FORD

Service Manual

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Tractors
1110 and 1210

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FORD

1110 AND 1210 TRACTORS

Repair Manual

FORD TRACTOR OPERATIONS FORD MOTOR COMPANY
TROY, MICHIGAN

SE 4300 284 PRINTED IN U.S.A.

FOREWORD

This repair manual provides information for the proper servicing and overhaul of Ford 1110 and 1210 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

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.

- **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 you feel the noise excessive, wear ear protection.

- **Hand Protection**
  It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents 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/cm^2). 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.

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.

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 — concrete for preference.
- 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.
- 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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- **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 applicances — make a visual check to make sure that the cable is not worn or frayed and that the plugs, sockets, etc., are intact. Make sure you know where the nearest isolating switch for your equipment is located.

GENERAL CONSIDERATIONS

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

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

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

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

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

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

PART 1
ENGINE SYSTEMS

Chapter 1
ENGINE AND LUBRICATION SYSTEM

Chapter 2
COOLING SYSTEMS

Chapter 3
TROUBLE SHOOTING, SPECIFICATIONS AND SPECIAL TOOLS

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PART 1
ENGINE SYSTEMS

Chapter 1
ENGINE AND LUBRICATION SYSTEM

A. DESCRIPTION AND OPERATION

This chapter describes the overhaul and repair of the Ford 1110 and 1210 diesel engines.

The engines, Figures 1 and 2, are of the same basic design and repair procedures are essentially the same except as noted in the repair procedures.

The Ford Model 1110 and 1210 tractors are equipped with in-line four cycle, liquid cooled, overhead valve engines.

The Ford Model 1110 is equipped with a two cylinder engine and the Model 1210 is equipped with a three-cylinder engine.

The engine model is identified by a code number cast into the side of the engine block as shown in the following chart.

IDENTIFICATION CHART

ENGINE CODE	TRACTOR MODEL	HORSEPOWER
LEK752C	1110	13
S723	1210	16

CYLINDER HEAD AND VALVE TRAIN COMPONENTS

The cylinder head incorporates the valve assemblies, rocker shaft, rocker arm components and pre-combustion chambers.

The intake manifold bolted to the right hand side of the cylinder head on the Model 1110 tractor. On the Model 1210 tractor, the intake manifold is incorporated into the left hand side of the valve cover assembly.

Standard size only valves are utilized with valve guides available for service repairs.

The Model 1110 uses two rocker arm pivot shaft assemblies, while the Model 1210 has one rocker shaft assembly.

A pre-combustion chamber is located between the injector assembly and the combustion chamber of the cylinder and provides an area for initial ignition of the fuel for improved starting. A glow plug, located in the head extends into the pre-combustion chamber and when energized, provides improved fuel ignition under cold weather conditions.

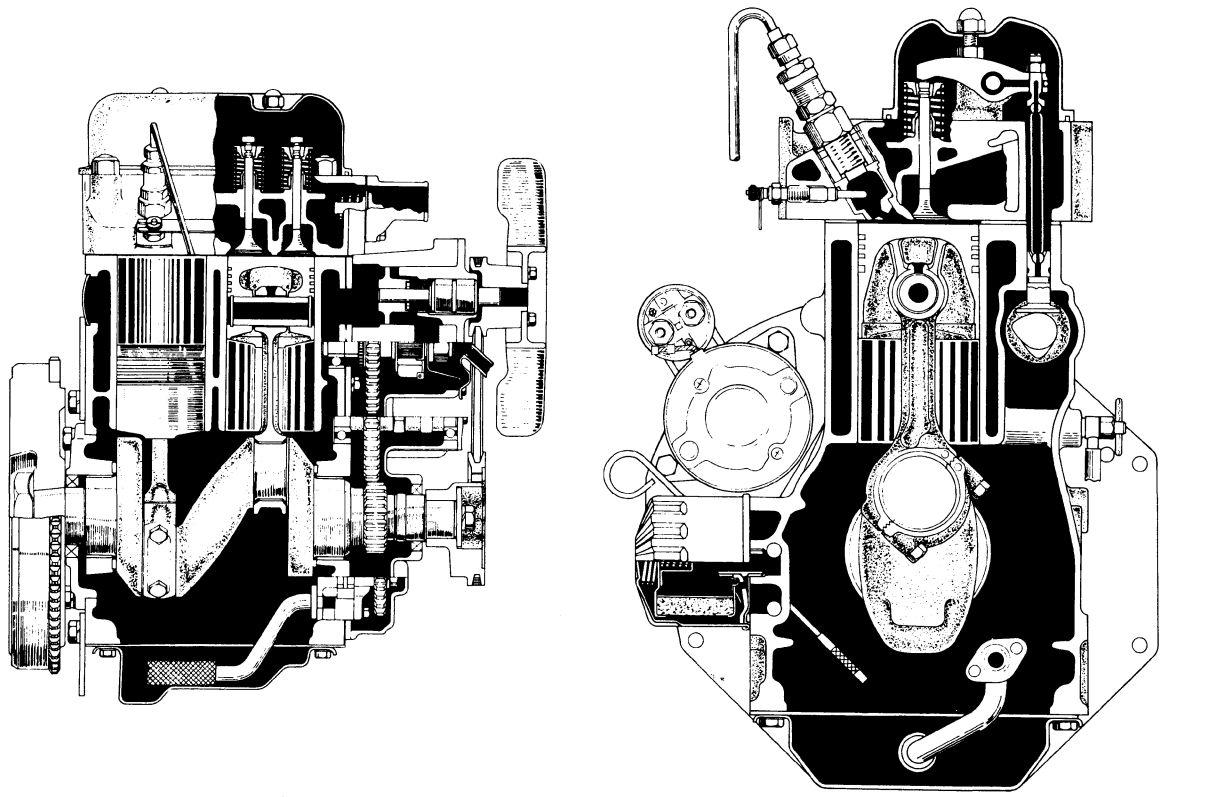

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Figure 1
Two Cylinder Engine — Model 1110

CYLINDER BLOCK ASSEMBLY

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

The Model 1110 crankshaft is supported in the block by the full circle bearing liners, one located in the front of the block and the other in the rear cover assembly.

The Model 1210 crankshaft is supported by four main bearings. The front main bearing is a full circle bearing located in the block. The 2nd, 3rd and 4th main bearings are split liners located in holders bolted to the block.

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

The Model 1110 engine utilizes an offset connecting rod and a four ring piston.

The Model 1210 engine utilizes a straight connecting rod and a three ring piston.

LUBRICATION SYSTEM

The gear rotor type oil pump is driven by the crankshaft gear and is located in a bore in the front end of the engine block. The oil pick-up tube attaches to the rear of the pump and extends into the oil pan sump.

OIL FLOW: (Model 1110)

Reference — Figure 3

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 area

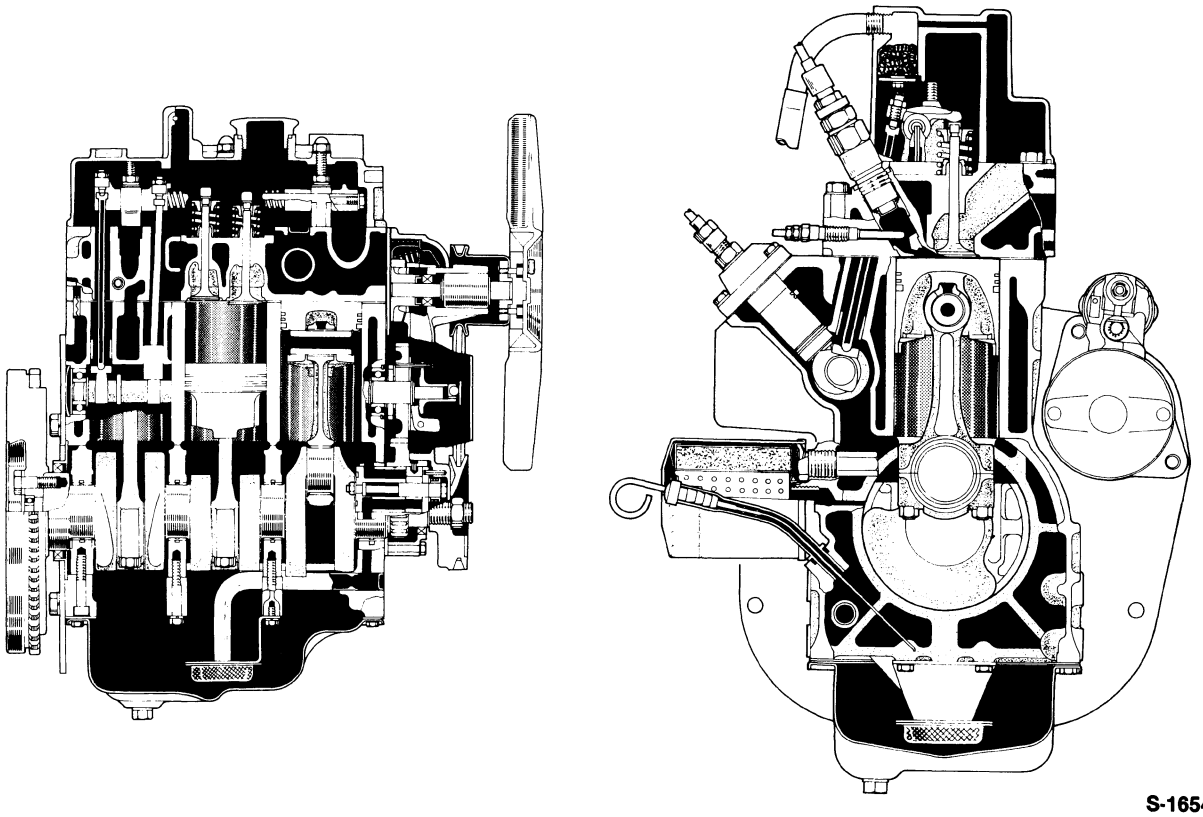

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Figure 2
Three Cylinder Engine — Model 1210

