VERSATILE

FORD
NEW HOLLAND

Service Manual

Tractor
1150

Reprinted

40115010

1150 TRACTOR SERVICE MANUAL

VERSATILE

VERSATILE FARM EQUIPMENT COMPANY

A division of Versatile Corporation

1260 CLARENCE AVENUE, WINNIPEG
MANITOBA, CANADA, R3T 1T3/(204) 284-6100

74801
JUNE 1984
PRINTED IN CANADA/8C/LG

FOREWORD

This service manual provides instructions for troubleshooting, removal, inspection, replacement and overhaul of 1981, 1982 and 1983 Model 1150 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.

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 manual 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 practised by all service personnel.

GENERAL SAFETY

1. Mount a fire extinguisher in the service area. Maintain it according to manufacturer's recommendations.
2. Never operate tractor in a closed building. If it is absolutely necessary to do so, ensure building is well ventilated and use ducting to channel exhaust fumes outside.
3. Always keep clothing relatively tight and belted. Remove jewelry or any objects that might catch in moving parts.
4. Use steps and handholds when entering or leaving tractor.
5. Park tractor on a clear, level area before servicing. Center steering, put all controls in neutral, set parkbrake, shut down engine and remove key. Engage articulation lock and chock wheels.
6. Operate all tractor controls from operator's seat.
7. Clear personnel before moving tractor.

TRANSPORT SAFETY

1. Use a strong chain, cable or tow bar and attach securely to front frame or drawbar of tractor. Do not tow tractor faster than 25 km/h (15 mph).
2. Use a trailer of at least 22 680 kg (25 ton) capacity to haul tractor.
3. Chain tractor securely to trailer, block wheels, set parkbrake and engage articulation lock to limit tractor movement.

JACKING SAFETY

1. Ensure jacks meet or exceed capacities listed in Special Tools and Equipment sections throughout this manual.
2. Ensure parkbrake and articulation lock are engaged and appropriate wheels are chocked or blocked.
3. Brace swing frame with strong wedge on frame pivot and engage articulation lock to prevent jackknifing.
4. Ensure jack is solid against component to be raised.
5. Use heavy block as base for jack. Block should be long enough to prevent jack sinking, tipping or shifting. Any additional blocks should be under jack.
6. Jack only high enough to install appropriate capacity safety stands.
7. Check jack immediately after starting lift. Lower jack immediately if jack slips or tilts.
8. Do not raise tractor or component higher than jack's limit.
9. Place safety stands under tractor or component and lower jack so that stands take the weight. Do not trust jack to support the weight while working.

HOIST SAFETY

1. Use a chain hoist and frame to lift tractor or components. Follow capacities recommended in Special Tools and Equipment sections throughout the manual.
2. Protect yourself from injury while raising tractor or components by observing the following precautions:
   a. Do not stand on tractor when lifting.
   b. Keep hands away from pinch points where parts pivot or where hoist chains or cables tighten against frame.

c. Do not let tractor or component swing and strike personnel or hoist frame as it leaves ground.

d. Keep support stands nearby and place under lifted item when the necessary height is reached.

e. Do not go under tractor or component supported by hoist. Place support stands of recommended capacity under item before working on it.

MAINTENANCE SAFETY

1. Shut down engine before repairing tractor.

2. Be alert when approaching tractor while it is running, especially around the articulation joint.

3. Engage articulation lock during tractor overhaul operations.

4. Never service, lubricate, clean or adjust tractor while it is running.

5. Before working on any hydraulic system component, shut down engine, set parkbrake, turn steering wheel and move implement control levers backwards and forwards several times to relieve system pressure. Disconnect any component that may be connected to the remote couplers.

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 remove engine radiator pressure cap while engine is hot. Allow it to cool to 74° C (165° F) before removing pressure cap.

9. Shut down engine and remove key before making any linkage adjustment.

10. Welding fuel tanks is dangerous and not recommended.

11. Repair adhesive is very flammable. Keep adhesive and its vapors away from heat, sparks or flame.

12. During adhesive use and until vapor is dissipated, avoid using spark producing electrical equipment. Keep container closed when not in use.

13. Use adhesive only in a well ventilated area.

FUEL AND FLUID SAFETY

1. Do not smoke and avoid open flames when:

   a. Filling fuel tanks.

   b. Filling batteries.

   c. Working on air conditioning systems. Refrigerant vapor and flame combine to form a lethal gas.

2. Never use an open pail or can to transport fuel. Use only an approved container manufactured for that purpose.

3. If clothing is splashed with fuel, change immediately. Fuel soaked clothes are an extreme fire hazard.

4. Dispose of all fuel soaked rags. Do not leave them lying around work area where they may be exposed to flame, spark or cigarette smoking.

SECTION 1: SPECIFICATIONS AND DATA

Table of Contents

SECTION 1: SPECIFICATIONS AND DATA

1 Introduction

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

2 Hoists and Jacks

Refer to Safety Section at beginning of manual.

3 Specifications

3.1 AIR CLEANER

Type . . . . . Dual element, dry type with safety element, precleaner, exhaust aspirated, air intake restriction warning light

3.2 AIR CONDITIONER

Charge . . . . . 3 (3.5 lb)

Oil Level . . . . . 200 mL (7 oz)

3.3 AXLES

Type . . . . . Spiral bevel differential unit, outboard planetary, floating ring gear final drive

Differential Ratio 4.63:1
Lubrication . . . . . SAE 85W140

Oil Capacity . . . . . 42 L (11.1 gal US)

Planetary Ratio 5.625:1

Final Ratio 26.04:1

3.4 BRAKES

Type
Mechanical . . . . . Twin disc, twin caliper
Powershift . . . . . Single disc, twin caliper

Disc
Mechanical . . . . . 430 mm (17 in.) driveline mounted on each side of transmission

Powershift . . . . . 510 mm (20 in.) driveline mounted on each side of transmission

Caliper . . . . . Twin piston, non-floating, hydraulically actuated by foot pedal

Parkbrake . . . . . Integral with hydraulic brake, self-adjusting, actuated by overcenter lever

3.5 CAB

Type . . . . . Independent module type with rollover protective structures (ROPS ASAE S336.1)

Seatbelt . . . . . SAE J141, SAE J385

3.6 CLUTCH

Type
Mechanical . . . . . 394 mm (15.5 in.) dia, three plate dry-type, safety start switch
Powershift . . . . . 394 mm (15.5 in.) dia twin torsional damper, safety start switch

3.7 COOLING SYSTEM

Capacity . . . . . 80.4 L (85 qt US)

Radiator Core Area (Frontal) . . 1.25 m^2 (1 935 $in.^2$)

Fan . . . . . 915 mm (36 in.) sucker-type, geardriven

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

3.8 DIMENSIONS

Wheelbase . . . . . 3 560 mm (140 in.)

Overall Length . . . . . 6 890 mm (271 in.)

Nominal Turning Radius . . . . . 4 630 mm (182 in.) to centerline of drawbar

Turning Radius
(measure to outside of outer tire) . . . . . 6 475 mm (255 in.) with 20.8 × 42 duals

Maximum Operating Weight 20 800 kg (46 500 lb)

3.9 DRAWBAR

Type . . . . . Swinging clevis of 50 × 150 mm (2 × 7 in.) steel with wear block. Replaceable hardened bushing

Height . . . . . 455 mm (18 in.) to top of main member

3.10 ELECTRICAL

System Voltage . . . . . 12 V negative ground

Starting System . . . . . 24 V negative ground

Batteries . . . . . Two low maintenance, 8D 29 plates per cell

Alternator . . . . . 90A, two charge lines

Lamps . . . . . Two 60W headlights, eight 50W halogen work lamps, two red taillights and four flashers

Trailer Connector Cable . . . . . SAE J560B

3.11 ENGINE

Type . . . . . Cummins Big Cam III KTA-1150-C470 inline 6 cylinder turbocharged, aftercooled diesel

Maximum Torque . . . . . 2 130 N·m (1 570 lbf ft) at 1 500 r/min

Maximum Brake Horsepower . . . 350 kW (470 hp) at 2 100 r/min

Full Load Governed Speed . . . . . 2 100 r/min

Full Throttle (No load) Speed . . . . . 2 250-2 300 r/min

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

Crankcase Capacity . . . . . 38 L (40 qt US)

Full flow oil filter with bypass oil conditioner filter and oil to water cooler, 30° angular capacity oil pan.

