









# Workshop manual RANGE ROVER VOLUME 1



**This manual covers vehicles from  
introduction 1995**

01	INTRODUCTION
04	GENERAL SPECIFICATION DATA
05	ENGINE TUNING DATA
06	TORQUE VALUES
07	GENERAL FITTING REMINDERS
09	LUBRICANTS, FLUIDS AND CAPACITIES
10	MAINTENANCE
12	ENGINE BMW DIESEL
12	ENGINE LANDROVER V8
17	EMISSION CONTROL
19	FUEL SYSTEM BMW DIESEL
19	FUEL SYSTEM LANDROVER V8
19	CRUISE CONTROL
26	COOLING SYSTEM BMW DIESEL
26	COOLING SYSTEM LANDROVER V8
30	MANIFOLD AND EXHAUST SYSTEM
33	CLUTCH
37	MANUAL GEARBOX

	01 04 05 07 09
	10
	12
	17 19
	26
	30
	33
	37

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Workshop manual VDR100370  
Body Repair Manual LRL0085

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# 01 - INTRODUCTION

## CONTENTS

Page

### INFORMATION

INTRODUCTION .....	1
DIMENSIONS .....	1
REFERENCES .....	1
REPAIRS AND REPLACEMENTS .....	1
POISONOUS SUBSTANCES .....	1
FUEL HANDLING PRECAUTIONS .....	2
SYNTHETIC RUBBER .....	3
RECOMMENDED SEALANTS .....	3
USED ENGINE OIL .....	3
ACCESSORIES AND CONVERSIONS .....	4
WHEELS AND TYRES .....	4
STEAM CLEANING .....	4
SPECIFICATION .....	4
SPECIAL SERVICE TOOLS .....	5
COPYRIGHT .....	5
JACKING .....	6
HYDRAULIC VEHICLE RAMP (FOUR POST) .....	7
TWO POST VEHICLE RAMPS .....	7
DYNAMOMETER TESTING - VEHICLES WITH ANTI-LOCK BRAKES (ABS) .....	7
JUMP STARTING .....	8
ABBREVIATIONS AND SYMBOLS USED IN THIS MANUAL .....	9
VEHICLE IDENTIFICATION NUMBER (VIN) .....	12
LOCATION OF IDENTIFICATION NUMBERS .....	13
EMERGENCY TOWING .....	15
TRANSPORTING THE VEHICLE BY TRAILER .....	16








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## INTRODUCTION

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This workshop manual covers the New Range Rover vehicle from introduction in 1995, and is designed to be used in conjunction with Electrical Troubleshooting Manual LRL0329 and Electrical Circuit Diagrams YVB101590 (2nd Edition). Amendments and additional pages will be issued to ensure that the manual covers latest models. Amendments and additions will be identified by the addition of a dated footer at the bottom of the page.

This Workshop Manual is designed to assist skilled technicians in the efficient repair and maintenance of Range Rover vehicles.

**Individuals who undertake their own repairs should have some skill and training, and limit repairs to components which could not affect the safety of the vehicle or its passengers. Any repairs required to safety critical items such as steering, brakes, suspension or supplementary restraint system should be carried out by a Range Rover Dealer. Repairs to such items should NEVER be attempted by untrained individuals.**

**WARNINGS, CAUTIONS** and **NOTES** are given throughout this Manual in the following form:



**WARNING:** Procedures which must be followed precisely to avoid the possibility of personal injury.



**CAUTION:** This calls attention to procedures which must be followed to avoid damage to components.



**NOTE:** This calls attention to methods which make a job easier or gives helpful information.

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## DIMENSIONS

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The dimensions quoted are to design engineering specification. Alternative unit equivalents, shown in brackets following the dimensions, have been converted from the original specification.

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## REFERENCES

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References to the left or right hand side in the manual are made when viewing the vehicle from the rear. With the engine and gearbox assembly removed, the water pump end of the engine is referred to as the front.

To reduce repetition, some operations covered in this Manual do not include reference to testing the vehicle after repair.

It is essential that work is inspected and tested after completion and if necessary a road test of the vehicle is carried out particularly where safety related items are concerned.

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## REPAIRS AND REPLACEMENTS

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When replacement parts are required it is essential that Range Rover parts are used. Attention is particularly drawn to the following points concerning repairs and the fitting of replacement parts and accessories: Safety features embodied in the vehicle may be impaired if other than Range Rover parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the vehicle manufacturer's specification. Torque spanner values given in the Workshop Manual must be strictly adhered to. Locking devices, where specified, must be fitted. If the efficiency of a locking device is impaired during removal it must be replaced with a new one. Certain fasteners must not be re-used. These fasteners are specified in the Workshop Manual.

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## POISONOUS SUBSTANCES

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Many liquids and other substances used are toxic and should not be consumed under any circumstances, and should be kept away from open wounds. These substances amongst others include anti-freeze, brake fluid, fuel, oil, windscreen washer additives, air conditioning refrigerant, lubricants and various adhesives.

## FUEL HANDLING PRECAUTIONS

The following information provides basic precautions which must be observed if fuel is to be handled safely. It also outlines other potential risks which must not be ignored.

This information is issued for basic guidance only; in any case of doubt, seek advice from your local Fire Officer or Fire Department.

Fuel vapour is highly flammable and in confined spaces is also very explosive and toxic.

When fuel evaporates it produces 150 times its own volume in vapour, which when diluted with air becomes a readily ignitable mixture. The vapour is heavier than air and will always fall to the lowest level. It can readily be distributed throughout a workshop by air currents, consequently, even a small spillage of fuel is very dangerous.

Always have a fire extinguisher containing **FOAM CO<sub>2</sub> GAS**, or **POWDER** close at hand when handling fuel, or when dismantling fuel systems and in areas where fuel containers are stored.



**WARNING: It is imperative that the battery is not disconnected during fuel system repairs as arcing at the battery terminal could ignite fuel vapour in the atmosphere. Always disconnect the vehicle battery BEFORE carrying out work on the fuel system.**

**Whenever fuel is being handled, transferred or stored, or when fuel systems are being dismantled, all forms of ignition must be extinguished or removed, any leadlamps used must be flame proof and kept clear of spillage.**

**No one should be permitted to repair components associated with fuel without first having had fuel system training.**

### Hot fuel handling precautions



**WARNING: Before commencing any operation requiring fuel to be drained from the fuel tank, the following procedure must be adhered to:**

1. Allow sufficient time for the fuel to cool, thus avoiding contact with hot fuels.
2. Vent the system by removing the fuel filler cap in a well ventilated area. Refit the filler cap until the commencement of fuel drainage.

### Fuel transfer



**WARNING: Fuel must not be extracted or drained from any vehicle while it is standing over a pit.**

The transfer of fuel from the vehicle fuel tank must be carried out in a well ventilated area. An approved transfer tank must be used according to the transfer tank manufacturer's instructions and local regulations, including attention to grounding of tanks.

### Fuel tank removal

A **FUEL VAPOUR** warning label must be attached to the fuel tank upon removal from the vehicle.

### Fuel tank repair

Under no circumstances should a repair to any tank be attempted.



## SYNTHETIC RUBBER

Many 'O' ring seals, flexible pipes and other similar items which appear to be natural rubber are made of synthetic materials called Fluoroelastomers. Under normal operating conditions this material is safe, and does not present a health hazard. However, if the material is damaged by fire or excessive heat, it can break down and produce highly corrosive Hydrofluoric acid which can cause serious burns on contact with skin. Should the material be in a burnt or overheated condition, handle only with seamless industrial gloves. Decontaminate and dispose of the gloves immediately after use.

If skin contact does occur, remove any contaminated clothing immediately and obtain medical assistance without delay. In the meantime, wash the affected area with copious amounts of cold water or limewater for fifteen to sixty minutes.

## RECOMMENDED SEALANTS

A number of branded products are recommended in this manual for use during maintenance and repair work.

These items include:

**HYLOMAR GASKET AND JOINTING COMPOUND**  
and  
**HYLOSIL RTV SILICON COMPOUND.**

They should be available locally from garage equipment suppliers. If there is any problem obtaining supplies, contact the following company for advice and the address of the nearest supplier.

