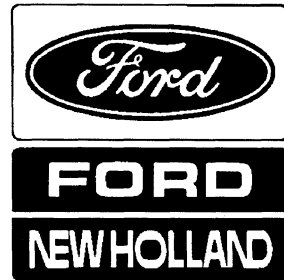


# VERSATILE

## Service Manual

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Bidirectional™ Tractors  
256, 276, 276 II

40025631

Reprinted

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## Safety

This section contains general safety precautions which should be thoroughly studied and practised by all service personnel. See the operator's manual for more detailed safety information.

### GENERAL SAFETY

1. Mount a fire extinguisher near the service area. Maintain it as recommended by the manufacturer.
2. Never operate the tractor in an enclosed building. If it is absolutely necessary to do so, be sure the building is well ventilated and ducting is used to carry exhaust fumes outside.
3. Always keep sleeves, jackets or other loose clothing relatively tight and belted. Loose clothing might catch in moving tractor parts.
4. Never jump from the tractor cab. Always use steps and handholds when mounting and dismounting tractor.
5. Park the tractor on a clear, level area before beginning any maintenance procedure. Shut down the engine and remove key; apply parkbrake; chock the front and back of at least two wheels. Ensure all operating controls are in neutral. Always disengage the PTO clutch and three-point hitch. Engage articulation lock.
6. Always lower implements to the ground when leaving equipment.
7. Always operate tractor controls from the operator's seat.
8. Use articulation lock during tractor servicing. See Section 10, STRUCTURES.

### TRANSPORT SAFETY

1. Use a trailer having a carrying capacity of at least 5 500 kg (12 000 lb) to haul the tractor.
2. Securely chain the tractor to the trailer; block the wheels and engage the parkbrake to prevent tractor movement. Engage articulation lock.

### JACKING SAFETY

1. Select a jack strong enough to carry the load. The minimum required required jack capacity is 4.5 tonnes (5 tons).
2. Stabilize the tractor by putting transmission into gear, engaging the parkbrake and chocking wheels securely. Engage articulation lock.
3. To prevent jackknifing, use two hoists or two rear jacks to lift the rear frame.
4. Put the jack securely under the axle tube, frame or drawbar where it is strong enough to keep the jack from tipping, sinking or shifting. Any additional blocking should be under the jack.
5. Jack up the front and/or rear frame just enough to install steel safety stands under the axle tubes or frame.
6. Check the jack position after it has started to lift. Lower the jack immediately if it starts to lean. Reset the jack; block the tractor more securely and lift again.
7. Keep the tractor stable by not raising it so high that it will slide off the jack.
8. Put support stands under the tractor. Lower the jack and let the tractor rest on the stands. This provides solid support for the tractor when the jack is removed.

### HOIST SAFETY

1. Use a chain hoist and frame to lift the tractor. The minimum hoist capacity required is 4.5 tonnes (5 tons); 4.5 tonnes (5 tons) for the A-frame or overhead support; and 2.7 tonnes (3 tons) for the support stands.
2. Protect yourself from injury as the tractor is being raised by observing the following:
  - a. Do not stand on the tractor when it is being lifted.
  - b. Keep hands away from pinch points where the chain links tighten or the chain is against the tractor frame.
  - c. Do not let the tractor swing and strike personnel or the frame as it leaves the ground.

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- d. Keep support stands nearby and place under the tractor when the necessary height is reached.
  - e. Do not go under a tractor supported by a chain hoist. Put support stands under the tractor before working under it.
  - f. Engage articulation lock.
  - g. A cab support is available where greater access is required.
3. Extreme care must be exercised when hoisting, lowering or moving any component of the transmission.

#### **MAINTENANCE SAFETY**

1. Shut down engine before repairing tractor.
2. Be alert when approaching the tractor while it is running, especially the PTO, articulation joint and three-point hitch.
3. Engage articulation lock during overhaul operations.
4. Never oil, grease or adjust the tractor while it is moving. Never run engine while tractor is being adjusted, cleaned or repaired.
5. Before repairing any hydraulic system component, shut down engine and move all implement controls forward and backward several times to relieve pressure. Disconnect any components connected to the hoses.
6. Wear a face shield or goggles to protect your eyes and heavy gloves to protect your hands when searching for hydraulic leaks or charging the air conditioning system.
7. Escaping hydraulic oil under pressure can penetrate the skin causing severe personal injury. Use a piece of cardboard or wood as a backstop when searching for leaks. If injured by escaping hydraulic oil, get immediate medical attention.
8. Do not smoke and avoid open flames when filling any batteries.
9. Shut down engine and remove key before disconnecting or servicing PTO drivelines.

10. Do not remove radiator cap while the engine is hot. Let engine cool below 74° C (165° F) before removing.
11. Stop engine before making any linkage adjustments.
12. Welding fuel tanks is dangerous and not recommended.
13. Repair adhesive is flammable. Keep adhesive and its vapors from heat, sparks and flame.
14. During adhesive use, and until vapor is gone, avoid using spark producing electrical equipment. Keep container closed when not in use.
15. Use adhesive only in a well ventilated area.

#### **FUEL AND FLUID SAFETY**

1. Do not smoke and avoid open flame when:
  - a. Filling the fuel tanks
  - b. Filling batteries
  - c. Working near a disassembled air conditioning system. Refrigerant vapor and flame combined produce lethal phosgene gas.
2. Add coolant to the radiator only when the engine is OFF. Turn the radiator cap slightly to relieve pressure before completely removing.
3. Do not use an open pail or can for transporting fuel. Use only an approved container manufactured for that purpose.
4. If clothes are splashed with fuel, change immediately. Fuel soaked clothes are an extreme fire hazard.
5. Dispose of all fuel soaked rags. Do not leave them lying around a work area where they may be exposed to flame, spark or cigarette smoking.

#### **LOADER SAFETY**

1. Keep children away from the loader operation area.
2. Keep bucket low when transporting a load.

3. Do not load, raise bucket and articulate tractor simultaneously.
4. Lower the loader arms, stop engine and engage parkbrake before leaving the operator's seat.
5. Never leave loader with bucket raised. When not in use, bucket should rest on the ground. Hydraulic hoses can rupture under pressure causing loader to collapse.
6. Never operate loader with frayed or damaged hoses or leaking fittings.
7. Never stand or work under a raised bucket.
8. Never allow anyone to ride in the loader bucket.
9. Raise and lower loader slowly to prevent tipping.
10. Keep bucket low when backing down ramps and slopes.

# SECTION 2

## ENGINE SYSTEMS

### 1 Introduction

The Versatile 200 Series tractor uses the Cummins four cylinder 4BT 3.9 diesel engine. This section contains service procedures for the engine related subsystems. For service procedures and engine overhaul information not covered in this manual, refer to the Cummins Engine Operators and Service Manuals available from any Cummins Dealer.

