VERSATILE

Service Manual

NEW HOLLAND

Tractor
150, 160

40015011

Reprinted

FOREWORD

This service manual provides instructions for troubleshooting, removal, inspection, replacement and overhaul of 1977, 1978, 1979, 1980 and 1981 Model 150 VERSATILE® Tractor components.

The service manual should be used in conjunction with the parts manual for the specific model year.

A table of contents precedes each section providing detailed coverage of the information contained within that section. The index at the end of the book should ease location of specific information, and an up-to-date list of Perkins Distributors is provided following the index.

REVISIONS AND ADDITIONS

The purpose of a loose-leaf service manual is to enable us to keep the book updated.

When changes are made, pages will be forwarded to you marked either as replacement or additional pages.

Replacement pages will carry the same page number as the original. Discard the original page and insert the replacement page in its place. Added pages will carry the original page number plus an alphabetical suffix. Insert these pages after the existing page.

Please complete the feedback page at the back of the book and return it to Versatile Farm Equipment Company. Such information will help us improve our service manuals in the future.

Safety

This section contains general safety precautions which should be thoroughly studied and practiced by all service personnel.

GENERAL SAFETY

1. Mount a fire extinguisher near the service area. Maintain it as recommended by the manufacturer.
2. Never operate the tractor in a closed building. If it is absolutely necessary to do so, be sure the building is well ventilated.
3. Always keep sleeves, jackets or other 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 level, clear area before beginning any maintenance procedure. Shut down the engine and remove the ignition key; apply parkbrake; chock the front and back or at least two wheels. Ensure that all operating controls are in neutral. Always disengage the PTO clutch and three-point hitch. Engage articulation lock (1981 Model).
6. Always lower implements to the ground when leaving equipment.
7. Always operate tractor controls from the operator's seat.

TRANSPORT SAFETY

1. Use a trailer having a carrying capacity of at least 12 000 lb (5 500 kg) 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 (1981 Model).

JACKING SAFETY

1. Select a jack strong enough to carry the load. The minimum required jack capacity is five tons (4.5 t).
2. Stabilize the tractor by putting transmission into gear, engaging the parkbrake, and chocking the wheels securely. Engage the articulation lock (1981 Model).
3. To prevent jackknifing, use two hoists or two floor jacks to lift the rear frame.
4. Put the jack securely under the axle tube, frame or drawbar where it is strong enough to support the lifted weight.
5. Use a heavy block as a base for the jack if working on the ground. It should be long enough to keep the jack from tipping, sinking or shifting. Any additional blocking should be under the jack.
6. Jack up the front and/or rear frame just enough to install steel safety stands under the axle tubes or frame.
7. 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.
8. Keep the tractor stable by not raising it so high that it will slide off the jack handle.
9. 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 five tons (4.5 t); for the A-frame or overhead support, five tons (4.5 t); and for the support stands, three tons (2.7 t).
2. Protect yourself from injury as the tractor is being raised by doing the following:
   a. Do not stand on the tractor as you are lifting.

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. Place support stands under the tractor before working under it.

f. Engage articulation lock (1981 Model).

3. Extreme care must be exercised when hoisting, lowering or moving any component of the transmission.

MAINTENANCE SAFETY

1. Shut down the 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 (1981 Models).
4. Never oil, grease or adjust the tractor while it is in motion. Never run engine while the 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 remove pressure. Disconnect any component that may be 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 when searching for leaks. If injured by escaping hydraulic oil, get immediate medical attention.
8. Do not smoke and avoid open flames when filling the batteries.
9. Shut down the engine and remove the ignition key before disconnecting or servicing PTO drivelines.
10. Do not remove the cooling system pressure cap while the engine is hot. Cool engine to less than 165° F (74° C).
11. Stop engine before making any linkage adjustments.
12. Welding fuel tanks is dangerous and not recommended.
13. Repair adhesive is easily flammable. Keep the adhesive and its vapors from heat, sparks and flame.
14. During adhesive use, and until the vapor is gone, avoid using spark producing electrical equipment. Keep the 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 the 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 stopped. Turn the radiator slightly to relieve pressure before completely removing the cap.

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-soiled 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 the 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

Table of Contents

SECTION 1: SPECIFICATIONS AND DATA

1 Introduction

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

2 Hoists and Jacks

Refer to Safety Section at beginning of book.

3 Specifications

3.1 DIMENSIONS

Overall Length . . . . . 150 in. (3 810 mm)

Overall Height . . . . . 109 in. (2 770 mm)

Wheelbase . . . . . 80 in. (2 030 mm)

Fuel Tank Capacity . . . . . 34 gal US (130 L)

Nominal Turning Radius . . . . . 121 in. (3 070 mm) to centerline of 72 in. (1 830 mm) tread

Maximum Operating Weight (Mass) with Loader and maximum ballast of 800 lb (365 kg) . . . . . 10 350 lb (4 705 kg)

3.2 TIRES

TABLE 1-1: Tire Inflation Chart

TIRE SIZE	PLY RATING	INFLATION
11.2 × 24 (284 × 610 mm)	6	26 psi (180 kPa)
13.6 × 24	6	22 psi (150 kPa)

3.3 ENGINE

Type . . . . . Perkins 236 cu in. (3 867 cm^3) diesel in-line, four-cylinder

Maximum Brake Horsepower at 2 250 r/min . . . . . 71 hp (53 kW)

Maximum Torque . . . . . 192 lbf ft (280 N·m) at 1 350 r/min

Full Load Governed Speed . . . . . 2 250 r/min

Full Throttle No Load Speed . . . . . 2 430 r/min

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

Bore . . . . . 3.875 in. (99 mm)

Stroke . . . . . 5 in. (127 mm)

Displacement . . . . . 235.9 cu in. (3.9 L)

Compression Ratio 16:1

Oil Capacity . . . . . 8.5 qt US (8 L)

Hydraulic Pump . . . . . Driven from timing gear

Fuel Tank Capacity . . . . . 34 gal US (120 L)

3.4 COOLING SYSTEM

Capacity . . . . . 17 qt US (16 L)

Radiator . . . . . Cross flow

Fan . . 6 blade, 17.5 in. (445 mm) dia, suction type

Pressure Cap . . . . . 7 psi (48.76 kPa)

3.5 ELECTRICAL SYSTEM

Type . . . . . 12 V, negative ground

Alternator . . . . . 12 V, 72 A, negative ground

Batteries . . . . . Two 95A/h side terminal (450A cranking power at 0° F (– 18° C)

3.6 TRANSMISSION

Type . . . . . Three-speed sliding gear shifting Tapered roller bearings. Spur gear

Speed Range . . . . 2 250 r/min with 13.6 × 24 tires
Gear 1 . . . . . 0 to 4.21 mph (7.77 km/h)
Gear 2 . . . . . 0 to 8.34 mph (13.42 km/h)
Gear 3 . . . . . 0 to 17.23 mph (27.72 km/h)

3.7 DRIVE HYDROSTATICS

Pump . . . . . Variable axial piston, drive from engine pulley operating in a closed loop system. Overload protection is provided via an integral relief and pressure override in the pump. Maximum pressure 5 000 psi (34 MPa). System charge is maintained by a 0.85 CID charge pump on main pump.

