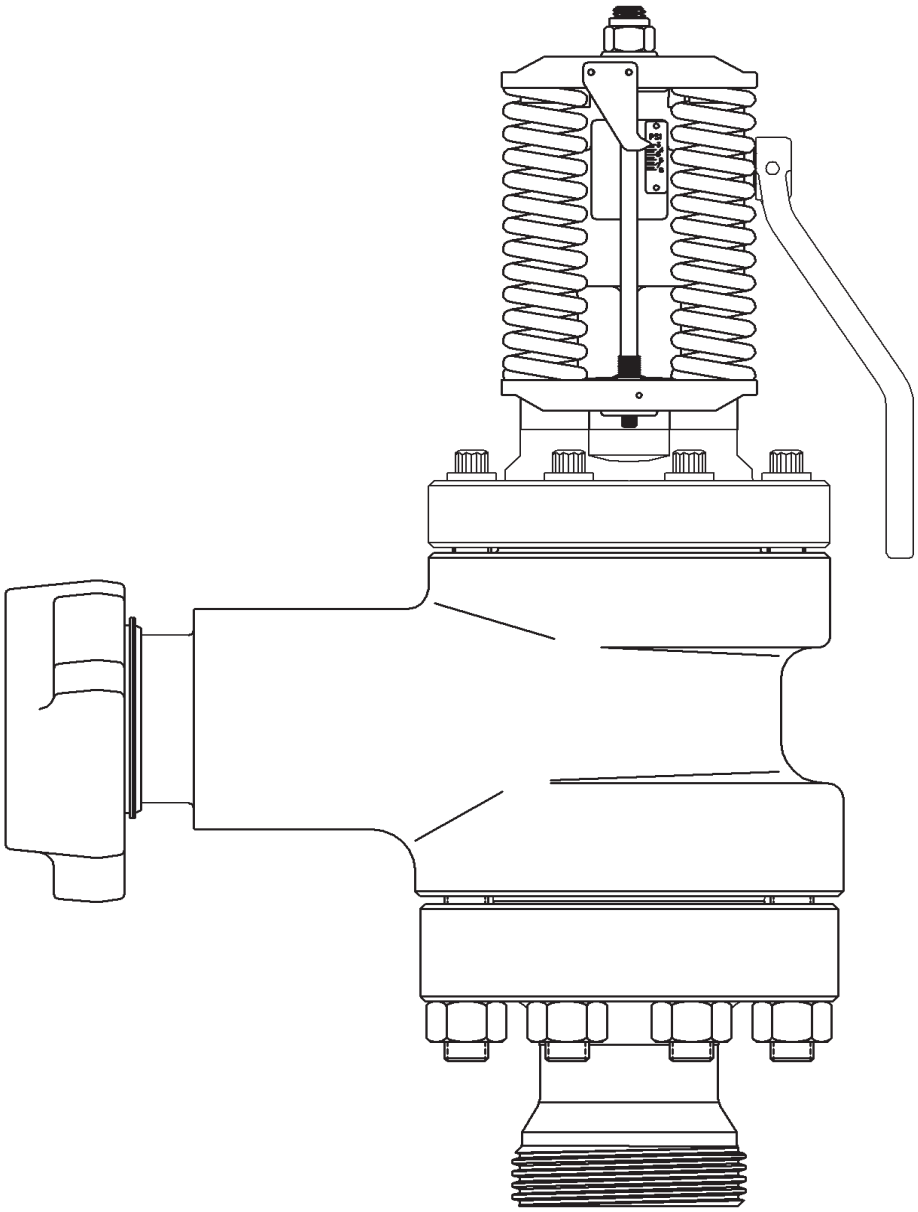
Oteco Inc. Houston, Texas	Manual: **OS-131380 Rev.A**
3" Oteco Reset Relief Valve, 3" Fig.1502 Female Union Inlet x	Revision Date: 11/7/05
3" Fig.1502 Male Union Outlet, 3,000-8,000 psig Working Pressure	
Issued: HK Date: 11/7/05	Approved: HK Date: 11/7/05

Installation and Maintenance
Pt. No. 131380



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1.0 OVERVIEW

This document covers installation guidelines and maintenance instructions that are important for the safe and reliable use of this reset relief valve. Oteco cannot anticipate all the situations that can occur while installing and using this reset relief valve. Therefore, the applicable industry specifications and standards should be used in the installation and use of this reset relief valve.

A parts list with item numbers and assembly drawings are included to assist in identifying the parts and their location in the valve.

Through out this document there are important warnings and special instructions that are enclosed in boxes. Special attention should be given to the information in the boxes because they are important to the safe use of this reset relief valve, and can help prevent serious injury or death.

Special attention should be paid to warnings and notes enclosed in a box, as is this explanatory note. The words DANGER, WARNING, & CAUTION are used in accordance with the following definitions:

DANGER – In most instances, ignoring or violating this warning will definitely result in bodily injury or death.

WARNING – Ignoring or violating this warning can directly result in bodily injury or death, or can cause equipment malfunction, which can result in bodily injury or death.

CAUTION – Ignoring or violating this warning can damage equipment.

The Oteco reset relief valve is used to protect piping systems and pumps from over pressure. The valve must be set to relieve system pressure at a predetermined safe pressure.

WARNING: This reset relief valve is not a precise or exact pressure relief instrument. Circumstances may arise where the valve could relieve pressure at a higher or lower pressure than the expected relief pressure. Such circumstances may include but not be limited to: pressure pulsations in piping, improper valve maintenance, inaccurate pressure relief setting or inaccurate pressure gauges. Precautions should be taken so that an unexpected relief of pressure would not result in damage to equipment, the environment or bodily injury or death.

The Oteco reset relief valve utilizes two coiled springs that exert a force on a piston that keeps the valve closed. When pressure in the piping system increases enough to exert a counteracting force on the piston that is greater than the force exerted by the springs, a linkage in the valve trips, and the piston will "pop" to the open position. This allows fluid to flow rapidly through the valve from its inlet, to its outlet, and then through the system discharge piping to a holding tank or mud pit. When the valve opens to relieve an over pressure condition, the pump that supplies flow to the valve should be stopped as soon as possible to minimize wear to the internal parts of the valve.
After all pressure is removed from the valve, the valve can be reset to the closed position by a lever located on the side of the bonnet.

CAUTION – Do not attempt to set the valve in the closed position with pressure in the piping system. This could cause damage to the valve preventing it from operating correctly.

