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# **CX SERIES REPAIR MANUAL COMPLETE CONTENTS**

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**The following pages are the collation of the contents pages from each section and chapter of the CX Series Repair manual. Complete Repair part # 86630597.**

**The sections used through out all New Holland product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books. Each book will be labeled as to which sections are in the overall Repair manual and which sections are in each book.**

**The sections listed above are the sections utilized for the CX Series Combines.**

## SECTION 00 - GENERAL INFORMATION

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## **INTRODUCTION**

This manual is subdivided in sections marked by two-digit numbers, with independent page numbering within each section. For a quick reference, these sections have the same identification number and the same description of the relevant Flat Time Rate Manual.

The dealt matters and the information can be easily detected by index on the previous pages.

At the bottom of each page there is the manual print number and the relevant publication/up-dating date.

The pages of further up-datings shall have the same print number, followed by a two-digit number (for example: 1st Up-dating 604.62.501.01; 2nd Up-dating 604.62.501.02; etc.) and the relevant publication date. These pages shall be completed by the new print of the index, duly revised.

The information of this manual are up-dated at the date of the publication. As NEW HOLLAND continuously improves its product range, some information could be not up-dated due to modifications of technical or commercial type, as well as for suiting the law regulations of the different countries.

In case of disagreement, refer to NEW HOLLAND Sales and Service networks.

## **IMPORTANT INFORMATION**

All repair and maintenance works listed in this manual must be carried out only by staff belonging to the NEW HOLLAND Service network, strictly complying with the instructions given and using, whenever required, the special tools.

Anyone who carries out the above operations without complying with the prescriptions shall be responsible for the subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional or local dealers, reject any responsibility for damages due to the anomalous behaviour of parts and/or components not approved by the manufacturer himself, including those used for the servicing or repair of the product manufactures or marketed by the Manufacturer.

In any case, no warranty is given or attributed on the product manufactures or marketed by the Manufacturer in case of damages due to an anomalous behaviour of parts and/or components not approved by the Manufacturer.

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## GENERAL INSTRUCTIONS

### SHIMMING

For each adjustment operation, select adjusting shims and measure individually using a micrometer, then add up the recorder values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value indicated for each on shim.

### ROTATING SHAFT SEALS

For correct rotating shaft seal installation, proceed as follows:

- before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes
- thoroughly clean the shaft and check that the working surface on the shaft is not damaged
- position the sealing lip facing the fluid; with hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will deviate the fluid towards the inner side of the seal
- coat the sealing lip with a thin layer of lubricant (use oil rather than grease) and fill the gap between the sealing lip and the dust lip on double lip seals with grease
- insert the seal in its seat and press down using a flat punch, do not tap the seal with a hammer or mallet
- whilst inserting the seal, check that it is perpendicular to the seat; once settled, make sure that it makes contact with the thrust element, if required
- to prevent damaging the seal lip on the shaft, position a protective guard during installation operations

### O-RING SEALS

Lubricate the O-RING seals before inserting them in the seats, this will prevent them from overturning and twisting, which would jeopardise sealing efficiency.

### SEALING COMPOUNDS

Apply one of the following sealing compounds on the mating surfaces marked with an X: RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET.

Before applying the sealing compound, prepare the surfaces as follows:

- remove any incrustations using a metal brush;
- thoroughly de-grease the surfaces using one of the following cleaning agents: trichlorethylene, petrol or a water and soda solution.

### COTTER PINS

When fitting split cotter pins, ensure that the pin notch is positioned in the direction of the force required to stress the pin.

Spiral cotter pins do not require special positioning.

## PROTECTING THE ELECTRONIC/ ELECTRICAL SYSTEMS DURING CHARGING OR WELDING

To avoid damage to the electronic/electrical systems, always observe the following:

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the combine or on any header attached to the combine.
  - Position the welder ground clamp as close to the welding area as possible.
  - If welding in close proximity to a computer module, then the module should be removed from the combine.

- Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.

**IMPORTANT:** *If welding must be performed on the unit, either the combine or the header (if it is attached), the battery ground cable must be disconnected from the combine battery. The electronic monitoring system and charging system will be damaged if this is not done.*

Remove the battery ground cable.  
Reconnect the cable when welding is completed.

4. Always disconnect the negative cable from the battery when charging the battery in the combine with a battery charger.



### WARNING



**Batteries contain sulfuric acid. In case of contact with skin, flush the affected area with water for five minutes. Seek medical attention immediately. Avoid contact with the skin, eyes or clothing. Wear eye protection when working near batteries.**

