

CONTENTS

ENGINE – Td6	12-1-1
Td 6 – External View	12-1-1
Description	12-1-2
ENGINE - V8	12-2-1
V8 – External View	12-2-1
Description	12-2-2
ENGINE MANAGEMENT SYSTEM – Td6	18-1-1
Engine Management Component Location – Sheet 1 of 2	18-1-2
Engine Management Component Location – Sheet 2 of 2	18-1-4
Engine Management Control Diagram – Sheet 1 of 2	18-1-6
Engine Management Control Diagram – Sheet 2 of 2	18-1-8
Description	18-1-10
Operation	18-1-35
Cruise Control Component Location	18-1-39
Cruise Control, Control Diagram	18-1-40
Description	18-1-42
ENGINE MANAGEMENT SYSTEM – V8	18-2-1
Engine Management Component Location – Sheet 1 of 2	18-2-2
Engine Management Component Location – Sheet 2 of 2	18-2-4
Engine Management Control Diagram – Sheet 1 of 2	18-2-6
Engine Management Control Diagram – Sheet 2 of 2	18-2-8
Bosch ME 7.2 Engine Management System	18-2-10
Variable Camshaft Control Components	18-2-41
VCC System	18-2-42
Cruise Control Component Location	18-2-50
Cruise Control System Control Diagram	18-2-51
Cruise Control	18-2-53
EVAP System	18-2-55
Emissions	18-2-56
FUEL DELIVERY SYSTEM – Td6	19-1-1
Td6 Fuel Delivery Component Location – Sheet 1 of 2	19-1-1
Td6 Fuel Delivery Component Location – Sheet 2 of 2	19-1-2
Td6 Fuel System Schematic	19-1-4
Description	19-1-6
FUEL DELIVERY SYSTEM – V8	19-2-1
Fuel Delivery System Component Location (All Except NAS)	19-2-2
Fuel Delivery System Component Location (NAS)	19-2-4
V8 Fuel Delivery System	19-2-6

CONTENTS

COOLING SYSTEM – Td6	26-1-1
Td6 Cooling System – Sheet 1 of 2	26-1-2
Td6 Cooling System – Sheet 2 of 2	26-1-4
Td6 Coolant Flow	26-1-6
Description	26-1-8
COOLING SYSTEM – V8	26-2-1
V8 Cooling System – Sheet 1 of 2	26-2-2
V8 Cooling System – Sheet 2 of 2	26-2-4
V8 Coolant Flow – Models With FBH	26-2-6
Description	26-2-8
MANIFOLDS AND EXHAUST SYSTEM – Td6	30-1-1
Exhaust Manifold Component Layout	30-1-2
Inlet Manifold Component Layout	30-1-4
Exhaust System Component Layout	30-1-6
Description	30-1-8
MANIFOLDS AND EXHAUST SYSTEM – V8	26-2-1
Exhaust Manifold Component Layout	26-2-1
Inlet Manifold Component Layout	26-2-2
Exhaust System Component Layout	26-2-4
Description	26-2-6
TRANSFER BOX	41-1
Transfer Box Component Location	41-1
Transfer Box Exploded View	41-2
Transfer Box Control Diagram	41-4
Description	41-6
Operation	41-20
AUTOMATIC TRANSMISSION – GM 5L40-E	44-1-1
GM 5L40-E Automatic Transmission Component Location	44-1-2
GM 5L40-E Automatic Transmission – Exploded View	44-1-4
GM 5L40-E Automatic Transmission – Sectional View	44-1-6
GM 5L40-E Automatic Transmission – Valve Block and Solenoid Valves	44-1-8
GM 5L40-E Automatic Transmission – Fluid Pump Cover Plate Assembly	44-1-10
GM 5L40-E Automatic Transmission Control Diagram	44-1-12
Description	44-1-14
Operation	44-1-58

