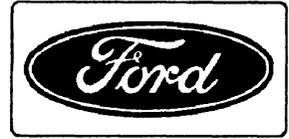


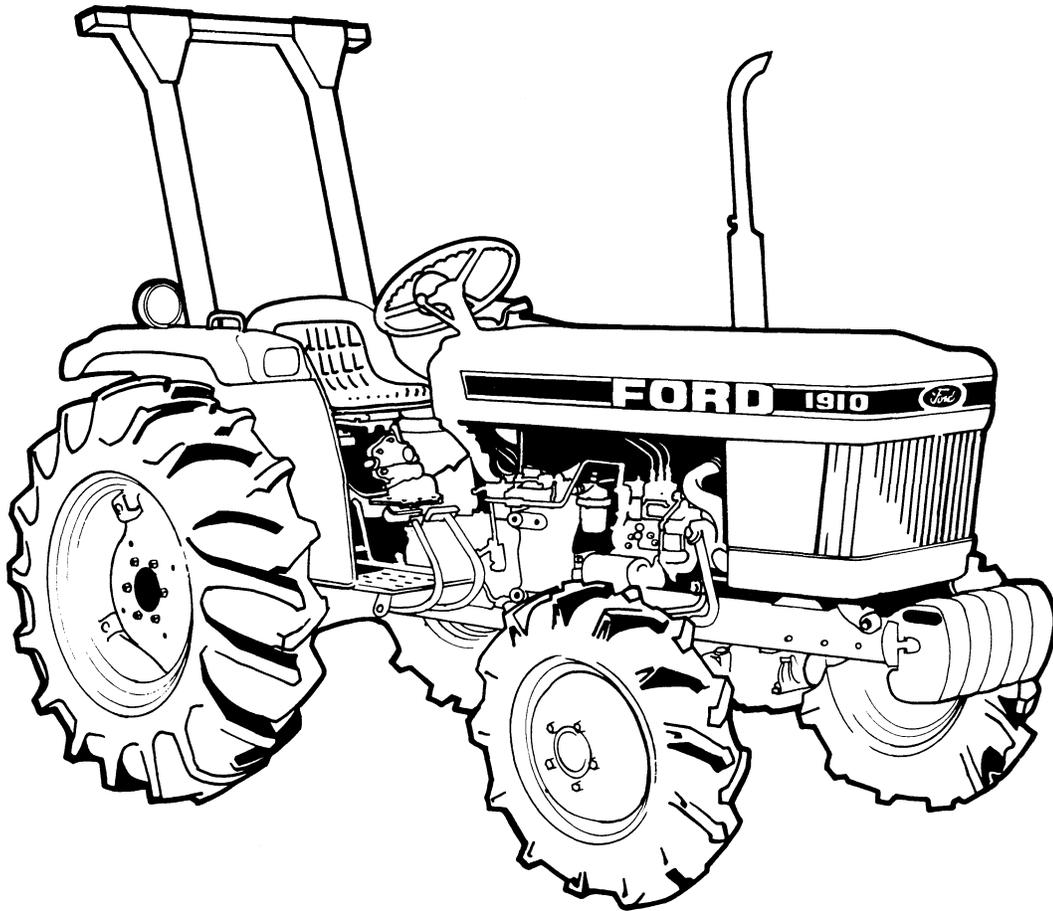
FORD



Service Manual

Tractors
1910, 2110

40191020



Reprinted

FOREWORD

This repair manual provides information for the proper servicing and overhaul of Ford 1910 and 2110 Tractor Models 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 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 and weights should be considered as approximately only and the illustrations do not necessarily depict the unit to standard build specification.

TRACTOR OPERATIONS
FORD MOTOR COMPANY

PRODUCTION DATE CODES AND SERIAL NUMBERS

The Tractor Identification Plate is located on the left side of the transmission case on the Ford 1910 and 2110 Tractors and is stamped with the following information:

Production Identification Number — Two letter prefix followed by the Tractor Serial Number.

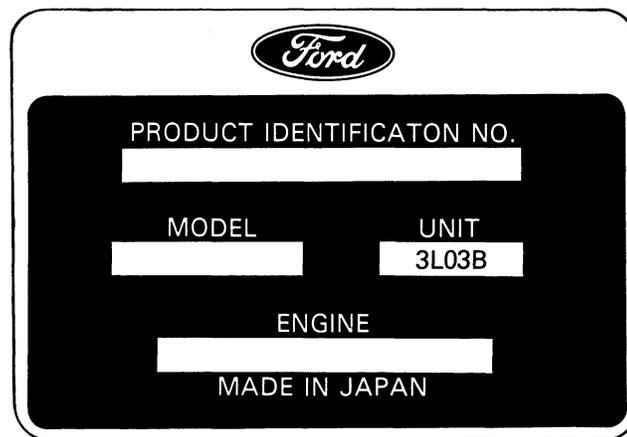
Whenever effecting repair or overhaul the relevant series information should be noted and used when referring to Service Bulletins and/or the Parts Catalogue.

Model — Production Model Code

Unit — Production Unit Date Code *

Engine — Serial number and engine production date code

TRACTOR SERIES IDENTIFICATION PLATE



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

* Example of Production Unit Date Code 3 L 03 B

← Year of Final Assembly 1983
 ← Month of Year November
 ← Day of Month (Third)
 ← Shift Period Day



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 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 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.

These 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 it's potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

Before using any electrical equipment — particularly portable appliances — 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 safety 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.
- Certain repair or overhaul procedures may necessitate "separating the tractor", either at the engine/front transmission or front transmission/rear transmission locations. These operations are simplified by the use of the Tractor Splitting Kit/Stand. Should this equipment not be available, then every consideration must be given to stability, balance and weight of the components, especially if a cab is installed.
- Use footsteps or working platforms when servicing those areas of a tractor that are not within easy reach.
- Before loosening any hoses or tubes connecting implements to remote control valves, etc., switch off the engine, remove all pressure in the lines by operating levers several times. This will remove the danger of personal injury by oil pressure.
- 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 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 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 equipment or implements are required to be attached to the hydraulic linkage, either for testing purposes or for transportation, then “position control” should be used.
- Always lower equipment to the ground when leaving the tractor.
- If high lift attachments are installed on a tractor beware of overhead power, electric or telephone cables when traveling. Drop attachment near to ground level to increase stability and minimize risks.
- Do not park or attempt to service a tractor on an incline. If unavoidable, take extra care and block all wheels.
- Observe recommended precautions as indicated in this Repair Manual when dismantling the air conditioning system as escaping refrigerant can cause frostbite.
- Prior to removing wheels and tires from a tractor, check to determine whether additional ballast (liquid or weights) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.
- 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.

SERVICE TECHNIQUES

A. SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles 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 vehicles, 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 vehicle 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 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 SYSTEMS — MODELS 1910 AND 2110

Chapter 1 ENGINE AND LUBRICATION SYSTEM

Section	Page
A. ENGINE AND LUBRICATION SYSTEM — DESCRIPTION AND OPERATION	1
B. ENGINE AND LUBRICATION SYSTEM — OVERHAUL.....	3

Chapter 2 COOLING SYSTEM

Section	Page
A. COOLING SYSTEM — DESCRIPTION AND OPERATION	39
B. COOLING SYSTEM — OVERHAUL.....	41

Chapter 3 TROUBLE SHOOTING — SPECIFICATIONS AND SPECIAL TOOLS

Section	Page
A. TROUBLE SHOOTING	49
B. SPECIFICATIONS	54
C. SPECIAL TOOLS	58

PART 1 ENGINE SYSTEMS — MODELS 1910 AND 2110

Chapter 1 ENGINE AND LUBRICATION SYSTEM

Section	Page
A. ENGINE AND LUBRICATION SYSTEM — DESCRIPTION AND OPERATION	1
B. ENGINE AND LUBRICATION SYSTEM — OVERHAUL.....	3

A. ENGINE AND LUBRICATION SYSTEM — DESCRIPTION AND OPERATION

This chapter describes engine overhaul and repair procedures for Model 1910 and 2110 engines. The engines are of the same basic design and repair procedures are essentially the same except as noted in the repair procedures.

The Model 1910 engine, Figure 1, is a three cylinder, wet sleeve block, whereas the Model 2110 engine, Figure 2, is a four cylinder, wet sleeve block engine.

Both engines are of the in-line, four cycle, overhead valve, liquid cooled design.

IDENTIFICATION CHART

ENGINE CODE	TRACTOR MODEL	HORSE POWER
T 853 A	1910	32 Eng. Max. 29.3 550 RPM — PTO
T 854 B	2110	40 Eng. Max. 35.4 564 RPM — PTO

CYLINDER HEAD AND VALVE TRAIN COMPONENTS

The cylinder head incorporates the valves, rocker arms, rocker arm supports and shafts, push rods and lifters.

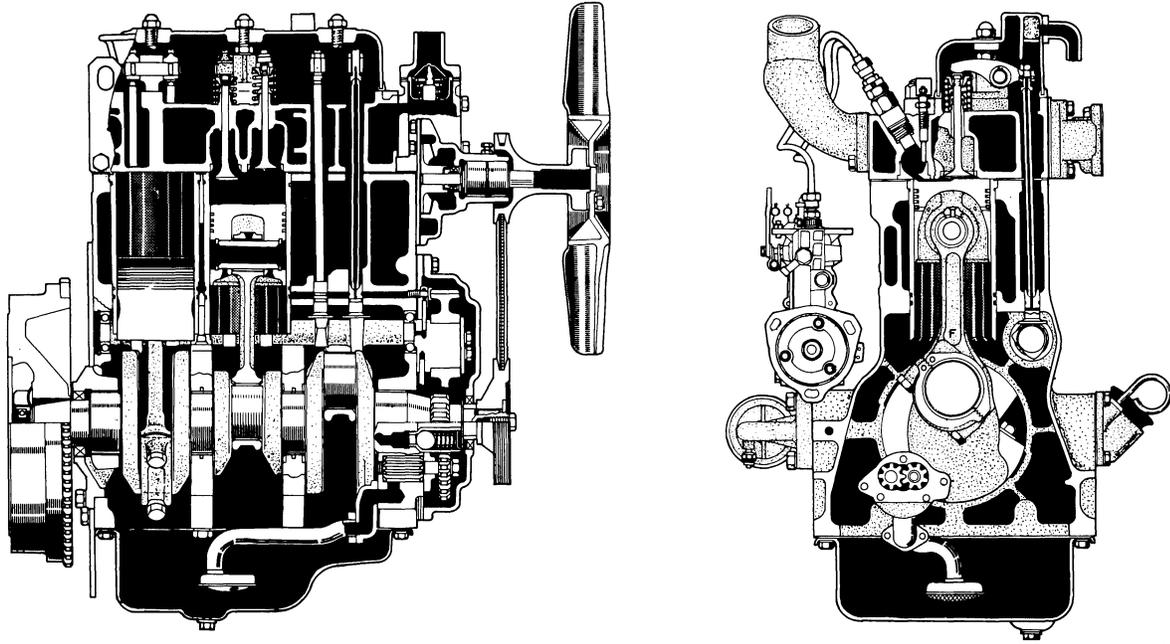
The cylinder head has replaceable valve seats and valve guides.

