ANDERSON GREENWOOD CROSBY

tyco flow control

WARNING

REMOVAL OF THE SEAL WIRES IN AN ATTEMPT TO ADJUST OR REPAIR THIS PRODUCT BY UNAUTHORIZED PERSONNEL VOIDS THE PRODUCT GUARANTEE AND MAY CAUSE DAMAGE TO EQUIPMENT AND SERIOUS INJURY OR DEATH.

DWN	S.WILLIS	8-03-95	**INSTRUCTIONS-INSTALLATION,**		
CHK	R.VIRGIL	8-15-95	**START-UP AND OPERATION FOR**		
APPR	J.ALBERTS	8-29-95	**DUAL PILOT MANIFOLDED TYPE 727**		
APPR			SIZE	**REPORT NUMBER**	REV
APPR			A	**05.9040.250**	D
APPR			PAGE 1 OF 20		

REVISIONS		
REV.	**DESCRIPTION**	**APPROVALS/DATE**
A	ECR #95-277-02	S.WILLIS 10-05-95 R.VIRGIL 10-05-95 J.ALBERTS 10-05-95
B	ECR #95-290-16	S.WILLIS 10-17-95 R.VIRGIL 10-17-95 J.ALBERTS 10-17-95
C	ECN #98-209-26	S.WILLIS 8-12-98 J.DIAL 8-25-98 G.ROWE 8-25-98
D	ECN #01-1877	S.WILLIS 12-03-01 G.ROWE 12-03-01 G.ROWE 12-03-01

SAFETY PRECAUTIONS:

1. When the valve is under pressure, never place any part of your body near the outlet ports of a pressure relief valve.

2. Always wear proper eye and ear protection and clothing anytime you are near pressurized valves.

3. Never attempt to remove a pressure relief valve from a system that is pressurized.

4. Never make adjustments to a pressurized pilot, the valve may inadvertently open which may cause serious injury.

5. Remove or gag the pressure relief valve prior to performing any hydrostatic testing of the system.

1.0 PRE-INSTALLATION HANDLING

The valve inlet and outlet connections should be kept covered until the valve is installed. All valves should be handled with care and not subjected to heavy shocks. A lifting lug is provided on 4″, 6″ and 8″ size valve bodies for lifting.

2.0 VALVE INSTALLATION (SEE FIGURE 1)

2.1 Piping Connections

2.1.1 Inlet Piping

The piping to the inlet of the valve should meet the general requirements outlined in Section 2 of American Petroleum Institute Recommended Practice 520 Part II. This document discusses several inlet piping design considerations and recommends that inlet piping pressure losses not exceed 3% of the set pressure when the valve is relieving at its maximum rated capacity.

2.1.2 Discharge Piping

Discharge piping that redirects the flow 90° is recommended to minimize reactive thrust loads during relief. All discharge piping should be properly braced to withstand the reactive thrust forces.

2.2 Mounting

Mount the valve in a upright position with proper support to withstand system vibration. Refer to Figure 1. **WARNING: DO NOT INSULATE OR LAG ANY PORTION OF THE VALVE ASSEMBLY INCLUDING THE PILOT, ACCESSORIES, AND ASSOCIATED TUBING. FAILURE TO COMPLY WITH THIS WARNING MAY RESULT IN VALVE MALFUNCTION AND/OR SERIOUS DAMAGE TO VALVE COMPONENTS.**

2.3 Remote Sense Connection (Optional Feature)

A remote sense option is available for the Series 700 valves. If this option is selected, a remote sense connector will be installed in place of the rear (farthest from the main valve) bottom cap plug as shown in Figure 1. With this connector in place the main valve internal pitot tube is blocked and an external pressure sensing line must be installed for the pilots to function properly. The sense line must have the equivalent flow area of 3/8" tubing for line lengths up to 10 feet. For line lengths exceeding 10 feet, 1″ or larger piping must be used. The remote sense line must also be sloped sufficiently so as to be self-draining, and must be well insulated to minimize condensate formation and freezing potential. Although it is strongly recommended that isolation valves not be installed in the remote sense line, full bore ball valves (bore same as ID of tubing / piping) may be used for this purpose if required. Use of other valve types / patterns for isolation is prohibited. Failure to comply with these guidelines may result in valve malfunction and / or spurious actuation.