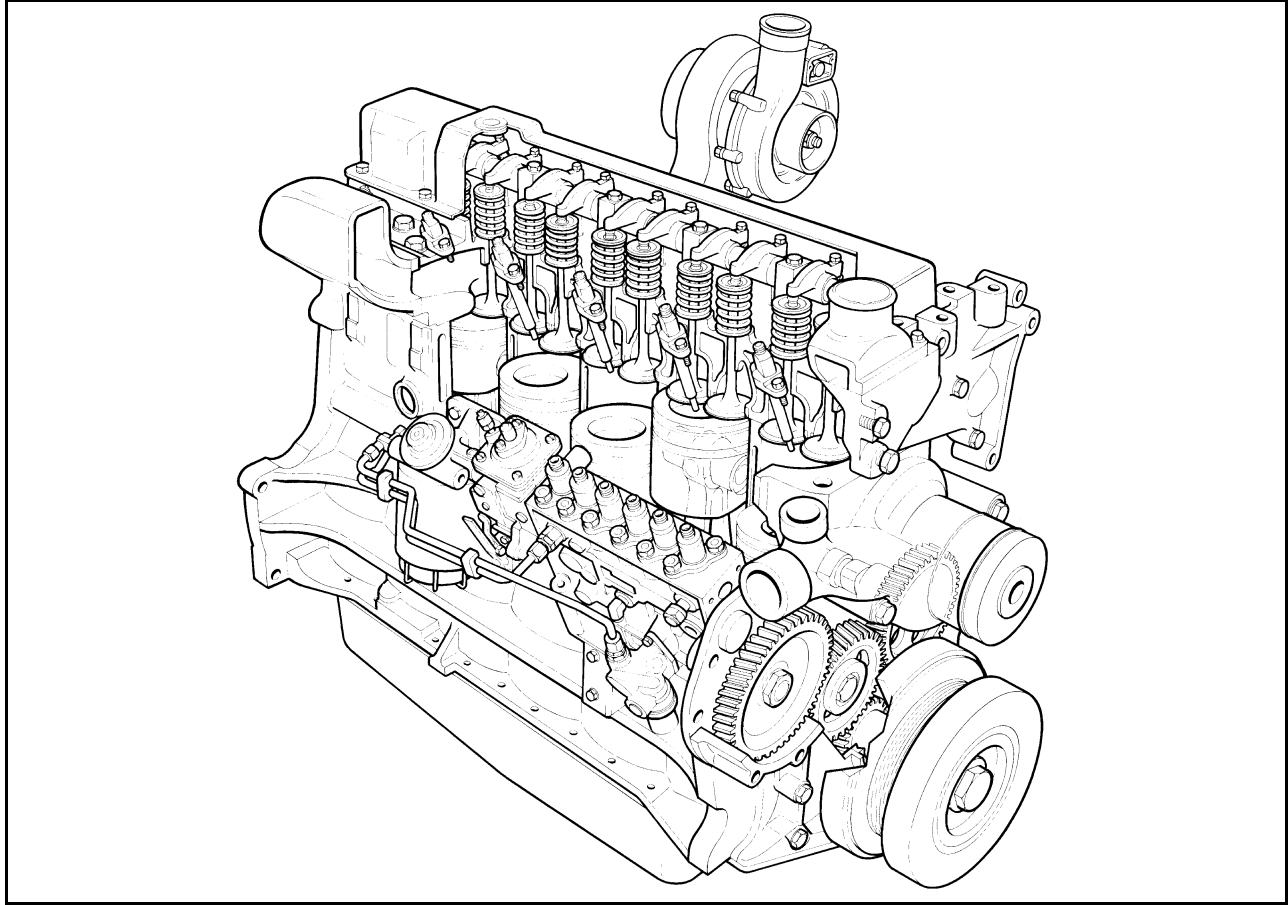
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## SECTION 10 - ENGINE

### Chapter 1 - 7.5L New Holland Engine

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**DESCRIPTION AND OPERATION**

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The New Holland 7.5 Litre engine is a 6-cylinder turbocharged and aftercooled, having a bore of 111.8 mm (4.4") and a stroke of 127 mm (5.0") which generates a displacement of 7.5L (456 in<sup>3</sup>).

The engine uses a mechanical or electronically controlled in line injection pump depending on model and has been designed to meet current emission regulations and must only be serviced by an authorised service agent. For a detailed Description and Operation of the fuel system reference must be made to the Fuel System Chapter in this Section of the manual.

All engines feature cross flow cylinder heads, with the inlet and exhaust manifolds on opposite sides of the cylinder head. The fuel and air combustion process, takes place in the specially designed bowl in the crown of the pistons.

**CYLINDER BLOCK ASSEMBLY**

The cylinder block is an alloy cast iron with deep cylinder skirts, and water jackets for cooling the cylinders. The cylinder bores are machined integral with the cylinder block, during the manufacturing process.

Cylinders are in line and vertical and numbered 1 to 6 from the front to the rear of the engine. They can be bored oversize for the fitment of sleeves, which are available in service.

The oil pan is the reservoir for the engine oil lubrication system and a cast iron front cover on the front of the engine covers the timing gear assembly.

## CYLINDER HEAD ASSEMBLY

The cylinder head incorporates an inlet and exhaust valve per cylinder with the valve rocker arm shaft assembly bolted to the cylinder block through the cylinder head. Cylinder head retaining bolts are evenly spaced with a six point pattern around each cylinder, this ensures an even clamping load across the cylinder head area.

The intake and exhaust manifolds are bolted to the head, the intake manifold is mounted on the right hand side of the engine, with the diesel injectors mounted outside the rocker cover. The exhaust manifold is mounted on the left hand side of the engine. Water outlet connections and thermostats being attached to the front of the cylinder block.

Valve guides are integral in the cylinder head, and valves with oversize stems are available in service. Special replaceable sintered iron valve seats are pressed into each valve port during manufacture and oversize valve seats also available in service.

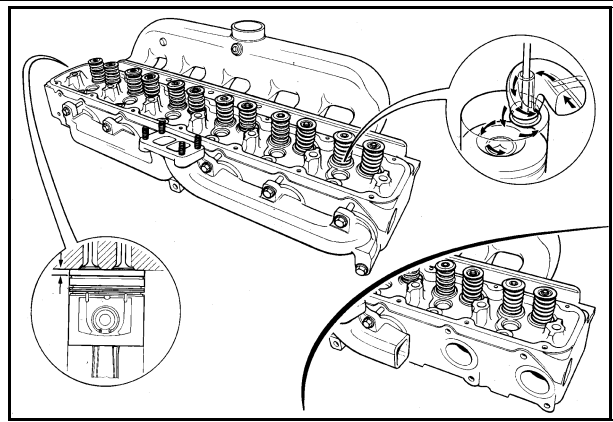
All valves are fitted with positive valve rotators and valve stem oil seals. Valve clearance is maintained by adjustment of the self locking adjusting screw, mounted in each of the rocker arms.