CONTENTS

AUTOMATIC TRANSMISSION – ZF 5HP24	44-2-1
ZF 5HP24 Automatic Transmission Component Location	44-2-2
ZF 5HP24 Automatic Transmission – Exploded View.....	44-2-4
ZF 5HP24 Automatic Transmission – Sectional View.....	44-2-6
ZF 5HP24 Automatic Transmission – Valve Block and Solenoid Valves	44-2-8
ZF 5HP24 Automatic Transmission Control Diagram	44-2-10
Description	44-2-12
Operation	44-2-50
DRIVE AND PROPELLER SHAFTS	47-1
Drive and Propeller Shafts – Component Location.....	47-1
Description	47-2
FINAL DRIVE	51-1
Differentials – Component Location	51-1
Description	51-2
Operation	51-10
STEERING	57-1
Steering Component Location – Td6	57-1
Steering Component Location – V8	57-2
Steering Control Diagram – Servotronic	57-3
Steering Control Diagram – Column Adjustment – Without Memory	57-4
Steering Control Diagram – Column Adjustment – With Memory	57-5
Steering Control Diagram – Column Lock	57-6
Steering Control Diagram – Steering Wheel Heating	57-8
Description	57-9
Operation	57-22
SUSPENSION	60-1
Suspension Component Location.....	60-1
Suspension Control Diagram	60-2
Description	60-3
Operation	60-27
BRAKES	70-1
Braking System Component Location.....	70-2
Front Brake Components	70-4
Rear Brake Components	70-5
Foundation Brakes	70-6
Dynamic Stability Control System Control Diagram	70-12
Dynamic Stability Control	70-14
Operation	70-26
Hand Brake Component Location.....	70-32
Hand Brake	70-34

CONTENTS

RESTRAINT SYSTEMS	75-1
Front Seat Belts	75-1
Rear Seat Belts	75-2
SRS Component Layout – Sheet 1 of 2	75-3
SRS Component Layout – Sheet 2 of 2	75-4
Description	75-5
SRS Control Diagram	75-18
Operation	75-20
DOORS	76-1-1
Front Door	76-1-1
Doors	76-1-2
Operation	76-1-10
INTERIOR TRIM COMPONENTS	76-3-1
Interior Mirror	76-3-1
Description	76-3-2
SEATS	76-5-1
Front Seat	76-5-1
Description	76-5-2
Seat Heating	76-5-8
SUNROOF	76-6-1
Sunroof Layout	76-6-1
Sunroof	76-6-2
Operation	76-6-3
AIR CONDITIONING	82-1
Refrigerant System Component Location	82-1
Heater Assembly and Ducting Component Location	82-2
Control System Component Location	82-4
FBH System Component Location	82-5
Description	82-6
A/C Control Diagram – Low Line System, Sheet 1 of 2	82-32
A/C Control Diagram – Low Line System, Sheet 2 of 2	82-34
A/C Control Diagram – High Line System, Sheet 1 of 2	82-36
A/C Control Diagram – High Line System, Sheet 2 of 2	82-38
Operation	82-40
WIPERS AND WASHERS	84-1
Wiper and Washer System Component Location	84-2
Wipers and Washers Control Diagram	84-4
Description	84-6
Operation	84-18

CONTENTS

CHARGING AND STARTING	86-1-1
Charging and Starting Component Location – Td6	86-1-1
Charging and Starting Component Location – V8	86-1-2
Description	86-1-3
LIGHTING	86-2-1
Exterior Lighting Component Location	86-2-2
Exterior Lighting Control Diagram – Sheet 1 of 2	86-2-4
Exterior Lighting Control Diagram – Sheet 2 of 2	86-2-6
Description	86-2-8
Operation	86-2-27
Interior Lighting Component Location	86-2-32
Interior Lighting Control Diagram	86-2-34
Description	86-2-36
Operation	86-2-38
BODY CONTROL UNIT	86-3-1
BCU Component Location	86-3-1
Description	86-3-2
COMMUNICATION DATA BUSES	86-4-1
Communication Data Buses Control Diagram – Sheet 1 of 2	86-4-2
Communication Data Buses Control Diagram – Sheet 2 of 2	86-4-4
Description	86-4-6
SECURITY	86-5-1
Locking and Alarm Component Layout – Sheet 1 of 2	86-5-1
Locking and Alarm Component Layout – Sheet 2 of 2	86-5-2
Immobilisation Component Layout	86-5-3
Description	86-5-4
Alarm and Locking Control Diagram	86-5-16
Immobilisation Control Diagram – Diesel	86-5-18
Immobilisation Control Diagram – Petrol	86-5-19
Operation	86-5-20
WINDOWS	86-6-1
Windows Component Layout	86-6-1
Description	86-6-2
Windows Control Diagram	86-6-6
Operation	86-6-8

