Workshop Manual Audi Quattro

Provisional repair instructions

2.2 litre fuel injection engine (K-Jetronic, turbocharger)
5-speed manual gearbox 016 4wd
Running gear
Body repair work
Electrical system

May 1980 edition

The Workshop Manual is divided into three booklets which can also be ordered separately and used individually at the different workbays as required. The booklets are valid for the Audi Quattro as from the start of production (May 1980). They contain repair notes for the repair groups listed on the inside front cover.

This booklet contains provisional repair notes for repair groups 10 to 97, as listed in the Contents on pages II and III, and describes important tests, adjustments and repair work. These instructions will be supplemented later either by Workshop Bulletins or a new edition of the booklet.

Where certain repair operations are not described, e.g. dismantling and assembling the gearbox or certain work on the engine, the repair groups concerned include notes on how to proceed in such cases.

Workshop Bulletins

Workshop Bulletins will be allocated to the individual booklets and should be filed at the back of the booklet concerned. To remind you that bulletins have been published, please mark the bulletin number by hand on the page of the manual given in the bulletin.

Fault finding

General fault finding instructions are incorporated in the Workshop Manual.

Further instructions on tracing and repairing likely faults are given in the "Fault Finding Handbook".

Technical information should always be made available to all foremen and mechanics because compliance with the instructions given is essential to ensure vehicle roadworthiness and safety. In addition, the normal safety precautions to be observed when working on motor vehicles are also applicable.

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The following table is **based on the engine code letters** and contains information on the engine installed in Audi Quattro vehicles and the publications which cover this engine.

Code letters		WR
Engine data		
Manufactured	from	5.80
	up to	
Capacity	litres	2.2
Output	kW at rpm	147/5500
Torque	Nm at rpm	285/3500
Bore	mm	79.5
Stroke	mm	86.4
Compression ratio		7.0
Valve timing at 1 mm valve lift and 0 mm valve clearance		
intake opens before TDC		3°
intake closes after BDC		47°
exhaust opens before BDC		43°
exhaust closes after TDC		7°
RON	min.	98
Fuel injection		K-Jetronic
Distributor		035 905 206 E
Turbocharger		X
Publications	Order No.[1])	
Workshop Manual Audi Quattro Provisional repair instructions	0.97.538.699..	x
Audi 100, Audi 200 2.2 l fuel injection engine (K-Jetronic/turbocharger)	0.97.533.973..	x
Maintenance	0.97.537.503..	x
Fault finding chart: K-Jetronic	000.530.423..	x
Current defects: Service Handbook[2]) Fault Finding Handbook[3])	000.530.300..	x

The Audi Quattro has a 2.2 litre fuel injection engine with K-Jetronic and a turbocharger. This is the same basic engine as the 2.2 litre fuel injection engine of the Audi 200 turbo. Engine repairs not described in this booklet can therefore be carried out using the Audi 100/200 Workshop Manual, June 1980 edition. However, it is then essential to refer to the Audi Quattro technical data published in this manual.

The engine also has an all-electronic ignition system which is described on page 33.

The K-Jetronic system and the turbocharger are basically the same as on the Audi 200. But the various components are modified to suit the installation on the Audi Quattro. The turbocharger also has a charge air intercooler, which increases engine power.

[1]) See catalogue of publications for language index
[2]) Only supplied in West Germany
[3]) Only supplied in export countries

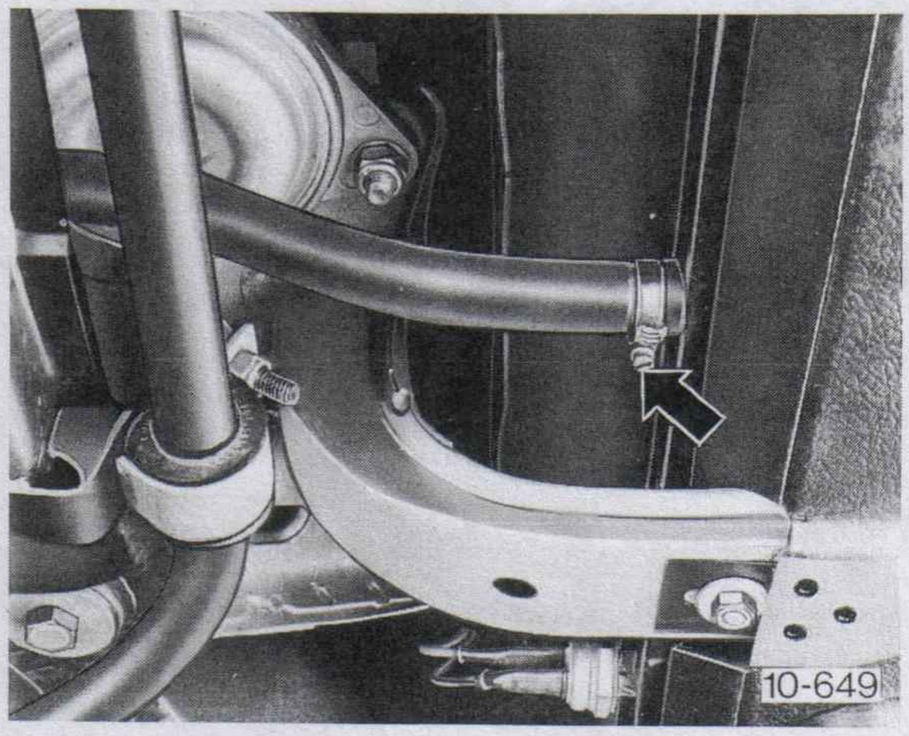
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REMOVING AND INSTALLING ENGINE

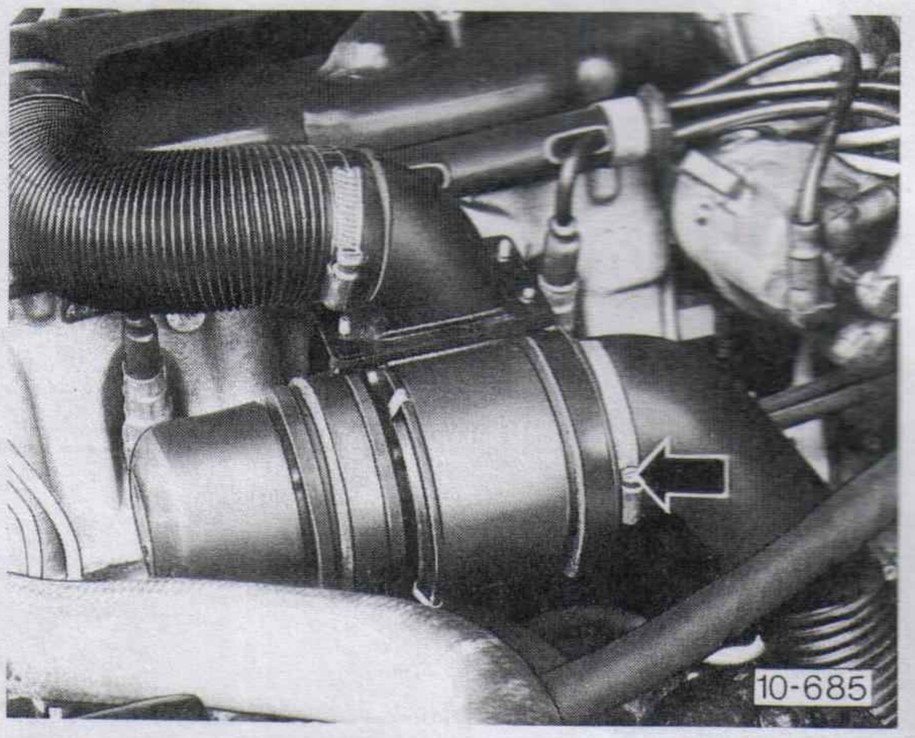
Removing:
The engine is removed together with the gearbox by lowering it out with a workshop crane.



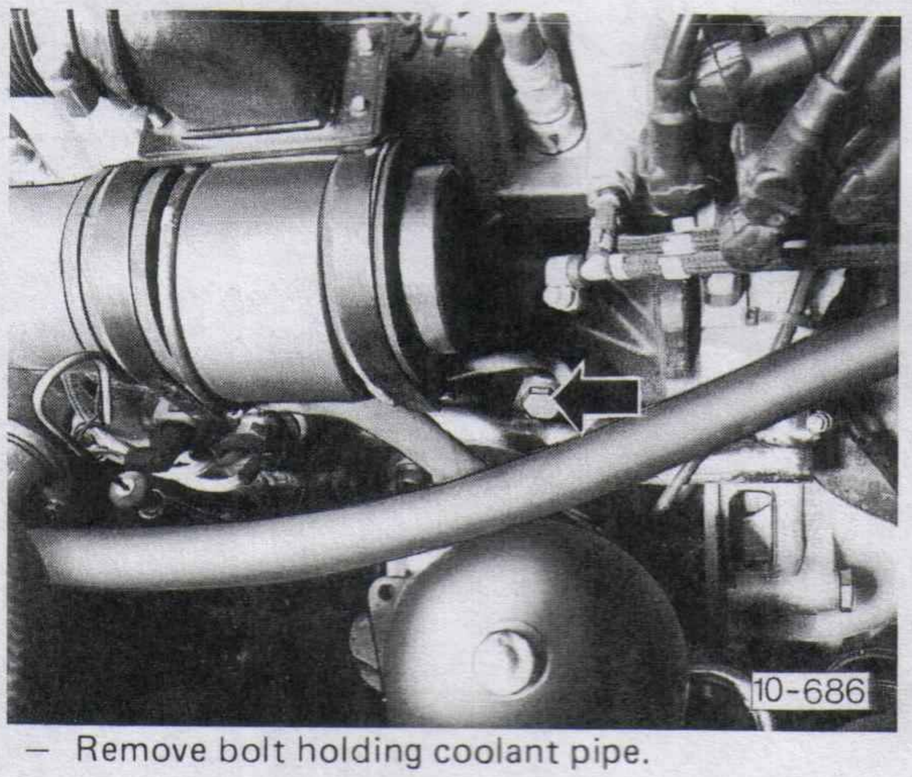
– Disconnect battery earth strap: lift up rear seat and remove battery cover.
– Set heater control to – warm –.
– Unscrew cap on radiator expansion tank.



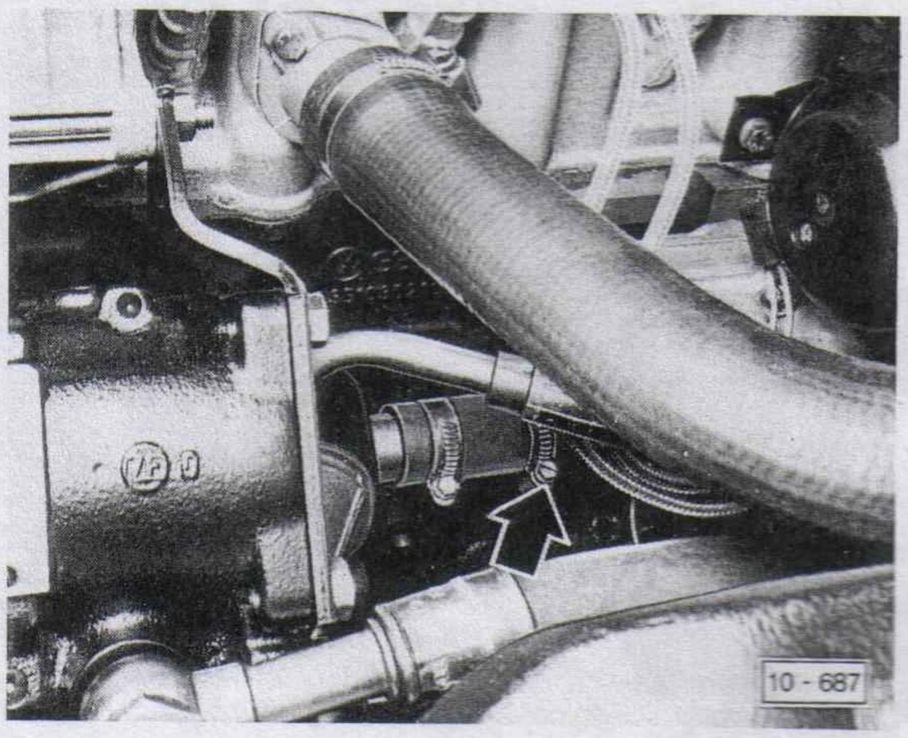
– Drain off coolant by detaching bottom hose at radiator.



– Remove intake hose for injector cooling fan.



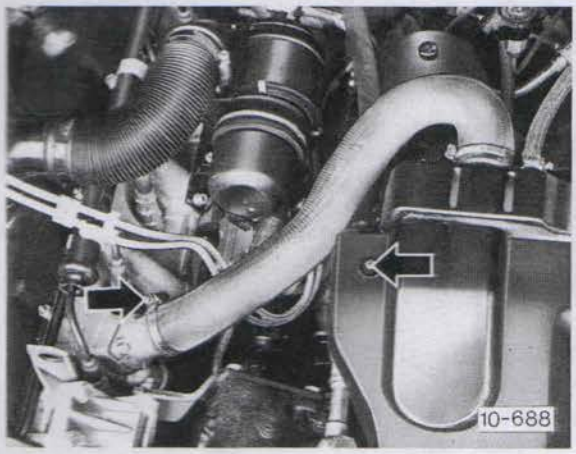
– Remove bolt holding coolant pipe.



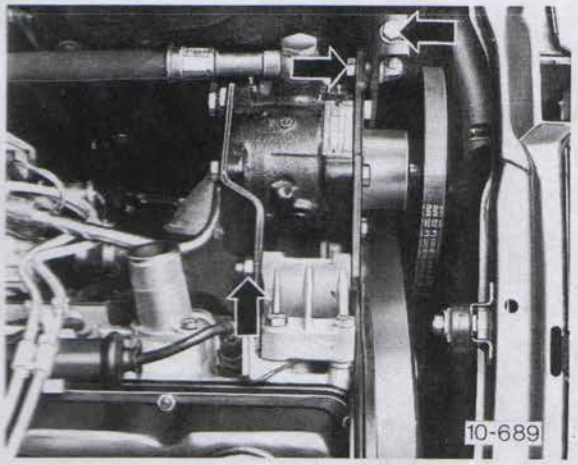
– Detach coolant hose from coolant pipe.

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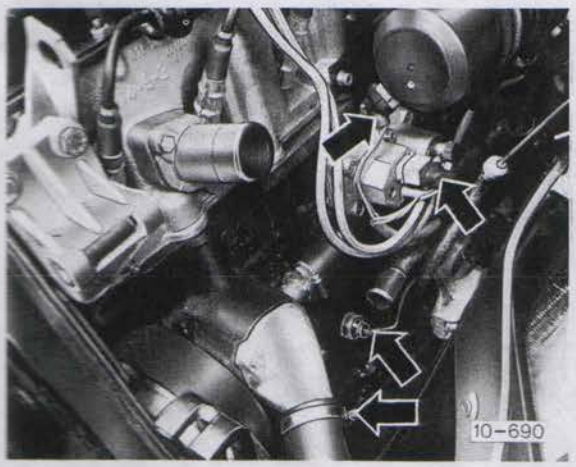
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– Remove upper radiator cowling
– Detach top coolant hose from engine.

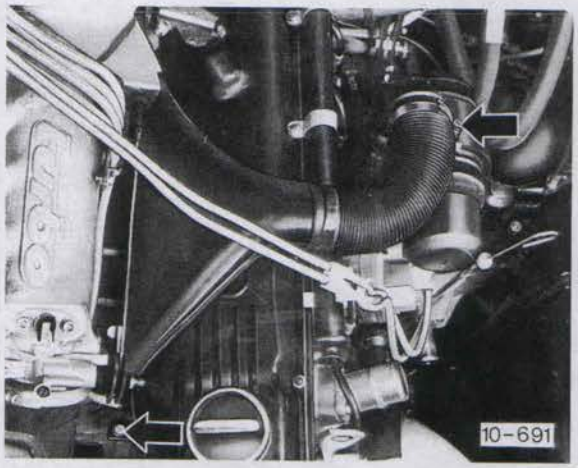


– Remove impeller pump for power assisted steering after slackening and removing V-belt. Leave hydraulic lines connected.
– Place pump clear on one side.

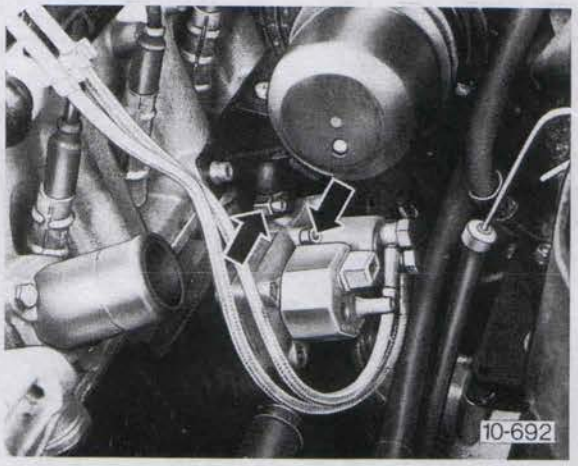


– Detach coolant hose from thermostat housing.
– Disconnect wiring from oil pressure switch, warm-up valve, cooling fan for injectors and sender unit for engine cold indicator light, and place wiring harness clear to one side.

– Disconnect plug from radiator fan.
– Detach coolant hose going to radiator expansion tank.
– Detach breather hose going to auxiliary radiator.
– Detach coolant hoses from auxiliary radiator.
– Disconnect plug from radiator fan switch and place wiring harness clear to one side.
– Detach radiator mounting.
– Detach right hand cowling from radiator.
– Detach lower radiator cowling.
– Lift out radiator after lifting out windshield and headlight washer reservoir.

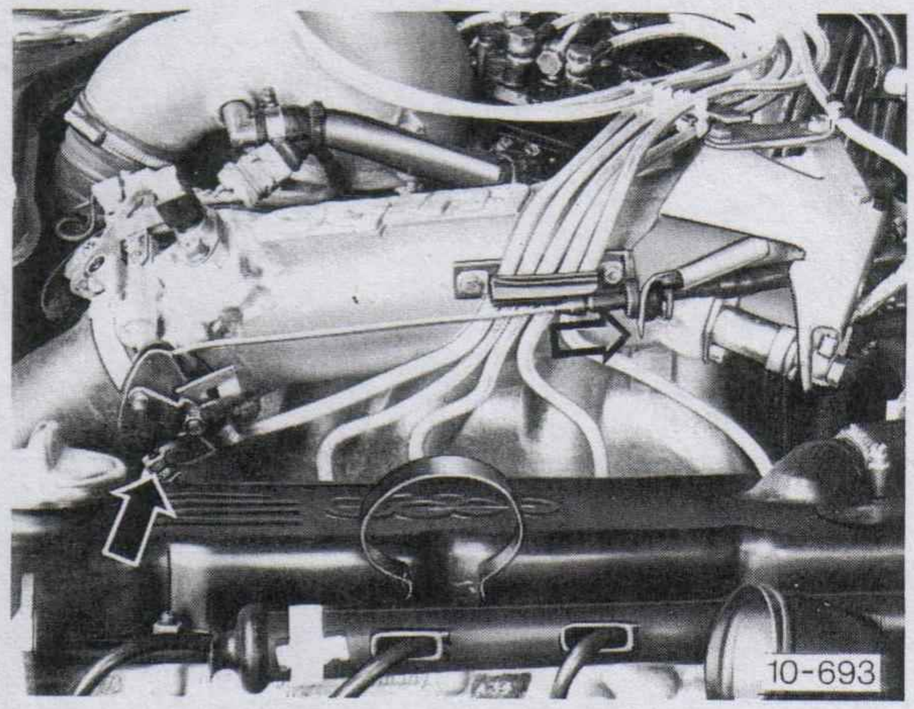


– Remove air guide and hose between cooling fan and injectors.

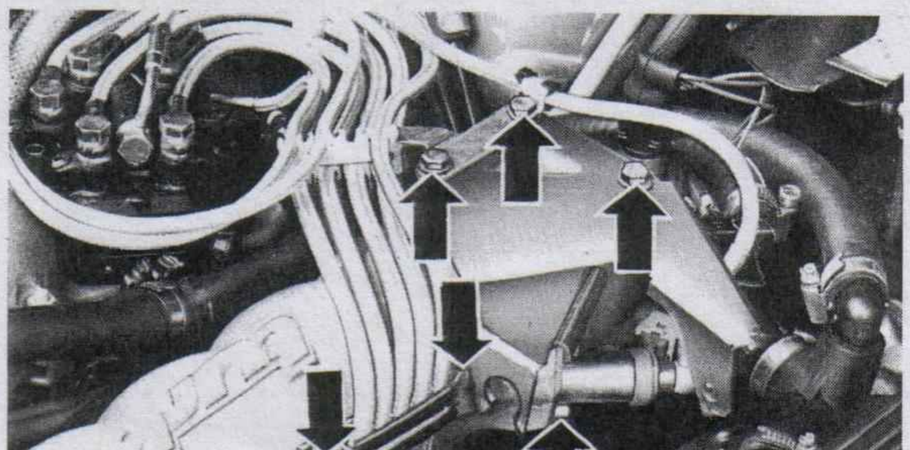


– Remove warm-up valve, do not disconnect fuel lines.

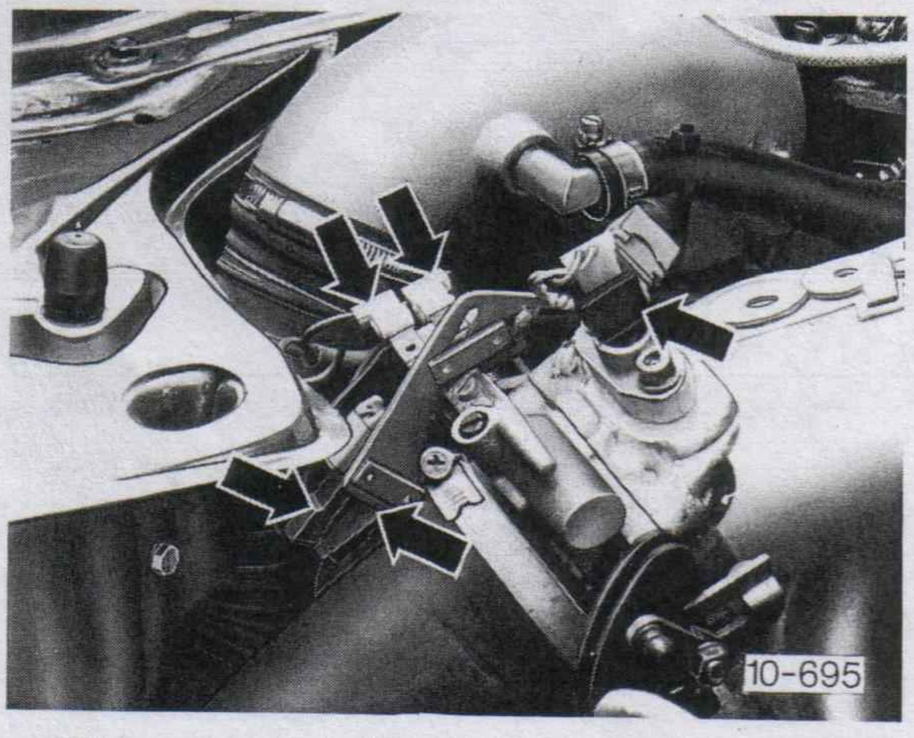
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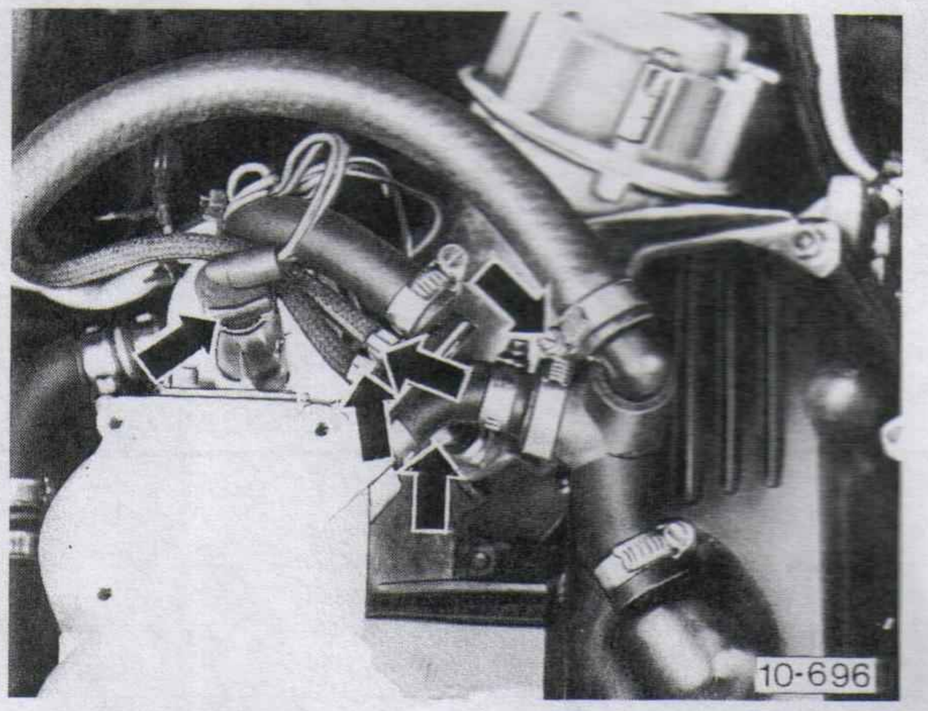
– Disengage accelerator cable after releasing lock clip. Pull accelerator cable through bracket.



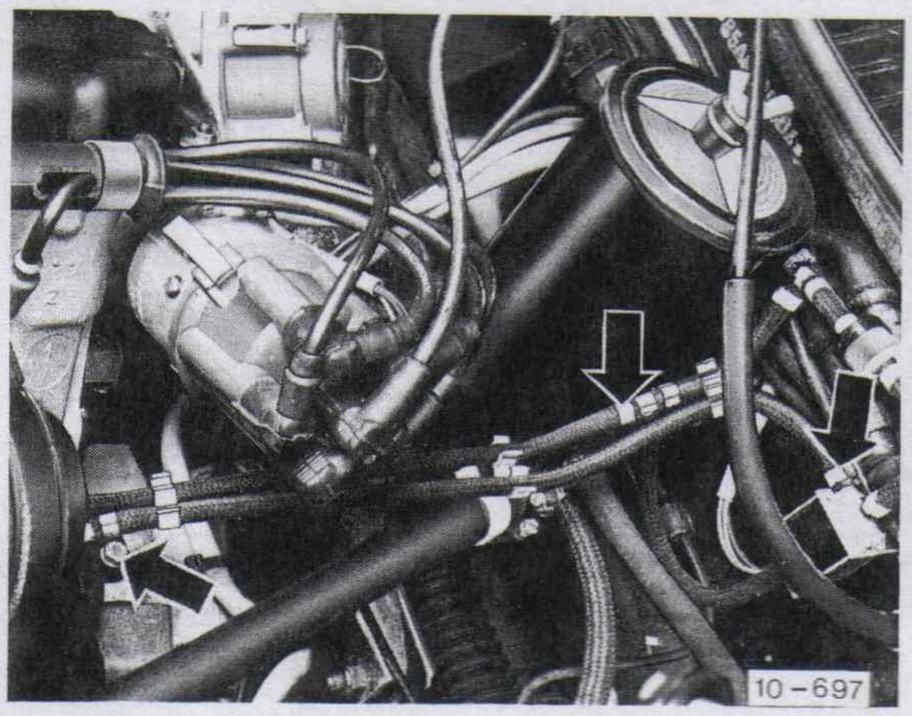
– Remove bracket holding fuel lines.
– Pull injectors out of their seats.
– Remove cold start valve, disconnect plug, but leave fuel line connected.



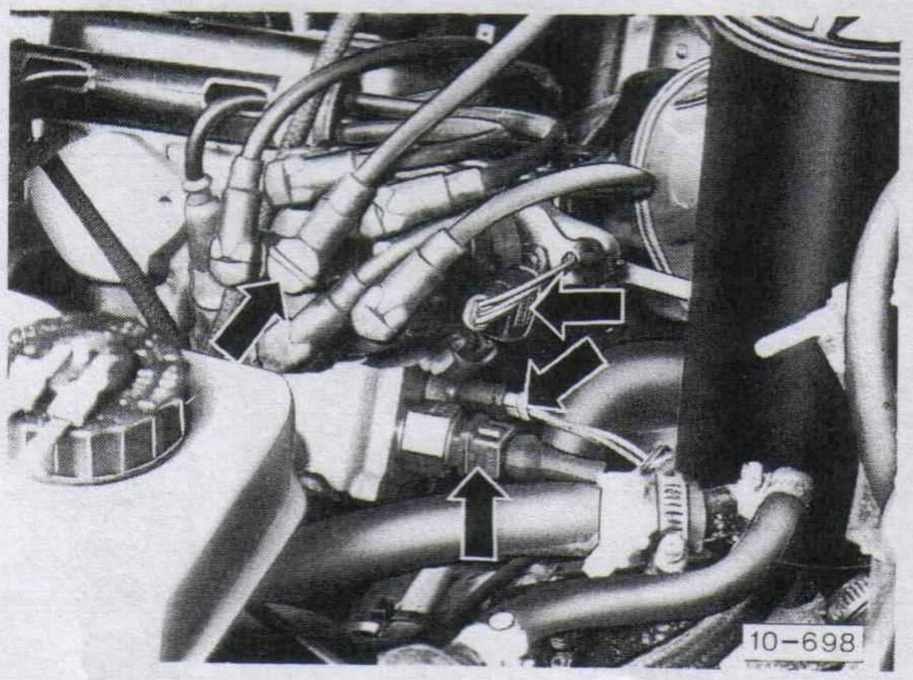
– Disconnect plugs from both throttle switches and sender unit for intake air temperature.
– Detach intake hose.
– Place wiring harness clear to one side.



– Disconnect plug from auxiliary air valve.
– Disconnect both vacuum hoses.
– Disconnect crankcase breather hose.
– Disconnect plug for cooling fan for injectors.
– Lay wiring harness clear to one side.



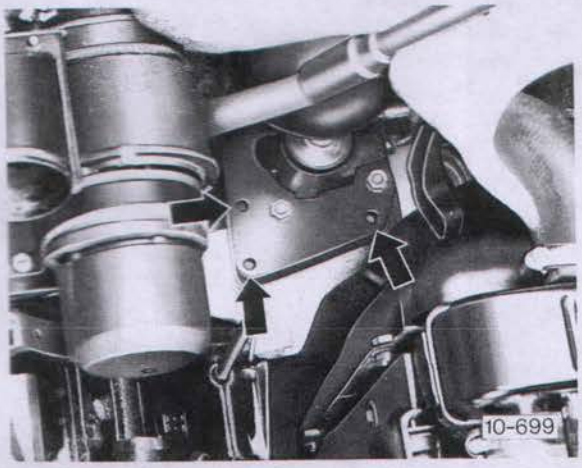
– Disconnect vacuum lines (two-way valve).
– Unscrew thermopneumatic valve. Do not disconnect vacuum lines.
– Remove ignition timing sender unit.
– Disconnect speedo cable from gearbox.



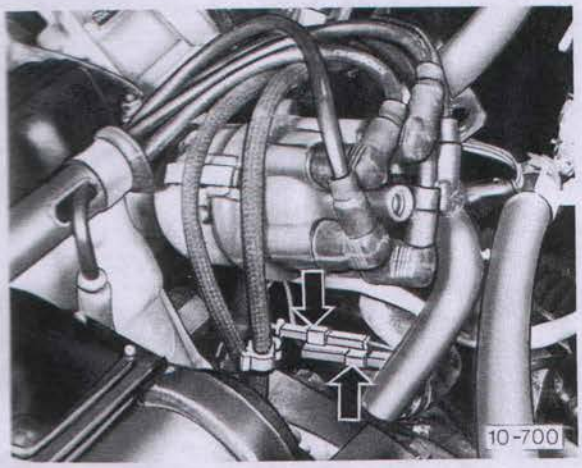
– Take off distributor cap.
– Disconnect lead from terminal 4 on distributor.
– Disconnect plug from Hall pick-up on distributor.

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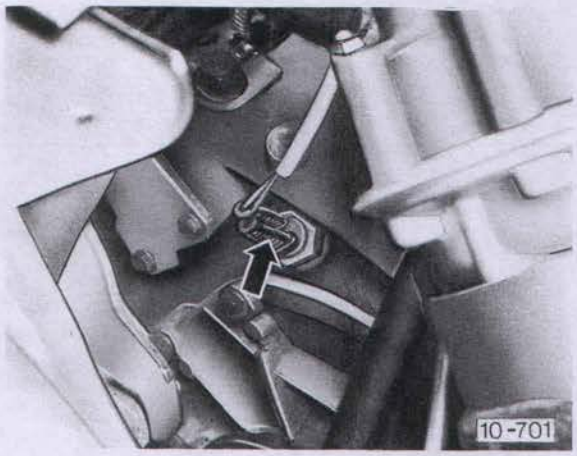
– Disconnect plug from thermo-time switch and engine hot indicator light.
– Disconnect heater hose from engine.



– Detach hydraulic brake servo with accumulator from engine bearer. Leave hydraulic lines connected.



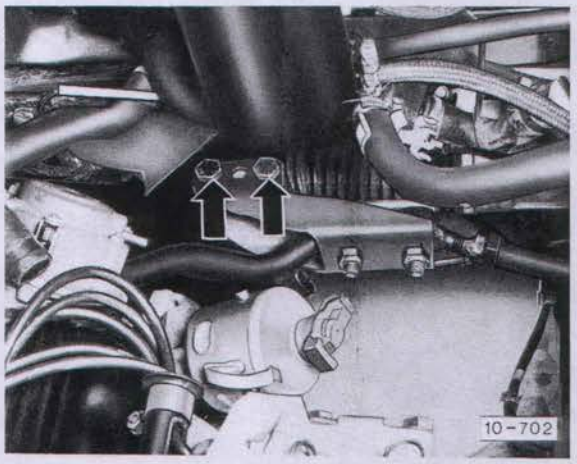
– Disconnect plug for differential lock indicator.



– Disconnect plug from reversing light switch.
– Disengage gearshift linkage.
– Remove clutch slave cylinder by disengaging retaining bar and knocking out retaining key (underneath retaining bar in gearbox). Leave hydraulic line connected.

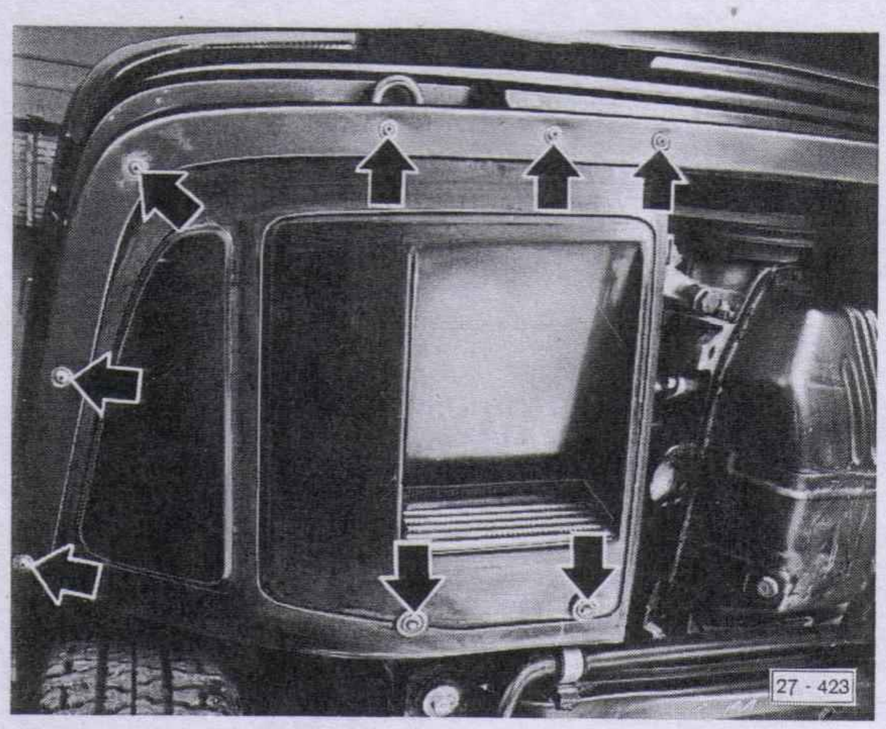
Important
Do not operate the clutch pedal after the slave cylinder is removed.

– Detach earth strap from left engine bearer.

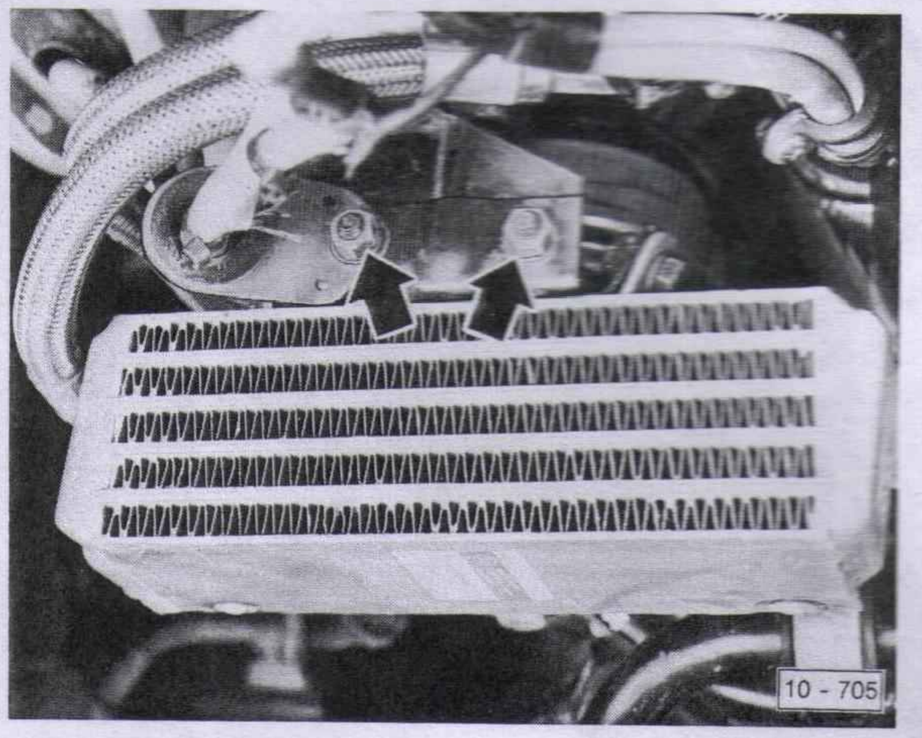


– Detach tie rod from steering rack.
– Detach vacuum hose from auxiliary air valve.

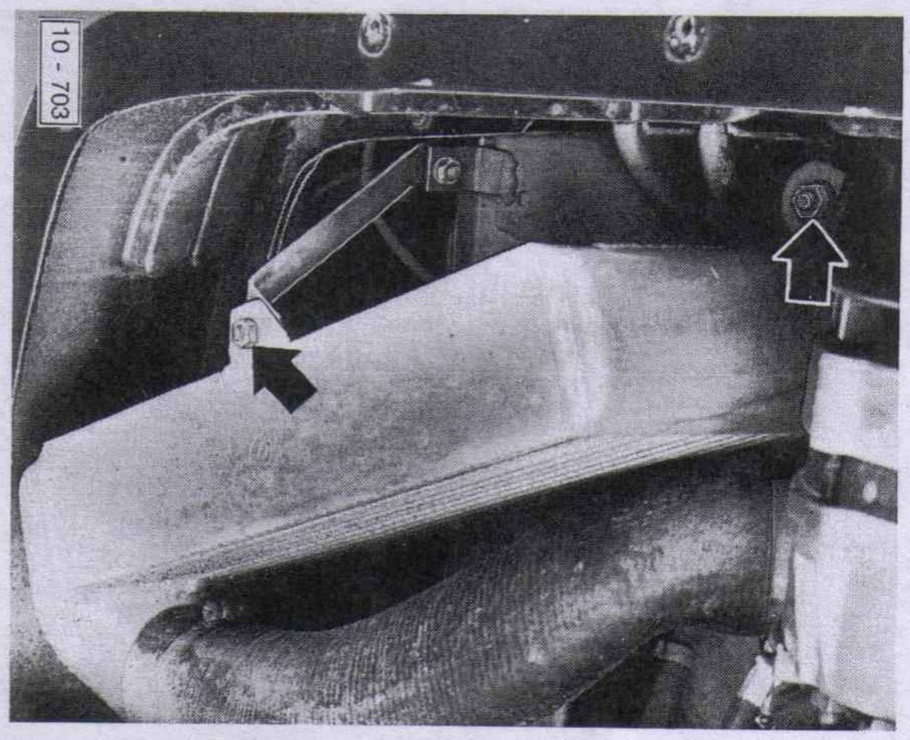
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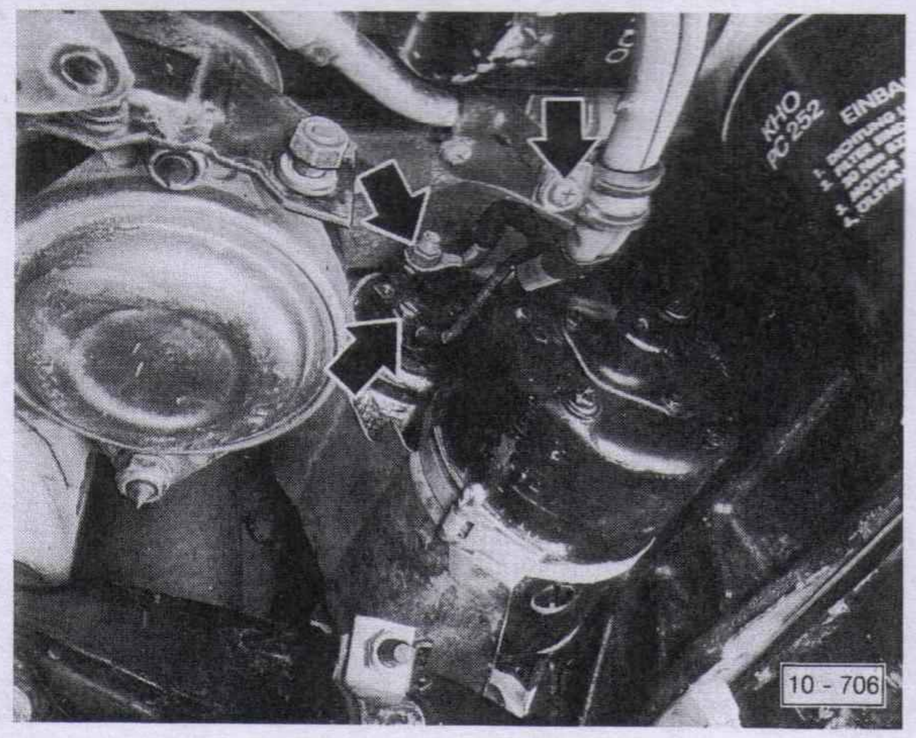
– Remove air guide for oil cooler.



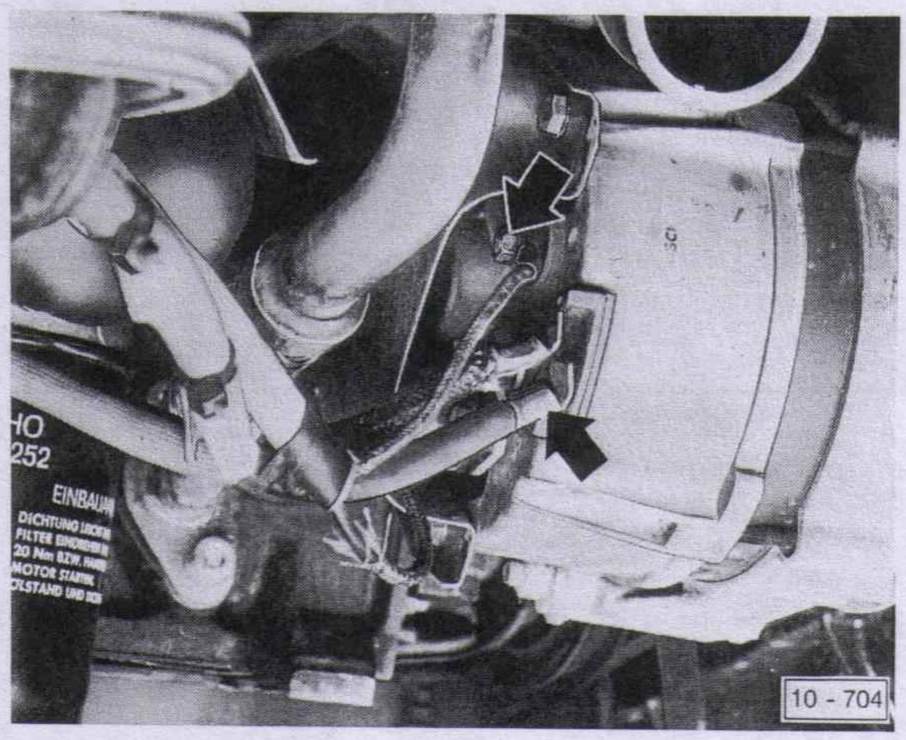
– Detach oil cooler. Do not disconnect oil lines.



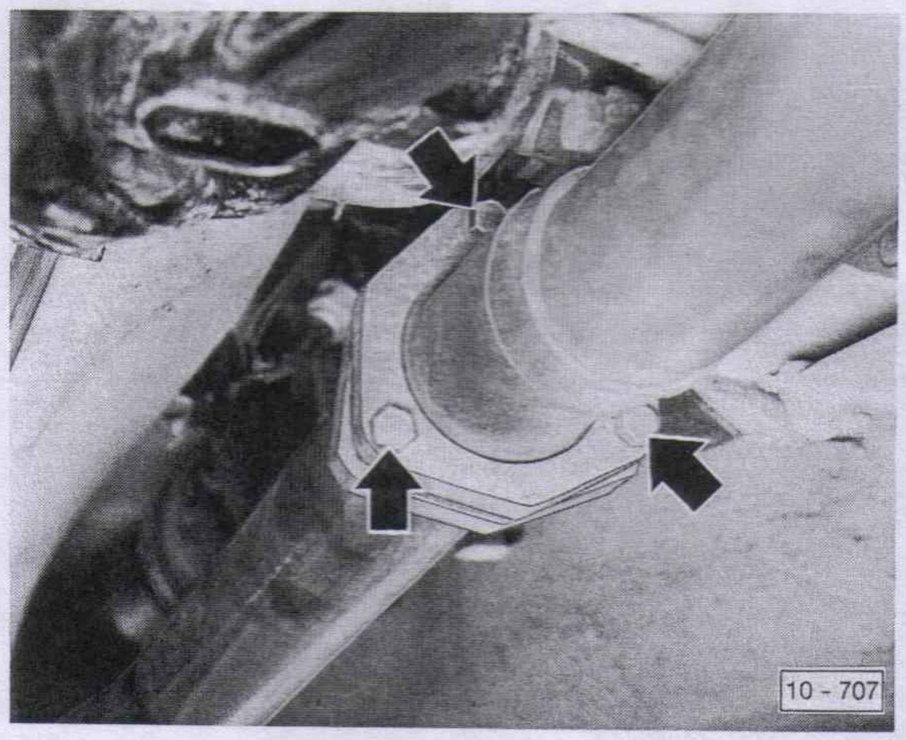
– Remove charge air intercooler.



– Disconnect wires from starter motor.

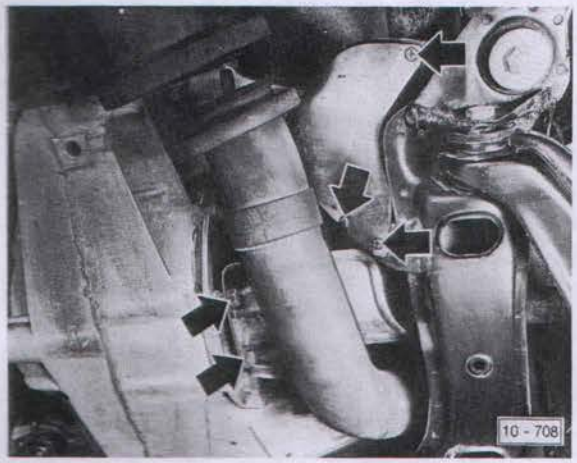


– Detach wiring from alternator.

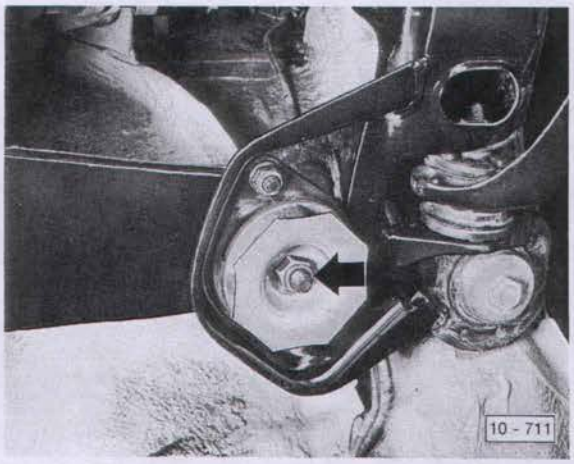


– Detach exhaust pipe at flange.

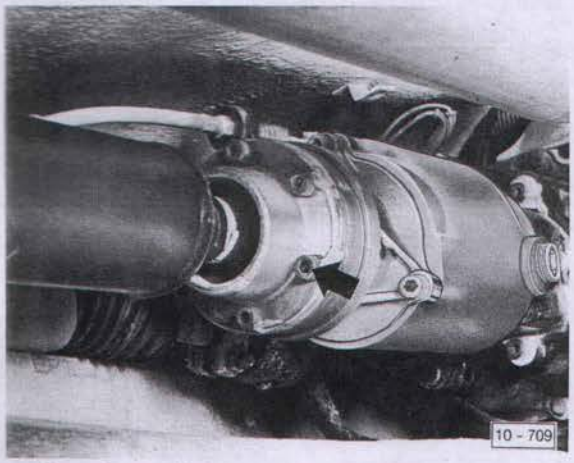
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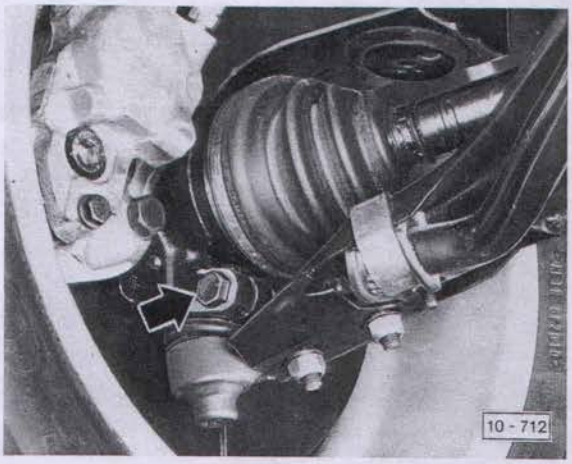
– Remove guard plate on gearbox and on right gearbox mount.
– Detach left and right drive shafts from gearbox.



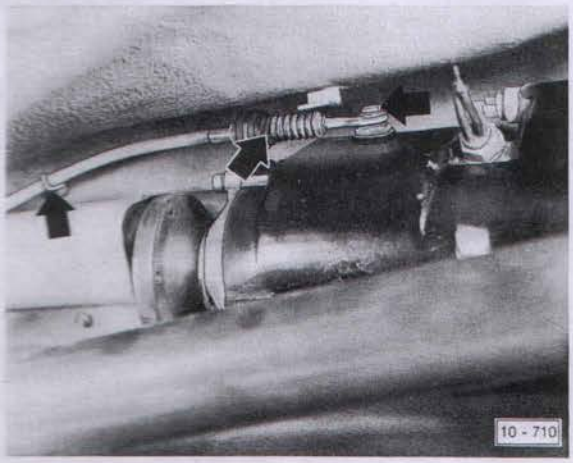
– Unscrew bolts holding left and right gearbox mounts to gearbox bearers.



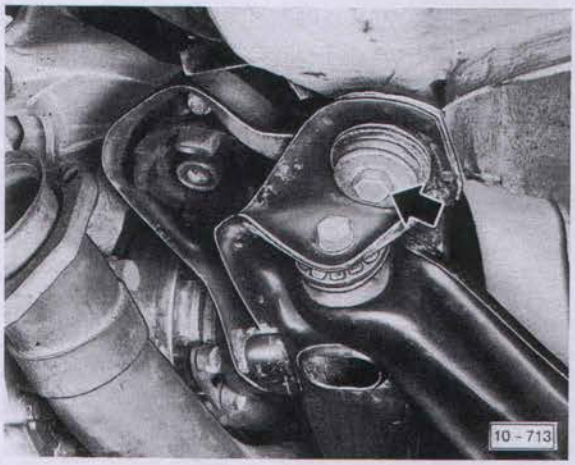
– Detach propellor shaft from gearbox.



– Unscrew mounting bolts on left and right wishbone joints.

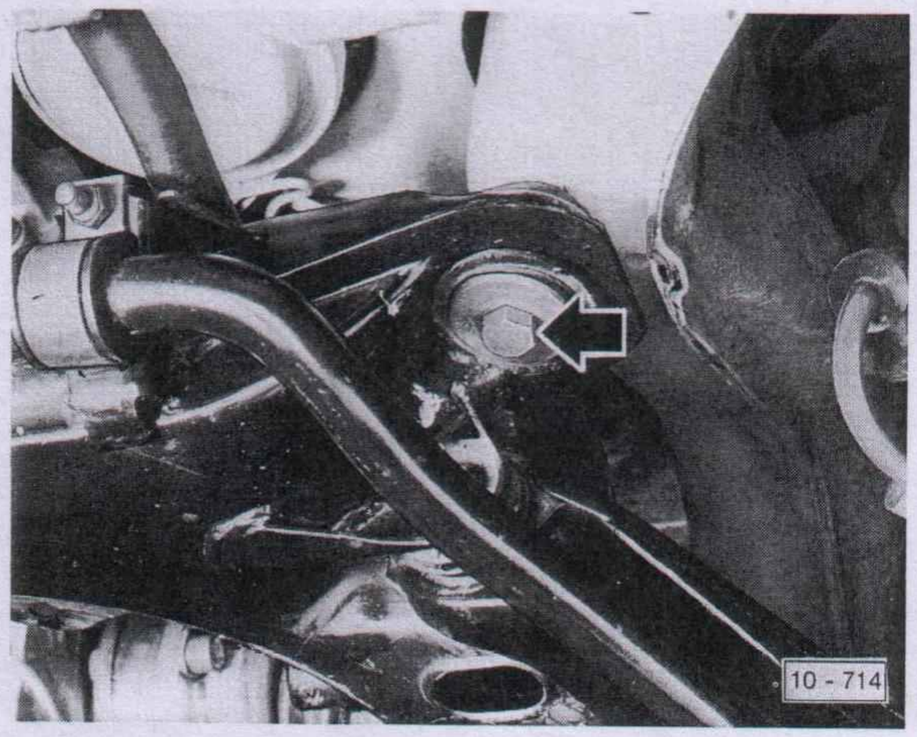


– Disengage cable for rear differential lock by taking out front and rear lock clips, pushing back sleeve and disengaging cable from bar.

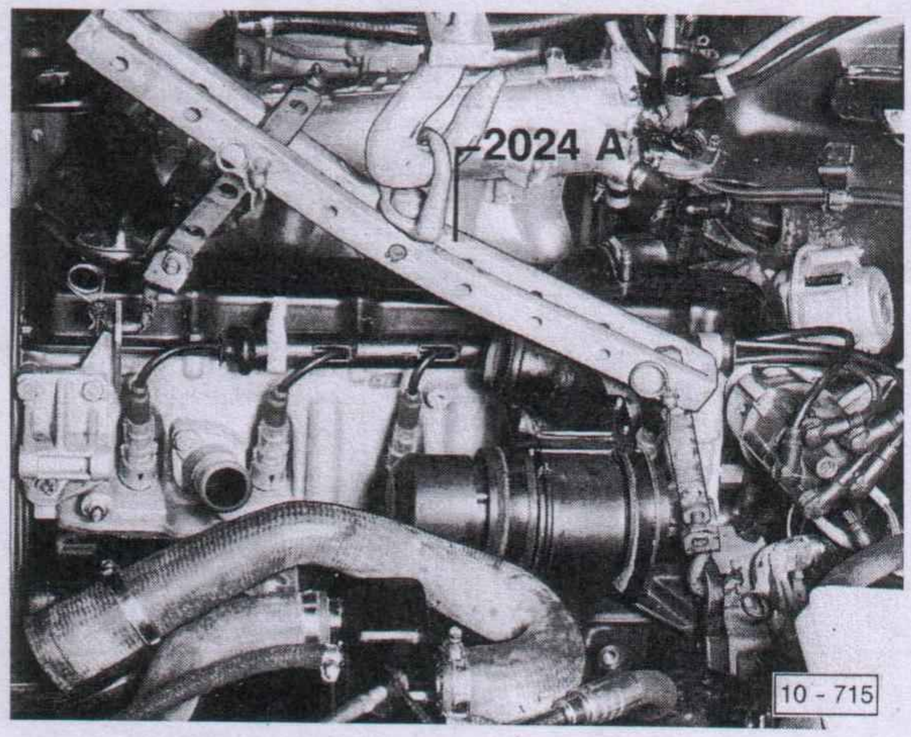


– Unscrew rear mounting bolts on subframe, left and right.

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– Unscrew front mounting bolts on subframe and detach subframe, pressing wishbone joint out of suspension strut.



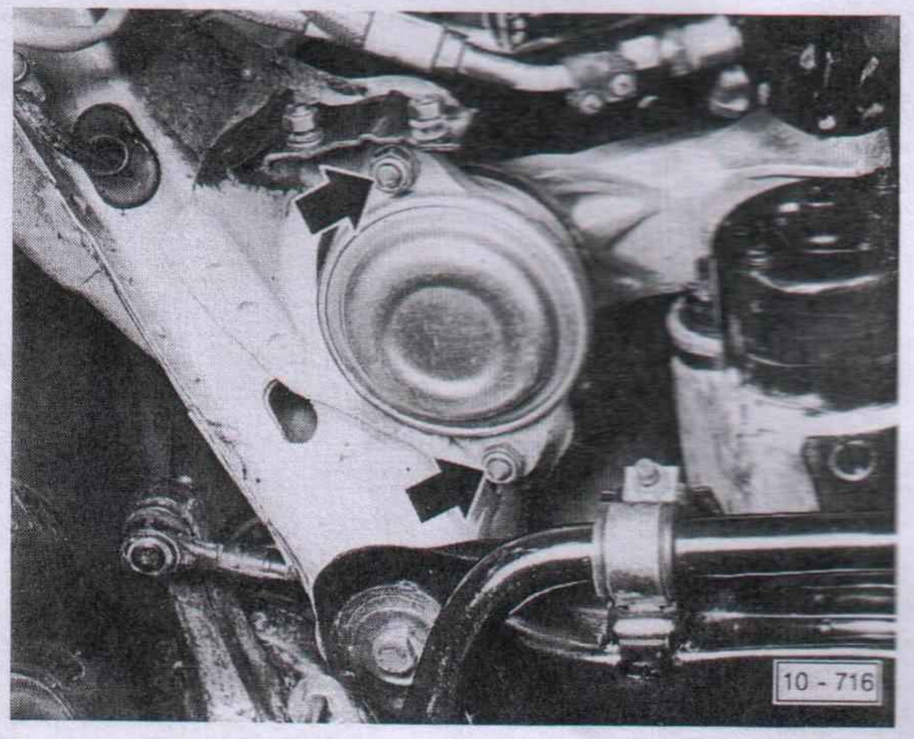
– Attach lifting bracket:

position 3 – 3rd hole
position 8 – 4th hole

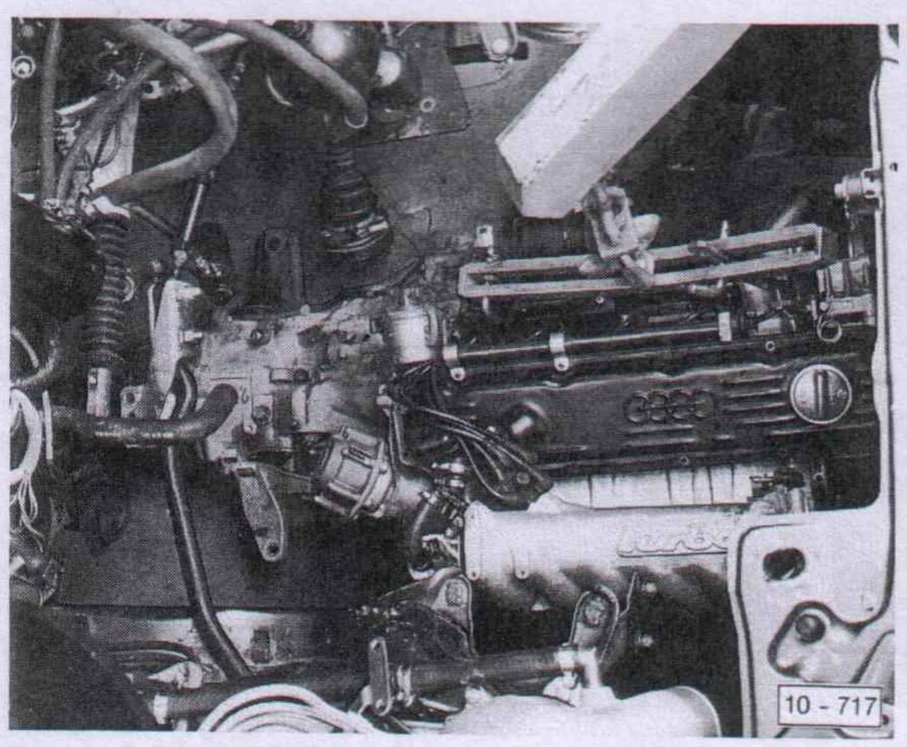
Note:
To balance the weight of the engine/gearbox assembly the vertical bars must be set at the correct length and in the correct positions on the horizontal sling bracket.

The positions marked 1 – 4 on the horizontal sling bracket must face towards the pulley end. The holes in the vertical bars are counted upwards from the hooks.

– Raise engine slightly.



– Detach front left and right engine bearers.



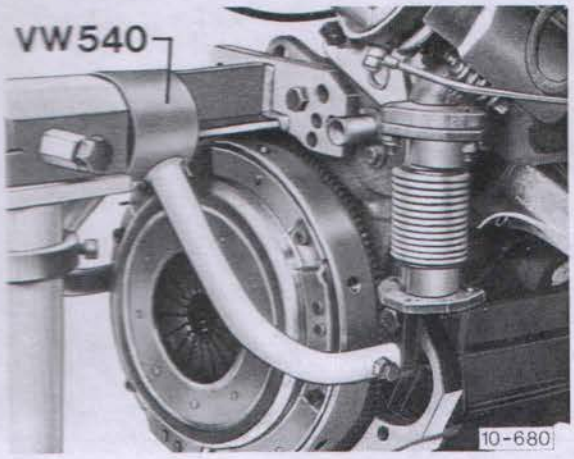
– Lower engine with gearbox.

Important
The assembly must be guided carefully when it is lowered out to prevent damage to the body and engine.

– Raise vehicle on hoist and remove engine.
– Separate engine and gearbox.

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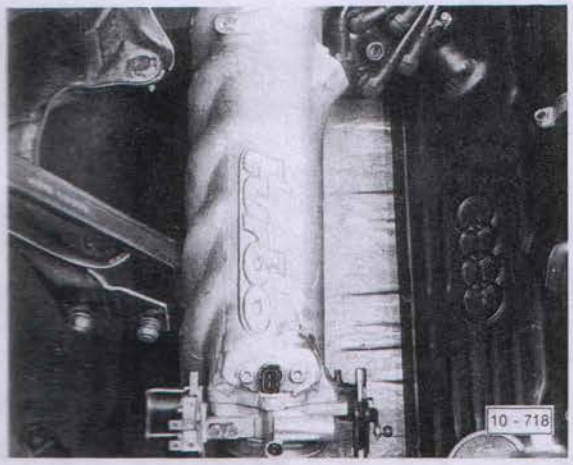
ATTACHING ENGINE TO ASSEMBLY STAND



– If work is to be carried out on the engine it should be secured to the assembly stand using the support.

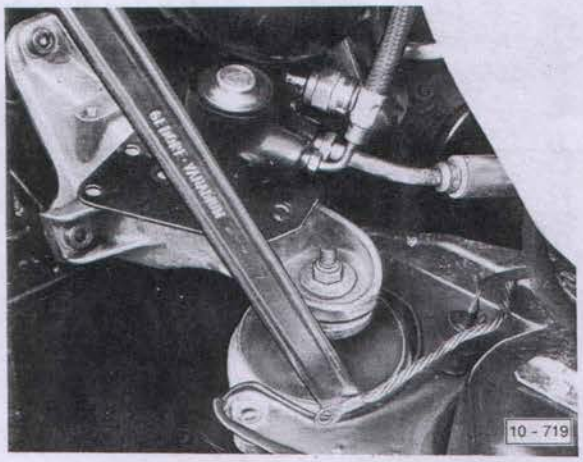
Important
Do not measure the cylinder bores with the engine attached to the assembly stand because this may cause a certain amount of distortion.

Installing:
Engine installation should be carried out in reverse sequence; note the following points:

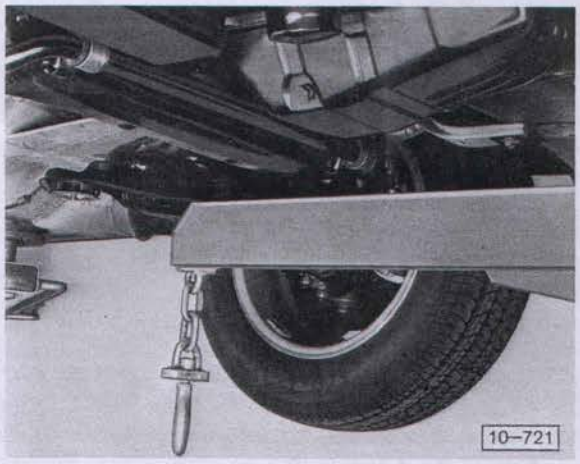


– Lift engine/gearbox assembly and guide engine past side member.

– Run in jack underneath gearbox and lift assembly using workshop crane and jack at the same time.



– Insert left engine mount into support and ensure that the rubber stop of the front engine mount seats in the stop shell.

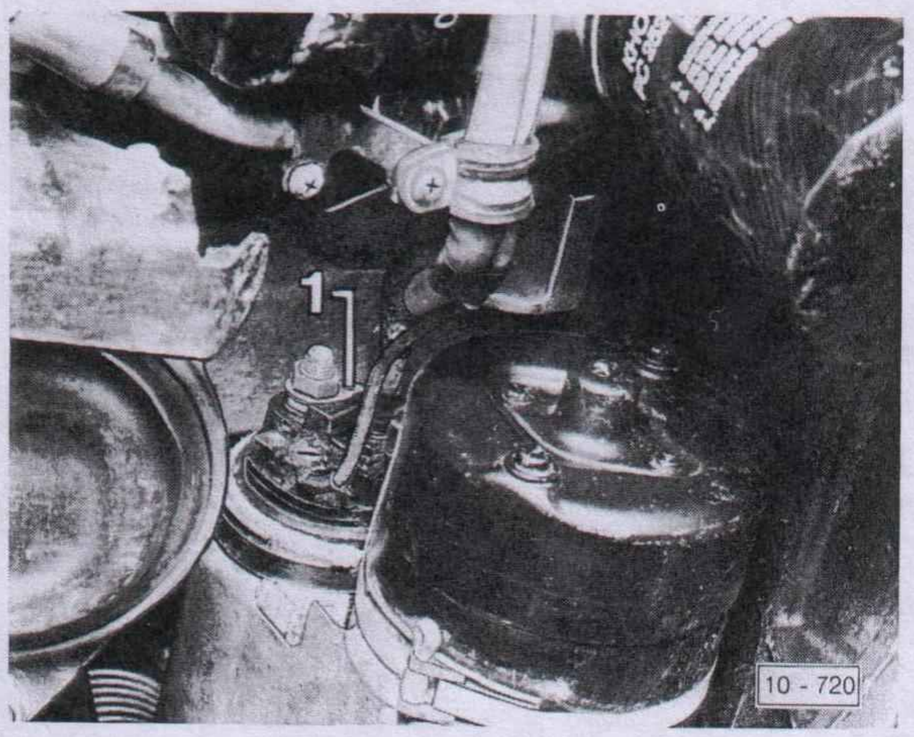


– Insert subframe, lifting into position with workshop crane.

Keep to correct sequence when tightening bolts:

1. rear left
2. rear right
3. front left
4. front right

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– Connect starter motor lead on correct side.

Important
If the lead –1– is connected on the wrong side it can come into contact with the engine or engine bearer. **This could cause a short circuit and risk of fire!**

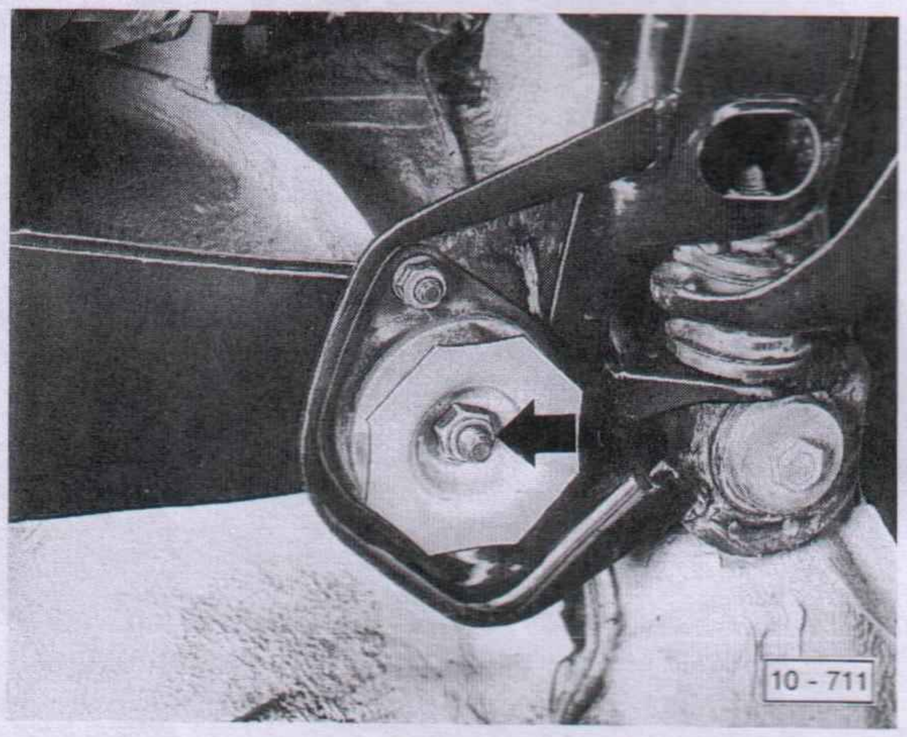
– Adjusting accelerator cable, repair group 25
– Filling cooling system – repair group 19

Tightening torques:

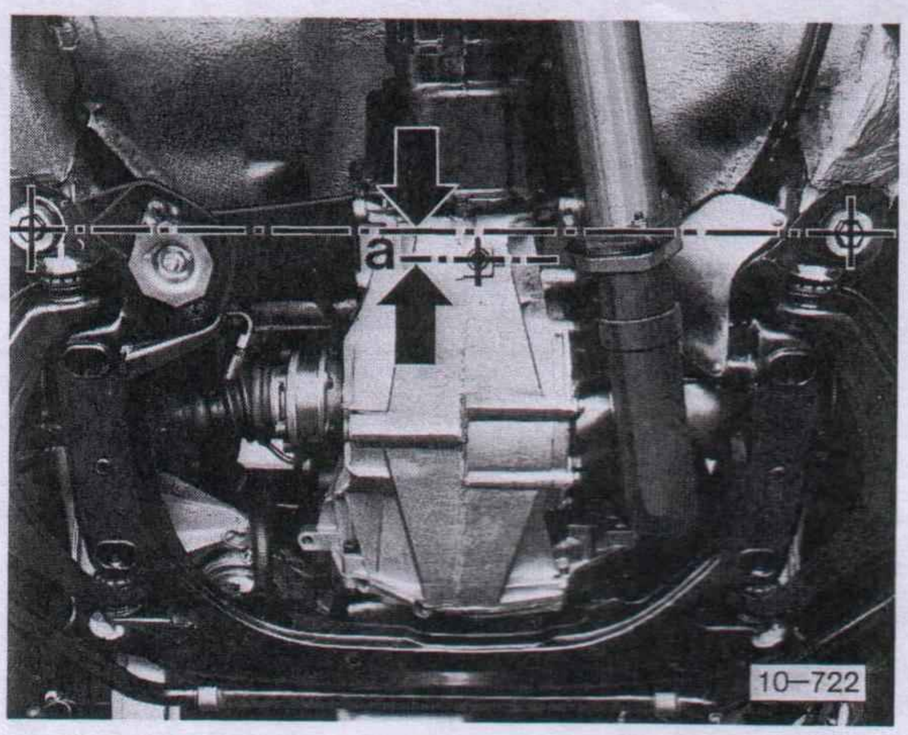
Engine to gearbox	
M 8	30 Nm
M 10	45 Nm
M 12	60 Nm
Exhaust pipe to gearbox bearer	30 Nm
Subframe to body	70 Nm
Warm-up valve	20 Nm
Cold start valve	10 Nm
Hydraulic brake servo to engine bearer	20 Nm
Earth strap to engine bearer	20 Nm
Tie rod bracket to steering rack	40 Nm
Charge air cooler to body	
M 8	20 Nm
M 6	10 Nm
Oil cooler to body	30 Nm
Exhaust pipe to flange	25 Nm
Drive shaft to gearbox	55 Nm
Prop shaft to gearbox	45 Nm
Gearbox carrier to gearbox mount	45 Nm
Wishbone joint to suspension strut	50 Nm
Engine mount to body	40 Nm

ALIGNING ENGINE AND GEARBOX

Note:
The position of the engine and gearbox must always be checked and aligned if necessary after removing and installing the engine.



– Loosen both mounting bolts on left and right gearbox bearers/mounts.
– Loosen both mounting nuts on left and right engine bearers.



– Shake engine and gearbox on their mounts to move into correct longitudinal position.
Distance a = 17.9 mm ± 1 mm.

Note:
The transverse position and height of the engine/gearbox are not adjustable.

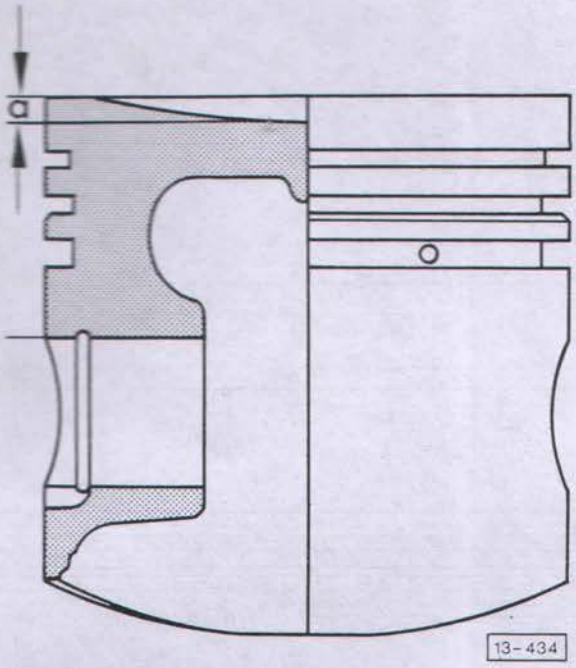


Fig. 1 Piston – depth of combustion recess

Engine code letters: WR
Dimension –a–: 12.5 mm

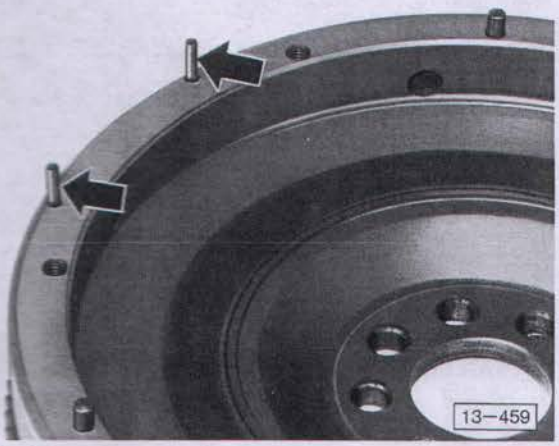


Fig. 2 Installing pins for dwell angle

Do not bend pins when renewing flywheel.

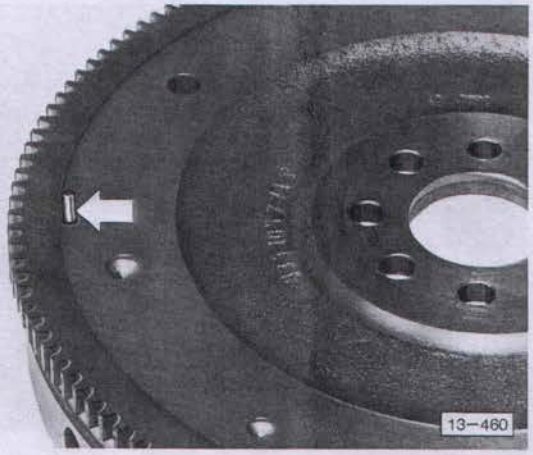


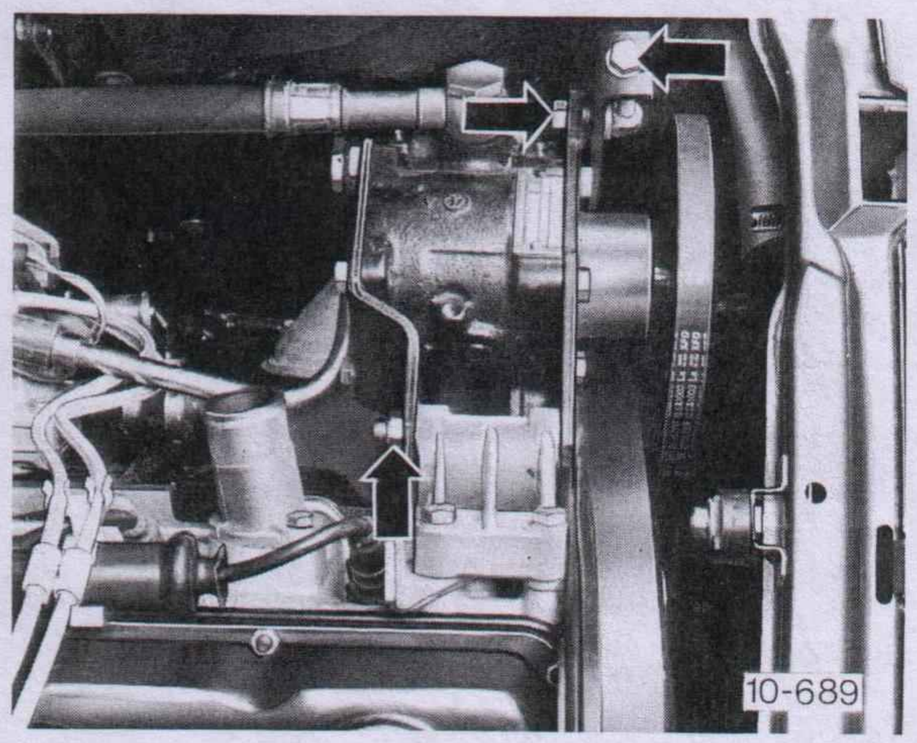
Fig. 3 Installing pin for ignition timing

Do not bend pin when renewing flywheel.

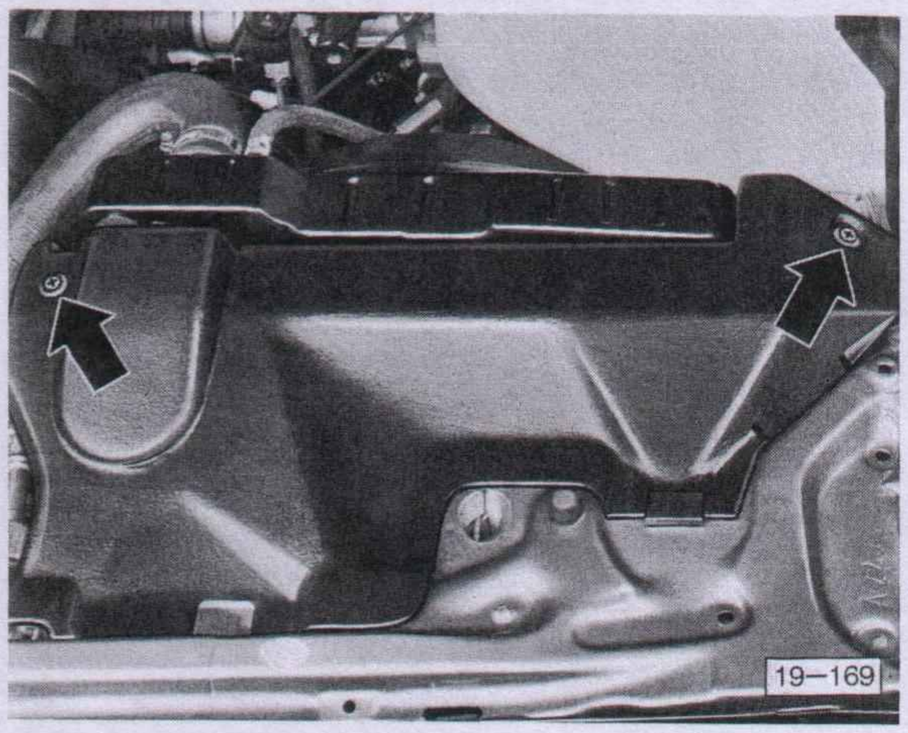
Important
If the pin for ignition timing is not installed (forgotten) when the flywheel is renewed, the electronic ignition system will receive no control signals and the engine will not start.

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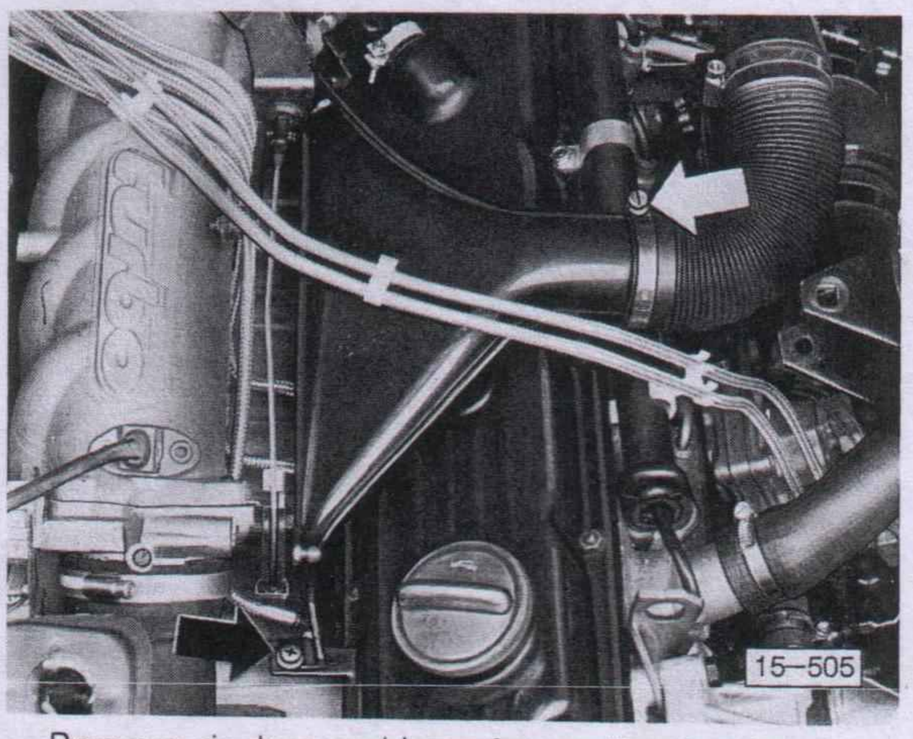
REMOVING AND INSTALLING CAMSHAFT OIL SEAL



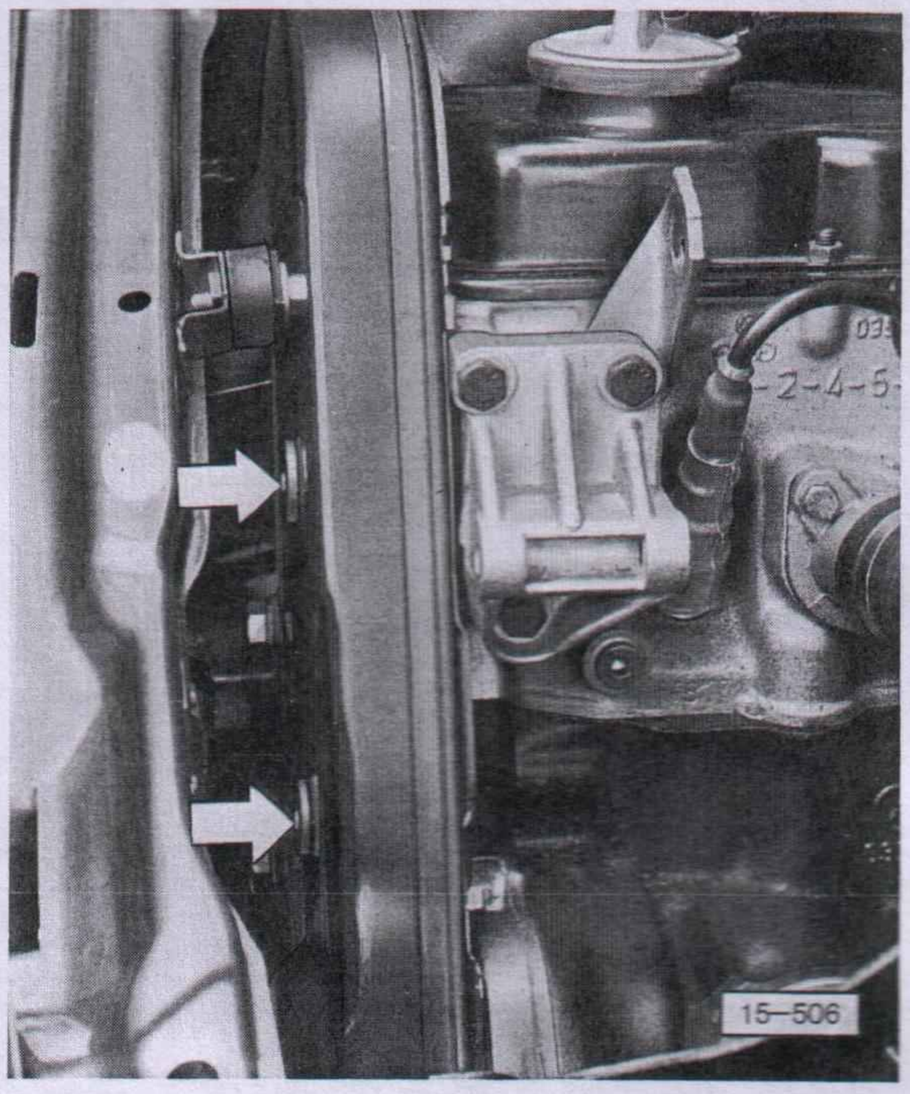
– Remove impeller pump for power assisted steering after slackening and removing V-belt. Leave hydraulic lines connected.
– Place impeller pump clear to one side.



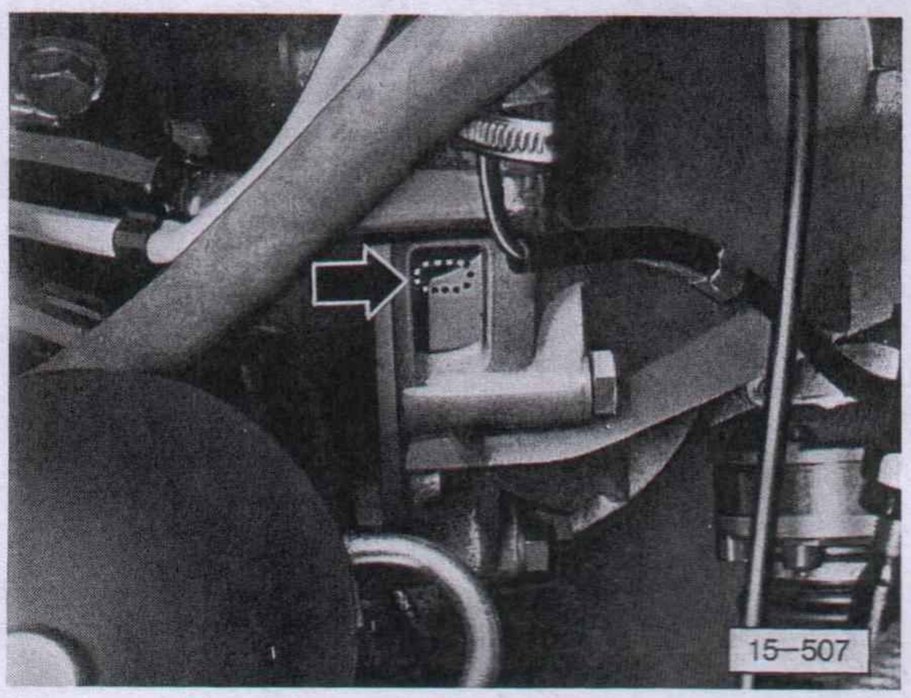
– Remove upper radiator cowling.



– Remove air duct and hose for cooling fan for injectors.



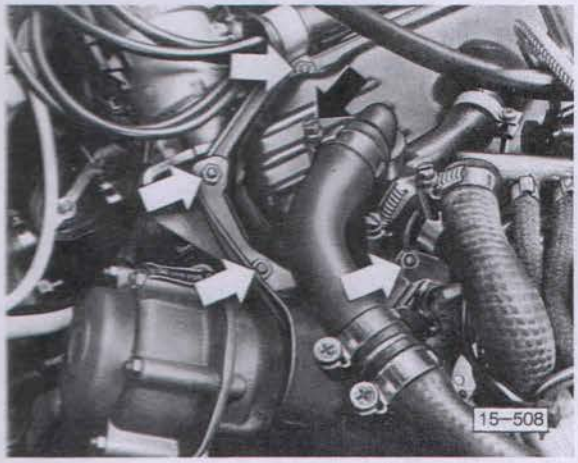
– Remove upper toothed belt guard.



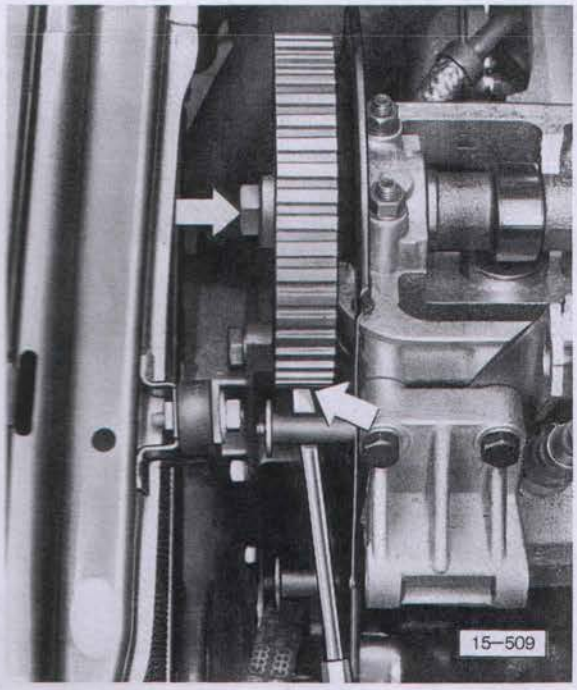
– Set crankshaft to TDC by engaging 4th gear and pushing vehicle.



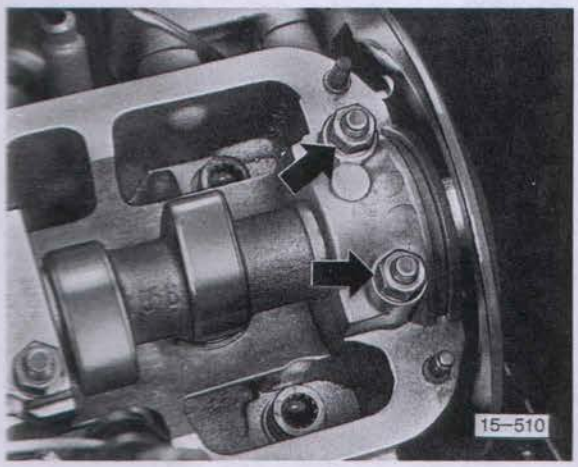
– Slacken toothed belt and remove: to do this slacken water pump mountings and turn pump downwards by inserting screwdriver through opening for hose in radiator cowling.



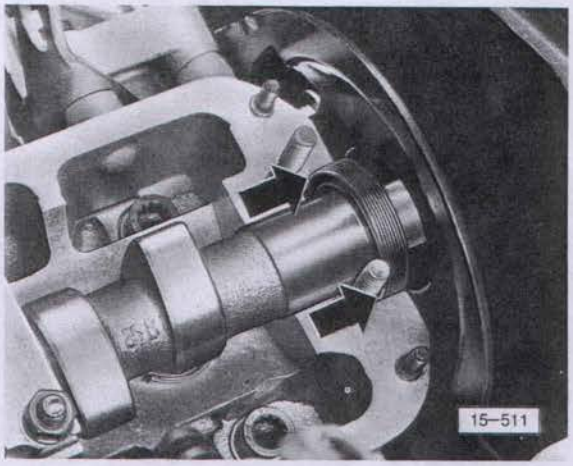
– Remove cover from waste gate.



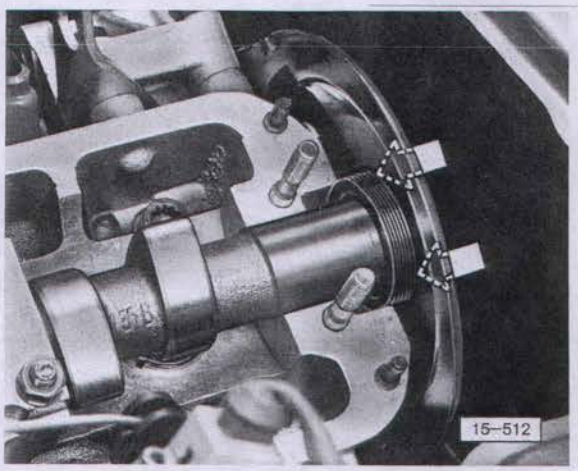
– Loosen camshaft sprocket mounting by holding sprocket against pin.
– Remove camshaft sprocket and woodruff key.



– Detach no. I camshaft bearing cap.



– Press out oil seal by hand.



– Press in new oil seal by hand.

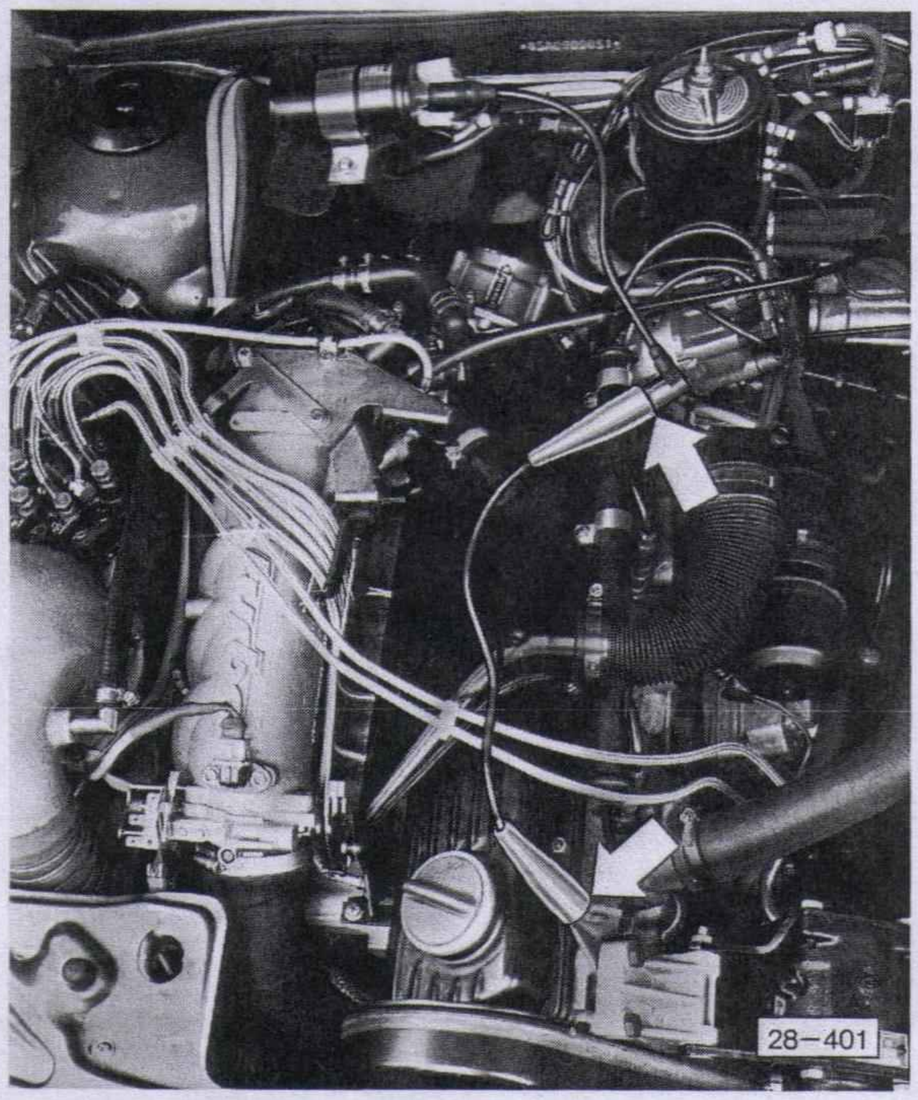
Note:
When installing the camshaft sprocket the part number on the sprocket must face the cylinder head.

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WR. 23.

MEASURING COMPRESSION PRESSURES

– Engine oil temperature at least 30° C.



