SPECIFICATIONS

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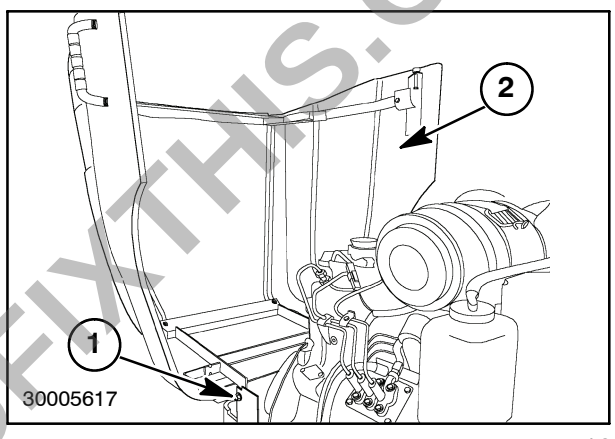
ENGINE OVERHAUL

Op. 10 012

ENGINE REMOVAL

IMPORTANT: *It is advisable to label parts, hoses, electrical connections, etc., when removing the engine from the tractor. This will ensure that the installation of the engine goes smoothly.*

1. Disconnect the negative battery cable from the battery.
2. Lift the engine cover and remove the two (2) bolts, 1, which secure the cover, 2, to the tractor.
3. Drain the engine oil from the engine.



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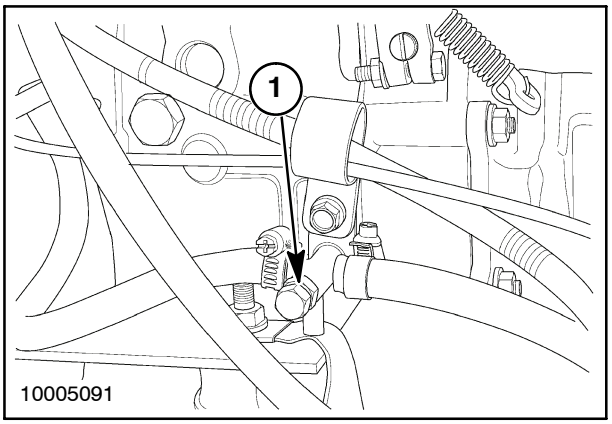
4. Place a suitable pan under the radiator petcock, 1, and open the petcock to drain the engine coolant from the radiator and engine.



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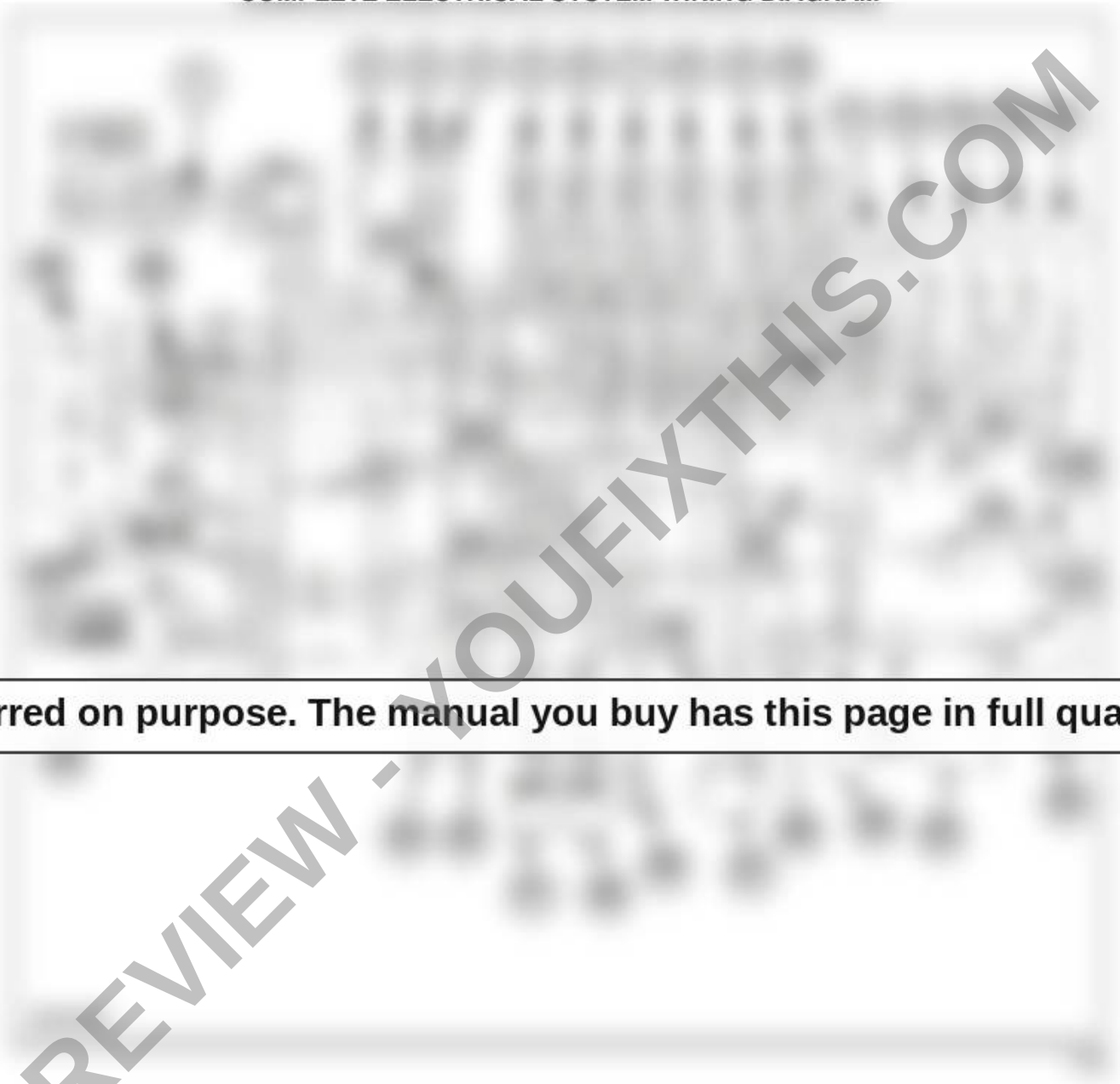
INDIVIDUAL CIRCUIT SCHEMATICS

