the calibration adjuster (Key 44).

4 Apply the input pressure:
For Direct-Acting Controllers - input pressure should be equal to the lower range value of the sensing element.

For Reverse-Acting Controllers - input pressure should be equal to the upper range value of the sensing element.

5 Rotate the pressure setting knob:
For Direct-Acting Controllers – rotate the pressure setting knob to the minimum value.

For Reverse-Acting Controllers – rotate the pressure setting knob to the maximum value.

6 Adjust the nozzle (Key 68) by rotating it until the controller output pressure falls between 8 and 10 Psig (0.6 to 0.7 Bar).

7 Apply the input pressure:
For Direct-Acting Controllers - apply input pressure to equal the upper range value of the sensing element.

For Reverse-Acting Controllers - apply input pressure to equal the lower range value of the sensing element.

8 Rotate the pressure setting knob:
For Direct-Acting Controllers - rotate the pressure setting knob to the maximum value.

For Reverse-Acting Controllers - rotate the pressure setting knob to the minimum value.

CAUTION

Do not watch the output gauge while adjusting the span of the controller. Change in output is not an accurate indication of change in span. While moving the calibration adjuster to increase span, the output pressure may decrease even though the span is increasing.

CALIBRATION (Continued)

NOTE

All calibration and adjustments must be made with the case cover (Key 3) open. Once calibrations are complete, close the case cover.

Proportional-Only Controller (4000) (Continued)

(Reference Figures 2, 6, 9, 10, 12, & 13)

Proportional-Only Controller Calibration (Continued)

9 If the output pressure does not fall between 8 and 10 Psig (0.6 and 0.7 Bar), adjust the span by loosening both calibration adjuster screws (Key 65) and moving the calibration adjuster (Key 44) in small increments.

For Direct-Acting Controllers: See Figure 2.

For Reverse Acting Controllers: See Figure 3.

NOTE: When adjusting the span and moving the calibration adjuster always ensure proper flapper (Key 49) to nozzle (Key 68) alignment. Hold the calibration adjuster securely in place by hand whenever loosening or tightening the adjuster screws. Proper function of the pressure controller depends on good nozzle to flapper alignment.

10 If further adjustment is required, repeat Calibration Steps 4 – 9.

11 Tune the controller according to your requirements.

Proportional-Plus-Reset Controller (4010)

(Reference Figures 2, 3, 5, 10, 13, 14, & 15)

Adjustments

Set Point

To increase the set point: Turn the pressure setting knob clockwise. (See Figure 13)

To decrease the set point: Turn the pressure setting knob counterclockwise. **NOTE:** If the controller is accurately calibrated, the desired set point on the dial (Key 48) will reflect the desired pressure set point.

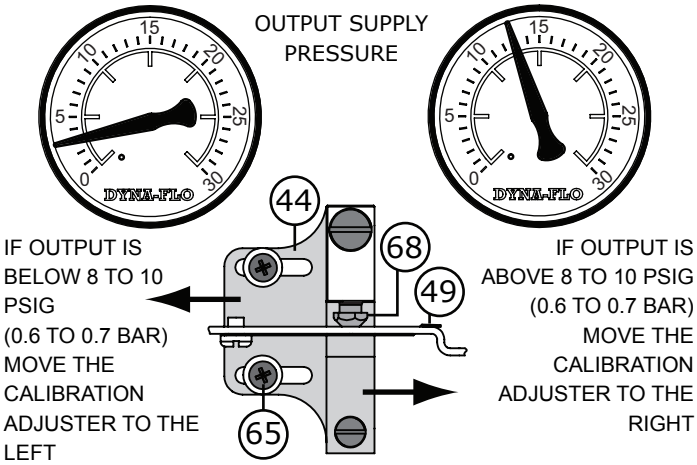


FIGURE 2 - DIRECT ACTING

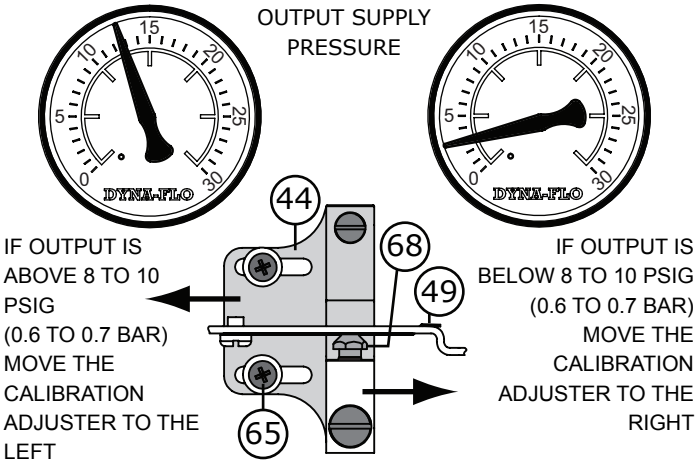


FIGURE 3 - REVERSE ACTING

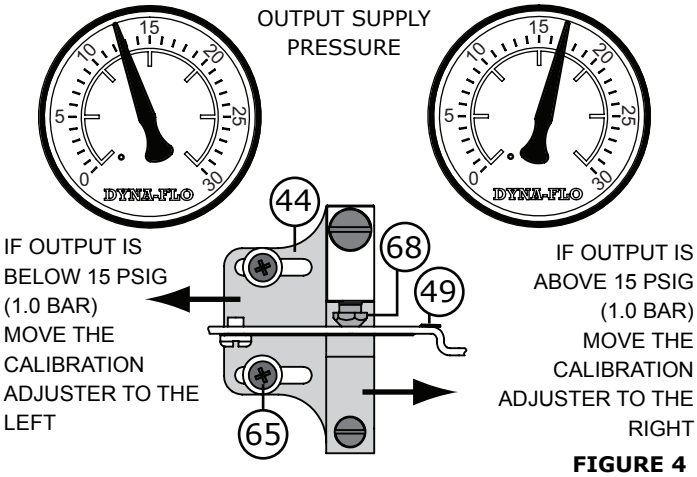


FIGURE 4

NOTE

All the output adjustments shown above are for a 3 to 15 Psig range. For 6 to 30 Psig range, adjust the values accordingly.

Phone: 780 • 469 • 4000 Toll Free: 1 • 866 • 396 • 2356 Fax: 780 • 469 • 4035 Website: www.dynaflo.com

CALIBRATION (Continued)

Proportional-Plus-Reset Controller (Continued)

Adjustments (Continued)

Proportional Band
Adjust the proportional band by rotating the proportional band knob (Key 16) to the desired setting.
NOTE: Proportional band may be adjusted from 3% to 100% of the nominal sensing element pressure rating. This adjustment determines the amount of change in pressure required to fully stroke the control valve.

Reset
To increase minutes per repeat: Turn the reset valve assembly (Key 31) counterclockwise (this creates a slower reset action).

To decrease minutes per repeat: Turn the reset valve assembly clockwise.

NOTE: Minutes per repeat is the time (in minutes) that is required for the reset action to create an output change equal to the change produced by the proportional control action. Essentially, this is the time (in minutes) necessary to increase/decrease the output pressure by an amount proportionally equal to an increase/decrease caused by a set point or process pressure change.

Proportional-Plus-Reset Controller Calibration

1 Connect an appropriate pressure source to the supply pressure regulator. Confirm that the regulator is sending the proper supply pressure (equal to the sensing element range) to the controller. **NOTE:** The controller must be connected Open Loop (output pressure changes must be 'dead ended' into a pressure gauge). See Table 1, 2, & 3 for pressure limits.

2 Rotate the reset valve assembly (Key 31) to 0.01 minutes per repeat (the fastest setting).

3 Rotate the proportional band valve assembly (Key 16) to 1.5 (15% of the proportional band).

4 Set the calibration adjuster screws (Key 65) to mid-position in the calibration adjuster (Key 44).

5 Apply the input pressure:
For Direct-Acting Controllers - input pressure should be equal to the lower range value of the sensing element.

For Reverse-Acting Controllers - input pressure should be equal to the upper range value of the sensing element.

6 Rotate the dial holder (Key 81):
For Direct-Acting Controllers – rotate the dial holder to the minimum value.

For Reverse-Acting Controllers – rotate the dial holder to the maximum value.

7 Adjust the nozzle (Key 68) by rotating it until the controller output pressure falls between 8 and 10 Psig (0.6 to 0.7 Bar).

8 Apply the input pressure:
For Direct-Acting Controllers: apply input pressure to equal the upper range value of the sensing element.

For Reverse-Acting Controllers: apply input pressure to equal the lower range value of the sensing element.

9 Rotate the dial holder:
For Direct-Acting Controllers: rotate the dial holder to the maximum value.

For Reverse-Acting Controllers: rotate the dial holder to the minimum value.

CAUTION

Do not watch the output gauge while adjusting the span of the controller. Change in output is not an accurate indication of change in span. While moving the calibration adjuster to increase span, the output pressure may decrease even though the span is increasing.

10 If the output pressure does not fall between 8 and 10 Psig (0.6 and 0.7 Bar), adjust the span by loosening both calibration adjuster screws (Key 65) and moving the calibration adjuster (Key 44) in small increments.

For Direct-Acting Controllers: See Figure 2.

For Reverse Acting Controllers: See Figure 3.

NOTE: When adjusting the span and moving the calibration adjuster always ensure proper flapper (Key 49) to nozzle (Key 68) alignment. Hold the calibration adjuster securely in place by hand whenever loosening or tightening the adjuster screws. Proper function of the pressure controller depends on good nozzle to flapper alignment.

11 If further adjustment is required, repeat Calibration Steps 4 – 9.

CALIBRATION (Continued)

Differential Gap Controller (4030)

Adjustments

Set Point
The differential gap will fall within the range of the pressure sensing element, and the location of the differential gap is determined by the position of the pressure setting knob. The pressure setting dial (Key 48) should be positioned where the desired output of the controller is to switch from zero to full supply pressure.

For Direct-Acting Controllers: the controller switches from zero to full supply pressure on rising process pressure.

For Reverse-Acting Controllers: the controller switches from zero to full supply pressure on falling process pressure.

Proportional Band
Adjusting the proportional band determines the span of the differential gap, and the span of that gap is the difference between the process pressures where the controller will switch from zero to full supply pressure, and vice versa. See Table 4 for the relationship between the proportional band setting and the differential gap.

