SAFETY PRECAUTION INFORMATION

⚠ CAUTION ⚠

Unsafe operating practices and improper use of the skid steer and its attachments on the part of the operator can result in injuries. Observe the following safety precautions at all times:

1. **For servicing, the skid steer should be on level terrain, engine stopped with the wheels blocked or the entire skid steer solidly supported with the wheels off the ground before servicing any component of the drivetrain.**
2. **For servicing under the operator's seat, raise the seat and pan assembly up to the raised latched position and securely latch.**
3. **Do not operate the skid steer unless the seat is latched in the operate position.**
4. **Do not service the skid steer with a raised boom unless the boom is resting on the boom lock pins.**
5. **Do not service the skid steer with the engine running unless the skid steer is properly and securely supported with all four wheels off the ground.**
6. **Use caution when servicing the unit around moving parts.**
7. **Do not tilt the boom and cab without proper instruction.**
8. **Do not tilt the boom and cab without using the proper cab tilting tool.**
9. **Reinstall all shields removed for service.**
10. **Never loosen any hydraulic connections before relieving the pressure in the hydraulic system.**
11. **Wear eye protection such as goggles, etc.**
12. **Wear ear protection such as ear plugs, etc. When you feel the noise level is uncomfortable.**
13. **If any servicing or adjustments require the battery to be disconnected, disconnect the (-) negative ground cable.**
14. **When servicing electrical components, disconnect the (-) negative ground cable.**
15. **If the electronic instrument cluster (EIC) requires removal from the dash area or the skid steer disconnect the (-) negative ground battery cable. This will shut off power to the EIC and prevent damage to the EIC board or blowing the 5-amp fuses if the board is accidentally grounded.**
16. **If welding is required on the skid steer, disconnect the (-) negative ground cable. failure to disconnect the battery may result in damage to the EIC (Electronic Instrument Cluster) monitoring system and other electrical components.**
17. **If welding is required on an attachment, remove the attachment from the skid steer.**
18. **Give complete and undivided attention to the job at hand so that complete control of the skid steer is maintained at all times.**
19. **Drive slowly over rough ground and on slopes; keep alert for holes, ditches and other irregularities that may cause the skid steer to overturn.**
20. **Avoid steep hillside operation which could cause the skid steer to overturn.**
21. **Never transport a loaded bucket at full height. Operate the skid steer with the load as low as possible until it becomes necessary to raise the boom to discharge the load into a truck, container, etc.**
22. **Reduce speed when turning so there is no danger of the skid steer overturning.**
23. **Never drive up or back up a hill or incline with a raised boom or the skid steer could over turn.**
24. **Always look behind you before backing the skid steer.**
25. **Maintain proper transmission oil level to prevent loss of hydrostatic braking.**
26. **Do not allow passengers to ride on the skid steer at any time.**
27. **Do not allow children to operate the skid steer or ride on the skid steer at any time.**
28. **Do not allow anyone to operate the skid steer without proper instruction. OSHA requires that all operators be instructed on the proper operation of the machine before they operate the unit.**
29. **Do not operate the skid steer in any position other than while in the operator's seat with the seat belt securely fastened.**

MINIMUM HARDWARE TIGHTENING TORQUES

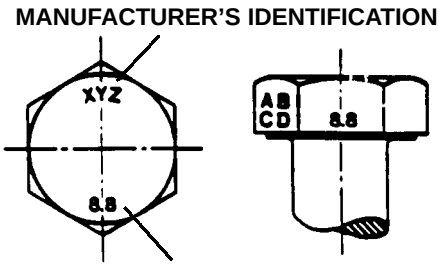
IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

METRIC HARDWARE AND LOCKNUTS

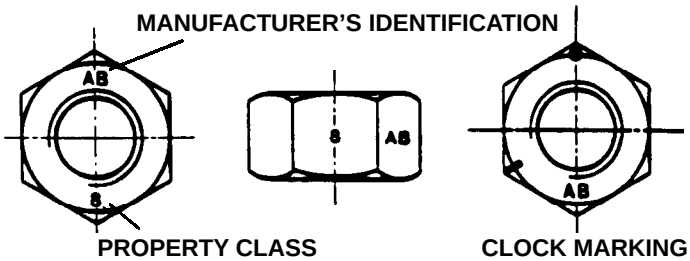
NOMINAL SIZE	CLASS 5.8		CLASS 8.8		CLASS 10.9		LOCKNUT CL.8 W/CL8.8 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	
M4	15* (1.7)	19* (2.2)	23* (2.6)	30* (3.4)	33* (3.7)	42* (4.8)	16* (1.8)
M6	51* (5.8)	67* (7.6)	79* (8.9)	102* (12)	115* (13)	150* (17)	56* (6.3)
M8	124* (14)	159* (18)	195* (22)	248* (28)	274* (31)	354* (40)	133* (15)
M10	21 (28)	27 (36)	32 (43)	41 (56)	45 (61)	58 (79)	22 (30)
M12	36 (49)	46 (63)	55 (75)	72 (97)	79 (107)	102 (138)	39 (53)
M16	89 (121)	117 (158)	137 (186)	177 (240)	196 (266)	254 (344)	97 (131)
M20	175 (237)	226 (307)	277 (375)	358 (485)	383 (519)	495 (671)	195 (265)
M24	303 (411)	392 (531)	478 (648)	619 (839)	662 (897)	855 (1160)	338 (458)

