
Workshop Manual

911

Carrera 4

Structure of the Workshop Manual

This Workshop Manual describes all of the important operations for which special instructions are required to ensure proper completion. This manual is essential for shop foremen and mechanics who need this information to keep the vehicles in safe operating condition. The basic safety rules, of course, also apply to all repairs on vehicles, without exception.

Breakdown of the Workshop Manual

1. Overview of repair groups
2. Record sheet for supplements
3. List of contents
4. Technical data
5. Repair groups

Breakdown of the repair groups

1. Table of tightening torques
2. Special tools required
3. Exploded diagrams
4. Legends for the exploded diagrams
5. Notes on assembly/application of special tools
6. Diagnosis for the repair groups

The Workshop Manual will be updated regularly by means of supplements which must be filed immediately to maintain the usefulness of the manual. Appropriate entries must be made in the record sheet to prove that the manual is complete.

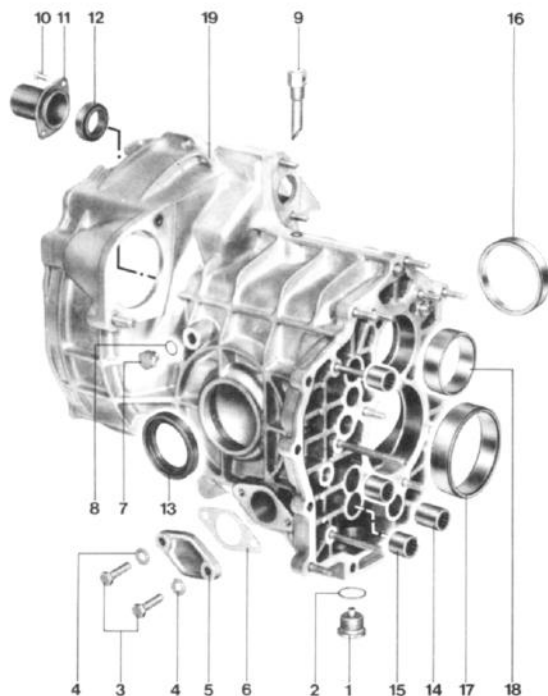
The content of this Workshop Manual will be supplemented with Technical Information Bulletins, which will be integrated into the manual from time to time.

Descriptions of design and function can be found in the service training course reference material.

Layout of the exploded diagram

A 34 B Manual Transmission, Controls, Case C 911 Carrera 4

Disassembling and assembling transmission



C 911 Carrera 4 B Manual Transmission, Controls, Case A 34

G	No	Description	Qty.	H	
				Removing	Installing
	1	Screw plug	1		Clean, tighten with 30 Nm
	2	Sealing ring	1		Replace
	3	Hexagon head screw	2		Tighten with 23 Nm (17 ftlb)
	4	Washer	2		
	5	Flange	1		
	6	Seal	1		Replace
	7	Screw plug	1		Tighten with 23 Nm (17 ftlb)
	8	Sealing ring	1		Replace
	9	Breather	1		Tighten with 35 Nm (25 ftlb). Observe installation position
	10	Fillister head screw	2		Tighten with 10 Nm (7 ftlb)
	11	Guide tube	1		
	12	Rotary shaft seal	1		Only install after assembling the gear set (also refer to Page 34-113)
	13	Rotary shaft seal	1		Drive into position with Special Tool 9252. Pack space between sealing lips with Kübler Silubrin Grease S
	14	Spherical sleeve	1	Pull out with a suitable internal puller (e.g. Schrem 14-20)	Press in with Special Tool 9254

34 - 128 Disassembling and assembling transmission Printed in Germany - VII, 1988

D

E

F

Disassembling and assembling transmission Printed in Germany - VII, 1988

F

E

34 - 128

D

- A - Repair group, numbers
- B - Repair groups, text
- C - Type of vehicle to be repaired
- D - Page number
- E - Operation
- F - Impressum, supplement number, year of printing
- G - Diagram item number in the order of disassembling
- H - Special notes to be observed when installing or removing

The notes on assembly/application of special tools which are given after the exploded diagram are always arranged in the order of text → diagram.

List of Repair Groups **Carrera 4**

General	Technical Data	Page 0.1
Repair Groups		Group
Volume I	Maintenance, Self-diagnosis	03
	Engine, Crankcase, Suspension	10
Engine, Maintenance	Engine, Crankshaft, Pistons	13
	Engine, Cylinder Head and Valve Drive	15
	Engine, Lubrication	17
	Engine, Cooling	19
	Fuel Supply	20
	Fuel System, Electronic Injection	24
	Exhaust System/Emission Controls	26
	Starter, Power Supply, Cruise Control	27
	Ignition System	28
	Diagnosis	
Volume II	Clutch, Controls	30
	Clutch	32
Transmission (manual)	Manual Transmission, Controls, Case	34
	Manual Transmission, Gears, Shafts	35
	Differential, Transaxle System, All-Wheel Drive	39
	Diagnosis	
Volume III	Clutch, Controls	30
	Torque Converter	32
	Automatic Transmission, Controls, Case	37
Transmission (automatic)	Automatic Transmission, Gears, Shafts	38
	Differential, Transaxle System	39
	Diagnosis	
Volume IV	Front Wheel Suspension	40
	Rear Wheel Suspension, Axle Shaft	42
Chassis	Wheels, Tires, Alignment	44
	Antiblock System	45
	Brakes, Mechanical	46
	Brakes, Hydraulics, Regulator, Booster	47
	Steering	48
	Diagnosis	
Volume VI	Body-Front Section	50
	Body-Center Section	51
Body	Body-Rear Section	53
	Lids	55
	Doors	57
	Electric Sunroof	60
	Hardtop	61
	Bumpers	63
	Glasses, Window Control	64
	Exterior Equipment	66
	Interior Equipment	68
	Seats	72
	Seat Covers	74
Volume VI	Heater	80
	Ventilation	85
Heating, Ventilation, Air Condition	Air Conditioner	87
Electrics	Diagnosis	
	Instruments, Fuel Gauge, Alarm System	90
	Radio, Telephone, On-board-computer	91
	Windshield Wipers and Washer	92
	Exterior Lights, Lamps, Switches	94
	Interior Lights	96
	Diagnosis	
Volume VII	Wiring	97
Electrics		
Wiring Diagrams		

