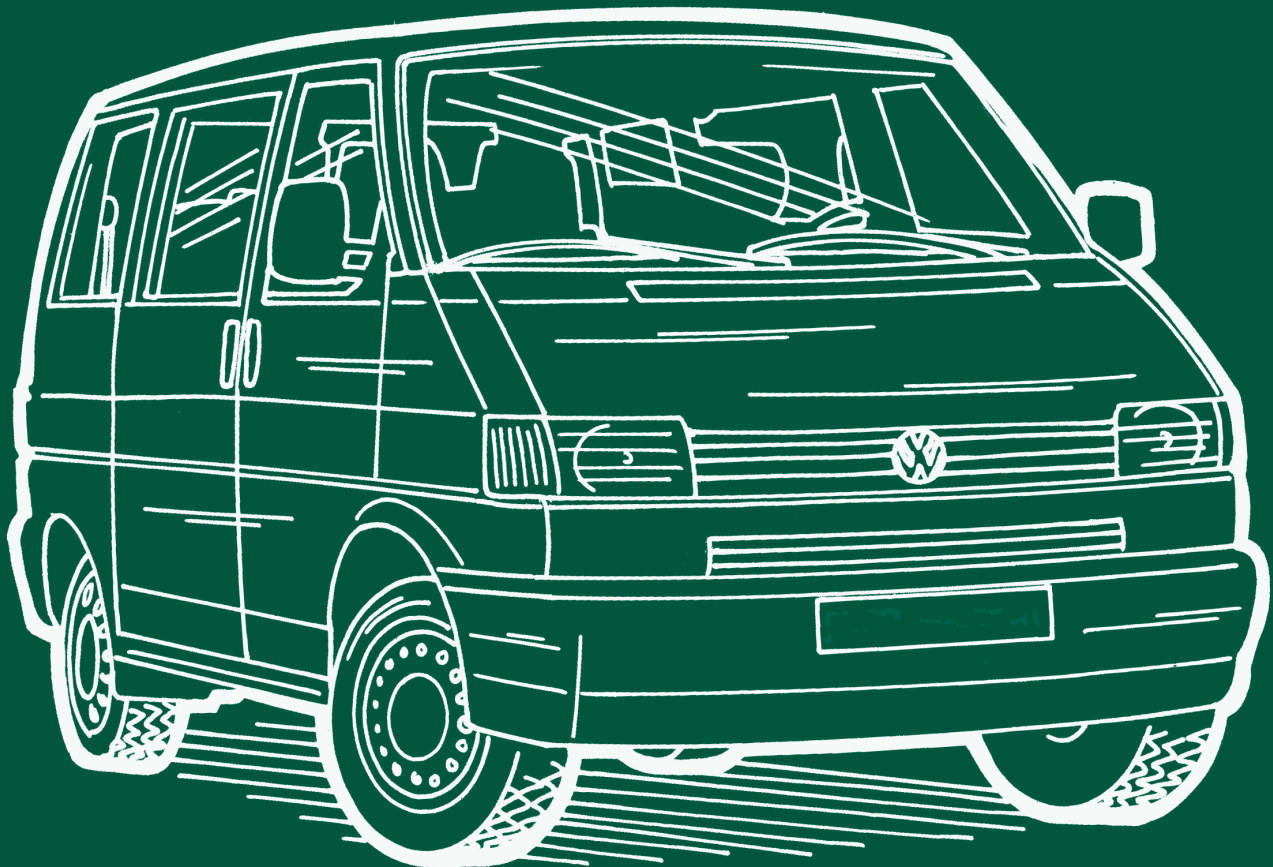


**VW**

**VOLKSWAGEN  
TRANSPORTER T4  
WORKSHOP MANUAL**

*( Powered by 1.9, 2.4 & 2.5 TDI diesel engines )*

***Diesel models - years 2000-2004***



**OWNERS EDITION**

# **VOLKSWAGEN TRANSPORTER T4**

## **WORKSHOP MANUAL**

*(Powered by 1.9, 2.4 & 2.5 TDI diesel engines)*

**Diesel models - years 2000-2004**

### **CONTENTS**

<b>Introduction</b>		<b>5</b>
<b>Chapter 1</b>	<b>Engine</b>	<b>10</b>
<b>Chapter 2</b>	<b>Clutch</b>	<b>79</b>
<b>Chapter 3</b>	<b>Transmission and Final Drive</b>	<b>86</b>
<b>Chapter 4</b>	<b>Drive Shafts</b>	<b>92</b>
<b>Chapter 5</b>	<b>Steering</b>	<b>96</b>
<b>Chapter 6</b>	<b>Front Suspension</b>	<b>103</b>
<b>Chapter 7</b>	<b>Rear Suspension and Axle</b>	<b>114</b>
<b>Chapter 8</b>	<b>Wheels and Tyres</b>	<b>120</b>
<b>Chapter 9</b>	<b>Brakes</b>	<b>121</b>
<b>Chapter 10</b>	<b>Electrical</b>	<b>135</b>
<b>Chapter 11</b>	<b>Bodywork</b>	<b>138</b>
<b>Fault Finding Section</b>		<b>145</b>
<b>Wiring Diagram Index</b>		<b>151</b>

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**COVERING  
VAN 800, 1000, 1200 - CARAVELLE CL AND GL  
BUS, LONG & SHORT WHEELBASE**

**Brooklands  
Books** 

# **VOLKSWAGEN TRANSPORTER T4 WORKSHOP MANUAL DIESEL MODELS 2000-2004**

**1.9 Litre DIESEL (ABL)  
2.4 Litre DIESEL (AJA and AAB)  
2.5 TDI DIESEL  
(ACV, AHY, AJT, AUF, AXG, AXL, AYC)**

**COVERING  
VAN 800, 1000, 1200 - CARAVELLE CL AND GL  
BUS, LONG & SHORT WHEELBASE**

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VW98WH

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# CONTENTS

Introduction		5
Chapter 1	Engine	10
Chapter 2	Clutch	79
Chapter 3	Transmission and Final Drive	86
Chapter 4	Drive Shafts	92
Chapter 5	Steering	96
Chapter 6	Front Suspension	103
Chapter 7	Rear Suspension and Axle	114
Chapter 8	Wheels and Tyres	120
Chapter 9	Brakes	121
Chapter 10	Electrical	135
Chapter 11	Bodywork	138
Fault Finding Section		145
Wiring Diagram Index		151

## ABOUT THIS BOOK

This Owners' Edition - Workshop Manual covers the the Volkswagen Transporter range from the end of 1999 (model year 2000) until the end of production and fitted with following engines: 1.9, 2.4 and 2.5 litre diesel engines. It has been specially written for the practical owner who wants to maintain a vehicle in first-class condition and carry out the bulk of his or her own servicing and repairs. Comprehensive step-by-step instructions are provided for service and overhaul operations to guide the reader through what might otherwise be unfamiliar and complicated tasks. Numerous drawings are included to amplify the text.

