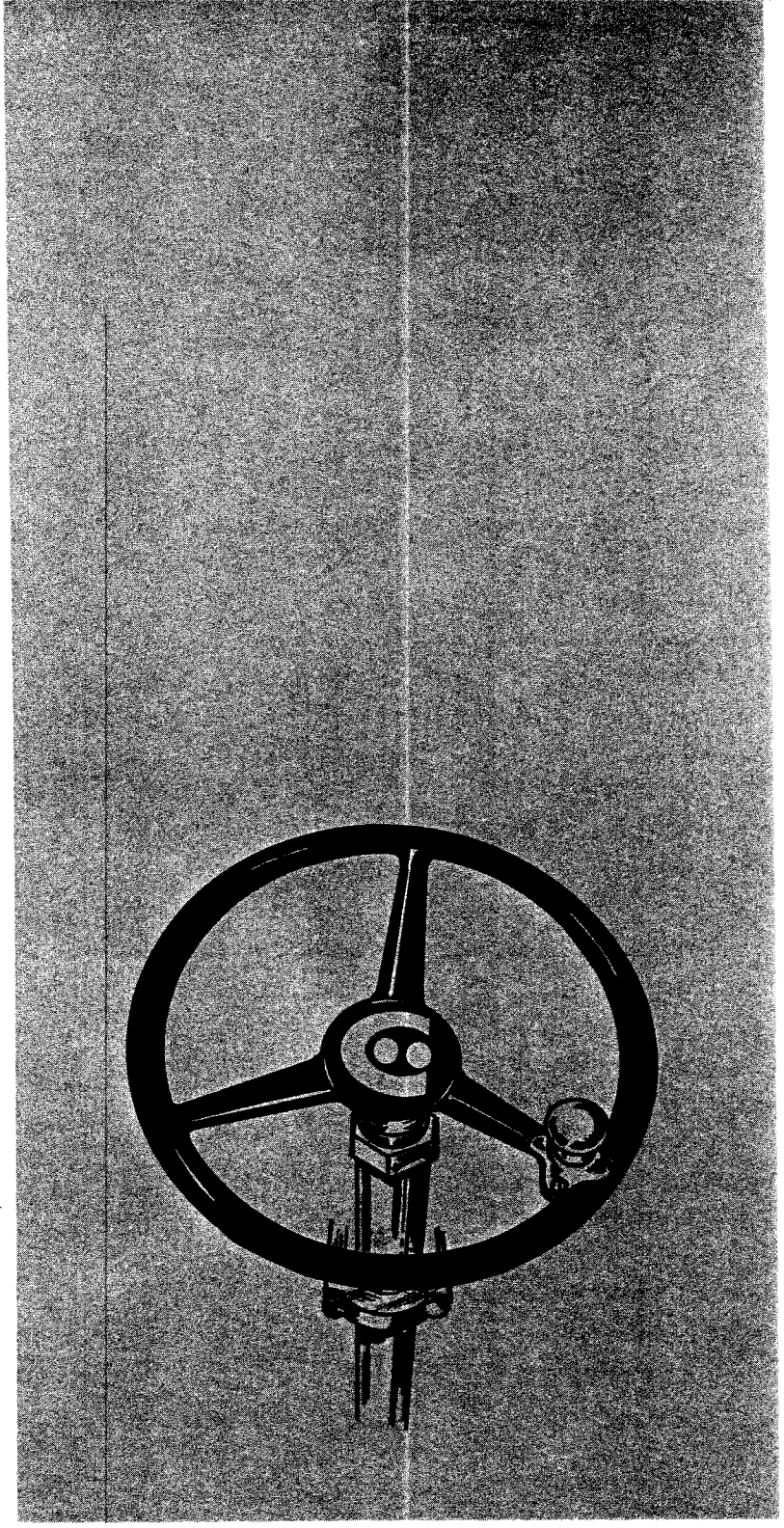


SERVICE MANUAL

950 STEERING SYSTEM

INTRODUCTION

This publication has instructions and procedures for the subject on the front cover. The information, specifications, and illustrations in this publication are on the basis of information that was current at the time this issue was written.

Correct operation, maintenance, test and repair procedures will give this product a long service life. Before starting a test, repair or rebuild job, the serviceman must read the respective sections of the Service Manual, and know all the components he will work on.

Your safety, and the safety of others, is at all times very important. When you see this symbol  in the manual, you must know that caution is needed for the procedure next to it. This symbol is a warning. To work safely, you must understand the job you do. Read all instructions to know what is safe and what is not safe.

It is very important to know the weight of parts. Do not lift heavy parts by hand. Use a hoist. Make sure heavy parts have a good stability on the ground. A sudden fall can cause an accident. When lifting part of a machine, make sure the machine has blocks at front and rear. Never let the machine hang on a hoist, put blocks or stands under the weight.

When using a hoist, follow the recommendation in the manual. Use correct lift tools as shown in illustrations to get the correct balance of the component you lift. This makes your work safe at all times.

SYSTEMS OPERATION

TESTING AND ADJUSTING

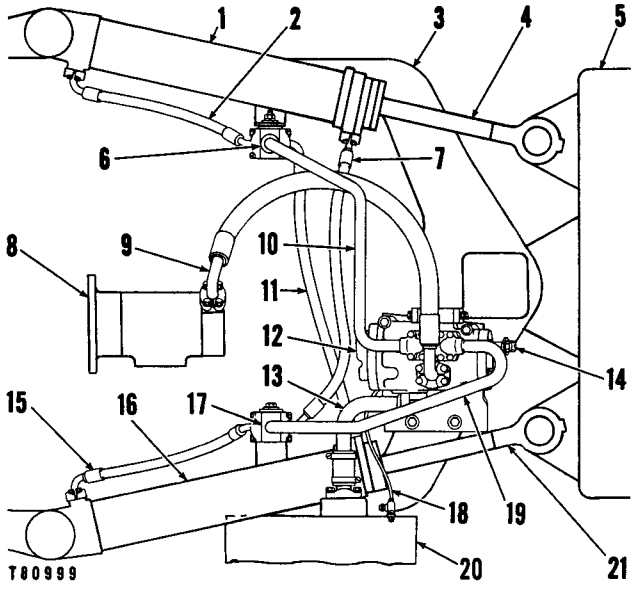
SPECIFICATIONS

STEERING HYDRAULIC SYSTEM

The small section of the loader and steering pump supplies oil for the steering system. Oil from the steering control valve returns to the supply tank.

Turning the steering wheel causes the steering gear to position the steering control valve spool which directs oil flow to the steering cylinders.

A spring-loaded follow-up linkage provides a follow-up to the steering control valve spool, centering the spool when the rotation of the steering wheel is stopped. The linkage also counteracts steering shock by opening the control valve slightly, when external forces are exerted on the machine.

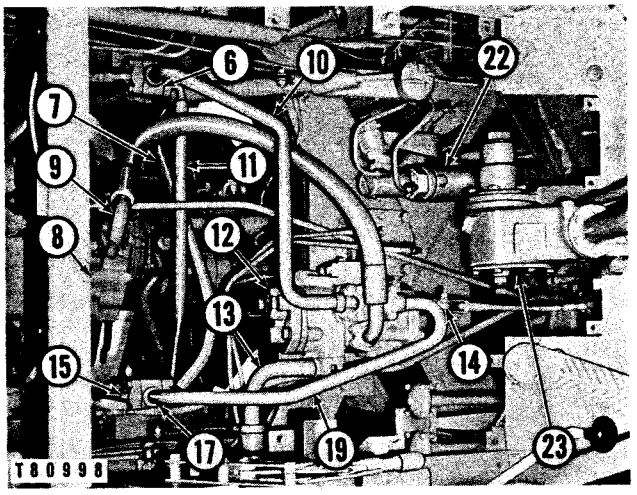


STEERING COMPONENTS

1. Left steering cylinder. 2. Oil line. 3. Rear frame. 4. Left steering cylinder rod. 5. Front frame. 6. Junction. 7. Oil line. 8. Hydraulic oil pump. 9. Oil line from pump to control valve. 10. Oil line. 11. Oil line. 12. Steering control valve. 13. Return line to tank. 14. Steering control valve spool. 15. Oil line. 16. Right steering cylinder. 17. Junction. 18. Drain line from steering control valve. 19. Oil line. 20. Hydraulic oil supply tank. 21. Right steering cylinder rod.

