

HYDRAULIC LIFT VALVE/CYLINDER MANUAL - WHEEL HORSE

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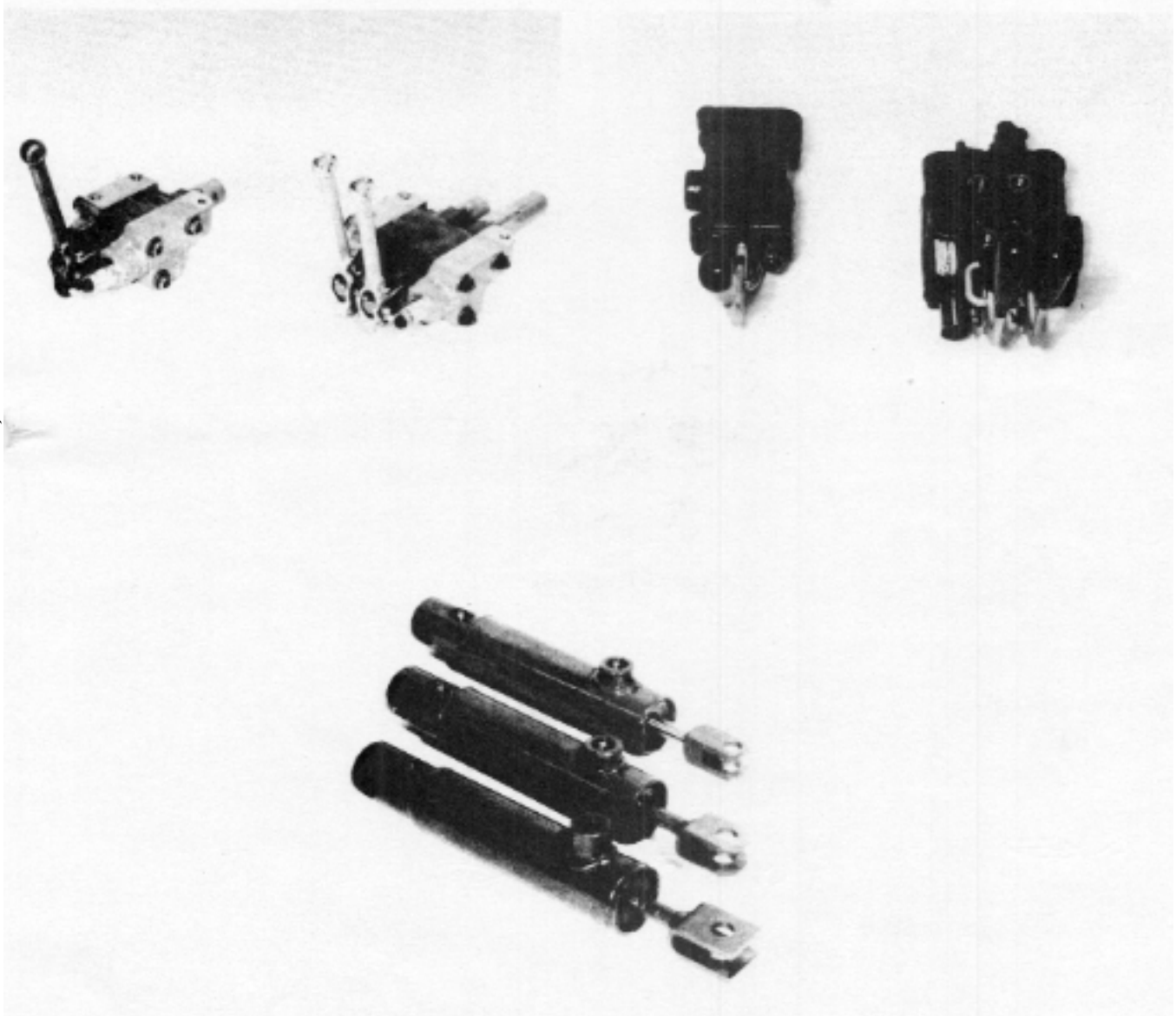
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HYDRAULIC LIFT VALVE & CYLINDER REPAIR MANUAL



WHEEL HORSE
lawn & garden tractors

FOREWORD

This service and repair manual has been compiled to provide authorized Wheel Horse service personnel with proper procedures and techniques for servicing hydraulic lift control valves and cylinders used on Wheel Horse equipment.

Following Table of Contents lists all areas covered. It is advisable to read all sections first to become familiar with repair procedures.

Since valves and cylinders are hydraulic components, strict cleanliness must be maintained during all stages of service and repair. Even a small amount of dirt or contamination can severely damage components. Always use clean solvent when cleaning parts. If contamination of hydraulic system has occurred or is suspected, be sure to clean entire system. Clean lift cylinder, valve, all hoses and lines. Transmission and transaxle must be cleaned to insure all contaminants are removed.

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CONTROL VALVE SERVICE

GENERAL INFORMATION

This manual covers the overhaul of the hydraulic lift control valves listed below.

102874 & 106681 (OMCO) Fig. 1 —

1973 18 HP Automatic, 1974-80 D-Series Automatic tractors with Sundstrand hydrostatic transmission. Lift system pressure is regulated by an implement relief valve located in the hydrostatic transmission.

103204 & 106680 (OMCO) Fig. 1 —

1973 16 HP and 1974-80 C-Series Automatic tractors with Sundstrand hydrostatic transmission. Lift system pressure is regulated by an implement relief valve located in the hydrostatic transmission.

108494 (OMCO) Fig. 2 —

1980-82 C & GT-Series Automatic tractors with Eaton hydrostatic transmission, except C-195. Lift system pressure is regulated by an implement relief valve located to the right of the valve handle.

109679 (OMCO) Fig. 2 —

1982-83 C-195 Twin Automatic tractors. Lift system pressure is regulated by an implement relief valve located next to the outside valve handle.

