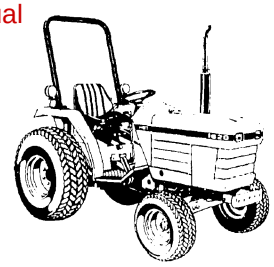
Tractors

1320
1520
1620
1715
1720



SERVICE MANUAL

NEW HOLLAND

Reprinted

40132030 5/95

FOREWORD

This repair manual provides information for the proper servicing and overhaul of Ford 1320-1520 and 1720 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 New Holland, Inc. policy is one of continuous improvement and the right to change prices, specifications, equipment or design at anytime without notice is reserved. All data in this Manual is subject to production variations, so overall dimensions and weights should be considered as approximate only and the illustrations do not necessarily depict the unit to standard build specification.

PRODUCTION DATE CODES AND SERIAL NUMBERS

The Tractor Identification Plate is located on the left side of the transmission case on the Ford 1320-1520 and 1720 Tractors and is stamped with the following information:

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

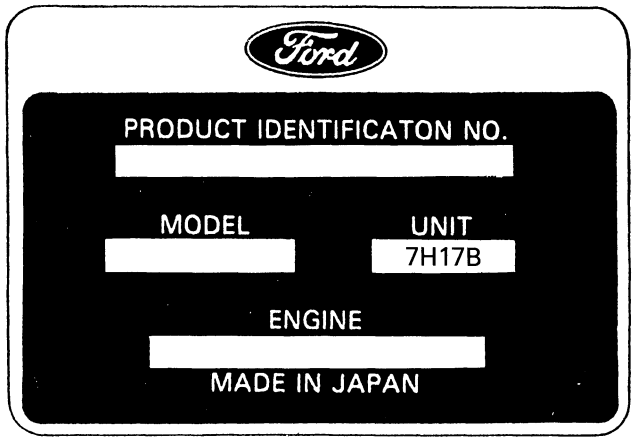
Whenever effecting repair or overhaul the relevant series information should be noted and used when referring to Service Bulletins and/or the Parts Catalog.

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
4 — 1984	A—Jan.	G—July	01/28/29/30/31	A—Midnight
5 — 1985	B—Feb.	H—Aug.		B—Day
6 — 1986	C—March	J—Sept.		C—Afternoon
7 — 1987	D—April	K—Oct.		
8 — 1988	E—May	L—Nov.		
	F—June	M—Dec.		

*Example of Production Unit Date Code 7 H 17 B

- 7 — Year of Final Assembly 1987
- H — Month of Year August
- 17 — Day of Month (Seventeen)
- B — Shift Period Day

SAFETY PRECAUTIONS

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

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

PERSONAL CONSIDERATIONS

- The wrong clothes or carelessness in dress can cause accidents. Check to see that you are suitably clothed.

  Some jobs require special protective equipment.

- **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 is excessive, wear ear protection.

- **Hand Protection**
  It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents 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 from coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.

- **Lifting Appliances**
  Always ensure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

  Never stand under a suspended load or a raised implement.

- **Compressed Air**
  The pressure from a compressed air line is often as high as 100 psi (6.9 bar) 7 (kgf/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.

- **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 its 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 the affect personal safety of the user.

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

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

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

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

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

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

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

OPERATIONAL CONSIDERATIONS

- Stop the engine, if at all possible, before performing any service.
- Place a warning sign on tractors which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended.
- Do not attempt to start the engine while standing beside the tractor or attempt to by-pass the safety start switch.
- Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.
- Always turn the radiator cap to the first stop, to allow pressure in the system to dissipate when the coolant is hot.
- Never work beneath a tractor which is on soft ground. Always take the unit to an area which has a hard working surface — 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.
- Some components on your tractor, such as gaskets and friction surfaces (brake lining, clutch lining, etc.) may contain asbestos. Breathing asbestos dust is dangerous to your health. You are therefore advised to have any maintenance or repair operation on such components carried out by an authorized Ford New Holland Dealer. If, however, service operations are to be undertaken on parts that contain asbestos, the essential precautions are listed below must be observed.

  — Work out of doors or in a well ventilated area.
  — Dust found on tractor or produced during work on the tractor should be dampened, placed in a sealed container and marked to ensure safe disposal.

-- If any cutting, drilling, etc., is attempted on materials containing asbestos, the item should be dampened and only hand tools or low speed power tools used.

- Continuous long term contact with used engine oil may cause skin cancer. Avoid prolonged contact with used engine oil. Wash skin promptly with soap and water.

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

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

SERVICE TECHNIQUES

A. SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all equipment 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 equipment, 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 equipment 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 replacing a hose on a moving component make sure the hose does not foul by moving the component through its 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.

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ENGINE SYSTEMS
MODELS 1320-1520-1720

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ENGINE AND LUBRICATION SYSTEM

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PART 1
ENGINE SYSTEMS
MODELS 1320-1520-1720

Chapter 1
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A. DESCRIPTION AND OPERATION

This chapter describes the engine overhaul and repair procedures of the Models 1320-1520 and 1720 tractors. Repair procedures are essentially the same for all models except as noted in the repair procedures.

The tractors are equipped with three-cylinder in-line 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
J823	1320	19.0
J843	1520	22.0
N843	1720	26.5

CYLINDER HEAD AND VALVE TRAIN COMPONENTS

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

A swirl 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 separated from the cast aluminum valve cover on all of these engines. 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. Standard size valves only are used.

CYLINDER BLOCK ASSEMBLY

The cylinder block assembly contains the pistons, connecting rods, crankshaft, 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.

The 2nd, 3rd and 4th bearings are split liners located in holders bolted to the block.

The camshaft is supported on two ball bearings located on each end of the block.

PISTON AND CONNECTING RODS

All models utilize a straight connecting rod and a three ring piston.

LUBRICATION SYSTEM

Models — All

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

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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 rocker arm assembly. Oil flows from the external tube into a passage in the rocker arm bracket to 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.

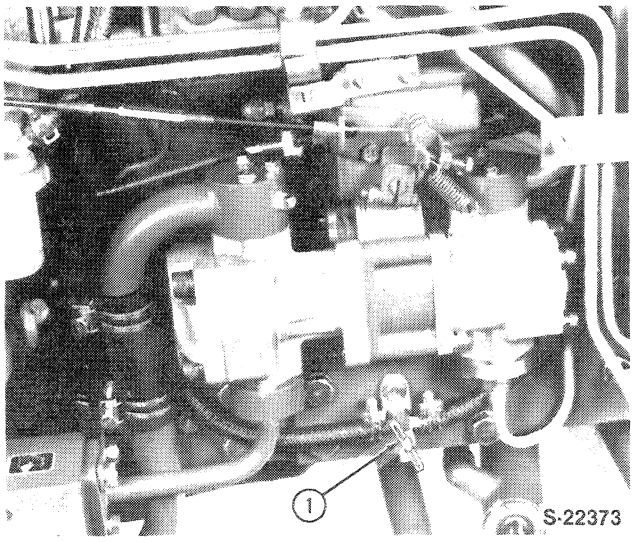


Figure 1
Radiator Drain Cock

1. Coolant Drain Cock

B. ENGINE OVERHAUL

CYLINDER HEAD AND RELATED COMPONENTS

REMOVAL

1. Drain the radiator assembly, Figure 1.
2. Remove the air cleaner assembly along with the air cleaner hoses, Figure 2.
3. Remove the upper radiator hose from the cylinder head, Figure 2.
4. Remove the exhaust muffler and manifold assembly, Figure 3.

