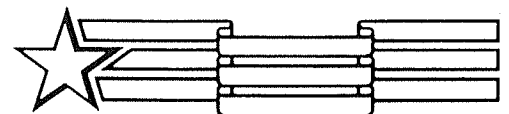


Ingersoll

CONTROL VALVE
Service Manual 9-50382

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QUALITY IN THE AMERICAN TRADITION

Ingersoll Tractor Company

INTRODUCTION

This manual contains service information for hydraulic control valves used on 200, 400, and 600 series tractors.

Consult the "Troubleshooting The Hydraulic System" and "Hydraulic Test Procedures" sections in this master service manual for troubleshooting and testing procedures.

Consult the parts catalog that pertains to your tractor for proper part numbers of the hydraulic control valve assemblies, as well as, repair parts.

Consult your Ingersoll Equipment Warranty Policy Manual regarding warranty repair policies.

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HYDRAULIC LIFT CONTROL VALVE

FOR TRACTORS: 220, 222, 442, 444 Prior to P.I.N. 9646800
155 and 195 - ALL

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 and 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 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 tapping 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.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor oil before assembly.
2. Install a new "O" ring (8) in the groove at the handle end of valve spool. Coat the "O" ring 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.
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 the adjusting screw (11). Turn about 1/2 of the adjusting screw threads into the valve.
6. Consult the "Hydraulic Test Procedures" section of master service manual for correct relief valve pressure setting and testing procedure.

IMPORTANT: 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 in 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.

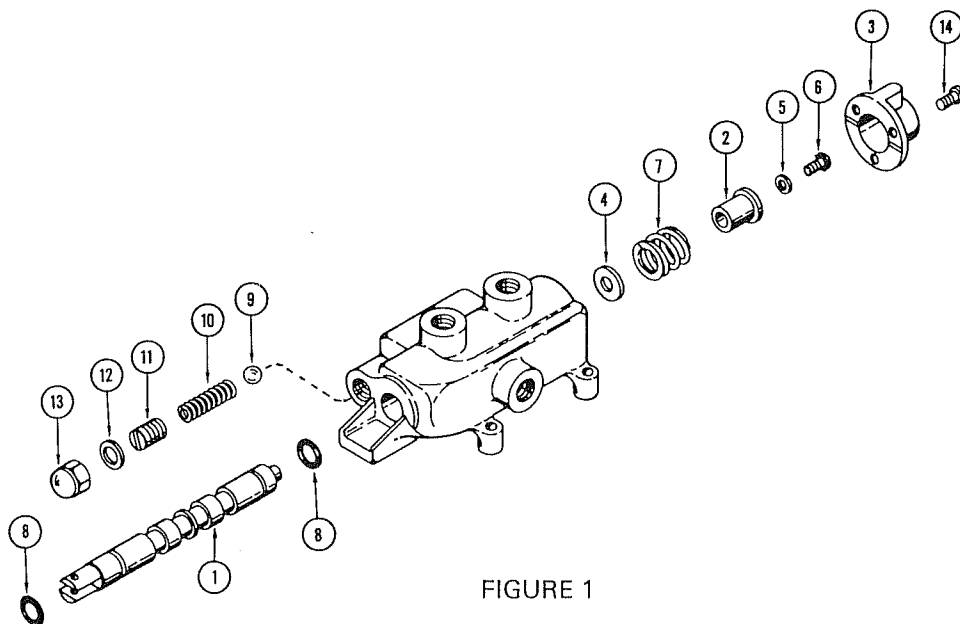


FIGURE 1

TRAVEL CONTROL VALVE

FOR TRACTORS: 220, 222, 442, 444 Prior to P.I.N. 9646800

DISASSEMBLY

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

IMPORTANT: Spread snap rings only enough to permit removal. Do not stretch them.

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

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 and oil seals from the valve body (10), adjusting plug (1) and ball seat (5).

INSPECTION

Inspect the bore in the valve body and 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.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor 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.
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. Consult the "Hydraulic Test Procedures" section of your master service manual for correct relief valve pressure setting and testing procedure.

IMPORTANT: 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.