COMPLETE ELECTRICAL SYSTEM WIRING DIAGRAM



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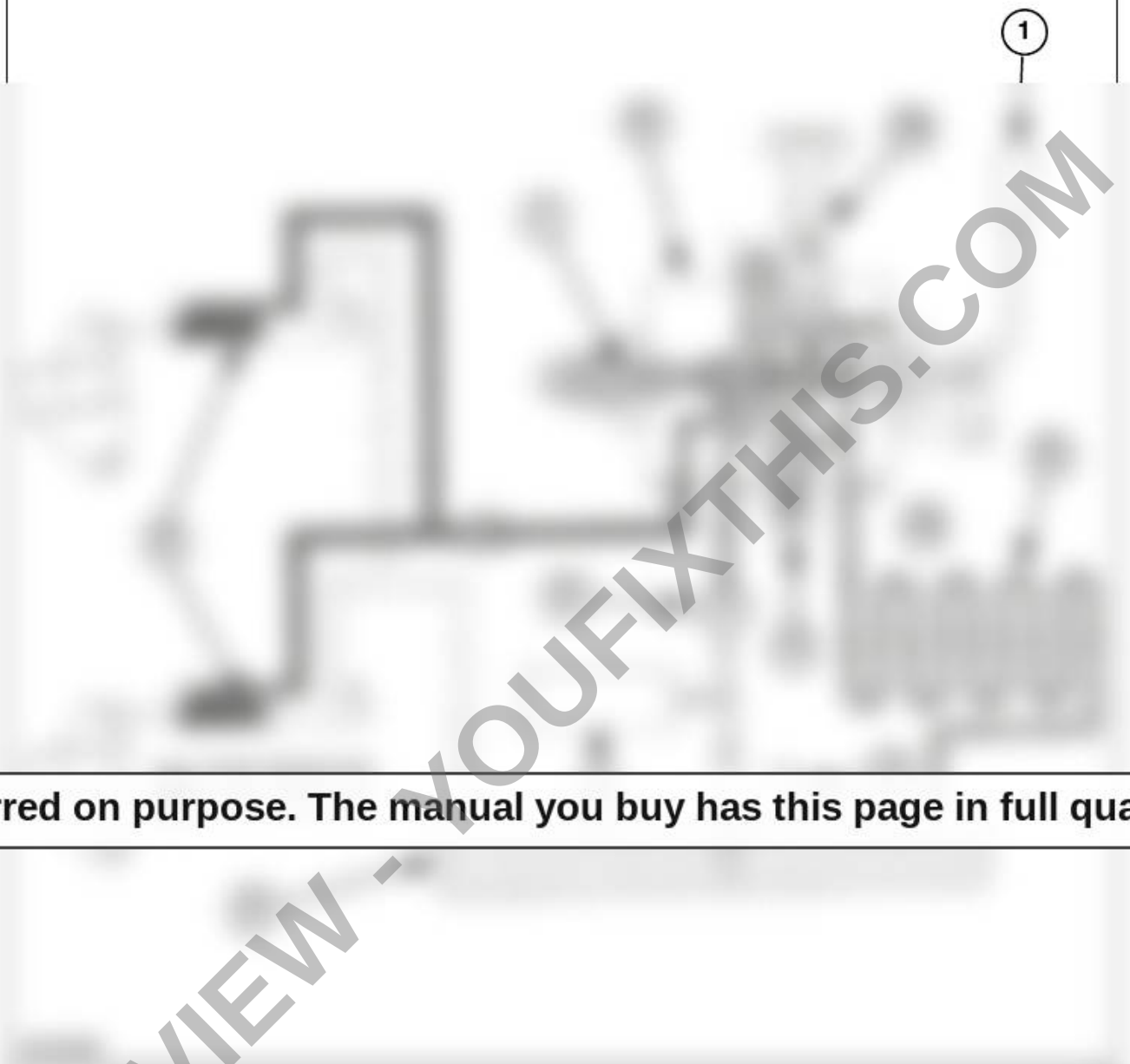

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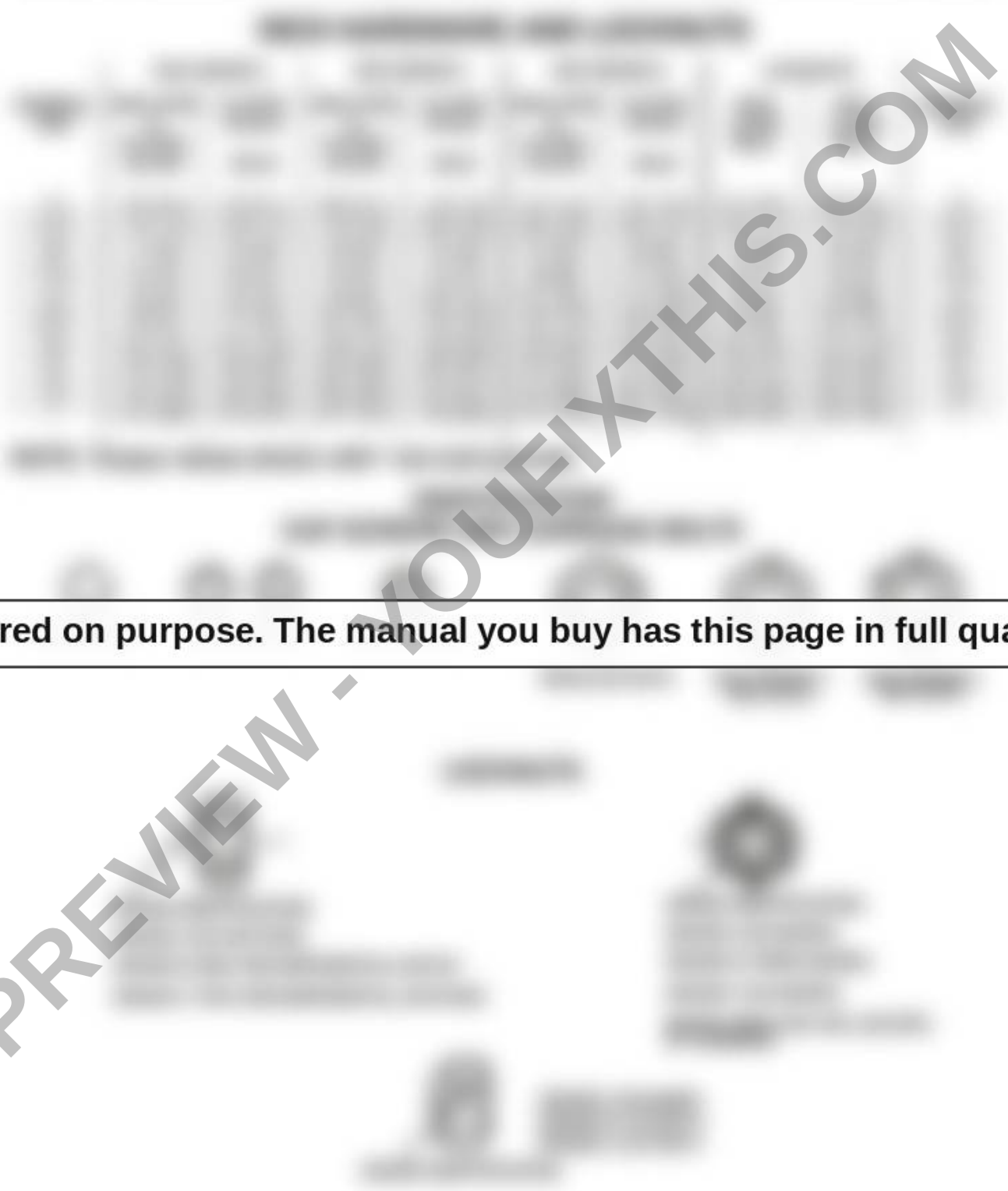
MINIMUM HARDWARE TIGHTENING TORQUES

