Ingersoll

CONTROL VALVE
COMPACT TRACTORS
Service Manual 9-50381

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Ingersoll Equipment Co., Inc. Winneconne, Wisconsin 54986-9576

SECTION I

SERVICING THE HYDRAULIC LIFT VALVES PART NUMBERS C14153 AND C12677

Refer to Figure 1-1

NOTE a. Valves, part number C 14153 is used on the Model F30 Hydraulic Lift Kit for Model 220, 222, 442, and 444 tractors prior to S/N 9646-800.

b. Valve, part number C 12677 is used on the Model E25 Hydraulic Lift Kit for Model 155 and 195 tractors.

DISASSEMBLY

1. Remove the three screws (14) and remove the end cap (3).

2. Remove the screw (6), washer (5), spacer (2), spring (7), and washer (4).

3. Remove the spool (1) from the valve body. Remove and discard the old seals (8).

4. With the valve positioned so the "relief valve" side is downward to prevent the ball (9) from sticking in the coring remove the cap (13), gasket (12), adjusting screw (11), relief spring (10), and ball (9).

INSPECTION

Inspect the bore in the valve body for grooves, deep scratches or excessive wear. If the valve body has damaged threads, cracks or groove marks the valve assembly must be replaced.

Inspect the valve spool(s) for grooves, deep scratches or excessive wear. Check the fit of the spool in the valve body bore with hand pressure. If there is excessive side clearance or if the spool is scored the valve assembly must be replaced.

Check the relief valve seat in the valve body for foreign material or damage. If the seat is nicked or chipped the valve assembly must be replaced.

NOTE A slight scratch on a relief seat can usually be corrected by rapping the relief ball against the seat with a brass drift pin and hammer. The smaller end of the drift pin should be approximately the same diameter as the ball. Install a new relief ball if the original ball was used to repair the seat.

Install new "O" rings and gasket during assembly.

Relief Spring (10) Inspection:	
Free Length	1-9/32"
Total Coils	12-1/4"
Active Coils	10-1/4"
Wire Diameter	.078"
Spring O.D.	.365"
Spring I.D.	.209"
240 lbs. per inch spring rate	
56 lbs. load at 1-1/32"	

Spool Return Spring (7) Inspection:

Free Length	1.046
Total Coils	4-1/4
Active Coils	2-1/4
Wire Diameter	.086
Spring O.D.	.865
Spring I.D.	.693
74 lbs. per inch spring rate	
31 lbs. load at .625"	