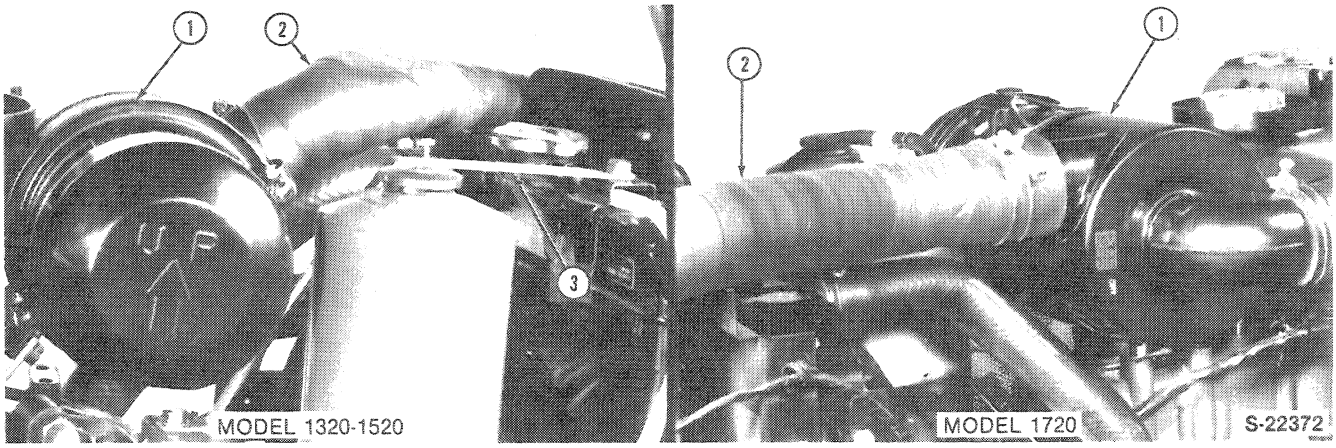


Figure 2
Air Cleaner Removal

1. Air Cleaner Assembly
2. Air Intake Tube
3. Radiator Support Brace (Model 1320/1520)

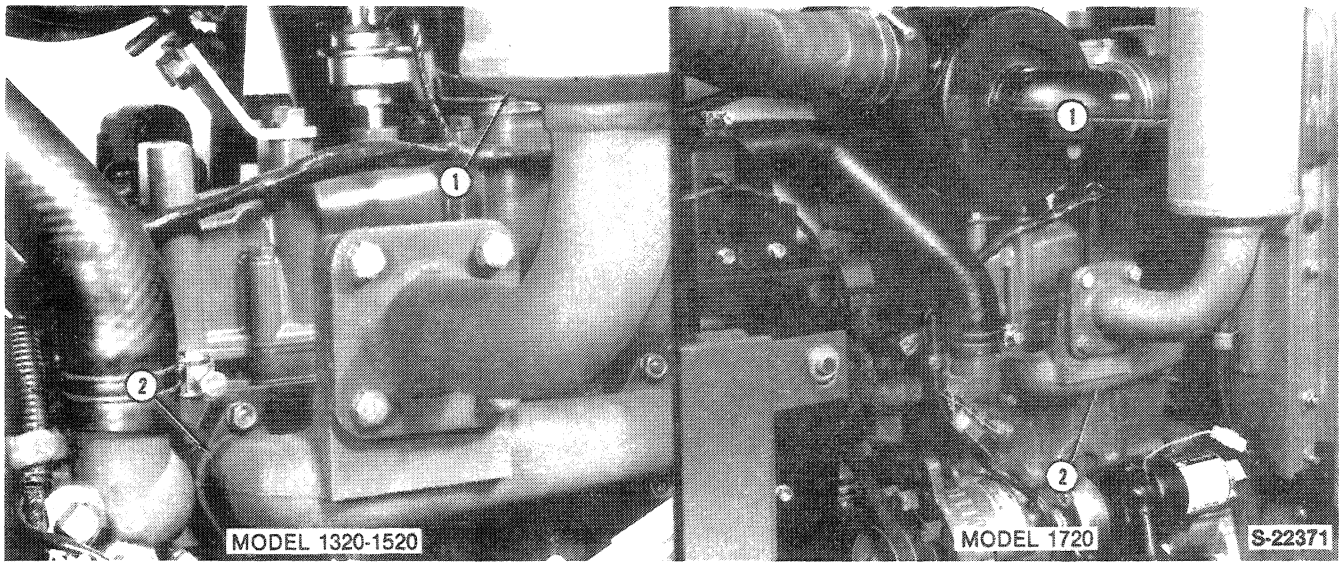


Figure 3
Exhaust Manifold Removal
1. Muffler Assembly
2. Exhaust Manifold

Model 1320-1520

Remove the radiator support brace from the cylinder head, Figure 2.

5. Remove the injection lines and cap all openings, Figure 4.

6. Remove the injector leak-off line (3), Figure 4.

7. Remove the injector assemblies, Figure 4.

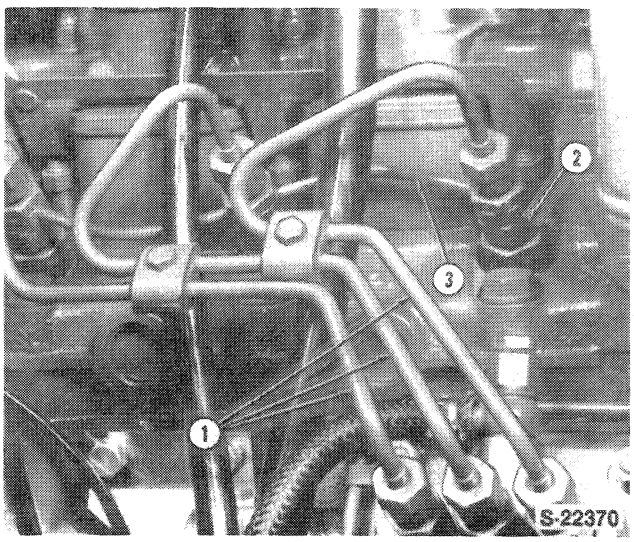


Figure 4
Injector Removal
1. Injection Lines
2. Injector Assembly
3. Injector Leak-off Line

