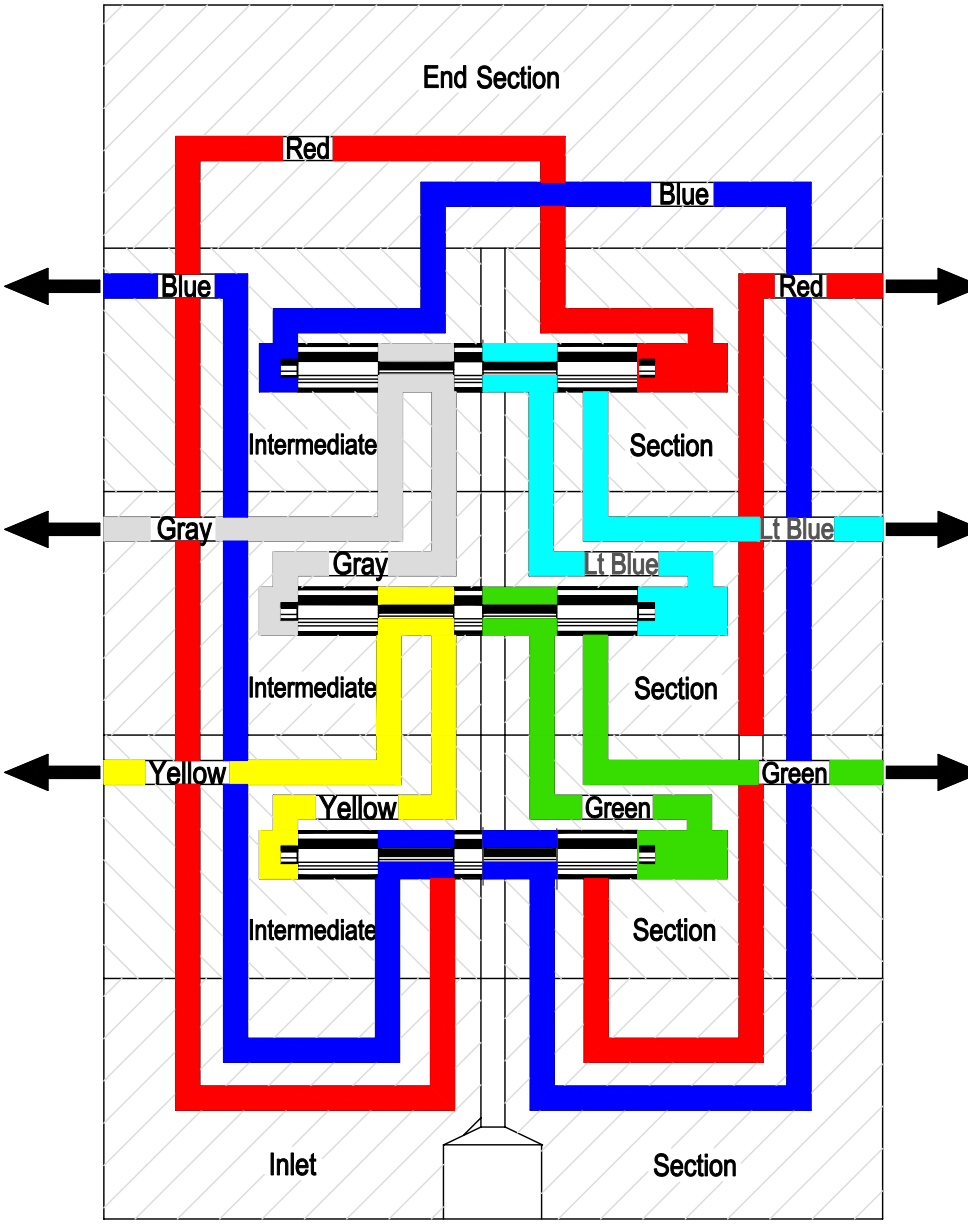
End Section
Red
Blue
Blue
Red
Intermediate
Section
Gray
Lt Blue
Gray
Lt Blue
Intermediate
Section
Yellow
Green
Yellow
Green
Intermediate
Section
Inlet
Section

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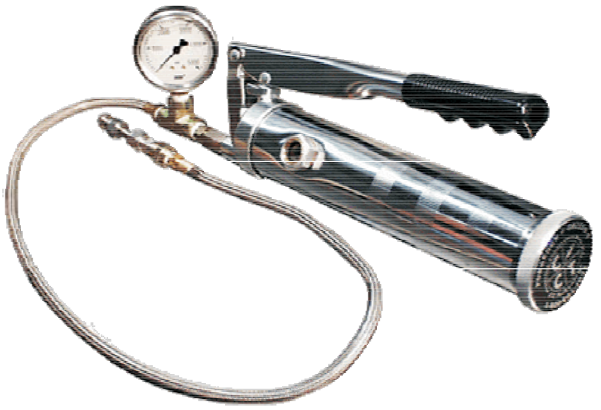
Purging Air from Divider Block Lubrication Systems

Divider block lubrication systems operate correctly only when all air has been purged from tubing lines and components. Using a lubrication system purge gun for manual air bleeding is necessary in the event any lubrication system components (tubing connections, divider blocks, indicator port plugs or piston enclosure plugs) are loosened, disconnected, or removed after their initial installation. Although lubrication systems can eventually self purge, this severely delays purging air from the total lubrication system and can result in phantom shutdowns, alarms or component failure. The small volume of oil supplied by each stroke of the lube pump results in a much slower rate of oil flow compared to the volume of oil injected by a manual hand pump. Therefore the use of a lubrication system purge gun becomes a necessity before startup or after maintenance. This will ensure that all air trapped in the lubrication system is completely removed.

