FORD

LGT 14D DIESEL LAWN AND GARDEN TRACTOR

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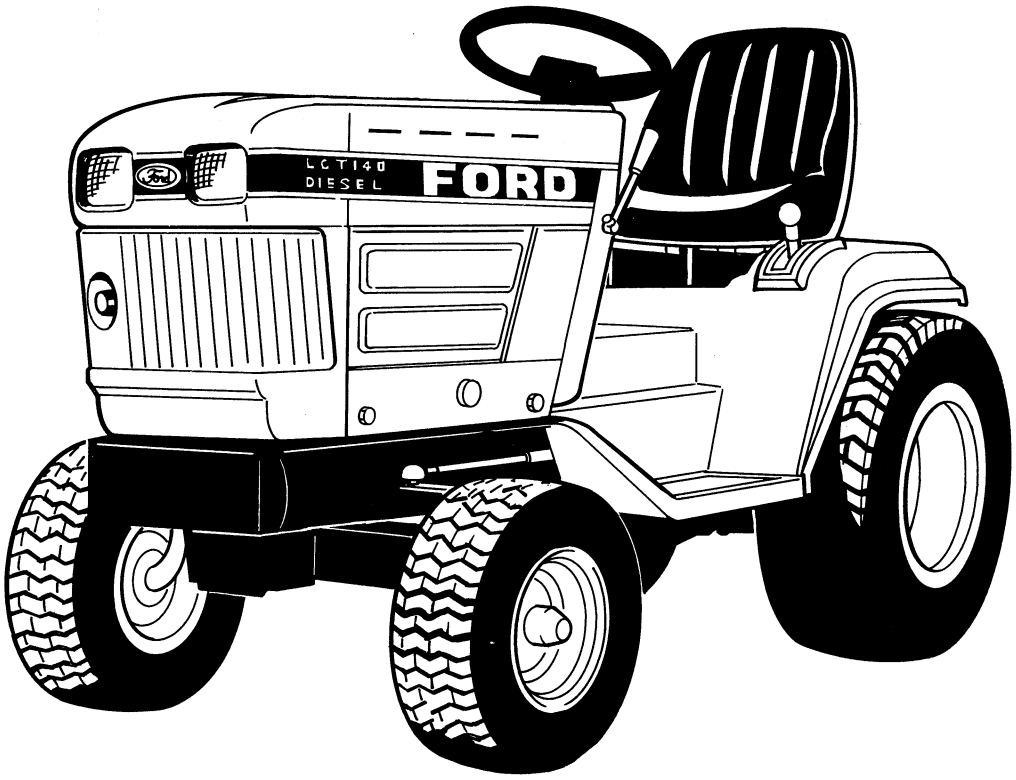


REPAIR MANUAL

Ford New Holland, Inc.
Troy, Michigan 48084

Reprinted

FOREWORD

This manual provides information for the proper servicing and overhaul of the Ford 14 HP diesel LGT tractor Model and is an essential publication for all service personnel carrying out repairs and maintenance procedures.

The Manual is divided into twelve PARTS, each sub-divided into Chapters. Each Chapter contains information on general operating principles, detailed inspection and overhaul and, where applicable, trouble shooting, special tools and specifications.

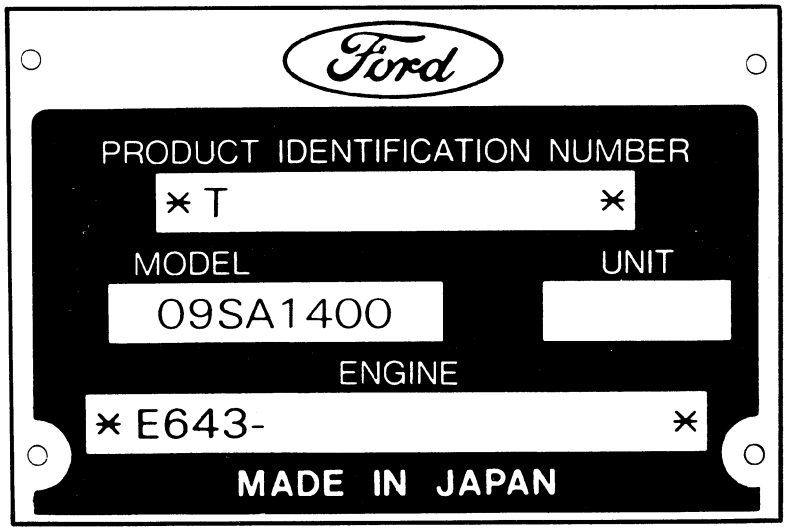
The material contained in this Manual was correct at the time of going to print but Ford New Holland, Inc. policy is one of continuous improvement and the right to change prices, specifications, equipment or design at anytime without notice is reserved. All data in this Manual is subject to production variations, so overall dimensions should be considered as approximate only and the illustrations do not necessarily depict the unit to standard build specification.

FORD NEW HOLLAND, INC.

PRODUCTION DATE CODES AND SERIAL NUMBERS

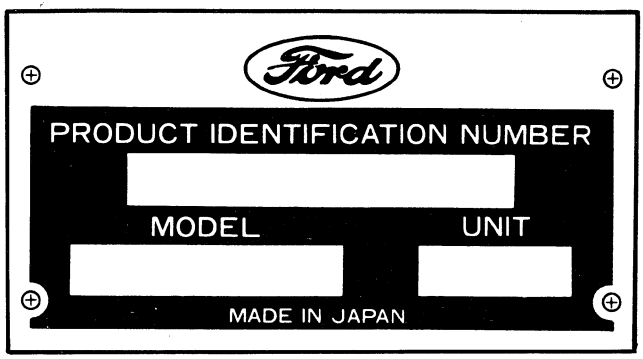
TRACTOR:

A VEHICLE IDENTIFICATION PLATE is located on the left-hand side of the tractor below the engine. The numbers on the plate are important should the tractor require future service.



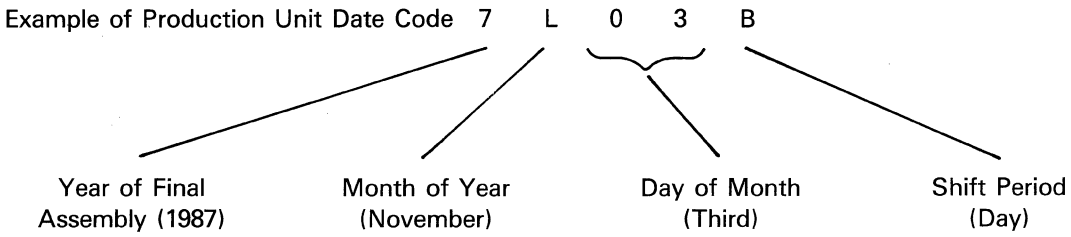
MOWER:

A PRODUCT IDENTIFICATION PLATE is located on the left-hand side of the mower deck. The numbers on the plate are important should the mower require service in the future.



UNIT PRODUCTION CODE:

First Number YEAR	First Letter MONTH	Second Number DAY OF MONTH	Second Letter PRODUCTION SHIFT
1 — 1981 2 — 1982 3 — 1983 4 — 1984 5 — 1985 0 — 1990	A — Jan. G — July B — Feb. H — Aug. C — March J — Sept. D — April K — Oct. E — May L — Nov. F — June M — Dec.	01/28/29/30/31	A — Midnight B — Day C — Afternoon



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 that tractor. 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

- The wrong clothes or carelessness in dress 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, discing, welding, painting, etc.
- **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.
- Avoid injury by correctly handling components. Make sure you are capable of lifting the object. If in doubt get help.
- **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 such as white spirit, paraffin, etc., 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 ensure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing 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**
  Always ensure 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 as high as 100 psi (6.9 bar) 7 (kgf/cm²). It is perfectly safe if used correctly. Any misuse may cause injury.

  Never use compressed air to blow dust, filing, dirt, etc., away from your work area unless the correct type of nozzle is fitted.

  Compressed air is not a cleaning agent, it will only move dust, etc., 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.

  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 — particularly portable applicances — make a visual check to make sure that the cable is not worn or frayed and that the plugs, sockets, etc., 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, etc., 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 tripping or slipping over, or 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/cigarettes, etc., 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 tractor fuel tank, battery or component parts.

- **First Aid**
  In the type of work that mechanics are engaged in, dirt, grease, fine dusts, etc., all 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 tractor 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

- Stop the engine, if at all possible, before performing any service.
- 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.
- Do not attempt to start the engine while standing beside the tractor or attempt to by-pass 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.
- Never work beneath a tractor which is on soft ground. Always take the unit to an area which has a hard working surface, preferably concrete.
- If it is found necessary to raise the tractor for ease of servicing or repair, make sure that safe and stable supports are installed beneath 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 connectors, not only of the tractor, but also those of the test equipment, are in good condition and tightly sealed. Pressure readings must be taken with the 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 hydraulic / diesel fluid under pressure can pentrate 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 engine and relieve pressure before connecting or disconnecting lines.*
- *Tighten all connections before starting engine or pressurizing lines.*

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

- When inflating tires beware of over inflation — constantly check the pressure. Overinflation can cause tires to burst and result in personal injury.

Safety precautions are very seldom the figment of someone's imagination. They are the result of sad experience, where most likely someone has paid dearly through personal injury.

Heed these precautions and you will protect yourself accordingly. Disregard them and you may duplicate the sad experience of others.

MOWER – SAFETY PRECAUTIONS

- Read the tractor and mower Operator's Manual carefully before using the equipment. Lack of operating knowledge can lead to accidents.
- Keep all safety devices and shields in place.
- Do not modify or alter or permit anyone else to modify or alter this mower or any of its components or any tractor function.
- Always keep people and pets a safe distance from the machine.
- Clear the work area of loose objects which might be picked up and thrown when the mower is operated.
- Disengage the power to the mower when transporting or not in use.
- Disengage the mower before backing up. Do not mow in reverse unless absolutely necessary and then only after careful observation of the entire work area behind the mower.
- Always shut the engine off when removing the grass catcher or unclogging the chute.
- Always disengage the power to the attachments and stop the engine before leaving the operator's seat.

SERVICE TECHNIQUES

A. SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all machinery as well as the personal safety of the individual doing the work. This Shop Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing machines, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the machines integrity by his choice of methods, tools or parts.

B. SERVICE TECHNIQUES

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficient working life of a component and lead to costly replacement.

Time spent on the preparation and cleanliness of working surfaces will pay dividends in making the job easier and safer and will result in overhauled components being more reliable and efficient in operation.

Use cleaning fluids which are known to be safe. Certain types of fluid can cause damage to O-rings and cause skin irritation. Solvents should be checked that they are suitable for the cleaning of components and also that they do not risk the personal safety of the user.

Replace O-rings, seals or gaskets whenever they are disturbed. Never mix new and old seals or O-rings, regardless of condition. Always lubricate new seals and O-rings with hydraulic oil before installation.

When replacing component parts use the correct tool for the job.

HOSES AND TUBES

Always replace hoses and tubes if the cone end or the end connections are damaged.

When installing a new hose loosely connect each end and make sure the hose takes up the designed position before tightening the connection. Clamps should be tightened sufficiently to hold the hose without crushing and to prevent chafing.

The hoses are the arteries of the unit, be sure they are in good condition when carrying out repairs or maintenance, otherwise the machine's output and productivity will be affected.