of the drilled bolt located directly above the oil pump. The relief valve is mounted in the front of the block and intersects the main oil passage. When the oil pressure becomes higher than the rated value, oil is discharged through the relief valve into the crankcase. Pressurized oil is directed to the crankshaft front main bearing and passes through a drilling in the crankshaft to the No. 1 cylinder rod bearing. The remaining portion of the oil is directed through the external tube to the idler gear shaft. Inter-connecting drilled passages in the idler gear shaft provide lubrication to the idler gear and connect with the external tube located between the idler gear shaft and the drilled bolt located above the camshaft. Oil flows from the tube and bolt to the main oil gallery. The main oil gallery flows the full length of the block assembly.

Oil flows from the oil gallery through a passage in the block to the rear main bearing and a cross-drilling in the crankshaft to the No. 2 cylinder connecting rod bearing.

The tappet bores are also located within the main oil gallery. Oil flows around the tappets for lubrication and into a cross drilling in the tappet. From here it flows through the center of the tappet and up the hollow push rod to the rocker arm assembly.

The adjusting screw and the rocker arm have drilled passages which provide pressurized lubrication to the rocker arm shaft. Controlled oil leakage at this point lubricates the valve stems. Oil flows from the top of the head back to the sump. Cylinder walls, pistons, and piston pins are splash-lubricated by the crankshaft.

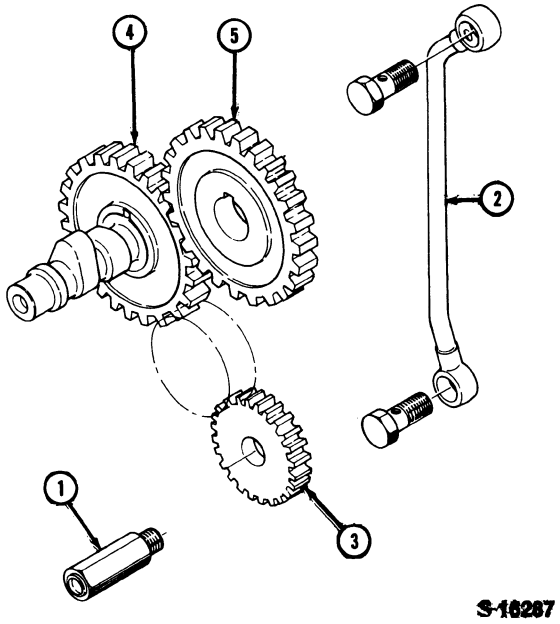


Figure 3
Engine Oil Relief Valve and Transfer Tube — Model 1110

1. Relief Valve Assembly
2. Oil Transfer Tube
3. Oil Pump Drive Gear
4. Idler Gear
5. Camshaft Gear

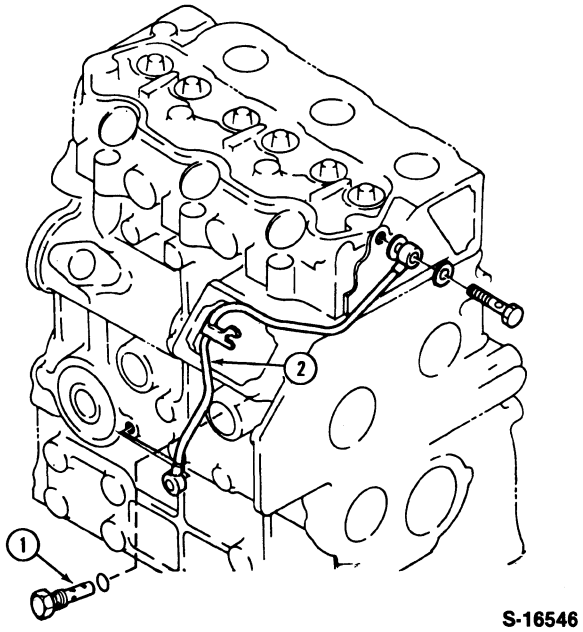


Figure 4
Engine Oil Pump Relief Valve and Transfer Tube — Model 1210

1. Relief Valve and O-Ring
2. Oil Transfer Tube (External)

OIL FLOW (Model 1210)

Reference — Figure 4

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. Pressurized oil from the pump flows through passages in the block, past the relief valve, through the oil filter and returns to the area of the drilled bolt of the oil transfer tube located on the right hand side of the block.

The relief valve is mounted in the side of the block and intersects the main oil passage. When the oil pressure becomes higher than the rated value, oil is discharged through the relief valve into the crankcase sump.

Pressurized oil flows from the oil gallery through passages in the block crankshaft bearings. Drilled passages in the crankshaft connect the oil passage from the main bearings to the connecting rod journals.

The remaining portion of the oil is directed through the external tube to the cylinder head. The external tube is attached by drilled bolts between the side of the block and the front of the cylinder head. Oil flows from the main oil gallery through the tube and a passage in the head to No. 1 rocker shaft pedestal into the rocker shaft. Oil flows through a small hole in the rocker arms and lubricates the valve stems, push rods and tappets.

Oil flows from the top of the head back to the crankcase sump. Cylinder walls, pistons, and piston pins are splash-lubricated by the crankshaft.

ENGINE OIL FILTER

Because engine oil becomes contaminated with dust, carbon particles, metal dust and sludge, it is directed through a filter before entering the engine lubrication passages. The filter is a full-flow type whereby all of the oil from the pump is routed through the filter. To protect the engine from a loss of lubrication, the filter contains a relief valve which opens if the element becomes plugged, Figure 5.

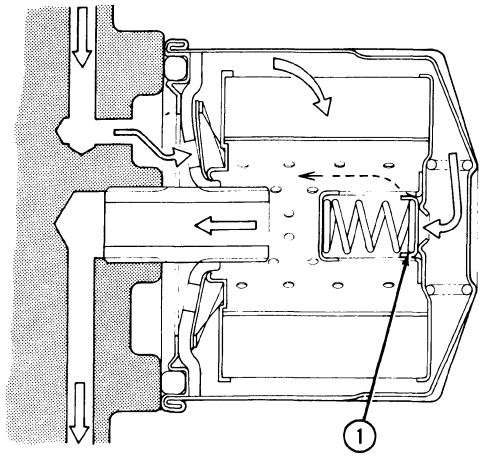


Figure 5
Full Flow Oil Filter Assembly
1. Relief Valve

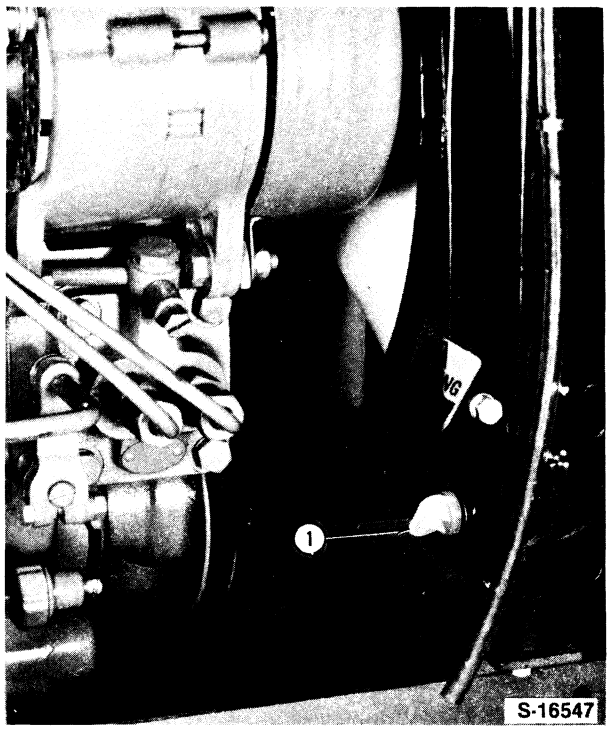


Figure 6
Radiator Coolant Drain
1. Drain Cock

B. ENGINE OVERHAUL

CYLINDER HEAD AND RELATED COMPONENTS

REMOVAL

1. Drain the radiator, Figure 6.
2. Remove the air cleaner assembly, Figure 7.
3. Remove the upper radiator hose.
4. Remove the exhaust muffler and manifold assembly, Figure 7.
5. Remove the upper radiator brace from the top of the cylinder head.
6. Remove the injector lines and cap all openings.
7. Remove the glow plugs, Figure 8.
8. Remove the injector assemblies, Figure 8.