Lubrication System Purge Gun



Note: Use only clean filtered oil common to the system when purging the divider block lubrication system.

Follow this procedure after installing any divider valve assembly, replacing tubing to divider valves, replacing individual divider blocks or when indicator port plugs or piston enclosure plugs are loosened or removed.

Step 1: After maintenance or before compressor start-up loosen the tubing connections at the inlet of the master divider valve, cylinder and packing gland injection points. If there are secondary divider valves loosen tubing connections at the inlet of the secondary divider valves .

Step 2: If a purge port is available at the pump head connect the purge gun. If no purge port is available remove the tubing from the discharge side of the pump and connect the purge gun to the tubing.

Step 3: Pump clean oil common to the system into the tubing line until there are no air bubbles observed flowing from the tubing connection at the inlet of the master divider valve. Always hold purge gun in a vertical position to eliminate pumping air into the system.

Step 4: Tighten the tubing connection at the inlet of the master divider valve while oil is still flowing.

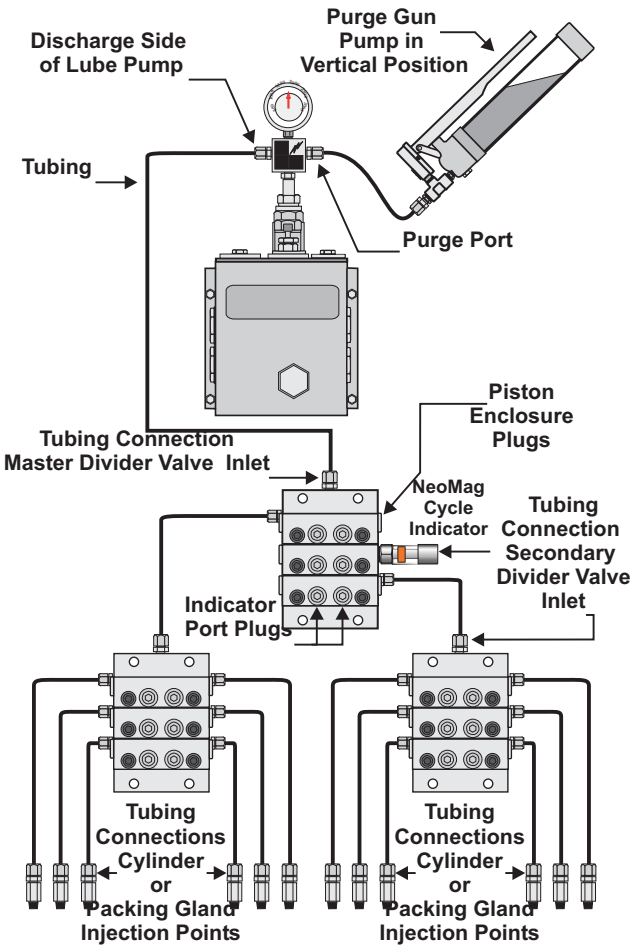
Step 5: Continue to operate the purge gun until no air bubbles are observed flowing from the tubing connection at the inlet of the secondary divider valve.

Step 6: Tighten the tubing connection at the inlet of the secondary divider valve while oil is still flowing.

Step 7: Continue to operate the purge gun until there are no air bubbles observed flowing from the tubing connections at the cylinder or packing gland injection points.

Step 8: Tighten the tubing connections at the cylinder and packing gland injection points while oil is still flowing.

The lubrication system is now ready to operate.



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Recommended Yearly Preventive Maintenance

To insure reliable operation of and accuracy of delivery from existing Trabon Lubrication Systems in operation on compressors, engines, and critical equipment.

1. Replace High Pressure Filter Element

2. Pressure test all divider blocks for bypass. Replace all divider sections with new which fail.

3. Drain & Replace oil in Gear Reducer-use 90 weight oil

4. Drain & Replace oil in Lubricator Reservoir. Use either gear oil or whatever oil is being pumped from the tank to the compressor.

5. Drain condensate and dirt from bottom of tank. Use the condensate drain valve for this purpose unless a high volume of dirt is found. If highly contaminated, drain the tank using 1/2" spuds on either end of the tank, flush and re-fill with proper oil.

6. Replace Rupture Disc. Tighten lightly, hand tight and a little more with a wrench.

7. NOTE: When opening, cleaning, draining for replacing any system component, care must be taken to remove all air from the system prior to start up. Open fittings at pump inlets to insure clear oil supply. Operate pumps with inlet to gauge assembly open to clear all air. Open inlet fitting of divider assembly and do the same thing. Cycle entire system to remove air from divider. Crack vent screws on top of divider assembly until clear oil is emitted. A portable hand pump is handy for this purpose.

8. Open pump adjustments wide open (turn adjusting screw full counter-clockwise) Hand stroke each pump and verify increased oil delivery at monitor to insure pumps are primed and operating.

9. Shut-off spare pump (turn full clockwise), and adjust active pump stroke for proper oil delivery at monitor. If equipped, alternating use of active and spare pump yearly will insure longest life for both.