Differential Gap Controller Calibration

NOTE: The controller must be connected Open Loop (output pressure changes must be 'dead ended' into a pressure gauge). See Table 1, 2, & 3 for pressure limits.

1 The differential controller must be temporarily converted to a proportional band controller by disconnecting the compensator tubing (Key 17) from the mounting base (Key 66) and switching the tubing to the other connection in the mounting base, See Figure 6. Do not invert the reversing block (Key 73).

2 Refer to the Proportional-Only Controller Calibration procedures on Page 7. After calibration proceed to step 3 below.

3 Once the controller has been calibrated as a proportional-only controller, return the proportional tubing to its original position from Step 1.

4 Adjust for the change in bellows (Key 38) that occurs after switching from the proportional bellows to the reset bellows in Step 3 by first determining the required proportional band setting for the desired differential gap (See Table 4).

Example: Using a 0 to 100 Psig (0 to 6.9 Bar) sensing element and a direct-acting controller set to move from zero to full supply pressure when the process pressure reaches 50 Psig (3.4 Bar) with a rising process pressure, and from full supply pressure to zero at 10 Psig (0.69) with falling process pressure.

The differential gap is

$$\frac{\text{(Upper Switch Point - Lower Switch Point)}}{\text{Bourdon Tube Range or sensing element range}} \times 100 = 40\%$$

$$\frac{50 \text{ Psig} - 10 \text{ Psig}}{100 \text{ Psig}} \times 100 = 40\%$$

See Table 4, with the differential gap at 40% the proportional band dial setting should be approximately 3.1. Rotate the proportional band knob (Key 16) to 3.1.

5 Setting the process pressure

For Direct-Acting Controllers:

A Set the pressure setting knob to the pressure at which the controller is to switch from zero to full supply pressure (with rising process pressure). The pressure would be 50 Psig (3.4 Bar) in the Example from Step 4.

B Monitor the output pressure gauge (Key 23) and increase the pressure to the sensing element, when the upper switching point is reached the controller output pressure should change from zero to full supply pressure (with rising input pressure). If the change from zero to full supply pressure does not occur at the proper switch point, adjust the nozzle (Key 68). Repeat this step until the input pressure and the upper switch point are at the desired setting.

C The output pressure should change back from full supply pressure to zero when the lower switch point (10 Psig from Step 4) is reached with falling input pressure.

For Reverse-Acting Controllers:
Reverse-acting controllers exhibit the opposite response as direct-acting controllers.

6 Observe the switch points by varying the process pressure, widen or narrow the differential gap as needed by rotating the proportional band knob. Repeat the above steps as needed.

7 Tune the controller according to your requirements.

Table 4

Differential Gap Settings

Proportional Band Setting	Differential Gap (% of Element Range)
1.2	10
1.8	20
2.5	30
3.1	40
3.8	50
4.4	60
5.1	70
5.7	80
6.4	90
7.0	100

CALIBRATION (Continued)

Transmitter

Adjustments

Zero
On the pressure setting knob, zero should be the center of the dial.

For direct-acting transmitters, the zero adjustment will determine at what process pressure the output signal will be at its low range limit (zero). Rotate the pressure setting knob clockwise to increase output and counter-clockwise to decrease output (this may vary depending on controller action and desired settings). Reverse-acting will be the opposite.

NOTE: Pressure setting knob dial increments are only approximate indications of transmitter zero setting. Monitor the process pressure and output pressure when making adjustments to the knob to ensure desired settings are achieved.

Span
Span adjustment on the transmitter is the same as proportional band adjustment on a controller.

The proportional valve assembly (Key 16) is marked from 0 to 10, and a dial setting of 10 would represent a span setting of 100% of the sensing element range. **NOTE:** the higher the span the higher the accuracy.

Transmitter Calibration
Transmitters provide an output signal that is proportional to the pressure applied to the sensing element, and has no direct effect on the process pressure.

The following calibration procedures use a pressure output range of 3 to 15 Psig (0.2 to 1.0 Bar). Values must be adjusted accordingly for a 6 to 30 Psig (0.4 to 2.0 Bar) output range.

1 Connect an appropriate pressure source to the supply pressure regulator. Confirm that the regulator is sending the proper supply pressure (equal to the sensing element range) to the controller.
NOTE: The transmitter must be connected Open Loop (output pressure changes must be 'dead ended' into a pressure gauge).

2 Rotate the span adjustment knob to 10 (100%).

3 Set the calibration adjuster screws (Key 65) to mid-position in the calibration adjuster (Key 44).

4 Rotate the dial holder (Key 81) to zero.

5 **For Direct-Acting Transmitters:**

A Set the input pressure to zero.

B Adjust the nozzle (Key 68) until the transmitter output pressure reaches 3 Psig (0.1 Bar).

C Apply input pressure equal to the upper range limit of the sensing element.

CAUTION

Do not watch the output gauge while adjusting the span of the transmitter. Change in output is not an accurate indication of change in span. While moving the calibration adjuster to increase span, the output pressure may decrease even though the span is increasing.

D If the output pressure is not 15 Psig, adjust the span by loosening both calibration adjuster screws (Key 65) and moving the calibration adjuster (Key 44) in small increments. See Figure 4.
NOTE: When adjusting the span and moving the calibration adjuster always ensure proper flapper (Key 49) to nozzle (Key 68) alignment. Hold the calibration adjuster securely in place by hand whenever loosening or tightening the adjuster screws. Proper function of the pressure transmitter depends on good nozzle to flapper alignment.

CALIBRATION (Continued)

Transmitter (Continued)

Transmitter Calibration (Continued)

5 **For Reverse-Acting Transmitters:**

A Apply input pressure equal to the upper range limit of the sensing element.

B Adjust the nozzle (Key 68) until the transmitter output pressure reaches 3 Psig (0.1 Bar).

C Set the input pressure to zero.

CAUTION

Do not watch the output gauge while adjusting the span of the transmitter. Change in output is not an accurate indication of change in span. While moving the calibration adjuster to increase span, the output pressure may decrease even though the span is increasing.

D If the output pressure is not 15 Psig, adjust the span by loosening both calibration adjuster screws (Key 65) and moving the calibration adjuster (Key 44) in small increments. See Figure 4.
NOTE: When adjusting the span and moving the calibration adjuster always ensure proper flapper (Key 49) to nozzle (Key 68) alignment. Hold the calibration adjuster securely in place by hand whenever loosening or tightening the adjuster screws. Proper function of the pressure transmitter depends on good nozzle to flapper alignment.

6 If further adjustment is required, repeat Calibration Steps 4 – 5.

7 Tune the transmitter according to your requirements.

CONTROLLER MAINTENANCE

WARNING

The following maintenance procedures require taking the controller out of service. To avoid personnel injury, only qualified technicians should perform the following procedures. Always ensure the controller is fully released of pressure or process fluid before starting maintenance. Use only ULC, CSA, or UL approved thread sealant on threaded connections.

Regular Maintenance

(Refer to Figure 7 to 15)

1 If the installation includes a supply regulator, periodically open the drain on the filter regulator to drain accumulated moisture.

2 Push the cleaner wire on the plug/wire restrictor Assembly (Key 92) to release moisture or particulate.

3 Inspect, and if necessary, clean the opening of the vent assembly (Key 32) or the remote vent pipe, if one is used.

Replacing Gauges

(Refer to Figure 13, 14, & 15)

1 2 gauges are used (Key 23), one for output (right side) and one for supply (left side) pressure.

2 Always ensure to check the range of the controller before ordering replacement gauges (0-30 Psi gauges WILL NOT work on a 6-30 Psi controller). See nameplate (Key 9).

3 Always use approved thread sealant on the threaded connections.

Replacing Bourdon Tube

(Refer to Figures 10 & 11)

WARNING

Isolate the process sensing line prior to disconnecting the bourdon tube from the control tubing (Key 21). Be aware of potential hazards from disconnecting process connections.

NOTE

If a bourdon tube with a different range was installed, install a new dial having an adjustment range corresponding to the range of the bourdon tube. Remove the machine screw, washer, and dial (Keys 47, 78, & 48).

CONTROLLER MAINTENANCE (Continued)

Replacing Bourdon Tube (Continued)

1 Disconnect the control tubing (Key 21) at the bourdon tube end.

2 Remove the screw (Key 55) that connects the link (Key 45) to the beam (Key 40).

3 Unscrew two screws (Key 60) and washers (Key 56), and remove the bourdon tube (Key 41).

4 Remove the link bearing screw (Key 55) that retains the connecting link (Key 45) to the bourdon tube (Key 41).

NOTE

New style link bearing screws are 1 piece (screw and bearing combined), old style link bearing screws were 2 pieces - the link screw and the bearing (1L37954620D). Use caution when working with old style link bearings, they are easy to lose.

5 Attach the link bearing screw to the replacement bourdon tube.

6 Attach the bourdon tube (Key 41) with two machine screws (Key 60) and washers (Key 56).

7 Connect the link bearing screw to the beam (Key 40).

8 Check to be sure that the beam is reasonably parallel with the bottom of the case. The connecting link (Key 45) should be in tension. If the beam is not parallel with the case, loosen the machine screws (Key 60), reposition the bourdon tube to get the beam parallel, and re-tighten the screws.

9 Check all tubing connections and bourdon tube for leaks, tighten connections if necessary.

10 Perform the proper calibration procedure.

Changing Proportional Valve

(Refer to Figures 5, 6, 13, & 15)

1 Disconnect the tubing and remove the proportional band valve assembly (Key 16) from the elbow fitting (Key 33) by turning it counter-clockwise.

2 Install the proportional band valve replacement assembly - **Do not over tighten!**

3 Check for leaks.

4 Calibrate the controller as required.

Changing Reset Valve

(Refer to Figures 5, & 16)

1 Disconnect the reset compensator tubing then remove the reset valve assembly (Key 31) by removing the mounting screw (Key 25) on the back of the controller.

2 Install the reset valve replacement assembly by securing it to the case by installing the mounting screw through the back of the case.

3 Connect the reset compensator tubing.

4 Check all connections for leaks.

5 Perform the proper calibration procedure.

Changing Action

(Refer to Figures 6, 10, 14, & 15)

WARNING

Isolate the controller from process, control, and supply pressure. Vent any trapped pressure from the controller before proceeding.

Direct action - Increasing sensed pressure produces increasing output pressure.