By turning an adjusting nut (Item 1) (see drawings in sections 10 and 11), which changes the force on the piston, the relief pressure can be adjusted from 3,000 psi to 8,000 psi. The relief pressure at which the valve is set is shown by the relief pressure indicator (Item 5) and scale (Item 11).
The position of the release button (Item 21) on the side of the bonnet indicates if the valve is in the set (closed) or open position. The valve is set (closed) if the release button is <u>not</u> in the depressed position against the side of the bonnet. If the release button is in the depressed position against the side of the bonnet, then the valve is open.

The valve can be opened to relieve pressure at any time by manually striking the release button, thereby depressing it against the side of the bonnet.

The installation of a high pressure, high-volume reset relief valve must be carefully designed in order to insure reliable operation and the safety of personnel and equipment when the valve operates, and to prevent environmental damage from the discharge stream.

The design of inlet and discharge piping must take into account the pressure to which the piping will be subjected and the reaction forces exerted by fluid flow and pressure. Discharge piping can be subjected to pressures which approach the pressure at the valve inlet port. Reaction forces can cause piping which is not adequately anchored to whip violently when the valve operates. Fluid discharged when the valve operates must be routed to a safe location with respect to personnel, equipment and the environment. Consideration must also be given to the orientation of the valve and to pressure pulsations in the fluid system.

WARNING: The reset relief valve, the up stream piping and down stream piping can be subjected to high reaction forces by the rapid discharge of fluids and pressure when the valve opens to relieve pressure. The up stream and down stream piping should be securely anchored to counteract these reaction forces and to prevent the violent whip of piping and/or separation of the reset relief valve from the piping. Ignoring or failure to follow this warning can result in damage to equipment, damage to the environment and bodily injury or death.

Competent engineering personnel must be engaged to design or review each installation.

2. 0 INSTALLATION GUIDELINES

2.1 Preferred Valve Orientation

Oteco, Inc. recommends that the reset relief valve be installed so that the inlet is vertical and the outlet is horizontal.
Valve end-to-end dimensions are shown on assembly drawing (Section 10).

2.2 Pressure Rating and Orientation of the Discharge Line

Fluid flow in piping is accompanied by pressure drop. The pressure drop in a run of piping is increased by the length of the run, by roughness of the pipe walls, by obstructions (valves), and by changes in direction (elbows).
If the discharge line downstream of the reset relief valve is of appreciable length, or if it has several changes of direction, the portion of the line nearest the valve can be subjected to a pressure nearly equal to the pressure at the valve inlet. For this reason, Oteco, Inc. recommends that the discharge piping from the outlet of the reset relief valve be of the same pressure rating as the piping between the valve inlet and the system being protected.
The discharge line should gradually slope away from the outlet of the reset relief valve to the mud pit or holding tank so that fluid in the line is self-draining. Fluid remaining in the line could dry and plug the line or freeze preventing discharge through the line.

WARNING: The discharge line should gradually slope away from the outlet of the reset relief valve to the mud pit or holding tank so that fluid in the line is self-draining. Fluid remaining in the line could dry and plug the line or freeze preventing discharge of the line. This situation could cause destruction of equipment and serious injury or death to personnel

2.3 Reaction Forces and Anchoring of Reset Relief Valve Piping

Fluid under pressure exerts a reaction force upon the piping which contains it. A fluid stream exerts a reaction force upon the piping through which it flows. These reaction forces can be of high magnitude. Moreover, the reaction force due to flow can fluctuate wildly as kicks (gas pockets within

the liquid stream) move through the piping and the reset relief valve. Unless the piping is securely anchored, it can whip violently as the reaction force fluctuates. Such uncontrolled movement of the piping can result in bodily injury or death. The support structure and the manner in which the piping is attached to the structure must be adequate to control movement of the piping under all conditions of pressure and flow.

WARNING: The reset relief valve, the up stream piping, and the down stream piping can be subjected to high reaction forces by the rapid discharge of fluids and pressure when the valve opens to relieve pressure. The up stream and down stream piping should be securely anchored to counteract these reaction forces and to prevent the violent whip of piping and/or separation of the reset relief valve from the piping. Ignoring or failure to follow this warning can result in damage to equipment, damage to the environment, and bodily injury or death.

Computation of reaction forces and design of piping supports are subjects beyond the scope of this manual. Qualified engineering personnel must be engaged to perform these tasks.

2.4 The Discharge Stream: Personnel and Environmental Considerations

The discharge stream must be piped to a location which is safe with respect to both personnel and the environment. With regard to personnel, consideration must be given to splash as well as to direct impingement of the stream.

2.5 A Piping Pitfall

A serious piping error, which has been discovered in some installations, is the return of the relief valve discharge line to the pump suction line, rather than directly to the suction tank. Such a configuration may expose the suction line to a pressure far in excess of its rating.
Also, backpressure on the valve is not recommended in that it could prevent the relief valve from operating correctly.

2.6 Relief Pressure Adjustment

The relief pressure setting of the valve can be set between 3,000 and 8,000 psi by turning the adjusting nut (Item 1) located near the top of the bonnet cover. To increase the relief pressure, the nut should be rotated clockwise (looking from the top of the nut). To decrease the relief pressure, the adjusting nut should be rotated counter clockwise (looking from the top of the nut). The relief pressure setting of the valve is shown on the scale (Item 11) located on the bonnet cover (Item 9). The relief setting of the valve should be verified before pressure is applied to the valve.

2.7 Inlet and Outlet Hammer Union Connections

This Oteco 3" reset relief valve has inlet and outlet hammer union connections that are manufactured to mate with FMC WECO® hammer unions.

WARNING – Do not strike, tighten or loosen connections or components that are pressurized. Failure to follow this warning could result in serious injury or death.

1. Inspect the mating hammer unions on the inlet and discharge piping to ensure they are compatible with FMC WECO® hammer unions.

WARNING – The hammer union inlet and outlet connection of Oteco, Inc. reset relief valves are manufactured to mate with FMC Weco® hammer unions. Hammer unions made by other companies may not be compatible with hammer unions on Oteco, Inc. reset relief valves. Never make connections to mating hammer unions unless the mating unions are positively identified as being compatible with FMC Weco® hammer unions. Specific questions regarding compatibility of hammer unions of manufacture other than FMC Weco®, must be directed to the appropriate manufacturer. Use of mating hammer unions which are not compatible with FMC Weco® hammer unions could result in leakage and/or failure under pressure resulting in equipment damage, bodily injury, or death.