Motor . . . Fixed displacement. Speed is infinitely variable from full forward to neutral to reverse and is controlled by adjusting the pump swash plate angle through a pintle shaft

Filter . . . . . 10 micron filter; filtering inlet oil to charge pump

Oil Cooler . . Excess case oil is drained through a 207 sq in. (1 340 cm²) oil cooler mounted in front of radiator

Tank . . . . . 10 gal US (38 L)

3.8 AIR CLEANER

Element . . . . . Dual element with dump valve

3.9 BRAKES

Road Brake . . . . 14 in. (356 mm) disc on driveline, hydraulically operated by either of two foot pedals

Parkbrake . . . . . Mechanically operated by over center lever

3.10 DRIVELINES

Engine to Hydrostatic Pump . . . . . Spicer

Transmission to Differentials . . . . . Spicer

PTO Driveline . . . . . With constant velocity joints

3.11 AXLES

Differential Ratio 3.73:1

Oil Capacity . . . . . 2.4 qt US (2 L)

Dropbox Ratio 2.94:1

Oil Capacity (per box) . . . . . 1.7 qt US (2 L)

Hub . . . . . Adjustable double integral keyed. Retained by two 7/8 in. dia U-bolts

Axle Drive Ratio 10.97:1

3.12 STEERING

Type . . . . . Articulated frames

Articulation, left or right . . . . . 35°

Actuation . . . . . Hydraulic

Cylinders . . . Two 2 × 7 in. (50 × 180 mm) stroke

3.13 HYDRAULIC SYSTEM

Type . . . . . Open center

Pump . . . . . Dual

Steering Circuit . . . . . 5 gal US/min at 2 250 psi (19 L/min at 15 513 kPa)

Remote Circuit . . . . . (1980 Model) 15 gal US/min at 2 250 psi (57 L/min at 15 513 kPa)

Control Valve . . . Gresen SPKYE – 4-4-4 WK 2250 LCHA, one four-way and one four-way float spool

Three-Point Hitch . . . . . Depth control valve

Reservoir . . . . . 40 qt US (38 L)

Third Spool Control . . . . . Optional

Oil Cooler . . . . . 120 sq in. (780 cm²)

3.14 FRAME

Articulation . . . . . 35°

Oscillation . . . . . 5-1/2° engine and axle

Articulation Bearings . . . . . 1.75 in. (45 mm) dia ball bushings

Oscillation Bearings . . . . . 1.25 in. (30 mm) dia ball bushings

Main Frame Construction . . . . . 1/4 × 6 in. (6 × 150 mm) rectangular tubing

3.15 DRAWBAR

Type . . . . . Straight swinging

Construction . . . 1.5 × 2.5 in. (40 × 65 mm) steel

Height . . . 17 in. (430 mm) to top of main member

3.16 CAB

Design . . . . . Independent module type with rollover protective structure

Steps . . . . . Slip resistant

Isolation . . . Full isolation on four rubber mounts

Seat Belt . . . . . Adjustable lap type

Seat and Steering Column . . . . . 180° rotation

3.17 INSTRUMENT PANEL

Gauges . . . . . Tachometer/hour meter, engine oil pressure, coolant temperature, voltmeter, fuel level

Warning Lights . . . . . Alternator, hydrostatic charge pressure

Controls . . . . . Keyswitch, with engine shutoff lightswitch/hazard, cold start button

Overhead Controls . . . . . Turn signals, fan speed control, heater control, air conditioning control

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

Fuses . . . . . Two 15 A fuses, left-hand protects gauges, right-hand protects fuel solenoid

3.18 CONTROL CONSOLE

Right Console (engine forward) . . . . . Range selector, throttle control, three-point hitch control

Left Console . . . . . Hydrostatic speed control, power take-off control, cold start control, third spool control (optional)

Auxiliary hydraulic controls are foot operated by pedals in the engine rear configuration and hand operated floor mounted levers in the engine forward configuration.

3.19 POWER TAKE-OFF

Drive . . . . . Direct driven from engine flywheel through an 11 in. (280 mm) dry over center clutch

Speed . . . . . 540 r/min at 2 250 engine r/min

Control Position . . . Left console, engine forward

3.20 THREE-POINT HITCH

Category II convertible to Category I. Sway-blocks standard with three-point hitch.

3.21 OPTIONS

Third Spool Implement Control Valve

Cab . . . . . Front and rear wipers, two-speed pressurizer, heater, air conditioning

Spark Arrestor

Three-Point Hitch

Scraper Blade

Power Take-Off

Engine Coolant Heater

1450 Loader with options . . . . . Grapple Fork
Round Bale Handler
Hay and Manure Fork
Manure Tines

2400 Swather

2800 Swather

Auger Header

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.

Perkins engine use No. 2 diesel fuels. They will also operate satisfactorily on No. 1 fuels or others within the following specifications:

1. Less than one percent sulfur content.
2. Sediment and water content less than 0.1 percent.
3. Cetane number of at least 40. A higher cetane number fuel may be necessary 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 100° F (38 ° C).

Further details about fuel specifications are contained in the Perkins Handbook for Diesel Engines.

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. Generally, any water that is suitable for drinking is adequate. A good commerical grade glycol base antifreeze should be used in a 1:1 ratio with water.

4.2.2 Hydraulic Fluid

Dexron Type A transmission fluid is recommended for use in the hydraulic and hydrostatic systems.

NOTE

It is recommended that different brands or grades of oil not be mixed in the hydraulic or hydrostatic systems.

4.2.3 Transmission Fluid

Hydraul 56 at temperatures above 40° F (4° C); SD SAE 5W20 for temperatures below 40° F (4° C)

4.2.4 Brake Fluid

SAE V1703D brake fluid should be used.

4.3 LUBRICANTS

4.3.1 Grades

CC (Commercial grade) oil is for service typical of certain heavy-duty diesel engines. It is designed to protect against low temperature deposits, rust and corrosion.