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



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TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine does not develop full power	Clogged air cleaner	Inspect and replace air cleaner if necessary
	Fuel line obstructed	Check for crimped fuel line. Inspect fuel filter for cleanliness
	Improper injection timing	Repair/ replace components as required
	Improper nozzle injection pressure and angle	Check injection timing Inspect for proper injection pressure an angle
	Low cylinder compression	Check engine compression
	Insufficient fuel injection	Repair at authorized shop
	Improper valve lash adjustment	Adjust valves to correct tolerances
	Burned, worn or sticking valves	Inspect and replace as necessary
	Blown head gasket	Replace head gasket
	Worn or sticking piston rings	Overhaul as necessary
	Faulty fuel shutoff solenoid	Replace fuel shutoff solenoid
Low oil pressure	Engine oil level low	Fill to proper level
	Wrong grade of oil	Replace with correct grade oil
	Clogged oil pump filter	Change oil and filter
	Faulty oil pressure relief valve	Replace relief valve
	Worn oil pump drive shaft gears, or broken oil pipe	Inspect oil system and components. Replace defective components
	Excessive main or connecting rod bearing clearances	Replace bearings or shaft if necessary
	Oil pump axial clearance not properly set	Check pump clearance and shim as needed to proper tolerance
Engine will not stop	Faulty fuel shutoff solenoid	Replace the solenoid
	Faulty key switch	Replace key switch
Low cylinder compression	Burned, worn or sticking valves	Replace valves
	Bent valve stem	Replace valves
	Broken or weak valve spring	Replace valve spring
	Blown cylinder head gasket	Replace head gasket
	Worn or sticking piston rings	Replace piston rings
	Scored piston	Replace piston
Poor engine idling	Improper injection timing	Correct the injection timing
	Air in injection pump	Purge air from the system
	Improper governor adjustment	Adjust the governor

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SECTION 00 - GENERAL INFORMATION

Chapter 1 - General Information

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LUBRICATION SYSTEM SPECIFICATIONS

Tractor Model	MC 22	MC 28	MC 35
Engine Model	S773	J843	N843L

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8. If the main bearings are above maximum limits, replace crankshaft components or regrind the crankshaft journals to the next undersize bearing as required to obtain correct clearance. See the specifications listed below to determine the cor-

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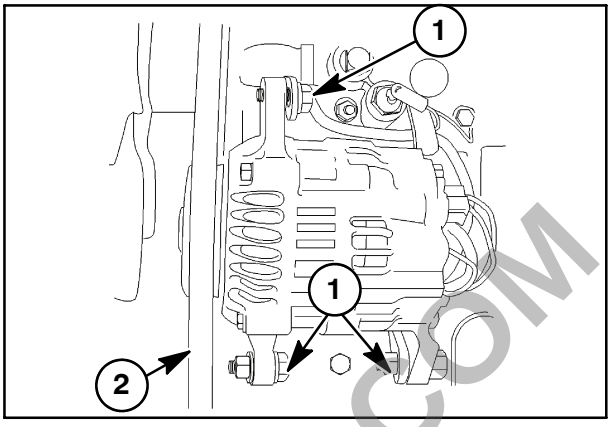
Removal - MC 28 and MC 35

1. Remove the radiator assembly. See “Radiator Removal” discussed previously in this section.
2. Loosen the alternator mounting bolts, 1, and adjusting bracket and remove the drive belt, 2.



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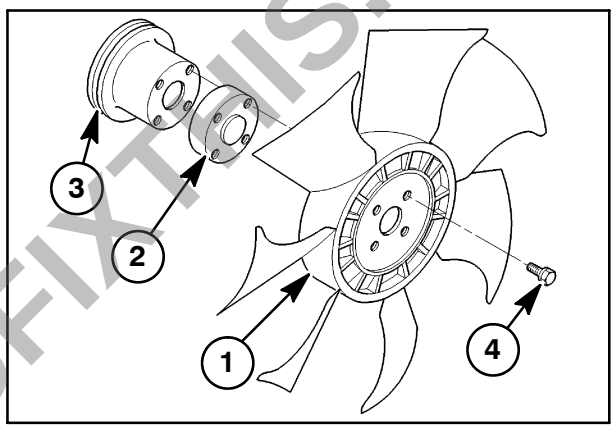
3. Remove the attaching bolts, 4, cooling fan, 1, fan holder, 2, and pulley, 3.



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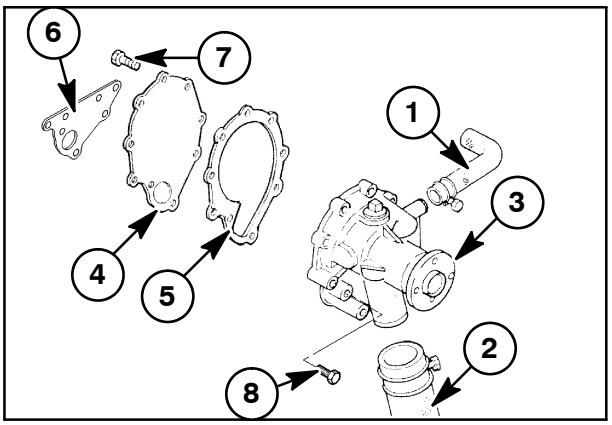
4. Remove the bypass hose, 1, and lower radiator hose, 2, from the water pump, 3.
5. Remove the water pump retaining bolts, 8, and remove the water pump, 3, and gasket, 5, from engine.
6. Remove the water pump mounting plate, 4, and gasket, 6.



