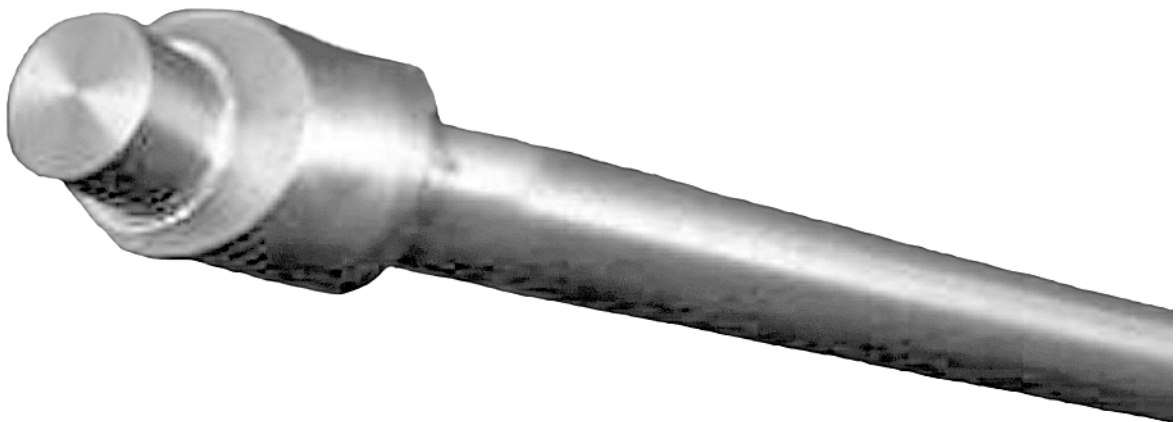


Model T8

Ultrasonic Flow Transducer

Installation Guide



GE
Measurement & Control

Model T8

Ultrasonic Flow Transducer

Installation Guide

916-075 Rev. D
November 2014



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Information Paragraphs

Note: *These paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.*

IMPORTANT: *These paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.*



CAUTION! This symbol indicates a risk of potential minor personal injury and/or severe damage to the equipment, unless these instructions are followed carefully.



WARNING! This symbol indicates a risk of potential serious personal injury, unless these instructions are followed carefully.

Safety Issues



WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.



WARNING! For installations in potentially hazardous areas, be sure to read the *Certification and Safety Statements* document at the end of this manual before beginning the installation.

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area



WARNING! Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.



WARNING! Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

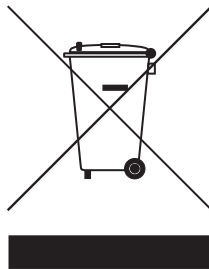
Unauthorized Operation

Make sure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

GE Measurement & Control Solutions is an active participant in Europe's *Waste Electrical and Electronic Equipment* (WEEE) take-back initiative, directive 2012/19/EU.



The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

Visit <http://www.ge-mcs.com/en/about-us/environmental-health-and-safety/1741-weee-req.html> for take-back instructions and more information about this initiative.

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Chapter 1. Installing the Transducers

1.1 Introduction

The *T8 Ultrasonic Flow Transducer* is used exclusively with the GE Sensing line of ultrasonic flowmeters. These transducers measure the flow rate of sonically-conductive gases through pipes having diameters from 4 in. (100 mm) to 36 in. (90 cm). Such measurements are typically independent of the pipe material.

1.2 Transducer Construction

Each T8 transducer assembly (see *Figure 1* below) consists of the following:

- A metallic *body* with a 1/2" NPT male thread for attaching an electrical junction box
- A *body flange* that is welded or machined to the transducer body
- A *transducer* with a piezoelectric element mounted on a wedge and wired to a BNC style electrical connector
- A BNC style electrical connector for use in connecting the transducer to the flowmeter

The T8 is available in various lengths from 12 in. (30 cm) to 72 in. (180 cm).

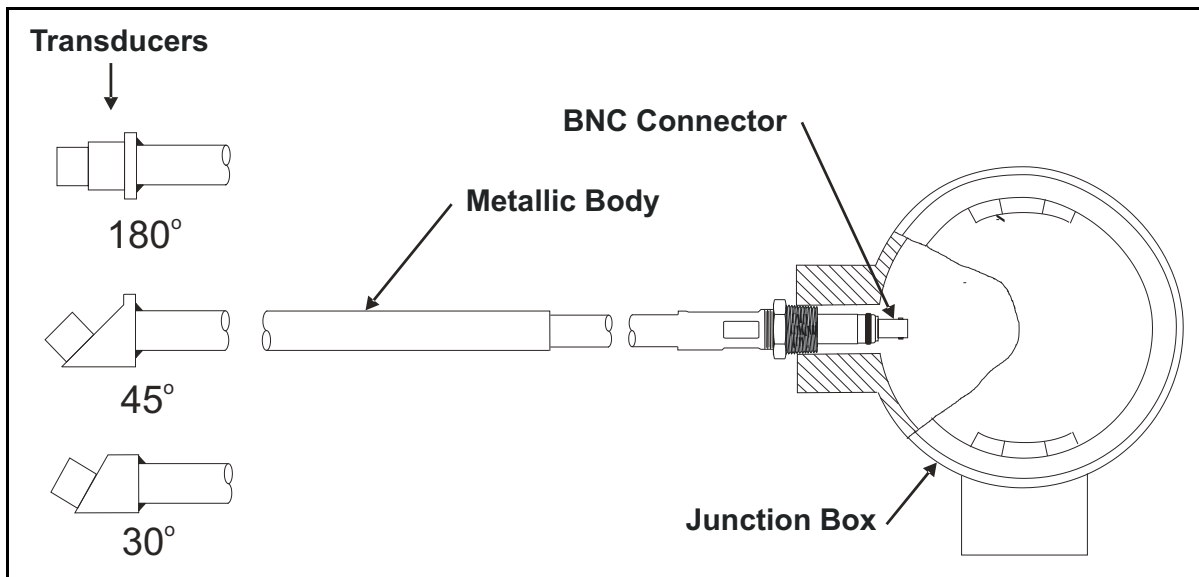


Figure 1: T8 Transducer Assembly

1.3 Installing T8 Transducers

The *pressure mechanism* is a piston-driven hydraulic pump used for inserting T8 transducers into pressurized pipelines. To perform this procedure safely, you must follow all the instructions in this chapter very carefully.

1.3.1 Equipment Needed

To properly install the T8 transducers, you must provide the following items:

- Pipe marker
- Spiral-wound gaskets (6)
- Adjustable torque wrench with a 3.75-19 ft-lb (5-20 N-m) range and a socket drive
- Standard and deep sockets
- Hot-tapping mechanism (for use by qualified personnel only)
- Open-end wrench
- Oscilloscope

1.3.2 Locating and Welding the Transducer Ports

To locate and weld the transducer ports, complete the following steps:

1. The variable **H** equals the distance between the center lines of the transducer ports (see *Figure 2 on page 3*). To calculate the distance **H**, use the following equation:

$$H = 2[(ID + 0.325) \cdot \tan \theta + U]$$

where: **ID** = pipe inside diameter

tan θ = tangent of transducer head angle

U = transducer centerline offset (0.155 for $\theta = 30^\circ$ or 0.067 for $\theta = 45^\circ$)

Example: To calculate the transducer port locations on a 30 in. (75 cm) pipe with a 0.40 in. (1 mm) wall thickness, using a T8 transducer with a 30° head angle:

$$H = 2 * [(29.2 + 0.325) * \tan 30^\circ + 0.155] = 34.40 \text{ in.}$$

2. For optimum performance, select a *port location* that has at least 20 pipe diameters of straight, undisturbed flow upstream and 10 pipe diameters of straight, undisturbed flow downstream from the point of measurement. Undisturbed flow means avoiding sources of turbulence such as valves, flanges, elbows; avoiding swirl; and avoiding irregular flow profiles.

1.3.2 Locating and Welding the Transducer Ports (cont.)

- Using the calculated H value, mark two crosshairs on the pipe where you intend to weld the transducer ports, so that the distance between the two marks equals the H value (see *Figure 2* below).

IMPORTANT: Port locations should **NOT** be located directly on the top or bottom of the pipe. Place the ports at between 15 degrees and 90 degrees from the vertical plane of the pipe.

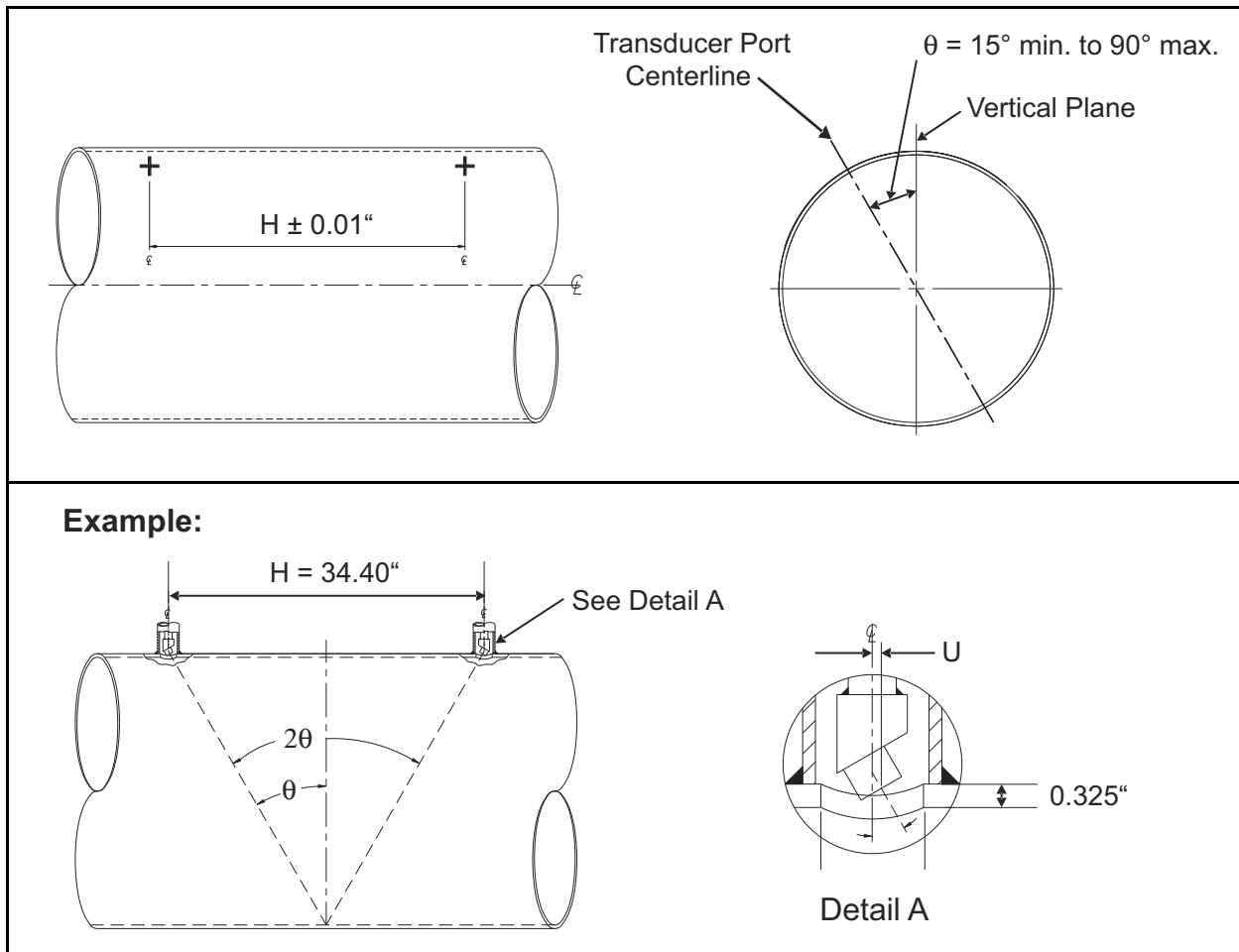


Figure 2: Locating the Transducer Ports

1.3.2 Locating and Welding the Transducer Ports (cont.)



WARNING! Only qualified personnel should weld bosses and nozzles, using a suitable ASME IX qualified welding procedure.

4. Weld the 2 in., schedule 80 nozzles with pipe flanges to the two marked locations on the pipe. Be careful to maintain perpendicularity and parallelism as shown in *Figure 3* below.

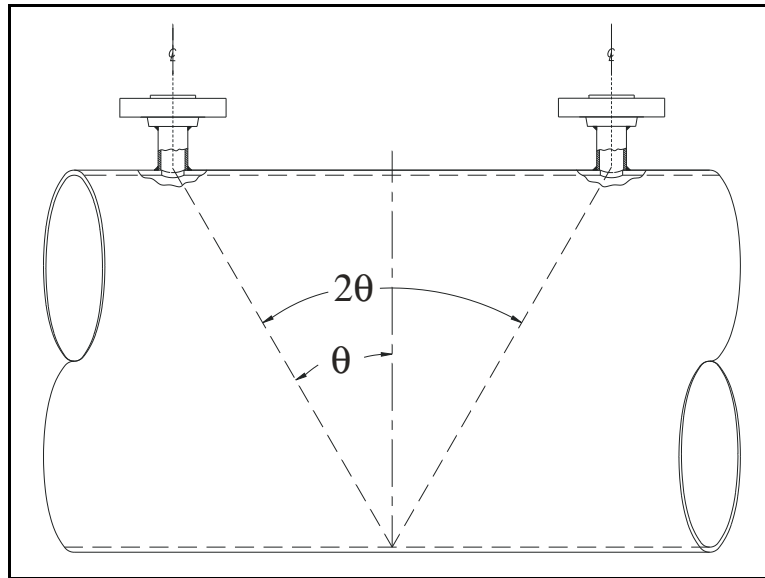


Figure 3: Welding the Nozzles with Flanges to the Pipe

5. Inspect the flange gaskets. They must not be previously used, warped, pitted or scratched.
6. Place one gasket on the top of each pipe nozzle flange, as shown in *Figure 4* below.

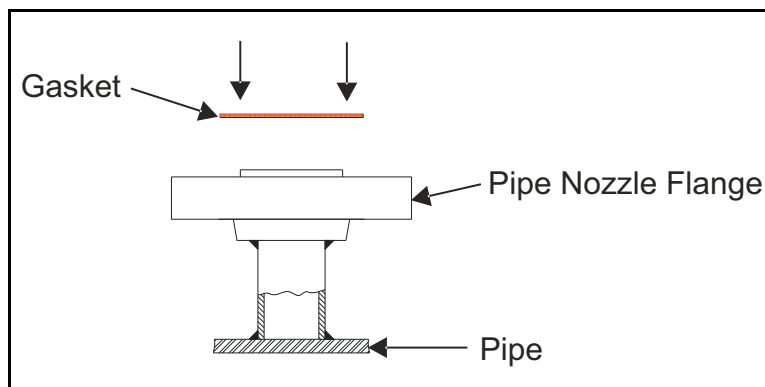


Figure 4: Placing a Gasket on a Pipe Nozzle Flange

1.3.2 Locating and Welding the Transducer Ports (cont.)

7. Bolt a 2 in. flanged, full-port, ball valve to each nozzle (see *Figure 5* below). Be sure to use a new flange gasket for each valve.

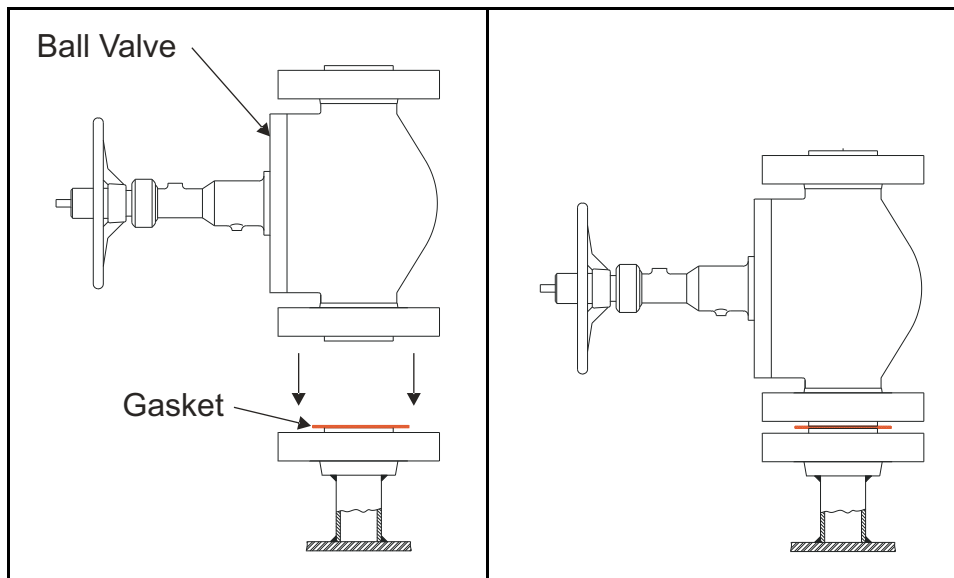


Figure 5: Mounting a Ball Valve onto the Flange

1.3.3 Hot Tapping the Ports



WARNING! Hot tapping should only be performed by qualified personnel. Follow all applicable code and safety practices during these procedures.

IMPORTANT: Refer to the manufacturer's instructions for your hot-tapping mechanism for more detailed procedures.