– Disconnect high tension lead from terminal 4 on distributor and earth it with a length of wire.

– Measure compression at starter cranking speed with throttle fully open.

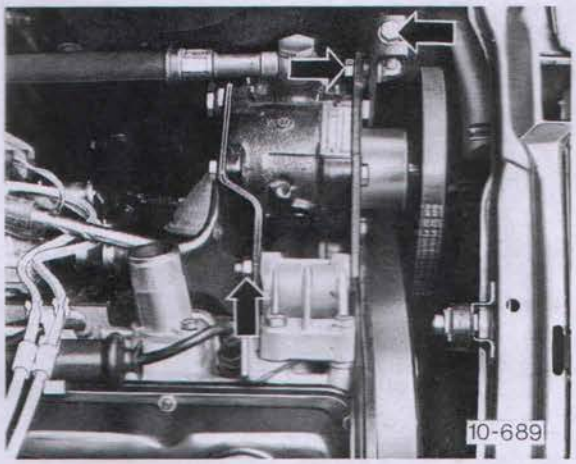
Specified compression pressure: 7 – 9 bar

Wear limit: 5.0 bar

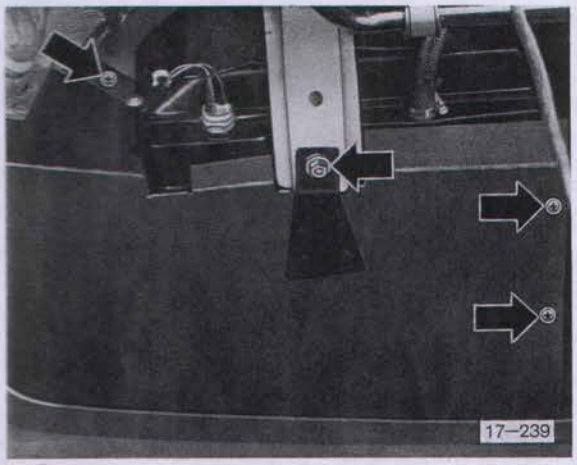
Maximum difference between cylinders: 2.0 bar

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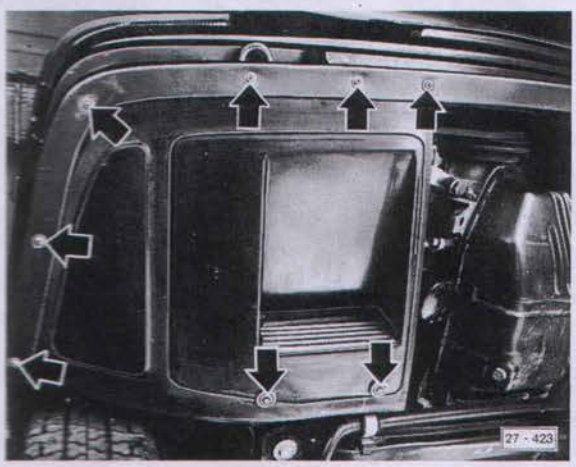
REMOVING AND INSTALLING CRANKSHAFT OIL SEAL – PULLEY END



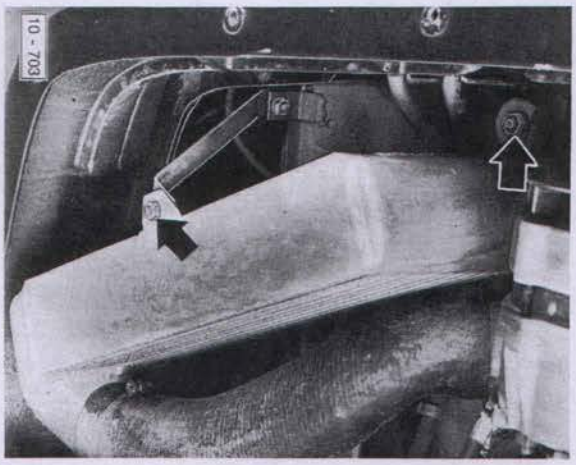
– Remove impeller pump for power assisted steering after slackening and removing V-belt. Leave hydraulic lines connected.
– Place impeller pump clear to one side.
– Remove upper radiator cowling.



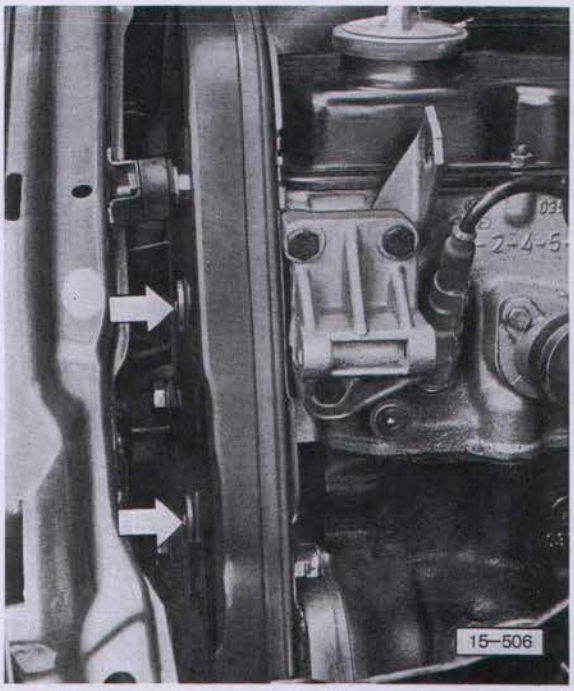
– Remove lower radiator cowling.



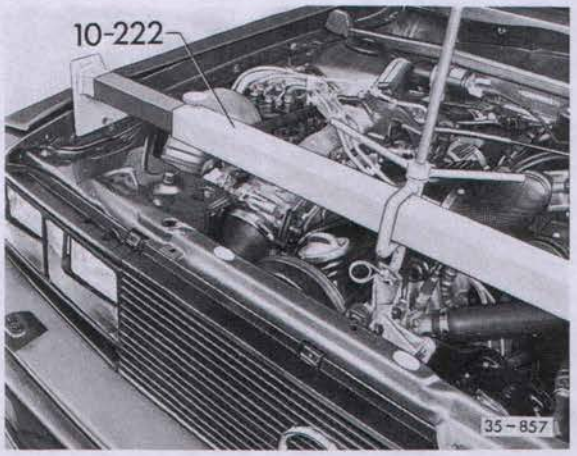
– Remove air guide for oil cooler.



– Remove charge air cooler.
– Remove front spoiler, see page 113.

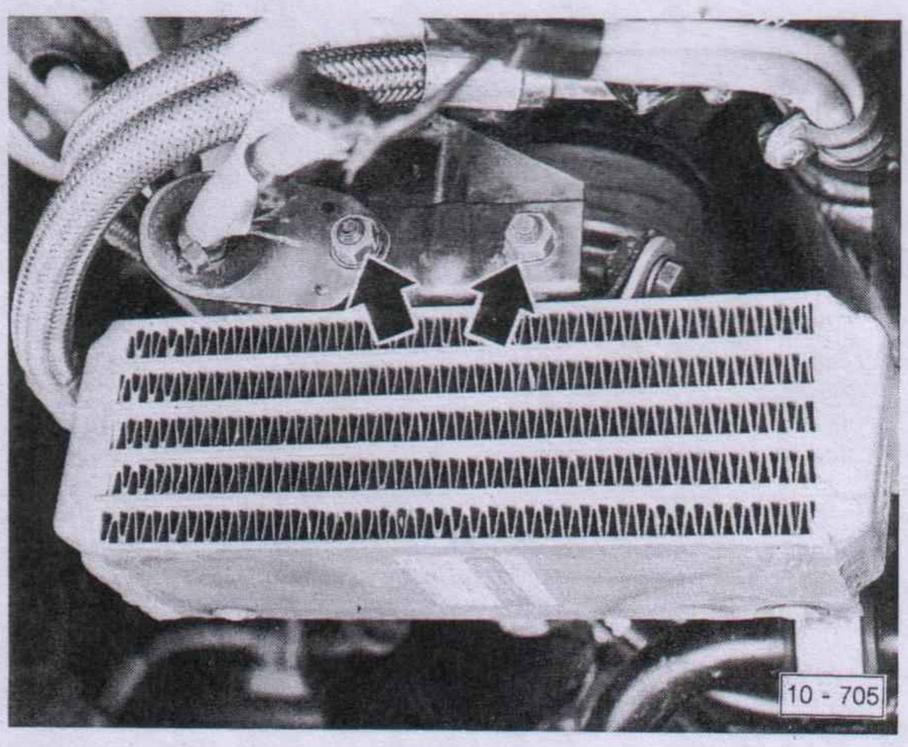


– Remove upper toothed belt guard.

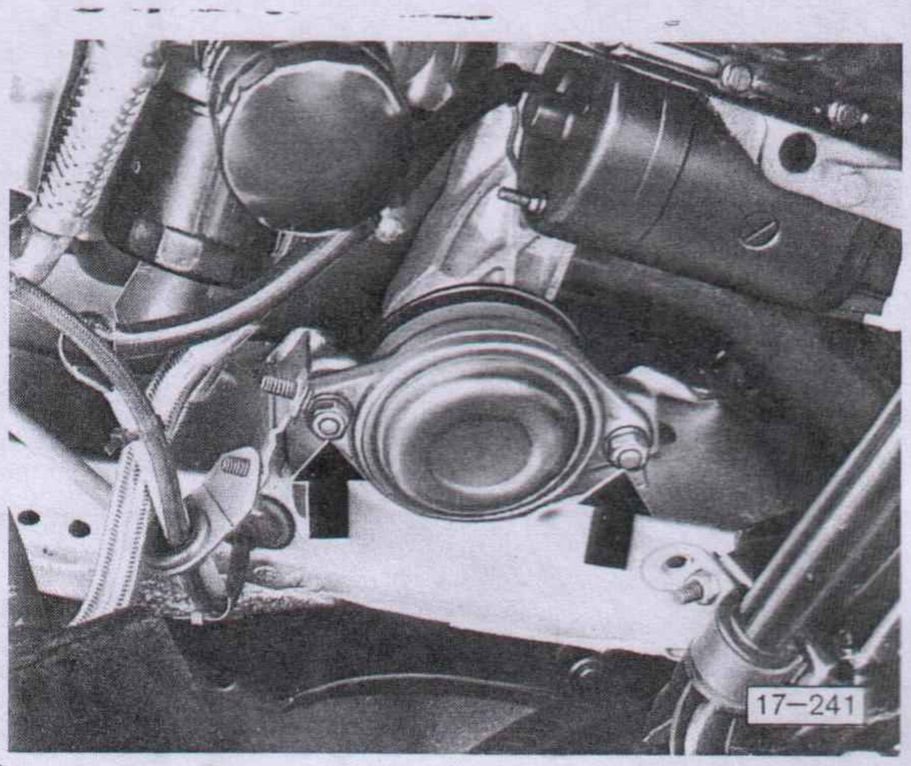


– Position engine support bracket 10-222.

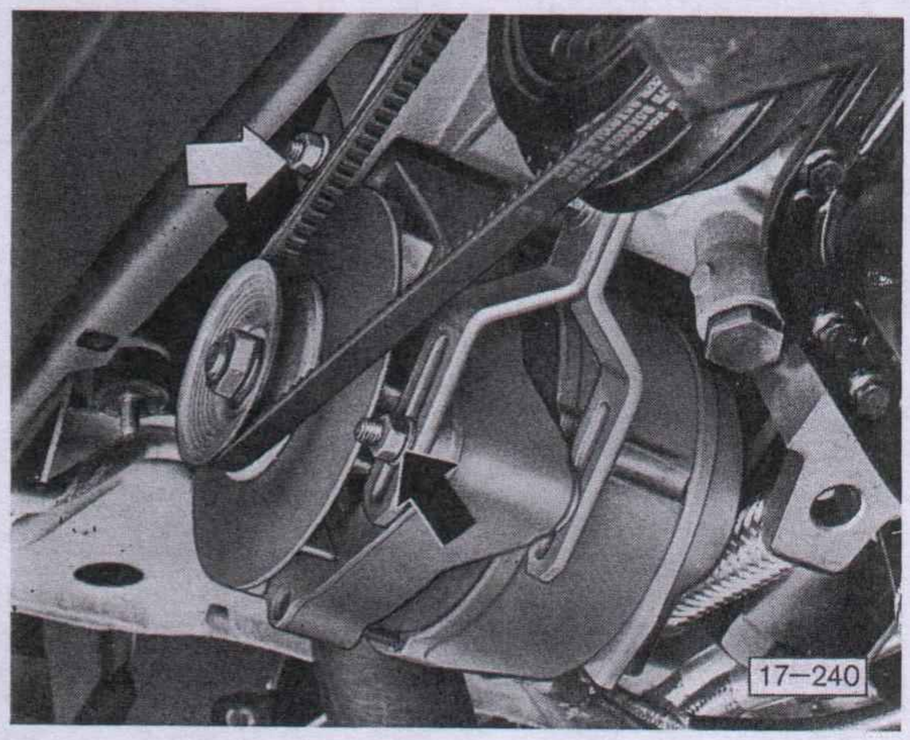
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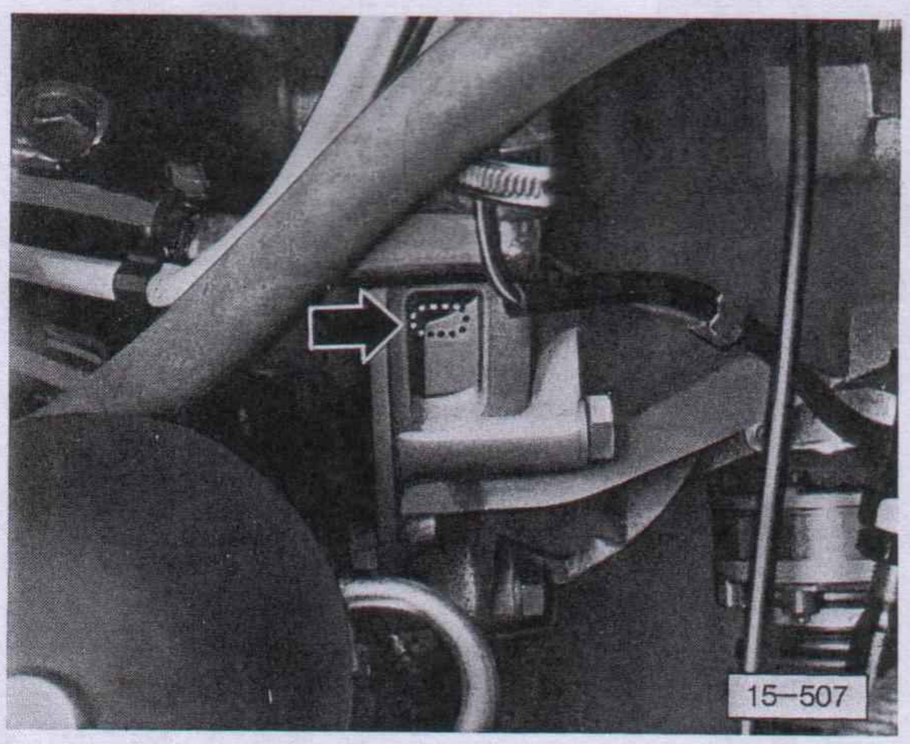
– Detach oil cooler.
Leave oil lines connected.



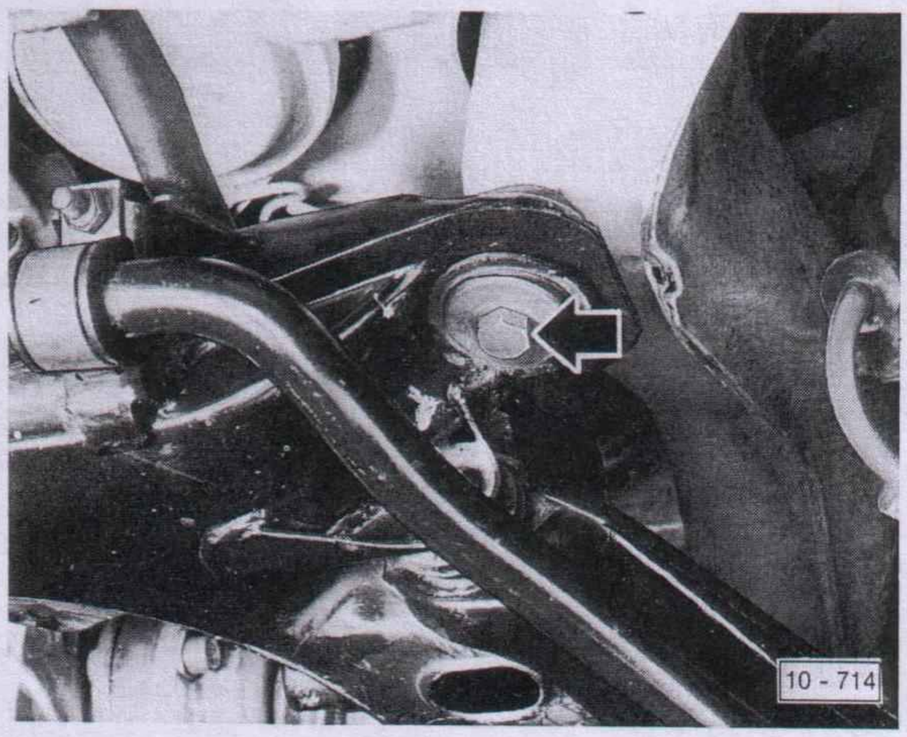
– Detach front engine mounts left and right.
– Remove upper radiator cowling.



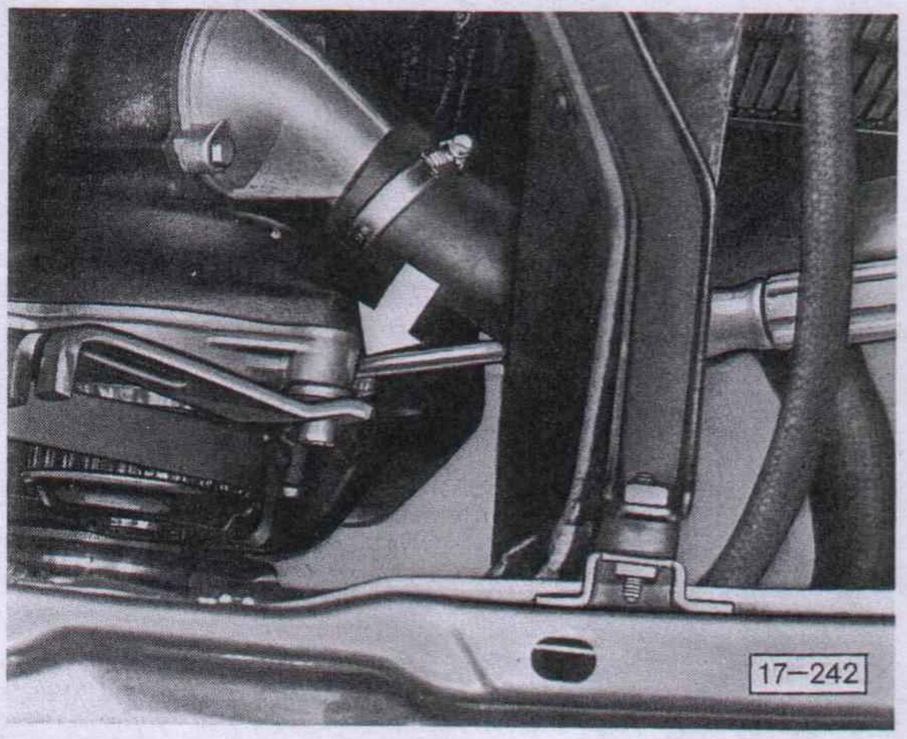
– Slacken and remove alternator V-belt.



– Set crankshaft to TDC marking.
– Remove lower toothed belt guard.



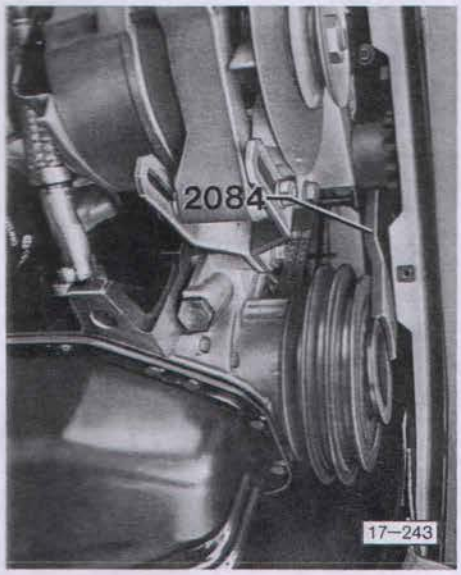
– Remove front subframe mounting bolts left and right.



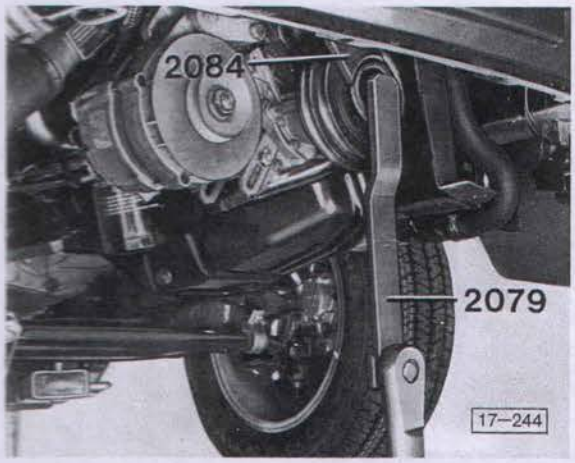
– Slacken toothed belt and remove from camshaft sprocket: to do this slacken water pump mountings and turn pump downwards by inserting screwdriver through opening for hose in radiator cowling.
– Lower engine.

16 Removing and installing crankshaft oil seal – pulley end

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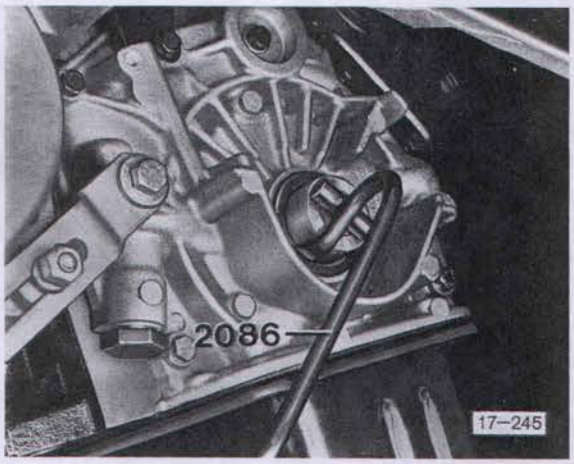


– Fit retaining plate. When tightening, reposition retaining plate against engine support accordingly.

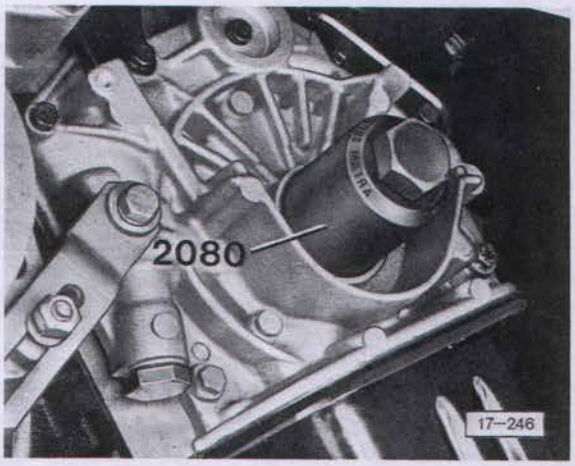


– Remove vibration damper.

Important
Tightening torque 350 Nm: this only applies when the extension 2079 is used. The extension must be in line with the torque wrench. Apply sealing compound, Part No. AMV 188 000 02, to the bolt threads, the seating surface on the bolt head and the seating surface of the sprocket.



– Extract crankshaft oil seal – pulley end.

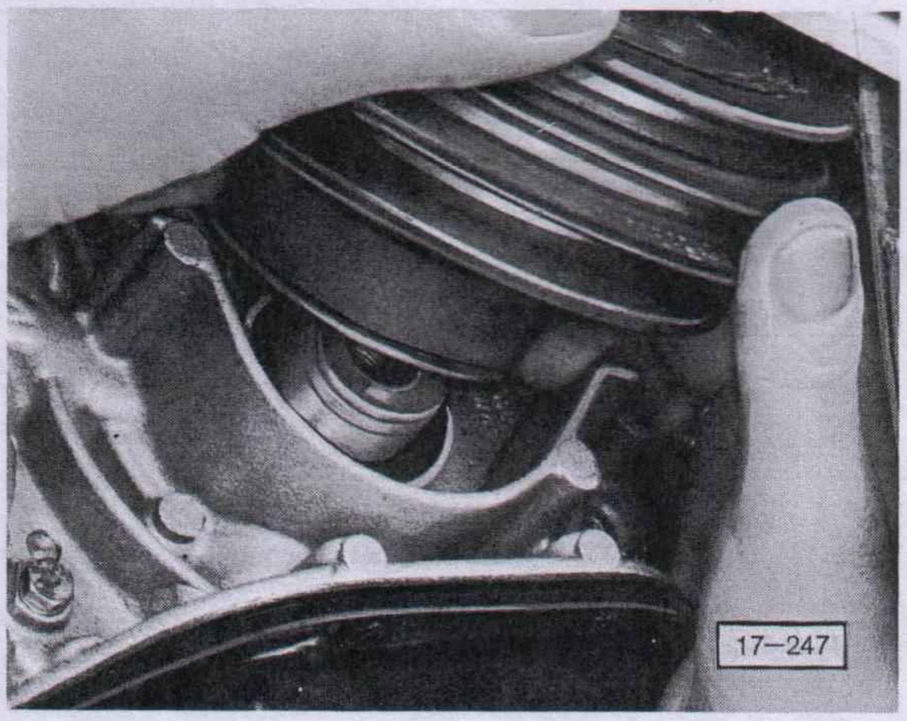


– Press in crankshaft oil seal – pulley end – until flush. Use vibration damper mounting bolt.

Note:
Lightly oil the sealing lip and outer rim of the oil seal before pressing it in.

Important
If the crankshaft is scored, the oil seal should be pressed fully home.

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– Fit toothed belt on sprocket and fit sprocket with vibration damper on crankshaft.

Caution
When fitting the vibration damper make sure that the toothed belt is not caught between the oil pump and the sprocket.

OIL CAPACITIES

Without filter replacement = 3.5 litres

With filter replacement (both oil filters) = 4.0 litres

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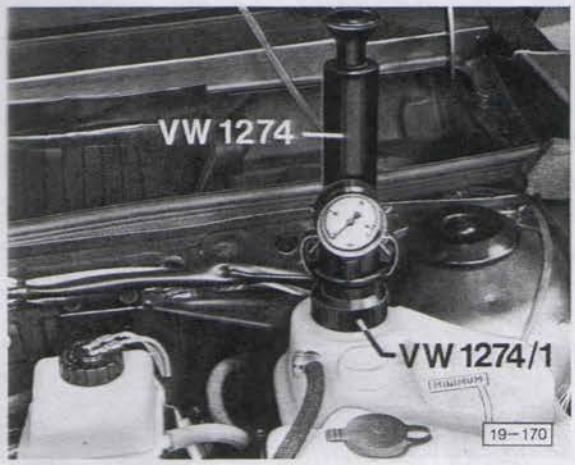


Fig. 1 Cooling system – checking for leaks

Always check with engine warm.
Test pressure: 1.35 bar

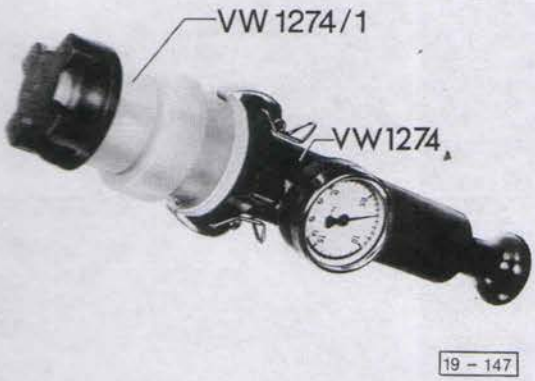


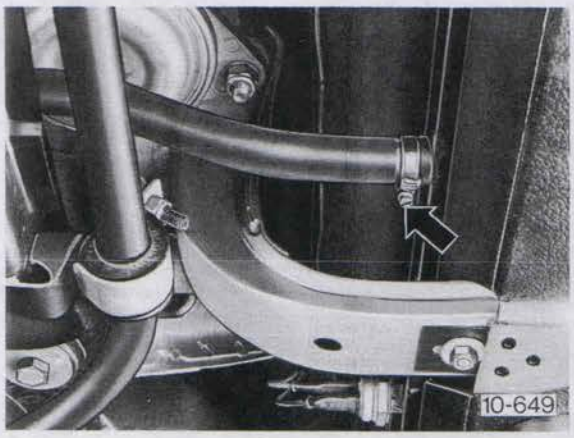
Fig. 2 Checking pressure relief valve in cap

Valve opens at 1.20 – 1.35 bar.

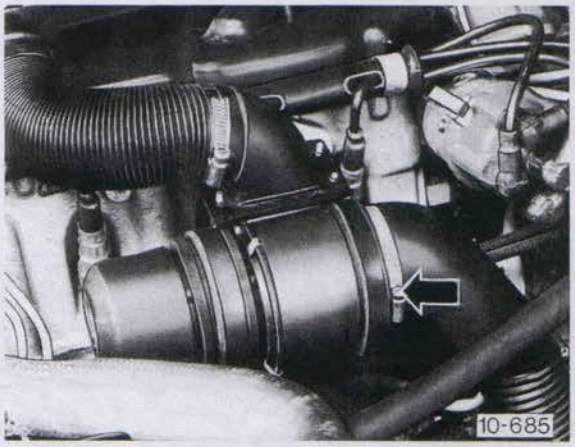
DRAINING AND FILLING COOLING SYSTEM

Draining:
– Set heater control to – WARM –.
– Take cap off expansion tank.

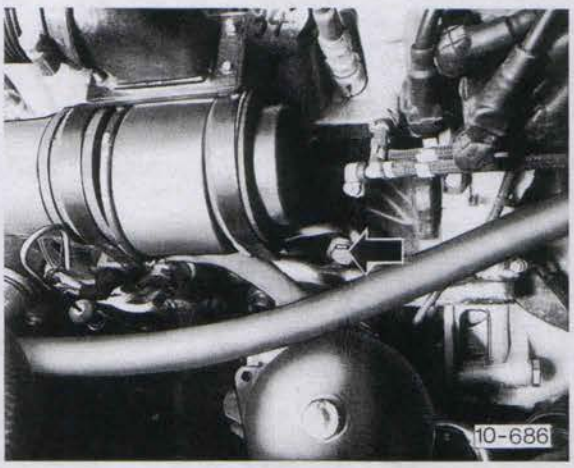
Note:
The coolant contains –G 10– additive so it should be drained into a container and kept for re-use.



– Drain coolant by detaching bottom hose from radiator.

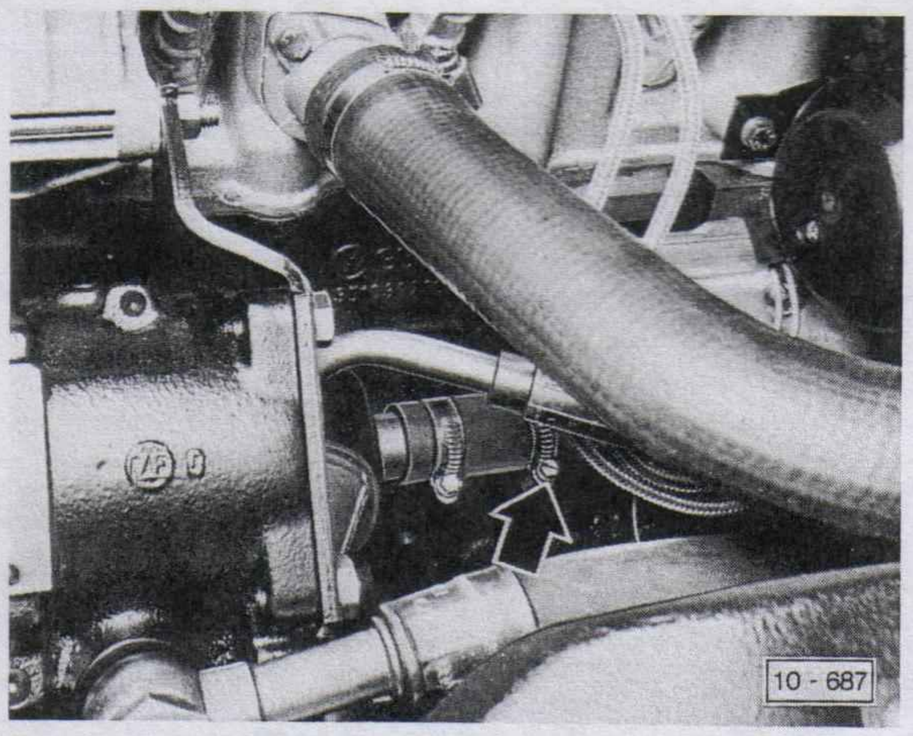


– Remove intake hose for cooling fan for injectors



– Remove mounting bolt on coolant pipe.

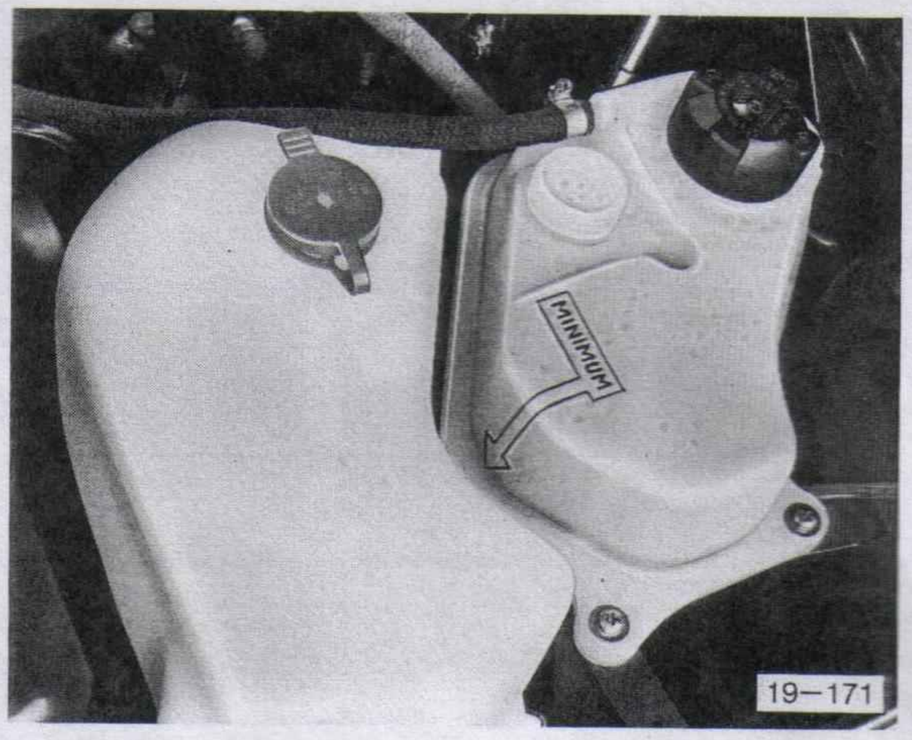
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– Detach coolant hose from coolant pipe.

Filling cooling system:
The cooling system is filled at the factory with a mixture of water and –G 10– antifreeze/corrosion inhibitor.
This protects the system from frost and corrosion and prevents scaling. The additive also raises the boiling point of the water.
In countries with a tropical climate the higher boiling point of the coolant mixture is an aid to reliability in service.
For these reasons the cooling system must always be filled throughout the year with –G 10– additive and water.

– Set heater control to – WARM –.
– Put coolant in until expansion tank is full.
– Fit cap on expansion tank.
– Run engine until radiator fan cuts in.



– Check coolant level in expansion tank and top up if necessary.
When the engine is warm the coolant level should be slightly over the "minimum" mark (above the tip of the arrow); when the engine is cold the level must be at least up to the "minimum" mark.

ANTIFREEZE CONCENTRATIONS

Frost protection down to °C	G 10 (amount in litres)	Water (amount in litres)
– 25	approx. 3.7	approx. 5.6
– 30	approx. 4.2	approx. 5.1
– 35	approx. 4.65	approx. 4.65

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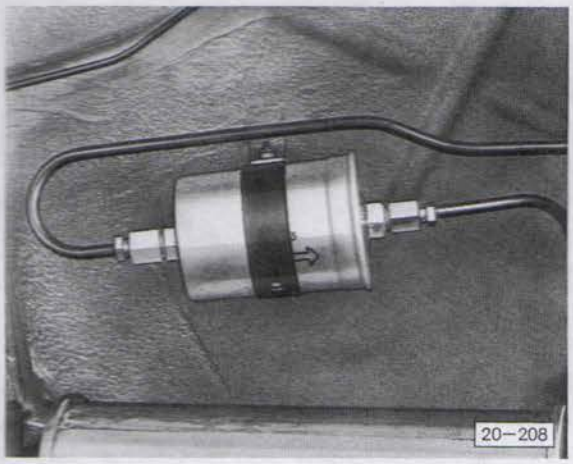


Fig. 1 Position of fuel filter (for fuel distributor)

On underside of vehicle, right hand side at the rear
Arrow points in direction of flow to fuel distributor.

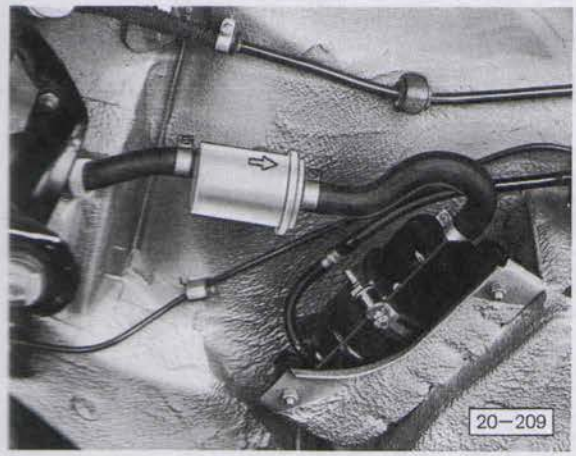


Fig. 2 Position of fuel filter (for fuel pump)

On underside of vehicle, left hand side at the rear
Arrow points in direction of flow to electric fuel pump.

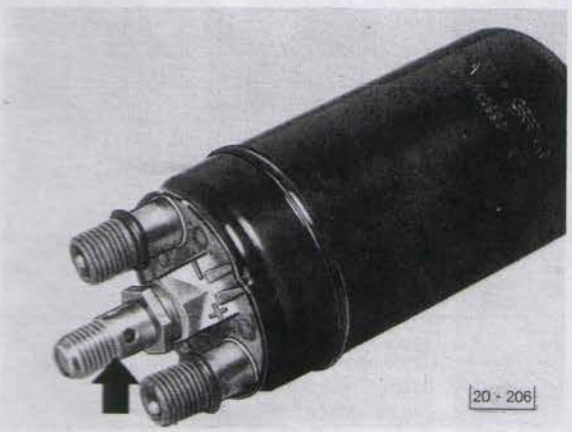


Fig. 3 Renewing non-return valve

Important Do not clamp electric fuel pump in vice.

– Tightening torque: 20 Nm

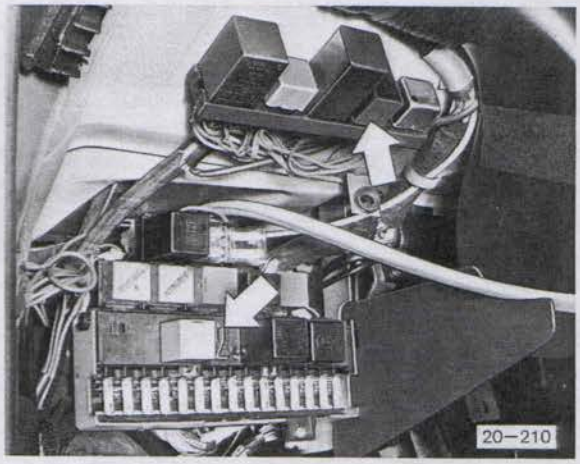


Fig. 4 Position of fuel pump relay

In relay holder (arrow).
A contact bridge is fitted in socket L of the central relay plate. Do not remove this bridge.

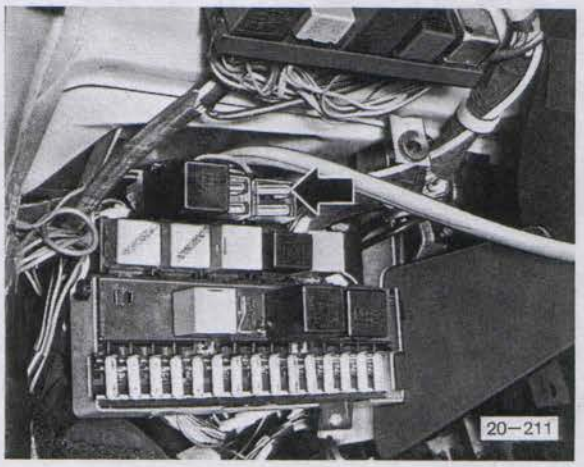


Fig. 5 Position of fuse (16 amps.) for electric fuel pump

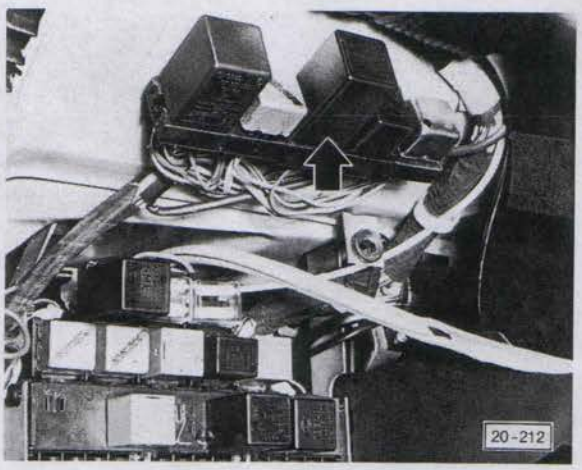


Fig. 6 Position of timing relay

This relay controls the injection pulses of the cold start valve.

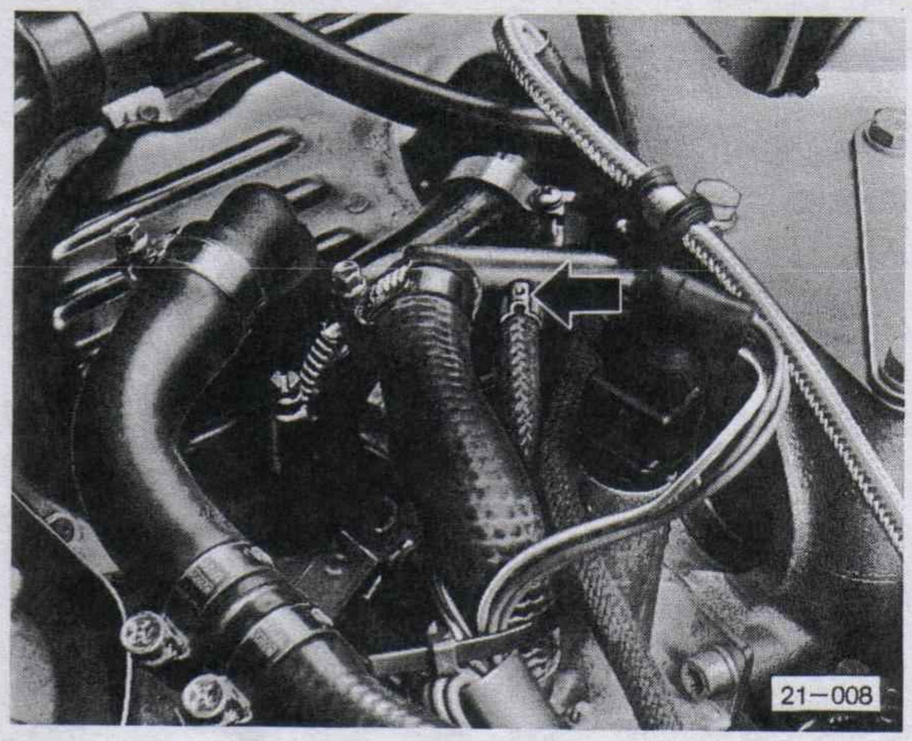
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CHECKING TURBOCHARGER AND WASTE GATE

This test involves measuring the boost pressure.

Note:
The boost pressure is measured at full throttle with the vehicle on the road.
Do not take longer than 10 secs. for each measurement.

> **Important**
> The boost pressure can also be measured on a chassis dynamometer, but the propellor shaft **must** be removed before the test.

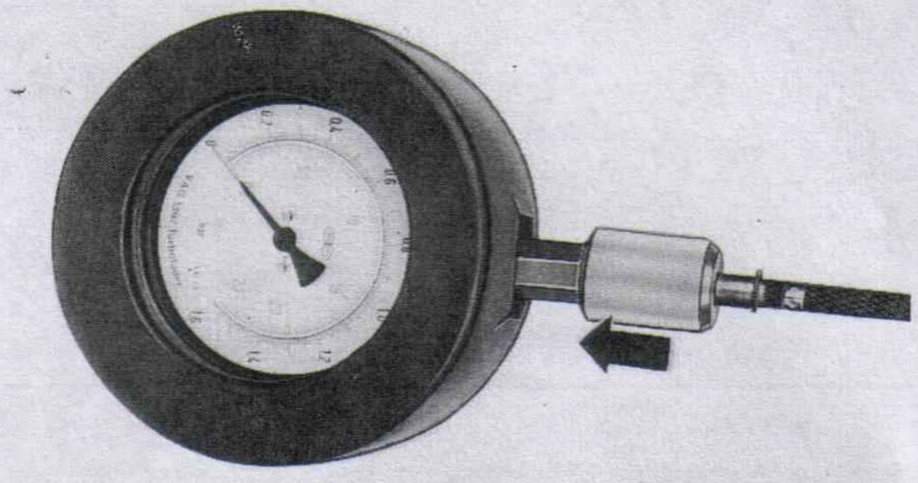


– Disconnect vacuum hose from connector on intake manifold.
– Connect pressure gauge – V.A.G 1397 – between disconnected vacuum hose and connector on intake manifold using T-adaptor.

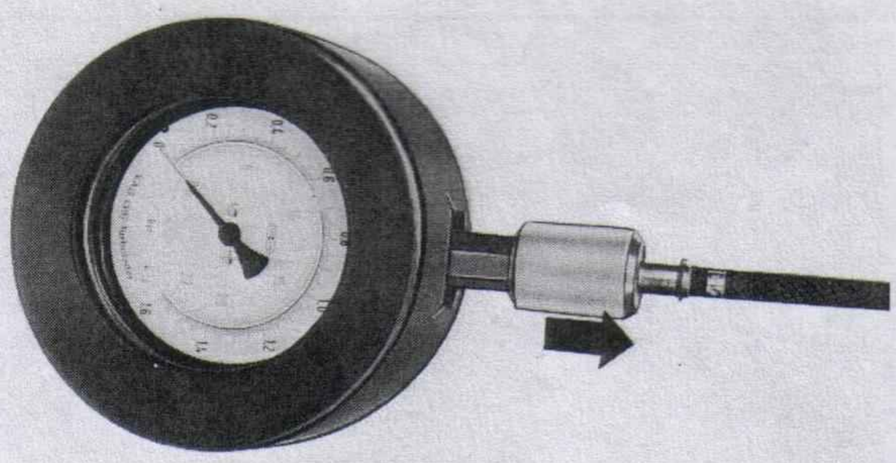
Caution
Do not use the boost pressure gauge fitted as standard as part of the vehicle's instrumentation. This gauge is not suitable for measuring boost pressure in order to test components.



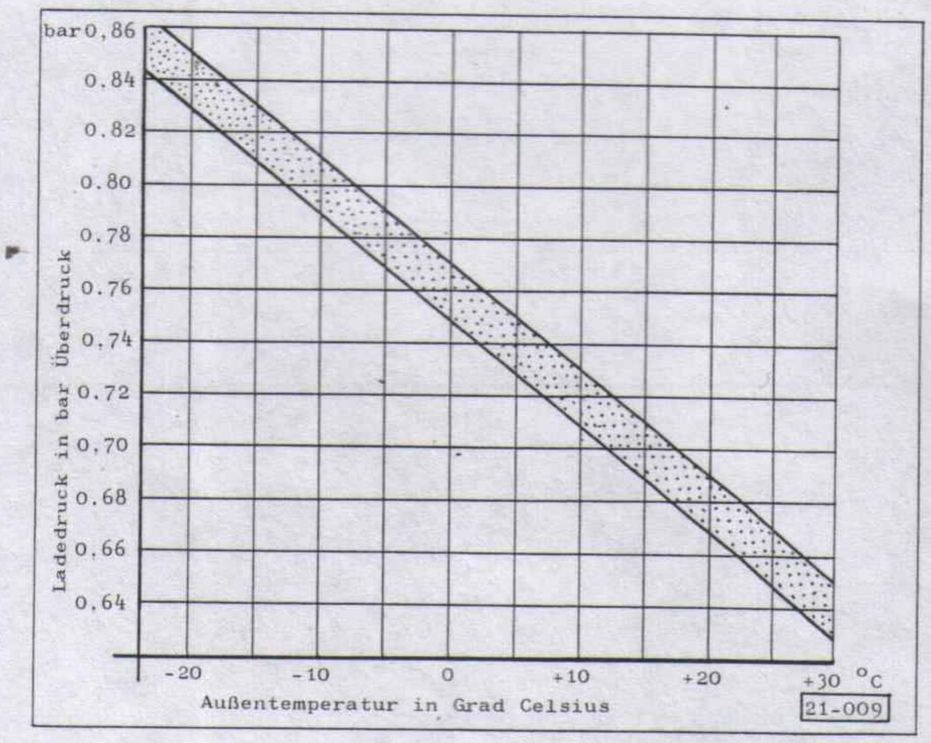
– Place pressure gauge – V.A.G 1397 – on front passenger's seat, making sure that the vacuum hose is not pinched where it comes out between the engine hood and body.



– Open cutoff valve by pushing towards pressure gauge – V.A.G 1397 –.
– With throttle wide open in 2nd gear apply brakes to bring engine speed down to 5500 rpm.



– Close cutoff valve on pressure gauge – V.A.G 1397 – by pulling valve.

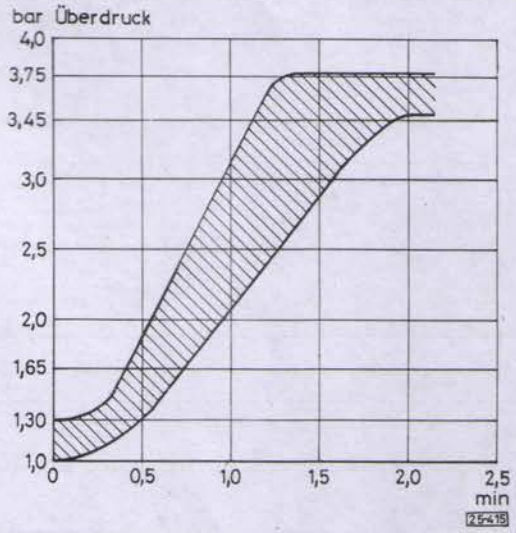


– The boost pressure must be in the specified range, depending on ambient temperature.
If the **gauge readings are as specified,** rectify the fault in the K-Jetronic or ignition system.
If the **gauge readings are not as specified,** try fitting a new waste gate as a test measure.
If the readings are then still not as specified when the boost pressure test is repeated, fit a new turbocharger.

wb 13.

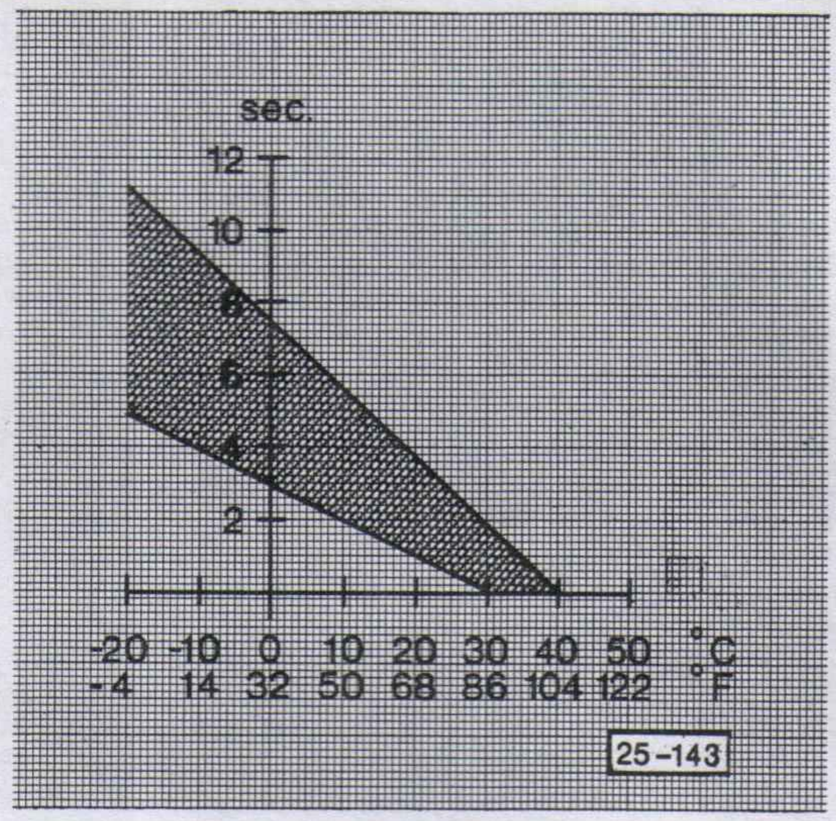
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TECHNICAL DATA – K-JETRONIC FUEL INJECTION

Engine code letters		WR
Control pressure – cold (vacuum hose on warm-up valve connected) (in bar at 20° C ambient temperature)		
Control pressure – warm (Engine oil temperature at least 50° C)		
Vacuum hose on warm-up valve connected	bar	3.40 – 3.80
Vacuum hose on warm-up valve disconnected	bar	2.75 – 3.05
System pressure	bar	5.2 – 6.0
Holding pressure minimum pressure after approx. 10 minutes	bar	2.8
minimum pressure after approx. 20 minutes	bar	2.6
Residual pressure 5 seconds after switching off	bar	3.0

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TECHNICAL DATA – K-JETRONIC FUEL INJECTION

Engine code letters			WR
Thermo-time switch Switch-on time		seconds	
Cold start valve – injection time		seconds	See diagram for switch-on time of thermo-time switch
Warm-up valve Heater coil resistance		Ω	16 – 22
Injectors Maximum variation in delivery rate within one set at idle at full throttle Opening pressure Maximum scatter within one set		 max. ml max. ml bar bar	 3.0 8.0 3.6 – 4.0 0.6
Fuel distributor Delivery rate at idle: test duration, fuel quantity, at full throttle: test duration, fuel quantity		 minutes ml seconds ml	 2 33 30 84
Idle speed* Oil temperature at least 60° C		rpm	900 ± 50
CO content* measured at rear silencer at idle speed and at least 60° C oil temperature		% by volume	1.0 ± 0.2
Fuel octane requirement (DIN 51600)		min. RON	98

*Note adjustment procedures – pages 25,26

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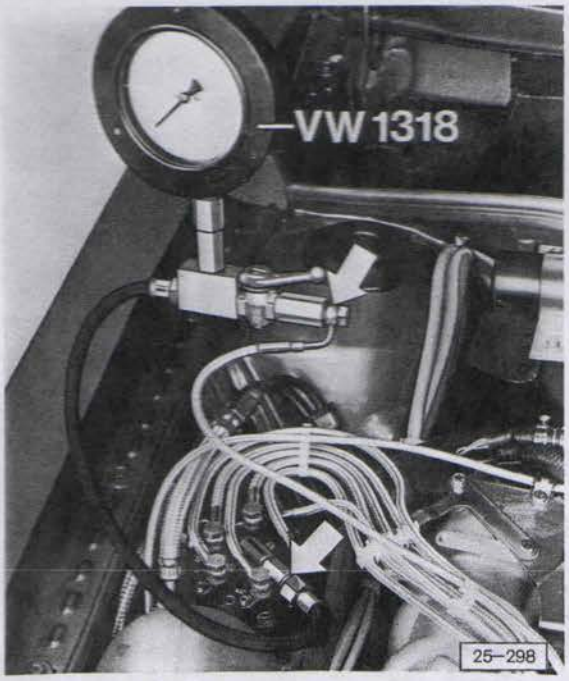


Fig. 1 Connecting pressure gauge

Connect VW 1318 pressure gauge between fuel distributor and control pressure line going to warm-up valve: screw pressure gauge connector into fuel distributor and connect control pressure line to pressure gauge with banjo bolt.

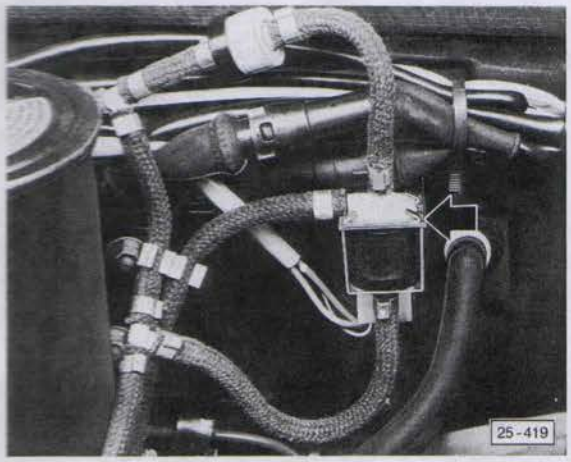
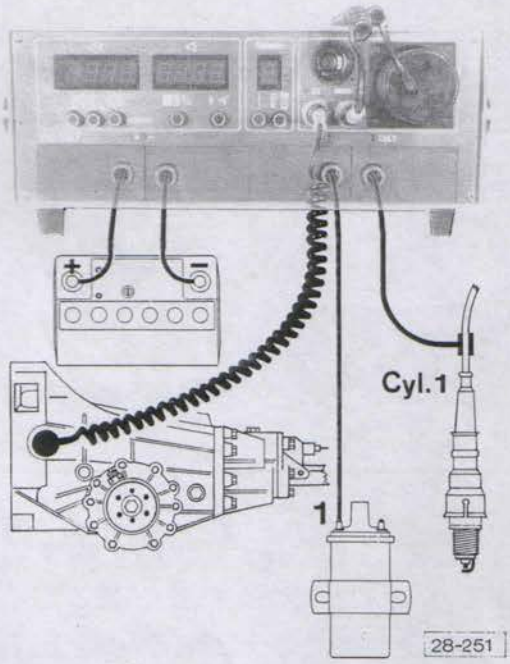


Fig. 2 Position of two-way valve

– The valve is controlled electrically by the switch for full throttle enrichment on the throttle unit, and passes on vacuum to the warm-up valve.

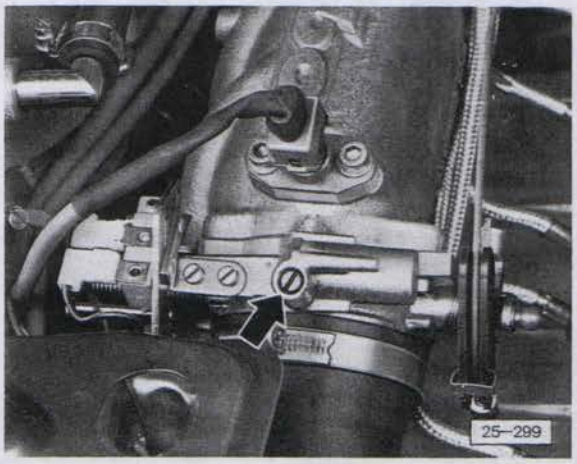
ADJUSTING IDLE SPEED



– Connect tester according to operating instructions.

Note:
Use adaptor for connection to terminal 1 on ignition coil.

– Engine oil temperature at least 60° C.
– High beams switched on, air conditioner switched off.
– Pressure gauge not connected.
– If injector lines have been detached or renewed, the engine must be revved up several times to 3000 rpm and allowed to idle for at least 2 minutes before carrying out the adjustment.

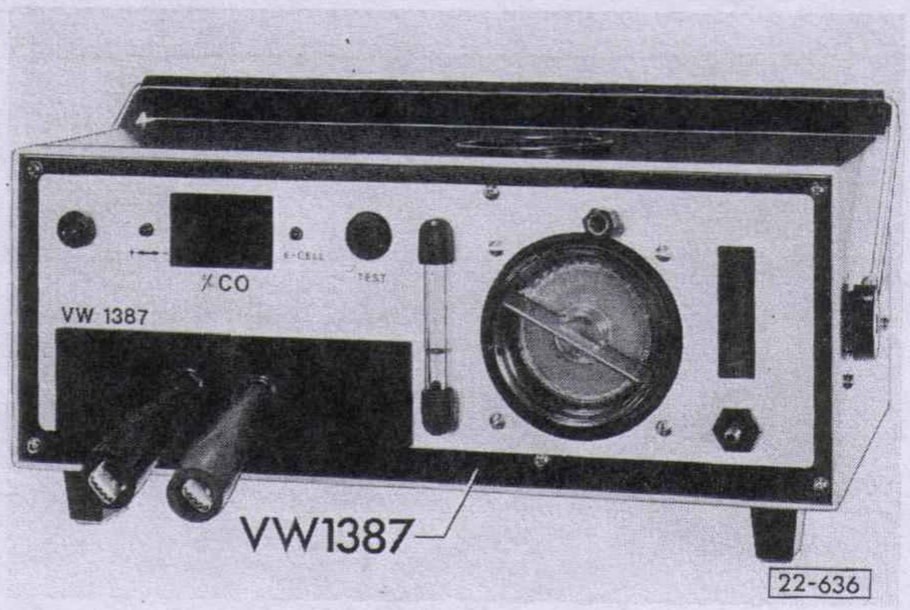


– Adjust idle speed.
Specified idle speed: 900 ± 50 rpm.

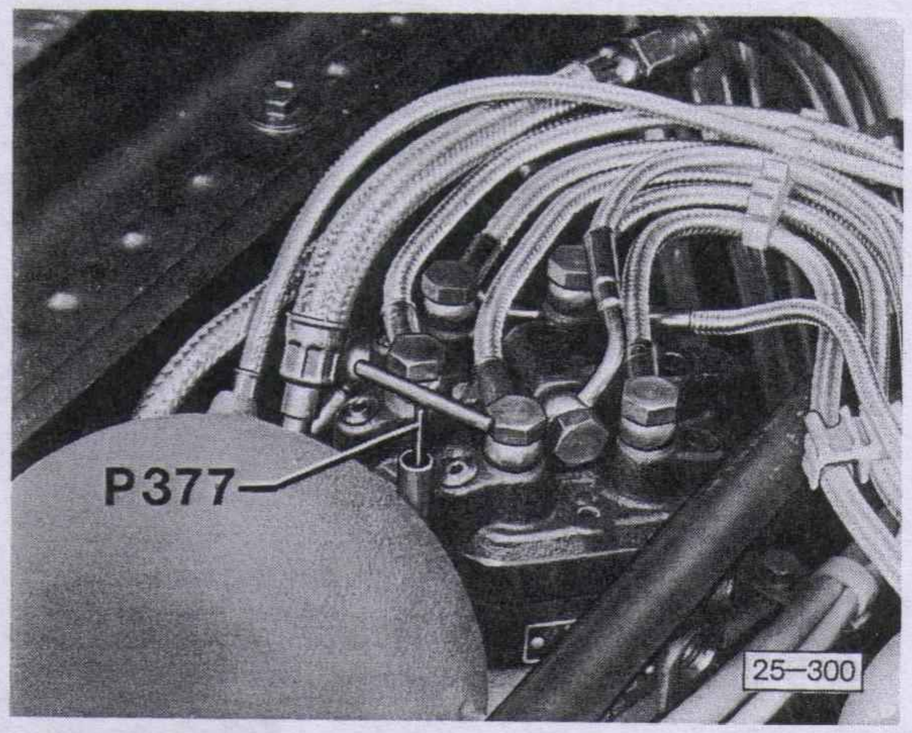
Note:
Radiator fan must not be running when idle speed is being adjusted.
If the idle speed is too high and cannot be adjusted, check idle switch for electronic ignition – page 43

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ADJUSTING CO CONTENT



– Connect tester according to operating instructions.
– Engine oil temperature at least 60° C.
– High beams switched on.
– Air conditioner switched off.
– Check idle speed and adjust as required.



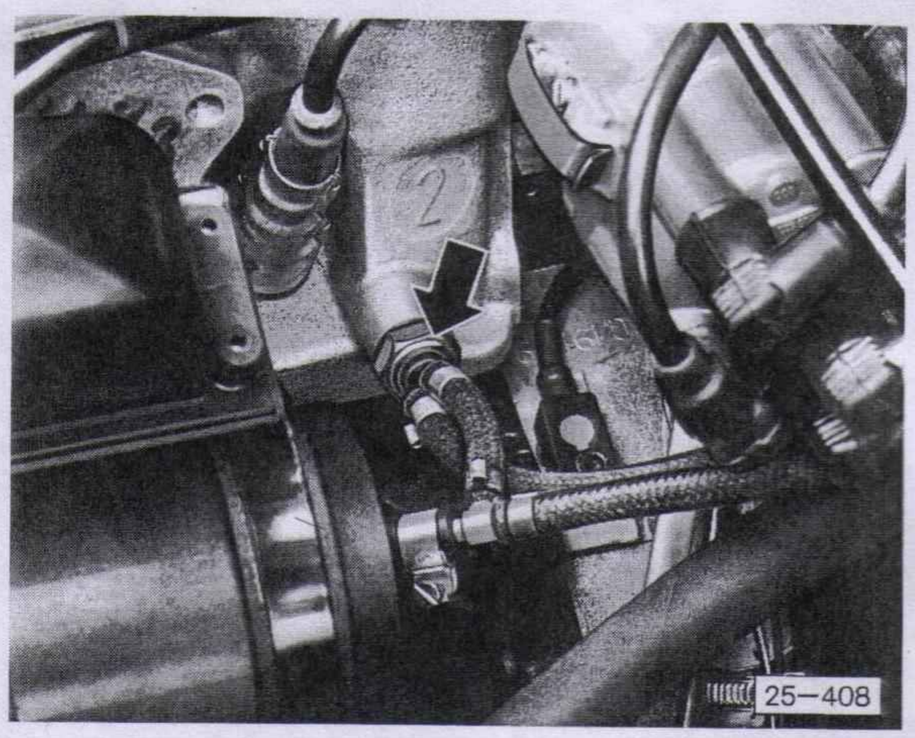
– Adjust CO content, first remove plug/lock cap.
  Turn to the right to increase CO content
  Turn to the left to decrease CO content
  Specification: 1.0 ± 0.2 % by volume
  measured at rear silencer

Note:
The radiator fan should not be running when carrying out the measurement.

> **Important**
> Do **not** press down or lift up the adjusting screw with the key when carrying out the CO adjustment.
> Do **not** accelerate the engine when the adjusting key is inserted (risk of bending components).
> Remove the key immediately after each adjustment and accelerate the engine briefly.

CHECKING THERMOPNEUMATIC VALVE

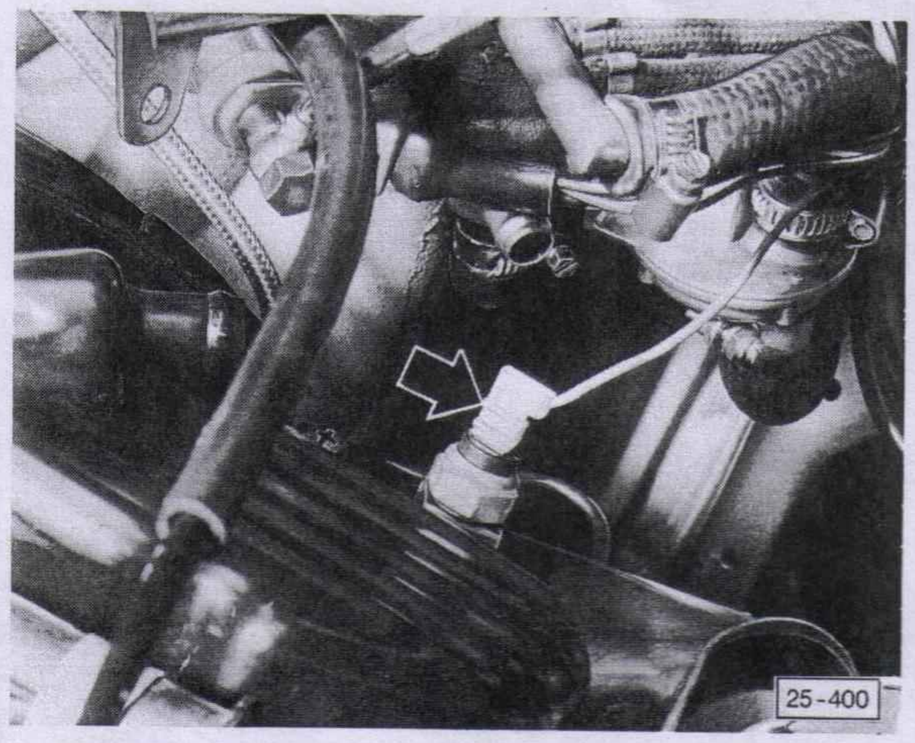
– Engine cold



Up to 58 ± 3° C – open
Above 58 ± 3° C – closed

CHECKING SWITCH FOR COOLING FAN FOR INJECTORS

– Engine cold.

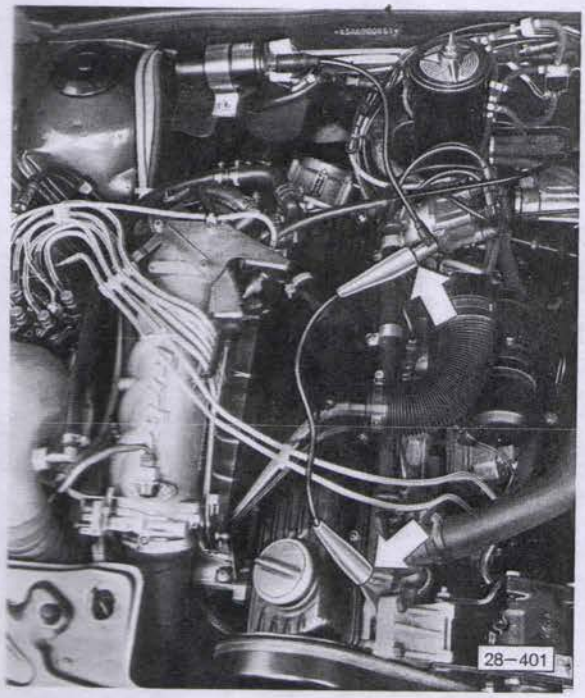


– Disconnect plug from switch for cooling fan for injectors.
– Connect ohmmeter between earth and disconnected terminal on switch.
– Check continuity
  open circuit up to 100° ± 4° C = ∞ Ω
  continuity at temperatures above
  100° ± 4° C = 0 Ω

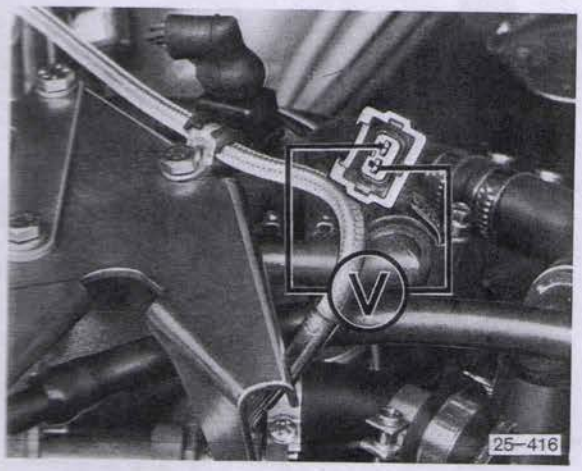
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CHECKING COLD START VALVE

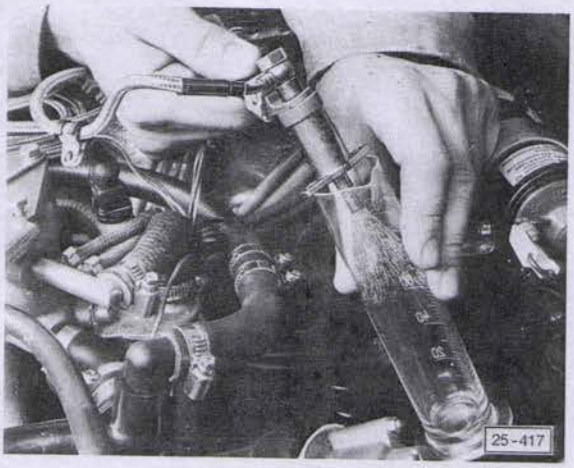
– Engine cold, coolant temperature below 30°C.



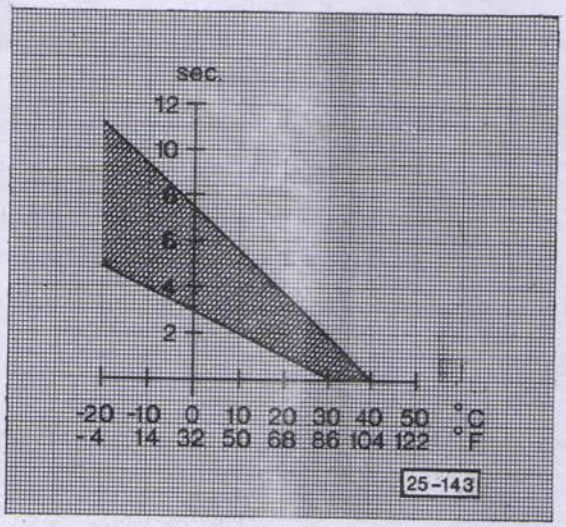
– Disconnect high voltage lead (terminal 4) at distributor and connect to earth using a length of wire.
– Disconnect plugs from warm-up valve and auxiliary air valve.
– Disconnect plug from cold start valve.
– Make sure that plug connector tabs are in correct position (not damaged or bent).



– Check voltage supply with starter motor running.
Specified voltage: at least 11.5 V

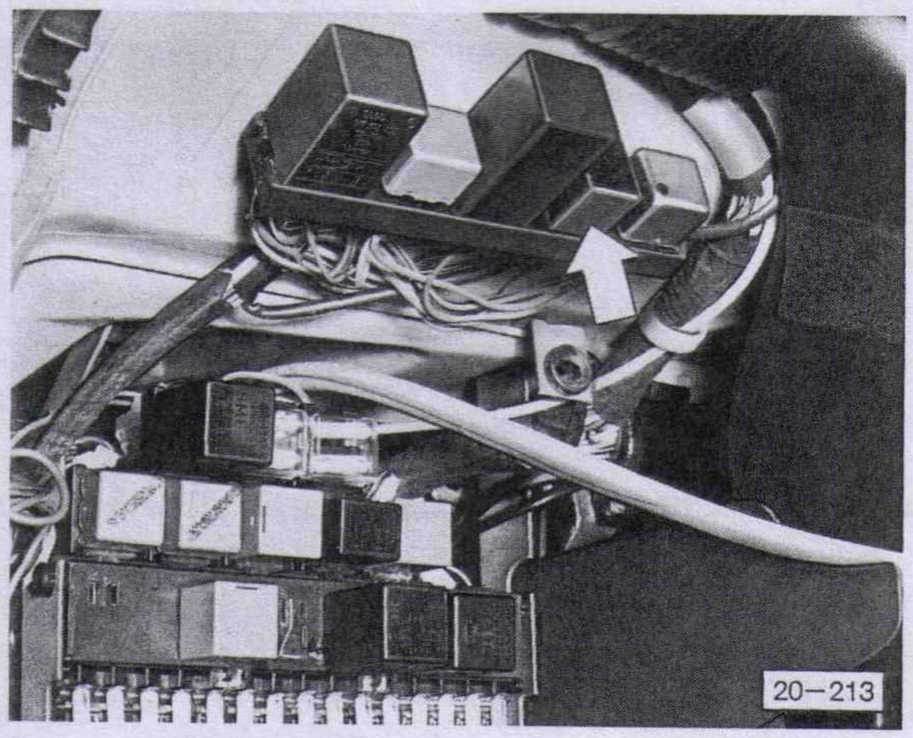


– Remove cold start valve and insert in measuring glass, leaving fuel line connected.
– Connect plug back onto cold start valve.
– Operate starter motor.
The cold start valve must give an even, cone-shaped spray pattern.

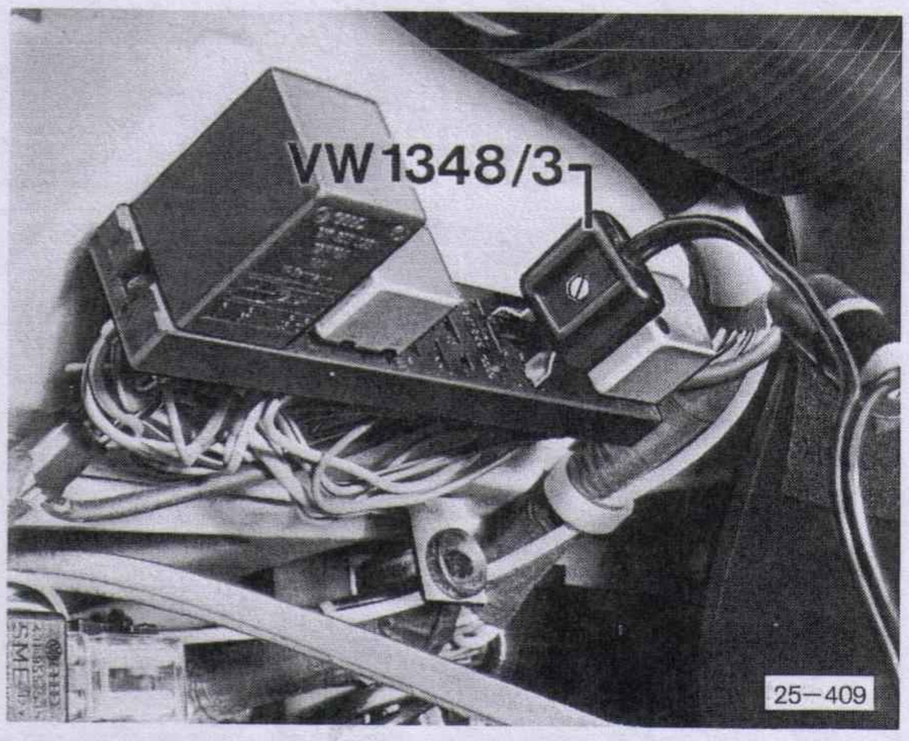


– The initial duration of the spray must be within the appropriate tolerance range for the ambient temperature. After waiting a short time the cold start valve must continue spraying at intervals when the starter motor is operated again.
– Dry off the nozzle of the cold start valve.

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– Remove left hand trim and pull fuel pump relay out of relay holder.



– Insert connector of remote control switch – VW 1348/3 – into contacts in relay holder.

Note:
The relay in the next socket has only been removed to give a clear illustration.

– Place switch near cold start valve (switch is held in place by a built-in magnet).

– Switch on remote control switch – VW 1348/3– and keep button pressed down.

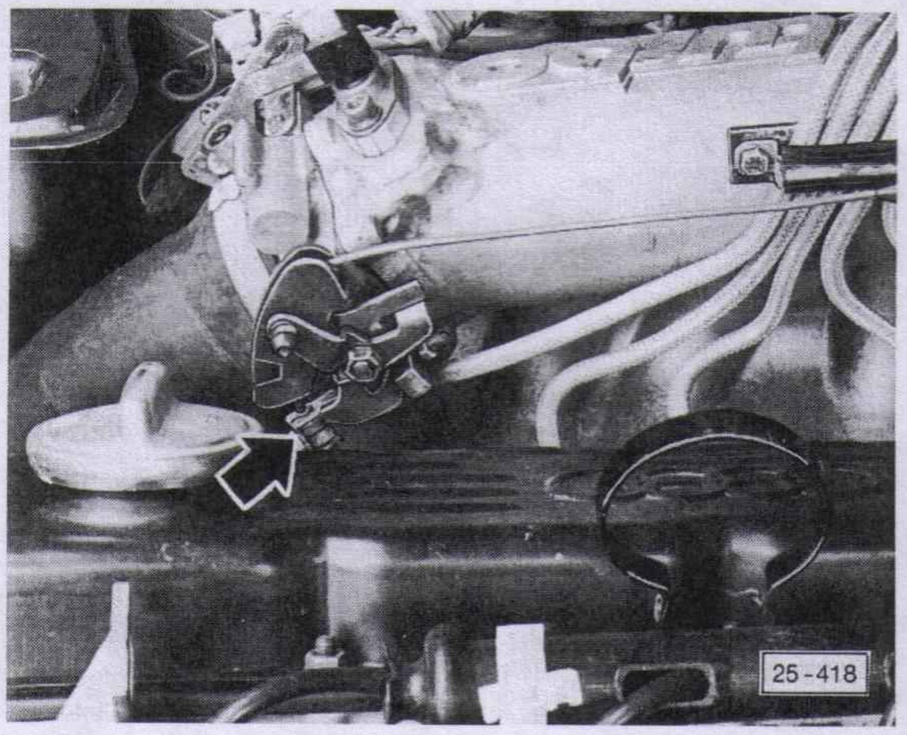
– Observe cold start valve for 1 minute: it must not drip during this time.

ADJUSTING ACCELERATOR CABLE

Caution
The accelerator cable is liable to kink and so must be handled with particular care when installing.
A single, slight kink can cause the cable to break in service.
Do

NOT

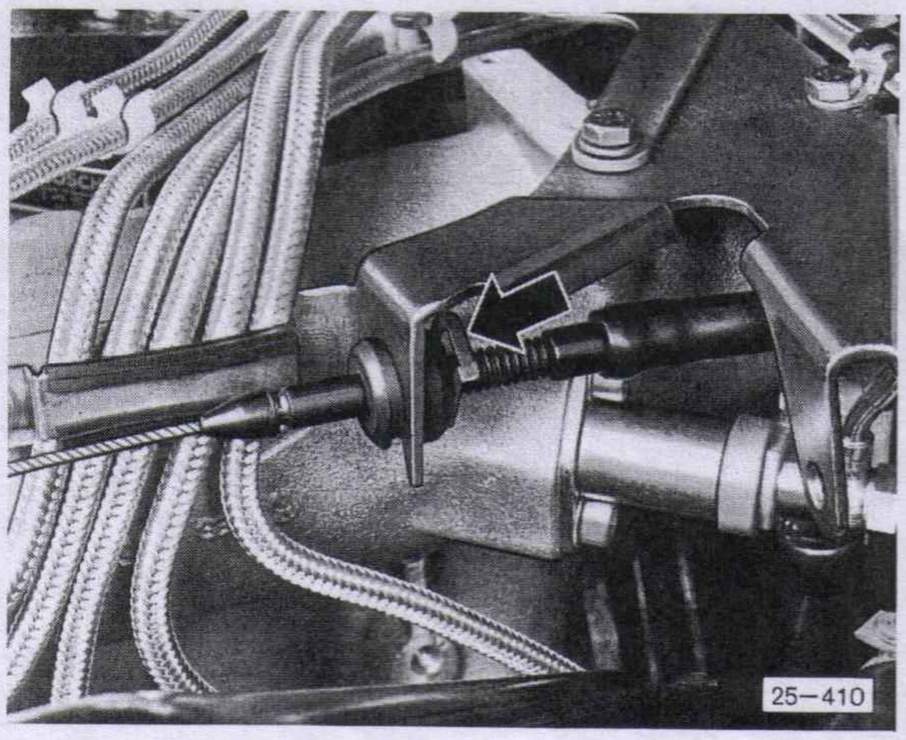
install a cable which has been kinked.
When installing, make sure that the accelerator cable is aligned properly between its support and anchorage points.



– Disengage accelerator cable by releasing lock clip.

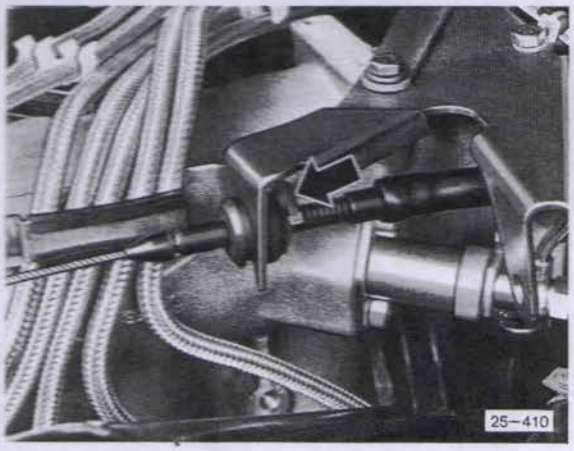
– Set throttle valve to idle position.

– Set accelerator pedal to idle position (distance from full throttle stop to point of contact on pedal = 75 mm).



– Secure accelerator cable to throttle lever (first remove the clip from the retainer).

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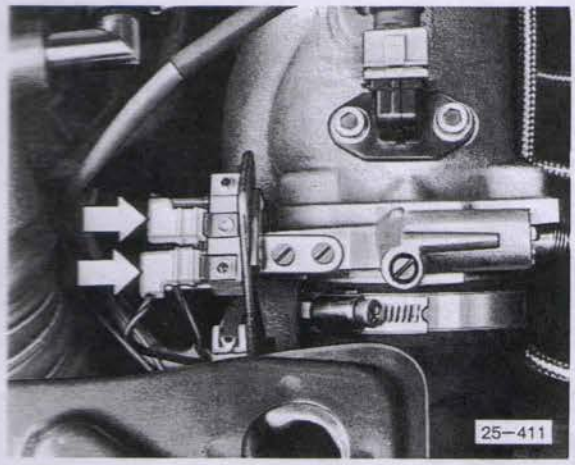


– Adjust accelerator cable by inserting the clip into the appropriate retaining groove (with the accelerator pedal still in the idle position).

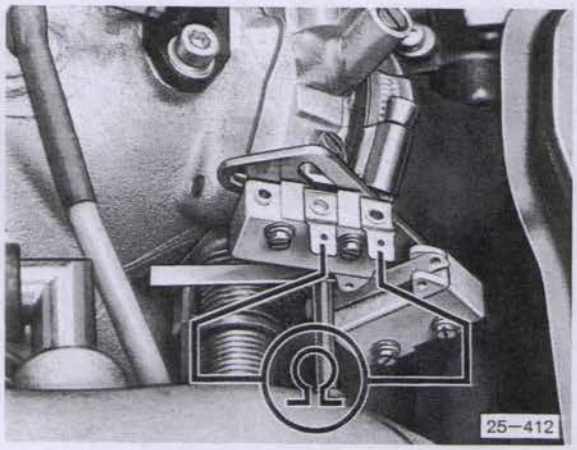
Checking adjustment:
With accelerator pedal at full throttle position there must be a clearance between the throttle lever and its stop

not exceeding 1 mm

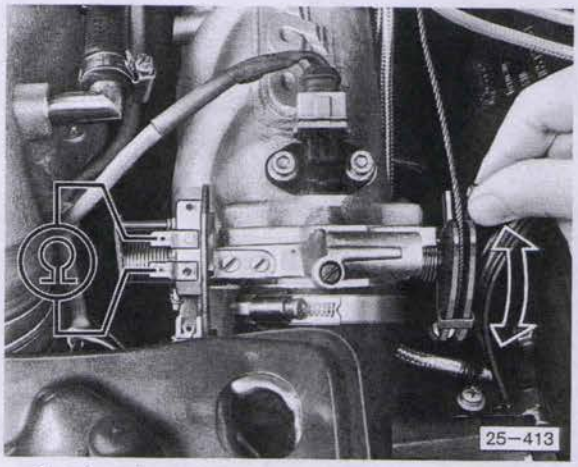
CHECKING AND ADJUSTING SWITCH FOR FULL THROTTLE ENRICHMENT



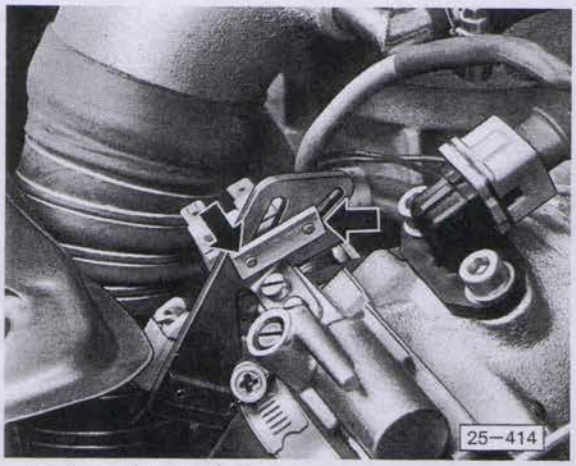
– Disconnect both plugs from switch for full throttle enrichment.



– Connect ohmmeter.
– Set throttle to idle position.
– Measure resistance
Specified resistance: 0 Ω
otherwise renew switch.



– Set throttle to full throttle position.
Measure resistance
Specified resistance: ∞ Ω
otherwise renew switch.

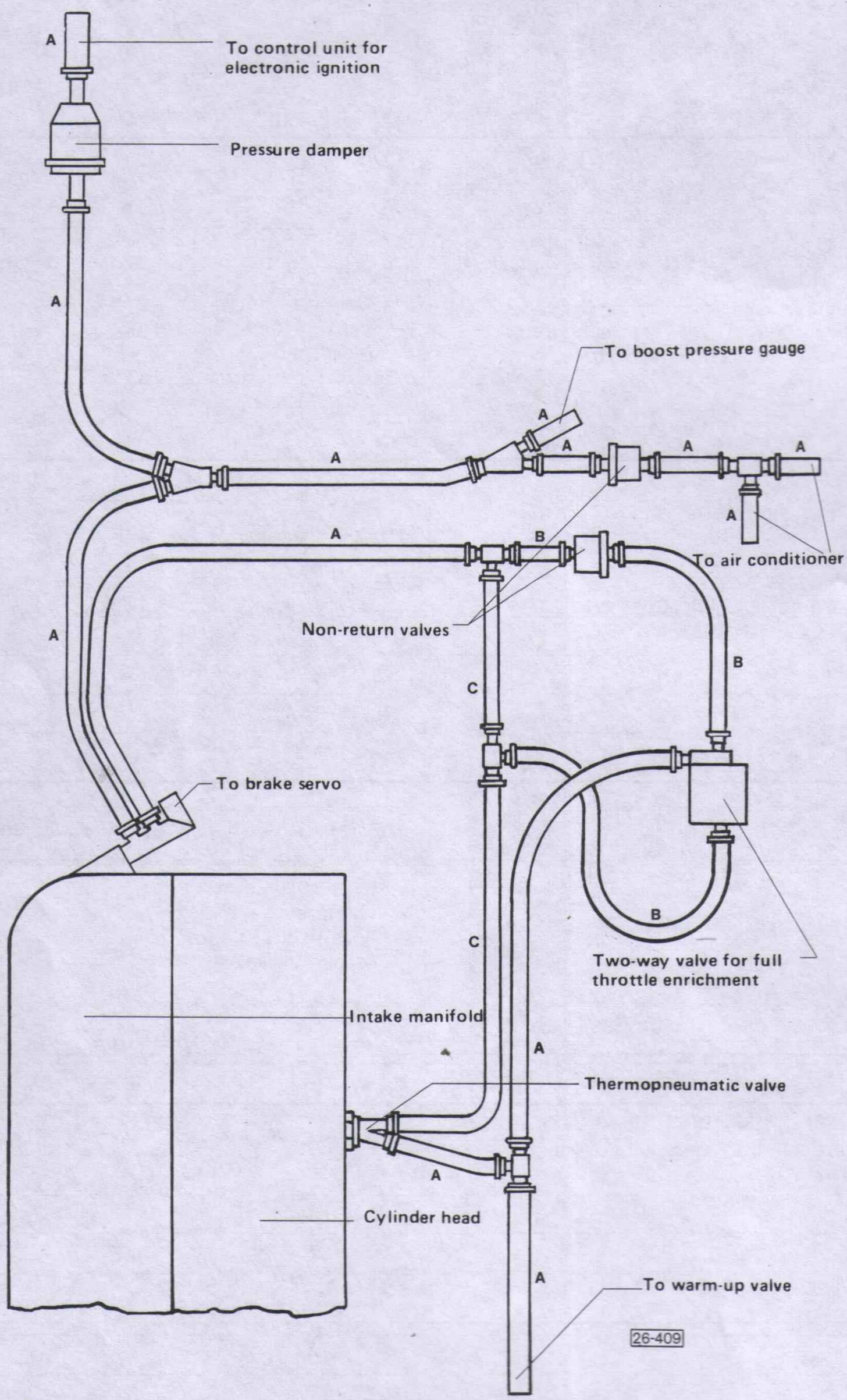


– If the switch for full throttle enrichment is renewed it must be mounted in the lowest position in the slot.

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WB 18,

VACUUM CONNECTIONS



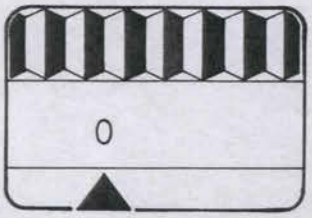
Colours of vacuum lines

A	black
B	grey
C	red

WB 9,

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TECHNICAL DATA – IGNITION SYSTEM

Engine code letters		WR
Gearbox		Manual gearbox
Distributor Part No.		035 905 206 E
Ignition timing* Adjust with engine switched off Marking:		 28-403
Dwell angle	not adjustable	$15^{o} - 50^{o}$ (22% – 70%)
Centrifugal advance, Vacuum advance, Vacuum retard, Digital idle stabilizer.		These functions are controlled by the electronic ignition control unit in accordance with engine speed, intake air temperature, manifold pressure and throttle position. These functions cannot be tested.
Sender unit for ignition timing resistance	K Ω	about 1.0
Sender unit for engine rpm resistance	K Ω	about 1.0
Sender unit for intake air temperature resistance	Ω	13 – 33
Spark plugs	Bosch	WR 5 DS
	Beru	RS 39
	Champion	N 3 G
	Electrode gap mm	0.8 ± 0.1
	Tightening torque Nm	30
Firing order		1 – 2 – 4 – 5 – 3
Rpm limiter incorporated in all-electronic ignition system	Cut-out speed rpm	6750 ± 10
Ignition coil	Secondary resistance K Ω	2.4 – 3.5
	Primary resistance Ω	0.52 – 0.76
Distributor rotor arm	Resistance k Ω	1.0

*Note adjusting procedures – page 36

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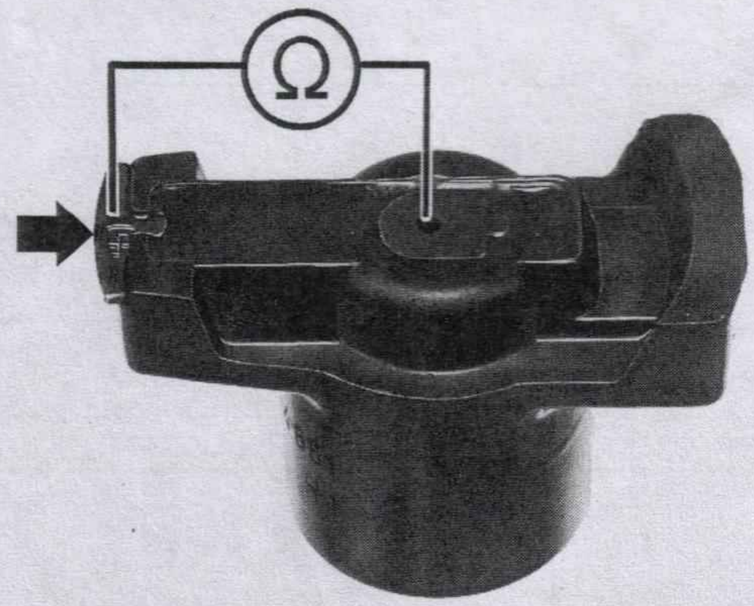


Fig. 1 Checking rotor arm

Specified resistance: approx. 1 k Ω

> **Important**
> When renewing, always use the proper standard part because the contact surface (arrow) on the rotor arm is wider.

SAFETY PRECAUTIONS FOR ELECTRONIC IGNITION SYSTEM

When working on vehicles with the Hall TCI system observe the following precautions to prevent injury and/or serious damage to the ignition system:

- Do not touch or disconnect ignition leads when the engine is running or being cranked by the starter.
- Always switch off the ignition before disconnecting ignition leads.
- Always switch off the ignition before hooking up or disconnecting test equipment (rpm/ ignition tester).
- There can be up to 400 volts on terminal 1 (-); do not connect a suppressor condenser or test lamp to this terminal.
- When the high tension lead (terminal 4) is disconnected from the distributor, always connect it directly to earth using an extension wire, otherwise the engine must not be turned at starter speed (e.g. for testing compression or the Hall TCI control unit).
- A fast charger can only be used to boost starter current for up to 15 seconds at a maximum of 16.5 volts. Wait for at least 1 minute between each starting attempt.
- Do not replace the ignition coil with a conventional type coil.
- Disconnect both sides of the battery before using arc or spot welding equipment.
- If the vehicle is heated to more than 80° C (e.g. paint drying oven, steam cleaning) wait for it to cool down before starting the engine.
- Switch off the engine before washing it down.
- Do not disconnect the battery when the engine is running.
- The HT circuit must be suppressed with at least 2 k Ω , and the rotor arm must have a resistance of at least 1 k Ω .
- If the ignition system is defective the plug on the Hall TCI control unit must be disconnected before the vehicle is towed.
- If it is not certain whether the ignition system is the cause of the failure, disconnect the plug from the Hall TCI control unit as a precaution before towing the vehicle.

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FUNCTION OF ELECTRONIC IGNITION SYSTEM

The ignition system is externally similar to the already familiar Hall TCI system. In addition to the existing components of the Hall TCI system, the electronic ignition system on the Audi Quattro has a control unit.

The control unit (installed under the glove compartment) of the electronic ignition system is the central ignition "processor" which determines the ignition timing and the amount of spark advance or retard.