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1. Bypass Hose
2. Lower Radiator Hose
3. Water Pump
4. Mounting Plate
5. Gasket
6. Gasket, Mounting Plate
7. Retaining Bolt, Mounting Plate)
8. Water Pump Retaining Bolt

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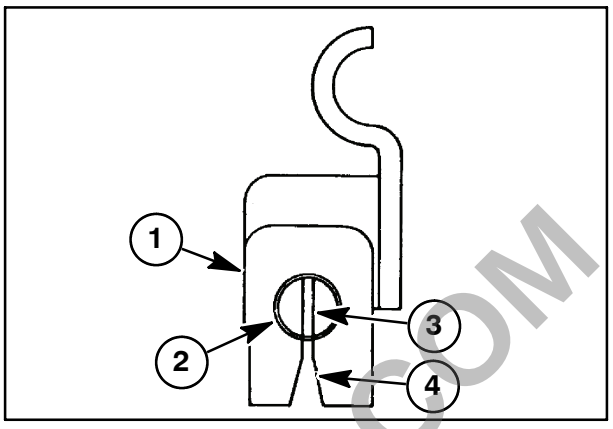
GOVERNOR ADJUSTMENTS

The governor assembly is mounted on the forward end of the engine block. To remove and install the governor assembly, see “Engine Timing Gear Cover, Timing Gears, and Cam Shaft”, discussed earlier in this section.

If the governor linkage has been disassembled, reassemble the linkage in the timing gear cover as discussed earlier in this section.

1. Adjust the governor lever, 1, by aligning the slot, 4, in the lever with the groove, 3, in the governor arm, 2.



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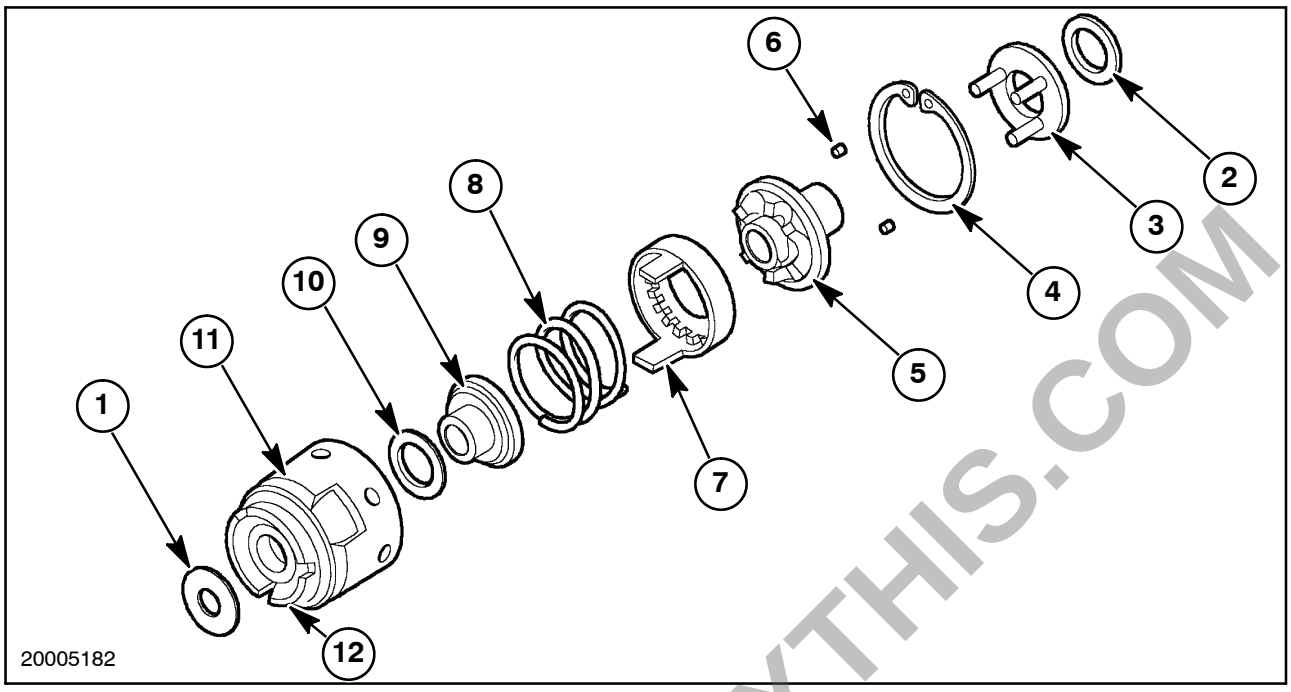

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1. Thrust Washer (Thin)
2. Thrust Washer (Thick)
3. Locking Sheave
4. Snap Ring
5. Drive Cam
6. Keeper Pins
7. Center Cam
8. Compression Spring
9. Driven Cam
10. Thrust Washer
11. Clutch Housing
12. Friction Brake

Disassembly

1. Remove the locking sheave, 3, from the drive cam, 5.
2. Remove the snap ring, 4, that retains the drive cam, 5, in the clutch housing, 11.
3. Remove the two (2) keeper pins, 6, from the clutch housing, 11.
4. Remove the drive cam, 5, from the clutch housing.
5. Remove the center cam, 7, compression spring, 8, and the driven cam, 9, and the thrust washer, 10, from the clutch housing.

NOTE: *The clutch housing has four plastic cams that are held on by a spring and is used as a clutch friction brake, 12. The clutch brake is not serviceable and should not be removed.*

Inspection

1. Clean all parts in a suitable solvent and allow to air dry.
2. Inspect the drive cam, driven cam, and center cam mating areas for damage or excessive wear. Replace parts found to have damage or excessive wear.
3. Inspect the compression spring for distortion. Replace as necessary.
4. Inspect the thrust washers for damage or excessive wear. Replace the thrust washers as necessary.
5. Inspect the clutch housing for damage or excessive wear. Replace the clutch as necessary.
6. Inspect the locking sheave and the engagement fork blocks for pitting or nicks. Replace the components if flaws cannot be removed with fine emery cloth.