After hose replacement to a moving component check that the hose does not foul by moving the component through the complete range of travel.

Be sure any hose which has been installed is not kinked or twisted.

Hose connections which are damaged, dented, crushed or leaking restrict oil flow and the productivity of the components being served. Connectors which show signs of movement from the original swaged position have failed, and will ultimately separate completely.

A hose with a chafed outer cover will allow water entry. Concealed corrosion of the wire reinforcement will subsequently occur along the hose length with resultant hose failure.

Ballooning of the hose indicates an internal leakage due to structural failure. This condition rapidly deteriorates and total hose failure soon occurs.

Kinked, crushed, stretched or deformed hoses generally suffer internal structural damage which can result in oil restriction, a reduction in the speed of operation and ultimate hose failure.

Free-moving, unsupported hoses must never be allowed to touch each other or related working surfaces. This causes chafing which reduces hose life.

PART 1
ENGINE

Chapter 1
ENGINE AND LUBRICATION SYSTEM

Chapter 2
COOLING SYSTEM

Chapter 3
TROUBLE SHOOTING, SPECIFICATIONS AND SPECIAL TOOLS

PRINTED IN U.S.A.

PART 1
ENGINE

Chapter 1
ENGINE AND LUBRICATION SYSTEM

A. DESCRIPTION AND OPERATION

This chapter describes the overhaul and repair of the Ford 14 HP LGT diesel engine.

The Ford 14 HP LGT tractor, Figure 1, is equipped with a 3-cylinder in-line, four cycle, liquid cooled, overhead valve engine. The 14 HP LGT engine is a new design engine identified by code number E643. The code number is cast into the left side of the block and readily accessible for reference.

The engine has a 43.4 cu. in. (617 cc) displacement with a compression ratio of 23.5:1.

The engine is positioned in the tractor chassis in reverse position, i.e., with the engine (fan, radiator, water pump, etc.) facing the rear of the tractor as shown, Figure 2.

All reference to left, right, front and rear in this repair manual is made as follows:

WHOLE TRACTOR: All reference to the tractor are as viewed by the operator traveling in the forward direction.

ENGINE ONLY (Removed From Tractor): All reference to the engine when removed from the chassis is consistent with normal engine repair procedures. That is, with the water pump at the front and the flywheel at the rear of the engine.

Figure 1
Ford 14 HP LGT Diesel Tractor

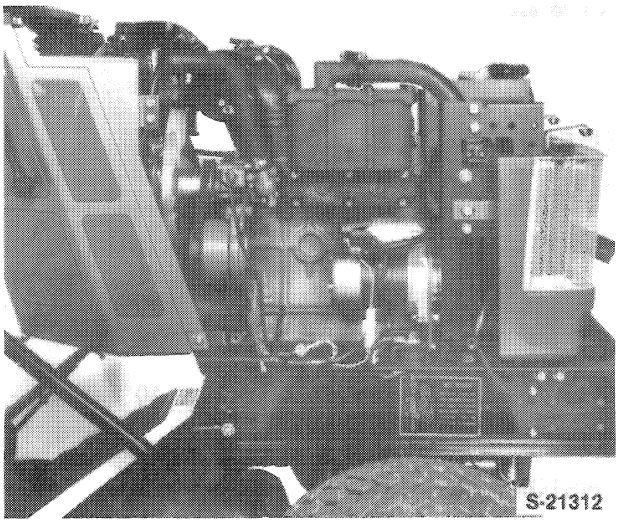


Figure 2
14 HP LGT Diesel Engine

CYLINDER HEAD AND VALVE TRAIN COMPONENTS

The cylinder head assembly includes the intake and exhaust valve assemblies, rocker shaft assembly and the pre-combustion chambers.

The intake manifold is incorporated into the valve cover assembly.

The exhaust manifold is an integral part of the muffler assembly.

The pre-combustion chamber is located between the injector assembly and the cylinder combustion chamber. Initial combustion takes place in the pre-combustion chamber. The expanding gases pass through drilled ports leading into the cylinder combustion area forming a swirl pattern of burning gases for a more complete and efficient burning of the air fuel mixture.

A glow plug located inside of the cylinder head extends into the pre-combustion area. When energized, the glow plug heats the incoming air/fuel mixture which provides improved starting for cold weather conditions.

CYLINDER BLOCK ASSEMBLY

The cylinder block assembly contains the pistons, connecting rods, crankshaft, timing gears and engine oil pump.

The crankshaft is supported by four main bearings. The front bearing is a full circle bearing located in the front casting wall of the engine block.

The second, third and fourth main bearings are split liners located in bearing holders bolted to the engine block.

The fourth main bearing holder is made of cast aluminum and has thrust bearing surfaces for controlling the crankshaft end play.

The camshaft assembly is supported on two roller bearings located one on each end of the engine block.

The pistons are of three ring design consisting of two compression and one oil control ring.

The oil control ring uses a coil spring type expander.

LUBRICATION SYSTEM

The gerotor type oil pump is an integral part of the idler timing gear and is driven by the crankshaft gear. It is located in the front of the engine block and to the left of the crankshaft as viewed from the front of the engine.

OIL FLOW

Engine lubrication oil is picked up from the crankcase sump through a screen by the pump intake tube and drawn into a lower side drilling in the engine block to the oil pump. Oil pressurized by the pump then flows through passages in the block, past the relief valve, through the oil filter and returns to the main oil gallery in the block in the area of the drilled bolt located on the side of the block. Oil flow in the main oil gallery extends to the four main bearing journals through passages in the crankshaft to the three connecting rod bearing journals. The remaining portion of the oil flow is directed through the external tube to the cylinder head. Oil flows from the external tube into a passage in the cylinder head to the front rocker shaft pedestal. The oil flows upward into the pedestal, through a roll pin that extends into the rocker shaft.

The roll pin serves to hold the rocker shaft in a fixed position and it also acts as a restrictor to maintain adequate oil pressure in the main oil gallery.

Oil seepage through the clearance between the rocker arms and the shaft overflows into the valve cover area and lubricates the valve stems, push rods and tappets.

The relief valve (1), Figure 3, is mounted in the side of the engine block and intersects the main oil gallery. When the oil pressure exceeds the rated pressure, oil is bypassed through the relief valve directly to sump through a passage in the engine block.

The cylinder walls, pistons and piston pins are splash lubricated by the crankshaft.

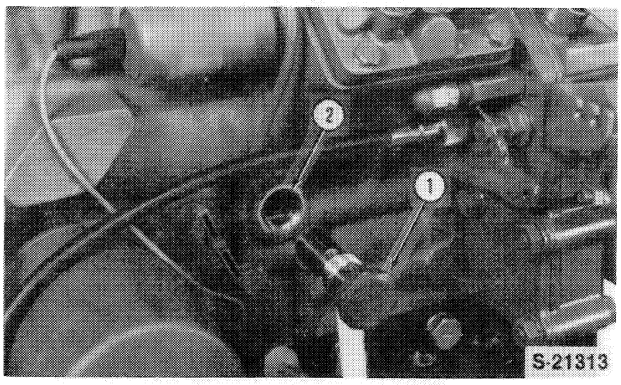


Figure 3
Engine Oil Relief Valve Location
1. Relief Valve
2. Main Oil Gallery

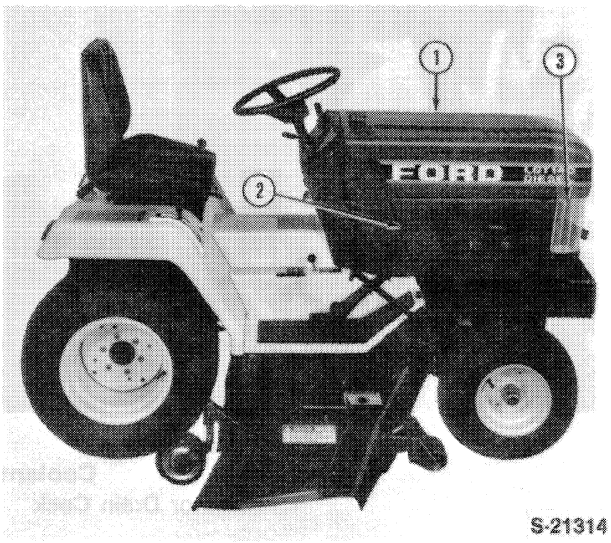


Figure 4
Engine Hood and Screens
1. Engine Hood
2. Engine Side Screens (2)
3. Engine Grill

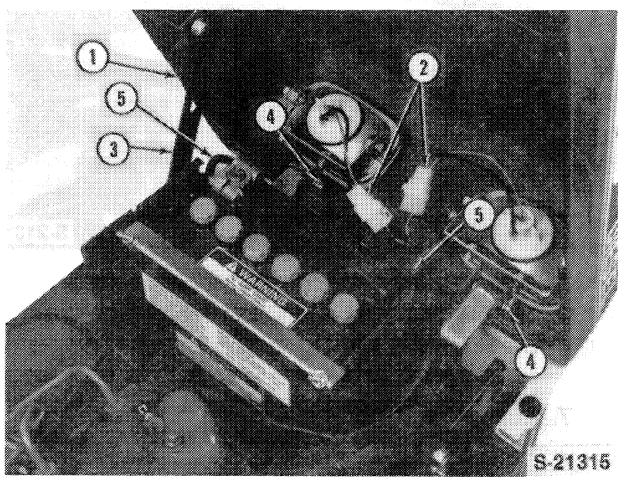


Figure 5
Engine Hood Removal
1. Hood
2. Headlight Connectors
3. Brace
4. Pivot Pins
5. Battery Cables

ENGINE OIL FILTER

Because engine oil becomes contaminated with dust, carbon particles, metal and sludge it is first directed through a filter before entering the lubrication system. The filter is a full flow type, whereby all the oil from the pump is routed through the filter. To protect the engine from loss of lubrication in the event of a plugged or restricted filter, a relief valve in the filter opens and permits unfiltered oil to flow through the system to maintain engine lubrication.

