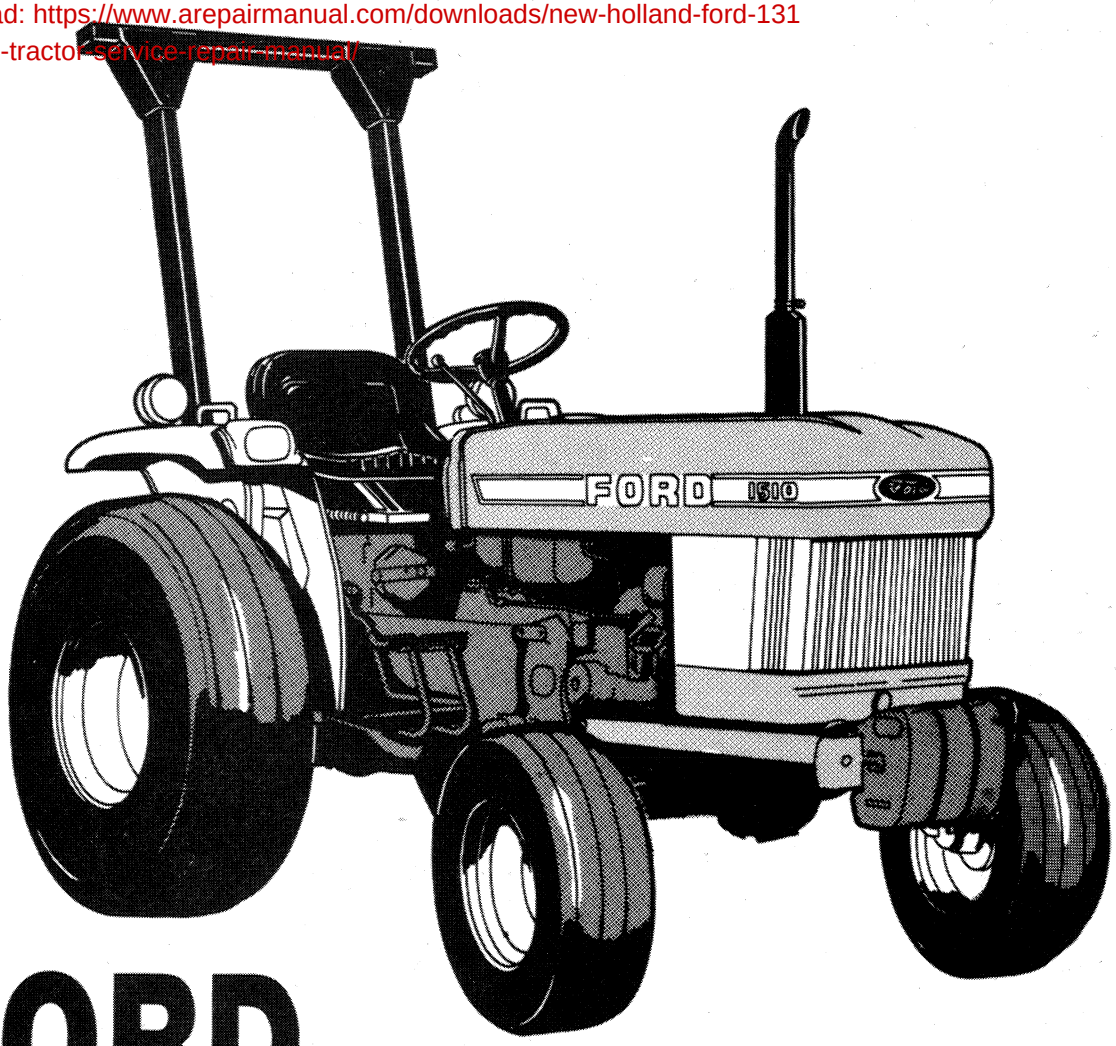


FORD

1310 — 1510 — 1710 TRACTORS

Repair Manual

40131020

FORD TRACTOR OPERATIONS FORD MOTOR COMPANY
TROY, MICHIGAN

SE 4301 584

PRINTED IN U.S.A.

Reprinted

FOREWORD

This repair manual provides information for the proper servicing and overhaul of Ford 1310, 1510 and 1710 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 any time without notice is reserved. All data in this Manual is subject to production variations, so overall dimensions and weights should be considered as approximate 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 1310, 1510 and 1710 Tractors and is stamped with the following information:

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

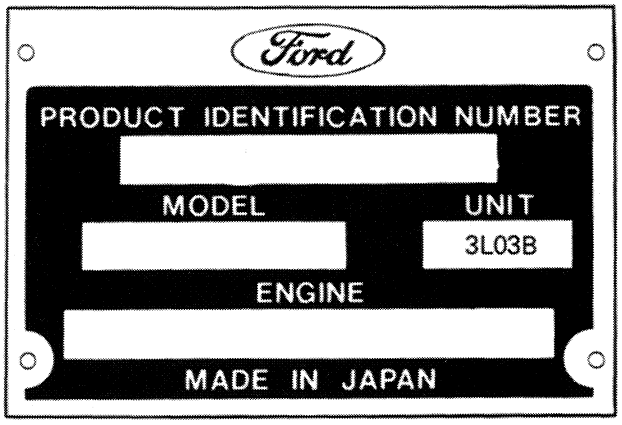
Whenever effecting repair or overhaul the relevant series information should be noted and used when referring to Service Bulletins and/or the Parts Catalogue.

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 0 3 B

- 3 — Year of Final Assembly (1983)
- L — Month of Year (November)
- 0 3 — Day of Month (Third)
- B — Shift Period (Day)

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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.

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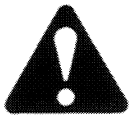
- **First Aid**
  In the type of work that mechanics are engaged in, dirt, grease, fine dusts, etc., all settle upon the skin and clothing. If a cut, abrasion or burn is disregarded it may be found that a septic condition has formed within a short time. What appears at first to be trivial could become 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/Stands. 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.

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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.

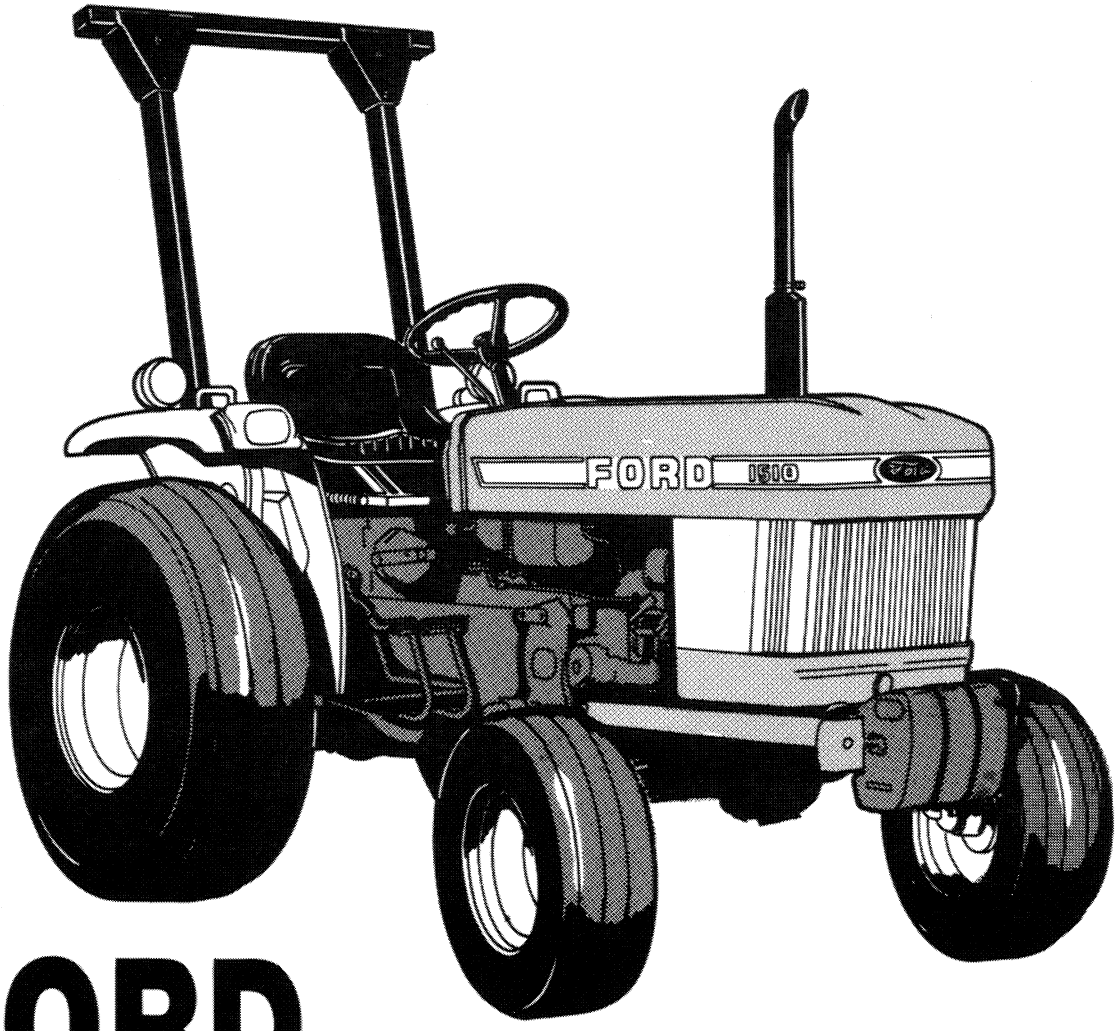
Hose connections which are damaged, dented, crushed or leaking, restrict oil flow and the productivity of the components being served. Connectors which show signs of movement from the original swaged position have failed, and will ultimately separate completely.

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.

Balooning 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.



FORD

1310 — 1510 — 1710 — 1710 OFFSET TRACTORS

Repair Manual

FORD TRACTOR OPERATIONS FORD MOTOR COMPANY
TROY, MICHIGAN

SE 4301 584 (REV. 686)

PRINTED IN U.S.A.

