

WORKSHOP MANUAL

NINETY



**LAND
ROVER**

ONE

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INTRODUCTION

This Workshop Manual covers the Land Rover Ninety and One Ten range of vehicles. It is primarily designed to assist skilled technicians in the efficient repair and maintenance of Land Rover vehicles.

Using the appropriate service tools and carrying out the procedures as detailed will enable the operations to be completed within the time stated in the 'Repair Operation Times'.

The Manual has been produced in separate books; this allows the information to be distributed throughout the specialist areas of the modern service facility.

A table of contents in Book 1 lists the major components and systems together with the section and book numbers. The cover of each book details the sections contained within that book.

The title page of each book carries the part numbers required to order replacement books, binders or complete Service Manuals. This can be done through the normal channels.

REFERENCES

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, 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.

DIMENSIONS

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

During the period of running-in from new, certain adjustments may vary from the specification figures given in this Manual. These adjustments will be re-set by the Distributor or Dealer at the After Sales Service, and thereafter should be maintained at the figures specified in the Manual.

REPAIRS AND REPLACEMENTS

When replacement parts are required it is essential that only Land 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 Land Rover parts are fitted. In certain territories, legislation prohibits the fitting of parts not to the vehicle manufacturer's specification. Torque wrench setting figures given in the Repair Operation 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 renewed. Owners purchasing accessories while travelling abroad should ensure that the accessory and its fitted location on the vehicle conform to mandatory requirements existing in their country of origin. The terms of the Owners Service Statement may be invalidated by the fitting of other than Land Rover parts.

All Land Rover parts have the full backing of the Owners Service Statement.

Land Rover Distributors and Dealers are obliged to supply only Land Rover service parts.

POISONOUS SUBSTANCES

Many liquids and other substances used in motor vehicles are poisonous and should under no circumstances be consumed and should as far as possible be kept away from open wounds. These substances among others include antifreeze, brake fluid, fuel, windscreen washer additives, lubricants and various adhesives.

FUEL HANDLING PRECAUTIONS

The following information provides basic precautions which must be observed if petrol (gasoline) is to be handled safely. It also outlines the other areas of risk which must not be ignored.

This information is issued for basic guidance only, and in any case of doubt appropriate enquiries should be made of your local Fire Officer.

GENERAL

Petrol/gasoline vapour is highly flammable and in confined spaces is also very explosive and toxic.

When petrol/gasoline 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 current, consequently, even a small spillage of petrol/gasoline is potentially very dangerous.

Always have a fire extinguisher containing FOAM CO₂ GAS, or POWDER close at hand when handling or draining fuel, or when dismantling fuel systems and in areas where fuel containers are stored.

Always disconnect the vehicle battery BEFORE carrying out dismantling or draining work on a fuel system.

Whenever petrol/gasoline is being handled, drained or stored, or when fuel systems are being dismantled all forms of ignition must be extinguished or removed, any head-lamps used must be flameproof and kept clear of spillage.

NO ONE SHOULD BE PERMITTED TO REPAIR COMPONENTS ASSOCIATED WITH PETROL/GASOLINE WITHOUT FIRST HAVING HAD SPECIALIST TRAINING.

FUEL TANK DRAINING

WARNING: PETROL/GASOLINE MUST NOT BE EXTRACTED OR DRAINED FROM ANY VEHICLE WHILST IT IS STANDING OVER A PIT.

Draining or extracting petrol/gasoline from vehicle fuel tank must be carried out in a well ventilated area.

The receptacle used to contain the petrol/gasoline must be more than adequate for the full amount of fuel to be extracted or drained. The receptacle should be clearly marked with its contents, and placed in a safe storage area which meets the requirements of local authority regulations.

WHEN PETROL/GASOLINE HAS BEEN EXTRACTED OR DRAINED FROM A FUEL TANK THE PRECAUTIONS GOVERNING NAKED LIGHTS AND IGNITION SOURCES SHOULD BE MAINTAINED.

FUEL TANK REMOVAL

On vehicles where the fuel line is secured to the fuel tank outlet by a spring steel clip, it is recommended that such clips are released before the fuel line is disconnected or the fuel tank unit is removed. This procedure will avoid the possibility of residual petrol fumes in the fuel tank being ignited when the clips are released.

As an added precaution fuel tanks should have a PETROL/GASOLINE VAPOUR warning label attached to them as soon as they are removed from the vehicle.

FUEL TANK REPAIR

Under no circumstances should a repair to any tank involving heat treatment be carried out without first rendering the tank SAFE, by using one of the following methods:

STEAMING: With the filler cap and tank unit removed, empty the tank. Steam the tank for at least two hours with low pressure steam. Position the tank so that condensation can drain away freely, ensuring that any sediment and sludge not volatilised by the steam, is washed out during the steaming process.

BOILING: With the filler cap and tank unit removed, empty the tank. Immerse the tank completely in boiling water containing an effective alkaline degreasing agent or a detergent, with the water filling and also surrounding the tank for at least two hours.

After steaming or boiling a signed and dated label to this effect should be attached to the tank

SPECIFICATION

Purchasers are advised that the specification details set out in this Manual apply to a range of vehicles and not to any one. For the specification of a particular vehicle, purchasers should consult their Distributor or 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.

Whilst every effort is made to ensure the accuracy of the particulars contained in this Manual, neither the Manufacturer nor the Distributor or 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

The use of approved special service tools is important. They are essential if service operations are to be carried out efficiently, and safely. The amount of time which they save can be considerable.

Every special tool is designed with the close co-operation of Land Rover Ltd., 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. P.O. Box 3, Daventry, Northamptonshire, England NN11 4NF.

The tools recommended in this Workshop Manual are listed in a multi-language, illustrated catalogue obtainable from Messrs. V. L. Churchill at the above address under publication number 2217/2/84 or from Land Rover Ltd., under part number LSM0052TC from the following address, Land Rover Limited, Service Department, Lode Lane, Solihull, West Midlands, England B92 8NW.

VEHICLE IDENTIFICATION NUMBER (VIN)

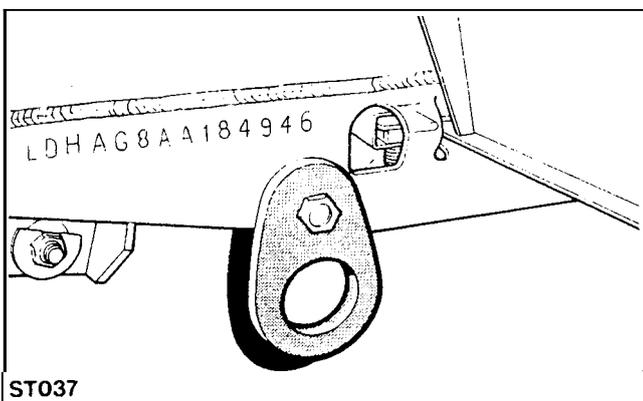
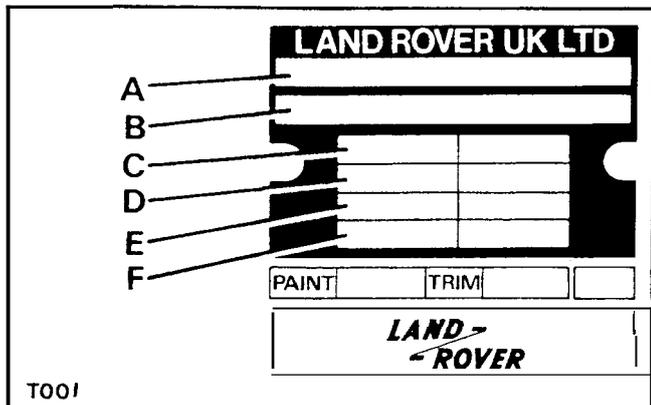
The Vehicle Identification Number and the recommended maximum vehicle weights are stamped on a plate riveted to the top of the brake pedal box in the engine compartment.

The number is also stamped on the right-hand side of the chassis forward of the spring mounting turret.

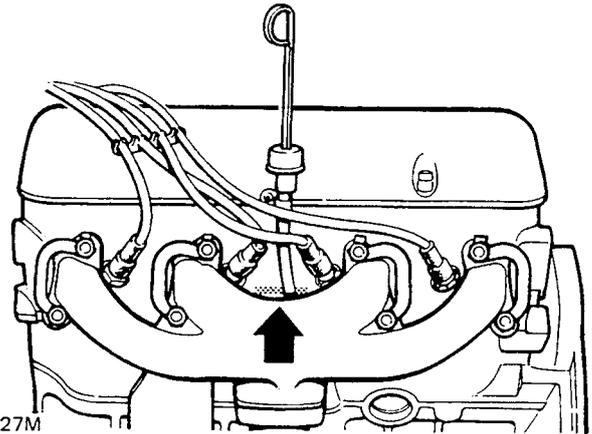
Always quote this number when writing to Land Rover Limited.

Key to Vehicle Identification Number Plate

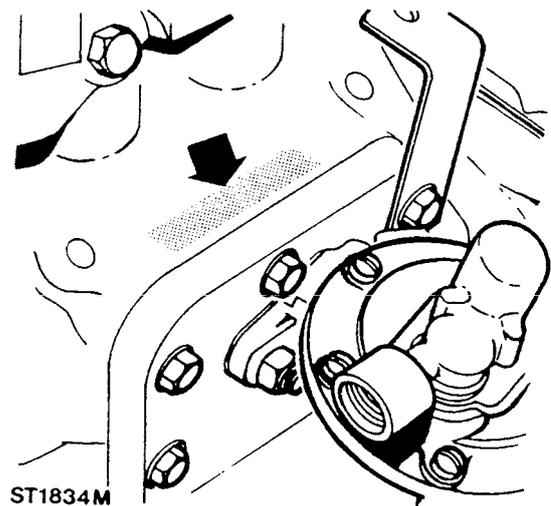
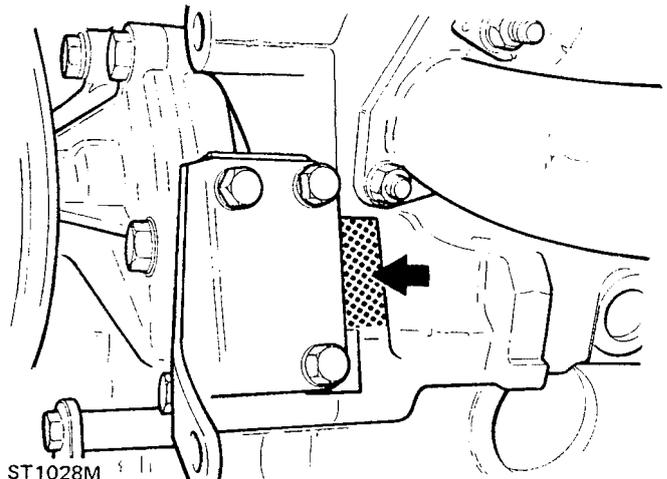
- A Type approval
- B VIN (minimum of 17 digits)
- C Maximum permitted laden weight for vehicle
- D Maximum vehicle and trailer weight
- E Maximum road weight — front axle
- F Maximum road weight — rear axle

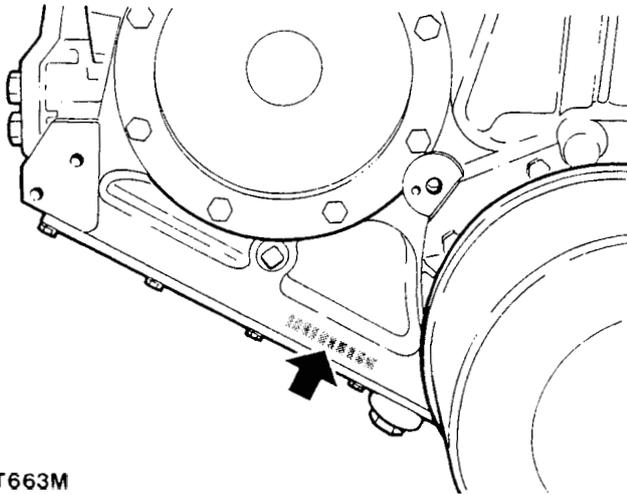
**ENGINE SERIAL NUMBER — V8 ENGINE**

The V8 engine serial number is stamped on a cast pad on the cylinder block between numbers 3 and 5 cylinders.

**ENGINE SERIAL NUMBER — 4 CYLINDER ENGINES**

The 4 cylinder engine number is stamped on a machined surface at the front left-hand side of the engine adjacent to the exhaust manifold front flange. On later engines the number is stamped above the rear side cover, as the second illustration shows.





ST663M

FRONT AXLE

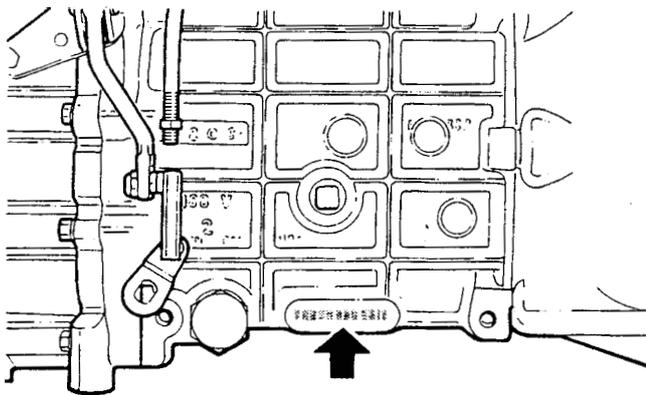
Stamped on top of the left-hand axle tube.

REAR AXLE

Stamped on rear of left-hand axle tube.

MAIN GEARBOX LT77 — 4 CYLINDER VEHICLES

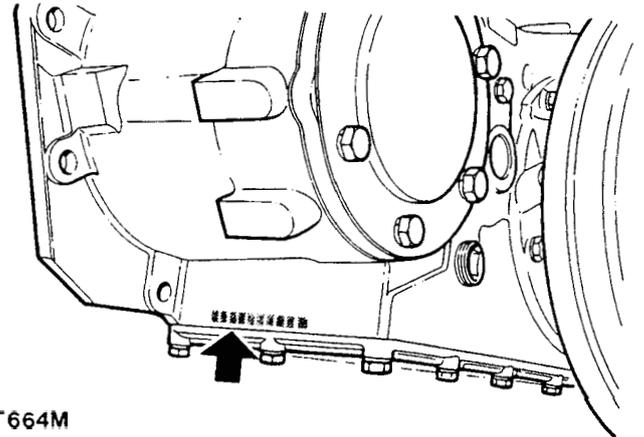
Stamped on a pad on the right-hand side of the gearbox immediately below the oil filler level plug.



ST665M

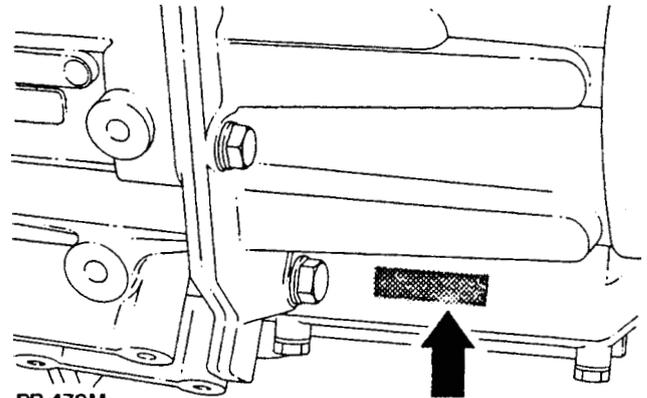
TRANSFER GEARBOX LT230R — 4 CYLINDER VEHICLES

Stamped on the casing on the left-hand side of the gearbox below the mainshaft rear bearing housing adjacent to the bottom cover.



ST664M

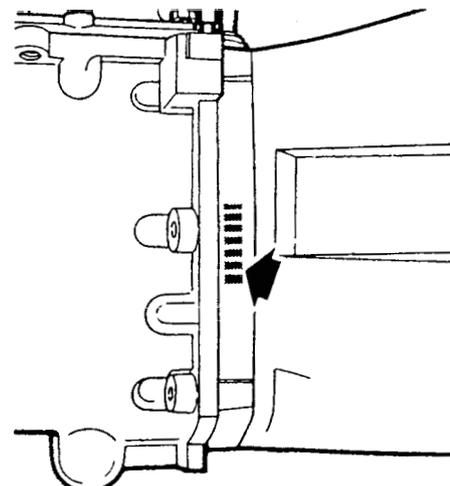
TRANSFER GEARBOX LT230T — 4 CYLINDER AND V8 VEHICLES FROM SERIAL NUMBER SUFFIX 'B' ONWARD



RR 470M

MAIN GEARBOX LT85 FIVE SPEED — V8 VEHICLES

Stamped on the right-hand side of the front bearing plate.



ST1546M

ENGINE

Type	V8
Number of cylinders	Eight, two banks of four
Bore	88,90 mm (3.500 in)
Stroke	71,12 mm (2.800 in)
Capacity	3528 cc (215 in ³)
Valve operation.....	Overhead by push-rod
Maximum power — B.H.P.....	113
Maximum power — KW.....	84.6
Maximum torque	251 Nm (185 lb ft) at 2500 rpm

Crankshaft

Main journal diameter	58,409 - 58,422 mm (2.2996 - 2.3001 in)
Minimum regrind diameter	57,393 - 57,406 mm (2.2596 - 2.2601 in)
Crankpin journal diameter	50,800 - 50,812 mm (2.0000 - 2.0005 in)
Minimum regrind diameter	49,784 - 49,797 mm (1.9600 - 1.9605 in)
Crankshaft end thrust	Taken on thrust washers of centre main bearing
Crankshaft end-float	0,10 - 0,20 mm (0.004 - 0.008 in)

Main bearings

Number and type	5, Vandervell shells
Material	Lead-indium
Diametrical clearance	0,010 - 0,048 mm (0.0004 - 0.0019 in)
Undersizes	0,254 mm, 0,508 mm (0.010 in, 0.020 in)

Connecting rods

Type.....	Horizontally split big end, plain small end
Length between centres.....	143,81 - 143,71 mm (5.662 - 5.658 in)

Big end bearings

Type and material	Vandervell VP lead-indium
Diametrical clearance	0,015 - 0,055 mm (0.0006 - 0.0022 in)
End-float on crankpin	0,15 - 0,36 mm (0.006 - 0.014 in)
Undersizes	0,254 mm, 0,508 mm (0.010 in, 0.020 in)

Gudgeon pins

Length	72,67 - 72,79 mm (2.861 - 2.866 in)
Diameter	22,215 - 22,22 mm (0.8746 - 0.8749 in)
Fit-in connecting rod	Press fit
Clearance in piston	0,002 - 0,007 mm (0.0001 - 0.0003 in)

Pistons

Clearance in bore, measured at bottom of skirt at right angles to gudgeon pin	0,018 - 0,033 mm (0.0007 - 0.0013 in)
---	---------------------------------------

Piston rings

Number of compression	2
Number of oil	1
No. 1 compression ring	Chrome parallel faced
No. 2 compression ring	Stepped to 'L' shape and marked 'T' or 'TOP'
Width of compression rings	1,56 - 1,59 mm (0.0615 - 0.0625 in)
Compression ring gap	0,44 - 0,57 mm (0.017 - 0.022 in)
Oil ring type	Perfect circle, type 98-6
Oil ring width	4,811 mm (0.1894 in) max
Oil ring gap	0,38 - 1,40 mm (0.015 - 0.055 in)

Camshaft

Location	Central
Bearings	Non-serviceable
Number of bearings	5
Drive	Chain 9,52 mm (0.375 in) pitch x 54 pitches

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:	
Inlet	45° - 45½°
Exhaust	45° - 45½°
Head diameter:	
Inlet	39,75 - 40,00 mm (1.565 - 1.575 in)
Exhaust	34,226 - 34,480 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)	9,49 mm (0.374 in)
Valve spring length fitted	40,4 mm (1.590 in) at pressure of 29,5 kg (65 lbs)

Lubrication

System	Wet sump, pressure fed
System pressure, engine warm at 2400 rpm	2,1 - 2,8 kgf cm ² (30 - 40 lbf in ²)
Oil filter (external)	Full-flow, self-contained cartridge
Oil filter (internal)	Gauze. Pump intake filter
Oil pump type	Gear

Oil pressure relief valve

Type	Non-adjustable
Relief valve spring:	
Free length	81,2 mm (3.200 in)
Compressed length at 4,2 kg (9.3 lb) load	45,7 mm (1.800 in)

Oil filter by-pass valve

Type	Non-adjustable
By-pass valve spring:	
Free length	37,5 mm (1.48 in)
Compressed length at 0,34 kg (0.75 lb)	22,6 mm (0.89 in)

2.25 LITRE PETROL ENGINE**ENGINE**

Type	4 cylinder
Bore	90,47 mm (3.562 in)
Stroke	88,9 mm (3.500 in)
Capacity	2286 cm ³ (139.500 in ³)
Valve operation	Overhead by push-rod
Compression ratio	8.0: 1
Maximum power @ 4000 rpm	55.2 Kw (74 bhp)
Maximum torque @ 2000 rpm	163Nm (120 lbf ft)

Crankshaft

Main journal diameter	63,487 - 63.500 mm (2.4995 - 2.500 in)
Minimum regrind diameter	63,246 - 63,2333 mm (2.4900 - 2.4895 in)
Crankpin journal diameter	58,725 - 58,744 mm (2.312 - 2.31275 in)
Minimum regrind diameter	58,48985 - 58,47080 mm (2.30275 - 2.30200 in)
Crankshaft end thrust	Taken on thrust washers at centre main bearing
Crankshaft end-float	0,05 - 0,15 mm (0.002 - 0.006 in)

Main bearings

Number and type	5 halved shells
Material	Steel shell, tin-aluminium lined
Diametrical clearance	0,020 - 0,063 mm (0.0008 - 0.0025 in)
Undersizes	0,25 mm (0.010 in)

Connecting rods

Type	Horizontally split big end, plain small end
Length between centres	175,36 - 175,46 mm (6.904 - 6.908 in)

Big end bearings

Type and material	Steel shell, copper-lead lined
Diametrical clearance	0,019 - 0,068 mm (0.00075 - 0.0027 in)
End-float on crankpin	0,20 - 0,30 mm (0.007 - 0.012 in)
Undersizes	0,25 mm (0.010 in)

Gudgeon pins

Type	Floating
Fit in piston	Push fit by hand
Clearance in connecting rod	0,007 - 0,015 mm (0.0003 - 0.0006 in)

Pistons

Type 8.0:1 compression ratio	Aluminium alloy, flat top
Clearance in bore, measured at bottom of skirt at right angles to gudgeon pin:	
Standard size pistons	0,06 - 0,07 mm (0.0023 - 0.0027 in)
Oversize pistons	0,043 - 0,055 mm (0.0017 - 0.0022 in)

Piston rings

Compression	2
Gap in bore	0,38 - 0,50 mm (0.015 - 0.020 in)
Clearance in groove.. ..	0,046 - 0,097 mm (0.0018 - 0.0038 in)
Oil control	1
Gap in bore	0,38 - 0,50 mm (0.015 - 0.020 in)
Clearance in groove.. ..	0,038 - 0,089 mm (0.0015 - 0.0035 in)

Camshaft

Location	Right-hand side (thrust side) of engine
End-float	0,06 - 0,13 mm (0.0025 - 0.0055 in)
Number of bearings	4
Material	Steel shell, white metal lined
Drive	Chain

Valves

Length:	
Inlet	111,20 - 111,66 mm (4.378 - 4.396 in)
Exhaust.. ..	111,22 - 111,58 mm (4.388 - 4.412 in)
Seat angle:	
Inlet	30"
Exhaust	45"
Head diameter:	
Inlet	44,32 - 44,57 mm (1.744 - 1.755 in)
Exhaust	34,93 - 35,18 mm (1.378 - 1.380 in)
Stem diameter:	
Inlet	7,899 - 7,912 mm (0.3109 - 0.3115 in)
Exhaust.. ..	8,682 - 8,694 mm (0.3418 - 0.3422 in)
Stem to guide clearance:	
Inlet	0,033 - 0,048 mm (0.0013 - 0.0019 in)
Exhaust.. ..	0,058 - 0,073 mm (0.0023 - 0.0029 in)
Valve lift:	
Inlet	10,236 mm (0.403 in)
Exhaust.. ..	9,85 mm (0.388 in)

Valve springs

Type	Duplex interference coil
Inner:	
Length, free	42,67 mm (1.680 in)
Length, under 8,0 kg (17.7 lb) load	37,13 mm (1.462 in)
Outer:	
Length, free	46,28 mm (1.822 in)
Length, under 21 kg (46 lb) load.. ..	40,30 mm (1.587 in)

Lubrication

System	Wet sump, pressure fed
System pressure, engine warm at 2000 rpm	2,45 - 4,50 kgf cm ² (35 - 65 lbf in ²)
Oil pump: Early type	
Type	Double gear
Drive	S olid shaft from camshaft s kew gear
End-float of gears:	
Steel gear	0,05 - 0,12 mm (0.002 - 0.005 in)
Aluminium gear	0,07 - 0,15 mm (0.003 - 0.006 in)
Radial clearance of gears	0,02 - 0,10 mm (0.001 - 0.004 in)
Backlash of gears.. ..	0,15 - 0,28 mm (0.006 - 0.012 in)

Lubrication (continued)

Oil pump: Latest type	
Type	Double gear, 10teeth, sintered iron gears
Drive	Splined shaft from camshaft skew gear
End-float of both gears	0,026 - 0,135 mm (0.0009 - 0.0045 in)
Radial clearance of gears	0,025 - 0,075 mm (0.0008 - 0.0025 in)
Backlash of gears..	0,1 - 0,2 mm (0.0034 - 0.0067 in)

Oil pressure relief valve

Type	Non-adjustable
Relief valve spring:	
Full length.....	67,82 mm (2.670 in)
Compressed length at 2,58 kg (5.7 lb) load	61,23 mm (2.450 in)

2.5 LITRE PETROL ENGINE**ENGINE**

Type	4 cylinder
Bore	90,47 mm (3.562 in)
Stroke	97 mm (3.82 in)
Capacity	2495 cm ³ (152.25 in ³)
Valve operation.....	Overhead by push-rod
Compression ratio..	8.0: 1
Maximum power @ 4000 rpm	59.5 Kw (80 bhp)
Maximum torque @ 2000 rpm..	175Nm (129 lbf ft)
Commencing serial no..	17H00011C

Crankshaft

Main journal diameter	63,487 - 63,500 mm (2.4995 - 2.500 in)
Minimum regrind diameter	63,246 - 63,2333 mm (2.4900 - 2.4895 in)
Crankpin journal diameter	58,725 - 58,744 mm (2.312 - 2.31275 in)
Minimum regrind diameter	58,48985 - 58,47080 mm (2.30275 - 2.30200 in)
Crankshaft end thrust	Taken on thrust washers at centre main bearing
Crankshaft end-float..	0,05 - 0,15 mm (0.002 - 0.006 in)

Main bearings

Number and type	5 halved shells
Material	Copper-lead lined
Diametrical clearance	0,018 - 0,06 mm (0.0007 - 0.0026 in)
Undersizes	0,25 mm (0.010 in)

Connecting rods

Type	Horizontally split big end, plain small end
Length between centres	175,36 - 175,46 mm (6.904 - 6.908 in)

Connecting rod bearings

Type and material	Steel shell, copper-lead lined
Diametrical clearance	0,025 - 0,075 mm (0.001 - 0.003 in)
End-float on crankpin	0,20 - 0,30 mm (0.007 - 0.012 in)
Undersizes	0,25 mm (0.010 in)

Gudgeon pins

Type	Floating
Fit in piston	Push fit by hand
Clearance in connecting rod	0,007 - 0,015 mm (0.0003 - 0.0006 in)

Pistons

Type 8.0:1 compression ratio	Aluminium alloy. Recessed crown.
Clearance in bore measured @ 17mm from bottom of skirt at right angles to gudgeon pin: Standard and oversize pistons	0,043 - 0,067 mm (0.0017 - 0.0026 in)

Piston rings

Compression	2
Gap in bore	0,40 - 0,65 mm (0.016 - 0.026 in)
Clearance in groove	0,046 - 0,097 mm (0.0018 - 0.0038 in)
Oil control	1
Gap in bore	0,30 - 0,55 mm (0.012 - 0.022 in)
Clearance in groove	0,026 - 0,076 mm (0.0012 - 0.003 in)

Camshaft

Location	Right-hand side (thrust side) of engine
End-float	0,06 - 0,13 mm (0.0025 - 0.0055 in)
Number of bearings	4
Material	Steel shell, white metal lined
Drive	76 link chain

Valves

Length :	
Inlet	111,20 - 111,66 mm (4.377 - 4.396 in)
Exhaust..	111,12 - 111,59 mm (4.374 - 4.393 in)
Seat angle:	
Inlet	30"
Exhaust..	45"
Head diameter:	
Inlet	44,32 - 44,58 mm (1.744 - 1.755 in)
Exhaust..	34,43 - 34,18 mm (1.355 - 1.345 in)
Stem diameter:	
Inlet	7,899 - 7,912 mm (0.3109 - 0.3115 in)
Exhaust..	8,697 - 8,679 mm (0.3424 - 0.3416 in)
Stem to guide clearance:	
Inlet	0,033 - 0,048 mm (0.0013 - 0.0019 in)
Exhaust	0,035 - 0,076 mm (0.0014 - 0.0022 in)
Valve lift:	
Inlet	10,236 mm (0.403 in)
Exhaust	9,85 mm (0.388 in)
Exhaust valve seat insert:	
External diameter..	36,576 - 36,601 (1.440 - 1.441 in)
Internal diameter..	28,448 - 28,702 mm (1.120 - 1.130 in)
Width	5,055 - 5,105 mm (0.199 - 0.201 in)
Seat angle and depth	45". 0,635 - 0,889 mm (0.025 - 0.035 in)

Valve springs

Type	Duplex interference coil
Inner:	
Length, free	42,67 mm (1.680 in)
Length, under 8,0 kg (17.7 lb) load	37,13 mm (1.462 in)
Outer:	
Length, free	46,28 mm (1.822 in)
Length, under 21 kg (46 lb) load	40,30 mm (1.587 in)

Lubrication

System	Wet sump, pressure fed
System pressure, engine warm at 2000 rpm	2,45 - 4,50 kgf cm ² (35 - 65 lbf in ²)
Oil pump:	
Type	Double gear, 10 teeth, sintered iron gears
Drive	Splined shaft from camshaft skew gear
End-float of both gears	0,026 - 0,135 mm (0.0009 - 0.0045 in)
Radial clearance of gears	0,025 - 0,075 mm (0.0008 - 0.0025 in)
Backlash of gears	0,1 - 0,2 mm (0.0034 - 0.0067 in)

