VERSATILE

Service Manual

FORD
NEW HOLLAND

Tractor
1156

Engine Systems
Fuel System
Electrical System
Clutch
Transmission & Brake System

Vol. 1

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CONTENTS

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SAFETY, OPERATION AND GENERAL INFORMATION

SAFETY PRECAUTIONS

Practically all service work involves the need to drive the tractor. The Operator's Manual, supplied with each tractor, contains detailed safety precautions relating to driving, operating and servicing. These precautions are as applicable to the service technician as they are to the operator, and should be read, understood and practiced by all personnel.

Prior to undertaking any maintenance, repair, overhaul, dismantling or re-assembly operations, whether within a workshop facility or out "in the field," consideration should be given to factors that may have an effect upon safety, not only upon the mechanic carrying out the work, but also upon bystanders.

PERSONAL CONSIDERATIONS

- Loose clothing can cause accidents. Check to see that you are suitably clothed.
- Some jobs require special protective equipment.
- **Skin Protection**
  Used motor oil may cause skin cancer. Follow work practices that minimize the amount of skin exposed and the length of time used oil stays on skin.
- **Eye Protection**
  The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiselling, grinding, welding, and painting.
- **Breathing Protection**
  Fumes, dust and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.
- **Hearing Protection**
  Loud noise may damage your hearing, and the greater the exposure the worse the damage. If the noise is excessive, wear ear protection.
- **Hand Protection**
  It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents may harm the skin.
- **Foot Protection**
  Substantial or protective footwear with reinforced toe-caps will protect your feet from falling objects. Additionally, oil-resistant soles will help to avoid slipping.
- **Special Clothing**
  For certain work it may be necessary to wear flame or acid-resistant clothing.
- Avoid injury through incorrect handling of components. Make sure you are capable of lifting the object. If in doubt get help.

EQUIPMENT CONSIDERATIONS

- **Machine Guards**
  Before using any machine, check to be sure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing from coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.
- **Lifting Appliances**
  Be sure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

  Never stand under a suspended load or a raised implement.
- **Compressed Air**
  The pressure from a compressed air line is often higher than 100 psi (6.9 bar). It is perfectly safe if used correctly. Misuse may cause injury.

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Never use compressed air to blow dust, filings and dirt away from your work area unless the correct type of nozzle is fitted and eye protection is used.

Compressed air is not a cleaning agent, it will only move dust, from one place to another. Look around before using an air hose as bystanders may get grit into their eyes, ears or skin.

- **Hand Tools**
  Many cuts, abrasions and injuries are caused by defective tools. Never use the wrong tool for the job, as this generally leads either to some injury or to a poor job.

  Never use:

  — A hammer with a loose head or split handle.
  — Spanners or wrenches with splayed or worn jaws.
  — Spanners or files as hammers; or drills, clevis pins or bolts as punches.

For removing or replacing hardened pins use a copper or brass drift rather than a hammer alone.

For dismantling, overhaul and assembly of major and sub components, always use the Special Service Tools recommended. They will reduce the work effort, labor time and the repair cost.

Always keep tools clean and in good working order.

- **Electricity**
  Electricity has become so familiar in day to day usage, that its potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

  Before using any electrical equipment — particulary portable appliances — make a visual check to make sure that the cable is not worn or frayed and that the plugs and sockets are intact. Make sure you know where the nearest isolating switch for your equipment is located.

GENERAL CONSIDERATIONS

- **Solvents**
  Use only cleaning fluids and solvents that are known to be safe. Certain types of fluids can cause damage to components, such as seals, and can cause skin irritation. Solvents should be checked that they are suitable not only for the cleaning of components and individual parts, but also that they do not affect the personal safety of the user.

- **Housekeeping**
  Many injuries result from slipping or tripping on, objects or material left lying around by a careless worker. Prevent these accidents from occurring. If you notice a hazard, don't ignore it — remove it.

  A clean, hazard-free place of work improves the surroundings and daily environment for everybody.

- **Fire**
  Fire has no respect for persons or property. The destruction that a fire can cause is not always fully realized. Everyone must be constantly on guard.

  — Extinguish matches, cigars, and cigarettes, before throwing them away.
  — Work cleanly, disposing of waste material into proper containers.
  — Locate the fire extinguishers and find out how to operate them.
  — Do not panic — warn those near and raise the alarm.
  — Do not allow or use an open flame near the fuel tank, battery or component parts.

- **First Aid**
  In the type of work that mechanics are engaged in, dirt, grease, and fine dusts settle upon the skin and clothing. If a cut, abrasion or burn is disregarded, it may be found that a septic condition has formed within a short time. What appears at first to be trivial could become painful and injurious. It only takes a few minutes to have a fresh cut dressed, but it will take longer if you neglect it. Make sure you know where the First Aid box is located.

- **Cleanliness**
  Cleanliness of the fuel and hydraulic system is essential for optimum performance. When carrying out service and repairs, plug all hose ends and component connections to prevent dirt entry.

  Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of a high pressure washer or steam cleaner is recommended.

OPERATIONAL CONSIDERATIONS

- Transport the tractor safely using a strong chain, cable or tow bar attached securely to the front frame or drawbar of tractor. Do not tow faster than 15 mph (25 km/h).

  Use a trailer of at least 25 ton (22,680 kg) capacity to haul the tractor.

  Chain the tractor securely to the trailer, chock the wheels, set the parkbrake and engage the articulation lock to limit the tractor movement.

- Park the tractor on a clear, level area. Stop the engine, if at all possible, before performing any service. Center the steering, put all controls in neutral, set the parkbrake, shut down the engine and remove the key. Engage the articulation lock and chock the wheels.

- Place a warning sign on tractors which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended. Always disconnect the ground lead first. When reconnecting, connect the ground lead last.

