VERSATILE

FORD
NEW HOLLAND

Service Manual

Bidirectional™ Tractors
256, 276, 276 II

40025631

Reprinted

CONTENTS

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.

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 1
SPECIFICATIONS AND DATA

1 Introduction

This section contains general information about specifications, capacities, fuel, fluids and lubricants for the tractor.

2 Hoists and Jacks

Refer to the Safety section at the beginning of this book.

3 Specifications

3.1 ACCESSORIES

Cold Start Kit ..... Manual control, ether type

Engine Block Heater ..... 750 W, immersion type

Engine End Frame Weights ..... Cast iron, suitcase style at 34 kg (75 lb) each (six max) Total weight including bracket is 227 kg (500 lb)

Hydraulic Tank Heater ..... 300 W, immersion type

Radio ..... AM/FM stereo cassette, headliner mounted with two 100 x 152 mm (4 x 6 in.) coaxial speakers and extendable roof mounted antenna

3.2 AIR CLEANER

Type ..... Dual element with dump valve

3.3 AXLES

Differential Type ..... Heavy Duty Hypoid

Differential Ratios
- Below Serial No. 332100 .....3.73:1
- Serial No. 332100-No. 432099 .....4.10:1
- Serial No. D432100 and Up 4.56:1

Oil Capacity (each) ..... 2.3 L (2.4 qt US)

Dropbox ..... Spur gear

Dropbox Ratio 3.18:1

Oil Capacity (per box) ..... 1.7 L (1.8 qt US)

3.4 BRAKES

Type ..... Hydraulic, self adjusting, disc and caliper, driveline mounted

Caliper ..... Single piston, floating hydraulically actuated by pedal

Controls ..... Two foot pedals

Parkbrake ..... Mechanically actuated by overcenter lever

3.5 CAB

3.5.1 Closed Cab (Optional)

Glass.....Tinted safety, 5.2 m^2 (56 ft^2)

Doors ..... Two

Emergency Exit ..... Drawbar end window (engine end on '84 models)

Wipers ..... Two wipers, two speed pantograph type

3.5.2 Open Cab

Type ..... 6 post module enclosed rollover protective structure (ROPS S383)

Seats ..... Black vinyl adjustable seat

3.5.3 General Features

Type ..... 6 post module enclosed rollover protective structure (ROPS S383)

Isolation ..... Full isolation on four rubber mounts, provision for tilt of 17° max.

Seat and Console.....Rotates 180°

Seat Belt ..... Adjustable lap type, SAE J141, J385

Safety Systems ..... Seat lock safety start, neutral safety switch

Fuses ..... Three 15A fuses protecting ignition circuit, 3-pt hitch and compressor options

3.6 CAPACITIES

Axles, Differentials (each) ..... 2.3 L (2.4 qt US)

Cooling System
- 256 .....22 L (23.2 qt US)
- 276 .....25 L (26.4 qt US)
- 276 II with Ford Engine .....24L (25.4 qt US)

Dropbox, Axle .....1.5 L (1.6 qt US)

Engine Oil
- Ford ..... 14 L (15.0 qt US)
- Cummins ..... 11 L (11.6 qt US)

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

Hydraulic/Hydrostatic Reservoir 32 L (34 qt US)

PTO Dropbox (single speed) ..... 2 L (2 qt US)

PTO Dropbox (dual speed) ..... 1.8 L (2.0 qt US)

Front PTO Transfer Case ..... 1.5 L (1.6 qt US)

Clutch/Splitter Box ..... 3.0 L (3.0 qt US)

Transmission ..... 8.0 L (8.5 qt US)

3.7 COOLING SYSTEM

Cooling System
- 256 ..... 22 L (23.2 qt US)
- 276 - 276 II ..... 25 L (26.4 qt US)
- 276 II Ford Engine ..... 24 L (6.3 gal US)

Radiator ..... 3 426 cm^2 (531 $in.^2$)
vertical flow, stagggered fins

Fan
- Cummins Engine ..... 21"-10 blade
- Ford Engine ..... 20"-6 blade

suction type

Pressure Cap ..... 48 kPa (7 psi)

3.8 DIMENSIONS

3.8.1 - 256-276

Overall Height ..... 2 839 mm (112 in.)

Overall Length ..... 4 030 mm (159 in.)

Cab Width ..... 1 050 mm (41.3 in.)

Wheelbase ..... 2 180 mm (86 in.)

Ground Clearances with 16.9 x 28 R1 Tires
- Dropaxle Bottom ..... 533 mm (21 in.)
- Differential ..... 660 mm (26 in.)
- Articulation Pins ..... 622 mm (24.5 in.)

Nominal Turning Radius
- 35° Articulation ..... 3 450 mm (136 in.)
- 30° Articulation ..... 4 060 mm (160 in.)
- 26° Articulation ..... 4 572 mm (180 in.)

Max Operating Weight (Mass) with Loader and Max Ballast of 450 kg (1 000 lb)
..... 5 280 kg (11 650 lb)

Shipping Weight Including Cab End PTO and Three-Point Hitch
..... 3 950 kg (8 700 lb)

3.8.2 Dimension - 276 II Ford

Overall Height ..... 2 896 mm (114 in.)
Overall Length ..... 4 140 mm (163 in.)
Cab Width ..... 1 050 mm (41.3 in.)
Wheel Base ..... 2 180 mm (86 in.)

Ground Clearances with 16.9 x 28 R1 Tires
- Dropaxle Bottom ..... 533 mm (21 in.)
- Differential ..... 660 mm (26 in.)
- Articulation Pins ..... 622 mm (24.5 in.)

Nominal Turning Radius
- 35° Articulation ..... 3 450 mm (136 in.)
- 30° Articulation ..... 4 060 mm (160 in.)
- 26° Articulation ..... 4 572 mm (180 in.)

Max Operating Weight (Mass) with Loader and Max Ballast of 636 kg (1 400 lb)
..... 6 131 kg (13 500 lb)

Shipping Weight Including Cab End PTO and Three-Point Hitch
..... 4 131 kg (9 100 lb)

Recommended engine end ballast for forklift and loader.
..... 450 kg (1 000 lb)
Combination of six cast iron weights and 227 kg (500 lb) liquid ballast

3.9 DRAWBAR

3.9.1 Cab End

Type ..... Swinging bar of 38 x 76 mm (1.5 x 3 in.) steel. Replaceable hardened bearings

Height ..... 415 mm (16 in.)

3.9.2 Engine End

Type ..... Fixed position, light duty

Capacity
- With Extension ..... 726 kg (1 600 lb)
- Without Extension ..... 1 135 kg (2 500 lb)

Height ..... 520 mm (20.5 in.) with 13.6 x 28 R1 tires

3.10 ELECTRICAL SYSTEM

Type ..... 12 V, negative ground

Alternator ..... 12 V, 85 A, negative ground

Batteries
- Cummins ..... Two, 625 cold canking amps at -18° C (0° F)
- Ford ..... One, 850 CCA

Lights ..... Two headlamps, two worklights, two red taillights, two amber turn signal lamps. Four additional worklights, optional

Seven Pin Connector ..... Cab end and optional engine end Standard SAE connector

3.11 ENGINE — CUMMINS

3.11.1 256 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)

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

Operating Torque ..... 298 N.m (220 lbf ft) at 2 500 r/min

Compression Ratio 17.5:1

3.11.2 276 Tractor and 276 II Tractor-Cummins

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

Max Torque ..... 404 N.m (298 lbf ft) at 1 500 r/min

Operating Torque ..... 331 N.m (244 lbf ft) at 2 500 r/min

Compression Ratio 16.5:1

3.11.3 Common Specifications-Cummins Engine

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 $in.^3$)

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)
Regulating Valve Opening Pressure .....414 kPa (60 PSI)

3.11.4 Ford Engine

Engine
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^3)
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 .....15W-40 SF/CD,
Engine Oil Pressure-Minimum Allowable
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 .....Isloated on 3 rubber mounts

3.12 FRAME

Articulation .....35° each side, 70° total

Oscillation .....10° engine and axle

Construction ..... Welded channel with oscillating axle cradle

3.13 HYDRAULIC SYSTEM

Capacity ..... 32 L (8.5 gal US) tank shared with hydrostatic system

Pressure Cap ..... Vented

Pump Type .....Variable displacement with 0.045 L/rev (2.77 $in.^3$/rev) max displacement (1985) through 1989 on 256, 276 & 276 II
0.038 L/rev (2.32 $in.^3$/rev) max displacement (1984)

Pressure Compensator Setting 20 684 to 21 374 kPa (3 000 to 3 100 psi) at zero flow

Hydraulic Flow at Couplers, With Engine at 2500 RPM, 2500 psi and Flow Control Wide Open

S/N of Tractor	GPM	L/Min
V205101-V209442	19	72.0
V209443-V333206	23	87.2
D432100 and up	26	98.5

Flow compensator setting .....1 896 ± 172 kPa (275 ± 25 psi) at zero flow

Filter Type ..... Paper element, 10 micron, bypass relief 172 kPa (25 psi)

Steering .....Load sensing hydrostatic, flow is 32 L/s (5 gpm US). Relief pressure is 15.86 MPa (2300 psi). Steering valve displacement is 167 mL (10.2 $in.^3$) per rev

Steering Cylinders ..... Single acting, 63 x 200 mm (2.5 x 8 in.)