## CAMSHAFT ASSEMBLY

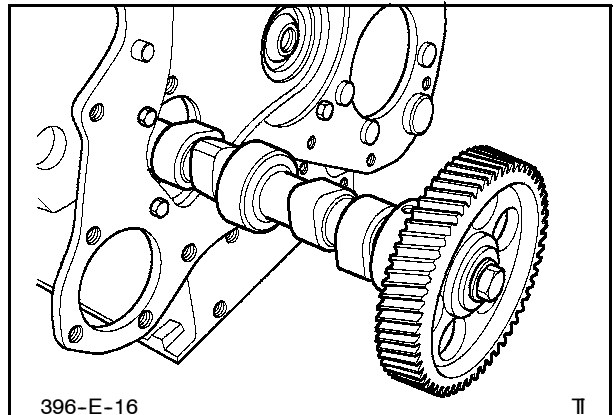
The camshaft runs in 5 replaceable bearings. The camshaft drive gear is in mesh with and driven by the camshaft idler gear which is driven by the crankshaft timing gear.

Camshaft end thrust is controlled by a thrust plate bolted to the block, and located between the camshaft gear and the front camshaft journal.

A helical gear is mounted on the rear of the camshaft, and drives the engine oil lubrication pump mounted forward of the flywheel.



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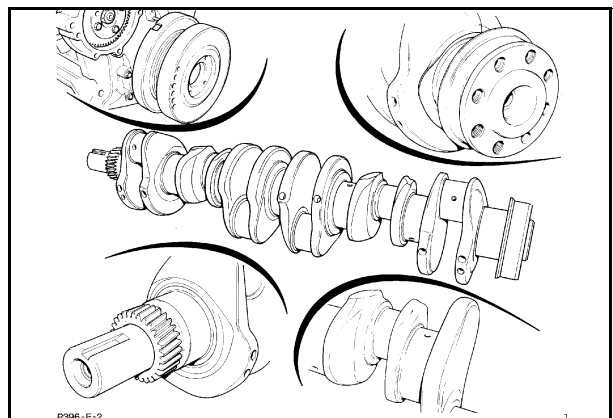
## CRANKSHAFT ASSEMBLY

The crankshaft is supported in the cylinder block by 7 main bearings.

The crankshaft is manufactured from steel with machined finished crank webs

End thrust is controlled by a thrust bearing incorporated in the centre main bearing of the crankshaft.

An external damper is fitted to the crankshaft pulley to ensure smooth running operation. Front and rear crankshaft oil sealing is effected by cassette type seals that are designed for long and durable service life.

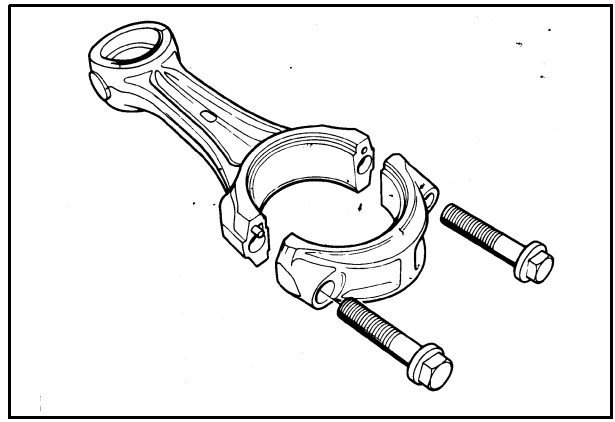


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5

## CONNECTING RODS

Connecting rods "Teepee" (wedge) shaped at the small end have been designed to reduce the reciprocating weight at the piston end. The connecting rods are of a heavy beam construction and are assembled as a matched set to each engine. They are retained in position by the connecting rod big end cap and secured by two bolts per rod. The small end of the connecting rod is fitted with a replaceable bronze bushing, through which the free floating piston pin is fitted. The steel pin being held in place within the piston by two snap rings.



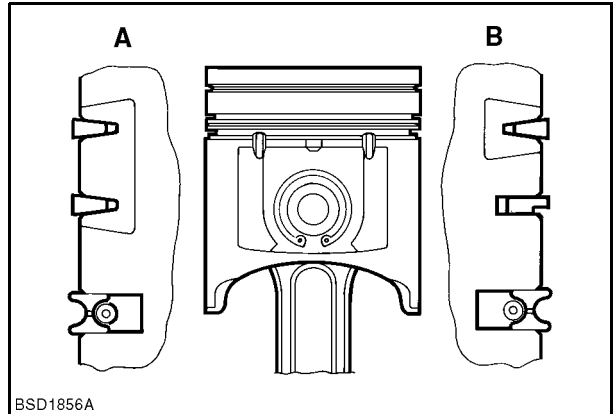
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## PISTONS

Pistons are constructed of an aluminium silicon alloy with an iron insert for the top ring. The combustion chamber being recessed into the piston crowns.

Each piston has two compression rings and one oil control ring, to reduce friction and increase positive sealing. All rings are located above the piston pin.

- A Engines with Electronically Controlled Injection Pump
- B Engines with Mechanically Controlled Injection Pump

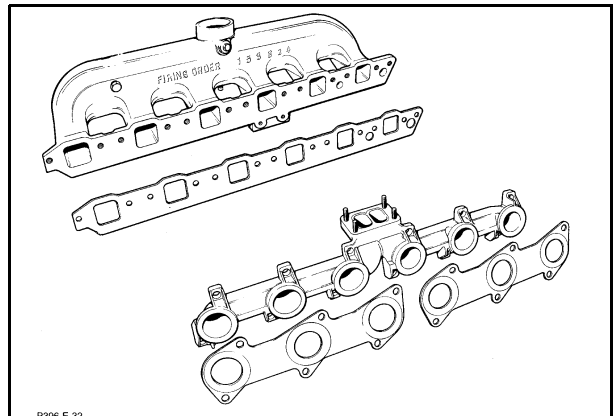


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## MANIFOLDS

The cross flow design aluminium intake, and cast iron exhaust manifolds, are on opposite sides of the cylinder head. This is designed to maintain balanced heat distribution within the cylinder head. The configuration of the manifolds also ensures minimum heat transfer to the intake manifold.

A grid heater is fitted to the intake manifold to assist in cold starting of the engine when coolant water temperature is below 30°C.