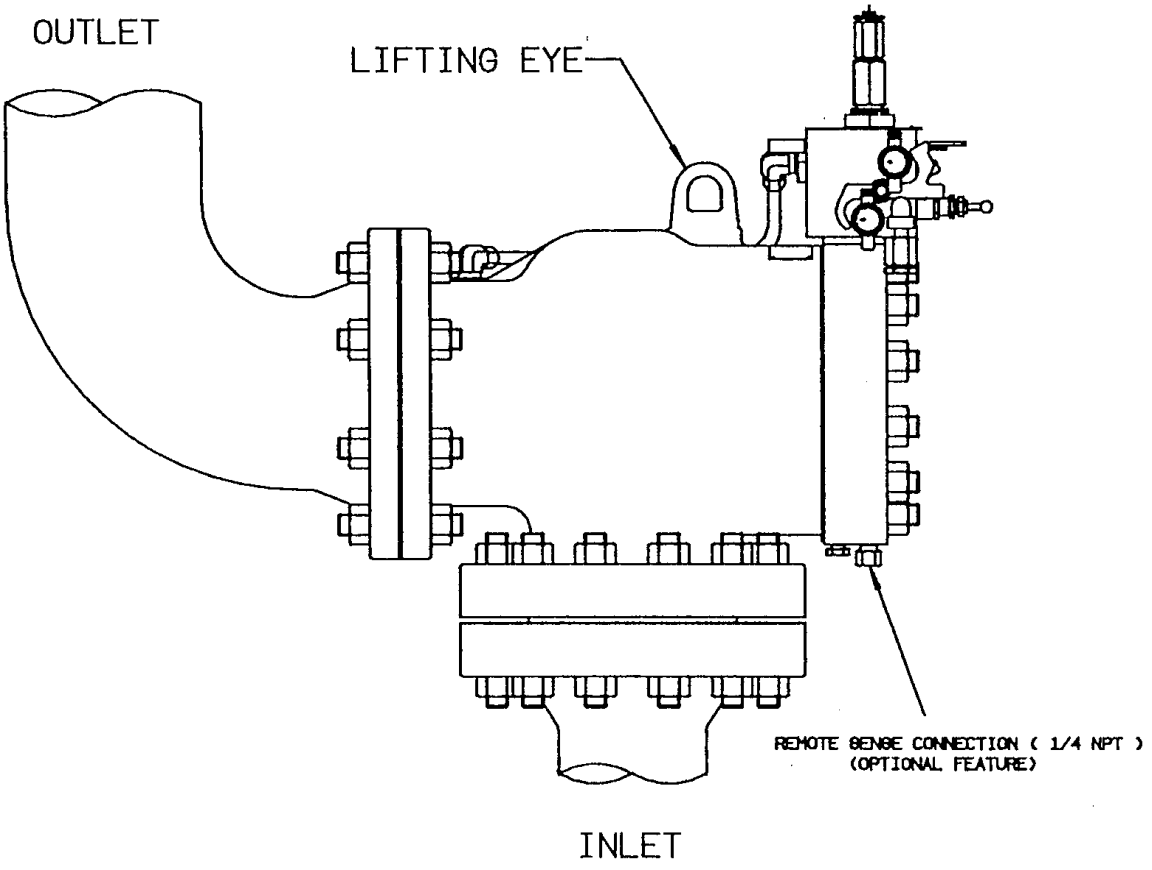

OUTLET
LIFTING EYE
REMOTE SENSE CONNECTION (1/4 NPT)
(OPTIONAL FEATURE)
INLET

FIGURE 1

3.0 VALVE START-UP AND PREHEATING

This valve is shipped from the factory with the "A" (lefthand) pilot active and both pilot manual vent valves closed. To prevent startup problems, fully read Section 5.0 of this report before changing these handvalve positions.

To prevent valve seat damage during shipping, the valve outlet shipping cover has an extension to hold the valve piston off of the valve seat. When this cover is removed the piston will normally close. However, in some cases, the piston may not fully seat when the outlet shipping cover is removed. If this occurs, refer to Appendix A for procedures to seat the main valve piston prior to start-up. **Note that the Appendix A procedures do not apply to 2", 3", and 4" air / gas service valves.** For these specific valves, the main valve piston may normally be seated by turning the valve so that it is standing on the outlet flange with the piston oriented vertically. The weight of the piston will usually move it onto the seat. If the piston still does not fully seat, contact the factory for assistance.

3.1 Block Valve Upstream of Inlet

If block valve is closed and system is at operating temperature and pressure, the main valve body must be preheated to prevent the valve from prematurely opening when pressurized.

If a small bypass valve is available, use this bypass to preheat and pressurize the relief valve prior to opening the block valve.

If a small bypass valve is not available, slowly open the block valve a small amount so that the steam can preheat the valve.

With either method allow a minimum of 15 minutes for temperature and pressure stabilization and then slowly open the block valve to full open position. Safety valve is now on line.

3.2 No Block Valve Upstream of Inlet

If there is no block valve upstream of safety valve inlet, the safety valve temperature and pressure will stabilize during the time required for the system to reach normal operating conditions.