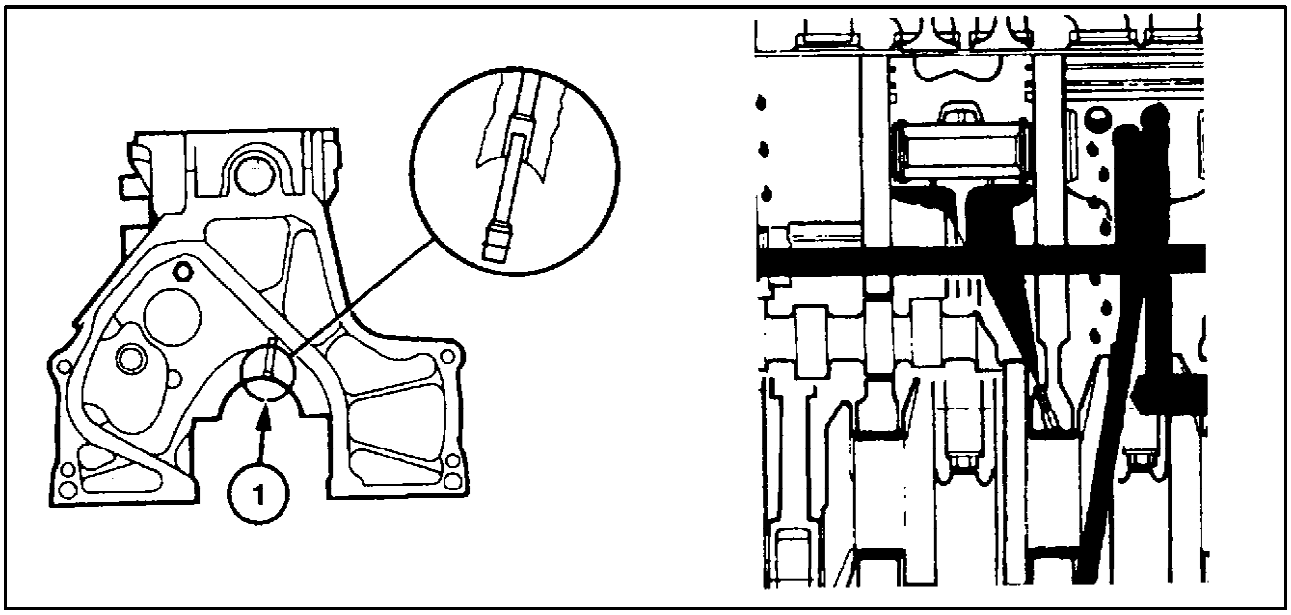
NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION
HEX CAP SCREW AND CARRIAGE BOLTS
CLASSES 5.6 AND UP



HEX NUTS AND LOCKNUTS
CLASSES 05 AND UP





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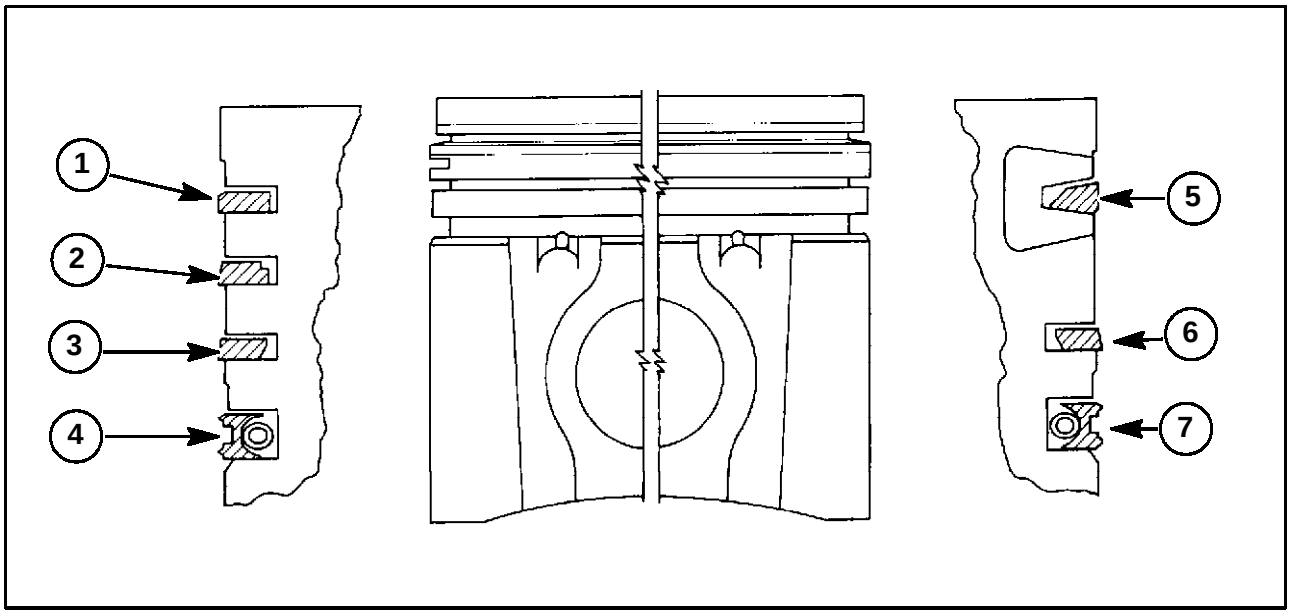
CYLINDER BLOCK

The cylinder block of the turbocharged engine contains oil jets, 1, fed from the main bearing journals to provide under piston cooling and additional lubrication.