110068 & 111066 (VICTOR) Fig. 11 —

1983 & later C & GT-Series Automatic tractors with Eaton hydrostatic transmission, except C-195. Although the valves are made by different vendors and require different overhaul kits, they are interchangeable as complete assemblies. Lift system pressure is regulated by an implement relief valve located next to the valve handle.

110492 (VICTOR) Fig. 11 —

1984 & later C-195 Twin Automatic tractors with Eaton hydrostatic transmission. Lift system pressure is regulated by a relief valve located next to the inside valve handle.

MANUFACTURING DATE CODE (OMCO)

The month and year a particular hydraulic valve was manufactured is stamped on the flat side of the outlet cover as shown in Figures 1 & 2. One or two lines of information may be on the cover, which are decoded as follows:

Example (on all valves): 0948 1 9

Example (on some valves): SR115 4 0

Manufacturer's Control numbers

Month Built

(1 = January; 12 = December)

Year Built

(9 = 1979; 0 = 1980; 1 = 1981, etc)

VALVE DESCRIPTION (OMCO)

The hydraulic control valves are made up of one or two spool valves and bodies, secured between an inlet and outlet cover. Normal working pressure is 500-700 PSI. Sundstrand implement system pressure can be field adjusted. On Eaton systems the implement relief valve is part of the control valve and is factory

set at 700 PSI — do not attempt to alter this setting. Severe transmission damage may result. Refer to the applicable repair manual for system pressure tests and adjustments.

When the valve handle is moved to push the spool valve inward, hydraulic port "A" is pressurized and port "B" is connected to the outlet port (Fig. 3). When the spool valve is pulled outward, hydraulic port "B" is pressurized and port "A" is connected to the outlet port. The spool valve is spring loaded to return to a middle, "neutral" position, where ports "A" and "B" are sealed off from both the pressure and outlet ports. These are open-center valves, so hydraulic oil is free to flow from the pressure port to the outlet port when the spool is in neutral. Attachment "float" is accomplished mechanically by the tractor's lift linkage.

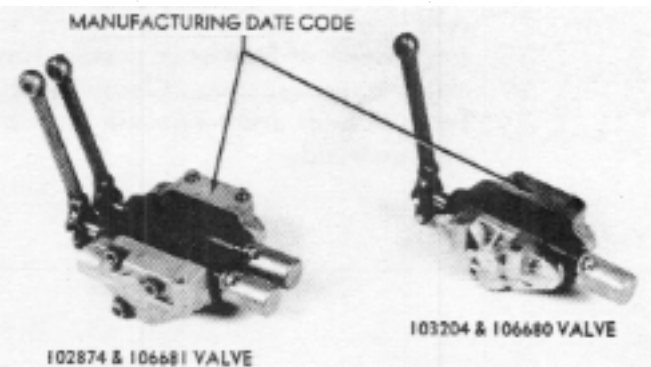


FIG. 1. OMCO Control Valves (Sundstrand Transmission)

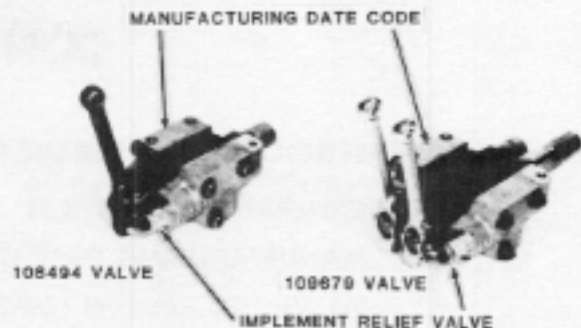


FIG. 2. OMCO Control Valves (Eaton Transmission)

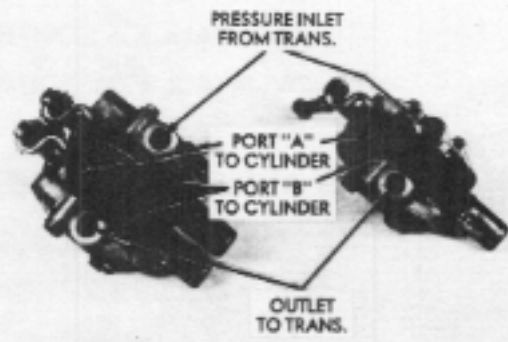


FIG. 3. OMCO Valve Port Identification

OVERHAUL KIT CONTENTS (OMCO)

The 105178 Overhaul Kit for OMCO control valves contains the parts listed below. Two kits are required to service 102874, 106681 & 109679 two-spool control valves.

ITEM	QTY.	DESCRIPTION
1	1	O-ring, Outlet Cover
2	1	O-ring, Valve Body (Large)
3	2	O-ring, Valve Body (Small)
4	2	O-ring, Spool Valve
5	1	O-ring, Spool Valve (Special)*
6	6	Mylar Shim
7	1	Spool Cap
8	2	Screw, Spool Cap
9	2	Lockwasher, Spool Cap
10	1	Spacer Block, Spool Cap
11	1	Spring, Spool Valve
12	1	Washer, Spool Valve
13	1	Spring Retainer, Spool Valve
14	1	Shoulder Screw, Spool Valve
15	1	"S" Link, Handle
16	1	Pin, Handle
17	1	Push Nut, Handle Pin

*Refer to overhaul procedure for application.

Except for the valve handle, supplied as Kit 105145, no other repair parts are available. The valve must be replaced if the overhaul kit fails to correct the problem.

OVERHAUL PROCEDURE (OMCO)

Service Notes

1. Use a clean, dirt-free work surface and clean solvent to prevent system contamination.
2. When separating valve sections, remove each section carefully and note the quantity and location of mylar shims, if used. These will be located around bolt holes between sections.
3. Section O-rings may be greased to hold them in place. Lubricate spool valve O-rings and spool valve with oil when reassembling.

