

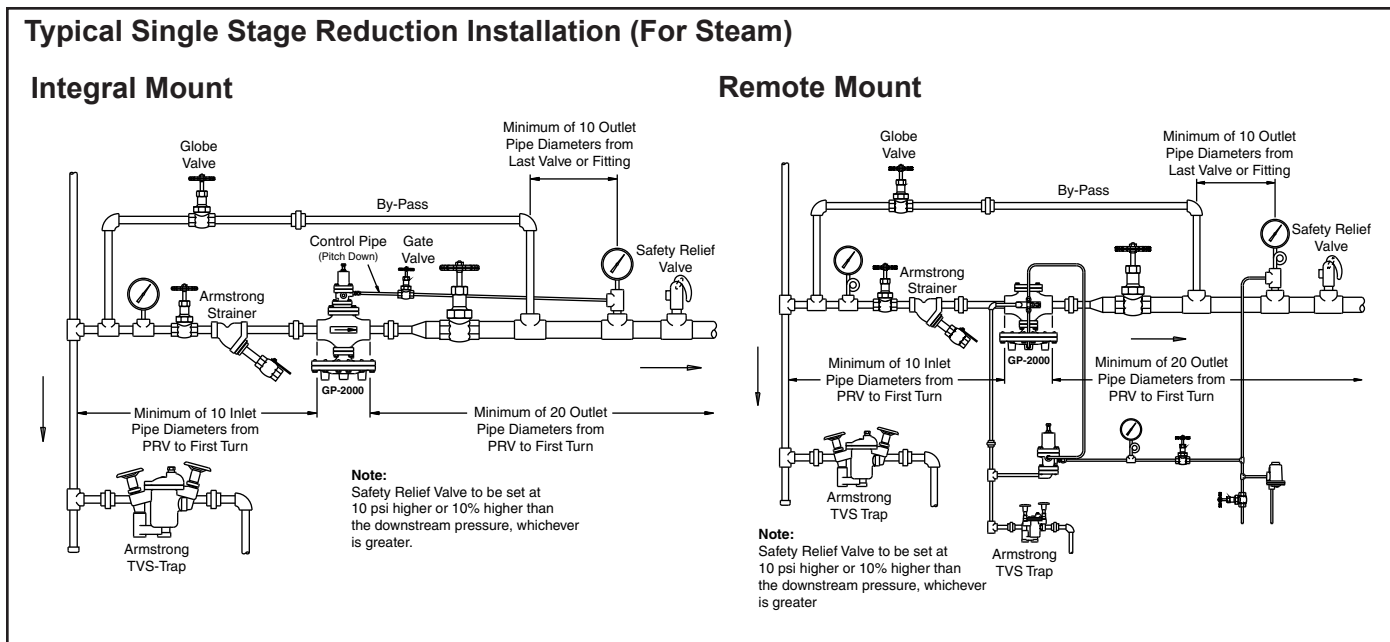


# Model GP-2000

## Pressure Reducing Valve

### Integral and Remote Pilot

#### Installation, Operation and Maintenance



*This bulletin should be used by experienced personnel as a guide to the installation of the Model GP-2000 Pressure Reducing Valve. Selection or installation of equipment should always be accompanied by competent technical assistance. You are encouraged to contact Armstrong International, Inc. or its local sales representative for additional information.*

## Installation Instructions

1. An Armstrong Inverted Bucket Steam Trap is recommended to drain the condensate at the inlet of the PRV.
2. An Armstrong 100 mesh Y-Strainer should be installed before the PRV to reduce the chance of dirt fouling.
3. Pressure gauges should be installed before and after the PRV. The downstream gauge should be installed in or near the control pipe.
4. Control pipe connections go into  $\frac{1}{4}$ " tapping on the side of the pilot valve. Be certain the pipe is **pitched away** from the PRV to drain condensate away from pilot. Erratic control could result if this is not done. Control pipe length should be a minimum of 10 outlet pipe diameters from the last tee, elbow or fitting.
5. If a bypass line is needed to allow system operation while the valve is being serviced then install a quality globe valve on the bypass line. Leaking valves will cause system problems.
6. Piping immediately downstream of PRV should be expanded to accommodate low-pressure expansion through a PRV. Approximately 6,000 – 12,000 FPM maximum velocity.
7. Install the PRV with diaphragm chamber down and with flow in the direction of the arrow on the body.
8. Do not install a quick opening or quick closing valve on the downstream side of the PRV. This can cause erratic pressure control and cause safety relief valves to discharge.