With the aid of this manual, many aspects of service, overhaul and repair are within the scope of an owner with a reasonable degree of mechanical aptitude. Some operations however demand more skill. Other jobs require the use of special tools and in some cases testing facilities and techniques that are not generally available. Only you can judge whether a job is within your capabilities. We do however try to assist the reader to come to an informed decision. Whilst every effort has been made to ensure that the information provided is correct, it is obviously not possible to guarantee complete freedom from errors or omissions.

Information to be found in the driver's handbook is not necessarily duplicated here and it is not possible within this volume to cover every aspect to be found in the manufacturer's own workshop manual which is of much greater size and complexity. However, it should be consulted if more detailed information is needed.

Always remember that you are responsible for your own safety and that of others when working on a vehicle. Take particular care with safety-related systems like the brakes and steering, and seek professional advice if in any doubt. Never work under a vehicle unless it is properly supported (a single jack is not enough). Take care with power tools, also regard as potentially harmful fuel, lubricants, solvents and sealers which should always be and kept in labelled, sealed containers.

With care and common sense, the practical owner can make an excellent job of maintenance and overhaul. The benefits include money saved and the satisfaction of work well done. You will be adding to your knowledge, too: knowing more about the vehicle you own will help you to make logical decisions about what needs to be done, even if it does in some instances have to go into a professional repair shop.

The Volkswagen Transporter T4 is a vehicle that will respond to careful regular servicing and is built to a standard that will ensure a long life if this is remembered.

# 0. Introduction

## 0.0. General Information

### 0.1. Identification

### 0.2. Dimensions (typical)

## 0.3. Capacities

### 0.4. General Servicing Notes

### 0.5. Jacking up of the Vehicle

## 0.0. General Information

This Manual covers the models in the Volkswagen Transporter range from the end of 1999, generally referred to as Type T4 vehicles, with a choice of three diesel engines. The following engines are covered in this manual:

- The 1.9 litre diesel engine is a four-cylinder engine and has the type designation “ABL”, replacing the engine type “1X”. The engine has a performance of 50 kW at 3700 rpm. Earlier engines of the same capacity were rated at 45 kW at the same speed. There is also a 55 kW diesel engine. Either a diesel or turbo diesel engine is fitted.
- The 2.4 litre diesel engine is a five-cylinder engine and has now the type designation “AJA”, replacing the previously used “AAB” engine. The engine has a performance of 55 kW at 3700 rpm (“AAB” engine 57 kW at 3700 rpm.) The engine is of the conventional type with indirect diesel fuel injection.
- From approx. August 1995 a new engine with a capacity of 2.5 litres has been fitted to T4 models, but the engine types have been changed since introduction. The engine performance is given in Section 1.0. The latest engines have the code letters “AXG”, “AXL” and “AYC”. All engines operate with direct fuel injection (TDI engine). A catalytic converter, exhaust gas recirculation, a turbo charger and a charge air intercooler are used in these vehicles.

The front suspension consists of an upper and lower wishbones, torsion bars and a stabiliser bar (anti-roll bar), together with double-acting, hydraulic shock absorbers. Not all models have the stabiliser bar. The individual parts of the front suspension can be removed from the vehicle

without dismantling the complete assembly. All parts of the front suspension are mounted to a strong crossmember, which can be removed as a complete unit in order to remove the individual units, if major repairs are necessary.

The rear suspension consists of suspension arms with coil springs and hydraulic shock absorbers and a stabiliser (anti-roll) bar. The suspension arms are rubber-mounted on the chassis. The wheel hub carrier is bolted to the outside of the suspension arm. The connection to the rear drive shafts takes place at the inside of each rear wheel hub carrier.

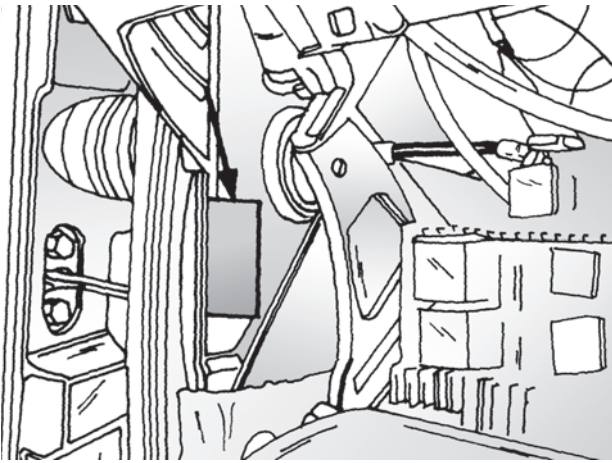
A rack and pinion steering, fitted with servo-assistance, is used. Disc brakes at the front wheels and rear wheels are fitted and a brake servo unit as standard fitment, make up the brake system, but not all models have the same front disc brake assemblies. Two types of Lucas calipers or Teves/ATE calipers were used during production and irrespective of the models in question will be covered in the relevant section. ABS can now be fitted to the vehicle. The vacuum for the operation of the brake servo unit is supplied by a separate exhauster pump (vacuum pump).

A five-speed manual or an automatic transmission can be fitted to the vehicles covered in this manual.

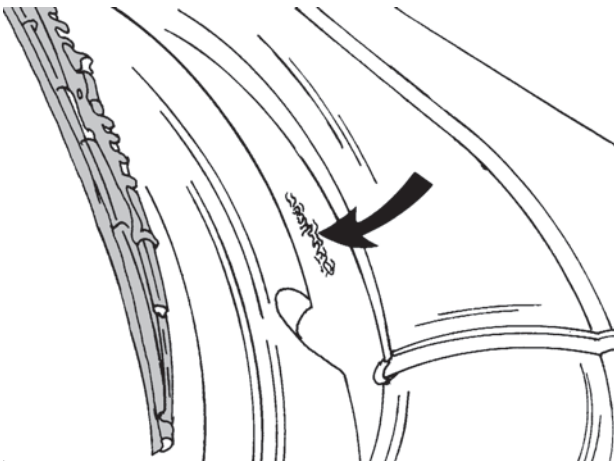
With regards to the range of models covered in the manual it must be pointed out that not all of these will be available in any particular country and that the manufacturer reserves the right to make modifications to standard equipment, optional extras and trim as may be necessary for any territory.

Since the variations between certain models are only in fittings and trim it will be unnecessary in some parts of this manual to refer to individual model designations.