The 276 II bidirectional tractor also uses the Ford 444T BSD engine. This section can be used also for the Ford engine 276 II as the installation is similar to the Cummins. For detailed service procedures, use the service manual section for the Ford engines.

### 1.1 ENGINE SPECIFICATIONS

#### 1.1.1 256 Tractor

Type ..... Cummins 4BT 3.9 diesel  
4 cylinder turbocharged

Max Brake Horsepower ..... 75 kW (100 hp)  
at 2 500 r/min

Estimated Max PTO Horsepower ..... 63 kW (85 hp)  
at 2 500 r/min

Peak Torque ..... 352 N.m (260 lbf ft)  
at 1 700 r/min

Torque Rise ..... 26 %

Compression Ratio ..... 17.5:1

Full Load Governed Speed ..... 2 500 r/min

Full Throttle No Load Speed ..... 2725 r/min

Idle Speed ..... 1 000 r/min

Bore ..... 102 mm (4.02 in.)

Stroke ..... 120 mm (4.72 in.)

Displacement.....3.92 L (239.3 in<sup>3</sup>)

Oil Capacity (with filter) ..... 11 L (11.6 qt US)

Oil Pressure-Minimum Allowable  
Idle .....69 kPa (10 psi)  
Rated Speed .....207 kPa (30 psi)

Oil Type .....SF/CD

Oil Grade ..... See Table 2-1

Coolant Capacity (Engine only) ..... 7.0 L (7.6 qt US)

Coolant Type ..... Glycol based antifreeze  
and water mixed at 1:1 ratio

Fuel Capacity ..... 148 L (39 gal US)

Fuel Type ..... No. 2 Diesel

Engine Dry Weight ..... 320 kg (705 lb)  
(less flywheel and electrical)

#### 1.1.2 276 and 276 II Tractor

Type ..... Cummins 4BTA 3.9 diesel  
4 cylinder turbocharged, aftercooled

Max Brake Horsepower ..... 87 kW (116 hp)  
at 2 500 r/min

Estimated Max PTO Horsepower ..... 85 kW (100 hp)  
at 2 500 r/min

Peak Torque ..... 404 N.m (298 lbf ft) at 1 700 r/min

Torque Rise ..... 26 %

Compression Ratio ..... 16.5:1

Full Load Governed Speed ..... 2 500 r/min

Full Throttle No Load Speed ..... 2 650 r/min

Idle Speed ..... 1 000 r/min

Bore ..... 102 mm (4.02 in.)

Stroke ..... 120 mm (4.72 in.)

Displacement.....3.92 L (239.3 in<sup>3</sup>)

Oil Capacity (with filter) ..... 11 L (11.6 qt US)

Oil Pressure-Minimum Allowable  
Idle .....69 kPa (10 psi)  
Rated Speed .....207 kPa (30 psi)

Oil type .....SF/CD

Oil Grade ..... See Table 2-1

Coolant Capacity (engine only) ..... 9.7 L (10 qt US)

Coolant Type ..... Glycol based antifreeze  
and water mixed at 1:1 ratio

Fuel Capacity ..... 148 L (39 gal US)

Fuel Type ..... No. 2 Diesel

Engine Dry Weight ..... 329 kg (725 lb)  
(less flywheel and electrical)

**TABLE 1: Engine Oil Grades**

Oil Grade	Temperature Range
10W30	-25°C to -10°C (-13°F to 14°F)
15W40	-10°C (14°F) and above
20W40	0°C (32°F) and above

**1.1.2.A Engine - Ford**

Model ..... BSD 444T  
 Type ..... Diesel, Turbocharged  
 Maximum Brake Power..... 87 kW (116 hp)  
 Estimated Maximum PTO  
 Power..... 75 kW (100 hp)  
 Estimated Max Drawbar  
 Power ..... 53.6 kW (71.5 hp)  
 Maximum Torque/@  
 REV/min..... 295 lb ft @ 1 400  
 Operating Torque @  
 2500 REV/min ..... 245 lb ft  
 Bore..... 112 mm (4.4 in)  
 Stroke ..... 112 mm (4.4 in)  
 Number of Cylinders ..... 4  
 Displacement..... 4.38 L (268 in<sup>3</sup>)  
 Compression Ratio ..... 16.5:1  
 Full Load Governed Speed ..... 2 500 REV/min  
 Full Throttle No Load Speed ..... 2 725 REV/min  
 Idle Speed..... 1 000 REV/min  
 Estimated Fuel Consumption  
 @ Rated Speed & Power  
 ..... 225 G/kW.hr (.37 lb/BHP-HR)  
 Oil: - Capacity .....  
 - Type ..... 10W-30 SF/CD,

Engine Oil Pressure:

Idle ..... 69 kPa (10 psi)  
 Rated Speed ..... 207 kPa (30 psi)  
 Filter Type ..... Full flow, spin on,  
 dual paper element  
 Oil Pan Gradability ..... 30°  
 Flywheel Housing ..... SAE #3  
 Piston Speed @ Rated REV/min..... 560 m/min  
 (1 837 ft/min)  
 Mounting ..... Isolated on 3 rubber mounts

**1.1.3 Torque Values**

Front Engine Mounts ..... 68 N.m (50 lbf ft)  
 Rear Engine Mounts ..... 270 N.m (200 lbf ft)  
 Driveline Capscrews ..... 35 N.m (26 lbf ft)  
 Battery Terminal Nuts ..... 10 N.m (7 lbf ft)  
 Air Cleaner Wing Nuts ..... 3.3 N.m (29 lbf in.)  
 Capscrews ..... See Table 2-2

**TABLE 2-2: General Recommended Capscrew Torques**

CAPSCREW SIZE	CLASS 9.8 (METRIC)*ARE CLASS 8.8		CLASS 10.9 (METRIC)	
	PLAIN	PLATED	PLAIN	PLATED
M6 × 1.0	10 N·m (7 lbf ft)	10 N·m (7 lbf ft)	15 N·m (10 lbf ft)	10 N·m (7 lbf ft)
M8 × 1.25	30 N·m (20 lbf ft)	20 N·m (15 lbf ft)	35 N·m (25 lbf ft)	25 N·m (18 lbf ft)
M10 × 1.5	55 N·m (40 lbf ft)	40 N·m (30 lbf ft)	70 N·m (50 lbf ft)	55 N·m (40 lbf ft)
M12 × 1.75	100 N·m (75 lbf ft)	75 N·m (55 lbf ft)	125 N·m (95 lbf ft)	95 N·m (70 lbf ft)
M14 × 2.0	155 N·m (115 lbf ft)	120 N·m (90 lbf ft)	200 N·m (150 lbf ft)	150 N·m (105 lbf ft)
M16 × 2.0	*255 N·m (170 lbf ft)	*170 N·m (120 lbf ft)	315 N·m (235 lbf ft)	235 N·m (175 lbf ft)
M20 × 2.5	*440 N·m (330 lbf ft)	*330 N·m (220 lbf ft)	610 N·m (450 lbf ft)	460 N·m (340 lbf ft)
M24 × 3.0	*765 N·m (570 lbf ft)	510 N·m (420 lbf ft)	1055 N·m (780 lbf ft)	790 N·m (580 lbf ft)