B. ENGINE OVERHAUL

ENGINE REMOVAL

1. Raise the hood (1) and remove the side screens (2), Figure 4.

2. Disconnect the two headlight wiring connectors (2), Figure 5.

3. Remove the two hood pivot pins (4) and brace (3) and remove the hood from the tractor.

4. Drain the coolant from the radiator and engine block, Figure 6.

5. Disconnect the battery cables (5), Figure 5, from the battery terminal posts.

6. Drain the engine crankcase oil, Figure 7.

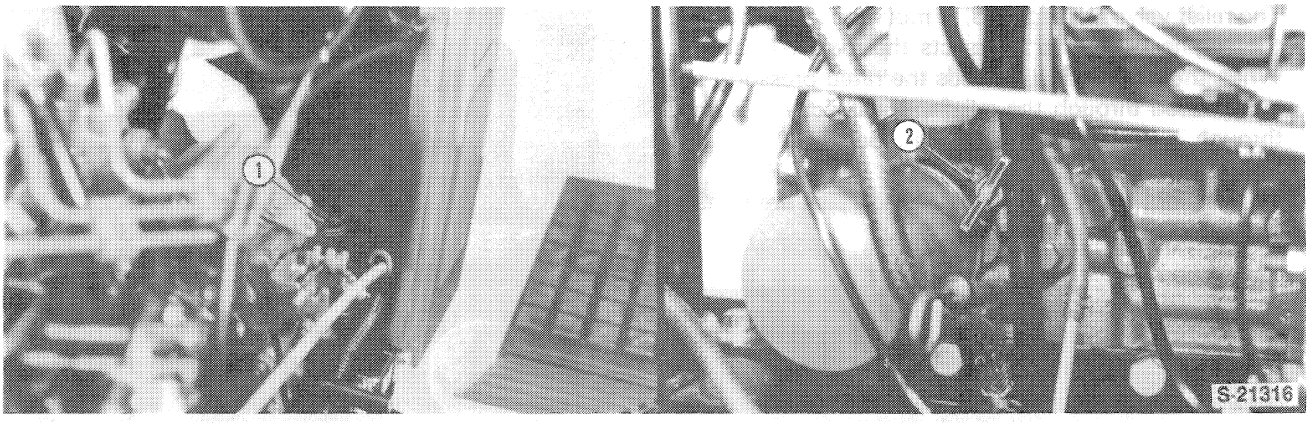


Figure 6
Coolant Drain Locations
1. Radiator Drain Cock
2. Engine Block Drain Cock

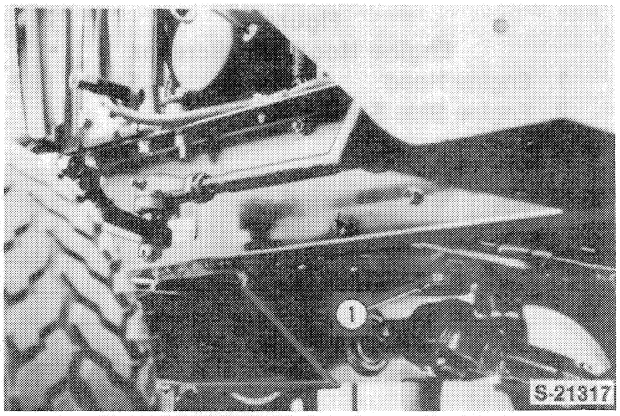


Figure 7
Crankcase Oil Drain
1. Drain Plug

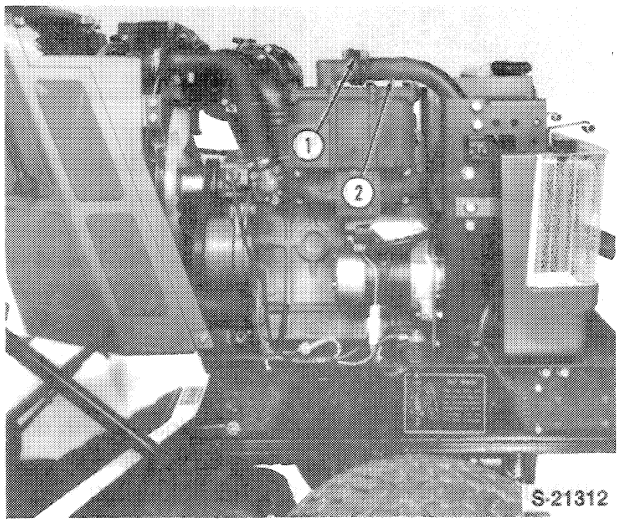


Figure 8
Exhaust Pipe Removal
1. Clamp
2. Exhaust Pipe

7. Loosen the exhaust pipe clamp (1) and remove the exhaust pipe (2), Figure 8.

8. Remove the air cleaner as follows; Reference Figure 9.

   - Loosen the intake tube clamps (3) and remove the intake tube (2).
   - Loosen the air cleaner hose clamps (5) and remove the hose (4).
   - Loosen the air cleaner canister retaining clamps (6) and remove the air cleaner assembly from the mounting bracket.
   - Remove the mounting bracket bolts and spacers and remove the bracket (1) from the cylinder head, Figure 10.

9. Remove the upper radiator hose (7), Figure 9.

10. Remove the injector fuel leak-off tube (8), Figure 9.

11. Disconnect the flexible fuel line hose (1), from the fuel filter, Figure 11.

    NOTE: *If the fuel has not been drained from the fuel tank, pinch the flexible hose closed to prevent fuel leakage.*

12. Disconnect the proofmeter cable (2) from the engine drive, Figure 11.

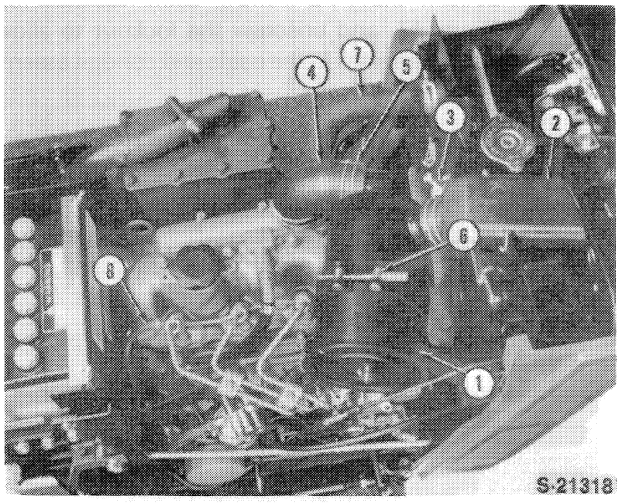


Figure 9
Air Cleaner Removal

1. Air Cleaner Assembly
2. Intake Tube
3. Intake Tube Clamp
4. Air Cleaner Hose
5. Air Cleaner Hose Clamp
6. Air Cleaner Retaining Strap
7. Upper Radiator Hose
8. Injector Leak-Off Tube

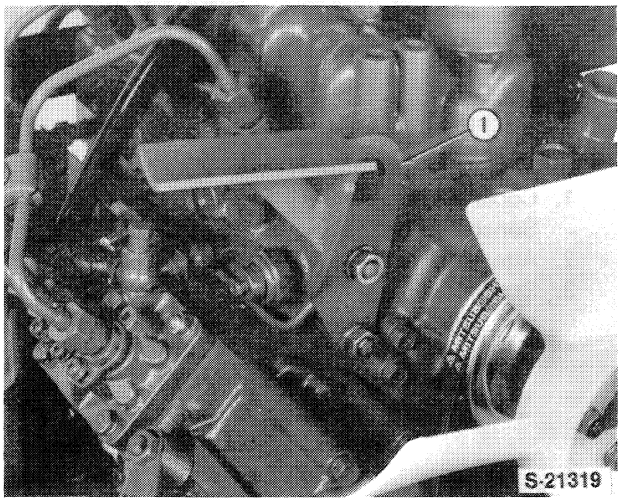


Figure 10
Air Cleaner Support Removal

1. Support Bracket

13. Disconnect the glow plug terminal wire (1), Figure 12.

14. Disconnect the engine oil pressure sensor switch wire (2), Figure 12.

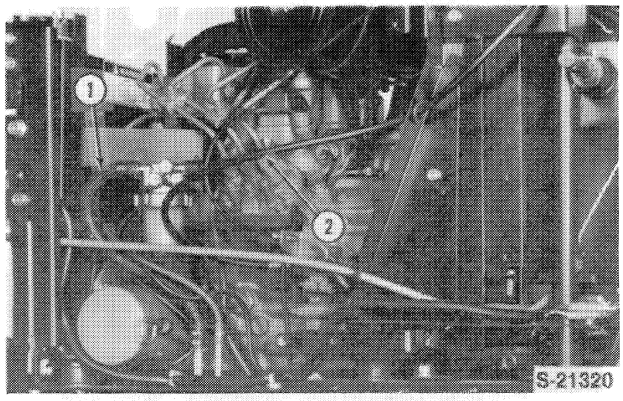


Figure 11
Fuel Line and Proofmeter Cable

1. Flexible Fuel Line
2. Proofmeter Cable

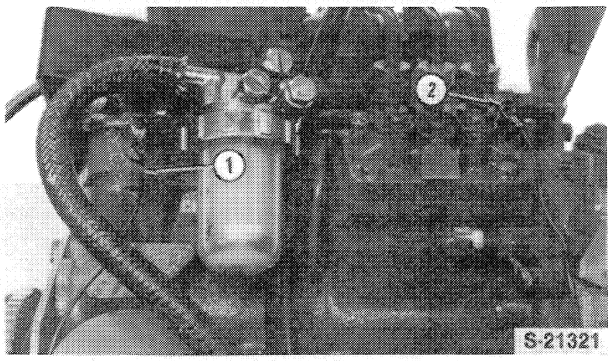


Figure 12
Glow Plug and Oil Pressure Wire Location

1. Glow Plug Terminal Wire
2. Oil Pressure Sensor and Wire

15. Disconnect the wire (2) from the injection pump solenoid stop control, Figure 13.

16. Remove the "E"-ring (2) and remove the throttle control cable (1) from the injection pump, Figure 14.

17. Disconnect the coolant temperature sensor wire (1) from the sensor switch, Figure 15.

18. Remove the wires (2) from the alternator assembly, Figure 15.

19. Remove the battery cable and wires (3) from the starter motor, Figure 15.

20. Remove the front grill support bolts (4) (three each side) and remove the grill (5), Figure 15.

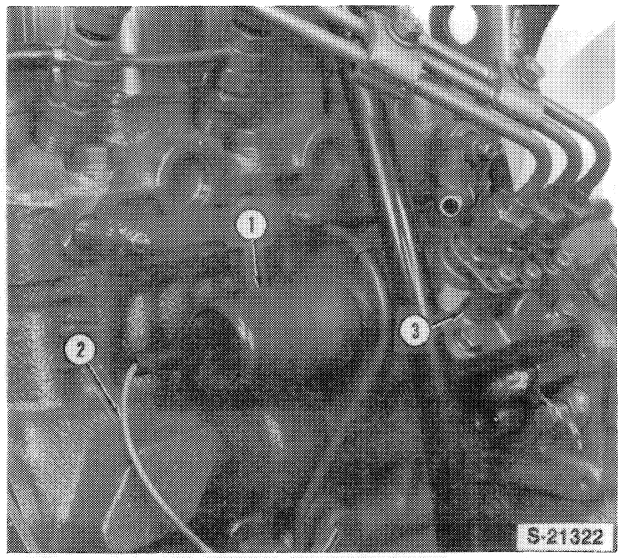


Figure 13
Engine Stop Solenoid

1. Solenoid
2. Solenoid Wire
3. Injection Pump

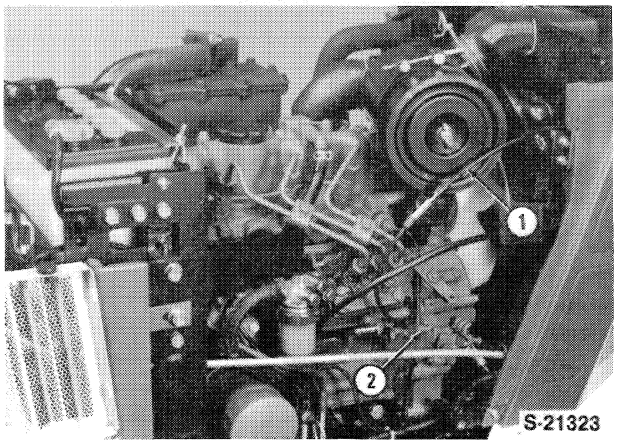


Figure 14
Throttle Cable Removal

1. Throttle Cable
2. "E" Ring

- Loosen the PTO control cable locknut (5), Figure 17, and unscrew the locknut to allow maximum slack in the cable and conduit assembly.
- Remove the PTO tightener lower spring (7).
- Disconnect the PTO cable from the tension spring (8) and remove the cable assembly bracket (6), Figure 17.
- Remove the drive belts (3) from the pulleys.