Reverse action - Increasing sensed pressure produces decreasing output pressure.

1 Changing the action is accomplished by reversing the position of 2 components:

- **A** the reversing block
- **B** the reset compensator tubing

2 Locate the compensator and reset compensator tubing (Keys 17 & 30) and reversing block (Key 73) positions for the action desired. See Figure 6.

3 In the controller, first locate the two bellows (Key 38) and the reversing block (Key 73).

For a 4000 (proportional-only) controller:
Disconnect the compensator tubing (Key 17) from the mounting base and reconnect it in the opposite hole.

For a 4010 (proportional-plus-reset) controller:
Disconnect both reset compensator tubes (Key 30) from the mounting base, and reconnect them in the opposite holes.

CONTROLLER MAINTENANCE (Continued)

Changing Action (Continued)

For both Models of Controllers:

A Remove the reversing block screw (Key 72), reversing block assembly (Key 73), and sealing screw (Key 75).

B Inspect the o-rings (Keys 69 & 70) located in the recessed area under the reversing block screw head and between the reversing block assembly and the calibration adjuster (Key 44). Replace the o-rings, if necessary.

C Position the reversing block assembly, with o-ring, on the calibration adjuster so that the nozzle (Key 68) is on the opposite side of the beam (Key 40) from which it was removed. Properly position the reversing block assembly so that the alignment pin engages the hole in the calibration adjuster. Install the reversing block screw (Key 72) with o-ring (Key 69).

D Install the sealing screw (Key 75) with o-ring in the hole previously covered by the reversing block assembly.

E Check all the connections for leaks with leak detector solution.

F Perform the proper calibration procedure.

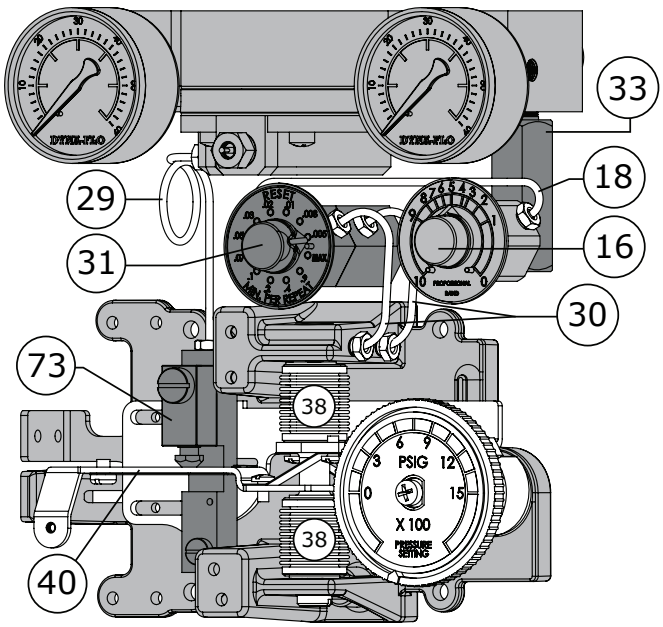


Figure 5 *Tubing View*

RELAY MANIFOLD

Replacement

(Refer to Figure 7, 8, & 14)

1 Isolate the controller from supply, control, and process pressure before proceeding.

2 Disconnect the relay tubing (Key 29) from the relay manifold assembly (Key 27).

3 Remove the relay manifold (Key 27) from the case by unscrewing the 2 retaining screws (Key 90) on the back of the case.

4 Remove the gauges (Key 23), proportional valve (Key 16), and elbow fitting (Key 33) from the manifold. Install the gauges, proportional band, and elbow fitting into the new replacement manifold.

5 Replace the relay manifold o-rings (Key 28). Place the o-rings for the inlet and outlet fittings on the relay manifold. With the manifold in place, insert and fasten the 2 screws (Key 90) from the backside of the case.

6 Connect the relay tubing, and check all connections for leaks.

7 Perform the proper calibration procedure.

Relay Reconditioning

(Refer to Figure 7, 8, & 14)

Disassembly

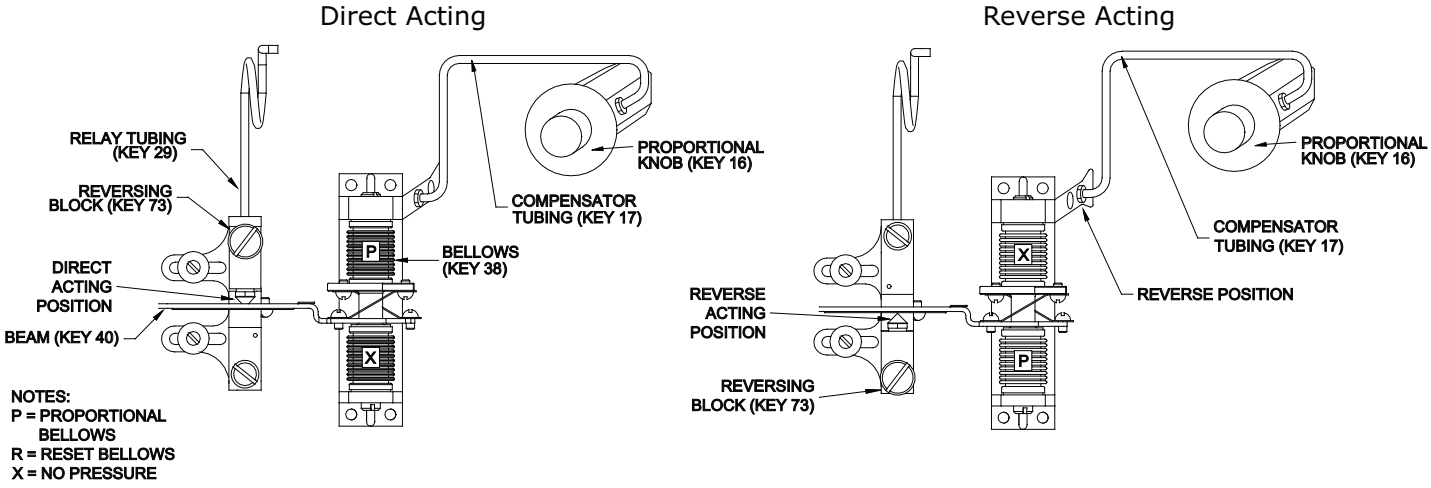
1 Complete Steps 1 through 4 of Relay Manifold Replacement.

2 Unscrew the Plug/Wire Restrictor Assembly (Key 92). Remove the o-rings (Key 87) from the assembly.

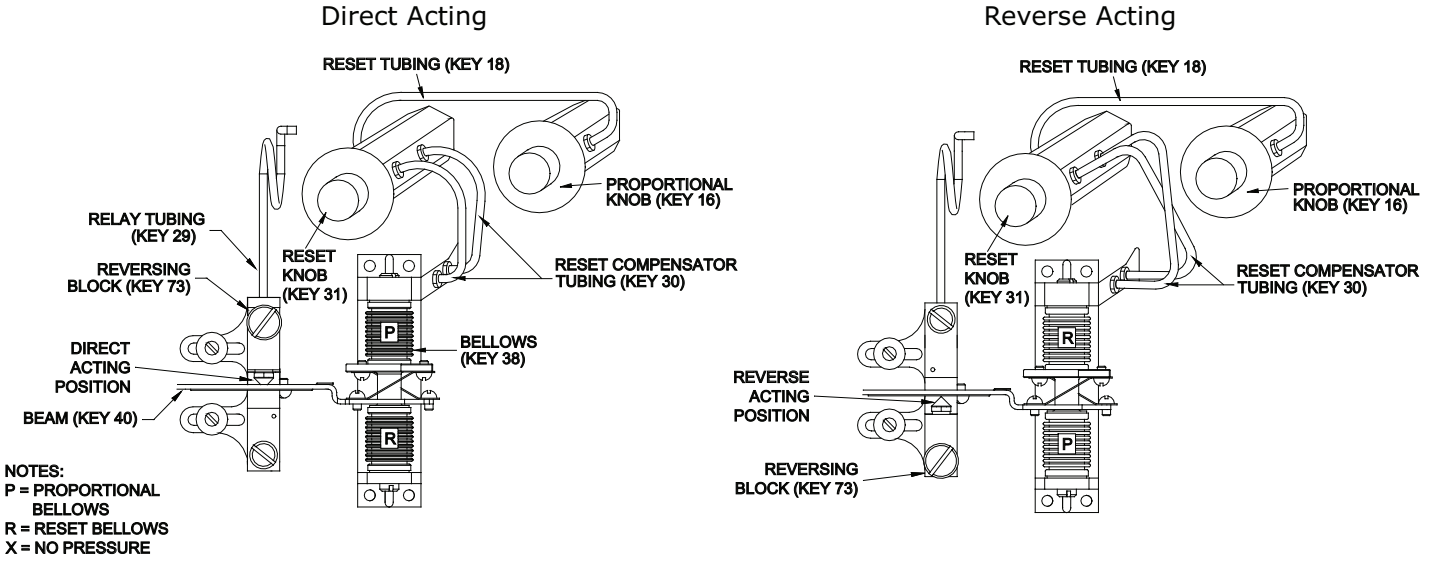
3 Place the relay manifold on the work surface with the casing screws facing up. Remove the casing screws (Key 86), in a crisscross pattern.

4 Separate and remove the diaphragm casing (Key 84), upper diaphragm (Key 95), spacer ring (Key 93), and diaphragm assembly (Key 83), relay spring (Key 91), from the relay manifold (Key 89). Remove the diaphragm assembly by pushing the diaphragm through the hole in the spacer ring.

5 Remove the 3 machine screws (Key 85) and 3 washers (Key 88) to access the seat ring (Key 94), valve plug (Key 96), valve spring (Key 97), and o-ring (82).