4.0 MAIN VALVE MANUAL OPERATION

An in-service main valve may be actuated (opened) by opening the manual blowdown vent handvalve for the **active** pilot. These handvalves are located on the front face of the manifold. **NOTE:** System pressure must be at least 100 psig to activate main valve using the manual blowdown valve.

5.0 PILOT SWITCH-OVER PROCEDURE

This safety valve has a pilot switch-over device to enable **active** pilot selection and **inactive** pilot isolation. An **active** pilot is one that provides the self-actuating feature of this safety valve and responds (opens) if the system pressure reaches the set pressure stamped on the nameplate of the main valve. An **inactive** pilot is one that has been isolated from system pressure and will not provide the self-actuating feature of this safety valve while isolated. The intent of the dual pilot design is to provide for pilot servicing or replacement by a spare pilot without interrupting over pressure protection for the operating system. **The pilot selector is designed to insure that there will always be at least one active pilot providing system overpressure protection.** Two padlock holes are provided on the selector assembly on the front of the manifold for safety locking of the pilot selector.

5.1 Pilot Switch-over Instructions (See Figure 2)

Before proceeding with the pilot switch-over it is necessary to establish which pilot is **active** and which pilot is **inactive.** Refer to the active pilot indicator on the pilot selector located on the front of the manifold, the word "**ON**" on the pilot selector slide bar will be visible on the **active** pilot side (left or right). The other pilot is the **inactive** spare. **To switch active pilot perform the following steps in the order given:**

WARNING: The pilots and manifold are hot. Always use gloves when operating manifold or handling pilots to prevent burns.