- Do not attempt to start the engine while standing beside the tractor or attempt to bypass the neutral start switch.

- Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.

- Always turn the radiator cap to the first stop to allow pressure in the system to dissipate when the coolant is hot.

- If possible take the unit to an area which has a hard working surface, preferably concrete.

- If it is necessary to raise the tractor for ease of servicing or repair, make sure that safe and stable supports are installed beneath the axle housings, casings, etc., before commencing work.

- Before loosening any hydraulic hose, lower the attachment to the ground, switch off the engine and relieve all hydraulic pressure by operating the control lever several times. This will remove the danger of personal injury from oil pressure or accidently dropping the attachment.

- Prior to pressure testing, make sure all hoses and connections on the tractor and the test equipment are in good condition and tightly sealed. Pressure readings must be taken with gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or the equipment, and to eliminate the possibility of personal injury.

WARNING: ESCAPING FLUID OF ANY KIND UNDER PRESSURE CAN PENETRATE THE SKIN CAUSING SERIOUS INJURY.

- **DO NOT USE YOUR HAND TO CHECK FOR LEAKS. USE A PIECE OF CARDBOARD OR PAPER TO SEARCH FOR LEAKS.**

- **STOP THE ENGINE AND RELIEVE PRESSURE BEFORE CONNECTING OR DISCONNECTING LINES.**

- **TIGHTEN ALL CONNECTIONS BEFORE STARTING THE ENGINE OR PRESSURIZING THE LINES.**

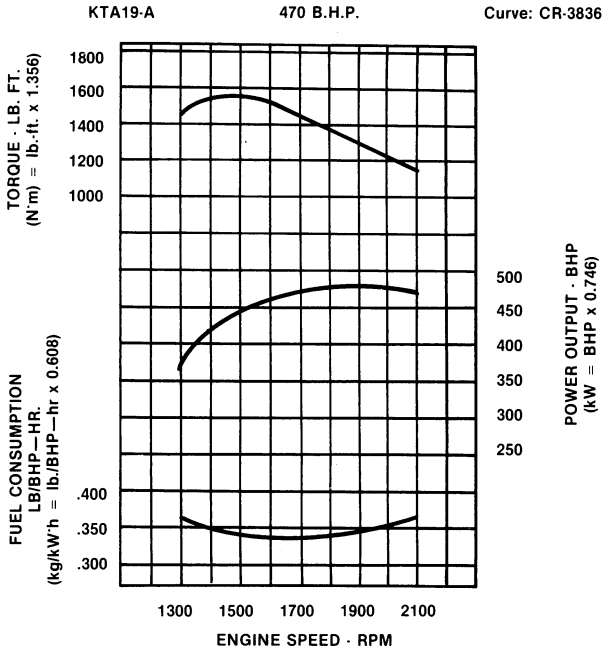
- **IF ANY FLUID IS INJECTED INTO THE SKIN, OBTAIN MEDICAL ATTENTION IMMEDIATELY OR GANGRENE MAY RESULT.**

SECTION 1
ENGINE SYSTEMS

CONTENTS

1B. COOLING SYSTEM

SECTION 1
ENGINE SYSTEMS
CUMMINS SIX CYLINDER KTA19-A470 ENGINE



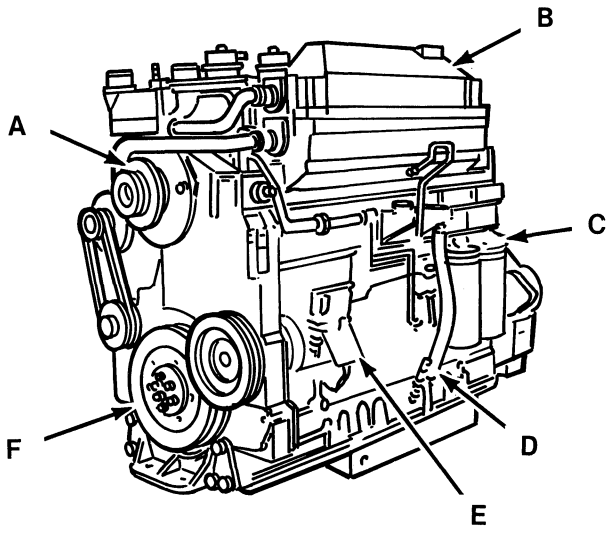
Torque Chart **Figure 1-1**

DESCRIPTION AND OPERATION

The Versatile 1156 tractor uses a Cummins Big Cam III six cylinder KTA19-A470 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 "Cummins Assistance" in this section. Operation, maintenance and engine service manuals are available from the Cummins Engine Company via any of their authorized dealers and distributors worldwide.

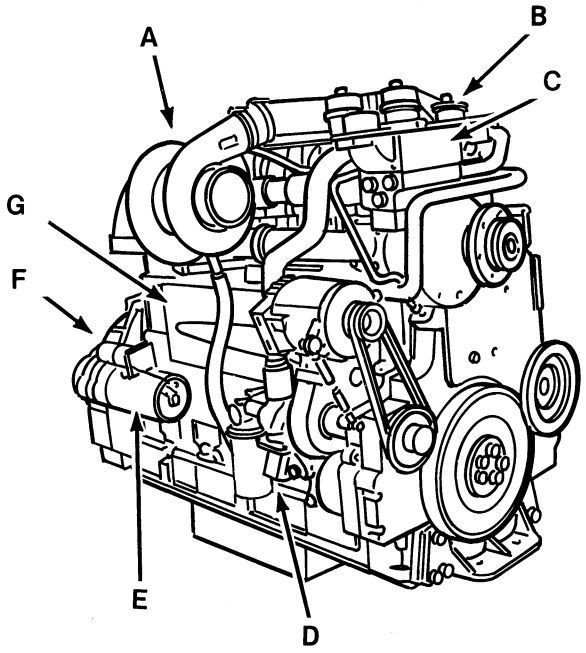
Efficiency of this engine is enhanced by the use of a CROSS-FLOW CYLINDER HEAD with the exhaust manifold on one side of the head and the intake manifold on the other. Coupled with 4 VALVES PER CYLINDER (2 intake, 2 exhaust) the engine is able to process huge quantities of fuel/air mixture for maximum efficiency and ample torque over a wide rpm range.