Survey of Information Published in Technical Manual beginning in 1985

**6
Cyl.**

1

	TI/ QI	No.	911 C2/C4	911	911 Turbo	Remarks, Model, Also refer to...	Date
1985							
- Oil Pump with Intake Plate and Filter Screen	T	1/85	●	●	●	New version	29.04.85
- Camshaft Sprocket Installation	Q	1/85	●	●	●	Threads not lubricated with oil	10.04.85
- Engine Carrier/Engine Mounts	Q	2/85	●	●	●	Optimoly HT	07.06.85
- Scrapping Exhaust Valves	Q	3/85			●	Sodium filled valves	13.08.85
1986							
- Thermo Valve Temperature Switch	Q	1/86	●	●	●	Hose routing	18.04.86
- Leakage Lower Valve Cover Gasket	Q	2/86	●	●	●	1987 Models on	20.06.86
- Oil Pressure Switch Oil Pressure Warning Lamp Flickers	Q	3/86	●	●	●	1984 Models on	07.07.86
- New Nuts and New Cylinder Head Tightening Specifications	T	1/86	●	●	●	Torque angle	30.12.86
- Modification on Bypass Valve	T	2/86	●	●	●	Noise	30.12.86
1987							
- Oil Pipes Chain Tensioner	Q	1/87	●	●	●	1987 Model/leakage	18.06.87
1988							
1989							
- Additional Sealing on Crankcase	T	1/89	●	●	●	Silastic 732 RTV	22.05.89
- Protection and Conservation Agent for Engines / Type 959	T	2/89			●	Type 959: VW-Part No.: AKR 320 KD 604	31.05.89
- Tightening Torque of Conrod Nuts	T	3/89	●	●	●	New grade 12.9: 15 Nm and 2 x 90°	20.12.89
1990							
- Camshaft housing cover	T	1/90	●	●	●	Additional washers: 6,2x20x4 (aluminium)	28.02.90
◆ = Conversion instructions or workshop campaign ∇ = Brochure ⊕ = Supplement or change for TI/QI							



SERVICE

Date

30.04.90

VKQPI

Survey of Information Published in Technical Manual beginning in 1985

**6
Cyl.**

2

	TI/ QI	No.	911 C2/C4	911	911 Turbo	Remarks, Model, Also refer to...	Date
1985							
- Misfiring Because of Ground Strap Corrosion	Q	1/85	●				15.02.85
- Fuel Injector Survey L-Jetronic	Q	2/85	●				15.02.85
- Throttle Housing	Q	3/85	●			Bypass air screw	10.04.85
- Corroded Spark Plug Connectors	Q	4/85	●		●		10.04.85
- Settings of DME Control Units	T	1/85	●				18.07.85
- List of Factory Tested an Approved Spark Plugs	T	2/85	●		●	Invalid/...TI-1/86	08.07.85
- Retrofitting - Catalysor	T ♦	3/85	●				20.12.85
- Retrofitting - Catalysor	T ♦	4/85	●				20.12.85
- Retrofitting - Catalysor	T ♦	5/85	●			Invalid/...TI-1/87	20.12.85
1986							
- Ignition Delay Relay	Q	1/86			●	1985-1986 Models/ Relay voltage 9 volts	16.01.86
- List of Factory Tested an Approved Spark Plugs	T	1/86	●		●	Invalid/...TI-1/88	30.04.86
- BatterieDischarging	Q	2/86	●		●	Removing battery	18.04.86
- Mixture Preparation Engine Stalls While Declutching	Q	3/86	●			1986 Model/"mixture too rich"	20.06.86
- Catalytic Converter Cars Poor Pickup	Q	4/86	●				20.06.86
- Engine Damage Engine Repairs	Q	5/86	●		●	Foreign particles in in- take system	20.06.86
- Information for Cars with Catalytic Converter	T	2/86	●				26.06.86
- Turbocharger Compressor Wheel Damage	Q	6/86			●	foreign particles	10.10.86
- Faulty Wire Bridge - Terminal 28 Lean Hesitation, CO Adjustment	Q	7/86	●			Terminal 28/resistance	25.11.86
1987							
- Additional Air Pump Maintenance	Q	1/87			●	Fuel return line	20.02.87
- Troubleshooting Fuel System/Engine Electrical System	Q	2/87	●			Plug connections (cleanliness)	20.02.87
♦ = Conversion instructions or workshop campaign ▽ = Brochure ⊕ = Supplement or change for TI/QI							



SERVICE

Date

30.04.90

VKQPI

Survey of Information Published in Technical Manual beginning in 1985

6
Cyl.

2

	TI/ QI	No.	911 C2/C4	911	911 Turbo	Remarks, Model, Also refer to...	Date
- Engine Power Fuel/Air Mixture	Q	3/87		●		1986-1987 Models/ term. 28/oxygen sensor	31.03.87
- Troubleshooting Temperatur Sensor	Q ♦	4/87		●		NTC II	22.05.87
- Service Installation - Catalytic Converter	T ♦	1/87		●			25.10.87
- Starting Motor Transmission Cars	Q	5/87		●		1987 Model/115 mm	31.08.87
- Battery Discharging	Q	6/87		●	●	Only coupe/inside lights	16.10.87
- Battery Discharging New Cars	Q	7/87		●	●	Checking battery con- dition	24.11.87
1988							
- Fuel Grade Exhaust System	Q	1/88		●	●	Exhaust tailpipe dis- coloration/unleaded	19.02.88
- Survey of Factory Tested and Approved Spark Plugs	T	1/88		●	●		06.07.88
- Survey of Control Units	T	2/88		●	●		06.07.88
- Fuel/Air Mixture Throttle Valve Housing	Q	2/88		●		Hose to thermo valve disconnected	19.09.88
- Starter Starter Gear Ring	Q	3/88		●		911 Turbo starter gear- ring/...QI-5/87	30.12.88
1989							
- Unleaded Gasoling Regular RON 91 / Euro Premium RON 95 / Premium RON 98	T	1/89	●	●	●	Fuel grade table.	31.01.89
- New Catalytic Converter Conversion Kit 930.113.911.03	T	2/89		●		...with plastic filling tube.	12.06.89
- Spark Plug connectors which are hard to remove	T	3/89	●			Engine Nos.: 62 K 00607 to 62 K 00788	02.05.89
- DME Control Unit	T ♦	4/89	●			...with green dot.	08.06.89
- Lighting up of Warning Signs and Faults in DME Fault Memory	T	5/89	●			Carrera 4	12.06.89
- Service Installation of Catalytic Converter	T ♦	6/89	●			Carrera 4 M'89 (K) 964.113.911.00	05.10.89
- Fuel Hose to Rear Fuel Pump	T ♦	7/89			●	Hose laid differently.	13.11.89