The control unit receives electrical signals from sender units on the engine for the following parameters:

- Engine rpm (sender unit located in gearbox housing, at top of clutch bellhousing),
- ignition timing mark (sender unit located in gearbox housing, lower left hand side of clutch bellhousing),
- intake air temperature (sender unit located on top of intake manifold at the front),
- throttle position (switch located on throttle unit), the control unit also senses the pressure in the intake manifold via a connecting hose.

From these signals the control unit determines the correct ignition timing for best engine efficiency in accordance with engine condition at any particular time (such as temperature, engine load, etc.)

The control unit also takes over the function of the digital idle stabilizer.

The digital idle stabilizer only operates in the engine speed range between 600 and 940 rpm. It is inoperative at all other engine speeds.

If the engine speed drops below 940 rpm the ignition is made to fire earlier, which has the effect of increasing engine speed.

The control unit also carries out the function of the safety relay for the electric fuel pump.

There are no vacuum units or centrifugal advance mechanism on the distributor.
These spark advance/retard functions are taken over by the control unit.

The distributor has a maintenance-free Hall pick-up and a rotor fitted on the distributor shaft.

The rotor in the distributor has only one aperture, unlike previous type Hall TCI distributors, which have one aperture per cylinder.

With the Audi Quattro ignition system the signal supplied by the Hall pick-up is only required for synchronizing the ignition timing mark with the no. 1 cylinder.

The actual ignition timing for cylinders 1 to 5 is determined by the control unit.

The Hall pick-up (located in the distributor) consists of a magnetic sensor with no moving contacts (a permanent magnet with integrated semi-conductor circuits – Hall IC) and a rotor mounted on the distributor shaft.
As the distributor shaft turns, the rotor moves out of the air gap of the magnetic sensor and the Hall pick-up passes on the signal to the control unit.

The Hall TCI control unit (located on the left side of the plenum chamber) regulates ignition coil current to the required value of about 7.5 amps. and maintains this current constant under all operating conditions.

The dwell angle is also controlled, so the secondary voltage is maintained virtually constant.

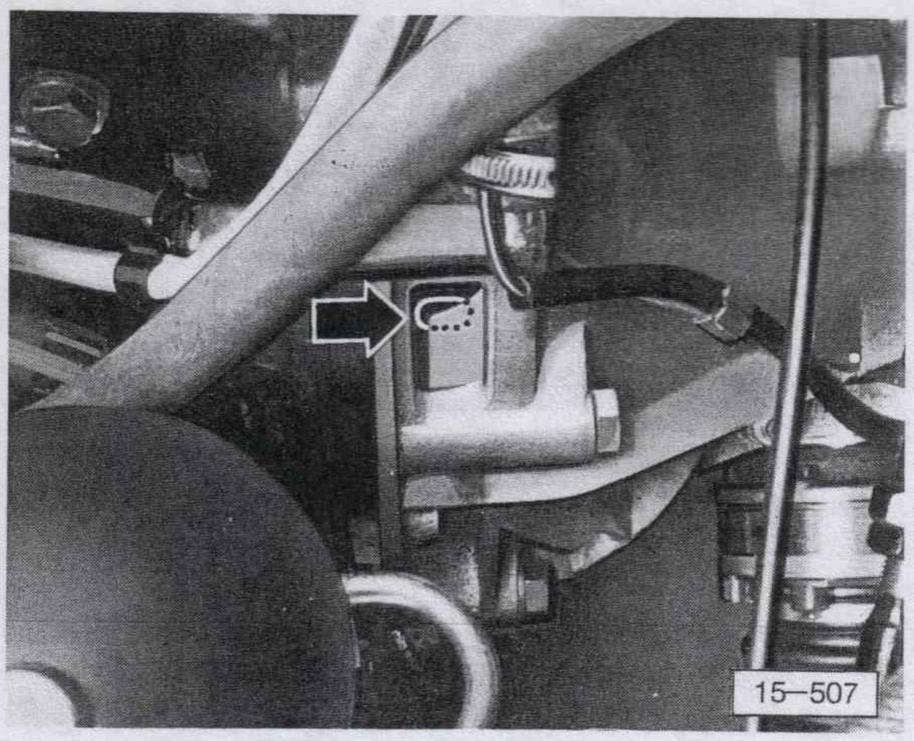
The Hall TCI control unit regulates the dwell angle by only energising the ignition coil for the time required to charge the primary windings. This minimises power loss in the control unit and ignition coil.

When the ignition is switched on with the engine not running the control unit switches off the current to the ignition coil after about one second to prevent the control unit and ignition coil from overheating.

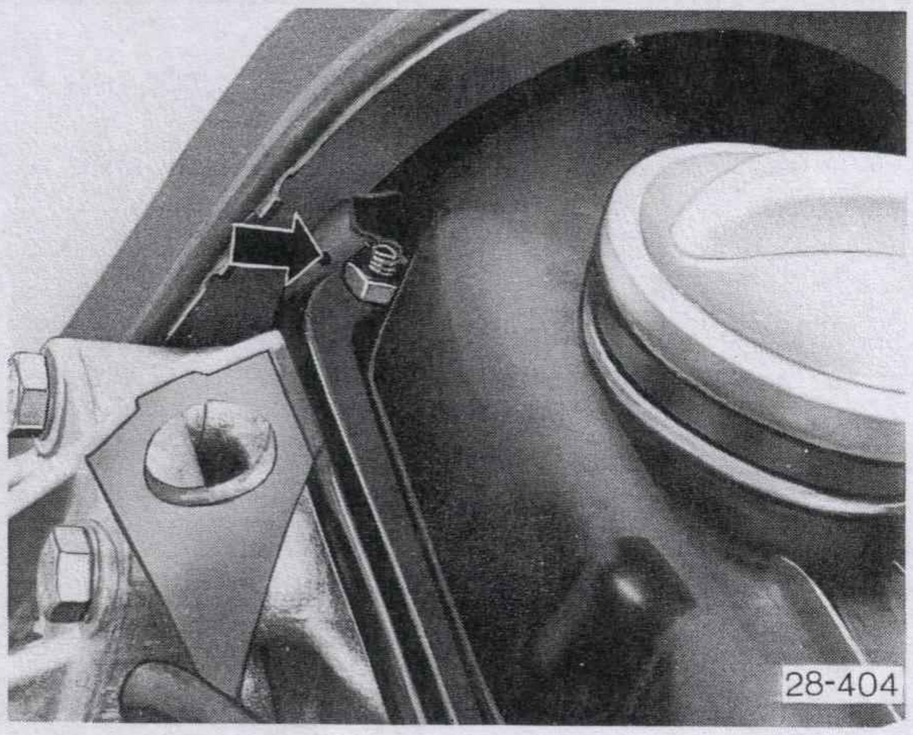
As a safety precaution the ignition coil has a 5.5 mm opening with a plug. This allows the sealing compound to escape in a controlled manner should a fault develop in the Hall TCI control unit circuitry.

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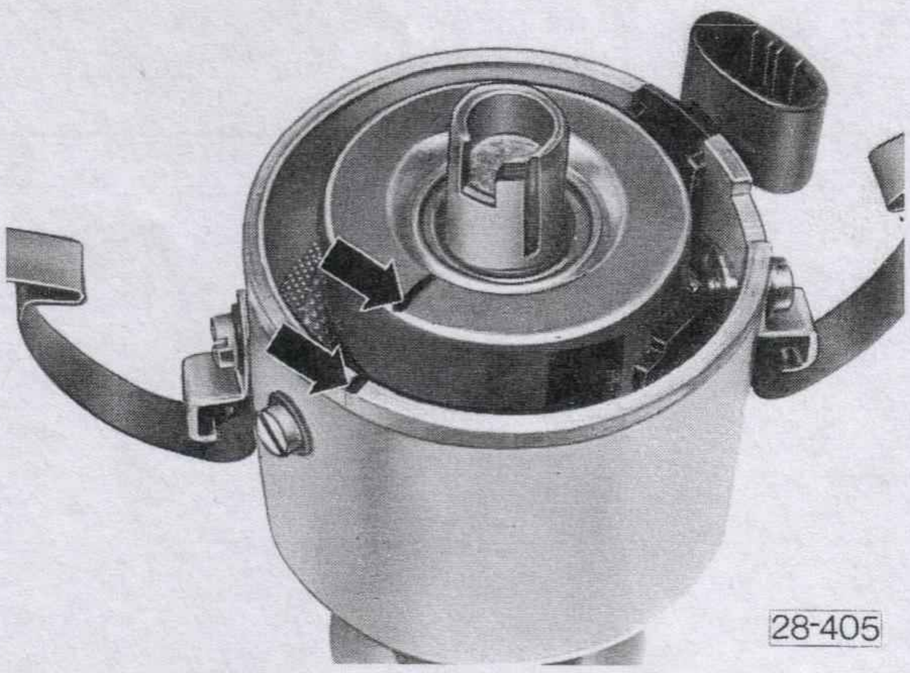
INSTALLING DISTRIBUTOR



– Set crankshaft to TDC by engaging 4th gear and pushing vehicle.



– Align marking on camshaft sprocket with upper surface of gasket.



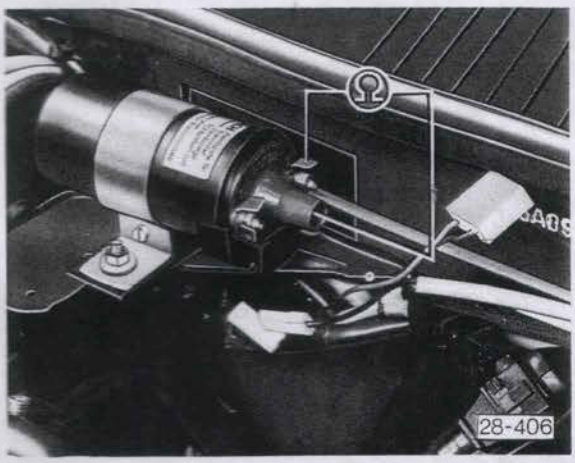
– Before installing distributor, turn distributor shaft so that the marking on the rotor points to the marking on the distributor housing.

– Install distributor.
– Turn distributor housing so that the marking on the rotor is aligned with the marking on the distributor housing.
– Secure distributor.
– It is not necessary to set the ignition timing with the engine running.
– Clean distributor cap before fitting, check for cracks and signs of tracking, renew if necessary.

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IGNITION COIL: CHECKING SECONDARY WINDING RESISTANCE

– Disconnect all leads from ignition coil.

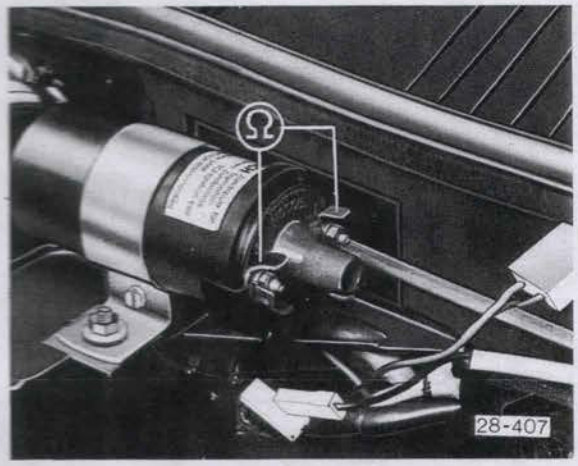


– Connect ohmmeter between terminal 1 (-) and terminal 4 on coil.

– Measure resistance
Specified resistance: 2.4 – 3.5 k Ω

IGNITION COIL: CHECKING PRIMARY WINDING RESISTANCE

– Disconnect all leads from ignition coil.



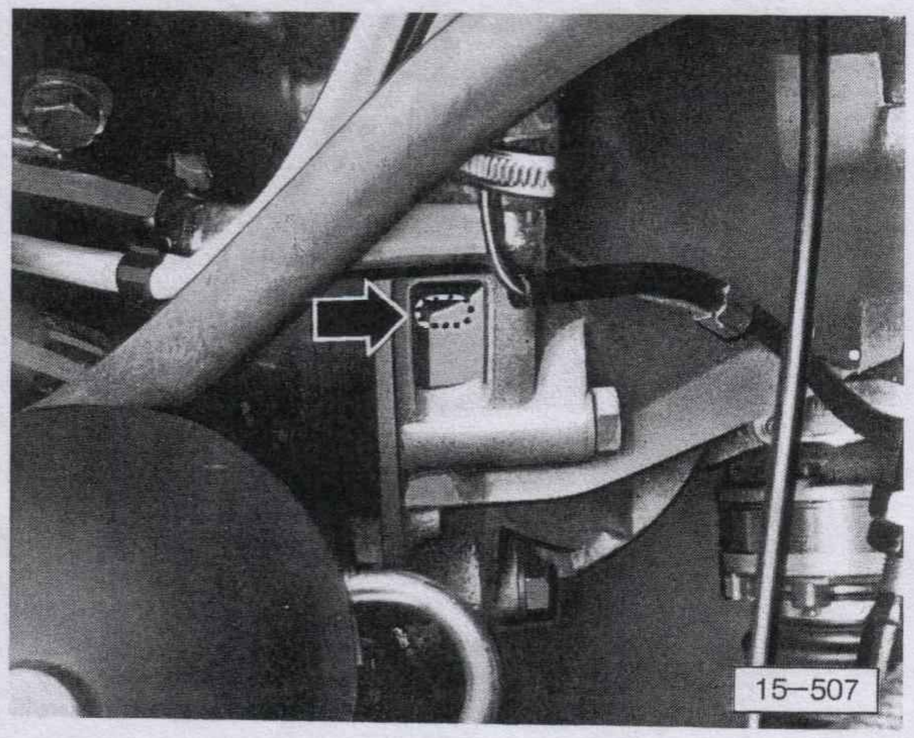
– Connect ohmmeter between terminal 1 (–) and terminal 15 (+) on coil.

– Measure resistance.
Specified resistance: 0.52 – 0.76 Ω

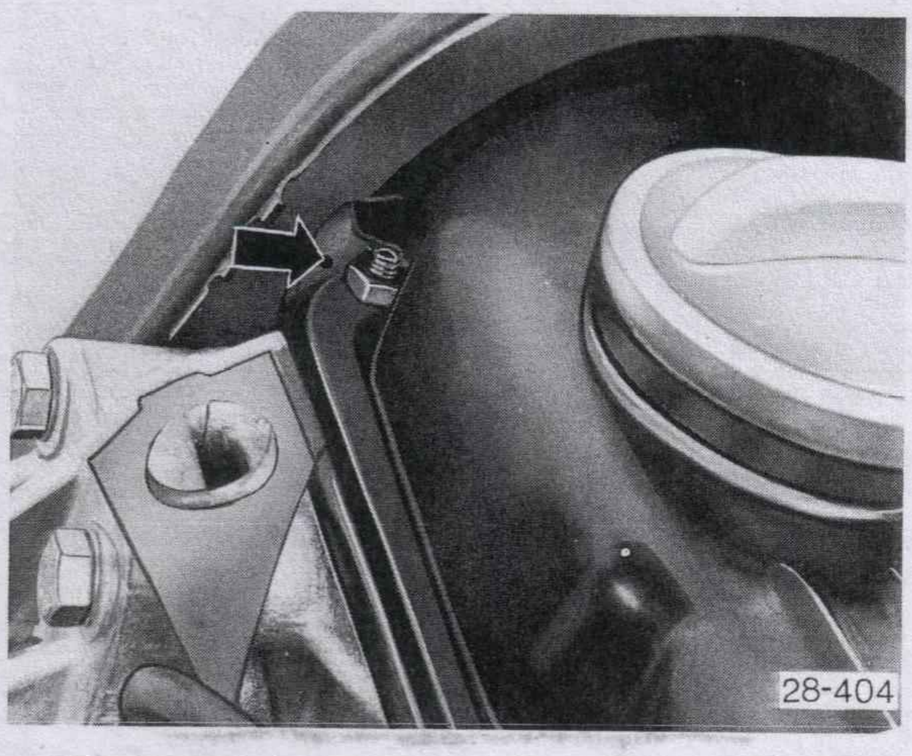
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ADJUSTING IGNITION TIMING

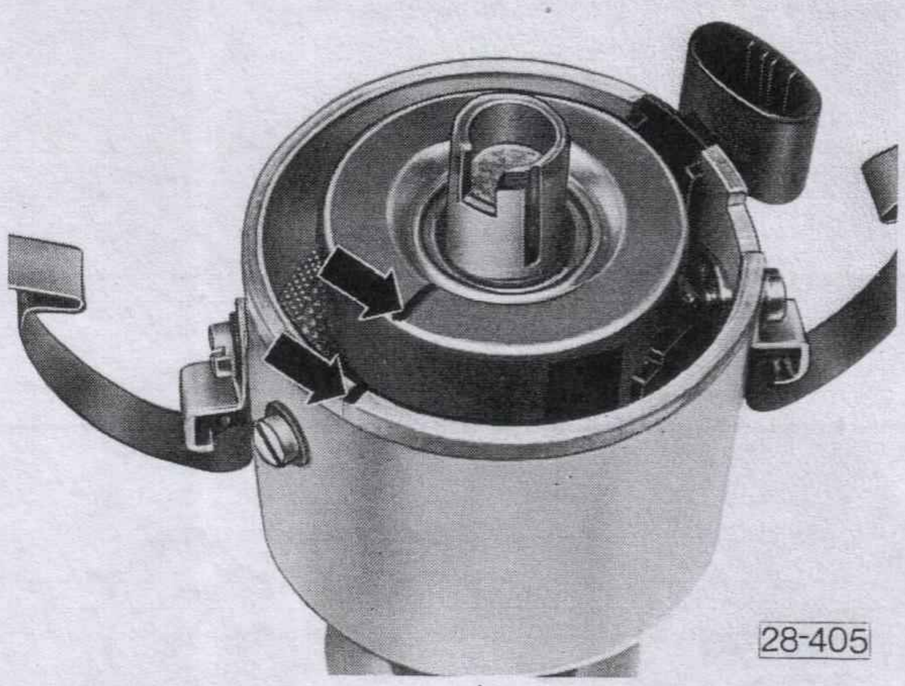
Note:
With the electronic Hall TCI ignition system the ignition timing is adjusted with the engine **switched off.**



– Set crankshaft to TDC by engaging 4th gear and pushing vehicle.



– Marking on camshaft sprocket must be aligned with upper surface of gasket.
– Remove distributor cap.
– Remove distributor rotor arm and dust cap.
– Loosen distributor mountings.

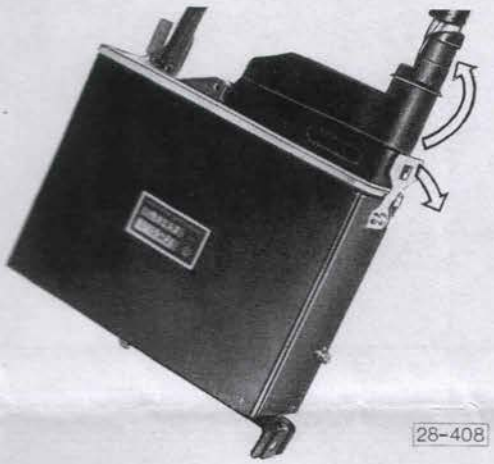


– Turn distributor housing so that marking on rotor is aligned with marking on distributor housing.
– Secure distributor.

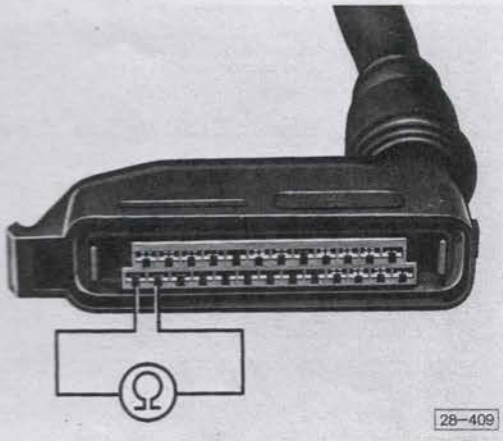
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CHECKING SENDER UNIT FOR IGNITION TIMING

– Remove glove compartment.

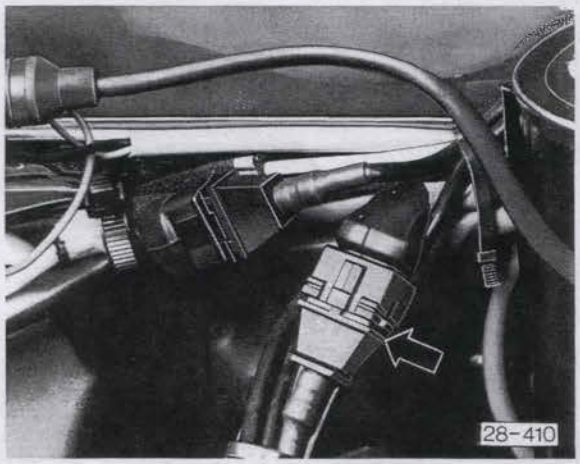


– Disconnect plug from electronic ignition control unit.

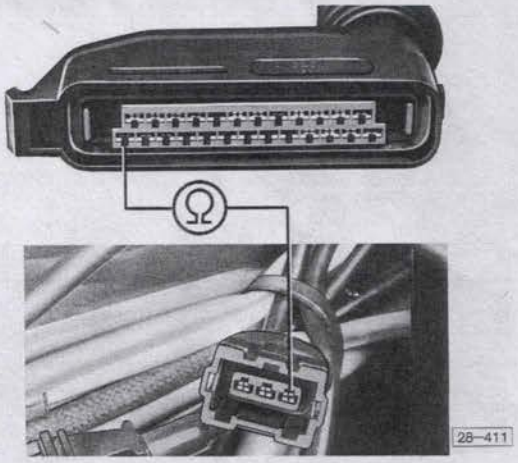


– Connect ohmmeter between contacts 12 and 13 of the disconnected plug.

– Measure resistance.
Specified resistance: about 1 k Ω
If resistance is not as specified, check lead for continuity as follows.

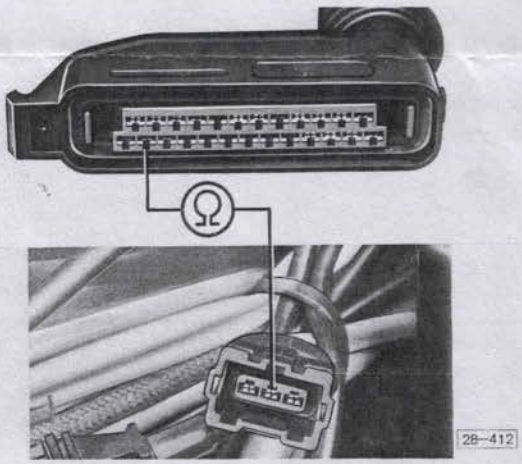


– Disconnect connector in harness between ignition timing sender unit and electronic ignition control unit.



– Connect ohmmeter between contact 13 of plug for electronic ignition control unit and right hand contact in connector.

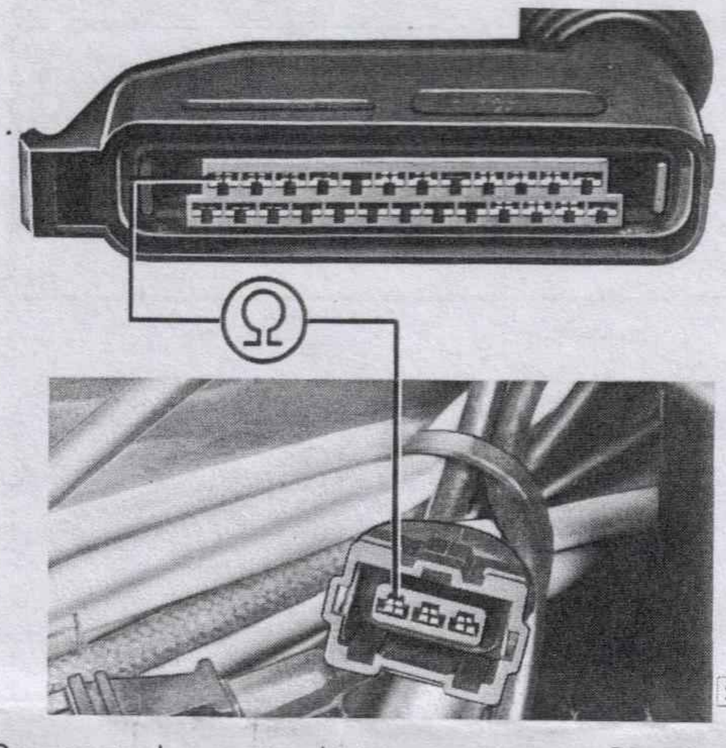
– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.



– Connect ohmmeter between contact 12 of plug for electronic ignition control unit and centre contact in connector.

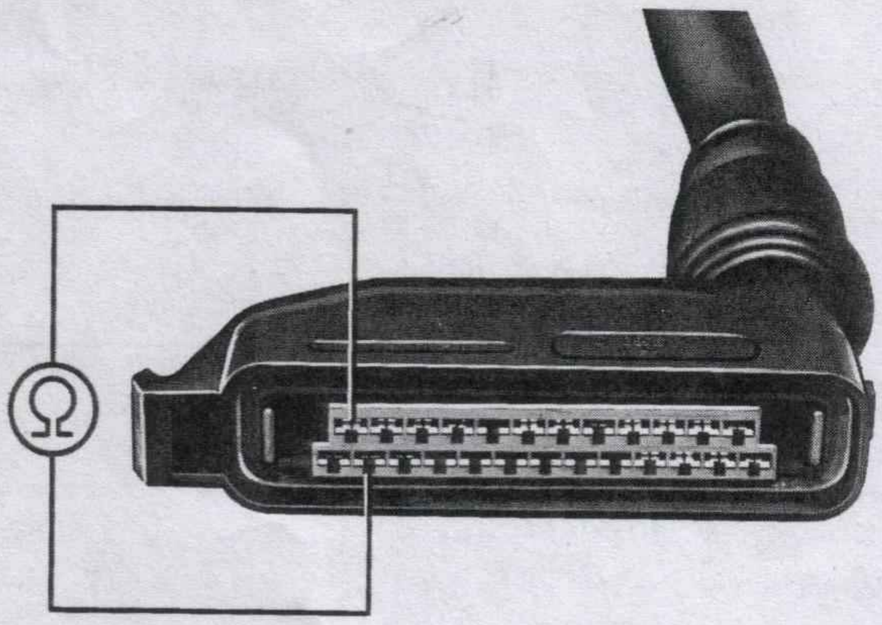
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– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.



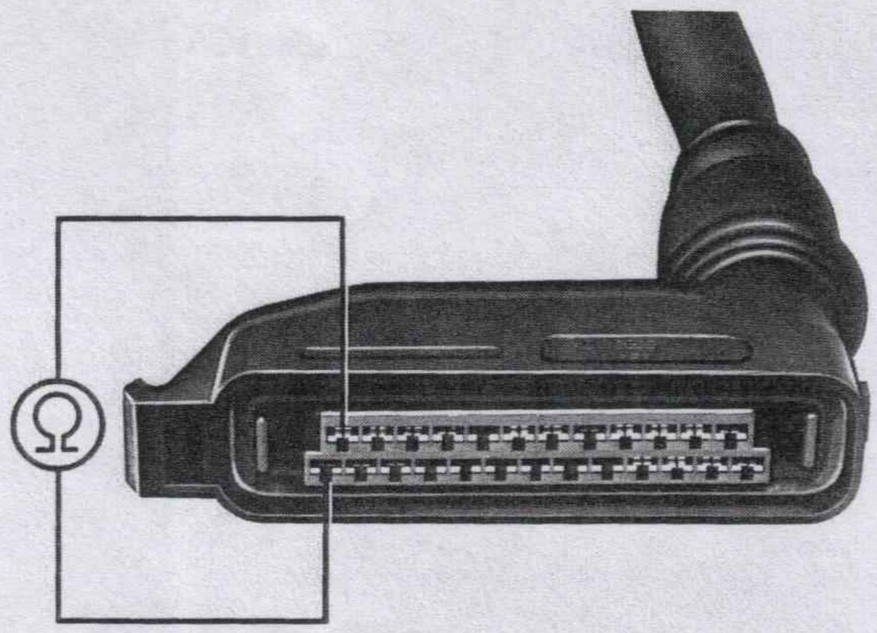
28–413

– Connect ohmmeter between contact 25 of plug for electronic ignition control unit and left hand contact in connector.
– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.



28–414

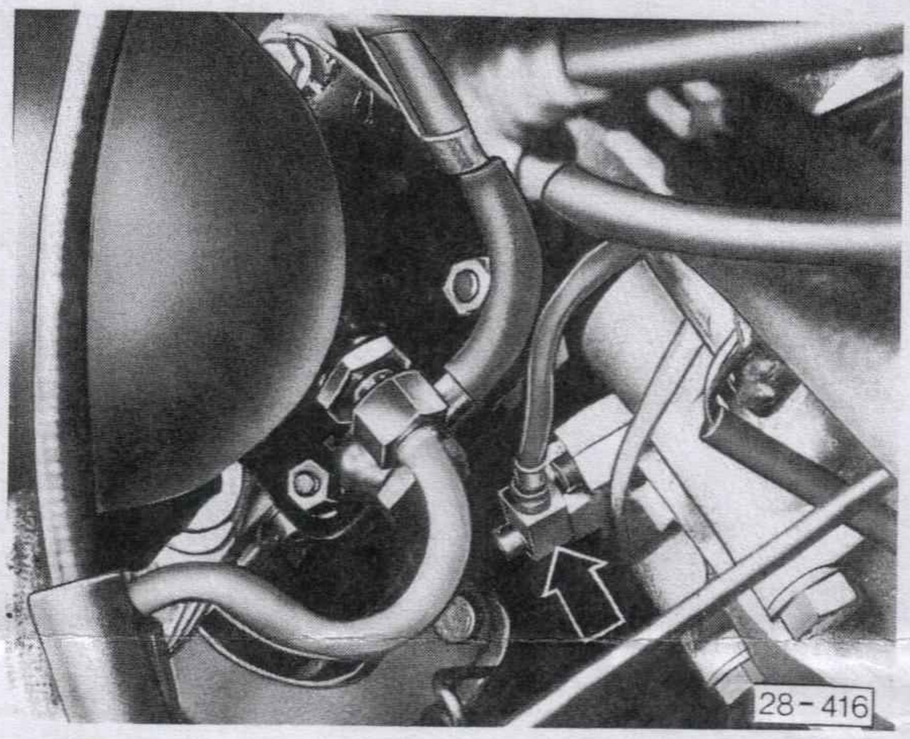
– Connect ohmmeter between contacts 12 and 25 of plug for electronic ignition control unit.
– Measure resistance.
Specified resistance: ∞ Ω
Renew both leads if resistance is not as specified.



28–415

– Connect ohmmeter between contacts 13 and 25 of plug for electronic ignition control unit.
– Measure resistance.
Specified resistance: ∞ Ω
Renew both leads if resistance is not as specified.

Note:
If the resistance is as specified on all these wiring tests, renew the ignition timing sender unit.



28-416

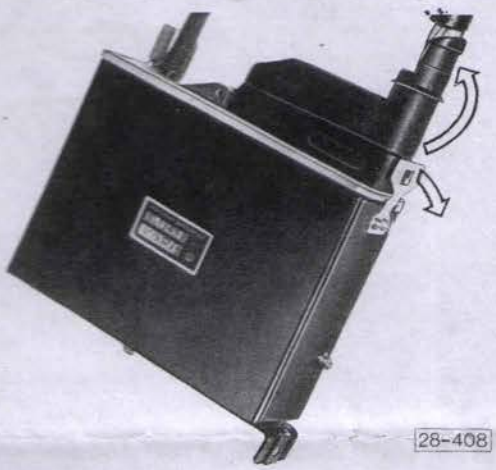
– Renewing ignition timing sender unit.

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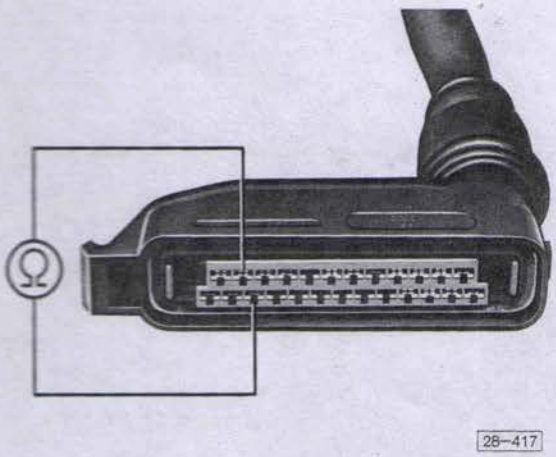
CHECKING SENDER UNIT FOR ENGINE RPM

Checking:

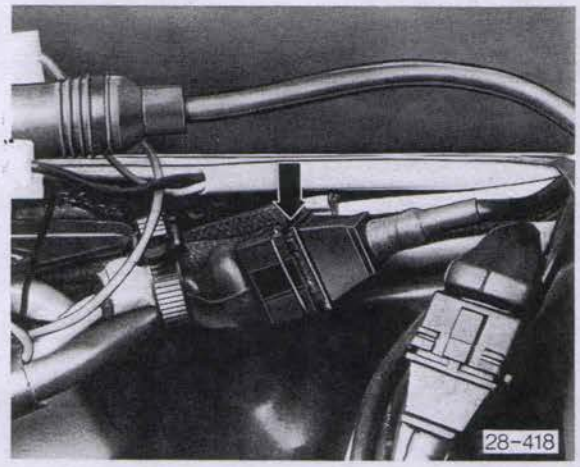
– Remove glove compartment.



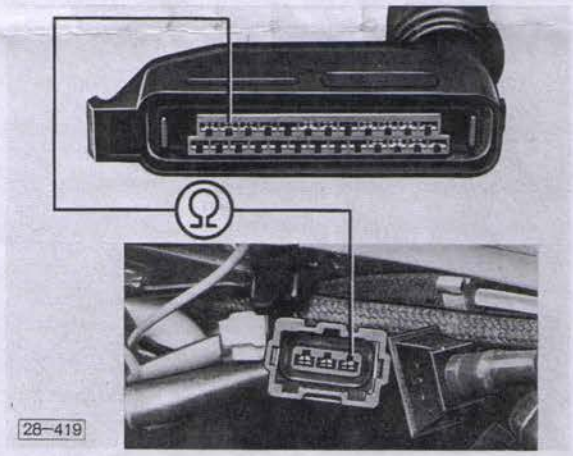
– Disconnect plug from electronic ignition control unit.



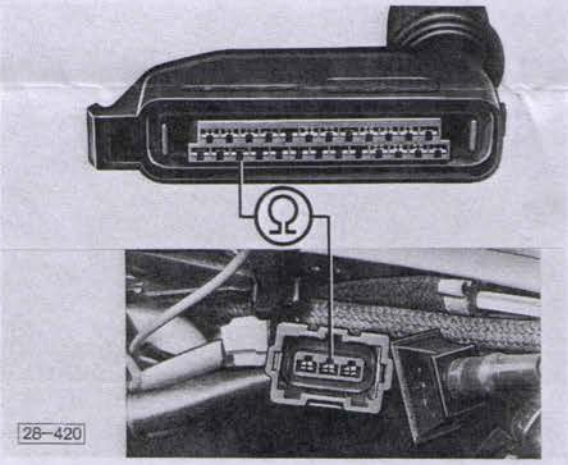
– Connect ohmmeter to contacts 11 and 24 of disconnected plug.
– Measure resistance.
Specified resistance: about 1 k Ω
If resistance is not as specified check electric lead for continuity as follows:



– Disconnect connector in harness between sender unit for engine rpm and electronic ignition control unit.



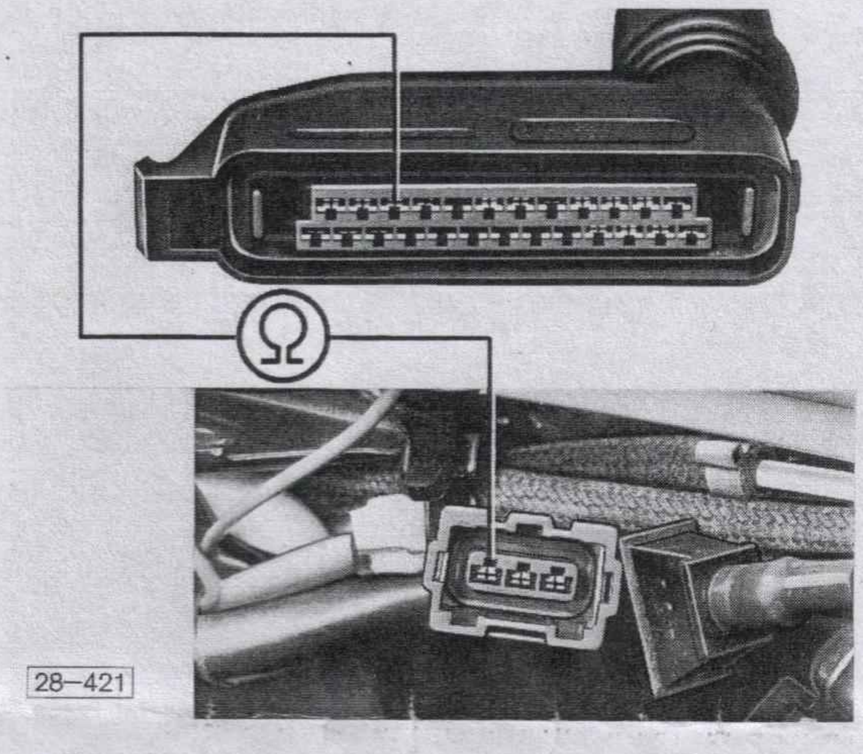
– Connect ohmmeter between contact 24 of plug for electronic ignition control unit and right hand contact in connector.
– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.



– Connect ohmmeter between contact 11 of plug for electronic ignition control unit and centre contact in connector.

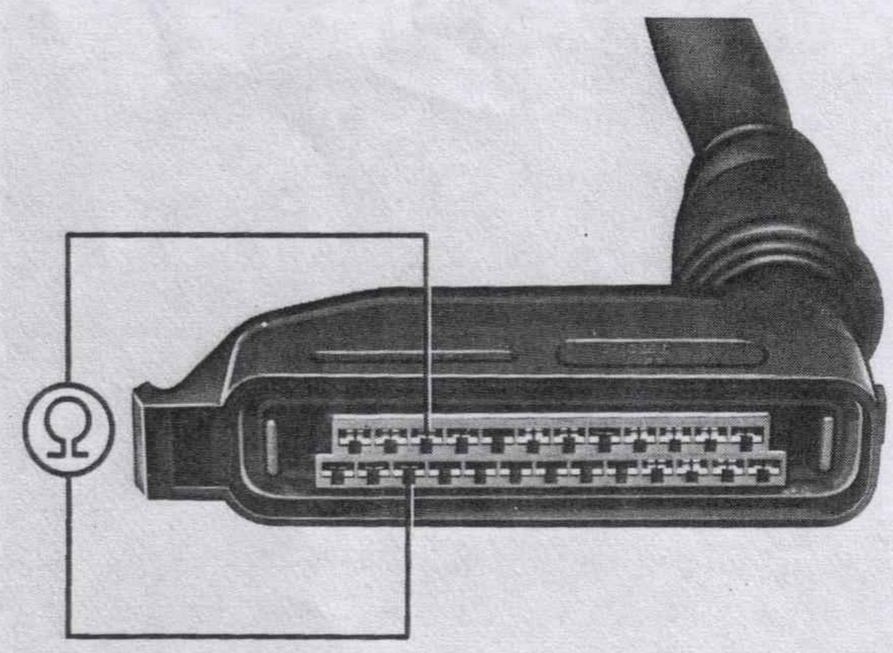
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– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.



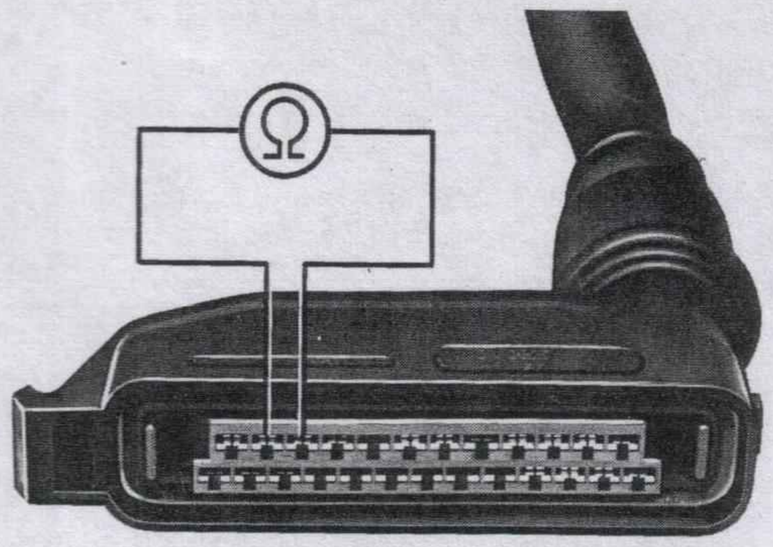
28–421

– Connect ohmmeter between contact 23 of plug for electronic ignition control unit and left hand contact in connector.
– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.



28–422

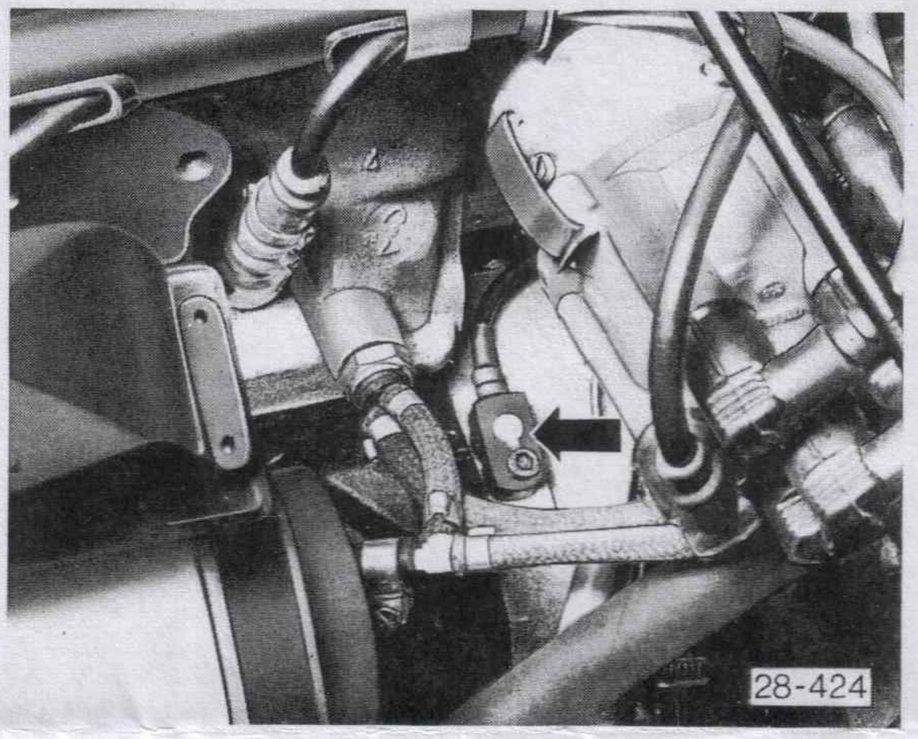
– Connect ohmmeter between contacts 11 and 23 of plug for electronic ignition control unit.
– Measure resistance.
Specified resistance: ∞ Ω
Renew both leads if resistance is not as specified



28–423

– Connect ohmmeter between contacts 23 and 24 of plug for electronic ignition control unit.
– Measure resistance.
Specified resistance: ∞ Ω
Renew leads if resistance is not as specified.

Note:
If the resistance is as specified on all these wiring tests, renew the sender unit for engine rpm.



28-424

– Renewing sender unit for engine rpm.

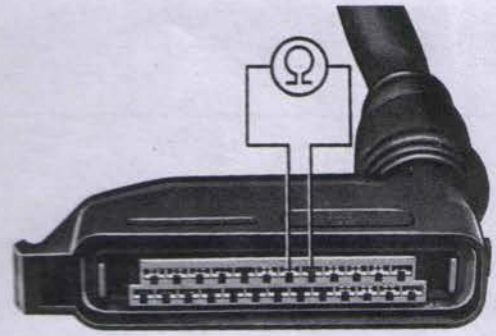
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CHECKING SENDER UNIT FOR INTAKE AIR TEMPERATURE

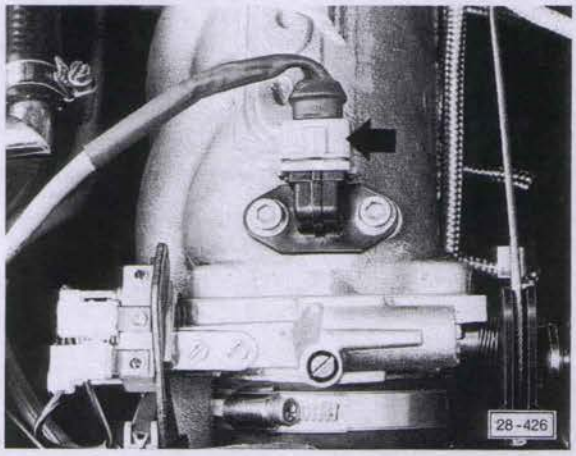
– Remove glove compartment.



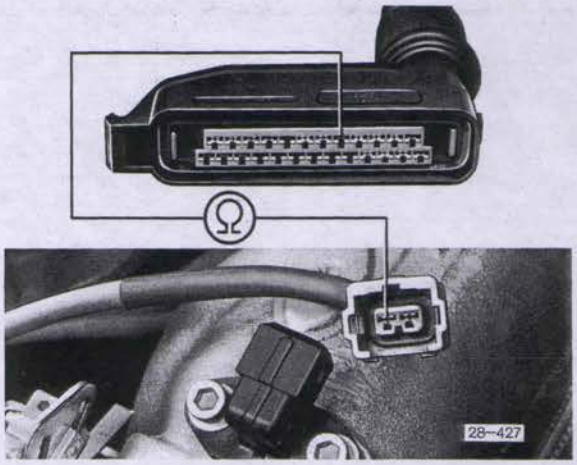
– Disconnect plug from electronic ignition control unit.



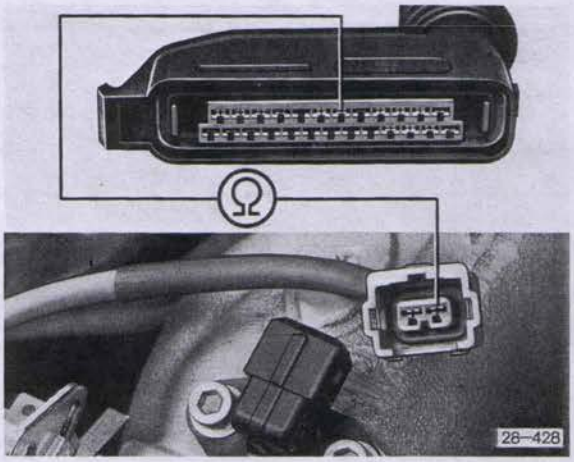
– Connect ohmmeter between contacts 18 and 19 of disconnected plug.
– Measure resistance.
Specified resistance: 13 – 33 Ω
If resistance is not as specified, check lead for continuity as follows.



– Disconnect plug from sender unit for intake air temperature.



– Connect ohmmeter between contact 18 of plug for electronic ignition control unit and left hand contact in connector.
– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.

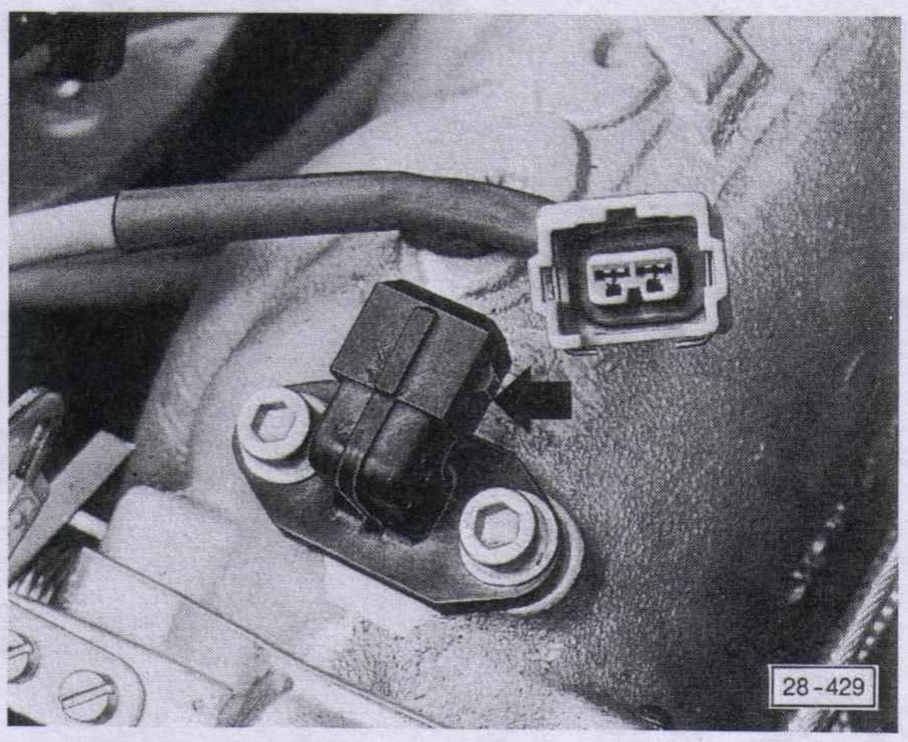


– Connect ohmmeter between contact 19 of plug for electronic ignition control unit and right hand contact in connector.

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– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.

Note:
If a resistance reading of 0 Ω is obtained in both these wiring tests, renew the sender unit for intake air temperature.

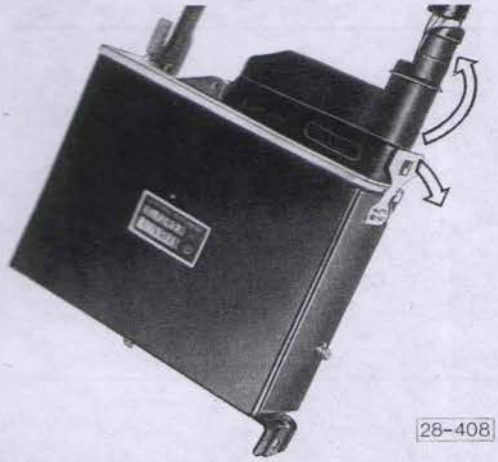


– Renewing sender unit for intake air temperature.

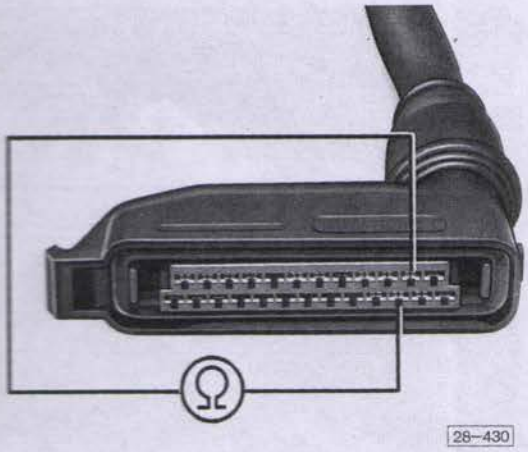
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CHECKING IDLE SWITCH FOR ELECTRONIC IGNITION

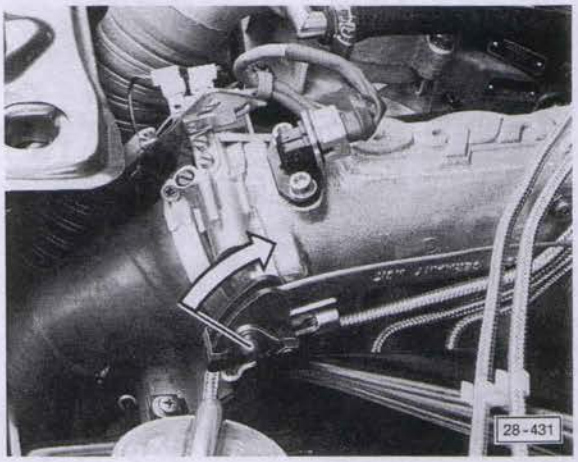
– Remove glove compartment.



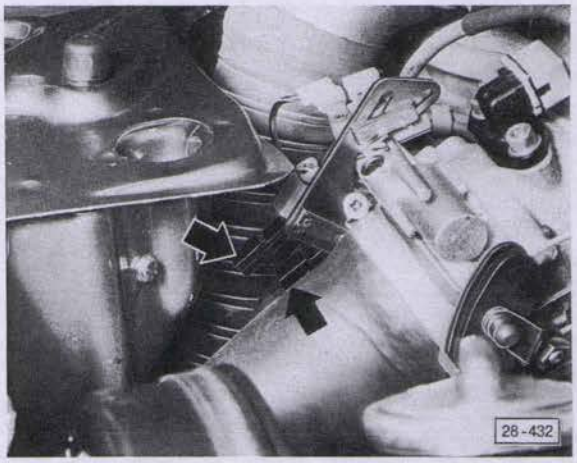
– Disconnect plug from electronic ignition control unit.



– Connect ohmmeter between contacts 3 and 15 of disconnected plug.
– Measure resistance.
The throttle valve must be closed (in idle position). Specified resistance: 0 Ω



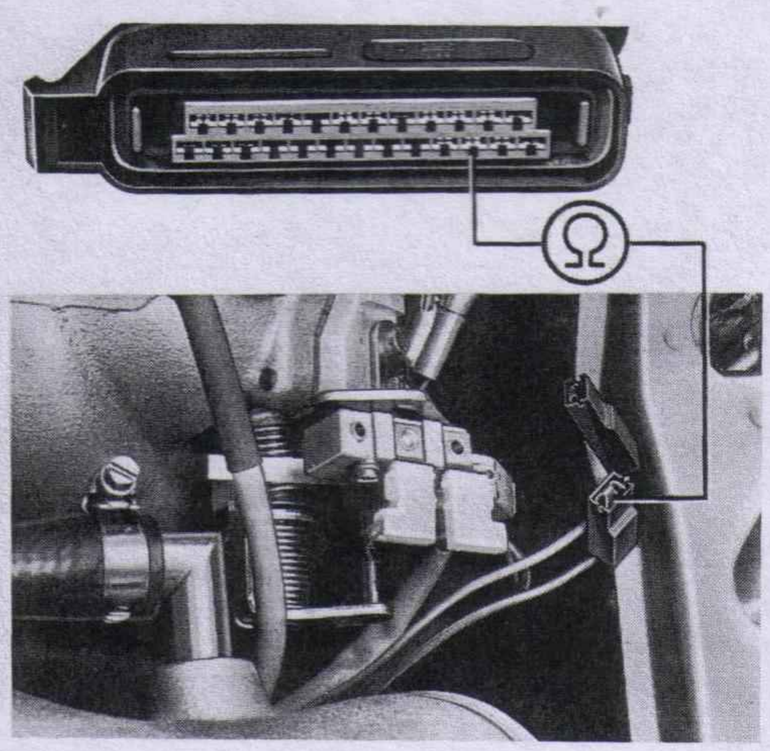
– Operate throttle lever and observe ohmmeter reading (ohmmeter still connected to contacts). Specified resistance after throttle lever is moved slightly: ∞ Ω
Check leads for continuity if resistance is not as specified.



– Disconnect both connector tabs from idle switch for electronic ignition system.

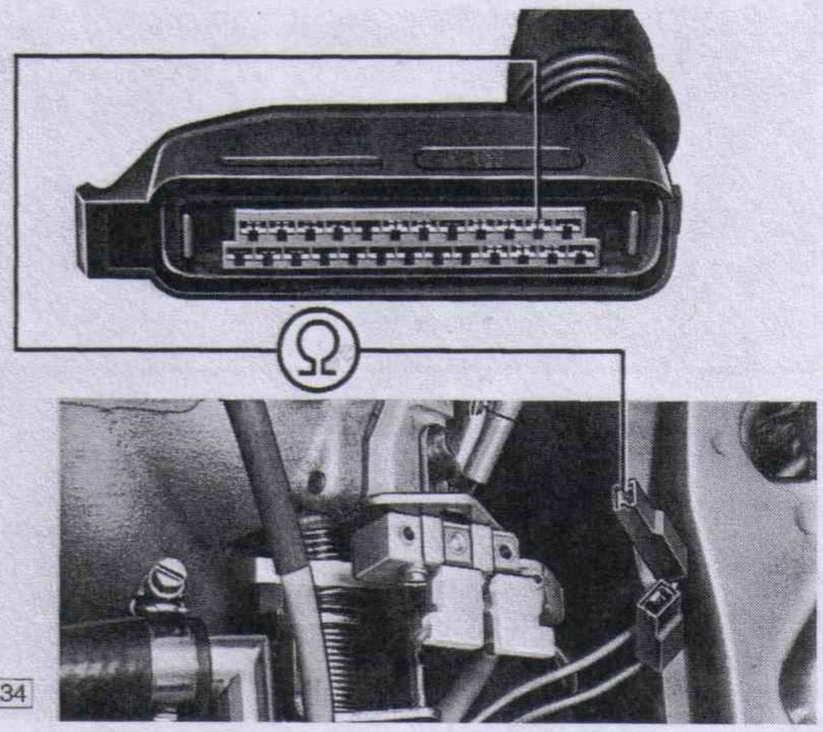
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wb 18



28–433

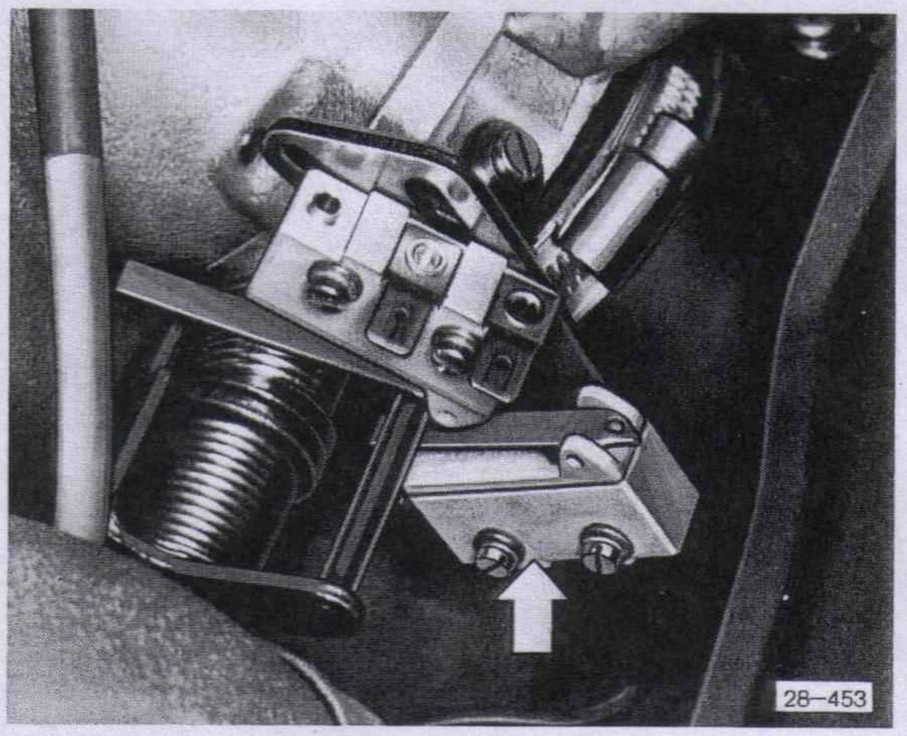
- Connect ohmmeter between contact 3 of plug for electronic ignition control unit and contact on brown/blue lead for idle switch.
- Measure resistance.
  Specified resistance: 0 Ω
  Renew lead if resistance is not as specified



28–434

- Connect ohmmeter between contact 15 of plug for electronic ignition control unit and contact on brown/yellow lead for idle switch.
- Measure resistance.
  Specified resistance: 0 Ω
  Renew lead if resistance is not as specified

Note:
If the resistance is as specified in all these wiring tests, renew the idle switch for the electronic ignition system.



28–453

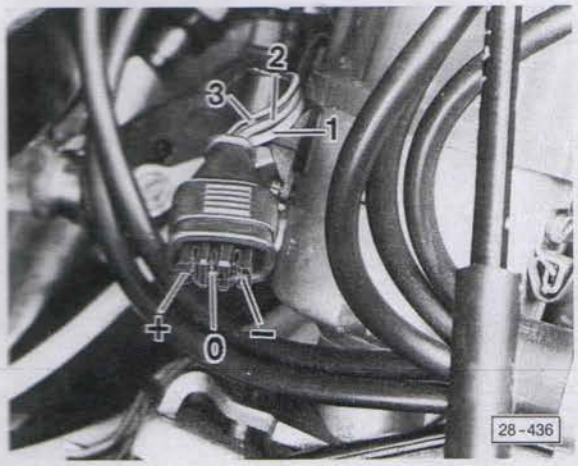
- Renewing idle switch for electronic ignition system.

  If there are elongated holes on the idle switch mounting, adjust the switch so that it operates immediately the throttle is opened.

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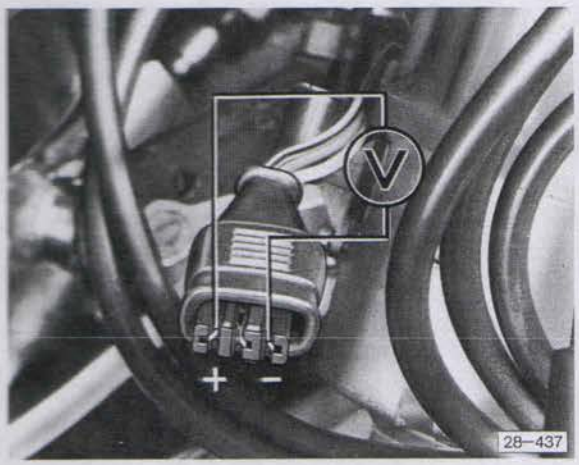
CHECKING HALL PICK-UP

– Battery voltage about 12 V.

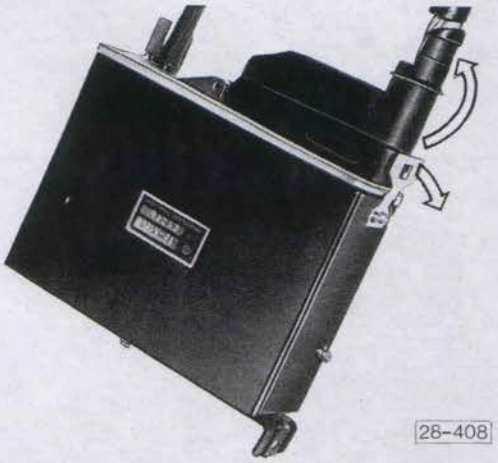


– Check that wiring of plug for Hall pick-up on distributor is correct.
1 = brown/withe (-)
2 = green (o)
3 = red/black (+)

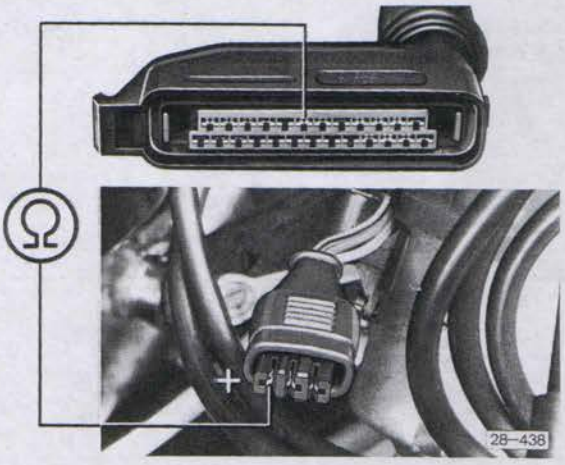
– Check that plug makes good contact (contacts in plug and connector on distributor must not be damaged, loose or bent).



– Measure voltage between positive contact (+) and negative contact (-) with voltmeter after switching on ignition.
Specified voltage: at least 10 V
Check leads for continuity if voltage is not as specified: remove glove compartment.

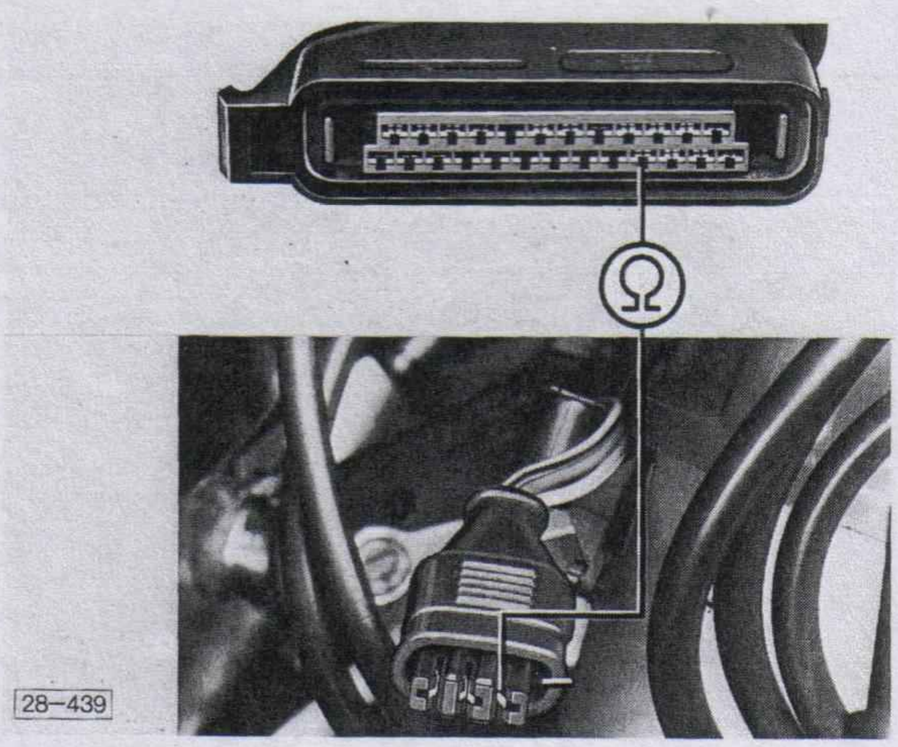


– Disconnect plug from electronic ignition control unit.



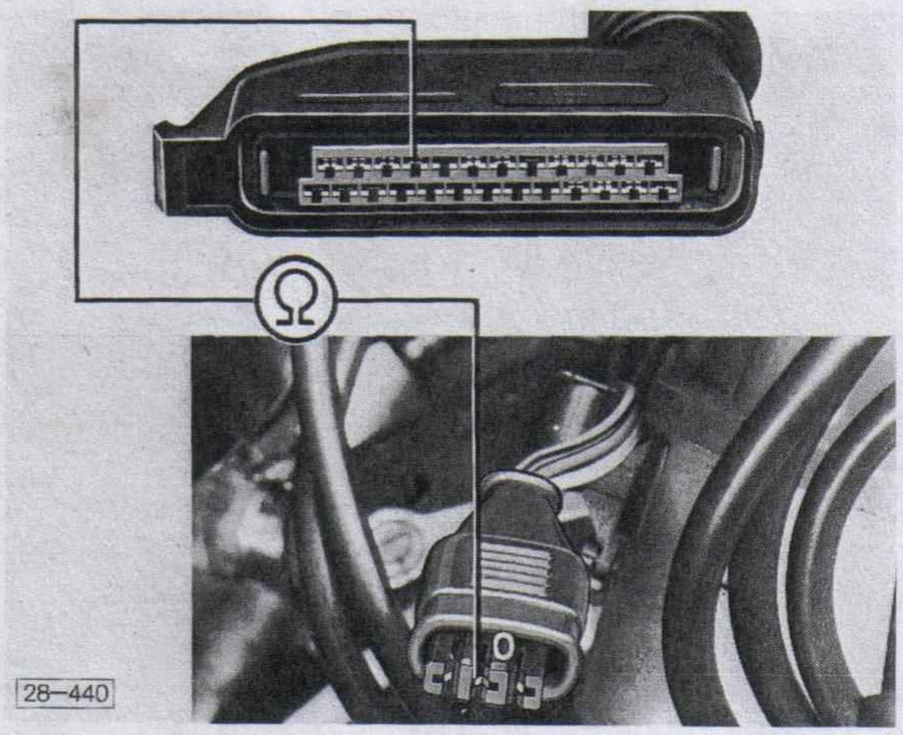
– Connect ohmmeter between contact 20 of plug for electronic ignition control unit and positive contact (+) on plug for Hall pick-up on distributor.
– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.

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28–439

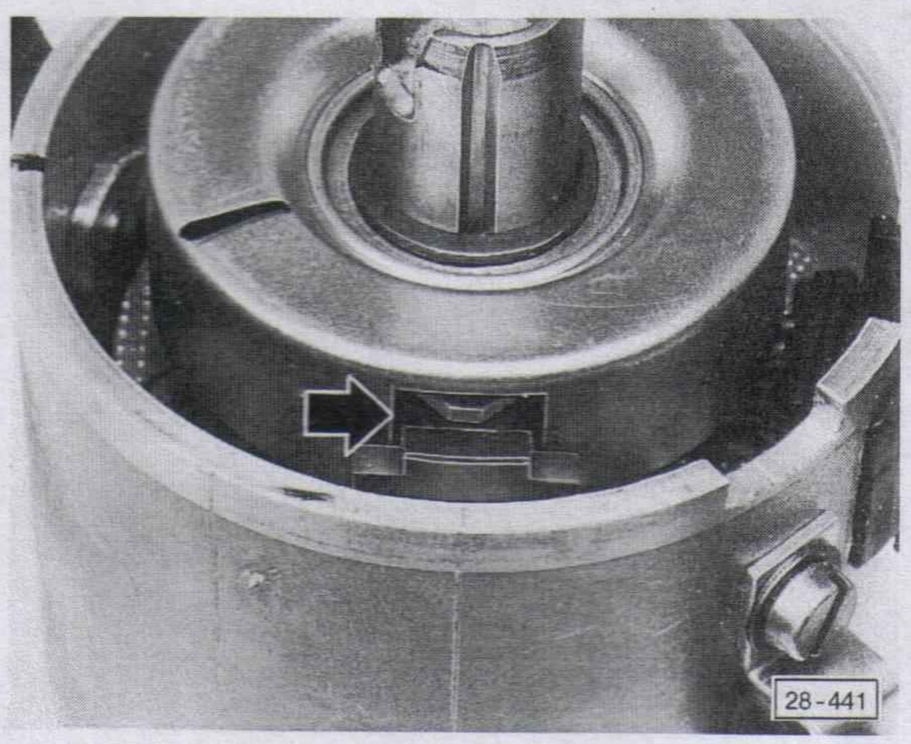
- Connect ohmmeter between contact 4 of plug for electronic ignition control unit and negative contact (-) on plug for Hall pick-up on distributor.
- Measure resistance.
  Specified resistance: 0 Ω
  Renew lead if resistance is not as specified.



28–440

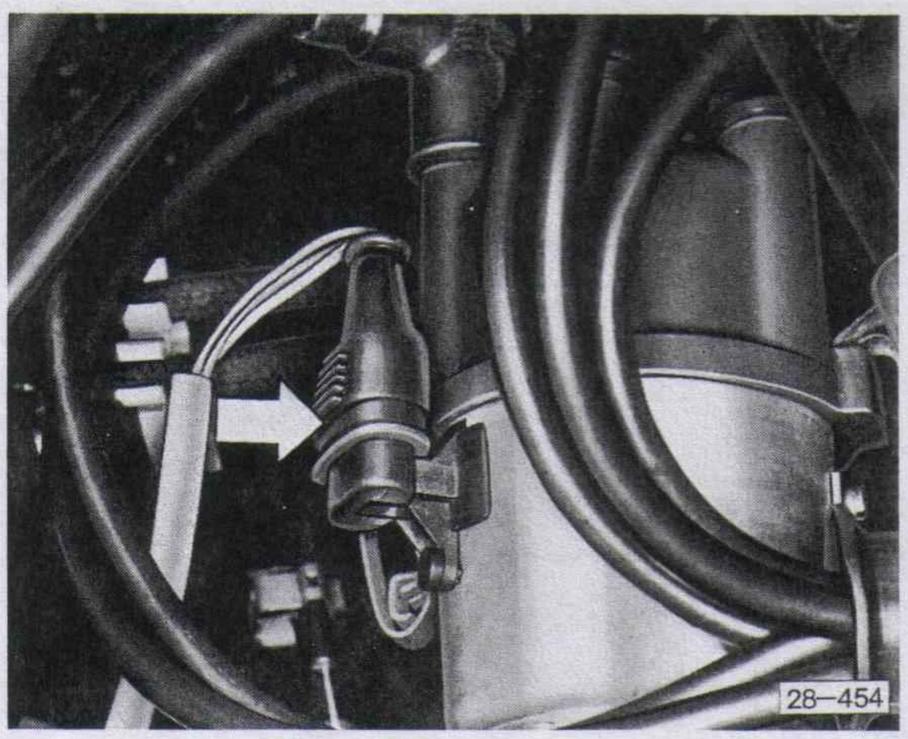
- Connect ohmmeter between contact 22 of plug for electronic ignition control unit and contact 0 of plug for Hall pick-up on distributor.
- Measure resistance.
  Specified resistance: 0 Ω
  Renew lead if resistance is not as specified.
- Remove distributor cap, rotor arm and dust cap.

Caution
Do not allow retaining clip for distributor cap to fall inwards onto pick-up system.



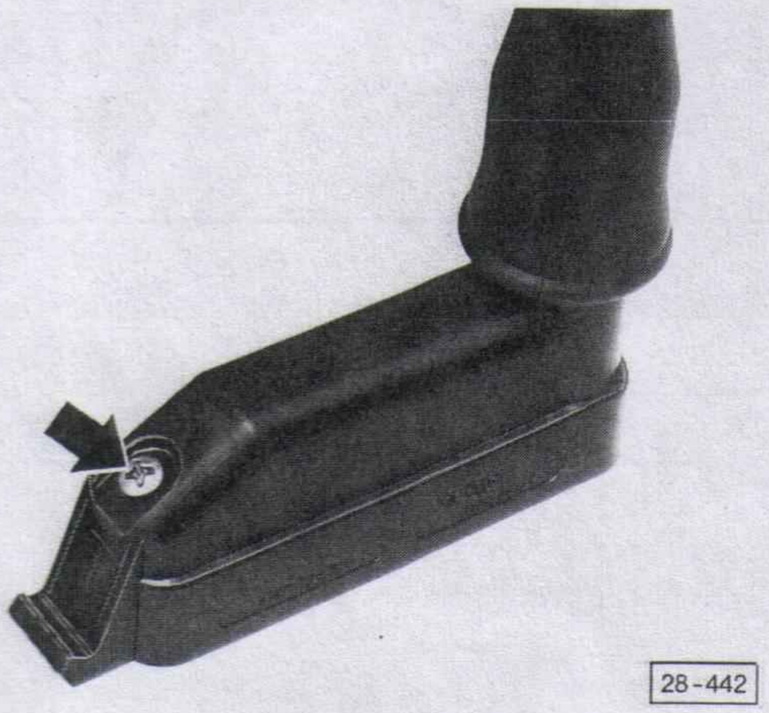
28-441

- Engage 4th gear and push vehicle to turn crankshaft so that rotor is **clear of air gap** for magnetic pick up.



28–454

- Reconnect plug on Hall pick-up on distributor.



28-442

- Dismantle plug for electronic ignition control unit.

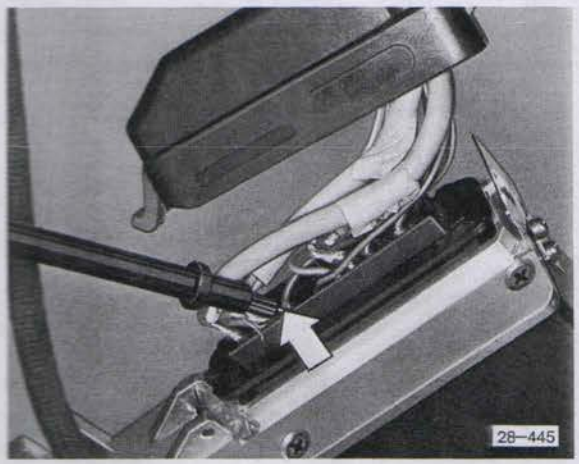
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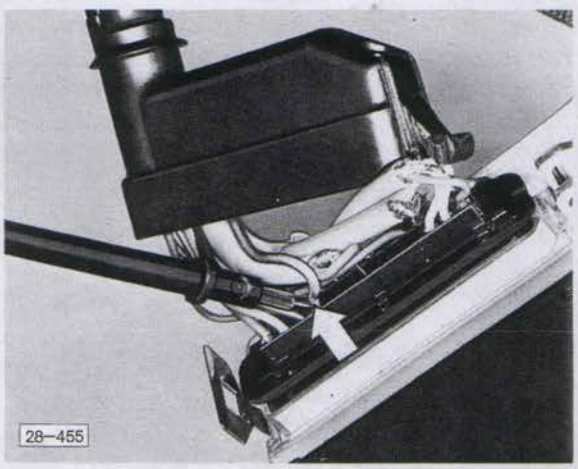
– Take plug housing apart.



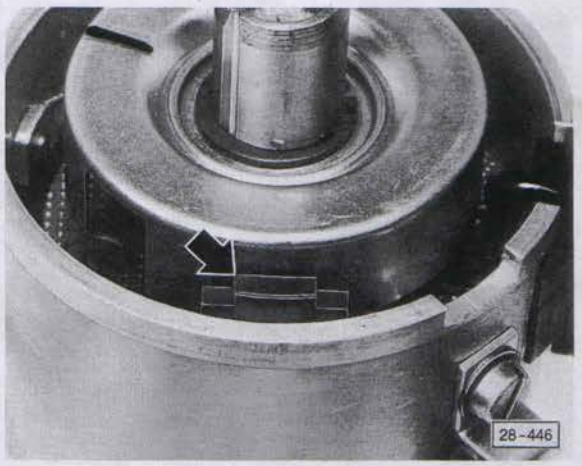
– Reconnect plug to electronic ignition control unit.



– Connect one voltmeter probe to contact 4 of plug with plug connected.



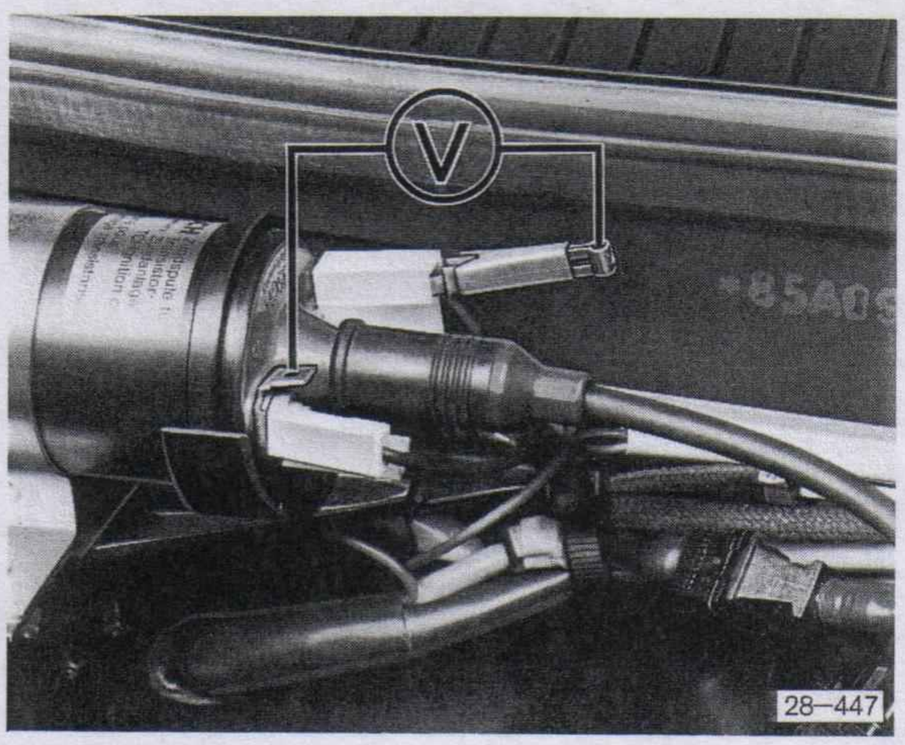
– Connect second voltmeter probe to contact 22 of plug with plug connected.
– Switch on ignition and measure voltage.
Specified voltage: 0 – 0.5 V
– Switch off ignition



– Engage 4th gear and push vehicle to turn crankshaft to that rotor is **fully aligned** with air gap in magnetic pick-up.
– Disengage 4th gear.
– Measure voltage with ignition on and voltmeter connected to contacts 4 and 22.
Specified voltage: at least 4.0 V
Renew distributor if voltage readings are not as specified.

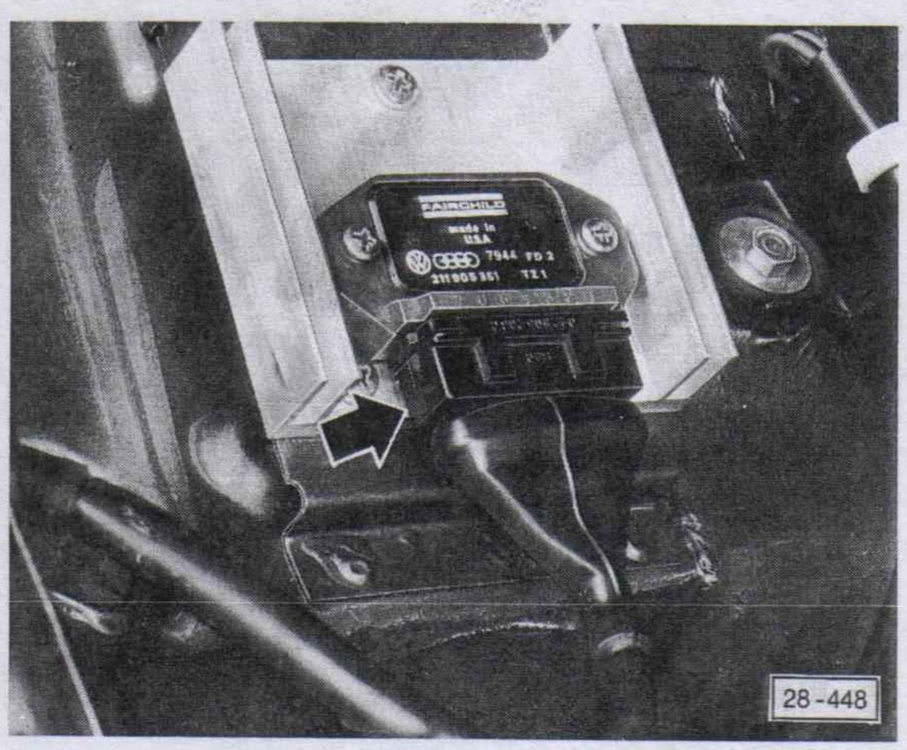
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CHECKING HALL TCI CONTROL UNIT

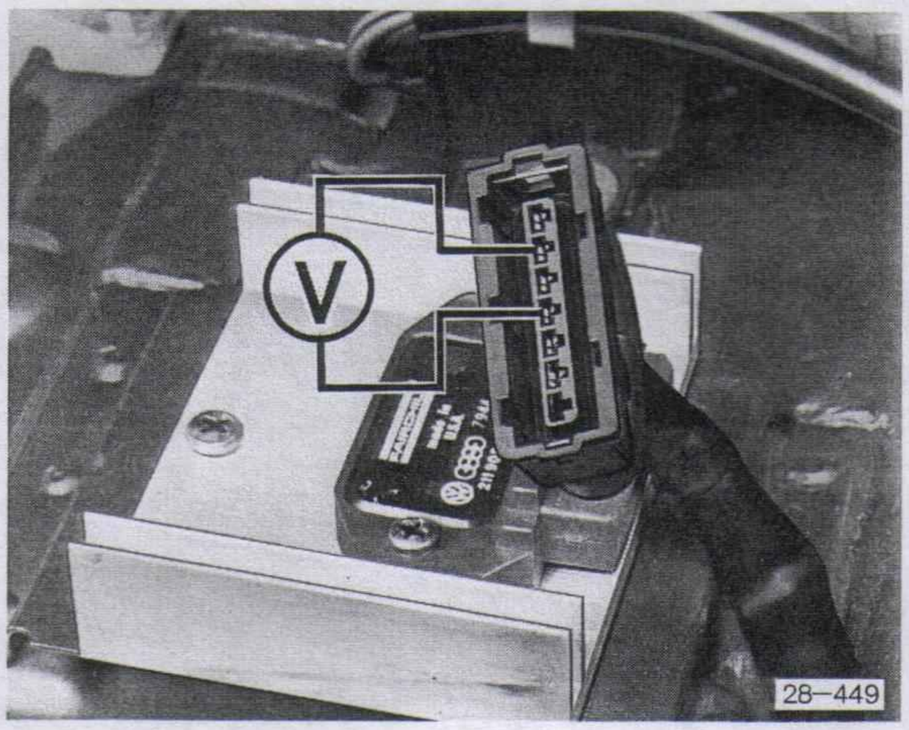


– Connect voltmeter to terminals 15 and 1 on ignition coil.
  Use adaptor for connection on terminal 1.
– Operate starter motor and measure voltage.
  Specified voltage: about 1.2 V

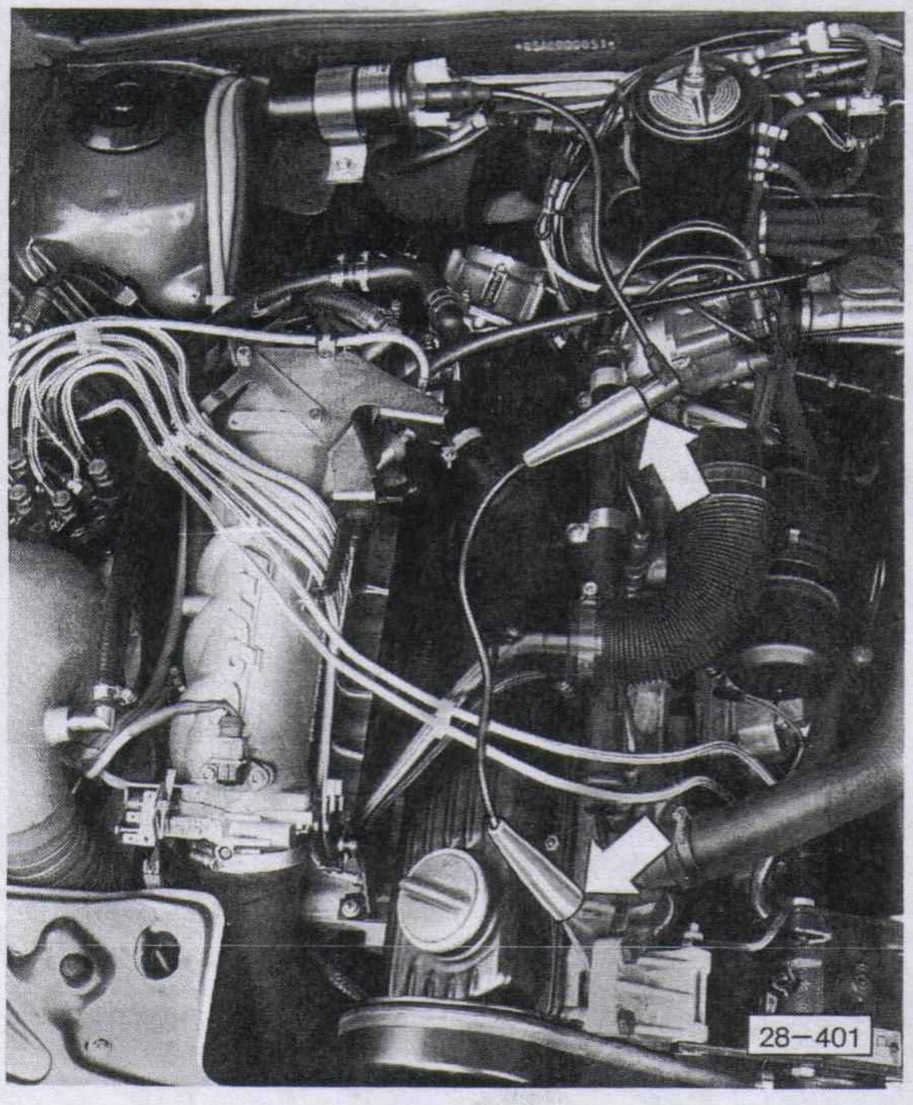
Note:
The cover on the plenum chamber has only been removed to give a clear picture.



– Disconnect plug from Hall TCI control unit.



– Connect voltmeter between contacts 4 and 2 on disconnected plug.
– Switch on ignition and measure voltage.
  Specified voltage: approx. the same as battery voltage. If voltage is not as specified, trace and repair interruption in wiring with the help of the current flow diagram.

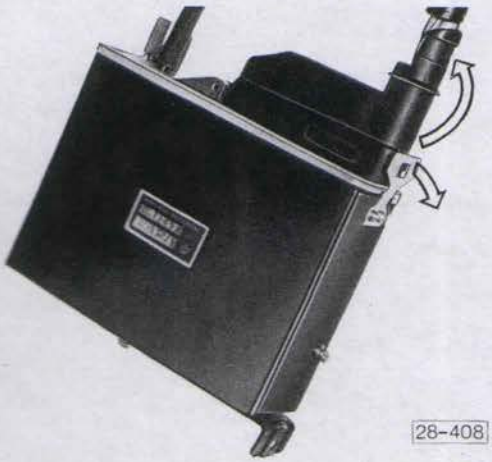


– Disconnect lead from terminal 4 on distributor and connect to earth with a length of wire.

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– Connect voltmeter between contacts 6 and 2 of disconnected plug. Operate starter motor and measure voltage.
Specified voltage: about 4.5 V
Check lead for continuity if voltage is not as specified: remove glove compartment.



– Disconnect plug from electronic ignition control unit.



– Connect ohmmeter between contact 17 of plug for electronic ignition control unit and contact 6 of plug for Hall TCI control unit.

– Measure resistance.
Specified resistance: 0 Ω
Renew lead if resistance is not as specified.

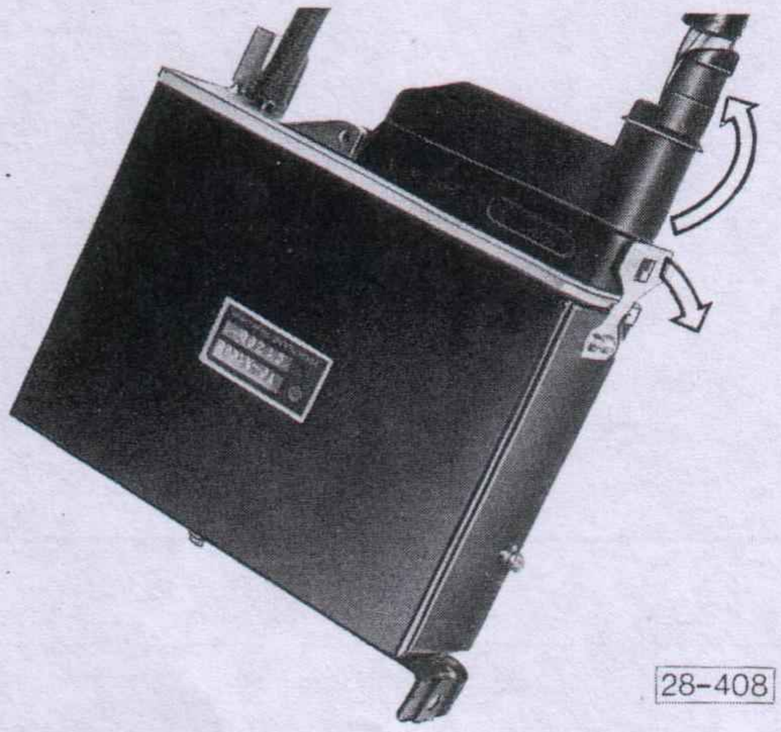
If results are as specified in these wiring tests, renew Hall TCI control unit.

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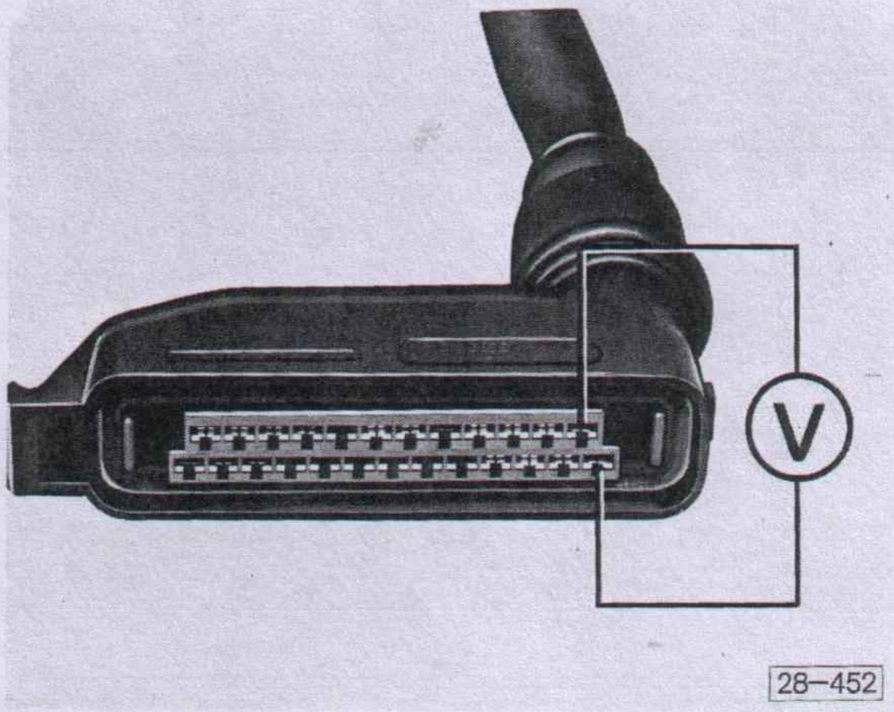
CHECKING ELECTRONIC IGNITION CONTROL UNIT

– Remove glove compartment and check voltage supply.

> **Important**
> The pressure hose (from the intake manifold) must be left connected to the control unit.



– Disconnect plug from electronic ignition control unit.



– Connect voltmeter between contacts 14 and 1 of plug for electronic ignition control unit.
– Switch on ignition and measure voltage.
Specified voltage: approx. the same as battery voltage. If voltage is not as specified, trace and repair interruption in wiring with the help of the current flow diagram.

Note:
The electronic ignition control unit cannot be checked without special instruments and an adaptor.
After checking the voltage supply it is therefore necessary to fit a new electronic ignition control unit as a test measure.
However, should it prove necessary to test the electronic ignition control unit, the following components must be checked in order to trace a fault to the control unit:

- ignition coil
- ignition timing sender unit
- sender unit for engine rpm
- sender unit for intake air temperature
- idle switch for electronic ignition system
- Hall pick-up
- Hall TCI control unit.

If these components check out, fit a new electronic ignition control unit.