**Fig. 0.1.** - The location of the type identification plate on the passenger side of the vehicle.



**Fig. 0.2.** - The location of the vehicle identification number at the bottom of the windscreen.

## 0.1. Identification

The type identification plate can be found near the front door pillar, close to the door striker plate, at the position shown in Fig. 0.1. The chassis number is stamped into the right-hand side, below the windscreen, and is visible from the outside of the vehicle (arrow, Fig. 0.2). The chassis number can have the following appearance:

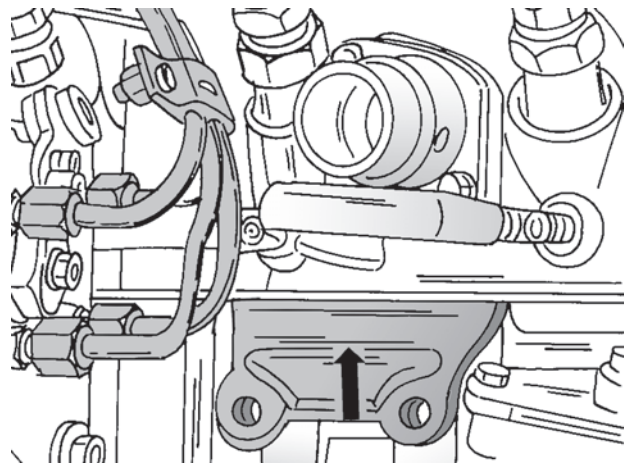
WVW2 ZZZ 370 Z Y H 00001

which relates to the following data:

- The first three letters with the “2” refer to the code letters of the manufacturer.
- The next three letters are filler letters.
- The number “370” refers to the model designation.
- The single “Z” is a filler letter.
- The letter “Y” refers to the model year, in this case

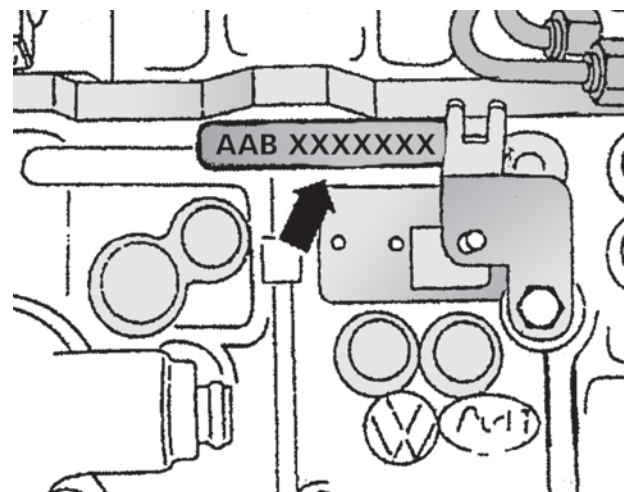
given for a 2000 model. After “Y” you will find “1”, “2” or “3” (2001, 2002, 2003), referring to subsequent model years.

- The “H” refers to the manufacturing plant in Germany.
- The last numbers are the actual serial number of the vehicle.



**Fig. 0.3.** - The location of the engine number on the 1.9 litre diesel engine.

The engine number of a 1.9 litre diesel engine is stamped into the cylinder block between the injection pump and the vacuum pump, at the position shown in Fig. 0.3. The engine code of the two five-cylinder engines can be found next to the injection pump on the left-hand side of the cylinder block, at the position shown in Fig. 0.4. The engine code and engine serial number are quoted. A sticker with the engine code and the engine number is attached to the upper timing belt cover.



**Fig. 0.4.** - The position of the engine number on the five-cylinder diesel engine.

These numbers are the essential information needed whenever spares or replacement parts are required. The vehicle manufacturer operates a policy of constant



improvement and updating and it is only by quoting the vehicle and engine numbers that your dealer can provide you with the correct spares and replacements. The engine code is also included in the details of the vehicle data plate.

**Note:** If ever in the life of your T4 a replacement cylinder block is fitted, make sure that the original engine number has been transferred to the new cylinder block. This is (a) a legal requirement and (b) will avoid complications whenever you want to sell, part exchange or use the vehicle abroad.

The transmission and the automatic transmission are also identified by a number. As not all transmissions, i.e. gearboxes have the same reduction ratio for the final drive, it will be necessary to refer to these identification numbers (further details in Section 3) when for example a second-hand transmission is fitted. Each transmission has a code and is allocated to a particular engine within the vehicle range.

Section "Brakes" will refer to details where to find the code for the fitted front brake calipers, without the need to remove the front wheels to check their construction.

## 0.2. Dimensions (typical)

Wheelbase:	2920 mm (116.0 in.) or 3320 mm (131.9 in.)
Front track:	1598 mm (63.5 in.) or 1607 mm (63.85 in.)
Rear Track:	1554 mm (61.75 in.) or 1572 mm (62.45 in.)
Min. ground clearance:	180 mm (7.15 in.), 160 mm (6.36 in.) - with lowered suspension
Turning circle:	
- Short wheelbase	11.7 metres (38.6 ft.)
- Long wheelbase	12.9 metres (42.6 ft.)

## 0.3.

## Capacities

Engine Oil:

Four-cylinder diesel engine	- Without filter	4.5 litres (8.0 Imp. pts.)
	- With filter	5.0 litres (8.75 Imp. pts.)
Five-cylinder diesel engine	- Without filter	5.0 litres (8.75 Imp. pts.)
	- With filter	5.5 litres (9.6 Imp. pts.)

Manual transmission:

- Type 02B	2.5 litres (4.5 Imp. pts.)
- Type 02G	2.3 litres (4.1 Imp. pts.)

Automatic Transmission:

Initial filling	6.0 litres (10.4 Imp. pts.)
Fluid change	3.0 litres (5.25 Imp. pts.)

Differential and Final Drive:

1.25 litres (2.2 Imp. pts.)

Cooling system:

9.0 litres (2 imp. gall.), all engine  
Depending on equipment different capacities apply

## 0.4. General Servicing Notes

The servicing and overhaul instructions in this Workshop Manual are laid out in an easy-to-follow step-by-step fashion and no difficulty should be encountered if the text and diagrams are followed carefully and methodically. The "Technical Data" sections form an important part of the repair procedures and should always be referred to during work on the vehicle.

In order that we can include as much data as possible, you will find that we do not generally repeat in the text the values already given under the technical data headings.

Again, to make the best use of the space available, we do not repeat at each operation the more obvious steps necessary - we feel it to be far more helpful to concentrate on the difficult or awkward procedures in greater detail. However, we summarise below a few of the more important procedures and draw your attention to various points of general interest that apply to all operations.

Always use the torque settings given in the various main sections of the manual. These are grouped together in separate sub-sections for convenient reference.

Bolts and nuts should be assembled in a clean and very lightly oiled condition and faces and threads should always be inspected to make sure that they are free from damage burrs or scoring. DO NOT degrease bolts or nuts.

All joint washers, gaskets, tabs and lock washers, split pins and "O" rings must be replaced on assembly. Seals will, in the majority of cases, also need to be replaced, if the shaft and seal have been separated. Always lubricate the lip of the seal before assembly and take care that the seal lip is facing the correct direction.

References to the left-hand and right-hand sides are always to be taken as if the observer is at the rear of the vehicle, facing forwards, unless otherwise stated.

Always make sure that the vehicle is adequately supported, and on firm ground, before commencing any work on the underside of the car. A small jack or a make shift prop can be highly dangerous and proper axle stands are an essential requirement for your own safety.