8. Remove the glow plug wire connectors and remove the glow plugs, Figure 5.

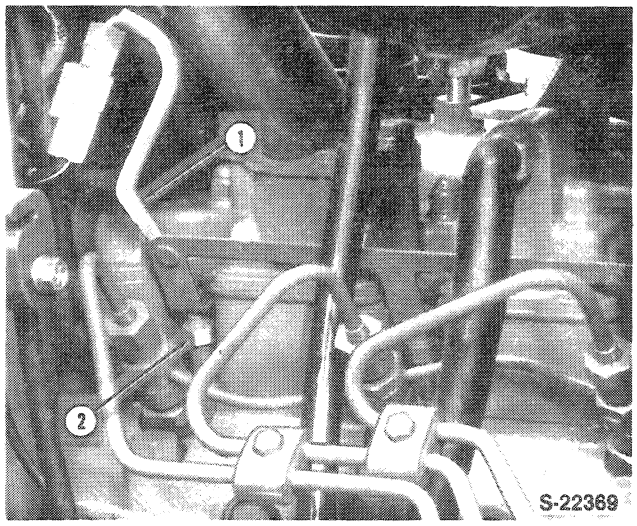


Figure 5
Glow Plug Removal
1. Glow Plug Wire Connector
2. Glow Plug Assembly

9. Remove the temperature sender switch, Figure 6.

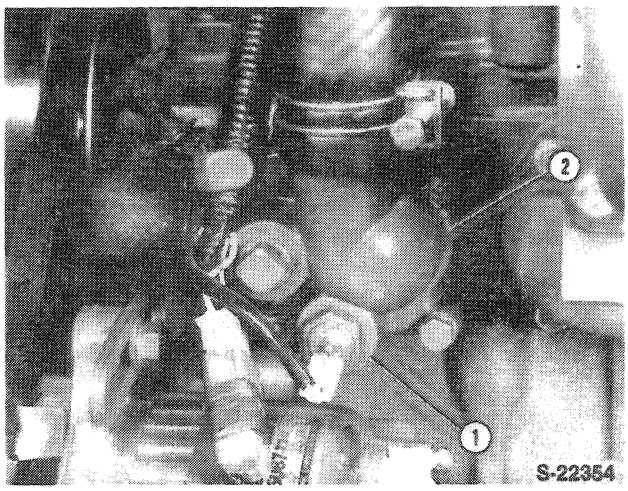


Figure 6
Temperature Sender

1. Sender
2. Coolant Outlet Connector

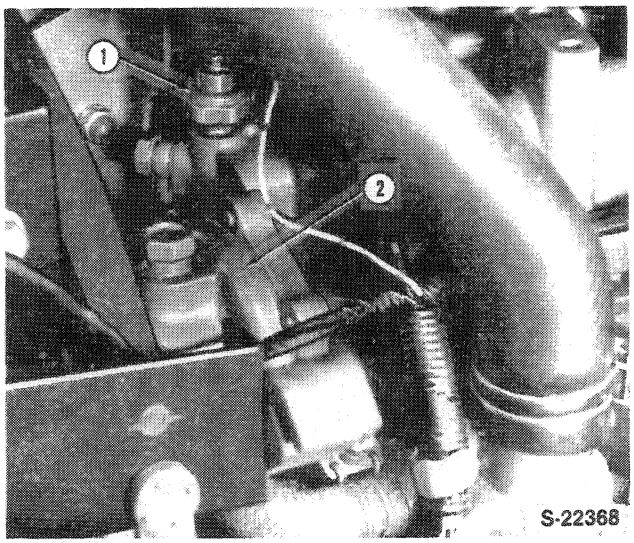


Figure 7
Oil Pressure Switch

1. Switch
2. Water Pump Assembly

10. Remove the oil sender switch from the front of the cylinder head, Figure 7.

11. Remove the water pump assembly, Figure 7.

12. Remove the external oil transfer tube bolt from the front of the cylinder head, Figure 8.

13. Remove the air inlet manifold assembly, Figure 9.

14. Remove the valve cover assembly, Figure 10.

15. Remove the valve rocker arm shaft and support as an assembly, Figure 11.

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

16. Remove the valve stem caps and push rods, Figure 11.

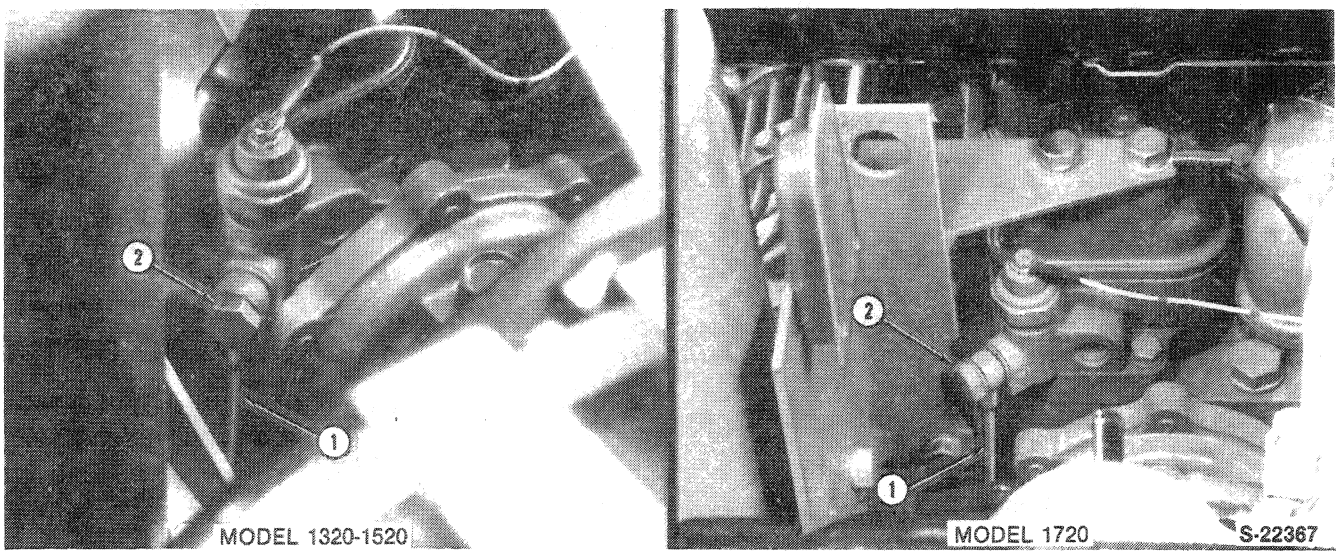


Figure 8
External Oil Transfer Tube

1. External Tube
2. Banjo Bolt

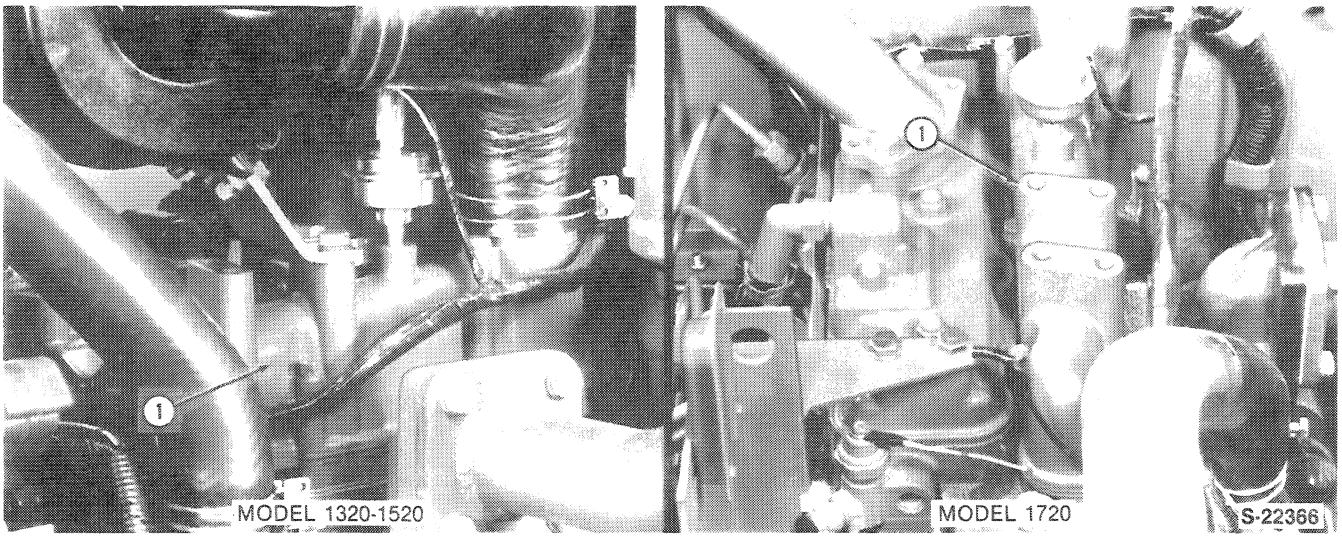


Figure 9
Inlet Manifold
1. Manifold

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

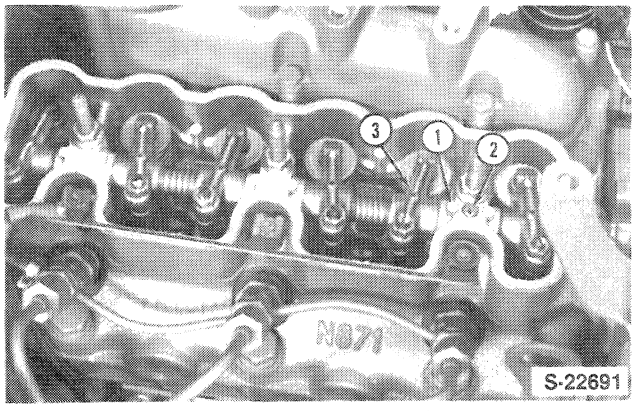


Figure 10
Valve Cover Removal
1. Rocker Shaft Support Bracket
2. Rocker Shaft Set Screw
3. Rocker Arms

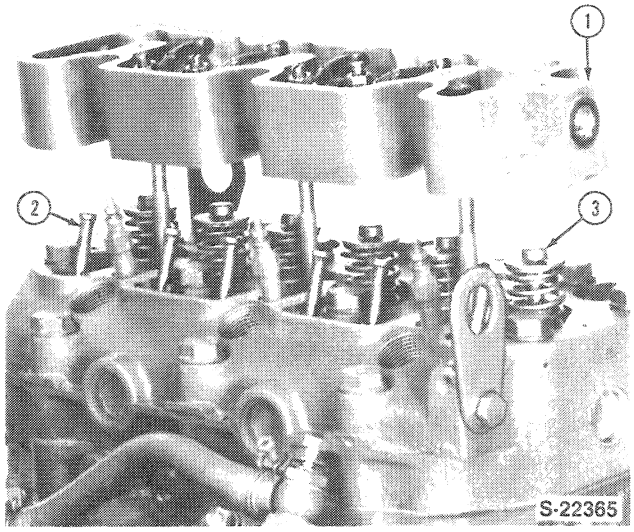


Figure 11
Rocker Arm Assembly — Removal
1. Rocker Arm Support Bracket
2. Push Rod
3. Valve Stem Cap

17. Remove the cylinder head bolts by alternately loosening a half turn at a time to prevent warping the head, Figure 12.

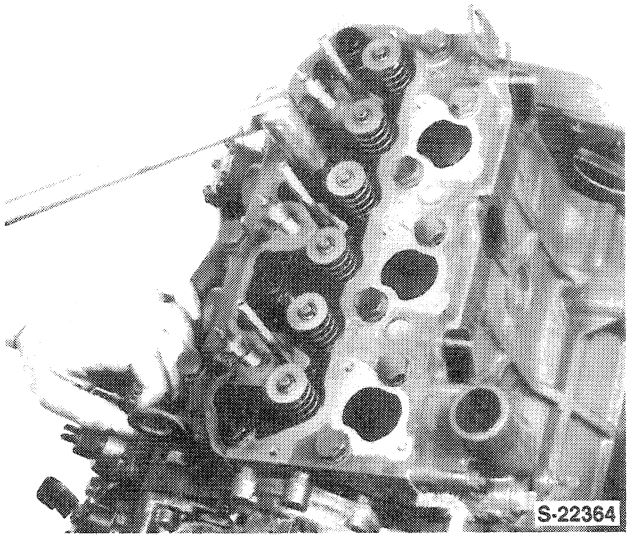


Figure 12
Cylinder Head Removal

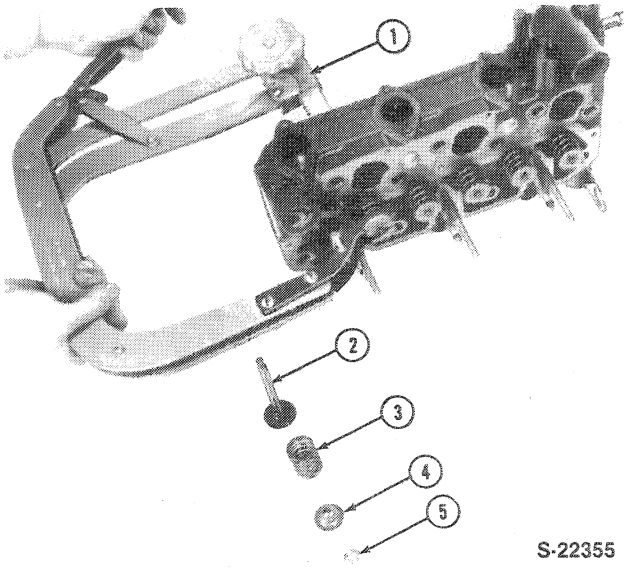


Figure 13
Cylinder Head Valve Removal

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

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 13.
3. Remove the valves and place the valve components together in separately marked containers for reassembly in their original location.

INSPECTION AND REPAIR

CYLINDER HEAD

1. Clean all carbon deposits from the 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, Figure 14, in the following areas:
   - Valve ports
   - Valve seats
   - Combustion chamber
   - External cracks in the water jackets

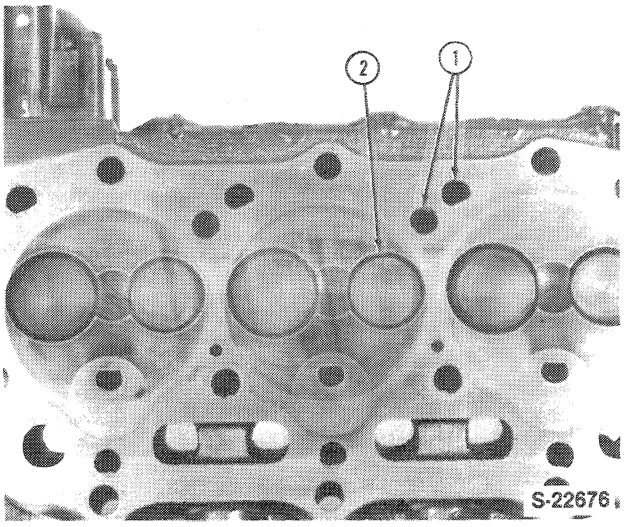


Figure 14
Cylinder Head Inspection

1. Cylinder Head Ports
2. Valve Seat

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 length wise, cross wise and diagonally, Figure 15.