A. Close vent valve #3 on inactive pilot side of the manifold front face.

B. Open isolation valve #1 on inactive pilot end of the manifold.

C. Open isolation valve #2 on inactive pilot end of the manifold. Both pilots are now activated

D. Lift handle on latch plate on inactive pilot end of the manifold.

E. Slide pilot selector bar to inactive side of switch-over manifold.

F. Lower handle on latch plate at newly inactive pilot end of
the manifold.

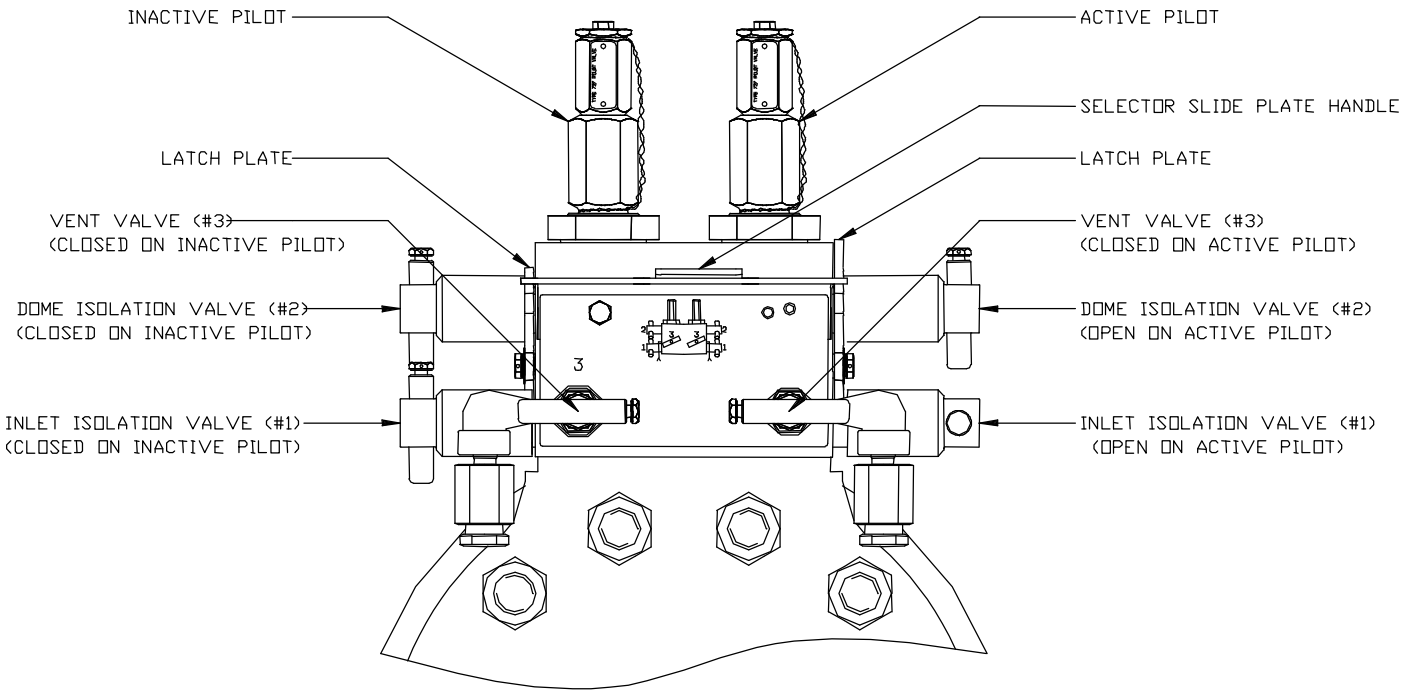

INACTIVE PILOT
ACTIVE PILOT
SELECTOR SLIDE PLATE HANDLE
LATCH PLATE
LATCH PLATE
VENT VALVE (#3)
(CLOSED ON INACTIVE PILOT)
VENT VALVE (#3)
(CLOSED ON ACTIVE PILOT)
DOME ISOLATION VALVE (#2)
(CLOSED ON INACTIVE PILOT)
DOME ISOLATION VALVE (#2)
(OPEN ON ACTIVE PILOT)
INLET ISOLATION VALVE (#1)
(CLOSED ON INACTIVE PILOT)
INLET ISOLATION VALVE (#1)
(OPEN ON ACTIVE PILOT)
3

FIGURE 2

G. Close isolation valves #1 and #2 on new inactive pilot.

CAUTION: Always close the isolation valves #1 and #2 on the inactive pilot. The dual pilot 727 is not intended to be operated with both pilots active. If both pilots are active when a system overpressure occurs the pilot with the lowest set pressure will activate and open the main valve but an extended system blowdown to as low as 70% of pilot set pressure will result.

6.0 PILOT REPLACEMENT (See Figure 3)

6.1 Pilot Removal

CAUTION: Before removing a pilot, verify that it has been rendered inactive with the valves in position as listed in Section 5.0. If they are not, switch the pilots as described in 5.0. To correctly depressure and remove a pilot from service perform the following steps in the order given.

A. Verify that the inactive pilot isolation handvalves #1 and #2 are closed. **CAUTION: Opening the vent handvalve #3 on an active pilot will activate (open) the main safety valve.**

B. Slowly open the inactive pilot vent valve #3 to vent fluid pressure trapped inside the manifold pilot cavity and pilot.

C. Once all indications of fluid venting have stopped the inactive pilot is now ready to be removed. Use a 2″ open or box end wrench to loosen the pilot hexagonal retaining bushing. Slowly rotate the bushing counter clockwise until it is free from the manifold, then lift the inactive pilot from the manifold.

WARNING: If during the bushing removal process, fluid venting is observed at the main pilot vent fitting on the rear of the manifold behind the pilot, immediately stop loosening the pilot bushing and verify pilot isolation valves #1 and #2 are fully closed and vent valve #3 is fully open.

D. After pilot removal check the pilot body to see if either the pilot's metal wedge seal or its metal o-ring seal have been retained on the pilot. **NOTE:** If the metal o-ring is found to have been retained on the pilot then save it for installation on the replacement pilot rather than attempting to replace it in the manifold bore. The metal wedge seal is best replaced in the manifold bore.

E. A screw-in safety cap is connected to the front of the manifold by a wire cable. This cap should be installed any time a pilot is removed from the manifold to prevent uncontrolled fluid venting should an inactive pilot isolation valve be accidentally opened and to keep foreign objects out of the pilot socket.

6.2 <u>Pilot Installation</u> (See Figure 3)

The cartridge pilot metal o–ring dome isolation seal and metal wedge main seal are reusable and do not generally require replacement during pilot change out. If seal replacement is to be performed see the Insruction sheet supplied in the Replacement Pilot Mounting Seal Kit for instructions.

A. Before installing a replacement pilot check for and insure the two required pilot seals described above, are in place in the manifold socket. **NOTE:** If the metal o-ring came out with the old pilot, install it on the replacement pilot prior to inserting it into the manifold. Also inspect the socket to insure that it is clean and it is clear of debris.

B. Lightly lubricate the pilot's metal o-ring contact surface and pilot bushing threads with Fluorolube or silicone lubricant.

C. Insert the replacement pilot into the manifold socket until its mounting bushing engages the socket thread and then tighten the bushing clockwise by hand as far as possible. The pilot insertion should be done with some care to prevent damaging either the pilot sealing surfaces or the pilot seals.

NOTE: During pilot insertion it is possible for the top edge of the wedge seal to catch on the bottom o-ring stop diameter on the pilot. If this occurs a slow rotation and wobbling of the pilot should free it and allow the pilot to be fully inserted.

D. Final pilot bushing tightening should be performed using a 2″ open or box end wrench. Slowly tighten bushing until the pilot is felt to seat against the wedge seal.

CAUTION: A maximum wrench torque of 70 to 80 ft-lbs. is required for wedge seal seating and the mounting bushing can be damaged by excessive tightening. Do not use a cheater or hammer wrench for bushing tightening.