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FAULT FINDING CHART

Fault	Possible cause	Test	Remedy
Engine will not pick up	Turbocharger defective	Check boost pressure - page 22	Renew turbocharger
	Waste gate defective	Check boost pressure - page 22	Renew waste gate
	Sender unit for intake air temperature defective	Check wiring and sender unit for intake air temperature - page 41	Renew sender unit for intake air temperature, restore continuity or renew lead
	Idle switch for electronic ignition defective	Check wiring and idle switch for electronic ignition - page 43	Renew idle switch for electronic ignition, restore continuity or renew lead
	Electronic ignition control unit defective	Check electronic ignition control unit and voltage supply - page 50	Renew electronic ignition control unit, restore continuity or repair lead

Fault	Possible cause	Test	Remedy
Idle speed cannot be set below 1500 rpm	Idle switch for electronic ignition system defective	Check wiring and idle switch for electronic ignition - page 43	Renew idle switch for electronic ignition, restore continuity or renew lead
	Electronic ignition control unit defective	Check electronic ignition control unit and voltage supply - page 50	Renew electronic ignition control unit, restore continuity or renew lead
	Fuel distributor or air flow meter defective	Check sensor plate lever, control plunger and CO adjusting screw	Renew defective components

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FAULT FINDING CHART

Fault	Possible cause	Test	Remedy
Engine will not start	Voltage supply to electric fuel pump defective	Check voltage supply to electric fuel pump	Restore continuity or renew lead
		Check fuse for electric fuel pump	Renew fuse
		Check fuel pump relay	Renew relay
	Electric fuel pump defective	Check electric fuel pump	Renew electric fuel pump
	Distributor incorrectly installed and ignition timing incorrect	Check ignition timing - page 36	Adjust ignition timing
	Voltage supply for electronic ignition control unit interrupted	Check voltage supply - page 50	Restore continuity or renew leads
	Hall TCI control unit defective	Check Hall TCI control unit and leads - page 48	Renew Hall TCI control unit, restore continuity or renew leads
	Hall pick-up defective	Check Hall pick-up and lead - page 45	Renew distributor, restore continuity or renew lead
	Ignition timing sender unit defective	Check ignition timing sender unit and leads - page 37	Renew ignition timing sender unit, restore continuity or renew lead
	Sender unit for engine rpm defective	Check lead and sender unit for engine rpm - page 39	Renew sender unit for engine rpm, restore continuity or renew lead
	Electronic ignition control unit defective	Check electronic ignition control unit - page 50	Renew electronic ignition control unit

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FAULT FINDING CHART

Fault	Possible cause	Test	Remedy
Vehicle will not accelerate at low engine rpm	Idle switch for electronic ignition defective	Check leads and idle switch for electronic ignition - page 43	Renew idle switch for electronic ignition, restore continuity or renew lead
	Electronic ignition control unit defective	Check electronic ignition control unit and voltage supply - page 50	Renew electronic ignition control unit, restore continuity or renew lead
Engine misfires	Distributor incorrectly installed and ignition timing incorrect	Check ignition timing - page 36	Adjust ignition timing
	Voltage supply for electric fuel pump defective	Check voltage supply for electric fuel pump	Restore continuity or renew lead
		Check fuse for electric fuel pump	Renew fuse
		Check fuel pump relay	Renew relay
	Electric fuel pump defective	Check electric fuel pump	Renew electric fuel pump
	Voltage supply for electronic ignition control unit interrupted	Check voltage supply - page 50	Restore continuity or renew leads
	Hall TCI control unit defective	Check Hall TCI control unit and leads - page 48	Renew Hall TCI control unit, restore continuity or renew leads
	Hall pick-up defective	Check Hall pick-up and lead - page 45	Renew distributor, restore continuity or renew lead
	Ignition timing sender unit defective	Check ignition timing sender unit and leads - page 37	Renew ignition timing sender unit, restore continuity or renew lead
	Sender unit for engine rpm defective	Check leads and sender unit for engine rpm - page 39	Renew sender unit for engine rpm, restore continuity or renew lead
	Electronic ignition control unit defective	Check electronic ignition control unit - page 50	Renew electronic ignition control unit

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5-speed manual gearbox 016 4wd – technical data

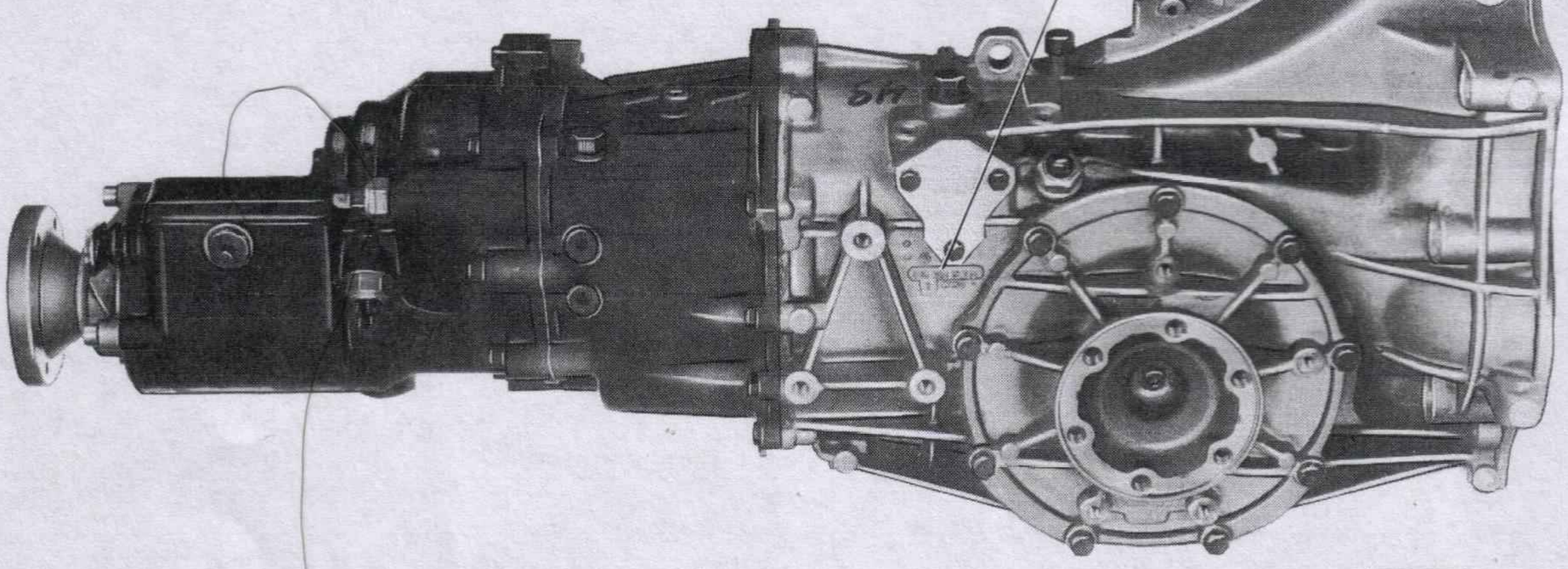
GEARBOX IDENTIFICATION

Gearbox code letters and date of manufacture

Example: UG 19 03 0

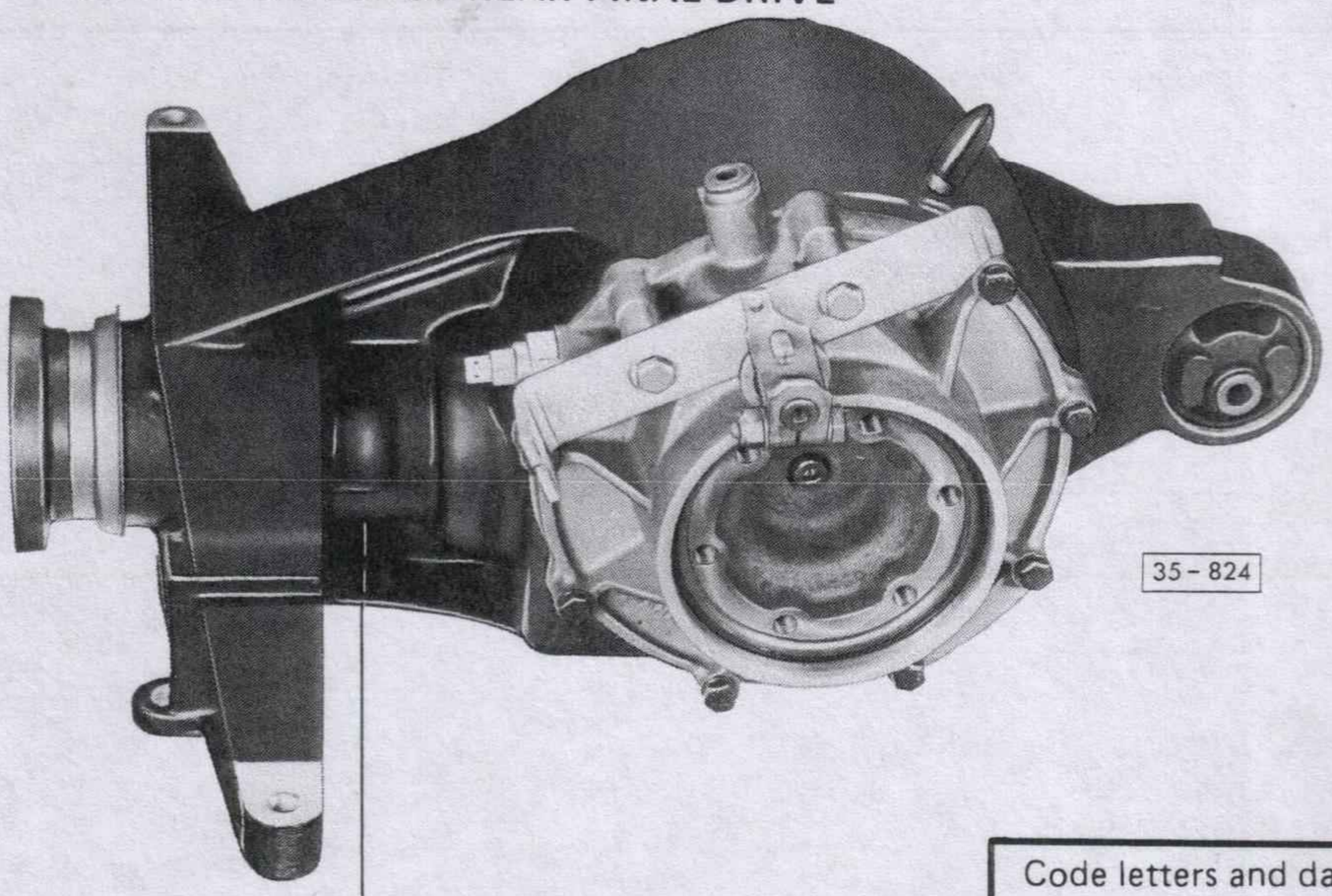
Code letters — Day — Month of manufacture — Year (1980)

5-speed manual gearbox 016 4wd



35 - 823

IDENTIFICATION OF REAR FINAL DRIVE



35 - 824

Code letters and date of manufacture of rear final drive

Example: UJ 19 03 0

Code letters — Day — Month of manufacture — Year (1980)

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CODE LETTERS, GEARBOX/ENGINE PAIRINGS, RATIOS, OIL CAPACITY

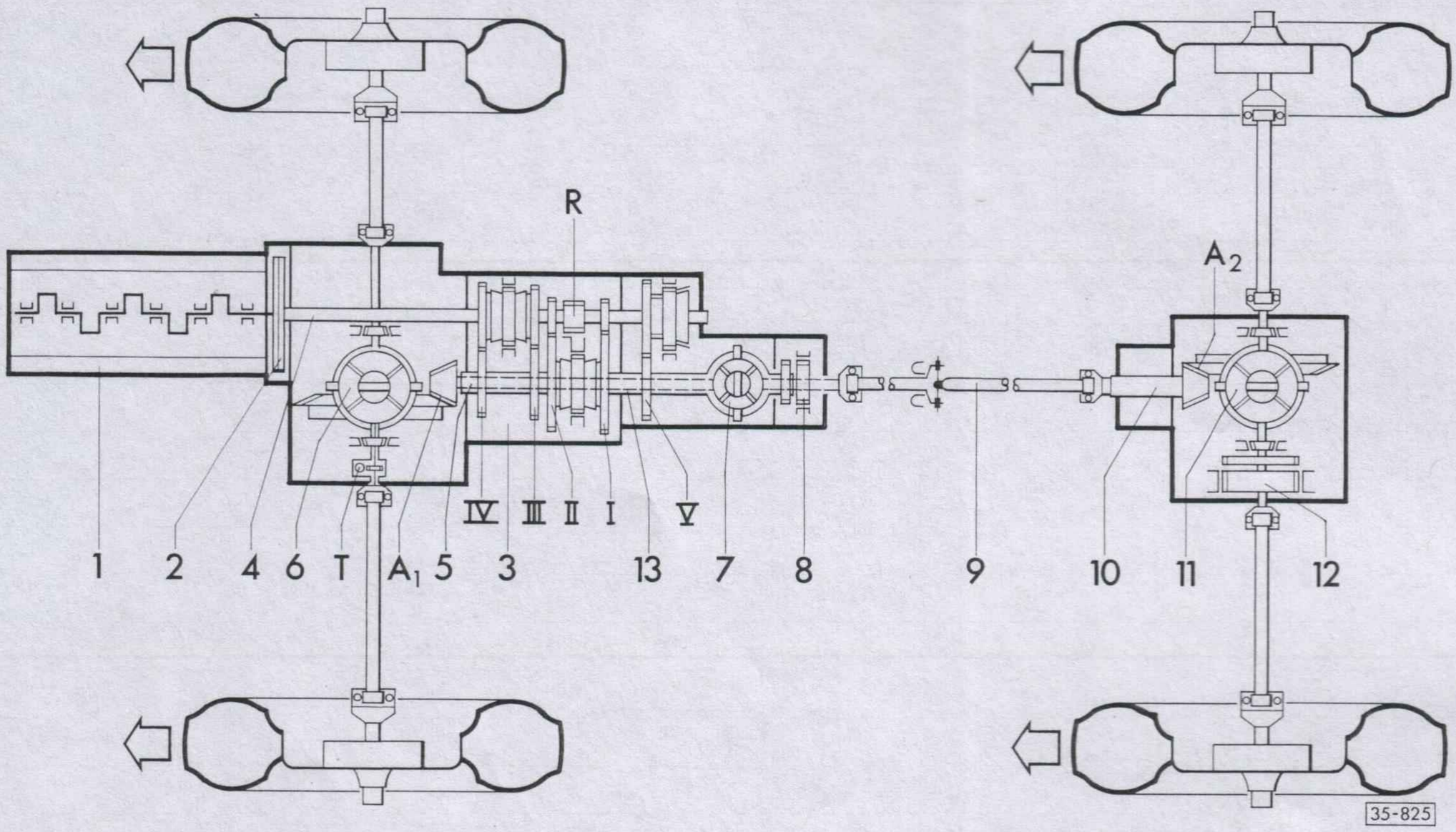
Code letters	Manual gearbox, front final drive	UG	UH
	Rear final drive	UJ	UR
Manufactured	from	5.80	12.80
	to		
Gearbox type		5-speed manual gearbox 016 for four wheel drive	
Gearbox No.:	Manual gearbox, front final drive	016 A	016 B
	Rear final drive	016 C	016 E
Gearbox/ engine pairings	Model	Audi Quattro	
	Engine	2.2 l 5-cyl. 147 kW (200 bhp) fuel injection engine with turbocharger	2.2 l 5-cyl. 120 kW (163 bhp) fuel injection engine with turbocharger
Ratios	Final drive, front and rear	35 : 9 = 3.89	37 : 9 = 4.11
$Z_2 : Z_1 = i$	1st gear	36 : 10 = 3.60	
	2nd gear	34 : 16 = 2.125	
	3rd gear	34 : 25 = 1.36	
	4th gear	29 : 30 = 0.967	
	5th gear	28 : 36 = 0.778	
	Reverse	42 : 12 = 3.50	
	Speedo	13 : 25 = 0.52	
Clutch operation		hydraulic	
Clutch plate dia.		240 mm	
Remarks			For USA

Gearbox oil		Gearbox, front final drive	Rear final drive
(filled for life)	Capacity	3.2 litres	2.2 litres
	Specification	Hypoid gear oil GL 4 (MIL-L-2105) SAE 80 or SAE 80 W-90	Hypoid gear oil GL 5 (MIL-L-2105 B) SAE 90

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5-speed manual gearbox 016 4wd – technical data

TRANSMISSION LAYOUT



Designation

1 – Engine
2 – Clutch
3 – Manual gearbox
4 – Input shaft
5 – Output shaft (pinion), front
6 – Front differential
7 – Inter-axle differential
8 – Inter-axle differential lock
9 – Propellor shaft
10 – Rear pinion
11 – Rear differential
12 – Differential lock
13 – Output gear train

Gearing

I – 1st gear
II – 2nd gear
III – 3rd gear
IV – 4th gear
V – 5th gear
R – Reverse
A_1 – Front final drive
A_2 – Rear final drive
T – Speedo drive

CALCULATING RATIO "i"

Z_1 = Number of teeth on driving gear

Z_2 = Number of teeth on driven gear

$$\frac{\text{Number of teeth on driven gear}}{\text{Number of teeth on driving gear}} = i \qquad \boxed{Z_2 : Z_1 = i}$$

Example	1st gear	Final drive
Driving gear:	$Z_{G1} = 10$	$Z_{A1} = 9$
Driven gear:	$Z_{G_2} = 36$	$Z_{A2} = 35$

Gear ratio "i_G"

$Z_{G2} : Z_{G1} = i_G$

$36 : 10 = 3.60$

Final drive ratio "i_A"

$Z_{A2} : Z_{A1} = i_A$

$35 : 9 = 3.89$

Overall ratio "$i_{overall}$"

$$\frac{Z_{G2}}{Z_{G1}} \cdot \frac{Z_{A2}}{Z_{A1}} = i \text{ overall}$$

$$\frac{36}{10} \cdot \frac{35}{9} = 14.00$$

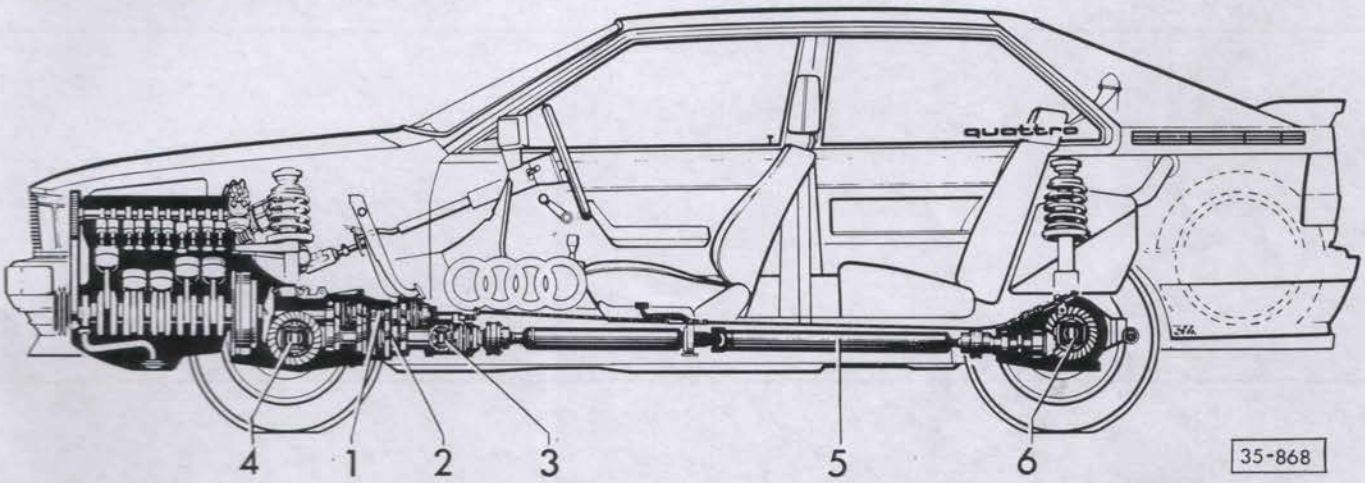
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FUNCTION AND CONSTRUCTION

The "type 016 4wd 5-speed manual gearbox" is based on the type 016 manual gearbox for the Audi 100. The difference is that the Audi Quattro has permanently-engaged four-wheel-drive.

The distribution of traction forces to all four road wheels of the vehicle gives better handling than is possible with two-wheel-drive passenger cars. This applies particularly when driving

- in bad weather conditions
- on gradients
- towing a trailer
- off road
- and when braking in a corner



1 – Input shaft
2 – Output gear train
3 – Inter-axle differential
4 – Front differential
5 – Propellor shaft
6 – Rear differential

With the 4wd gearbox power is transmitted via the input shaft – 1 – and the output gear train – 2 – to an inter-axle differential – 3 –. From here the traction forces are distributed evenly to the front and rear wheels,

- to the front wheels via an output shaft and pinion (running in bearings in the hollow output gear train), the front differential – 4 – and the drive shafts,
- to the rear wheels via propellor shaft – 5 –, a pinion, rear differential – 6 – and drive shafts.

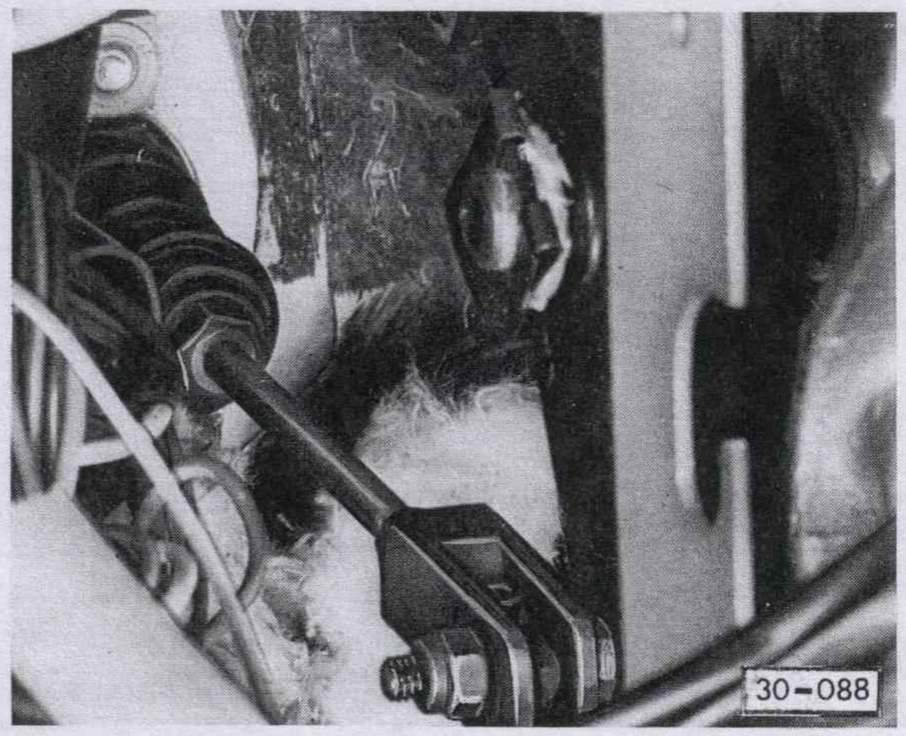
The inter-axle differential compensates for differences in the rates of rotation of the wheels (for instance when cornering). The front and rear differentials have a similar task. They have to compensate for the different rates of rotation of the nearside and offside wheels. In addition to this, the inter-axle differential and the rear differential can be locked. This can be particularly useful in difficult weather conditions (wet roads, snow or ice). Refer to the notes in the Instruction Manual.

WB 14,6

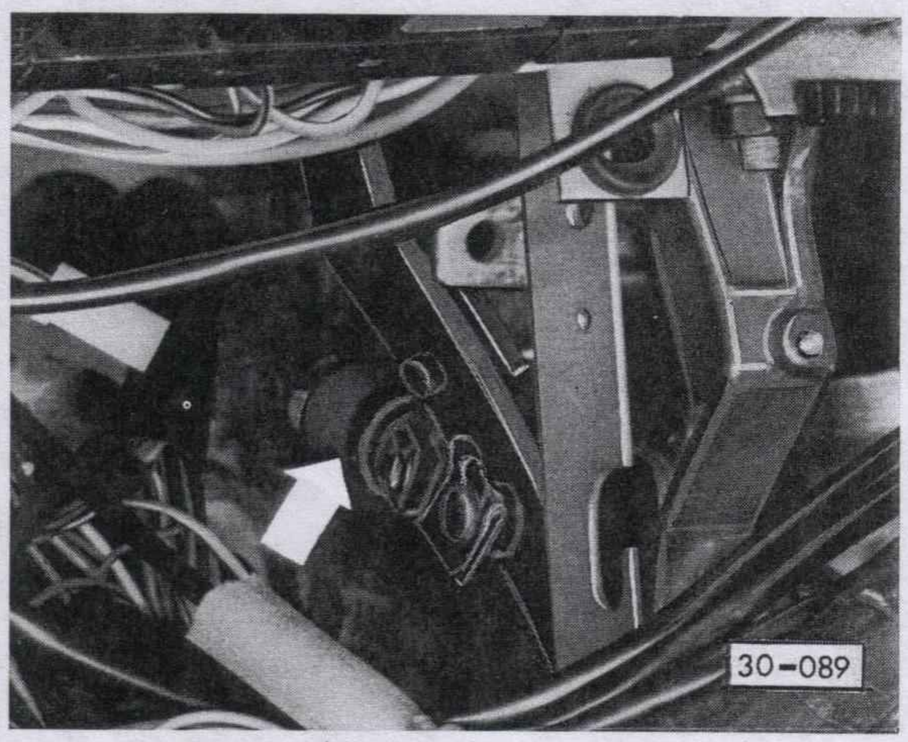
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SERVICING CLUTCH OPERATING MECHANISM

Adjusting length of master cylinder plunger



– Adjust fork joint so that clutch pedal is approx. 10 mm higher than brake pedal.



– When adjusting fork joint make sure that over-centre spring returns clutch pedal and that pedal does not contact pedal bracket in return position. If this is not done, clutch lining can wear prematurely.

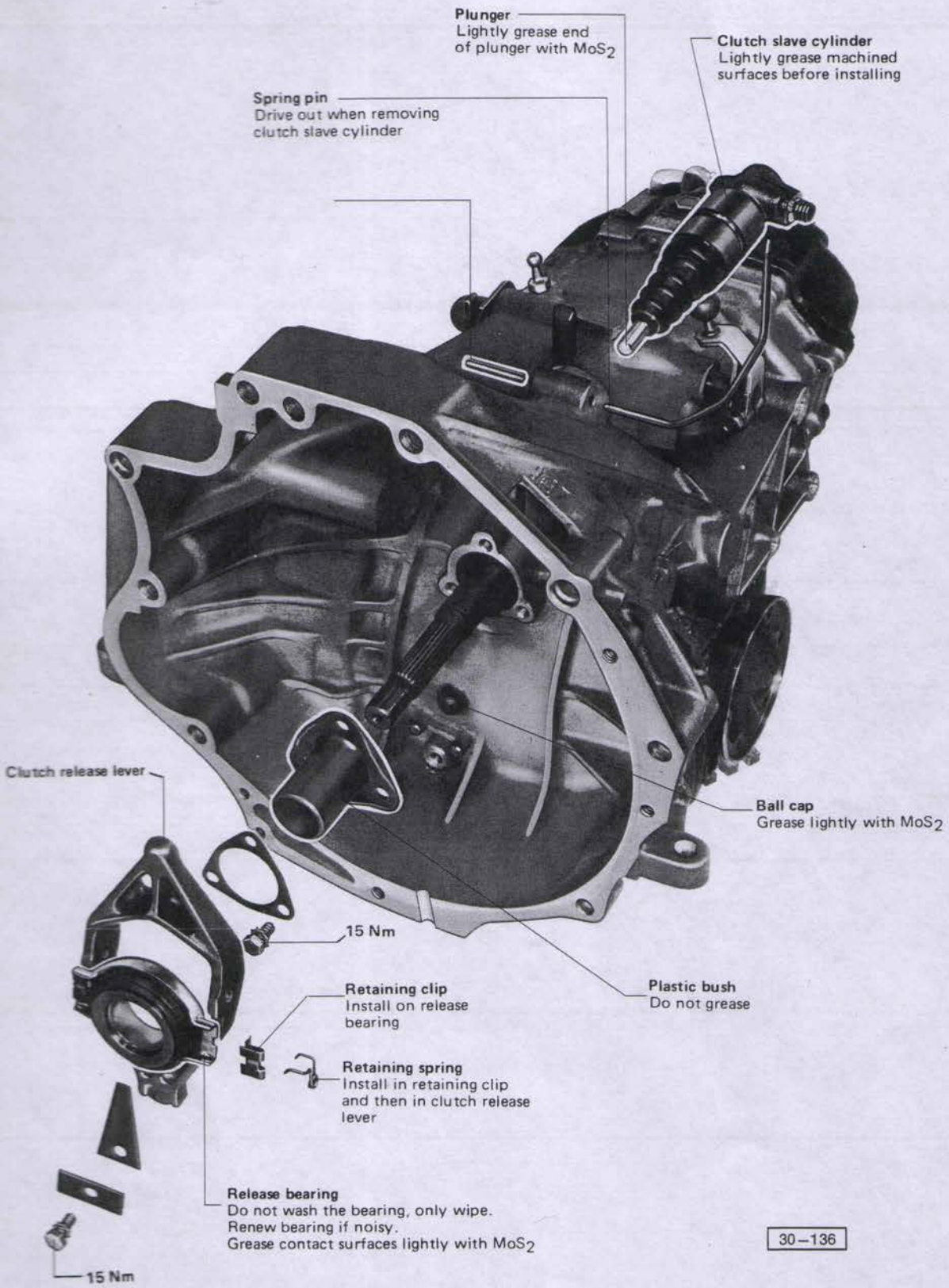
Note:
Renew all self-locking nuts and clips when carrying out repairs. Grease all pins lightly with MoS_2.

Bleeding clutch:
Connect brake bleeder appliance VW 1238/1 (also refer to section on bleeding brakes).

Operating pressure 2 - 2.5 bar. Open bleeder valve until brake fluid comes out with no air bubbles.

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SERVICING CLUTCH RELEASE MECHANISM

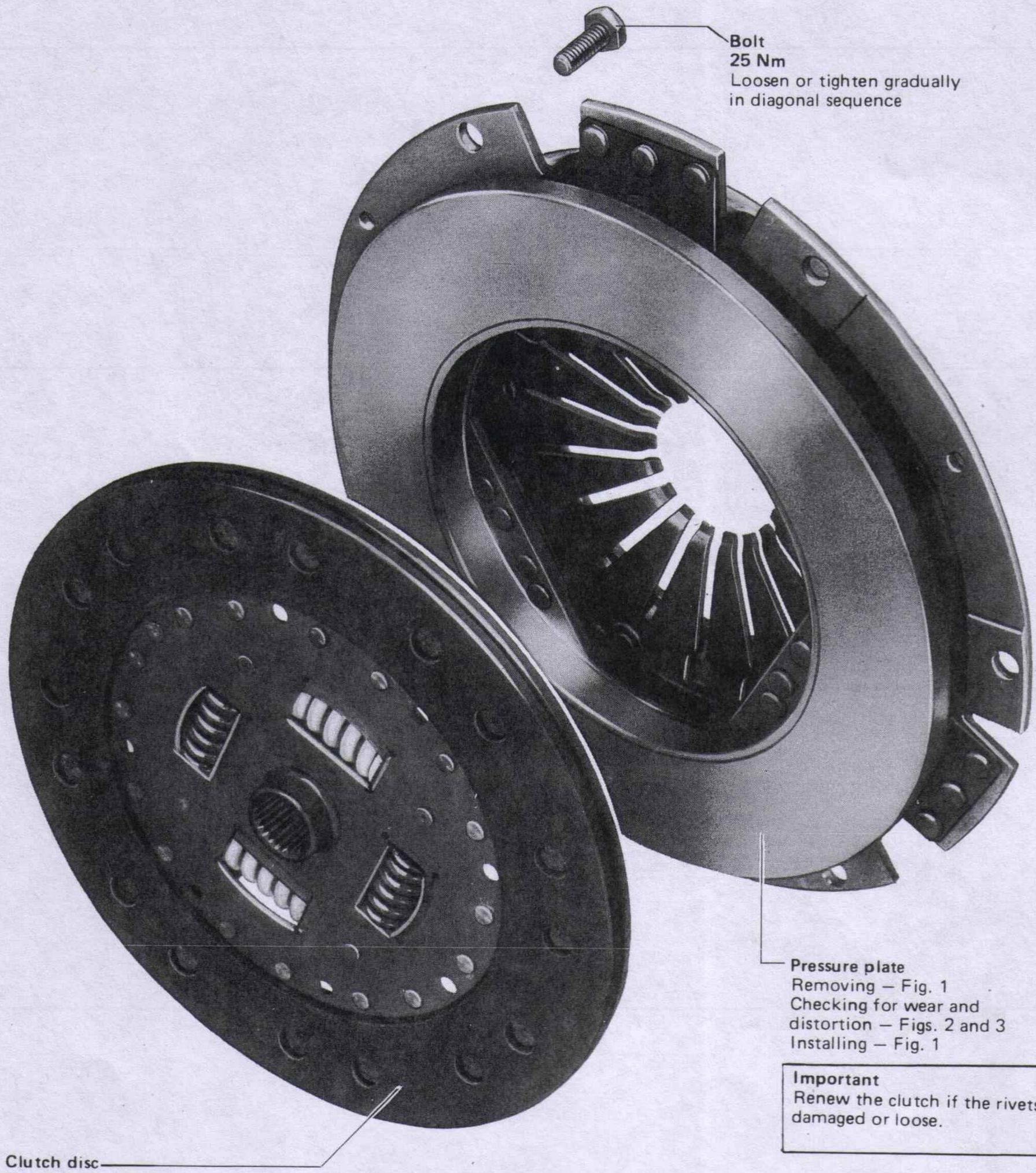


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SERVICING CLUTCH

Removing and installing clutch

Note:
Remove gearbox to work on the clutch – page 65.



Bolt
25 Nm
Loosen or tighten gradually in diagonal sequence

Pressure plate
Removing – Fig. 1
Checking for wear and distortion – Figs. 2 and 3
Installing – Fig. 1

Important
Renew the clutch if the rivets are damaged or loose.

Clutch disc
Centering – Fig. 1
Checking runout – Fig. 4
Coat splines lightly with Moly paste or Moly spray

Important
Check splines: clutch disc must move freely on input shaft without excessive radial play.

30–122

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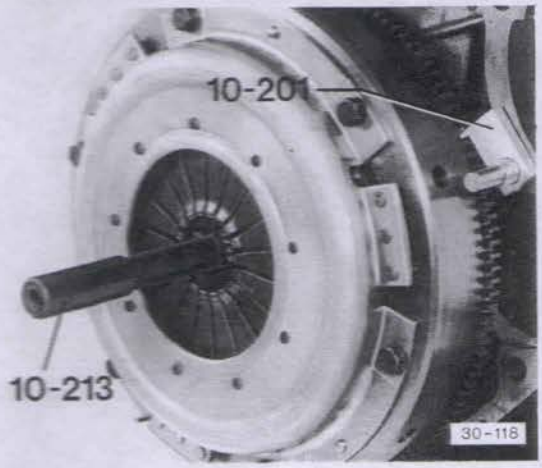


Fig. 1 Removing and installing clutch

– Mark position

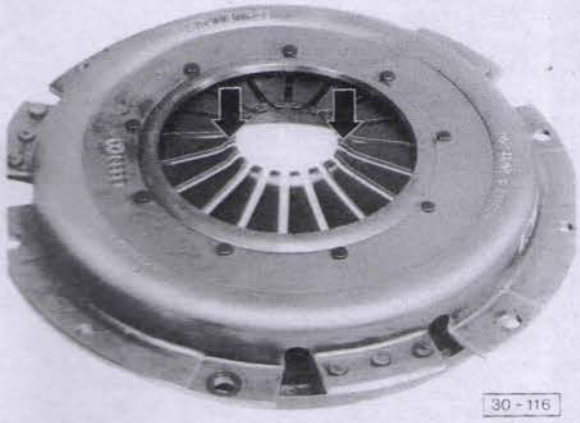


Fig. 2 Checking pressure plate for wear

– Check the ends of the diaphragm springs for scoring.

– Scoring not exceeding 0.3 mm deep is acceptable.

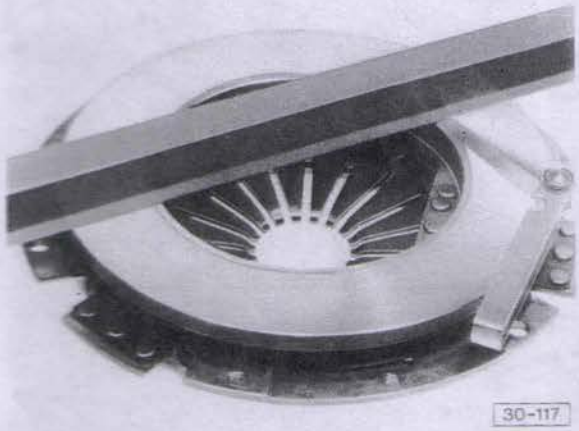


Fig. 3 Checking pressure plate for distortion

– Wear limit: max. 0.3 mm at inside edge.

– Check for cracks and signs of burning.

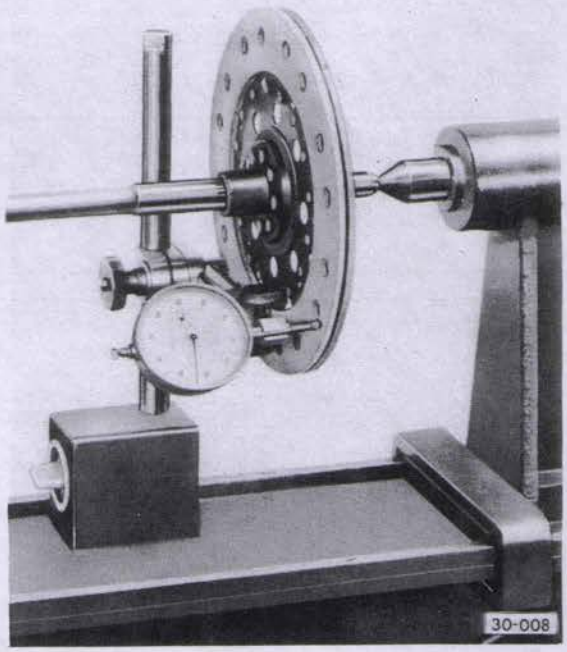


Fig. 4 Checking clutch disc for lateral runout

Runout must not exceed 0.5 mm
(measured 2.5 mm from outside edge).

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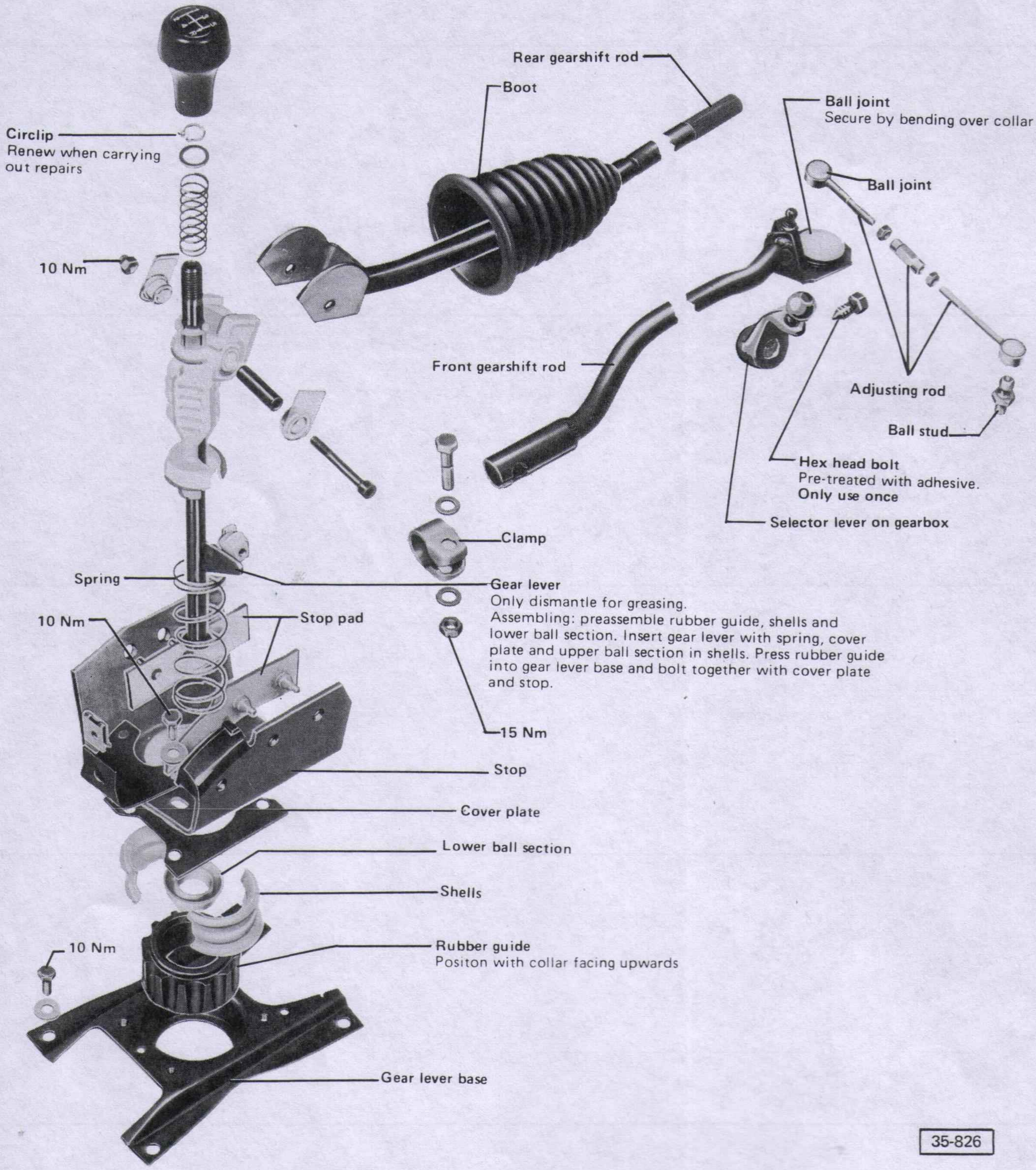
SERVICING GEARSHIFT LINKAGE

Adjusting linkage – page 63

Important
Grease all joints and moving surfaces with special grease, Part No. AOS 126 000 (white).

Removing and installing gearshift rods

Detach rear gearshift rod from gear lever, press front rod off selector lever on gearbox and detach adjusting rod. Take gearshift rods out downwards.



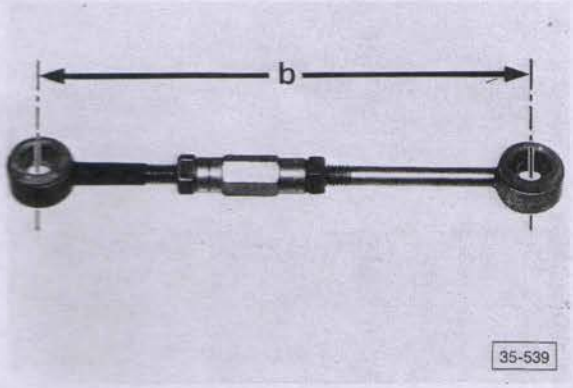
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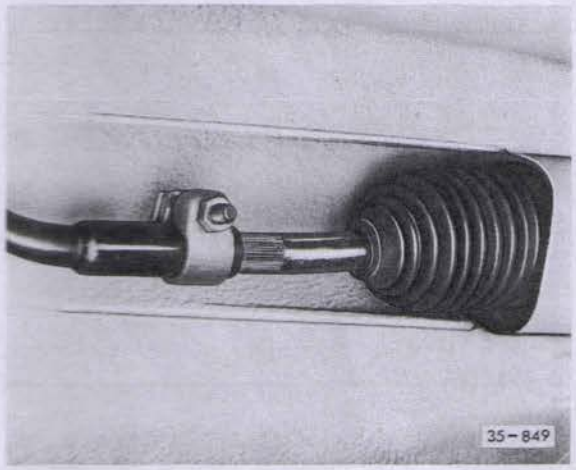
ADJUSTING GEARSHIFT LINKAGE

Checking basic setting

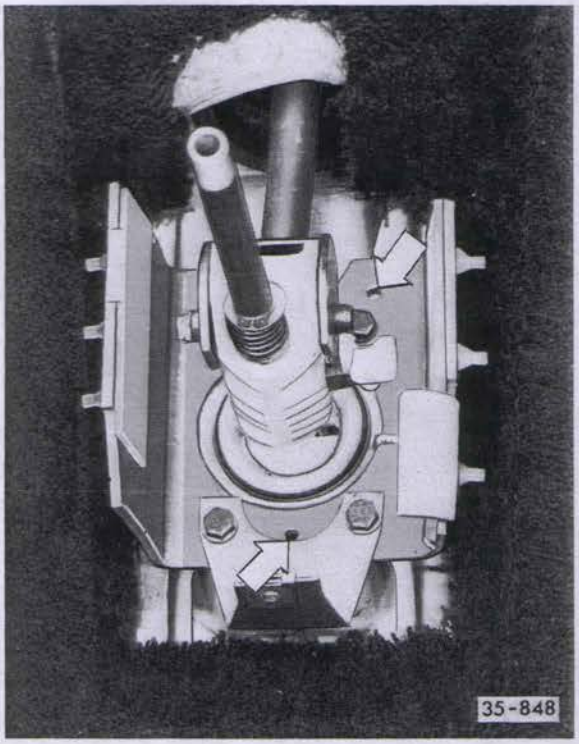
- Engage 1st gear.
- Press gear lever to the left against stop.
- Release gear lever: it must spring back by itself to the right (about 5 - 10 mm).
- Engage 5th gear.
- Press gear lever to the right against stop.
- Release gear lever: it must spring back by itself to the left (about 5 - 10 mm).
- The gear lever must spring back about the same distance after being engaged in 1st and 5th gears. If this is not the case, the setting can be altered slightly by moving the stop sideways in the slots. If this adjustment is not sufficient, proceed as follows:
- Gearbox in neutral.



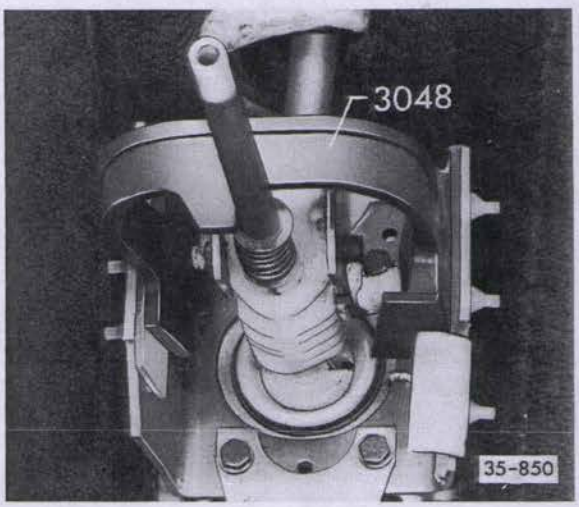
- Set adjusting rod: b = 134 mm.
- Install adjusting rod.



- Loosen clamp: connection between front and rear gearshift rods must move freely.



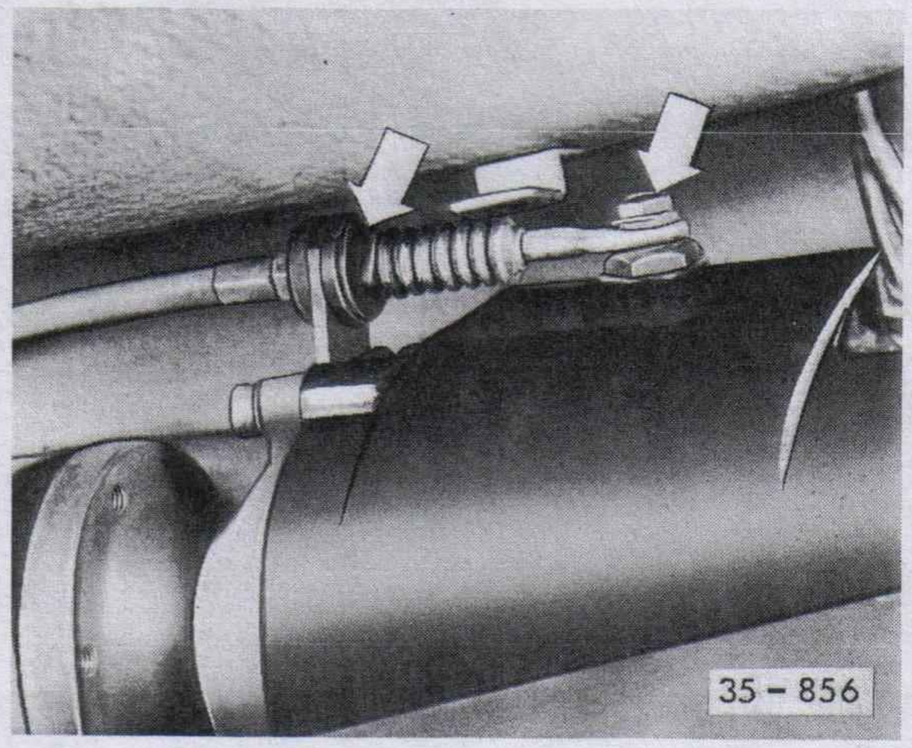
- Align centering holes in stop and gear lever base; tighten bolts.



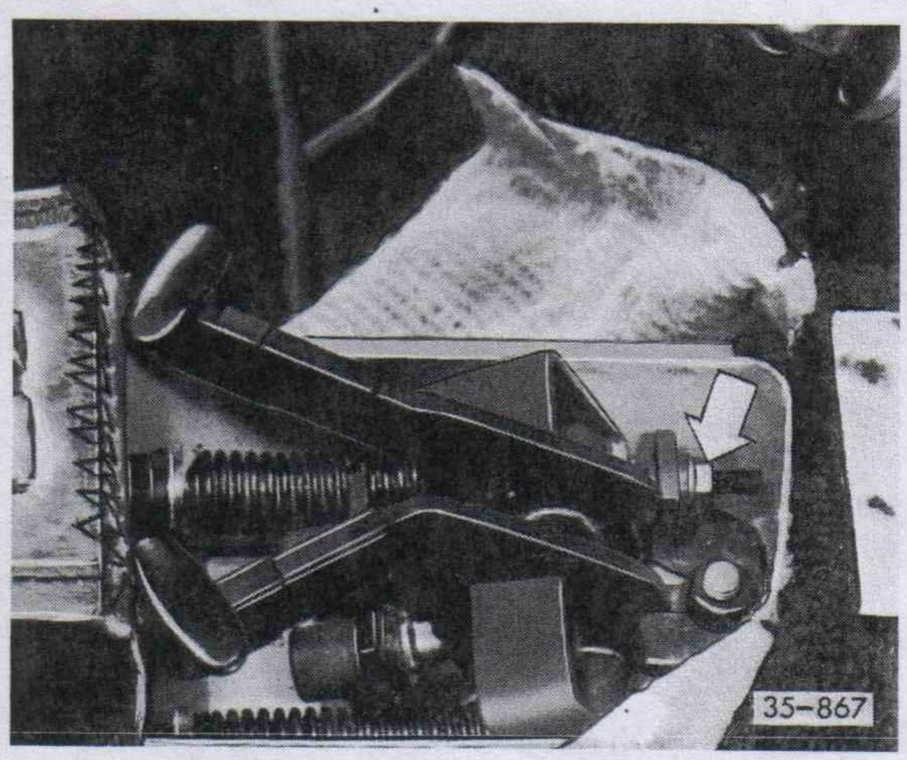
- Attach gauge 3048, first inserting pins of gauge into open holes on right of stop pad – then into holes on left of stop pad.
- Tighten clamp.
- Remove gauge.
- When the gear lever is engaged in 1st and then 5th gears and pressed outwards to either side it must spring back about the same distance. If this is not the case, the adjustment can be altered slightly by moving the stop sideways in the slots.
- Select all gears, paying particular attention to the function of the reverse gear lock.

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ADJUSTING INTER-AXLE DIFFERENTIAL LOCK



– Secure cable on gearbox.
– Make sure that rubber stops and rubber boot are seated properly.
– Push threaded pin through guide sleeve and bush on support bracket.
– Fit rubber boot, ensuring a proper seal.

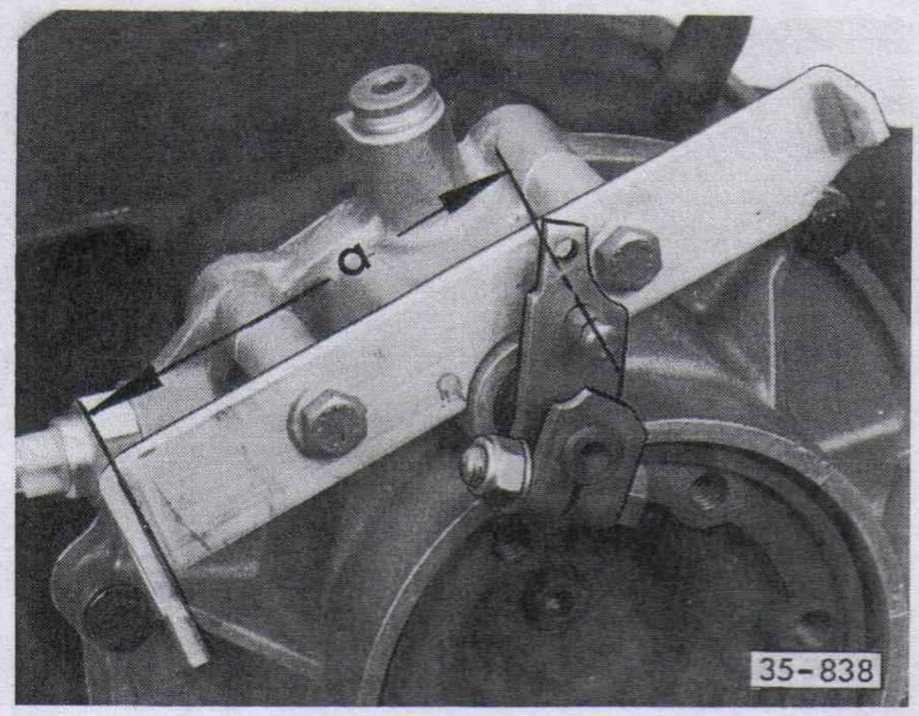


– Bring collar nut into contact with bush on support bracket and operate lever several times. If necessary turn collar nut again to bring it back into contact with bush. From this position turn collar nut another two turns and lock with hex nut.

Note:
When the lever is pulled the differential lock cannot engage when the splines are directly in line. When this happens the spring on the guide sleeve is merely preloaded, and the lock will then engage when one wheel is turned or when the vehicle is moving.

ADJUSTING REAR DIFFERENTIAL LOCK

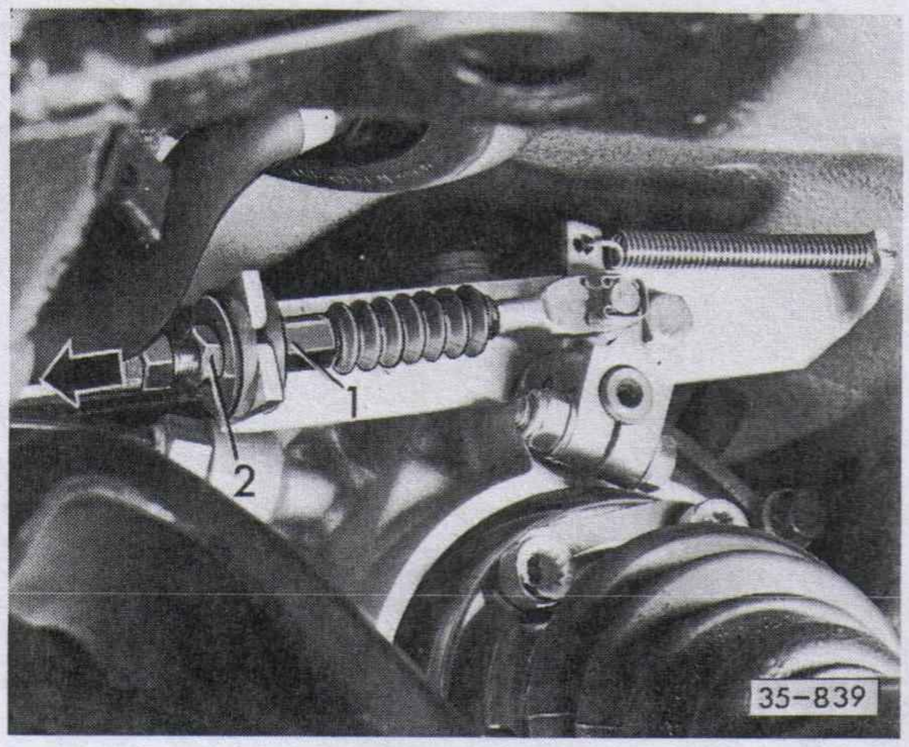
– Ensure that the cable sleeve is properly located at the tunnel opening. The tabs of the clamping piece must be spread properly (check from inside).
– Check that retaining clip on cable pin is located properly, renew if necessary.



– Adjust clamping lever to **a = 93 mm.**

Before adjusting: disengage return spring and set clamping lever in return position (turn selector shaft to the right in detent).

– Guide cable through slot in support bracket, engage cable eyelet and secure.



– Pull back cable sleeve (arrow) until resistance can be felt (clamping lever remains in return position).
– Turn back coupling nut – 1 – and lock with hex nut – 2 –. Ensure that rubber washers are seated properly.
– Engage return spring.

Note:
When the lever is pulled the differential lock cannot engage when the splines are directly in line. When this happens the spring on the guide sleeve is merely preloaded and the lock will engage when one rear wheel is turned or when the car is moving.

WB 14, 6,

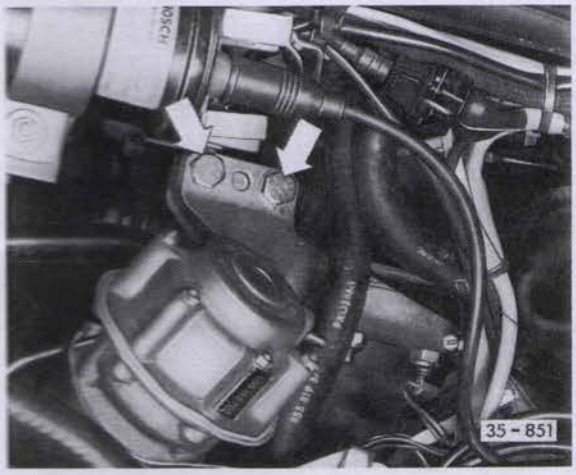
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If repairs not described in this Workshop Manual should be necessary on the type 016 5-speed gearbox or the rear final drive, these components should be renewed complete until further information is published.

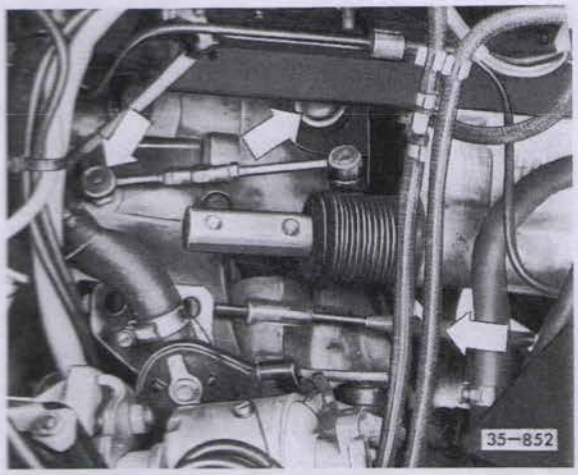
REMOVING AND INSTALLING GEARBOX

Removing:

- Disconnect battery earth strap.
- Unscrew and remove sender unit for ignition timing from gearbox housing.
- Unscrew upper engine/gearbox bolts.
- Detach speedo cable with special tool 3016.



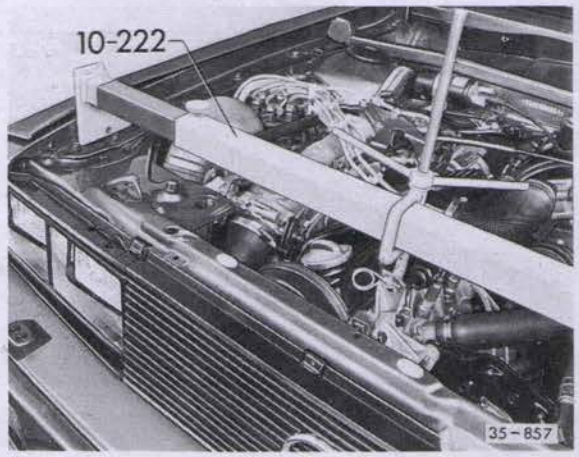
- Detach coupling from steering rack. First unscrew lock nut from below.



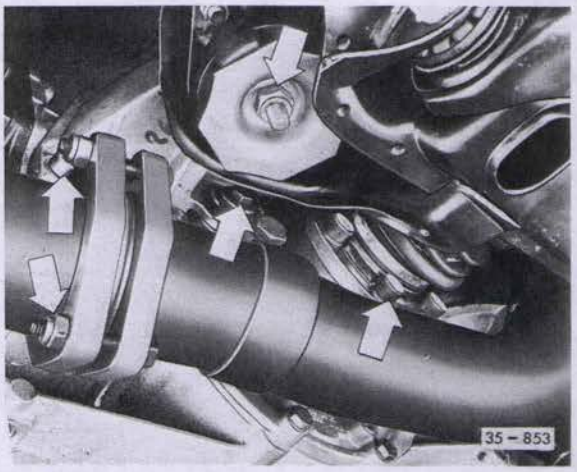
- Detach retainer for clutch slave cylinder, knock out spring pin and take out slave cylinder.

Important
Leave hydraulic pipe connected.

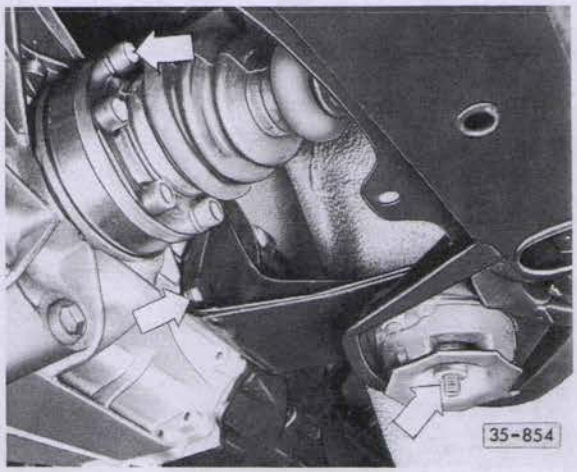
- Disconnect reversing light wiring at switch.
- Press gearshift rod and adjusting rod off ball joints.



- Attach support bar.
- Detach cover plates for drive shaft and right gearbox mount.

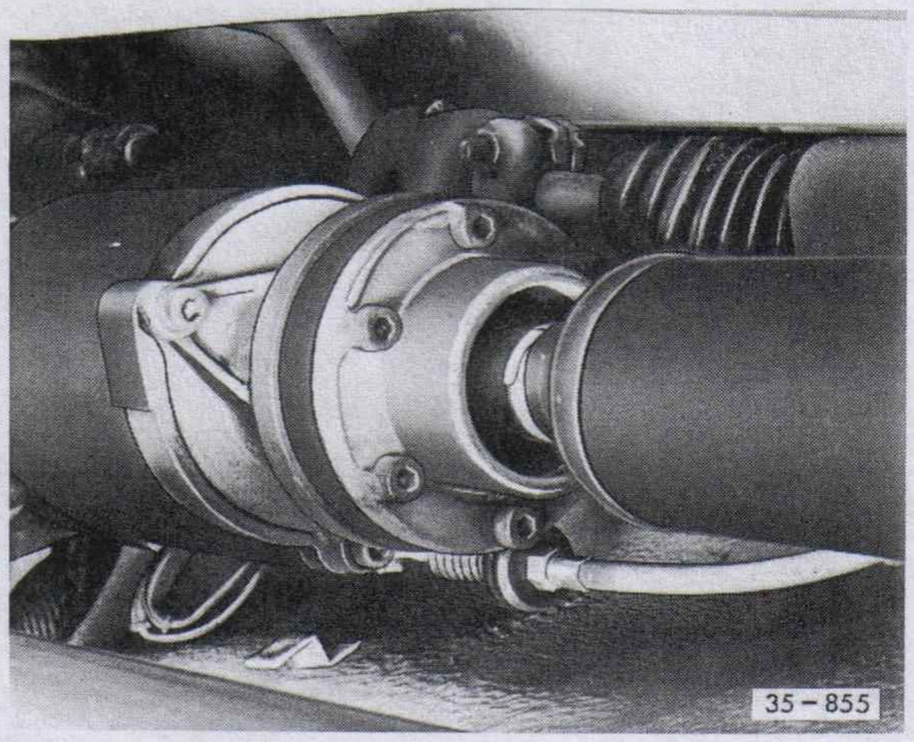


- Detach right gearbox support, exhaust pipe mounting and right drive shaft.

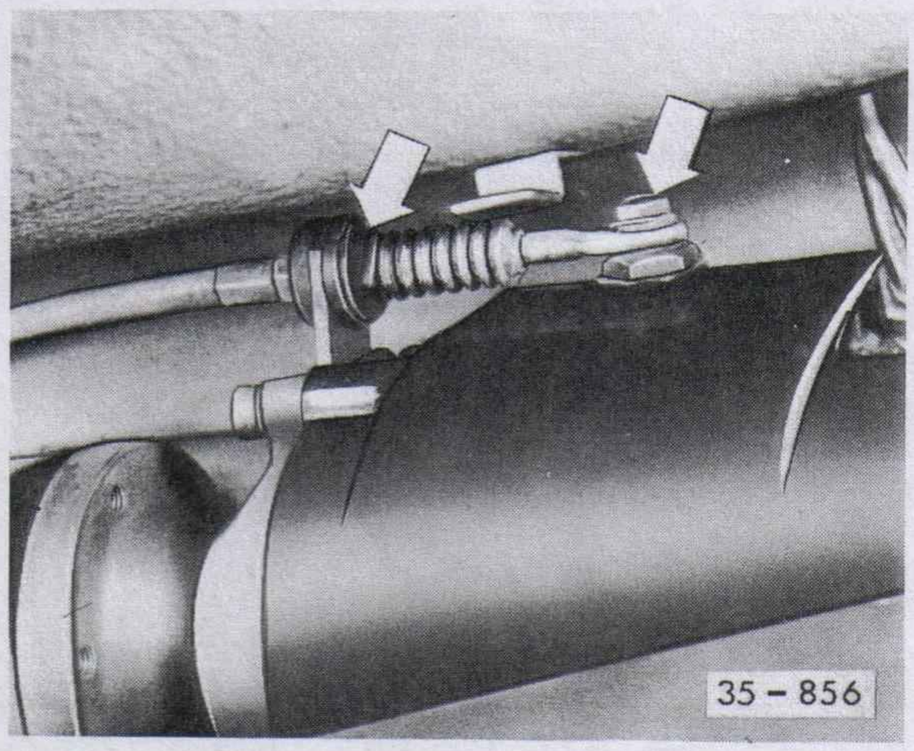


- Detach left gearbox support and left drive shaft.

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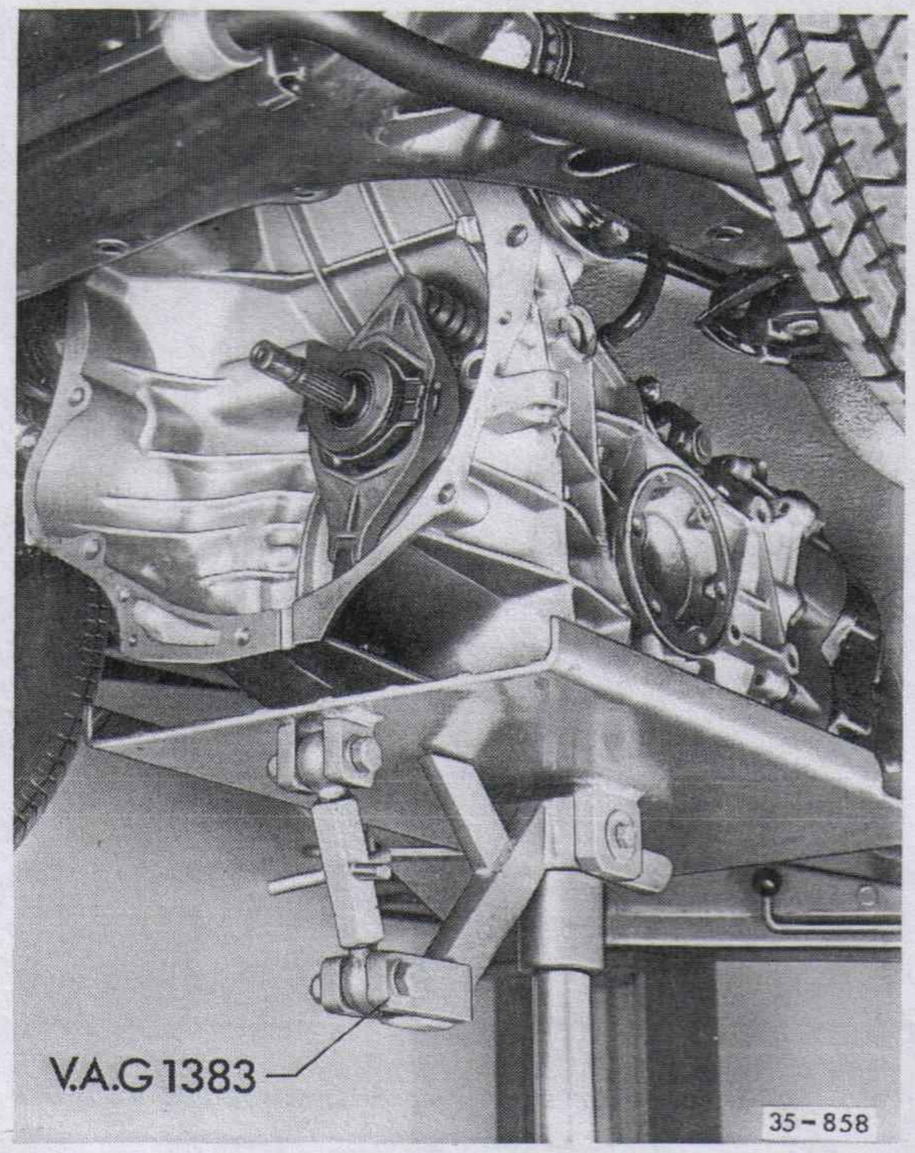


– Detach propellor shaft from gearbox.



– Disengage cable for inter-axle differential lock.
– Detach clutch cover plate from gearbox.
– Take up weight by tightening spindle of support bar 10-222.
– Support gearbox with attachment V.A.G 1383.
– Remove lower engine/gearbox bolts.
– Separate gearbox from engine.

Caution
Ensure clearance for drive shafts, tie rods and gearshift rod.



– Carefully lower gearbox.

Installing

Install following reverse sequence. Install engine/ gearbox mountings free of strain. Readjust gearshift linkage if necessary.

Notes:

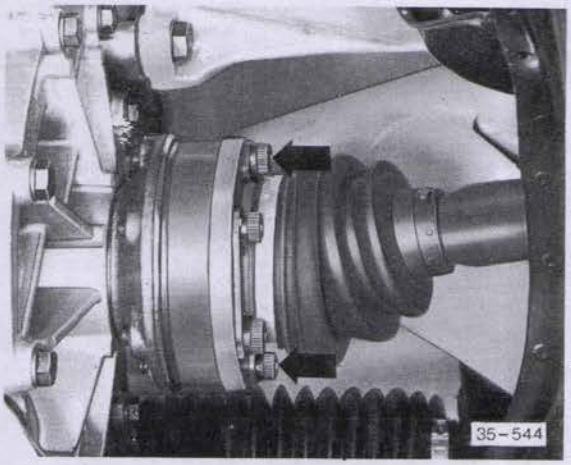
– Clean input shaft splines and lubricate with a small amount of Moly lubricating paste or Moly spray.
– For better clearance around exhaust pipe saw off right hand lug on gearbox housing (near starter mount) if this has not already been done at the factory.

Tightening torques:

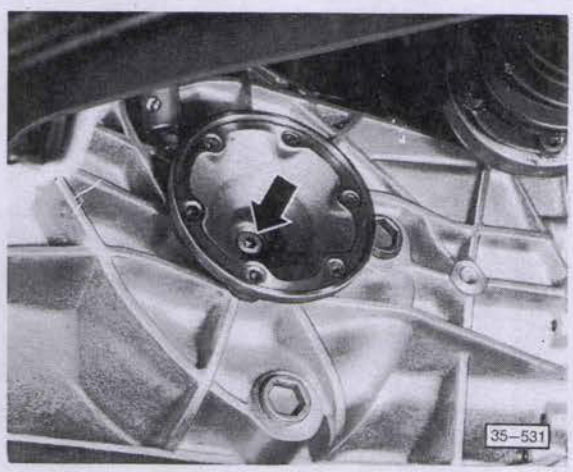
Gearbox to engine (M 12)	60 Nm
Drive shaft to gearbox	80 Nm
Gearbox carrier to gearbox	40 Nm
Gearbox carrier to mount/subframe	45 Nm
Prop shaft to gearbox	45 Nm

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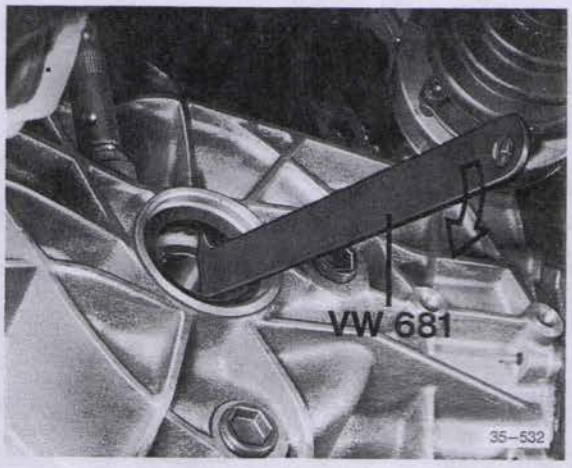
RENEWING DRIVE FLANGE OIL SEAL – FRONT FINAL DRIVE (gearbox in vehicle)



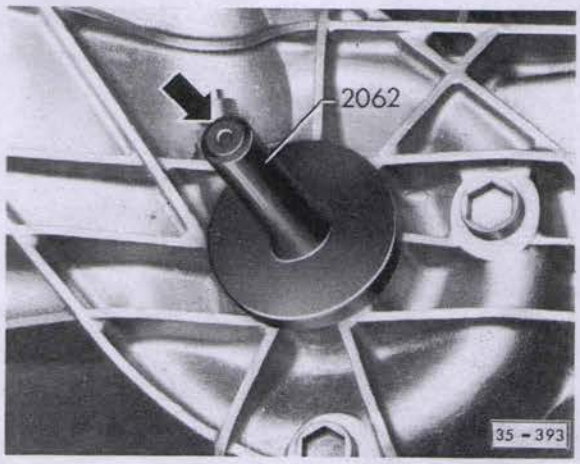
– Detach drive shaft.



– Remove bolt securing drive flange.
– Hold flange with pin.
– Pull out drive flange using container to catch oil.



– Lever out oil seal.



– Drive in oil seal onto seat. On right hand side also use sleeve 30-20.
– Fill space between sealing lip and dust lip with multipurpose grease.

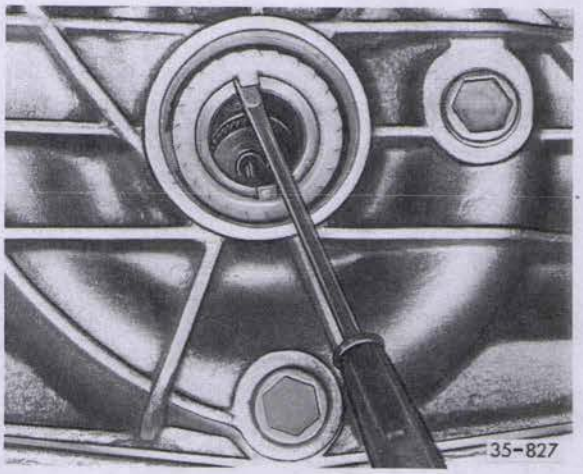
Note:
Remove guard plate when renewing oil seal on right hand side.

Tightening torques:

Drive flange to gearbox	25 Nm
Drive shaft to drive flange	80 Nm

RENEWING SPEEDO GEAR

– Remove drive shaft, drive flange and oil seal on left hand side.

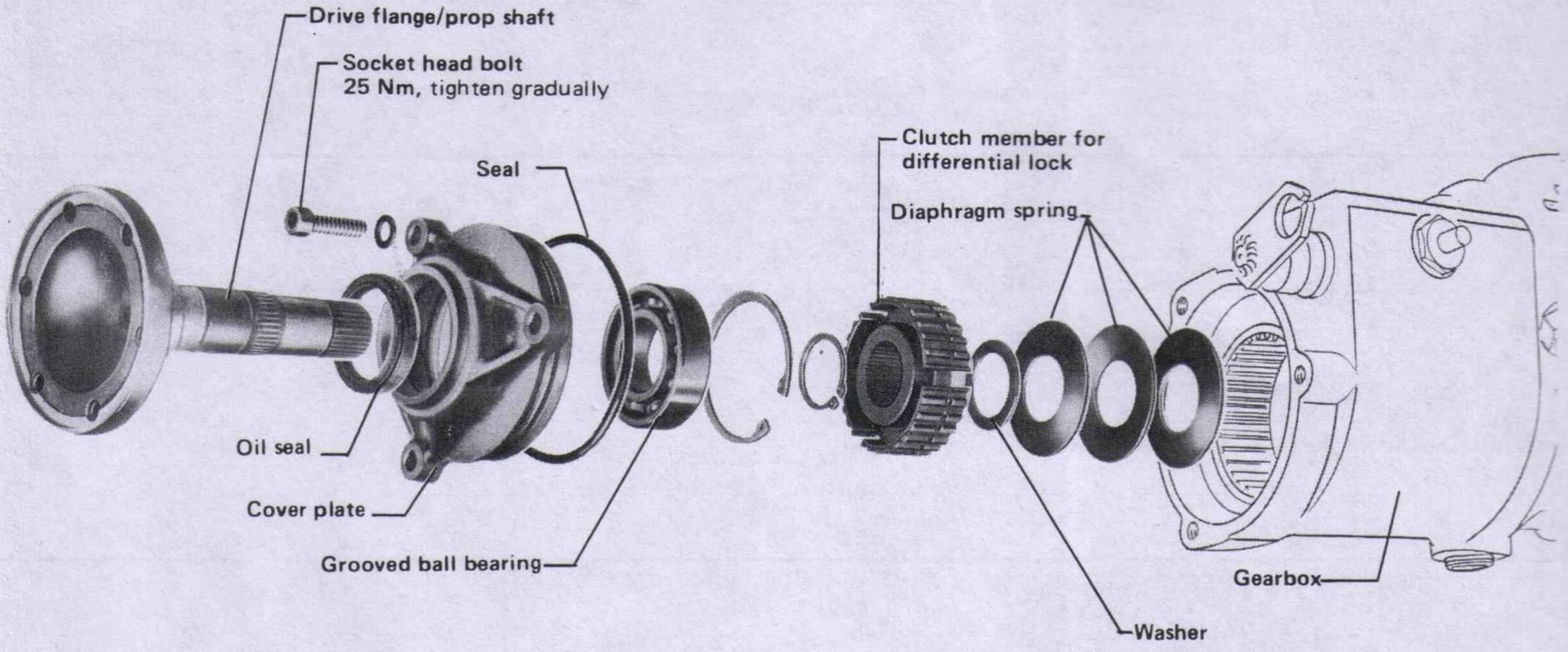


– Lever out speedo gear.
– Press in new speedo gear.
– Drive in new oil seal.
– Install drive flange and drive shaft.
Tightening torques – see above.

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RENEWING OIL SEAL AND GROOVED BALL BEARING FOR DRIVE FLANGE/PROPELLOR SHAFT – FRONT FINAL DRIVE

(gearbox in vehicle)

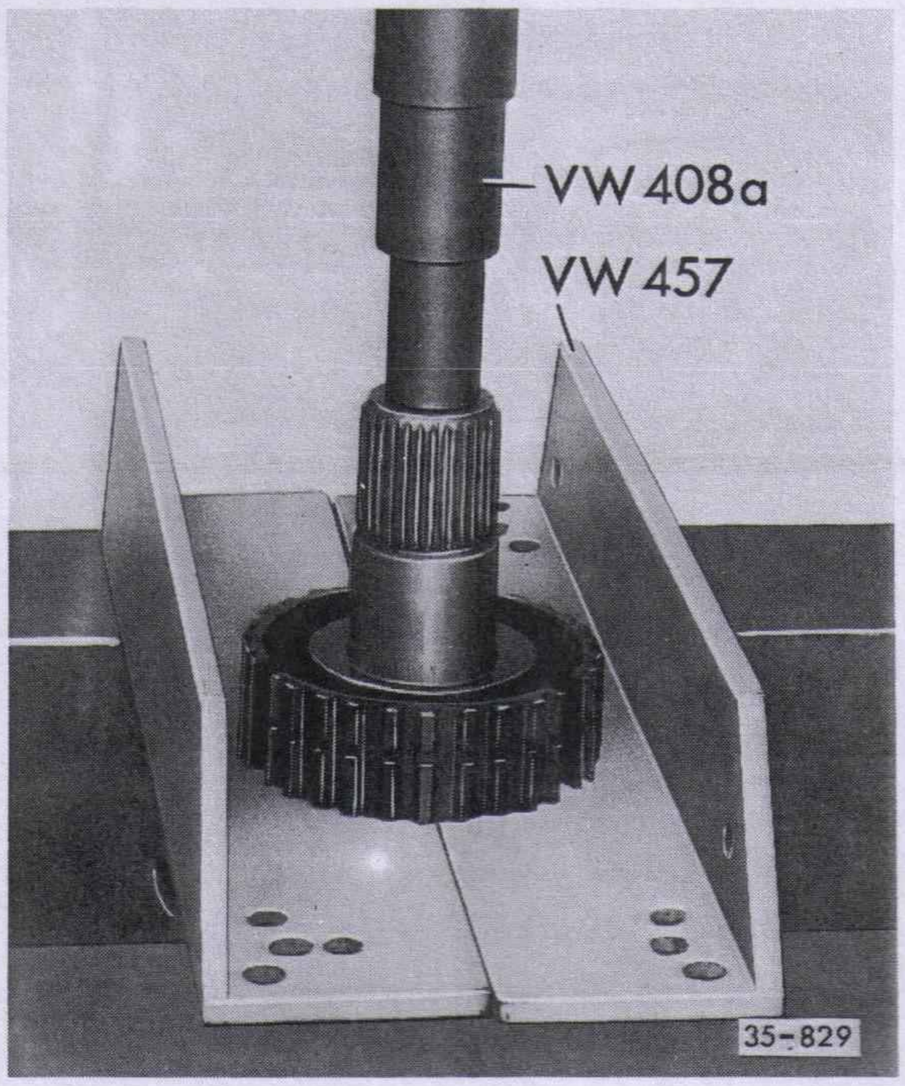


Procedure:

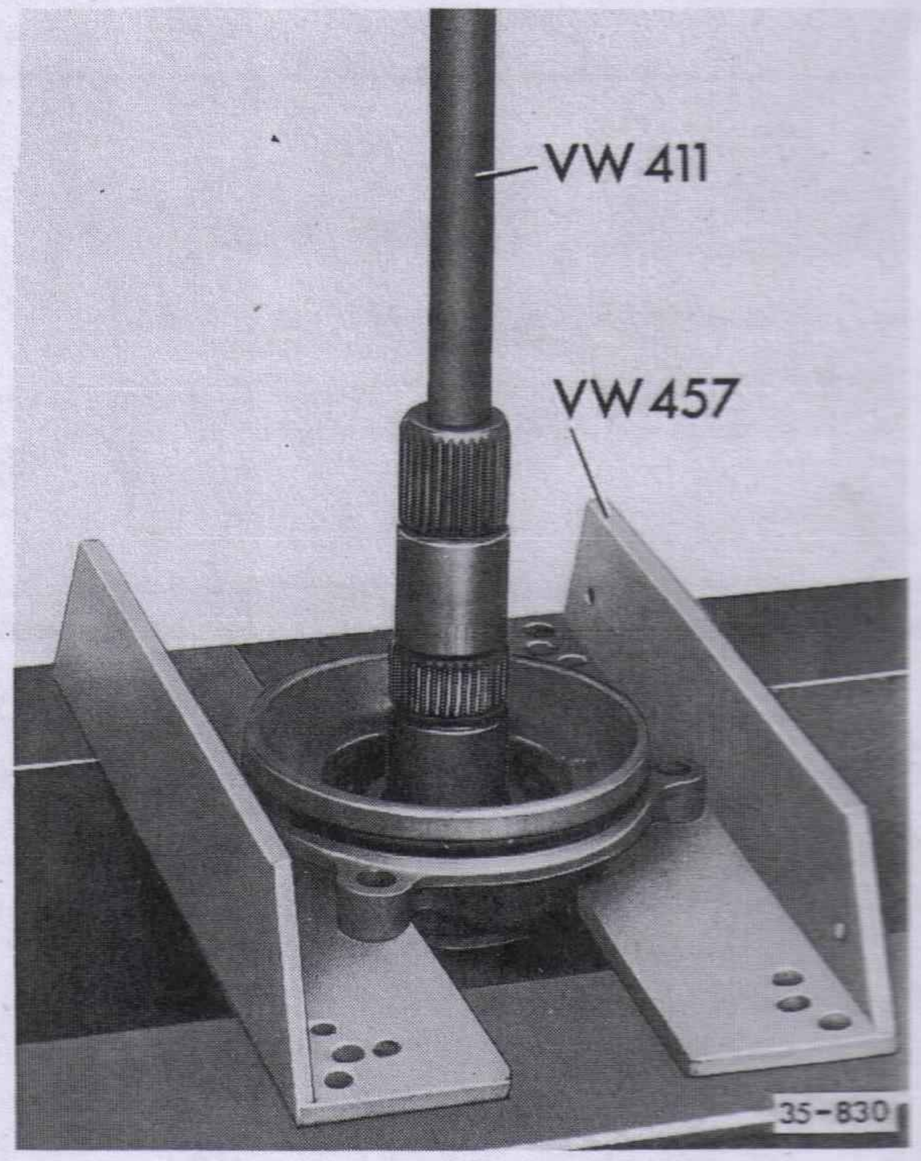
– Detach propellor shaft at the front.

– Detach cover plate from gearbox and remove.

– Remove small circlip.

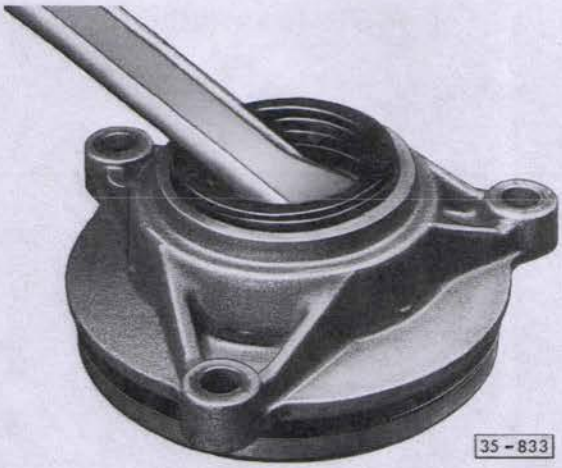


– Press off clutch member.



– Press out drive flange.

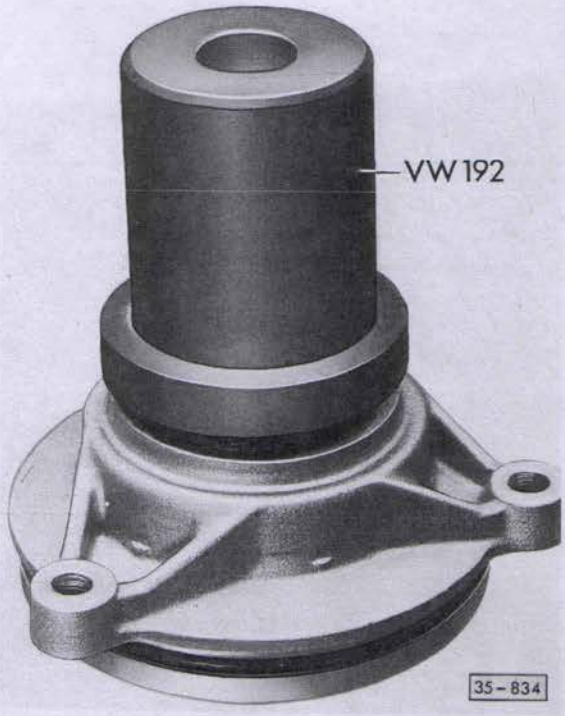
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– Lever out oil seal.

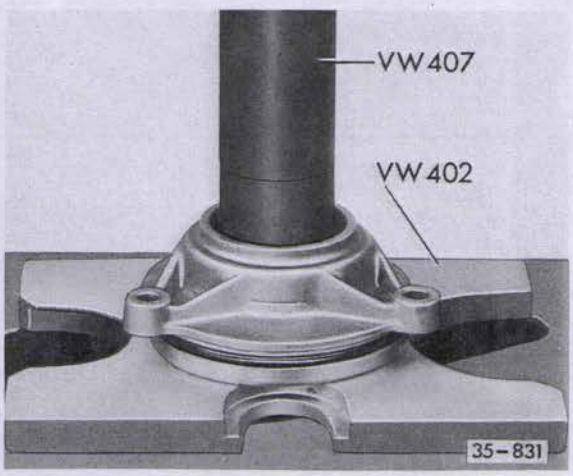
The following steps are only required if the ball bearing also needs renewing:

– Remove large circlip.

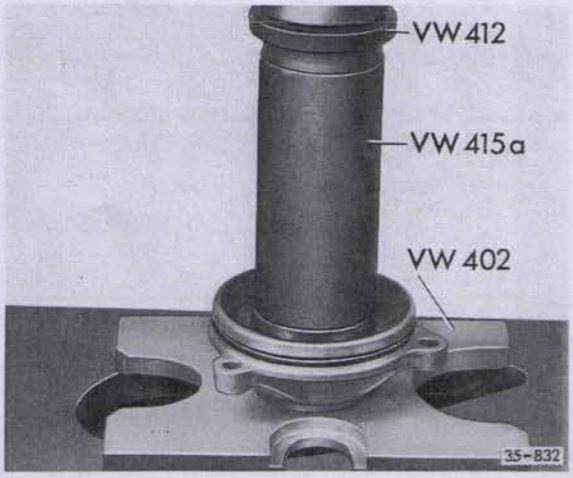


– Drive in oil seal onto stop.

– Fill space between sealing lip and dust lip with multipurpose grease.

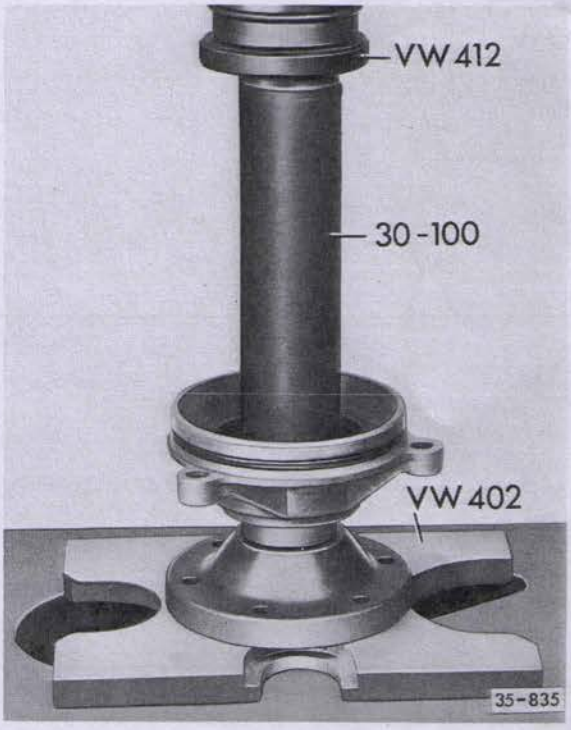


– Press out grooved ball bearing.



– Press in grooved ball bearing.

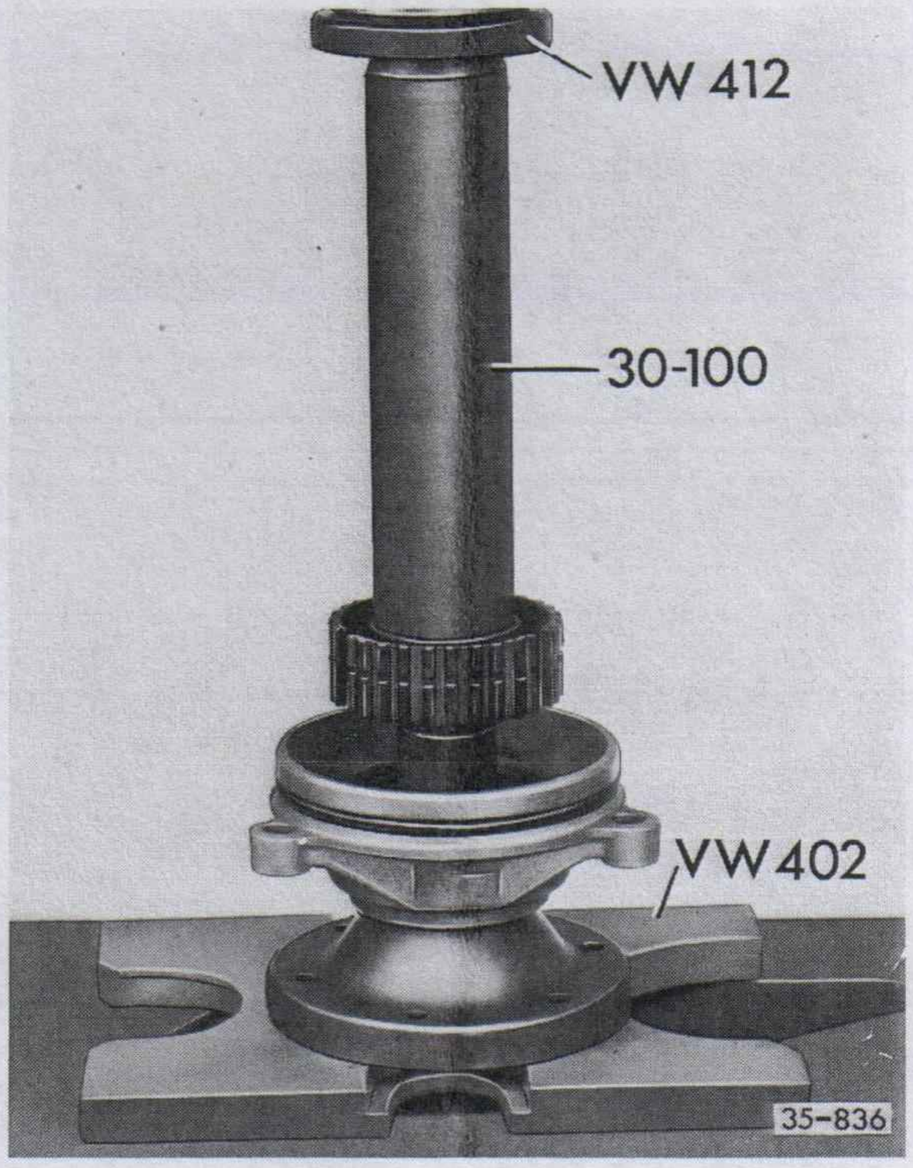
– Install large circlip.



– Press in drive flange.

– Fit small circlip.

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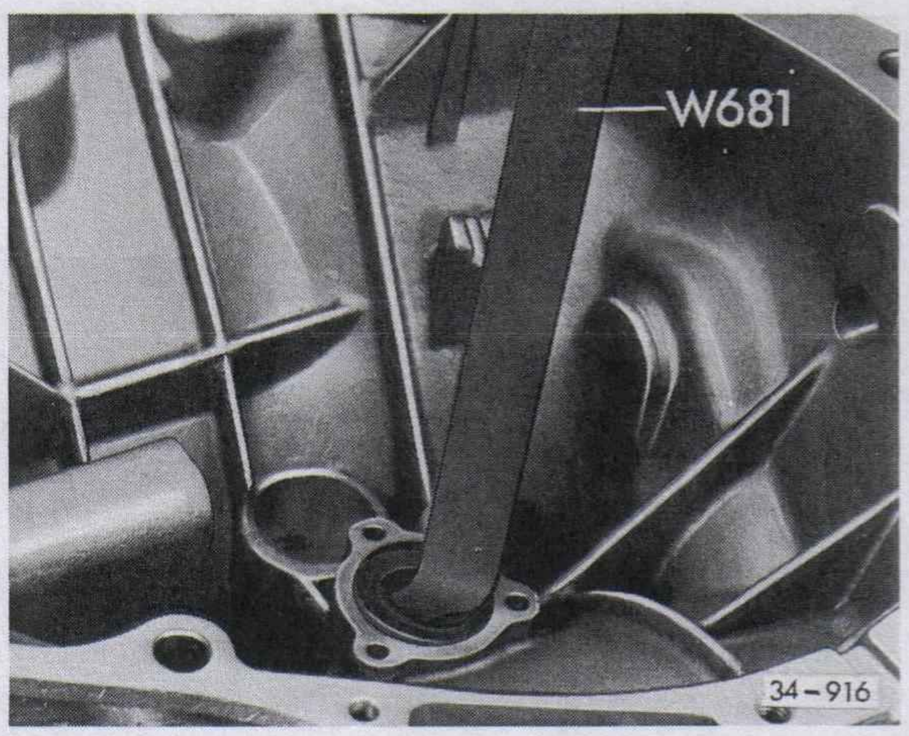
– Press on clutch member.

Position:
The wider portion of the external splines divided by the continuos groove faces towards the cover plate.

– Fit washer and diaphragm springs.
– Install cover plate with new seal and tighten bolts to 25 Nm.
– Attach propellor shaft and tighten bolts to 45 Nm.

RENEWING OIL SEAL FOR INPUT SHAFT
(gearbox removed)

– Detach clutch release mechanism and guide sleeve.



– Extract input shaft oil seal.



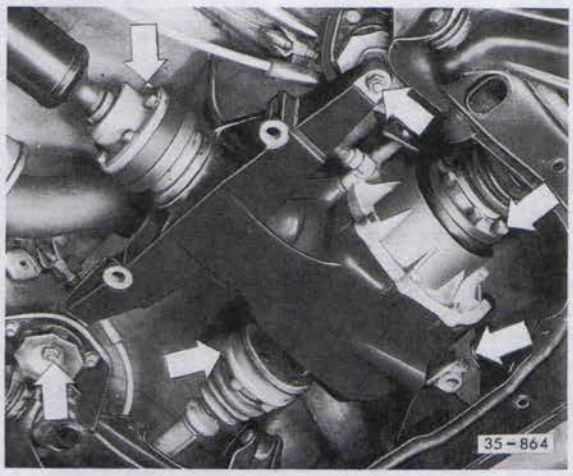
– Knock input shaft oil seal fully home.

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If repairs not described in this Workshop Manual should be necessary on the type 016 5-speed gearbox or the rear final drive, these components should be renewed complete until further information is published.

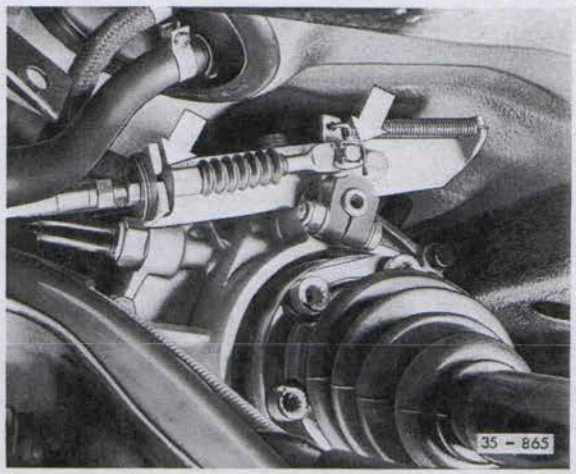
REMOVING AND INSTALLING REAR FINAL DRIVE

Removing



– Detach propellor shaft: if necessary engage rear differential lock and lock one wheel.

– Detach drive shafts.



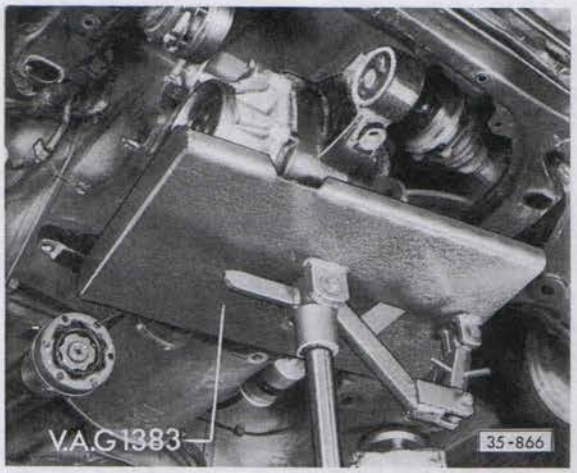
– Disengage cable for differential lock at lever.