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

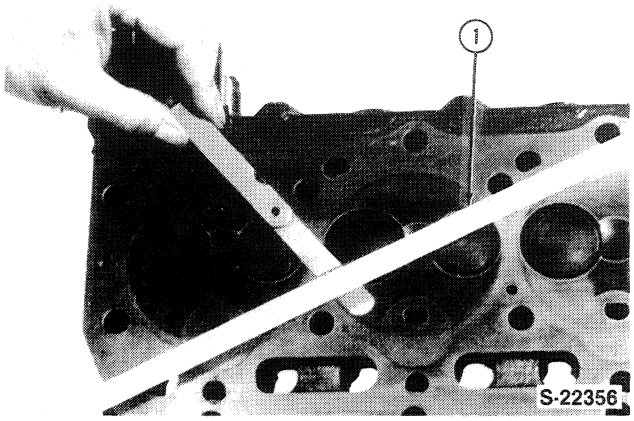


Figure 15
Cylinder Head Flatness Check
1. Straight Edge

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 16.

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 17, if necessary, use a 15° stone to lower the seat contact point and use a 75° stone to raise the seat contact point.

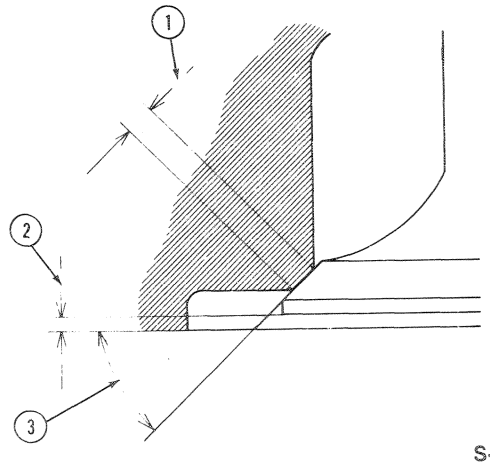


Figure 16
Valve Grinding Checks
1. Correct Valve Seat Width and Location
2. Correct Valve Head Margin
3. 45° Valve Seat Angle

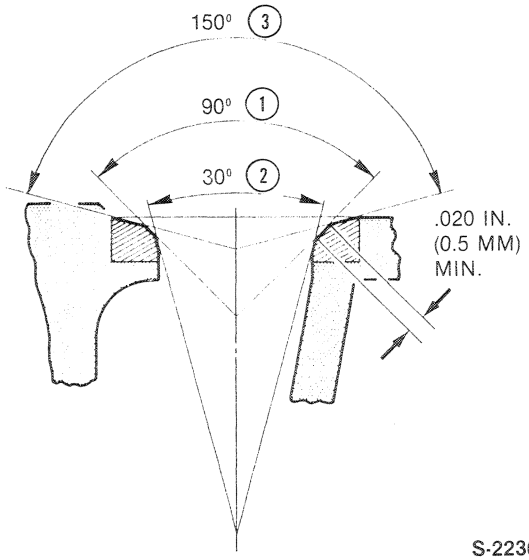


Figure 17
Valve Seat Grinding
1. Seat Angle — 45° Stone
2. Lower Seat Location — 15° Stone
3. Raise Seat Location — 75° Stone

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 18.

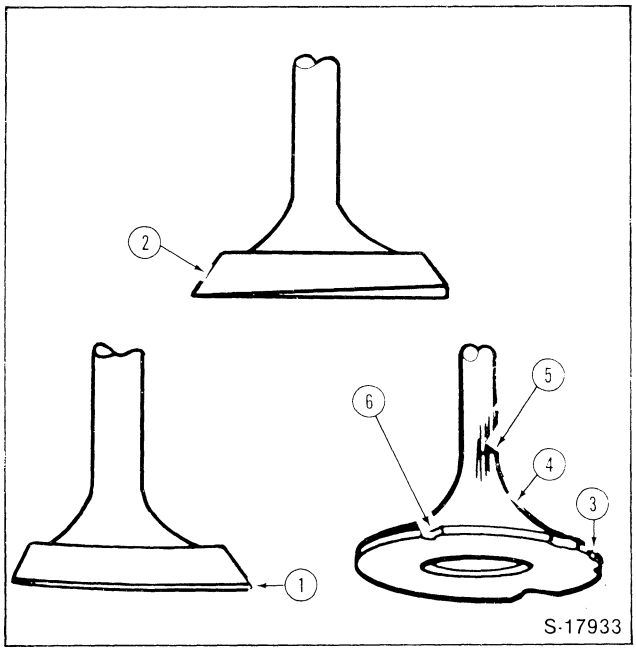


Figure 18
Valve Defect Inspection

1. Margin Too Thin Min. .002 in. (.5 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 19.

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

	Intake	Exhaust
Ford Model:	.271 in.	.269 in.
All	(6.89 mm)	(6.84 mm)

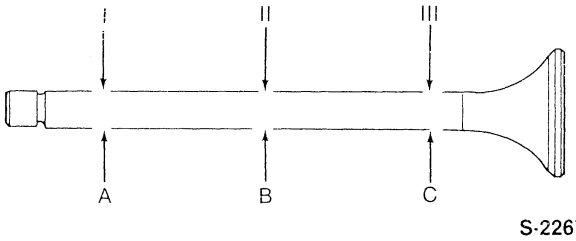


Figure 19
Valve Stem Wear Points

3. If inspection indicates that the valve may be re-used, the valve should be ground as shown, Figure 20.

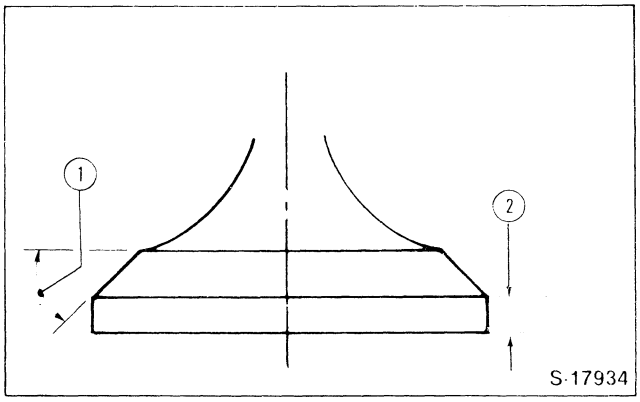


Figure 20
Valve Correctly Ground

1. 45° Angle Seat
2. Minimum Valve Margin

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.*

If Prussian Blue is not available, mark the valve face or seat with a soft lead pencil as shown, Figure 21. Rotate the valve slightly in the seat. The penciled lines will be broken at the seat contact area.

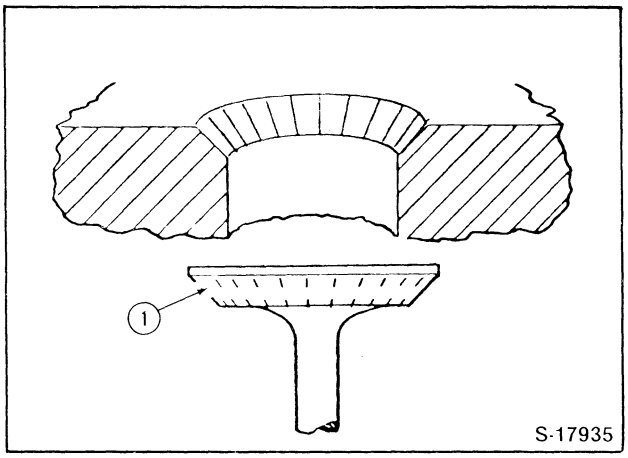


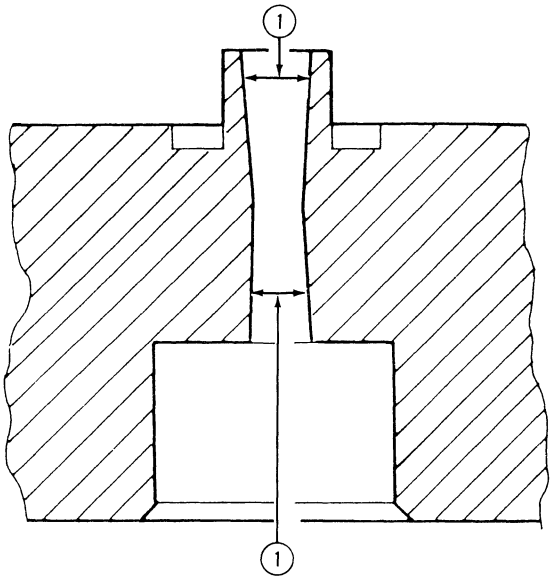
Figure 21
Valve Seat Contact Location

1. Seat

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 22.



S-22362

Figure 22
Valve Guide Wear Check
1. Wear Point

2. Determine the stem to guide clearance by subtracting the stem diameter from the valve guide diameter, Figure 23.

   Replace valves if the clearance is more than .0078 in. (0.2 mm).