1. Inspect the flange gaskets. They must not be previously used, warped, pitted or scratched.
2. Place a new gasket on the top of the ball valve flange, as shown in *Figure 6* below.

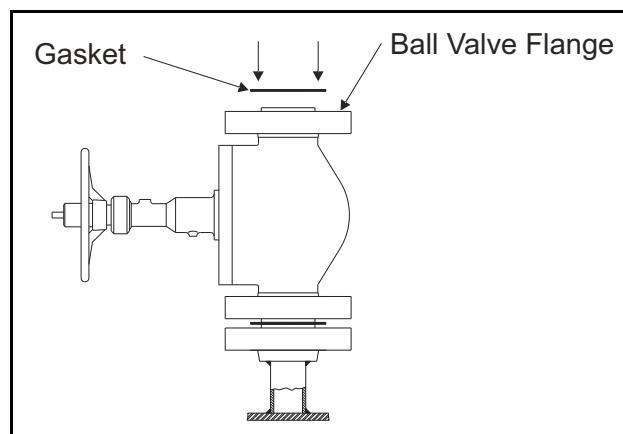


Figure 6: Placing a Gasket on the Ball Valve Flange

1.3.3 Hot Tapping the Ports (cont.)

3. Bolt the hot-tapping mechanism to the 2 in. flanged ball valve, as shown in *Figure 7* below.

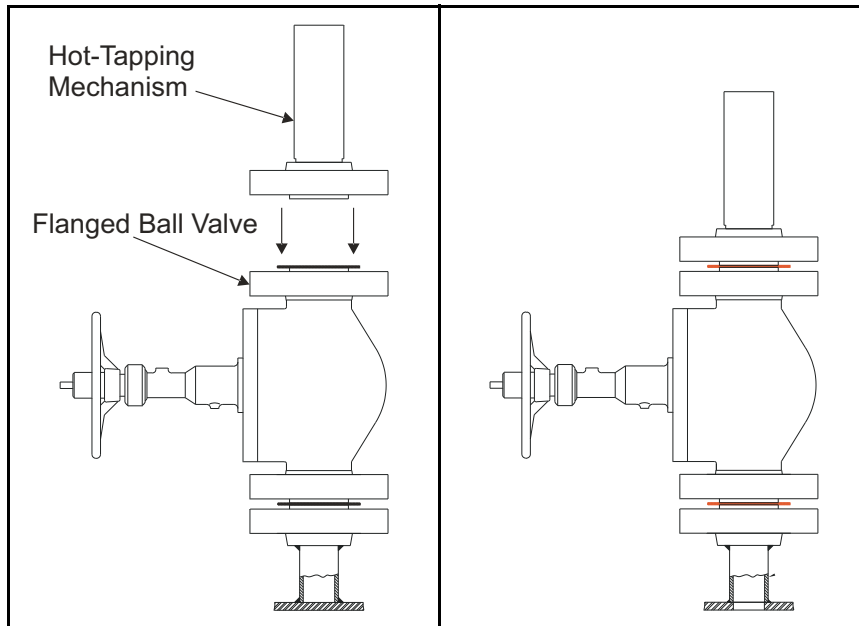


Figure 7: Securing the Hot-Tapping Mechanism

4. Make sure the ball valve is fully “open” (see *Figure 8* below).

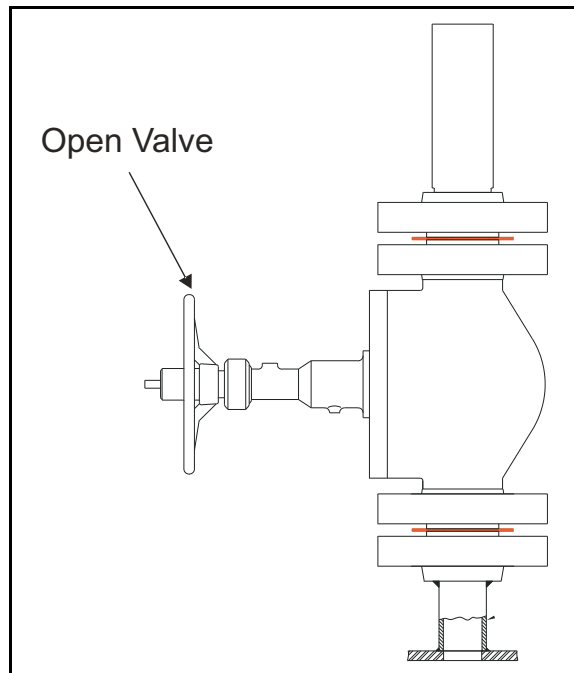


Figure 8: Checking the Open Valve

1.3.3 Hot Tapping the Ports (cont.)

5. Drill a 1.75 in. diameter hole through the pipe wall, as shown in *Figure 9* below.

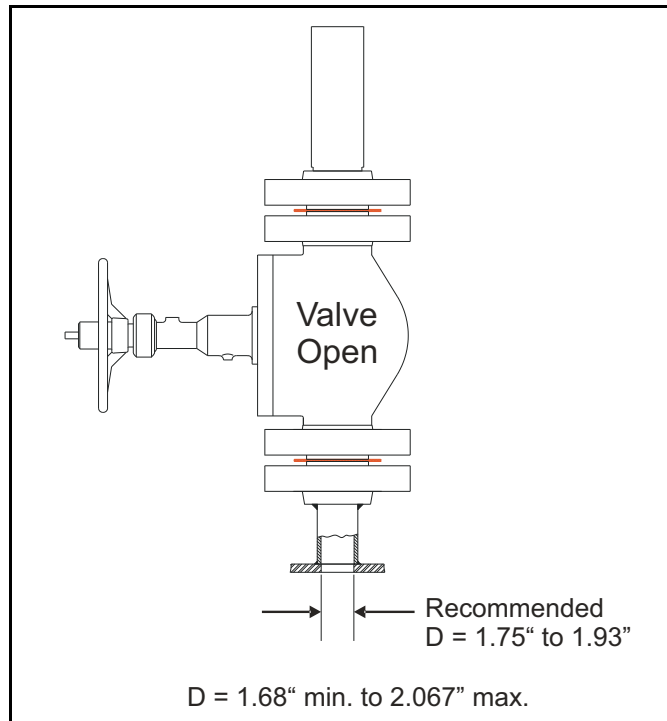


Figure 9: Drilling a Hole Through the Pipe Wall

6. Retract the drill bit of the hot-tapping mechanism and "close" the ball valve (see *Figure 10* below).

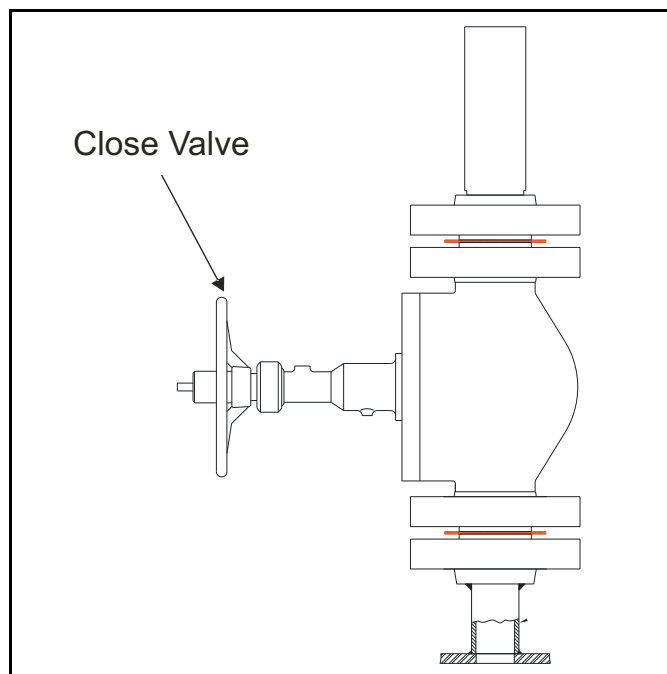


Figure 10: Closing the Ball Valve

1.3.3 Hot Tapping the Ports (cont.)

7. Unbolt the hot-tapping mechanism from the ball valve and remove the mechanism from the port (see *Figure 11* below).

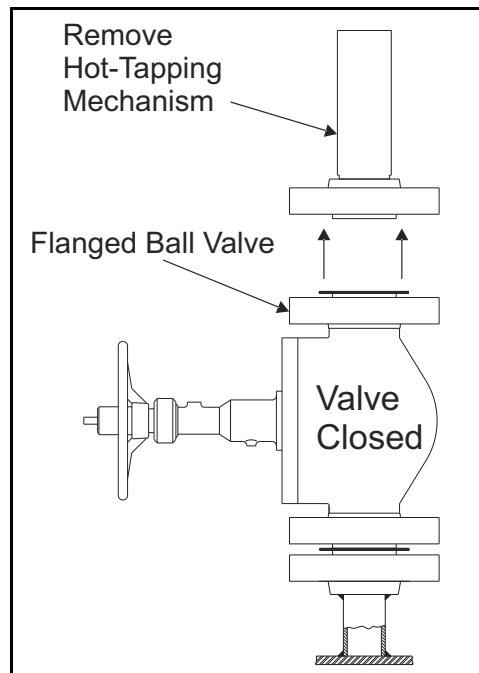


Figure 11: Removing the Mechanism from the Port

8. Repeat steps 1 through 7 to hot tap the other port.

1.3.4 Positioning the Transducer

Complete the steps in this section to position the T8 transducer in the hot-tapped port.

Note: *Keep the cover for the safety collar loosely around the transducer to allow for proper alignment.*

1. Measure the transducer length (“DD”) from the center of the transducer head to the end of the BNC connector.

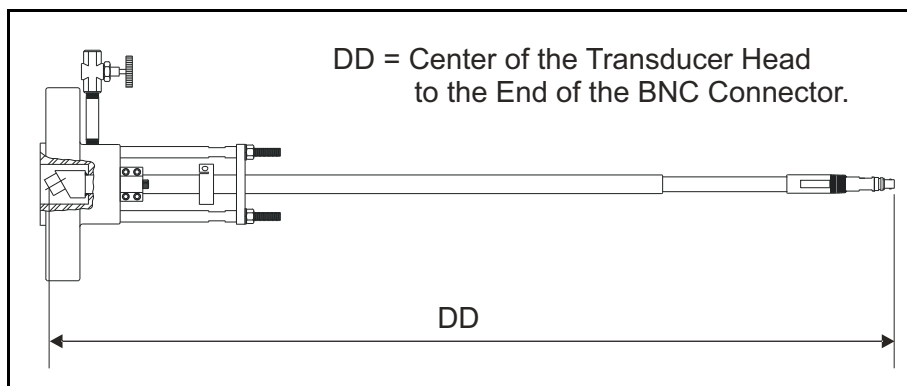


Figure 12: Measuring the Transducer Length

1.3.4 Positioning the Transducer (cont.)

2. Make sure the transducer head is fully retracted into the *Low Pressure Assembly (LPA)*. If the transducer is not fully retracted, loosen all the screws of the locking collar and manually retract the transducer into the LPA (see *Figure 13* below).

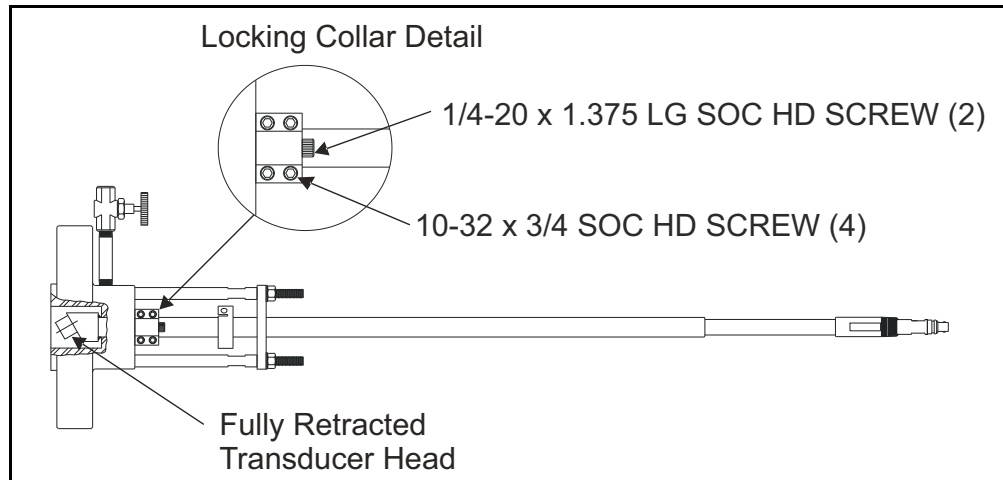


Figure 13: Transducer Head Fully Retracted

3. Rotate the transducer barrel until the transducer face points in the general direction of the other port. Then, tighten the locking collar screws with a torque wrench to fasten the transducer in place. Use the maximum torque shown in *Figure 14* below, but do not overtighten the screws. Alternate the tightening sequence of the six screws to properly “seat” the locking collar.

IMPORTANT: *The long flat or the flat marked “F” is in line with the transducer face (see Figure 14 below). To aid the installation, make a mark on the flange indicating the direction of the transducer face.*

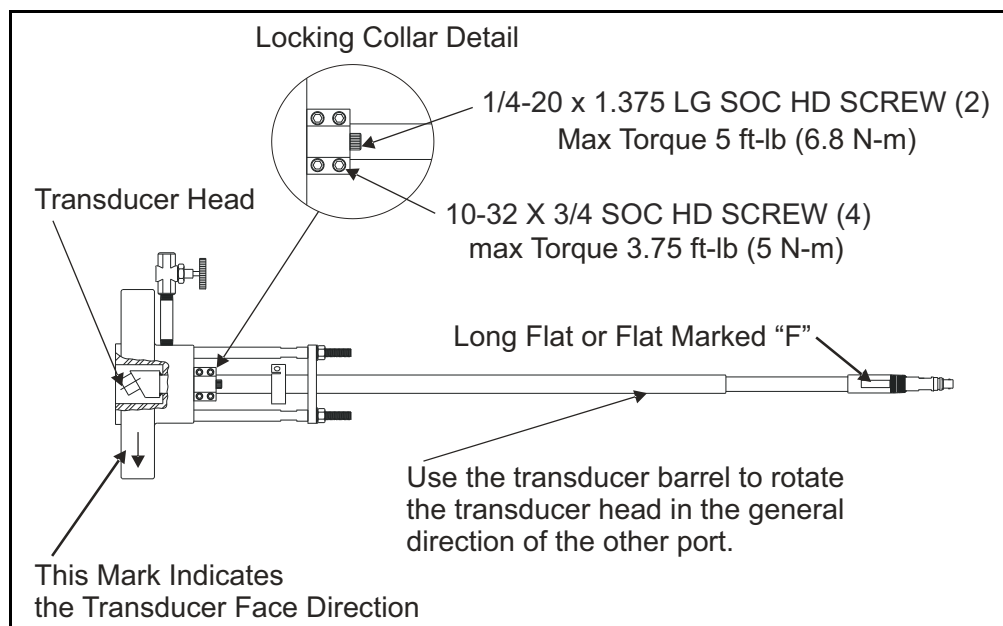


Figure 14: Rotating the Transducer Barrel

1.3.4 Positioning the Transducer (cont.)

4. Inspect the flange gaskets. They must not be previously used, warped, pitted or scratched.
5. Place a new gasket on the top of the ball valve flange (see *Figure 15* below).

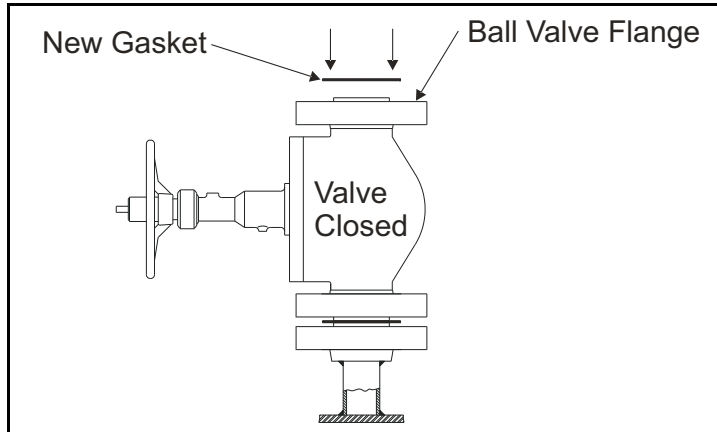


Figure 15: Placing a New Gasket on the Flange

6. Bolt the LPA mechanism to the 2 in. flanged ball valve, as shown in *Figure 16* below.

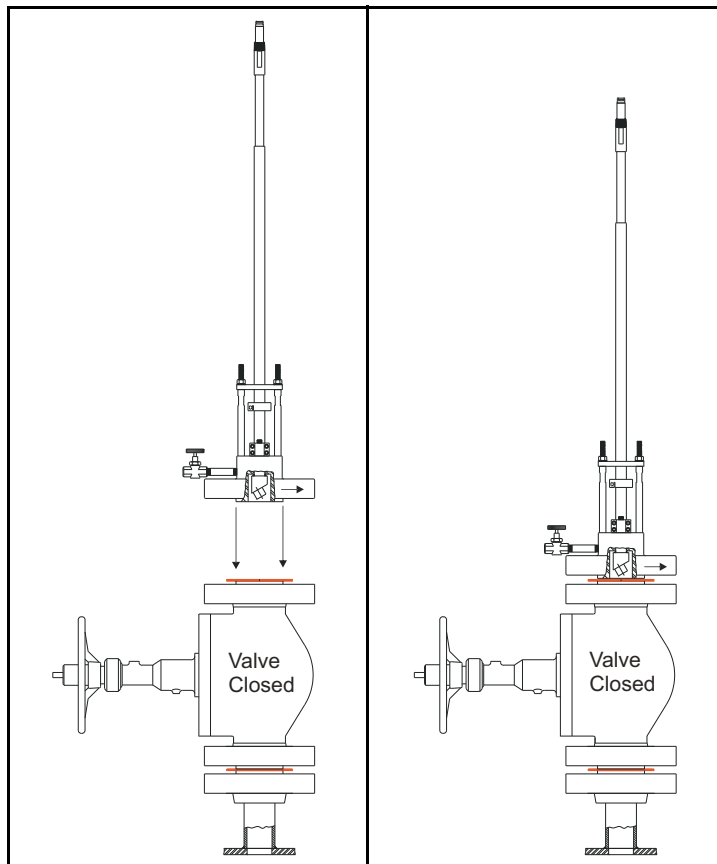


Figure 16: Bolting the LPA Mechanism to the Ball Valve

1.3.4 Positioning the Transducer (cont.)

7. Measure the "A" dimension, which is the distance from the outside surface of the pipe wall to the end of the BNC connector on the transducer (see *Figure 17* below). Then, calculate the insertion distance ("I") by using the following equation:

$$I = A + W - (C + DD)$$

where: **A** = distance from the pipe wall to the end of the BNC connector on the transducer

W = pipe wall thickness

C = 0.325 in. (a constant)

DD = distance from the center of the transducer head to the end of the BNC connector, as measured in step 1.