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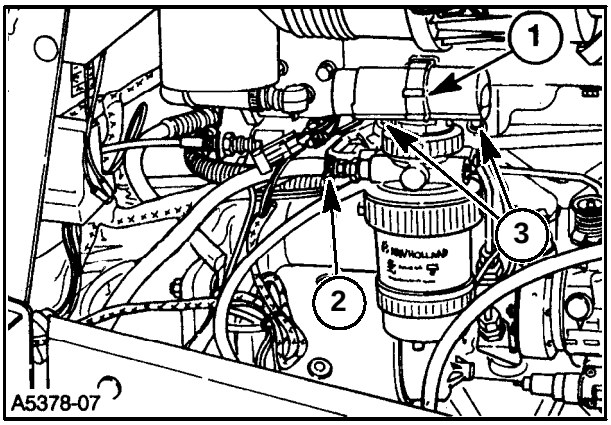
PISTONS AND CONNECTING RODS

Effective with engine serial number 532563, a piston change was made. The early piston is fitted with three compression rings, 1, 2, and 3, and oil control ring, 4, with expander. The later piston is fitted with a keystone top compression ring, 5; a second compression ring, 6; and an oil control ring, 7, with expander. Both pistons are of the "Mexican Hat" type, so called because of the raised section in the middle of the combustion bowl. This configuration aids the swirl of the incoming air from the cylinder head, improving fuel/air mixing.

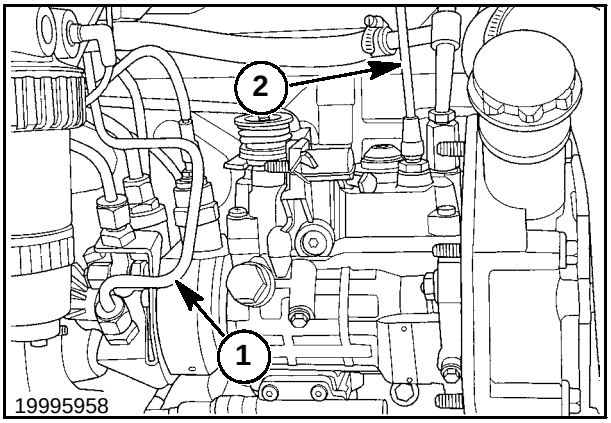
The connecting rods are machined from high-strength forged steel. The big end bearings are renewable, steel-backed, copper/lead alloy overlay with tin plating. The small end bearings are a press fit plain bush of tin-backed lead/bronze.

10. Disconnect the electrical connectors from the fuel electric lift pump, 1.
11. Disconnect the filter inlet and outlet fuel lines, 2.
12. Remove the two socket head capscrews, 3, and remove the filter and pump assembly.



22

13. Remove the injector lines, 1, from the injection pump and the injectors. Remove the fuel leakoff line from the injection pump, 2. Cap all openings to prevent dirt entry.
14. Disconnect the fuel and electrical connections at the intake manifold heater located at the inlet to the manifold.
15. Disconnect and plug the heater hoses.
16. Remove the retaining bolts and lock washers. Remove the intake manifold and gasket.
17. Remove the rocker arm cover from the engine.



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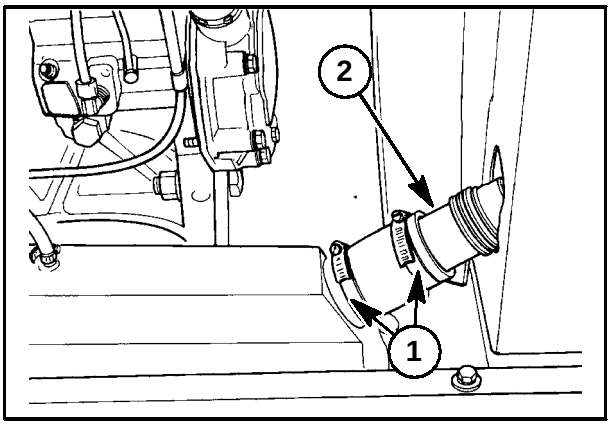
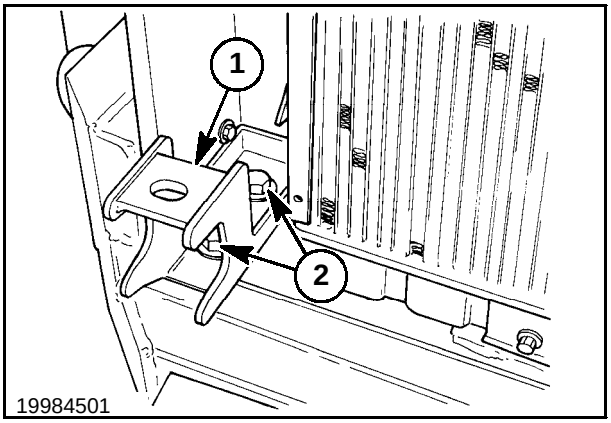
8. Loosen clamps, 1, and remove the fuel tank filler neck, 2.



84

9. Remove the rear door latch bracket, 1, by removing the two capscrews, 2.

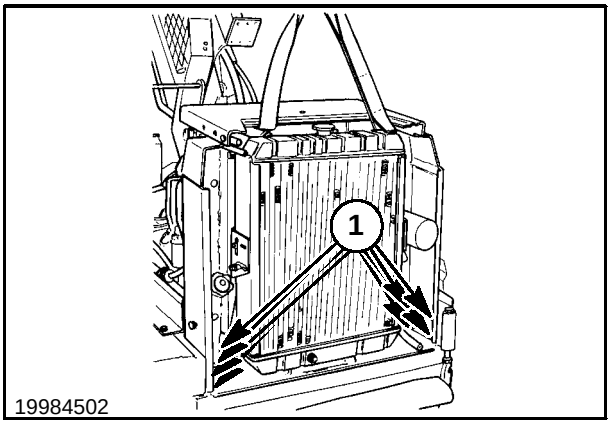


85

10. Remove eight mounting cap screws, 1, (four screws on each side). Remove the radiator/oil cooler assembly from the skid steer.

NOTE: *The radiator/oil cooler assembly is heavy and may require a lifting device to remove.*

11. Remove the alternator drive belt.
12. Withdraw the four bolts which pass through the water pump into the block and remove the pump.