2. Inspect the mating hammer unions on the inlet and discharge piping to ensure they are clean, free from damage and are the same size and figure number as the inlet and outlet hammer union connections on the Oteco reset relief valve.

WARNING- Components of a hammer union assembly must be all the same size and figure number. Never connect Oteco, Inc. reset relief valves to mating hammer unions that are not the same size and figure number as the respective hammer unions on the inlet and outlet ports of the Oteco reset valve. Mismatched hammer union connections may fail under pressure, which can cause equipment damage, bodily injury or death.

3. Securely make up the valve inlet and outlet connections completely before applying pressure to the valve.

DANGER – The inlet and outlet connections must be tight joints. Leakage through the hammer unions will erode the connection and can bring about separation of the valve from the piping, which can result in bodily injury or death.

2.8 Setting of the Valve to the Closed Position

After removing all pressure from the reset relief valve, the valve can be set in the closed position by the reset handle (Item 13) located on the side of the bonnet.

CAUTION – Do not attempt to set the valve to the closed position with pressure in the piping system. This could cause damage to the valve preventing it from operating correctly.

2.9 Valve Calibration

All Oteco reset relief valves are calibrated at Oteco for pressure relief before shipment. Because operating conditions can vary widely, it is recommended that pressure relief of the reset relief valve be periodically verified by users for each application. Calibration should be performed as required. See Section 7.0 for calibration instructions.

3.0 MAINTENANCE

The Oteco reset relief valve is an important piece of safety equipment. Safety of personnel and protection of equipment depend on it working properly. It should be operated periodically to insure it is functioning properly. It is recommended that the valve be calibrated at a minimum of once every 6 months.
Should the reset relief valve need repair service, Oteco, Inc. maintains an inventory of spare parts for the valve that can be supplied for field repair, or the valve can be shipped to Oteco for repair.
The reset relief valve should be recalibrated after repair work is performed.

WARNING: Do not place the valve in service after repair until the valve has been tested and recalibrated to verify that it is operating correctly. Premature relief of pressure or failure to relieve pressure at the predetermined pressure setting can result in equipment damage, bodily injury or death.

3.1 General Repair Procedure

1. The general procedure for disassembly of the reset relief valve is to disassemble the upper part of the valve first (See Section 3.4). Then the lower part of the valve should be disassembled (Section 3.5).

2. To replace the upper and middle seals (Items 43 and 47) and O rings (Items 44, 45 and 48), the bonnet cover (Item 9), bonnet assembly, upper link (Item 38), two lower links (Item 39), body cover flange (Item 41), seal retainer (Item 36), and piston (Item 46) must be removed.

3. The lower seal (Item 51) and O rings (Items 52 and 53) are replaced by removing the inlet sub (Item 54).

4. The general procedure for reassembly of the reset relief valve is to first assemble the lower part of the valve (See section 4.0). Then the upper part of the valve should be assembled. (See Sections 5.0 and 6.0)

3.2 Tools Required for Disassembly and Assembly

The tools required to disassemble or assemble this Oteco reset relief valve can be purchased at most commercial tool suppliers. The following tools are required:

1. 3/8 inch hex Allen wrench
2. 1/2 inch hex Allen wrench
3. 7/8 inch 12 point box wrench
4. 1-5/8 inch box wrench
5. 1-1/16 inch 6 point or 12 point box wrench
6. 3/8 inch open end wrench
7. Needle nose pliers
8. O-ring removal tool
9. 2 large screw drivers
10. Ball pein hammer 8-16 ounce size
11. 7/64 inch diameter x 1-1/4 inches min. length straight shank pin punch
12. 7/32 inch diameter x 1-3/4 inches min. length straight shank pin punch

3.3 Replacement Parts

Oteco, Inc. has assigned part numbers for kits that have parts for repair of this valve. It is recommended that these kits be ordered and stocked by the repair facility in the event the reset relief valve requires service.

Repair kit for replacement of seals and piston.
Kit Pt. No. 143221 **Table** 1

Item	Qty	Pt. No.	Description (Dimensions are Nominal)
26	5	142432	Spiral Pin (1/8 dia. x 5/8 lg.)
43	1	302636	Upper Seal
44	1	302611	O ring
45	1	302634	O ring
46	1	143185	Piston/Bearing assy
47	1	302689	Middle Seal
48	1	302610	O ring
51	1	302686	Lower Seal
52	1	302427	O ring
53	1	302428	O ring
57	2	301862	Union seal

Repair kit for replacement of links, pins, and crank w/bearings.
Kit Pt. No. 143222 **Table 2**

Item	Qty	Pt. No.	Description (Dimensions are Nominal)
14	1	142437	Spiral pin, (5/16 dia. x 1-1/2 long)
15	1	142405	Crank Pivot Pin (3/8 O.D. x 1-9/16 lg.
16	2	142406	Spiral Springs
18	1	143210	Crank/Bearing assy
19	1	142433	Spiral pin, (1/8 dia. x 7/8 long)
20	1	142200	Top Crank Pin
26	5	142432	Spiral pin, (1/8 dia. x 5/8 long)
38	1	142404	Upper Link/Bearing assy
39	2	142402	Lower Link
40	2	142403	Pins f/links, (3/8 O.D. x 1-9/16 lg.)

See Section 9.0 (Parts List) for a list of part numbers for all the parts of this valve. Individual parts can be ordered from this list.

3.4 Disassembly Required for Access to Upper and Middle Seals

Go to step 3 if reset relief valve has already been removed from system piping and moved to repair area.

1. Remove pressure from the valve

DANGER: Tag and block valves or pump controls as necessary to ensure that pressure cannot accidentally be applied during maintenance of the valve.

2. Disconnect the inlet and outlet union connections from the valve and move valve to repair area.

WARNING – Do not strike, tighten or loosen union connections that are under pressure. Failure to follow this warning could result in serious injury or death.

3. Remove adjusting nut (Item 1) using 1-1/16 box wrench. Then remove upper spring retainer (item 4) and two (2) load springs (Item 31). Remove four (4) socket head cap screws (Item 7) using 3/8 hex allen wrench and lift bonnet cover assembly (Item 9) from bonnet. Remove spring guide rod (Item 28) and reset crank spring (Item 30) from bonnet (Item 34).

4. Remove enough grease from top portion of bonnet cavity to expose two (2) spiral springs (Item 16) and top crank pin (Item 20). Remove these two spiral springs (Item 16) using needle nose pliers. Place a large screwdriver behind upper link (Item 38) and rotate the upper link until it is horizontal. Punch out 1/8 dia. spiral pin (Item 26) from upper link using a 7/64 dia. punch and small hammer. Remove top crank pin (Item 20).