Implement Valve ..... Three spools stacked with priority section, adjustable flow control on each spool, fourth spool supplied with three-point hitch option. Flow is 1.26 L/s (20 gpm US). Relief pressure is 19.30 MPa (2 800 psi)

Type ..... Closed center, load sensing

Flow Control ..... Individual spool control with one spool controlled in cab

Hydraulic Couplers ..... Quick connect, accepts standard ASAE and ISO type A male tips

3.14 HYDROSTATIC SYSTEM

Capacity ..... 32 L (8.5 gal US) tank shared with hydraulic system

Pump Type ..... Variable displacement, piston pump, fixed displacement motor, closed loop

Displacement.....75.3 cm^3 (4.6 $in.^3$)

System Pressure ..... Relief valve in motor
1984 ..... 37.92 MPa (5 500 psi)
1985 ..... 41.37 MPa (6 000 psi)

Charge Pump (1984).....13.9 cm^3 (0.85 $in.^3$) displacement, internal gerotor 1.52 MPa (220 psi) pressure

Charge Pump (1985).....13.9 cm^3 (0.85 $in.^3$) displacement, internal gerotor 1.93 MPa (280 psi) pressure

Filtration ..... 10 micron element on suction line

3.15 OPTIONS

Open Cab ..... 6 post ROPS construction side tilt, four rubber mounts

Hitch ..... Engine end, trailer type, fixed position for light duty work

Engine End Implement Hydraulics ..... Closed center, load sensing, one or two spool stacked

Engine End Implement Valve ..... Spring centered 5 position

Engine End Flow Control ..... Individual spool control

Engine End Hydraulic Couplers ..... Quick connect standard ASAE and ISO type A male tips

PTO ..... Cab and engine end

Three-Point Hitch ..... Cab and engine end

3.16 POWER TAKE-OFF

Type .....Available for cab and engine ends
Independent multidisc overcenter wet clutch

Capacity (single speed drop box) ..... 2 L (2 qt US)
Capacity (dual speed drop box) ..... 1.8 L (1.8 qt US)

Speed at 2 500 r/min Engine Speed ..... 540 r/min single speed box or 1000 r/min single speed box or 540 or 1000 r/min dual speed box (cab end only)

3.17 STEERING

Type ..... Load sensing, hydrostatic

Flow ..... 32 L/s (5 gpm US)

Relief Pressure ..... 15.86 MPa (2 300 psi)

Cylinders ..... Two single acting, 63 x 200 mm (2.5 x 8 in.) on self aligning bushings

Pump Displacement.....167 mL (10.2 $in.^3$) per rev

Articulation .....35°, fully hydrostatic

3.18 THREE-POINT HITCH

3.18.1 Cab End

Category ..... II/I

Lift Capacity ..... Estimated 2 000 kg (4 400 lb) at 610 mm (24 in.) behind hitch points
Estimated 3 175 kg (7 000 lb) at hitch points.

Sway Blocks ..... Standard

Hitch Type ..... Claw hitch on lower links

Control ..... Electronic position control with automatic and manual modes. Raise/Lower switch on FNR lever

3.18.2 Engine End

Category ..... II/I
Lift Capacity ..... 909 kg (2 000 lb) at 610 mm (24 in.) behind hitch points
1 485 kg (3 270 lb) at hitch points

Sway Control ..... Sway Links

Hitch Type ..... Claw hitch on lower links

Control ..... Electronic position control

3.19 TIRES

Type ..... R1, 6 ply tires in 13.6 x 26, 14.9 x 28 and 16.9 x 28 sizes
R2, 6 ply tires in 14.9 x 28 size

3.19.1 Tires — 276 II Ford

Type .....R1 6 ply tires
14.9 x 28
16.9 x 28

R2 6 ply tires
14.9 x 28

R4 8 ply tires
16.9 x 28

3.20 TRANSMISSION

Type ..... 3 speed, constant mesh with sliding shifting collar

Capacity ..... 8.7 L (9 qt US)

Shift ..... Cable operated via console mounted lever

TABLE 1-1: Speed Ranges at 2 500 r/min with 16.9 x 28 Loaded Radius 635 mm (25 in.) Tires

Rnge	Speed		Serial Number
	km/h	mph	
1	0-8.2	5.1	256 84 205101
2	0-15.1	9.4	to
3	0-30.8	19.1	256 84 205789
1	0-8.2	5.1	256 85 209050 to
2	0-13.3	8.2	256 85 209555
3	0-30.8	19.1	276 85 241025 to
			276 85 241074
1	0-9.5	5.9	256 85 209556 and on
2	0-13.3	8.2	276 85 241075 and on
3	0-30.8	19.1	

TABLE 1-2: 276 II Ford Speed Ranges at 2 500 RPM with 16.9 x 28 Loaded 635 (25") Tires

Speed Range @ 2 500 RPM with 16.9 x 28 Tires, Loaded Radius 660 mm (26.0 in)

RANGE	SPEED (FORWARD OR REVERSE)
1	0-8.9 km/h (5.53 mph)
2	012.46 km/h (7.74 mph)
3	0-28.90 km/h (17.96 mph)

3.21 WHEELS

Type

256/276 below serial #332100
fix rim or power adjustable

276 II serial number 332100
and above including
276 II with Ford engine
Eight position rim

Duals

256/276 below serial number
332100 - 13.6 x 28 and
14.9 x 28 R1 only
276 II serial number 332100
including 276 II with Ford engine
14.9 x 28 and 16.9 x 28

3.21.1 Wheel Spacing

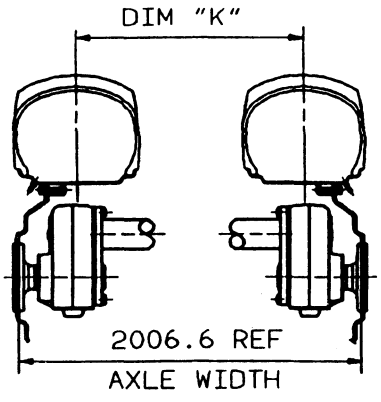
TABLE 1-2: Wheel Spacing Chart (center to center)

Tire Size	13.6 x 28				14.9 x 28				16.9 x 28			
Position	Convex		Concave		Convex		Concave		Convex		Concave	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
Power Adjust	1575	62.0	1849	72.8	1574	62.0	1849	72.8	1610	63.4	1808	71.2
	1676	66.0	1950	76.8	1676	66.0	1950	76.8	1712	67.4	1910	75.2
	1778	70.0	2052	80.8	1778	70.0	2052	80.8	1813	71.4	2011*	79.2*
	1880	74.0	2153	84.8	1880	74.0	2153	84.8	1915	75.4	2113*	83.2*
	1981	78.0	2255	88.8	1981	78.0	2255*°	88.8*°	2016*	79.4*	2214*	87.2*
	2083	82.0	2357	92.8	2083	82.0	2357*°	92.8*°	2118*	83.4*	2316*	91.2*
	2184	86.0	2458*	96.8*	2184	86.0	2458*°	96.8*°	2220*	87.4*	2418*	95.2*
Fixed	1918	75.5	2108	83.8	1917	75.5	2108°	83.8°	1971	77.6	2057	81.8
Duals**	N.A.	N.A.	3000	118	N.A.	N.A.	3000	118	N.A.	N.A.	N.A.	N.A.
Duals	1918	75.5	N.A.	N.A.	1918	75.5	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

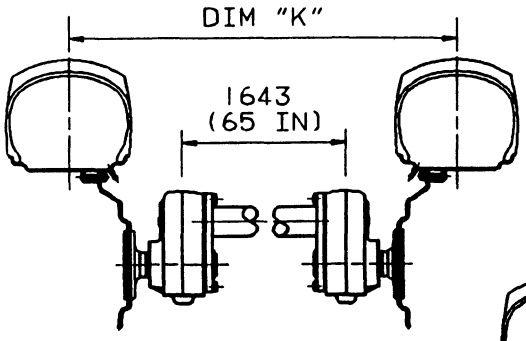
* 30° steering stops required with R1 tires

** 25° Steering stops required with duals

° 30° Steering stops required with R2 tires

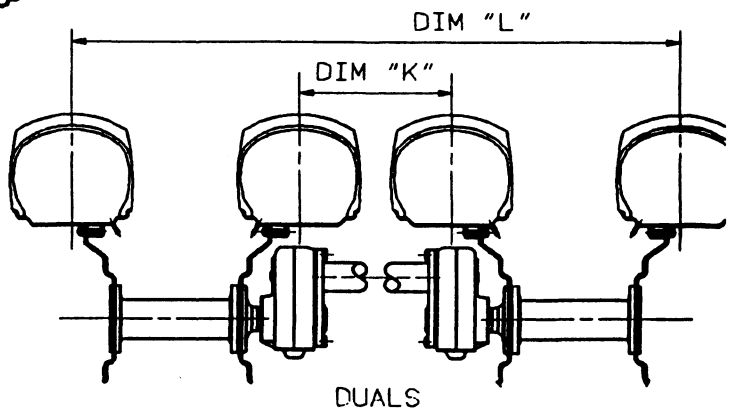


POSITIONS: A-D



POSITIONS: E-H

POS	DIM K (TREAD) W15 & W12	DIM L (TREAD) W15 & W12
A	1610.0 (63.4)	2492.0 (98.1)
B	1721.4 (67.8)	2603.4 (102.5)
C	1909.8 (75.2)	2791.8 (109.9)
D	2021.2 (79.5)	2903.2 (114.3)
E	2010.0 (79.1)	2892.0 (113.9)
F	2121.4 (83.5)	3003.4 (118.2)
G	2309.8 (90.9)	N.A.
H	2421.2 (95.3)	N.A.