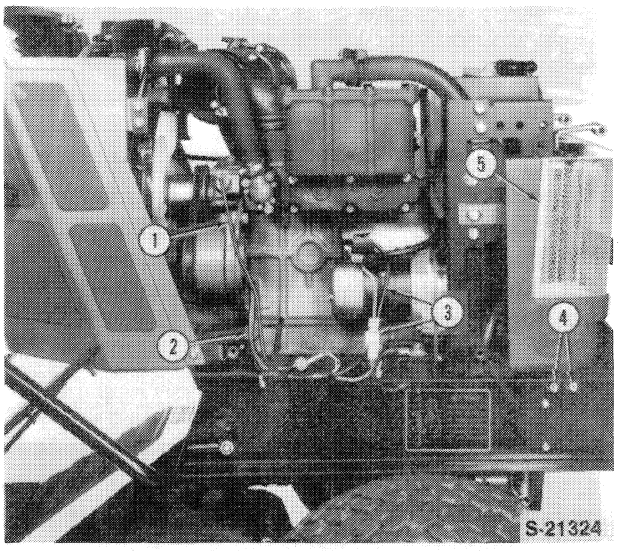


Figure 15
Engine Removal

1. Coolant Temperature Sensor Wire
2. Alternator Wires
3. Starter Motor Cable and Solenoid Wires
4. Grill Support Bolts
5. Front Grill

21. Remove the PTO drive belts as follows, Reference Figures 16 and 17.
    - Remove the upper and lower shields (1) and (3), Figure 16.
    - Loosen the belt guide bolts and slide the guides (1) away from the bolts (3), Figure 17.
22. Remove the four battery stand to frame attaching bolts (2) and remove the battery stand (1) from the tractor, Figure 18.
23. From under the tractor, remove the two transmission drive shaft coupling bolts (3) and spacers (4), Figure 19.
24. Remove the transmission drive shaft by sliding the shaft rearward to disengage the spline drive to the crankshaft pulley coupling (5).

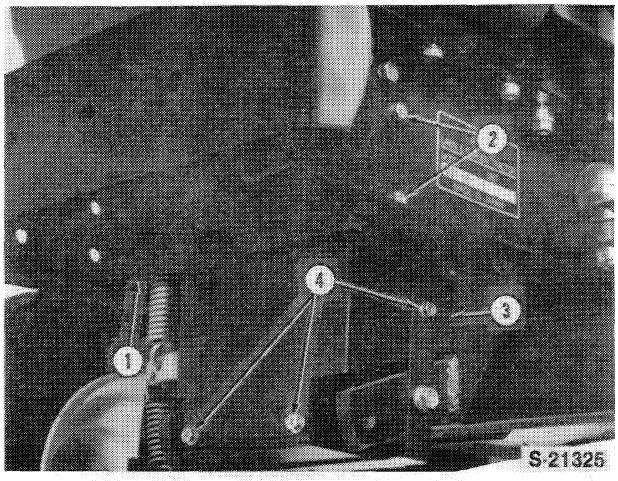


Figure 16
PTO Drive Shield Removal

1. Upper Shield
2. Upper Shield Mounting Bolts (4)
3. Lower Shield
4. Lower Shield Mounting Bolts (4)

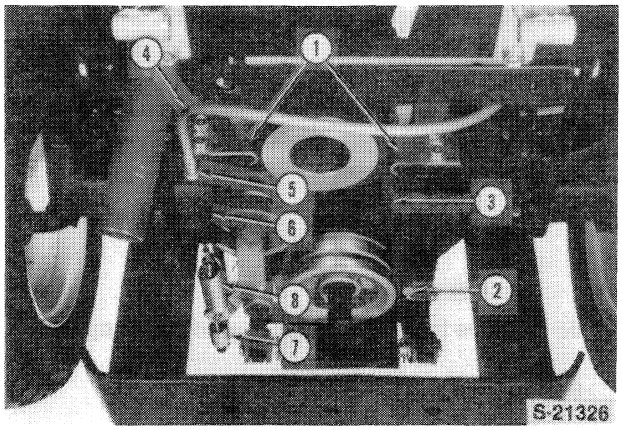


Figure 17
PTO Drive

1. Belt Guide (2)
2. Guide Bolt
3. Belts (2)
4. PTO Control Cable
5. Locknut
6. Bracket
7. Lower Tension Spring
8. Upper Tension Spring

25. Remove the three air flow baffle mounting screws (3) and remove the baffle (1), Figure 20.

26. Remove the two fan shroud mounting screws (4), Figure 20.

27. Remove the engine side screen pin bracket (5) and reposition the fan shroud so as to be clear of the radiator and side screens.

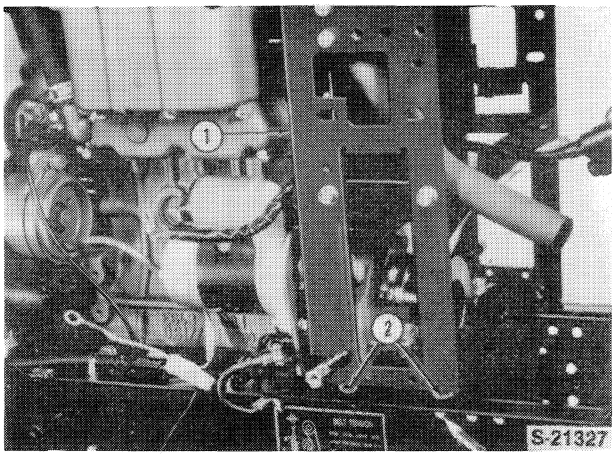


Figure 18
Battery Stand Removal

1. Battery Stand
2. Mounting Bolts (4)

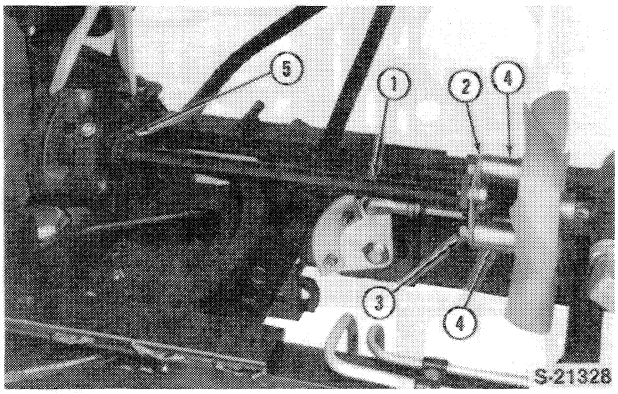


Figure 19
Transmission Drive and Coupling

1. Drive Shaft
2. Coupling
3. Bolts
4. Spacers
5. Pulley Hub

NOTE: *Shown with sheet metal removed for clarity.*

28. Attach an overhead hoist to the engine lifting brackets and take up the chain slack.

29. Remove the four engine mounting bolt nuts (1), Figure 21.

30. Remove the ground cable from the frame mounting bolt.

31. Carefully lift the engine out of the tractor.

NOTE: *Use care to not damage the engine fan or fan shroud due to the small amount of clearance available.*

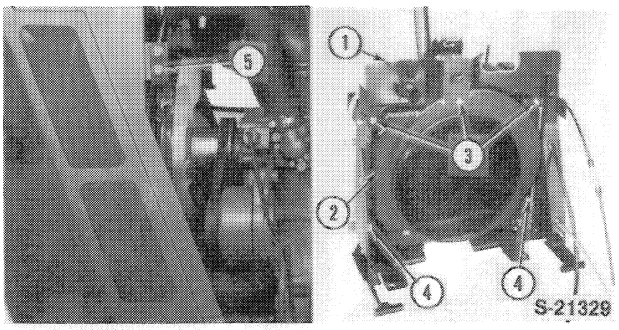


Figure 20
Fan Shroud and Air Baffle Removal

1. Air Baffle
2. Fan Shroud
3. Air Baffle Retaining Screws
4. Fan Shroud Retaining Screws
5. Engine Side Screen Mounting Pin

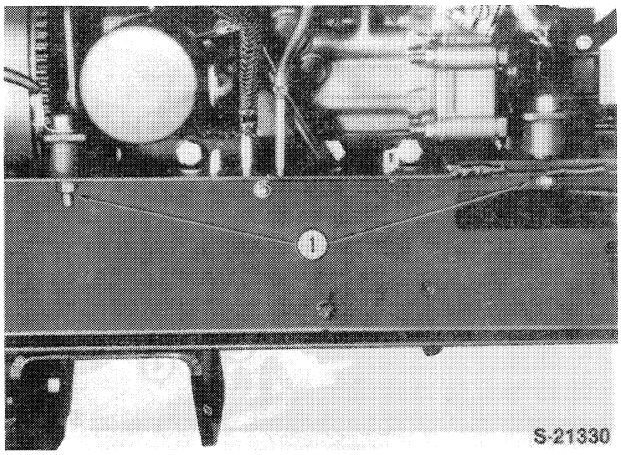


Figure 21
Engine Removal

1. Engine Mounting Bolts

ENGINE DISASSEMBLY

NOTE: *The cylinder head and related components can be serviced with the engine in place in the tractor.*

1. Perform Steps 1-5 and 7-10 under "Engine Removal" as described.

2. Disconnect the glow plug terminal wire (1), Figure 22.

3. Disconnect the engine oil pressure sensor wire (2), Figure 22.

4. Disconnect the coolant temperature sensor wire (3) from the temperature sensor, Figure 22.

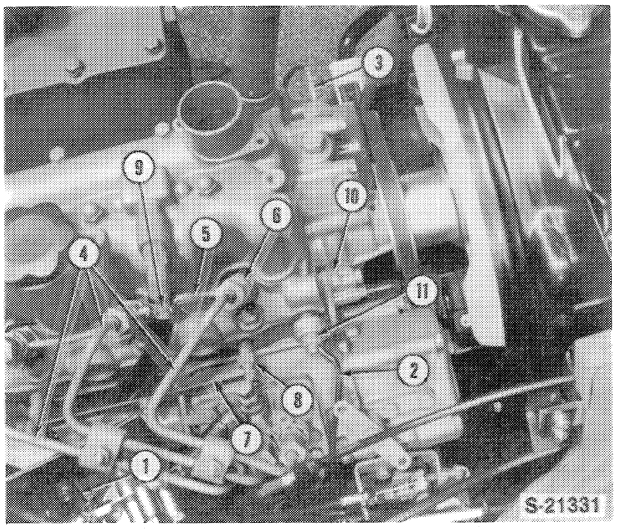


Figure 22
Engine Disassembly

1. Glow Plug Wire
2. Oil Pressure Sensor Wire
3. Coolant Temperature Sensor Wire
4. Injector Lines (3)
5. Fuel Leak-Off Line
6. Injectors (3)
7. Glow Plug Connector Strap
8. Glow Plugs
9. Vapor Vent Tube
10. External Oil Tube Banjo Bolt
11. Oil Pressure Sensor Switch