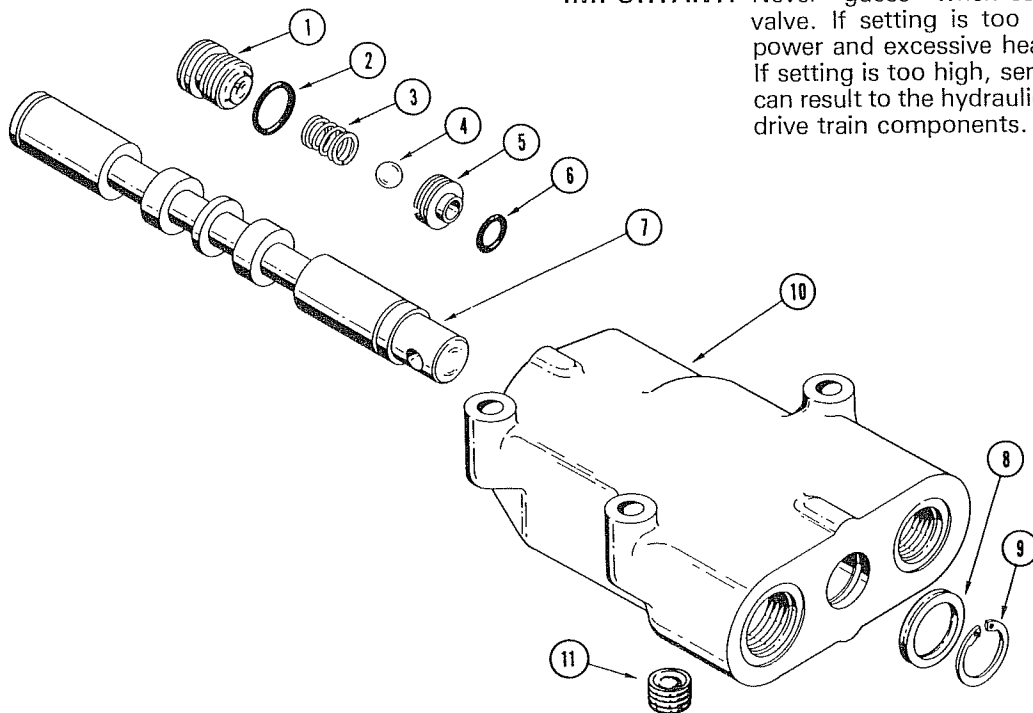


FIGURE 2

TRAVEL CONTROL VALVE (INCLUDES LIFT CONTROL VALVE)

FOR TRACTORS: 220 - P.I.N. 9646800 to P.I.N. 9780390
222 - P.I.N. 9646800 to P.I.N. 9782106
224 - P.I.N. 9646800 to P.I.N. 9783598
442 - P.I.N. 9646800 and after
444 - P.I.N. 9646800 to P.I.N. 9785020
446 - P.I.N. Prior to 9787653
448 - P.I.N. Prior to 9789869

DISASSEMBLY

1. Remove the two snap rings (1) and remove the travel control spool (2) from valve body (5).

IMPORTANT: Spread the snap rings only enough to permit removal. Do not stretch them.

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. Remove the "lift" control spool (3) from the valve body.
4. With the lift spool clamped in a "padded" vise (between brass or wood blocks), carefully remove the detent spool (11) with a screwdriver. The detent spacer (12), spring (13) and washer (14) will come off with the spool.
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) remove the lift relief valve cap (10A), gasket (9A), screw (8A), spring (15) and ball (16).

NOTE: With the valve in this position the relief ball (16) cannot fall into the coring.

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

INSPECTION

Inspect the bore in the valve body and 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 tapping 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.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor oil before assembly.
2. Two Spool Valve Only: With the valve standing on its front end (inlet and outlet port end) install the lift relief valve ball (16), spring (15) small end down, screw (8A)*, gasket (9A) and cap nut (10A).
3. Install the main relief valve ball (6), spring (7), screw (8)*, gasket (9), and cap nut (10).
4. Coat the "O" rings with oil and install them in the grooves at the front of the valve (inlet/outlet port end) for both the lift and travel spools.
5. Insert the "linkage" end of each spool (2 and 3) into their respective bores from the rear (relief valve end) of the valve body. Carefully rotate the spools until they have passed the "O" rings.
6. Using a rotary motion move the spools far enough through the valve body to expose the "O" ring grooves at the relief valve" end of the bore. Install the other "O" rings (4). Coat with oil and rotate the spools back to their normal position.
7. Travel Control Spool: Install the two snap rings (1). Use new snap rings if the original ones are sprung or do not fit tightly in the spool grooves.
8. Lift Control Spool: Install the washer (14), spring (13), spacer (12), and detent spool (11). Install the detent cover (17), detent balls (16), springs (19), and caps (18).

*Consult the "Hydraulic Test Procedures" section of your master service manual for correct relief valve pressure settings and testing procedure.

IMPORTANT: 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.