3.12 EXHAUST SYSTEM

Muffler . . . . . One 254 × 381 mm (10 × 15 in.) dual

Inlet Diameter . . . . . 127 mm (5 in.)

Outlet Diameter . . . . . 152 mm (6 in.)

3.13 FRAME

Type . . . . . 42° angled aticulated frame

Oscillation . . . . . ± 15°

Articulation Lock . . . . . Bar-type

3.14 FUEL TANKS

Total Capacity . . . . . 1 515 L (400 gal US)
Type . . . . . 63.5 mm (2.5 in.) filler neck on both tanks. Remote breather is 610 mm (24 in.) above tanks

3.15 HYDRAULICS

Tank Capacity
Mechanical . . . . . 95 L (25 gal US)
Powershift . . . . . 83 L (22 gal US)

Type . . . . . Closed center; load sensing steering

Pump . . . . . Two variable displacement pressure and flow compensated piston pumps

Displacement . . . . . 0.045 L (2.77 in³) max

Max Flow at 2 100 r/min . . . . . 209.7 L/min (55 gpm US)

Max Flow at 1 000 r/min . . . . . 100 L/min (26.5 gpm US)

System Pressure . . . . . 17.2 MPa (2 500 psi)

3.15.1 STEERING VALVE

Displacement . . . . . 1.2 L (75 in.³)

Max Flow . . . . . 147.5 L/min (39 gpm)

Revolutions lock-to-lock 5.3

3.15.2 IMPLEMENT CONTROL VALVE

Type . . . . . 5 spool; individual flow on each spool adjustable 0° to 156° approx on all spools with detented positions; No. 1 includes float position

Pressure Release . . . . . 15 MPa ± 517 kPa (2 175 psi ± 75psi)

System Filtration . . . . . 100 mesh reusable screen filter on suction line; 25 micron replacement element on return line

Temperature Sensor . . . . . Alarm light set for 93° C (200° F)

3.16 OPTIONS

Engine Block Coolant Heater
Cold Start Aid
Differential Lock
Clutch Decelerator

3.17 RADIO

Type . . . . . AM/FM stereo cassette player

3.18 STEERING

Type . . . . . Hydrostatic, two 101.6 × 460 mm (4 × 18 in.) cylinders

3.19 TIRES

Inflation . . . . . See Table 1, outside tires (duals or triples) should have 14 kPa (2 psi) less pressure than inside tires

3.20 TRANSMISSION

Capacity
Mechanical . . . . . 18.5 L (19 qt US)
Powershift . . . . . 68.2 L (18 gal US)

Type
Mechanical . . . . . 8 forward, 4 reverse; constant mesh with sliding shift collars
Powershift . . . . . 12 forward, 2 reverse; constant mesh with hydraulic master clutch

Lubrication . . . . . Independent system with pump, filter, cooler and low pressure sensor

TABLE 1-1: Tire Inflation Chart

SIZE	PLY	NO BALLAST	MAX BALLAST
20.8 × 42	10	110 kPa (16 psi)	138 kPa (20 psi)
20.8 × 38	8	110 kPa (16 psi)	143 kPa (20 psi)
24.5 × 32	10	124 kPa (18 psi)	138 kPa (20 psi)
30.5 × 32	10	110 kPa (16 psi)	110 kPa (16 psi)

4 Fuel, Fluids and Lubricants

4.1 FUELS

The tractors operate on No. 2 diesel fuel, although they will also operate satisfactorily on other fuels within these specifications:

1. Less than one percent sulphur content.
2. Sediment and water 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. Less than 0.02 percent ash content.
6. Viscosity of 1.4 to 5.8 mm^2/s at 37.8° C (100° F).

Refer to Cummins Manual for further details.

4.2 FLUIDS

SAE J1703 Super Duty Fluid is recommended for all temperature usage.

4.2.2 Coolant

WATER: Clean and preferably soft

ANTIFREEZE: Use a good commercial grade glycol base antifreeze in the proportions recommended by its manufacturer. Do not use oil base or alcohol base antifreezes. Foaming and jelling could result and damage the cooling system.

IMPORTANT

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

IMPORTANT

Do not use Dow Chemical Dowtherm 209 brand antifreeze in the tractor. It is not compatible with the corrosion inhibitor.

Check engine coolant level daily and keep within 50 mm (2 in.) of surge tank filler neck. When adding coolant due to leakage, add one unit DCA to 3.75 L (1 gal US) water then mix at a 1:1 ratio with antifreeze.

4.3 LUBRICANTS

4.3.1 Grades

CD (Commercial grade) used in turbocharged diesel engines. It provides protection from bearing corrosion, engine wear and high temperature deposits.

SF (Service grade) provides increased oxidation stability and improved anti-wear. It also protects against rust, engine deposits and corrosion.

4.3.2 Engine Oil

Check engine oil daily. Do not mix brands or grades of oil. If it is necessary to change brands of oil, completely drain the engine and replace both filters before filling. Oil consumption may vary between 1 and 3 L (1 to 3 qt US) per day depending on loads and operating conditions.

RECOMMENDED OIL

Viscosity	Ambient Temp
10W30	– 25° to 35° C (– 13° to 95° F)
15W40	– 10° C and above (14° F and above)
20W40	0° C and above (32° F and above)

ALTERNATE OILS

Viscosity	Ambient Temp
10W	– 25° to 0° C (– 13° to 32° F)
20W20	– 5° to 20° C (23° to 68° F)
30	4° C and above (39° F and above)
40	10° C and above (50° F and above)

Below – 23° C (– 10° F), refer to Arctic Oil Recommendations in the Cummins Manual.

4.3.3 Differentials and Planetaries

Use SAE 85W140GL5 for tempertures above 32° C (90° F).

Use SAE 80W90GL5 for temperatures below 32° C (90° F)

4.3.4 Hydraulic and Transmisssion Oil

Use VERSATILE® HyGear 23 for temperatures above 4° C (40° F)

Use VERSATILE® HyGear 24 for temperatures below 4° C (40° F)

4.3.5 Grease

Use lithium complex grease for extreme pressure conditions. Use SAE high temperture, multi-purpose grease for all other fittings.