   NOTE: *Be sure to remove the injector sealing washer and the cup type heat shield from the injector bore, if not removed with the injector.*

9. Remove the temperature sender switch, Figure 9.
10. Remove the thermostat housing and thermostat, Figure 10, Model 1110.

    Remove the water pump and thermostat assembly, Figure 11, Model 1210.

11. On the Model 1210, remove the external oil transfer tube, Figure 4.
12. Remove the valve cover and gasket.
13. Remove the valve rocker arm and shaft as an assembly, Figure 12.
14. Remove the valve stem caps (Model 1210) and push rods.

    NOTE: *Be sure to keep the valve components in separately marked containers for re-assembly in their original position.*

15. Remove the cylinder head bolts and nuts alternately a half turn at a time to prevent warping the head.

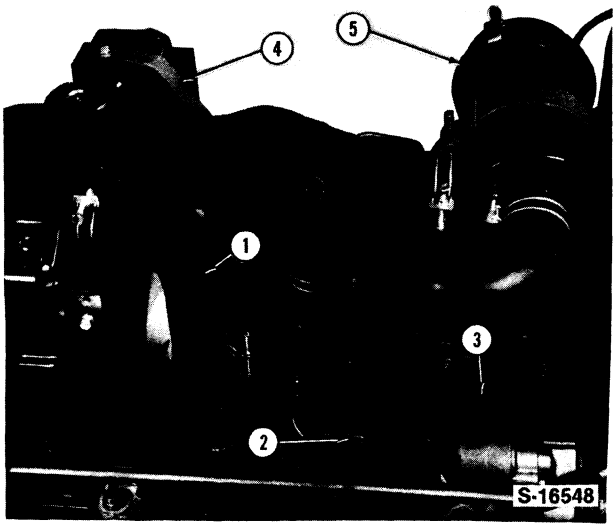


Figure 7
Cylinder Head Removal (Model 1210 Shown)
1. Upper Radiator Hose
2. Exhaust Muffler
3. Exhaust Manifold
4. Radiator Brace
5. Air Cleaner Assembly

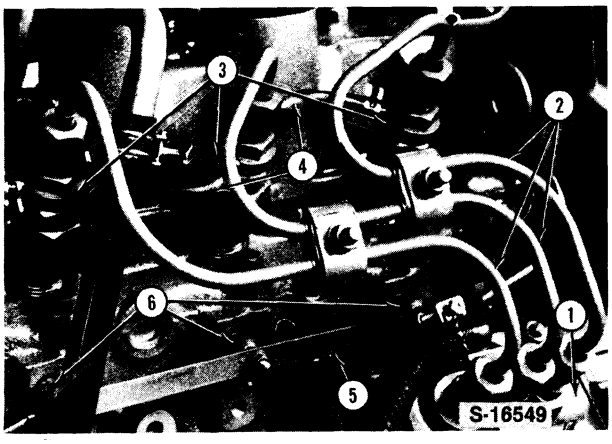
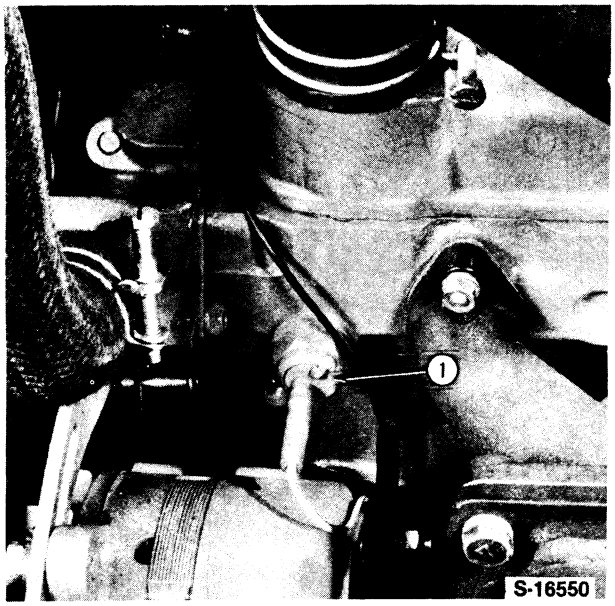


Figure 8
Injector Removal — (Model 1210 Shown)
1. Injection Pump
2. Injector Lines
3. Injectors
4. Injector Leak-Off Lines
5. Glow Plug Connector
6. Glow Plugs



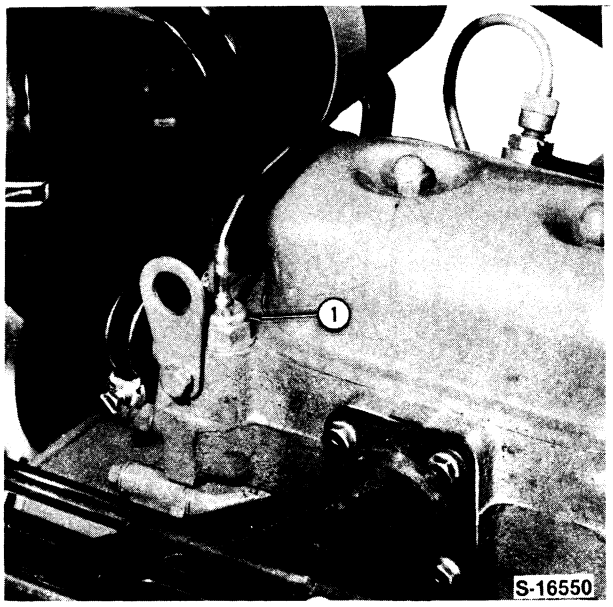


Figure 9
Temperature Sender Switch
1. Sender Switch

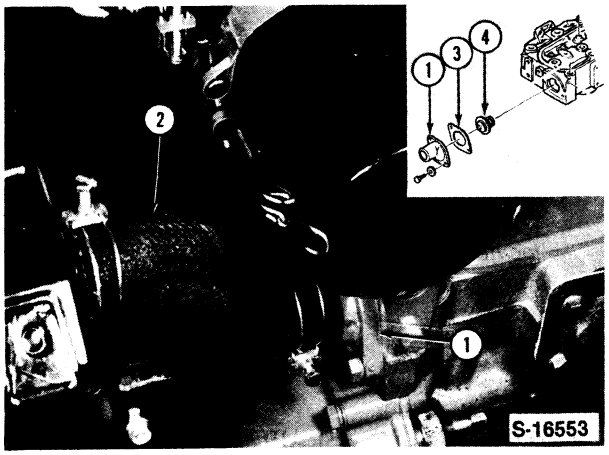


Figure 10
Thermostat Housing Removal — Model 1110
1. Thermostat Housing
2. Upper Radiator Hose
3. Gasket
4. Thermostat

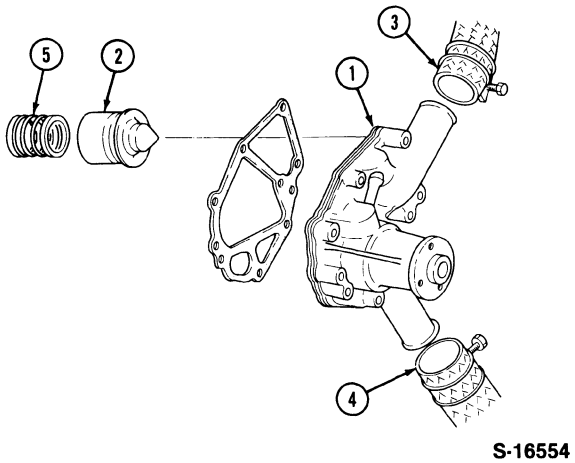


Figure 11
Water Pump and Thermostat — Model 1210
1. Water Pump Assembly
2. Thermostat
3. Upper Radiator Hose
4. Lower Radiator Hose
5. Spring