## Start-Up and Adjustment Procedures

Improper sizing or adjustment of the pressure reducing valve may cause hunting, scale problems, water hammer, etc. and can heavily damage the main parts of the valve. Adjust the valve as follows:

1. Close the gate valves before and after the pressure reducing valve and blow fluid leisurely through the by-pass line. Adjusting the opening of the by-pass globe valve so as not to blow the safety relief valve. After draining, be sure to close the by-pass globe valve.
2. Loosen the lock nut and adjusting screw to relieve the pressure on the adjusting spring.
3. Slowly open the inlet side gate valve to the full open position, and open the outlet side gate valve enough so that a little fluid can flow through.
4. Slowly turn the adjusting screw clockwise until the desired pressure is obtained while watching the pressure gauge at the outlet side.
5. Slowly open the outlet side valve to the full open position.
6. After adjustment, tighten the lock nut.

**Note:** Downstream usage must be present in order to set any pressure-reducing valve.

**Table 2-1. Spring Chart**

Reduced Pressure	Color Code
*1.5 - 3 psig	Yellow
3 - 21 psig	Yellow
15 - 200 psig	Green

\*When using this spring range, remove one (1) pilot diaphragm. Capacities are reduced by 1/2 when this spring is being used.

## Disassembly

**Note:** Before disassembly, check to make sure that the valves before and after the reducing valve are closed, including the valve in the control pipe. Also, make sure that the pressure has been relieved and that the valves are holding.

### A. Disassembly of the Pilot Valve

**Ref: (Fig. 3-1)**

1. Loosen the (28) lock nut, turn the adjusting screw (27) counterclockwise and turn until pressure is relieved from spring.
2. Remove the hex head bolts (37) and take out the top spring plate (25), adjusting spring (24), bottom plate (26) and two (2) pilot diaphragms (23). (1 diaphragm if 1.5-3 spring)
3. Remove the (18) pilot valve capsule [hexagonal part at the center of the (2) pilot body. Disassemble pilot valve capsule – place a 7/32" socket over small hexagonal screw in middle of capsule (21) and hold opposite end with a flat head screwdriver. Turn counterclockwise to unscrew and expose valve stem and seat.

2. Remove the four hex head bolts (38) from the pilot body (2) to remove the pilot from the main body (1). If the pilot is mounted remotely, remove the bolts to the main valve top cover. Care should be taken when doing this – the main valve is held by a spring, which is compressed. Once bodies are apart, remove spring plate retainer (14), screen (15), main valve spring (13) and main valve (6).
3. If the seat must be replaced, remove the four nuts (40) that attach the main body (1) to the top diaphragm case. The main valve seat is tightened from the bottom side of the body using a "T" bar. Loosen with "T" bar and unscrew main valve seat from the top.

### B. Disassembly of the Main Valve

1. Disconnect the copper tubing on the side of the valve (30A), (30B), and (30C).

### C. Disassembly of the Main Diaphragm

1. Remove all bolts (41) holding the top and bottom diaphragm cases (4 & 5) together.
2. Separate both halves. Remove both main diaphragms (12), retainer (11) and main spindle (9).