### MacDERMID LUBRICANTS LTD.

Hylo House,  
Cale lane,  
New Springs,  
Wigan  
WN2 1JR  
United Kingdom

Tel: 01942 824242  
Fax: 01942 501110

## USED ENGINE OIL



**WARNING: Prolonged and repeated contact with engine or motor oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis.**

**Used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.**

### Handling precautions

1. Avoid prolonged and repeated contact with oils, particularly used engine oils.
2. Wear protective clothing, including impervious gloves where applicable.
3. Do not put oily rags in pockets.
4. Avoid contaminating clothes, particularly underwear, with oil.
5. Overalls must be cleaned regularly. Discard unwashable clothing and oil impregnated footwear.
6. First aid treatment must be obtained immediately for open cuts and wounds.
7. Use barrier creams, before each work period, to help the removal of oil from the skin.
8. Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
9. Do not use gasoline, kerosene, diesel fuel, petrol, thinners or solvents for washing the skin.
10. If skin disorders develop, obtain medical advice.
11. Where practicable, degrease components prior to handling.
12. Where there is a risk of eye contact, eye protection should be worn, for example, goggles or face shields; in addition an eye wash facility should be provided.

### Disposing of used oils

#### Environmental protection precaution

It is illegal to pour used oil onto the ground, down sewers or drains, or into waterways.

Dispose of used oil through authorised waste disposal contractors. If in doubt, contact your Local Authority for advice on disposal facilities.

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**ACCESSORIES AND CONVERSIONS**

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**DO NOT FIT** unapproved accessories or conversions, as they could affect the safety of the vehicle. Land Rover will not accept liability for death, personal injury, or damage to property which may occur as a direct result of the fitment of non-approved conversions to the Range Rover.

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**WHEELS AND TYRES**

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**WARNING: DO NOT** replace the road wheels with any type other than genuine Range Rover wheels which are designed for multi-purpose on and off road use and have very important relationships with the proper operation of the suspension system and vehicle handling. Replacement tyres must be of the make and sizes recommended for the vehicle, and all tyres must be the same make, ply rating and tread pattern.



**CAUTION:** When refitting a road wheel, apply a suitable anti-seize compound such as Raworth 33/04, to the spigot bore of the wheel. This will prevent possible seizure of the wheel to the hub spigot. Ensure that no compound comes into contact with the braking components.

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**STEAM CLEANING**

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To prevent consequential rusting, any steam cleaning within the engine bay **MUST** be followed by careful re-waxing of the metallic components affected. Particular attention must be given to the steering column, engine water pipes, hose clips and ignition coil clamp.

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**SPECIFICATION**

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The specification details and instructions set out in this Manual apply only to a range of vehicles and not to any particular one. For the specification of a particular vehicle, purchasers should consult their Dealer.

The Manufacturers reserve the right to vary their specifications with or without notice, and at such times and in such manner as they think fit. Major as well as minor changes may be involved in accordance with the Manufacturer's policy of constant product improvement.

While every effort is made to ensure the accuracy of the particulars contained in this Manual, neither the Manufacturer nor Dealer, by whom this Manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.





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## SPECIAL SERVICE TOOLS

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The use of approved special service tools is important. They are essential if service operations are to be carried out efficiently, and safely. Where special tools are specified, **only these tools should be used to avoid the possibility of personal injury or damage to the components.** Also the amount of time which they save can be considerable.

Every special tool is designed with the close co-operation of Land Rover, and no tool is put into production which has not been tested and approved by us. New tools are only introduced where an operation cannot be satisfactorily carried out using existing tools or standard equipment. The user is therefore assured that the tool is necessary and that it will perform accurately, efficiently and safely.

Special tools bulletins will be issued periodically giving details of new tools as they are introduced.

All orders and enquiries from the United Kingdom should be sent direct to V. L. Churchill. Overseas orders should be placed with the local V. L. Churchill distributor, where one exists. Countries where there is no distributor may order direct from:

V. L. Churchill Limited,  
PO Box 3,  
Daventry, Northants,  
England, NN11 4NF.

The tools recommended in this Workshop Manual are listed in a multi-language illustrated catalogue, publication number **LPA ST ML 95**, which is obtainable from V. L. Churchill Limited at the above address.

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## COPYRIGHT

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## JACKING

The following instructions must be carried out before raising the vehicle off the ground.

1. Use a solid level ground surface.
2. Apply parking brake.
3. Select 'P' or 1st gear in main gearbox.
4. Select Low range in transfer gearbox.



**CAUTION:** To avoid damage occurring to the under body components of the vehicle the following jacking procedures must be adhered to.

**DO NOT POSITION JACKS OR AXLE STANDS UNDER THE FOLLOWING COMPONENTS.**

Body structure	Air suspension pipes
Bumpers	Fuel lines
Brake lines	Front radius arms
Panhard rod	Steering linkage
Rear Trailing links	Fuel tank
Engine sump	Gearbox bell housing



**CAUTION:** If supporting vehicle by the front crossmember, the safety stands must be positioned carefully to avoid damage to air suspension pipes.

## Vehicle jack

The jack provided with the vehicle is only intended to be used in an emergency, for changing a wheel. Do **NOT** use the jack for any other purpose. Refer to Owner's Manual for vehicle jack location points and procedure. Never work under a vehicle supported by the vehicle jack.

## Hydraulic jack

A hydraulic jack with a minimum 1500 kg, 3,300 lbs load capacity must be used.



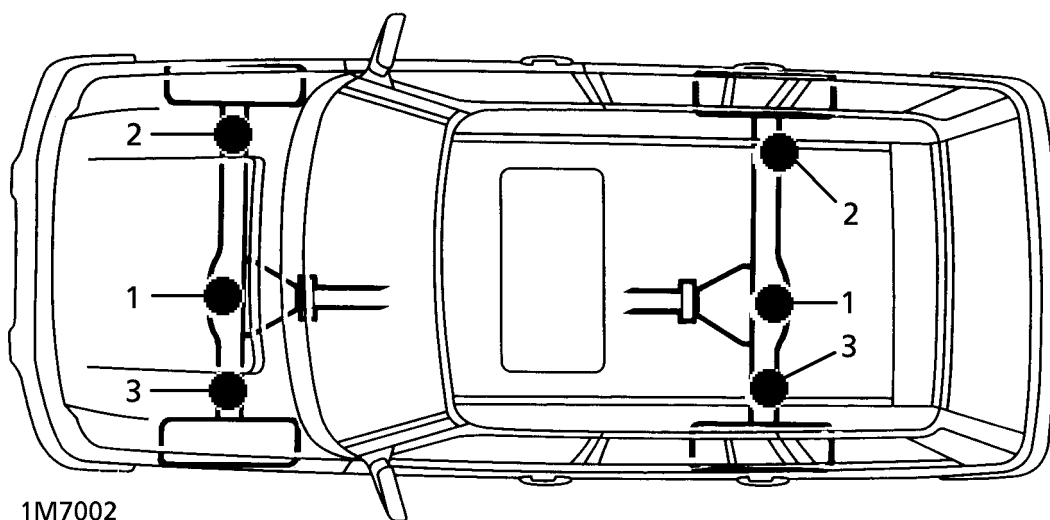
**CAUTION:** Do not commence work on the underside of the vehicle until suitable axle stands have been positioned under the axle.

## Raise the front of the vehicle

1. Position cup of hydraulic arm under differential casing.



**NOTE:** The differential casing is not central to the axle. Care should be taken when raising the front road wheels off the ground as the rear axle has less sway stiffness.



2. Raise front road wheels to enable an axle stand to be installed under left hand axle tube.
3. Position an axle stand under right hand axle tube, carefully lower jack until axle sits securely on both axle stands, remove trolley jack.
4. Before commencing work on underside of vehicle re-check security of vehicle on stands.
5. Reverse procedure when removing vehicle from stands.

#### Raise rear of vehicle

1. Position cup of hydraulic arm under differential casing.
2. Raise vehicle to enable axle stands to be installed under left and right hand axle tubes.
3. Lower jack until axle sits securely on axle stands, remove trolley jack.
4. Before commencing work on underside of vehicle re-check security of vehicle on stands.
5. Reverse procedure when removing vehicle from stands.

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#### HYDRAULIC VEHICLE RAMP (FOUR POST)

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Use only a 'drive on' type ramp which supports vehicle by its own road wheels. If a 'wheel-free' condition is required, use a 'drive on' ramp incorporating a 'wheel-free' system that supports under axle casings. Alternatively, place vehicle on a firm, flat floor and support on axle stands.