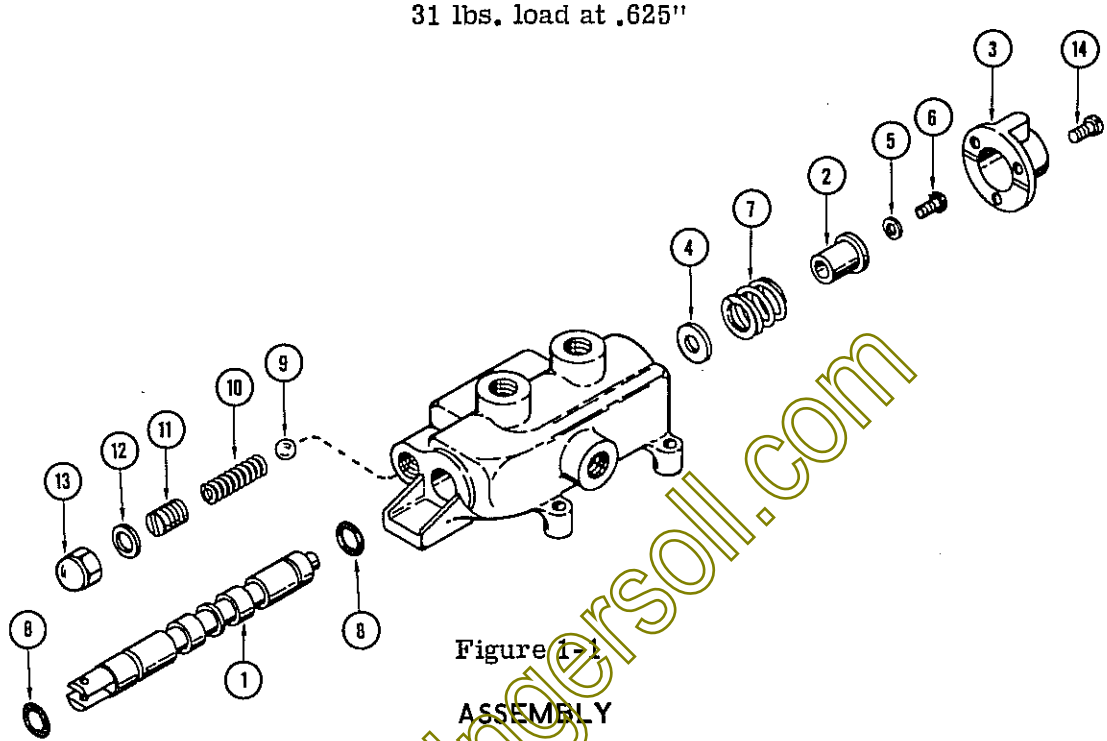


Figure 1-1

ASSEMBLY

1. Wash all parts with solvent and blow air dry. Coat all parts with clean light oil before assembly.

2. Install a new "O" ring (8) in the groove at the handle end of valve spool. Coat the "O" ring and spool bore in the valve body with grease or vasoline. Using a rotary motion, place the spool, spring end first into the bore at the relief valve end of the valve body. Check and remove all sharp protrusions from spool retaining ring grooves and spool lands.

3. Rotate the spool far enough into the valve to expose the "O" ring groove at the spring end. Install a new "O" ring (8) in the groove and coat with grease or vasoline. Rotate the spool back to its normal position.

4. Place the spring (7) onto the spacer (2) and install them with the washer (4) next to the spool. Secure with washer (5) and screw (6). Install the end cap (3) with three screws (14).

5. With the handle end of the valve facing upward, install the relief ball (9), the spring (10) and adjusting screw (11). Turn about 1/2 of the adjusting screw threads into the valve.

6. Using a grease gun or hand pump, adjust the relief valve to the correct "cracking" pressure specified on page 13 of the Hydraulic System test Procedure, Win. Form No. 9-99782. The grease gun and hand pump connections and test procedure are explained on page 8 of Win Form No. 9-99782.

NOTE Never "guess" when setting relief valves. If setting is too low, lack of power and excessive heat will result. If setting is too high, serious damage can result to the hydraulic lift system and linkage.

7. Install the gasket (12) and only "snuggly" tighten the adjusting screw cap (13). Over tightening the cap will damage the gaskets causing oil leakage.

SECTION 2

SERVICING THE ONE-SPOOL TRAVEL CONTROL VALVES PART NUMBERS C14172 AND C14613

Refer to Figure 2-1

NOTE These valves are used on Model 220, 222, 442, and 444 tractors prior to S/N 9646800.

DISASSEMBLY

1. Remove the two snap rings (9) and remove the spool (7) from the valve body (10).

NOTE When removing, spread snap rings only enough to remove, being careful not to "set" them to a larger diameter. (Careful! They fly too!)

2. Remove the adjusting plug (1) relief spring (3), ball (4), and relief valve seat (5) from the valve body.

NOTE When the ball seat (5) is backed out of the inner threads into the oil passage core, use a pencil magnet to start it through the outer threads.

3. Remove "O" rings or oil seals from the valve body (10), adjusting plug (1) and ball seat (5).

INSPECTION

Inspect the bore in the valve body for grooves, deep scratches or excessive wear. If the valve body has damaged threads, cracks or groove marks the valve assembly must be replaced.

Inspect the valve spool for grooves, deep scratches or excessive wear. Check the fit of the spool in the valve body bore with hand pressure. If there is excessive side clearance or if the spool is scored the valve assembly must be replaced.