CAPSCREW SIZE	GRADE 5 (IMPERIAL)		GRADE 8 (IMPERIAL)	
	PLAIN	PLATED	PLAIN	PLATED
3/8-16	40 N·m (30 lbf ft)	35 N·m (25 lbf ft)	65 N·m (45 lbf ft)	50 N·m (35 lbf ft)
3/8-24	50 N·m (35 lbf ft)	35 N·m (25 lbf ft)	70 N·m (50 lbf ft)	50 N·m (35 lbf ft)
7/16-14	70 N·m (50 lbf ft)	50 N·m (35 lbf ft)	95 N·m (70 lbf ft)	72 N·m (55 lbf ft)
7/16-20	75 N·m (55 lbf ft)	55 N·m (40 lbf ft)	105 N·m (80 lbf ft)	80 N·m (60 lbf ft)
1/2-13	100 N·m (75 lbf ft)	75 N·m (55 lbf ft)	140 N·m (105 lbf ft)	105 N·m (80 lbf ft)
1/2-20	115 N·m (85 lbf ft)	90 N·m (65 lbf ft)	165 N·m (200 lbf ft)	120 N·m (90 lbf ft)
9/16-12	7115 N·m (110 lbf ft)	105 N·m (80 lbf ft)	210 N·m (155 lbf ft)	155 N·m (115 lbf ft)
9/16-18	165 N·m (120 lbf ft)	120 N·m (90 lbf ft)	230 N·m (170 lbf ft)	175 N·m (130 lbf ft)
5/8-11	205 N·m (150 lbf ft)	155 N·m (115 lbf ft)	285 N·m (210 lbf ft)	215 N·m (160 lbf ft)
5/8-18	230 N·m (170 lbf ft)	175 N·m (130 lbf ft)	325 N·m (240 lbf ft)	240 N·m (180 lbf ft)
3/4-10	360 N·m (265 lbf ft)	270 N·m (200 lbf ft)	510 N·m (375 lbf ft)	380 N·m (280 lbf ft)
3/4-16	400 N·m (295 lbf ft)	300 N·m (225 lbf ft)	510 N·m (420 lbf ft)	430 N·m (315 lbf ft)
7/8-9	580 N·m (430 lbf ft)	440 N·m (320 lbf ft)	820 N·m (605 lbf ft)	615 N·m (455 lbf ft)
7/8-14	640 N·m (475 lbf ft)	480 N·m (355 lbf ft)	905 N·m (670 lbf ft)	680 N·m (500 lbf ft)
1-8	875 N·m (645 lbf ft)	655 N·m (485 lbf ft)	1230 N·m (910 lbf ft)	925 N·m (680 lbf ft)
1-14	975 N·m (720 lbf ft)	735 N·m (540 lbf ft)	1380 N·m (1020 lbf ft)	1040 N·m (765 lbf ft)

### 1.3.2 Engine Removal

Cummins engine shown - Ford engine similar.