♦ = Conversion instructions or workshop campaign
▽ = Brochure
⊕ = Supplement or change for TI/QI



SERVICE

Date

30.04.90

VKQPI

Survey of Information Published in Technical Manual beginning in 1985

**6
Cyl.**

2

	Ti/ QI	No.	911 C2-C4	911	911 turbo	Remarks, Model, Also refer to...	Date
1990							
- Cable harness connector at the air-flow sensor	T ♦	1/90	●			Cable cluster mounted in tight loop.	21.02.90
- Securing heat shield to exhaust system	T	2/90	●			...coat with Optimoly HT	31.08.90
- Engine Temperature Sensor (NTC) II	T	3/90		●		M'84 (E)-'89 (K) spare part: 930.606.915.00	16.11.90

♦ = Conversion instructions or workshop campaign
 ▽ = Brochure
 ⊕ = Supplement or change for Ti/QI



SERVICE

Date	
30.04.90	31.12.90
	VKQPI

The workshop manual of the Carrera 4 also includes that for the Carrera 2.
The Carrera 4 acts as the basis for description of the repairs in the manual.
"Carrera 4" also appears on every page in the header line.

Deviating descriptions for repairs on the Carrera 2 follow those of the Carrera 4. These repair descriptions for both models are separated by a yellow sheet.

"Carrera 2" appears on all pages in the header line after the separating sheet. The page number starts with 100 as an additional distinction.

Page

General

Technical data	0 - 2
Jacking up the vehicle	0 - 8

Maintenance and self-diagnosis

Vehicle maintenance up to Model Year 91	03 - 1
Operating instructions for system tester 9288	03 - 35
No diagnosis possible	03 - 43

Engine, crankcase, suspension

Tightening torques for engine	10 - 1
Removing and installing the engine	10 - 5
Flanging on and off the engine/transmission assembly	10 - 12

Engine, crankshaft, pistons

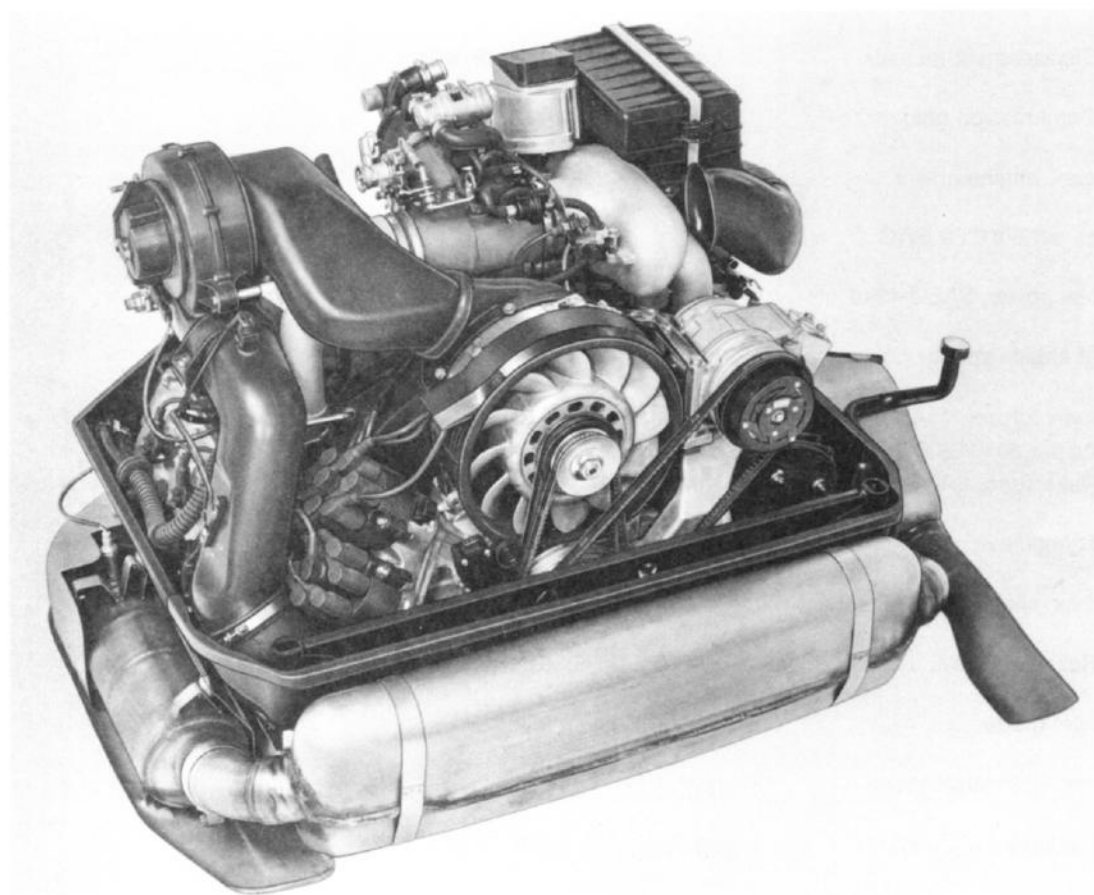
Dismantling and assembling the crankcase	13 - 1
Dismantling and assembling the crankshaft	13 - 4
Normal and rework dimensions of crankshaft	13 - 6
Crankshaft - standard and machined sizes	13 - 8
Weight groups of con rods	13 - 9
Disassembling and assembling the oil pump	13 - 11
Measuring and repairing the crankcase	13 - 19
Dismantling and assembling crankcase sections	13 - 23
Sealing the crankcase mating sections	13 - 31
Crankcase screw connection	13 - 33
Removing and installing the belt pulley with vibration absorber	13 - 37
Dismantling and assembling double-mass flywheel	13 - 38a
Dismantling and assembling pistons, cylinders	13 - 39
Pistons and cylinders - Dimensions and identification	13 - 42a
Assembly of piston pin retainer with special tool 9500 and 9500/1	13 - 43
Assembling the cooling air duct for cylinders	13 - 45
Removing and installing two-piece oil return pipes	13 - 46
Checking and adjusting drive belts	13 - 47