Oil pressure relief valve

Type	Non-adjustable
Relief valve spring:	
Full length	67,82 mm (2.670 in)
Compressed length at 2,58 kg (5.7 lb) load	61,23 mm (2.450 in)

2.25 LITRE DIESEL ENGINE**ENGINE**

Type	4 cylinder
Bore	90,47 mm (3.562 in)
Stroke	88,9 mm (3.500 in)
Capacity	2286 cm ³ (139 in ³)
Valve operation	Overhead by push-rod
Compression ratio	23:1
Maximum power	44Kw (59 bhp) at 4000 rpm
Maximum torque	136Nm (100 lbf ft) at 1800rpm

Crankshaft

Main bearing journal diameter	63,487 - 63,500 mm (2.4995 - 2.500 in)
Regrind dimensions:	
63,246 - 63,2333 mm (2.490 - 2.4895 in)	Use 0.010 in U/S bearings
Crankpin journal diameter	58,725 - 58,744 mm (2.312 - 2.31275 in)
Regrind dimensions:	
58,48985 - 58,4708 mm (2.30275 - 2.30200 in)	Use 0.010 in U/S bearings
Crankshaft end thrust	Taken on thrust washers at centre main bearing
Crankshaft end-float	0,05 - 0,15 mm (0.002 - 0.006 in)

Main bearings

Number and type	5 halved shells
Material	Steel shell, copper-lead lined, tin plated
Diametrical clearance	0,020 - 0,063 mm (0.0008 - 0.0025 in)

Connecting rods

Type	Horizontally split big end, plain small end
Length between centres	175,38 - 175,43 mm (6.905 - 6.907 in)

Big end bearings

Type and material	Steel shell, copper-lead lined
Diametrical clearance	0,020 - 0,0635 mm (0.0008 - 0.0025 in)
End-float on crankpin	0,15 - 0,356 mm (0.006 - 0.014 in)

Gudgeon pins

Type	Floating
Fit in piston	Push fit by hand
Clearance in connecting rod	0,0196 - 0,0036 mm (0.0007 - 0.00014 in)
Diameter	30,1564 - 30,1625 mm (1.18726 - 1.1875 in)

Pistons

Type	Aluminium alloy, with V shape recess in crown
Clearance in bore, measured at bottom of skirt at right angles to gudgeon pin:	
Standard size pistons	0,111 - 0,134 mm (0.0044 - 0.0053 in)
Oversize pistons	0,111 - 0,157 mm (0.0044 - 0.0062 in)

Piston rings

Compression No. 1 (top):	
Type	Square friction edge, chrome plated
Gap in bore	0,35 - 0,50 mm (0.014 - 0.019 in)
Clearance in groove	0,06 - 0,11 mm (0.0025 - 0.0045 in)
Compression Nos. 2 and 3:	
Type	Bevelled friction edge. Marked 'T' or 'TOP' on upper side
Gap in bore	0,25 - 0,38 mm (0.010 - 0.015 in)
Clearance in groove	0,06 - 0,11 mm (0.0025 - 0.0045 in)
Oil control No. 4:	
Type	Ring and spring
Gap in bore	0,279 - 0,406 mm (0.011 - 0.016 in)
Clearance in groove	0,038 - 0,064 mm (0.0015 - 0.0025 in)

Valves

Length:	
Inlet	116,26 - 116,51 mm (4.377 - 4.587 in)
Exhaust	116,79 - 117,25 mm (4.598 - 4.616 in)
Seat angle:	
Inlet	45°
Exhaust	45°
Head diameter:	
Inlet	39,12 - 39,37 mm (1.540 - 1.550 in)
Exhaust	33,25 - 33,50 mm (1.309 - 1.318 in)
Stem diameter:	
Inlet	7,912 - 7,899 mm (0.3114 - 0.3109 in)
Exhaust	8,682 - 8,694 mm (0.3418 - 0.3422 in)
Stem to guide clearance:	
Inlet	0,033 - 0,048 mm (0.0013 - 0.0019 in)
Exhaust	0,058 - 0,073 mm (0.0023 - 0.0029 in)
Valve lift:	
Inlet	9,85 mm (0.388 in)
Exhaust	10,26 mm (0.404 in)

Camshaft

Location	Right-hand side (thrust side) of engine
End-float	0,1 - 0,2 mm (0.004 - 0.008 in)
Number of bearings	4
Material	Steel shell, white metal lined
Drive	Chain

Valve springs

Type	Duplex Interference double coil
Inner:	
Length, free	42,67 mm (1.680 in)
Length, under 8,0 kg (17.7 lb) load	40,30 mm (1.587 in)
Outer:	
Length, free	46,28 mm (1.822 in)
Length, under 21 kg (46 lb) load	40,30 mm (1.587 in)

Lubrication

System	Wet sump, pressure fed
System pressure, engine warm at 2000 rpm	2,5 - 4,57 kgf cm ² (35 - 65 lbf in ²)
Oil pump:	
Type	Double gear
Drive	Splined shaft from camshaft skew gear
End-float of gears:	
Steel gear	0,05 - 0,12 mm (0.002 - 0.005 in)
Aluminium gear	0,07 - 0,15 mm (0.003 - 0.006 in)
Radial clearance of gears	0,02 - 0,10 mm (0.001 - 0.004 in)
Backlash of gears	0,15 - 0,28 mm (0.006 - 0.012 in)

Oil pressure relief valve

Type	Non-adjustable
Relief valve spring:	
Full length	67,82 mm (2.670 in)
Compressed length at 2,58 kg (5.7 lb) load	61,23 mm (2.450 in)

2.5 LITRE DIESEL ENGINE**ENGINE**

Number of cylinders	4
Bore	90,47 mm (3.562 in)
Stroke	97,00 mm (3.819 in)
Capacity	2495 cc
Compression ratio	21:1
Piston area (total)	257,1 cm ³ (39.86 in ³)
Maximum power at 4000 rpm	65.5 bhp
Maximum torque at 1800 rpm	113 lbf ft

Crankshaft

Main bearing journal diameter	63,487 - 63,500 mm (2.4995 - 2.5000 in)
Regrind dimensions:	
63,246 - 63,2333 mm (2.490 - 2.4895 in)	Use 0.010 in U/S bearings
Crankpin journal diameter	58,725 - 58,744 mm (2.312 - 2.31275 in)
Regrind dimensions:	
58,48985 - 58,4708 mm (2.30275 - 2.30200 in)	Use 0.010 in U/S bearings
Crankshaft end thrust	Taken on thrust washers at centre main bearing
Crankshaft end-float	0,05 - 0,15 mm (0.002 - 0.006 in)

Main bearings

Number and type	5 halved shells
Diametrical clearance	0,018 - 0,061 mm (0.0007 - 0.0024 in)

Connecting rods

Length between centres	175,38 - 175,43 mm (6.905 - 6.907 in)
Diametrical clearance (big-end bearings)	0,025 - 0,075 mm (0.001 - 0.003 in)
End-float on crankpin	0,15 - 0,356 mm (0.006 - 0.014 in)

Pistons

Type	Aluminium alloy 'V' shaped valve recess in crown
Skirt diametrical clearance (at right angle to gudgeon pin)	0,025 - 0,05 mm (0.001 - 0.002 in)

Gudgeon pins

Type	Floating
Fit in piston	Hand push fit
Diameter	30,1564 - 30,1625 mm (1.18726 - 1.18750 in)
Clearance in connecting rod	0,0196 - 0,0036 mm (0.00077 - 0.00014 in)

Piston rings

Type:	Top	Square friction edge, chrome plated
	Second	Taper faced
	Oil control	Expander and rails

Camshaft

Drive	25,4 mm (0.1 in) wide dry toothed belt
Location	Right-hand side (thrust side)
End-float	0,1 - 0,2 mm (0.004 - 0.008 in)
Number of bearings	4
Material	Steel shell, white metal lined

Valves

Seat angle:	
Inlet	45°
Exhaust	45°
Head diameter:	
Inlet	39,12 - 39,37 mm (1.540 - 1.550 in)
Exhaust	33,25 - 33,50 mm (1.309 - 1.319 in)
Valve lift:	
Inlet	9,85 mm (0.388 in)
Exhaust	10,26 mm (0.404 in)
Cam lift:	
Inlet	6,81 mm (0.268 in)
Exhaust	7,06 mm (0.278 in)
Stem diameter:	
Inlet	7,912 - 7,899 mm (0.3114 - 0.3109 in)
Exhaust	8,682 - 8,694 mm (0.3418 - 0.3422 in)

Valve springs

Type	Duplex Interference double coil
Inner:	
Length, free	42,67 mm (1.680 in)
Length, under 8,0 kg (17.7 lb) load	40,30 mm (1.587 in)
Outer:	
Length, free	46,28 mm (1.822 in)
Length, under 21 kg (46 lb) load	40,30 mm (1.587 in)

Lubrication

System	Wet sump, pressure fed
System pressure, engine warm at 2000 rpm	2,5 - 4,57 kgf cm ² (35 - 65 lbf in ²)
Oil pump: Early type	
Type	Double gear
Drive	Splined shaft from camshaft skew gear
End-float of gears:	
Steel gear	0,05 - 0,12 mm (0.002 - 0.005 in)
Aluminium gear	0,07 - 0,15 mm (0.003 - 0.006 in)
Radial clearance of gears	0,02 - 0,10 mm (0.001 - 0.004 in)
Backlash of gears..	0,15 - 0,28 mm (0.006 - 0.012 in)
Oil pump: Latest type	
Type	Double gear, 10teeth, sintered iron gears
Drive	Splined shaft from camshaft skew gear
End-float of both gears..	0,026 - 0,135 mm (0.0009 - 0.0045 in)
Radial clearance of gears	0,025 - 0,075 mm (0.0008 - 0.0025 in)
Backlash of gears	0,1 - 0,2 mm (0.0034 - 0.0067 in)

Oil pressure relief valve

Type	Non-adjustable
Relief valve spring:	
Full length	67,82 mm (2.670 in)
Compressed length at 2,58 kg (5.7 lb) load	61,23 mm (2.450 in)

GENERAL DATA**FUEL SYSTEM — 2.25 Petrol**

Carburettor	See 'ENGINE TUNING DATA'
Air cleaner..	Oil bath with built-in centrifugal pre-cleaner

Fuel pump — Early Models

Type	Mechanical with sediment bowl and hand primer
Pressure range	3 - 5 psi

Fuel pump — Latest Models

Make and Type	Facet, electric. Mounted on R.H. side of chassis
Pressure range	3 - 5 psi

FUEL SYSTEM — 2.25 and 2.5 Diesel

Injection pump	See 'ENGINE TUNING DATA'
Fuel lift pump type	Mechanical, with hand primer
Pressure range	0,35 - 0,56 kgf cm ² (5 - 8 lbf ft ²)

FUEL SYSTEM — V8 engine

Carburettor
 Fuel pump — Make,type
 Air cleaner.....

See ‘ENGINE TUNING DATA’
 Facet, electric mounted vertically on R.H. side of chassis
 Cyclone, replaceable element

COOLING SYSTEM — 2.25 Petrol, 2.25 and 2.5 Diesel

Type.....
 Thermostat
 Pressure cap
 Type of pump

Pressurized spill return system with thermostat control,
 pump and fan assisted
 82°C
 0,6 kgf cm² (9 lbf in’)
 Centrifugal

COOLING SYSTEM — V8 engine

Type.....
 Thermostat
 Type of pump

Pressurized spill return system with thermostat control,
 pump and fan assisted
 Emission and non-emission 82°C, Australia 88°C
 Centrifugal

CLUTCH — 2.25 Petrol

Type
 Centre plate diameter
 Facing material
 Facing material identification colour
 Number of damper springs
 Damper spring colour
 Clutch release bearing.....

Borg and Beck diaphragm spring
 242,1 mm (9.500 in)
 Raybestos 1488-05
 White/violet on periphery
6
 Dark grey/light green
 Ball journal

CLUTCH — 2.25 and 2.5 Diesel engine — Early type

Type.....
 Centre plate diameter
 Facing material
 Number of damper springs
 Damper spring colour.....
 Clutch release bearing.....

Verto diaphragm spring
 242,1 mm (9.500 in)
 Raybestos 1488-05
 8
 2 off white/green
 2 off pigeon blue
 4 off ruby red
 Ball journal

CLUTCH — Later type

Type.....
 Centre plate diameter (frictionplate)
 Facing material
 Number of damper springs
 Damper spring colour
 Clutch release bearing.....

Verto diaphragm spring
 235 mm (9.25 in)
 Verto 791
 8
 2 off white/green — suffix ‘C’
 2 off pigeon blue — suffix ‘A’
 4 off ruby red — suffix ‘B’
 Ball journal

CLUTCH — V8 engine

Type
 Centre plate diameter
 Facing material
 Damper spring colour
 Release bearing.....
 Number of damper springs.....

Borg and Beck diaphragm spring
267 mm (10.5 in)
 Raybestos 1488-05. Grooved. White/violet
 Light blue/dark blue
 Ball journal
6

Main gearbox

Type LT77	Single helical constant mesh
Speeds	5 forward 1 reverse
Synchromesh	All forward speeds
Ratios:	
Fifth	0.8314:1
Fourth (direct)	1.0000:1
Third	1.5074:1
Second	2.3008:1
First	3.5850:1
Reverse	3.7007:1

Transfer box

Type LT230R	Two-speed reduction on main gearbox output. Front and rear drive permanently engaged via a lockable differential	
Ratios:		
High	1.6670	
Low	3.3198	
Overall ratios (final drive):	In high transfer	In low transfer
Fifth	4.9042:1	9.7666:1
Fourth	5.8987:1	11.7471:1
Third	8.8917:1	17.7075:1
Second	13.5715:1	27.0272:1
First	21.1472:1	42.1138:1
Reverse	21.8293:1	43.4723:1
Input gear	26 Teeth	
Intermediate gear	19 x 41 x 35 Teeth	
Output gear	40 x 37 Teeth	

TRANSMISSION — V8 Engine**Main gearbox**

Type LT95	Single helical constant mesh
Speeds	4 forward 1 reverse
Synchromesh	All forward speeds
Ratios:	
Fourth (direct)	1.0000:1
Third	1.5049:1
Second	2.4480:1
First	4.0691:1
Reverse	3.6643:1

Transfer box

Type LT95	Two-speed reduction on main gearbox output. Front and rear drive permanently engaged via a lockable differential	
Ratios:		
High	1.3362	
Low	3.3206	
Overall ratios (final drive):	In high transfer	In low transfer
Fourth	4.7281:1	11.7497:1
Third	7.1154:1	17.6822:1
Second	11.5745:1	28.7634:1
First	19.2390:1	47.8101:1
Reverse	27.3250:1	43.0538:1

TRANSMISSION — Ninety and One Ten V8 with 5-speed gearbox**Main gearbox**

Type — Manual	LT85 5-speed helical constant mesh, with synchromesh on all forward gears		
Main gearbox ratios	Fifth (Cruising gear)	0.7951	
	Fourth	1.0000	
	Third	1.4362	
	Second	2.1804	
	First	3.6497	
	Reverse	3.8242	

Transfer gearbox

Type	LT230T. Two-speed reduction on main gearbox output. Front and rear drive permanently engaged via a lockable differential.		
— Ninety models	High	1.1923	
	Low	3.3198	
— One Ten models	High	1.410	
	Low	3.3198	
Overall ratio (including final drive) — Ninety models		In high transfer	In low transfer
	Fifth (Cruising gear)	3.3544	9.3401
	Fourth	4.2189	11.7471
	Third	6.0592	16.8712
	Second	9.1989	25.6134
	First	15.3977	42.8734
	Reverse	16.1339	44.9233
Overall ratio (including final drive) — One Ten models		In high transfer	In low transfer
	Fifth (Cruising gear)	3.9695	9.3401
	Fourth	4.9925	11.7471
	Third	7.1702	16.8712
	Second	10.8856	25.6134
	First	18.2210	42.8734
	Reverse	19.0922	44.9233

REAR AXLE — One Ten only

Type	Salisbury 8HA
Ratio	3.538
Track	1485,90 mm (58.50 in)

FRONT AXLE — All models and Ninety rear

Type	Spiral bevel, enclosed constant velocity joints
Ratio	3.538

PROPELLER SHAFTS — All Models

Type: Front and rear	Single Hookes universal needle roller joints. Sliding portion on front shaft gaiierea, rear shaft open
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SUSPENSION — All Models

Type	Coil springs controlled by telescopic dampers front and rear
Front	Transverse location of axle by Panard rod, and fore and aft location by two radius arms
Rear	Fore and aft movement inhibited by two tubular trailing links. Lateral location of axle by a centrally positioned 'A' bracket bolted at the apex to a ball joint mounting. An optional levelling unit is positioned between the ball joint and upper cross member

BRAKES 2.25 Petrol and V8 Engine

System	Direct acting servo assisted dual braking system with Girling tandem master cylinder and pressure differential warning actuator, combination valve, or G. valve
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Footbrake — All Models

Front	Lockheed Disc
Disc diameter	300 mm (11.81 in)
Number of pistons per wheel	4
Total lining area	232 cm ²
Lining material	Don 230
Rear	Girling single cylinder drum brake
Drum diameter	280 mm (11 in)
Total lining area	493 cm ²
Brake drum width	63.9 mm
Lining material	Ferodo 2629

Handbrake — All Models

Type	Transmission drum brake cable operated
Drum diameter	254 mm (10 in)
Lining material	Don 269

BRAKES — 2.25 and 2.5 litre Diesel engine

System	Direct acting servo assisted dual braking system with Girling tandem master cylinder and pressure differential warning actuator, combination valve, or G. valve. Servo assistance initiated by an engine driven air evacuation pump and sustained by a vacuum tank (vacuum tank deleted on 2.5)
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Evacuation pump — 2.25 litre Diesel

Maximum speed	5000 rpm. Belt drive
Oil capacity	40 cm ³ (2.4 in ³) SAE 15W-50

Evacuation pump — 2.5 litre Diesel

Maximum speed	4000 rpm. Gear drive from camshaft
Lubrication	Oil feed via skew gear
Minimum vacuum level at 2500 rpm	0,8 bar

STEERING — All Models

Type:	
Manual — Early Models only	Burman recirculating ball
Manual..	Gemmer Hour-glass worm and wheel
Optional power assisted — Early Models.....	Adwest Varamatic
Optional power assisted — Later Models.....	Adwest Lightweight or Gemmer
Ratios:	
Manual Burman straight ahead	20,55: 1
Manual Gemmer	20,2: Constant
Power assisted straight ahead.	17.5:1
Number of turns lock to lock:	
Manual.....	4.75
Power assisted	3.49
Camber angle	Zero
Castor angle	3"
Swivel pin inclination..	7"
Front wheel toe-out — permanent 4-wheel drive	1,19 - 2,38 mm ($\frac{3}{64}$ - $\frac{3}{32}$ in)
Turning circle between kerbs:	
Right-hand drive	14,0 m (45.67 ft)
Left-hand drive	13,28 m (43.58 ft)
Steering wheel diameter	420 mm (16.5 in)
Steering damper	Fitted to drag link
Track	1485,90 mm (58.50 in)
Steering column type	Collapsible coupling

WHEELS AND TYRES — All Models

Type of wheel	Ventilated disc
Wheel size.	5.50 in F x 16 in
Number of studs	5
Tyre size	7.50 x 16

ELECTRICAL EQUIPMENT — All Models

System	12 volt, negative earth
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Battery — 2.25 litre Petrol and V8 engine

Type:		
Lucas — standard 9 plate	B.B.M.S. No. 371	Designation
Chloride — standard 9 plate	B.B.M.S. No. 291	190/84/90
Lucas — cold climate 13 plate	B.B.M.S. No. 389	Designation
Chloride — cold climate 13 plate	B.B.M.S. No. 369	315/120/92

Battery — 2.25 and 2.5 Litre Diesel engine

Type	Chloride B.B.M.S. No. 243 15 plate designation 395/175/90
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Alternator — 2.25 litre Petrol and Diesel and 2.5 Diesel

Type	Lucas A115-34
Maximum D.C. output at 6000 rpm	34 amps
Rotor — winding resistance	3.27 ohms at 20°C ± 5%
Stator — winding resistance per phase	0.138 ohms at 20°C ± 5%
New brush length	20 mm
Renew brush at	10mm
Brush spring pressure	1.3- 2.7 N (4.7 - 9.8 oz)
Regulator controlled voltage	13.6- 14.4volts measured across battery

Note: From the following engine numbers a 45 amp output alternator is fitted.

12J05497C	Land Rover 90/110 2.5 litre Diesel
11H05639C	Land Rover 90 2.3 litre Petrol
11H05629C	Land Rover 110 2.3 litre Petrol

Alternator — V8 engine

Type	Lucas A115-45
Maximum D.C. output at 6000 rpm	45 amps
Rotor — winding resistance	3.2 ohms at 20°C ± 5%
Stator — winding resistance per phase	0.092 ohms at 20°C ± 5%
New brush length	20 mm
Renew brush at	10mm
Brush spring pressure	1.3- 2.7 N (4.7 - 9.8 oz)
Regulator controlled voltage	13.6- 14.4 volts measured across battery

Starter motor — 2.25 Petrol engine

Type	Lucas 2M100
Brush spring tension	1020gms (36 ozs)
Minimum brush length	9,5 mm (0.375 in)

Starter motor — 2.25 and 2.5 Diesel engine

Type	Lucas 2M113
New brush length	22.2 mm (0.875 in)
Renew brush at	8 mm (0.312 in)
Armature end-float —	
Cast aluminium intermediate bracket	0,03 - 1,4 mm (0.001 - 0.056 in)
Pressed steel intermediate bracket	0,03 - 1,55 mm (0.001 - 0.061 in)
Commutator minimum diameter	38 mm (1.5 in)

Starter motor — V8 engine

Type	Lucas 3M100 pre-engaged
Brush spring tension	1020gms (36 ozs)
Brush minimum length	9,5 mm (0.375 ins)

Wiper motor — All Models

Type	Lucas 14W uprated two-speed
Armature end-float	0,1 - 0,20 mm (0.004 - 0.008 in)
Minimum brush length..	4,8 mm (0.190 in)

Distributor — All Petrol engines**Coil — All Petrol engines**

} See 'ENGINE TUNING DATA'

Fuses — All Models

Type	12 cartridge fuses of the following values:
	Three 10 amp
	Six 8 amp
	One 12 amp
	Two 2.5 amp

Starter motor — 2.5 litre Diesel — Later Models

Type	Paris Rhone D9R91 12 volt
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TYRE PRESSURES

Tyres — size and type		Normal		Emergency soft			
		All load conditions		Unladen		Laden	
		Front	Rear	Front	Rear	Front	Rear
6.00-16 CROSS-PLY	bar	2,4	3,25	1,1	1,1	1,1	1,6
	lbf/in ²	35	47	16	16	16	23
	kgf/cm ²	2,5	3,3	1,1	1,1	1,1	1,6
7.50-16 CROSS-PLY	bar	1,9	2,4	1,1	1,1	1,1	1,6
	lbf/in ²	28	35	16	16	16	23
	kgf/cm ²	2,0	2,5	1,1	1,1	1,1	1,6
205R16 RADIAL-PLY	bar	1,9	2,4	1,1	1,1	1,1	1,6
	lbf/in ²	28	35	16	16	16	23
	kgf/cm ²	2,0	2,5	1,1	1,1	1,1	1,6
7.50R16 RADIAL-PLY	bar	1,9	2,75	1,1	1,1	1,1	1,6
	lbf/in ²	28	40	16	16	16	23
	kgf/cm ²	2,0	2,8	1,1	1,1	1,1	1,6
7.50-16 CROSS-PLY	bar	1,9	2,9	1,1	1,1	1,1	1,8
	lbf/in ²	28	42	16	16	16	26
	kgf/cm ²	2,0	3,0	1,1	1,1	1,1	1,8
750R16 RADIAL-PLY	bar	1,9	3,3	1,1	1,1	1,1	1,8
	lbf/in ²	28	48	16	16	16	26
	kgf/cm ²	2,0	3,4	1,1	1,1	1,1	1,8

REPLACEMENT BULBS AND UNITS

Headlamps:	
— UK and Europe (except France)	60155 W Halogen bulb
— France and Algeria	60155 W Halogen bulb, yellow
— Rest of world, right-hand steering	75150W Sealed beam unit
— Rest of world, left-hand steering	60/50 W Sealed beam unit
Front side lamps	12 v 5W
Side repeater lamps	12 v 4 w
Stop/tail lamps	12 v 21/5W
Flasher lamps	12 v 21 w
Number plate lamp	12 v 4 w
Reverse lamp	12 v 21 w
Rear fog guard lamp	12 v 21 w
Interior lamp	12 v 21 w
Warning lights	12 v 12 w
Instrument illumination	12 v 3w
Hazard switch warning light	12V 0.6W

VEHICLE WEIGHTS AND PAYLOAD

Payload figures quoted in the accompanying table are nominal values for a base specification vehicle and will in general represent the maximum, as any options or extras fitted to the vehicle will increase its unladen weight and hence decrease its allowable payload.

When loading a vehicle to its maximum (Gross Vehicle Weight), consideration must be taken of the unladen vehicle weight and the distribution of the payload to ensure that axle loadings do not exceed the permitted maximum values. It is the customer's responsibility to limit the vehicle's payload in an appropriate manner such that neither maximum axle loads nor Gross Vehicle Weight are exceeded.

Land Rover Ninety													
Model — Petrol/Diesel	Soft Top			Pick-up			Hard Top			Station Wagon			
	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	
Gross Vehicle Weight	STANDARD SUSPENSION 2400 kg												
EEC Kerb Weight	kg	1606	1643	1602	1635	1672	1631	1648	1685	1644	1690	1727	1686
EEC Payload	kg	794	757	798	765	728	769	752	715	756	710	673	714
Unladen Weight	kg	1487	1519	1483	1516	1548	1512	1529	1561	1525	1571	1603	1567
Payload	kg	913	881	917	884	852	888	871	839	875	829	797	833
Maximum Axle Weights, all Ninety models with Standard Suspension													
Front Axle 1200 kg Rear Axle 1380 kg													
Gross Vehicle Weight	HIGH LOAD SUSPENSION 2550 kg												
EEC Kerb Weight	kg	1633	1670	1629	1662	1699	1658	1675	1712	1671	1717	1754	1713
EEC Payload	kg	917	880	921	888	851	892	875	838	879	833	796	837
Unladen Weight	kg	1514	1546	1510	1543	1575	1539	1556	1588	1522	1598	1630	1594
Payload	kg	1036	1004	1040	1007	975	1011	994	962	998	952	920	956
Maximum Axle Weights, all Ninety models with High Load Suspension													
Front Axle 1200 kg Rear Axle 1500 kg													

Land Rover One Ten																
Model — Petrol/Diesel	Soft Top			Pick-up			Hard Top			Station Wagon			High Capacity Pick-up			
	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	2.5P	2.5D	3.5P	
Gross Vehicle Weight	UNLEVELLED SUSPENSION 3050 kg															
EEC Kerb Weight	kg	1723	1742	1698	1724	1743	1699	1777	1796	1752	1887	1906	1862	1813	1859	1778
EEC Payload	kg	1327	1308	1352	1326	1307	1351	1273	1254	1298	1163	1144	1188	1237	1191	1272
Unladen Weight	kg	1588	1599	1563	1589	1600	1564	1642	1653	1617	1752	1763	1727	1678	1716	1643
Payload	kg	1462	1451	1487	1461	1450	1486	1408	1397	1433	1298	1287	1323	1372	1334	1407
Maximum Axle Weights, all One Ten models with Unlevelled Suspension																
Front Axle 1200 kg Rear Axle 1850 kg																
Gross Vehicle Weight	LEVELLED SUSPENSION 2950 kg															
EEC Kerb Weight	kg	1733	1752	1708	1734	1753	1709	1787	1806	1762	1897	1916	1872	1823	1869	1788
EEC Payload	kg	1217	1198	1242	1216	1197	1241	1163	1144	1188	1053	1034	1078	1127	1081	1162
Unladen Weight	kg	1598	1609	1573	1599	1610	1574	1652	1663	1627	1762	1773	1737	1688	1726	1653
Payload	kg	1352	1341	1377	1351	1340	1376	1298	1287	1323	1188	1177	1213	1262	1224	1297
Maximum Axle Weights, all One Ten models with Levelled Suspension																
Front Axle 1200 kg Rear Axle 1750 kg																

V8 PETROL ENGINE TUNING DATA
(with 4-speed gearbox and without electronic ignition)

ENGINE

Compression ratio.....	9.35:1 or 8.13:1 Dependent upon market
Firing order	1—8—4—3—6—5—7—2
Cylinder numbering system, front to rear:	
Left bank	1—3—5—7
Right bank	2—4—6—8
Compression pressure (minimum)	9,5 kgf cm ² (135 lbf in ²)
Timing marks	On crankshaft pulley vibration damper
Valve clearance.. ..	Not adjustable

Valve timing:

Inlet opens	36" B.T.D.C.
Inlet closes	64" A.B.D.C.
Inlet duration.. ..	280°
Inlet peak	99" A.T.D.C.
Exhaust opens.. ..	74" B.B.D.C.
Exhaust closes.....	26" A.T.D.C.
Exhaust duration	280"
Exhaust peak	119° B.T.D.C.