Disassembly & Reassembly

1. Remove the push nut from the valve handle pin and remove the valve handle (or handles).

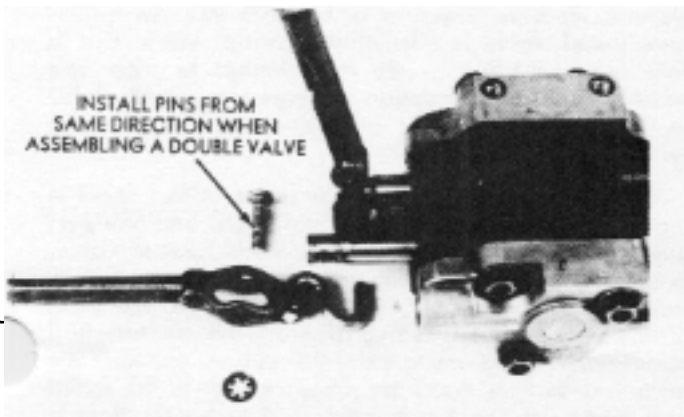


FIG. 4. Remove Valve Handle(s) (Double Valve Shown)

2. Remove the parts shown in Fig. 5A or 5B, as applicable.

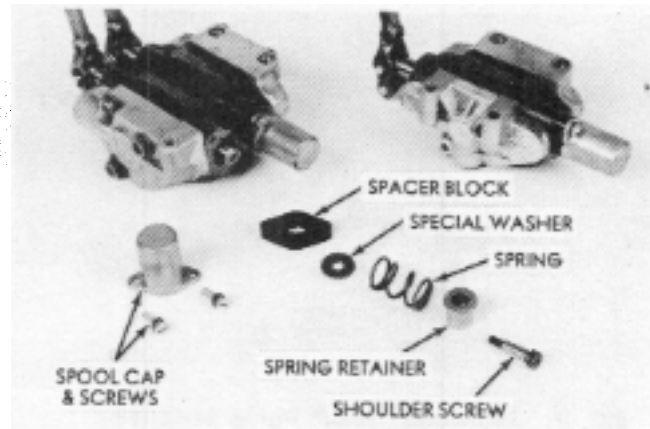


FIG. 5A. Spool Cap & Valve Disassembly

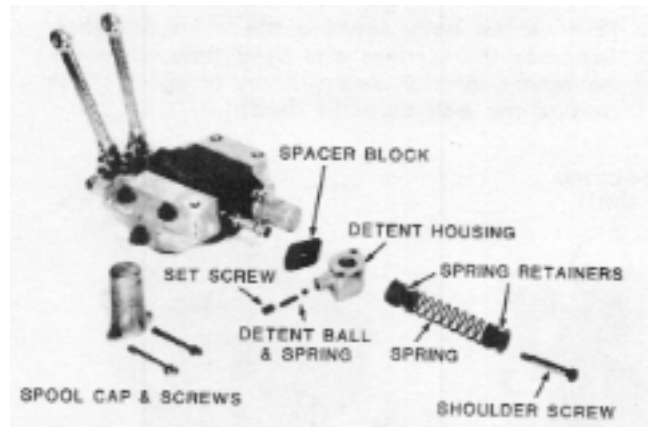


FIG. 5B. Spool Cap & Valve Disassembly — Spool Valve with Detented Float Position

3. Push the spool valve out toward the spool cap end. Remove and discard the spool valve O-rings. (Fig. 6).

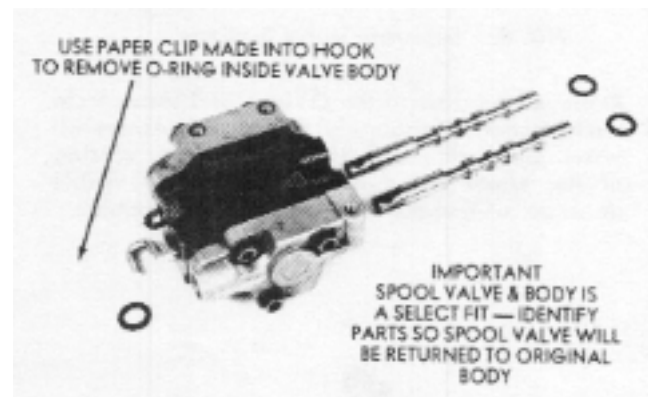


FIG. 6. Spool Valve Removal (Double Valve Shown)

4. If the valve has a relief valve it should be removed for cleaning. Remove the valve by unscrewing the complete tension adjustment assembly from the inlet cover. **Do not tamper with relief valve setting;** severe transmission damage may result if it is incorrectly set. Remove the spring and valve. If a new O-ring is needed for the tension adjuster, obtain P/N 973310.

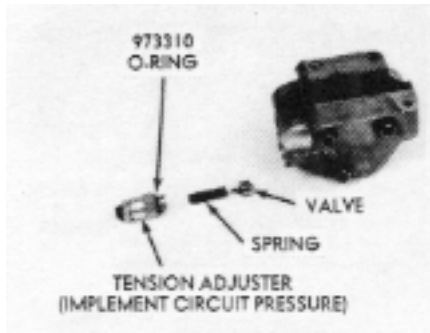


FIG. 7. Implement Relief Valve Removed (108494/109679 Valves)

5. Remove the bolts securing the valve together. Separate the sections one at a time, carefully noting the location and quantity of mylar shims around the bolt holes (if used).