1. Drain cooling system through draincock on bottom left hand corner of the radiator (Figure 2-1).

#### CAUTION



**DO NOT DRAIN THE COOLING SYSTEM WHEN HOT**

#### CAUTION

**SET PARKBRAKE, CHOCK WHEELS AND ENGAGE ARTICULATION LOCK BEFORE SERVICING TRACTOR.**

**DISCONNECT BATTERY CABLES FIRST, TO PREVENT POSSIBLE DAMAGE TO ELECTRICAL SYSTEM.**

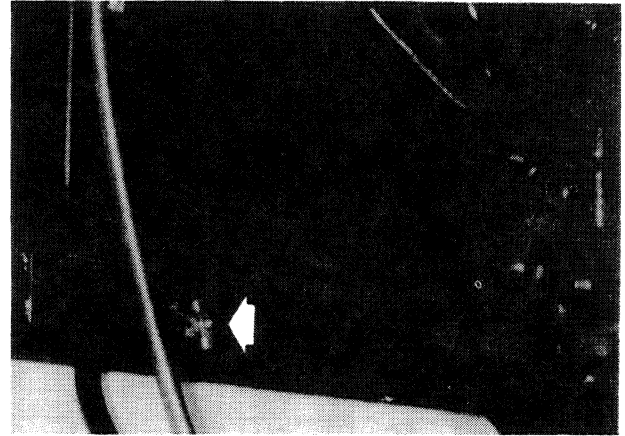


2. Disconnect harnesses from electrical accessories (Figure 2-2).

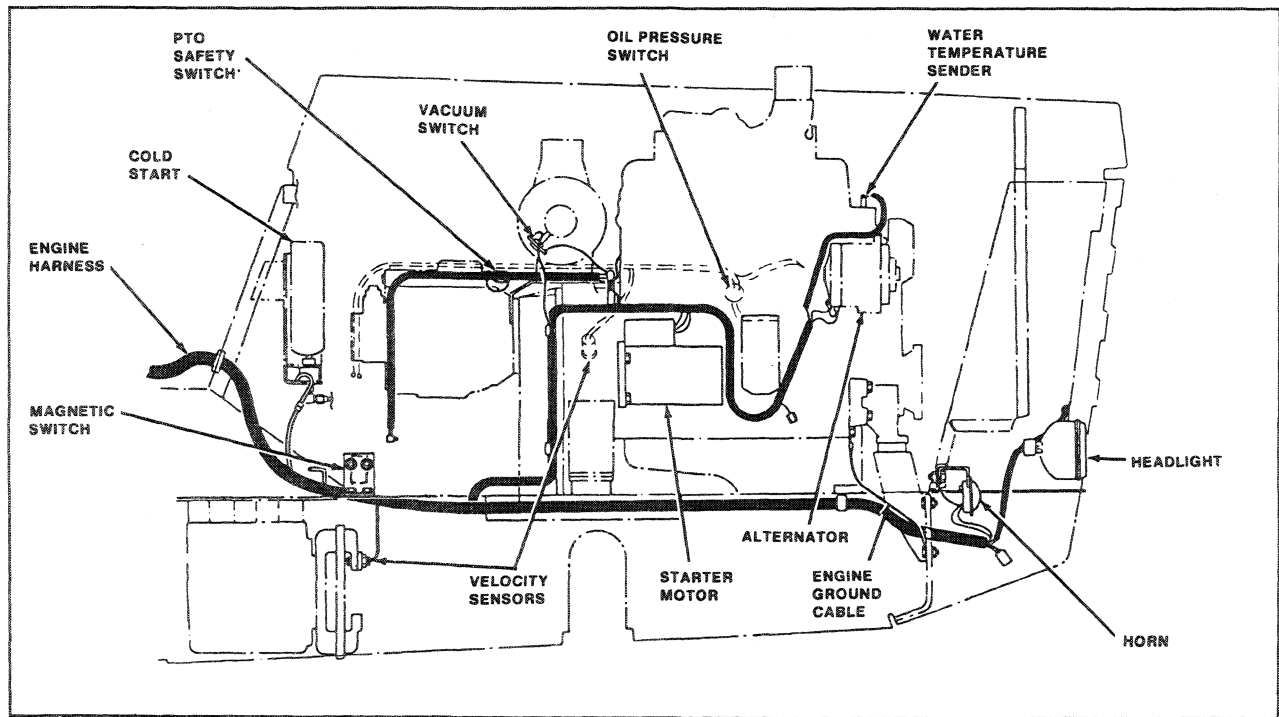
#### NOTE

*Label all wires as they are disconnected.*

3. Disconnect the following harnesses:
  - a. Alternator harness.
  - b. Harness and battery cables from cranking motor.
  - c. Temperature probe harness.



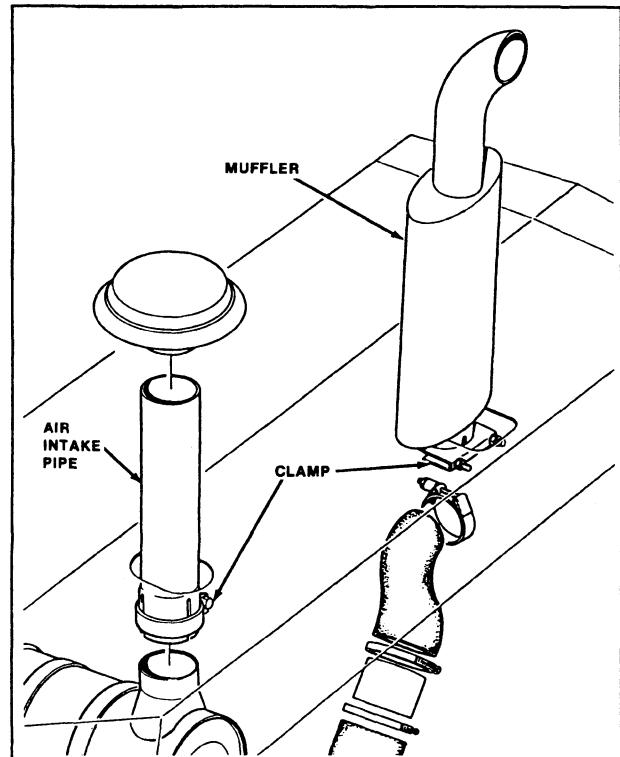
**FIGURE 2-1: Radiator Drain**



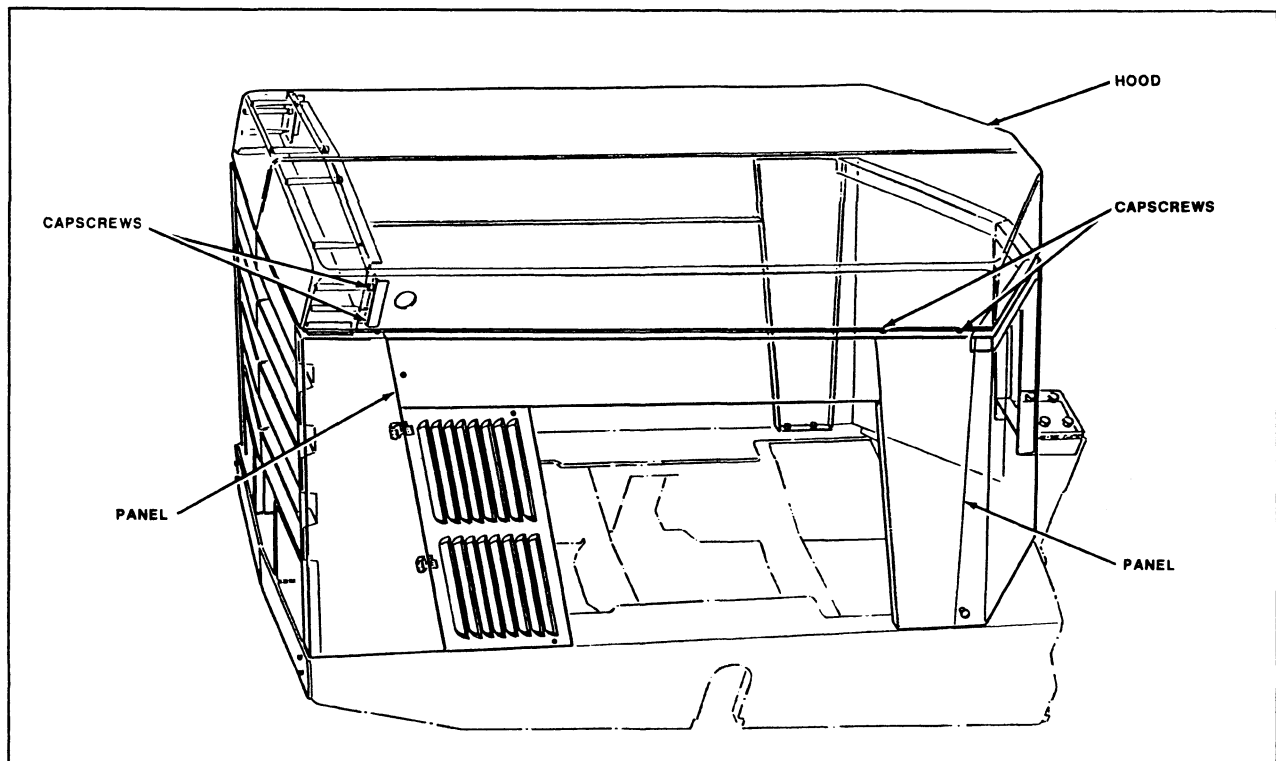
**FIGURE 2-2: Engine Electrical Harnesses Removal**

- d. A/C compressor harness.
- e. Oil pressure sensor harness.
- f. Ground cable from the engine block.
- g. Speed sensor harness.