DUALS

4 Fuel, Fluids and Lubricants

WARNING

DO NOT HANDLE FUELS OR FILL FUEL TANKS NEAR AN OPEN FLAME, WHILE SMOKING OR UNDER ANY CONDITION THAT COULD CAUSE A SPARK.

DO NOT USE AN OPEN PAIL OR CAN FOR TRANSPORTING FUEL. USE ONLY AN APPROVED CONTAINER MANUFACTURED FOR THAT PURPOSE.

IF CLOTHES ARE SPLASHED WITH FUEL, CHANGE IMMEDIATELY. FUEL SOILED CLOTHES ARE AN EXTREME FIRE HAZARD.

DISPOSE OF ALL FUEL SOAKED RAGS. NEVER LEAVE THEM LYING AROUND A WORK AREA WHERE THEY MAY BE EXPOSED TO FLAME, SPARK OR CIGARETTE SMOKING.

BE ALERT

4.1 FUELS

Fuel quality is an important factor for dependable performance and satisfactory engine life. Suitable fuels must be clean, completely distilled, well-refined and non-corrosive to the fuel system.

Cummins engines use No. 2 diesel fuels. They will also operate satisfactorily on No. 1 fuels or other within the following specifications.

1. Less than one percent sulphur content.
2. Sediment and water content less than 0.1 percent.
3. Cetane number of at least 40. A higher grade may be neccessary at low temperatures or high altitudes.
4. Pour point below the lowest expected temperature.
5. Ash content of less than 0.02 percent.
6. Viscosity of 1.4 to 5.8 centistokes at 40° C (104° F).

Further details about fuel specifications are contained in the Cummins B Series Operator's Manual and section on the FORD ENGINE in the 276 II operator's manual.

4.2 FLUIDS

4.2.1 Coolant

The tractor is factory supplied with 1:1 ratio of water to antifreeze. The coolant should be a water/ antifreeze mix.

IMPORTANT

Do not use calcium chloride solution; it is harmful to the cooling system.

4.2.1.1 ADDING OR REPLACING COOLANT

It is recommended that a closed container of coolant be premixed for topping up the radiator level. The water should be clean and preferably soft. A good commercial grade glycol base antifreeze should be used in a 1:1 ratio with water.

See recommendations for adding coolant or changing coolant in the Ford engine in the operator's manual.

IMPORTANT

Add 1.3 liters (44 oz) of FW-15 coolant additive to cooling system on the Ford engine when the system is drained and flushed.

Add 180 ML (6 oz) of FW-15 coolant additive every 300 hours of engine operation. See Engine section in the operator's manual.

4.2.2 Hydraulic Oil

Dexron II transmission fluid or brand equivalent is recommended for use in the hydraulic and hydrostatic systems.

Ford 134 oil can also be used above -15° C (4° F).

NOTE

Do not mix brands or grades of oil in the hydraulic or hydrostatic systems.

4.2.3 Transmission Fluid

Versatile® HyGear 23 or brand equivalent at temperatures above 4° C (40° F); HyGear 24 for temperatures below 4° C (40° F).

Ford 134 oil can also be used.

4.2.4 Brake Fluid

SAE J1703F brake fluid should be used.

4.3 Lubricants

4.3.1 Grades

SF/CD oils should be used in naturally aspirated and turbo charged diesel engines. It protects against bearing corrosion and night temperature deposits.

4.3.2 Engine Oil - Cummins Engine

Use SAE 10W30 SF/CD motor oil at temperatures of -25° to -10°C (-10° to 14°F). Use 15W40 or 20W40 SF/CD above -10°C (14°F).

Engine Oil - Ford Engine

Use Ford 15W-40 motor oil. In arctic conditions, a high quality lighter weight oil can be used.

4.3.3 Differentials and Dropboxes

SAE 85W90 GL5 gear oil.

4.3.4 PTO Dropbox

Versatile® HyGear 23 or equivalent above 4°C (40° F) and HyGear 24 below 4°C (40° F). Use Dexron II transmission fluid in PTO transfer case.

4.3.5 Grease

SAE high temperature multipurpose grease is recommended for all pressure grease fittings.

5 Lubrication

5.1 General

Figures 1-1, 1-2, 1-3, 1-4 and 1-5 show the tractor lubrication points. Refer to subsection 3, SPECIFICATIONS, for capacities and requirements. Table 1-3 lists the frequency of lubrication. Refer to Table 1-4 for a list of petroleum products for use in the tractor.

TABLE 1-3: Lubrication Schedule

	10 HRS	50 HRS	100 HRS	200 HRS	300 HRS	400 HRS	LUB[1]	NO OF PTS	LUB PTS[2]
Lubricate main drivelines	•	•	•	•	•	•	B	9	1
Lubricate steering cylinder pivots	•	•	•	•	•	•	B	4	2
Lubricate main frame pivots	•	•	•	•	•	•	B	2	3
Lubricate oscillating cradle pivots	•	•	•	•	•	•	B	2	4
Change engine oil and filter		•	•	•	•	•	A	-	-
Change transmission oil		• [3]				•	C	-	10
Change hydrostatic/hydraulic oil and filters						•	E	-	-
Change dropaxle/differential oil						•	D	6	11
Lubricate seat pivots						•	B	-	-
Lubricate window and door hinges						•	A	6	9
Lubricate three-point hitch and rockshaft	•	•	•	•	•	•	B	12	5,6
Lubricate PTO drivelines	•	•	•	•	•	•	B	10	7,8
Change PTO clutch/splitter box/transfer case oil		•				•	E	-	12
Change PTO dropbox oil		• [3]				•	C	-	13

[1] See Table 1-4: Lubricant Brands
[2] See Figures 1-1 to 1-4
[3] Initial oil and filter change after the first 50 hrs of operation

TABLE 1-4: Lubricant Brands

	USE	VERSATILE	IMPERIAL	SHELL	TEXACO	FORD	CLASSIFICATION
A	Engine		Essolube XD3	Rotella T	Ursa Super Plus	15W-40	SAE 15W40 SF/CD
B	Grease		Unitol	Alvania EP2	Marfak AP		Multipurpose Grease
C	Transmission PTO Dropbox	HyGear 23	Hydraul 56	Donax TD	Texamatic TDH	134	Above 4° C (40° F)
		HyGear 24	Hydraul 50	Donax TDL		Below 4° C (40° F)	
D	Differential/ Dropaxle See Note 2		Gear Oil GX	Spirax HD	Multigear EP	See Note #2	SAE 85W90 GL5
E	Hydraulics Hydrostatics PTO Clutch/ Splitter Box Transfer Case **See NOTE 1**		Dexron II	Donax TG	Texamatic	134 See Note #1	Transmission Fluid

NOTE #1: Hydraulic/hydrostatic system is factory filled with Dexron II® ATF. Equivalent grades of Ford 134 hydraulic transmission fluid may be used provided the system is drained and flushed. Use correct viscosity of oil for the ambient operating temperature. Use Ford 134 above 4° F (-15° C).

NOTE #2: 276 II tractors with Dana Powr-Lok limited slip differential must have 4 ounces of on road limited slip additive added to the differential oil when it is changed. Change the differential oil after the first 100 hours and every two years or 2,000 hours thereafter. Ford automotive dealers stock the additive under number C8AZ19B546A oil friction modifier.

