CONSOLIDATED®

CON-8MM

INSTALLATION & MAINTENANCE MANUAL

2 1/2 - 1553 Safety Valve

With
Retrofit 1700 Series Internal

INDUSTRIAL VALVES | DRESSER

DRESSER VALVE AND CONTROLS DIVISION
INDUSTRIAL VALVE NORTH AMERICAN OPERATIONS
ALEXANDRIA, LOUISIANA USA

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IT IS IMPORTANT TO NOTE THAT THIS SERVICE MANUAL CONTAINS VARIOUS WARNINGS AND CAUTIONS WHICH SHOULD BE CAREFULLY READ IN ORDER TO MINIMIZE THE RISK OF PERSONAL INJURY OR THE POSSIBILITY THAT IMPROPER SERVICE METHODS WILL BE FOLLOWED WHICH MAY DAMAGE THE VALVE OR RENDER IT UNSAFE. IT IS ALSO IMPORTANT TO UNDERSTAND THAT THESE WARNINGS AND CAUTIONS ARE NOT EXHAUSTIVE. DVCD COULD NOT POSSIBLY KNOW, EVALUATE AND ADVISE THE CUSTOMER OR UTILITY OF ALL CONCEIVABLE WAYS IN WHICH SERVICE MIGHT BE DONE, OR OF THE POSSIBLE HAZARDOUS CONSEQUENCES OF EACH WAY. CONSEQUENTLY, DVCD HAS NOT UNDERTAKEN ANY SUCH BROAD EVALUATION ACCORDINGLY, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY DVCD MUST SATISFY HIMSELF THOROUGHLY THAT NEITHER HIS SAFETY NOR VALVE SAFETY WILL BE JEOPARDIZED BY THE SERVICE METHOD HE SELECTS. CONTACT DRESSER IF THERE IS ANY QUESTION ON THE METHOD.

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BEFORE INSTALLING VALVE, READ PAGE 6 REGARDING INSTALLATION.

SAFETY PRECAUTIONS

FOLLOW ALL PLANT SAFETY REGULATIONS BUT BE SURE TO OBSERVE THE FOLLOWING:

1. BE SURE TO LOWER THE WORKING PRESSURE BEFORE MAKING ANY VALVE ADJUSTMENT. THIS WILL AVOID POSSIBLE PERSONAL INJURY.

2. DO NOT STAND IN FRONT OF THE DISCHARGE SIDE OF A PRESSURE RELIEF VALVE WHEN TESTING OR OPERATING.

3. HEARING PROTECTION SHOULD BE USED WHEN TESTING OR OPERATING VALVE.

4. WEAR APPROPRIATE PROTECTIVE CLOTHING.

5. EXERCISE CAUTION WHEN EXAMINING A PRESSURE RELIEF VALVE FOR AUDIBLE/VISIBLE LEAKAGE.

6. USE OF AUXILLIARY LIFTING DEVICES FOR IN SERVICE TESTING OF VALVES IS NOT RECOMMENDED. CONSULT YOUR SAFETY DEPARTMENT PRIOR TO USING ANY AUXILLARY LIFTING DEVICE.

7. WHEN REMOVING THE PRESSURE RELIEF VALVE DURING DISASSEMBLY, STAND CLEAR AND/OR WEAR PROTECTIVE CLOTHING TO PREVENT EXPOSURE TO SPLATTER OF ANY CORROSIVE PROCESS MEDIUM WHICH MAY HAVE BEEN TRAPPED INSIDE. ENSURE VALVE IS ISOLATED FROM SYSTEM PRESSURE BEFORE VALVE IS REMOVED.

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INTRODUCTION

These instructions are intended to aid the machinist and the mechanic in carrying out effectively their responsibility of keeping safety valves in good operating condition. The methods illustrated and described have been found practical through actual use in the field and are offered for their simplicity and accuracy.

Several tables are included giving essential dimensions so that the job can be done with conventional machinist's tools.

Emphasis in machining should be placed on having the work set up to run true at locations indicated in the illustrations so that good alignment and concentricity, both of which are essential to good performance, are obtained when the work is completed.

TERMINOLOGY FOR SAFETY VALVES

Back Pressure - Back pressure is the static pressure existing at the outlet of a safety device due to pressure in the discharge system.
Blowdown - blowdown is the difference between actual popping pressure of a safety valve and actual reseating pressure expressed as a percentage of set pressure or in pressure units.
Bore Area - Bore area is the minimum cross-sectional area of the nozzle.
Bore Diameter - Bore diameter is the minimum diameter of the nozzle.
Chatter - Chatter is abnormal rapid reciprocating motion of the moveable parts of a safety valve in which the disc contacts the seat.
Closing Pressure - Closing pressure is the value of decreasing inlet static pressure at which the valve disc reestablishes contact with the seat or at which lift becomes zero.
Disc - A disc is the pressure containing moveable member of a pressure safety valve which effects closure.
Inlet Size - Inlet size is the nominal pipe size of the inlet of a pressure relief valve, unless otherwise designated.
Lift - Lift is the actual travel of the disc away from closed position when a valve is relieving.
Lifting Device - A lifting device is a device for manually opening a safety device by the application of external force to lessen the spring loading which holds the valve closed.
Nozzle - A nozzle is the pressure containing member which constitutes the inlet flow passage and includes the fixed portion of the seat closure.
Outlet Size - Outlet size is the nominal pipe size of the outlet of a safety valve, unless otherwise designated.
Overpressure - Overpressure is a pressure increase over the set pressure of a safety valve, usually expressed as a percentage of set pressure.
Popping Pressure - Popping pressure is the value of increasing inlet static pressure at which the disc moves in the opening direction at a faster rate as compared with corresponding movement at higher or lower pressures. It applies only to safety or safety relief valves on compressible fluid service.
Pressure Containing Member - A pressure containing member of a safety valve is a part which is in actual contact with the pressure media in the protected vessel.
Pressure Retaining Member - A pressure retaining member of a safety valve is a part which is stressed due to its function in holding one or more pressure containing members in position.
Rated Lift - Rated Lift is the design lift at which a valve attains its rated relieving capacity.
Safety Valve - A safety valve is a pressure relief valve actuated by inlet static pressure and characterized by rapid opening or pop action.
Set Pressure - Set pressure is the value of increasing inlet static pressure at which a safety valve displays the operational characteristics as defined under "Popping Pressure." It is one value of pressure stamped on the safety valve.
Seat - A seat is the pressure containing contact between the fixed and moving portions of the pressure containing elements of a valve.
Seat Tightness Pressure - Seat tightness pressure is the specified inlet static pressure at which a quantitative seat leakage test is performed in accordance with a standard procedure.
Seat Diameter - Seat diameter is the smallest diameter of contact between the fixed and moving members of the pressure containing elements of a valve.
Simmer - Simmer is the audible or visible escape of fluid between the seat and disc at an inlet static pressure below the popping pressure and at no measurable capacity. It applies to safety valves on compressible fluid service.
Warn - See "Simmer"

NOMENCLATURE

NOTE 1: OUT OF POSITION. 90° TO RIGHT WHEN FACING OUTLET.