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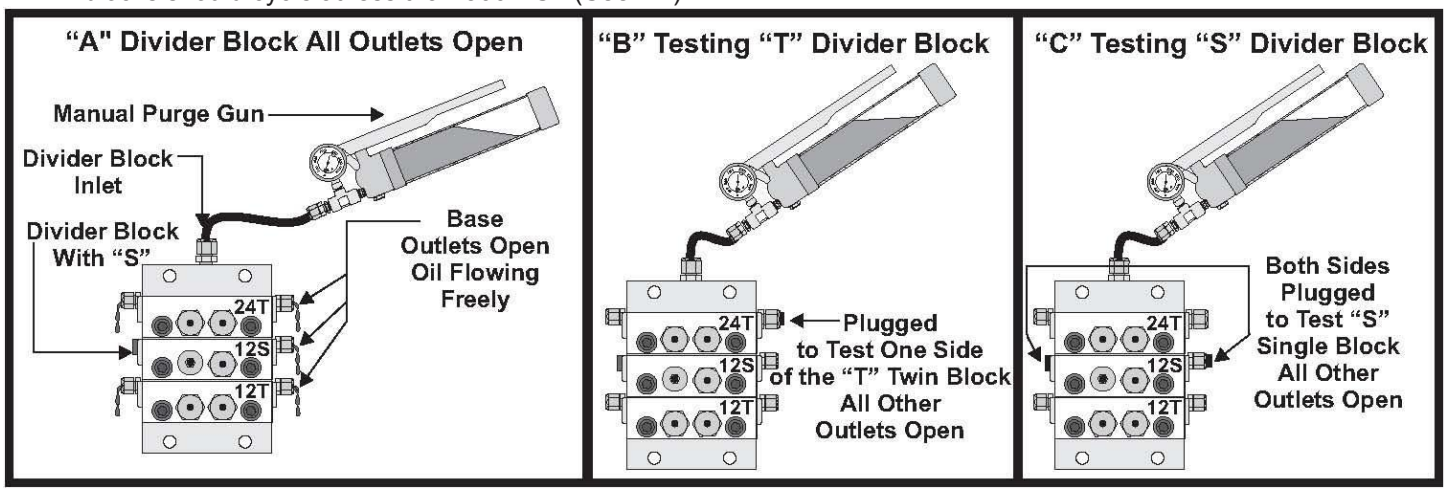
Pressure Testing Divider Blocks For By-Passing

All divider blocks are metal to metal sealing surfaces and the possibility of oil passing around the piston to a point of least resistance is always present. By-passing can be a result of excessive clearance between the piston and bore of a new divider block or from millions of cycles each year causing wear between the piston and bore. For this reason it is necessary to test each individual divider block before installation and/or after continued use. This will confirm the piston to bore tolerances are close enough to build adequate pressure to force oil into the injection point. Note: Never assume tolerances between the piston and bore are acceptable even if the divider block is new and the piston is cycling properly. Pressure test all divider blocks in low to medium service at least every two years. When high injection pressures are present or there is no filtration of the oil before the lubrication system the divider blocks should be pressure tested or replaced every 12 months. Divider blocks are much less expensive to replace than compressor cylinders, rods or packing, not to mention the cost of labor and lost revenue from down time.

Procedure for Testing Divider Blocks For By-Passing

To test divider blocks for by-passing, a manual purge gun equipped with a pressure gauge and capable of developing 5000 PSI is necessary. For pressure testing the divider block use a 10-weight oil at room temperature to simulate hot oil. Test each divider block assembly complete with pin indicators installed. Test only one divider block at a time..

A. Place the divider block assembly in an open container with all base outlets open. Connect the purge gun to the inlet of the divider block assembly. Operate the purge gun to cycle the divider block several times to purge air from the assembly and verify that oil will flow freely from all outlets. Divider blocks should cycle at less than 300 PSI. (See “A”)



Divider blocks stamped with a “T” should have only one outlet on the base plugged during testing of that side of the piston. Each outlet of the divider block stamped with a “T” must be plugged and tested one side at a time (See “B”). Individual testing of each outlet ensures both sides of the piston will build adequate pressure. All divider blocks stamped with an “S” on the front should have both outlets on the base plugged to test for by-passing (See Figure “C”) This will test both sides of the piston at the same time.

B. Plug the outlet on the base under the divider block being tested with a 1/8" pipe plug. If a tubing fitting is installed in the base, plug the fitting with a tubing plug. Leave all other outlets open. Operate the purge gun until the pressure gauge indicates 4500 PSI. The block may cycle once or twice, but should pressure to 4500 PSI immediately. Stop pumping oil into the divider valve at 4500 PSI. Check the plug in the discharge outlet to confirm there are no external leaks. The pressure gauge should not lose more than 1000 PSI during a 30-second test. Note: Testing the divider blocks at higher pressures is necessary if the application dictates higher system operation.

If the pressure gauge on the purge gun drops suddenly and oil squirts from the other outlets, a by-pass condition exists. The piston is worn and is allowing oil to by-pass. This is not acceptable and the divider block must be replaced. If the tested block does not lose more than 1000 PSI in 30 seconds, relieve the pressure, move the plug to the next outlet and repeat the same test. After all divider blocks have been pressure tested with this recommended procedure, the divider blocks should be reassembled, purged with oil and put back in service.

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Locating Blockage in Divider Block Lubrication System

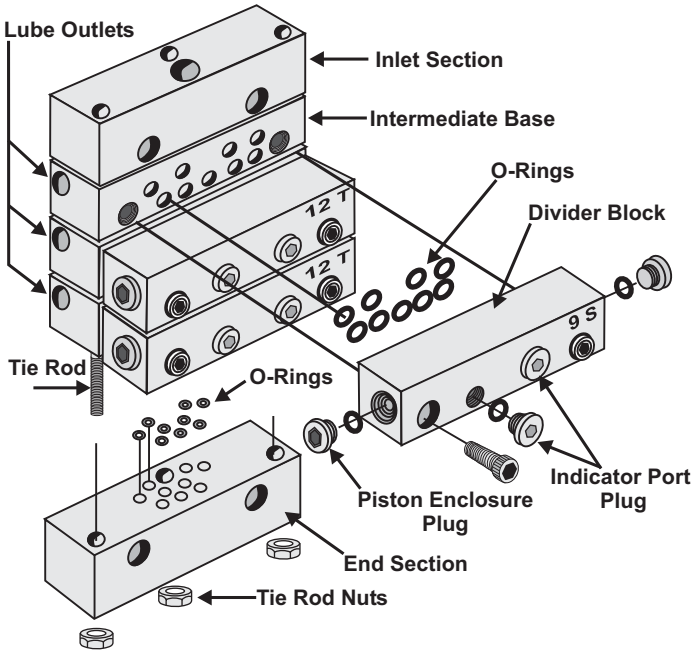

Figure A. Components of The Divider Block Assembly
(see pages 20,21,22)