TABLE 1-2: Fuels, Fluids and Lubrication Schedule

	AS REQUIRED	DAILY 10 HOURS	WEEKLY 50 HOURS	MONTHLY 200 HOURS	400 HOURS	ANNUALLY	LUBRICANT[4]	NUMBER OF POINTS	SERVICE POINTS[5]
Change fuel system filter					•	•		1	27
Check brake fluid level			•	•	•	•	D	1	
Change coolant/install precharge element						•		1	
Change coolant filter (DCA)				•	•			1	25
Change engine oil and filters	•[1]			•	•	•	A	2	26,31
Lubricate differentials				•	•	•	C	9,19	
Change planetary/differential oil	•[2]				•	•	C	6	8
Change hydraulic oil					•	•	B	1	
Change hydraulic suction filter					•	•		1	33
Change hydraulic return filter				•	•	•		1	32
Change trans oil, wash filter screen					•	•	B	1	29,30
Change trans return filter	•[3]			•	•	•		1	28
Lubricate driveline			•	•	•	•	E	11	
Lubricate driveline steady bearing			•	•	•	•	E	1	11
Lubricate main pivot frame			•	•	•	•	E	1	20
Lubricate upper and lower pivots frame			•	•	•	•	E	2	21,24
Lubricate drag link pivot bearings			•	•	•	•	E	4	22
Lubricate steering cylinder pivots			•	•	•	•	E	4	23
Lubricate clutch cross shaft			•	•	•	•	F	2	2
Lubricate clutch shaft support bearing			•	•	•	•	F	1	1
Lubricate clutch release bearing		•	•	•	•	•	F	1	1
Lubricate door and window hinge pins						•	A	4	

1. Change oil after the first 50 hours of operation and every 200 hours thereafter.
2. Change oil after the first 30 hours of operation and every 400 hours thereafter.
3. Change filter after the first 50 hours of operation and every 200 hours thereafter.
4. See Table 1-3, Lubricant Brand Equivalency Chart.
5. See Figure 1-1, 1-2 or 1-3 for service point locations.

5 Lubrication

5.1 GENERAL

Service intervals recommended in this manual are based on operation under average conditions. Service the tractor more frequently when operating tractor in conditions of severe heat, cold, dust or humidity. Table 1-2 lists the points and frequency of lubrication. Refer to Table 1-3 for the lubricant brands meeting the required specifications. Figures 1-1 and 1-2 show the tractor lubrication points.

1. Check battery charge every 90 days. If not 1.270 specific gravity, charge batteries. See Electrical System, Section 3, LUBRICATION AND MAINTENANCE.

6 Belts and Filters

6.1 GENERAL

Refer to Table 1-4 for correct replacement belts and filters. Refer to Figure 1-3 for filter locations.

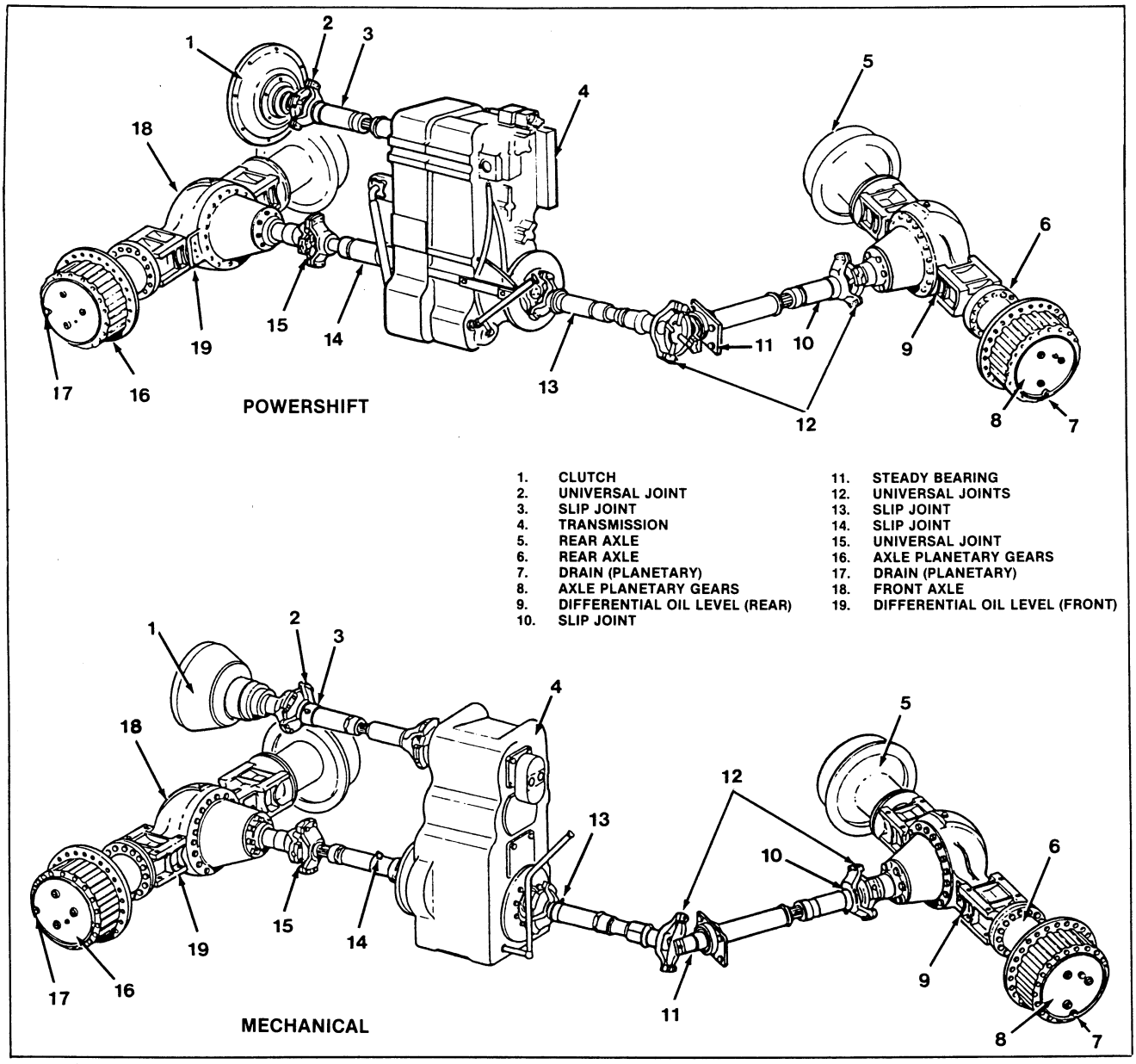

FIGURE 1-1: Driveline Lubrication Points

TABLE 1-3: Lubricant Brands

		VERSATILE	IMPERIAL	SHELL	TEXACO	GULF	CLASSIFICATION
A	Engine		Essolube XD3	Rotella T	Ursa Super Plus	Low Ash Super Duty 15W40	Factory fill is SAE 10W30 SF/CD above 4° C (40° F)
B	Trans Hyd Oil	HyGear 23 HyGear 24	Hydraul 56 Hydraul 50	Donax TD Donax TDL	Texamatic TDH	Duratran	SAE 20 SF/CD above 4° C (40° F) SAE 5W20 below 4° C (40° F)
C	Differential/ Planetary		Gear Oil GX	Spirax HD	Multigear EP	Gearlube	SAE 85W140 GL5 above 32°C (90°F) SAE 80W90 below 32° C (90° F)
D	Brake Fluid		Atlas Extra Heavy Duty 450	Super Heavy Duty Brake Fluid		H.D. Brake Fluid	SAE J 1703F All weather conditions
E	Grease		Unitol	Alvania EP2	Marfak AP	Super Crown E.P.2	SAE Multipurpose grease, high temp, all weather cond
F	Clutch Shaft Support Bearing		Unirex EP2				Extreme pressure conditions, lithium complex grease