CARBURETTERS

Type	Two Solex
European Australian	175 CDSE
Other markets — non-emission	175 CD3
Needle:	
Australian	BIFH
Other markets — non-emission	BIFQ
— emission	BIFK
Idle speed (engine hot):	
Australian	700 - 750 rpm (run-in) 550 - 650 rpm (new engine)
Other markets — non-emission	550 - 650 rpm
— emission.....	700 - 750 rpm (run-in) 550 - 650 rpm (new engine)
Fast idle speed (engine hot)	1050- 1150rpm
Mixture setting — CO at idle:	
Australian	2% - 3.5% Pulsair connected
Other markets	1.5% - 3% Pulsair connected

IGNITION

Coil make/type	AC Delco with ballast resistor
Primary resistance at 20°C (68°F).....	1.2- 1.4 ohms
Consumption, ignition on, at 2000 rpm	1 amp
Sparking plug type	Champion N12Y or Unipart GSP131
Sparking plug gap	0,71 - 0,84 mm (0.028 - 0.033 in)
Ignition timing, dynamic or static.....	5" to 7° B.T.D.C.
Fuel octane rating Australia.. ..	97 RON minimum
Non-emission	97 RON minimum
Emission	90 RON minimum
Engine idle speed.....	750rpm maximum with vacuum pipe disconnected

DISTRIBUTOR

Make/type	Lucas 35D8		
Rotation of rotor	Anti-clockwise		
Dwell angle	26" - 28"		
Contact breaker gap	0,35 - 0,40 mm (0.014 - 0.016 in)		
Condenser capacity	0.18 - 0.25 microfarad		
Centrifugal advance range and capsule.. ..	2" - 4" at 750rpm	} 15.03 Emission Engines	} ADR 36 Emission Engines
	12° - 14° at 2300 rpm		
	1/20 - 4 1/2° at 10in Hg		
Vacuum advance capsule range	5" - 7° at 20 in Hg		
	5" - 7" at 9 in Hg		
Vacuum retard capsule range.. ..	5" - 7" at 14in Hg		
		1° - 3" at 800rpm	
		7° - 9° at 1800 rpm	
		2 1/2° - 4W at 10in Hg	
		7" - 9" at 20 in Hg	
		5" - 7" at 9 in Hg	
		5" - 7° at 14 in Hg	

V8 ENGINE TUNING DATA
(Ninety and One Ten V8 with 5-speed gearbox and electronic ignition)

EUROPE

ENGINE

Compression ratio.....	V8 cylinder	
	8.13:1	
Valve timing	Inlet	Exhaust
Opens	30" B.T.D.C.	68" B.B.D.C.
Closes	75" A.B.D.C.	37" A.T.D.C.
Duration	285°	285"
Valve peak	112.5" A.T.D.C.	105.5" B.T.D.C.

CARBURETTERS

Type	2 x Solex 175 CDSE
Solex specification number.....	3994
Needle	BIFK
Idle speed (engine hot).. ..	700 to 750 rev/min (run-in engine)
	550 to 650 rev/min (new engine)
Fast idle speed (engine hot)	1050 to 1150 rev/min
Mixture setting — CO at idle	1.5 to 3% Pulsair connected

IGNITION

Distributor make/type.....	Lucas 35 DM8 Electronic (Early Models)
	Lucas 35 DLM8 Electronic (Later Models)
Direction of rotation.....	Clockwise
Centrifugal advance	
Decelerating check with vacuum retard pipe disconnected	
Engine rev/min	Crankshaft angle
3600.....	22" to 28"
2400.....	13" to 21"
1600.....	5" to 9"
1000.....	0" to 3"
No advance below 500 rev/min	
Ignition timing, dynamic; models with emission control	6" B.T.D.C. with vacuum pipes disconnected using 90-93 octane fuel — 2star rating in UK

V8 ENGINE TUNING DATA
(Ninety and One Ten V8 with 5-speed gearbox and electronic ignition)

AUSTRALIA

ENGINE	V8 cylinder	
Compression ratio.. .. .	9.35:1	
Valve timing	Inlet	Exhaust
Opens	30" B.T.D.C.	68" B.B.D.C.
Closes	75" A.B.D.C.	37" A.T.D.C.
Duration	285"	285"
Valve peak	112.5" A.T.D.C.	105.5" B.T.D.C.

CARBURETTERS

Type	2 x Solex 175 CDSE
Solex specification number.. .. .	4104
Needle	BIFH
Idle speed (engine hot).. .. .	700 to 750 rev/min (run-in engine) 550 to 650 rev/min (new engine)
Fast idle speed (engine hot)	1050 to 1150 rev/min
Mixture setting — CO at idle	2% to 3.5% Pulsair connected

IGNITION

Distributor make/hype.. .. .	Lucas 35 DM8 Electronic (Early Models) Lucas 35 DLM8 Electronic (Later Models)
Direction of rotation.	Clockwise
Centrifugal advance	
Decelerating check with vacuum retard pipe disconnected	
Engine rev/min	Crankshaft angle
2900.....	12" to 16"
2400.....	8" to 12"
1600.....	2" to 6"
No advance below 800 rev/min	
Ignition timing	6" B.T.D.C. with vacuum pipes disconnected using 96 octane fuel

V8 ENGINE TUNING DATA
(Ninety and One Ten V8 with 5-speed gearbox and electronic ignition)

SAUDI ARABIA

ENGINE	V8 cylinder	
Compression ratio.. .. .	8.13:1	
Valve timing (low lift camshaft)	Inlet	Exhaust
Opens	36" B.T.D.C.	74" B.B.D.C.
Closes	64" A.B.D.C.	26° A.T.D.C.
Duration	280°	280°
Valve peak	99" A.T.D.C.	119° B.T.D.C.

CARBURETTERS

Type	2 x Solex 175 CDSE
Solex specification number	3999
Needle	BIFC
Idle speed (engine hot)	700 to 750 rev/min (run-in engine) 550 to 650 rev/min (new engine)
Fast idle speed (engine hot)	1050 to 1150 rev/min
Mixture setting — COat idle	1.5% to 3% Pulsair connected

IGNITION

Distributor make/type	Lucas 35 DM8 Electronic (Early Models) Lucas 35 DLM8 Electronic (Later Models)
Direction of rotation	Clockwise
Centrifugal advance	
Decelerating check with vacuum retard pipe disconnected	
Engine rev/min	Crankshaft angle
4600	21" to 25"
3600	16" to 20°
3000	12" to 16"
2400	7" to 11"
1600	1" to 3"
No advance below 900 rev/min	
Ignition timing, dynamic; models with emission control	6" B.T.D.C. with vacuum pipes disconnected using 90-93 octane fuel

V8 ENGINE TUNING DATA

(Ninety and One Ten V8 with 5-speed gearbox and electronic ignition)

ALL COUNTRIES EXCEPT EUROPE, SAUDI ARABIA AND AUSTRALIA**ENGINE**

Compression ratio,	V8 cylinder	
	8.13:1	
Valve timing (low lift camshaft)	Inlet	Exhaust
Opens	36" B.T.D.C.	74" B.B.D.C.
Closes	64" A.B.D.C.	26" A.T.D.C.
Duration	280"	280"
Valve peak	99" A.T.D.C.	119" B.T.D.C.

CARBURETTERS

Type	2 x Solex 175 CDSE
Solex specification number	4000
Needle	BIFQ
Idle speed (engine hot)	700 to 750 rev/min (run-in engine) 550 to 650 rev/min (new engine)
Fast idle speed (engine hot)	1050 to 1150 rev/min

IGNITION

Distributor make/type.....	Lucas 35 DM8 Electronic (Early Models) Lucas 35 DLM8 Electronic (Later Models)
Direction of rotation.....	Clockwise
Centrifugal advance	
Decelerating check with vacuum retard pipe disconnected	
Engine rev/min	Crankshaft angle
4200.....	23° to 27°
3500.....	20° to 24°
3000.....	16° to 20°
2000.....	8° to 12°
1200.....	2° to 6°
No advance below 400 rev/min	
Ignition timing, dynamic.....	6° B.T.D.C. with vacuum pipes disconnected using 90 octane fuel

2.25 LITRE PETROL ENGINE TUNING DATA**ENGINE**

Firing order.....	1—3—4—2
Compression pressure (approximately):	
8.0:1 compression ratio.....	11,2 kgf cm ² (160 lbf in ²) @ 300 rpm cranking speed
Ignition timing, static and dynamic up to 600 rpm:	
8.0:1 compression ratio.....	T.D.C. when using 90 octane fuel } with vacuum 3° A.T.D.C. when using 85 octane fuel } pipe connected
Timing marks.....	On crankshaft pulley
Valve clearance, inlet and exhaust.....	0,25 mm (0.010 in) Engine hot
Valve timing:	
Inlet opens.....	16° B.T.D.C. } With a 0,38 mm (0.015 in)
Inlet closes.....	42° A.B.D.C. } valve clearance.
Inlet peak.....	103° A.T.D.C. } Nominal setting for
Exhaust opens.....	51° B.B.D.C. } checking only.
Exhaust closes.....	13° A.T.D.C. }
Exhaust peak.....	109° B.T.D.C. }

DISTRIBUTOR — LUCAS

Type.....	Lucas 45D
Rotation of rotor.....	Anti-clockwise
Contact breaker gap.....	0,35 - 0,40 mm (0.014 - 0.018 in)
Dwell angle.....	46° - 56°
Centrifugal advance range.....	1° - 1° at 300 Distributor 19° - 21° at 2250 rpm
Vacuum advance capsule range.....	0° - ½° at 3.5 Hg 11° - 13° at 25 Hg

DISTRIBUTOR — DUCELLIER

Type.....	Ducellier Sliding Contact
Rotation.....	Anti-clockwise
Contact breaker gap.....	0,35 - 0,40 mm (0.014 - 0.016 in)
Dwell angle.....	57°
Centrifugal advance range.....	0° - 1° at 300 Distributor 19° - 21° at 2250 rpm
Vacuum advance capsule range.....	0° - ½° at 3.5 Hg 11° - 13° at 25 Hg

SPARKING PLUGS

8.0:1 compression ratio	Champion N9YC
Gap	0,72 - 0,88 mm (0.028 - 0.035 in)

IGNITION COIL

Make/type	Bosch 0221 119 368
Primary resistance at 20°C (68°F)	2.9 ohms
Consumption — ignition on at engine idle speed	2.0 amps approx.

CARBURETTER

Make/type	Weber 32/34 DM TL
Needle valve	175

	Primary	Secondary
Venturi	24	25
Auxiliary Venturi	4	4
Main jet	112	112
Air correction jet	160	190
Emulsion tube	F30	F39
Idle jet	52	60
Idle CO%	1.5% ± 1%	
Idle speed — hot — Non Air Conditioning	700 rpm	
Idle speed — hot — Air Conditioning	800 rpm ± 50 rpm	
Float level	7 ± 0,5 mm (0.275 ± 0.019 in)	

2.25 and 2.5 LITRE DIESEL ENGINE TUNING DATA**ENGINE**

Firing order	1—3—4—2
Injection timing	13" B.T.D.C. (2.25 litre Diesel)

Timing marks:

Valve timing	On engine flywheel and damper on 2.5 Diesel
Injection timing	On engine flywheel and pump flange
Valve clearance inlet and exhaust	0,25 mm (0.010 in)

Valve timing:

Inlet opens	16" B.T.D.C.
Inlet closes	42" A.B.D.C.
Inlet peak	103° A.T.D.C.
Exhaust opens	51° B.B.D.C.
Exhaust closes	13" A.T.D.C.
Exhaust peak	109° B.T.D.C.
Low idle speed	650 ± 20 rpm
High idle speed	4200 ± 20 rpm

INJECTORS

Make/type	CAV Pintaux
Nozzle size	BDNO/SPC 6209 or BDNO/SP 6209
Opening pressure	135 Atm

HEATER PLUGS

Make/type

Probe type, Champion CH 63 12 volt



DISTRIBUTOR PUMP

Make/type

CAV DPA-2.25 DPS-2.50 type with mechanical governor and auto advance and solenoid electrical shut-off

Direction of rotation.....

Clockwise, viewed from drive end

Maximum speed setting (sealed) 2.25 engine

4200 engine rpm

Maximum speed setting (sealed) 2.50 engine

4400 ± 8 rpm

Back leakage rate 150- 100Atm:

New nozzle

7 seconds

Original nozzle.....

5 seconds



TORQUE WRENCH SETTINGS

ENGINE 2.25 litre Petrol and Diesel

	Nm	lbf ft
Bearing in water pump casing	7 .10	5 .7.3
Breather filter to top cover	7 .10	5 .7.3
By-pass housing to thermostat housing	22 .28	16 .20.6
Carburettor to inlet manifold	22 .28	16 .20.6
Chainwheel pulley to camshaft	40 .50	30 .36.8
Clutch cover plate to flywheel	30 .38	22 .28
Connecting rod to cap	37 .41	27 .30
Fan assembly to water pump hub	22 .28	16 .20.6
Fly wheel to crankshaft	130 .143	96 .105
Fuel pump to side cover	20 .28	14.7 .20.6
Heat shield bracket to manifold	22 .28	16 .20.6
Heat shield to bracket	22 .28	16 .20.6
Oil strainer to mounting bracket	22 .28	16 .20.6
P. clip to lifting bracket	7 .10	5 .7.3
Plug to immersion heater tapping	20 .28	14.7 .20.6
Oil pump cover to pump body	20 .28	14.7 .20.6
Rocker shaft to pedestal	20 .27	14.7 .20
Solenoid heat shield to manifold heat shield	22 .28	16 .20.6
Starter motor to housing	40 .50	30 .36.8
Sump plug to sump	30 .40	22 .29.5
Distributor clamp	13 .19	9.5 .14
Distributor to adaptor	7 .10	5 .7.3
Pulley to crankshaft	260 .280	192 .206
Water temperature to cylinder head adaptor	14 .18	10.3 .13.2
Spark plug	14 .19	10.3 .14
Adaptor for water temperature transmitter to cylinder head	22 .28	16 .20.6
Cover thermostat housing to cylinder head	7 .10	5 .7.3
Lifting bracket to cylinder head	27 .40	20 .29.5
Rocker pedestal to cylinder head	22 .28	16 .20.6
Top cover to cylinder head	8 .11	6 - 8
Alternator adjusting link to cylinder block	22 .28	16 .20.6
Alternator mounting bracket to cylinder block	22 .28	16 .20.6
Camshaft thrust plate to cylinder block	7 .10	5 .7.3
Chain damper to cylinder block	7 .10	5 .7.3
Cylinder head (Diesel) to cylinder block	115 .130	84.8 .95.8
Cylinder head (Petrol) to cylinder block	91 .113	67 .83
DPA injector pump (Diesel) to cylinder block	22 .28	16 .20.6
Distributor housing (Petrol) to cylinder block	22 .28	16 .20.6
Drive shaft/gear to cylinder block	10 .17	7.4 .12.5
Engine mounting foot to cylinder block	80 .95	59 .70
Flywheel housing to cylinder block	40 .50	30 .36.8
Front cover to cylinder block	22 .28	16 .20.6
Main bearing cap (Diesel) to cylinder block	130 .136	96 .100
Main bearing cap (Petrol) to cylinder block	130 .136	96 .100
Oil feed pipe to cylinder block	20 .25	14.7 .18.4
Oil filter to cylinder block	40 .50	30 .36.8
Oil pump to cylinder block	22 .28	16 .20.6
Plug oil gallery front to cylinder block	30 .40	22 .30
Plug oil gallery rear to cylinder block	30 .40	22 .30
Side cover to cylinder block	22 .28	16 .20.6
Side cover FP mounting to cylinder block	22 .28	16 .20.6
Sump to cylinder block (bolts and nuts)	15 .20	11 .14.7
Water pump to cylinder block	22 .28	16 .20.6
Dipstick tube assembly to cylinder block	22 .28	16 .20.6

ENGINE 2.5 litre Diesel

	Nm	lbf ft
DPS pump studs to front cover	6-10	4.5 _7.3
DPS pump to front cover	22 _28	16 _20.6
DPS pump to support bracket	22 _28	16 _20.6
Pulley to DPS pump	42 _48	31 _35.4
Distributor pipe banjo bolts	14 _20	10.3 _15
Tensioner assembly	22 _28	16 _20.6
Vacuum pump	22 _28	16 _20.6
Oil squirt to cylinder block	14 _20	10.3 _15
Throttle linkage to DPS pump	5 - 7	4 - 5
Throttle bracket to DPS pump	5 - 7	4 - 5
Front cover to cylinder block	22 _28	16 _20.6
Front cover plate to cylinder block	22 _28	16 _20.6
Cover plate to front cover plate	22 _28	16 _20.6
Cowl mounting bracket to front cover	22 _28	16 _20.6
Timing pointer to front cover	22 _28	16 _20.6
Drain plate to front cover	7 - 10	5 _7.3

ENGINE V8 Petrol engine

Air intake adaptor to carbs ...	24	17
Alternator mounting bracket o cylinder head	34	25
Alternator to mounting bracket	24	17
Alternator to adjusting link	24	17
Chainwheel to camshaft	54 _61	40 _45
Connecting rod bolt	47 _54	35 _40
Clutch attachment to flywheel	24 _30	18 _22
Cylinder head:		
Outer row	54 _61	40 _45
Centre row	88 _95	65 _70
Inner row	88 _95	65 _70
Distributor clamp bolt	19 _22	14- 16
Exhaust manifold to cylinder heads	19 _22	14- 16
Fan attachment	11,5	9
Flywheel to crankshaft	74 _81	55 _60
Inlet manifold to cylinder heads	47 _54	35 _40
Lifting eye to cylinder heads.,	24	17
Main bearing cap bolts	68 _75	50 _55
Main bearing cap rear bolts	88 _95	65 _70
Manifold gasket clamp bolt	13,5 _20	10 _15
Oil pump cover to timing cover	11 _14	8 - 10
Oil plug	25 _30	18 _22
Oil relief valve cap	40	30
Oil sump drain plug	40,6 _47	30 _35
Oil sump to cylinder block	8- 11	5 - 8
Oil sump rear to cylinder block	17,6 _20.3	13 _15
Rocker cover to cylinder head	7	5
Rocker shaft bracket to cylinder head	34 _40	25 _30
Spark plug	13,8 _16.2	10- 12
Starter motor attachment	40,6 _47,4	30 _35
Damper to crankshaft	257 _285	190 _210
Timing cover to cylinder block	24 _30	18 _22
Tempatrol unit to water pump	36 _40	27 _30
Water pump pulley to water pump hub	23	17
Water pump timing cover to cylinder block	24 _30	18 _22

CLUTCH V8 Petrol engine

	Nm	lbf ft
Clutch cover bolts	27.5	20
Slave cylinder bolts	27.5	20

CLUTCH — 4-cylinder Petrol and Diesel engine

	Nm	lbf ft
Clutch cover bolts	30 .38	22 .28

**MAIN GEARBOX (FIVE-SPEED)LT 77 mm —
4-cylinder Petrol and Diesel engine**

Oil pump body to extension case	7 .10	5 - 7
Clip to clutch release lever	7 - 10	5 - 7
Attachment plate to gearcase	7 - 10	5 - 7
Attachment plate to remote housing	7 .10	5 - 7
Extension case to gearcase	22 .28	16- 21
Pivot plate	22 .28	16- 21
Remote selector housing to extension case	22 .28	16- 21
Gear lever housing to remote housing	22 .28	16- 21
Guide clutch release sleeve	22 .28	16- 21
Slave cylinder to clutch housing	22 .28	16- 21
Front cover to gearcase	22 .28	16- 21
5th support bracket	22 .28	16- 21
Plunger housing to remote housing	22 .28	16- 21
Blanking plug extension case	7 - 10	5 - 7
Gear lever retainer	7 - 10	5 - 7
Yoke to selector shaft	22 .28	16- 21
Fixing gear lever assembly nut	40 .47	30 - 35
Reverse pin to centre plate nut	47 .54	35 - 40
Clutch housing to gearbox bolt	65 .80	48 - 59
Plug — detent spring	22 .28	16- 21
Oil drain plug	25 .35	19- 26
Oil filter plug	25 .35	19- 26
Plug oil filler — remote housing	25 .35	19- 26
Breather	7 - 11	5 - 8
Oil level plug	25 .35	19- 26
Blanking plug — reverse switch hole	20 .27	15 - 20
Fifth gear layshaft nut	204 .231	130 - 170

**MAIN GEARBOX (FIVE-SPEED)LT85 —
V8 engine**

Stop 4th speed adjustment	7 - 10	5 - 7
Clip to clutch release lever	7 - 10	5 - 7
Spring housing to top cover	7 - 10	5 - 7
Plate — lower (retained with Loctite 270)	22 .28	16- 21
Slave cylinder to clutch housing	22 .28	16- 21
5th fork bracket	22 .28	16- 21
Front cover to bearing plate	22 .28	16 .21
Plate — Lower (upper fixings)	22 .28	16 .21
Selector fork to shaft and reverse beam to shaft	22 .28	16 .21
Top cover to gearbox	22 .28	16 .21
1st/2nd selector fork to shaft	30 .40	22 .30
Extension case to gearbox	47 .54	35 .40
Extension case to gearbox	47 .54	35 .40
Extension case to gearbox	47 .54	35 .40
Extension case to gearbox	47 .54	35 .40
Clutch housing/bearing plate/gearbox	65 .80	48 .59
Layshaft	204 .231	150 - 170
Reverse lever pivot	65 .80	48 .59
Gross hole/gearbox casing	13,5 .20	10 .15
Filler/top cover	25 .35	19 .26
Oil level/gear case	25 .35	19 .26
Filter plug	65 .80	48 .59
Drain plug	25 .35	19 .26
Reverse light switch hole-blanking plug	13,5 .20	10 - 15
Switch reverse light (optional)	13,5 .20	10 - 15

TRANSFER BOX LT230R —

4-cylinder Petrol and Diesel engine

	Nm	lbf ft
Pinch bolt, operating arm	7 - 10	5 - 7
Gate plate to grommet plate	7 - 10	5 - 7
End cover	7 - 10	5 - 7
Speedometer cable retainer	7 - 10	5 - 7
Speedometer housing/rear output	See note	
Locating plate to gear change housing	5 - 7	4 - 5
Bottom cover to transfer case	22 .28	16 .21
Front output housing to transfer case	22 .28	16 .21
Cross shaft housing to front output housing	22 .28	16 .21
Gear change housing	22 .28	16 .21
Pivot shaft.....	22 .28	16 .21
Connecting rod	22 .28	16 .21
Retaining plate intermediate shaft	22 .28	16 .21
Front output housing cover	22 .28	16 .21
Gear change housing	22 .28	16 .21
Bracket to extension housing.....	22 .28	16 .21
Finger housing to front output housing.....	22 .28	16 .21
Mainshaft bearing housing	22 .28	16 .21
Brake drum	22 .28	16 .21
Gearbox to transfer box	40 .50	29 .37
Bearing housing to transfer gearbox	40 .50	29 .37
Speedometer housing to transfer gearbox	40 .50	29 .37
Selector fork to cross shaft	22 .28	16 .21
Yoke to selector shaft high/low	22 .28	16 .21
Selector fork high/low to shaft.....	22 .28	16 .21
Operating arm high/low.....	22 .28	16 .21
Transmission brake	65 .80	48 .59
Gearbox to transfer case	40 .50	29 .37
Gearbox to transfer case	See note	
Oil drain plug	25 .35	19 .26
Differential case	55 .64	40 .47
Output flange	146 .179	108 .132
Differential case rear and shaft main drive		
214-wheel drive	66 .80	50 .60
Link arm and cross shaft lever to ball joint	8 - 12	6 - 9
Oil filler/level plug	25 .35	19 .26
Transfer breather	7 - 11	5 - 8

NOTE:- Studs to be assembled into casings with sufficient torque to wind them fully home. but this torque must not exceed the maximum figure quoted for the associated nut on final assembly.

TRANSFER GEARBOX LT230T —

4 cylinder Petrol and Diesel engine and V8

Fixings securing mounting brackets to gearbox	80 .100	59 .73
Pinch bolt operating arm	7 - 10	5 - 7
Gate plate to grommet plate	7 - 10	5 - 7
Bearing housing to transfer case	7 - 10	5 - 7
Speedometer cable retainer	7 - 10	5 - 7
speedometer housing	See note	
Locating plate to gear change	5 - 7	4 - 5
Bottom cover to transfer	22 .28	16 .21
Front output housing to transfer	22 .28	16 .21
Front output housing to transfer	22 .28	16 .21

TRANSFER GEARBOX LT230T —**4 cylinder Petrol and Diesel engine and V8 (cont.)**

	Nm	lbf ft
Cross shaft housing to front output housing	22 .28	16 .21
Gear change	22 .28	16 .21
Gear change	22 .28	16 .21
Cross shaft to high/low lever	22 .28	16 .21
Pivot shaft to link arm	22 .28	16 .21
Connecting rod	22 .28	16 .21
Anti-rotation plate intermediate shaft	22 .28	16 .21
Front output housing cover	22 .28	16 .21
Pivot bracket to extension housing	22 .28	16 .21
Finger housing to front output housing	22 .28	16 .21
Mainshaft bearing housing to transfer case	22 .28	16 .21
Brake drum to coupling flange	22 .28	16 .21
Gearbox to transfer case.....	40 .50	29 .37
Gearbox to transfer case	40 .50	29 .37
End cover bearing housing to transfer case.....	40 .50	29 .37
Speedometer housing to transfer	40 .50	29 .37
Speedometer housing to transfer	40 .50	29 .37
Selector finger to cross shaft (high/low)	22 .28	16 .21
Selector fork high/low to shaft.....	22 .28	16 .21
Transmission brake to speedometer housing	65 .80	48 .59
Gearbox to transfer case	40 .50	29 .37
Transfer case assembly	See note	
Oil drain plug	25 .35	19 .26
Detent plug	Plug to be coated with Hylomar and peened . Screw plug fully in (spring solid) then turn two complete turns back .	
Differential casings	55 .64	40 .47
Front and rear out flange	146 .179	108 .132
Differential case rear	66 .80	50 .59
Oil filler and level plug transfer	25 .35	19 .26
Transfer breather	7 - 11	5 - 8
Inter shaft stake nut	130 .140	96 .104

NOTE:- Studs to be assembled into casings with sufficient torque to wind them fully home. but this torque must **not** exceed the maximum figure quoted for the associated nut on final assembly .

GEARBOX AND TRANSFER BOX LT95 V8 Petrol engine

Bell housing to cylinder block bolts	36,6 .44,8	27 .33
Gearbox casing to bell housing 2 off	146,5 .179	108 .132
Gearbox casing to bell housing 2 off	85,4 .104,4	63 .77
Gearbox casing to bell housing nuts	85,4 .104,4	63 .77
Gearbox casing to bell housing stud and nuts	146,5 .179	108 .132
Output flange — rear — nut and bolts	43,4 .51,5	32 .38
Output shaft — rear — nut	146,5 .179	108 .132
Output shaft — front — nut	146,5 .179	108 .132
Gear selector spherical scat bolts	13,6 .16,3	10 - 12
Propeller shaft to flange bolts	43,4 .51,5	32 .38
All other nuts and bolts:		
M6	9,9 .11,9	7.3 .8.7
M8	23,7 .29.7	17.5 .21.3
M10	48 .58	35.4 .42.8

FRONT AXLE

	Nm	lbf ft
Hub driving member to hub	60-70	44 _52
Brake disc to hub	65 _80	48 _59
Stub axle to swivel pin housing	60 _70	44-52
Brake caliper to swivel pin housing	120 _150	88 _111
Upper swivel pin to swivel pin housing	60 _70	44 _52
Lower swivel pin to swivel pin housing	22 _28	16 _21
Oil seal retainer to swivel pin housing	7 - 10	5 - 7
Swivel bearing housing to axle case	65 _80	48 _59
Pinion housing to axle case	36 _46	26 _34
Crown wheel to differential case	55 _61	40 _45
Differential bearing cap to pinion housing	80 _100	54 _74
U/J flange to prop shaft	41 -52	30 _38
Mudshield to swivel pin housing	7 - 10	5 - 7
Bevel pinion nut	95 _163	70 _120

REAR AXLE AND FINAL DRIVE

Crown wheel to differential case	150 _170	111 _125
Rear cover to axle case	20 _27	15 _20
Ball joint mounting bracket to axle case	125 _142	92 _105
U/J flange to prop shaft	41 _52	30 _38
Drum to hub	15 _20	11 _15
Rear brake assembly and stub axle rear to axle case	60 _70	44-52
Hub driving member to hub	60 _70	44 _52

PROPELLER SHAFTS

Coupling flange bolts	43 - 51	32 _38
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REAR SUSPENSION

Bottom link to chassis nut	176	130
Bottom link to mounting rubber nuts	64	47
Top link bracket to chassis nuts	47	35
Bump stop rubber bracket nuts	32	24
Shock absorber bracket to chassis nuts	64	47
Shock absorber upper attachment to bracket	82	60
Anti roll bar bush to chassis nuts	24	18
Upper link ball joint to axle castle nut	176	130
Anti roll bar ball joint castle nut	40	30
Shock absorber lower attachment nuts	75	55

STEERING AND FRONT SUSPENSION

Tie bar to mounting arm nut	81	60
Mounting arm to chassis nuts	176	130
Tie bar to steering box nuts	81	60
Panard rod to mounting arm nut	176	130
Panard rod to anchor bracket nut	176	130
Panard rod mounting bracket to chassis bolts	115 _130	85 _96
Drop arm to drag link castle nut	81	60
Steering damper to drag link nut	50	37
Drop arm to steering box nut	176	130
Radius arm to axle nuts	176	130
Steering box to chassis nuts	81	60
Radius arms to chassis nuts	176	130
Track rod clamp bolt nuts	14	10
Drag link clamp bolt nuts	14	10
Steering wheel retaining nut	38	28
Road wheel nuts	108	80
Ball joint nuts	41	30
Collapsible coupling nuts	45	33

BRAKES

Brake disc to hub	65 -80	48 -59
Brake caliper to swivel housing	120 -150	88 -111
Brake pipe connections to:		
P.D.W.A. valve	9 - 11	7 - 8
Servo, primary port	9 -11	7 - 8
Servo, secondary port	20 -24	15 -18
Jump hose — female,.....	11 -13,5	8-10
Wheel cylinders	6.8 -9.5	5 - 7

ELECTRICAL EQUIPMENT V8 engine

Alternator:		
Shaft nut	27.2 -47,5	20 -35
Through bolts	4.5 -6.2	3.3 -4.6
Rectifier bolts	3.4 -3.96	2.5 -2.9
Starter motor to engine bolts	40.6 -47.4	30 -35
Starter motor:		
Through bolts	10.8	8.0
Solenoid fixing stud nut	6	4.5
Solenoid upper terminal nut	4	3.0
Reverse light switch.....	20 -27	15 -20

Lucas 35 DM8 Electronic ignition distributor V8 engine

Pick up bearing plate support pillars	1.0 -1.2	9- 11
Pickupbarrelnuts	1.1-1.5	10 -12

ELECTRICAL EQUIPMENT 4-cylinder Petrol and Diesel engine

Alternator:		
Shaft nut	27.2 -47.5	20 -35
Through bolts	4.5 -6.2	3.3 -4.6
Rectifier bolts	3.4 -3.96	2.5 -2.9
Heater plugs — Diesel	15 -30	11-22
Starter motor to engine	40 -50	30 -36.8
Petrol models:		
Starter through bolts	10.8	8
Diesel models:		
Solenoid to starter nuts	6	4.5
Solenoid outer terminal nuts	4	3
Starter yoke terminal outer nut	2	1.5
Starter through bolts	10.8	8
Starter earth stud nut	8	6
Eccentric pivot pin locknut	21	16

GENERAL FITTING INSTRUCTIONS

PRECAUTIONS AGAINST DAMAGE

1. Always fit covers to protect wings before commencing work in engine compartment.
2. Cover seats and carpets, wear clean overalls and wash hands or wear gloves before working inside car.
3. Avoid spilling hydraulic fluid or battery acid on paint work. Wash **off** with water immediately if this occurs. Use Polythene sheets in boot to protect carpets.
4. Always use a recommended Service Tool, or a satisfactory equivalent, where specified.
5. Protect temporarily exposed screw threads by replacing nuts or fitting plastic caps.