Dirt, grease and mineral oil will rapidly destroy the seals of the hydraulic system and even the smallest amounts must be prevented from entering the system or coming into contact with the components. Use clean brake fluid or a cleaner to wash the hydraulic system parts. An acceptable alternative cleaner is methylated spirit, but if this is used, it should not be allowed to remain in contact with the rubber parts for longer than necessary. It is also important that all traces of the fluid should be removed from the system before final assembly.

Always use genuine manufacturer's spares and replacements for the best results.

Since the manufacturer uses metric units when building the cars it is recommended that these are used for all precise units. Inch conversions are given in most cases but these are not necessarily precise conversions, being rounded off for the unimportant values.

Removal and installation instructions, in this Workshop Manual, cover the steps to take away or put back the unit or part in question. Other instructions, usually headed "Servicing", will cover the dismantling and repair of the unit once it has been stripped from the vehicle. It is pointed out that the major instructions cover a complete overhaul of all parts but, obviously, this will not always be either necessary and should not be carried out needlessly.

There are a number of variations in unit parts on the range of vehicles covered in this Workshop Manual. We strongly recommend that you take care to identify the precise model, and the year of manufacture, before obtaining any spares or replacement parts.

Std.: To indicate sizes and limits of components as supplied by the manufacturer; also to indicate the production tolerances of new unused parts.

O/S: Parts supplied as Oversize or Undersize or recommended limits for such parts, to enable them to be used with worn or re-machined mating parts.

U/S: O/S indicates a part that is larger than Std. size U/S may indicate a bore of a bushing or female part that is smaller than Std.

Max.: Where given against a clearance or dimension indicates the maximum allowable if in excess of the value given it is recommended that the appropriate part is fitted.

TIR: Indicates the Total Indicator Reading as shown by a dial indicator (dial gauge).

TDC: Top Dead Centre (No. 1 piston on firing stroke).

MP: Multi-Purpose grease.

## 0.5. Jacking up of the Vehicle

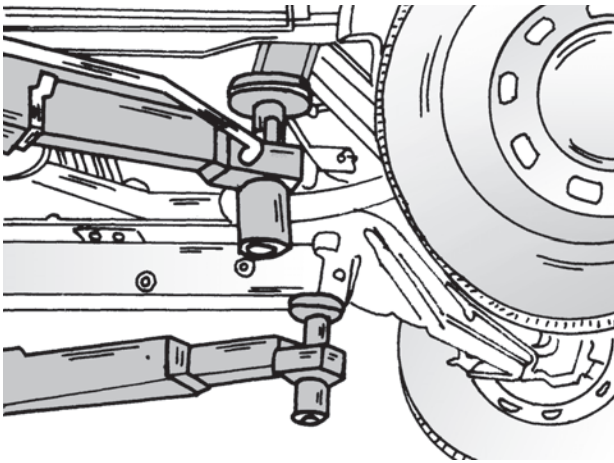
For small jobs, jack up the vehicle as described in the Owner's Manual, with the jack supplied in the vehicle. If a mobile jack is used, make sure it can be inserted between the lowest point of the vehicle and the ground. If necessary, use the vehicle jack to lift the vehicle slightly, until the mobile jack can be inserted. Due to the construction of the vehicle, a mobile jack and/or chassis stands should only be placed under the vehicle as follows, noting that a piece of rubber or wood should always be inserted between the jack head and the jacking point to protect the part in question.

Never apply a mobile jack or a hydraulic jack underneath the engine oil sump, the transmission, the rear axle, the front axle or underneath the front crossmember, as these parts or surrounding parts can either be damaged or distorted.

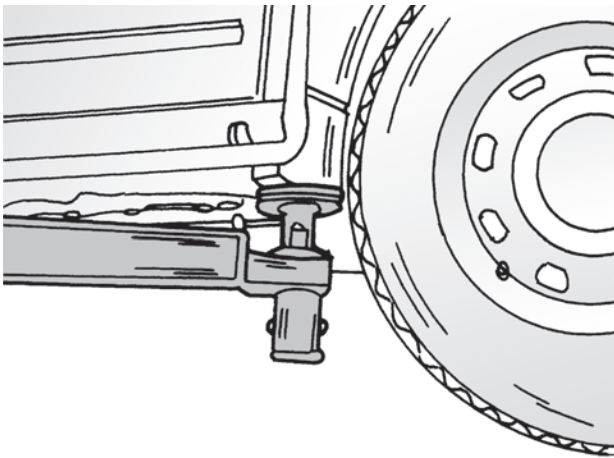
The recommendation is to first jack up one side of the vehicle, placing a chassis stand underneath the body and then jacking up the other side.

To jack-up the front of the vehicle, place the jack underneath the crossmember at the position shown in Fig. 0.5. Chock the front and rear wheels on the other side of the vehicle with a brick, to prevent the vehicle from rolling off the jack. Also apply the handbrake.

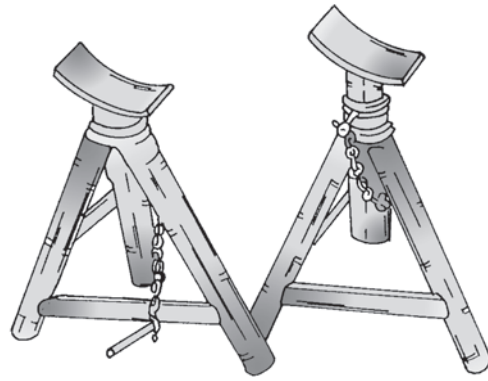
To jack up the rear end of the vehicle place the jack head underneath the mounting bracket of the rear suspension arm, as shown in Fig. 0.6. Engage a gear and chock the front and rear wheels on the other side. Also apply the handbrake.



**Fig. 0.5.** - Jacking up the front end of the vehicle. The illustration shows a garage-type jack, but a mobile or hydraulic jack is applied at the same position.



**Fig. 0.6.** - Jacking up the rear end of the vehicle. The illustration shows a garage-type jack, but a mobile or hydraulic jack is applied at the same position.



**Fig. 0.7.** - "Three-legged" chassis stands are a "must" when supporting the vehicle during operations underneath.

Strong chassis stands must be placed underneath the sides of the body. The bolt used for the height adjustment of the stands (Fig. 0.7) must be strong enough carry the weight of the vehicle - remember this, as make-shift bolts of small diameter will not do.

It is always difficult to raise a vehicle first on one side and then on the other. Take care that the vehicle cannot tip-over when the first side is lifted. Ask a helper support the vehicle from the other side.

