

# List of Repair Groups 944

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**Technical Data 924 S / 944 / 944 S / 944 S2****Front axle****Wheel suspension**

Independent wheel suspension with steel or light-alloy control arms and spring struts (McPherson design).

Steel control arms: 944 up to MY '85/2 and 924 S

Light-alloy control arms: 944 as of MY '85/2 and 944 S / 944 S2

**Springs**

One coil spring per wheel, mounted coaxially to the damper strut

**Shock absorbers**

Double-acting hydraulic damper struts standard:

VW or F + S

Special option: Koni / FS for 944 S2 with M 031 as of MY '90

**Stabilizers****Standard****Option**

up to end of MY '86 and 924 S

Solid stabilizers  
20 mm dia.

Solid stabilizer  
21.5 mm dia. or  
tubular stabilizer  
23 x 3.5 mm dia.

944 as of MY '87  
944 S  
(introduced during  
MY '87)

Solid stabilizers  
20 mm dia. or  
21.5 mm dia.  
(including part of  
production with M 404,  
supplied as standard  
equipment =  
tubular stabilizer front  
25.4 x 4 mm dia. and  
solid stabilizer rear  
18 mm dia.)

Tubular stabilizer  
25.5 x 4 mm dia.

944 S2

Tubular stabilizer  
26.8 x 4 mm dia.

as for standard  
version

## TORQUE SPECIFICATIONS FOR FRONT AXLE

Location	Description	Threads	Material	Tightening torque Nm (ftlb)
Control arm to cross member	Self-locking hex nut	M 12x1.5	8	65 (48)
Control arm to body	Hex bolt	M 10	8.8	46 (34)
Control-arm bearing to aluminum control arm (caster eccentric)	Self-locking hex nut	M 12x1.5	8	85 (63)
Control arm to steering knuckle	Self-locking hex nut	M 10	12	50 (37)
Cross member to body	Hex bolt	M 12	8.8	85 (63)
Guard for hydraulic bearing to cross member	Hex bolt	M 6	8.8	10 (7)
Tie rod to steering knuckle	Castle nut, self-locking nut	M 12x1.5 M 12x1.5	22 H	30+20 (22+14) 50 (37)
Stabilizer linkage to body	Hex bolt	M 8	8.8	23 (17)
Clamp for stabilizer to linkage	Locknut	M 8	8	23 (17)
Stabilizer to steel control arm	Locknut	M 8	8	23 (17)
Stabilizer linkage to aluminum control arm	Self-locking hex nut	M 10	8	25 (18)
Plug for shock absorber cartridge	Threaded cap			150 + 30 (111 + 22)
Spring strut bearing to spring strut	Self-locking hex nut	M 14x1.5	8	77 (57)
Panhead bolt to clamping nut	Socket-head bolt	M 7	10.9	13 + 3 (9.5 + 2.2)

Location	Description	Threads	Material	Tightening torque Nm (ftlb)
Guard to steering knuckle	Hex bolt	M 7	8.8	10 (7)
Floating caliper to steering knuckle	Hex bolt	M 12x1.5	8.8	85 (63)
Spring strut to steering knuckle	Self-locking hex nut	M 12x1.5	10	100 (74)
Spring strut to body	Hex nut	M 8	8	25 (18)
Brake disc to wheel hub	Hex nut	M 8	8	23 (17)
Track control arm joint to steel control arm	Hex nut	M 7		25 (18)
Light alloy wheel to brake disc	Light-alloy wheel nut	M 14x1.5	AlZnMgCU 1.5 F 53	130 (96)
Steel wheel to brake disc	Steel spherical collar nut	M 14x1.5	10.9	130 (96)



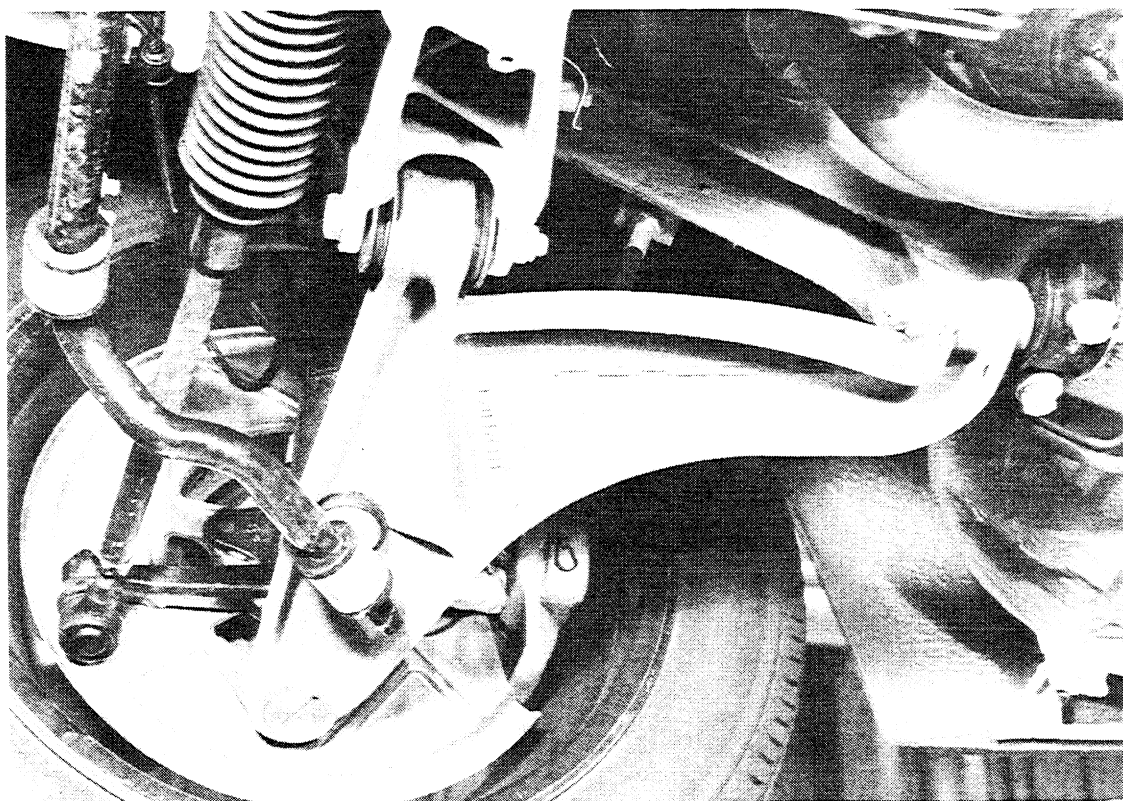
## LIGHT ALLOY\* CONTROL ARMS - MODIFICATIONS/NOTES

In 1985/2 models onward, the steel control arms were replaced by cast light alloy front-axle control arms\* characterized by increased rigidity and lower dead weight.

The rubber bearing was redesigned and the caster adjusting eccentric modified.

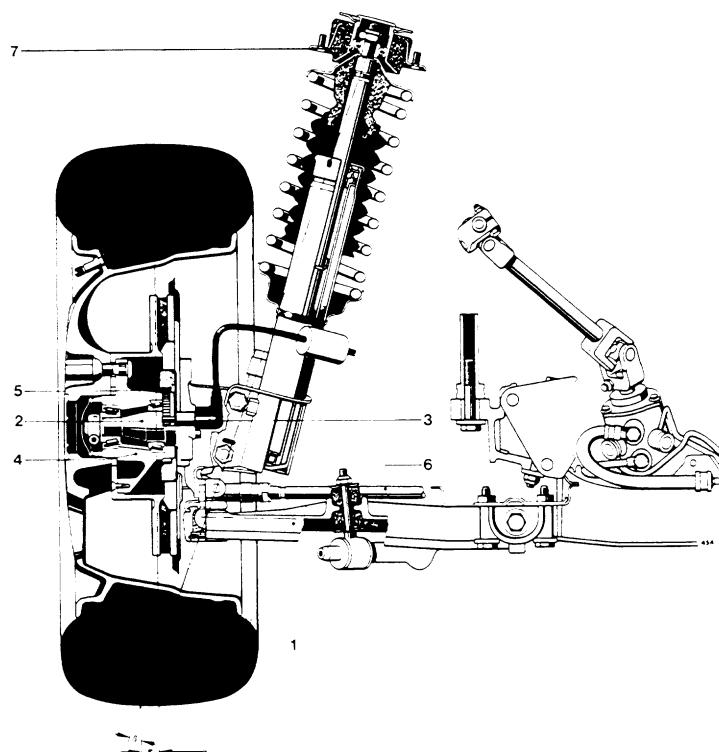
The ball-and-socket joint of the light-alloy control arm is not available as a spare part, because it cannot be changed with conventional workshop equipment. In the event of damage (e.g. if the protective rubber cap should leak), the control arm must be replaced as a whole.

The light-alloy control arms can be installed in cars with steel control arms. Parts required are the caster eccentric, the stabilizer to control arm linkage (stabilizer mounting point on control arm has been modified) and the bearing parts.



\*The 924 S is not fitted with light-alloy control arms.

## NOTES ON FRONT AXLE, '87 MODELS ONWARD



- As of model year '87, all 4-cylinder cars will have negative steering offset (r)

- The front axle of the 924 S has not been modified, as the steering offset is already negative

- To achieve a negative steering offset (approx. 14.5 mm) in the 944/944 S/944 turbo, the parts listed below have been modified

No./Designation	The most important front-axle modifications to the 944/944 S/944 turbo, '87 models onward
1 - Front-axle control arm	Extended at outboard end
2 - Steering knuckle	Wheel-bearing pin larger. Cars with ABS have a hole to locate wheel-speed sensor (No. 3)
4 - Wheel hub	Modified geometry and wheel bearing seat
5 - Wheel bearing (taper roller)	Larger (from 928 S)
6 - Track rod	Longer than before, same as in 924 S
7 - Spring strut bearing	Modified to accommodate increased angle of spring strut. King pin inclination has been increased by approx. 4° to 20°.
- - Rims	Rim offset modified (except 924 S)

## **Running gear tuning (rubber-metal mounts) of 944 S2**

Starting with Model Year 1991, a standardized version of the rubber-metal mounts of the running gear was used.

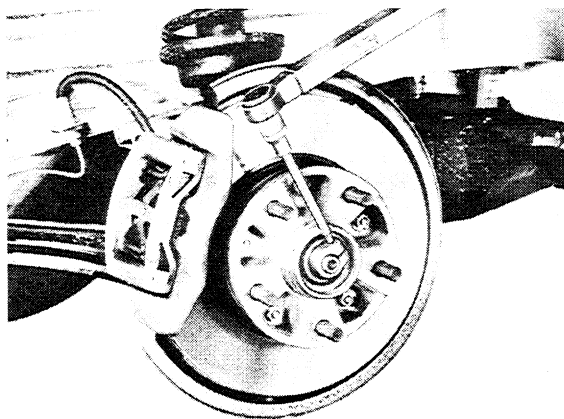
Based on the former versions of „hard“ as used on the 944 Turbo and 944 S2 with M 030, and the „soft“ version fitted as standard equipment to the 944 S2, an ideal state of tuning was determined. This concerns both the front and the rear axle.

**Please refer to page 42 - 04 for an overview of the old and new versions (as used from MY '91). When performing repair operations, make sure this modification is taken into account.**

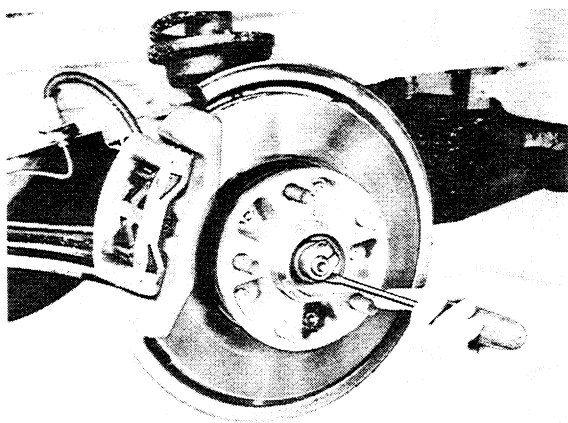
### ADJUSTING FRONT WHEEL BEARINGS

Wheel-bearing play is correct when finger pressure applied to a screwdriver (never use a turning action or leverage) will still move the thrust washer.

1. Remove wheel. Pry off hub cover with two tire levers.
2. Unscrew socket-head bolt of clamping nut. Tighten the clamping nut slightly while turning the hub at the same time.
3. Slacken clamping nut until finger pressure applied to a screwdriver is just enough to move thrust washer. Do not rest screwdriver on hub.



5. Re-check setting by moving thrust washer, correct if necessary.



4. Tighten socket-head bolt of clamping nut to  $13 + 3 \text{ Nm}$  ( $9.5 + 2.2 \text{ ftlb}$ ) without turning clamping nut.

## CHECKING PROTECTIVE CAPS OF BALL JOINTS ON CONTROL ARMS AND TIE RODS

The rubber caps fitted to the ball joints on the front axle may be damaged by external influences, e.g. flying stones, or during assembly work. If a protective cap leaks, the control arm or the joint of the tie rod must be replaced, as dirt or moisture penetrating the joint will cause its destruction. For this reason, we also recall the point contained in the service plan for vehicle maintenance entitled:

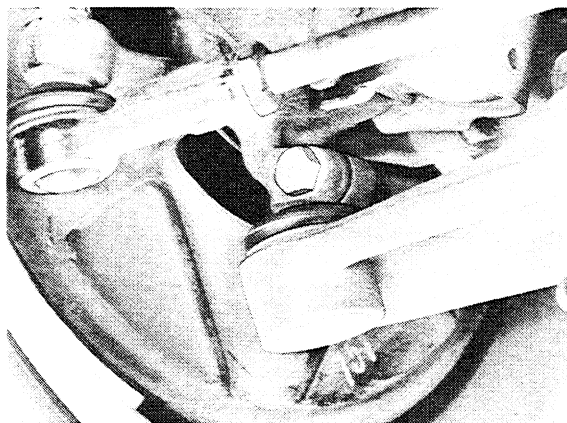
Check tightness of all connections to steering gear, tie rods and control arms, check operation and leaktightness of protective caps and joints.

We also recommend a visual check of the protective caps fitted to the joints for leaks when work is performed on the front axle (visual inspection).

### Checking protective rubber caps of ball joints on control arms

1. Raise car on lifting platform, steering lock disengaged.
2. Turn front wheels to full lock.
3. Inspect visible surfaces on left and right after cleaning. Press rubber cap back with fingers to reveal any hidden cracks.
4. Turn front wheels to opposite lock and check other half of rubber caps.

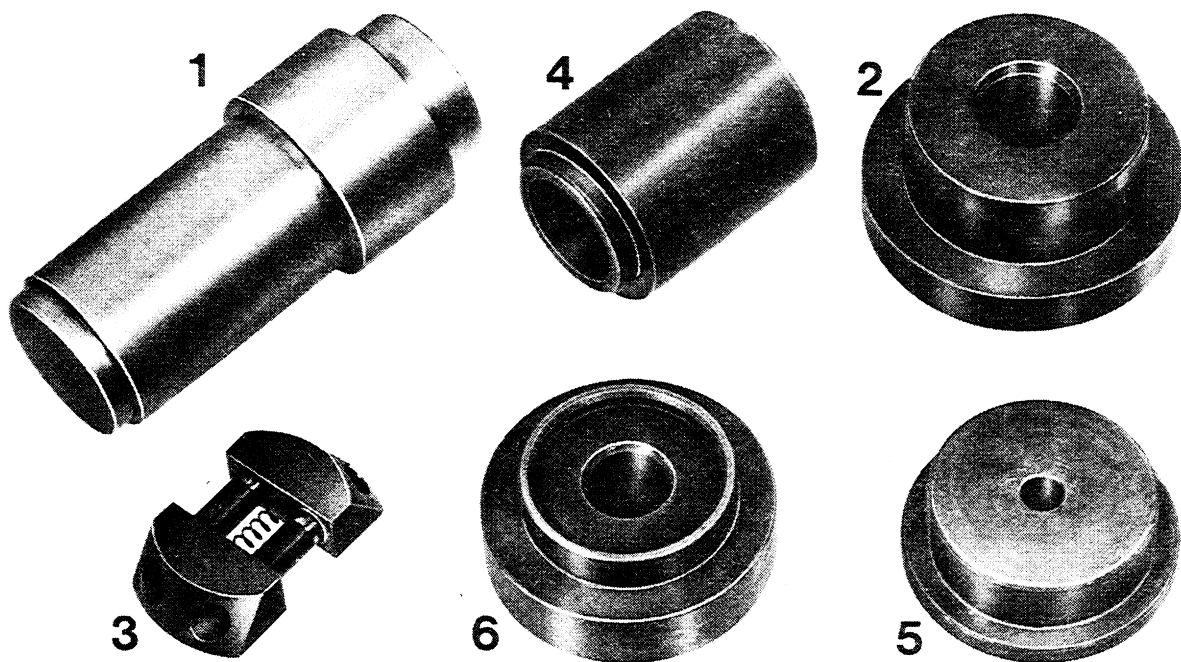
A small area near the brake disc guard cannot be inspected visually. Check this area by hand.



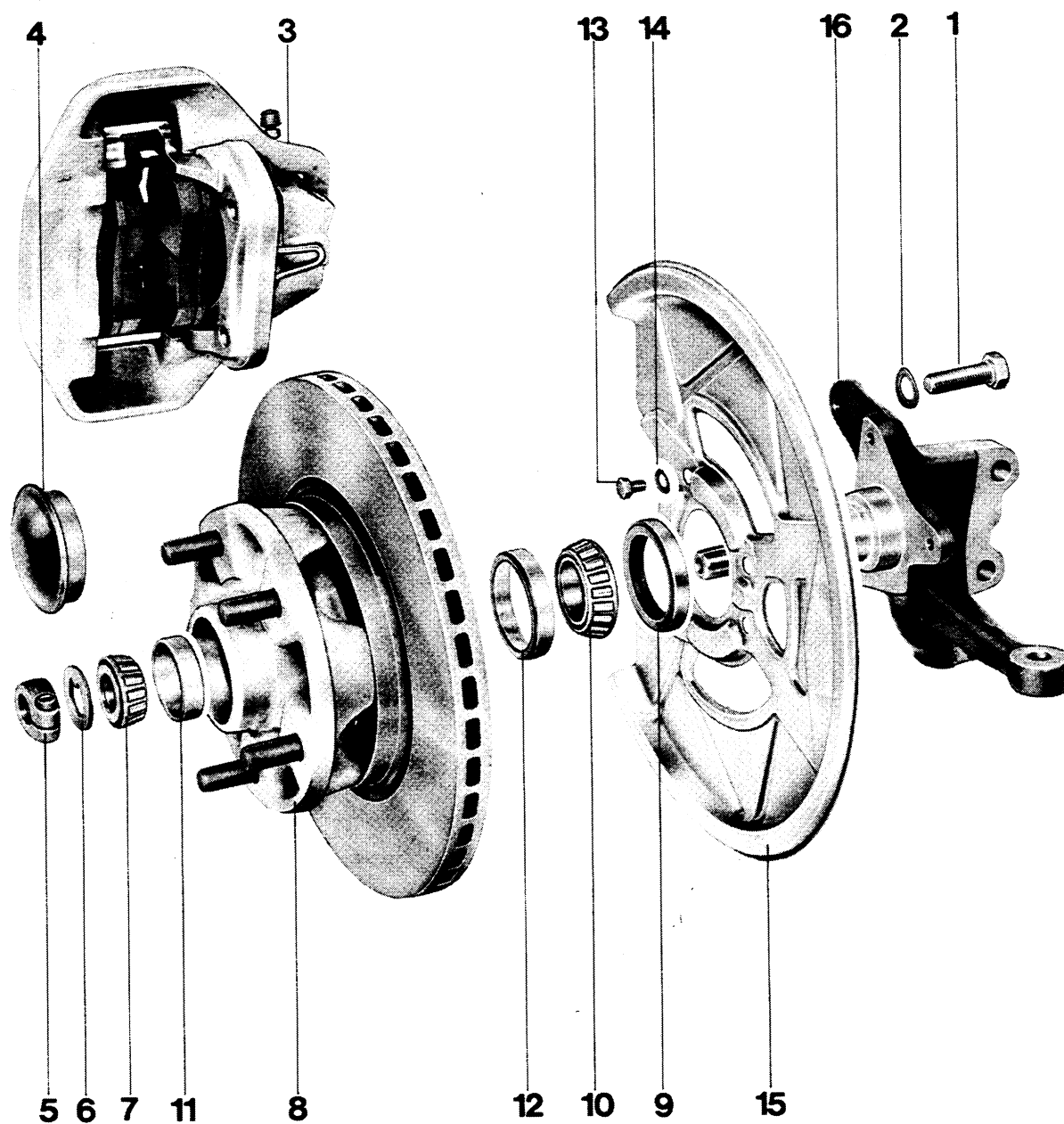
### Note on the tie-rod joints

Tie rod joints with different identification codes were used, depending on type, model year and model. Check that parts are correctly matched to avoid any negative influence on steering.

## TOOLS



No.	Description	Special Tool	Remarks
1	Press tool	9154	
2	Press tool	VW 511	
3	Press tool	P 85	
4	Press tool	P 263	
5	Press tool	VW 447 i	
6	Press tool	VW 433	



No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Bolt M 12 x 1.5 x 40	2		Torque: 85 Nm (61 ft lb)	
2	Washer	2		Replace if necessary	
3	Brake caliper	1	Do not detach brake hose for work on front wheel suspension, but suspend from suitable point with piece of wire.		
4	Grease cap	1	Pry off with two tire irons		
5	Clamping nut with bolt	1		Adjust wheel bearing play. Bolt torque: 13 Nm (9 ft lb)	
6	Thrust ring	1			
7	Wheel bearing, outer	1		Check, replacing if necessary. Lubricate with multi-purpose grease	
8	Front wheel hub with brake disc	1		Pack wheel bearings and wheel hub with approx. 60 grams of multi-purpose grease	
9	Radial oil seal	1	Press out with a screwdriver	Replace, press in with VW 433. Use VW 511 as support underneath wheel hub. Pack space with multi-purpose grease	
10	Wheel bearing, inner	1		Check, replacing if necessary. Lubricate with multi-purpose grease	

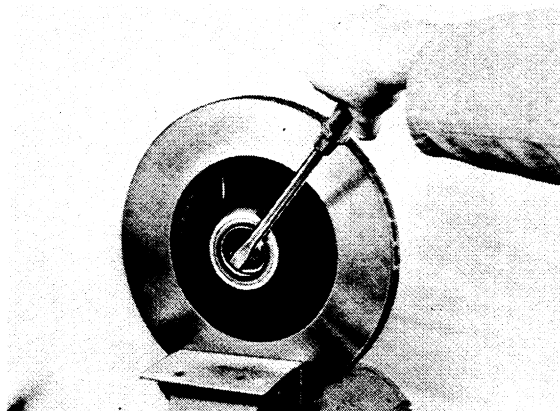


No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
11	Bearing outer race	1	Heat wheel hub to 120 ... 150 °C (250 ... 300 °F). Use VW 511 as support underneath wheel hub. Press out with 9154	Heat wheel hub to 120 ... 150 °C (250 ... 300 °F). Insert and press in with P 263	Straightening is not approved.
12	Bearing outer race	1	Heat wheel hub to 120 ... 150 °C (250 ... 300 °F). Press out with P 85 and 9154. Use VW 511 for support	Heat wheel hub to 120 ... 150 °C (250 ... 300 °F). Insert with VW 447 i and press in with 9154. Use VW 511 for support	
13	Bolt	3		Torque: 10 Nm (7 ft lb)	
14	Washer	3		Replace if necessary	
15	Cover	1			
16	Steering knuckle	1		Check seats for front wheel bearings for wear	

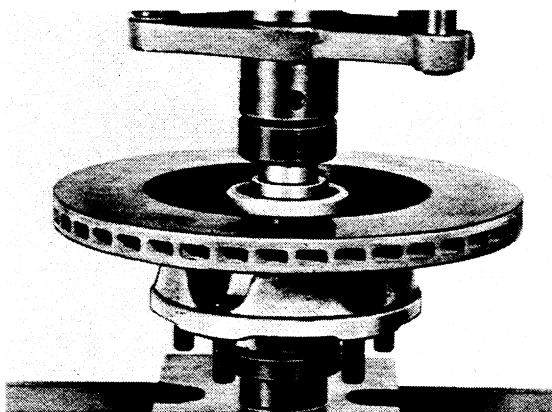
## DISASSEMBLING AND ASSEMBLING WHEEL SUSPENSION

## Disassembling

1. Pry off grease cap with two tire irons.
2. Pry out radial oil seal with a large screwdriver.  
Be careful not to damage bearing surface for seal.



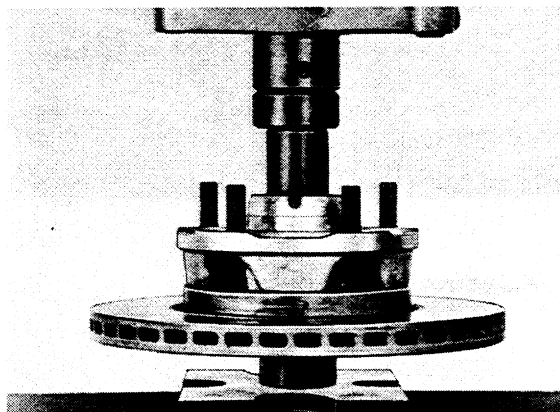
3. Heat wheel hub with brake disc to 120 ... 150 °C (250 ... 300 °F). Press out small bearing outer race.



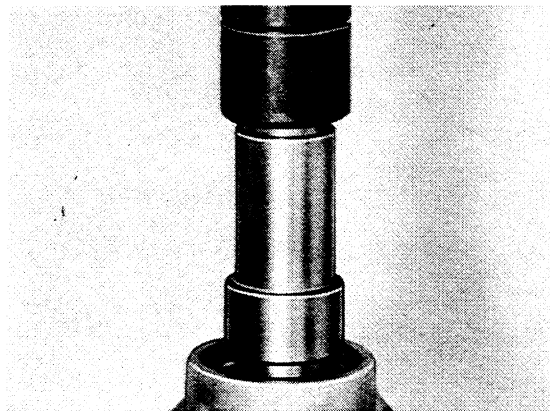
4. Press out large bearing outer race with Special Tools P 85 and 9154. Use Special Tool VW 511 for support.

## Assembling

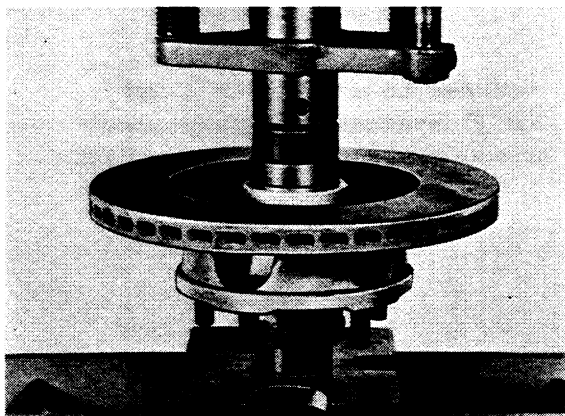
1. Heat wheel hub to 120 ... 150 °C (250 ... 300 °F). Install small bearing outer race and press in against stop with Special Tool P 263.



2. Press in large bearing outer race against stop with Special Tools 9154 and VW 447 i. Use Special Tool VW 511 as support underneath the wheel hub.



3. Press in seal far enough so that it is flush with the hub.



4. Adjust front wheel bearing play.

# KONI SHOCK ABSORBER INSTALLATION CHART/REPLACING KONI SHOCK ABSORBER CARTRIDGES\*

In all 924 S models and the 944 until end of model year '86, only the cartridge of Koni shock absorbers can be replaced. However, replacement is only possible if the housing is not damaged (deformed).

In the course of model year 1982, the specifications for the compression and rebound stages for the front and rear axles were changed. It is not possible to adapt the initial version to the modified version by adjustment. Replacement cartridges and replacement dampers are pre-set. Initial-design shock absorbers and shock-absorber cartridges are no longer available as spare parts. Install the modified shock-absorber cartridges or shock absorbers in cars with original-design absorbers. Mixed installation is not permissible unless two absorbers of the same design are fitted per axle.

<u>SP No. and code of shock-absorber cartridges</u>	<u>Specification**</u>	<u>Application/installation and code/paint finish of complete shock-absorber assembly</u>
477 412 059 B Painted yellow	Adjusted approx. 1 turn from basic setting	944 initial design black, yellow ring
944 343 059 00 Painted yellow with blue adhesive tape (color-code dot)	Adjusted approx. 1/2 turn from basic setting	Modified design (installation in course of model year 1982) 944 until end of model year '86. 924 S black, blue ring or yellow, blue ring
(944 343 059 01)*** Painted yellow with green ring (color-code dot)	Adjusted approx. 2 turns from basic setting	Sports running gear M 030, 944 until end of model year '86, 924 S - black (only used with green dot). - black, height-adjustable - yellow, green ring

\* Applies only for 924 S all models and for 944 until end of model year '86.

\*\* These specifications are approximate values. Precise adjustments are made in the factory with a shock-absorber testing machine. This is the only way of attaining the specified absorption forces. Replacement cartridges and replacement shock absorbers are pre-adjusted.

\*\*\* Not available as spare part. Same design as 944 343 059 00, but with different setting.

## Procedures for Adjusting Rebound Travel

1. Push down piston rod completely. Turn piston rod (without using force) until adjusting cam engages in opening of valve. Mark engaging position on piston rod and housing with chalk.
2. Now turn piston rod according to required absorbing force. Use a 7 mm wrench socket for turning.

Left (anticlockwise)

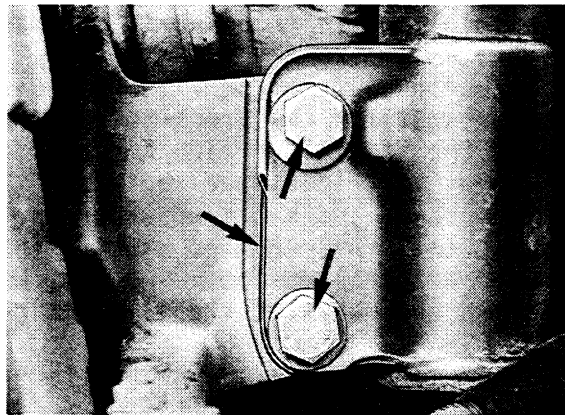
Piston rod facing up  
(installed position)

Softer rebound travel

Right (clockwise)

Piston rod facing up  
(installed position)

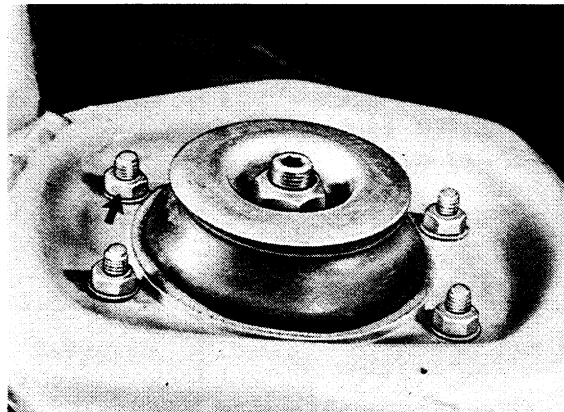
Harder rebound travel



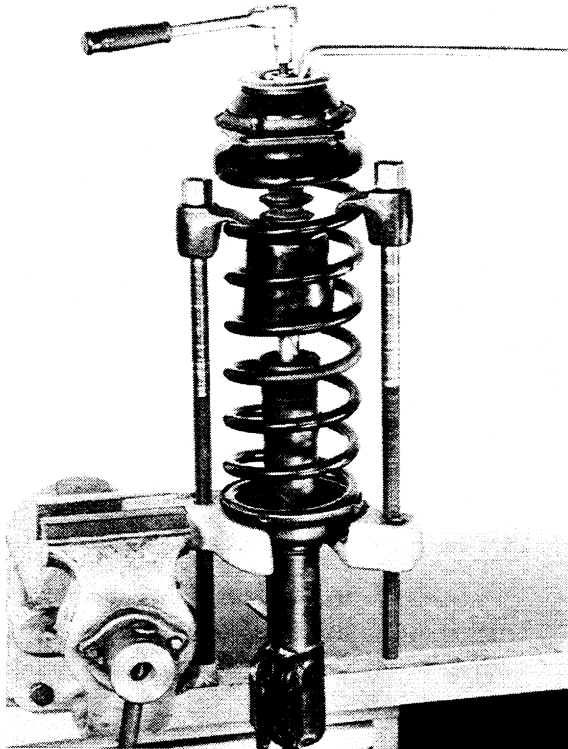
3. Unscrew four mounting nuts of spring strut mount on wheel housing. Take out spring strut.

3. After finishing adjustments pull up piston rod again to disengage the adjusting mechanism.

## Removing Shock Absorber Cartridge



1. Remove wheel. Take brake hose out of holder on spring strut.
2. Mark position of spring strut to steering knuckle. Do this carefully to make sure of correct camber and toe. Remove hexagon head and eccentric bolt on steering knuckle.
4. Compress coil spring with VW 340 or a standard coil spring compressor, unscrew self-locking nut and take off stop and bearing flange.



### Installing Shock Absorber Cartridge

1. Remove any escaped oil in the housing and clean inside of housing.
2. Install new cartridge. Do not forget spacer between cap and cartridge (supplied loose). Tighten cap to torque of  $150 \pm 30$  Nm.

#### Note :

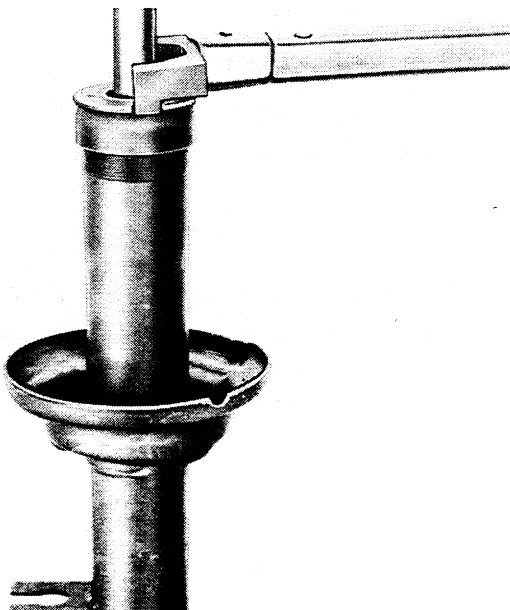
The shock absorber housing may be filled with thin oil or ATF to improve cooling.

However the shock absorber housing should not be more than max. 2/3 full, if cartridge is touching bottom of housing.

If too much oil is added, it would run out of housing when hot. This would automatically cause incorrect diagnosis (defective absorber).

5. Release coil spring and take all parts off of piston rod.
6. Clamp shock absorber in a vise (fitted with soft jaws) and unscrew cap with 9186 or equivalent. Pull out old cartridge.

3. Install spring strut in car after assembling. Line up spring strut with marks accurately when bolting. Do not only adjust on the camber eccentric, but also compensate the play of the hexagon head bolt in the lower bore. Replace all self-locking nuts and tighten to specified torque.



4. Check axle alignment with tester, since it can not be sure that car still had specified values before removal of spring strut or values were within tolerances.

## Koni shock absorbers with externally adjustable contraction stage

The externally adjustable Koni damper (with adjustable front-axle height) is used for the sport running gear M 030 as of MY '87. Adjustment is as on the 944 Turbo.

Shock absorber strut System/Identification	Adjusting values	Application/Installation
Twin-tube gas shock absorber, painted yellow, height-adjustable Part no. engraved (on shock absorber tube above the threads for height adjustment)	adjusted by approx. 3/4 turn from basic setting (right-hand lock/softest contraction stage)	height-adjustable sport running gear as of MY '87 for 944/944 S/944 S2

### Adjusting the contraction stage

1. Remove protective cap from piston rod.  
Place adjuster thumbwheel on adjusting screw.



2. The adjuster thumbwheel allows the adjusting screw to be rotated continuously in order to trim the damping force to suit the operating conditions.  
Always start from zero position (right-hand lock/softest contraction stage).  
Always adjust both wheels of one axle at the same time and by the same number of turns.

#### Stiffer contraction stage

turn to the left (counterclockwise)

#### Softer contraction stage

turn to the right (clockwise)

#### Note

To adjust, do not use a pair of pliers but only the genuine adjuster thumbwheel.

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3. Remove adjuster thumbwheel and put on protective cap (always remove adjuster thumbwheel following adjustment in order to avoid potential damage to the hood).

## Tolerance groups of coil springs

### General Information

The coil spring versions differ from each other by their length and hardness (spring rate). They are identified by corresponding color marks.

In addition, each spring version is also subdivided into two or three tolerance groups, respectively (tolerance of spring rate  $\pm 4\%$ ).

### Assembly notes

**For repairs, always fit springs with identical color marks.** Since the vehicle is subject to settling of the suspension with increasing mileage, this may result in uneven vehicle height if only one spring is replaced. We therefore recommend the **spring to be exchanged in pairs**. Replacing springs in pairs is not required in the case of vehicles with height adjustment facility (sport running gear M 030).

### Survey

**Coil spring part no. 477 411 105 Q**, spring rate 21.8 N/mm, wire dia. 12.0 mm

**Application: 944 / 924 S with standard and sport shock absorbers**

Group	Length, removed	Spring force F at length $L_1 = 251$ mm	Color dot
1	approx. 381 mm	2727 - 2800 N	1 blue
2	approx. 381 mm	2800 - 2873 N	2 blue
3	approx. 381 mm	2873 - 2946 N	3 blue

**Coil spring part no. 477 411 105 G**, spring rate 24.1 N/mm, wire dia. 12.3 mm

**Application: 924 S and 944 up to end of MY '86 with sport running gear M 030**

Group	Length, removed	Spring force F at length $L_1 = 251$ mm	Color dot
1	approx. 359 mm	2502 - 2560 N	1 red
2	approx. 359 mm	2560 - 2629 N	2 red
3	approx. 359 mm	2629 - 2698 N	3 red



**Coil spring, part no. 944 343 531 00**, spring rate 28 N/mm,  
inconstant wire dia. 11.7 - 12.2 mm

**Application: 944 as of MY '87 with sport running gear M 030 (Koni shocks)**

Group	Length, removed	Spring force F at length $L_1 = 220$ mm	Color dot
1	approx. 329 mm	2850 - 2950 N	1 x white 1 x blue
2	approx. 329 mm	2950 - 3050 N	2 x white 1 x blue

**Coil spring, part no. 951 343 531 00**

**Application: 944 S with stand. shock abs. (unpress.)**, spring rate 21.8 N/mm, wire dia. 12.0 mm

Group	Length, removed	Spring force F at length $L_1 = 251$ mm	Color dot
1	approx. 407 mm	3265 - 3355 N	1 white
2	approx. 407 mm	3355 - 3445 N	2 white
3	approx. 407 mm	3445 - 3535 N	3 white

**Coil spring, part no. 951 343 531 01**, spring rate 21.8 N/mm, wire dia. 12.0 mm

**Application: 944 S with sport shock absorbers (gas filled shock absorbers)**

Group	Length, removed	Spring force F at length $L_1 = 251$ mm	Color dot
1	approx. 396 mm	3034 - 3118 N	1 yellow
2	approx. 396 mm	3118 - 3202 N	2 yellow
3	approx. 396 mm	3202 - 3286 N	3 yellow

**Coil spring, part no. 944 343 531 02**, spring rate 23.8 N/mm, wire dia. 11.3 mm

**Application: 944 S<sub>2</sub> with standard shock absorbers**

Group	Length, removed	Spring force F at length $L_1 = 244$ mm	Color dot
1	approx. 378 mm	_____	1 purple
2	approx. 378 mm	_____	2 purple
3	approx. 378 mm	_____	3 purple

**Coil spring, part no. 944 343 531 03**, spring rate 23.8 N/mm, wire dia. 11.3 mm

**Application: 944 S2 with sport shock absorbers up to MY '89**

Group	Length, removed	Spring force F at length $L_1 = 244$ mm	Color dot
1	approx. 367 mm	_____	1 turquoise
2	approx. 367 mm	_____	2 turquoise
3	approx. 367 mm	_____	3 turquoise

**Coil spring, part no. 944 343 531 01**, spring rate 28 N/mm, inconstant wire dia. 11.7 - 12.2 mm

**Application: 944 S2 with sport running gear M 030 (Koni shock absorbers)**

Group	Length, removed	Spring force F at length $L_1 = 220$ mm	Color dot
1	approx. 329 mm	3050 - 3150 N	1 white - 1 yellow
2	approx. 329 mm	3150 - 3250 N	2 white - 1 yellow

**Coil spring, part no. 944 343 531 04**, spring rate 28 N/mm, wire dia. 11.6

**Application: 944 S2 with Turbo running gear tuning (M 031 / as of MY '90 / F + S shock abs.)**

Group	Length, removed	Spring force F at length $L_1 = 241$ mm	Color dot
1	approx. 348 mm	2881 - 2961 N	1 beige
2	approx. 348 mm	2961 - 2040 N	2 beige
3	approx. 348 mm	3040 - 3120 N	3 beige

## Technical Data 924 S / 944 / 944 S / 944 S2

## Rear axle

## Suspension

independent suspension with trailing arms

## Springs

one round transverse torsion bar per wheel

## Torsion bar dia.

refer to adjustment values for front-  
and rear-axle spring brace adjusting values  
(page 44 - 2a)

## Shock absorbers

double-acting hydraulic shock absorbers  
standard: F + S  
Option: Koni / F+ S for 944 S2 with  
M 031 as of MY '90

## Stabilizers

944 up to end of MY '86  
and 924 S

## Standard

## Option

\_\_\_\_\_

14 mm

944 as of MY '87  
and 944 S

\_\_\_\_\_

18 mm\*

(including part of  
production with M 404  
as part of  
standard equipment =  
Solid stabilizer  
18 mm dia. and  
Tubular stabilizer  
25.4 x 4 mm dia.)(introduced during  
MY '87)  
  
20 mm  
for sport running  
gear M 030

944 S2

16 mm

16 mm with  
M 030 / M 031Spring brace adjustment  
(Spring brace inclination)

Page 44 - 2a

## Spacers

21 mm per wheel (for steel trailing arms)

\* Some examples of 944 MY '89 feature **16 mm stabilizers with 24-mm dia. torsion bars**.  
Refer to Technical Information Gr. 4 No. 8/89.

Location	Description	Threads	Material	Tightening Torque Nm (ftlb)
Bearing flange to cross tube	Hex bolt	M 10	8.8	46 (30)
Bearing flange to body	Locknut	M12x1.5	8	70 (52)
Thrust bearing to bearing flange	Locknut	M 10	8	46 (30)
Thrust bearing to body	Hex bolt	M 10	8.8	46 (30)
Support bearing to body	Hex bolt	M 10	8.8	46 (30)
Support bearing to strut	Locknut	M 8	8	23 (17)
Trailing arm to rear-axle strut	Locknut/ camber eccentric	M 12x1.5	10	90 (66)
Trailing arm to rear-axle strut	Locknut	M 12x1.5	10	103 (76)
Trailing arm to cross tube	Locknut	M 12x1.5	8	61 (45)
Shock absorber to body	Hex nut	M 12x1.5	8	61 (45)
Shock absorber to steel trailing arm	Hex nut	M 12x1.5	8	61 (45)
Shock absorber to aluminum trailing arm	Hex bolt	M 14x1.5	8.8	123 (91)
Adjusting lever to spring strut	Locknut, eccentric and hex bolt	M 16x1.5	10	245 (180)
Stabilizer linkage to rear-axle strut and stabilizer	Locknut	M 10	8	46 (34)
Stabilizer clamp to rear-axle cross tube	Hex bolt	M 8	8.8	23 (17)

Location	Description	Threads	Material	Tightening Torque Nm (ftlb)
Brake backplate to steel trailing arm	Hex bolt	M 10	10.9	58 (43)
Wheel hub to rear wheel shaft with steel trailing arm	Castle nut	M 24x1.5	C 45	380 + 70 (280 + 52)
Wheel hub to rear wheel shaft with aluminum trailing arm	Locknut	M 22x1.5	8	500 (368)
Axle shaft to transmission and rear wheel shaft	Multi-spline bolt	M 8	12.9	42 (31)
Guard to brake backplate or trailing arm	Hex bolt	M 6	8.8	10 (7)
Brake caliper to brake backplate or trailing arm	Hex bolt	M 12x1.5	8.8	85 (63)
Brake-pipe holder to brake caliper or trailing arm	Union nut	M10x1	5.8	12 (9)
Brake-pipe holder to brake backplate or trailing arm	Hex bolt	M 6	8.8	10 (7)
Cable holder to arm	Hex bolt	M 6	8.8	10 (7)
Brake disc to wheel hub	Countersunk head bolt	M 6	8.8	5.0 (3.6)
Light-alloy wheel to wheel hub	Light-alloy wheel nut	M 14x1.5	AlZnMgCu 1.5 F 53	130 (96)
Steel wheel to wheel hub	Steel spherical collar nut	M 14x1.5	10.9	130 (96)

## Running gear tuning (rubber-metal mounts) of 944 S2

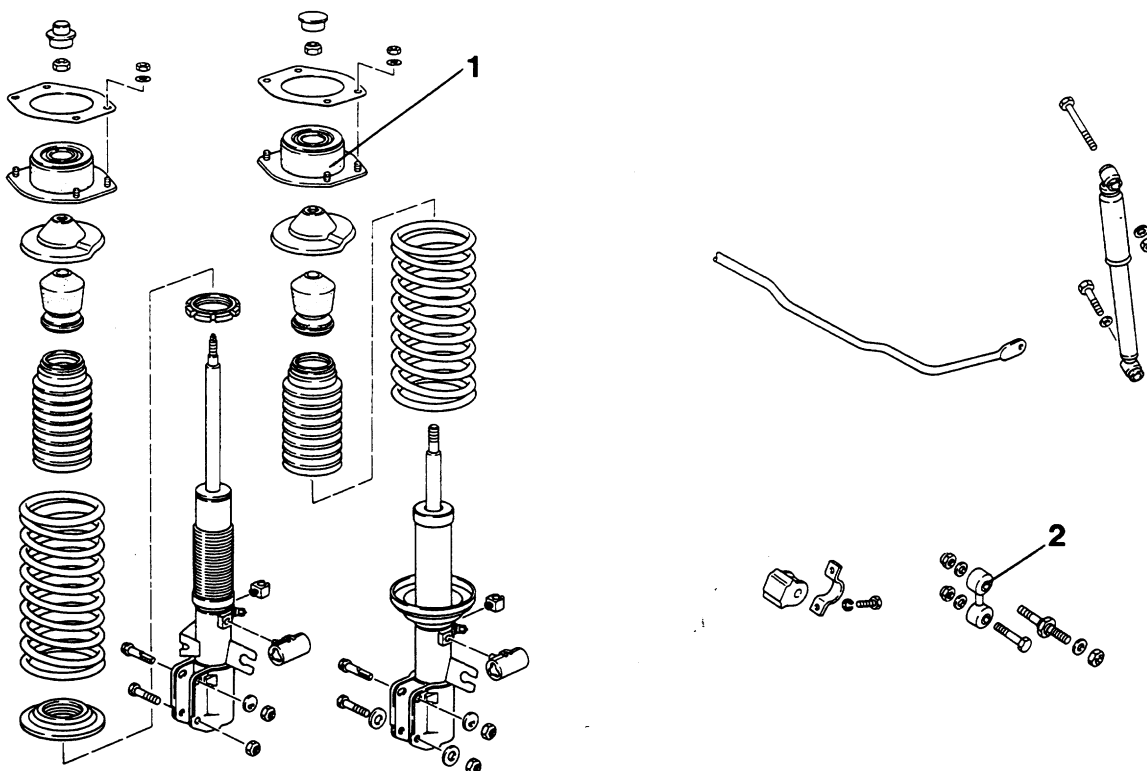
Starting with Model Year 1991, a standardized version of the rubber-metal mounts of the running gear was used.

Based on the former „hard“ versions as used on the 944 Turbo and 944 S2 mit M 030, and the „soft“ version fitted as standard equipment to the 944 S2, an ideal state of tuning was determined.

This concerns both the front and the rear axle.

When performing repair operations, make sure this modification is taken into account.

### Front axle and rear axle

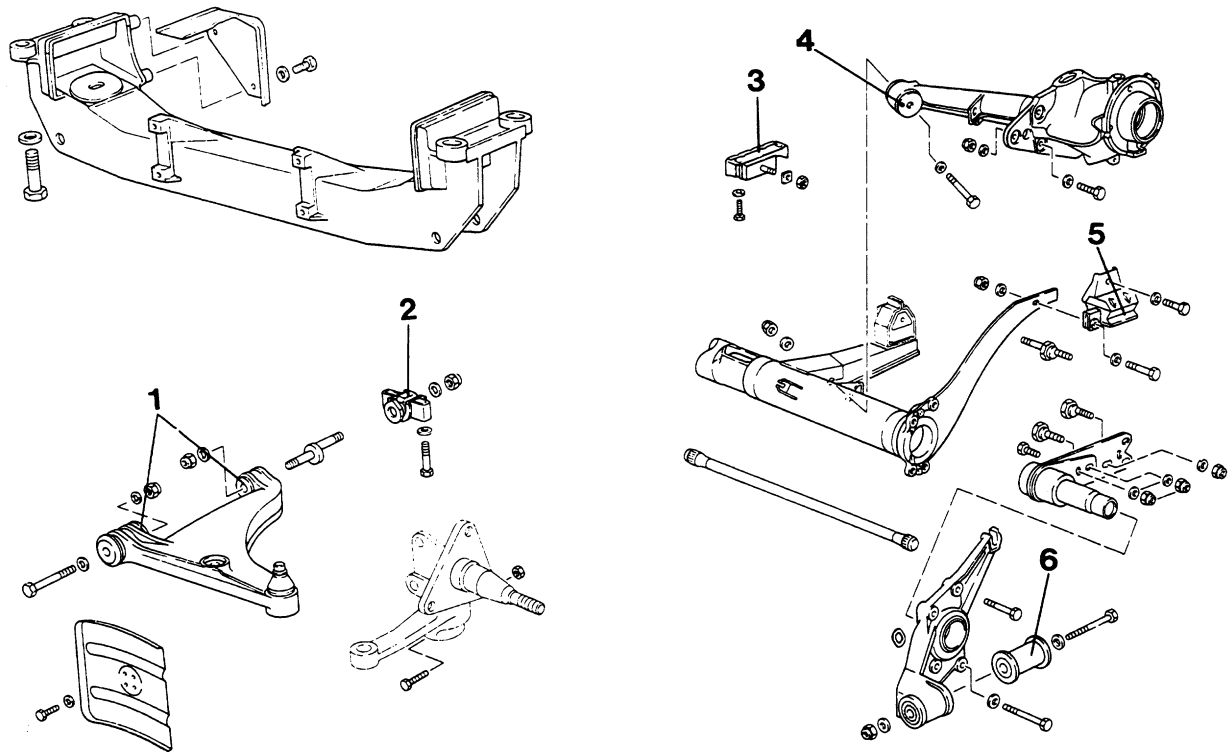


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- 1 = Spring strut mount
- 2 = Stabilizer

soft  
soft

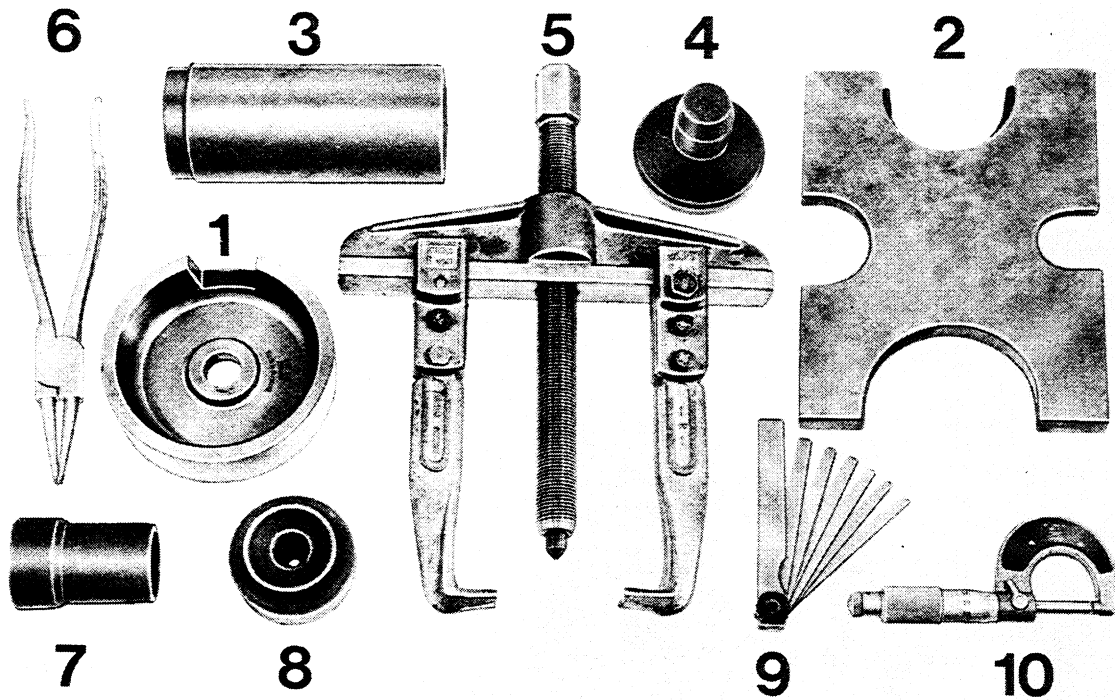
## Front axle and rear axle



573/574

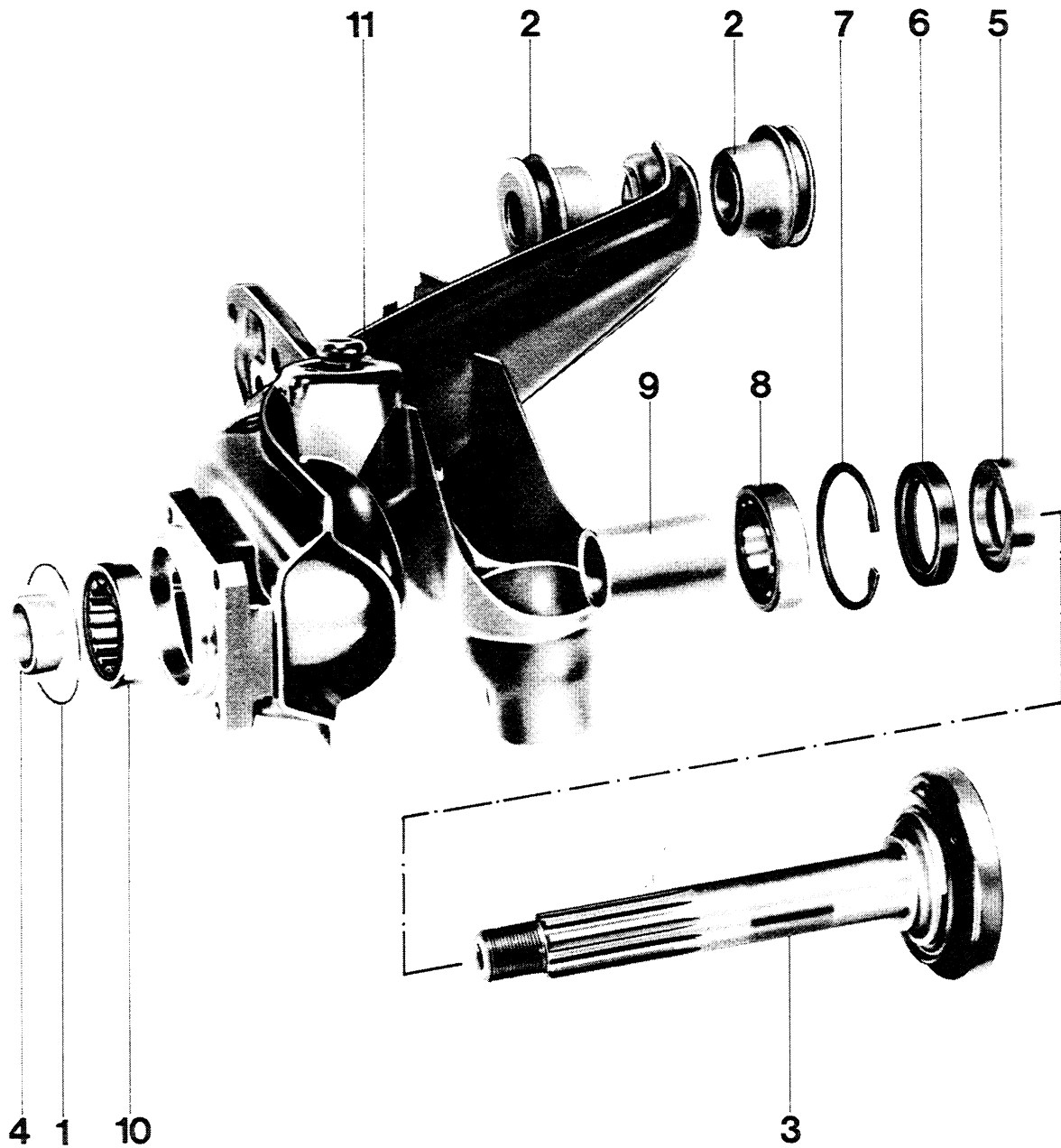
- |                                   |      |
|-----------------------------------|------|
| 1 = Control arm flange            | soft |
| 2 = Control arm rubber mount      | soft |
| 3 = Transverse tube thrust mount  | hard |
| 4 = Rear-axle trailing arm flange | hard |
| 5 = Support mount                 | soft |
| 6 = Rubber mount bearing flange   | soft |

## TOOLS



No.	Description	Special Tool	Remarks
1	Holder	VW 441	or equivalent
2	Press tool	VW 402	
3	Pipe	VW 415 a	
4	Press tool	VW 412	
5	Puller	US 1078	Standard, e. g. Kukko 20 - 2
6	Circlip pliers		Standard
7	Pipe	VW 454	
8	Thrust pad	VW 433	
9	Feeler blade gauge		Standard
10	Micrometer	US 1025	Standard





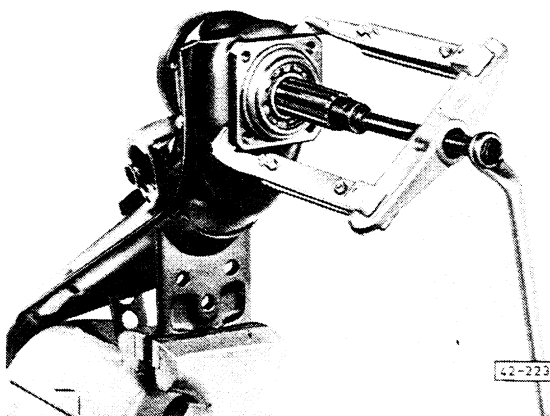
No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Seal	1		Replace	
2	Mount	2	Drive out alternately with a chisel	Replace, press in	
3	Rear wheel shaft	1	Press out with a two-claw puller	Press in, do not forget spacer no. 5, thin coat of Optimoly HT for splines	
4	Bearing inner race	1		Pull in with VW 454	
5	Spacer, inner	1		Replace when scored, position correctly	
6	Seal	1	Press out with a tire iron	Replace, pack space with multi-purpose grease	
7	Circlip	1		Measure thickness with a feeler gauge, make sure of correct fit	Available circlips: (1.95 mm – only 924) 2.00 mm 2.05 mm 2.10 mm 2.15 mm 2.20 mm
8	Ball bearing	1	Drive out with a soft mandrel	Press in	
9	Spacer tube	1			

No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
10	Roller bearing	1	Knock out with a soft mandrel	If bearing has edging on only one side of cage, it must face the wheel	Welding and straightening are not approved.
11	Trailing arm	1		Pack cavity in wheel bearing housing and in the bearings with approx. 80 grams of multi-purpose grease	

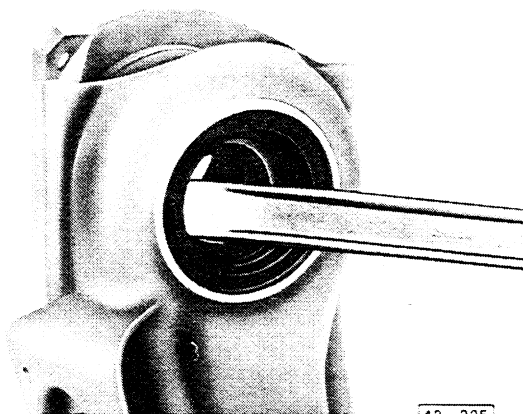
## DISASSEMBLING AND ASSEMBLING TRAILING ARM

## Disassembling

1. Press out rear wheel shaft.



2. Press out seal with a tire iron.

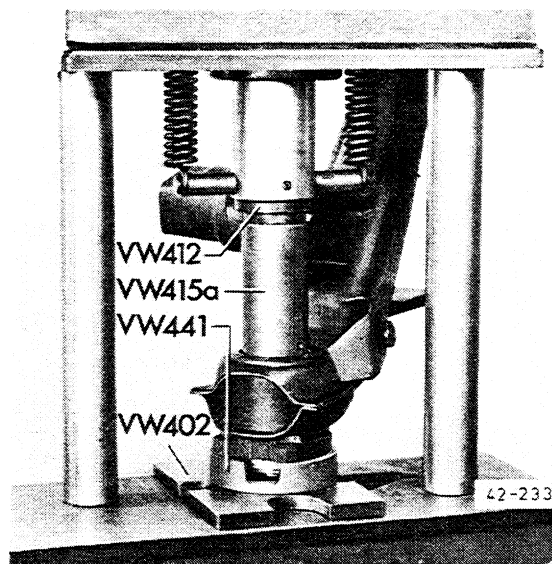


3. Remove circlip. Knock out ball bearing and roller bearing with a suitable mandrel. Openings opposite each other in the wheel bearing housing can be used to make disassembly easier.

## Assembling

1. Check rubber/metal mount, bearings, seals, wheel shaft and spacers for wear, damage or scoring, replacing damaged parts.

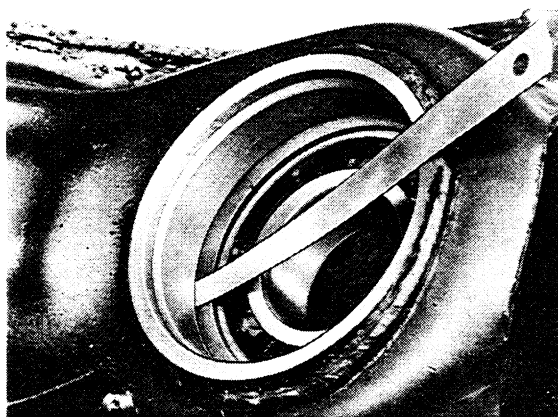
2. Press in ball bearing against stop.



3. The axial play of rear axle bearings can be adjusted to 0 . . . 0.05 mm by thickness of circlip. The following circlips are available.

2.00 mm  
2.05 mm  
2.10 mm  
2.15 mm  
2.20 mm

4. Install thinnest circlip (2.00 mm) and drive against bearing outer race with Special Tool VW 415 a. Measure gap between circlip and groove upper edge at several points.



5. Install circlip with correct thickness and make sure it fits correctly.

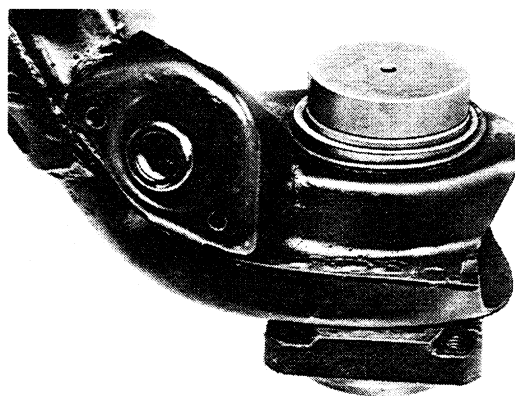
Example:

Initially installed circlip	2.00 mm
0.10 mm feeler gauge blade fits in gap	
0.15 mm feeler gauge blade does not fit	+ 0.10 mm
Required circlip thickness	<u>2.10 mm</u>

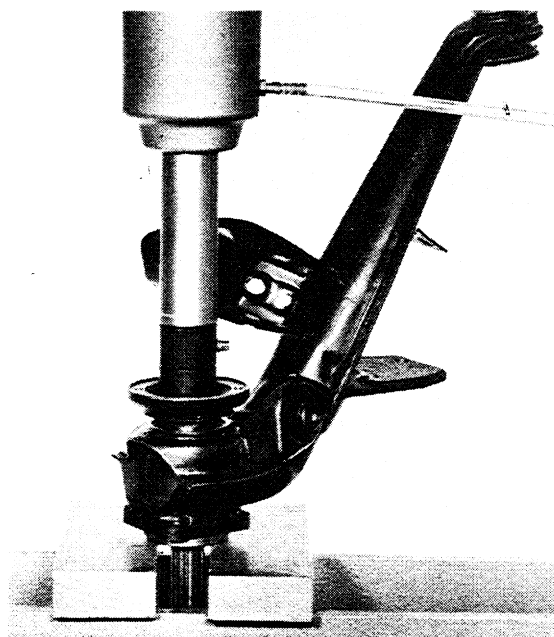
6. Lubricate ball bearing with multi-purpose grease. Drive in seal with Special Tool VW 433 (with trailing arm on wood support) or with VW 415 a, 402, 412 and 441 until against stop. Pack space between sealing lips with a multi-purpose grease.

Note

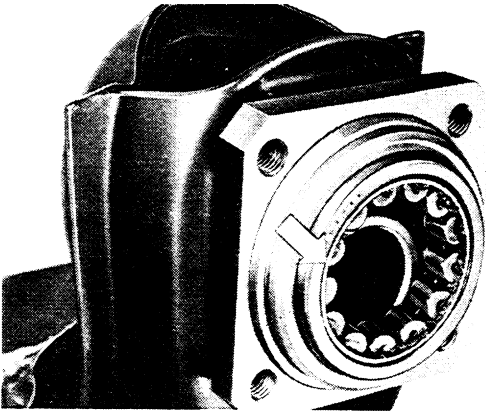
Approx. 80 grams of grease in wheel bearing housing and in wheel bearings.



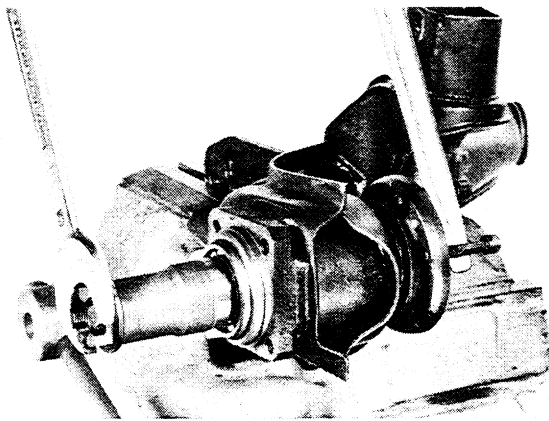
7. Press in rear wheel shaft (do not forget spacer).



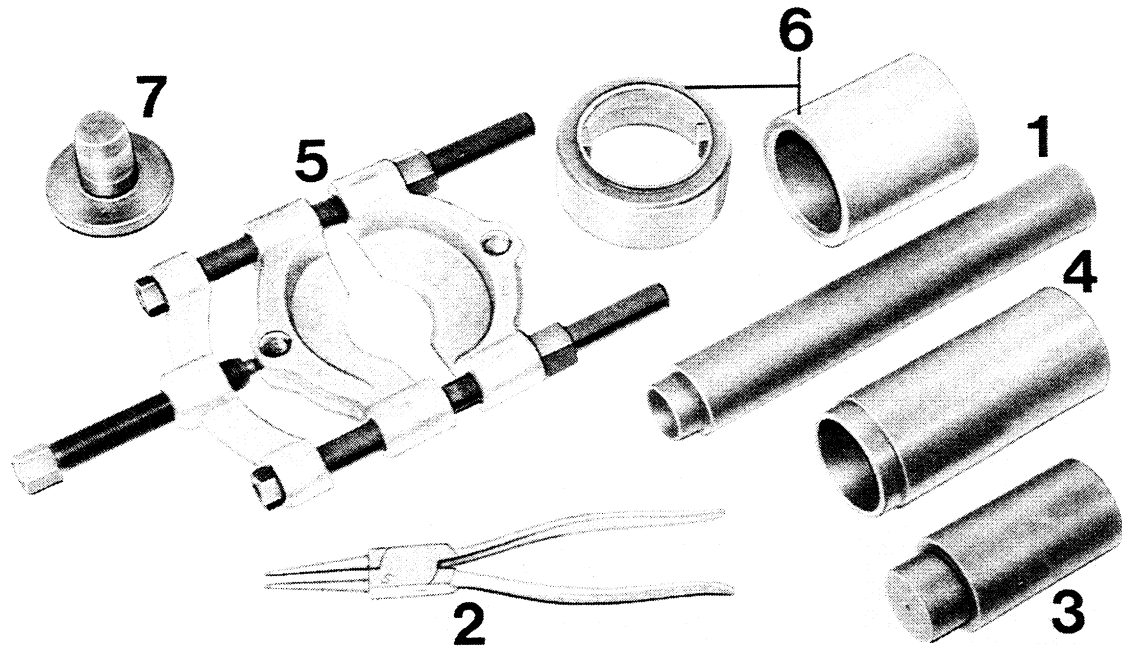
8. Install spacer tube. Drive in roller bearing with a suitable piece of pipe. If bearing has edging on only one side of cage, this side has to face out.



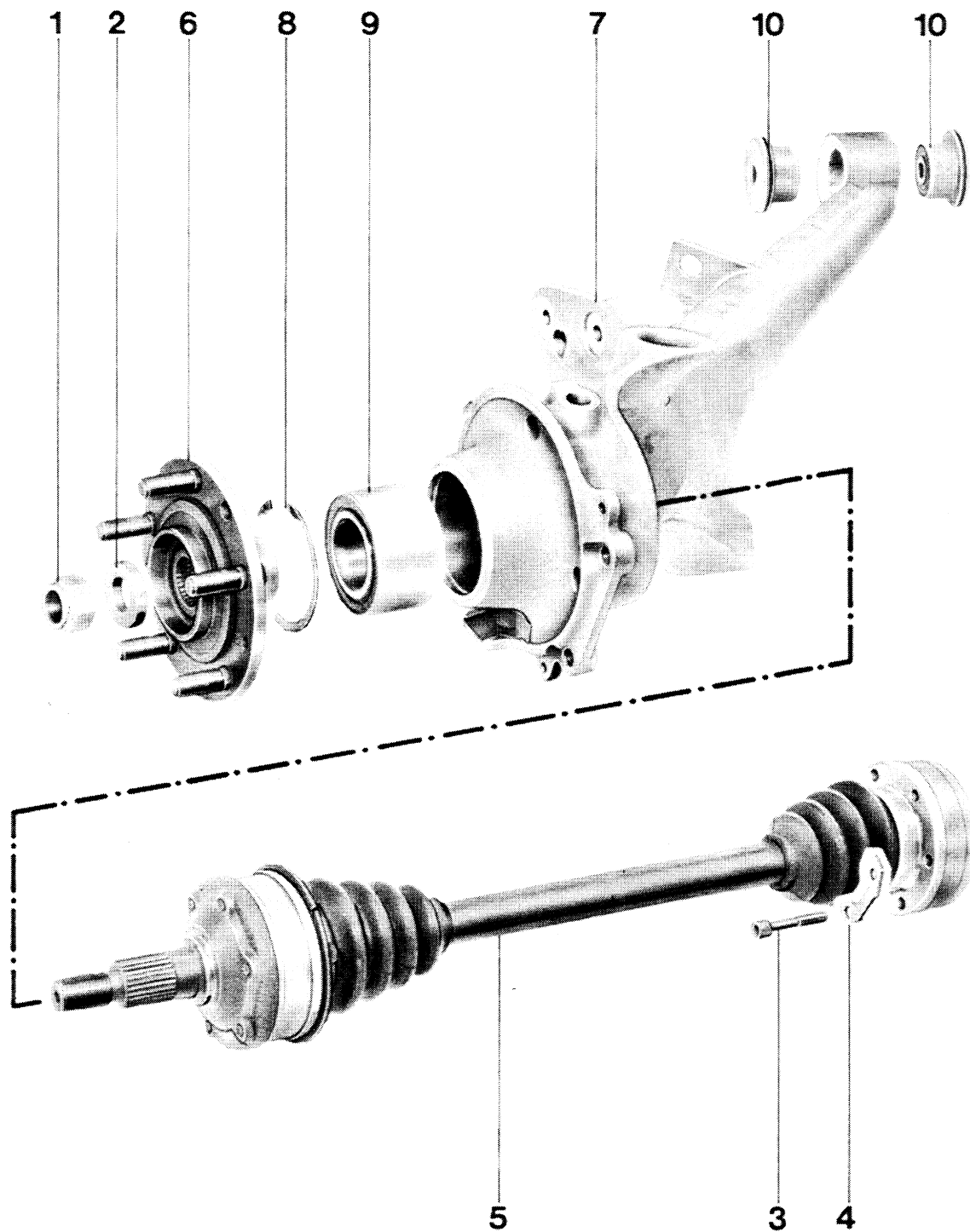
9. Pull in roller bearing inner race with Special Tool VW 454, outer spacer and castle nut.