PART 1
ENGINE SYSTEMS — MODELS 1310-1510-1710 1710 OFFSET (SAME AS STANDARD MODEL)

Chapter 1
ENGINE AND LUBRICATION SYSTEM

Chapter 2
COOLING SYSTEM

Chapter 3
TROUBLE SHOOTING, SPECIFICATIONS AND SPECIAL TOOLS

PART 1
ENGINE SYSTEMS — MODELS 1310-1510-1710

Chapter 1
ENGINE AND LUBRICATION SYSTEM

A. DESCRIPTION AND OPERATION

This chapter describes the engine overhaul and repair procedures for the 1310-1510-1710 Ford Tractors.

The engines are of the same basic design and repair procedures are essentially the same except as noted in the repair procedure.

Ford 1310-1510 and 1710 tractors are equipped with three-cylinder in-line diesel engines. They are all four cycle, overhead valve, liquid cooled engines.

The engines are identified by a code number cast into the side of the cylinder block.

Engine Identification	Tractor Model	Horsepower
S753	1310	19
K773	1510	22
H843	1710	26

CYLINDER HEAD AND VALVE TRAIN COMPONENTS

The cylinder head incorporates the valve assemblies, rocker arms, rocker shaft, push rods, and lifters.

A pre-combustion chamber located between the injector assembly and the main combustion chamber of the cylinders provides improved starting and greater fuel efficiency. Initial combustion starts in the pre-combustion chamber and as the air fuel expansion occurs a strong swirl pattern is created in the main combustion chamber for more complete combustion of the air fuel mixture.

The air intake manifold is incorporated into the cast aluminum valve cover of the Models 1310 and 1710 engines. The Model 1510 tractor has a separate air intake manifold bolted to the right hand side of the cylinder head. The exhaust manifold is bolted to the left hand side of the cylinder head on each of the models.

Cylinder heads have integral valve guides. Only standard size valves are used for service.

CYLINDER BLOCK ASSEMBLY

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

The crankshaft is supported on four main bearings. The front bearing is positioned in a bore in the front of the block for each of the engines. The rear bearing is located

in a rear cover which is bolted to the back of the block for the Models 1510 and 1710 and in the rear of the block for the Model 1310. Two intermediate split bearings are located in holders bolted to the block.

The camshaft is supported on two ball bearings on the Models 1310 and 1510 and on three ball bearings on the Model 1710.

PISTON AND CONNECTING RODS

The Model 1310 utilizes a straight connecting rod and a three ring piston.

The Models 1510 and 1710 utilize an offset connecting rod with a four ring piston.

LUBRICATION SYSTEM

Model 1310:

The oil pump assembly is located within the injection pump drive gear at the front of the block and 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 drilling in the block to the oil pump. 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 on the side of the block. Oil flow in the main oil gallery extends to the four main bearings. Oil flow to the main bearings passes through drilled passages in the crankshaft to the three connecting rod bearings. 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 No. 1 rocker shaft pedestal. Oil flows up the pedestal through clearance around the bolt into the rocker shaft. Oil leakage from clearance between the rocker arms and the shaft overflows in the valve cover and lubricates the valve stems, push rods and tappets.

The relief valve is mounted in the side of the block and intersects the main oil passage. When the oil pressure exceeds the rated pressure, oil is by-passed through the relief valve directly to sump.

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

Models 1510-1710:

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.

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 to the four 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 drilled bolt located above the oil pump, through the tube, to the drilled bolt located above the camshaft. The oil passes through a drilled passage in the block and cylinder head to an oil transfer tube connected to the rocker shaft. Oil flows the extent of the rocker shaft through lubrication holes to the rocker arms. Oil overflow in the valve cover lubricates the valve stems, push rods and tappets.

The relief valve is mounted in the front of the block and intersects the main oil gallery. When the oil pressure exceeds the rated pressure, oil is by-passed through the relief valve directly to sump.

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

B. ENGINE OVERHAUL

CYLINDER HEAD AND RELATED COMPONENTS

REMOVAL

1. Drain the radiator assembly, Figure 1.

2. **Model 1310 only:** Remove the air cleaner assembly along with the air cleaner hoses, Figure 2.

   Models 1510 and 1710 only: Remove the air cleaner hose from the air cleaner to valve cover air inlet connection, Figure 3.

3. Remove the upper radiator hose from the cylinder head, Figure 3.

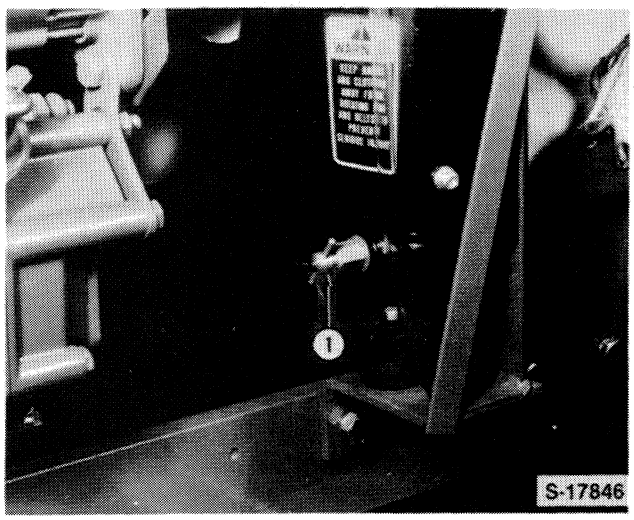


Figure 1
Radiator Drain — Models 1510-1710
1. Drain Cock

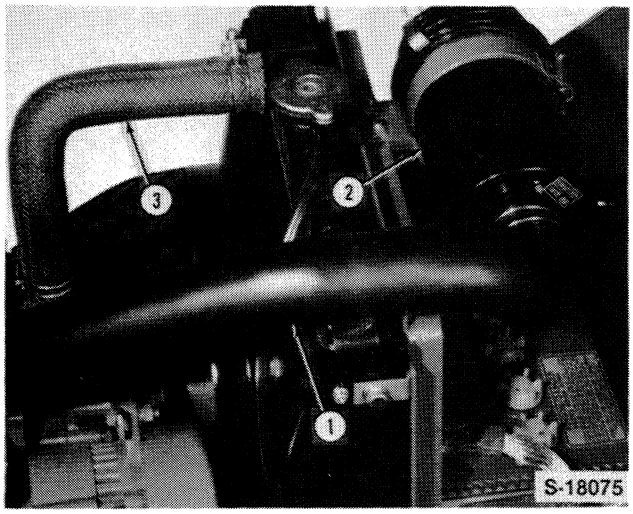


Figure 3
Air Cleaner Removal — Models 1510-1710
1. Air Cleaner Outlet Hose
2. Air Cleaner Assembly
3. Upper Radiator Hose

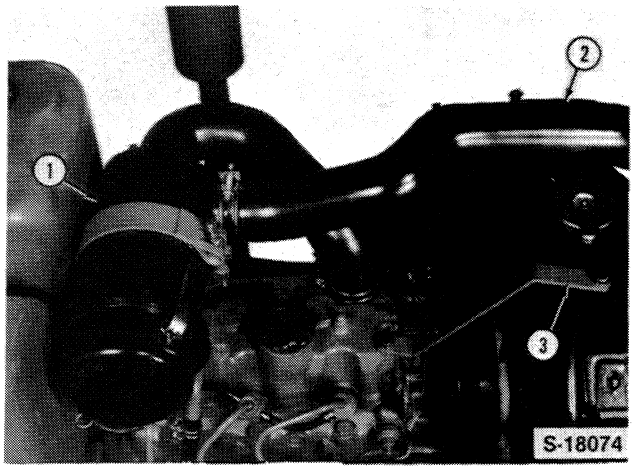


Figure 2
Air Cleaner — Model 1310
1. Air Cleaner Assembly
2. Air Inlet Tube
3. Radiator Support Brace

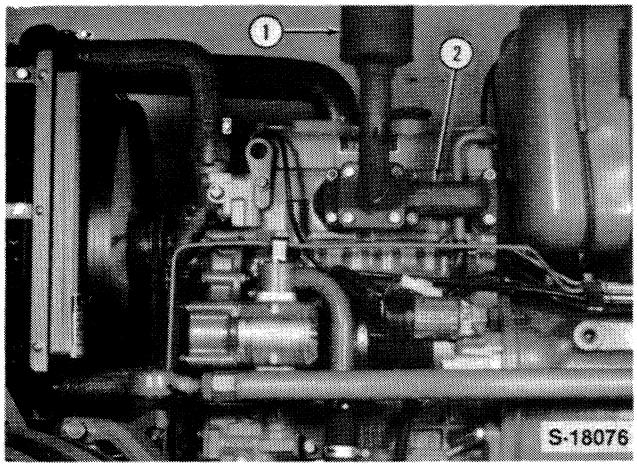


Figure 4
Exhaust Manifold Removal — Models 1510-1710
1. Muffler Assembly
2. Exhaust Manifold

4. Remove the exhaust muffler and manifold assembly, Figure 4.

5. **Model 1310 only:** Remove the radiator top support brace from the cylinder head, Figure 2.