CONTENTS

ENTERTAINMENT AND INFORMATION SYSTEMS	86-8-1
MID Audio System Component Location	86-8-2
MID Audio System Control Diagram	86-8-4
Multi-Function Display Audio Component Location	86-8-6
Multi-Function Display Audio Control Diagram	86-8-8
Screen Aerial Components	86-8-10
Speaker System Component Location	86-8-11
Base Speaker Control Diagram	86-8-12
Power Amplifier Speaker System Control Diagram	86-8-14
DSP Amplifier Speaker System Control Diagram	86-8-16
Audio Systems	86-8-18
Navigation System Component Location (Except Japan)	86-8-37
Navigation System Control Diagram (Except Japan)	86-8-38
Navigation System Component Location (Japan Only)	86-8-40
Navigation System Control Diagram (Japan Only)	86-8-42
New Range Rover Navigation System	86-8-44
Telephone System Component Location	86-8-55
Telephone System Control Diagram	86-8-56
Telecommunication System	86-8-58
Voice Recognition System Control	86-8-63
DRIVING AIDS	86-10-1
Park Distance Control Component Layout	86-10-1
PDC Control Diagram	86-10-2
Description	86-10-3
Operation	86-10-6
Tyre Pressure Monitoring Component Layout	86-10-8
TPM Control Diagram	86-10-10
Description	86-10-12
Operation	86-10-15
INSTRUMENTS	88-1
Instrument Pack – Front View	88-1
Instrument Pack – Front View – NAS Only	88-2
Instrument Pack – Control Diagram	88-4
Description	88-6
Operation	88-31



Td 6 – External View



M12 7758A

ENGINE – TD6


Description

General

The Td6 diesel engine is a 3.0 litre, 6 cylinder, in-line direct injection unit, with 4 valves per cylinder, operated by two overhead camshafts. The engine emissions comply with ECD3 (European Commission Directive) legislative requirements and employs a catalytic converter, electronic engine management control, positive crankcase ventilation and exhaust gas recirculation to limit the emission of pollutants. The unit is water cooled and turbo-charged. The fuel injection system features common rail technology.

The cylinder block is of cast iron construction with a cast aluminium stiffening plate bolted to the bottom of the block to improve lower structure rigidity. The cylinder head is cast aluminium with a moulded plastic camshaft cover. The single-piece oil sump is also cast aluminium. The exhaust manifold is mounted on the right side of the engine and a moulded plastic acoustic cover is fitted over the upper engine to reduce engine generated noise.

To reduce the level of transmitted engine vibration to the vehicle body, the engine is mounted on two hydraulically damped mountings, fitted between the engine support brackets and engine sub-frame. These are controlled by the Engine Control Module (ECM).

 **ENGINE MANAGEMENT SYSTEM – Td6, DESCRIPTION AND OPERATION, Description.**

Technical Features

The technical features include:

- In-line 6–cylinder engine with a cast iron crankcase
- Plastic cylinder head cover
- Light alloy cylinder head
- 4-valve technology with centrally arranged fuel injector
- Valves and springs identical to the Td4
- Plastic manifold based on two-shell weld technology
- Exhaust turbocharger, with Variable Nozzle Turbine (VNT)
- Compression ratio 18:1
- Common rail fuel injection system
- High pressure fuel pump
- Cooling duct pistons with central crown bowl
- Electronically controlled Exhaust Gas Recirculation (EGR)
- Exhaust re-treatment by means of a diesel specific oxidation catalytic converter and primary catalytic converter
- Switchable hydraulic engine mounts
- 7-blade cooling fan with viscous clutch drive
- Engine cut out begins at 4000 rpm. The cutout limit is reached at approx. 4800 rpm.