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#### TWO POST VEHICLE RAMPS

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The manufacturer of RANGE ROVER VEHICLES DOES NOT recommend using 'Two Post' ramps that employ four adjustable support arms. These are NOT considered safe for Range Rover vehicles.

If a vehicle is installed on a Two Post ramp, responsibility for safety of the vehicle and personnel performing service operations is attributable to the Service Provider.

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#### DYNAMOMETER TESTING - VEHICLES WITH ANTI-LOCK BRAKES (ABS)

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**WARNING: Do not attempt to test ABS function on a dynamometer**

#### Four wheel dynamometers



**NOTE: Before testing a vehicle on a four wheel dynamometer disconnect the valve relay. See *Electrical Trouble Shooting Manual*.**

**The ABS function will not work, the ABS warning light will illuminate. Normal braking will be available.**

Provided that front and rear rollers are rotating at identical speeds and that normal workshop safety standards are applied, there is no speed restriction during testing except any that may apply to the tyres.

#### Two wheel dynamometers

**IMPORTANT: Use a four wheel dynamometer for brake testing if possible.**



**NOTE: ABS will not function on a two wheel dynamometer. The ABS light will illuminate during testing. Normal braking will be available.**

If brake testing on a single rig is necessary it must be carried out with propeller shaft to the rear axle removed, AND neutral selected in BOTH main and transfer boxes.

If checking engine performance, the transfer box must be in high range and drive shaft to stationary axle removed.



**WARNING: Vehicles from 99 MY are fitted with 4 wheel traction control, which must be disabled prior to testing on a single axle dynamometer.**

## JUMP STARTING

**WARNING:** Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames, sparks or lighted tobacco are brought near battery. When charging or using a battery in an enclosed space, always provide ventilation and shield your eyes.

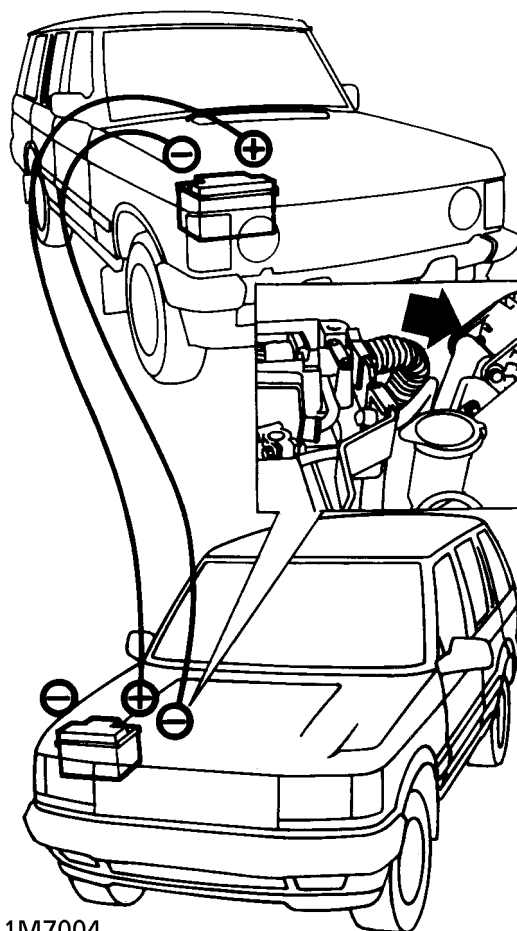
Keep out of reach of children. Batteries contain sulphuric acid. Avoid contact with skin, eyes, or clothing. Also, shield eyes when working near battery to protect against possible splashing of acid solution. In case of acid contact with skin, eyes, or clothing, flush immediately with water for a minimum of fifteen minutes. If acid is swallowed, drink large quantities of milk or water, followed by milk of magnesia, a beaten egg, or vegetable oil. **SEEK MEDICAL AID IMMEDIATELY.**

### To Jump Start - Negative Ground Battery

**WARNING:** To avoid any possibility of injury use particular care when connecting a booster battery to a discharged battery.

1. Position vehicles so that jump leads will reach, ensuring that vehicles **DO NOT TOUCH**, alternatively a fully charged slave battery may be positioned on floor adjacent to vehicle.
2. Ensure that ignition and all electrical accessories are switched off; the parking brake must be applied and neutral selected on a manual gearbox; for an automatic gearbox select neutral (N) or park (P). Connect the jump leads as follows;
  - A. Connect one end of first jumper cable to positive (+) terminal of booster battery.
  - B. Connect other end of first jumper cable to positive (+) terminal of discharged battery.
  - C. Connect one end of second jumper cable to negative terminal of booster battery.
  - D. Connect other end of second jumper cable to a good earth point on the engine, **NOT TO NEGATIVE TERMINAL OF DISCHARGED BATTERY**. Keep jumper lead away from moving parts, pulleys, drive belts and fan blade assembly.

**WARNING:** Making final cable connection could cause an electrical arc which if made near battery could cause an explosion.



1M7004

3. If booster battery is installed in another vehicle, start engine and allow to idle.
4. Start engine of vehicle with discharged battery, following starting procedure in Owners' Manual.

**CAUTION:** If vehicle fails to start within a maximum time of 12 seconds, switch ignition off and investigate cause. Failing to follow this instruction could result in irreparable damage to catalyts.

5. Remove negative (-) jumper cable from the engine and then terminal of booster battery.
6. Remove positive (+) jumper cable from positive terminals of booster battery and discharged battery.



## ABBREVIATIONS AND SYMBOLS USED IN THIS MANUAL

Across flats (bolt size) .....	AF	Digital Diesel Electronics .....	DDE
After bottom dead centre .....	ABDC	Digital Signal Processing .....	DSP
Air Conditioning .....	A/C	Digital Versatile Disc .....	DVD
Air Fuel Ratio .....	AFR	Direct current .....	dc
After top dead centre .....	ATDC	Direct Ignition System .....	DIS
Air Temperature Control .....	ATC	Direct Injection .....	DI
Alternating current .....	ac	Directional Control Valve .....	DCV
Ambient Air Pressure .....	AAP	Double Overhead Camshaft .....	DOHC
Ambient Air Temperature .....	AAT	Dual Mass Flywheel .....	DMF
Ambient Pressure .....	AP		
Ampere .....	amp or A	Electronic Air Control Valve .....	EACV
Ampere hour .....	amp hr	Electronic Air Suspension .....	EAS
Anti-lock Braking System .....	ABS	Electronic Automatic Transmission .....	EAT
Anti-shunt Control .....	ASC	Electronic Brake pressure Distribution .....	EBD
Automatic .....	Auto	Electronic Control Unit .....	ECU
Automatic Volume Control .....	AVC	Electronic Diesel Control .....	EDC
Auxiliary .....	AUX	Electronic Erasable Programmable Read Only Memory .....	EEPROM
		Electronic Fuel Injection .....	EFI
Battery Backed-Up Sounder .....	BBUS	Electronic Traction Control .....	ETC
Before bottom dead centre .....	BBDC	Electronic Unit Injector .....	EUI
Before top dead centre .....	BTDC	Electronic Vacuum Regulator .....	EVR
Body Electrical Control Module .....	BeCM	Electrical Reference Library .....	ERL
Boost Pressure .....	BP	Emergency Key Access .....	EKA
Bottom dead centre .....	BDC	Emergency Locking Retractor .....	ELR
Brake horse power .....	bhp	Engine Control Module .....	ECM
Brake Pedal Positions .....	BPP	Engine Coolant Temperature .....	ECT
British Standards .....	BS	Engine Fuel Temperature .....	EFT
		Engine Management System .....	EMS
Camshaft Position .....	CMP	Enhanced Other Network .....	EON
Calculated Load Value .....	CLV	European Community Directive .....	ECD
Canister Vent Solenoid .....	CVS	European Norm .....	EN
Carbon Dioxide .....	CO <sub>2</sub>	European Economic Community .....	EEC
Carbon monoxide .....	CO	European On Board Diagnostics .....	EOBD
Celsius .....	C	Evaporative Emission .....	EVAP
Centimetre .....	cm	Exhaust Gas Recirculation .....	EGR
Central Door Locking .....	CDL		
Centre Differential Control .....	CDC	Fahrenheit .....	F
Centre High Mounted Stop Lamp .....	CHMSL	Fast Throttle Control .....	FTC
Chlorofluorocarbon .....	CFC	Feet .....	ft
Clutch Pedal Position .....	CPP	Feet per minute .....	ft/min
Compact Disc .....	CD	Field Effect Transistor .....	FET
Compact Disc - Read Only Memory .....	CD-ROM	Fifth .....	5th
Controller Area Network .....	CAN	First .....	1st
Crankshaft Position .....	CKP	Fluid ounce .....	fl oz
Cubic centimetre .....	cm <sup>3</sup>	Foot pounds (torque) .....	lbf.ft
Cubic feet per minute .....	ft <sup>3</sup> /min	Fourth .....	4th
Cubic inch .....	in <sup>3</sup>	Fuel Burning Heater .....	FBH
		Fuel Injection Pump .....	FIP
dB .....	Decibels	Gallons .....	gal
Degree (angle) .....	deg or °	Gallons (US) .....	US gal
Degree (temperature) .....	deg or °	Gramme (force) .....	gf
Diagnostic Control Unit .....	DCU	Gramme (mass) .....	g
Dial Test Indicator .....	DTI	Greenwich Mean Time .....	GMT
Diameter .....	dia.	Global Positioning System .....	GPS
		Gravity .....	g