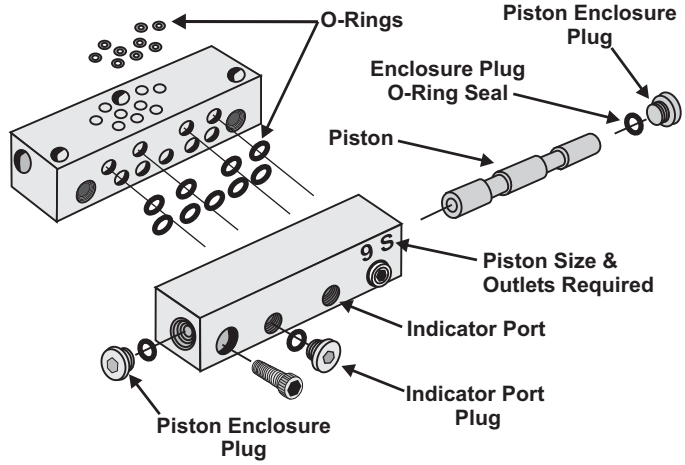

Figure B. Intermediate Base & Divider Block

DIVIDER BLOCK ASSEMBLY DESCRIPTION

The divider block assembly consists of an inlet and end section, intermediate sections plus a minimum of three divider blocks. The divider block baseplate assembly is held together with tie rods and nuts. (Figure A). Each divider block contains a piston of predetermined size to inject a calculated amount of oil into each point receiving lubrication.

A Master Divider Block is the first divider block downstream from the lube pump. A Secondary Divider Block is any divider block receiving oil from the master divider block.

BLOCKAGE IN THE SYSTEM

If blockage occurs in the divider blocks, lube lines, check valves or injection points the system will build excessive pressure attempting to overcome the blockage. Excessive pressure is limited and signaled by the use of pressure indicators and atmospheric rupture assemblies.
When blockage occurs and oil flow discontinues, monitoring devices protect the compressor by alarm or compressor shutdown.

DIVIDER BLOCK IDENTIFICATION

Stamping located on the front of the divider block indicates the quantity of oil discharged by that particular block with each cycle of the piston. The oil discharged with each cycle of the piston is expressed in thousandths of cubic inches (12 = .012 ^{3} in , 9 = .009 ^{3} in , etc.). Divider blocks are manufactured to require one (1) or two (2) outlets unless cross port bars are designed into the system. The number of lube outlets required is indicated by a stamped letter (S= single, one outlet only, T= twin, two outlets required). See Figure B. Never block any outlet that is designed to discharge lubricant.
Notice: Divider block pistons are individually fitted to each bore to extremely close tolerances and cannot be turned end for end or interchanged with other pistons.

CONTAMINATION BLOCKAGE

Dirt or foreign material of any form cannot be tolerated and will cause serious damage or blockage to the lubrication system components. If contamination does not cause immediate malfunction, it will greatly reduce the expected life of the divider block system components. Cleaning the divider block and components will only temporarily solve the problem. The source of contamination must be eliminated. Proper filtration of oil to at least 25 microns before entering the lube system is essential for trouble free dependable lubrication system operation. All filter elements must be changed on a periodic basis.

SEPARATION BLOCKAGE

Hard wax or soap like deposits in the divider block system indicate separation of the lubricant thickener out of solution or the presence of animal fat lubricants. Cleaning the divider block system will only temporarily solve this problem. Consult you lubricant supplier for alternate lubricants. When changing to a new lubricating oil always inquire if they are compatible to avoid problems with the lubricator pumps, divider blocks and check valves.

AIR

Air cannot be tolerated in lines or components. Although not usually the cause of damage to the lube system, air in the lube lines and components is often the cause of system locking, lubrication failure or phantom compressor shutdown. All divider block system components must be full of oil and free of air for proper operation.

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Purging Air from Divider Block Lubrication Systems

Blockage in divider block systems is caused by: (1) Crushed Tubing Line (2) Blocked Injection Point (3) Improperly Drilled Fitting (4) Dirt or Foreign Material (5) Air in the System

Make a visual inspection of the system and check for crushed tubing lines. Check to ensure all divider blocks required to discharge oil do not have pipe plugs installed in the base plate outlet. Divider blocks with a letter “T’ stamped on the front should have (2) two outlets open from the base plate. Divider blocks with a letter “S” stamped on the front should have (1) one outlet open on the base plate and one outlet plugged.

ALL SERVICING MUST BE DONE UNDER THE CLEANEST POSSIBLE CONDITIONS
Dirt, foreign material and air are the worst enemies of all lubrication systems. Always use clean filtered oil common to the system when using a purge gun to locate blockage and purging the lubrication system.