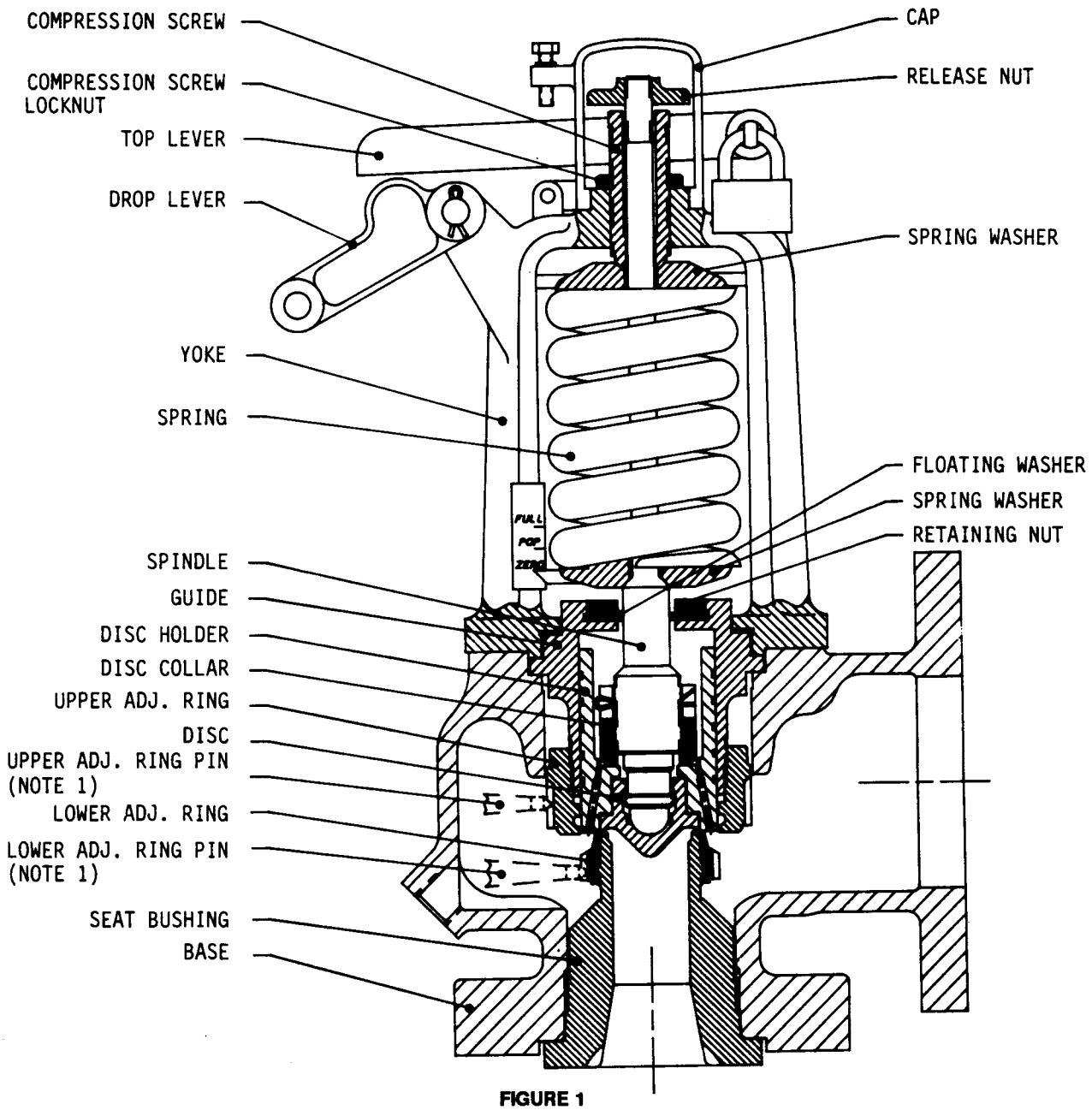


FIGURE 1

DESIGN FEATURES

1. **Forged Nozzle And Disc**
   The nozzle is a forged through nozzle providing high integrity material for the pressure containing portion of the inlet flow path. The disc is a fully machined, pressure containing member made from a forged blank.
2. **Design Life**
   For most service conditions, pressure retaining parts subject to mechanical stresses, are designed for a design life equivalent to the boiler.
3. **Thermal Compensation**
   The open yoke design, together with proper selection of spindle materials, renders the valve relatively free from changes in pressure settings due to inlet temperature variations. High ambient temperatures adjacent to the valve spring and yoke may cause set pressure variations, and need to be considered when adjusting the valve. Temperature stabilization is always necessary prior to adjusting a valve for set pressure.
4. **Thermodisc**
   The Thermodisc design, in providing for the rapid equalization of temperature around the valve seat, provides a degree of tightness far above that offered by competitive valves. Selection of materials provides desired "Thermal Flexibility" and "Mechanical Flexibility."
5. **Two Ring Control**
   The 1553 Retrofit has an upper adjusting ring to adjust blowdown and a lower adjusting ring to eliminate simmer.

HANDLING STORAGE & PREINSTALLATION

Safety valves should be stored in a dry environment to protect them from the weather. They should not be removed from the skids or crates until immediately prior to installation. Flange protectors and sealing plugs should also be installed until just prior to installation. When Safety Valves are uncrated and the flange protectors removed, immediately prior to installation, meticulous care should be exercised to prevent dirt and other foreign materials from entering the inlet and outlet ports while bolting in place.

WARNING

The inlet and outlet portions of the valve may contain bags of desicant which must be removed prior to placing the unit in service.

The valve, either crated or uncrated, should always be kept with the inlet down, i.e., never laid on its side, to prevent misalignment and damage to internals. Uncrated valves should be moved or hoisted by wrapping a chain or sling around discharge neck, then around upper yoke structure in such manner as will insure the valve is in vertical position during lift, i.e., not lifted in horizontal position. Never lift the full weight of the valve by the lifting lever. Never hook to the spring to lift. Crated valves should always be lifted with the inlet down.

Safety valves, either crated or uncrated, should never be subjected to sharp impact. This would be most likely to occur by bumping or dropping during loading or unloading from a truck or while moving with a power conveyor, such as a forklift truck. While hoisting to the installation, care should be exercised to prevent bumping the valve against steel structures and other objects.

RECOMMENDED INSTALLATION PRACTICE

1. The valve should be installed to meet all the requirements of Figure 2.

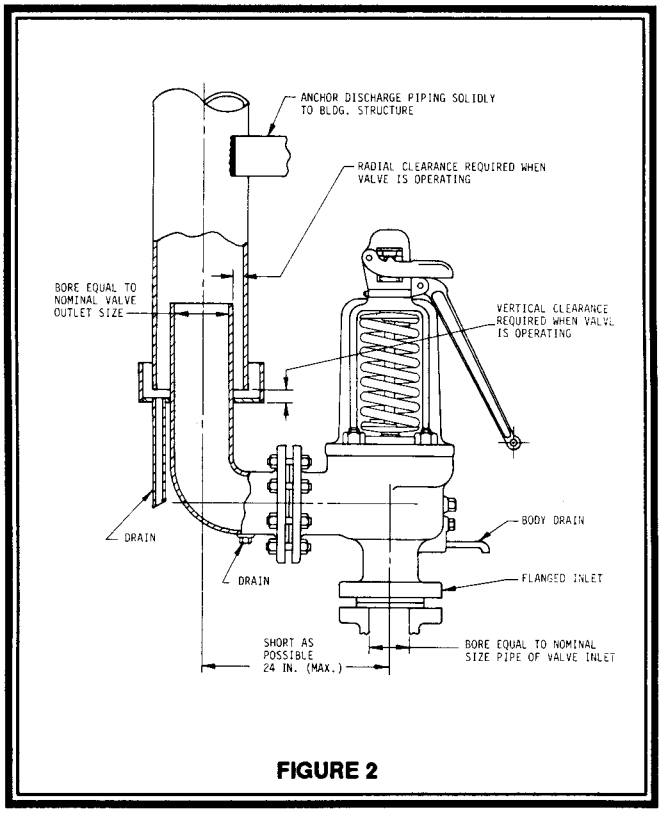


FIGURE 2

2. The safety valve shall be connected to the header independent of any other connection, and attached as close as possible to the header, without unnecessary intervening pipe or fitting. The intervening pipe or fitting shall not be longer than the face-to-face dimension of the corresponding tee fitting of the same diameter and pressure per ANSI Standards.
3. No valve of any description should be placed between the safety valve and the header, nor on the discharge pipe between the pressure relief valve and the atmosphere.
4. In no case may the inlet piping to the valve have a bore less than nominal size of the valve inlet. For example, a valve with a six inch (152.4 mm) inlet must have the inlet piping with a bore of not less than six inches (152.4 mm) inlet must have the inlet piping with a bore of not less than six inches (152.4mm).
5. Excessive pressure loss at the inlet of the safety valve will cause extremely rapid opening and closing of the valve, which is known as "chattering." Chattering may result in lowered capacity as well as damage to the seating surface of the valve. Severe chattering can also cause damage to other parts of the valve. The following recommendations will assist in eliminating the factors that produce chatter:
   a. Header nozzle corners must be rounded to a radius of not less than 1/4 of the opening diameter.
   b. Pressure drop due to friction flow to the inlet of the valve should not be greater than 50% of the expected blowdown of the safety valve.
6. To decrease the effects of a phenomenon known as "sonic vibrations," the following recommendations are made:
   a. Safety valve should be installed at least eight to ten pipe diameters downstream from any bend in a steam line. This distance should be increased when the valve is installed on the horizontal section of a header which is preceded by an upward section.
   b. Safety valves should not be installed closer than eight to ten pipe diameters either upstream or downstream from a diverging or a converging "Y."
   c. In cases where piping configurations renders the above two recommendations impractical or impossible, the downstream corners of the header nozzle inlets should be rounded to a greater extent than the upstream corners. The header nozzle entrance should be rounded so the radius at the downstream corner will be equal to a minimum of 1/4 of the nozzle diameter. The radius should be reduced gradually, leaving only a small portion of the upstream corner with a smaller radius.
   d. Safety valves should never be installed in a steam line in a position directly opposite a branch line.
7. Excessive line vibrations are known to produce shifts in pressure relief valve set pressures. Vibrations may possibly introduce chatter causing damage to the valve, and reduce its capacity. This vibration also contributes to increased incidents of seat leakage.

FIELD SETTING

All Safety Valves are steam tested at the factory to verify set pressure adjustability and seat tightness. Every valve is set to have a clean popping action and to reseat tightly. However, because the boiler used in setting the valves has a small capacity compared to the capacities of the valves, adjustments on the actual installation are necessary to ensure proper valve action and adjusting ring settings.

Gagging of other valves not being set generally is necessary; however, for setting of low pressure valves, depending on system pressure being used, it may not be required to gag the higher set valves.

When performing tests on the installation, the valves should be adjusted by opening under full flow conditions if operating procedures permit. Practical considerations may limit this type of testing. For such operations, close system pressure control is required and a minimum number of valves should be gagged so that over pressure protection can be maintained.

It is important to note that all adjustments of adjusting rings are FACTORY initial adjustments. This final adjustment must be made on the operating system with conditions approximately what would be realized under actual operating conditions. Valves are intentionally set for long blowdown to prevent chattering, etc. under initial setting conditions.

Factors which can affect valve operation at over pressure and which should be considered when initially setting the valves are as follows:

1. Ambient temperature near the valve and valve temperature stabilization.
2. Line vibration.
3. Line capacity at time when valve must lift.
4. Discharge stack or drain piping binding.

5. Fluid flow vibrations set up by upstream bends and other disturbances.

POPPING POINT ADJUSTMENT

To change the popping pressure of the valve, remove the cap and lever assembly, loosen the compression screw locknut and turn the compression screw clockwise to increase pop point, or counter clockwise to decrease pop point.

After each adjustment of the compression screw, the locknut should be tightened. The arm of the top spring washer should always be free from bearing against the yoke. This can be accomplished by holding a screwdriver between the arm and the yoke to prevent any movement of the top spring washer while adjusting the compression screw. Install the cap and lever assembly after set pressure adjustments have been completed as outlined in other parts of this manual.

RING ADJUSTMENT

The positions of the upper adjusting ring and the lower adjusting ring are locked by means of the upper adjusting ring pin and the lower adjusting ring pin respectively. These pins are threaded into the valve body and engage notches which are cut into the rings. To adjust either ring the corresponding ring pin must be removed. A screwdriver (or other suitable tool) inserted through the ring pin hole can be used to turn the rings.

CAUTION

ALWAYS GAG THE SAFETY VALVE FOR PROTECTION. THIS WILL ENSURE THAT THE DISC IS NOT ACCIDENTALLY LIFTED FROM THE SEAT BY THE ADJUSTING TOOL DURING RING ADJUSTMENT. THIS WILL ALSO ENSURE THAT AN UNEXPECTED RISE IN SYSTEM PRESSURE WILL NOT BE A HAZARD TO SERVICE PERSONNEL.