   NOTE: *Glow plugs must be removed before removing injection pre-chamber.*

6. Remove the injection lines and cap all openings, Figure 5.

7. Remove the injector assemblies, Figure 5.

   NOTE: *Be sure to remove the injector sealing washer and cup type shield from the injector bore, Figure 6.*

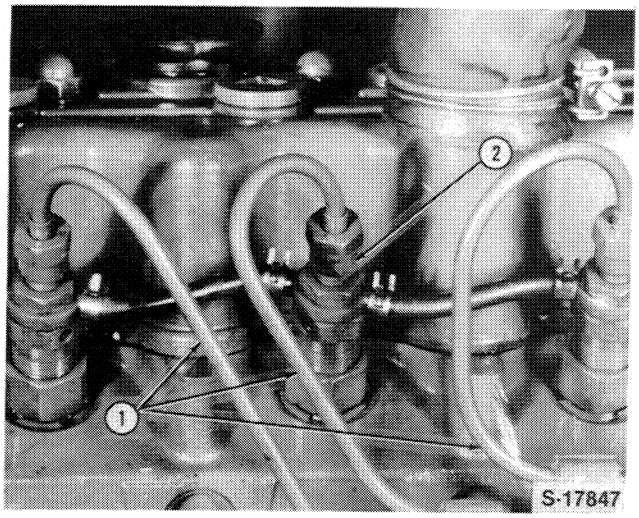


Figure 5
Injector Removal
1. Injector Lines
2. Injector Assembly

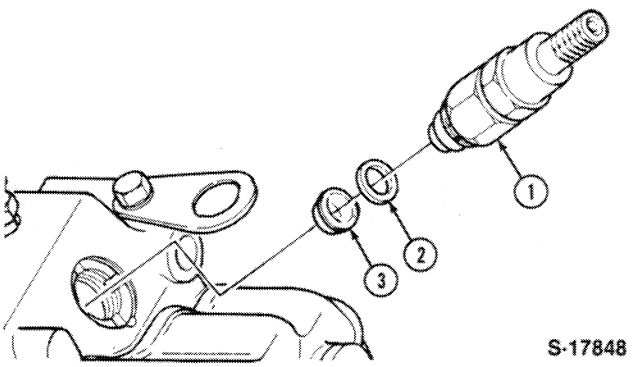


Figure 6
Injector Removal
1. Injector Assembly
2. Sealing Washer
3. Heat Shield

8. Remove the glow plug wire connectors and remove the glow plugs, Figure 7.

9. Remove the temperature sender switch, Figure 8.

10. **Model 1310 only:** Remove the oil sender switch from the right hand side of the cylinder head, Figure 9.

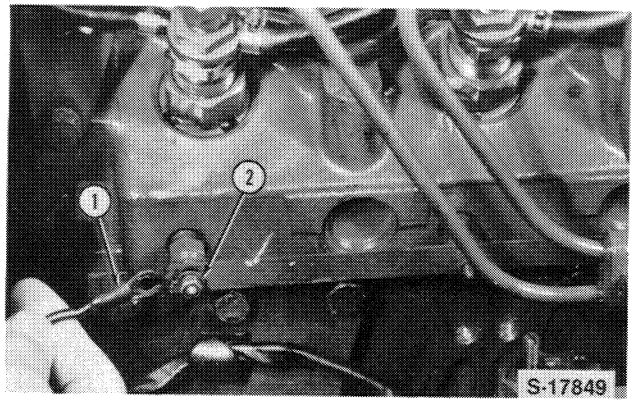


Figure 7
Glow Plug Removal
1. Glow Plug Wire Connector
2. Glow Plug Assembly

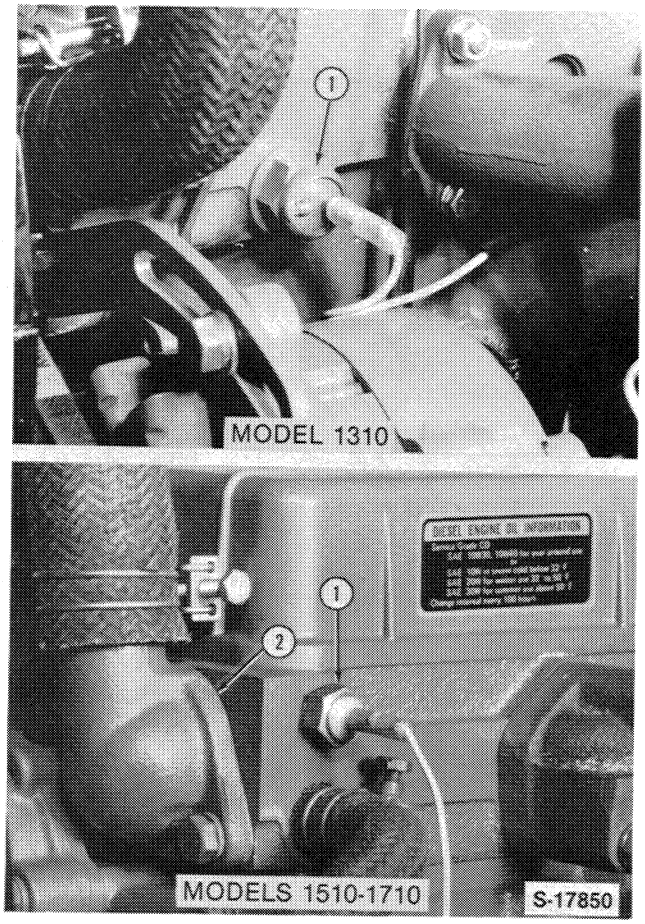


Figure 8
Temperature Sender Switch
1. Sender Switch
2. Coolant Inlet Connector

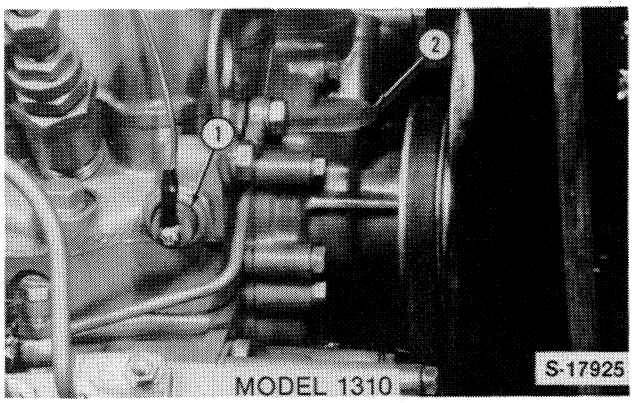


Figure 9
Oil Pressure Switch — Model 1310
1. Sender Switch 2. Water Pump Assembly

11. **Model 1310 only:** Remove the water pump and thermostat assembly, Figure 9.

    Models 1510 and 1710 only: Remove the coolant inlet connector and thermostat, Figure 8.

12. **Model 1310 only:** Remove the external oil transfer tube bolt from the front of the cylinder head, Figure 10.

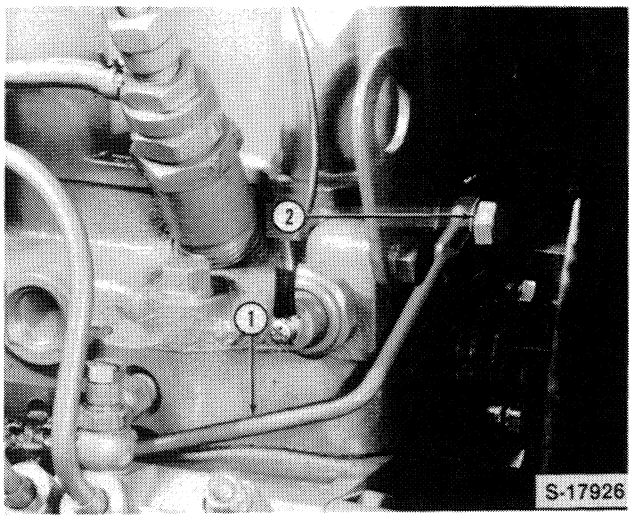


Figure 10
External Oil Transfer Tube — Model 1310
1. External Tube 2. Banjo Bolt

13. **Model 1510 only:** Remove the air inlet manifold assembly, Figure 11.

14. Remove the valve cover assembly.

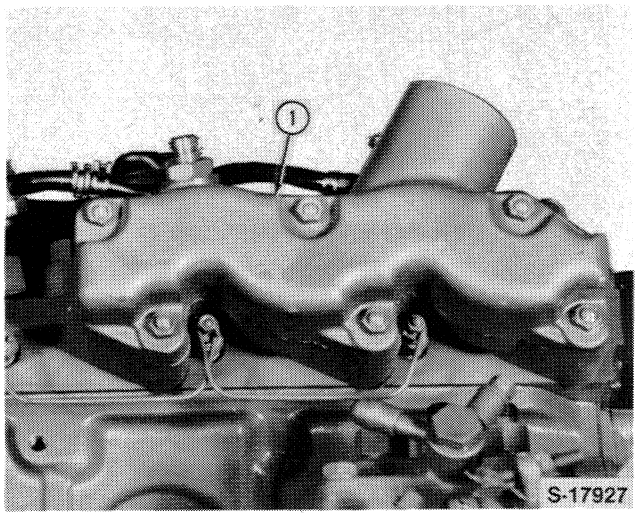


Figure 11
Inlet Manifold — Model 1510
1. Manifold

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

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

16. Remove the valve stem caps and push rods, Figure 12.

    NOTE: *Keep all valve components in separately marked containers for re-assembly in their original location.*

17. Remove the cylinder head bolts by alternately loosening a half turn at a time to prevent warping the head, Figure 13.