5. Remove four (4) socket head cap screws (Item 50) at base of bonnet assembly using 3/8 hex allen wrench. Remove the other four (4) socket head cap screws (Item 49) at base of bonnet assembly using 1/2 hex allen wrench.

6. Lift bonnet assembly from body cover flange (Item 41). The stem of the piston (Item 46), two (2) lower links (Item 39) and upper link (Item 38) are now exposed. Rotate lower links until they are horizontal. Support the lower links with a block and punch out both lower 1/8 dia. spiral pins (item 26) using 7/64 punch. Remove link pin (Item 40) and separate the lower links from the stem of the piston. Upper link can be separated from lower links if necessary by removing the remaining two (2) 1/8 dia. spiral pins (Item 26) and remaining link pin (Item 40).

7. Remove eight (8) bolts (Item 42) from body (Item 37) using 7/8 12 point box wrench. Lift body cover flange from body and piston.

8. Remove seal retainer (Item 36) from body by prying up on seal retainer with two screw drivers opposite each other inserted in the groove located on the side near the top of seal retainer.

9. Remove piston (Item 46) from body (Item 37). (Piston may have come out with seal retainer)

10. Remove middle seal (Item 47) from body and upper seal (Item 43) from body cover flange. Remove two (2) O rings (Items 44 & 45) from seal retainer (Item 36)

This completes the disassembly necessary to access the upper and middle seals.

3.5 Disassembly Required for Access to Lower Seals

Go to step 3 if reset relief valve has already been removed from system piping and moved to repair area.

1. Remove pressure from the valve.

DANGER: Tag and block valves or pump controls as necessary to ensure that pressure cannot accidentally be applied during maintenance of the valve.

2. Disconnect the inlet and outlet hammer union connections from the valve and move valve to repair area.

WARNING – Do not strike, tighten or loosen union connections that are under pressure. Failure to follow this warning could result in serious injury or death.

3. Remove eight (8) nuts (Item 56) from threaded studs (Item 55) using 1-5/8 box wrench.

4. Remove union sub (Item 54) from body (Item 37).

5. Remove lower seal (Item 51).

6. Remove two (2) O rings (Items 52 & 53) from union sub.

This completes the disassembly necessary required to access the lower seals

3.6 Inspection

WARNING: Reset relief valve parts should be thoroughly cleaned and carefully inspected for damage and wear. Damaged or worn parts should be replaced with new parts when assembling a reset relief valve. Using damaged or worn parts in a reset relief valve may cause the valve to not function properly which could result in equipment damage, bodily injury, or death.

3.6.1 Threads

Inspect threads for obvious damage, such as galling and pulled threads. Hammer union nut (Item 58), socket head cap screws (Items 7, 49 & 50), bolts (Item 42), nuts (Item 56) threaded stud (Item 55), body (Item 37), body cover flange (Item 41), sub (Item 54), and bonnet (Item 34) should be inspected. Items with severe or extensive thread damage must be replaced.

3.6.2 Sub (Item 54)

Inspect the sub for dents, cuts and erosion damage. Replace the sub if it is damaged.

3.6.3 Body (Item 37)

Inspect the male union outlet for dents, cuts and erosion damage. Inspect the inside diameters in the lower portion of the valve body (Item 37) that house the lower seal and O ring (Items 51 & 52) as well as the inside diameters of the upper portion of the valve body that house the middle seal and O ring (Items 47 & 45). These inside diameters must be smooth and free of dents, corrosion and erosion. The body must be replaced if damaged.

3.6.4 Piston (Item 46)

The outside diameters of the piston should be free of scratches and dents. Replace the piston if it is damaged. Inspect the pressed in bushing (Item 38A) in the piston. Replace bushing if it is loose or the inside diameter is worn or out of round.

3.6.5 Seal Retainer (Item 36)

The surfaces of the seal retainer must be smooth. Replace the seal retainer if it is damaged.

3.6.6 Body Cover Flange (Item 41)

The ends of the body cover flange must be flat and free of dents. The inside diameters must be smooth and free of dents, cuts and erosion. The stem end of the piston (Item 46) must slide freely through the body cover flange. The faces that contact the O rings (Items 44 and 48) must be flat and free of dents, cuts or erosion.

3.6.7 Upper Link (Item 38) and Lower Links (Item 39)

Inspect the pressed in bushing in the upper link. Replace the bushing if it is loose or its inside diameter is worn or out of round.
Inspect the raised flats on the lower links that contact the crank for wear. If damaged, both lower links must be replaced as a pair.

3.6.8 O Rings (Items 44, 45, 48, 52 and 53) and Seals (Items 43, 47, 51 & 57)

It is recommended that O rings and seals not be reused. New O rings and seals should be used each time the valve is taken apart and repaired. See Table 1 for seal kit that is available from Oteco.

3.6.9 Bearings (Items 9A, 17, 34A, 38A) and pins (Items 15, 20, & 40)

Inspect and replace all bearings that are worn , cracked, or fit loosely.
Inspect and replace crank pins and link pins that are worn, not straight or have cracks.
See Table 2 for bearings and pins kit.

3.6.10 Reset Crank (Item 27), Reset Roller (Item 25), and Reset Handle (Item 13)

The two shafts of the reset crank should be parallel and straight. Replace reset crank if it is bent. The reset roller should be replaced if it is worn, out of round, or has flat spots on the outside diameter. Replace the reset handle if it is bent, or the shaft hole or roll pin hole are worn or out of round.

3.6.11 Load Springs (Item 31)

Check the length of the load springs. The length of the springs should be within 3/32 inch of each other and not shorter than 7-1/8 inches. Replace both springs if replacement of the springs is required. Do not replace just one spring. The valve must be recalibrated whenever the springs are replaced.

WARNING: Do not place the reset relief valve in service after the load springs have been replaced until the reset relief valve has been recalibrated to verify that it is operating correctly. Premature relief of pressure or failure to relieve pressure at the predetermined pressure setting can result in equipment damage, bodily injury or death.

4.0 LOWER VALVE ASSEMBLY

All parts should be cleaned and free of dirt. The body (Item 37) of the valve should be clamped vertically in a vise. The inlet end of the valve body should be facing up.

1. Lubricate the threads of the eight (8) studs (Item 55) and install into the body.

2. Coat the inside diameters of the body and the new lower seal (Item 51) with a thin coat of grease. Install seal into body.
   The groove in the face of the seal should face the inlet (The groove will be visible when the seal is installed).