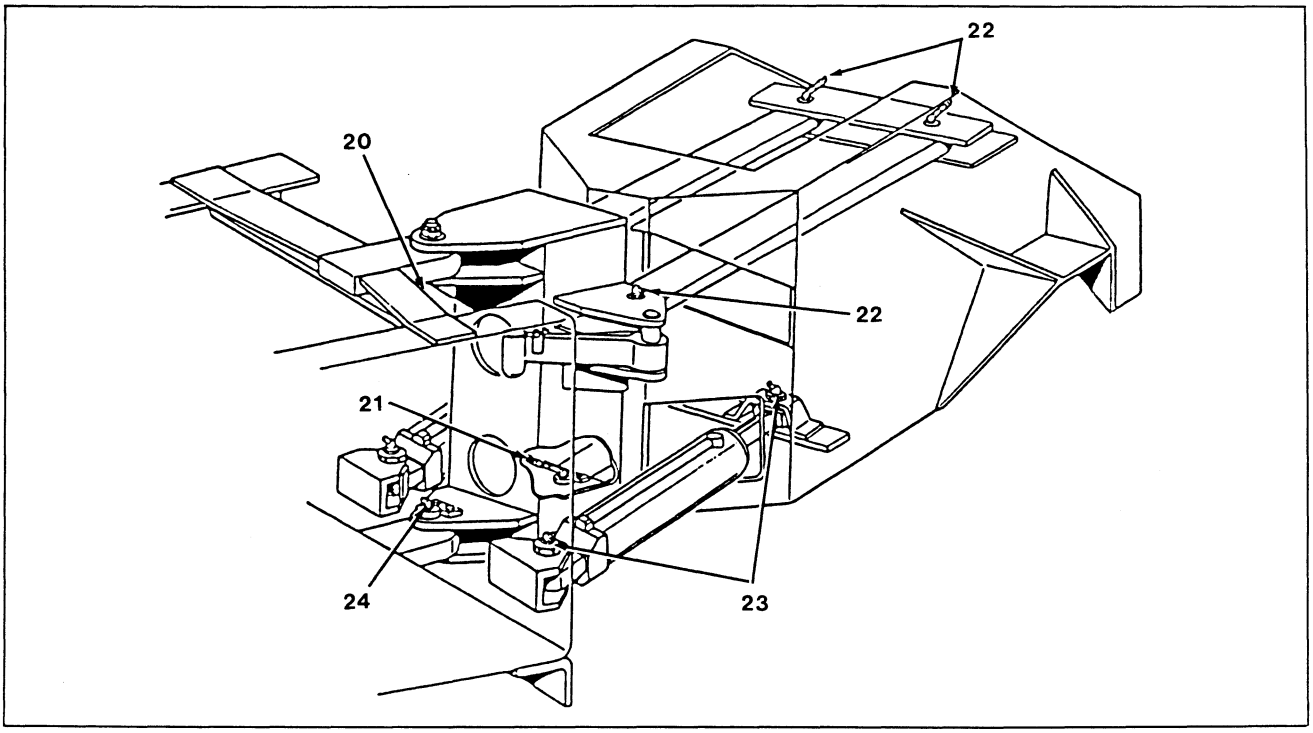

FIGURE 1-2: Steering Cylinder and Articulated Frame Lubrication Points

TABLE 1-4: Belts and Filters

Component	Part Numbers				
	Year 1981 (Mech)	Year 1982 (Mech)	Year 1982 (Power.)	Year 1983 (Mech)	1983 (Power.)
Engine Crankcase Filter	31133	31133	31133	31133	31133
Engine Bypass Filter	57124	57124	57124	57124	57124
Fuel Filter Element	61559	61559	61559	61559	61559
Air Cleaner Primary Element	63971	63971	63971	63971	63971
Air Cleaner Safety Element	63972	63972	63972	63972	63972
Water Filter	25881	25881	25881	25881	25881
Water Filter Precharged	26206	26206	26206	26206	26206
Transmission Circuit Element	63304	63304	68256	63304	68256
Hydraulic Suction Element	63290	63290	61071	63290	61070
Hydraulic Return Element	63297	63297	61070	63297	61070
Cab Pressurizer Panel Element	63218	63218	63218	63218	63218
Cab Recirculation Element	63077	63077	63077	63077	63077

7 Storage

7.1 STORING THE TRACTOR

1. Change hydraulic oil.
2. Change transmission oil.
3. Change engine coolant.
4. Drain and flush gear oil from differentials and planetary gear housings. Fill with new oil.
5. Change engine oil and filters.
6. Start engine. While engine is warming up, operate the transmission, hydraulic system, steering and differentials to distribute the new lubricants to components. Warm engine to at least 70° C (160° F); it may be necessary to shield the radiator to achieve this temperature. Stop engine.
7. Clean tractor of all debris, dirt and accumulated grease.
8. Drive tractor to storage location.
9. Relieve tension on alternator, air conditioner compressor and fan belts.
10. Coat all exposed hydraulic cylinder shaft areas with grease or a rust preventative.
11. Using plastic bags or tape, seal the following openings: air cleaner inlet, exhaust muffler, fuel tank breather and air conditioner air intake screens.
12. Touch up all scratches or chips with VERSATILE® paint.
13. Block up tractor to remove weight from tires. Remove dual tires.
14. Cover tires if they will be exposed to heat and/or direct sunlight.
15. If tractor is to be stored outside, cover with a waterproof canvas or other protective material.

7.2 STORING BATTERIES

1. Low maintenance batteries do not require charging before or during storage. Under normal conditions, storage life will be 12 months before recharging.
2. Check battery charge. If not 1.270 specific gravity, charge batteries. See Electrical