Lower Ring Adjustment

Initial adjustments were made to the lower adjusting ring during reassembly of the valve. If the ring position is lost, the ring position can be established as follows:

1. Gag the safety valve to prevent the disc from being accidentally lifted from the seat.
2. Remove service port plugs.
3. Remove the lower adjusting ring pin.
4. Turn the lower adjusting ring counter-clockwise until it contacts the disc holder.
5. Refer to Figure 3 and turn the lower adjusting ring clockwise the number of notches indicated by Column A. This is also dimension A.
6. Lock the lower adjusting ring into position by installing the lower adjusting ring pin and turning it clockwise until tight.
7. Replace service port plugs.
8. Remove the gag.
9. Test the valve on the system and adjust the lower ring to the lowest position which does not produce simmer.

The ideal ring position must then be found by test for the set of operating conditions present. If simmer is present or the valve fails to lift, the lower ring should be moved upward slowly, one notch at a time to remove the simmer. The ideal position for the lower ring is the lowest position that does not introduce simmer or a buzzing sound.

Upper Ring Adjustment

If the upper adjusting ring position is in question, the factory position can be set as follows:

1. Gag the safety valve to prevent the disc from being accidentally lifted from the seat.
2. Remove service port plugs.
3. Remove upper adjusting ring pin.
4. Rotate the upper adjusting ring until it is level with the disc holder. A flashlight may be needed to provide ample lighting t make this observation.
5. From this point, turn the upper adjusting ring counterclockwise the number of notches indicated by column B of Figure 3. This is also dimension B.

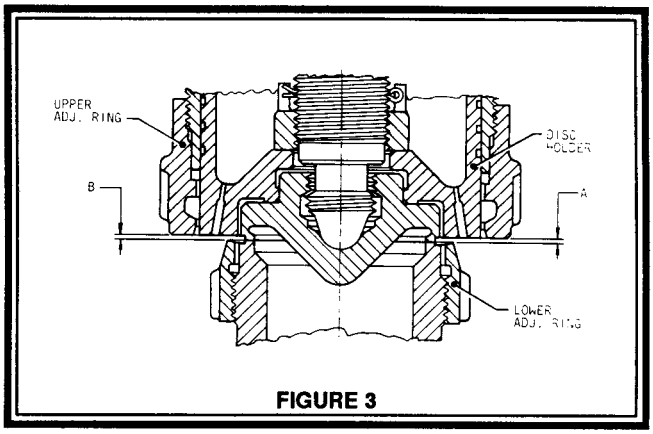


FIGURE 3

FINAL FACTORY POSITIONS (FIELD STARTING POSITIONS)

ORIFICE	LOWER RING HOLDER TO SEAT IN NOTCHES (Column A)	UPPER RING HOLDER TO SEAT IN NOTCHES (Column B)
2	2	12

6. Lock the upper adjusting ring into position by installing the upper adjusting ring pin.
7. Install the service plug.
8. Remove the gag.

Blowdown Adjustments
When further adjustments are required to obtain final blowdown setting, the upper adjusting ring should be moved 5-10 notches at a time as follows:

To reduce blowdown - MOVE RING UP - TURN COUNTERCLOCKWISE.

To increase blowdown - MOVE RING DOWN - TURN CLOCKWISE.

It is possible to raise the upper ring too far and prohibit attainment of full lift. When this occurs, lower the upper adjusting ring to the point where full lift is attainable. If the valve fails to lift, the lower adjusting ring requires further adjustment. See Lower Adjustment Ring Position.

In attempting to obtain blowdown on the order of 4%, it is important to be sure that the upper and lower adjusting ring positions are not separated so as to lose control of the valve. The first indication of reaching this condition is a slow up and down "hunting" action of the valve immediately before closing. If this action occurs at a blowdown longer than desired, moving both rings downward a small amount will generally produce a slightly shorter blowdown. When making this adjustment, move the upper ring twice as many notches as the lower.

After adjustments are complete, check the ring pins to see that they engage the ring grooves, but without touching the bottom of the groove. The pins should not bear against the rings.

SEALING VALVES AFTER TEST

After testing the valve for proper set point and blowdown, the ring pins, and top lever pin will be seated.

Means are provided in the design of the 1553 valves for sealing all external adjustments. Seals are installed by Dresser at the time of shipment. Seals are also required to be installed after field adjustment or repair of the valves by either the manufacturer, his authorized representative repairer, or the user.

Seals should be installed in such a manner as to prevent changing the adjustment without breaking the seal. They also serve as a means of identifying the manufacturer, repairer, or user making the adjustment. Unauthorized breakage of the seals will void the valve warranty.

DISASSEMBLY

The 1553 Safety Valve can be easily disassembled for inspection, reconditioning seats, or replacing internal parts. The initial spring load can be established after reassembly. Refer to Figure 1 for nomenclature.

Before starting to disassemble the valve, be sure that there is no steam pressure in the drum or header, then proceed as follows:

CAUTION
PARTS FROM ONE VALVE SHOULD NOT BE INTERCHANGED WITH PARTS FROM ANOTHER VALVE.

1. Remove the top lever pin and top lever.
2. Loosen cap and lift off cap.
3. Remove the release nut cotter pin and release nut.
4. Measure and record the distance from the top of the spindle to the top of the compression screw (See figure 4). This will be used to adjust compression screw at reassembly.
5. Loosen the compression screw locknut. Rotate the compression screw counter-clockwise until all spring tension is removed.
6. Loosen and remove the yoke stud nuts.
7. Lift the yoke, spring and spring washers up and over the spindle.
8. Remove the spring and washer assembly from the yoke.

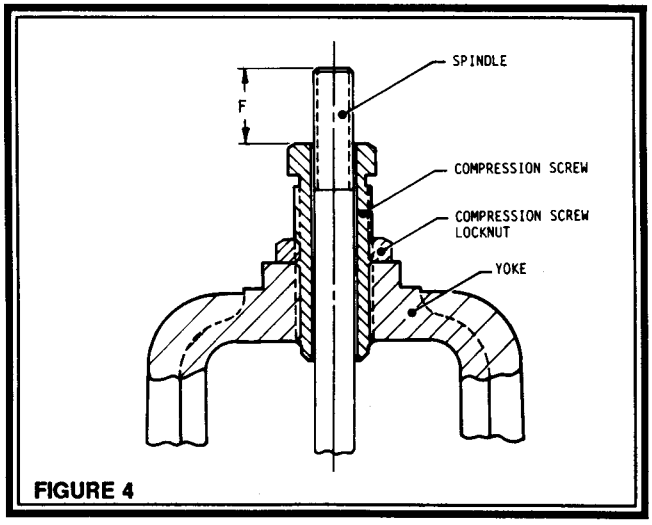


FIGURE 4

9. Remove the upper adjusting ring ring pin located in the valve base.
10. The spindle, disc, and disc holder assembly can then be lifted from the valve. Take care to ensure that the disc seating surface is not damaged when the assembly is rested on the floor or work table.

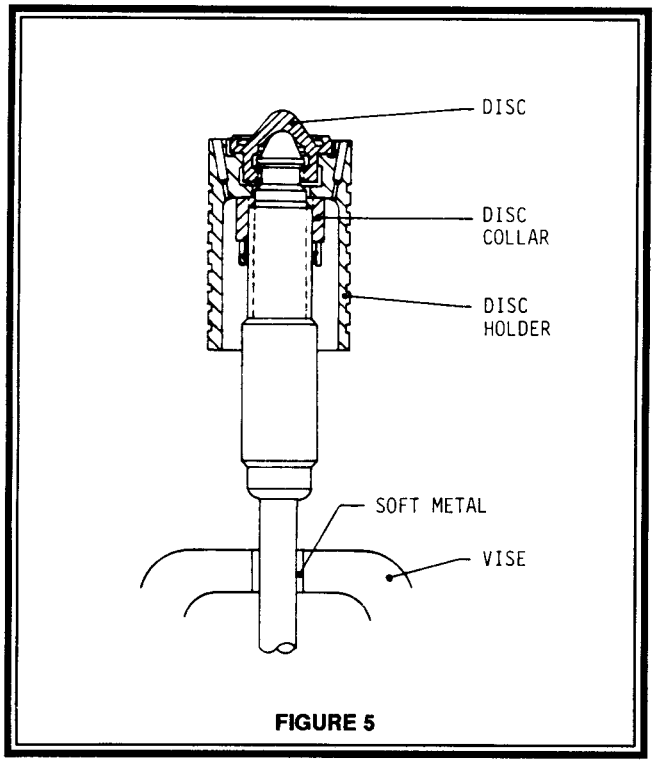


FIGURE 5

11. The spindle, disc, and disc holder assembly should be placed into a vise as shown in Figure 5. Lift the disc holder and remove the disc by unscrewing it from the spindle (turn counter-clockwise). Now remove the disc holder from the spindle. Leave the disc collar installed. If for some reason the disc collar must be removed, remove the cotter pin, and turn the disc collar counter clockwise to remove.
12. In order that the blowdown of the valve will be unchanged, the position of the upper adjusting ring should be marked for reassembly. Make punch marks in an axial line on the tooth of the upper adjusting ring and the outside barrel of the guide. Then measure the height of the guide and upper adjusting ring assembly as shown in Figure 6, Dimension B, and record this information.
13. Measure and record the height from the valve nozzle to the recess in the base where the guide would normally rest as shown in Figure 7, Dimension C.