CYLINDER BLOCK ASSEMBLY

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

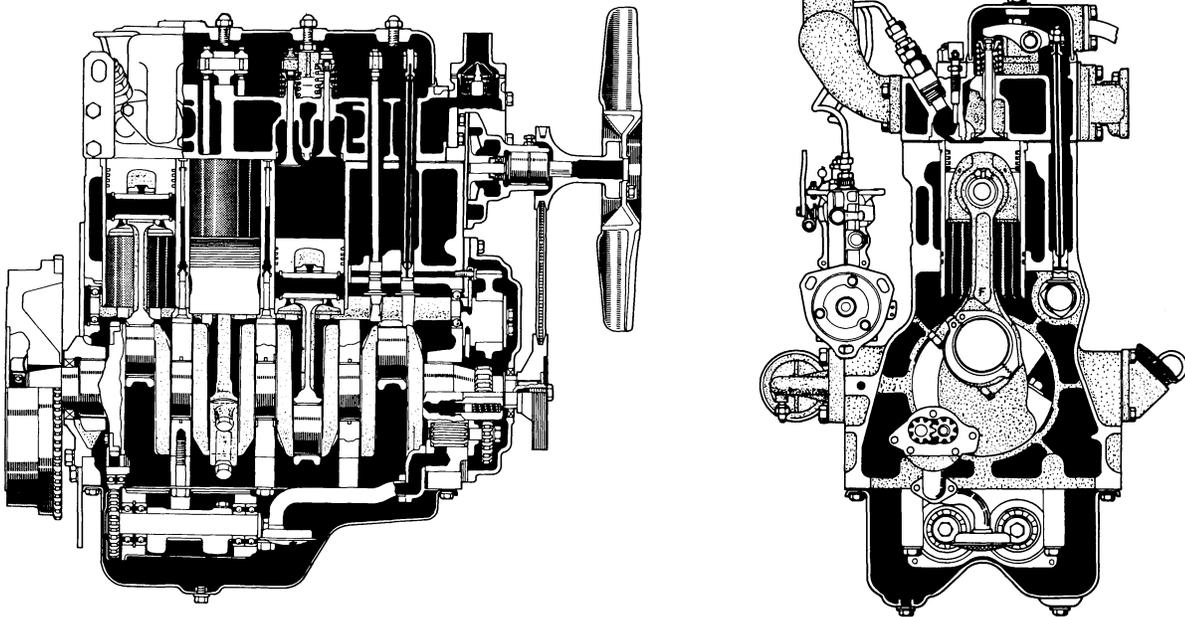
The Model 2110 engine also incorporates a dynamic balancer assembly, Figure 2, that is bolted to the underside of the cylinder block and is driven by the crankshaft.

On the Model 1910 engine, the crankshaft is supported by four main bearings and the Model 2110 engine crankshaft is supported on five main bearings.



S-19372

Figure 1
Engine Assembly — Model 1910



S-19373

Figure 2
Engine Assembly — Model 2110

The front main bearing is located in a bore in the front of the block while the rear bearing is located in the rear bearing cover assembly, which is bolted to the rear of the engine block.

The camshaft is supported by two ball bearings on the front and rear and one needle bearing in the center of the block.

PISTON AND CONNECTING RODS

Both engines utilize four ring pistons with offset connecting rods.

LUBRICATION SYSTEM

The oil pump is located in a bore in the front of the block assembly below and to the left of the crankshaft as viewed from the front. The oil pump is driven by the crankshaft gear.

Oil is picked up from the sump by the intake tube and drawn into the lower side of the oil pump body. Oil from the pump flows through passages in the block, past the relief valve, through the oil filter and returns to the main oil gallery in the area of the drilled bolt located directly above the oil pump.

Oil flow in the main oil gallery extends the length of the block on the right hand side to connecting passages to each of the main bearings.

Oil flow to the main bearings passes through drilled passages in the crankshaft to the connecting rod bearings.

The remaining oil flow is directed through the external tube at the front of the block to a drilled bolt located above the camshaft and extends into an oil gallery that extends the length of the block on the left hand side. The valve tappet bores are located within this oil passage. Oil flows around the tappets for lubrication and into a cross drilling in the tappets. From the tappets, oil flows through the center of the tappet and up the hollow push rods to the rocker arm assembly.

The adjusting screws and rocker arms have drilled passages which provide pressurized lubrication to the rocker arm shafts. Controlled leakage at the rocker arms flows from the top of the head back to the sump.

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

B. ENGINE AND LUBRICATION SYSTEM – OVERHAUL

CYLINDER HEAD

REMOVAL

Reference-Figure 3

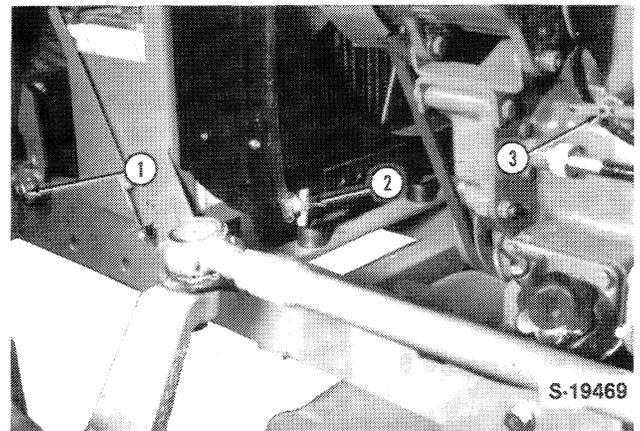
1. Remove the hood pivot bolts and remove the hood assembly.

NOTE: On newer model 1910 and 2110 tractors there are hood props to disconnect also.

2. Drain the coolant from the radiator and engine block.

Reference-Figure 4

3. Loosen the hose clamps and remove the air cleaner hose from the inlet manifold.



**Figure 3
Cylinder Head Removal**

- | | |
|------------------------|-------------------------|
| 1. Hood Pivot Bolts | 3. Cylinder Block Drain |
| 2. Radiator Drain Cock | Cock |

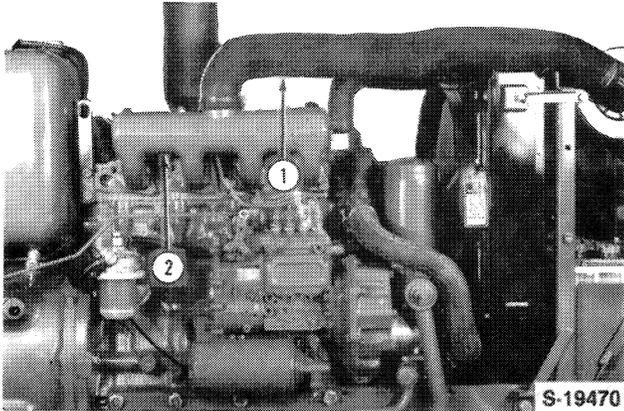


Figure 4

Cylinder Head Removal (2110 shown)

1. Air Cleaner Hose 2. Air Inlet Manifold

Reference-Figure 5

4. Disconnect the wiring (2) from the alternator (1).
5. Disconnect the temperature sender wire from the sender unit (4).

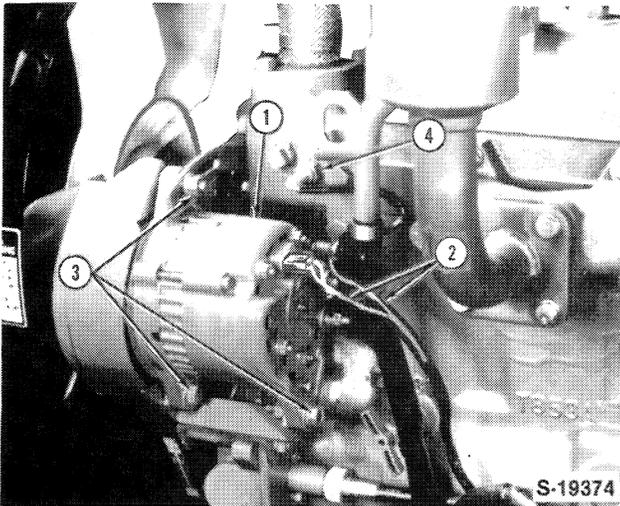


Figure 5

Cylinder Head Removal (1910 shown)

1. Alternator Assembly 4. Temperature Sender
2. Alternator Wiring
3. Alternator Mounting Bolts

Reference-Figure 6

6. Loosen the hose clamps and remove the upper radiator hose (1) and by-pass hose (2) from the thermostat housing (4).
7. Remove the thermostat housing (4) and gasket.

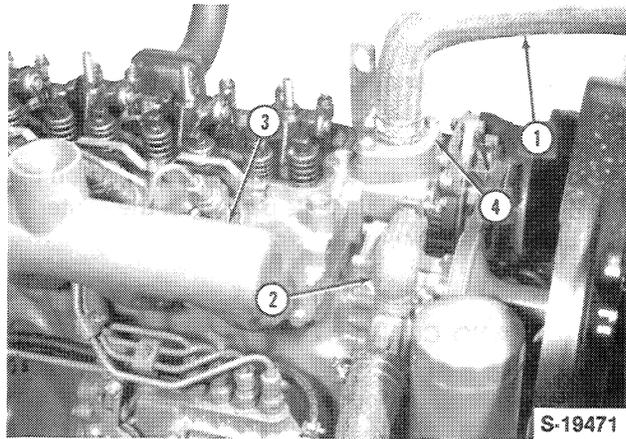


Figure 6

Cylinder Head Removal (2110 shown)

1. Upper Radiator Hose 3. Inlet Manifold
2. Coolant Bypass 4. Thermostat Housing Hose

Reference-Figure 7

8. Disconnect the glow plug wiring terminal connector (1).
9. Remove the glow plug connector (3) and remove the glow plugs (5).

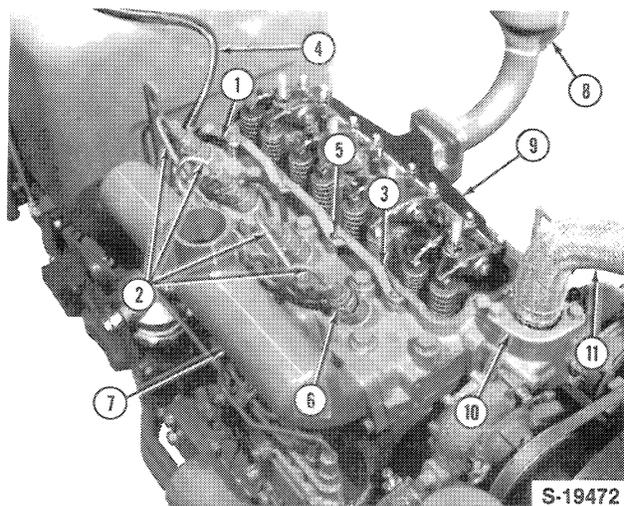


Figure 7

Cylinder Head Removal (2110 shown)

1. Glow Plug Wiring 8. Exhaust Muffler
2. Injector Lines 9. Exhaust Manifold
3. Glowplug Connector 10. Coolant Outlet Connector
4. Fuel Leak-off Line
5. Glow Plugs 11. Upper Radiator Hose
6. Injectors
7. Inlet Manifold

10. Remove the fuel leak-off line (4).
11. Remove the injector lines (2) and cap all openings.
12. Remove the injector assemblies (6) from the cylinder head.
13. Remove exhaust muffler (8) and exhaust manifold assemblies (9).
14. Remove the valve cover assembly.