SE (Service grade) oil is designed to protect against oxidation, high temperature engine deposits and corrosion.

4.3.2 Engine Oil

SAE 10W30 motor oil of grades CC and SE.

4.3.3 Differentials and Dropboxes

SAE 90 (GL-5) gear oil.

4.3.4 PTO Gearbox

SAE 10W20 motor oil.

4.3.5 Grease

SAE high-temperature multi-purpose 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 1-2 lists the frequency of lubrication. Refer to Table 1-3 for a list of petroleum products suitable for use in the tractor.

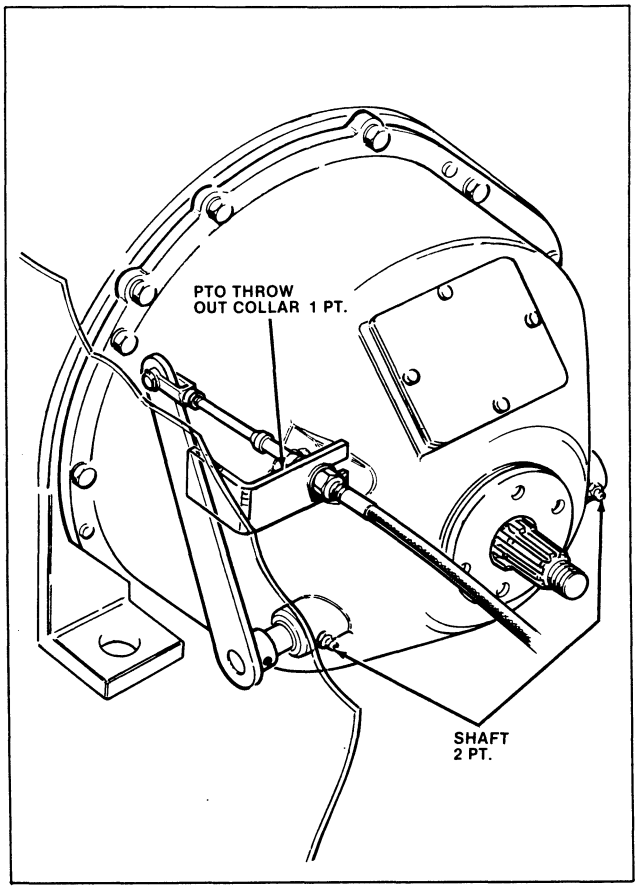

FIGURE 1-1: PTO Clutch Lubrication

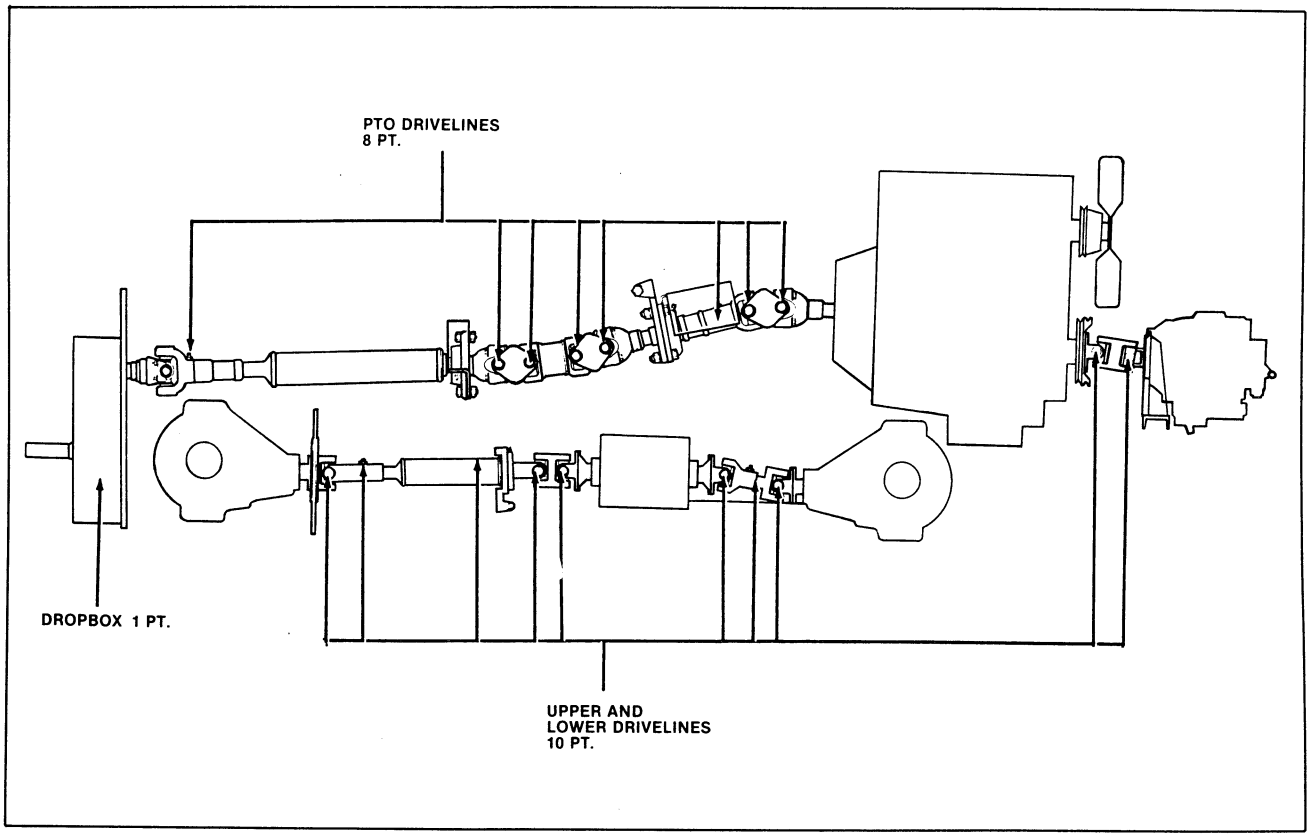

FIGURE 1-2: Driveline Lubrication

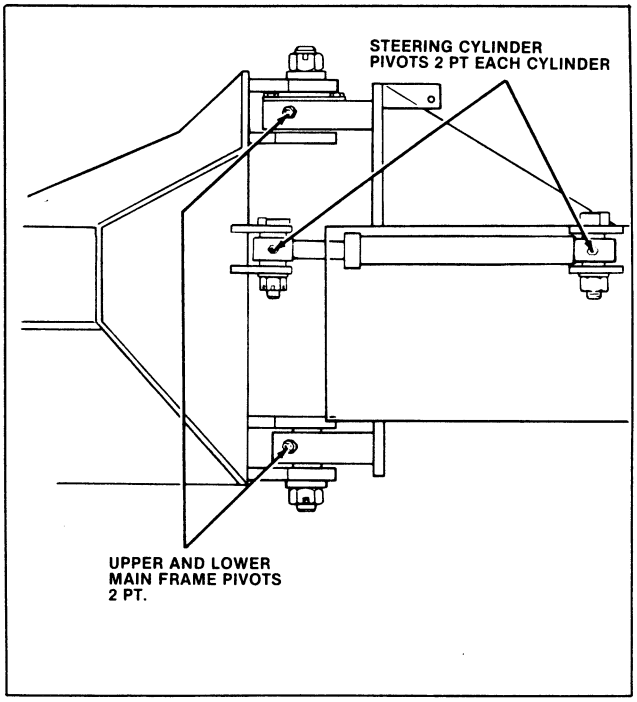

FIGURE 1-3: Steering Cylinder Pivots and Main Frame Lubrication

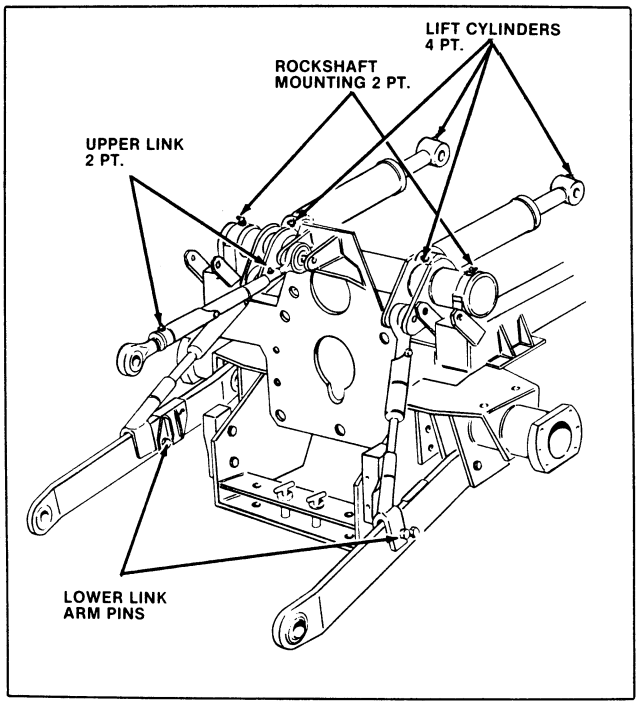

FIGURE 1-4: Three-Point Hitch Lubrication

TABLE 1-2: Lubrication Schedule

	50 HOURS	100 HOURS	150 HOURS	200 HOURS	250 HOURS	300 HOURS	350 HOURS	400 HOURS	LUBRICANT