	Page
Engine, cylinder head, valve drive	
Engine control	15 - 1
Determining parallelity of chain sprockets	15 - 2e
Dismantling and assembling the cylinder head	15 - 9
Camshafts, timing	15 - 8
Dismantling and assembling camshaft housing	15 - 10a
Refacing the cylinder head	15 - 10e
Replacing valve guides	15 - 10f
Disassembling and assembling cylinder head	15 - 11
Removing and installing valve springs	15 - 14
Removing and installing valve stem seal	15 - 15
Assembling cylinder head, angle-controlled tightening method	15 - 16
Removing and installing the knock sensor	15 - 19
Dismantling and assembling hydraulic pump drive (power steering)	15 - 21
Engine Lubrication	
Assignment - relief valve - safety valve	17 - 1
Dismantling and assembling the oil pump	17 - 3
Replacing oil tank	17 - 5
Fuel supply	
Checking the delivery quantity of the fuel pump	20 - 1
Checking the fuel pressure	20 - 3
Removing, dismantling and assembling fuel tank	20 - 5
Fuel system, electronic injection	
Inspection and adjustment values	24 - 1
Injection system components - Removing and installing DME center section	24 - 3
Injection system components - Removing and installing lower DME section	24 - 7
Exhaust system	
Exhaust system	26 - 1
Starter, Power Supply, Cruise Control	
Removing and installing the starter	27 - 1
Removing and installing generator	27 - 3

	Page
Ignition system	
Accident risks related to electronic ignition systems	28 - 1
DME control unit coding	28 - 2
DME control units	28 - 3
Replacing plug connectors, plug leads and threaded sleeve	28 - 5
Determining engine speed sender clearance (Tiptronic vehicles)	28 - 9
DME diagnosis/Troubleshooting	D24/28-1

911

Carrera 4



88/100

Technical Data - 911 Carrera 4

(Adjusting values and wear limits are included in the respective repair groups)

Note: USA values in brackets (engine type M 64/01)

Drive unit

Internal engine designation		M 64/01
Number of cylinders		6
Bore	mm (in.)	100 (3.94)
Hub	mm (in.)	76.4 (3.01)
Displacement (actual)	cm ³ (in. ³)	3600 (219.7)
Compression ratio		11.0 : 1
max. engine power	kW (HP)	184 (250)
as per 80/1269 EWG		
Net power, SAE J 1349	kW (HP)	184 (247)
at engine speed	rpm	6100
max. torque	Nm (kpm)	310 (31.6)
As per 80/1269 EWG		
Net torque, SAE J 1349	Nm (ftlb)	310 (228)
at engine speed	rpm	4800
max. specific power output	kW/l (PS/l)	51.1 (69.4)
Net power, SAE J 1349	kW/l (PS/l)	51.1 (68.6)
Fuel grade	RON (MON)	95/85
max. permitted speed	rpm	6700
Engine weight (dry)	kg (lbs)	240 (529)

Engine design

Type	6-cylinder, four-stroke internal combustion engine with 2 horizontally opposed cylinder banks (flat engine)
Crankcase	Light alloy, two-piece
Crankshaft	Forged, supported by 8 bearings
Crankshaft bearings	Friction bearings
Connecting rods	Forged
Conrod bearings	Friction bearings
Pistons	Light alloy, pressed
Cylinders	Light alloy, individual cylinders
Cylinder head	Light alloy, individual cylinder heads with ceramic exhaust port liners
Valve guides	Press-fitted
Valve arrangement	1 inlet, 1 exhaust, suspended V formation
Valve timing	One overhead camshaft each on right and left
Camshaft	Cast
Camshaft drive	Double chain
Valve clearance	0.10 mm (inlet, exhaust cold)
Timing	Inlet opens 4 degrees before TDC Inlet closes 56 degrees after BDC Exhaust opens 44 degrees before BDC Exhaust closes 4 degrees after TDC
Intake system	With controlled tuning flap

Engine cooling

Type	Air-cooled system
Blower drive	Via V-belts from the crankshaft
Transmission ratio: crankshaft/blower	approx. 1:1.60
Air delivery rate	1010 l/sec at 6100 rpm of the crankshaft

Engine lubrication

Type	Dry sump lubrication with isolated oil reservoir
Oil cooling	Thermostatically controlled, front oil cooler in the front right-hand fender, 2-stage electric blower
Oil filter	In the return line
Oil pressure at $n = 5000$ rpm	approx. 5.0 bar at 90 degrees oil temperature
Oil pressure indicator	0-5 bar electric and oil pressure warning lamp
Oil consumption	Up to 1.5 l / 1000 km

Exhaust system

Single-branch system joined together outside the heat exchanger, 3-way catalytic converter with closed-loop Lambda control, intermediate and final mufflers, partial encapsulation of the engine

Emission control

Closed-loop Lambda control with 3-way catalytic converter (metal carrier).

Heating

Engine-dependent hot air heating with additional electric blowers and automatic temperature control

Fuel system

Type	DEE (Digital Engine Electronics)
Fuel supply	1 electric roller cell pump

Electrical system

Interference suppression		ECE-R 10 and 72/245/EEC
Battery voltage	V	12
Battery capacity	Ah	72
Alternator output	A/W	115/1610 3-phase current
Ignition		DEE, dual ignition, knock sensor controller
Firing order		1 - 6 - 2 - 4 - 3 - 5
Ignition timing control		via DME
Spark plugs		Bosch FR 5 DTC
Spark gap	mm (in.)	0.8 ± 0.1 (0.032 ± 0.004)

Body construction	Integral steel body, rear spoiler, coupé
--------------------------	--

Dimensions (at DIN curb weight)

Length	mm	4250	
Width	mm	1652	
Height	mm	1320	
Wheel base (design)	mm	2272	
Front track			with rim
	mm (in.)	1380 (54.1)	6J x 16
Rear track			
	mm (in.)	1374 (54.1)	8J x 16
	mm (in.)	1369 (53.9)	7J x 16

Dimensions

Ground clearance (at max. permitted weight)	mm	120
Ramp angle (at max. permitted weight)	12.0	degrees
Front overhang angle (at max. permitted weight)	12.5	degrees
Rear overhang angle (at max. permitted weight)	12.0	degrees

Weights (as per DIN 70020)

Front curb weight	kg (lbs)	600 (1322)
Rear curb weight	kg (lbs)	850 (1872)
Total curb weight	kg (lbs)	1450 (3194)
max. total weight	kg (lbs)	1790 (3943)
max. front axle load	kg (lbs)	760 (1674)
max. rear axle load	kg (lbs)	1050 (2313)
max. roof load including roof rack	kg (lbs)	75 (165) with original Porsche roof transport system
max. trailer load, without brakes*	kg (lbs)	500 (1101)
max. trailer load, with brakes*	kg (lbs)	1200 (2643)
max. car/trailer weight	kg (lbs)	2990 (6586)
max. drawbar load	kg (lbs)	75 (165)