Check the relief valve seat (5) for foreign material or damage. If the seat is nicked or scratched it must be replaced.

Install all new "O" rings and seals during assembly.

Relief Spring (3) Inspection:

Free Length	.750"
Total Coils	5.0
Active Coils	3.0
Wire Diameter	.1205"
Spring O.D.	.531"
Spring I.D.	.289"

1045 lbs. per inch spring rate

ASSEMBLY

1. Wash all parts with solvent and blow air dry. Coat all parts with clean light oil before assembly.

2. Install the relief valve seat (5) with a new "O" ring (6).

3. Install the relief ball (4), relief spring (3), and adjusting plug (1) with a new "O" ring. Turn in the adjusting plug until the "O" ring is just inside the valve body.

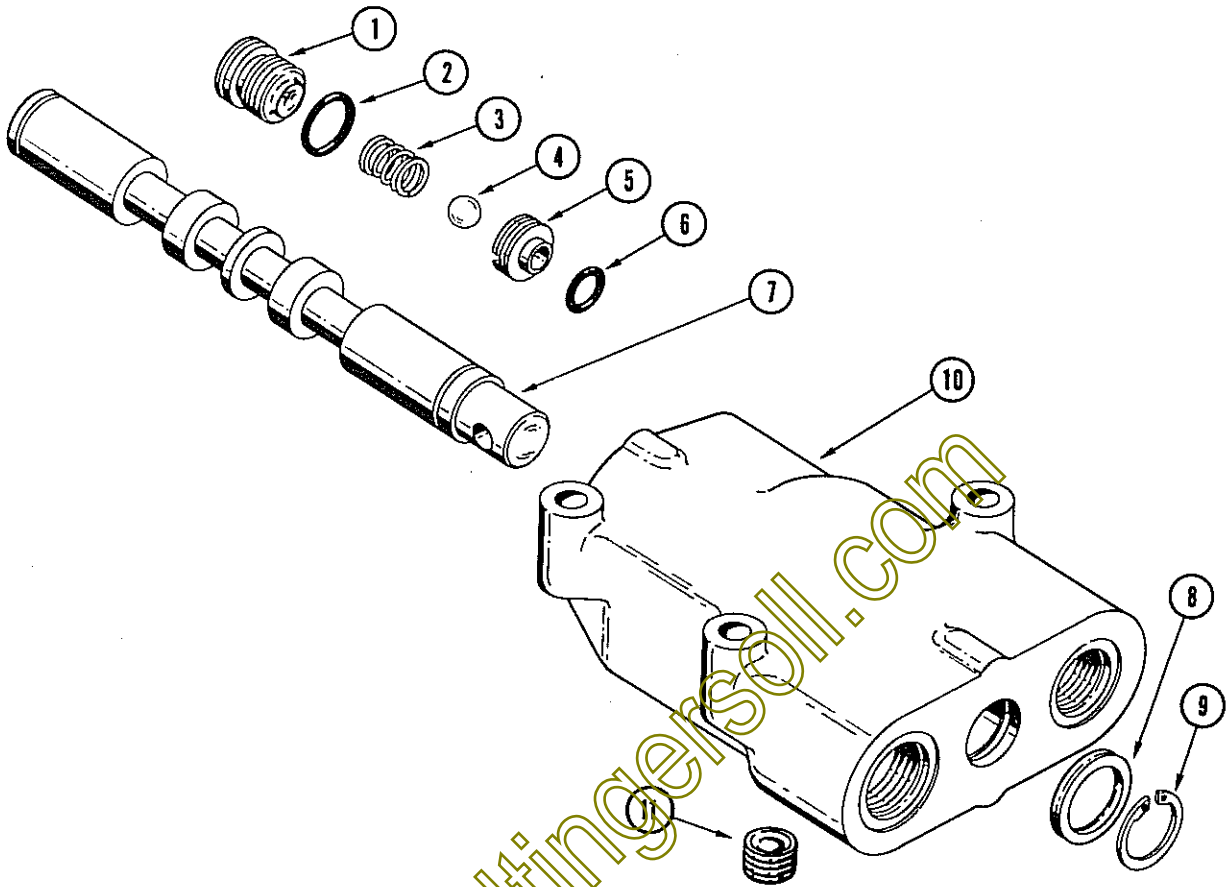


Figure 2-1

4. Install the quad ring (8) into the spool bore groove at the end of the valve body which has the "inlet" and "return" ports. Coat the quad ring with grease or vasoline.