# 1. Engines

- |   |  |
|---|--|
| <b>1.0. Main Features</b>                     | <b>1.9. Indirect Diesel Injection System</b>         |
| <b>1.1. Engine – Removal and Installation</b> | <b>1.10. Adjustment on the Fuel Injection System</b> |
| <b>1.2. Engine Dismantling</b>                | <b>1.11. Injectors</b>                               |
| <b>1.3. Engine - Assembly</b>                 | <b>1.12. Glow Plugs</b>                              |
| <b>1.4. Engines – Servicing and Overhaul</b>  | <b>1.13. Air Cleaner</b>                             |
| <b>1.5. Engine Tightening Torques</b>         | <b>1.14. TDI Engine – 2.5 Litre</b>                  |
| <b>1.6. Lubrication System</b>                | <b>1.15. Turbo Charger</b>                           |
| <b>1.7. Cooling System</b>                    |  |

## 1.0. Main Features

Type: 4- or 5-cylinder, in line, water-cooled diesel engine with indirect or direct (TDI) injection and distributor injection pump

Valve gear: Overhead camshaft, timing belt drive to camshaft and injection pump drive gear on 4-cylinder. On five-cylinder engines, the injection pump is driven by separate belt. Camshaft operating directly onto inverted, hydraulically operated bucket-type tappets.

Engine Codes:

- |                                    |                                   |
|------------------------------------|-----------------------------------|
| - Four-cylinder engine:            | ABL (replaces engine 1X)          |
| - Five-cylinder engine, 2.4 litres | AJA (replaces AAB)                |
| - Five-cylinder engine, 2.5 litres | ACV, AHY, AJT, AUF, AXG, AXL, AYC |

Swept Volume:

- |                           |            |
|---------------------------|------------|
| - 4-cylinder engine:      | 1.9 litre  |
| - 5-cylinder, 2.4 litres: | 2.4 litres |
| - 5-cylinder, 2.5 litres: | 2.5 litres |

Bore:

- |                              |                      |
|------------------------------|----------------------|
| - 1.9 and 2.4 litre engines: | 79.5 mm (3.0393 in.) |
| - 2.5 litre engine:          | 81.0 mm (3.218 in.)  |

Stroke, all engines: 95.5 mm (3.794 in.)

Compression Ratio:

- |                                     |          |
|-------------------------------------|----------|
| - Four-cylinder engine:             | 22.5 : 1 |
| - Five-cylinder engine, 2.4 litres: | 23.0 : 1 |
| - Five-cylinder engine, 2.5 litres: |          |
| - ACV and AJT engines:              | 19.5 : 1 |
| - AUF, AXG, AXL, AYC engines:       | 19.0 : 1 |

Output (performance) – DIN:

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| - 4-cylinder engine:             | 50 kW at 3700 rpm                    |
| - 5-cylinder engine, 2.4 litres: | 55 kW at 3700 rpm (AAB engine 57 kW) |
| - 5-cylinder engine, 2.5 litres: |                                      |
| - ACV engine:                    | 75 kW at 3500 rpm                    |
| - AHY engine:                    | 111 kW at 4000 rpm                   |
| - AJT engine:                    | 65 kW at 3800 rpm                    |
| - AUF engine:                    | 75 kW at 3500 rpm                    |
| - AXG engine (from Sept. 2000):  | 111 kW at 4000 rpm                   |
| - AXL engine (from May 2001):    | 75 kW at 3500 rpm                    |
| - AYC engine (from May 2001):    | 75 kW at 3500 rpm                    |

### Max. Torque:

- 4-cylinder engine, ABL:	14.0 kgm at 2000 – 3000 rpm
- 5-cylinder engine, 2.4 litres, AJA:	16.0 kgm at 1900 – 2900 rpm
- 5-cylinder engine, 2.5 litres:	
- ACV engine:	25.0 kgm at 2300 rpm
- AHY engine:	29.5 kgm at 1900 – 3000 rpm
- AJT engine:	19.5 kgm at 1900 – 2500 rpm
- AUF engine:	25.0 kgm at 1900 – 2300 rpm
- AXG engine (from Sept. 2000):	29.5 kgm at 1900 – 3000 rpm
- AXL engine (from May 2001):	25.0 kgm at 1800 – 2500 rpm
- AYC engine (from May 2001):	25.0 kgm at 1900 – 2300 rpm

### Valve Timing

Inlet valve opens:	6° A.T.D.C. 8° A.T.D.C.
Inlet valve closes:	20° A.B.D.C. 28.0° A.B.D.C.
Exhaust valve opens:	25.5° B.B.D.C. 37° B.B.D.C.
Exhaust valve closes:	6.5° B.T.D.C. 10° B.T.D.C.
Checking values:	1 mm valve stroke and “0” valve clearance

BTDC = Before top dead centre  
ABDC = After bottom dead centre

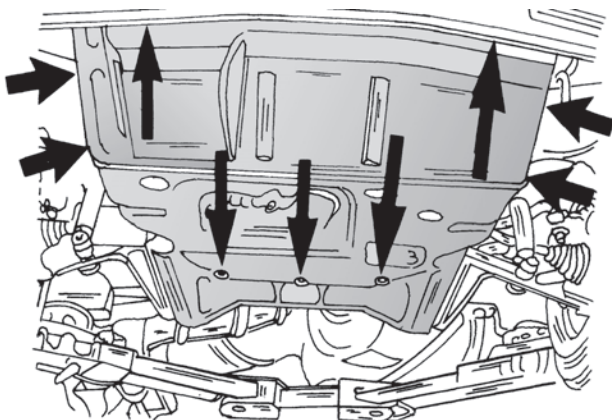
BBDC = Before bottom dead centre  
ATDC = After top dead centre

## 1.1. Engine – Removal and Installation

The 1.9 litre engine is removed without the transmission from below the vehicle. The 2.4 litre and the 2.5 litre engines are removed together with the transmission, also from below the vehicle. Proceed as follows for the two engine types:

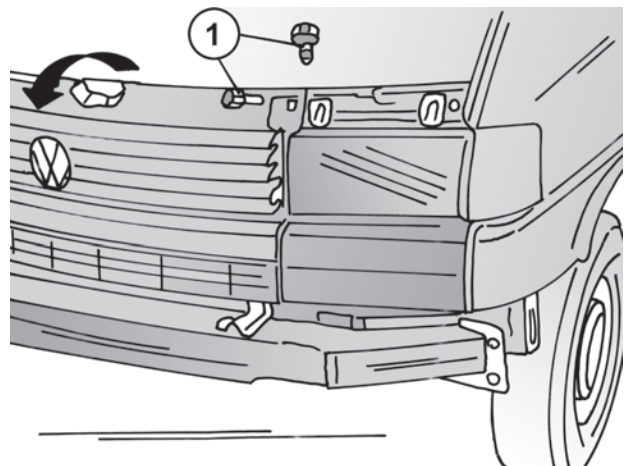
### 1.1.1 1.9 Litre Engine

The engine is removed without with the transmission from below the vehicle. A strong mobile jack must be available. VW workshops use a special device to guide the engine. As this will obviously not be available to the average D.I.Y. man, we recommend that a helper holds the engine on the jack whilst it is lowered. Before the engine is removed, it is necessary to tilt the radiator and the bonnet lock carrier towards the front. This operation will also be necessary for various maintenance and service operations and the following description will be referred to at various stages when required.