– Release lock nut at support bracket and unscrew coupling nut from cable sleeve.

– Disengage cable through slot on support bearing (only possible when differential lock is not engaged).

– Disconnect wire for differential lock indicator light switch.

– Remove mounting bolts (see Fig. 35-864).



– Slightly raise final drive with attachment V.A.G 1383, move forward, then lower carefully.

Installing

Carry out installation in reverse sequence. Make sure that final drive mountings are free of strain. If necessary readjust differential lock.

Tightening torques:

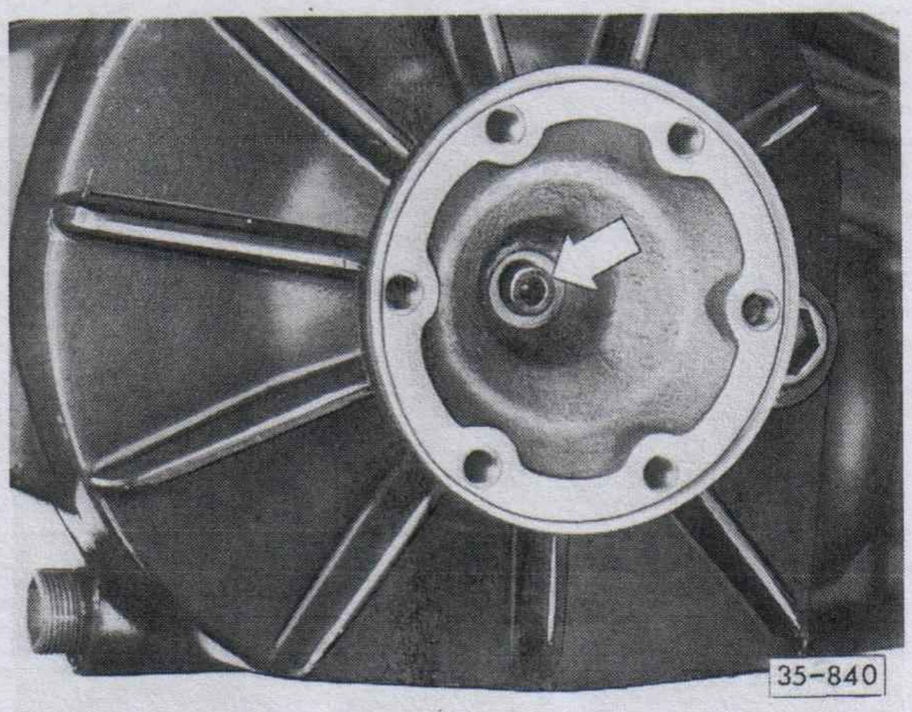
Final drive to mounts/subframe	45 Nm
Prop shaft to final drive	45 Nm
Drive shaft to final drive	80 Nm

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RENEWING DRIVE FLANGE OIL SEAL (RIGHT) – REAR FINAL DRIVE

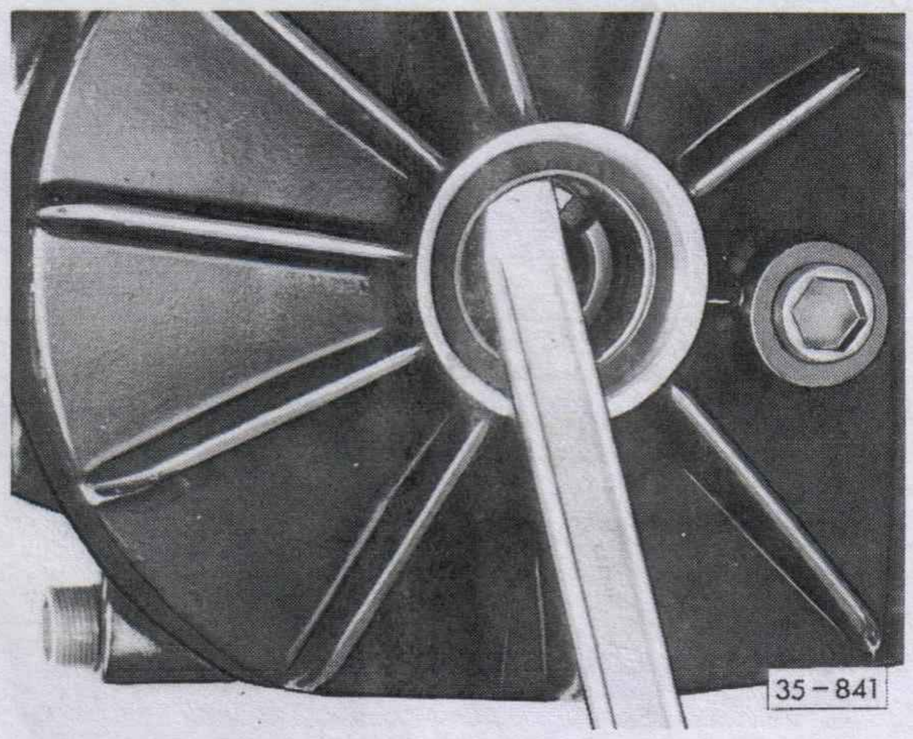
(Final drive in vehicle)

– Detach drive shaft.

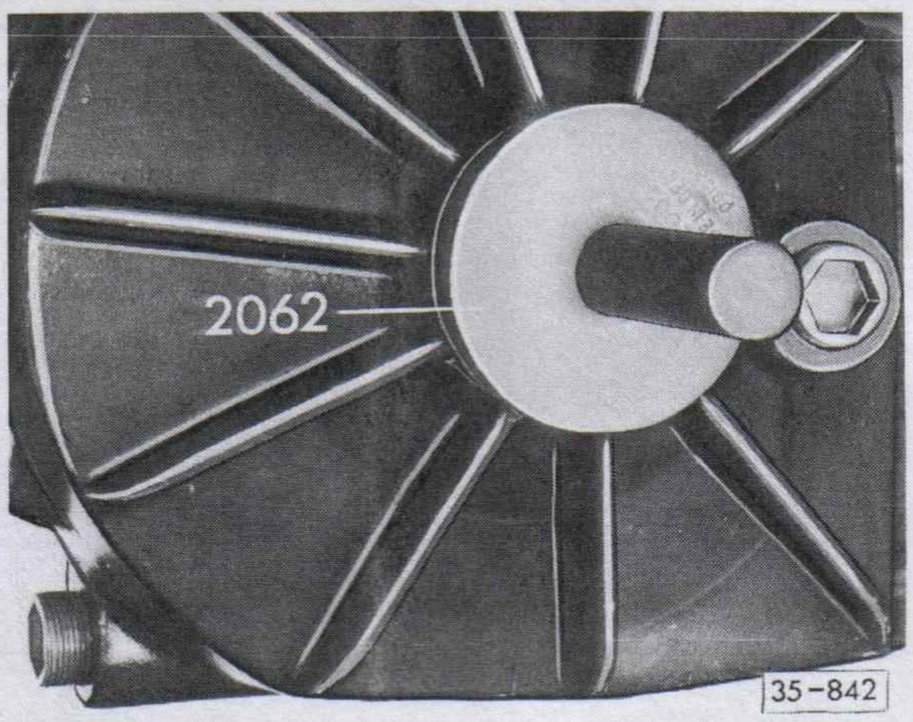


– Remove bolt holding drive flange: hold flange with pin.

– Pull out drive flange using container to catch oil.



– Lever out oil seal.



– Knock in drive flange oil seal on to seat.

– Fill space between sealing lip and dust lip with multipurpose grease.

Tightening torques:

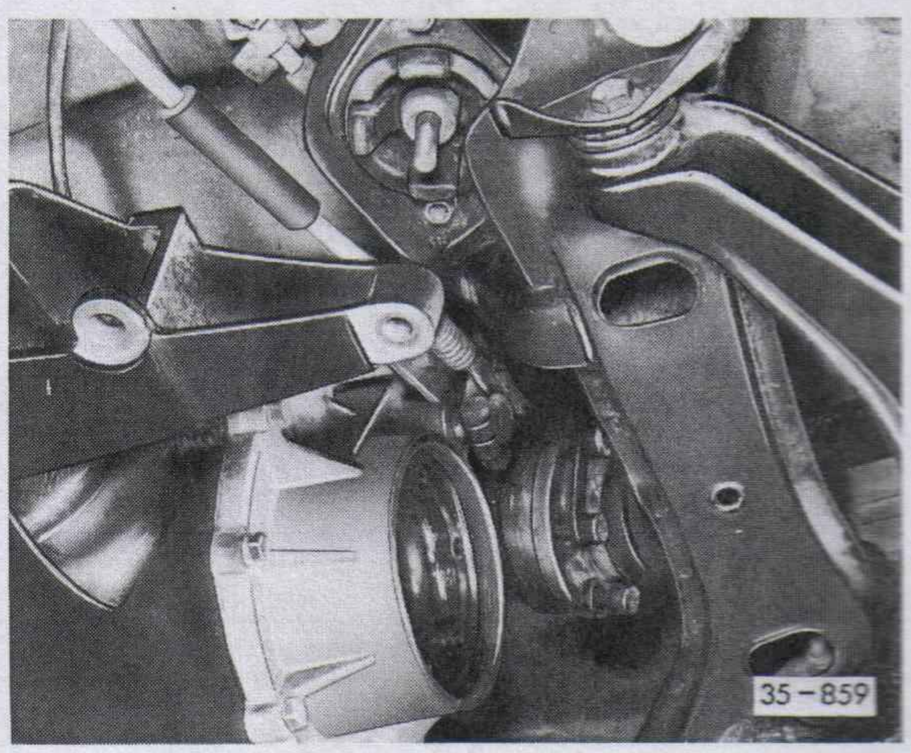
Drive flange to final drive	25 Nm
Drive shaft to drive flange	80 Nm

RENEWING DRIVE FLANGE OIL SEAL (LEFT) – REAR FINAL DRIVE

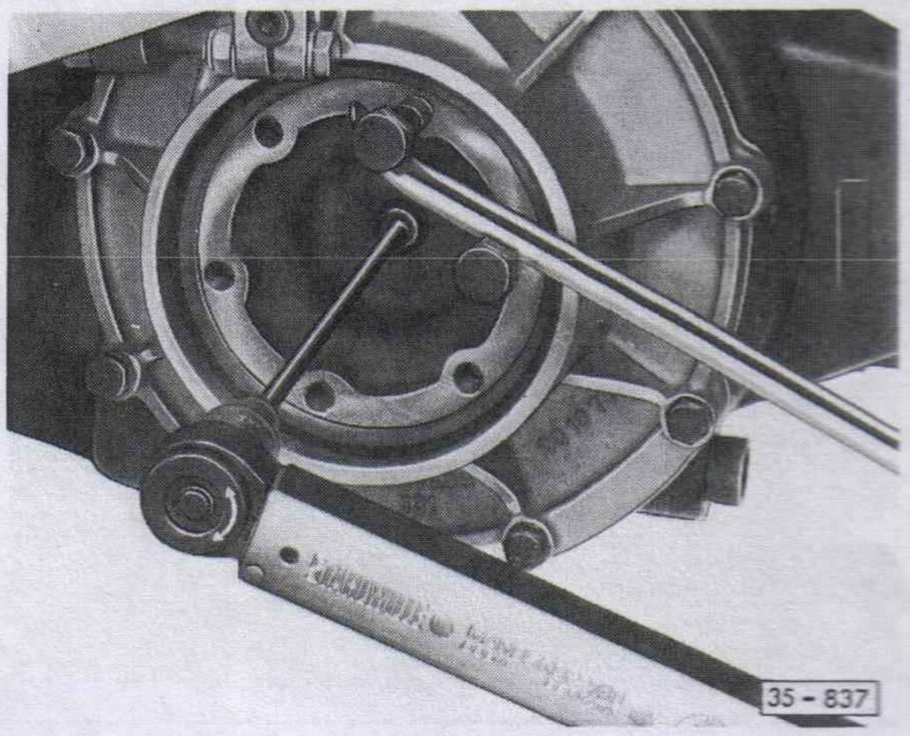
(Final drive in vehicle)

– Drain off oil from final drive.

– Detach drive shaft from flange and move clear by pushing upwards.



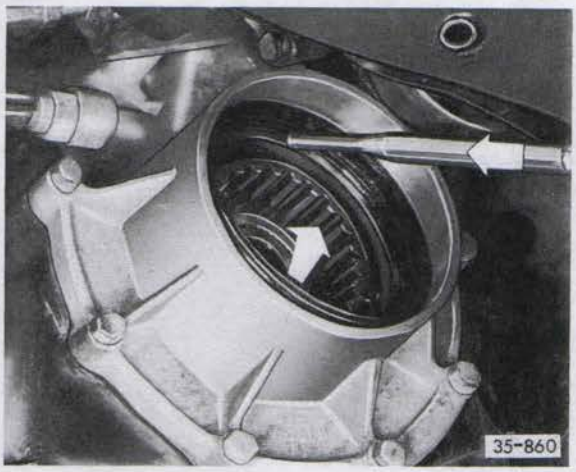
– Remove left support and lower final drive until flange is clear.



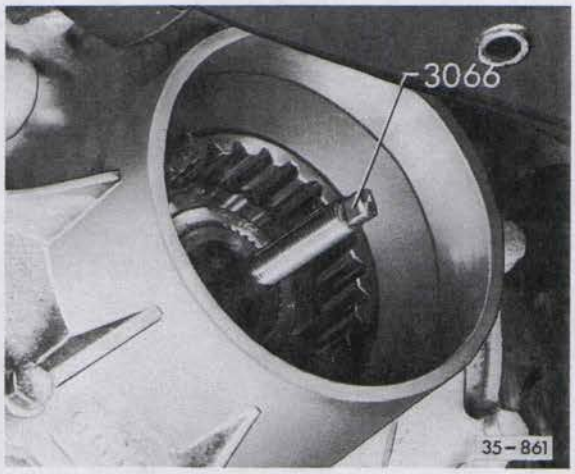
– Remove bolt holdingdrive flange and pull out drive flange using bolts.

Note:
Do not lose shim between drive flange and differential.

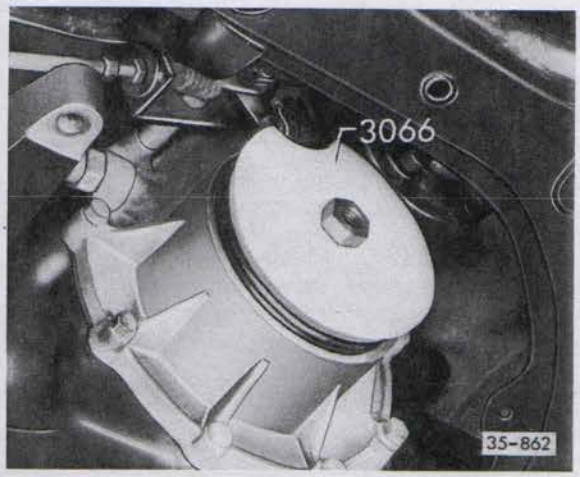
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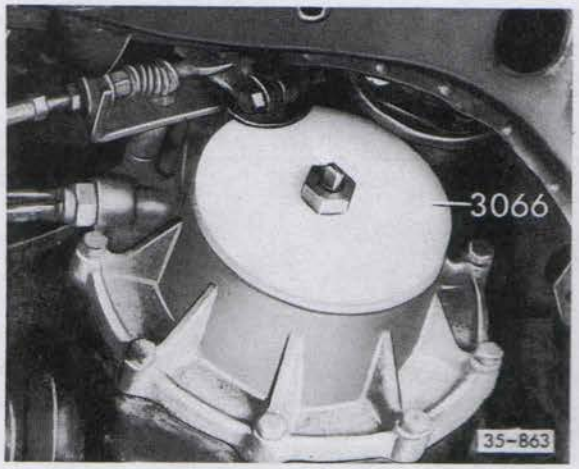
– Dislodge oil seal and remove.



– Screw in threaded pin of special tool 3066.



– Fit oil seal on thrust plate and install onto seat.



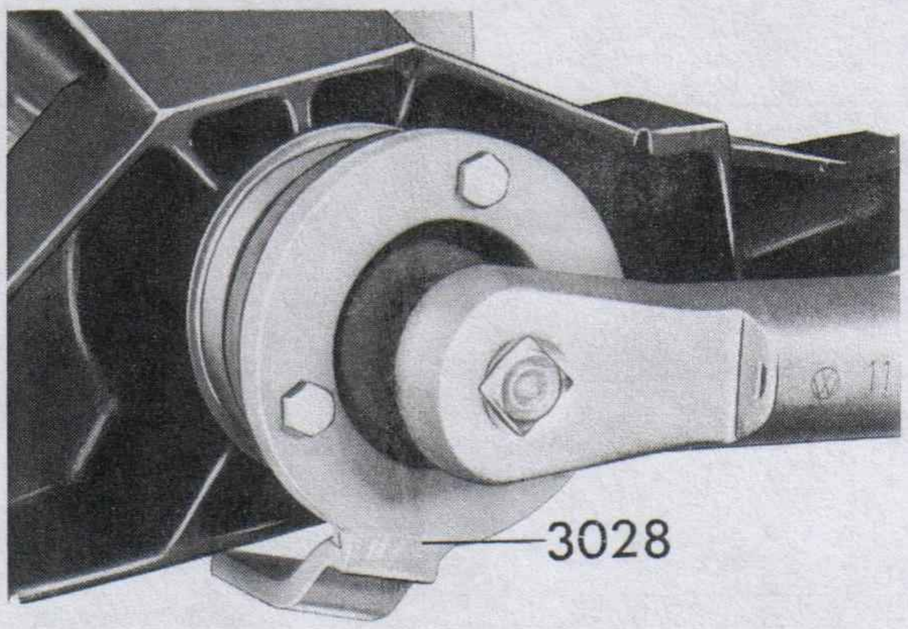
– Remove special tool.
  a) – Unscrew hex nut 4-5 turns.
  b) – Unscrew threaded pin.
– Grease sealing lip and dust lip of oil seal with multipurpose grease.
– Install drive flange and shim (stick in place with grease), tighten bolt to 25 Nm.
– Attach drive shaft, tighten bolts to 80 Nm.
– Attach left support, tighten nut to 45 Nm.
– Put in gearbox oil.
  See "Technical data" for capacity and specifications.

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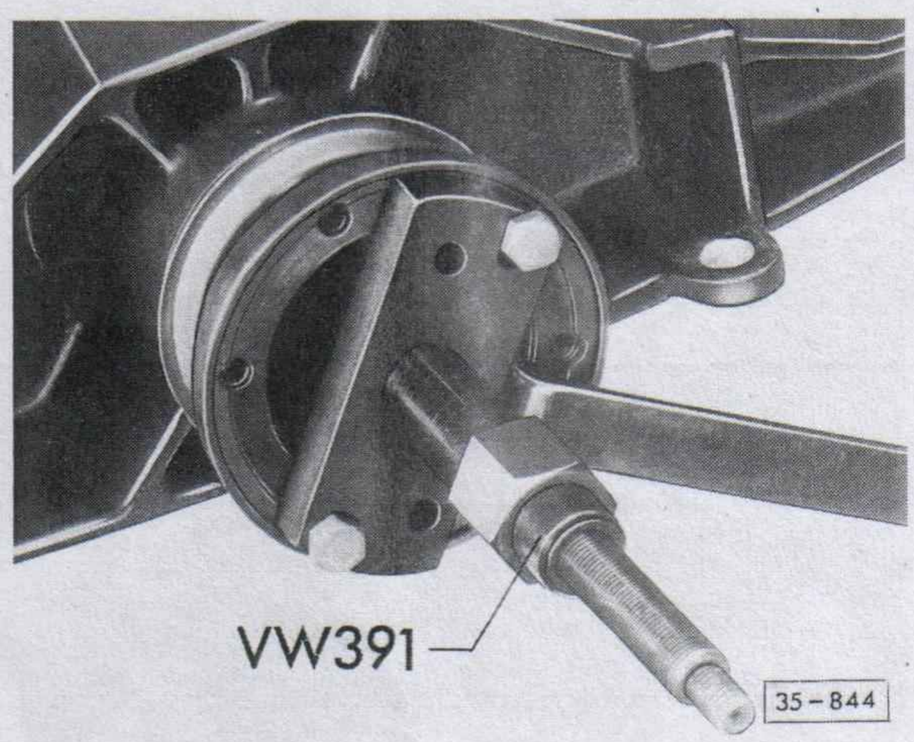
RENEWING OIL SEAL FOR DRIVE FLANGE/ · PROPELLOR SHAFT – REAR FINAL DRIVE
(Final drive in vehicle)

– Detach propellor shaft at the rear.

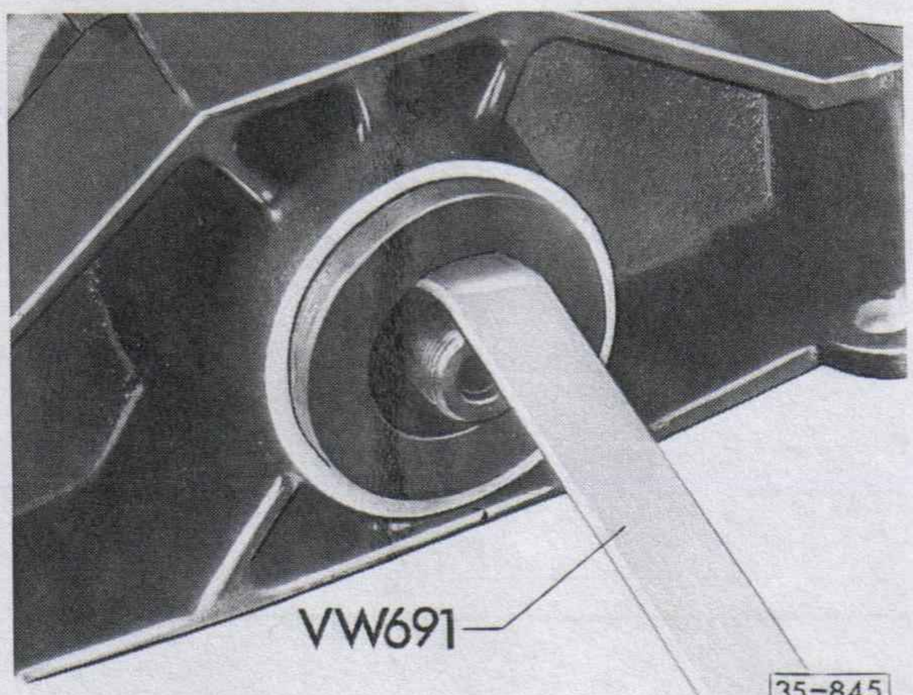
– Mark position of pinion nut in relation to pinion shaft.



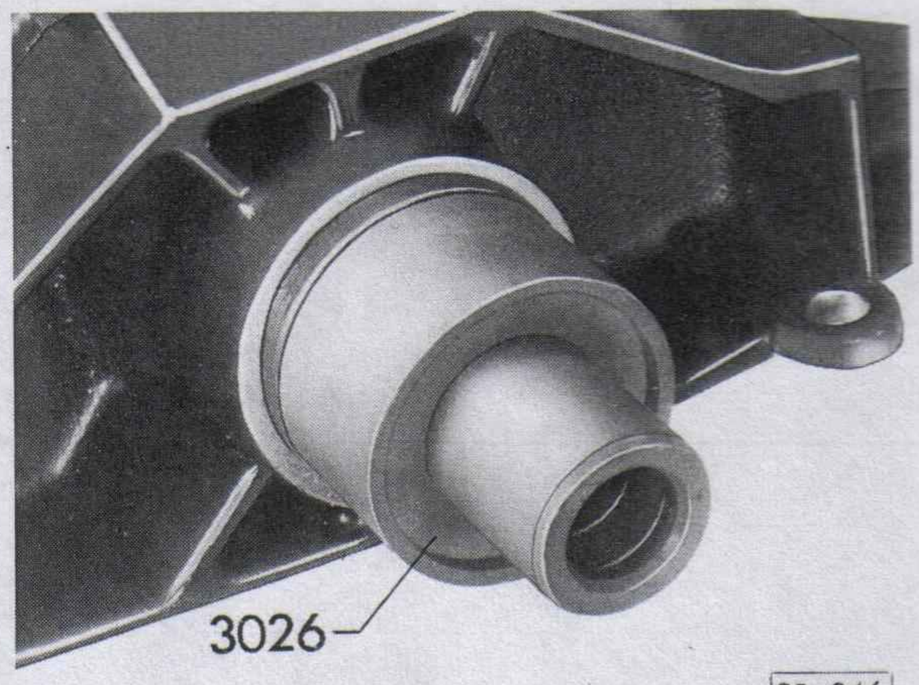
– Fit holder 3028 and remove pinion nut.



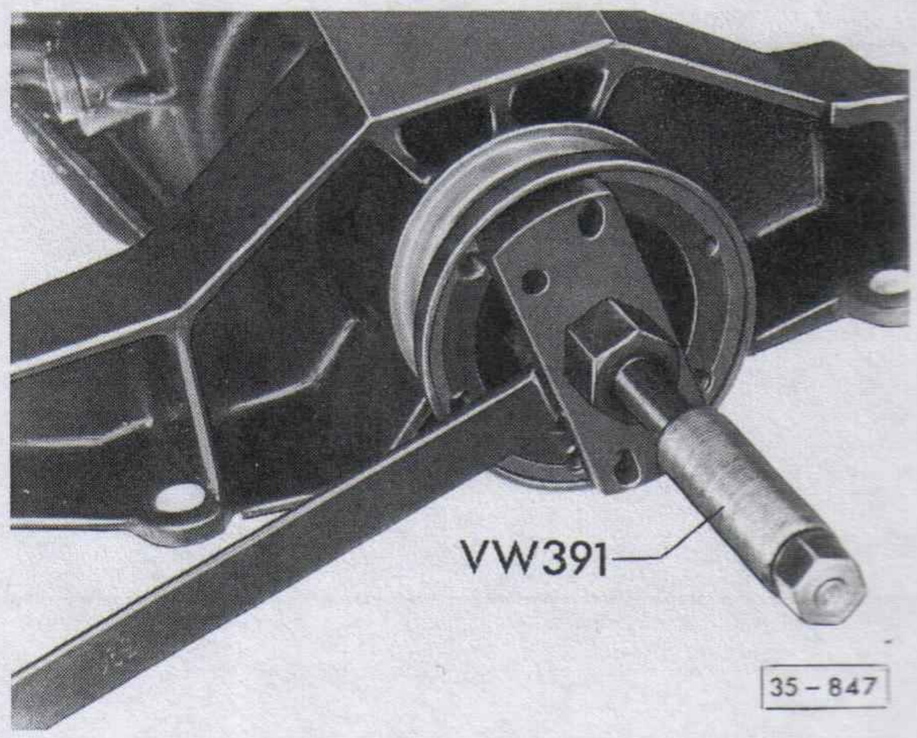
– Pull off flange.



– Extract oil seal.



– Fill space between lips of new seal with multi-purpose grease and knock seal fully home.



– Install flange.

– Degrease pinion nut and thread. Apply a thin coat of **VW D 6 locking solution** to the thread in the nut.

– Tighten pinion nut exactly to the mark made before removal. Peen over collar of pinion nut.

> **Important**
> Always reinstall the same nut; otherwise it is impossible to maintain the original position.

– Install propellor shaft, tighten bolts to 45 Nm.

– Check oil level and add oil if necessary.

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BRAKES, WHEELS, TYRES, RUNNING GEAR, STEERING

Brakes

Caution
Always disengage both differential locks before checking the brakes on a dynamometer.

Brake master cylinder	mm dia.	23.81
Brake servo		hydraulic brake servo (Teves H 31)
Front brakes		
Caliper piston dia.	mm	54
Brake disc dia.	mm	280
Brake disc thickness	mm	22 ventilated
Pad thickness	mm	14
Area of four pads	cm^2	200
Rear brakes		
Caliper piston dia.	mm	36
Brake disc dia.	mm	245
Brake disc thickness	mm	10
Pad thickness	mm	12
Area of four pads	cm^2	120
Brake fluid capacity	litres	approx. 0.6

Wheels, tyres

	Standard tyres	Optional extra equipment	Spare wheel	Winter tyres
Tyre size	205/60 VR 15	205/60 VR 15	T 125/70 D 15	185/70 SR 15 185/65 HR 15
Rim size	6 J x 15*	7 J x 15*	4 J x 15	6 J x 15**
Rim offset mm	45	45	55	45
Bolt hole circle dia. mm	112	112	112	112

*Light alloy rims **Pressed steel rims

Running gear

Wheelbase (unladen)		mm	2524
Track (unladen)	front	mm	1418
	rear	mm	1451
Track (gross vehicle weight)	front	mm	1420
	rear	mm	1460
Turning circle (between kerbs)		m	10.31
Turning circle (wall to wall)		m	11.31
Wheel lock angle (inside wheel):	unladen		36° 15′
Wheel lock angle (outside wheel):	unladen		32° 16′
Ground clearance at gross vehicle weight		mm	125
Wheel alignment data			page 85

Steering

Scrub radius (outboard)		mm	13.6
Steering wheel turns from lock to lock			3.44
Overall steering ratio			19.5:1
Capacity of power assisted steering system (Dexron ATF)	litres (approx.)		0.65

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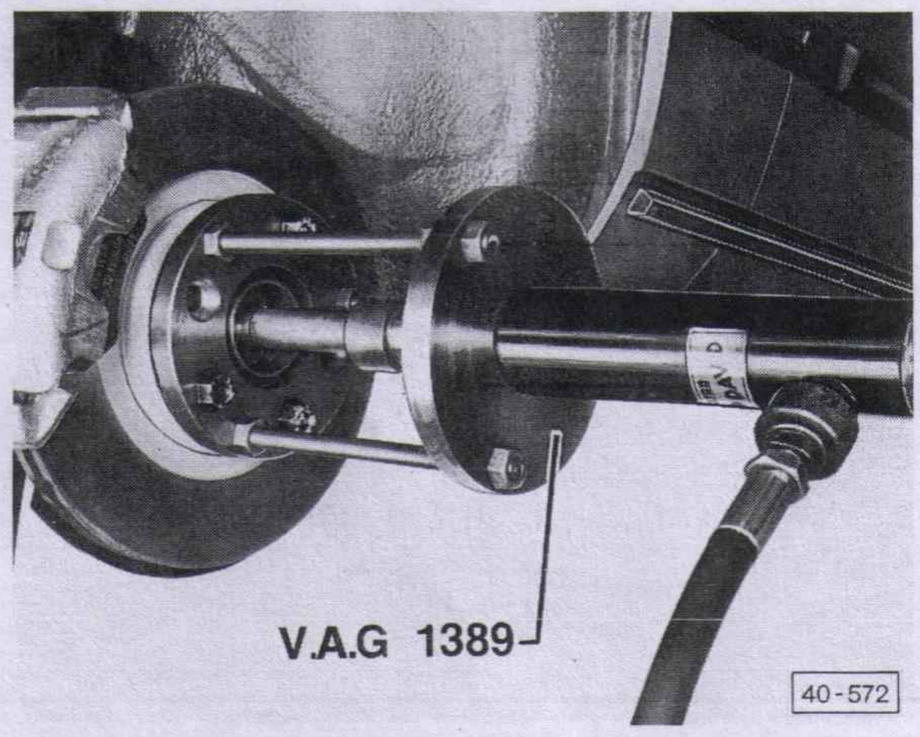
REMOVING AND INSTALLING DRIVE SHAFTS

Removing:

– Loosen wheel bolts.



– Remove wheel trim cap.
– Remove mounting nut (vehicle standing on its wheels).
– Remove wheel.
– Remove right guard plate.
– Detach drive shaft from flange.
– Press drive shaft off flange.



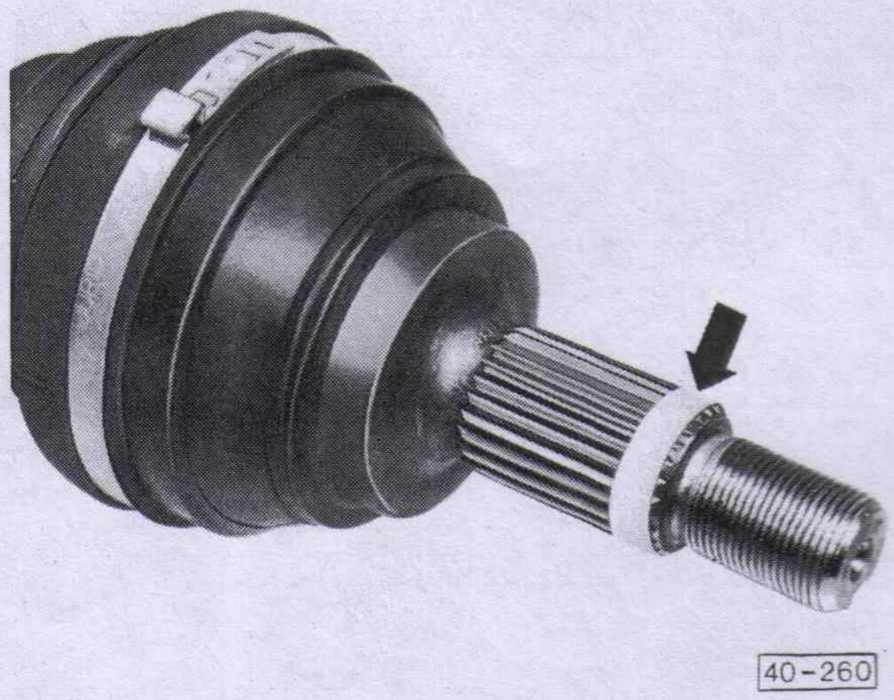
– Secure hydraulic puller to wheel hub with **3 wheel bolts.**
– Press drive shaft out of hub, ensuring clearance between inner constant velocity joint and gear-box.
– Take out drive shaft.

Note:
To remove the drive shafts the steering has to be turned to the right for the left drive shaft and to the left for the right drive shaft.

Installing:

Renew gasket on inner constant velocity joint.

Important
Clean splines on drive shaft and wheel hub to remove oil and grease and traces of locking compound.



– Apply – D 6 – locking compound around the splines of the outer joint over an area about 5 mm wide and then install drive shaft.

Important
Allow at least 60 minutes for – D 6 – locking compound to harden.

Tightening torques:

Drive shaft to drive flange	80 Nm
Drive shaft to wheel hub	280 Nm
Wheel bolts	110 Nm

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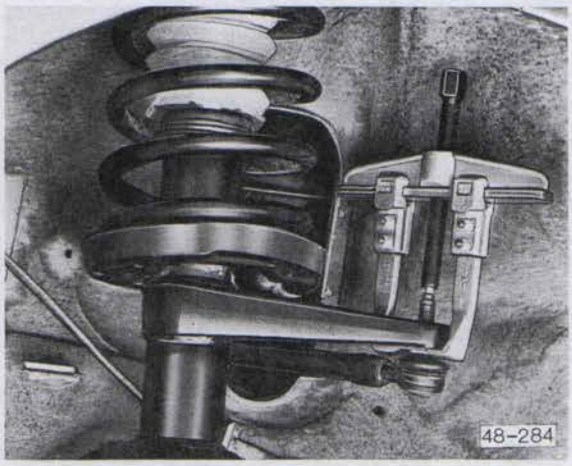
REMOVING AND INSTALLING FRONT SUSPENSION STRUT

Removing:

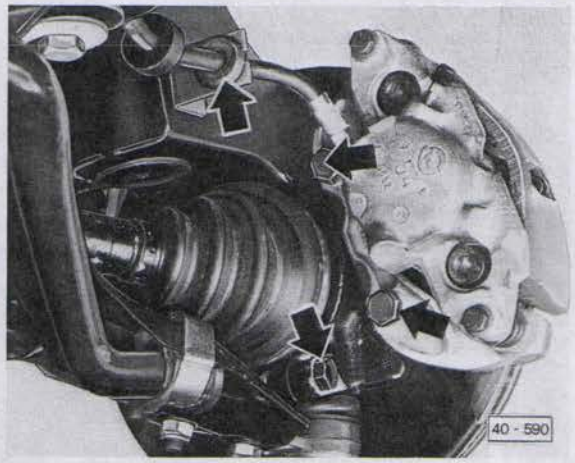
– Loosen wheel bolts.



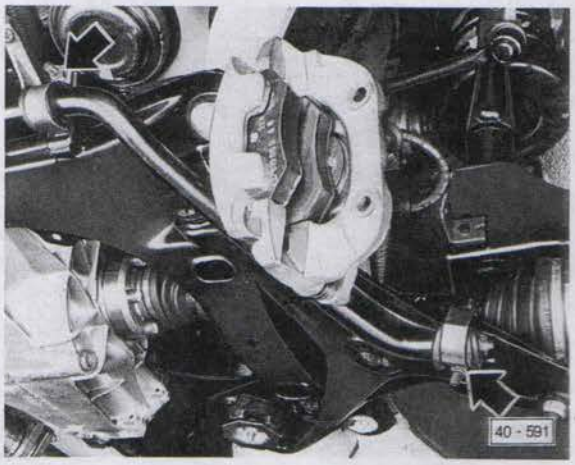
– Remove wheel trim cap.
– Remove wheel hub mounting nut (vehicle standing on its wheels).
– Remove wheel.



– Press off tie rod end.

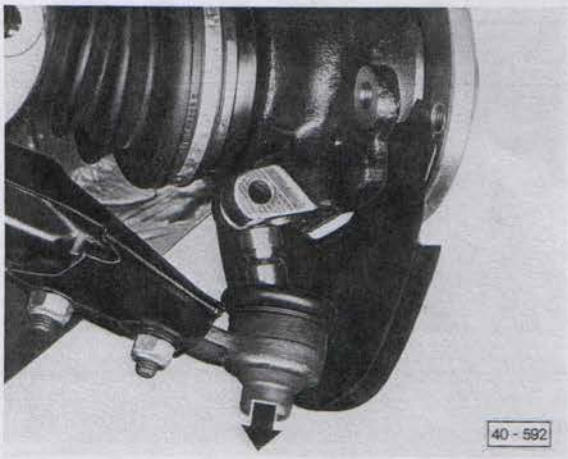


– Detach brake caliper.
– Remove brake disc.
– Pull brake hose with rubber grommet out of bracket.
– Secure brake caliper to body with wire.
– Remove clamping bolt securing track control arm joint to wheel bearing housing.



– Remove stabilizer.

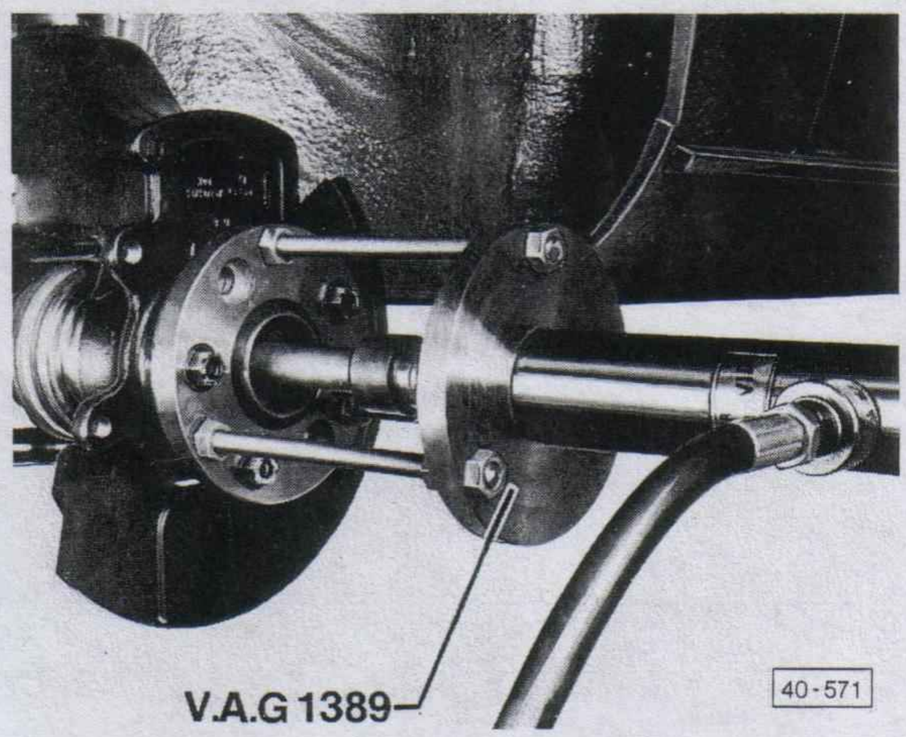
Note:
Vehicle must be standing on its wheels when stabilizer is installed.



– Press down firmly on track control arm to remove joint from wheel bearing housing.

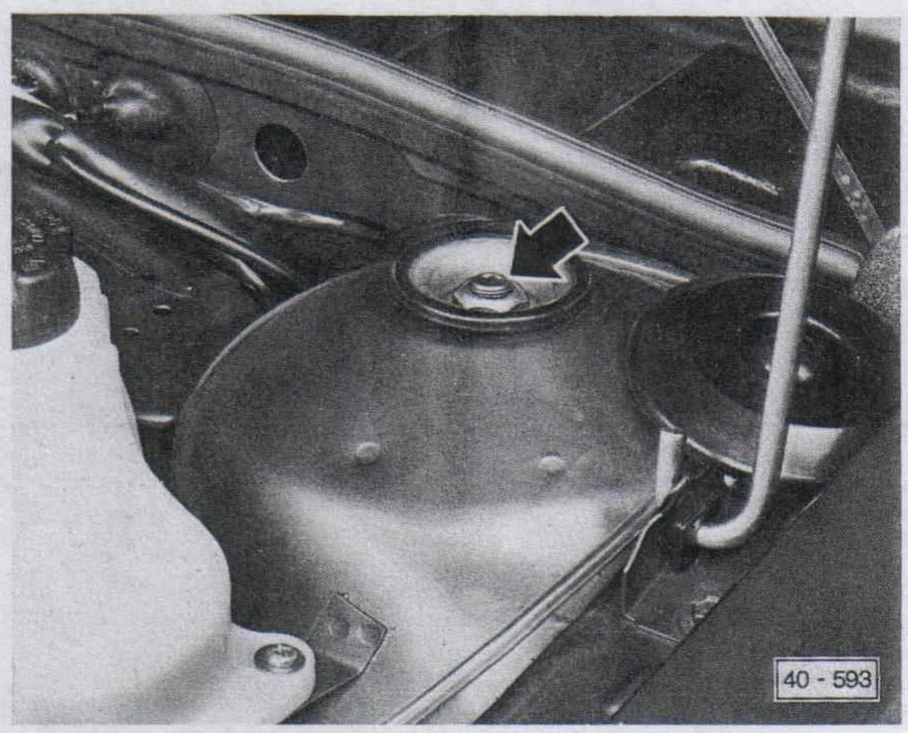
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40-571

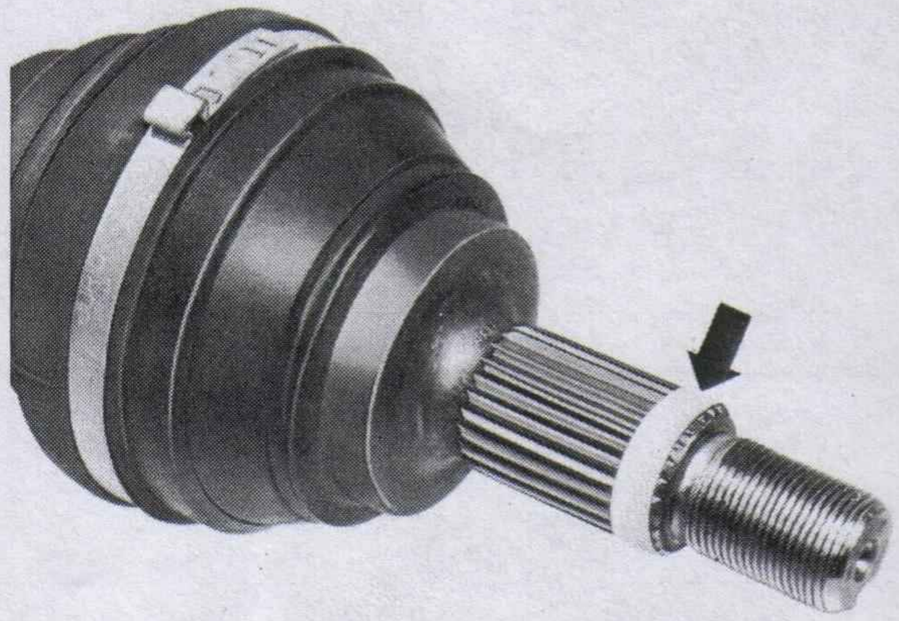
– Secure hydraulic puller to wheel hub with 3 wheel bolts.
– Press drive shaft out of hub.
– Remove cover from suspension strut.



– Unscrew nut from piston rod, holding piston rod with Allen key.
– Support suspension strut from below, or secure it to prevent it from falling out.

Installing:
– Renew gasket on inner constant velocity joint.

> **Important**
> Clean splines on drive shaft and in wheel hub to remove oil and grease and traces of locking compound.



40-260

– Apply – D 6 – locking compound around splines of outer constant velocity joint over an area about 5 mm wide and then install drive shaft.

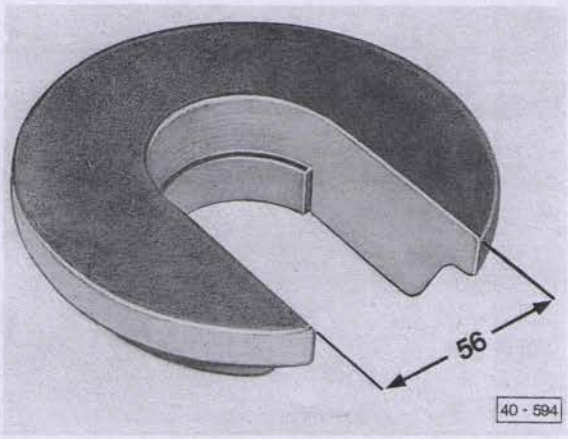
> **Important**
> Allow at least 60 minutes for – D 6 – locking compound to harden.

Tightening torques:

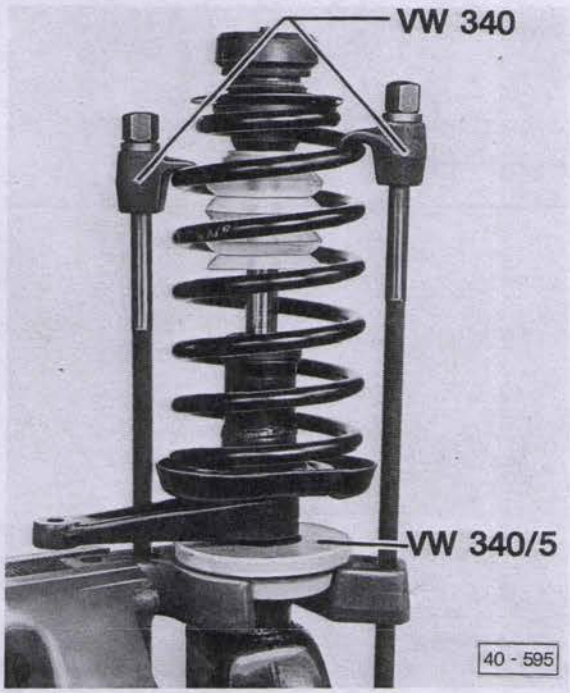
Drive shaft to wheel hub	280 Nm
Slotted nut to piston rod	50 Nm
Suspension strut to body	60 Nm
Clamping bolt for track control arm joint	65 Nm
Brake caliper to wheel bearing housing	115 Nm
Stabilizer to subframe and track control arm	25 Nm

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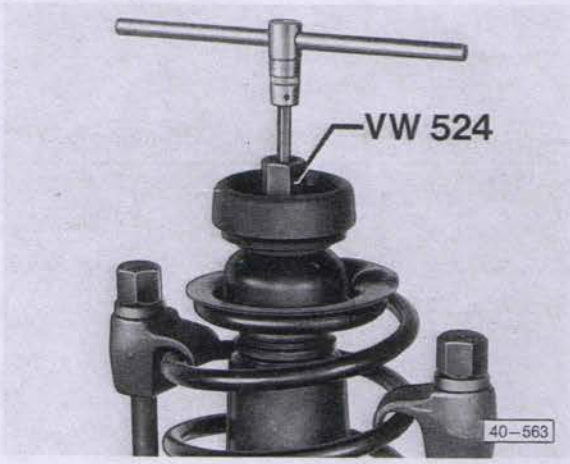
RENEWING FRONT SHOCK ABSORBERS
(Suspension strut removed)



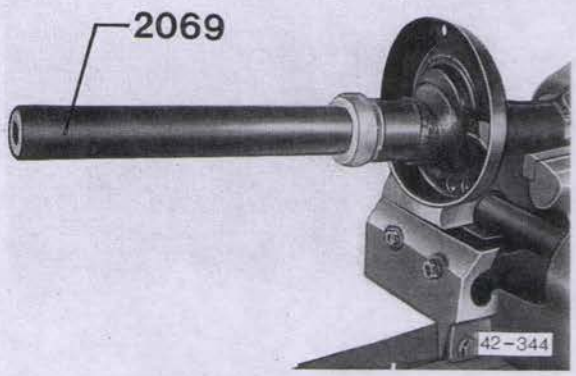
Note:
The adaptor VW 340/5 must be modified to take the suspension strut.



– Insert suspension strut with adaptor VW 340/5 in spring compressor.
– Compress coil spring.



– Unscrew slotted nut.
– Remove suspension strut bearing and spring retainer.
– Detach spring compressor.
– Dismantle suspension strut components.
– Clamp wheel bearing housing in vice.



– Remove screw cap.
– Take out shock absorber.

Tightening torques:

Slotted nut to piston rod	50 Nm
Screw cap to wheel bearing housing	180 Nm

RENEWING WHEEL BEARING

See – Repairing front suspension strut –, Audi 100/200 Workshop Manual, Audi 200 Running gear booklet, January 1980 edition, page 8.

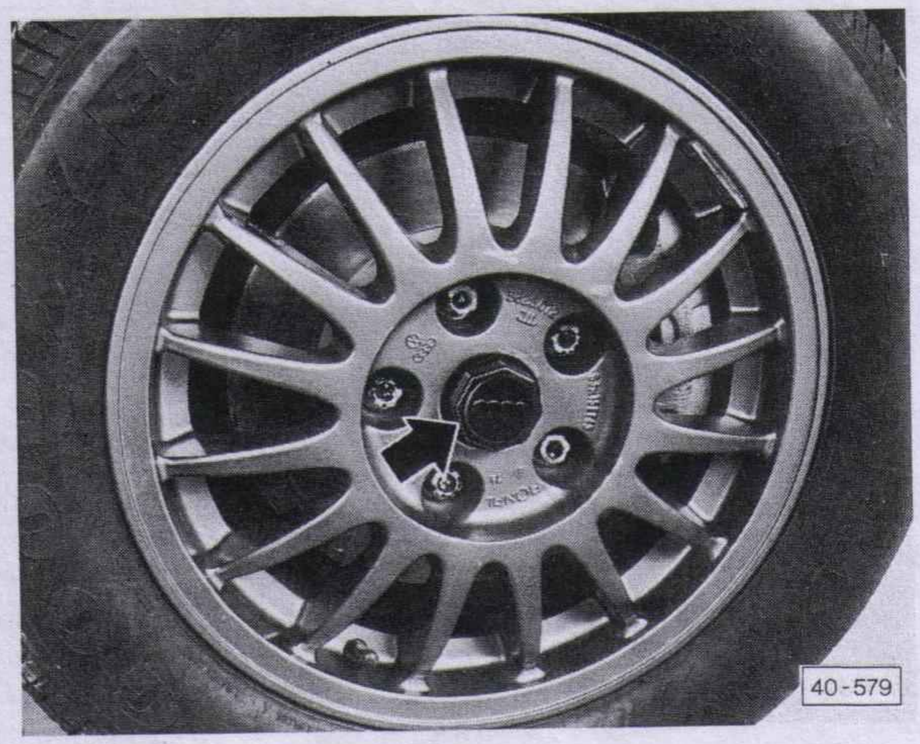
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 WB 30, 22, 11

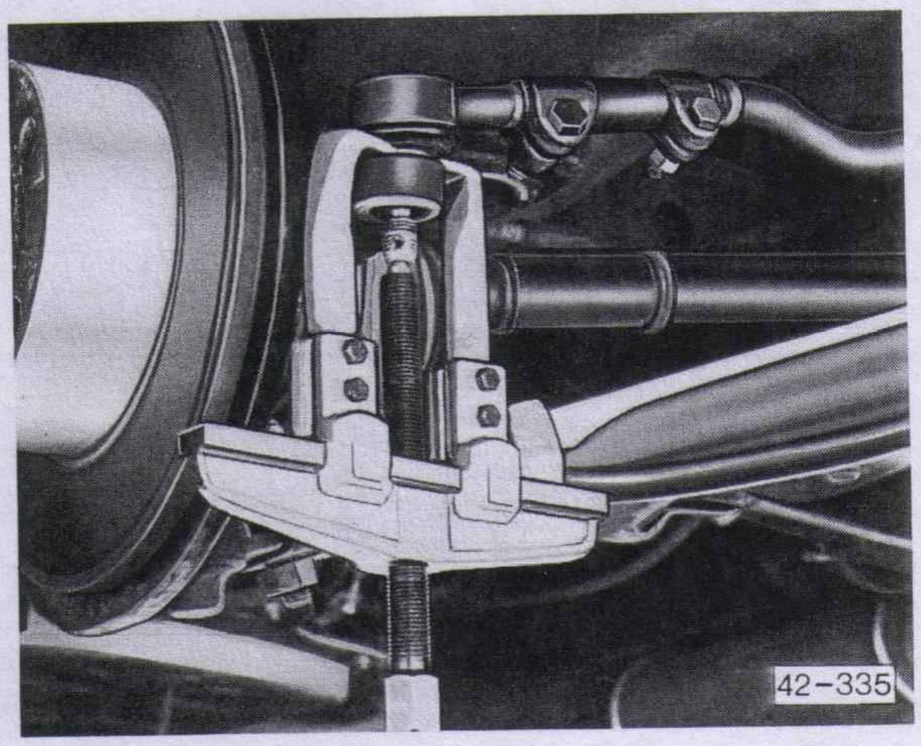
REMOVING AND INSTALLING DRIVE SHAFTS

Removing:

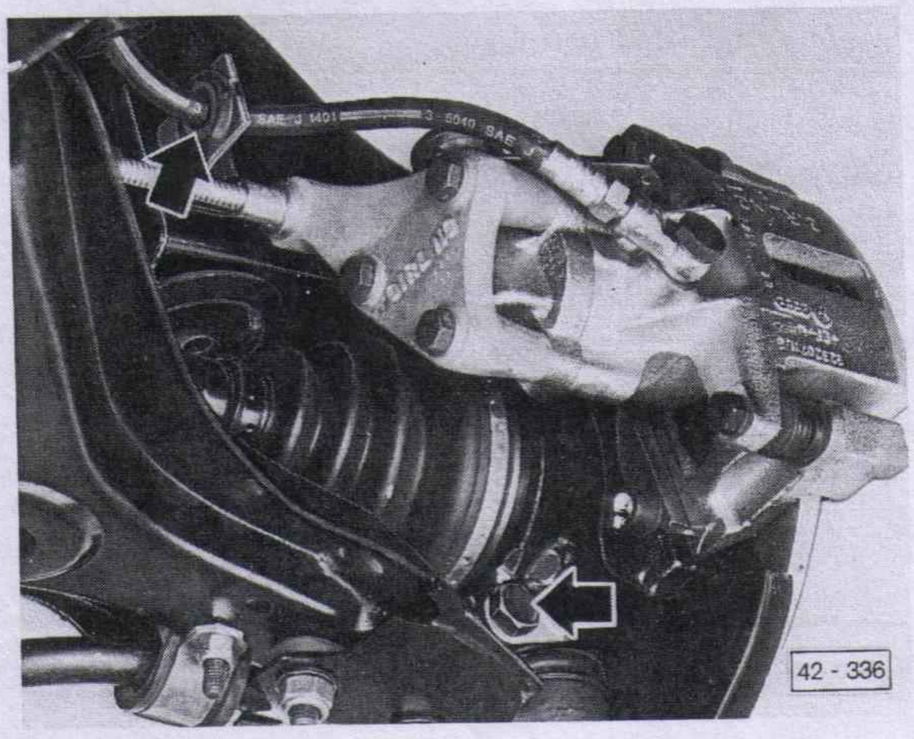
– Loosen wheel bolts.



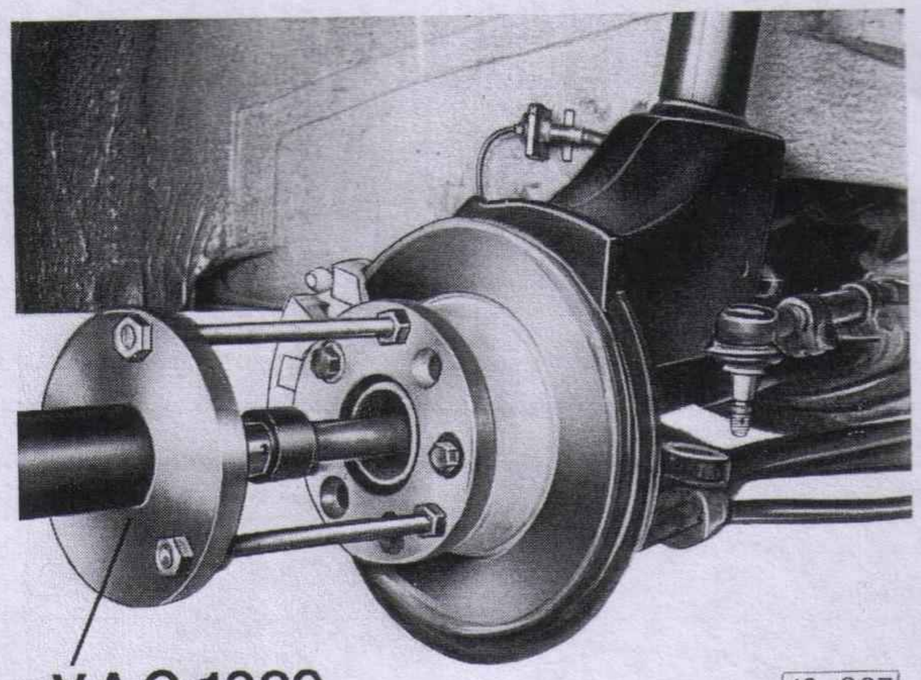
– Remove wheel trim cap.
Remove hub mounting nut (vehicle standing on its wheels).
– Detach drive shaft from flange.
Remove wheel.



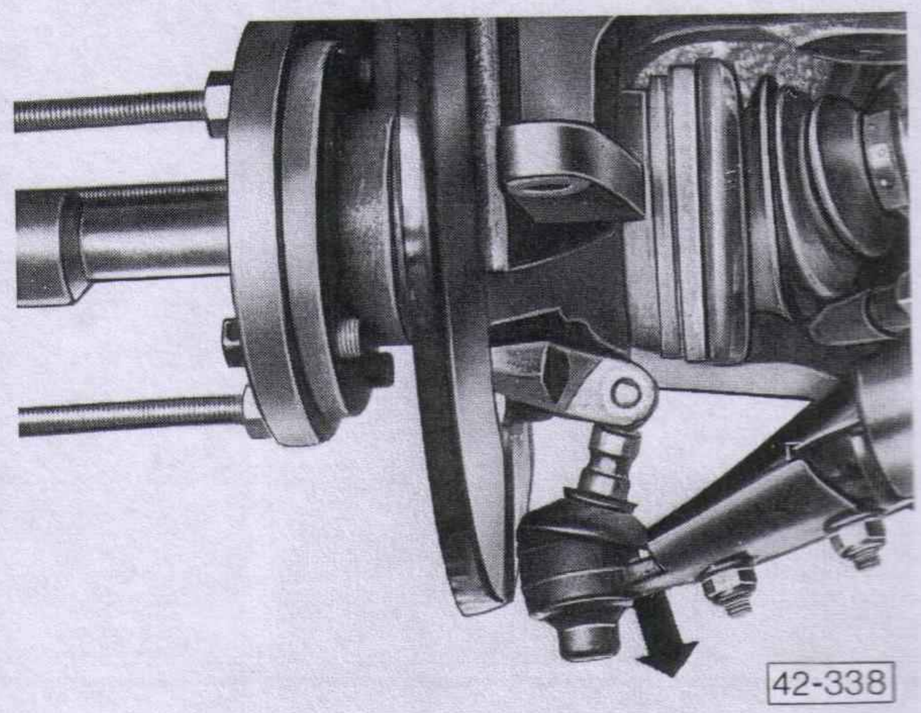
– Press off tie rod end.



– Remove clamping bolt.
– Pull brake hose with rubber grommet out of bracket.



– Secure hydraulic puller to wheel hub with 3 **wheel bolts.**



– Press down firmly on track control arm to remove joint from wheel bearing housing.
– Pivot suspension strut outwards.
– Press drive shaft out of wheel hub with hydraulic puller, ensuring clearance between inner constant velocity joint and differential housing.
– Take out drive shaft.

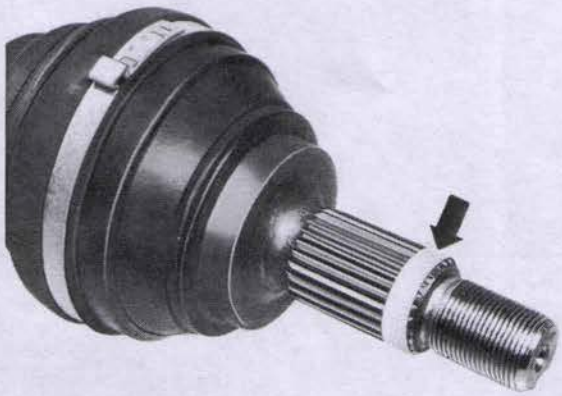
Note:
The drive shafts are diagonally interchangeable, i.e. the rear left shaft is identical to the front right shaft, or the rear right shaft can be installed on the front left.

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Installing:

– Renew gasket on inner constant velocity joint.

> **Important**
> Clean splines on drive shaft and in wheel hub to remove oil and grease and traces of locking compound.



40-260

– Apply –D6– locking compound around splines of outer joint over an area about 5 mm wide and then install drive shaft.

> **Important**
> Allow at least 60 minutes for –D6– locking compound to harden.

Tightening torques:

Drive shaft to drive flange	80 Nm
Drive shaft to wheel hub	280 Nm
Clamping bolt for track control arm joint	65 Nm
Wheel bolts	110 Nm

REMOVING AND INSTALLING REAR SUSPENSION STRUT

Removing:

– Loosen wheel bolts.

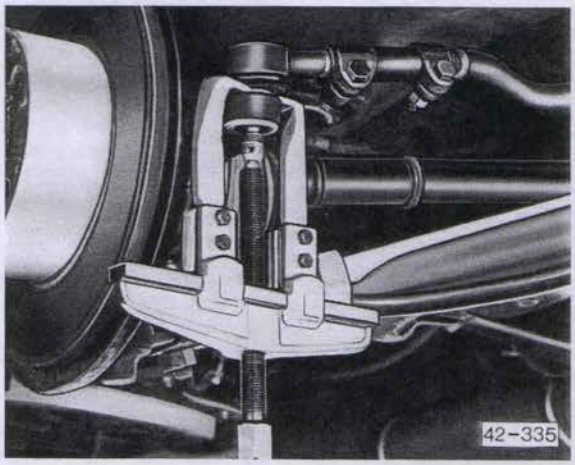


40-579

– Remove wheel trim cap.

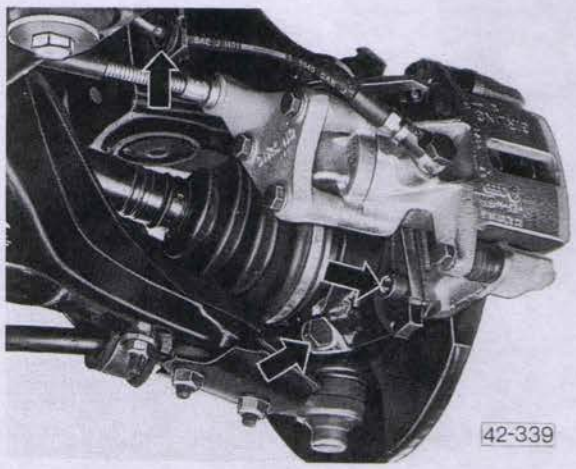
– Unscrew hub mounting nut (vehicle standing on its wheels).

– Remove wheel.



42-335

– Press off tie rod end.



42-339

– Remove clamping bolt.

– Pull brake hose with rubber grommet out of bracket.

– Detach brake caliper.

– Remove brake disc.

– Secure brake caliper with wire.



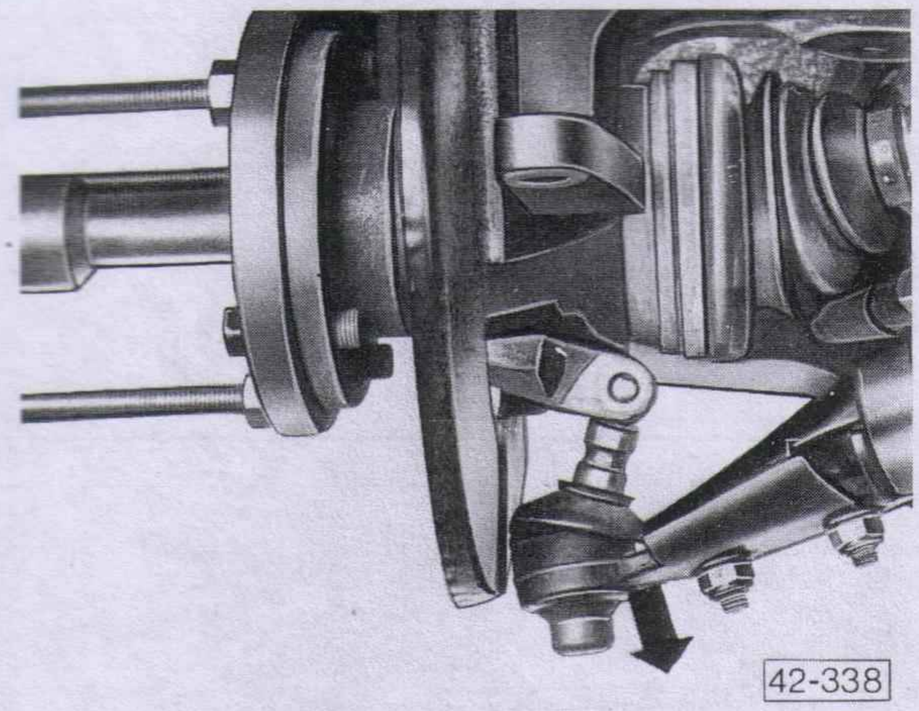
42-340

– Secure hydraulic puller to wheel hub with **3 wheel bolts.**

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42 Rear suspension, drive shafts

WB 30, 22, 11

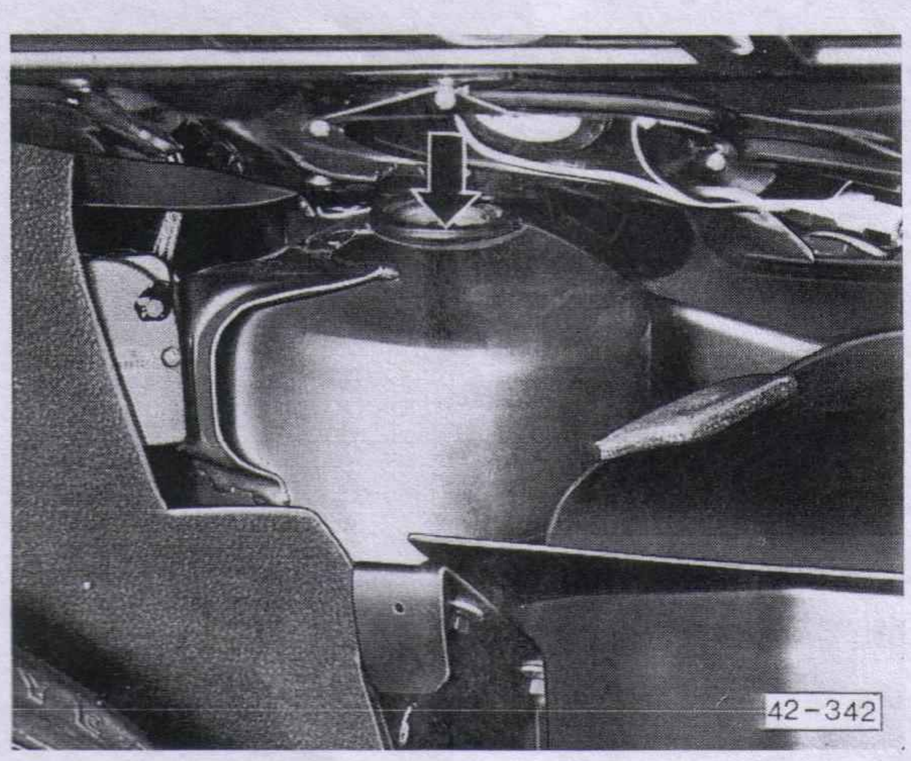


42-338

Tightening torques:

Drive shaft to wheel hub	280 Nm
Wheel bolts	110 Nm
Brake caliper to wheel bearing housing	65 Nm
Clamping bolt for track control arm joint	65 Nm
Tie rod to steering lever	60 Nm
Suspension strut to body	60 Nm

– Press down firmly on track control arm to remove joint from wheel bearing housing.
– Press drive shaft out of wheel hub with hydraulic puller.
– Detach hydraulic puller.
– Remove fuel tank trim.
– Remove retainer for sun roof panel.
– Remove cover.



42-342

– Unscrew nut from piston rod. (To hold piston rod use a 7 mm Allen key – normal commercial type – cut down accordingly).
– Hold suspension strut from outside (two mechanics required).

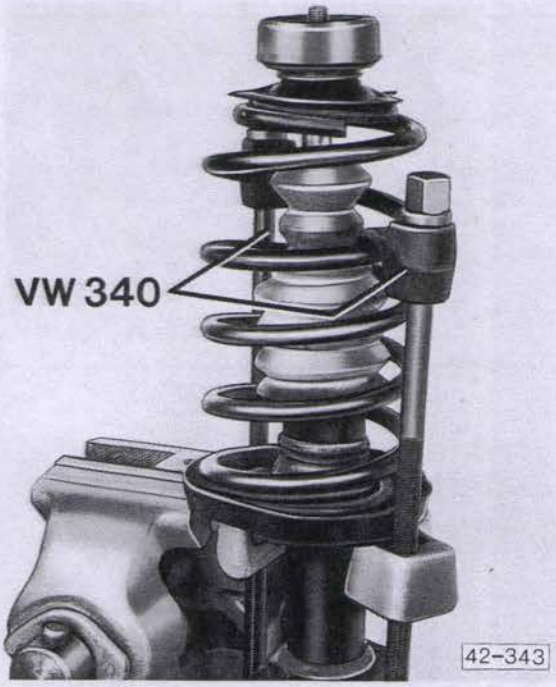
Note:
The rear suspension must be in the rebound position when unscrewing the suspension strut/body mounting nuts.

82 Removing and installing rear suspension strut

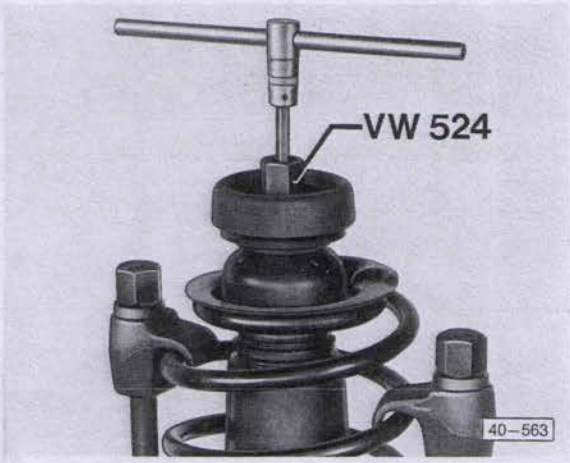
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RENEWING SHOCK ABSORBERS
(Suspension strut removed)

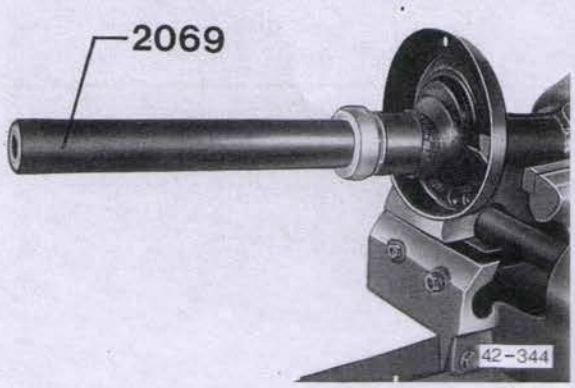
– Clamp spring compressor in vice.



– Compress coil spring.



– Unscrew slotted nut.
– Remove suspension strut bearing and spring retainer.
– Detach spring compressor.
– Remove suspension strut components.
– Clamp wheel bearing housing in vice.



– Unscrew screw cap.
– Take out shock absorber.

Tightening torques:

Slotted nut to piston rod	50 Nm
Screw cap to wheel bearing housing	180 Nm

RENEWING WHEEL BEARINGS

See – Repairing suspension strut – Audi 100/200 Workshop Manual, Audi 200 Running gear booklet, January 1980 edition, page 8.

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WHEELS, TYRE SIZES

	Standard tyres	Optional extra equipment	Spare wheel	Winter tyres
Tyre sizes	205/60 VR 15	205/60 VR 15	T 125/70 D 15	185/70 SR 15 185/65 HR 15
Rim size	6 J x 15*	7 J x 15*	4 J x 15	6 J x 15**
Offset mm	45	45	55	45
Bolt hole circle dia. mm	112	112	112	112

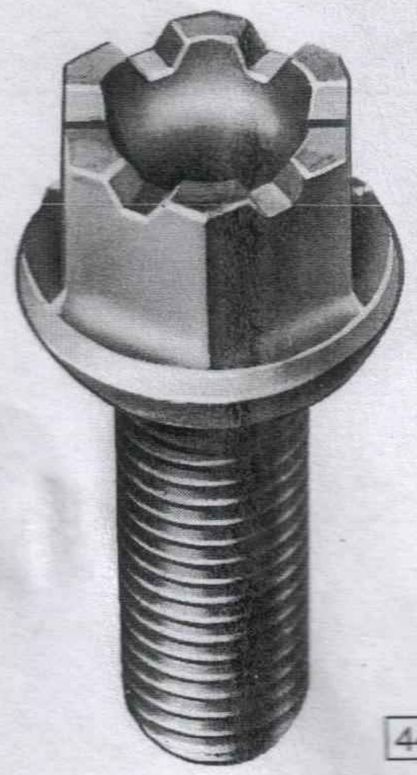
*Light alloy rims **Pressed steel rims

TYRE PRESSURES

in bar	front	rear
with 2 occupants	1.8	1.7
fully laden	1.9	1.9
Spare tyre	4.2	4.2

Important
With winter tyres the tyre pressure should be 0.2 bar higher than the pressure given for normal tyres (see table above).

WHEEL BOLTS



M 14 x 1.5 x 27.5 wheel bolts for pressed steel and light alloy rims.

Tightening torque : 110 Nm

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The wheel alignment can best be checked with optical measuring equipment, such as the VW 1237 wheel alignment and track tester. If no optical measuring equipment is available the camber can also be checked with the VW 261 protractor and the toe with a mechanical track tester.

Check the following points before measuring wheel alignment:

- Measuring equipment correctly adjusted.
- Vehicle unladen (kerb weight).
- Tyres inflated to specified pressures.
- Vehicle aligned accurately and suspension bounced.
- No excessive play in steering linkage.
- No excessive play in suspension.

WHEEL ALIGNMENT DATA

Front suspension	McPherson strut type
Total toe (wheels not pressed)	0° + 5′ – 10′
Camber (in straight-ahead position) Maximum permissible difference between left and right	– 50′ ± 30′ max. 30′
Toe angle difference at 20° lock to left and right	-1° 15′ ± 30′
Castor (not adjustable) Corresponds to difference in camber when turned from 20° left lock to 20° right lock Maximum permissible difference between left and right	+ 1° 30′ ± 40′ + 1° ± 25′ max. 30′
Rear suspension	McPherson strut type
Camber Maximum permissible difference between left and right	– 30′ ± 30′ max. 30′
Toe on each wheel with specified camber	– 5′ ± 5′
Total toe (with specified camber) Maximum permissible deviation in alignment	– 10′ ± 10′ max. 25′

Note:
It is advisable to measure wheel alignment only after 1000 – 2000 km, when the coil springs have been able to settle.

Calculating deviation in alignment:
If both toe angles are positive (+/+), or both angles negative (–/–), subtract the lower number from the higher number and divide by 2.

Example:

Toe angle of left rear wheel		**Toe angle of right rear wheel**
+ 15′	15′ – 5′ = 10′ 10 : 2 = 5′	+ 5′

Deviation in alignment = 5′

If one toe angle is positive and the other negative (+/–), add the two numbers and divide by 2.

Example:

Toe angle of left rear wheel		**Toe angle of right rear wheel**
+15′	15′ + 5′ = 20′ 20 : 2 = 10′	– 5′

Deviation in alignment = 10′

The result obtained is the deviation of the effective running direction of the two rear wheels with respect to the longitudinal axis of the vehicle.

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FITTING TYRES

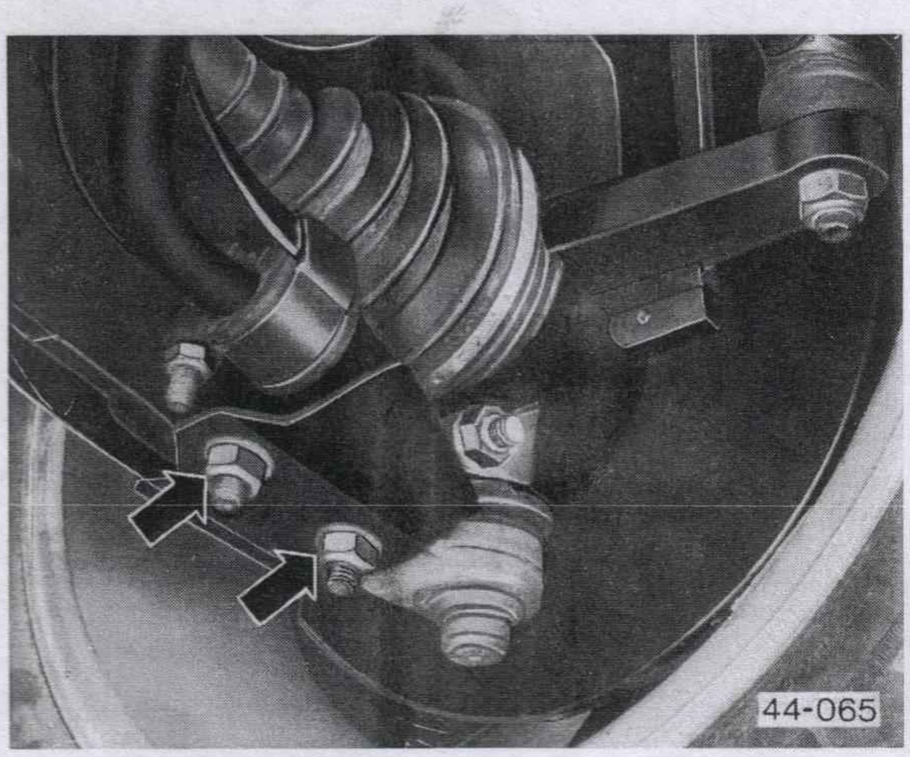
Particular care must be taken when fitting and removing tyres on light alloy rims. The tyre beading and rim flanges should be liberally coated with suitable rubber lubricant. The guide roller on tyre mounting machines should be adjusted so that there is about 8 – 10 mm clearance from the wheel ribs. Otherwise the rim can be damaged due to the flexing of the guide arm when removing and fitting the tyre.

BALANCING WHEELS

Caution
DO NOT balance the wheels on the vehicle.

There is a shoulder on the wheel hub for centering the wheel. When balancing the wheels they should be centered in the same way to obtain maximum accuracy. For this purpose the mounting flange of the balancing machine should be fitted with a suitable centering ring. The wheel is aligned with the centering ring and secured with the wheel bolts for balancing.

ADJUSTING CAMBER OF REAR WHEELS
(Check adjustment left and right)

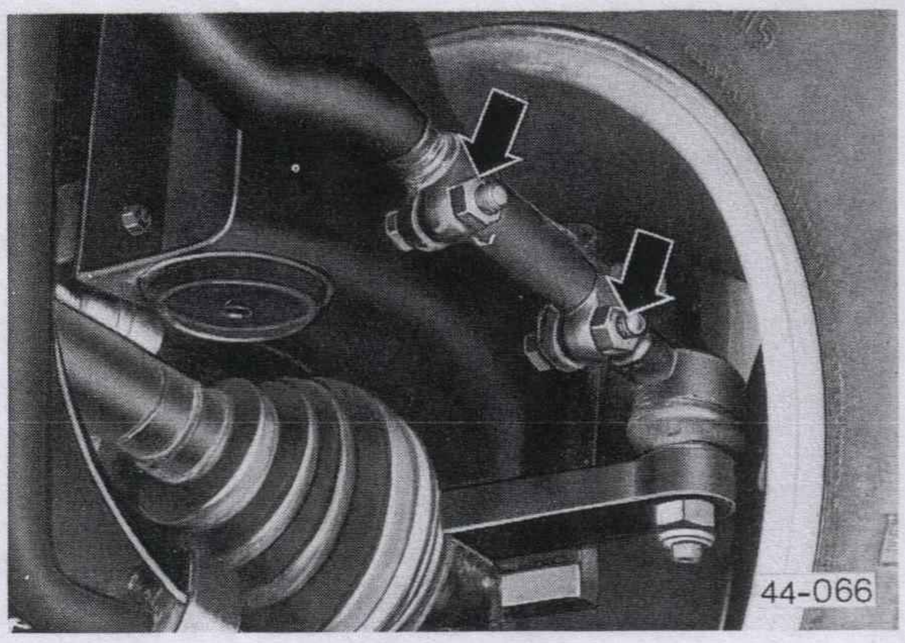


– Loosen mounting nuts and move joint in slots on track control arm as required.
– Tighten mounting nuts and recheck camber. Readjust if necessary.
– **Check toe and adjust if necessary.**

Tightening torque:

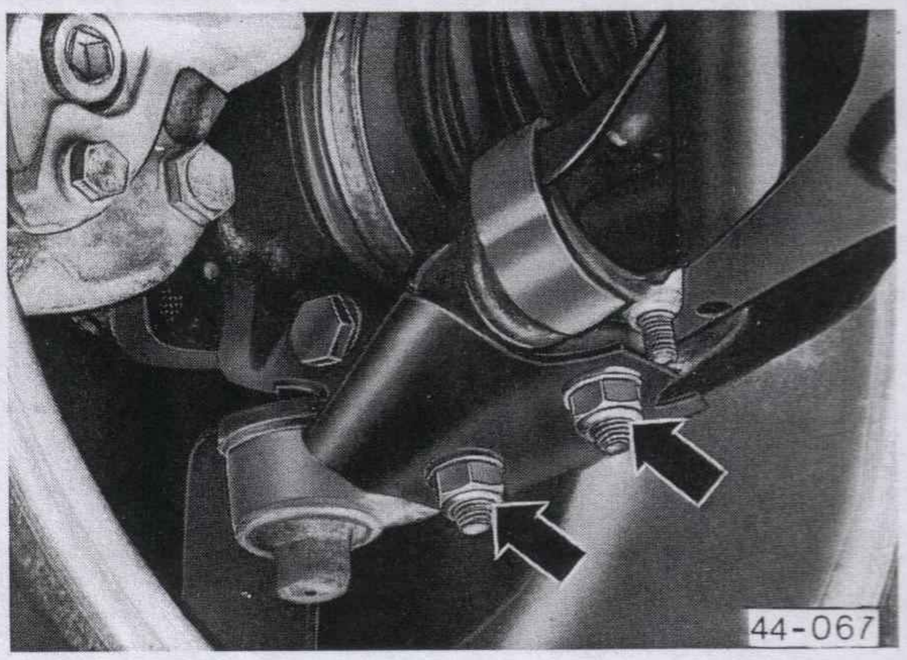
Joint to track control arm	65 Nm

ADJUSTING REAR WHEEL TOE
(Check adjustment left and right)



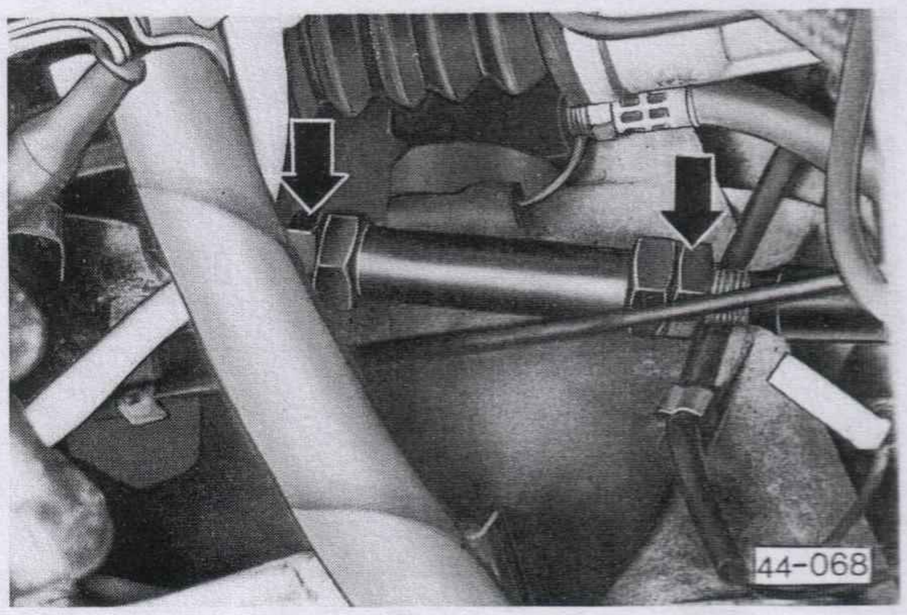
– Loosen clamps.
– Turn threaded collar as required.
– Tighten clamps.

ADJUSTING CAMBER OF FRONT WHEELS



– Loosen mounting nuts and move joint in slots on track control arm as required.
– Tighten mounting nuts and recheck camber; readjust if necessary.
– **Check toe and adjust if necessary.**

ADJUSTING FRONT WHEEL TOE



– Loosen lock nuts.
– Turn threaded collar as required.
– Tighten lock nuts.
– Reposition steering wheel to straight-ahead position if necessary.

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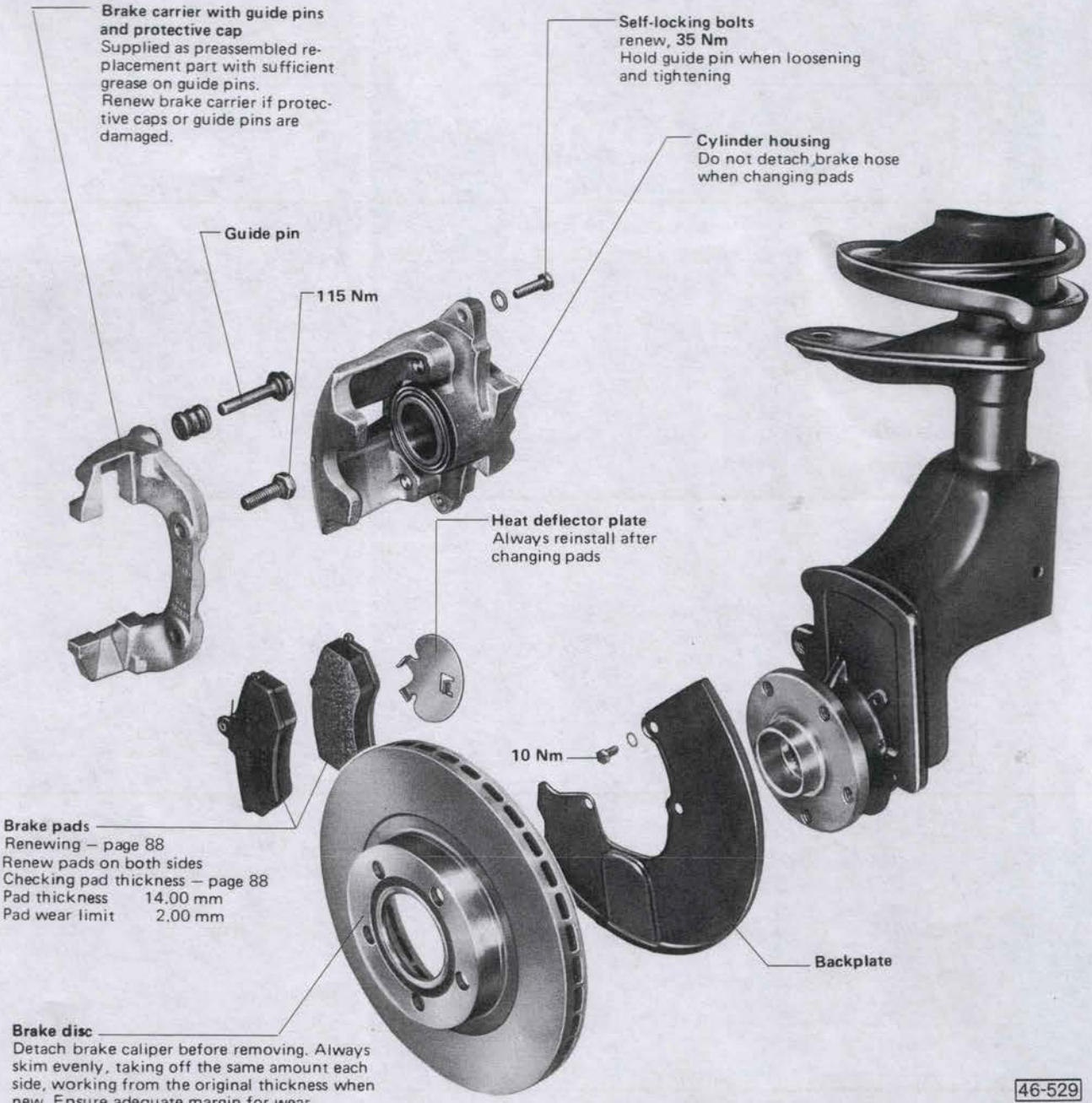
BRAKE SYSTEM

The Audi Quattro has disc brakes front and rear. The handbrake is incorporated in the rear calipers.

REPAIRING FRONT BRAKES

Repairs to the brake calipers not described here can be carried out using the Audi 100/200 Workshop Manual, Audi 200 Running gear booklet, January 1980 edition.

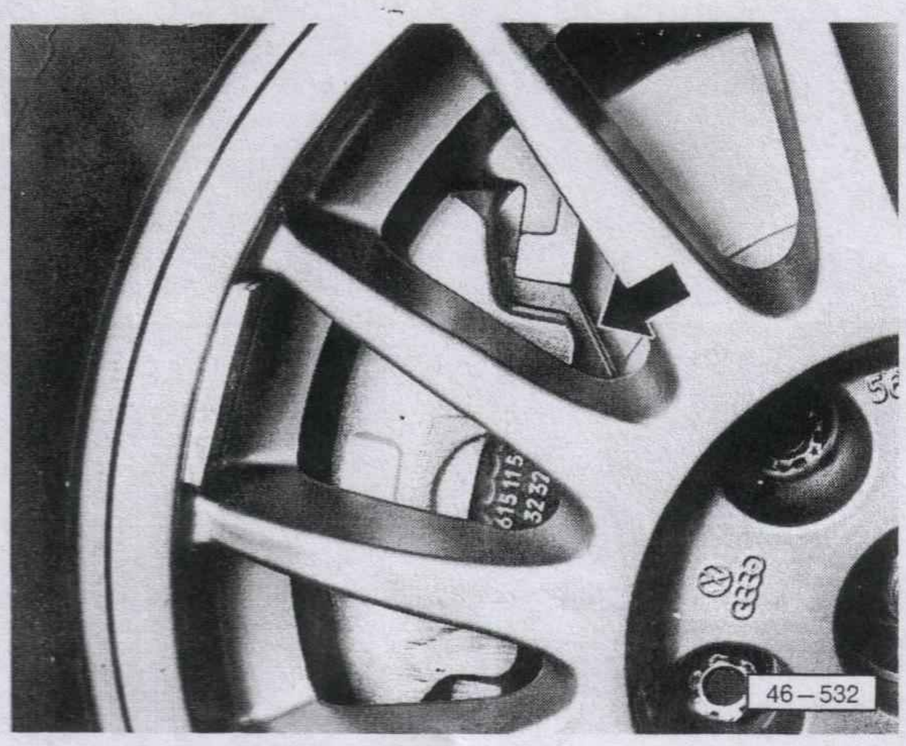
Important
Install all parts in repair kit.



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CHECKING PAD THICKNESS



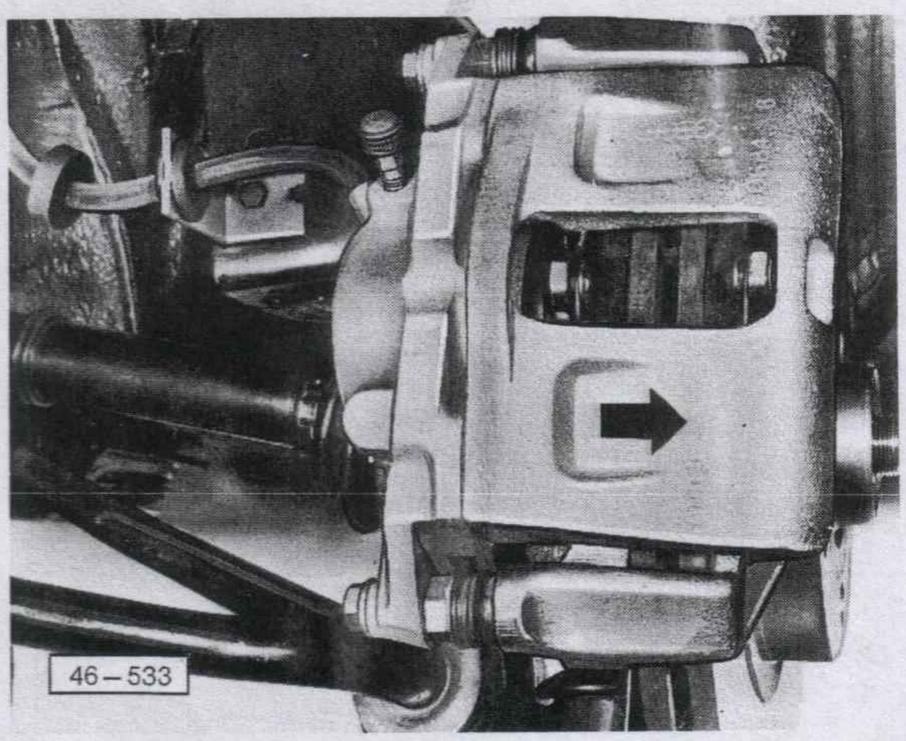
– Visually check thickness of outer brake pads by looking through one of the openings in the wheel rim, using an electric torch.

– If pad thickness is down to **7 mm** (including backplate) the pads have reached their wear limit and must be replaced.

RENEWING BRAKE PADS

– Remove wheels.

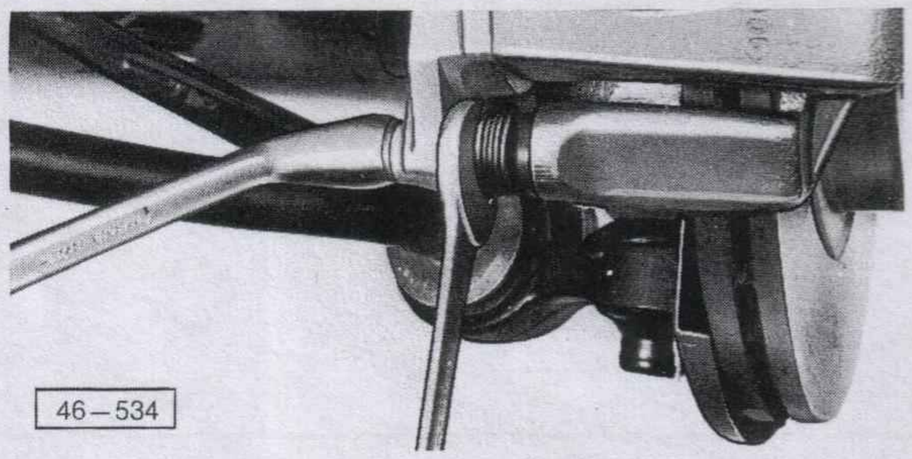
– If the brake pads are to be reused, they must be marked when removing. Install them in the same position otherwise the brakes will pull unevenly.



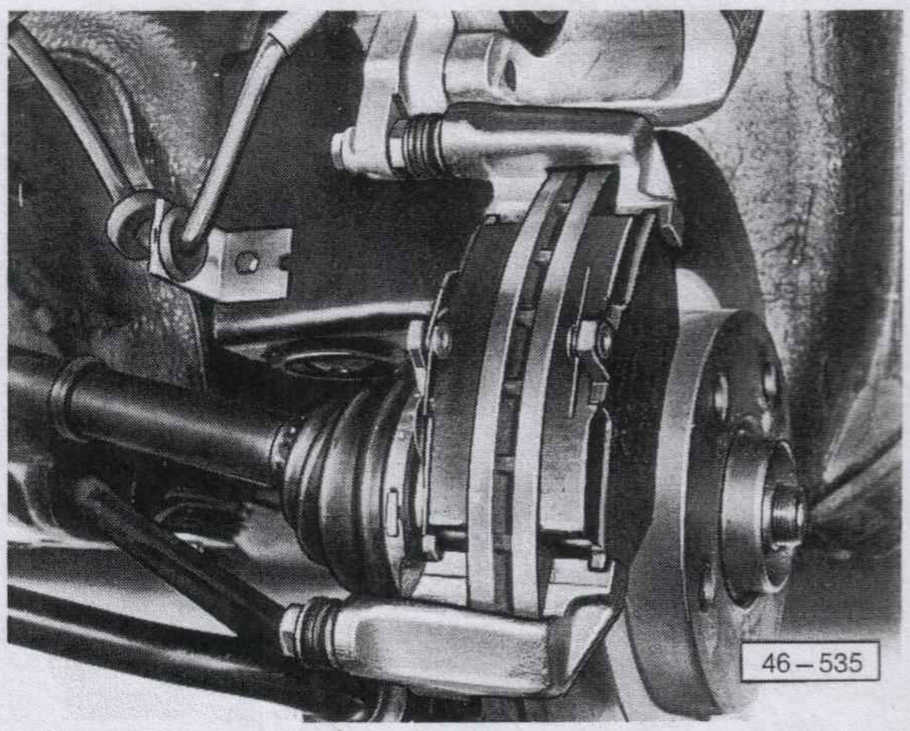
– Push cylinder housing in direction of arrow by hand to press back piston.