## Assembly

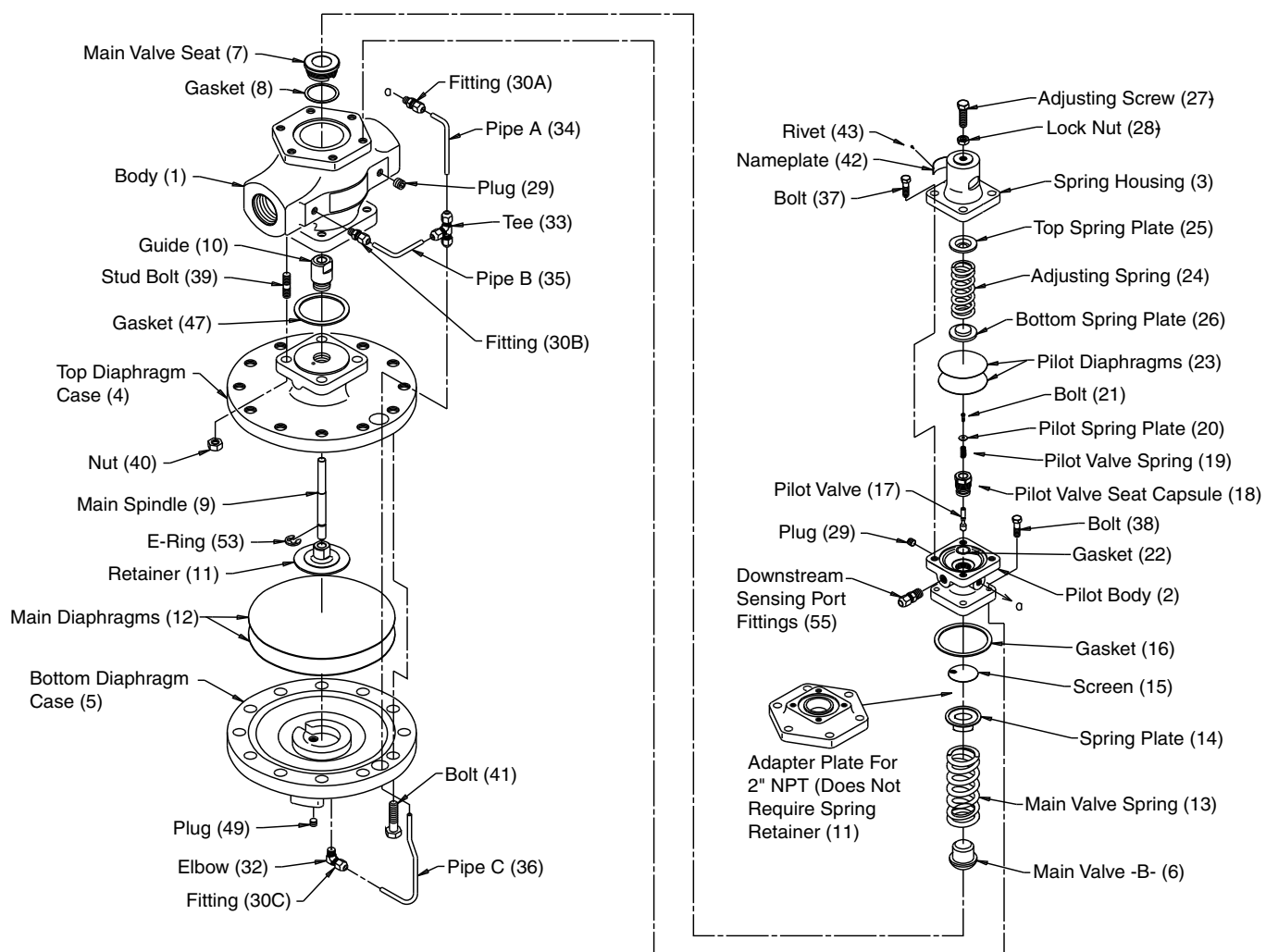
1. Check to make sure there are no scratches on the main valve, valve seat or pilot valve. If there are no scratches apply lapping compound and re-lap the valve and seat. (See Bulletin AY-768).
2. Make sure the sliding parts (Pilot valve stem and main valve stem) move freely.
3. Never-Seeze® gasket compound should be used on both main diaphragms and on bottom of pilot diaphragms.
4. Assemble valve in reverse order from disassembly.
5. Tighten bolts uniformly (criss-cross pattern).
6. Verify if your valve has old or new type tubing to assure proper placement of orifices (see page 6).
7. Be sure fitting 30A, 30B, 30C and tee fitting (33) are in the correct position and not over tightened. Ref. Figure 6-1.
8. Make sure copper pilot valve gasket (22) and main valve seat gasket (8) are in place before tightening pilot valve capsule and main valve seat.

# Start-Up and Adjustment Procedures

Main Valve Kits K-2100 thru K-2108	Main Diaphragm Kits K-2130 thru K-2136	Gasket Sets K-2380 thru K-2386	Adapter Kits OB-2000 and OB-2000PT K-2020 thru K-2036
1 Main Valve 1 Main Body Top Gasket 1 Body Spacer Gasket	2 Main Diaphragms Never-Seeze® compound	1 Screen 1 Main Body Top Gasket 1 Main Body Bottom Gasket 1 Body Spacer Gasket	All external tubing and fittings needed to remote mount pilot valves to main valves
Pilot Kit K-2PDK	Pilot Kit K-2110	Tube Kits K-2120	Adjusting Springs
2 Pilot Diaphragms Never-Seeze® compound	1 Pilot Valve Capsule 2 Pilot Diaphragms 1 Pilot Capsule Gasket	For all external tubing and fittings.	Yellow *1.5 - 3 Yellow 3 - 21 Green 15 - 200

\*Must remove one pilot diaphragm.  
(Also reduces capacity to half.)