Lubricate drivelines	•	•	•	•	•	•	•	•	B
Lubricate steering cylinder pivots	•	•	•	•	•	•	•	•B	
Lubricate main frame pivots	•	•	•	•	•	•	•	•	B
Lubricate front axle oscillation pivots	•	•	•	•	•	•	•	•	B
Change engine oil and filter	•			•				•	A
Change transmission oil								•	C
Change hydrostatic oil and filter								•	E
Change hydraulic oil and filter								•	E
Change axle dropbox oil								•	D
Lubricate seat pivots								•	B
Lubricate door hinges								•	A
Lubricate three-point hitch	•	•	•	•	•	•	•	•	B
Lubricate PTO clutch linkage	•	•	•	•	•	•	•	•	B
Lubricate PTO drivelines	•	•	•	•	•	•	•	•	B
Lubricate 1450 loader	•	•	•	•	•	•	•	•	B

TABLE 1-3: Lubricant Brands

	IMPERIAL	SHELL	TEXACO	GULF
A	Essolube HDX	Rotella S	Ursa Tex	Gulflube XHD
B	Unitol	Alvania EP2	Marfak AP	Super Crown EP 2
C	Hydraul 56	Donax TD	Texaco TDH	Duratran
D	Gear Oil GX 80W90	Spirax	Multigear EP	Gearlube HT
E	Dexron	Donax TG	Texamatic	Automatic Transmission Fluid