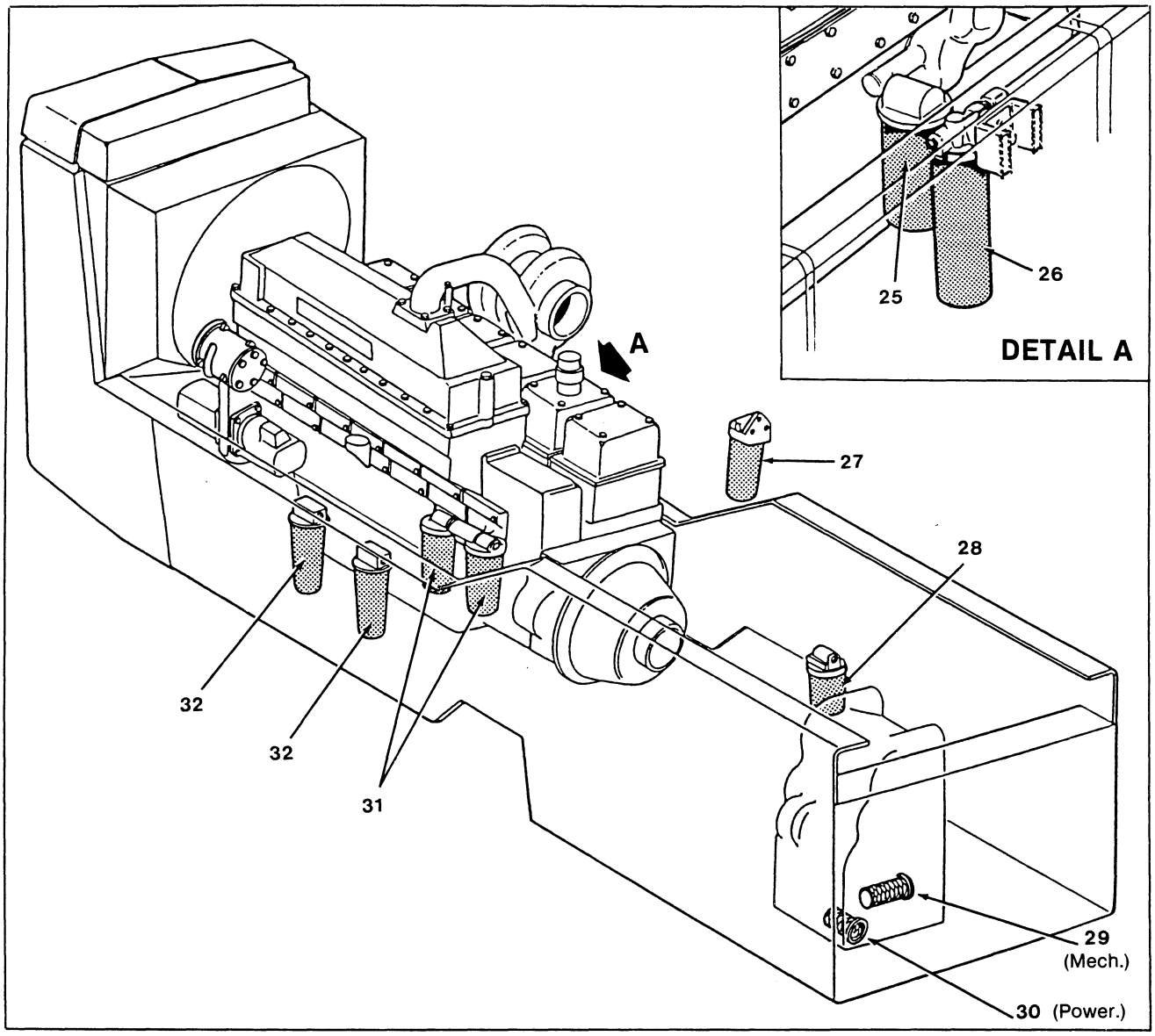

FIGURE 1-3: Filter Locations

System, Section 3, LUBRICATION AND MAINTENANCE.

WARNING

AVOID SMOKING OR OPEN FLAMES IN OR NEAR BATTERY CAHRGING AREA DURING OR FOR TWO HOURS FOLLOWING CHARGING

BE ALERT

3. Remove batteries from tractor and store in a dry, weatherproof area.

7.3 REMOVAL FROM STORGE

1. Remove protective covering from tractor tires and seals from air cleaner inlet, exhaust muffler, fuel tank breather and air conditioner air intake screens.

2. Remove blocks. Lower tractor onto tires.

3. Correct any leaks.

4. Inflate tires to recommended pressure.

5. Install fully charged batteries. Tighten cable clamps at both ends of cables.

6. Tension alternator, air conditioner compressor and fan belts.

7. Check fluid level of engine crankcase, axles and planetaries. transmission, hydraulic reservoir, master brake cylinder reservoir and engine coolant radiator.

8. If fuel filters were changed during or after storage, ensure filters, pump and lines are primed.

7.4 INITIAL ENGINE START-UP

Initial start-up can place abnormal loads on the cranking system. Do not crank the engine longer than 30 seconds. Allow at least 2 min between cranking cycles to permit starting motor to cool and batteries to recover.

1. Set parkbrake.

2. Set throttle to idle.

IMPORTANT

On initial start-up of engine, do not increase speed above 1 000 r/min, unless necessary to prevent stalling, until engine oil pressure is normal.

3. Press on clutch and put transmission in neutral. Hold clutch pedal to floor.

4. Turn keyswitch ON.

5. When engine starts, observe above IMPORTANT. Alternator warning light should go out. Release clutch slowly and transmission oil pressure warning light should go out within 30 seconds.

6. Warm engine to at least 50° C (120° F) before putting it under load.

If engine does not start after 30 seconds cranking cycle, repeat above starting procedures.

If engine still does not start, observe exhaust during cranking. If exhaust is clear, the engine is not receiving fuel. Check the following:

1. Dip check fuel tank level by inserting a clean stick (broom handle) through the fuel tank filler neck.

2. Fuel line obstruction or loose union connection.

3. Operation of fuel solenoid valve.

4. Fuel system for adequate priming.

5. Fuel pump operation for delivery of fuel.

SECTION 2: ENGINE SYSTEMS

Table of Contents

SECTION 2: ENGINE SYSTEMS

1 Introduction

The Versatile 1150 tractor uses a Cummins Big Cam III six cylinder KTA-1150-C470 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 operation and maintenance or engine shop manuals available from any Cummins dealer.

1.1 SPECIFICATIONS

1.1.1 Fluids and Capacities

Refer to Table 2-1.

TABLE 2-1: Fluids and Capacities

SYSTEM	FLUID	CAPACITY
Engine Oil	10W30 SF/CD	58.7 L (62 qt US)
Coolant Glycol/Water	1:1 Ratio of 80.4 L (85 qt US)	
Fuel Oil	No. 2 Diesel	1515 L (400 gal US)

Cooling System Pressure ..... 48 kPa (7 psi)
Engine Oil Pressure ..... 200-410 kPa (30-60 psi)

1.1.2 Torque Values

Engine Mounts ..... 95 N·m (70 lbf ft)
Starter Mounting Bolts ..... 90 N·m (65 lbf ft)
Hydraulic Pump Mounting Bolts ..... 90 N·m (65 lbf ft)
Fan Bolts ..... 144 N·m (106 lbf ft)
Alternator Pulley Nut ..... 108 N·m (80 lbf ft)

NOTE

For capscrews and nuts not specified in this section refer to Table 2-2.

1.1.3 Filters

Refer to Table 2-3.

1-2 TROUBLESHOOTING

Refer to Table 2-4, Troubleshooting Engine Systems. The troubleshooting chart lists most problems related to the engine systems. For more detailed troubleshooting information, refer to Cummins Service Bulletin No. 983643-CE "Tuneup Troubleshooting".

1.3 ENGINE REPLACEMENT

1.3.1 Special Tools and Equipment

1. Hoist, 2 700 kg (3 ton) capacity
2. Lifting fixture (Cummins Part ST-1258)
3. Two lift hooks (Cummins Part ST-1286)
4. Engine stand
5. Hose plugs

1.3.2 Removal

– CAUTION

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

DISCONNECT BATTERY CABLES FIRST, TO PREVENT ELECTRICAL DAMAGE FROM OCCURRING.

1. Drain engine oil from pan. Allow 10 min to drain completely and install drain plug. Torque to 90 N·m (65 lbf ft).
2. Drain cooling system through stopcock ports. Allow 15 min to drain system and tighten stopcocks.

TABLE 2-2: General Recommended Capscrew Torque Values

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)

TABLE 2-3: Replacement Filter Part Numbers

Component	Part Number
Engine Crankcase Filters	31133
Engine Bypass Filter	57124
Primary Air Filter	63971
Safety Air Filter	63972
Fuel Filter	61559
Water Filter	25881
Water Filter - Precharge	26206

3. Remove exhaust temperature and air intake vacuum sender connectors from engine harness (Figure 2-1).

4. Release clamps at both ends of exhaust pipe. Remove exhaust pipe and cover turbocharger and muffler openings.

5. Cut tie straps from aspirator hose and remove hose from muffler and air cleaner.

6. Release clamps at both ends of air intake tube. Remove intake tube and cover air cleaner and turbocharger openings.

7. Remove fan guards from tractor frame hinges.

8. Remove heater return hose from water pump housing.

9. Loosen clamps and remove water pump inlet hose.

10. Loosen radiator hose clamps at thermostat housing and remove hose.

TABLE 2-4: 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 aspirator system	Faulty water pump	Insufficient coolant	Faulty thermostats	Faulty indicator/gauge	Internal coolant leak	External coolant leak	Dirty radiator	Improper coolant mix	DCA not serviced	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			•		•			•	•			•	•	•			•											•				
Poor deceleration			•				•																									
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																												•	•	•	•	•