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

VALVE SPRINGS

1. Place the valve springs on a flat surface. Measure the free-length of the spring and squareness, Figure 24.

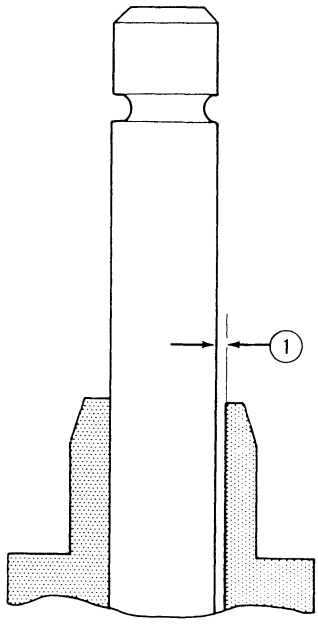


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Figure 23
Valve Stem to Guide Clearance Check
1. Clearance

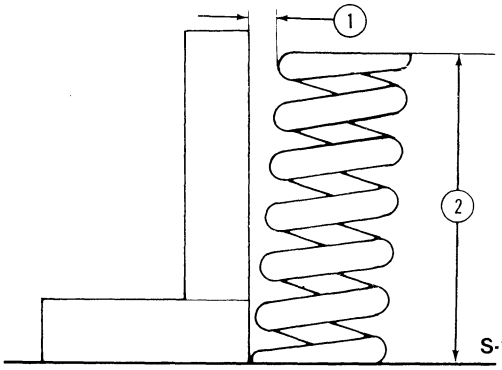

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Figure 24
Valve Spring Length and Squareness Check
1. Squareness 2. Free Length

Replace springs that do not meet the following specifications:

	Max. Out of Square	Min. Free-Length
Model: All	.079 in. (2.0 mm)	1.319 in. (33.5 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: All .....28 lbs. (Min.) at 1.2 in. Height
(7 kg at 30 mm)

1. Remove the set screw (1), Figure 25.
2. Remove the plug from the rear of the rocker shaft support.
3. Thread a 8 mm bolt into the rear end of the rocker shaft and slowly withdraw the rocker shaft while at the same time removing the rocker arms and springs, Figure 25.

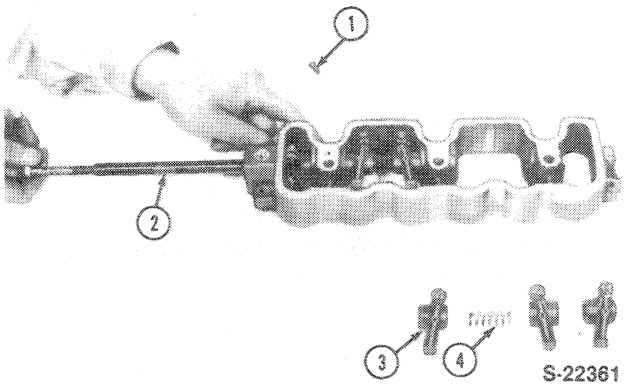


Figure 25
Rocker Arm

1. Screw
2. Rocker Arm Shaft
3. Rocker Arm
4. Spring

NOTE: *A set screw (1), Figure 25, locks the rocker shaft in place in the support. Remove the set screw before attempting to remove the rocker shaft.*

4. Inspect the rocker arms and shaft for wear or damage. Check the adjusting screws for damaged threads or excessive wear.
5. Check the valve stem contact area for pitting or excessive wear. Slight wear patterns may be removed using a fine grit oil stone.
6. Using a micrometer, measure the wear points on the rocker shaft as indicated, Figure 26.

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

	Minimum Shaft Diameter
Ford Model: All	.456 in. (11.57)

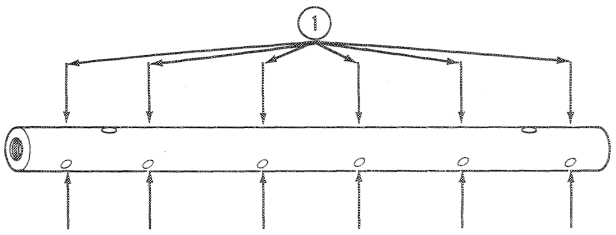


Figure 26
Rocker Shaft Wear Check

1. Wear Points

7. Using a hole gauge, measure the inside bore diameter of the rocker arm, Figure 27.

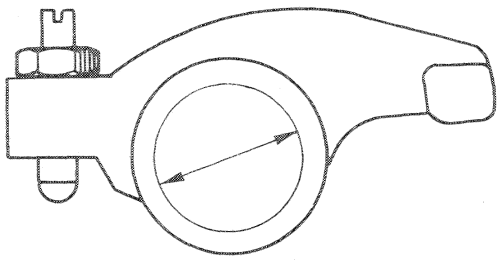


Figure 27
Rocker Arm Wear Check

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

	Minimum Shaft Diameter
Ford Model: All	.456 in. (11.57 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. Install new intake valve seals on the guides using Tool No. 1587.

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

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 usage 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 28.

   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.*

   NOTE: *The variation in the amount of protrusion among all pistons must be within .004 in. (0.1 mm).*

2. If removed, install the tappets.

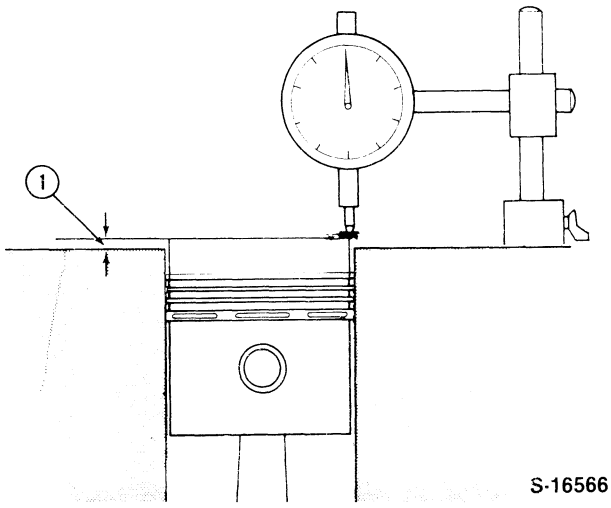


Figure 28
Measuring Piston Height Above Face of Block
1. Dial Indicator

3. Select the proper head gasket and place it on the block with the side marked with the last four digits of part code no. up.

4. Tighten the cylinder head bolts in steps in the sequence as shown, Figure 29. Tighten to the final torque specification.

   Torque Specification . . . . . 65-69 lbs. ft (88-94 Nm)

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

6. Install and assemble the rocker shaft components in the support. Install the set screw and end plugs.

7. Install the assembled rocker shaft support onto the head and tighten the bolts to the specified torque.

MODEL	MEASUREMENT VALUE	HEAD GASKET PART CODE NO.	INSTALLED THICKNESS
1320	From (0.5 to 0.6 mm)	111147150	t = 1.2
1520-1720	0.0197-0.0236 in.	111146981	
1320	From (0.6 to 0.7 mm)	111147160	t = 1.3
1520-1720	0.02365-0.0276 in.	111146991	
1320	From (0.7 to 0.8 mm)	111147170	t = 1.4
1520-1720	0.0276-0.0315 in.	111147001	

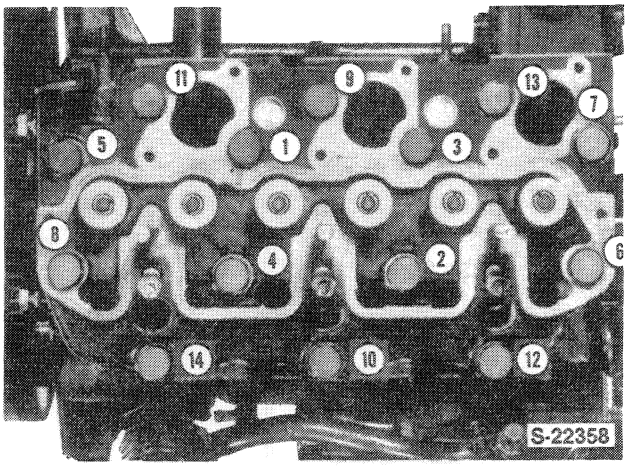


Figure 29
Head Bolt Torquing Sequence

8. Adjust the rocker arm to valve clearance, Figure 30. 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).

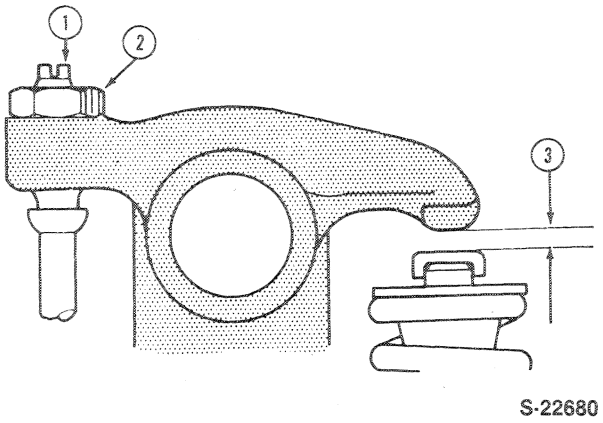


Figure 30
Valve Clearance Adjustment (Cold)

1. Adjusting Screw
2. Locknut
3. Valve Clearance 0.008 in. 0.2 mm)

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. Disconnect the wire (2) and remove the fuel shut-off solenoid (1), Figure 31.