*Up to 16% gradient

Filling capacities

Engine	Only use approved engine oils. Refer to Technical Information Handbook
Engine oil capacity	approx. 11.5 l (approx. 9 l for oil change) determined by measurements with the oil dipstick as per Owner's Manual
Transmission with differential	Front axle 1.2 l Rear axle 3.8 l
Fuel tank	approx. 77 l (approx. 10 l reserve)
Brake-fluid reservoir	approx. 0.75 l
Washer fluid for windshield and headlights	approx. 7.4 l
Intensive washing	approx. 0.7 l
Power-assisted steering	approx. 1.0 l

Performance

Top speed	km/h (mph)	260 (162)
Acceleration from 0.100 km/h	s	5.9
Kilometer from standing start	s	25.5

Hill climbing

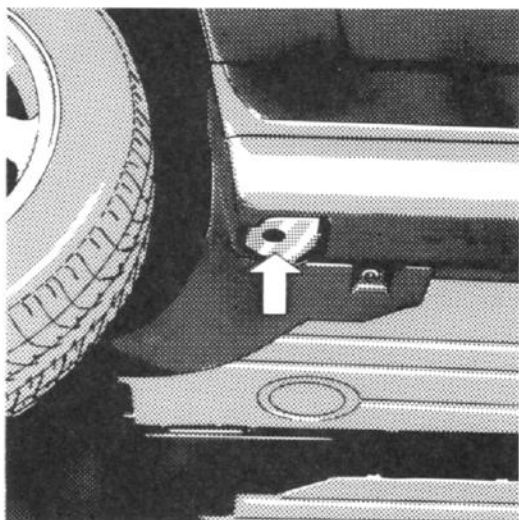
	Manual transmission	
In %	1. gear	86%
	2. gear	41%
	3. gear	24%
	4. gear	15%
	5. gear	11%

Raising the vehicle

The vehicle must only be lifted using the illustrated jacking points. When driving onto a lifting platform, make sure that there is enough clearance between the platform and the vehicle.

front

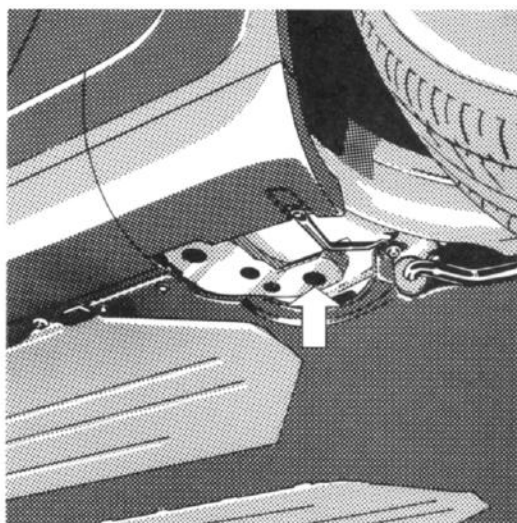
At the jacking point



132/03

Rear

At the jacking point



133/03

Maintenance Schedule

The recommended Service Intervals apply under normal driving conditions and do not take into account any Optional Equipment. Dusty areas require more frequent checking and possible replacement of the air filter element. Tyre, clutch and brake wear as well as the condition of the engine oil are all largely dependent on driving habits, and are also affected by arduous operating conditions; this could mean shorter intervals between services and replacement of parts. This applies, naturally, also to: "Battery: check fluid level and, if necessary, top up."

Vehicles with a low yearly mileage (kilometres) should be serviced at least once a year. The extent of maintenance can depend on the driving conditions. Your Official Porsche Centre will be pleased to inform you of the contents of the yearly service check. As part of this servicing, after the first 2 years the Porsche Dealer will make out a Status Report. This is intended to ensure that the conditions for the Long-life guarantee are not jeopardized. If required by the condition of the vehicle, a full upper- and lower-body cleaning may be necessary.

Exchange and new spare parts receive the same contents of service as components of new vehicles.

The terms "inspect" and "check" include all associated work such as adjustments, readjustments, corrections and replenishment. They do not include the repair, replacement or overhaul of components or assemblies.

3 000 to 4 000 km / 2 000 to 2 500 miles Servicing

Front axle: check toe adjustment incl. tyre condition, tyre pressure	3
Diagnosis System: read out system faults	5
Change engine oil and oil filter	6
Check valve clearance	7
V-belt: check tension	10
Visual inspection for leaks: oils and fluids	12
Windscreen washer, headlight washer: check function, fluid level and nozzle adjustment, regard antifreeze content for the winter season	23
Lighting system: check function	23
Brake hoses and lines: visual inspection for leaks, clearance; damage, check brake fluid level	14
Transmission / axle drives: Visual inspection for leaks, check oil levels	19
Exhaust system: visual inspection for leaks and damages	20
Check screw connections for tightness and attachment	20
Exhaust emissions test on vehicles without catalytic converter. Perform system adaptation	26

Test drive:

Brake pedal and hand brake, brake power assist unit, clutch, automatic speed control, steering, heating, air conditioner and instruments: check function	-
Drive train, longitudinal- and lateral limited slip differential: check for noises and operation	29
Visual inspection for leaks: oils and fluids	29

Service every 20 000 km / 12 000 miles

Diagnosis system: read out system faults	5
Change engine oil and oil filter	6
Check valve clearance	7
V-belt: check condition and tension	10
Toothed belt for power-steering pump: check condition	11
Change spark plugs	11
Visual inspection for leaks: oils and fluids	12
Air filter: replace filter element	12
Crankcase ventilation: check tightness of hose connections	12
Fuel system: visual inspection for leaks, damages, clearance and tightness of hose connections	12
Intake air: check hoses, lines and connections for tightness	12
Hand brake: check free travel of hand brake lever	13
Brake pedal: check play of brake pedal.	
Brake hoses and lines: visual inspection for leaks, clearance, damage, and corrosion.	14
Check brake fluid level.	
Brake system: visual inspection of brake pads and discs	15
Hydraulic clutch actuator: visual inspection for leaks, check final position of clutch pedal	17
Throttle actuator: check cables, linkages and joints for smooth running, full throttle opening and resonanz flap movement	16
Steering gear: check screw connections for tightness	
Visual inspection of the bellows for damage	18
Tie rod links: check play, tightness and dust caps	
Power-assisted steering: visual inspection for leaks and check fluid level	18
Ball joints: visual inspection of dust caps for damage	19
Wishbone: check screw connections for tightness	19
Transmission, axle drives: visual inspection for leaks, check oil levels	19
Drive shafts: visual inspection of sleeves for leaks and damage	19