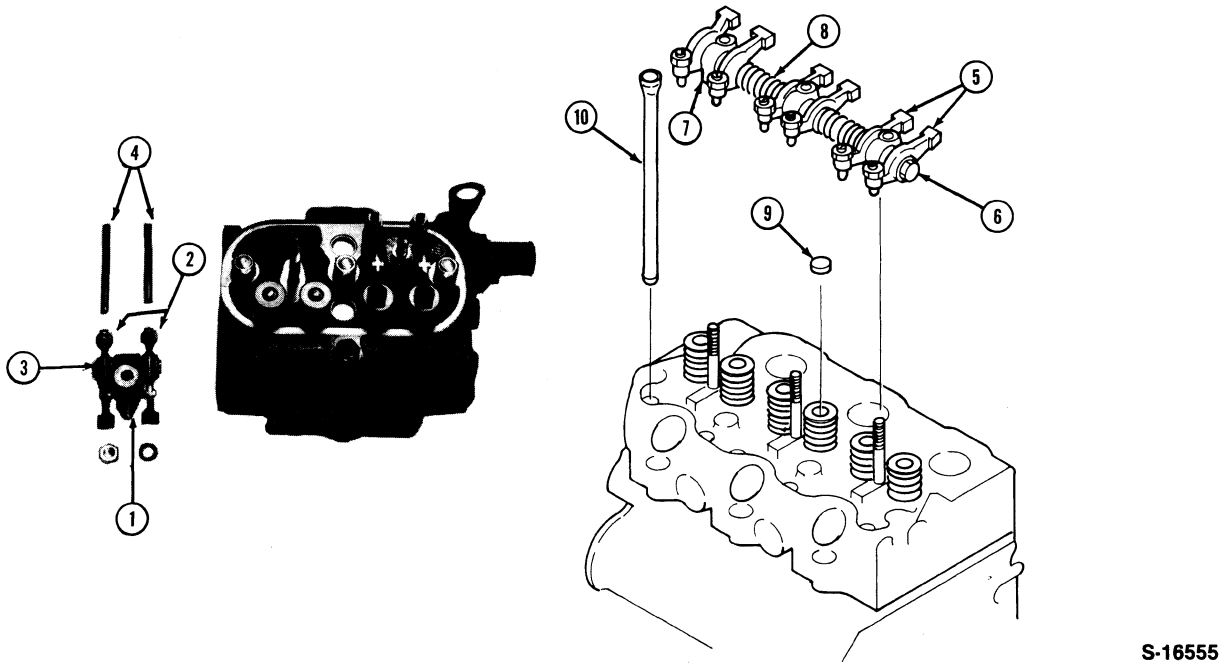


Figure 12
Rocker Shaft Removal

1. Rocker Arm Support
2. Rocker Arms
3. Rocker Arm Pivot Shaft
4. Push Rods
5. Rocker Arms
6. Shaft
7. Rocker Arm Support
8. Springs
9. Valve Stem Cap
10. Push Rod

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 retainers from the valves, Figure 13.

3. Remove the valves and place the valve components together with the valve in separate containers for re-assembly in their original positions.

4. Remove the pre-combustion chambers.

   Model 1110:
   Gently tap the pre-combustion chamber from the underside of the head to loosen, or pull the chamber using a suitable slide hammer.

   Model 1210:
   Remove the retainer ring, using the special tool, Tool No. 1589, Figure 14. Remove the pre-chamber as described above for Model 1110.

   NOTE: *Be sure to remove the sealing washer located between the pre-combustion chamber and the head.*

INSPECTION AND REPAIR

Cylinder Head:

1. Clean all carbon deposits from the combustion chamber, precombustion chamber and valve ports using a wire wheel and scraper.

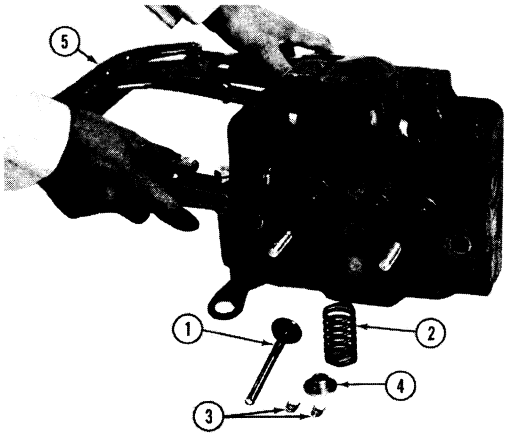


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Figure 13
Valve Removal

1. Valve
2. Valve Spring
3. Valve Retainer Lock
4. Retainer
5. Valve Spring Compressor

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

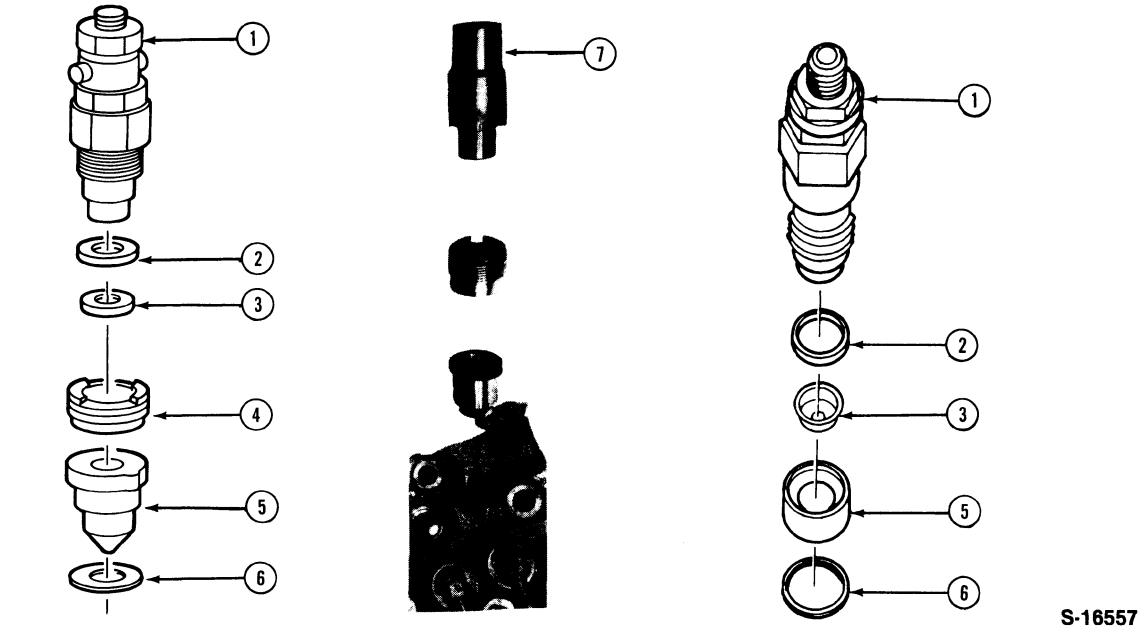
3. Clean the cylinder head in solvent and blow dry with compressed air.

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

   - Valve ports
   - Valve seats
   - Combustion and precombustion chambers
   - External cracks in the water jackets.

5. Inspect the gasket surface for scratches or nicks which could cause leakage after assembly.

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.



1110

1210

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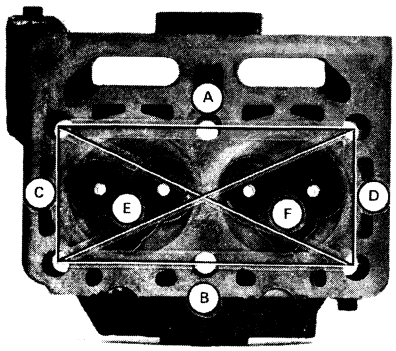
Figure 14
Pre-Combustion Chamber Removal

1. Injector Assembly
2. Gasket
3. Cup Shield
4. Retainer Ring
5. Pre-Chamber
6. Gasket
7. Special Tool, Tool No. 1589

7. Using a straight edge and feeler gauge, check the cylinder head for warp along lines A, B, C, D, E and F, Figure 15.

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



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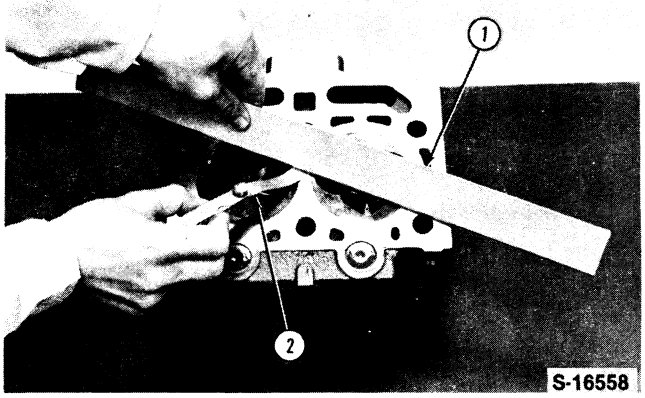

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Figure 15
Measuring Cylinder Head Flatness
1. Straight Edge
2. Feeler Gauge

VALVE SEATS

Examine the valve seats and reface the seat if damaged. Valve seat grinding requires that the seat be ground to a specific width and positioned to contact the valve face at a specified point, Figure 16.

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 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.

2. Check the seat width, Figure 16.

   Use a 30° stone to lower the seat if necessary.

   Use a 60° stone to raise the seat if necessary.