MODEL 4000 Proportional-Only Controller



MODEL 4010 Proportional-Plus Reset Controller

Figure 6 *Tubing Connections*

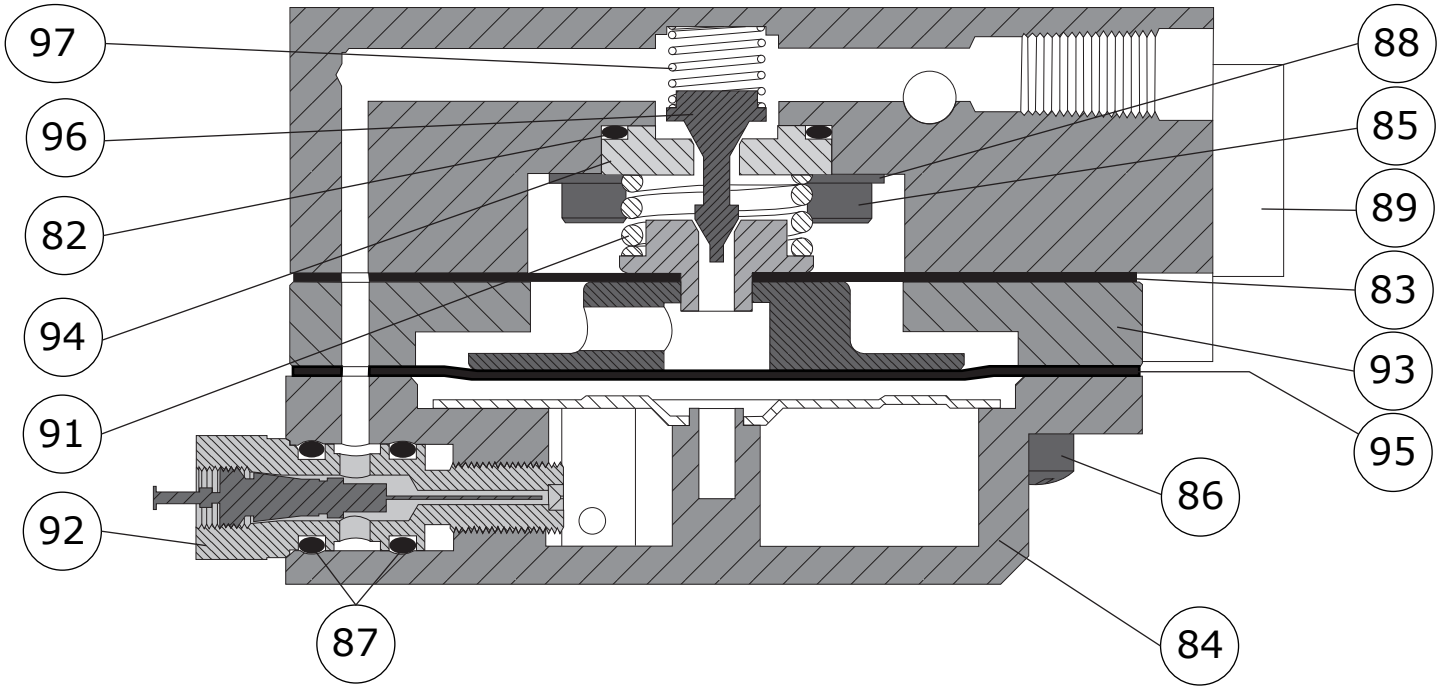


Figure 7 *New Style Relay Manifold Cross Section (Key 27)*

NOTE - The seat ring (Key 94) in Old Style Relays are pressed into the relay manifold and cannot be replaced.

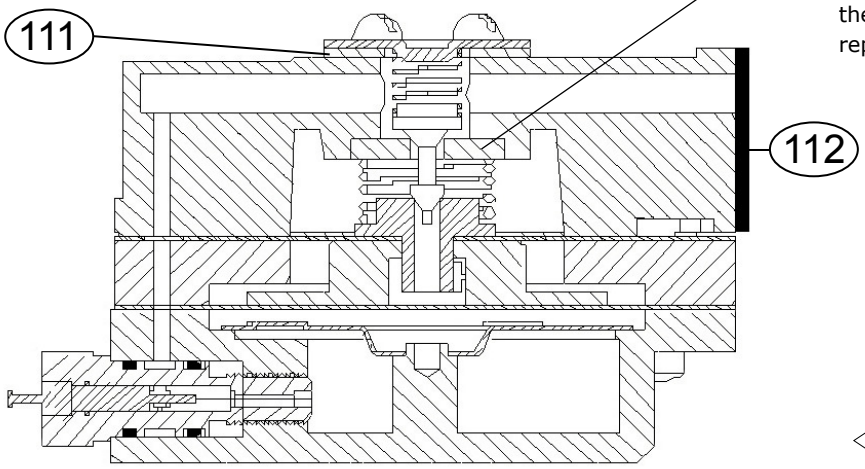


Figure 8
Old Style Relay Manifold Cross Section

Phone: 780 • 469 • 4000 Toll Free: 1 • 866 • 396 • 2356 Fax: 780 • 469 • 4035 Website: www.dynaflo.com

RELAY MANIFOLD (Continued)

Disassembly (Continued)

6 Inspect the valve seats (under a good light) for roughness due to corrosion. One seat is located in the diaphragm assembly (Key 83), and the other seat is located on the seat ring (Key 94).

7 Inspect diaphragms, gaskets, valve plug, valve seats, and spring for damage, wear, and corrosion. Replace them if necessary.

8 The lower diaphragm is part of the diaphragm assembly and must be replaced as an assembly.

9 Clean all parts thoroughly before re-assembling.

Re-assembly

1 With the opening in the relay manifold (Key 89) facing up, install the seat o-ring (Key 82) in the pocket of the relay manifold. Place the valve plug spring (Key 97) in the bottom of the manifold. Carefully place the valve plug on top of the spring, such that the plug is pointing up.

2 Carefully place the seat ring on top of the o-ring, ensuring the plug is sticking through the seat ring.

3 Compress the seat ring in place, install the 3 screws (Key 85) and washers (Key 88) that retain the seat ring.

4 Place the relay spring on the seat. Insert the diaphragm assembly into the spacer. Place the diaphragm assembly on the relay manifold assembly, ensuring the seat on the diaphragm assembly is properly placed on the plug. Ensure all flow passage holes are aligned, and place the upper diaphragm on the spacer. Refer to Figure 7 for reference.

5 Once the assembly of all these components is complete, the diaphragm casing assembly (Key 84) can then be installed. Place the diaphragm casing on top of the upper diaphragm, taking care to maintain the alignment of the flow passages. A second check is to align the grooves on the casing and spacer ring, with the mark stamped on the relay manifold.

6 Compress the components down and install the casing screws (Key 86), but do not tighten them. Once they are all in, tighten in a crisscross pattern.

7 Install the o-ring (Key 87) on the plug/wire restrictor (Key 92), and install the plug/wire restrictor into the diaphragm casing.

8 Install the elbow fitting (Key 33), proportional band (Key 16), gauges (Key 23), and appropriate tubing. Check all connections for leaks.

9 Replace the relay manifold o-rings (Key 28). Place the o-rings on the inlet & outlet fittings on the relay manifold. With the manifold in place, insert and fasten the 2 screws (Key 90) from the backside of the case.

10 Perform the proper calibration procedure.

Changing Output Signal Range

(Refer to Figures 10, 11, 12, 14, & 15)

From 3 to 15 Psig (0.2 to 1.0 Bar) to a 6-30 Psig (0.4 to 2.0 Bar) output signal range or vice versa.

1 Isolate the controller from supply, control, and process pressure before proceeding.

2 Remove the relay manifold from the case, see Relay Manifold Replacement (Page 15).

3 Refer to the parts list to make sure you have the bellows (Key 33) in appropriate range and material. 2 required.

4 Disconnect the relay tubing assembly (Key 29).

5 Disconnect the compensator tubing (Key 17) from the mounting base. Bending of the tubing will be reduced if you loosen the fitting at the proportional valve end as well.

6 Disconnect the control tubing (Key 21) from the pressure block (Key 19).

7 Remove the 4 machine screws (Key 62), and lift the mounting base sub-assembly from the case.

8 Remove the link bearing screw (Key 55) that connects the connecting link (Key 45) to the beam (Key 40).

9 Unscrew two screws (Key 60) and washers (Key 56), and remove the bourdon tube (Key 41).

10 Remove the other link bearing screw (Key 55) and connecting link (Key 45) from the bourdon tube (Key 41).

NOTE

Bearings on old style link bearing screws are easy to lose.

Changing Output Signal Range (Continued)

11 Remove the bellows screws (Key 35) so that the bellows and beam assembly can be removed from the mounting base (Key 66) or bellows frame (Key 43) for old style mounting base assemblies. It may be necessary to compress the bellows slightly in order to remove the bellows assembly.

12 While firmly holding the bottom feedback bellows (Key 38) in your hand, turn the upper bellows counter-clockwise with your other hand to separate the bellows from the beam (Key 40) assembly.

13 Remove the bellows stud (Key 37) for re-use with the new bellows.

14 With the stud that connects the two bellows in place in the cross spring spacer (Key 39), screw the new bellows onto the stud. Install a new gasket (Key 34) on each bellows.

15 Compress the feedback bellows, and install them into the mounting base (Key 66) or bellows frame (Key 43).

16 With the beam parallel to the mounting base, secure the bellows with the bellows screws.

17 When tightening the bellows screws, make sure that the nozzle (Key 68) is centered on the flapper (Key 49).

18 Install the bourdon tube - refer to Steps 4, 9, and 10 in reverse order.

19 Return the mounting base sub-assembly to the case and secure with the machine screws (Key 62).

20 Reconnect all tubing. Take care to get the compensator tubing back in the right connection on the mounting base (Refer to Figure 6).

21 Unscrew the supply and output gauges (Key 23) and install new gauges with correct ranges.

22 Check all tubing connections and the bellows screws for leaks. Tighten as necessary.

23 Perform the proper calibration procedure.

NOTE

Use proper thread sealant on all tubing connections.