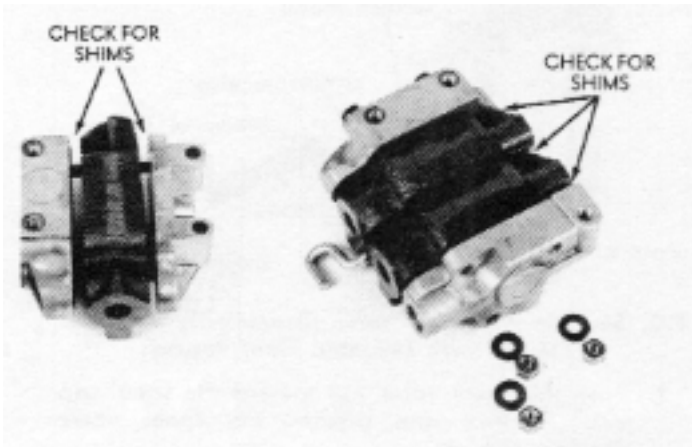


FIG. 8. Separate Valve Sections

6. Remove and discard the O-rings and shims from each section. Thoroughly clean and inspect all parts. Generally, any deep scratches or scoring of the spool valve or bore, or other visible damage will make the valve unserviceable.

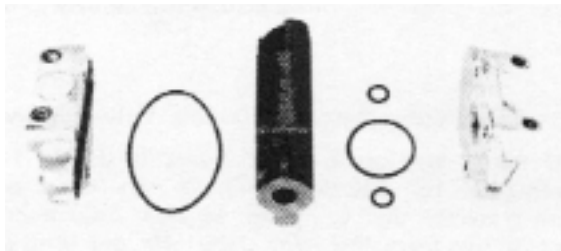


FIG. 9. Single Valve Disassembled

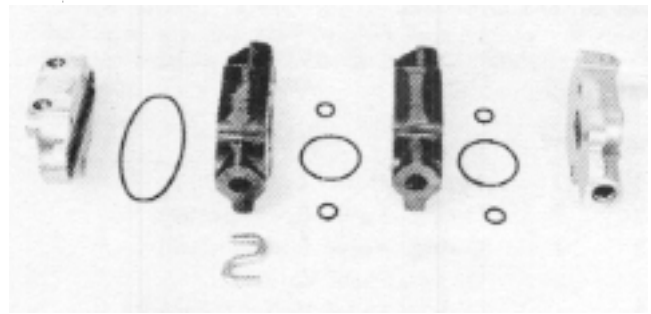


FIG. 10. Double Valve Disassembled

7. Reassemble the valve in reverse order, using the new parts supplied in the overhaul kit. The following assembly notes apply:
 - a. Use care not to pinch O-rings between sections. Torque bolts to 72-75 in. lbs.
 - b. Install an O-ring in valve body. Insert spool valve from spool cap end, then install valve handle.
 - c. Install an O-ring in the groove at the spool cap end of the valve body. If the valve was made before 6-75 (see "Manufacturing Date Code"), use the special oversize O-ring, which is slightly thicker than the standard ring.
 - d. When securing the shoulder screw (Fig. 5), be sure the shoulder passes through the center of the special washer, or the spool valve will operate in only one direction.
 - e. The float detent, on valves so equipped (Fig. 5B), is adjusted using the set screw on the bottom of the valve. Properly adjusted, the spool valve will lock into the float position when engaged, yet release easily when light pressure is applied to the handle.

VALVE DESCRIPTION (VICTOR)

The hydraulic control valves are made up of one or two spool valves and a cast iron valve body. Normal working pressure is 500-700 PSI. An implement relief valve is part of the control valve and is factory set at 700 PSI — do not attempt to alter this setting. Severe transmission damage may result. Refer to the applicable repair manual for system pressure tests and adjustments.

There are two ports for each spool. When spool is moved into valve, one port is pressurized and one port becomes an outlet. When spool is moved out of valve, ports are reversed. Spool valve is spring loaded to return to a middle, "neutral" position, where both lift cylinder ports are sealed off from the pressure and outlet ports. These are open-center valves, so hydraulic oil is free to flow from the pressure port to the outlet port when the spool is in neutral. Attachment float is accomplished mechanically by the tractor's lift linkage, or through a detented float position provided on one spool of the two-spool control valve.

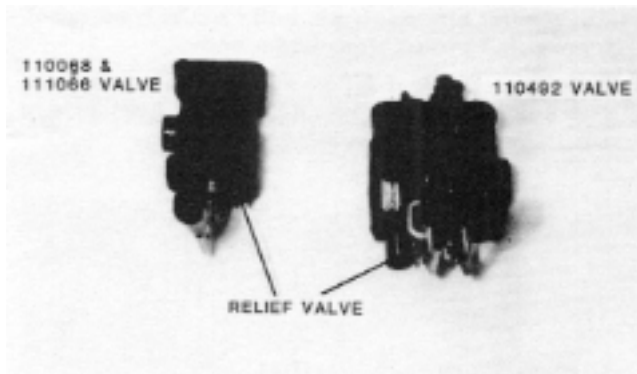


FIG. 11. VICTOR Control Valves (Eaton Transmission)

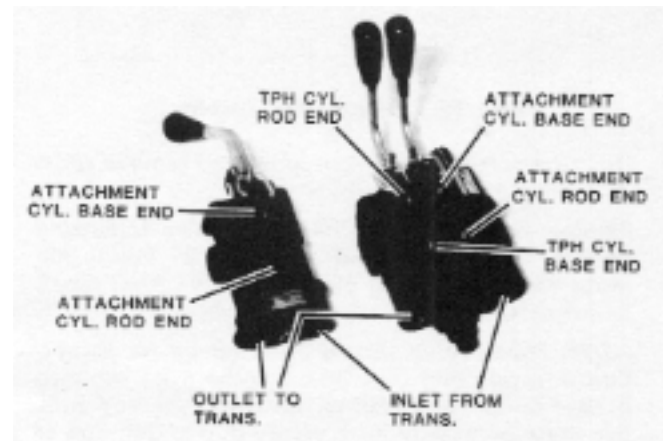


FIG. 12. VICTOR Valve Port Identification

OVERHAUL KIT CONTENTS (VICTOR)

VICTOR 110068 & 111066 Control Valves

The 109081 Overhaul Kit for VICTOR control valves contains the parts listed below.