**Fig. 1.1.** – The arrows show where the noise dampening panel is secured underneath the vehicle.

- From underneath the vehicle unscrew the noise dampening panels. To do this, unscrew the screws and nuts shown in Fig. 1.1, unlock the lower panel assembly and take out of its mountings. Tighten the screws and nuts to 0.9 kgm (7ft.lb.) during installation.
- To tilt the radiator towards the front, in the direction shown by the arrow in Fig. 1.2, remove the two screws (1) on the L.H. and R.H. side and then pivot the radiator and the lock plate towards the front. Lock the lock carrier plate in position. Note that the radiator grille must be removed in the case of certain models.



**Fig. 1.2.** - After removal of the screws (1) one each side of the vehicle, tilt the complete front end of the vehicle in the direction of the arrow. Note that on models with extended front end you will have to remove the radiator grille.

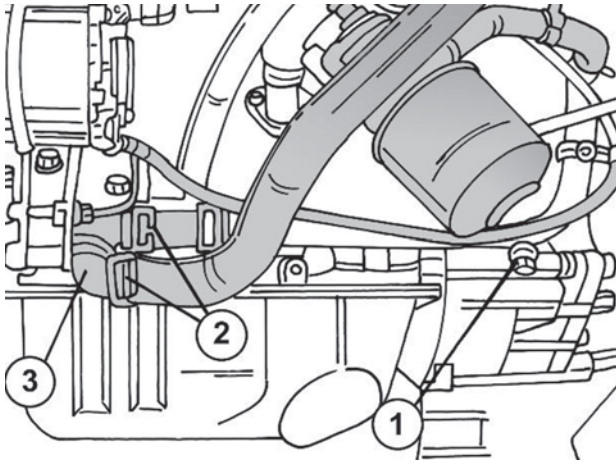
The removal of the engine can now proceed as follows:

- Disconnect the battery negative terminal. The battery can be removed from the vehicle since this will avoid



any possibility of damage or inadvertent short-circuiting.

- Place the heater operating lever into the “Warm” position and remove the cap from the expansion tank. The engine must be cold. Observe the necessary precautions if the engine is hot.

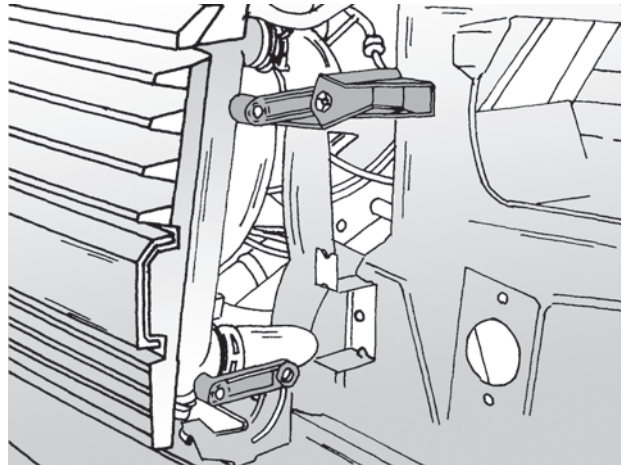


**Fig. 1.3.** - Draining the cooling system. The numbers are referred to in the text.

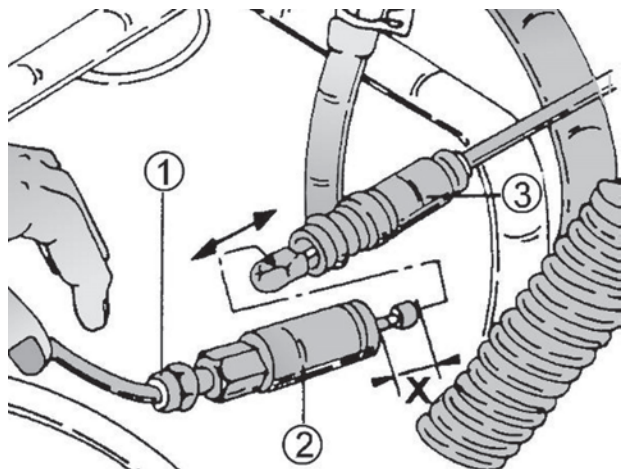
- Drain the cooling system. To do this, refer to Fig. 1.3 and slacken the hose clips securing the two hoses (2) or unscrew the water pump flange (3). It is also possible to remove the drain plug (1) to drain the cooling system, depending where the work is carried out. As anti-freeze is contained in the cooling system, check the condition of the solution before deciding whether to drain it or to collect it in a suitable container. A pair of pliers for spring-type clamps may be required to open the hose clamps. If not available, cut through the old clamps and use screw-type clamps during installation.
- Slacken the hose clamps on the upper radiator hose and withdraw the hose from the cylinder head. Also disconnect the hose between radiator and water pump and radiator and expansion tank on the engine or the expansion tank. Hoses are either secured by means of spring clamps or screw-type clamps. Spring clamps can be replaced with screw-type clamps during installation.
- Knock the pins out of the spreader clips on the L.H. and R.H. sides of the radiator and remove the spreader clips from the radiator mounting. Fig. 1.4 shows where the pins are located. Disconnect the electrical lead from the temperature switch on the radiator and the connector for the radiator cooling fan motor. Completely remove the radiator. Remove the hoses from their connections to create enough room for the removal of the radiator assembly.
- Disconnect the throttle control cable from the lever on

the injection pump, remove the clip from the cable bracket and free the cable from its attachment.

- Disconnect the two fuel lines from the injection pump. Beware of a siphon flow.



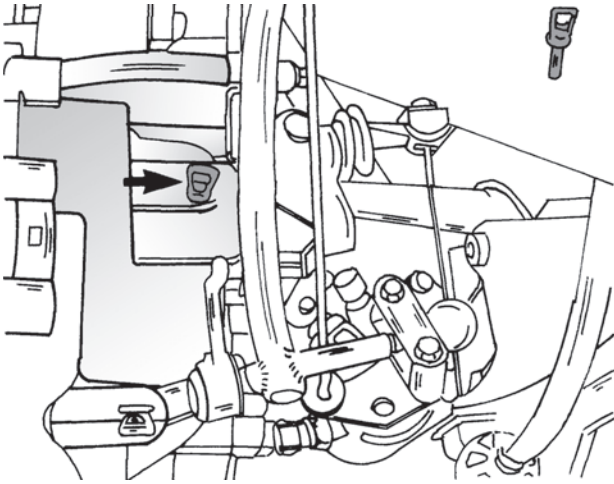
**Fig. 1.4.** - The radiator is secured on the left-hand and right-hand sides at the positions shown by the arrows.



**Fig. 1.5.** - Details for the removal of the cold start operating cable. The numbers are referred to in the text.

- Disconnect the operating cable from the cold start device. To do this, pull the cable in Fig. 1.5 tight, screw in the adjusting screw (1), separate the plugs (2) and (3) and unclip the cable.
- Disconnect the cable connector plug from the rear of the alternator.
- Disconnect all electrical leads from all remaining switches, connections, etc. and all hoses after marking their terminals and/or connections.
- Disconnect the cable connector plug from the rear of the alternator.
- Disconnect all electrical leads from all remaining switches, connections, etc. and all hoses after marking

their terminals and/or connections. These include the temperature sender unit for the water temperature. If any of the radiator hoses have been left on the engine connections, remove them now.