SAFETY PRECAUTIONS

1. Whenever possible use a ramp or pit when working beneath vehicle, in preference to jacking. Chock wheels as well as applying hand brake.
2. Never rely on a jack alone to support vehicle. Use axle stands or blocks carefully placed at jacking points to provide rigid location.
3. Ensure that a suitable form of fire extinguisher is conveniently located.
4. Check that any lifting equipment used has adequate capacity and is fully serviceable.
5. Inspect power leads of any mains electrical equipment for damage and check that it is properly earthed.
6. Disconnect earth (grounded) terminal of vehicle battery.
7. Do not disconnect any pipes in air conditioning refrigeration system, if fitted, unless trained and instructed to do so. A refrigerant is used which can cause blindness if allowed to contact eyes.
8. Ensure that adequate ventilation is provided when volatile degreasing agents are being used.

WARNING: Fume extraction equipment must be in operation when trichloride, methylene chloride, chloroform or perchlorethylene are used for cleaning purposes.

9. Do not apply heat in an attempt to free stiff nuts or fittings; as well as causing damage to protective coatings, there is a risk of damage to electronic equipment and brake lines from stray heat.
10. Do not leave tools, equipment, spilt oil etc., around or on work area.
11. Wear protective overalls and use barrier creams when necessary.

PREPARATION

1. Before removing a component, clean it and its surrounding areas as thoroughly as possible.
2. Blank off any openings exposed by component removal, using greaseproof paper and masking tape.
3. Immediately seal fuel, oil or hydraulic lines when separated, using plastic caps or plugs, to prevent loss of fluid and entry of dirt.
4. Close open ends of oilways, exposed by component removal, with tapered hardwood plugs or readily visible plastic plugs.
5. Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts.
6. Before dismantling a component, clean it thoroughly with a recommended cleaning agent; check that agent is suitable for all materials of component.
7. Clean bench and provide marking materials, labels, containers and locking wire before dismantling a component.

DISMANTLING

1. Observe scrupulous cleanliness when dismantling components, particularly when brake, fuel or hydraulic system parts are being worked on. A particle of dirt or a cloth fragment could cause a dangerous malfunction if trapped in these systems.
2. Blow out all tapped holes, crevices, oilways and fluid passages with an air line. Ensure that any O-rings used for sealing are correctly replaced or renewed, if disturbed.
3. Mark mating parts to ensure that they are replaced as dismantled. Whenever possible use marking ink, which avoids possibilities of distortion or initiation of cracks, liable if centre punch or scriber are used.
4. Wire together mating parts where necessary to prevent accidental interchange (e.g. roller bearing components).
5. Wire labels on to all parts which are to be renewed, and to parts requiring further inspection before being passed for reassembly; place these parts in separate containers from those containing parts for rebuild.
6. Do not discard a part due for renewal until after comparing it with a new part, to ensure that its correct replacement has been obtained.

INSPECTION — GENERAL

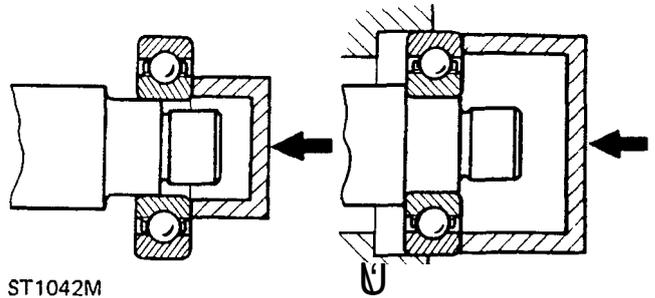
1. Never inspect a component for wear or dimensional check unless it is absolutely clean; a slight smear of grease can conceal an incipient failure.
2. When a component is to be checked dimensionally against figures quoted for it, use correct equipment (surface plates, micrometers, dial gauges, etc.) in serviceable condition. Makeshift checking equipment can be dangerous.
3. Reject a component if its dimensions are outside limits quoted, or if damage is apparent. A part may, however, be refitted if its critical dimension is exactly limit size, and is otherwise satisfactory.
4. Use 'Plastigauge' 12 Type PG-1 for checking bearing surface clearances; directions for its use, and a scale giving bearing clearances in 0,0025 mm (0.0001 in) steps are provided with it.

BALL AND ROLLER BEARINGS

NEVER REPLACE A BALL OR ROLLER BEARING WITHOUT FIRST ENSURING THAT IT IS IN AS-NEW CONDITION.

1. Remove all traces of lubricant from bearing under inspection by washing in petrol or a suitable degreaser; maintain absolute cleanliness throughout operations.
2. Inspect visually for markings of any form on rolling elements, raceways, outer surface of outer rings or inner surface of inner rings. Reject any bearings found to be marked, since any marking in these areas indicates onset of wear.
3. Holding inner race between finger and thumb of one hand, spin outer race and check that it revolves absolutely smoothly. Repeat, holding outer race and spinning inner race.
4. Rotate outer ring gently with a reciprocating motion, while holding inner ring; feel for any check or obstruction to rotation, and reject bearing if action is not perfectly smooth.
5. Lubricate bearing generously with lubricant appropriate to installation.
6. Inspect shaft and bearing housing for discolouration or other marking suggesting that movement has taken place between bearing and seatings. (This is particularly to be expected if related markings were found in operation 2.) If markings are found, use 'Loctite' in installation of replacement bearing.
7. Ensure that shaft and housing are clean and free from burrs before fitting bearing.
8. If one bearing of a pair shows an imperfection it is generally advisable to renew both bearings: an exception could be made if the faulty bearing had covered a low mileage, and it could be established that damage was confined to it only.

9. When fitting bearing to shaft, apply force only to inner ring of bearing, and only to outer ring when fitting into housing.

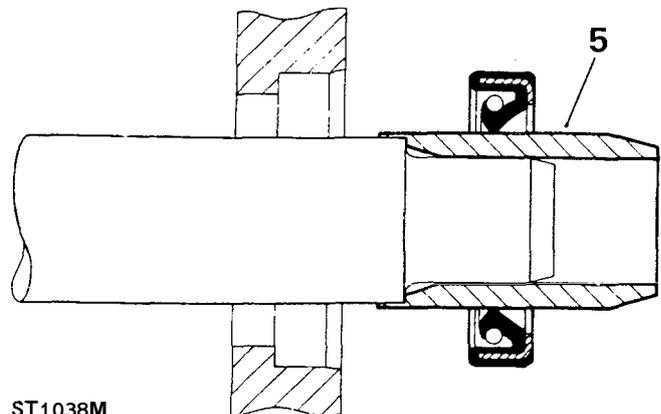


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10. In the case of grease-lubricated bearings (e.g. hub bearings) fill space between bearing and outer seal with recommended grade of grease before fitting seal.
11. Always mark components of separable bearings (e.g. taper roller bearings) in dismantling, to ensure correct reassembly. Never fit new rollers in a used cup.

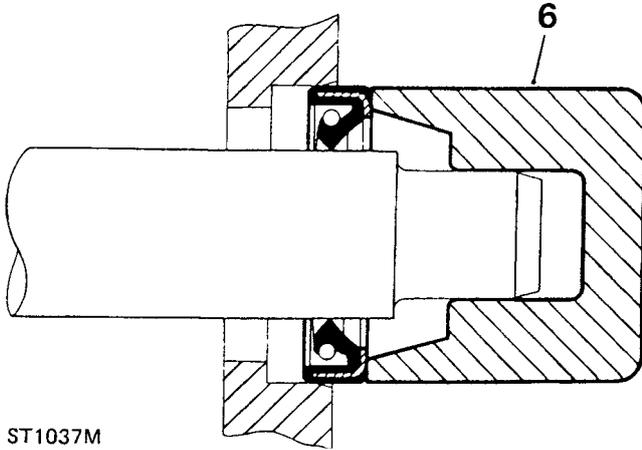
OIL SEALS

1. Always fit new oil seals when rebuilding an assembly. It is not physically possible to replace a seal exactly when it has bedded down.
2. Carefully examine seal before fitting to ensure that it is clean and undamaged.
3. Smear sealing lips with clean grease; pack dust excluder seals with grease, and heavily grease duplex seals in cavity between sealing lips.
4. Ensure that seal spring, if provided, is correctly fitted.
5. Place lip of seal towards fluid to be sealed and slide into position on shaft, using fitting sleeve when possible to protect sealing lip from damage by sharp corners, threads or splines. If fitting sleeve is not available, use plastic tube or adhesive tape to prevent damage to sealing lip.



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- Grease outside diameter of seal, place square to housing recess and press into position, using great care and if possible a 'bell piece' to ensure that seal is not tilted. (In some cases it may be preferable to fit seal to housing before fitting to shaft.) Never let weight of unsupported shaft rest in seal.



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- If correct service tool is not available, use a suitable drift approximately 0,4 mm (0.015 in) smaller than outside diameter of seal. Use a hammer VERY GENTLY on drift if a press is not suitable.
- Press or drift seal in to depth of housing if housing is shouldered, or flush with face of housing where no shoulder is provided. Ensure that the seal does not enter the housing in a tilted position.

NOTE: Most cases of failure or leakage of oil seals are due to careless fitting, and resulting damage to both seals and sealing surfaces. Care in fitting is essential if good results are to be obtained.

JOINTS AND JOINT FACES

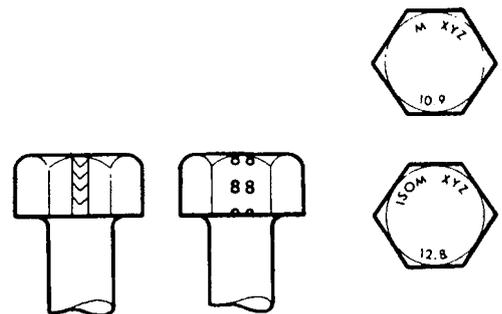
- Always use correct gaskets where they are specified.
- Use jointing compound only when recommended. Otherwise fit joints dry.
- When jointing compound is used, apply in a thin uniform film to metal surfaces; take great care to prevent it from entering oilways, pipes or blind tapped holes.
- Remove all traces of old jointing materials prior to reassembly. Do not use a tool which could damage joint faces.
- Inspect joint faces for scratches or burrs and remove with a fine file or oil stone; do not allow swarf or dirt to enter tapped holes or enclosed parts.
- Blow out any pipes, channels or crevices with compressed air, renewing any O-rings or seals displaced by air blast.

FLEXIBLE HYDRAULIC PIPES, HOSES

- Before removing any brake or power steering hose, clean end fittings and area surrounding them as thoroughly as possible.
- Obtain appropriate blanking caps before detaching hose end fittings, so that ports can be immediately covered to exclude dirt.
- Clean hose externally and blow through with airline. Examine carefully for cracks, separation of plies, security of end fittings and external damage. Reject any hose found faulty.
- When refitting hose, ensure that no unnecessary bends are introduced, and that hose is not twisted before or during tightening of union nuts.
- Containers for hydraulic fluid must be kept absolutely clean.
- Do not store hydraulic fluid in an unsealed container. It will absorb water, and fluid in this condition would be dangerous to use due to a lowering of its boiling point.
- Do not allow hydraulic fluid to be contaminated with mineral oil, or use a container which has previously contained mineral oil.
- Do not re-use fluid bled from system.
- Always use clean brake fluid to clean hydraulic components.
- Fit a blanking cap to a hydraulic union and a plug to its socket after removal to prevent ingress of dirt.
- Absolute cleanliness must be observed with hydraulic components at all times.
- After any work on hydraulic systems, inspect carefully for leaks underneath the vehicle while a second operator applies maximum pressure to the brakes (engine running) and operates the steering.

METRIC BOLT IDENTIFICATION

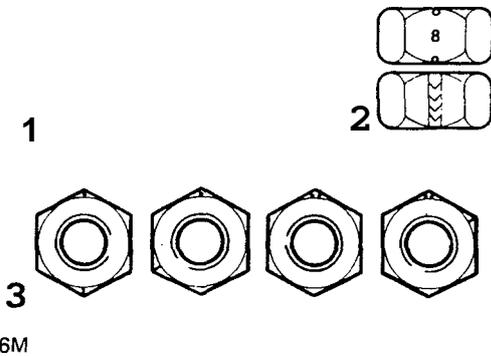
- An ISO metric bolt or screw, made of steel and larger than 6 mm in diameter can be identified by either of the symbols ISO M or M embossed or indented on top of the head.
- In addition to marks to identify the manufacture, the head is also marked with symbols to indicate the strength grade e.g. 8.8, 10.9, 12.9 or 14.9, where the first figure gives the minimum tensile strength of the bolt material in tens of kg/sq mm.
- Zinc plated ISO metric bolts and nuts are chromate passivated, a greenish-khaki to gold-bronze colour.



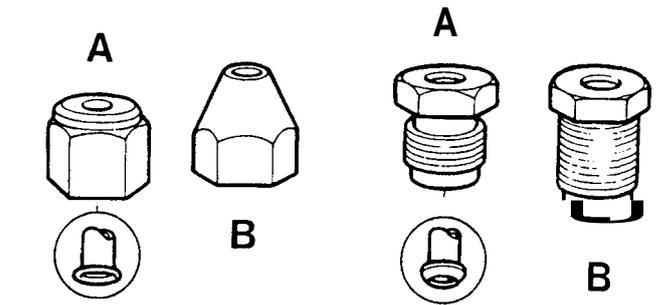
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METRIC NUT IDENTIFICATION

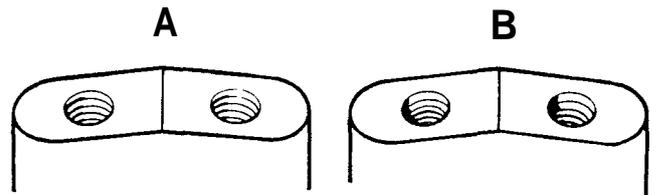
1. A nut with an ISO metric thread is marked on one face or on one of the flats of the hexagon with the strength grade symbol 8, 12 or 14. Some nuts with a strength 4, 5 or 6 are also marked and some have the metric symbol M on the flat opposite the strength grade marking.
2. A clock face system is used as an alternative method of indicating the strength grade. The external chamfers or a face of the nut is marked in a position relative to the appropriate hour mark on a clock face to indicate the strength grade.
3. A dot is used to locate the 12 o'clock position and a dash to indicate the strength grade. If the grade is above 12, two dots identify the 12 o'clock position.



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ST1034M

The metric female nut is **always** used with a trumpet flared pipe and the metric male nut is **always** used with a convex flared pipe.

4. All metric ports in cylinders and calipers have no counterbores, but unfortunately a few cylinders with UNF threads also have no counterbore. The situation is, all ports with counterbores are UNF, but ports not counterbored are most likely to be metric.
5. The colour of the protective plugs in hydraulic ports indicates the size and the type of the threads, but the function of the plugs is protective and not designed as positive identification. In production it is difficult to use the wrong plug but human error must be taken into account.

The Plug colours and thread sizes are:

	UNF
RED	$\frac{3}{8}$ in x 24 UNF
GREEN	$\frac{7}{16}$ in x 20 UNF
YELLOW	$\frac{1}{2}$ in x 20 UNF
PINK	$\frac{7}{8}$ in x 18 UNF
	METRIC
BLACK	10 x 1 mm
GREY	12 x 1 mm
BROWN	14 x 1,5 mm

6. Hose ends differ slightly between metric and UNF. Gaskets are not used with metric hoses. The UNF hose is sealed on the cylinder or caliper face by a copper gasket by the metric hose seals against the bottom of the port and there is a gap between faces of the hose and cylinder.

Pipe sizes for UNF are $\frac{3}{8}$ in, $\frac{1}{4}$ in and $\frac{5}{8}$ in outside diameter.

Metric pipe sizes are 4,75 mm, 6 mm and 8 mm. 4,75 mm pipe is exactly the same as $\frac{3}{8}$ in pipe. 6 mm pipe is 0.014 in smaller than $\frac{1}{4}$ in pipe. 8 mm pipe is 0.002 in larger than $\frac{3}{8}$ in pipe.

Convex pipe flares are shaped differently for metric sizes and when making pipes for metric equipment, metric pipe flaring tools must be used.

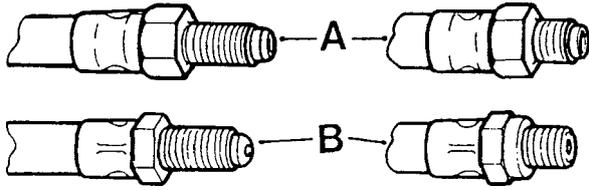
HYDRAULIC FITTINGS — Metrication

WARNING: Metric and Unified threaded hydraulic parts. Although pipe connections to brake system units incorporate threads of metric form, those for power assisted steering are of UNF type. It is vitally important that these two thread forms are not confused, and careful study should be made of the following notes.

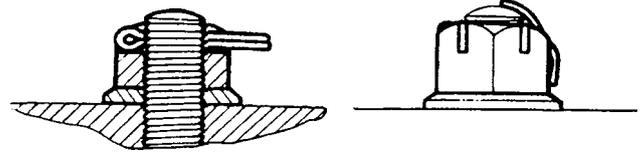
Metric threads and metric sizes are being introduced into motor vehicle manufacture and some duplication of parts must be expected. Although standardisation must in the long run be good, it would be wrong not to give warning of the dangers that exist while UNF and metric threaded hydraulic parts continue together in service. Fitting UNF pipe nuts into metric ports and vice-versa should not happen, but experience of the change from BSF to UNF indicated that there is no certainty in relying upon the difference in thread size when safety is involved.

To provide permanent identification of metric parts is not easy but recognition has been assisted by the following means. (Illustration A Metric, B Unified.)

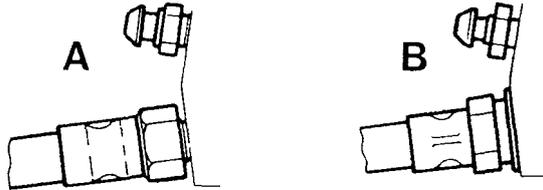
1. All metric pipe nuts, hose ends, unions and bleed screws are coloured black.
2. The hexagon area of pipe nuts is indented with the letter 'M'.
3. Metric and UNF pipe nuts are slightly different in shape.



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ST1030M



ST1032M

The greatest danger lies with the confusion of 10 mm and $\frac{3}{8}$ in UNF pipe nuts used for $\frac{1}{8}$ in (or 4,75 mm) pipe. The $\frac{3}{8}$ in UNF pipe nut or hose can be screwed into a 10 mm port but is very slack and easily stripped. The thread engagement is very weak and cannot provide an adequate seal.

The opposite condition, a 10 mm nut in a $\frac{3}{8}$ in port, is difficult and unlikely to cause trouble. The 10 mm nut will screw in $1\frac{1}{2}$ or 2 turns and seize. It has a crossed thread 'feel' and it is impossible to force the nut far enough to seal the pipe. With female pipe nuts the position is of course reversed.

The other combinations are so different that there is no danger of confusion.

KEYS AND KEYWAYS

1. Remove burrs from edges of keyways with a fine file and clean thoroughly before attempting to refit key.
2. Clean and inspect key closely; keys are suitable for refitting only if indistinguishable from new, as any indentation may indicate the onset of wear.

TAB WASHERS

1. Fit new washers in all places where they are used. Always renew a used tab washer.
2. Ensure that the new tab washer is of the same design as that replaced.

SPLIT PINS

1. Fit new split pins throughout when replacing any unit.
2. Always fit split pins where split pins were originally used. Do not substitute spring washers: there is always a good reason for the use of a split pin.
3. All split pins should be fitted as shown unless otherwise stated.

NUTS

1. When tightening a slotted or castellated nut never slacken it back to insert split pin or locking wire except in those recommended cases where this forms part of an adjustment. If difficulty is experienced, alternative washers or nuts should be selected, or washer thickness reduced.
2. Where self-locking nuts have been removed it is advisable to replace them with new ones of the same type.

NOTE: Where bearing pre-load is involved nuts should be tightened in accordance with special instructions.

LOCKING WIRE

1. Fit new locking wire of the correct type for all assemblies incorporating it.
2. Arrange wire so that its tension tends to tighten the bolt heads, or nuts, to which it is fitted.

SCREW THREADS

1. Both UNF and Metric threads to ISO standards are used. See below for thread identification.
2. Damaged threads must always be discarded. Cleaning up threads with a die or tap impairs the strength and closeness of fit of the threads and is not recommended.
3. Always ensure that replacement bolts are at least equal in strength to those replaced.
4. Do not allow oil, grease or jointing compound to enter blind threaded holes. The hydraulic action on screwing in the bolt or stud could split the housing.
5. Always tighten a nut or bolt to the recommended torque figure. Damaged or corroded threads **can** affect the torque reading.
6. To check or re-tighten a bolt or screw to a specified torque figure, first slacken a quarter of a turn, then re-tighten to the correct figure.
7. Always oil thread lightly before tightening to ensure a free running thread, except in the case of self-locking nuts.

UNIFIED THREAD IDENTIFICATION

1. Bolts

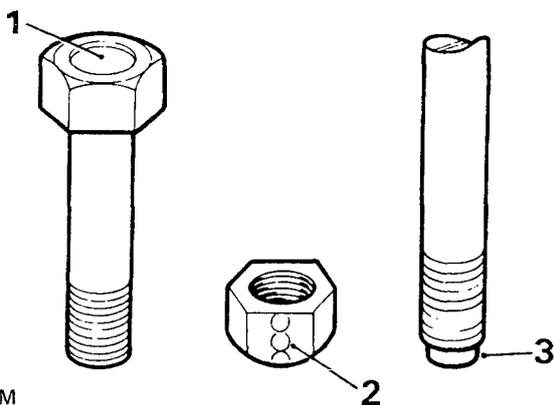
A circular recess is stamped in the upper surface of the bolt head.

2. Nuts

A continuous line of circles is indented on one of the flats of the hexagon, parallel to the axis of the nut.

3. Studs, Brake Rods, etc.

The component is reduced to the core diameter for a short length at its extremity.



ST1039M

RECOMMENDED LUBRICANTS AND FLUIDS

Service instructions for temperate climates — ambient temperature range —10°C to 35°C

COMPONENTS	BP	CASTROL	DUCKHAMS	ESSO	MOBIL	PETROFINA	SHELL	TEXACO
Engine V8 Carburettor Dashpots	BP Visco 2000 (15W/40) or BP Visco Nova (10W/40)	Castrol GTX (15W/50) or Castrolite (10W/40)	Duckhams 15W/50 Hypergrade Motor Oil	Esso Superlube (15W/40)	Mobil Super 10W/40 or Rally Formula 15W/50	Fina Supergrade Motor Oil 10W/40 or 15W/40	Shell Super Motor Oil 15W/40 or 10W/40	Havoline Motor Oil 15W/40 or Eurotex HD 10W/30
Engine 4-cyl. petrol	BP Visco 2000 (15W/40) or BP Visco Nova (10W/40)	Castrol GTX (15W/50) or Castrolite (10W/40)	Duckhams 15W/50 Hypergrade Motor Oil	Esso Superlube (15W/40)	Mobil Super 10W/40 or Mobil 1 Rally Formula 15W/40	Fina Supergrade Motor Oil 10W/40 or 15W/40	Shell Super Motor Oil 15W/40 or 10W/40	Havoline Motor Oil 15W/40 or Eurotex HD 10W/30
Engine 4-cyl. diesel	BP Visco 2000 (15W/40) BP Vanellus C3 Multigrade 15W/40 or BP Visco Nova (10W/40)	Castrol GTX (15W/50) or Castrol Deusol RX Super 15W/40 or Castrolite (10W/40)	Duckhams 15W/50 Hypergrade Motor Oil or Duckhams Fleetol Multi-V 20W/50 or Duckhams Fleet Master 15W/40	Esso Superlube (15W/40) or XD-3 15W/40 Essolube	Mobil Super 15W/40 or Mobil Delvac Super 15W/40 or Mobil 1 Rally Formula 15W/50	Fina Supergrade Motor Oil 10W/40 or 15W/40	Shell Super Motor Oil 15W/40 or Shell Rimula X 15W/40	Havoline Motor Oil 15W/40 or URSA Super Plus 15W/40 or Eurotex Motor Oil 10W/30
*LT77 — five- speed gearbox	BP Autran G	Castrol TOF	Duckhams Q-Matic	Esso Type G	Mobil ATF 210	Fina Purimatic 33G	Shell Donax TF	Texamatic Type G
*LT95 — four- speed gearbox including transfer box	BP Visco 2000 (15W/40) or Visco Nova 10W/40	Castrol GTX (15W/50)	Duckhams 15W/50 Hypergrade Motor Oil	Esso Superlube (15W/40)	Mobil Super 10W/40	Fina Supergrade Motor Oil 10W/40 or 15W/40	Shell Super Motor Oil 15W/40 or 10W/40	Havoline Motor Oil 15W/40 or Eurotex HD 10W/30
Front differential Rear differential Swivel pin housings and LT230R & LT230T Transfer box	BP Gear Oil SAE 90EP	Castrol Hypoy SAE 90EP	Duckhams Hypoid 90	Esso Gear Oil GX 85W/90	Mobil Mobilube HD 90	Fina Pontonic MP SAE 80W/90	Shell Spirax 90 EP	Texaco Multigear Lubricant EP 85W/90
Oils listed on lines marked (*) may so be used in IIZ! transfer box.								
LT85 — five- speed gearbox — V8 cylinder	BP Visco 2000 (15W/40) or BP Visco Nova (10W/40)	Castrol GTX (15W/50)	Duckhams Hypergrade 15W/50	Esso Superlube 15W/40	Mobil Super 10W/40	Fina Supergrade Motor Oil 10W/40 or 15W/40	Shell Multigrade 15W/40 or 10W/40	Havoline Motor Oil 15W/40 or Eurotex HD 10W/30
Prop. shaft Front and rear	BP Energrease L2	Castrol LM Grease	Duckhams LB 10	Esso Multi- purpose Grease H	Mobil- grease MP	Fina Marson HTL 2	Shell Retinax A	Marfak All purpose Grease
Steering box (Manual)	BP Gear Oil SAE 90EP	Castrol Hypoy SAE 90EP	Duckhams Hypoid 90	Esso Gear Oil 85W/90	Mobil Mobilube HD 90	Fina Pontonic MP SAE 80W/90	Shell Spirax 90EP	Texaco Multigear Lubricant EP 85W/90
Power steering fluid reservoir as applicable	BP Autran DX 2D	Castrol TQ Dexron IID	Duckhams Fleetmatic CD or Duckhams D-Matic	Esso ATF Dexron IID	Mobil ATF 220 D	Fina Dexron IID	Shell ATF Dexron IID	Texamatic Fluid 922G
Air cleaner 4-cyl. petrol	BP Visco (15W/40) or BP Visco (10W/30)	Castrol GTX (15W/50) or Castrolite (10W/40)	Duckhams 15W/50 Hypergrade Motor Oil	Esso Superlube (15W/40)	Mobil Super 10W/40 or Rally Formula 15W/50	Fina Supergrade Motor Oil 10W/40 or 15W/40	Shell Super Motor Oil 15W/40 or 10W/40	Havoline Motor Oil 10W/30 or Eurotex HD 10W/30
Air cleaner 4-cyl. diesel	BP Visco (15W/40) or BP Visco Nova (10W/30)	Castrol GTX (15W/50) or Castrolite (10W/40)	Duckhams 15W/50 Hypergrade Motor Oil	Esso Superlube (15W/40)	Mobil Super 15W/40 or 10W/40	Fina Supergrade Motor Oil 10W/40	Shell Super Motor Oil 15W/40 or 10W/40	Havoline Motor Oil 15W/40 or 10W/30 or Eurotex HD 10W/30
Brake and clutch reservoirs	Universal Brake Fluid or other brake fluids having a minimum boiling point of 260°C (500°F) and complying with FMVSS 116 DOT 3							
Lubrication nipples (hubs, ball joints, etc.)	BP Energrease L2	Castrol LM Grease	Duckhams LU 10	Esso Multi- purpose Grease H	Mobil- grease MP	Fina Marson HTL 2	Shell Retinax A	Marfak All purpose Grease
Ball joint assembly Top link	Dextragrease Super GP							
Cooling system Anti-freeze	Universal Anti-freeze See under Anti-freeze section 09.							