5. Insert the handle end of the spool (7) into bore at the "relief valve" end of the valve body and carefully rotate the spool until it has passed the lubricated quad ring.

6. Using a rotary motion move the spool far enough through the valve body to expose the groove at the " relief valve" end of the bore. Install the other quad ring (8). Coat with grease or vasoline and rotate the spool back to its normal position.

7. Install the two snap rings (9) on the valve spool. Use new snap rings if the original ones are sprung or do not fit tightly in the spool grooves.

8. Using a grease gun or hand pump, adjust the relief valve to the correct "cracking" pressure specified on page 13 of the Hydraulic System Test Procedure, Win. Form No. 9-99781. The grease gun and hand pump connections and test procedure are explained on page 8 in Win. Form No. 9-99781.

NOTE Never "guess" when setting a relief valve. If setting is too low lack of power and excessive heat will result. If setting is too high, serious damage can result to the hydraulic system and drive train components.

SECTION 3
SERVICING THE ONE-SPOOL VALVE, PART NUMBER C16492 AND C18712 AND TWO-SPOOL VALVE, PART NUMBER C16493, C18211, C18713 AND C19221

Refer to Figure 3-1 and 3-2

NOTE These valves are used on Model 220, 222, 442, and 444 tractors S/N 9646800 and above, also the 224, 446, 644 and 646.

DISASSEMBLY

1a. To remove the travel spool from 200 and 400 series tractor valve, remove the two snap rings (1) and remove the travel control spool (2) from valve body (5).

1b. To remove the travel spool from the loader tractor valve:

1. Remove the return spring cover screws(25) and cover (26).

2. Remove screw (27) from spacer (28), and remove spacer (28), spring (29) and washer (30).

3. Remove spool (2) from valve.

NOTE When removing, spread the snap rings only enough to remove, being careful not to "set" them to a larger diameter. (Careful! They fly too!)

2. To remove the lift spool, remove the detent screws (18), springs (19) and balls (16). Remove the detent cover screws (20) and the cover (17).

3. With the valve clamped in a "padded" vise (between brass or wood blocks), carefully remove the detent spool (11) with a screw driver. The detent spacer (12), spring (13) and washer (14) will come off with the spool.

NOTE Since the detent spool is under a small amount of spring tension, manually hold or clamp the spacer (12) and spring (13) to prevent them from becoming lost during removal.

4. Remove the "lift" control spool (3) from the valve body.

5. Remove the "main" relief valve cap (10), gasket (9), adjusting screw (8), spring (7) and ball (6).

6. Two Spool Valve Only--With the valve upside down (hydraulic motor and lift cylinder ports facing upward as the valve is located in the tractor) remove the secondary relief valve cap (10), gasket (9), screw (8), spring (15), and ball (16).

NOTE With the valve in this position the relief ball (16) cannot fall into the coring and be "swallowed" by the valve.