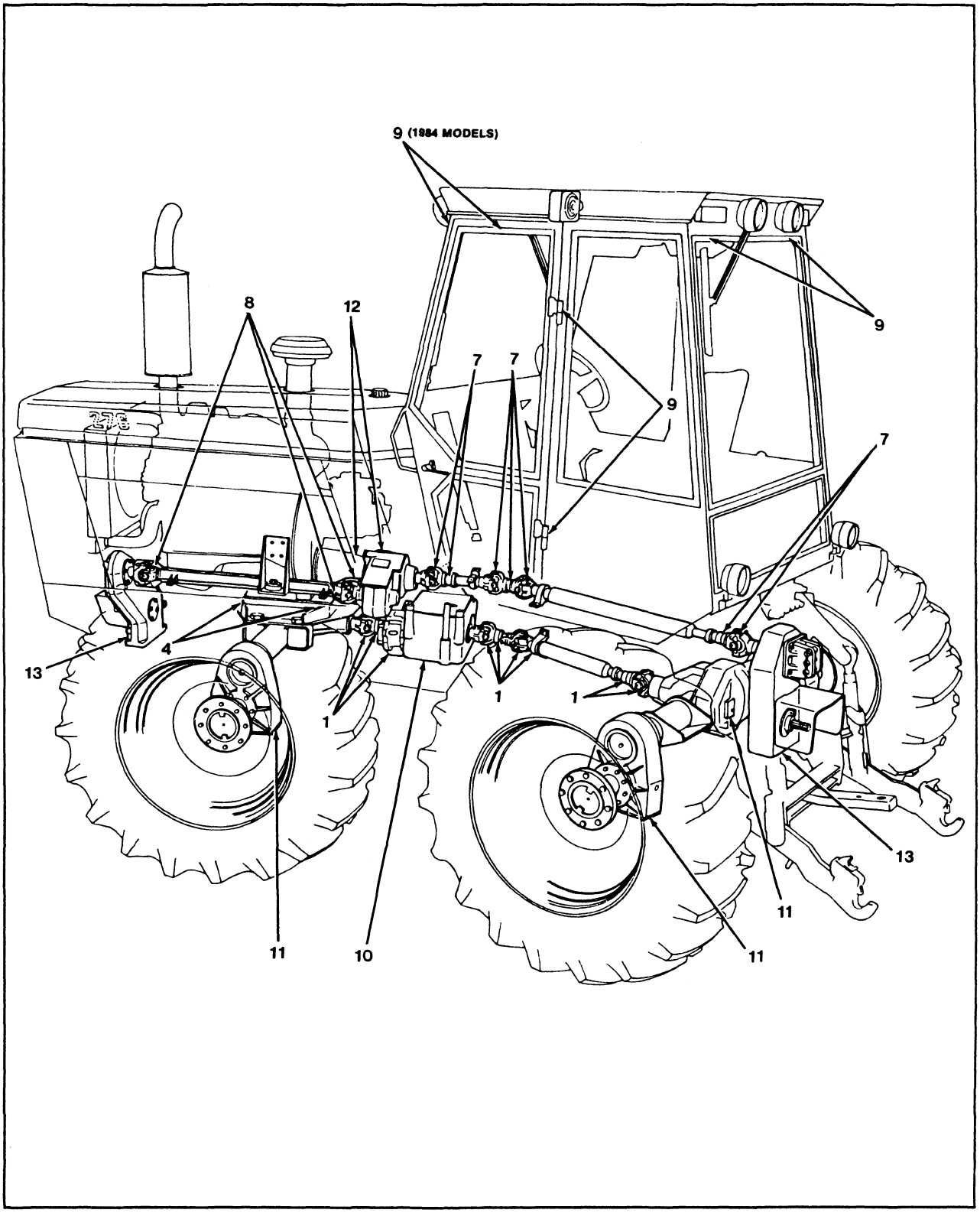


FIGURE 1-1: Driveline Lubrication Points

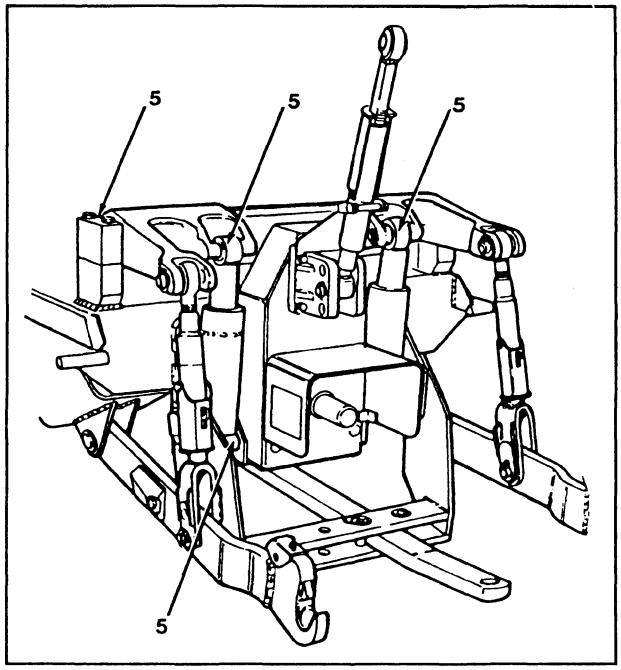


FIGURE 1-2: Cab End 3-Pt Hitch Lubrication Points

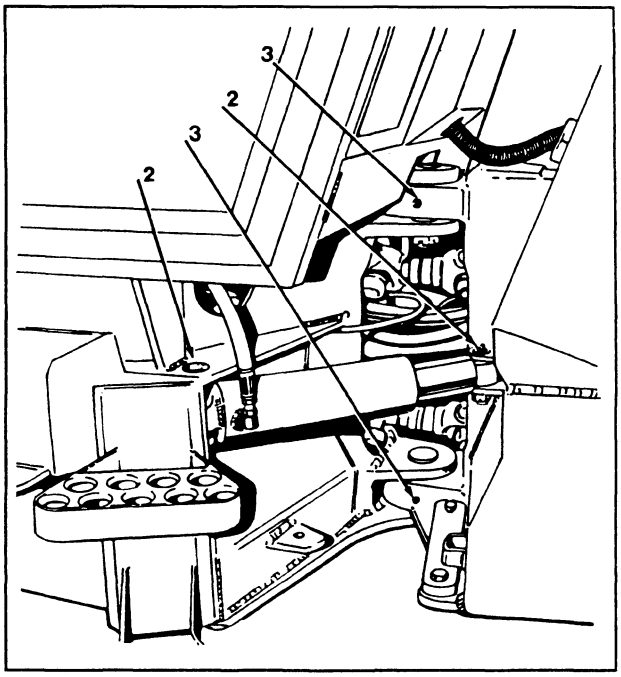


FIGURE 1-3: Articulation Area Lubrication Points

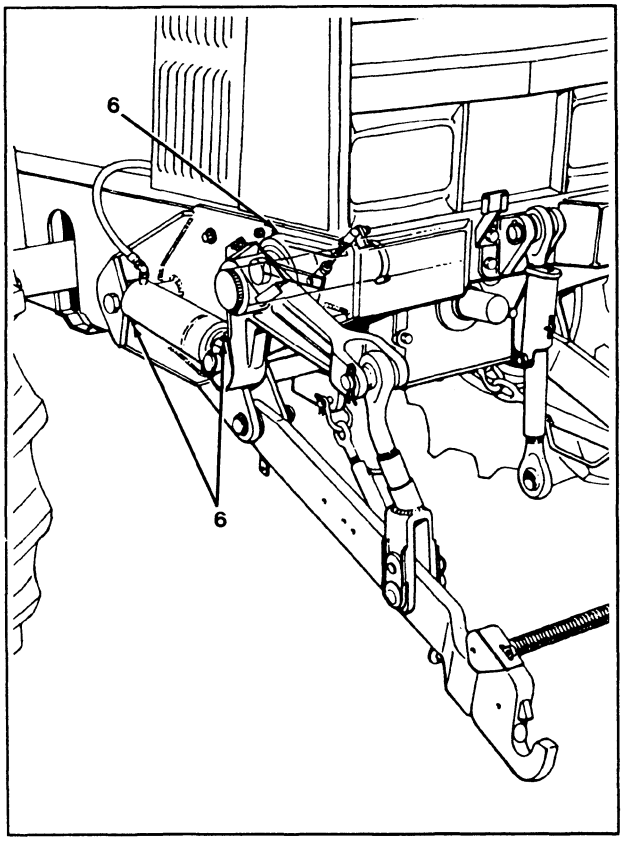


FIGURE 1-4: Engine End 3-Pt Hitch Lubrication Points

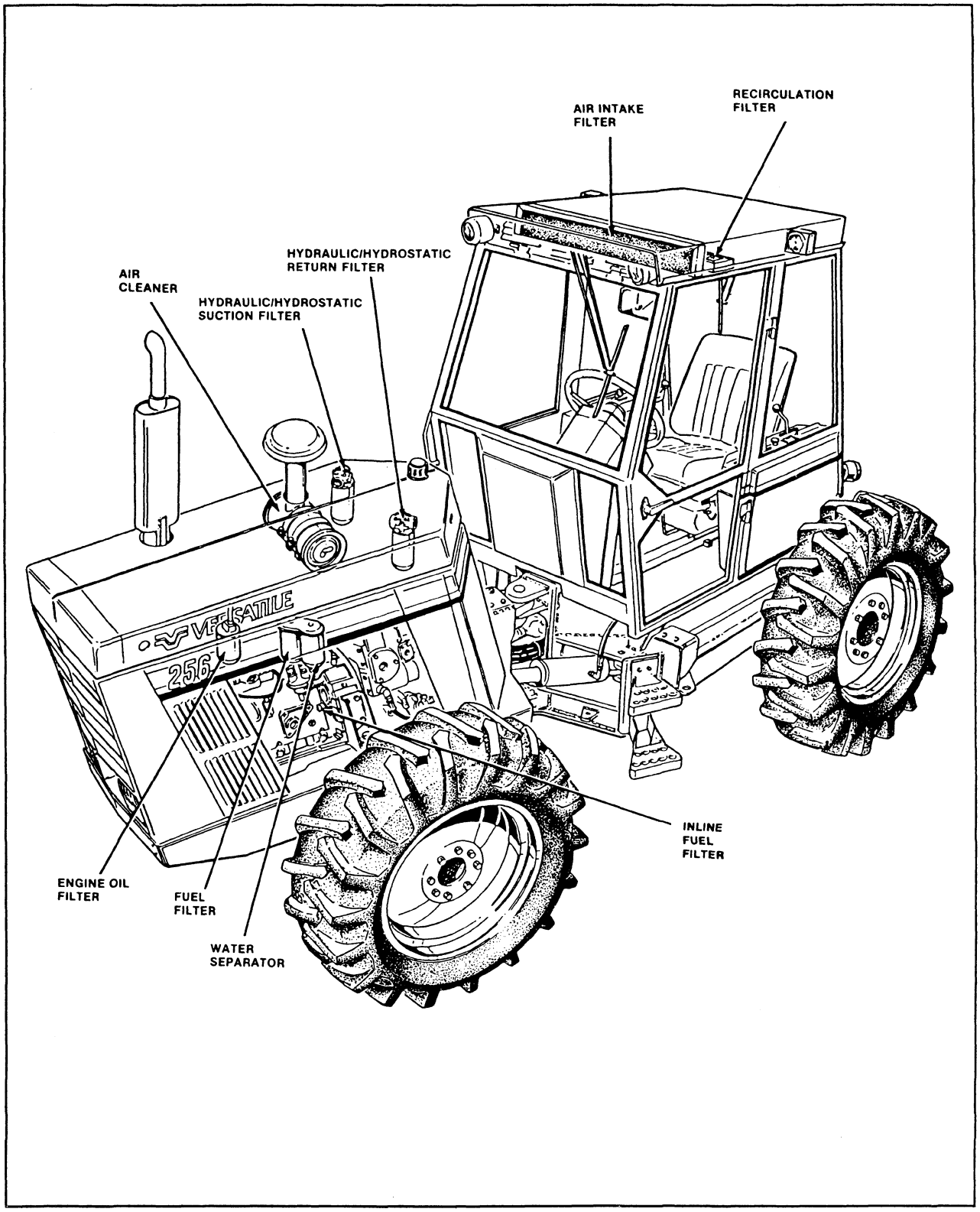


FIGURE 1-5: Filter Locations

6 Belts and Filters

6.1 GENERAL

Refer to table 1-5 for correct replacement belts and filters. Refer to Table 1-6 for filter locations.

TABLE 1-5: Belts and Filters

Component
Fan, Alternator Belt
Compressor Belt
Engine Oil filter
Fuel Filter
Separator Filter
Hydraulic, Hydrostatic Filters (cast)
Hydraulic, Hydrostatic Filters (spin-on)
Cab Filter Element
Cab Recirculation Filter 115 mm (4.5 in.)
Cab Recirculation Filter 92 mm (3.6 in.)
Air Cleaner Element, primary - 103344 - required
Air Cleaner Element, safety

7 Storage

7.1 GENERAL

When the tractor is not to be used for several months, it must be prepared for storage to prevent component damage. Prepare a kit for the storage period including plastic bags and tape to seal openings, paint for scratched surfaces grease and rust preventative, clean clothes and various fluids to refill all systems to required levels.

7.2 ENGINE STORAGE

Before storing the tractor, start and run the engine until the coolant temperature is at least 70° C (160° F). Shielding the radiator may be neccessary to achieve this temperature. Shut down the engine while the temperature is up to prevent condensation from forming during storage.

7.3 TRACTOR STORAGE

After warming the engine, shut engine down and proceed as follows:

1. Drain crankcase.
2. Install new engine oil filter.
3. Fill crankcase with new oil.
4. Drain and flush cooling system. Refill with 1:1 ratio of water and glycol base antifreeze.
5. Change differential and dropbox oil.
6. Change hydraulic and hydrostatic oil.
7. Change PTO gearbox oil.
8. Run engine to circulate coolant.
9. Operate transmission, hydraulic system and steering to distribute oil to all components.
10. Stop engine.
11. Relieve tension from drive belts and inspect compressor, alternator and fan belts for condition.
12. Remove and store both batteries.
13. Clean tractor and paint scratches and chips.
14. Jack up tractor and block axles to remove weight from tires. Cover tires if they are exposed to heat or sunlight.
15. Coat all exposed hydraulic cylinder shafts with grease or rust preventative.
16. Using plastic bags and tape, seal the following openings: air cleaner inlet, exhaust muffler, fuel tank breather tube and cab air intake screens.
17. Store in a dry protected place. If tractor is to be stored outside, cover with a protective material.

7.4 STORING BATTERIES

1. Maintenance free batteries do not require charging before or during storage. Under normal conditions, storage life will be 12 months before recharging.
2. Check hydrometer. If green dot is not visible, charge batteries. See Section 8, ELECTRICAL SYSTEM.
3. Remove batteries from tractor and store in a dry weatherproof area.
4. Clean battery tops and keep batteries dry to reduce self-discharge.

7.5 PREPARATION AFTER STORAGE

When tractor is taken out of storage, do the following:

1. Inflate tires to recommended pressure.
2. Check coolant level.
3. Check oil levels in engine, axles, hydraulic system, PTO gearbox, gear transmission, hydrostatic transmission and brake reservoir.
4. Check hoses, fittings, seals, tires and lines for possible failure or looseness.
5. Install batteries.

7.6 ENGINE STARTUP AFTER STORAGE

— CAUTION —

BEFORE STARTING ENGINE, ENSURE ALL CONTROLS ARE IN NEUTRAL AND PARKBRAKE ENGAGED.

OPERATE CONTROLS FROM OPERATOR'S SEAT ONLY.

STOP ENGINE BEFORE DOING ANY WORK ON THE TRACTOR.

KEEP ALL SHIELDS IN PLACE.

BE ALERT

DO NOT OPERATE TRACTOR IN A CLOSED BUILDING.

Initial startup can put abnormal loads on the engine cranking system. To reduce cranking loads do the following:

1. Electrical cables must be clean, tight and in good condition. They should be cleaned at all connection points, including battery terminals, before starting the tractor.
2. If fuel filter was changed prior to startup, prime fuel lines.
3. Never crank engine longer than 30 seconds. Allow two minutes for starter motor to cool between cranking cycles.
4. Batteries must be fully charged. Check sight glass for green dot. If green dot is visible, battereis are fully charged. If not, see Section 8, ELECTRICAL SYSTEM.