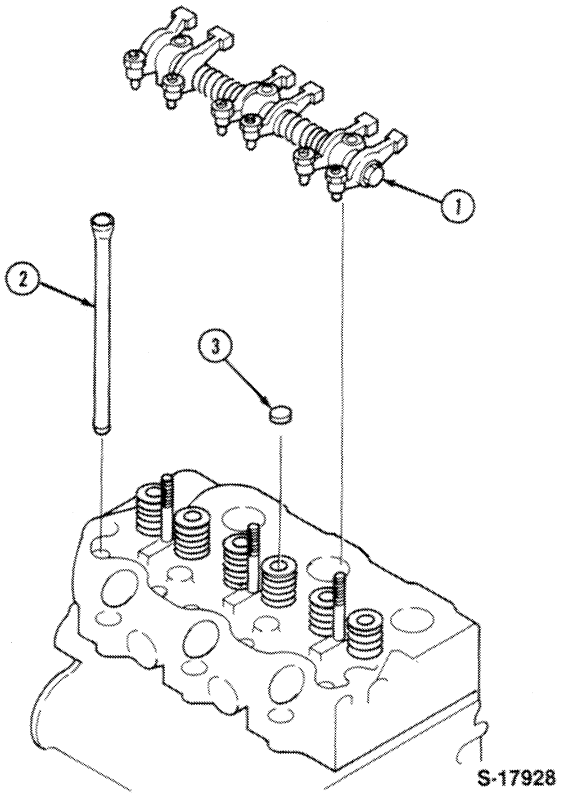


Figure 12
Rocker Shaft Removal (Model 1310 shown)
1. Rocker Shaft Assembly
2. Push Rod
3. Valve Stem Cap

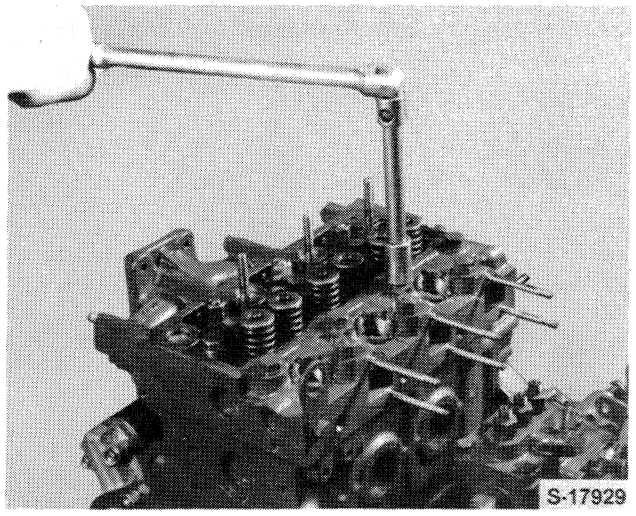


Figure 13
Cylinder Head Removal

DISASSEMBLY

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

2. Use a valve spring compressor and remove the valve spring retainer locks, spring and spring retainer from the valves, Figure 14.

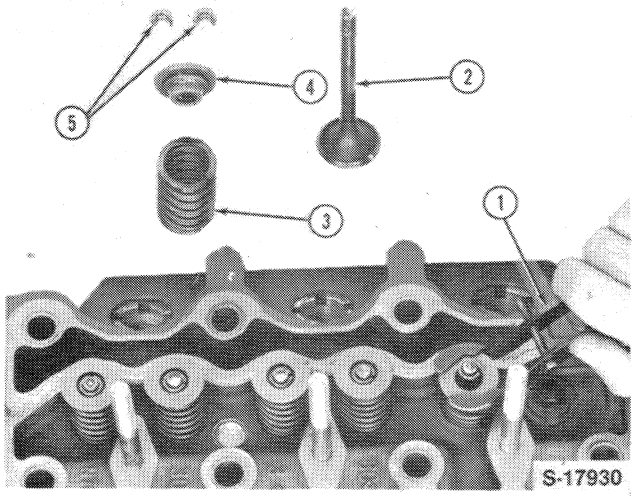


Figure 14
Cylinder Head Valve Removal
1. Valve Spring Compressor
2. Valve
3. Spring
4. Retainer
5. Keepers

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

4. **Model 1310 only:** Using Tool No. 1589, remove the pre-combustion chamber from the cylinder head, Figure 15.

   NOTE: *Glow plugs must be removed before attempting to remove pre-combustion chamber.*

   Models 1510 and 1710 only: Using Tool No. 1589, remove the retaining ring from the cylinder head. Gently tap the bottom end of the pre-chamber to loosen it from the head, or use a slide hammer with internal expanding jaw attachment to pull the pre-combustion chamber from the head.

   Be sure to remove the cup type shield and sealing washer from the pre-combustion chamber, Figure 16.

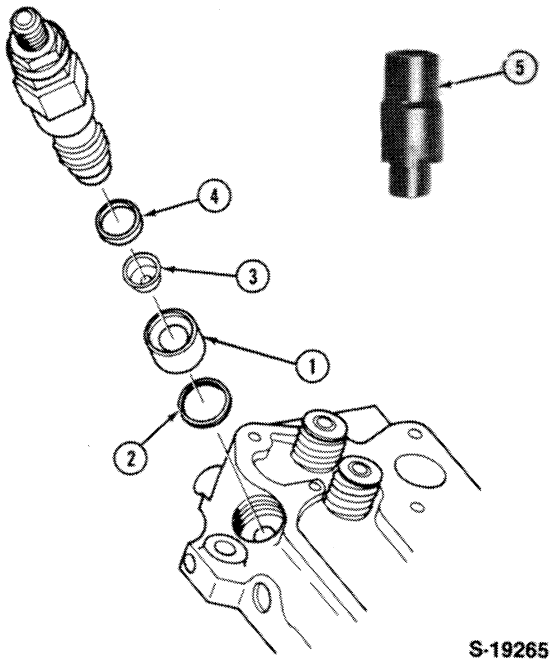


Figure 15
Pre-Combustion Chamber Removal — Model 1310

1. Pre-Chamber
2. Sealing Washer
3. Heat Shield
4. Injector Sealing Washer
5. Tool No. 1589, Spanner Wrench

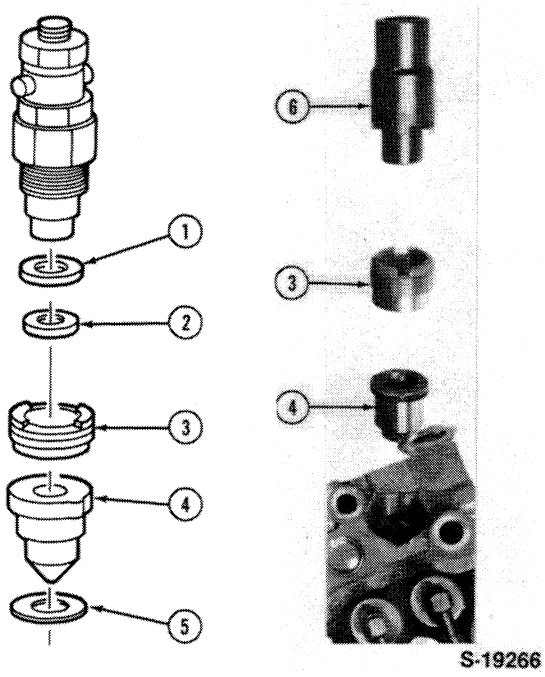


Figure 16
Pre-Combustion Chamber Removal — Models 1510-1710

1. Injector Washer
2. Heat Shield
3. Retainer Ring
4. Pre-Chamber
5. Sealing Washer
6. Tool No. 1589, Spanner Wrench

INSPECTION AND REPAIR

CYLINDER HEAD

1. Clean all carbon deposits from the combustion chamber, pre-combustion chamber and valve ports using a wire brush and scraper.

2. Clean all dirt and residue from the gasket surface using care not to scratch or nick the machined surface.

3. Clean the cylinder head in solvent and air dry.

4. Check the head for cracks or damage in the following areas:

   - Valve ports
   - Valve seats
   - Combustion chamber and pre-combustion chamber.
   - External cracks in the water jackets

5. Inspect the gasket surfaces for scratches or nicks which could cause leakage.

6. Examine the core hole plugs for rust or signs of leakage. If a plug shows signs of damaging rust or leakage, replace all the plugs in the head.

7. Use a straight edge and feeler gauge and check the cylinder head for warp in the area shown at (2), Figure 17.

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

VALVE SEATS

Examine the valve seats and reface the seat if damaged.

Valve seat grinding requires that the seat be ground to the correct width and properly positioned as shown in Figure 18.

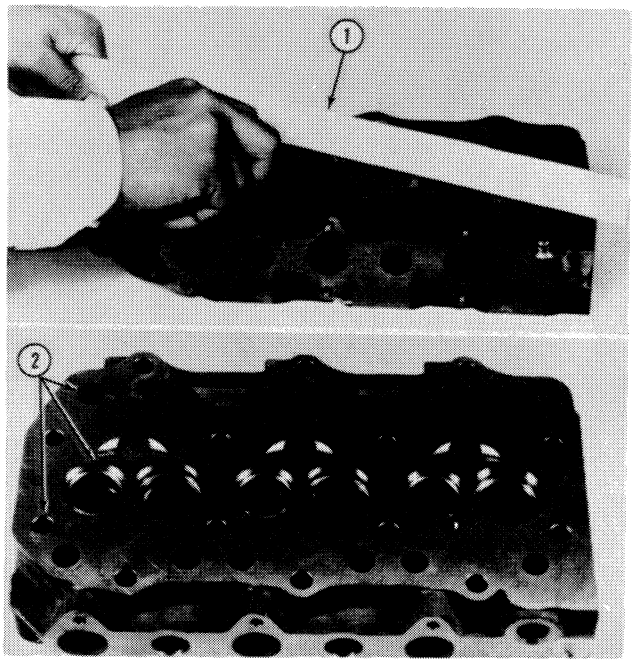


Figure 17
Cylinder Head Flatness Check
1. Straight Edge
2. Check Areas

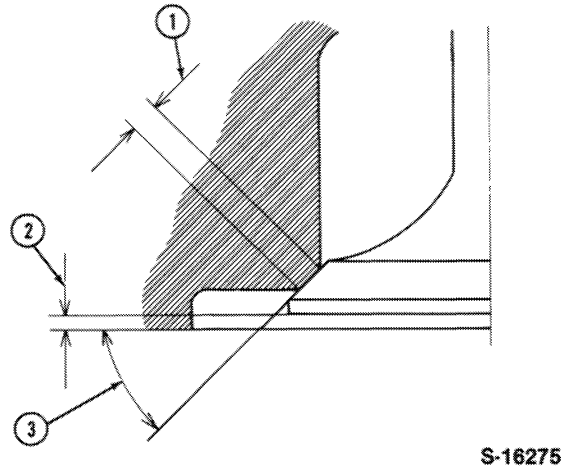


Figure 18
Valve Grinding Checks
1. Correct Valve Seat Width and Location
2. Correct Valve Head Margin
3. 45° Valve Seat Angle

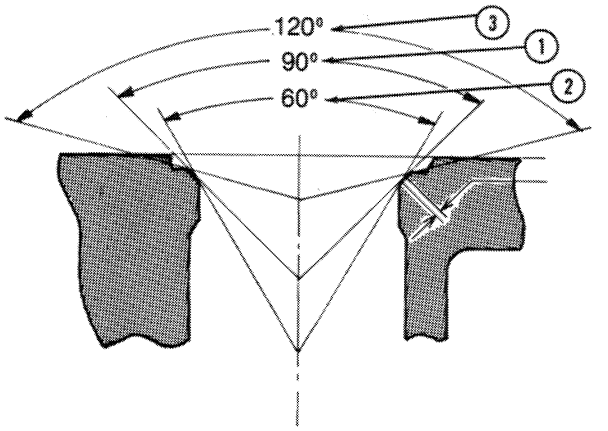


Figure 19
Valve Seat Grinding
1. Seat Angle — 45° Stone
2. Lower Seat Location — 30° Stone
3. Raise Seat Location — 60° Stone

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

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

2. Check the seat width, Figure 18. If necessary, use a 30° stone to lower the seat contact point and use a 60° stone to raise the seat contact point, Figure 19.