RECOMMENDED LUBRICANTS AND FLUIDS

SERVICE INSTRUCTIONS ALL MARKETS

COMPONENTS	BP	CASTROL	DUCKHAMS	ESSO	MOBIL	PETROFINA	SHELL	TEXACO	SPEC. REF. ALL BRANDS
Windscreen hinges Ventilator hinges Ventilator control Seat slides. Hood retention clips Door lock striker	BP Energrcase L2	Castrol LM Grease	Duckhams LB 10	Esso Multi- purpose Grease H	Mobil Mobil- grease MP	Fina Marson HTL2	Shell Retinax A	Marfak All purpose Grease	NGLJ-2 Multi- purpose Lithium- based Grease
Windscreen washers	All Seasons Screen Washer Fluid								
Bonnet pintle	Graohite Lock Grease Tvoe 'B'								
Door locks (anti-burst) Inertia reels	DO NOT LUBRICATE. These components are 'life' lubricated at the manufacturing stage								
Battery lugs Earthing surfaces Where paint has been removed	Petroleum jelly. NOTE : Do not use Silicone Grease								
Air Conditioning System Refrigerant Compressor Oil	METHYLCHLORIDE REFRIGERANTS MUST NOT BE USED Use only refrigerant 12. This includes 'Freon 12' and Arcton 12' Shell Clavus 68 BP Energol LPT 68 Sunisco 4GS Texaco Capella E Wax Free 68								

RECOMMENDED LUBRICANTS AND FLUIDS
SERVICE INSTRUCTIONS FOR AMBIENT CONDITIONS OUTSIDE TEMPERATE CLIMATE LIMITS
OR FOR MARKETS WHERE THE PRODUCTS LISTED ARE NOT AVAILABLE

COMPONENTS	SERVICE CLASSIFICATION WORLDWIDE		AMBIENT TEMPERATURE °C									
	PERFORMANCE LEVEL		SAE VISCOSITY	-30"	-20"	-10"	0"	10°	20°	30°	40"	50"
Engine	Petrol	Diesel	5W/20 5W/30 5W/40									
Carburetterdashpot Oil can Oils	Oils must meet BL Cars spec. BLS.22.OL.02	Oils must meet BI. Cars spec. BLS.22.OL.02 and MIL-L-46152A or	10W/30									
Oil bath air cleaners	API service levels SE or SF or SE/CC or SF/CD or SE/CD or SF/CD or the CCMC requirements	API service levels CC or CD or SE/CC or SE/CD or SF/CD or the CCMC requirements	10W/40 10W/50 15W/40 15W/50 20W/40 20W/50									
Power steering reservoir	ATF M2C 33 For G											
Front and rear Axle differential Swivel pin housing LT230 transfer box Steering box	API GL4 or MIL-L-2105		90 EP 80W EP									
LT77 gearbox	ATF M2C 33 F or G											
LT95 gearbox including transfer box	Oils must meet BL Cars spec. BLS.22.OL.02 or API service levels SE or SF or SE/CC or SE/CD or SF/CC or SF/CD or the CCMC requirements		10W/30 10W/40 10W/50 10W/40 10W/50 15W/40 15W/50 20W/40 20W/50									
LT85 gearbox — V8 cylinder	Oils must meet BL Cars spec. BLS.22.OL.02 or API service levels SE or SF or SE/CC or SE/CD or SF/CC or SE/CD or the CCMC requirements		10W/30 10W/40 10W/50 10W/40 10W/50 15W/40 15W/50 } 20W/40 20W/50 }									
Brake and clutch reservoirs	Brake fluid must have a minimum boiling point of 260°C (500°F) and comply with FMVSS 116 DOT 3											
Lubrication nipples hubs, ball joints, etc)	VLGI-2 multipurpose lithium based grease											

ANTI-FREEZE

Use only UNIVERSAL Anti-freeze or an Ethylene Glycol based anti-freeze, containing no methanol, with non-Phosphate corrosion inhibitors suitable for use in cast iron and aluminium alloy engines to ensure protection of the cooling system against frost and corrosion.

Engine	Mixture	Percentage Concentration	Protection
4-cyl. Engines (cast iron)	One part anti-freeze two parts water	33%	Down to -20°C
	One part anti-freeze one part water	50%°	Below -20°C to -36°C
V8 Engine (aluminium)	One part anti-freeze one part water	50%°	Down to -36°C

IMPORTANT: Coolant solution must not fall below proportions of one part anti-freeze to three parts water, i.e. min. 25% anti-freeze in coolant, otherwise damage to engine is liable to occur.

CORROSION INHIBITOR

When anti-freeze is not required the cooling system must be flushed out with clean water and filled with a solution of ONE PART MARSTONS SQ 36 inhibitor to NINE parts water to provide a 10% mixture concentration.

CAPACITIES

The following capacity figures are approximate and are provided as a guide only. All oil levels must be set using the dipstick or level plugs as applicable.

Component	Litres	Imperial unit
Engine sump oil, 4-cylinder..	6,00	11.00 pints
Extra when refilling after fitting new filter, 4-cylinder..	0,85	1.50 pints
Air cleaner oil, 4-cylinder	0,85	1.50 pints
Engine sump oil, V8 cylinder	5,10	9.00 pints
Extra when refilling after fitting new filter, V8 cylinder.....	0,56	1.00 pint
Main gearbox oil, five-speed	2,20	3.90 pints
Transfer box oil, LT230R five-speed main gearbox.....	2,80	4.90 pints
LT85 five-speed gearbox	3,00	5.25 pints
LT230T transfer gearbox	2,80	4.9 pints
Main gearbox oil, four-speed	2,60	4.70 pints
Transfer gearbox oil, four-speed main gearbox	3,16	5.50 pints
Front differential	1,70	3.00 pints
Rear differential: Salisbury 8HA	2,30	4.00 pints
Swivel pin housing oil (each)	0,35	0.60 pint
Fuel tank, rear	79,50	17.50 gallons
Fuel tank, side (except Station wagon)	68,20	15.00 gallons
Fuel tank, side (Station wagon only)	45,50	10.00 gallons
Cooling system, 4-cylinder petrol models (standard)	10,30	18.00 pints
Cooling system, 4-cylinder diesel models and heavy duty petrol models.....	11,00	19.00 pints
Cooling system, V8 cylinder models	12,80	22.50 pints
Steering box manual.....	0,43	0.75 pints
Power steering box and reservoir fluid	2,90	5.0 pints

MAINTENANCE SCHEDULES

Revised Maintenance Schedules are introduced with the commencement of the Land Rover Ninety V8 model range. The new schedules also apply to four-cylinder, petrol and diesel models, and feature a reduced 10.000 km (6,000 miles) service. The new schedules supersede previous issues.

Efficient maintenance is one of the biggest factors in ensuring continuing reliability and efficiency. For this reason the following detailed schedules are included so that at the appropriate intervals owners and operators may know what is required. The Maintenance Schedules are based upon intervals of 10.000 km (6,000 miles) or 6 months unless otherwise stated.

Note: The 10.000 km service must be repeated every 10.000 km (6,000 miles) or six months, whichever is first.

The 20.000 km service must be repeated every 20.000 km (12,000 miles) or 12 months, whichever is first, with additional maintenance at the intervals specified in the schedule.

Every 10.000 km (6,000 miles) or 6 months	Every 20.000 km (12,000 miles) or 12 months		Every 10.000 km (6,000 miles) or 6 months	Every 20.000 km (12,000 miles) or 12 months	
	<input type="checkbox"/>	1 Check condition and security of seats, seat belt mountings, seat belts and buckles		<input type="checkbox"/>	31 <input type="checkbox"/> <input type="checkbox"/> Check/top-up gearbox oil
	<input type="checkbox"/>	2 Check operation of all lamps		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	32 Renew transfer box oil
	<input type="checkbox"/>	3 Check operation of horns		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	33 Check/top-up transfer box oil
	<input type="checkbox"/>	4 Check operation of warning indicators		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	34 Renew front axle oil
	<input type="checkbox"/>	5 Check operation of windscreen and rear wipers and washers		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	35 ChecWtop-up front axle oil
	<input type="checkbox"/>	6 Check condition of wiper blades		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	36 Renew swivel pin housing oil
	<input type="checkbox"/>	7 Check security and operation of handbrake		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	37 ChecWtop-up swivel pin housing oil
	<input type="checkbox"/>	8 Check rear view mirror(s) for security, cracks and crazing		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	38 Renew rear axle oil
	<input type="checkbox"/>	9 Check operation of all doors, bonnet and tailgate locks		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	39 ChecWtop-up rear axle oil
	<input type="checkbox"/>	10 Check operation of window controls		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	40 Lubricate rear suspension upper link ball joint
<input type="checkbox"/>	<input type="checkbox"/>	11 Lubricate all locks (not steering lock) hinges and door —check mechanisms		<input type="checkbox"/> <input type="checkbox"/> Every 40.000 km 24,000 ml	41 Lubricate propeller shaft sealed sliding joints
	<input type="checkbox"/>	12 Lubricate accelerator control linkage and pedal pivot		<input type="checkbox"/> <input type="checkbox"/>	42 Lubricate propeller shaft universal joints
	<input type="checkbox"/>	13 ChecWadjust tyre pressures including spare		<input type="checkbox"/> <input type="checkbox"/>	43 Lubricate handbrake mechanical linkage
	<input type="checkbox"/>	14 ChecWadjust headlamp alignment		<input type="checkbox"/> <input type="checkbox"/>	44 Check visually brake, fuel, clutch pipes/unions for chafing, leaks and corrosion
	<input type="checkbox"/>	15 Check front wheel alignment		<input type="checkbox"/> <input type="checkbox"/>	45 Check exhaust system for leakage and security
<input type="checkbox"/>	<input type="checkbox"/>	16 ChecWtop-up battery electrolyte		<input type="checkbox"/> <input type="checkbox"/>	46 Check for oil leaks from engine and transmission
	<input type="checkbox"/>	17 Remove battery connections, clean and grease (refit)		<input type="checkbox"/> <input type="checkbox"/>	47 Check for oil/fluid leaks from steering and suspension systems
<input type="checkbox"/>	<input type="checkbox"/>	18 Removeroadwheels		<input type="checkbox"/> <input type="checkbox"/>	48 Check axle breather pipes, ensure they are not blocked, pinched or split
	<input type="checkbox"/>	19 Check tyres comply with Manufacturer's specification		<input type="checkbox"/> <input type="checkbox"/>	49 Check security and condition of suspension fixings
	<input type="checkbox"/>	20 Check tyres visually for cuts, lumps, bulges, uneven wear and tread depth		<input type="checkbox"/> <input type="checkbox"/>	50 Check condition and security of steering unit, joints and gaiters
<input type="checkbox"/>	<input type="checkbox"/>	21 Remove road wheel brake drums, wash out dust, inspect shoes for wear and drums for condition		<input type="checkbox"/> <input type="checkbox"/>	51 Check tightness of propeller shaft coupling bolts
<input type="checkbox"/>	<input type="checkbox"/>	22 Inspect wheel cylinders for fluid leaks		<input type="checkbox"/> <input type="checkbox"/>	52 Clean fuel sedimenter (Diesel only)
<input type="checkbox"/>	<input type="checkbox"/>	23 Inspect brake pads for wear, calipers for leaks, and discs for condition		<input type="checkbox"/> <input type="checkbox"/> Every 80.000 km 48,000 ml	53 Clean electric fuel pump filter
<input type="checkbox"/>	<input type="checkbox"/>	24 Refit road wheel brake drums		<input type="checkbox"/> <input type="checkbox"/>	54 Renew fuel filter element (Petrol)
<input type="checkbox"/>	<input type="checkbox"/>	25 Adjust road wheel brakes		<input type="checkbox"/> <input type="checkbox"/>	55 Drain flywheel housing if drain plug is fitted for wading (refit)
<input type="checkbox"/>	<input type="checkbox"/>	26 Adjust handbrake if required		<input type="checkbox"/> <input type="checkbox"/>	56 Clean camshaft drive belt housing filter (Diesel)
<input type="checkbox"/>	<input type="checkbox"/>	27 Refit road wheels to original position		<input type="checkbox"/> <input type="checkbox"/>	57 Check condition of heater plug wiring for fraying, chafing and deterioration (diesel only)
<input type="checkbox"/>	<input type="checkbox"/>	28 Renew engine oil		<input type="checkbox"/> <input type="checkbox"/>	58 Remove heater plugs, clean, test and refit (diesel only)
<input type="checkbox"/>	<input type="checkbox"/>	29 Renew engine oil filter		<input type="checkbox"/> <input type="checkbox"/>	59 Every 40.000 km 24,000 ml Remove diesel injectors, clean, test and refit
<input type="checkbox"/>	<input type="checkbox"/>	30 Every 40.000 km 24,000 ml Renew gearbox oil			

Every 10,000 km (6,000 miles) or 6 months	Every 20,000 km (12,000 miles) or 12 months	Every 10,000 km (6,000 miles) or 6 months	Every 20,000 km (12,000 miles) or 12 months
	<input type="checkbox"/>		<input type="checkbox"/>
60	<input type="checkbox"/>	87	<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
61	<input type="checkbox"/>	88	Every 40,000 km (24,000 mi) <input type="checkbox"/>
	<input type="checkbox"/>	89	<input type="checkbox"/>
62	<input type="checkbox"/>	90	<input type="checkbox"/>
	<input type="checkbox"/>	91	<input type="checkbox"/>
63	<input type="checkbox"/>	92	<input type="checkbox"/>
64	<input type="checkbox"/>		<input type="checkbox"/>
65	<input type="checkbox"/>		<input type="checkbox"/>
66	Every 40,000 km (24,000 mi) <input type="checkbox"/>		<input type="checkbox"/>
67	<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
68	<input type="checkbox"/>		<input type="checkbox"/>
69	Every 60,000 km (36,000 mi) <input type="checkbox"/>	93	<input type="checkbox"/>
70	<input type="checkbox"/>	94	<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
71	<input type="checkbox"/>	95	<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
72	<input type="checkbox"/>		<input type="checkbox"/>
73	<input type="checkbox"/>		<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
74	<input type="checkbox"/>	96	<input type="checkbox"/>
75	<input type="checkbox"/>	97	<input type="checkbox"/>
76	<input type="checkbox"/>	98	<input type="checkbox"/>
77	<input type="checkbox"/>	99	<input type="checkbox"/>
78	<input type="checkbox"/>	100	<input type="checkbox"/>
79	<input type="checkbox"/>		<input type="checkbox"/>
80	<input type="checkbox"/>	101	<input type="checkbox"/>
81	<input type="checkbox"/>	102	<input type="checkbox"/>
	<input type="checkbox"/>	103	<input type="checkbox"/>
82	<input type="checkbox"/>	104	<input type="checkbox"/>
	<input type="checkbox"/>		<input type="checkbox"/>
83	<input type="checkbox"/>	105	<input type="checkbox"/>
	<input type="checkbox"/>	106	<input type="checkbox"/>
84	<input type="checkbox"/>	107	<input type="checkbox"/>
	<input type="checkbox"/>	108	<input type="checkbox"/>
85	<input type="checkbox"/>	109	<input type="checkbox"/>
	<input type="checkbox"/>	110	<input type="checkbox"/>
86	<input type="checkbox"/>	111	<input type="checkbox"/>
	<input type="checkbox"/>	112	<input type="checkbox"/>
	<input type="checkbox"/>	113	<input type="checkbox"/>
	<input type="checkbox"/>	114	<input type="checkbox"/>

WARNING: Two-wheel roller tests must be restricted to 5 km/h (3 m.p.h.) because the Land Rover One Ten and Ninety is constant four-wheel drive.

At 100,000 km (60,000 mile) intervals it is imperative that the camshaft drive belt be renewed, failure to do so could result in serious engine damage.

RECOMMENDATIONS

At 30,000 km (18,000 mile) intervals or every 18 months, whichever is the sooner, the hydraulic brake fluid should be completely renewed.

At 40,000 km (24,000 mile) intervals remove the Pulsair injection manifold and connecting pipes, ensure that the internal bores and the cylinder head drillings are clean and free from obstructions, clean as necessary and refit. (Emission control V8 petrol engines)

At 60,000 km (36,000 mile) intervals or every 3 years, whichever is the sooner, all hydraulic brake fluid, seals and flexible hoses should be renewed. all working surfaces of the master cylinder, wheel cylinders and caliper cylinders should be examined and renewed where necessary.

At 60,000 km (36,000 mile) intervals remove all suspension dampers, test for correct operation, refit or renew as necessary.

Vehicles fitted with free wheeling front hubs

The hubs require no routine maintenance. When the hub bearings are adjusted, or any time the vehicle has been used for wading, the moving parts of the free wheel hubs should be lightly smeared with Rocol 1000 grease or a similar molybdenum disulphide bearing grease.

LUBRICATION

This first part of the maintenance section covers renewal of lubricating oils for the major units of the vehicle and other components that require lubrication, as detailed in the 'Maintenance schedules'. Refer to the 'General specification data' for capacities and recommended lubricants.

Vehicles operating under severe conditions of dust, sand, mud and water should have the oils changed and lubrication carried out at more frequent intervals than that recommended in the maintenance schedules.

Draining of used oil should take place after a run when the oil is warm. Always clean the drain and filler-level plugs before removing. In the interests of safety disconnect the vehicle battery to prevent the engine being started and the vehicle moved inadvertently, while oil changing is taking place.

Allow as much time as possible for the oil to drain completely except where blown sand or dirt can enter the drain holes. In these conditions clean and refit the drain plugs immediately the main bulk of oil has drained.

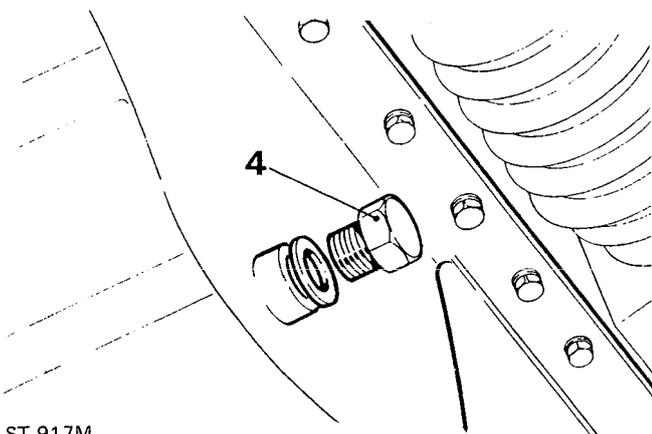
Where possible, always refill with oil of the make and specification recommended in the lubrication charts and from sealed containers.

RENEW ENGINE OIL AND FILTER

DRAIN THE OIL — All engines

1. Drive vehicle to level ground.
2. Run the engine to warm the oil; switch off the ignition and disconnect the battery for safety.
3. Place an oil tray under the drain plug.
4. Remove the drain plug in the bottom of the sump at the left-hand side — V8 and right-hand side 4-cylinder engines. Allow oil to drain away completely and replace the plug and tighten to the correct torque.

NOTE: The example shown below is a 4 cylinder engine sump.

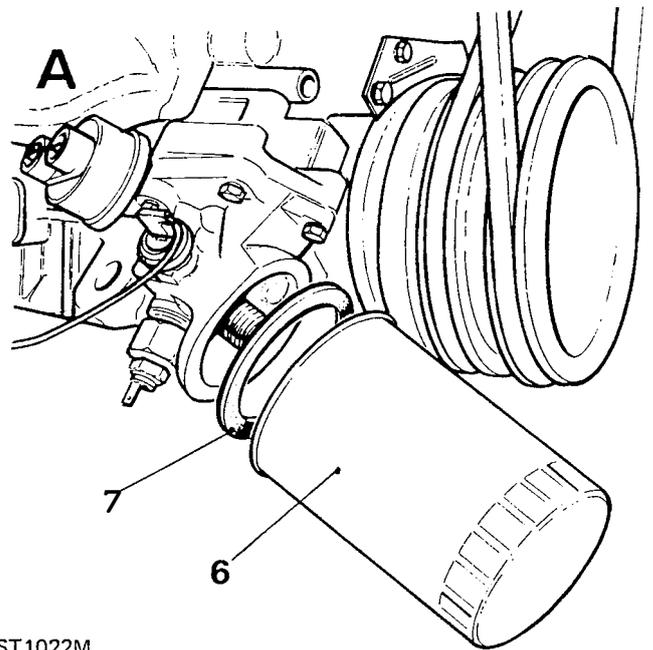


ST 917M

Renew oil filter — V8 and 2.5 Diesel engines

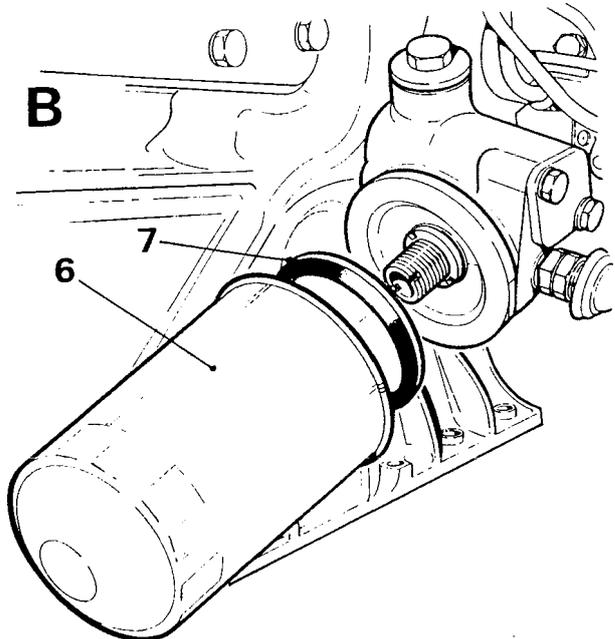
5. Place an oil tray under the engine.
6. Unscrew the filter anti-clockwise, using a strap spanner as necessary.
7. Smear a little clean engine oil on the rubber washer of the new filter, then screw the filter on clockwise until the rubber sealing ring touches the machined face, then tighten a further half turn by hand only. Do not overtighten.

Illustration A. V8 engine.



ST1022M

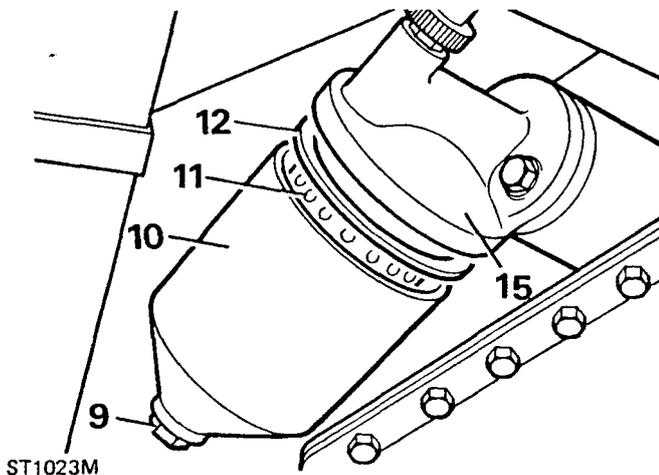
Illustration B. 2.5 Diesel engine.



ST 918M

Renew oil filter — 2.25 petrol and diesel engine

8. Place oil tray under engine.
9. Unscrew filter retaining bolt.
10. Remove the container.
11. Remove the element.
12. Discard the used filter element and large rubber washer.
13. Wash the container in kerosene.
14. Place the new filter element in the container and reassemble the unit, using the new large rubber washer supplied with the element.
15. Ensure that all the sealing washers are in position and intact, and that the container is correctly located in the adaptor.
16. Tighten the filter retaining bolt to the correct torque. Do not overtighten.



Refill sump with oil — all models

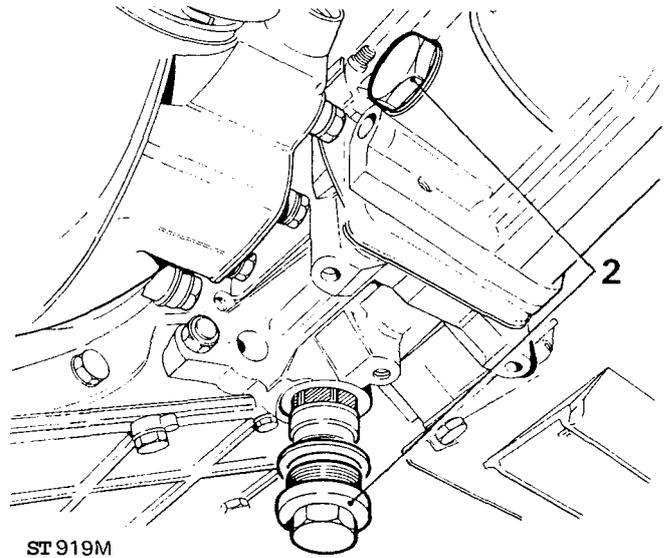
17. Check that the drain plug is tight.
18. Clean the outside of the oil filler cap, remove it from the rocker cover and clean the inside.
19. Pour in the correct quantity of new oil of the correct grade from a sealed container to the high mark **on** the dipstick and firmly replace the filler cap.
20. Run the engine and check for leaks from the filter. Stop the engine, allow the oil to run back into the sump for a few minutes, then check the oil level again and top **up** if necessary.

RENEW MAIN AND TRANSFER GEARBOX OILS

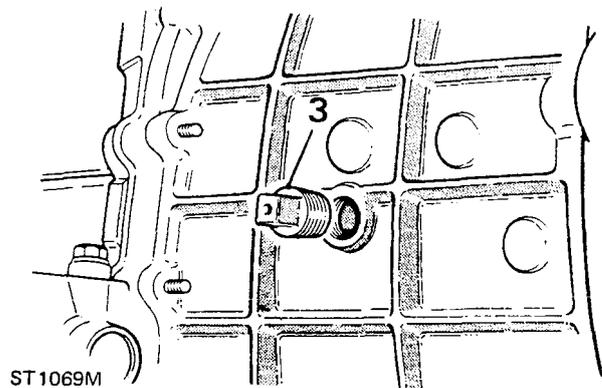
DRAIN AND REFILL LT77mm MAIN GEARBOX

4-cylinder engines

1. Drive the vehicle to level ground and place a suitable container under the gearbox to catch the old oil.
2. Remove the gearbox and extension case drain plugs and allow the oil to drain completely. Wash the extension case filter in kerosene and refit the plugs using new washers, if necessary, and tighten to the correct torque.



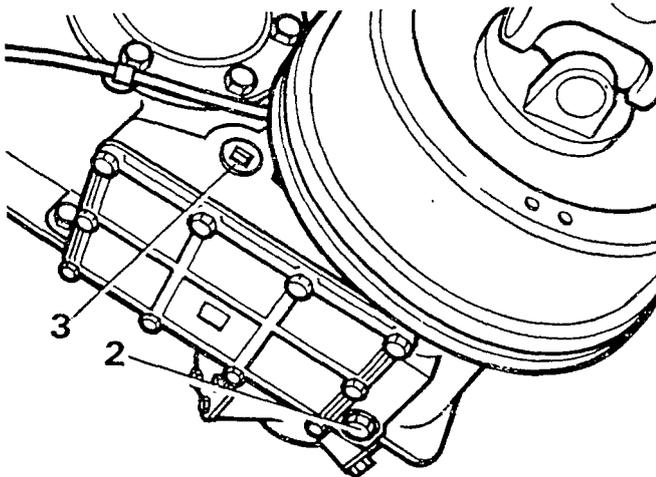
3. Remove the oil filler-level plug and inject the approximate quantity of new oil of the correct make and grade until it begins to run out of the filler-level hole. Fit the plug and tighten to the correct torque. Since the plug has a tapered thread it must not be overtightened. Wipe away any surplus oil.





DRAIN AND RENEW 230R AND 230T TRANSFER GEARBOX (4-cylinder engine)

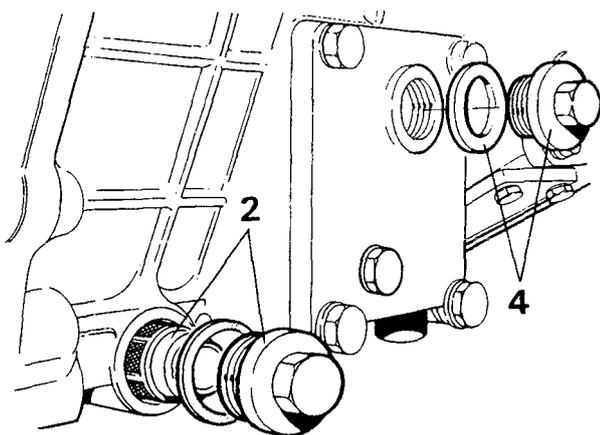
1. Drive the vehicle to level ground and place a container under the gearbox to catch the old oil.
2. Remove the drain plug and allow the oil to drain. Fit the plug using a new washer, if necessary, and tighten to the correct torque.
3. Remove the filler-level plug and inject the approximate quantity of the recommended oil until it begins to run from the plug hole. Fit the level plug and tighten only to the correct torque, do not overtighten, wipe away any surplus oil.



ST1070M

DRAIN AND RENEW LT95 MAIN GEARBOX (V8 engines)

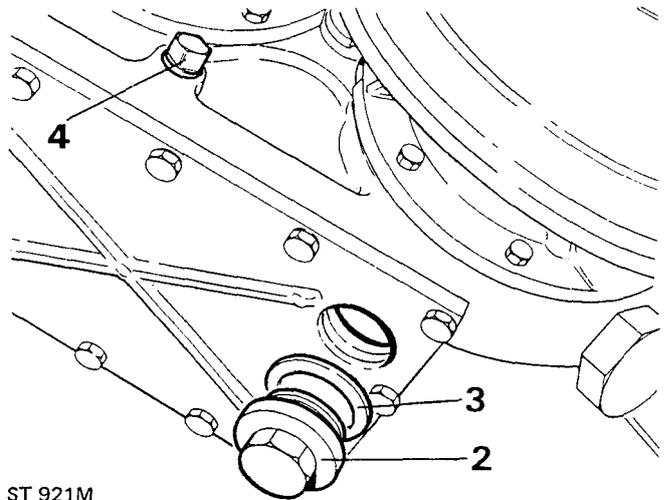
1. Drive the vehicle to level ground and place a container under the gearbox to catch the old oil.
2. Remove the drain plug, washer and filter from the bottom of the gearbox casing and allow the oil to drain completely.
3. Wash the filter in petrol, allow to dry and fit to the casing. Using a new washer, if necessary, fit the plug and tighten to the correct torque.
4. Remove the oil filler-level plug from the side of the gearbox and inject the approximate quantity of the correct oil until it begins to run from the filler-level hole. Clean and refit the plug using a new washer and tighten to the correct torque. Wipe away any surplus oil.



ST 920M

DRAIN AND RENEW LT95 TRANSFER GEARBOX OIL

1. Drive vehicle to level ground and place a container beneath the gearbox to catch the old oil.
2. Remove the drain plug and allow time for the oil to drain completely.
3. Clean and refit the drain plug using a new washer, if necessary and tighten to the correct torque.
4. Remove the oil filler-level plug and inject the approximate quantity of a recommended oil until it begins to run from the hole. Clean and fit the plug and tighten to the correct torque. Do not overtighten. Wipe away any surplus oil.

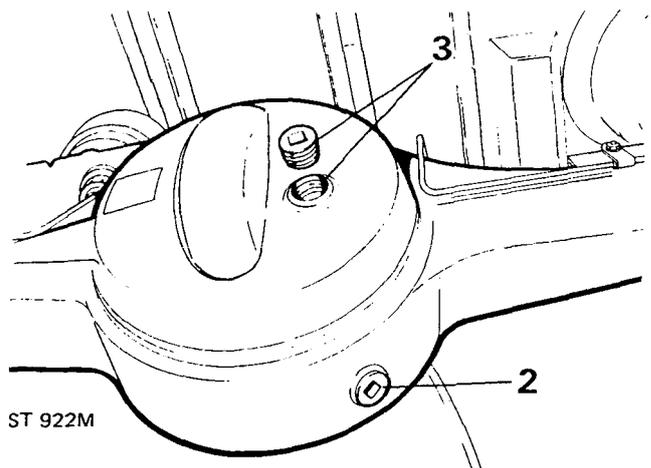


ST 921M

RENEW FRONT AND REAR AXLE OIL

1. Drive the vehicle to level ground and place a container under the axle to be drained.
2. Using a spanner with a 13 mm (0.5 in) square drive remove the drain plug and allow the oil to drain completely. Clean and refit the drain plug.
3. Remove the oil filler-level plug and inject new oil of a recommended make and grade until it begins to run from the hole. Clean and fit the filler-level plug and wipe away any surplus oil.