A "Constant Power" engine achieves peak power over a wide range of engine speeds. Therefore, even though the engine is lugged down, the horsepower output of the engine remains constant. Refer to Figure 1-1. Torque builds very quickly, much faster than the decrease in rpm, for the first 10% of rpm reduction. Torque then increases more gradually until maximum torque is reached. The "Constant-Power" engine maintains horsepower even though rpm declines. The "CONSTANT-POWER" concept is an exclusive feature of Cummins engines. "Constant Power" is the ability to produce a nearly uniform power output over a broad operating range. This is achieved by increasing the peak torque to provide more power at reduced engine speeds. The increased torque at lower engine speeds translates directly into more usable power.



Engine-Fuel Pump Side **Figure 1-2**

A Fan hub
B Aftercooler
C Full flow oil filter
D Dipstick
E Fuel pump
F Vibration damper



Engine-Exhaust Side **Figure 1-3**

A Turbocharger
B Cooler outlet
C Thermostat housing
D Coolant inlet
E Starting motor
F Flywheel housing
G Engine oil cooler

External Engine Component Identification

The illustrations which follow show the locations of the major external engine components, the filters, and other service and maintenance points. Refer to Figures 1-2 and 1-3.

Engine Break-In

The Cummins engine used in the Model 1156 tractor has been run on a dynamometer before installation but not enough to be considered broken-in.

1. Do not operate the engine at more than 3/4 load for the first 24 hours of operation. Full load should only be held for short intervals during the next 24 hours of operation. (3/4 load is approximately one gear lower than the highest gear the tractor can pull a specific load.)

2. Check oil level every 8 to 10 hours for the first 100 hours of operation.

3. Follow recommendations outlined in the Cummins operator's manual supplied with the tractor.

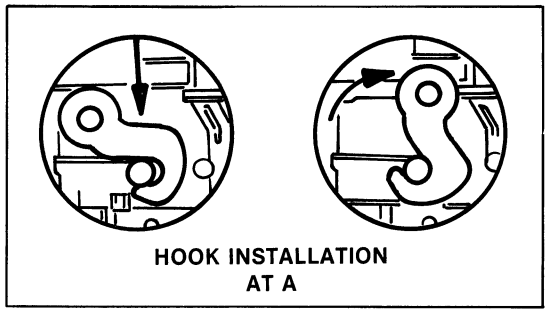
CUMMINS ASSISTANCE

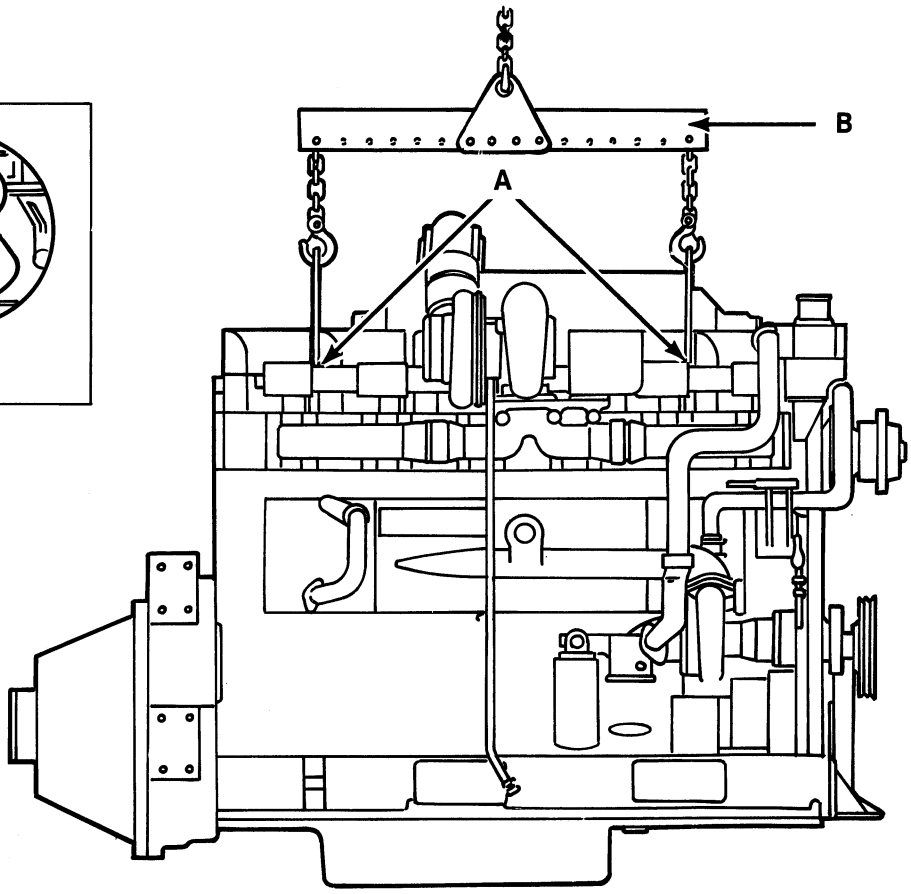
The Cummins Engine Company backs its engines with service and complete parts support. A service network of more than 3,000 Cummins distributors and dealers, the largest in the world devoted exclusively to diesel engines, are available for assistance. Technicians are trained to provide the Cummins owner with sound advice, expert service and professional treatments at all Cummins locations.