Heated Front Screen .....	HFS	Metre .....	m
Heated oxygen sensor .....	HO <sub>2</sub> S	Millilitre .....	ml
Heated Rear Window .....	HRW	Millimetre .....	mm
Height Dilution Of Precision .....	HDOP	Miles per gallon .....	mpg
High .....	HI	Miles per hour .....	mph
High compression .....	hc	Minus (of tolerance) .....	-
High Density Polyethylene .....	HDPE	Minimum .....	min.
High Molecular Weight .....	HMW	Minute (angle) .....	'
High Strength Low Alloy .....	HSLA	Model Year .....	MY
High tension (electrical) .....	HT or ht	Modular Engine Management System .....	MEMS
Hill Descent Control .....	HDC	Motorised Valve .....	MV
Hour .....	h	Multi-Function Logic .....	MFL
Hydrocarbons .....	HC	Multi-Function Unit .....	MFU
Hydrofluorocarbon .....	HFC	Multi-Point injection .....	MPI
		Multiport Fuel Injection .....	MFI
Idle Air Control Valve .....	IACV	Negative (electrical) .....	-ve
In Car Entertainment .....	ICE	Negative Temperature Coefficient .....	NTC
Inches of mercury .....	in. Hg	Newton metres (torque) .....	Nm
Inches .....	in	Nitrogen Dioxide .....	NO <sub>2</sub>
Inertia-fuel Shut Off .....	IFS	Non-Return Valve .....	NRV
Injector Pulse Width .....	IPW	North American Specification .....	NAS
Inlet Throttle .....	ILT	Number .....	No.
Intake Air Temperature .....	IAT		
Intermediate Frequency .....	IF	Off-road Mode .....	ORM
Internal diameter .....	I.D. or i.dia.	Ohms .....	ohm
International Organisation for Standardisation .....	ISO	On Board Diagnostics .....	OBD
		On Board Monitoring .....	OBM
Kilogramme (force) .....	kgf	Organic Acid Technology .....	OAT
Kilogramme (mass.) .....	kg	Ounces (force) .....	ozf
Kilogramme centimetre (torque) .....	kgf.cm	Ounces (mass) .....	oz
Kilogrammes per hour .....	kg/h	Ounce inch (torque) .....	ozf.in.
Kilogramme per square millimetre .....	kgf/mm <sup>2</sup>	Outside diameter .....	O.D. or o.dia.
Kilogramme per square centimetre .....	kgf/cm <sup>2</sup>	Overhead Cam .....	OHC
Kilogramme metres (torque) .....	kgf.m	Oxides of Nitrogen .....	NOx
Kilometres .....	km		
Kilometres per hour .....	km/h	Part number .....	Part No.
KiloPascal .....	kPa	Percentage .....	%
Kilowatts .....	kW	Pints .....	pt
Kilovolts .....	kV	Pints (US) .....	US pt
Knock Sensor .....	KS	Plus or Minus .....	±
		Plus (tolerance) .....	+
Left-hand .....	LH	Polytetrafluorethylene .....	PTFE
Left-hand Drive .....	LHD	Position Dilution Of Position .....	PDOP
Left-hand thread .....	LHThd	Positive (electrical) .....	+ve
Light Emitting Diode .....	LED	Positive Crankcase Ventilation .....	PCV
Litres .....	l	Positive Temperature Coefficient .....	PTC
Liquid Crystal Display .....	LCD	Pound (force) .....	lbf
Liquid Vapour Separator .....	LVS	Pounds force feet .....	lbf.ft
Low .....	LO	Pounds inch (torque) .....	lbf.in
Low compression .....	lc	Pound (mass) .....	lb(s)
Low Emission Vehicle .....	LEV	Pounds per square inch .....	psi
Low tension .....	l.t.	Pounds per square inch .....	lbf/in <sup>2</sup>
		Power Assisted Steering .....	PAS
Malfunction Indicator Light .....	MIL	Pressure Conscious Reducing Valve .....	PCRv
Manifold Absolute Pressure .....	MAP	Printed Circuit Board .....	PCB
Mass Air Flow .....	MAF	Programme Information .....	PI
Maximum .....	max.	Pulses Per Second .....	PPS
MegaPascal .....	MPa	Pulse Width Modulation .....	PWM
Metal Oxide Semiconductor Field Effect Transistor .....	MOSFET		



Radio Data Service .....	RDS
Radio Frequency .....	RF
Radius .....	r
Ratio .....	:
Read Only Memory .....	ROM
Red/Green/Blue .....	RGB
Reference .....	ref.
Regionalisation .....	REG
Research Octane Number .....	RON
Rest Of World .....	ROW
Revolution per minute .....	rev/min
Right-hand .....	RH
Right-hand Drive .....	RHD
Roll Over Valve .....	ROV
Rover Engineering Standards .....	RES
Second (angle) .....	"
Second (numerical order) .....	2nd
Secondary Air Injection .....	SAI
Self Levelling and Anti-Lock Brake System ....	SLABS
Self Levelling Suspension .....	SLS
Single Overhead Camshaft .....	SOHC
Single Point Entry .....	SPE
Society of Automotive Engineers .....	SAE
Specific gravity .....	sp.gr.
Square centimetres .....	cm <sup>2</sup>
Square inches .....	in <sup>2</sup>
Standard .....	std.
Standard wire gauge .....	s.w.g.
Supplementary Restraint System .....	SRS
Synchroniser/Synchromesh .....	synchro.
Temperature, Manifold Absolute Pressure .....	TMAP
Third .....	3rd
Thermostatic Expansion Valve .....	TXV
Three Way Catalyst .....	TWC
Throttle Position .....	TP
Top Dead Centre .....	TDC
Torsional Vibration .....	TV
Traffic Announcement .....	TA
Traffic Management Control .....	TMC
United Kingdom .....	UK
United States .....	US
US gallons per hour .....	US galls/h
Variable .....	Var.
Variable Intake System .....	VIS
Variable Reluctance Sensor .....	VRS
Vehicle Identification Number .....	VIN
Vehicle Information Communications System ....	VICS
Vehicle Speed Sensor .....	VSS
Velocity Dilatation Of Precision .....	VDOP
Volts .....	V
Watts .....	W
Wide Open Throttle .....	WOT

**SCREW THREADS**

American Standard Taper Pipe .....	NPTF
British Standard Pipe .....	BSP
Unified Coarse .....	UNC
Unified Fine .....	UNF

### VEHICLE IDENTIFICATION NUMBER (VIN)

An adhesive label containing the Vehicle Identification Number and the recommended maximum vehicle weights is located on the left hand side of the bonnet locking platform.

The number is also stamped on the outside of the chassis in the front RH wheel arch to the rear of the anti-roll bar link.



**NOTE:** It may be necessary to remove underseal in order to locate the number; ensure underseal is restored on completion.

ROVER GROUP LTD			
A	*	*	
B		2780	Kg
C		6280	Kg
D	1	1320	Kg
E	2	1840	Kg
PAINT		TRIM	
			PVG PVA
			LAND-ROVER

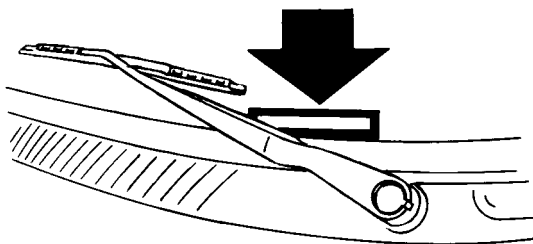
1M7003

### Federal (USA) vehicle identification number

An adhesive label containing the Vehicle Identification Number, date of manufacture and gross axle weight ratings is fixed to the lock face of the front left hand door. The information includes wheel and tyre sizes and tyre pressures at gross axle weight ratings.

