Section 3 Commissioning

Safety Messages . . . . . page 3-1
Transmitter Commissioning . . . . . page 3-2
Commissioning The Annubar . . . . . page 3-2

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

⚠WARNING

Explosions could result in death or serious injury:

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a Field Communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.
- If the line is pressurized, serious injury or death could occur by opening valves.

⚠CAUTION

Section 3 contains information that are suggested procedures only. The user must follow all plant safety procedures for their process and location.

TRANSMITTER COMMISSIONING

See the appropriate transmitter manual for wiring and configuration instructions:

Table 3-1. Transmitter Manual document numbers

Transmitter	HART document Number	FOUNDATION fieldbus document number	Profibus document number
Rosemount 3051S MultiVariable Mass and Energy Flow Transmitter	00809-0100-4803	N/A	N/A
Rosemount 3051S Pressure Transmitter	00809-0100-4801	00809-0200-4801	N/A
Rosemount 3095 MultiVariable Mass Flow Transmitter	00809-0100-4716	00809-0100-4716	N/A
Rosemount 3051 Pressure Transmitter	00809-0100-4001	00809-0100-4774	00809-0100-4797
Rosemount 2051 Pressure Transmitter	00809-0100-4101	00809-0200-4101	N/A

COMMISSIONING THE ANNUBAR

Direct Mount Transmitter

Prepare Transmitter for Service

Prior to commissioning the flowmeter, a zero trim procedure (or “dry zero”) should be performed to eliminate any positional effects to the transmitter. Refer to Figure 3-1 and Figure 3-2 for valve designations.

1. Open first the equalizer valve(s) MEL and MEH or ME.
2. Close valves MH and ML.
3. Read the transmitter output. It should read within the range 3.98 mA to 4.02 mA. If the output is outside of this range, perform a zero trim procedure as described in transmitter manual (see Table 3-1 for transmitter manual document numbers).

“Calibrate Out” Line Pressure Effects

For applications with static pressures of 100 psi (6.9 bar) and higher, the DP sensor should be zeroed for line pressure effects. The “zero” calibration procedure is affected by static pressure and ambient temperature, but these effects can be minimized by zeroing the DP sensor at normal operating conditions.

The effect of static pressure is calibrated out by exposing the transmitter to the line pressure and performing a “zero” or wet calibration, as described below.

Although the line pressure effects are relatively small, they significantly affect the accuracy of the Annubar when used with low flows.

Periodic “zero” calibration and/or commissioning is recommended to maintain the accuracy of Annubar. The frequency of this type of maintenance should be established for each individual application.

Liquid Service 3-Valve Manifold

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Open the high and low manifold valves MH and ML. Refer to Figure 3-1 for valve designations.
2. Open the Equalizer valve ME.
3. Open the drain/vent valves on the transmitter DVH and DVL; bleed until no air is apparent in the liquid.
4. Close both drain/vent valve DVH and DVL.
5. Close the low side manifold valve ML.
6. Check the transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA then perform a zero trim procedure as described in the transmitter manual.
7. After the zero trim, if the signal reads outside of the range 3.98 mA to 4.02 mA, repeat steps 1 - 6.
8. Close the Equalizer valve ME.
9. Open the low side valve ML and ensure that the high side valve MH is open.
10. The system is now operational.