5. Use cold start aid if ambient temperature is below 10° C (50° F) and engine is cold.
6. Avoid high r/min after engine starts. Bearings are dry after storage and can be damaged by high r/min.
7. If new batteries are installed, they must be of equivalent or higher capacity than the original batteries.
8. Tighten all V-belts. Alternator belt must be tight and in good condition to keep battery charged.
9. Allow hydrostatic system to warm and oil to circulate through the system. Idle tractor 30 to 45 minutes for oil to reach operating temperature.
10. If engine does not start within 30 seconds, assuming cold start aid is used as neccessary and cranking speed is ample, engine is not likely receiving fuel.
11. If white smoke comes from exhaust, engine is receiving fuel but more cold start aid is needed.
12. If exhaust is clear, fuel system is not delivering fuel to combustion chambers. Check the following:
    a. Check fuel system prime.
    b. Check operation of fuel shutoff valve solenoid.
    c. Check fuel pump delivery by loosening ferrule nut on line between fuel pump and engine. Fuel should flow from the fitting when engine is cranked.
    d. Check for a water-freeze block at a low point in the fuel line.

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^3)

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^3)

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^3)
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 ..... Isloated 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 x 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 x 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 x 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 x 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 x 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 x 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 x 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 x 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)

1.2 TROUBLESHOOTING

Refer to Table 2-3, Troubleshooting Engine Systems. The troubleshooting chart lists most problems related to the engine systems. For more detailed troubleshooting information, refer to the Cummins Engine Operator's and Service Manuals and the Ford Diesel Engine Diagnosis Manual.

1.3 ENGINE REPLACEMENT

1.3.1 Special Tools and Equipment

1. Hoist, 900 kg (1 ton) capacity
2. Lifting fixture with hooks
3. Engine stand
4. Hose plugs

TABLE 2-3: Troubleshooting Engine Systems

	Water in fuel	Dirty fuel filters/lines	External fuel leaks/air in lines	Plugged fuel tank vent	Dirty injector nozzles	Faulty fuel shutoff solenoid	Throttle linkage not adjusted	Wrong fuel/poor grade fuel	Internal fuel leak	Fuel system not primed	Faulty cold start	Restricted air intake	Restricted air filters	High exhaust back pressure	Faulty muffler	Air intake leak	Faulty turbocharger	Faulty water pump	Insufficient coolant	Faulty thermostats	Faulty indicator/gauge	Internal coolant leak	External coolant leak	Dirty radiator	Improper coolant mix	Oil level too high	Wrong grade oil	Oil level too low	Dirty oil filters	Oil leaks
Engine does not start	•	•	•			•		•		•	•																			
Engine starts, runs poorly	•	•	•		•	•		•							•															
Excess smoke at idle		•			•			•																						
Excess smoke under load		•			•			•				•	•	•	•	•	•													
Loss of low power		•	•	•	•		•	•	•			•	•	•		•	•									•	•			
Low max r/min		•	•				•																							
Excess fuel consumption		•	•		•			•	•			•	•	•			•									•				
Erratic idle speed			•	•			•	•																						
Surging at governed r/min			•				•																							
Engine stalls			•	•		•	•	•	•																					
Dilution of oil								•	•													•					•			
High operating temperature								•						•				•	•	•			•	•	•	•		•		
Continually clogged air cleaner															•						•									
Excessive exhaust noise															•		•													
Low operating temperature																				•	•				•					
Low/loss of coolant																					•	•	•							
Coolant dirty																						•								
Air in coolant																						•	•							
Coolant freezes																									•					
Excessive corrosion																														
Low oil pressure																						•				•	•	•	•	
Excessive oil consumption												•														•	•		•	

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

BE ALERT

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.