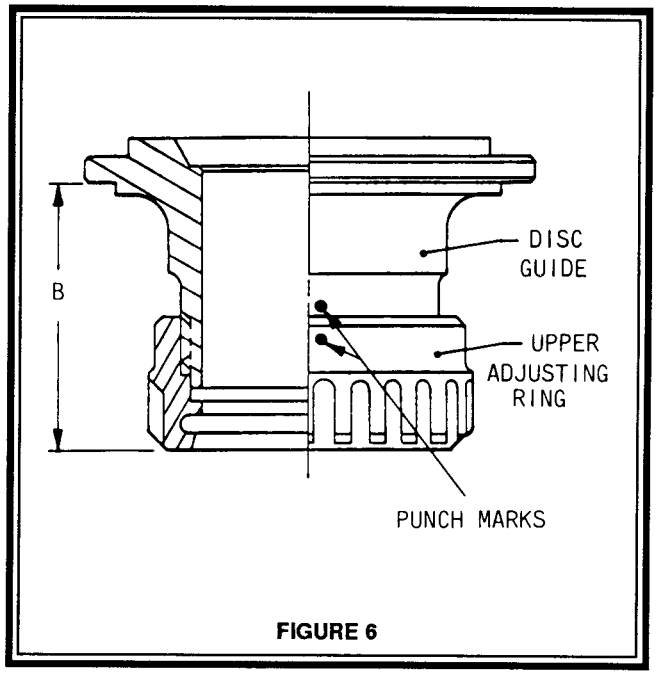


FIGURE 6

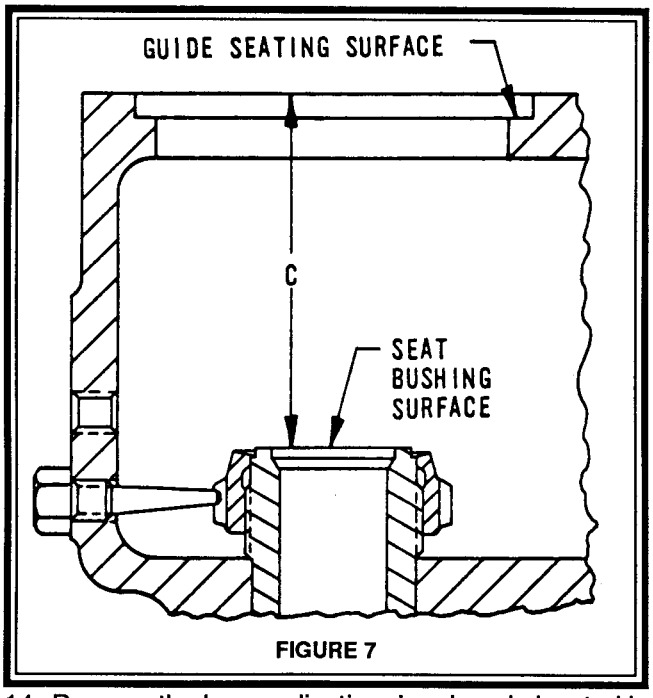


FIGURE 7

14. Remove the lower adjusting ring ring pin located in the valve base. Mark the lower ring in line with the lower ring pin hole. Place a ring lap across the top of the nozzle seat. Rotate the lower adjusting ring counter-clockwise and count the number of notches until contact is made with the ring lap. Reference Figure 8. Record this information for reassembly.

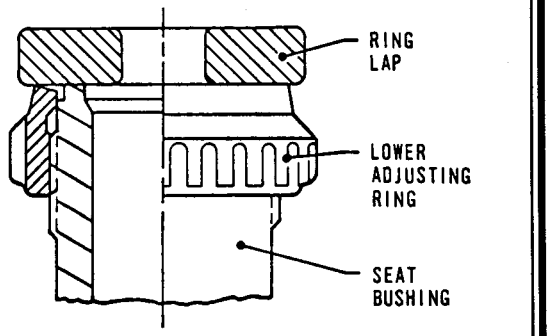


FIGURE 8

MAINTENANCE

It is not necessary to remove 1553 flanged valves from the boiler for maintenance. The normal maintenance required is generally confined to touching up seats and occasionally replacing the disc.

The following tools are recommended for this work:
A. Flat lapping plate (Part No. 0439004).
B. Grinding compounds
C. High temperature lubricant.
D. Two ring laps per valve size and type.
See Maintenance Tools & Supplies Section page.

All of the above tools can be procured from the Alexandria factory, prices on application. It may not be necessary to use all of the ring-laps at any one time, but having a sufficient supply on hand will save the time of reconditioning them during a boiler outage. After the boiler is back on the line, the ring-laps should be reconditioned on the flat lapping plate, or returned to the factory for reconditioning, at a nominal cost, on a special lapping machine. A lap should not be used on more than one valve without being reconditioned.

Valves that have been leaking should be disassembled in accordance with prior instructions. Since the position of the adjusting rings has been recorded, the rings can be disassembled for cleaning every time the valve is disassembled. Parts for each valve should be kept together or marked, to make sure that they are replaced in the same valve.

Reconditioning of the seat surfaces of the disc and seat bushing is accomplished by lapping with a flat cast iron, ring lap, as outlined in the lapping procedure section.

LAPPING PROCEDURE

The following precautions and hints will enable anyone to do a "Professional Job of Lapping" seats:

To lap the seats of the Valve, the following items must be available for each valve.
1. Two ring laps per valve.
2. 1A Clover Grinding Compound
3. 1000 Grit Grinding Compound (either Kwik-Ak-Shun or KM-50A)
4. Clean, lint free cotton rags, alcohol, and demineralized water.

Before lapping the nozzle and disc seat, the leading edges (inside diameter of seats) of both must be lightly chamfered as follows:

Use a fine grit India stone to break the inner edge and outer edge of the nozzle seat and disc seat. The purpose of this is to remove any small metal particles or fins attached to the sharp corner surfaces. Do not exceed .002 inches (0.5mm) chamfer for this purpose.

TO LAP BUSHING SEAT

Cover the seat lap face with a light coating of 1-A Clover Compound and gently place the lap on the valve nozzle seat.

Warning
A heavy coat of lapping compound tends to round off the edges of the seat.

Lap, using an eccentric circular motion counter-clockwise while holding the lap loosely in the fingers, allowing the weight of the lap to rest on the seat surface. Control the motion of the lap to prevent either the inside or outside edge of the lap from touching the nozzle seat surface. If either edge touches the seat surface, the seat can become scratched and rounded.

Warning
Care should be used not to run off the seating surface with the lap as this will cause the seats to become uneven.

Do not lap more than fifteen minutes with any one lap. Use a new lap if further lapping is required to remove any

defect in the seat. To finish lapping the nozzle seat, apply a light coating of #1000 Grit Compound to the face of a new lap and repeat the above lapping motion for ten (10) seconds.

Remove the lap and wipe the lap surface with clean lint free cloth leaving compound on the nozzle seat.

Replace the lap on the seat and lap as above but without adding compound. Repeat this operation until the seat has a mirror finish.

TO LAP DISC SEAT

When lapping the disc seat, the lap should be held stationary and the disc moved as above using care not to strike the cone of the disc on the lap.

NOTES

1. It may not be necessary to use all the laps at any one time, but having a sufficient supply on hand will save the time of reconditioning. The laps should be reconditioned on the flat lapping plate per Note 2. A lap should not be used on more than one valve without being reconditioned. Laps must be checked for flatness prior to use and at frequent intervals during use. A lap that is flat within one-half light band is considered satisfactory. Information on the Monochromatic Light and optical flat is available upon request from the Dresser Field Service Department.
2. To recondition the ring laps, wipe all compound from the lapping plate and ring lap, then use a figure-eight motion of the ring lap on a lapping plate. If the lap is not flat, a shadow will be apparent. To remove the shadow, coat the lapping plate with 1000 Grit Compound and lap the ring with two figure-eight motions covering the lapping plate, as shown in Figure 9.

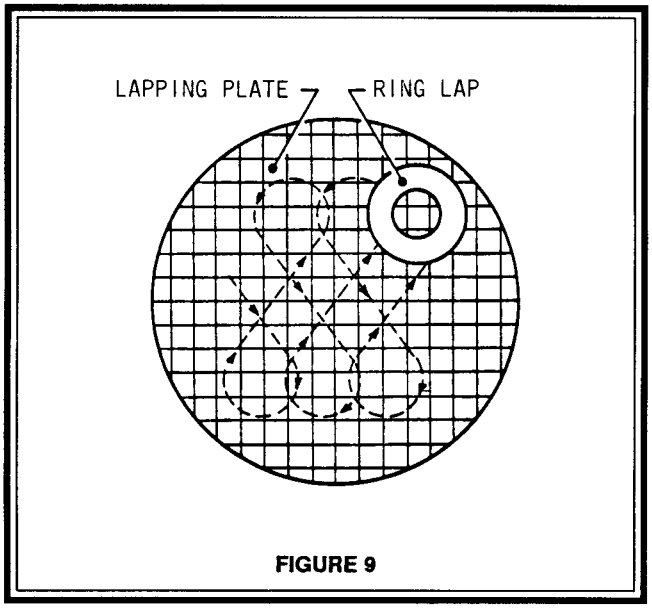


FIGURE 9

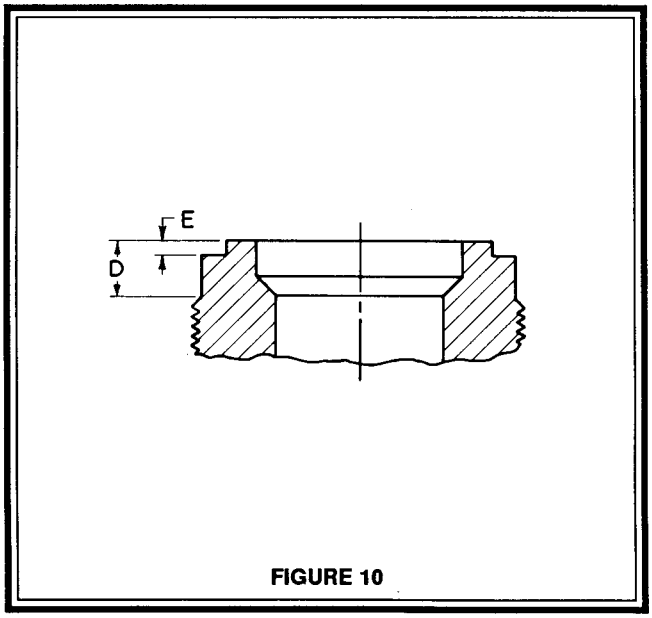


FIGURE 10

REMACHINING THE BUSHING SEAT

Machining should be used to recondition a badly worn bushing seat or to recondition a bushing for which Dimension E per Figure 10 is out of tolerance. Seat bushings must be reconditioned when Dimension E is less than or equal to .010 inches.