NOTE: Use care not to lose the cover bolt sealing washers.

Reference-Figure 8

15. Remove each of the rocker arm supports (1) as an assembly.

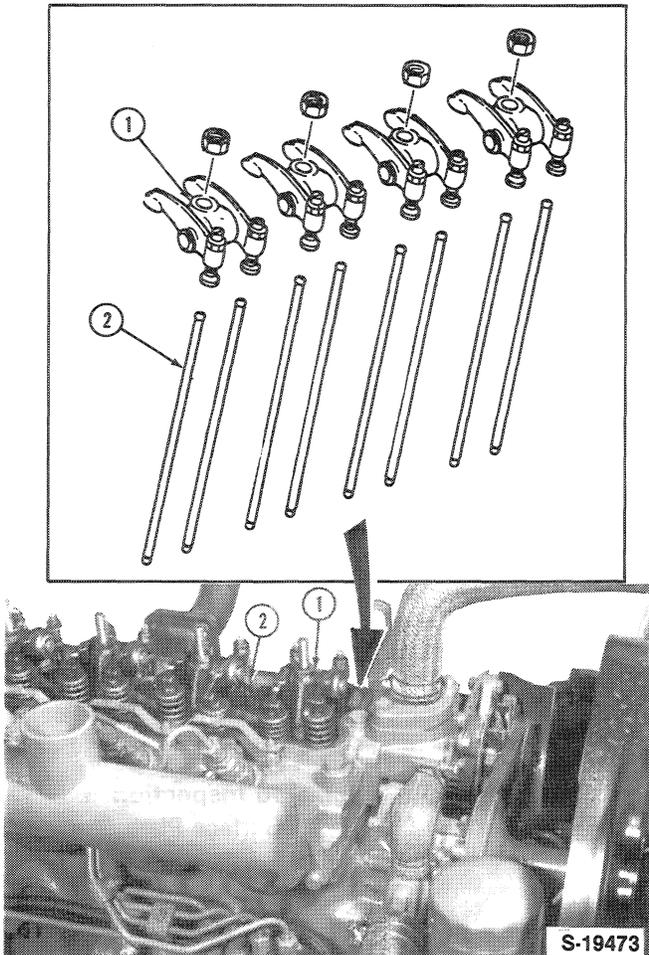


Figure 8
Cylinder Head Removal (2110 shown)

1. Rocker Arm Support
2. Push Rods

NOTE: Use care to not lose the valve stem caps and 3-shims under the rocker arm support. Place the rocker arms and valve components in individually marked containers so as to reassemble in their original locations.

16. Loosen the cylinder head bolts gradually a half turn at a time to prevent warping of the cylinder head. Remove the cylinder head.

DISASSEMBLY

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

Reference-Figure 9

2. Using a valve spring compressor, compress the valve spring (3) and remove the retainer locks (5).
3. Release the valve spring compressor and remove the valve spring and retainer (4).
4. Remove the valves (1) from the head and place in a numbered container to facilitate identification for installing the components in their original location on assembly.

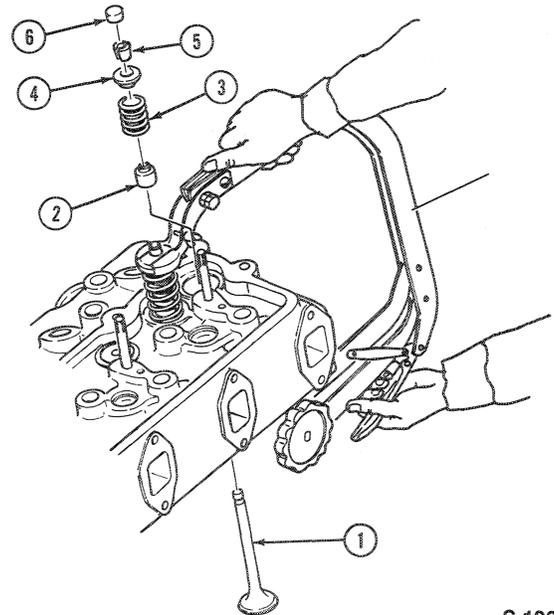
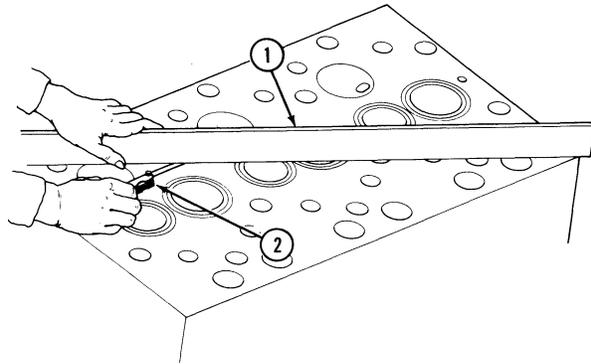


Figure 9
Cylinder Head Disassembly

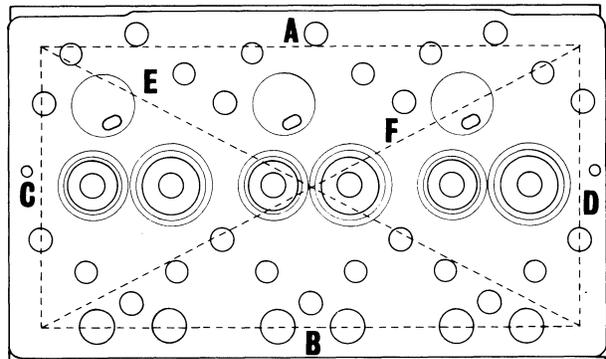
1. Valve
2. Seal
3. Spring
4. Retainer
5. Retainer Locks
6. Cap

5. Remove and discard the valve stem seals (2).
6. Clean all carbon residue from the cylinder head. Clean the gasket surface using care not to damage or scratch the machined surface. Clean the cylinder head in a suitable solvent and air dry.



INSPECTION AND REPAIR

1. Inspect the casting for cracks or damage in the following areas:
 - Valve ports
 - Valve seats
2. Inspect the machined gasket surface for scratches or gouges, which could cause leakages.
3. Inspect the core plug bores for rust or other signs of leakage. Replace core plugs if necessary.



S-19401

Figure 10

Cylinder Head Inspection (1910 shown)

1. Straight Edge
2. Feeler Gauge

Reference-Figure 10

4. Using a straight edge and feeler gauge, check the cylinder head for warpage along the lines A, B, C, D, E and F, as shown.

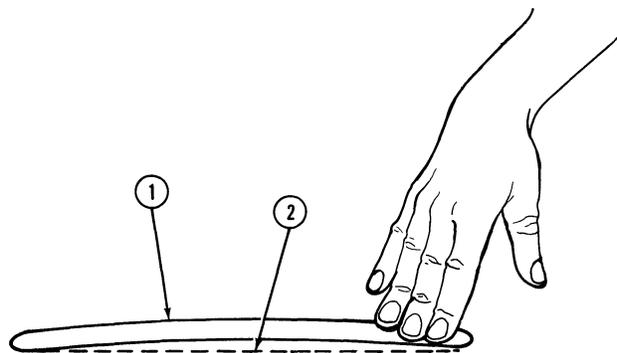
Replace or resurface the head if the warp is greater than .006 inch (0.12 mm).

5. Inspect the ends of the push rods for excessive wear.

NOTE: *If excessive wear is observed, carefully inspect the corresponding tappet and rocker arm for excessive wear.*

Reference-Figure 11

6. Check the push rods for straightness. Replace bent push rods. Do not attempt to straighten.



S-19402

Figure 11

Valve Rocker Push Rod Inspection

1. Push Rod
2. Surface Plate

VALVE SEATS

Reference-Figure 12

Inspect the valve seats and reface the seats if damaged or worn.

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

A valve that extends too deep into the combustion chamber will result in valve burning and if the valve is recessed too deep into the head will cause a rapid build-up of carbon deposits.

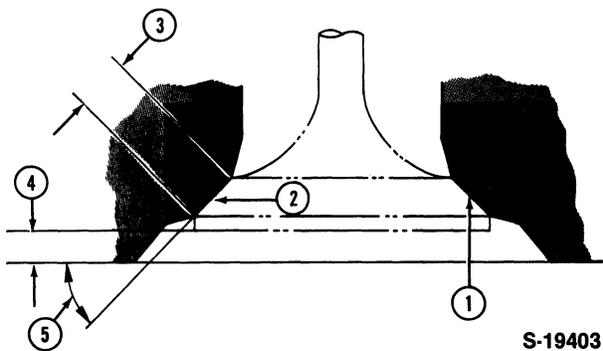


Figure 12
Valve and Seat Inspection

- | | |
|---------------------|------------------|
| 1. Valve Face | 4. Countersink |
| 2. Valve Seat | 1910 — .028-.039 |
| 3. Seat Width | in. (0.7-1.0 mm) |
| .067-.098 in. | 2110 — .039-.047 |
| (1.7-2.5 mm) | in. (1.0-1.2 mm) |
| 5. Seat Angle — 45° | |

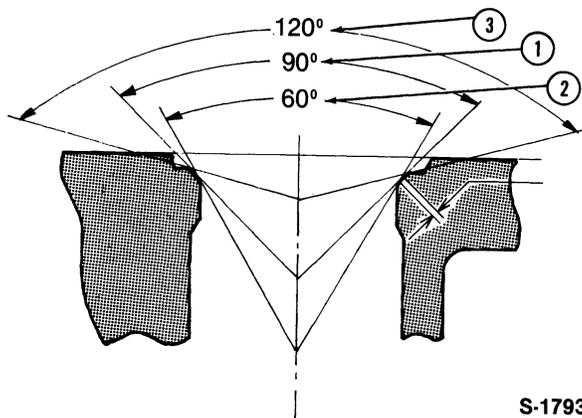


Figure 13
Valve Seat Grinding

- | | |
|------------------------|------------------------|
| 1. Seat Angle — 45° | 3. Raise Seat Location |
| 2. Lower Seat Location | Stone — 60° Stone |
| — 30° Stone | |

1. Check the valve seats for cracks or surface defects. Use a 45° stone if necessary to reface the seat as shown. Grind away only enough material to provide a smooth even seat.
2. Check the seat width. If necessary, use a 30° stone to lower the seat and use a 60° stone to raise the seat, Figure 13.

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

VALVES

Reference-Figure 14

1. Clean all carbon deposits from the valve using a soft wire brush. Inspect the condition of the valve and discard any valves that are badly burned, cracked or bent.
2. Using a micrometer, measure the valve stem at points "A", "B" and "C", Figure 15.