Figure 3-1



## Troubleshooting Guide

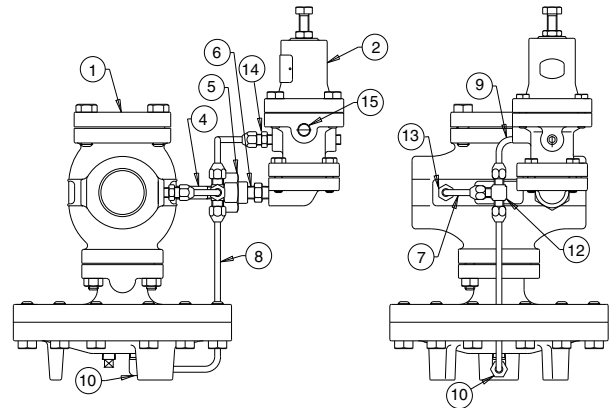
**Before working on the valve, make sure that the inlet strainer is clean, bypass valve is closed and upstream and downstream pressure gauges are working properly. Refer to Figure 3-1.**

Problem	Cause	Test	Solution
<b>Outlet Pressure does not reach desired value.</b>	Inlet pressure is not adequate for desired results.	Maximum outlet pressure is 85% of the inlet with a minimum DP = 7 psi.	Raise inlet pressure if possible.
	Adjustment is not proper.	Turn adjusting screw (27) clockwise.	Dismantle and clean.
	Orifice is too large in fitting (30B).	Remove and check.	Install proper fitting.
	Orifice of fitting (30C) is plugged.		Clean or replace fitting.
	Pilot valve is clogged.	Close inlet valve. Remove fittings (30A) and (30B). Turn (27) adjusting screw counterclockwise until it is loose. Open inlet steam valve and turn (27) adjusting screw clockwise. If fluid does not appear at (30A), pilot valve is clogged.	Disassemble and clean (18) pilot valve seat. Also, check (15) screen.
	Main diaphragms are damaged.	Close all valves and remove fitting (30C). Open bypass valve around PRV. If fluid appears out of diaphragm casing at (30C), diaphragm has failed.	Disassemble and replace (12) main diaphragms.
<b>Secondary pressure exceeds the pressure setting.</b>	Valve size is too small and cannot supply enough capacity.	Throttle downstream valve located downstream of sensing line. If desired pressure can be reached after throttling valve PRV is too small.	Resize and install larger valve.
	A) Adjustment is not proper.	Turn (27) adjusting screw counterclockwise.	Readjust.
	B) Orifice of fitting (30B or C) is plugged.	Remove and check.	Clean or replace fitting.
	C) Dirt is either caught between the main valve and seat or pilot main valve and seat.	1) Close inlet and outlet steam valves. 2) Turn (27) adjusting screw counterclockwise until loose. 3) Remove all copper tubing from the side of the valve. 4) Open inlet steam valve. 5) If fluid appears at (30A), proceed to solution #1. 6) If fluid appears at (30B), proceed to solution #2 and also see 'D' below. 7) Fluid does not appear at either part, proceed to 'E' below.	1) Tighten or loosen adjusting screw to flush out dirt. If pilot valve still leaks, clean or replace it. 2) Disassemble and remove main valve (it will lift out easily). If it appears shiny at one point, apply lapping compound and lap the valve and seat (see bulletin AY-768 for lapping instructions).
	D) Dirt is between main spindle (9) and guide (10).	If valve fails test at (30B) (as described above in item 6) check while assembled.	Clean.
	E) By-pass valve is not shut or is leaking.	Close and listen with stethoscope.	Repair or replace.
	F) Sensing line is plugged.	Break union and open valve.	Clean and replace.
G) Sensing line is not connected.	Refer to Drawings on Page 1.	Install sensing line as shown on installation drawing on Page 1.	
<b>Operation is unstable.</b>	Orifice fitting is partially plugged.	Check (30B) and (30C).	Remove and clean or replace.
	Sensing pipe is installed at a point where there is too much turbulence.	Refer to Drawings on Page 1.	Install sensing pipe at another location.
	Liquid is collecting in sensing line.		Slant pipe away from PRV.
	Quick opening/closing valve located too close to the outlet or inlet PRV.		Relocate PRV.
<b>Excessive noise is present.</b>	Valve size is larger than what was required causing valve chatter.	Recalculate load. Check for valve chatter.	Change valve or add orifice plate to outlet of PRV.
	Pressure reduction ratio exceeds 20:1.	Verify inlet and outlet pressure.	Use two stage reduction.
	Fluid velocity is too high.	Verify with PRV software (consult factory).	Resize station using two stage reduction or use sound silencer down from PRV.
	Automatic valve (i.e., solenoid) is too close to PRV.	Visual.	Relocate.