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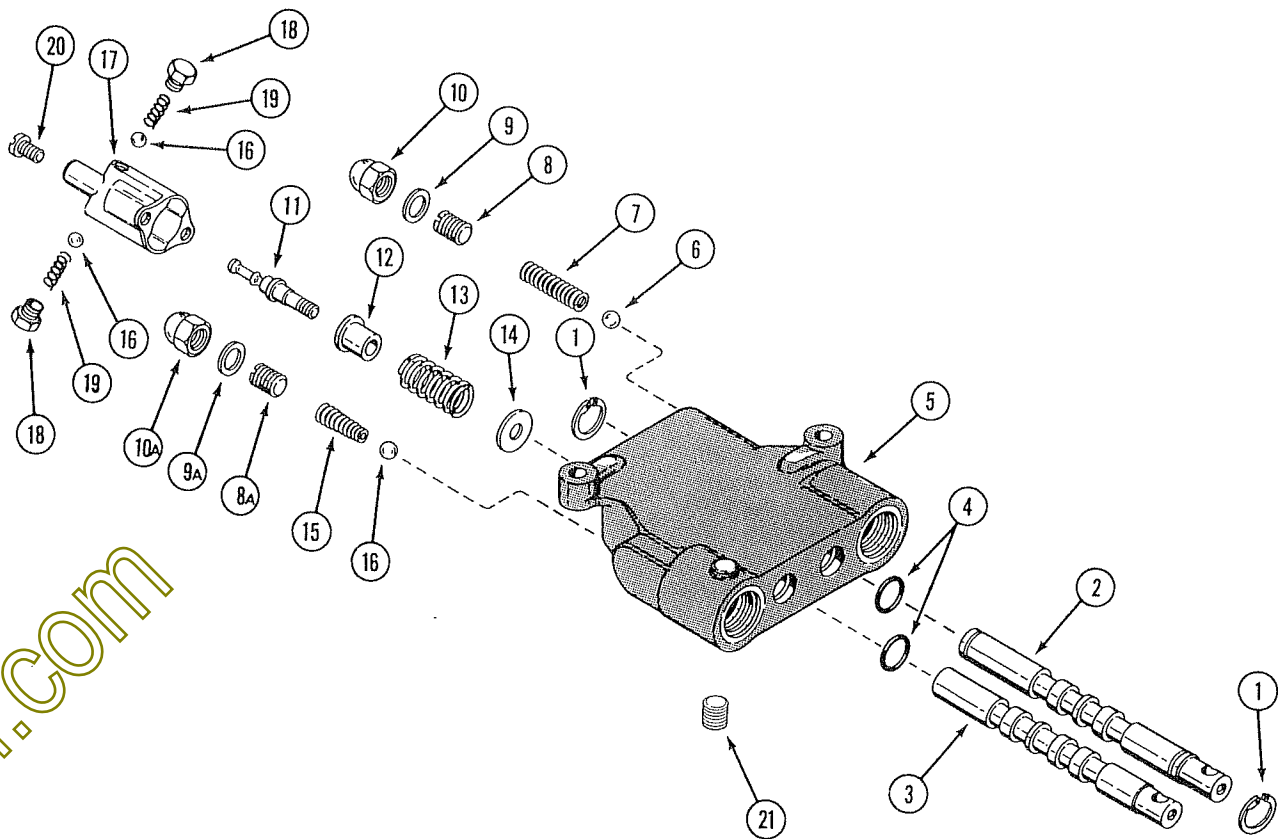


FIGURE 3

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

TRAVEL CONTROL VALVE (INCLUDES LIFT CONTROL VALVE)

FOR TRACTORS: 220 - P.I.N. 9780390 to P.I.N. 14035005
222 - P.I.N. 9782160 to P.I.N. 14036630
224 - P.I.N. 9783598 to P.I.N. 14038300
444 - P.I.N. 9785020 to P.I.N. 14039740
446 - P.I.N. 9787653 to P.I.N. 14041700
448 - P.I.N. 9789869 to P.I.N. 14044240
644, 646, 648 - ALL

DISASSEMBLY

1. To remove the travel spool (2), remove the end cap cover screws (20) and the cover (35) and pull the spool from the valve body.
2. To remove the lift spool, remove the detent screws (18), springs (19), and balls (36). Remove the detent cover screws (20) and the cover (17) and pull the spool from the valve body.
3. The detent spool (11) and associated parts can be removed from the lift spool (3) and the centering spring (32) can be removed from the travel spool (2) by clamping the linkage end of the spool in a padded vice and unthreading the detent spool (11) or the screw (34) from the spool.
4. Remove the main relief valve cap (30), gaskets (29), jam nut (27), screw (28), spring (7), ball seat (22) ball (6), seat (26). Use an allen wrench to remove the seat (26).
5. With the valve upside down (hydraulic motor and lift cylinder ports facing upward) remove the lift relief 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.

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

INSPECTION

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

Check the relief valve seats in the valve body for foreign material or damage. If the main relief valve seat is damaged, it must be replaced.