ITEM	QTY.	DESCRIPTION
1	2	O-ring, Spool Valve
2	1	Washer (Under Return Spring)
3	1	Spool Return Spring
4	1	Spool Retainer Cap
5	1	Snap Ring
6	1	Washer (Under 7)
7	1	Screw, Spool Retainer
8	1	Ball (Relief Valve)
9	1	Spring, White (Relief Valve)
10	1	Gasket, Relief Valve Cap

Except for the valve handle, handle link, clevis pin and cotter pins, no other repair parts are available. The valve must be replaced if the overhaul kit fails to correct the problem.

VICTOR 110492 Control Valve

The 109097 Overhaul Kit for VICTOR control valves contains the parts listed below.

ITEM	QTY.	DESCRIPTION
1	2	"O" Ring — Load Check Plug
2	4	"O" Ring — Spool
3	4	Screw With Lockwasher
4	1	Spacer Screw
5	2	Steel Ball — Detent
6	3	Washer
7	1	Spacer — Spool w/o Detent
8	1	Return Spring — Spool w/o Detent
9	1	Return Spring — Spool With Detent
10	1	Detent Spacer Screw
11	1	Spacer — Spool With Detent
12	2	Spring — Load Check Valve
13	2	Spring — Detent
14	1	Spring — Relief Valve
15	1	Ball Retainer
16	2	Gasket — Relief Valve
17	1	Steel Ball — Relief Valve

Except for the valve handle, handle link, clevis pin and cotter pins, no other repair parts are available. The valve must be replaced if the overhaul kit fails to solve the problem.

OVERHAUL PROCEDURE (VICTOR)

Service Notes

1. Use a clean, dirt-free work surface and clean solvent to prevent system contamination.
2. Lubricate spool valve O-rings and spool valve with oil when reassembling.

Disassembly & Reassembly (SINGLE SPOOL VICTOR)

1. Remove the snap ring from the spool retainer cap (Fig. 13).
2. Remove the screw and washer from the retainer cap and remove the cap, spring and washer.
3. Remove the clevis pin from the handle and remove the handle and handle link (Fig. 14).
4. Pull the spool out of the valve body. Remove and discard the O-rings.

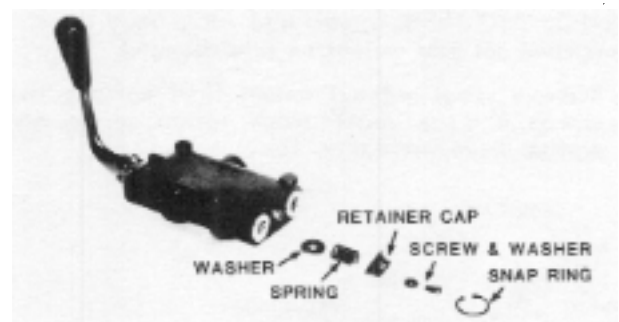


FIG. 13. Remove Retainer Cap and Return Spring

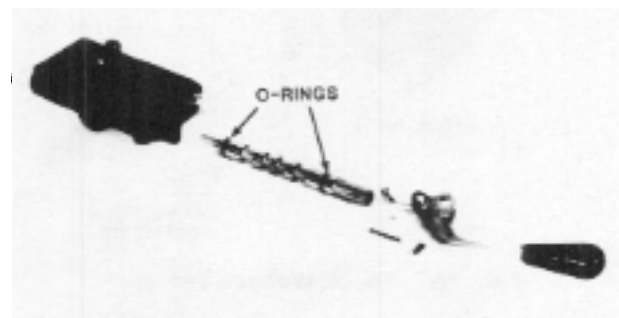


FIG. 14. Remove Handle and Spool

5. The relief valve should be removed for cleaning. Remove the cap nut; discard the gasket (Fig. 15).
6. Using a center punch, lightly mark the adjustment set screw and valve body so the set screw can be returned to its exact position. **Do not tamper with relief valve setting; severe transmission damage may result if it is incorrectly set.**
7. Remove the set screw, spring and ball.

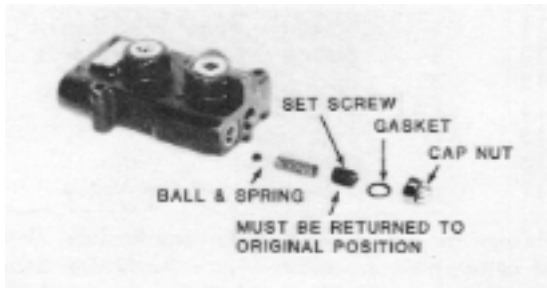


FIG. 15. Implement Relief Valve

8. Reassemble the valve in reverse order, using the new parts supplied in the kit. The following assembly notes apply:
 - a. Be sure to place the relief valve set screw in its exact original location.
 - b. The overhaul kit contains a new relief valve spring and ball. Use these parts only if necessary due to damage or wear. If the original parts are replaced, implement system pressure should be checked using an accurate gauge. If not 700 PSI, carefully adjust the relief valve set screw to obtain this value. Gauge connection is shown in the Eaton Model 11 Automatic Transmission Repair Manual.

Disassembly (TWO SPOOL VICTOR)

IMPORTANT NOTE: Spools and valve body are a matched set and cannot be interchanged.

1. Remove spool without detent first; Remove two screws, end cap, spacer screw, spacer, spring, and washer from valve (Fig. 16).

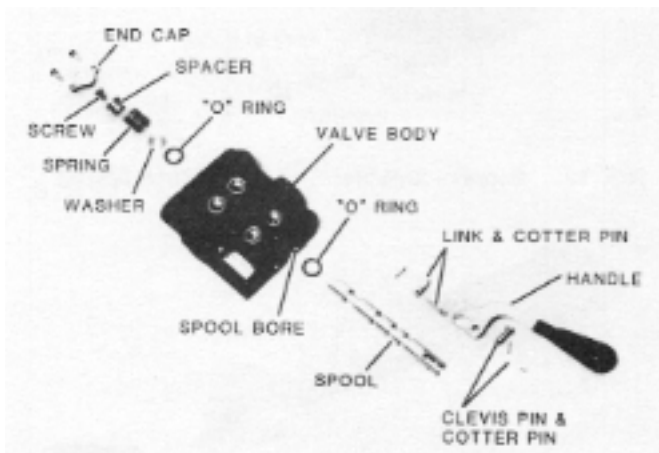


FIG. 16. Spool Without Detent

2. Remove cotter pin and link from valve body and handle. Pull handle and spool out of valve. Re-

move cotter pin, clevis pin and handle from spool. Remove "O" Rings from valve body.