(A): Divider Block Systems with One Divider Valve Assembly and Reset Pressure Indicator Pins:

Step A1: Connect a manual lubrication system purge gun to the inlet of the divider block assembly or purge port on the pressure cross assembly as shown on page 8 Figure "C" and slowly operate pump. Continue to raise pressure until an indicator pin pops out. See page 8 Figure "D". If no indicator pin pops out, blockage is in the divider block assembly. See Step 4 page 8. If an indicator pin pops out, the extended pin indicates blockage down the discharge line common to that pin. Remove the tubing connection from the check valve at the injection point common to the divider block with the indicator pin extended out. Slowly operate the purge pump. If high pressure exists check tubing and fittings. If the purge pump operates freely and oil flows from the tubing, connect the purge pump to the check valve at the injection point. Slowly operate the purge pump. If high pressure exists the check valve or the injection point on the cylinder or packing gland is plugged. Correct as necessary. Always test the check valve for reverse leakage by pumping oil into the outlet side. If oil leaks through the check valve replace it immediately.

(B): Divider Block Systems with One Divider Valve Assembly without Reset Pressure Indicator Pins:

Step B1: With manual purge gun connected to the divider block or purge port on the pressure cross assembly as in Step A1, remove each indicator port plug one at a time and slowly operate the pump. Do not exceed 1,000 PSI. If pressure on the gauge holds replace the indicator port plug. Remove and replace each indicator port plug one at a time until pressure drops on the pressure gauge and the divider block cycles freely when operating the purge pump. If the pressure gauge drops after removing an indicator port plug and the divider valve cycles freely the blockage is downstream of that individual divider block. Replace the indicator port plug and remove the tubing connection from the check valve at the injection point. Slowly operate the purge pump. If high pressure exists check tubing and fittings. If the purge pump operates freely and oil flows from the tubing connect the purge pump to the check valve at the injection point. Slowly operate the purge pump. If high pressure exists the check valve or the injection point on the cylinder or packing gland is plugged. Correct as necessary. Always test the check valve for reverse leakage by pumping oil into the outlet side of the check valve. If oil leaks through the check valve replace it immediately. If all indicator port plugs are removed and the divider block will not cycle, blockage is in the divider block assembly.

(C):Divider Block Systems with Master and Secondary Divider Blocks with Pressure Indicator Pins installed:

Step C1: Connect a manual lubrication system purge gun as shown on page 9 Figure "E" to the inlet of the master divider block assembly or purge port on the pressure cross assembly and slowly operate pump. Continue to raise pressure until an indicator pin pops out. See page 8 Figure "D". The pin indicates blockage down the discharge line common to that pin. If an indicator pin pops out, see Step 2. If no indicator pin pops out, blockage is in the master divider block assembly.

(D): Divider Blocks Without Pressure Indicator Pins:

Step D1: With manual purge gun connected to the master divider block or purge port on the pressure cross assembly remove each indicator port plug one at a time and operate the pump. Do not exceed 1,000 PSI. If pressure on the gauge drops and the divider block cycles freely after an indicator plug is removed, the blockage is downstream of that individual divider block. See Step 2. If all indicator port plugs are removed and the master divider block will not cycle, blockage is in this divider block assembly.

Step 2: Testing indicates blockage is located downstream of the Master divider block. If installed remove the indicator pin, or indicator port plug and connect the purge gun to the indicator port on the front of the master divider block that feeds the blocked line. See page 9 Figure "F". Remove all indicator port plugs in the secondary divider block assembly. If oil can be easily pumped through all indicator ports, the blockage is not in the tubing line or the divider valve. See Step 3. If oil does not flow freely through the indicator ports the blockage is in the secondary divider block or its supply line. Disconnect the tubing line from the inlet of the secondary divider block assembly and pump the purge gun to verify blockage is not in the tubing line. If blockage is in the divider block assembly.

Step 3: Remove indicator port plugs or indicator pins from the secondary divider blocks. Connect purge gun to each indicator port of the secondary divider blocks one at a time and slowly operate pump. See page 9 figure "G". If high pressure exists in any port tested blockage has been located. Check tube, fittings, check valves, packing gland and cylinder injection points by pumping oil into each. Correct as necessary.

Locating Blockage Cont...

Step 4: When testing indicates blockage is in the divider block, before disassembly, remove all piston enclosure plugs. See page 6 Figure A. Without removing the pistons use a brass rod and finger pressure only to move each piston back and forth. If all pistons are moveable, replace the enclosure plugs and retest the assembly by pumping oil into the inlet. (Blockage may have been dislodged and the assembly may be in working condition without further service.)

If piston is jammed or wax like substance or dirt is found in the piston bore, the divider block must be disassembled and cleaned. Before removing, make a note of divider block positions on the base from top to bottom. See Figure C. (Example 9T-12T-24T). Working with one block at a time, remove the piston with a brass rod. If the piston is stuck, try removing it in the opposite direction. The piston may have to be forced out by lightly tapping it with a brass rod only. Do not use any type of hard metal object to remove the piston. After removal, thoroughly wash the piston and divider block with a clean suitable solvent. Blow out all ports in the divider block and use a small piece of wire to clean out all passages. Inspect divider block bore and piston for scratches or score marks. If either of these are damaged a new divider block must be installed. The final step is to thoroughly clean the base sections and blow out all ports with compressed air.

Caution: DO NOT use emery cloth, bearing cloth or any type of abrasive substance to clean or smooth any piston or bore. To do so will cause the divider block to bypass and can cause extensive damage to compressor components. Pistons are precision fitted to each bore to extremely close tolerances and cannot be turned end for end or interchanged with other pistons.