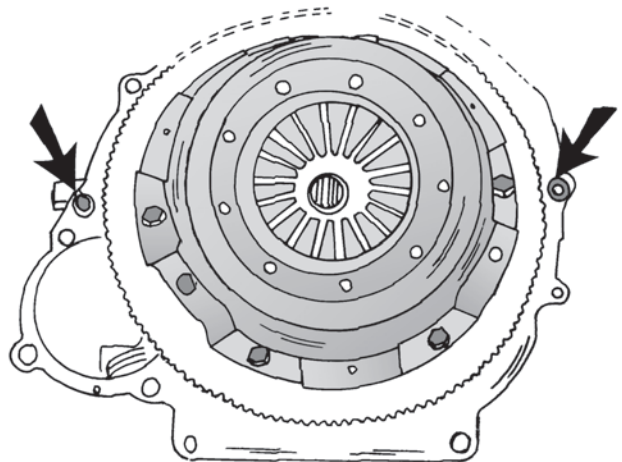
**Fig. 1.6.** - Unscrew the plug at the position shown from the transmission and secure the clutch release lever by inserting an M8 x 22 mm bolt.

- Remove the rubber plug from the hole in the transmission, shown by the arrow in Fig. 1.6, and secure the clutch release lever with a pin. The illustration shows the special pin used by VW workshops (top right), but an M8 x 22 mm bolt will do.
- Remove the coolant pipe between the thermostat housing and the heat exchanger for the heater.
- Place a mobile jack underneath the centre of the engine. A block of wood must be placed between oil sump and jack head. Operate the jack until the engine is slightly under tension.
- Remove all bolts between engine and transmission from below the vehicle and remove the rear engine mounting.
- Release the steering pump belt tension and unscrew the pump from the engine. Place the pump to one side where it is out of the way.
- Remove the drive shafts (Section 4) and front exhaust pipe.
- Check that engine and transmission are securely supported on the jack and remove the centre bolt securing the engine mounting on the R.H. side. Completely unscrew the engine mounting bracket.
- Remove all bolts connecting the engine to the transmission at the top.

- Withdraw the engine from the transmission, taking care all the time that the engine cannot drop off the jack. A second person must operate the jack slowly. Make sure that none of the connections have been left in position and take care that no damage is done when the engine is lowered from the engine compartment. Also make sure that the engine cannot rest on the clutch shaft.

Install the engine and transmission in the reverse sequence to removal, noting the following points below:

- Check the clutch release bearing before installation of the engine. Slightly coat the contact face of the release bearing and the clutch shaft with grease. The guide sleeve for the release bearing must not be lubricated.
- Check that the two dowel pins, shown in Fig. 1.7, are located in the cylinder block. Sometimes they will remain in the transmission, but must be transferred before the engine is fitted. In this case, fit new dowel pins, as the original ones may be damaged when removed from the transmission.



**Fig. 1.7.** - The arrows show where the dowel pins must be fitted to the cylinder block.

- Coat the intermediate plate on the engine side with grease and place it over the two dowel pins and against the engine.
- Lift the engine into position in the engine compartment. Again a helper must operate the jack as the engine is guided in. When level with the clutch shaft, push the engine against the transmission and engage the clutch shaft with the clutch driven plate. If engagement does not take place immediately, move the crankshaft to and fro by pulling on the alternator drive belt. Push the engine fully against the transmission before fitting the upper bolts. The gap must be nearly closed before the bolts are inserted and tightened.



- Refit all engine mountings and tighten the bolts to the following torques:

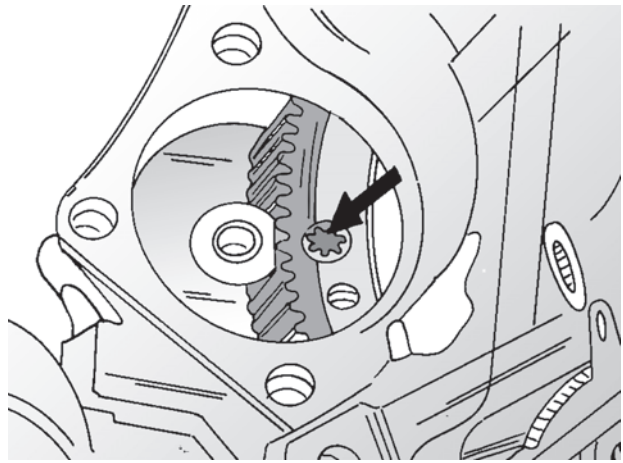
Engine mounting bracket to engine mounting:	6.5 kgm (47 ft.1b.)
Engine support, right, on cylinder block:	5.0 kgm (36 ft.1b.) + 90° angle-tightening
Engine to Transmission:	
M8 threads:	2.0 kgm (15 ft.1b.)
M10 threads:	6.0 kgm (43 ft.1b.)
M12 threads:	8.0 kgm (58 ft.1b.)
Engine support, rear, on cylinder block:	4.5 kgm (32.5 ft.1b.)
Engine support, rear, on transmission:	2.0 kgm (15 ft.1b.)
Steering pump/cylinder block:	2.5 kgm (18 ft.1b.)

- Re-connect the exhaust pipe to the manifold as described in the relevant section.
- Fill the cooling system as described in Section 1.8. "Cooling".
- Fill the engine with engine oil. Also check the transmission oil level and correct if necessary.
- Adjust the throttle cable as described in the fuel section.
- Check the headlamp adjustment or have it professionally checked.

### 1.1.1. WITH AUTOMATIC TRANSMISSION

The removal and installation of the engine is carried out in a similar manner as described in Section 1.1.0, but the following differences should be noted:

- Unscrew the complete bracket for the throttle cable from the cylinder head. Do not disconnect the throttle cable from the bracket.
- Place the transmission selector lever into position "P" and slacken the clamp nut in order to release the gearchange cable. Release the throttle cable by pressing the ball joint connection off the pin, carefully using a screwdriver.
- Release the throttle pedal cable from the lever connection and unscrew the bracket.
- Unbolt the torque converter from the drive plate. The converter is secured by three bolts, which will be visible through the opening for the starter motor. Rotate the engine until the bolts appear one after the other, as shown in Fig. 1.8 and unscrew them.



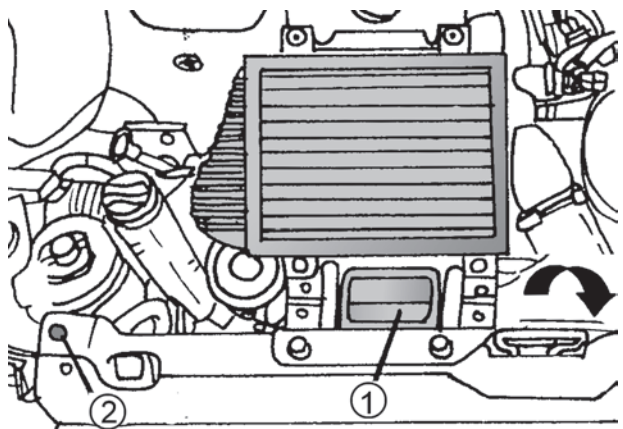
*Fig. 1.8. – The drive plate to torque converter bolts will appear in the starter motor opening when the engine is rotated.*

- Refer to Section 1.1.0 when installing the engine. The installation is a reversal of the removal procedure, including the connection of the torque converter to the drive plate.