## TOOLS



No.	Description	Special Tool	Remarks
1	Pressing out mandrel	P 297 a	Standard tool  e.g. Kukko 15-17 Gr. 2
2	Circlip pliers		
3	Pressing tool	VW 432	
4	Pipe	VW 415 a	
5	Extractor		
6	Pressing out/in tool	VW 459/1 VW 459/2	
7	Pressing tool	VW 412	



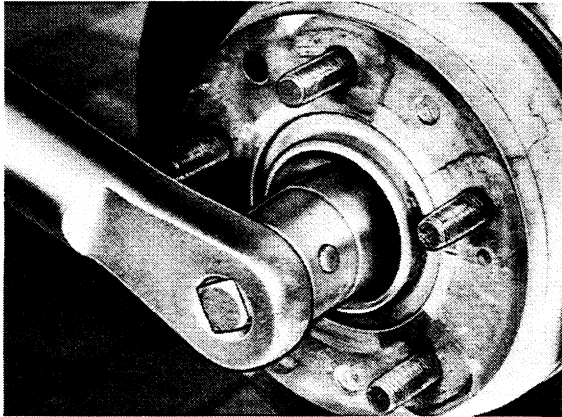


No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Self-locking nut	1		Replace, tightening torque: 500 Nm (368 ftlb)	
2	Washer	1			
3	Socket-head bolt	6		Tightening torque: 42 Nm (31 ftlb)	
4	Backer	3			
5	Drive shaft (axle shaft with rear-wheel shaft)	1	Because of lack of space (exhaust assembly), begin by disconnecting shock absorber from trailing arm on left-hand side	Check for damage, apply a thin coat of Optimoly HT to splines	Page 42 - 12
6	Wheel hub	1	Drive out with P297a	Press in wheel hub by placing wheel hub on a suitable support and applying pressure to inner race of inclined ball-bearing with drift VW 415 a	Reworking is impermissible
7	Trailing arm	1		Replace if damage is suspected	
8	Circlip	1		Replace if necessary	
9	Inclined ballbearing	1	Heat trailing arm to 120° - 150°C, press out with pressure piece VW 432	Heat trailing arm to 120° - 150°C, insert new bearing and press home with VW 432.	
10	Silentbloc rubber mount	2	First pry out inner rubber mount	Replace, press in	Page 42 - 14

## DISASSEMBLING AND ASSEMBLING ALUMINUM TRAILING ARM

## Removing/Disassembling

1. Take off rear wheel. Unscrew self-locking nut on drive shaft.

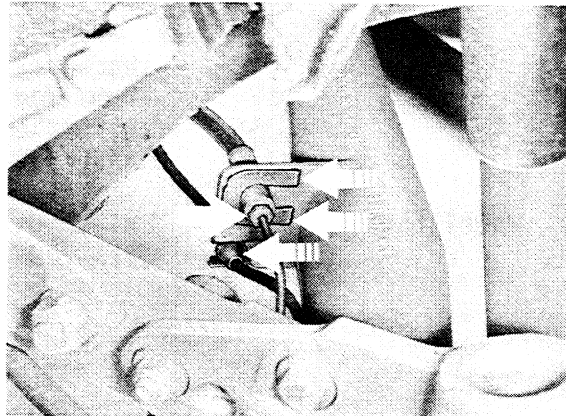


2. Disconnect parking brake cable on parking brake lever.
3. Unscrew vibration damper on trailing arm. Lift trailing arm slightly with a suitable jack to avoid tension on the mounting bolt.
4. Unscrew axle shaft bolts on transmission and move out the complete drive shaft (axle shaft + wheel shaft).

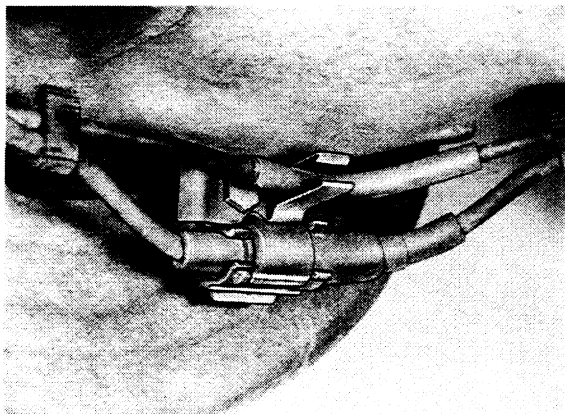
## Note

Push up the transmission end of the shaft in direction of the intermediate shift lever on the transmission when moving out the left drive shaft, due to the lack of space (exhaust assembly).

5. Remove brake hose on trailing arm, by removing the spring lock and unscrewing the brake pipe. Plug brake hose or hold down brake pedal slightly with a pedal prop.  
Take wires for brake pad wear indicator out of holder.



6. Take plug for brake pad wear indicator out of holder and disconnect.



9. Remove parking brake shoes and spreader arm. Pull parking brake cable out of trailing arm.

10. Remove trailing arm after unscrewing on spring strut and rear axle cross tube.

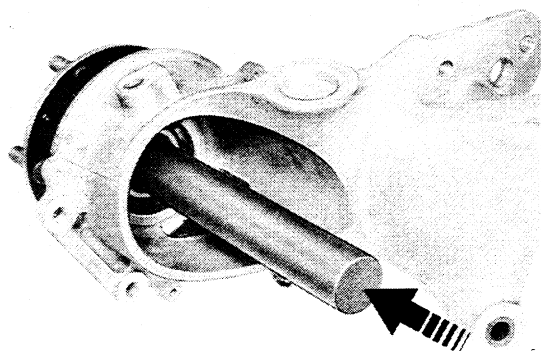
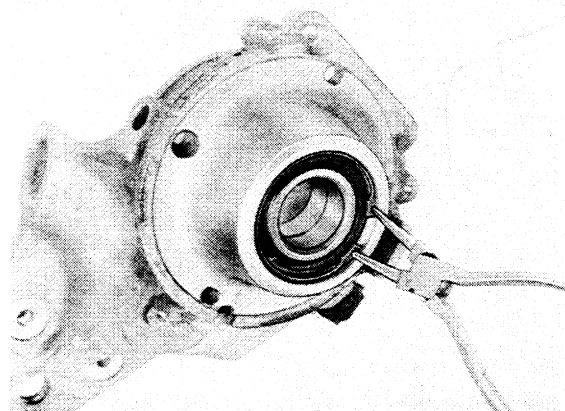
#### Note

Mark position of trailing arm to spring strut for installation later (toe, camber).

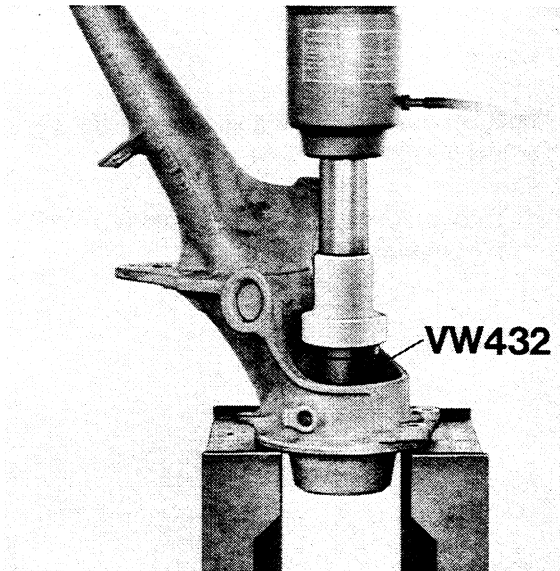
11. Take off brake guard and remove circlip for angular ball bearing.

7. Unscrew brake caliper and remove brake disc.

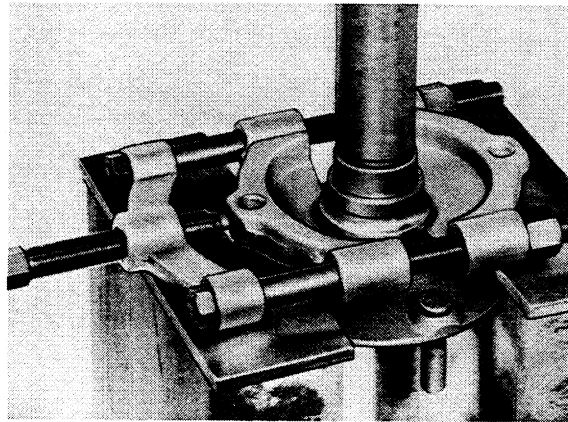
8. Drive out rear wheel hub with Special Tool P 297 a.



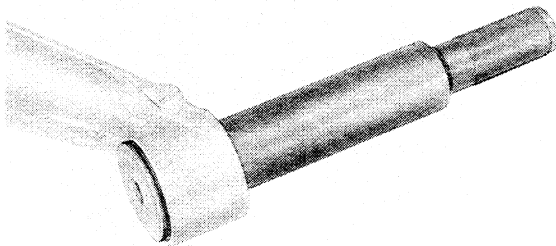
12. Heat trailing arm to 120 ... 150° C. Press out angular ball bearing with Special Tool VW 432 and a suitable base.



14. If applicable, press bearing inner race off of wheel hub with an extractor and Special Tool P 297 a.

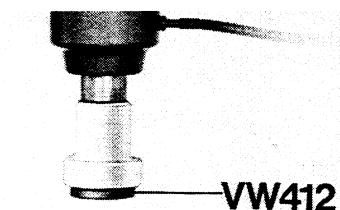


13. If applicable, remove rubber mounts. Drive out inside rubber mount slightly with a flat chisel applied alternately and finally pry out with two tire irons. Drive out inside rubber mount with a suitable pressure piece.

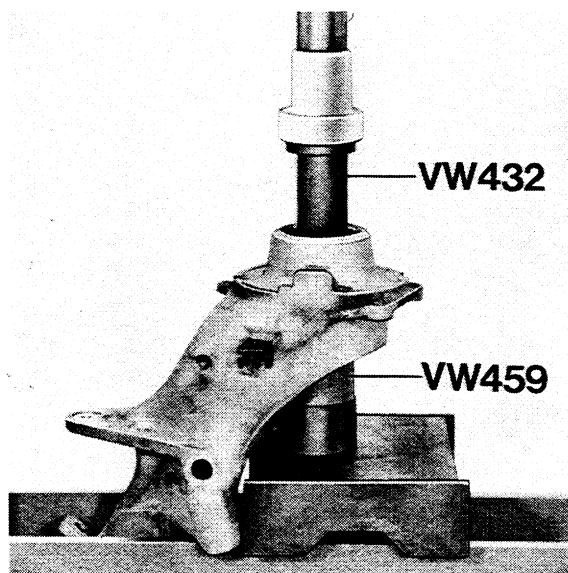
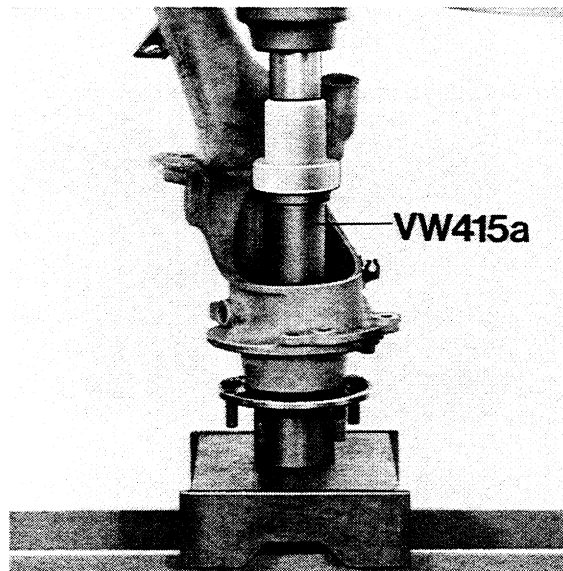
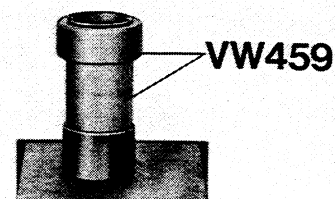


#### Assembling/Installing

1. Set up and align trailing arm under a press on VW 459 and suitable bases for installation of the wheel bearing. Remove trailing arm again and heat to 120 ... 150° C. Insert angular ball bearing and press in slightly on the aligned bases.



3. Press in wheel hub after installation of the circlip.



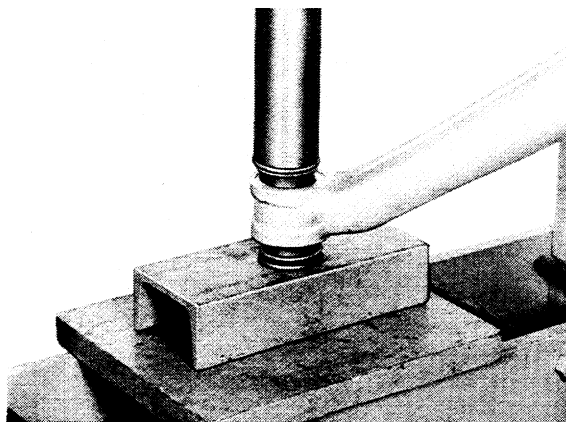
4. Install trailing arm. Tighten bolts and nuts to correct tightening torque (see page 42 - 02/03). Mount spreader arm and parking brake shoes (see pages 46 - 11 to 46 - 15).

#### Note

Insert drive shaft before mounting the vibration damper on the trailing arm on the left side.

5. Adjust parking brake. Bleed brakes. Check wheel alignment.

2. If applicable, press in new inside and outside rubber mounts against stop.



## Koni - Shock absorbers - References for 944 / 924 S

The contraction stage of Koni shock absorbers may be adjusted. *Spare shock absorbers are preadjusted.*

### Notes for 944 models fitted with steel trailing arms

In the course of Model Year 1982, the adjusting values of the shock absorbers (pressure and contraction stage) were modified.

Adapting the original version to the modified setting by adjusting the shocks is not possible. The original version of the shock absorbers is no longer available. In case of repairs, vehicles fitted with the original absorber type should be fitted with the modified shock absorbers. Combining original and modified versions is only permissible if identical shock absorber pairs are used on each axle.

Part no. / Identification	Adjusting values*	Application/ Installation
477 513 031 J** painted yellow Mounting boss dia. 12 mm	adjusted approx. 1 turn, starting from basic setting	944 with optional shock absorbers (M 474) and <b>steel arms</b> . Orig. version (no longer available / note above instructions)
944 333 031 00** painted yellow, with blue adhesive tape Mounting boss dia. 12 mm	basic setting adjusted by approx. 1/2 turn	944 with optional shock absorbers (M 474) and <b>steel arms</b> . Modified version. Introduced during Model Year 1982
951 333 032 01** painted yellow Mounting boss dia. 14 mm	basic setting adjusted by up to approx. 1/2 turn in some cases, adjusted by 1 turn (red dot)	944 / 924 S with optional shock absorbers (M 474) and aluminum arm
944 333 032 01*** painted yellow with green tape Mounting boss dia. 14 mm	adjusted approx. 1 turn from basic setting	924 S with sport running gear M 030 (aluminum arms)
951 333 032 04** painted yellow, Mounting boss dia. 14 mm	adjusted approx. 1 1/4 turn from basic setting	944 with sport running gear M 030 and aluminum arms

\* The adjusting values are approximative. Precision adjustment is carried out in the factory using shock absorber test equipment.

\*\* Part no. engraved near mounting boss of shock absorber.

\*\*\* Identical to 951 333 032 01, but with modified setting.

## Koni - Shock absorbers - References for 944 S / 944 S2

The contraction stage of Koni shock absorbers may be adjusted. *Spare shock absorbers are preadjusted.*

Part no./ Identification	Adjusting values*	Application/Installation
951 333 032 01** painted yellow, Mounting boss dia. 14 mm	basic setting adjusted by up to 1/2 turn in some cases adjusted by 1 turn (red dot)	944 S with optional shock absorbers (M 474)
951 333 032 08** painted yellow, with 2 blue color dots offset by 180 deg. Mounting boss dia. 14 mm	basic setting	944 S2 MY '89 with optional shock absorbers (M 474)
951 333 032 04** painted yellow, with 2 white dots offset by 180 deg. Mounting boss dia. 14 mm	adjusted by approx. 1 1/4 turn from basic setting	944 S / 944 S2 with sport running gear M 030

To adjust the contraction stage, refer to page 42 - 19

\* The adjusting values are approximative. Precision adjustment is carried out in the factory using shock absorber test equipment.

\*\* Part no. engraved near the mounting boss of the shock absorber.

## Adjusting the Koni shock absorbers

### Operations for adjusting the contraction stage

1. For shock absorbers on cars fitted with aluminum rear-axle trailing arms, remove the rubber auxiliary spring (bump stop) from the protective tube before adjusting the shock absorber. Bores are provided for this effect below the mounting boss of the shock absorber. Engage a length of wire into the bores and push the auxiliary rubber spring down and out of the protective tube and take it off the shock absorber.

#### Caution:

Take care not to damage the piston rod.

3. Rotate the protective tube/piston rod:

To the left B  
(counterclockwise)

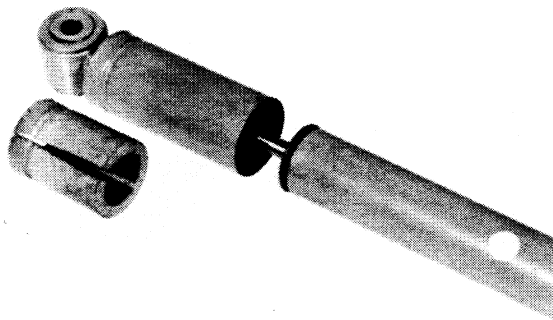
Protective tube/piston  
rod points  
up (installation  
position)

softer contraction stage

To the right A  
(clockwise)

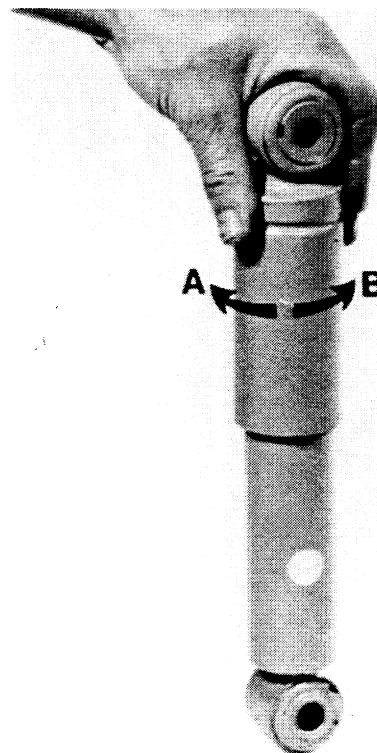
Protective tube/piston  
rod points up  
(installation position)

harder contraction stage



87/962

2. Push protective tube and piston rod assembly all the way down. Rotate protective tube (but do not apply a force) until the adjustment device engages. Mark engagement position on the protective and shock tube using a piece of chalk.



87/964



4. After adjusting the shock absorber, pull protective tube/piston rod up again to disengage the adjustment device.  
If required, (on cars fitted with aluminum rear-axle trailing arms) refit the auxiliary rubber spring.

## Wheels and tires

### Tire condition / tire pressure

Tires are safety-relevant items that are only capable of meeting the requirements applicable if they are run at the correct tire pressure and with sufficient tread depth.

The tire pressures indicated are minimum pressures. The tires must never be run at lower pressures since this affects roadholding in a negative manner and may lead to severe tire damage.

Valve caps protect the valve against dust and dirt and therefore help prevent leaks. Always screw on caps tightly and replace missing caps.

For safety reasons, do not limit tire checks to checking the tire pressure but also check for sufficient tread depth, ingress of foreign matter, pinholes, cuts, tears and bulges in the sidewall (cord breakage)!

### Tire pressure of cold tires (summer and winter tires)

#### up to end of MY '89

	924 S / 944	944 S* / 944 S2
front	2.0 bar excess pressure	2.5 bar excess pressure
rear	2.5 bar excess pressure	2.5 bar excess pressure

#### as of MY '90

	944 S2 MY '90	944 S2 as of MY '91
front	2.5 bar excess pressure	2.5 bar excess pressure
rear	2.5 bar excess pressure (optional: 3.0 bar excess pressure)	2.5 bar excess pressure

### Collapsible spare tire

front and rear	2.5 bar excess pressure	for 8 PR 89 P tires
	2.2 bar excess pressure	for 4 PR 83 P tires

\* Due to changes in standards and legislation, "V" and "ZR" tires for the 944 S require tire pressures that deviate from the values indicated in the Owner's Manual.

Always use the new tire pressures indicated above. Relevant adhesive labels are available from all official Porsche dealers.

**Tire and wheel survey / tire specification character**

For a tire and wheel survey for summer and winter tires, refer to the relevant Technical Information (TI), Group 4.

**When replacing summer tires, check for the correct tire specification character.** The specification character N 1 or N 0, respectively, helps to distinguish summer tires approved by Porsche from other versions of identical tire type and the same tire size. The tires approved by Porsche are also identified in the corresponding TI.

**Important Notes**

**From MY '87 (with the exception of the 924 S model), the rim offset of the wheels has been modified.** Wheels designated for cars as of MY '87 must not be mounted on older vehicles. In the same manner, wheels for cars made before MY '87 must not be fitted to vehicles produced from MY '87.

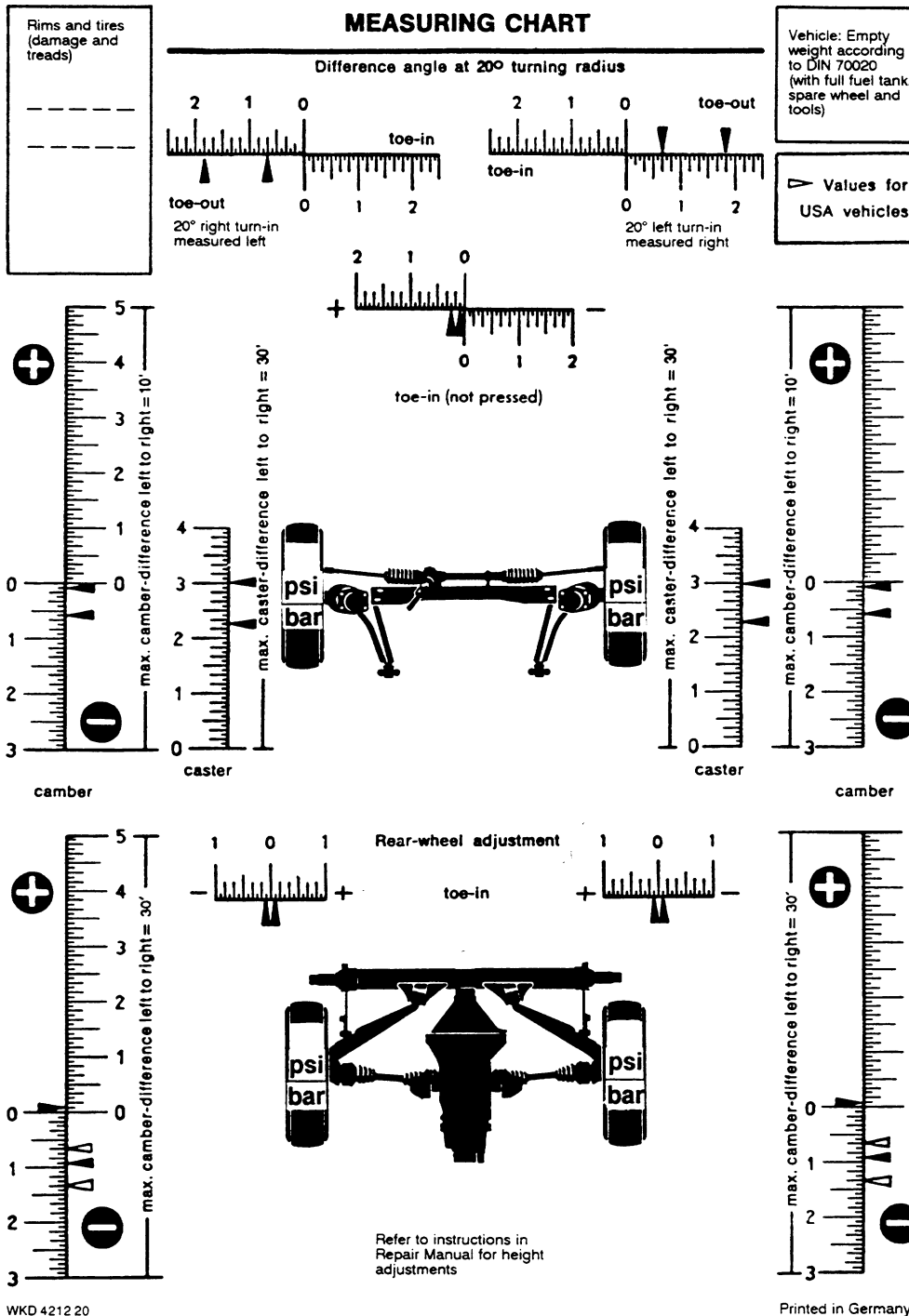
On vehicles equipped with brake pad wear indicators, counterweights to a max. weight of 40 g may be fitted on the inside of 15-inch light-alloy disc wheels (due to space limitations at the front axle). If required, use 2 weights.

## Sample measuring chart up to end of MY '89

Name: \_\_\_\_\_ Vehicle: All Porsche types 924/944 until end of model year 89

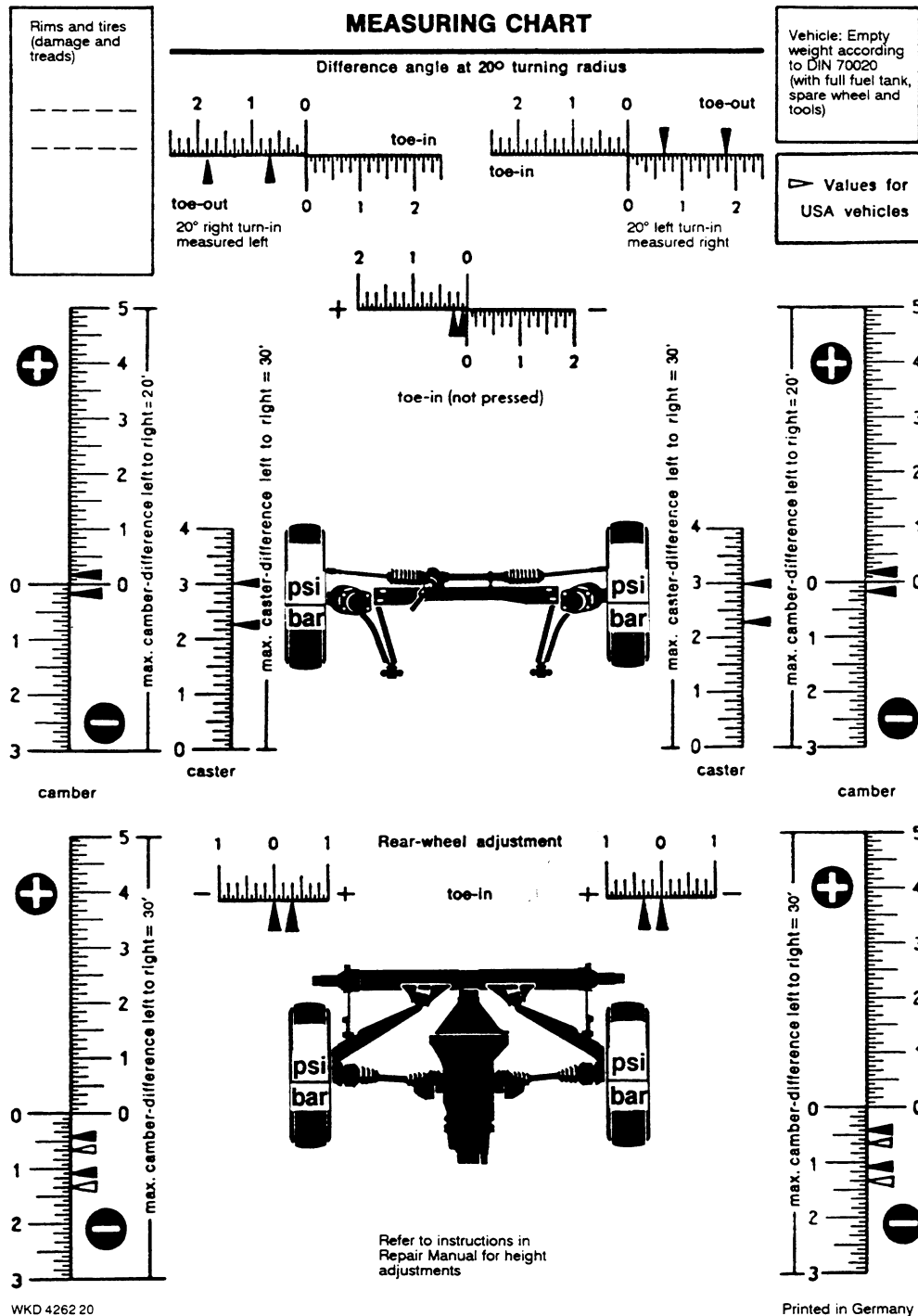
Vehicle Ident. No.: \_\_\_\_\_ License plate No: \_\_\_\_\_ miles/km: \_\_\_\_\_

Date: \_\_\_\_\_ measured by: \_\_\_\_\_



## Sample test card 1990 models onward

Name: \_\_\_\_\_ Vehicle: All Porsche types 944 90 models onward  
 Vehicle Ident. No.: \_\_\_\_\_ License plate No: \_\_\_\_\_ miles/km: \_\_\_\_\_  
 Date: \_\_\_\_\_ measured by: \_\_\_\_\_



## Wheel Alignment Values – 924 S / 944 / 944 S / 944 S 2

The following values apply at curb weight according to DIN 70020 (car with full fuel tank, spare wheel and tools).

Values for USA and Canada are given in brackets.

### Wheel Alignment Values

	Specified Value and Tolerance		Max. Difference
	Until end of '89 Mod.	Since '90 Mod.*	Left to Right
Front Axle			
Toe - unpresse	+ 10' ± 5'	+ 10' ± 5'	
Toe difference angle at 20° lock	- 40' to - 1° 50'	- 40' to - 1° 50'	Can only be affected by replacing steering arms
Camber	- 20' ± 15'	0° ± 10'	10' until end of '89 models 20' since '90 models
Caster	2°30' + 30' - 15'	2°30' + 30' - 15'	30'
Rear Axle			
Toe per wheel	0° ± 5'	+ 10' ± 10'	10'
Camber	- 25' ± 30' (- 1° ± 20')	- 45' ± 20' (- 1° ± 20')	30' 30'

\* The changed wheel alignment values also apply to the 944 Turbo. Please note in the 944 Turbo manual. They will be corrected in the next supplement.

## Ride Level Height and Spring Strut Values

### Front Axle

Ride level height\*  
bolt lower edge  
of rear arm mount  
**below** wheel center

944 / 944 S M 030 / M 637  
(spring struts adjustable in height)

146 ± 10 mm

944 S 2 M 030  
(spring struts adjustable in height)

130 ± 10 mm

### Rear Axle

Spring strut adjustment  
(angle of spring strut)\*\*

Ride level height\*  
strut mt. center (torsion bar  
center) **below** wh. ctr. (value)

#### 924 S / 944 / 944 S until end of 1988 models

Standard (steel + alu. arms)  
Torsion bar dia. 23.5 mm

23°  
(24°30' USA, Canada)

- 3.5 ± 10 mm

M 030 / M 637 until end of  
1986 models  
Torsion bar dia. 24.5 mm

20°

- 18.5 ± 10 mm

M 030 / M 637 87/88 models  
Torsion bar dia. 25.5 mm

18°

- 18.5 ± 10 mm

#### Since 1989 models

944 standard with  
torsion bar dia. 23.5 mm

23°  
(24°30' USA, Canada)

- 3.5 ± 10 mm

944 S 2 standard with  
torsion bar dia. 24 mm

Conv. 23°  
Coupe 22°

- 10.5 ± 10 mm

944 / 944 S 2 M 030 / M 031  
torsion bar dia. 25.5 mm

18°

- 18.5 ± 10 mm

#### \* Max. left to right difference in ride level height: 10 mm.

Height of bumper is decisive for USA/Canada cars. Distance from measuring surface (road/level floor) to upper edge of bumper must be 522 ± 20 mm **on the rear axle**. **On the front axle** this distance must be 526 ± 20 mm or 533 ± 20 mm for the 944 S2.

#### \*\* Max. left to right difference: 0,5°. 1° changes in spring strut inclination changes the ride level height by approx. 5 mm.

## CHECKING WHEEL ALIGNMENT

Check wheel alignment with an optical or electronic tester. Testing procedures are described in the instructions supplied with the pertinent tester. The following requirements must be fulfilled before commencing with the wheel alignment test.

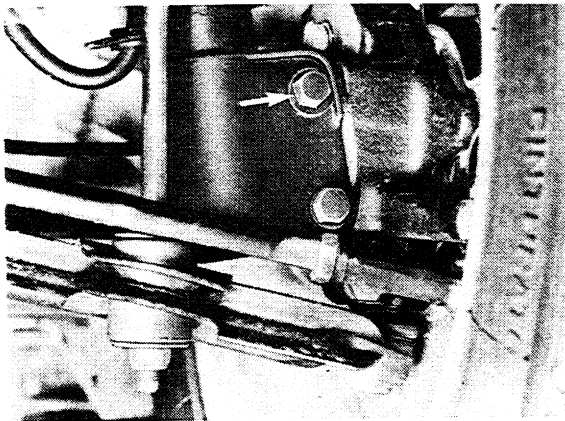
- Car at curbweight to DIN 70020, i.e. ready-to-drive car with full fuel tank, spare wheel and tools.
- Correct joint and wheel bearing play.
- Specified tire inflation pressure and uniform tire treads.

If both the front and rear wheel alignment of a car are concerned, first check and correct the rear wheel alignment. Have steering wheel and steering gear in middle position when adjusting toe-in.

## FRONT AXLE

### Adjusting Camber

Camber is adjusted by turning the eccentric bolt (arrow).



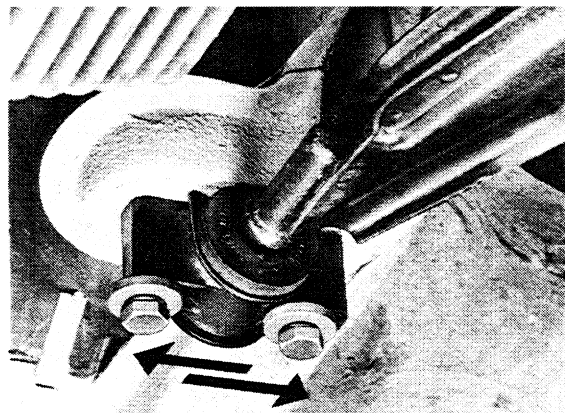
### Adjusting Caster

Version I = Cars with steel control arms

Version II = Cars with aluminium control arms

Version I = (Steel Control Arms)

Caster is adjusted by moving the rear control arm mount laterally.

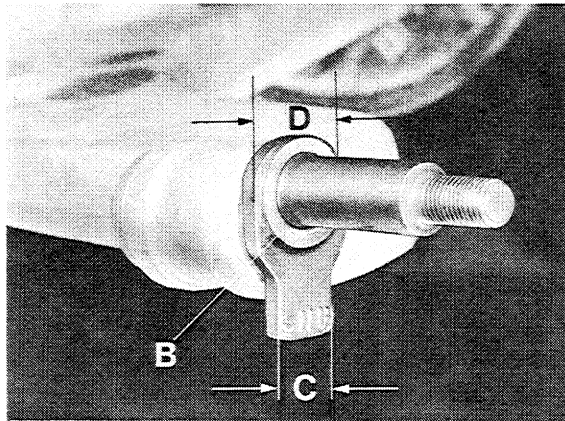
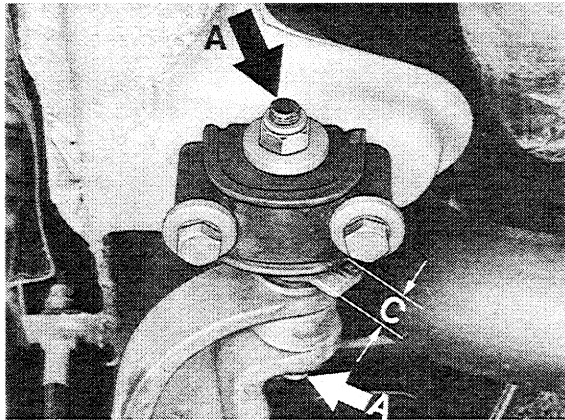




**Version II (aluminum control arms)**

Undo self-locking hexagon nut A on caster excenter B. Turn the caster excenter B to set the specified value. Depending on the position of the excenter, use a 19 mm open-end wrench (range C) or a 32 mm wrench (range D).

(Hexagon nut tightening torque  
A = 85 Nm (63 ftlb))



85/47

**Adjusting the toe**

Preliminary operations: Center steering box in the center position using Special Tool 9116. If the steering wheel is offset, try to achieve an optimum value when relocating the wheel. Remove Special Tool 9116 afterwards.

Block steering wheel in center position using a steering wheel locking tool and adjust toe at the tie rods.

**Toe difference angle**

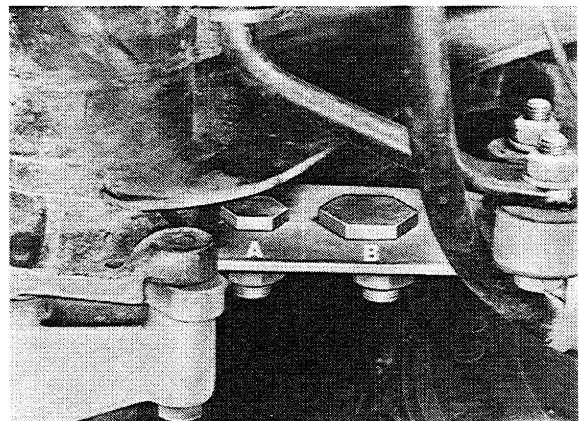
The toe difference angle is not adjustable (and may be modified only by exchanging the steering levers).

**Rear axle****Height check/height adjustment \***

Measuring points: Center of torsion bar and wheel center, both measured from road contact surface.

Adjusting value: refer to page 44 - 2a.

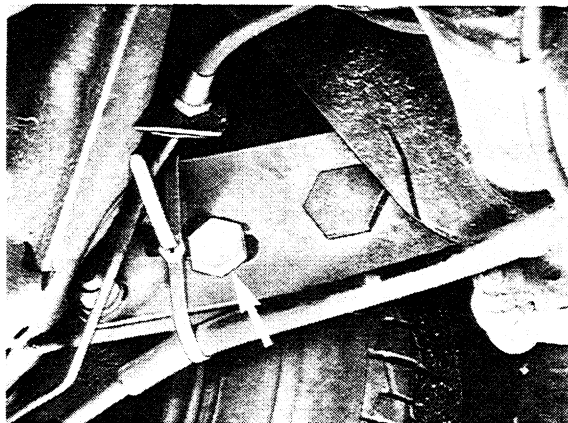
If required, correct rear vehicle height at the two-part spring brace by loosening mounting bolt A and adjusting with eccentric bolt B.



\* On vehicles with **ride height adjustment feature**, also check and adjust the front axle height. For adjusting values, refer to page 44 - 2a.

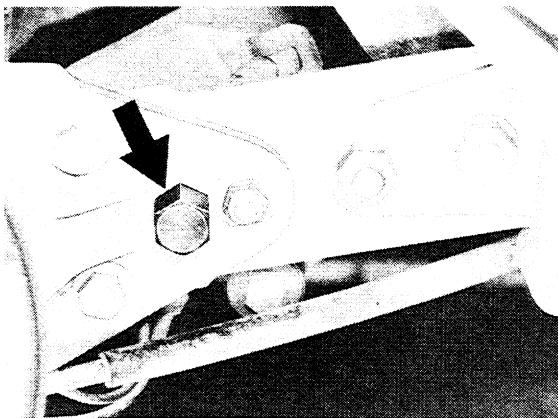
### Adjusting Camber

Loosen bolted connection between spring strut and trailing arm. Also loosen stabilizer suspension in cars with a stabilizer. Adjust to specified value by turning the camber eccentric.

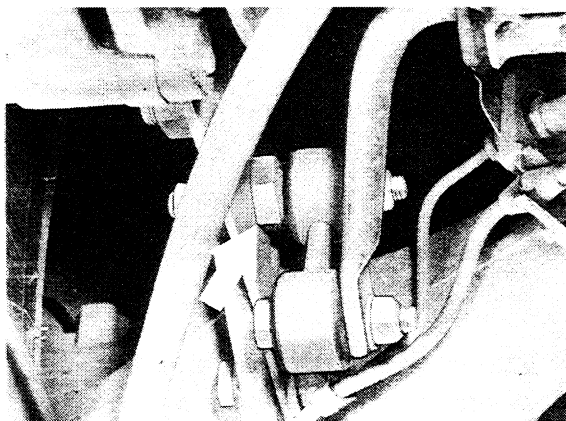


### Adjusting Toe

Adjust toe by moving trailing arm in slots of spring strut. Use Special Tool 9171 for this step.



Without Stabilizer



With Stabilizer

## INSTALLING AND REMOVING ALUMINUM WHEELS ON VEHICLE

### General Information

Aluminum wheel nuts must be loosened and tightened only with special tool P 300.

The aluminum wheel nuts can shear by reason of:

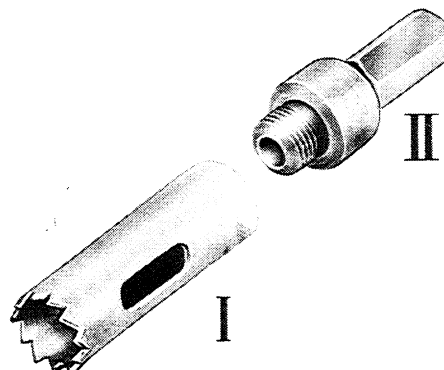
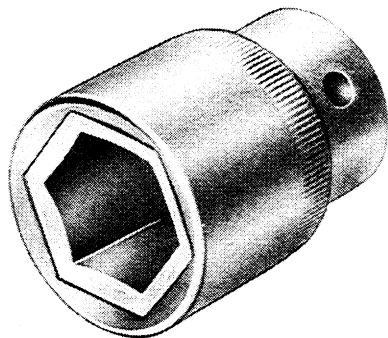
- use of unsuitable tools (the wheel nuts are held only by about 2/3 of total depth)
- excessive tightening torque
- excessively jerky loosening (impact wrench)
- lack of or unsuitable lubricant

If this were to happen, the calott would shear off of the wheel nut's hexagon exactly at the point of transition, thus impairing removal of the rim.

### Installing and Removing Removal with Sheared - off Nut (s)

1. Always use a Special Tool P 300 in perfect condition. Other socket wrenches, wrench sockets, or wheel bolt wrenches must not be used. Impact tools must never be used, regardless of circumstances.

The rim can be taken off the wheel hub without damage using the tools listed below. However, damage to the wheel bolt(s) cannot be avoided.



2. Lubricate threads and calott with Optimoly TA.

3. Always tighten nuts to specified torque of 130 Nm (96 ftlb)

- I. Compass saw, 17.5 mm diameter. This tool can be used after grinding down and smoothing inside diameter (welding seam must be ground down).
- II. Shaft for mounting compass saw.
- III. Commercially-available hand drill.

### Delivery and Supply Sources

Sauer-Werkzeug GmbH & Co. KG  
Humboldstr. 53

2000 Hamburg 76

Tel.: 040/223322  
2296666  
Telex: 214120

Order No.  
303 017 - Compass saw 17.5  
303 161 - Adapter, size 1

or on commercial market

Manufacturer: The Cooper Group  
Deutschland GmbH

7122 Besigheim

Order No.  
261 110 00 - Compass saw 17.5 - H 111  
264 020 00 - Adapter M 402 H

1. Grind off calotte with the mentioned tools.  
Work with a speed of approx. 450 rpm to guarantee good chip removal. Also bleed tool.  
The calotte will jump off of the wheel bolt after complete removal of threads from the sheared off wheel nut.

### Note

The wheel rim might be ground slightly during this step, but this is not important.

2. Replace pertinent wheel bolt(s) on removed wheel hub.  
Use a proper size drift for removal and installation.  
Front wheel hub must be heated to 120 - 150° C for this step.

## GENERAL

As of model year '87, the Porsche 944, 944 S and 944 turbo are available with an anti-lock braking system (ABS) as an optional extra (M593).

The anti-lock braking system represents an important contribution to the enhancement of active safety in the car.

It prevents the wheels locking in an emergency stop until shortly before the car comes to a halt, thus assuring full steerability and directional stability. In addition, the system optimizes the braking distance corresponding to the varying degree of grip between wheel and road surface.

Nevertheless, it is still up to the driver to adapt his style of driving to road and weather conditions and to the changing traffic situation.

The decisive advantage of ABS is in the stability and manoeuvrability which it affords to the car in moments of danger - when the brakes are fully applied even when the car is cornering.

In design and method of operation, the ABS is basically identical with that fitted to the 928 S.

The 944 ABS is described in the Customer Services Information Sheet, '87 Models WKD 493 210.

### Note:

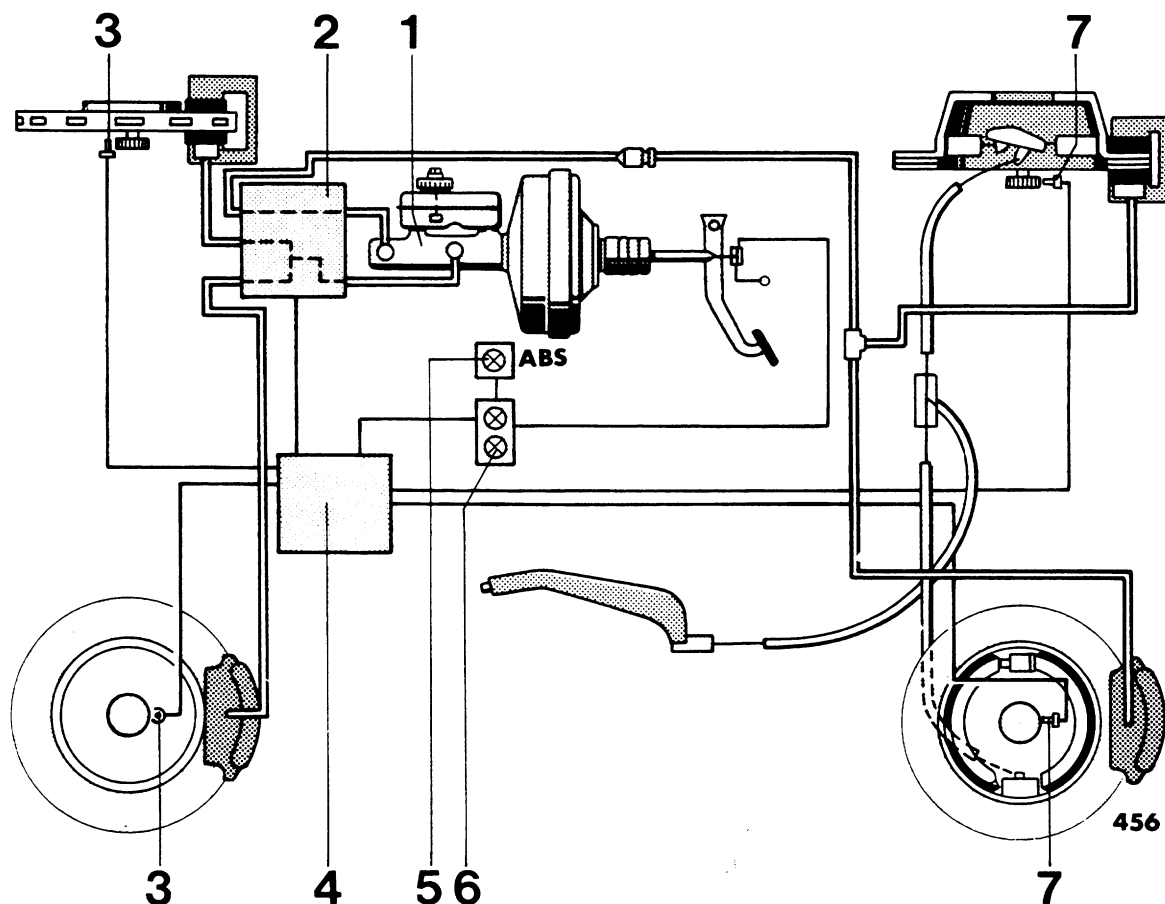
The ABS control unit is matched to the approved tire dimensions. The use of unapproved tires can lead to different wheel speeds which the control unit interprets as different road speeds at the car's axles.

If the difference in rolling radius exceeds a certain amount, the control unit deactivates the ABS and the ABS pilot lamp lights up.

ABS hydraulic unit changed from model year 1988 (blocking diode, for ABS pilot lamp shifted from the hydraulic unit into valve relay).

## ABS - DIAGRAMMATIC VIEW

The three-channel ABS manufactured by Bosch has a separate speed sensor for each wheel. A front/rear braking circuit split is used (black/white split), in other words, one braking circuit acts on the front axle (push-rod circuit) with the second acting on the rear axle (floating circuit).

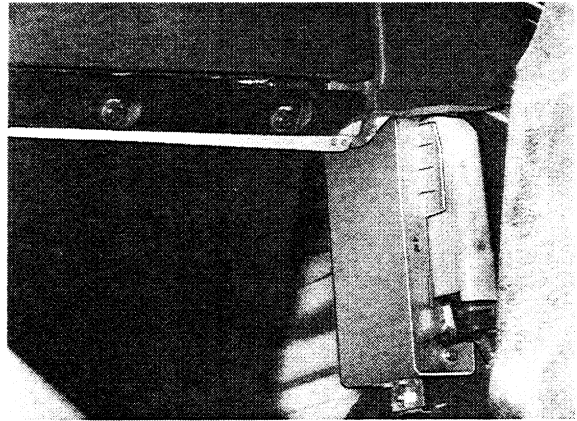


- 1 - Tandem brake master cylinder
- 2 - Hydraulic unit
- 3 - Speed sensor (cross-pole), front\*
- 4 - ABS control unit
- 5 - ABS pilot lamp
- 6 - Stoplights
- 7 - Speed sensor (flat-pole), rear\*

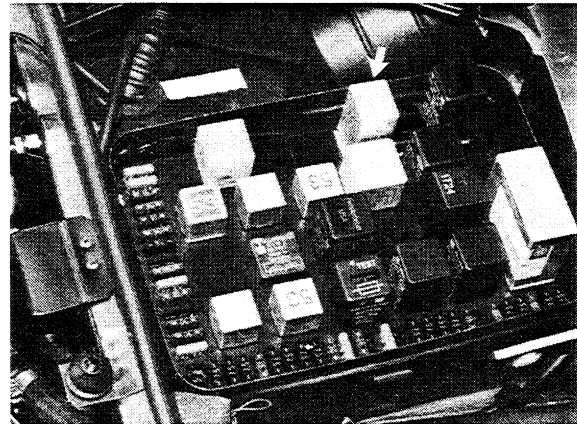
\* Each wheel-speed sensor is accompanied by an impulse ring with 45 teeth. The front-axle impulse rings are pressed onto the front-wheel hubs, the rear-axle units are milled onto the wheel shafts.

## Positions of ABS components

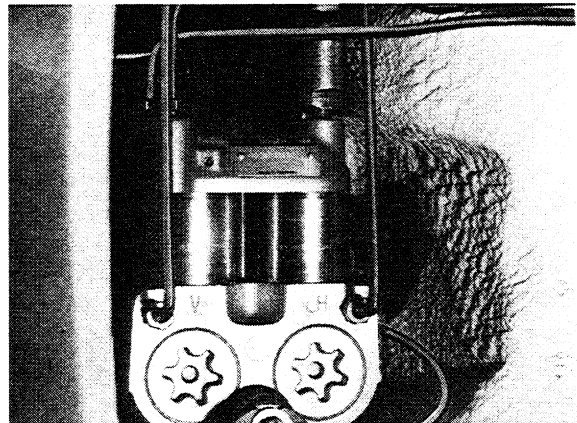
The control unit is mounted on the wheel arch in the passenger-side footwell.



The ABS relay is on central electric board.  
944 = relay G20  
968 = relay G22

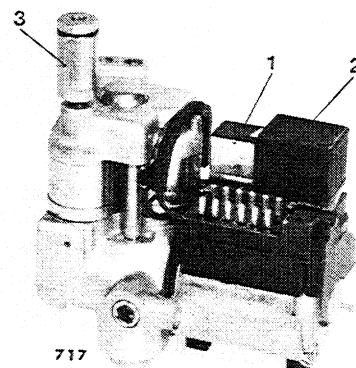


The hydraulic unit is installed beneath the right-hand front fender.

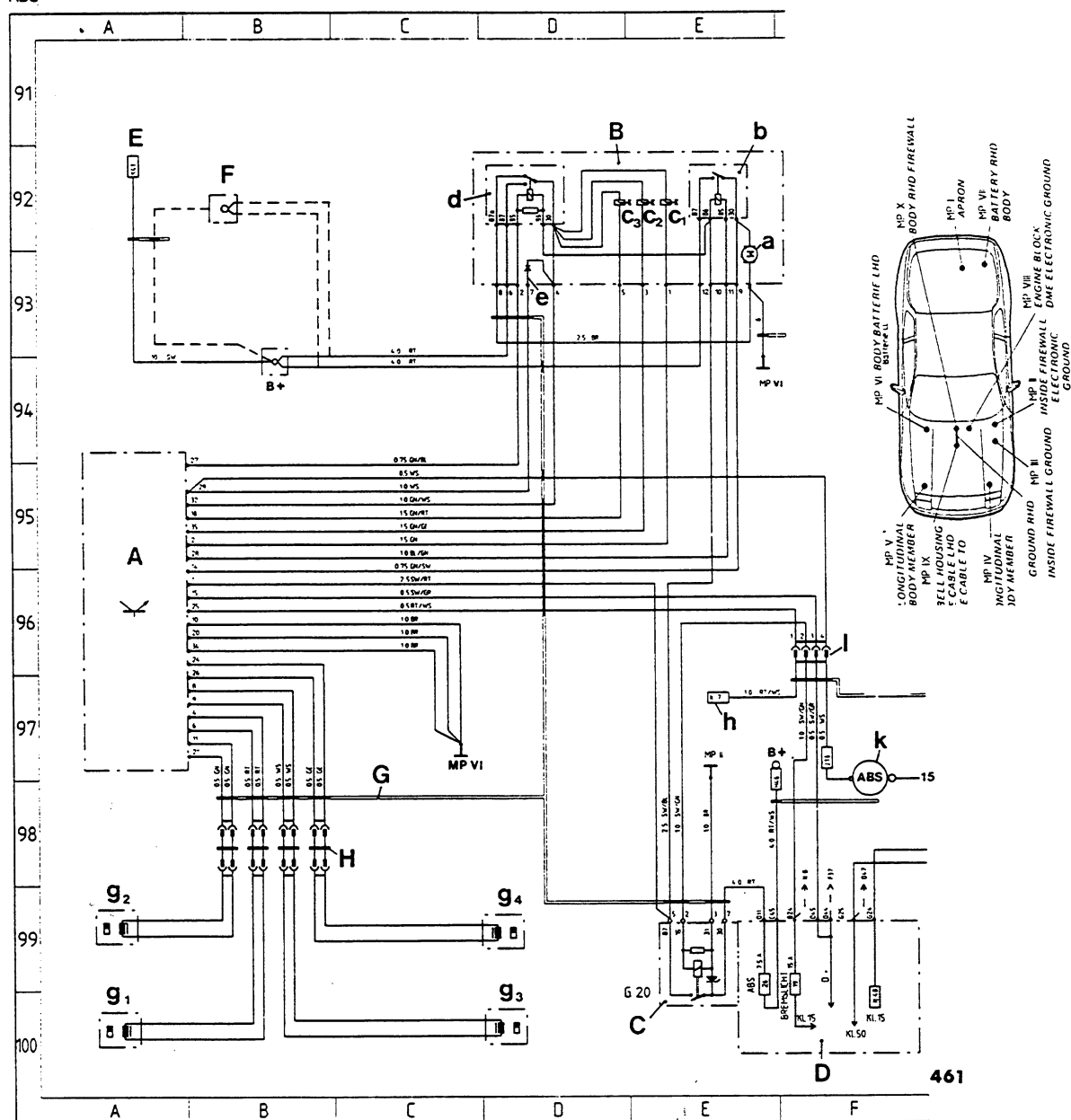


The solenoid-valve and pump-motor relays are mounted on the hydraulic unit.

- 1 – Solenoid-valve relay
- 2 – Pump-motor relay
- 3 – Braking-force regulator



ABS




- A — ABS Control unit
- B — Hydraulic control unit
- C — ABS relay (G 20 on CEB)
- D — Central Electric Board
- E — To starter terminal 30
- F — ABS plug connector (RHD only)
- G — ABS wiring harness
- H — Combination lead 4 x
- I — Four-pin plug (near CEB)
- MP VI — Ground pin - control unit
- Ground lead - hydraulic unit

- a — Pump motor
- b — Pump relay
- c<sub>1</sub> — Solenoid valve, front left
- c<sub>2</sub> — Solenoid valve, front right
- c<sub>3</sub> — Solenoid valve, rear
- d — Valve relay
- e — Diode
- g<sub>1</sub> — Speed sensor, front left
- g<sub>2</sub> — Speed sensor, front right
- g<sub>3</sub> — Speed sensor, rear left
- g<sub>4</sub> — Speed sensor, rear right
- h — Stop light
- k — ABS lamp in combination instrument




## IMPORTANT NOTES ON TROUBLESHOOTING AND ON THE ABS TEST PROGRAM

A test program with ABS tester must be carried out after certain repairs to the ABS (see Function testing, page 45 - 06). ABS Test Plan, Sheet No. WKD 493 710 is required for this test and for troubleshooting.




# SERVICE



928 S  
928 S<sub>4</sub>

# TEST PLAN

# ABS



944  
944 S  
944 *Turbo*

# INFORMATION

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Aktiengesellschaft

# TECHNIK

## IMPORTANT NOTES FOR WORKING ON CARS WITH ABS

Note the following when working on cars with ABS:

Welding

Disconnect the plug from the electronic control unit before using electric welding equipment.

Painting

The maximum short-term load which can be placed on the control unit during painting is 95°C; the maximum long-term load (approx. 2 hours) is 85°C.

Charging battery

When using a fast charger, disconnect the battery from the electrical system.

Installing battery

When the battery is reinstalled after removal, retighten both cable clamps correctly.

Assisted starting

Do not use a fast charger to start the engine.

Multi-pin plug of electronic control unit

Never disconnect or reconnect the multi-pin plug of the electronic control unit while the ignition is switched on.

Function testing

After any work on the braking system which did not effect parts directly involved in the ABS, a simple function check is all that is required. In other words, the pilot lamp in the instrument cluster must go out when the engine is started, if the ABS is intact. Work of this nature includes replacing brake pads, brake hoses, brake discs, brake unit, tandem master cylinder, brake cables and parts of the parking brake lines not connected to the hydraulic unit.

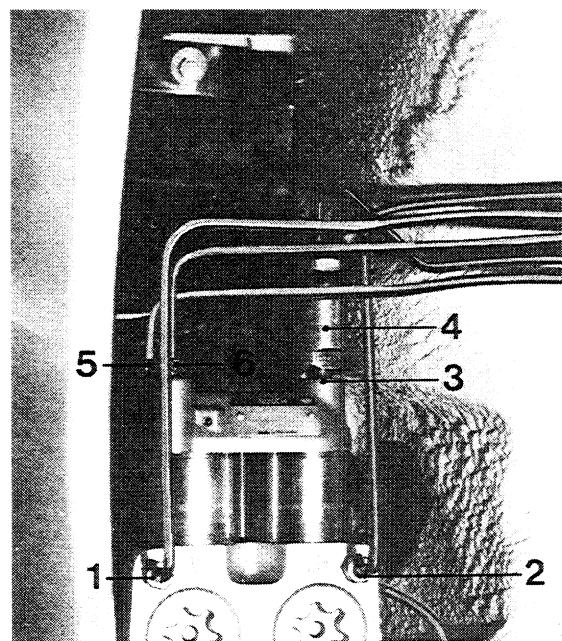
If work is carried out on the hydraulic unit\* (the electronic control unit\*) the wheel-speed sensors or the lines or if units are replaced, for example when accident damage is repaired, a function test must be carried out with the ABS tester.

- \* - It is impermissible to repair or disassemble hydraulic unit or electronic control unit.
- The electronic control unit has a self-diagnosis testing facility. For this reason, it is neither possible nor necessary to check the control unit unless the check is carried out as part of a ABS test required for other reasons and only when this test is carried out with the Bosch K 7 - ETT 016.00/VAG 1516 testing equipment.

## REMOVING AND INSTALLING HYDRAULIC UNIT

### Removing

1. With ignition switched off, disconnect ground lead from battery.
2. Remove right-hand front wheel. Mark respective positions of wheel and wheel hub for reassembly. Remove wheel-arch inner panel.
3. Disconnect braking-force regulator (installed in 944 S and 944 turbo only) and all brake lines (Nos. 1 - 6) from hydraulic unit.

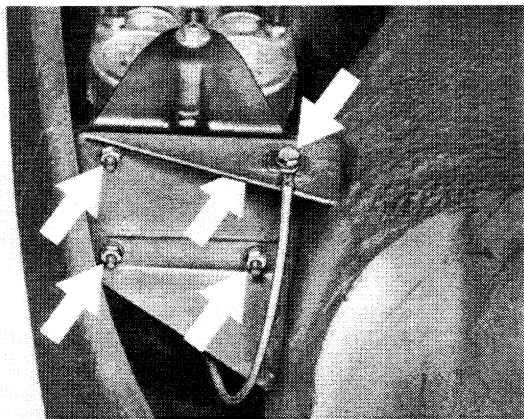


### Note:

If necessary, unclip the brake lines from the holders in the wheel arch. Insert stoppers immediately to plug brake lines and connections (risk of dirt penetrating the system). If no stoppers are available for the brake lines, drain the reservoir beforehand and cover the lines.

- 1 - From brake master cylinder, front-axle braking circuit (code V in some cases)
- 2 - From brake master cylinder, rear-axle braking circuit (code H in some cases)
- 3 - Rear brake line (code h)
- 4 - Braking-force regulator (only 944 S and 944 turbo)
- 5 - Front left brake line (code l)
- 6 - Front right brake line (code r)

4. Disconnect ground and remove mounting bolts from hydraulic-unit holder.

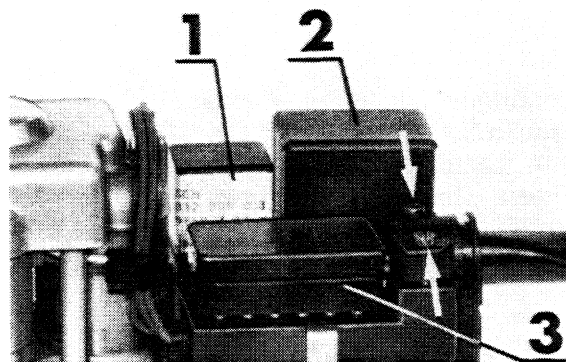
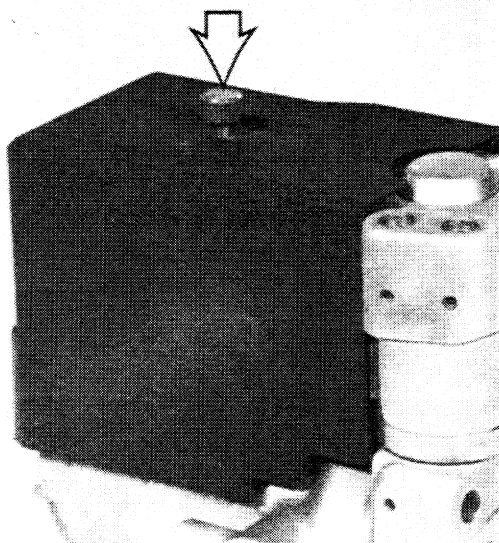


6. Move hydraulic unit and holder out slightly to gain access to strain relief for 12-pole plug (No. 3). Disconnect strain relief and remove plug.

Note:

The two relays for pump motor No. 2 and for the solenoid valve No. 1 can be replaced (page 45 - 6/45 - 7).

5. Remove cover from hydraulic unit.



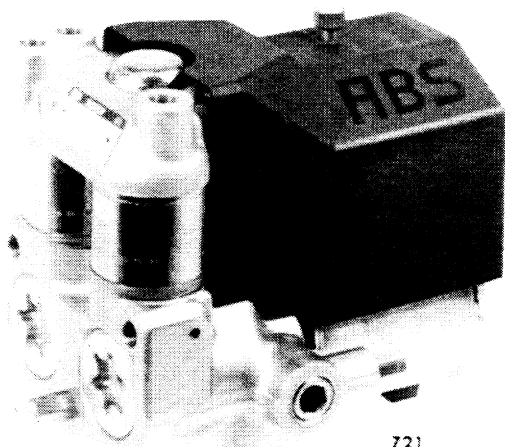
7. Unclip ABS wire harness from hydraulic-unit holder and remove hydraulic unit with holder.

## Installing

Note 1. Installation is the reverse of the above sequence.

ABS hydraulic unit modified as from Mod. 88. Blocking diode for ABS pilot light from the relay socket integrated into the valve relay (arrow).

Identifying feature: Recessed cover with the marking ABS.



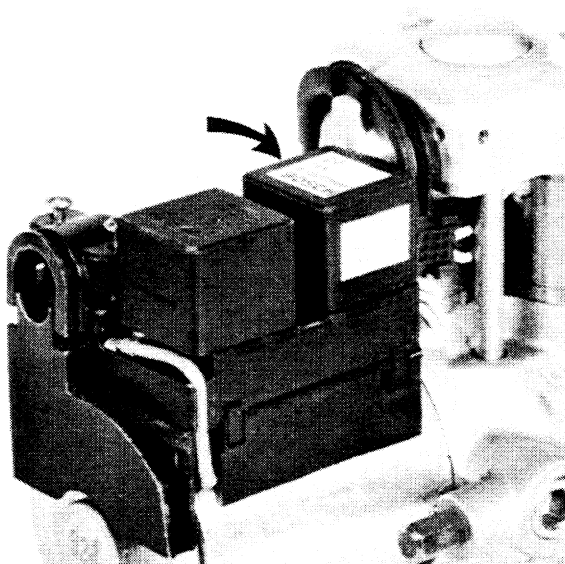
1. Installation is the reverse of the above sequence.

2. It is essential to bear the following in mind:

- connect brake lines to correct hydraulic-unit ports (see page 45 - 1)
- check that brake lines are correctly routed

3. Bleed braking system and check for leaks. Same procedure as for cars without ABS.

4. Install wheel-arch inner panel and front wheel. Conduct function test with ABS tester.

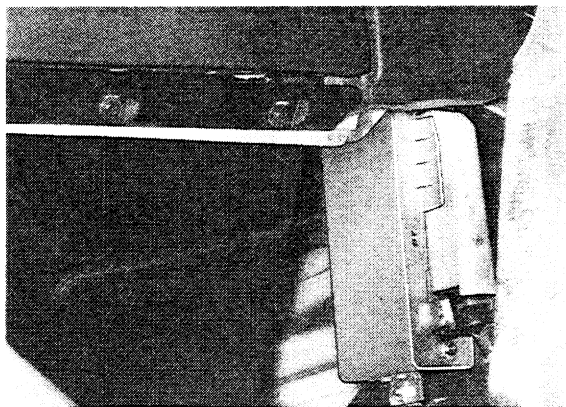


## REMOVING AND INSTALLING ELECTRONIC CONTROL UNIT

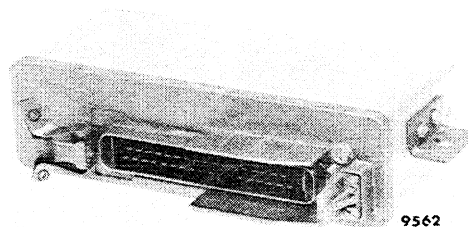
RemovingNote:

The electronic control unit is in the passenger-side footwell. It is imperative to switch off the ignition before disconnecting the multi-pin plug from the control unit or removing the control unit.

1. Disengage retaining spring (spring lock) and disconnect plug from electronic control unit.



2. Unscrew retaining nuts and remove electronic control unit from holder.

InstallingNote:

When replacing, take care to ensure that the correct control unit is used.

The control unit may be confused with that for the 928 models, model year '86 and earlier (for 90-tooth impulse rings).

Externally, the only difference between the control units is the Bosch or Porsche number.

1. Attach electronic control unit to holder.

2. Re-connect multi-pin plug to electronic control unit so that it is securely seated.

The retaining spring must be heard to lock into position.

\_\_\_\_\_

## REMOVING AND INSTALLING RELAYS

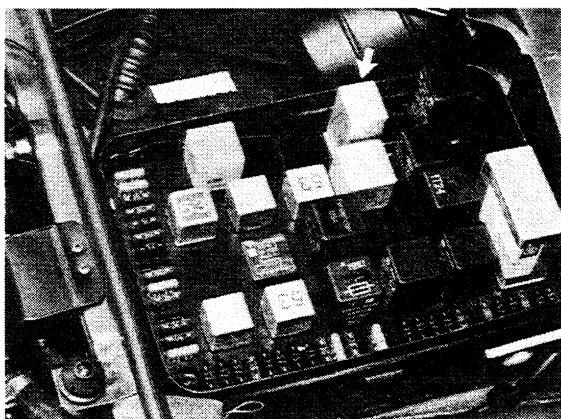
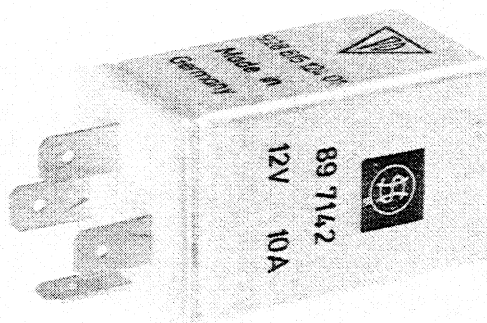
General

- The anti-lock braking system is equipped with three relays.
- The ABS relay (arrowed) is mounted on the central electrics unit (relay G 20) it supplies voltage to the ABS control unit, the pump-motor relay and the solenoid-valve relay (circuit diagram page 45 - 04).
- The solenoid-valve relay and the pump-motor relay are situated beneath the cover of the hydraulic unit.  
The hydraulic unit is mounted in the rear of the right-hand front wheel arch.