5. Remove the injector lines (4) and cap all openings.

6. Remove the vapor vent tube (9).

7. Remove the external oil tube banjo bolt (10) from the front of the head.

8. Loosen the alternator bracket bolt (2), Figure 23. Then remove the belt from the alternator and fan pulley.

9. Remove the water pump mounting bolts (2) and remove the water pump and fan as an assembly, Figure 24.

10. Remove the muffler/exhaust manifold assembly (5), Figure 23.

11. Remove the valve cover/intake manifold assembly (1), Figure 25.

12. Remove the valve rocker shaft as an assembly, Figure 26.

NOTE: *Alternately loosen the rocker shaft support bolts a turn at a time to prevent bending the rocker shaft.*

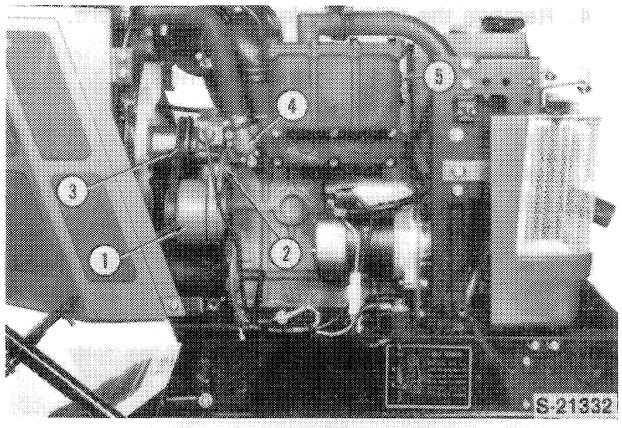


Figure 23
Engine Disassembly

1. Alternator Assembly
2. Alternator Mounting Bolt
3. Belt
4. Thermostat Housing
5. Muffler Assembly

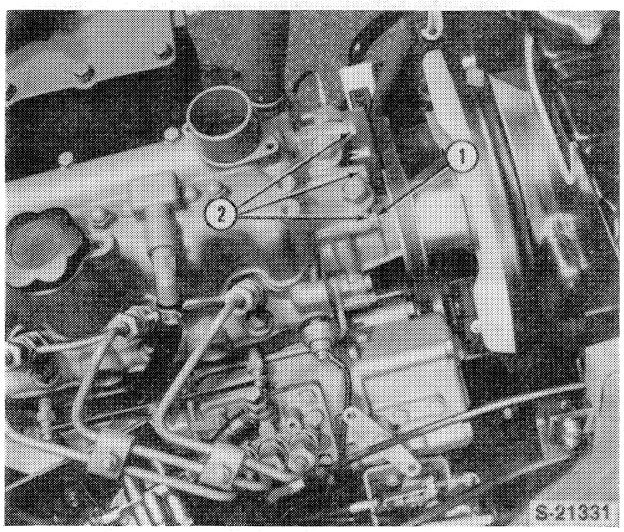


Figure 24
Water Pump Removal

1. Water Pump Assembly
2. Water Pump Mounting Bolts

13. Remove the push rods and place them in separately marked holder for installation in their original location.

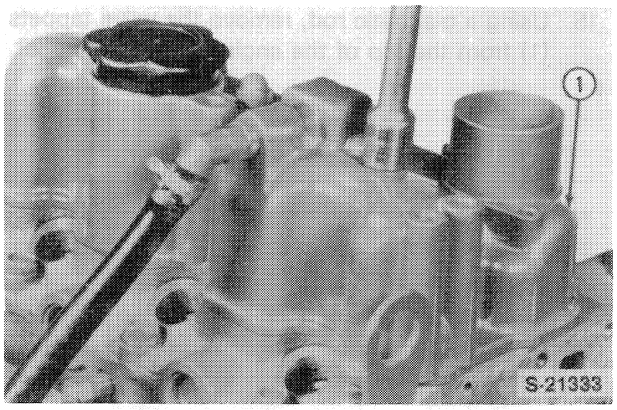


Figure 25
Valve Cover Removal

1. Valve Cover

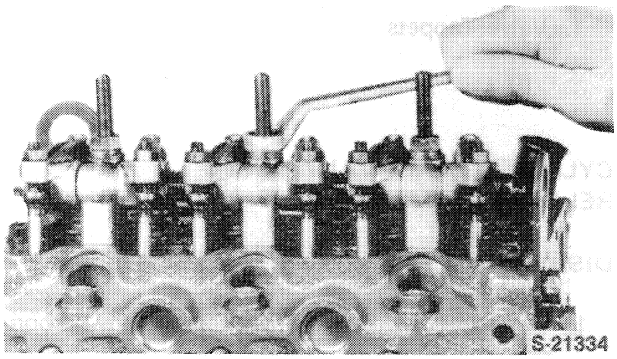


Figure 26
Valve Rocker Shaft Removal

14. Remove the cylinder head bolts by loosening the bolts a half turn at a time to prevent warping the head, Figure 27.

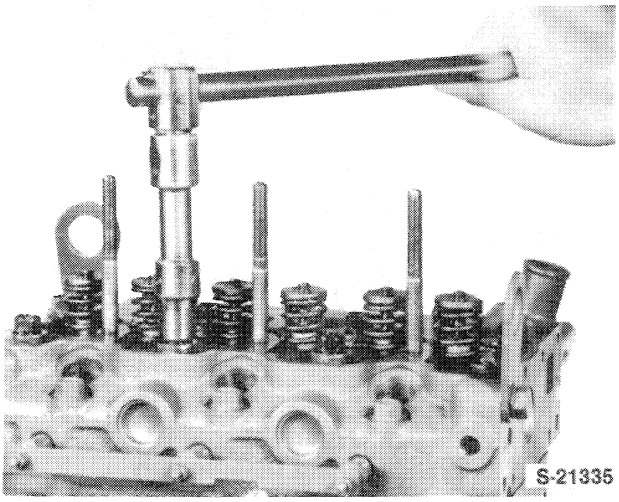


Figure 27
Cylinder Head Removal

15. Using a magnetic rod, remove the valve tappets (1) from the top of the engine block, Figure 28.

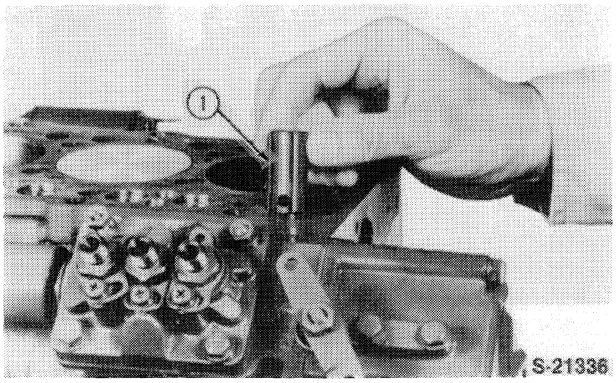


Figure 28
Valve Tappet Removal
1. Valve Tappets

CYLINDER HEAD, VALVES AND RELATED COMPONENTS

DISASSEMBLY

1. Clean the cylinder head and remove any carbon deposits from around the valve heads.

2. Use a suitable valve spring compressor and remove the valve spring retainer locks (4), retainers (3) and springs (2), Figure 29.

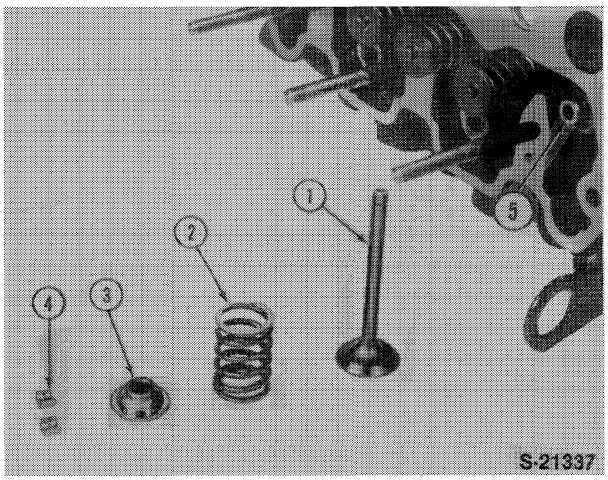


Figure 29
Cylinder Head Disassembly
1. Valve
2. Spring
3. Retainer
4. Retainer Locks
5. Valve Guide Seal

3. Remove the valves and place all valve components together in separately marked containers for reassembly in their original location.

4. Remove the valve guide seals and discard.

5. Remove the injectors from the head.

   NOTE: *Be sure to remove the injector sealing washer from the bore if it was not removed along with the injector.*

6. Disconnect the glow plug connector strap (1) and remove the glow plugs, Figure 30.

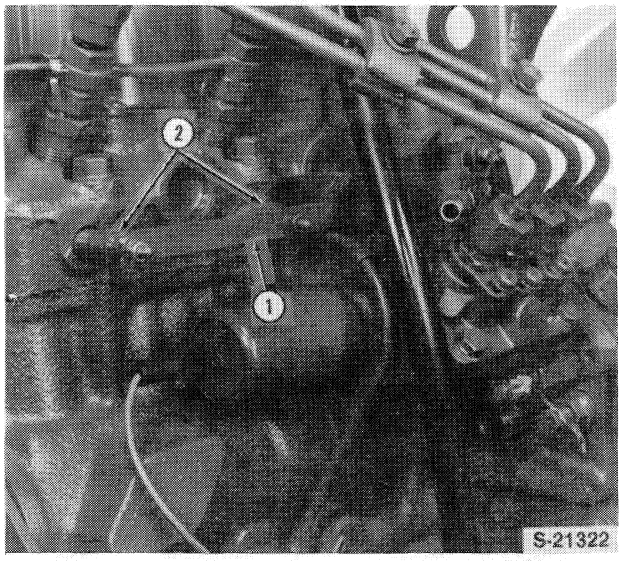


Figure 30
Glow Plug Removal
1. Connector Strap
2. Glow Plugs

7. Remove the thermostat housing (1) and remove the thermostat, spring and gasket, Figure 31.

8. If required, use a brass drift and gently tap the pre-combustion chamber from the bottom side of the head and remove the pre-combustion chamber, spacer and gasket ring from the top and discard, Figure 32.

   NOTE: *Remove the pre-combustion chamber only if it is defective or if carbon deposits cannot be removed any other way.*

   Do not reuse the pre-combustion chamber after it has been removed as it is a press fit in the head and it may not hold if reinstalled.