Prior to machining the seat place the lower ring and ring lap on the bushing per Figure 8. Raise the lower ring until contact with ring lap is made. Turn the lower ring clockwise and verify that the lower ring can be lowered at least 8 notches. If the lower ring cannot be lowered at least 8 notches, Dimension D per Figure 10 is out of tolerance and the seat bushing must be replaced. If sufficient adjustment of the lower ring can be obtained, the seat can be machined. Figure 11 is a typical set up of the base of nozzle for remachining in a lathe. Runout between surface Z and X must not exceed .002 total indicator reading. Diameters W and Y must be concentric to within .004 total indicator reading. After reseating, again verify lower ring adjustability of 8 notches.

If sufficient adjustment can be obtained, proceed to lap the nozzle. If sufficient adjustment cannot be obtained, replace the seat bushing.

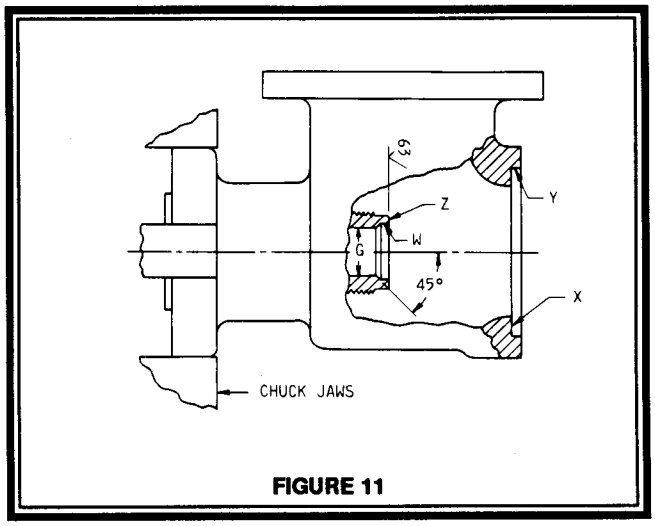


FIGURE 11

SPINDLE RUNOUT

It is important that the spindle be kept very straight in order to transmit the spring force to the disc without lateral binding. Overgagging is one of the common causes of bent spindles. Surfaces that must be concentric are shown in Figure 12.

The total indicator reading between A and B should not exceed .007 in. (.18 mm) when the spindle is rotated. If it does, the spindle must be straightened prior to reuse.

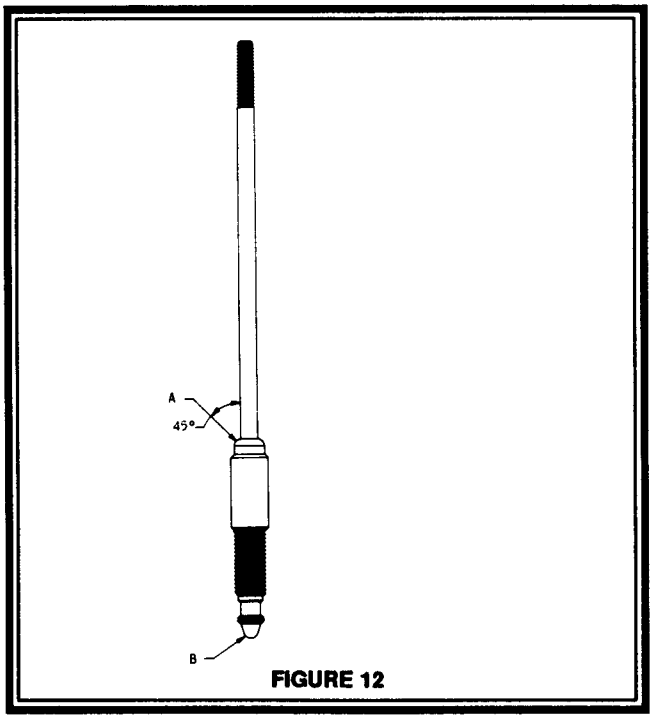


FIGURE 12

To straighten the spindle, place the unthreaded portion of the small and large end in padded V blocks with the point of maximum indicator readout upward, and then apply a downward force with a padded press or jack as required until the spindle is within specifications.

Other parts of the spindle not used as working surfaces may run out considerably more than .007 in. (.18 mm) but this should not be regarded as unacceptable.

DISC REPLACEMENT AND DISC-SPINDLE BEARING REQUIREMENTS

To replace the disc, disassemble the valve in accordance with the prior instructions.

The replacement disc has been lapped on our special lapping machine and requires only that the seat be touched up. However, the spindle tip bearing should be re-established by grinding the spindle tip on the disc. This can be done with the removable assembly propped upon the compression screw end of the spindle or held in a vise as shown in Figure 13.

The spindle nose should be ground into the disc spindle pocket until the bearing is clearly marked. The band position is shown in Figure 14. The desired band width is shown in Table 1. The finished machine size of the spindle nose radius and the flat diameter for each orifice size and valve type are shown in these tables. If the required bearing band cannot be obtained by hand grinding then this radius should be checked and remachined if necessary.

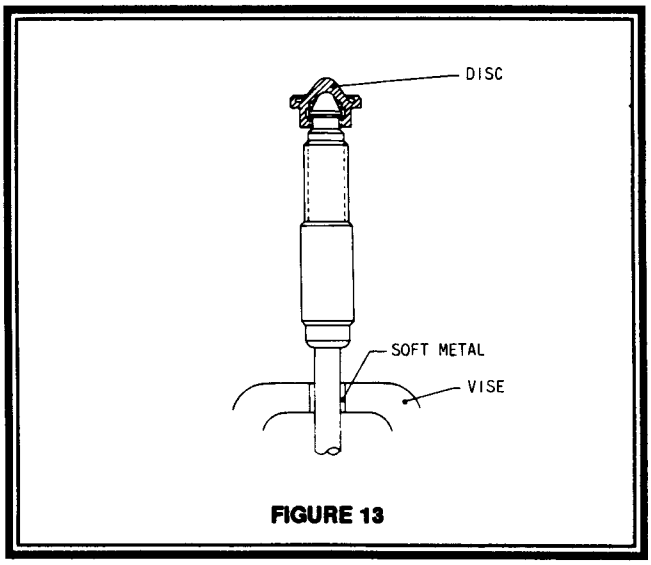


FIGURE 13

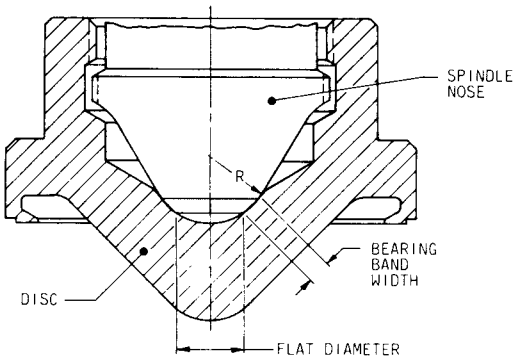


FIGURE 14

TABLE 1

SIZE	NOSE RADIUS "R"	FLAT DIA.	BEARING BAND WIDTH
	IN	IN	IN
	MM	MM	MM
2-1/2	0.371 + .000 -.004 / 9.423+.000 -.102	4.763	3.175

If the band extends too high on the radius it will be difficult to rock the disc and the disc may lock up under pressure. If the band is too narrow, the spindle may indent the disc and again the rock will be lost.

After the bearing area is re-established, clean both surfaces. Then apply lubricant to the spherical surface of the spindle tip and work it into the surfaces by rotating the disc on the spindle.

Place the disc holder on the spindle allowing it to rest on the face of the disc collar per Figure 15. Then assemble the disc holder and new disc. The disc should be free enough to rock on the spindle tip. If there is no freedom, lower the disc collar until the disc is free to rock slightly initially, approximately .001 to .002 inches (0.25 to .05mm) rock. The disc collar must then be lowered two additional notches from this initial position and secured with a stainless steel cotter pin. Clearance between disc and disc holder should be .015 to .020 inches (0.38 to 0.51 mm) when satisfactory and must be verified before proceeding. Reference to Figure 16. To verify clearance, measure distance from disc seat face to disc holder face when the assembly is resting in the position shown in Figure 16. Then lift evenly on the disc-holder until it contacts the back side of the disc. Measure the dimension at the same location where the first reading was taken. the difference between the first and second reading is the clearance between the disc and holder.

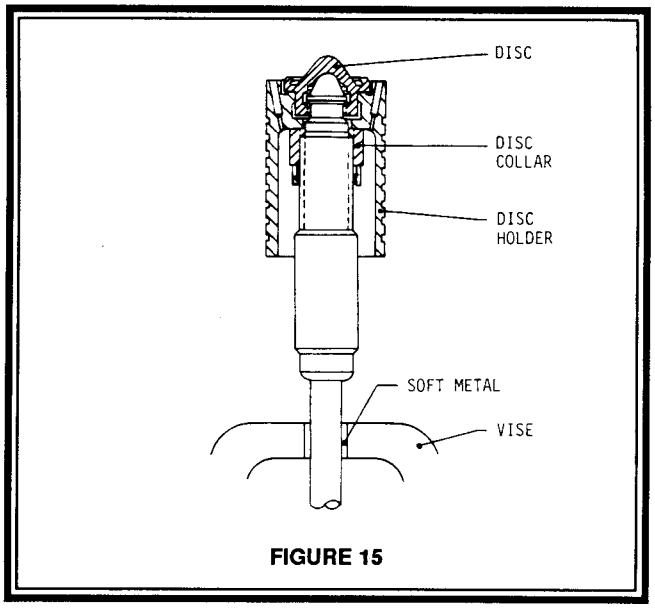


FIGURE 15

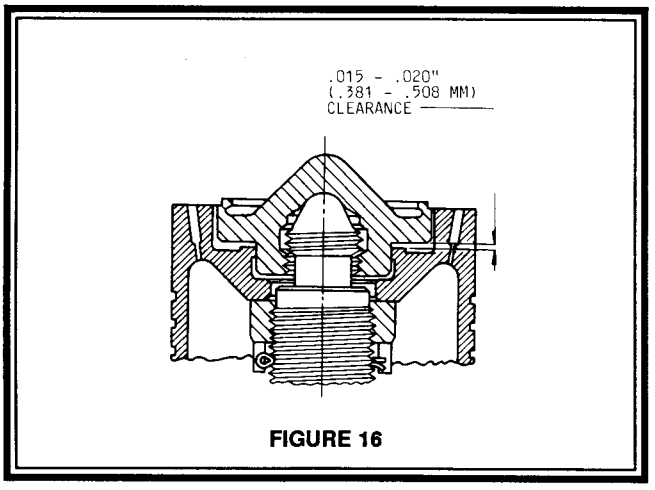


FIGURE 16

CAUTION

FAILURE TO PROVIDE THE RECOMMENDED DISC ROCK AT ASSEMBLY WILL RESULT IN A LEAKING VALVE.