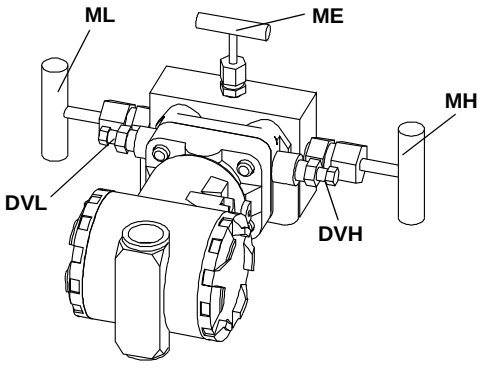


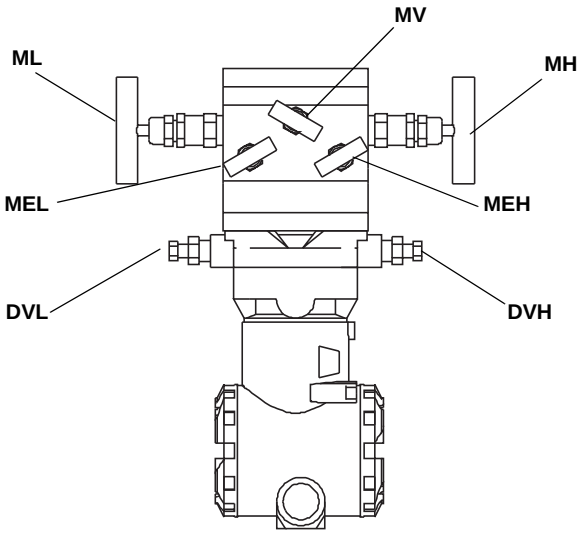
Figure 3-1. Valve Identification for Direct Mounted Annubar Models with 3-Valve Manifold

Liquid Service 5-Valve Manifold

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Open high and low manifold valves MH and ML. Refer to Figure 3-2 for valve designations.
2. Open high side equalizer valve MEH.
3. Open low side equalizer valve MEL.
4. Open manifold vent MV; Bleed until no air is present in the liquid.
5. Close manifold vent MV.
6. Close low side manifold valve ML.
7. Check transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA then perform a zero trim procedure as described in the transmitter manual.
8. After the zero trim, if the signal reads outside the range 3.98 mA to 4.02 mA, repeat steps 1-6.
9. Close low side equalizer valve MEL.
10. Close high side equalizer valve MEH.
11. Open low side manifold valve ML and ensure high side manifold valve MEH is open.
12. The system is now operational.

Figure 3-2. Valve Identification for Direct Mounted Models with 5-Valve Manifold



Gas Service 3-Valve Manifold

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Open the high and low manifold valves MH and ML. Refer to Figure 3-1 for valve designations.
2. Open the Equalizer valve ME.
3. Open the drain/vent valves on the transmitter DVH and DVL; bleed to ensure that no liquid is present.
4. Close both drain/vent valve DVH and DVL.
5. Close the low side valve ML.
6. Check the transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA, then perform a zero trim.
7. After zero trim, if the signal reads outside of the range 3.98 mA to 4.02 mA, repeat steps 1 - 6.
8. Close the Equalizer valve ME.
9. Open the low side valve ML, ensure that the high side valve MH is open. The system is now operational.

Gas Service 5-Valve Manifold

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Open high and low manifold valves MH and ML. Refer to Figure 3-2 for valve designations.
2. Open high side equalizer valve MEH.
3. Open low side equalizer valve MEL.
4. Open manifold vent MV; Bleed until no liquid is present in the gas.
5. Close manifold vent MV.
6. Close low side manifold valve ML.
7. Check transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA then, perform a zero trim procedure as described in the transmitter manual.
8. After the zero trim, if the signal reads outside the range 3.98 mA to 4.02 mA, repeat steps 1-6.
9. Close low side equalizer valve MEL.
10. Close high side equalizer valve MEH.
11. Open low side manifold valve ML and ensure high side manifold valve MEH is open.
12. The system is now operational.