Before calling for assistance write down the following information and have it ready:

A. Type and make of equipment
B. Engine model and serial number
C. Total hours of operation
D. Nature of problem

BASIC ENGINE





Engine Lifting
A Lifting hooks
B Lift fixture

Figure 1-4

ENGINE MOUNT REPLACEMENT

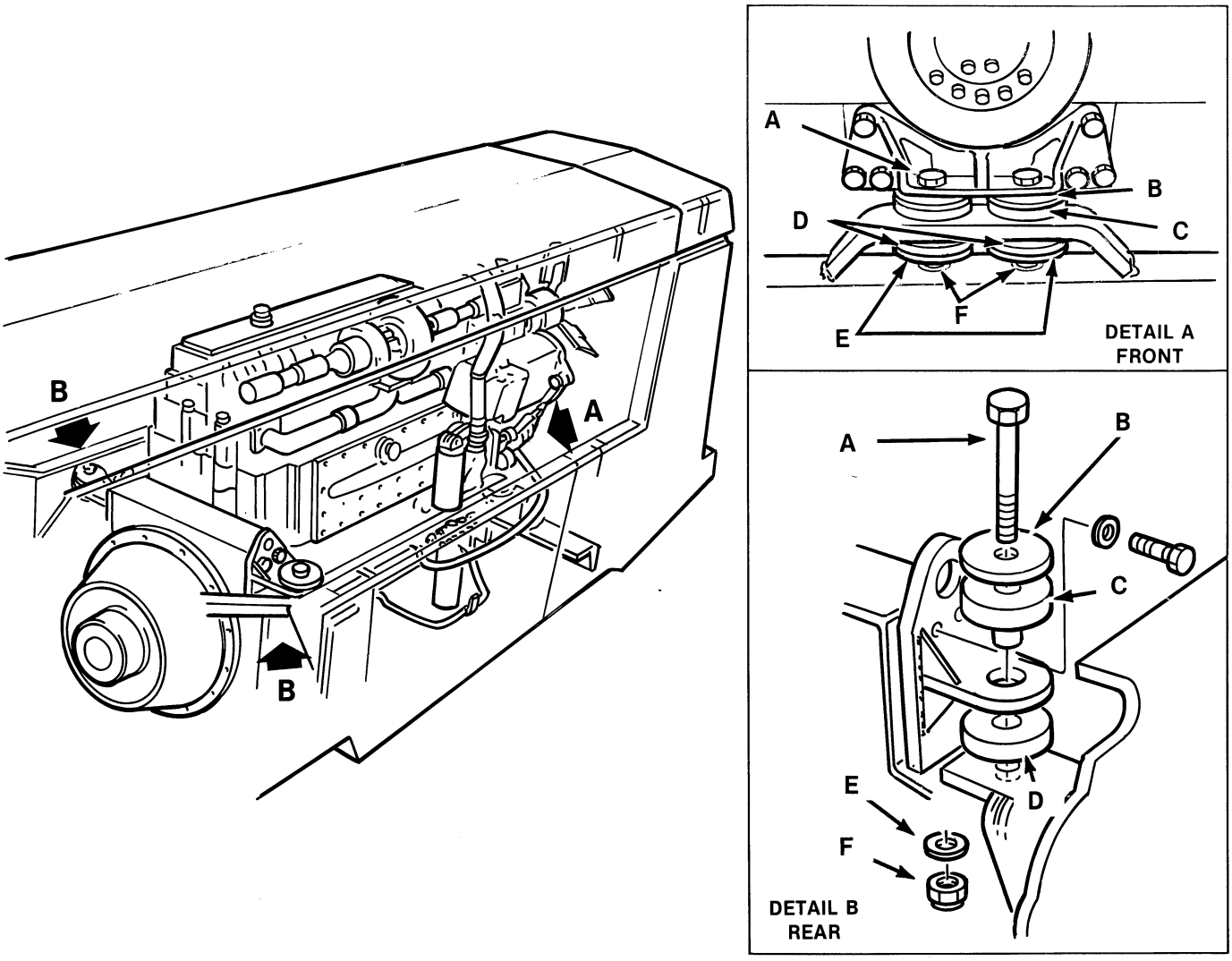
NOTE: The lift fixture, Figure 1-4 is available from the Cummins Engine Distributor as tool number ST1286 for the hooks and ST1258 for the lift bar.

Front Mounting Pads
Refer to Figure 1-4A, Detail A:

WARNING: DO NOT PUT FINGERS BETWEEN THE FRAME AND ENGINE MOUNT. USE A TOOL TO REMOVE AND POSITION THE ISOLATOR PADS.

1. Engage the articulation lock and the parkbrake. Chock the wheels. Refer to "Safety Operation and General Information".
2. Install the engine lifting hooks Figure 1-4. Place an overhead hoist into position ready to raise the front of the engine.
3. Remove the engine mount locknuts F, isolator washers E, and lower isolators D, Figure 1-4A.
4. Raise the engine 1/2" (12 mm) and place safety stands under the engine.
5. Remove the capscrews A, isolator washers B, and top isolator pads C.
6. Replace the top isolator washers B, and isolator pads C. Position the new pads so they are properly centered for maximum vibration dampening and install the cap screws A.

   NOTE: Always replace the isolator pads as a set.