### Key to Vehicle Identification Number Plate

- A. VIN (17 digits)
- B. Maximum permitted laden weight for vehicle
- C. Maximum vehicle and trailer weight
- D. Maximum road weight-front axle
- E. Maximum road weight-rear axle



1M7005

In addition, the VIN is stamped on a plate which is visible through the left side of the windscreen.



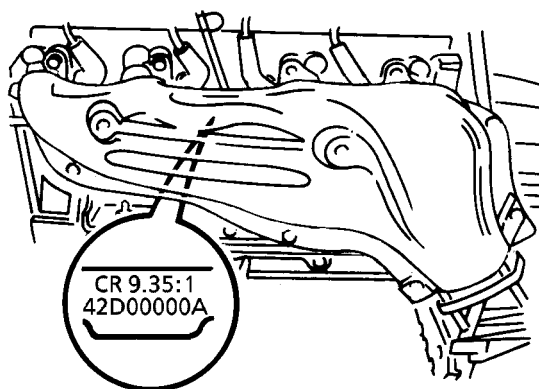
**LOCATION OF IDENTIFICATION NUMBERS**

**Engine serial number - V8 engine**

Stamped on a cast pad on the cylinder block, between numbers 3 and 5 cylinders.



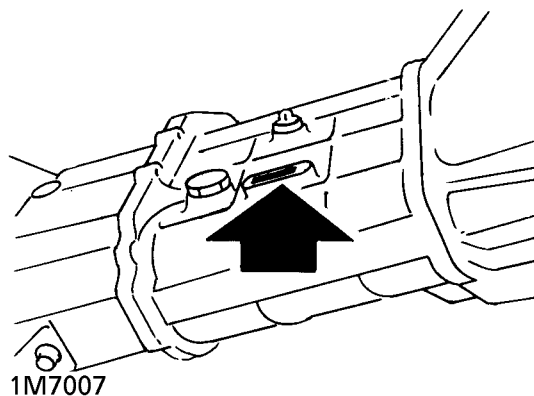
**NOTE: The engine compression ratio is stamped above the serial number.**



1M7006

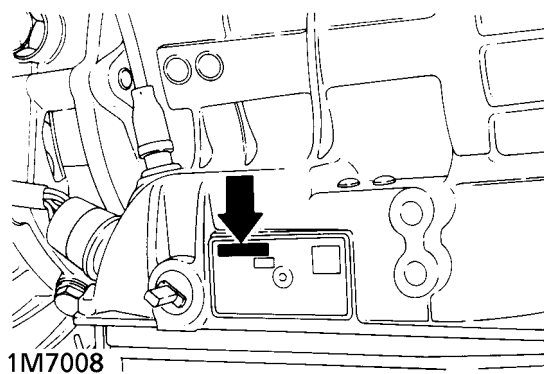
**Main gearbox R380 - 5 speed**

Stamped on a cast pad on the bottom right hand side of the gearbox.



**Automatic gearbox ZF4HP22/ZF4HP24**

Stamped on a plate riveted to the bottom left hand side of the gearbox casing.

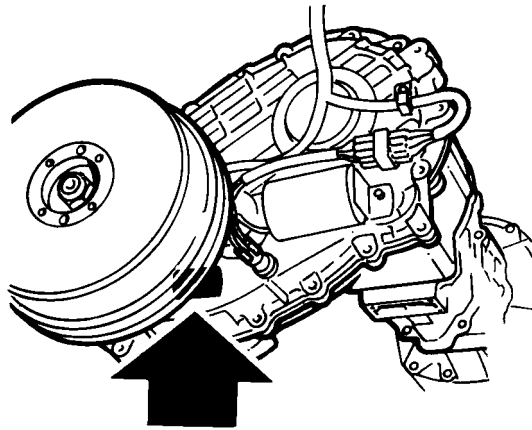


**Engine serial number - BMW Diesel engine**

Stamped on the LH side of the cylinder block above the sump.

**Transfer gearbox-Borg Warner**

Stamped on a plate attached to the gearbox casing, between filler/level and drain plug.



1M7009

**Front and rear axle**

Stamped on the left hand axle tubes.

**Vehicle identification number (VIN)**

Made up of 17 digits, these numbers are used to identify manufacturer, model range, specification, body type, engine, transmission/steering, model year, plant and build sequence number and serve to identify the vehicle.

This example shows the sequence:

**European code**

S A L L P A M J 7 M A

S Europe  
 AL UK  
 LP Range Rover  
 A European Spec.  
 M 4 Door Station Wagon  
 J 4.6 Litre Fuel Injection  
 7 Manual right steering  
 M 1995 Model Year  
 A Solihull

**Federal (USA) code**

S A L P V 1 2 4 2 S A

S Europe  
 AL UK  
 P Range Rover  
 V North America Spec.  
 1 4 Door Station Wagon  
 2 4.0 Litre fuel injection  
 4 Automatic, Left Hand Steering  
 2 Check Digit  
 S 1995 Model Year  
 A Solihull

## EMERGENCY TOWING



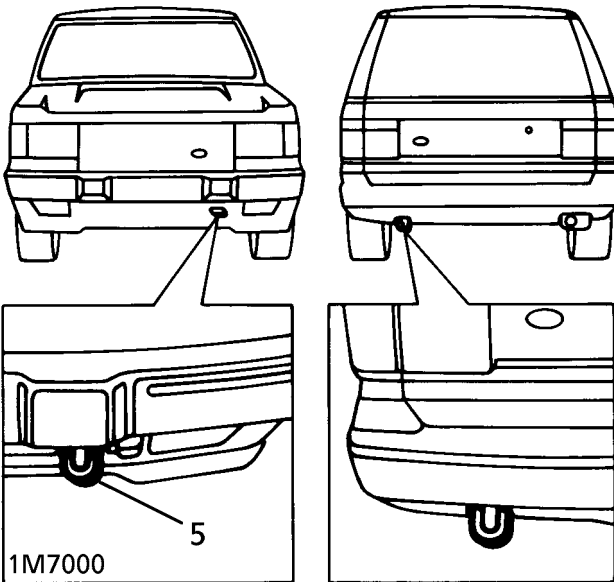
**CAUTION:** The New Range Rover has permanent four-wheel drive. The following instructions must be adhered to when towing:-

towing:-

### Towing the vehicle on four wheels

If it is necessary to recover the vehicle by towing on all four wheels, 'Transfer neutral' **MUST** be selected.

1. With the starter key removed, insert a fuse of 5 amps or more in fuse position '11' in the RH seat fuse box.
2. Turn the starter switch to position '2'; the transfer box will now automatically select neutral.
3. Wait until the message centre displays 'TRANSFER NEUTRAL' and then turn the starter switch off, position '0'.
4. Turn the starter switch to position '1' to unlock the steering and leave in this position while the vehicle is being towed.



5. Secure tow rope to the front towing eye.
6. Release the parking brake.



**CAUTION:** Power assistance for braking and steering systems will not be provided without the engine running. Greater pedal pressure will be required to apply the brakes, the steering wheel will require greater effort to turn the front wheels.

The vehicle tow connection should be used only in normal road conditions.



**CAUTION: DO NOT** remove the starter key or turn the switch to position '0' when the vehicle is in motion.

7. To reactivate the transfer box after towing, turn the starter switch off to position '0' and remove the fuse from position '11'. On automatic vehicles the transfer box will automatically engage the Low or High gear range.
8. On manual vehicles, first press the range change switch. The transfer box will then engage the Low or High gear range.

### Suspended tow by breakdown vehicle



**CAUTION:** To prevent vehicle damage, front or rear propeller shaft **MUST** be removed, dependant upon which axle is being trailed.

9. To facilitate reassembly, first mark the propeller shaft drive flanges at transfer box and axle.
10. Remove propeller shaft fixings and lift shaft from vehicle.
11. If the front axle is to be trailed, turn ignition key to position '1' to release the steering lock.



**CAUTION:** If the rear axle is to be raised, the steering wheel and/or linkage **MUST** be secured in a straight ahead position. **DO NOT** use the steering lock for this purpose.