Steam Service (Filling the water legs)

1. Ensure that the steam line is depressurized with no steam.
2. Check the transmitter for a dry zero of 4 mA with no water loss.
3. Attach hose connection valve to high side vent DVH. See Figure 3-3.
4. Attach a water supply to the hose connection. The water supply should have a maximum psi of 100.
5. Open the high and low manifold valves MH and ML and equalizer valve ME (MEH and MEL for 5-Valve Manifolds).
6. Ensure low side vent DVL is closed.
7. Open the hose connect valve for a minimum of 30 seconds. Water will flow through both the high and low chambers and into the pipe.
8. Close the high side manifold valve MH for 30 seconds to force water to the ML side.
9. Re-open the MH valve.
10. Open low side vent DVL until no air is observed.
11. Close the low-side vent DVL.
12. Close the hose connect valve and remove hose.
13. Close both manifold high side valve MH and manifold low side valve ML.
14. Check the transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA, air is probably still in the system; repeat this procedure from step 2, and trim sensor if necessary.
15. Open the manifold high side valve MH.
16. Close equalizer valve ME (for 5-Valve Manifolds first close valve MEL, then close valve MEH).
17. Open the manifold low side valve ML. The system is now operational.

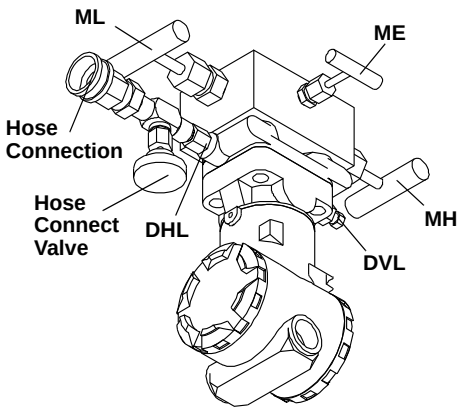


Figure 3-3. Valve Identification for Direct Mounted Annubar Models in Steam Service

Steam Service 3-Valve Manifold

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. After flow has been started and allowed to reach operating conditions a zero trim procedure needs to be performed.
2. Using the drain/vent valves DVH and DVL; burp (carefully crack vents open and closed to ensure that no air is present, this may need to be done more than one time.) Refer to Figure 3-1 for valve designations.

NOTE
This step would cause a loss of some water column in both the high and low sides, due to draining of the water legs. If step 2 is performed, the Annubar assembly should be given sufficient time to re-stabilize before continuing to step 3.

3. Close the low side valve ML.
4. Open the Equalizer valve ME.
5. Check the transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA then, perform a zero trim.
6. Close the Equalizer valve ME.
7. Open the low side valve ML, ensure that the high side valve MH is open. The system is now operational

Steam Service 5-Valve Manifold

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. After flow has been started and allowed to reach operating conditions a zero trim procedure needs to be performed.
2. Using the drain/vent valves DVH and DVL; burp (carefully crack vents open and closed to ensure that no air is present, this may need to be done more than one time.) Refer to Figure 3-2 for valve designations.

NOTE
This step would cause a loss of some water column in both the high and low sides, due to draining of the water legs. If step 2 is performed, the Annubar assembly should be given sufficient time to re-stabilize before continuing to step 3.

3. Close the low side valve ML.
4. Open manifold vent MV; Bleed until no liquid is present in the gas.
5. Close manifold vent MV.
6. Close low side manifold valve ML.
7. Check transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA then, perform a zero trim procedure as described in the transmitter manual.

Remote Mount Transmitter

Prepare Transmitter for Service

Prior to commissioning the flowmeter, a zero trim procedure (or “dry” zero) should be performed to eliminate any positional effects to the transmitter. Refer to Figure 3-1 and Figure 3-2 for valve designations.

1. Open first the equalizer valve(s) MEL and MEH or ME.
2. Close valves MH and ML.
3. Read the transmitter output. It should read within the range 3.98 mA to 4.02 mA. If the output is outside of this range, perform a zero trim procedure as described in transmitter manual (see Table 3-1 for transmitter manual document numbers).

Check for System Leaks

Check the system for leaks after installation is complete. A leak in a differential pressure instrument system can produce a difference in pressure that is larger than the signal itself.

Before the system is filled and/or commissioned, it is a simple matter to use compressed air or another inert, compressed gas to check for leaks. The gas pressure must be below the maximum allowed, but at least equal to the normal operating pressure in order to reveal potential leaks. A typical pressure used is 100 psig (690 kPa).