9. Remove the oil pressure sensor switch from the head.

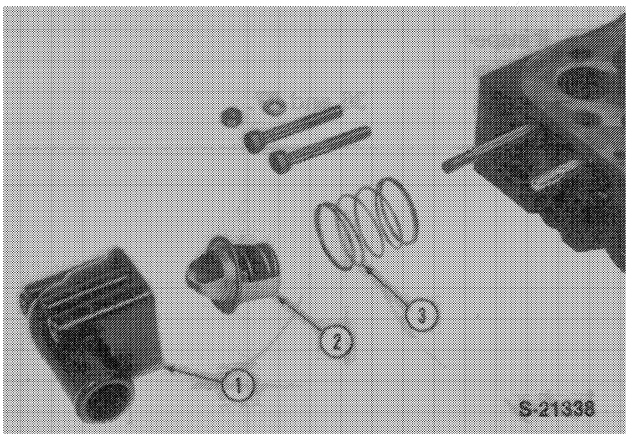


Figure 31
Thermostat Removal

1. Housing
2. Thermostat
3. Spring

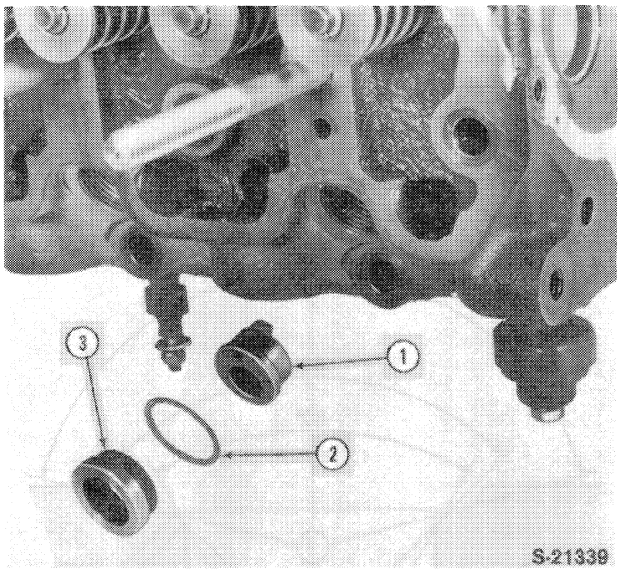


Figure 32
Pre-Combustion Chamber Removal

1. Pre-Combustion Chamber
2. Sealing Gasket
3. Spacer

INSPECTION AND REPAIR

1. Clean all carbon deposits from the combustion chambers, pre-combustion chambers and valve ports using a soft wire brush and scraper.
2. Clean all deposits and residue from the gasket surface using care to not scratch or nick the machined surface.
3. Wash the cylinder head in a suitable solvent and air dry.
4. Check the cylinder head for cracks or other damage paying particular attention to the following areas:
   - Valve ports
   - Valve seats
   - Combustion chamber
   - Water jacket
5. Inspect the gasket surface for scratches or nicks which could cause coolant or combustion leakage.
6. Examine the core plugs for rust or other signs of coolant leakage. If a plug shows signs of leakage, replace all core plugs in the head.
7. Using a straight edge and feeler gauge, check the cylinder head for warpage as shown, Figure 33.

   Resurface or replace the cylinder head if warpage is greater than 0.005 in. (0.12 mm).

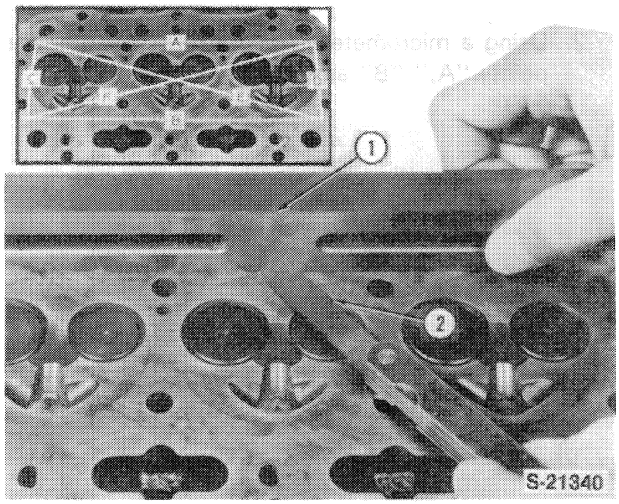


Figure 33
Cylinder Head Warpage Check

1. Straight Edge
2. Feeler Gauge

VALVES

1. Using a soft wire brush, clean all carbon deposits from the valves. Inspect the condition of the valves and discard any that are badly burned, cracked or bent as shown, Figure 34.

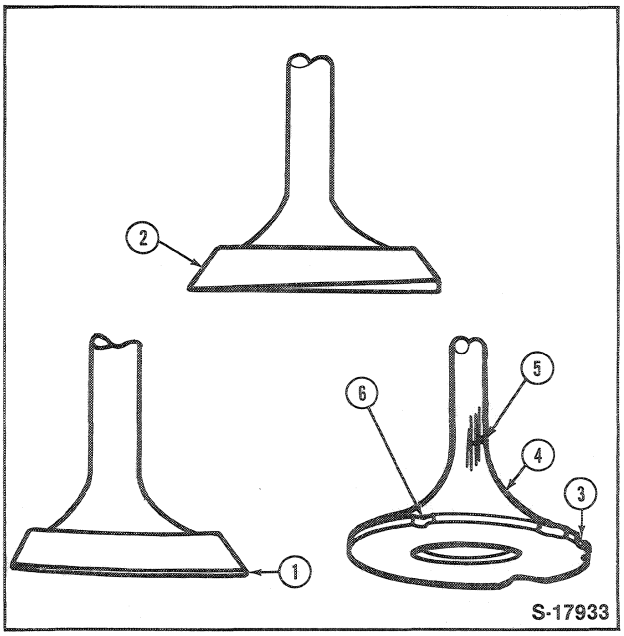


Figure 34
Valve Defect Inspection

1. Margin Too Thin — Min. .0393 in. (1.0 mm)
2. Bent Valve
3. Pitting
4. Indented
5. Wear or Necking
6. Burned

2. Using a micrometer measure the valve stem at points "A," "B" and "C," Figure 35.

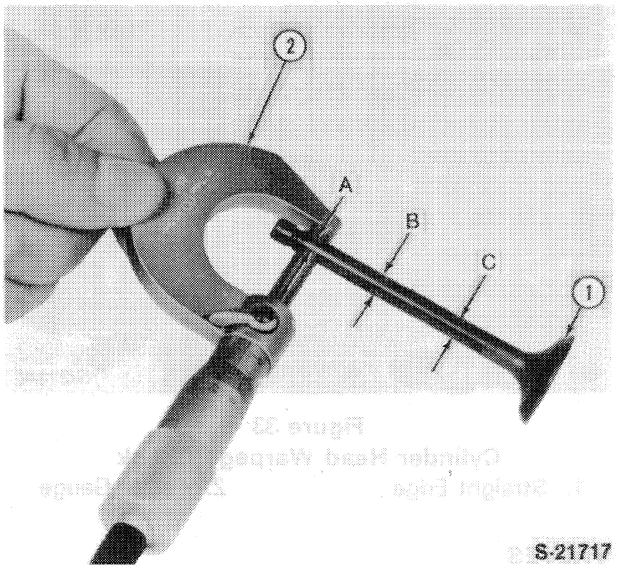


Figure 35
Valve Stem Wear Check

1. Valve
2. Micrometer
   A-B-C, Wear Points

Replace valves if the stem wear at any point is such that the stem diameter is less than 0.23 in. (5.9 mm).

3. If inspection indicates that the valve may be reused, the valve face and seat should be ground as shown, Figures 36 and 37.

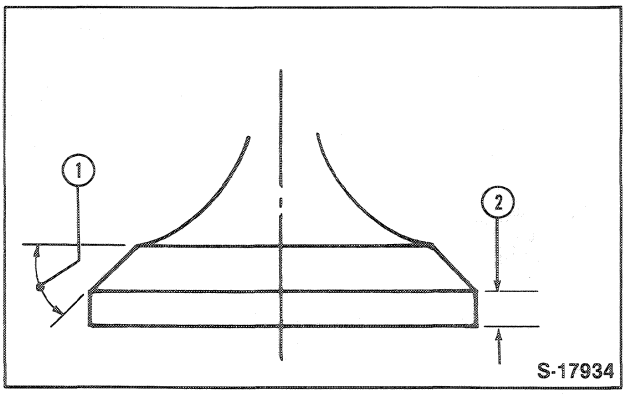


Figure 36
Valve Correctly Ground

1. 45° Angle Seat
2. Minimum Valve Margin .020 in. (.5 mm)

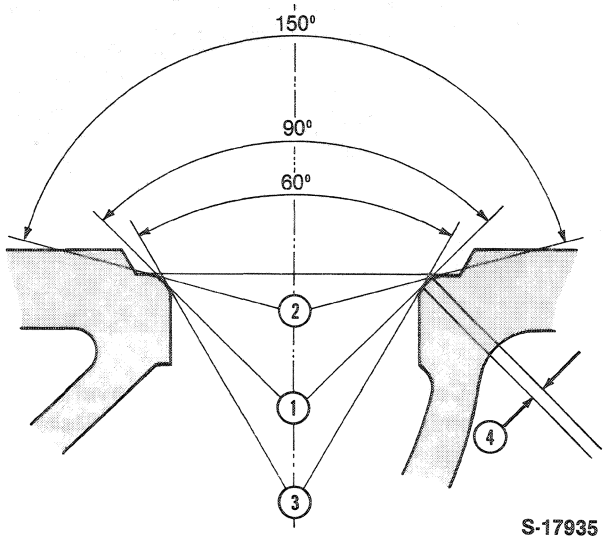


Figure 37
Valve Seat Grinding

1. Valve Seat Angle — 45°
2. Lower Seat — 30° Stone
3. Raise Seat — 60° Stone
4. Seat Width — 0.060-0.070 in. (1.59-1.80 mm)

After grinding, recheck the valve margin, (2), Figure 36, to be sure that the correct valve head thickness is maintained.

Minimum margin .....0.020 in. (0.5 mm)

IMPORTANT: *After finish grinding the valve face and seat, check to assure that the seat contacts the center of the valve face. Using Prussian Blue, lightly coat the valve seat, then place the valve in position in the head and rotate the valve slightly while holding a light downward pressure on the valve. If the blueing is transferred to the center of the valve face the contact is correct.*

If Prussian Blue is not available, mark the valve face or seat with a soft lead pencil as shown, Figure 38. Turn the valve slightly in the seat. The penciled lines will be broken at the seat contact area.

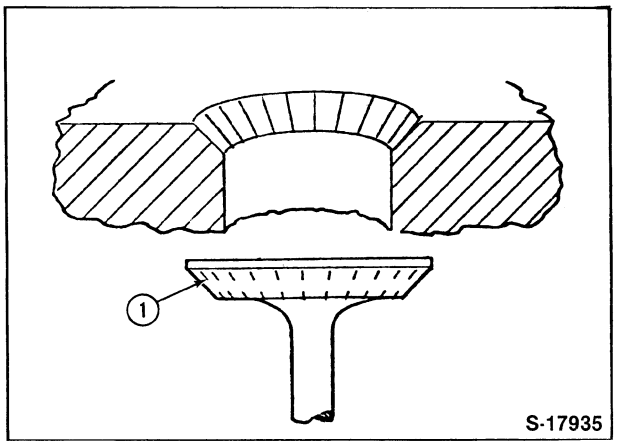


Figure 38
Valve Seat Contact Location
1. Seat

VALVE GUIDES

1. Thoroughly clean the valve guides before attempting to check for internal wear.

2. Using a small hole gauge, measure the valve guide bore at the top and bottom wear points as shown, Figure 39.

3. Determine the stem to guide clearance by subtracting the valve stem diameter from the valve guide diameter as measured above.

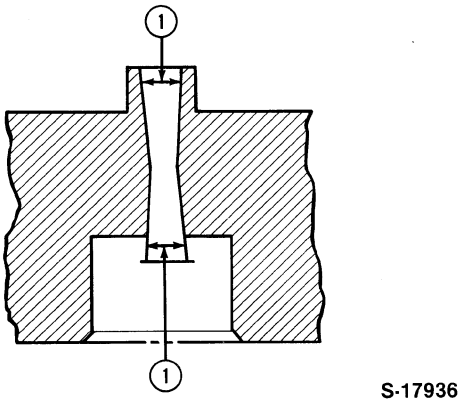


Figure 39
Valve Guide Wear Check
1. Wear Point

If the clearance, Figure 40, exceeds 0.008 in. (0.2 mm) intake or 0.010 in. (0.25 mm) exhaust, replace the valve and/or head as required.