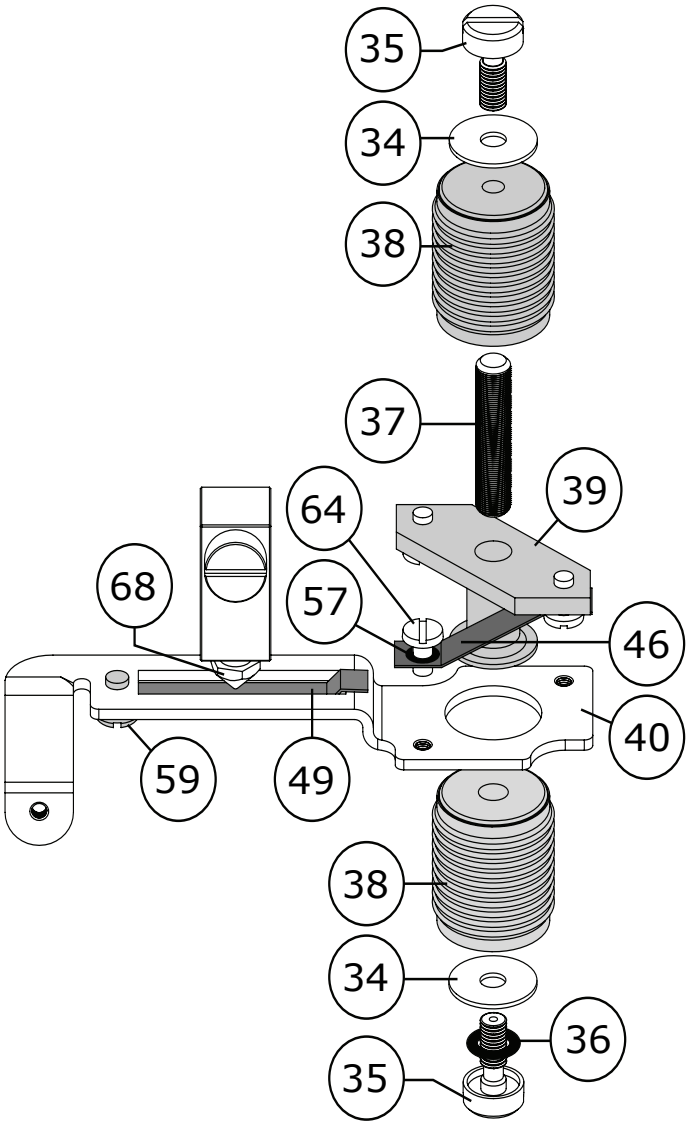


Figure 9 *Bellows Sub-Assembly*

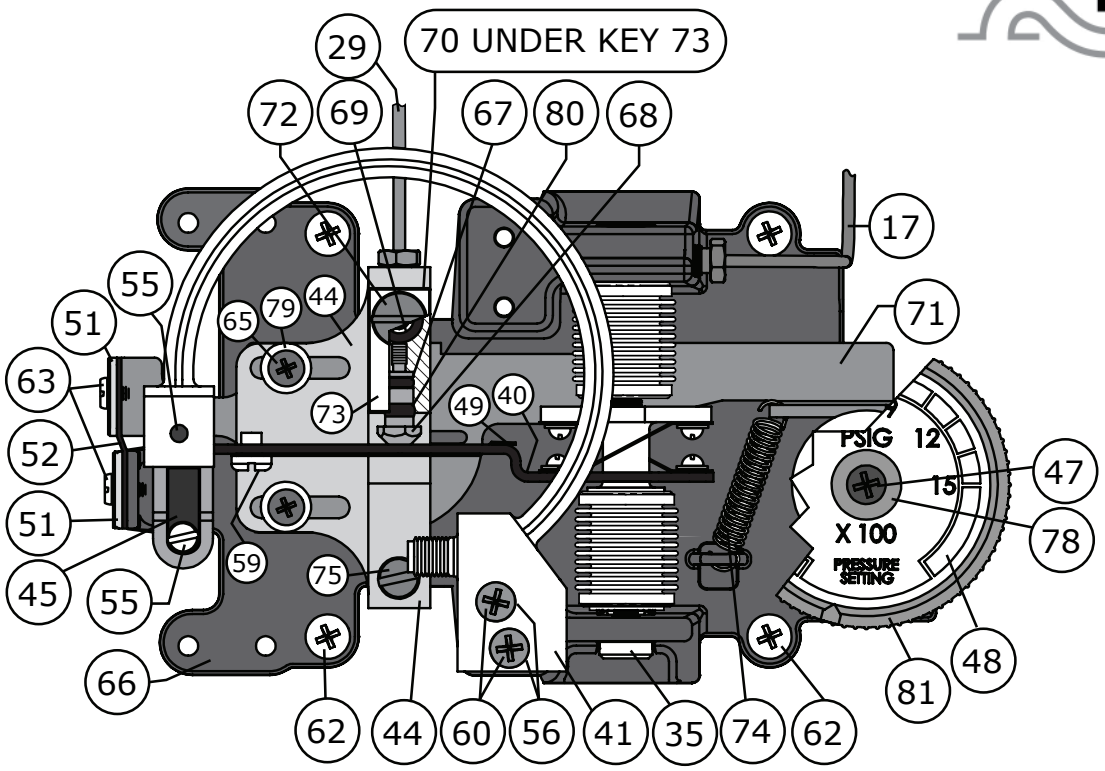


Figure 10 *New Style Mounting Base Sub-Assembly*

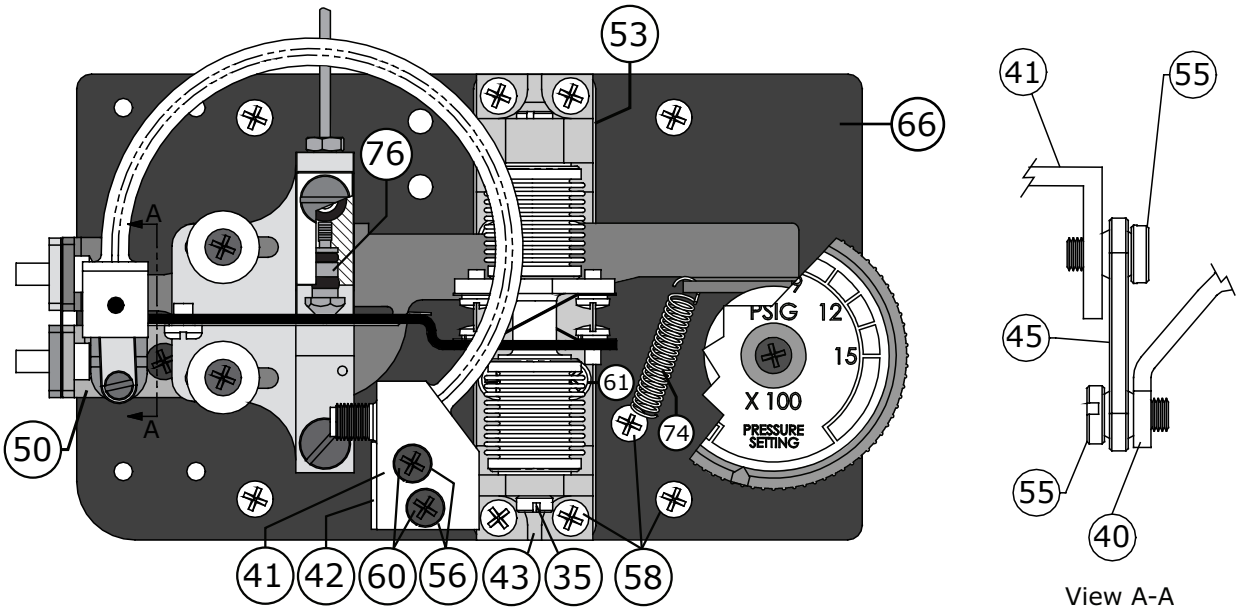


Figure 11 *Old Style Mounting Base Sub-Assembly*

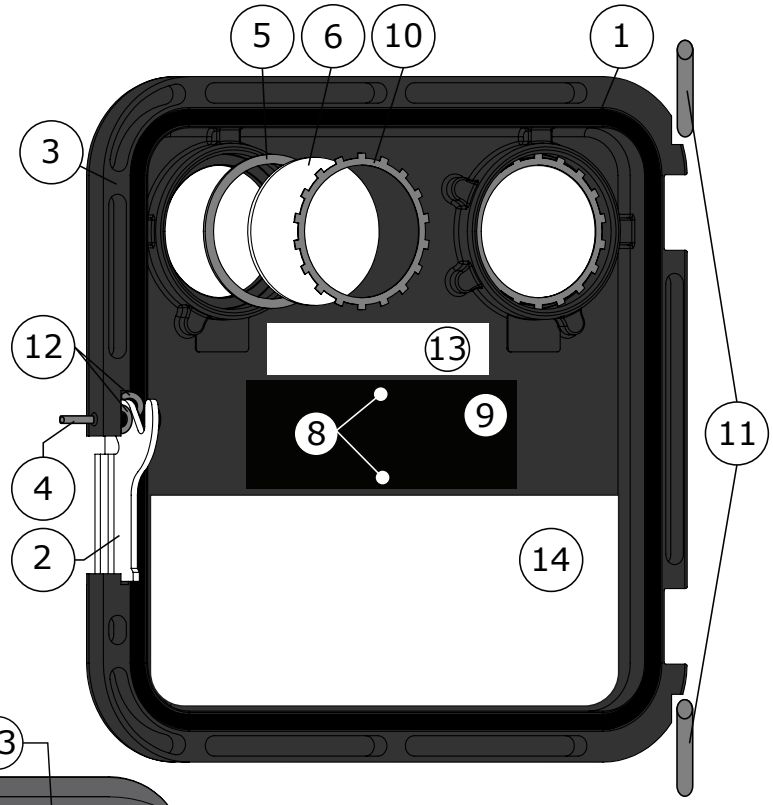


Figure 12
Case Cover Assembly

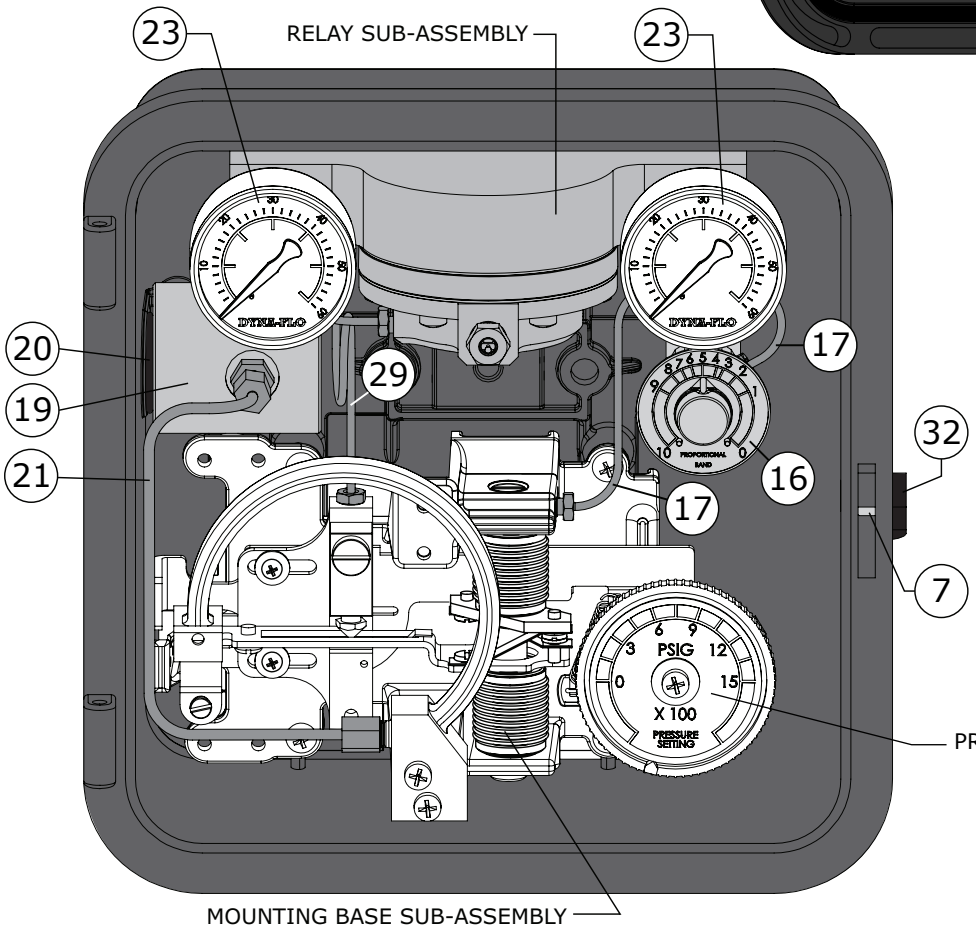


Figure 13
Case Assembly Front View 4000

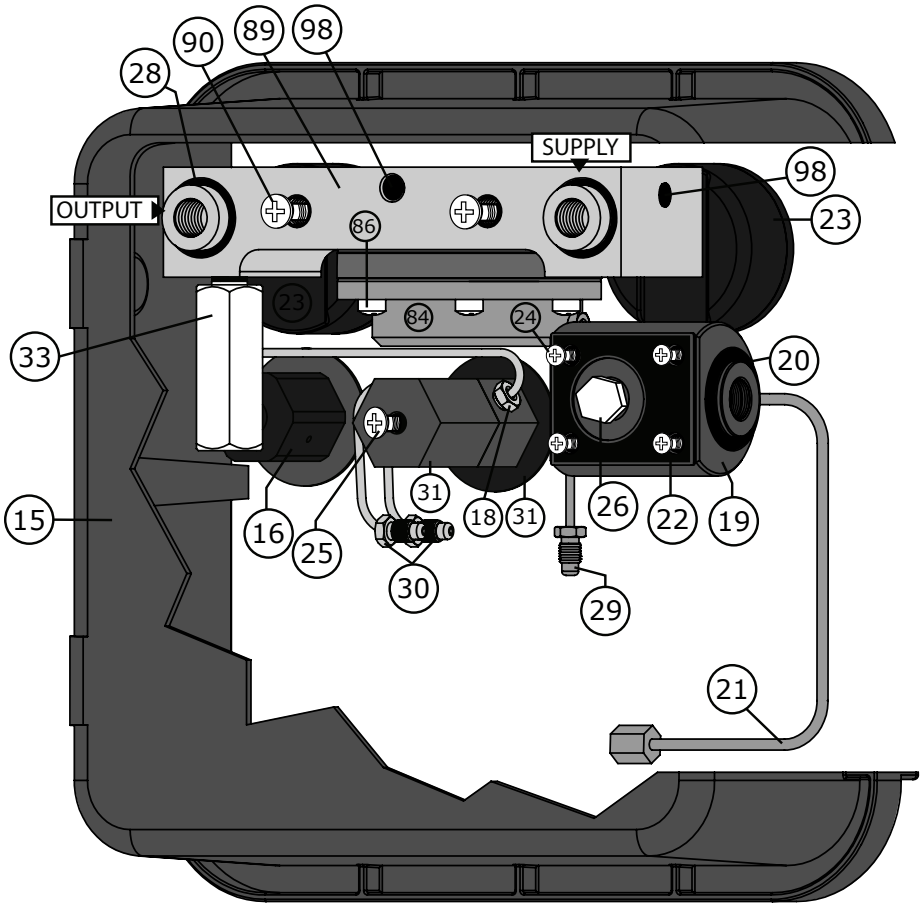


Figure 14
Case Assembly
Back View 4010

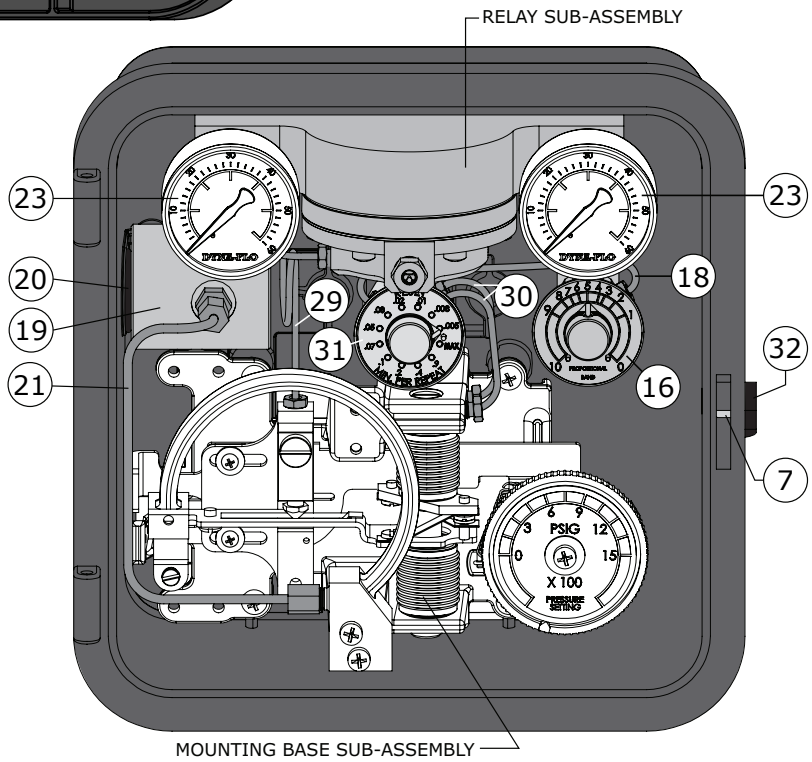


Figure 15
Case Assembly
Front View 4010

Parts

Case Cover (See Figure 6)

Key	Description	Part Number
1	**Cover Gasket**, Nitrile	1J40750643D
2	**Cover Latch**, Steel Plated	1H28862898D
3	**Cover**, Aluminum	PC00000011D
4	**Latch Pin**, Steel Plated	PC00000003D
5	**Gasket**, Gauge Glass, Neoprene, Qty: 2	0T01910408D
6	**Gauge Glass**, Qty: 2	DF5000X044D
7	**Latch Roll Pin**, Steel Plated	PC00000003D
8	**Nameplate Screw**, Steel Plated, Qty: 2	1C94192898D
9	**Nameplate**, SST	PC00000013D
10	**Retaining Ring**, Gauge Glass, SST, Qty: 2	PC00000006D
11	**Roll Pin**, Cover Hinge, SST, Qty: 2	1H28882899D
12	**Spring Washer**, Cover Latch, Steel Plated, Qty: 2	PC00000004D
13	**Calibration Sticker**, Vinyl	INSTCALSTICK
14	**Cover Sticker**, Vinyl	PC0000X124D

Case (See Figure 7 & 8)

Key	Description	Part Number
15	**Case**, Aluminum	PC00000044D
16	**Proportional Valve Assembly**	10A9122X03D
17	**Compensator Tubing**, SST 4000	1H6864000AD
18	**Reset Tubing**, SST 4010	1H6866000AD