– CAUTION

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

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

BE ALERT

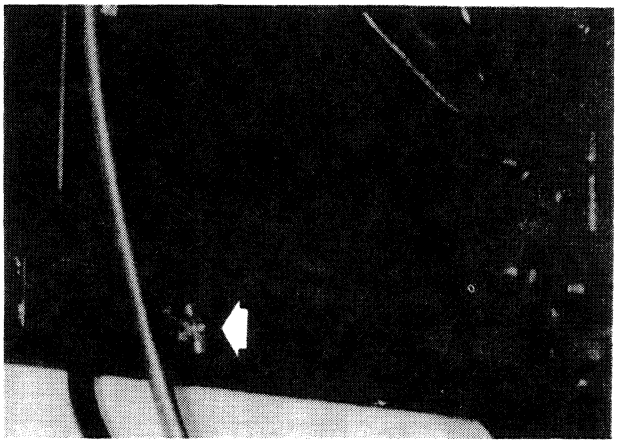


FIGURE 2-1: Radiator Drain

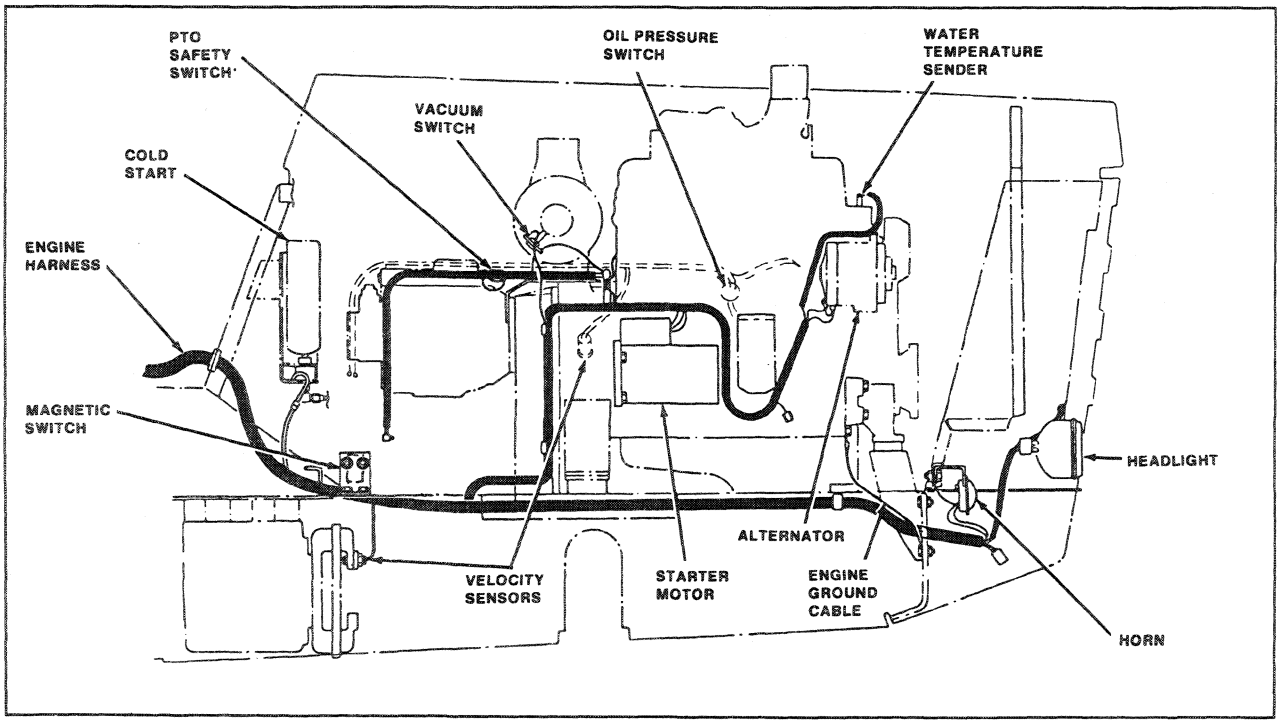


FIGURE 2-2: Engine Electrical Harnesses Removal

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).