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

VALVES

1. Clean all deposits from the valves using a soft wire brush. Inspect the condition of the valve and discard any that are badly burned, cracked or bent, Figure 20.

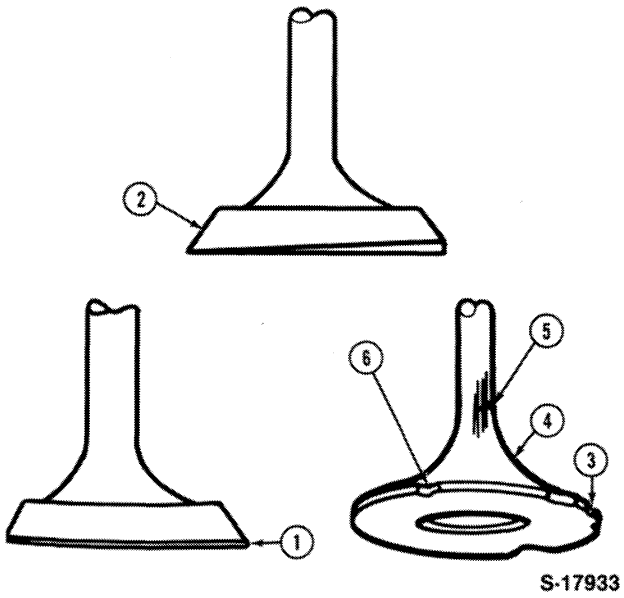


Figure 20
Valve Defect Inspection

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 21.

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

	Intake	Exhaust
Ford Model 1310	.271 in (6.89 mm)	.269 in. (6.84 mm)
Ford Models 1510 and 1710	.310 in. (7.88 mm)	.309 in. (7.85 mm)

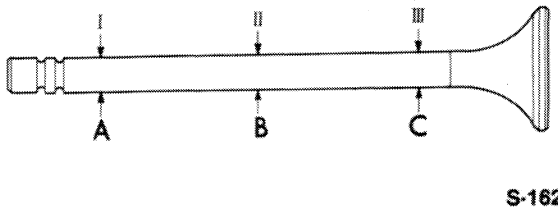


Figure 21
Valve Stem Wear Points

3. If inspection indicates that the valve may be reused, the valve should be ground as shown, Figure 22.

   IMPORTANT: *After grinding the valve and seat, check to assure that the seat contacts the center of the valve face. Using Prussian 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 blue is transferred to the center of the valve face, the contact is correct.*

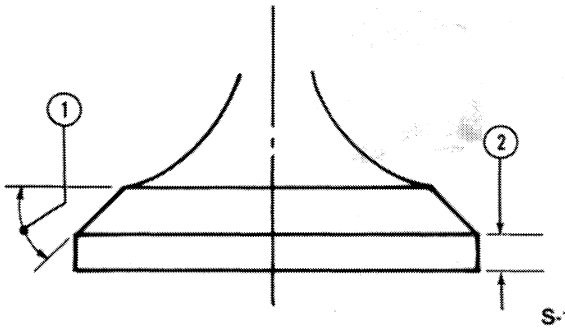


Figure 22
Valve Correctly Ground

1. 45° Angle Seat
2. Minimum Valve Margin
   Model 1310 = .020 in. (.5 mm)
   Models 1510-1710 = .040 in. (1.0 mm)

If Prussian Blue is not available, mark the valve face or seat with a soft lead pencil as shown, Figure 23. Rotate the valve slightly in the seat. The penciled lines will be broken at the seat contact area.

VALVE GUIDES

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

1. Using a small hole gauge, measure the valve guide bore at the top and bottom wear points, Figure 24.

2. Determine the stem to guide clearance by subtracting the stem diameter from the valve guide diameter, Figure 25.

3. Replace the cylinder head if excessive clearance is determined. See "Specifications", Chapter 3, for wear limits.

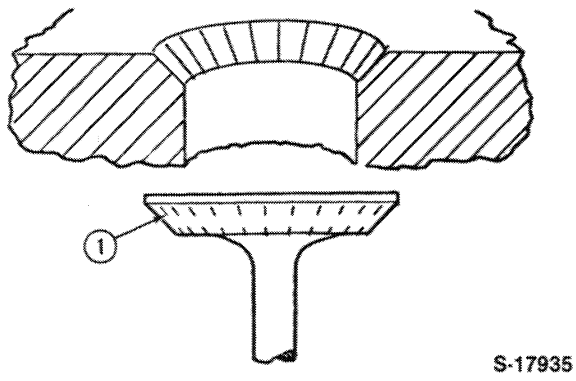


Figure 23
Valve Seat Contact Location
1. Seat

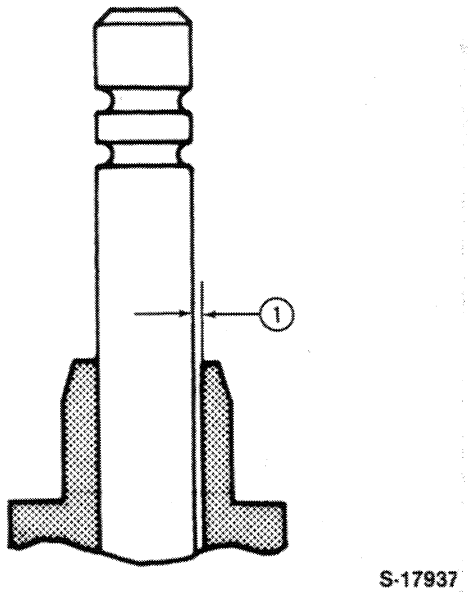


Figure 25
Valve Stem to Guide Clearance Check
1. Clearance

VALVE SPRINGS

1. Place the valve springs on a flat surface. Measure the free-length of the spring and squareness, Figure 26.

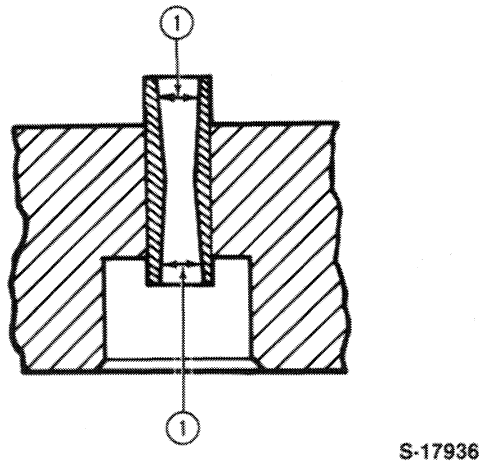


Figure 24
Valve Guide Wear Check
1. Wear Point

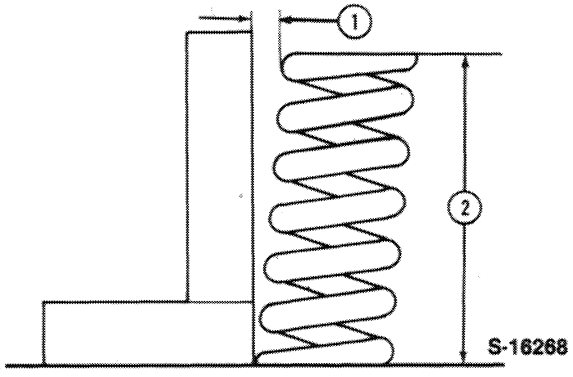


Figure 26
Valve Spring Length and Squareness Check
1. Squareness 2. Free Length

Replace springs that do not meet the following specifications:

	Max. Out of Square	Min. Free-Length
Model 1310	.070 in. (1.8 mm)	1.319 in. (33.5 mm)
Model 1510 and 1710	.079 in. (2.0 mm)	1.732 in. (44 mm)

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

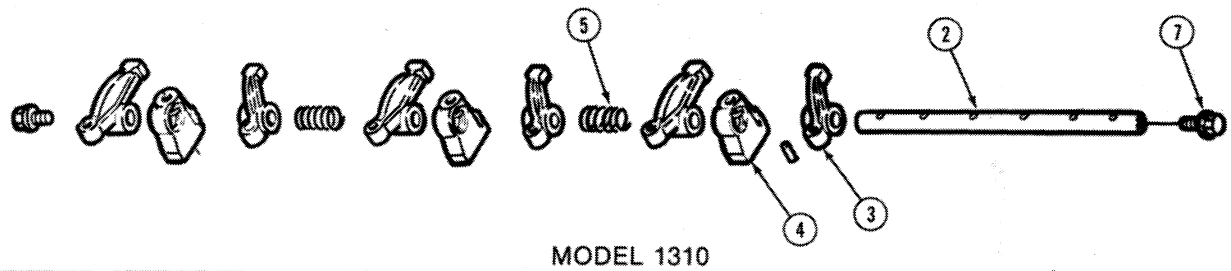
Model 1310 .....28 lbs. (Min.) at 1.2 in. Height (7 Kg at 30 mm)

Models 1510 and 1710.58 lbs. (Min.) at 1.1 in. Height (13 Kg at 38 mm)

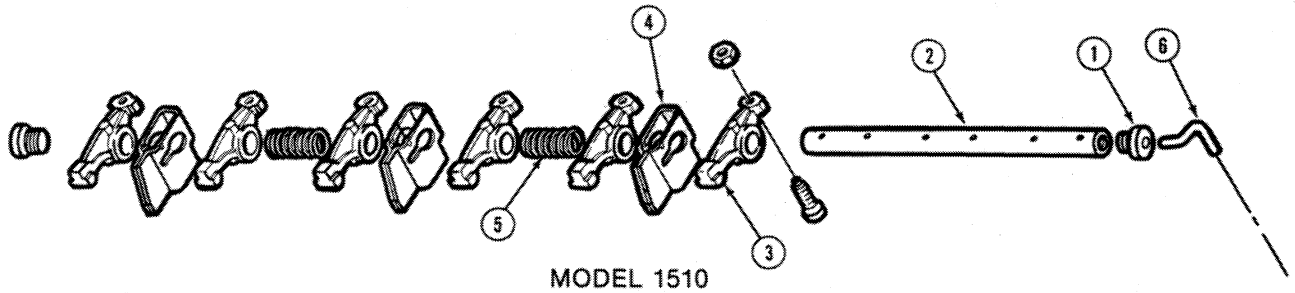
ROCKER ARMS – PIVOT SHAFTS

1. Remove the snap ring or bolt from the end of the shaft and slide the rocker arms, pedestal and springs off the shaft, Figure 27.