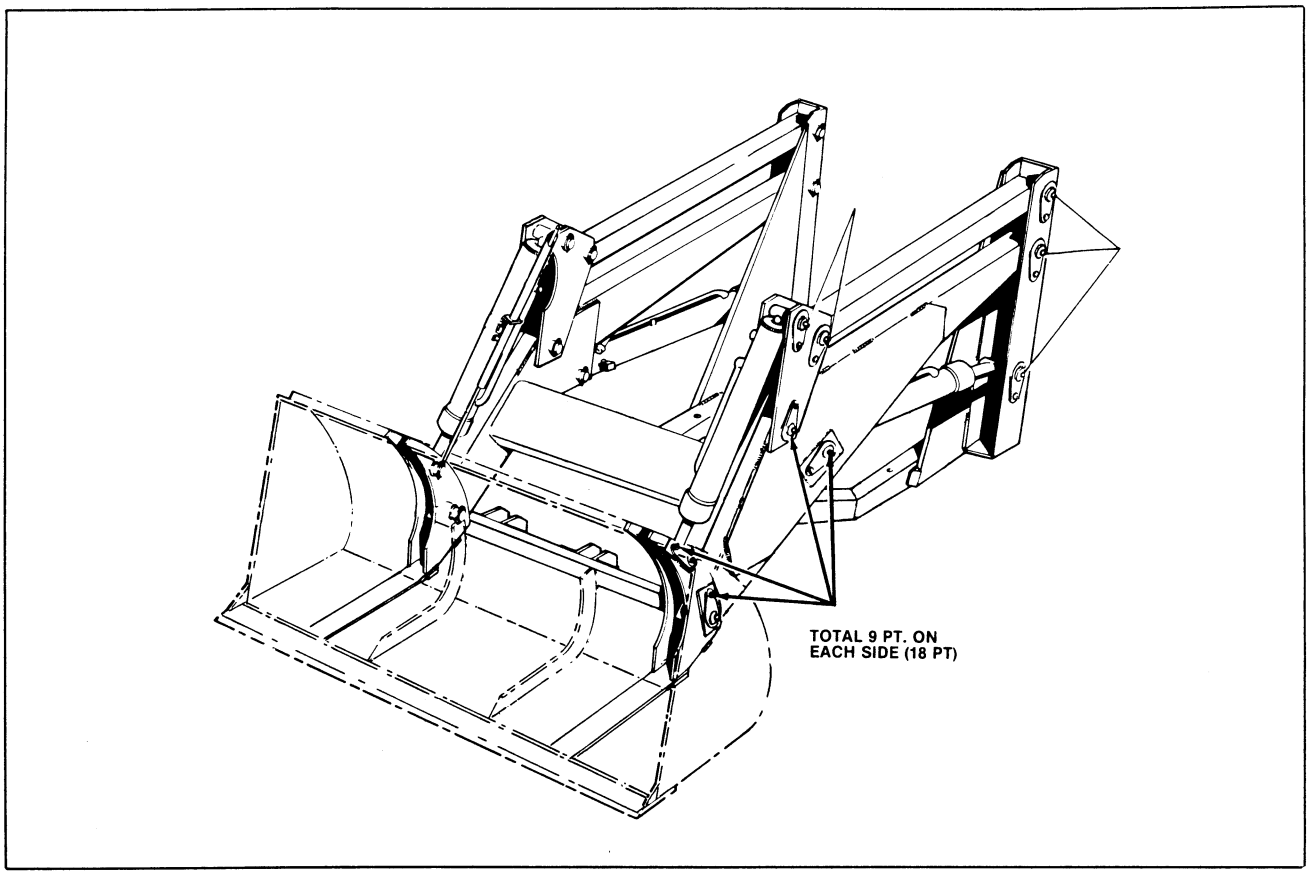

FIGURE 1-5: Loader Lubrication

6 Belts and Filters

6.1 GENERAL

Refer to Table 1-4 for correct replacement belts and filters. Refer to Figure 1-6 for filter locations.

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 preventive; clean cloths and various fluids to refill all systems to required levels.

7.2 PREPARATION OF ENGINE FOR STORAGE

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

7.3 PREPARATION OF TRACTOR FOR STORAGE

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

1. Drain crankcase.
2. Install new engine oil fiilters.
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 fluid.
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 of drive belts and inspect compressor, alternator and fan belts for condition.
12. Remove and store both batteries.
13. Clean tractor and touch up all scratched or chipped surfaces.
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 or tape, seal the following openings: air cleaner inlet, exhaust muffler, fuel tank breather tube and car 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

NOTE

Charge to a full charge state every 30 days.

If the tractor is to be stored for more than 30 days, proceed as follows:

1. Remove batteries from tractor.
2. Check electrolyte level to make sure it is at bottom of cell filler necks.
3. Check battery charge with a hydrometer. If necessary, charge batteries.
4. Store batteries in a cool, dry place.
5. Clean battery tops and keep batteries dry to reduce self-discharge.

7.5 PREPARATION AFTER STORAGE

When tractor is taken out of storage, the following steps are to be taken:

1. Inflate tires to recommended pressure.
2. Check cooling system level.

TABLE 1-4: Belts and Filters

Component	Part Numbers			
	Year 1981	Year 1980	Year 1978	Year 1977
Fan Belt	34922	34922	34922	34922
Compressor Belt	47613	47613	47613	47613
Engine Oil Filter Element	34778	34778	34778	34778
Fuel Filter Element	34827	34827	34827	34827
Hydrostatic Circuit Element	34890	34890	34890	34890
Hydraulic Circuit Element	SW-6502	SW-6502	SW-6502	SW-6502
Cab Air Intake Element	48321	48321	48321	48469
Recirculating Filter	55161	55161	51385	N/A
Air Cleaner Element (Primary)	51933	51933	362103VI	362103V1
Air Cleaner Element (Safety)	51934	51934	N/A	N/A

3. Check oil levels in crankcase, 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 THAT ALL OPERATING CONTROLS ARE IN THE NEUTRAL AND PARKBRAKE ENGAGED.

OPERATE CONTROLS ONLY FROM THE OPERATOR'S SEAT.

STOP ENGINE BEFORE PERFORMING ANY WORK OR MAINTENANCE ON THE TRACTOR.

KEEP ALL SHIELDS IN PLACE.

DO NOT START OR OPERATE TRACTOR IN A CLOSED BUILDING.

BE ALERT

Initial startup can place 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 any attempt is made to start the unit.

2. If fuel filter has been changed prior to startup, prime filter lines.

3. Never crank engine for longer than 30 seconds. Allow two min. for starting motor to cool between cranking cycles.

4. Battery must be fully charged (1.270 specific gravity hydrometer reading). This reading should not be taken immediately after charging or discharging battery.

5. Use cold starting aid if ambient temperature is below 50° F (10° C) 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 hydrostatics to warm up and circulate through system. Idle tractor 30 to 45 min. for oil to reach operating temperature.

10. If engine does not start within 30 seconds (assuming starting aids are used as necessary and cranking speed is ample) engine is most likely not receiving fuel.

11. If white smoke comes from exhaust, engine is receiving fuel but more starting aid is needed.

12. If exhaust is clear, fuel system is not delivering fuel to combustion chambers and the following checks should be made:

    a. Check that fuel system is primed adequately.

    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 fuel line.