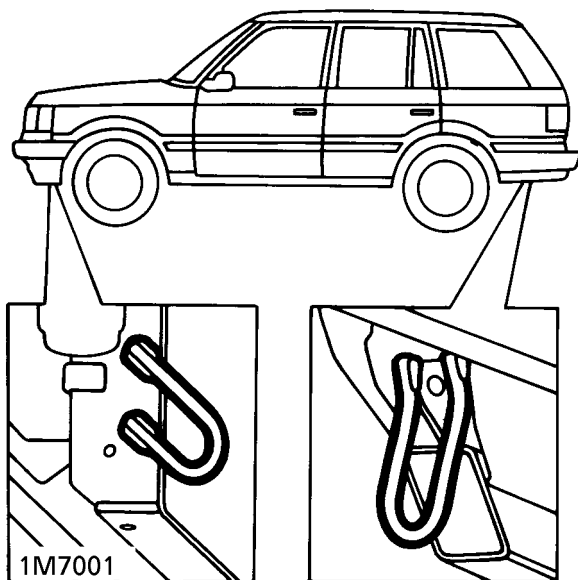
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**TRANSPORTING THE VEHICLE BY TRAILER**

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If the vehicle should require transporting on a trailer or the back of a lorry, the air suspension must be set to 'ACCESS' before being lashed. **See FRONT SUSPENSION, Description and operation.**

Lashing eyes are provided on the front and rear chassis cross members to facilitate the securing of the vehicle, as shown.



**CAUTION: DO NOT** secure lashing hooks or trailer fixings to any other part of the vehicle.



**CAUTION: If the air suspension cannot be set to the 'ACCESS' position, then the vehicle must be lashed by its wheels and not the lashing eyes.**

Install vehicle on the trailer and apply park brake. Select neutral in main gearbox; this will prevent damage to the parking pawl of the automatic gearbox.

## 04 - GENERAL SPECIFICATION DATA

### CONTENTS

Page

#### INFORMATION

ENGINE - 4.0 V8 .....	1
ENGINE - 4.6 V8 .....	4
ENGINE - BMW DIESEL .....	7
ENGINE MANAGEMENT SYSTEM (EMS) V8 ENGINE .....	10
FUEL SYSTEM - BMW DIESEL ENGINE .....	12
COOLING SYSTEM - V8 ENGINE .....	12
COOLING SYSTEM - BMW DIESEL ENGINE .....	12
MANUAL TRANSMISSION .....	13
AUTOMATIC TRANSMISSION .....	14
STEERING .....	15
SUSPENSION .....	15
SHOCK ABSORBERS .....	15
AIR CONDITIONING .....	15
BRAKES .....	16
ELECTRICAL .....	17
REPLACEMENT BULBS .....	18
VEHICLE WEIGHTS AND PAYLOAD .....	19
VEHICLE DIMENSIONS .....	20
TYRE PRESSURES .....	20
WHEELS AND TYRES .....	20








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**ENGINE - 4.0 V8**


---

Type .....	4.0 litre V8	
Number of cylinders .....	Eight, two banks of four	
Bore .....	94.00 - 94.04 mm	3.7008 - 3.7024 in
Stroke .....	71.04 - 71.20 mm	2.7966 - 2.8031 in
Capacity .....	3950 cm <sup>3</sup>	241 in <sup>3</sup>
Valve operation .....	Overhead by push-rod	
Compression ratio	<b>High Compression</b>	<b>Low Compression</b>
Up to 99MY .....	9.35:1	8.2:1
From 99MY .....	9.38:1	8.23:1
Maximum power (at 4750 rev/min)		
Up to 99MY .....	140 kW	132 kW
From 99MY		
All except NAS .....	136 kW	132 kW
NAS only .....	140 kW	-

**Crankshaft**

Main journal diameter .....	63.500 - 63.487 mm	2.50 - 2.4995 in
Crankpin journal diameter .....	55.513 - 55.500 mm	2.1856 - 2.1850 in
Crankshaft end thrust/end float .....	Taken on thrust washers of centre main bearing	
	0.10 - 0.20 mm	0.004 - 0.008 in

**Main bearings**

Number and type		
Up to 99MY .....	5, Vandervell shells	
From 99MY .....	5, Glacier Vandervell / AS15	
Material .....	Lead bronze with lead-indium overlay	
Diametrical clearance .....	0.010 - 0.048 mm	0.0004 - 0.002 in

**Connecting rods**

Type .....	Horizontally split big-end, plain small-end	
Length between centres .....	155.12 - 155.22 mm	6.1071 - 6.1110 in

**Big-end bearings**

Type and material		
Up to 99MY .....	Vandervell VP Lead bronze with lead-indium overlay	
From 99MY .....	Glacier Vandervell GPL2120 / AS124A	
Diametrical clearance .....	0.015 - 0.055 mm	0.0006 - 0.002 in

**Piston pins**

Length .....	60.00 - 60.50 mm	2.3622 - 2.3819 in
Diameter .....	23.995 - 24.000 mm	0.9447 - 0.9449 in
Fit-in connecting rod .....	Press fit	
Clearance in piston .....	0.015 - 0.006 mm	0.00059 - 0.00024 in

**Pistons**

Clearance in bore, measured 10 mm from base of skirt at right angles to piston pin

Up to 99MY .....	0.020 - 0.050 mm	0.0008 - 0.0020 in
From 99MY .....	0.022 - 0.067 mm	0.0009 - 0.0026 in

**Piston rings**

Number of compression rings .....	2	
Number of oil control rings .....	1	
No 1 compression ring .....	Nitrided steel barrel faced	
No 2 compression ring .....	Tapered spherical barrel marked 'TOP'	
Width of compression rings		
Bottom .....	1.478 - 1.49 mm	0.0582 - 0.0587 in
Top		
Up to 99MY .....	1.21 - 1.23 mm	0.0476 - 0.0484 in
From 99MY .....	1.17 - 1.19 mm	0.0461 - 0.0479 in
Compression ring gap		
Bottom .....	0.40 - 0.65 mm	0.0157 - 0.0256 in
Top .....	0.3 - 0.5 mm	0.0118 - 0.0197 in
Oil control ring type		
Up to 99MY .....	Aclonofom	
From 99MY .....	3 Piece Aeconoform	
Oil control ring width .....	3.0 mm	0.1181 in
Oil control ring rail gap .....	0.38-1.40 mm	0.0150 - 0.0551 in

**Camshaft**

Location .....	Central	
Bearings .....	Non serviceable	
Number of bearings .....	5	
Drive .....	Chain 9.52 mm pitch x 54 pitches.	
Camshaft end float		
Up to 99MY .....	0.076 - 0.355 mm	0.003 - 0.014 in
From 99MY .....	0.075 - 0.350 mm	0.002 - 0.013 in

**Tappets** ..... Hydraulic self-adjusting





**Valves**

Length		
Inlet .....	116.59 - 117.35 mm	4.590 - 4.620 in
Exhaust .....	116.59 - 117.35 mm	4.590 - 4.620 in
Seat angle	<b>Up to 99MY</b>	<b>From 99MY</b>
Inlet .....	46° - 46° 25'	45° - 45° 30'
Exhaust .....	46° - 46° 25'	45° - 45° 30'
Head diameter		
Inlet .....	39.75 - 40.00 mm	1.565 - 1.575 in
Exhaust .....	34.227 - 34.48 mm	1.3475 - 1.3575 in
Stem diameter		
Inlet .....	8.664 - 8.679 mm	0.3411 - 0.3417 in
Exhaust .....	8.651 - 8.666 mm	0.3406 - 0.3412 in
Stem to guide clearance		
Inlet .....	0.025 - 0.066 mm	0.0010 - 0.0026 in
Exhaust .....	0.038 - 0.078 mm	0.0015 - 0.0031 in
Valve lift (inlet and exhaust) .....	9.94 mm	0.3913 in
Valve spring length fitted		
Up to 99MY .....	40.40 mm (1.59 in) at pressure of 29.5 kg (65 lb)	
From 99MY .....	40.93 mm (1.61 in) at pressure of 29.5 kg (65 lb)	