6.3 Pilot Seal Tightness Test

Each time a pilot is installed it is recommended that the tightness of its main seat and wedge ring seal be verified on system fluid pressure as follows:

A. Close the inactive pilot's vent valve #3 and slowly open its inlet isolation valve #1 to pressurize the pilot.

B. After allowing a minimum of 15 minutes for pilot heating and expansion, reclose Isolation Valve #1 and check that pilot wedge seal is fully seated in the manifold using a 2″ wrench on the pilot bushing. The maximum torque required to accomplish the pilot wedge seal's seating is still approximately 70 to 80 ft-lb. Do not use excessive force or a cheater bar or wrench extension when tightening this bushing.

C. Slowly reopen inlet Isolation Valve #1 and check the pilot main vent on the back side of the manifold block for any signs of audible leakage or visible wisping of condensate. If no leakage is observed then either close the pilot's Inlet Isolation valve #1 and slowly crack its Vent Valve #3 to vent and drain the pilot cavity or, if desired, switch this pilot to active service by the procedure set forth in Section 5.0.

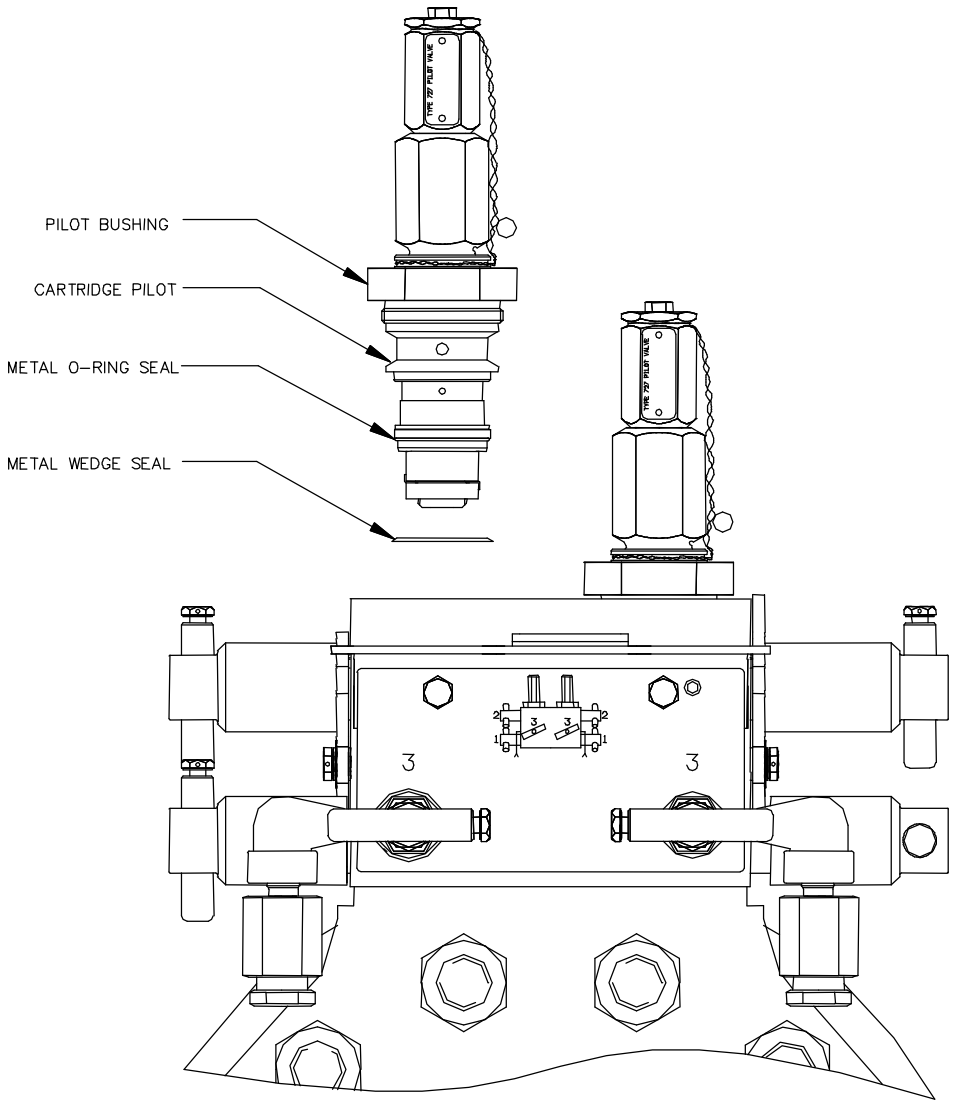

PILOT BUSHING
CARTRIDGE PILOT
METAL O-RING SEAL
METAL WEDGE SEAL
3
3

FIGURE 3

7.0 FIELD TEST - PILOT SET PRESSURE VERIFICATION

On a cold valve start-up a minimum of 2 hours should be allowed for proper pilot temperature stabilization before performing a pilot field test.