Replace valves if the stem wear diameter is less than the following dimensions:

- | | |
|--------------------|--------------------|
| Intake valve..... | .310 in. (7.88 mm) |
| Exhaust valve..... | .309 in. (7.85 mm) |

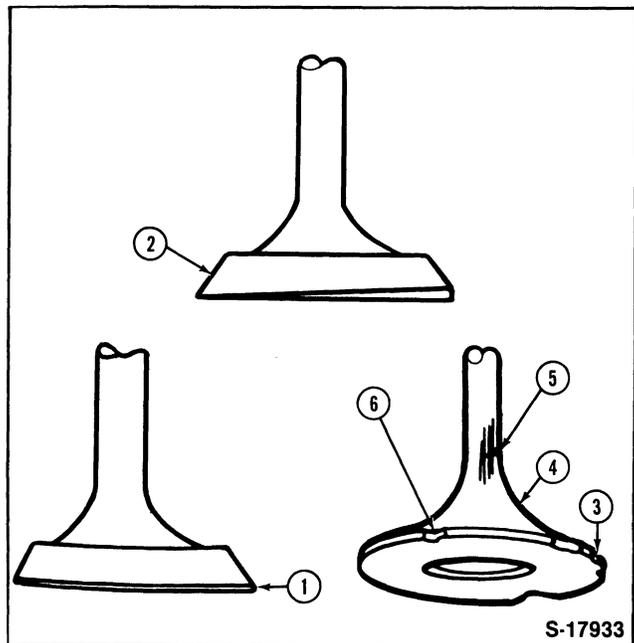
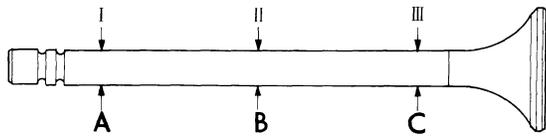


Figure 14
Valve Face and Stem Inspection

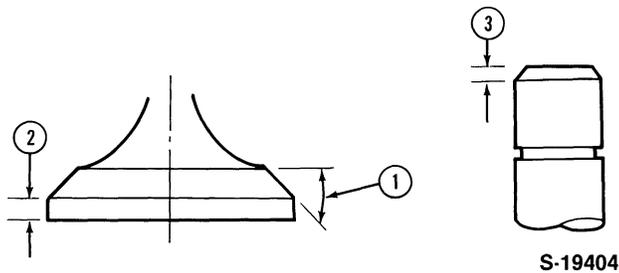
- | | |
|----------------------|--------------------|
| 1. Margin Too Thin | 4. Indented |
| (Min. .0394 in.; 1.0 | 5. Wear or Necking |
| mm) | 6. Burned |
| 2. Bent Valve | |
| 3. Pitting | |



S-16271

Figure 15
Valve Stem Wear Points

3. If inspection indicates that the valve may be re-used, the valve should be reground as shown, Figure 16.



S-19404

Figure 16

Correctly Ground Valve Face and Stem

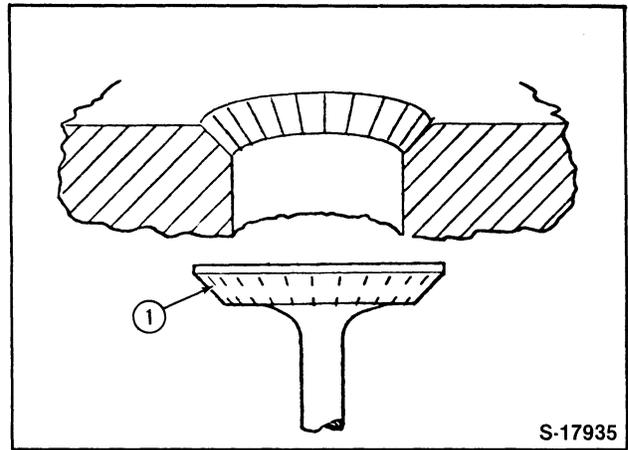
- | | |
|---------------------|-----------------------|
| 1. Face — 45° Angle | 3. Valve Stem Chamfer |
| 2. Margin — Min. | — .031 in. (.794 mm) |
| .0394 in. (1.0 mm) | |

IMPORTANT: After grinding the valve and seat, check to be sure that the seat contacts the center of the valve face. Using Prussion Blue, lightly coat the valve seat. Place the valve in position and rotate the valve slightly while holding a light pressure against the valve. If the Prussion Blue is transferred to the center of the valve face, the contact area is correct.

If Prussion Blue is not available, mark the valve face or seat with a soft lead pencil as shown, Figure 17. Rotate the valve slightly in the seat. The penciled lines will be broken showing the seat contact area as shown, Figure 17.

VALVE GUIDES

Clean the valve guides thoroughly before attempting to check for guide wear.



S-17935

Figure 17
Valve Seat Contact Location

1. Seat Contact

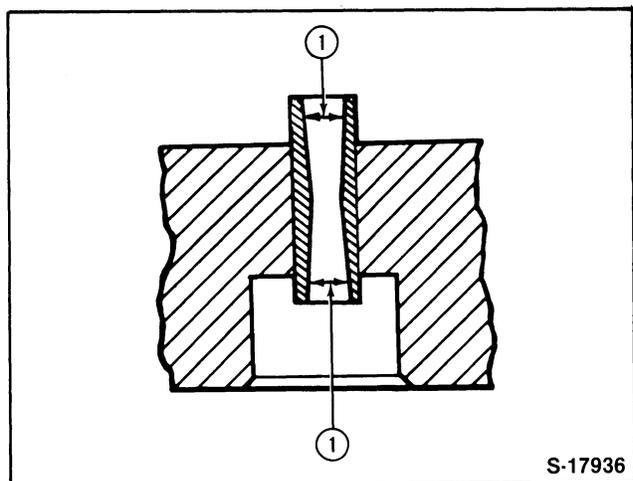
1. Using a small hole gauge, measure the valve guide bore at the top and bottom wear points, Figure 18.

2. Determine the stem to guide clearance by subtracting the valve stem diameter from the valve guide diameter measurement, Figure 19.

3. Replace the valve guides if the stem to guide clearance is excessive:

Intake valve008 in. (.2 mm) Max.

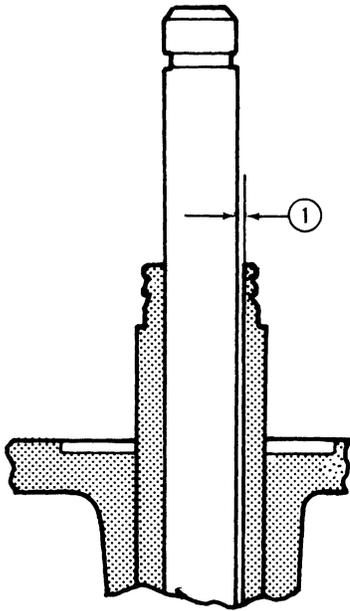
Exhaust valve010 in. (.25 mm) Max.



S-17936

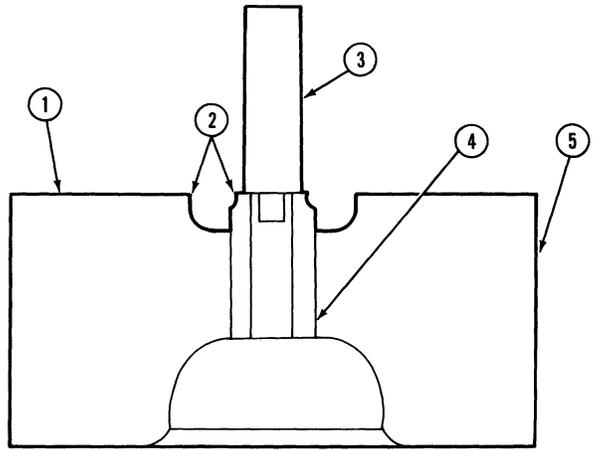
Figure 18
Valve Guide Wear Check

1. Wear Points



S-19405

Figure 19
Valve Stem-to-Guide Clearance Check
 1. Clearance



S-19406

Figure 20
Valve Guide Removal and Installation
 1. Press
 2. Bar Stock
 3. Cylinder Head
 4. Valve Guide
 5. Valve Cover Surface
 (Valve Guide Must be Flush With This Surface)

VALVE GUIDE — REMOVAL AND INSTALLATION

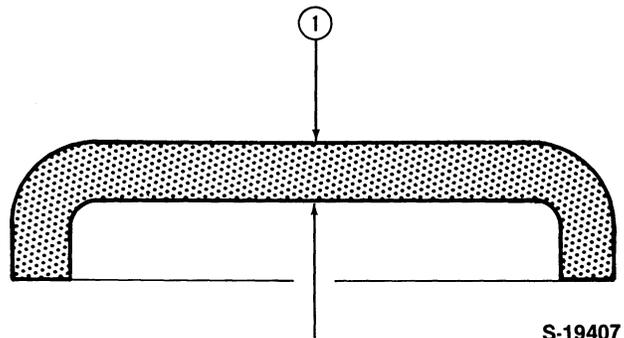
REMOVAL

Reference-Figure 20

Using a piece of round stock slightly smaller than the outside diameter of the guide, press the valve guide (2) out of the cylinder head (3).

INSTALLATION

Using a piece of bar stock the same width as the valve cover, press the new valve guide into the cylinder head from the top. Align the upper end of the guide flush with valve cover surface of the cylinder head as shown, Figure 20.



S-19407

Figure 21
Valve Stem Cap Wear Check
 1. Thickness Check —
 .033 in. (0.85 mm)
 Min.

VALVE STEM CAPS

1. Inspect the valve stem caps for cracks, excessive wear or damage and discard if necessary.
2. Using a dial type caliper gauge, measure the valve cap thickness as shown, Figure 21.

Replace caps that are worn more than the following limits:

Cap thickness033 in. (0.85 mm) Min.

VALVE SPRINGS

1. Place the valve springs on a flat surface and measure the free-length of the spring, Figure 22. Check the spring for squareness and discard any springs that do not meet the following specifications:

Free length1.732 in. (44 mm) Min.

Out of square0.063 in. (1.2 mm) Max.

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

Load rating29 lbs. (13 Kg) Min
at 1.42 in. (36 mm) compressed length.

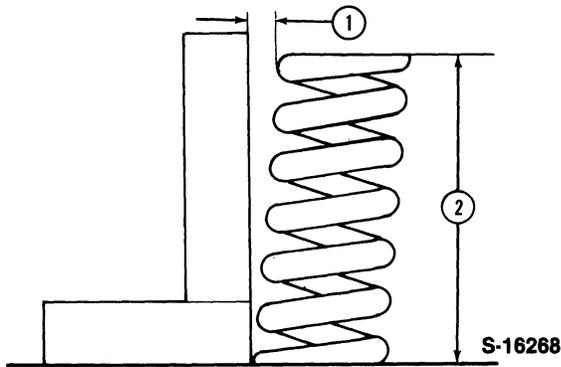


Figure 22

Valve Spring Height and Squareness Check

1. Squareness Check 2. Height Check

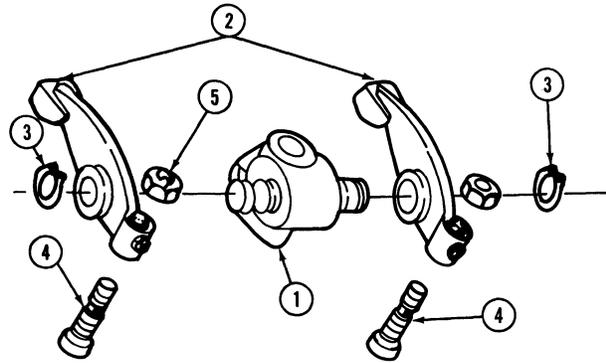
ROCKER ARM PIVOTS

DISASSEMBLY

1. Remove the snap rings (3) from each end of the rocker arm shaft (1), Figure 23.
2. Slide the rocker arms (2) off the shaft.