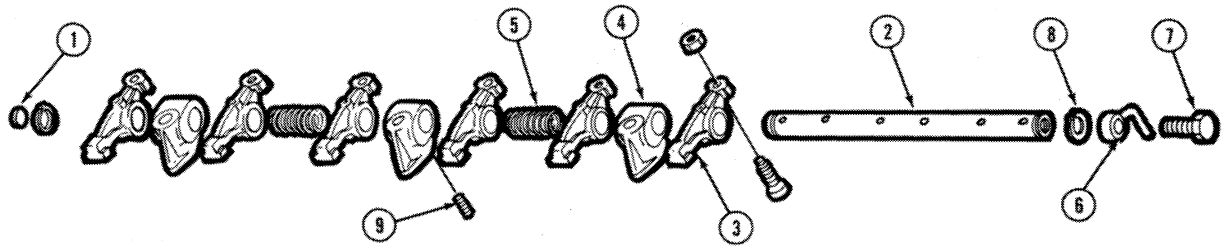
NOTE: *A set screw on the Model 1710 located on the side of the center pedestal locks the rocker shaft to the center pedestal. Remove the set screw to slide the center pedestal off the shaft.*



MODEL 1310



MODEL 1510



MODEL 1710 S-18077

Figure 27
Rocker Shaft Assembly

1. Plug
2. Shaft
3. Arm
4. Pedestal
5. Spring
6. Oil Tube
7. Bolt
8. Snap Ring
9. Set Screw

2. Inspect the rocker arms and shaft for wear or damage. Check the adjusting screws for damaged threads or excessive wear.

3. Check the valve stem contact area for pitting or excessive wear. Slight wear patterns may be removed using a fine grit oil stone.

4. Using a micrometer, measure the wear points on the rocker shaft as indicated, Figure 28.

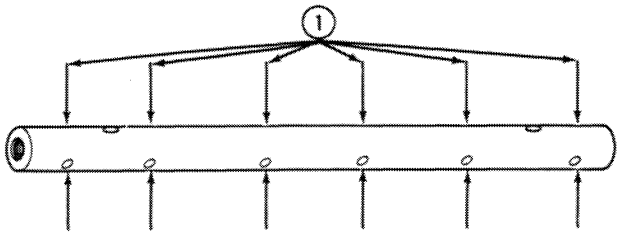


Figure 28
Rocker Shaft Wear Check
1. Wear Points

Replace the rocker shaft if the wear at any point exceeds the following diameter:

	Minimum Shaft Diameter
Ford Model 1310	.456 in. (11.6 mm)
Ford Models 1510 and 1710	.691 in. (17.6 mm)

5. Using a hole gauge, measure the inside bore diameter of the rocker arm, Figure 29.

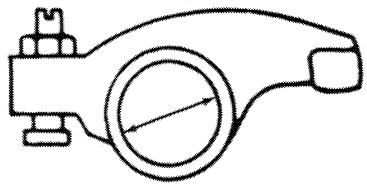


Figure 29
Rocker Arm Wear Check

Replace rocker arms having a bore diameter exceeding the following measurement:

	Maximum Bore Diameter
Ford Model 1310	.462 in. (11.7 mm)
Ford Model 1510	.675 in. (17.2 mm)
Ford Model 1710	.702 in. (17.9 mm)

Replace the rocker shaft and/or rocker arm if the rocker arm to shaft clearance exceeds .008 in. (0.2 mm).

PUSH RODS

1. Check all push rods for straightness by rolling on a flat surface. Replace rods which are bent.

2. Inspect the ends of the push rods for excessive wear. If any push rod is worn, the corresponding lifter and rocker arm should also be inspected for excessive wear.

ASSEMBLY

CYLINDER HEAD

1. Insert each valve in the guide from which it was removed and lightly lap the valve to be sure of an even seat around the valve face.

   Remove the valve and remove all traces of lapping compound.

2. Using a spring compressor, assemble the valves, springs, retainers and keepers.

3. Install the pre-combustion chamber using a new sealing washer, Figure 30.

   NOTE: *Be sure the locating tang on the pre-chamber is properly positioned in the groove in the cylinder head.*

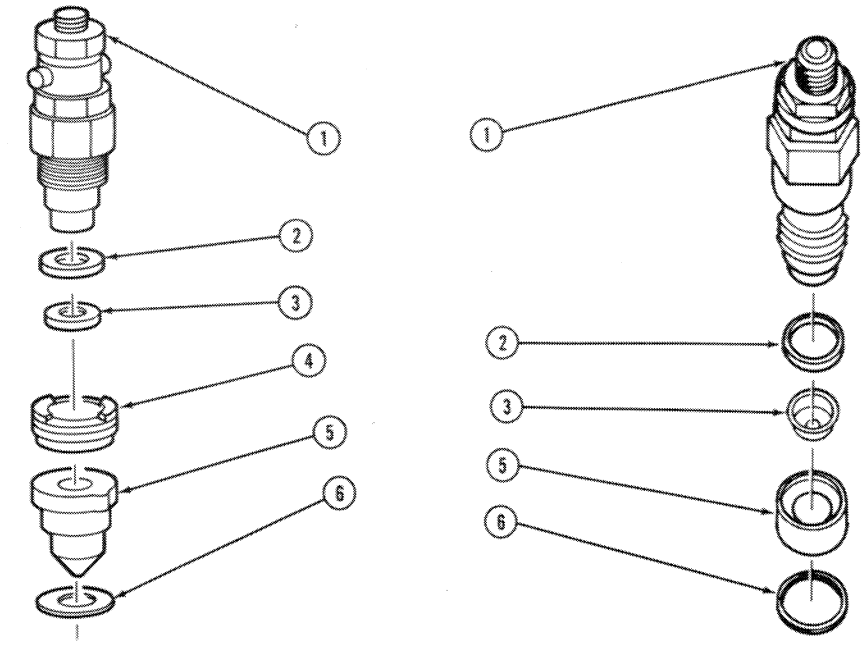


Figure 30
Pre-Combustion Chamber Installation

1. Injector Assembly
2. Sealing Washer
3. Heat Shield
4. Retaining Ring
5. Pre-Chamber
6. Sealing Washer

INSTALLATION

During assembly, the ultimate engine compression ratio is established by the thickness of the head gasket used. For service replacement, head gaskets of different thickness are available. The correct head gasket must be selected based upon the amount the pistons protrude above the face of the block when at top dead center.

The correct head gasket useage is determined as follows:

1. Position each of the pistons at top dead center and using a dial indicator, determine the distance each piston projects above the face of the block, Figure 31.

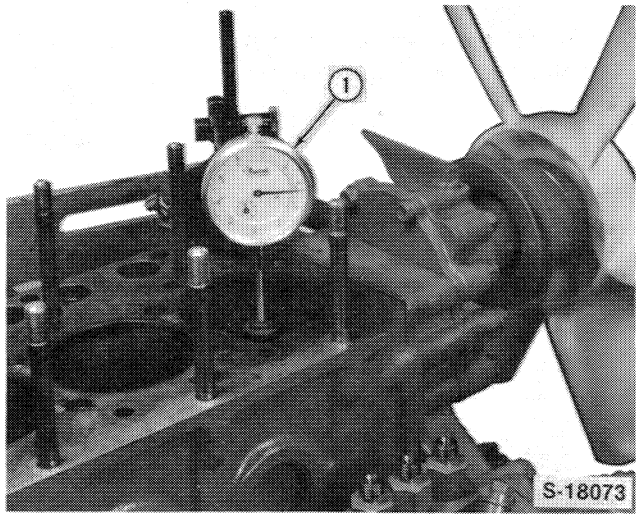


Figure 31
Measuring Piston Height Above Face of Block

1. Dial Indicator

NOTE: *Measure each of the pistons while holding a slight down pressure on the piston. Use the dimension taken from the cylinder which has the greatest projection and select a head gasket as indicated in the following chart.*

7. Adjust the rocker arm to valve clearance, Figure 33. 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).

HEAD GASKET USEAGE CHART

Tractor Model	Measurement	Free Thickness	Part Number
1310	.018-.022 in. (.45-.55 mm)	.047 in. (1.2 mm)	SBA-111146880
	.022-.026 in. (.55-.65 mm)	.051 in. (1.3 mm)	SBA-111146890
	.026-.030 in. (.65-.75 mm)	.055 in. (1.4 mm)	SBA-111146900
1510	.0080-.012 in. (.2-.3 mm)	.057 in. (1.45 mm)	SBA-111146920
	.012-.016 in. (.3-.4 mm)	.061 in. (1.55 mm)	SBA-111146851
	.016-.020 in. (.4-.5 mm)	.065 in. (1.65 mm)	SBA-111146861
1710	.018-.023 in. (.45-.58 mm)	.057 in. (1.45 mm)	SBA-111146561
	.023-.030 in. (.58-.75 mm)	.061 in. (1.55 mm)	SBA-11146651

NOTE: *On the Model 1310, the gasket thickness is stamped along the side TOP mark of the gasket, on Models 1510 and 1710, the last four digits of the part number are stamped on the gasket.*

2. If removed, install the tappets.

3. Select the proper head gasket and place it on the block with the side marked TOP up.

4. Install the head bolts and stud nuts. Tighten in stages to the following torques.

Model 1310 . . . . . 33-36 lbs.ft. (44-49 Nm)
Model 1510
12 mm Bolts . . . . . 65-72 lbs.ft. (88-98 Nm)
10 mm Bolts . . . . . 42-46 lbs.ft. (57-62 Nm)
Model 1710
14 mm Bolt and Nut . . . 94-98 lbs.ft. (127-132 Nm)
10 mm Bolts . . . . . 42-46 lbs.ft. (57-62 Nm)

NOTE: *Lubricate threads before tightening.*

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

6. Install the assembled rocker shaft, Figure 32, and tighten the support bolts in steps to the specified torque. See "Specifications," Chapter 3.