The head ends of the cylinders are mounted to the rear frame and the cylinder rods are attached to the front frame. The cylinders pull and push the front frame from side to side to produce the required turning angle.

When making a right turn, oil is directed to the head end of the left steering cylinder and the rod end of the right steering cylinder. The left cylinder rod extends and the right cylinder rod retracts, moving the front frame to the right. When making a left turn, the oil flow is reversed.

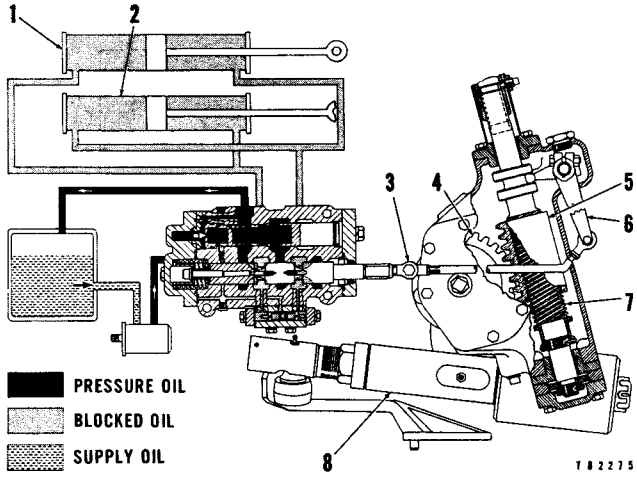


STEERING COMPONENTS

6. Junction. 7. Oil line. 8. Hydraulic oil pump. 9. Oil line from pump to control valve. 10. Oil line. 11. Oil line. 12. Steering control valve. 13. Return line to tank. 14. Steering control valve spool. 15. Oil line. 17. Junction. 19. Oil line. 22. Follow-up linkage. 23. Steering gear assembly.

FLOW OF OIL IN NEUTRAL POSITION

When control valve spool (20) is in NEUTRAL (centered position), the vehicle is not steering. Oil pressure in steering cylinders (1 and 2) is equal because of the small amount of pump oil from passage (14) flowing through slots (A) into ports (12 and 16) which lead to the steering cylinders.



STEERING SYSTEM IN NEUTRAL POSITION

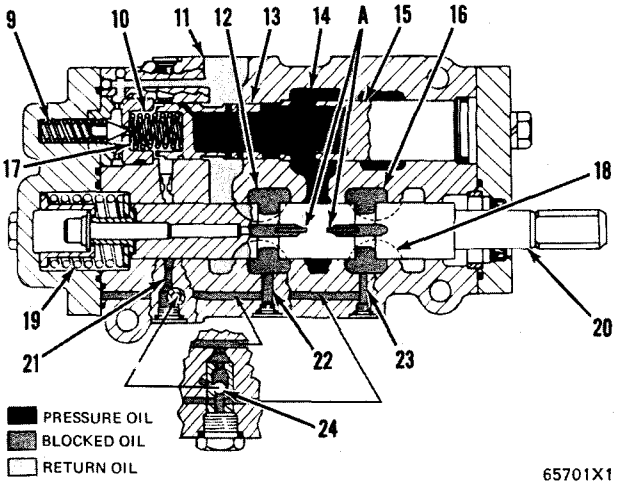
1. Steering cylinder. 2. Steering cylinder. 3. Linkage. 4. Gear sector. 5. Gear nut. 6. Lever. 7. Steering shaft worm. 8. Follow-up linkage.

The equal pressure in both cylinders eliminates erratic steering cylinder operation. A small amount of oil is allowed to circulate through control valve

spool unloading slots (18) to the cylinders to compensate for steering shock.

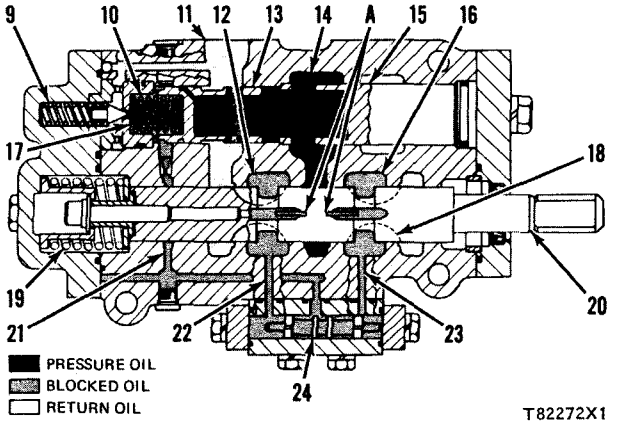
Oil from the pump enters the valve body through passage (14). With control valve spool (20) in NEUTRAL position, the valve spool blocks most of the oil flow to cylinder ports (12 and 16).

Oil pressure overcomes the force of springs (17), moving valve (13) to the left. As valve (13) moves, passage (11) is opened to tank and pump oil is returned to the supply tank.



FLOW OF OIL IN NEUTRAL POSITION

9. Spring. 10. Chamber. 11. Return passage to oil tank. 12. Outlet port to cylinder. 13. Valve. 14. Inlet passage from oil pump. 15. Spacer. 16. Outlet port to cylinder. 17. Springs. 18. Unloading slots. 19. Centering spring. 20. Spool. 21. Passage. 22. Passage. 23. Passage. 24. Shuttle valve. A. Slots.



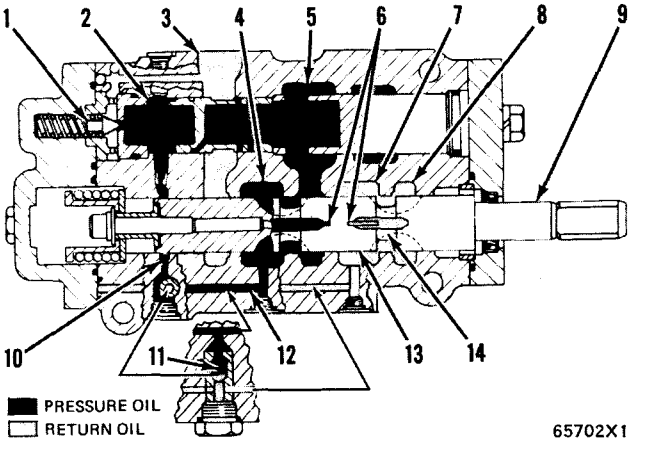
FLOW OF OIL IN NEUTRAL POSITION (EARLY MACHINES)

9. Spring. 10. Chamber. 11. Return passage to oil tank. 12. Outlet port to cylinder. 13. Valve. 14. Inlet passage from oil pump. 15. Spacer. 16. Outlet port to cylinder. 17. Springs. 18. Unloading slots. 19. Centering spring. 20. Spool. 21. Passage. 22. Passage. 23. Passage. 24. Shuttle valve. A. Slots.