7. Remove the seals (4) from the valve body.

8. On loader travel valve only, remove the power-beyond-fitting (22) and "O" ring (23) and (24).

INSPECTION

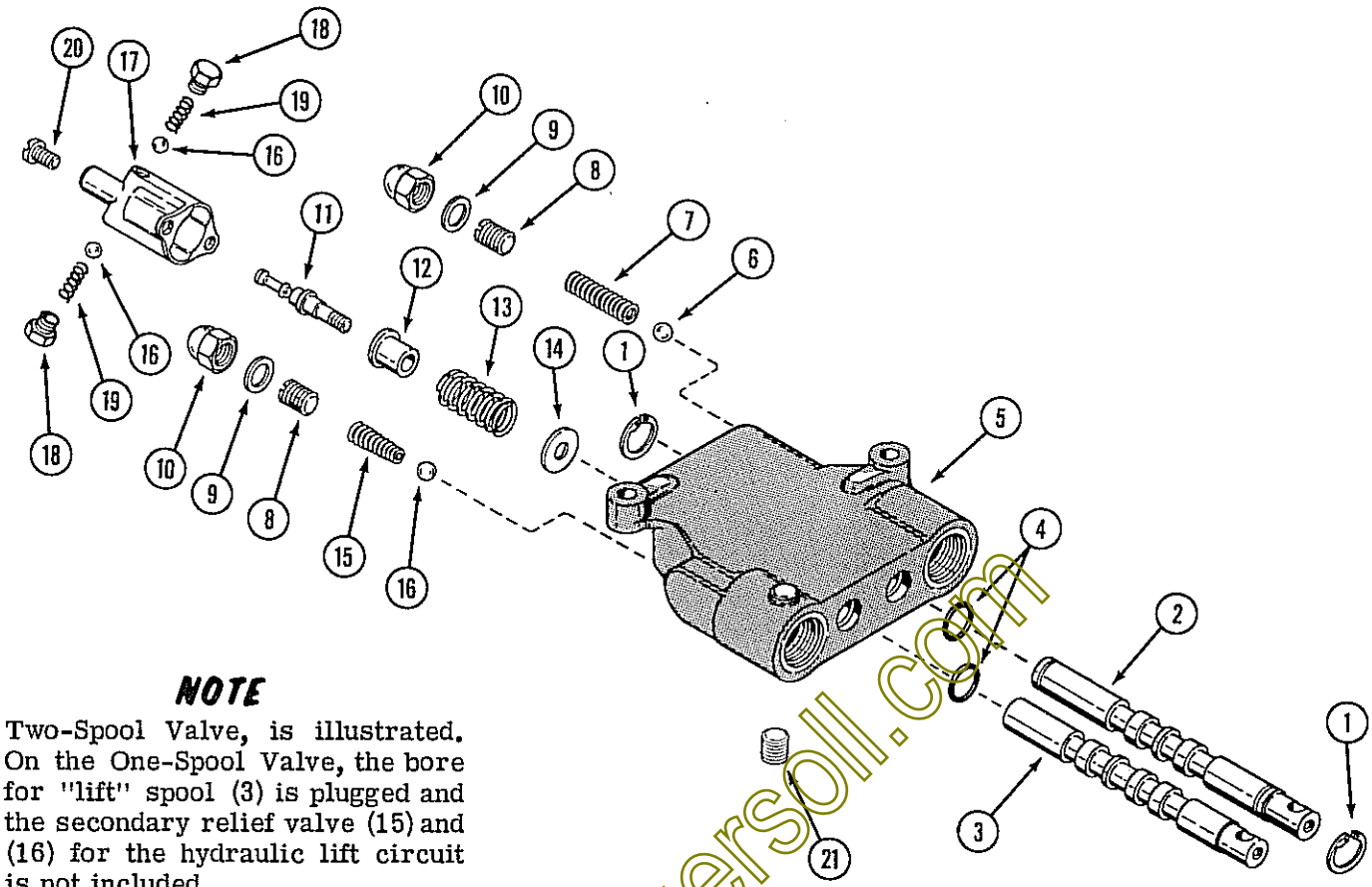
Inspect the bore(s) in the valve body for grooves, deep scratches or excessive wear. If the valve body has damaged threads, cracks or groove marks, the valve assembly must be replaced.

Inspect the valve spool(s) for grooves, deep scratches or excessive wear. Check the fit of the spool(s) in the valve body bore(s) with hand pressure. If there is excessive side clearance, or if there is scoring the valve assembly must be replaced.

Check the relief valve seat(s) in the valve body for foreign material or damage. If a seat is nicked or chipped the valve assembly must be replaced.