INSPECTION AND REPAIR

1. Inspect the rocker arms and shafts for wear or damage.



S-19408

Figure 23

Rocker Arm Pivot Components

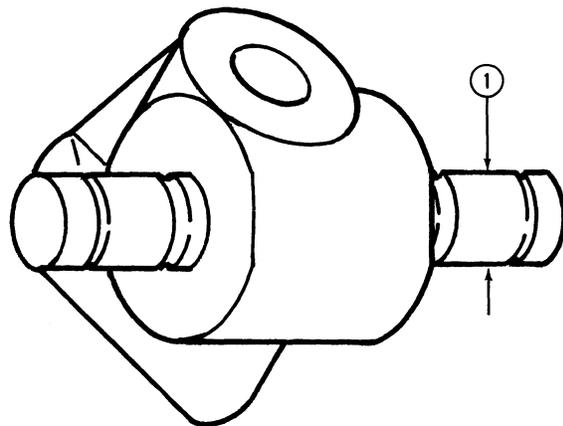
- | | |
|----------------------------|-------------------|
| 1. Support and Shaft Assy. | 3. Snap Rings |
| 2. Rocker Arms | 4. Adjusting Bolt |
| | 5. Nut |

2. Inspect the valve stem contact area for pitting or wear. Slight wear patterns may be removed using a fine grit stone.

3. Check the adjusting screws for damaged threads or excessive wear.

Replace any components which are visually worn or damaged.

4. Using a micrometer, measure the diameter of the rocker arm shaft, Figure 24.



S-19409

Figure 24

Rocker Arm Shaft Wear Check

1. Shaft Wear
Diameter — .534 in.
(13.5 mm) Min.

Replace the rocker shaft and support assembly if the shaft is worn more than the following specification:

Shaft diameter534 in. (13.5 mm) Min.

- Using a hole gauge, measure the inside bore diameter of the rocker arm, Figure 25.

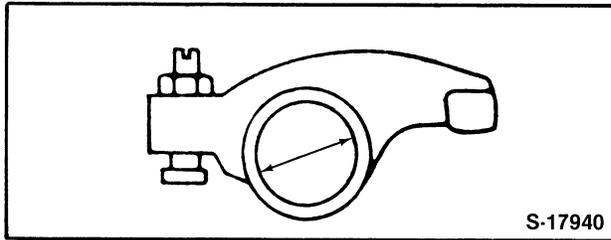


Figure 25
Rocker Arm Wear Check

Subtract the rocker shaft diameter from the rocker arm bore diameter to obtain the shaft-to-arm clearance.

Replace the rocker arm and/or shaft assembly if the clearance exceeds the following specifications:

Clearance008 in. (0.2 mm) Max.

ASSEMBLY

CYLINDER HEAD

- Insert each valve into the guide from which it was removed and lightly lap the valve to be sure of an even seat all around the valve face.
- Remove the valve and remove all traces of lapping compound.
- Using a spring compressor, assemble the valves, springs, retainers and locks.
- Assemble the rocker arms onto the pivot shafts and install the snap rings.

INSTALLATION

In manufacture the ultimate engine compression ratio is established by the thickness of the head gasket. For service replacement, two different thickness head gaskets are used. The correct head gasket must be selected based upon the distance the pistons protrude above the face of the cylinder block when at top-dead-center.

To determine the correct head gasket, measure as follows.

- Turn the crankshaft to position each of the pistons, one at a time, at top dead center.
- Using Figure 26 as a reference, make measurements A and B.

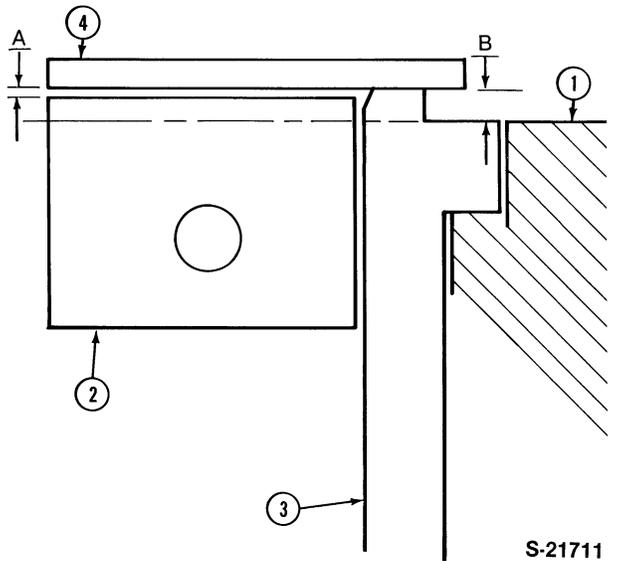


Figure 26
Piston Protrusion Above Block at TDC

- | | |
|---|-------------------------------|
| A. Dimension — Piston Sleeve Below Top of | 1. Engine Block — Top Surface |
| B. Dimension — Sleeve Above Top of Block | 2. Piston |
| | 3. Sleeve |
| | 4. Straight Edge |

- Subtract dimension A from dimension B. The difference is the piston protrusion above the block. Use this dimension with the head gasket chart (pg. 12) to select the proper head gasket.

HEAD GASKET CHART

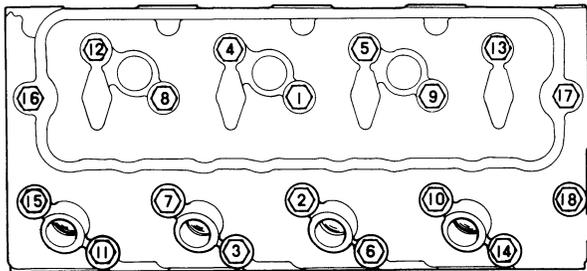
TRACTOR MODEL	MEASUREMENT	FREE THICKNESS	PART NUMBER
1910	Under .024 in. (.60 mm)	.060 in. (1.5 mm)	SBA-111146930
	Over .024 in. (.60 mm)	.070 in. (1.7 mm)	SBA-111146940
2110	Under .024 in. (.60 mm)	.060 in. (1.5 mm)	SBA-111146733
	Over .024 in. (.60 mm)	.070 in. (1.7 mm)	SBA-111146783

NOTE: The last four digits of the part number are stamped on the head gasket.

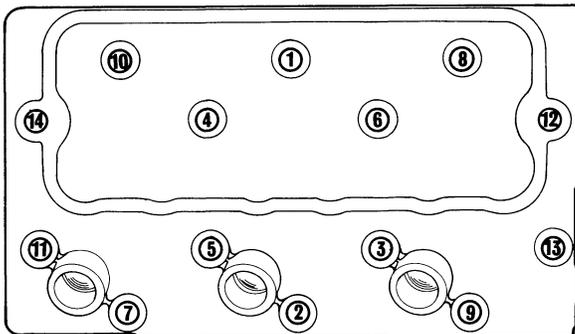
from SB 6-86-2T

- Place the head gasket with the side marked "TOP" up on the engine block.
 - Carefully set the cylinder head in position without disturbing the head gasket.
- Lubricate the head bolts with the engine oil and install the bolts loosely.
 - Gradually tighten the head bolts in stages in sequence as shown, Figure 27.
 - Tighten all bolts to the specified torque:

Head bolt torque65-69 lbs. ft. (88-93 Nm)



MODEL 2110



MODEL 1910

S-19411

Figure 27
Cylinder Head Bolt Tightening Sequence

Replace the push rods and valve stem caps in their original locations.

Place 3-shims on each rocker arm stud bolts.

Position each of the assembled rocker arm and shaft assemblies over the stud bolts and install the nuts and washers.

NOTE: Use care to carefully position the rocker arms over the valve stem caps and push rods.

Tighten the nuts to the specified torque:

Rocker post stud nut torque 20-29 lbs. ft. (27-39 Nm)

Adjust the valve rocker arm to valve clearance, Figure 28. Be sure the tappet is in its lowest position before making the adjustment. To be sure the tappet is in its lowest position, bring the piston to top-dead-center on the compression stroke (both valves closed).

Loosen the adjusting bolt lock nut (2) and turn the adjusting screw (1) to obtain .012 in (0.3 mm) clearance.

Tighten the lock nut.

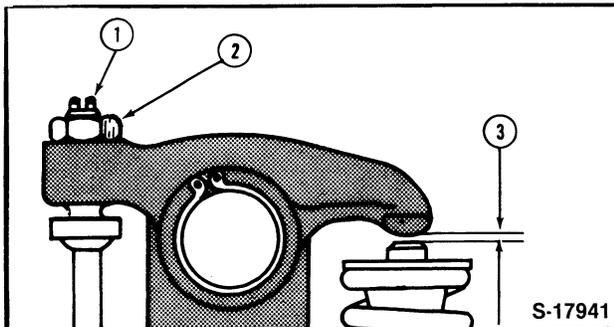


Figure 28

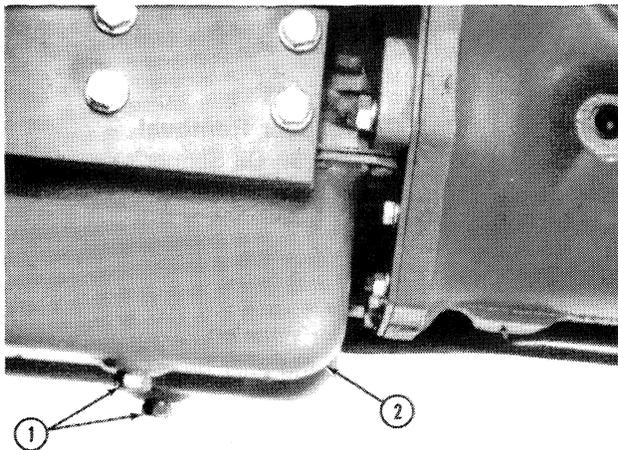
Valve Lash Adjustment

- | | |
|--------------------|--------------------------------|
| 1. Adjusting Screw | 3. Valve Lash |
| 2. Lock Nut | Clearance — 0.012 in. (0.3 mm) |

**ENGINE FRONT COVER,
TIMING GEARS AND OIL PUMP**

REMOVAL

1. Remove the radiator assembly. See "Radiator Removal," Chapter 2 this part.
2. Drain the engine crankcase oil, Figure 29.