A slight scratch on the lift relief seat can usually be corrected by tapping 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.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor oil before assembly.
2. With the valve standing on its front end (inlet and outlet port end), install the lift relief valve ball (16), spring (15), screw (8)*, gasket (9) and cap (10).
3. Install the main relief valve seat (26), ball (6), spring seat (22), spring (7), screw (28)*, gasket (29), jam nut (27), gasket (29), and cap (30).
4. Coat the "O" rings (4) with oil and install them in the grooves at the front of the valve (inlet/outlet port end) for both the lift and travel spools.
5. Insert the "linkage" end of each spool (2 and 3) into their respective bores from the rear (relief valve end) of the valve body. Carefully rotate the spools until they have passed the "O" rings.
6. Using a rotary motion move the spools far enough through the valve body to expose the "O" ring grooves at the "relief valve" end of the bore. Install the other "O" rings (4). Coat with oil and rotate the spools back to their normal position.
7. Travel Control Spool: Install the washer (31), spring (32) (optional - may be omitted on tractor valves - required on 600 series loader valves), spacer (33), screw (34) and end cap (35).
8. Lift Control Spool: Install the washer (14), spring (13), spacer (12), and detent spool (11). Install the detent cover (17), detent balls (36), springs (19), and caps (18).

*Consult the "Hydraulic Test Procedures" section of your master service manual for correct relief valve pressure settings and testing procedure.

IMPORTANT: 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.

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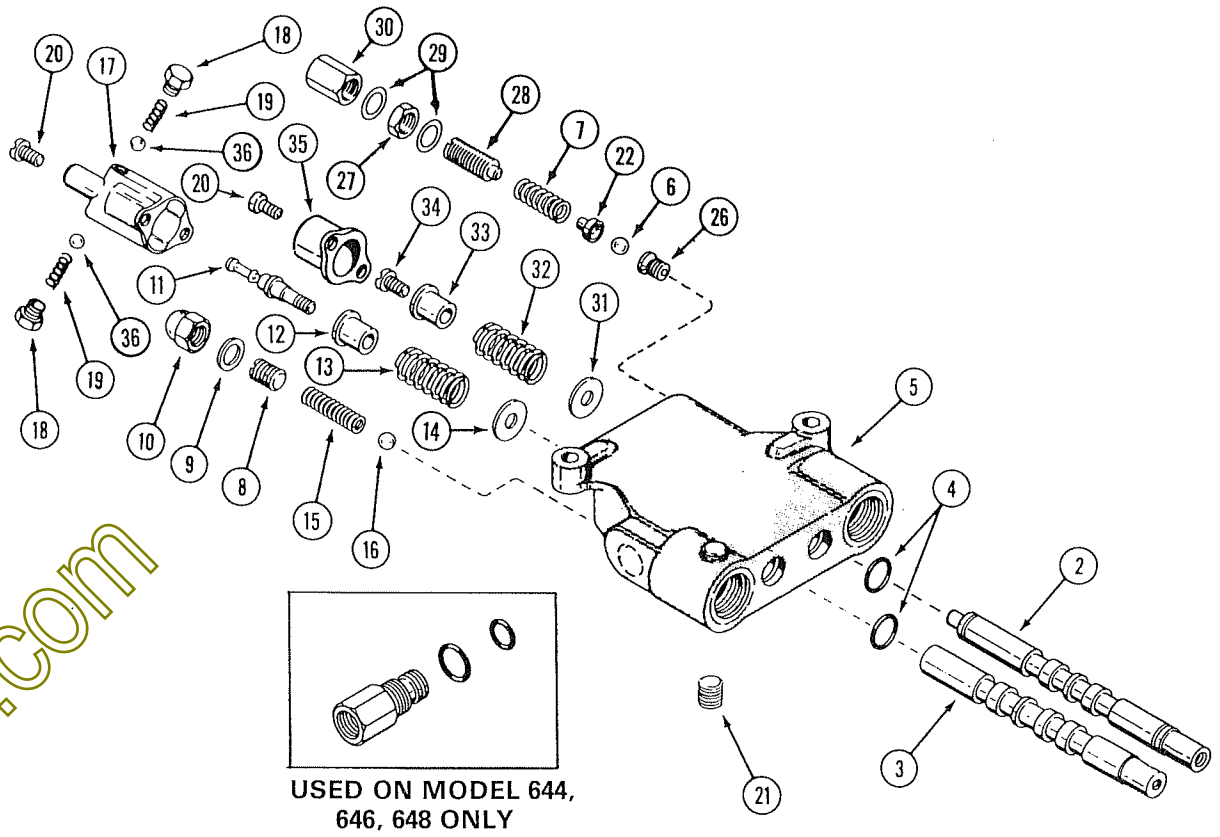