GRINDING THE UPPER SPRING WASHER

The compression screw spherical radius must be ground into the upper washer so that a bearing band of 1/8 in. (3.2 mm) minimum to 3/16 in. (4.8 mm) maximum is obtained. To grind these items a 320 grit (Clover 1A) lapping compound is used until a satisfactory bearing band is obtained. Clean compression screw, and upper spring washer, when completed.

GRINDING LOWER SPRING WASHER

The lower spring washer must be ground to the spindle. To grind the lower spring washer, a 320 grit (Clover 1A) lapping compound is used. The bearing width should be 1/8 in. (3.2 mm) minimum to 3/16 in. (4.8mm) maximum. Clean lower spring washer and spindle when complete.

REASSEMBLY

ADJ. RINGS & GUIDE INSTALLATION

1. Lubricate threads and install lower adjusting ring. Install to the original position recorded at disassembly. If the original position has been lost or if the nozzle seat required machining, then place a clean ring lap on the nozzle seat, and adjust the lower ring by bringing the ring up to the ring lap. Then lower the ring by turning it clockwise two notches. Refer to Figure 8. This will be the starting position. The final position will be determined during field testing.
2. Lubricate lower ring pin threads and lock the lower ring in position with the ring pin. Verify that the lower ring is capable of a slight rotation. If the lower ring does not move, the pin is too long. Grind the end of the pin slightly to shorten it while retaining the original tip contour, and reinstall.
3. Lubricate threads and install upper adjusting ring on the guide.

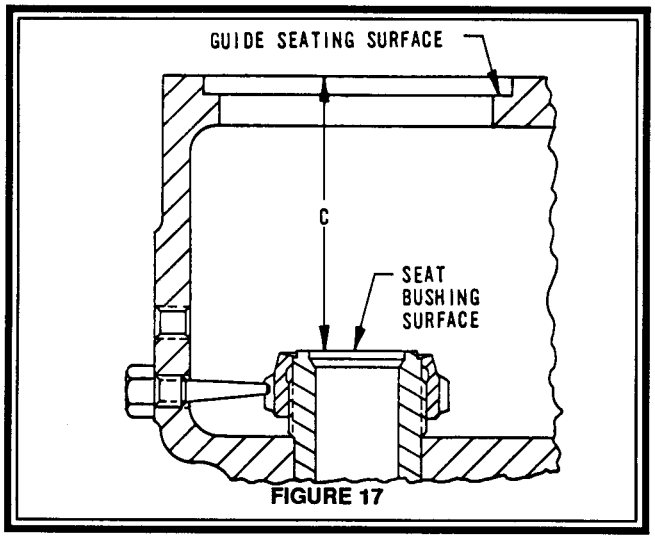


FIGURE 17

Measure the height from the bushing seat to the recess in the base (Dimension C) where the guide would normally rest, refer to Figure 17. Compare this value with that recorded when the valve was disassembled. Calculate the difference between these measurements.

Relocate the upper adjusting ring to the position recorded (Dimension B) during disassembly to component level, reference Figure 18. If the difference in height from the nozzle seat to the guide recess bore has not changed when compared to the above measurements, the guide and upper ring is properly positioned.

If the measurements between the nozzle seat and the guide recess bore are different, the difference between the old and new dimensions should be added to the overall height of the guide and upper adjusting ring assembly (Dimension B), and the upper adjusting ring reset to this new dimension. Remove the guide assembly from the base.

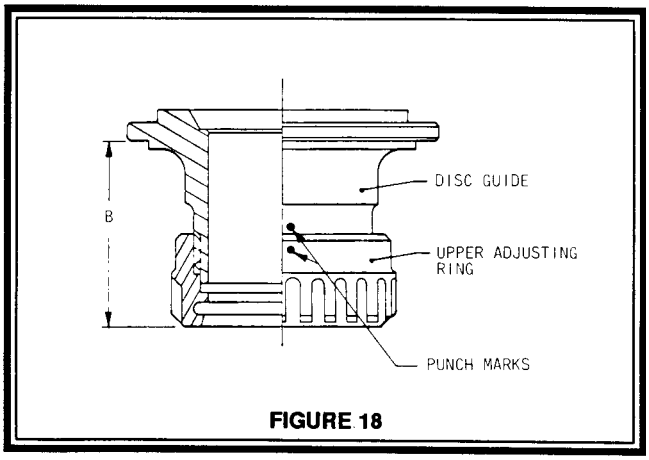


FIGURE 18

SPINDLE ASSEMBLY

1. Clamp the spindle in a vise using soft metal, or equal, between the spindle and vise jaws, with the "ball end" of the spindle upward. Refer to Figure 20. Verify that spindle has been lapped to the disc as outlined in Disc Replacement and Disc Spindle Bearing Requirements. If not this must be accomplished before proceeding.

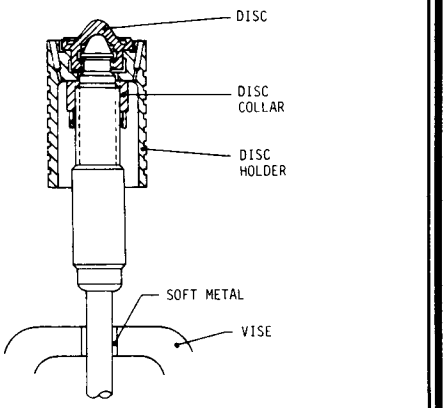


FIGURE 19

2. Lubricate threads and install disc collar. Carefully lower the disc holder onto the spindle allowing it to sit on the face of the disc collar.
3. Thread the disc onto the spindle. The disc must be free to rock on the spindle tip as outlined in the Maintenance Section, Disc Replacement and Disc Spindle Bearing Requirements. If discrepant, correct the cause before proceeding. When satisfactory, remove the disc and disc holder and secure disc collar with a stainless steel cotter pin. Using side cutters, carefully cut-off excess cotter pin legs, and bend cotter pin for a neat installation.
4. Lubricate the spindle tip and assemble disc holder and disc to spindle. Recheck disc rock.
5. Remove complete assembly from the vise. Protect the disc seat surface at all times.

SPINDLE UPPER RING GUIDE-BASE ASSEMBLY INSTALLATION

1. Wipe the disc seat with a soft, clean, lint-free cloth and alcohol (or other approved solvent).
2. Gently lower the spindle and disc holder assembly into the base until the disc seat contacts the nozzle.
3. Make sure the guide is properly seated in the guide recess of the body.
4. Lubricate upper ring pin threads, install upper ring pin so as to lock upper ring into position, keeping ring free of contact with ring pin.

YOKE, SPRING AND SPRING WASHER ASSEMBLY

1. Fit the top and bottom spring washers to the spring.
2. Place the spring assembly between the two yoke arms.
3. Place the yoke, spring and spring washers over the spindle.
4. Lower the assembly letting the spindle pass through the hole in the compression screw.
5. Align the yoke stud holes with base stud and lower the yoke until it rests on the base head flange.
6. Install and tighten the yoke stud nuts.
7. Rotate the compression screw clockwise to compress the spring. Adjust the compression screw until the distance from the top of the compression screw and top of the yoke is the value recorded during disassembly. This will result in little or no adjustment of the set pressure when resetting the valve.
8. Install release nut onto the spindle and thread clockwise until the release nut is fully engaged on spindle thread and lock in place.
   a. Adjust the release nut until it clears top lever by 1/8 inches (32. mm). Remove the lever pin, top lever, and cap. Insert a cotter pin through the release nut slots and spindle and spread cotter pin ends. Re-assemble the cap with the drop lever, top lever, and top lever pin. Install a cotter pin to lock the top pin in place. A final check should be made to ensure the proper clearance exists between the release nut and the top lever. Tighten cap set screw to secure the cap.
9. The valve is now ready for testing after which the following steps can be implemented.
   a. After testing, the compressions screw should be locked firmly in place with the lock nut.
   b. Install the cap over the release nut and seat the cap firmly into place on the yoke. Install the top lever in cap and then insert lever pin through top lever and yoke holes.

HYDROSTATIC TESTING & GAGGING

During any hydrostatic test all safety valves on the unit must be gagged. This gagging procedure prevents the possibility of damage to the safety valve internals in the event that the test pressure exceeds the safety valve set pressure. When adjusting valve set pressures, other valves in the system should also be gagged.

Probably the most common source of Safety Valve trouble is over-gagging. During hydrostatic testing, and during Safety Valve setting, gags should be applied only finger tight. During setting, overgagging will also cause damage to the seating surface and result in seat leakage. In applying gags remember that the valve spring will hold the valve closed against its set pressure.

The additional gag load applied should be only enough to ensure that the valves do not lift at the expected overpressure.

Gags should never be applied when the boiler is cold. The spindle of the Safety Valve expands considerably with the temperature increase. If it is not free to expand with this temperature change it may become seriously bent.