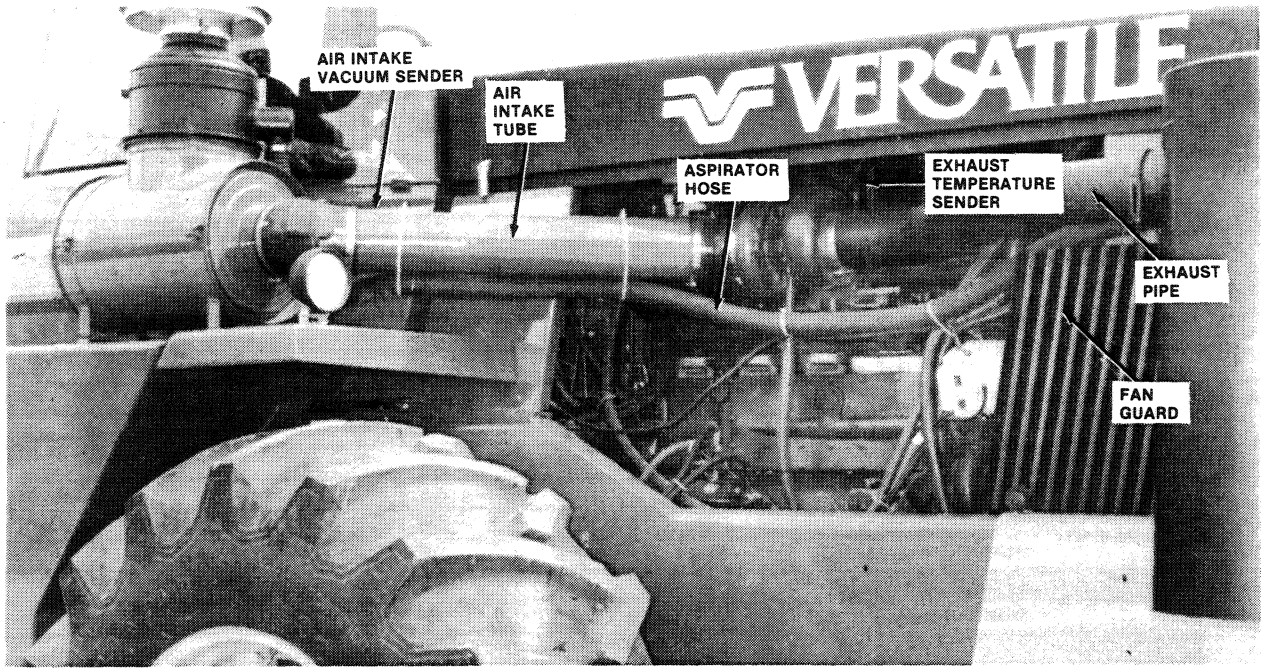

FIGURE 2-1: Tractor Right Side

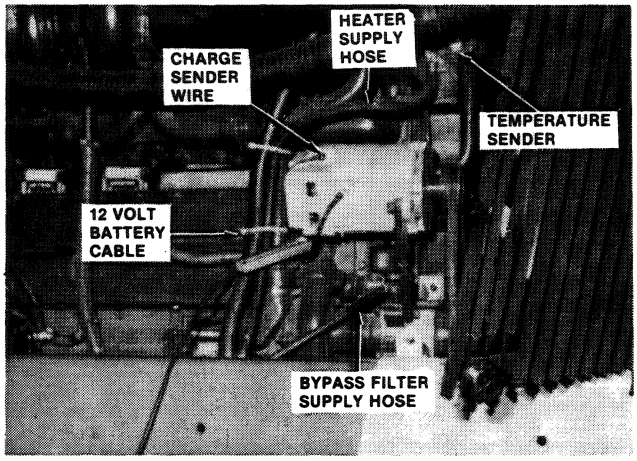

FIGURE 2-2: Engine Right Side

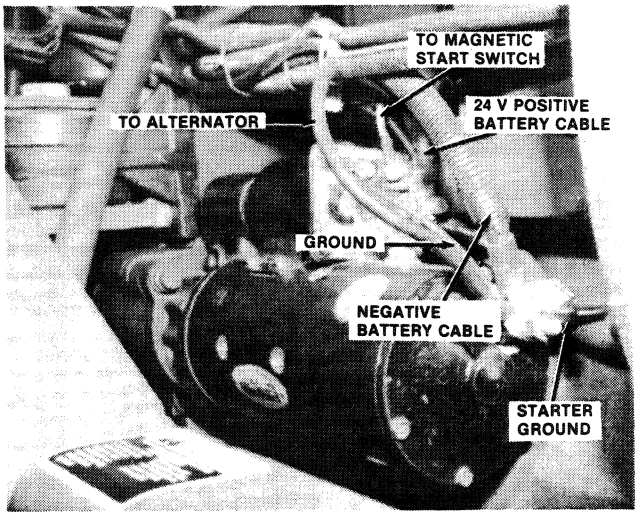

FIGURE 2-3: Starter Wiring

NOTE

Label all sender wires to ensure proper installation.

11. Disconnect coolant temperature sender from the engine harness (Figure 2-2).

12. Remove heater supply hose from thermostat housing.

13. Remove engine oil bypass filter supply hose from engine adaptor and return hose from drain pan.

14. Remove 12 volt battery cable from alternator. Disconnect charge sender wire.

15. Label and remove battery cable from starter, and secure cables away from engine (Figure 2-3).

16. Disconnect magnetic start switch harness from starter. Label each wire.

17. Disconnect thermoguard from engine harness (Figure 2-4).

CAUTION

DO NOT DISCONNECT AIR CONDITIONING HOSES. SYSTEM MUST REMAIN CLOSED TO PREVENT CONTAMINATING LINES OR DISCHARGING REFRIGERANT.

BE ALERT

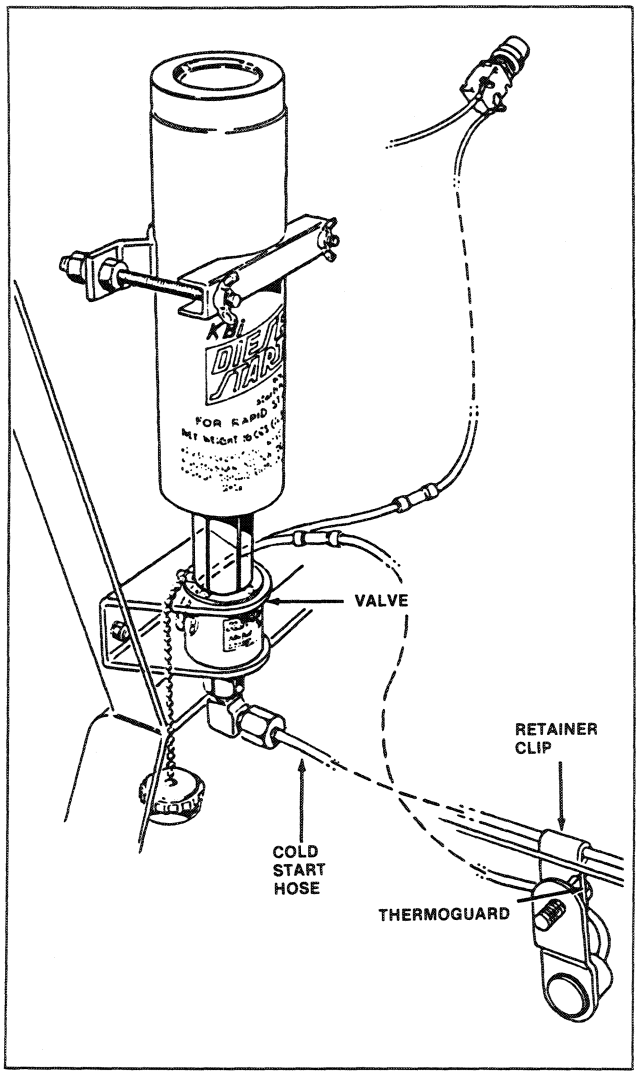

FIGURE 2-4: Cold Start

18. Remove cold start hose from valve. Secure hose behind retainer clip on engine.

19. Label and disconnect oil pressure sender wire from oil filter.

20. Remove air conditioning hoses mounting clamp from engine (Figure 2-5).

21. Loosen three capscrews and remove compressor pulley dust shield.

22. Relieve compressor belt tension and remove belts.

23. Disconnect compressor connector from engine harness.

24. Remove four capscrews, plainwashers and nuts from compressor and remove compressor from mounting bracket. Secure compressor to frame.