86

FUEL INJECTORS

PROBLEM	POSSIBLE CAUSES	CORRECTION
Engine emits black smoke	Faulty injectors	Overhaul or replace injectors
Nozzle does not “buzz” while injecting	Dirty or sticking needle valve	Clean or replace needle valve and nozzle holder
	Valve seat leakage	Clean or replace valve and nozzle assembly
	Damaged nozzle retaining nut	Replace retaining nut
Nozzle leak back	Worn needle valve	Replace needle valve and nozzle holder
	Dirty nozzle and/or holder	Clean or replace nozzle and holder
	Loose nozzle retaining nut	Tighten nut
Nozzle opening pressure incorrect	Adjusting nut loose	Tighten nut
	Damaged nozzle or seized needle valve	Replace needle valve and nozzle holder
	Blocked nozzle holes	Clean nozzle
	Incorrect shims fitted	Adjust shim pack
Nozzle seat leakage	Dirty nozzle and/or nozzle holder	Clean or replace needle valve and nozzle holder
	Sticking needle valve	Clean or replace nozzle and nozzle holder
Incorrect spray pattern	Dirty nozzle and/or nozzle holder	Clean or replace nozzle and nozzle holder
	Restricted nozzle holes	Clean or replace nozzle and nozzle holder
	Damaged needle valve or nozzle	Replace needle valve and nozzle holder

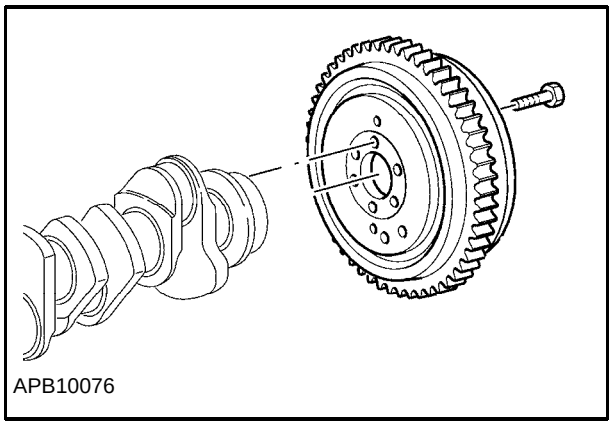
5. Quickly place the hot gear on the flywheel with flat face against the shoulder on the flywheel. The gear to flywheel runout should be checked using a dial indicator and should not exceed a Total Indicator Reading of 0.63 mm (0.025 in.).

Flywheel Surface

1. In the event of flywheel surface damage due to excessive clutch wear, the surface may be skimmed. A maximum of 3 mm (0.118 in.) is to be removed from the face of the flywheel.

Installation

1. Clean the crankshaft rear flange and mating surface of the flywheel, install the flywheel, and torque the bolts to 197 N·m (145 ft. lbs.).



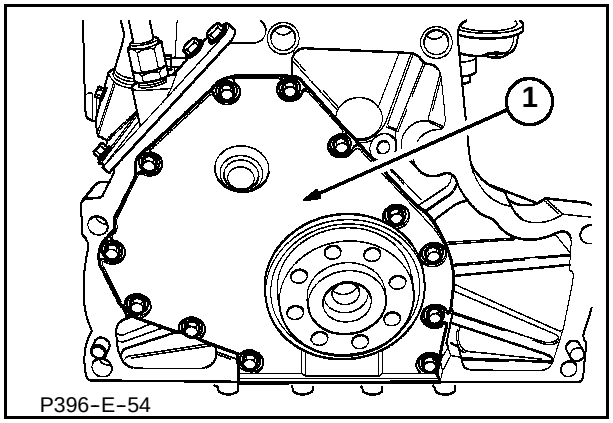
263

Op. 10 102 40

REAR COVER PLATE REMOVAL

To gain access to the engine oil pump, camshaft gear, or end of crankshaft, remove the oil pan as previously described along with the rear cover, in the following manner.

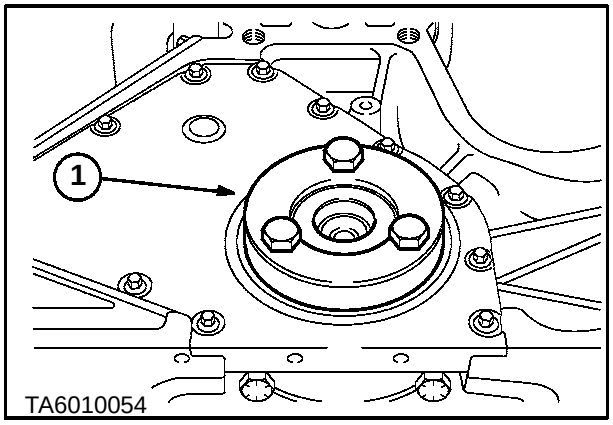
1. With rear of engine exposed, loosen and remove the 12 attaching bolts and gently pry off cover plate, 1.
2. Clean off all sealer, remove crankshaft oil seal, and check for damage or distortion around the sealing faces.



264

Installation

1. Ensure rear of block face is clean and free of old sealer, install a new gasket and apply sealer to faces, 1. With the plate in the recess, install and leave the bolts loose.
2. Apply a liberal coating of new engine oil on a new oil seal and position the rear seal over the end of the crankshaft. Locate tool, # FNH 01301, on the end of the crankshaft using the three attaching bolts. Tighten evenly and squarely until the seal is fully seated.



265

Op. 10 105 12

Piston
Replace one. Engine in machine. (4.5)

Each additional (0.3)

Includes remove and replace cylinder head, oil pan, piston and rod assembly. Clean, fit new rings, reinstall with new gaskets. Run engine, check for leaks. Reset valve clearances.