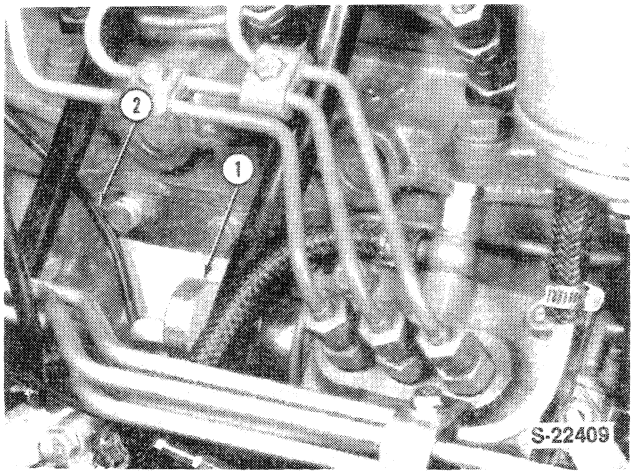


Figure 31
Fuel Shut-Off Solenoid

1. Solenoid
2. Wire

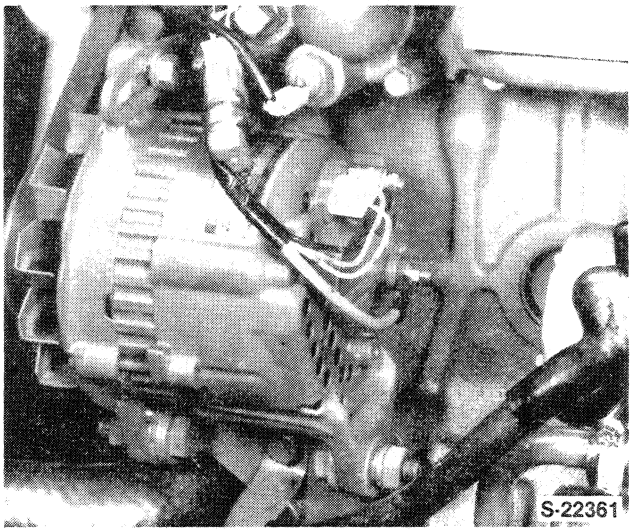
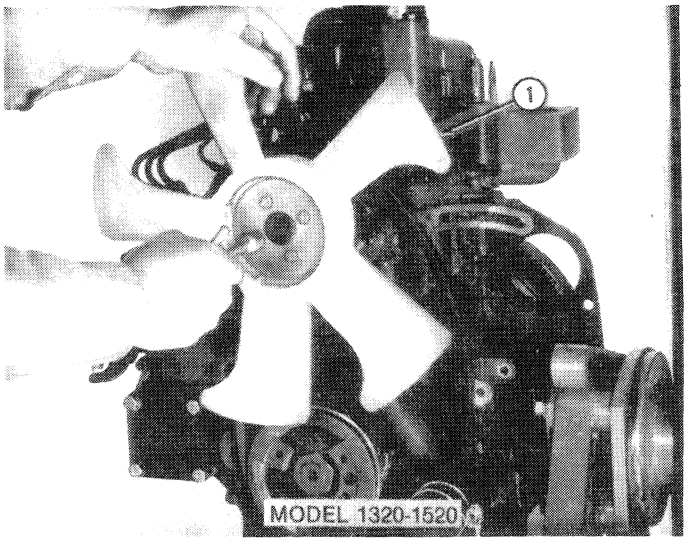


Figure 32
Alternator Removal

3. Remove the alternator assembly, Figure 32.
4. Remove the fan, Figure 33.

   - Remove the water pump assembly, Figure 34.

5. Remove the crankshaft pulley.



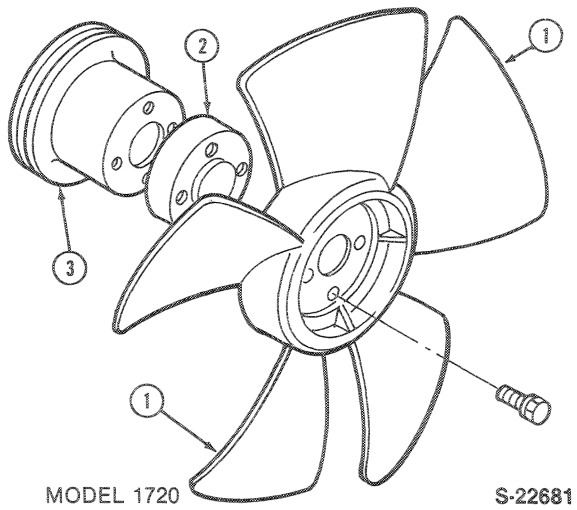


Figure 33
Cooling Fan Removal
1. Fan 2. Holder 3. Pulley

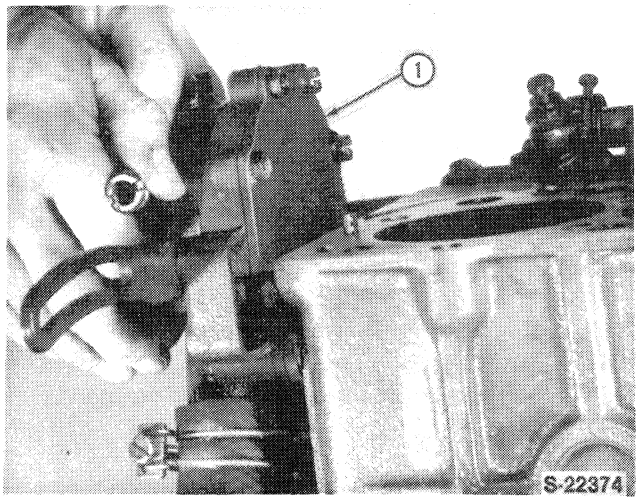


Figure 34
Water Pump Removal
1. Water Pump

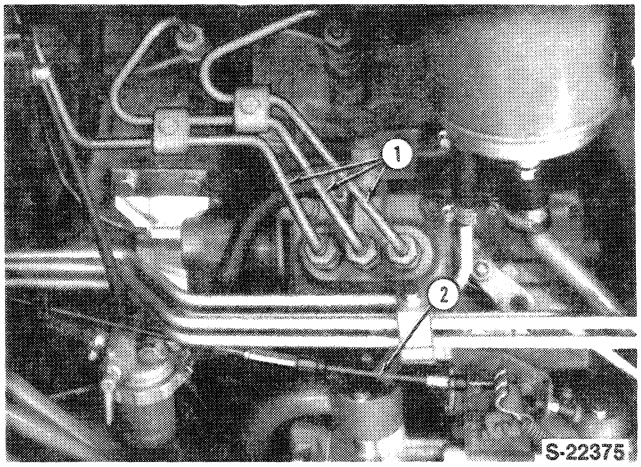


Figure 35
Injection Line Removal
1. Injection Lines 2. Throttle Control Cable

6. Remove the injector lines and cap the openings, Figure 35.

7. Disconnect the throttle control rod at the injection pump, Figure 35.

8. 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 36.

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

9. Remove the suction and pressure tubes from the power steering pump. Cap the lines and pump openings.

10. Remove the nuts and washers that hold the power steering pump to the front cover and remove the pump.

11. Remove the front cover attaching bolts and remove the front cover.

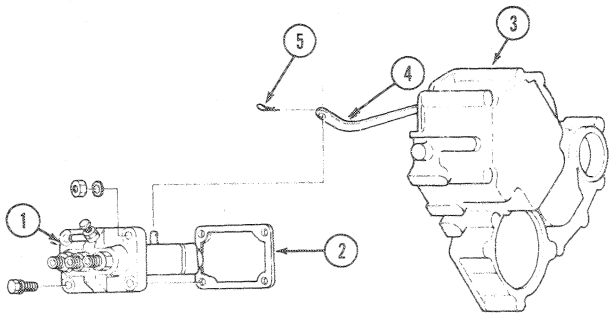


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Figure 36
Timing Gear Cover Removal

1. Injection Pump
2. Shim
3. Cover
4. Governor Link
5. Hair Pin

TIMING GEAR AND OIL PUMP – REMOVAL

CAMSHAFT GEAR

1. Remove the governor assembly, camshaft gear and tachometer drive gear components, Figure 37.

OIL PUMP ASSEMBLY

The oil pump is located inside of the pump drive gear at the front of the engine block, Figure 38.

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 38.

   NOTE: *The oil pump shaft and port block assembly is a press fit in the block, Figure 39. If necessary to remove due to damage, remove the port block and shaft assembly as follows:*

   - Remove the engine front adapter plate.
   - Using a special tool 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 40, remove the port block assembly.