3. Coat O rings (Items 52 & 53) with grease and install into grooves of sub (Item 54).
   Line up holes in sub with threaded studs in body and install sub into body. Screw nuts (Item 56) on to eight (8) threaded studs (Item 55). Tighten nuts to 300-350 ft-lbs torque.

This completes the installation of the lower valve assembly.

5.0 UPPER VALVE ASSEMBLY

All parts should be cleaned and free of dirt. The body (Item 37) of the valve should be clamped vertically in a vise. The inlet end of the valve body should be facing down.

1. Coat the inside of the body, new seals (Items 43 & 47), new O rings (Items 44, 45 & 48), piston (Item 46), and seal retainer (Item 36) with a thin coating of grease.

2. Install the middle seal (Item 47) into body. The groove in the face of the seal should be facing up. (The groove will be visible when the seal is installed.)

3. Placed the piston (Item 46) into body.

4. Install O ring (Item 45) into groove on the outside diameter of seal retainer. Carefully install seal retainer over stem end of piston and into body. Install O ring (Item 44) into groove in face of seal retainer.

5. Lubricate inside diameters of body cover flange (Item 41) with a thin coating of grease. Install the upper seal (Item 43) into counterbore of body cover flange. Square shoulder of seal should butt against counterbore shoulder of body cover flange. (The O ring in the face of the seal will be visible when the seal is installed.)

6. Install O ring (Item 48) into groove in face of body. Carefully install body cover flange over stem of piston on to seal retainer and on to body lining up the eight (8) bolt holes in the body cover flange with the eight (8) bolt holes in the body. Care should be taken not to damage the upper seal (Item 43) when installing the body cover flange.

7. Lubricate threads of eight (8) bolts (Item 42). Install the eight (8) bolts through the bolt holes in the body cover flange and screw bolts in to body. Tighten bolts to 240 to 290 ft-lbs torque.

This completes the installation of the upper valve assembly.

6.0 INSTALLATION PROCEDURE FOR BONNET ASSEMBLY, LINKS, COVER ASSEMBLY AND LOAD SPRINGS

The bonnet assembly consists of the following parts:

Item no.	Description	Item No.	Description
3	Spiral Pin	22	Release Button Spring
6	Self Tap Screw	23	Release Button Shaft
10	Load Screw	24	Release Button Bushing
15	Crank Pivot Pin	32	Lower Spring Retainer
18	Crank/Bearing Assy	33	Grease Fitting
19	Spiral Pin	34	Bonnet/Bearing Assy
21	Release Button	35	Instruction Plate

The bonnet cover assembly consists of the following parts:

Item No.	Description	Item No.	Description
2	Adjusting Stud	13	Reset Handle
3	Spiral Pin	14	Spiral Pin
6	Self Tap Screw	25	Reset Crank Roller
8	Name Plate	26	Spiral Pin
9	Cover Bearing Assy	27	Reset Crank
11	Relief Pressure Scale	29	Spring Keeper
12	Reset Lever O ring		

1. Attach the upper link (Item 38) to the two lower links with lubricated link pin (Item 40). The raised flats on the lower links must be on the same side (oriented in the same direction with respect to each other). The wide end of the upper link must be installed between the ends of the lower links that are nearest the lower links' raised flats. Line up the holes and

   insert link pin. Line up slots of link pin with 1/8 diameter holes in lower links and install two spiral pins (Item 26) into holes in lower links.

2. Attach the upper link-lower link assembly to the top of the piston that is protruding out of the body cover flange. Line up the holes in the lower links with the bearing hole in the piston and insert lubricated link pin (Item 40). Rotate the lower links until they are horizontal. Place a block under the lower links for support. Line up the slots in the link pin with the 1/8 holes in the lower links and install two (2) spiral pins (Item 26) into holes in lower links.

3. Rotate the lower links and upper link until they are vertical. The raised flats on the lower links must be positioned so that the when the bonnet assembly is installed on to the body cover flange they face the release button (Item 21) on the side of the bonnet assembly. Rotate the piston, and upper and lower link assembly to orient the raised flats correctly.

WARNING: The raised flats on the lower links must be oriented to face the release button (Item 21) on the side of the bonnet assembly. In this position the raised flats of the lower links will contact the raised pads at the bottom of the crank (Item 18) when the valve is in the set (closed) position. The reset relief valve will not operate correctly if they are not placed in this position, which could result in equipment damage, bodily injury, or death.

4. When the lower links have been positioned and oriented correctly, orient the bonnet assembly over the upper and lower links so that when it is installed, the top hole in the upper link (Item 38) will line up with the holes in the crank (Item 18) for the insertion of the top crank pin (Item 20).

5. Install the bonnet assembly over the upper link and lower links on to the body cover flange.

6. Align the hole in the upper link between the top crank pin holes in the crank. Lubricate and install top crank pin (Item 20). Align 1/8 diameter holes in top crank pin and upper link. Insert 7/64 diameter punch into hole through both parts. With 7/64 diameter punch in place rotate upper link so it is horizontal. Maintaining this position, carefully remove 7/64 diameter punch.
   Install spiral pin (Item 26) into 1/8 diameter hole in upper link and top crank pin. End of assembled spiral pin should be flush with outside diameter of upper link.

7. Position the piston (Item 46) to the down (set) position. The raised flats on the lower links (Item 39) should then be in position against the raised pads at the bottom of the crank (Item 18). Install the spiral springs (Item 16) on the ends of the top crank pin (Item 16). To install the two spiral springs, insert each spiral spring's inner straight tab into the slot at each end of the top crank pin (Item 20). Clamp the outer straight tab of each spiral spring with needle nose pliers and wind the spring tighter (approximately 90º). Insert each outer straight tab of the spiral spring into its slot in the crank. When assembled, the small bent end of the outer

   straight tab of each spiral spring should be pointing toward the side of the bonnet assembly with the release button (Item 21). After assembly verify that all of the straight tabs of the spiral springs are fully inserted into the slots of the crank and top crank pin.

8. Align the bolt holes at the base of the bonnet (Item 34) with the threaded bolt holes in the body cover flange. Install four (4) cap screws 5/8" diameter x 2" long (Item 49) and four (4) cap screws 1/2 diameter x 2" long (Item 50). Tighten 5/8 diameter cap screws (Item 49) to 65-95 ft-lbs torque. Tighten 1/2 diameter cap screws (Item 50) to 35-60 ft-lbs torque.