3. Remove two detent plugs, springs and balls from detent end cap (Fig. 17). Remove two detent end cap screws and end cap from valve.

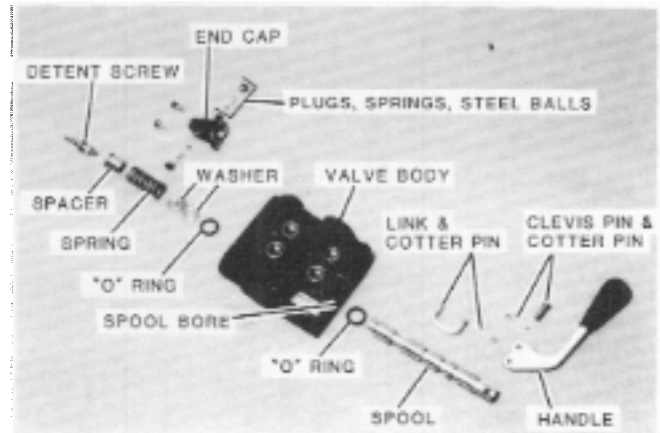


FIG. 17. Spool With Detent

4. Unscrew detent screw from spool and remove spacer, spring and two washers from valve.
5. Remove cotter pin and link from valve body and handle. Pull handle and spool out of valve. Remove cotter pin, clevis pin and handle from spool. Remove "O" Rings from valve body.

NOTE: Relief valve should be removed for inspection and cleaning (Fig. 18). Overhaul kit contains a new relief valve spring, ball retainer and ball. Use these parts only if necessary due to damage or wear. Record number of turns of adjustment screw during removal.

6. Remove relief valve cap and steel gasket from valve (Fig. 18).

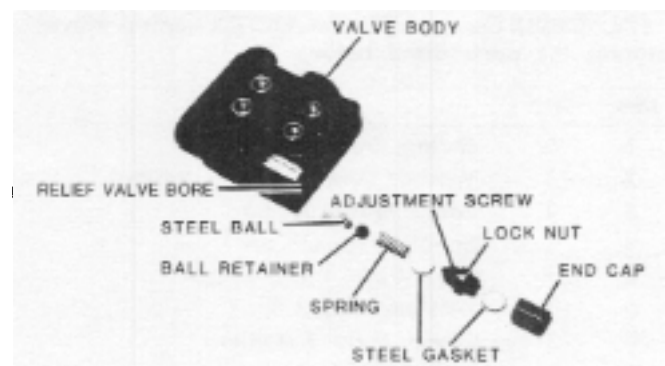


FIG. 18. Pressure Relief Valve

7. Punch aligning marks on end of adjustment screw and valve body. Loosen screw jam nut. Unscrew adjustment screw and remove screw and steel gasket from valve body. Record number of turns taken to remove adjustment screw.
8. Remove relief valve spring, ball retainer and ball from valve.
9. Remove two load check valve plugs, "O" Rings, springs and poppets from valve (Fig. 19).

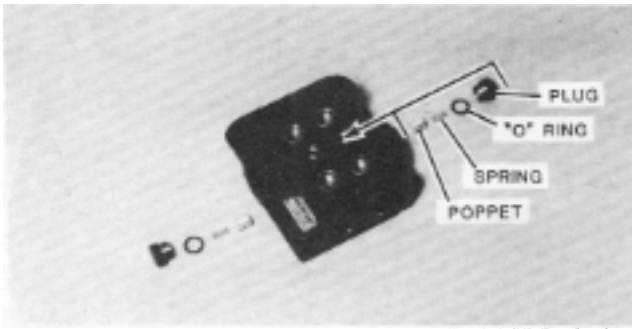


FIG. 19. Load Check Valves

Assembly (TWO SPOOL VICTOR)

1. Coat two load check poppets and "O" Rings with lithium base grease (Fig. 19). Install plugs, "O" Rings, check poppets and springs into top center bores of valve.
2. Position valve body so that relief valve bore is vertical (Fig. 18). Drop ball into bore so that ball rests on relief seat. Apply grease to ball retainer and spring and assemble. Enough grease should be used so spring and ball retainer stick together. Insert spring and ball retainer assembly into bore against ball. Slide metal gasket on adjustment screw and install screw into valve bore number of turns recorded during disassembly. Hold adjustment screw and tighten jam nut to 45-52 ft. lbs. torque. Insert metal gasket over adjustment screw and screw cap onto adjustment screw.
3. Coat detent spool with oil and slide spool into valve bore from relief valve side (Fig. 17). Push spool into bore only far enough to expose handle side "O" Ring groove in valve body. Coat "O" Ring with lithium grease and install in groove of valve body. Check that "O" Ring is properly seated in groove. Push spool over "O" Ring only far enough so that other end of spool exposes "O" Ring groove in valve body.

Coat "O" Ring with lithium grease and install in groove of valve body. Check that "O" Ring is properly seated in groove. Push spool over "O"

Ring until end of spool is flush with end of valve. Position handle into slot of spool and align bottom hole of handle and hole in spool. Install clevis pin into handle and spool and secure using cotter pin. Install link into holes of handle and valve body and secure using cotter pin.