HYDRAULIC PUMP DRIVE GEAR
Reference – Figure 41

1. Remove the power steering pump. See Part 9.

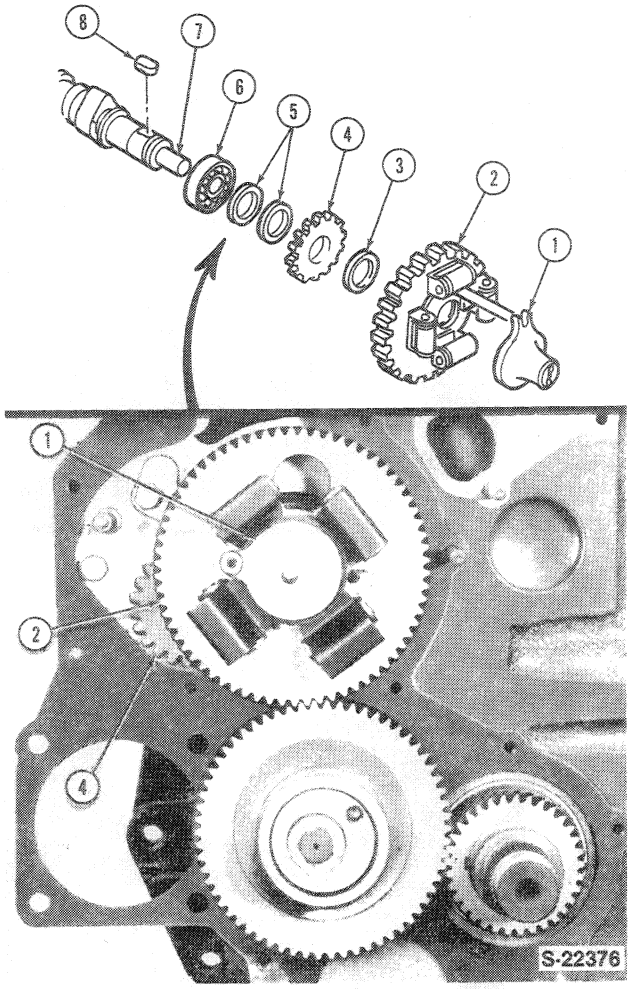

Figure 37
Governor and Camshaft Gear Removal

1. Slider
2. Gear Assembly
3. Spacer
4. Tachometer Drive Gear
5. Spacers
6. Bearing
7. Camshaft
8. Key

2. Remove the hydraulic pump. See Part 8.

3. Remove the drive gear and bearing assembly, Figure 41, from the timing gear cover.

INSPECTION AND REPAIR

TIMING GEARS AND GOVERNOR ASSEMBLY

1. Wash all components in a suitable solvent and air dry.

2. Inspect the governor assembly for excess wear or damage. Replace any components found faulty.

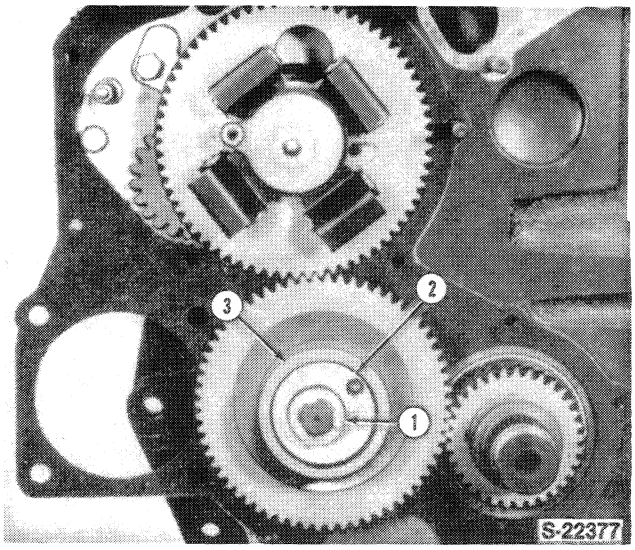

Figure 38
Engine Oil Pump Removal
1. "E" Snap Ring
2. Collar
3. Spring

3. Inspect the timing gear teeth for excess wear, chips, etc.

4. Inspect the camshaft and injection pump drive keys and the key ways for wear.

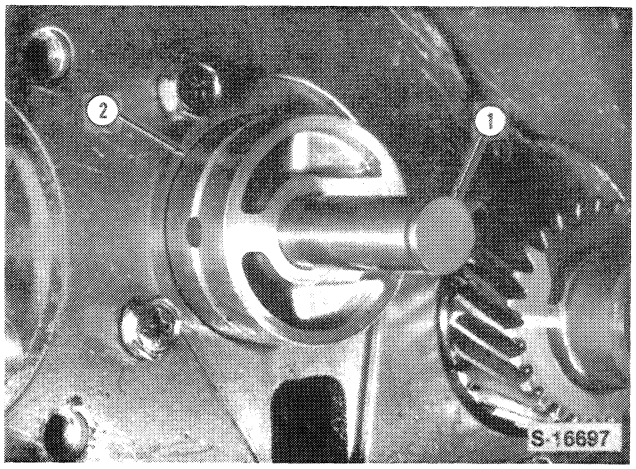

Figure 39
Port Head and Shaft Removal
1. Shaft
2. Port Block

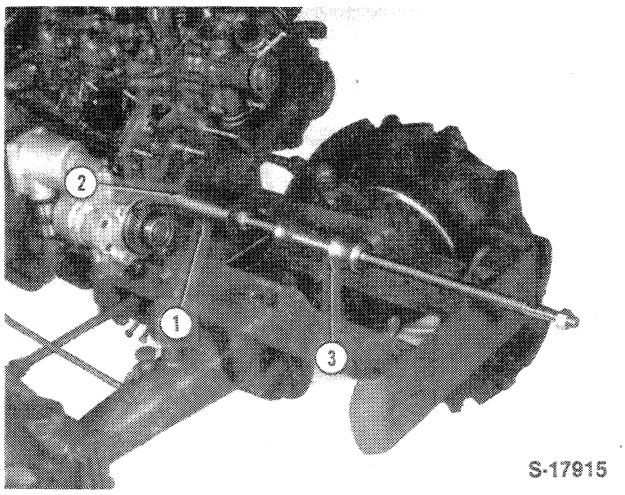

Figure 40
Oil Pump Port Block Removal
1. Puller
2. Set Screws (2)
3. Slide Hammer

OIL PUMP ASSEMBLY

The oil pump consists of the inner and outer rotors, idler gear, port block, shaft and cover, Figure 42.

1. Check for excessive wear on the face of the pump cover and port block, Figure 42.

2. Inspect the pump shaft and rotors for excessive wear or scratches.

3. Measure the rotor to rotor clearance, Figure 43. Replace the components as required, if wear is excessive. See "Specifications," Chapter 3.

INSTALLATION

If the engine oil pump port block assembly was removed, install a new port block assembly as follows:

- Using a special tool insert the threaded guide pins (1) into the cylinder block, Figure 44. Assemble the oil pump shaft to the port block using nut and washer previously removed.

- Insert the port block assembly into the installer and place on the guide pins as shown, Figure 45.

- Use a suitable driver and install the port block assembly as shown, Figure 46. The installer must bottom against the engine block when fully positioned.

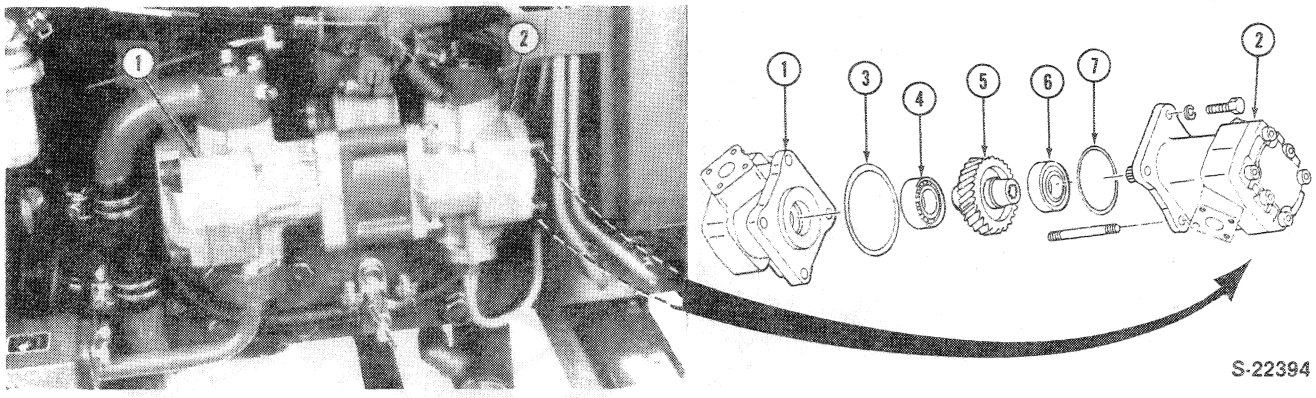

Figure 41
Hydraulic Pump Drive Gear Removal

1. Hydraulic Pump Assembly
2. Power Steering Pump Assembly
3. O-Ring
4. Bearing
5. Drive Gear
6. Bearing
7. O-Ring

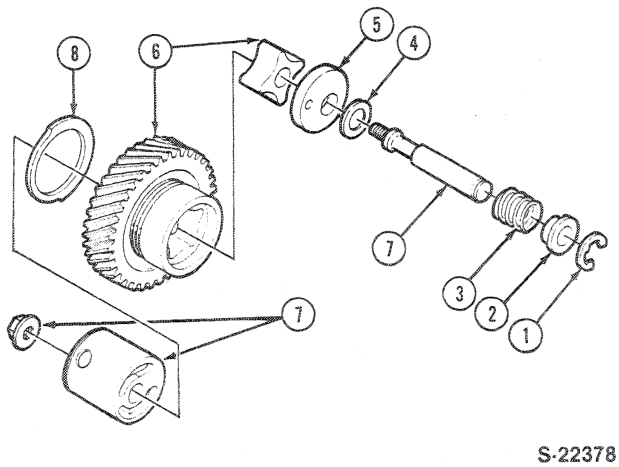

Figure 42
Engine Oil Pump Components — Model 1720

1. "E" Snap Ring
2. Collar
3. Spring
4. Shim
5. Cover
6. Rotor and Gear Assembly
7. Port Block and Shaft Assembly
8. Thrust Washer

1. Install a new gasket and the front adaptor plate to the engine block.

2. Install the tachometer drive shaft and plate, Figure 47.

3. Position the two spacers, tachometer drive gear, camshaft gear, key, flyweight assembly, pins and slider on the camshaft, Figure 48.

4. Assemble the pump drive gear and retaining spring. Position the assembly on the port block, Figure 49. Turn the crankshaft to align the timing marks between the crankshaft and camshaft gears with the injection pump drive gear and install the pump drive gear.

5. Position the oil pump inner rotor on the shaft inside the idler gear and install the cover, shim, spring, collar and "E" snap ring, Figure 42.