FIGURE 4

TRAVEL CONTROL VALVE (INCLUDES LIFT CONTROL VALVE)

FOR TRACTORS: 220 - P.I.N. 14035005 to P.I.N. 14090930
222 - P.I.N. 14036630 to P.I.N. 14069687
224 - P.I.N. 14038300 to P.I.N. 14070796
226 - Prior to 14093640
444 - P.I.N. 14039740 to P.I.N. 14094620
446 - P.I.N. 14041700 to P.I.N. 14074315
448 - P.I.N. 14044240 to P.I.N. 14075995

DISASSEMBLY

1. To remove the travel spool remove the detent screws (31), springs (19), balls (30), detent cover screws (20) and cover (17). Pull the spool from the valve body.
2. To remove the lift spool, remove the detent screws (18), springs (19A), and balls (16). Remove the detent cover screws (20A) and the cover (17A), and pull the spool from the valve body.
3. The detent spools (11 and 29) and associated parts can be removed from the lift spool (3) and travel spool (2) respectively by clamping the linkage end of the spool in a padded vice and unthreading the detent spool from the control spool.
4. Remove the main relief valve cap (25), gaskets (24), jam nut (27), screw (23), spring (7), spring seat (22), ball (6), seat (26). Use an allen wrench to remove the seat (26).
5. With the valve upside down (hydraulic motor and lift cylinder ports facing upward) remove the lift relief cap (10), gasket (9), screw (8), spring (15) and ball (30).

NOTE: With the valve in this position the relief ball (16) cannot fall into the coring.

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

INSPECTION

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

Check the relief valve seats in the valve body for foreign material or damage. If the main relief valve seat is damaged, it must be replaced.

A slight scratch on the lift relief seat can usually be corrected by tapping 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 gaskets during assembly.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor oil before assembly.
2. With the valve standing on its front end (inlet and outlet port end), install the lift relief valve ball (30), spring (15), screw (8)*, gasket (9), and cap (10).
3. Install the main relief valve seat (26), ball (6), spring seat (22), spring (7), screw (23)*, gasket (24), jam nut (27), gasket (24), and cap (25).
4. Coat the "O" rings (4) with oil and install them in the grooves at the front of the valve (inlet/outlet port end) for both the lift and travel spools.
5. Insert the "linkage" end of each spool (2 and 3) into their respective bores from the rear (relief valve end) of the valve body. Carefully rotate the spools until they have passed the "O" rings.
6. Using a rotary motion move the spools far enough through the valve body to expose the "O" ring grooves at the "relief valve" end of the bore. Install the other "O" rings. Coat with oil and rotate the spools back to their normal position.
7. Travel Control Spool: Install the washers (28), detent spool (29), detent cover (17), detent balls (30), springs (19), caps (31).
8. Lift Control Spool: Install the washer (14), spring (13), spacer (12), and detent spool (11). Install the detent cover (17A), detent balls (16), springs (19A), and caps (18).

*Consult the "Hydraulic Test Procedures" section of your master service manual for correct relief valve pressure settings and testing procedure.

IMPORTANT: 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.