Service every 20 000 km / 12 000 miles

Exhaust system: visual inspection for leaks and damages, check screw connections for tightness and attachment	20
Tyres: check condition, correct tyre pressure	20
Door arrester: check function and lubricate	20
Door hinges: lubricate	20
Check door-, front hood locks and safety hooks on front hood for tightness and function	20
Safety belt: check function and condition	21
Seals for doors, hood and roof: remove abraded rubber, apply suitable agent to lubricate seals	21
Check function of the vehicle lighting. All headlights: check setting	
Horn: check function	23
Windscreen washer, headlight washer: check function, fluid level and nozzle adjustment, regard antifreeze content for the winter season	23
Intensive cleaner: check function and fluid level	24
Battery: check fluid level	24
All other electrical equipment as well as control- and warninglights: check function	24
Heater, ventilation and air conditioner: check function and refrigerant level	24
Exhaust emission unit: check if catalytic converter, oxygen sensor and channeled filler inlet are positioned, visual inspection of all electrical connections, check function of oxygen sensor	25
Ignition circuit 1 and 2: check function	25
Exhaust emissions test: test CO content (measure before and behind the catalytic converter if equipped), Perform system adaptation	26

Test drive:

Brake pedal and hand brake, brake power assist unit, clutch, automatic speed control, steering, heating, air-conditioner and instruments: check function	29
Drive train, longitudinal- and lateral limited slip differential: check for noises and operation	29
Visual inspection for leaks: oils and fluids	29

Additional service every 40 000 km / 24 000 miles

Change fuel filter	29
--------------------	----

Additional service every 80 000 km / 48 000 miles

Manual transmission and axle drives: change oil	30
---	----

Yearly service after the first 2 years

File Status Report for Long -life guarantee	-
---	---

Service every 2 years

Change brake fluid	31
--------------------	----

Front axle:

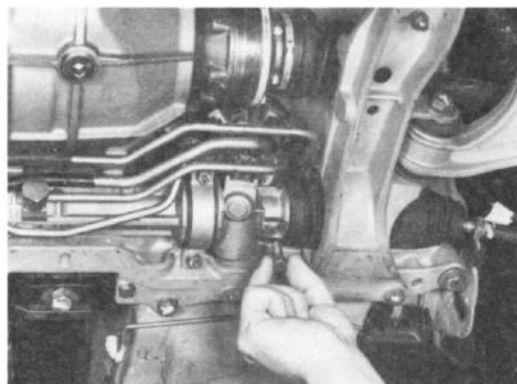
Checking the toe

Use a visual or electronic axle measuring unit to check and/or adjust the toe. Refer to the operating instructions for the respective axle measuring unit for the measuring procedure. The following preconditions must be fulfilled before checking the toe for the front axle:

- Curb weight of car according to DIN 70020 = ready-to-drive car with full fuel tank, spare wheel and tools.
 - Correct joint and wheel bearing play (wheel bearing play cannot be adjusted).
 - Correct tire pressure
1. Bounce the vehicle at rear and front axles 2-3 times and allow to return under its own power.
 2. Check the front toe with the steering wheel in the straight ahead position and adjust the tie rods if necessary. (Refer to the next page for wheel alignment values).

Necessary preparations

First check whether the steering wheel is offset in relation to the steering gear. This requires removing the underside trim panel and centering the steering gear in middle position with Special Tool 9116. If adjustment is necessary, try to get the optimum position for the steering wheel. Then remove ST 9116.



88/406

Clamp the steering wheel in middle position before adjusting toe.



88/553

Wheel alignment values

The following values apply at curb weight as per DIN 70020 (vehicle with full fuel tank, spare wheel and tools).

	Specification and tolerance	max. deviation between left and right
Front axle		
Toe (total) - unpressed	+ 25' ± 5'	only influenced by replacing the steering arms
Toe difference angle at 20° lock	- 40' ± 30'	
Camber	0° ± 10'	
Caster	4° 25' ± 15'	
Rear axle		
Toe per wheel	+ 15' ± 5'	10'
Camber	- 20' ± 10'	20'

Tire condition / inflation pressure

Tires constitute a safety element and they can only fulfill the demands made on them if the inflation pressure is correct and there is adequate tread depth.

The specified inflation pressures are minimum pressures; under no circumstances should the tire pressure be allowed to sink below these levels as this will not only detrimentally affect the driving behavior, but also increases the risk of serious tire damage.

Valve caps protect the valves from dust and dirt and therefore prevent leakage. Always screw caps on tightly and replace any that are missing.

For safety reasons, a tire-pressure check should always be accompanied by a visual inspection to ensure adequate tread depth and a check for objects piercing the tire, slits, cuts, cracks and bulges in the side wall (cord break).

Inflation pressure with the tires cold (summer and winter tires).

Front	2.5 bar
Rear	3.0 bar

Collapsible spare wheel	
front/rear	2.5 bar

Diagnosis system:

Read out the fault memory

The procedure for reading out the fault memory is described in the operating instructions for System Tester 9288. A copy of the operating instructions is supplied with each tester.

The System Tester 9288 is connected to the vehicle via a 19-pole socket outlet.



88/428

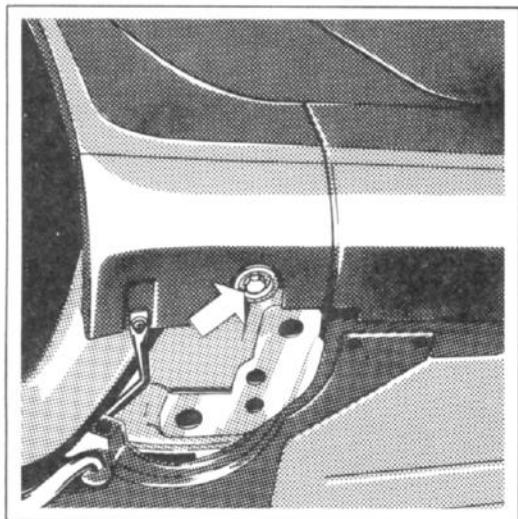
Also refer to repair group 03, self-diagnosis for operating instructions.