# OB-2000 & GP-2000, K1, K3, K6 Remote Mount Pilot Tubing - Assembly Instructions

(See drawings for proper piping of remote pilots)

1. The valves have the following "similar" parts. 1/4" long nipple (4), 1/4"x 1/4" short nipple (6), fitting B (13) and union set (5). Use thread tape on the threads of both nipples.
2. Remove the 1/4" plug on the inlet side of the main valve body (1) (for GP-2000 remote mount pilot and OB-2000 temperature pilot) with an allen wrench.
3. Thread the 1/4" long nipple (4) into the main valve body (1) (in place of the 1/4" plug).
4. Thread one-half of the union set (5) onto the long nipple (4). Thread the other half onto the short nipple (6).
5. Thread the short nipple (6) into the pilot (2) or (3).  
**Note: The arrow on the side on the temperature pilot (3) must point away from the main valve. The short nipple (6) will thread into the bottom cap of the pressure pilot (2) (remote mount).**
6. Assemble the C-tube (8), B-tube (7) and tee (12) as shown in the diagrams on Page 6. Connect the union set (5) and tighten. **Very Important: Be sure that the groove on the Tee is on the top (Old GP-11 series does not have groove and can be used either way).**



**GP-2000, GP-2000K-1,  
GP-2000K-3, GP-2000K-6  
Remote Mount**

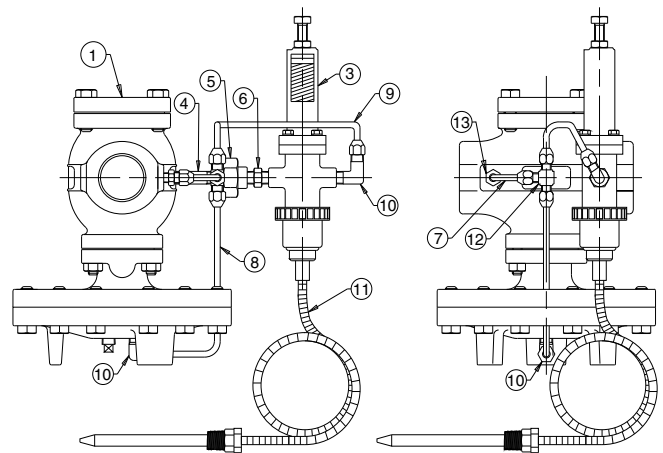
- |    |   |
|----|---|
| 1  | Main Valve Body                         |
| 2  | Pressure Pilot or Air Pilot (not shown) |
| 3  | Temperature Pilot                       |
| 4  | 1/4" Long Nipple                        |
| 5  | Union Set                               |
| 6  | 1/4" x 1/4" Short Nipple                |
| 7  | B-Tube                                  |
| 8  | C-Tube                                  |
| 9  | D-Tube                                  |
| 10 | Elbow                                   |
| 11 | Capillary                               |
| 12 | Tee                                     |
| 13 | Fitting B                               |
| 14 | Fitting A                               |
| 15 | Downstream Sensing Port                 |

## For GP-2000 Remote Mounted Pilot

7. Place fitting A (14) into the pilot and thread into place. **Note: This fitting is open with no restricted opening. Use thread tape on threads.**
8. Once the union set (5) has been tightened to fitting A (14) of the pressure pilot (2) it should be facing the main valve (1). (See remote mount drawing)
9. Connect the S shaped D-tube (9) to the outlet of the pressure pilot at fitting A (14) and to top of the tee (12) and tighten. **Note: Make sure the downstream sensing port (15) on the pilot faces downstream.**

## For OB-2000

10. Thread the elbow (10) into the outlet of the temperature pilot (3) and into the bottom of the main valve as shown in drawings.
11. Place the D-tube (9) into the elbow (10) and the tee (12) and tighten.