9. Insert spring guide rod (Item 28) into the reset crank spring (Item 30). Place spring guide rod with spring into hole in bonnet (Hole is located between crank (Item 18) and side of bonnet (Item 34). Insert spring keeper (Item 29) into hole in side of reset crank (Item 27). Spring keeper should be inserted on the reset handle (Item 13) side of reset crank.

10. Hold bonnet cover assembly over bonnet in position of final assembly. Line up hole in spring keeper (Item 29) with spring guide rod. Maintaining this alignment set bonnet cover assembly onto bonnet assembly. Bonnet cover assembly should be lifted slightly to verify that spring guide rod is in spring keeper.

11. Install four (4) cap screws 1/2" diameter x 1-1/2" long (Item 7). Tighten Cap screws to 35-60 ft-lbs torque.

12. Place both load springs (Item 31) on to lower spring retainer (Item 32). Align hole in upper spring retainer (Item 4) with adjusting stud (Item 2). Install upper spring retainer on to load springs. The two raised surfaces on the upper spring retainer fit into the inside diameters of the load springs.

13. Install the adjusting nut (Item 1) on to the adjusting stud (Item 2). Screw the adjusting nut until the nut comes in contact with the upper spring retainer and a small compression load is placed on the load springs.

This completes the installation of bonnet assembly and bonnet cover assembly.

WARNING: Do not place the reset relief valve in service after assembly of the valve until the reset relief valve has been recalibrated to verify that it is operating correctly. Premature relief of pressure or failure to relief pressure at the predetermined pressure setting can result in equipment damage, bodily injury or death.

7.0 CALIBRATION OF THE RESET RELIEF VALVE

Oteco recommends that the reset relief valve be calibrated at a minimum of once every 6 months. Also the reset relief valve should be recalibrated each time the valve is disassembled for repair and reassembled. The valve should be calibrated at 3,000 psig and 8,000 psig.

The valve is calibrated by applying pressure to the valve until it opens to relieve pressure on a test stand and then adjusting the load screw (Item 10) to increase or decrease the compression of the two load springs (Item 31) as required to obtain the correct relief pressure. The load screw can be turned by inserting a 3/8" open end wrench into the two flats at the lower end of the load screw. The two flats of the load screw should be parallel to the spiral pin hole in the lower spring retainer (Item 32) when the calibration pressure tests are being performed. After the valve has been calibrated, a spiral pin (Item 3) must be inserted into the spiral pin hole in the lower spring retainer to keep the load screw from turning, thereby changing the calibration.

WARNING: The spiral pin (Item 3) must be installed into the lower spring retainer (Item 32) after the valve has been calibrated. Failure to install this spiral pin will allow the load screw (Item 10) to turn, thereby putting the valve out of calibration and changing the relief pressure (either lower or higher), which could cause damage to equipment, bodily injury or death.

Calibration of the reset relief valve should be performed in a shop were equipment is available to apply pressure to the valve in a safe controlled manner. Test equipment should be designed to withstand the pressures at which the reset relief valve will be tested and to support the weight of the reset relief valve. Qualified engineering personnel must be engaged to perform these tasks.

The pressure gauge used for calibration of the reset relief valve should be rated and capable of reading pressures in the range of the valve being calibrated. The pressure gauge should be calibrated to minimum accuracy of plus or minus 1/2% of full scale.

1. The valve should be placed on the test stand and calibrated in the vertical position. Precautions should be taken to protect personnel during testing and calibration.

WARNING: Safety issues should always be addressed when applying pressure to valves, and piping components. Never look directly into the outlet of the reset relief valve while pressure is applied to the inlet of the reset relief valve. The reset relief valve opens quickly when it opens to relieve pressure, and can propel fluid at high velocity through the outlet of the valve. When calibrating the valve, the outlet of the valve should be directed in a manner that fluid under pressure that is propelled from the valve will not harm personnel, equipment, or the environment. Never place your hand into a high velocity fluid stream or use your hand or body as a probe to detect leakage. High velocity fluid streams such as those resulting from leakage or discharge (reset relief valve opening to relieve pressure) of the valve can cause bodily injury or death. Use a mirror if visual inspection is necessary to detect leakage.

WARNING: The valve should be securely anchored to counteract the reaction forces created by the sudden release of fluid and pressure when the valve opens to relieve pressure. Separation of the valve from the test equipment when the valve operates could result in damage to equipment, bodily injury or death.

2. The spiral pin (Item 3) located in the lower spring retainer (Item 32) must be removed to calibrate the reset relief valve. Some disassembly of the bonnet assembly is required to remove this spiral pin.
   To remove spiral pin, remove adjusting nut (Item 1). Remove upper spring retainer (Item 4) and two (2) load springs (Item 31). Remove four (4) socket head cap screws (Item 7). Remove bonnet cover assembly from bonnet. Lift load screw (item 10) and lower spring retainer (Item 32) approximately 2 inches so that lower spring retainer is positioned to allow clearance to remove the spiral pin. Drive out spiral pin (Item 3) using a 7/32 diameter punch and hammer.

3. Reinstall bonnet cover assembly onto bonnet. Hold bonnet cover assembly over bonnet in position of final assembly. Line up hole in spring keeper (Item 29) with spring guide rod (Item 28). .Maintaining this alignment set bonnet cover assembly onto bonnet assembly. Bonnet cover assembly should be lifted slightly to verify that spring guide rod is in spring keeper.

4. Install four (4) cap screws 1/2" diameter x 1-1/2" long (Item 7). Tighten cap screws to 35-60 ft-lbs.

5. Adjust the reset relief valve pressure setting to 3,000 psig by turning the adjusting nut (Item 1) until the relief pressure indicator (Item 5) is set at 3,000 psi on the relief pressure scale (Item 11).

6. Place the valve in the closed (set) position using reset handle (Item 13).

7. Slowly apply pressure to the reset relief valve until the pressure gauge reading is approximately 250 psi. Manually strike the release button (Item 21) depressing it to the side of the bonnet. This will open the valve and purge air out of the reset relief valve. Remove pressure from the reset relief valve. Place the reset relief valve in the closed position using reset handle (Item 13).
   Again slowly apply pressure to the reset relief valve until it opens ("pops") to relieve pressure. Record the pressure at which the valve opened "popped". Refer to Table 4 to determine if the valve "popped" in the acceptable tolerance range. If the valve "popped" below 3,000 psig tolerance, then the load screw (Item 10) needs to be screwed tighter to compress the load springs (Item 31) further. (The load screw threads are right hand)
   If the valve "popped" above the 3,000-psig tolerance then the load screw should be loosened to relieve some of the compression on the load springs.