Before pressurizing the system, check for leaks by doing the following:

1. Open equalizer valve(s) MEH, MEL, or ME to prevent overpressuring the DP sensor on one side. Refer to Figure 3-4, Figure 3-5, and Figure 3-6 for valve designations.
2. Close valves PH, PL, MV, DVH, and DVL.
3. Open valves MH and ML.
4. Install all appropriate tapped plugs.
5. Apply pressure at a convenient point on either the high or low side of the system. The DVH, DVL, or MV ports could be used.
6. Use a suitable leak detection solution and apply to all of the impulse piping, valves, manifold, and connections. A leak is indicated by a continuous stream of bubbles.
7. Repair any leaks in the system by first removing pressure from the system. Repeat steps 1-6 as necessary until no leaks are detected.
8. Remove test pressure and re-install all appropriate plugs.

“Calibrate Out” Line Pressure Effects

NOTE
Do not begin this procedure until the system leak check has been completed on the impulse piping and all leaks have been fixed.

For applications 100 psi and higher, the DP sensor should be zeroed for line pressure effects. The “zero” calibration procedure is affected by static pressure and ambient temperature, but these effects can be minimized by zeroing the DP sensor at normal operating conditions.

The effect of static pressure is calibrated out by exposing the transmitter to the line pressure and performing a “zero” or wet calibration, as described below.

Although the line pressure effects are relatively small, they significantly affect the accuracy of the Annubar when used with low flows.

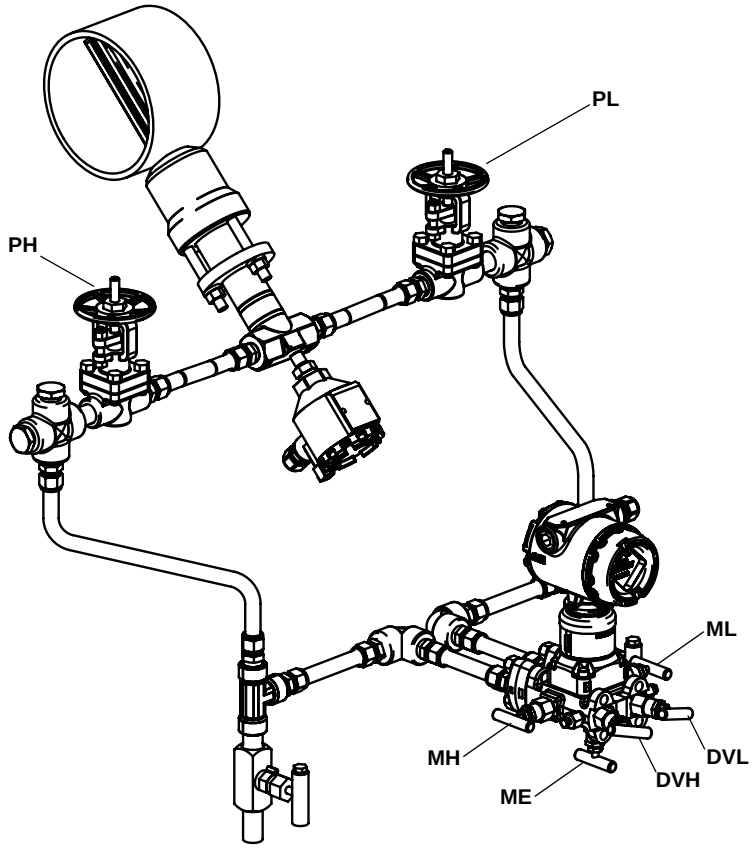
Periodic “zero” calibration and/or commissioning is recommended to maintain the accuracy of Annubar. The frequency of this type of maintenance should be established for each individual application.