Boiler pressure should be brought up to within 80% of the pressure of the low set valve before applying gags.

APPLICATION OF TEST GAGS (All Pressures)

1. Refer to Figure 1. Remove top lever pin and top lever then loosen the cap screw. Remove cap. The release nut is fixed to the spindle by means of a cotter pin. Note that the release nut does not quite engage top of compression screw.
2. Center the test gag screw in the exposed end of the SPINDLE and hook the legs of gag under the sides of the YOKE as shown in Figure 21.
3. Apply the gag load by turning the gag screw clockwise. If the gag on any valve has not been tightened sufficiently, the valve will leak. On steam service the leakage is accompanied by a "Sizzling" sound.

   IF THIS OCCURS, THE HYDROSTATIC TEST PRESSURE OR STEAM PRESSURE SHOULD BE REDUCED UNTIL THE VALVE BECOMES TIGHT AND THEN THE GAG SHOULD BE TIGHTENED STILL FURTHER.

   This procedure must be followed exactly since it is very difficult to stop the leak by additional gagging once it has started. Any attempt to stop the leakage through the valve without first lowering the system pressure could result in damage to the valve seats.

4. After the hydrostatic test or steam test is completed, the gags should be removed when the pressure has been reduced to 80% or 90% of the pressure of the low set valve. UNDER NO CIRCUMSTANCES SHOULD THE GAGS BE LEFT ON THE VALVES.

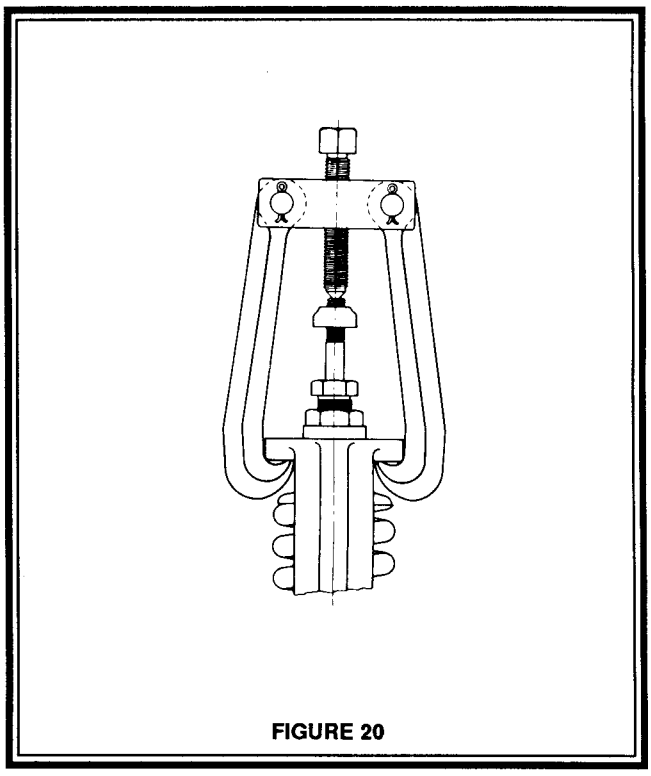


FIGURE 20

MAINTENANCE TOOLS AND SUPPLIES

LAPPING TOOLS

The following tools are required for proper maintenance of Consolidated 1553 Safety Valve seats:

Ring Laps - The ring lap is used for lapping the nozzle and disc seats. Part number 1672807.

Lapping Plate - The lapping plate is used for reconditioning the ring laps. One diameter plate is required for all sizes of ring laps. Part number 0439004.

Lapping Compound - Lapping compound is used as a cutting medium for lapping and polishing the seats and bearing surfaces in the 1553 safety valves.

*Note 1: One set of (2) Ring Laps is recommended for each orifice valve in service, to assure ample flat laps are available at all times.

Lapping Compounds

Brand	Grade	Grit	Lapping Function	Size Container	Part #
Clover	1A	320	General	4 oz.	199-3
Clover	3A	500	Finishing	4 oz.	199-4
Kwik-Ak-Shun	--	1000	Polishing	1 lb.	199-11
				2 oz.	199-12

SERVICE PARTS INVENTORY PHILOSOPHY

The basic objective in formulating a service parts inventory philosophy is to provide prompt valve service capability, thus preventing maintenance outage time extensions. To accomplish this, it is necessary to have immediate availability of the proper inventory of service parts for optimum valve quantities. This can be achieved at a minimum of cost by defining the inventory on a frequency of need basis.

To assist towards this objective, the field Service and Repair Organization of Dresser Industries - Industrial Valve Operations recommends that the following guidelines be utilized to establish meaningful inventory levels:

1. Identify the total number of safety valves by size, type number, temperature class, and serial number.
2. Identify the frequency of replacement tendency of specific parts.
   Class I - Parts Most Frequently Replaced
   Class II - Parts Less Frequently Replaced, but Critical in the Event of an Emergency Requirement.
   Class III - Parts Seldom Replaced
   Class IV - Hardware (e.g., nuts, bolts, pins, cap components, etc.)
   Class V - Practically Never Requiring Replacement.
3. "Need probability coverage" is defined as the probable per cent (%) of total, uninterrupted operational time which can be expected by stocking predetermined valve component classifications.

   Determine "need probability coverage" which is compatible with a specific company's operational objectives and service parts inventory investment philosophy. Then relate "need probability coverage" to parts classifications which will satisfy that need. Guidelines are as follows:

Parts Classification	Need Probability Coverage
Class I	70%
Class I & II	85%
Class I, II, & II	95%
Class I, II, III, & IV	99%

4. Consult recommended spare parts list by valve type to determine quantity of parts for valves to be covered by the inventory plan.
5. Select parts and specify quantities.

IDENTIFICATION AND ORDERING MATERIALS

When ordering service parts, please furnish the following information to insure receiving the correct replacement parts:

Identify valve by the following nameplate data:

1. Size
2. Type
3. Temperature Class
4. Example:
   2 1/2-1553
   S/N BG-5171

Specify parts required by:

1. Part Name
2. Part Number (If known)
3. Quantity

In addition, the serial number is stamped on the top edge of the outlet flange. Be sure to include the one or two letters preceding the figures in the serial number. A typical valve nameplate is shown in Figure 21.

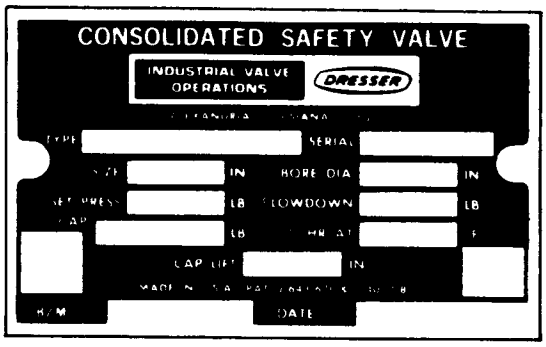


FIGURE 21

TROUBLE SHOOTING

The following table indicates the difficulties which may be encountered, the most probable cause, and the necessary corrective action.

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
No Action, Valve does not go into full lift	A. Upper ring too high	A. Increase blowdown as outlined
	B. Foreign material trapped between disc holder & guide.	B. Disassemble valve and correct any abnormality as outlined in manual. Inspect system for cleanliness.
	C. Lower ring too low.	C. Adjust per manual.
Hangup, or valve does not close from full lift	A. Lower ring too high.	A. Move lower ring to the left one notch per adustment until problem is eliminated.
	B. Foreign material	B. Disassemble valve and correct any abnormal condition as outlined in manual. Inspect system for cleanliness.
Excessive blowdown	A. Upper ring too low.	A. Decrease blowdown as outlined in manual.
	B. Exhaust pressure too high.	B. Decrease exhaust pressure by increasing discharge stack area.
Valve leaking and/or exhibits erratic popping action.	A. Damaged seat	A. Disassemble valve, lap seating surfaces, replace disc if required as outlined in manual.
	B. Part misalignment	B. Disassemble valve, inspect contact area of disc and nozzle, lower spring washer and spindle, compression screw and upper spring washer, spindle straightness, etc., as outlined in the manual.
	C. Disc has insufficient rock.	C. Disassemble valve and check disc rock per manual.
	D. Discharge stack binding on outliet.	D. Correct as required.
Simmer	A. Lower ring too low	A. Adjust per manual
	B. Steam line vibrations	B. Investigate and correct cause.

RECOMMENDED SPARE PARTS

1553 SAFETY VALVE WITH RETROFIT
1700 SERIES INTERNAL PARTS

CLASS	PART NAME	QUANTITY PARTS/ SAVE SIZE TYPE, SET PRESSURE AND TEMPERATURE CLASS VALVES IN SERVICE	NEED PROBABILITY COVERAGE
I.	1. Disc	1/1	70%
	2. Adj. Ring Pin (Upper)	1/1	
	3. Adj. Ring Pin (Lower)		
II.	4. Adj. Ring (Upper)	1/4	85%
	5. Adj. Ring (Lower)	1/4	
	6. Holder	1/4	
	7. Spindle	1/2	
	8. Guide	1/4	
	9. Seat Bushing	1/10	
III.	10. Disc Collar	1/4	95%
	11. Spring	1/6	
	12. Spring Washers (2)	1 Set/6	
	13. Compression Screw	1/4	
IV.	14. Disc Collar Pin	1/4	99%
	15. Compression Screw Nut	1/4	
	16. Cap Assembly	1/10	
	17. Release Nut	1/10	
	18. Top Lever Assembly	1/10	
	19. Drop Lever Assembly	1/10	

YOUR SAFETY IS OUR BUSINESS!!!

Dresser Industrial Valve & Controls Division has authorized no company nor individual to manufacture replacement parts for our valve products.

When ordering replacement valve parts, please specify in your purchase order: "All parts must be documented as new and sourced from Dresser Industrial Valve & Controls Division."

BE SURE! BE SAFE!

MANUFACTURER'S FIELD SERVICE & REPAIR PROGRAM

FACTORY SETTING VS. FIELD SETTING
Every CONSOLIDATED® Safety Valve is set and adjusted on steam before shipment from the factory. Blowdown adjustments are made as carefully and accurately as possible on the factory test boiler. However, it must be recognized that actual field operating conditions may vary considerably from factory test conditions.