Table 4

Calibration Pressure setting (psig)	3,000	8,000
Tolerance (psig)	± 250	± 400

8. To adjust the compression on the load springs turn the load screw 1/2 turn in the direction needed to make the valve relieve pressure "pop" within the 3,000 psig setting tolerance.

   The load screw can be turned by inserting a 3/8" open end wrench into the flats at the lower end of the load screw. The two flats should be kept parallel with the spiral pin hole in the lower spring retainer (Item 32).

9. Repeat steps 6, 7, and 8. until reset relief valve "pops" within the tolerance range for the 3,000 psig setting. When valve has "popped " at least 3 times within the 3,000 psig setting tolerance range, then the valve's relief pressure calibration should be checked at 8,000 psig.

10. Turn the adjusting nut (item 1) to adjust the reset relief valve pressure setting to 8,000 psig.

11. Close the valve. Slowly apply pressure to the reset relief valve until it opens ("pops"). Record the pressure at which the valve "popped". Relief pressure test should be repeated at least 3 times to verify that relieve pressure is in tolerance for the 8,000 psig setting (see Table 4). If the reset relief valve did not "pop" within the tolerance range for 8,000 psig then the load screw should be turned 1/2 turn in the direction needed to make the reset relief valve "pop" within the 8,000 psig setting tolerance. The reset relief valve should then be pressured and "popped" three more times to verify that relief pressure is in tolerance for the 8,000 psig setting.

After the reset relief valve has "popped" three times within the tolerance range for 8,000 psig, then the relief pressure calibration should be checked at 3,000 psig. The reset relief valve should be pressured and "popped" three times at the 3,000 psig setting to verify that relief pressure is in tolerance.

If the valve will not calibrate correctly (does not relieve pressure in the tolerance range at 3,000 psig and 8,000 psig settings) then the valve will need to be disassembled and inspected per Section 3.6. After repairs are made, the valve must be recalibrated. Contact Oteco Inc. if the cause cannot be determined as to why the reset relief valve will not calibrate or otherwise does not function properly.

12. After the reset relief valve has been calibrated, the spiral pin (Item 3) must be installed in the lower spring retainer (Item 32).

WARNING: The spiral pin (Item 3) must be installed into the lower spring retainer (Item 32) after the valve has been calibrated. Failure to install this spiral pin will allow the load screw (Item 10) to turn, thereby putting the valve out of calibration and changing the relief pressure (either lower or higher), which could cause damage to equipment, bodily injury or death.

13. After calibration of the reset relief valve, the bonnet cavity (Item 34) should be filled with a good quality, water resistant, low temperature grease by pumping the grease through the grease fitting (Item 33) until grease starts to push out the plastic plug (Item 34B) located under the shelf of the bonnet between the load springs (Item 31). Push plastic plug back into hole after greasing operation is completed.
Low temperature, water resistant grease (Pt. No. 142052) may be purchased from Oteco.

8.0 HYDROSTATIC TEST

A hydrostatic seal test of the reset relief valve can be performed. Test equipment should be designed to withstand the pressures at which the reset relief valve will be tested and to support the weight of the reset relief valve. Qualified engineering personnel must be engaged to perform these tasks.

WARNING: Catastrophic failure of pressurized valves, and/or piping components can propel fluids, seals and metal at high velocities that can cause serious injury or death to personnel. Adequate barriers between the pressured equipment and personnel should be provide to protect personnel during testing.

DANGER – Never look directly into the outlet of the reset relief valve while pressure is applied to the inlet of the reset relief valve. Never place your hand into a high velocity fluid stream or use your hand or body as a probe to detect leakage. High velocity fluid streams such as those resulting from leakage or discharge (reset relief valve opening to relieve pressure) of the valve can cause bodily injury or death. Use a mirror if visual inspection is necessary to detect leakage.

8.1 Hydrostatic Seal Test

1. A hydrostatic seal test can be performed at a maximum of 8,000 psig working pressure with the reset relief valve in the closed (set) position. This is a leak test of the seals and related parts. The reset relief valve should be seal tested in the vertical position.

2. Turn the adjusting nut (Item 1) to set the reset relief valve setting to 3,000 psig. Slowly apply pressure to the reset relief valve until the pressure gauge reading is approximately 250 psi. Manually strike the release button (Item 21) depressing it to the side of the bonnet.

   This will open the valve and purge air out of the reset relief valve. Remove pressure from the reset relief valve. Place the reset relief valve in the closed position using reset handle (Item 13).

3. The valve should be set at a pressure setting slightly over 8,000 psig (approximately 8,500 psig setting) so that it will not "pop" to relieve pressure at 8,000 psig.

Warning: The reset relief valve setting should never be set above 8,000 psig in operating conditions. The maximum operating relief pressure for this reset relief valve is 8,000 psig. The relieve of pressure "pop" above 8,000 psig could damage the valve where it would not function properly thereby causing damage to equipment, damage to the environment, serious injury, or death.

4. Pressure should be applied slowly to 8,000 psig and held for 3 minutes. Decrease pressure to 0 psig. Again slowly apply pressure to 8,000 psig and hold for 15 minutes. There should be no visible signs of leaks during either holding period.