NOTE A slight scratch on a relief seat can usually be corrected by rapping the relief ball against the seat with a drift pin and hammer. The smaller end of the drift pin should be approximately the same diameter as the ball. Install a new relief ball if the original ball was used to repair the seat.

Install all new "O" rings and gasket(s) during assembly.



NOTE

Two-Spool Valve, is illustrated. On the One-Spool Valve, the bore for "lift" spool (3) is plugged and the secondary relief valve (15) and (16) for the hydraulic lift circuit is not included.

Figure 3-1. Travel Valve on 200 and 400 Series Tractors

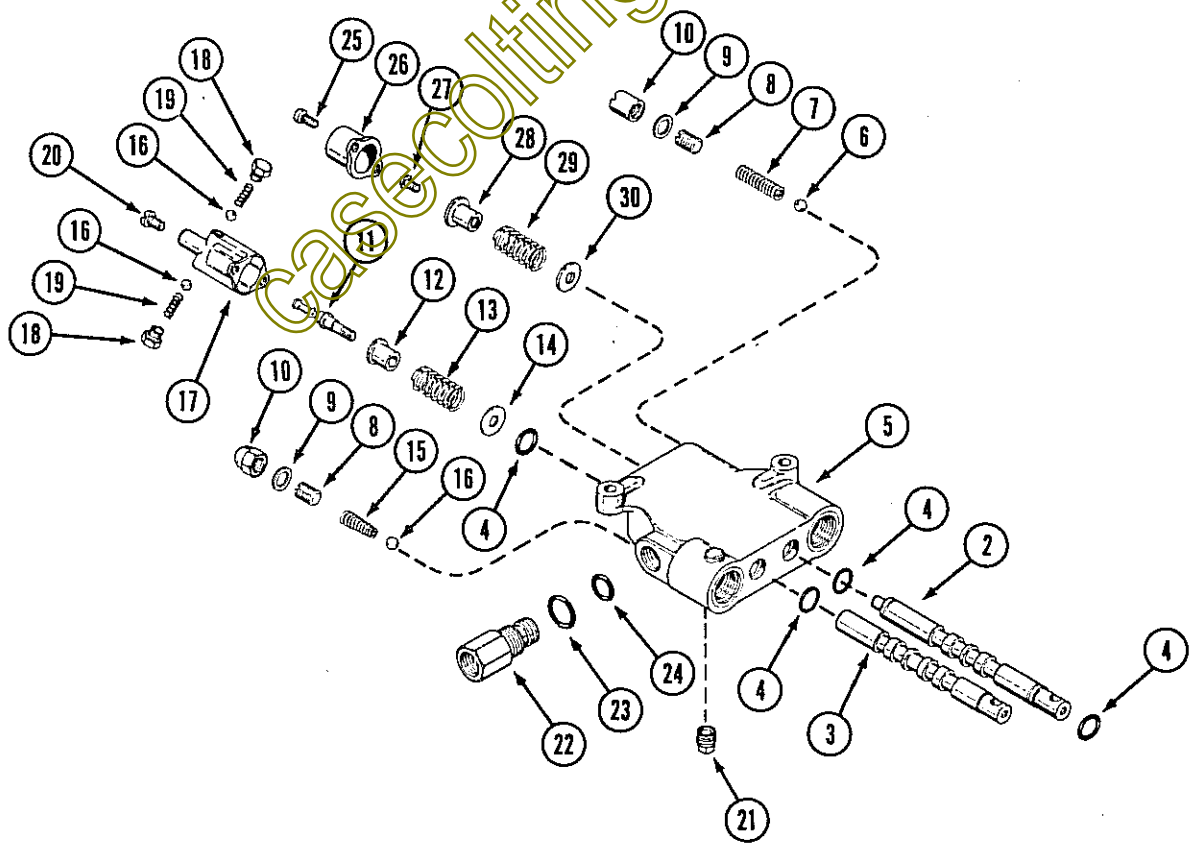


Figure 3-2. Travel Valve on Loader Tractors.