19	**Control Pressure Block**, Steel Plated (old style)	PC00000024D
	(new style)	PC00000024X
20	**O-Ring**, Control Pressure Block, Neoprene (old style)	1C37620699D
	(new style)	DF20781X01D
21	**Control Tubing Assembly**, SST	PC00000023D
22	**Gasket**, Pressure Block, Neoprene	1C32860301D
23	**Gauge**, Qty: 2	
	0-30 gauge used for 3-15 Psig (0 - 1.03 Bar)	PC00000037D
	0-60 gauge used for 6-30 Psig (0 - 2.07 Bar)	PC00000038D
24	**Machine Screw**, Pressure Block, Steel Plated, Qty: 4	PC00000026D

Case (Continued)

Key	Description	Part Number
25	**Mounting Screw**, Reset Valve, Steel Plated	1B4638X001D
26	**Pipe Plug**, Pressure Block, Steel	1A76752466D
27	**Relay Manifold Assembly**	PC00000056D
28	**O-Ring**, Relay Manifold, Nitrile, Qty:2	PC00000071D
29	**Relay Tubing Assembly**, SST	1H6861000AD
30	**Reset Compensator Tubing Assembly**, SST 4010, Qty: 2	1H6868000AD
31	**Reset Valve Assembly**, 4010	PC00000200D
32	**Vent Assembly**, Plastic / SST	Y602-12D
33	**Elbow Fitting,** Aluminum Proportional Band	PC00000043D

Bellows Sub-Assembly (See Figure 9)

Key	Description	Part Number
34	**Bellows Gasket**, Neoprene, Qty: 2	1D39700301D
35	**Bellows Screw**, SST, Qty: 2	22B8036X02D
36	**O-Ring**, Bellows Screw, Nitrile, Qty: 2	1D68750699D
37	**Bellows Stud**, SST	1H2658X001D
38	**Bellows**, SST, Qty: 2	
	3-15 Psig (0.21 - 1.03 Bar)	14A5726X02D
	6-30 Psig (0.41 - 2.07 Bar)	14A5726X04D
	SST / Aluminum Caps, Qty: 2	
	3-15 Psig (0.21 - 1.03 Bar)	14A5726X01D
	6-30 Psig (0.41 - 2.07 Bar)	14A5726X03D
39	**Cross Spring Spacer**, Aluminum	1H26594401D