Removing and Installing ABS relay

Remove cover from central electrics unit.

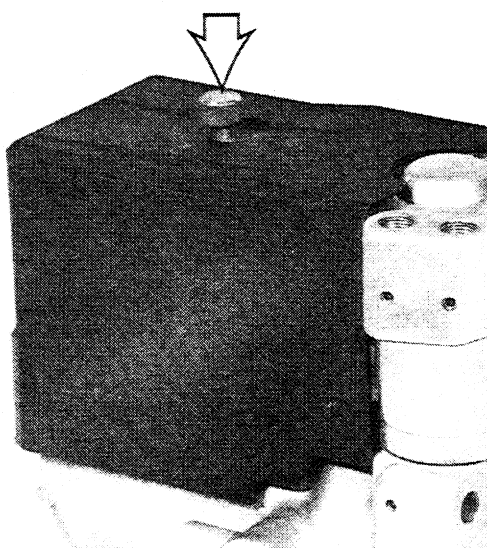
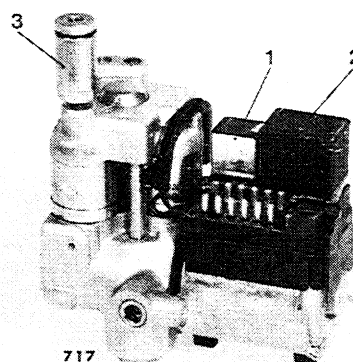
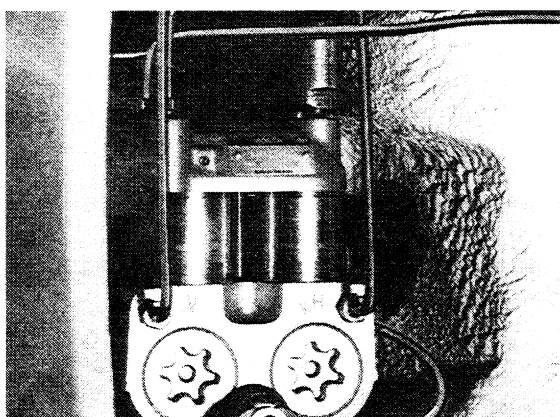
Remove or connect ABS relay (electronic relay with overvoltage protection) with ignition switched off.





### Removing and installing solenoid-valve and pump-motor relays

1. Remove right-hand front wheel.  
Remove wheel-arch inner panel.
2. Remove hydraulic-unit cover.
3. With ignition switched off, withdraw solenoid-valve relay No. 1 (5-pole/as from Mod. 88, 6-pole, see Page 45-3) or pump-motor relay No.2 (4-pole).

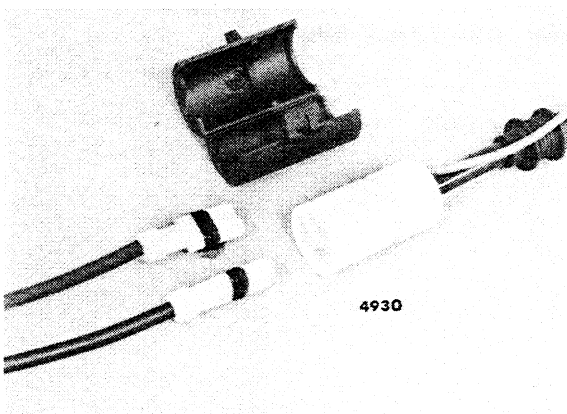
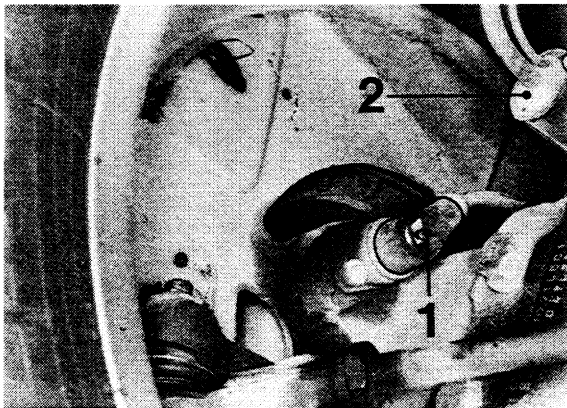


4. Installation is the reverse of the above sequence.

## REMOVING AND INSTALLING WHEELSPEED SENSORS, FRONT AND REAR AXLES

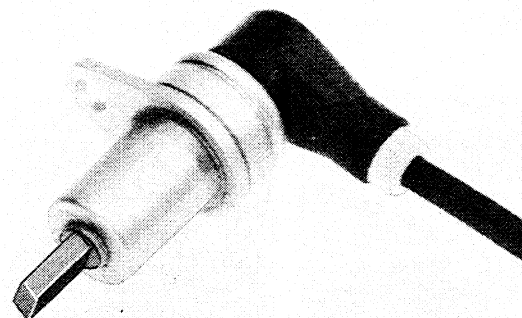
Front axleRemoving

- With the ignition switched off, open and disconnect ABS cable connector on spring strut (No. 2).
- Unscrew mounting bolt (hex socket-head bolt) of wheelspeed sensor No.1 and remove wheelspeed sensor from steering knuckle.

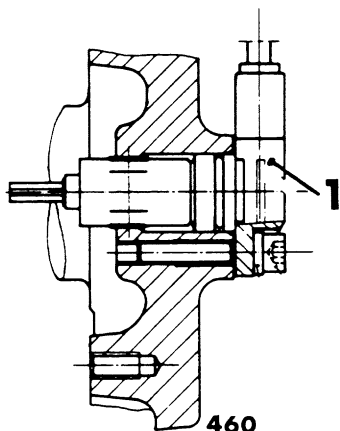
InstallingNote:

- do not remove wheelspeed sensor from its protective packing until just before it is to be installed (loss of permanent magnetism)
- before installing, check that there are no metallic particles (chips) on the magnetic edge of the wheelspeed sensor

1. Apply Molykote Longterm 2 to wheelspeed sensor and hole in steering knuckle. Replace O-ring of wheelspeed sensor.



2. Without using force, insert wheelspeed sensor in steering knuckle and tighten hex socket-head bolt to secure.  
Tightening torque: 10 Nm (7 ftlb)



Note:

The distance between wheelspeed sensor and impulse ring is a design feature and cannot be adjusted.

3. Reconnect cable plug and place in holder on spring strut.  
If necessary, remove wheel.

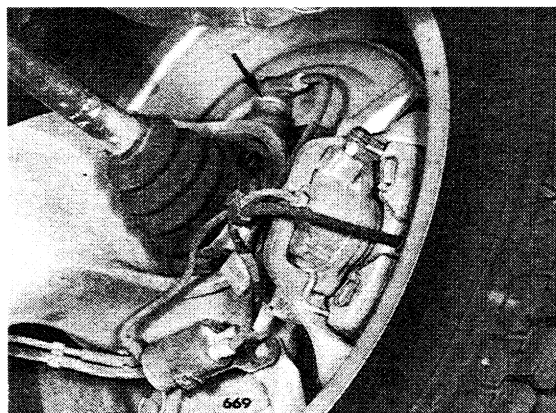
4. Check operation with ABS tester.

Rear axle

Removing

1. With ignition switched off, open and disconnect ABS cable connector on control arm. Withdraw clip for wheelspeed-sensor cable from holder.

Unscrew wheelspeed-sensor retaining bolt.

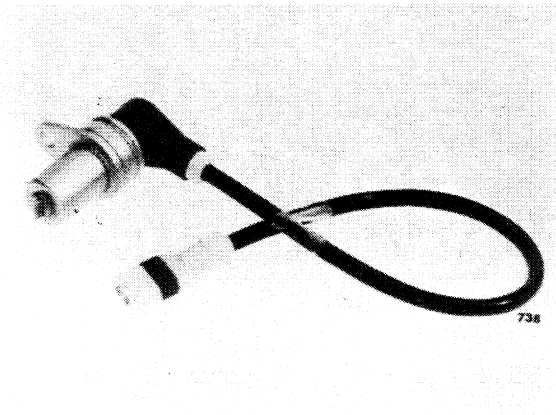


2. Remove wheelspeed sensor from trailing arm.

## Installing

### Note:

- do not remove wheelspeed sensor from its protective packing until just before it is to be installed (loss of permanent magnetism)
  - before installing, check that there are no metallic particles (chips) on the magnetic edge of the wheelspeed sensor
1. Apply Molykote Longterm 2 to wheelspeed sensor and hole in trailing arm. Replace O-ring of wheelspeed sensor.
  3. Reconnect cable plug and insert in holder. Insert cable clip in holder on trailing arm.
  4. Check operation with ABS tester.



2. Without using force, insert wheelspeed sensor in wheel carrier and tighten hex socket-head bolt to secure. Tightening torque: 10 Nm (7 ftlb)

### Note:

The clearance between wheelspeed sensor and impulse ring is a design feature and cannot be adjusted.

# Technical data 924 S / 944 / 944 S / 944 S2

Designation	Remarks, Dimensions		Wear limit	
	924 S/944/944 S	944 S2	924 S/944/944 S	944 S2
<b>Service brake (foot brake)</b>	Hydraulic two-circuit brake system with front-axle/rear-axle brake circuit assignment (black/white), brake booster, ventilated brake disks with floating-frame caliper or fixed caliper on front and rear axles. The push-rod brake circuit is assigned to the front wheels. Each fixed caliper has 4 pistons			
Brake boosters (light-weight construction)	Ø 9 inch	Ø 9 inch		
Booster factor	3.1 bzw. 3.4*	3.4		
Brake master cylinder** (aluminium) up to end of Model 86 as well as 924 S ( Ø in mm)	23.81/19.05	—		
Model 87 onward apart from 924 S ( Ø in mm)	23.81/20.64	23.81/20.64		
Brake-power controller in the rear-axle brake circuit Switching pressure / reduction factor	33 bar / 046*** (944 S only)	18 bar/046		
Brake disk Ø front	282.5 mm	298 mm (304 mm)		
rear	289 mm	299 mm		
Active brake disk Ø				
front	224.6 mm	245 mm (250,8 mm)		
rear	242 mm	246 mm		

\* Special running gear with brake system as on 944 Turbo from MY '89

\*\* Model 87 onward, apart from 924 S, boost factor 3.4

\*\*\* vehicles with ABS (special option for Mod. 87 onward / standard on part of production vehicles as of model year '90) with two central valves.

\*\*\*\* 924 S and 944 without brake-power regulator.

Designation	Remarks, dimensions		Wear limit	
	924 S/944/944 S	944 S2	924 S/944/944 S	944 S2
Piston O/ in front brake caliper mm	54	2 x 36 + 2 x 40 (2 x 36 + 2 x 44)*		
rear mm	36	2 x 28 + 2 x 30		
Brake-pad thickness, front	13 mm	13 mm	2 mm	2 mm
rear	13 mm	13 mm	2 mm	2 mm
Brake-pad surface per front wheel	92 cm <sup>2</sup>	86 cm <sup>2</sup> (126 cm <sup>2</sup> )*		
Brake-pad surface per rear wheel	63 cm <sup>2</sup>	86 cm <sup>2</sup>		
Total brake-pad surface	310 cm <sup>2</sup>	344 cm <sup>2</sup> (424 cm <sup>2</sup> )*		
Thickness of new brake disk, front	20,5 mm	28 mm		
rear	20 mm	24 mm		
min. brake-disk thickness** after machining front	19.1 mm	26.6 mm (30,6 mm)*	18.5 mm	26 mm (30 mm)
rear	19.2 mm	22.6 mm	18.6 mm	22 mm
Max. thickness tolerance of brake disk	0.02 mm	0.02 mm		
Max. lateral run-out of brake disk	0.05 mm	0.05 mm		
Max. lateral run-out, installed	0.1 mm	0.1 mm		
Lateral runout of wheel hub max.	0.05 mm	0.5 mm		
Max. raw depth after machining	0.006 mm	0.006 mm		

\* Special running gear with brake system as on 944 Turbo from model year '89

\*\* The brake disk must only be machined symmetrically, i.e. the same on both sides.

Designation	Remarks, dimension		Wear limit	
	924 S/944/944 S	944 S2	924 S/944/944 S	944 S2
Brake-pedal play with brakes bled and engine stationary	approx. 10 mm	approx. 10 mm		
<b>Parking brake (handbrake)</b>	mechanical, acting on both rear wheels drum brake			
Parking-brake drum Ø	180 mm	180 mm	181 mm	181 mm
Width of brake shoes	25 mm	25 mm		
Brake-pad surface per wheel	85 cm <sup>2</sup>	85 cm <sup>2</sup>		
Brake-pad thickness	4.5 mm	4.5 mm	2 mm	2mm

## TORQUE SPECIFICATIONS FOR MECHANICAL BRAKE PARTS

Location	Description	Threads	Material	Tightening Torque Nm (ftlb)
Socket-head bolt to clamping nut	Socket-head bolt	M 7	10.9	13 + 3 (9.5 + 2.2)
Caliper to steering knuckle	Hex bolt	M 12x1.5	8.8	85 (63)
Brake disc to wheel hub	Hex nut countersunk screw	M 8 M 6	8	23 (17) 10 (7)
Guard to steering knuckle	Hex bolt	M 7	8.8	10 (7)
Wheel hub to rear- wheel shaft with steel trailing arms	Castle nut	M 24x1.5	8.8	380 + 70 (280 + 52)
with aluminum trailing arms	Locknut	M 22x1.5	8	500 (368)
Brake-pipe holder to brake backplate or trailing arm	Hex bolt	M 6	8.8	10 (7)
Wire holder to trailing arm	Hex bolt	M 6	8.8	10 (7)
Guard to brake backplate or trailing arm	Hex bolt	M 6	8.8	10 (7)
Brake disc to wheel hub	Countersunk bolt	M 6	8.8	5 (3.6)
Floating caliper to brake backplate or trailing arm	Hex bolt	M 12x1.5	8.8	85 (63)
Brake backplate to trailing arm	Hex bolt	M 10	10.9	58 (43)
Parking-brake lever to body	Hex bolt	M 8	8.8	21 (15.5)



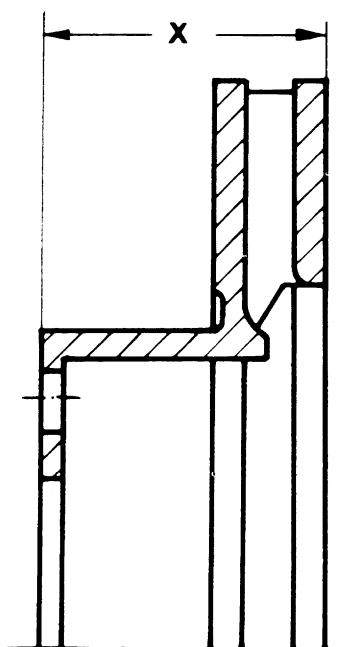
Location	Description	Threads	Material	Tightening Torque Nm (ftlb)
Brake cable to yoke	Hex bolt	M 6	8.8	8.5 (6.2)
Parking brake cable to turnbuckle	Nut	M 6	8	8.5 (6.2)
Brake booster to connector	Hex nut	M 8	8	21 (15.5)
Connector to firewall	Hex nut	M 8	8	21 (15.5)
Swivel on brake push rod	Hex nut	M 10	8	35 (26)

## NOTES ON BRAKING SYSTEM, '87 MODELS ONWARD

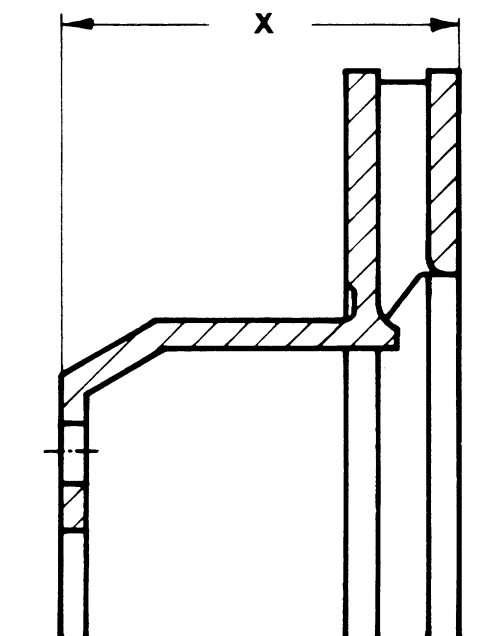
Brake Discs

As of model year '87 and with the exception of the 924 S, the pot size (distance X) of the brake discs has been changed because of the installation of ABS (optional extra M 593).

Front brake disc



Rear brake disc



Asbestos-free brake pads worldwide as from model 89 and as from model 88 for Sweden, Norway, Denmark (FA = Textar T 400 / RA = Textar T 426). May be retrofitted to the front and rear axles of all 924 S/ 944 / 944 S vehicles. A combination of asbestos-free / asbestos is not permitted.

- Refer to page 46 - 07 for 944 S 2 brake pads.

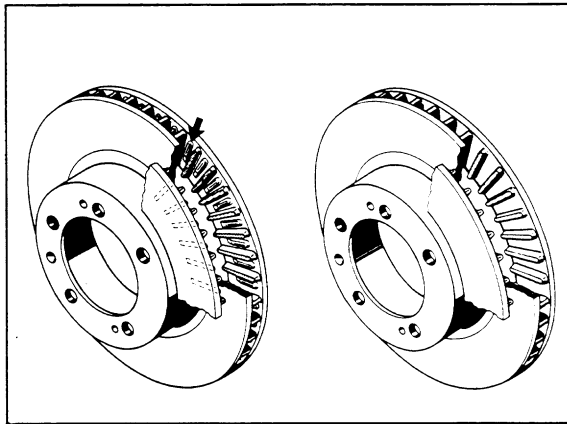
## Notes on four-piston fixed brake calipers

A four-piston fixed caliper brake has been installed in the 944 S 2.

944 S 2 vehicles built during model year 1989 have varying construction statuses.

This involves the following components:

- **Front brake disks**  
Changed over to brake disks with semi-ribs (arrow).
- **Front cover panel**  
Cutouts enlarged to cool brakes.
- **Four-piston fixed caliper, front and rear**  
Piston seal modified from wiper-ring version to cap version.
- **Brake pads front and rear**  
Type of brake pad changed.



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The following applies to repairs or assembly work:

### Front brake disk

When replacing brake discs, ensure that the same type are used right and left.

### Front cover plate

The cut-outs for brake cooling must be the same size left and right. If panels with large cut-outs are installed, never use plates with smaller cut-outs.

### Four-piston fixed caliper

The same type of fixed caliper must be used on each axle.

### Brake pads

Only use the same type of brake pads on front and rear axles. Never mix brake pads with asbestos/without asbestos or asbestos-free brake pads of various types.

**When replacing brake pads, use Pagid S 537 - 537 (asbestos-free) on the 944 S 2.**

**Not applicable to M 030 (large brake calipers, as for turbo from MY '89).**

**Use asbestos-free Textar T 400 brake pads on all 944 turbo vehicles and on the 944 S2 with special running gear M 030.**

## CHECKING THICKNESS OF BRAKE PADS

### Cars Without Brake Pad Wear Indicator

Replace brake pads when worn to thickness of 2 mm.

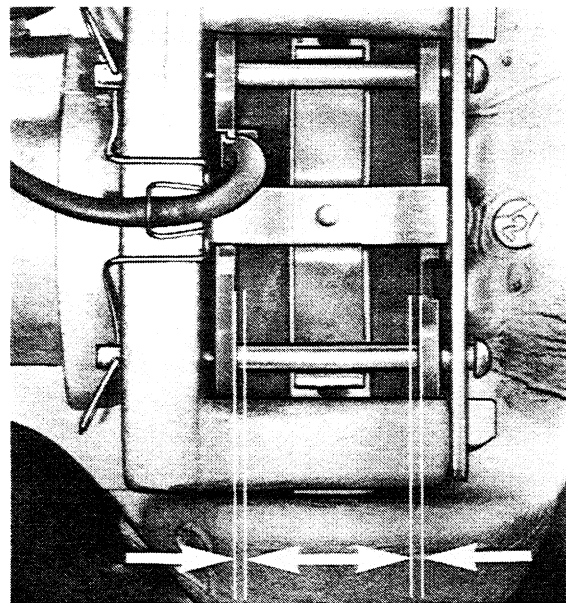
### Cars With Brake Pad Wear Indicator (Since 1984 Models)

Replace brake pads when brake pad indicator lamp comes on, however at latest when worn to thickness of 2 mm.

If brake pad wear is reported by the indicator lamp, the warning contact (sensor with wire and plug) must also be replaced. It will not be necessary to replace the warning contact, if brake pads are replaced when worn to a thickness of 2.5 mm.

Replace warning contacts with ground wire cores. If only the plastic part of the warning contact is ground, replacement will not be necessary.

2. Inspect brake pads visually for wear.



Wear limit is reached, when pad has a remaining thickness of 2 mm.

1. Remove wheels to check brake pad thickness.

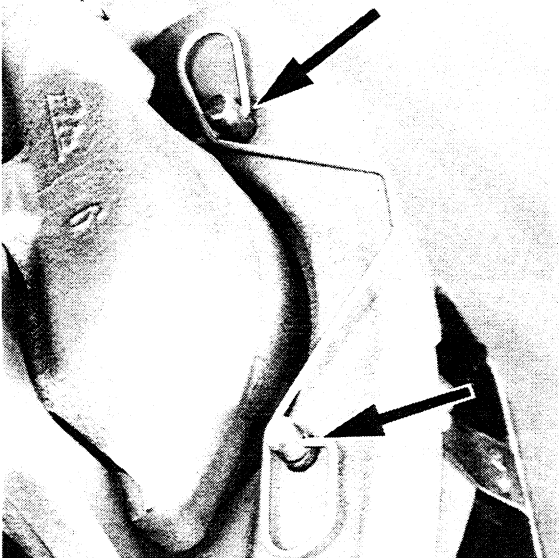
## REMOVING AND INSTALLING BRAKE PADS

## Removing

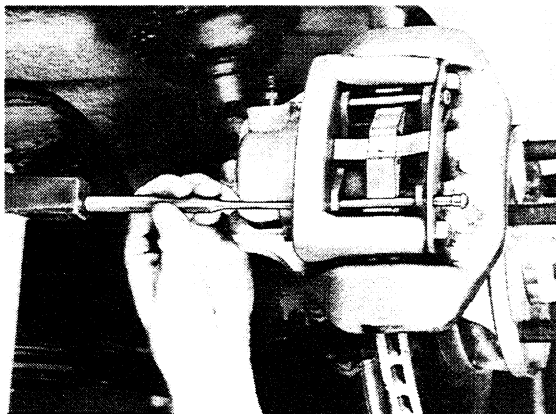
## Note:

If brake pads can be re-used, mark them when removing. Pads must not be moved from outside to inside and vice versa or from right to left wheel. This would cause uneven braking effect.

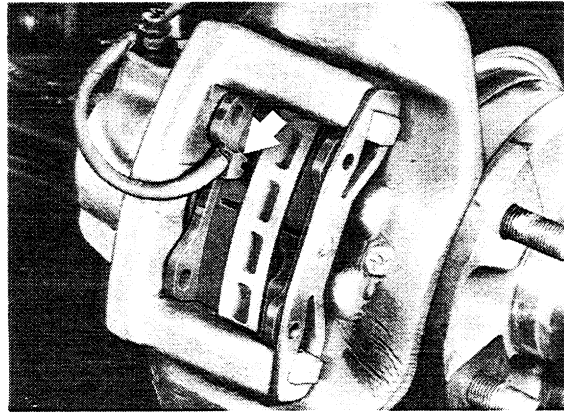
1. Remove spring-type locks for retaining pins.



2. Remove retaining pins.



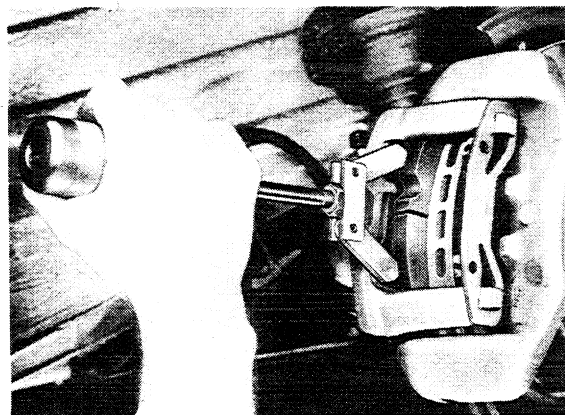
3. Cars with brake pad wear indicator:  
Pull warning contact out of pad plate.



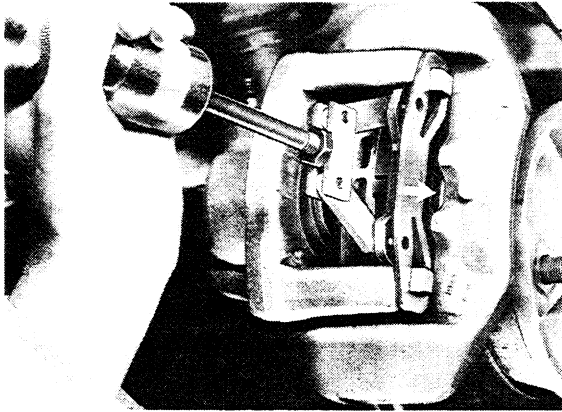
## Note:

Replace warning contacts with ground off or ground wire cores. Warning contacts can be re-used when there are only traces of grinding on the plastic part of the warning contact.

4. Pull out inner brake pad with a suitable tool, e. g. Hazet 1966-2 impact puller.



5. Pull out outer brake pad. This requires pressing out floating caliper frame until brake pad protrudes out of pin on floating caliper frame.



#### Note :

To prevent brake fluid tank from overflowing, draw off small amount of brake fluid before pressing back piston.

Use syringe reserved exclusively for brake fluids.

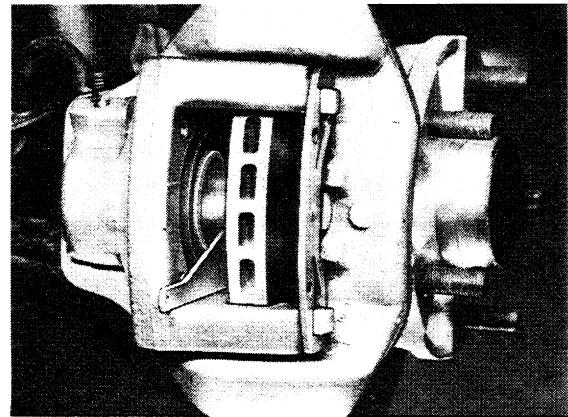
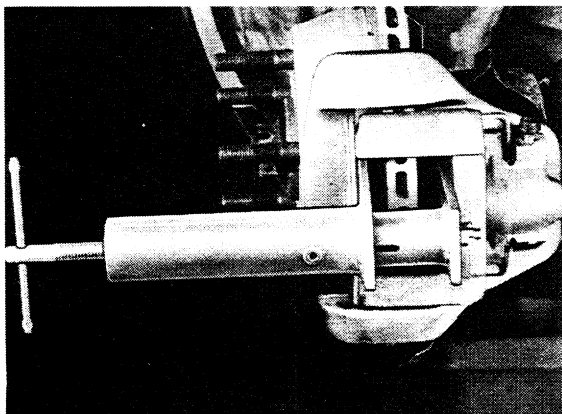
Brake fluids are poisonous and must not be siphoned off through a hose.

3. Clean brake pad bearing and sliding surfaces in brake calipers with alcohol or a cylindrical brush. Never use solutions containing mineral oils or sharp edged metallic tools.

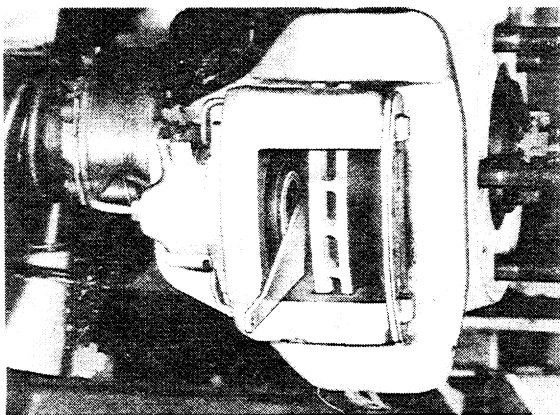
4. Check 20° piston position and adjust with piston turning pliers, if necessary.

#### Installing

1. Replace brake pads, which show deep cracks, have become loose from back plates or are covered with oil. Also in this case replace all four pads of one axle.
2. Press back piston to initial position with special tool.



Front Axle



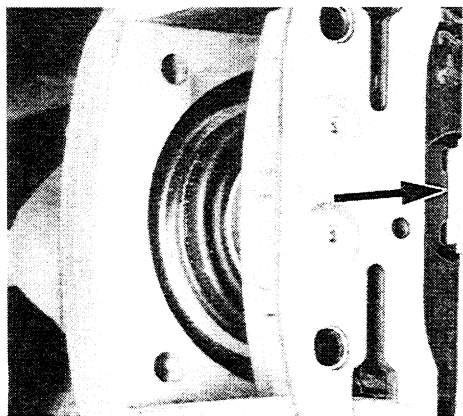
Rear Axle

5. Install outer brake pad and press floating caliper frame in direction of brake disc so that pin engages in groove of pad back-plate.

**Note :**

Apply a thin coat of grease on bearing and sliding surfaces to prevent seizure of brake pads in brake calipers through corrosion.

Use Optimoly HT (copper paste) or Plastilube (Schillings, P. O. Box 1703, 7080 Aalen).



6. Install inner brake pad.

7. Install retaining pin and cross spring.  
Cars with brake pad wear indicator:  
Press warning contact into inner pad back-plate.

8. Install spring-type lock.

9. Depress brake pedal of stationary car firmly several times to move brake pads to their normal operating position. Now check level of brake fluid in tank, adding more if necessary.

### Breaking In Brake Pads

New brake pads must be broken in during the first 200 km. Only then will they reach maximum friction and wear values. During this time full stops from top speeds should be limited to emergency situations.

## Brake pads for four-piston fixed caliper brakes, removing and installing

The procedure for changing brake pads on the 944 S 2 is the same as for other Porsche models with four-piston fixed calipers.

Refer to the Workshop Manual for the 944 turbo for this procedure. In addition to this, observe the following:

**Use the correct type of brake pad.**

**Notes on Page 46 - 07.**

**Replace damper plates each time brake pads are changed.** Remove the damper plates before pressing the piston back into the initial position.

On the 944 S 2, the damper plates are only installed on four- piston fixed calipers with cap seal (both front and rear axles). Also please refer to suppressor and vibration damper survey in Technical Information Group 4, No. 1/90.

The damper plates have an adhesive strip and protective foil. **The protective foil must be removed before installation.**

**The brake-pad carrier plates (reverse side of brake pads) must not be lubricated.**



## ADJUSTING BRAKE PUSHROD

Note:

The brake pushrod need only be adjusted when:

- the brake booster has been replaced - swivel has been removed from brake pushrod
- pushrod or swivel have been turned.

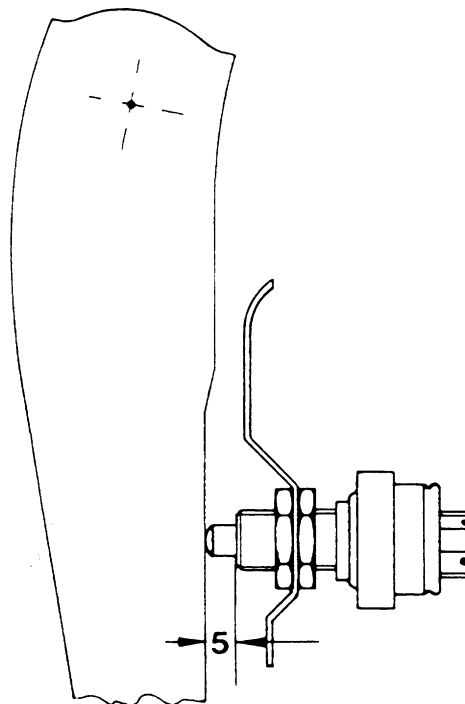
The brake pedal does not have a stop. Its initial position is reached when the braking unit (brake booster + brake master cylinder) are in the released position. Since the brake pedal is unsupported in its initial position when the brake pushrod is correctly adjusted, the fixed clearances in the brake unit are assured. Consequently, with the engine off and brakes bled, approx. 10 mm of pushrod play can be felt when the brake-pedal pad is depressed by hand.

Adjusting

1. Adjust length of brake pushrod by turning swivel. The length from brake booster-to-connector (adapter) contact face to center of swivel lockpin should be  $186 + 1$  mm or  $207 + 1$  mm (see page 47 - 11).
2. Tighten locknut.
3. Check stoplight switch setting.

## CHECKING STOPLIGHT SWITCH SETTING

The stoplight switch is a mechanically operated switch mounted on a bracket above the brake-pedal pad. In the initial position (neutral position) of the brake-pedal lever, the distance between stoplight and lever must be 5 mm. If necessary, turn mounting nuts to change position of stoplight switch until specified gap of 5 mm is reached. Turn mounting nuts in opposite directions to lock.

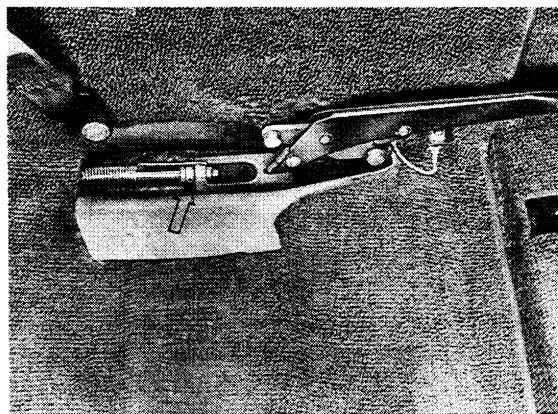


## CHECKING AND ADJUSTING PARKING BRAKE

If no more than average force is enough to raise the lever by more than 2 notches without noticeable braking effect, the parking brake requires adjustment.

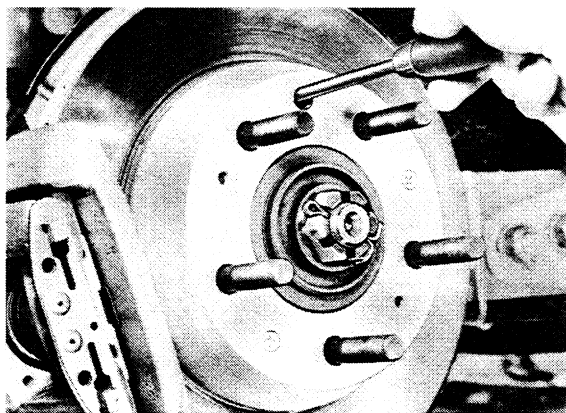
1. Jack up car and remove rear wheels
2. Release parking brake and push disc brake pads on rear wheels back until brake disc can be turned with ease.
3. Slacken adjusting nut on turnbuckle until cable is slack.
4. Insert a screwdriver through the hole in the brake disc and turn adjusting device until the wheel is locked. Turn locking device in opposite direction until wheel can be turned freely. Follow this by turning the adjusting device back until the wheel can be turned freely, and then turn back (undo) by another 2 notches.

5. Pull up parking-brake lever 2 notches and turn adjusting nut until wheels can just be turned by hand (with the lever in 4th notch, the wheels must be locked).



6. Release parking brake lever and check that both wheels turn freely.

7. Lock adjusting nut.



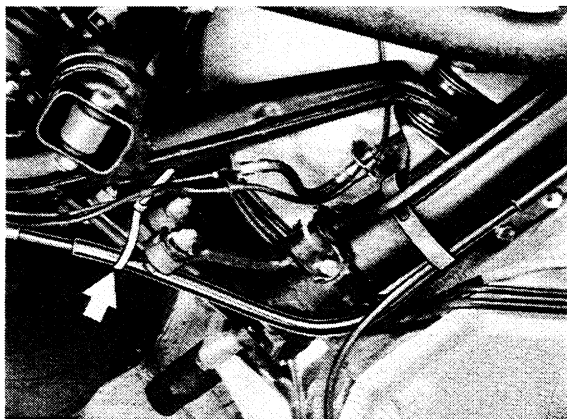
## MODIFIED SUSPENSION OF PARKING BRAKE CABLES

Since October 7, 1983 parking brake cables are suspended from the rear axle cross tube, instead of the spring struts, so there is guarantee for free movement of parking brake cables even during wheel bump travel.

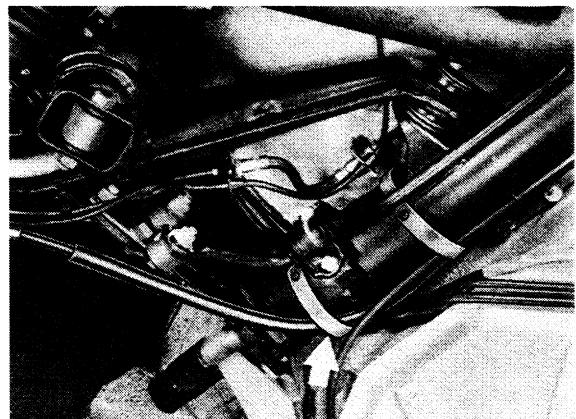
Cars with the old suspension system can be converted to the new suspension. This is accomplished by removing the straps on the spring struts and replacing them with retaining straps on the left and right sides of the rear axle cross tube outside of the stabilizer mounts.

The retaining strap already installed on the left side of the rear axle cross tube (inside of stabilizer mount) is not changed.

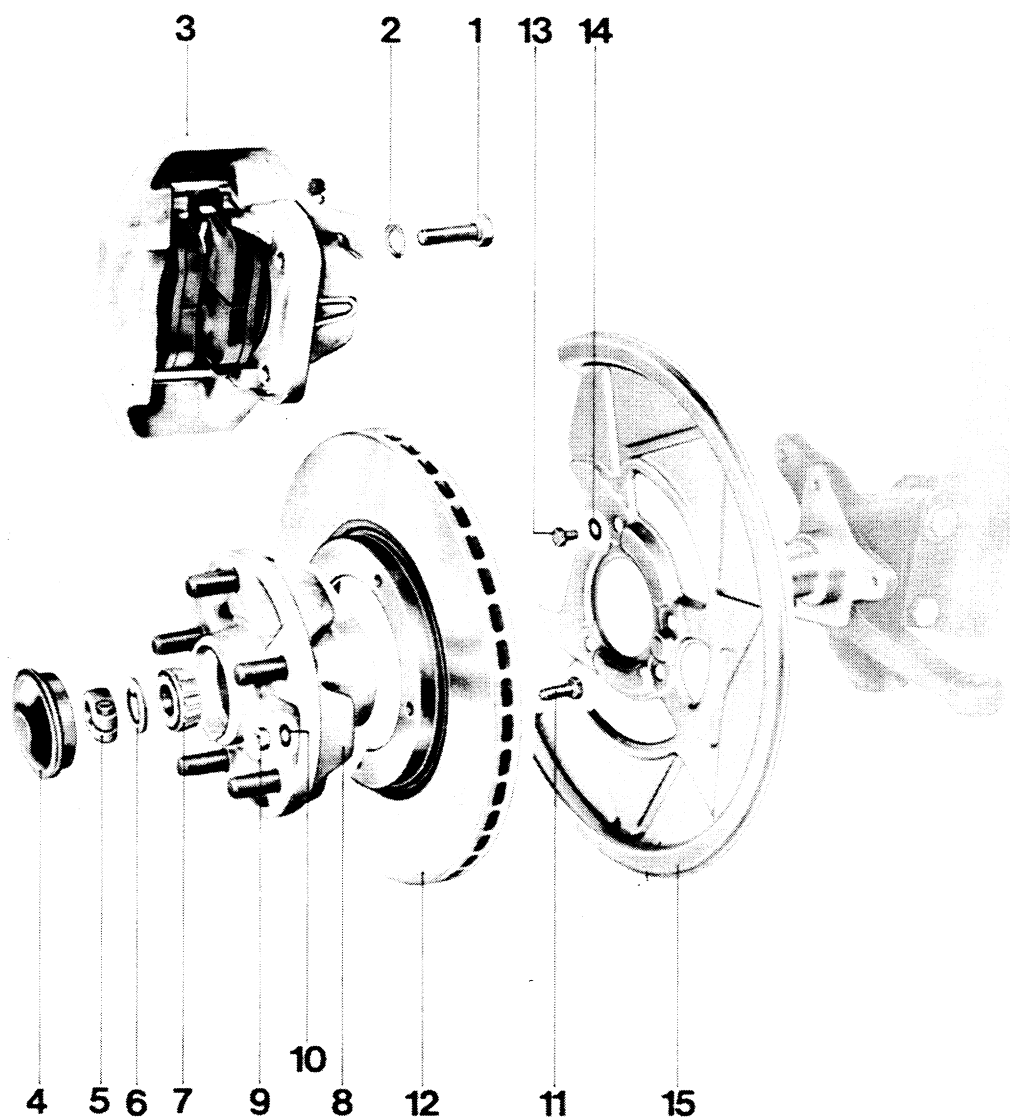
Parts Required:	2 x 477 711 979	Retaining strap
	2 x N 013 510 1	Rivet base
	2 x N 013 530 3	Rivet head



Old Suspension



New Suspension  
(since Oct. 7, 1983)



No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Bolt M 12 x 1.5 x 40	2		Torque: 85 Nm (61 ft lb)	
2	Spring	2		Replace, if necessary	
3	Caliper	1	Suspend from suitable point with a piece of wire. Only detach brake hose for repairs	Do not mix up left and right calipers if both were removed. Bleeder valves must face up	
4	Grease cap	1	Pry off with two tire irons		
5	Clamping nut with bolt	1		Adjust wheel bearing play. Bolt torque: 13 Nm (9 ft lb)	
6	Thrust washer	1			
7	Wheel bearing, outer	1		Check, replacing if necessary	
8	Front wheel hub	1			
9	Nut	5		Torque: 23 Nm (17 ft lb)	
10	Washer	5		Replace, if necessary	
11	Bolt	5			
12	Brake disc	1		Check for wear and damage. Mark for installation	
13	Bolt M 7 x 10	3		Torque: 10 Nm (7 ft lb)	
14	Washer	3		Replace, if necessary	
15	Guard	1			

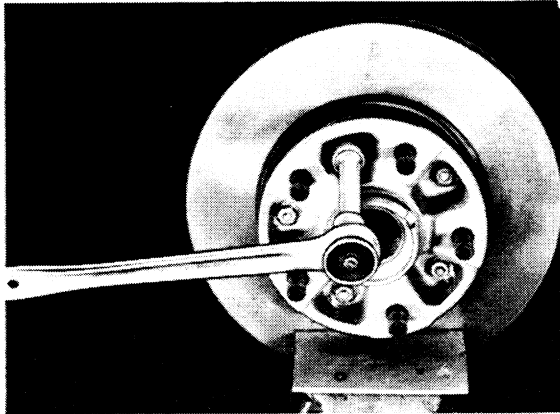
## Disassembling and assembling notes

### Disassembling

1. Remove brake caliper and suspend in a suitable place (do not undo brake hose or brake line).
2. Remove brake disc. Proceed according to model specified (refer to below instructions).

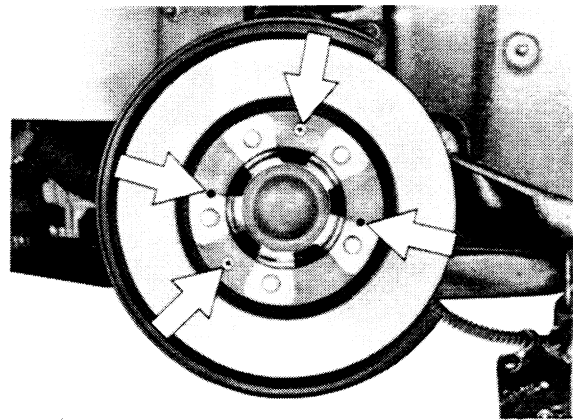
#### Brake disc of 944 up to end of MY '86 and all 924 S

- Remove wheel hub with brake disc.
- Mark installation position of brake disc relative to wheel hub. Remove fastening screws. Take off wheel hub.



#### Brake disc as of MY '87 for 944, 944 S and 944 S 2

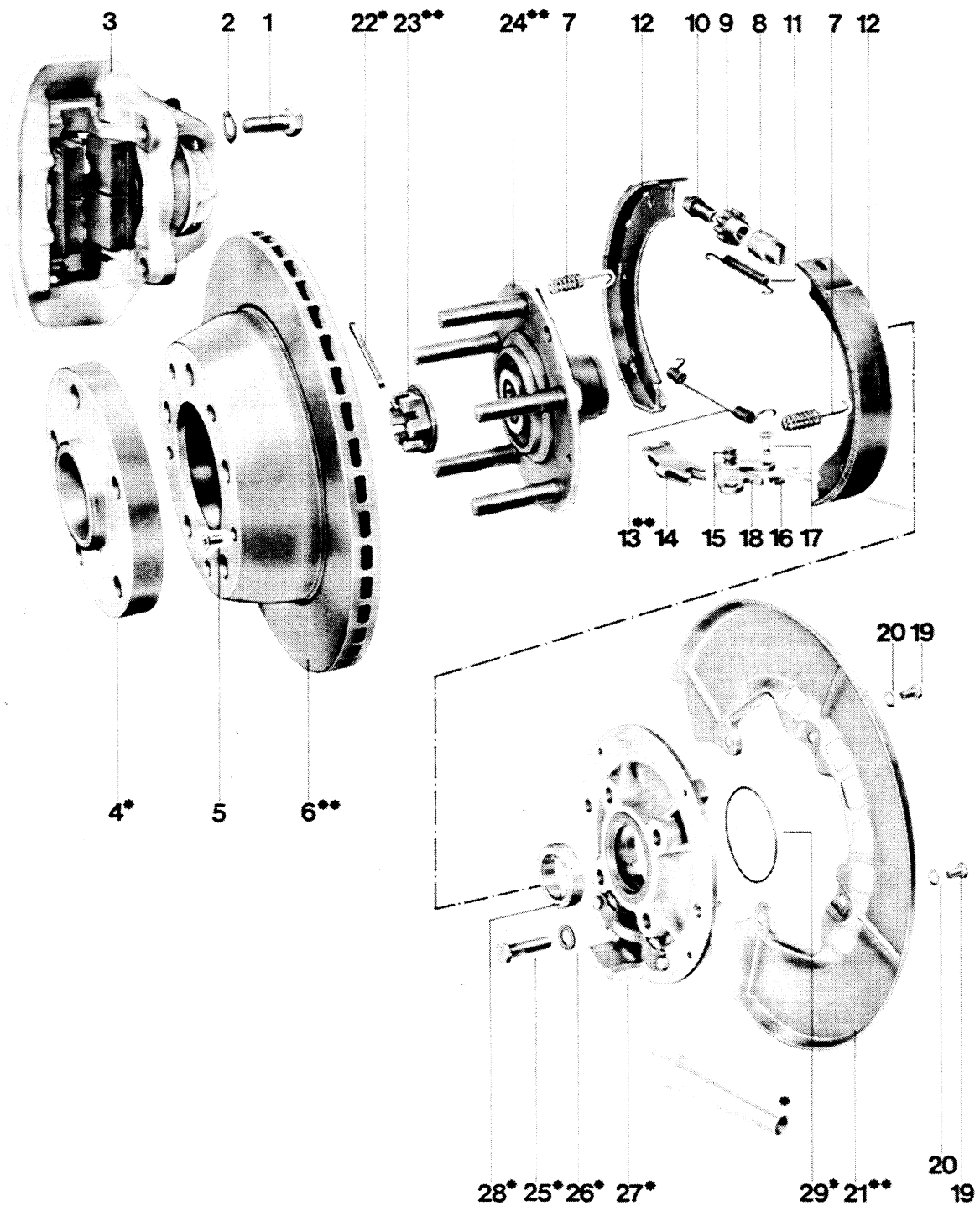
- Brake disc may be dismantled without removing the wheel hub. (Deviation from explosion drawing and references on page 46 - 7 / 46 - 8)
- Take off brake disc after having removed the countersunk screws. If the brake disc has seized and cannot be freed even by applying light blows with a rubber hammer, screw two hexagon bolts evenly into both 8 mm threads of the brake disc and press off the disc.



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### Assembling

1. Check all parts for proper serviceable condition and replace if necessary.
2. Clean centering surface of the brake disc on wheel hub and apply a very thin coat of Optimoly TA.
3. Install brake disc.  
If the wheel hub has been removed, insert tapered roller bearing coated with multi-purpose grease (Quantity for wheel bearing and wheel hub approx. 60 g) and adjust wheel bearing clearance (page 40 - 1).
4. Refit brake caliper. Tighten mounting bolts to 85 Nm (63 ftlb).



\* Parts only exist for steel trailing arms.

\*\* Parts differ for steel and aluminum trailing arms.



No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Bolt M 12 x 1.5 x 35	2		Torque: 85 Nm	
2	Washer	2		Replace if necessary	
3	Floating frame caliper	1		Bleeder valve faces up	
4*	Spacer	1			
5	Ctsk. screw	1			
6**	Brake disc	1	Set back brake. First unscrew nut (no. 23), if wheel hub has to be removed,	Check for wear and damage	
7	Spring	2		Check for correct seating on brake back-plate or trailing arm	
8	Support sleeve	1			
9	Adjusting nut	1			
10	Adjusting screw	1			
11	Return spring	1			
12	Brake shoe	2		Replace if necessary; wear limit 2 mm	
13**	Return spring	1			
14	Thrust bar	1			
15	Pivot pin	1		Grease lightly	
16	Circlip	1			
17	Shaft	1		Grease lightly	

No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
18	Operating lever	1			
19	Bolt			Torque: 10 Nm	
	- steel arms	4			
	- aluminum arms	3			
20	Washer			Replace, if necessary	
	- steel arms	4			
	- aluminum arms	3			
21**	Guard	1			
22*	Cotter pin	1		Replace	
23**	Castle nut for steel trailing arms Lock nut for aluminum trailing arms	1		Torque: 380 + 70 Nm for castle nut (tighten to 380 Nm and turn further to next cotter pin hole); 500 Nm for lock nut	Do not unscrew castle or lock nut to remove parking brake cable and parking brake shoes
24**	Wheel hub	1		Apply thin coat of Optimoly HT on splines	
25*	Bolt	4		Torque: 58 Nm	
26*	Washer	4			
27*	Brake backplate	1			
28*	Spacer	1		Position correctly	
29*	Seal	1		Replace	

\* Parts only exist for steel trailing arms.

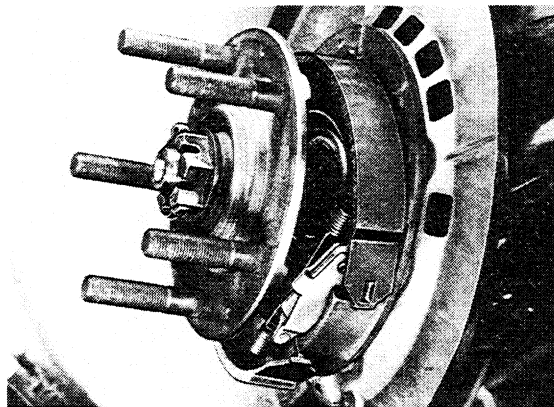
\*\* Parts differ for steel and aluminum trailing arms.

## DISASSEMBLING AND ASSEMBLING REAR WHEEL BRAKE

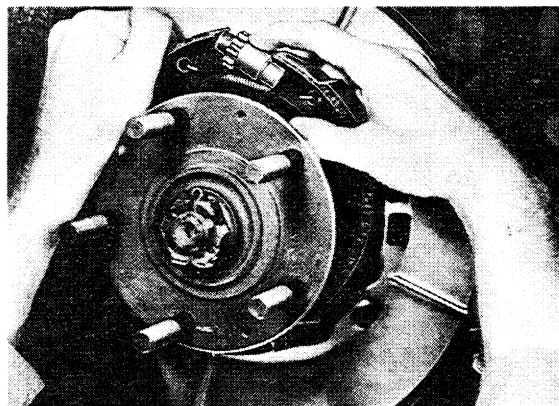
## Disassembling

1. Remove spacer. If wheel hub has to be removed (not necessary for replacement of parking brake shoes), unscrew castle nut after removing cotter pin. Car must be resting on its wheels to unscrew castle nut.
2. Turn automatic slack control in "loosen" direction with a screwdriver applied through hole in brake disc. Detach floating frame caliper. Take off brake disc after removing countersunk bolt.
3. Remove springs, automatic slack control and upper return spring. Remove parking brake shoes.

3. Mount long lower return spring on parking brake shoes, move in parking brake shoes and insert in spreader lever.



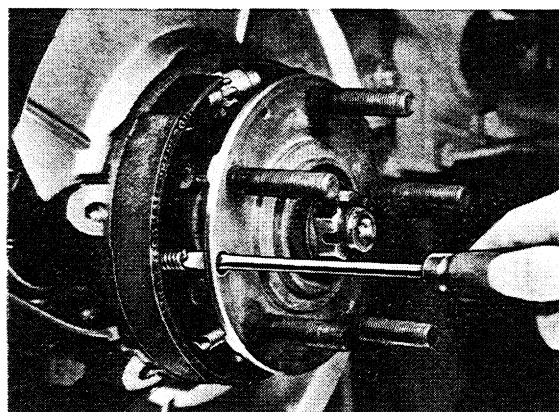
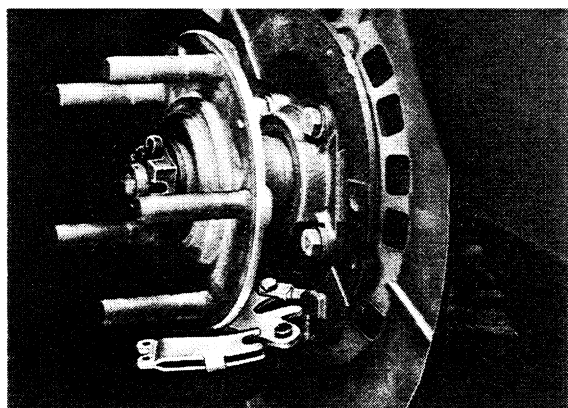
4. Connect upper return spring. Pull parking brake shoes apart and insert automatic slack control.



## Assembling

1. Give automatic slack control, shaft on spreader lever and sliding surfaces of parking brake shoes a light coat of grease.
2. Assemble spreader lever.

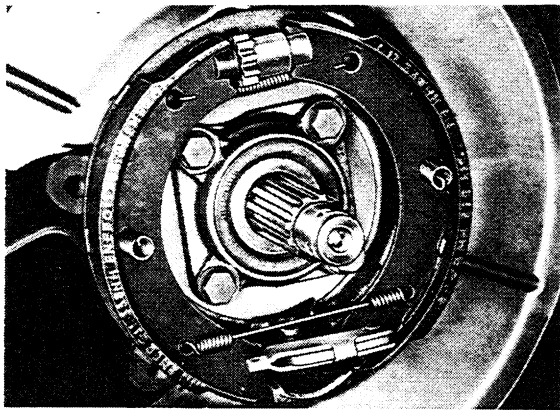
5. Center parking brake shoes. Mount springs.



**Note**

Make sure that hooks of springs engage correctly in land of brake backplate or trailing arm.

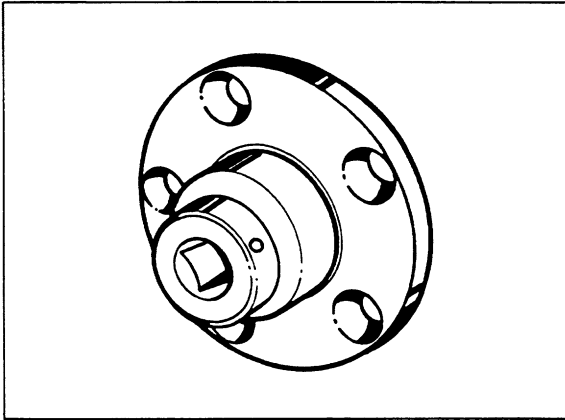
6. Recheck installation of parking brake shoes, automatic slack control, return springs, springs and spreader lever, correcting if necessary.



7. Mount brake disc and brake caliper. Note torque specifications.  
Adjust and bleed brakes.

## Checking brake disc lateral runout

1. Measuring requirements: No tilt play present at wheel. If required, adjust wheel bearing clearance of front wheels.
2. Fit adapter plate (Special Tool 9510/1) to **wheel hub**. Tightening torque of wheel nuts (mounting nuts): 130 Nm.



1035 - 46

3. Engage dial gauge holder, e.g. Ate Part No. 03.9314-5500.3/01, into brake caliper, determine center position and fit by turning the wing screw.

### Notes

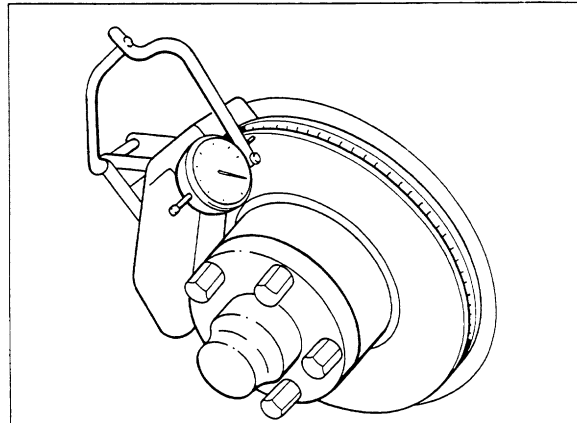
If required, fit dial gauge holder with Ate conversion kit, Part No. 03.9314-5510.3/01 (longer wing screw and bracket for dial gauge if required).

**Four-piston fixed caliper brake:** Make sure the spreader spring locating lug at the mounting plate of the fixed caliper is not damaged when the dial gauge holder is fitted in place.

### Floating-caliper brake:

To fit the dial gauge holder, the brake pads must be removed.

4. Fit dial gauge with a slight preload. Place measuring pointer on maximum diameter of braking surface.



1036A - 46

5. Rotate brake disc and read off runout on dial gauge.  
Max. permissible runout of fitted brake disc **max. 0.1 mm.**

### Note

The floating frame of the floating-caliper brake may touch the brake disc after the brake pads have been removed. When rotating the disc, push back the floating frame if required.

### Runout of removed

<b>brake disc</b>	: max. 0.05 mm.
<b>Runout of wheel hub</b>	: max. 0.05 mm.

6. If the brake disc runout exceeds 0.1 mm, remove the brake disc and check runout of the wheel hub. Mark position of disc with regard to wheel hub.

7. Check wheel hub runout as follows:

Measure once outside (arrow) and once inside wheel stud area of hube face.

Lift off dial gauge carefully in cutout area of wheel hub.

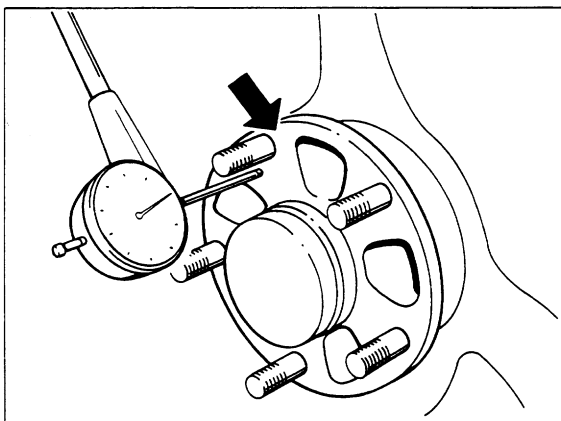
To fit the dial gauge, use either a magnetic universal dial gauge holder, e.g. as supplied by SNAP-ON (Order No. PMF 137), or a dial gauge holder (VW 387).

**Notes**

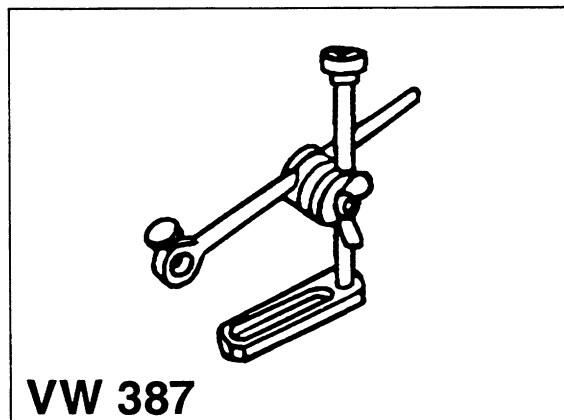
Make sure the brake hoses and brake lines are not damaged when the brake caliper is removed and installed.

The above SNAP-ON order no. PMF 137 is valid for a complete dial gauge kit since the individual dial gauge holder is not available separately.

The dial gauge kit may also be used to check the brake disc lateral runout.



1038 - 46



1039 - 46

8. **Excessive wheel hub runout:**

Replace wheel hub.

**Wheel hub runout o.k.:**

Cleaning level and centering surfaces of brake disc and wheel hub. Then coat centering surface of wheel hub with a thin coat of Optimoly TA.

Fit brake disc to wheel hub in another position, offset radially with regard to wheel hub. Repeat measurements with fitted adapter plate - Special Tool 9510/1.

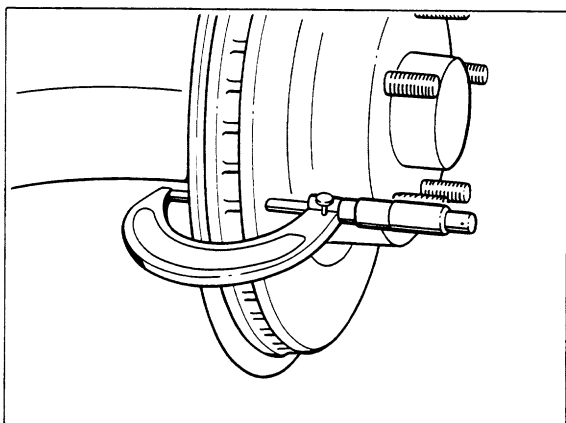
If the lateral runout is still in excess of 0.1 mm, the brake disc must be replaced.

**Note**

If the brake disc runout has been reduced by offsetting the brake disc with regard to the wheel hub, one 6 mm countersunk screw may be omitted if two 6 mm countersunk screws had been fitted.

## Checking brake disc thickness

Measure brake disc thickness in approx. 8 places within the braking surface using a micrometer.



1040 - 46

**Tightening torque for hydraulic brake system**

Location	Thread	Tightening torque Nm (ftlb)
Brake-pressure line to master cylinder, brake hose, distributor and brake caliper	M 10 x 1	12(9)
Brake-power regulator to master cylinder or hydraulic unit	M 10 x 1	14(10.5)
Brake hose to brake caliper	M 10 x 1	14(10.5)
Bleeder screw to floating caliper	M 7	4(3)
Bleeder screw to fixed caliper	M 10	8(6) - 12(9)
Master cylinder to brake booster	M 8	21(15.5)
Brake booster to adapter	M 8	21(15.5)
Adapter to firewall	M 8	21(15.5)
Fastening bracket on brake carrier or trailing arm	M 6	10(7.5)
Stop screw in master cylinder	M 6	7(5) - 10(7.5)



## NOTES ON BRAKING-FORCE BOOSTER

A braking-force booster is installed for the rear-axle braking circuit of the 944 S and 944 turbo.

The changeover pressure differs.

944 S :	33/5
944 S 2/ 944 turbo:	18/5
924 S and 944 are not fitted with braking-force regulators	

### Location

Cars with ABS : screwed in to port h of hydraulic unit.

Cars without ABS : screwed in to the brake master cylinder (intermediate piston circuit).

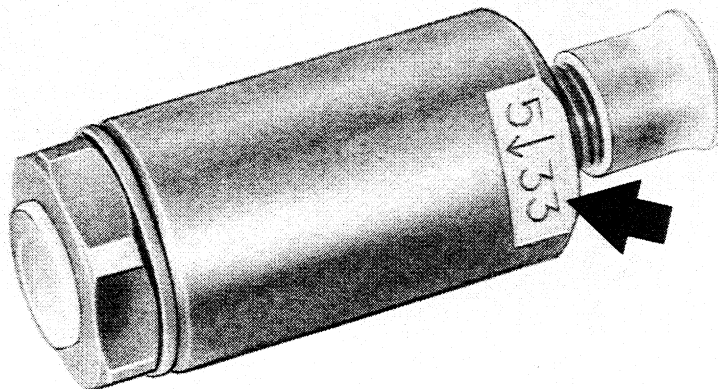
### Identification

Changeover pressure and reduction factor stamped on regulator.

33 or 18 = changeover pressure in bar    5 = reduction factor 0.46  
(check correct correlation).

### Notes on assembly

It is essential to ensure that correlation is correct. Under no circumstances may braking-force regulators with a different reduction factor (e.g. 3 = 0.3) be installed. When slackening and tightening the brake line, always counter by holding the hexagon of the braking-force regulator. In contrast, never turn the hexagon when removing or installing the regulator. The two flats at the connecting thread are provided for this purpose.



## Notes on the four-piston fixed caliper

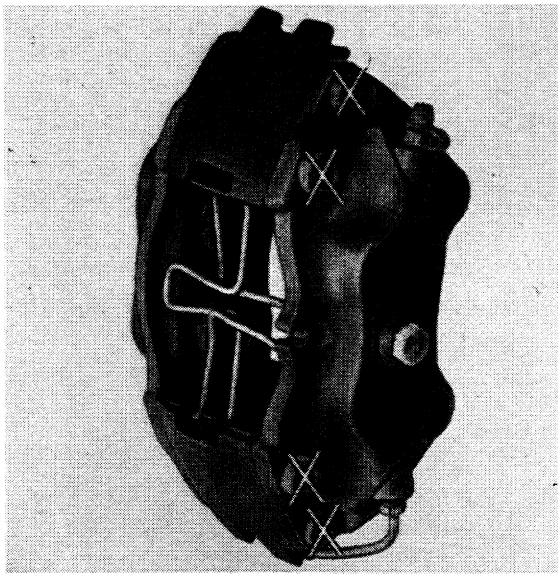
### Assembly notes

**Never separate the two halves of each brake caliper from one another.**

**Disregard any information stating otherwise, and alter any existing written documentation to this effect.**

It is possible to replace piston seals, wiper rings and spring plates while fixed caliper is assembled.

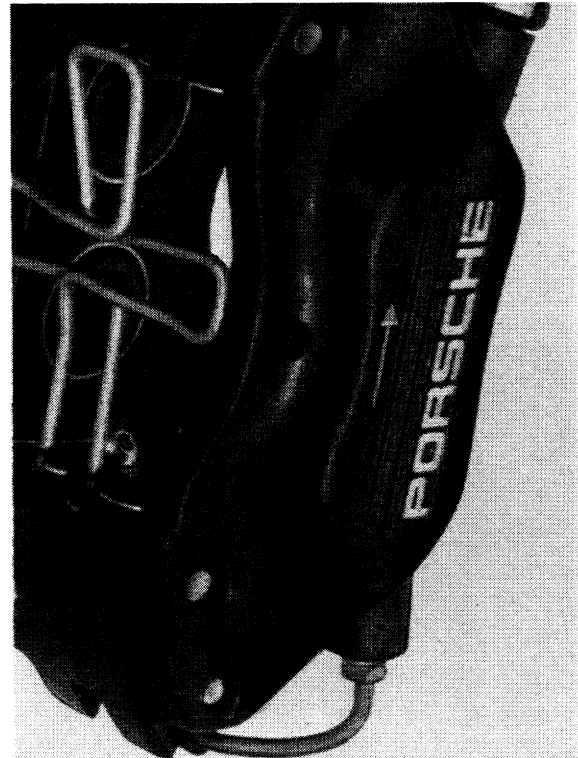
Always use brake-cylinder paste Unisilicon TK 44 N 2 when assembling brake pistons. This also applies when repairing **other brake calipers**. Unisilicon paste is available as a spare part (Part No. 000.043.117.00).



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**X = never undo or tighten screws**

In order to check that the brake caliper is in the correct installation position, while brake pads are installed, an arrow above the Porsche trademark indicates the direction of rotation for the brake disk.



11582

### Modification to the four-piston fixed calipers

During Model year 1989, the type of piston seal was modified from a wiper ring to a protective cap.

**When replacing components, make sure that the same type of fixed caliper is used on each axle. Never mix different types on one axle**



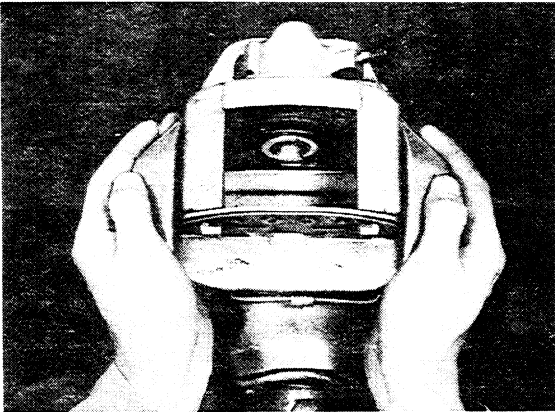
No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Spring lock	1		Replace, if necessary	
2	Retaining pin	2		Replace, if necessary	
3	Cross spring	1		Replace, if necessary	
4	Brake pad	2		Check, replacing if necessary. Wear limit: 2 mm. It is recommended to install pads after installation of brake caliper	
5	Mounting frame	1		Make sure slides fit correctly on rear calipers	
6	Spring guide (front wheel brake caliper)	1			
7	Brake cylinder	1	Knock off of floating frame with a plastic hammer. Place wood liner in floating frame		
8	Floating frame	1			
9	Spring guide (rear wheel brake caliper)	1		Don't mix up left and right spring guides	Greater angle on upper spring guide outlet
10	Clamping ring	1		Make sure of perfect fit	
11	Cap	1		Replace	
12	Piston	1	Press out of cylinder with compressed air. Use wood liner. Caution!	Use brake cylinder paste. Adjust piston with 20° gauge	

No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
13	Seal	1	Remove with a plastic rod	Replace; install with brake cylinder paste	
14	Dust cap	1			
15	Bleeder screw	1			
16	Slide (only on rear wheel brake calipers)	2		Replace, if necessary	

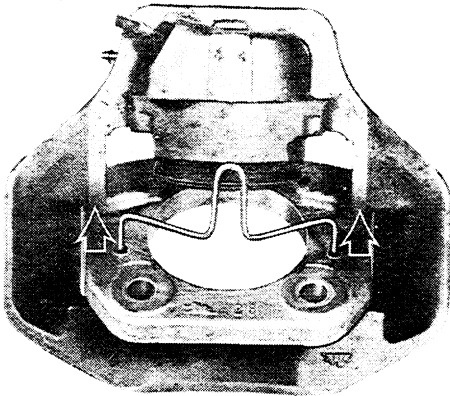
## DISASSEMBLING AND ASSEMBLING BRAKE CALIPER

## Disassembling

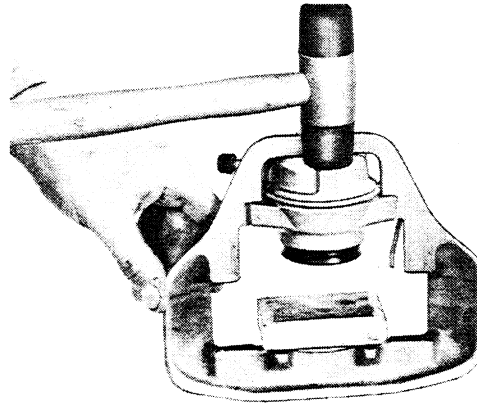
1. Press floating frame off of mounting frame.