**OB-2000**

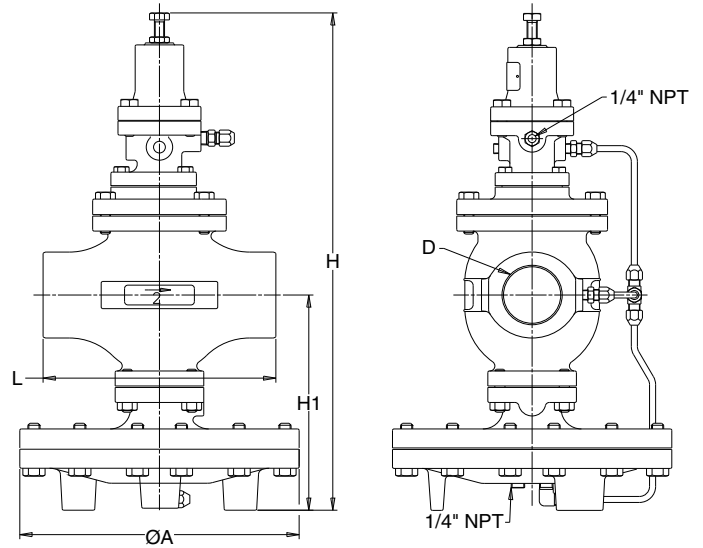
# Tubing Set-Up

The external tubing for our GP-2000 series has been modified to enhance the performance of the model. It is important to have these fittings in the correct location in order to get optimum performance from these valves. The location of all fittings is critical and should not vary from the assembly instructions.

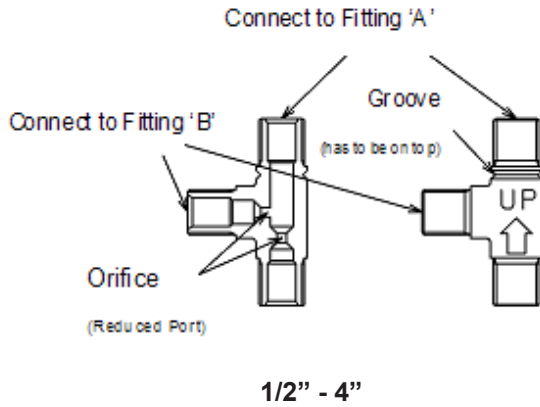
**Note:** Fittings and tee are to be located in similar positions for all GP-2000 models.

## External View With Tubing

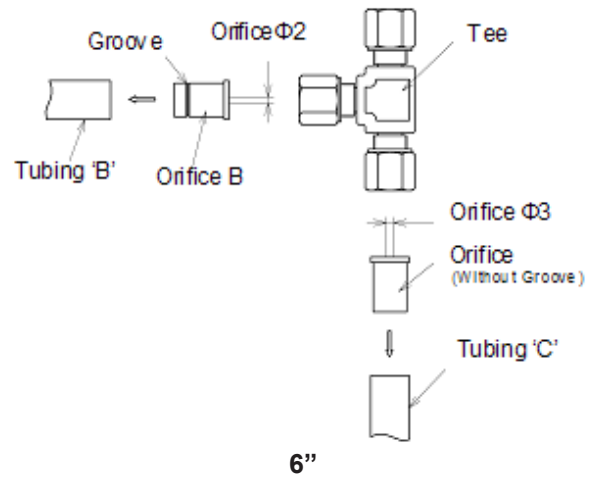
Figure 6-1



## Tubing Location



1/2" - 4"



6"

### General Characteristics (1/2" - 4")

Groove has to be on top.  
Tee has two reduced and one full port.  
Fitting A&B and Elbow have no restriction.  
Fitting A&B are the same parts.

### General Characteristics (6")

Tee is reversible.  
Orifices are attached between Tee and Tubing.  
Fitting and Elbow have no restriction.

## Notes

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