Apply grease to inside and outside of spacer and install on spring. Slide two washers onto end of spool. Install detent screw into spacer and spring assembly. Install detent screw, spacer and spring on end of spool. Torque to 2-3 ft. lbs. Locate notch in flat surface of end cover. Slide end cap over spring with notch positioned down and secure to valve using two screws. Apply lithium grease into holes of end cap and on two detent springs. Install steel balls, springs and plugs into holes in end cap.

4. Coat remaining spool with oil and slide spool into valve bore from relief valve side (Fig. 16). Push spool into bore only far enough to expose handle side "O" Ring groove in valve body. Coat "O" Ring with lithium grease and install in groove of valve body. Check that "O" Ring is properly seated in groove. Push spool over "O" Ring only far enough so that other end of spool exposes "O" Ring groove in valve body.

Coat "O" Ring with lithium grease and install in groove of valve body. Check that "O" Ring is properly seated in groove. Push spool over "O" Ring until end of spool is flush with end of valve. Position handle into slot of spool and align bottom hole of handle and hole in spool. Install clevis pin into handle and spool and secure using cotter pin. Install link into holes of handle and valve body and secure using cotter pin.

Apply grease to inside and outside of spacer and install on spring. Slide washer onto end of spool. Install detent screw into spacer and spring assembly. Install detent screw, spacer and spring on end of spool. Torque to 2-3 ft. lbs. Locate notch in flat surface of end cap. Position end cap on valve with notch down and secure to valve using two screws.

LIFT CYLINDER SERVICE

GENERAL INFORMATION

This manual covers the overhaul of the hydraulic lift cylinders listed below. The 8365 cylinder used on GT-14, 18HP Automatic and D-Series Automatic tractors is not repairable, nor are the cylinders used on D-250 tractors.

105254 -

1976-77 C-Series Automatic tractors, and 1975 and prior tractors where original equipment 6618 cylinder has been replaced by 105254.

106249 & 108872 -

1978 & later C & GT-Series Automatic tractors.

CYLINDER DESCRIPTION

The lift cylinder consists of a bi-directional steel piston secured to a chrome plated piston rod. The

piston works in a machined steel cylinder, and the direction of travel is controlled by the hydraulic lift valve. The cylinder is welded closed at one end and has a sealed piston rod guide bushing at the opposite end.

Three types of piston and rod construction are used. The first has the piston welded to the piston rod and uses a threaded clevis at the exposed end. The second type has a piston secured with a nut and the clevis is welded to the exposed end. The welded clevis type of cylinder was first used during the 1981 model year. The third type has a piston threaded onto the piston rod and the clevis is welded to the exposed end. This cylinder was first used during the 1983 model year.

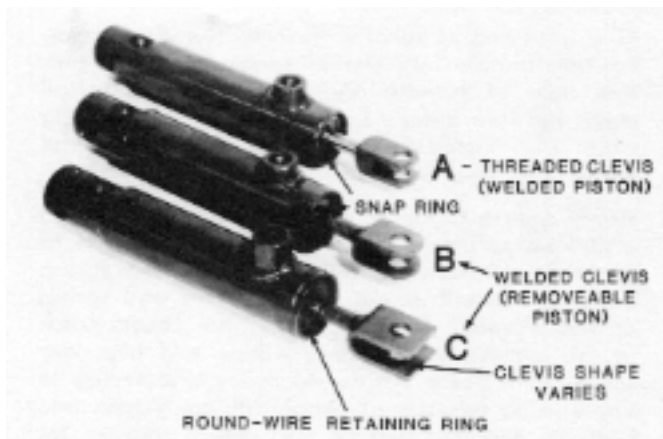


FIG. 21. Hydraulic Lift Cylinders

O-RING & GASKET KIT CONTENTS

The 101699 O-ring and Gasket Kit contains the following items, and is used on cylinders A & B (Fig. 21):

ITEM	QTY.	DESCRIPTION
1	2	O-ring Piston and Guide Bushing O.D.
2	1	O-ring, Guide Bushing I.D.
3	1	Rod Wiper, Guide Bushing
4	2	Gasket, Piston
5	1	Snap Ring, Cylinder
6	1	O-ring, Piston Rod*

*Removeable Piston Construction.

The 109088 Service Kit contains the following items, and is used on cylinder C (Fig. 21):

ITEM	QTY.	DESCRIPTION
1	1	O-ring, Piston Rod
2	1	O-ring, Guide Bushing I.D.
3	1	Back-up Washer, (Wiper Side of Guide Bushing O-ring)
4	1	Wiper, Guide Bushing
5	1	O-ring, Guide Bushing O.D.
6	1	Rectangular Section Seal, Piston
7	1	O-ring, Piston
8	1	Retaining Ring

No other repair parts are available. The lift cylinder must be replaced if the service kit fails to solve the problem.

OVERHAUL PROCEDURE

Service Notes

1. Use a clean, dirt-free work surface and clean solvent to prevent system contamination.
2. Lubricate all internal parts with oil when reassembling.

Disassembly & Reassembly

1. Loosen the setscrew and remove the clevis (threaded type). The piston rod may be held with locking pliers just behind the clevis, if necessary.
2. Remove the snap ring or retaining ring from the cylinder (Fig. 22A or 22B).