2. Run mounting frame out of floating frame after removal of spring guide (only on front wheel brake calipers).



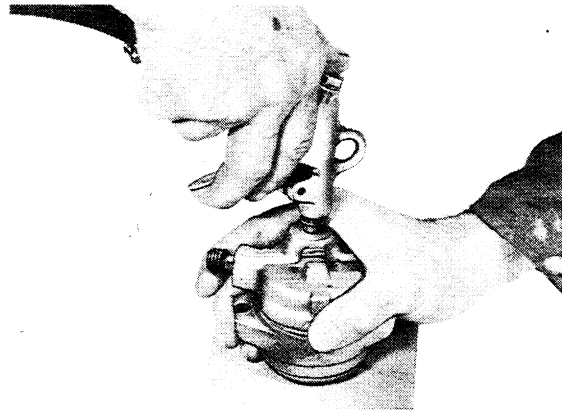
3. Drive brake cylinder off of floating frame with a plastic hammer applied alternately on sides. Use a wood liner in floating frame to avoid damage.



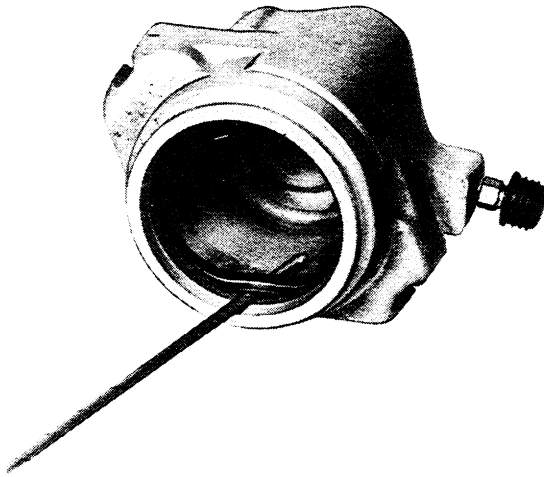
4. Press piston out of cylinder with compressed air.

## Note

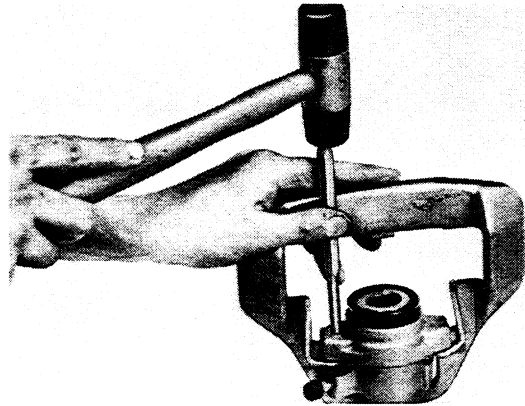
Support piston firmly on a wood liner.  
**CAUTION!**



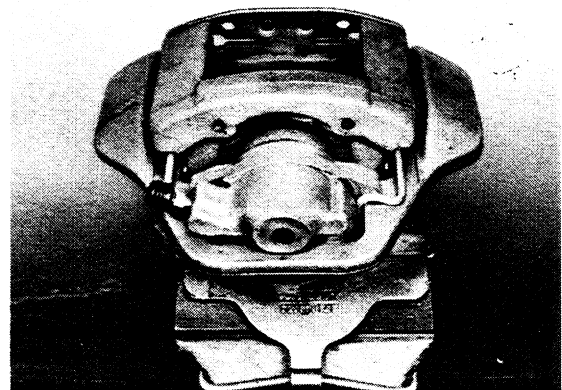
5. Remove seal with a plastic rod.



2. Drive brake cylinder with spring guide on to floating frame with a soft mandrel applied alternately.

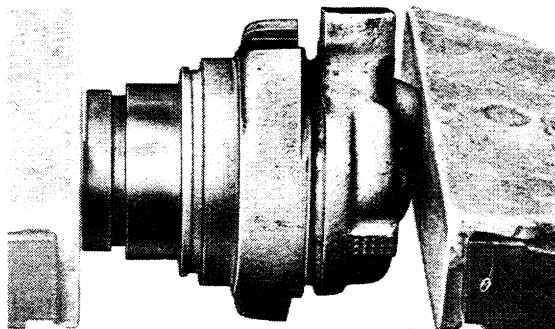


3. Insert mounting frame. Be careful not to damage the slides (slides only on rear wheel brake calipers).



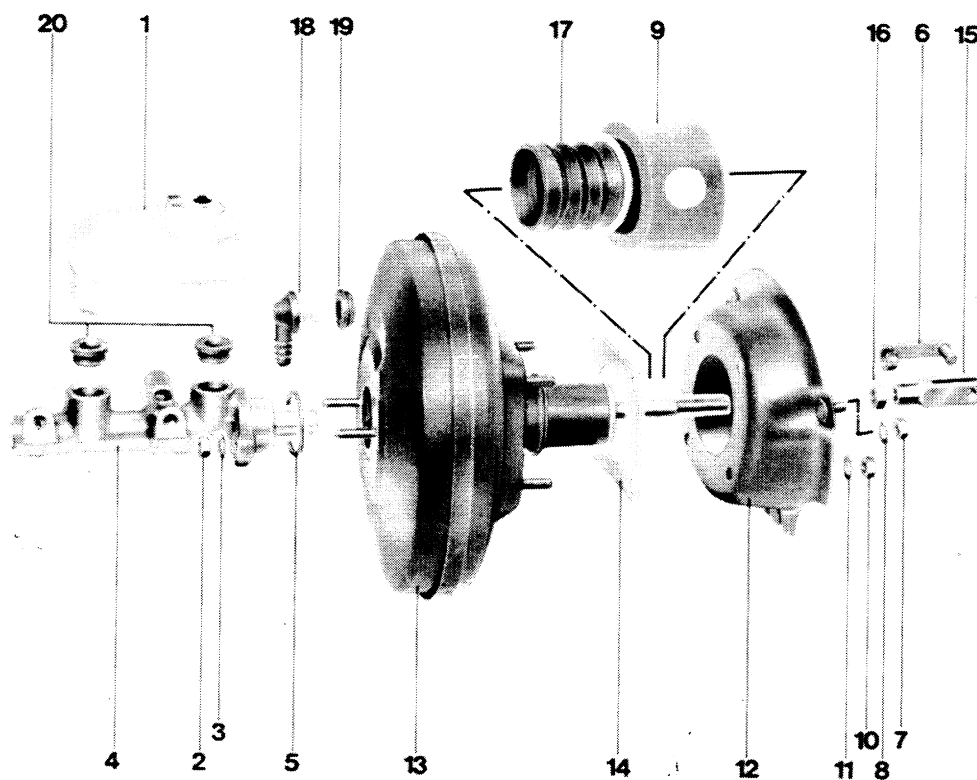
#### Assembling

1. Coat cylinder bore, piston and seal with a very thin brake cylinder paste. Press piston into cylinder in approximately correct position (20° chamfer).



4. Adjust piston 20° position with a piston turning pliers accurately (see page 46 - 3).

\_\_\_\_\_





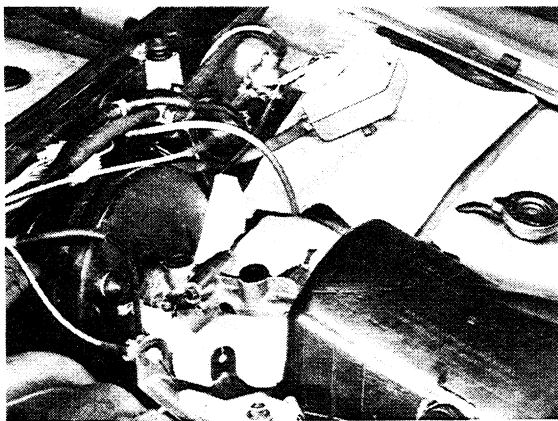
No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Brake-fluid reservoir	1		Apply thin coat of brake-cylinder paste to plug No. 20	
2	Hex nut	2		Replace if necessary, tightening torque: 21 Nm (15.5 ftlb)	Self-locking (Teves design)
3	Washer	2			Only used when No. 2 is not self-locking
4	Tandem brake master cylinder	1			Page 47 - 11
5	Seal	1		Replace	Use square-section or O-ring
6	Lockpin	1		Install right way round	
7	Hex nut	3		Tightening torque: 21 Nm (15.5 ftlb)	
8	Spring washer	3		Replace if necessary	
9	Seal	1		Replace if necessary	
10	Hex nut	4		Tightening torque: 21 Nm (15.5 ftlb)	
11	Washer	4			
12	Adapter	1		Note installation position	
13	Brake booster	1			Page 47 - 11
14	Seal	1		Replace if necessary	
15	Swivel	1		Adjust, see page 47 - 11	

No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
16	Nut	1		Torque: 35 Nm (25 ft lb)	
17	Dust cover	1		Replace if necessary	
18	Check valve	1		Check function by blowing air into valve. From engine end = no flow (valve must be tight). From brake booster end = flow.	
19	Rubber seal	1			
20	Plug	2		Replace; install with brake cylinder paste	

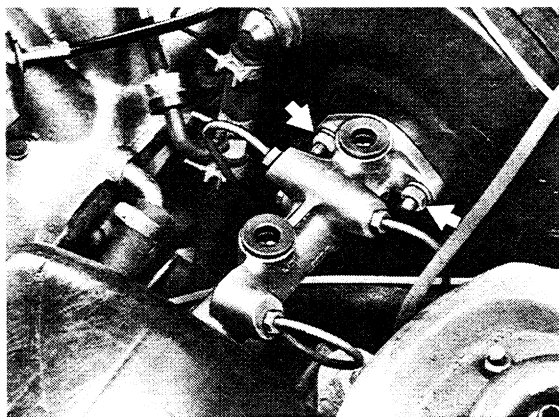
## REMOVING AND INSTALLING BRAKE BOOSTER

## Removing

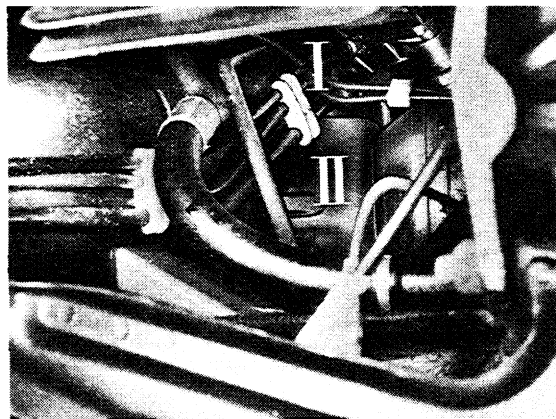
1. Place rags underneath tandem brake master cylinder and on left wheel house. Pull brake fluid tank out of tandem brake master cylinder and catch escaping brake fluid (do not reuse). Place tank with connected clutch hose on wheel house.



2. Disconnect brake lines on brake master cylinder (front axle push rod brake circuit). Unscrew mounting nuts and take out brake master cylinder.



3. Disconnect vacuum hose on check valve of brake booster. Pull out oil dipstick.
4. Pry off fuel line holding clip on mounting bolt uniformly in area of adapter II (danger of damaging).



5. Remove lockpin for push rod on brake pedal.
6. Unscrew three mounting nuts of brake booster/ adapter assembly. Mounting nuts are accessible after pulling down insulation sheet in footwell (disconnect throttle cable on accelerator pedal for this purpose).
7. Take out brake booster from above at engine compartment end.

## Installing

### Notes for replacement

- With the exception of the 944 turbo and cars with ABS, brake units (tandem brake master cylinder and brake booster) from two manufacturers were used in production (Teves and Girling).

When replacement parts are installed, tandem brake-master cylinders and brake boosters from either manufacturer can be installed together in the car, with the exception of the models listed above.

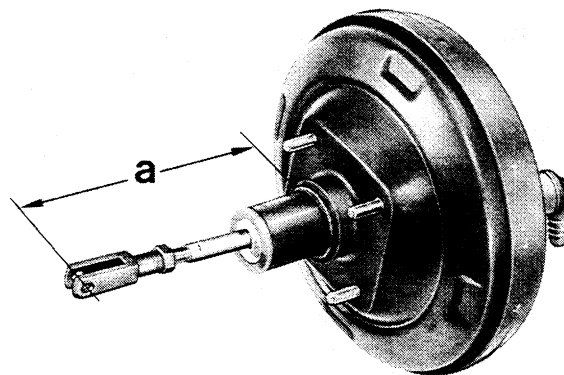
- In cars with ABS (M 593, '87 models onward), it is essential to install brake master cylinders with central valves

- With the exception of the 924 S, brake master cylinders installed in '87 models onward have a different  $\emptyset$  and stroke. Check correct correlation.

1. Screw swivel onto brake pushrod and adjust. Tighten locknut.

$a = 186 + 1 \text{ mm}$  - until end of model year '86 and 924 S

$a = 206 + 1 \text{ mm}$  - '87 models onward, except 924 S



2. Assemble brake booster with adapter in correct position.
3. Install brake booster in car. When inserting brake booster in car, guide swivel of pushrod onto brake pedal at same time and connect.
4. Check stoplight switch setting and correct if necessary (46 - 5). Install clips for fuel lines.
5. Install brake master cylinder. Use new seal between brake master cylinder and brake booster and new plugs for the brake-fluid reservoir. Use only brake-cylinder paste or brake fluid when pressing reservoir on to plugs.
6. Bleed braking system and clutch. Check for leaks and check operation.

## REPAIRING BRAKE MASTER CYLINDER\*

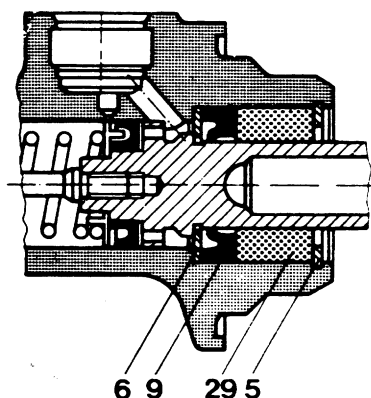
### General

Stepped aluminum brake master cylinders from two manufacturers (Teves and Girling) are used in production.

The secondary boot seal on the pushrod piston differs depending on the make of the cylinder. Always use a correct repair kit when repairing a brake master cylinder.

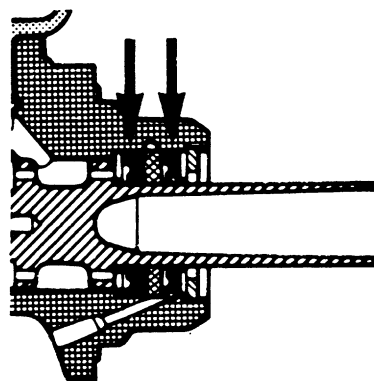
### Teves Cylinder

One double-action secondary boot (No. 9), brake-fluid sealing to inside, vacuum sealing to outside



### Girlinging Cylinder

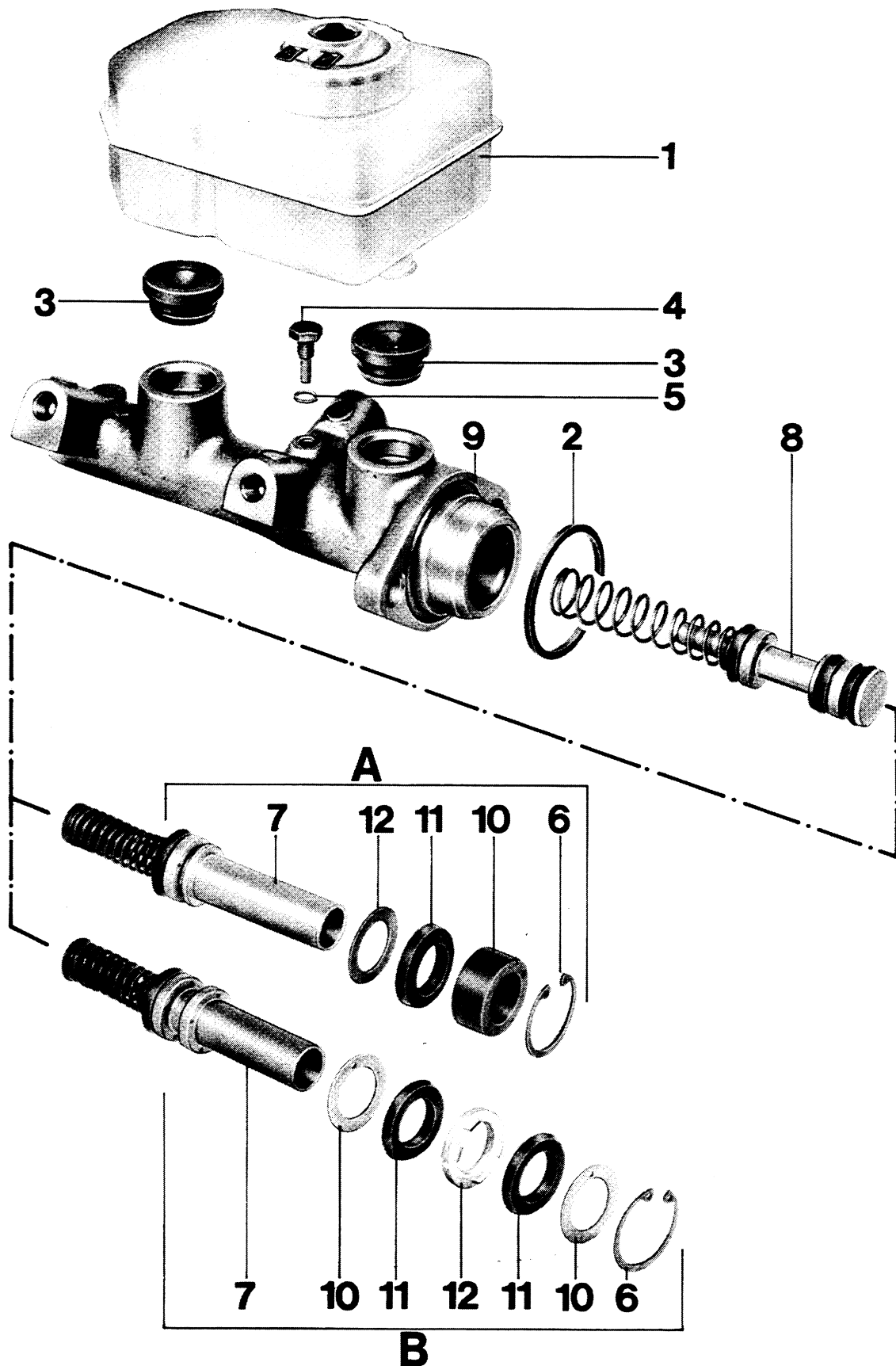
2 secondary boots



### Types of brake master cylinder

Differences and distinguishing features	Teves	Girling
Manufacturer's code on cylinder body	Ate	G
Stop screw for intermediate piston	Screw at top	Screw on the right-hand side
Cylinder body	No leak bore	With leak bore
Secondary boot seal on pushrod piston	1 boot (guide sleeve visible)	2 boots (stop washer visible)

\* This description does not include brake master cylinders with central valves (vehicles with ABS) and the standard brake master cylinder for 944, 944S and 944 turbo, '87 models onward. These brake master cylinders cannot and may not be repaired.



A - TEVES VERSION  
B - GIRLING VERSION

No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Brake fluid reservoir	1	Clutch hose remains connected	Install with brake cylinder paste	Square or O-ring (both are interchangeable)
2	Seal	1		Replace	
3	Plug	2		Replace; install with brake cylinder paste	
4	Stop screw	1			
5	Aluminum seal	1		Replace	
6	Circlip	1	Apply pressure on primary piston	Replace, make sure of proper fit	
7	Primary piston assy. consisting of: Primary piston Filler disc Primary cup Support ring Spring Stop sleeve Travel limiting screw	1		Coat piston skirt with silicone grease (see page 47 - 18)	
8	Secondary piston assy. consisting of: Secondary cups Secondary piston Filler disc Primary cup Support ring Tapered spring	1			

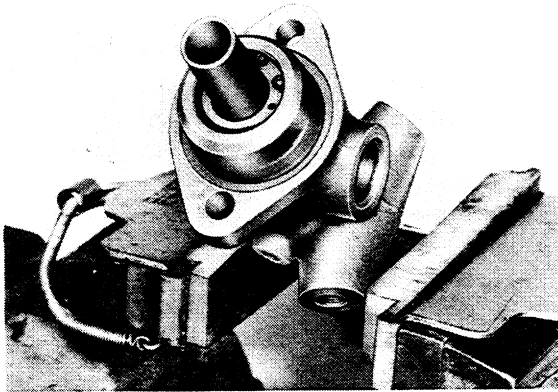
No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
9	Cylinder housing	1			Use proper repair kit depending on make
10	Guide sleeve	1		Position correctly, inside chamfer faces out	Only Teves
11	Secondary cup	1		Sealing lip faces cylinder bore; fill groove with silicone grease (see page 47 - 18)	Only Teves
12	Stop washer	1			Only Teves
10	Stop washer	2			Only Girling
11	Secondary cup	2		Sealing lip faces cylinder bore; fill groove with silicone grease (see page 47 - 18)	Only Girling
12	Plastic washer	1		Position correctly, lugs face out	Only Girling



## REPAIRING BRAKE MASTER CYLINDER

### Disassembling

1. Clean outside of removed brake master cylinder (see page 47 - 10) with alcohol and dry with compressed air.
2. Clamp cylinder housing in a vise (fitted with soft jaws). Remove plugs for brake fluid reservoir and stop screw for secondary piston.
3. Slide primary piston into cylinder housing slightly with a rounded-off drift and remove circlip.  
Pull primary piston out of housing.



4. Tap cylinder housing on a soft base (wood) until the secondary piston slides out of housing.

### Cleaning and Checking Parts

1. Clean cylinder housing with alcohol and dry with compressed air.
2. Check cylinder housing and threads for damage, cylinder bore for scoring and corrosion.

#### Note :

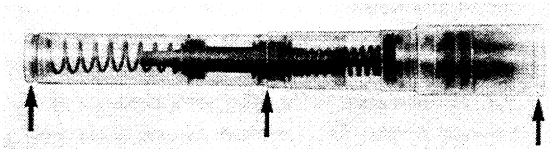
Never reuse a cylinder housing with damage in bore. In this case a new tandem brake master cylinder must be used.  
Machining (polishing) the cylinder bore is not approved.

3. If surface finish of cylinder bore is okay, check whether all connecting, compensating and inlet/outlet ports are open.

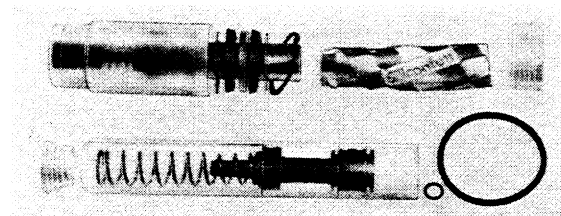
### Assembling

1. Give cylinder bore a light coat of brake cylinder paste. Clamp cylinder housing in a vise (fitted with soft jaws) with cylinder opening facing down at an angle.

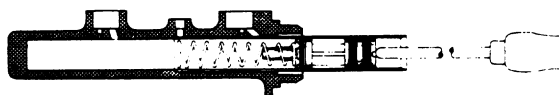
2. Remove both plugs in assembly and packing sleeve, and separate sleeve with intermediate piston on entire sleeve.



3. Slide sleeve for secondary set so far on sleeve with push rod piston that both sleeve ends are flush and skirt of push rod piston with inside parts of secondary set is cleared. Then remove plastic bag of silicone grease (insofar as not supplied loose), seal, aluminum seal, circlip, stop washer(s), secondary cup(s) and guide sleeve or plastic washer.

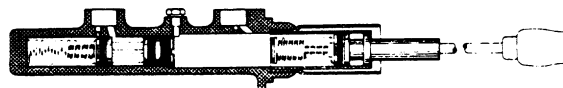


4. Run intermediate piston sleeve with outside chamfer leading into large cylinder bore against stop and hold tight. Push parts inside of this sleeve into cylinder bore with a rounded-off drift until intermediate piston rests on bottom of cylinder. Hold inside parts tight with a mandrel. Pull back assembly sleeve slightly. Screw in stop screw with a new aluminum seal and tighten to 7 - 10 Nm torque. Release piston slowly until it rests on stop screw. Remove drift and assembly sleeve.



5. Turn cylinder around in vise so that cylinder opening faces up.

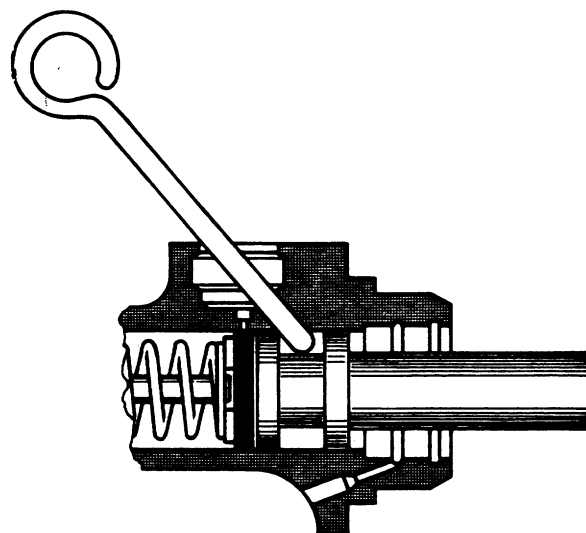
Insert the previously adjusted secondary set sleeve and push rod piston sleeve as well as the contained push rod piston into cylinder bore for secondary set against seat with small sleeve diameter leading and press push rod piston completely into cylinder bore with a rounded-off drift. Remove assembly sleeves.

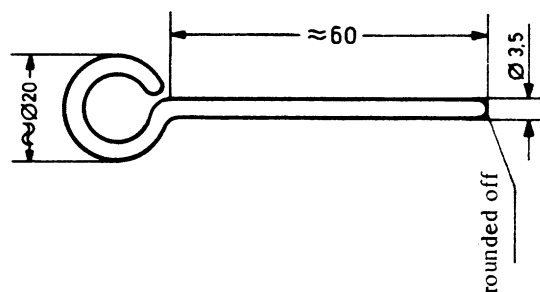


6. Press push rod piston into cylinder bore slightly and insert an assembly needle (made locally) through afterrunning bore of push rod piston brake circuit into annular space behind both piston shoulders of push rod piston. Release push rod piston slowly. (See page 47 - 18 for sketch of locally made assembly needle.)

#### Note

For Teves version the assembly needle must be behind the stop shoulder of the push rod piston (see picture for point 8).

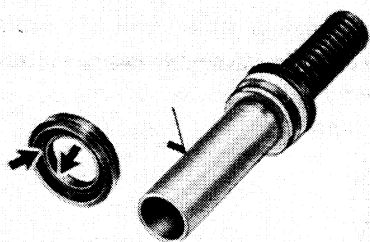




7. Apply a thin coat of silicone grease supplied in repair kit on skirt of push rod piston and fill grooves of secondary cup(s) with it.

#### Note:

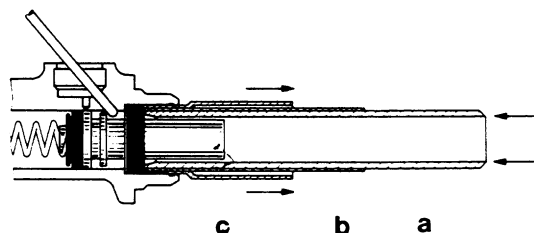
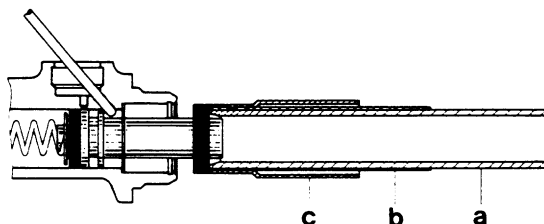
If there are two secondary cups (Girling version), fill outer cup with most of the silicone grease to prevent it from running dry.



8. Slide secondary set sleeve (c) and push rod piston sleeve (b) together in such a manner, that end of push rod piston sleeve is aligned with inside shoulder on small diameter end of secondary set sleeve. Place stop washer in housing and install secondary cup on piston skirt.

Cup lips face cylinder bore.

Hold cup with two fingers and slide assembly sleeve with the adjusted step over the cup and then into cylinder bore completely. First slide intermediate piston sleeve (a) against seat on secondary cup with inside chamfer over skirt of push rod piston and press cup down, while pulling back secondary set sleeve (c) and push rod piston sleeve (b) by the same distance as the cup height. Then remove assembly sleeves.



#### 9a. Teves Version

Insert guide sleeve in correct position (inside chamfer facing out). Install circlip.

#### 9b. Girling Version

Slide plastic washer into cylinder bore with pin facing out. Install second secondary cup as described in point 8. Insert stop washer and circlip.

10. Press primary piston into cylinder bore slightly and remove assembly rod.  
Recheck circlip for correct installation.
  
  11. Install brake master cylinder in car. Use a new seal between brake master cylinder and brake booster as well as new plugs for brake fluid reservoir.  
Only use brake cylinder paste or brake fluid to press plugs into brake fluid reservoir.
  
  12. Bleed brakes and clutch. Check for leaks, function and effect.
-

## BLEEDING BRAKING SYSTEM/CHANGING BRAKE FLUID

### General

To assure speedy professional work, we recommend the use of electric refilling and bleeding equipment. The work described below was carried out using Alfred Teves GmbH equipment. Refer to the Operating Instructions for a precise description of the equipment.

### Brake Fluid

Brake fluid is hygroscopic, in other words, it absorbs moisture from the air, which lowers its boiling point.

Example: At 2% water content, the boiling point of the brake fluid sinks by approx. 60°C (minimum requirement for brake fluid to SAE J 1703 or DOT 3 or DOT 4 min. 190°C, 230°C respectively).

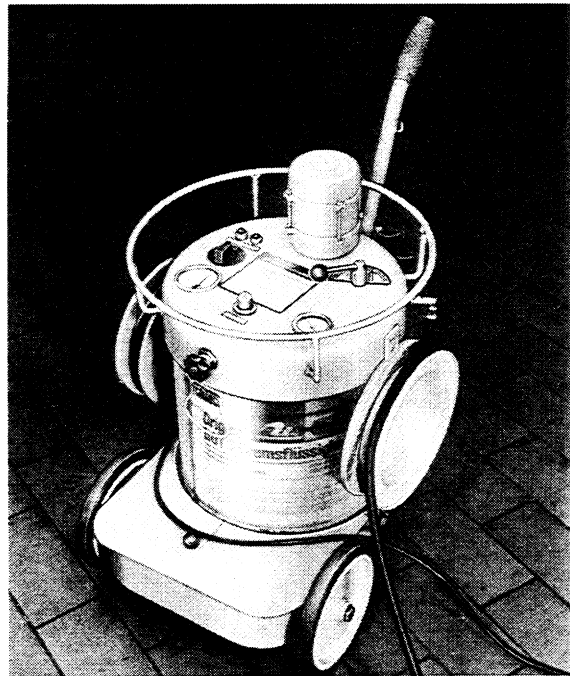
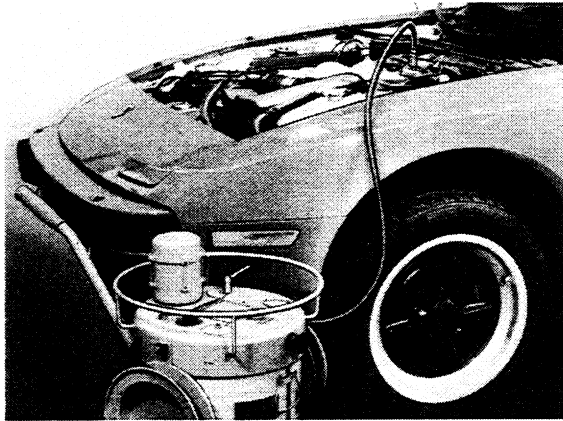
Brake fluid which is dirty or contains water may lead to failure of the hydraulic braking system. Never reuse old brake fluid.

Brake fluid must be renewed at least every 2 years. Use DOT 3 or DOT 4 (SAE J 1703) brake fluid.

Capacity: 1 liter total (1000 cc), approx. 250 cc per wheel.

### Bleeding brakes/changing brake fluid

1. Top up level of fluid in reservoir to brim. Remove filter screen (restrictor).
2. Connect bleed nozzle to reservoir and push rapid-action coupling of filler hose on to nipple of bleed nozzle.

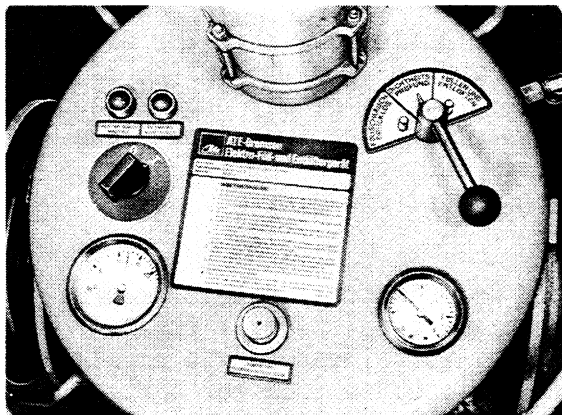


3. Switch pump on. Set selector lever to "filling and bleeding" position.
4. Open each bleed valve in turn until the brake fluid which issues is clean and free of air bubbles.
5. To make quite sure that the brake fluid pumped from the system is clean and free of air bubbles and to determine the amount of brake fluid used, catch the fluid in a transparent container.
6. When bleeding the system, depress the brake pedal several times with bleed valves open to expell all air bubbles from the brake master cylinder.

#### Note:

There is no difference in the procedure for bleeding the braking system of cars fitted with ABS.

7. Once the system has been bled or the brake-fluid changed, it is advisable to carry out a low-pressure leaktightness test. Needless to say, the precondition is that bleed nozzle, filler hose and overflow hose (bleed hose) are also completely leaktight. All system bleed valves must be closed. With the selector lever still at the "fill and bleed" position, check the overpressure reading on the working-pressure gage.
8. Now move selector lever to position for leaktightness test. For approx. 5 minutes, the reading of the working-pressure gage must remain unchanged. If pressure drops within this period there is a leak in the braking system or clutch.
9. Push dust caps onto bleed valves. Use an extractor to bring the level of fluid in the reservoir down to the max. mark. Insert filter screen and screw on reservoir cap.



**Technical Data 924 S / 944 / 944 S / 944 S2**

Steering		Rack-and-pinion steering, with hydraulic power assistance as optional extra-power steering (introduced in the course of model year '83)
Steering wheel	Standard: Optional:	380 mm dia. 360 mm dia.
Steering wheel ratio at middle		22.39 : 1 (power steering LHD 18.85 : 1 RHD 18.96 : 1)
Turning circle diameter		10.75 m
Track circle diameter		10.1 m
Steering wheel turns from lock to lock		3.84 - 4.02 (power steering LHD 3.24 RHD 3.26)



## TORQUE SPECIFICATIONS FOR STEERING

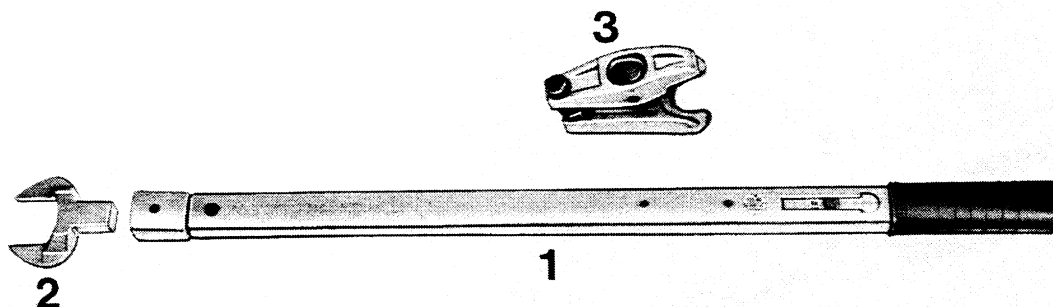
Location	Description	Threads	Material	Tightening Torque Nm (ftlb)
Axle shaft to steering gear and steering column	Self-locking hex nut	VM 8	12	30 + 5 (22 + 3.6)
Steering gear to cross member	Hex bolt	M 8	8.8	23 (17)
Cover for pinion bearing	Hex bolt	M 6	8.8	7 (5.1)
Cover for thrust-piece mount	Hex bolt	M 6	8.8	7 (5.1)
Locknut for adjusting screw	Hex nut	M10x1	22 H	25 (18)
Tie rod to steering knuckle	Castle nut	M12x1.5	8	30 + 20 (22 + 14)
	Locknut	M12x1.5		50 (37)
Tie rod to rack (not for power steering)	Locking nut	M22x1.5	C15Pb	50 (37)
Tie-rod joint to tie rod (not for power steering)	Hex nut	M14x1.5	17 H	30 (22)
Steering wheel to steering column	Hex nut	M16x1.5	17 H-2	45 (33)
Steering column switch to outer tube	Socket-head bolt	M 8	8.8	15 (11)
	Hex bolt	M 5		4 (2.9)
Outer tube to body	Socket-head bolt/hex bolt	M 8	8.8	23 (17)
Mount to body	Hex bolt	M 6	8.8	7 (5.1)

Location	Description	Threads	Material	Torque in Nm (kpm)
Power Steering*				
Tie rod to rack	Tie rod	M 14 x 1.5		70 (7.0)
Tie rod joint to tie rod	Nut	M 14 x 1.5	17 H	70 (7.0)
Feed and return lines on steering gear	Hollow union bolt	M 12 x 1.5	6.8	20 (2.0)
Feed line on power pump	Hollow union bolt	M 14 x 1.5	6.8	30 (3.0)
Ring hose nipple for intake hose on power pump	Hollow union bolt	M 16 x 1.5	6.8	45 (4.5)

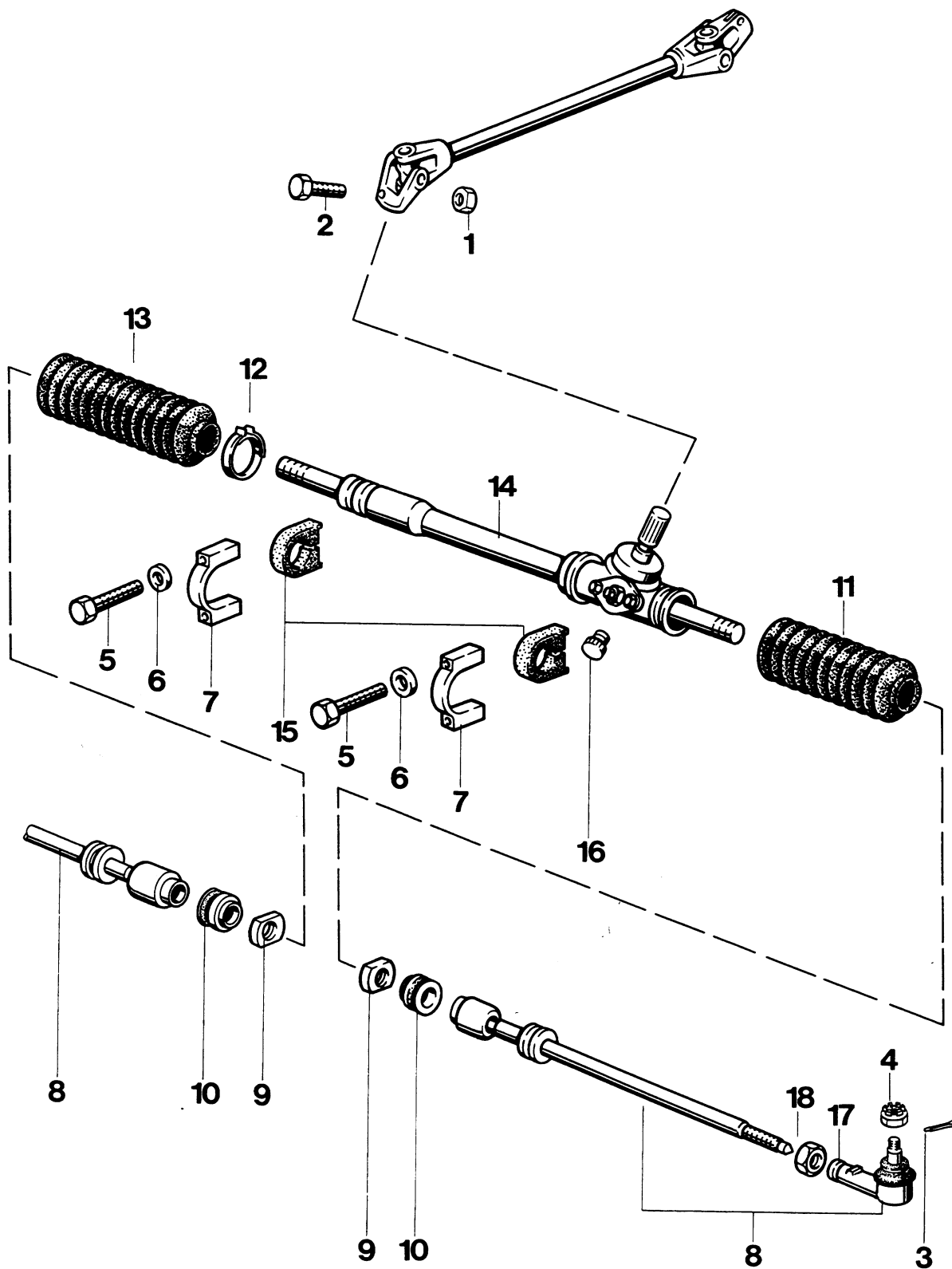
\* Values not listed here are the same as for cars without power steering.

## Removing and installing manual steering gear

### Tools



No.	Designation	Special tool	Order number	Explanation
1	Torque wrench Stahlwille 730 R/20 or Hazet 6292-1 CT			commercially available (refer to workshop manual)
2	Wrench socket			commercially available, e.g. Hazet or Stahlwille (24 mm across flats)
3	Tie-rod puller			commercially available, e.g. Nexus 168 - 1
-	Centering bolt	9116	000.721.911.60	



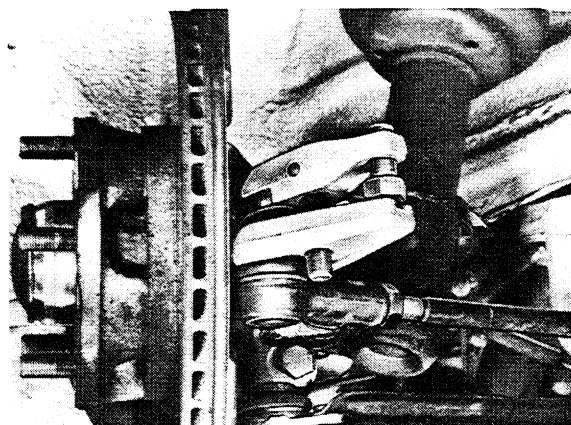
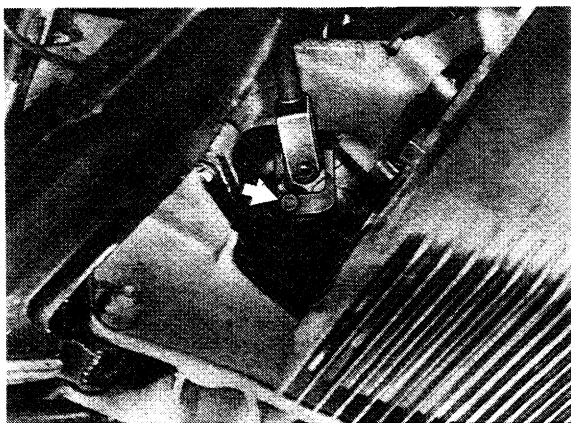
No.	Designation	Qty.	Note:	
			Removal	Installation
1	Self-locking hexagon nut	1		replace, tighten to 30 Nm (22 ftlb)
2	Hexagon head bolt	1		when fitting steering shaft, avoid putting the shaft under strain
3	Split pin	2	only present if castle nut is fitted	replace
4	Castle nut or lock ring	2		Tighten <b>castle nut</b> to 30 Nm (22 ftlb), turn to next split pin hole if required (max. torque 50 Nm (37 ftlb)). Tighten <b>lock nut</b> to 50 Nm. (37 ftlb)
5	Hexagon head bolt	4	if the steering or the tie-rod(s) are to be replaced, start by slackening the castle nut(s), item 9.	tighten to 23 Nm (17 ftlb)
6	Washer	4		
7	Clamp	2		Fit with Contifix or Capella - Oil B Waxfree (supplied by Texaco). Note instructions for Capella assembly oil on page 48 - 010.
8	Steering tie rod assy.	2	undo only if the steering or the tie rod(s) have to be replaced.	when replacing, note references on page 48 - 011 (3 versions). Adjust with the steering rack blocked (page 48 - 011).
9	Lock nut	2		tighten to 50 Nm (37 ftlb) with the steering rack adjusted correctly. Check adjustment again after having tightened the adjustment.

No.	Designation	Qty.	Note:	
			Removal	Installation
10	Steering stop ring	2		install in correct position. Caution: Never omit the stop ring when fitting the steering tie-rod to the steering gear since this may cause the tie-rod to retract fully into the steering gear housing (risk of damage to the steering)
11	Bellows, left-hand	1		check, replace if required
12	Clamp	1		replace, only fitted to RH side
13	Bellows, right-hand	1		check, replace if required
14	Rack-and-pinion steering gear	1		Never fit steering tie-rod(s) without stop ring, item 10. Coat fully extended tie-rod ends with VW steering gear grease AOF 063 000 04.
15	Rubber insert, right-hand (1 x) left-hand (1 x)	2		check, replace if required
16	Plug	1	center in centered position relative to steering gear, remove plug	replace if required
17	Ball joint	2		check, make sure correct version is fitted when parts are replaced (refer to spare parts catalog)
18	Hexagon nut	2		

## Removal and installation notes

### Removal

1. Take off front wheels and driveline undertray.
2. Remove stabilizer by unbolting the stabilizer supports at the control arms and the stabilizer mounts at the side members.
3. Remove universal joint bolt from steering gear.
4. Loosen four steering gear fastening screws far enough (do not unbolt completely) to allow the articulated shaft to be removed from the steering pinion.  
If the steering gear and/or the tie-rod has to be replaced, start by unbolting the tie-rod(s) at the steering rack (do not remove yet).  
Extend the steering rack as little as possible out of the steering gear housing on the side to be dismantled.
5. Press off tie rods (ball joints) using a commercially available puller.



6. Now screw the four fastening screws all the way out and move the steering gear to the front.

### Installation

1. If the steering gear is being replaced, install the rubber inserts and mounting clamps in the correct position and coat with Capella-Oil B Waxfree (supplied by Texaco)\*. Extend steering rack ends completely and coat with VW steering gear grease AOF 063 000 04.
2. Push articulated shaft in correct position (steering wheel and steering gear in center position) onto steering gear with the steering fastening screws screwed on only lightly (to facilitate assembly).
3. Tighten steering gear. Tightening torque 23 Nm (17 ftlb). Tighten fastening screw of articulated shaft with 30 Nm (22 ftlb).
4. If the tie-rods have been removed, assemble them to the steering rack. **Make sure the relevant features are kept in mind. Refer to page 48 - 011.**
5. If required, readjust toe.

### Adjusting the steering

Adjustment operations are described on page 48 - 18.

This is applicable to the manual steering gear only.

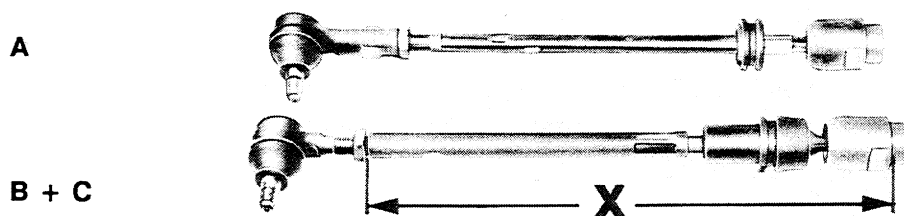
The power steering gear is not adjustable.

\* Capella assembly oil is no longer marketed. It is now replaced by Omnis 32.



## Tie-rods - Versions / Assembly

### Versions



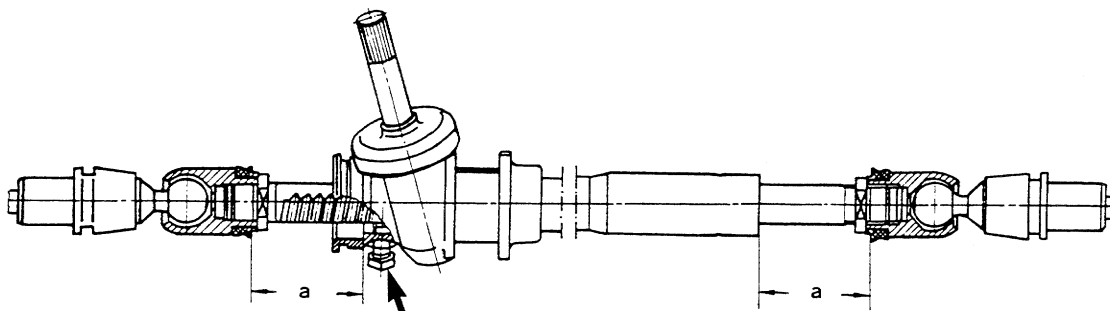
**A = Original version.** For replacement purposes, version B may be fitted in pairs.

**B = Modified, rubber-damped version.** Used on 944 up to end of MY '86 and on 924 S irrespective of model year. Dimension  $X \approx 343$  mm

**C = Rubber-damped version for 944 MY '87.** Slightly longer than version B. Dimension  $X \approx 374$  mm.

### Assembly to steering gear

- Center steering gear in center position using Special Tool 9116 (arrow).
- Bolt on tie-rods uniformly complete with steering stop ring.  
Distance a - steering gear housing to rubber stop =  $64 - 1$  mm.
- Tighten lock nut with 50 Nm (37 ftlb). Refer to notes on page 44 - 012.



**Important notes**

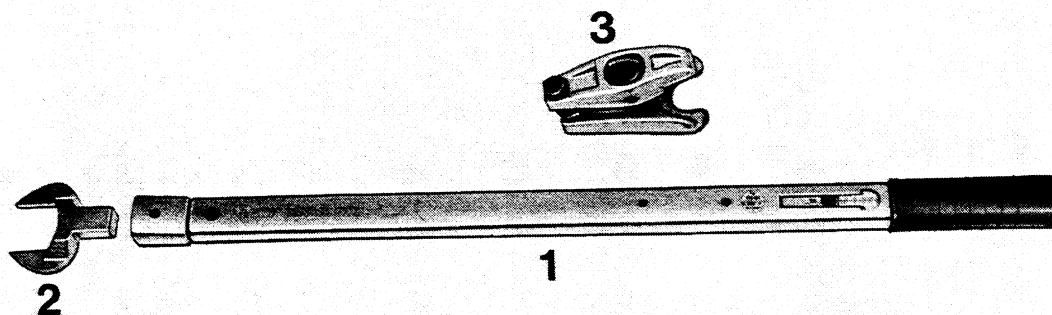
During tightening, the stop surface at the steering stop ring shifts by approx. 1 mm.

I.e. adjusting distance a must be checked and readjusted, if required, after the lock nut has been tightened.

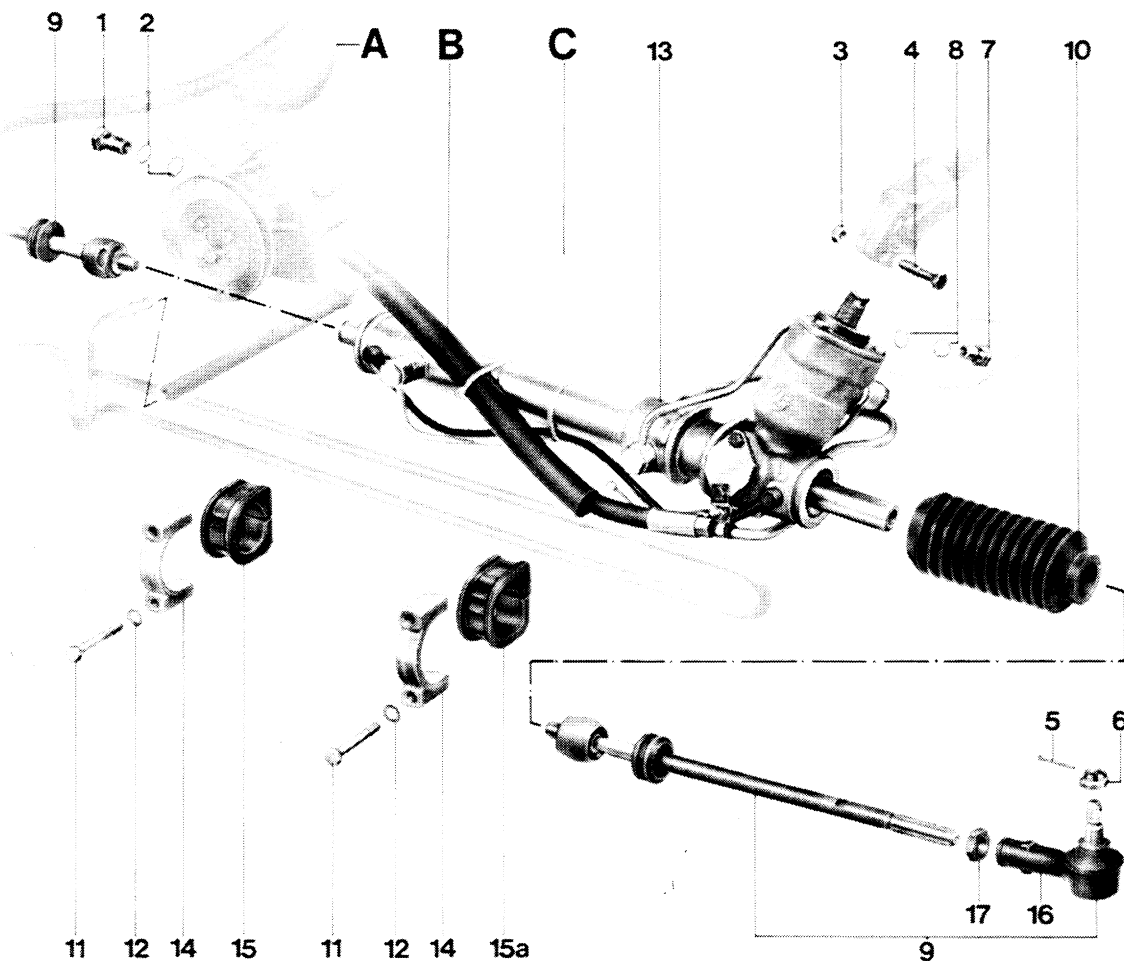
The steering stop ring must not be omitted under any circumstances when the steering box or the steering tie-rod is refitted. Otherwise the tie-rod may retract fully into the steering gear housing, causing the steering rack guide sleeve to be damaged.

Before refitting the protective sleeves (bellows), extend the steering tie-rods fully and coat the tie-rod ends with VW steering gear grease AOF 063 000 04.

## TOOLS



No.	Description	Special Tool	Remarks
1	Torque wrench Stahlwille 730 R/20 or Hazet 6292-1 CT		
2	Wrench socket	9183	
3	Tie rod puller		



A – SUCTION HOSE

B – PRESSURE LINE

C – RETURN LINE

No.	Description	Qty.	Note When:		Special Instructions
			Removing	Installing	
1	Hollow union bolt	1		Torque: 30 Nm (22 ft lb)	Tighten lock nut to 50 Nm
2	Seal	2		Replace	
3	Self-locking nut	1		Replace; torque: 30 Nm (22 ft lb)	
4	Bolt	1			
5	Cotter pin	2	only present if castle nut is fitted	Replace	
6	Castle nut	2		Torque: 30 Nm (22 ft lb) If necessary turn further to next cotter pin hole (max. torque: 50 Nm – 36 ft lb)	
7	Hollow union bolt	1		Torque: 20 Nm (14 ft lb)	
8	Seal	2		Replace	
9	Steering tie rod assy.	2	Only loosen if steering or steering tie rod(s) have to be replaced	Use torque wrench with 9183. Torque: 85 Nm (61 ft lb) Lock (peen) after tightening	
10	Dust cover	2		Check, replacing if necessary	
11	Bolt	4		Torque: 23 Nm (17 ft lb)	
12	Washer	4			
13	Rack-and-pinion power steering gear	1		Coat ends of completely run out pinion with VW steering gear grease AOF 063 000 04	

No.	Description	Qty.	Note When		Special Instructions
			Removing	Installing	
14	Clamp	2		Install with Contifix or Capella-Oil B Wax-free (Texaco) *	
15	Rubber insert, right	1		Check, replacing if necessary	
15 a	Rubber insert, left	1		Check, replacing if necessary	
16	Ball joint	2			
17	Nut	2		Check, replacing if necessary	

\* Capella assembly oil is no longer marketed. It is now replaced by Omnis 32.

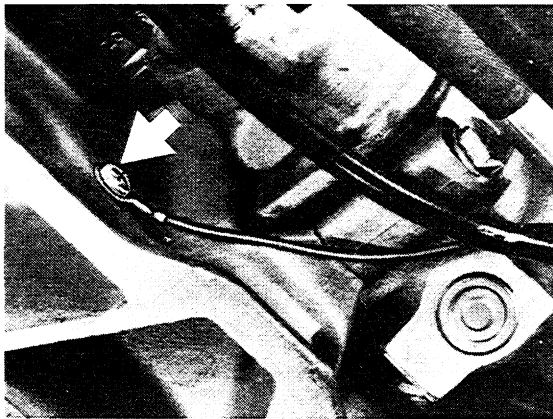
## REMOVING AND INSTALLING POWER STEERING GEAR

## Removing

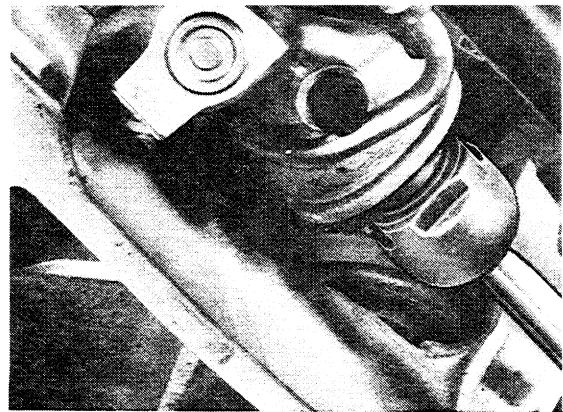
1. Take off front wheels and splash shield.

2. Remove stabilizer by disconnecting stabilizer mounts on control arms and stabilizer suspension on side members.

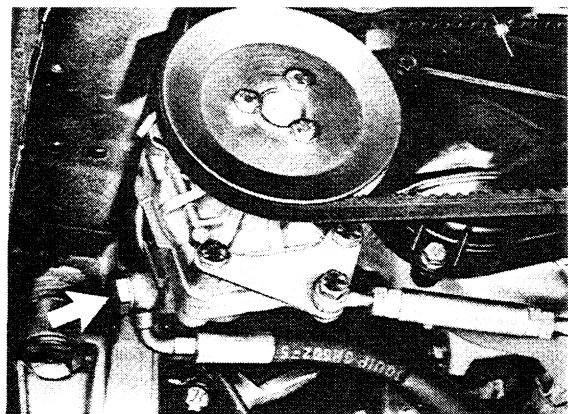
3. Disconnect ground wire on front axle cross member.



4. Loosen (do not remove) tie rod(s) on steering rack with 9183 used in conjunction with a suitable torque wrench. Only unscrew when steering and/or tie rod(s) have to be replaced. The rack should then only be run out of steering gear case as far as necessary on the disconnecting side.

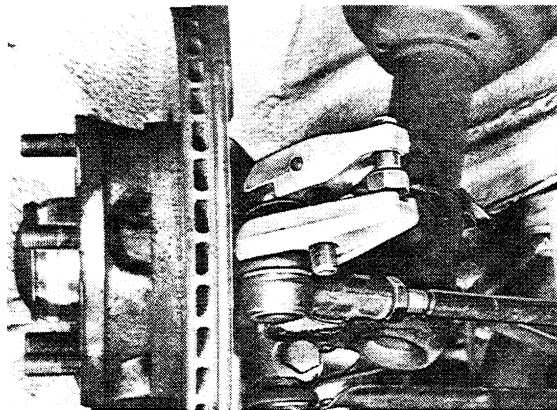
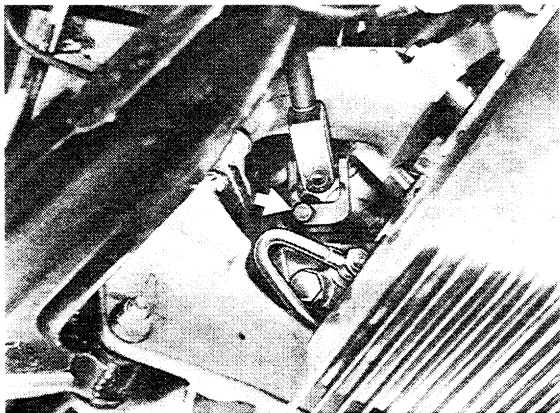


5. Disconnect pressure line on power steering pump. Catch hydraulic fluid running out of pump or tank and power steering gear (never reuse). To make sure that approximately all of the fluid runs out of steering, position pressure line (connection) lower than the steering and turn the steering wheel from stop to stop several times.

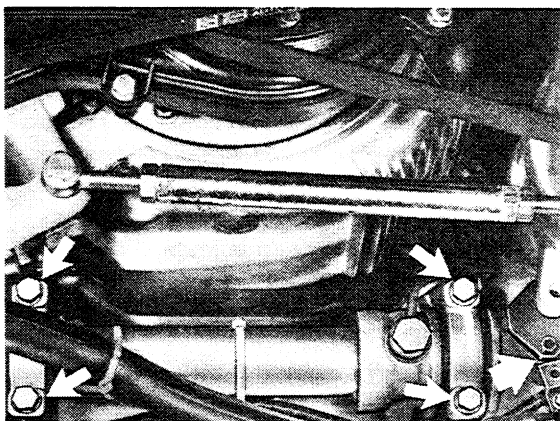
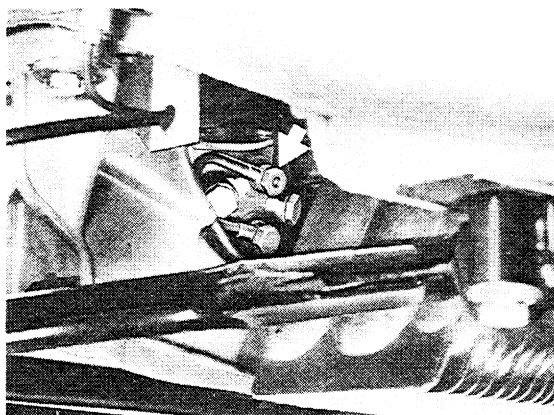


6. Remove bolt on universal joint. Loosen (do not unscrew completely) four mounting bolts of steering gear until shaft can be removed from steering pinion.

Unscrew pressure line clamp on steering gear to have access to the left lower mounting bolt.



8. Unscrew return line on steering gear.



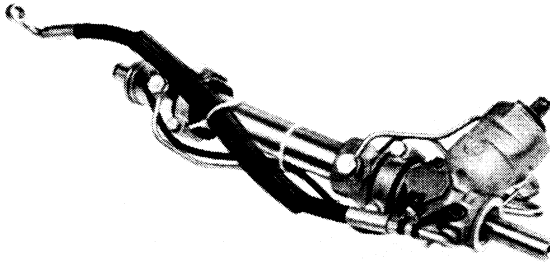
9. Now unscrew the four mounting bolts completely and take out steering gear forward.

7. Press out tie rods (ball joints) with a standard puller.

### Installing

1. If a new steering gear is being installed, mount rubber inserts and clamps in correct position with Cappella-Oil B Waxfree (Texaco) before installing steering gear in car. Screw on pressure line; tightening torque for hollow union bolt: 20 Nm (14 ft lb). Coat ends of completely extended rack with VW steering gear grease AOF 086000.





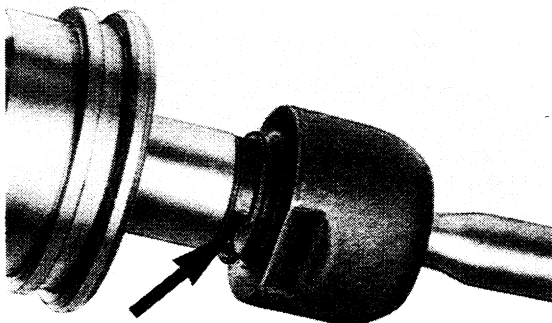
5. After installing all parts, fill system with hydraulic fluid, bleed steering system, check for leaks and test function (see page 48 - 11).

6. Adjust toe, if necessary.

2. Slide shaft on steering gear in correct position (steering wheel and steering gear in center position). The steering gear mounting bolts should only be screwed in lightly for this job to facilitate installation.

3. Mount steering gear. Tightening torque: 23 Nm (17 ft lb). Tighten mounting bolt of shaft to 30 Nm (22 ft lb).

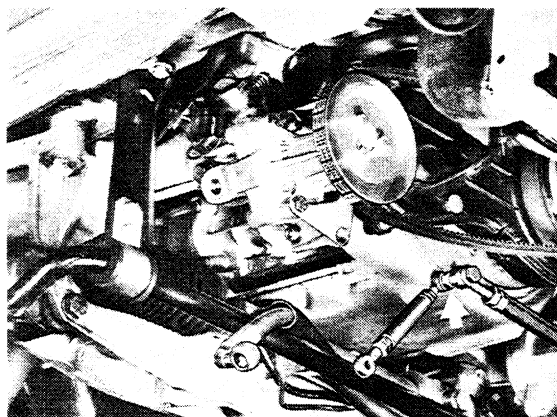
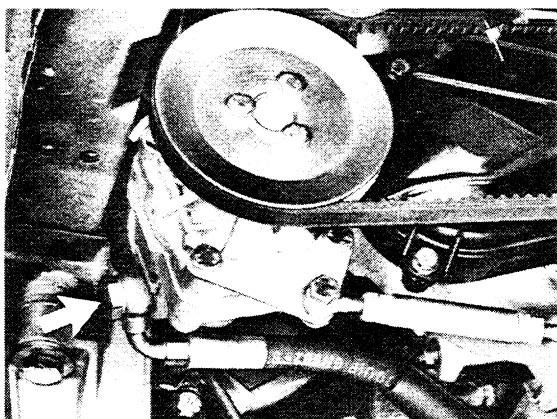
4. Mount tie rods (if removed — see point 4) on rack with a torque of 85 Nm (61 ft lb). Bend down collar on opening of rack to lock. Make sure that this does not damage surface of rack (leakage).



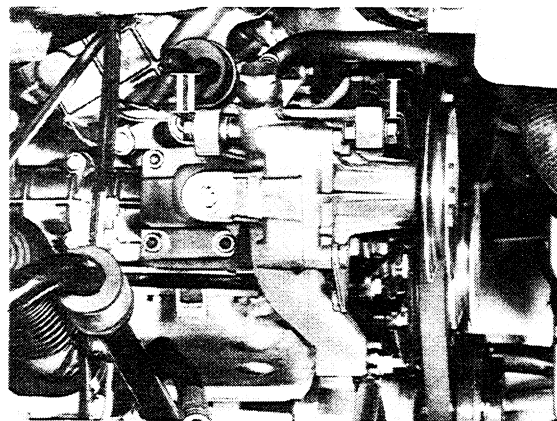
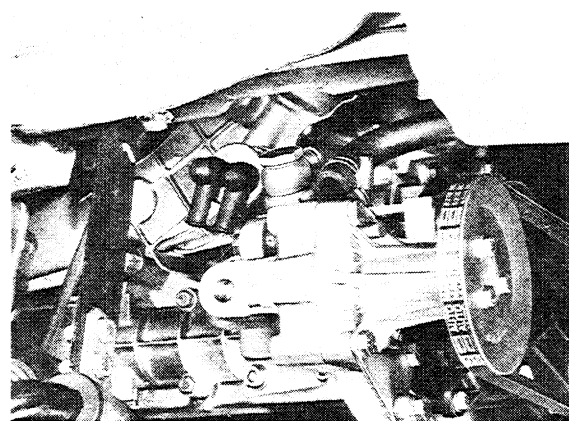
## REMOVING AND INSTALLING POWER STEERING PUMP

## Removing

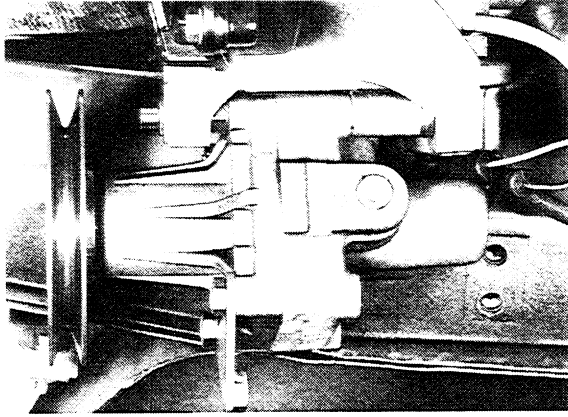
1. Remove splash shield.
2. Disconnect pressure line on power steering pump.  
Catch escaping hydraulic fluid, but do not reuse.
4. Unscrew connecting rod on power steering pump and nut (arrow).  
Turn connecting rod down.



3. Remove intake hose after loosening clamp.
5. Remove mounting nut I and mounting bolt II.  
Take off drive belt.



6. Swivel power steering pump upward on its bracket and remove spacer from below.



4. Fill system with hydraulic fluid, bleed steering system, check for leaks and test function.

7. Take power steering pump out of bracket.

### Installing

1. If the power steering pump pulley has been removed, use Loctite 270 to secure the 3 mounting bolts.

2. Install power steering pump in car. Check and adjust drive-belt tension (see page 13 - 2 a).

3. Make sure delivery line and intake hose are correctly routed (to prevent rubbing) when the power steering pump is installed.

## Checking and servicing the rack-and-pinion power steering

### General

Power steering damage occurs due to lack of oil in the hydraulic circuit. Even minor leaks may cause the fluid to escape due to the high oil pressure inside the hydraulic circuit and may result in damage to the power-steering pump.

Grunt sounds noticeable when turning the steering wheel or foaming in the supply tank indicate a lack of oil and/or air ingress. Before topping up the supply tank, however, eliminate any leaks in the inlet side and/or replace any defective parts of the pressure side.

### Important note

**Do not attempt to repair or dismantle rack-and-pinion steering gear and power steering pump.** Both steering gear and power steering pump are available on an exchange basis in various countries.

In countries that do not operate an exchange part scheme, the steering gear as well as the power steering pump may in certain cases be reconditioned by an authorized ZF dealership.

### Checking the power steering pump drive belt tension

Refer to page 13 - 2a for the drive belt tension.

### Checking the steering system for leaks (visual check)

With the engine running at idle, turn the steering wheel to lock and keep in that position. This allows maximum line pressure to build up.

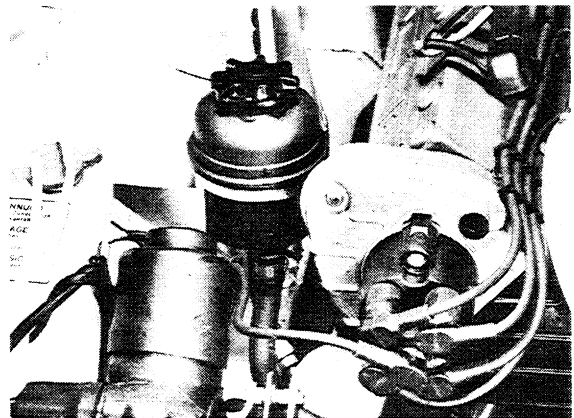
With the steering wheel in this position, check all line connections for tightness, retighten if necessary.

Run this check for max. 10 sec. If the check requires more time, allow for a short break every 10 seconds.