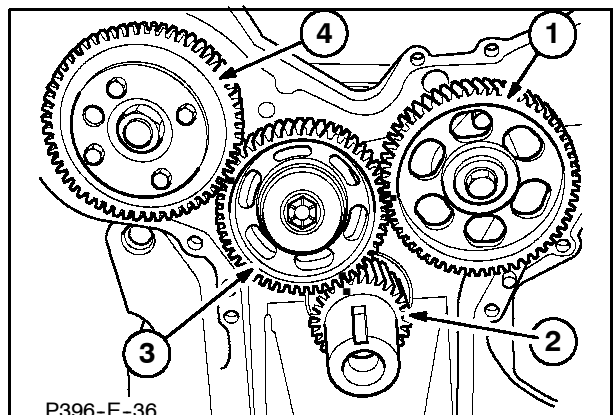


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## TIMING GEARS

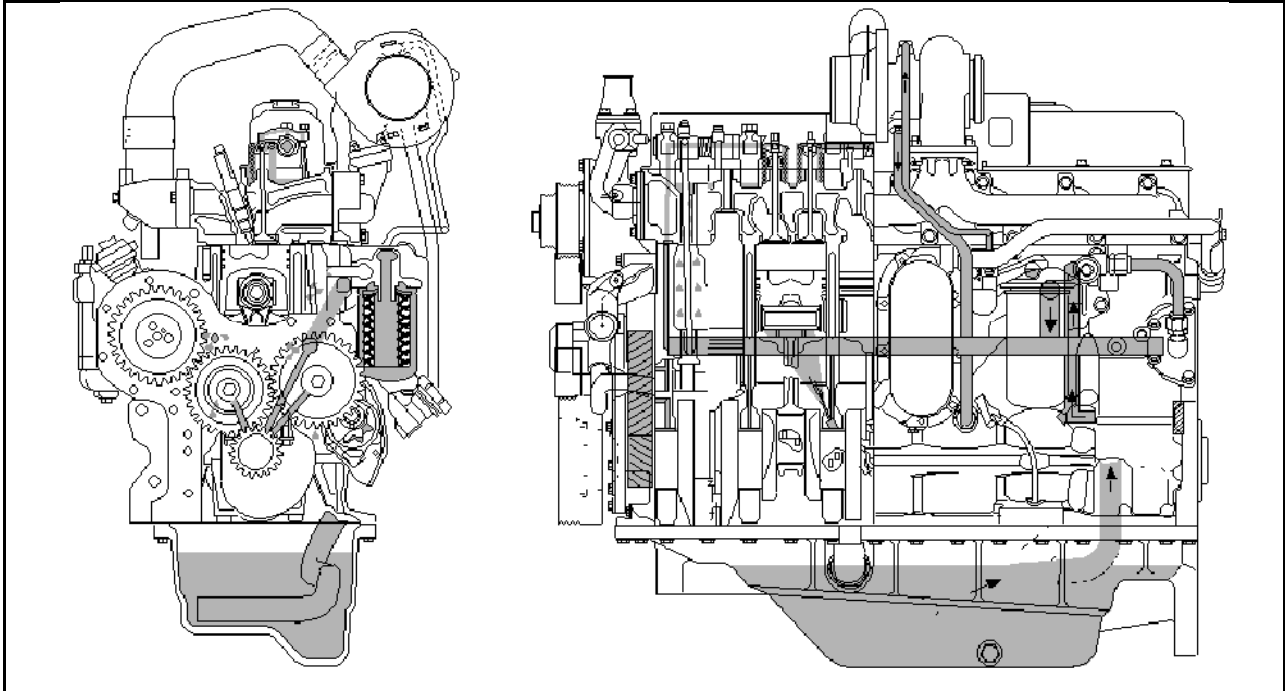
The crankshaft timing gear is heated and press fitted on to the front of the crankshaft, to a high degree of accuracy during manufacturing. This enables precise timing being maintained during the life of the engine. The crankshaft gear, 2, drives the idler gear, 3, which is attached to the front of the cylinder block. The idler gear then drives the camshaft gear, 1, and the injection pump gear, 4.

The camshaft gear is bolted to the front of the camshaft, and is keyed to maintain position of the gear on the camshaft.



9

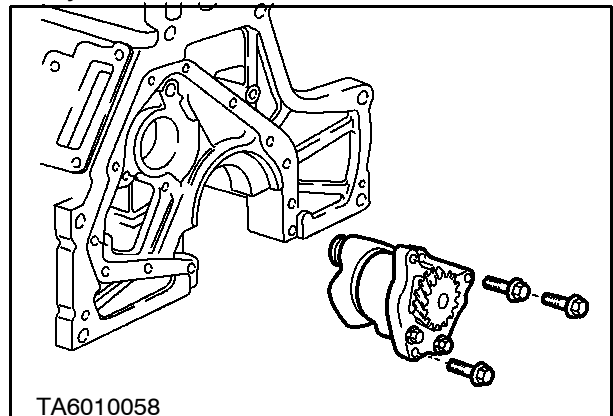
## LUBRICATION SYSTEM



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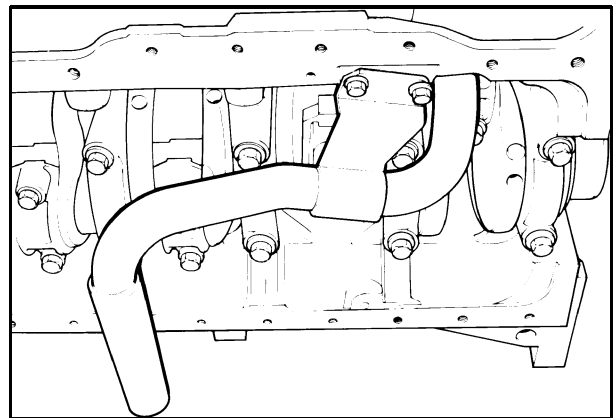
### Engine Lubrication System

Lubrication of the engine, Fig. 10, is maintained by a rotor type oil pump mounted in the rear of the engine block, forward of the flywheel on the left hand side of the engine.