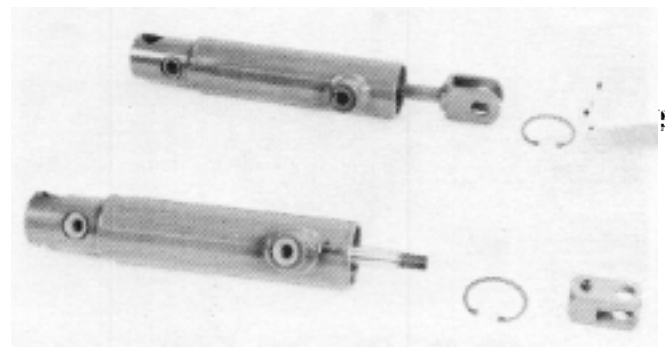


FIG. 22A. Remove Clevis & Snap Ring

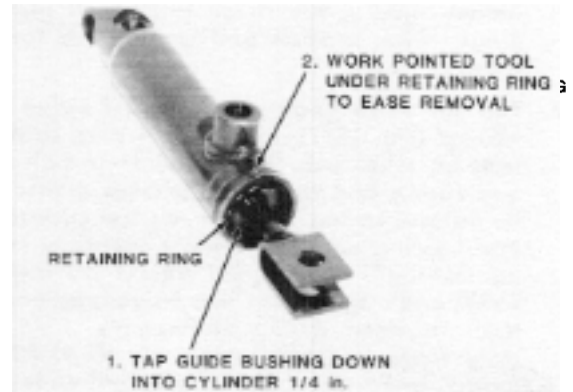


FIG. 22B. Remove Retaining Ring

3. Thread the clevis partially onto the piston rod, if applicable. Tap the cylinder off the rod bushing and piston with a soft-faced mallet.
4. Cylinders serviced with 101699 Kit are shown in Fig. 24. Cylinders serviced with 109088 Kit are shown in Fig. 25 and 26. Remove and discard all O-rings and seals. Straighten out a paper clip and form a hook in one end to remove O-rings from grooves.

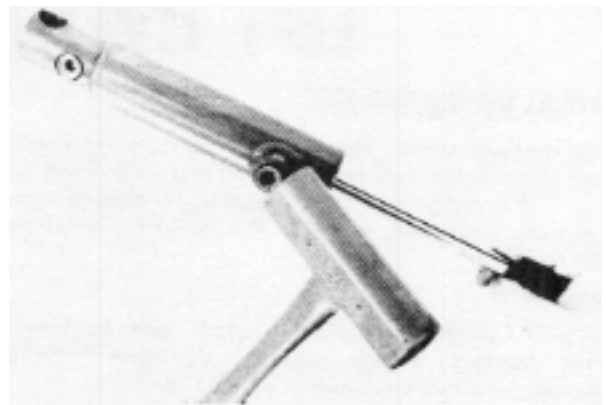


FIG. 23. Cylinder Removal

5. Clean and carefully inspect all parts. In general, any deep scratches or scoring of the piston and its bore, or of the piston rod and the I.D. of the rod bushing will make the cylinder unserviceable.

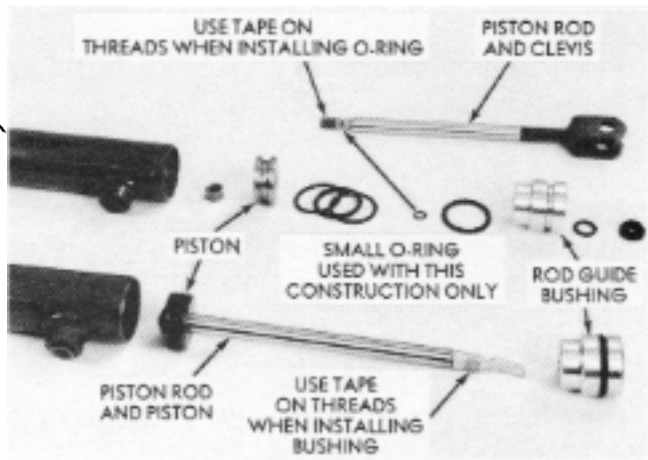


FIG. 24. Piston, Rod & Bushing Seals

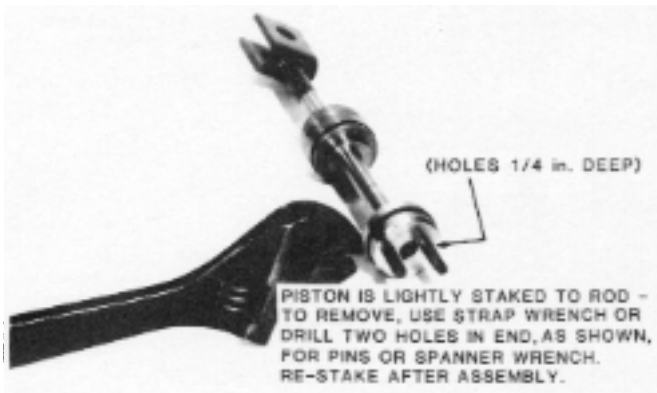


FIG. 25. Piston Removal

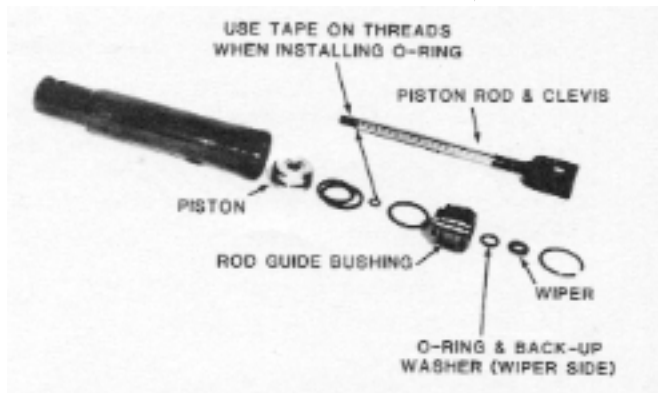


FIG. 26. Piston, Rod & Bushing Seals

6. Install the new O-rings, gaskets and seals contained in the service kit. One gasket should be on each side of the piston O-ring (Fig. 24 cylinders). Use masking tape as indicated in Fig. 24 & 26 to protect the O-rings from damage during assembly.
7. Use extreme care when installing parts into the cylinder. Be sure the piston and bushing O-rings are not cut on the grooves inside the cylinder. Carefully align the parts before attempting to insert them into the cylinder.
8. After reinstalling the retaining ring (Fig. 22B), fully extend the piston rod until the piston pushes the rod guide bushing up to "capture" the retaining ring.

Product information and specifications are shown herein as of the time of printing. Wheel Horse Products, Inc. reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligation.



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