### Checking the power steering fluid level

Screw off supply tank cover.

The supply tank is fitted to the right-hand wheel house wall inside the engine compartment.



2. Run engine at idle. Wipe off dipstick, screw cover back on and remove again. The fluid level must be between both marks. If required, top up with ATF-DEXRON II D.



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#### Bleeding the steering system

1. To bleed the complete system after new steering components or lines have been fitted or after excessive hydraulic fluid losses have been remedied, start engine several times and turn off immediately as soon as it has started. This process causes the fluid level in the supply tank to drop rapidly. Make sure to top up continuously using ATF Dexron II D. The supply tank must never run empty.

#### Note

To facilitate refitting, establish the fluid level using a measuring tape while topping up constantly. Fluid level: approx. 40 mm from top edge of supply tank.

2. As soon as the fluid level no longer drops when the engine is started for a short moment, start the engine again and let it run at idle speed.
3. Turn steering wheel rapidly from lock to lock several times to allow air to escape from the cylinders. When reaching the end position of the piston, do not pull harder on the steering than is required for turning the steering (to avoid unnecessary pressure buildup).
4. Check fluid level while performing this operation. If it continues to drop, top up until the fluid remains at a constant level and no more air bubbles rise in the supply tank when the steering wheel is turned.

#### Note

When stopping the engine, the fluid level in the supply tank must not rise by more than 10 mm.

If the fluid level with the engine stationary and running, respectively, deviates by more than 10 mm, trapped air remains in the hydraulic fluid.

5. With the engine running at idle, establish correct fluid level (between min. and max. marks) without turning the steering wheel.

## TOOLS

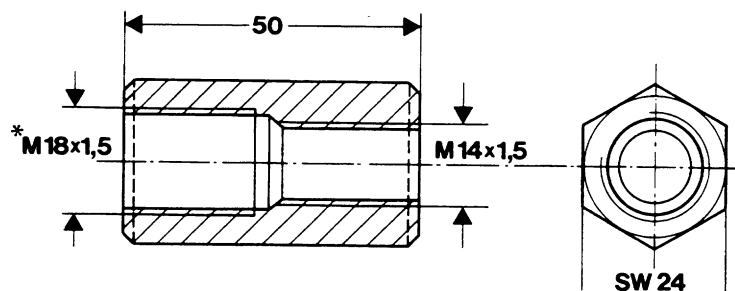
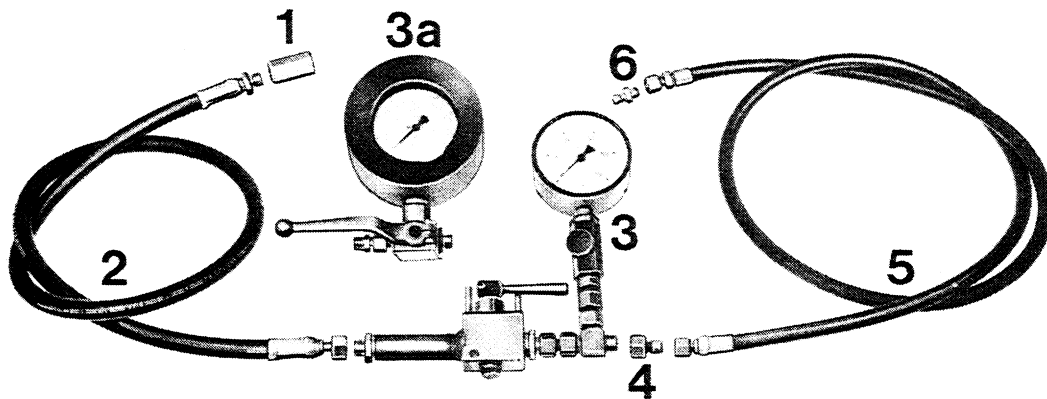
## Note :

All parts (items 1 — 6) can be used for 944 and 928 models.

The pressure gage is mounted between power pump and pressure line (928: between pressure line and steering gear).

If old pressure gage (no. 3, see below) is used, make sure high pressure hoses (no. 2 and no. 5) are connected on pressure gage in correct position (sides mixed in comparison to 928).

Any connection of high pressure hoses is possible on pressure gage no. 3 a.



TOOL TABLE / PAGE 48 - 14

\* Depending on pressure gage version, M 18 x 1.5 or M 16 x 1.5 threads (see Tool Table).

## TOOLS

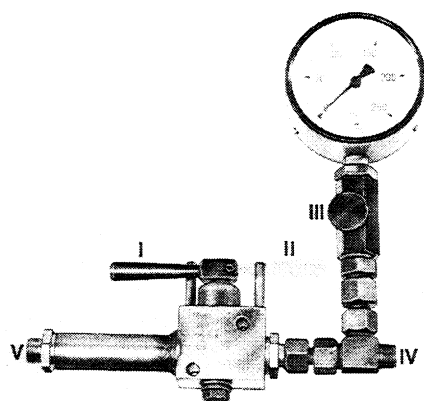
No.	Description	Special Tool	Remarks
1	Adapter		<p>Made locally for pressure gage (item no. 3); see sketch on page 48 - 13</p> <p>Made locally for pressure gage (item no. 3 a) with deviation from sketch; threads not M 18 x 1.5 (for gage no. 3) b u t M 16 x 1.5</p>
2	High pressure hose up to 200 bar, 1.5 meters long (2900 psi, 5 ft long)		<p>Standard. M 18 x 1.5 and sealing head on one end, M 18 x 1.5 and flat seal on other end for pressure gage no. 3. M 16 x 1.5 and sealing head on one end, M 16 x 1.5 and flat seal on other end for pressure gage no. 3 a</p>
3	Pressure gage 0 – 250 bar (0 – 3600 psi)		Old version; no longer available
3a	Pressure gage 0 – 160 bar (0 – 2300 psi)	V. A. G. 1402 or US 1074 B	
4	Adapter		<p>Standard, M 18 x 1.5 to M 16 x 1.5 (not required for pressure gage 3 a)</p>
5	High pressure hose 200 bar, 2 meters long (2900 psi, 6.5 ft long)		<p>Standard, M 16 x 1.5 and sealing head on both ends</p>
6	Connector		<p>Standard, M 16 x 1.5 and sealing head on one end and M 14 x 1.5 with flat seal on other end</p>

## CHECKING HYDRAULIC OPERATION OF STEERING (PRESSURE TEST)

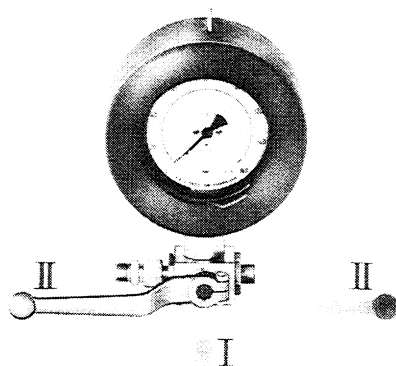
### General Information

Tester (pressure gage) is installed between power pump and pressure line. If using old pressure gage, install in correct position. Connections and lever positions are marked for better understanding of the following instructions.

### Old Version



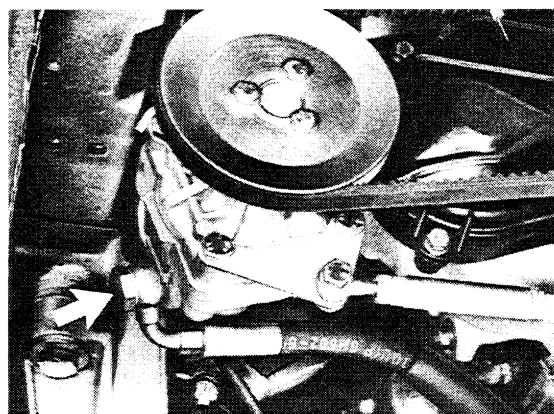
V. A. G. 1402 or US 1074 B



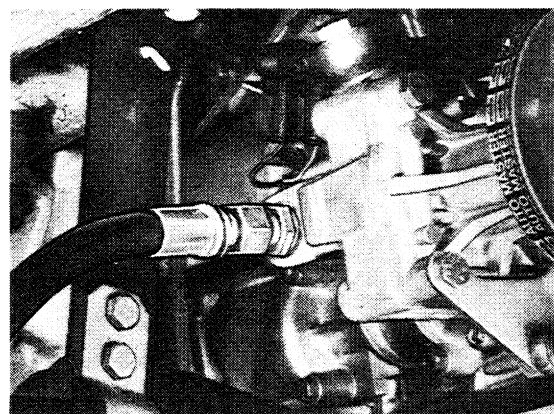
- I — Shut-off valve open
- II — Shut-off valve closed
- III — Restrictor
- IV — From power pump
- V — To pressure line

### Installing Pressure Gage

1. Remove splash shield.
2. Detach pressure line on power pump. Catch hydraulic fluid (but do not reuse).

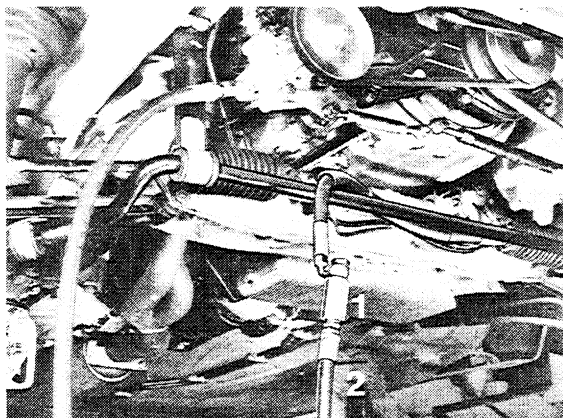


3. Screw high pressure hose no. 5 with connector on power pump (use 14 x 18 seal).





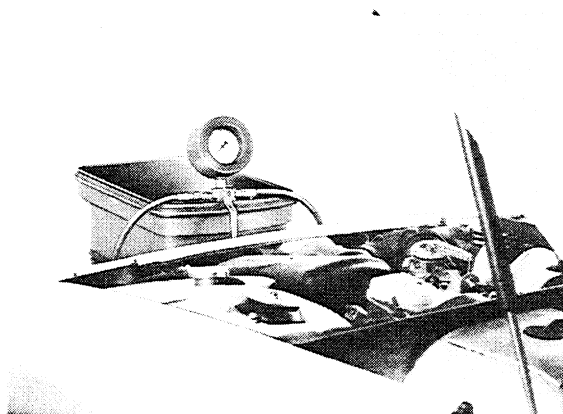
4. Mount 1.5 meter long high pressure hose no. 2 on pressure pipe with help of hollow bolt and adapter no. 1 (seals 2 x 14 x 18 and 1 x 18 x 22 or 1 x 16 x 20 are required).



5. Install pressure gage between high pressure hoses and place on stand (e.g. toolbox) in front of car in view of tester. Make sure hose section of pressure line is not bent off. Test hose must also have safe distance to drive belts or pulleys.

### Note

Use adapter no. 4 and install high pressure hose no. 5 on connection IV of pressure gage in case of the old pressure gage version.



6. Open shutoff valve on pressure gage (lever position I), fill supply tank and bleed steering system (see page 48 - 11).

### Checking Delivery Pressure of Power Pump

1. Close shutoff valve (lever position II) with engine running at idle speed and read pressure. Specification: 100 to 120 bar. Open shutoff valve again immediately.

### Note

Shutoff valve should not be closed longer than 5 seconds because of wear. Lever position II right or II left must be selected for pressure gage version 3a depending on how high pressure hoses are connected on the pressure gage. (No display with wrong lever position II.)

2. Replace power pump, if specified value is not reached or exceeded.

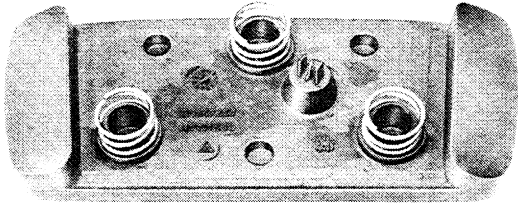
### Checking System Pressure

1. Let engine run at idle speed. Shutoff valve must be open (lever position I).
2. Turn steering wheel against left and right locks and read hydraulic pressure from pressure gage each time. Specification: 100 to 120 bar. It is not sufficient that only the steering stop is effective, but instead the returning force of the rotary piston valve must also be overcome. Force on steering wheel: approx. 100 N (10 kp).
3. If the specified value is not reached on the left or/and right sides (excessive leak oil flow), replace complete steering gear.

## REMOVING AND INSTALLING STEERING WHEEL \*

### Removing

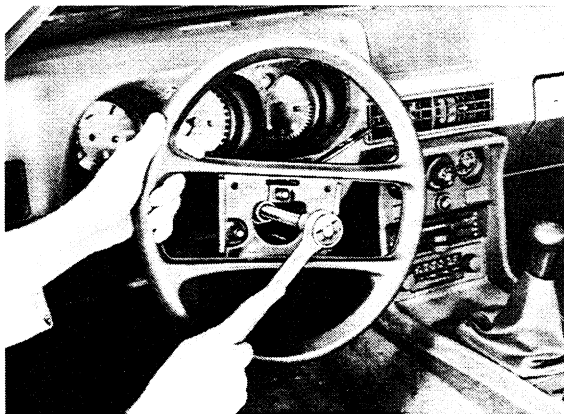
1. Pull impact pad off of steering wheel with wheels in straight ahead position. Begin at bottom (only 4 spoke steering wheels) and outside to avoid damage. Pull off horn wires.



### Installing

1. Mount steering wheel with road wheels in straight ahead position or that marks are aligned in such a manner, that steering wheel spokes are horizontal
2. Install nut with washer and torque to 45 Nm (4.5 kpm).
3. Mount horn wires on impact pad and press impact pad onto retaining pins.
4. Check function of horn and self-cancelling action of turn signal switch.

2. Mark position of steering wheel to steering shaft for installation later.
3. Unscrew nut and take off steering wheel with washer.

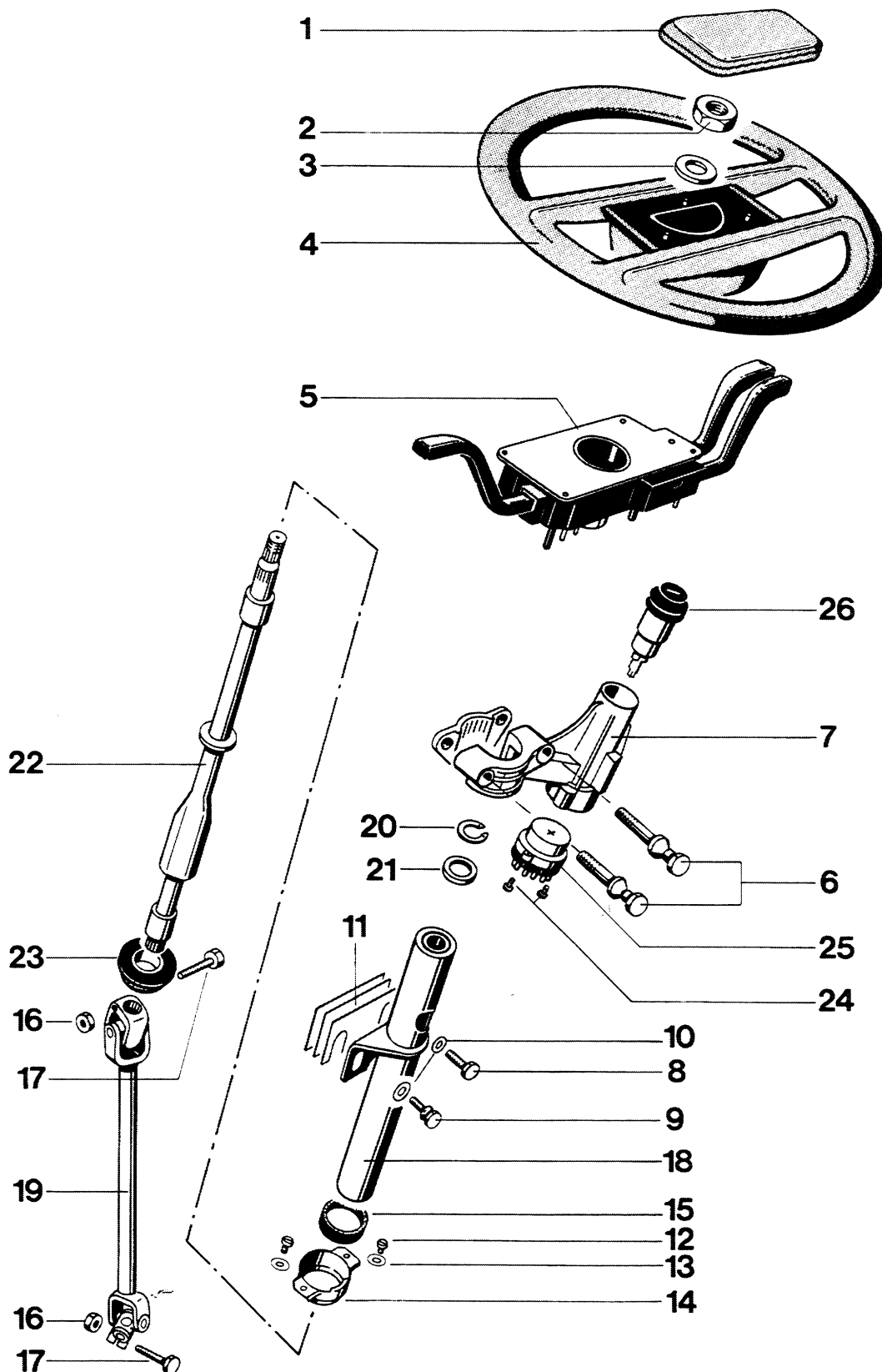


\* Not applicable to airbag steering wheel (see Page 68-8 for marking on airbag unit on the steering wheel). See Page 68-9 for removing and installing airbag steering wheel.

**Removing and installing the steering shaft with protective tube  
as from Model 85/2**

**Removing and installing the steering shaft with protective tube  
as from Model 85/2**

# Removing and installing the steering shaft with protective tube as from Model 85/2



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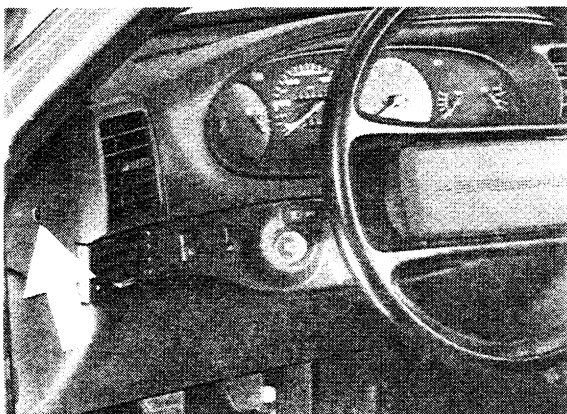
No.	Description	Qty.	Note when:	
			Removing	Installing
1	Cap	1		
2	Hexagon nut	1		Tightening torque 45 Nm
3	Spring washer	1		Replace if necessary
4	Steering wheel	1		Center the steering in the middle position with Special Tool 9116, lubri- cate the hub with Molykote A and push on with the spokes horizon- tal
5	Steering column switch	1		
6	Breakaway screws	2	Drill out	
7	Steering-lock housing	1		
8	Breakaway screw	1	Chisel out	
9	Hexagon head screw	1		Tightening torque 23 Nm
10	Washer	2		
11	Shims	x		Use the same number as removed
12	Hexagon head screw	2		Tightening torque 7 Nm
13	Washer	2		
14	Support ring	1		
15	Rubber bearing	1		Apply a film of Contifix
16	Lock nut	2		Replace, Tightening torque 30 + 5 Nm
17	Hexagon head screw	2		

No.	Description	Qty.	Note when::	
			Removing	Installing
18	Protective tube	1		Check the ball bearing, replace the steering rod tube if necessary
19	Steering cross-link	1		Install without stresses
20	Circlip			
21	Shim	1		
22	Steering shaft	1		Install without stresses
23	Needle bearing	1		
24	Screw	2		
25	Ignition-starter switch	1		
26	Lock cylinder	1	See Page 94 - 5	

## Notes on assembly

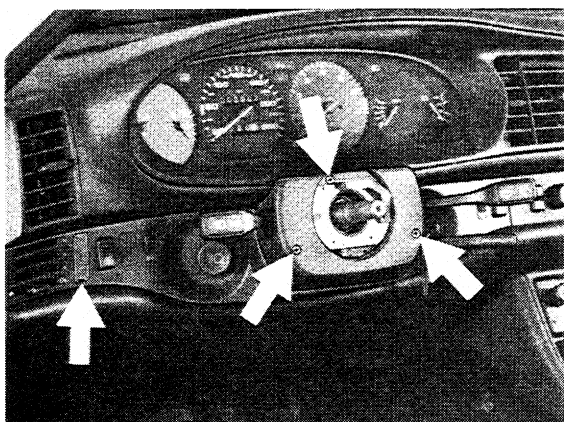
### Removing

1. Disconnect the battery.
2. Remove the steering wheel (see Page 48 - 17, see Page 68 - 9 for the airbag steering wheel). Loosen the cover panel on the left-hand side of the switchboard.



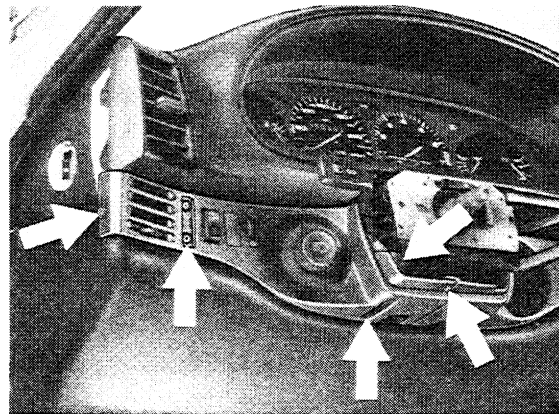
85/234A

3. Loosen the cover panel from the steering column switch and remove the cover for the fastening screws in the switch panel.



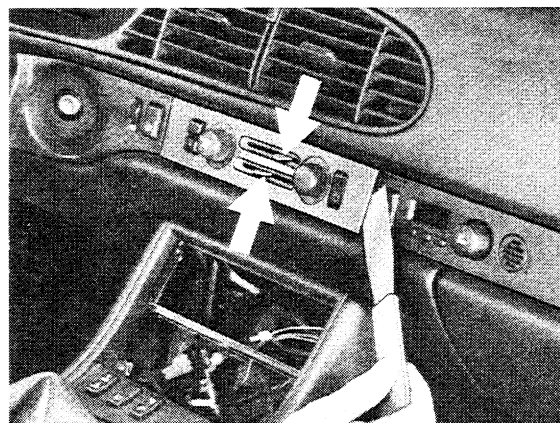
85/235

4. Undo the fastening screws for the switch panel and remove. Separate the plug connection.



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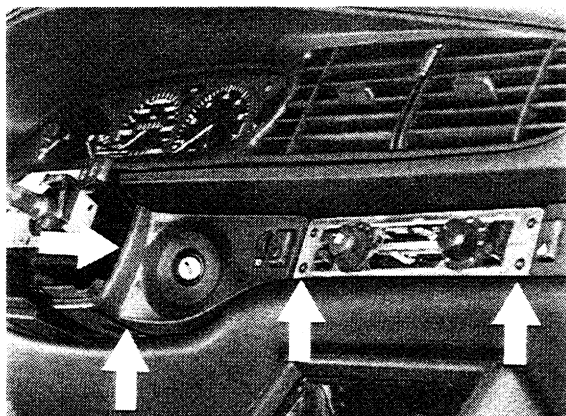
5. Remove the knobs from the control switch. Loosen the control switch panel carefully with a spatula.



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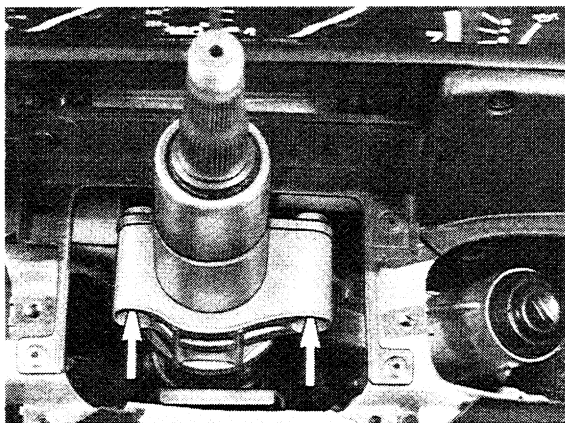


6. Undo the fastening screws for the control switch and the steering lock cover.



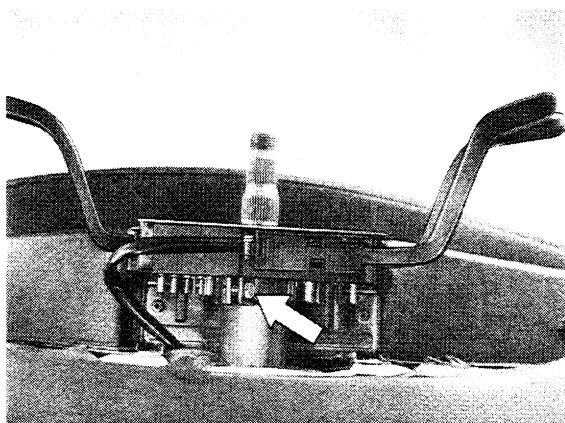
85/249

8. Separate the plug connection for the ignition-starter switch. Drill out the breakaway screws in the steering column housing and remove the housing.



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7. Remove the steering column switch.

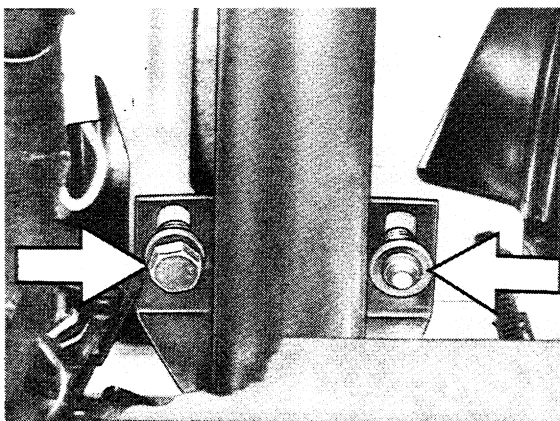


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**Note:**

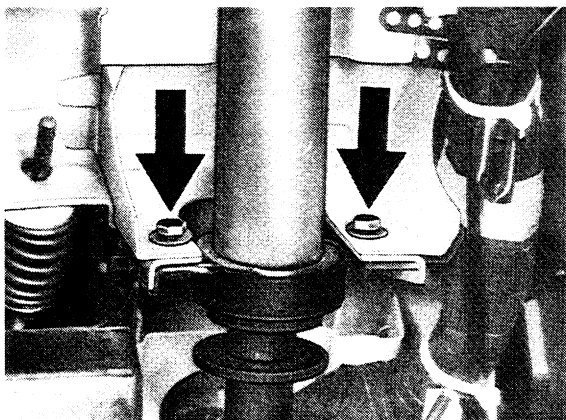
Make sure that the shims between the casing tube and chassis do not get lost.

9. Chisel out the breakaway screw in the protective tube and undo the hexagon head screw.



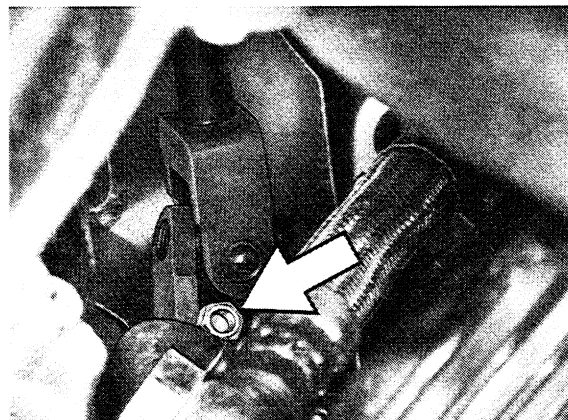
88/38

10. Undo the hexagon head screws for the support bearing.



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12. Disconnect the cross-link from the steering gear.



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#### Note

944 turbo: the exhaust shield plate must be undone before removing the upper screw connection for the steering cross-link.

11. Disconnect the cross-link from the steering shaft.



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13. Pull out the steering shaft with protective tube towards the interior of the vehicle.

14. Remove the circlip and shim from the steering shaft and pull the shaft out of the protective tube.

#### Installing

##### Note:

The assembly sequence must always be observed to ensure stress-free installation of the cross-link and steering shaft.

1. Apply a film of Contifix to the support ring rubber bearing and slide both together onto casing tube.
2. Install cross-link and protective tube with steering shaft, all fastening screws remain loose.

3. Tighten the fastening screw between cross-link and steering shaft (upper), and then tighten the fastening screw from the cross-link to the steering gear (lower).
  4. Use the same number of shims to adjust the protective tube as were removed. (The steering shaft should be in the middle of the upper edge of the dashboard cutout and the support console).
  5. Tighten the fastening screws for the protective tube. Adjust the support bearing and tighten the fastening screws.
  6. Adjust the steering-lock housing, the spigot for the steering-wheel lock must engage easily. Tighten the breakaway screws but do not break off.
  7. Adjust the steering column switch and mount the steering wheel briefly. There should be 2 - 4 mm play between the steering column switch and the steering wheel.
  8. Once a functional and visual inspection has been carried out on all relevant components, break off the breakaway screws.
  9. Install panels and covers.
  10. Center the steering in the middle position with Special Tool 9116 and mount the steering wheel (lubricating the hub with Molykote A), with the spokes horizontal.
-

## Safety notes

Observe the following safety notes when performing body repairs:

- Removal of components may change the gravity center of the vehicle.  
The vehicle may therefore have to be tied down by additional measures on the lifting platform.
- If welding or other spark-generating operations are performed in the vicinity of the battery, the battery must be removed as a rule.
- Rooms designated for body repairs may not be used to stock other vehicles without protection (risk of fire damage due to sparks, battery, paint and body glass damage).
- Be extremely careful when grinding or welding in the vicinity of the fuel tank and other parts of the fuel system. If necessary, remove any components affected.
- Do not weld, braze or solder any parts of the filled air conditioning system. This also applies to welding, brazing or soldering operations on the vehicle that may result in the risk of components of the air conditioning system warming up.
- When drying the vehicle following a respray, do not expose the vehicle to temperatures of max. 80°C for more than 2 hours.

To protect electronic control units against excessive voltage when using electric welding equipment, observe the following safety measures:

- Disconnect clamp from negative battery terminal and cover negative battery terminal.
- Connect ground clamp of the electric welding equipment directly and as closely as possible to the component to be welded. Make sure no electrically insulated parts are located between the ground clamp and the welding location.
- Do not touch electronic control units and electric lines with the ground clamp or with the welding electrode.

### Treatment of electronic control units following accident repairs

Following an accident, electronic control units have to be replaced only if at least one of the following conditions is met:

- The housing is visibly deformed or damaged.
- The support area and/or console is deformed (no outside damage evident on the unit).
- The connector is damaged or corroded due to moisture.
- Operation check and/or self-diagnosis of the units reveals the following fault:  
**“Control unit faulty ”.**

If electronic components, e.g. the ABS control unit, have to be removed to allow repair operations to be performed and if they are to be reused afterwards, they must be checked for proper operation according to specifications after they have been refitted.

## ECONOMICAL BODY REPAIRS ON CELETTE ALIGNMENT BENCH

The attachment set ENS 224.300 was developed for drawing and straightening jobs on the body. This attachment set consists of the basic equipment for Type 924, with which all of the important body take-up points can be checked.

The new rear axle attachments are included in ENS 224.309 for cars beginning with 1978 model with the modified rear axle.

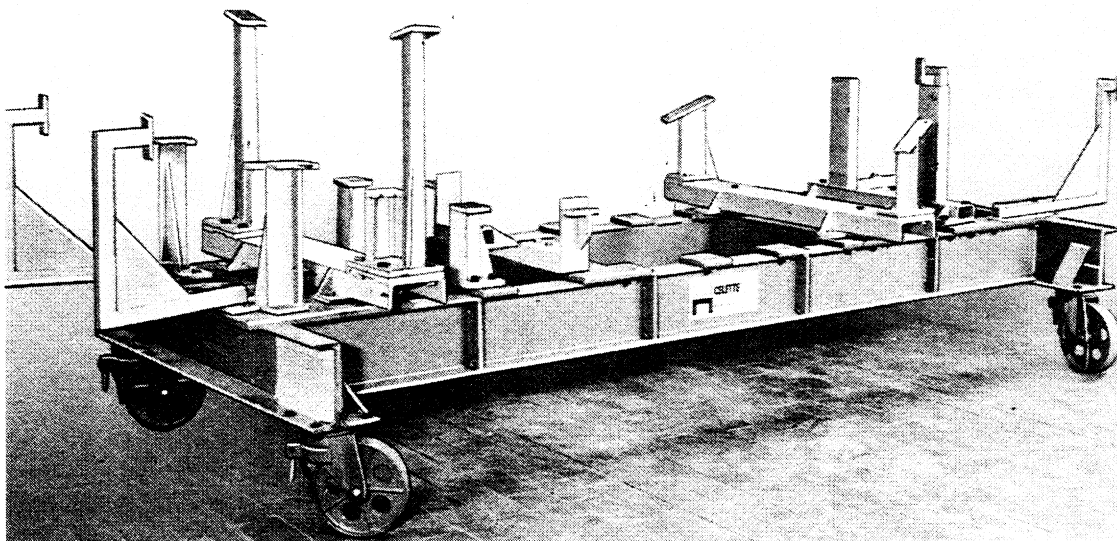
For cars with modified control arm take-ups on the front axle, beginning with 1979 model, the pertinent elements are part of attachment set ENS 224.308.

The side members in the front end of Type 944 cars have been changed in the area of the front control arm take-ups. Attachment set ENS 224.307 is required to check these points and the rear control arm take-ups.

The basic set ENS 224.300, attachment set ENS 224.307 and attachment set ENS 224.309 are required for drawing and straightening jobs on Type 944.

The spring strut drifts and auxiliary platform take-ups must be adjusted to zero. The max. permissible axial tolerance is  $\pm 3$  mm, whereby the difference between left and right may be max. 4 mm.

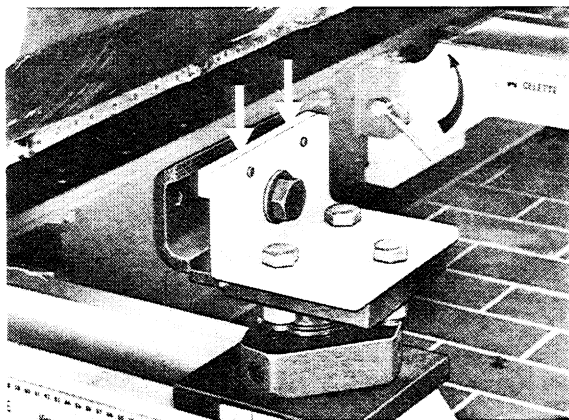
The height tolerance for all take-up points is 4 mm. The body should bolt on the attachment set at all take-up points.

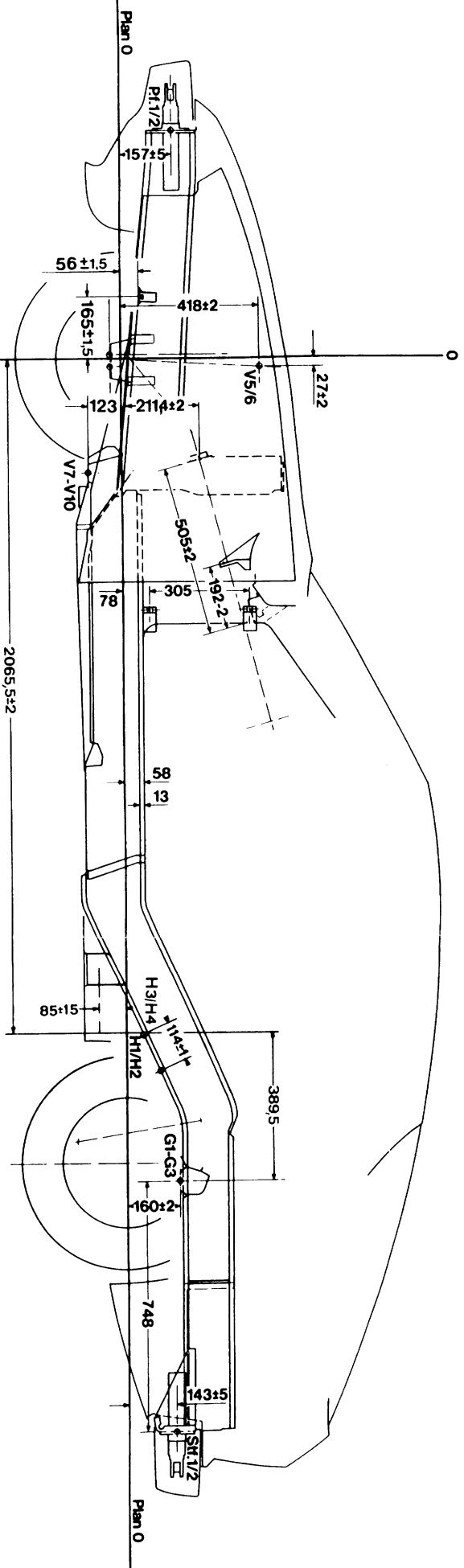


Celette Alignment Bench with Basic Set

## CELETTE ALIGNMENT BENCH – UNIVERSAL ANCHORAGE

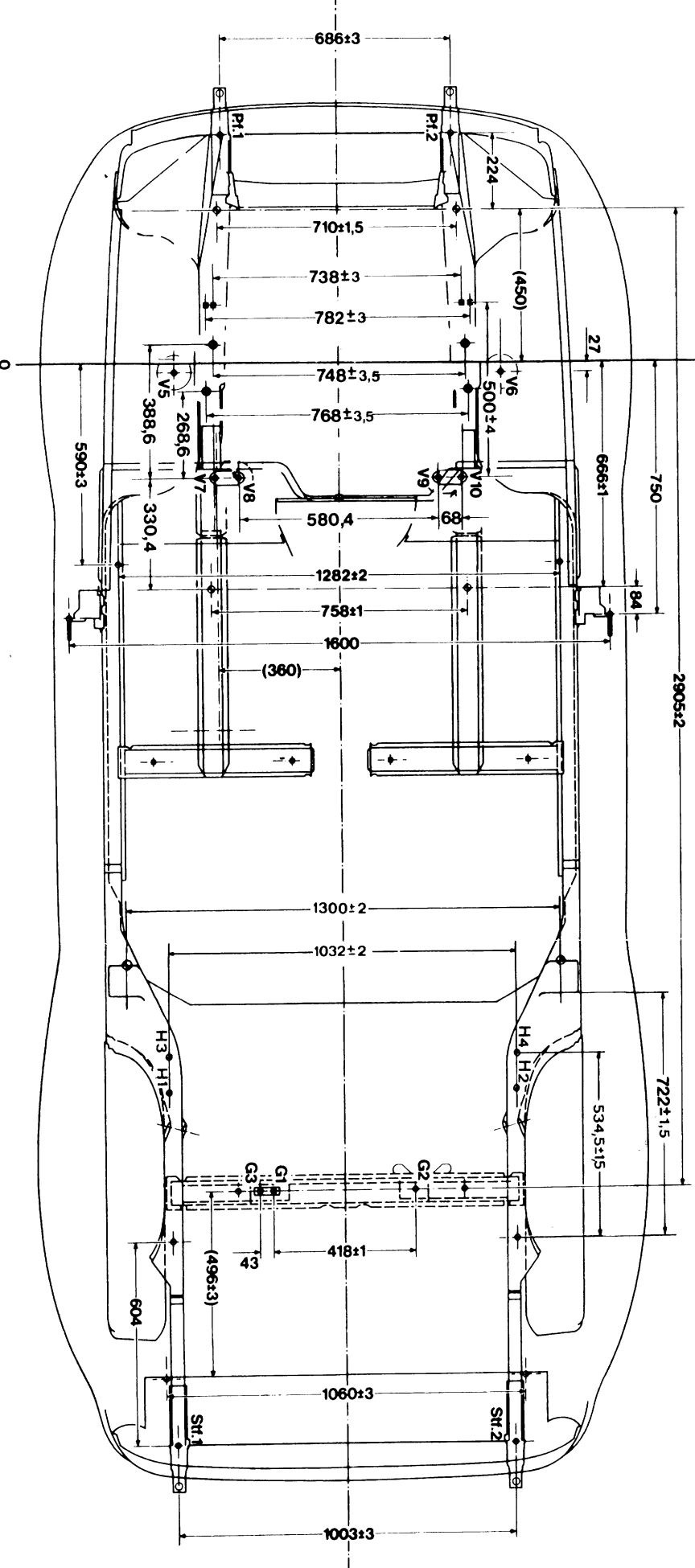
Remove the ribbed clamping shoes on the bearing blocks (arrows) to mount a Type 944 body on the Celette alignment bench with universal anchorage.





#### Designations

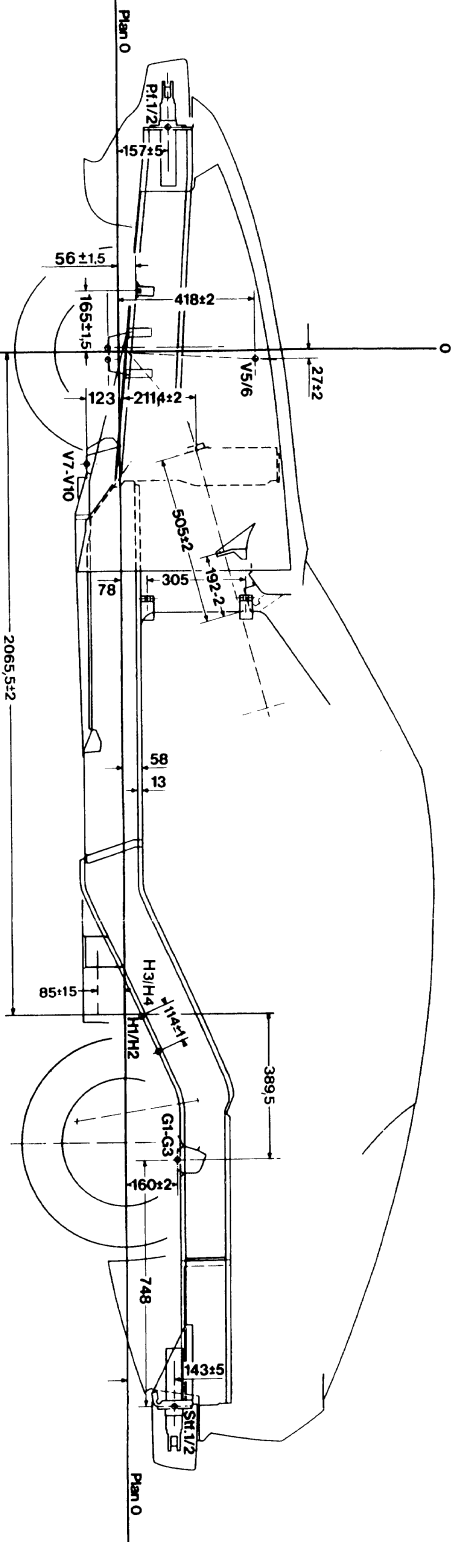
V 1 - V 10	Front Axle
H 1 - H 4	Rear Axle
G 1 + G 2	Transmission
G 2 + G 3	Automatic Transmission
Pf. 1 + Pf. 2	Absorbers
Stf. 1 + Stf. 2	Bumpers



#### REPAIR CONTROL DIMENSIONS

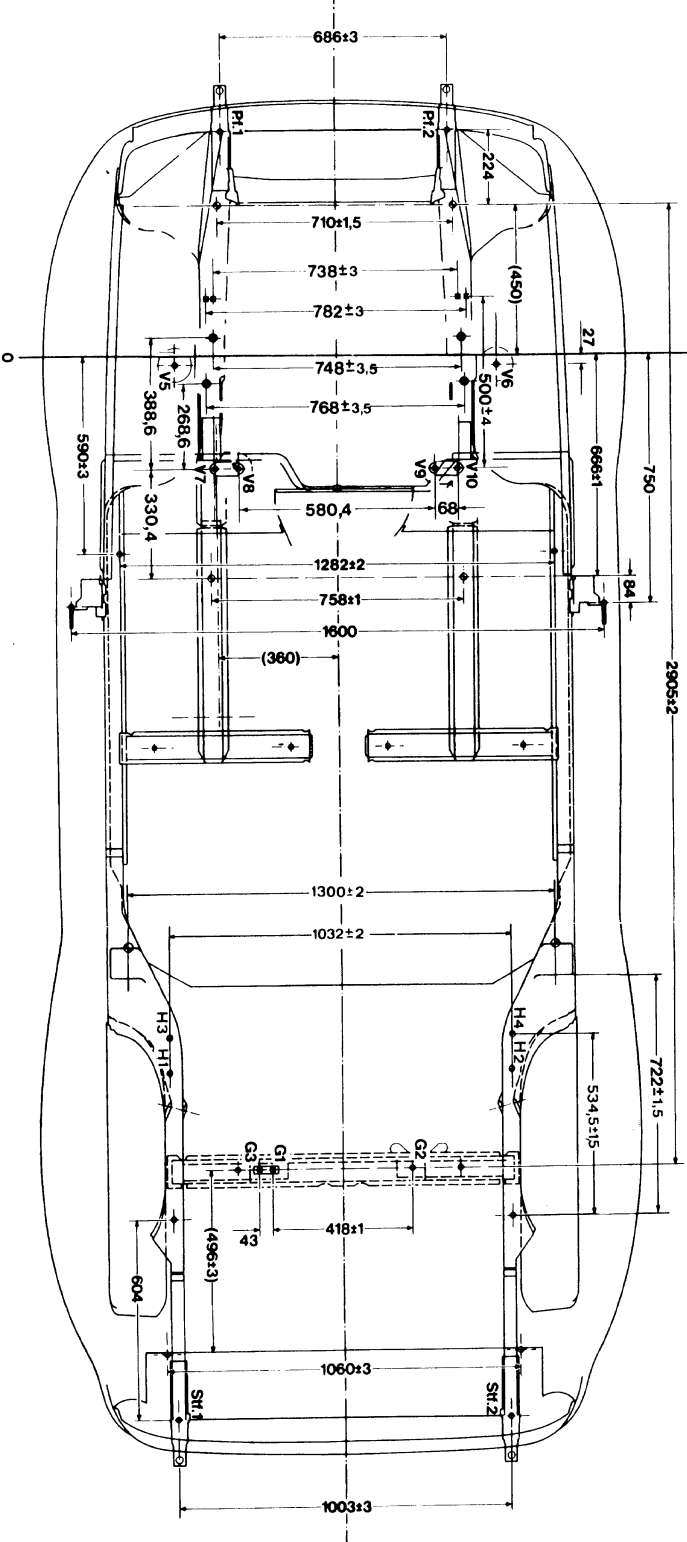






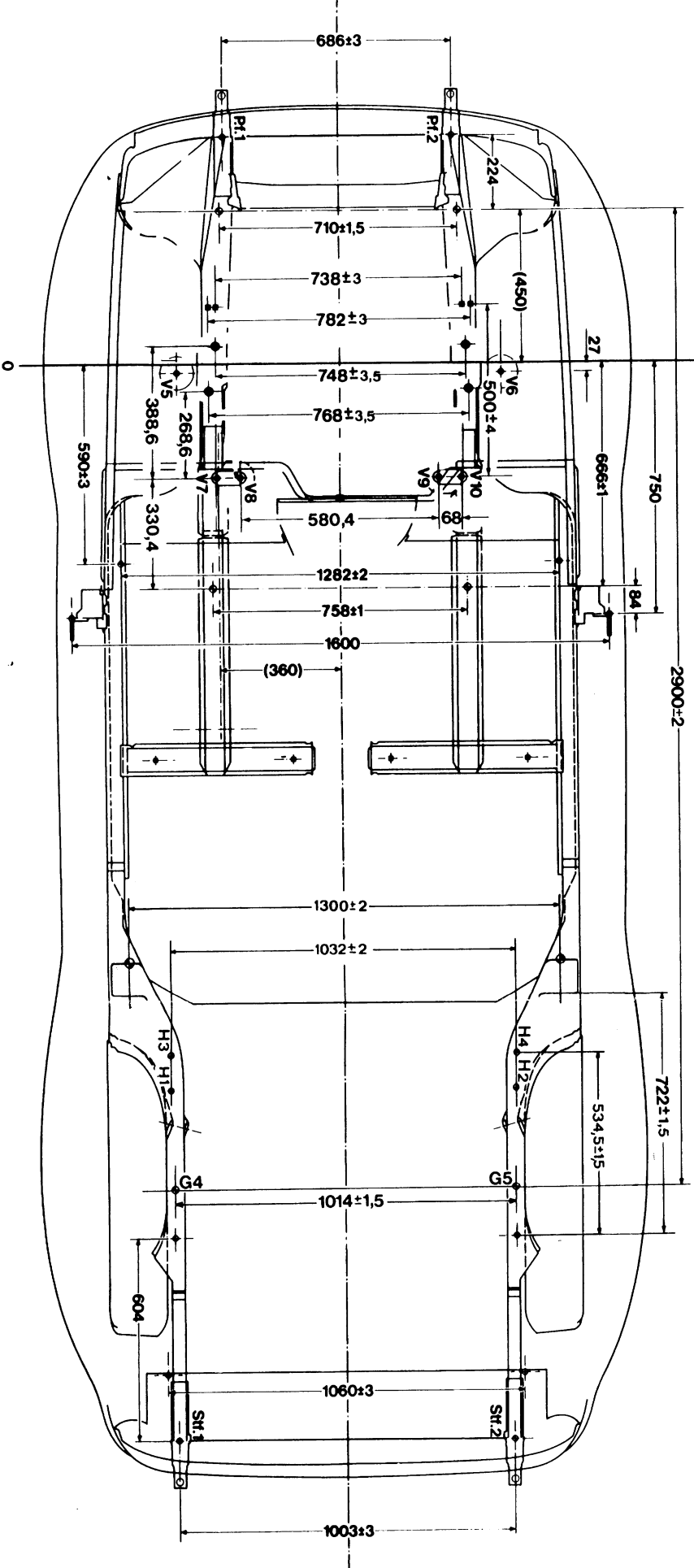
#### Designations

V 1 - V 10	Front Axle
H 1 - H 4	Rear Axle
G 1 + G 2	Transmission
G 2 + G 3	Automatic Transmission
Pt. 1 + Pt. 2	Absorbers
St. 1 + St. 2	Bumpers



#### REPAIR CONTROL DIMENSIONS





**V1 - V10      Front Axle**

## H1 - H4 Rear Axle

## G4 + G5 Transmission

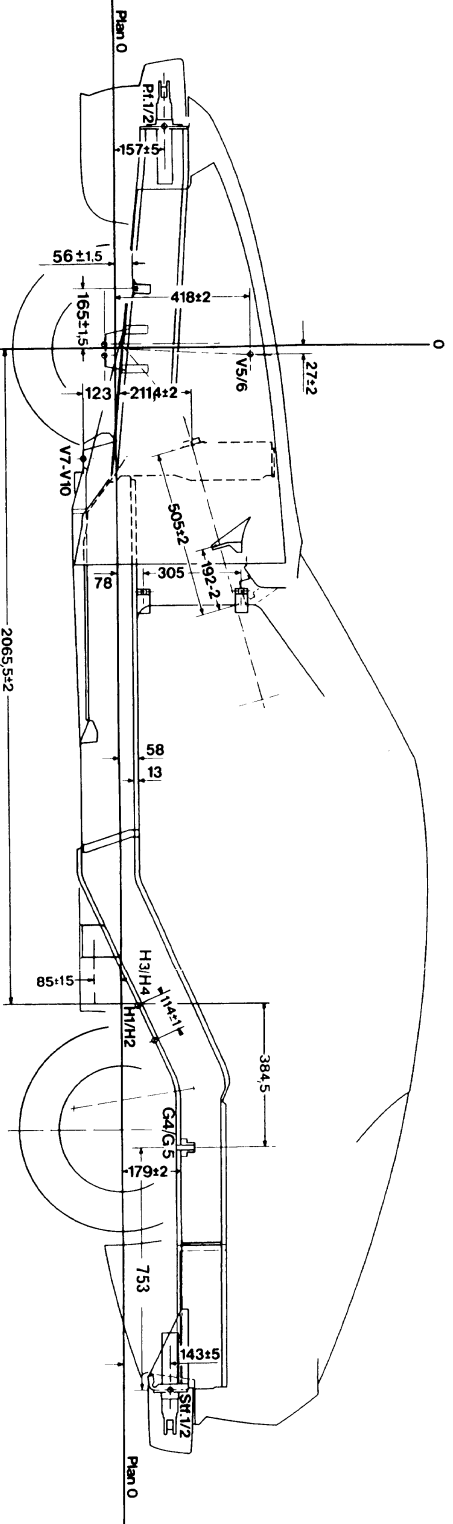
## Pf. 1 + Pf. 2 Absorbers

## Stf. 1 + Stf. 2 Bumpers

REPAIR CONTROL DIMENSIONS



## SINCE 1985 MODELS



Codes:

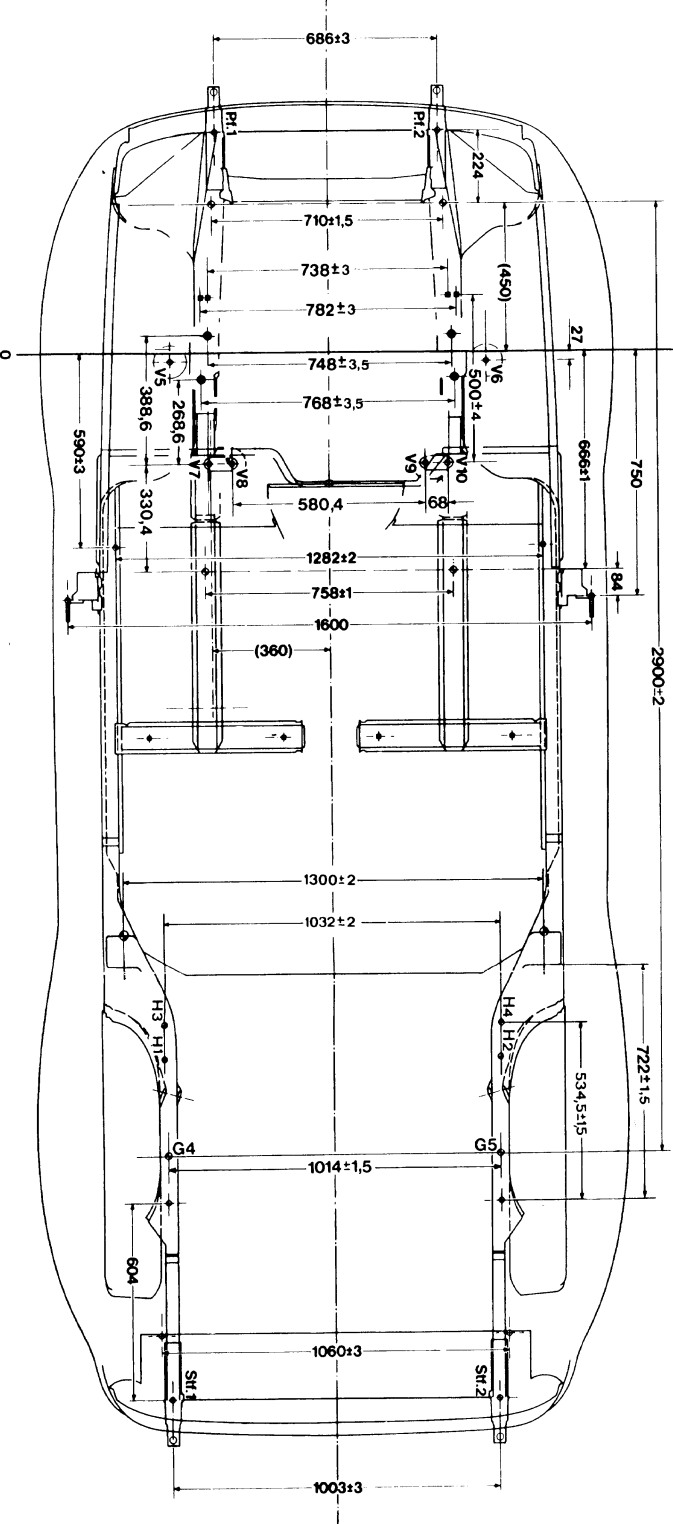
V1 - V10 Front Axle

H1 - H4 Rear Axle

G4 + G5 Transmission

Pf. 1 + Pf. 2 Absorbers

Stf. 1 + Stf. 2 Bumpers



REPAIR CONTROL DIMENSIONS



SINCE 1985 MODELS

**Repair checking dimensions – Cabrio****Additions and differences of cabriolet to coupe bodywork dimensions****Remarks**

Dimensions are measured direct and are therefore angled!

All dimensions are measured to center of hole!

**Important!**

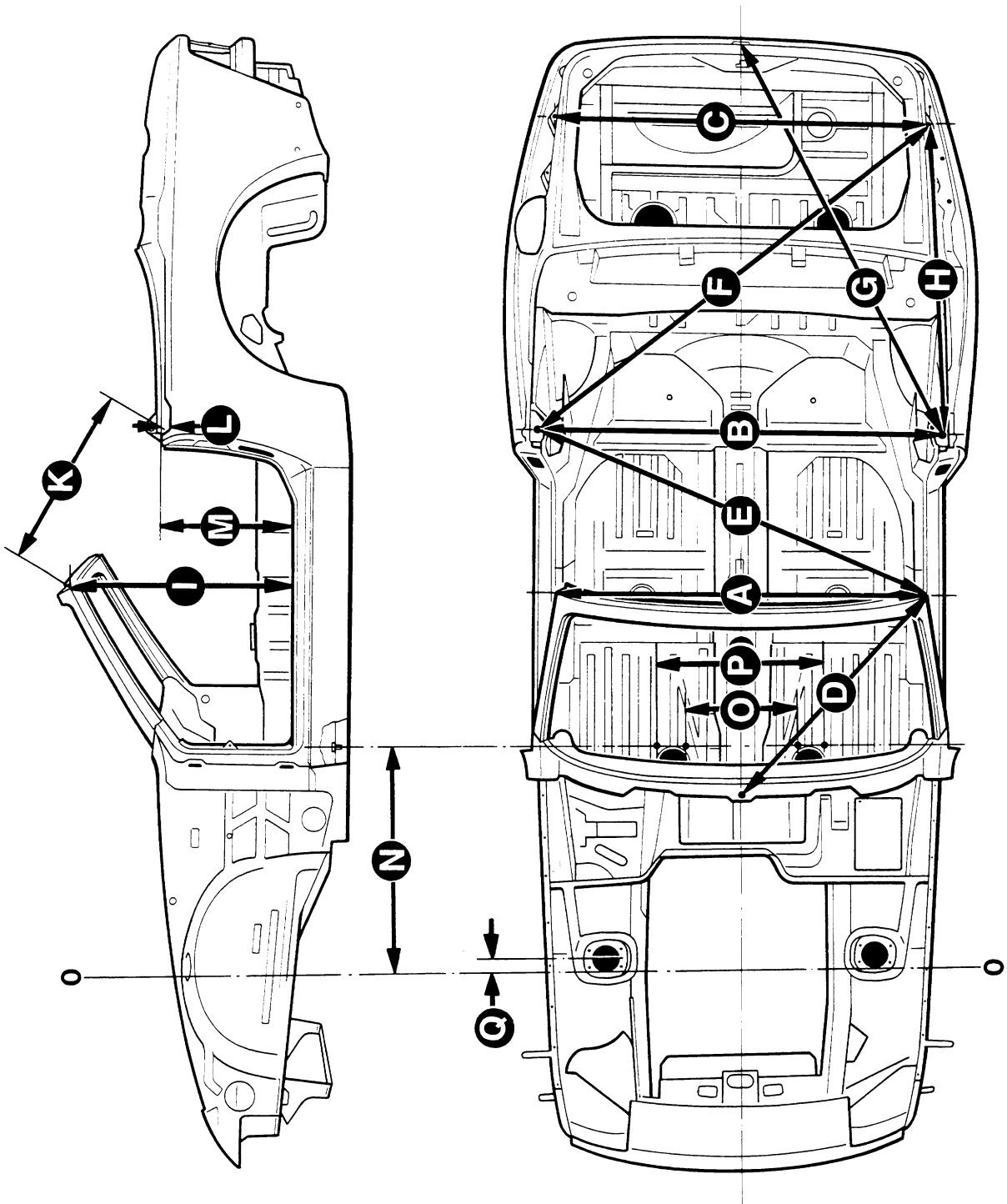
For the axial dimensions the left/right deviation must not exceed the prescribed tolerance!

**Repair checking dimensions – Cabrio**

Line	Line designation	mm
A	Windshield frame corner left to corner right	1245 ± 3
B	Front bolting points of folding top bearings	1442 ± 3
C	Rear bolting points of side elements	1328 ± 3
D	Windscreen wiper mounting hole – corner of windshield frame	985 ± 2
E	Windshield frame corner diagonally to front bolting point of folding top bearing	1502 ± 3
F	Front bolting point of folding top mounting diagonally to rear bolting point of side element	1763 ± 3
G	Front bolting point of folding top bearing to mounting hole of closing cylinder, center rear	1555 ± 3
H	Front bolting point of folding top bearing to rear bolting point of side element	1094 ± 3
I	Windshield frame corner horizontally to spot welding flange of door sill (measured without cover strip)	790 ± 2
K	Windshield frame corner to front bolting point of folding top bearing	685 ± 2
L	Top of B-pillar to folding top bearing	26 ± 1
M	Top of B-pillar, parallel, to spot welding flange of door sill	470 ± 2
N	From Plan 0 to fastening point of tunnel strut	790 ± 2
O	Fastening points of tunnel strut inside	418 ± 2
P	Fastening points of tunnel strut outside	638 ± 2
Q	From Plan 0 to center of spring strut mounting	27 ± 1

**All dimensions measured to center of hole!**

## Repair checking dimensions – Cabrio



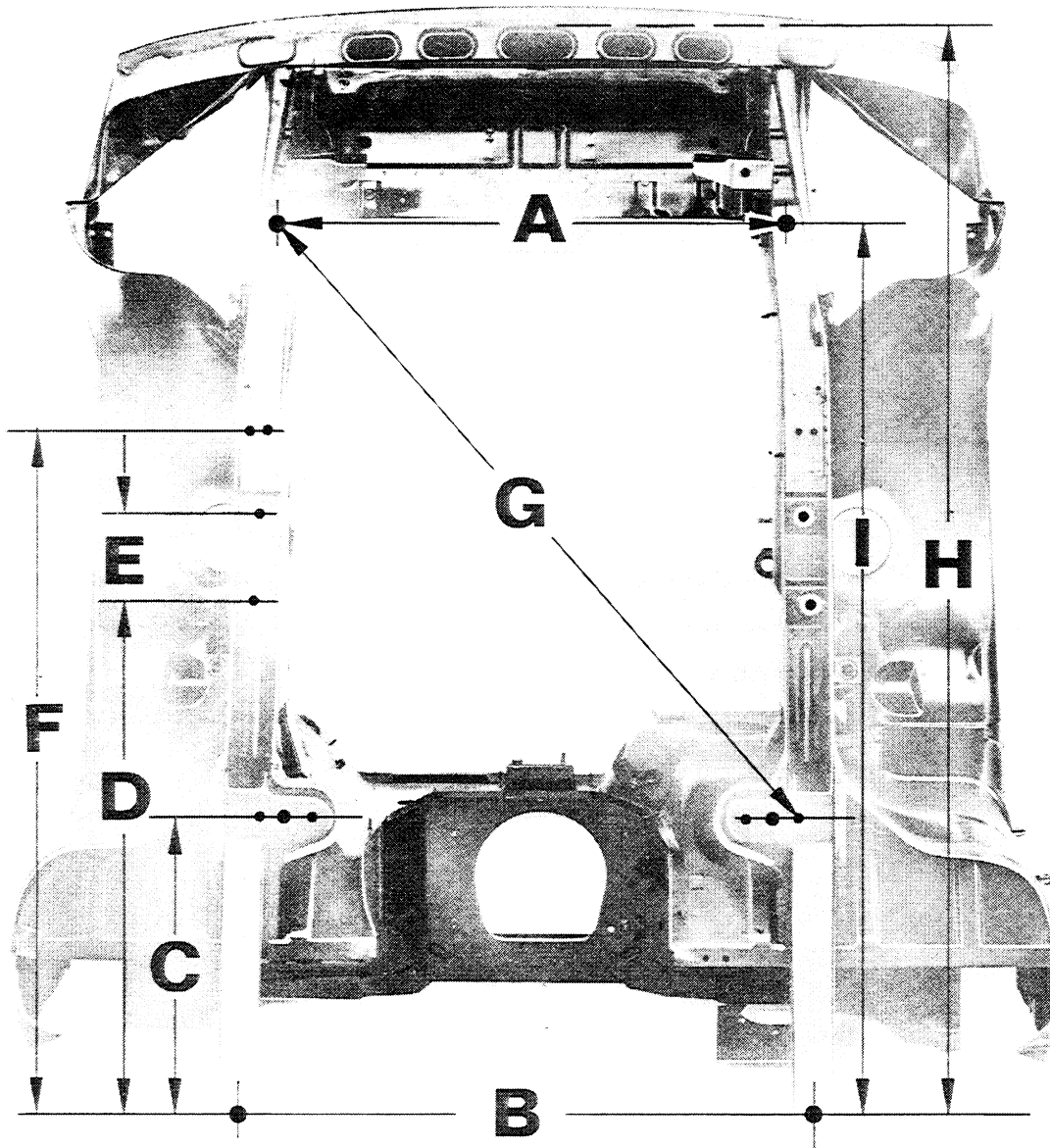
## DIMENSIONS FOR FLOOR PLATE/FRONT END

Distance	Description	mm
A	Side member take-up hole, front	$710 \pm 3$
B	Side member take-up hole, center	$758 \pm 1$
C	Side member take-up hole – control arm take-up	$330.4 \pm 3$
D	Side member take-up hole – rear cross member bolt	$599 \pm 3$
E	Rear cross member bolt – front cross member bolt	$120 \pm 0$
F	Side member take-up hole – stabilizer bolt	$831 \pm 3$
G	Outer control arm take-up – side member take-up hole	$1080 \pm 5$
H	Side member take-up hole – side member front edge	$1340 \pm 5$ (1360)
I	Side member take-up hole – front side member take-up hole	$1127 \pm 5$ (1145)

**Important!**

The deviation between left and right must not exceed the specified tolerances for axial and diagonal distances.

All distances are measured from or to center of hole and bolt as well as horizontally. Distances in brackets are determined directly with a measuring tape.

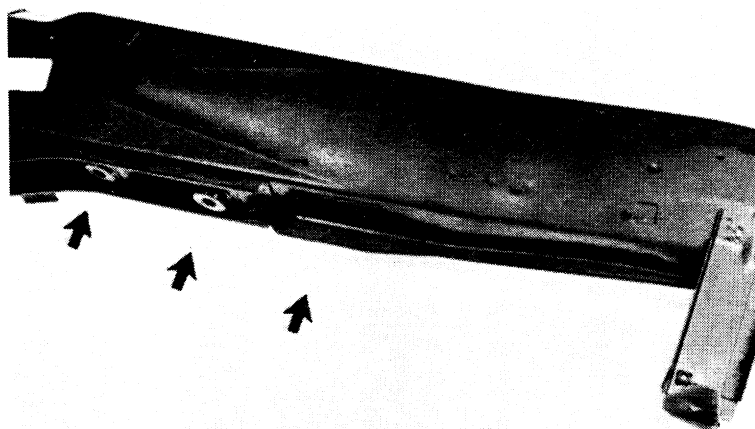




## SIDE MEMBERS

In comparison to 1981 model 924 cars the front side members of the floor assembly have been changed.

Take-up points for cross member and stabilizer are incorporated in the side members.

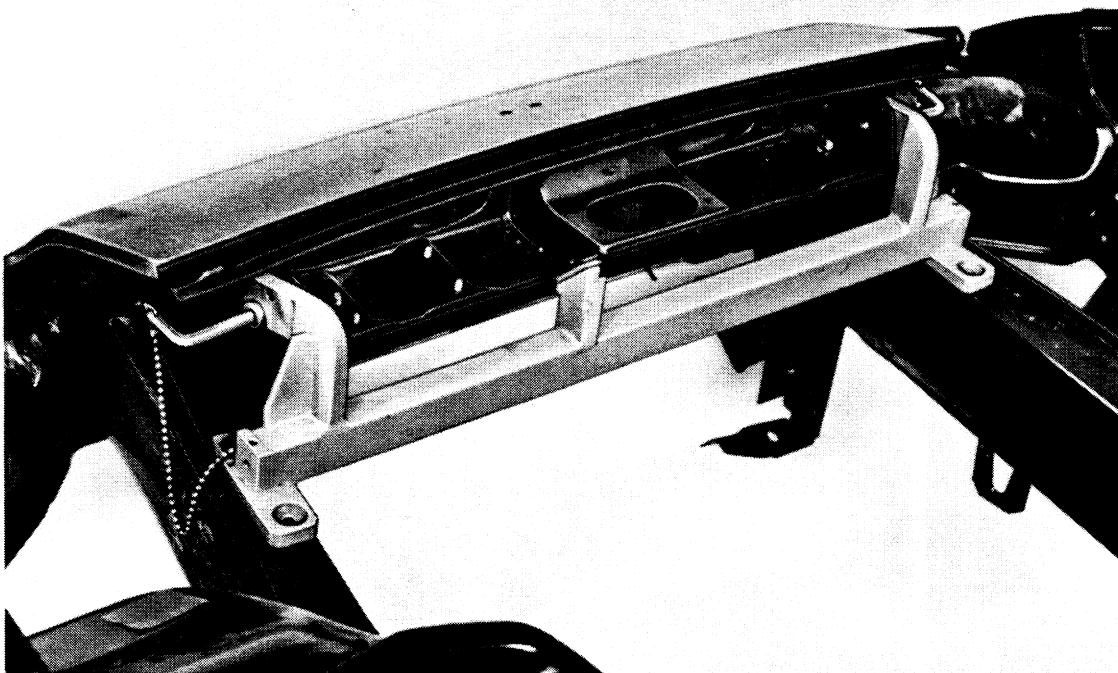
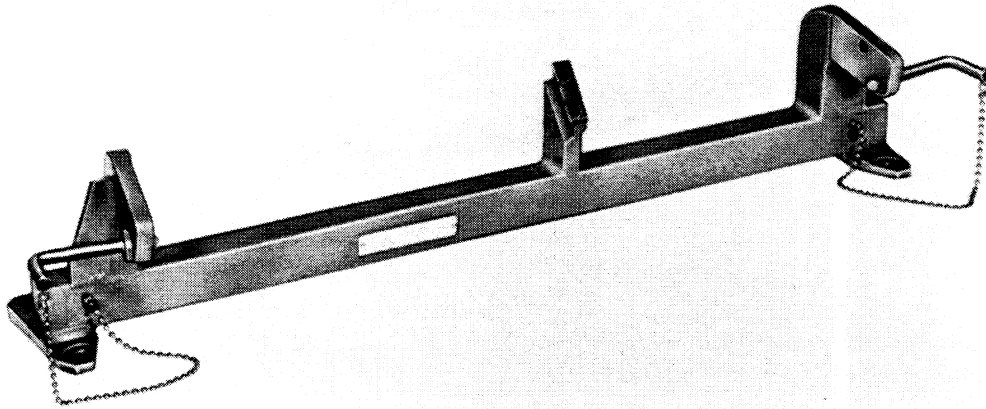


## LOCK CARRIER GAUGE 9117/1

The former gauge 9117 can only be used on Type 924 cars up to and including 1979 models. Beginning with this date there were changes in the area of the inner pivot point installation.