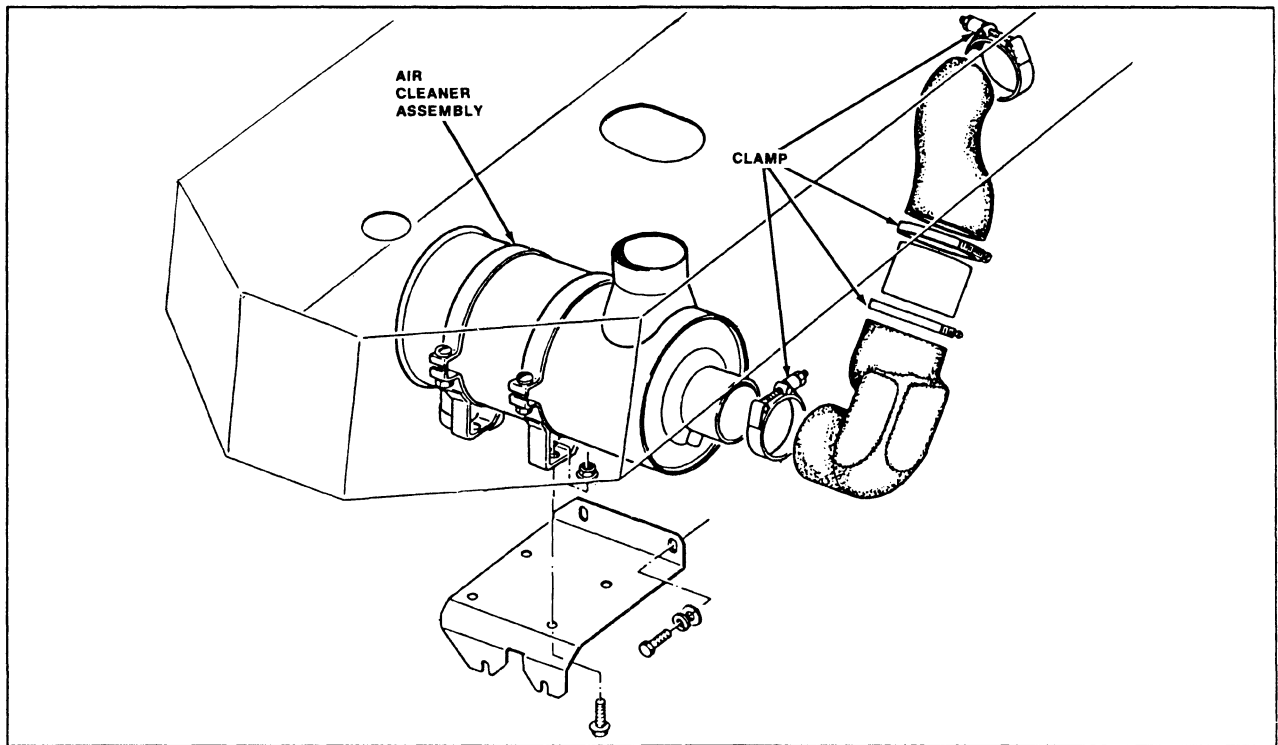
4. Remove muffler and air intake cap on air cleaner (Figure 2-3).
5. Remove fan guards, side panels and hood (Figure 2-4).
6. Remove clamp on pipe to air cleaner from turbocharger, and remove air cleaner assembly (Figure 2-5).
7. Cap air cleaner and turbocharger openings.
8. Disconnect cold start atomizer line at air intake manifold and cap atomizer.
9. Remove capscrews and fan (Figure 2-6).
10. Loosen clamps securing upper and lower radiator hoses and heater pressure and return hoses. Disconnect hoses from engine and label (Figure 2-7).



**FIGURE 2-3: Muffler and Air Intake Cap Removal**



**FIGURE 2-4: Engine Panels and Hood Removal**



**FIGURE 2-5: Air Cleaner Assembly Removal**

**CAUTION**



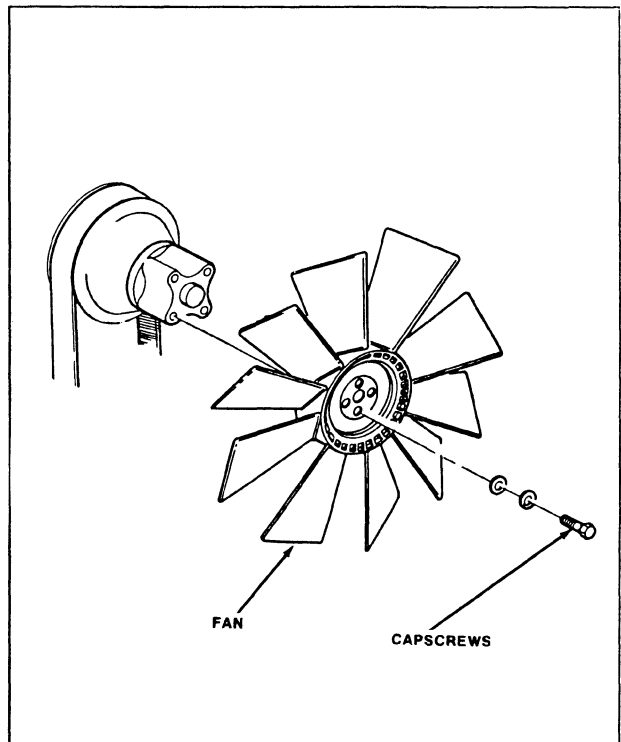
**DO NOT PUT HANDS OR OBJECTS ON THE SHARP RADIATOR FINS.**

11. Disconnect throttle cable from fuel pump and fuel intake and return hoses from engine. Cap hoses and ports (Figure 2-8).