11

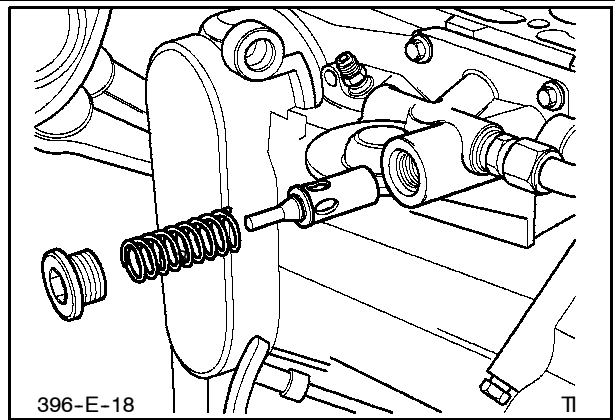
The oil pump is driven from the rear of the camshaft and draws oil from the engine oil pan through a tube and screen assembly.



12

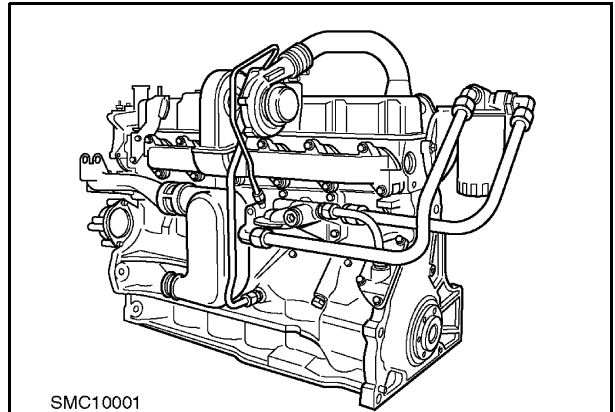
## SECTION 10 - ENGINE - CHAPTER 1

A spring loaded relief valve is integral with the dummy oil filter head mounted on the left hand side of the engine block and prevents over pressurisation of the system.



13

The spin on type oil filter is mounted at the rear of the engine.

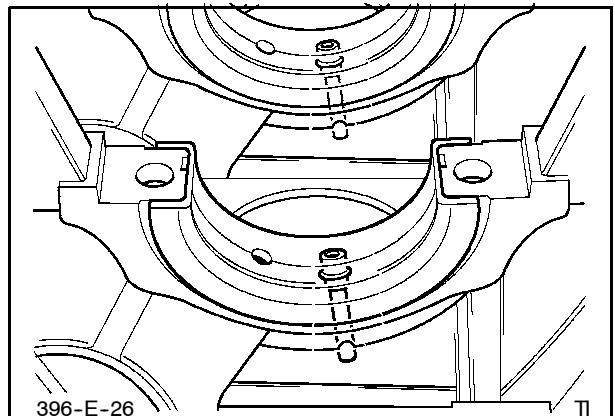


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Oil flows from the filter to the main oil gallery, which runs the length of the cylinder block and also intersects the camshaft follower chamber.

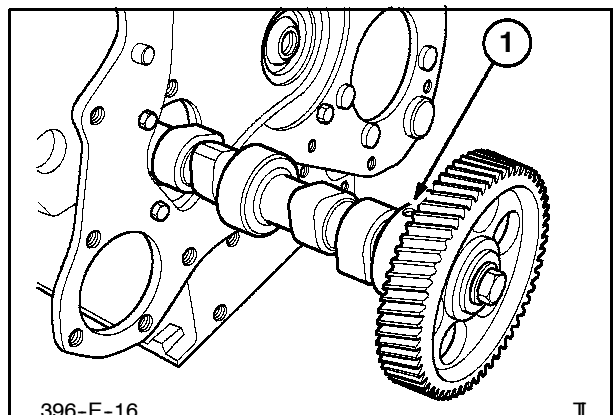
The main gallery supplies oil to the crankshaft main bearings, connecting rods and both big and small ends. The underside of the pistons and pins, are lubricated by oil pressure jets mounted adjacent to each main journal housing.

The camshaft drive gear bushing is pressure lubricated through a drilled passage from the front main bearing. The gear has small oil passages machined on both sides allowing excess oil to escape.



15

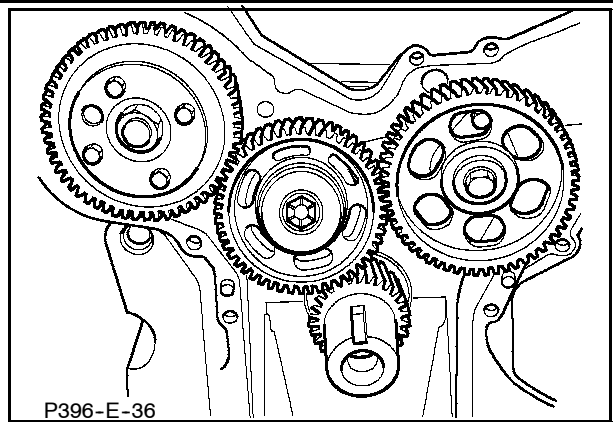
An intermittent flow of oil is directed to the valve rocker arm shaft assembly via a drilled passage in the cylinder block. This is located vertically above No.1 camshaft bearing, 1, and aligns to a hole in the cylinder head. The rotation of the camshaft allows a controlled intermediate flow of lubrication.



16

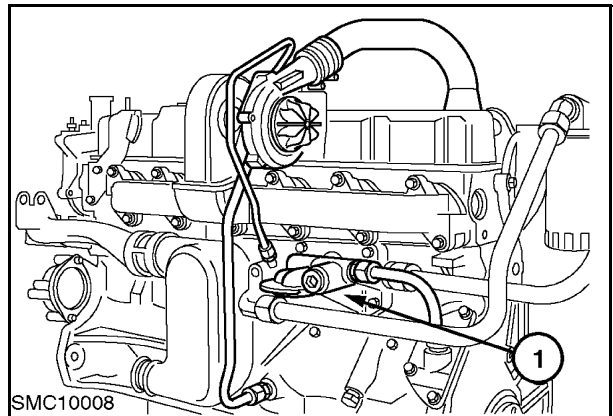
## SECTION 10 - ENGINE - CHAPTER 1

Timing gears are lubricated by splashed oil from the cam follower chamber, and the pressure lubricated camshaft drive gear bushing.