Important
Before pressing in the piston draw off a little brake fluid from the brake fluid reservoir.

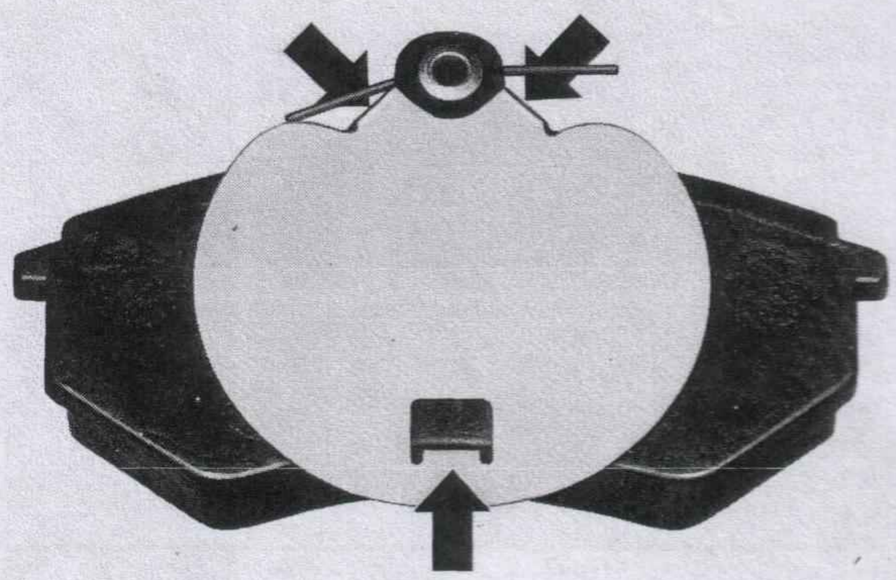
Use the bleeder bottle or a plastic bottle which is only used for brake fluid to draw off the fluid from the reservoir. Brake fluid is **poisonous** and must on no account be sucked out through a hose with the mouth.



– Unscrew lower cylinder housing mounting bolt while holding guide pin.



– Pivot cylinder housing upwards and take out brake pads.



– Fit heat deflector plate onto brake pad.

– Install brake pads. (Install brake pad with heat deflector plate on piston side).

– Pivot cylinder housing downwards and tighten mounting bolt to 35 Nm.

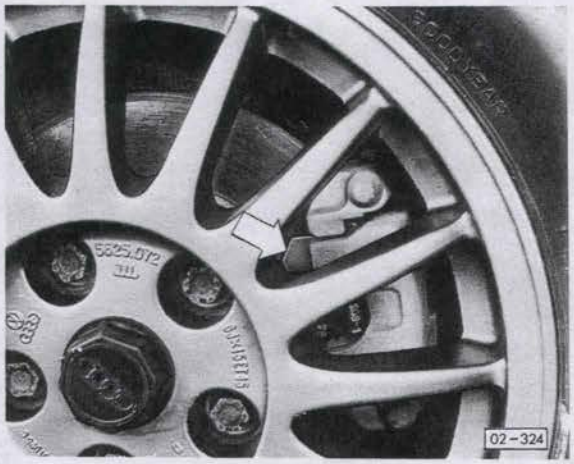
Note:
Always install both hex head self-locking bolts and both heat deflector plates included in the repair kit.

Important
Depress the brake pedal firmly several times with the vehicle stationary in order to seat the brake pads in their normal running position.

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REPAIRING REAR BRAKES

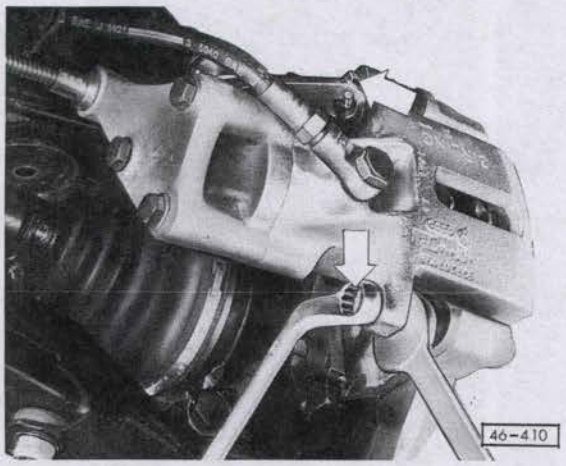
CHECKING PAD THICKNESS



- Visually check thickness of outer brake pads by looking through one of the openings in the wheel rim, using an electric torch.
- If the pad thickness is down to **7 mm** (including backplate) the pads have reached their wear limit and must be replaced.

RENEWING BRAKE PADS

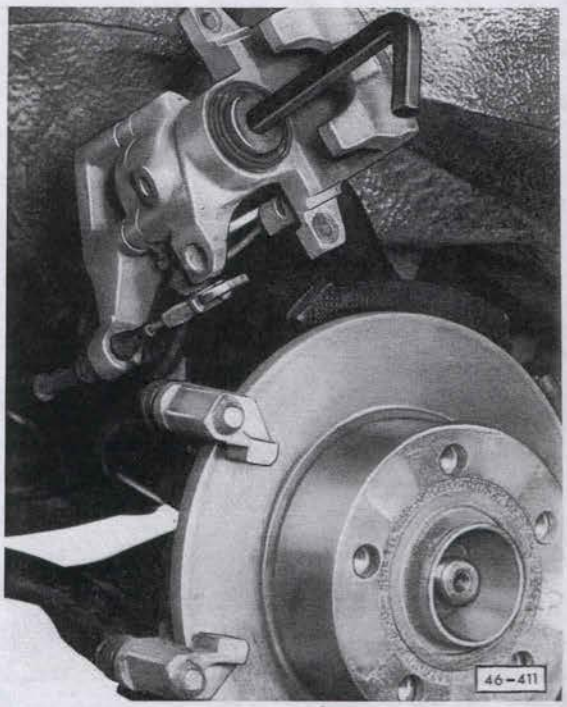
- Remove wheels.
- If the brake pads are to be reused, they must be marked when removing. Install them in the same position otherwise the brakes will pull unevenly.



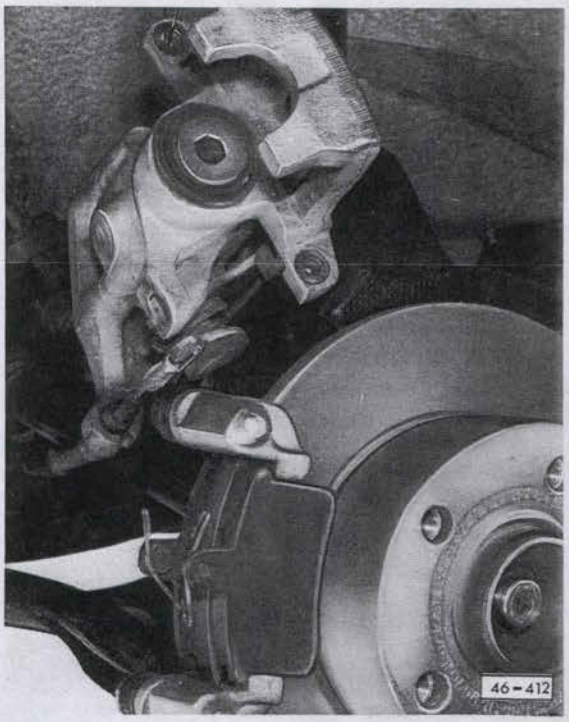
- Detach cylinder housing.
- Remove brake pads.

Important
Before screwing back the piston draw off a little brake fluid from the brake fluid reservoir.

Use the bleeder bottle or a plastic bottle which is only used for brake fluid to draw off the fluid from the reservoir. Brake fluid is **poisonous** and must on no account be sucked out through a hose with the mouth.



- Screw back piston by turning to the right and pushing in firmly.



- Insert brake pads.
- Attach cylinder housing and tighten bolts to 35 Nm.

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Note:

Always install all four hex head self-locking bolts included in the repair kit.

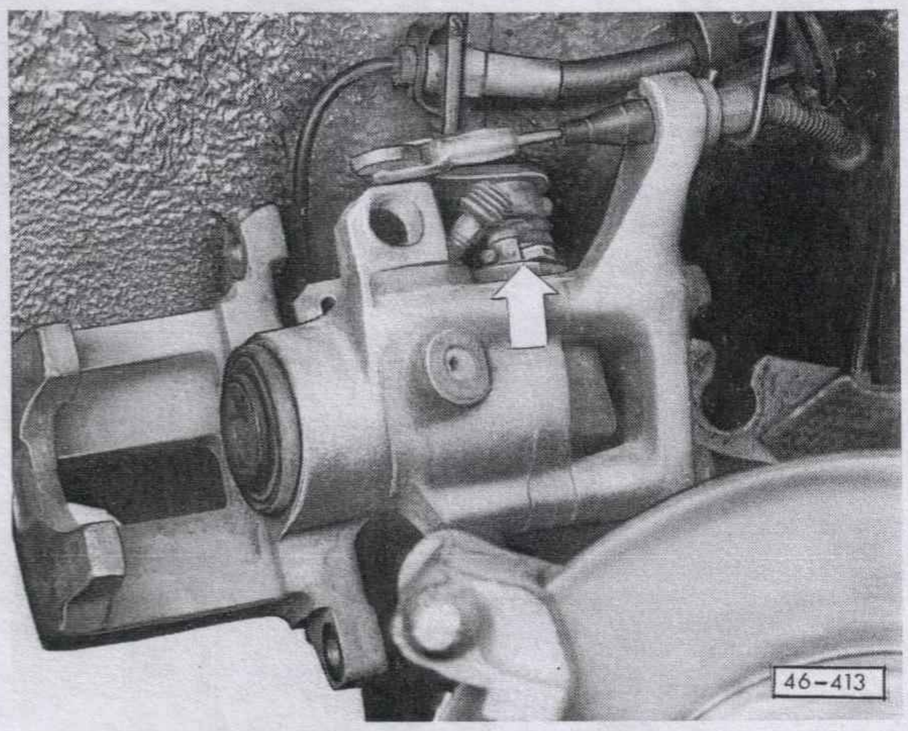
Important:
Depress the brake pedal with moderate force about 40 times with the engine switched off.
This automatically gives the basic brake adjustment.
Check the adjustment of the handbrake and correct if necessary – see below.

ADJUSTING HANDBRAKE

Note:
The rear brakes are self-adjusting, so it is only necessary to readjust the handbrake if the handbrake cables, the brake calipers, the pull rod or the brake pads are renewed.

– Switch off engine.

– Release handbrake.

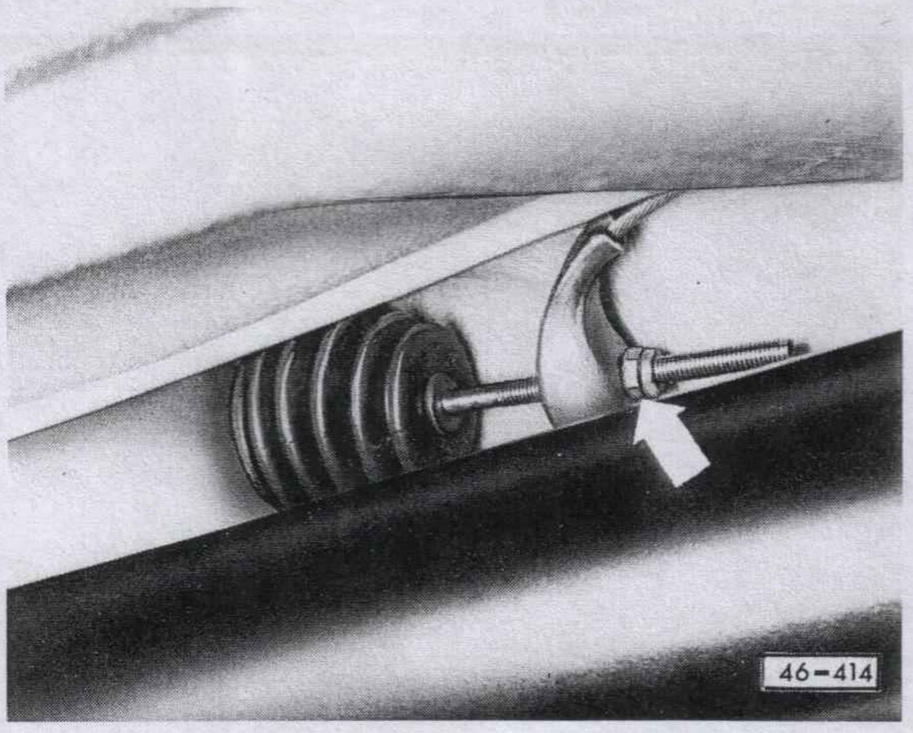


– The levers for the handbrake cables must contact the stop; if necessary slacken adjusting nut for cables accordingly.

Note:
The illustration shows the stop (arrow) with the cylinder housing removed.

– Depress brake pedal approx. 40 times with moderate force.

– Pull handbrake lever onto **3rd tooth.**



– Tighten adjusting nut so that both wheels can only just be turned by hand.

Note:
The adjusting nut is not readily accessible. It may be necessary to detach the propellor shaft from the rear differential.
Tightening torque for mounting bolts: 45 Nm.

– Release handbrake.

– Check that both levers for the handbrake cable are contacting the stop and that both wheels rotate freely. If this is not the case check the handbrake linkage for freedom of movement.

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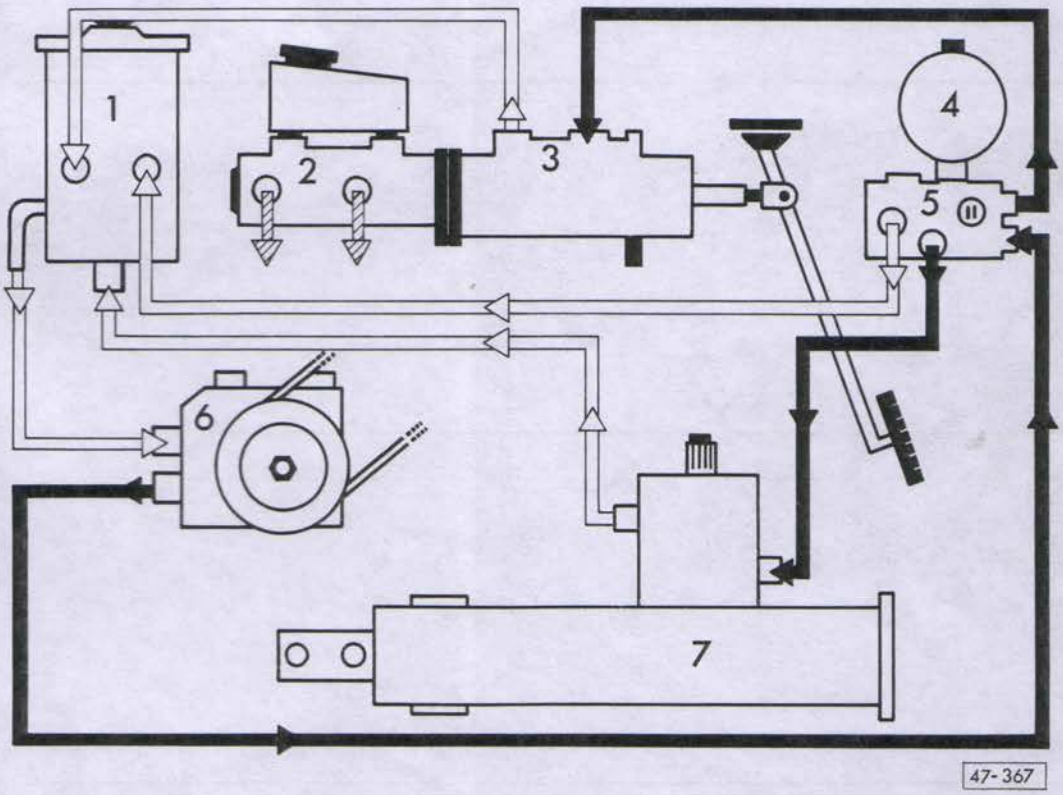
BRAKE MASTER CYLINDER

The brake circuits are split front and rear.

The push rod piston in the master cylinder operates the front calipers and the floating piston operates the rear calipers.

Repairs to the brake calipers and master cylinder not described here can be carried out using the Audi 100/200 Workshop Manual, Audi 200 Running gear booklet, January 1980 edition.

HYDRAULIC BRAKE SERVO SYSTEM



1 – Reservoir
2 – Brake master cylinder
3 – Hydraulic brake servo
4 – Hydraulic accumulator
5 – Flow regulator
6 – Impeller pump
7 – Power assisted steering

The system consists of a hydraulic brake servo – 3 –, mounted directly on the master cylinder – 2 – and a pressure-controlled flow regulator – 5 – with an hydraulic accumulator – 4 –. The system is fed by the impeller pump – 6 – for the power assisted steering – 7 –. The flow regulator diverts a small amount of the fluid delivered through the ATF circuit and this is used to pressurise the hydraulic accumulator to about 52 bar. The function of the PAS is not impaired.

If the pressure should drop below this value an electrical warning switch on the flow regulator operates a visual indicator in front of the driver.

The ATF maintained under pressure is available at the hydraulic servo to assist the pedal effort. When the pedal is operated the pressure of the fluid augments the force applied to the pedal. When the pedal is released the used ATF, no longer under pressure, is returned to the reservoir.

BRAKE PRESSURE REGULATOR

The pressure-sensitive brake pressure regulator with automatic override function is located below the brake servo and restricts the pressure applied to the rear brakes in a pre-determined manner. If the front brake circuit should fail, a cutoff piston operates to allow the full, unrestricted brake pressure to be applied to the rear calipers.

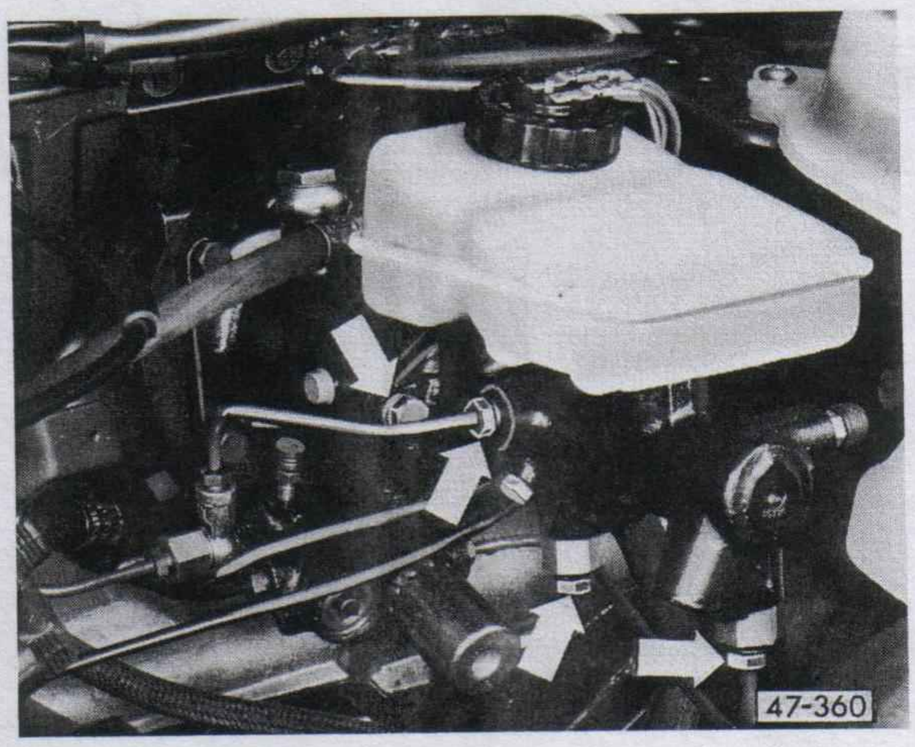
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REMOVING AND INSTALLING BRAKE MASTER CYLINDER

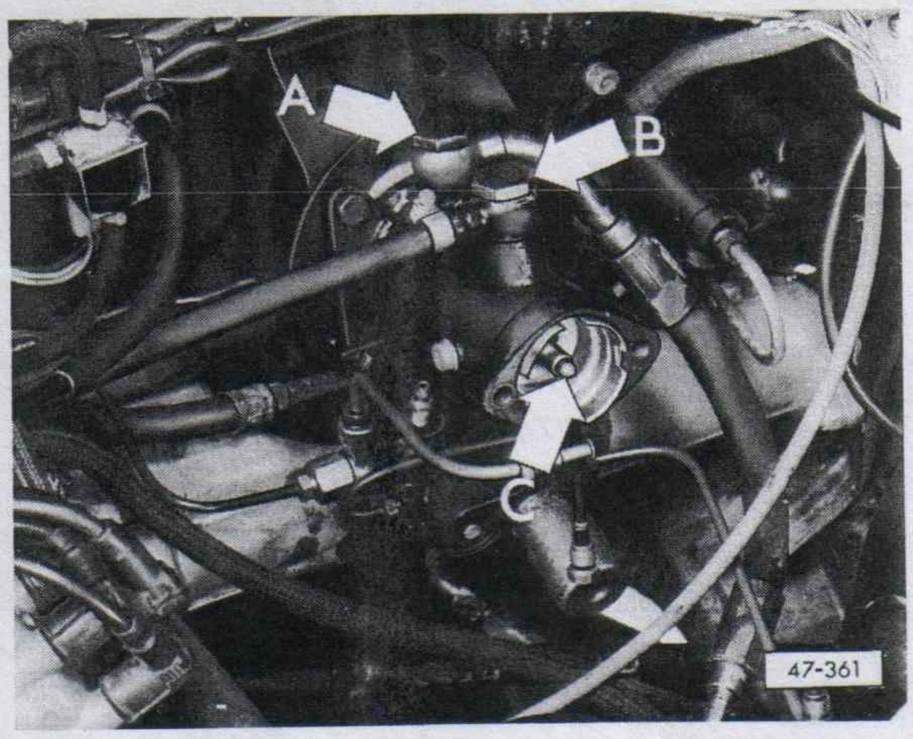
> **Caution**
> Before working on the brake system **always** relieve pressure in the hydraulic accumulator by depressing the brake pedal 20 times (same pedal force as an emergency stop).

Removing

– Detach brake lines from master cylinder.



– Detach master cylinder from servo.



– When removing the master cylinder ensure that the plunger (arrow C) in the brake servo is not pulled out as well.

Installing

– Install in reverse sequence.

– Bleed the brake system after installation, see page 95.

CHECKING BRAKE PRESSURE REGULATOR

The pressure-sensitive brake pressure regulator is mounted on a bracket below the brake servo.

– Raise vehicle and connect pressure gauge VW 1310 to front left and rear left brake calipers.

– Bleed both gauges.

– Depress brake pedal and read off pressures front and rear.

Front brakes	50	bar
Rear brakes	35 - 39	bar

Front brakes	100	bar
Rear brakes	58 - 62	bar

– Renew the brake pressure regulator if the pressure under test is not within the specified tolerance range.

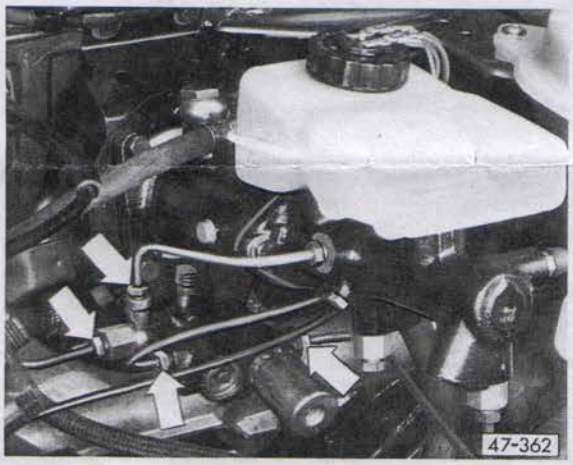
– Disconnect pressure gauges and bleed brake system, see page 95.

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REMOVING AND INSTALLING BRAKE PRESSURE REGULATOR

Caution
Before working on the brake system **always** relieve pressure in the hydraulic accumulator by depressing the brake pedal 20 times (same force as an emergency stop).

Removing



– Detach brake lines from brake pressure regulator.
– Detach pressure regulator from bracket.
– Take out pressure regulator.

Installing

– Install in reverse sequence.
– Bleed brake system after installation, see page 95.

CHECKING BRAKE SERVO

With the engine switched off relieve pressure in the hydraulic accumulator by depressing the brake pedal 20 times (same force as an emergency stop).

Keep the pedal depressed with moderate force and start the engine. If the servo system is operating properly the pedal should be felt to yield slightly under the foot. If this does not happen, trace the fault as follows:

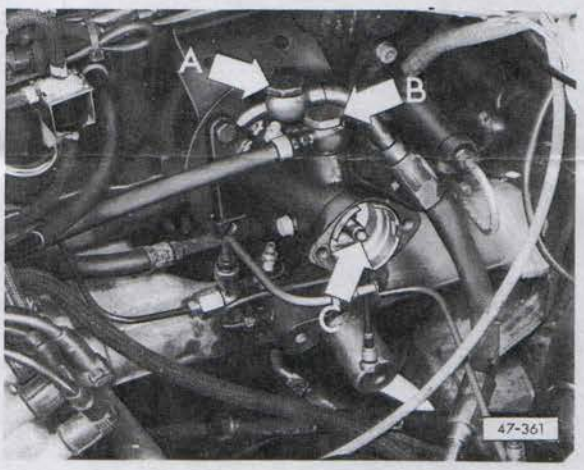
Replace the servo, flow regulator with hydraulic accumulator, and steering pump individually one after the other and check the servo system each time until the defective component is traced and the fault rectified.

REMOVING AND INSTALLING BRAKE SERVO

Caution
Before working on the brake servo system **always** relieve the pressure in the hydraulic accumulator by depressing the brake pedal 20 times (same force as an emergency stop).

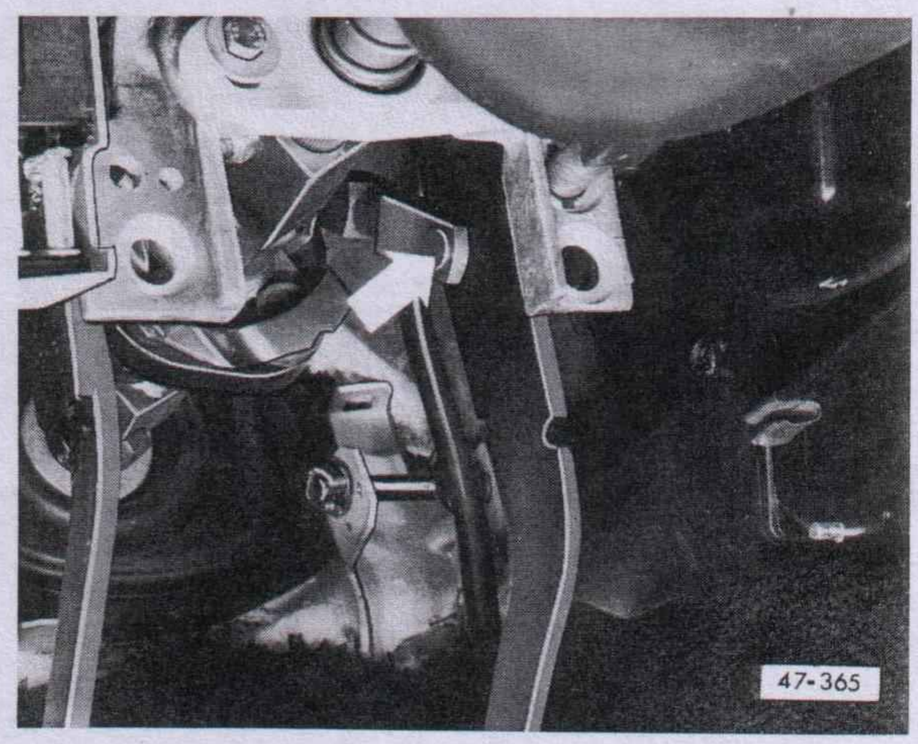
Removing

– Remove brake master cylinder, see page 92.



– Detach pressure line (arrow A) and return line (arrow B) from brake servo.

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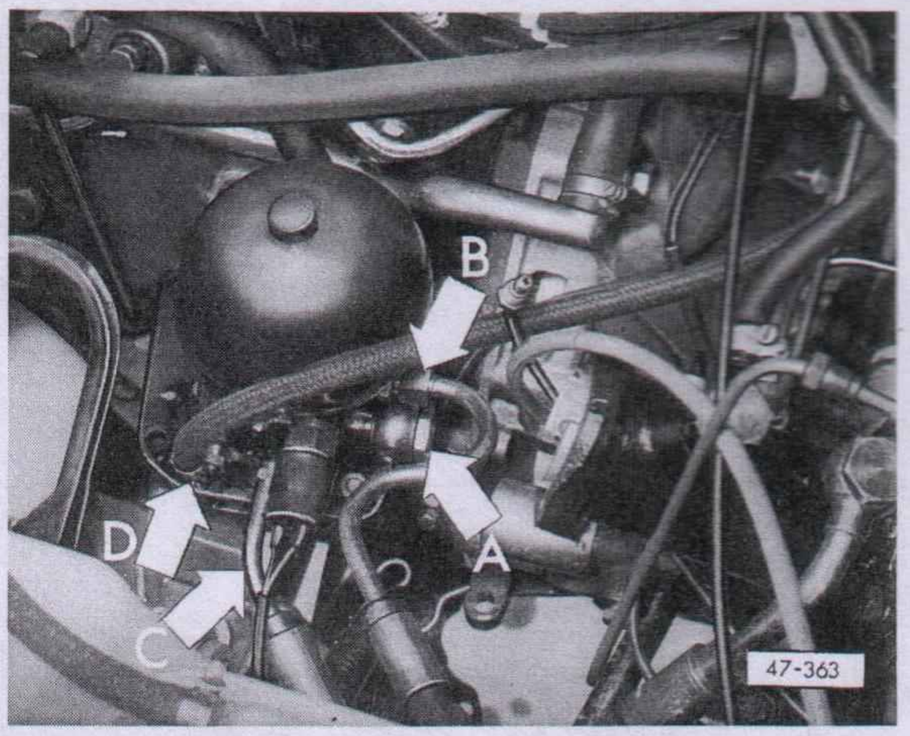
– Remove retaining pin from fork joint.
– Unscrew mounting bolts for brake servo on support bracket.
– Take out brake servo.

Installing

– If a new brake servo is used, measure the position of the fork joint on the piston rod, and adjust to the same position when installing.
– Install brake servo and secure to support bracket.
– Secure fork joint to brake pedal with retaining pin, use new lock clip.
– Secure pressure line and return line to brake servo. Use new seals on the banjo bolts. Tightening torque 30 ± 5 Nm.
– Install master cylinder, see page 92, and bleed brakes, see page 95.

REMOVING AND INSTALLING FLOW REGULATOR WITH HYDRAULIC ACCUMULATOR

Caution
Before working on the brake servo system **always** relieve pressure in the hydraulic accumulator by depressing the brake pedal 20 times (with the same force as an emergency stop).



– Detach the following lines at the **flow regulator:**

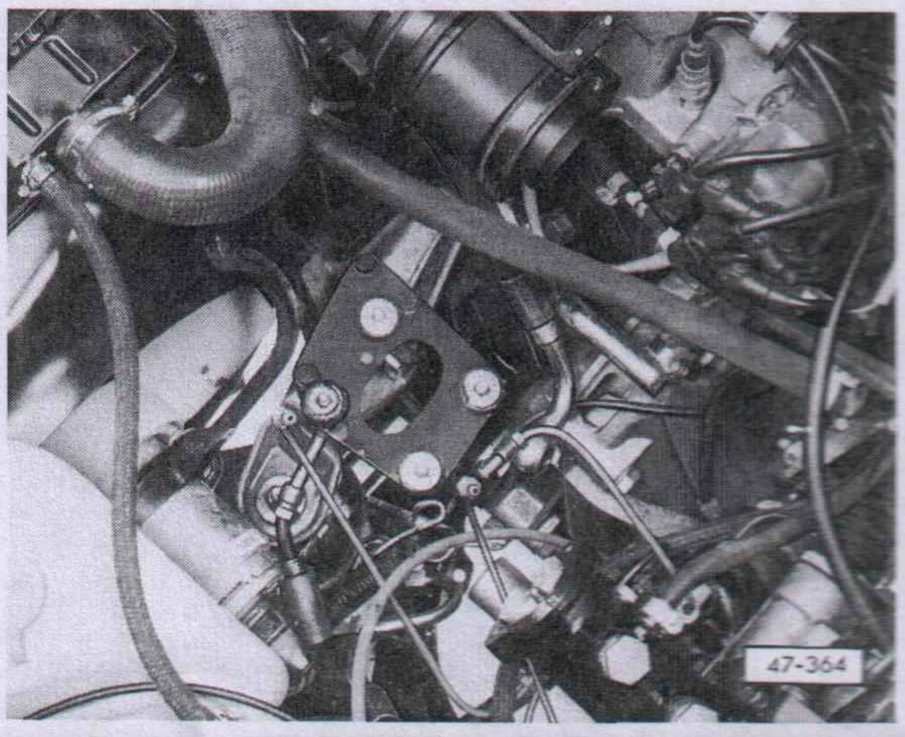
pressure line from impeller pump to flow regulator (arrow A)

pressure line from flow regulator to brake servo (arrow B)

pressure line from flow regulator to steering gear (arrow C)

return line on flow regulator (arrow D)

– Disconnect wire from warning switch on flow regulator.



– Unscrew mounting nuts on flow regulator retaining plate and take out flow regulator with hydraulic accumulator.

Installing

– Install in reverse sequence. Use new seals on the banjo bolts.

Tightening torques for brake lines to flow regulator

pressure line to impeller pump:	30 + 10 Nm
pressure line to brake servo:	25 + 10 Nm
pressure line to steering gear:	45 + 5 Nm
return line:	15 + 3 Nm

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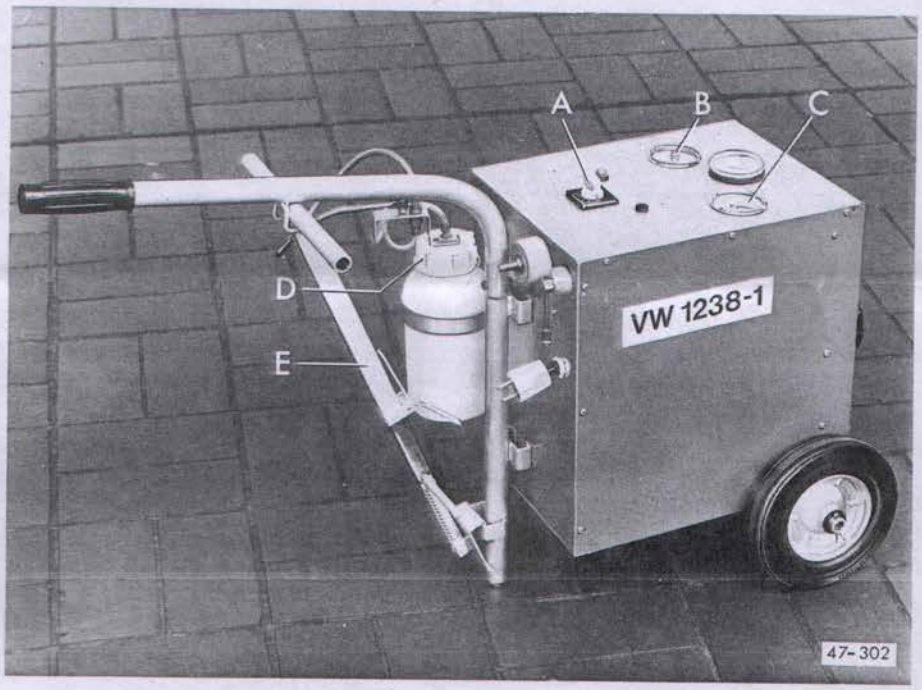
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INITIAL OPERATION OF BRAKE SERVO SYSTEM

(After renewing components)

- Fill fluid reservoir with ATF up to 10 mm below the Max. mark.
- Start engine and keep topping up fluid level in reservoir up to Max. mark. At the same time turn the steering to full lock in both directions several times with the vehicle raised.
- Switch off the engine.
- Relieve pressure in hydraulic accumulator by depressing brake pedal 20 times (with the same force as an emergency stop).
- Start engine, check ATF level in reservoir after about 1 minute and top up to Max. mark if required.

BLEEDING BRAKE SYSTEM AND CHANGING BRAKE FLUID WITH VW 1238/1 FILLING AND BLEEDING APPLIANCE



A = Selector switch
B = Fluid capacity gauge
C = Pressure gauge
D = Bleeder bottle
E = Brake pedal operating device

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WB 7,

47 Brakes – hydraulics, regulator, servo

Preparing the appliance

– Fill with brake fluid as required.

> **Caution!**
> Only use new, unused brake fluid conforming to US standard FMVSS 116 DOT 3. Genuine VW/Audi brake fluid meets these specifications. Brake fluid is both poisonous and corrosive and must not be allowed to come into contact with painted surfaces.
>
> Brake fluid is hygroscopic, i. e. it absorbs moisture from the atmosphere. It must therefore always be stored in airtight containers.

– Connect appliance to mains, indicator light must come on.

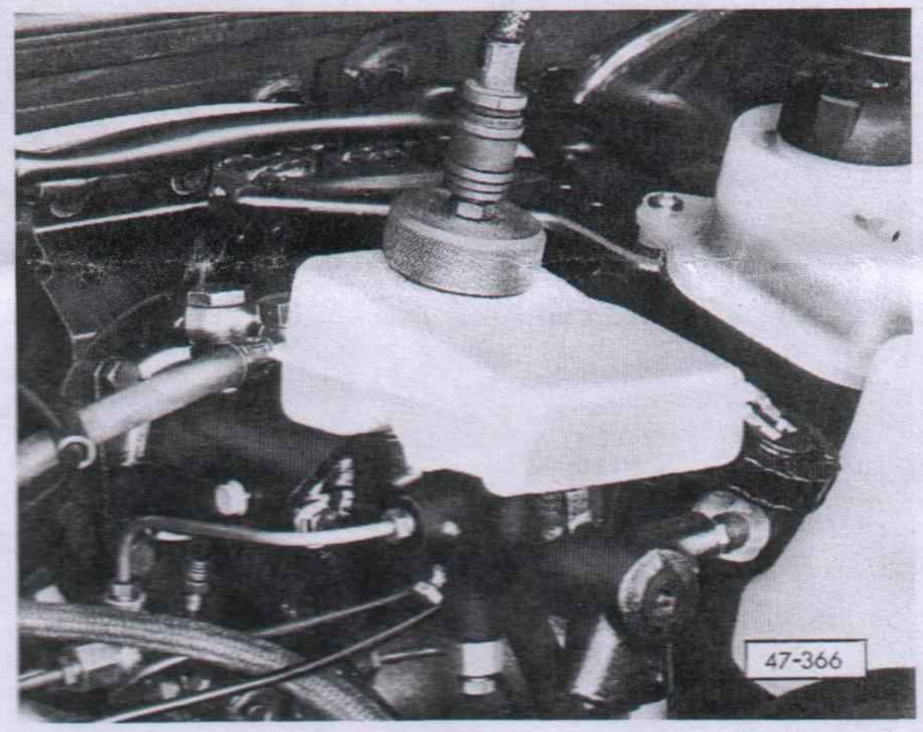
– Set selector switch to position 1. Pressure gauge must show an operating pressure of 2 to 2.5 bar.

– Set selector switch to position 0.

Bleeding brakes, checking for leaks

> **Important**
> Before working on the brake system **always** relieve pressure in the hydraulic accumulator by depressing the brake pedal 20 times (same force as for an emergency stop).

– Set up the brake pedal operating device between the driver's seat and the brake pedal. Pretension device.



– Unscrew cap from brake fluid reservoir. Screw appropriate connector onto thread on brake fluid reservoir.

– Attach hose from bleeding appliance to connector.

– Align red needle with black needle on fluid capacity gauge. This enables you to check how much fluid has been used.

– Set selector switch to position 1. The pump then applies pressure to the brake fluid in the vehicle. Open bleeder screws in the sequence given below and bleed brake calipers.
Collect the used brake fluid in the bleeder bottle supplied with the appliance.

Bleeding sequence:

1 – Rear right brake caliper

2 – Rear left brake caliper

3 – Front right brake caliper

4 – Front left brake caliper

– Check brake system for leaks. Set selector switch to position 2. Watch pressure gauge. If reading remains constant there is no leakage. If reading drops this means that there is a leak in the system.

– Remove brake pedal operating device.

– Set selector switch to position 0. Wait for pressure gauge reading to drop to zero and then detach hose.

– Check fluid level in reservoir, if necessary draw off excess fluid with suction bottle.

Changing brake fluid

The heat generated by braking is not only transferred to the brake discs but also to the calipers and thus to the brake fluid.

Brake fluid has the undesirable property of absorbing water, for example moisture from the atmosphere: it is hygroscopic. A high water content considerably reduces the boiling point which means that bubbles of vapour can form at very high temperatures. At very low temperatures, the water content increases the viscosity of the brake fluid.

The temperature of the fluid can exceed the boiling point and cause vapour bubbles to form when driving down long, steep hills in a high gear, or when the vehicle is towed incorrectly with the brakes applied continuously. If the viscosity of the brake fluid is too high this can in certain circumstances lead to the ingress of air into the master cylinder at very low temperatures. Both conditions only occur in extreme cases, but when they do occur they can cause brake failure.

For these reasons it is essential to change the fluid in the hydraulic system as specified in the Maintenance Instructions in order to keep the water content of the brake fluid to a minimum.

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96 Bleeding brake system, changing brake fluid with VW 1238/1 filling and bleeding appliance

WB 7

Important

Before working on the brake system **always** relieve pressure in the hydraulic accumulator by depressing the brake pedal 20 times (same force as for an emergency stop).

Prepare appliance as for bleeding

- Using the special suction bottle draw off as much brake fluid as possible from the brake fluid reservoir (this ensures that the used fluid in the reservoir is not pumped through the brake system).
- Set up the brake pedal operating device between driver's seat and brake pedal and pretension.
- Screw a connector onto the thread on the reservoir.
- Attach the hose from the appliance to the connector.
- Set selector switch to position 1. Open the bleeder screws in the sequence shown in the following table and wait for the appropriate quantities of fluid to be pumped out. The used brake fluid is forced out of the system as the new fluid is pumped in.

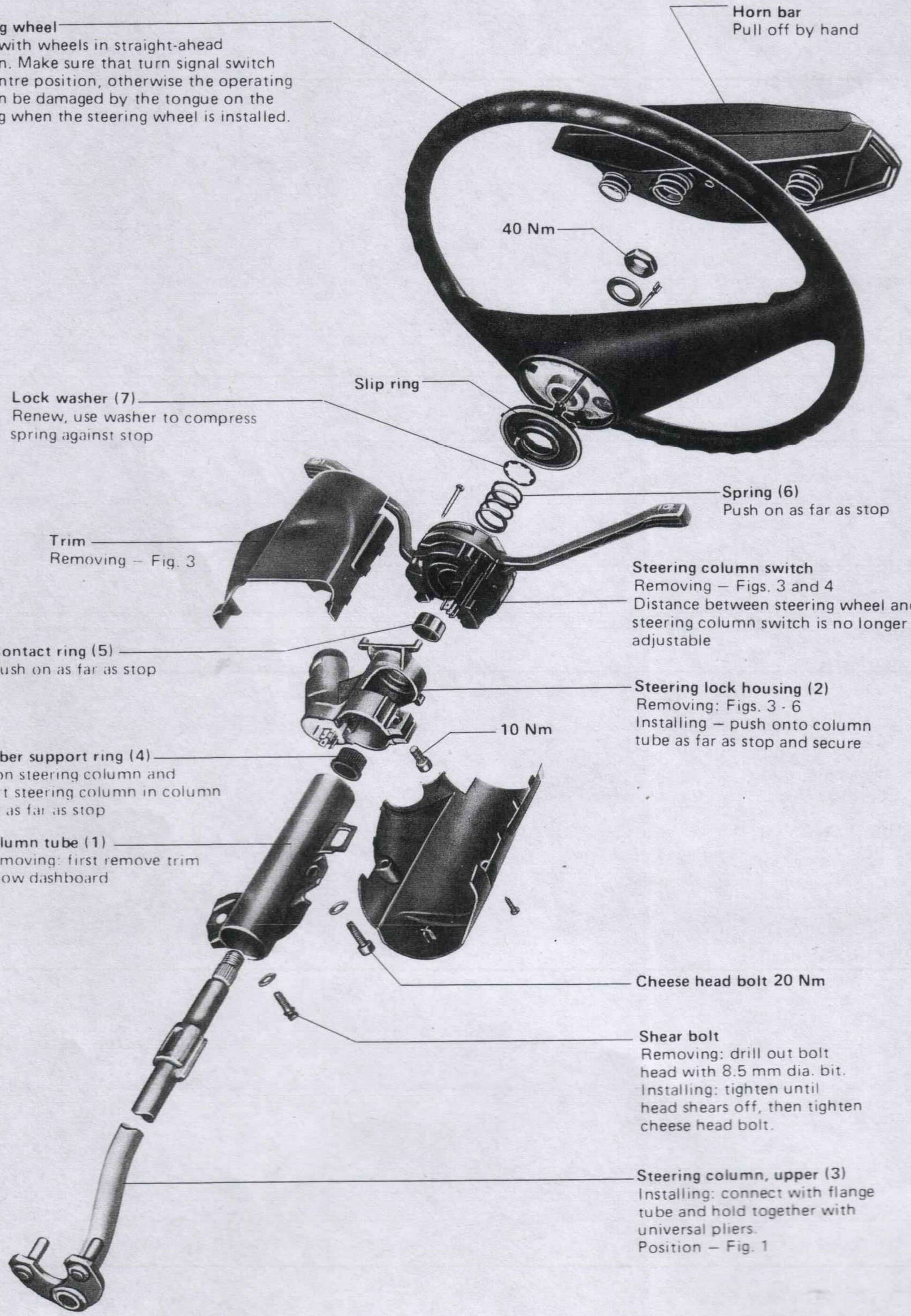
Sequence: caliper	Amount of brake fluid which must be pumped out of the calipers
Rear right	500 cc
Rear left	500 cc
Front right	500 cc
Front left	500 cc

- Check brake system for leaks. Set selector switch to position 2. Watch pressure gauge. Constant pressure reading – no leaks. If pressure reading drops there is a leak in the brake system.
- Remove brake pedal operating device.
- Set selector switch to position 0. Only detach hose when pressure gauge registers zero.
- Check fluid level in reservoir and if necessary draw off surplus fluid with suction bottle.

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REMOVING AND INSTALLING STEERING COLUMN WITH COLUMN TUBE

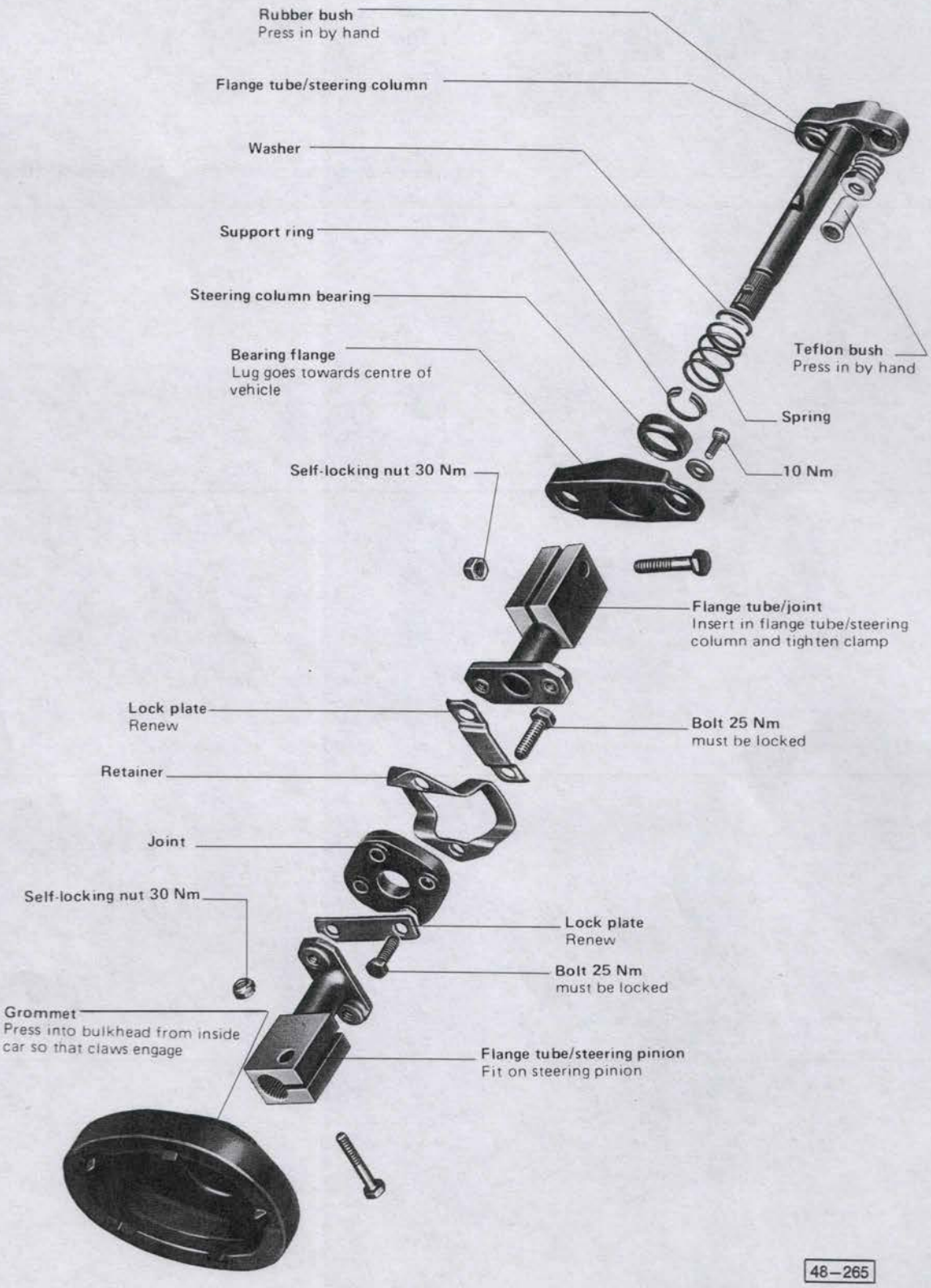
Installation note:
Preassemble the numbered parts in sequence (see Fig. 2) and then install complete.



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Note:
Preassemble components and install lower steering column complete: push lower steering column onto steering pinion until flange tube is in contact with upper steering column (Fig. 1).
Then tighten lower clamp. Renew self-locking nuts.



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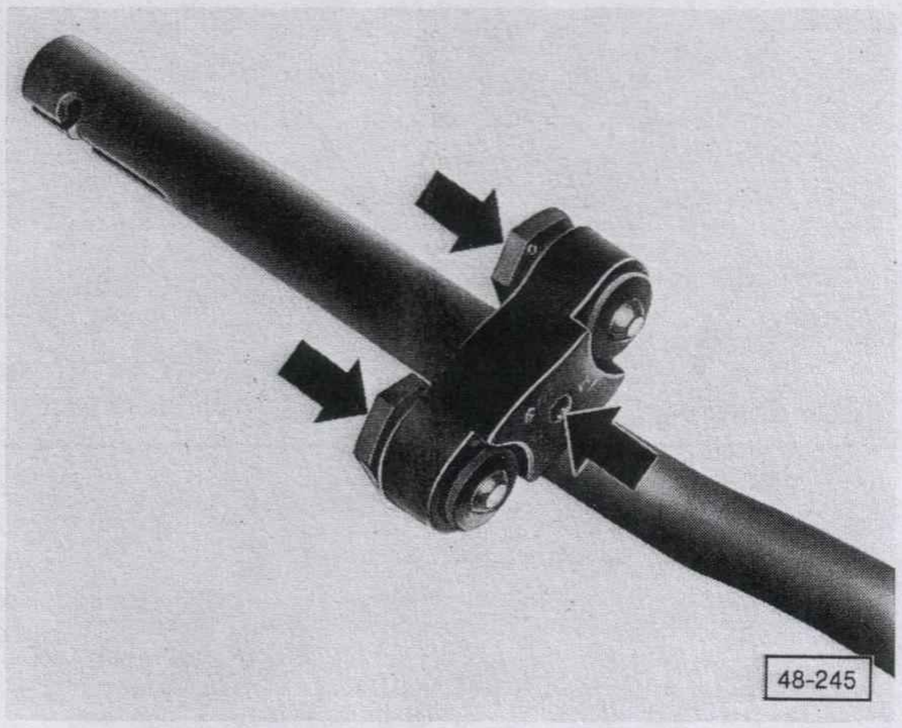


Fig. 1 Position of flange tube/steering column

Push flange tube onto steering column as far as stop.

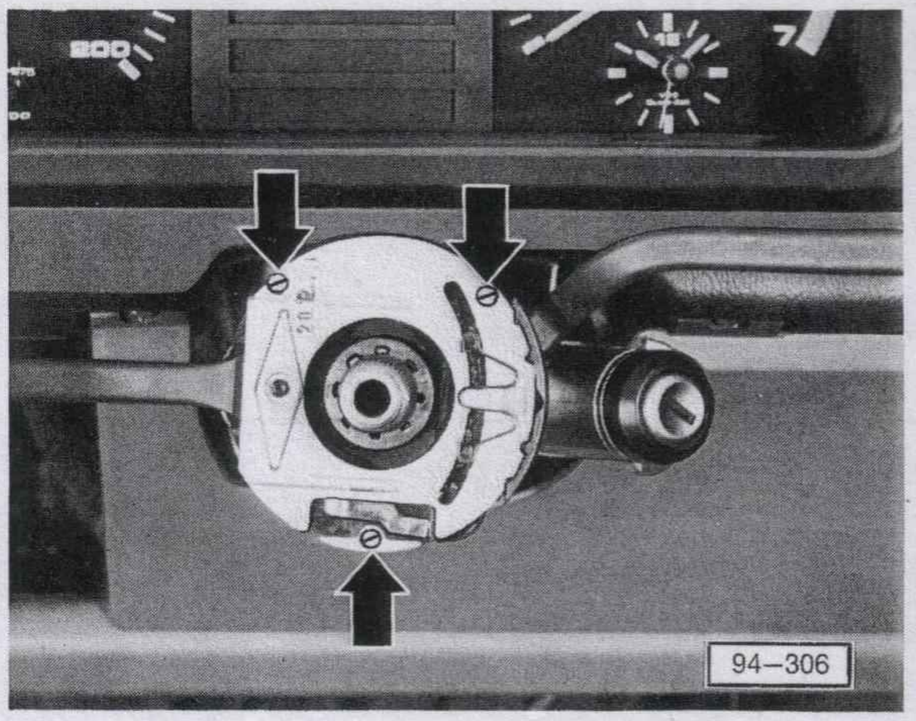


Fig. 4 Removing steering column switch

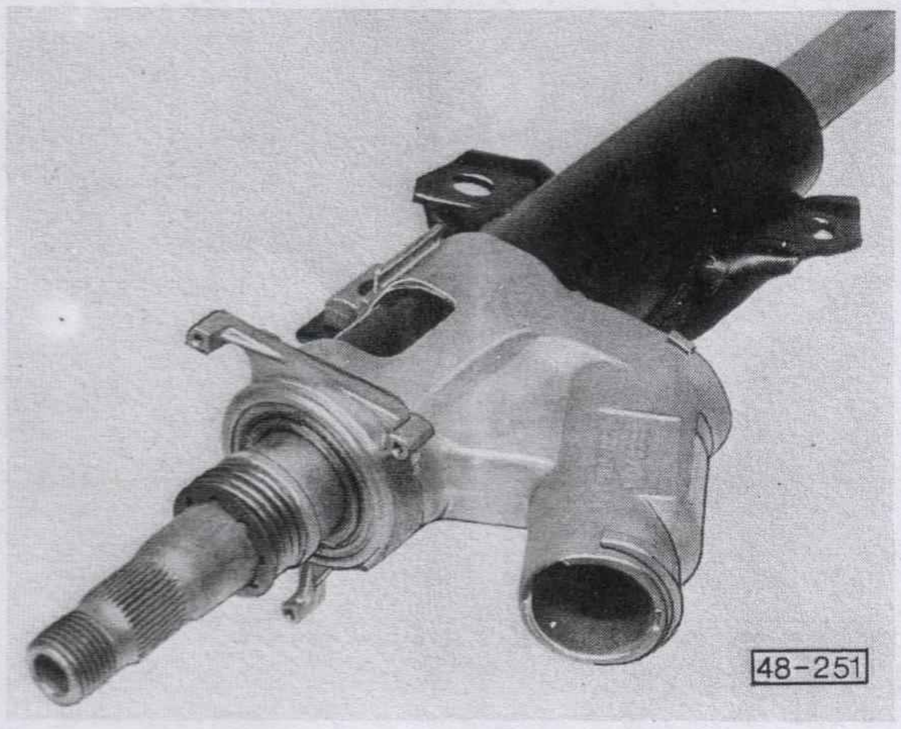


Fig. 2 Preassembled steering column

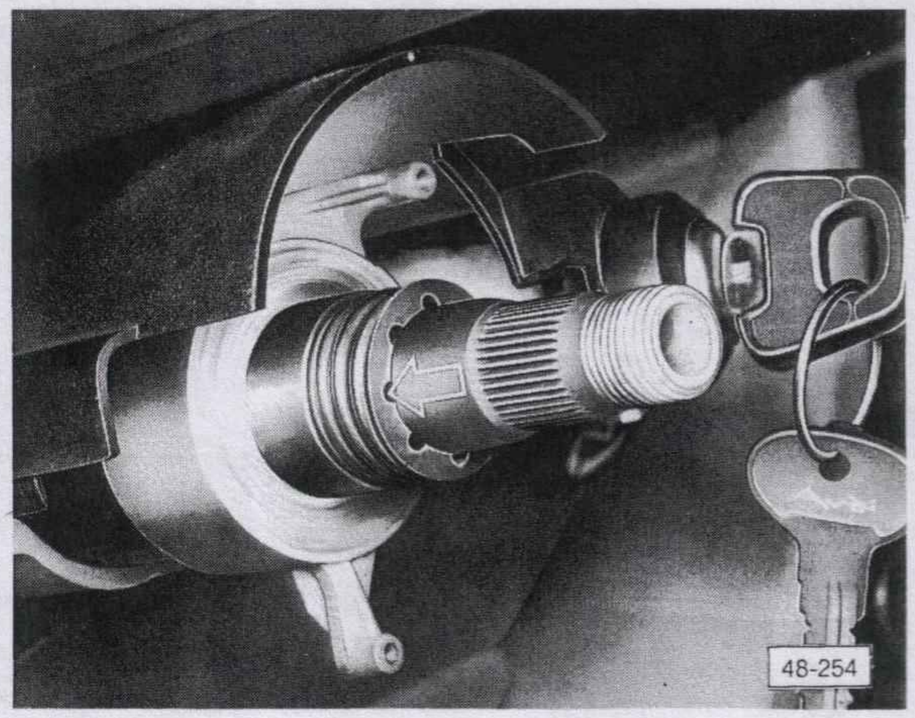


Fig. 5 Levering off lock washer

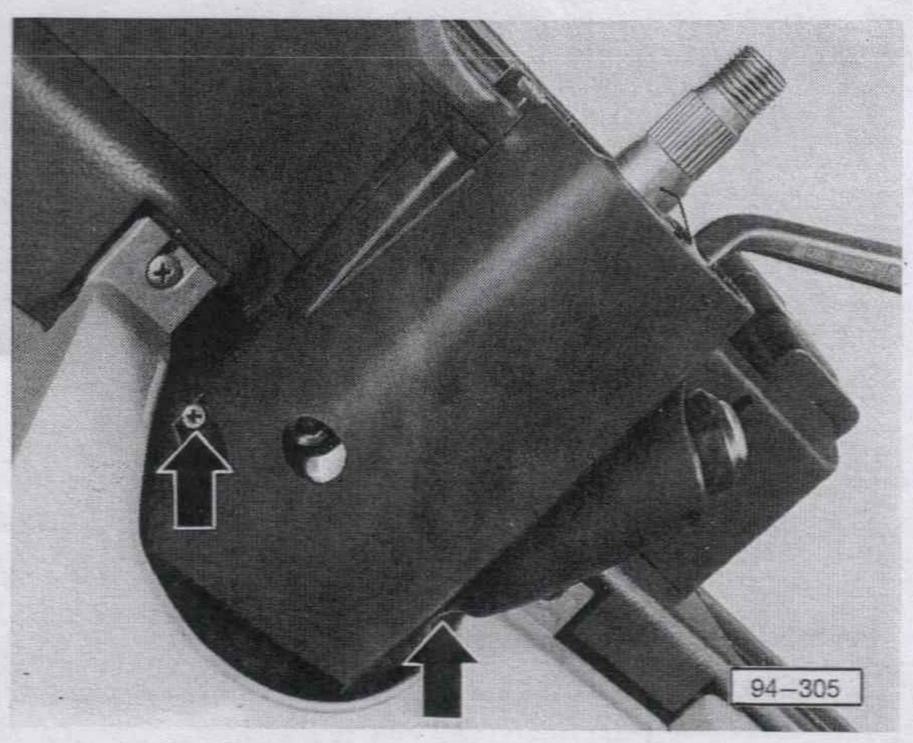


Fig. 3 Removing trim

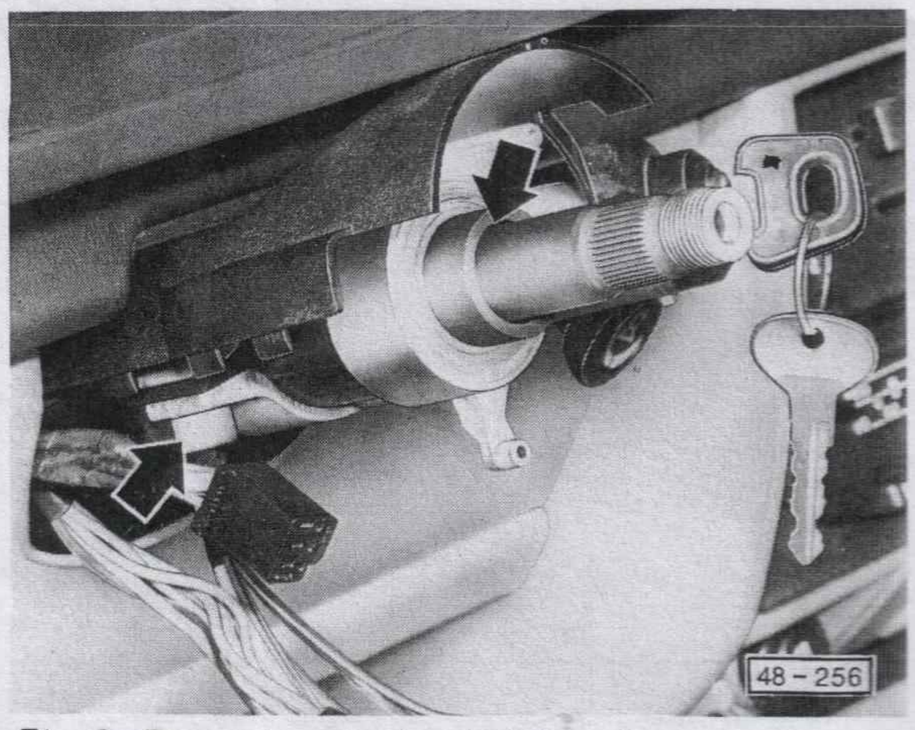


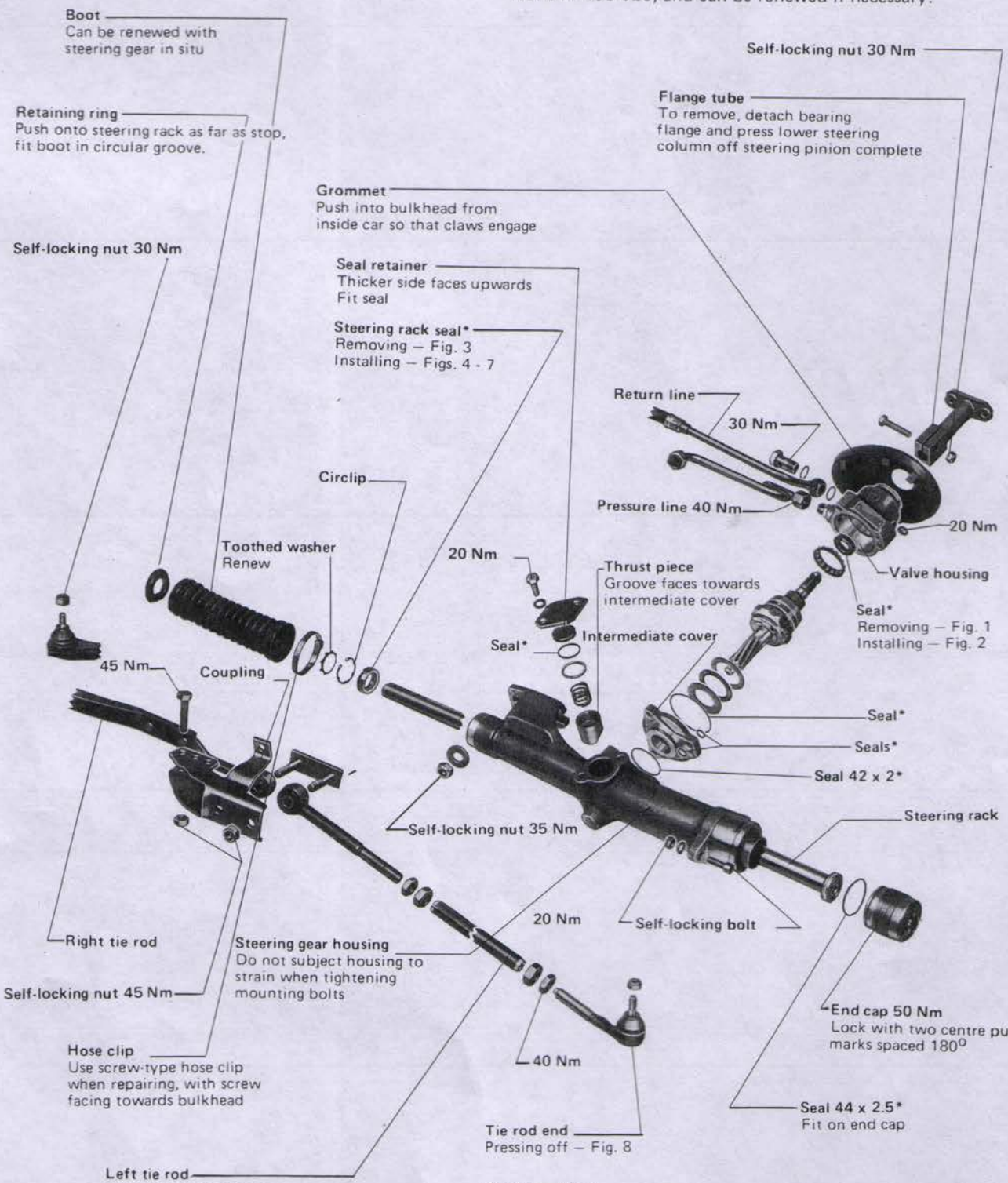
Fig. 6 Removing steering lock housing

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REPAIRING POWER ASSISTED STEERING

Important
Work on a clean bench and keep all components absolutely clean.

Note:
Renew all self-locking nuts and bolts. Do not attempt to straighten or weld steering components. Always check the output pressure of the impeller pump and the system pressure before repairing the steering gear. All components marked with an asterisk are included in repair kit, Part No. 811 498 020, and can be renewed if necessary.



Checking ATF level – page 103
Putting in ATF – page 104
Bleeding steering system and hydraulic brake servo – page 105
Checking steering system and hydraulic brake servo for leaks – page 105
PAS – faults and repair measures – page 106

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Fig. 1 Driving out seal in valve housing

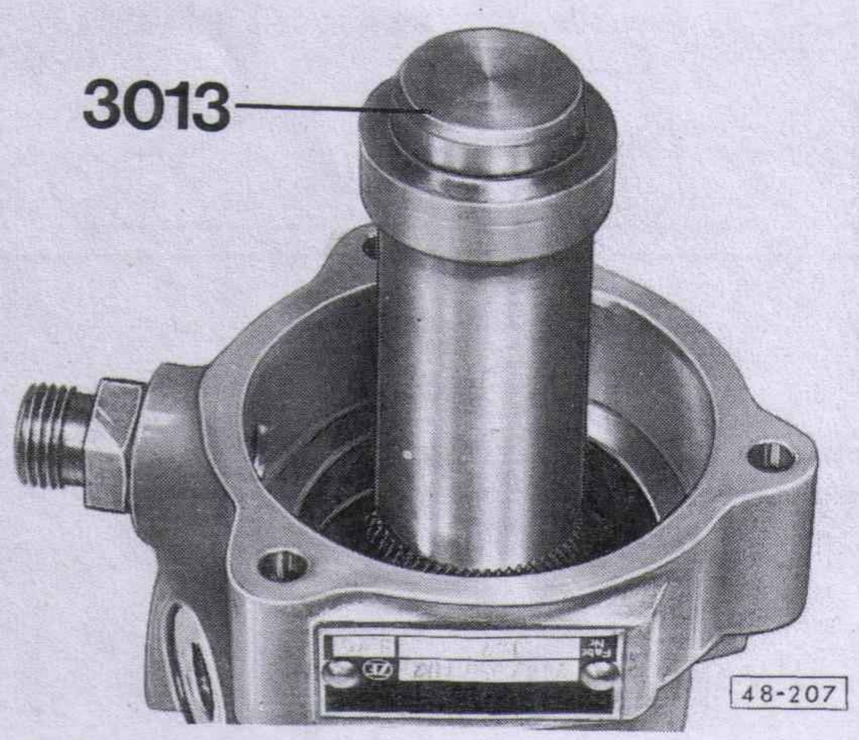


Fig. 2 Driving seal onto seat in valve housing

Sealing lip faces towards intermediate cover.

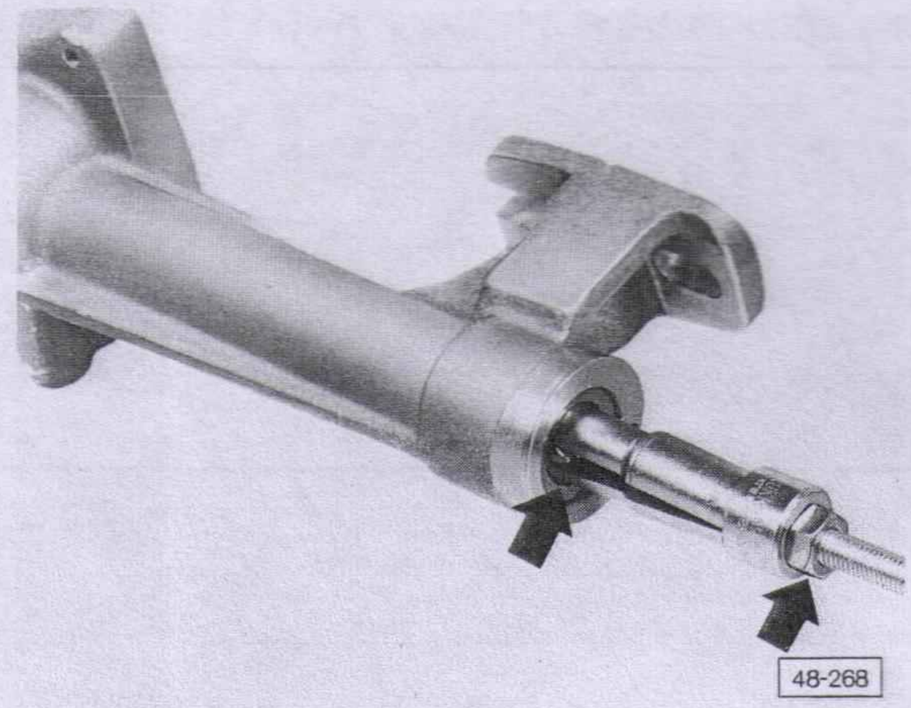


Fig. 3 Extracting steering rack seal

E.g. with Kuko 21/3 internal puller (normal commercial type). Fit puller in sealing lip.

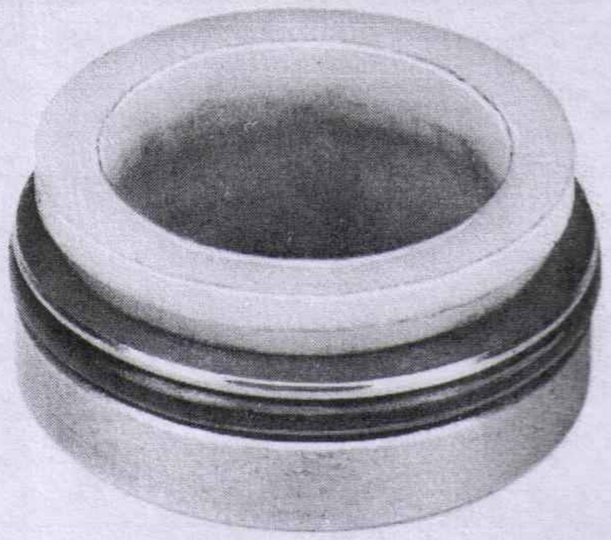


Fig. 4 Insert fitting sleeve in steering rack seal

Place steering rack seal on flat surface and insert fitting sleeve as shown.

Note:
Every set of seals also contains one fitting sleeve.

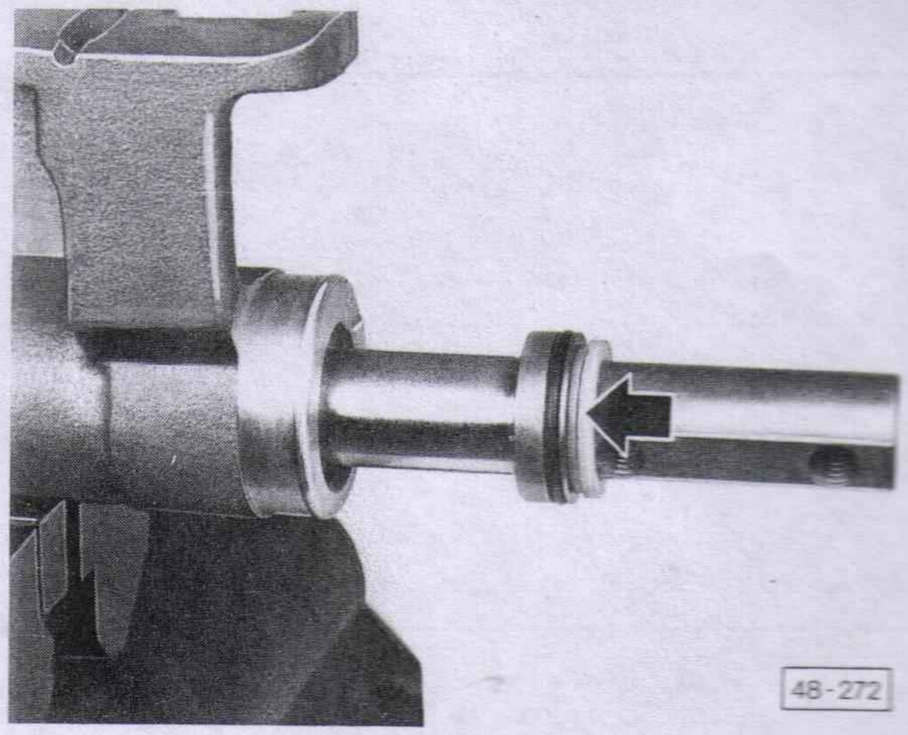


Fig. 5 Pushing on steering rack seal with fitting sleeve

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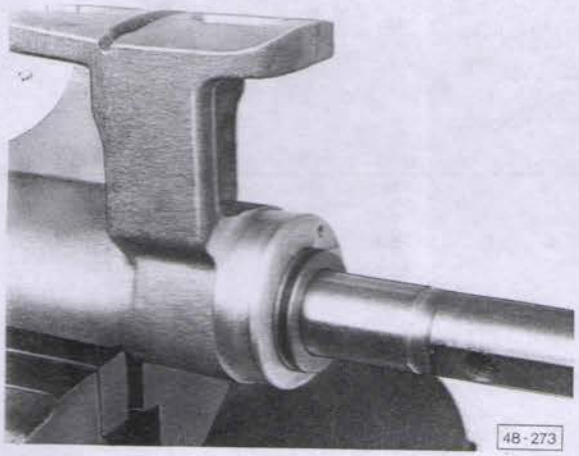


Fig. 6 Push on steering rack seal as far as steering gear housing

First remove fitting sleeve.

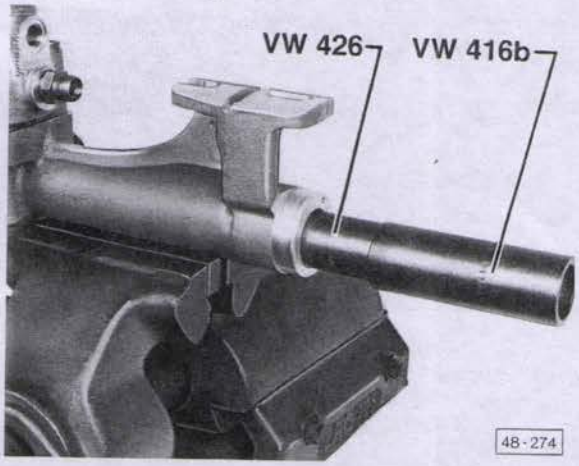


Fig. 7 Drive in steering rack seal onto seat

Engage circlip, install toothed washer with teeth facing outwards.

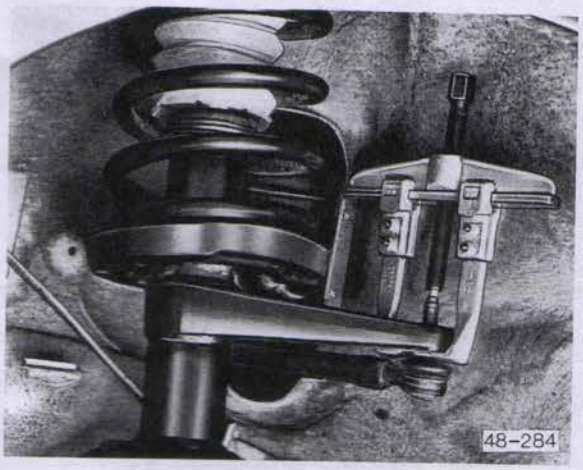
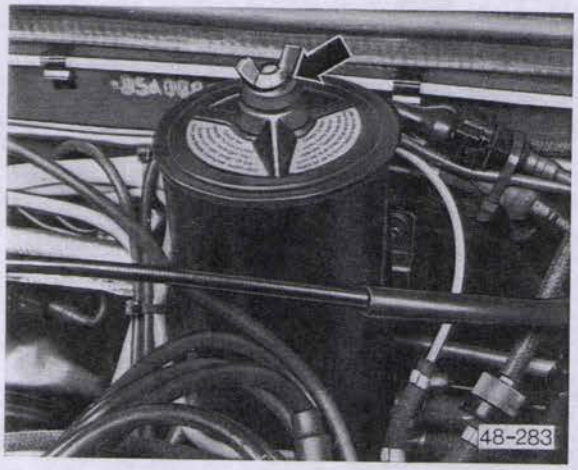


Fig. 8 Pressing off tie rod end

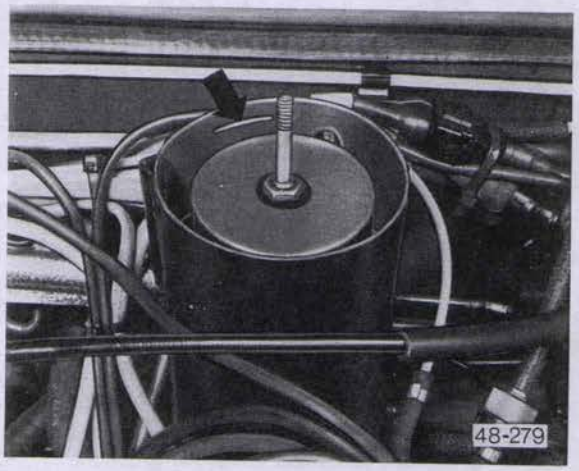
CHECKING ATF LEVEL

– Engine must not be running.



– Unscrew reservoir cap.

– With engine switched off, depress brake pedal firmly about 20 times until ATF level in reservoir no longer rises.



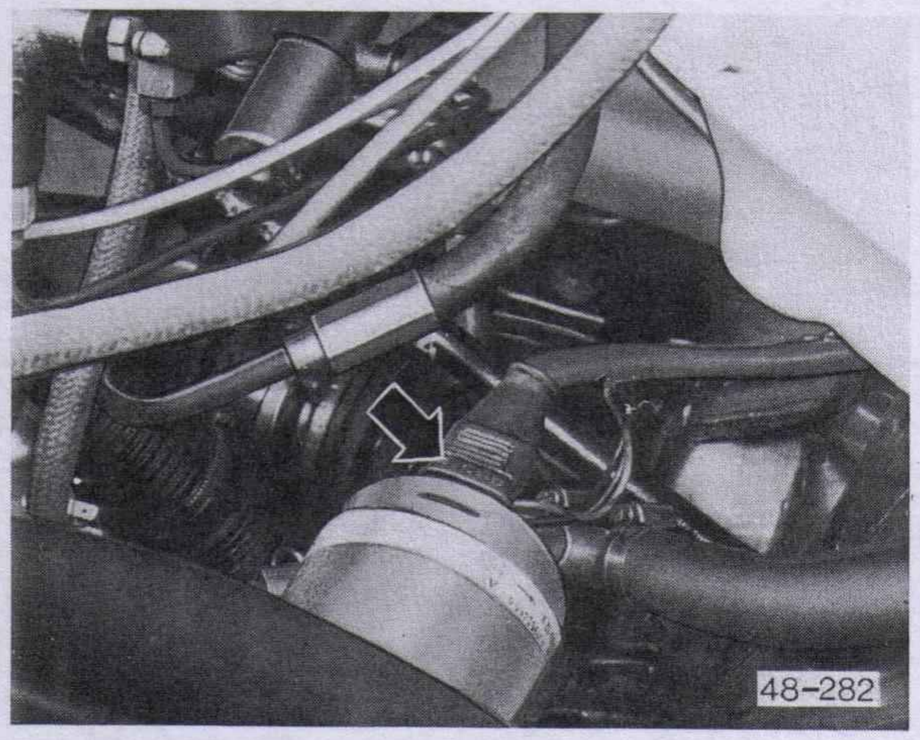
– Top up ATF level to mark.

Important
If the ATF level in the reservoir is low, **always** check the steering system and hydraulic brake servo system for leaks. If a leak is found at the steering pinion, renew the seal in the valve housing and the seals on the intermediate cover. If the steering rack seal in the steering gear housing is leaking there will be ATF present inside the boot. To check this, unscrew the hose clip on the boot and push the boot to one side. If fluid is present, completely dismantle the steering gear and renew all sealing components marked with an asterisk.
If the hydraulic brake servo is leaking it must be renewed.

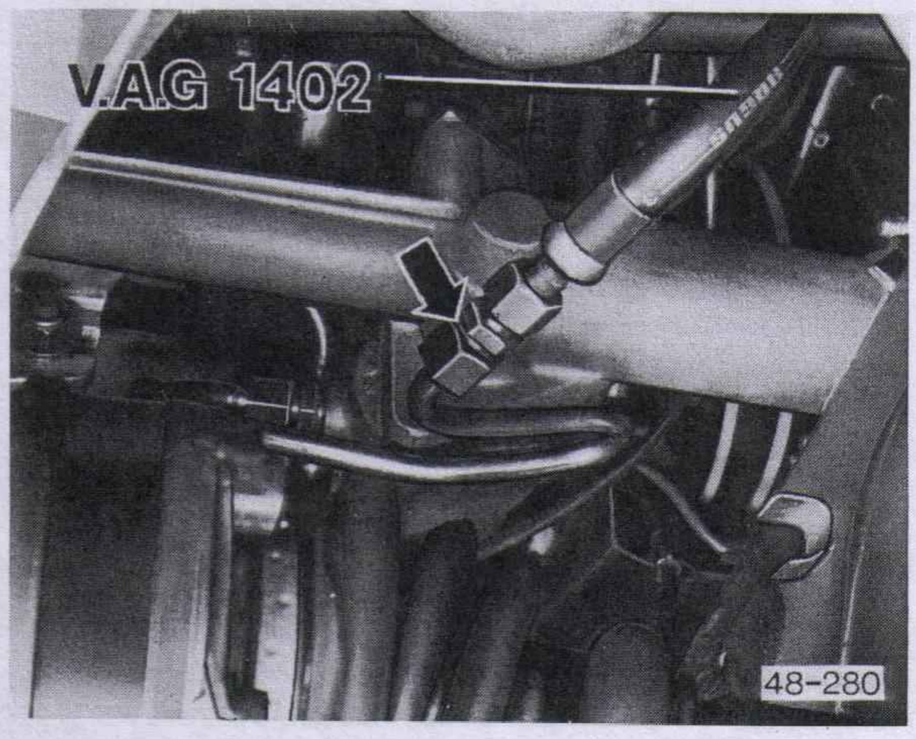
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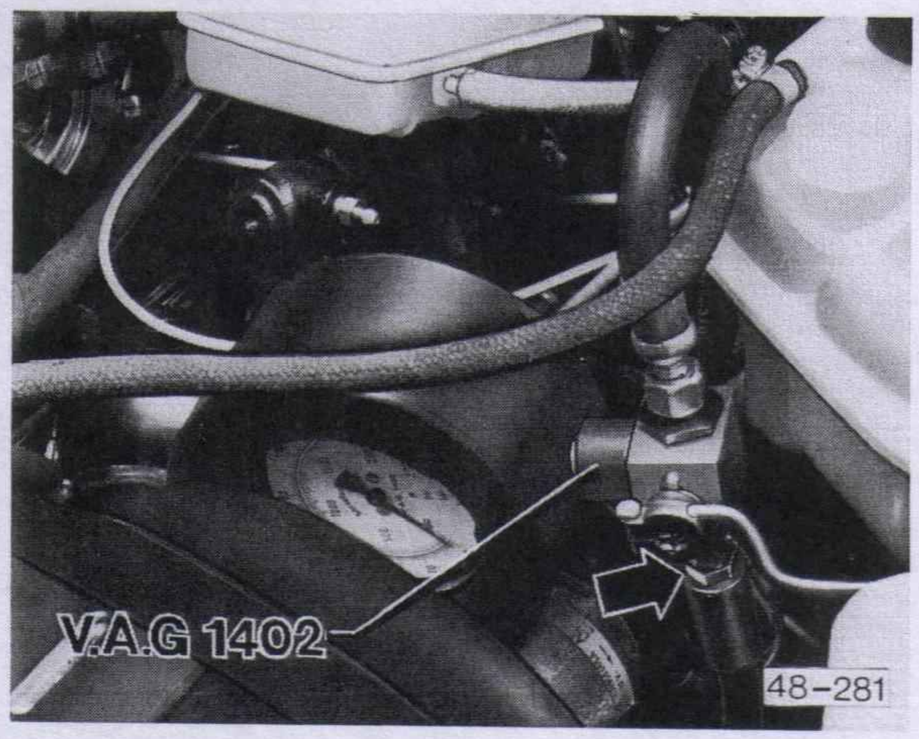
CHECKING OUTPUT PRESSURE OF IMPELLER PUMP



– Disconnect plug from fan motor.



– Connect pressure gauge in pressure line between expansion hose and connecting pipe on valve housing (connection on valve housing).



(Connection on pressure gauge)

– Top up fluid level in ATF reservoir.
– With engine idling, close cutoff valve (not longer than 5 secs.) and read off pressure.

  Specified pressure: 68 – 82 bar.
– If the specified pressure is not obtained, check the pressure and flow limiting valve (see Audi 200 Workshop Manual, Running gear booklet, January 1980 edition, page 75).

CHECKING SYSTEM PRESSURE

– With the engine idling and the pressure gauge cutoff valve open turn the steering wheel to full lock left and right and note the pressure gauge reading at each full lock position.
  Specified pressure: 68 – 82 bar.
– If the specified pressure is not obtained with the steering on left and/or right lock, repair or renew the steering gear complete.
– Remove pressure gauge and reconnect hydraulic lines.
– Run engine at idle for about 1 minute and top up ATF level to about 30 mm below the mark on the reservoir.
– Switch off engine.
– Check ATF level – page 103

PUTTING IN ATF (Dexron ATF)

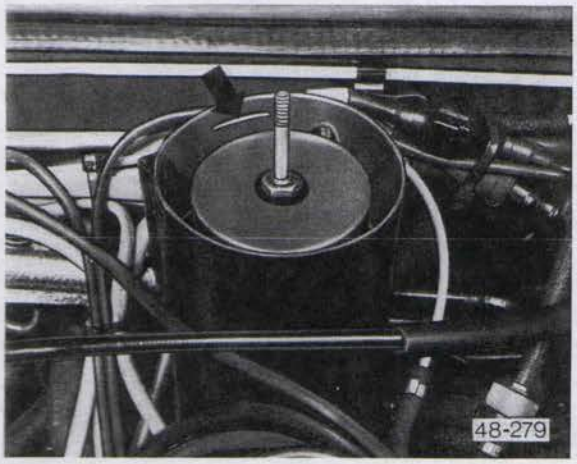
– Do not reuse ATF that has been drained off.
– Always renew **all** filters in the reservoir when renewing steering components, the hydraulic brake servo, the accumulator or when changing the ATF.
– Add ATF up to about 30 mm below the mark on the reservoir.
– Start engine several times briefly (switch off immediately engine starts) to fill the complete system with fluid.
– This will make the fluid level in the reservoir drop rapidly, so keep adding more fluid to keep the level about 30 mm below the mark.

  Do not allow the reservoir to be sucked dry, otherwise air will enter the system.
– Then check ATF level, see page 103.

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BLEEDING STEERING SYSTEM AND HYDRAULIC BRAKE SERVO

- When the fluid level in the reservoir no longer drops when the engine is started briefly, the engine can be started and allowed to run.
- Then turn the steering wheel several times quickly from lock to lock to allow the air to escape. (When the piston is at the end of its travel do not use more force on the steering wheel than is necessary to turn the steering).



- Watch the fluid level while the system is being bled: if the level continues to drop, add more fluid immediately until the level remains contant at about 30 mm below the mark on the ATF reservoir and no more air bubbles appear in the reservoir when the steering wheel is turned.
- With the engine switched off depress the brake pedal firmly about 20 times.
- Then top up the ATF level to the mark.

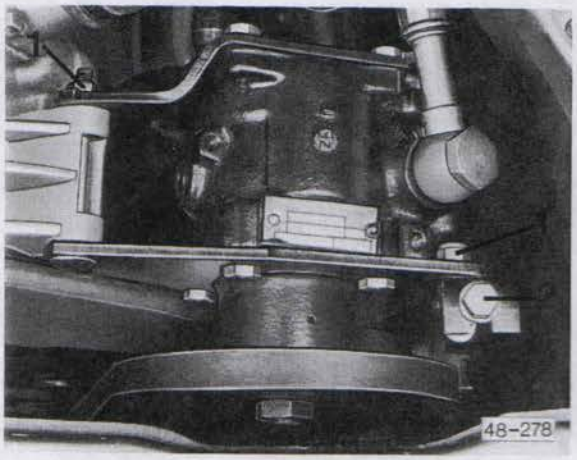
Note:
The steering system bleeds itself after a while with the engine running.

CHECKING STEERING SYSTEM AND HYDRAULIC BRAKE SERVO FOR LEAKS
(with engine running)

- Turn the steering wheel to full lock in each direction and hold briefly in this position in order to build up maximum pressure in the connecting lines.
- With the steering wheel in this position, carry out the following visual checks for leaks.

1. rotary piston valve
2. steering rack seal (unscrew hose clip on boot and push boot to one side)
3. impeller pump
4. hydraulic connections
5. hydraulic brake servo
6. accumulator

TIGHTENING OR RENEWING V-BELT FOR IMPELLER PUMP



- Loosen nuts –1–.
- Turn adjustor screw –2– to give correct tension.
- Tighten nuts –1–.

Note:
Remove the alternator belt (and, if fitted, the compressor belt) before renewing the V-belt for the impeller pump.
Belt tension is correct if the belt yields about 10 mm when pressed with the thumb halfway between the two pulleys.

Repair note – impeller pump

Before removing the impeller pump, the pressure line between the pump and the accumulator, or the accumulator, depress the brake pedal firmly about 20 times with the engine switched off to relieve pressure in the accumulator.

Repairs on the impeller pump are described in the Audi 100/Audi 200 Workshop Manual, Audi 200 Running gear booklet, January 1980 edition on page 73.

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FAULTS AND REPAIR MEASURES

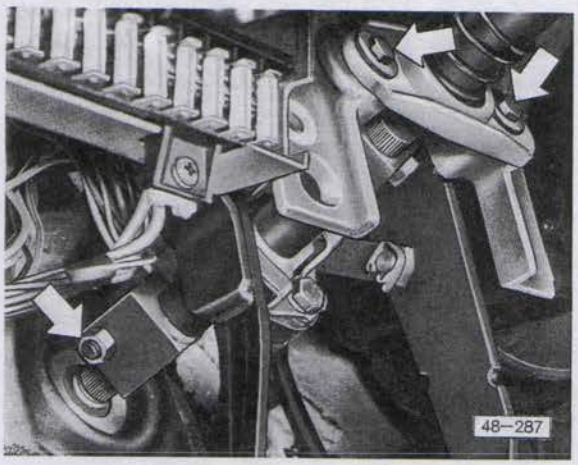
Fault	Possible causes	Test	Remedy
Fluid level in ATF reservoir too low	Air trapped in steering system has escaped during normal operation	Check ATF level – page 103	Top up ATF in reservoir to mark – page 103.
	Seal in valve housing leaking.	Visual check for leaks at steering spindle/valve housing – page 101.	Renew seal, renew sealing rings, pages 101, 102.
	Leaks in steering, pump, hydraulic brake servo, accumulator or hydraulic connections.	Visual check for leaks.	Tighten connections, renew seals – page 101. Renew hydraulic brake servo – page 93.
Fluid in ATF reservoir has to be topped up again, but no external leaks visible	Steering rack seal leaking.	Fluid can be found inside boot if large amounts are escaping. Loosen hose clip on boot and push boot to one side.	Renew seals (install complete repair kit) – page 101.
Steering effort increases as lock is applied.	Pressure and flow limiting valve sticking in pump housing, or drillings in valve piston obstructed by foreign particles.	Check pressure and flow limiting valve, see Audi 200 Workshop Manual, Running gear booklet, January 1980 edition, page 88.	Clean or renew pressure and flow limiting valve.
	Pump output pressure insufficient.	Check pump output pressure – page 104.	Renew impeller pump complete.
	Steering not moving freely.	Raise vehicle at the front, turn steering	Renew or repair complete steering.
PAS noisy	Insufficient ATF in system.	Check ATF level – page 103.	Top up ATF – page 104.
	Loose unions on intake side (air being drawn in).	Check connections.	Tighten unions.
	Dirty filter in reservoir.	Check filter	Insert new filter cartridge.
	Insufficient belt tension.	Check belt tension – page 105.	Retension belt or renew – page 105.

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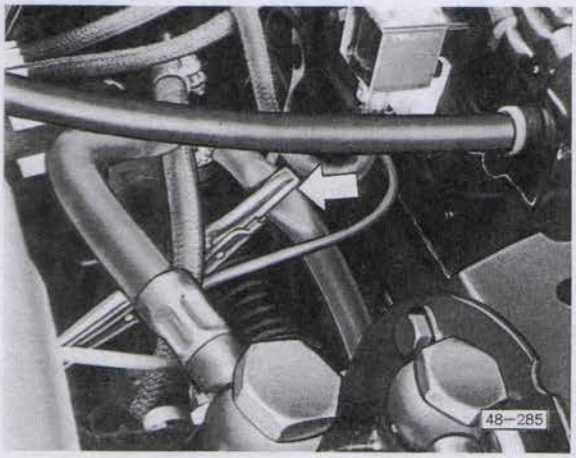
REMOVING AND INSTALLING STEERING GEAR

Removing:

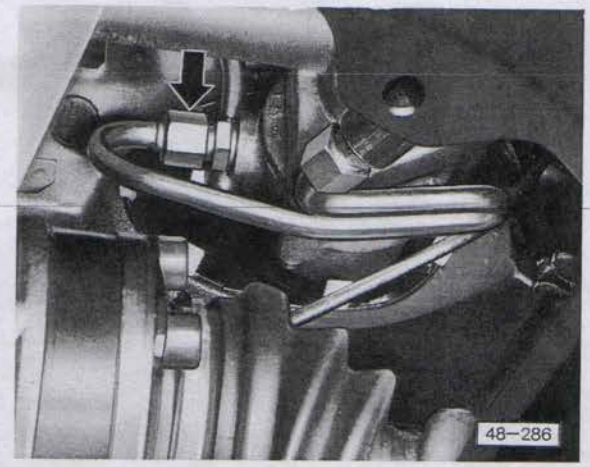
– Remove trim below dashboard on the left.