25. Disconnect tachometer sender from engine harness.

26. Disconnect fuel pump D.C. solenoid and decelerator from engine harness.

WARNING

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

BE ALERT

27. Remove fuel pump supply and injector return lines from engine.

28. Remove throttle cable from mounting bracket. Thread nuts back on cable.

29. Remove hydraulic pump mounting capscrews. Ease each pump from engine and secure to tractor frame.

NOTE

Do not remove hydraulic hoses from pumps to eliminate risk of contaminating hydraulic system.

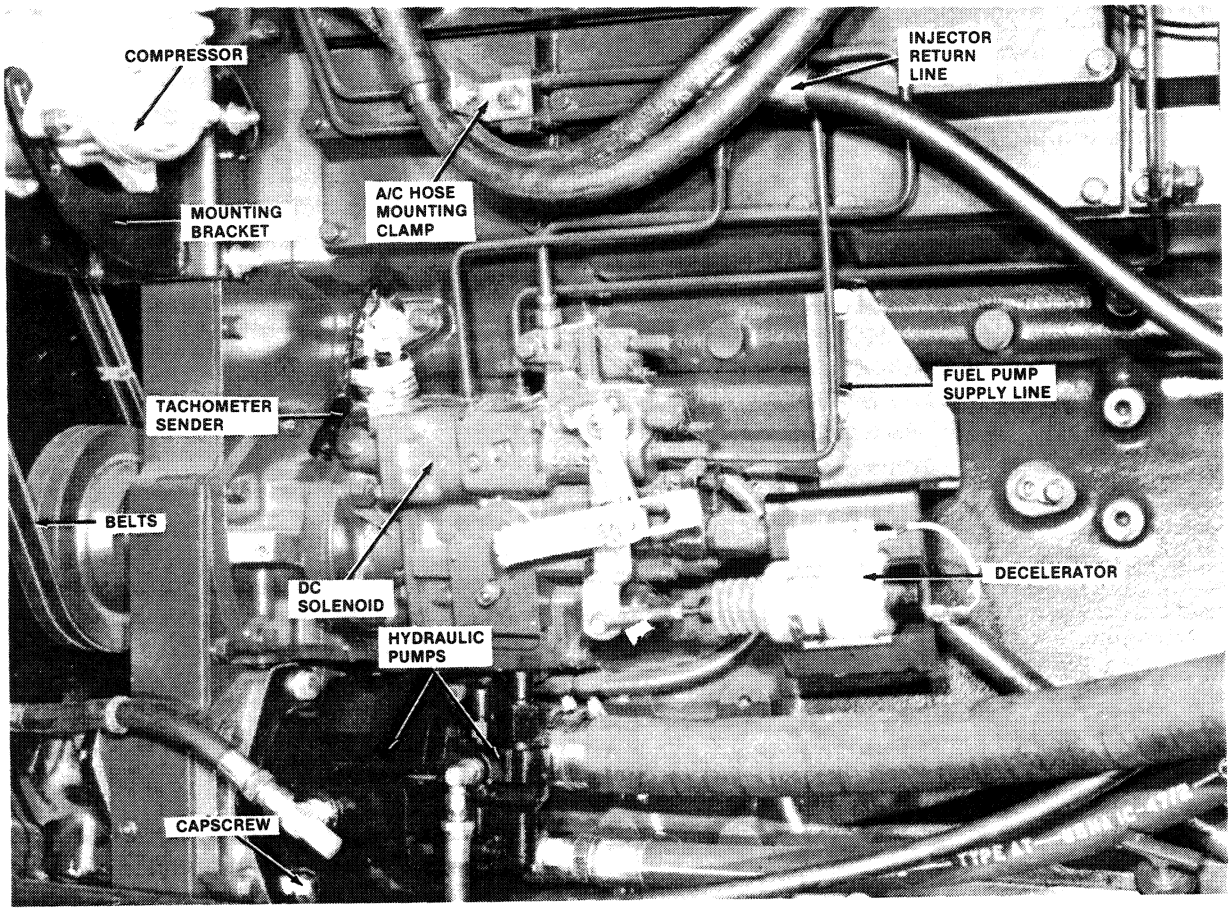

FIGURE 2-5: Engine Left Side

30. Remove clutch bearing lubrication hoses from clutch housing fittings (Figure 2-6).

31. Remove clevis pin from yoke end of clutch control rod.

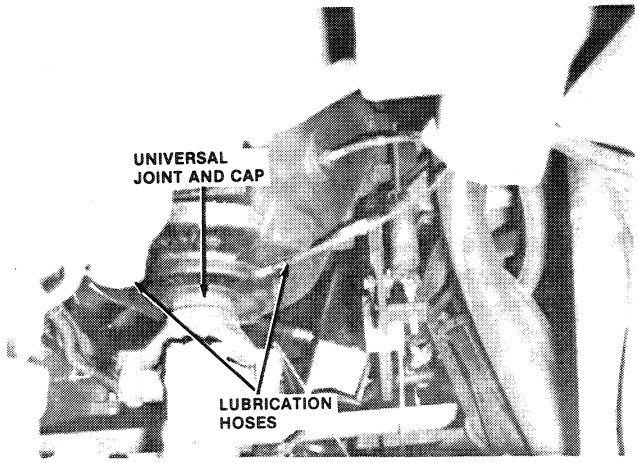

FIGURE 2-6: Clutch and Driveline

32. Scribe first universal joint and cap (to ensure proper assembly). Disconnect driveline at universal joint.

33. Remove four capscrews from front and rear hood supports.

34. Using a hoist remove hood from tractor.

35. Remove one capscrew from steering valve shaft (Figure 2-7). Loosen four capscrews and remove steering valve from bracket. Tie valve to frame away from engine.

36. Secure lifting hooks to No. 1 and No. 5 cylinder head lift points (Figure 2-8). Attach lifting fixture.

37. Remove front and rear engine mount capscrews and upper isolator hardware. Remove ground cable from left rear engine mount.

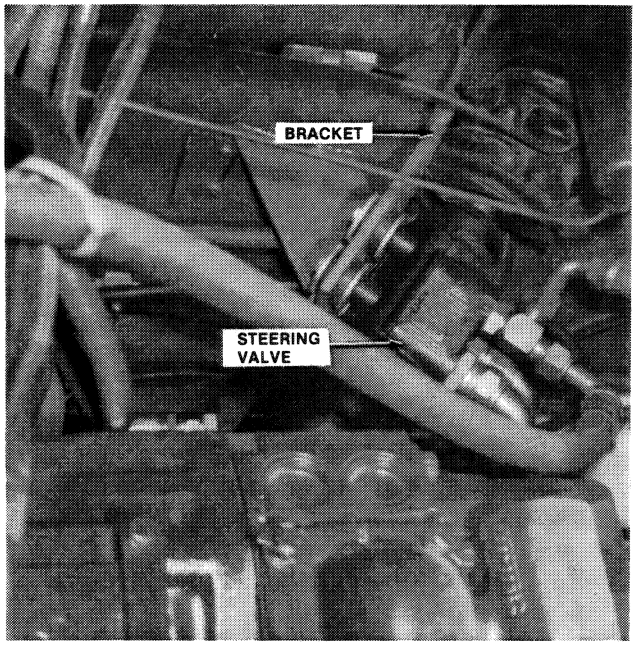

FIGURE 2-7: Steering Valve Removal

IMPORTANT

Raise engine slowly to prevent damage.