**WARNING**



**CLEAN UP FUEL SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE.**



**FIGURE 2-6: Fan Removal**

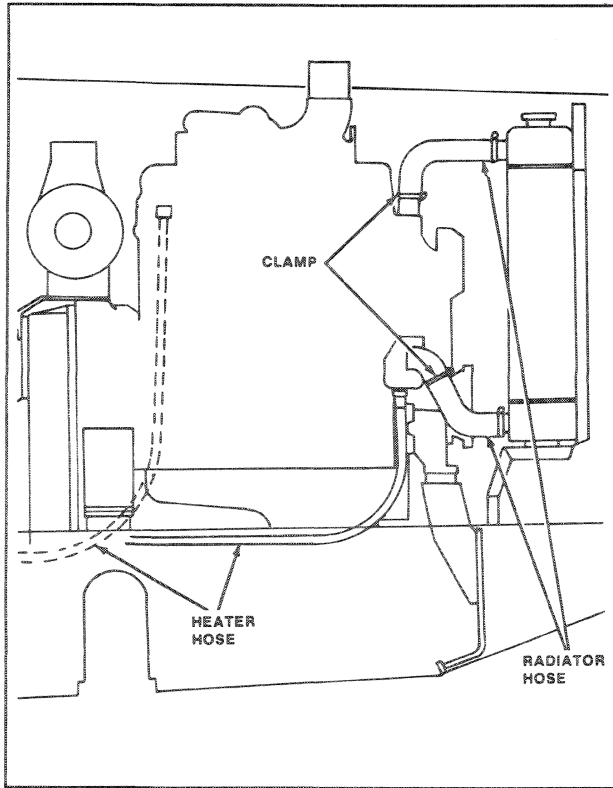


FIGURE 2-7: Radiator and Heater Hoses

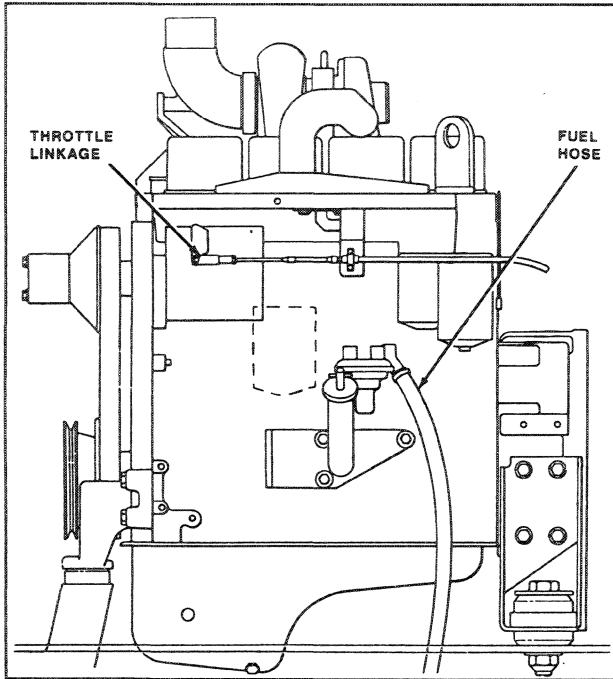


FIGURE 2-8: Fuel Hoses and Throttle Cable

**WARNING**



CLEAN UP FUEL SPILLS IMMEDIATELY. DIESEL FUEL IS FLAMMABLE

12. Loosen A/C compressor capscrews and remove drive belt. Remove compressor from mounting bracket with hoses still attached (Figure 2-9).

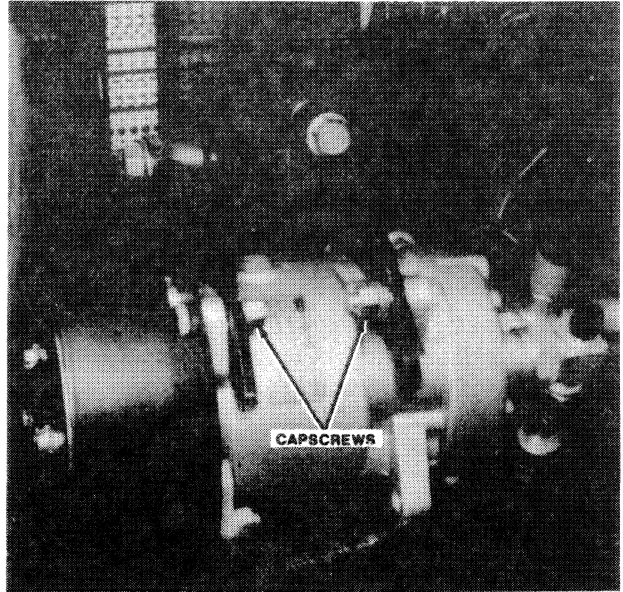


FIGURE 2-9: A/C Compressor Removal

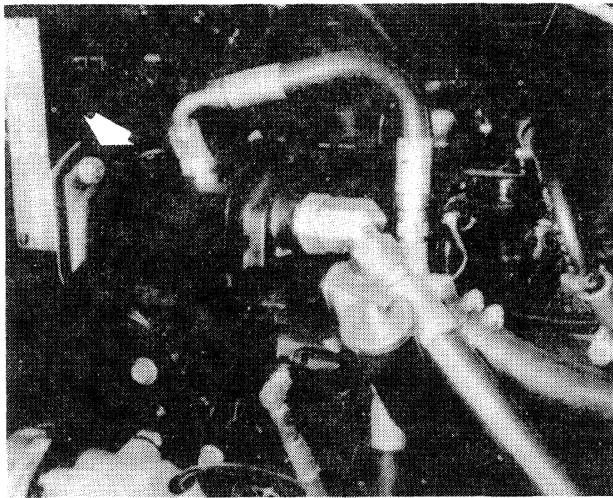
**WARNING**



DO NOT DISCONNECT AIR CONDITIONING HOSES. SYSTEM REMAINS PRESSURIZED EVEN WHEN TRACTOR IS NOT RUNNING.

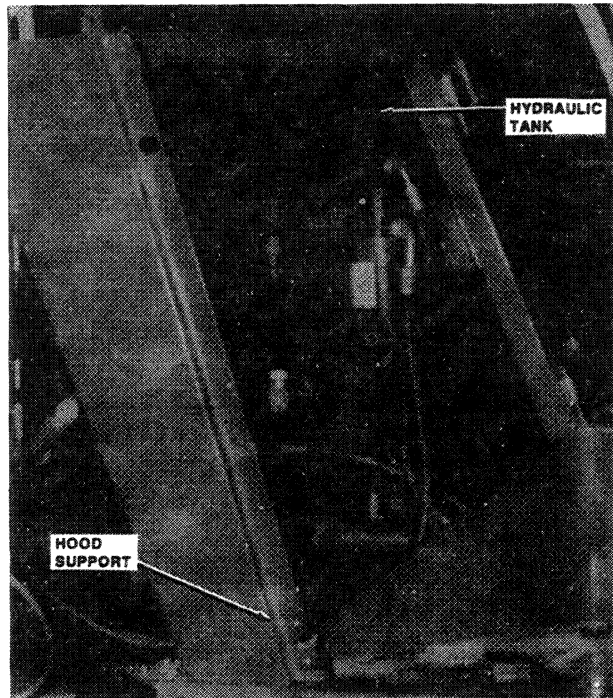
REFER TO SECTION 9: ENVIRONMENTAL FOR SYSTEM SERVICING PROCEDURES.

- Remove mounting capscrews securing hydraulic pump to the engine. Pull pump back disengaging pump drive gear teeth from engine gear. Remove hose clamp securing pump suction hose from the engine, and swing pump with the hoses to the side (Figure 2-10).