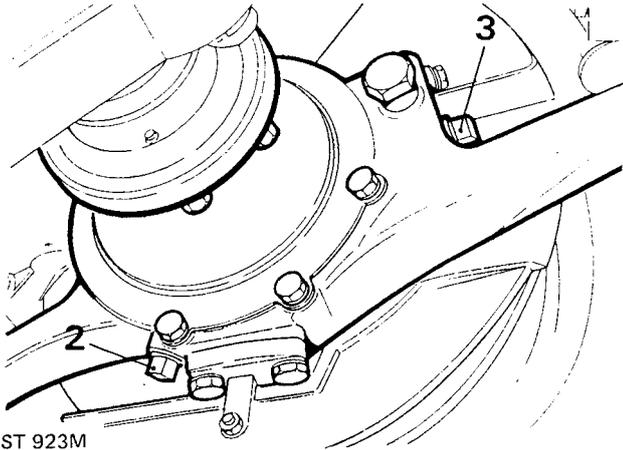
NOTE: Whilst the illustration shows a '90' model front differential, the procedure is the same for all axles.



ST 922M

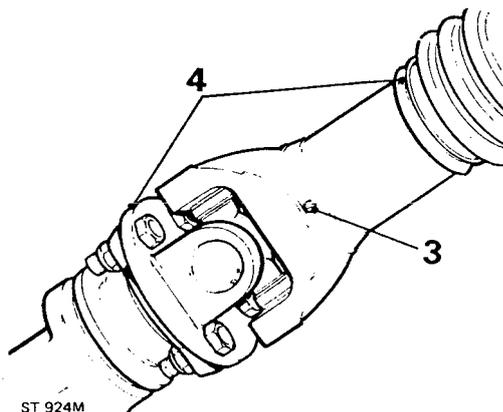
RENEW SWIVEL PIN HOUSING OIL

1. Drive the vehicle to level ground and place a container under each swivel housing to catch the used oil.
2. Remove the drain plug and allow the oil to drain completely and clean and refit the plugs.
3. Remove the oil filler-level plug and inject the recommended make and grade of oil until oil begins to run from the level hole. Clean and fit the level plugs and wipe away any surplus oil.



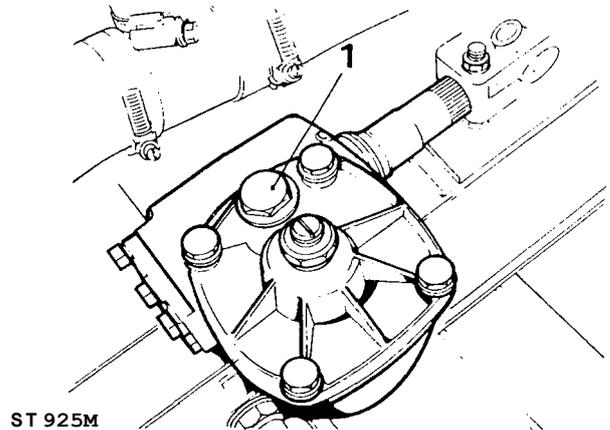
LUBRICATE PROPELLER SHAFTS

1. Clean all the grease nipples on the front and rear propshaft universal joints, and sliding portion of the rear shaft.
2. Charge a low pressure hand grease gun with grease of a recommended make and grade and apply to the grease nipples.
3. Remove the screwed plug from the front shaft and fit a suitable grease nipple.
4. Disconnect one end of the front propeller shaft and compress the sliding portion whilst applying grease. It is necessary to compress the shaft to prevent over filling with grease. It should be noted that this sliding portion must only be lubricated at 40.000 km (24,000 mile) intervals.
5. Reconnect the propeller shaft, remove the grease nipple and fit the screwed plug.



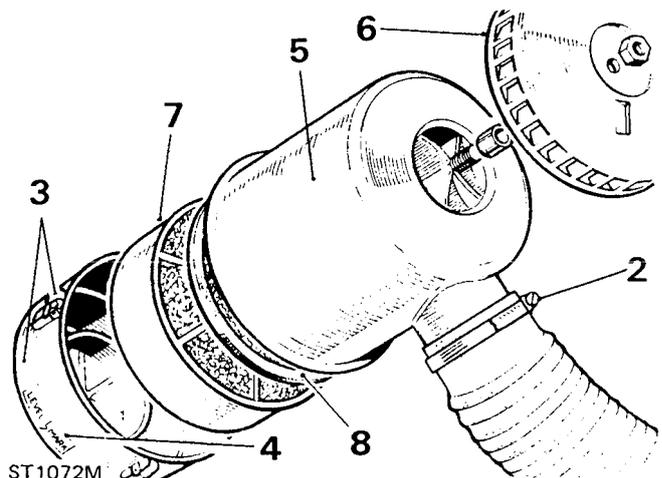
TOP-UP MANUAL STEERING BOX

1. Remove the oil filler plug and observe the oil level which should be 25 mm (1.0 in) below the top of the filler hole.
2. If necessary top-up to the correct level with a recommended oil. Clean and refit the plug and wipe away any surplus oil.



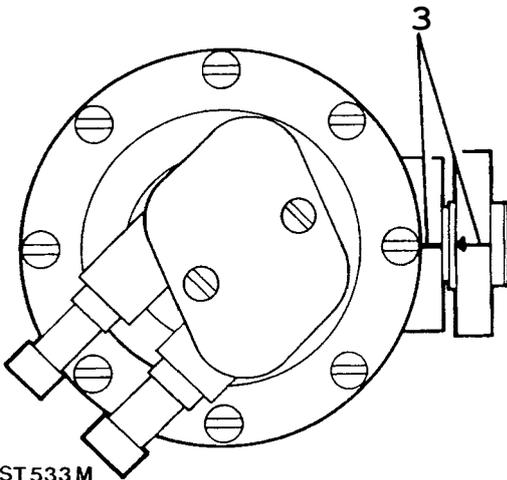
RENEW AIR CLEANER OIL — 2.25 litre engines (early models)

1. Slacken wing nut and release the clamping strap securing the complete air cleaner.
2. Disconnect the outlet elbow from the intake pipe and remove the cleaner from the vehicle.
3. Remove the oil bowl from the bottom of the cleaner by releasing the three securing clips.
4. Clean all dirty oil and sludge from the bowl and refill with fresh engine oil to the level indicated by a ring formed in the pressing; the capacity is approximately 0,85 litre (1.5 imperial pints).
5. Clean the spiral in the cleaner body by swilling the complete body in paraffin and shake off the surplus.
6. Remove and clean the air intake cap.
7. Clean the wire mesh filter.
8. Reassemble filter using a new scaling ring.
9. Refit the complete unit into the vehicle.

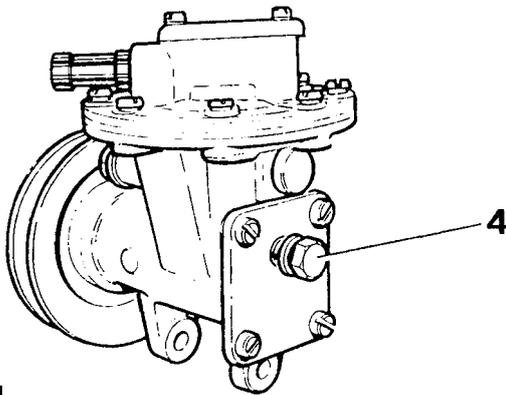


TOP-UP BRAKE VACUUM PUMP OIL — 2.25 litre Diesel engine

1. Slacken the drive belt, and the pump pivot bolts and nuts and slip the belt from the pulley.
2. Move the pump to an upright position and temporarily tighten the nuts and bolts to maintain this position.
3. Turn the pump pulley so that the indicating marks on the pulley hub and pump body line up.

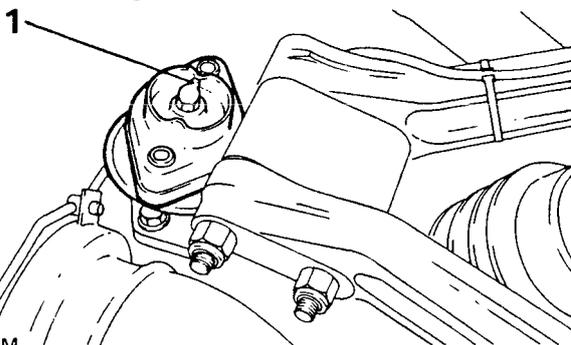


4. Remove the oil level plug at the rear of the pump and if necessary inject a recommended SAE 15W-50 oil up to the level of the hole.
5. Refit the level plug, and fit and tension the drive belt.



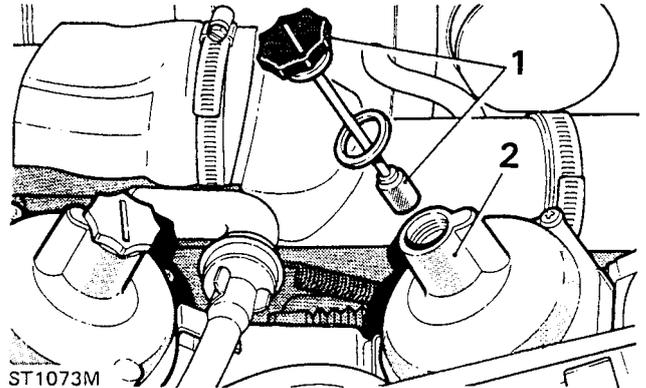
REAR SUSPENSION BALL JOINT

1. Apply a grease gun to the nipple using a recommended grease.



TOP-UP CARBURETTOR PISTON DAMPER — V8 only

1. Unscrew the cap on top of both suction chambers and withdraw the damper.
2. Top-up the reservoir with engine oil to within 12 mm (0.5 in) from the top of the hollow piston rod. Refit the damper and secure the cap.

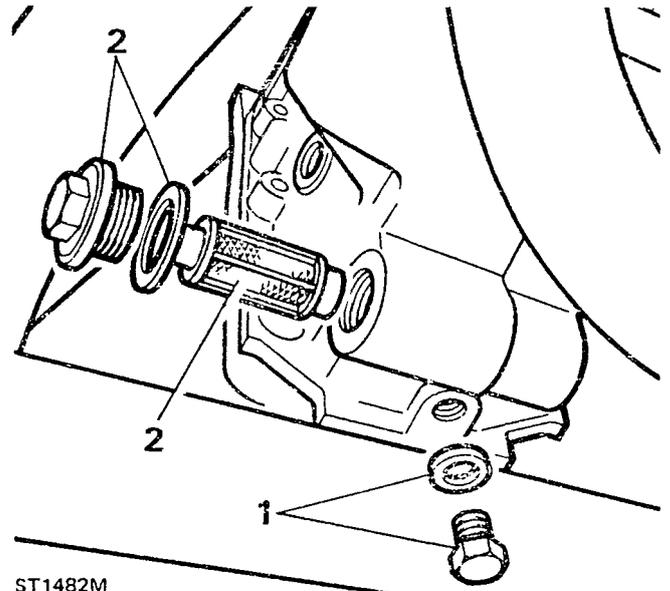


RENEW LT85 MAIN GEARBOX OIL

Drain and refill monthly when operating under severe wading conditions.

To change the gearbox oil proceed as follows:

1. Immediately after a run when the oil is warm, drain off the oil into a container by removing the drain plug and washer from the bottom of the gearbox casing.
2. Remove the oil filter.



3. Wash the filter in clean fuel; allow to dry and replace.
4. Clean and refit drain plug and washer and refill gearbox through the oil level/filler plug, with the correct grade of oil, to the bottom of the oil level/filler hole. For capacity see Data Section.

GENERAL MAINTENANCE AND ADJUSTMENT

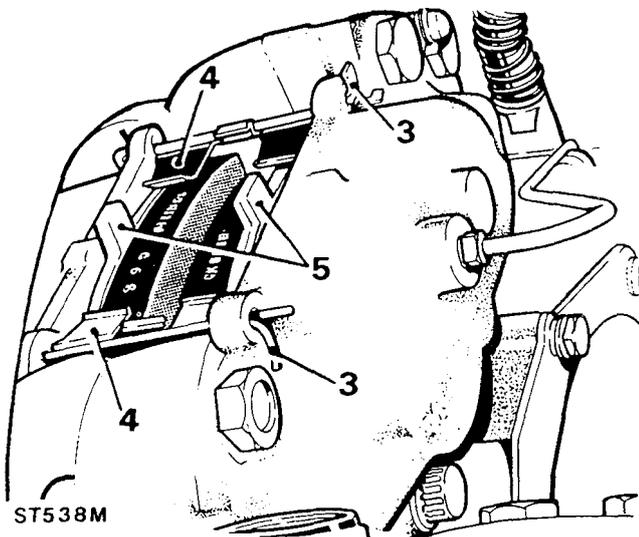
This second part of the maintenance section covers adjustments and items of general maintenance as dictated by the 'Maintenance Schedules'. However, only maintenance operations that are not included in the Overhaul Sections of the manual appear in this section.

EXAMINE AND RENEW FRONT BRAKE FRICTION PADS

Examine the friction pads for wear and if less than 3 mm (0.125 in) thick or oil contaminated, they must be renewed on both wheels at the same time, as follows:

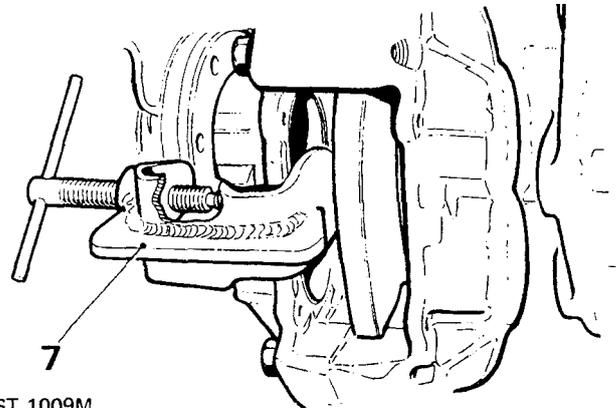
NOTE: See Book 4 Section 70 for latest method of friction pad retension.

1. Slacken both front wheel nuts and jack-up the vehicle and lower onto axle stands, and remove wheels.
2. Clean the exterior of the calipers.
3. Remove the split pins from the brake caliper.
4. Remove the retaining springs.
5. Withdraw the friction pads.
6. Clean the exposed parts of the pistons, using only new brake fluid.



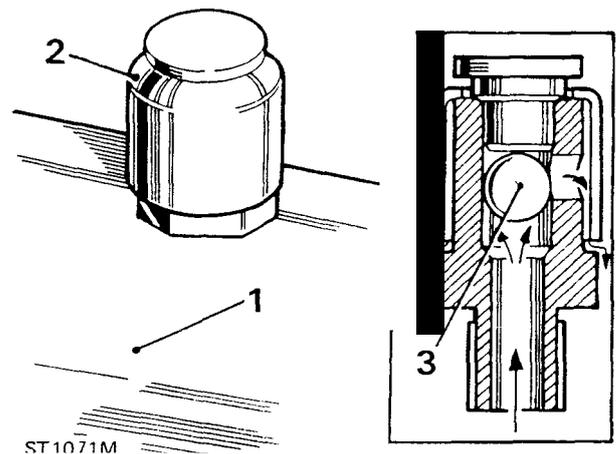
7. Using piston clamp 186672 press each piston back into its bore, whilst ensuring that the displaced brake fluid does not overflow from the reservoir.
8. Smear the faces of the pistons with Lockheed disc brake lubricant taking care not to let any reach the lining material.
9. Insert the new friction pads.
10. Place the friction pad retaining springs in position and fit new split pins and splay the ends.
11. Apply the footbrake several times to locate the pads.
12. Check the fluid reservoir and top-up if necessary.

13. Fit the road wheels, lower the vehicle and finally tighten the wheel retaining nuts.



CLEAN AND CHECK AXLE BREATHERS — ball valve type (where fitted)

1. Clean the outside of the breather and unscrew from the axle tube.
2. Wash the breather in petrol and shake to ensure that the ball valve is free.
3. Lubricate the ball with engine oil and refit to axle tube.



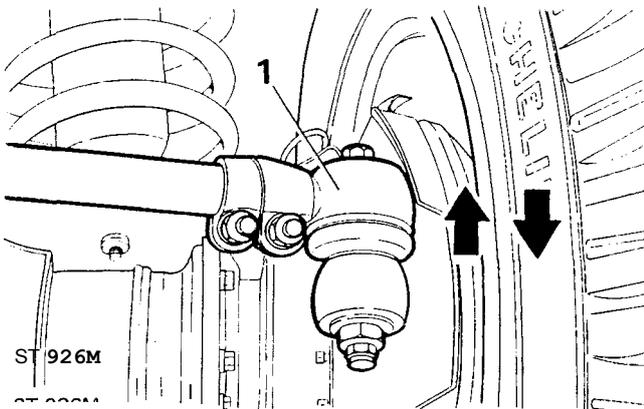
Remote axle breathers — where fitted

Pipes attached to the breathers on the axles terminate at points inside the chassis members on early models and into the engine compartment on later vehicles. This allows the axles to breathe whilst the vehicle is traversing mud and water. No maintenance is required except to ensure that the pipe: do not become blocked, kinked, or split, or damaged in any other way to prevent proper breathing.

CHECK STEERING BALL JOINTS

Ball joints are lubricated for the normal life of ball joints during manufacture and require no further lubrication. This applies only if the rubber gaiter has not become dislodged or damaged. The joints should be checked at the specified mileage intervals but more frequently if the vehicle is used under arduous conditions.

1. Check for wear in the joints by moving the ball joint up and down vigorously. If free movement is apparent renew the complete joint assembly.

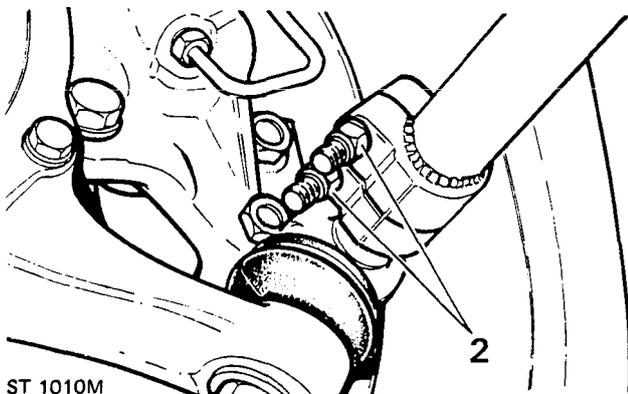


CHECK FRONT WHEEL ALIGNMENT

Use recognised wheel alignment equipment to perform this check and adjustment. See 'General Specification and Data' section for the correct alignment. Check and adjust with the vehicle on level ground.

1. Set the road wheels to the straight ahead position and push the vehicle forward a short distance.
2. Slacken the clamp bolts securing the ball joints at both ends of the track rod.
3. Twist the track-rod to decrease or increase its effective length as required to achieve the correct alignment.
4. Push the vehicle rearwards whilst moving the steering wheel from side to side to settle the ball joints. Then with the wheels in the straight ahead position push the vehicle forward a short distance and recheck the alignment. If necessary make further adjustments. When the alignment is correct tighten the ball joint clamp bolts.

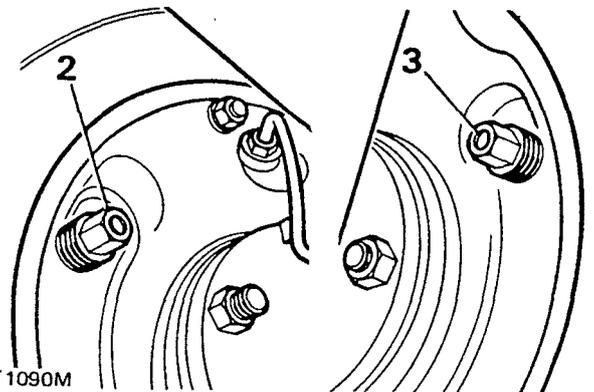
The ball joint pins must be central in their housing and not inclined to one side. See section 57.



ADJUST REAR BRAKES

Land Rover One Ten Vehicles

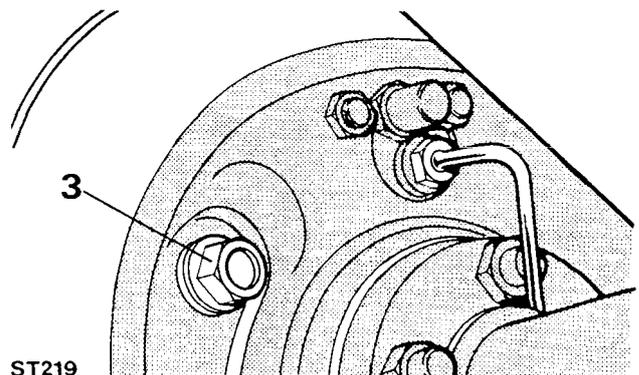
1. Raise up vehicle and lower onto axle stands.
2. Each shoe is independently set by means of a hexagon adjuster. Check that the wheel turns freely and turn one adjuster until the shoe is locked against the drum. Slacken **off** the adjuster sufficiently for the wheel to turn freely — approximately two serrations on the snail cam.
3. Repeat the above procedure for the second brake shoe and the opposite wheel.
4. Remove the axle stands and road test the vehicle brakes.



Land Rover Ninety Vehicles

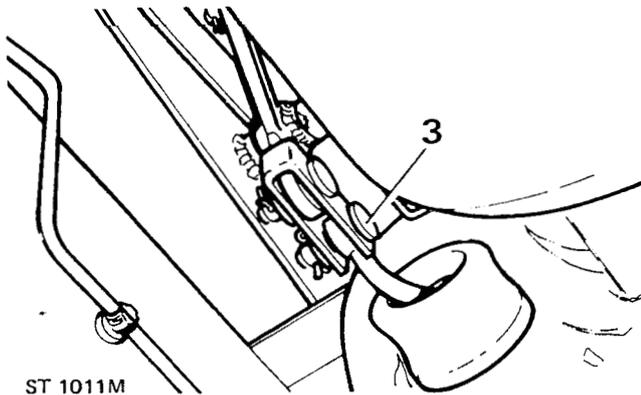
The shoes are set by a single hexagon adjustment bolt operating through a serrated snail cam enabling both shoes to be adjusted to obtain the best results.

1. Raise-up the vehicle on to axle stands.
2. Check that the wheel rotates freely then turn the adjuster until the brake shoes are in firm contact with the drum.
3. Slacken *off* the adjuster just sufficiently for the drum to rotate freely.
4. Repeat the procedure for the other wheel.
5. Remove the axle stands and road test the vehicle.

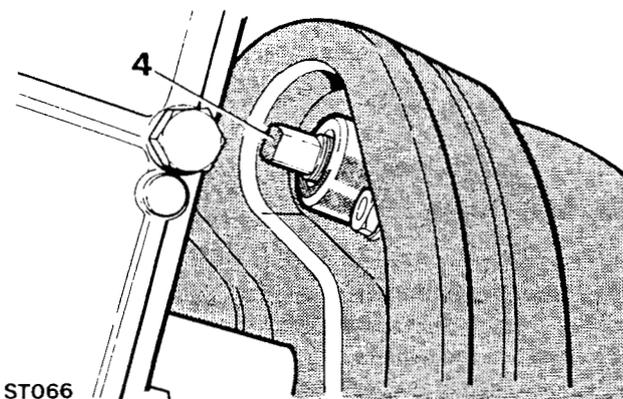


ADJUST TRANSMISSION BRAKE (Handbrake)

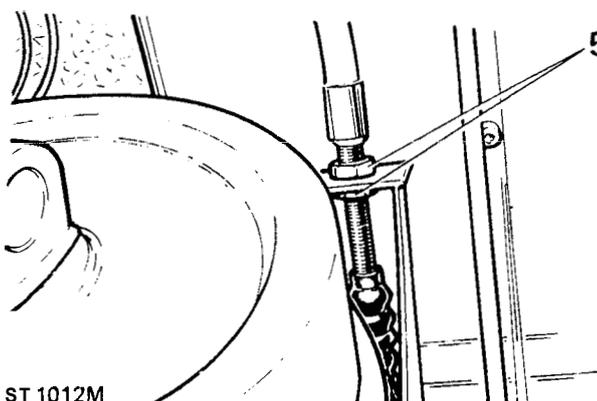
1. Set the vehicle on level ground and chock the wheels.
2. Release the handbrake fully.
3. Remove the clevis pin connecting the handbrake lever to the relay at the gearbox end.



4. Turn the adjuster on the back plate clockwise until the shoes are fully expanded against the drum,



5. Adjust the outer sheath of the handbrake cable by means of the two locknuts at the gearbox end until the holes in the clevis on the inner cable line up with the hole in the relay lever.



6. Fit the clevis pin, washer and a NEW split pin.
7. Slacken the adjuster 1 or 2 notches until handbrake shoes just clear the drum.
8. Apply the handbrake gradually. The drum should still rotate on the first ratchet and start to come on at the second ratchet.

CAUTION: DO NOT over adjust the handbrake, the drum must be free to rotate when the handbrake is released, otherwise serious damage will result.

DRAIN FLYWHEEL HOUSING

1. The flywheel housing can be completely sealed to exclude mud and water under severe wading conditions, by means of a plug fitted in the bottom of the housing.
2. The plug should only be fitted when the vehicle is expected to do wading or very muddy work.
3. When the plug is in use it must be removed periodically and all oil allowed to drain off before the plug is replaced

Illustration A. 4-cylinder vehicles.

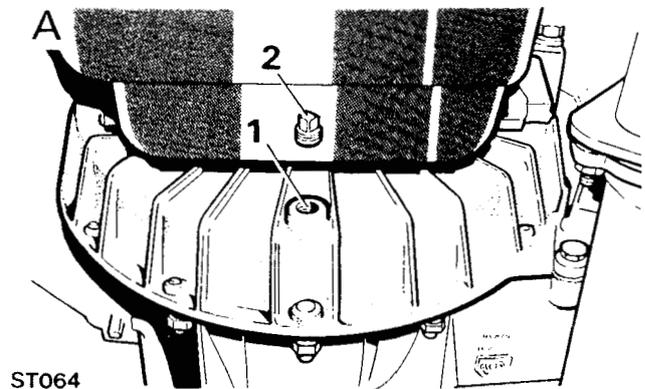
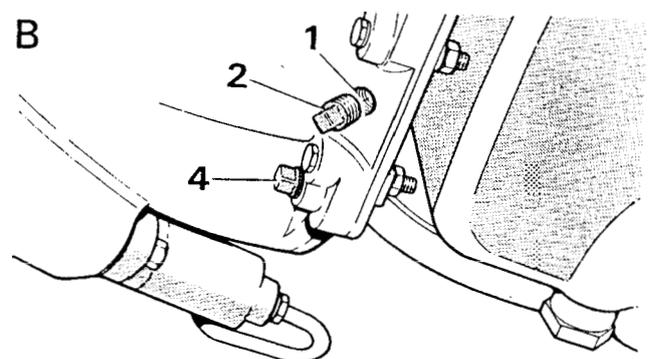


Illustration B. V8 vehicles.



4. When plug is not in use it should be stowed as follows:

4 cylinder models — in tool kit

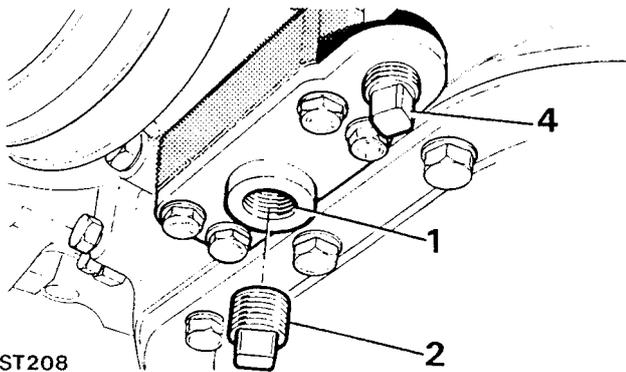
V8 — screwed into housing near drain hole.

DRAIN ENGINE TIMING COVER — 2.5 Diesel only

1. The timing cover can be completely sealed to exclude mud and water under severe wading conditions, by fitting a plug in the drain hole at the bottom of the cover.
2. The plug should only be fitted when the vehicle is expected to do wading or very muddy work.
3. When the plug is in use it must be removed periodically and any oil present allowed to drain off before the plug is replaced.

NOTE: There should not be any oil in the timing cover, but if there is, the cause should be investigated as soon as possible, as the timing belt will deteriorate if it becomes contaminated with oil.

4. When the plug is not in use it should be stowed in the tapped hole adjacent to the drain hole.

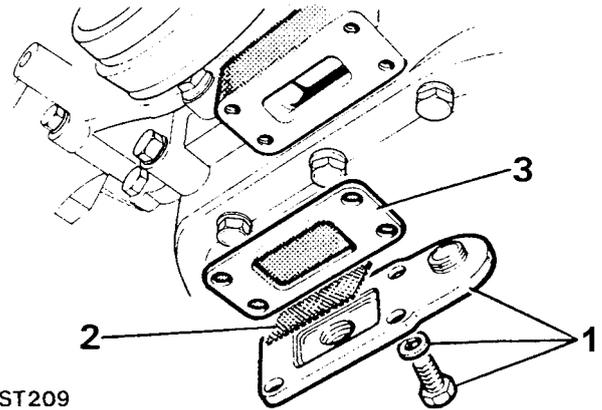


ST208

CLEAN ENGINE TIMING COVER FILTER — 2.5 Diesel only

A gauze filter is fitted at the bottom of the engine timing cover to help prevent mud and other debris entering the drain hole, when the wading plug is not in use. The filter must be removed and cleaned periodically, to ensure that it does not become blocked and prevent the timing cover draining properly. Under normal circumstances, the filter should be cleaned at the intervals specified in the Maintenance Schedule or, more frequently if the vehicle operates regularly in wet or dusty conditions.