Oil in chamber (10) is displaced by valve (13) through passages (21, 22 and 23), through shuttle valve (24), to outlet ports (12) or (16) and out passage (11) through slots (18). The position of the shuttle valve is determined by the position of valve spool (20) prior to moving to the NEUTRAL position.

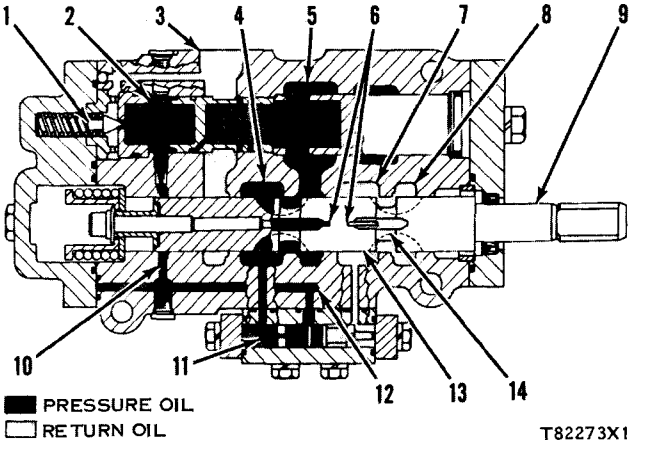
FLOW OF OIL IN RIGHT TURN POSITION

When the steering wheel is being turned to the RIGHT, the steering shaft worm gear is threaded down through the gear nut. The levers are pivoted counterclockwise, pulling control valve spool (9) forward in the control valve body. Oil is directed



FLOW OF OIL IN RIGHT TURN POSITION

1. Pilot valve. 2. Chamber. 3. Return passage to oil tank. 4. Outlet port to cylinders. 5. Inlet passage from oil pump. 6. Slots. 7. Outlet port to cylinders. 8. Passage. 9. Valve spool. 10. Passage. 11. Shuttle valve. 12. Passage. 13. Land. 14. Unloading slots.



FLOW OF OIL IN RIGHT TURN POSITION (EARLY MACHINES)

1. Pilot valve. 2. Chamber. 3. Return passage to oil tank. 4. Outlet port to cylinders. 5. Inlet passage from oil pump. 6. Slots. 7. Outlet port to cylinders. 8. Passage. 9. Valve spool. 10. Passage. 11. Shuttle valve. 12. Passage. 13. Land. 14. Unloading slots.

out port (4) to the head end of the left cylinder and the rod end of the right cylinder to make a right turn. The pressure oil in port (4) is also directed through shuttle valve (11) to passage (12). This allows the pressure oil in port (4) to be in passage (10) which leads to relief valve chamber (2).

As the machine is turning, the changing angle between the front and rear frames actuates the follow-up linkage. The linkage returns valve spool (9) back to the NEUTRAL position when the steering wheel is stopped.

When making a left turn, the steering gear assembly levers are pivoted clockwise pushing control valve spool (9) into the control valve body. Oil is now directed from pump passage (5) out port (7) to the head end of the right cylinder and the rod end of the left cylinder and the vehicle starts making a left turn.

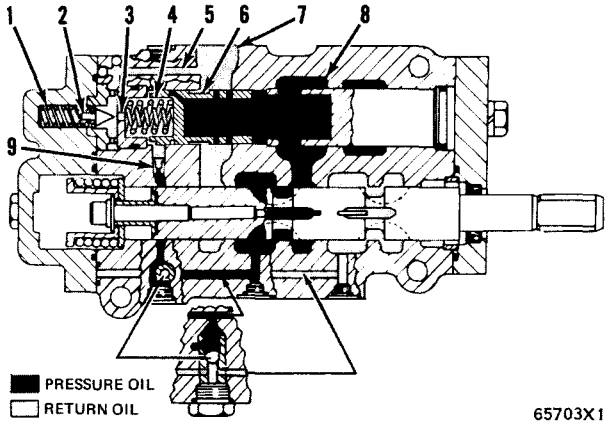
The pressure oil in port (7) is also directed to shuttle valve (11). Now the position of the shuttle valve allows the pressure oil in port (7) to pass through passage (10) to relief valve chamber (2).

OPERATION OF RELIEF VALVE

The pressure relief valve prevents excessive pressures from being imposed on the hydraulic system components.

If a malfunction in the follow-up linkage would prevent the steering control valve from centering or if an obstruction (external force) prevents the vehicle from turning, oil pressure in the steering circuit increases. Increased oil pressure is sensed in relief valve chamber (4). When increasing oil pressure reaches approximately 2500 psi (175,8 kg/cm^2), the setting of the relief valve, pilot valve (2) is forced open. The oil in chamber (4) now drains allowing the high pressure oil in front of valve (6) to move the dump valve to the rear which allows the high pressure oil to dump through return passage (7) to the tank.

Shims behind spring (1) adjust the force of the spring which holds pilot valve (2) seated when the oil pressure in the circuit is below the setting of the relief valve. Removing shims decreases or adding shims increases the pressure relief setting of the valve.



OPERATION OF RELIEF VALVE

1. Spring. 2. Pilot valve. 3. Pilot valve seat. 4. Chamber. 5. Passage. 6. Valve. 7. Return passage to oil tank. 8. Inlet passage from pump. 9. Orifice.

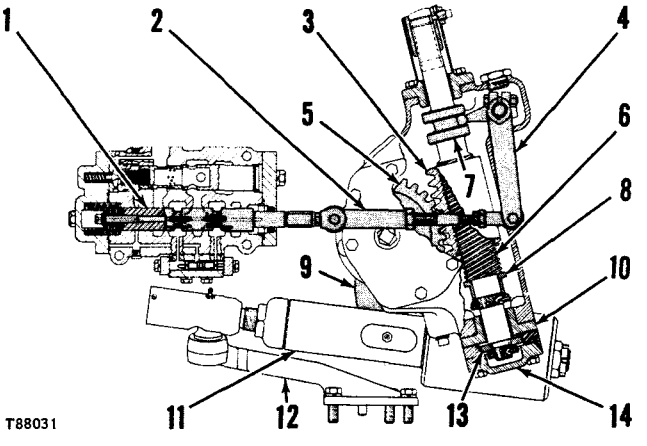
OPERATION OF FOLLOW-UP LINKAGE

The follow-up mechanism performs two operations. First, it returns the steering control valve to the NEUTRAL position when the steering wheel is stopped. Second, the mechanism can counteract steering shock by opening the control valve slightly and permitting pressure oil to enter the cylinder against which shock is being applied, thus counteracting the shock. The follow-up mechanism also acts as a steering stabilizer.

The rear end of follow-up linkage (11) is connected to anchor (12) which is bolted to the front frame.

The front end of follow-up linkage (11) is connected to lever (9) on the steering gear on the rear frame.

When the steering wheel is turned clockwise, worm gear (6) is rotated down in gear nut (3) until washer (13) contacts cover (14). As the worm gear moves down, lever (4) and linkage (2) move the steering control valve spool (1) from the NEUTRAL position. The control valve spool directs oil to the head end of the left steering cylinder and to the rod end of the right steering cylinder to turn the machine to the right.



OPERATION OF FOLLOW-UP LINKAGE

1. Valve spool. 2. Linkage. 3. Gear nut. 4. Lever. 5. Gear sector. 6. Worm gear. 7. Shoulder. 8. Spacer. 9. Lever. 10. Retainer assembly. 11. Follow-up linkage. 12. Anchor. 13. Washer. 14. Cover.