Engine Mounts **Figure 1-4A**

Front Detail "A"

A Cap screws
B Washers
C Isolator pads
D Lower isolators
E Isolator washers
F Locknuts

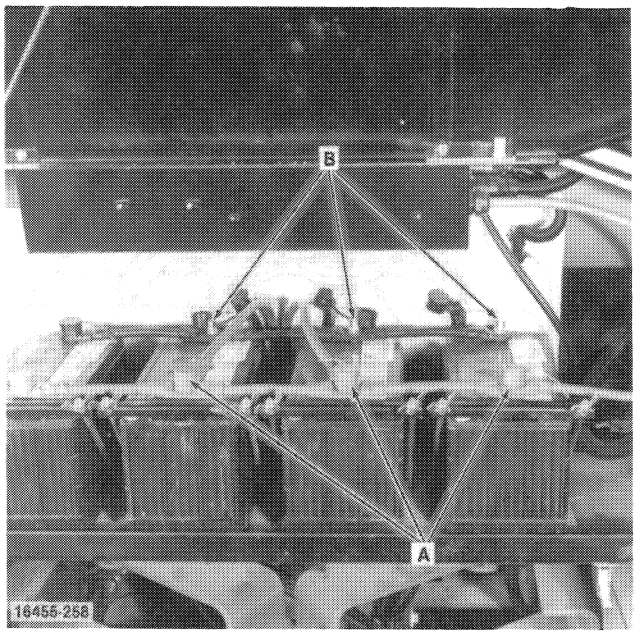
Rear Detail "B"

A Cap screw
B Isolator washers
C Upper isolators
D Isolator pad
E Washer
F Locknut

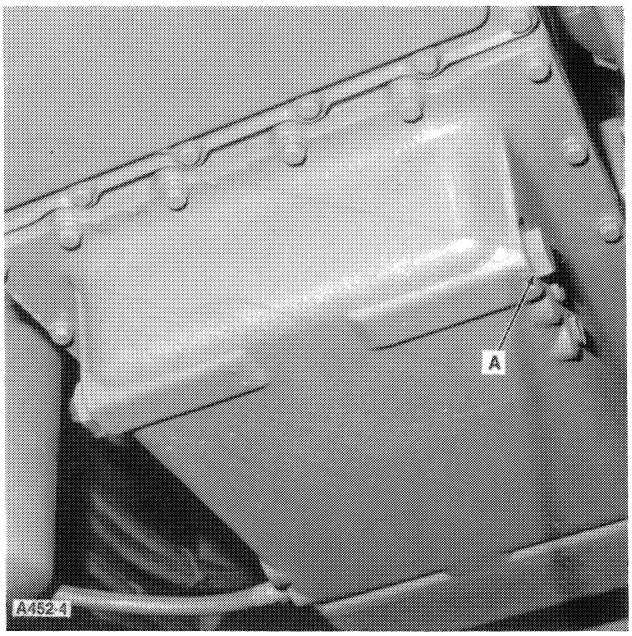
7. Remove the safety stands and lower the engine.
8. Install the lower isolators D, isolator washers E, and locknuts F. Torque the locknuts to 75 lbs.-ft. (95 N·m)

Rear Mounting Pads
Refer to Figure 1-4A, Detail B:

1. Engage the articulation lock and the parkbrake. Chock the wheels. Refer to "Safety Operation and General Information."
2. Install the engine lifting hooks Figure 1-4. Place an overhead hoist into position ready to raise the rear of the engine.
3. Remove the engine mount locknuts F, plain washers E, cap screws A, isolator washers B, and top isolators C.
4. Raise the engine up 1/2" (12 mm) and place safety stands under the engine.
5. Replace the lower isolator pads, D. Position the new pads so they are properly centered for maximum vibration dampening.



Batteries **Figure 1-5**
A Positive cables
B Negative cables - ground



Oil Pan **Figure 1-6**
A Drain plug

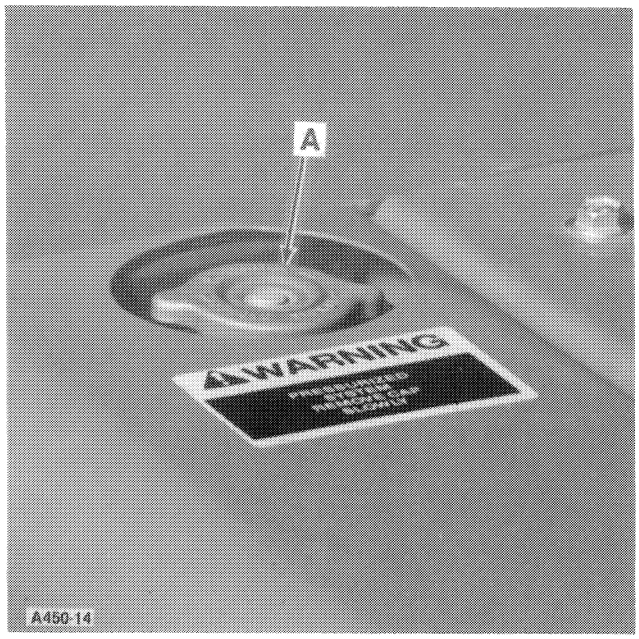
NOTE: Always replace the isolator pads as a set.