The Field Test Assembly required for testing is shown in Figure 4.

WARNING: Never attempt to perform the procedures described below on an active pilot. Opening vent valve #3 will result in venting of hot steam or gas and can cause the main valve to open.

CAUTION: The following procedure does not interfere with the safety function of the active pilot and if the operating system pressure increases to the pilot's nameplate set pressure at any time while you are performing the following procedure, the active pilot will respond and actuate the main valve to protect the system.

7.1 Pilot Set Pressure Verification (See Figure 4)

A. Insure that the pilot for which you are verifying set pressure is inactive and its isolation valves #1 and #2 are closed. (Refer to Section 5.0 for instructions on activating and de-activating pilots).

B. Open the vent valve #3 on the inactive pilot. This should be done with caution as a small volume of pressure may be relieved from the pilot through the vent port fitting on the end of the manifold.

C. Remove the steam quenching vent fitting from the 1/4 NPT elbow fitting on the inactive pilot vent and connect the test assembly hose to this adapter using an appropriate high pressure hose adapter on the elbow fitting.

D. Close the vent valve of the test gas supply.

E. Slowly open the test gas supply valve and read test supply pressure on test gauge.

F. Slowly increase test pressure until pilot pops.

G. Record popping pressure.

H. Repeat pop test as required until three consistent pops are observed. **NOTE:** Every actuation of a pilot increases the wear on that pilot's lapped seat components and reduces their operational life so pilot test actuations should be kept to a minimum for maximum pilot seat life.

For set pressures below 70 psig the measured pop pressure should be within ±2 psi of the nameplate set pressure stamped on the nameplate of the pilot and main valve. For set pressures 70 psig and above the measured pop pressure should be within ±3% of the nameplate set pressure stamped on the nameplate of the pilot and main valve.

I. When testing is completed, close the gas bottle valve and open the vent valve on the gas test supply to vent test pressure in the pilot and hose assembly.

J. Close vent valve #3 on the tested pilot, remove test assembly hose and replace steam quenching fitting on vent elbow fitting.

CAUTION: After testing always return the vent discharge to its factory installed downward orientation to direct venting steam downward and away from the manifold operator during active pilot venting for manual main valve actuation.