When the steering wheel is stopped, follow-up linkage (11) will push lever (9) toward the front of the machine causing gear sector (5) to rotate counterclockwise. This rotation raises gear nut (3) and worm gear (6) as a unit causing lever (4) to return valve spool (1) to the NEUTRAL position. If the steering wheel is not turned further, the steering cylinders will maintain the turning radius. If the steering wheel is turned clockwise again, the worm gear will move further down inside gear nut (3) and will again cause lever (4) and linkage (2) to move the valve spool from the NEUTRAL position.

When the steering wheel is turned counterclockwise, worm gear (6) is rotated up inside gear nut (3) until washer (13) contacts retainer assembly (10). As the worm gear raises, lever (4) and linkage (2) move valve spool (1) from the NEUTRAL position. Oil is directed to the head end of the right steering cylinder and to the rod end of the left steering cylinder to turn the machine to the left.

When the steering wheel is stopped, follow-up linkage (11) pulls lever (9) toward the rear of the machine causing gear sector (5) to rotate clockwise. Gear nut (3) and worm gear (6) move down as a unit to position the valve spool in the NEUTRAL position.

STEERING HYDRAULIC SYSTEM

Tests and adjustments of the steering hydraulic system can be made with a 9S2000 Hydraulic Flow Meter, a 5S5123 Hydraulic Testing Group, a stop watch, magnet, an inch (mm) scale and a FT508 Stop Block. In all instances, visual checks and measurements should be made first. Then proceed to operational checks and finally to instrumentation checks.

WARNING: When testing and adjusting the hydraulic system, park the machine on level ground. Allow only one man on the machine. Keep all other personnel away from the machine.

VISUAL CHECKS

1. Check the oil level in the hydraulic oil supply tank. Slowly loosen the tank filler cap and allow tank pressure to bleed off before removing the cap.

2. Inspect all external oil lines, connections, cylinders and external valves for leaks or damage.

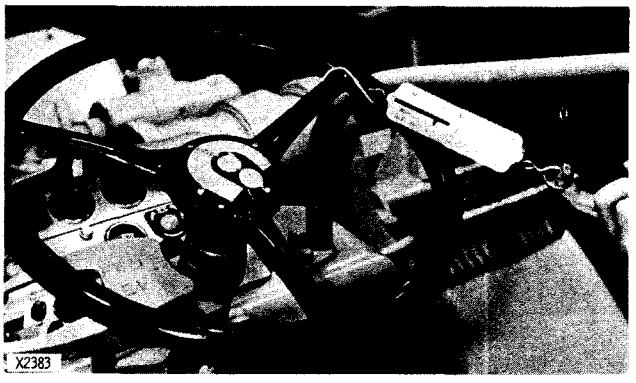
3. Inspect the steering control linkage and follow-up linkage for damage. Check the adjustments.

4. Remove the filter elements and check for presence of foreign material. A magnet will separate ferrous metal material from non-ferrous metal material and non-metallic sealing material (piston rings, O-ring seals, etc.). If such contaminants are found, the damaged component must be located and repaired. The hydraulic system should then be flushed.

OPERATIONAL CHECKS

The oil must be at normal operating temperature. Start the engine, raise the bucket and turn the machine in each direction. Observe if slow, erratic, or improper steering operation exists.

Checking Steering Effort



CHECKING STEERING WHEEL TURNING EFFORT

With the engine running, the force required to turn the steering wheel should not exceed 6 lb. (2,7 kg) when measured with a spring scale at the steering wheel rim. An alternate method is: Remove the cover and use a torque wrench on the steering wheel retaining nut. Steering wheel torque should not exceed 45 lb. in. (52 cm.kg).

PROBLEM: Steering wheel turns hard in both directions.

PROBABLE CAUSE:

1. Binding between gear nut and gear sector in the steering gear.
2. Steering control valve linkage binding or damaged.
3. Follow-up linkage damaged.
4. Drain line damaged or plugged, restricting valve spool movement.
5. Binding between steering column and shaft assembly.

PROBLEM: Machine steers slow in both directions.

PROBABLE CAUSE:

1. Low pump output.
2. Inadequate control valve spool movement.
3. Relief valve setting low.
4. Relief valve leaking.

PROBLEM: Machine steers slow in one direction only.

PROBABLE CAUSE:

1. Inadequate control valve spool movement in one direction (valve spool not centered).
2. Steering control linkage incorrectly adjusted.
3. Follow-up linkage damaged.
4. Sticking shuttle valve.

PROBLEM: Jerky or erratic steering.

PROBABLE CAUSE:

1. Air in system.
2. Malfunction of follow-up linkage.
3. Excessive backlash between the gear nut and gear sector in the steering gear.

INSTRUMENTATION TESTS

Tools Needed: 5S5123 Hydraulic Testing Group, 9S2000 Hydraulic Flow Meter, 8M2885 Pressure Gauge (two), FT508 Stop Block, 4S9402 Rule, Stop Watch.

Tests must be made with the oil at normal operating temperature. Loosen the filler cap on hydraulic tank to relieve tank pressure before installing or removing test equipment.

Checking Pump Efficiency

For any pump test, the pump flow, measured in gpm (lit/min) at 100 psi (7,0 kg/cm^2) will be larger than the pump flow at 1000 psi (70,3 kg/cm^2) at the same rpm.

The difference between the pump flow of two operating pressures is the flow loss.

Method of finding flow loss . . .

Pump flow at 100 psi ..... 57.5 gpm (lit/min)*
Pump flow at 1000 psi .....–52.0 gpm (lit/min)*
Flow loss ..... 5.5 gpm (lit/min)*

Flow loss when expressed as a percent of pump flow is used as a measure of pump performance.

Example of finding percent of flow loss . . .

$$\left(\frac{\text{gpm flow loss}}{\text{Pump flow @ 100 psi}}\right) \times 100 = \text{Percent of flow loss}$$

or $$\left(\frac{*\ 5.5}{*57.5}\right) \times 100 = 9.5\%$$

If the percent of flow loss is more than 10%, pump performance is not good enough.

*Numbers in examples are for illustration and are not values for any specific pump or pump condition. See SPECIFICATIONS for pump flow of a new pump at 100 psi and 1000 psi.

Test On The Machine

Install a 9S2000 Flow Meter. [See subject, PUMP TESTS (CHART B) in FLOW METER TEE TEST PROCEDURE II, FORM NO. REG00880]. Measure pump flow at 100 psi (7,0 kg/cm^2) and at 1000 psi (70,3 kg/cm^2) with engine at 2000 rpm.

Formula I:

$$\left(\frac{\text{gpm @ 100 psi} - \text{gpm @ 1000 psi}}{\text{gpm @ 100 psi}}\right) \times 100 = \text{Percent of flow loss}$$

Test On The Bench

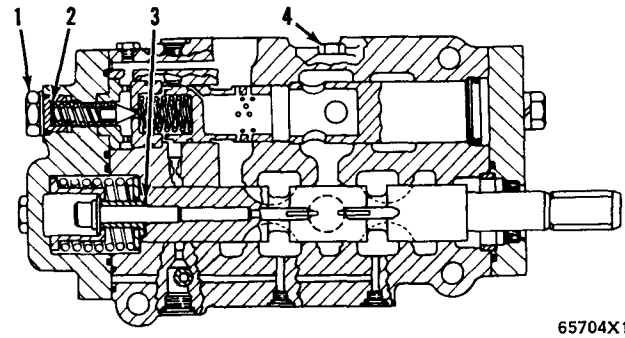
If the test bench can not be run at 1000 psi at a high rpm, do the first part of the test with the pump shaft rotation at 935 rpm. Measure pump flow at 100 psi (7,0 kg/cm^2) and at 1000 psi (70,3 kg/cm^2). Then in order to measure the pump flow for the last part of the test, see SPECIFICATIONS for: Pump rpm at 100 psi with the engine at 2000 rpm.