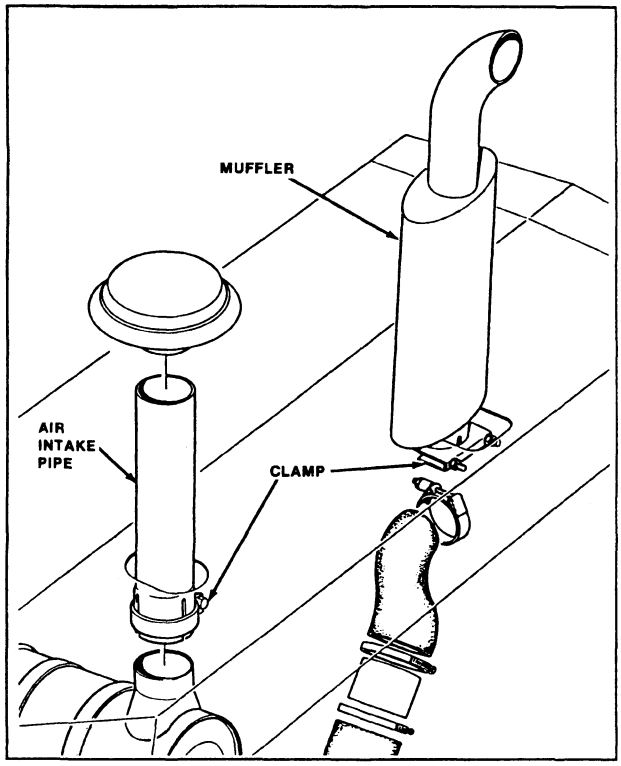


FIGURE 2-3: Muffler and Air Intake Cap Removal

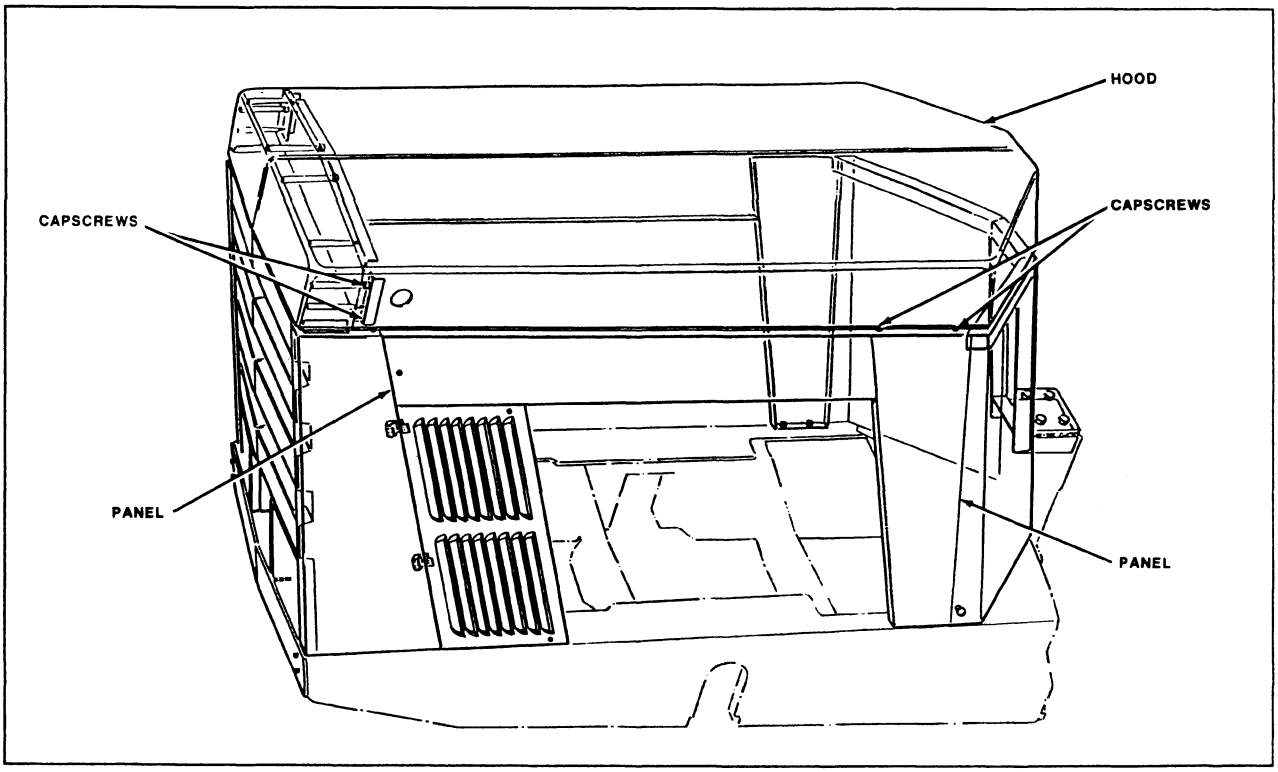


FIGURE 2-4: Engine Panels and Hood Removal

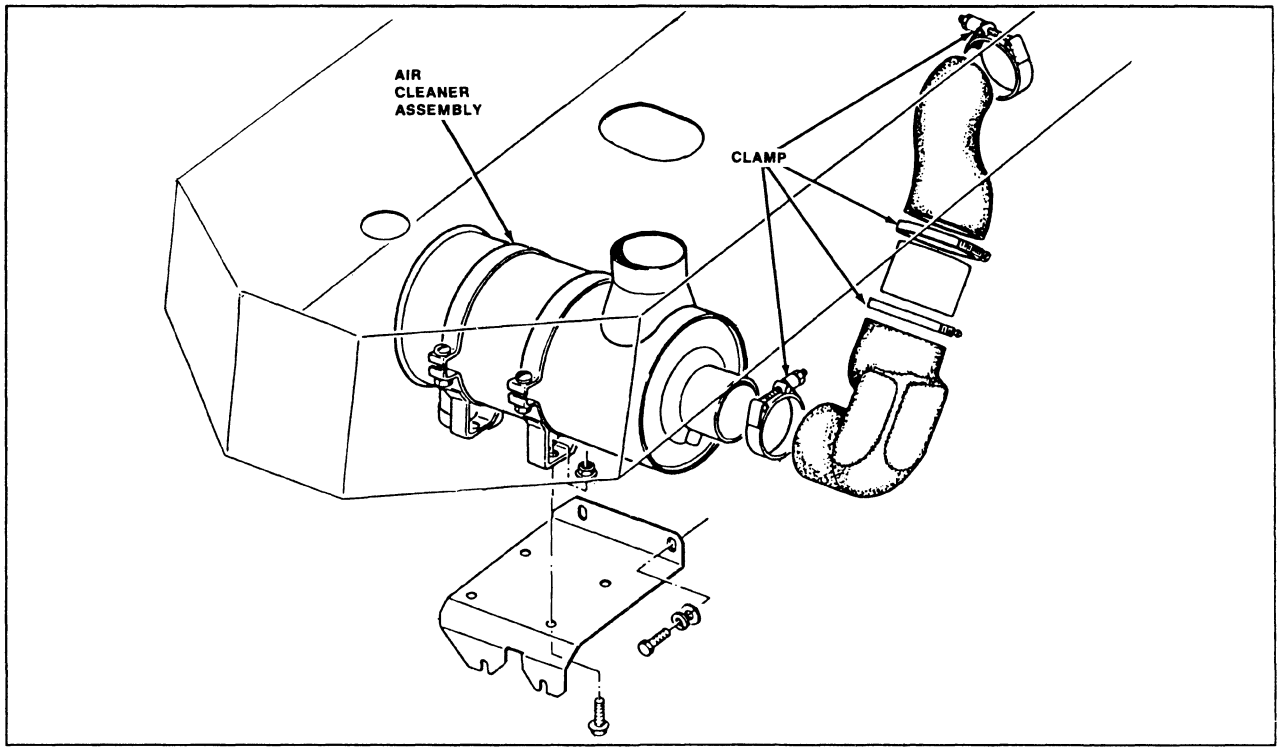


FIGURE 2-5: Air Cleaner Assembly Removal

CAUTION

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

BE ALERT

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.

BE ALERT

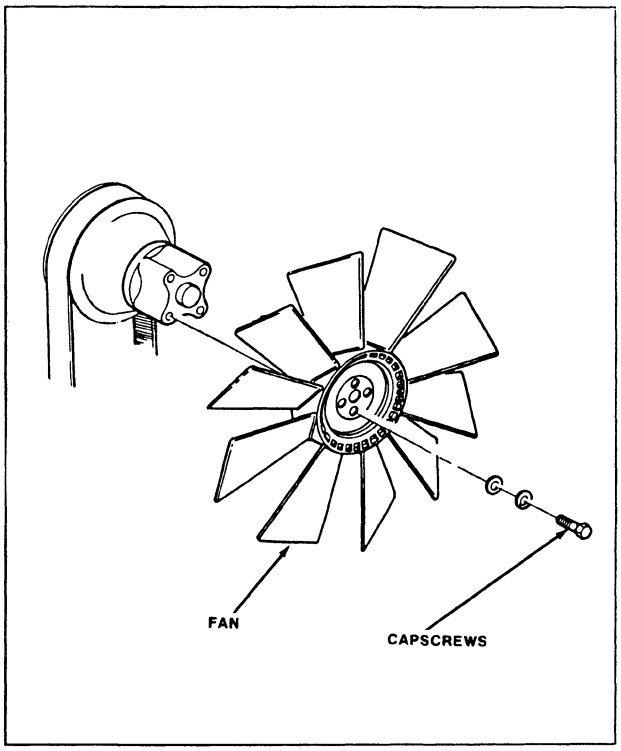


FIGURE 2-6: Fan Removal

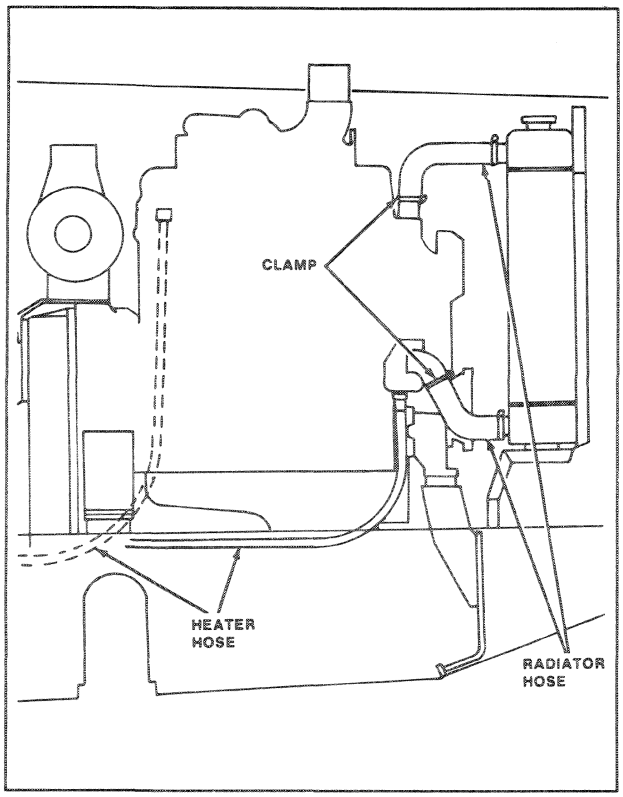


FIGURE 2-7: Radiator and Heater Hoses

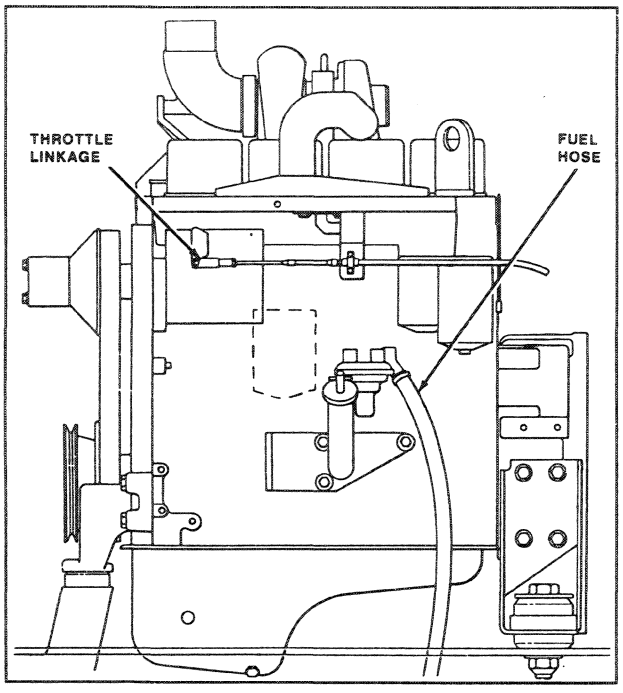


FIGURE 2-8: Fuel Hoses and Throttle Cable

WARNING

BE ALERT

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).

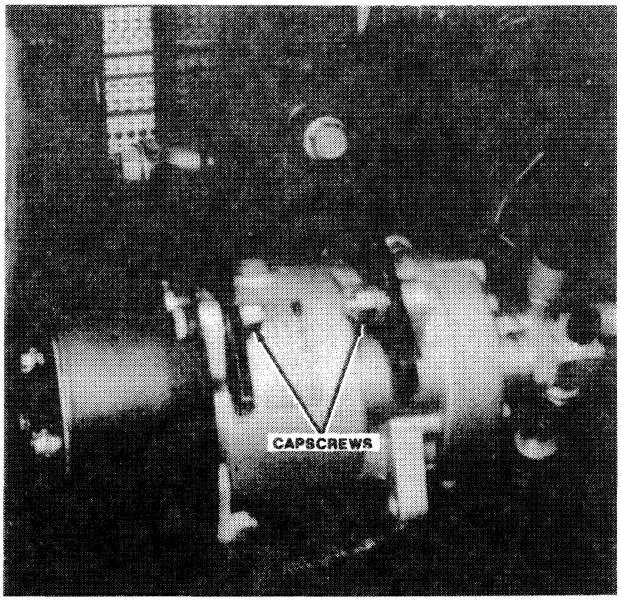


FIGURE 2-9: A/C Compressor Removal

WARNING

BE ALERT

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

REFER TO SECTION 9: ENVIRONMENTAL FOR SYSTEM SERVICING PROCEDURES.

13. 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).