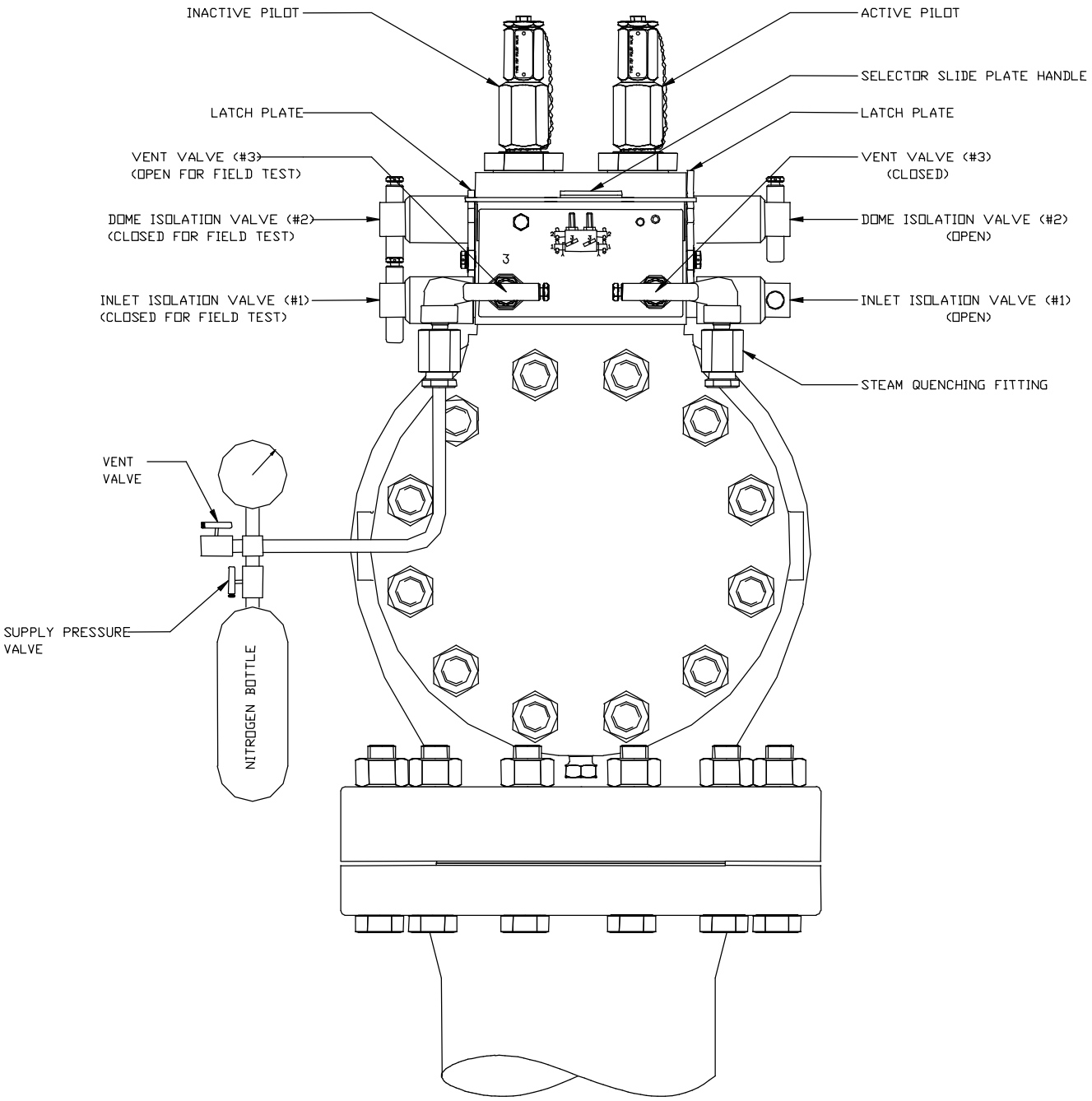

INACTIVE PILOT
ACTIVE PILOT
SELECTOR SLIDE PLATE HANDLE
LATCH PLATE
LATCH PLATE
VENT VALVE (#3)
(OPEN FOR FIELD TEST)
VENT VALVE (#3)
(CLOSED)
DOME ISOLATION VALVE (#2)
(CLOSED FOR FIELD TEST)
DOME ISOLATION VALVE (#2)
(OPEN)
INLET ISOLATION VALVE (#1)
(CLOSED FOR FIELD TEST)
INLET ISOLATION VALVE (#1)
(OPEN)
STEAM QUENCHING FITTING
VENT
VALVE
SUPPLY PRESSURE
VALVE
NITROGEN BOTTLE

FIGURE 4

8.0 PILOT GAG (See Figure 5)

A gag rod is an optional accessory used to keep the pilot and main valve closed when testing a system at pressures above the pilots set pressure.

8.1 Gagging Procedure

A. Place spare pilot in service as described in Section 5.0 (Pilot Switchover Instructions).

B. Remove screw in top of cap of now “Inactive” pilot.

C. Insert gag rod and screw into cap until it contacts the lower spring washer, tighten rod hand tight and tighten locknut. - **CAUTION: OVERTIGHTENING WHEN INSTALLING THIS ROD WILL DAMAGE THE PILOT SEAT**.

D. Place gagged pilot in active service and place opposite pilot in “inactive” condition. The isolated “Inactive” pilot does not require gagging.

E. To remove gag place gagged pilot in “Inactive” condition, loosen rod locknut, unscrew and remove gag rod, and replace screw in pilot cap.

WARNING: NEVER LEAVE A PILOT GAGGED DURING NORMAL SYSTEM OPERATION. THE SAFETY VALVE WILL NOT OPEN IF AN OVERPRESSURE CONDITION OCCURS.

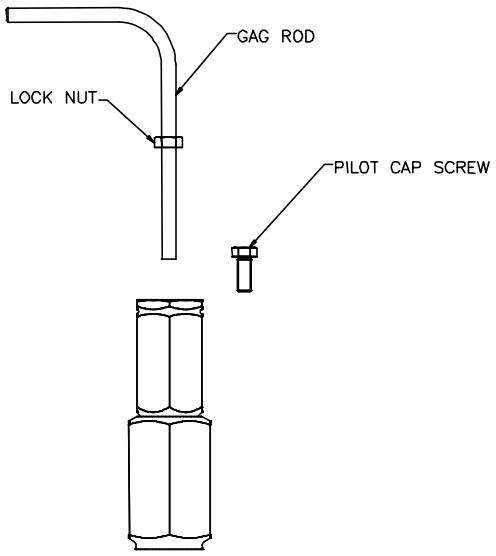


FIGURE 5

9.0 MAINTENANCE

Maintenance on both the main valve and pilot internals should be performed on a regular basis. The interval between inspection and maintenance will depend on the service conditions and frequency of valve operation. All maintenance should be performed only by factory trained personnel.