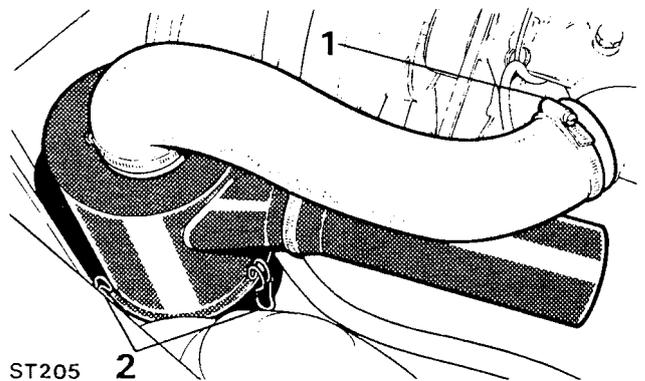
1. From underneath the vehicle, remove the four bolts and plain washers and, withdraw the wading plug plate from the bottom of the timing cover.
2. Wash the filter in kerosene or clean fuel. Brush off any mud or other debris and ensure that the whole filter is quite clean.
3. Check the condition of the gasket for the wading plug plate. If necessary, fit a new gasket.
4. Refit the wading plug plate. Tighten the securing bolts.



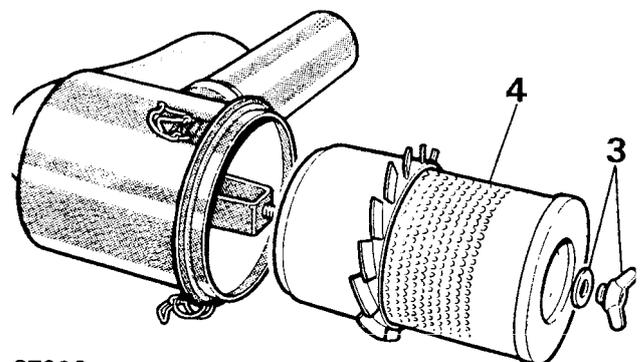
ST209

RENEW AIR CLEANER ELEMENT — 2.5 Diesel and 2.25 Petrol engines

1. Disconnect the air cleaner hose.
2. Pull up the three clips and lift out the air cleaner canister.
3. Unscrew element wing nut and sealing washer.
4. Remove and discard the element. DO NOT attempt to clean the element, fit a new one during reassembly.
5. Clean interior of canister.
6. Fit a new element and sealing washer.



ST205



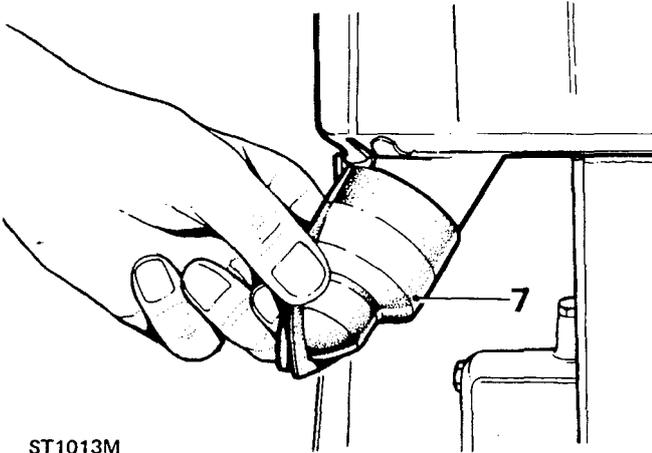
ST206

continued

Check air cleaner dump valve

The dump valve provides an automatic drain for the air cleaner and is fitted in the base of the air cleaner support bracket.

7. Squeeze open the dump valve and check that the interior is clean. Also check that the rubber is flexible and in a good condition.
8. If necessary, remove the dump valve to clean the interior. Fit a new valve if the original is in a poor condition.



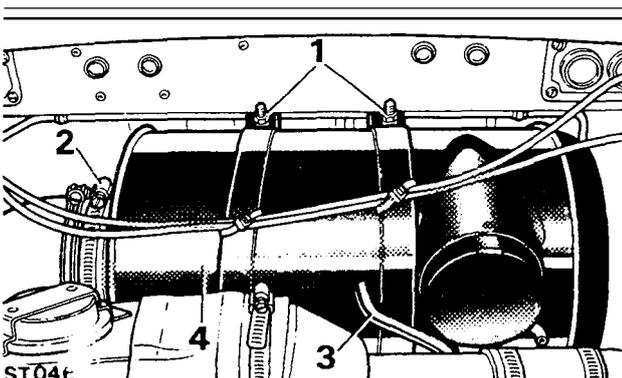
ST1013M

Fit air cleaner

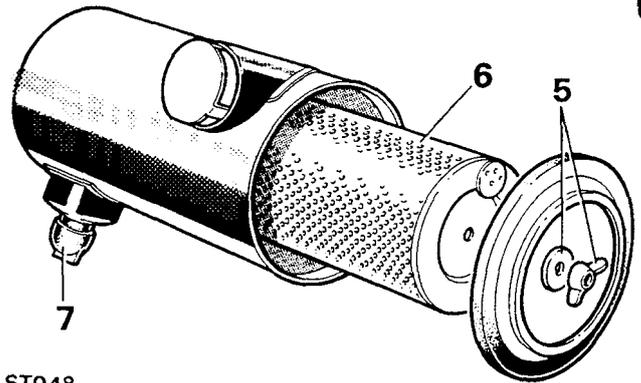
9. Fit air cleaner canister and secure with the clips.
10. Connect the air cleaner hose.

RENEW AIR CLEANER ELEMENT — V8 engine

1. Unscrew the two air cleaner strap retaining nuts.
2. Disconnect the air cleaner hose.
3. Remove the engine breather hose.
4. Withdraw air cleaner canister.
5. Unscrew element wing nut and washer and remove filter seal.
6. Remove and discard the element. DO NOT attempt to clean the element, fit a new one during reassembly and secure with the wing nut.



ST04c



ST048

Check air cleaner dump valve

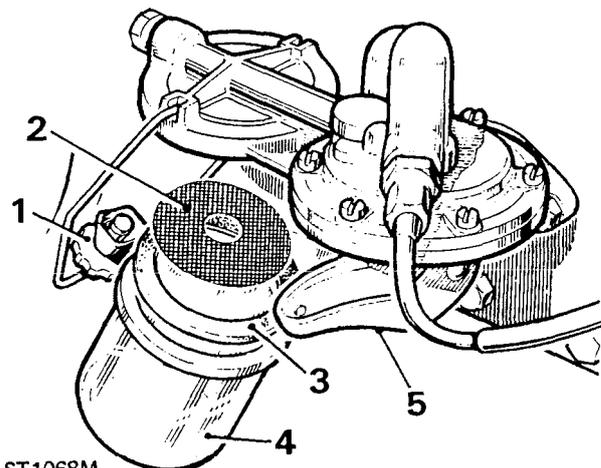
7. Squeeze open the dump valve and check that the interior is clean. Also check that the rubber is flexible and in a good condition.
8. If necessary, remove the dump valve to clean the interior. Fit a new valve if the original is in a poor condition.

Fit air cleaner

9. Fit a new element and reassemble the air cleaner.
10. Fit the air cleaner canister.
11. Fit the breather hose.
12. Fit the air cleaner hose.
13. Secure with the retaining straps and nuts.

CLEAN FUEL LIFT PUMP SEDIMENT BOWL — Petrol engine — early vehicles

1. Remove the bowl by slackening the thumb screw and swinging the retainer to one side.
2. Remove and clean the filter gauze in clean petrol.
3. Ensure that the sealing washer is in good condition.
4. Replace gauze and refit the bowl.
5. Prime the pump by operating the hand lever.

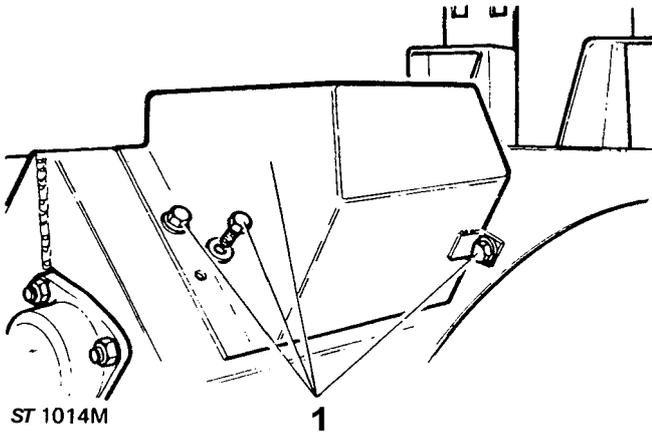


ST1068M

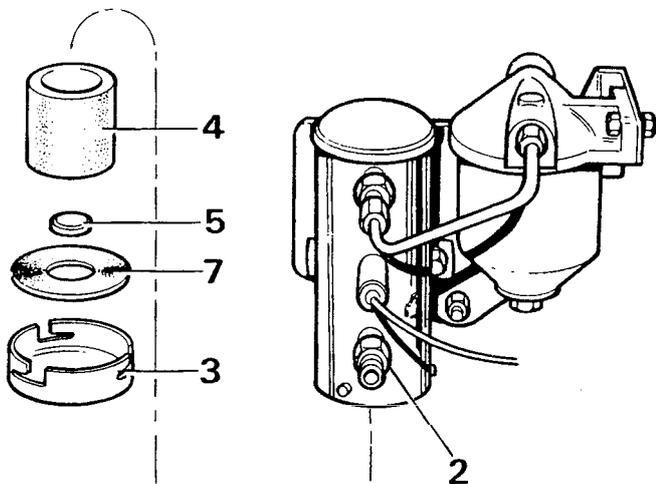
CLEAN ELECTRIC FUEL PUMP FILTER — V8 and later 2.25 Petrol engine vehicles

The pump is located mid-way along the right hand side of the chassis.

1. Release the three bolts and remove the protective cover —except '90' models.



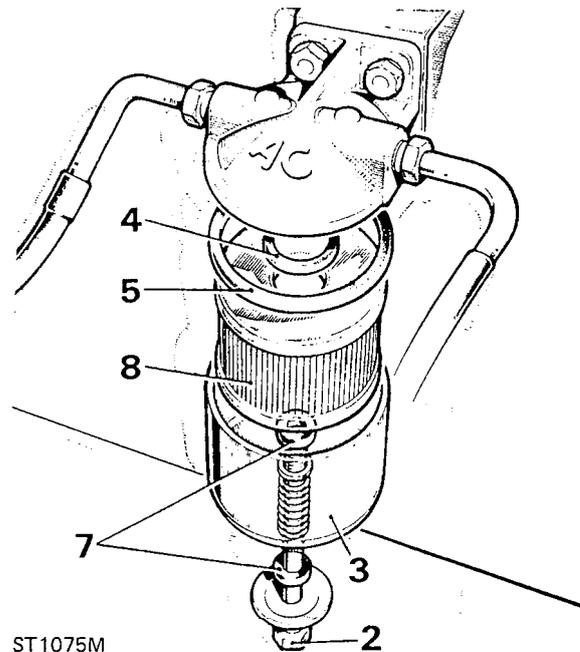
2. From beneath the vehicle disconnect the fuel inlet pipe from the pump and blank the end of the pipe by suitable means to prevent fuel draining from the tank.
3. Release the end cover from the bayonet fixing.
4. Withdraw the filter and clean by using a compressed air jet from the inside of the filter.
5. Remove the magnet (where fitted) from the end cover and clean. Replace the magnet in the centre of the end cover.
6. Reassemble the fuel pump and refit the fuel inlet pipe.
7. Use a new gasket for the end cover if necessary.
8. Fit the protective cover.



RENEW FUEL FILTER ELEMENT — Petrol engines 4-cylinder and V8

The element provides a filter between the pump and carburettor and is located adjacent to fuel pump on the right hand side of the chassis.

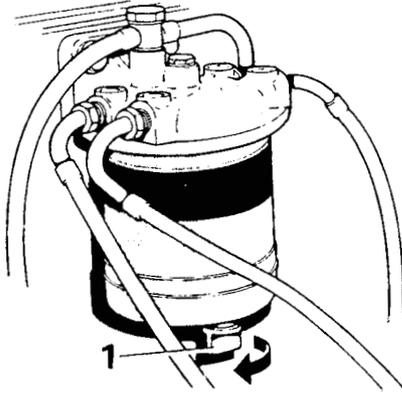
1. Release the three bolts and remove the protective cover. See 'Clean electric fuel pump filter'.
2. Unscrew the centre bolt.
3. Withdraw the filter bowl.
4. Remove the small sealing ring and remove the element.
5. Withdraw the large sealing ring from the underside of the filter body.
6. Discard the old element and replace with a new unit.
7. Ensure that the centre and top sealing rings are in good condition and replace as necessary.
8. Fit new element, small hole downwards.
9. Refit sealing rings (small and large).
10. Replace filter bowl and tighten the centre bolt.



RENEW FUEL FILTER ELEMENT — Diesel engines

Drain off Water

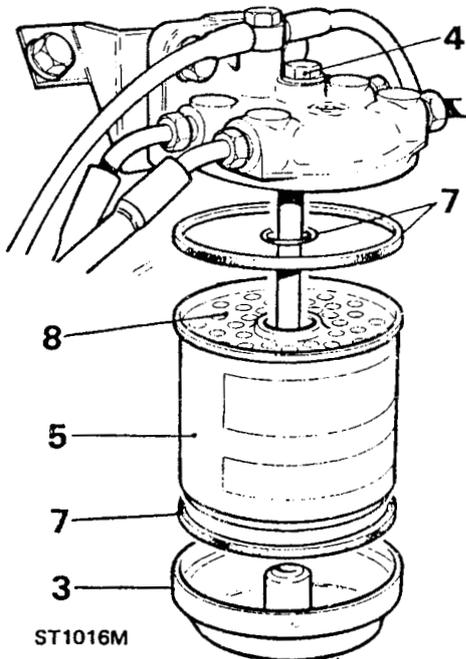
1. Slacken off drain plug to allow water to run out.
2. When pure diesel fuel is emitted, tighten drain Plug.



ST062

Renew filter

3. Support element holder.
4. Unscrew the special bolt on top of the filter, the element holder can now be removed.
5. Remove and discard the used element.
6. Wash the element holder in petrol or fuel oil.
7. If necessary renew both the large rubber washer and the small rubber washer in the filter top, also renew the large rubber washer in the element holder.
8. Push the new element onto the filter top spigot with the holes in the element to the top.
9. Fit the element holder to the bottom of the element, and secure with the special bolt.
10. Prime the system and check for fuel leaks.



ST1016M

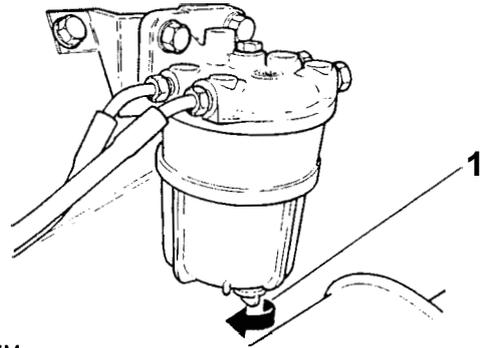
FUEL SEDIMENTER — Diesel engines (where fitted)

The sedimenter increases the working life of the fuel filter by removing the larger droplets of water and larger particles of foreign matter from the fuel.

Drain off water as follows:

Drain off Water

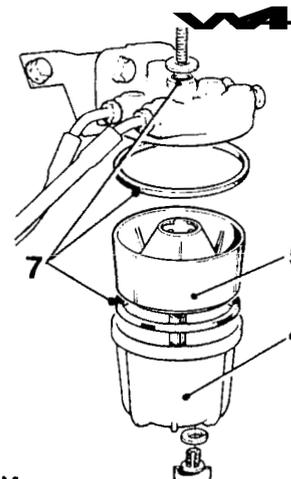
1. Slacken off drain plug to allow water to run out.
2. When pure diesel fuel is emitted, tighten drain plug. Dismantle and clean as detailed below.



ST 1017M

Clean element

3. Disconnect fuel inlet pipe at sedimenter and raise pipe above level of fuel tank to prevent draining from tank. Support in this position.
4. Support sedimenter bowl and unscrew bolt on top of unit and remove bowl.
5. Remove the sedimenter element.
6. Clean all parts in kerosene.
7. Fit new seals and reverse removal procedure.
8. Slacken off the drain plug, when pure diesel fuel runs out tighten plug.
9. If necessary, prime the system.
10. Start engine and check for leaks from sedimenter.

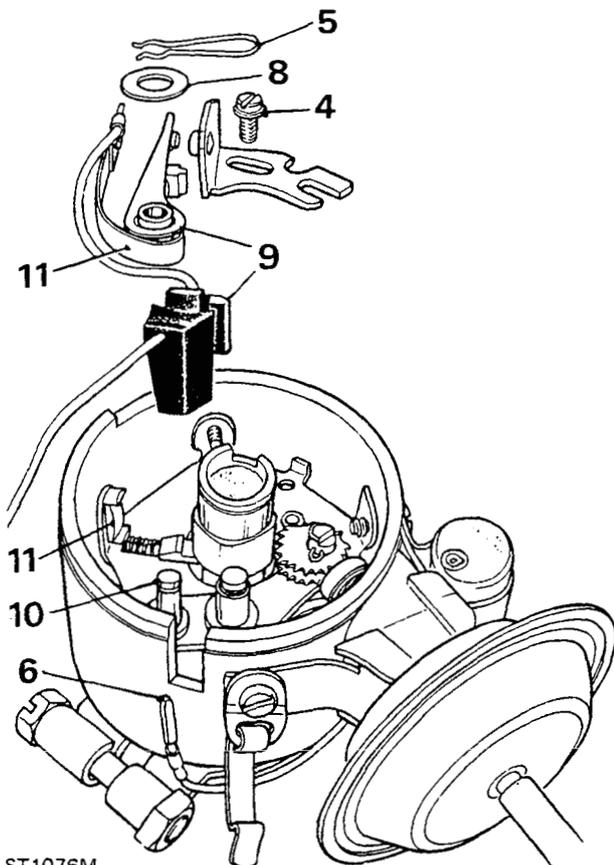


ST 1018M

RENEW DUCELLIER DISTRIBUTOR POINTS —
4-cylinder engines

Renew Points

1. Release the spring clips and remove the distributor cap.
2. Pull off the rotor arm.
3. Remove the dust shield.
4. Remove the retaining screw and remove the fixed contact point.
5. Slide the spring clip rearwards.
6. Disconnect the suppressor lead from the connector block.
7. Disconnect the lead from ignition coil.
8. Remove insulation washer from the moving contact point.
9. Lift off the moving contact point complete with leads and connector block from the distributor body.
10. Fit the new moving point over post.
11. Locate the leaf spring in the plastic guide.
12. Fit the insulation washer.
13. Secure the assembly with the spring clip.
14. Fit the connector block to the distributor body.
15. Connect ignition coil lead.
16. Fit suppressor lead to connector block.
17. Fit the fixed contact point and loosely retain with the screw.

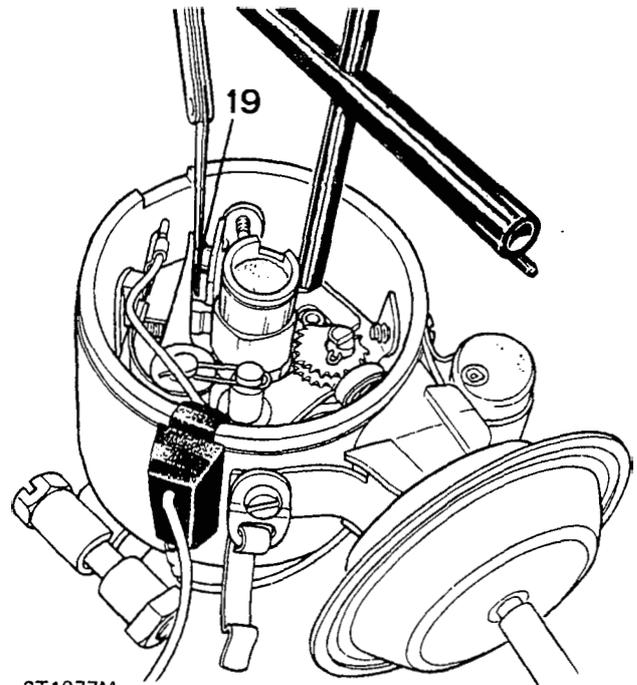


ST1076M

Adjust points

NOTE: The following two instructions describe the adjustment of the contact points. The accompanying illustration shows it being done with the aid of special tool 18G1308. Whilst the points can be adjusted to the datum setting only (see data) without the tool full distributor adjustment, i.e. dwell angle, dwell variation and vacuum advance can only be achieved by using this tool in conjunction with engine diagnostic equipment. It is essential that the above adjustments are carried out in order to maintain correct emission levels and maximum engine efficiency.

18. Rotate the engine until a cam of the rotor fully opens the points.
19. Using a feeler, adjust the position of the fixed contact point to the datum setting and tighten the retaining screw.
20. Check and adjust the dwell angle, dwell variation and vacuum advance.



ST1077M

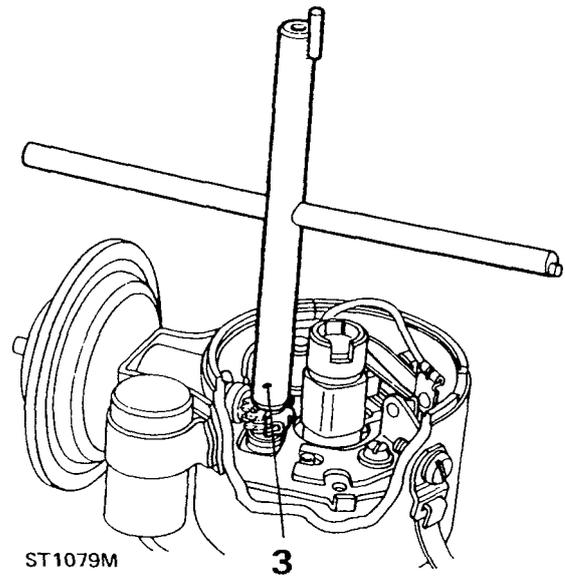
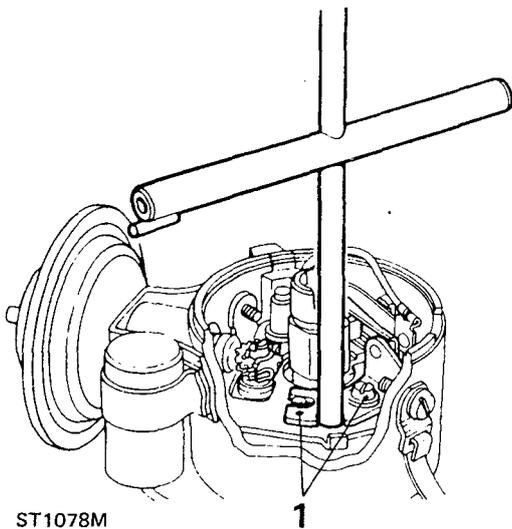
ADJUST DUCELLIER DISTRIBUTOR — 4-cylinder Petrol engine

Service tool:
1861308

Check and Adjust Dwell Angle

NOTE: The following six instructions can only be carried out using engine diagnostic equipment and special tool 18G1308.

1. Start the engine, disconnect the vacuum pipe from the vacuum unit and with the engine idling check the dwell angle — see data. If adjustment is required stop the engine, remove the distributor cap, rotor arm and dust cover, slacken the fixed contact retaining screw and using the eccentric-post end of the special tool, as illustrated, make an appropriate adjustment. Tighten the retaining screw, reassemble the distributor and recheck the dwell angle.



Check vacuum advance

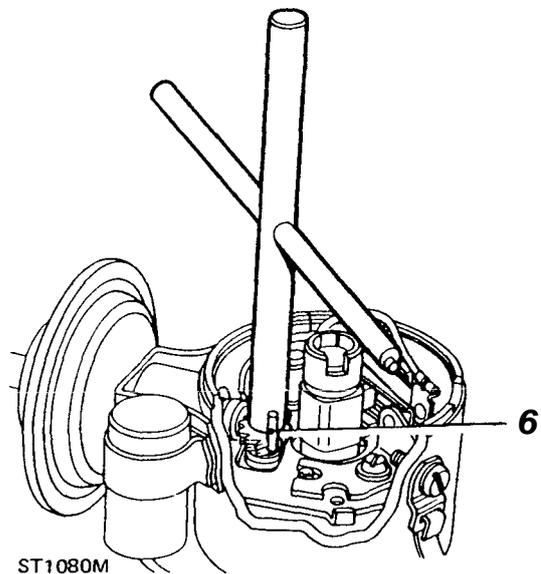
NOTE: If the vacuum unit has been removed or the distributor dismantled, the vacuum advance must be checked and if necessary adjusted.

4. Disconnect the vacuum pipe and connect a vacuum pump to the unit.
5. Start and run the engine at idle speed and using a timing light, slowly increase the vacuum and note the point at which vacuum advance starts and compare the figure with that given in data.
6. Adjustment of the serrated cam, with the special tool, one tooth at a time, will alter the point at which vacuum advance starts.

Check and adjust dwell variation

NOTE: A dwell variation outside the accepted tolerance — see data — can be caused by a mechanical fault or wear within the distributor. This may be checked as follows:

2. Disconnect the vacuum advance, start the engine and increase the speed to 2000 r.p.m. A variation outside the tolerance given in data indicates that the distributor has a mechanical fault which cannot be rectified by adjustment.
3. If the variation is acceptable, reconnect the vacuum pipe, start the engine and increase the engine speed to 2,000 r.p.m. and release the throttle. Check the dwell variation and if necessary adjust by turning the eccentric 'D' post with the special tool (female 'D' end). Setting the dwell for minimum variation may alter the basic setting and this must be rechecked at idle speed.



RENEW LUCAS CONTACT BREAKER SLIDING CONTACTS —4-cylinder petrol engine

The contact set should be renewed every 40.000 km (25,000 miles).

Remove the old contacts

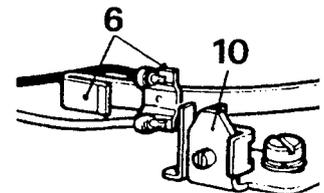
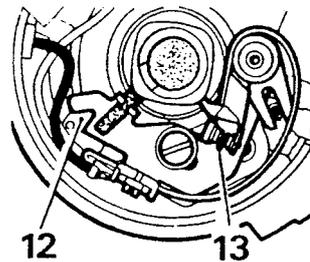
1. Remove the distributor cap.
2. Remove the rotor arm.
3. Remove the retaining screw and lift the contact set complete from the plate.
4. Press the contact set spring and release the terminal plate and leads from the spring.

Fit new contacts

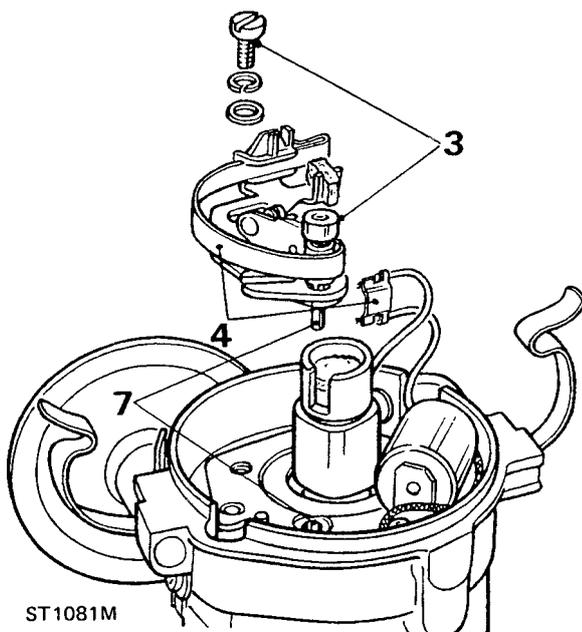
5. Clean the points with petrol to remove the protective coating.
6. Press the contact spring and fit the terminal plate with the black lead uppermost.
7. Fit the contact set to the moving plate, ensuring that the peg, underneath the contact pivot, locates in the hole in the moving plate.
8. The sliding contact actuating fork must also locate over the fixed peg.
9. Loosely secure the assembly with the screw, plain and spring washer.
10. Check that the contact leaf spring locates properly in the insulation shoe.

Adjust gap

11. Rotate the crankshaft until the contact heel is on the highest point of a cam.
12. Adjust the gap by inserting a screwdriver blade between the 'V' shaped notch and pip and twist the screwdriver.
13. Insert a 0,35 to 0,40 mm (0.014 to 0.016 in) feeler gauge between the points and adjust to a sliding fit and tighten the retaining screw.
14. Fit the rotor arm.



ST1082M



ST1081M

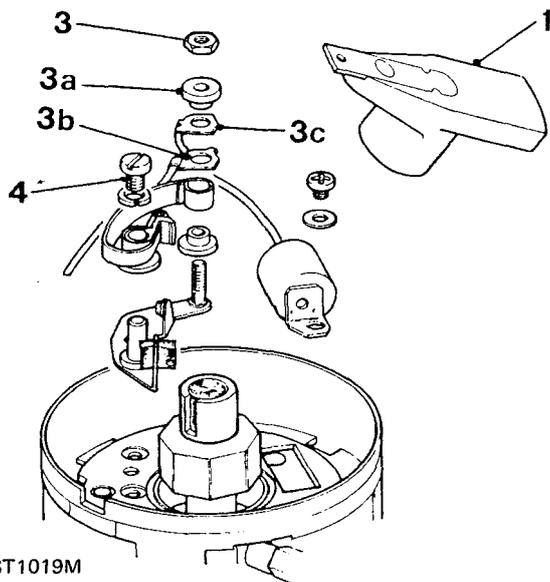
RENEW DISTRIBUTOR CONTACT SET —V8 engine

Fixed contact type

1. Unclip and remove the distributor cap.
2. Withdraw the rotor arm.
3. Remove the contact breaker spring anchor nut and lift off:
 - (a) the top-half of insulation bush
 - (b) the low tension lead (black)
 - (c) the capacitor lead (orange)
4. Remove the contact breaker retaining screw, plain and spring washer and remove contact set assembly.
5. Remove the complete insulation bush.
6. Fit the contact breaker set ensuring that the small post protruding from below the contact set locates through the hole in the cover plate into the hole in the end of the vacuum unit actuating lever, secure with the screw, plain and spring washers.

continued

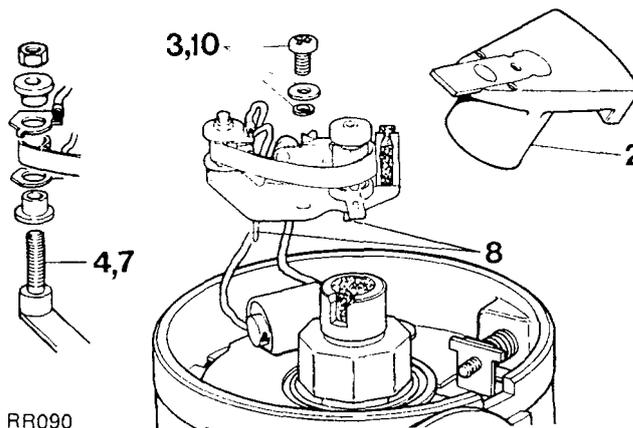
7. Assemble the contact breaker spring insulating bushes and electrical leads, as illustrated, in the following sequence:
 - (a) lower bush
 - (b) spring
 - (c) low tension lead
 - (d) capacitor lead
 - (e) top bush
 and secure with the anchor spring nut.
8. Apply a few drops of engine oil to the distributor cam lubrication pad.