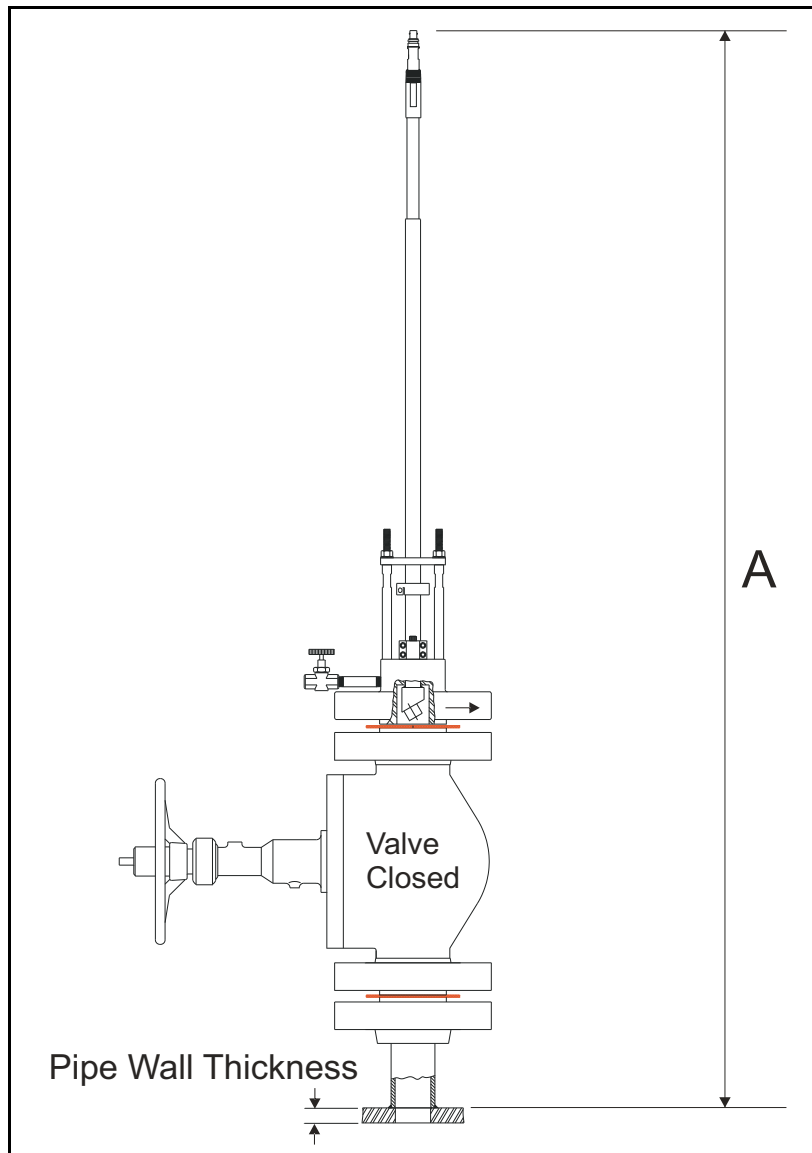


Figure 17: Measuring the "A" Dimension

1.3.4 Positioning the Transducer (cont.)

8. Mark the insertion distance on the shaft of the transducer, using one layer of colored electrical tape around the circumference so that the ends overlap (see *Figure 18* below). Alternatively, apply any mark that is waterproof and easily identifiable.

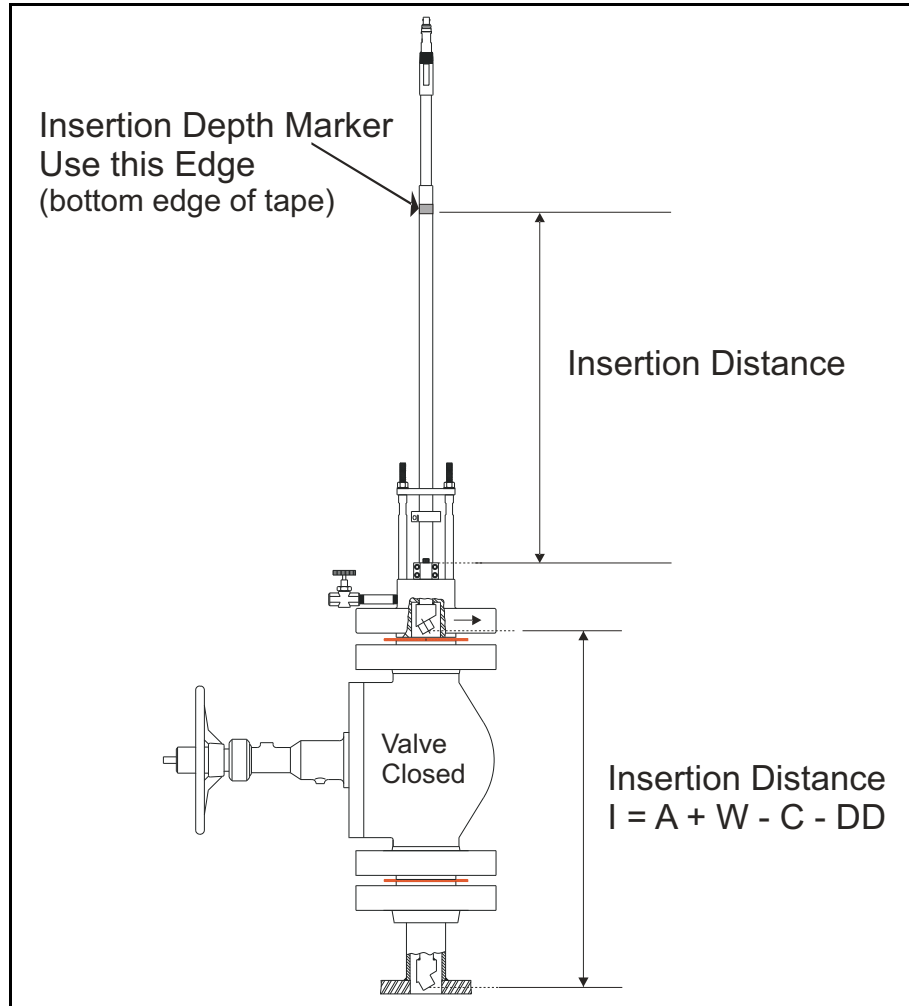


Figure 18: Marking the Insertion Distance

9. Repeat steps 1 through 8 to position the other transducer in the other port.

1.3.5 Attaching the Hydraulic Cylinder

The next step in the transducer installation process is to attach the hydraulic cylinder to one of the transducer ports.

1. Install the connector protector on the 1/2" NPT thread of the transducer shaft until it is finger-tight (see *Figure 19* below).

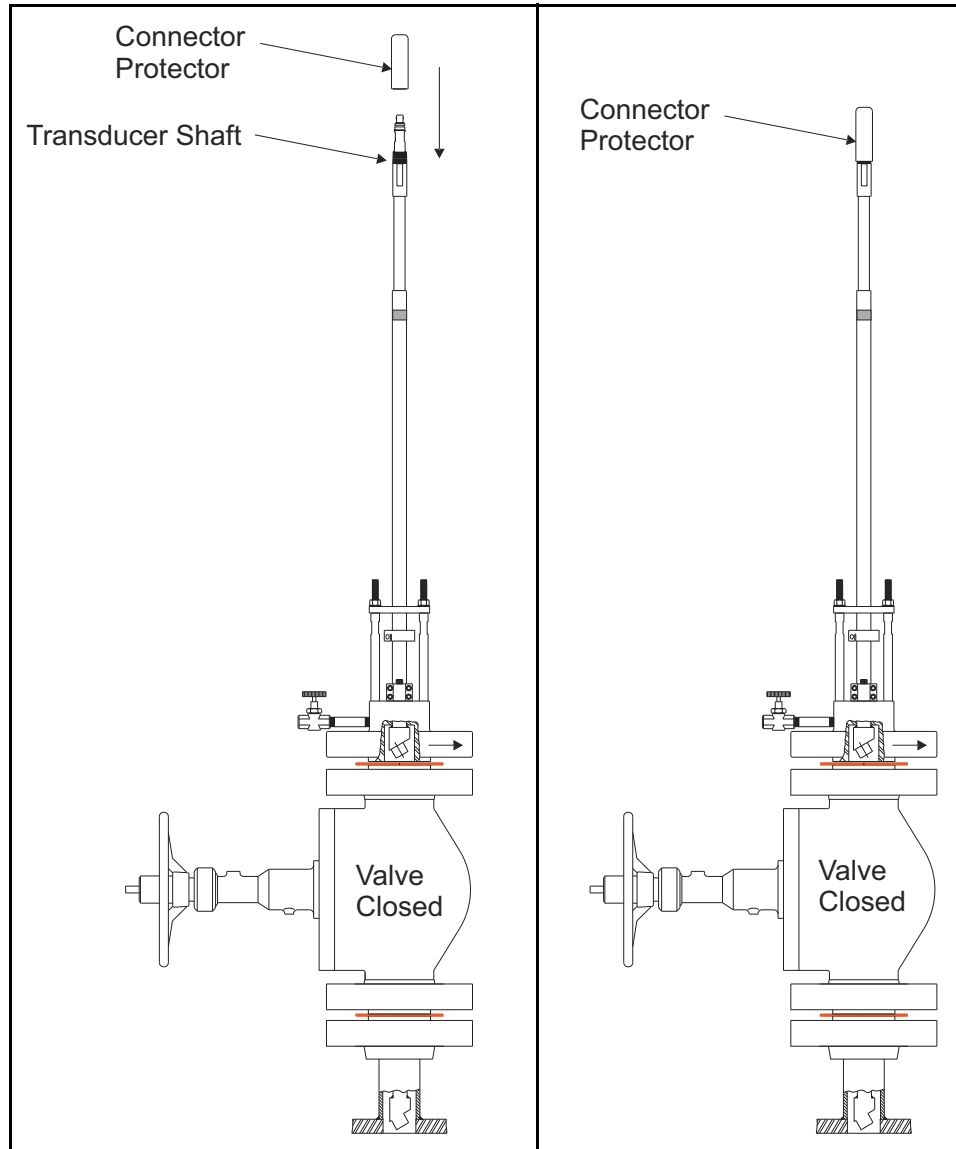


Figure 19: Installing the Connector Protector

1.3.5 Attaching the Hydraulic Cylinder (cont.)

- Refer to *Figure 20* below and attach the hydraulic cylinder to the four studs of the LPA with four 3/8-16 hex nuts. Tighten the nuts to a maximum torque of 19 ft-lb (25 N-m).

IMPORTANT: *If the piston of the hydraulic cylinder touches the connector protector before the hydraulic cylinder can seat properly onto the studs, remove the hydraulic cylinder from the LPA. Connect the hydraulic pump to the hydraulic cylinder, and refer to “Resetting or Storing the Hydraulic Cylinder” on page 24 to move the piston to the appropriate position.*

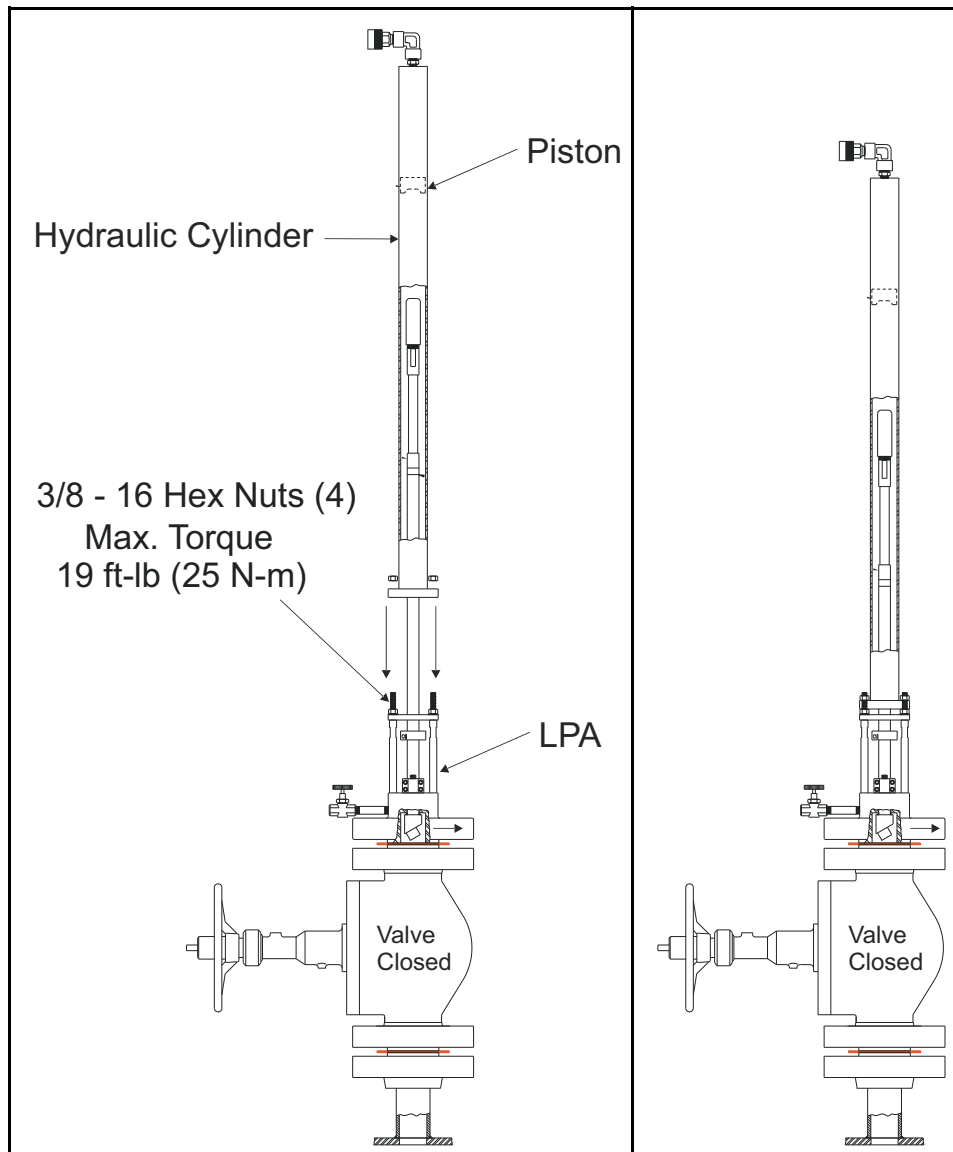


Figure 20: Attaching the Hydraulic Cylinder

1.3.5 Attaching the Hydraulic Cylinder (cont.)

3. Refer to *Figure 21* below and attach the hose of the hydraulic pump to the hydraulic cylinder at the pipe coupler.

Note: *The 2 in. ball valve should be closed and the locking collar should be tightly secured to the transducer shaft.*