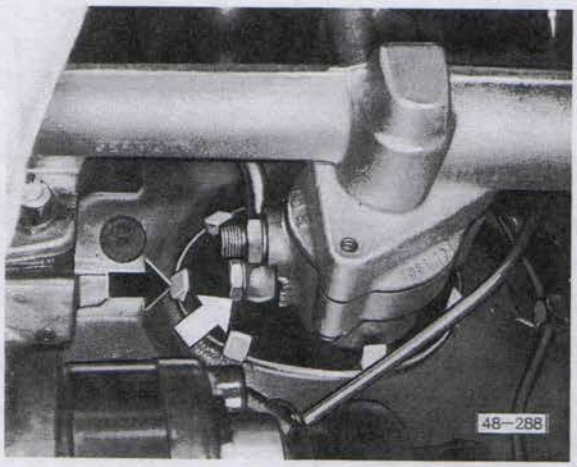
– Remove lower steering column complete.



– Carefully clamp off return line between rotary piston valve and reservoir with pliers.

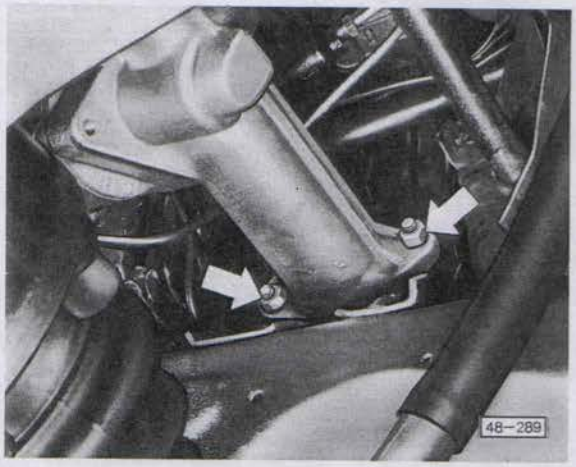


– Detach pressure line.



– Remove grommet: press claws towards centre.

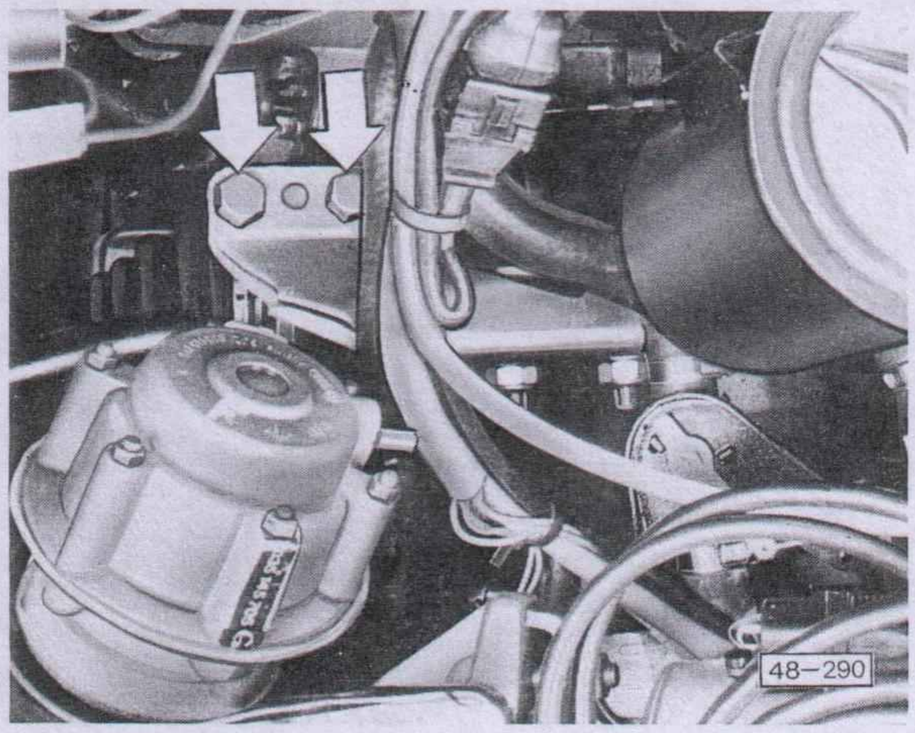
– Detach return line (from inside car).



– Detach steering gear from left wheelhousing.

– Turn steering to full right lock.

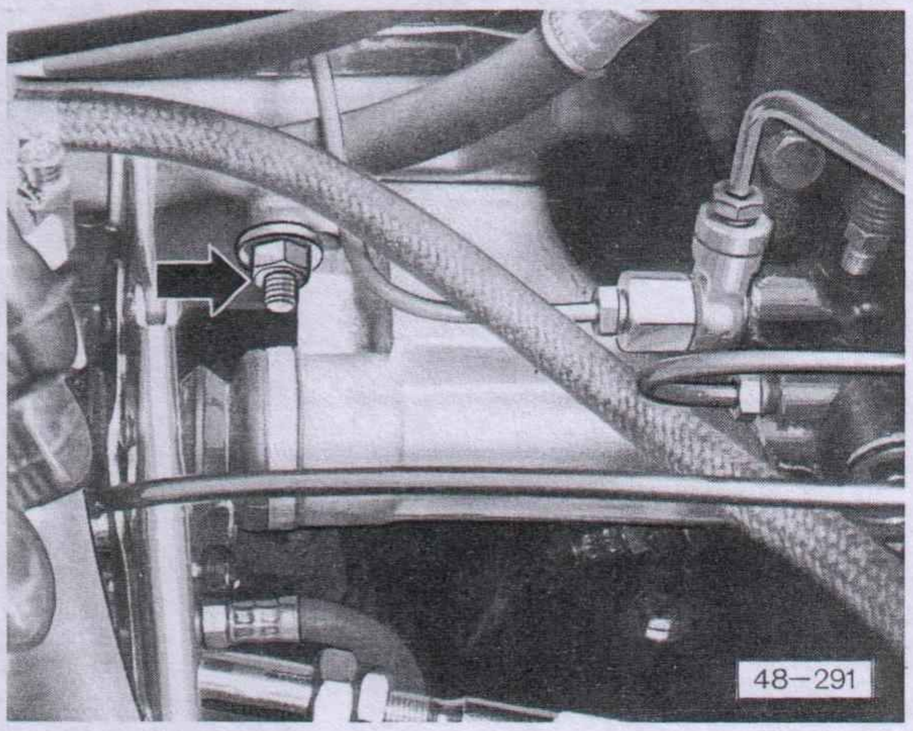
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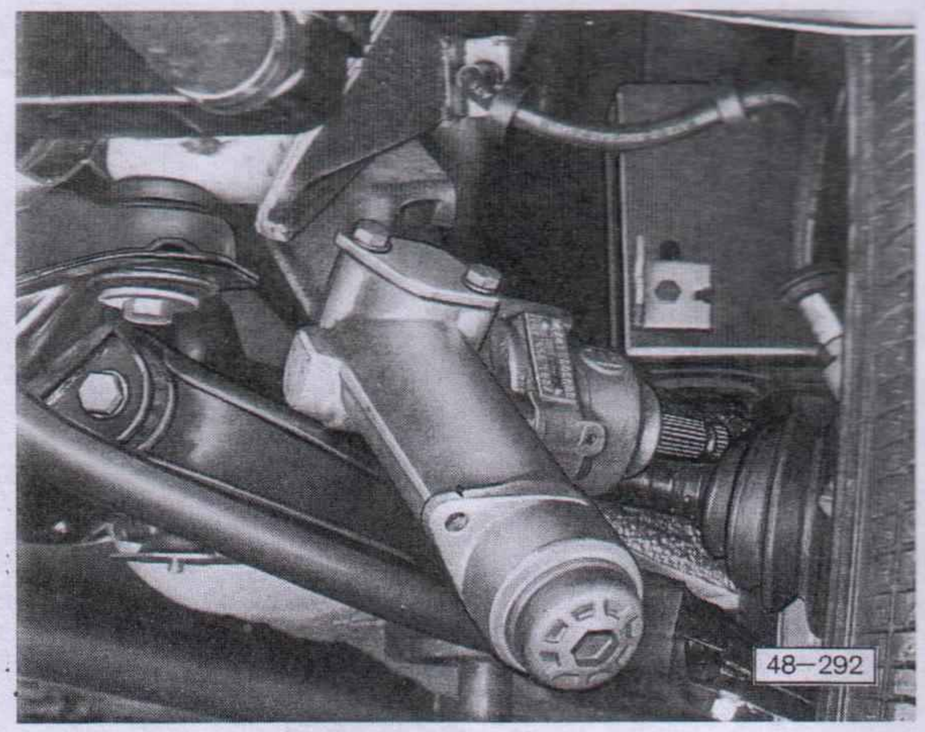
– Detach coupling from steering rack.

Important
Always remove the two self-locking nuts first (below coupling), and then the two mounting bolts.

– Push steering rack into steering gear housing as far as it will go.



– Detach steering gear from bulkhead.



– Take out steering gear between left wheel-housing and track control arm: pull brake hose out of bracket and turn wheels to the left.

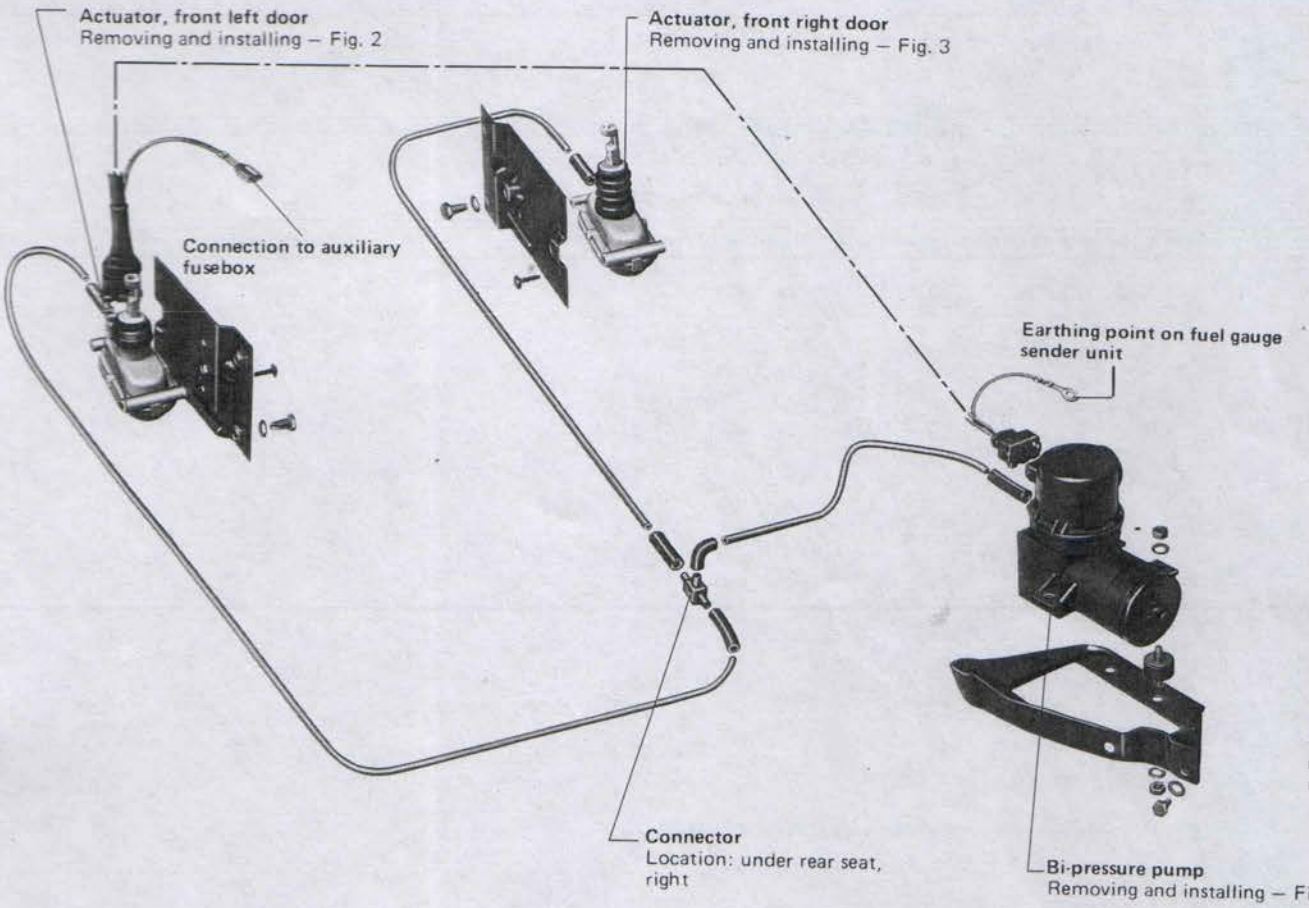
Installing:

– Mount steering gear on bulkhead and wheel-housing free of strain.
– Connect return line with new seals.
– Install grommet (all claws must engage).
– Install lower steering column by fitting on upper steering column and pushing onto pinion as far as it will go.
– Secure flange to pinion.
– Align and secure bearing flange.
– Install trim below dashboard.
– Put in ATF – see page 104.
– Bleed steering system and hydraulic brake servo, see page 105.

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REPAIRING CENTRAL LOCKING SYSTEM

Fault finding chart – page 111
Current flow diagram – page 134



80–303

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WB 17,

57 Front doors

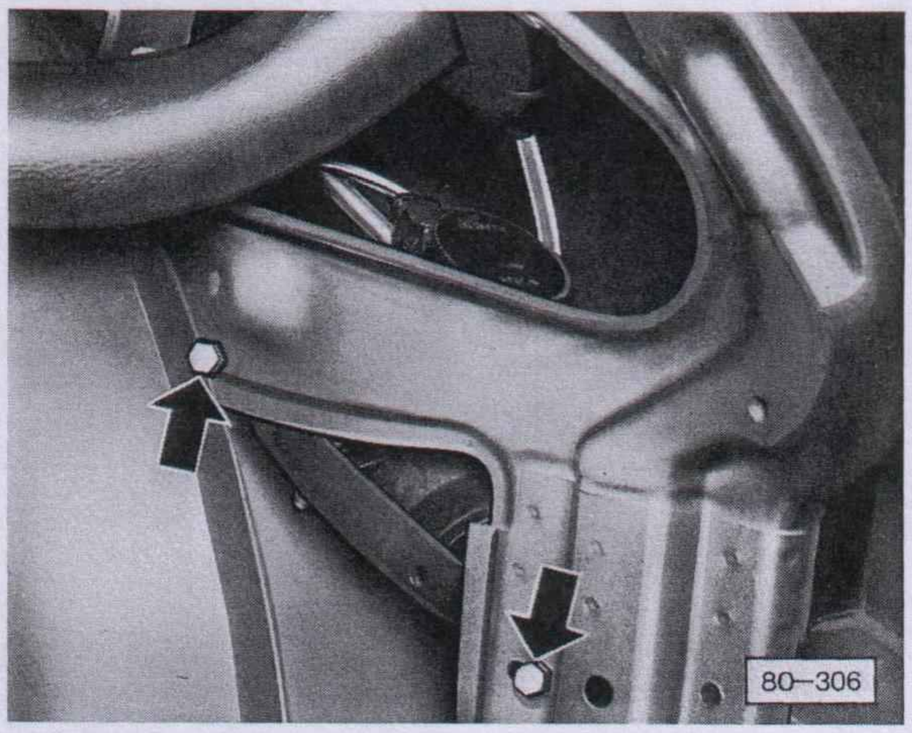


Fig. 1 Removing and installing bi-pressure pump

– Remove luggage compartment trim on right hand side.

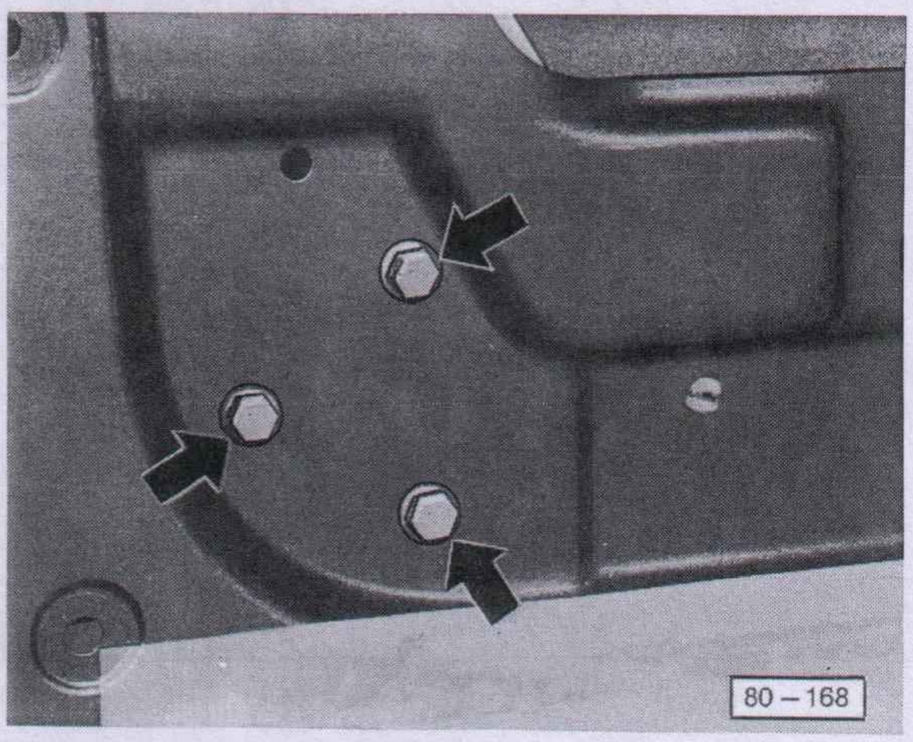


Fig. 2 Removing and installing actuator in left door

– Detach door trim.

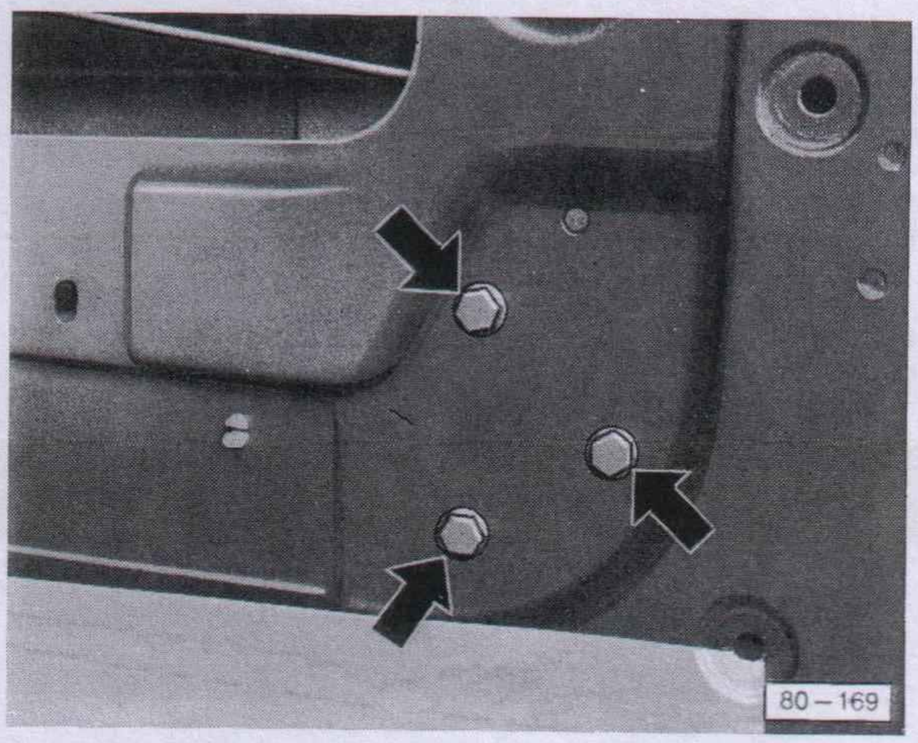


Fig. 3 Removing and installing actuator in right door

– Detach door trim.

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FAULT FINDING CHART – BI-PRESSURE SYSTEM DEFECTIVE (ELECTRICAL PART)

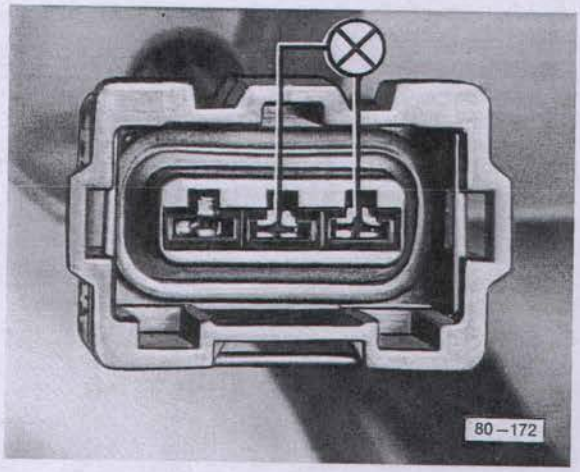
See applicable current flow diagram for wiring

Note:
If the system is in working order, all the locks must operate within about 2 secs.
The bi-pressure pump must not run longer than 7 secs. If the pump runs longer than 7 secs, this means that the system is leaking. Even when the system is leaking the pump must still not run longer than 20 secs.; after this time the control unit must switch off the pump.

Check before testing:

– Auxiliary fuse o.k.

Important
If the malfunction is traced to a fault as described in this chart, also check the appropriate wiring as an extra precaution.



Bi-pressure pump not running

– Remove right hand trim in luggage compartment.
– Disconnect plug from pump.
– Lock pin on front left door must be in "open" position.
– Connect test lamp between centre contact and right hand contact (Fig. 80-172)

Test lamp does not come on	Test lamp comes on

Actuator in front left door defective, renew. As an extra precaution also check the appropriate wiring for continuity.

End

Actuator in front left door or bi-pressure pump defective

– Set lock pin in front left door to "closed" position.
– Connect test lamp between centre contact and left hand contact (Fig. 80-173)

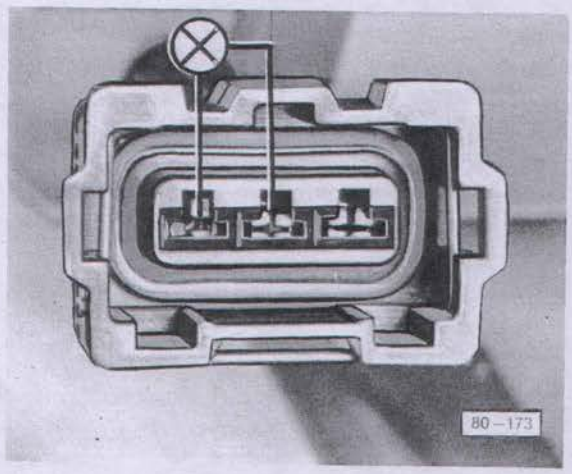
Test lamp does not come on	Test lamp comes on

Actuator in front left door defective, renew

End

Bi-pressure pump defective, renew

End



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FAULT FINDING CHART – BI-PRESSURE SYSTEM DEFECTIVE (PNEUMATIC PART)

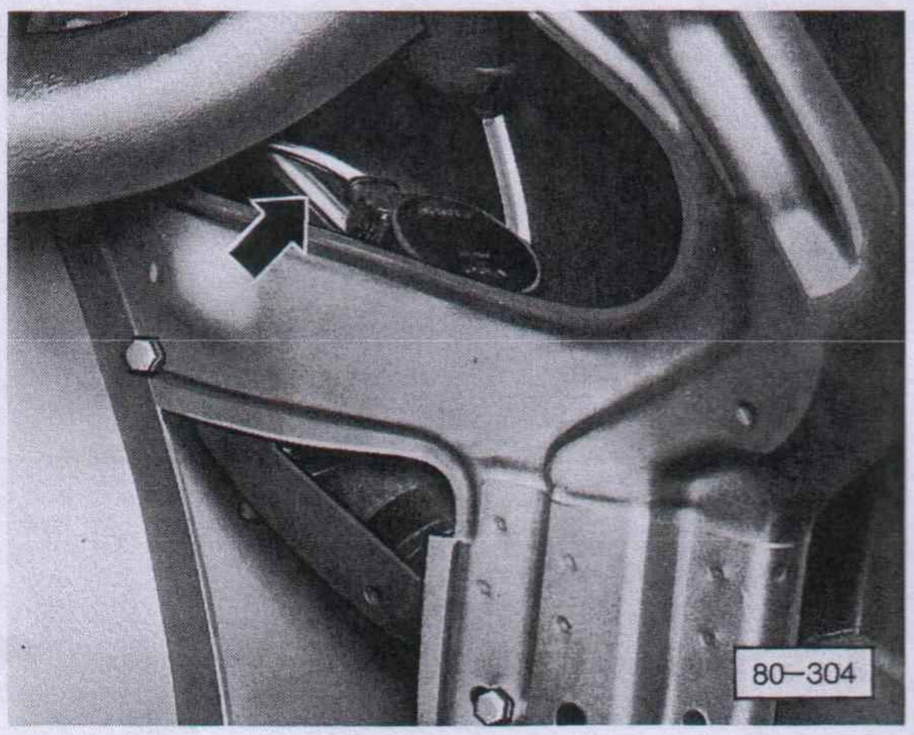
Note:
If the system is in working order, all the locks must operate after about 2 secs.
The bi-pressure pump must not run longer than 7 secs. If the pump runs longer than 7 secs. this means that the system is leaking. Even when the system is leaking the pump must still not run longer than 20 secs.; after this time the control unit must switch off the pump.

Check before testing:
Electrical part of system o.k.

Bi-pressure pump leaking

- Remove right hand trim in luggage compartment.
- Clamp off connecting line for actuators at pump (Fig. 80-304).
- Operate central locking system.

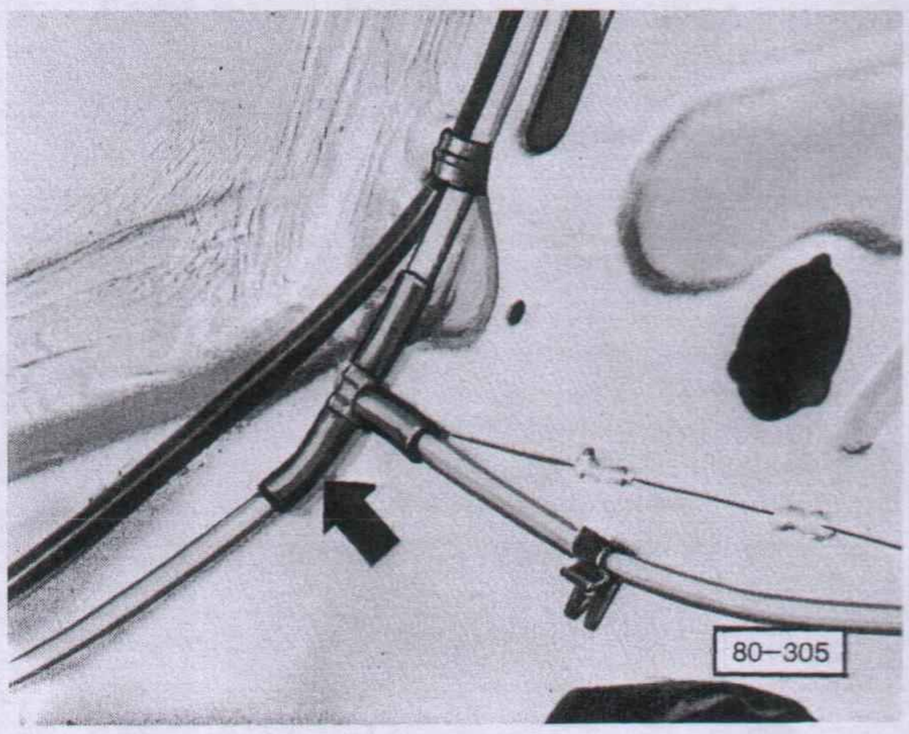
Bi-pressure pump runs longer than 7 secs.	Bi-pressure pump does not run longer than 7 secs.
Bi-pressure pump defective, renew → End	



Actuator in front left door leaking

- Release clamp at bi-pressure pump
- Remove rear seat cushion and backrest.
- Clamp off right hand side of central locking system at connector (Fig. 80-305)
- Operate central locking system.

Bi-pressure pump runs longer than 7 secs.	Bi-pressure pump does not run longer than 7 secs.
Actuator in front left door or its connecting line leaking. Renew actuator or repair leak in connecting line. → End	Actuator in front right door or its connecting line leaking. Renew actuator or repair leak in connecting line. → End



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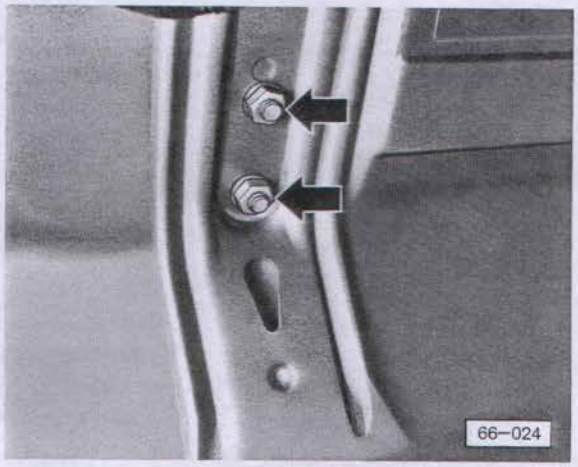
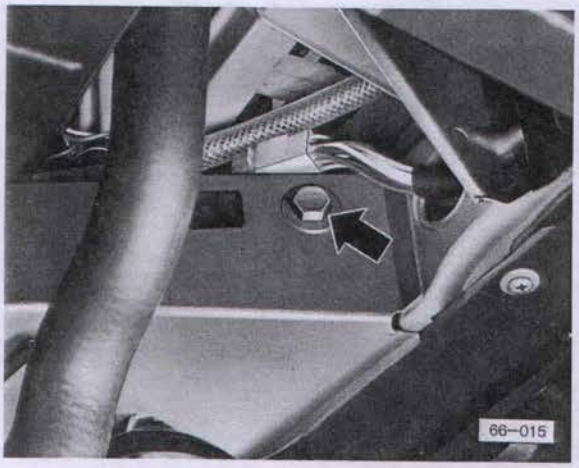
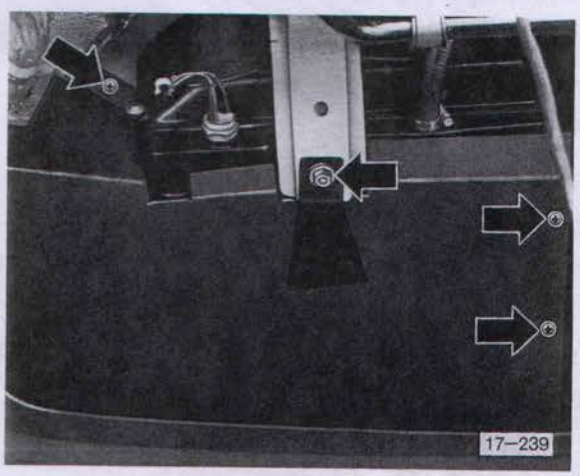


Fig. 1 Removing and installing rear bumper

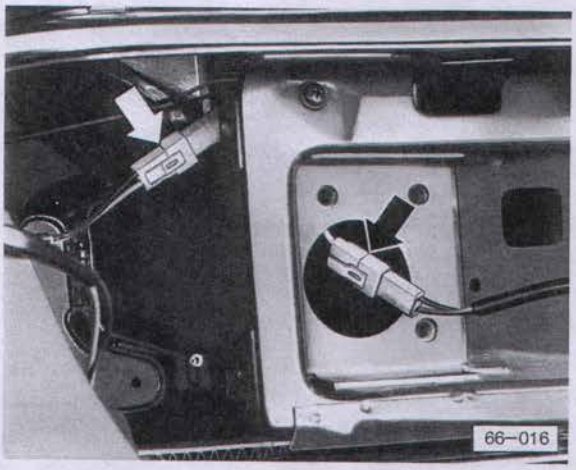


– Remove bumper.
– Pull bumper forward out of front spoiler.

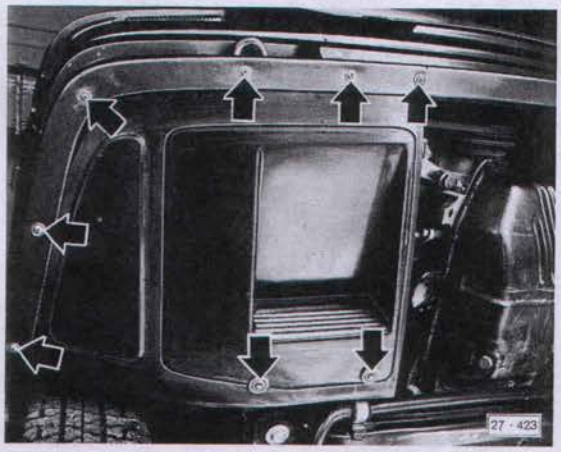
REMOVING AND INSTALLING FRONT SPOILER



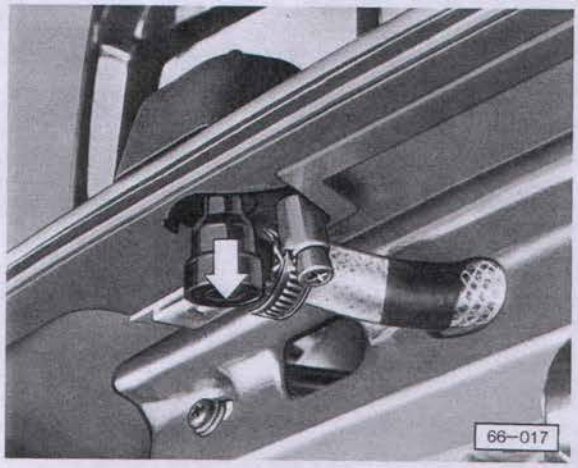
– Remove bottom radiator cowl.



– Disconnect connectors for foglights and turn signals.

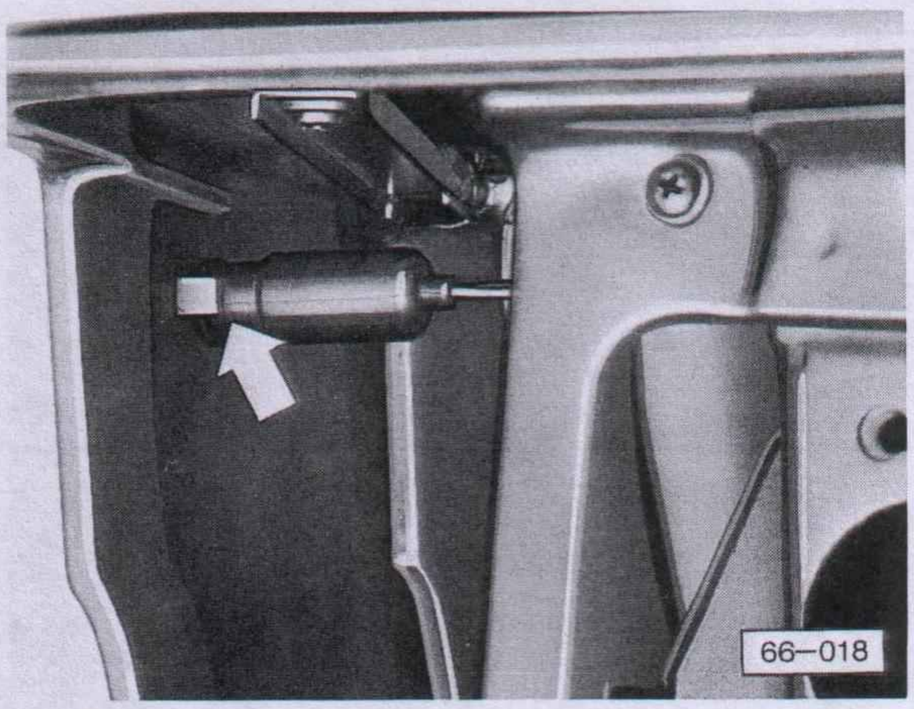


– Remove air guide for oil cooler.

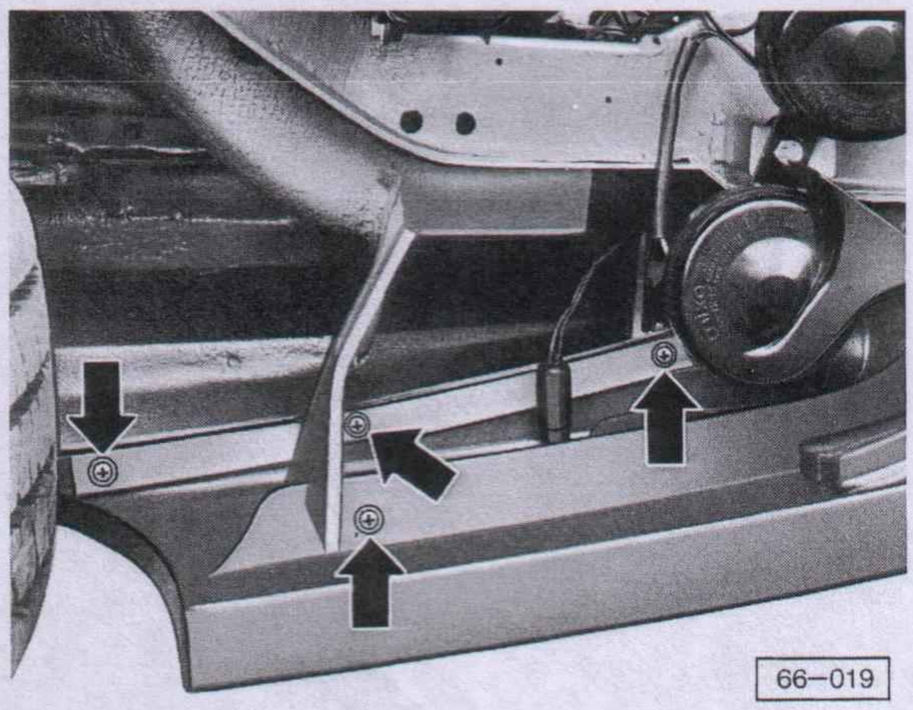


– Disconnect elbow connector from headlight washer jet.

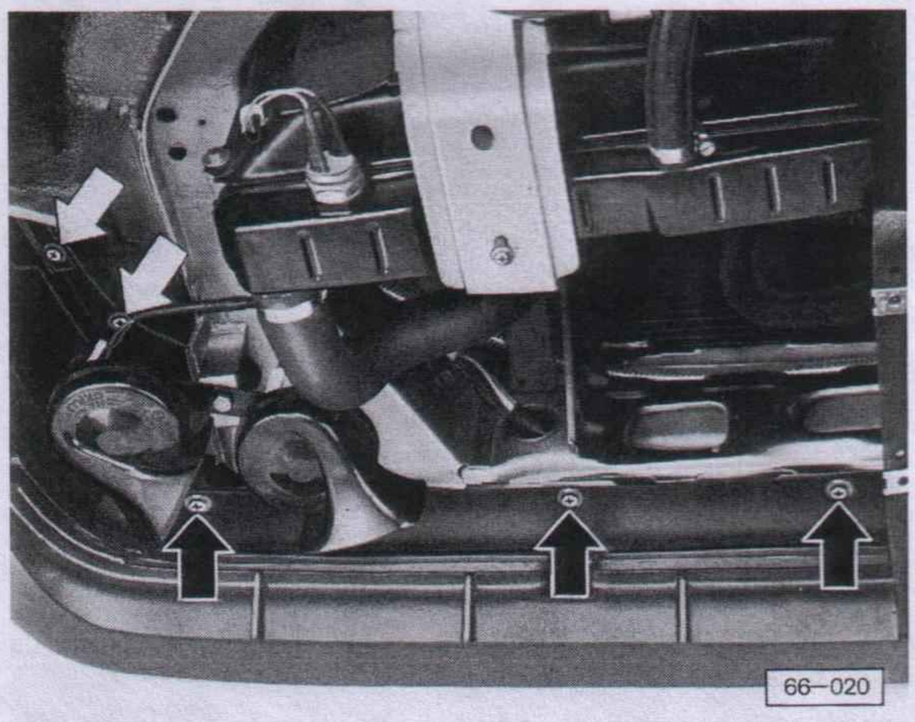
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– Disconnect connector from auxiliary turn signal.



– Detach front spoiler at the side.

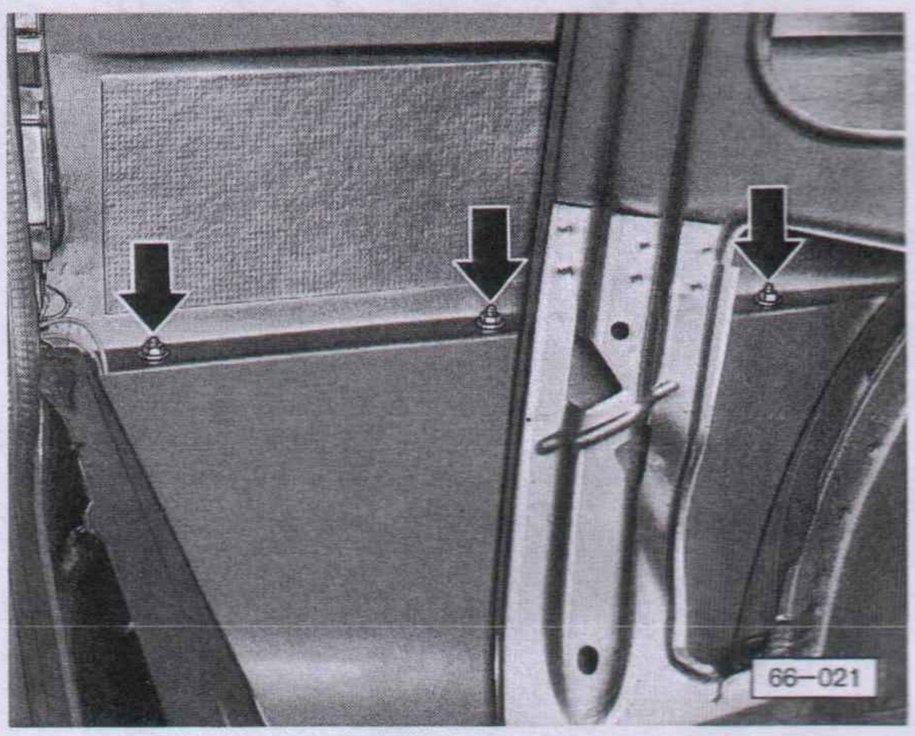


– Detach front spoiler at the front.

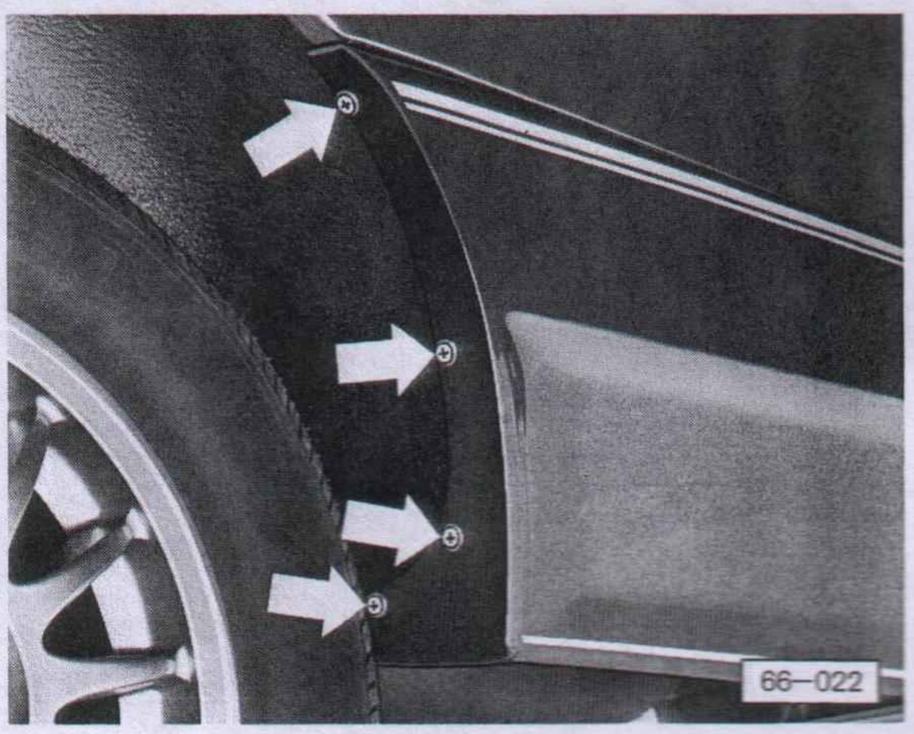
– Pull front spoiler out of retaining clips at the top.

REMOVING AND INSTALLING REAR SPOILER

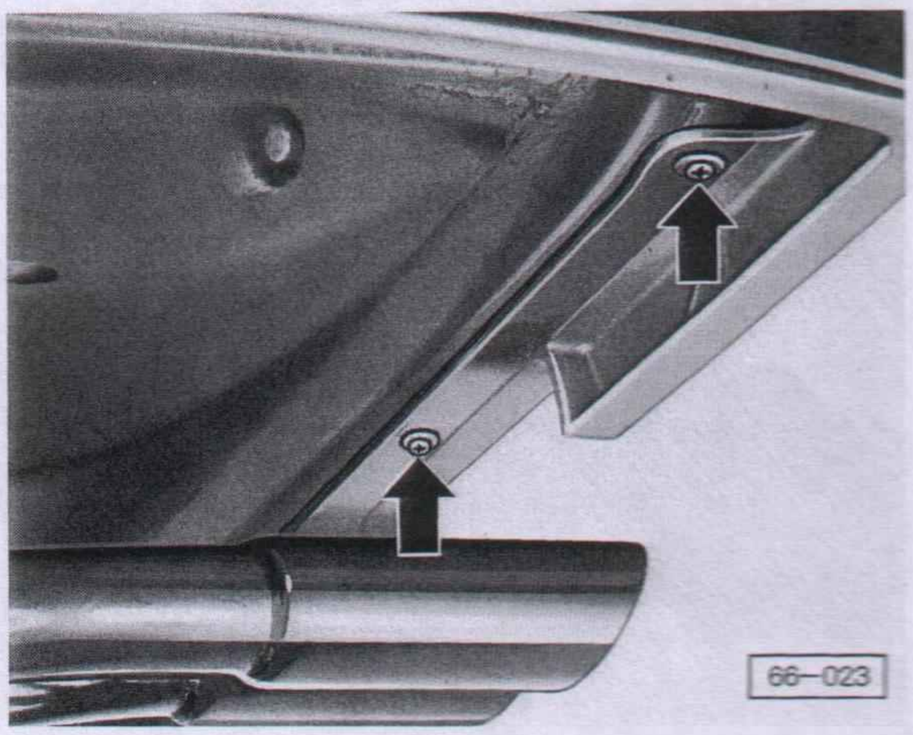
– Remove left and right luggage compartment trim.



– Detach rear spoiler at the side.



– Detach rear spoiler from rear fender.



– Detach rear spoiler at the bottom.

– Pull rear spoiler out of retaining clips at the top.

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Rated voltage	V	12
Battery capacity	Ah	63
Starter	kw	1.1
Alternator	A	90

Bulb chart

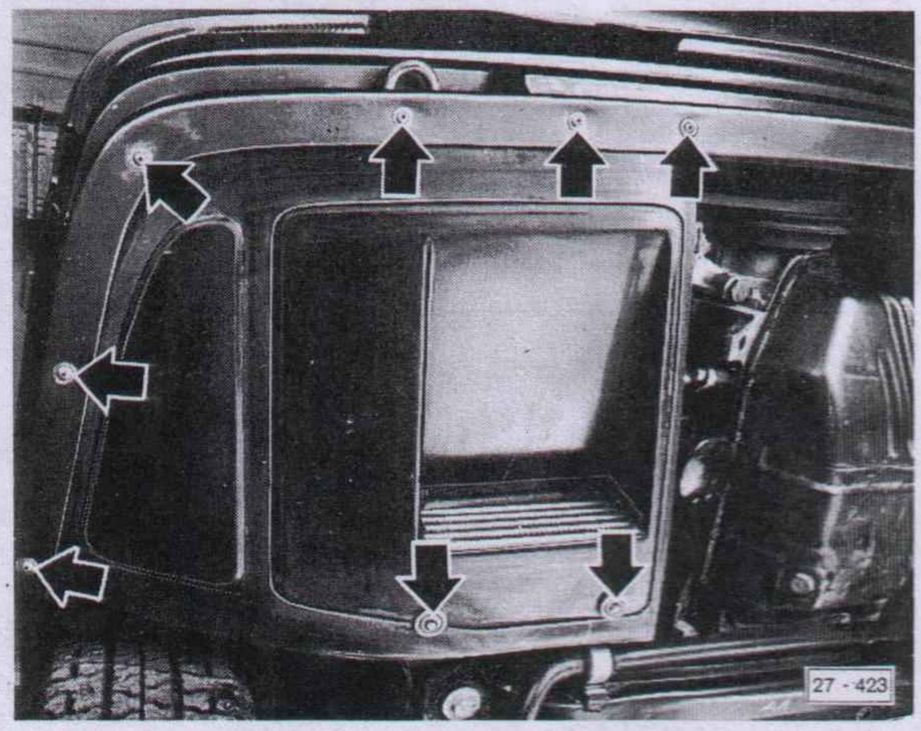
Low beam headlight	H 4 – 12 V/55 W
High beam headlight	H 1 – 12 V/55 W
Side light	12 V/ 4 W
Turn signal	12 V/21 W
Foglight	H 3 – 12 V/55 W
Tail foglight	12 V/21 W
Brake light	12 V/21 W
Reversing light	12 V/ 21 W
Licence plate light	12 V/ 4 W
Interior light	12 V/10 W
Ashtray illumination	12 V/1.2 W
Heater control illumination	12 V/ 1.2 W
Instrument cluster illumination	12 V/ 3 W
Indicator lights in instrument cluster (except indicator lights for alternator charge and engine hot)	12 V/ 1.2 W
Indicator lights for alternator charge and engine hot	12 V/ 2 W
Glove compartment light	12 V/ 1.2 W
Luggage compartment light	12 V/ 5 W
Auxiliary turn signal	12 V/ 5 W

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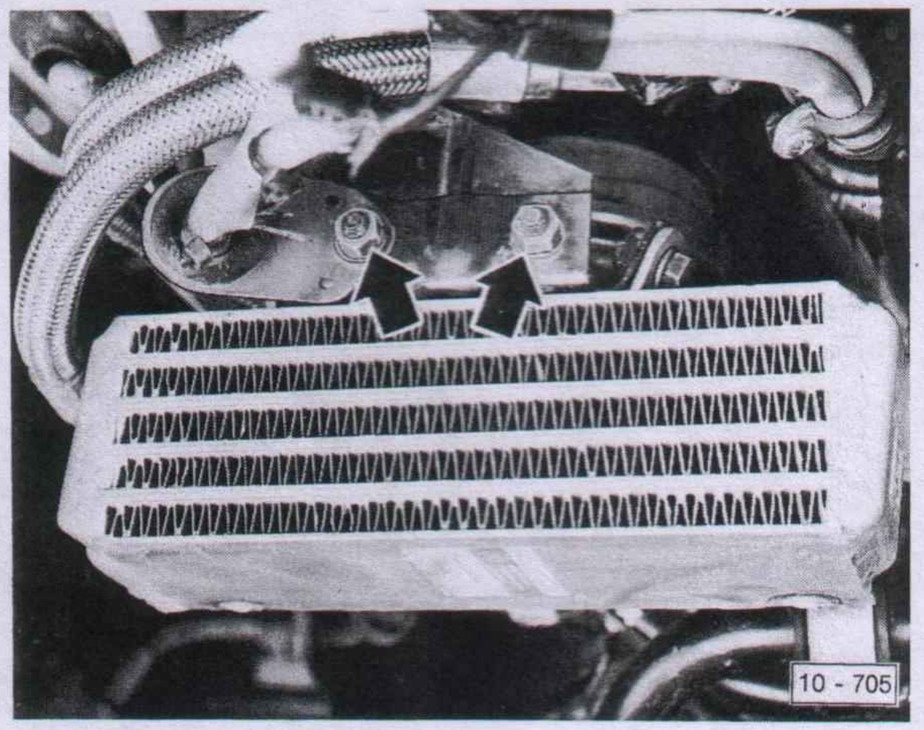
27 Starter – current supply

REMOVING AND INSTALLING STARTER

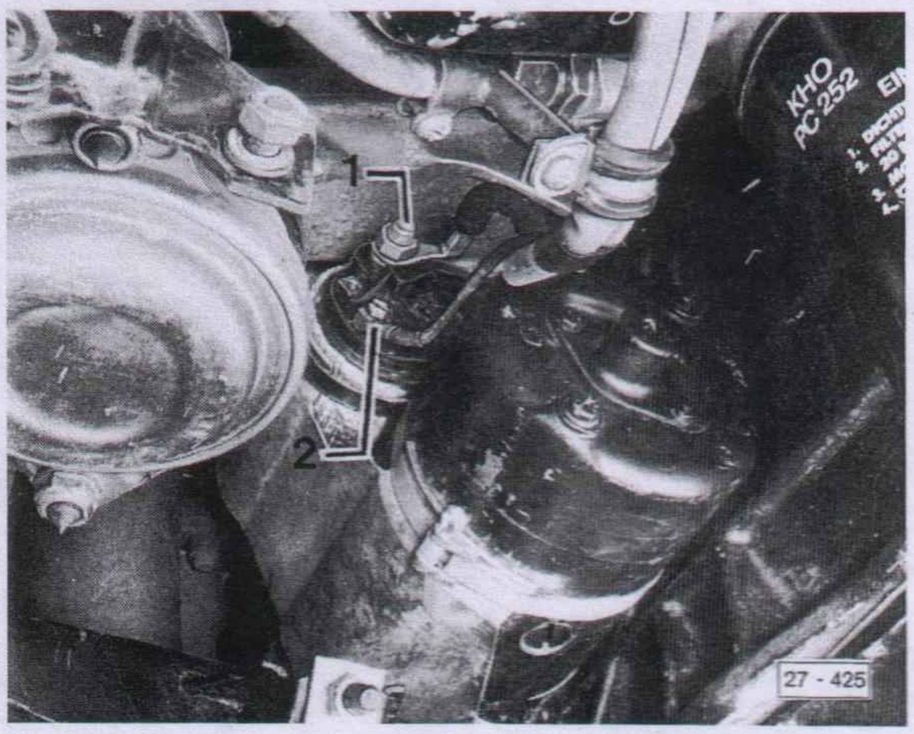
– Disconnect battery earth strap.



– Remove air guide for oil cooler.



Unscrew oil cooler mounting bolts (leave oil lines connected).



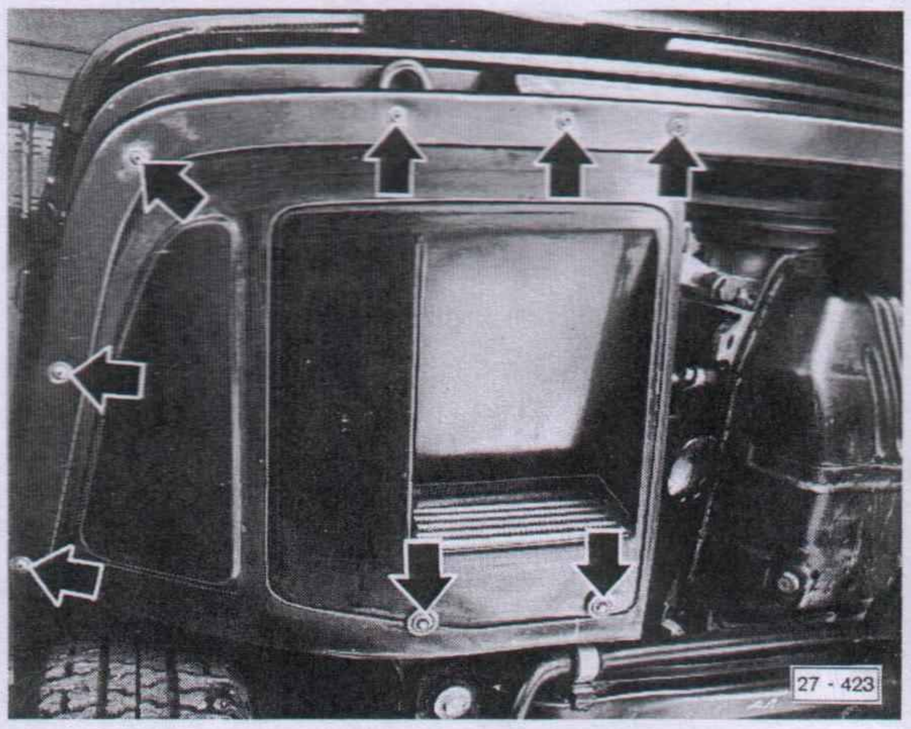
– Disconnect wiring from starter

1 – Terminal 30
2 – Terminal 50

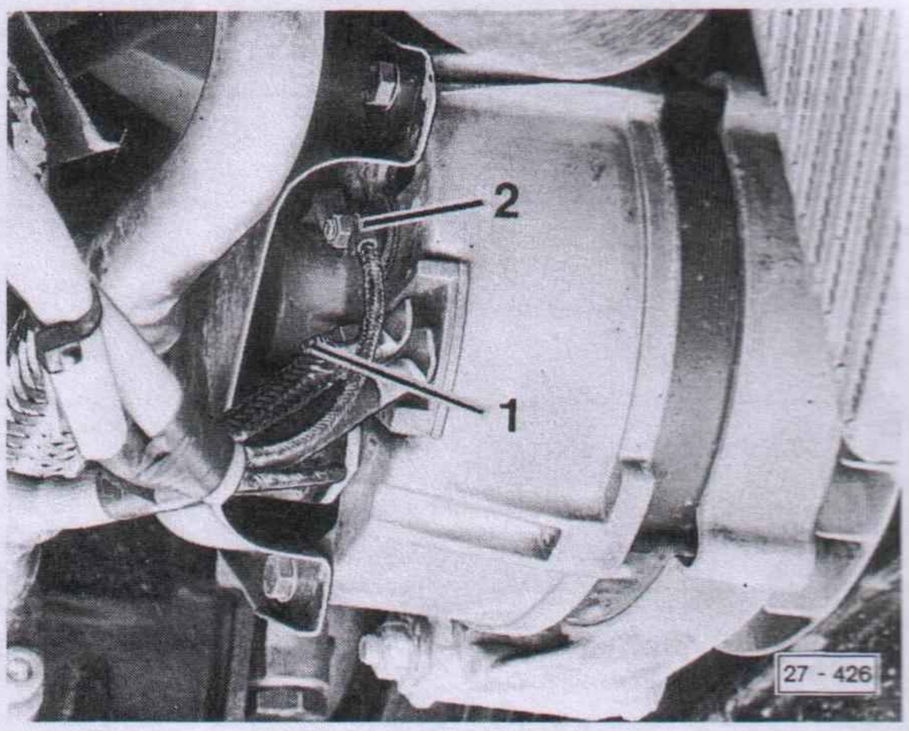
– Unscrew starter mounting bolts.

REMOVING AND INSTALLING ALTERNATOR

– Disconnect battery earth strap.

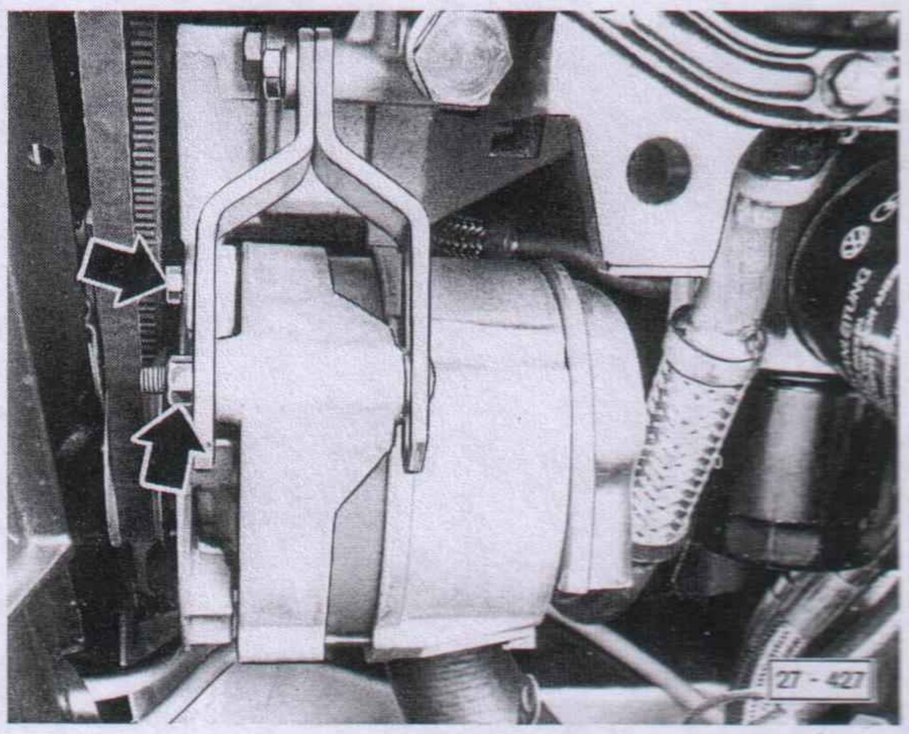


– Remove air guide for oil cooler.



– Disconnect wiring from alternator.

1 – Terminal 30 (B+)
2 – Terminal 61 (D+)

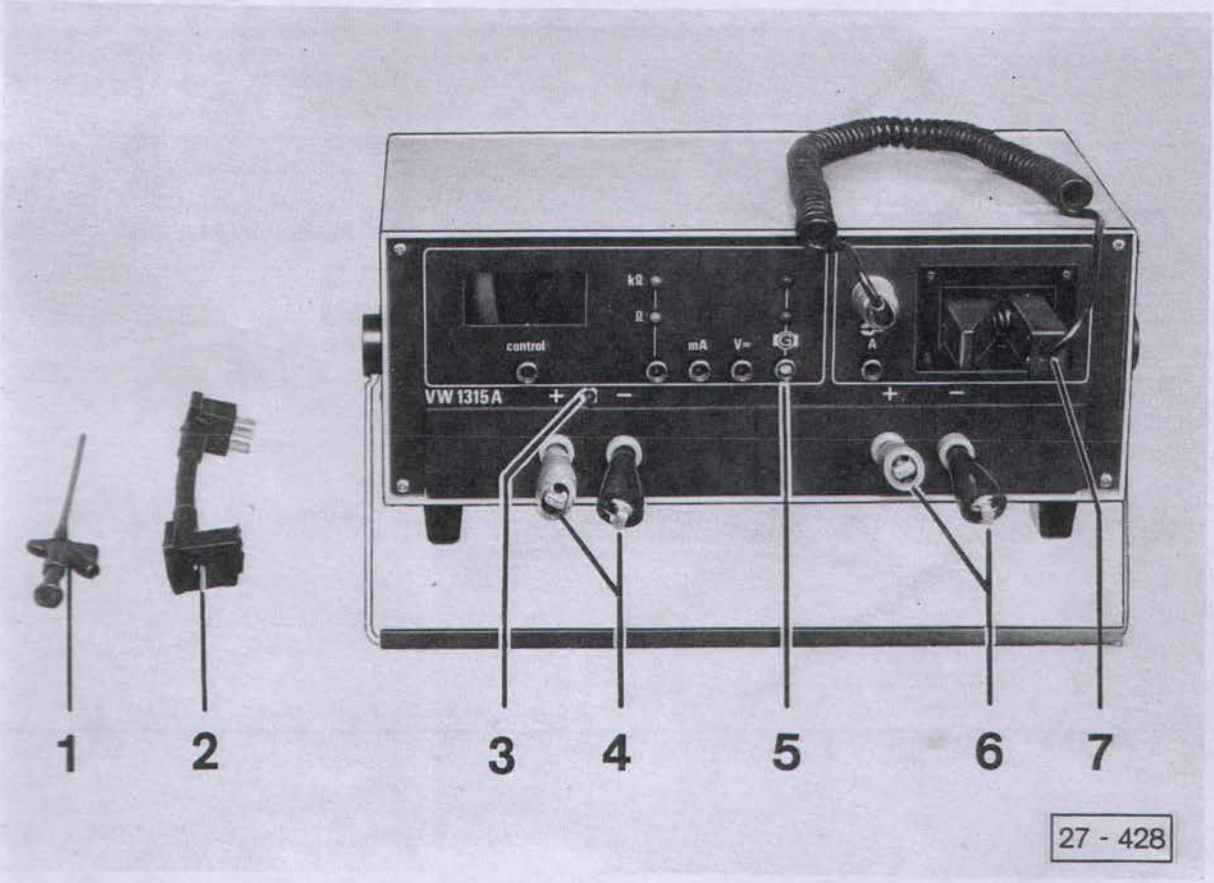


– Remove alternator mounting bolts.

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TESTING ALTERNATOR AND VOLTAGE REGULATOR WITH VW 1315 A MULTIPLE TESTER

Note:
Before testing, check V-belt tension, alternator mountings, routing of wiring and earth straps.



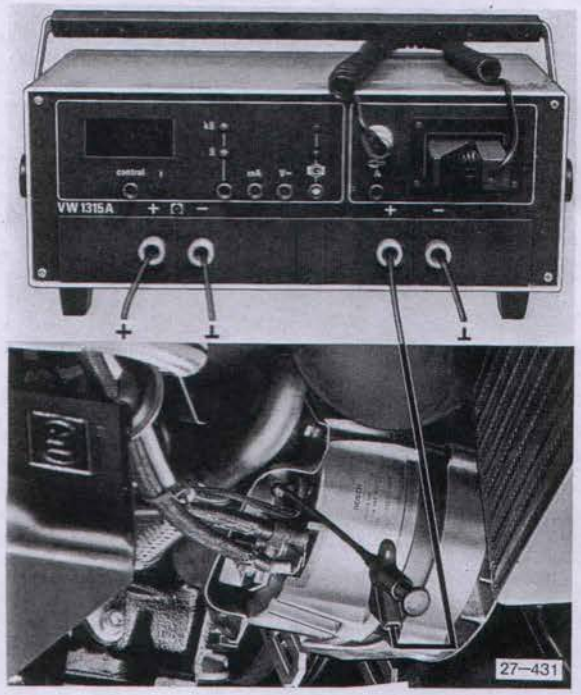
1 – Test probe/clamp
2 – Adaptor for alternator test
3 – Indicator light for reversed polarity
4 – Power supply leads for tester
5 – Alternator test button
6 – Test leads
7 – Test clamp

– Connect leads – 4 – (red = positive, black = negative)

Note:
Indicator light – 3 – comes on if polarity is reversed.

– Connect test probe/clamp – 1 – to red terminal of test leads – 6 –, connect black terminal to earth.

– Remove air guide for oil cooler (page 116).



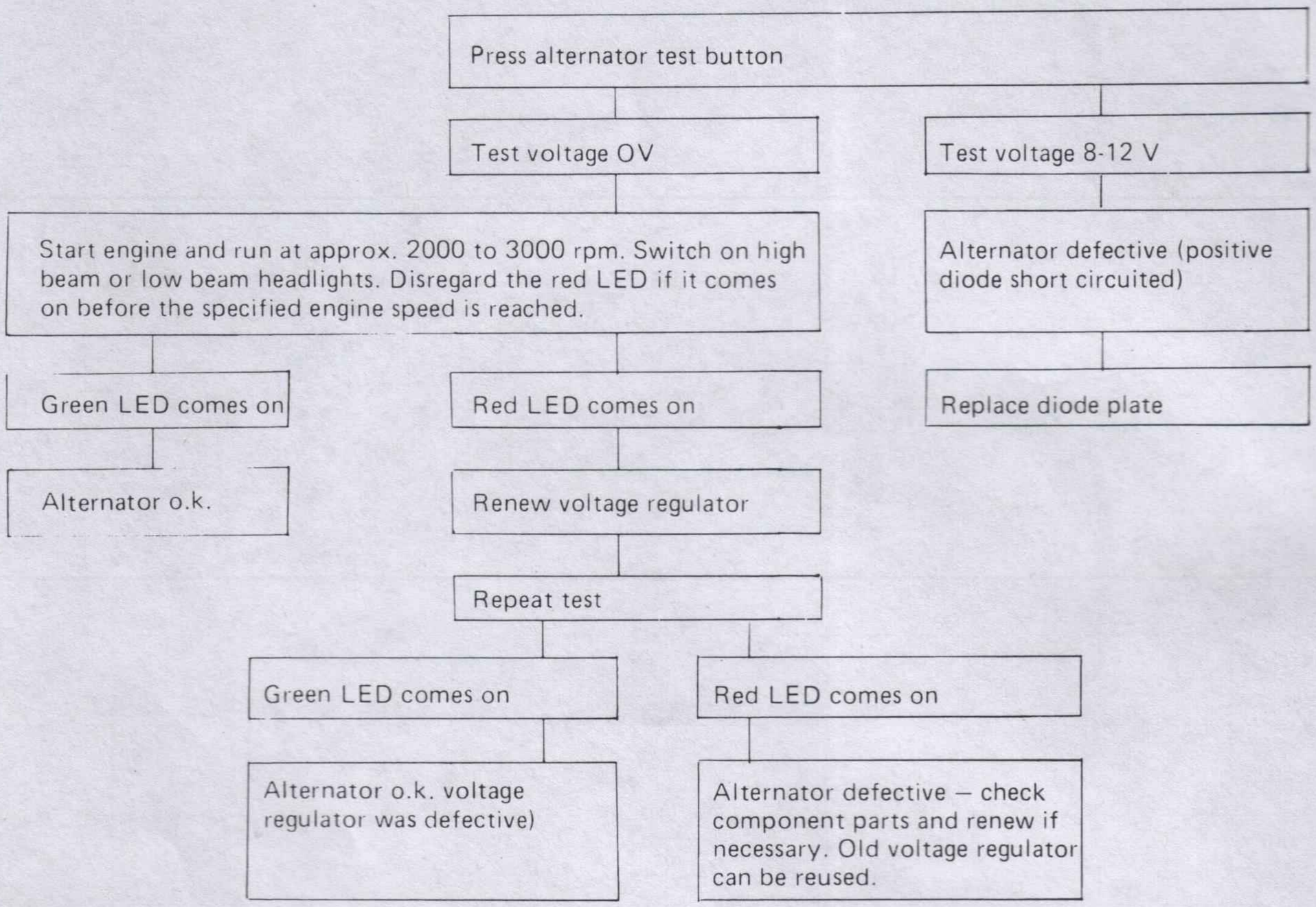
– Connect test probe/clamp to alternator D+.

– See following page for test procedure.

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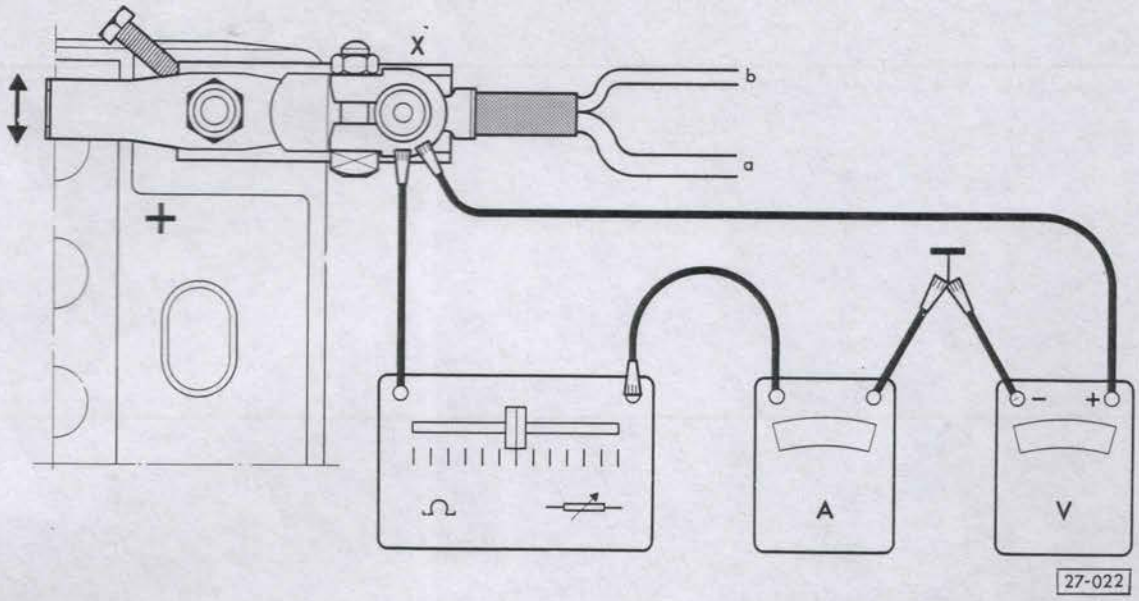
27 Starter – current supply

Test procedure:



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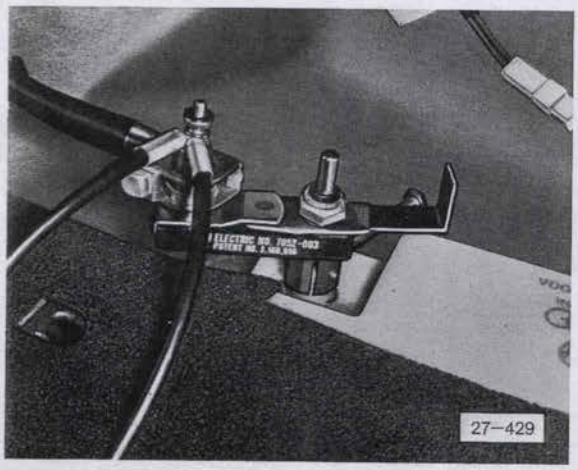
TESTING ALTERNATOR AND VOLTAGE REGULATOR WITH BATTERY CUTOUT SWITCH AND LOAD RESISTOR



a = To starter
b = To fuse box
x = Battery cutout switch

A = Ammeter
V = Voltmeter
Ω = Load resistor

- Disconnect battery earth cable
- Disconnect clamp from positive terminal of battery
- Connect battery cutout switch to positive terminal of battery
- Connect positive battery clamp to battery cutout switch
- Connect ammeter, voltmeter and load resistor as shown in diagram



- Connect battery earth cable and close battery cutout switch
- Start engine and run at 3000 rpm
- Adjust load resistor so that ammeter shows approximately 20 A.



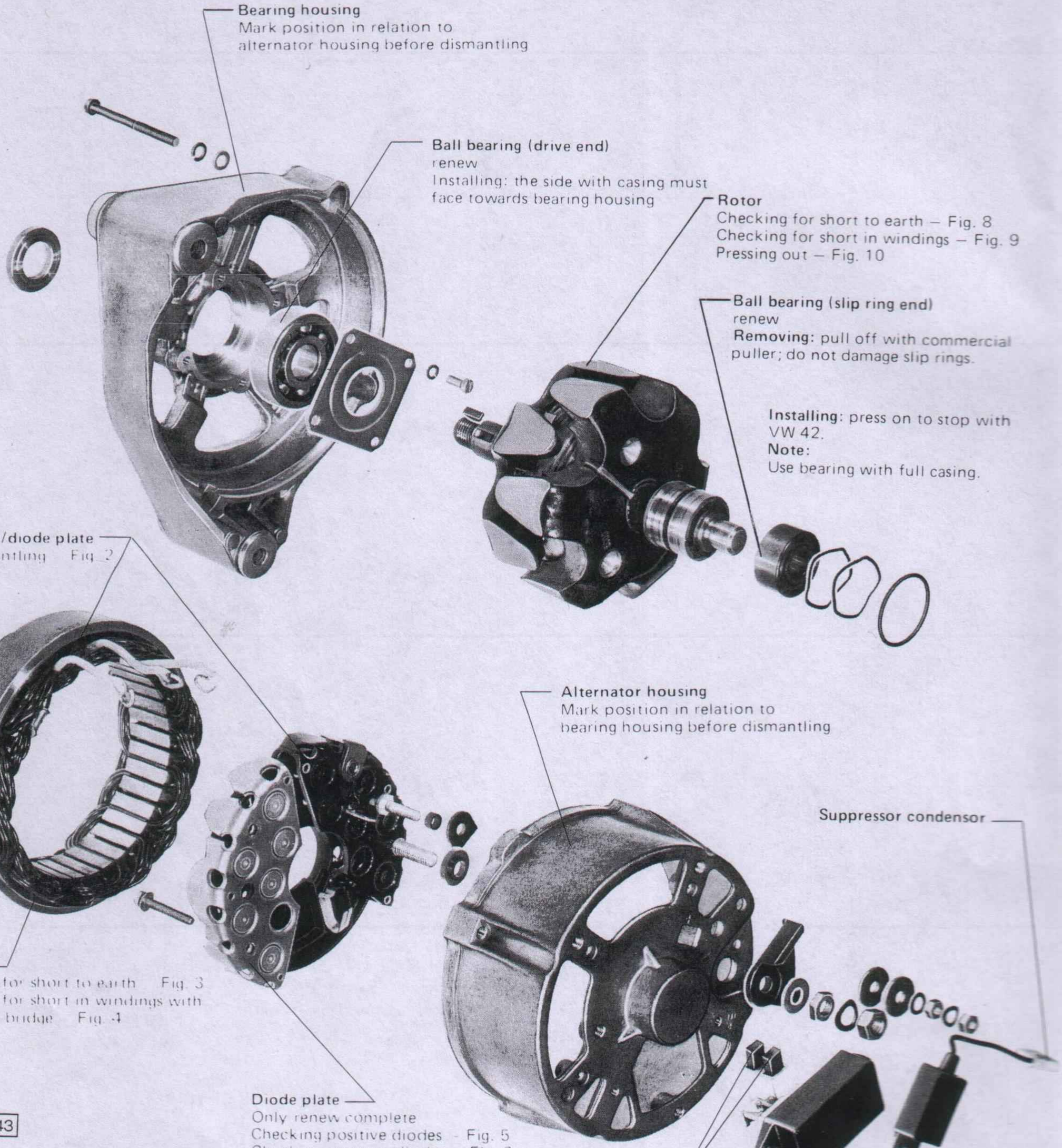
- Open battery cutout switch. This isolates the battery from the test circuit. The current under load is now determined only by the load resistor.
- Adjust load resistor so that ammeter reads 60 amps.
- Voltmeter should now indicate between 12.5 V and 14.5 V.
- If this value is not as specified, first install a new voltage regulator and repeat the measurement.
- If the test readings are now as specified this means that the old voltage regulator was defective.
- If the test readings are still not correct, the alternator is defective. Check the component parts and renew if necessary. The old voltage regulator can be reused.

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SERVICING ALTERNATOR (75 A, 90 A, BOSCH VERSION)

Testing alternator and voltage regulator:
with battery cutout switch and load resistor – page 119
with VW 1315 multiple tester – page 117

Removing and installing alternator – page 116



27-243

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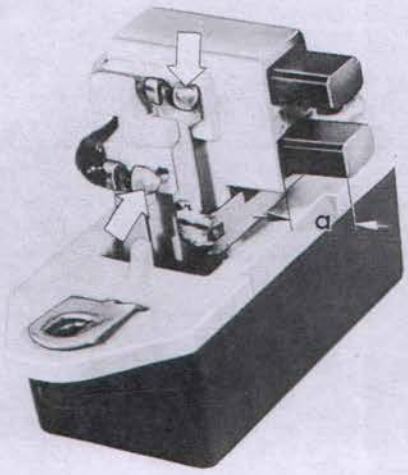


Fig. 1 Renewing alternator carbon brushes

a = 10 mm

Wear limit 5 mm

Disconnect braids (arrows) with soldering iron.

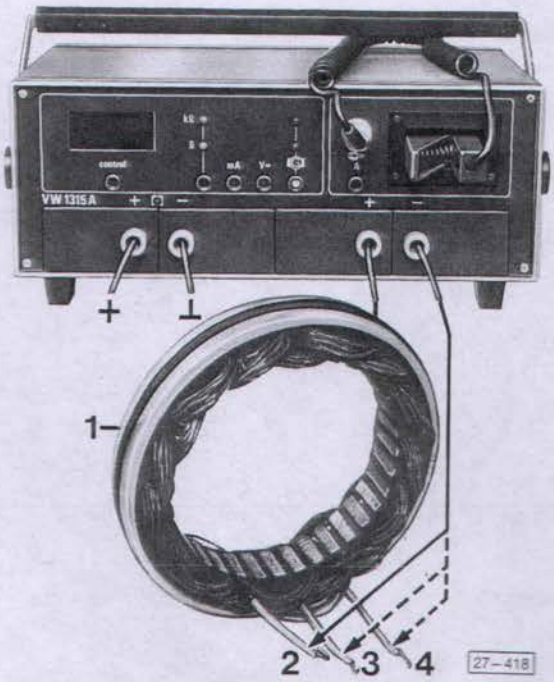


Fig. 3 Stator – checking for short to earth

Test instrument: VW 1315 A

Press button for measuring resistance.

Place test probes on points

1 and 2
1 and 3
1 and 4
in turn.

(One additional measuring point on 90 amp alternator).

The digital display must flash on and off (infinite resistance).

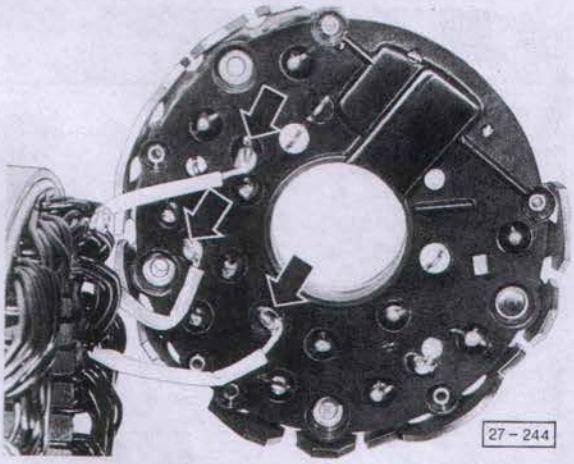


Fig. 2 Dismantling stator/diode plate

Disconnect braids (arrows) with soldering iron.
(One additional braid on 90 amp. alternator).

Use long-nosed pliers as a heat sink.

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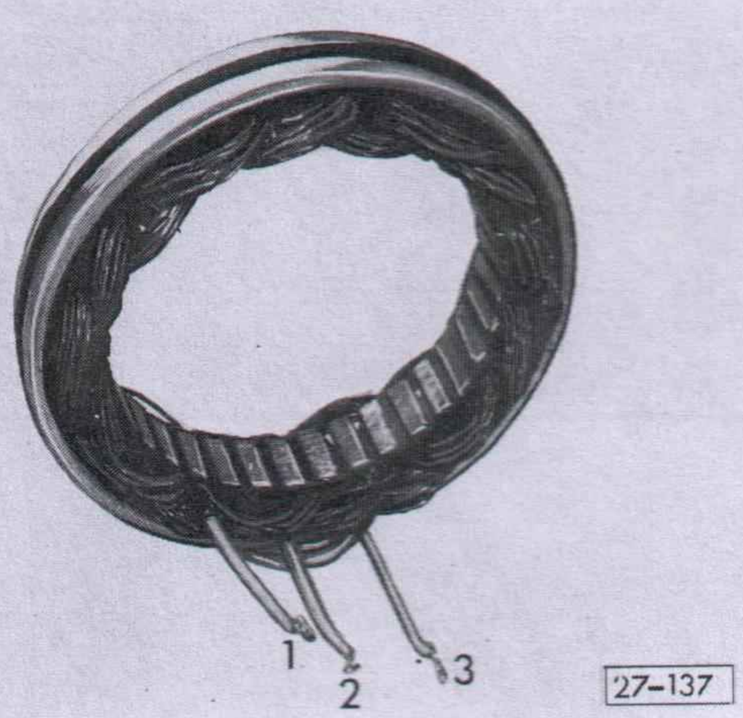


Fig. 4 Stator – checking for short in windings

Test instrument: resistance bridge

Place test probes on winding connections

1 and 2
1 and 3
2 and 3

in turn. (One additional winding connection on 90 amp alternator).

Reading must not exceed 0.1 Ω for each measurement.

Renew stator if results are not as specified.

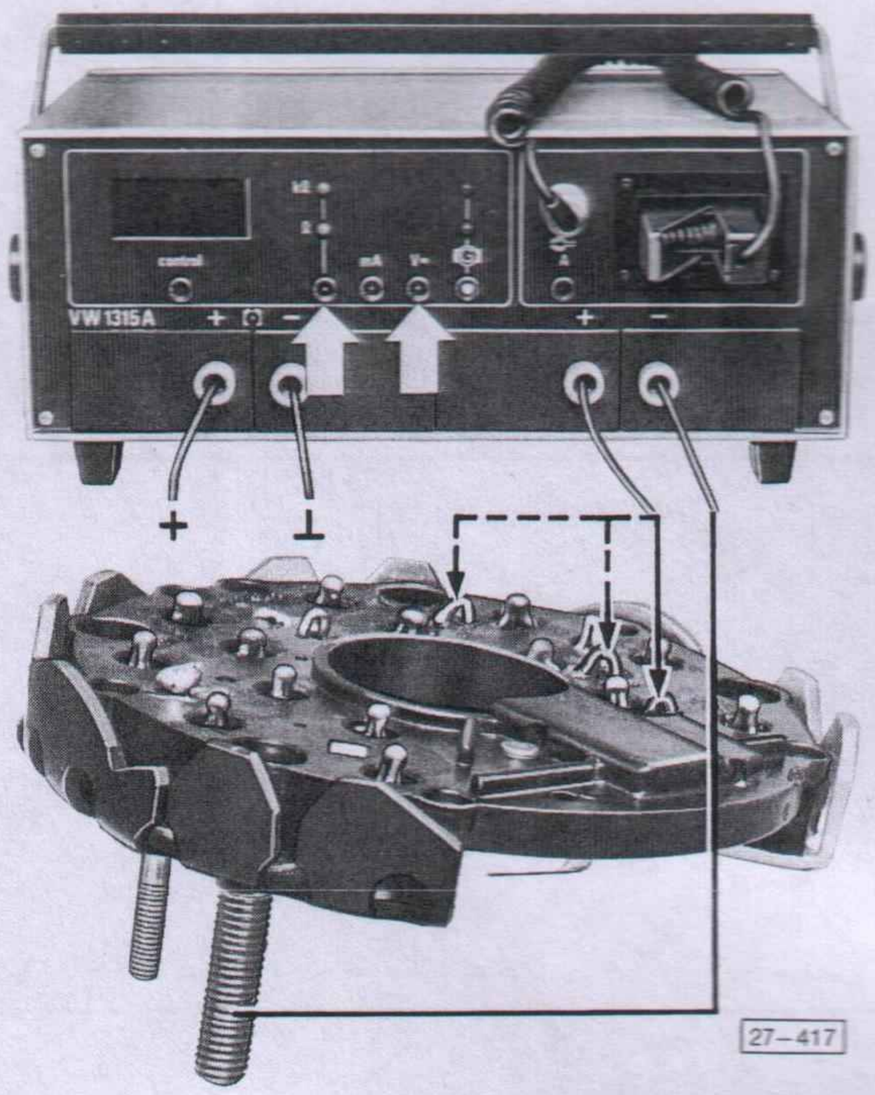


Fig. 5 Testing positive diodes

Test instrument: VW 1315 A

Press buttons for measuring resistance and measuring voltage **at the same time.**

Connect black terminal to B+.
Place red terminal on the 3 connection points in turn. (One additional connection point on 90 amp alternator).

Reading must be 50 - 80 Ω for all measurements.

Renew diode plate if results are not as specified.

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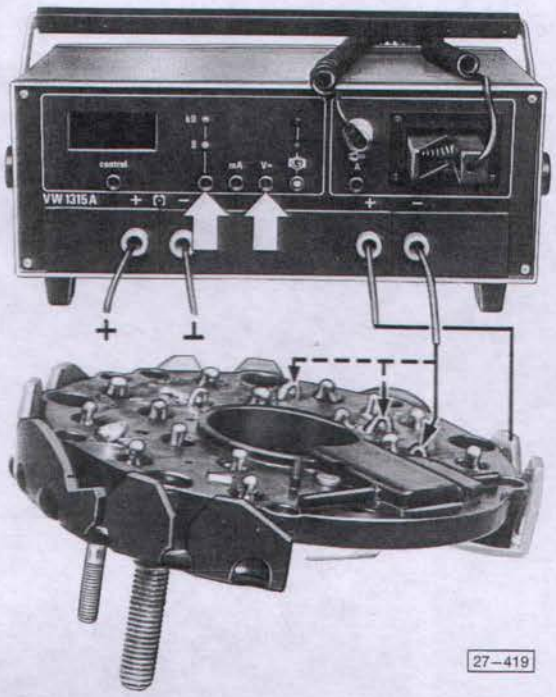


Fig. 6 Testing negative diodes

Test instrument: VW 1315 A

Press buttons for measuring resistance and measuring voltage **at the same time.**

Connect red terminal to negative heat sink. Connect black terminal to 3 connection points in turn (one additional connection point on 90 amp alternator).

Reading must be 50 - 80 Ω for all measurements.

Renew diode plate if results are not as specified.

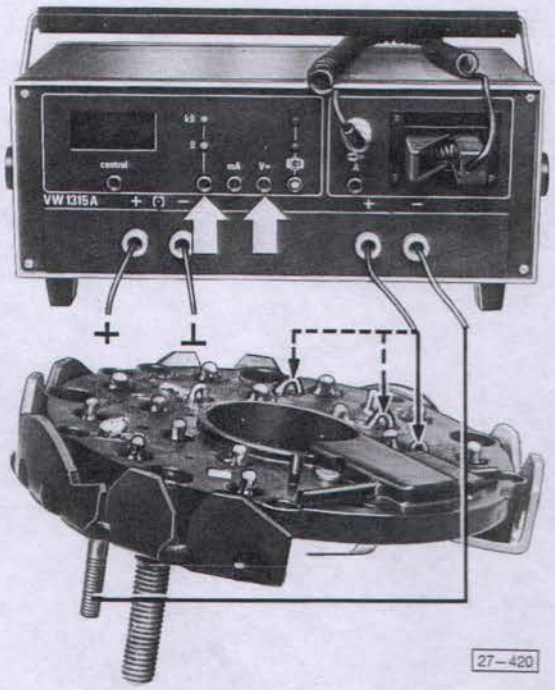


Fig. 7 Testing exciter diodes

Test instrument: VW 1315 A

Press buttons for measuring resistance and measuring voltage **at the same time.**

Connect black terminal to D+. Place red terminal on the 3 connection points in turn. (The 90 amp alternator also has only 3 exciter diodes).

Reading must be 50 - 80 Ω for all 3 measurements.

Renew diode plate if results are not as specified.

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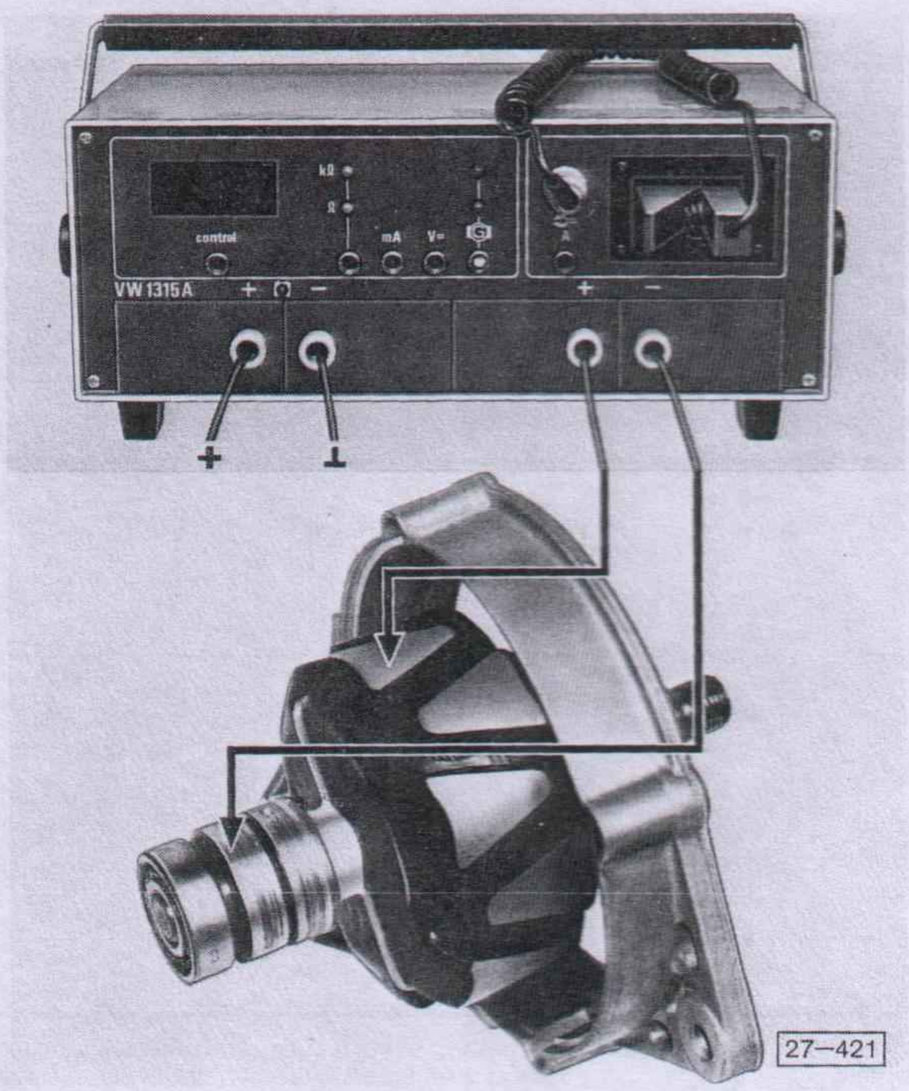


Fig. 8 Rotor – checking for short to earth

Test instrument: VW 1315 A

Press button for measuring resistance. Digital display must flash on and off (infinite resistance).

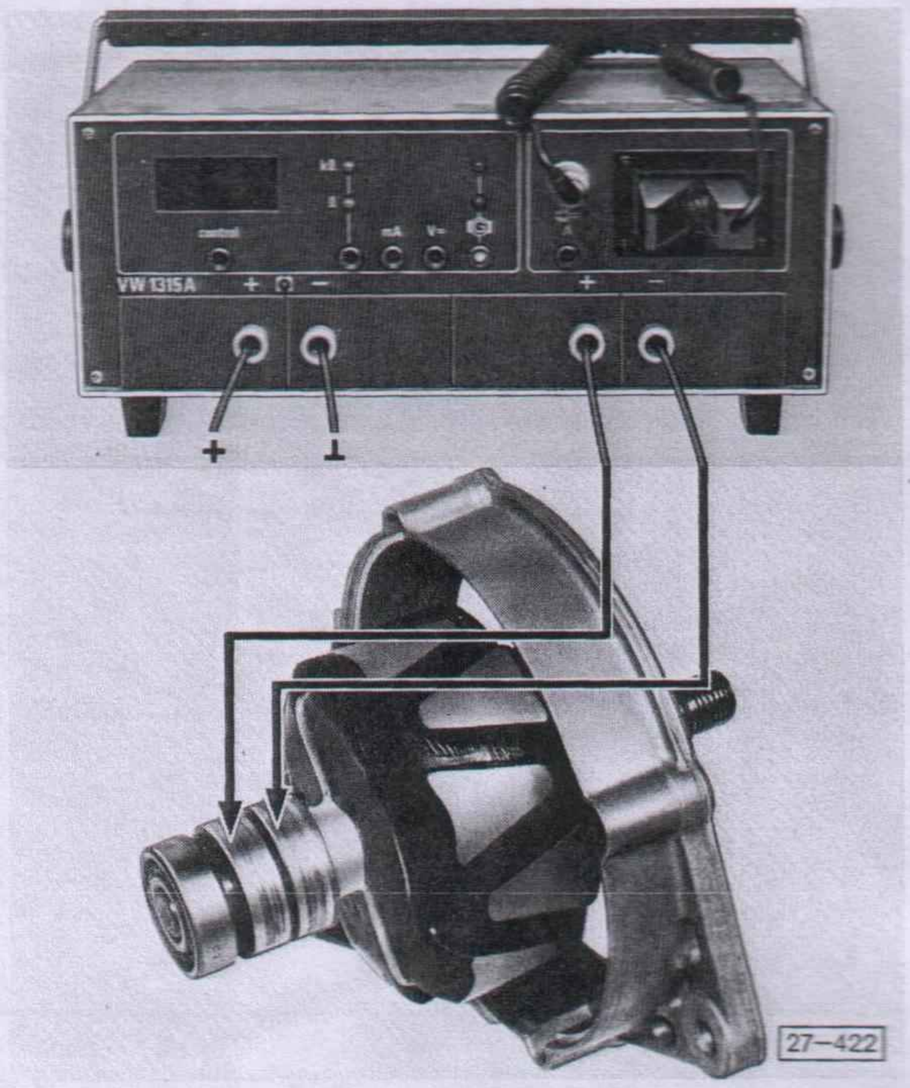


Fig. 9 Rotor – checking for short in windings and continuity

Test instrument: VW 1315 A

Press button for measuring resistance.

Resistance reading must be 3 - 4 Ω

No continuity if digital display flashes on and off (infinite resistance).

Short in windings if resistance is below 3 Ω .