CYLINDER HEAD

Valve Rocker Arm Cover
Remove and replace. (0.4)

Cylinder Head Overhaul
Engine in machine. (6.5)

Engine removed from machine. (5.5)

Remove cylinder head and gasket. Clean head and block surface.

Reseat all valves. Grind all valve seats, reface all valves.

Additional time: Replace valve seat - each (0.2)

Clean and inspect valve guides. Ream and fit new valves as necessary.

Inspect and shim valves springs.

Install head, set valve clearances. Run engine and check for leaks. Reset valve clearances.

Op. 10 101 20

Cylinder Head Remove and Replace
Engine in machine (2.5)

Includes remove and replace valve rocker cover and shaft assembly. Adjust valve clearances. Install new gaskets.

Valve Spring
Change one. (0.8)

Head not removed.

Includes remove and replace rocker arm cover.

Change all. (1.3)

Head not removed.

Includes remove and replace rocker arm cover.

CAMSHAFT, TIMING GEARS AND COVER ASSEMBLY

Camshaft
Remove and replace. Engine removed from machine. (3.1)

Includes remove and replace rocker shaft assembly, timing gear cover.

Valve Lifters
Remove and replace all. Camshaft removed from engine. (0.7)

Includes remove and replace oil pan.

Timing Gear Cover
Remove and replace. Engine in machine. (2.0)

Remove and replace. Engine removed from machine. (0.7)

Includes remove and replace radiator support (in machine) and crankshaft pulley.

FUEL SYSTEM

Injection Pump
Remove and replace. (2.4)

Includes remove and replace starter, high-pressure and low-pressure pipes, bleed system.

High-Pressure Pipes
Remove and replace one (0.2)

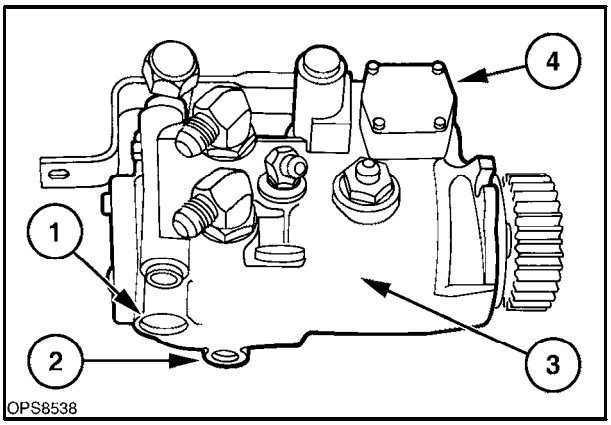
Remove and replace all. (0.4)

Op. 29 100 46

DISASSEMBLY

1. Thoroughly clean the complete pump assembly before teardown. Plug all ports so dirt and solvent do not enter the pump.

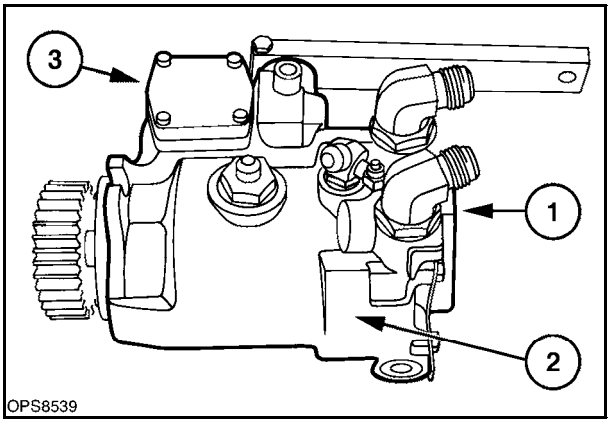
   The right hand hydrostatic pump consists of these main components; charge pump adaptor assembly, 1, backplate, 2, main pump housing, 3, and servo control assembly, 4.



45

   The left hand hydrostatic pump consists of the backplate, 1, main pump housing, 2, and servo control assembly, 3.

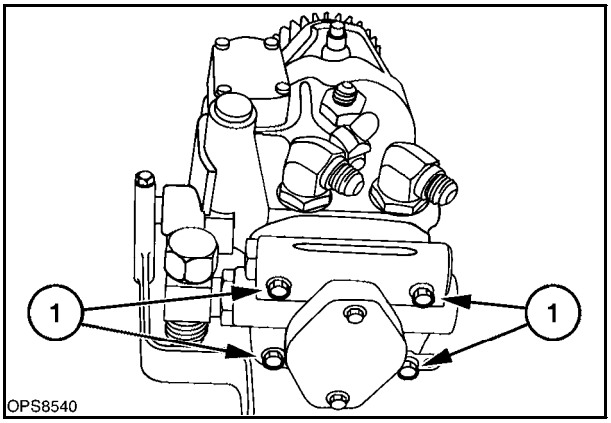
NOTE: *Dealer warranty adjustment requests for any hydrostatic component repair must include the machine model, serial numbers, transmission model number, and date codes. These codes are stamped into the servo control end cap.*



46

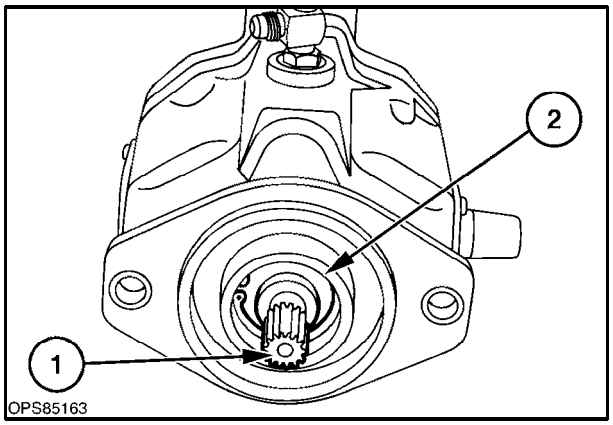
   The following disassembly instructions apply to the right hand hydrostatic pump, with gerotor charge pump. When disassembling the left hand pump, disregard steps concerning the charge pump.