After entire divider block assembly has been cleaned, inspected and all blocks and pistons appear in good condition, lubricate and reassemble, positioning the divider blocks on the base in their original order as per notes. Make sure all pistons slide smoothly and fit snugly in divider block bores. After assembly, test for proper operation and purge the system with a purge gun using oil common to the system. **To insure proper operation of the divider block system, it is absolutely necessary that all tubing and components be filled with clean oil common to the system. All air must be purged from tubing and components before start-up.**

Figure "C". Lubrication System with One Divider Block Assembly

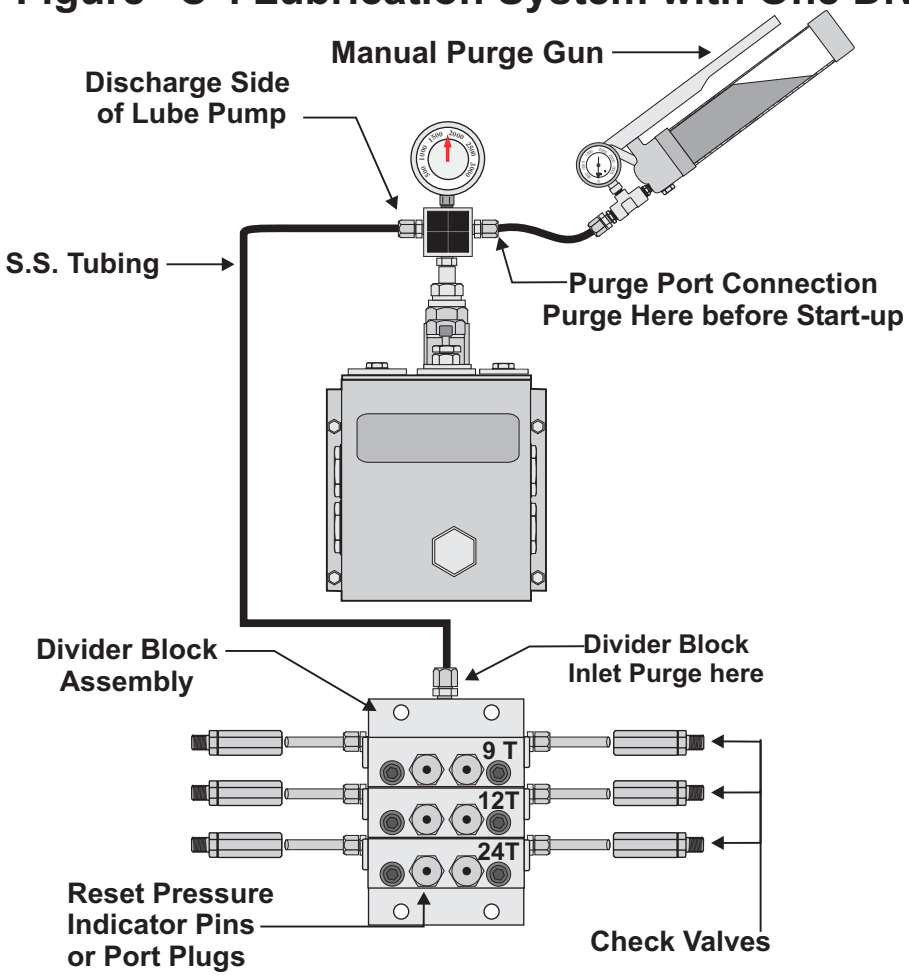
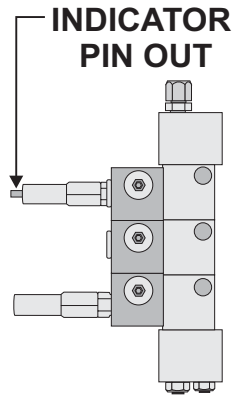


Figure "D".



Divider Block Side View

Locating Blockage Cont...

Figure "E"
Lubrication System with Master and Secondary Divider Blocks

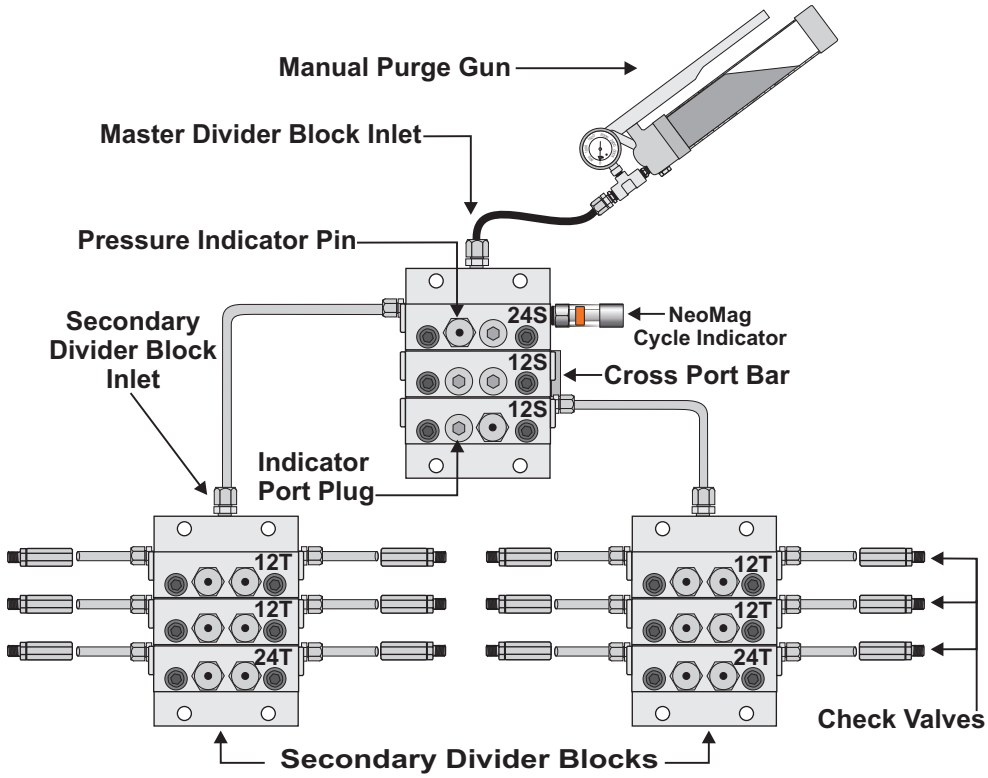
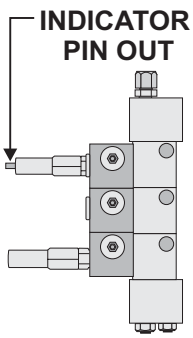


Figure "D".