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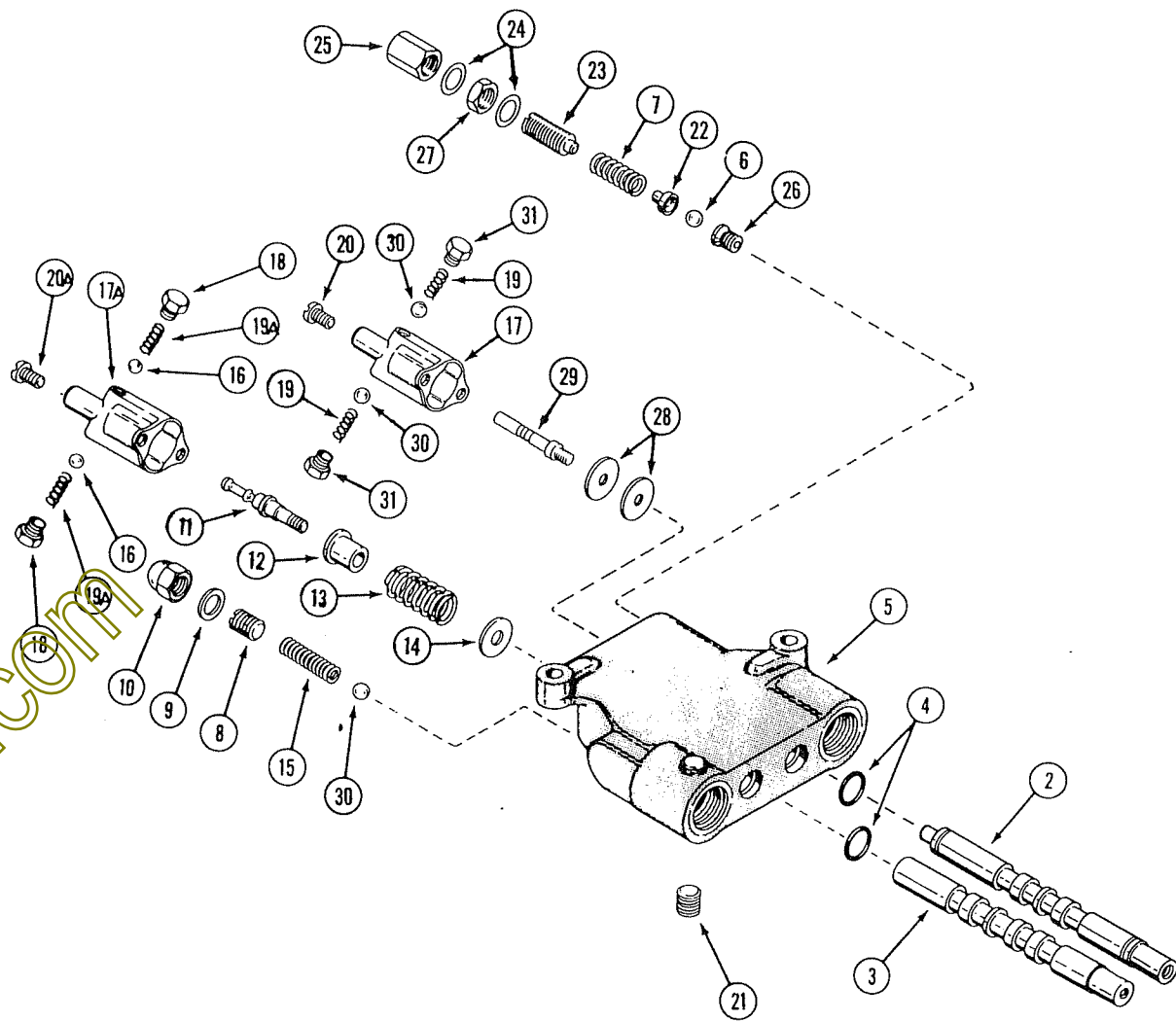


FIGURE 5

TRAVEL CONTROL VALVE (INCLUDES LIFT CONTROL VALVE)

FOR TRACTORS: 220 - P.I.N. 14090930 and after
222 - P.I.N. 14069687 and after
224 - P.I.N. 14070796 and after
226 - P.I.N. 14093640 and after
444 - P.I.N. 14094620 and after
446 - P.I.N. 14074315 and after
448 - P.I.N. 14075995 and after

DISASSEMBLY

1. To remove the travel spool, remove the detent screws (31), springs (19), balls (30), detent cover screws (20) and cover (17). Pull the spool from the valve body.
2. To remove the lift spool, remove the detent screws (18), springs (19A), and balls (16). Remove the detent cover screws (20A) and the cover (17A), and pull the spool from the valve body.
3. The detent spools (11 and 29) and associated parts can be removed from the lift spool (3) and travel spool (2) respectively by clamping the linkage end of the spool in a padded vice and unthreading the detent spool from the control spool.
4. Remove the main relief valve cap (25), gaskets (24), jam nut (27), screw (23), spring (7), spring seat (22), ball (6), seat (26). Use an allen wrench to remove the seat (26).
5. With the valve upside down (hydraulic motor and lift cylinder ports facing upward) remove the lift relief cap (10), gasket (9), screw (8), spring (15) and ball (30).

NOTE: With the valve in this position the relief ball (16) cannot fall into the coring.

6. Remove the holding valve end caps (32), springs (34), and washers (35). Slide the holding valve spool (36) from the valve body.
7. Remove the seals (4) from the valve body.

INSPECTION

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

Check the relief valve seats in the valve body for foreign material or damage. If the main relief valve seat is damaged, it must be replaced.