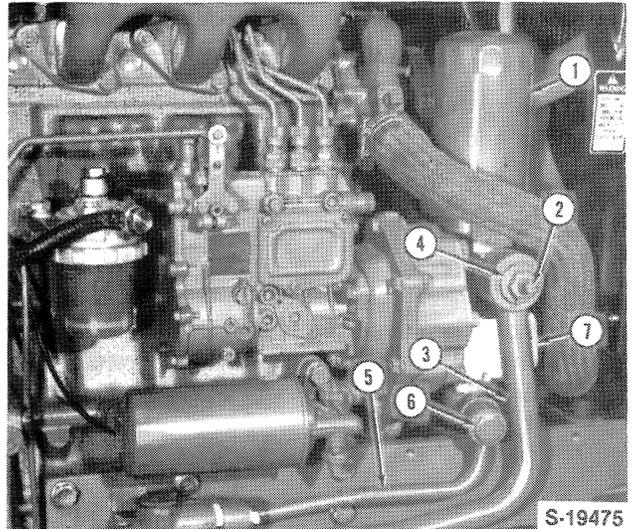
S-19474

Figure 29
Engine Oil Drain Plugs (Four-Wheel Drive Model Shown)

1. Drain Plugs (2)
2. Oil Pan

Reference-Figure 30

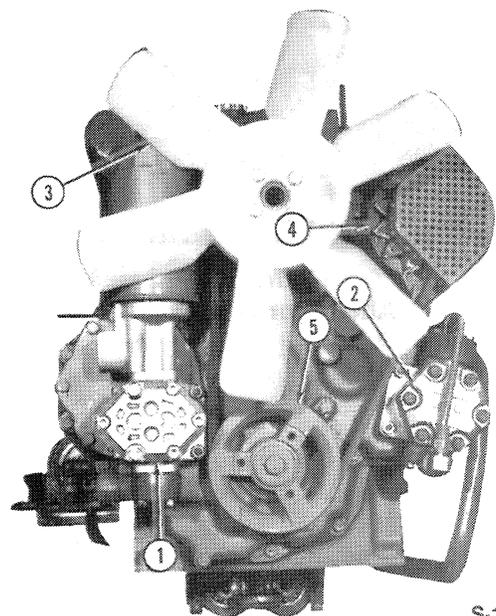
3. Remove the plug (2), from the hydraulic tube banjo bolt (4).
4. Set the throttle lever in the "stop" position and crank the engine for 4-5 seconds to drain the oil out of the hydraulic filter (1). Reinstall the plug in the banjo bolt.
5. Remove the banjo bolts (6) from the hydraulic lines (5) at the hydraulic pump (7) and filter assembly.
6. Remove the hydraulic pump attaching bolts and remove the pump and filter as an assembly, Figure 31.



S-19475

Figure 30
Hydraulic Filter Removal (Model 1910 Shown)

1. Filter (Hyd.)
2. Plug
3. Suction Tube
4. Banjo Bolt
5. Hydraulic Lines
6. Banjo Bolt
7. Hydraulic Pump



S-19476

Figure 31
Timing Gear Cover Removal (Model 2110 Shown)

1. Hydraulic Pump and Filter Assembly
2. Power Steering Pump
3. Coolant Fan
4. Alternator Assy.
5. Crankshaft Pulley

7. Disconnect the wiring from the alternator assembly, Figure 32.
8. Loosen the alternator tightener and mounting bolts and remove the alternator drive belt.
9. Remove the alternator assembly.
10. Remove the cooling fan.
11. Remove the crankshaft pulley retaining bolt and washer and pull the pulley off the crankshaft, Figure 31.

NOTE: Use a suitable puller if necessary. Do not use hammer on pulley to loosen.

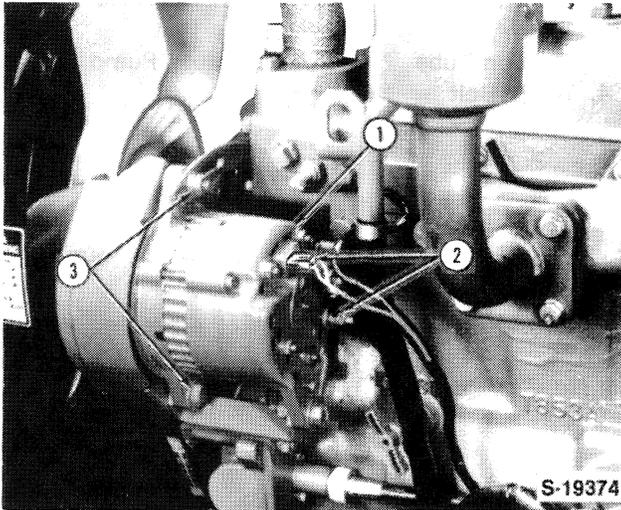


Figure 32
Alternator Removal

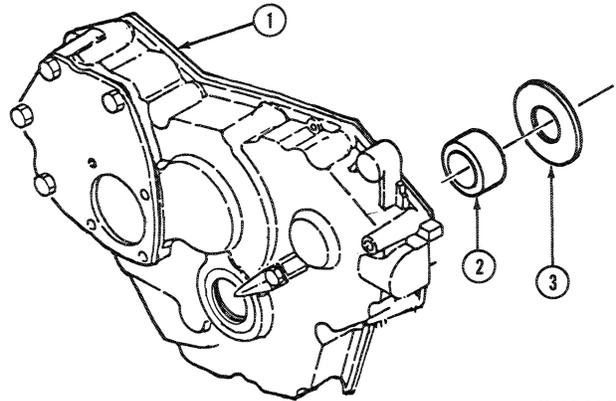
- | | |
|------------------------|------------------------|
| 1. Alternator Assembly | 3. Alternator Mounting |
| 2. Alternator Wiring | Bolts |

Reference-Figure 33

12. Remove the timing gear cover retaining bolts and remove the cover (1) and gasket.

NOTE: Use care in removing the cover to prevent damage to the crankshaft oil seal if it's to be reused.

13. Remove the collar (2) and oil slinger (3).



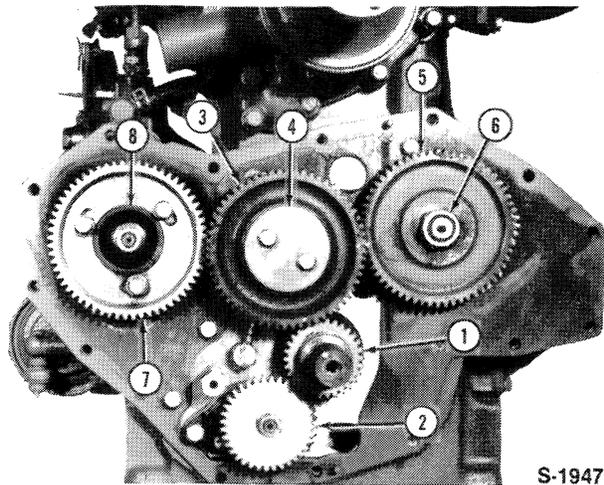
S-19412

Figure 33
Timing Gear Cover Removal

- | | |
|----------------------|----------------|
| 1. Timing Gear Cover | 3. Oil Slinger |
| 2. Collar | |

Reference-Figure 34

14. Remove the two idler gear retaining bolts and remove the plate (4) and idler gear (3).



S-19477

Figure 34
Timing Gears Removal

- | | |
|------------------------|------------------------------|
| 1. Crankshaft Gear | 6. Retaining Nut |
| 2. Oil Pump Drive Gear | 7. Injection Pump Drive Gear |
| 3. Idler Gear | 8. Pump Drive Coupling |
| 4. Retaining Plate | |
| 5. Camshaft Gear | |

Reference-Figure 35

15. Remove the camshaft gear retaining nut (1), and remove the gear (2), spacer washer (3), tachometer drive gear (4) and collar (5).

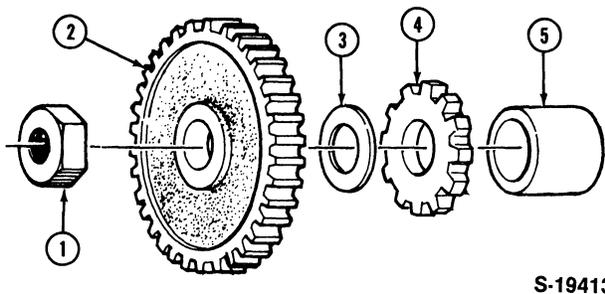


Figure 35
Camshaft Gear Removal

- | | |
|------------------|--------------------------|
| 1. Retaining Nut | 4. Tachometer Drive Gear |
| 2. Camshaft Gear | 5. Collar |
| 3. Spacer Washer | |

16. Remove the tachometer drive gear and shaft assembly, Figure 36.

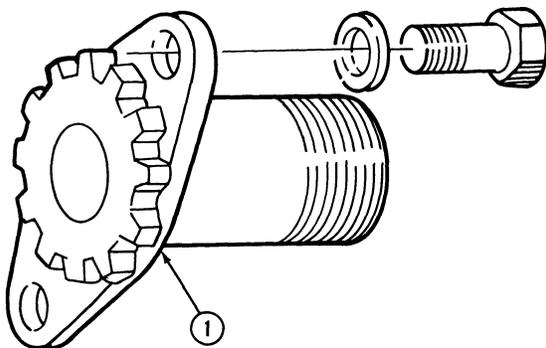


Figure 36
Tachometer Drive Gear Removal

1. Tachometer Drive Assembly

17. Remove the injection pump gear retaining bolts and remove the gear from the pump drive coupling, Figure 34.

NOTE: *Observe the injection pump gear to coupling alignment marks before removal. If necessary mark the gear and coupling for assembly at the original timing setting.*

18. Remove the oil pump gear retaining nut and remove the oil pump drive gear (2), Figure 34.

19. If necessary, remove the oil transfer tube banjo bolts (1) and (5) and remove the tubes and idler gear support (3), Figure 37.

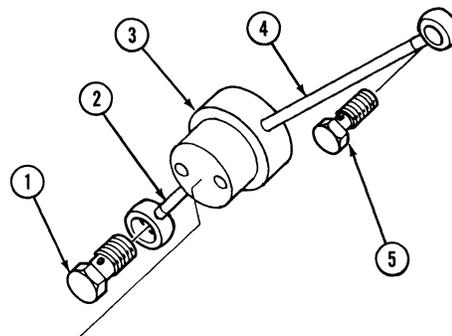


Figure 37
Oil Transfer Tube Removal

- | | |
|-----------------------|---------------|
| 1. Banjo Bolt | 4. Tube |
| 2. Tube | 5. Banjo Bolt |
| 3. Idler Gear Support | |

INSPECTION AND REPAIR
TIMING GEARS

1. Wash all components in a suitable solvent and air dry.
2. Inspect the gear teeth for excess wear, chipped or other tooth damage.
3. Inspect the camshaft gear and camshaft key-ways for excess wear. Replace the affected components if wear is present.

ENGINE OIL PUMP — REMOVAL

If not previously removed, remove the engine timing gear cover. See "Timing Gear Cover — Removal," this section.

1. Remove the oil pump drive gear, Figure 34.
2. Remove the five pump cover bolts and remove the cover, Figure 38.
3. Withdraw the pump shaft and gear set from the pump body, Figure 38.