Divider Block Side View

Figure "F"
Locating Blockage Down Stream of Master Divider Block

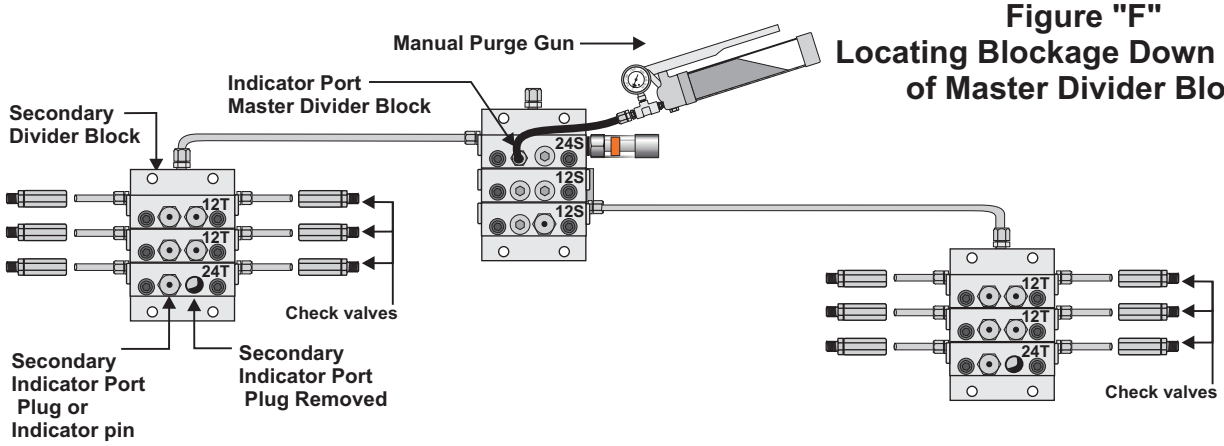
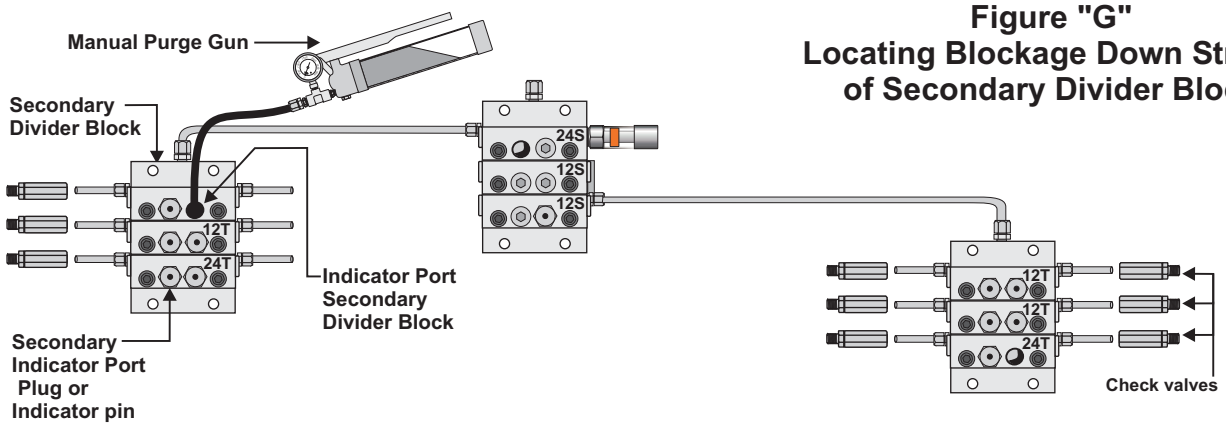


Figure "G"
Locating Blockage Down Stream of Secondary Divider Block



Rupture Indicator

Rupture indicators are used on MH divider valve applications where lube system pressures exceed 2,500 psi. The high pressure from lube line blockage causes a disc to rupture. The lubricant then forces an indicator pin to protrude, locating the blockage. (See Figure 5.) The high pressure backs up through the system and trips a switch to shut the system off. When the fault is corrected, the disc must be replaced and the pin reset manually. See Table 4 for ordering data and Figure 6 for dimensions.