Formula II:

$$\left(\frac{\text{gpm @ 100 psi} - \text{gpm @ 1000 psi}}{\text{gpm @ 100 psi @ pump rpm}}\right) \times 100 = \text{Percent of flow loss}$$

Testing Pressure Relief Valve

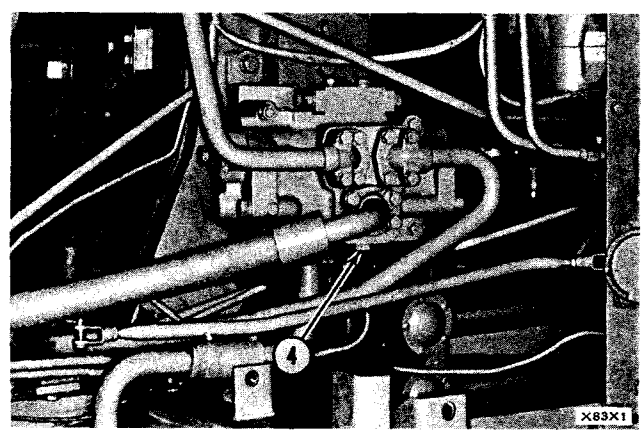
1. Remove the floor plate directly in front of the operator's seat.



CROSS SECTION OF STEERING CONTROL VALVE

1. Plug. 2. Shims (main relief valve). 3. Shims (balance cylinder pressure). 4. Plug.

2. Remove the test plug (4) and install necessary fittings, hose and a 7S8714 Gauge (0 to 4000 psi).



PRESSURE TAP LOCATION

4. Plug.

3. Install a FT508 Stop Block on a frame stop.

4. With engine at high idle speed turn the machine against the stop block and hold the steering wheel turned. The pressure relief valve setting should be in the range of 2500 ± 50 psi (175,8 ± 3,5 kg/cm^2).

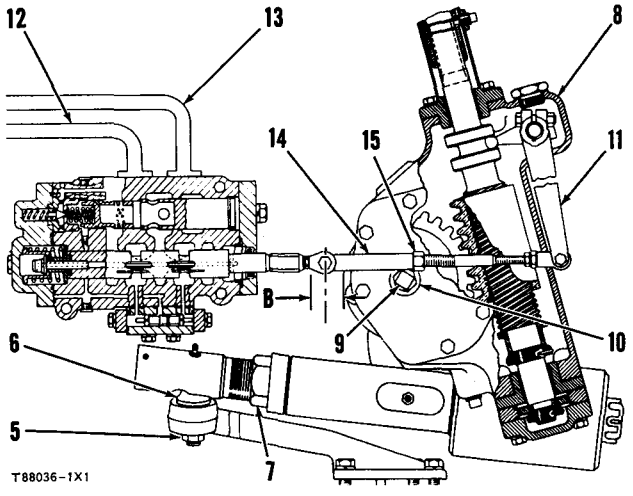
5. Add or remove shims (2) to adjust the relief valve setting. Adding shims increases the pressure setting.

CHANGE IN PRESSURE BY REMOVAL OR ADDITION OF ONE SHIM (2)		
SHIM PART NO.	THICKNESS	CHANGE IN psi (kg/cm²)
3H2549	.010 in. (0,25 mm)	79 psi (5,5 kg/cm²)

NOTE: Tighten plug (1) to 36 ± 4 lb. ft. (5,0 ± 0,6 mkg). Tighten plug (4) to 24 ± 2 lb. ft. (3,3 ± 0,3 mkg) (7J966 Control Valve).

Testing Cylinder Pressure Balance

6. Install the appropriate plate assemblies between lines (12 and 13) and steering control valve. Install a hose assembly and a 8M2885 Gauge (0 to 200 psi) in each plate assembly.



STEERING CONTROL VALVE AND RELATED LINKAGE

5. Nut and lock. 6. Eyebolt assembly. 7. Locknut. 8. Housing assembly 9. Setscrew. 10. Setscrew locknut. 11. Lever. 12. Oil line to steering cylinders. 13. Oil line to steering cylinders. 14. Linkage rod end. 15. Rod end locknut. B. Total linear movement when steering wheel is rotated from lock to lock. Approximately 1.12 in. (28,4 mm).

WARNING: Connect the steering safety link.

7. Disconnect end (14) from valve spool. Disconnect eyebolt assembly (6) from follow-up mechanism.

8. The steering valve spool should be centered by its centering springs. With the diesel engine operating at high idle speed, the pressure on each gauge (at lines 12 and 13) will be in the approximate range of 55 ± 15 psi (3,9 ± 1,0 kg/cm²). The difference between the pressures must not vary more than 20 psi (1,4 kg/cm²). If the gauge reading connected to line (13) is higher, add shims (3).

Steering Gear Adjustment

If troubleshooting the system or when assembling the steering gear, the following items should be checked.

9. At assembly make certain center tooth of the gear sector meshes with center notch of the gear nut.

10. Backlash between the gear sector and gear nut is set at .000 to .006 in. (0,0 to 0,15 mm). Rotate the eccentric gear sector shaft housing for adjustment (with right hand side cover removed).

11. Tighten setscrew (9) to remove end clearance of shaft, back out screw (9) 1/8 turn, and tighten locknut (10) to 50 ± 5 lb. ft. (6,9 ± 0,7 mkg).

12. The steering control valve spool should be in the NEUTRAL or centered position because of its centering springs. Turn the steering wheel to its extreme left and right positions while noting the linear movement (B) of lever (11) and rod end (14). With the steering wheel turned to its centered position, or when lever (11) is in the middle of its travel, adjust end (14) to permit a loose pin fit with the valve spool. Install the pin in a horizontal position as illustrated. Tighten locknut (15). Refer to the topic CHECKING STEERING SPEED for an additional method of final adjustment to lever (11) and end (14).

Follow-Up Linkage Adjustment

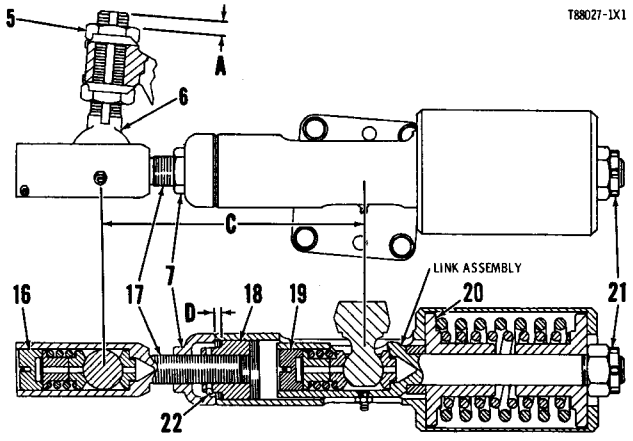
If troubleshooting the system or when assembling the follow-up linkage, the following items should be checked.

13. Tighten plugs (16 and 19) and then adjust to ¼ to ½ turn loose. Install the locking pins.

14. Tighten nut (21) to remove all end play between link assembly and end. Then loosen nut (21) ¼ turn.

15. Back off nut (7) as far as possible. Adjust nut (18) to obtain reference dimension (D) [.56 in. (14,2 mm)]. Adjust end (17) to obtain reference dimension (C) [7.12 in. (180,8 mm)].

16. Adjust nut (5) on link assembly (6) to obtain .50 in. (12,7 mm) of eyebolt assembly thread projection beyond nut [reference dimension (A)].