A slight scratch on the lift relief seat can usually be corrected by tapping 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 gaskets during assembly.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor oil before assembly.
2. With the valve standing on its front end (inlet and outlet port end), install the lift relief valve ball (30), spring (15), screw (8)*, gasket (9), and cap (10).
3. Install the main relief valve seat (26), ball (6), spring seat (22), spring (7), screw (23)*, gasket (24), jam nut (27), gasket (24), and cap (25).
4. Coat the "O" rings (4) with oil and install them in the grooves at the front of the valve (inlet/outlet port end) for both the lift and travel spools.
5. Insert the "linkage" end of each spool (2 and 3) into their respective bores from the rear (relief valve end) of the valve body. Carefully rotate the spools until they have passed the "O" rings.
6. Using a rotary motion move the spools far enough through the valve body to expose the "O" ring grooves at the "relief valve" end of the bore. Install the other "O" rings. Coat with oil and rotate the spools back to their normal position.
7. Travel Control Spool: Install the washers (28), detent spool (29), detent cover (17), detent balls (30), springs (19), caps (31).
8. Lift Control Spool: Install the washer (14), spring (13), spacer (12), and detent spool (11). Install the detent cover (17A), detent balls (16), springs (19A), and caps (18).
9. Install the holding valve spool (36), washers (35), springs (34), "O" ring (33), and plug (32).

*Consult the "Hydraulic Test Procedures" section of your master service manual for correct relief valve pressure settings and testing procedure.

IMPORTANT: 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.

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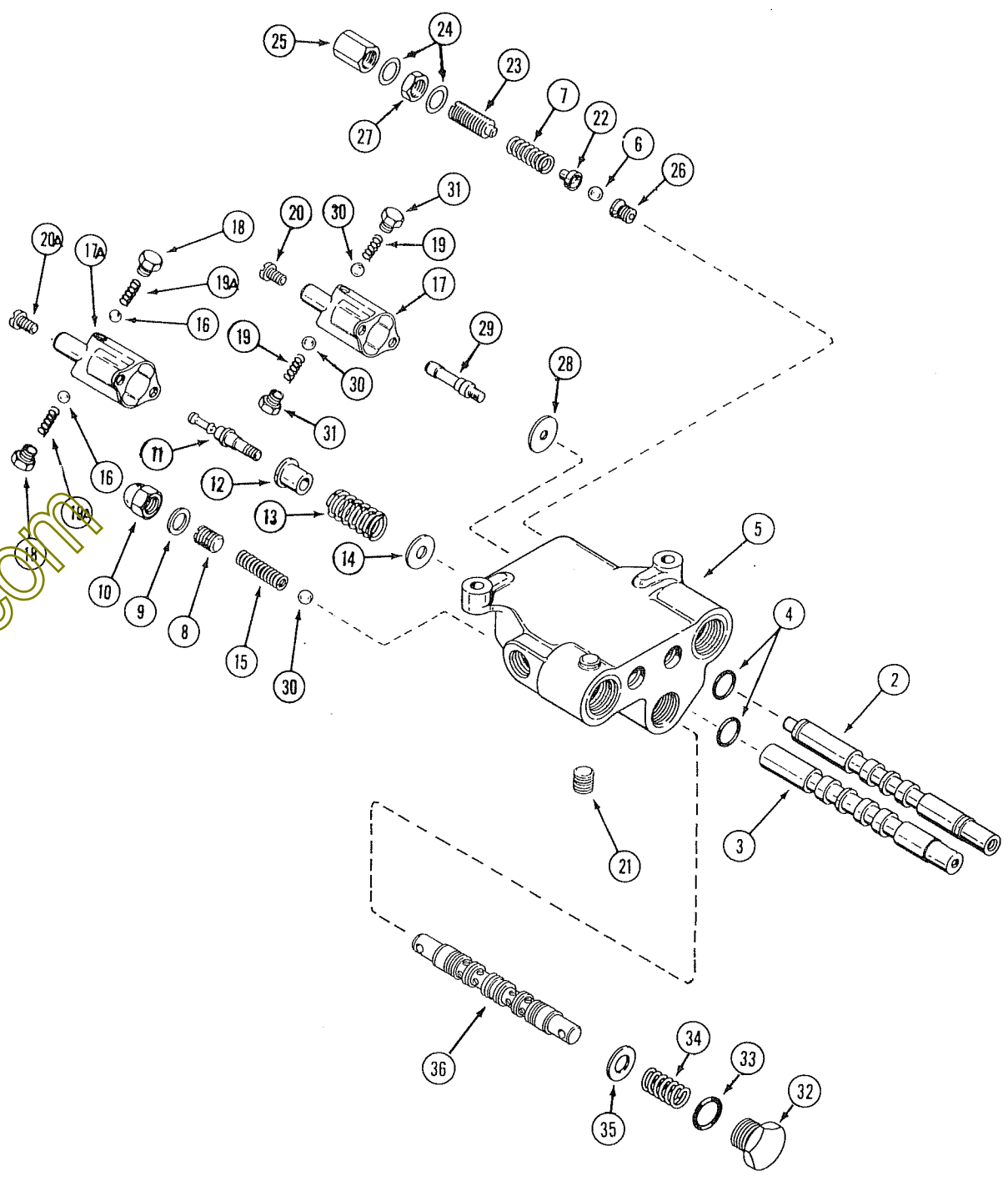