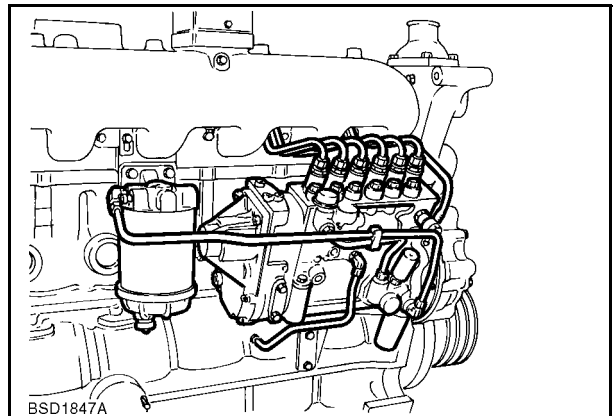
17

The turbocharger is supplied with oil from the oil filter support housing, 1, mounted on the left hand side of the engine.



18

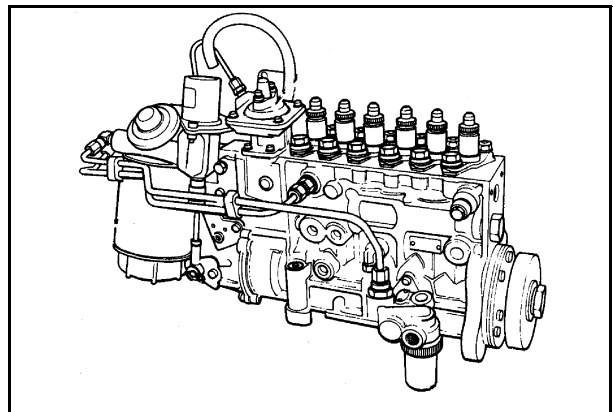
The fuel injection pump is pressure lubricated from a port, 1, on the right hand side of the engine block. The fuel pump is either electronically controlled using an electronic control unit



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or

Mechanically controlled depending on model build



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## ENGINE OVERHAUL-INTRODUCTION

In the following procedures and illustrations the engine is shown removed from the vehicle however there are certain operations that can be performed with the engine installed.

Where it is necessary to remove the engine use a suitable hoist or overhead gantry and standard engineering procedures. Removal of the engine is described in Chapter 3 of Section 10 of this manual.

Dismantle the engine following conventional techniques and by referring to the appropriate overhaul sections of this chapter. Always refer to the specification section as necessary.

**NOTE:** *Where it is necessary to remove additional items to gain access to the components on the engine Refer to Chapter 3 "Remove and Replace, 7.5L NH Engine".*

**NOTE:** *All gaskets, seals, and 'O' rings must be replaced during re-assembly. Where new sealant is to be applied refer to "Engine Specifications".*

For concerns relating to the fuel system refer to the fuel system Chapter in this manual. On engines fitted with the electronically controlled fuel injection pump refer to the "Engine Fault Codes" chapter in the electrical section of the manual.

### **Operations or repairs that can be performed with the engine still in the vehicle.**

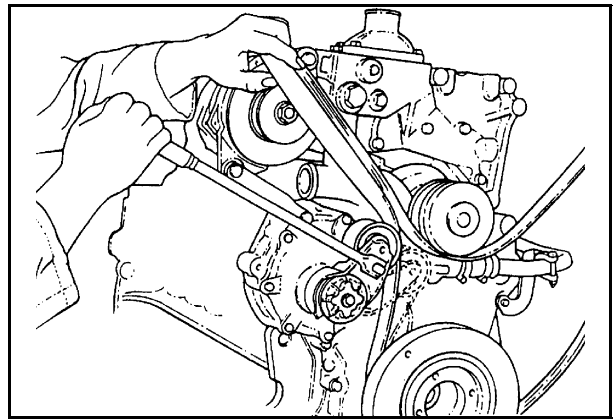
1. Front timing cover, Pump drive gear and idler gear. Removal of engine is required in order to remove and replace the camshaft timing gear.
2. Front pulley and damper assembly.
3. Cylinder head and associated inlet and exhaust components.
4. Fuel injection pump removal and timing.
5. Water pump, thermostat, and associated components .
6. Oil pump relief valve.
7. Turbocharger.

## INJECTION PUMP TIMING CHECK

If a fuel related concern is identified check the injection pump timing before proceeding with any other disassembly.

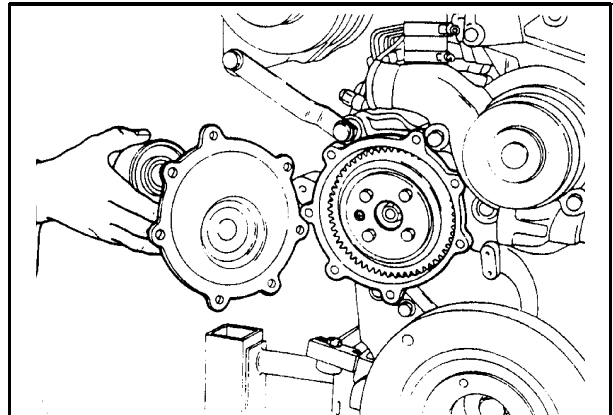
**NOTE:** Where it is necessary to remove additional items to gain access to the components on the engine Refer to Chapter 3 "Engine Removal and Replacement".