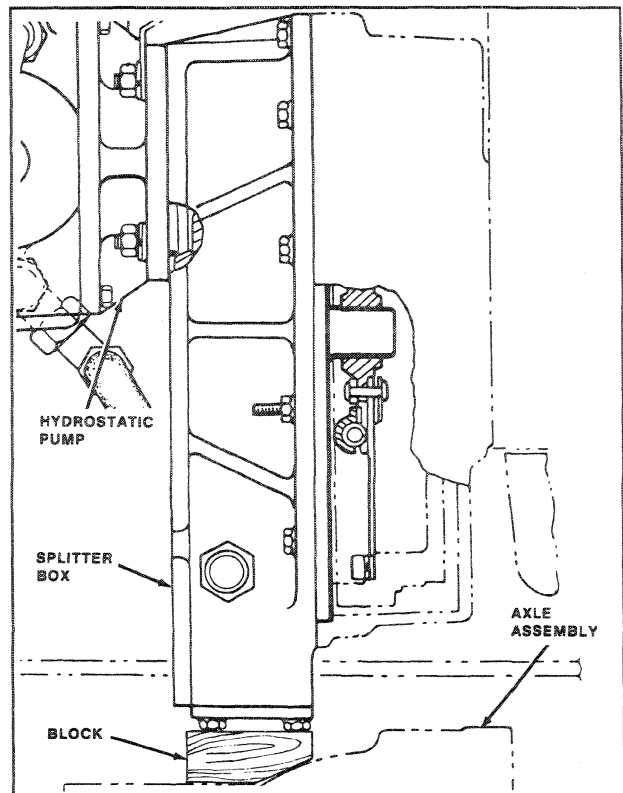
**FIGURE 2-10: Hydraulic Pump Removal**

- Remove hardware securing rear hood support and hydraulic tank. Tip hood support and tank towards cab (Figure 2-11).



**FIGURE 2-11: Hydraulic Tank and Hood Support Removal**

- Attach lifting fixture to the splitter box assembly. Support splitter box assembly underneath with blocks so splitter box weight will rest on the axle frame when mounting capscrews are removed from the engine flywheel housing (Figure 2-12).



**FIGURE 2-12: Supporting the Splitter Box**

- Disconnect PTO driveshafts from splitter box (Figure 2-13).

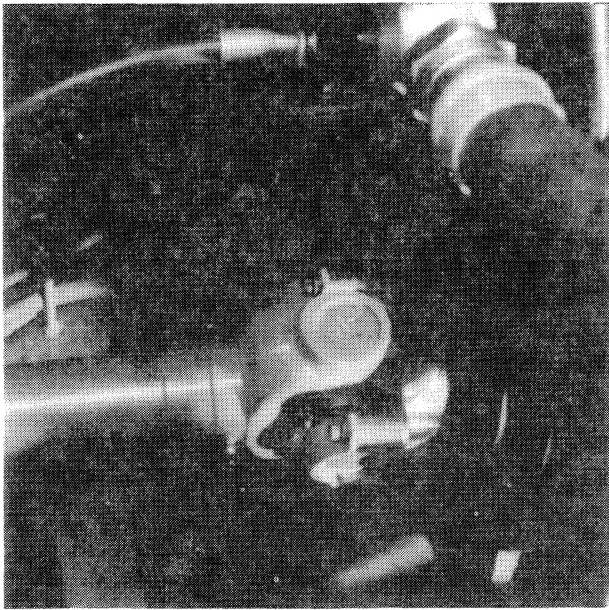
**NOTE**

*Mark driveshaft splines for proper phasing.*

- Remove capscrews securing the splitter box to the flywheel housing, ensuring that splitter box weight is supported (Figure 2-14).

**NOTE:**

*The hydraulic implement pump remains on the splitter box on the 276 II tractor with Ford engine.*



**FIGURE 2-13: PTO Driveshaft Removal**

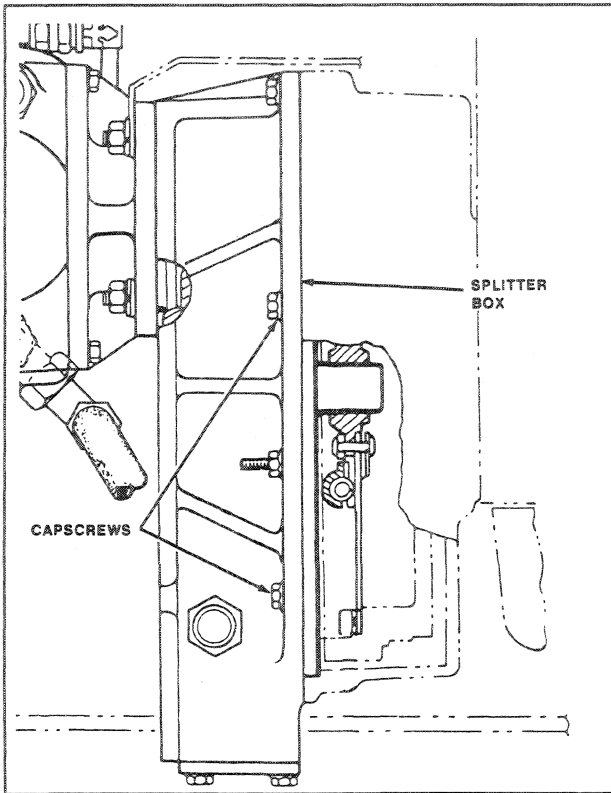
18. Raise splitter box until weight is taken off the flywheel housing and slide splitter box back to free it from the flywheel housing and the torsional damper splines. Lower splitter box onto the axle frame. Ensure that it is properly blocked and supported (Figure 2-14).

**CAUTION**

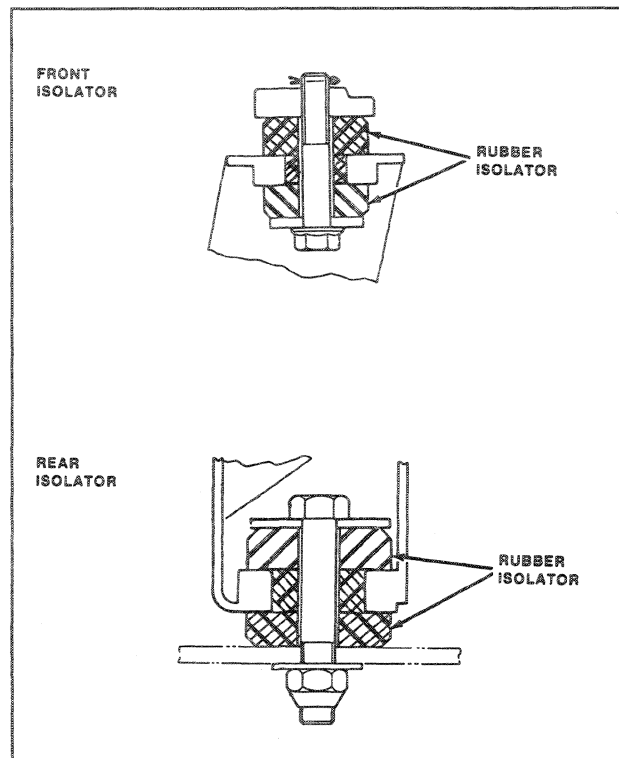
**THE SPLITTER BOX IS HEAVY. ENSURE THAT THE SPLITTER BOX IS PROPERLY SUPPORTED AND BALANCED BEFORE DISCONNECTING IT FROM THE ENGINE.**



19. Attach the lifting fixture to the engine lift points.
20. Remove rear engine mount capscrews and upper isolator hardware. Remove front engine mount capscrew, cotter key and lower isolator hardware (Figure 2-15).