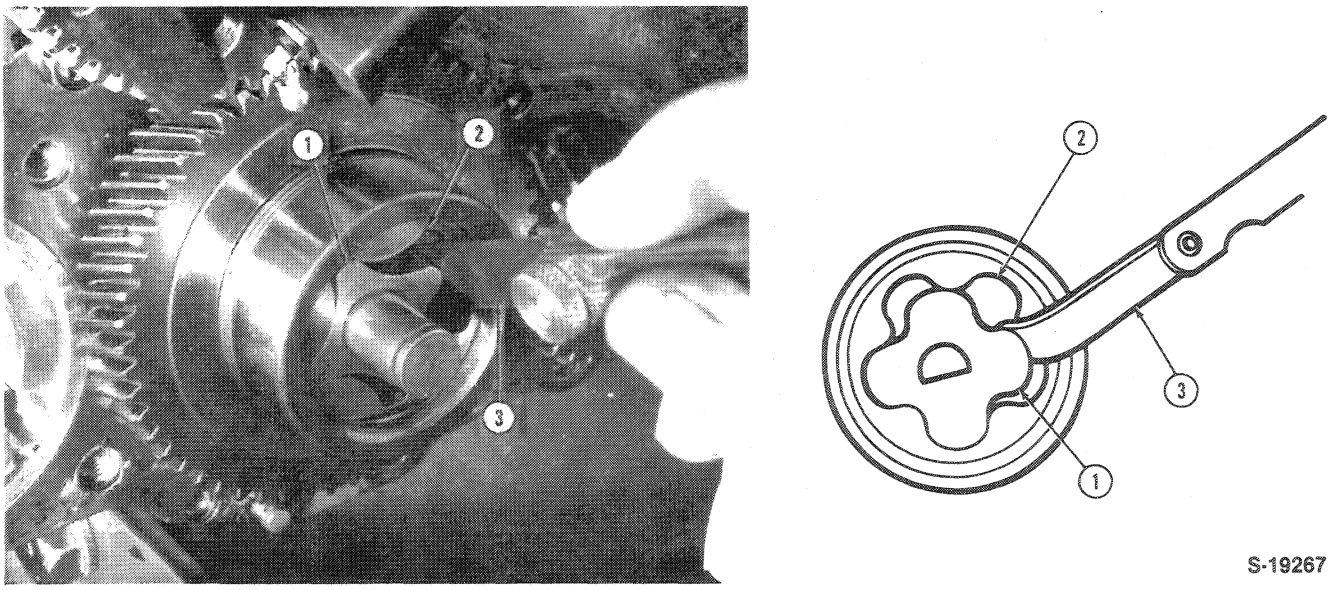

Figure 43
Rotor to Rotor Clearance Check
1. Inner Rotor 2. Outer Rotor 3. Feeler Gauge

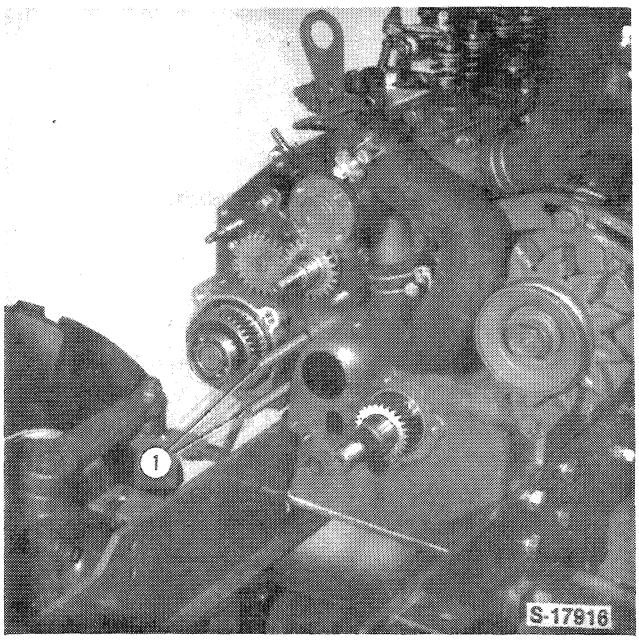

Figure 44
Port Block and Shaft Installation
1. Guide Pins, Tool No. 11044

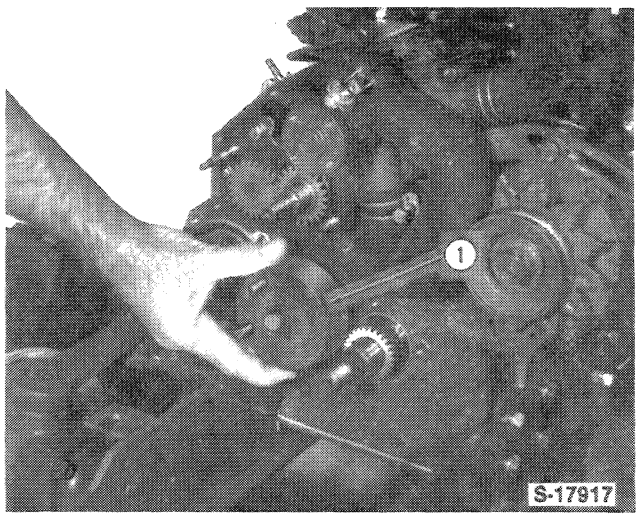

Figure 45
Port Block and Shaft Installation
1. Port Block Installer

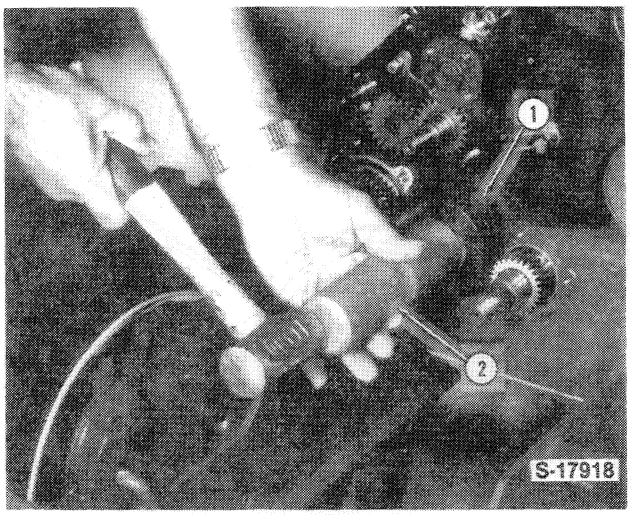

Figure 46
Port Block and Shaft Installation
1. Installer
2. Driver

TIMING GEAR COVER

INSPECTION AND REPAIR

Inspect the governor linkage and replace any worn or damaged parts. See Part 2, Fuel System, Chapter 1 for governor linkage assembly and adjustments.

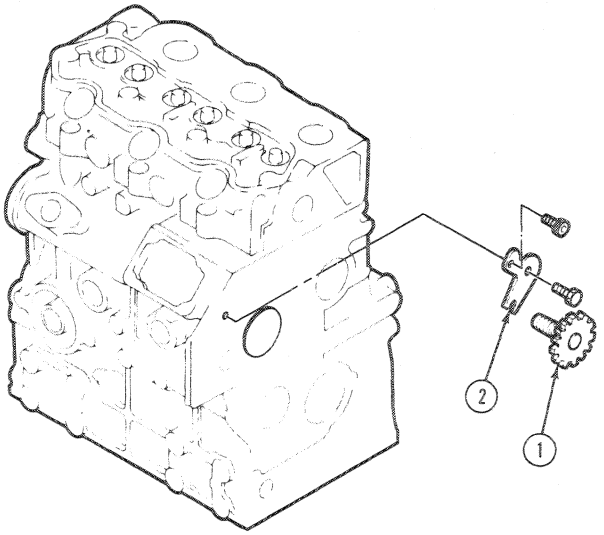

Figure 47
Tachometer Drive Shaft and Plate Installation — Model 1720
1. Tachometer Drive Gear
2. Plate

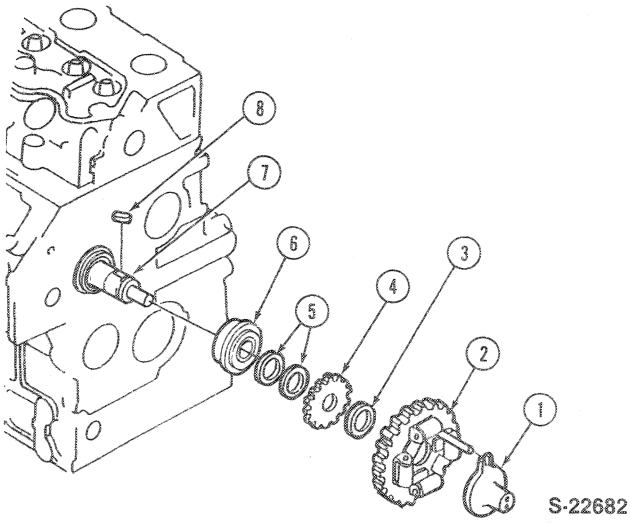

Figure 48
Camshaft Gear and Governor Installation
1. Slider
2. Gear Assembly
3. Spacer
4. Tachometer Drive Gear
5. Spacers
6. Bearing
7. Camshaft
8. Key

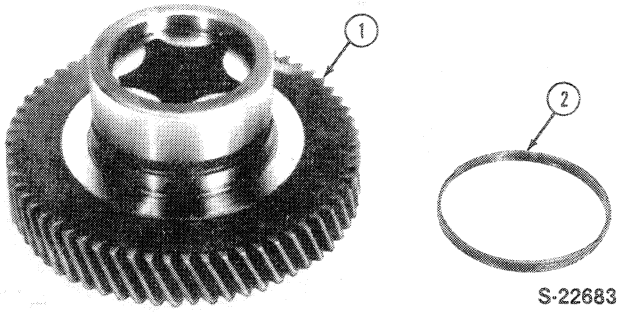

Figure 49
Engine Oil Pump Installation
1. Gear and Housing
2. Spring Retainer 1147

INSTALLATION

1. Install a new timing gear cover gasket and reinstall the timing gear cover following the removal procedure in reverse.

   NOTE: *Be sure the dowel pin in the cover properly aligns with the hole in the oil pump cover, Figure 50.*

CONNECTING RODS, BEARINGS, PISTONS, RINGS AND CYLINDER BLOCK

NOTE: *The pistons and connecting rods can be removed with the engine in the tractor after removal of the cylinder head and oil pan as previously described.*