If the pump body requires removal, proceed as follows.

4. Remove the engine oil pan.

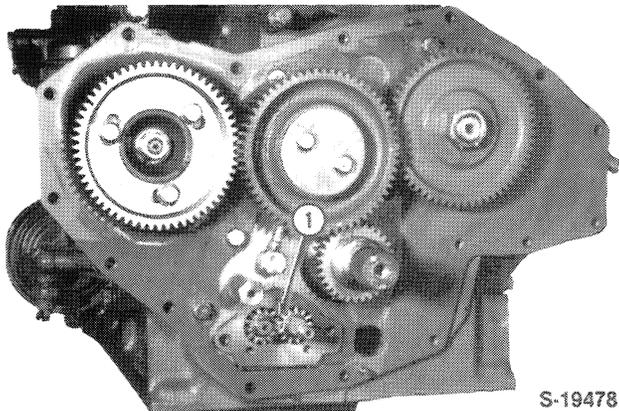


Figure 38

Oil Pump Cover and Gear Removal

1. Oil Pump Gears

NOTE: *On four wheel drive models, the front axle and support assembly must be removed prior to removal of the engine oil pan. See "Separating The Tractor," part 12.*

5. Remove the oil pick-up tube and adapter, Figure 39, from the back of the pump body.
6. Remove the pump body out the front of the engine block.

**INSPECTION AND REPAIR
ENGINE OIL PUMP**

1. Using a straight edge and feeler gauge, measure the gear to housing end clearance, as shown, Figure 40.

Replace the pump assembly if the end clearance exceeds 0.004 in. (.1 mm).

2. Using a feeler gauge, measure the gear to housing clearance as shown, Figure 41.

Replace the pump assembly if the clearance exceeds .006 in. (.15 mm).

3. Inspect the pump body gear tracks for score marks.

Replace the pump assembly if deep scratches are present.

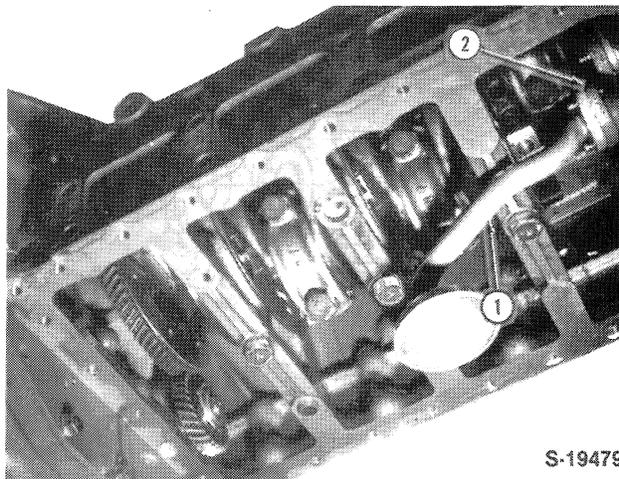


Figure 39

Oil Pump Removal (Model 2110 Shown)

1. Oil Pump Pick-Up
2. Oil Pump Adapter Tube and Screen

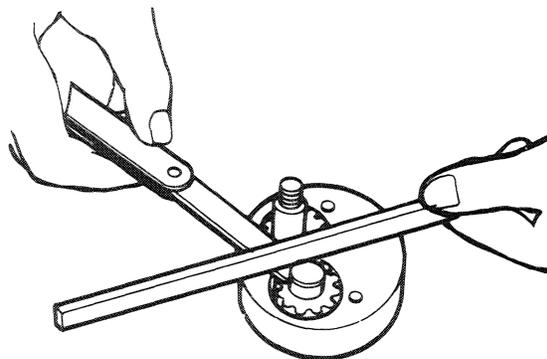


Figure 40

Pump-Gear-to-Housing, End Clearance Check

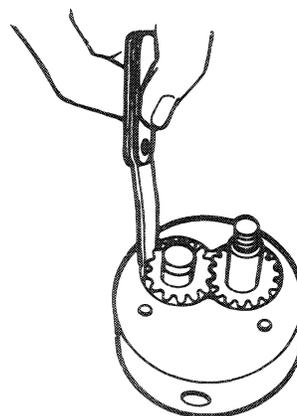


Figure 41

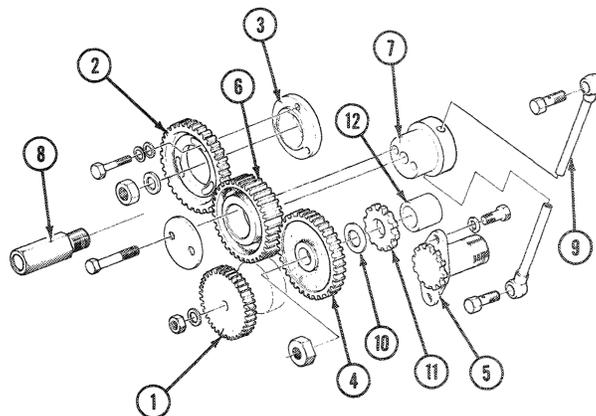
Pump-Gear-to-Housing, Side Clearance Check

**ASSEMBLY AND INSTALLATION
OIL PUMP ASSEMBLY**

Assembly of the oil pump and pick-up tube follows the disassembly procedure in reverse.

Tighten the pump mounting and pick-up tube attaching bolts to the specified torque. See "Specifications," Chapter 3.

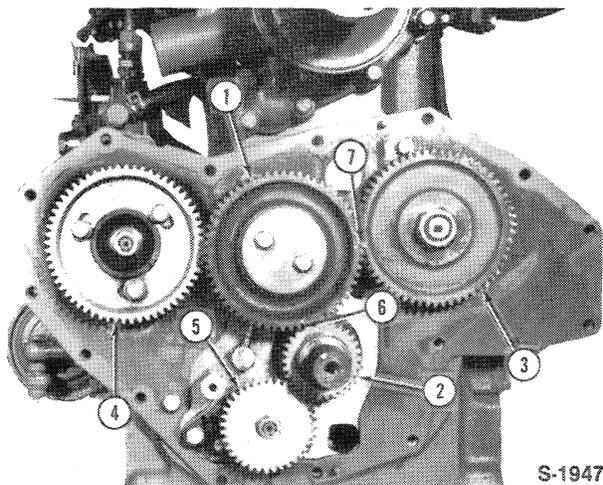
Install the pump drive gear, washer and nut and tighten the nut to 22-25 lbs. ft. (29-34 Nm).



S-19418

**ASSEMBLY —
TIMING GEARS AND COVER**

1. Install the oil transfer tubes, banjo bolts and idler gear support, Figure 37.
2. Install the idler gear (1) on the support aligning the timing marks with the crankshaft gear (6), Figure 42.



S-19477

Figure 42

Timing Gear Components Installation

- | | |
|-------------------------------------|-----------------------------------|
| 1. Idler Gear | 7. Idler Gear to
Camshaft Gear |
| 2. Crankshaft Gear | Timing Marks |
| 3. Camshaft Gear | |
| 4. Injection Pump Gear | |
| 5. Oil Pump Gear | |
| 6. Idler Gear to
Crankshaft Gear | |
| Timing Marks | |

Reference-Figure 43

3. Install the tachometer drive gear and shaft assembly (5).

**Figure 43
Engine Front Timing Gear and Components
Assembly**

- | | |
|---------------------------------|------------------------------|
| 1. Oil Pump Gear | 8. Relief Valve
Assembly |
| 2. Injection Pump Gear | 9. Oil Transfer Tubes |
| 3. Coupling | 10. Spacer |
| 4. Camshaft Gear | 11. Tachometer Drive
Gear |
| 5. Tachometer Shaft
Assembly | 12. Collar |
| 6. Idler Gear | |
| 7. Idler Gear Support | |

4. Install the collar (12), tachometer drive gear (11), spacer (10) and drive key on the camshaft.

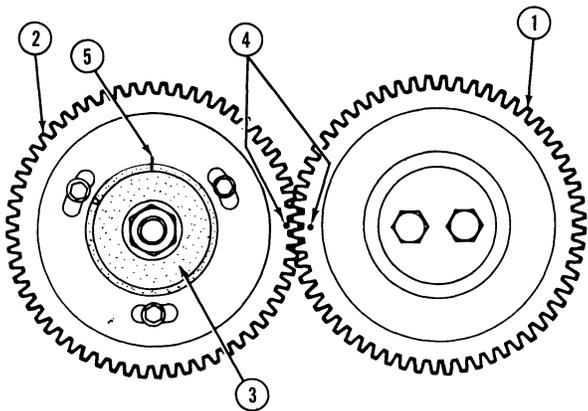
Rotate the camshaft as required to install the camshaft gear aligning the timing (matching) marks on the idler gear and camshaft gear, Figure 42.

5. Install the camshaft gear retaining nut and tighten to the specified torque:

Camshaft nut torque 107-114 lbs. ft.
(150-160 Nm)

6. Rotate the crankshaft counterclockwise until the idler gear-to-crankshaft timing mark is in the position as shown, Figure 44. Install the injection pump drive gear onto the pump drive coupling aligning the timing mark with the idler gear matching mark (4).

Rotate the pump coupling to align the coupling and gear chisel marks (5), Figure 44. Install the three drive gear-to-coupling bolts and tighten to the specified torque.



S-19419

Figure 44
Injection Pump Drive Gear Timing

- | | |
|---------------------------|-----------------|
| 1. Idler Gear | 4. Timing Marks |
| 2. Injection Pump Gear | 5. Timing Marks |
| 3. Injection Pump Coupler | |

NOTE: If new injection pump drive components are used, or if the chisel marks are not present, see "Injection Pump Timing," Part 2, for basic timing procedure.

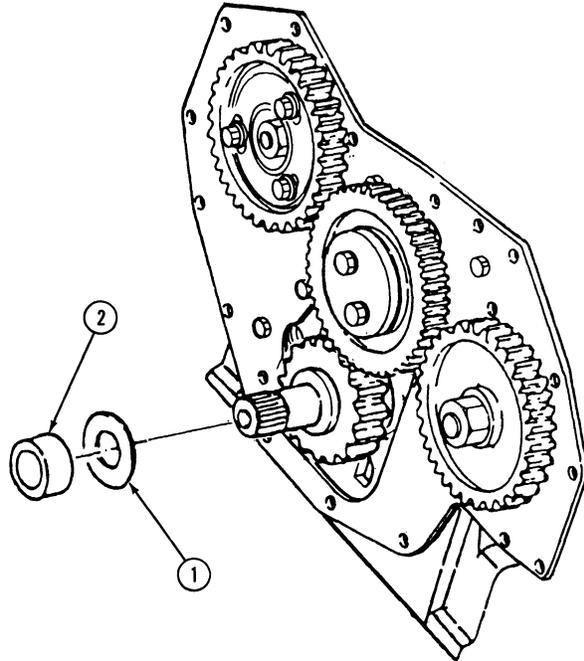
- If removed, install the engine oil pressure relief valve and tighten to the specified torque, Figure 43:

Oil pressure relief valve torque . . . 65-72 lbs.-ft.
(88-98 Nm)

- Position the oil slinger and collar on the crankshaft, Figure 45.
- Using a suitable size driver, install a new oil seal in the timing gear cover.
- Apply a gasket sealer to the cover gasket and position the gasket on the engine.
- Position the seal protector, Nuday Tool No. 1584, on the crankshaft and carefully install the cover assembly.