**FIGURE 2-14: Splitter Box Mounting**



**FIGURE 2-15: Engine Isolators**

## NOTE

*The engine should now be ready to lift out of the frame. Ensure that all attaching components are free of the engine.*

21. Slowly raise engine out of the tractor and mount on the engine stand. Refer to the Cummins Shop Repair Manual for proper mounting procedures.
22. Remove isolator pads from tractor frame (Figure 2-15).

## NOTE

*Discard rubber isolators, lock washers and tie straps. These items must be replaced during assembly.*

### 1.3.3 Engine Installation

## NOTE

*Refer to Table 2-2 for mounting hardware torque specifications.  
Installation is the reverse of removal.*

1. Set lower isolator pads over rear frame mounting holes and upper isolator pad over front frame mounting hole (Figure 2-15). The lower isolator pad has the projection on it.
2. Position engine over tractor frame and lower into frame. Maintain sufficient clearance from radiator and splitter box while lowering the engine and ensure engine mounts, isolator pads and tractor holes are properly aligned.
3. Install upper isolator pad, flatwasher, and cap-screw to the rear engine mounts (from the top). Install flatwasher and locknut from the bottom and torque locknut to 270 N.m (200 lbf ft).

## CAUTION

**DO NOT PUT FINGERS BETWEEN FRAME AND ENGINE MOUNTS. USE A TOOL TO POSITION THE ISOLATOR PADS.**



4. Install lower isolator pad, flatwasher, and cap-screw to the front engine mount (from the bottom). Torque the locknut to 95 N.m (70 lbf ft). Install cotter key.
5. Remove the lifting fixture and hooks from the engine.
6. Attach the lifting fixture to the splitter box assembly, and lift the splitter box off the axle frame. Slide the splitter box forward, engaging splines on the torsional damper. Install cap-screws and lockwashers and tighten securely (Figure 2-14).
7. Connect PTO driveshaft. Ensure it is correctly phased (Figure 2-13). Torque journal strap cap-screws to 35 N.m (26 lbf ft).
8. Install hydraulic pump to the engine. Ensure that the teeth on the pump gear align with the engine gear teeth (Figure 2-10).
9. Reposition rear hood support and hydraulic tank (Figure 2-11).
10. Install A/C compressor and drive belt (Figure 2-9). Tighten belt so deflection is 10 to 12 mm (3/8 to 1/2 in.).
11. Connect fuel intake and return lines and throttle cable. Do not overtighten hose clamps (Figure 2-8).
12. Connect heater pressure and return hoses and upper and lower radiator hoses. Do not overtighten hose clamps (Figure 2-7).
13. Install fan (Figure 2-4). Torque capscrews to 24 N.m (18 lbf ft).
14. Install cold start atomizer line.



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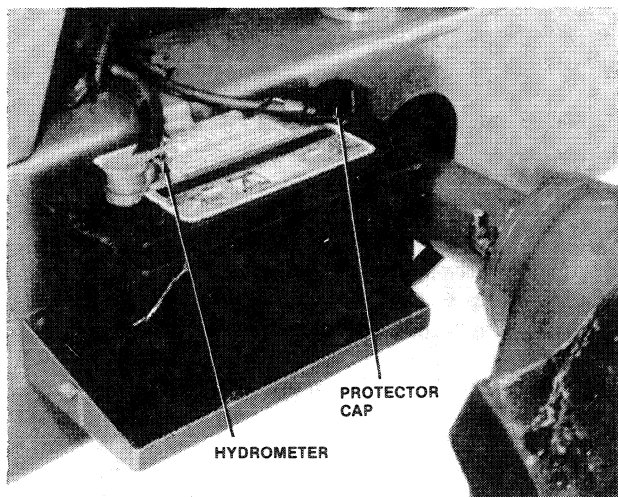
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15. Install air cleaner body and air intake pipe to the turbocharger. Tighten clamp securely and ensure the connection is sealed (Figure 2-5).
16. Install hood, fan guards and side panels (Figure 2-4).
17. Install air intake cap and the muffler, taking care to remove previously installed caps (Figure 2-3).
18. Connect electrical harness to electrical accessories (Figure 2-2).

**NOTE**

*Refer to Electrical Schematic for wiring connections.*

19. Connect the following harnesses:
  - a. Alternator harness.
  - b. Harness to battery cables from the cranking motor.
  - c. Temperature probe harness.
  - d. A/C compressor harness.
  - e. Oil pressure sensor harness.
  - f. Speed sensor harness.
20. Fill cooling system with water and glycol based antifreeze mixed at 1:1 ratio (Figure 2-1). Always add 1.3 L (44 oz) of FW-15 Ford coolant additive to the cooling system when replacing the coolant in the tractor. Each 300 hours of operation, add 180 ml (6 oz) of coolant additive. FW-15 is Ford part ENS M99B 169-A.
21. Fill engine crankcase with SF/CD oil (See Table 2-1).
22. Connect battery cables to the batteries (Figure 2-16). Torque to 10 N·m (7 lbf ft).



**FIGURE 2-16: Connecting Battery Cables**

23. Adjust throttle linkage (Para 2.2.2).
24. Adjust PTO linkage (See Section 3, PTO DRIVE TRAIN).
25. Adjust hydrostatic pump linkage (See Section 5, HYDROSTATICS).
26. Prime fuel system (Para 2.2.5).
27. Disconnect wire to fuel solenoid and crank engine until indicator lamp on the dash goes out, to establish oil pressure in the engine.

**CAUTION**

**DO NOT CRANK ENGINE LONGER THAN 30 SEC. DAMAGE TO CRANKING MOTOR MAY RESULT.**



28. Reconnect fuel solenoid and start tractor.
29. Run engine at idle for 15 min. Shut engine down and check for leaks.
30. Check all fluid levels and top up as required.

**1.4 ENGINE MOUNT REPLACEMENT**

**1.4.1 Special Tools and Equipment**

1. Hoist, 900 kg (1 ton) capacity
2. Engine lifting fixture

**CAUTION**

**DO NOT PUT FINGERS BETWEEN FRAME AND ENGINE MOUNT. USE A TOOL TO POSITION ISOLATOR PADS.**



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