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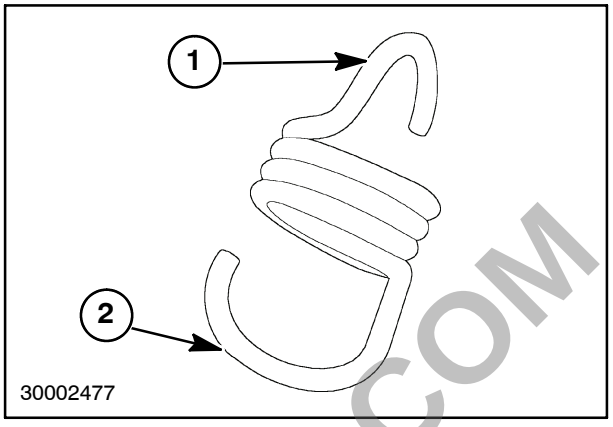
NOTE: *The round end, 1, of the brake spring connects to the spring holder in the axle housing, while the flat end, 2, of the brake spring is connected to the brake actuator plate. This is important for re-assembly.*



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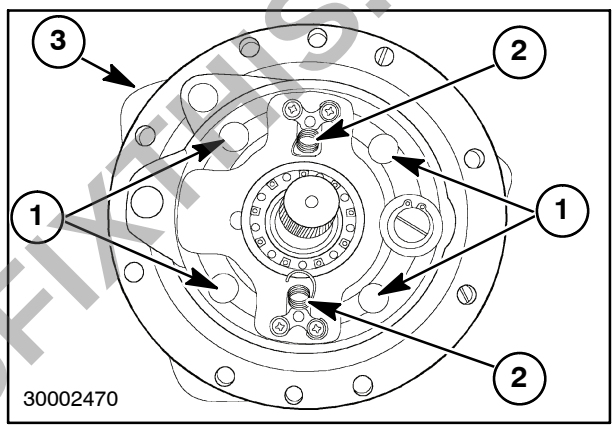
4. Remove the four steel balls, 1, and the two brake springs, 2, from the axle housing, 3.



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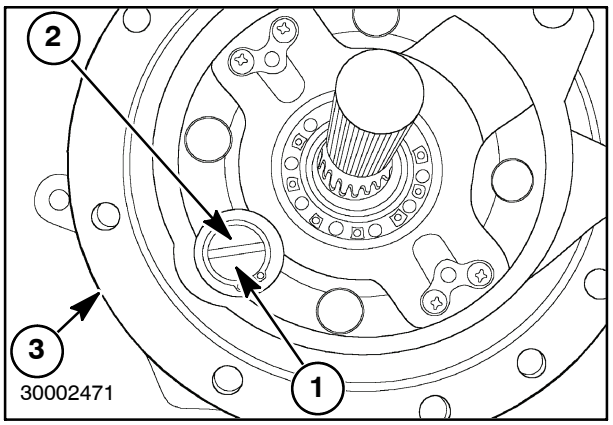
5. Remove the retaining ring, 1, from the brake actuator shaft, 2. Remove the shaft, 2, from the axle housing, 3.



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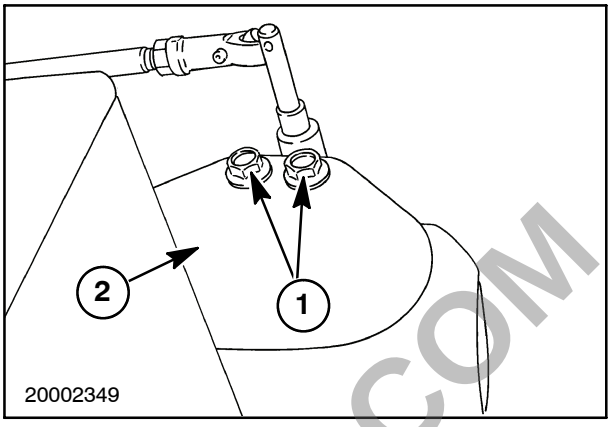
19. If the tractor is equipped with cruise control, remove the two (2) bolts, 1, which secure the magnet locking plate, 2, to the HST linkage.



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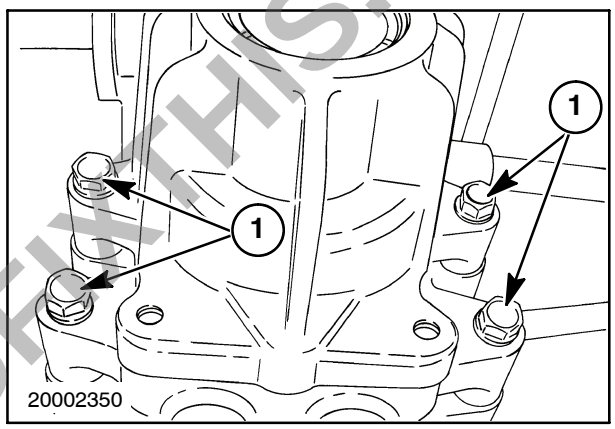
20. Remove the four (4) bolts, 1, which secure the HST unit to the gear box.
21. Carefully remove and lower the HST unit from the tractor.



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OVERHAUL

Op. 31 220

PTO

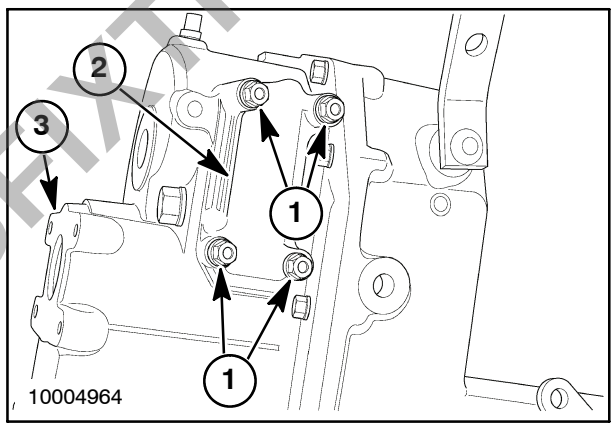
NOTE: *The PTO is not serviceable in the tractor. The PTO is located in the front transaxle housing. The transaxle must be removed from the tractor and disassembled to gain access to the PTO for service.*

Removal

Remove the front axle assembly from the tractor. See Section 27-Differential, Front Axle for the removal procedure.

Disassembly - Rear Transmission

7. Loosen and remove the nuts, 1, that secure the side PTO cover, 2, to the rear transmission housing, 3. Remove the cover.