6. Remove the safety stands and lower the engine.
7. Install the upper isolators C, isolator washers B, capscrews A, flat washers E, and locknuts F. Torque the locknuts to 75 lbs.-ft. (95 N·m)

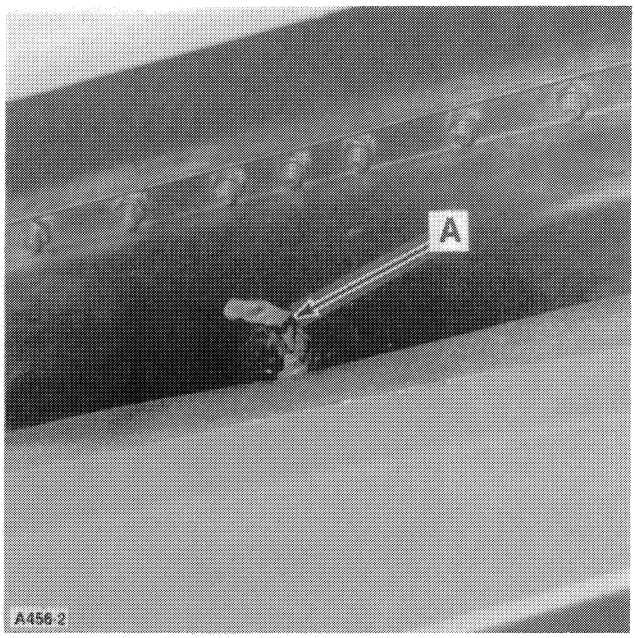
ENGINE REMOVAL AND REPLACEMENT

WARNING: SET THE PARKBRAKE, CHOCK THE WHEELS, ENGAGE ARTICULATION LOCK, AND DISCONNECT THE BATTERY BEFORE STARTING WORK ON THE ENGINE.

1. Disconnect the three battery ground cables B, Figure 1-5, and then disconnect the three positive cables A.
2. Remove the drain plug A, Figure 1-6 and drain the engine oil. Allow 10 minutes to drain completely and install the drain plug. Torque to 65 lbs.-ft. (80 N·m).

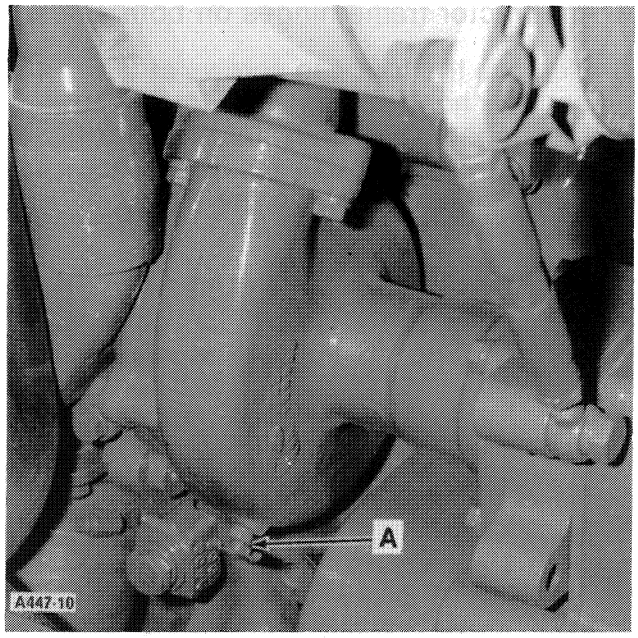


Radiator **Figure 1-7**
A Radiator cap

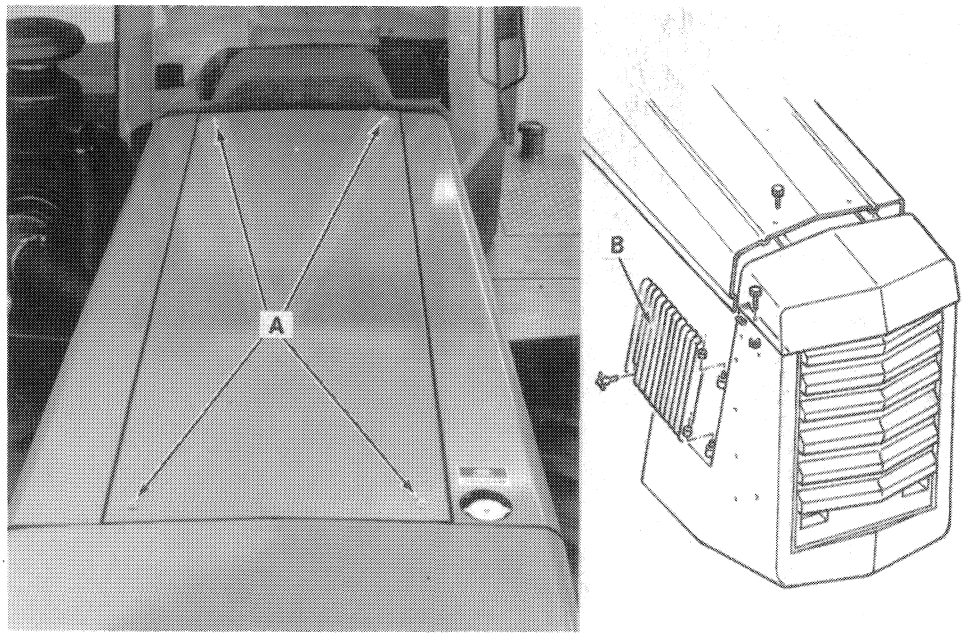


Radiator **Figure 1-8**
A Drain cock

3. Drain the cooling system by removing the radiator cap, A, Figure 1-7. Open the drain cocks, A, Figure 1-8, on the radiator, and water pump, A, Figure 1-9.