ST1019M

Sliding contact type

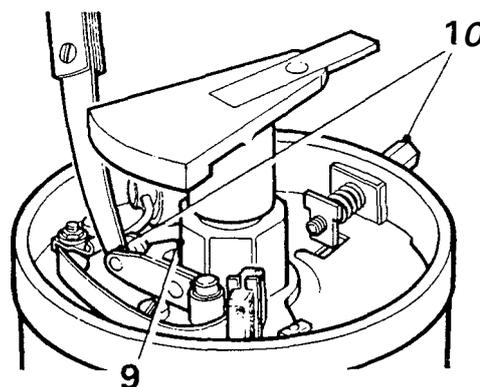
1. Release the clips and remove the distributor cap.
2. Remove the rotor arm from the cam spindle.
3. Remove the retaining screw and washers and lift the complete contact breaker assembly from the moveable plate.
4. Remove the nut and plastic bushes from the terminal post to release the leads and spring.
5. Discard the old contact breaker assembly.
6. Clean the new points with petrol to remove the protective coating.
7. Connect the leads to the terminal post in the following sequence:
 - (a) lower plastic bush
 - (b) red lead tab
 - (c) contact breaker spring eye
 - (d) black lead tab
 - (e) upper plastic bush
 - (f) retaining nut.
8. Fit the contact set to the moving plate ensuring that the two pegs locate in the holes.



RR090

Adjust points — both types

9. Turn the engine in the direction of rotation until the contacts are fully open or the heel of the contact set is on the highest point of the cam.
10. Using a feeler gauge and the dwell angle adjuster on the side of the distributor, set the points to a nominal gap of 0,35 to 0,40 mm (0.014 to 0.016 in).
11. **At** the earliest opportunity check and adjust the dwell angle — see data — using special turning equipment.
12. Fit the rotor arm and distributor cap ensuring that the H.T. pick-up brush moves freely.

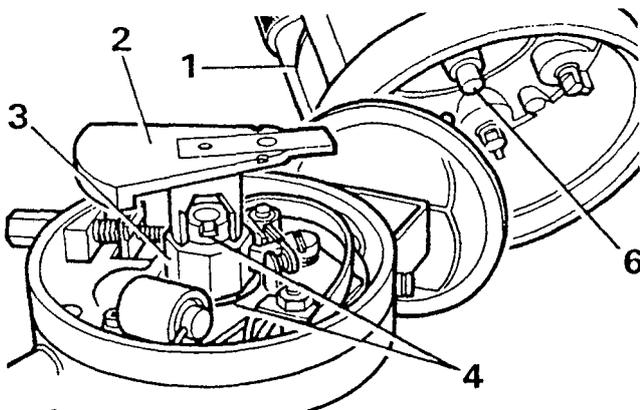


ST1083M

CLEAN AND LUBRICATE V8 ENGINE DISTRIBUTOR

Fixed contact type

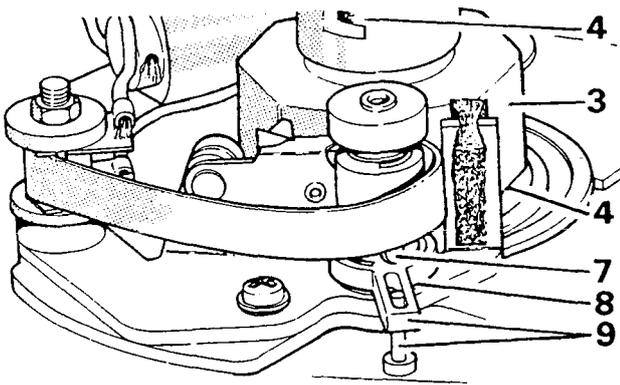
1. Remove distributor cap.
2. Remove rotor arm.
3. Lightly smear the cam with clean engine oil.
4. Add a few drops of thin machine oil to lubricate the cam bearing and distributor shaft.
5. Wipe the inside and outside of the distributor cap with a soft dry cloth.
6. Ensure that the carbon brush works freely in its holder.
7. Refit rotor arm and distributor cap



RR093

Sliding contact type

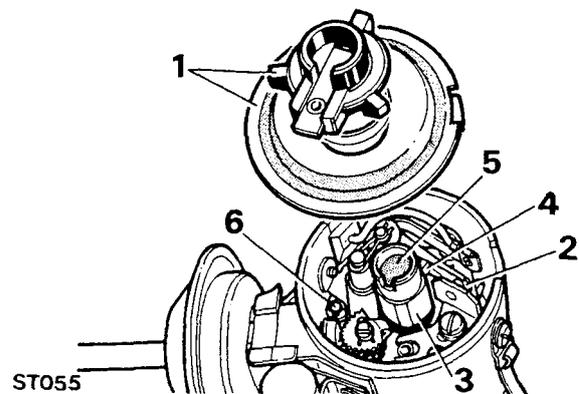
1. Remove distributor cap.
2. Remove rotor arm.
3. Lightly smear the cam with clean engine oil.
4. Add a few drops of thin machine oil to lubricate the cam bearing and distributor shaft.
5. Wipe the inside and outside of the distributor cap with a soft dry cloth.
6. Ensure that the carbon brush works freely in its holder.
7. Lubricate the actuator ramps and contact breaker heel ribs with Shell Retinax or equivalent grease.
8. Grease the underside of the heel actuator.
9. Apply grease to the fixed pin and actuator fork.
10. Refit rotor arm and distributor cap.



RR092

CLEAN AND LUBRICATE DUCELLIER DISTRIBUTOR

1. Remove the distributor cover and lift off the rotor arm and anti-dust shield.
2. Inspect the contact breaker points; if burnt or worn they should be renewed.
3. Very lightly smear the cam with grease — Shell Retinax.
4. Lubricate the pressure pad with grease — Shell Retinax.
5. Add a few drops of oil to the felt pad in the top of the cam spindle.
6. Turn the engine until the distributor centrifugal weight pivot post is visible through the cut-out in the base plate and lubricate the pivot post with a drop of oil. Repeat for the opposite pivot post.
7. Carefully wipe away all surplus lubricant; and ensure that the contact breaker points are clean and dry.
8. Fit the anti-dust shield.
9. Refit the rotor arm, engage the slot in the spindle and push down firmly.
10. Wipe clean with dry nap-free cloth, the inside and outside of the distributor cover, particularly between the electrodes, and fit the distributor cover.



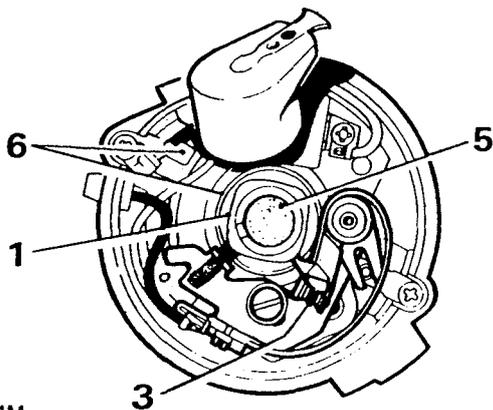
CLEAN V8 ENGINE ELECTRONIC IGNITION DISTRIBUTOR

80.000 km (48,000 miles)

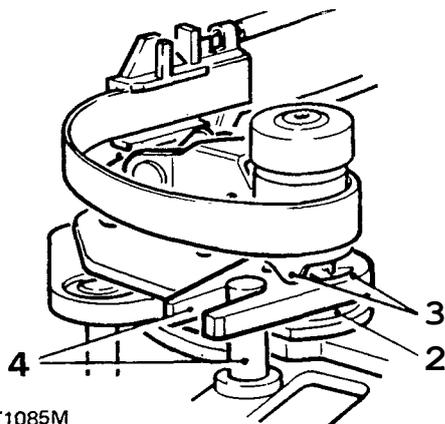
Remove the distributor cap and rotor arm and wipe inside with a nap-free cloth.
DO NOT DISTURB the clear plastic insulating cover which protects the magnetic pick-up module.

CLEAN AND LUBRICATE LUCAS DISTRIBUTOR

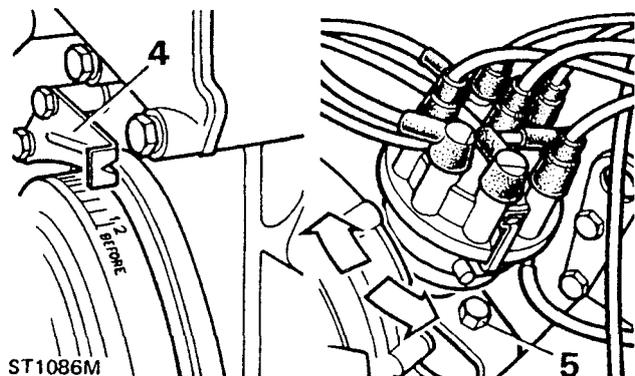
1. Clean and lightly grease the cam with Shell Retinax or equivalent and remove any surplus lubricant.
2. Using the same grease lubricate the underside of the heel actuator.
3. Grease the actuator ramps and contact breaker heel ribs.
4. Apply grease to the fixed pin and the actuator fork.
5. Apply a drop of clean engine oil to the felt pad underneath the rotor arm.
6. Every 40.000 km (25,000 miles) lubricate the automatic advance mechanism by injecting one or two drops of engine oil through the aperture in the base plate.
7. Wipe the internal and external surfaces of the distributor cap with clean dry nap-free cloth and fit the cap to the distributor body.



ST1084M



ST1085M



ST1086M

CHECK AND ADJUST V8 ENGINE DISTRIBUTOR TIMING

Using Electronic Timing Equipment

A pointer on the timing cover and marks on the crankshaft pulley indicate positions around T.D.C. on No. 1 cylinder (i.e. front cylinder on left-hand bank). Refer to 'Engine Tuning data' for appropriate ignition timing.

Engine speed accuracy during ignition timing is important. Any variation from the required idle speed, particularly in an upward direction, will lead to wrongly set ignition timing.

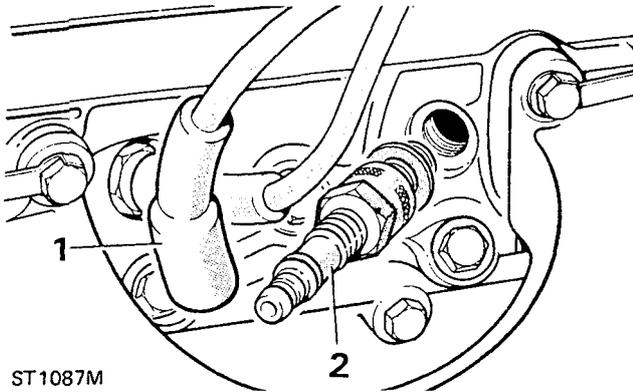
1. Connect a stroboscopic timing light as instructed by the manufacturer. The engine is timed on No. 1 cylinder.
2. Run the engine at idle speed.
3. Position the timing light to illuminate the crankshaft pulley and scale.

WARNING: Ensure that personnel and equipment are kept clear of the rotating cooling fan while using the timing light.

4. If the timing is correct the pulley mark indicated in the Tuning Data will show. If correct, instruction 5 may be ignored.
5. With the engine still running at idle speed, slacken the clamp bolt and carefully rotate the distributor body as required until the correct pulley mark shows. Turn anticlockwise to advance and clockwise to retard.
6. Tighten the clamp bolt with the unit in this position.

CLEAN, ADJUST OR RENEW SPARK PLUGS

1. Withdraw the H.T. leads from the spark plugs by gripping the shrouds, do not pull on the leads.
2. Using an appropriate plug spanner, remove the spark plugs.



Clean and set gaps

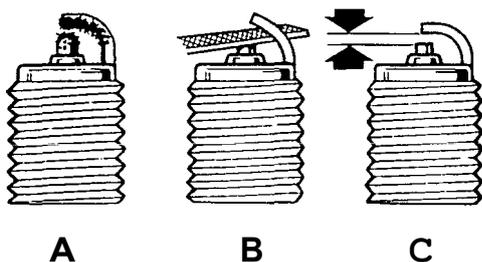
3. Fit plug in plug cleaning machine.
4. Wobble plug with circular motion while operating abrasive blast for a maximum of four seconds.

CAUTION: Excessive abrasive blasting will erode insulator nose.

5. Change to air blast only and continue to wobble plug for a minimum of thirty seconds to remove abrasive grit from plug cavity.
6. Wire-brush plug threads, open gap slightly.
7. Using point file, square off electrode surfaces.
8. Set electrode gap, see 'Engine Tuning data',
9. Test plugs in accordance with cleaning machine manufacturer's instructions. If satisfactory, refit plugs in engine.
10. If no machine is available carefully wire brush electrodes and blow or wash away carbon particles.

Illustration shows:

- A. Dirty or unsatisfactory electrode
- B. Filing plug electrodes
- C. A clean plug correctly set



ST051

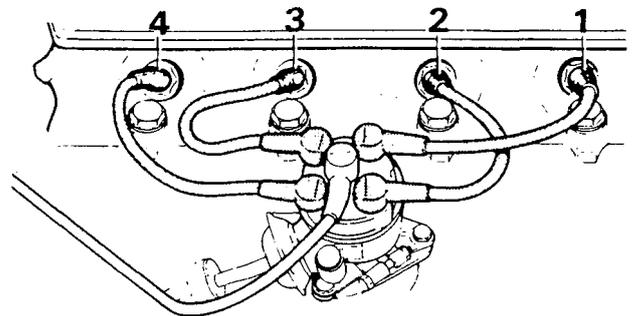
Refit or renew spark plugs

11. Check that the washers are fitted to the plugs.
12. It is important that only spark plugs specified in Data section are used for replacements.
13. Incorrect grades of plug may lead to piston overheating and engine failure.
14. Wash new plugs in petrol to remove the protective coating, then set the electrode gaps to the appropriate figures given in 'Engine Tuning data'.
15. Fit the plugs and washers to the engine but do not overtighten.
16. Examine high tension leads, including the coil to distributor lead, for insulation cracking or corrosion at end contacts. Fit new leads as necessary.
17. In addition to correct firing order, high tension leads must be fitted in correct relation to each other to avoid cross firing, as illustrated. This is particularly important on the V8 engine.

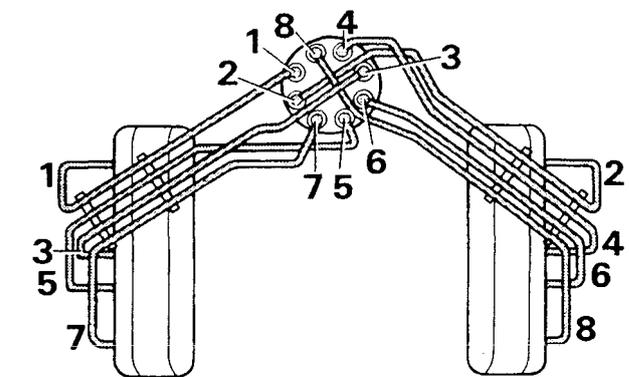
First illustration. 4-cylinder engine.

Second illustration. V8 engine.

18. When pushing leads on plugs ensure ferrules within shrouds are firmly seated on plugs.



ST052



ST098

CLEAN AND TEST HEATER PLUGS — Diesel engines

REMOVE THE PLUGS

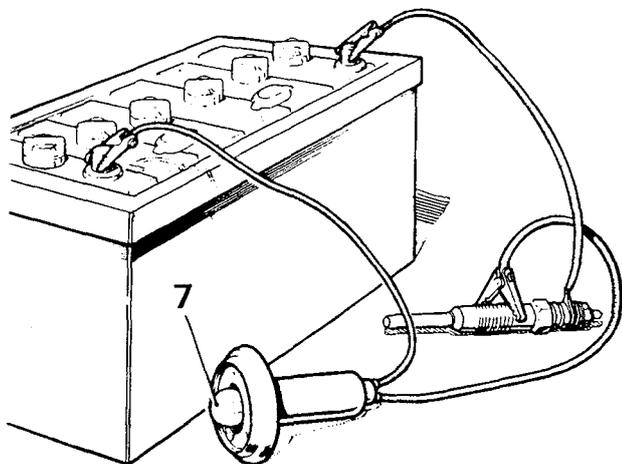
1. Disconnect the battery.
2. Remove the terminal nut from each heater plug.
3. Detach the heater plug lead and washer from each plug.
4. Remove the heater plugs.

Clean and inspect

5. Remove carbon from base of heater plugs to avoid the possibility of short circuiting of the element. Do not sandblast.
6. Examine the element for signs of fracture and deterioration and the seating for scores. Plugs with fractures or doubtful elements must be renewed. Where scoring of the seating may impair the sealing, the plug should be renewed.

Test and refit

7. Test the plug internal circuit for continuity by connecting it in circuit with a 12 volt side lamp bulb and a 12 volt supply. If the bulb does not light an open circuit is indicated and the heater plug must be renewed.

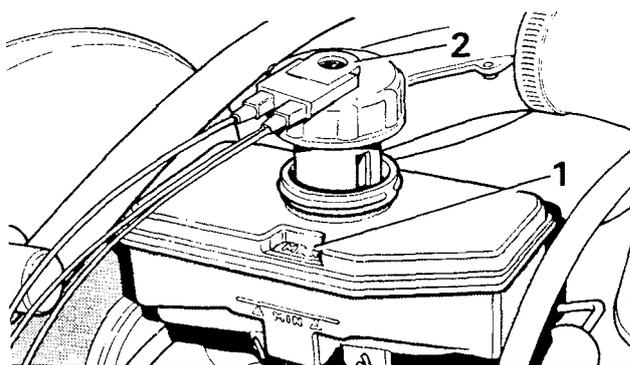


ST1021M

8. Ensure that the terminals are clean and that the thread at the base of the plug is free from carbon.
9. Fit the heater **plugs** to the engine. Do not overtighten.
10. Fit the heater plug lead and washer to each plug.
11. Connect the battery.

CHECK BRAKE FLUID RESERVOIR

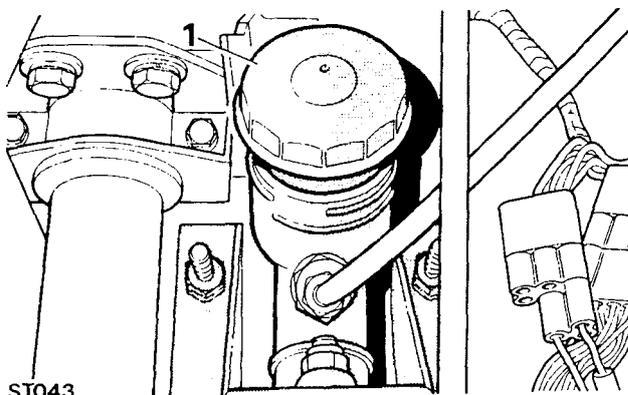
1. Check the fluid level in the fluid reservoir by observing the level in relation to the 'MIN' or 'MAX' marks on the side of the translucent reservoir.
2. If the level is below the 'MAX' mark clean the outside of the filler cap and top-up with new, clean fluid from a sealed container. Use only fluid recommended in the 'General specification data' section. Refit the cap.



ST1088M

CHECK CLUTCH FLUID RESERVOIR

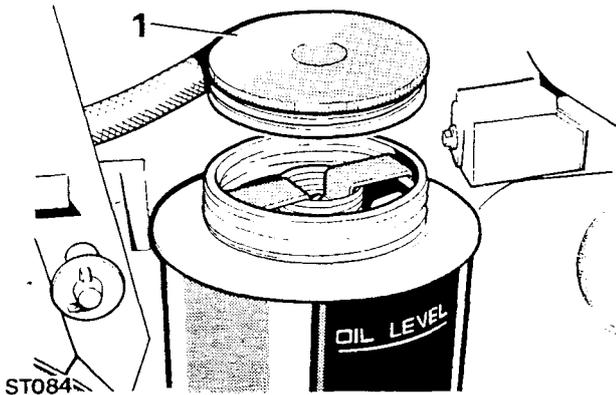
1. Clean and remove the reservoir cap and observe the fluid level in relation to the marks on the side of the reservoir.
2. Top-up if necessary with new, clean fluid from a sealed container and of a recommended specification — see 'General specification data' section. Refit the cap.



ST043

CHECK POWER STEERING FLUID RESERVOIR

1. Clean and remove the reservoir cap and observe the fluid level in relation to the mark on the side of the reservoir.
2. If necessary top-up with a recommended fluid — see ‘General specification data’ section — until the fluid is 12 mm (1/2 in) above the filter. Refit the cap.



CHECK COOLING SYSTEM COOLANT

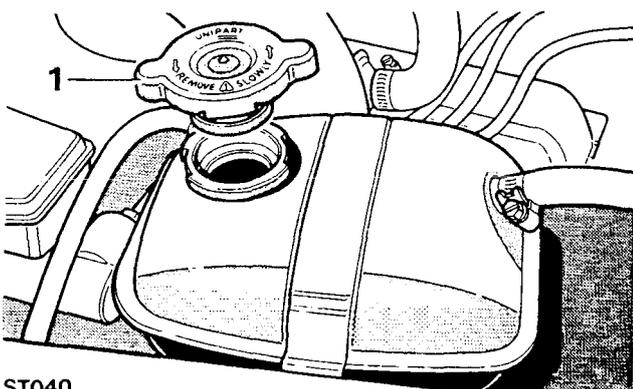
Refer to the ‘Cooling system’ section for details of anti-freeze and inhibitors and to the ‘General specification data’ section for anti-freeze protection quantities.

With a cold engine, the expansion tank should be approximately half full.

WARNING: Do not remove the filler cap when the engine is hot because the cooling system is pressurised and personal scalding could result.

To remove the filler cap, first turn it anti-clockwise a quarter of a turn and allow all pressure to escape, before turning further in the same direction to lift it off.

When replacing the filler cap it is important that it is tightened down fully, not just to the first stop. Failure to tighten the filler cap properly may result in water loss, with possible damage to the engine through overheating.



BATTERY

Check Specific Gravity

The specific gravity of the electrolyte should be checked using a battery hydrometer. The readings should be as follows:

Temperate climate below 26.5°C (80°F) as commissioned for service, fully charged 1.270 to 1.290 specific gravity.

As expected during normal service, three-quarter charged 1.230 to 1.250 specific gravity.

If the specific gravity should read between 1.190 to 1.210, half-charged, the battery must be bench charged and the electrical equipment in the car should be checked.

Tropical climate above 26.5°C (80°F) as commissioned for service, fully charged 1.210 to 1.230 specific gravity.

As expected during normal service, three-quarter charge 1.170 to 1.190 specific gravity.

If the specific gravity should read between 1.130 to 1.150, half-charged, the battery must be bench charged and the electrical equipment on the car should be checked.

Check and Top-Up Electrolyte Level

1. Wipe all dirt and moisture from the battery top.
2. Remove the filler cover. If necessary add sufficient distilled water to raise the level to the top of separators. Replace the filler plugs or manifold lid.
3. Avoid the use of a naked light when examining the cells.
4. In hot climates it will be necessary to top up the battery at more frequent intervals.
5. In very cold weather it is essential that the vehicle is used immediately after topping up, to ensure that the distilled water is thoroughly mixed with the electrolyte. Neglect of this precaution may result in the distilled water freezing and causing damage to the battery.

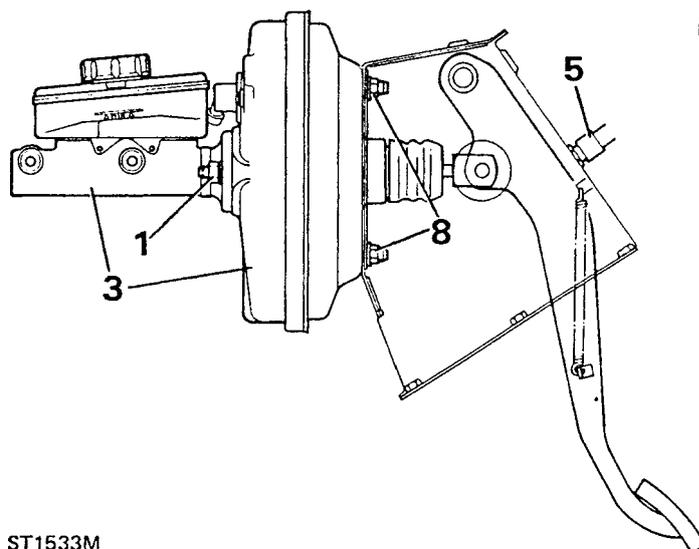
Battery terminals

6. Remove battery terminals, clean, grease and refit.
7. Replace terminal screw; do not overtighten. Do not use the screw for pulling down the terminal.
8. Do NOT disconnect the battery cables while the engine is running or damage to alternator semiconductor devices may occur. It is also inadvisable to break or make any connection in the alternator charging and control circuits while the engine is running.
9. It is essential to observe the polarity of connections to the battery, alternator and regulator, as any incorrect connections made when reconnecting cables may cause irreparable damage to the semiconductor devices.

IMPORTANT NOTE: If a new battery is fitted to the vehicle, it should be the same type as fitted to the vehicle when new. Alternative batteries may vary in size and terminal positions and this could be a possible fire hazard if the terminals or leads come into contact with the battery clamp assembly. When fitting a new battery ensure that the terminals and leads are clear of the battery clamp assembly.

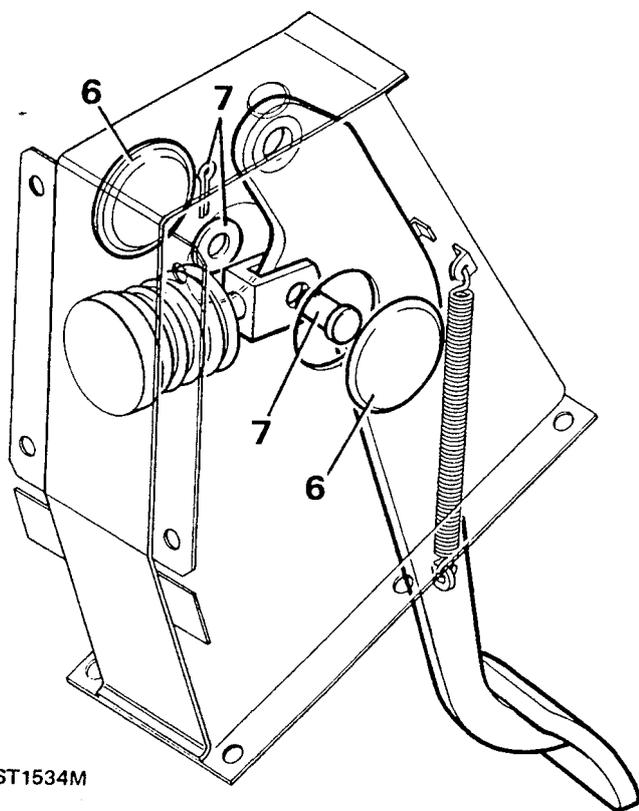
RENEW BRAKE SERVO FILTER

1. Remove the nuts securing the master cylinder to the servo.
2. Release the clip retaining the brake pipe to the clutch pipe.
3. Separate the master cylinder from the servo.
4. Disconnect the vacuum hose from the servo.
5. Disconnect the Lucars from the stop lamp switch at the rear of the pedal box.
6. Remove the blanking grommets from the pedal box.
7. Remove the split pin from the clevis and withdraw the clevis pin and washer.



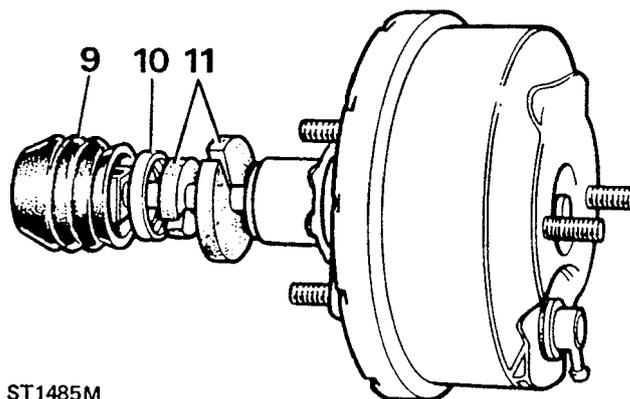
ST1533M

9. Pull back the dust cover.
10. Release the end-cap.
11. Cut the filters to remove them from the shaft.



ST1534M

8. Remove the four nuts securing the servo to the pedal box and remove the servo.

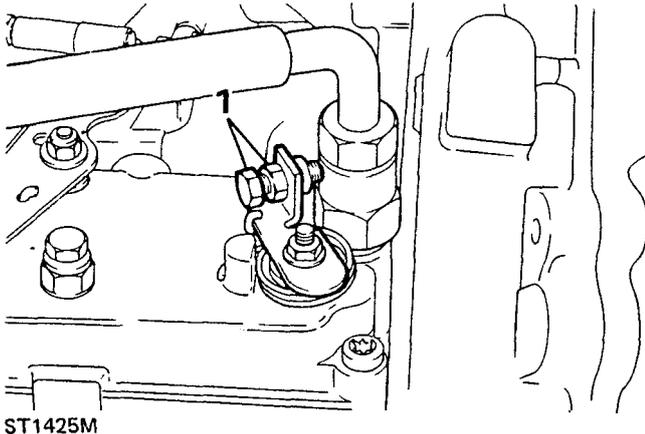


ST1485M

12. Clean the filter seating and fit the new filters noting that they must be cut to fit over the shaft.
13. Fit the end-cap and dust cover and refit the servo and master cylinder to the vehicle reversing the removal procedure. Use a new split pin to secure the clevis.
14. Test the brakes.

ENGINE SLOW RUNNING —2.5 Diesel

1. Using a suitable tachometer, check the engine slow running adjustment 'see Engine tuning data'. If adjustment is necessary slacken the locknut and turn the control screw clockwise to increase the revolutions and anti-clockwise to decrease the engine speed. Tighten the locknut, increase the engine speed for a few seconds then re-check the slow running.



2. If a tachometer is not available adjust the control screw until the slowest speed is obtained consistent with smooth and even running.

NOTE: The slow running control is the only permitted adjustment in service. Any additional adjustments required must only be carried out by authorised C.A.V. agents.