Pressure (psi)	1/8-27 NPTF	1/8-27 NPSF w/O-Ring	Replacement Disc (3/8 in Dia.)	Disc Color
2800 ± 20%	563228 (509-499-620)	563229 (509-499-625)	557422 (509-277-000)	Green
3700 ± 20%	563220 (509-499-100)	563221 (509-499-105)	557423 (509-278-000)	Yellow
4600 ± 20%	564355 (509-499-120)	563222 (509-499-125)	557424 (509-279-000)	Red
5500 ± 20%	563223 (509-499-140)	563224 (509-499-145)	557425 (509-280-000)	Orange
6400 ± 20%	563225 (509-499-160)	563226 (509-499-165)	557427 (509-282-000)	Pink
7300 ± 20%	563227 (509-499-200)	– (509-499-205)	557428 (509-283-000)	Blue
8200 ± 20%	– (509-499-220)	– –	557429 (509-284-000)	Purple

Table 4. Rupture Indicator Ordering Data

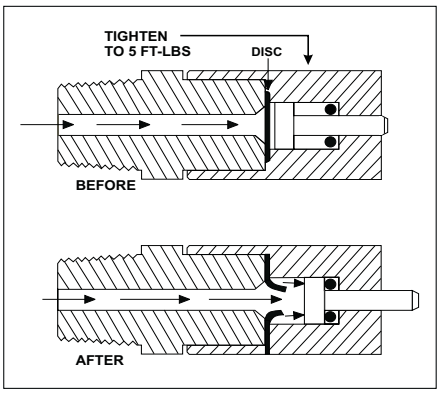


Figure 5. Rupture Indicator Operation

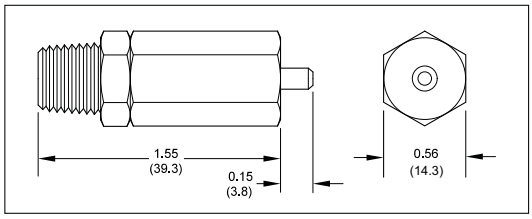


Figure 6. Rupture Indicator Dimensions

Rupture-to-Atmosphere Indicator

These indicators, which are standard on all Graco pumps, provide pump protection and give visual indication of excessive system pressure. The pressure disc ruptures at a predetermined pressure setting, venting lubricant to the atmosphere and relieving the high pressure. (See Figure 7.) See Table 5 for ordering data.

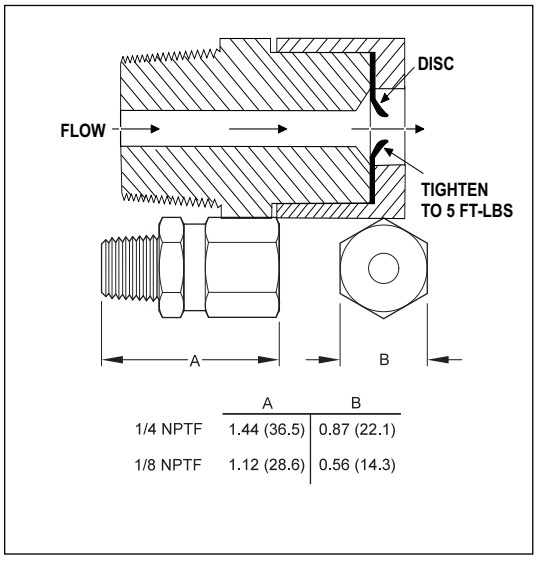


Figure 7. Rupture-to-Atmosphere Operation/Dimensions

Pressure (psi*)	Complete Assembly	Replacement	Disc Color	Blowout Disc
1/4 in NPTF Fittings		**11/16 in Dia**		**(QTY = 6)**
900	Disc. (509-206-060)	557431 (509-290-000)	Black	Disc. (560-900-250)
1450	563179 (509-206-100)	557433 (509-292-000)	Yellow	563962 (560-900-270)
1750	563182 (509-206-120)	557434 (509-293-000)	Red	563963 (560-900-280)
2050	563183 (509-206-140)	557435 (509-294-000)	Orange	563964 (560-900-290)
2350	563184 (509-206-160)	557436 (509-295-000)	Aluminum	563965 (560-900-300)
2650	– (509-206-180)	557437 (509-296-000)	Pink	Disc. (560-900-310)
2950	563185 (509-206-200)	557438 (509-297-000)	Blue	563966 (560-900-320)
3250	– (509-206-220)	557439 (509-298-000)	Purple	Disc. (560-900-330)
1/8 in NPTF Fittings		**3/8 in Dia.**		**(OTY = 25)**
900	– (509-230-060)	555788 (509-276-000)	Black	563952 (560-900-050)
1450	Disc. (509-230-100)	557423 (509-278-000)	Yellow	563954 (560-900-070)
1750	564059 (509-230-120)	557424 (509-279-000)	Red	563955 (560-900-080)
2050	Disc. (509-230-140)	557425 (509-280-000)	Orange	563956 (560-900-090)
2350	563191 (509-230-160)	557426 (509-281-000)	Aluminum	563957 (560-900-100)
2650	Disc. (509-230-180)	557427 (509-282-000)	Pink	563958 (560-900-110)
2950	563192 (509-230-200)	557428 (509-283-000)	Blue	563959 (560-900-120)
3250	563193 (509-230-220)	557429 (509-284-000)	Purple	563960 (560-900-130)
5000	563194 (509-230-350)	557430 (509-285-200)	Brown	563961 (560-900-140)
High Pressure 1/8 in NPTF Fittings		**3/8 in Dia.**		**(QTY = 25)**
3700	564479 (509-494-100)	557423 (509-278-000)	Yellow	563954 (560-900-070)
4600	563216 (509-494-120)	557424 (509-279-000)	Red	563955 (560-900-080)
5500	563217 (509-494-140)	557425 (509-280-000)	Orange	563956 (560-900-090)
6400	563218 (509-494-160)	557427 (509-282-000)	Pink	563958 (560-900-110)
7300	563219 (509-494-200)	557428 (509-283-000)	Blue	563959 (560-900-120)
8200	– (509-494-220)	554729 (509-284-000)	Purple	563960 (560-900-130)
9500	– (509-230-500)	– (509-285-000)	Gray	–

* Disc up to 2350 psi have a tolerance of ± 500 psi. Discs greater than 2350 psi have a tolerance of ± 20%

Table 5. Rupture-to-Atmosphere Ordering Data