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

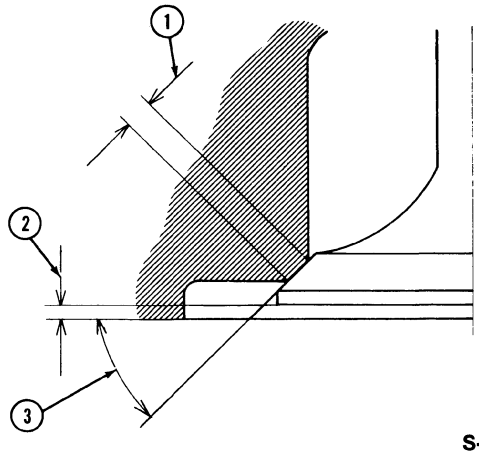

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Figure 16
Valve Seat Dimensions
1. Valve Seat Width — .047-.059 in. (1.2-1.5 mm) — Seat must strike center of valve face
2. Width — Model 1110, .039-.051 in. (1.0-1.3 mm)
   Model 1210, .033-.045 in. (0.85-1.15 mm)
3. Angle of Valve Seat — 45°

VALVES

1. Clean all deposits from the valves using a soft wire brush and inspect the condition of the valve. Discard any valves that are badly burned, cracked or bent, Figure 17.

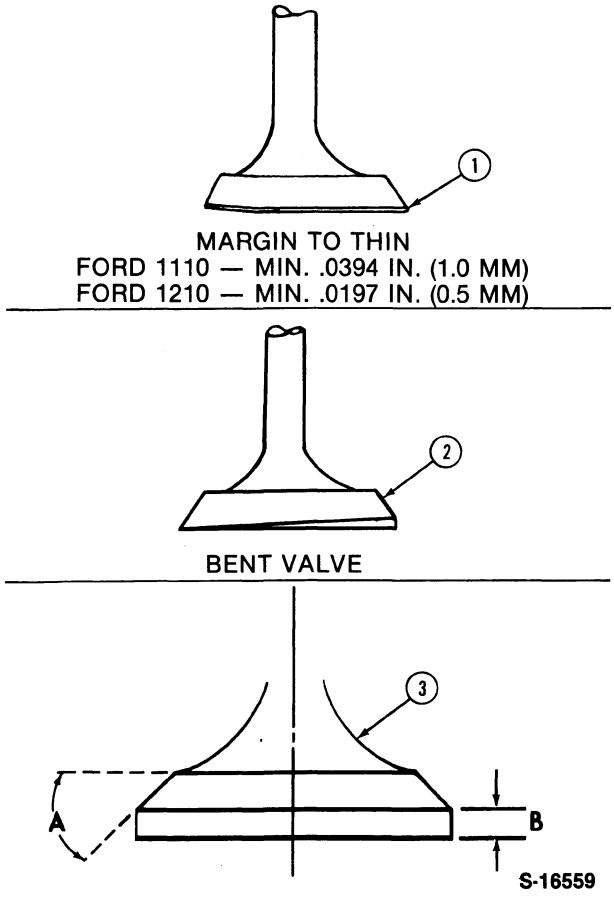


Figure 17
Valves

1. Margin Too Thin
2. Bent Valve
3. Correctly Ground Valve

A. Angle — 45°
B. Correct Margin

2. Using a micrometer, measure the valve stem at points A, B and C, Figure 18.

   Replace valve if the stem diameter is less than the following dimensions as measured at the wear points.

	Intake	Exhaust
Model 1110	0.310 in. (7.88 mm)	0.309 in. (7.85 mm)
Model 1210	0.271 in. (6.89 mm)	0.269 in. (6.84 mm)

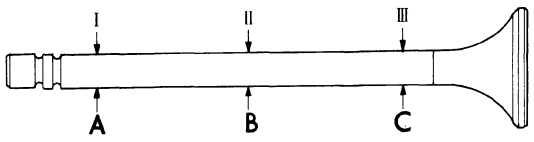


Figure 18
Valve Stem Wear Points

3. If inspection indicates that the valve is in satisfactory condition, the valve face and stem should be ground as shown in Figures 17 and 19.

   NOTE: *On Model 1110, regrind the valve stem chamfer if required to dimension shown.*

   IMPORTANT: *The finished valve seat should contact the center of the valve face. Use Prussian Blue to lightly coat the valve seat. Place the valve in position and rotate the valve slightly holding a light pressure against the valve. If the blue is transferred to the center of the valve face, the contact is correct.*

   If Prussian Blue is not available, mark the valve face and seat with a soft lead pencil as shown, Figure 20. Rotate the valve slightly in the seat. The pencil lines will be broken at the seat contact area.

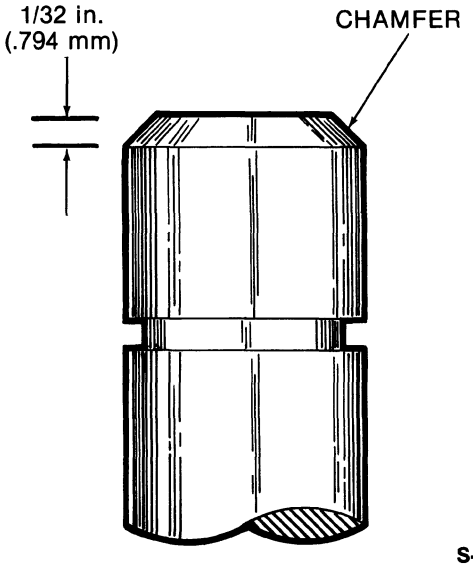


Figure 19
Valve Stem Chamfer Model 1110 only

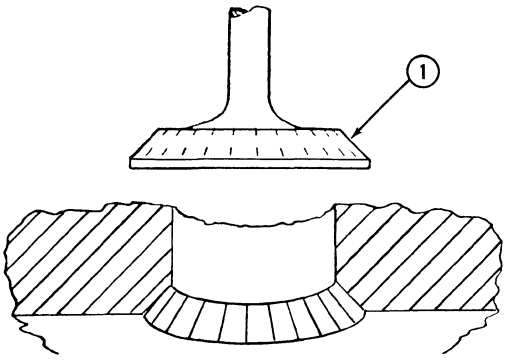


Figure 20
Valve Seat Contact
1. Contact Area

VALVE GUIDES

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

1. Using a small hole gauge, measure the valve guide at the top and bottom wear points, Figure 21.

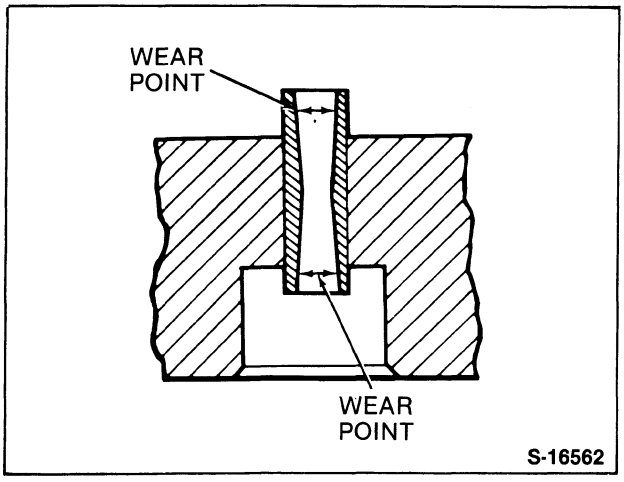


Figure 21
Valve Bell-Mouth Wear Points

2. Determine the stem to guide clearance by subtracting the stem diameter from the valve guide diameter, Figure 22.

3. If valve guides are worn beyond wear limits, replace the head, see "Specifications", Chapter 3.

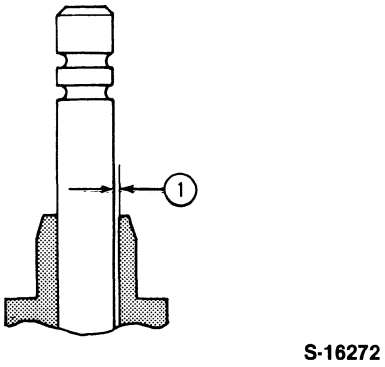


Figure 22
Valve Stem
1. Valve Stem-To-Guide Clearance Check

VALVE SPRINGS

1. Place the valve springs on a flat surface. Measure the free standing height and squareness, Figure 23.

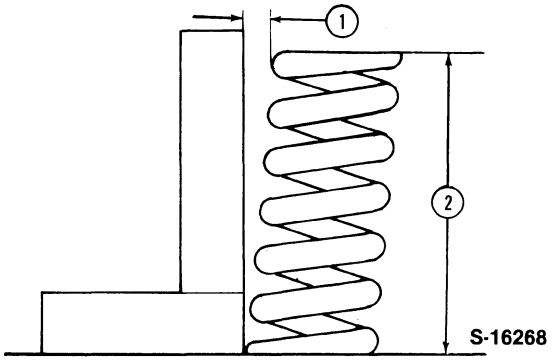


Figure 23
Valve Spring Height and Squareness Check
1. Squarness Check 2. Height Check

Replace springs that do not meet the following specifications.