FOLLOW-UP LINKAGE

5. Nut. 6. Eyebolt assembly. 7. Nut. 16. Plug. 17. End. 18. Nut. 19. Plug. 20. End. 21. Nut. 22. Screw. A. .50 in. (12,7 mm) reference dimension. C. 7.12 in. (180,8 mm) reference dimension. D. .56 in. (14,2 mm) reference dimension.

Checking Centered Turning Angle

NOTE: Disconnect the steering safety link.

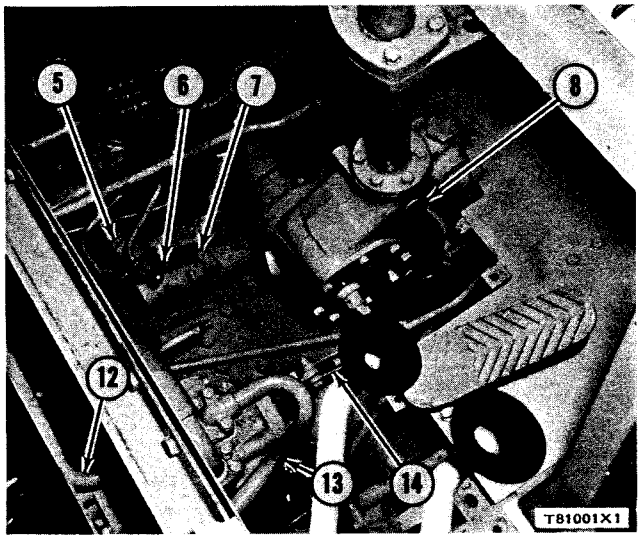
17. All steering linkage and other controls should be connected. With the diesel engine operating at high idle speed, turn the machine to right hand stop and left hand stop, noting the clearance dimension between the frame stops. Adjust nut (18) to center turning angle between the frame stops. Rotating nut (18) in a clockwise direction will increase the length of dimension (C) and cause the machine to steer left to the center position. Tighten locking screw (22) and nut (7).

Checking Frame Stop Clearance

18. Turn the machine to steering limits, both right hand and left hand. Adjust the position of eyebolt assembly (6) to provide .25 ± .12 in. (6,4 ± 3,0 mm) clearance between the frame stops.

Checking Steering Speed

19. Turn the machine to the extreme right turn position. Depress the accelerator pedal to high idle rpm. Using a stop watch calibrated in hundredths of a second, record the time (to the nearest tenth of a second) required to turn the machine to the extreme left turn position. With the machine in the left turn position, record the time required to turn the machine to the extreme right turn position. Record five readings in each direction of turning, and then average the times. The time required for extreme left to right and right to left turns should not be more than 3.0 seconds. The difference between left to right and right to left turns should not be more than 0.2 seconds.



STEERING CONTROL VALVE AND LINKAGE

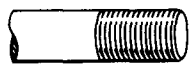
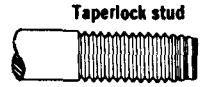
5. Nut and lock. 6. Eyebolt assembly. 7. Locknut. 8. Housing assembly. 12. Oil line to steering cylinders. 13. Oil line to steering cylinders. 14. Linkage rod end.

WARNING: Connect the steering safety link.

20. By adjusting rod end (14) ½ turn at a time, the steering speeds can be equalized. Loosen the nut on rod end (14), remove the pin from rod end (14) and control valve spool, rotate the rod end in a clockwise direction to increase speed of right to left turn. Install the pin horizontally as illustrated and tighten the nut.

GENERAL TIGHTENING TORQUE FOR BOLTS, NUTS AND TAPERLOCK STUDS

The following charts give the standard torque values for bolts, nuts and taperlock studs of SAE Grade 5 or better quality. Exceptions are given in the Specifications.

THREAD DIAMETER		STANDARD TORQUE	
inches	millimeters	lb. ft.	mkg
Standard thread 		Use these torques for bolts and nuts with standard threads.	
1/4	6,35	9±3	1,24±0,4
5/16	7,94	18±5	2,5±0,7
3/8	9,53	32±5	4,4±0,7
7/16	11,11	50±10	6,9±1,4
1/2	12,70	75±10	10,4±1,4
9/16	14,29	110±15	15,2±2,0
5/8	15,88	150±20	20,7±2,8
3/4	19,05	265±35	36,6±4,8
7/8	22,23	420±60	58,1±8,3
1	25,40	640±80	88,5±11,1
1 1/8	28,58	800±100	110,6±13,8
1 1/4	31,75	1000±120	138±16,6
1 3/8	34,93	1200±150	166±20,7
1 1/2	38,10	1500±200	207±27,7
		Use these torques for bolts and nuts on hydraulic valve bodies.	
5/16	7,94	13±2	1,8±0,3
3/8	9,53	24±2	3,3±0,3
7/16	11,11	39±2	5,4±0,3
1/2	12,70	60±3	8,3±0,4
5/8	15,88	118±4	16,3±0,5
Taperlock stud 		Use these torques for studs with Taperlock threads.	
1/4	6,35	5±2	0,69±0,3
5/16	7,94	10±3	1,4±0,4
3/8	9,53	20±3	2,8±0,4
7/16	11,11	30±5	4,1±0,7
1/2	12,70	40±5	5,5±0,7
9/16	14,29	60±10	8,3±1,4
5/8	15,88	75±10	10,4±1,4
3/4	19,05	110±15	15,2±2,0
7/8	22,23	170±20	23,5±2,8
1	25,40	260±30	35,9±4,1
1 1/8	28,58	320±30	44,2±4,1
1 1/4	31,75	400±40	55±5,5
1 3/8	34,93	480±40	66±5,5
1 1/2	38,10	550±50	76±7

T95416–4

CONTROL VALVE FOR STEERING
(7J966)

Opening pressure of relief valve ..... 2500 ± 50 psi (175,8 ± 3,5 kg/cm²)

Pressure in circuit with valve in NEUTRAL ..... 55 ± 15 psi (3,9 ± 1,0 kg/cm²)

(1) Torque for plug ..... 36 ± 4 lb. ft. (5,0 ± 0,6 mkg)

(2) 2J6089 Spring for pilot valve:

- Length under test force ..... 1.43 in. (36,3 mm)
- Test force ..... 64.0 to 71.0 lb. (29,0 to 32,2 kg)
- Free length after test ..... 1.74 in. (44,2 mm)
- Outside diameter ..... .49 in. (12,4 mm)

(3) 4J7490 Spring for dump valve (inner):

- Length under test force ..... 1.63 in. (41,4 mm)
- Test force ..... 13.3 ± .7 lb. (6,0 ± 0,3 kg)
- Free length after test ..... 2.00 in. (50,8 mm)
- Outside diameter ..... .60 in. (15,2 mm)

(4) Torque for plug ..... 9 ± 2 lb. ft. (1,2 ± 0,3 mkg)

(5) Torque for orifice plug ..... 10 ± 2 lb. ft. (1,4 ± 0,3 mkg)

(6) 2J6088 Spring for dump valve (outer):

- Length under test force ..... 1.53 in. (38,9 mm)
- Test force ..... 22.05 ± 1.1 lb. (10,0 ± 0,5 kg)
- Free length after test ..... 2.34 in. (59,4 mm)
- Outside diameter ..... .81 in. (20,6 mm)

(7) Torque for plug ..... 24 ± 2 lb. ft. (3,3 ± 0,3 mkg)

(8) 5J361 Spring for valve spool:

- Length under test force ..... 1.68 in. (42,7 mm)
- Test force ..... 4.0 ± 0.3 lb. (1,8 ± 0,14 kg)
- Free length after test ..... 2.125 in. (54,0 mm)
- Outside diameter ..... 1.40 in. (35,6 mm)

(9) Thickness of 5J4776 Shim ..... .005 in. (0,13 mm)

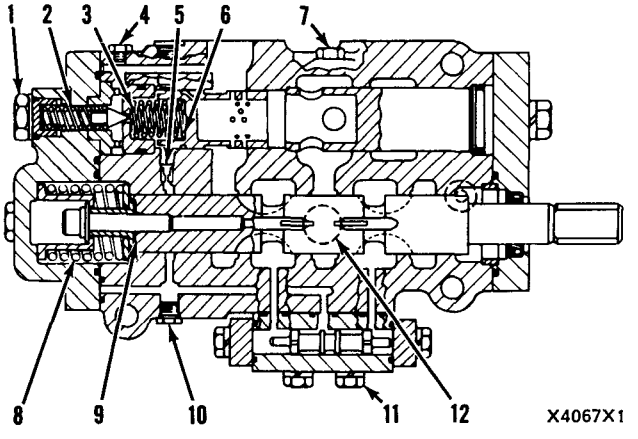
Thickness of 4J8224 Shim ..... .010 in. (0,25 mm)

Use shims to position valve spool to get same oil pressure in each steering cylinder.