Engine Data

The technical data is detailed below.

DESCRIPTION	TYPE
Engine type/valves	R6/4
Displacement (eff.)	2926 ccm
Stroke/bore	88.0/84.0 mm
Compression ratio	18 : 1
Firing order	1, 5, 3, 6, 2, 4
Engine weight	210 kg
Power to weight ratio	1.56 kg/kW
Total oil capacity (including filter)	8.8 litres



Cylinder Block Components

The cylinder block components are described below:

Cylinder Block

The cylinders and crankcase are contained in the cylinder block, which is of single grey cast iron construction with hollow beam structure. The cylinders are direct bored. Oil is supplied via lubrication jets for piston and gudgeon pin lubrication and cooling.

Lubrication oil is distributed throughout the block via the main oil gallery to critical moving parts through channels bored in the block which divert oil to the main bearings, and to the big-end bearings via holes machined into the crankshaft.

A tapping at the front RH side of the cylinder block connects a pipe to the turbocharger by means of a banjo connection. Oil under pressure from the oil pump provides lubrication for the turbocharger bearings.

Cylinder cooling is achieved by coolant circulating through chambers in the engine block casting.

NOTE: The water jacket does not have core plugs.

Two hollow metal dowels are used to locate the cylinder block to the cylinder head, one on each side at the front of the unit. Two additional hollow metal dowels are used to locate the timing cover to the cylinder block.

A port is included at the rear right hand side of the cylinder block which connects to the turbocharger oil drain pipe to return lubrication oil to the sump.

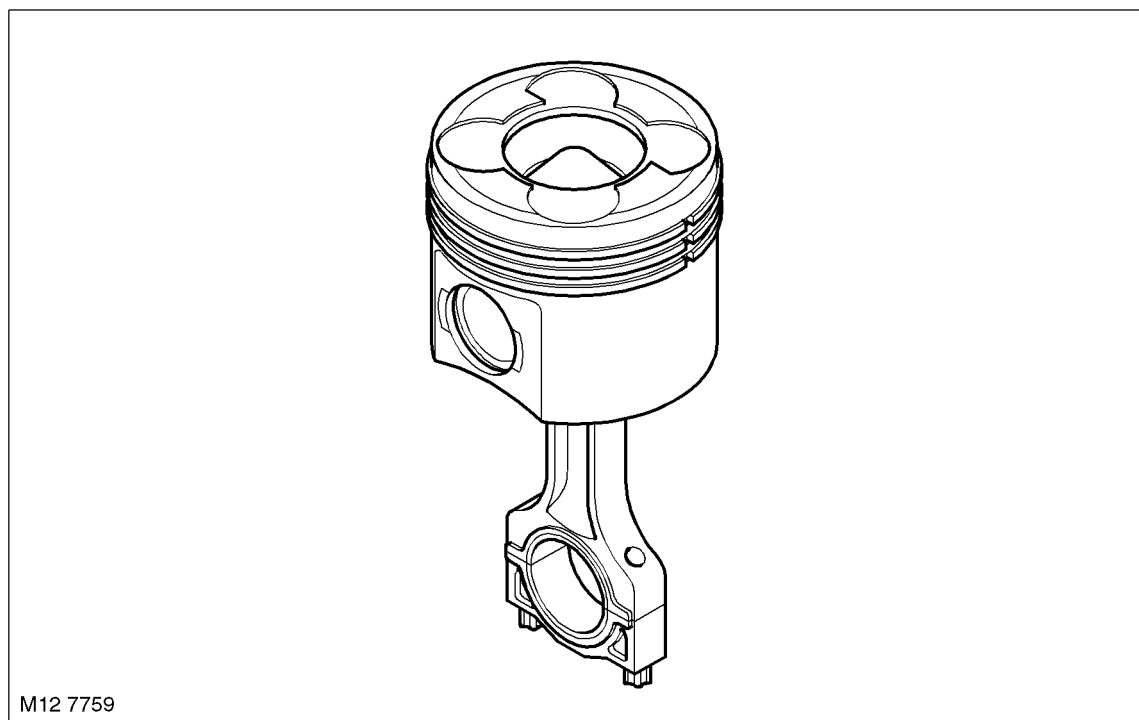
A plug sealing the lubrication cross-drilling gallery is located at the front right hand side of the cylinder block. Plugs for the main lubrication gallery are included at the front and rear of the cylinder block.