Liquid Service below 250 °F (121 °C)

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Ensure that primary instrument valves PH and PL are *closed*. Refer to Figure 3-4 for valve designations.
2. Open valves ME, ML, and MH.
   a. For 5-valve manifolds, first open valve MEH, then open valve MEL.
3. Slowly open the low side primary instrument valve PL and then the high side primary instrument valve PH.
4. For 3-valve manifolds:
   a. Open drain/vent valves DVL and DVH to bleed air out of system. Bleed until no air is apparent in the liquid.
   b. Close valves DVL and DVH.

Figure 3-4. Remote Mount Liquid Application



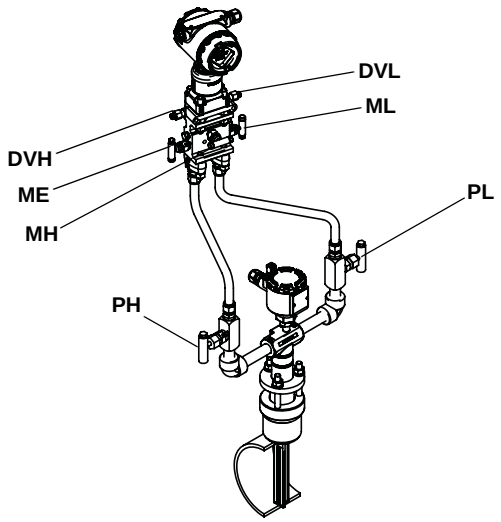
5. For five-valve manifolds:
   a. Slowly open vent valve MV to bleed out any entrapped air in manifold. Bleed until no air is apparent in the liquid.
   b. Close vent valve MV.
6. Gently tap the transmitter body, valve manifold, and impulse piping to dislodge any remaining entrapped air.
   If air remains, repeat steps 4 or 5.
7. Close the low side primary instrument valve PL.
8. Check the transmitter zero by noting the output. If the signal reads outside the range 3.98 mA to 4.02 mA, air is probably still in the system; repeat the procedure from step 2. Perform a zero trim procedure, if necessary.
9. Close equalizer valve(s).
   a. For 3-valve manifolds, close valve ME.
   b. For 5-valve manifolds, first close valve MEL, then close valve MEH.
10. Slowly open low side primary instrument valve PL. The system is now operational.
    a. For 5-valve manifolds only: Open vent valve MV. If valve MV is leaking, valves MEH and/or MEL are not fully closed or require repair. This must be done before taking any readings. Close vent valve MV once verified.

Gas Service

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Ensure primary instrument valves PH and PL are open. Refer to Figure 3-5 for valve designations.
2. Slowly open drain valves DVH and DVL to allow the condensate to drain.
3. Close drain valves DVH and DVL.
4. Close the primary instrument valves PH and PL.
5. Open valves ME, ML, and MH.
   a. For 5-valve manifolds, first open valve MEH, then open valve MEL.
6. Slowly open the high side primary instrument valve PH.
7. Check transmitter zero by noting the reading. If the signal reads outside of the range 3.98 mA to 4.02 mA, condensate may be in the DP transmitter or system; repeat the procedure from step 1 to remove any condensate. A signal outside the range 3.98 mA to 4.02 mA can also be caused by system leaks; check for leaks in system. Perform zero trim procedure, if necessary.
8. Close equalizer valve(s).
   a. For 3-valve manifolds, close valve ME.
   b. For 5-valve manifolds, first close valve MEH, then close valve MEL.
9. Slowly open the low side primary instrument valve PL. The system is now operational.
   a. For 5-valve manifolds only: Open vent valve MV. If valve MV is leaking, valves MEH and/or MEL are not fully closed or require repair. This must be done before taking any readings. Close vent valve MV once verified.