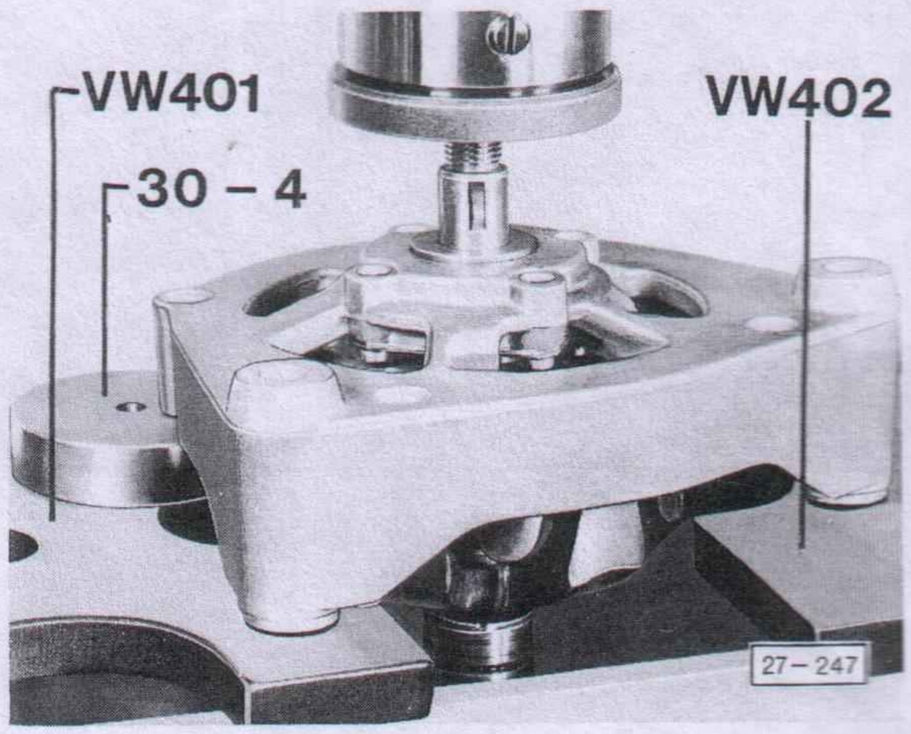
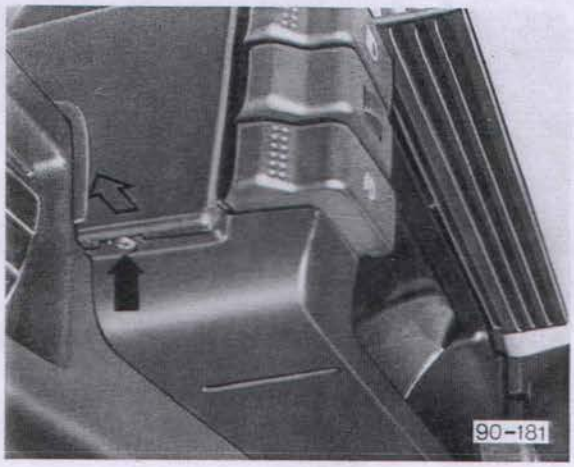


Fig. 10 Pressing out rotor

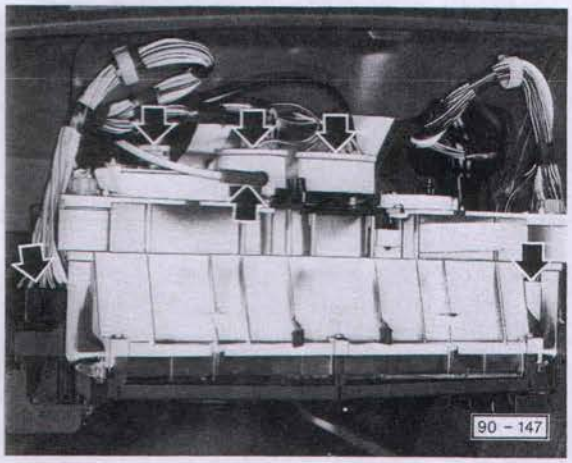
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REMOVING AND INSTALLING INSTRUMENT CLUSTER

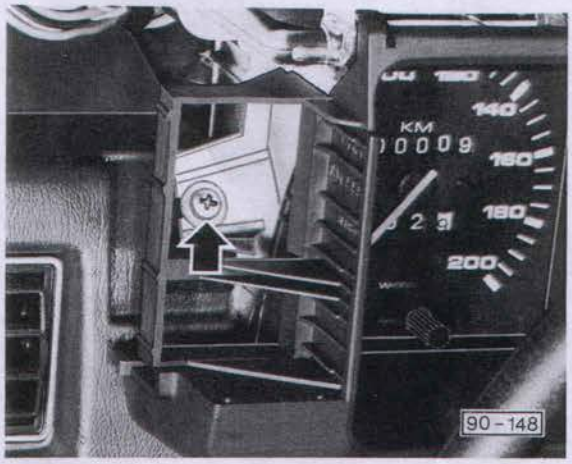
– Disconnect battery earth strap.



– Remove instrument cluster trim.



– Disconnect multiple plug.
– Detach speedometer drive cable.
– Detach connecting line for boost pressure gauge.
– Remove switches.



– Remove instrument cluster.

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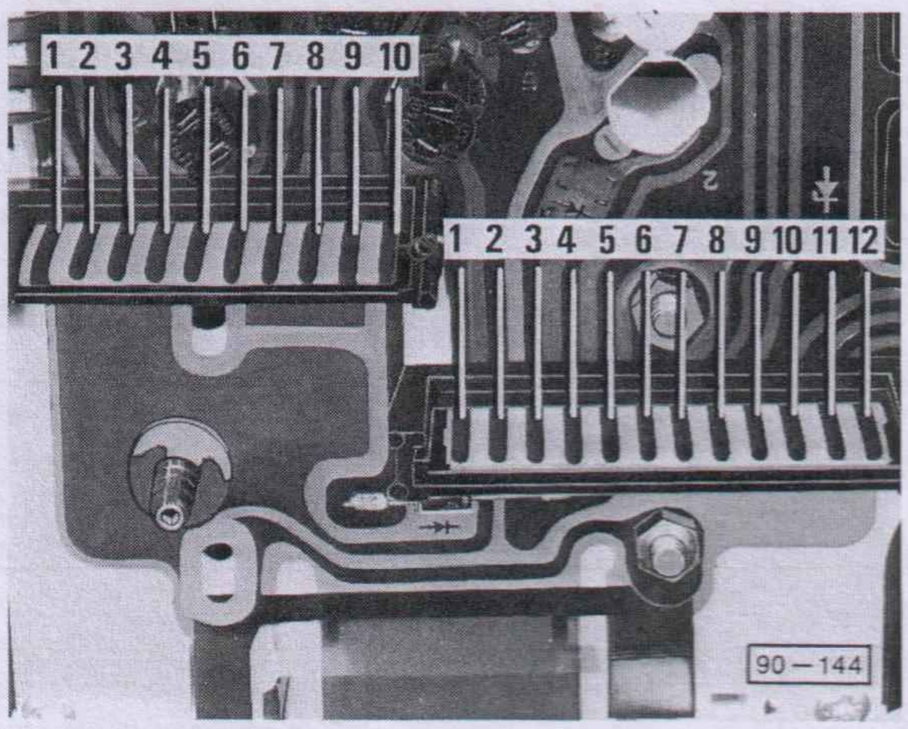


Fig.1 Identification of connections to multiple plugs on instrument cluster

10-pole:

1 – Gearshift indicator
2 – Flasher unit for indicator light: engine hot (input)
3 – Positive lead from voltage stabilizer – output
4 – Earth lead for high beam indicator light, voltage stabilizer, instrument illumination, clock, tachometer, hazard light indicator light
5 – High beam indicator light
6 – Foglight and tail foglight indicator light (earth)
7 – Foglight and tail foglight indicator light
8 – Temperature gauge or indicator light: engine cold
9 – From flasher unit for indicator light: engine hot (output) to indicator light: engine hot
10 – Oil pressure indicator light

12-pole:

1 – Handbrake indicator light
2 – Alternator charge indicator light
3 – Positive lead for indicator lights for: turn signals, alternator charge, handbrake, oil pressure, engine hot, engine cold; flasher unit for indicator light: engine hot, via contact 11 to tachometer and voltage stabilizer
4 – Turn signal indicator light
5 – Fuel gauge
6 – Hazard light indicator light
7 – Heated rear window indicator light
8 – Heated rear window indicator light (earth)
9 – Tachometer, terminal 1
10 – Clock (positive)
11 – See contact 3
12 – Instrument illumination (positive)

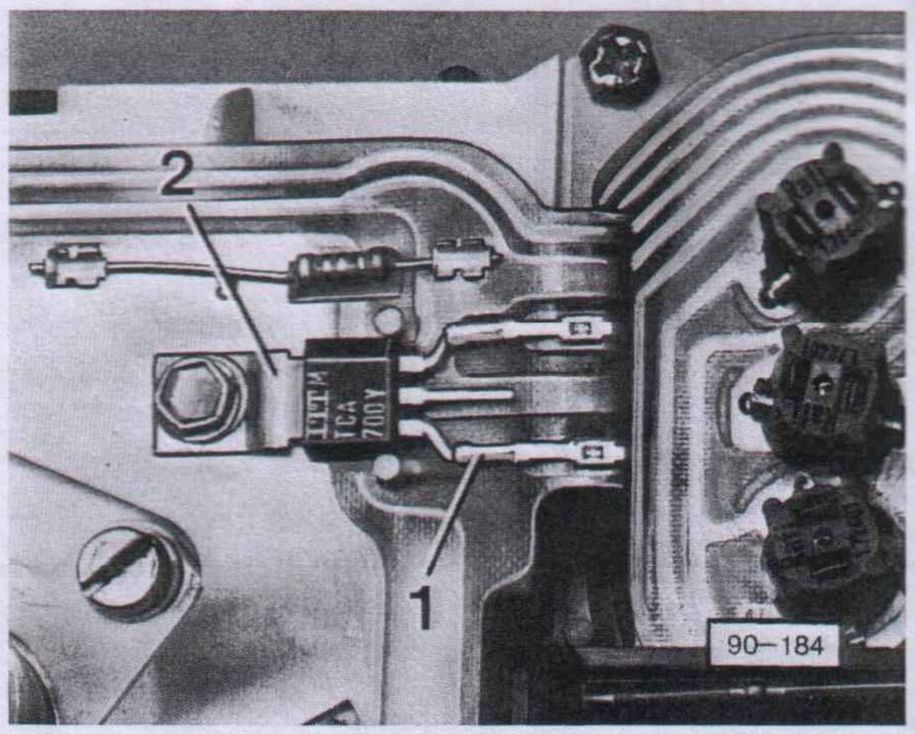


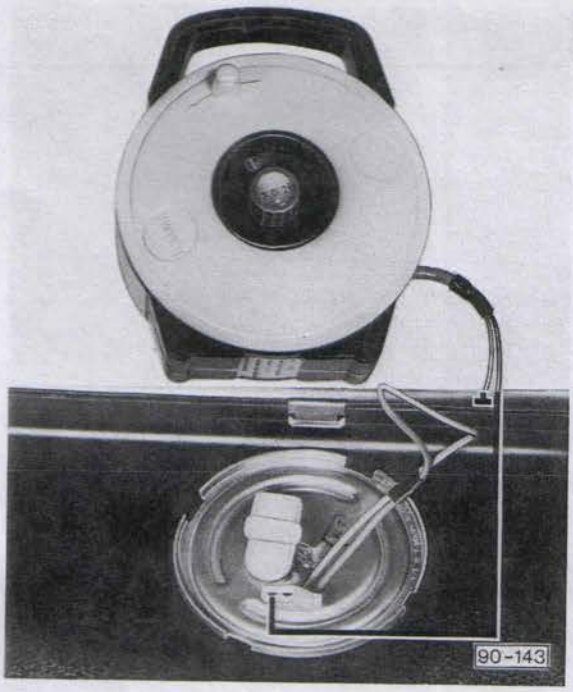
Fig. 2 Checking voltage stabilizer

– Connect voltmeter between positive output – 1 – and earth – 2 –.
– Constant voltage for instruments must be approx. 10 V.
– If the voltage is above 10.5 V or below 9.5 V, voltage stabilizer is defective.

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CHECKING FUEL GAUGE

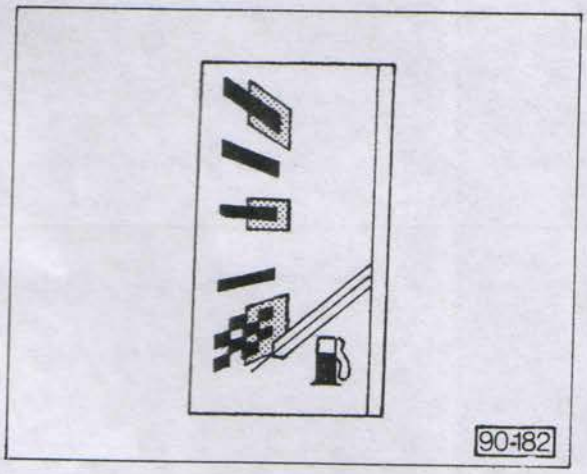
(Fault finding chart – page 128)



– Connect test appliance VW 1301.

– Set test appliance VW 1301 as follows:

1/1:	60
1/2:	155
Reserve:	302



– The needle must be within the appropriate tolerance ranges.

ADJUSTING FUEL GAUGE

– Disconnect battery earth strap.

– Unscrew filler cap.

– Drain fuel tank.

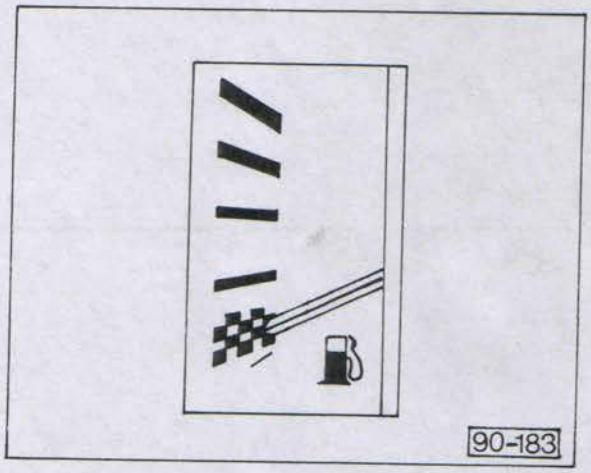
> **Caution!**
> Observe safety precautions when draining tank.

– Put in 8 litres of fuel.

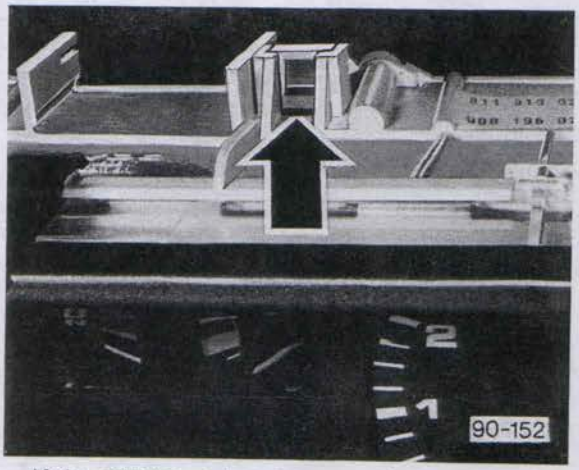
– Connect battery earth strap.

– Switch on ignition

Note:
The ignition must be left switched on for at least 2 minutes before adjusting the fuel gauge.



– The needle must be in the centre of the reserve marking.



– If the adjustment is not correct, the scale of the fuel gauge can be moved up or down as required.

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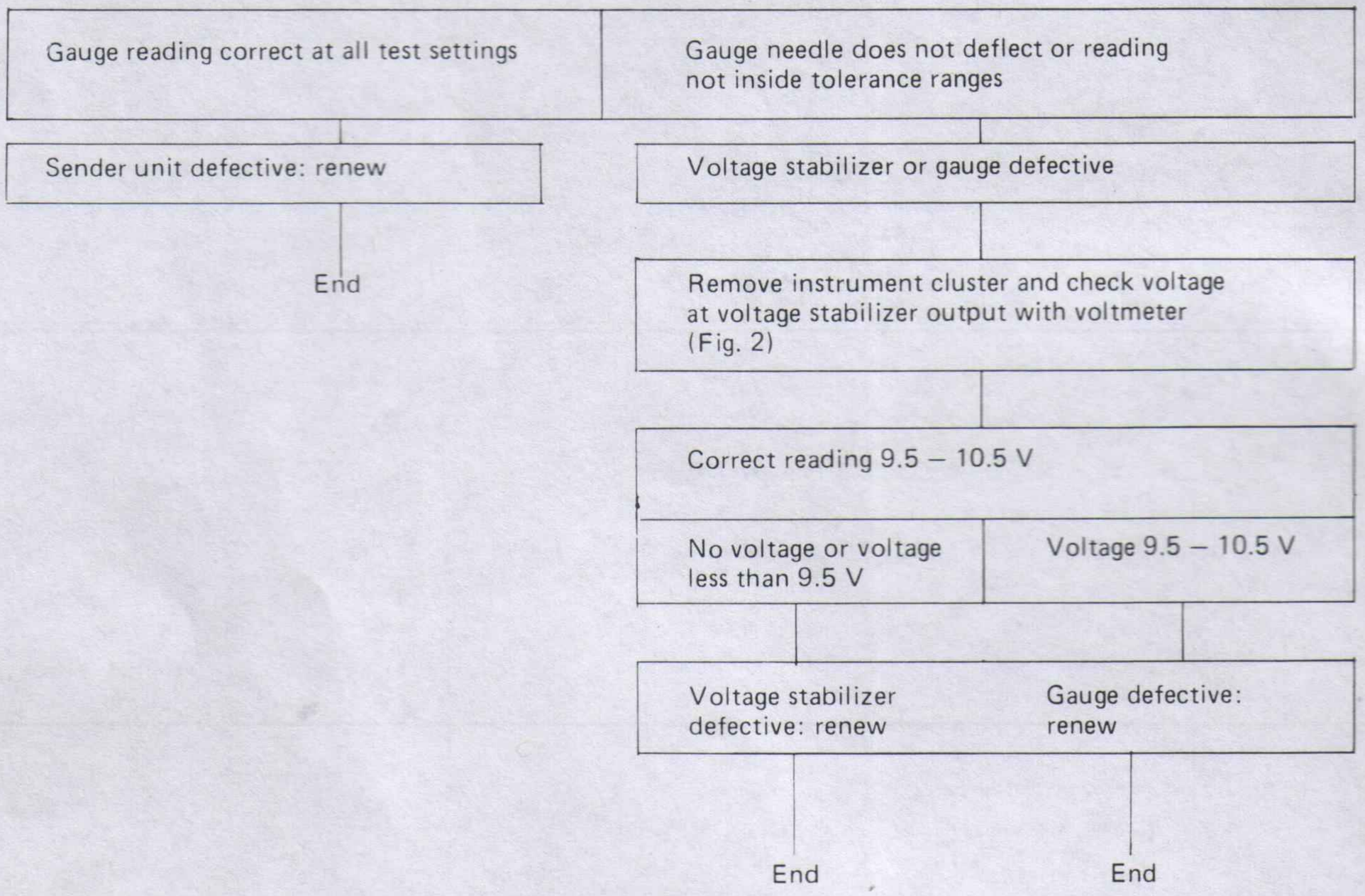
CHECKING FUEL GAUGE – FAULT FINDING CHART

First check that battery is in good condition.

Test procedure:

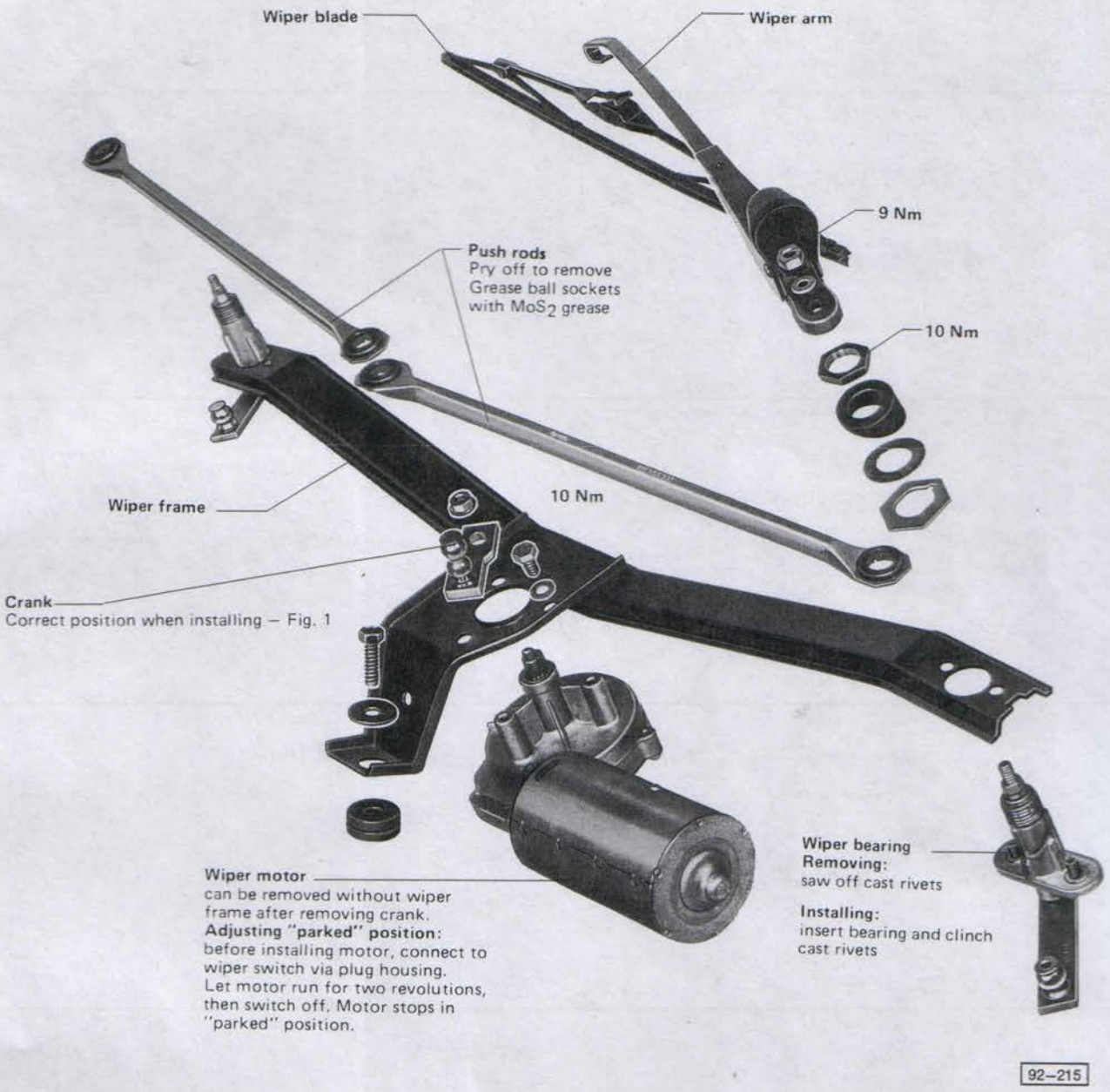
- Disconnect lead from fuel gauge sender unit.
- Connect VW 1301 test appliance (page 127).
- Start engine and adjust test settings (page 127).

Results can be evaluated as follows:



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REMOVING AND INSTALLING WINDSHIELD WIPERS



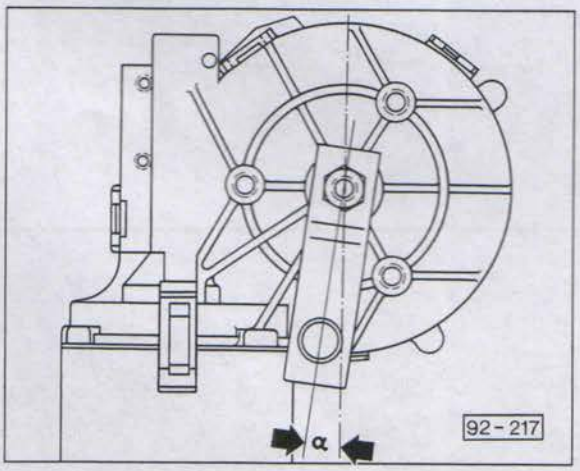


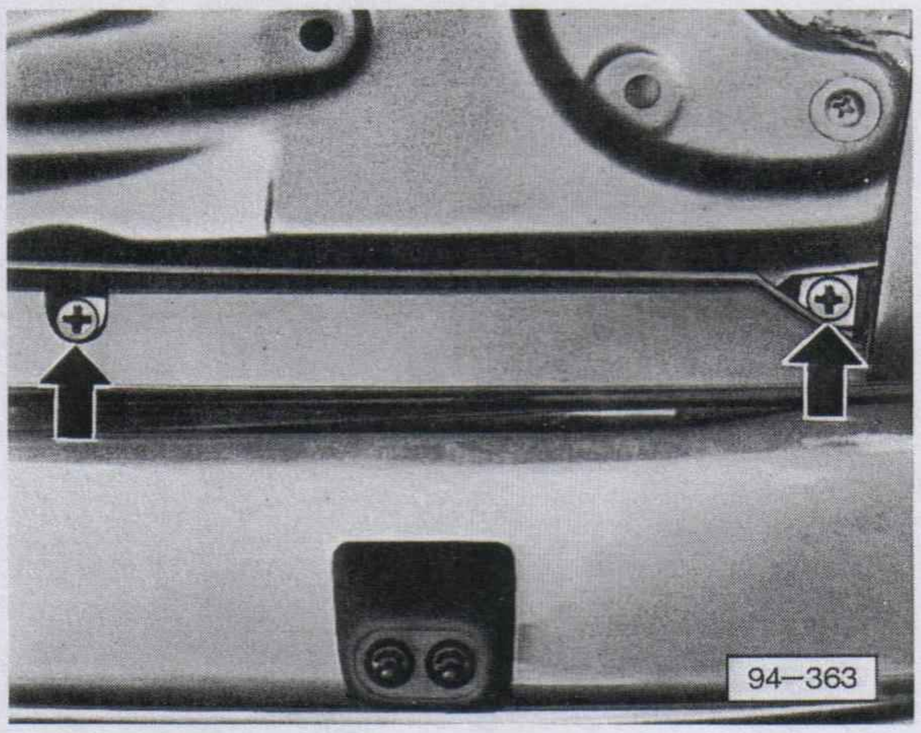
Fig. 1 Installing crank in correct position

α = approx. 8°

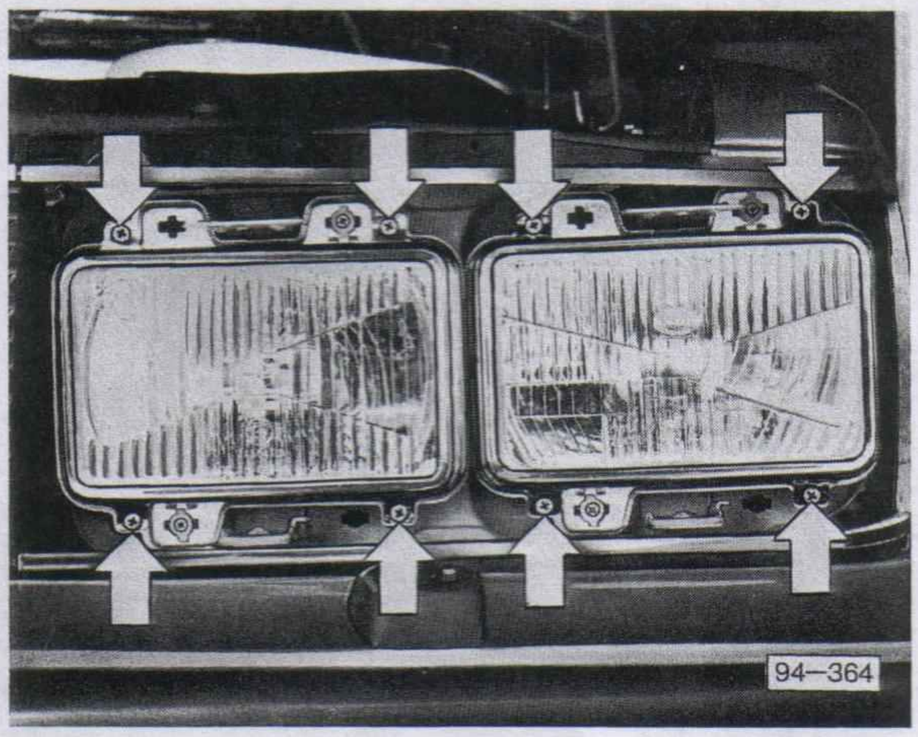
Important
Before installing the crank, set the wiper motor in the "parked" position.

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REMOVING AND INSTALLING HEADLIGHTS



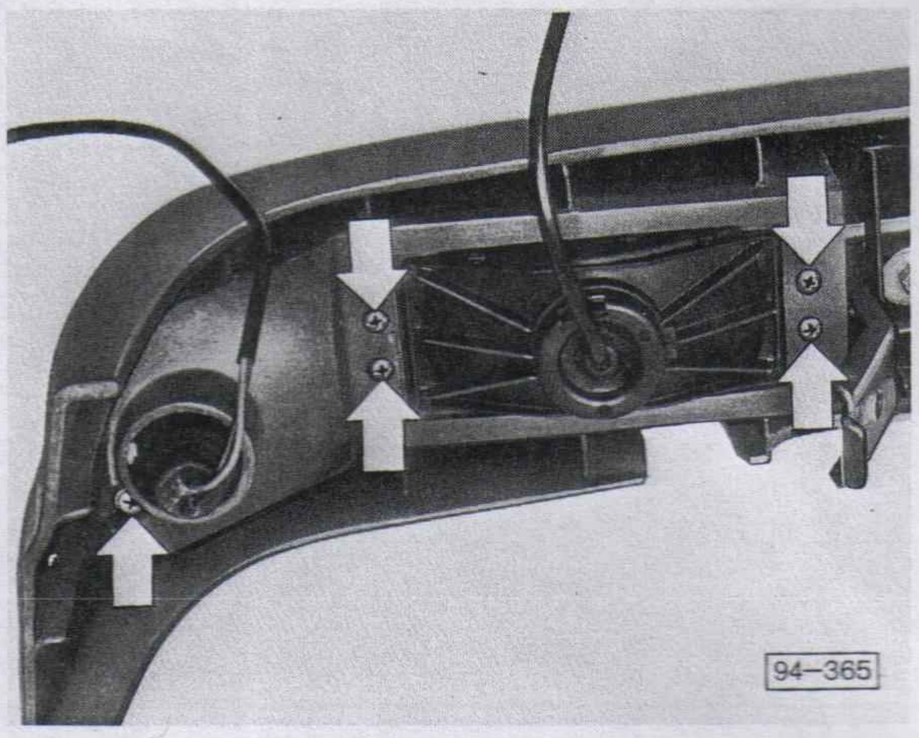
– Remove headlight moulding.



– Remove headlights.

REMOVING AND INSTALLING FOGLIGHTS AND FRONT TURN SIGNALS

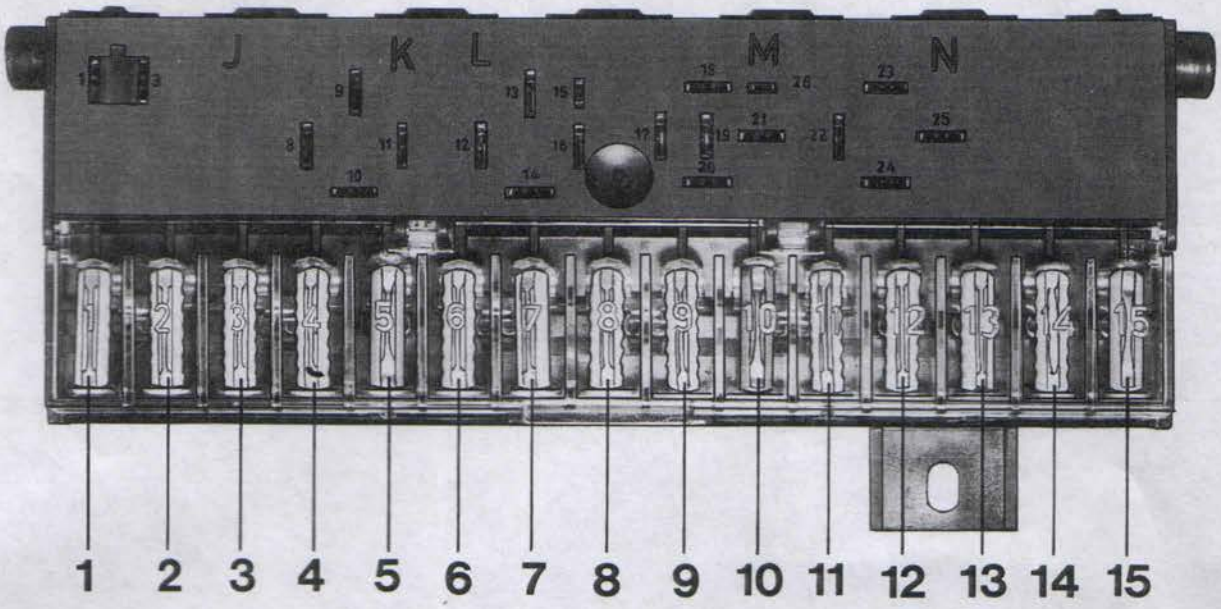
– Remove bumper (page 113).



– Removing and installing foglights and front turn signals

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RELAY PLATE WITH FUSE HOLDER



Relay plate with fuse holder (front view)

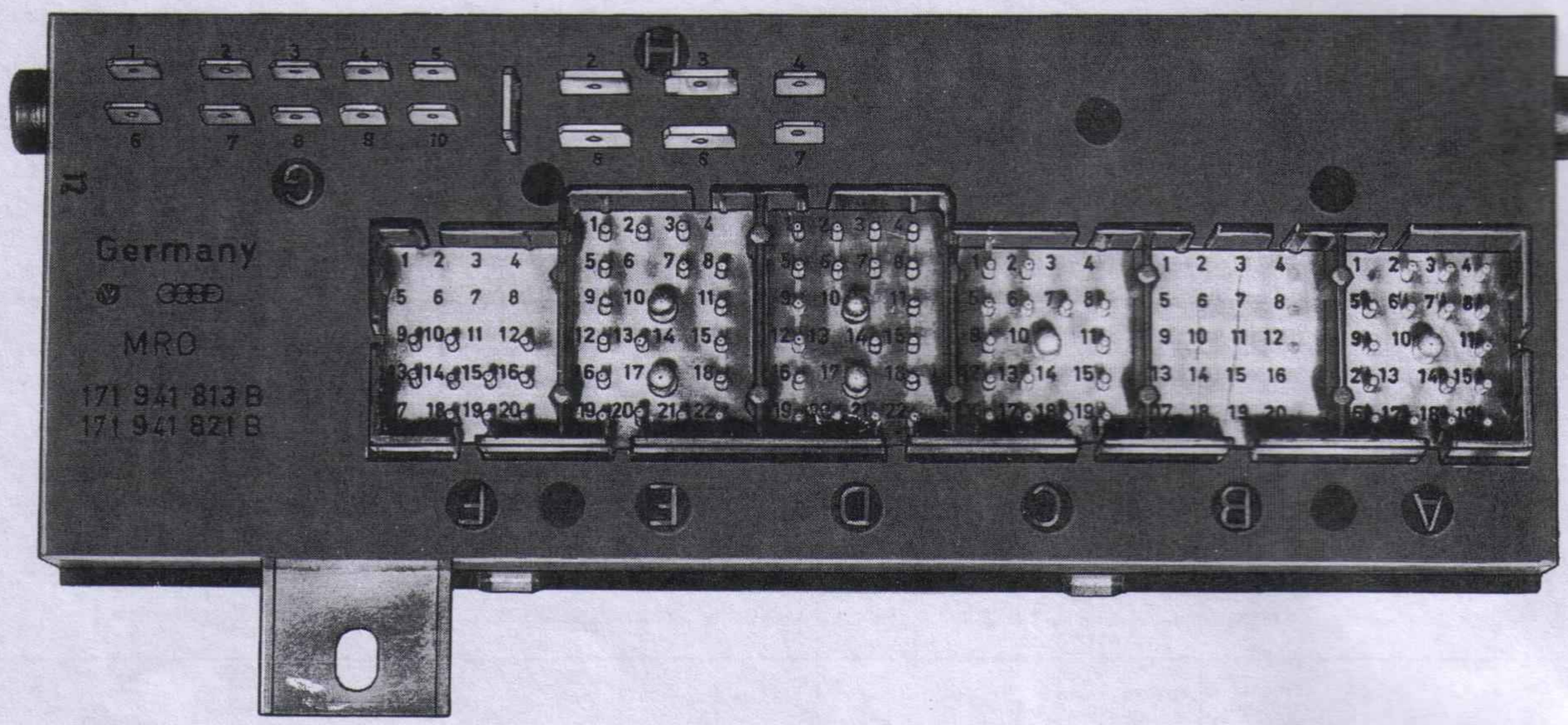
Fuses:

1 –	Low beam headlight, left	8 amps.
2 –	Low beam headlight, right	8 amps.
3 –	High beam headlight, left	8 amps.
4 –	High beam headlight, right	8 amps.
5 –	Heated rear window	16 amps.
6 –	Brake lights, turn signals	8 amps.
7 –	Cigar lighter, glove compartment light, radio	8 amps.
8 –	Switch illumination	8 amps.
9 –	Reversing lights, horn	8 amps.
10 –	Blower	25 amps.
11 –	Wiper motor	8 amps.
12 –	Licence plate lights	8 amps.
13 –	Side light, right	8 amps.
14 –	Side light, left	8 amps.
15 –	Foglights	8 amps.

Relays:

J – Not used
K – Auxiliary relay terminal X
L – Fuel pump relay
M – Wash/wipe intermittent relay
N – Hazard light/turn signal flasher unit

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Relay plate with fuse holder (rear view)

A – Front left harness (white)
B – Not used
C – Front right harness (colourless)
D – Instrument panel harness (blue)
E – Instrument panel harness (black)
F – Rear harness (yellow)
G – Single plugs
H – Single plugs (terminal 30)

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DESIGNATION OF CONTACTS ON RELAY PLATE AND TERMINALS ON RELAYS

Designation	Contact	Terminal on relay	Connected with
Socket J: contacts bridged	1 3		Contact G 10, D 17 Contact E 10, fuse 1, 2
Socket K: Auxiliary relay terminal X	8 9 10 11	86 30 87 85	Contact L 15, M 18, N 23, C 5, D 11 Contact L 13, D 3, D 9, H 1 to H 7, fuse 6, 7 Contact E 13, G 7, fuse 10, 11 Contact D 7
Socket L: contacts 13 and 14 bridged	12 13 14 15 16	1 30 87 31 15	Contact A 3 Contact K 9, D 3, D 9, H 1 to H 7, fuse 6, 7 Contact A 8 Contact K 8, M 18, N 23, C 5, D 11 Contact A 12, C 15, E 2, G 3 fuse 8, 9
Socket M: Wash/wipe intermittent relay	17 18 19 20 21 26	15 31 53 S T 53 M J	Contact C 13, D 5, E 15, fuse 11 Contact K 8, L 15, N 23, C 5, D 11 Contact C 9 Contact E 7, G 2 Contact E 16 Contact E 8
Socket N: Hazard light/turn signal flasher unit	22 23 24 25	49a 31 49 –	Contact D 1, E 3 Contact K 8, L 15, M 18, C 5, D 11 Contact D 12 Contact D 6

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Workshop Bulletin.
Audi Quattro

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of 12/80

File in booklet: Provisional Repair Instructions, May 1980 edition

Page to be marked: See headings A - H below

MODIFICATIONS TO THE AUDI QUATTRO

A number of engineering modifications were effected before the market introduction of the Audi Quattro (November 1980), but after completion of the Audi Quattro Workshop Manual "Provisional Repair Instructions" (May 1980 edition). These modifications are described on the following pages.

The modifications must be taken into account when carrying out repair work and servicing, and should be noted in the Workshop Manual on the pages given.

Contents

	Page
A - List of engine data	2
B - Aligning engine and gearbox	3
C - K-Jetronic fuel injection	3
D - Vacuum connections	3
E - Wheels, tyre sizes	3
F - Repairing power assisted steering	3
G - Technical data / ignition system	4
H - Fault finding charts:	
Idle speed	5
Engine will not rev	5
Engine misfires	6

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A - LIST OF ENGINE DATA

Page 1 in Workshop Manual

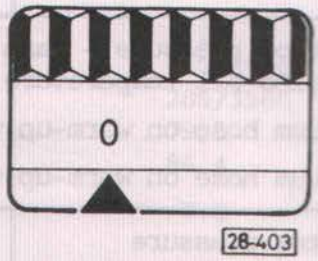
Code letters		WR
Engine data		
Manufactured	from	11/80
	up to	
Capacity	litres	2.2
Output	kw at rpm	147/5500
Torque	Nm at rpm	285/3500
Bore	mm	79.5
Stroke	mm	86.4
Compression ratio		7.0
Valve timing at 1 mm valve lift and 0 mm valve clearance		
intake opens before TDC		0°
intake closes after BDC		44°
exhaust opens before BDC		40°
exhaust closes after TDC		4°
RON	min.	98
Fuel injection		K-Jetronic
Distributor		035 905 206 L
Turbocharger		x
Engine is specially tuned for:		
Publications	Order No. 1)	
Workshop Manual:		
Audi Quattro Provisional Repair Instructions	0.97.538.699..	x
Audi 100, Audi 200 2.2 l fuel injection engine (K-Jetronic/turbocharger)	0.97.537.271..	x
Maintenance	0.97.538.201..	
Fault finding chart:		
K-Jetronic	000.530.423..	x
Current defects:		
Service Handbook 2)		x
Fault Finding Handbook 3)	000.530.300..	x

1) See catalogue of publications for language index
2) Only supplied in West Germany
3) Only supplied in export countries

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G - TECHNICAL DATA - IGNITION SYSTEM

Page 31 in Workshop Manual

Engine code letters		WR
Gearbox		Manual gearbox
Distributor	Part No.	035 905 206 L
Ignition timing* Adjust with engine switched off.	Marking	 28-403
Dwell angle (not adjustable)		15° - 50° (22% - 70%)
Centrifugal advance, vacuum advance, vacuum retard, digital idle stabilizer.		These functions are controlled by the electronic ignition control unit in accordance with engine speed, intake air temperature, manifold pressure and throttle position. These functions cannot be tested.
Sender unit for ignition timing	Resistance K ohm	approx. 1.0
Sender unit for engine rpm	Resistance K ohm	approx. 1.0
Sender unit for intake air temperature	Resistance ohm	13 - 33
Spark plugs	Bosch	W 250 P 21 (W 4 DP)
	Electrode gap mm	0.7 ± 0.1
	Tightening torque Nm	30
Firing order		1 - 2 - 4 - 5 - 3
Rpm limiter incorporated in all-electronic ignition system	Cut-out speed rpm	6750 ± 10
Ignition coil	Secondary resistance K ohm	6.3 - 9.2
	Primary resistance ohm	0.61 - 0.83
Distributor rotor arm	Resistance K ohm	1.0

*Note adjusting procedures - page 36 in Workshop Manual

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H - FAULT-FINDING CHART

Page 51 in Workshop Manual

Supersedes fault-finding chart "Idle speed cannot be set below 1500 rpm".

Fault	Possible cause	Test	Remedy
Idle speed 1500 rpm	Idle switch for electronic ignition system defective or set incorrectly	Check wiring and idle switch for electronic ignition - page 43	Renew or adjust idle speed for electronic ignition, restore continuity or renew wiring.
	Electronic ignition control unit defective	Check electronic ignition control unit and voltage supply - page 50	Renew electronic ignition control unit, restore continuity or renew lead
	Fuel distributor or air flow meter defective	Check sensor plate lever, control plunger and CO adjusting screw	Renew defective components.

Additional fault-finding chart:

Fault	Possible cause	Test	Remedy
Engine will not rev over 4000 rpm	Idle switch for electronic ignition defective or set incorrectly	Check wiring and idle switch for electronic ignition - page 43	Renew idle switch for electronic ignition, restore continuity or renew lead
	Sender unit for intake air temperature defective	Check wiring and sender unit for intake air temperature - page 41	Renew sender unit for intake air temperature, restore continuity or renew lead

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Page 53 in Workshop Manual

Supersedes fault-finding chart "Engine misfires".

Fault	Possible cause	Test	Remedy
Engine misfires	Distributor incorrectly installed and ignition timing incorrect	Check ignition timing - page 36	Adjust ignition timing
	Boost pressure too high	Check turbocharger and waste gate - page 22	Renew waste gate
	Voltage supply for electric fuel pump defective	Check voltage supply for electric fuel pump	Restore continuity or renew lead
		Check fuse for electric fuel pump	Restore continuity or renew lead
		Check fuel pump relay	Renew relay
	Electric fuel pump defective	Check electric fuel pump	Renew electric fuel pump
	Voltage supply for electronic ignition control unit interrupted	Check voltage supply - page 50	Restore continuity or renew lead
	Hall TCI control unit defective	Check Hall TCI control unit and leads - page 48	Renew Hall TCI control unit, restore continuity or renew leads
	Hall pick-up defective	Check Hall pick-up and leads - page 45	Renew distributor, restore continuity or renew lead
	Ignition timing sender unit defective	Check ignition timing sender unit and leads - page 37	Renew ignition timing sender unit, restore continuity or renew leads
	Sender unit for engine rpm defective	Check leads and sender unit for engine rpm - page 39	Renew sender unit for engine rpm, restore continuity or renew lead
	Electronic ignition control unit defective	Check electronic ignition control unit - page 50	Renew electronic ignition control unit

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of 3/81

File in booklet: Provisional Repair Instructions, May 1980 edition

Page to be marked: 89, 90

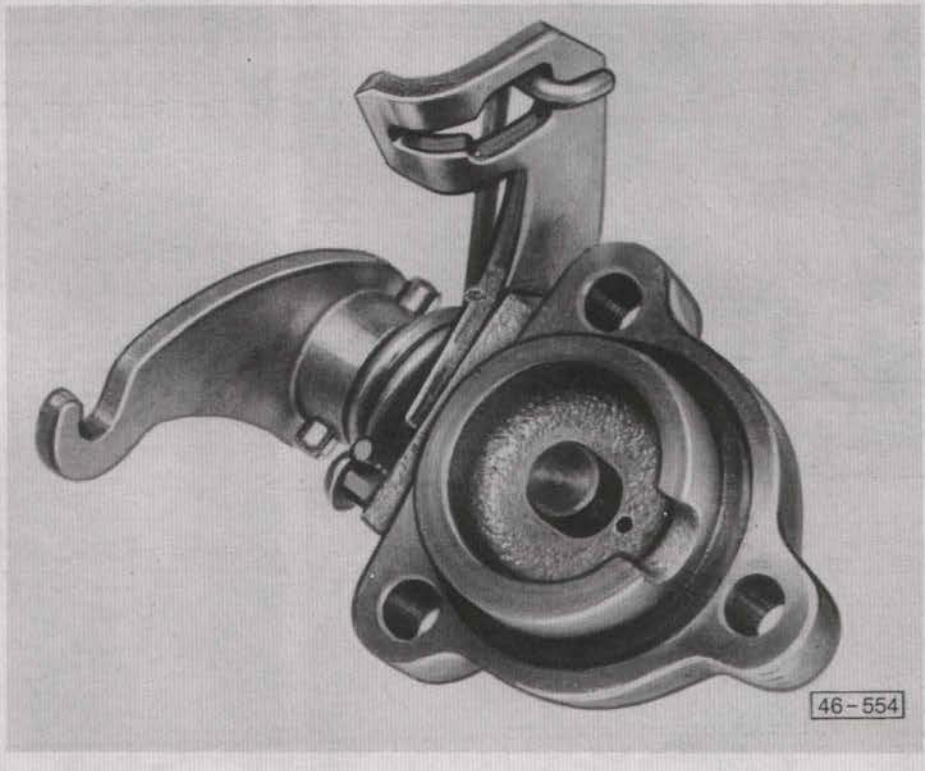
REAR BRAKE CALIPERS

In isolated cases it can occur that the handbrake cable lever does not move freely in the housing cover.

From Ch. No. 85BA 900 722 onwards the brake calipers installed in production therefore have improved sealing for the handbrake mechanism.

Housing covers with improved sealing are available as complete replacement units for repair purposes:

housing cover, left	Part No. 437 615 422 A
housing cover, right	Part No. 437 615 421 A



Complete housing cover with improved sealing

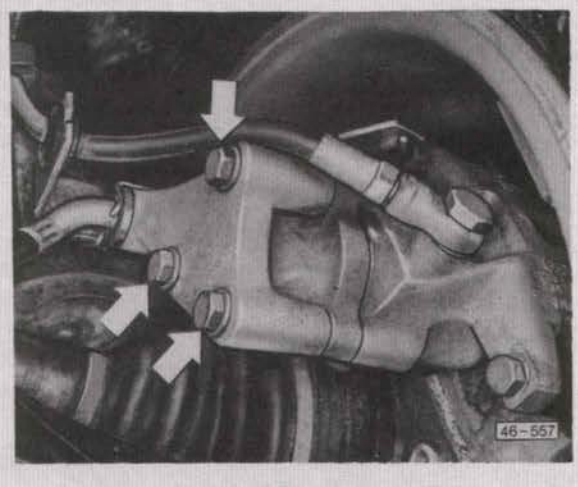
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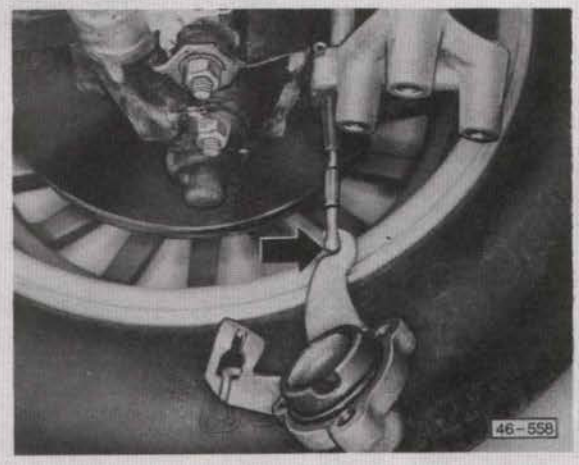
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RENEWING HOUSING COVER

- Release handbrake.



- Unscrew bolts holding support bracket for handbrake cable.
- Detach support bracket with housing cover.
- Disengage handbrake cable.



- Engage handbrake cable in handbrake cable lever on new housing cover.
- Fit support bracket with housing cover.

Caution
When fitting the new housing cover ensure that the locating pin on the push rod is inserted into the drilling in the housing cover.

- Tighten bolts securing support bracket.
- Apply handbrake.
- Release handbrake.



- Check that both handbrake cable levers are against the stop and that both wheels rotate freely. If this is not the case, check the handbrake linkage for freedom of movement and check handbrake adjustment.

Note:

The illustration shows the stop (arrow) with the cylinder housing removed.

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Workshop Bulletin.

Audi Quattro

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of 04/81

File in booklet: Provisional Repair Instructions - May 1980 Edition -

Page to be marked: II, 65 71

Removing and installing propshaft

Adjusting propshaft

Repair instructions:

At present no repair work can be carried out on the propshaft with the exception of removing and installing and adjustment operations.

The joints and bearings cannot be renewed with normal workshop tools, neither can the front and rear propshaft sections be renewed separately because the shaft must then be balanced. This operation also is not possible using normal workshop equipment.

For this reason therefore only the removal, installation and adjustment operations of the propshaft are described here.

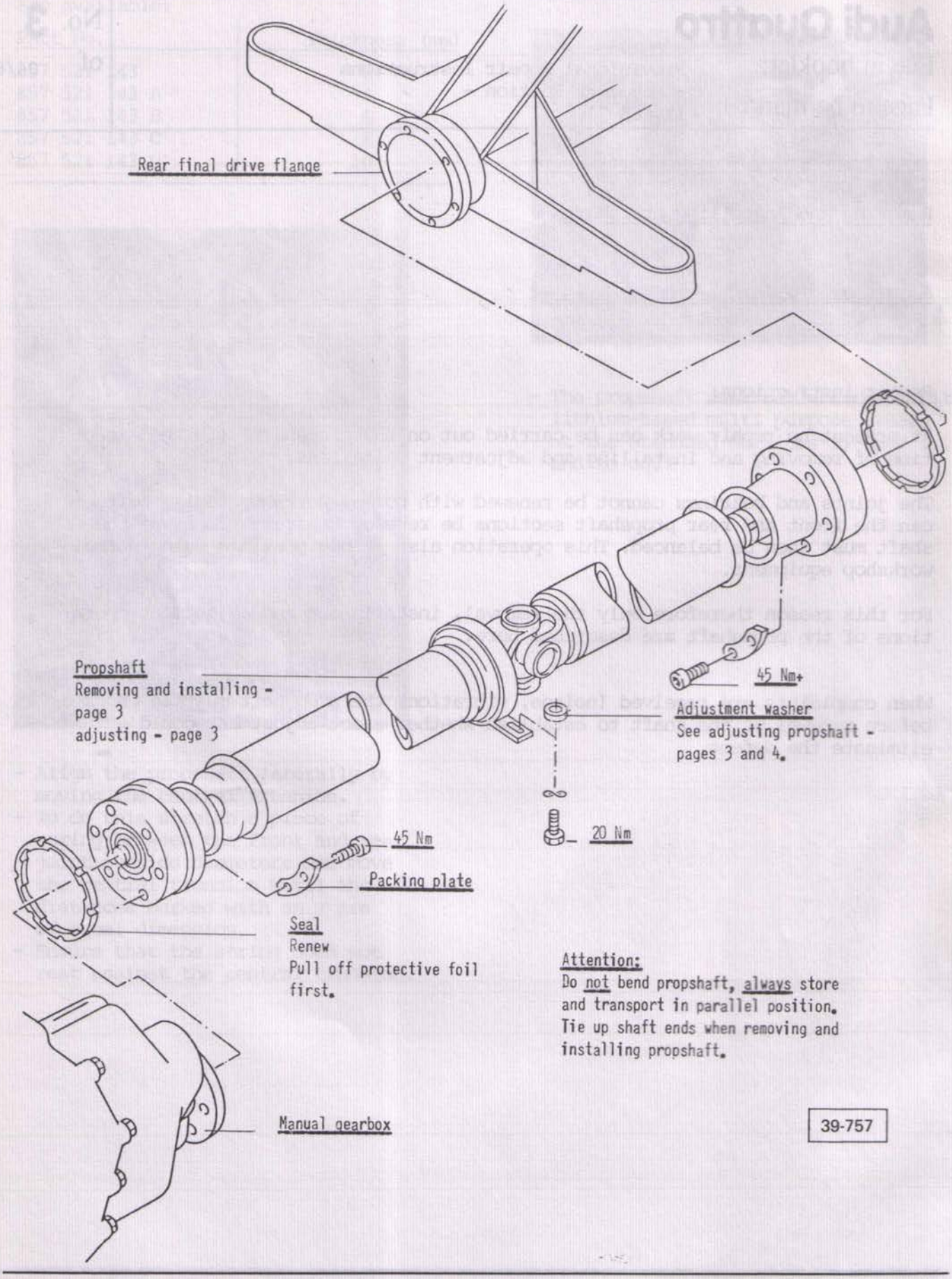
When complaints are received (noises, vibration) the propshaft must be checked before renewal of the shaft to establish whether exact adjustment could eliminate the defect.

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REMOVING AND INSTALLING PROPSHAFT

ADJUSTING PROPSHAFT

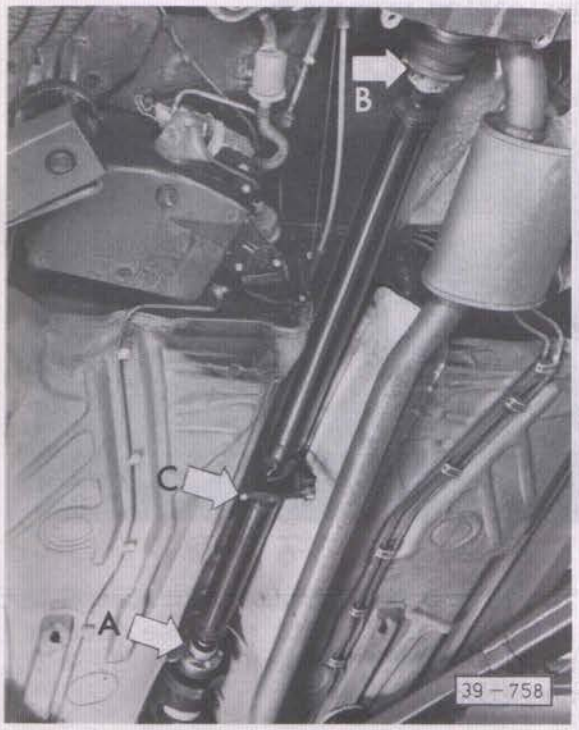


Attention:
Do not bend propshaft, always store and transport in parallel position.
Tie up shaft ends when removing and installing propshaft.

39-757

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Removing and installing propshaft



- Detach propshaft from gearbox (arrow A). Tie propshaft up.
- Detach propshaft from rear final drive (arrow B). If necessary, engage differential lock and block wheel. Tie propshaft up.
- Detach central trunnion from body (arrow) and take propshaft off.

Transport propshaft in parallel state only

Tightening torques:

Propshaft to gearbox .... 45 Nm
Propshaft to final drive. 45 Nm
Central trunnion to body. 20 Nm

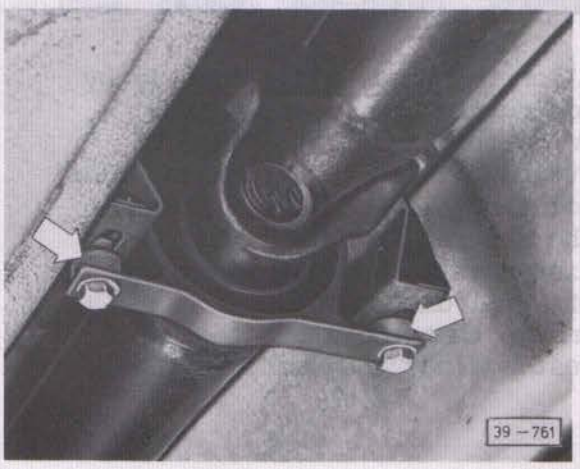
Adjust propshaft after installation.

Adjusting propshaft

The aim of adjustment is:
Because both propshaft halves must be parallel to one another.
The adjustment operations must be very carefully carried out because a badly adjusted propshaft often leads to the causes of vibration and rumbling noises.



- Check the propshaft with a locally manufactured gauge (A). Manufacture gauge (A) from a suitable material approx. 120 cm in length ensuring that the edge is perfectly straight. Cut a recess in the gauge - 1.5 cm deep and 20 cm long - in the central trunnion area.

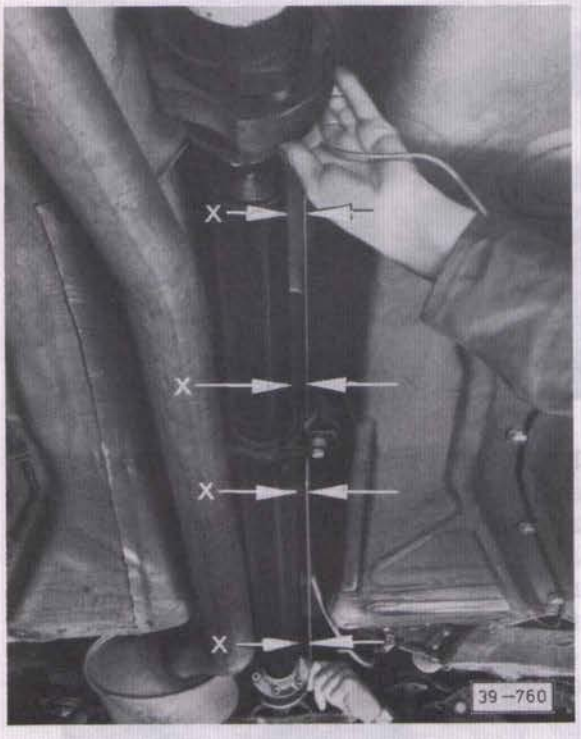


- Adjust the height of the propshaft at the trunnion by inserting appropriately thick adjustment washers so that the complete shaft forms an exactly straight line.

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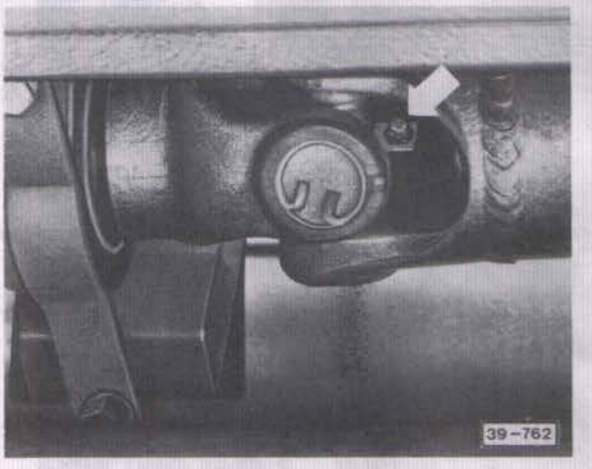
The following adjustment washers are available:

Part No.	Thickness (mm)
857 521 143	2
857 521 143 A	4
857 521 143 B	6
857 521 143 C	8
857 521 143 D	10



- Align the propshaft laterally by moving the central trunnion.
- To do this stretch a piece of string between the front and rear joint outside diameters and move the central trunnion until the distances marked with an x are of equal dimension.
- Ensure that the string does not rest against the central trunnion.

Lubricating propshaft



- The propshaft must be lubricated with lithium-based multi purpose grease at the Standard Services 3, 5, 7 ... and so on.

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File in booklet: Provisional Repair Instructions, May 1980 edition

Page to be marked: 89, 90

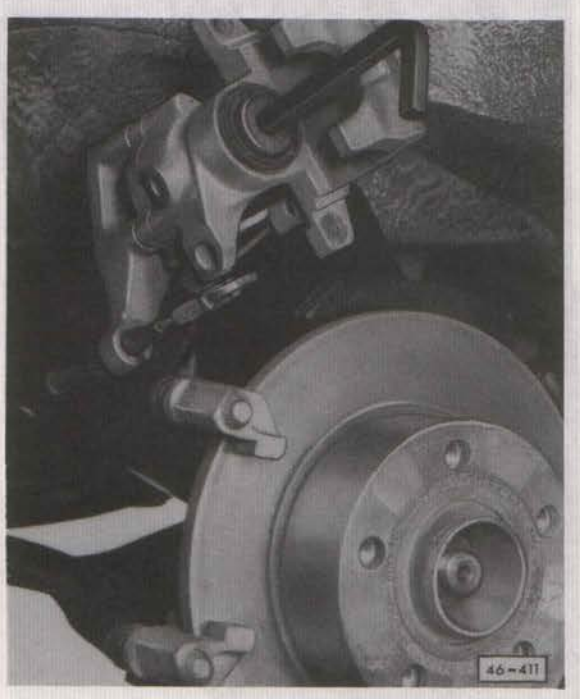
RENEWING REAR BRAKE PADS

- Remove wheels.
- If brake pads are to be reused they must be marked on removal so they can be installed in the same position, otherwise the brakes will pull unevenly.



- Detach cylinder housing.
- Remove brake pads.

Caution
Draw off a small amount of brake fluid from the reservoir before screwing back the pistons.
Use the bleeder bottle or a plastic bottle kept specially for this purpose.
Brake fluid is poisonous and must on no account be sucked out through a hose with the mouth.



- Screw in piston by turning to the right and pushing in firmly.

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- Fit brake pads.
- Install cylinder housing and torque bolts to 35 Nm.

Note:
Always use the 4 self-locking hex head bolts supplied in the repair kit.

BASIC ADJUSTMENT - REAR BRAKES

Important
Always carry out basic adjustment after renewing pads.

The handbrake cable must not be tensioned when carrying out the basic adjustment.

Checking adjustment:



- Press handbrake cable levers alternately against stops using a screwdriver (see arrow).

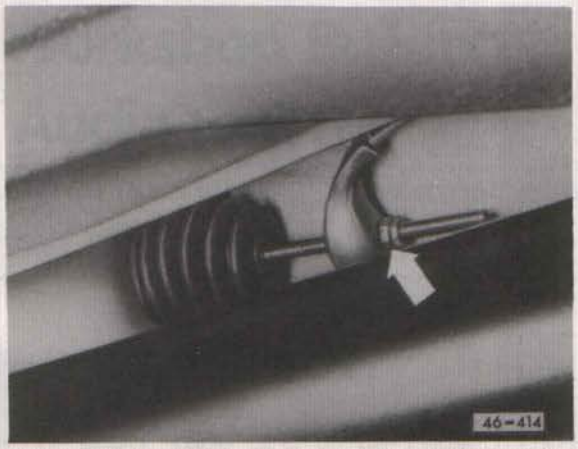


Note:

The illustration shows the stop (arrow) with the cylinder housing detached.

- If the lever on the opposite brake caliper is pulled away from its stop, this means that the handbrake cable is pretensioned too far.

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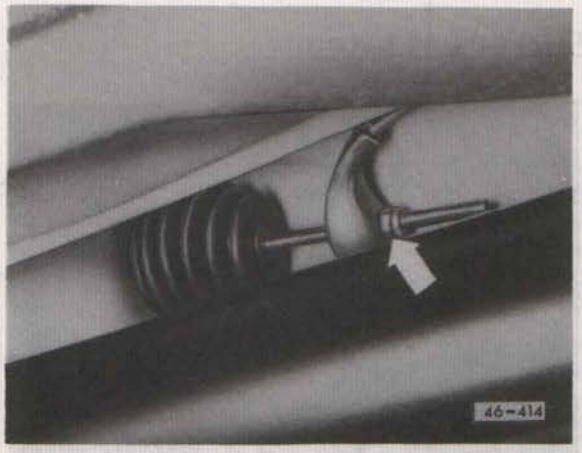
- Slacken off handbrake cable adjuster nut accordingly so that both levers contact their stops.
- With engine switched off depress brake pedal about 40 times with moderate force.
- Check that both wheels rotate freely.

ADJUSTING HANDBRAKE

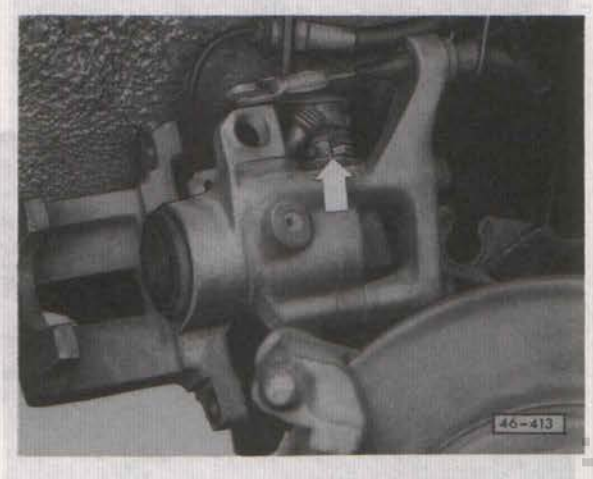
Note:
The rear brakes are self-adjusting, so the handbrake does not normally need readjusting. This is only necessary if the handbrake cables, the brake calipers or pull rod are renewed.

Important
Always carry out the basic adjustment for the rear brakes before adjusting handbrake - see pages 2 and 3.

new



- Turn handbrake cable adjuster nut until



both levers just move clear of the stops (two mechanics).

- Slacken off adjuster nut 2 turns.

Note:
The illustration shows the stop (arrow) with the cylinder housing detached.

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Checking adjustment:



- Press handbrake cable levers alternately against their stops using a screwdriver.



- If the lever on the opposite brake caliper is pulled away from the stop this means that the handbrake cable is tensioned too far.
- Slacken off handbrake cable adjusting nut accordingly until both levers contact their stops.
- Apply and release handbrake.
- Check that both wheels rotate freely, if necessary examine handbrake linkage for freedom of movement.

new

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File in booklet: Provisional Repair Instructions, May 1980 edition

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A number of modified components are being installed in production for improved running characteristics.

All the modified components, their position and appropriate test procedures are described in this Workshop Bulletin. Note these instructions when carrying out repairs.

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A- CONTROL UNIT FOR ELECTRONIC IGNITION, AUXILIARY AIR VALVE

There have been isolated cases of fluctuations in the tachometer reading when the throttle is closed abruptly at high engine speeds.

To prevent this an electronic ignition control unit with different ignition timing characteristics, Part No. 035 905 383 C, has been introduced from Ch. No. 85BA 900 903 onwards (and can also be used on earlier vehicles). The ignition timing at idle is now 12° before TDC, previously 6° before TDC.

Renewing:

When control unit 035 905 383 C is installed as a replacement part up to Ch. No. 85BA 900 902 and Ch. No. 85BA 901 297 with air conditioner it is also necessary to use auxiliary air valve Part No. 049 133 453 B, and to set the idle speed accordingly, see page 7.

The operation of the gate valve (opening and closing) in auxiliary air valve 049 133 453 B is matched to the different idle ignition timing characteristics of control unit 035 905 383 C. This influences engine speed during warm-up accordingly.

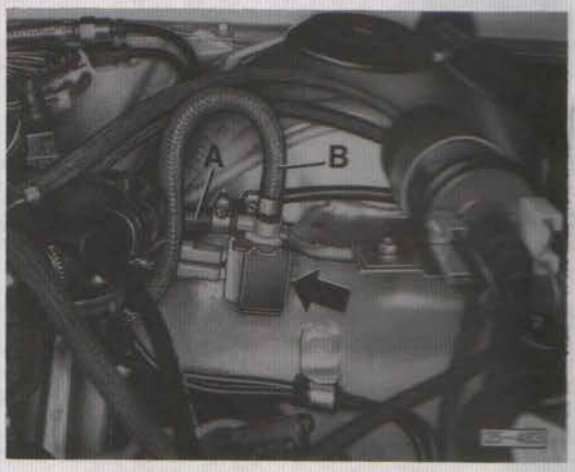
Auxiliary air valve Part No. 035 133 453 C will still be available as a replacement part for vehicles up to Ch. No. 85BA 900 902 and Ch. No. 85BA 901 297 with air conditioning.

The installation position and the test procedure for the control unit and auxiliary air valve have not been changed.

B - FAST IDLE VALVE (WITH AIR CONDITIONER)

Fast idle valve, Part No. 035 906 283, has been introduced from Ch. No. 85BA 901 298 onwards to improve idling behaviour with the air conditioner switched on.

Position:



The fast idle valve is mounted on the right of the bulkhead in the engine compartment and is connected via hose -A- to a T-piece in front of the throttle and via hose -B- to the intake manifold.

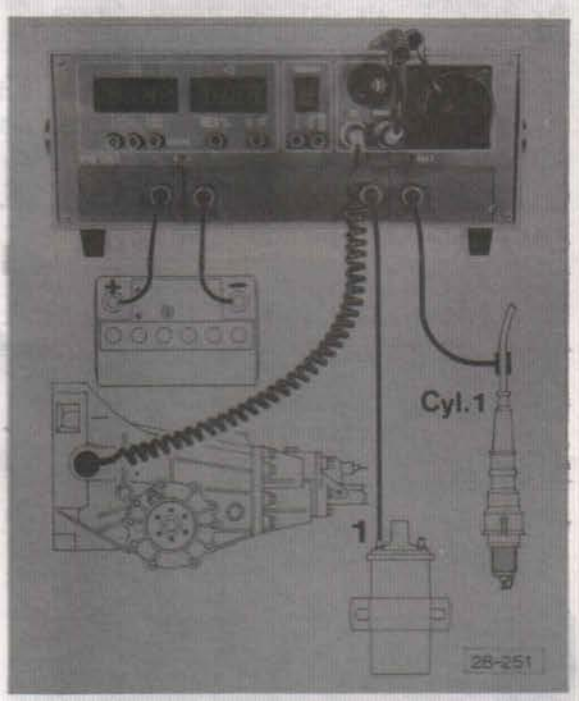
Operation:

When the air conditioner is switched on the fast idle valve is opened electrically, energised by the magnetic clutch of the air conditioner. This feeds additional air directly into the intake manifold, bypassing the throttle, thus giving a slightly faster engine speed.

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Testing:

- All hoses properly connected and airtight.
- Wiring connected properly.



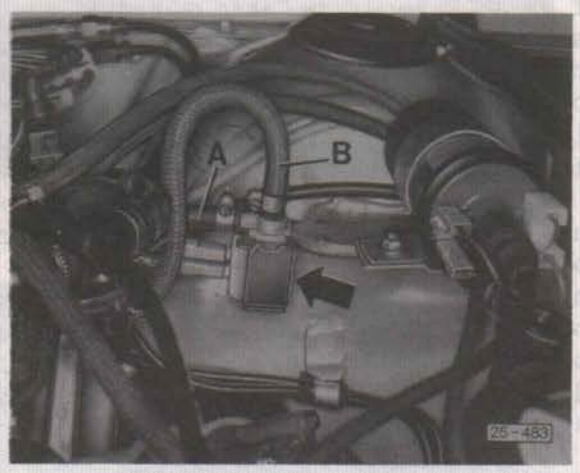
- Connect test instrument according to operating instructions.



- Use an adaptor for connection to terminal 1 on ignition coil.
- Start engine and run at idle.
- Switch on air conditioner.

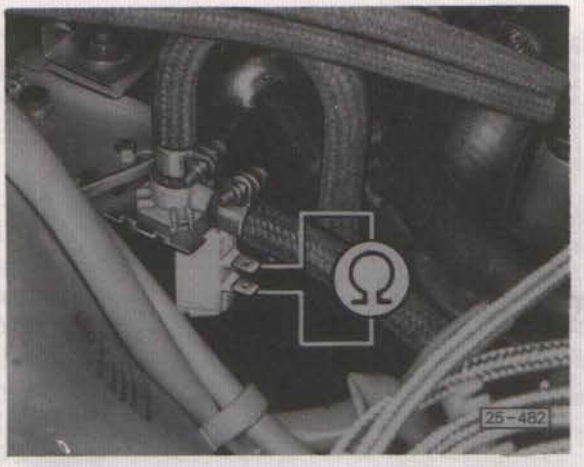


- Check whether magnetic clutch of air conditioner has engaged. (Clutch plate must turn with air conditioner compressor pulley).
- Measure engine speed.



- Pinch together hose -A- or -B-. Engine speed must drop, otherwise check electrical operation of fast idle valve:
- Disconnect plug from fast idle valve.

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- Connect ohmmeter and measure resistance.
  Specified resistance: approx. 24 ohms, otherwise renew fast idle valve.

Note:

If test readings are correct but fast idle valve still does not work properly, check power supply for fast idle valve using current flow diagram and repair break in wiring if necessary.

The electrical wiring is identical to that given for 2-way valve N 16 in current track 6 shown in Workshop Bulletin No. 1, Audi 80, Audi Coupé, Heating, Air Conditioner, edition 2/81, except that the wiring is routed differently.

C - SENDER UNIT FOR INTAKE AIR TEMPERATURE

The sender unit for intake air temperature, Part No. 035 905 379 B (previously 035 905 379 A) has been introduced from Ch. No. 85BA 901 141 onwards.

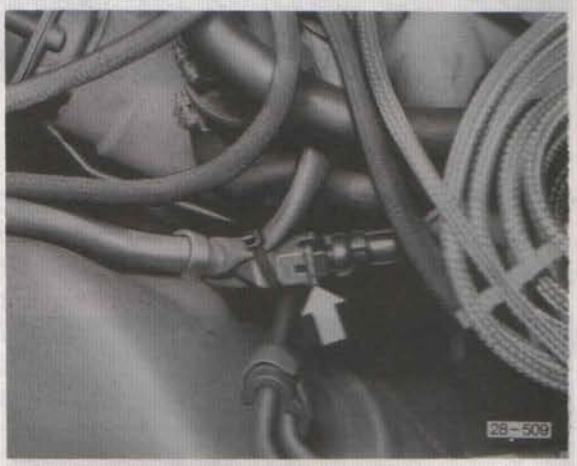
The new sender unit has welded or soldered wiring connections instead of the plug connector.

This ensures trouble-free contact at the sender unit.

The installation position has not been changed, but the test procedure is different because of the way the wiring is attached.

Testing:

Vehicles from Ch. No. 85BA 901 141



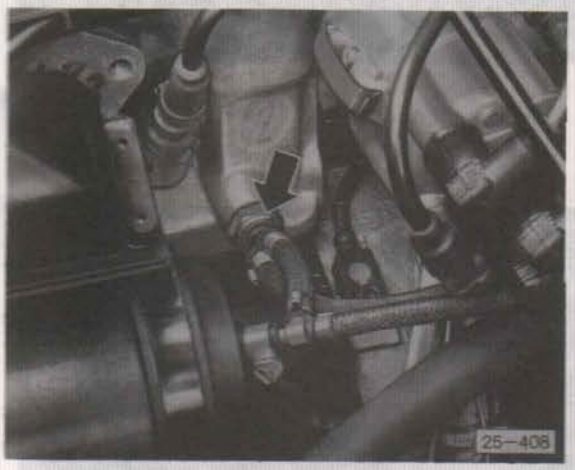
From Ch. No. 85BA 901 141 up to Ch. No. 85BA 901 344 the temperature sender units installed had the connecting wires soldered or welded onto the sender unit, but a plug connector is provided on the right hand wheelhousing.

- Disconnect plug connector.
- Connect ohmmeter between contacts on the sender unit side of the connection.
- Measure resistance.
  Specified resistance: 13 - 33 ohms, otherwise renew sender unit.
- Continue testing as follows.

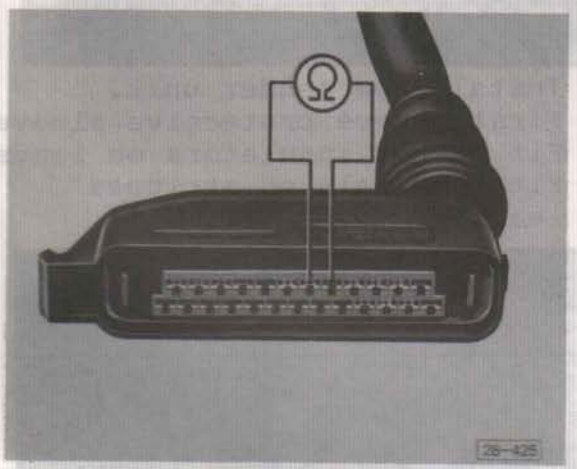
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- Remove glove compartment.

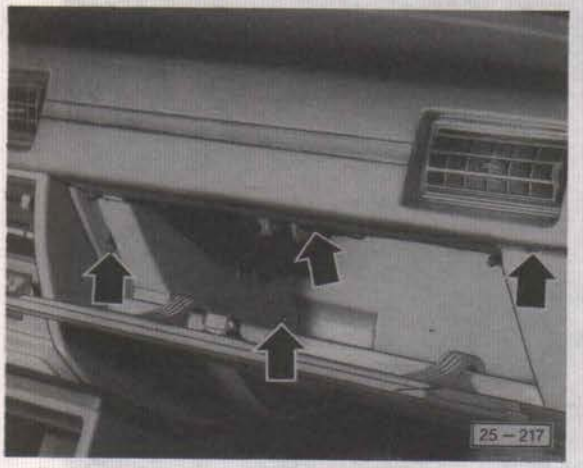


- Disconnect plug from control unit for electronic ignition system.



- Connect ohmmeter between contacts 18 and 19 on disconnected plug.
- Measure resistance.
  Specified resistance: 13-33 ohms, otherwise trace and repair break in wiring between contacts 18 and 19 of disconnected plug for electronic ignition control unit and connector on wheelhousing (Fig. 28-509).

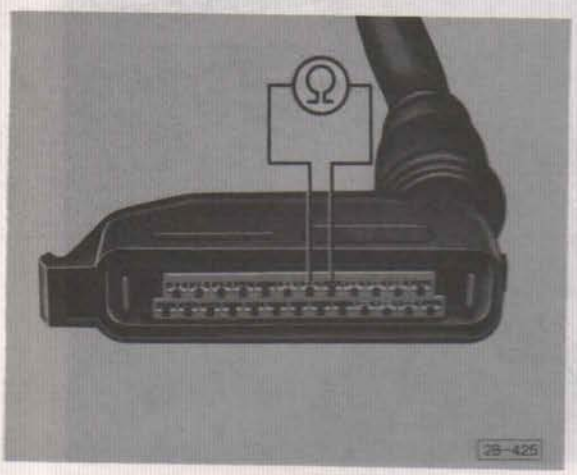
Checking:
Vehicles from Ch. No. 85BA 901 345 onwards.



- Remove glove compartment.

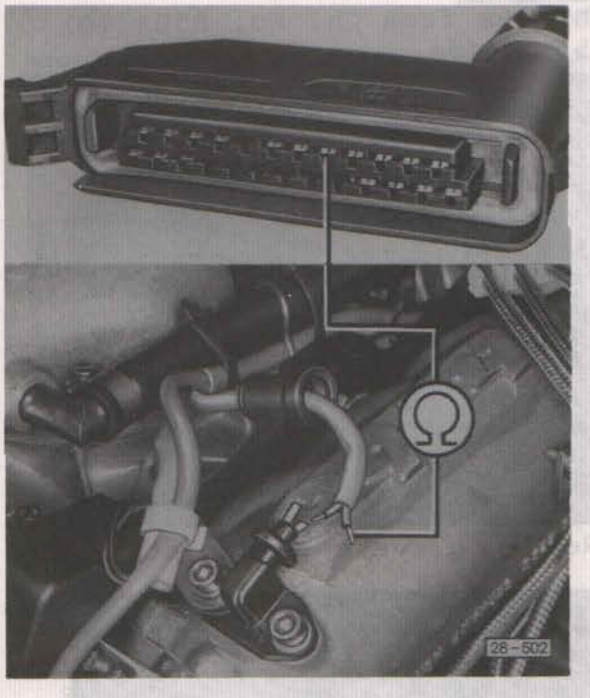


- Disconnect plug from control unit for electronic ignition.

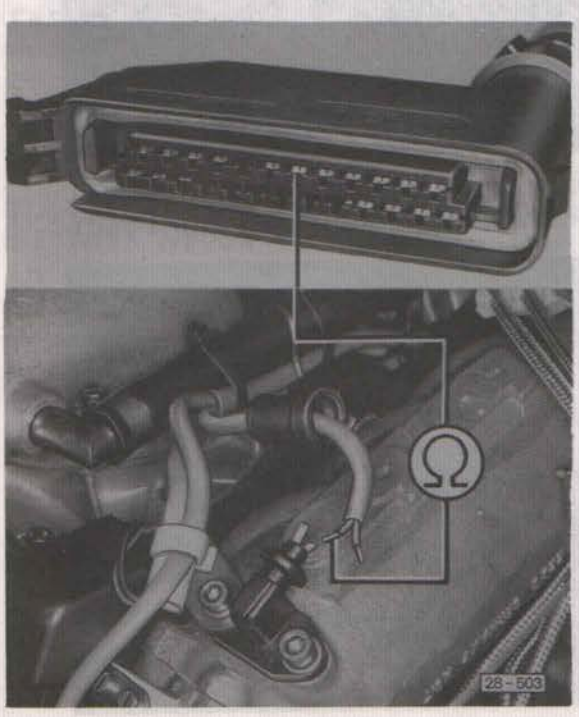


- Connect ohmmeter between contacts 18 and 19 of disconnected plug.
- Measure resistance. Specified resistance: 13-33 ohms.
- Push back grommet on temperature sender unit.

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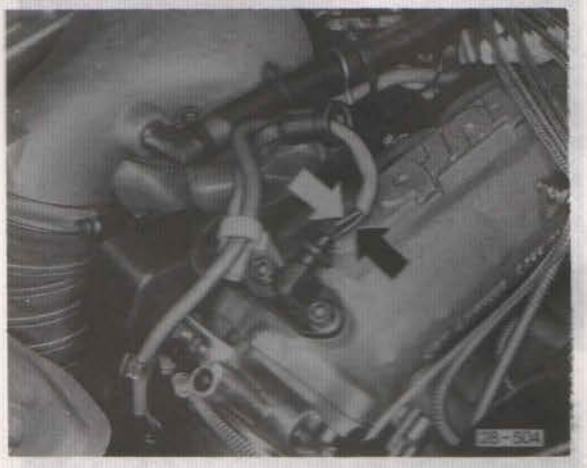


- Connect ohmmeter between lead and contact 18 on plug.
- Measure resistance. Specified resistance: 0 ohms, otherwise renew lead.

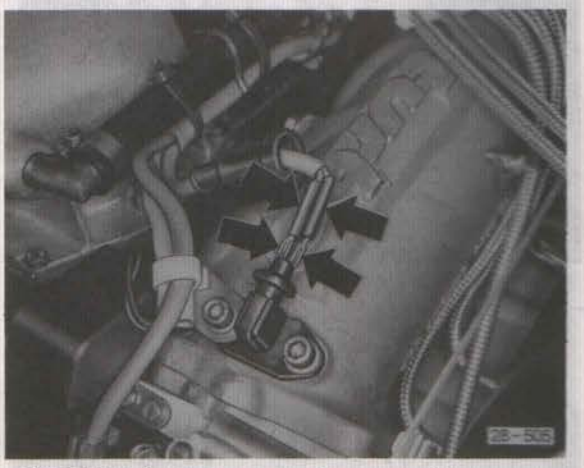


- Connect ohmmeter between lead and contact 19 on plug.
- Measure resistance. Specified resistance: 0 ohms, otherwise renew lead.

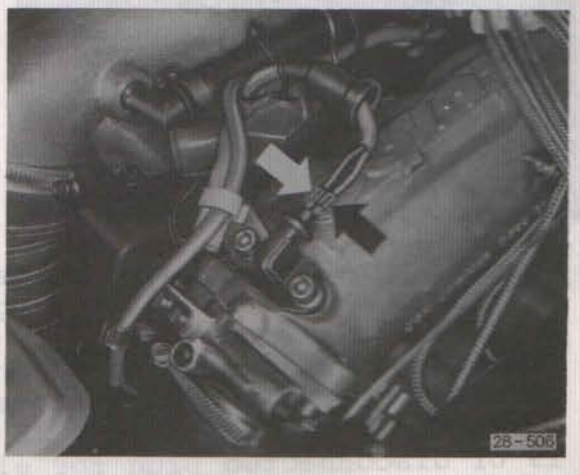
Renewing:



- Separate leads from sender unit and remove insulation.
- Remove sender unit.



- Install new sender unit. First remove protective sleeve.
- Fit rubber insulators on leads.
- Fit terminals on stripped leads.



- Solder leads to contacts on sender unit.
- Position rubber insulators.

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D - IDLE SPEED

From now on a lower idle speed setting is specified for quieter engine running. This also applies to earlier models.

Up to and including Ch. No. 85BA 900 902 and 85BA 901 297 with air conditioner

850 ± 50 rpm

From Ch. No. 85BA 900 903 and 85BA 901 298 with air conditioner

800 ± 50 rpm.

Note:

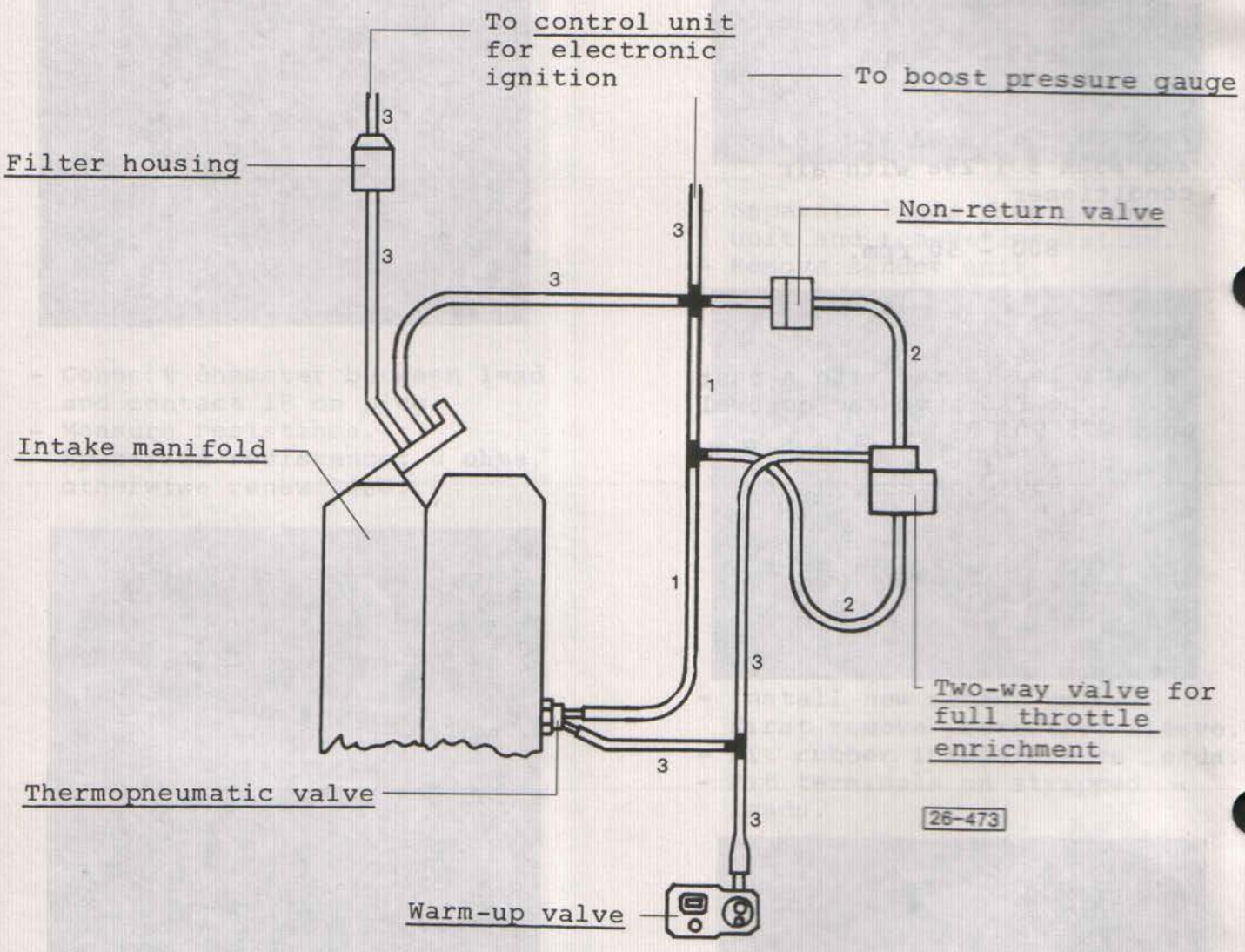
On vehicles fitted with a cast iron type PAS pump and control unit 035 905 383 C

850 ± 50 rpm.

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E - VACUUM CONNECTIONS

On vehicles without air conditioner from Ch. No. 85BA 901 373



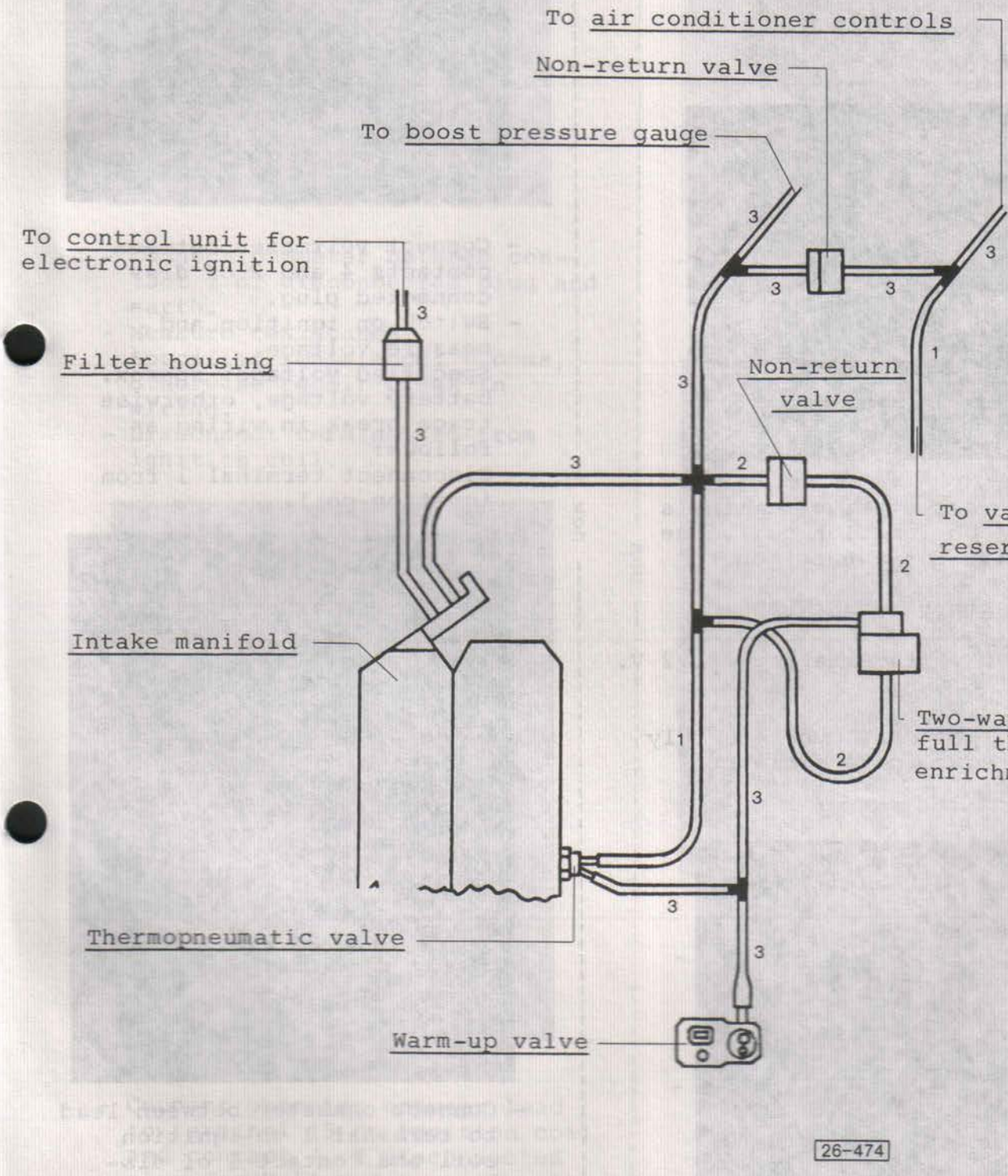
Vacuum hose colour coding

1 - red
2 - grey
3 - black

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E - VACUUM CONNECTIONS

On vehicles with air conditioner from Ch. No. 85BA 901 319



Vacuum hose colour coding

1 - red
2 - grey
3 - black

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F - CHECKING HALL TCI CONTROL UNIT

The test procedure for the Hall TCI control unit has been changed. The procedure described on page 48 of the Workshop Manual is no longer applicable.

Checking:



- Connect voltmeter to terminals 15 and 1 on ignition coil. Use an adaptor for connection to terminal 1.
- Operate starter and measure voltage.
  Specified voltage: approx. 1.2 V.

Note:
The plenum chamber cover has only been removed to give a clear photograph.



- Disconnect plug from Hall TCI control unit.

new



- Connect voltmeter between contacts 4 and 2 of disconnected plug.
- Switch on ignition and measure voltage.
  Specified voltage: approx. battery voltage, otherwise trace break in wiring as follows:
- Disconnect terminal 1 from ignition coil.

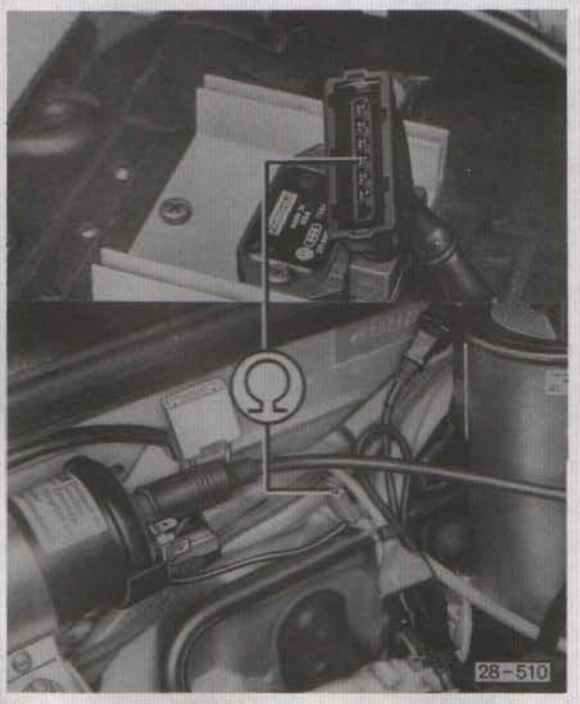


- Connect ohmmeter between lead to terminal 1 on ignition coil and contact 1 of disconnected plug for Hall TCI control unit.
- Measure resistance.
  Specified resistance: 0 ohms, otherwise repair break in wiring.

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- Connect ohmmeter between contact 2 of disconnected plug and earth.
- Measure resistance.
  Specified resistance: 0 ohms, otherwise repair break in wiring.
- Disconnect terminal 15 from ignition coil.

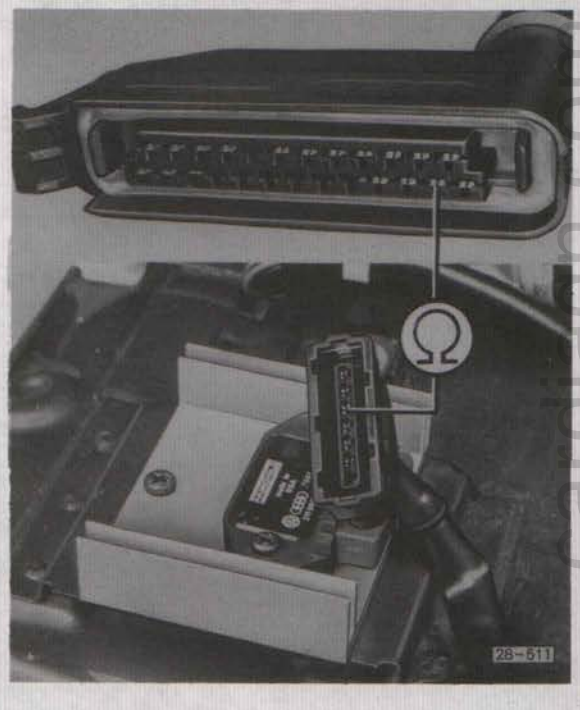


- Connect ohmmeter between lead to terminal 15 on ignition coil and contact 4 of disconnected plug for Hall TCI control unit.
- Measure resistance.
  Specified resistance: 0 ohms, otherwise repair break in wiring.
- Remove glove compartment.

new



- Release and disconnect plug for electronic ignition control unit.



- Connect ohmmeter between contact 2 on plug for electronic ignition control unit and contact 3 on plug for Hall TCI control unit.
- Measure resistance.
  Specified resistance: 0 ohms, otherwise repair break in wiring.

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- Connect ohmmeter between contact 17 on plug for electronic ignition control unit and contact 6 on plug for Hall TCI control unit.
- Measure resistance.
  Specified resistance: 0 ohms, otherwise repair break in wiring.

Note:

Renew the Hall TCI control unit if the tests show no faults in the wiring.

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