Connecting Rods

The connecting rods are machined, H-sectioned steel forgings. The big-end bearing shells are plain split halves. The upper half of the bearing shell is treated using the sputtering process (cathodic surface coating process) to improve its resistance to wear.

The small-end of the connecting rod has a bushed solid eye which is free to move on the gudgeon pin. The small-end bush is a hand-push transition fit.

Connecting Rod and Piston



Pistons

The six pistons are gravity die cast with graphite-compound coated aluminium alloy skirts. Although the piston is similar to that fitted to the Td4 engine the lobe in the piston crown bowl is higher.

The combustion chamber is designed on a swirl chamber principle.

The swirl chamber partly contains the inlet air during the combustion process and helps provide turbulence for efficient air/fuel mixture to promote complete combustion. This reduces fuel consumption, exhaust emission and smoke produced at full load. The four recesses in the piston's crown also provide clearance for the valve heads.

The pistons are attached to the small-end of the connecting rods by fully floating gudgeon pins which are retained in the piston by circlips.

The pistons incorporate an oil cooling channel for piston and gudgeon pin cooling, oil being supplied under pressure from the piston lubrication jets.

Piston Rings

Each piston is fitted with two compression rings and an oil control ring. The top compression ring is located in a steel insert ring carrier which helps to provide a minimal reaction to compression forces.

The top ring is a 10° chromium-plated keystone ring. The 2nd compression ring is a tapered compression ring and the lower ring is a chromium-plated spring loaded bevelled ring.