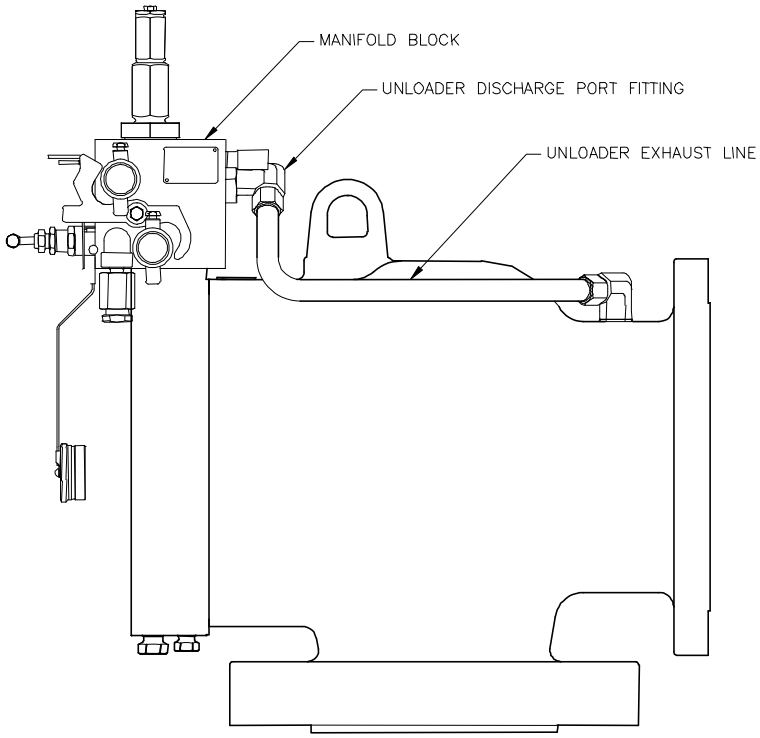
Servicing for this product is available from both the factory and factory authorized service centers worldwide. For the location of the authorized service center nearest to your location contact your local Factory Sales Representative.

Valve maintenance and service training is available from the factory. For maintenance training information, contact:

Attn: Valve Services,
Anderson, Greenwood & Co
P.O. Box 944
Stafford, TX 77497-0944
Phone: (713) 274-4476
Fax: (713) 240-1800

APPENDIX A

MAIN VALVE PISTON SEATING PROCEDURES

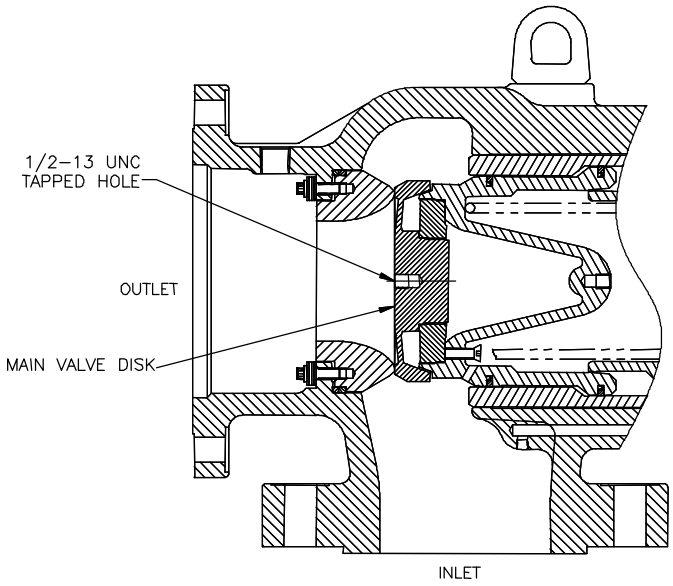


Manifolded Dual Pilot 727

Instructions for Seating Steam Service Main Valve Piston

Note: The following procedure is to be employed only in the event that the main valve piston is not fully seated prior to startup. **This procedure is not applicable to air / gas service valves.**

1. Loosen tube fitting nuts on both ends of unloader exhaust line and remove exhaust line.
2. Remove unloader discharge port fitting (located on back side of manifold block).
3. Connect pressure source (i.e. gaseous nitrogen) to unloader discharge port and apply 150 – 200 psig to push main valve piston on to seat.
4. Disconnect pressure source.
5. Reinstall unloader discharge port fitting and unloader exhaust line.



6" – 8" VALVES

Manifolded Dual Pilot 727

Alternate Instructions for Seating Main Valve Piston – 6" and 8" Valves Only

Note: The following procedure is to be employed only if the main valve piston is not fully seated prior to startup. This procedure may be used with either steam or air / gas service valves.

1. Install ½-13 UNC eyebolt in tapped hole located in center of main valve disk (accessed through valve outlet).
2. Gently pull piston onto seat using eyebolt.
3. Remove eyebolt from disk.