Replacing engine oil and filter

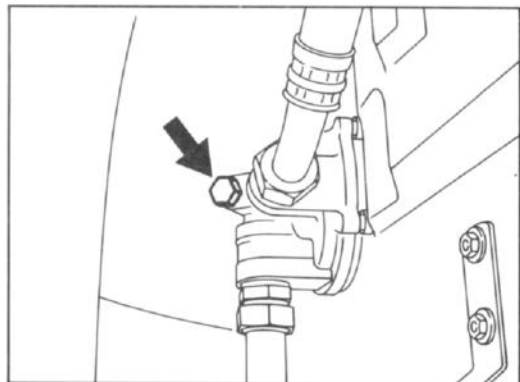
Precondition:
engine at operating temperature

1. Remove engine guard. Undo the drain plugs in the crankcase and thermostat housing and drain out the engine oil.

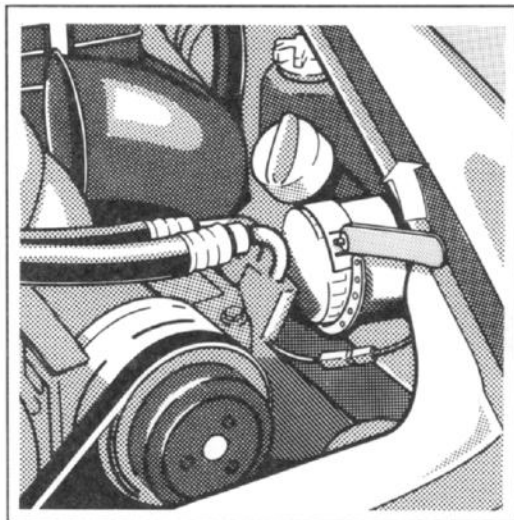
Drain plug - thermostat housing



2. Undo oil drain plug at oil filter console and drain remaining used oil into a suitable container.



3. Undo the oil filter with a standard clamping band, e.g. Hazet 2171 - 2. Catch any remaining oil.



123/03

4. Clean the drain plug. Always replace the sealing rings. Tightening torque for the drain plug on the crankcase 70 Nm (52 ftlb). Drain plug on the thermostat housing 65 Nm (48 ftlb) and oil filter console plug 31 Nm (23 ftlb).
5. Apply a light film of oil to the seal on the oil filter, install by hand, turning until the seal makes contact. Finally, tighten by a further approx. 1/2 turn.
6. Fill with approx. 6 liters of engine oil. Run the engine at idle and top up with approx. 3 liter. The oil-change volume amounts to approx. 9 liter. Only use approved engine oils. Refer to the Technical Information Handbook.

Check the oil level at operating temperature and at idle speed. Check the engine, oil reservoir, lines and front oil cooler for leaks (visual inspection)

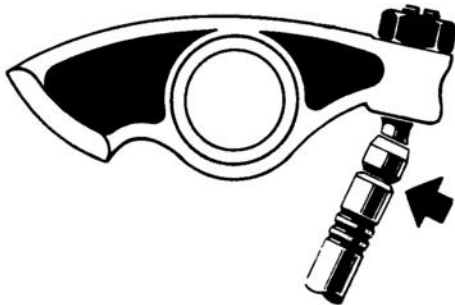
Checking and adjusting the valve clearance

Note

Always check or adjust the valve clearance with the engine cold (approx. 20 °C).
Check by inserting the feeler gauge between the end face of the stem and the cap of the valve adjusting screw.

If the spark plugs are not removed when the valves are adjusted, the engine must only be rotated at the bottom pulley or at the internal multi-tooth end of the generator shaft.

Check hex nut on alternator shaft for tight fit after the adjustment has been completed.



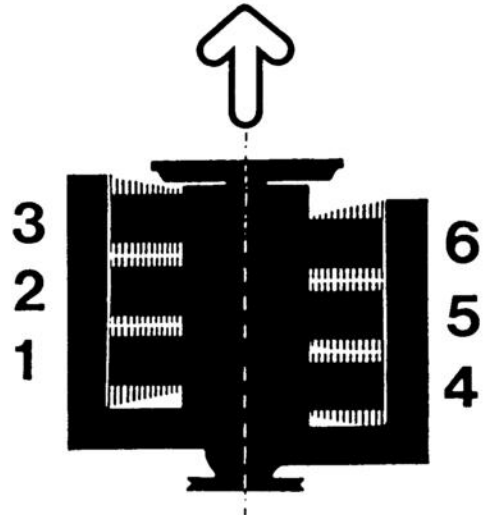
152-03

Valve clearance with the engine cold:

Intake	0.1 mm
Exhaust	0.1 mm

The clearance is adjusted according to the firing order 1 - 6 - 2 - 4 - 3 - 5. The piston for the respective cylinder must be in top dead center of the compression stroke as both valves are then closed. The TDC marking for each cylinder can be found on the pulley.

Cylinder designation

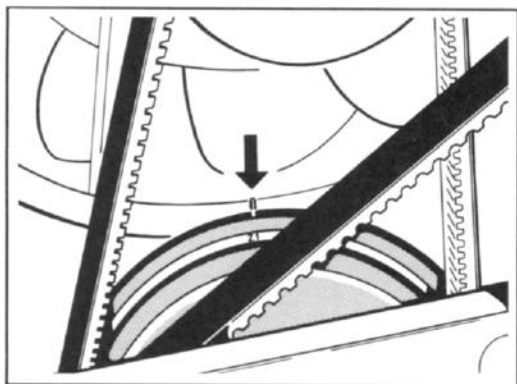


153-03

Firing order 1 - 6 - 2 - 4 - 3 - 5

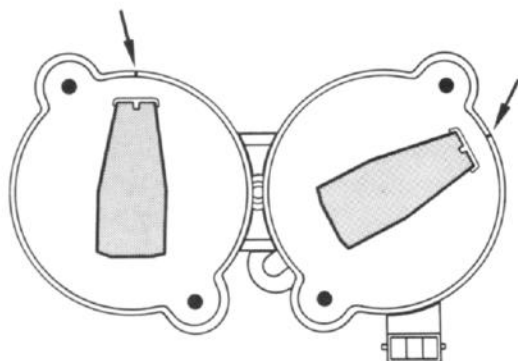
1. Cylinder 1 is the first to be adjusted. For this, turn the crankshaft to the right with the V-belt pulley until both valves of the cylinder are closed (overlapping cylinder 4) or until the distributor arm is aligned with the marking on the distributor housing. The TDC marking (Z1) on the pulley must be level with the crankcase seam or the locating mark on the blower housing.