With the adjusting screw locknut loosened, turn the adjusting screw to obtain .008 in. (0.2 mm) clearance and tighten the locknut.

ENGINE FRONT COVER, TIMING GEARS AND OIL PUMP

REMOVAL

To remove the front cover assembly, first remove the radiator. See Chapter 2, "Radiator Removal".

COVER REMOVAL

1. Drain the engine crankcase oil.

2. Remove the exhaust muffler and manifold assembly, Figure 34.

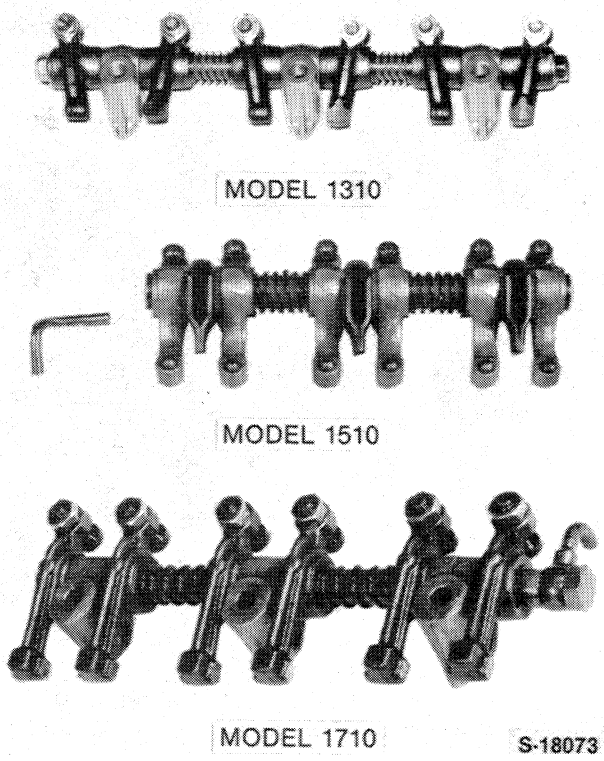


Figure 32
Rocker Shaft Assembly Installation

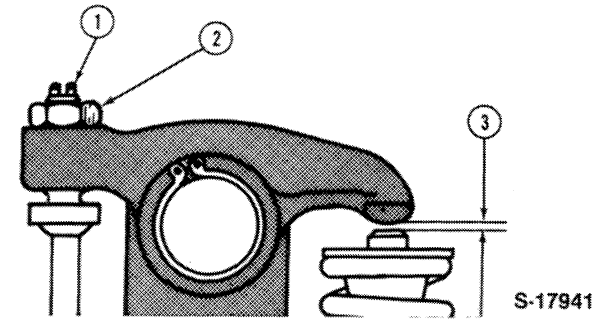


Figure 33
Valve Clearance Adjustment (Cold)
1. Adjusting Screw
2. Locknut
3. Valve Clearance 0.008 in. (0.2 mm)

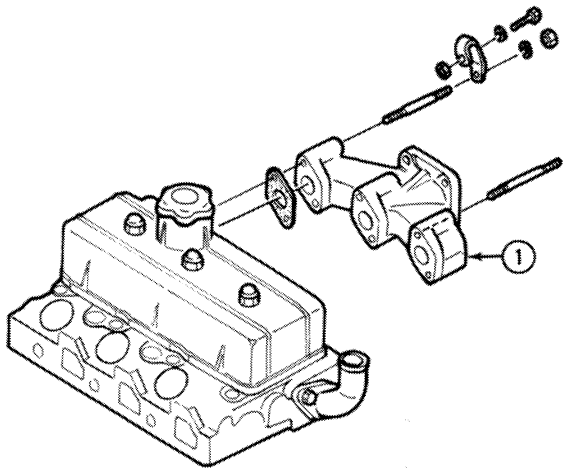


Figure 34
Exhaust Manifold Removal (Model 1510 Shown)
1. Exhaust Manifold

3. **Models 1510 and 1710 only:** Remove the alternator assembly, Figure 35.

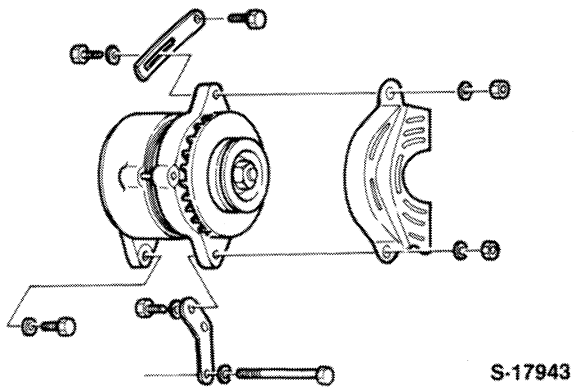


Figure 35
Alternator Removal (Model 1510 Shown)

4. Remove the fan, Figure 36.

Models 1510 and 1710 only:

- Remove the water pump assembly, Figure 37.

5. Remove the crankshaft pulley.

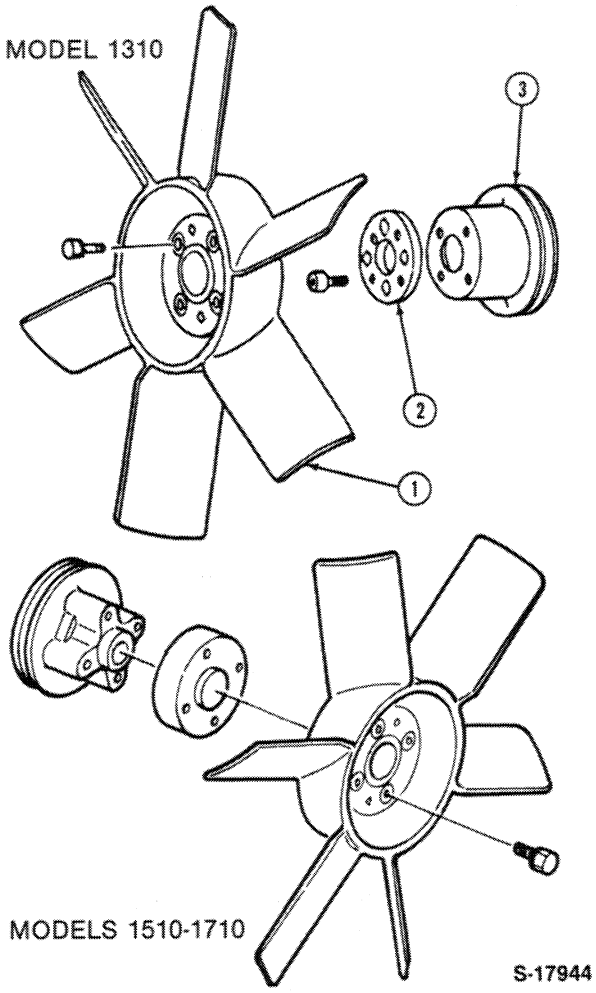


Figure 36
Fan Removal
1. Fan
2. Hub Spacer
3. Pulley

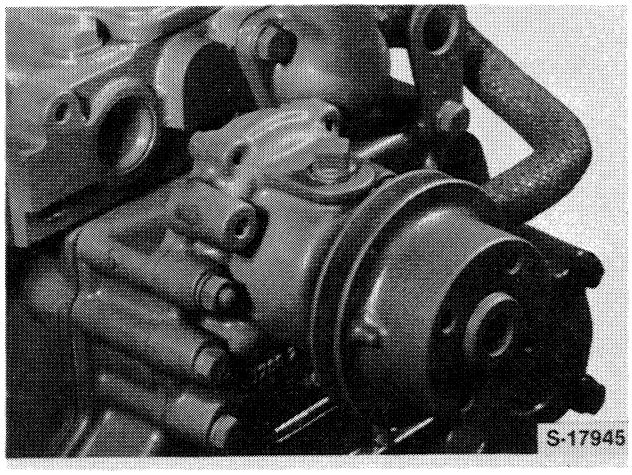


Figure 37
Water Pump Removal — Models 1510-1710

Model 1310 only:

- Remove the injector lines and cap the openings, Figure 38.

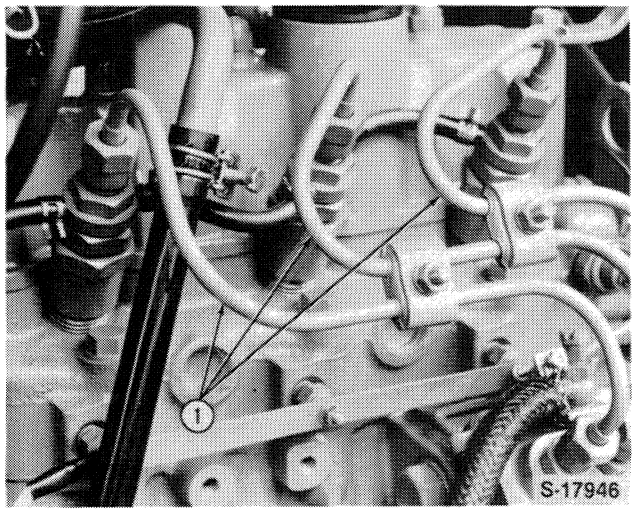


Figure 38
Injection Line Removal — Model 1310
1. Injection Lines

- Disconnect the throttle control rod at the injection pump.
- Loosen the injection pump mounting bolts and nuts. Raise the injection pump enough to disconnect the snap pin and separate the governor link from the control rack, Figure 39.