	Max. out-of -Square	Min. Face Length
Model 1110	0.079 in. (2.0 mm)	1.732 in. (44 mm)
Model 1210	0.070 in. (1.8 mm)	1.319 in. (33.5 mm)

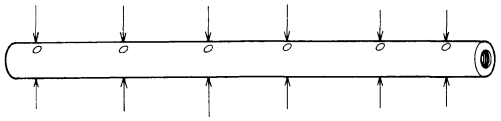
2. Place the springs in a suitable spring tester and measure the spring load rating to determine spring tension. Replace springs that do not meet the following load specifications.

Model 1110	Model 1210
29 lbs. (13 Kg) at 1.496 in. (38 mm)	.15 lbs. (7 Kg) at 1.2 in. (30.4 mm)

ROCKER ARMS — PIVOT SHAFTS

1. Examine the rocker arms and shafts for wear or damage. Check the adjusting screws for damaged threads or excessive wear. Check the valve stem contact area for pitting or excessive wear. Slight wear patterns may be removed using a fine grit oil stone.

2. Using a micrometer, measure the wear points on the rocker shaft, Figure 24.



S-16563

Figure 24
Rocker Arm Wear Points (Model 1210 Shown)

Replace the rocker shaft when the minimum shaft diameter is less than the following:

	Min. Shaft Dia.
Model 1110	0.533 in. (13.55 mm)
Model 1210	0.456 in. (11.57 mm)

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

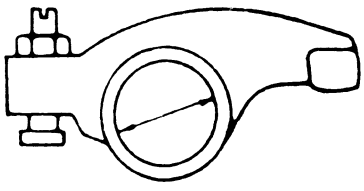


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Figure 25
Measurement — Inside Bore

Replace rocker arms when the shaft bore exceeds the following measurements:

	Max. Bore Dia.
Model 1110	0.5402 in. (13.72 mm)
Model 1210	0.462 in. (11.74 mm)

ASSEMBLY

Cylinder Head

1. Insert each valve in the guide from which it was removed and lightly tap 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 in the cylinder head.

3. Install the pre-combustion chamber using a new sealing washer, Figure 26.

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

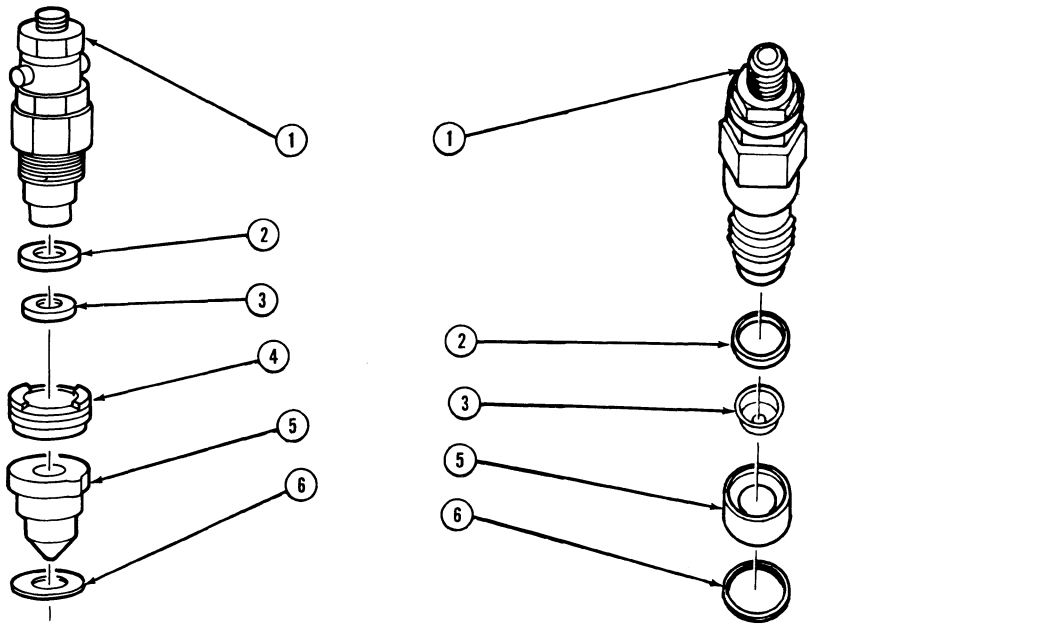
INSTALLATION

In manufacture, 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 and the correct head gasket must be selected based on the amount the pistons protrude above the face of the block at top dead center.

Correct head gasket usage is determined as follows:

1. Position the piston at the top dead center. Use a dial indicator to determine the distance the piston projects above the block, Figure 27.

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



1110 1210

Figure 26
Pre-Combustion Chamber Installation

1. Injector Assy.
2. Gasket
3. Cup Shield
4. Retaining Ring
5. Pre-Chamber
6. Gasket

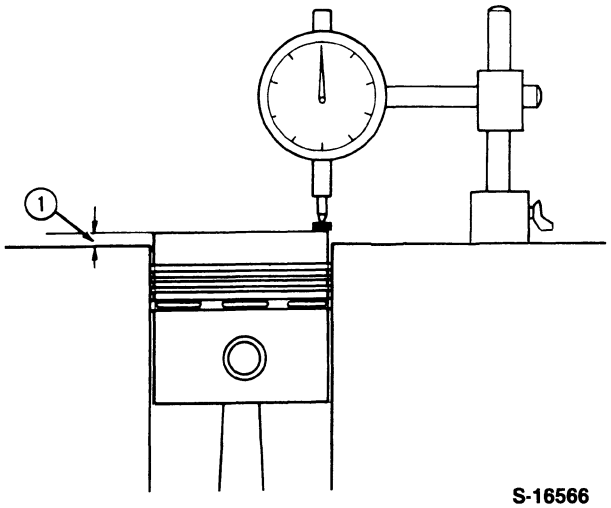


Figure 27
Measuring Piston Height Above Block Face

1. Piston Height Dimension

Tractor Model	Measurement	Head gasket to be mounted (Free thickness)	Part No. - S8A–
1110	.0287-.033 in. (0.73-.085 mm)	.061 in. (1.55 mm)	111146621
	.033-.039 in. (0.85-.099 mm)	.067 in (1.70 mm)	111146622
1210	.014-.018 in. (0.35-.045 mm)	.043 in. (1.1 mm)	111146820
	.018-.022 in. (0.45-0.55 mm)	.047 in. (1.2 mm)	111146830
	.022-.026 in. (0.55-0.65 mm)	.051 in. (1.3 mm)	111146840

NOTE: (1) Ford 1110 model, lowest four digits of part number are stamped on the face of the gasket.

(2) Ford 1210 model, decimal point digits of head gasket thickness is stamped on the TOP face of the head gasket.

2. Place the head gasket with the side marked TOP up on the engine block.

   NOTE: *Lubricate threads before tightening.*

3. Install the head bolts and studs. Torque the bolts in stages to the following torque specifications, Figure 28.

Head Bolt Torque

Model 1110 . . . . . 94.0-97.6 lbs.-ft. (127.4-132.3 Nm)

Model 1210 . . . . . 32.5-36.2 lbs.-ft. (44.1-49.0 Nm)

4. Install the assembled rocker assemblies, Figure 29. Torque the support bolts to specifications, See Chapter 3.

5. Adjust the rocker arm valve clearance. Be sure the tappet is in the lowest position.

   To be sure the lifter is in the correct position, bring the piston to top-dead-center on the compression stroke (both valves closed), Figure 30. With the lock nut loosened, turn the adjusting screw to obtain a clearance of 0.008 in. (0.2 mm) cold. Tighten the lock nut to the specified torque.

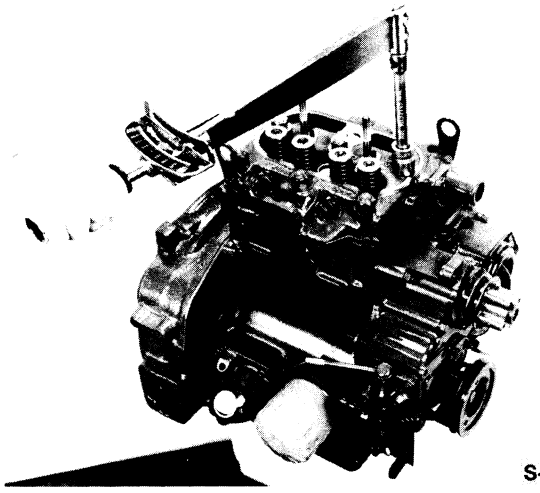


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Figure 28
Head Bolt Torquing

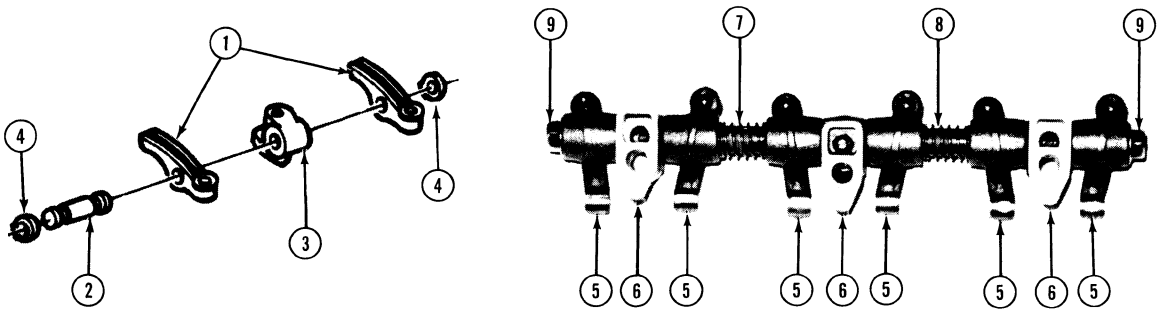

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Figure 29
Valve Rocker Assembly