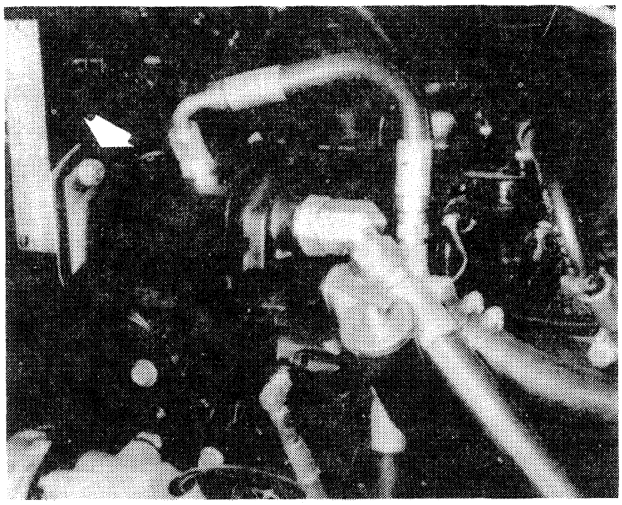


FIGURE 2-10: Hydraulic Pump Removal

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

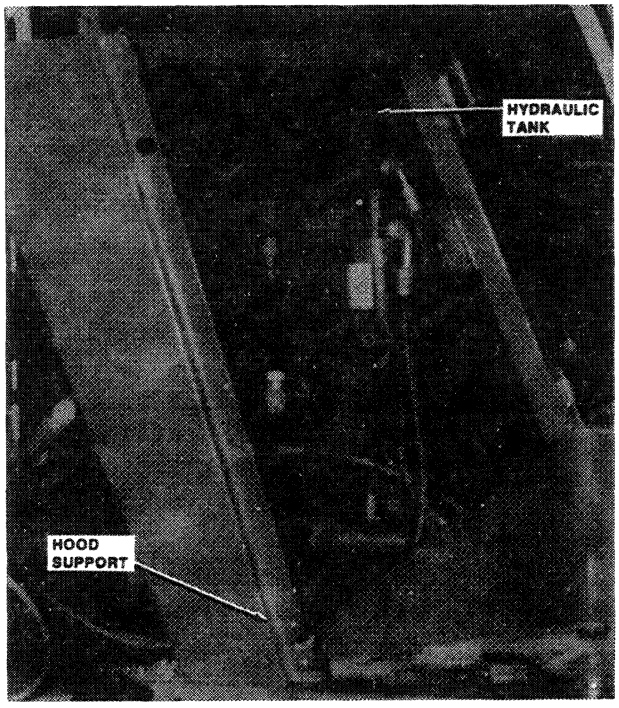


FIGURE 2-11: Hydraulic Tank and Hood Support Removal

15. 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).

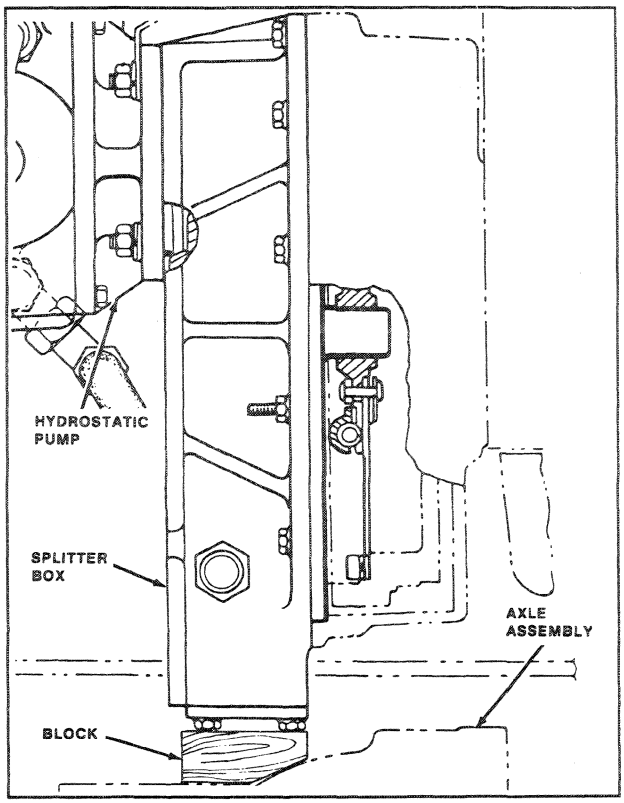


FIGURE 2-12: Supporting the Splitter Box

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

NOTE

Mark driveshaft splines for proper phasing.

17. 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.

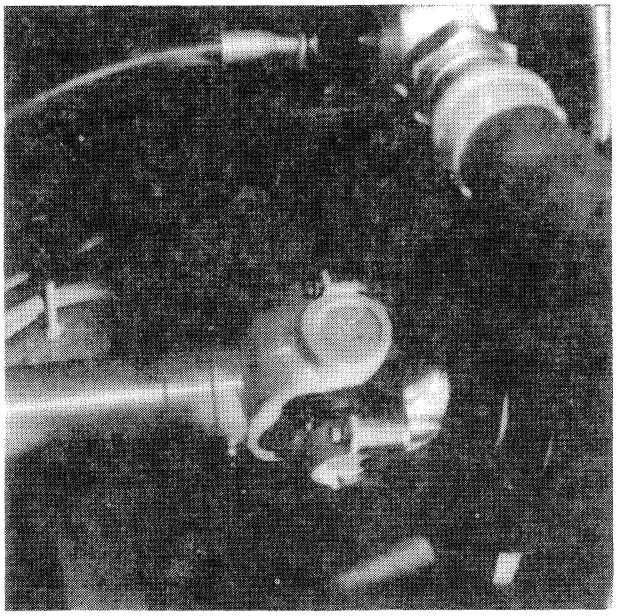


FIGURE 2-13: PTO Driveshaft Removal

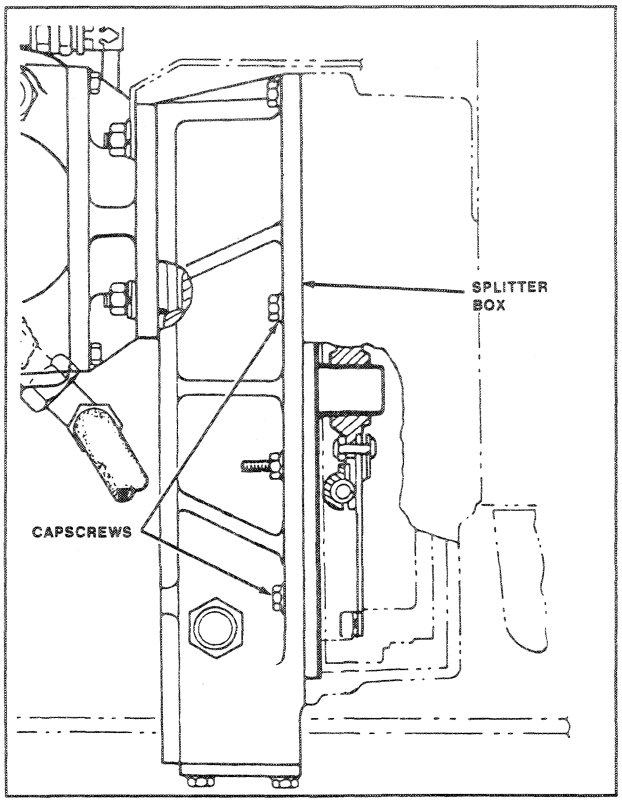


FIGURE 2-14: Splitter Box Mounting

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).

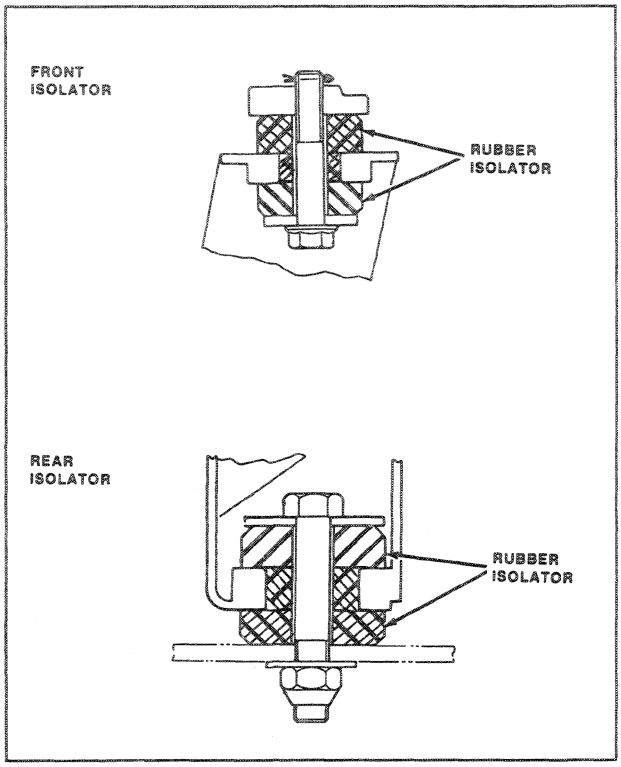


FIGURE 2-15: Engine Isolators

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 capscrew 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 capscrew 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 capscrews and lockwashers and tighten securely (Figure 2-14).

7. Connect PTO driveshaft. Ensure it is correctly phased (Figure 2-13). Torque journal strap capscrews 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.