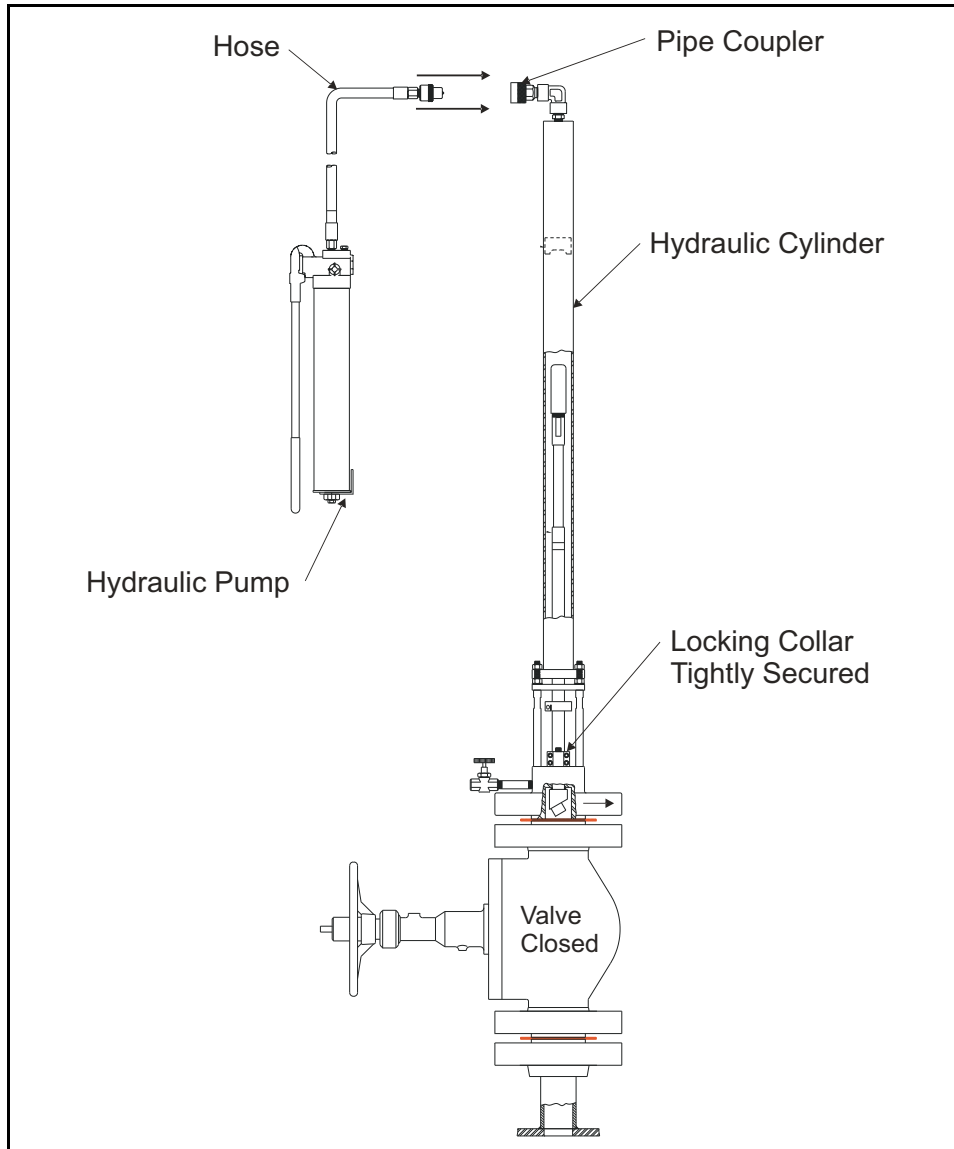


Figure 21: Attaching the Hydraulic Pump

1.3.6 Inserting the Transducer

After attaching the hydraulic cylinder, you are now ready to insert the T8 transducer.

1. To prepare for pumping, rotate the side knob of the hydraulic pump clockwise to tighten it (see *Figure 22* below).
2. Slowly pump the handle of the pump until you feel resistance, then stop pumping. The resistance indicates that the piston is applying pressure to the transducer.

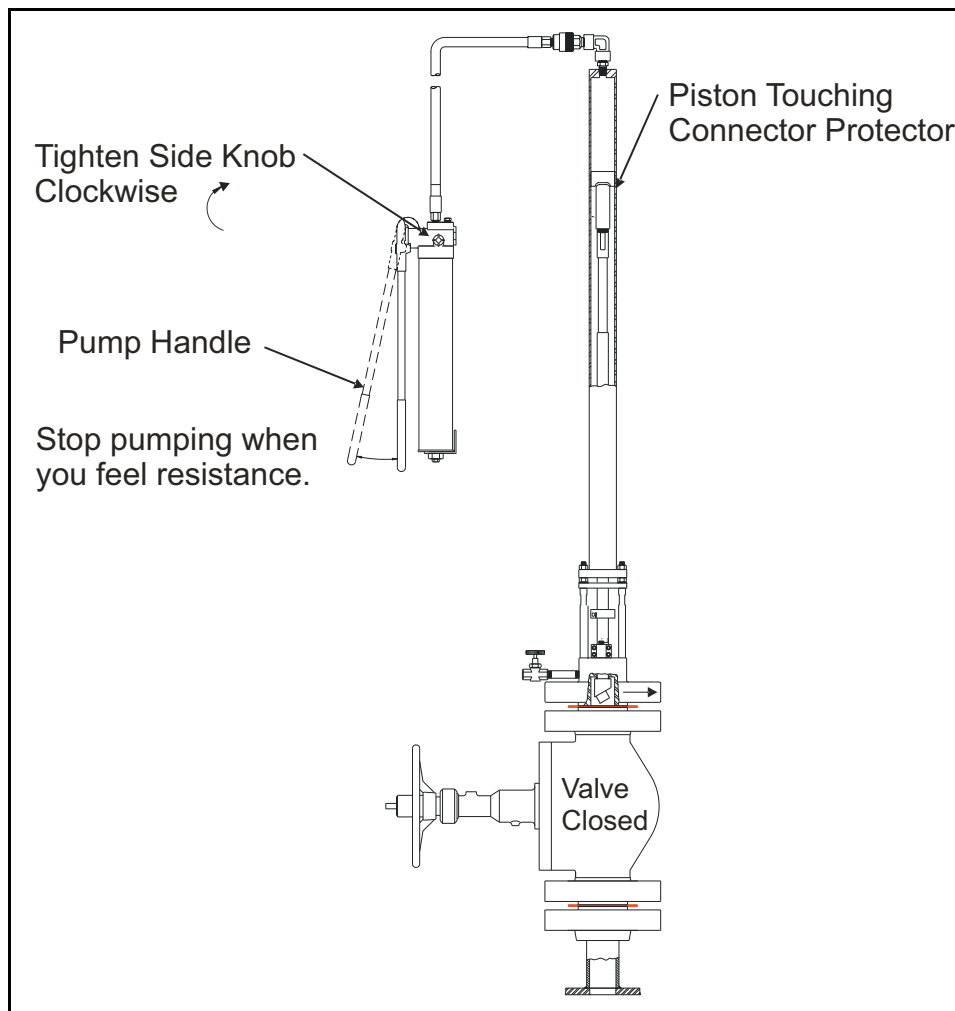


Figure 22: Tightening the Hydraulic Pump Side Knob

1.3.6 Inserting the Transducer (cont.)

3. There are four 10-32 x 3/4 socket head screws and two 1/4-20 x 1 3/8 socket head screws on the locking collar (see *Figure 23* below). Evenly loosen these screws. just enough so that the transducer can move freely.

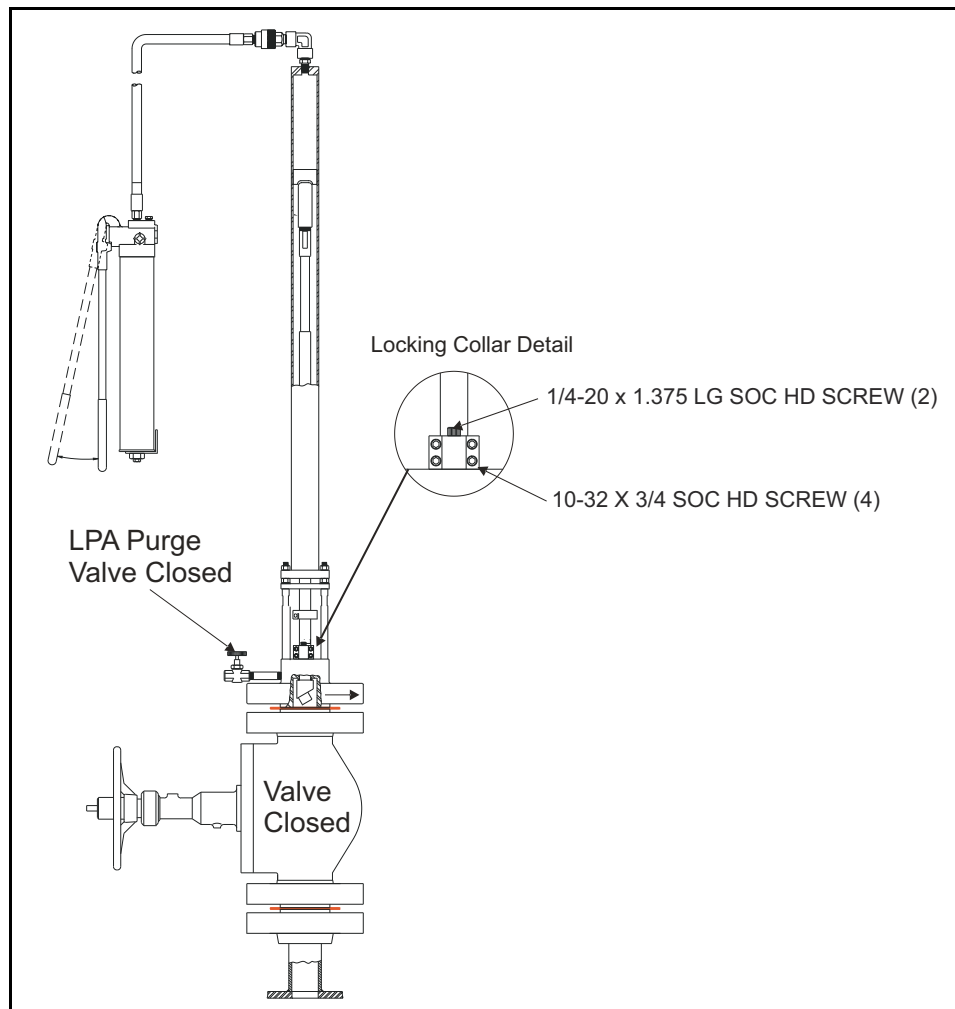


Figure 23: Loosening the Socket Head Screws

4. Before opening the ball valve do the following:
 - Make sure the LPA purge valve (see Figure 23 above) is in the “Closed” position.
 - Verify that the hydraulics are engaged and the transducer shaft has pressure applied (there should be resistance when the pump handle is pumped).



WARNING! Make sure you perform the above checks before opening the ball valve, otherwise personal injury or damage to the equipment may occur.

1.3.6 Inserting the Transducer (cont.)

5. Slowly open the 2 in. ball valve and check for gas leaks:
 - If you discover any leaks, close the ball valve and fix the leaks.
 - If you do not detect any leaks, proceed to the next step.
6. See *Figure 24* below and slowly pump the hydraulic pump handle until the transducer moves to the pre-marked insertion depth, as indicated by the edge of the electrical tape touching the edge of the locking collar. You will feel resistance on the hydraulic pump handle as you insert the transducer against the line pressure.

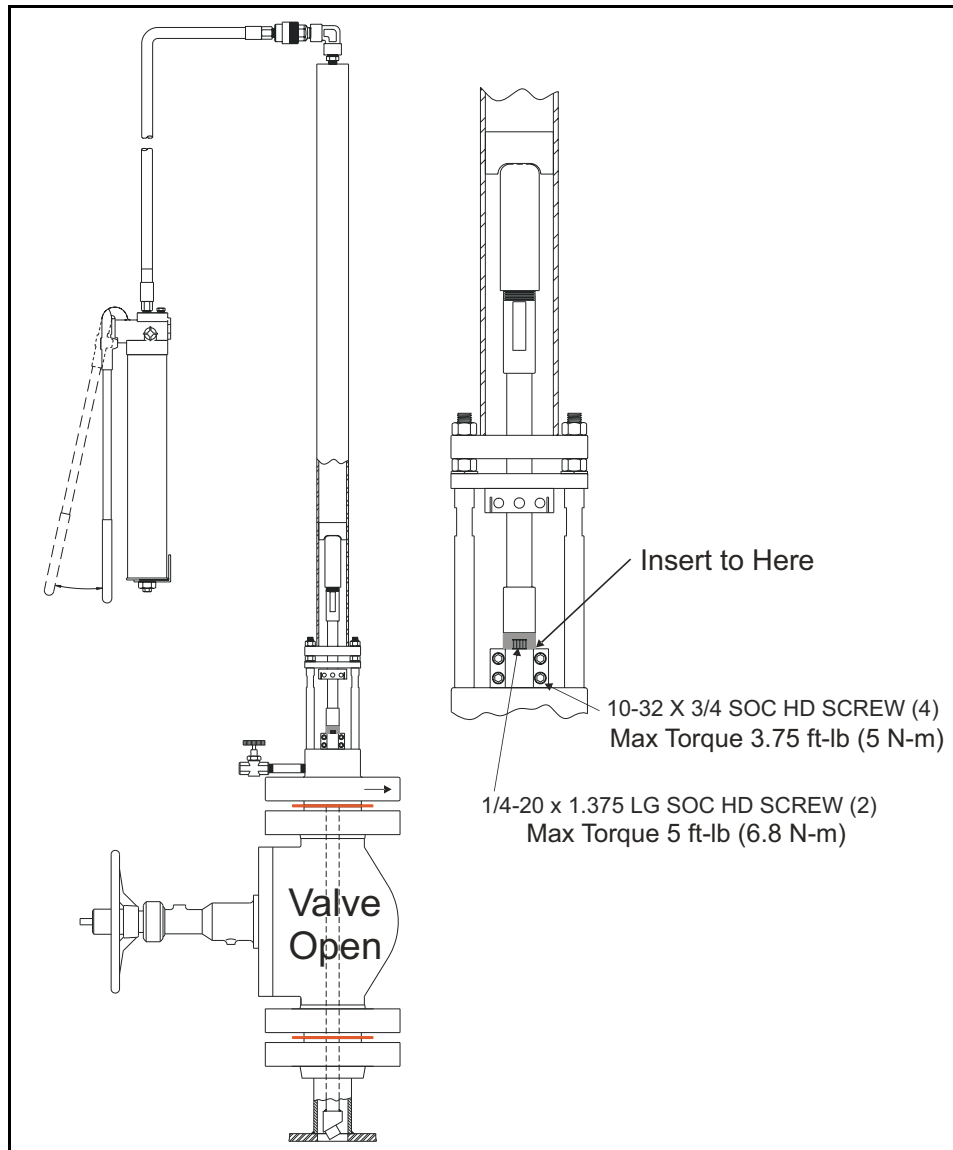


Figure 24: Pumping the Hydraulic Pump Handle

7. Tighten the locking collar screws with a torque wrench to fasten the transducer in place. Use the maximum torque listed in *Figure 24* above, but do not overtighten the screws.

Note: *Alternate the tightening sequence of the six screws to properly “seat” the locking collar.*

1.3.7 Adjusting the Safety Alignment Collar

The next step in the transducer installation procedure is to adjust the safety alignment collar.

1. Locate the safety alignment collar that was shipped with the T8 transducer.
2. Use an Allen wrench to remove the two socket head cap screws and the set screw from the safety alignment collar (see *Figure 25* below).

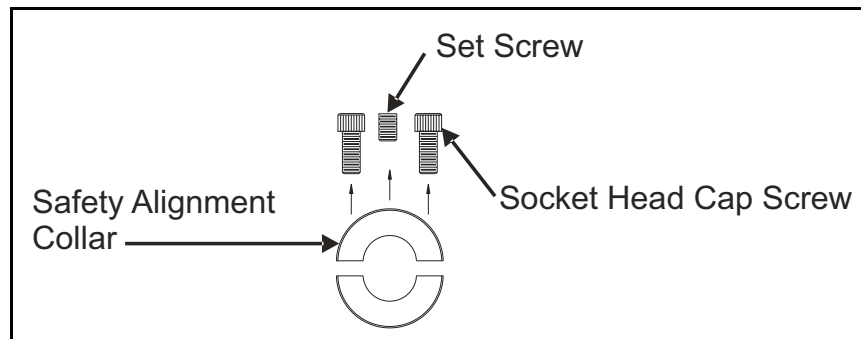


Figure 25: Preparing the Safety Alignment Collar for Installation

3. Using the socket head cap screws, loosely attach the safety alignment collar to the barrel of the transducer (see *Figure 26* below).

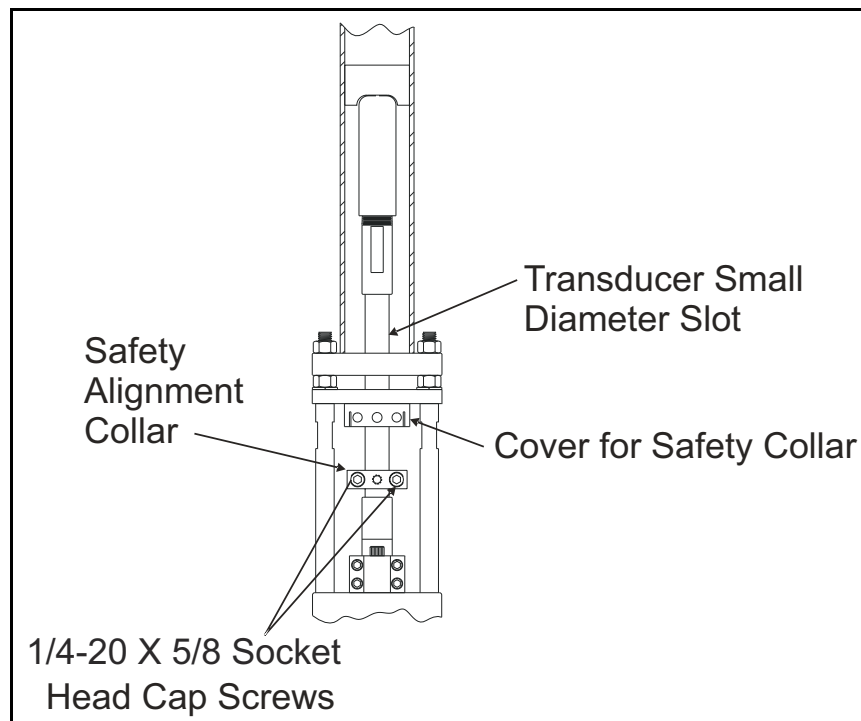


Figure 26: Attaching the Collar to the Transducer Barrel

1.3.7 Adjusting the Safety Alignment Collar (cont.)

4. Slide the safety alignment collar into the safety collar cover and position both collars so that they are touching the safety plate (see *Figure 27* below).