**Lubrication**

System type .....	Wet sump, pressure fed
Oil pump type .....	Crank driven rotor
Oil pressure	
Up to 99MY .....	2.06 to 2.7 bar (30 to 40 lbf/in <sup>2</sup> ) at 2400 rev/min with engine warm
From 99MY .....	3.45 bar (50 lbf/in <sup>2</sup> ) at 2000 rev/min with engine warm
Oil filter-internal .....	Wire screen, pump intake filter in sump
Oil filter-external .....	Full flow, self-contained cartridge

**ENGINE - 4.6 V8**

Type .....	4.6 litre V8	
Number of cylinders .....	Eight, two banks of four	
Bore .....	94.00 - 94.04 mm	3.7008 - 3.7024 in
Stroke .....	81.92 - 82.08 mm	3.2252 - 3.2315 in
Capacity .....	4554 cm <sup>3</sup>	278 in <sup>3</sup>
Valve operation .....	Overhead by push-rod	
Compression ratio	<b>High Compression</b>	<b>Low Compression</b>
Up to 99MY .....	9.35:1	8.36:1
From 99MY .....	9.37:1	8.37:1
Maximum power (at 4750 rev/min)		
Up to 99MY .....	165.5 kW	157 kW
From 99MY		
All except NAS .....	160 kW	150 kW
NAS only .....	165.5 kW	

**Crankshaft**

Main journal diameter .....	63.500 - 63.487 mm	2.50 - 2.4995 in
Crankpin journal diameter .....	55.513 - 55.500 mm	2.21 - 2.20 in
Crankshaft end thrust/end float .....	Taken on thrust washers of centre main bearing	
	0.10 - 0.20 mm	0.004 - 0.008 in

**Main bearings**

Number and type		
Up to 99MY .....	5, Vandervell shells	
From 99MY .....	5, Glacier Vandervell / AS15	
Material .....	Lead bronze with lead-indium overlay	
Diametrical clearance .....	0.010 - 0.048 mm	0.0004 - 0.002 in

**Connecting rods**

Type .....	Horizontally split big-end, plain small-end	
Length between centres .....	149.68 - 149.78 mm	5.893 - 5.897 in

**Big-end bearings**

Type and material		
Up to 99MY .....	Vandervell VP Lead bronze with lead-indium overlay	
From 99MY .....	Glacier Vandervell GPL2120/AS124A	
Diametrical clearance .....	0.015 - 0.055 mm	0.0006 - 0.002 in

**Piston pins**

Length .....	60.00 - 60.50 mm	2.3622 - 2.3819 in
Diameter .....	23.995 - 24.000 mm	0.9447 - 0.9449 in
Fit-in connecting rod .....	Press fit	
Clearance in piston .....	0.015 - 0.006 mm	0.0006 - 0.0002 in

**Pistons**

Clearance in bore, measured at bottom of skirt at right angles to piston pin		
Up to 99MY .....	0.020 - 0.050 mm	0.0008 - 0.0020 in
From 99MY .....	0.022 - 0.067 mm	0.0009 - 0.0026 in



**Piston rings**

Number of compression rings .....	2	
Number of oil control rings .....	1	
No 1 compression ring .....	Nitrided steel barrel faced	
No 2 compression ring .....	Tapered spherical barrel marked 'TOP'	
Width of compression rings		
Bottom .....	1.478 - 1.49 mm	0.0582 - 0.0587 in
Top		
Up to 99MY .....	1.21 - 1.23 mm	0.0476 - 0.0484 in
From 99MY .....	1.17 - 1.19 mm	0.0461 - 0.0479 in
Compression ring gap		
Bottom .....	0.40 - 0.65 mm	0.0157 - 0.0256 in
Top .....	0.3 - 0.5 mm	0.0118 - 0.0197 in
Oil control ring type		
Up to 99MY .....	Aclonofom	
From 99MY .....	3 Piece Aeconoform	
Oil control ring width .....	3.0 mm	0.1181 in
Oil control ring rail gap .....	0.38-1.40 mm	0.0150 - 0.0551 in

**Camshaft**

Location .....	Central	
Bearings .....	Non serviceable	
Number of bearings .....	5	
Drive .....	Chain 9.52 mm pitch x 54 pitches.	
Camshaft end float		
Up to 99MY .....	0.076 - 0.355 mm	0.003 - 0.014 in
From 99MY .....	0.075 - 0.350 mm	0.002 - 0.013 in

**Tappets** ..... Hydraulic self-adjusting

**Valves**

Length		
Inlet .....	116.59 - 117.35 mm	4.590 - 4.620 in
Exhaust .....	116.59 - 117.35 mm	4.590 - 4.620 in
Seat angle	<b>Up to 99MY</b>	<b>From 99MY</b>
Inlet .....	46° - 46° 25'	45° - 45° 30'
Exhaust .....	46° - 46° 25'	45° - 45° 30'
Head diameter		
Inlet .....	39.75 - 40.00 mm	1.565 - 1.575 in
Exhaust .....	34.227 - 34.48 mm	1.3475 - 1.3575 in
Stem diameter		
Inlet .....	8.664 - 8.679 mm	0.3411 - 0.3417 in
Exhaust .....	8.651 - 8.666 mm	0.3406 - 0.3412 in
Stem to guide clearance		
Inlet .....	0.025 - 0.066 mm	0.0010 - 0.0026 in
Exhaust .....	0.038 - 0.078 mm	0.0015 - 0.0031 in
Valve lift (inlet and exhaust) .....	9.94 mm	0.3913 in
Valve spring length fitted		
Up to 99MY .....	40.40 mm (1.59 in) at pressure of 29.5 kg (65 lb)	
From 99MY .....	40.93 mm (1.61 in) at pressure of 29.5 kg (65 lb)	

**Lubrication**

System type .....	Wet sump, pressure fed
Oil pump type .....	Crank driven rotor
Oil pressure	
Up to 99MY .....	2.06 to 2.7 bar (30 to 40 lbf/in <sup>2</sup> ) at 2400 rev/min with engine warm
From 99MY .....	3.45 bar (50 lbf/in <sup>2</sup> ) at 2000 rev/min with engine warm
Oil filter-internal .....	Wire screen, pump intake filter in sump
Oil filter-external .....	Full flow, self-contained cartridge

---

**ENGINE - BMW DIESEL**


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Type .....	Indirect injection, turbocharged, intercooled	
Number of cylinders .....	6	
Bore .....	80.00 mm	3.15 in
Stroke .....	82.80 mm	3.26 in
Capacity .....	2497 cm <sup>3</sup>	152 in <sup>3</sup>
Compression ratio .....	22.5:1 ± 1:1	
Valve operation .....	OHC chain driven	
Turbo charger .....	Mitsubishi TD04 - 11G4	

**Camshaft**

Drive .....	Chain
Number of bearings .....	7

**Cylinder head**

Longitudinal warp .....	0.1 mm	0.004 in
Lateral warp .....	0.05 mm	0.002 in

**Valves and guides**

Valve head diameter:	Inlet .....	36.0 mm	1.42 in
	Exhaust .....	31.0 mm	1.22 in
Stem diameter - Standard:	Inlet .....	6.97 mm	0.274 in
	Service limit .....	6.95 mm	0.273 in
	Exhaust .....	6.95 mm	0.273 in
	Service limit .....	6.93 mm	0.272 in
Stem diameter - 1st oversize:	Inlet .....	7.07 mm	0.28 in
	Service limit .....	7.05 mm	0.277 in
	Exhaust .....	7.06 mm	0.278 in
	Service limit .....	7.04 mm	0.27 in
Stem diameter - 2nd oversize:	Inlet .....	7.17 mm	0.282 in
	Service limit .....	7.15 mm	0.28 in
	Exhaust .....	7.16 mm	0.281 in
	Service limit .....	7.14 mm	0.279 in
Valve head stand-down:	Inlet .....	0.65 to 0.85 mm	0.02 to 0.03 in
	Exhaust .....	0.85 to 1.05 mm	0.03 to 0.04 in
Valve head oversizes - increased thickness .....	0.25 and 0.50 mm		0.01 and 0.02 in
Valve tilt - inlet and exhaust .....	0.5 mm		0.02 in
Valve seats:			
Valve seat angle .....	45° ± 10'		
Correction angle - outside .....	15°		
Correction angle - inside .....	60°		
Seat face outside diameter	Inlet .....	35.5 mm	1.4 in
	Exhaust .....	30.6 mm	1.2 in
Valve seat width	Inlet .....	1.75 to 2.25 mm	0.007 to 0.09 in
	Exhaust .....	2.60 to 2.90 mm	0.10 to 0.11 in
Valve guides:			
Inner diameter for reaming - inlet and exhaust			
Standard .....	7.0 mm		0.275 in
1st oversize valve stem .....	7.1 mm		0.28 in
2nd oversize valve stem .....	7.2 mm		0.283 in