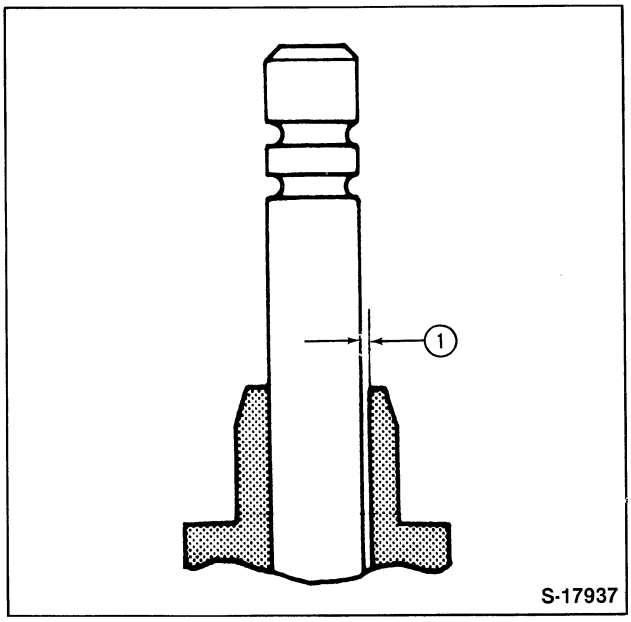


Figure 40
Valve Stem to Guide Clearance Check
1. Clearance

VALVE SEATS

Examine the valve seats and reface if worn or damaged.

Valve seat grinding requires that the seat be ground to the correct width and established in the proper position as shown, Figure 37.

A valve that extends too deep into the combustion area will result in valve burning. If the valve is recessed too deep into the cylinder head it will cause a rapid build-up of carbon deposits.

IMPORTANT: *The valve guide serves as the standard when correcting the valve seat. Be sure that the valve guide wear is within the specified wear limit before attempting to regrind the valve seat.*

Valve seat grinding requires that the seat be ground to the correct width and positioned as shown, Figure 37.

1. Check the seat surface for defects. Use a 45° stone if necessary to reface the seat. Grind away only enough material to provide a smooth, even seat.

2. Check the seat width, Figure 37.

   If necessary, use a 30° stone to lower the seat contact area and a 60° stone to raise the seat contact area.

   Regrind the valve seat to obtain a seat contact width as follows:

   Standard seat width . . . . . 0.062-0.070 in. (1.59-1.80 mm)
   Max. Seat Width . . . . . 0.10 in. (2.5 mm)

   If the valve head is found to exceed the maximum depth of 0.070 in. (1.8 mm), replace the cylinder head, Figure 41.

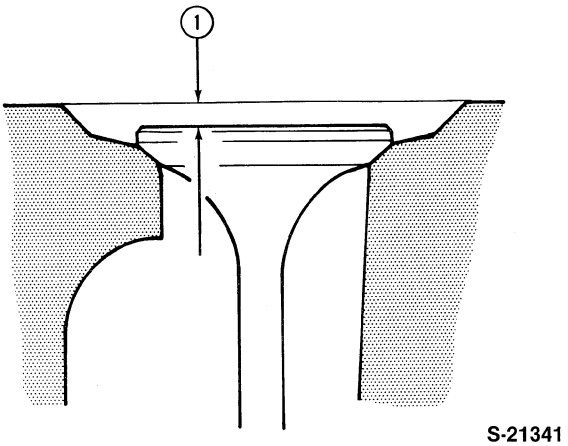


Figure 41
Valve Recess Depth
1. Depth — 0.070 in. (1.8 mm) Max.

NOTE: *Refacing the seat should always be coordinated with refacing of the valve to assure a compression tight fit.*

VALVE SPRINGS

Place the valve springs on a flat surface and measure the free length and squareness of the spring as shown, Figure 42.

Replace springs that do not meet the following requirements:

	Standard	Service Limit Maximum
Out-of-Round . .	0.04 in. (1.0 mm)	0.05 in. (1.2 mm)
Free Length . . .	1.3 in. (33 mm)	1.24 in. (31.5 mm)

Place the spring in a suitable spring load tester and measure the spring load rating. Replace springs that do not meet the following specifications:

Compressed Load Rating . . . . . 13.2 lbs. (60 Kg) Min. when compressed to 1.71 in. (28.3 mm) length

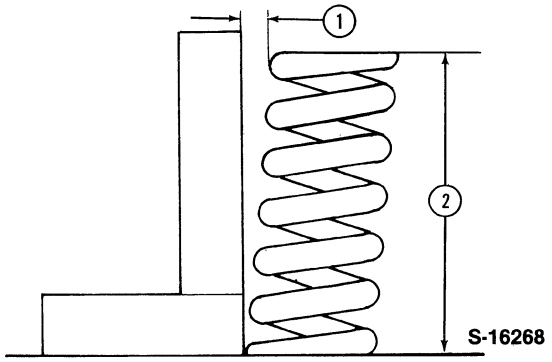


Figure 42
Valve Spring Length and Squareness Check
1. Squareness 2. Free Length

ROCKER ARM ASSEMBLY

DISASSEMBLY

1. Remove the bolts (1) at each end of the rocker arm shaft (6) and remove the rocker arm (2), pedestal (3), spring (4) and shims (5), Figure 43.

2. Remove the roll pin (7) in the front pedestal and shaft and remove the pedestal from the shaft.

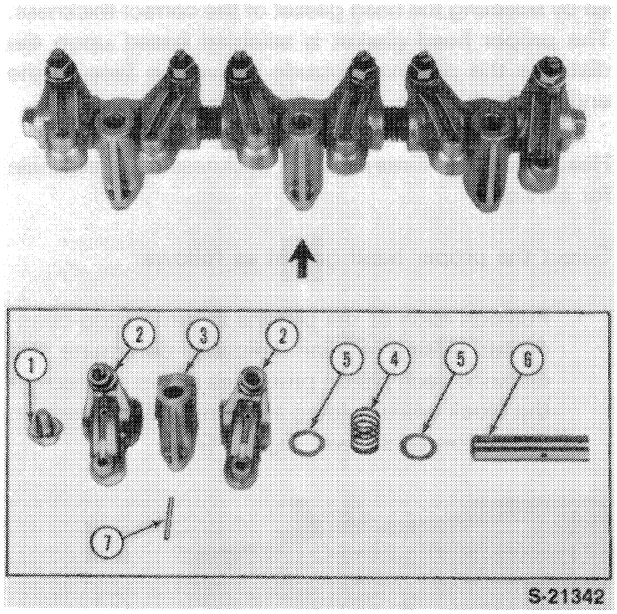


Figure 43
Rocker Shaft Components

1. Bolts (2)
2. Rocker Arm
3. Pedestal
4. Spring
5. Shims
6. Shaft
7. Roll Pin

INSPECTION AND REPAIR

1. Inspect the rocker arms and pivot shaft for wear or other damage.

2. Check the adjusting screws for damaged threads and excessive wear.

3. Check the rocker arm to valve stem contact tips for excess wear or damage. Replace the rocker arm if defective.

4. Using a micrometer, measure the rocker arm wear points on the shaft, Figure 44.

   Replace the rocker shaft if the wear at any point is such that the shaft diameter is less thaan 0.455 in. (11.77 mm) diameter (min.).

5. Using a hole gauge, measure the inside bore diameter of the rocker arms, Figure 45.

   Replace any rocker arms having a bore diameter exceeding 0.460 in. (11.7 mm), Figure 45.

6. Determine the rocker arm to shaft clearance by subtracting the rocker shaft diameter from the rocker arm bore diameter. Replace the rocker shaft and/or rocker arm if the clearance exceeds 0.008 in. (0.2 mm).

Figure 44
Rocker Shaft Wear Check

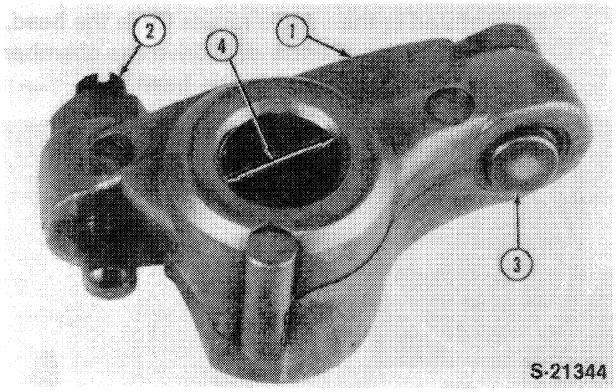


Figure 45
Rocker Arm Assembly

1. Arm Assembly
2. Adjusting Bolt
3. Valve Stem Contact Pin
4. Bore Diameter

ASSEMBLY

ROCKER SHAFT

Assemble the rocker shaft components on the shaft in the order as shown, Figure 43. On assembly observe the following requirements.

Position the front pedestal on the shaft aligning the roll pin hole in the pedestal with the hole in the shaft. Using a new roll pin, drive the roll pin into the shaft so that the outer end is just below the pedestal to head mating surface.

NOTE: *Rocker shaft lubrication oil flows through the roll pin to the inside of the rocker shaft. Therefore, be sure the roll pin is not damaged on installation or driven in too far to bottom against the top side of the rocker shaft.*

VALVES

1. Insert the valves in the guides from which they were removed and lightly lap the valve to be sure of an even seat contact around the valve face. Then remove the valve and remove all traces of valve lapping compound by washing with soap and water.

2. Install new seals on the valve guides.

3. Using a suitable compressor, assemble the valves, springs, retainers and locks.

4. If removed, install a new pre-combustion chamber. Position the pre-combustion chamber tang (2) centered in the middle recess (5) in the head, Figure 46. Using a brass drift drive the chamber in until it is fully seated in the head.

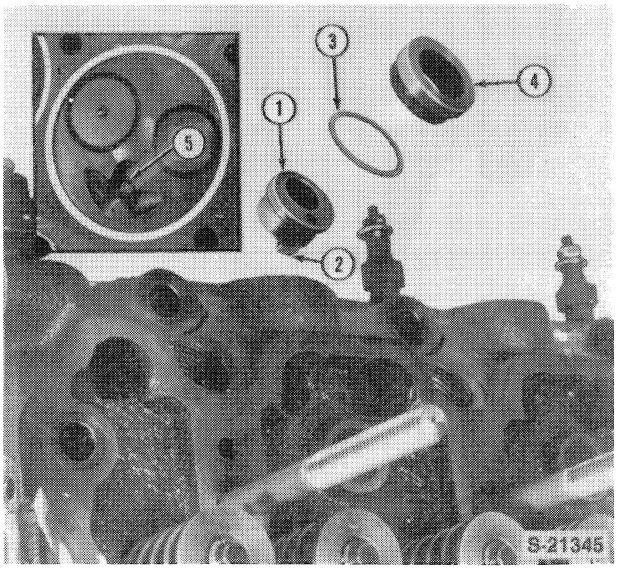


Figure 46
Pre-Combustion Chamber Installation

1. Pre-Combustion Chamber
2. Tang
3. Gasket Ring
4. Spacer
5. Recess

INSTALLATION

During assembly the engine compression is established by selecting the head gasket of the correct thickness. The proper head gasket is selected based upon the distance the pistons protrude above the face of the engine block when at top-dead-center.