1. Remove engine drive belts.



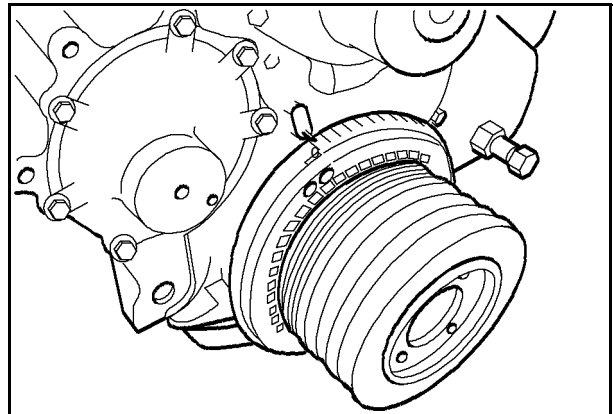
21

1. Remove injection pump timing cover.



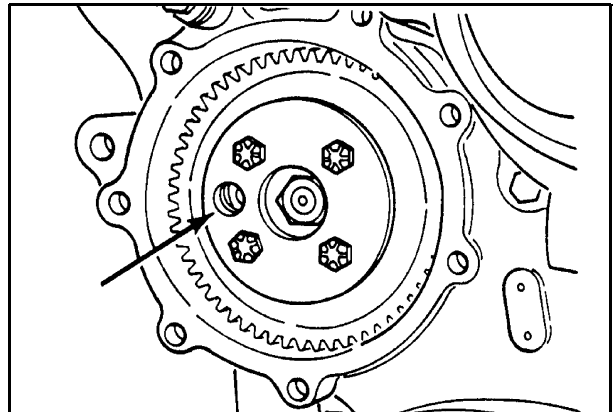
22

2. Using 29mm socket (1-1/8 inch) socket rotate crankshaft to top dead centre (TDC) with number 1 cylinder firing.



23

3. When engine is at TDC the threaded hole in the injection pump drive flange aligns with the pump timing plate.

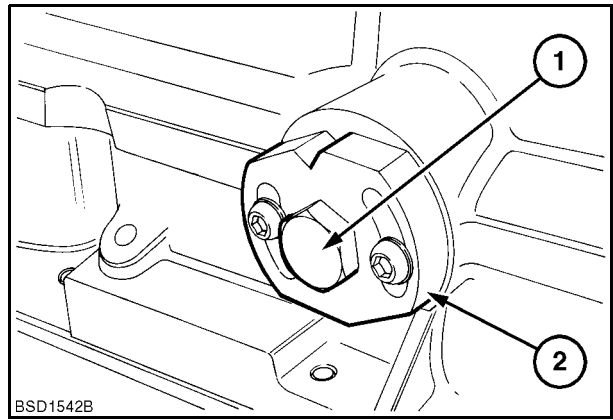


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## SECTION 10 - ENGINE - CHAPTER 1

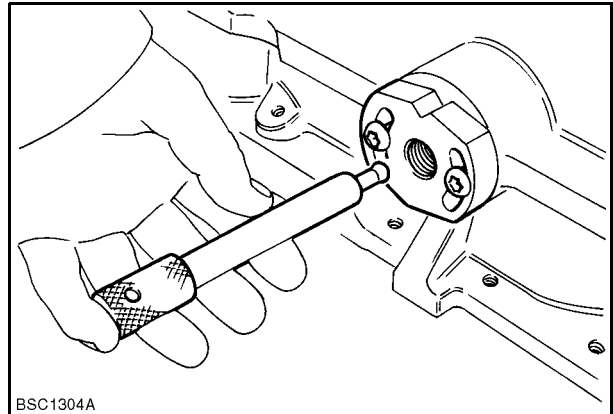
4. To ensure the crankshaft is accurately positioned at TDC remove the crankshaft timing plug, 1, from the side of the engine block.

**IMPORTANT:** DO NOT disturb the timing pin bush, 2. This has been accurately set during original manufacture. If the bush is moved then pump timing CAN NOT be accurately set.



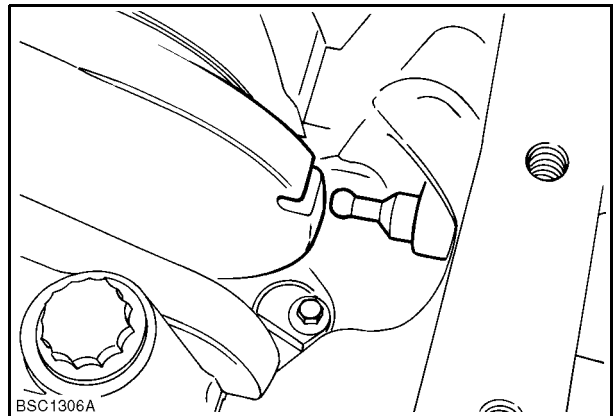
25

5. insert the crankshaft timing pin 297672 into the side of the block.



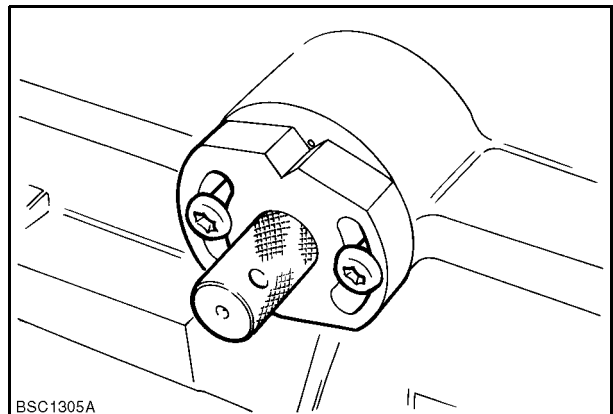
26

6. If necessary gently turn the crankshaft to engage the rounded end of the timing pin in the slot of the crankshaft. This is not visible and must be performed by 'feel'.



27

7. When the timing pin is located in the slot of the crankshaft the pin is fully seated.  
Do Not attempt to rotate the crankshaft when timing pin is fully inserted as damage will occur.