Note: *If necessary, adjust the height of both screws on the safety collar cover to allow the safety alignment collar to fit into it.*

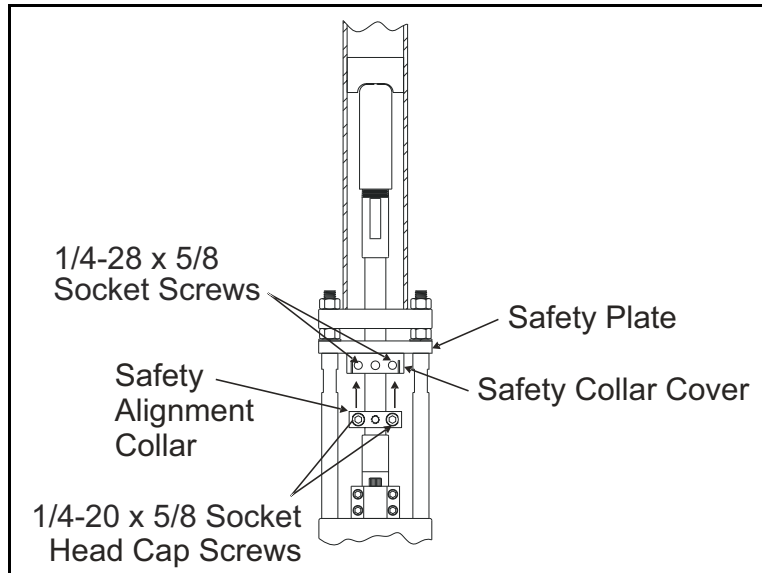


Figure 27: Positioning the Safety Alignment Collar

5. Secure the safety alignment collar by tightening the two 1/4-28 x 5/8 socket head screws with an Allen wrench. Then, install the set screw in the threaded hole of the safety adjustment collar (see *Figure 28* below).

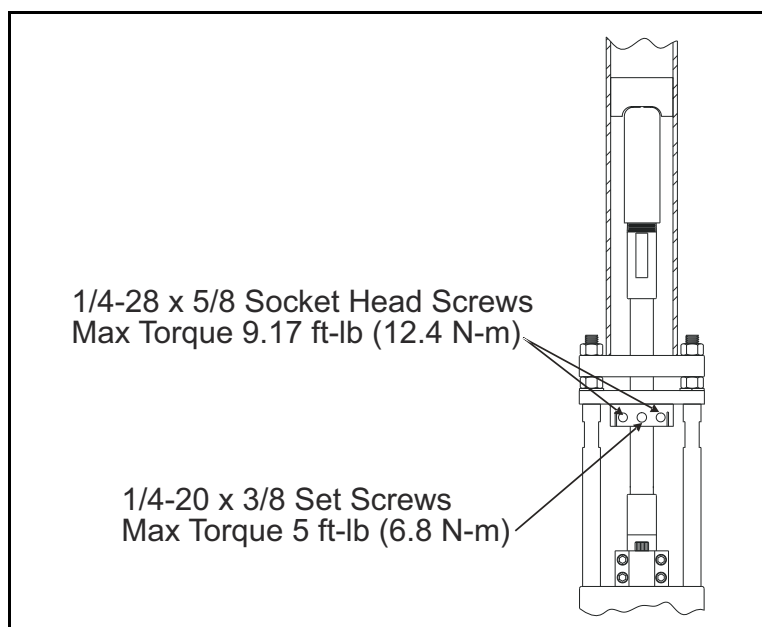


Figure 28: Securing the Safety Alignment Collar

1.3.8 Removing the Hydraulic Cylinder

The final step in the T8 transducer installation process is the removal of the hydraulic cylinder from the port.

1. Verify that the screws on the locking and safety alignment collars are tightened to the appropriate torque. Then, very slowly turn the side knob of the hydraulic pump counterclockwise to release the pressure of the hydraulic cylinder on the transducer shaft (see *Figure 29* below).

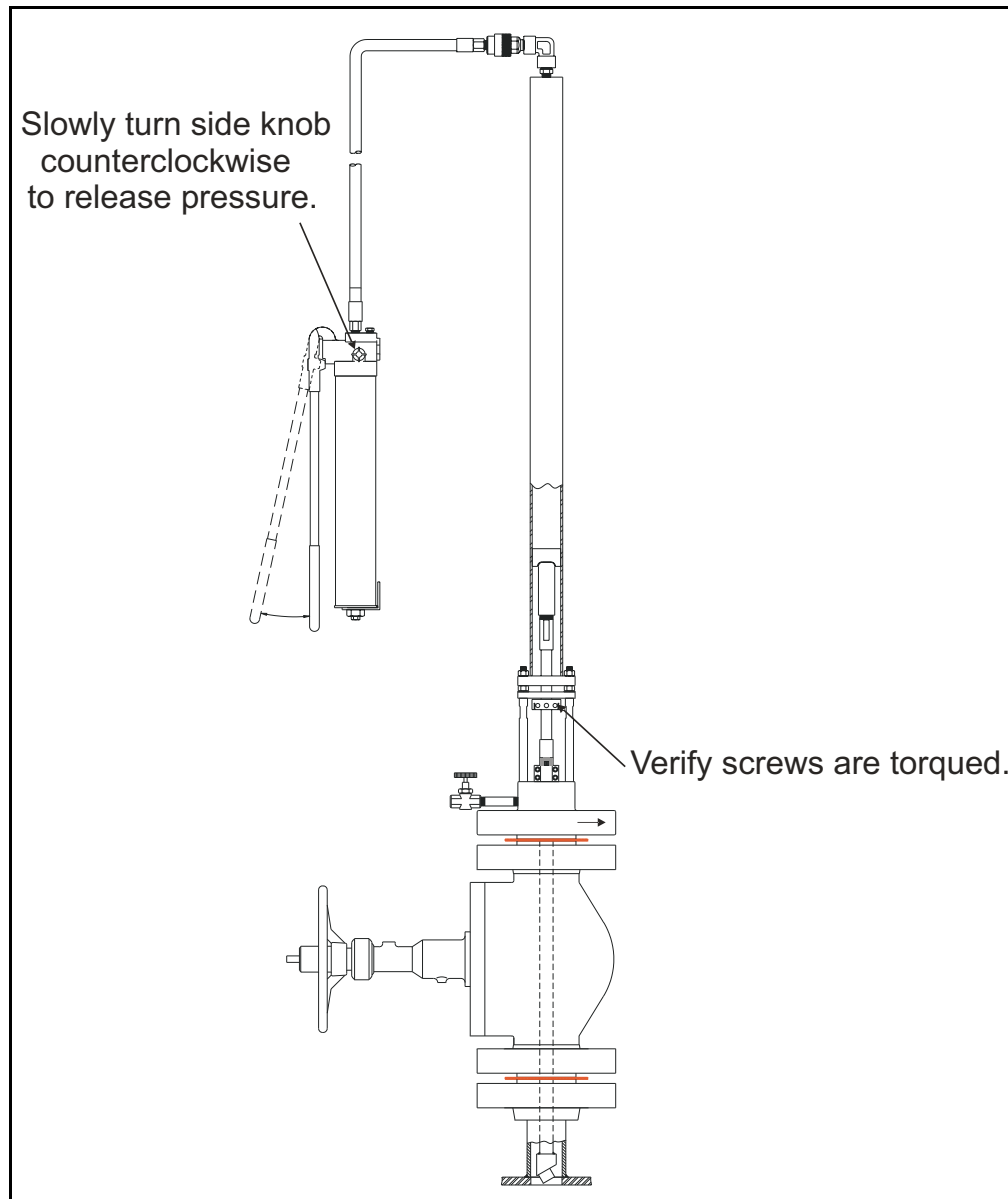


Figure 29: Releasing the Hydraulic Cylinder Pressure

1.3.8 Removing the Hydraulic Cylinder (cont.)

2. See *Figure 30* below and remove the hydraulic cylinder by unscrewing the four 3/8-16 stainless steel hex nuts.

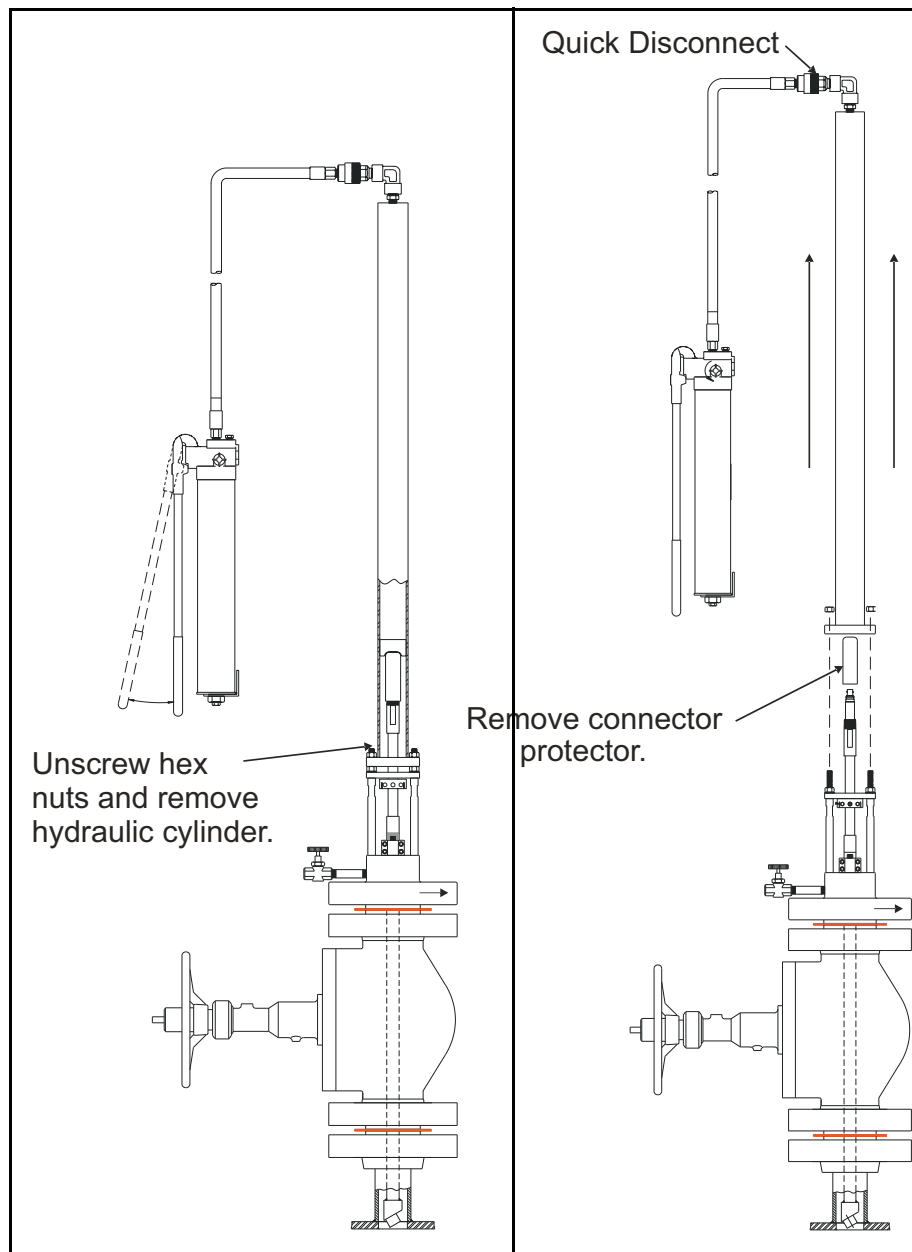


Figure 30: Removing the Hydraulic Cylinder

3. Unscrew and remove the connector protector (see *Figure 30* above).

Note: *Disconnecting the hydraulic pump at the quick-disconnect pipe coupler simplifies the hydraulic cylinder removal.*

1.3.8 Removing the Hydraulic Cylinder (cont.)

- Attach the pipe adapter to the 1/2" NPT thread of the transducer, and then attach the junction box to the pipe adapter. Use a wrench on the flats of the transducer body to prevent transducer rotation when installing the junction box (see *Figure 31* below).

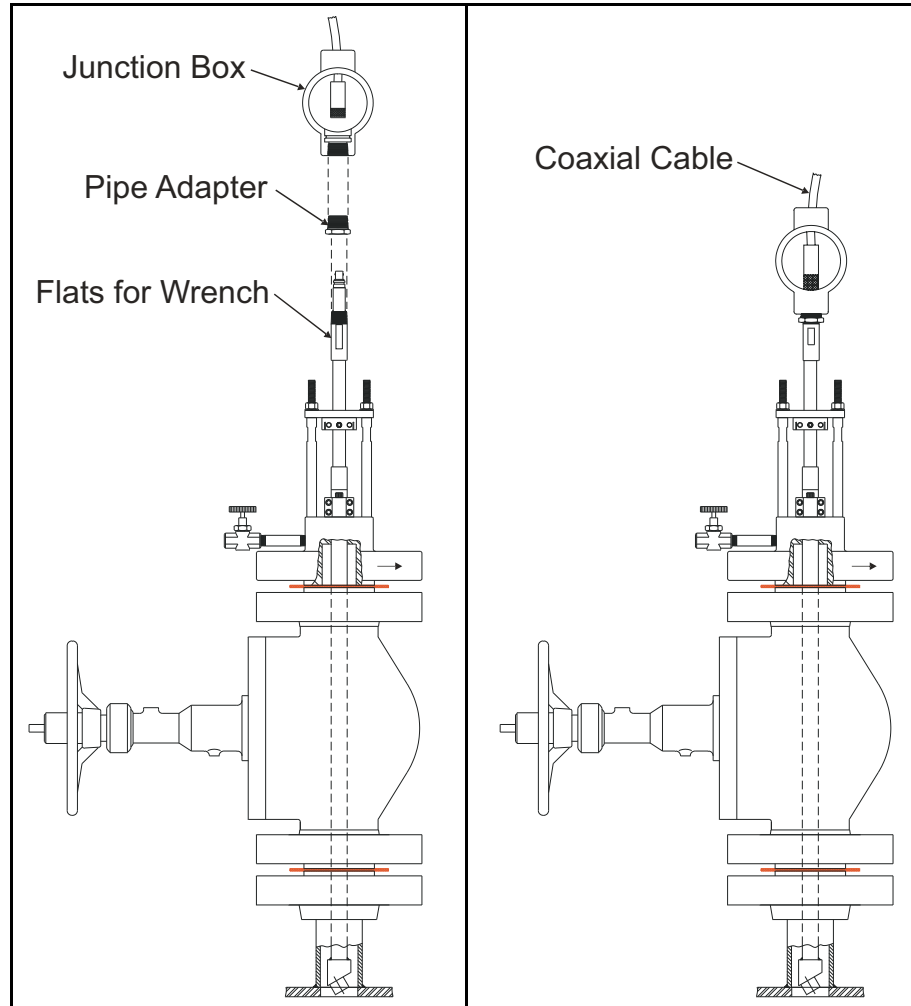


Figure 31: Installing the Junction Box and Transducer Cable

- Connect a coaxial cable to the transducer to complete the installation for this port (see *Figure 31* above).

Note: Use a junction box with a straight-through hub when submersible/waterproof cable is connected to the transducer.

- Connect the transducer to your flowmeter electronics console, as described in the flowmeter *User's Manual*.

Repeat the procedures described in this chapter to install the second T8 transducer. After both transducers have been installed, proceed to the next section.

1.4 Resetting or Storing the Hydraulic Cylinder

To prepare the hydraulic cylinder for its next use or for storage, you must retract the piston.

1. Remove the safety pin and attach the guide for the push rod to the hydraulic cylinder with four 3/8-16 hex nuts (see *Figure 32* below). Save the safety pin for future use.