2. To ensure proper reassembly, mark the relationship between the servo control assembly, charge pump adaptor assembly, and main pump housing with a marker or scribe.
3. As the pump is being overhauled, lay the parts on a clean wooden bench top or heavy cardboard to prevent damage to the machined surfaces.
4. Position the pump into a protected jaw vise, clamping onto the outer portion of the mounting flange with the cap screws of the gerotor charge pump facing up.
5. Remove the four cap screws, 1, and tap the housings with a plastic or rubber mallet to separate the two pumps. Lift the charge pump adaptor assembly straight up off the shaft and backplate. The gerotor may stay in the adaptor or on the backplate.



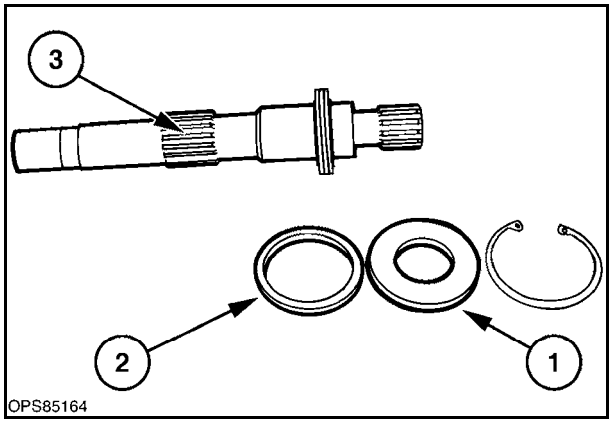
47

9. Remove the motor drive shaft, 1, from the motor housing by removing retaining ring, 2, and tapping the opposite end of the shaft with a soft mallet. The seal may be damaged during removal.



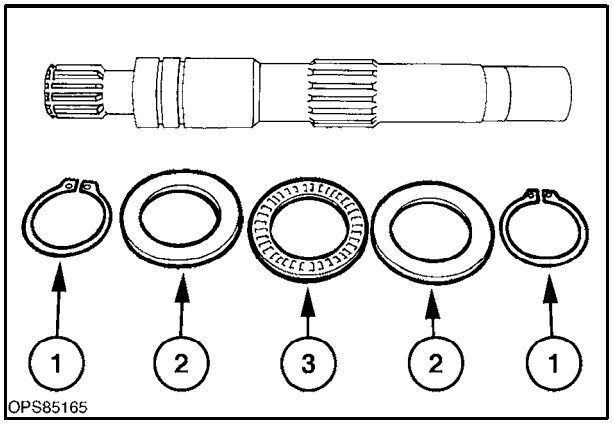
186

10. Remove the outer shaft seal, 1, and washer, 2, from the motor drive shaft, 3.



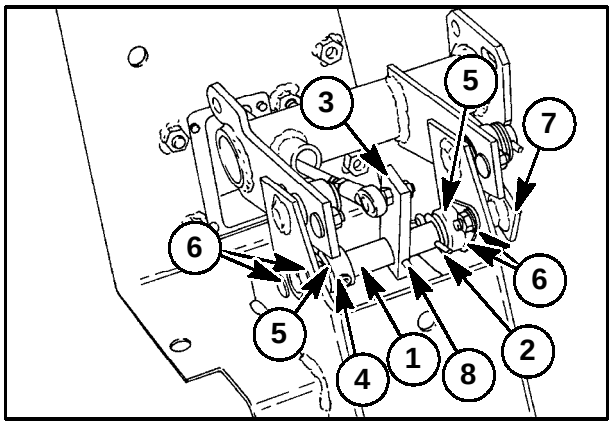
187

11. The motor shaft, thrust bearing assembly, consists of two retaining rings, 1, two thrust washers, 2, and a thrust bearing, 3. Disassemble these parts for inspection.



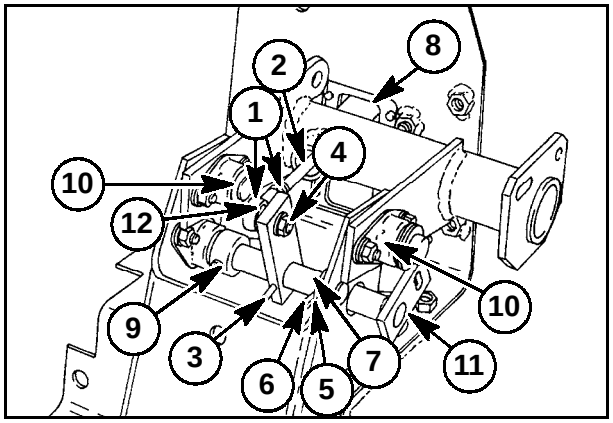
188

12. Assemble the pivot shaft, 1, shim washers, 2, arm, 3, set collar, 4, and bearings, 5, in the control arm housing.
13. Rotate the pivot shaft, 1, to position the arm upward as shown at 7.
14. Note the position of the arm, 3, on the shaft in relation to the arm at 7. Insert groove pin, 8, through arm, 3, and into shaft just far enough to position the arm. Do not hammer into place at this time.