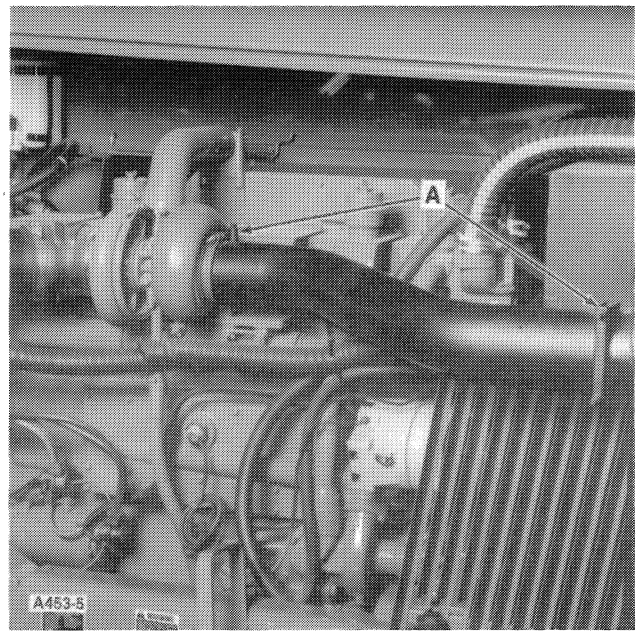
Water Pump **Figure 1-9**
A Drain cock



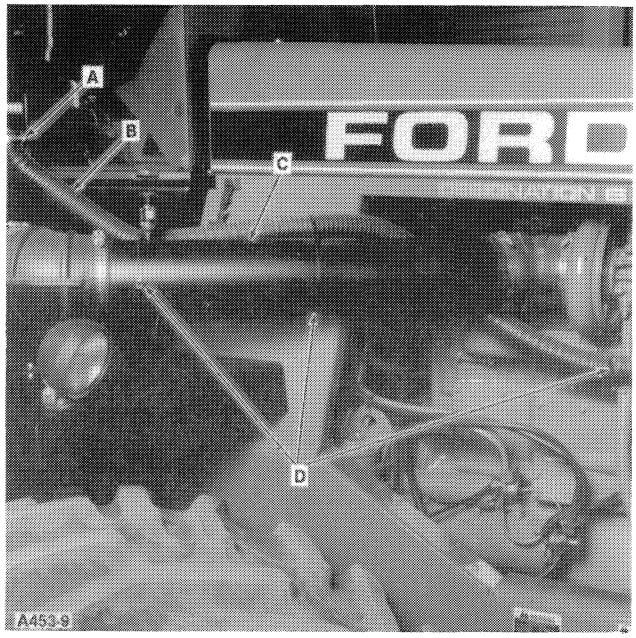
Hood
A Cap screws
B Fan guards

Figure 1-10

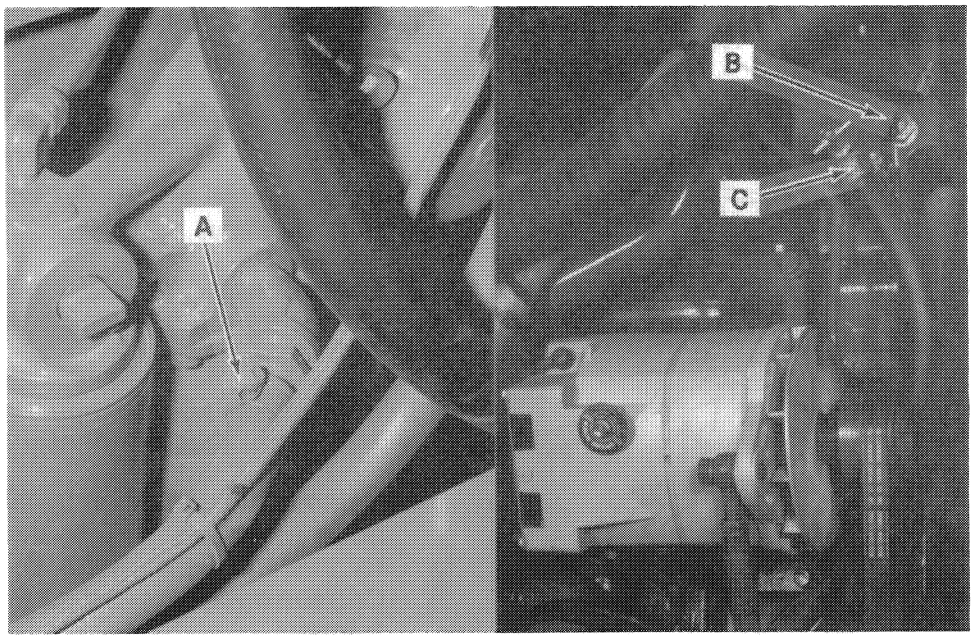
4. Remove fan guards B, Figure 1-10, from the tractor frame hinges on both sides.
5. Remove the four cap screws at the front and rear hood supports A, Figure 1-10 and disconnect the windshield washer hose under the hood. Use a suitable hoist to remove the hood from the tractor.
6. Release the clamps, A, Figure 1-11, at both ends of the exhaust pipe. Remove the exhaust pipe and cover the turbocharger and muffler openings.
7. Cut the tie straps, D, Figure 1-12, and release clamps, A, from the aspirator hose, B, and remove the hose from the muffler and air precleaner.



Exhaust Pipe **Figure 1-11**
A Clamps



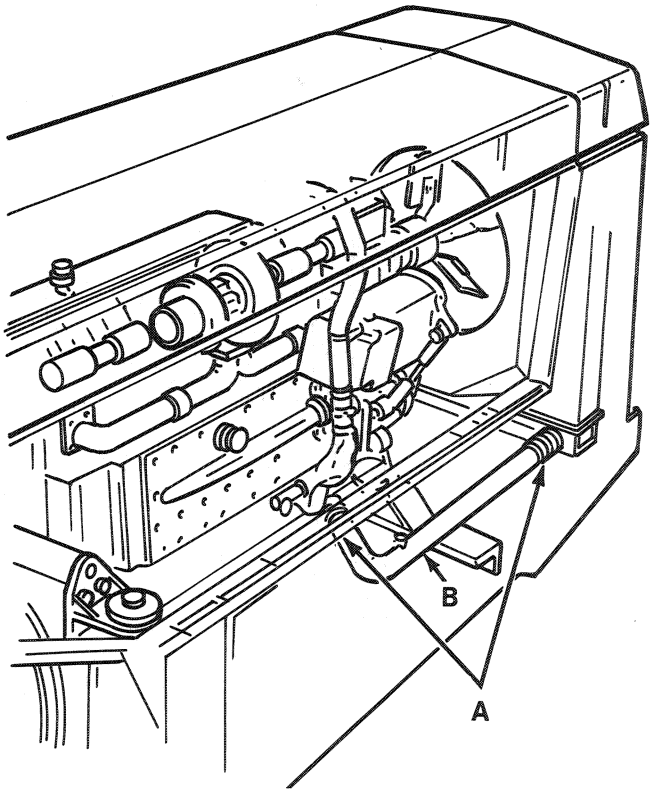
Air Intake **Figure 1-12**
A Clamps
B Aspirator hose
C Air intake tube
D Tie straps