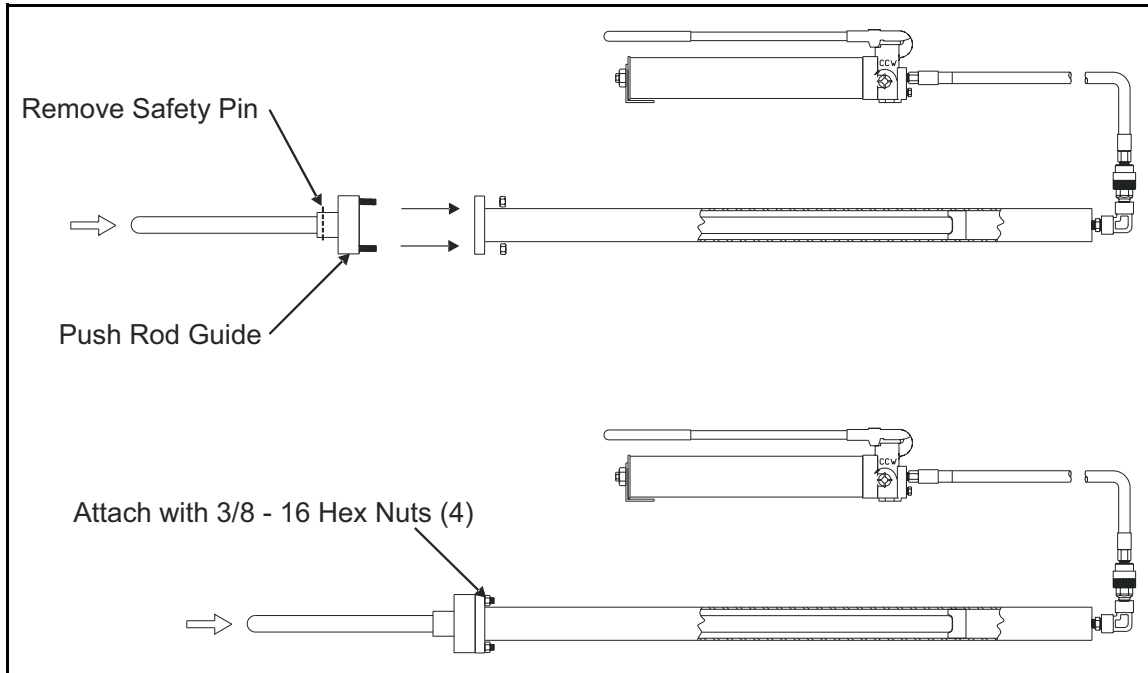


Figure 32: Retracting the Piston

2. If it was previously removed, re-attach the hydraulic pump to the hydraulic cylinder at the pipe coupler (see *Figure 33* below).

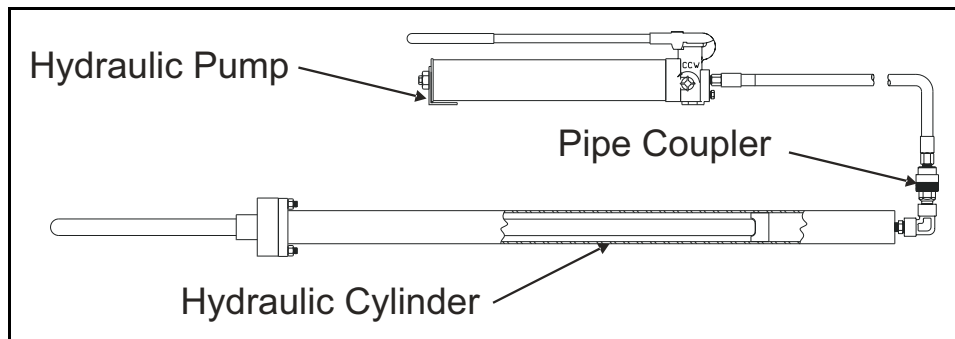


Figure 33: Reattaching the Hydraulic Pump

1.4 Resetting or Storing the Hydraulic Cylinder (cont.)

- Turn the side knob of the hydraulic pump counterclockwise to release the oil pressure (see *Figure 34* below).

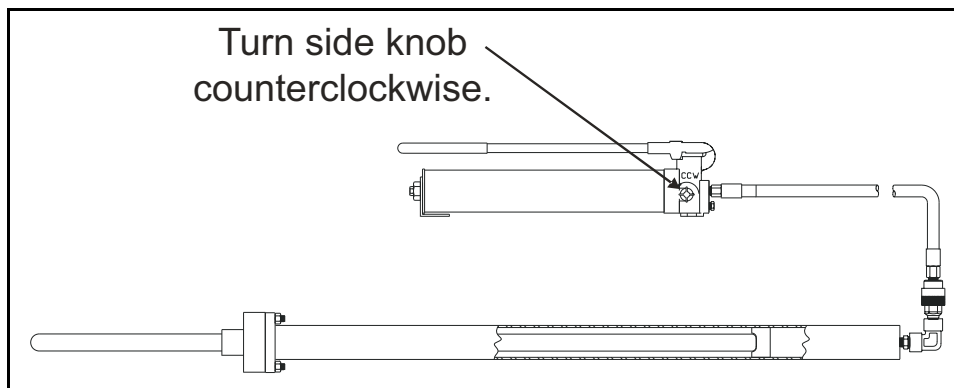


Figure 34: Releasing the Oil Pressure

- Hold the cylinder with one hand, and push the rod with the other hand until the piston bottoms out inside the cylinder (see *Figure 35* below).

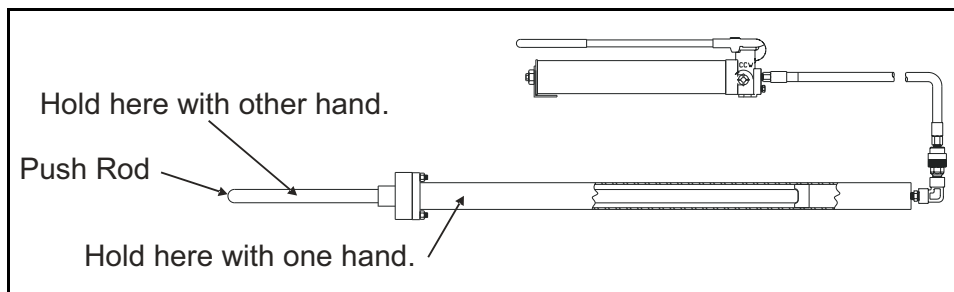


Figure 35: Pushing the Rod into the Cylinder

- Do one of the following:
 - If you are ready to insert a transducer into a port, proceed to the appropriate section of this chapter.
 - If you have already installed both transducers, proceed to step 6 on the next page.

1.4 Resetting or Storing the Hydraulic Cylinder (cont.)

6. Position the 0.28 in. diameter hole of the push rod to align with the 0.28 in. diameter hole of the push rod guide. Then, push the safety pin through the holes to secure the cylinder, push rod and push rod guide assembly (see *Figure 36* below).

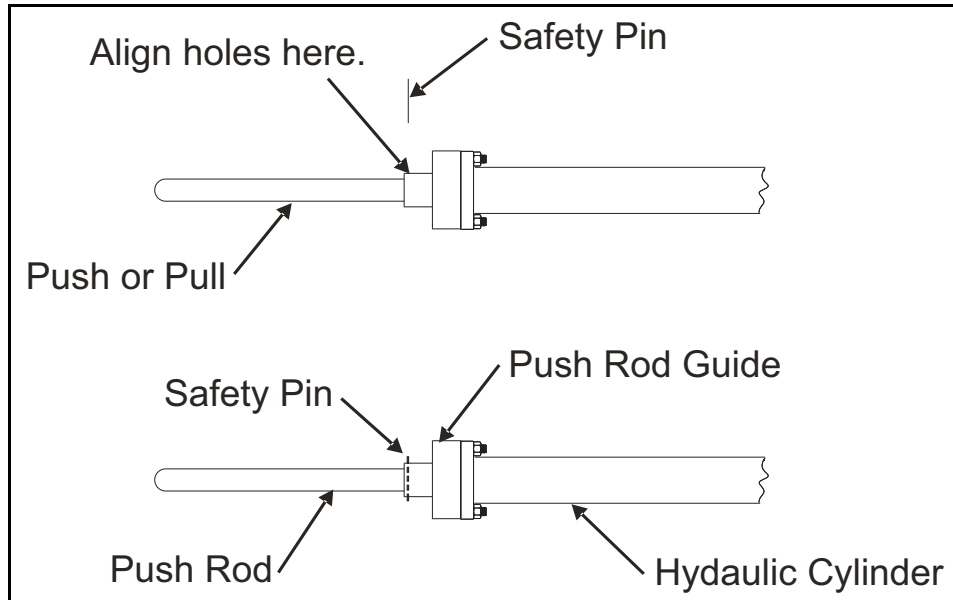


Figure 36: Aligning the Push Rod and Guide

After both transducers are installed and the hydraulic cylinder has been stored, proceed to the next chapter to align your T8 transducers.

Chapter 2. Aligning the Transducers

2.1 Introduction

After you finish installing the T8 transducers, as described in the previous chapter, you must fine tune the transducer alignment using the procedures in this chapter.

IMPORTANT: *Alignment is not necessary for the T8 transducer with a 180° head. Skip this chapter.*

2.2 Preparing for Transducer Alignment

To prepare for alignment of the T8 transducers, complete the following steps:

1. Make sure the flowmeter electronics console is powered **ON** and that the transducers are properly connected to the flowmeter.
2. From the *Diagnostic* menu on the flowmeter, display the *transducer signal strength* on the electronics console. If necessary, refer to your flowmeter *Service Manual* for instructions.
3. As described in your flowmeter *Service Manual*, connect an *oscilloscope* to the transducer terminals.
4. Find the *signal strength*, *quality* and *amplitude* limits in the troubleshooting/diagnostics section of the flowmeter *Service Manual*. You will need to know these limits to complete the alignment procedure.

2.3 Aligning the Transducers

To align the T8 transducers, complete the following steps:

1. At each transducer installation point, refer to *Figure 37* below and verify that:
 - The *safety alignment collar* and the *cover* for the safety collar are firmly against the *safety plate*
 - The *screws* on the safety alignment collar are tightened to the appropriate torque
 - Each *transducer* is positioned at the correct insertion depth
 - The *transducer face* points directly toward the other transducer (check the flat and the flange mark)

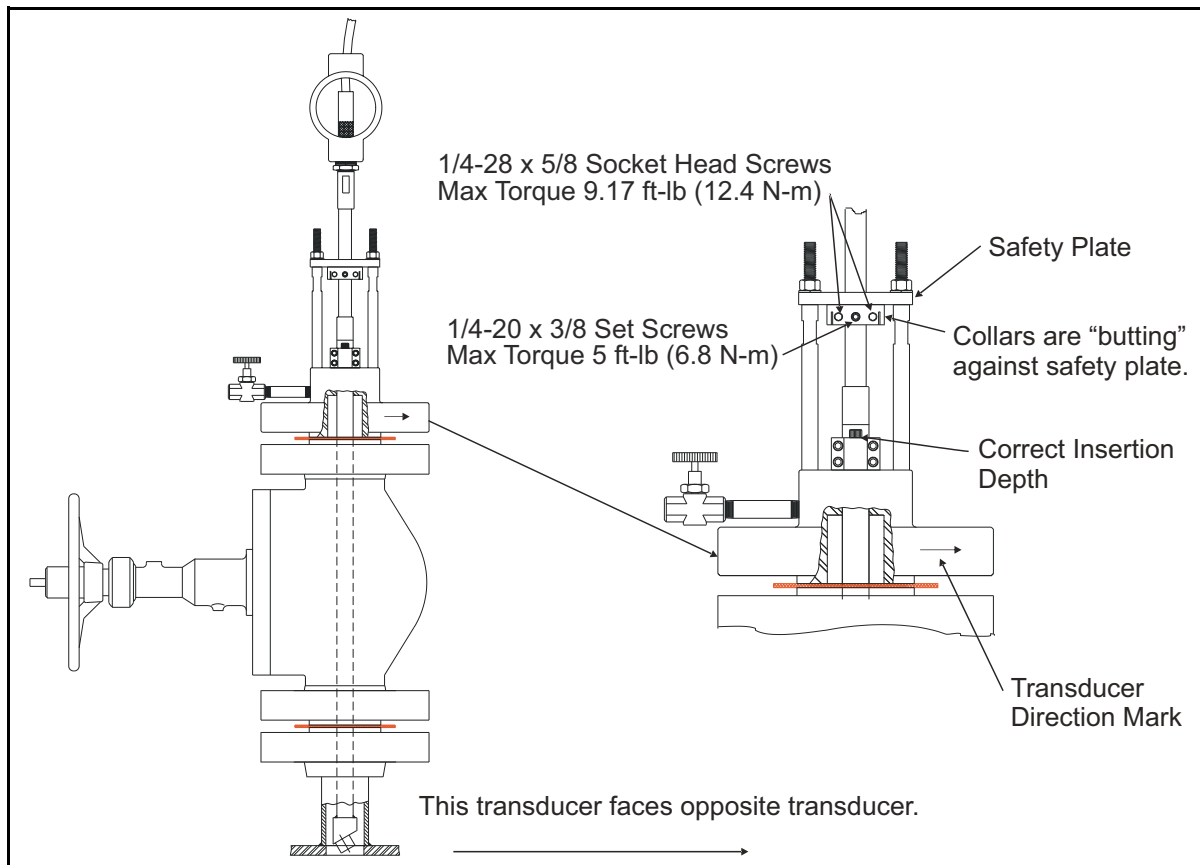


Figure 37: Aligning the Transducers

2.3 Aligning the Transducers (cont.)

2. At each transducer port, evenly loosen the two 1/4-20 screws and the four 10-32 screws just enough to free the locking collar from the transducer shaft (see *Figure 38* below). If the locking collar will not come loose, remove the 1/4-20 screws completely.

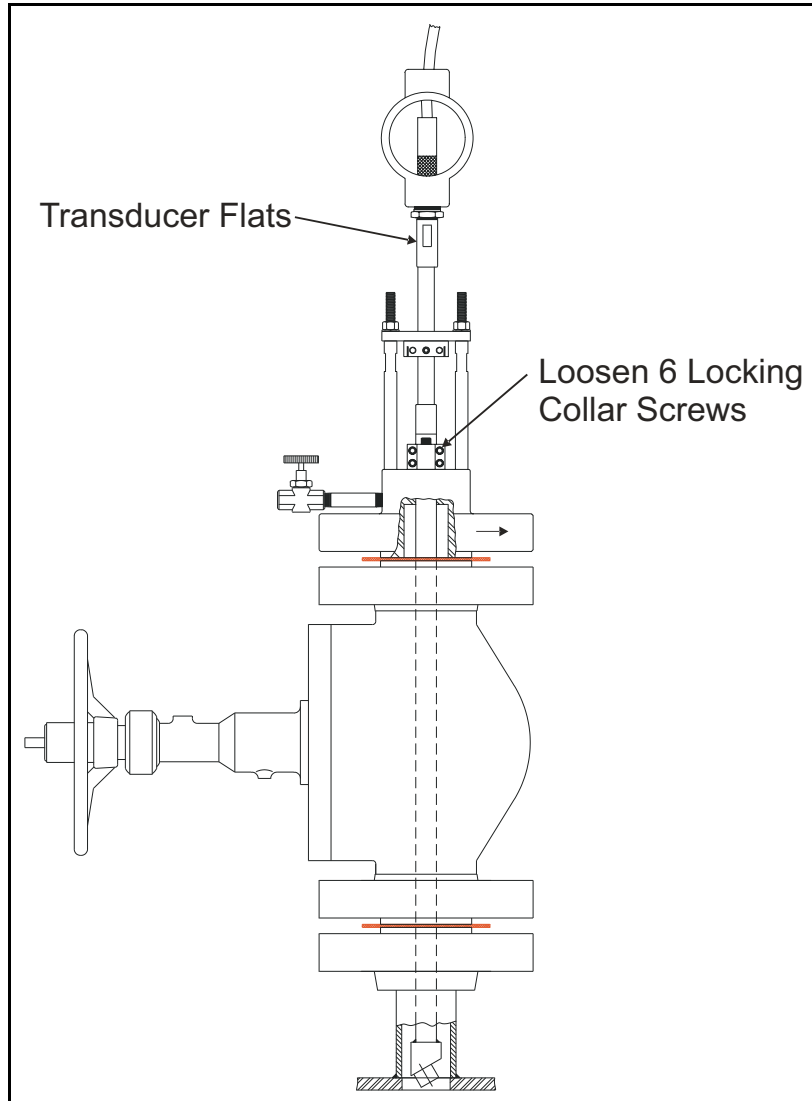


Figure 38: Freeing the Locking Collar

2.3 Aligning the Transducers (cont.)

Refer to *Figure 39* below and continue the alignment procedure as follows:

3. Position a wrench on the transducer flats (see *Figure 38 on page 29*) and rotate the transducer about one degree clockwise or counterclockwise. Observe the signal strength displayed on the flowmeter console for at least two or three readings or observe the receive signal on the oscilloscope.
4. Rotate the other transducer about one degree clockwise or counterclockwise. Observe the signal strength displayed on the flowmeter console for at least two or three readings or observe the receive signal on the oscilloscope.
5. Alternately rotate the two transducers until the signal strength, signal amplitude and the signal quality are optimized.