321

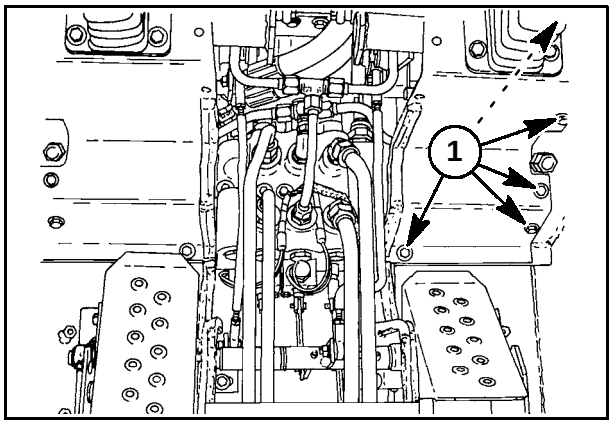
15. Attach the ball end and jam nut, 1, onto rod, 2. Install spacer, 12, (OD - 7/16″; length - 15/32″) between the ball end and arm, 3. Secure with a 5/16″ x 1-3/4″ bolt, lock washer, and nut at 4.
16. Install shim washers at 5, between the cotter pin, 6, and bearing, 7, to center rod, 2, in the control handle tube at 8. Secure the cotter pin and slide the set collar, 9, against the opposite bearing to remove any side movement of the shaft and tighten the setscrew.
17. Drive the groove pin in the arm, 3, completely into place.
18. With the handle in the neutral position angle, adjust the length of the rod, 12, so the ball stud at the arm aligns with the pivot bearings at 10. This will also set the pivot arm, 11, in a vertical position.
19. Rotate the handle to make sure the rod, 2, does not interfere at the top or bottom of the control handle tube. Move the control handle back and forth (forward and reverse) and make sure the control arm, 3, does not move. When there is no movement, tighten the jam nuts at both ends of the rod.



322

REINSTALLATION

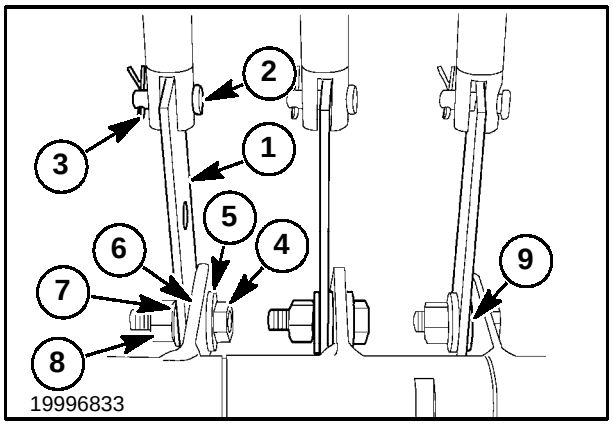
1. Place the handle assembly in the unit and install the five handle mounting bolts, 1, and tighten securely. If the unit is high-flow, reconnect the wires from the high-flow switch.



323

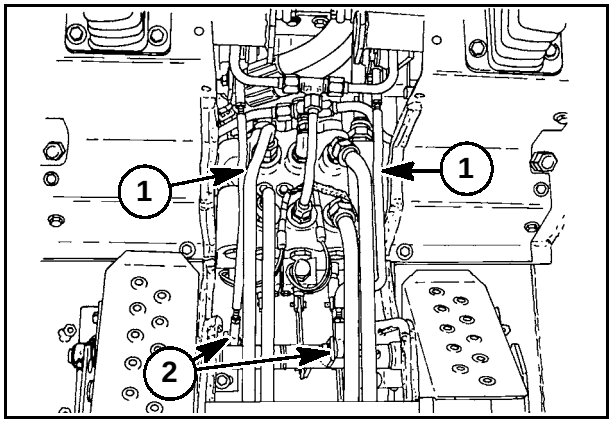
PROBLEM	POSSIBLE CAUSE	CORRECTION
Boom and bucket will not function	Service/Run switch in the service position	Put Service/Run switch in the run position
	Boom and bucket solenoids malfunctioning	Check solenoid operation
	Pump shaft broken	Replace relief valve and replace or repair pump
Boom arms will not raise, or raise slowly	Low oil flow from pump	Plugged inlet line or worn pump
	Low relief valve pressure	Check pressure, replace valve if pressure is not correct
	Control linkage binding	Free linkage
	Boom solenoid malfunctioning	Check solenoid operation
	Boom and bucket overloaded	Reduce load
	Cylinder rods are bent	Rebuild or replace cylinders
	Boom arms are binding at pivots	Remove binding and lubricate linkage
	Boom circuit relief valve malfunctioning	Check circuit relief valve pressure setting
	Bucket tilt valve spool is not returning to center position, binding	Correct binding, spool centering spring damaged.
	Auxiliary hydraulic handle locked in detent position	Return handle to neutral position
Boom or bucket leaks down, or low bucket circuit pressure	Control valve O rings leaking on plugs or circuit relief valve	Repair control valve with seal kit and replace O rings and back-up rings
Boom and/or bucket will not move smoothly, jerky.	Air leaks at pump line and fittings	Tighten or replace line and fittings
Bucket will not tilt back, tilts back slowly, or tilts forward slowly	Low oil flow from pump	Plugged inlet line, clean or replace line
	Worn or damaged pump	Check pump flow, rebuild or replace pump as necessary
	Valve spool is not in correct position, spool binding	Free control linkage, centering spring damaged
	Bucket solenoid malfunctioning	Check solenoid operation
	Cylinder rods are bent	Rebuild or replace cylinders
	Cylinder seals are leaking	Rebuild cylinders
	Bucket is overloaded	Reduce load
	Auxiliary hydraulic handle locked in detent position	Return handle to neutral
Bucket cylinder pin will not take grease	Pin drilled incorrectly	Replace with new pin

10. Install the control spool links, 1, with clevis pins, 2, and cotter pins, 3.
11. Link the boom valve link and the bucket valve link to the hub arms with 3/8″ hex head bolts, 4, flat washer, 5, thick link washer, 6, lock washer, 7, and nut, 8.
12. Install the auxiliary hydraulic link with 3/8″ hex head bolts, flat washer, two flat washers, 9, lock washer, and nut.