TDC marking - pulley



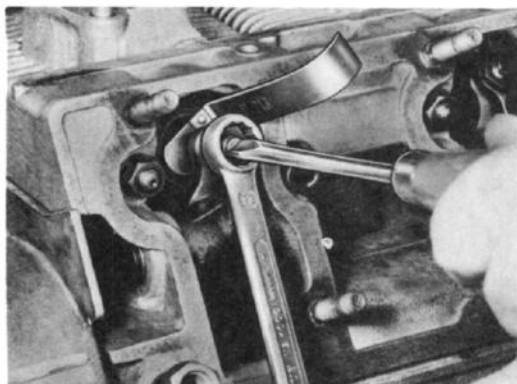
151-03

Distributor marking - cylinder 1



154-03

2. Check the valve clearance with P 213 b; if necessary, undo the hexagon nut on the adjusting screw and correct the valve clearance by turning the adjusting screw with a suitable screwdriver, hold the adjusting screw firmly and tighten the counternut.



88/7720

3. Check the clearance again.
4. Now, continue turning the crankshaft clockwise with the pulley as far as the next marking (120°). The valves for cylinder 6 can be adjusted in this position.
5. Turn the crankshaft to the next marking (120°) to bring cylinder 2 to firing point.
6. Repeat this procedure accordingly to adjust the other valves (cylinders 4, 3 and 5).
7. Always replace the valve-cover seals and the self-locking nuts.
Tightening torque 9.7 Nm (7 ftlb)

The following assembly operations must be carried out before adjusting valves:

Assembly work from above:

1. Remove the rear wheels
2. If the vehicle is fitted with a catalytic converter, separate the plug connection to the Lambda probe, removing the hot-air blower beforehand.

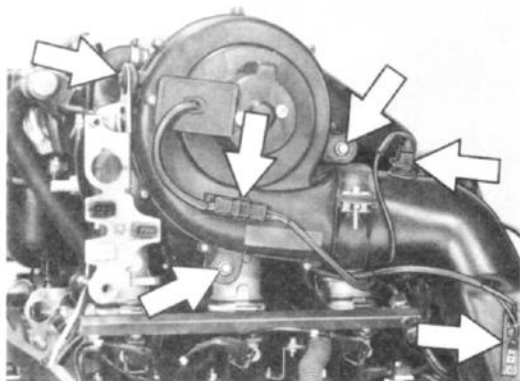


Illustration shows the engine removed

88/288

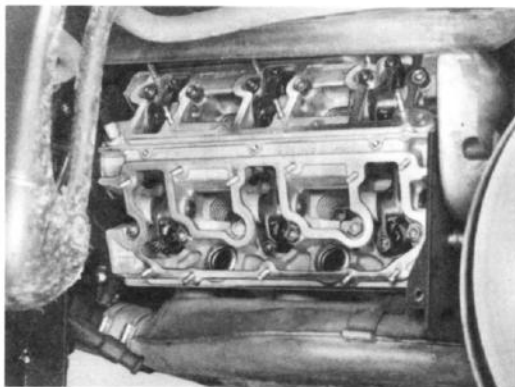
3. Push the probe cable with rubber grommet downwards through the engine paneling on the left-hand side.
4. Undo the front fastening screws on the engine side paneling beforehand.
(4 screws M 6 x 10)

Assembly work from below.

1. Remove the engine guard.
2. Remove the exhaust system complete (except heat exchanger).
3. Remove the side encapsulation panels from the engine.
4. Undo the side engine paneling.
5. Disconnect the spark plug sockets from the upper and lower ignition circuits.
6. Remove the valve covers for intake and exhaust.

Note

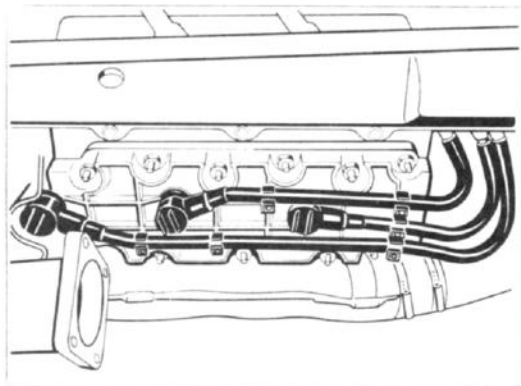
The clearance for intake and exhaust valves can now be checked and/or adjusted from below.



88/534

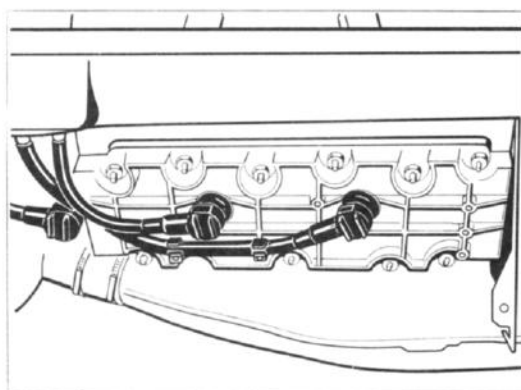
Installation of ignition leads on exhaust valve covers differs, so that valve covers must not be mixed up when installed.

Check for perfect seating of spark plug connectors and routing of ignition leads.



309/03

Left Side – Cyl. 1 - 3



310/03

Right Side – Cyl. 4 - 6

Checking and/or adjusting alternator, fan wheel and air conditioning compressor drive belts

Caution: Make sure the ignition key is pulled off whenever measurements are made.

Checking used drive belts (alternator and fan wheel)

Use belt tension measuring instrument (Special Tool 9574) to check tension.

A description of how to use the Special Tool is contained in Repair Group 13, page 13 - 30.

Retensioning the belt is only required if the belt tension displayed at the measuring instrument is less than 15 scale increments when the engine is cold and less than 20 scale increments when the engine is hot.

Retensioning the belts

Retension belts as described in the General Adjustment Notes section.

Before measuring the belt tension, start engine and let engine idle briefly.

Tension:

Cold engine:	15 to 23 scale increments
Engine at operating temperature:	20 to 28 scale increments

Fitting a new belt (alternator and fan wheel)

When fitting a new belt, be sure to observe the correct **assembly sequence** in order to avoid any loss of belt tension during vehicle operation.

1. Fit new belt. Adjust tension by inserting or removing shims as required.
Shims are available for belt tensioning in thicknesses of 0.5 mm and 0.7 mm. The 0.7 mm shim is identified by a 2 mm dia. drill hole.
2. Before measuring the belt tension, start engine once more and run engine at idle briefly.

Tension:

Cold engine: 23 to 35 scale increments

3. Run engine at idle for approx. 15 minutes or test drive vehicle for approx. 10 miles.

Check tension again.

Specification: 28 to 40 scale increments

Retension if required.

Test requirement: Engine at operating temperature

Adjustment specifications for A/C compressor drive belt

Specification: 30 to 35 scale increments

Retension if required.