**Crankshaft**

Main bearing bearing journal diameter		
Yellow .....	59.984 to 59.990 mm	2.3616 to 2.3618 in
Green .....	59.977 to 59.983 mm	2.3612 to 2.3615 in
White .....	59.971 to 59.976 mm	2.3610 to 2.3611 in
Oversize bearings .....	0.25 and 0.50 mm	0.01 and 0.02 in
Big-end journal diameter:		
Standard .....	44.975 to 45.00 mm	1.770 to 1.771 in
1st undersize - Size 1 - 0.25 mm (0.01 in) .....	44.725 to 44.75 mm	1.761 to 1.762 in
2nd undersize - Size 2 - 0.50 mm (0.02 in) .....	44.475 to 44.50 mm	1.751 to 1.752 in
Oversize bearings .....	0.25 and 0.50 mm	0.01 and 0.02 in
Crankshaft end float .....	0.080 to 0.163 mm	0.003 to 0.006 in

**Main bearings**

Number and type .....	7 halved shells with oil grooves	
Diametrical clearance .....	0.020 to 0.058 mm	0.001 to 0.002 in

**Connecting rods**

Diametrical clearance (big-end bearings) .....	0.010 to 0.055 mm	0.0004 to 0.002 in
Gudgeon pin bush bore .....	28.995 to 29.021 mm	1.142 to 1.143 in
Maximum deviation of connecting rod parallelism .....	0.05 mm	0.002 in
Maximum distortion .....	0.5 mm	0.02 in

**Pistons**

Type .....	Aluminium alloy, combustion chamber in crown	
Piston diameter measured 7 mm (0.27 in) from lower edge and at right angles to gudgeon pin .....		
Intermediate size .....	79.96 ± 0.009 mm	3.14 ± 0.004 in
Oversize 1 .....	80.04 ± 0.009 mm	3.15 ± 0.004 in
Oversize 2 .....	80.21 ± 0.009 mm	3.16 ± 0.004 in
Piston running clearance .....	0.031 to 0.63 mm	0.0012 to 0.002 in

**Piston rings**

Type:		
Top .....	Double keystone	
Second .....	Taper faced	
Oil control .....	Bevelled ring with spring	
Gap in bore:		
All .....	0.2 to 0.4 mm	0.008 to 0.020 in
Clearance in piston grooves:		
Top .....	Not measured	
Second .....	0.040 to 0.072 mm	0.002 to 0.004 in
Oil control .....	0.030 to 0.065 mm	0.001 to 0.003 in

**Cylinder bores**

Standard .....	80.00 to 80.04 mm	3.150 to 3.151 in
Intermediate .....	80.08 to 80.12 mm	3.153 to 3.154 in
1st oversize .....	80.25 to 80.29 mm	3.20 to 3.21 in
Maximum ovality .....	0.04 mm	0.002 in
Maximum taper .....	0.04 mm	0.002 in



**Lubrication**

System .....	Wet sump, pressure fed	
Oil pressure, at idle .....	2.0 bar	29.0 lbf/in <sup>2</sup>
Regulated pressure .....	3.8 bar	55.0 lbf/in <sup>2</sup>
Oil pump:		
Type .....	Internal gear type pump, mounted on front of engine	
Drive .....	Direct from crankshaft	
Radial clearance:		
Inner rotor/bearing sleeve (max.) .....	0.065 mm	0.003 in
Outer rotor/pump body (max.) .....	0.4 mm	0.02 in
Axial clearance:		
Inner rotor/pump body .....	0.065 mm	0.003 in
Outer rotor/pump body .....	0.070 mm	0.004 in
Oil pressure relief valve .....	piston operated, non-adjustable	
Relief valve spring:		
Length relaxed .....	84.10 mm	3.3 in
Oil filter .....	Disposable cartridge	
Engine oil cooler .....	Mounted on front of coolant radiator	

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**ENGINE MANAGEMENT SYSTEM (EMS) V8  
ENGINE**


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## Type

Up to 99MY ..... Sagem - Lucas Gems 8 hot wire system, electronically controlled

From 99MY ..... Bosch Motronic M5.2.1, electronically controlled

Fuel pump ..... High pressure electrical, immersed in the fuel tank

## Fuel pump delivery pressure

Up to 99MY ..... 2.4-2.6 bar                      34-37 lbf/in<sup>2</sup>

From 99MY ..... 3.5 bar                                      50.75 lbf/in<sup>2</sup>

Fuel filter ..... Bosch in-line filter 'canister' type

**Mass airflow sensor**

## Make and type

Up to 99MY ..... Lucas 'Hot Wire' 20AM

From 99MY ..... Bosch EH1174 (includes air intake temperature sensor)

**Injectors**

## Make and type

Up to 99MY ..... Lucas D1000

From 99MY ..... Bosch EV6C

**Electronic Control Module**

## Make and type

Up to 99MY ..... Lucas GEMS 8.2

From 99MY ..... Bosch M5.2.1

**Fuel pressure regulator**

## Make and type

Up to 99MY ..... Lucas 8RV

From 99MY ..... Rochester (part of fuel pump)

**Coolant temperature sensor**

Make and type ..... Lucas 8TT

**Bypass air valve (Stepper motor)**

## Make and type

Up to 99MY ..... Lucas 3ACM

From 99MY ..... Bosch

**Throttle position sensor**

## Make and type

Up to 99MY ..... Lucas 3TP

From 99MY ..... Bosch DKG1



**Heated oxygen sensor - catalyst vehicles**

Make and type

Up to 99MY ..... Lucas 4LS  
From 99MY ..... Bosch LSH

**Camshaft position sensor**

Make and Land Rover part no.

Up to 99MY ..... Honeywell ERR2261  
From 99MY ..... Lucas ERR6170

**Crankshaft position sensor**

Make and type

Up to 99MY ..... Lucas 4CS  
From 99MY ..... Bosch DG6

**Knock sensor**

Make and type

Up to 99MY ..... Lucas 2KS  
From 99MY ..... Bosch KS1S

**Intake air temperature sensor**

Make and type

Up to 99MY ..... Lucas 10TT  
From 99MY ..... Not applicable (combined with MAF sensor)

**Ignition coils**

Make and type

Up to 99MY ..... Lucas 2DIS2  
From 99MY ..... Bosch 0 221 503 407

**Fuel temperature sensor**

Make and type

Up to 99MY ..... Lucas 6TT  
From 99MY ..... Not applicable

**FUEL SYSTEM - BMW DIESEL ENGINE**

Injection pump type .....	Bosch rotary R515
Injection pump timing .....	0.95 ± 0.02 mm lift at TDC
Injectors .....	<b>See ENGINE TUNING DATA, Information.</b>
Heater plugs .....	<b>See ENGINE TUNING DATA, Information.</b>
Fuel lift pump type .....	Electric in tank fuel pump
Fuel filter .....	Paper element type
Air cleaner .....	Paper element type
Turbocharger .....	Mitsubishi TD04 11G4

**COOLING SYSTEM - V8 ENGINE**

System type .....	Pressurized, spill return, thermostatically controlled water and anti freeze mixture. Vertical flow radiator with remote header tank and pump assisted.	
Cooling fan .....	9 blade axial flow. Viscous coupling.	
Pump type .....	Centrifugal, impeller, belt driven.	
Thermostat opening		
Up to 99MY .....	88 °C	190 °F
From 99MY .....	85 ± 5 °C	185 ± 9 °F
Expansion tank cap pressure (system pressure) .....	1.0 bar	15 lbf/in <sup>2</sup>

**COOLING SYSTEM - BMW DIESEL ENGINE**

System type .....	Pressurized, spill return, thermostatically controlled water and anti freeze mixture. Pump assisted thermo syphon. Coolant radiator combined with oil cooler and turbo intercooler.	
Cooling fan .....	11 blade axial flow 433 mm diameter. 1.44:1 drive ratio. Viscous coupling.	
Pump type .....	Centrifugal, impeller, belt driven.	
Thermostat opening .....	80 °C	176 °F
Expansion tank cap pressure (system pressure) .....	1.0 bar	15 lbf/in <sup>2</sup>