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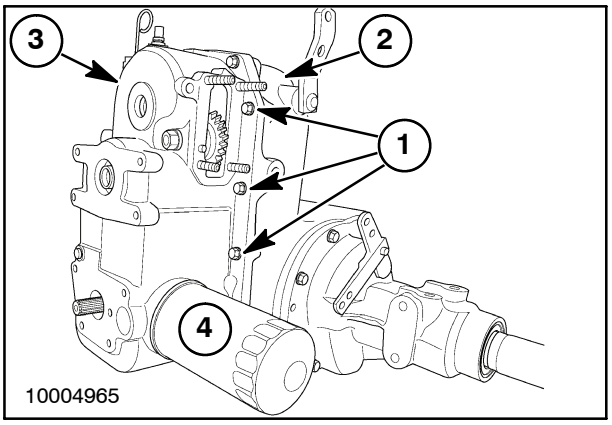
8. Loosen and remove the ten retaining bolts and two retaining nuts, 1, that secure the rear transmission cover, 2, to the front transmission housing, 3.
9. Separate the rear transmission cover, 2, from the front transmission housing, 3.
10. If not previously removed, remove the hydraulic fluid filter, 4, from the rear transmission cover, 2.



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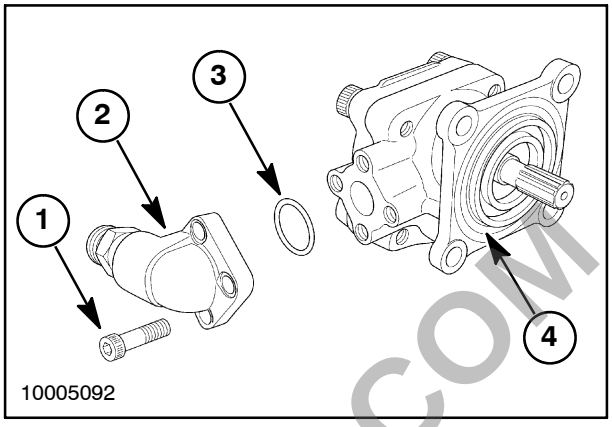
7. Using a new lubricated O ring, 3, in the hydraulic pump output fitting, 2, install the pump output fitting to the pump body, 4. Secure the fitting to the pump body using the three (3) socket head screws, 1.



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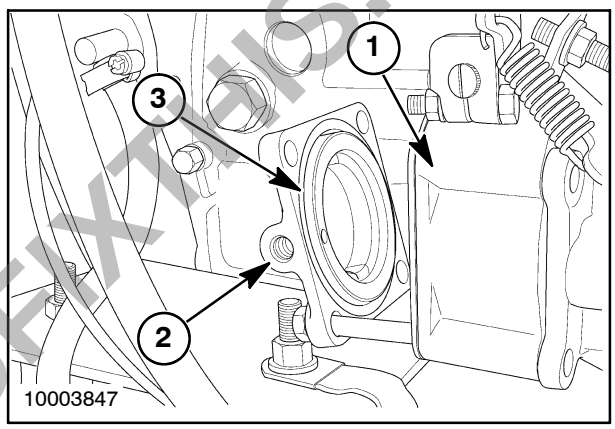
Installation

1. Lubricate and install a new O ring, 3, between the engine block, 1, and the rear hydraulic pump cover, 2.



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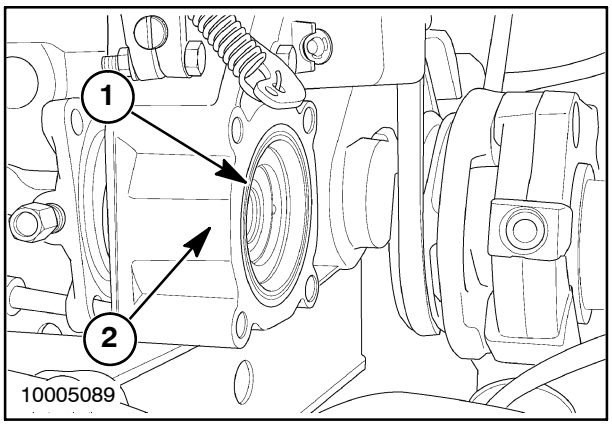
2. Lubricate a new O ring, 1, and place the O ring between the engine block, 2, and the hydraulic pump.



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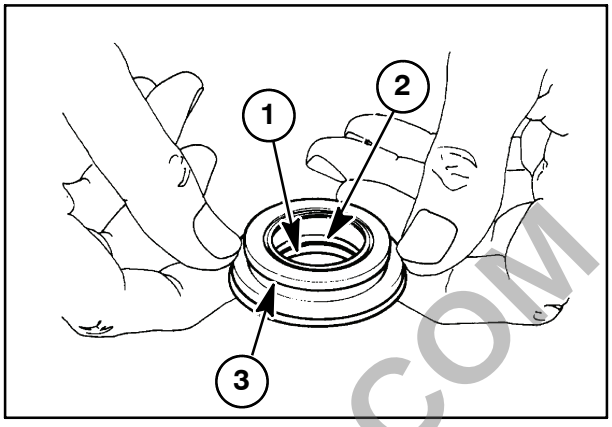
10. Install a new O ring, 3, dust seal, 2, and oil seal, 1, in the gland bushing. Rotate the gland while installing into the steering motor housing to facilitate installation.



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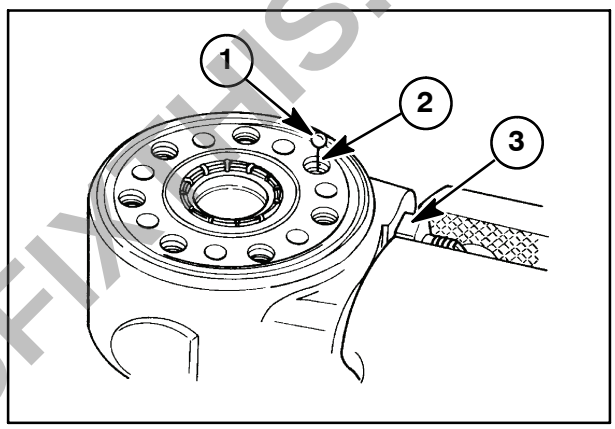
NOTE: *If a fitting is not available to use as a gripping point for the vise, place the steering motor housing in a soft-jaw vise.*

NOTE: *If the hole for the check valve was unmarked, the check valve hole is the deepest threaded hole in the bottom of the steering motor housing.*

11. Place the steering motor in a vise, bottom end facing up, using the fitting, 3, installed as a gripping point. Install the check ball, 1, into the check valve hole, 2.