(10) Torque for plugs (two) ..... 13 ± 2 lb. ft. (1,8 ± 0,3 mkg)

(11) Torque for bolts ..... 24 ± 2 lb. ft. (3,3 ± 0,3 mkg)

(12) Torque for plug ..... 50 ± 3 lb. ft. (6,9 ± 0,41 mkg)



NOTE: FOR TORQUE VALUES NOT GIVEN, SEE THE FIRST PAGE OF SPECIFICATIONS FOR GENERAL TIGHTENING TORQUES

CONTROL VALVE FOR STEERING
(8J2348)

Opening pressure of relief valve ..... 2500 ± 50 psi (175,8 ± 3,5 kg/cm²)

Pressure in circuit with valve in NEUTRAL ..... 55 ± 15 psi (3,9 ± 1,0 kg/cm²)

(1) 2J6089 Spring for pilot valve:

- Length under test force ..... 1.43 in. (36,3 mm)
- Test force ..... 64.0 to 71.0 lb. (29,0 to 32,2 kg)
- Free length after test ..... 1.74 in. (44,2 mm)
- Outside diameter ..... .49 in. (12,4 mm)

(2) 4J7490 Spring for dump valve (inner):

- Length under test force ..... 1.63 in. (41,4 mm)
- Test force ..... 13.3 ± .7 lb. (6,0 ± 0,3 kg)
- Free length after test ..... 2.00 in. (50,8 mm)
- Outside diameter ..... .60 in. (15,2 mm)

(3) Torque for orifice plug ..... 10 ± 2 lb. ft. (1,4 ± 0,3 mkg)

(4) 2J6088 Spring for dump valve (outer):

- Length under test force ..... 1.53 in. (38,9 mm)
- Test force ..... 22.05 ± 1.1 lb. (10,0 ± 0,5 kg)
- Free length after test ..... 2.34 in. (59,4 mm)
- Outside diameter ..... .81 in. (20,6 mm)

(5) 5J361 Spring for valve spool:

- Length under test force ..... 1.68 in. (42,7 mm)
- Test force ..... 4.0 ± 0,3 lb. (1,8 ± 0,14 kg)
- Free length after test ..... 2.125 in. (54,0 mm)
- Outside diameter ..... 1.40 in. (35,6 mm)

(5) 1J9533 Spring for valve spool:

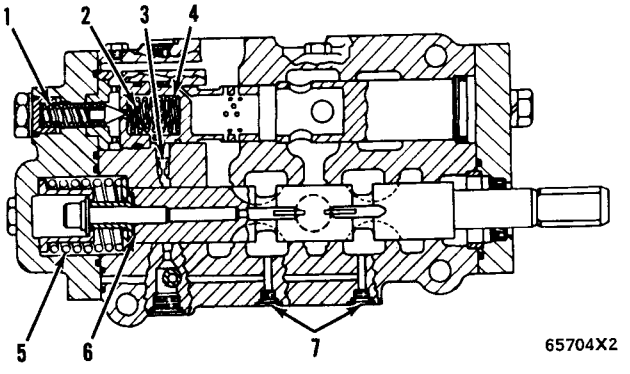
- Length under test force ..... 2.12 in. (53.9 mm)
- Test force ..... 10 to 11 lb. (4.52 to 4.99 kg)
- Free length after test ..... 5.75 in. (146.1 mm)
- Outside diameter ..... 1.37 in. (38.8 mm)

(6) Thickness of 5J4776 Shim ..... .005 in. (0,13 mm)

Thickness of 4J8224 Shim ..... .010 in. (0,25 mm)

Use shims to position valve spool to get same oil pressure in each steering cylinder.

(7) Torque for plugs (two) ..... 13 ± 2 lb. ft. (1,8 ± 0,3 mkg)



65704X2

HYDRAULIC PUMP
(7J740 and 8J151)

Rotation is counterclockwise when seen from drive end.

Type of pump: Vane

For test use SAE 10W oil at 150° F (65° C)

LARGE SECTION OF PUMP (Drive end) (Implement)

Test at Full Speed:

Output ..... 62.3 U.S. gpm (235,8 lit/min)
at a pressure of ..... 100 psi (7,0 kg/cm²)
with pump at ..... 1870 rpm
with engine at ..... 2000 rpm
Output ..... 59.2 U.S. gpm (224,1 lit/min)
at a pressure of ..... 1000 psi (70,3 kg/cm²)
with pump at ..... 1870 rpm
with engine at ..... 2000 rpm

Test at Half Speed:

Output ..... 30.9 U.S. gpm (117,0 lit/min)
at a pressure of ..... 100 psi (7,0 kg/cm²)
with pump at ..... 935 rpm
with engine at ..... 1000 rpm
Output ..... 27.8 U.S. gpm (105,2 lit/min)
at a pressure of ..... 1000 psi (70,3 kg/cm²)
with pump at ..... 935 rpm
with engine at ..... 1000 rpm

SMALL SECTION OF PUMP (Cover end) (Steering)

Test at Full Speed:

Output ..... 34.4 U.S. gpm (130,2 lit/min)
at a pressure of ..... 100 psi (7,0 kg/cm²)
with pump at ..... 1870 rpm
with engine at ..... 2000 rpm
Output ..... 33.0 U.S. gpm (125,0 lit/min)
at a pressure of ..... 1000 psi (70,3 kg/cm²)
with pump at ..... 1870 rpm
with engine at ..... 2000 rpm

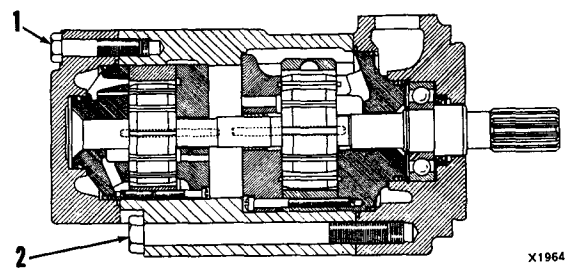
Test at Half Speed:

Output ..... 17.1 U.S. gpm (64,7 lit/min)
at a pressure of ..... 100 psi (7,0 kg/cm²)
with pump at ..... 935 rpm
with engine at ..... 1000 rpm
Output ..... 15.7 U.S. gpm (59,4 lit/min)
at a pressure of ..... 1000 psi (70,3 kg/cm²)
with pump at ..... 935 rpm
with engine at ..... 1000 rpm

(1) Torque for bolts ..... 70 ± 5 lb. ft. (9,7 ± 0,7 mkg)

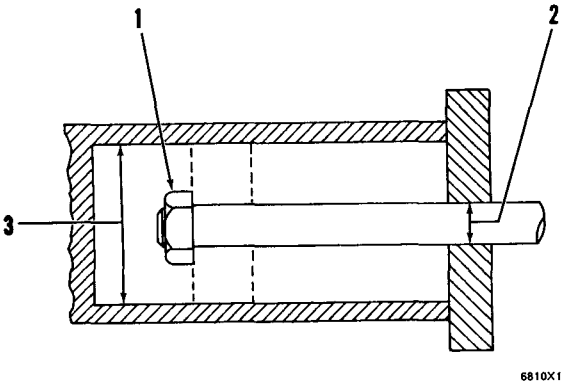
(2) Torque for bolts ..... 150 ± 10 lb. ft. (20,7 ± 1,4 mkg)

NOTE: See subject, PUMP TESTS (Chart B) in FLOW METER TEE TEST PROCEDURE II, FORM NO. REG00880.