Mounting Base Sub-Assembly (See Figure 10 & 11)

Key	Description	Part Number
40	**Beam**, SST	1H26682507D
41	**Bourdon Tube**, SST	
	3-15 Psig (0 - 1.03 Bar)	10B2892X01D
	6-30 Psig (0 - 2.07 Bar)	10B2892X02D
	0-100 Psig (0 - 6.89 Bar)	10B2892X03D
	0-200 Psig (0 - 13.79 Bar)	10B2892X04D
	0-300 Psig (0 - 20.68 Bar)	10B2892X05D
	0-600 Psig (0 - 41.37 Bar)	10B2892X06D
	0-1000 Psig (0 - 68.95 Bar)	10B2892X07D
	0-1500 Psig (0 - 103.42 Bar)	10B2892X08D
	0-3000 Psig (0 - 206.84 Bar)	10B2892X09D

Parts (Continued)

Mounting Base Sub-Assembly
(Continued) (See Figure 10 & 11)

Key	Description	Part Number
41	**Bourdon Tube**, Continued	
	0-5000 Psig	10B2892X10D
	0-8000 Psig	10B2892X11D
	0-10,000 Psig	10B2892X12D
42	**Bourdon Tube Bracket**, Aluminum, (old style)	PC00000025D
43	**Bellows Frame,** Aluminum, (old style)	2H26530801D
44	**Calibration Adjuster**, Steel Plated	2H26624401D
45	**Connecting Link**, SST	1L37964101D
46	**Cross Spring**, SST, Qty: 2	1H26603703D
47	**Dial Screw**, Steel Plated	1J84152898D
48	**Dial**, SST	
	3-15 Psig (0 - 1.03 Bar)	16A7662X01D
	6-30 Psig (0 - 2.07 Bar)	16A7662X02D
	0-100 Psig (0 - 6.89 Bar)	16A7662X03D
	0-200 Psig (0 - 13.79 Bar)	16A7662X04D
	0-300 Psig (0 - 20.68 Bar)	16A7662X05D
	0-600 Psig (0 - 41.37 Bar)	16A7662X06D
	0-1000 Psig (0 - 68.95 Bar)	16A7662X07D
	0-1500 Psig (0 - 103.42 Bar)	16A7662X08D
	0-3000 Psig (0 - 206.84 Bar)	16A7662X09D
	0-5000 Psig (0 - 344.74 Bar)	16A7662X10D
	0-8000 Psig (0 - 551.58 Bar)	16A7662X11D
	0-10,000 Psig (0 - 689.48 Bar)	16A7662X12D
49	**Flapper**, SST	1H26694113D
50	**Flexure Strip Base**, Steel, (old style), Qty: 2	1C89772508D
51	**Flexure Strip Washer**, Steel Plated, Qty: 2	16A7671X01D
52	**Flexure Strip**, SST	1C89783601D
53	**Gasket**, Bellows Frame, Neoprene, (old style)	1H26540301D
54	**Knob Spring**, Steel Plated	1C22152702D
55	**Link Bearing Screw**, SST, Qty: 2	PC00000041D
56	**Lockwasher**, Bourdon Tube, Steel Plated, Qty: 2	1H26722898D

Mounting Base Sub-Assembly
(Continued)

Key	Description	Part Number
57	**Lockwasher**, Steel Plated, Qty: 4	1H26712898D
58	**Machine Screw**, Steel, (old style), Qty: 9	1A5733X001D
59	**Machine Screw**, Flapper, Steel Plated	1B27512898D
60	**Machine Screw**, Bourdon Tube, Steel Plated, Qty: 2	1H26772898D
61	**Machine Screw**, Bellows Frame, Steel Plated, (old style), Qty: 4	1A33212898D
62	**Machine Screw**, Mounting Base, Steel Plated, Qty: 4	PC00000040D
63	**Machine Screw**, Flexure Strip, Steel Plated, Qty: 4	14B4995X01D
64	**Machine Screw**, Cross Springs, Steel Plated, Qty: 4	1V74352898D
65	**Machine Screw**, Calibration Adjuster, Steel Plated, Qty: 2	1A5733X001D
66	**Mounting Base**, Aluminum	26A7668X01D
	old style	2H26512501D
67	**O-Ring**, Nozzle - Top, Nitrile	1E22260699D
68	**Nozzle**, Reversing Block, SST	
	new style	PC00000080A
	old style	1U63913513D
69	**O-Ring**, Under Reversing Block Screw, Nitrile	1D68750699D
70	**O-Ring**, Under Reversing Block, Nitrile	1D68750699D
71	**Pressure Arm**, Steel Plated	36A7669X01D
72	**Reversing Block Screw**, SST	24A5720X01D
73	**Reversing Block**, Steel Plated	26A0975X01D
74	**Rotary Spring**, SST	1J42343702D
75	**Sealing Screw**, SST	14A5721X01D
76	**Sleeve**, Nozzle, Delrin, (old style)	16A0976X01D
77	**Socket Cap Screw**, Bourdon Tube Bracket, Steel Plated, (old style), Qty: 2	PC00000051D
78	**Washer**, Dial, Steel	1R98202507D
79	**Washer**, Calibration Adjuster, Steel Plated, Qty: 2	1E87302899D
80	**O-Ring**, Nozzle - Bottom, Nitrile	PC00000060D
81	**Dial Holder**, Plastic	36A7670X01D

Parts (Continued)

Relay Sub-Assembly (See Figure 4 & 5)

Key	Description	Part Number
82	**O-Ring**, Relay Seat Ring, Nitrile	PC00000069D
83	**Diaphragm Assembly**	18A2451X44D
84	**Diaphragm Casing Assembly**, Aluminum/Steel	12B0460X01D
85	**Machine Screw**, SST, Qty: 3	PC00000055D
86	**Machine Screw**, Steel, Qty: 6	1C89692898D
87	**O-Ring**, Nitrile, Qty: 2	1D68750699D
88	**Washer**, Relay Seat, Steel Plated, Qty: 3	PC00000053D
89	**Relay Manifold**, Aluminum	PC00000049D
90	**Socket Cap Screw**, Steel, Manifold/Case, Qty: 2	PC00000051D
91	**Relay Spring**, Steel Plated	1C89612701D
92	**Plug/Wire Restrictor Assembly**	12B0468X01D
93	**Spacer Ring**, Aluminum	38A3778X01D
94	**Seat Ring**, SST	PC00000050D
95	**Upper Diaphragm**	1L55560204D
96	**Valve Plug**, SST	0Y0617X002D
97	**Valve Spring**, SST	0X08363702D
98	**Set Screw**, SST, Qty: 3	PC00000048D

Case Mounting Parts (See Figure 12 & 13)

Key	Description	Part Number
99	**Cap Screw**, Wall or Panel Mount, Steel Plated, Qty: 4	1B84802405D
100	**Cap Screw**, Steel Plated, Qty: 2	H18.8C516.100
101	**Button Screw**, Steel Plated, Qty: 2	SBR18.8516.200
102	**Hex Nut**, Steel Plated, Qty: 4	1C33282898D
103	**Lockwasher**, Steel Plated, Qty: 2	1C22572898D
104	**Machine Screw**, Steel Plated, Qty: 2	1C63922898D
105	**Mounting Bracket**, Actuator Casing, Steel Plated	1F40122507D
106	**Mounting Bracket**, Actuator Yoke, Steel Plated	1C22182502D
107	**Mounting Bracket**, Panel or Wall, Steel Plated, Qty: 2	1H2892000AD
108	**Mounting Bracket**, Pipestand, Steel Plated	3N97572509D
109	**Mounting Spacer**, Steel Plated, Qty: 2	1F90672409D
110	**Pipe Mounting Clamp**, Steel, Qty: 2	1P42702898D
111	**Yoke Spacer**, Steel Plated, Qty: 2	1J83072409D
112	**Hex Nut**, Steel Plated, Qty: 2	NH18.8C516

Repair Kits — Part Numbers

Controller Repair Kit (for old and new style) — **R4000X00L1D**

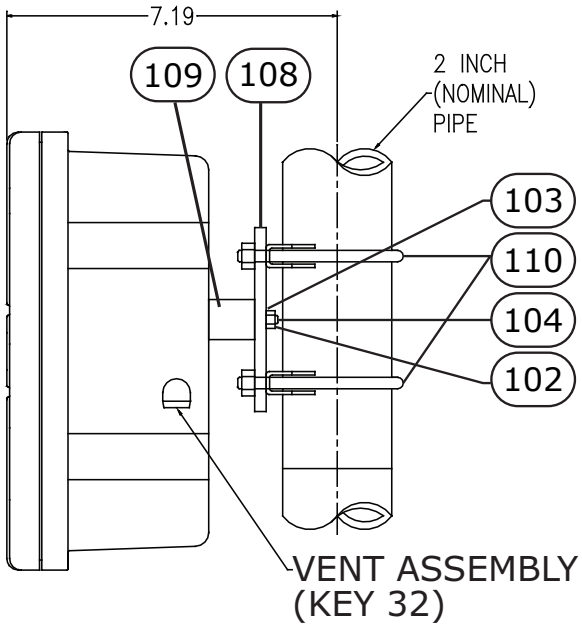
Kit Contains Keys: 1, 5, 20, 22, 34, 36, 45, 49, 53, 55, 59, 67, 68, 69, 70, 72, 73, 75, 80

Relay Repair Kit (Figures 7 & 8) — **RRELAYX0L1D**

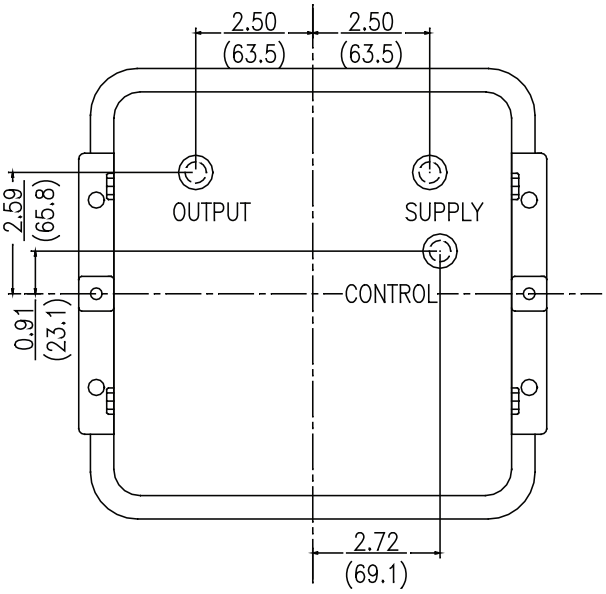
Kit Contains Keys: 28, 82, 83, 87, 91, 92, 94, 95, 96, 97
111 - Gasket, Spring Plate, Neoprene, 1H26960301D 112 - Gasket, Relay Mount, Neoprene, 1C89740301D