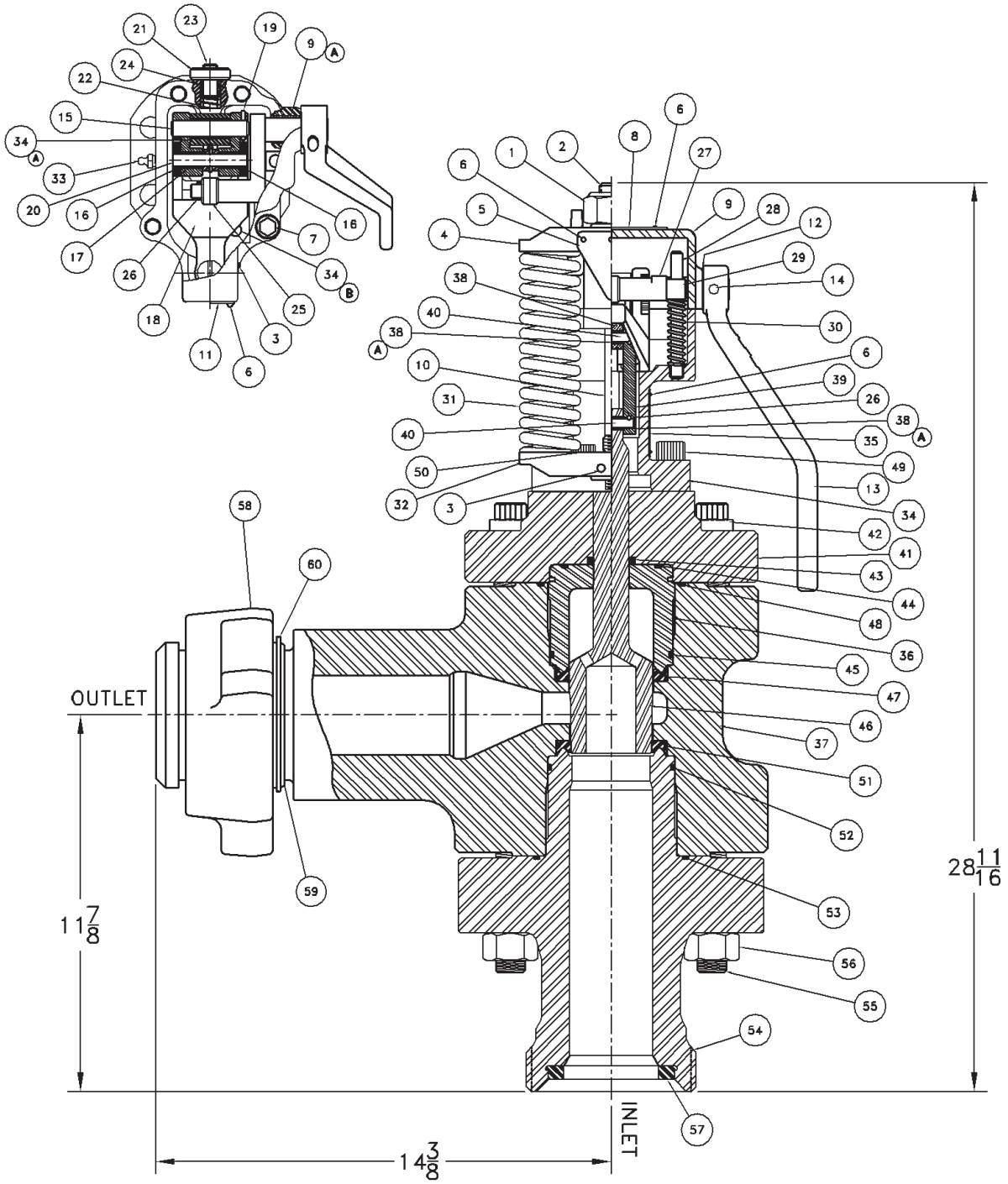
9.0 PARTS LIST

ITEM	QTY	PART NO.	DESCRIPTION
1	1	301786	ADJUSTING NUT
2	1	142414	STUD, ADJUSTING
3	2	142435	PIN, SPIRAL
4	1	142426	RETAINER, UPPER SPRING
5	1	142418	INDICATOR, RELIEF PRESSURE
6	12	301729	SELF TAP SCREW
7	4	143310	SOCKET HEAD CAP SCREW
8	1	142420	NAMEPLATE
9	1	142419	COVER, BEARING ASSEMBLY
9-A	1	142425	BEARING, BONNET COVER
10	1	143220	SCREW, LOAD
11	1	142007	RELIEF PRESSURE SCALE
12	1	142439	"O" RING, RESET LEVER
13	1	143186	HANDLE, RESET
14	1	142437	PIN, SPIRAL
15	1	142405	PIN, CRANK PIVOT
16	2	142406	SPRING, SPIRAL
17	2	142422	BEARING, CRANK
18	1	143210	CRANK/BEARING ASSEMBLY
19	1	142433	PIN, SPIRAL
20	1	142200	PIN, TOP CRANK
21	1	143320	BUTTON, RELEASE
22	1	142407	SPRING, RELEASE BUTTON
23	1	143330	SHAFT, RELEASE BUTTON
24	1	142408	BUSHING, RELEASE BUTTON
25	1	142440	ROLLER, RESET CRANK
26	6	142432	PIN, SPIRAL
27	1	142442	CRANK, RESET
28	1	142340	ROD, SPRING GUIDE
29	1	142412	KEEPER, SPRING
30	1	142413	SPRING, RESET CRANK
31	2	143058	LOAD SPRING
32	1	142427	RETAINER, LOWER SPRING
33	1	301616	FITTING, GREASE
34	1	142436	BONNET/BEARING ASSEMBLY
34-A	2	142424	BEARING, BONNET
34-B	1	142431	PLUG
35	1	142421	INSTRUCTION PLATE
36	1	143035	SEAL RETAINER
37	1	143081	3" FIG 1502 MALE UNION BODY
38	1	142404	UPPER LINK/BEARING ASSEMBLY
38-A	2	142423	BEARING, F/UPPER LINK & PISTON
39	2	142402	LINK, LOWER
40	2	142403	PIN, LINK
41	1	143034	BODY COVER FLANGE
42	8	302613	FLANGE BOLT
43	1	302636	UPPER SEAL
44	1	302611	O RING
45	1	302634	O RING
46	1	143185	PISTON/BEARING ASSY

ITEM	QTY	PART NO.	DESCRIPTION
47	1	302689	MIDDLE SEAL
48	1	302610	O RING
49	4	302470	SOCKET HEAD CAP SCREW
50	4	302495	SOCKET HEAD CAP SCREW
51	1	302686	LOWER SEAL
52	1	302427	O RING
53	1	302428	O RING
54	1	143199	3" FIG 1502 FEMALE UNION SUB
55	8	302472	THREADED STUD
56	8	302471	NUT
57	1	301862	UNION SEAL
58	1	302625	3" FIG 1502 UNION NUT
59	3	302628	3" FIG 1502 RETAINER SEGMENT
60	1	301515	3" FIG 1502 RETAINER RING

Oteco Inc. Houston, Texas	Manual: **OS-131380 Rev.A**
3" Oteco Reset Relief Valve, 3" Fig.1502 Female Union Inlet x	Revision Date: 11/7/05
3" Fig.1502 Male Union Outlet, 3,000-8,000 psig Working Pressure	
Issued: HK Date: 11/7/05	Approved: HK Date: 11/7/05

10.0 ASSEMBLY DRAWING



11.0 EXPLODED DRAWING