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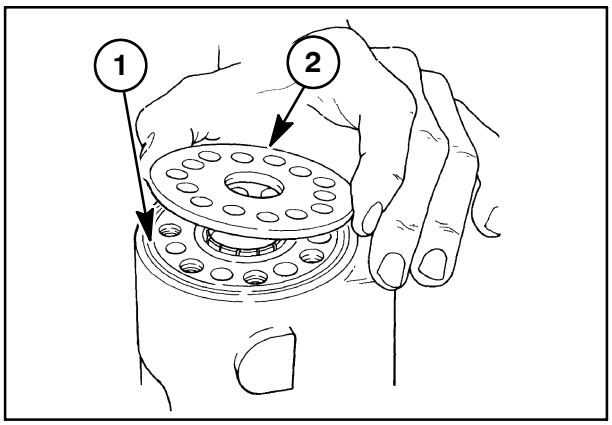
12. Install a new O ring, 1, onto the steering motor housing and position the spacer plate, 2, on top of the housing and O ring so the holes in the plate are aligned with the holes in the steering motor housing.



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ELECTRICAL SYSTEM COMPONENTS - DESCRIPTION AND TESTING

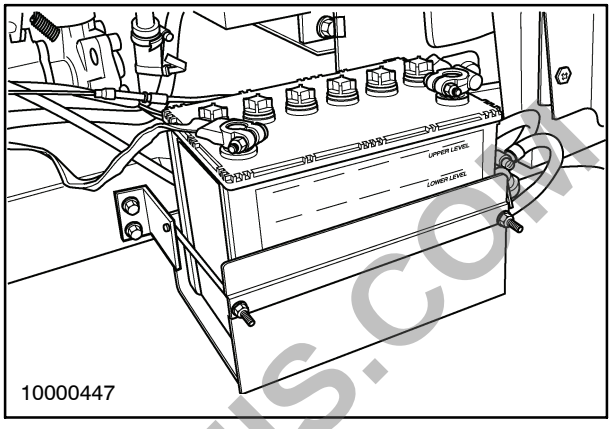
⚠ WARNING ⚠

Before working on any component of the electrical system, the negative (-) battery cable should be disconnected from the battery, as electrical shock or damage to system components may occur. Some testing requires 12-volt power; care should be taken in cases where power is needed.

BATTERY

Description

The MC22, MC28, and MC35 tractors are equipped with a BCI group 35, 12-volt, 54Ah battery with a minimum cold cranking ability of 490 amps at –18°C (0°F). The battery is located under the engine cover on the right side of the tractor frame.



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The battery connections must be tight and free of corrosion. If necessary, wash the battery's outside surface and terminals with a solution of baking soda and water, making sure the cleaning solution does not get inside the battery. After cleaning, wash the battery with clean water, and then apply a small amount of petroleum jelly to the terminals to prevent corrosion.

A good battery charge must be maintained in freezing temperatures. If the battery is allowed to become discharged, or run down, the electrolyte will become weak and possibly freeze. This may result in damage to the battery case. If water must be added, use distilled water, adding the water just before using the tractor. This ensures that the water will mix with the electrolyte during the charging process, preventing the water from freezing.

To determine the battery charge, use a battery electrolyte tester to test the electrolyte in the battery.

Checking the Battery Electrolyte Level

NOTE: *Check the battery electrolyte level after every 50 hours of operation.*

⚠ WARNING ⚠

Always check the battery electrolyte level with the tractor engine stopped, as an explosive gas is produced inside the battery when the alternator is charging the battery. Do not use an exposed flame and do not smoke when checking the battery electrolyte level.

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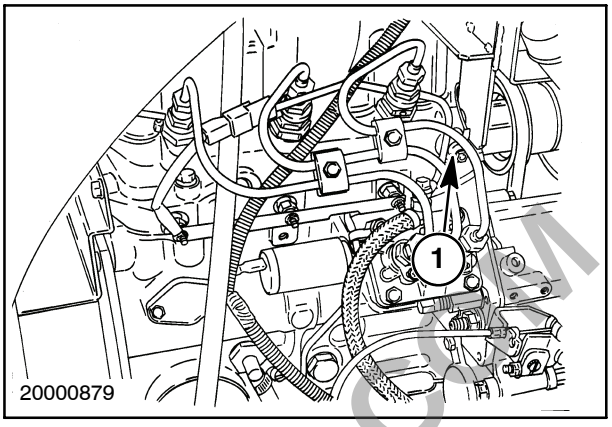
Op. 55 414

ENGINE OIL PRESSURE SWITCH

Description and Location

The engine oil pressure switch, 1, is located in the front of the engine cylinder head. On MC 22 tractors, the oil pressure switch is located on the right side of the cylinder head. On MC 28 and MC 35 tractors, the oil pressure switch is located on top of the cylinder head. The engine oil pressure switch closes (circuit completed) when engine oil pressure is less than 29.4 kPa (4.3 psi). When the switch closes, the oil pressure relay energizes. This illuminates an indicator light on the instrument panel lights and the low oil pressure alarm is activated, alerting the operator of low oil pressure. The engine oil pressure switch is closed before the tractor engine is started, and is opened after the engine is started. If the indicator light and alarm fail to switch off after the tractor is started, the oil level inside the engine may be low or there may be a problem with the oil pump.



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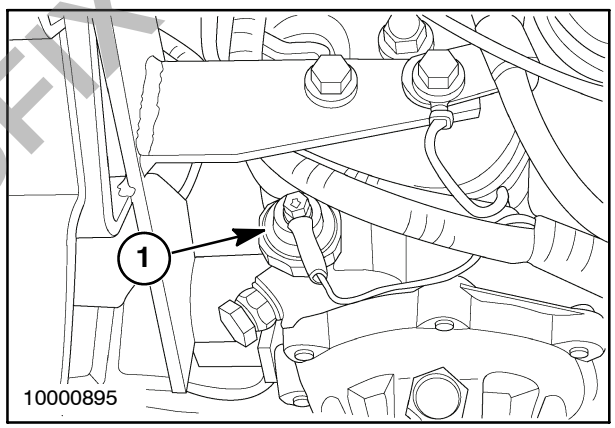

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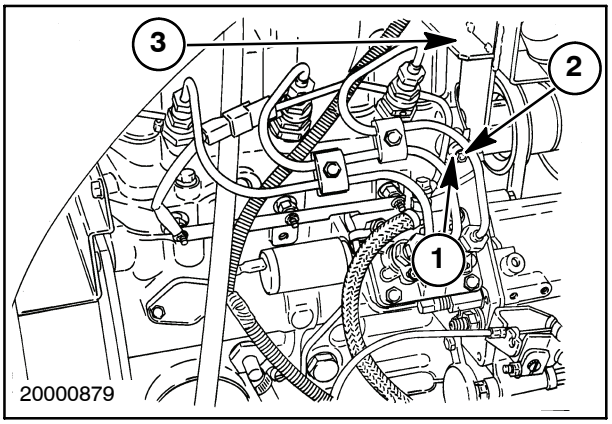
MC 22

Removal

1. Disconnect the negative (–) battery cable from the battery.
2. Unbolt the air filter assembly mounting bracket, 3 from the tractor engine.
3. Remove the retaining screw, 2, that secures the electrical ring terminal to the oil pressure switch, 1.
4. Push the air filter assembly out of the way and remove the oil pressure switch, 1, from the engine cylinder head.