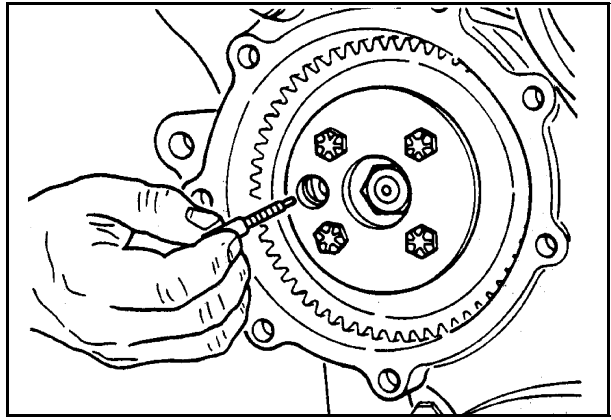
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## SECTION 10 - ENGINE - CHAPTER 1

8. Check that the injection pump go/no-go timing pin Tool No 295005 (NA-FNH00536-2) will screw into the pump hub.

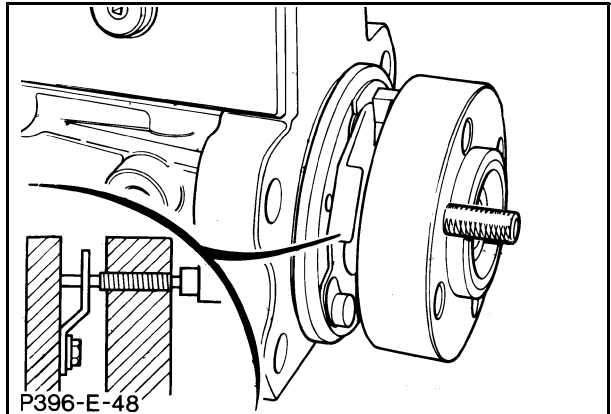
**IMPORTANT:** The engine must never be rotated while the timing pin is installed.

9. If the pin engages in the pump timing plate (inset, Figure 30) when the crankshaft is at TDC the pump timing is correct.



29

10. If pump timing is incorrect and timing pin can not be screwed into pump, remove pump timing gear, install rigid timing pin 295005 (NA-FNH00536-1) into pump and refit timing gear.



30

**NOTE:** This injection pump timing check assumes that the crankshaft and camshaft timing gears were correctly positioned during engine assembly. To check the position of these timing gears it is necessary to remove the engine front cover.



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## OVERHAUL

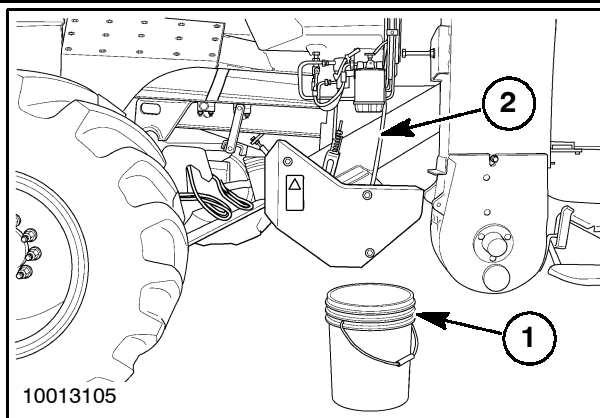
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### CYLINDER HEAD, VALVES, AND RELATED PARTS

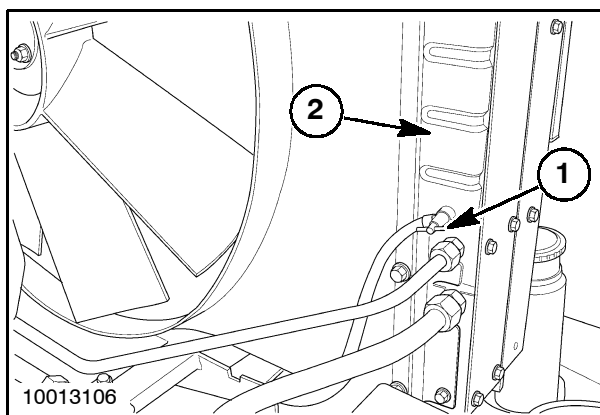
#### Cylinder Head Removal

**NOTE:** The cylinder head can be removed with the engine installed in the combine.

1. Drain the engine coolant by placing a suitable container, 1, below the coolant drain hose, 2.
2. Drain the coolant from the engine block using drain tap, 1, on left hand side of the radiator, 2.

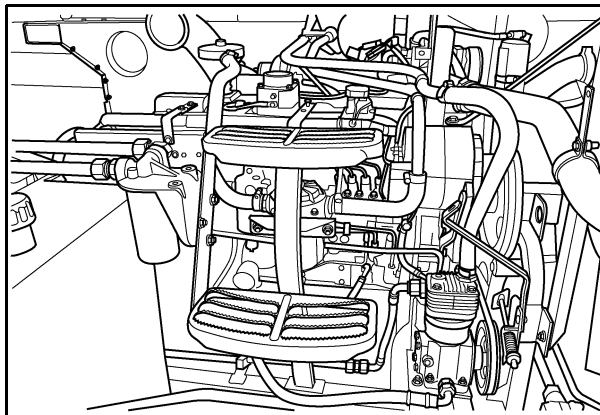


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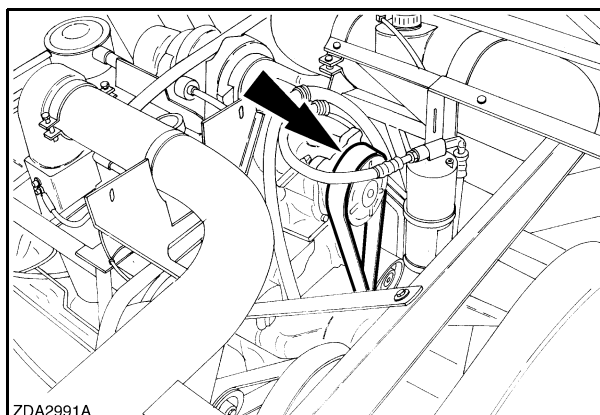
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3. Remove all necessary hardware and components in order to gain access to the cylinder head. Refer to Chapter 3 "Remove and Replace, 7.5L NH Engine" for further details.



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4. Remove the fan belt.



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