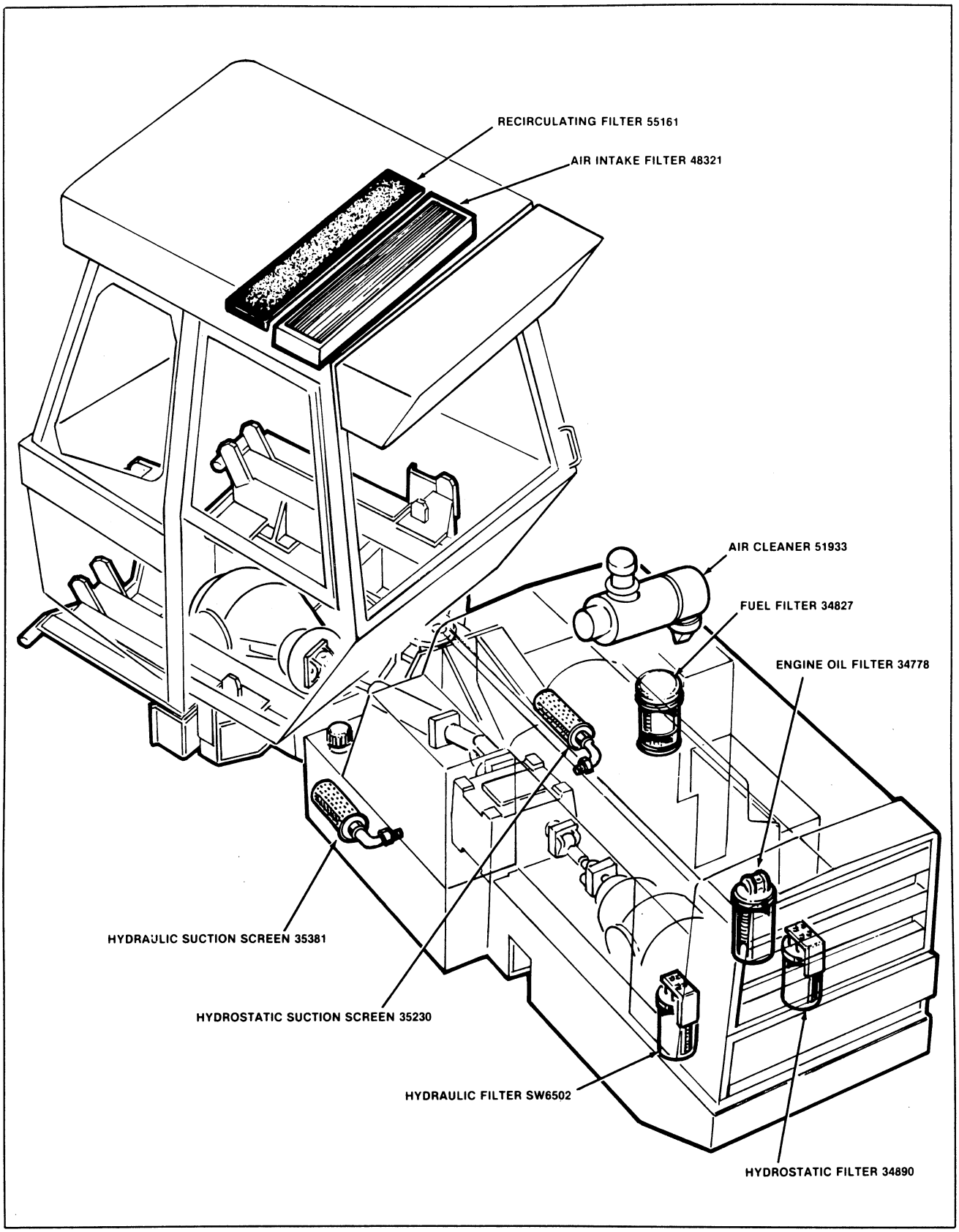

FIGURE 1-6: Filter Locations

SECTION 2: ENGINE SYSTEMS

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SECTION 2: ENGINE SYSTEMS

1 Introduction

The 150 Tractor has a Perkins four cylinder, 236 cu in., 71 hp engine. This section discusses the engine and related sub-systems. For more detailed overhaul procedures, refer to the Perkins Workshop Manual available from the following Perkins distributors, or contact one of the Perkins dealers listed at the manual back.

AUSTRALIA

Perkins Engines Division
P.O. Box 156
Dandenong, Victoria 3175
Australia
Telephone: 792-0431
Telex: AA 30816
Cables: 'Perkoil'

BRAZIL

Motores Perkins S.A.
Caixa Postal 30.028
c Sao Paulo
Estado de Sao Paulo
Brazil
Telphone: 443-1499
Telex: 23715
Cables: 'Perkoil' Sao Paulo

CANADA

Perkins Engines Canada Ltd.
7 Meridian Road
Rexdale, Ontario
Canada
Telephone: 677-4960
Telex: 0221225
Cables: 'Perkoil' Toronto

FRANCE

Moteurs Perkins S.A.
55 Boulevard Ornano
93203 Saint-Denis
France
Telephone: 243-04:40
Telex: 62251 Saint-Denis
Cables: 'Perkoil' Paris

GREAT BRITAIN

Perkins Engines Limited
Peterborough
England
PE1 5NA
Telephone: Peterborough 67474
Telex: 32132
Cables: 'Perkoil' Peterborough

ITALY

Motori Perkins S.p.A.
22100 Como-Camerlata
Via Pasquale Paoli 9/A
Italy
Telephone: 504885
Telex: 38063
Cables: 'Perkoil' Camerlata

UNITED STATES

Perkins Engines Inc.
P.O. Box 283
24175 Research Drive
Farmington, Michigan 48024
U.S.A.
Telephone: 313-477-3900
Telex: 023-5300
Cables: 'Perkoil' Farmington

1.1 GENERAL

Because of the close integration between the engine and certain engine systems, some repetition of information is unavoidable. Refer to the specific subsection for more detailed information.

1.2 SPECIFICATIONS

1.2.1 Fluids and Capacities

SYSTEM	TYPE OF FLUID	CAPACITY
Engine Oil	5W20/10W30 CC CE	8.5 qt US (8 L)
Coolant	1:1 glycol/water mixture	17 qt US (16 L)
Fuel Oil	No. 2 diesel	34 gal US (120 L)

Cooling System Pressure . . . . . 7 psi (49 kPa)

Oil Pressure . . . . . 30 to 60 psi (200 to 410 kPa)

1.2.2 Torque Values

Front Engine Mounts . . . . . 50 lbf ft (68 N·m)

Rear Engine Mounts . . . . . 90 lbf ft (122 N·m)

Driveline Capscrews . . . . . 25 to 27 lbf ft (34 to 37 N·m)

Battery Cable Terminal Nuts . . . . . 5 to 10 lbf ft 7 to 13 N·m)

Air Cleaner Mounting Nuts . . . . . 31 lbf ft (42 N·m)

Muffler Mounting . . . . . 31 lbf ft (42 N·m)

TABLE 2-1: Capscrew Torque

CAPSCREW SIZE	GRADE 5	GRADE 8
5/16 - 18 UNC	17 lbf ft (23 N·m)	25 lbf ft (34 N·m)
5/16 - 24 UNF	19 lbf ft (26 N·m)	27 lbf ft (37 N·m)
3/8 - 16 UNC	31 lbf ft (42 N·m)	44 lbf ft (60 N·m)
3/8 - 24 UNF	35 lbf ft (47 N·m)	50 lbf ft (68 N·m)
7/16 - 14 UNC	49 lbf ft (66 N·m)	70 lbf ft (95 N·m)
7/16 - 20 UNC	55 lbf ft (75 N·m)	78 lbf ft (106 N·m)
1/2 - 13 UNC	75 lbf ft (102 N·m)	106 lbf ft (144 N·m)
1/2 - 20 UNC	85 lbf ft (115 N·m)	120 lbf ft (163 N·m)

1.2.3 Filters

TABLE 2-2: Replacement Filters Part Numbers

	MODEL YEAR			
	1977	**1978**	**1980**	**1981**
Oil Filter	34778	34778	34778	34778
Primary Air Filter	362103V1	362103V1	51933	51933
Safety Air Filter	N/A	N/A	51934	51934
Fuel Filter	34827	34827	34827	34827

1.3 TROUBLESHOOTING

This is a guide for locating the correct troubleshooting chart. Use this chart when more than one system is involved.