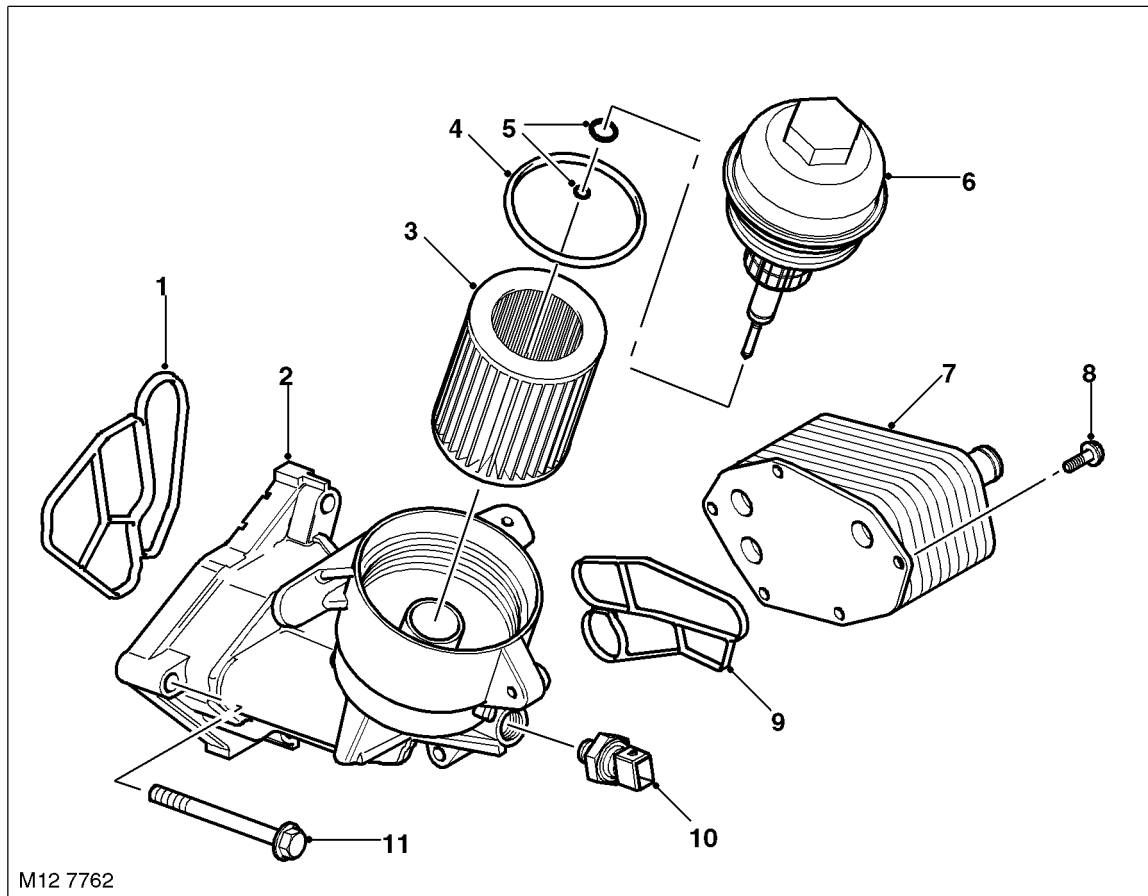
Piston Lubrication Jets

The six lubrication jets (one for each cylinder) have a long hook-type nozzle and are fitted at the bottom right hand side of each cylinder.

The jets provide lubrication to the cylinder walls, and to the piston underskirt for cooling the pistons and lubricating the gudgeon pins and small-end bearings. The input port to each lubrication jet mates with a port provided in each mounting position, tapped at the underside of the cylinder block from a main gallery on the RH side of the block.



Integrated Oil Cooler and Filter Assembly



M12 7762

- | | |
|-----------------------|--|
| 1 Sealing gasket | 8 Heat exchanger to filter housing attachment bolt (Torx –3 off) |
| 2 Filter housing | 9 Heat exchanger to filter housing gasket |
| 3 Filter element | 10 Oil pressure switch |
| 4 O-ring seal – cap | 11 Filter housing to engine block attachment bolts – 3 off |
| 5 O-ring seal (2 off) | |
| 6 Filter cap | |
| 7 Heat exchanger | |

The combined engine oil cooler and filter assembly, mounted to the left side of the engine block, is connected to the vehicle cooling and lubrication systems. The disposable paper filter element is replaced by unscrewing the cover from the filter housing.

The oil filter housing has an integral thermostatic valve which controls the amount of oil flowing through the oil cooler, dependent on the oil temperature.

Oil from the cylinder block passes through the oil filter housing and partial flow is directed through the oil cooler before it is returned to the cylinder block. The coolant for the heat exchanger is supplied directly from the crankcase.

The oil pressure switch, operating a warning lamp in the instrument pack, is fitted to the oil filter housing.


Oil Pressure Switch

The oil pressure switch is located in a port in the oil filter housing. If the oil pressure drops below a given value the switch operates the warning lamp in the instrument pack

ENGINE – TD6


High Pressure Fuel Pump

The high pressure fuel pump supplies fuel to the fuel rail and is fixed to a flange on the front LH side of the cylinder block. The pump is a 3 radial piston type controlled by the EDC engine management system and chain driven from the crankshaft at 0.75 times engine speed.

 **ENGINE MANAGEMENT SYSTEM – Td6, DESCRIPTION AND OPERATION, Description.**

Crankshaft Position (CKP) Sensor

The crankshaft position (CKP) sensor is mounted on the rear LH side of the cylinder block. The sensor is an inductive type which acts on a reluctor on the flywheel.