Figure 3-5. Remote Mount Gas Application

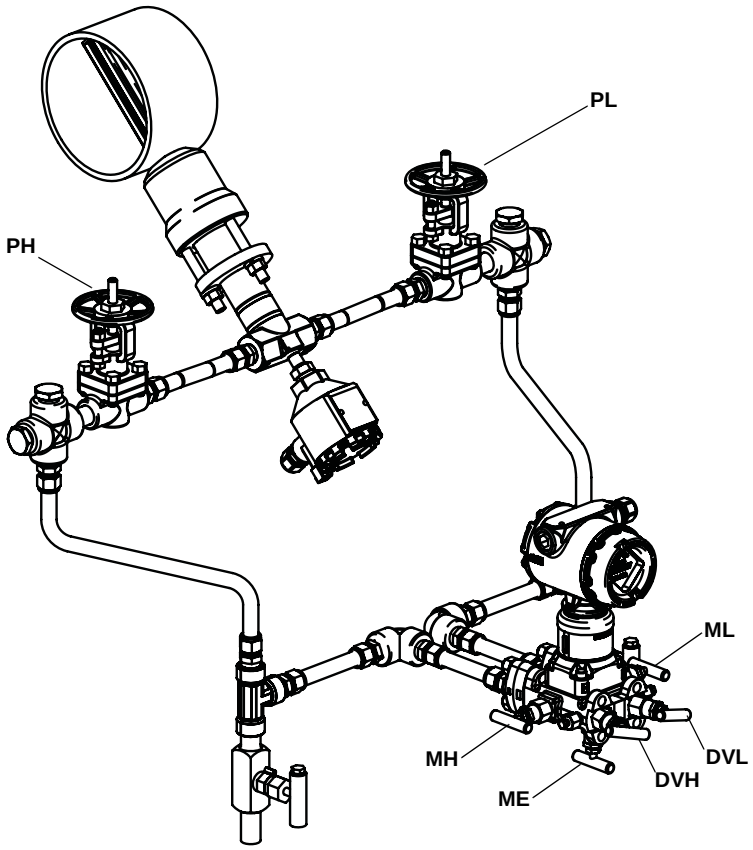


Steam Service or Liquid Service above 250 °F (121 °C)

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Ensure that primary instrument valves PH and PL are *closed*; ME, ML, and MH are *closed*; and DVL and DVH are *closed*. Refer to Figure 3-6 for valve designations.
   a. For 5-valve manifolds, ensure that valves MEH and MEL are *closed*.
2. Fill tees with water on each side until water overflows.
3. Open valves MH, ML, and equalizer valve ME.
   a. For 5-valve manifolds, open valves MH and ML and equalizer valves by first opening MEH, then opening MEL.
4. Briefly, open drain valves DVL and DVH.
5. Tap manifold until no air bubbles are visible.
6. Close both drain valves DVL and DVH.
7. Refill tees with water to the middle of each tee fitting.
8. Gently tap transmitter body, valve manifold, and impulse piping to dislodge any remaining entrapped air.
9. Check transmitter zero by noting the output. If the signal reads outside of the range 3.98 mA to 4.02 mA, air is probably still in the system; repeat this procedure from step 2. Perform zero trim procedure, if necessary.
10. Close equalizer valve ME.
    a. For 5-valve manifolds, first close valve MEH, then close valve MEL.
11. Replace plugs in tees, allowing for air gap at the top of each tee.
12. Slowly open primary instrument valves PH and PL. The system is now operational.
    a. For 5-valve manifolds only: Open vent valve MV. If valve MV is leaking, valves MEH and/or MEL are not fully closed or require repair. This must be done before taking any readings. Close vent valve MV once verified.

Figure 3-6. Remote Mount Steam Installation



Re-Check zero post equilibrium

The following procedures assume the process pipe is pressurized to normal operating pressure and should be followed to obtain a true zero at static or “pipe” pressure.

1. Close primary instrument valves, PH and PL.
2. Remove plugs on tee fittings.
3. Check transmitter zero by noting output. Perform zero trim procedure, if necessary.
4. Re-install plugs on tee fittings.
5. Open primary instrument valves, PH and PL.