38. Raise engine out of tractor and mount on engine stand (See Cummins shop repair manual).

39. Remove lower isolator pads from tractor frame.

1.3.3 Installation

1. Put lower isolator pads over tractor frame mounting holes.

2. Position engine over tractor and lower into frame. Maintain sufficient clearance from firewall components while lowering engine.

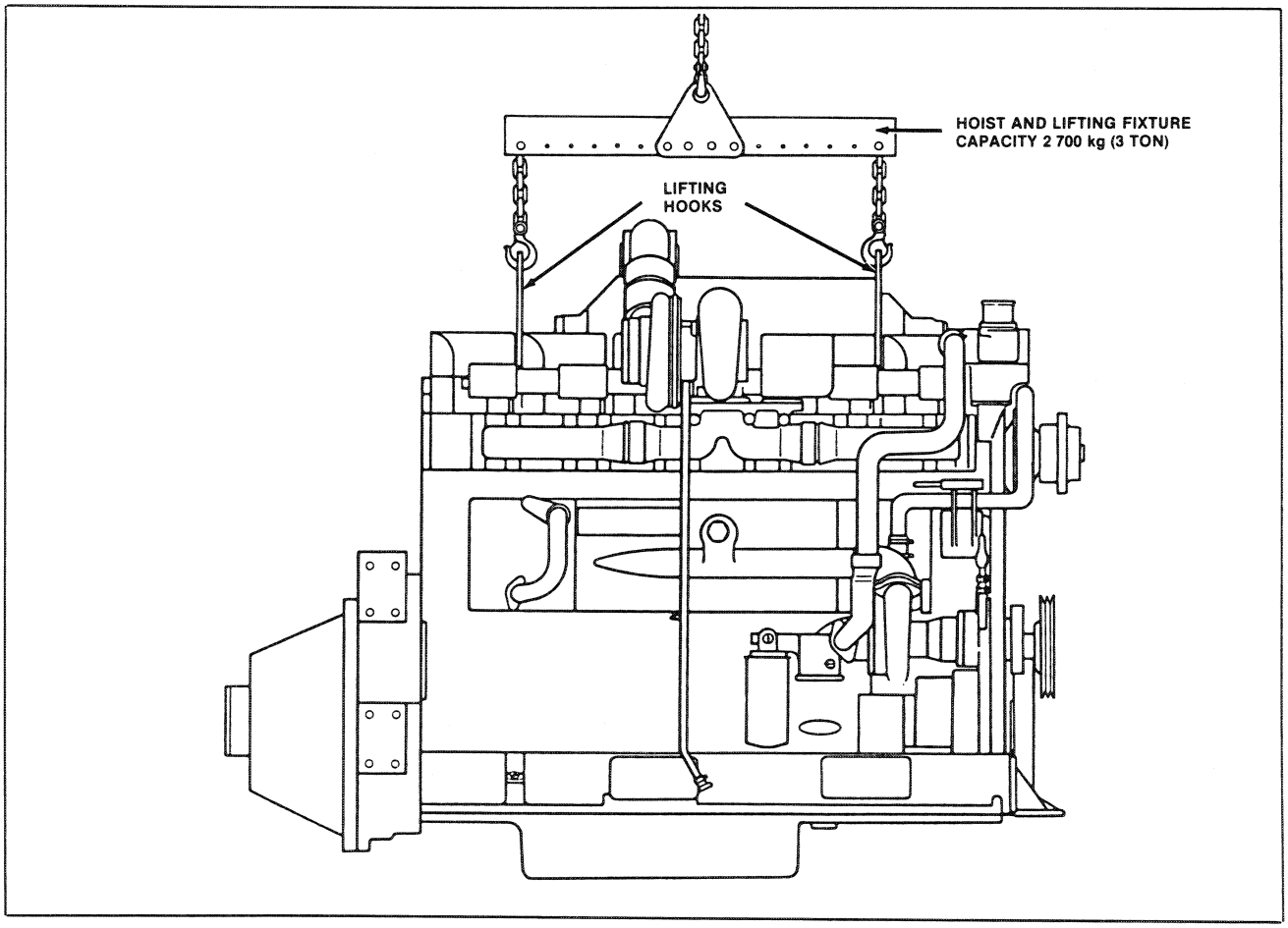

FIGURE 2-8: Engine Lift System

IMPORTANT

Lower engine cautiously to prevent damage.

3. Ensure engine mounts, isolator pads and tractor frame holes are properly aligned.

- CAUTION

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

4. Install one upper isolator pad, washer, capscrew, flatwasher and locknut on each mount. Torque locknut to 95 N·m (70 lbf ft).

5. Secure ground cable to left rear engine mount with one capscrew and nut. Torque to 55 N·m (40 lbf ft).

6. Remove lifting fixture and hooks from engine.

7. Use hoist to position hood over tractor and lower into place.

8. Secure hood to frame with four capscrews.

9. Align universal joint scribe marks and connect the driveline. Install universal joint to yoke with a soft hammer. Torque capscrews to 100 N·m (75 lbf ft).

10. Secure clutch control rod to linkage with a clevis pin and a cotterpin. Connect lubrication hoses to clutch housing fittings.

11. Install steering valve to shaft with a capscrew. Secure valve to the mounting bracket with four capscrews, bushings and eight plainwashers.

12. Install hydraulic pumps to engine with four capscrews and lockwashers. Torque to 90 N·m (60 lbf ft).

13. Install throttle cable to mounting bracket with two hex nuts and lockwashers (Figure 2-9).

14. Secure cable plate to end of cable with two hex nuts and lockwashers.

15. Fasten decelerator connector and DC solenoid terminal to engine harness.

16. Connect tachometer sender to wire connector on engine harness.

17. Install air conditioner compressor to bracket with four capscrews, plainwashers and locknuts. Attach belt and set tension to 40 kg (90 lbs).

18. Fasten air conditioner compressor wire to engine harness.

19. Secure air conditioner compressor hose clamp to engine with one flange screw. Torque to 10 N·m (7 lbf ft).

20. Install fuel supply line to injector pump. Install fuel return line to engine adaptor.

21. Connect oil pressure sender to engine harness.

22. Install cold start hose and nut to valve. Secure thermoguard harness to connector.

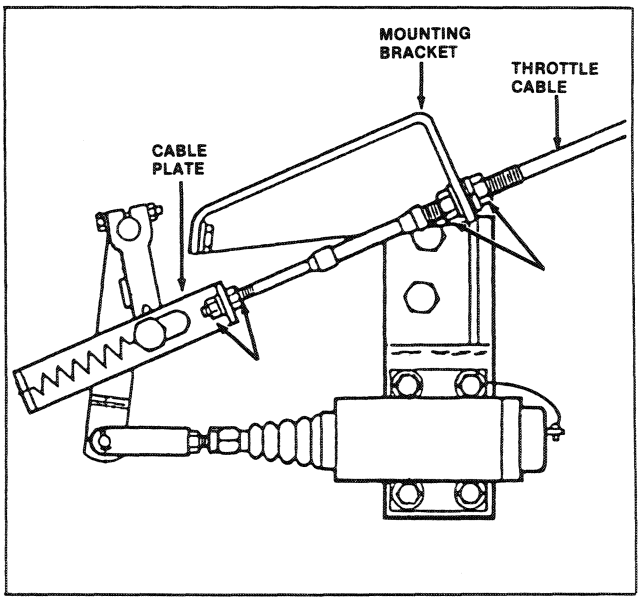

FIGURE 2-9: Throttle Cable Installation