SECTION 4
SERVICING THE LOADER BUCKET CONTROL VALVE
PART NUMBER C18179

Refer to Figure 4-1

DISASSEMBLY

1a. Remove the return spring cover screws (13) and cover (27) from lift spool (4).

1b. Remove screw (26) from spacer (24), and remove spacer, spring (23), and and washer (22).

1c. Remove spool (4) from valve.

2a. Remove the detent screws (21), springs (20) and balls (19) from end of bucket spool (3).

2b. Remove the detent cover screws (13) and the cover (18).

2c. With the valve clamped in a "padded" vise (between brass or wood blocks), carefully remove the detent spool (17) with a screw driver. The detent spacer (16), spring (15) and washer (14) will come off with the spool.

NOTE Since the detent spool is under a small amount of spring tension, manually hold or clamp the spacer (16) and spring (15) to prevent them from becoming lost during removal.

2d. Remove the bucket control spool (3) from the valve body.

3. Remove the relief valve cap (12), gasket (11), adjusting screw (10) spring (8) and ball (9).

4. Remove the seals (5) and (6) from the valve body.

INSPECTION

Inspect the bore(s) in the valve body for grooves, deep scratches or excessive wear. If the valve body has damaged threads, cracks or groove marks, the valve assembly must be replaced.

Inspect the valve spool(s) for grooves, deep scratches or excessive wear. Check the fit of the spool(s) in the valve body bore (s) with hand pressure. If there is excessive side clearance, or if there is scoring the valve assembly must be replaced.

Check the relief valve seat in the valve body for foreign material or damage. If a seat is nicked or chipped the valve assembly must be replaced.

NOTE A slight scratch on a relief seat can usually be corrected by rapping the relief ball against the seat with a drift pin and hammer. The smaller end of the drift pin should be approximately the same diameter as the ball. Install a new relief ball if the original ball was used to repair the seat.

Install all new "O" rings and gasket(s) during assembly.

Main Relief Spring (7) Inspection--
Figure 3-1 Figure 3-2

Loader Relief Spring (8)
Figure 4-1

Free Length	1.310"
Total Coils	12.0
Active Coils	10.0
Wire Diameter	.091"
Spring O.D.	.365"
Spring I. D.	.183"
57 lbs. load at .1235 Length	

Secondary (tapered) Relief Valve Spring (15) Inspection--
Figure 3-1 Figure 3-2

Free Length	1.200"
Total Coils	12.5
Active Coils	10.5
Wire Diameter	.060"
Spring O.D.-Large End	.365"
Spring I.D. -Large End	.245"
Spring O.D.-Small End	.245"
Spring I.D.- Small End	.125"
20 lbs. load at 1-1/32" Length	

Lift Spool Detent Return Spring (13) Inspection--
Figure 3-1 Figure 3-2

Free Length	2.125"
Total Coils	7.250
Active Coils	5.250
Wire Diameter	.074"
Spring O.D.	.773"
Spring I.D.	.625"
30 lbs. load at 7/8" Length	
40 lbs. load at 5/8" Length	