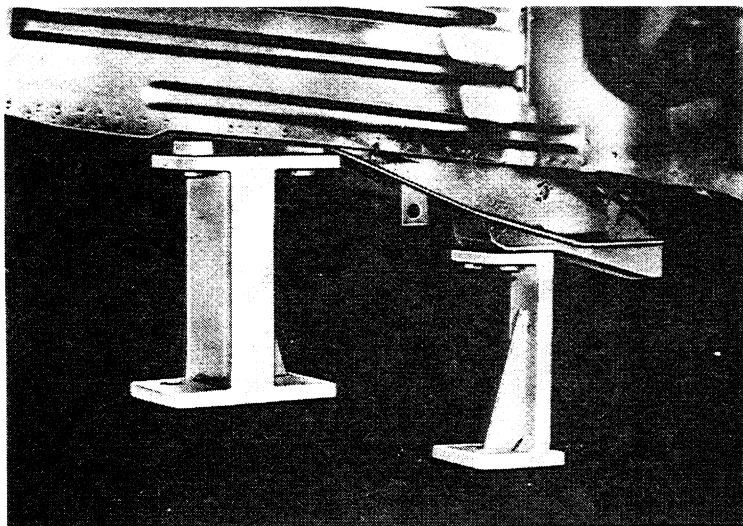
The new gauge 9117/1 can be used for all 924 and 924 Turbo cars as well as 944 models from beginning of production.

It is required for accurate welding of the lock carrier. It can also be used to check installation of concealed headlight mounts.

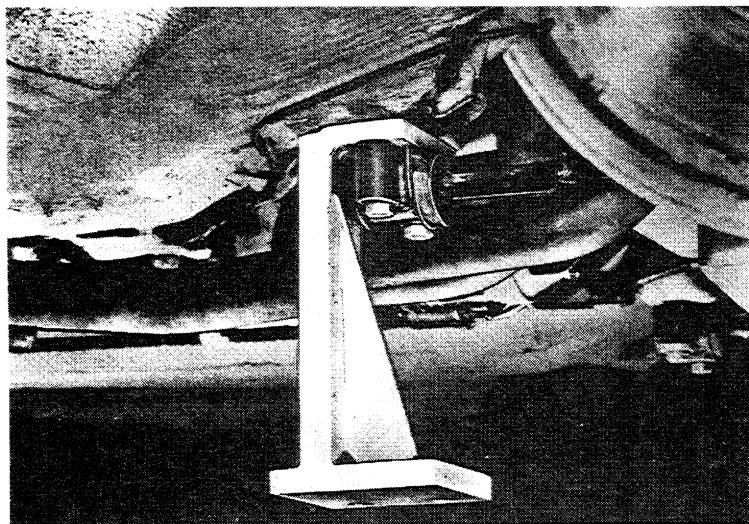


**FRONT AXLE TAKE-UP ATTACHMENT SET ENS 224 307**

The attachment set for mounting the body after removal of engine and transmission consists of 2 parts on each side, both of which are mounted on the cross member and control arm take-ups.

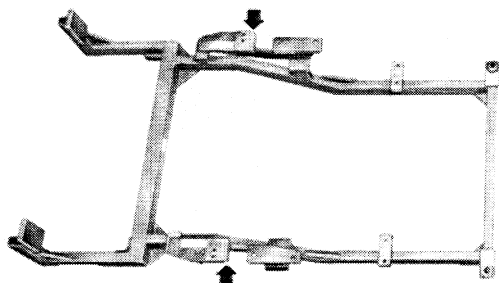


For economical front axle take-up, without removal of front mounted equipment, the control arm bolts are loosened and the control arm pressed down. The attachment is inserted between the control arm and body, and then bolted.

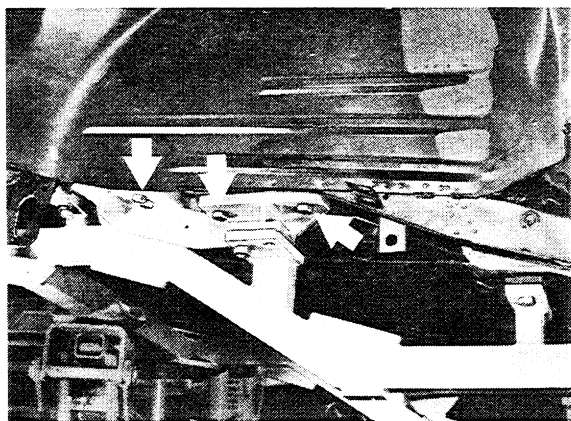


### ADAPTER 9175/1 FOR ENGINE CROSS MEMBER AND STABILIZER TAKE-UP

Adapter 9175/1, which can only be used in conjunction with front end gage 9175 (arrows), has been designed for Type 944 cars.



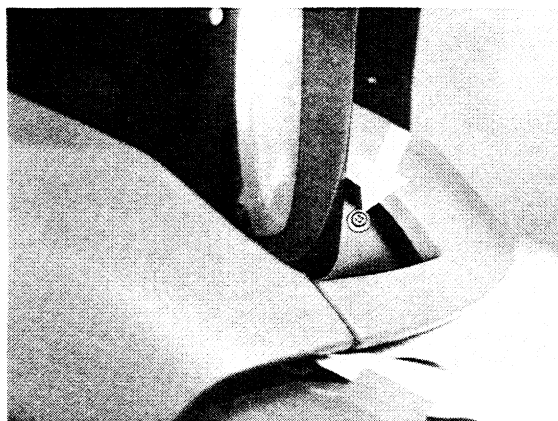
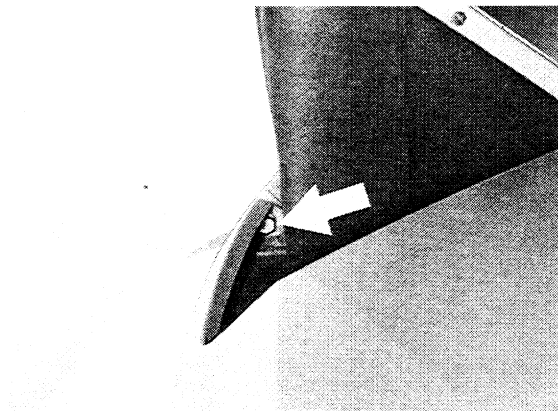
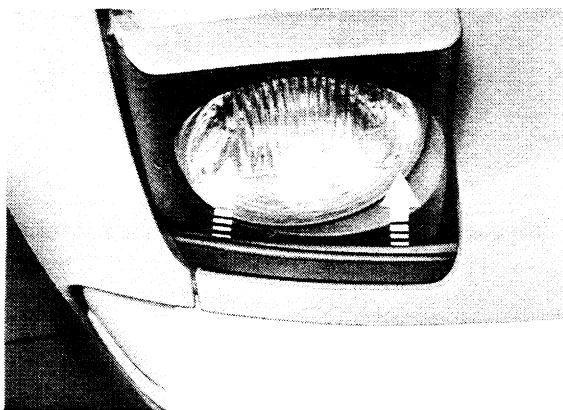
After removal of engine/transmission the mounting points in the side members can be checked for correct positioning and dimensioning (arrows).



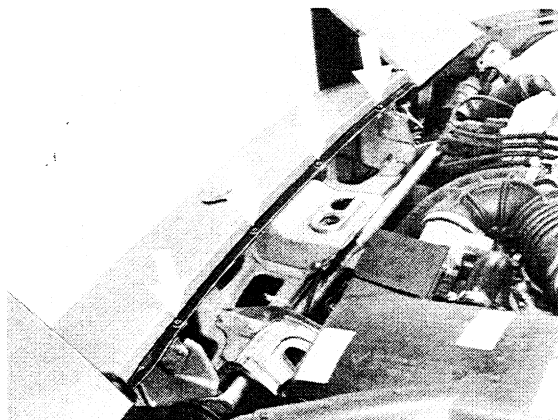
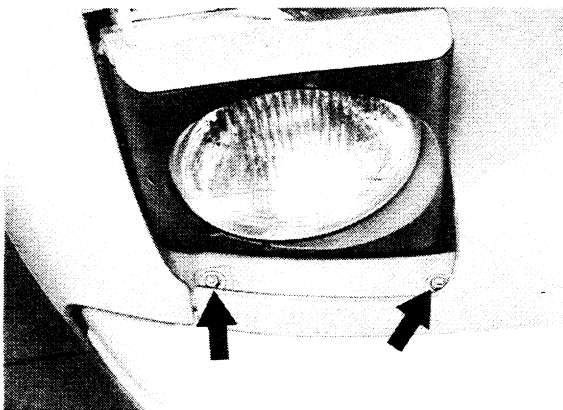
## REMOVING AND INSTALLING FRONT END PANEL

### Removing

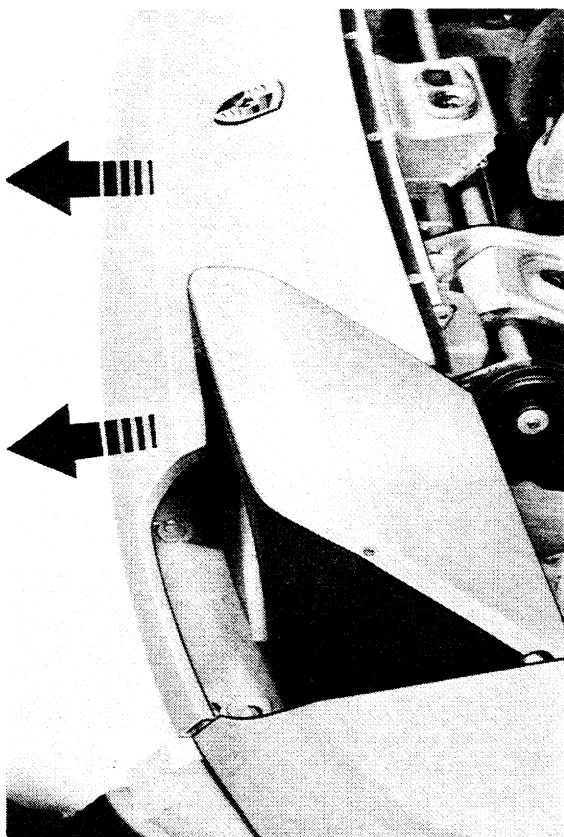
1. Raise engine hood and run out concealed headlights.
2. Cover bumpers and remove cover strips to avoid damaging the paint finish.



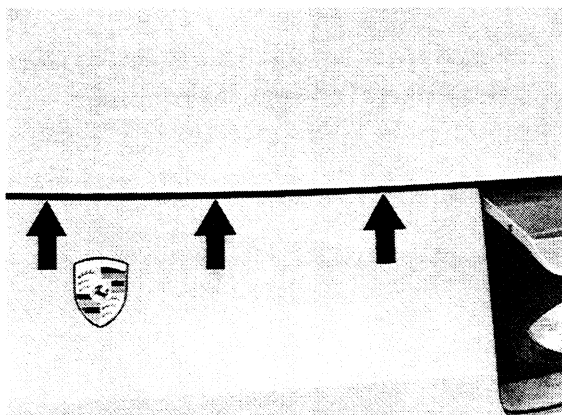
3. Unscrew mounting nuts and remove bolts.



4. Take end panel off of car forward.

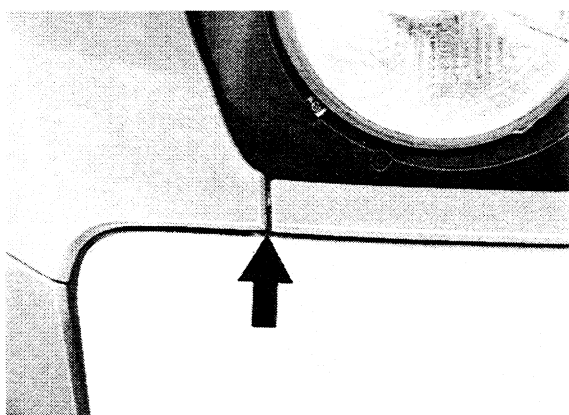


2. Lower engine hood and adjust front panel that gap between panel and hood runs at equal distance. Raise engine hood and tighten screws.



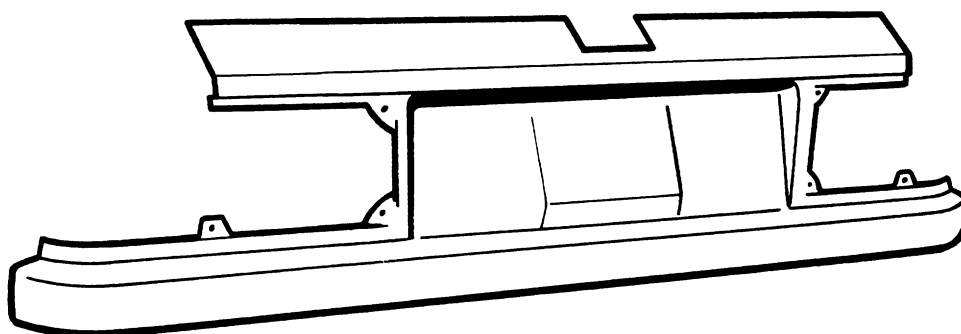
### Installing

1. Move in end panel from front. Insert mounting screws. Align end panel and fenders to be in same plane. Tighten nuts and screws.



## Replacing rear end-panel – Cabrio

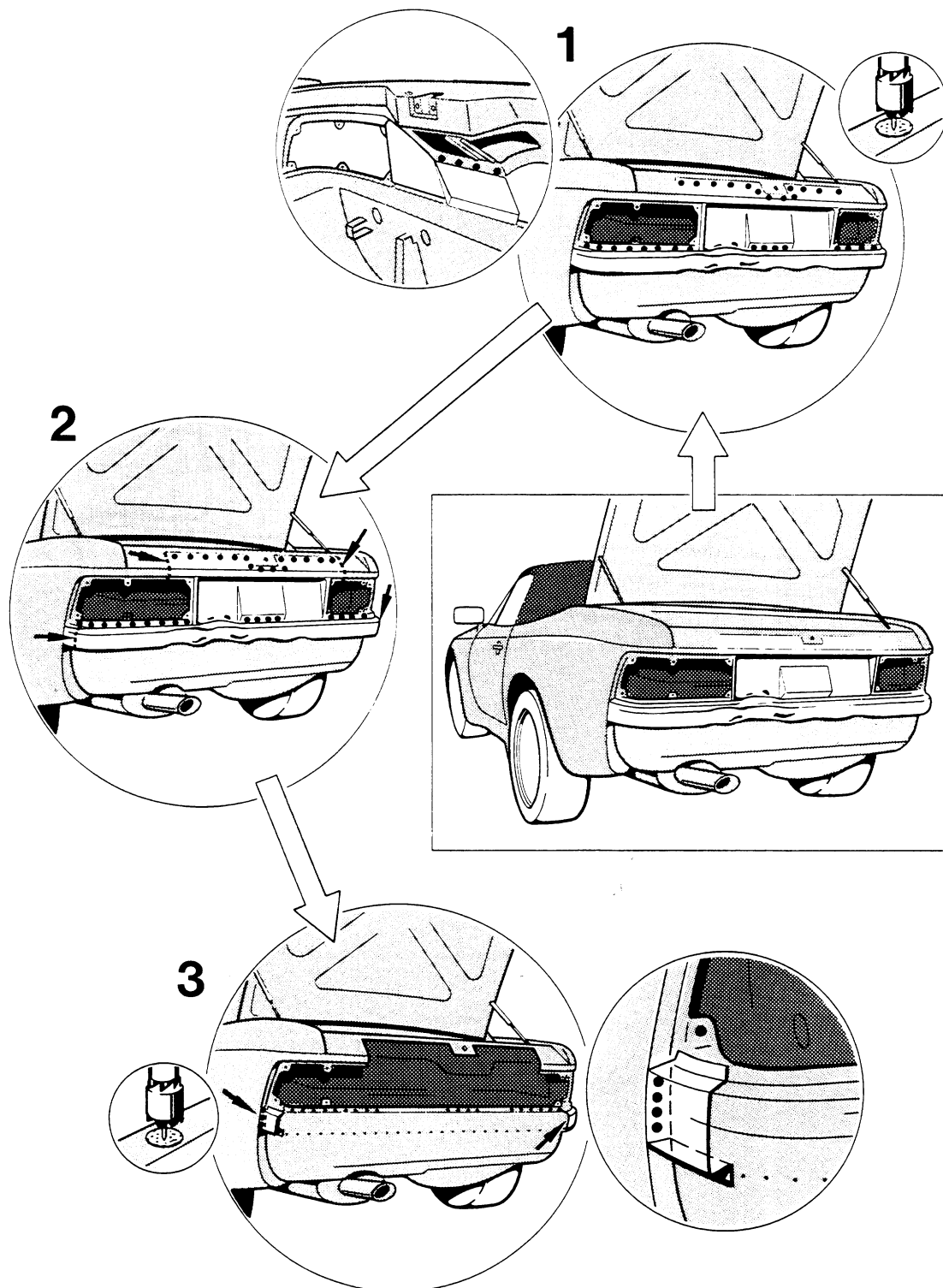
The following end-panel is required as a spare part for the bodywork repair:



484 - 53

## Replacing rear end-panel – Cabrio

### Removing end-panel from body





## Replacing rear end-panel – Cabrio

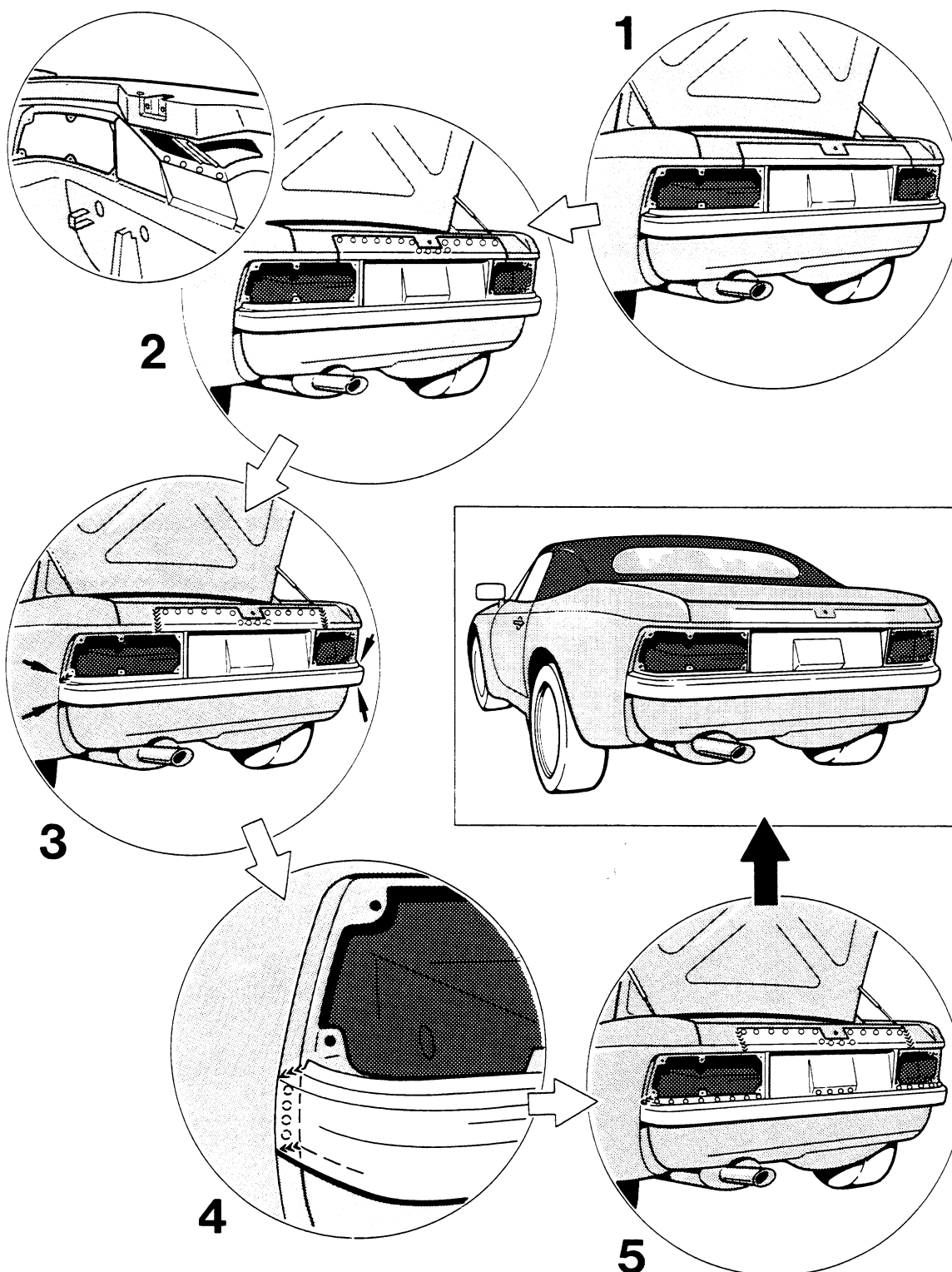
### Removing end-panel from body

**Straightening work on the body in this area must be completed before the end-panel is replaced!**

No.	Task	Instructions
1	Separate spot welding joins of rear end-panel to end element and to spare wheel recess panel	Separate spot welding joins of end-panel to end element and spare wheel recess panel using welding spot cutter.
2	Separate welding join of end-panel to end element Cut out end-panel along side panels	Cut through inert gas welding seams between end-panel and end element using a bodywork saw. Cut through end-panel to one side of end-panel / side panel welding joins using a bodywork saw and remove.
3	Separate spot welding and other welding joins of end-panel to side panels	Separate spot welding joins of end-panel to side panels using a welding spot cutter. Cut through welding joins of end-panel to side panels using a bodywork saw.

## Replacing rear end-panel – Cabrio

### Fitting end-panel into bodywork



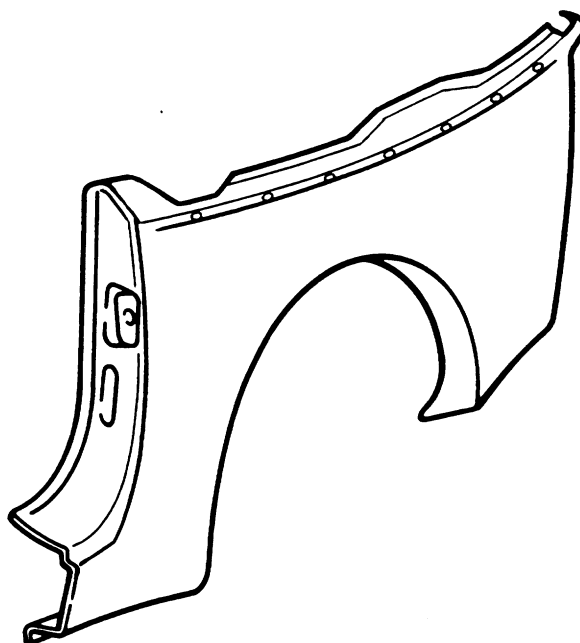
## Replacing rear end-panel – Cabrio

### Fitting end-panel into bodywork

No.	Task	Instructions
	Clean welding surfaces	Clean paint etc. from welding surfaces of body using a hot-air blower or rotary brush. Remove the factory-applied primer on the welding surface of the replacement part (end-panel) using a rotary brush.
	Prepare plug welding surfaces	Drill holes in the end-panel at the join points to the end element and the spare wheel recess panel for plug welding. Drill holes in the spot welding flange in the side panels for plug welding to the end-panel.
1	Fit end-panel into bodywork and tack weld	Fit end-panel into bodywork, align it, fasten with clamping tools and tack weld using inert gas.
	Assemble tail lights and bumper to check body contours	The body contours with the tack-welded end-panel must fit in with the contours of the tail lights and bumper. Remove tail lights and bumper again after checking.
2	Plug weld end-panel to end element and spare wheel recess panel	Align end-panel with end element and spare wheel recess panel and plug weld using inert gas.
3	Weld end-panel to end element and side panels using inert gas	Align end-panel with end element and butt weld along the whole seam using inert gas. Weld end-panel at horizontal joins with side panels along the whole seam using inert gas.
4	Plug weld side panels to end-panel	Align side panels with end-panel in the areas of the spot welding flanges and plug weld them using inert gas.
5	Spot weld end-panel to spare wheel recess panel	Spot weld end-panel to spare wheel recess panel in the areas of the tail lights and number plate.
	Grind down welding surfaces	

### Replacing rear side panel – Cabrio

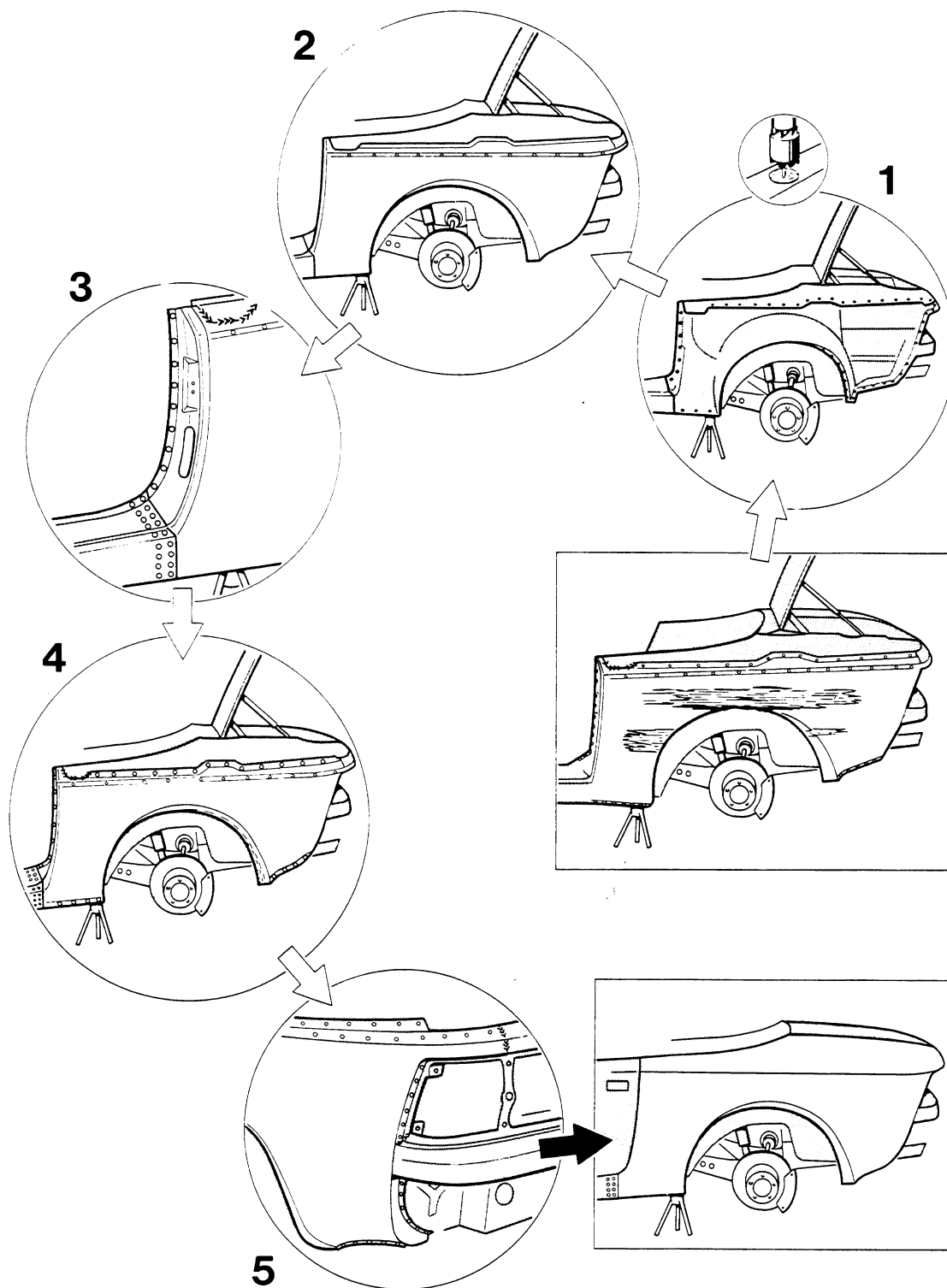
The following side panel is required as a spare part for the bodywork repair:



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## Replacing rear side panel – Cabrio

Removing side panel from bodywork and fitting it



## Replacing rear side panel – Cabrio

### Removing side panel from bodywork and fitting it

Remove all applicates and covering parts on the side panel, inside and outside.

**Straightening work on the bodywork in this area must be completed before the side panel is replaced!**

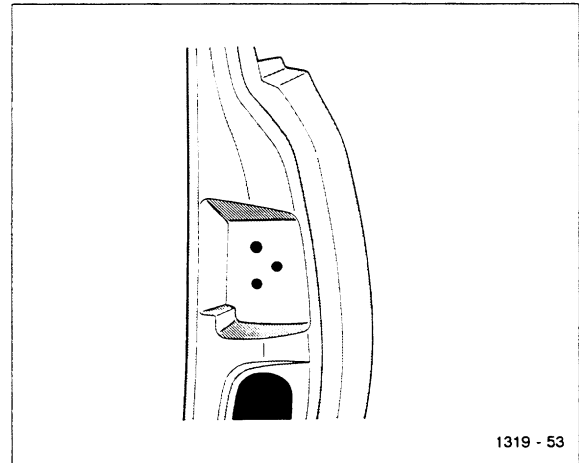
No.	Task	Instructions
1	Separate welding joins of side panel to end element and inner side panel	Cut through inert gas welding seams between side panel and end-panel and inert gas welding seam between side panel and inner side panel using a bodywork saw.
	Separate spot welding joins of side panel to end-panel, inner side panel, wheel arch and door sill connection element	Separate spot welding joins of side panel to end element, inner side panel, wheel arch and door sill connection element using a welding spot cutter. Remove side panel.
	Clean welding surfaces	Clean underseal, paint etc. from welding surfaces on bodywork using a hot-air blower or rotary brush. Remove the factory-applied primer on the welding surfaces of the replacement part (side panel) using a rotary brush.
2	Fit side panel into bodywork and tack weld	Fit side panel into bodywork, align it, fasten with clamping tools and tack weld using inert gas.
	Assemble door, tail light and bumper to check body contours	The body contours with the tack-welded side panel must fit in with the contours of the tail light, bumper and door. The gap between the door and the side panel must exhibit a parallel shape. Remove the door, tail light and bumper again after checking.

No.	Task	Instructions
3	Weld side panel to inner side panel with inert gas Spot weld side panel to inner side panel Plug weld door sill connection element to side panel	Align side panel with inner side panel and intermittently weld along the whole seam (overlapped) using inert gas. Align side panel with inner side panel (area of B-pillar) and spot weld. Align door sill connection element with side panel and plug weld using inert gas.
4	Spot weld side panel to inner side panel, wheel arch and door sill connection element	Align side panel with inner side panel, wheel arch and door sill connection element and spot weld.
5	Weld side panel to end element using inert gas Spot weld side panel to end element and wheel arch Plug weld side panel to end element	Align side panel with rear end element and butt weld along the whole seam using inert gas. Align side panel with rear end element (area to one side of tail light) and spot weld. Align side panel with wheel arch (area of bumper) and spot weld. Align side panel with rear end element (area of tail light) and plug weld using inert gas.
	Grind down welding surfaces.	

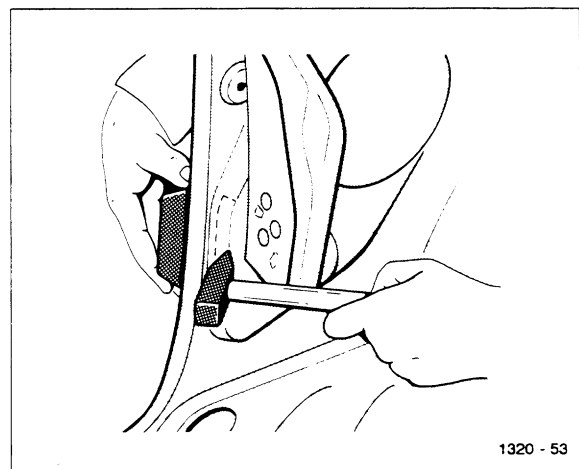
## Reworking inner rear side panel (striker area)

**Required reworking operations on inner rear side panel when replacing the outer rear side panel (for vehicles up to MY '91)**

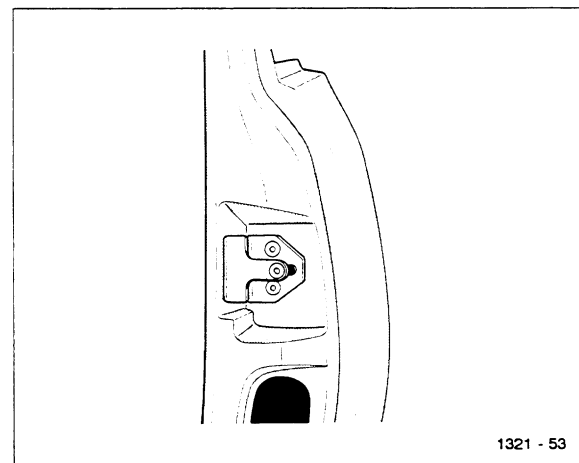
The stamping area for the striker was enlarged on the outer rear side panels as of MY '91.



Before fitting a new outer rear side panel into a vehicle up to MY '91, the inner rear side panel has to be modified in the striker stamping area.



When fitting a new outer rear side panel, it is also recommended to fit a new striker and a new striker pin.





## ADJUSTING ELECTRIC TAILGATE UNLOCKING CABLE

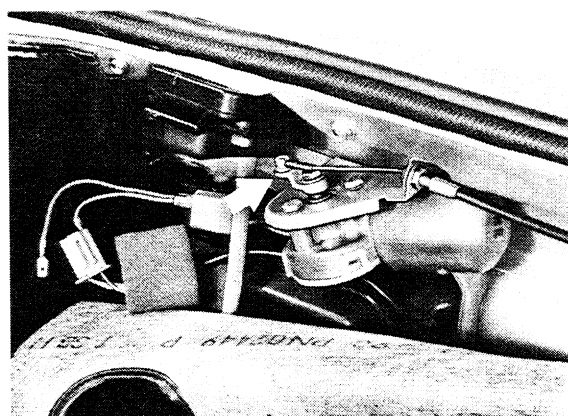
## Note :

The crank on the drive motor has to be moved to top dead center for adjustment of the cable. Procedures:

1. Disconnect plug for unlocking motor.
2. Make up two leads, each with a flat male plug and a flat female plug.

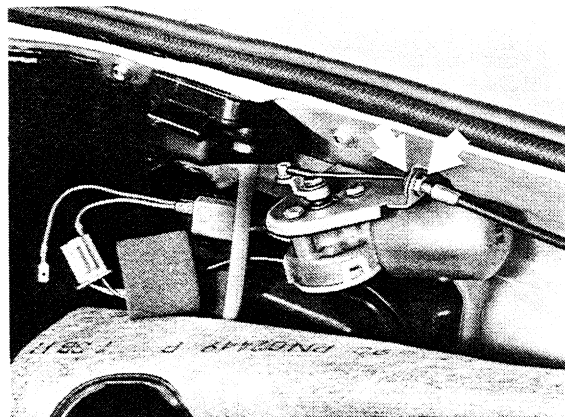


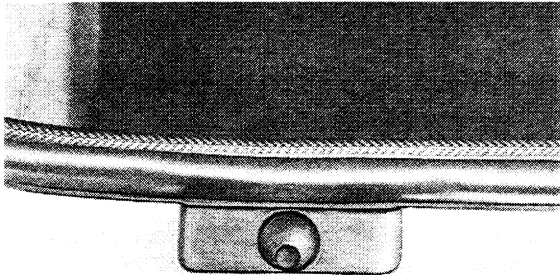
4. Connect second lead on blue wire of plug section for the motor.
5. Contact positive pin (red wire) of plug section for wire harness with other end of lead briefly, until crank on motor has reached top dead center.



3. Connect one of the leads between brown wires of the disconnected plug sections.

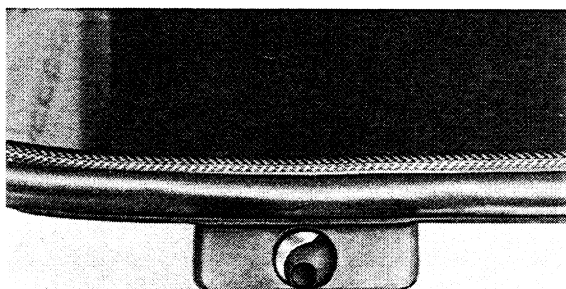
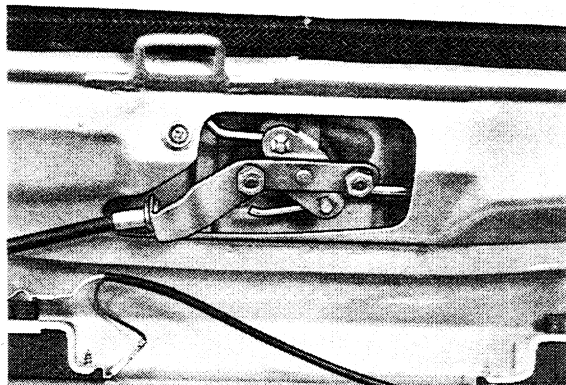
6. Adjust cable on adjusting threads that locking bars of both locks are completely open.





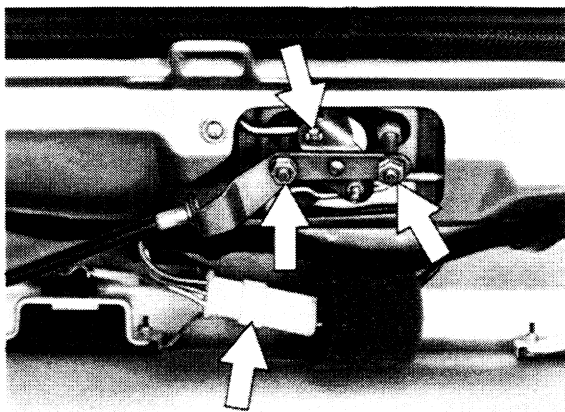
7. Remove leads and connect plug sections.

8. Locks should not be operated in neutral position of unlocking motor.



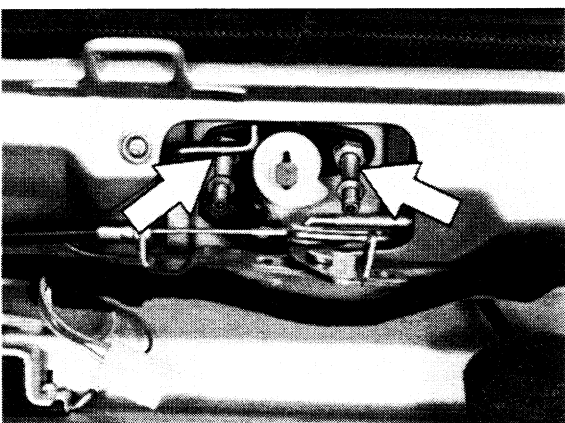
## Removing and installing the tailgate lock microswitch

1. Loosen the carpet lining of the luggage compartment at the rear wall.
2. Undo the fastening nuts.



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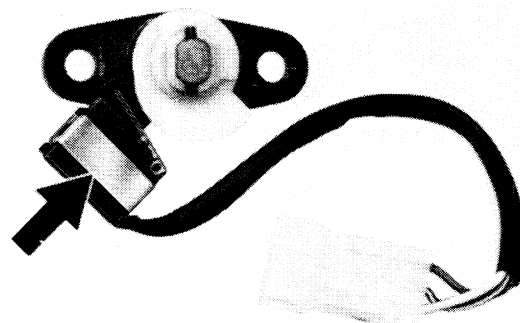
3. Disconnect the upper linkage.
4. Separate the plug connection.



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5. Undo the threaded bolts.

6. Remove the tailgate lock with microswitch.

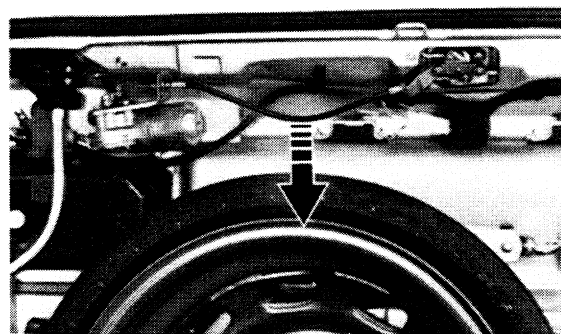


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7. Remove the clips.

### Note

If necessary, you can operate the release mechanism by pulling on the Bowden cable until the tailgate is released mechanically.

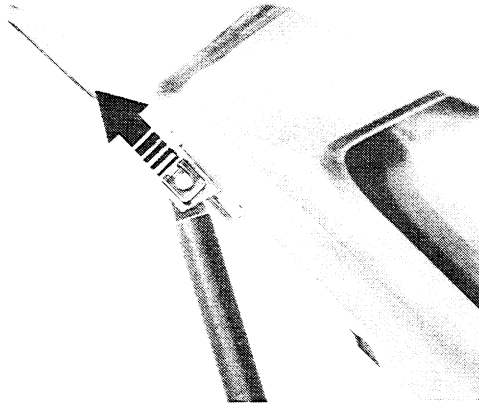


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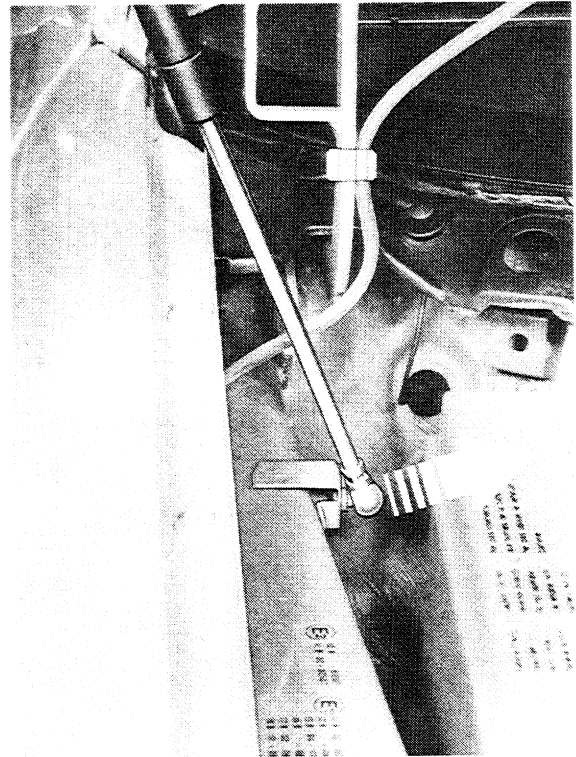
## REMOVING AND INSTALLING ENGINE HOOD

### Removing

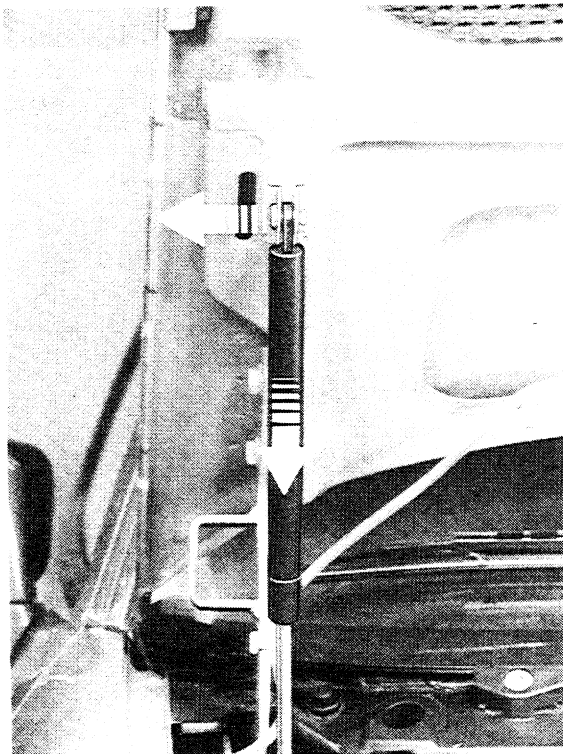
1. Raise engine hood and support front end.
2. Unclip retainers on bolts.



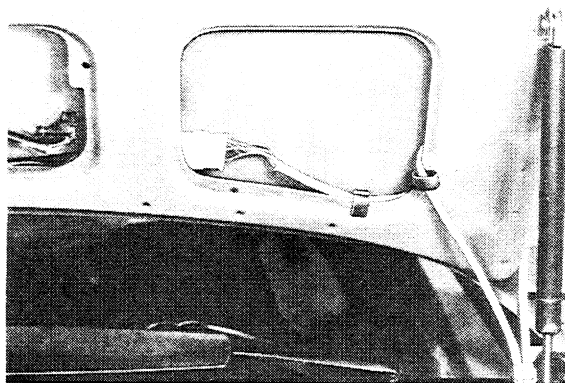
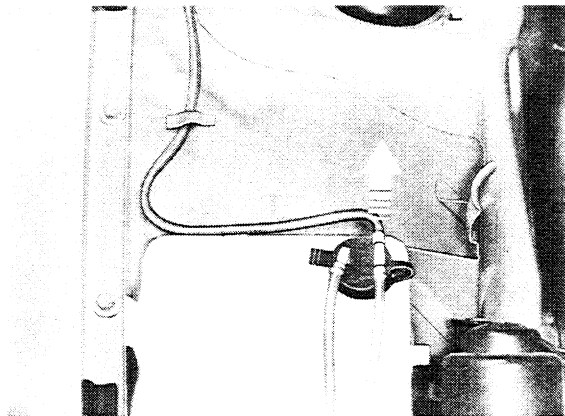
4. Tilt gas pressure props to one side and unclip in ball heads.



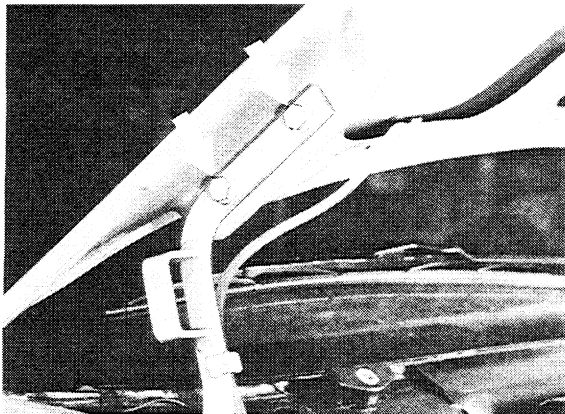
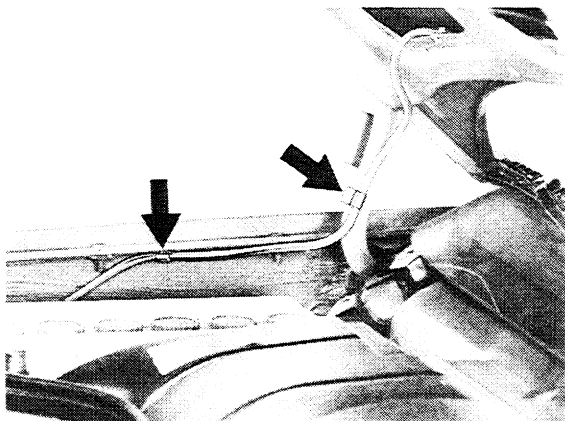
3. Press down gas pressure props slightly and pull out bolts with help of a pliers.



5. Pull off hose on windshield washing fluid tank and take hose out of holders.



7. Unscrew hood mounting bolts and lift hood off of car (with a second person).

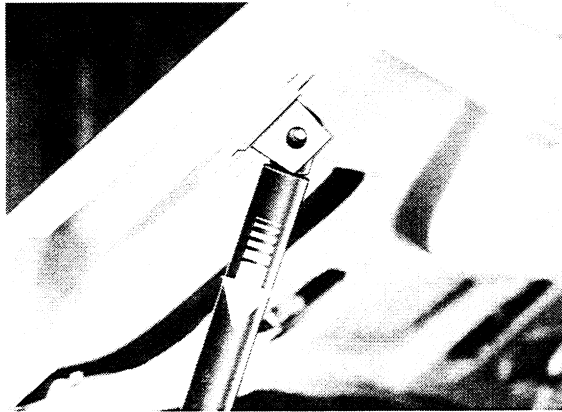


6. Disconnect electric plugs for windshield spray jet heating and engine compartment light, and take wires out of holders.

### Installing

1. Lift (with second person) hood on to car, install and tighten mounting bolts finger tight. Lower hood and align to have equal clearance between fenders and front panel. Raise hood and tighten mounting bolts.

2. Support front end of engine hood. Clip gas pressure props in the ball heads. Compress gas pressure props slightly (do not press up hood to avoid damaging the windshield) and guide into gas pressure prop take-ups.



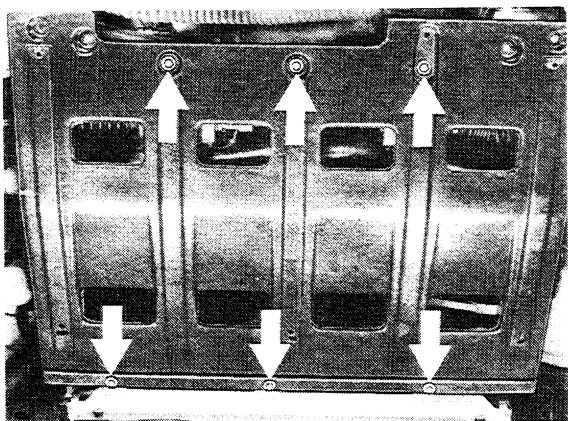
3. Compress gas pressure props to align them with the take-up bores and insert the bolts. Clip retainers in grooves of bolts.
4. Secure hose for windshield washer in holders and on washing fluid tank. Connect electric plugs and secure wires in holders.

## REPLACING FRONT HOOD CABLE

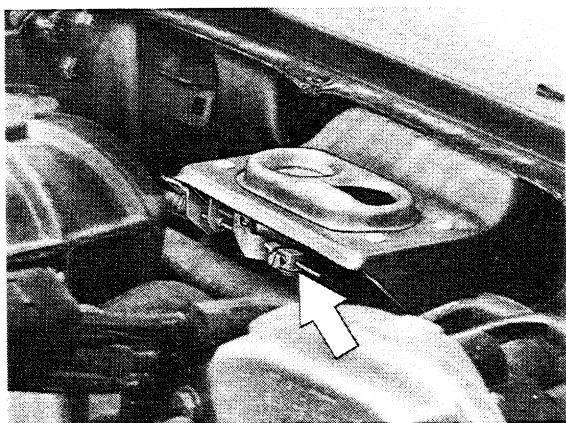
## R e m o v a l .

If the hood does not open when the hood release handle is pulled, proceed as follows:

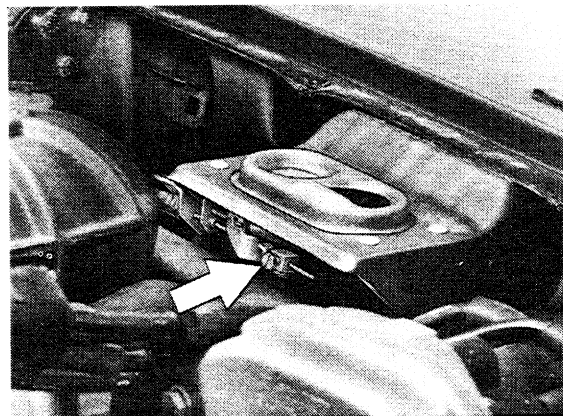
1. Raise vehicle on lifting platform, unscrew engine splashguard.



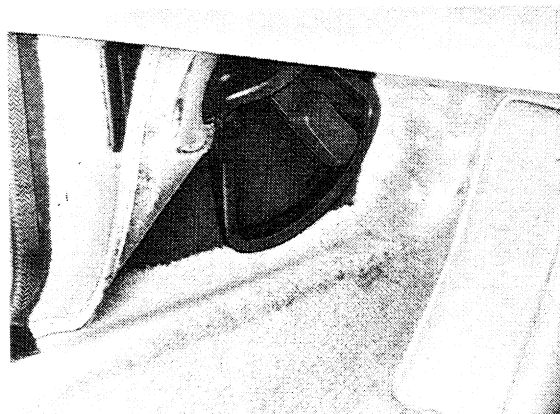
2. Using a suitable tool, open the lower part of the hood lock from below.



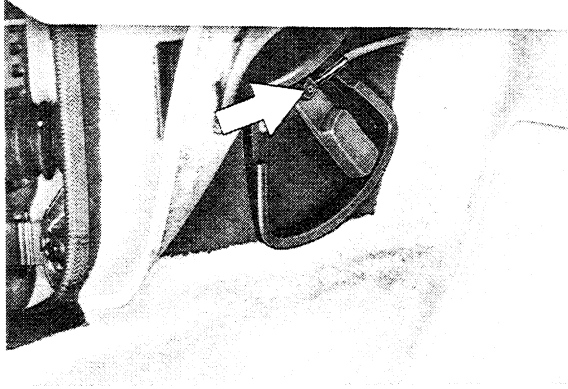
3. Unscrew clamping screw on lower part of hood lock.



4. Pull away carpet in area of hood release handle.



5. Remove and support release handle.  
Drive out rollpin and pull out hood  
cable.



#### I n s t a l l a t i o n

Installation is accomplished in reverse order.

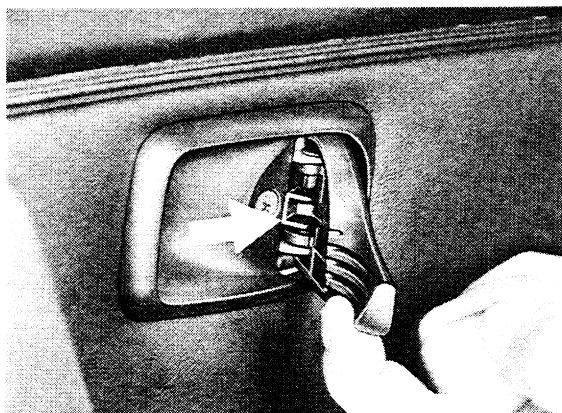
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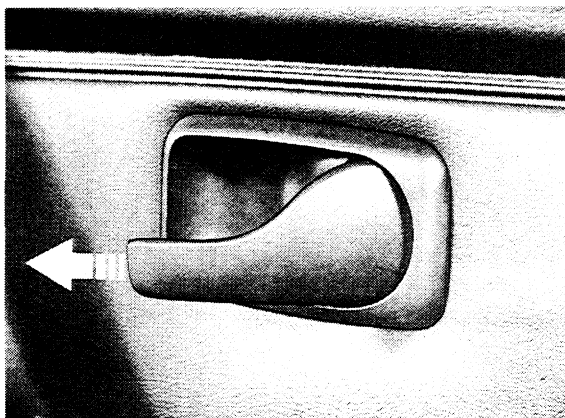
## REMOVING AND INSTALLING INSIDE DOOR HANDLE

### Removing

1. Move inside door handle to open position and unclip retainer with a suitable tool.

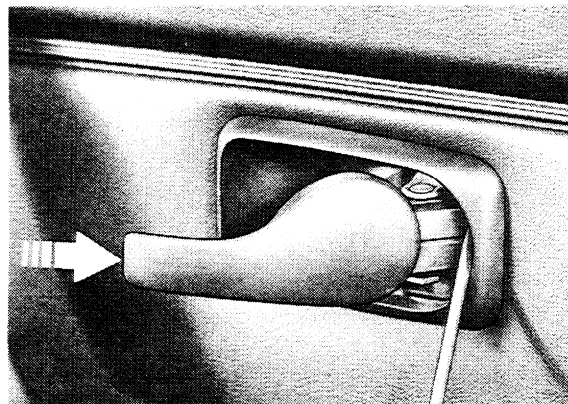


2. Pull out inside door handle.



### Installing

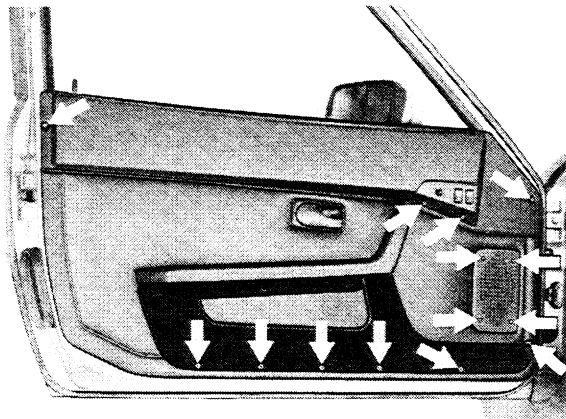
1. Open internal mechanism with a suitable tool, slide inside door handle into guide and clip in retainer.



## REMOVING AND INSTALLING DOOR PANELING

## R e m o v a l

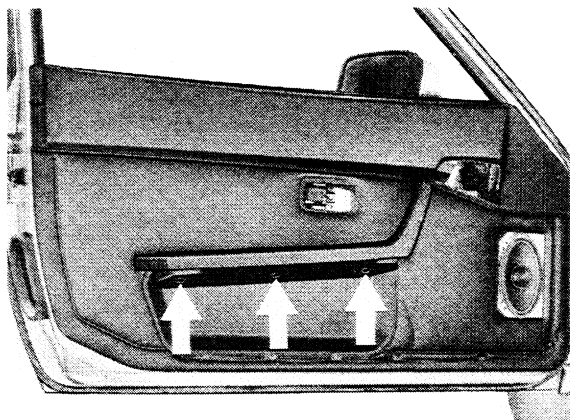
1. Remove hoods, unscrew fastening screws for door paneling, loud-speaker aperture, storage tray, and the switch aperture. Disconnect electrical plugs.



## I n s t a l l a t i o n

Installation is in reverse order.

2. Unscrew armrest fastening screws, and lift door panel up and away from the door.



---

REMOVING AND INSTALLING WINDOW GUIDERAIL

## R e m o v a l

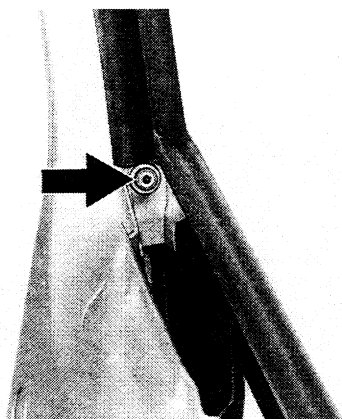
## N o t e

Before removal, the door panel, film, and door window must be removed.

## I n s t a l l a t i o n

Installation takes place in reverse order.

Pull window guide out of window guiderail. Unscrew the upper and lower fastening screws and pull window guiderail out from below.



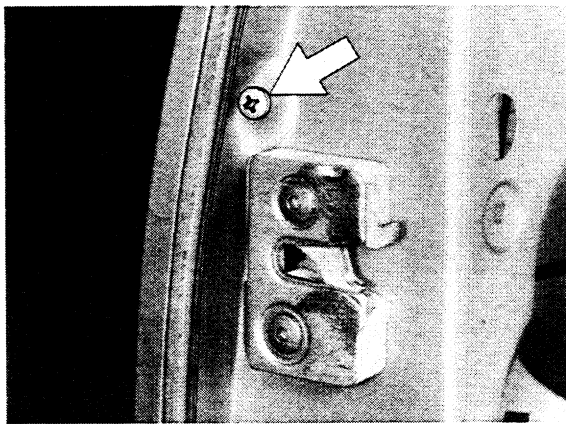
## REMOVING AND INSTALLING OUTSIDE DOOR HANDLE

## R e m o v a l

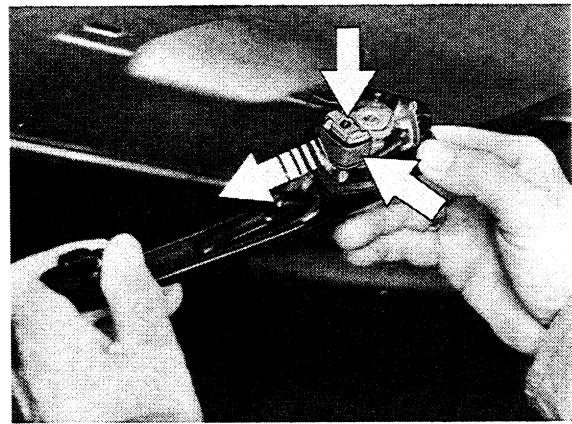
## N o t e

Before removal, the door paneling, door film, door window, and window guiderail must be removed.

1. Unscrew ratchet fillister-head screw on door frame.



2. Push outside door handle forward and detach from outer door panel. Unclip connecting and actuating rods on lock. Unscrew cable-bracket screw and carefully unclip microswitch with suitable tool.



## I n s t a l l a t i o n

Installation takes place in reverse order.

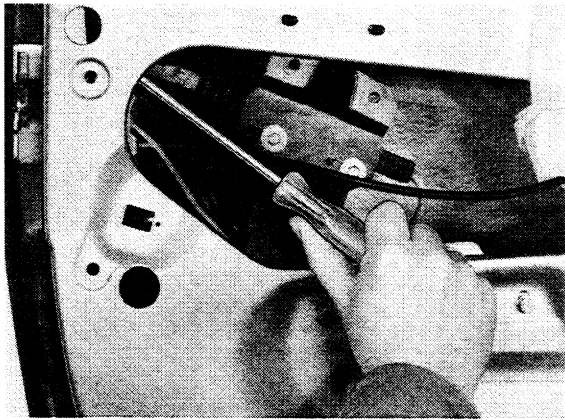
## REMOVING AND INSTALLING DOOR LOCK AND INNER ACTUATOR

## R e m o v a l

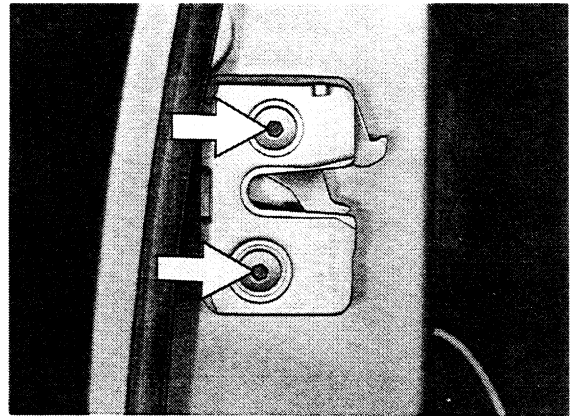
## N o t e:

Before removing the inner parts, the door paneling, door film, door window, and window guiderail must be removed.

1. Unclip connecting and actuating rods on door interior lock.



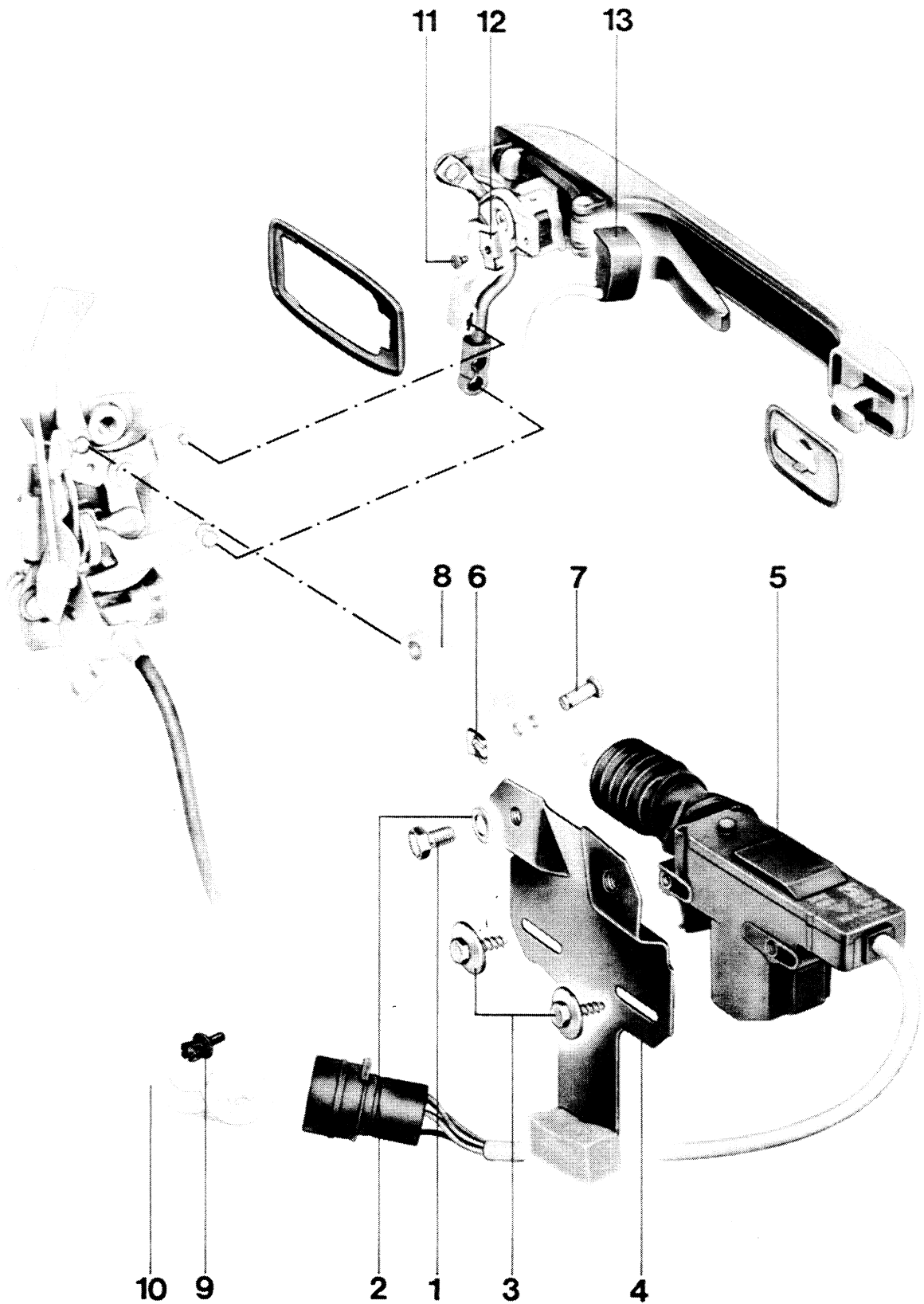
2. Unscrew lock-fastening screws and remove inner and outer lock parts from the door.



## I n s t a l l a t i o n

Installation takes place in reverse order.

## CENTRAL LOCKING SYSTEM

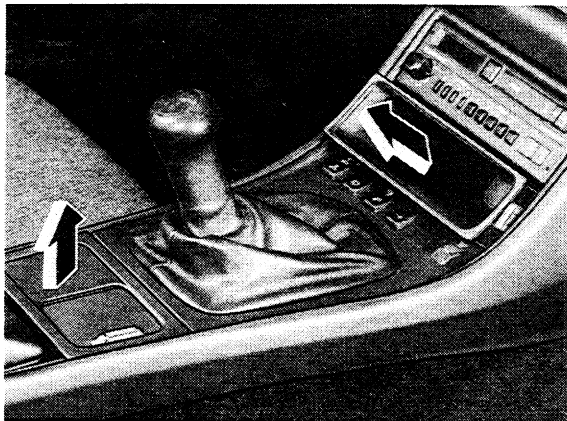


No.	Designation	Qty.	Note when:	
			Removing	Installing
1	Hex screw	2		
2	Washer	2		
3	Sheet-metal screw	2		
4	Mounting plate	1		
5	Actuating element	1		Note setting
6	Retaining clip	1		
7	Pin	1		
8	Connecting rod	1		
9	Rivet	1		
10	Holder	1		
11	Hex screw	1		
12	Cable holder	1		
13	Microswitch	1		Clip on securely

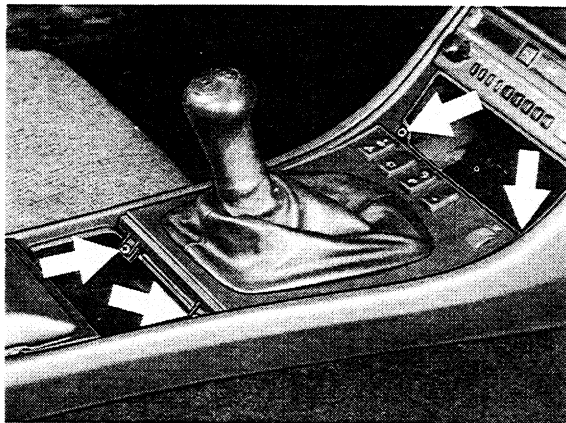


## Removing and Installing Central Locking System Button

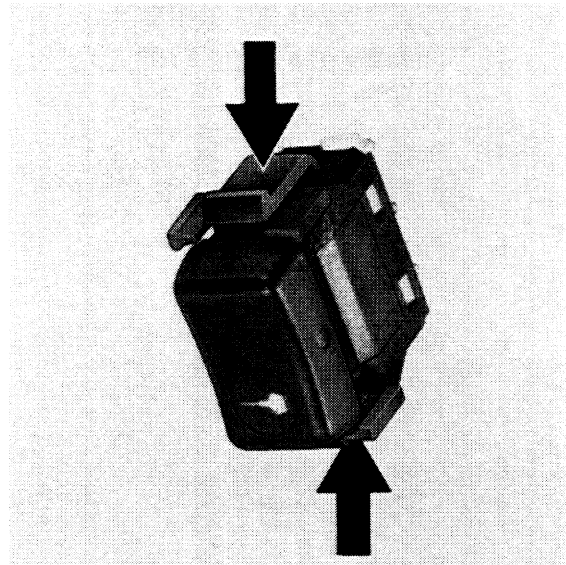
1. Pull out storage tray and ash-tray.



2. Unscrew fastening screw on cover frame of middle console.



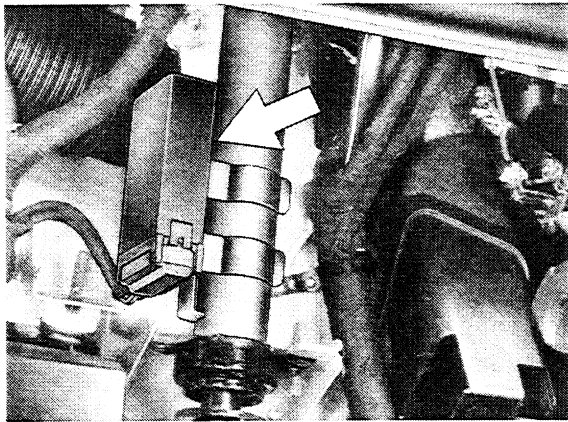
3. Take central locking button out of its catch and separate plug connection.



### Removing and installing central-locking control unit

The control unit is mounted beneath the instrument panel and is attached to the steering column by a metal holder.