171

13. Install control rods, 1, to the pedal hub arms, 2, with the bolts, washers, lock washers and nuts removed during pedal removal.
14. Install the step shield and step shield hardware.



172

ADVANCED WARNING SYSTEM (AWS)

This skid steer is equipped with an Advanced Warning System (AWS) that provides information to the operator about the operation of the skid steer.

The AWS provides an interlock system with the seat and seat belt to prevent movement of the boom and bucket if the operator is out of the seat or the seat belt is unbuckled and the controls are in neutral.

The AWS provides an automatic engine preheat system to aid in cold weather starting.

The AWS provides information to the operator about the following monitored functions:

- Hydraulic Oil Filter
- Engine Air Filter
- Engine Preheat Relay Coil
- Fuel Level
- Fuel Solenoid
- Engine Coolant Temperature
- Hydrostatic Transmission Charge Pressure
- Transmission/Hydraulic Oil Temperature
- Battery Voltage
- Engine Oil Pressure
- Alternator/Water Pump Belt Breakage Warning
- Operator Seat and Seat Belt
- Hydraulic Boom/Bucket Solenoid
- Engine RPM
- Engine Hours

The AWS provides an engine shut down feature if the engine oil pressure or the hydrostatic transmission charge pressure are low.

The AWS will signal the operator if the alternator/water pump drive belt fails.

The AWS provides a security feature allowing the operator to enter a two digit security code, preventing starting of the engine and movement of the boom and bucket.

The AWS provides the following features for dealer technician use in diagnostics and troubleshooting of the monitored function circuits:

Diagnostics

- Test individual monitored circuits.

Fault/Warning History

- Fault occurrence with hour level of last occurrence.

Clear Faults

- Clear Faults to zero.

Engine Code

- Set EIC to loader engine model.

Select Displayed Temperature Units, Fahrenheit or Celsius

- Temperature displayed in English (Fahrenheit) or Metric (Celsius).

Adjust Engine RPM

- Calibrate EIC display to external RPM tach reading.

Clear Memory

- Return EIC to original factory settings.
- Engine code reset to (01).
- Hours reset to (0000.0) zero.
- Temperature displayed (Fahrenheit).
- Engine RPM calibration cleared.

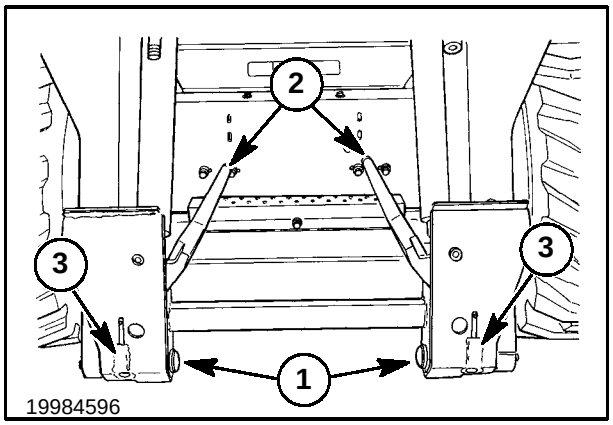
Adjust skid steer hours

- Change unit hours when installing a new EIC board in a loader.

Op. 82 100 70

ATTACHMENT MOUNTING PLATE

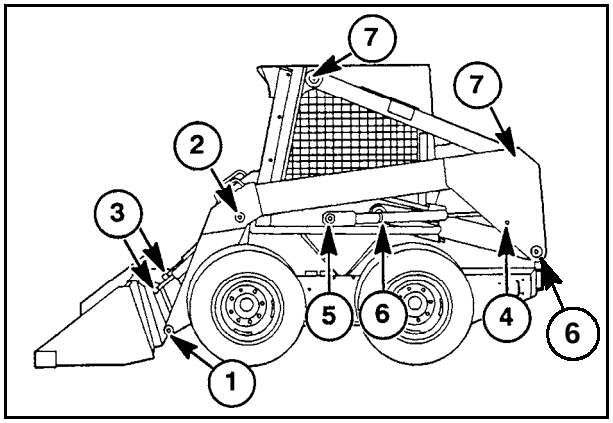
The mounting plate is attached to the main boom frame with two tapered pivot pins at 1. The attachments used on the skid steer can be easily attached or removed from the loader with the over center levers, 2, and pins, 3. The control levers and pins are spring loaded to hold the levers over center when unlatched to assist in changing attachments. When the control levers are in the latched position the spring-loaded pins are forced into the latch points on the attachment. The control levers and pins are shown in the unlatched position.



5

BOOM AND CYLINDER PIVOT PINS

When the boom, upper and lower boom links and cylinders are removed, the following figures and charts may be use for proper pin placement. The following charts and figures list the pivot pin, part number, location, and size for identification and locations.



6

BOOM AND CYLINDER PIVOT PIN LOCATION AND MACHINE USAGE

Ref.	Description	Part Number	Qty.	Torque
1	Mounting Plate Pivot	86501434	2	80 ft. lbs. (108 N·m)
2	Upper Bucket Cyl. Pivot	86501432	2	80 ft. lbs. (108 N·m)
3	Lower Bucket Cyl. Pivot	9614349	2	28 ft. lbs. (38 N·m)
4	Upper Boom Cyl. Pivot	86521982	2	28 ft. lbs. (38 N·m)
5	Lower Boom Cyl. Pivot	86501428	2	250 ft. lbs. (338 N·m)
6	Boom Lower Link Pivot	86501424	4	250 ft. lbs. (338 N·m)
7	Boom Upper Link Pivot	86501426	4	250 ft. lbs. (338 N·m)