NOTE: FOR TORQUE VALUES NOT GIVEN, SEE THE FIRST PAGE OF SPECIFICATIONS FOR GENERAL TIGHTENING TORQUES

STEERING CYLINDERS
(5J1388 and 7K9407)



(1) Torque for nut with lubricant on threads ..... 900 ± 90 lb. ft. (124,47 ± 12,4 mkg)

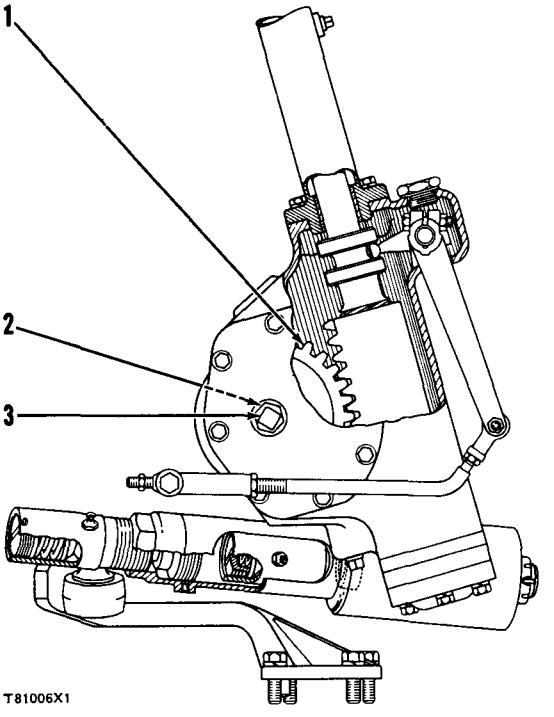
(2) Bore in new head ..... 1.503 ± .001 in. (38,18 ± 0,025 mm)

Diameter of new rod ... 1.4980 ± .0015 in. (38,05 ± 0,038 mm)

(3) Bore in new cylinder (5J1388) ..... 3.4995 ± .0015 in. (88,89 ± 0,038 mm)

(3) Bore in new cylinder (7K9407) ..... 3.500 in.; + .005, —.002 in. (88,90 mm; + 0,13, —0,05 mm)

STEERING GEAR AND FOLLOW-UP LINKAGE



(1) Amount of free movement (backlash) between gear sector and gear nut ..... .000 to .006 in. (0,00 to 0,15 mm)

(2) Torque for nuts on both ends of gear sector shaft ..... 450 ± 25 lb. ft. (62,2 ± 3,5 mkg)

(3) Torque for locknut after adjusting screw is adjusted 1/8 turn loose ..... 50 ± 5 lb. ft. (6,9 ± 0,7 mkg)

(4) Adjustment of nut ..... ¼ turn loose

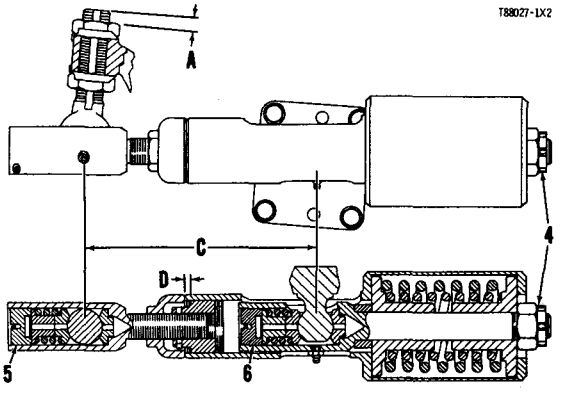
(5) Adjustment of plug ..... ¼ to ½ turn loose

(6) Adjustment of plug ..... ¼ to ½ turn loose

(A) Reference Dimension (nut to end of eyebolt) .. .50 in. (12,7 mm)

(C) Reference Dimension (Center to center of balls) ..... 7.12 in. (180,8 mm)

(D) Reference Dimension (Adjustment nut clearance) ..... .56 in. (14,2 mm)



HITCH GROUP

(1) Torque for upper cap bolts of lower hitch:

Step 1: Install three bolts evenly spaced around cap with no shims under cap. Tighten the bolts the same amount. Do this procedure again until bolts are tightened to ... 65 ± 5 lb. ft. (9,0 ± 0,7 mkg)

Step 2: Make sure lower cap is against frame. Measure the clearance between the upper cap and frame at each bolt.

Step 3: Install shims under the upper cap of the minimum thickness measured.

Step 4: Install all cap bolts and tighten to ..... 65 ± 5 lb. ft. (9,0 ± 0,7 mkg)

(2) Torque for bolts of lower hitch pin:

Step 1: Install plate without shims. Install two bolts 180° apart. Tighten bolts to ..... 100 ± 10 lb. ft. (13,8 ± 1,4 mkg)

Step 2: Measure the clearance between the plate and the frame 360° around the plate.

Step 3: Install shims of the minimum thickness measured minus ..... .010 in. (0,25 mm)

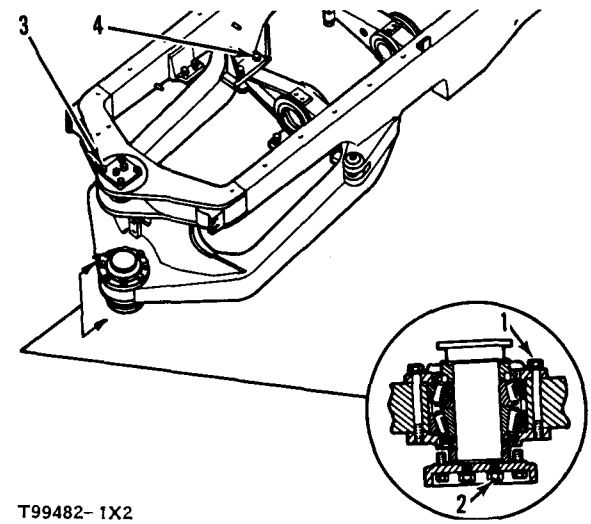
Step 4: Install all pin bolts and tighten to ..... 100 ± 10 lb. ft. (13,8 ± 1,4 mkg)

(3) Torque for cover bolts of upper hitch:

Step 1: Tighten two opposite bolts the same amount.

Step 2: Tighten the other two bolts the same amount. Do this procedure again until all bolts are tightened to ..... 50 ± 25 lb. ft. (6,9 ± 3,5 mkg)

(4) Torque for nuts ..... 345 ± 30 lb. ft. (47,7 ± 4,1 mkg)



T99482-1X2

NOTE: FOR TORQUE VALUES NOT GIVEN, SEE THE FIRST PAGE OF SPECIFICATIONS FOR GENERAL TIGHTENING TORQUES

FEBRUARY 1973
FORM NO. REG00591-02

PRINTED IN U.S.A.