IMPORTANT: *You can only observe the signal quality with an oscilloscope. If you do not have an oscilloscope, adjust the transducers to obtain the highest signal strength.*

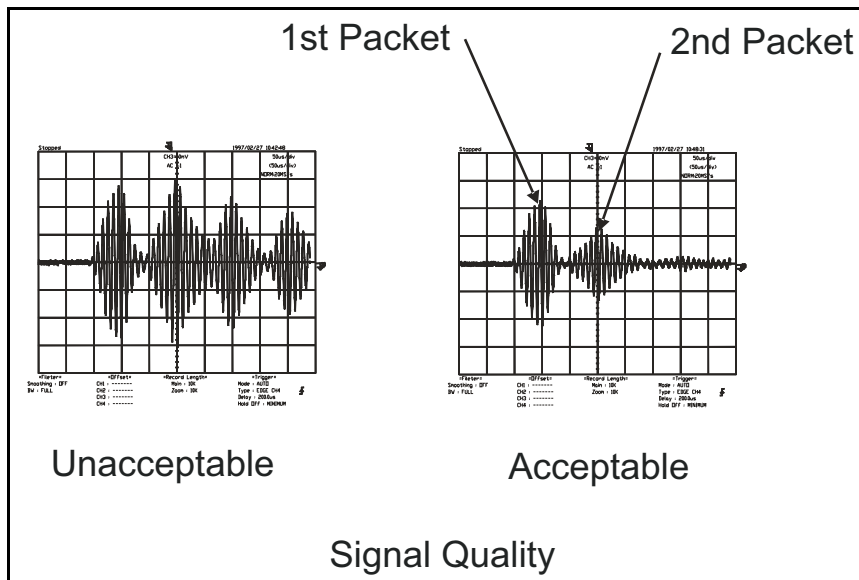


Figure 39: Observing the Signal Strength

2.3 Aligning the Transducers (cont.)

Refer to Figure 40 below and continue the alignment procedure as follows:

6. After adjusting the transducers for the highest signal strength and the best signal quality, reinstall the two 1/4-20 screws at each transducer port and secure the locking collar by tightening the screws with a torque wrench. Use a maximum torque of 3.75 ft-lb (5 N-m) on the four 10-32 screws and 5 ft-lb (6.8 N-m) on the two 1/4-20 screws. Alternate the tightening sequence of the six screws to properly “seat” the locking collar.
7. If necessary, re-tighten the junction box to the pipe adapter. Be sure to use a wrench on the transducer flats to prevent the transducer from rotating during re-tightening of the junction box.

You have now completed the transducer alignment procedure.

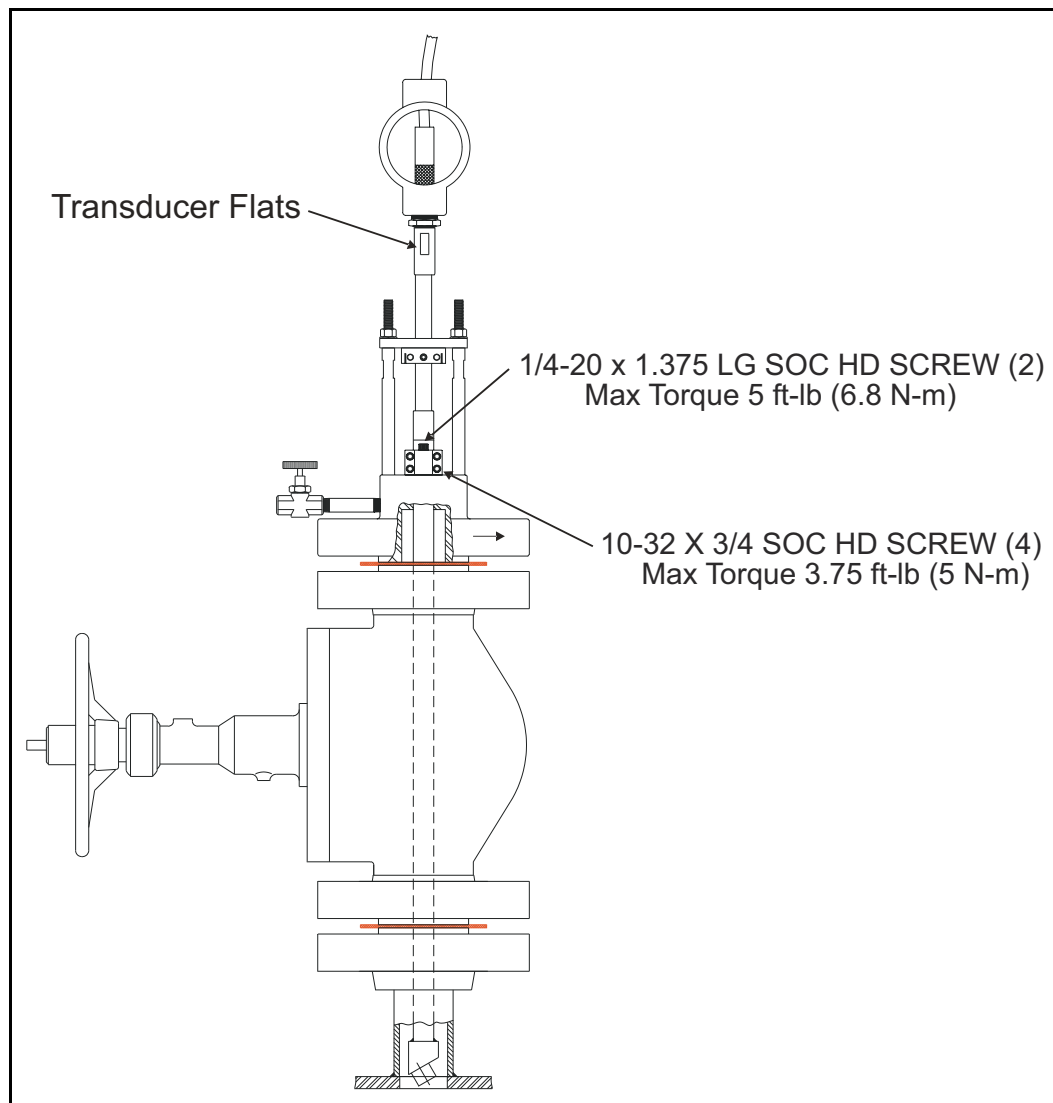


Figure 40: Completing the Transducer Alignment Procedure

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Chapter 3. Removing the Transducers

3.1 Introduction

To safely remove the T8 transducers from the process line, you must follow the instructions in this chapter very carefully.



WARNING! Make sure the flowmeter power is disconnected before performing the procedures in this chapter.

3.2 Attaching the Hydraulic Cylinder

Begin the transducer removal process by referring to *Figure 41* below and completing the following steps:

1. Disconnect the coaxial cable from the transducer.
2. Use a wrench on the flats of the pipe adapter to prevent it from rotating, and remove the junction box from the pipe adapter.

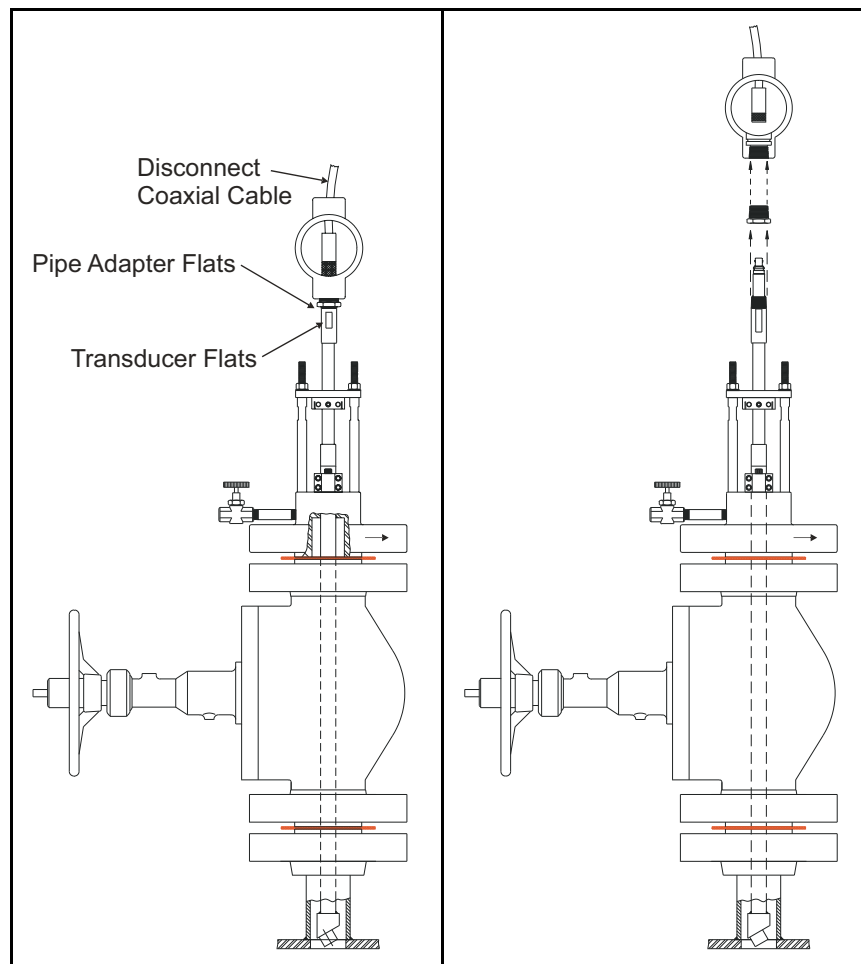


Figure 41: Preparing to Remove a Transducer

3.2 Attaching the Hydraulic Cylinder (cont.)

3. Use a wrench on the flats of the transducer body to prevent the transducer from rotating, and disconnect the pipe adapter.
4. Place the connector protector onto the 1/2" NPT thread of the transducer shaft and finger-tighten it.
5. Attach the hydraulic cylinder to the four studs on the LPA, using four 3/8-16 stainless steel nuts (see *Figure 42* below). Tighten the four 3/8-16 stainless steel hex nuts to a maximum torque of 19 ft-lb (25 N-m).

Note: *Disconnecting the hydraulic pump at the “quick disconnect” will simplify attaching the hydraulic cylinder.*

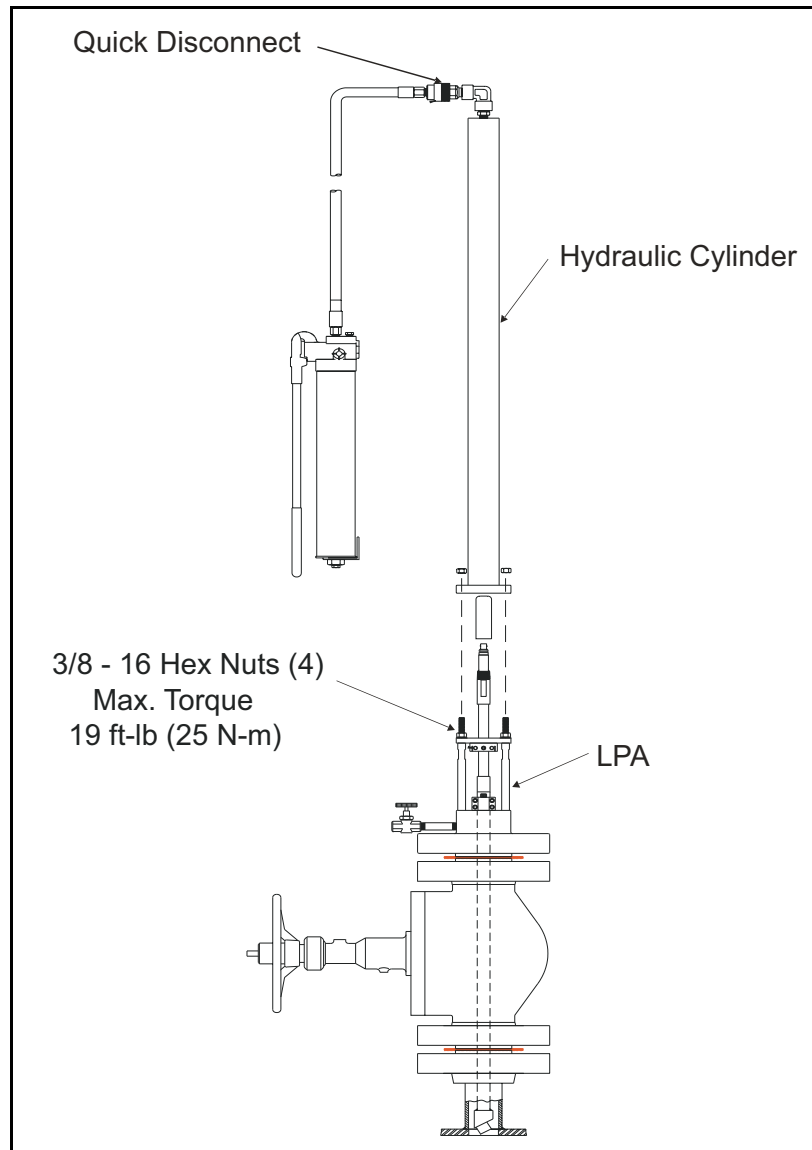


Figure 42: Attaching the Hydraulic Cylinder

3.3 Removing the Transducer

After attaching the hydraulic cylinder, refer to *Figure 43* below and complete the following steps:

1. To prepare for pumping, rotate the side knob of the hydraulic pump clockwise to tighten it.
2. Slowly pump the handle of the pump to bring the piston into contact with the connector protector. When you feel resistance, stop pumping the handle. The resistance indicates that the piston is touching the connector protector.
3. Verify that the hydraulics are engaged and that the transducer shaft has pressure applied, as indicated by a feeling of resistance when the pump handle is pumped).

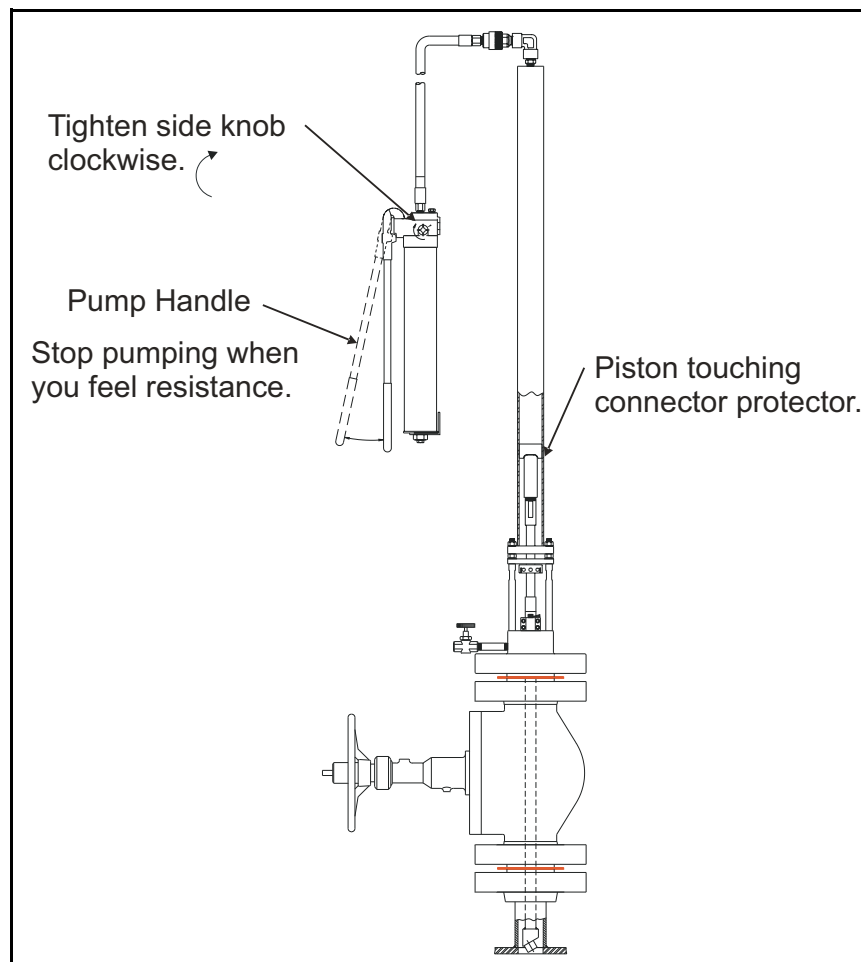


Figure 43: Pumping to Move the Piston

3.3 Removing the Transducer (cont.)

Refer to *Figure 44* below and continue as follows:

4. Use an Allen wrench to remove the set screw from the safety alignment collar.
5. Evenly loosen the two 1/4-28 x 5/8 socket head cap screws with an Allen wrench just enough to slide the safety alignment collar out of the cover.
6. Remove the alignment collar from the transducer by removing the two 1/4-28 x 5/8 socket head cap screws.

Note: *Alternatively, you may mark the spot with a waterproof pen.*

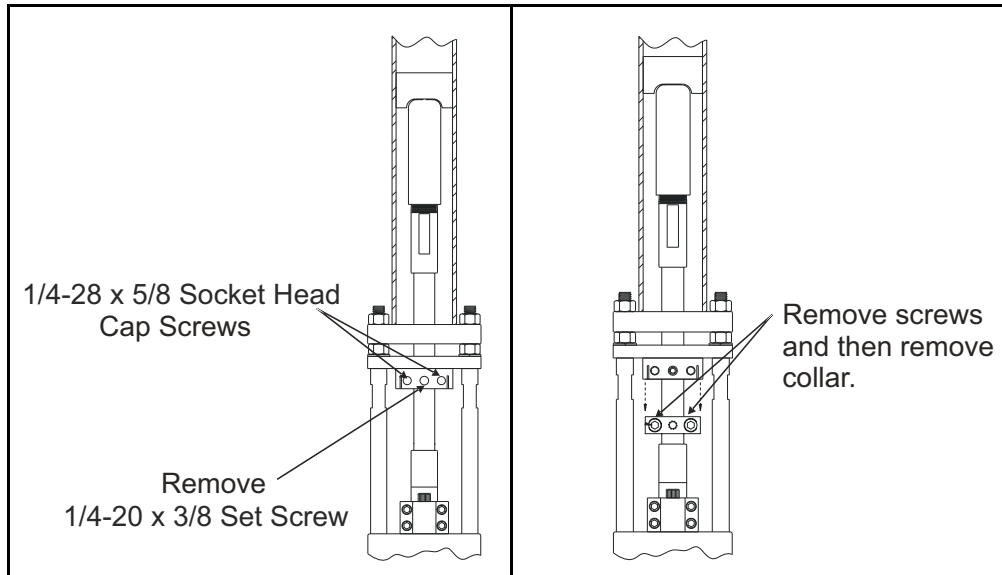


Figure 44: Removing the Alignment Collar

3.3 Removing the Transducer (cont.)

7. Refer to *Figure 45* below and check the condition of the insertion depth marker. If it was erased or otherwise damaged, replace the marker with one layer of colored electrical tape around the transducer circumference until the ends overlap. Place the edge of the tape against the edge of the locking collar.