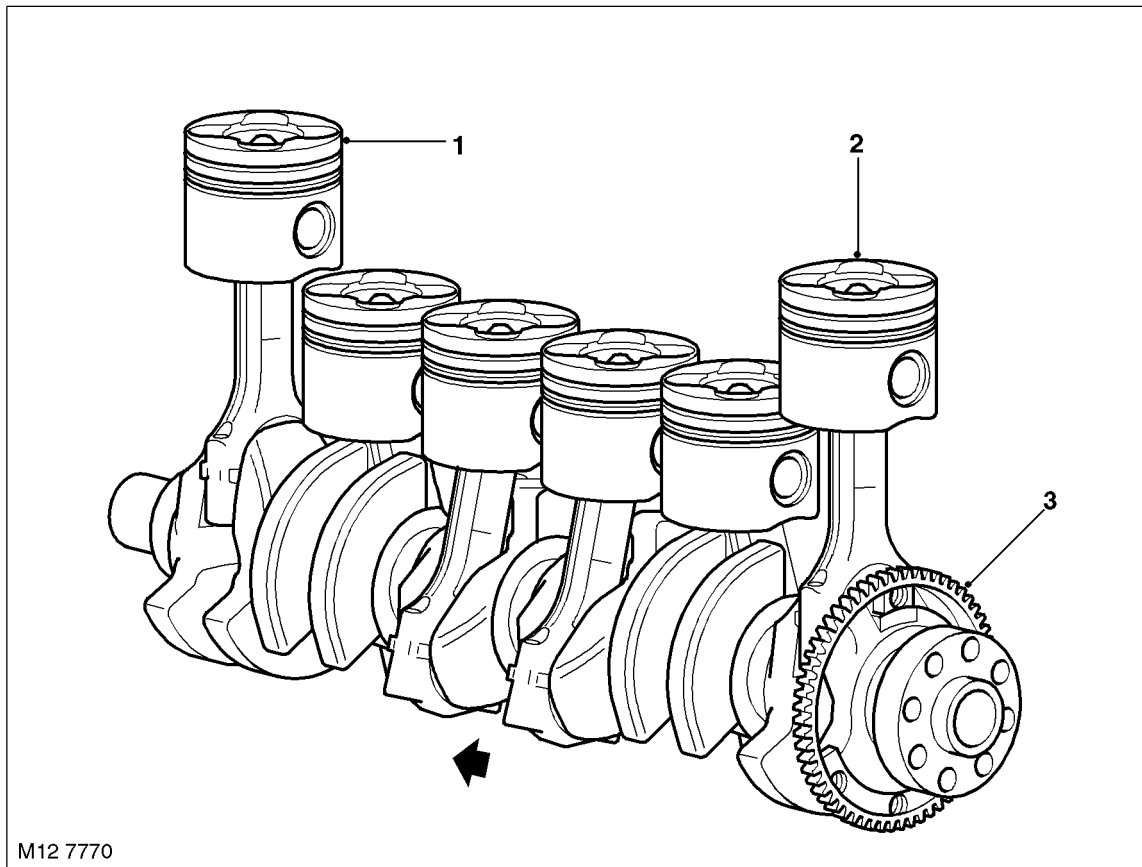
 **ENGINE MANAGEMENT SYSTEM – Td6, DESCRIPTION AND OPERATION, Description.**

Crankshaft and Sump Components

The crankshaft and sump and oil pump components are described below:

Crankshaft

Crankshaft Drive



Arrow denotes front of engine.

- 1 No 1 Piston
- 2 No 6 Piston

- 3 Incremental wheel

The crankshaft is manufactured from high tensile steel. The bearing surfaces and radii are inductively hardened for toughness and fatigue resistance. It is supported on 7 main bearings with a flanged thrust bearing located between No 5 and No 6 cylinders. Dynamic balancing is achieved by the use of twelve balance weights.

Cross-drillings in the crankshaft between the adjoining main and big-end bearings are used to divert the lubrication oil to the big-end bearings.