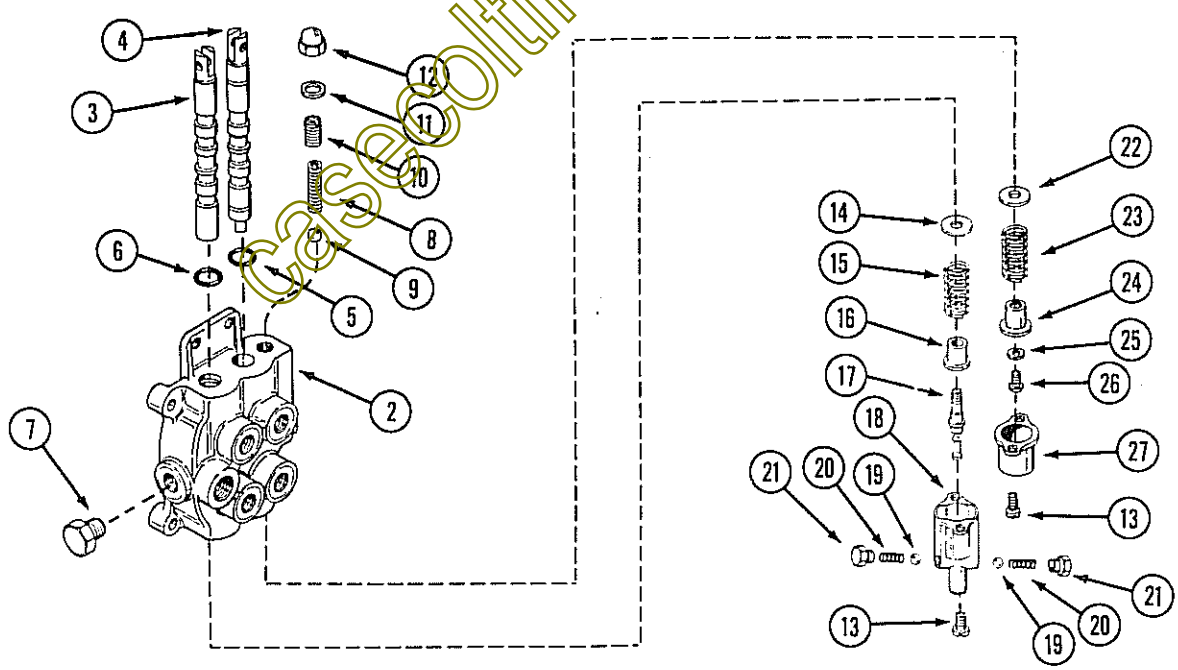


Figure 4-1 Loader Bucket Control Valve

ASSEMBLY

1. Wash all parts with solvent and blow air dry. Coat all parts with clean light oil before assembly.

2. Install the relief ball (9) spring (8) and adjusting screw (10). Turn about one-half of the adjusting screw threads into the valve.

3. Install new seal(s) (5) and (6) into the spool bore groove(s) at the end of the valve body which has the relief valve. Lubricate the seals generously with grease or vasoline.

4. Insert the handle end of the spool(s) into the bore(s) at the opposite end of the valve body and carefully rotate past the lubricated seal(s). Spool grooves should be checked for burrs or sharp edges at land and snap ring groove and such obstructions removed with a fine grit stone or emery cloth.

5. Using a rotary motion move the spool(s) far enough through the valve body to expose the seal groove(s) at the detent end of the bore(s). Install the seals, lubricate generously and carefully rotate the spool(s) back to the normal "centered" position.

6. Install the washer (22), return spring (23), spacer (24), screw and lockwasher (25 and 26), cover (27) and secure cover with screws (13).

7. Clamp the valve in a "padded" vise with the handle end of the spools pointing downward. Support the handle end of the "lift" control spool (3) so it cannot come out of the valve body.

8. Coat the threads of the detent spool (17) with "green" Loctite. Assemble the detent spacer (16), spring (15) and washer (14) onto the threaded end of detent spool. Center the detent assembly on the spool and manually compress enough to turn the detent spool into the lift control spool. Tighten the detent spool only "snuggly". Remove the support from the handle end of the lift control spool.

9. Install the detent cover (18) with the two screws (13). Be sure the cover is placed over the detent spacer and is flush against the valve body.

10. Using a grease gun or hand pump, adjust relief valve(s) to the correct "cracking" pressure specified in the Hydraulic System Test Procedure, Win. Form No. 9-99782. The grease gun and hand pump connections and test procedure are also explained in Win. Form No. 9-99782.

NOTE Never "guess" when setting relief valves. If setting is too low, lack of power and excessive heat will result. If setting is too high, serious damage can result to the hydraulic system and drive train components.

11. Install the gasket (11) and only "snuggly" tighten adjusting screw cap (12). Overtightening the cap will damage the gasket causing oil leakage.

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