1. Detach control unit and unbolt holder.

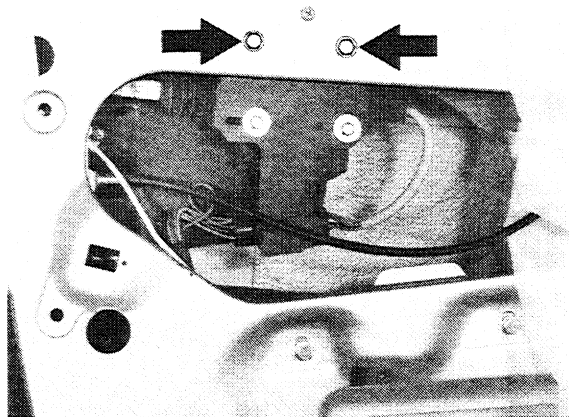


2. Disconnect plug.

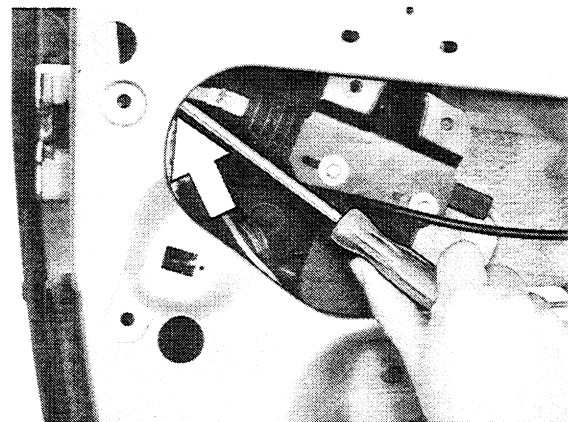
### Removing and installing actuator

#### Removing

1. Remove door trim panel.
2. Remove mounting bolts from holder.



3. Remove linkage from ball joint (door inside lock).



4. Disconnect plug, remove connecting rod and unbolt holder.

5. Push holder forward in slots in door and tighten bolts.

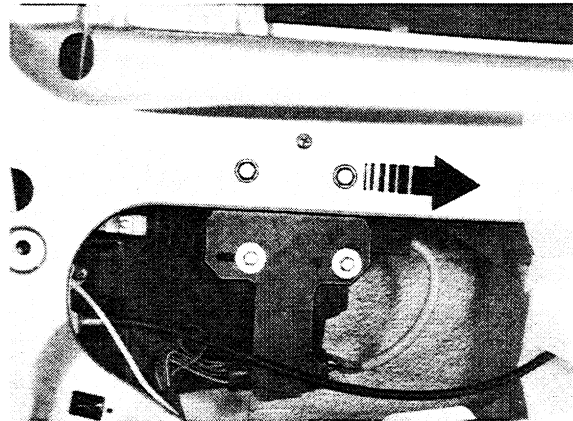
### Installing

1. Screw holder on to actuator and tighten until it is just possible to move actuator.

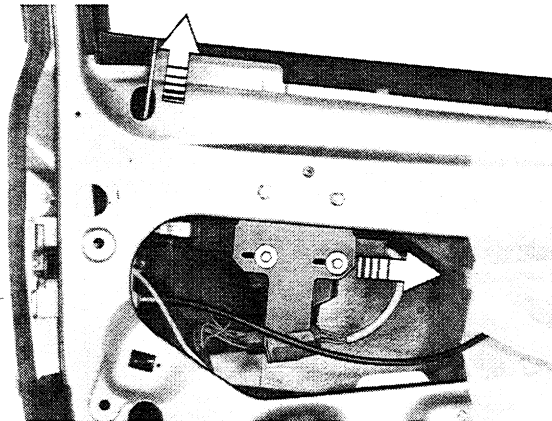
2. Connect two halves of plug and attach to holder.

3. Connect connecting rod to actuator and push on to door inside lock.

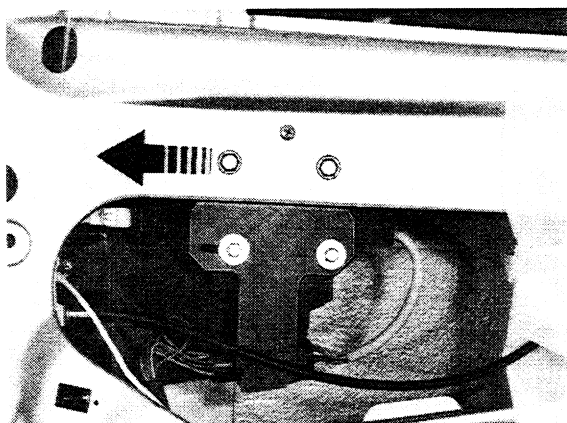
4. Bolt holder with actuator into position inside door and tighten so that holder can still be moved.



6. Hold the linkage of the locking button to keep door lock in open position. Push actuator forward in slots of holder and tighten bolts.



7. Slacken mounting bolts of holder slightly and move actuator toward rear in slots to obtain reserve travel. Tighten mounting bolts.



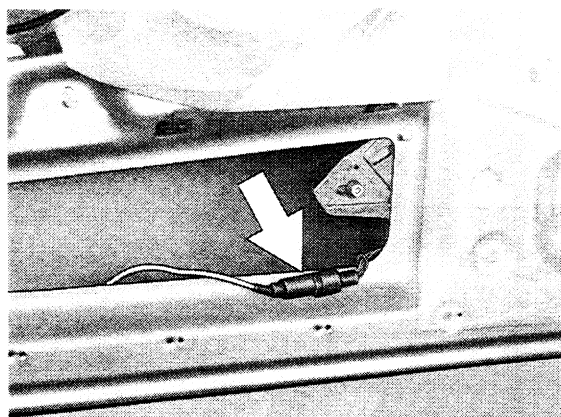
8. Check operation.

Note:

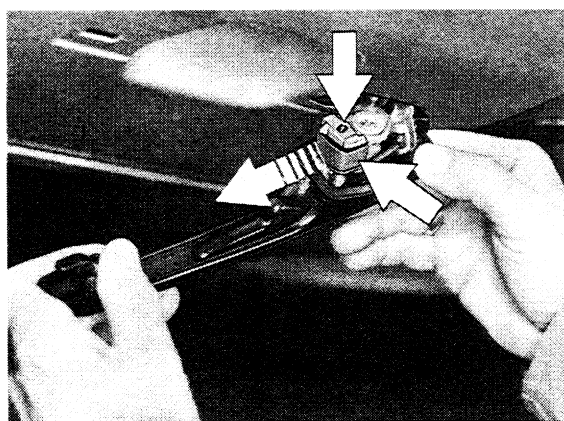
When sanding and painting, take care to cover the lock well to prevent malfunctions due to dust penetrating the lock mechanism.

Removing and installing microswitch in door lock cylinder

1. Remove door trim panel.
2. Remove plug from holder and disconnect.



3. Unbolt door outside handle and remove. Detach cable holder (strain relief).



4. With a screwdriver, carefully press off microswitch.

CENTRAL LOCKING SYSTEM FUNCTION TABLE

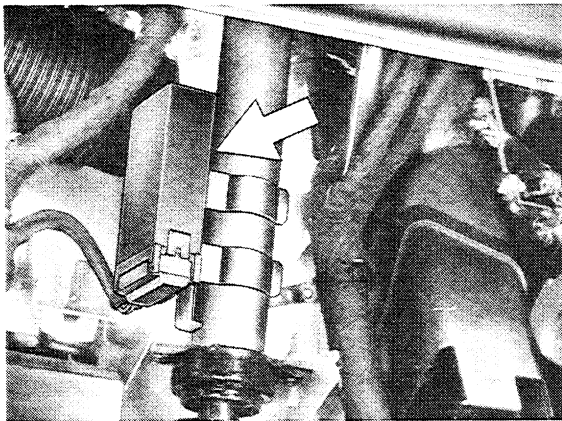
		Mechanical Function	Ignition off	Ignition on
Left Doors	Key	I - unlock	C - unlock C - lock	C - unlock C - lock
	Door-lock- ing Knob	I - lock I - unlock (each only with door shut)	C - unlock	C - unlock
Right doors	Key	I - unlock	C - unlock C - lock	C - unlock C - lock
	Door-lock- ing knob	I - unlock I - lock	C - unlock	C - unlock
Central locking button with display		no function	C - lock no function	C - unlock C - lock each with Display

I = Individual Door  
C = Central function

## CENTRAL LOCKING SYSTEM TROUBLESHOOTING

## Note

The testing of the central locking system and the localizing of a defect can be carried out on the 12-pin plug of the control unit without extensive disassembly and assembly.



Make up 2 short auxiliary cables with 2.5 mm round pins (from defective lead cable or commercially-available plug) for connecting the measurement and test equipment.

Use circuit diagram 944, 944 turbo sheet 10, page 97 - 91.

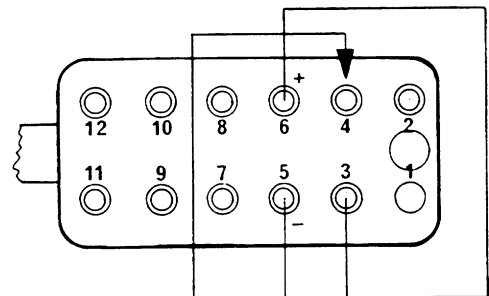
1. Pull control unit from steering column and disconnect plug.

## 2. Testing Control Unit Power Supply

Connect positive (30, fuse 8) to term.6 and negative (-) to term.5. With "ignition on" positive (15, fuse 17) must be connected to term.8.

## 3. Testing the Control Elements

The control elements are actuated together. Connect plug term.6 (+) and term. 3 with the auxiliary lead. Both doors "opened", bring opened driver's doors into locked position by the outside lock. Plug auxiliary lead to term.5 (-) and touch to term.4.



The control elements should lock.

Reverse connections at terminals 3 and 4, in other words, briefly connect plus to ter.4 and minus to ter.3. The actuators must unlock.

### 3.1 Checking operation of microswitches in the actuators

Set both doors to the open position. Connect a continuity tester across terminals 10 and 5. Lock and unlock the door locking button of each door in turn. In the locked position, the tester must show continuity.

Lock both doors. Connect continuity tester across terminals 2 and 5. Unlock and lock doors at locking buttons.

In each case, the tester must show continuity in the unlocked position.

### 4. Checking operation of microswitches in lock cylinders

Connect continuity tester across terminals 5 and 7.

Use key to turn lock cylinder of each door toward "open". In each case, the tester must show continuity.

Remove lead from ter.7 and connect to ter.9. Turn lock cylinders toward "closed". In each case, the tester must show continuity.

### 5 Checking operation of pushbutton switch in central console

Connect continuity tester across ter.12 and ter.5 (ground). When the pushbutton switch is actuated, the tester must show continuity.

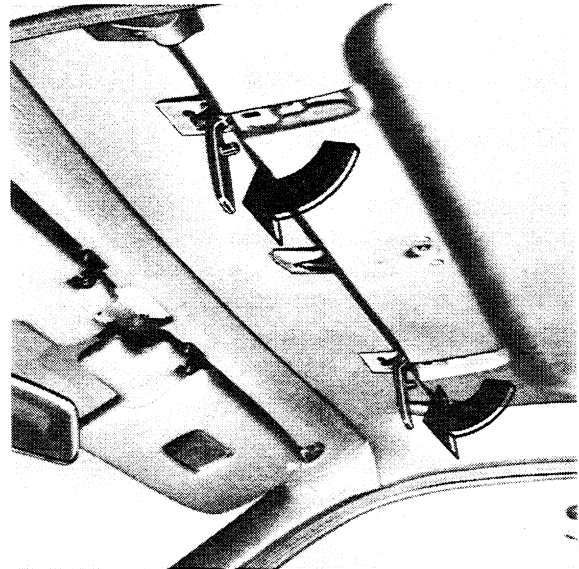
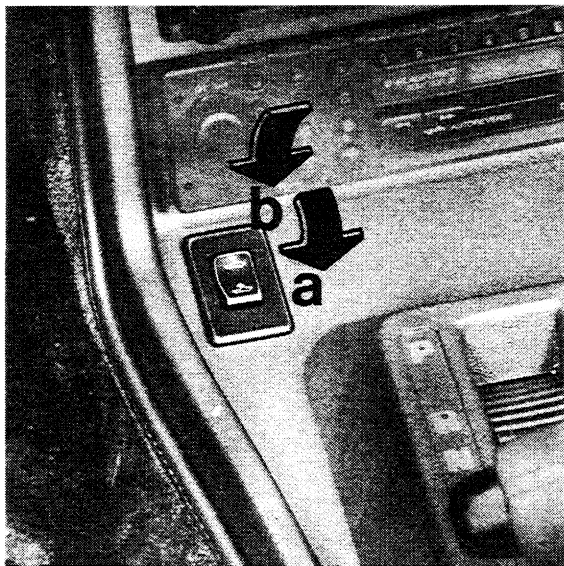
Use a length of wire to connect ter.11 and ter.6 (+) the indicator lamp in the pushbutton switch must light up. Switch on position lights. The key symbol in the switch must be illuminated.

## OPERATING INSTRUCTIONS FOR REMOVABLE SUN ROOF SINCE 1984 MODELS

The electrically operated and removable sun roof can be opened in infinite steps up to final position with a switch in the center console after turning on the ignition.

Roof opened = tumbler switch pushed back (a).

Roof closed = tumbler switch pushed forward (b).



3. Lift and remove roof.
4. If applicable, place removed roof in protective cover provided for storage of roof.

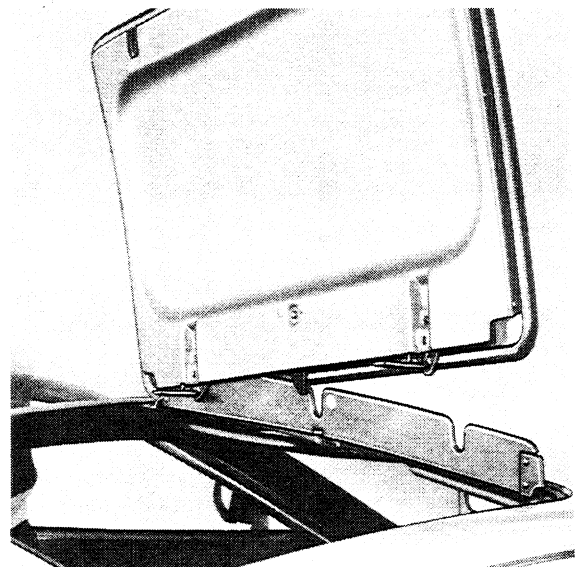
### Mounting Roof

1. Slide roof over wind deflector and front guides from above at an angle.

### Removing Roof

The roof should be cleaned first to avoid scratching the roof on deposits of dirt while removing.

1. Turn off ignition and push back (a) tumbler switch until drive elements unlock the roof.
2. Release front fasteners.



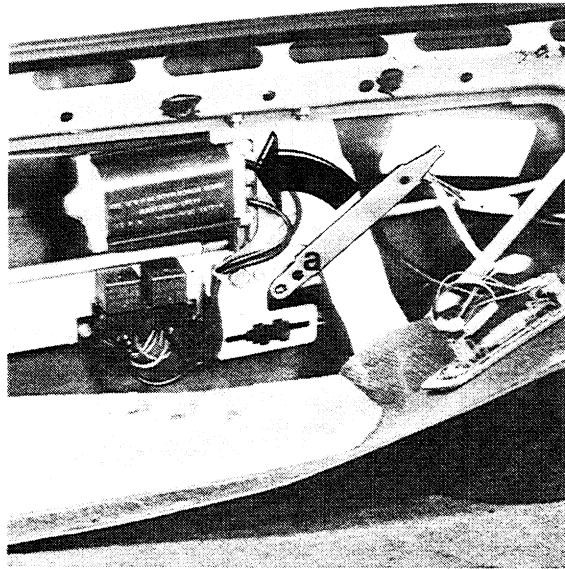


2. Lower roof toward rear.
3. Turn off ignition and push tumbler switch forward (b) until drive elements lock the roof.
4. Lock front fasteners.

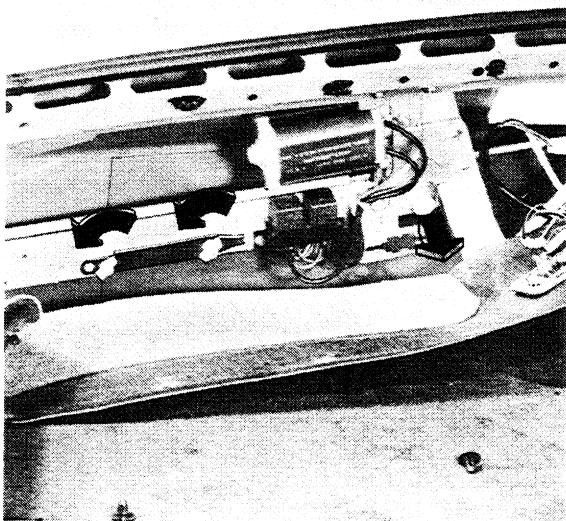
### Closing Roof Manually

Should the electric sun roof operation fail, the roof could also be closed manually. The drive motor and wrench are located behind the carpet on the left side section of the luggage compartment.

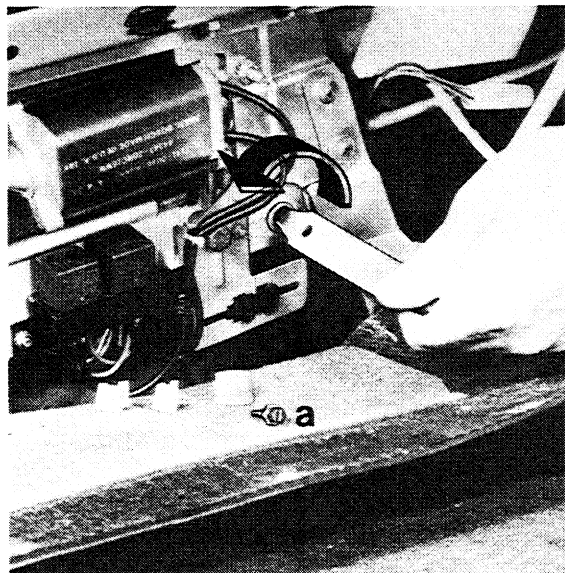
1. Unclip and fold back carpet.
2. Unscrew winged screws on wrench and take cap off of adjusting screw.



4. Turn the now visible threaded sleeve anticlockwise with the wrench until the roof is closed.



3. Unscrew and remove adjusting screw (a) with the wrench.



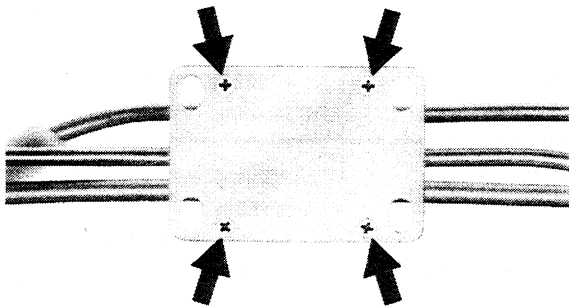
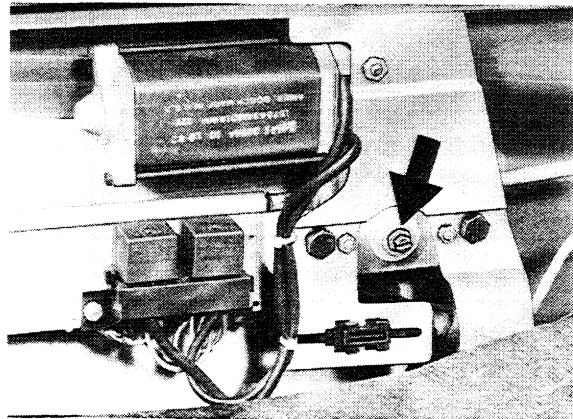
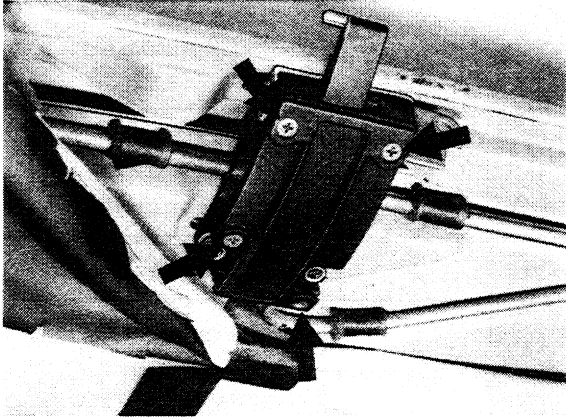
5. Screw in adjusting screw (a) again and adjust the slip clutch (see page 61 - 18).

## TROUBLESHOOTING SUN ROOF

Condition	Cause	Correction
Roof motor runs, but roof does not unlock or lift.	Riser cable on drive pinion defective. Dog broken. Drive pinion faulty.	Replace assembly set. Check and adjust clutch. Replace dog. Replace pinion on motor.
Roof does not run, no noise when operating switch.	Power supply for motor and drive. Microswitch faulty.	Check power supply for motor and drive. Check microswitch.
Roof opens onesidedly.	Gearbox faulty.	Replace assembly set.
Roof protrudes at rear in locked state.	Roof maladjusted.	Adjust gates. Adjust elements. If necessary, correct collar in roof opening.
Roof protrudes at front in locked state.	Centering wedges too high.	Use washers underneath centering wedges.
Roof leaks (water enters).	Seal damaged. Collar in roof opening does not fit correctly.	Replace seal. Correct collar in roof opening.
Rattling noise.	a) Gates loose.  b) Screws of assembly set loose. c) Roof fasteners and centering wedges loose. d) Wind deflector loose.	Check gates, replacing if necessary. Tighten screws. Tighten screws.  Tighten screws. Tighten screws.
Loud noise (knocking) in rear roof beam and drive elements do not move.	Gearbox faulty.	Replace assembly set.

## Important Information

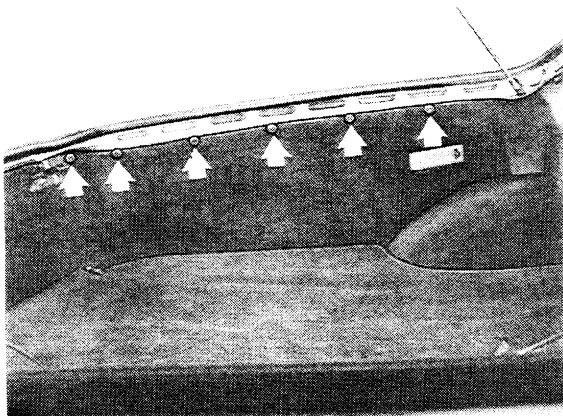
1. Never open element guides and gearbox on assembly set.
2. Do not turn adjusting screw of slip clutch, if not absolutely necessary.



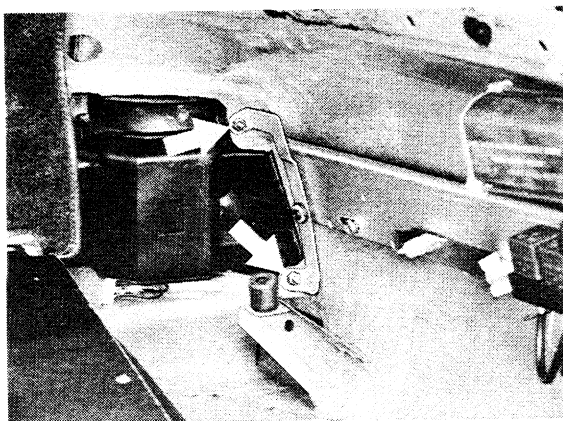
## REMOVING AND INSTALLING ELECTRIC SUN ROOF DRIVE AND ASSEMBLY SET

### Removing

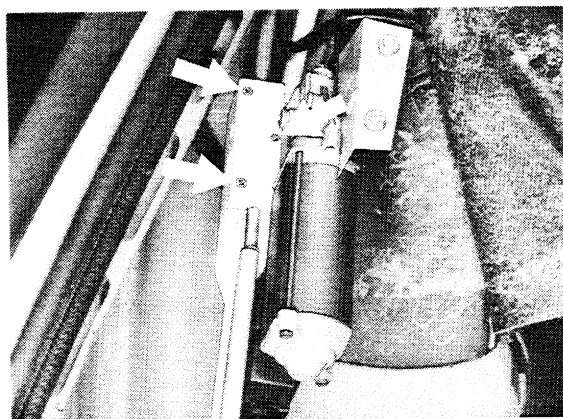
1. Raise tailgate, remove trim panel clips and place trim panel aside.



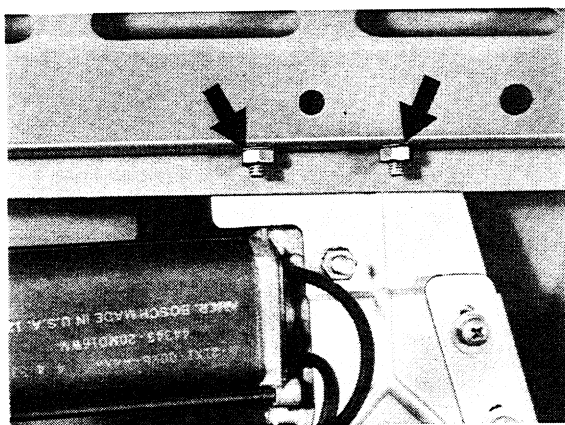
2. Unscrew nuts on studs and disengage electric drive in mounting points.



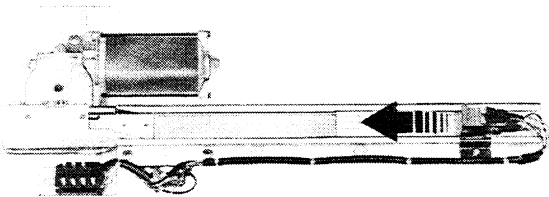
3. Swing electric drive into inside of car slightly. Unscrew cover mounting screws and remove cover.



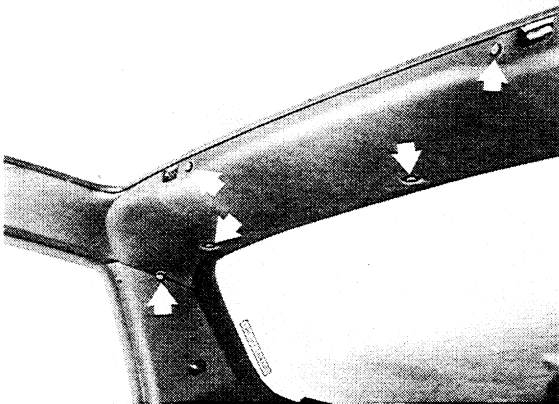
4. Disconnect plug on electric drive.



5. Unclip drive cam and remove electric drive with guide rail.

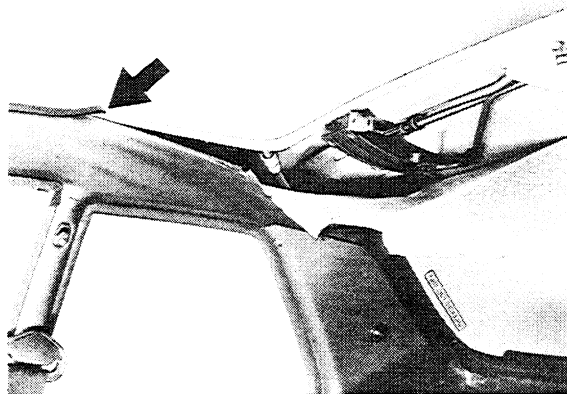


6. Remove lifting sun roof.
7. Remove caps on heads of bolts.

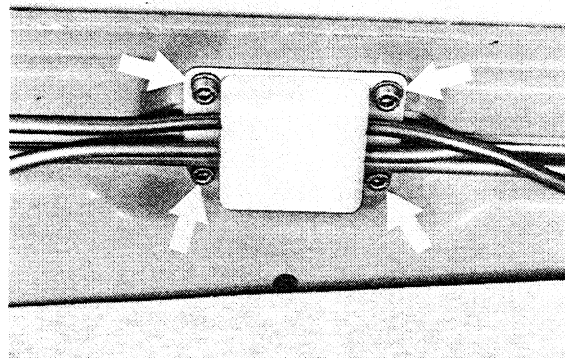
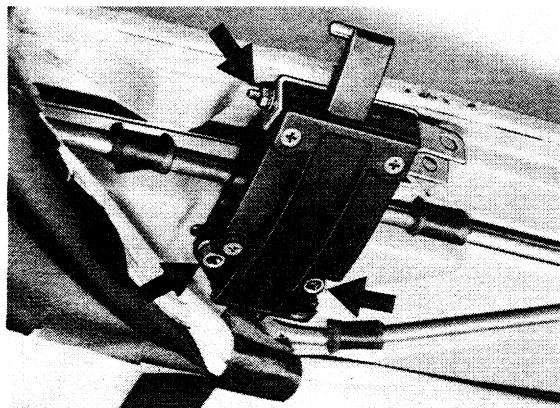


8. Remove mounting bolts and washers, and take off trim panel.

9. Pull off edge guard partially (arrow).
10. Loosen roof liner on body partially.



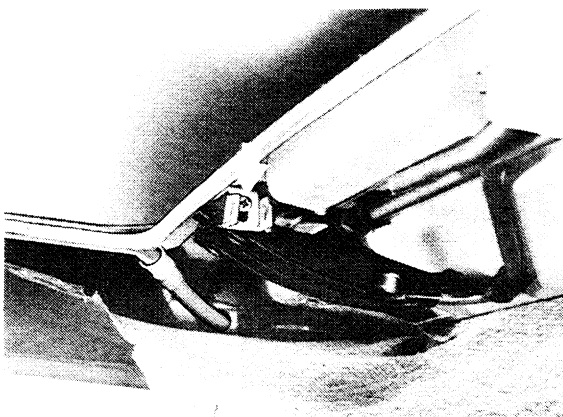
11. Remove mounting screws of element guides and transfer gearbox.



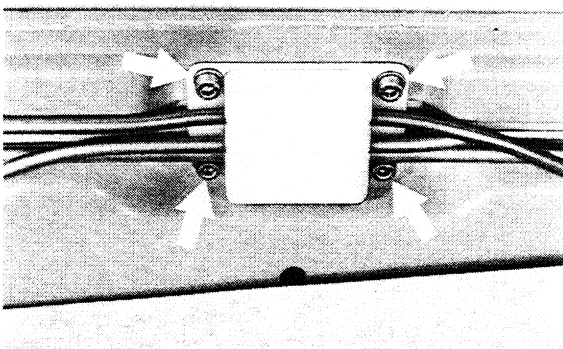
12. Remove assembly set from car by pulling long pipe out of C pillar.

## Installing

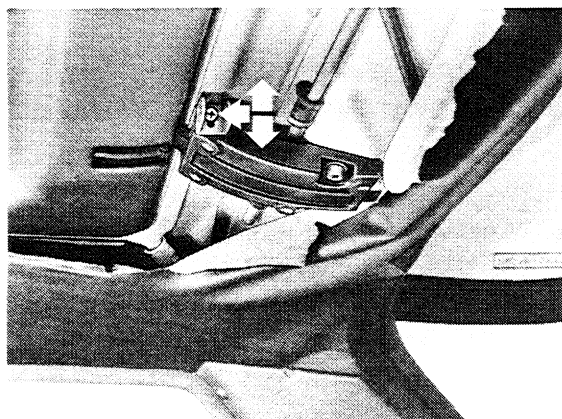
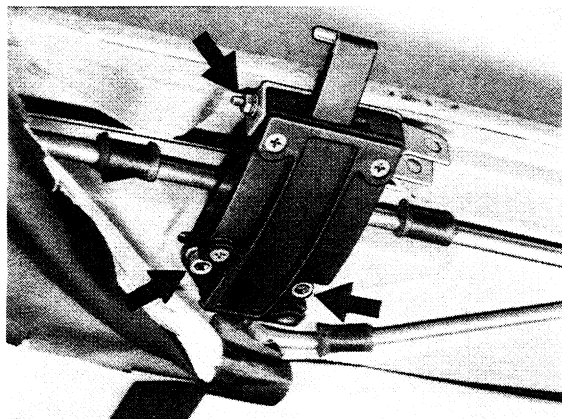
1. Guide long pipe of assembly set into assembly opening of body. Slide pipe through the C pillar by turning the entire part. Never use force, the pipe must not be bent.
2. Secure element guides of assembly set in holders on both sides lightly.



3. Mount transfer gearbox in center of roof beam.  
Use new, non-microencased screws.

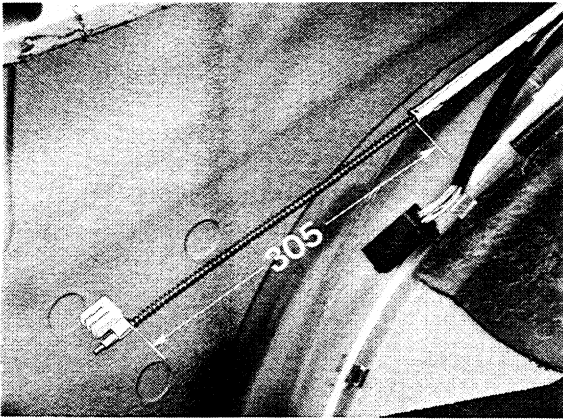


4. Bolt rear end of element guides on roof hoopsticks (without tension).  
Adjust front mounting points of element guides (see adjusting sun roof).

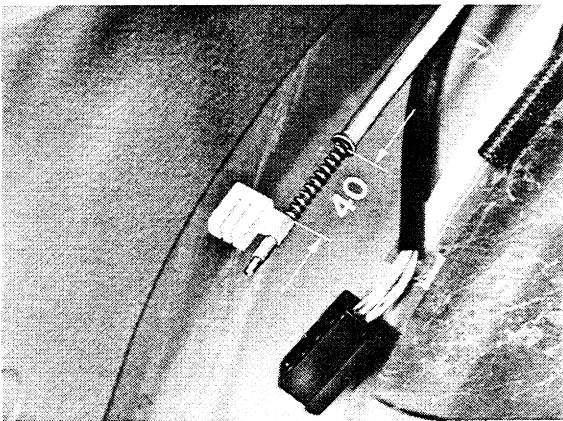
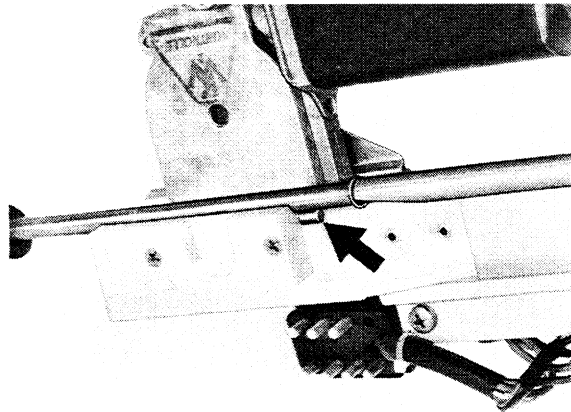


5. The pipe with the raising cable must protrude into the trunk parallel to the side panel. The distance between the end of the pipe and drive is  $305 \pm 1.0$  mm in pulled state and  $40 \pm 1.0$  mm in pushed state. If these distances are not reached, the assembly set has to be replaced. Adjustment of the raising cable is not possible. It must be possible to move the raising cable back and forth by hand.

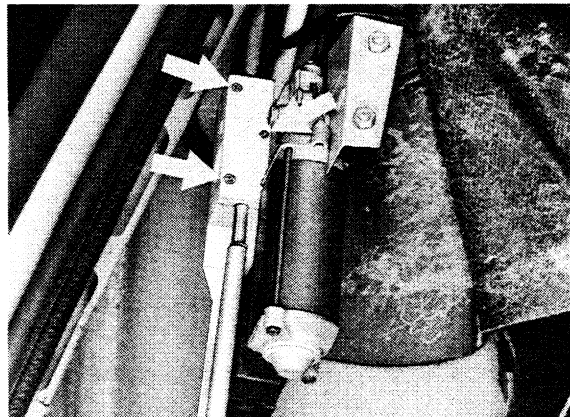




7. The pipe must be placed in the pinion housing precisely with the cams.

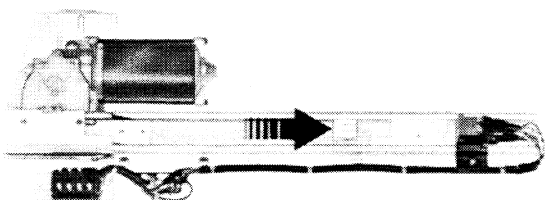


8. Mount and bolt down cover.

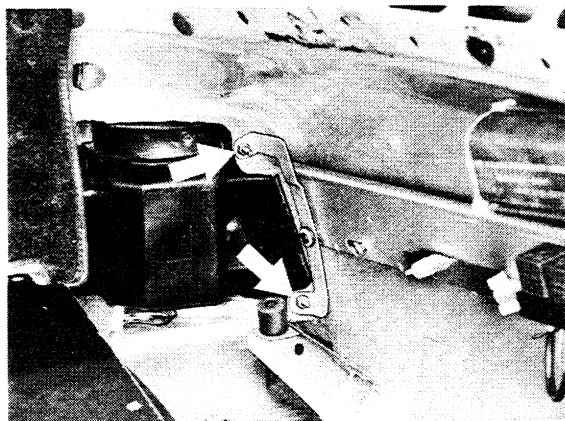
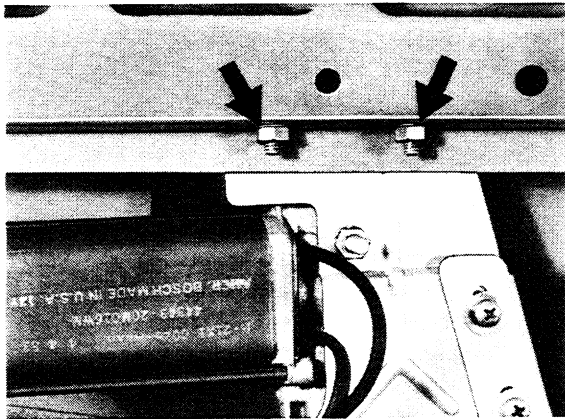


6. Work drive with raising cable into guide rail of electric drive, route along the rail and clip on counterpiece in cam.

9. Connect plugs. Place holder on end of rail on studs of tailgate and screw on nuts.



10. Engage console of electric drive in rear frame profile, screw on nuts and plug console claws on edge guard. Tighten all nuts.



11. Adjust lifting sun roof.



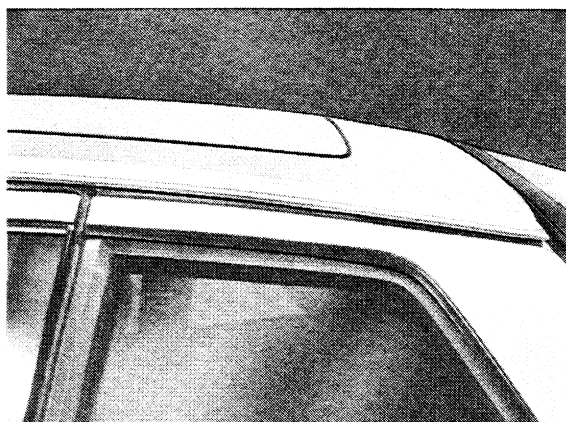
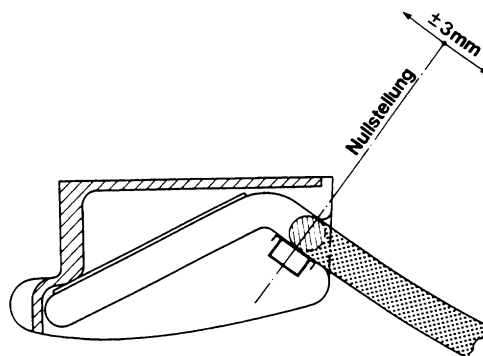
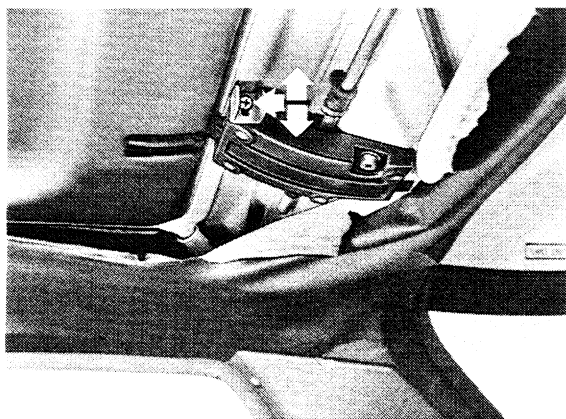
## ADJUSTING LIFTING SUN ROOF

Following jobs must be completed before adjusting.

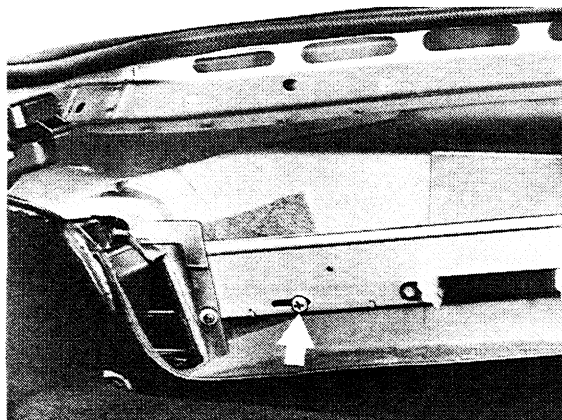
- Lifting sun roof removed.
- Trim on rear roof frame removed.
- Edge guard and roof liner on rear roof frame loosened on body partially (see "Removing Electric Drive and Assembly Set" - points 6 through 10).

## Adjusting

1. Place edge guard on collar, install roof, arrest and adjust element guides in slots that lifting roof lid and car roof are in same plane.  
Tighten mounting screws.
3. If staybolts of element guides are not in neutral position  $\pm 3\text{ mm}$  (see sketch), left trim panel must be removed in luggage compartment and excessive deviation eliminated by adjusting the switch lever on the rail.

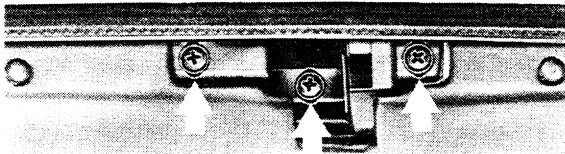


2. Remove roof and pull off edge guard, cement roof liner on body and slide on edge guard. Screw trim panel on roof frame and install caps on heads of screws.

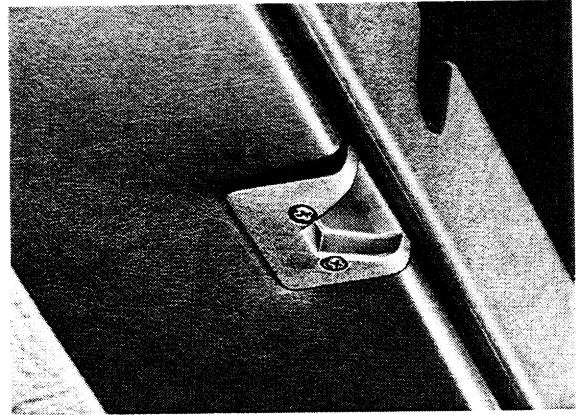


4. Install trim panel again after finishing adjustment.

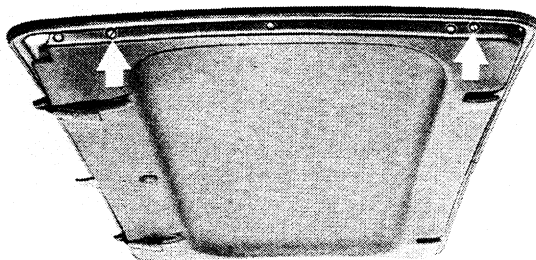
5. The gates bolted on the lifting roof lid have slots, with which the lifting roof lid and car roof panel can be adjusted to be in the same plane. Check gate guides, replacing if worn or damaged.



7. Should the lifting roof lid protrude at the front, the centering wedges must be unscrewed on the roof beam and installed again with washers underneath.



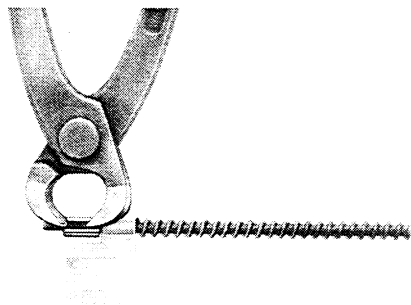
6. Cable anchors located in the lifting roof lid must be adjusted that the cable of the lifting roof runs parallel to the cable of the car roof.



## REPLACING DRIVE DOG

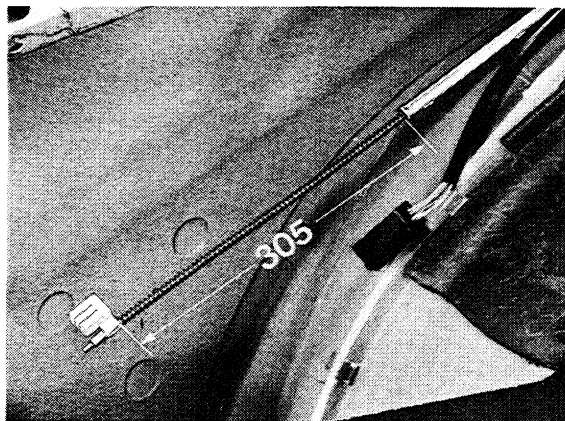
### Removing

1. Remove electric drive, see "Removing and Installing Electric Sun Roof Drive and Assembly Set",
2. Spread clamping sleeve with a suitable pliers and take off clamping sleeve and drive dog.



### Installing

1. Slide drive dog on to raising cable.
2. Clamp clamping sleeve to distance on the raising cable and with the gap in alignment with beads on the pipe.



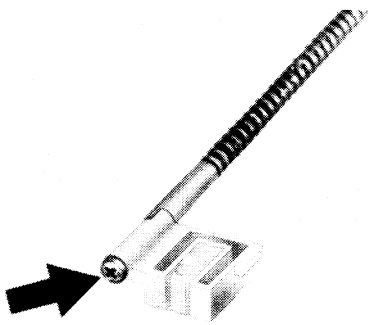
305 + 1.0 mm / 40 + 1.0 mm

3. Install electric drive.

## REPLACING UNSCREWING - TYPE DRIVE DOG

### Removing

1. Remove electric drive, see "Removing and Installing Electric Sun Roof Drive and Assembly Set".
2. Unscrew mounting screw and lift off drive dog.
2. Install electric drive.



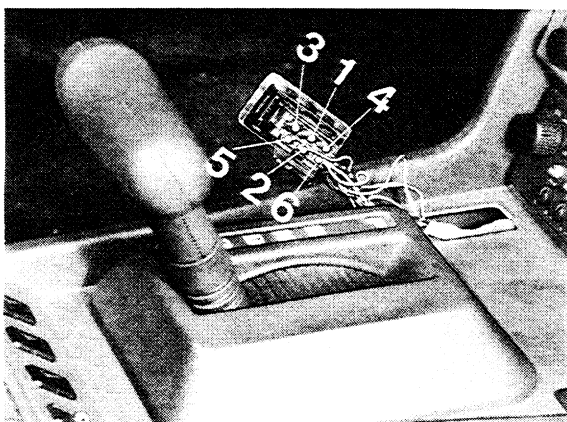
### Installing

1. Adjust drive dog on raising cable and install screw with washer on raising cable. Drive dog must be aligned with beads on pipe.

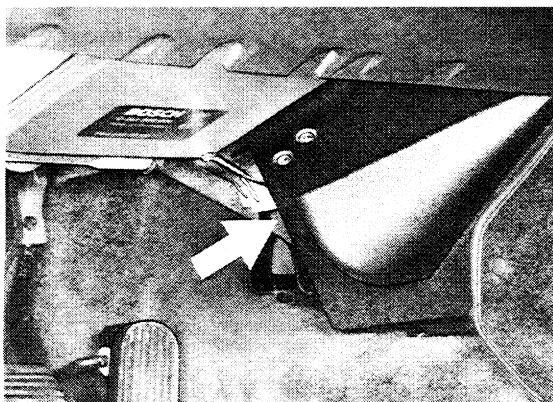


### CHECKING CONTROLS OF POWER SUN ROOF DRIVE

1. Check fuse no. 8 (8 amps).
2. Take sun roof switch out of center console with help of a spatula. Unfold plug connection cover for switch.



Check lines or replace control unit for sun roof/radio, if voltage values are not as specified.



3. Perform following tests with a volt-meter or test lamp.
  - 3.1 Terminal 2 must have battery voltage with the ignition turned on.
  - 3.2 Terminal 3 must have battery voltage with the ignition turned off and the ignition key inserted (radio position).
  - 3.3 Terminal 4 must have battery voltage when the left front wheel is lifted and rotated (speed above 5 km/h).

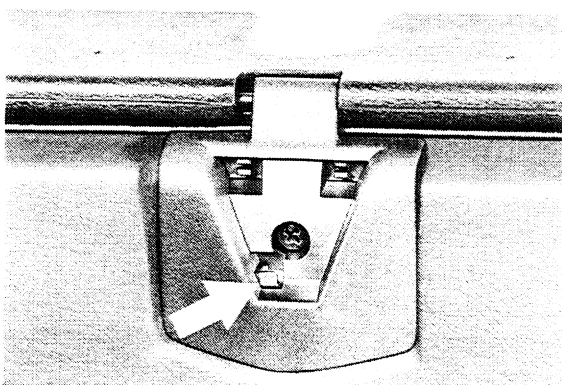
4. Check microswitch in roof opening.

#### Note

The microswitch will prevent running out the lifting elements unintentionally after removing the roof.

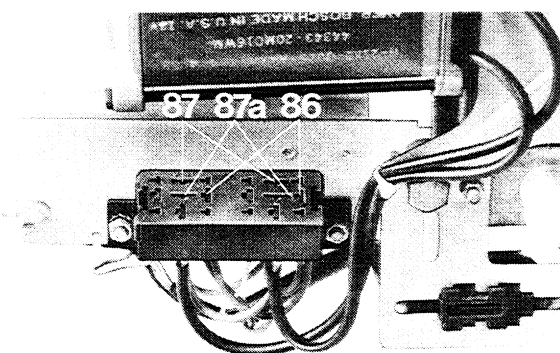
Check microswitch - see next page.

- 4.1 Microswitch must remain in closed position with the roof installed up to the maximum lifting position. The switching point can be identified by a loud "click".
- 4.2 The roof cannot be lifted when the microswitch is open or a wire is interrupted.
- 4.3 The operating lever on the microswitch must move easily.



#### CHECKING POWER SUPPLY FOR SUN ROOF MOTOR

1. Check fuse no. 9 (25 amps) in extra fuse box.
2. If fuse is okay, loosen trim panel in luggage compartment at rear left and pull off relay on sun roof drive.

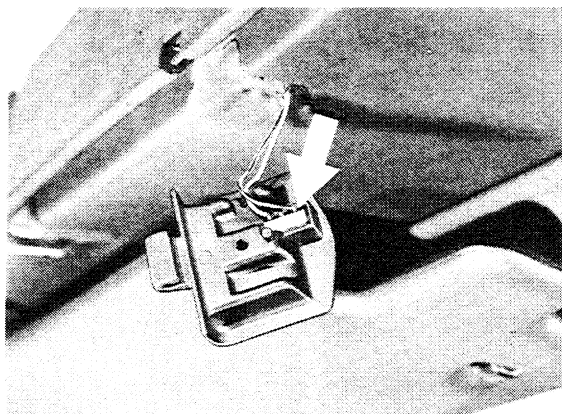
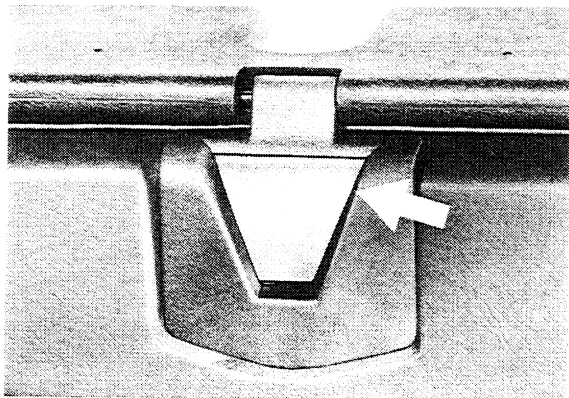


3. Perform following tests with a voltmeter or test lamp.
  - 3.1 Both relay socket terminals 87 must have battery voltage.
  - 3.2 Terminals 86 and 87a must have ground potential.

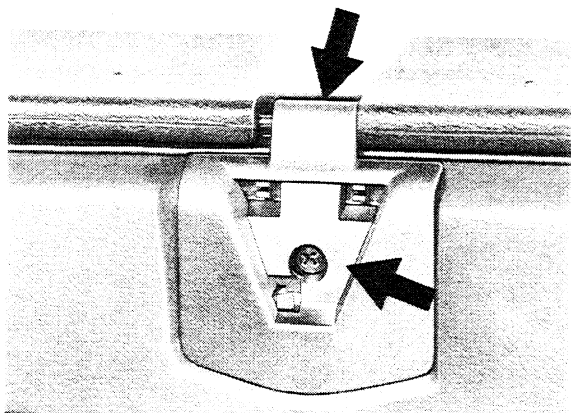
## REMOVING AND INSTALLING SUN ROOF MICROSWITCH IN ROOF OPENING

### Removing

1. Unlock and remove lifting roof lid. Disengage operating flap in lifting roof mount with a body spatula.
3. Take microswitch out of lifting roof mount and unsolder wires.



2. Unscrew lifting roof mount and press out of wind deflector.



### Installing

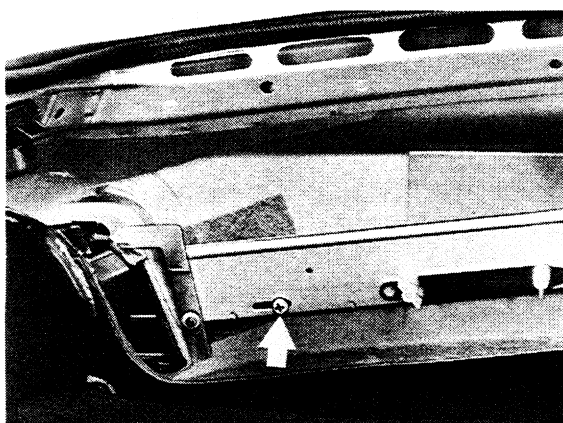
#### Note

Be careful not to pinch wires when tightening screws.  
The operating lever on the microswitch must not clamp.

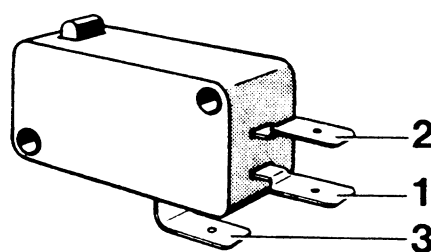
## REMOVING AND INSTALLING SUN ROOF MICROSWITCH ON ELECTRIC DRIVE

### Removing

1. Loosen trim panel in luggage compartment at rear left.
2. Unscrew mounting bolt on micro-switch holder.



Wire connections on microswitch 1

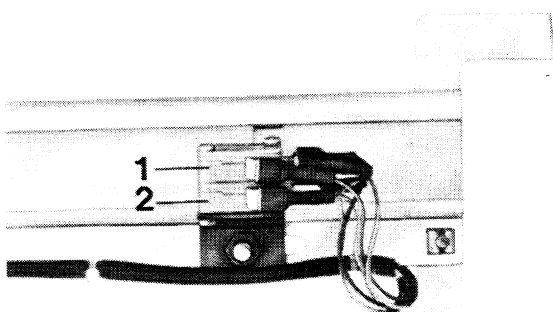


3 = black/red  
1 = green/red  
2 = black

3. Pull out holder and unscrew micro-switch.

### Installing

Rear view of installed microswitch.



Wire connections on microswitch 2

3 = gray/green  
1 = not connected  
2 = gray/black

1 = Three wires connected  
2 = Two wires connected

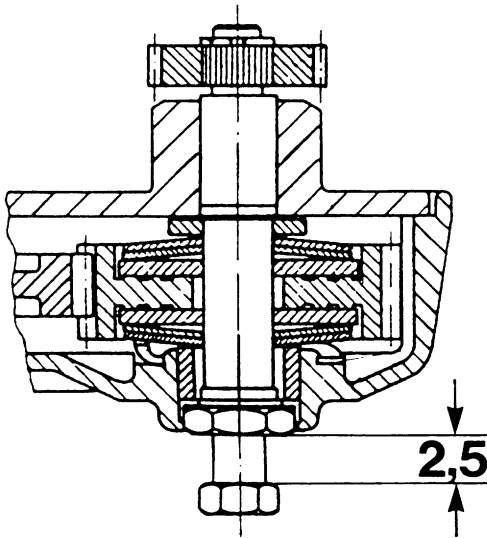


## ADJUSTING SLIP CLUTCH ON SUN ROOF MOTOR

### Note

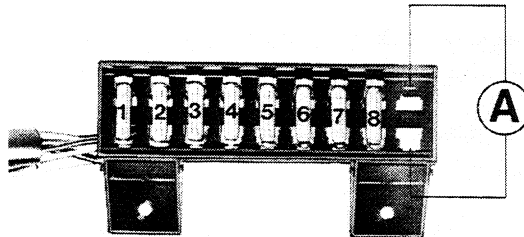
The slip clutch was adjusted in the factory and only has to be readjusted, if the adjusting screw had been removed for manual operation of the roof.

The lock nut is cemented on the adjusting screw at a distance of 2.5 mm from the screw's head.

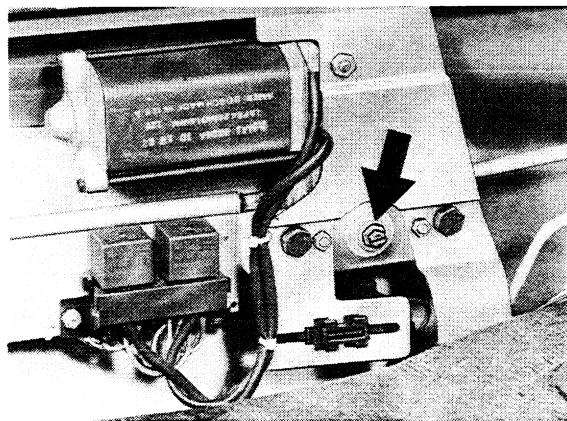


To guarantee perfect operation of the slip clutch, the adjustment should be made by measuring the power input of the sun roof motor.

1. Remove fuse no. 9 in extra fuse box.  
Connect ammeter on fuse carrier no. 9.



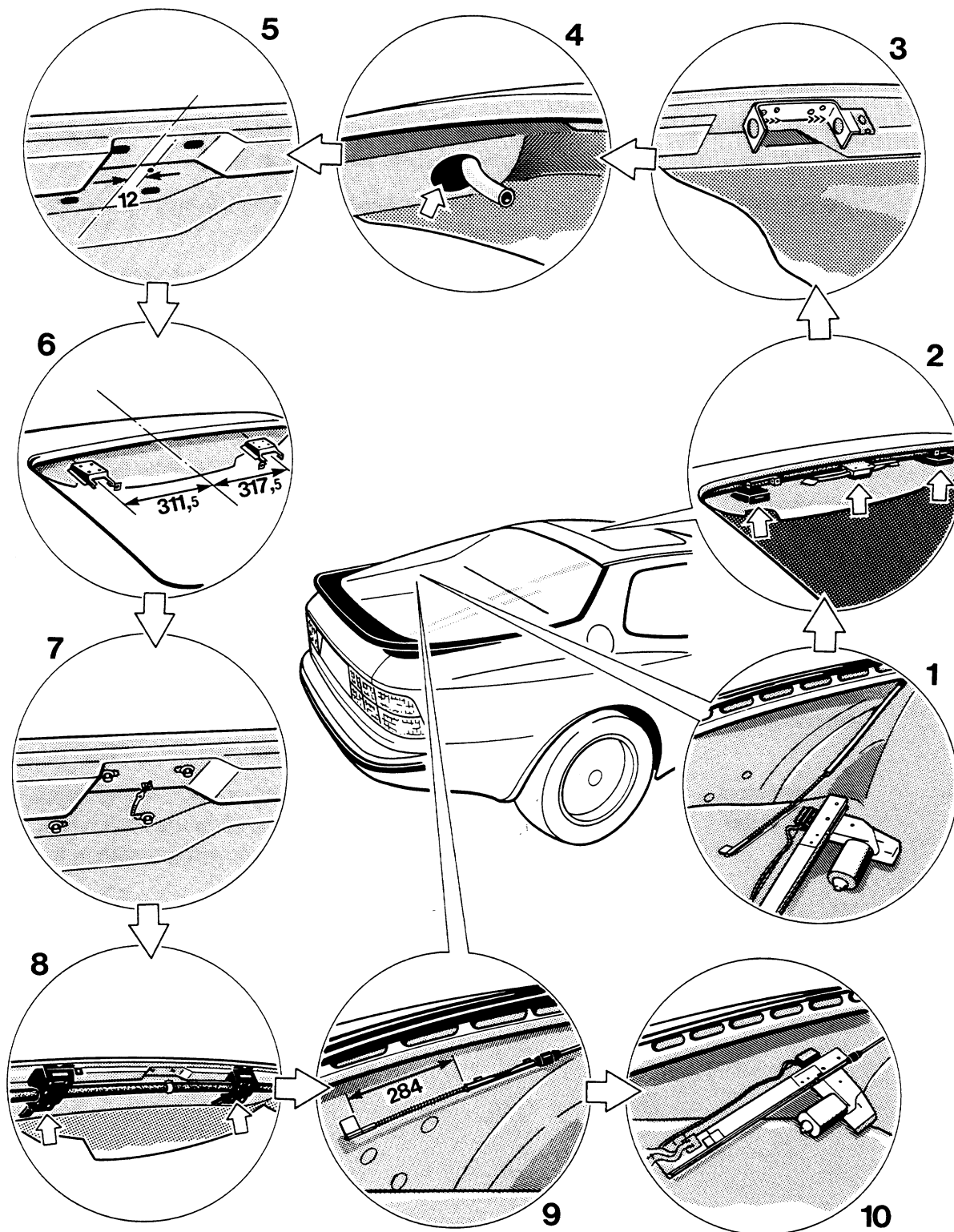
2. Screw in adjusting screw on slip clutch and tighten slightly.



3. Turn on ignition and operate switch to move lifting roof lid to final position of drive.  
Measure power input in final position (clutch slips).
4. Tighten adjusting screw until power input is 12 to 14 amperes.
5. Disconnect ammeter and install 25 ampere fuse again.

## Converting the lifting roof

Converting the lifting mechanism of the lifting roof to the new version (as of February, 1986)



## Converting the lifting mechanism

Converting the lifting mechanism of the lifting roof to the new version (as of February, 1986)

No.	Operation	Instructions
	Remove the lifting roof	
	Remove interior in the rear roof rail area	Remove roof lining, pull off rear edge protector and loosen adjacent areas of roof lining.
	Loosen side panel lining	Open tailgate, loosen side panel lining clips and move side panel lining aside.
	Loosen mounting of electrical drive	Screw mounting nuts off the threaded studs and disengage electrical drive from its mounting locations. Move electrical drive aside and disconnect plug connectors.
1	Separate fitting kit from electrical drive.	Loosen fastening screws at housing of electrical drive and remove cover. Unclip yoke from switching cam and remove yoke complete with lift cable from guide rail.
	Separate yoke from lift cable	Loosen fastening screw and pull yoke off the lift cable.
2	Loosen fitting kit in roof area	Loosen fastening screws for right-hand and left-hand segment guide and for transfer box.
	Pull out fitting kit	
3	Separate spotwelds of support panels	Separate spotwelds between support panels and roof rail using a spotweld cutter. Separate MIG weld seams between support panels (front side) and roof rail.
4	Enlarge cutout for drain hose	<b>Right-hand side only:</b> Enlarge cutout for drain hose in the body panel just enough to allow the short tube – including the covering – of the mounting assembly to be introduced into the cutout.
5	Drill mounting hole for tie-wrap	Drill a <b>7.3 mm</b> dia. hole for the tie-wrap in a position offset <b>12 mm</b> to the left (in forward direction).

No.	Operation	Instructions
6	Position adapter plates	<b>Positioning the left-hand adapter plate:</b> Center of vehicle to center of adapter plate <b>317.5 mm</b> . <b>Positioning of right-hand adapter plate:</b> Center of vehicle to center of adapter plate <b>311.5 mm</b> . Drill blind rivet holes in roof rail.
	Prime body sections affected	Apply primer to body sections worked with grinding, drilling or cutting equipment.
	Rivet adapter plates in place and fit tie-wraps	Rivet adapter plates to roof rail. Fit tie-wraps.
7	Block threaded plates for fitting of transfer case	Tighten threaded plates of old transfer case mounting to prevent rattle (use short bolts).
8	Insert and tighten fitting kit	Insert assembly kit into body, tighten segment guides and tighten up tie-wraps.
9	Assemble and adjust lift cable	Fit connector and connecting tube to lift cable. Use connector to install tube assembly kit and connecting tube. Screw yoke to lift cable. Turn protruding section of lift cable to adjust length to <b>284 mm</b> (measured between connecting tube and yoke). <b>Note:</b> When adjusting, the arc segments must be engaged to stop into the segment guides.
10	Connect fitting kit to electrical drive	Insert yoke complete with lift cable into guiding sleeve of the electrical drive and clip into actuating cam. Insert connecting tube into housing, install and tighten cover.
	Fit electrical drive	Close connector for electrical drive. Engage electrical drive into mounting points and tighten.
	Install side panel lining	
	Install interior	Glue roof liner to edge of body panel (roof aperture), put edge protector back on and install roof lining.
	Insert lifting roof	
	Check operation of lifting roof	

## Lifting sun roof as from February 1986

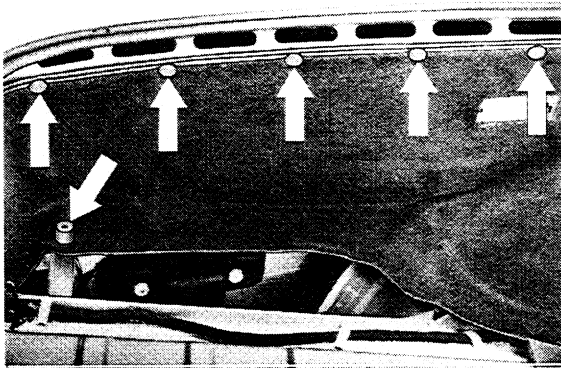
### General

A new lifting sun roof lifting system has been in use from February 1986 onwards. Operation of the new lifting sun roof has not changed in comparison with the previous version.

### Closing lifting sun roof manually:

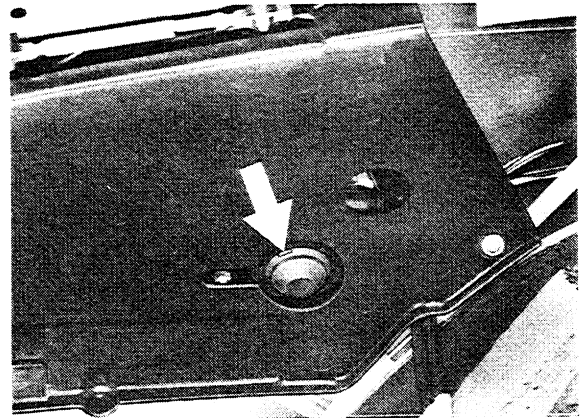
Should electric lifting sun roof operation fail, the roof can also be closed manually. The drive motor is located behind the carpet on the left side section of the luggage compartment.

1. Open the flap on the luggage compartment cover. Remove securing screw of the round rubber buffer, release clips on the carpet and fold carpet back.



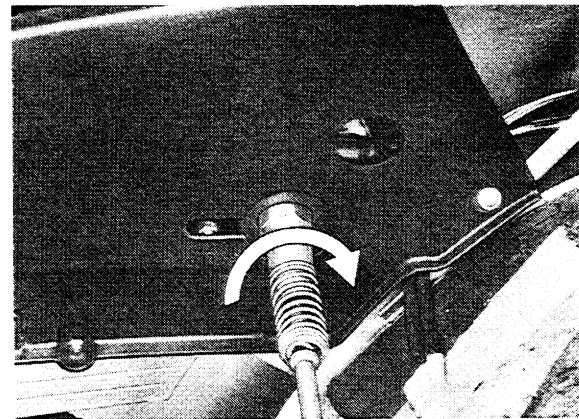
87/986

2. Remove cover cap.



87/987

3. Plug the ignition plug wrench included in the on-board tools onto the now visible hexagon nut and turn in clockwise direction until the lifting sun roof is closed.

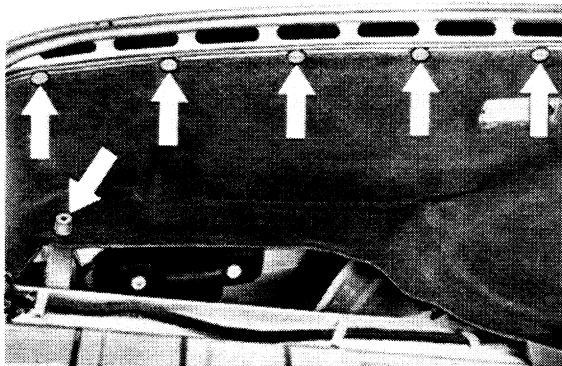


87/985

## Lifting sun roof - removing and installing electric sun roof drive and assembly set

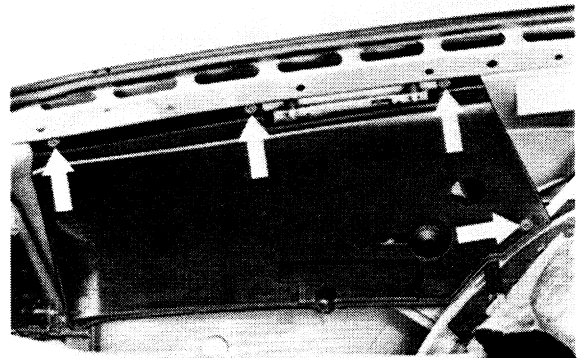
### Removing

1. Open tailgate and flap on the luggage compartment cover. Unscrew securing screw of round rubber buffer, remove trim panel clips and place trim panel aside.



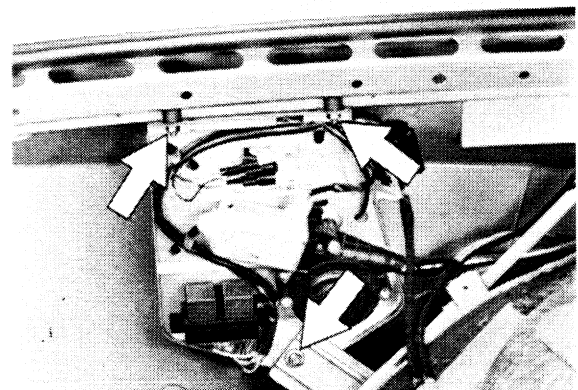
87/986

2. Unscrew cover mounting screws and remove cover from car.



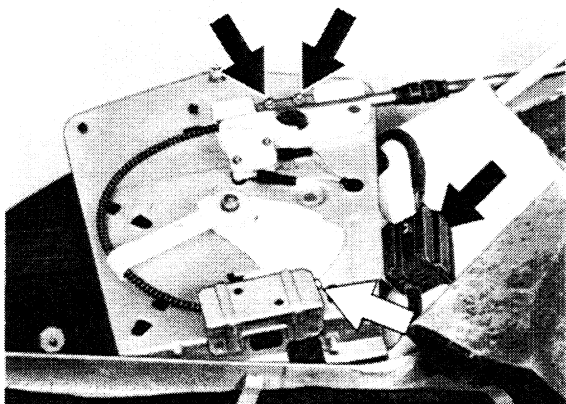
87/988

3. Unscrew hexagon nuts from studs and disengage electric drive from mounting points.



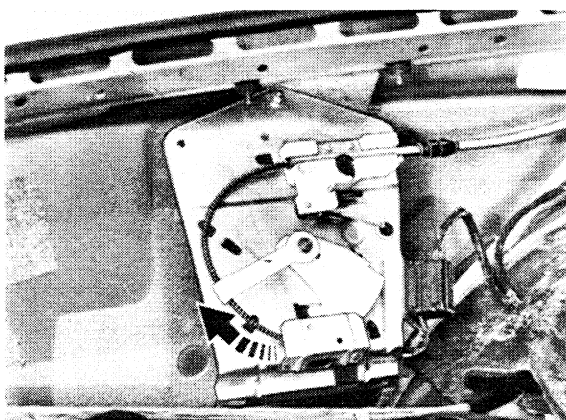
87/982

4. Swing electric drive into inside of car. Un-screw mounting screw and hexagon nuts on raising cable. Disconnect connector from electric drive.