Install the cover bolts and gradually tighten the bolts to the specified torque. See "Specifications," Chapter 3.

- Install the crankshaft pulley aligning the pulley to the crankshaft timing marks, as shown, Figure 46.



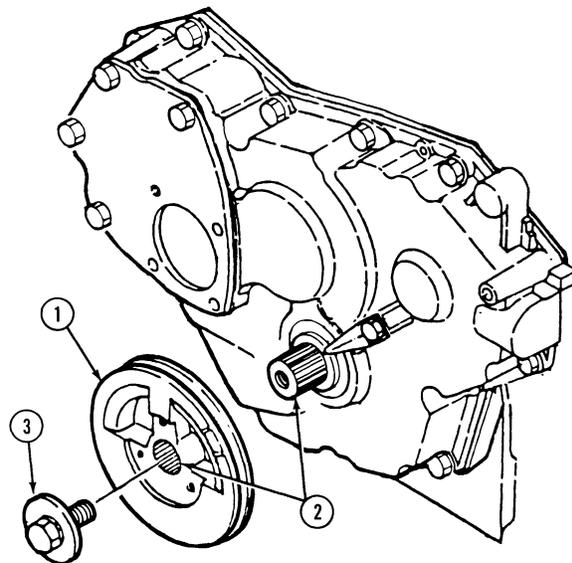
S-19420

Figure 45
Timing Gears and Cover Assembly

- | | |
|----------------|-----------|
| 1. Oil Slinger | 2. Collar |
|----------------|-----------|

Install the pulley attaching bolt and washers and tighten to the specified torque:

Pulley bolt torque 36-43 lbs.-ft.
(49-59 Nm)



S-19421

Figure 46
Crankshaft Pulley Installation

- | | |
|-----------------|--------------------|
| 1. Pulley | 3. Bolt and Washer |
| 2. Timing Marks | |

CONNECTING RODS, BEARINGS, PISTONS, RINGS AND CYLINDER BLOCK

Note the pistons and connecting rods can be removed with the engine in the tractor after removing the cylinder head and oil pan.

DISASSEMBLY

1. Remove the cylinder head assembly. See "Cylinder Head Removal," this section.
2. Drain the engine oil, Figure 47.
3. Remove the oil pan bolts and remove the pan.

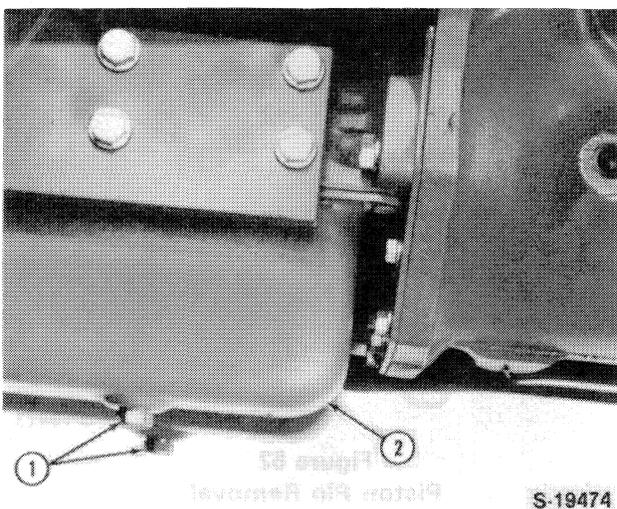


Figure 47
Engine Oil Drain Plugs (Four-Wheel Drive Model Shown)

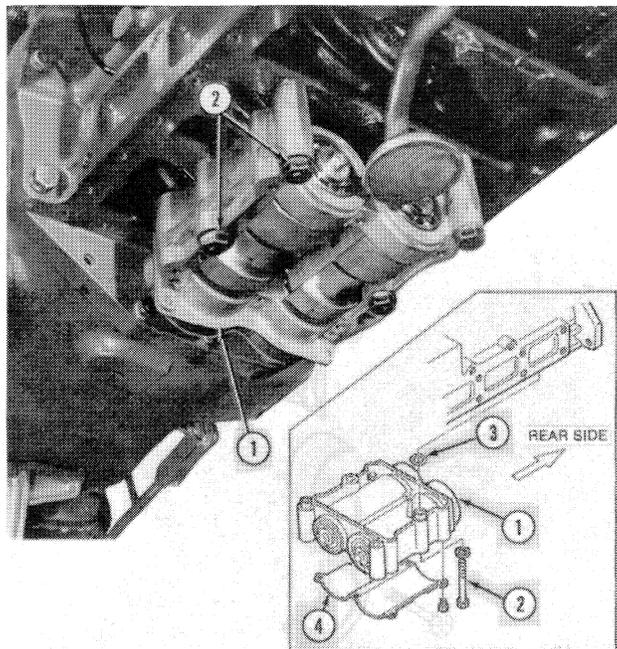
1. Drain Plugs
2. Oil Pan

NOTE: On four wheel drive models, separate the front axle and support assembly from the engine chassis. See "Separating The Tractor," Part 12.

4. On the Model 2110 tractor, remove the dynamic balancer attaching bolts and lower the balancer assembly from the block and crankshaft assembly, Figure 48.

NOTE: Observe the quantity of shims used, if any, and retain for installation in their original location between the balancer frame and engine block.

5. Remove the snap ring, thrust washer and idler gear, Figure 49.
6. Remove the carbon deposit around the top of each of the cylinders.



S-21234

Figure 48
Dynamic Balancer Removal (Model 2110)

1. Dynamic Balancer Ass'y
2. Attaching Bolts
3. Shims
4. Cover

If necessary use a ridge reamer to remove the ridge at the top of the cylinder.

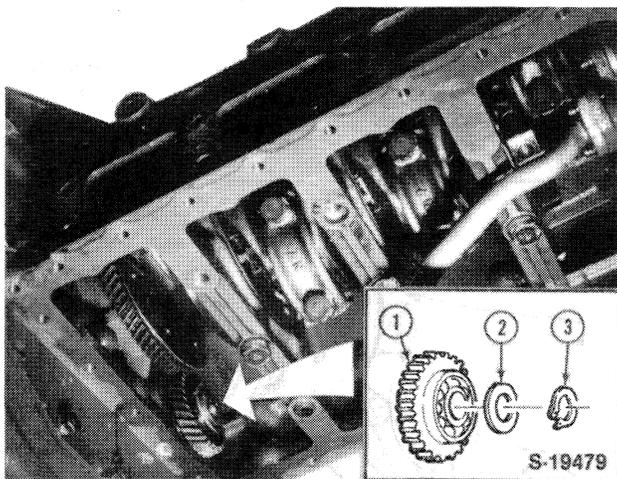
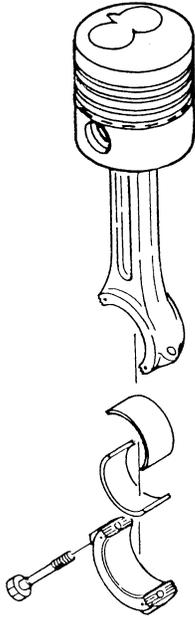


Figure 49
Balancer Idler Gear Removal (Model 2110)

1. Idler Gear
2. Thrust Washer
3. Snap Ring

7. Remove the connecting rod bearing caps one at a time and push the connecting rod and piston assembly out the top of the block, Figure 50.

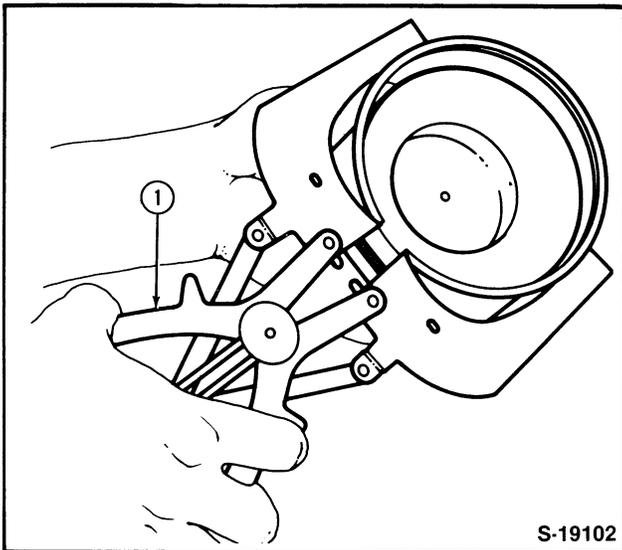


S-19422

Figure 50
Piston and Rod Assy. Removal

NOTE: Keep each of the piston and rod assembly components in separate containers and identify the cylinder for ease of assembly.

8. Use a suitable ring expander and remove the piston rings, Figure 51.
9. Remove the piston pin retaining rings. Using Nuday Tool No. 1585, drive the piston pin out, Figure 52.



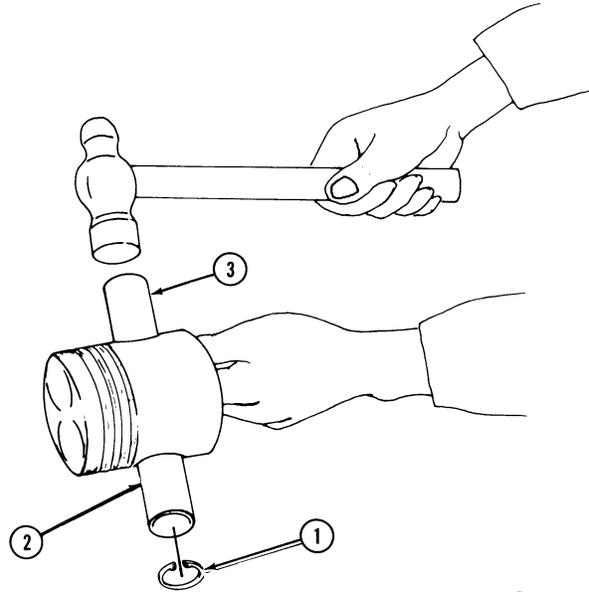
S-19102

Figure 51
Piston Ring Removal

NOTE: Mark the piston and connecting rod for ease of assembly.

INSPECTION AND REPAIR

Wash the piston and connecting rod components in a suitable solvent and air dry.



S-19423

Figure 52
Piston Pin Removal

- | | |
|--------------------|--------------------------|
| 1. Retaining Rings | 3. Driver, Tool No. 1585 |
| 2. Piston Pin | |

PISTONS

1. Using a suitable ring groove cleaner, Figure 53, remove the carbon deposits from the ring grooves. Use care to avoid cutting any metal from the sides or bottom of the grooves.
2. Using a new ring and feeler gauge, check the ring to groove side clearance, Figure 54.

Replace pistons if the side clearance exceeds the following limits:

Compression rings012 in. (0.3 mm) Max.

Oil control ring006 in. (.15 mm) Max.

NOTE: The top ring and groove are keystone.