  NOTE: *It is not necessary to remove the injection pump.*

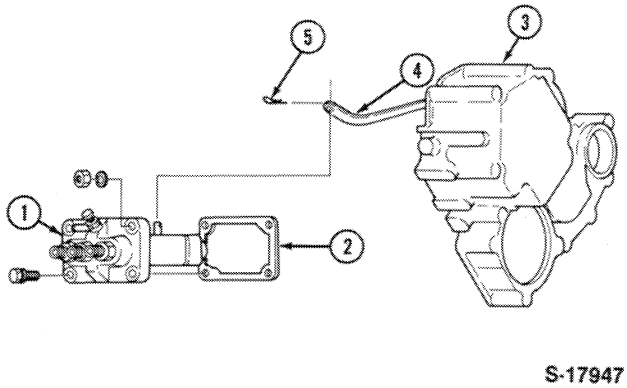


Figure 39
Timing Gear Cover Removal — Model 1310
1. Injection Pump
2. Shim
3. Cover
4. Governor Link
5. Hair Pin

6. Remove the timing gear cover bolts and remove the cover assembly, Figure 40, Models 1510 and 1710.

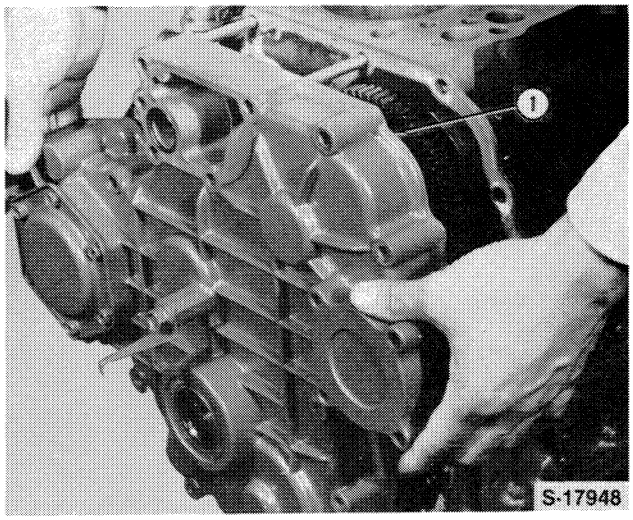


Figure 40
Timing Gear Cover Removal
(Model 1710 Shown)
1. Cover

NOTE: *Do not disturb the smoke level adjustment screw, Figure 41.*

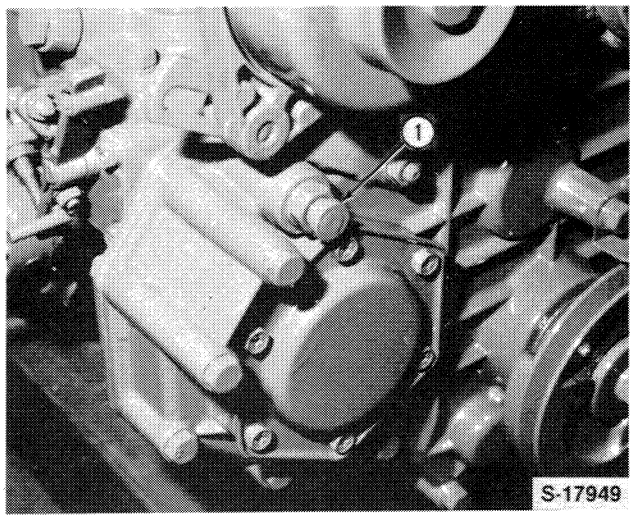


Figure 41
Smoke Level Adjustment (Model 1510 Shown)
1. Adjustment Screw

TIMING GEAR AND OIL PUMP – REMOVAL

CAMSHAFT GEAR

Model 1310 only:

1. Remove the Governor assembly, camshaft gear and tachometer drive gear components, Figure 42.

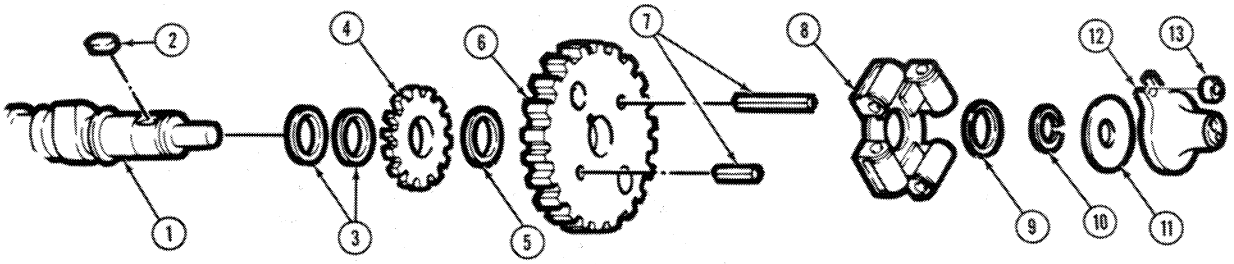
OIL PUMP ASSEMBLY

The Model 1310 oil pump is located inside of the pump drive gear at the front of the engine block, Figure 42.

1. Remove the "E" snap ring and slide the drive gear along with the rotors, cover, spring, shim and collar off the pump shaft as an assembly, Figure 43.

NOTE: *The oil pump shaft and port block assembly is a press fit in the block, Figure 44. If necessary to remove due to damage, remove the port block and shaft assembly as follows:*

- *Remove the engine front adapter plate.*
- *Using Tool No. 11092, place the collars in the grooves of the port block assembly. Align the set screws of the puller with the counterbores in the collars and tighten. Using a slide hammer as shown, Figure 45, remove the port block assembly.*



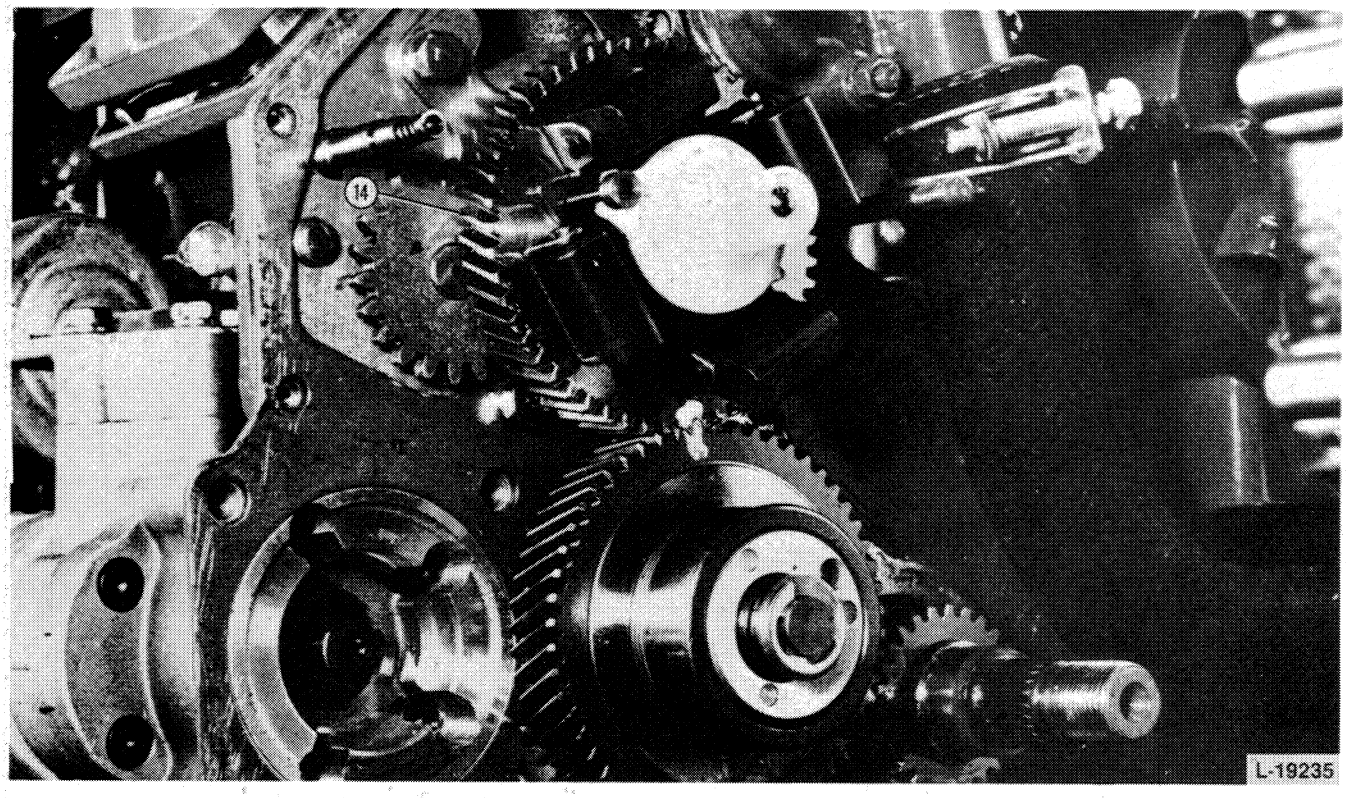


Figure 42
Governor and Camshaft Gear Removal — Model 1310

1. Camshaft
2. Key
3. Spacers
4. Tachometer Drive Gear
5. Spacer
6. Camshaft Gear
7. Pins
8. Flyweight Assembly
9. Shim
10. Snap Ring
11. Shim
12. Slider
13. Collar
14. Camshaft Gear and Governor Assembly