PROBLEM		POSSIBLE FAULTY SYSTEM
Engine does not start	Subsection 6	Cold Start
	Subsection 4	Air Intake/Exhaust
	Subsection 2	Fuel
Excessive smoke under load	Subsection 2	Fuel
	Subsection 4	Air Intake/Exhaust
Loss of or no power	Subsection 2	Fuel
	Subsection 4	Air Intake/Exhaust
	Subsection 5	Lubrication
Excessive fuel consumption	Subsection 2	Fuel
	Subsection 4	Air Intake/Exhaust
Crankcase sludge	Subsection 5	Lubrication
	Subsection 3	Cooling
Dilution of oil	Subsection 2	Fuel
	Subsection 3	Cooling
Low oil pressure	Subsection 2	Fuel
	Subsection 5	Lubrication
	Subsection 3	Cooling
Coolant temperature high	Subsection 3	Cooling
	Subsection 4	Air Intake/Exhaust

1.4 ENGINE REPLACEMENT

CAUTION

SET PARKBRAKE. CHOCK FRONT AND REAR OF AT LEAST TWO WHEELS. PIN ARTICULATION LOCK (1981 MODEL).

NOTE

These procedures require two persons.

1.4.1 Special Tools and Equipment

1. Lifting hoist of two tons (2 tonnes) capacity
2. Torque wrench with 90 lbf ft (122 N·m) capacity
3. Engine stand
4. Hose caps

1.4.2 Removal

1. Remove four thumbscrews securing rear panel to tractor frame (Figure 2-1). Remove rear panel.
2. Remove grill screen.
3. Remove two locknuts at each fuel tank securing hood rear.
4. Remove capscrews, nuts and lockwashers from front mounting brackets on each side of hood.
5. Remove four screws from hood top.
6. Disconnect fuel tank breather hoses from breather. Cap hoses.
7. Remove air cleaner restriction gauge tube from hood right rear.
8. Loosen clamp and remove air cleaner extension with weathercap.
9. Remove hood.
10. Drain engine coolant through radiator petcock and drain port (Figure 2-2).
11. Remove upper and lower radiator hoses.
12. Disconnect fuel return line, running from filter to left tank, from filter. Cap and label.
13. Disconnect front ground cable at engine left front.
14. Disconnect battery ground cables at left rear of engine.
15. Disconnect cab heater return hose (Figure 2-2) and supply hose (Figure 2-3) at engine connections. Cap ends and label.
16. Disconnect suction hose at fuel lift pump. Cap end.
17. Remove three nuts securing exhaust pipe to manifold. Loosen clamp at muffler. Remove exhaust pipe.
18. Disconnect clamps at air cleaner outlet and engine air intake ports. Remove air intake tube (Figure 2-4).
19. Disconnect water temperature sender wire at sender, located at top rear of engine. Label.
20. Disconnect ether atomizer at engine air intake port. Put atomizer with cold start aid at right fuel tank.
21. Remove thermoguard from engine block (1981 Model).

WARNING

OPERATE HYDRAULIC CONTROLS SEVERAL TIMES TO RELIEVE PRESSURE IN HYDRAULIC LINES.