### 1.1.2. FIVE-CYLINDER ENGINES

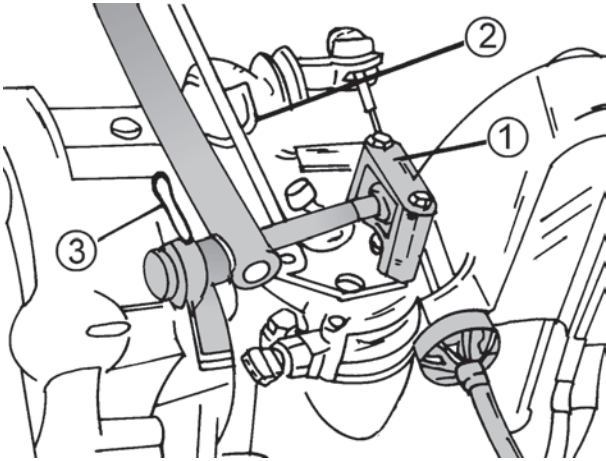
The engine is removed towards the bottom together with the transmission.

- Disconnect the battery earth cable, remove the noise dampening panel underneath the vehicle and tilt the front end of the vehicle downwards in the familiar manner or remove the radiator grille, depending on the model. Each side of the lock carrier has two securing bolts. Remove the radiator (refer to Fig. 1.1.). In the case of a vehicle with short front end remove the radiator with fan, air guide and lock carrier as a unit.
- In the case of a 5-cyl. engine with code letters AUF, AYC and ACV refer to Fig. 1.9 and remove the bracket for the charge air cooler. The cooler is now removed together with the charge air hoses. Two securing bolts (2) secure the charge air cooler on each side to the lock carrier.



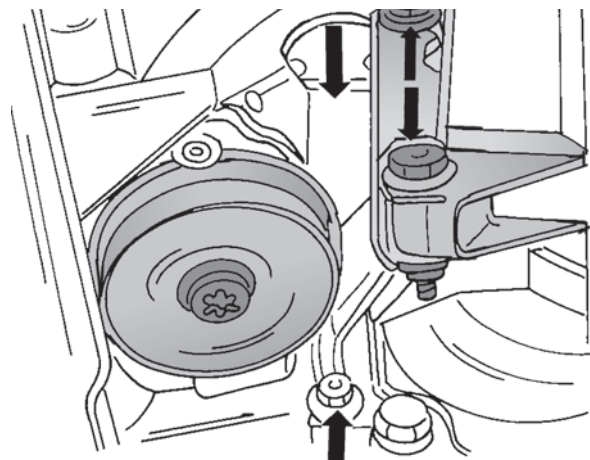
*Fig. 1.9. – Details for the removal and installation of the charge air cooler of a 2.5 litre engine with the engine codes given in the text.*

- Disconnect the throttle cable from the lever on the injection pump and the cold start operating cable as described for the four-cylinder engine (refer to Fig. 1.7).
- Unscrew the clutch release cylinder from the transmission without disconnecting the hydraulic fluid pipe. Some models may have a mechanically controlled clutch. In this case disconnect the clutch operating cable. In the case of the 2.5 litre engine remove the hose/metal pipe from the hydraulic clutch slave cylinder on the transmission.



**Fig. 1.10.** – Disconnecting the actuating unit from the transmission. The numbers are referred to in the text.

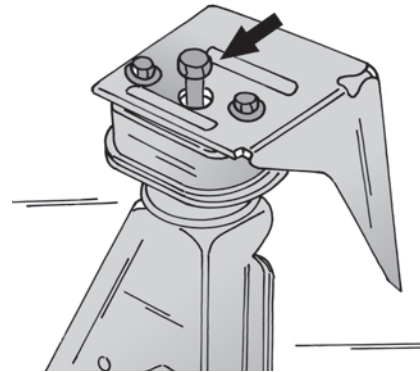
- Disconnect all electrical cables from engine, transmission, starter motor, etc.



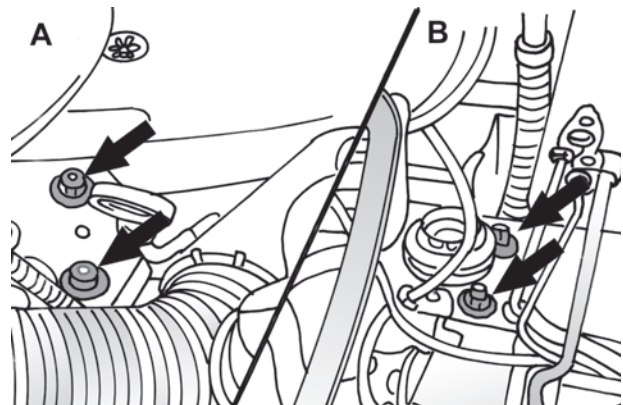
**Fig. 1.11.** – The arrows show where the transmission mountings are attached.

- Remove the gear actuating unit as follows, referring to Fig. 1.10. Unscrew the clevis (1) and lever up the gear stick at the front from the gear control lever (2). Unscrew the bearing block with the selector rod (3).
- Disconnect the oil pipes for the steering pump and the storage tank of the cooling system and let the hydraulic oil run out.

- Remove the L.H. and R.H. drive shaft as described in Section 4. In the case of a 4-wheel drive vehicle disconnect the propeller shaft.
- Disconnect the exhaust pipe from the exhaust manifold as described in the relevant section. Clamps are used to connect the two parts.
- Unscrew the pressure and return pipe for the hydraulic fluid from the steering box and carefully bend the pipes to one side, out of the way.
- Refer to Fig. 1.11 and remove the four bolts shown by the arrows. This will free the transmission from the transmission mounting. Note that some vehicles are fitted with a pendulum mounting bracket which must be removed. If this is the case refer to Section “Manual Transmission”.
- Place a mobile jack underneath the transmission (wooden block between jack head and transmission), until the assembly is under slight tension and remove the central bolts for engine and transmission mountings on the L.H. and R.H. side. This is the bolt shown in Fig. 1.12. If no central bolt is fitted as shown, refer to Fig. 1.13 and remove the bolts shown by the arrows. It will be difficult to gain access to the bolts. The engine side is shown with “A”, the transmission side with “B”.



**Fig. 1.12.** – Power unit mounting with central bolt. Only remove the bolt shown by the arrow.



**Fig. 1.13.** – Power unit mounting without central bolt. In this case remove the nuts shown by the arrows.