FIGURE 6

LOADER BUCKET CONTROL VALVE

FOR TRACTORS: 644 - ALL
646 - ALL
648 - ALL

DISASSEMBLY

1. To remove the lift spool (4), remove the spool cover screws (13), and spool cover (27). Pull the spool from the valve body.
2. To remove the bucket spool (3), remove the detent screws (21), springs (20), and balls (19). Remove the detent cover screws (13) and the cover (18). Pull the spool from the valve body.
3. The detent spool (17) and centering spring (23) and associated parts can be removed from the lift and bucket spools (4 and 3) respectively by clamping the linkage end of the spools in a padded vice and unthreading the detent spool (17) and screw (26) from the control spools.
4. If present, remove the relief valve cap (12), gasket (11), screw (10), spring (8) and ball (9).
5. Remove the seals (5 and 6) from the spool (4) and valve body (2) respectively.

INSPECTION

Inspect the bore in the valve body and the valve spools for grooves, deep scratches or excessive wear. Check the fit of the spools in the valve body bores 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 tapping 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.

ASSEMBLY

1. Clean all parts with solvent and air dry. Coat all parts with clean, light motor 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 (6) into the spool bore groove at the end of the valve body which has the relief valve. Lubricate the seal with oil.

4. Insert the handle end of the spool (3) into the bore at the opposite end of the valve body and carefully rotate past the lubricated seal.
5. Using a rotary motion move the spool far enough through the valve body to expose the seal groove at the detent end of the bore. Install the seal (6), lubricate and carefully rotate the spool back to the normal "centered" position.
6. Install the valve spool (4) into the spool bore. Install the seal (5) over the bottom groove of the spool (4). Lubricate the seal with oil.
7. Using a rotary motion, push the spool up to expose the top seal groove. Install the seal (5) over the top seal groove of spool (4).

Lubricate the seal with oil.
8. Using a rotary motion, push the spool down to its centered position.
9. Install the washer (22), return spring (23), spacer (24), screw and lockwasher (25 and 26), cover (27) and secure cover with screws (13).

10. 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.
11. 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.
12. 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.
13. Install the balls (19), springs (21) and nuts (21).
14. Install the gasket (11) and only "snuggly" tighten adjusting screw cap (12). Overtightening the cap will damage the gasket causing oil leakage.

*Consult the "Hydraulic Test Procedures" section of your master service manual for correct relief valve pressure settings and testing procedure.

IMPORTANT: 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.

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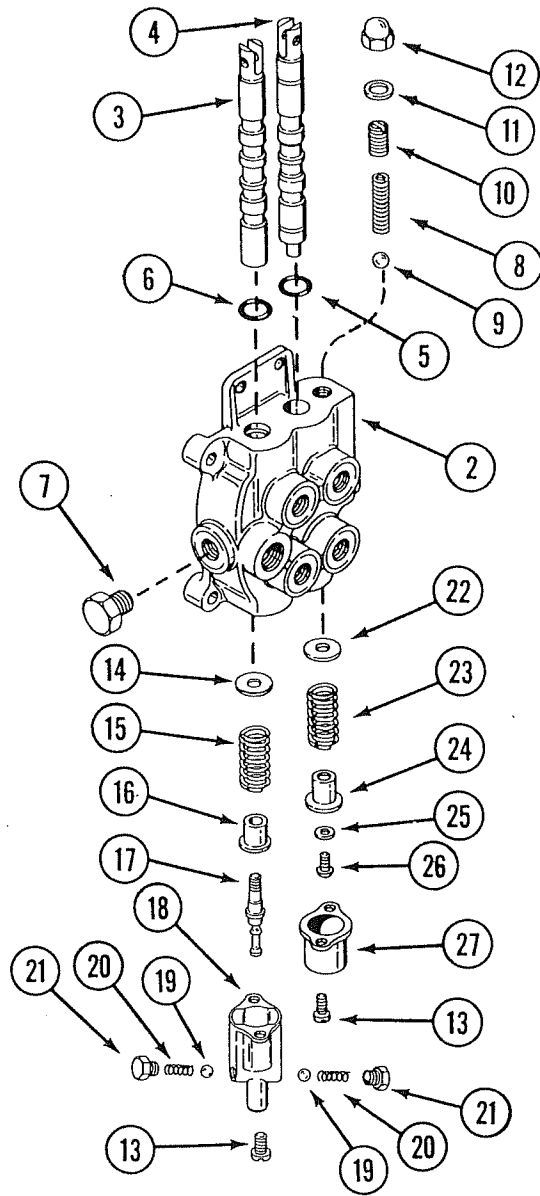


FIGURE 7

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