Conditions beyond the manufacturer's control that affect Safety Valve operation are:

a. Quantity of steam being discharged through the valve, i.e. the actual installation capacity exceeding that of the test boiler, thus permitting the valve to flow its full rated capacity.
b. Quality of steam being discharged.
c. Discharge piping stresses and back pressure.
d. Ambient temperature.
e. Shipping or storage damage
f. Improper gagging
g. Improper bolting of flanges.
h. Damage due to foreign material in the steam.

Final Safety Valve adjustments made on the actual installation are the best means of insuring that the valves perform in compliance with the ASME Boiler Code and/or other applicable code requirements.

FIELD SERVICE
Utilities and process industries expect and demand service on a moment's notice. CONSOLIDATED® Field Service can be depended upon for prompt response, even in extreme off-hour emergency situations.

Dresser Industrial Valve Operations maintains the largest and most competent field service staff in the industry. Service Engineers are located at strategic points throughout the United States to respond to customer's requirements for service. Each Service Engineer is factory trained and is experienced in servicing Safety Valves. Our Service Engineers restore nozzle critical dimensions which effect valve performance, and are capable of modernizing valves in the field.

It is highly recommended that the professional talents of a D.I.V.D. Field Service Engineer be employed to make final field adjustments during the initial setting of CONSOLIDATED® Safety Valves.

All Service Engineers' activities are coordinated from the Alexandria, Louisiana, Field Service and Repair Office. Upon receipt of a purchase order number authorizing the trip, the man is dispatched.

Contact: Field Service Dept.
Mgr.. Field Service
(318) 640-6055

VALVE REPAIR

FACTORY REFURBISHING

Many customers find it desirable to return their valves to the manufacturer for restoration or modernizing. Consolidated® products returned to Dresser's valve renewal center in Alexandria, Louisiana are restored to original specifications and returned with a new valve warranty. An inventory of Consolidated® service parts is available, enabling the return of refurbished valves within forty-eight hours after receipt.

In addition to valve restoration, the factory renewal center offers a host of unique services not authorized through any other channel. Examples are:

1. Seat bushing replacements on certain valve types.
2. Installation of updated retrofit kits on specific Consolidated® valves.
3. Hydroset repairs, recalibration, and certification.
4. Specialty spring testing.
5. Repairs to valves in Nuclear applications.
6. Repairs to valves in use by the U.S. Government, Navy, and Coast Guard.

For more information on Dresser's Valve renewal services, please contact:

Manager, Valve Renewal
(318) 640-6059

SERVICE WARRANTY

Factory repaired valves carry a warranty which covers workmanship and new parts installed during repair, for a period of one year from date of repair completion.

DRESSER PRODUCT REPAIR BY UNAUTHORIZED SOURCES

DIVD has authorized no outside repair companies, contractors, nor individuals to perform warranty repair service on new products, field or factory repaired products of its manufacture. Therefore, customers contracting such repair services from unauthorized sources must do so at their own risk. Likewise, if any DIVD product fails to perform within the scope of its design, we must be notified and given the opportunity to inspect and correct the product. We will accept no backcharges for unauthorized repair sources performing corrective repairs on our products.

SAVE BIG MAINTENANCE DOLLARS!
UP TO 50%!

HERE'S HOW:

PLUS 3:
Dresser's Full Support GREEN TAG CERTIFIED Valve Field Service and Repair Program

Featuring the Portable Electronic Valve Testing Device Type 2566

What Is Plus 3?

PLUS 3 is Dresser's three phase valve field service and repair program.

Through the use of our electronic vlave testing device, local repair, and continuous preventive maintenance support, PLUS 3 offers a highly effective integrated systems approach to lowering the cost of valve maintenance.

In addition, PLUS 3 effectively binds participating customer operations, Dresser Industries and individual Green Tag Centers together in a fast response program leading to reliable valve performance.

1 In-Place Valve Testing

2 Local Factory-Quality Repair

3 Continuous Preventive Maintenance Support

Dresser is proud of all products and services offered through our Green Tag-certified PLUS 3 Program. We want to help you keep all pressure relief valves in good working order. This way, they'll be ready to help protect your facilities and personnel from major accidents.

Call Today!

Field Service:
318/640-6055
Local Green Tag Center Information:
318/640-6033
Preventive Maintenance Support:
318/640-6158

NOTES

YOUR SAFETY IS OUR BUSINESS!!!

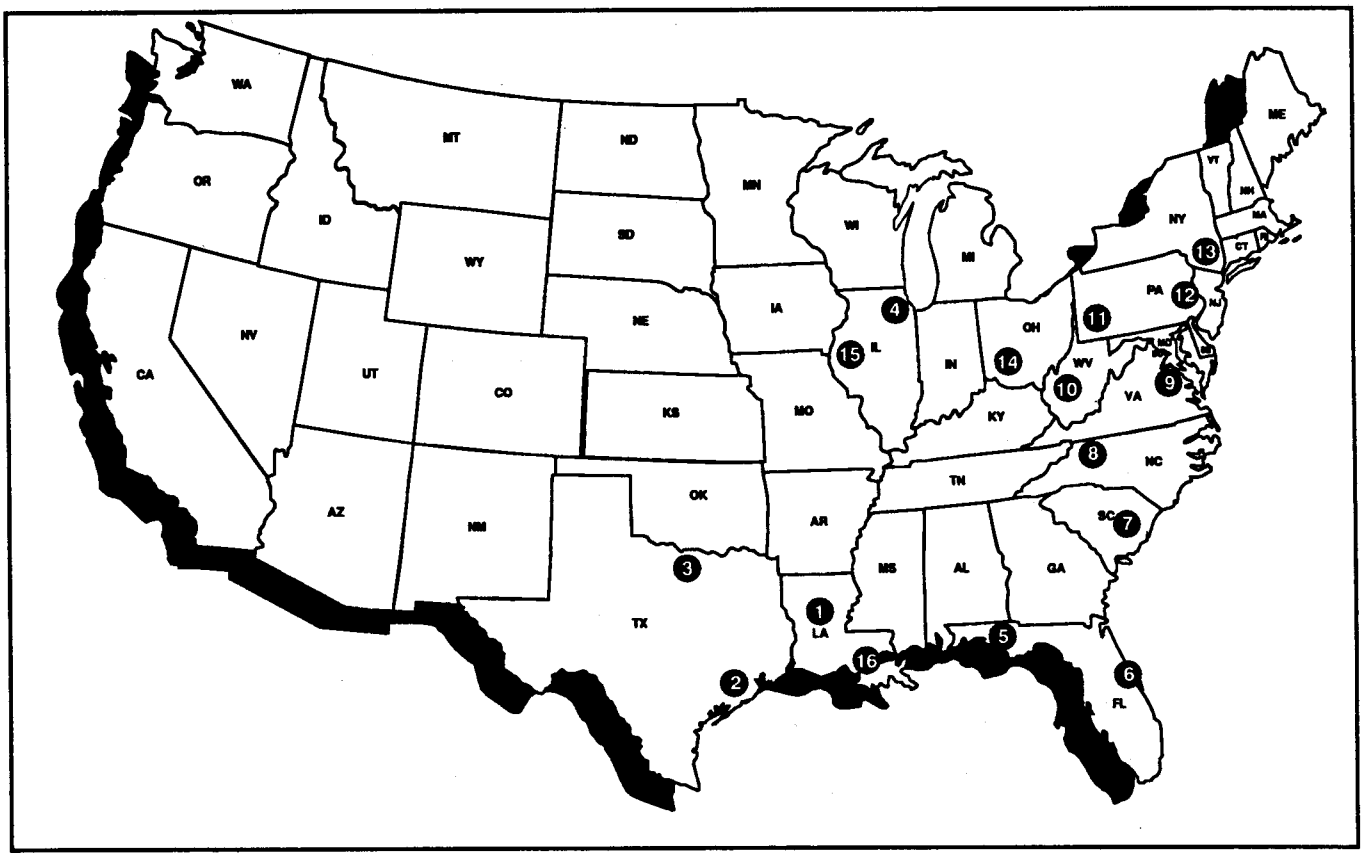
Dresser Industrial Valve & Controls Division has authorized no company nor individual to manufacture replacement parts for our valve products.

When ordering replacement valve parts, please specify in your purchase order: "All parts must be documented as new and sourced from Dresser Industrial Valve & Controls Division."

BE SURE! BE SAFE!

NOTES

SERVICE DEPARTMENT



THE DRESSER FIELD SERVICE ORGANIZATION IS UNEQUALED.

For prompt field service, please call Dresser Industrial Valve Operation Service Department, Alexandria, Louisiana.
Normal Working Hours - (318) 640-6055
After Hours, Weekends, Holidays - (318) 640-2250

LOCATION OF SERVICE ENGINEERS

Alexandria, LA	1
Houston, TX	2
Dallas, TX	3
Chicago, IL	4
Pensacola, FL	5
Jacksonville, FL	6
Charleston, SC	7
Winston-Salem, NC	8
Richmond, VA	9
Charleston, WV	10
Pittsburgh, PA	11
Philadelphia, PA	12
Poughkeepsie, NY	13
Cincinnati, OH	14
Crawfordsville, IN	15
New Orleans, LA	16

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Alexandria, Louisiana 71309-1430
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Telex 58-6423
Rapifax (318) 640-6222

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Franklin Park, Illinois 60131
Telephone (312) 451-3913
Telex 72-1452
Rapifax (312) 451-3997

Southern Region
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Houston, Texas 77084
Telephone (713) 579-8720
Telex 76-2770
Rapifax (713) 579-7844

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Telex 382-2665
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Spartan, Kempton Park 1620
Transvaal, South Africa
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Telex 427216

United Kingdom
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Operations - Dewrance & Co., Ltd.
Trevithick Works
Gillibrands Estate
Skelmersdale, Lancashire WN8 9TU
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Telex 627039
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