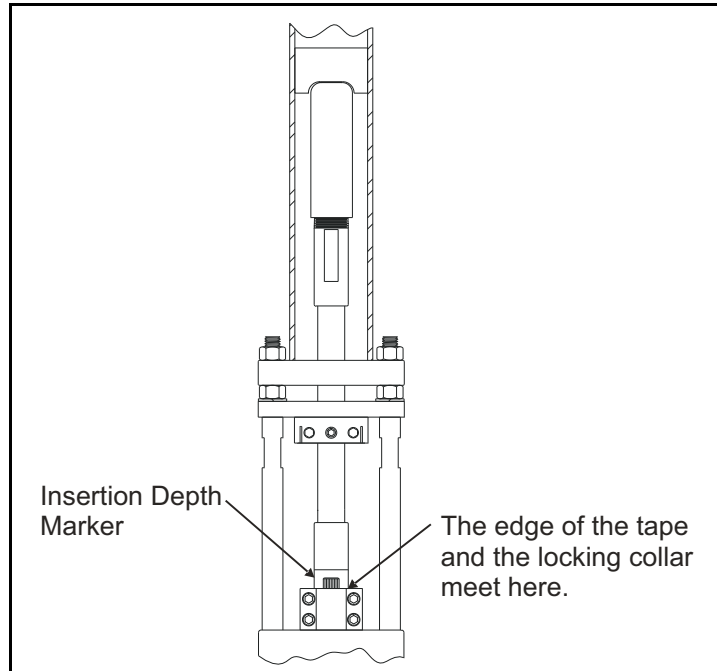


Figure 45: Checking the Insertion Depth Marker

8. Make sure the piston of the hydraulic cylinder is still applying positive pressure to the connector protector (see *Figure 46* below). Then, evenly loosen the screws in the locking collar just enough to free the collar from the transducer shaft.

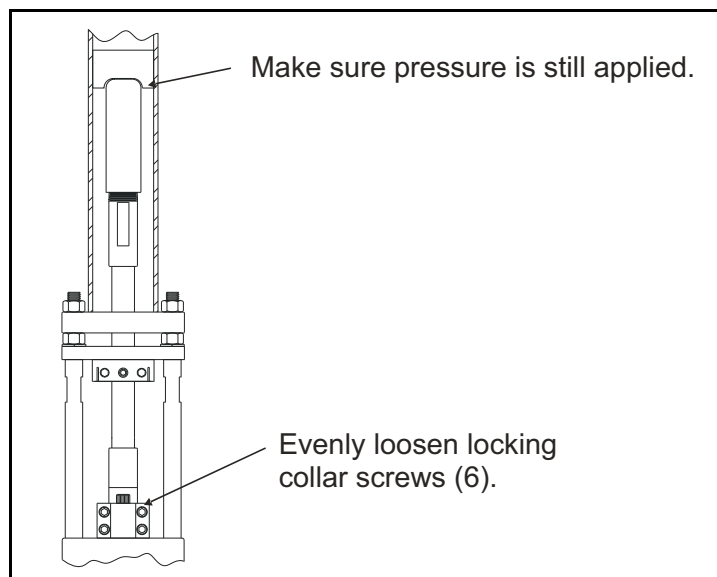


Figure 46: Loosening Locking Collar Screws

3.3 Removing the Transducer (cont.)

Refer to *Figure 47* below and continue as follows:

9. After the locking collar is loose, very slowly turn the side knob of the hydraulic pump counterclockwise to release the pressure and allow the transducer to slowly slide out of the flange.
10. After the transducer head is completely retracted inside the LPA, turn the 2 in. flanged ball valve to its closed position.

Proceed to the next section to complete the removal procedure.

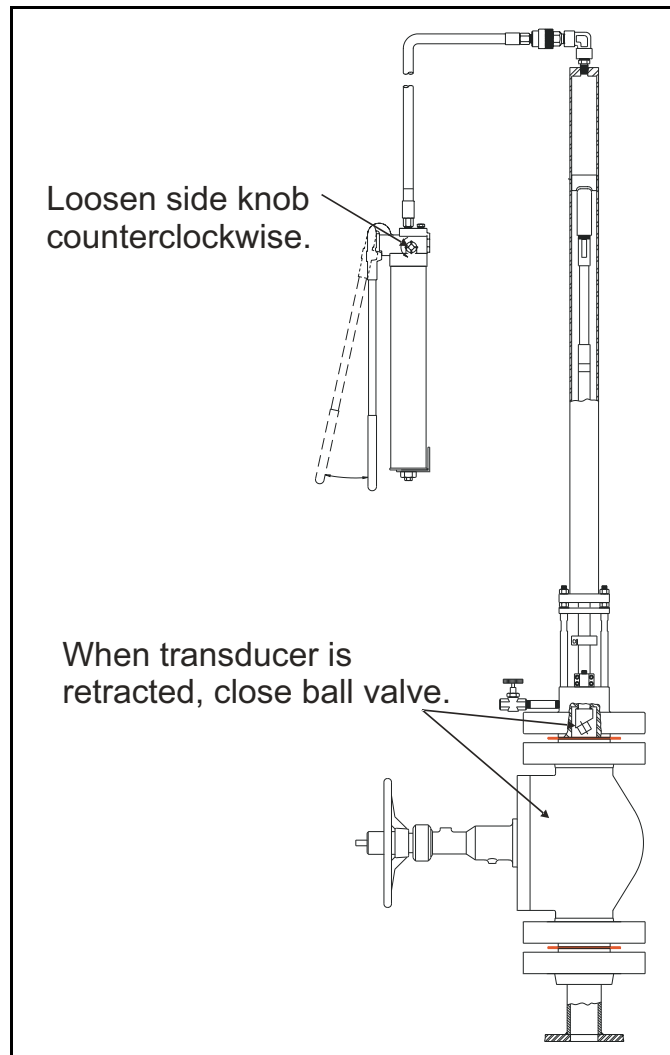


Figure 47: Releasing the Pressure

3.4 Disconnecting the Hydraulic Cylinder

To remove the hydraulic cylinder, refer to *Figure 48* below and complete the following steps:

1. Tighten the locking collar screws with a torque wrench to secure the transducer in place. Use the maximum torque listed in *Figure 48* above, but do not overtighten the screws.

IMPORTANT: *Alternate the tightening sequence of the six screws to properly “seat” the locking collar.*

2. Open the purge valve to vent and release the gas pressure trapped inside the LPA.

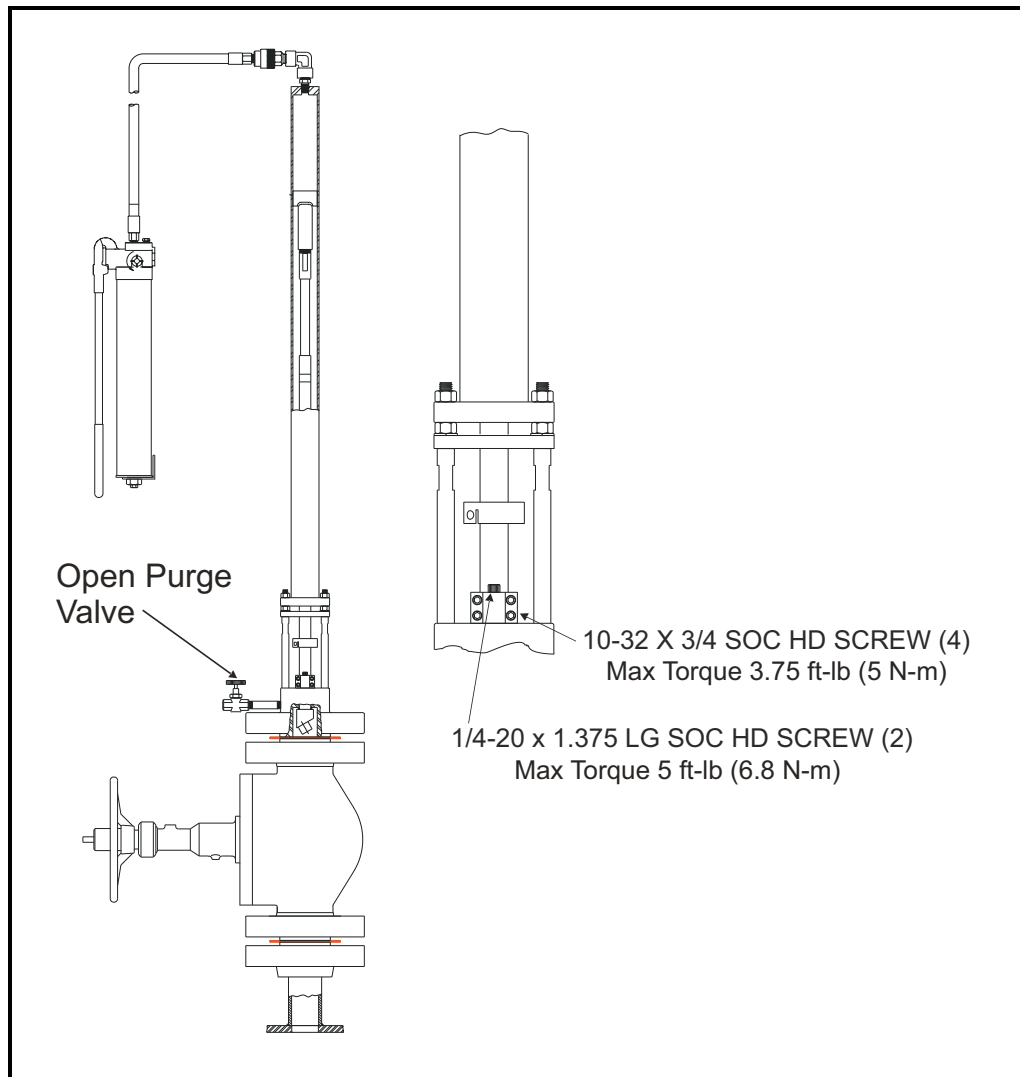


Figure 48: Preparing to Remove the Hydraulic Cylinder

3.4 Disconnecting the Hydraulic Cylinder (cont.)

Refer to *Figure 49* below and continue as follows:

1. Disconnect the hydraulic cylinder from the hydraulic pump at the quick disconnect.
2. Remove the four 3/8-16 hex nuts to detach the hydraulic cylinder from the four studs of the LPA.
3. Unbolt and remove the LPA/transducer assembly from the 2" flanged ball valve.
4. Unscrew and remove the connector protector.

You have completed the removal procedure for this transducer. If necessary, repeat the process to remove the other transducer. After both transducers have been removed, properly store the hydraulic cylinder for future use.

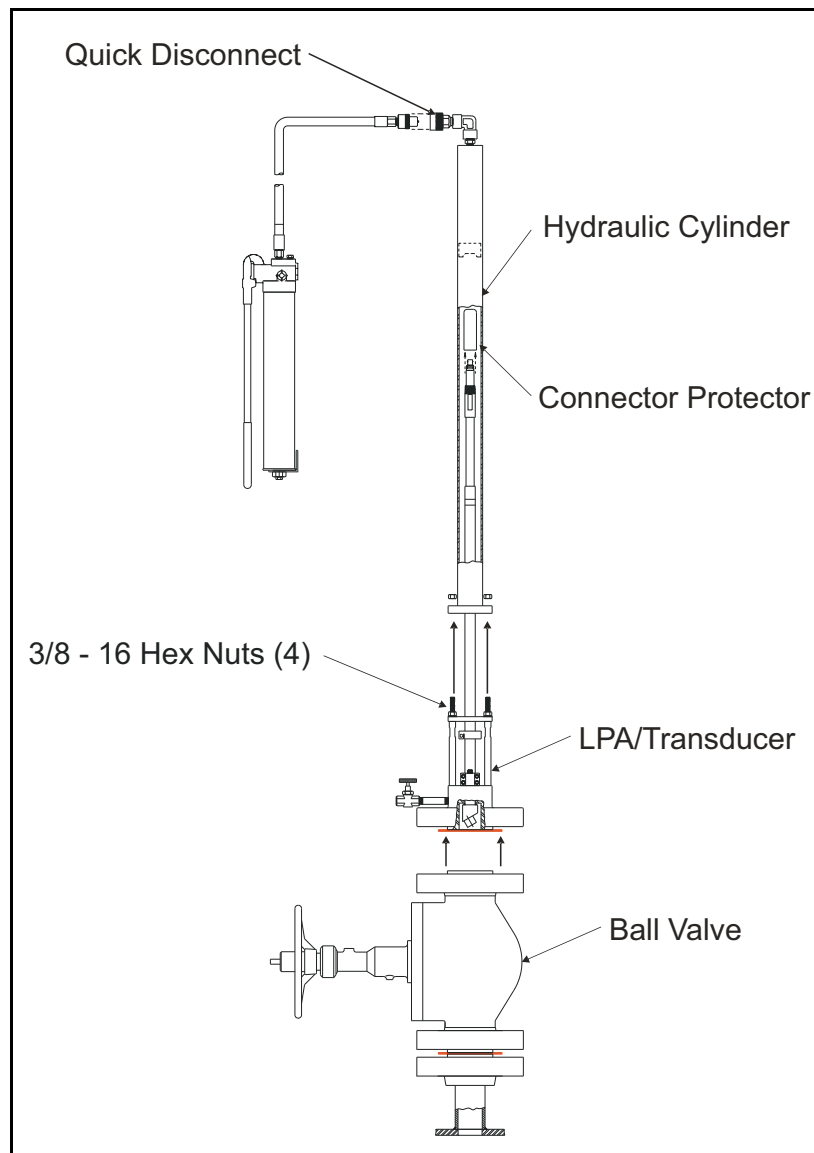






Figure 49: Removing the Hydraulic Cylinder

Chapter 4. Specifications

4.1 T8 Transducer Physical Specifications

Applications:	High-Pressure Applications with an Insertion/Retraction Mechanism, Natural Gas
Installation Type:	Wetted
Material:	Titanium
Field Mounting:	Flowcell, Hot Tap or Cold Tap
Process Connection:	Flanged, 2 in. (50 mm)
Holder Type:	High-Pressure Insertion Mechanism
Holder Ratings:	150#, 300#, 600#, 900#
Operating Frequency:	100 kHz
Pressure Range:	0 to 2700 psig
Electrical Rating:	200 V peak-to-peak, 5 mA
Ambient Temperature Range:	<i>Europe:</i> -40°F to +140°F (-40°C to +60°C) <i>North America:</i> -4°F to +140°F (-20°C to +60°C)
Process Temperature Range:	-58°F to +302°F (-50°C to +150°C)

4.2 T8 Transducer Certifications

North American - Explosion proof:	 Class I, Division 1, Group C, D C US
European/International - Flameproof:	 II 2 G Ex d IIC T6 60°C Tamb -40 to +60°F (-40 to +140°C) KEMA02ATEX2283X
North American - Weatherproof:	 IP66, TYPE 4X, 200Vpp, 5mA C US
European/International - Weatherproof:	IP 66 

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Warranty

Each instrument manufactured by GE Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Sensing determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If GE Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Sensing instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Sensing will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

[no content intended for this page]

We,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

**Models T3, T5, T8, T11, T14 and T17 Wetted Ultrasonic Flow Transducers
Series BWT1 / F...PA / XAMP... Ultrasonic Flowmeter Transducer Assembly**

to which this declaration relates, are in conformity with the following standards:

- EN 60079-0: 2012
- EN 60079-1: 2007
- II 2 G Ex d IIC T6...615°C Gb **T3:** KEMA06ATEX0052, **T5:** KEMA01ATEX2045X, **T8:** KEMA02ATEX2283X, **T11:** KEMA02ATEX2252, **T14:** KEMA04ATEX2054X, **T17:** KEMA01ATEX2045X
Series BWT1 / F...PA / XAMP...: KEMA01ATEX2051X; IEC Ex KEM09.0010X
(DEKRA, Utrechtseweg, 310 Arnhem, The Netherlands - NoBo 0344)
- EN 61326-1: 2006, Class A, Table 2, Industrial Locations
- EN 61326-2-3: 2006
- EN 61010-1: 2012, Overvoltage Category II

Other standards used:

- EN 50014: 1997 + A1, A2
- EN 50018: 2000

following the provisions of the 2004/108/EC EMC and 94/9/EC ATEX Directives.

Where products were initially assessed for compliance with the Essential Health and Safety Requirements of the ATEX Directive 94/9/EC using earlier harmonized standards, a subsequent review has determined that "technical knowledge" is unaffected by the current harmonized standards listed above.

The units listed above and any ancillary equipment supplied with them do not bear CE marking for the Pressure Equipment Directive. They are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

Billerica - January 2014

Issued



Mr. Gary Kozinski
Certification & Standards, Lead Engineer



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