Head gaskets of three different thicknesses are available for service.

Select the proper head gasket as follows:

1. Position each of the pistons in turn at top-dead-center. Using a dial indicator determine the distance each piston protrudes above the face of the block while holding a downward pressure on the piston as shown, Figure 47.

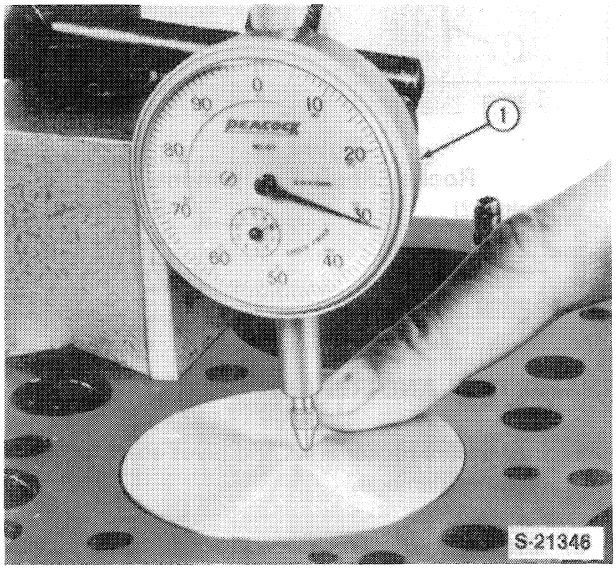


Figure 47
Measuring Piston Height Above Face of Block

1. Dial Indicator

Use the dimension taken from the cylinder which has the greatest piston projection and select the proper gasket as indicated in the following chart.

Piston Projection Measurement	Head Gasket Part Number	Gasket Installed Thickness
0.020-0.0255 in. (0.55-0.65 mm)	111147090	0.043 in. (1.1 mm)
0.0255-0.029 in. (0.65-0.75 mm)	1111477100	0.047 in. (1.2 mm)
0.029-0.033 in. (0.75-0.85 mm)	1111477110	0.051 in. (1.3 mm)

NOTE: *The last four digits of the part number are stamped on the top surface of the gasket as shown, Figure 48.*

2. If removed, install the tappets in their respective bores.

NOTE: *On installation, lubricate the tappets with heavy weight clean engine oil before inserting in the block.*

3. Select the proper head gasket and place it on the block with the part number facing up.

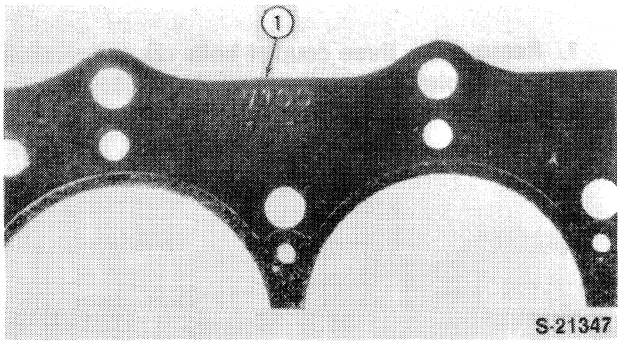


Figure 48
Head Gasket Part Number Code Location
1. Part Number Code

NOTE: *If the part number digit code is illegible, the gasket may be identified by the notch cut-outs as shown, Figure 49.*

Part Number Code .....7090 (one notch)
7100 (two notches)
7110 (no notch)

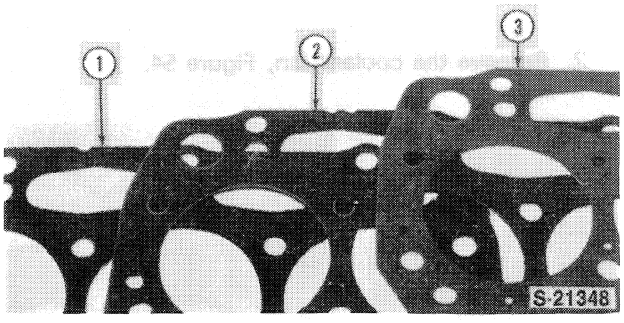


Figure 49
Head Gasket Identification
1. Single Notch — Part No. Code 7090
2. Two Notches — Part No. Code 7100
3. No Notch — Part No. Code 7110

4. Install the cylinder head using care to locate the roll pin dowel in the pin locating bore.

5. Lubricate the head bolt and stud threads and tighten in stages in sequence as shown, Figure 50.

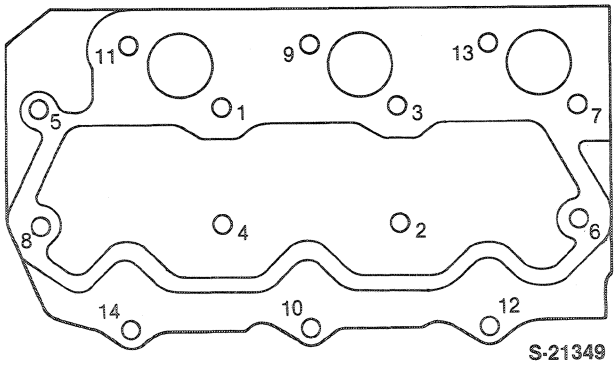


Figure 50
Head Bolt Tightening Sequence

Head Bolt Torque .....25-28 lbs. ft.
(3.5-4.0 Kg/m)

6. Reinstall the push rods in their original locations.

7. Install the assembled rocker shaft and tighten the pedestal bolts in steps to the specified torque.

Pedestal Bolt Torque.....15-18 lbs. ft.
(2.0-2.5 Kg/m)

8. Adjust the rocker arm clearance, Figure 51. Be sure the tappets are in their lowest position before making the adjustment as follows:

Bring the piston to the top-dead-center on the compression stroke (both valves closed). With the locknut loosened, turn the adjusting screw to obtain 0.008 in. (0.2 mm) "cold" clearance and tighten the locknut.

9. Using a new valve cover gasket, install the valve cover/intake manifold assembly. Tighten the cover bolts in steps to the specified torque.

Valve Cover Bolt Torque .....7-9 lbs. ft.
(1.0-1.3 Kg/m)

10. Install the oil transfer tube banjo bolt (2), Figure 52, and tighten to the specified torque.

Banjo Bolt Torque .....7-9 lbs. ft.
(1.0-1.3 Kg/m)

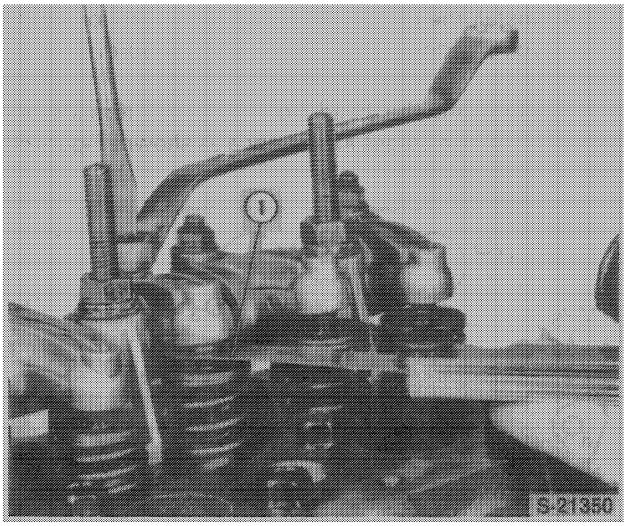


Figure 51
Valve Tappet Adjustment
1. Tappet Clearance — 0.008 in. (0.2 mm)

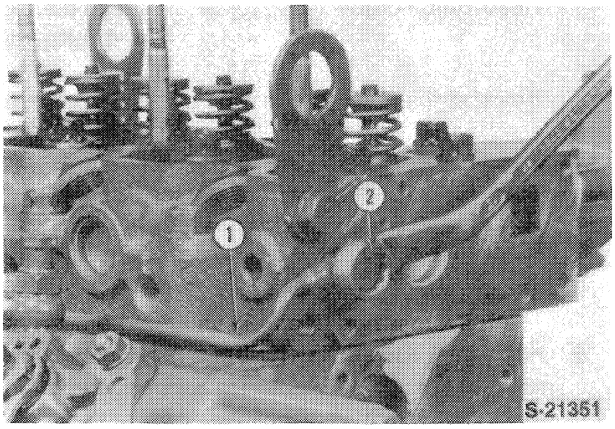


Figure 52
External Oil Transfer Tube Installation
1. Tube 2. Banjo Bolt

11. Using a new gasket, install the water pump and fan as an assembly.

12. Install the injector assemblies using new sealing washers and tighten to the specified torque.

    Injector Torque . . . . . .43-51 lbs. ft. (6.0-7.0 Kg/m)

13. Install the fuel leak-off line and injector liner.

14. Install the oil pressure sensor switch and tighten to the specified torque.

    Sender Switch Torque . . . . . .7-11 lbs. ft. (1.5-2.0 Kg/m)

15. Complete the assembly of the electrical wiring, fuel lines, controls and sheet metal following the removal procedure in reverse order.

ENGINE FRONT COVER, TIMING GEARS, OIL PUMP AND CAMSHAFT

The engine must be removed from the tractor to service these components. Refer to steps 1-31, "Engine Removal," this section.

1. Remove the three coupler bolts (2) and remove the coupler (1) from the crankshaft pulley, Figure 53.

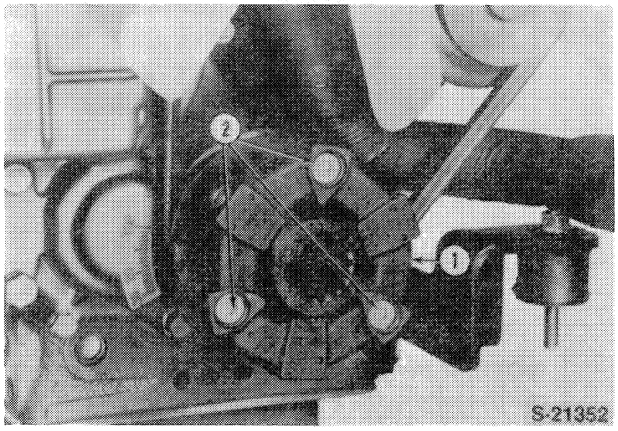


Figure 53
Transmission Drive Coupler
1. Coupler 2. Mounting Bolts (3)

2. Remove the coolant fan, Figure 54.

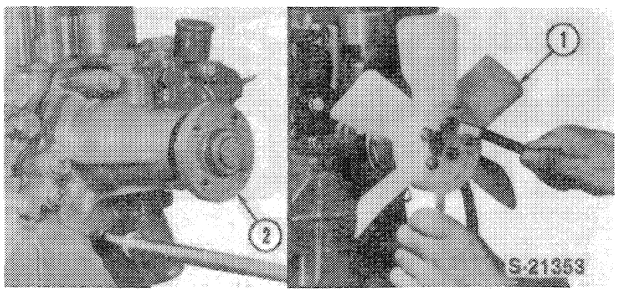


Figure 54
Water Pump Removal
1. Coolant Fan 2. Water Pump