Parts Ordering

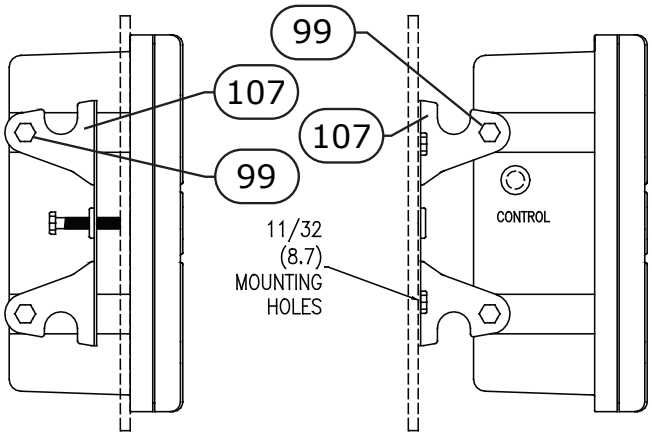
Whenever corresponding with Dyna-Flo about a 4000 series pressure controller, refer to the nameplate (Key 9, Figure 12) for the serial number of the unit. Please order by the complete part number (as given in the following parts list) of each part required.



PIPESTAND MOUNTING



BACK VIEW



PANEL MOUNTING WALL MOUNTING

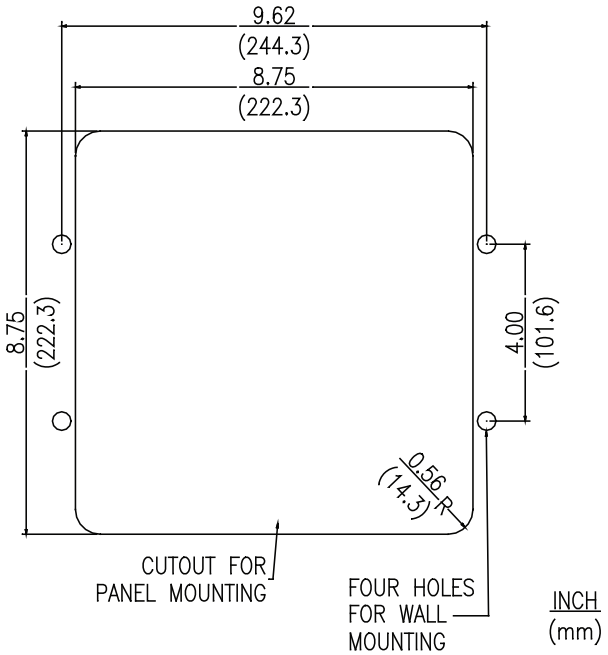


Figure 16 *Mounting Details, Pipestand, Surface Panel*

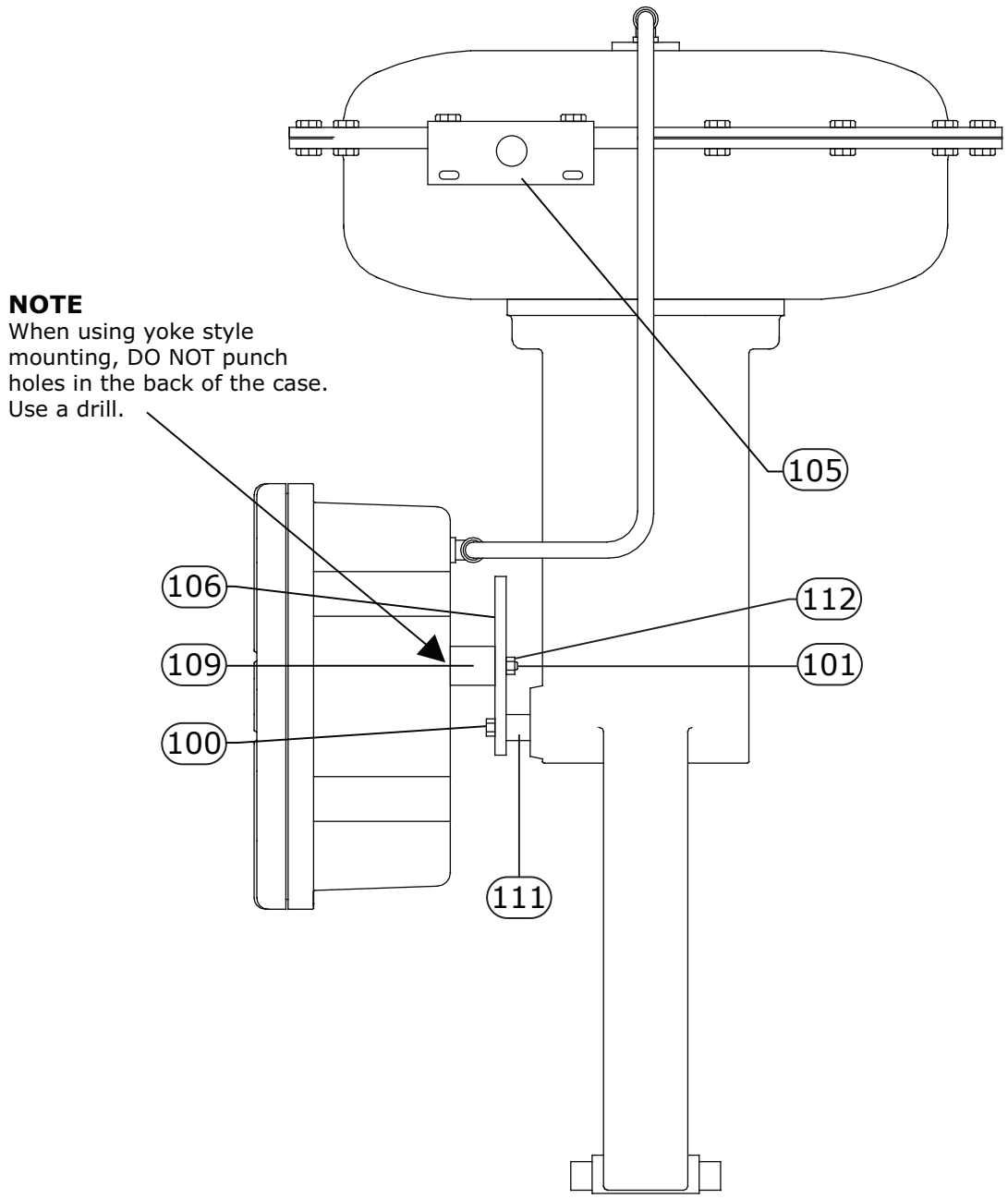


Figure 17 *Mounting Details, Actuator Yoke*

Our Commitment to Quality

Dyna-Flo is committed to continuous improvement. While all efforts have been made to ensure the accuracy of the content in this document, modifications or improvements to the information, specifications, and designs may occur at any time without notice. This document was published for informational purposes only, and does not express or imply suitability, a warranty, or guarantee regarding the products or services described herein or their use or applicability.

Neither Dyna-Flo Control Valve Services Ltd., nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for selection, use and maintenance of any product remains with the purchaser and end-user.

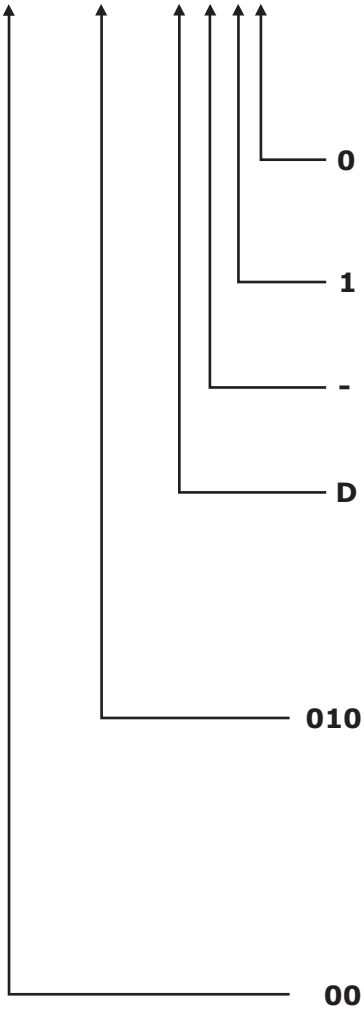
Phone: 780 • 469 • 4000 Toll Free: 1 • 866 • 396 • 2356 Fax: 780 • 469 • 4035 Website: www.dynaflo.com

Ordering Guide

Dyna-Flo 4000 Pressure Controller | **Model Numbering System**

Sample Part Number

40**00**—010—D—10



Code	Description
	Options
0	None
1	NACE Process Only
2	Sour Instrument Only
3	NACE Process and Sour Instrument
	Controller Output
1	3 to 15 Psig (2 to 6.9 Bar) / 0 to 20 Psig (0 to 6.9 Bar)
2	6 to 30 Psig (0.4 to 13.8 Bar) / 0 to 30 Psig (0 to 13.8 Bar)
	Options
-	None (standard)
S	Bourdon Tube Stop
	Controller Action
D	Direct
R	Reverse
	Input Signal Range
003	0 to 30 Psig (2.1 Bar)
006	0 to 60 Psig (4.1 Bar)
010	0 to 100 Psig (6.9 Bar)
020	0 to 200 Psig (13.8 Bar)
030	0 to 300 Psig (20.7 Bar)
060	0 to 600 Psig (41.4 Bar)
100	0 to 1000 Psig (68.9 Bar)
150	0 to 1500 Psig (103 Bar)
300	0 to 3000 Psig (207 Bar)
500	0 to 5000 Psig (345 Bar)
	Note: consult factory for higher input signal ranges
	Controller Mode
00	Proportional
10	Proportional + Reset
30	Differential Gap