Heater Connections **Figure 1-13**

A Heater return hose
B Sender wire
C Heater supply hose

8. Remove the clamps at both ends of the air intake tube, C, Figure 1-12. Remove the intake tube and cover the air cleaner and turbocharger openings.
9. Remove the heater return hose at the water pump housing A, Figure 1-13.
10. Loosen clamps A, Figure 1-14, and remove the water pump inlet pipe B.



Water Pump Inlet Tube **Figure 1-14**

A Clamps
B Inlet pipe

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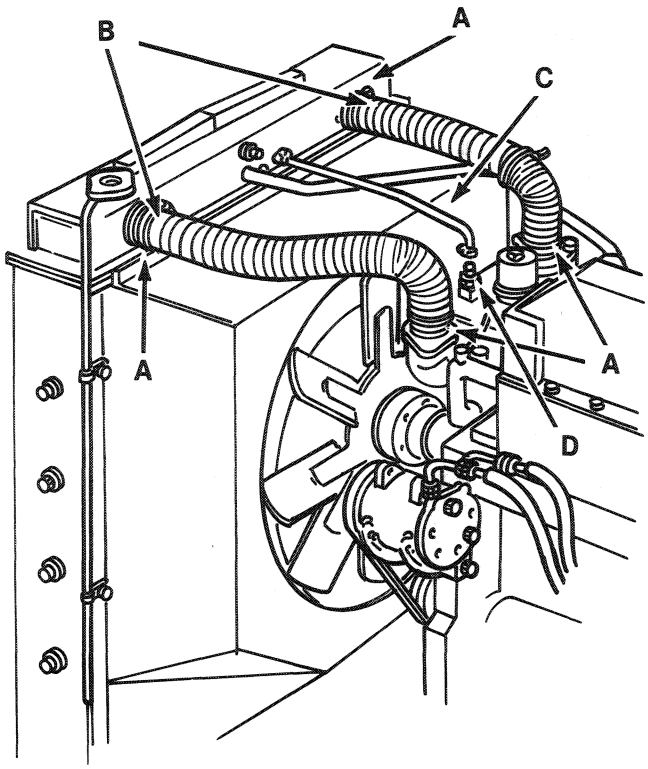


Coolant Hoses **Figure 1-15**

A Clamps
B Hoses
C Deaerating hose
D Barbed fitting

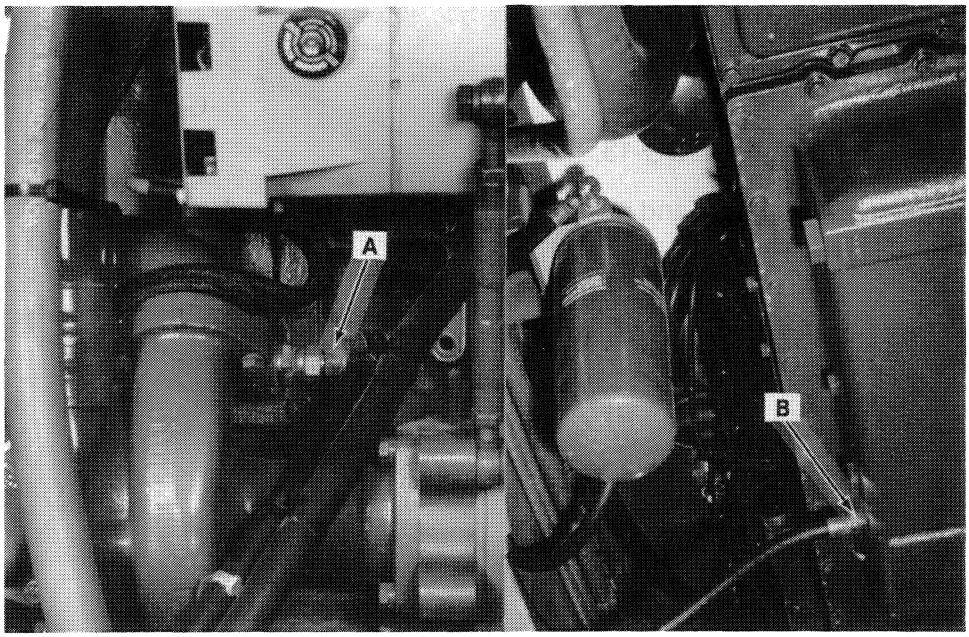
11. Loosen the radiator hose clamps at the thermostat housing and radiator, A, Figure 1-15, and remove hoses B, and seal both openings. Remove the deaerating hose C, Figure 1-15, and seal the barbed fitting, D.

    NOTE: Label all sender wires for proper reinstallation

12. Disconnect the coolant temperature sender from the engine harness B, Figure 1-13.

13. Remove the heater supply hose, C, Figure 1-13, from the thermostat housing.

14. Remove the engine oil bypass filter supply hose A, Figure 1-16, at the engine adaptor and the return hose, B, at the oil pan. Cap the openings and tie the hoses to the frame.



Oil By-Pass Hose **Figure 1-16**

A Supply hose
B Return hose

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