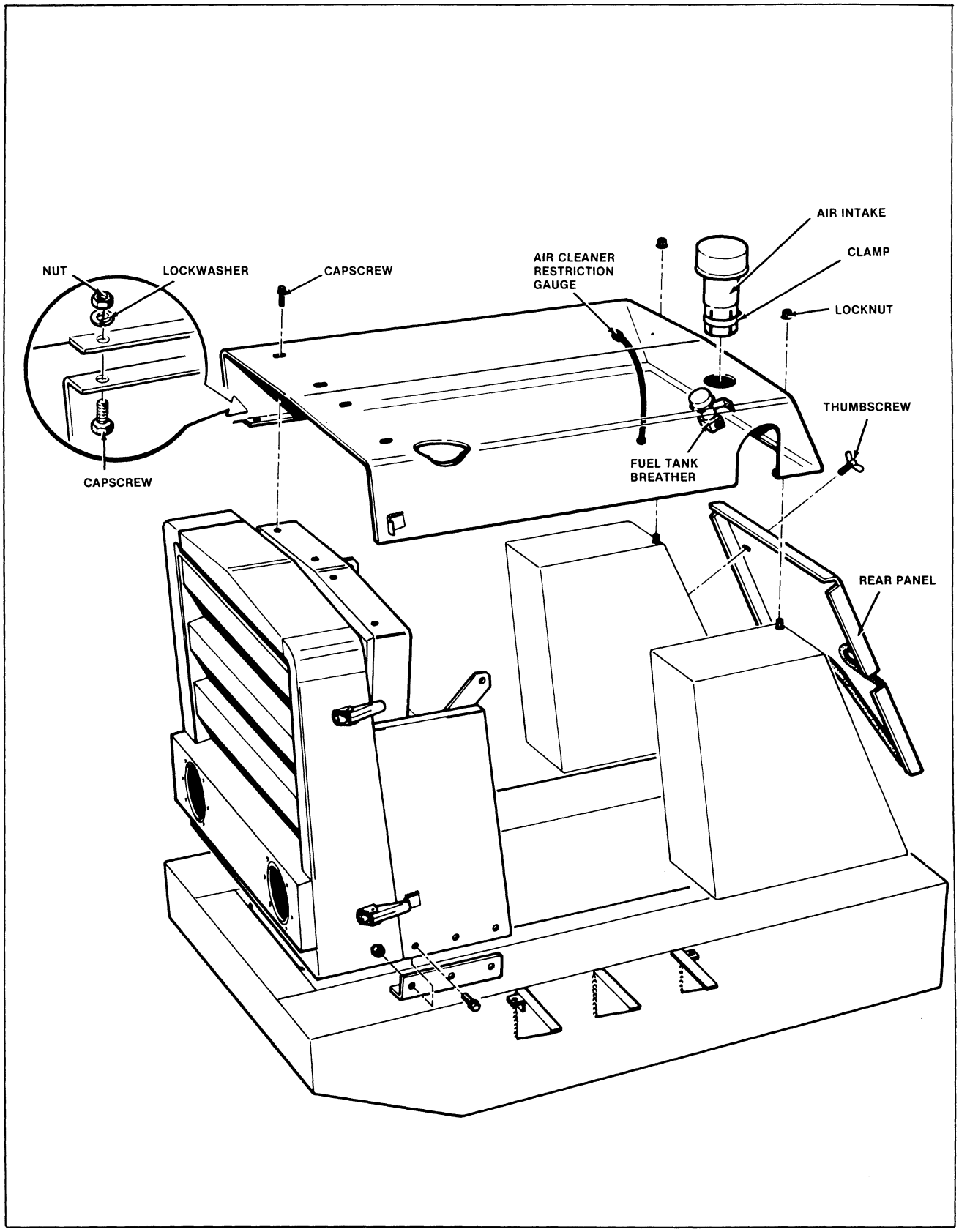

FIGURE 2-1: Hood Removal

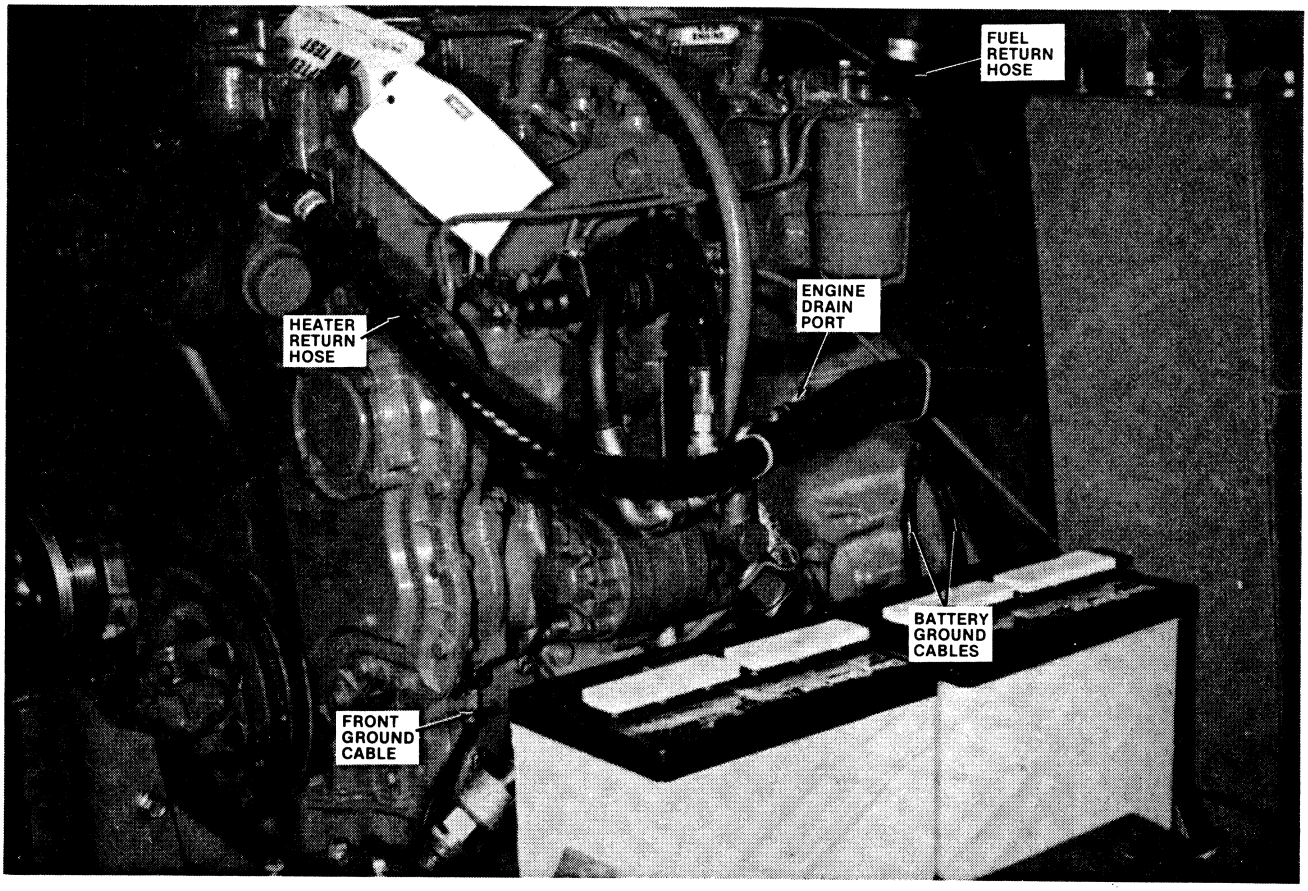

FIGURE 2-2: Engine Left Side

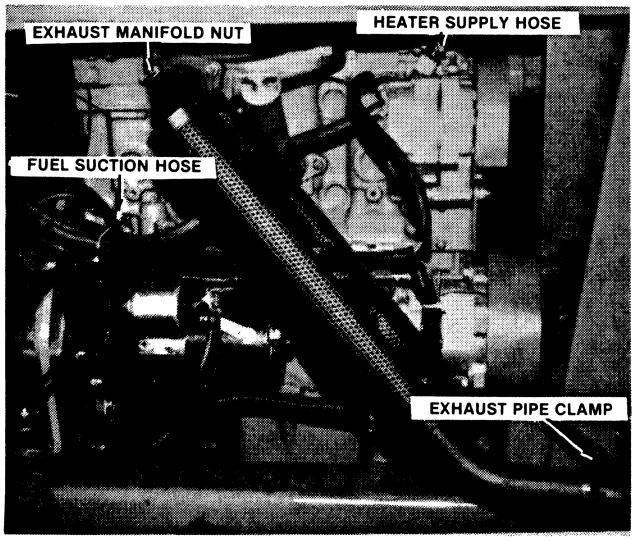

FIGURE 2-3: Engine Right Side

22. Disconnect hydraulic suction, implement and steering hoses from hydraulic pump. Cap ends and label. Elevate hoses clear of engine. Leave balance hose on hydraulic pump and pump with engine (Figure 2-5).

23. Disconnect cable at alternator. Label. Remove plug (Figure 2-6).

24. Disconnect compressor and carefully wire to frame, clear of engine. It is unnecessary to discharge air conditioning system or disconnect air conditioning lines at compressor.

25. Disconnect and label electrical leads at starter (Figure 2-7).

26. Disconnect oil pressure sending wire at sender. Label (Figure 2-8).