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Engine Glow Plug Circuit
The engine glow plug circuit includes all the circuits and components that heat the engine glow plugs and illuminate the glow plug indicator light when the key switch is turned to the “HEAT” or “START” position.

NOTE: *When the key switch is in the “HEAT” position, electrical current is being supplied from terminal 30 to terminal 19 and terminal ACC of the key switch. When the key switch is in the “START” position, electrical current is being supplied from terminal 30 to terminal 50, terminal 19, and terminal ACC of the key switch.*

NOTE: *When the key switch is in the “HEAT” and “START” position, power is constantly supplied to the engine glow plugs. The glow plug indicator light timer does not control current to the glow plugs, only current to the indicator light located on the instrument panel.*

1. Current flow starts at the positive (+) terminal of the tractor battery. From the battery, current flows to the engine starter motor through the positive (+) battery cable.
2. From the starter motor, current flows through the fusible link wire to the number 30 terminal (common) of the key switch. When the key switch is turned to the “HEAT” position, current flows through terminal 30 and out of the key switch through terminal 19. From terminal 19, current flows to a circuit junction.
   - From the junction current flows to another junction that branches off to the glow plugs and the glow plug indicator light timer. Current flows to terminal “C” of the indicator light timer. The engine glow plugs are grounded through the engine, completing the circuit for the glow plugs. When the key switch is in the “HEAT” position, the glow plugs will heat as electrical current is passing through them.
   - Current flows from the junction to terminal 2 of the instrument panel connector. From the instrument panel connector current flows to the glow plug indicator light on the instrument panel. When the key switch is turned the “HEAT” position, the glow plug indicator light timer is activated. The light ground circuit is then complete from the indicator light, through terminal 6 of the instrument panel connector, and through terminals “D” and “A” of the timer for four (4) seconds. After a four to five second delay, the timer will cut the ground circuit for the glow plug indicator light at terminals “D” and “A”.
3. When the key switch is in the “START” position, the indicator light on the instrument panel will remain illuminated. This is because current is being supplied from terminal 50 (START terminal) of the key switch to terminal “B” of the glow plug indicator light timer, which will bypass the delay the timer uses to cut the ground circuit to the indicator light.

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Alternator Output

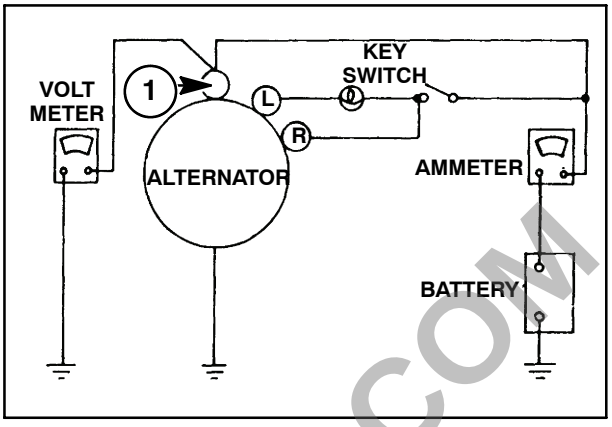
NOTE: *Use the following methods if an alternator/ charging system analyzer is unavailable.*

1. Connect a 50-amp capacity test ammeter between the positive battery cable and the key switch.
2. Connect a voltmeter to the battery terminal, 1, of the alternator and to a ground source.
3. Observe the voltmeter. The meter should indicate battery voltage. If the voltmeter does not read battery voltage, the wiring between the alternator and the battery may be faulty and should be repaired or replaced. If the battery voltage reading is correct, proceed to the next step.

⚠ WARNING ⚠

Do not attempt to start the engine without first shorting the wires between the ammeter leads. Otherwise, injury or damage to charging and testing components may occur.

4. Use a jumper wire to short the test ammeter leads and start the tractor engine.
5. After the tractor engine is started, remove the jumper wire between the test leads of the ammeter.
6. Increase the engine speed to approximately 2000 RPMs and observe the ammeter reading.
7. If the ammeter indicates 5 amps or less, observe the voltmeter reading. The voltmeter is indicating adjusting voltage, which is the amount of increased voltage the alternator supplies to the battery. The reading should indicate a higher voltage than what is indicated when voltage is taken at the battery. If the reading is not higher, the alternator is not generating enough voltage and a component may be malfunctioning.
8. If the ammeter indicates more than 5 amps, continue to charge the battery until the ammeter reading falls below 5 amps. If the reading does not fall below 5 amps, test the battery or replace the battery with one that is fully charged.



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PINION MESHES WITH RING GEAR BUT STARTING MOTOR FAILS TO TURN

FAULT LOCATION	POSSIBLE CAUSE	CORRECTION
Wiring	Line connecting solenoid to battery broken or defective ground	Repair or replace
	Lead wire connecting solenoid to motor tightened improperly	Repair or replace
Starting motor	Ball bearing locked	Replace
	Brush worn	Replace
	Improper installation	Reinstall
	Brush spring defective	Replace
	Commutator dirty	Clean
	Armature of field coil defective	Repair or replace
	Field coil-to-brush connection defective	Replace
Solenoid	Contact not touching properly	Replace
	Contact contacting surface roughened	Replace
Battery	In discharge state	Recharge or replace

MOTOR FAILS TO STOP AFTER ENGINE STARTS AND KEY SWITCH IS TURNED OFF

FAULT LOCATION	POSSIBLE CAUSE	CORRECTION
Key switch	Switch defective	Replace
Solenoid	Solenoid defective	Replace

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MC 35 STARTER MOTOR SPECIFICATIONS

Manufacturer ..... Denso Corporation

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