1. Rocker Arms
2. Pivot Shaft
3. Pedestal Support
4. Snap Rings
5. Rocker Arms
6. Rocker Shaft Support
7. Springs
8. Rocker Shaft
9. Retaining Bolt

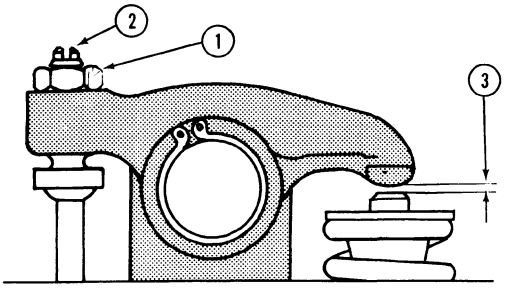

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Figure 30
Valve Lash Adjustment

1. Lock Nut
2. Adjusting Screw
3. Valve Clearance 0.008 in. (0.2 mm)

ENGINE FRONT COVER, TIMING GEARS AND OIL PUMP

REMOVAL

For detailed description of radiator removal — See Chapter 2.

1. Drain the radiator.
2. Drain the engine crankcase oil.
3. Remove the upper and lower radiator hoses.
4. Remove the upper radiator support.
5. Remove the radiator mounting bolts and remove the radiator, Figure 31.
6. Remove the coolant fan and fan pulley, Figure 32.
7. Disconnect the wiring harness from the alternator assembly.
8. Remove the alternator assembly and mounting brackets, Figure 33.

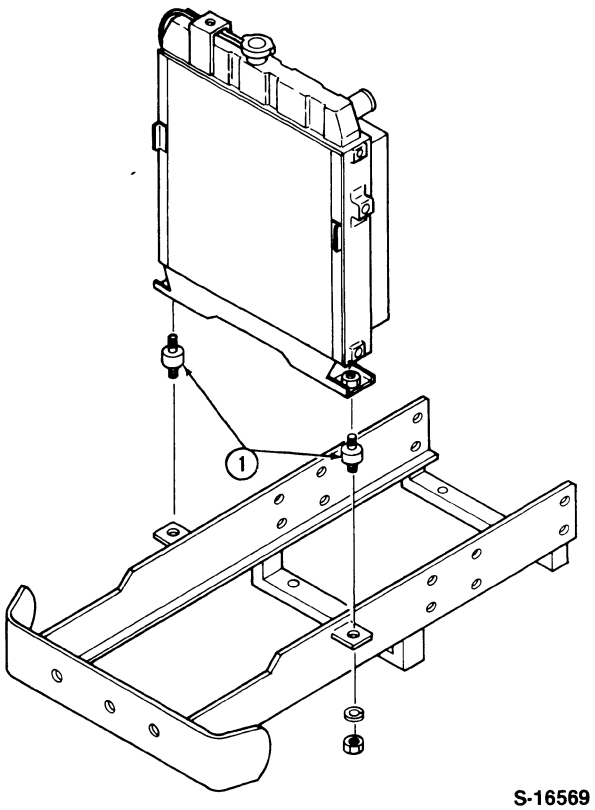

Figure 31
Radiator Removal
1. Mounting Studs

Model 1110:

- Remove the water pump assembly, Figure 34.
- Disconnect the throttle control rod from the injection pump.
- Remove the injection lines and cap all openings.
- Close the fuel shut-off valve.
- Remove the fuel inlet line from the injection pump and plug all openings.
- Remove the fuel injection pump mounting bolts.
- Set the pump control lever in the mid-position and remove the injection pump, Figure 35.

  NOTE: *If there are shims located between the injection pump and the mounting surface, carefully remove the shims and retain for re-use during assembly.*

- Remove the crankshaft pulley.
- Remove the camshaft gear cover and remove the governor assembly, Figure 36.

  NOTE: *If there are shims located between the governor weight assembly and the camshaft gear, carefully remove the shims and retain for re-use during assembly.*

- Disconnect the tachometer cable from the drive.
- Remove the camshaft gear, shim, tachometer gear, key and collar, Figure 37.
- Disconnect the hydraulic inlet and outlet lines from the hydraulic pump and filter, Figure 38.
- Remove the hydraulic pump and filter as an assembly.
- Remove the timing gear cover, Figure 39.

Model 1210:

- Remove the hydraulic pump mounting bolts.
- Remove the throttle control rod from the governor lever, Figure 40.
- Remove the injector lines and cap all openings.
- Remove the injection pump mounting bolts. Raise the injection pump sufficiently to remove the snap pin and separate the link from the control rack, Figure 41.
- Remove the crankshaft pulley, Figure 42.
- Remove the timing gear cover and gasket, Figure 43.

TIMING GEARS — REMOVAL

Model 1110:

The timing gears on the Model 1110 are located as shown in Figure 44

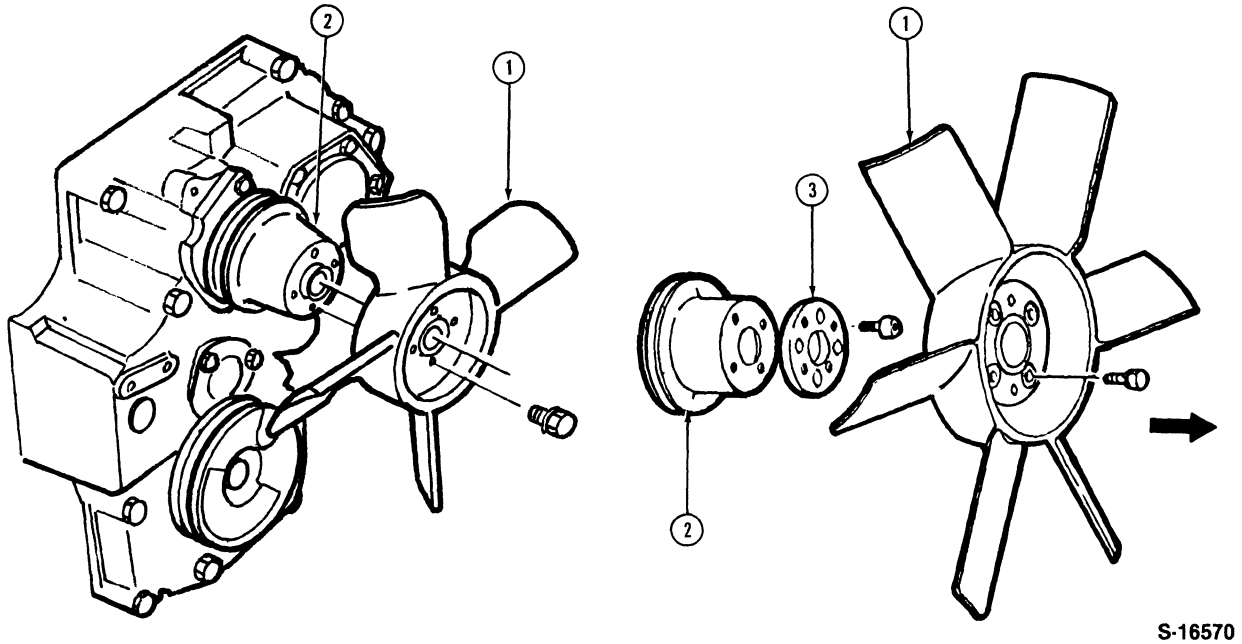

Figure 32
Cooling Fan and Pulley Removal

1. Fan
2. Pulley
3. Spacer

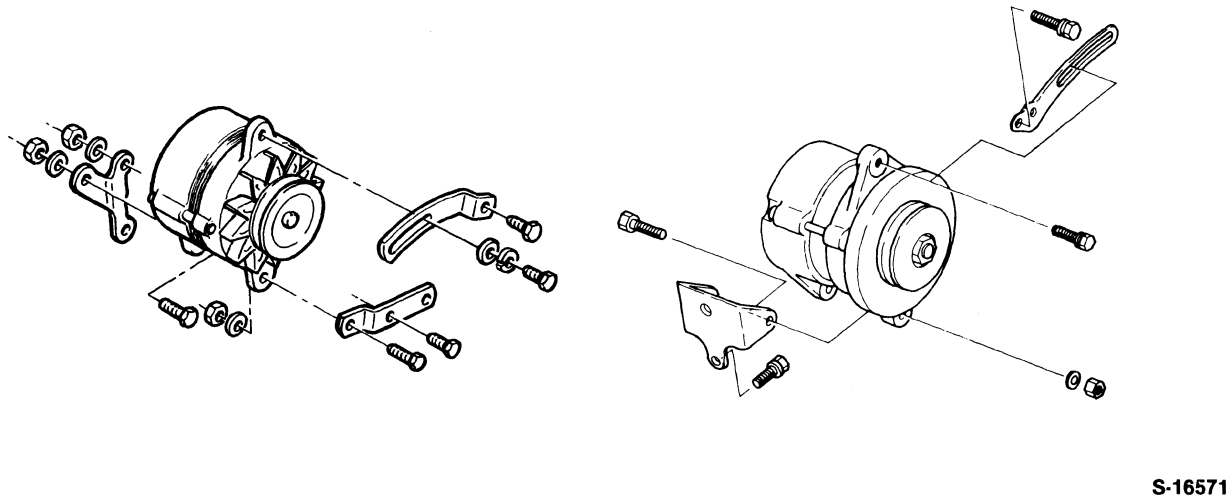

Figure 33
Alternator Removal

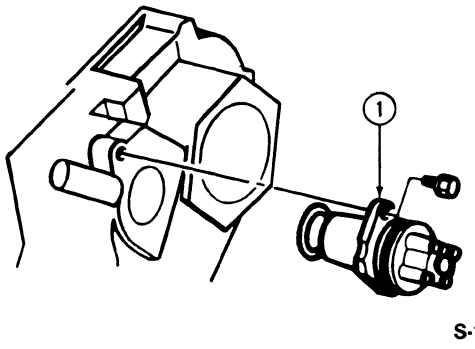

Figure 34
Water Pump Removal — Model 1110
1. Coolant Temperature Sender

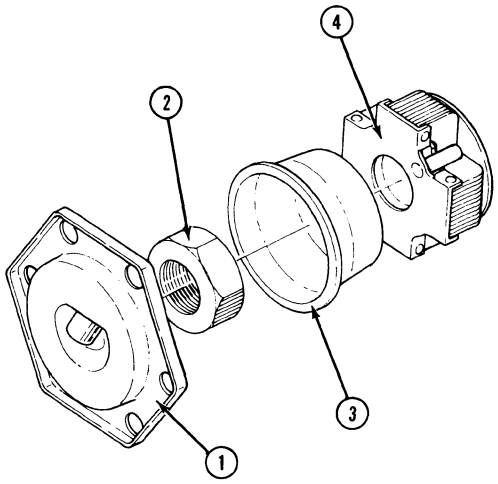

Figure 36
Governor Removal — Model 1110
1. Cover
2. Nut
3. Oil Slinger
4. Weight

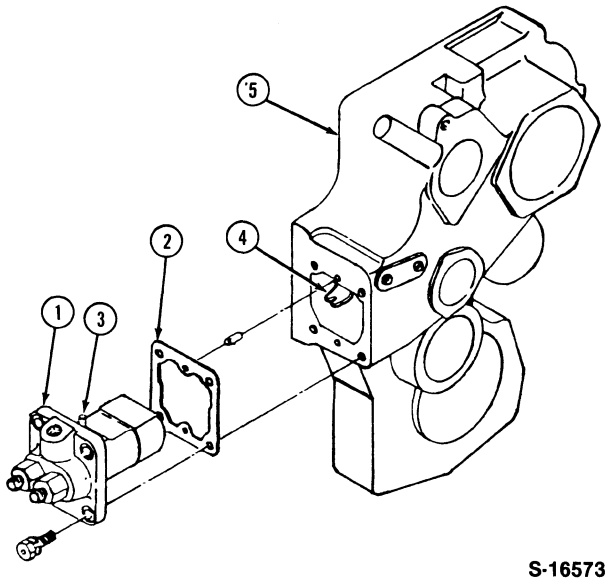

Figure 35
Injection Pump Removal — Model 1110
1. Injection Pump
2. Shim
3. Rack Control Pin
4. Governor Control Link
5. Front Cover

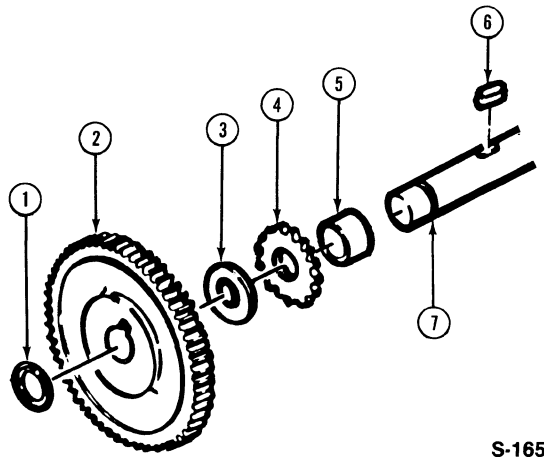

Figure 37
Camshaft Gear Removal — Model 1110
1. Snap Ring
2. Camshaft Drive Gear
3. Shim
4. Tachometer Drive Gear
5. Collar
6. Key
7. Camshaft

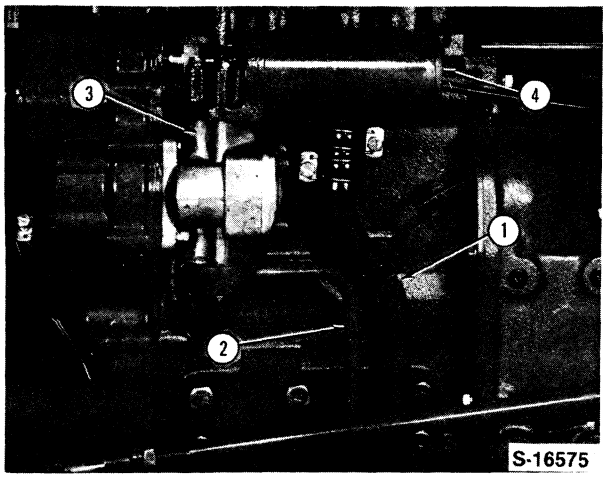

Figure 38
Hydraulic Pump Removal — Model 1110
1. Hydraulic Inlet Line
2. Hydraulic Outlet Line
3. Hydraulic Pump
4. Hydraulic Filter

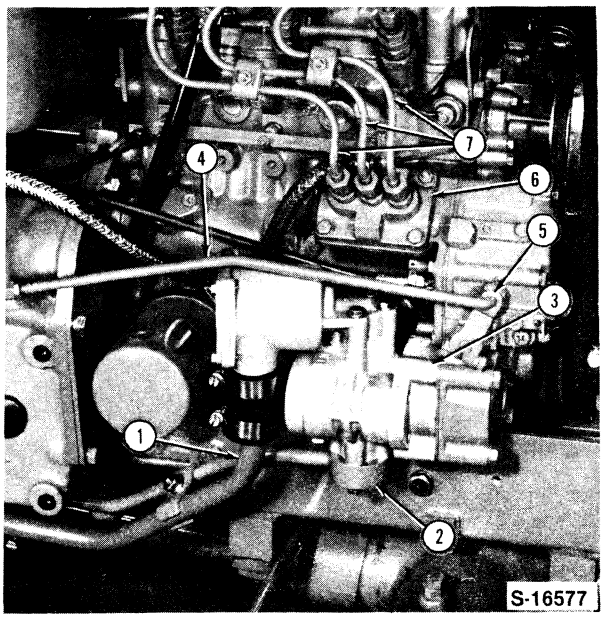

Figure 40
Hydraulic Pump Removal — Model 1210
1. Hydraulic Inlet Line
2. Hydraulic Outlet Line
3. Hydraulic Pump
4. Throttle Control Rod
5. Governor Lever
6. Injection Pump
7. Injection Lines

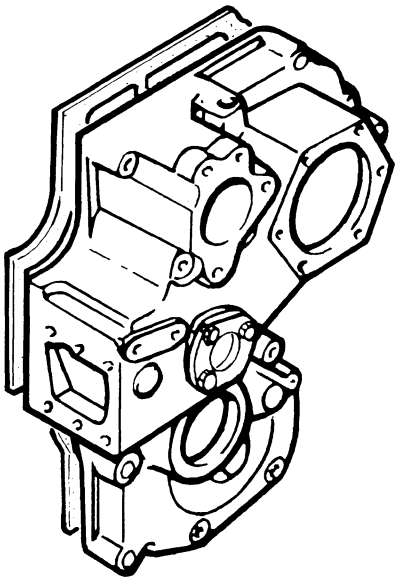

Figure 39
Timing Gear Case Removal — Model 1110

Note the timing mark on the crankshaft gear that must be aligned with a similar mark on the idler gear and another set of timing marks on idler gear and camshaft gear. All of the timing marks must be aligned with the No. 1 piston at top-dead-center on the compression stroke.

1. Remove the idler gear and injection pump cam as an assembly along with the rear cam bearing, Figure 45.

   - If not previously removed, remove the camshaft gear, shim, tachometer drive gear, key and collar, Figure 46.