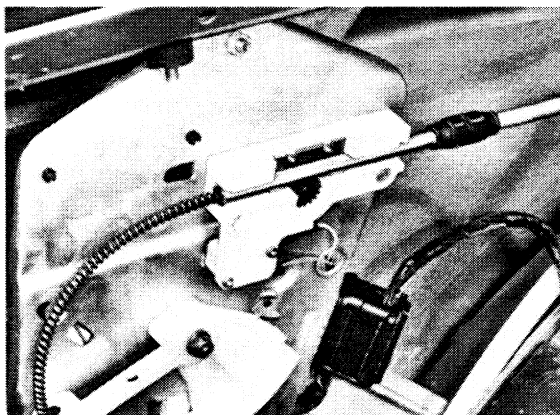
87/980

5. At raising cable end, extract square shaft from swing lever.



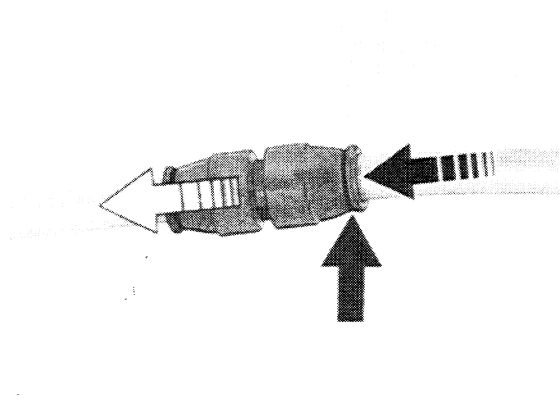
86/75

6. Detach connecting tube with raising cable from pinion housing and also detach electric drive.



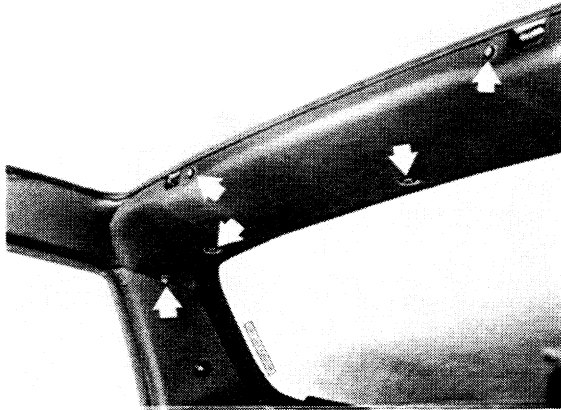
86/76

7. On guide tube, press clamping sleeve in the tube's longitudinal direction and extract connecting tube with clamping sleeve.



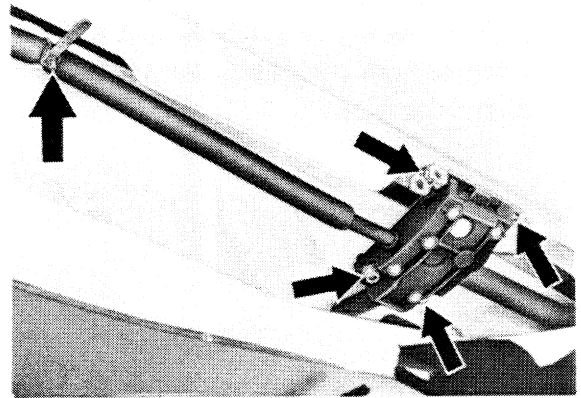
86/70

8. Take out lifting sun roof and partly remove roof trim panel, edge guard and roof section.



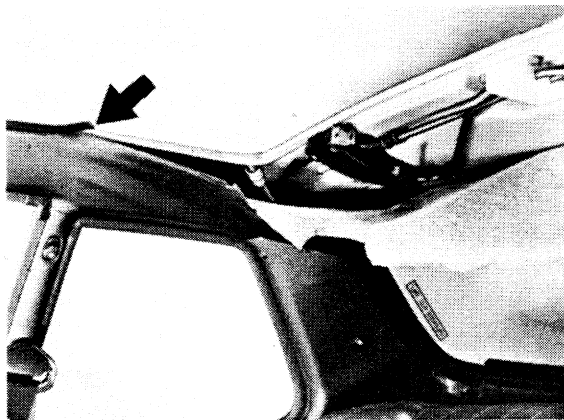
10390

9. Unscrew mounting screws and nuts of element guides and remove cable tying straps.



87/976A

10. Remove assembly set from car by pulling long pipe out of C pillar.

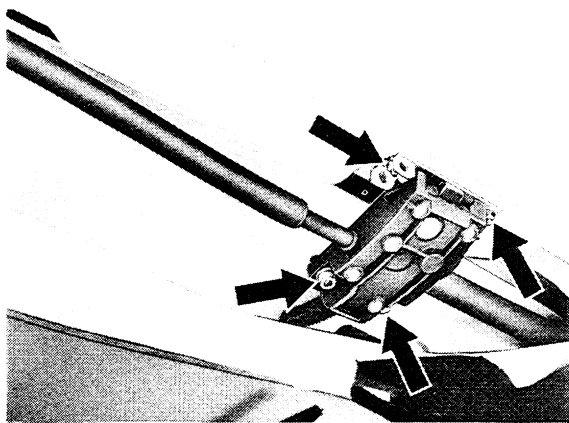


10387



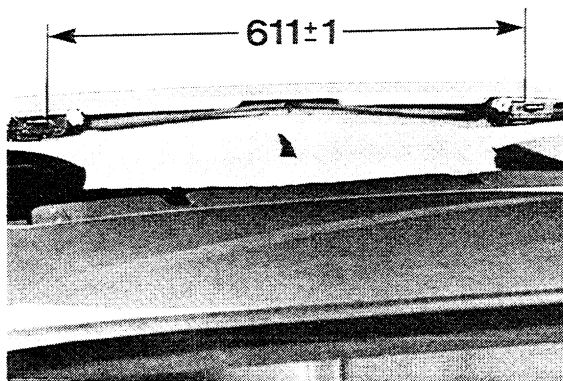
### Installing

1. Guide long pipe of assembly set into assembly opening of body. Slide pipe through the C pillar without using force.
2. Secure element guides with brackets in holders on both sides lightly in the roof beam.

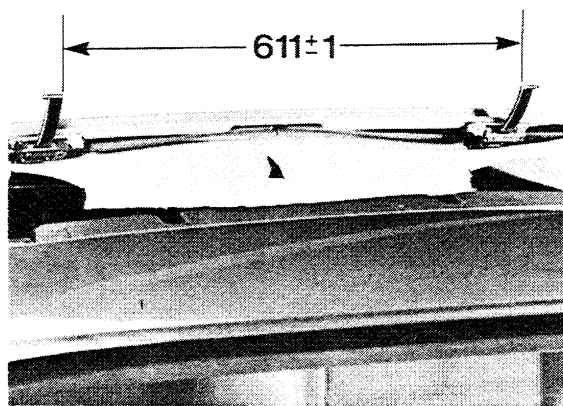


87/976B

3. Slide element guides home into the brackets and adjust parallel to each other in accordance with the specified distances. Tighten rear screws. Check dimensions in the extended and retracted positions of the elements and readjust if necessary. Tighten front nuts.

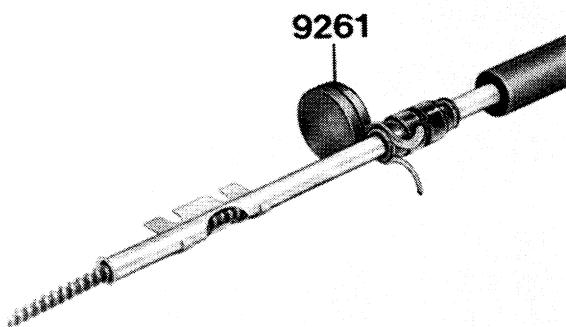


86/155



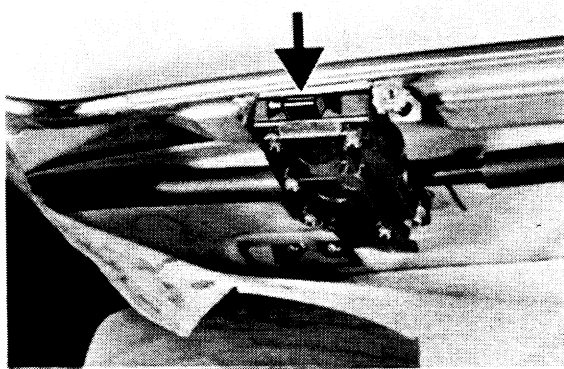
86/154

4. Plug connecting clip onto the raising cable and install the clamping sleeve using special tool "9261". Plug clamping sleeve home on connecting and guide tube.

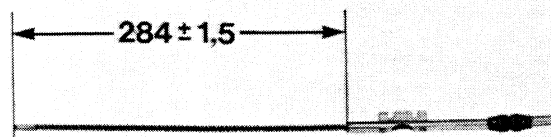


87/974

5. Adjust raising cable with elements retracted home and in accordance with the specified dimensions. Turn clockwise for a longer distance and counterclockwise for a shorter distance.

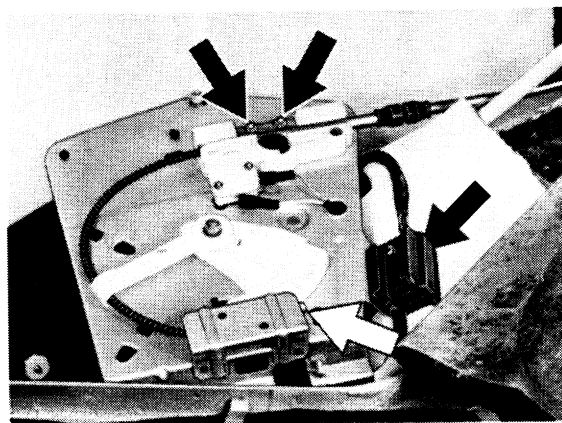


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87/975

6. Carefully work the connecting tube with raising cable on the electric drive into the pinion and pinion housing and secure with hexagon nuts. Guide raising cables through the trailing lever, insert into the square hole in the swing lever and secure with the screw. Join connector halves.

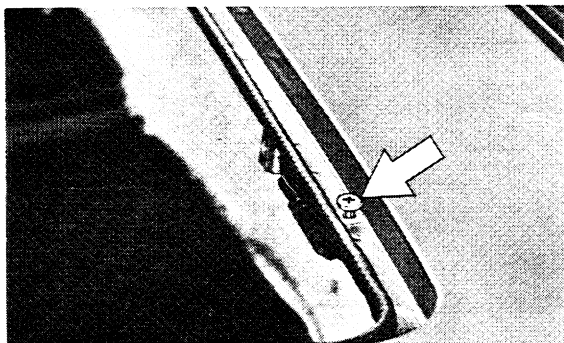


87/980

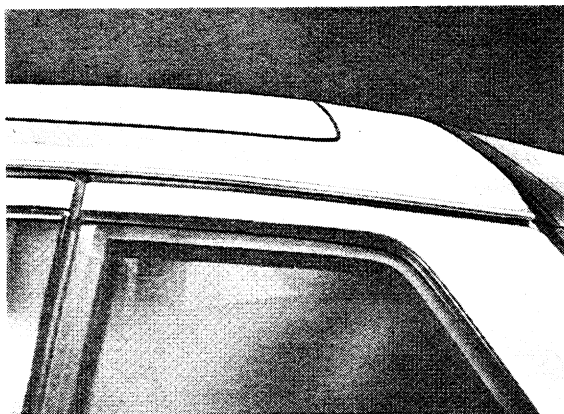
7. Carry out further installation in reverse order to removal.

## Adjusting lifting sun roof

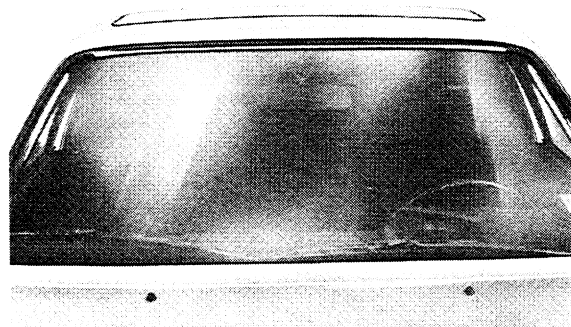
1. Insert lifting sun roof and, if necessary, adjust on front and rear adjusting bolts until lifting sun roof runs level with the roof.



86/87

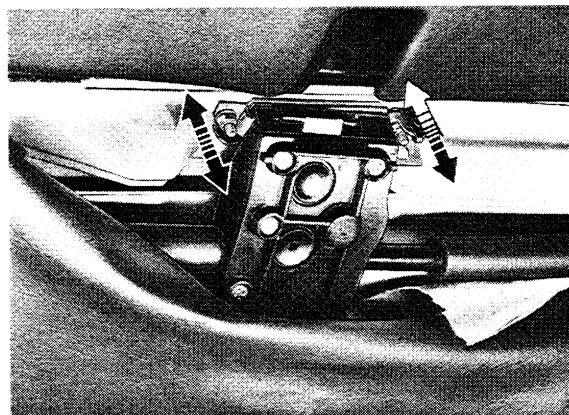


10405



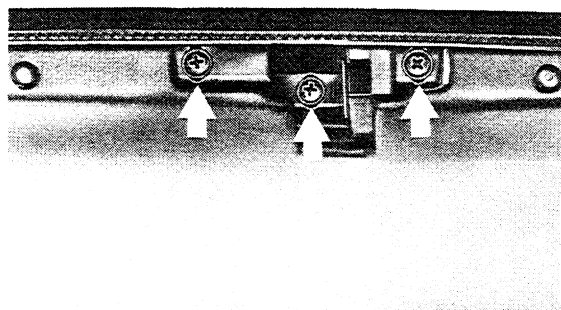
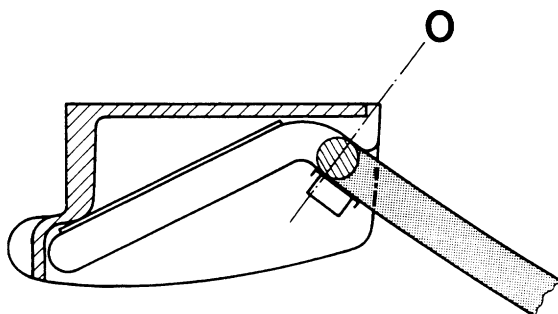
10433

2. If necessary, adjust the adjusting screws of the element guides so that the elements travel into the gates with large-scale tension.



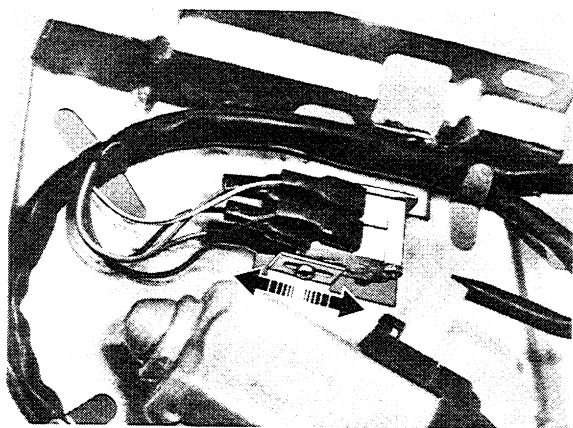
87/1013

3. If the elements are not in zero position, deviations must be equalized by adjusting microswitches on the electric drive.



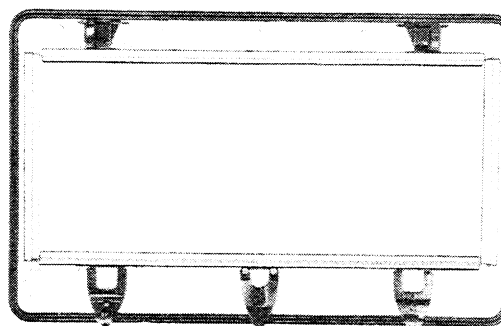
10408

5. To increase stability of shape, lifting sun roof has been reinforced on the inside by adhered aluminium profiles. The pull anchors have been dropped.



86/59

4. The gates bolted on the lifting roof have slots with which the lifting roof and car roof panel can be adjusted to be in the same plane. Check gate guides, replacing if worn or damaged.

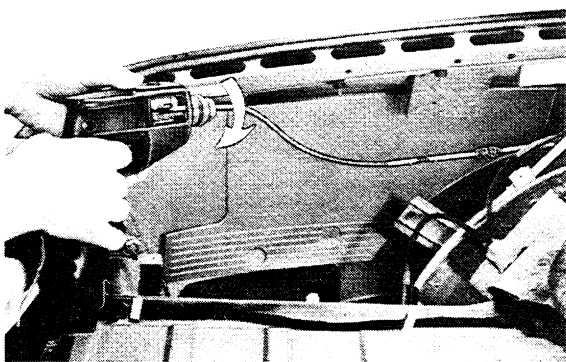


86/58

6. Should the lifting roof protrude at the front, the centering wedges must be unscrewed on the roof beam and installed again with washers underneath.

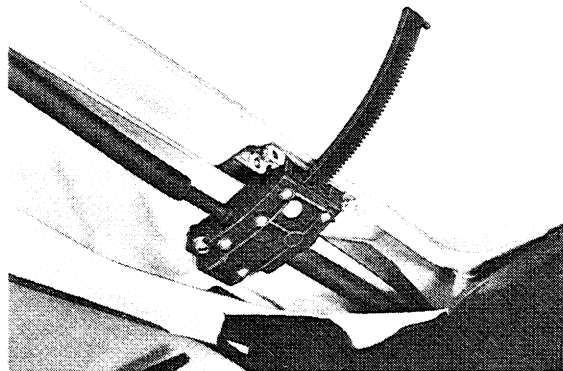
### Removing and installing raising cables and elements

1. Remove electrical drives. See Lifting sun roof – Removing and installing electric sun roof drive and assembly set.
2. Using a drill, turn the raising cable on the square shaft out of the assembly set.



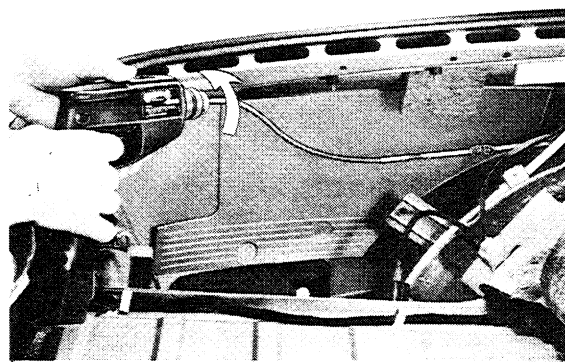
87/979 A

3. Pull element out of the element guide.  
Grease new element and insert home. Use special grease.

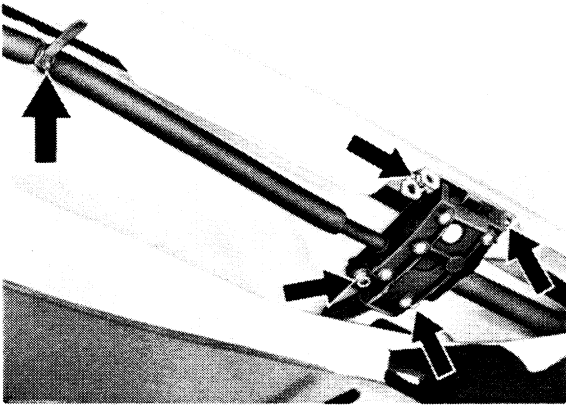


87/977

4. Grease raising cable and insert in the assembly set using a left-turning drill. Use special grease. Make sure the elements lie on the element guide.

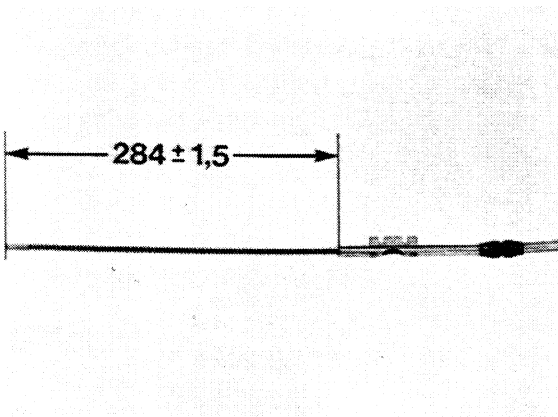


87/979B



87/976

5. Adjust raising cable in accordance with distance data.

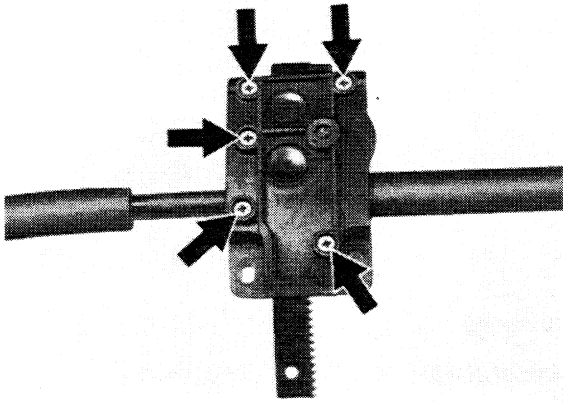


87/975

## Removing and Installing Gear in Element Guide

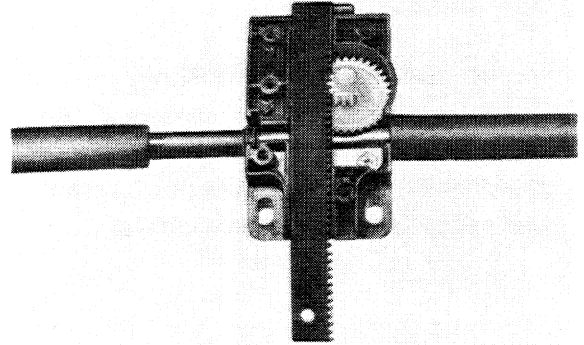
### Removing

1. Remove electric drive and installation kit – see "Removing and Installing Electric Drive and Installation Kit" under lifting roof.
2. Unscrew mounting screws of element plate.



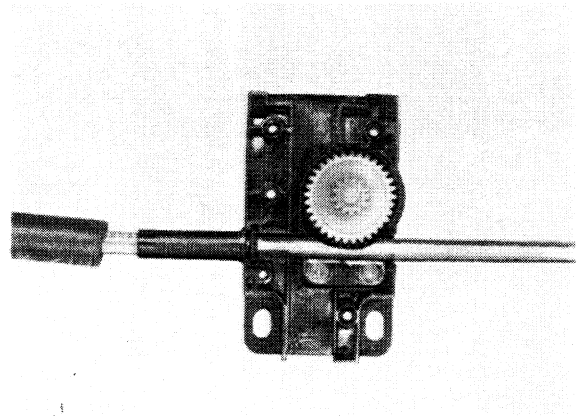
87/973

3. Take off element plate and remove element from the element housing.



87/972

4. Press gear out of the element housing from behind.



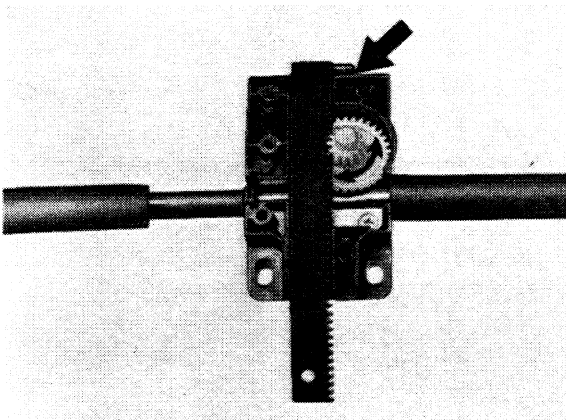
86/61

## Installing

### Remarks

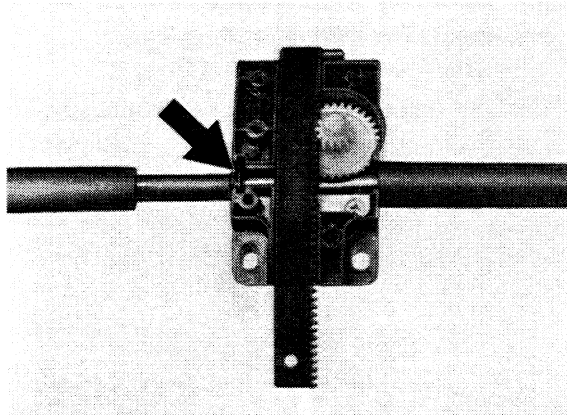
Check the slip clutch of the electric drive prior to installation of the gear – see "Slip Clutch" on page 61 - 39.

1. Inspect gear, replacing if necessary.  
Lubricate and insert gear in guide and raising cable in such a manner, that the element bears on the element guide without tension and without play. Use special grease.



87/972 A

2. Make sure that plastic pipe bears in its guide prior to installation of the element plate. Bolt element plate on the element housing.



87/972 B

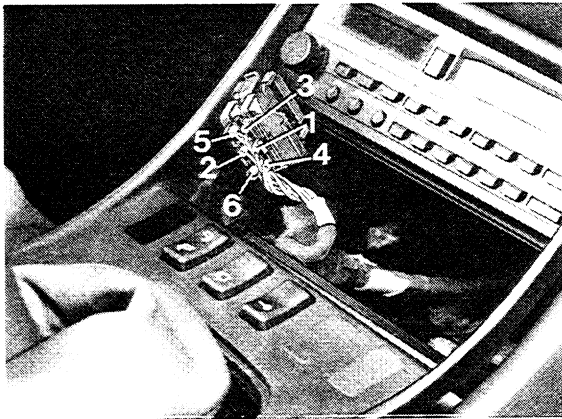
### Remarks

Special grease: TL-VW 745 universal cold grease, see Technical Information No. 2/86 X (Table of Operating Fluids).



## Testing controls of lifting sun roof drive

1. Check fuse number 8 (terminal 30), fuse number 18 (terminal 15) and fuse number 36 (terminal R).
2. Remove lifting sun roof switch and hold open cover on connector.



87/978

3. Perform following tests with a voltmeter or a test lamp:
  - 3.1 Terminal 1 must have battery voltage with the ignition turned on.
  - 3.2 Terminal 2 must have battery voltage with the ignition key in position R (radio position).

- 3.3 Terminal 5 must have battery voltage when the speed is greater than or equal to 1.8 km/h and when the doors on cars with central locking are locked.

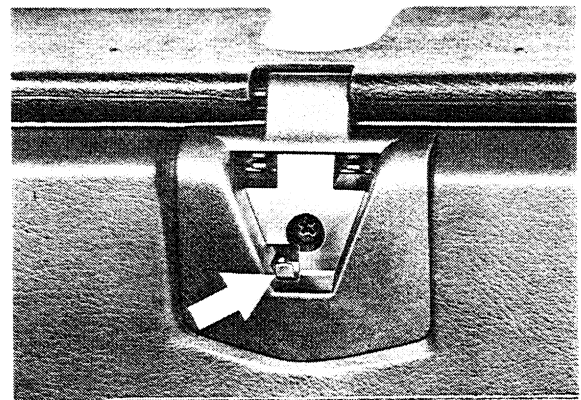
Check lines or replace control unit for lifting sun roof if voltage values are not as specified.

4. Check microswitch in roof opening.

### Note

The microswitch will prevent running out the lifting elements unintentionally after removing the roof.

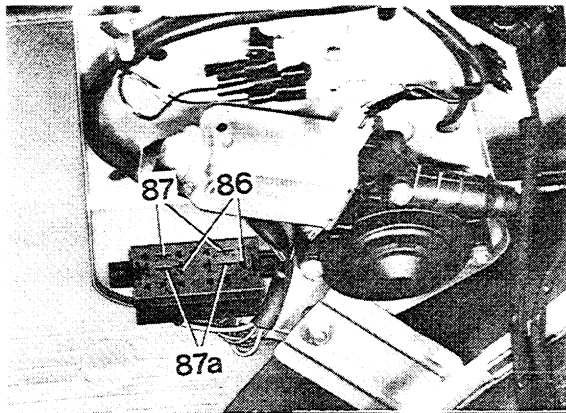
- 4.1 Microswitch must remain in closed position with the roof installed up to the maximum lifting position.
- 4.2 The roof cannot be lifted when the microswitch is open or when a wire is interrupted.
- 4.3 The operating lever on the microswitch must move easily.



11 123 A

## Checking power supply for lifting sun roof motor

1. Check fuse number 1.
2. If fuse is okay, loosen trim panel in luggage compartment at rear left and pull off relay.



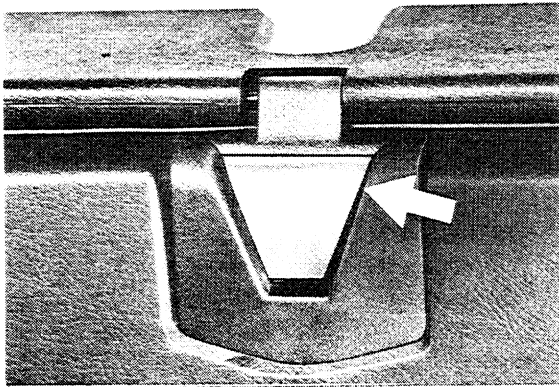
87/983

3. Perform following tests with a voltmeter:
  - 3.1 Both relay socket terminals 87 must have battery voltage.
  - 3.2 Terminals 86 and 87 a must have ground potential.

## Removing and installing sun roof microswitch in roof opening

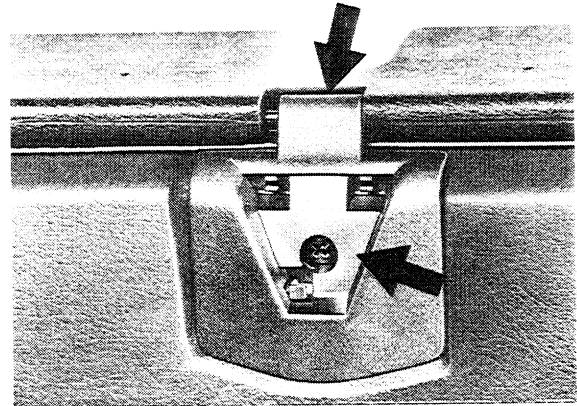
### Removing

1. Unlock and remove lifting sun roof.
2. Remove sun visors and roof frame trim.
3. Disengage operating flap in lifting roof mount with a body spatula.



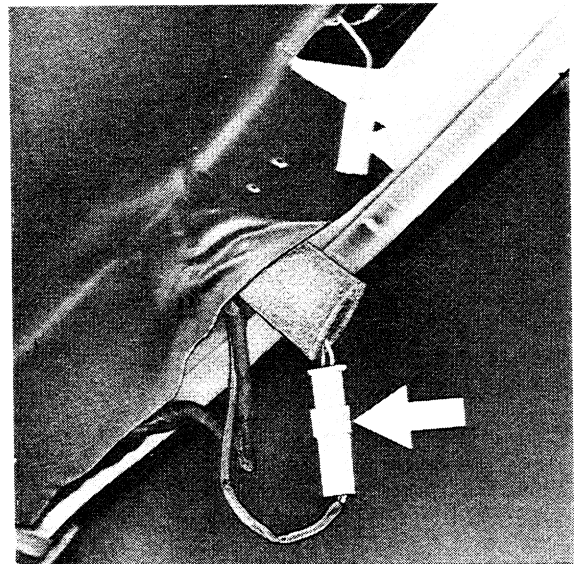
11 124

4. Unscrew lifting roof mount and press out of wind deflector.



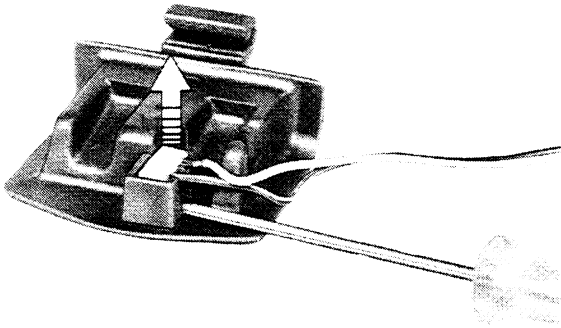
11 123

5. Release roof section and roof frame padding.
6. Disconnect the connector.



87/984

7. Carefully force microswitch out of lifting roof mount using a screwdriver.



87/989

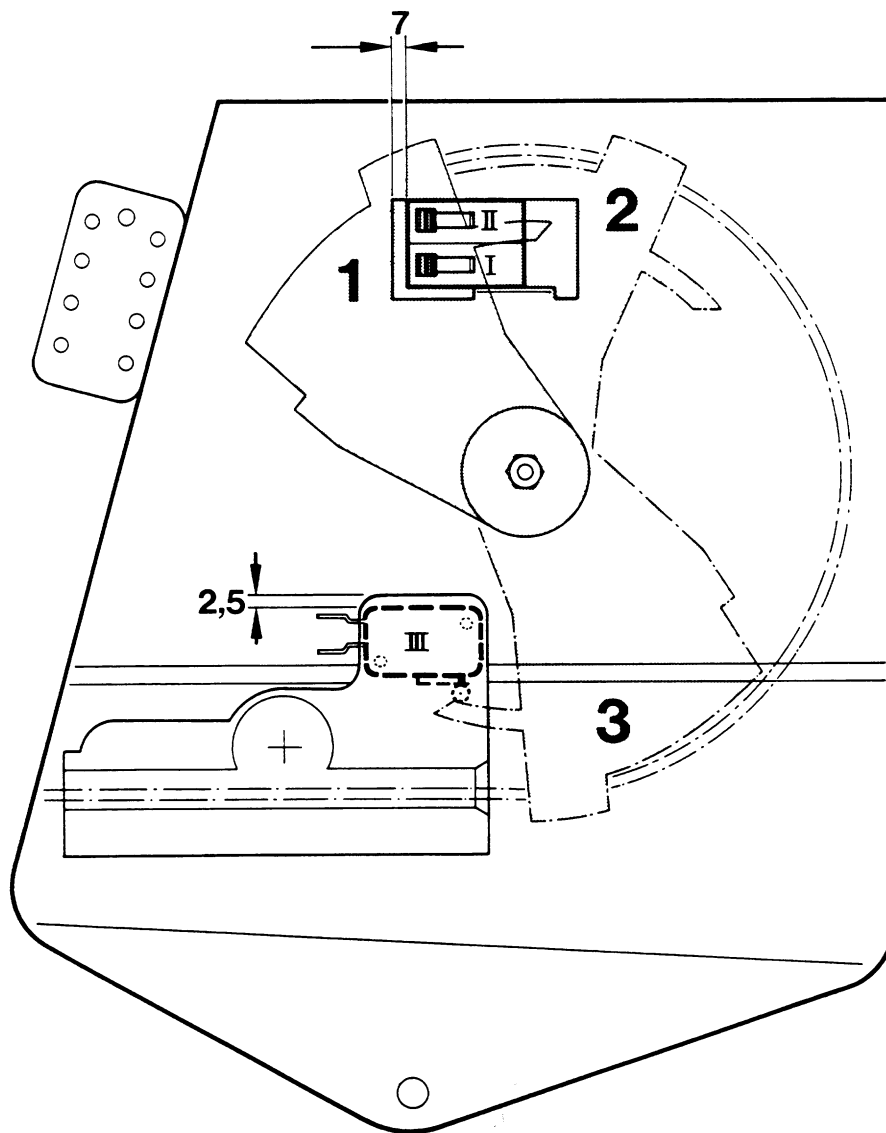
### Installing

#### Note

Be careful not to pinch wires when tightening screws. The operating lever on the microswitch must not jam.

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### Adjusting lifting sun roof microswitch on electric drive



29-61

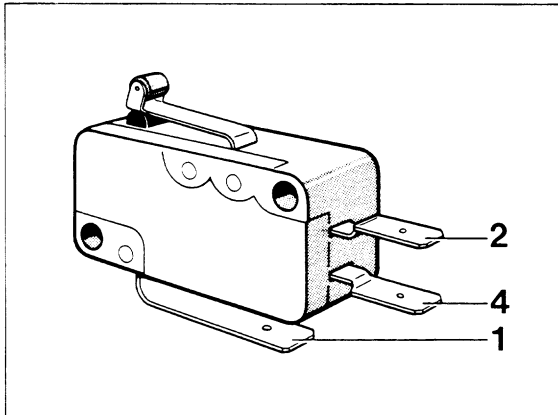
Microswitches I and II can only be adjusted together. In longitudinal direction leave a 7 mm clearance between the outer edges of the microswitches and the recess. In transverse direction they must be adjusted so that they switch reliably, but are not damaged mechanically by the lever. A clearance of 2.5 mm must be observed in the case of microswitch II.

Lever position:

- 1 - released
- 2 - locked
- 3 - open

## Connections on the microswitches

Wire connections on microswitch I



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- 1 - black/red
- 2 - green/red
- 4 - black

Wire connections on microswitch II

- 1 - grey/green
- 2 - not connected
- 4 - grey/black

Wire connections on microswitch III

- 1 - yellow
- 2 - yellow/black
- 4 - not connected

## Slip Clutch

The slip clutch of the electric drive does **not** have to be loosened for manual operation of the lifting roof, as compared with the former version.

### Checking Slip Clutch:

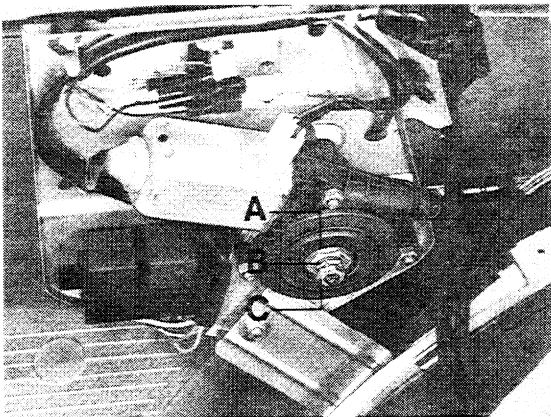
Slip clutch is adjusted in the factory.

This adjustment can be checked by way of the torque required to have the clutch slip as described below.

1. Run out elements to the "lifting roof opened about halfway" position to avoid damaging the gears or raising cable (not necessary when electric drive is disconnected on the raising cable).
2. Turn hexagon nut - **A** - with a size 21 mm wrench socket and torque wrench. The slip clutch must slip at a torque of  $6 \pm 0.5 \text{ Nm}$ .

### Remarks

The breaking loose torque could be considerably greater, so that this test must be repeated six times in steps of 60 degrees.



87/981

### Adjusting Slip Clutch:

The torque must be corrected if the slip clutch test produces any deviation from the specified torque of  $6 \pm 0.5 \text{ Nm}$ .

1. Unscrew lock nut - **C** -.
2. Adjust the torque by turning hexagon nut - **B** - .  
Loosening the hexagon nut reduces the torque.  
Tightening the hexagon nut increases the torque.

### Remarks

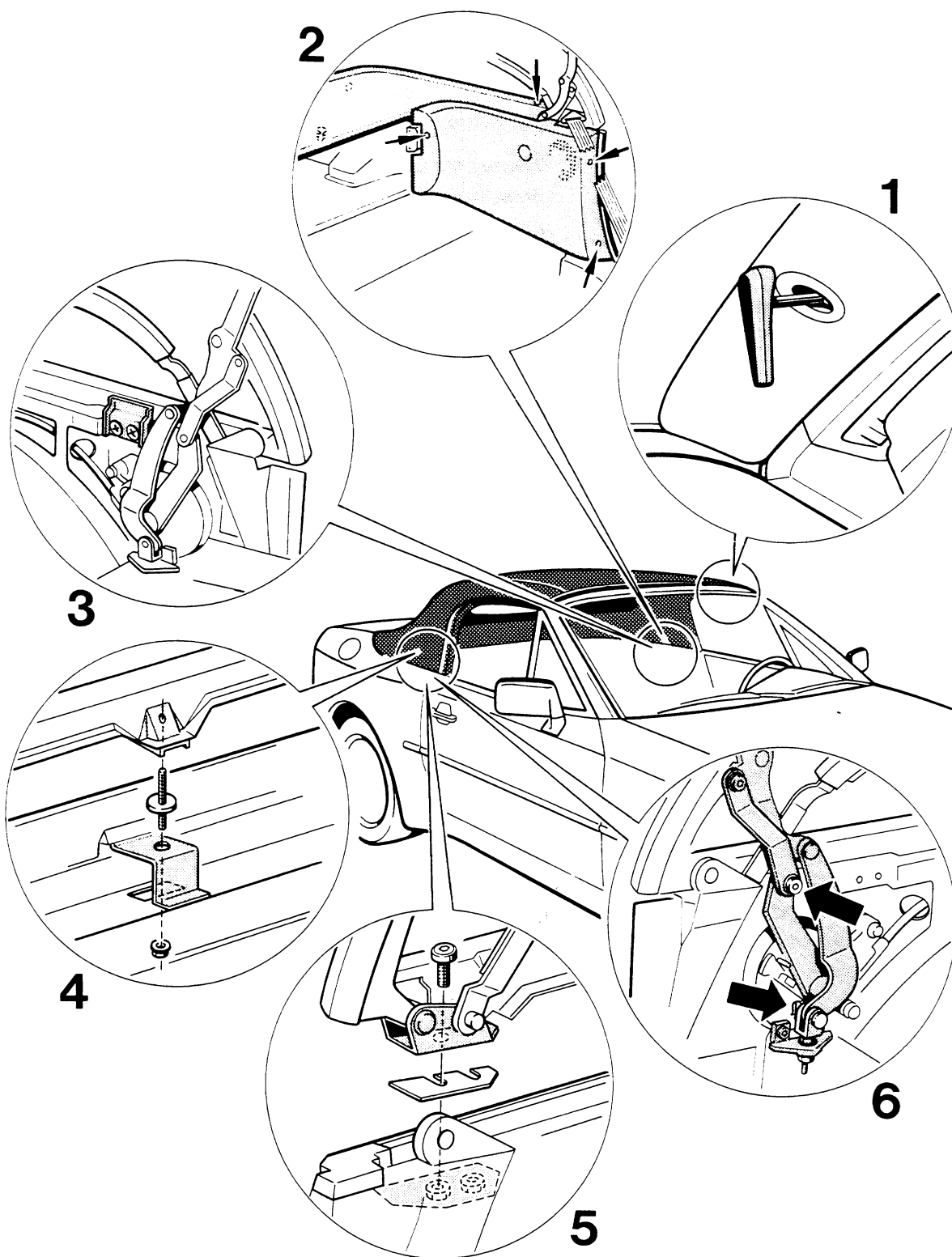
This adjustment should be carried out in very small steps, since turning hexagon nut - **B** - will cause considerable change in torque.

3. Install lock nut - **C** - with **Loctite No. 270** and tighten with  $15 \pm 2 \text{ Nm}$  torque.

A = Hexagon nut for checking torque

B = Hexagon nut for adjusting torque

C = Lock nut

**Removing and installing folding top**



## Removing and installing folding top

### Removing folding top

No.	Task	Instructions
1	Release folding top	Release front of folding top left and right using special handles inside the vehicle and lift off and upwards.
	Fold seat backrests forwards	Release both seat backrests and fold forwards.
2	Remove rear side lining and rear lining	Pull off door gasket at B-pillar from spot welding flange and detach adhesive fastening of rear side lining. Undo screw fastening of rear side lining and take out lining. Undo right and left screw fastenings of rear lining, unclip 8 press studs from hat shelf and remove rear lining.
3	Undo fastening screws of folding top retaining bracket from rear inner side elements	Undo two screw fastenings of rear inner side elements on both left and right.
	Detach luggage compartment lining in area of hat shelf	From luggage compartment side, detach adhesive fastening of luggage compartment lining in area of hat shelf.
4	Undo fastening nuts of folding top retaining bracket in area of luggage compartment	From the luggage compartment side, undo 4 fastening nuts of folding top retaining bracket.
5	Undo screw fastenings of folding top bearings	Raise rear of folding top and undo screw fastenings of both folding top bearings.
6	Undo plug-in fastenings of articulated forks to support struts 1 and screw fastenings of support struts 2 to guide levers	Disengage securing plate from the connecting bolt of articulated fork / support strut 1, press out connecting bolt and detach support strut 1 from articulated fork. Unscrew fastening bolt of support strut 2 from fastening point on guide lever.
	Lift folding top off vehicle	

## Removing and installing folding top

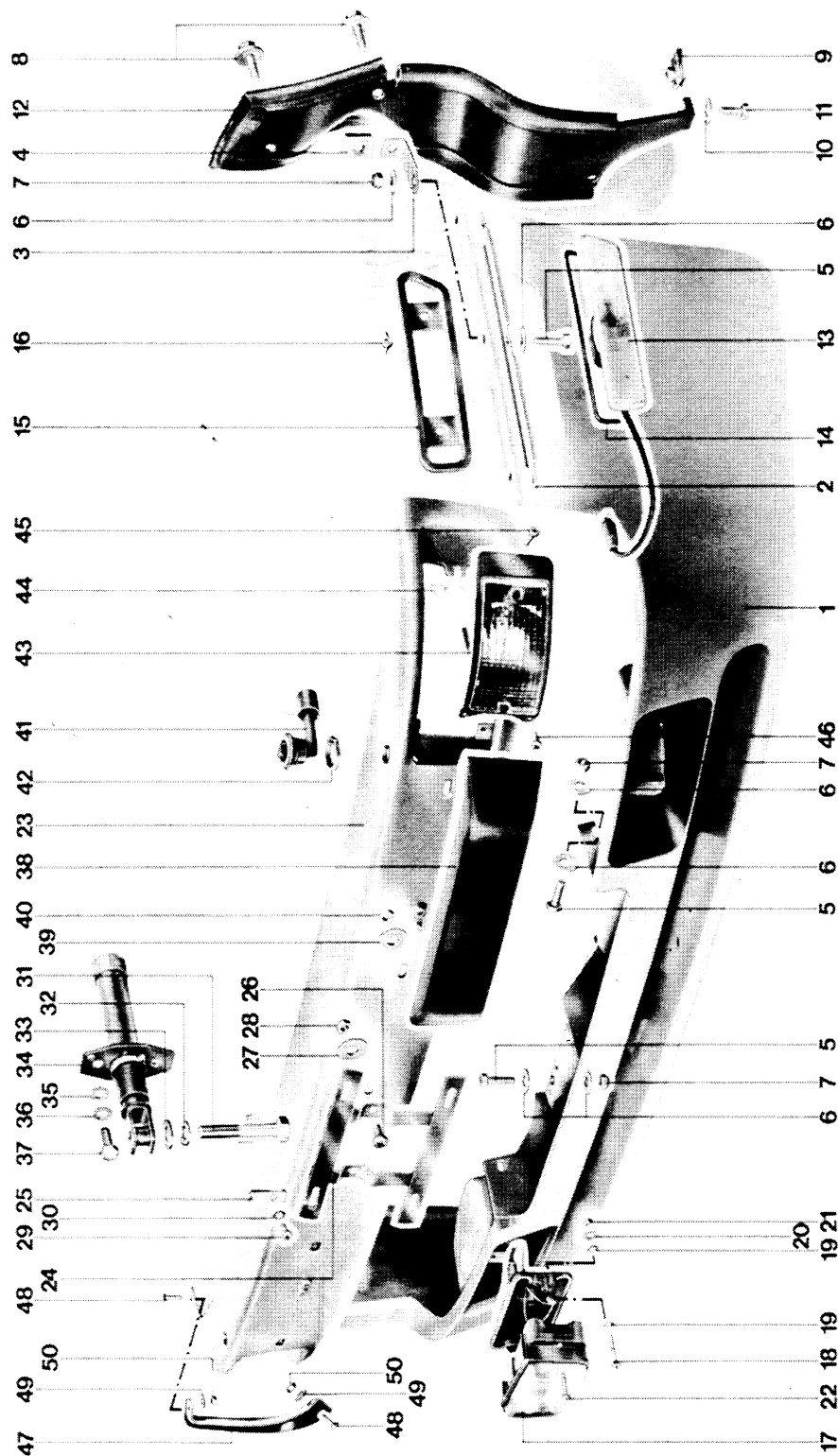
### Installing folding top

No.	Task	Instructions
	Place folding top on vehicle	
	Screw together support struts 2 to guide levers and plug-in fastenings of articulated forks to support struts 1	2 microencapsulated set screws M 8 x 20 2 securing plates 2 connecting bolts <b>Note</b> The microencapsulated set screws must be replaced by new ones!
	Restore screw fastenings of folding top bearings	4 fillister head screws with hexagonal socket heads M 8 x 20
	Bolt on folding top retaining brackets in area of luggage compartment	4 nuts M 6
	Bolt folding top retaining brackets to rear inner side elements	4 sheet metal screws 4.2 x 16
	Fit rear lining	8 Clips 2 sheet metal screws 3.5 x 16
	Fit rear side linings	6 sheet metal screws 3.5 x 16 Dekalin adhesive
	Fit door gasket onto spot welding flange	
	Adjust folding top	Adjust folding top in area of luggage compartment by means of adjusting screws on folding top retaining bracket so it is parallel to body contours
	Bolt folding top retaining bracket into place	Bolt folding top retaining bracket into place in area of luggage compartment
	Glue luggage compartment lining into place	Dekalin adhesive

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REMOVING AND INSTALLING SPOILER AND BUMPER

## REMOVING AND INSTALLING SPOILER AND BUMPER



No.	Description	Qty.	Note When		Special Instructions
			Removing	Installing	
1	Front spoiler	1	Unscrew bolts on fender mounting plate and brace. Disconnect side marker lights and front fog light plugs.	Align with fenders. Apply coat of non-hardening body sealing compound between spoiler and fenders in inside area of flange.	Polyurethane part.
2	Mounting plate	2			
3	Bracket	1			
4	Snap nut	3			
5	Bolt M 6 x 15	6			
6	Washer A 6.4	6			
7	Nut	6			
8	Screw B 6.3 x 19	3			
9	Nut M 6	1			
10	Washer A 6.4	1			
11	Bolt M 6 x 16	1			
12	Cover	1	Unscrew bolts on front spoiler bracket and brace	Position bracket correctly	Polyurethane part
13	Side marker light	2			
14	Gasket	2			
15	Mounting part	1			
16	Nut	4			
17	Front fog light	2			

No.	Description	Qty.	Note When		Special Instructions
			Removing	Installing	
18	Bolt	8			
19	Washer	16			
20	Washer	8			
21	Nut	8			
22	Screw	4			
23	Bumper	1	Disconnect turn signal plugs	Check for uniform distance to body	
24	License plate holder	1			
25	Nut	2			
26	Screw M 6 x 15	2			
27	Washer B 6.4	2			
28	Nut M 6	2			
29	Screw	2			
30	Washer	2			
31	Bolt M 10 x 60	2			
32	Washer B 10	2			
33	Washer A 10.5	2			
34	Impact absorber	2		Adjust to same height as body edge	
35	Washer 8.4	4			
36	Washer B 8	4			
37	Bolt M 8 x 25	4			
38	Rubber guard strip	2			
39	Washer	4			
40	Nut	4			

No.	Description	Qty.	Note When		Special Instructions
			Removing	Installing	
41	Spray jet	2			
42	Nut	2			
43	Turn signal	2			
44	Threaded plate	2			
45	Screw	2			
46	Screw	4			
47	Cover	1			
48	Screw M 4 x 15	2			
49	Washer	2			
50	Nut	2			

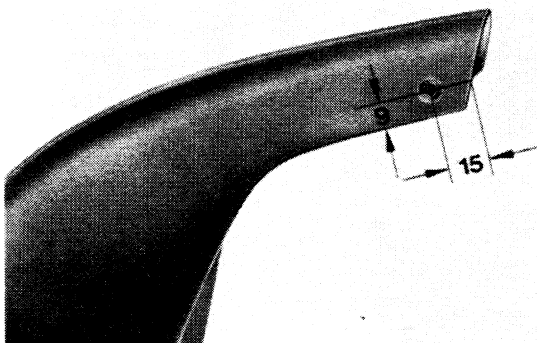
**Note**

If bumper does not have holes for installation of the cover, drill and countersink holes subsequently according to specified dimensions.

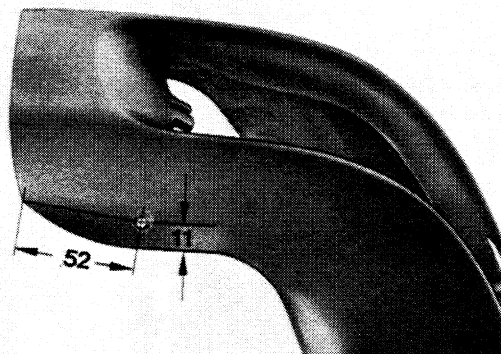
**Note**

(holes only on right side)

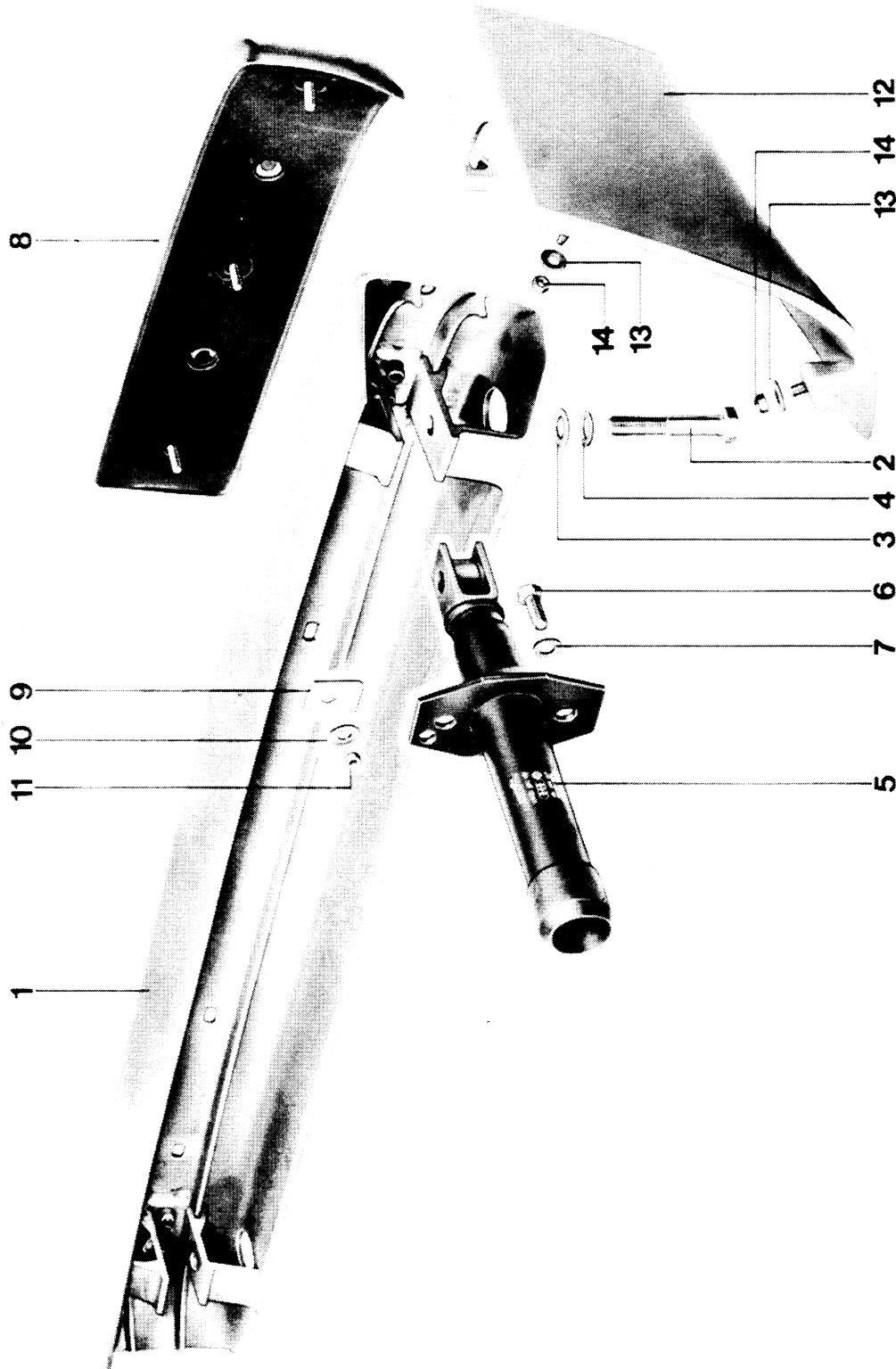
Bumper top right



Bumper bottom right



## DISASSEMBLING AND ASSEMBLING REAR BUMPER



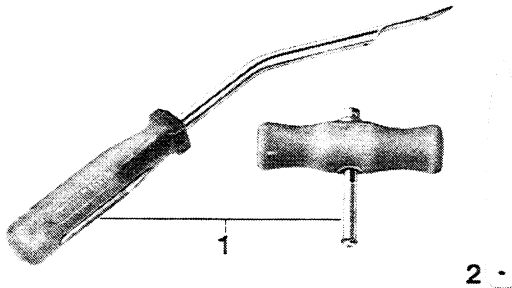


No.	Description	Qty.	Note When		Special Instructions
			Removing	Installing	
1	Bumper	1		Check for uniform distance to body	
2	Bolt M 12 x 65	2			
3	Washer	2			
4	Lockwasher	2			
5	Impact absorber	2	Replace if necessary	Adjust to same height on left and right sides	
6	Bolt M 8 x 20	4			
7	Lockwasher	4			
8	Bumper overrider	2	Replace if necessary		
9	Overrider bracket	6			
10	Washer	6			
11	Nut M 6	6			
12	Cover	2		Check for neat fit on bumper and side panel	
13	Washer	4			
14	Nut M 5	4			

## REMOVING AND INSTALLING WINDSHIELD

## Tools

- 1 Cutting tool
- 2 Plastic wedge
- 3 Two double-suction cups
- 4 Manual cartridge gun



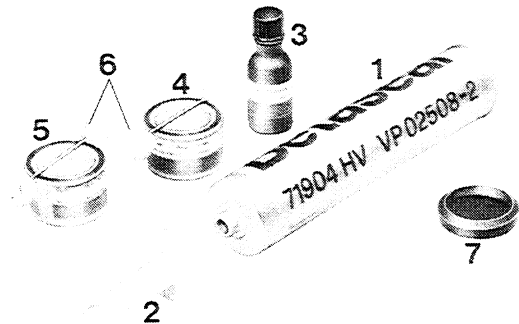
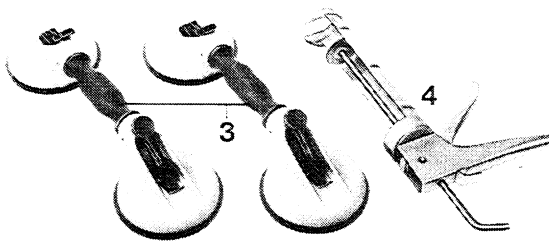
## Standard Tools

Carpet knife, combination pliers, protective goggles and leather gloves.

## Adhesive Sealing Set

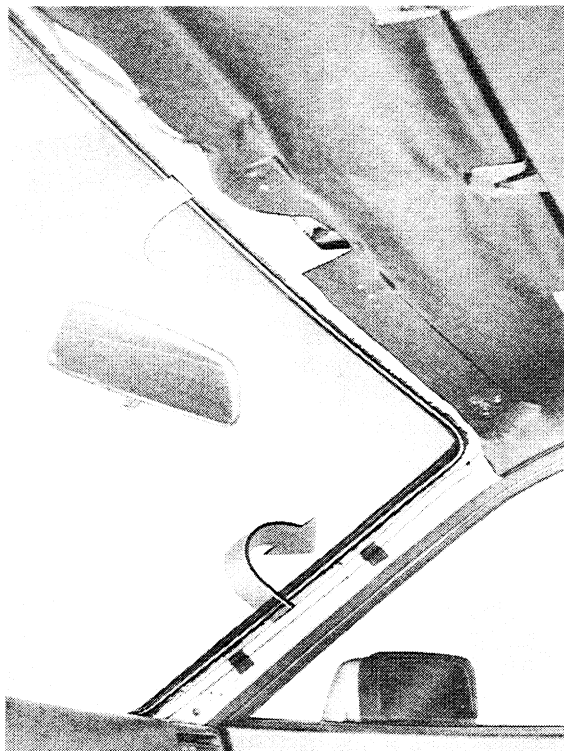
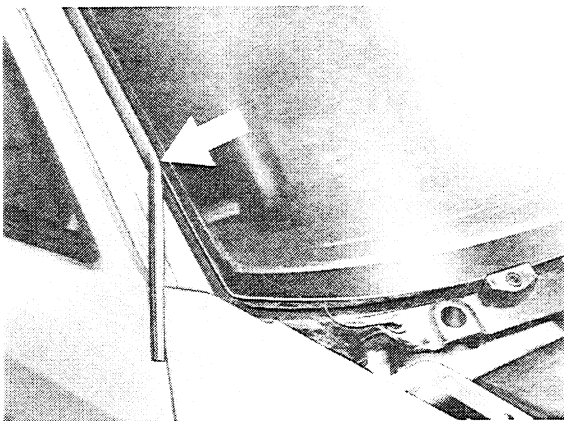
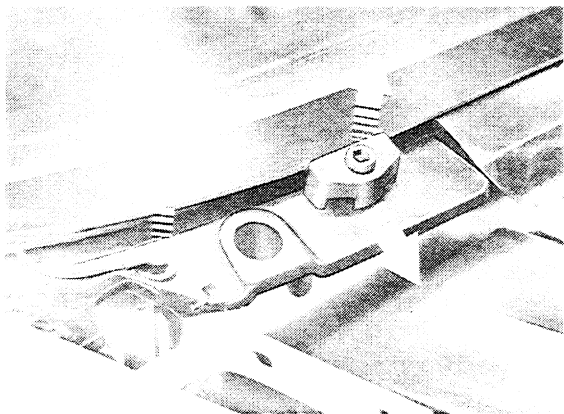
consisting of:

- 1 Adhesive sealing material in 300ml cartridge
- 2 Injection nozzle
- 3 Cleaning solution 20 ml
- 4 Body primer 30 ml
- 5 Glass primer 30 ml
- 6 Primer application tool
- 7 Cutting wire 0.5 mm x 1.8 m

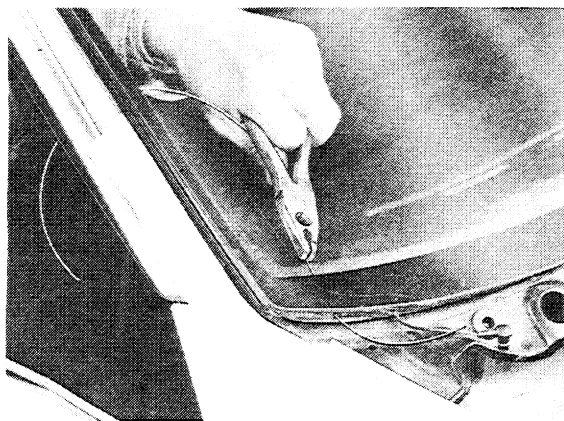


## Removing

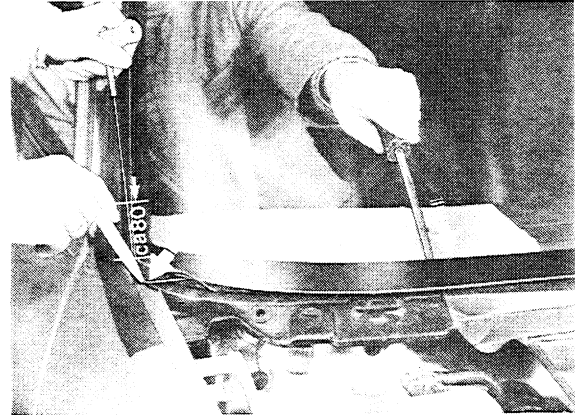
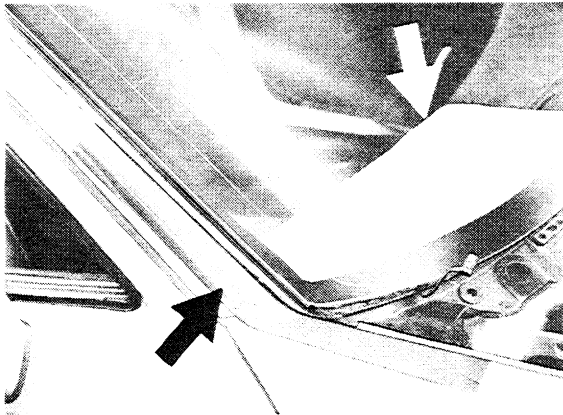
1. Remove engine hood, windshield wipers, sun visors, trim panel on front roof beam and trim panels on A pillars.
2. Unplug windshield antenna. Unscrew eccentric and lift off from above. Push out upper spacer parts forward. Pull cover strip out of holder.
3. Bend open spacing frame in area of A pillars and roof beam from the inside with a suitable tool.



4. Cut off half of cutting wire and puncture through adhesive sealing material with end of wire from the inside with help of a pliers.



5. Cover areas subject to damage.

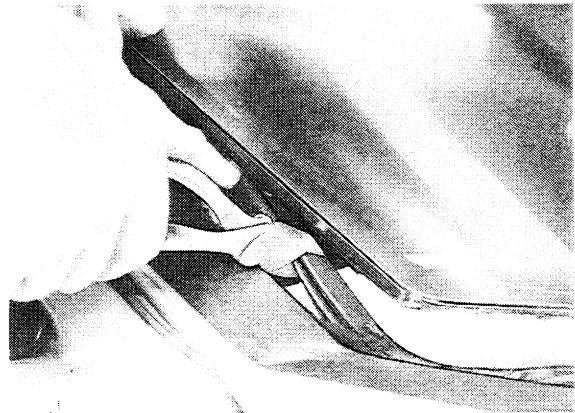
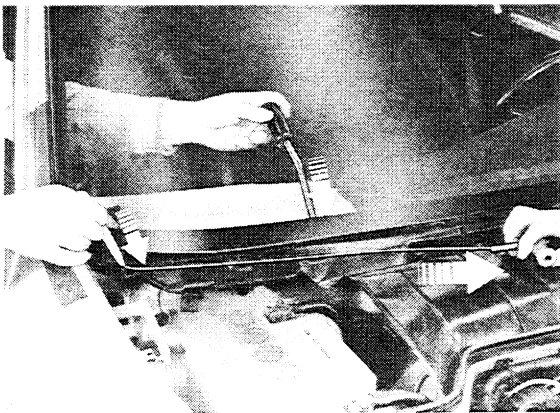


6. Mount cutting tool on ends of wire. Insert cutting tool into glued seal from inside in order to avoid damaging the window glass and antenna. Press down wire with a plastic wedge and cut through cemented seal.

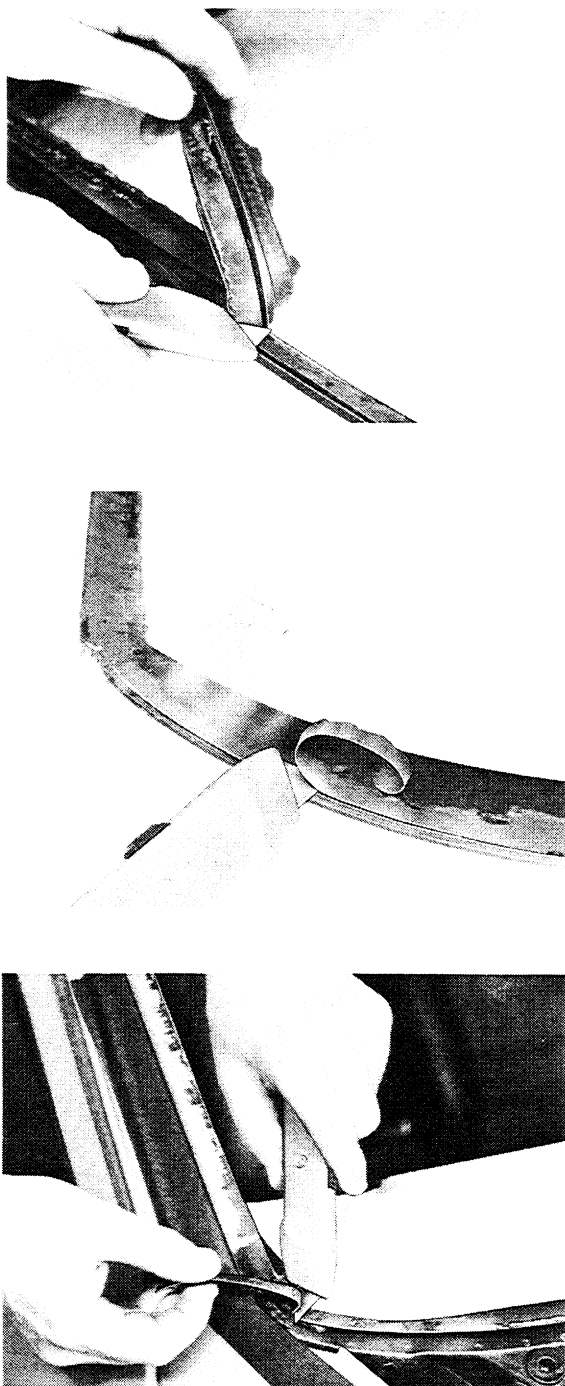
7. Lift window glass at bottom slightly and cut off spacing frame on left and right sides. Take windshield glass out of body opening.

#### Note

Do not saw, since this would cause the wire to heat up and break

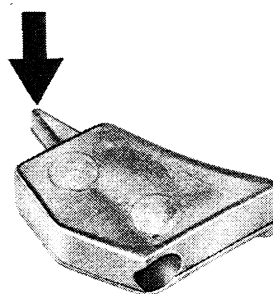
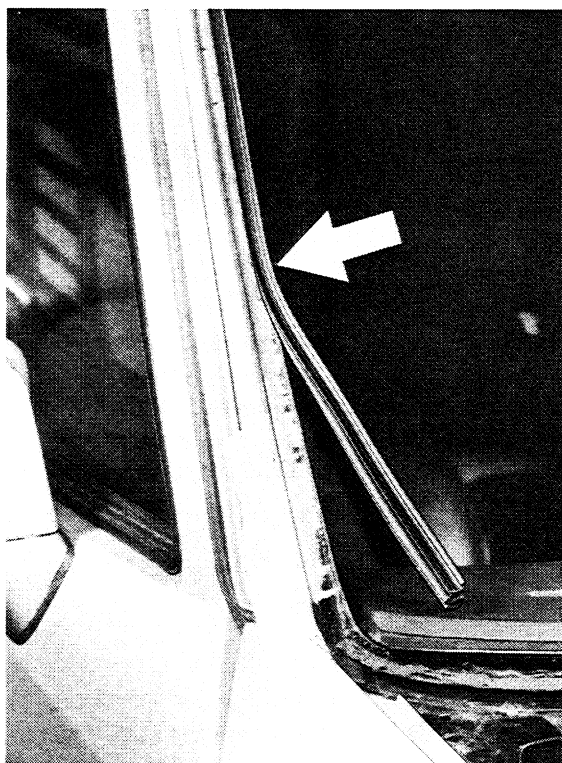


8. Remove spacing frame and remaining cemented seal from the windshield and body opening edges with a carpet knife only to the extent, that a surface covering residual cement remains and the windshield and lower body opening edge do not have to be primed.

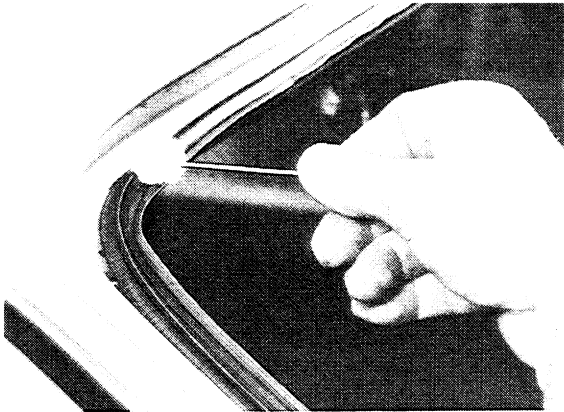


## Installing

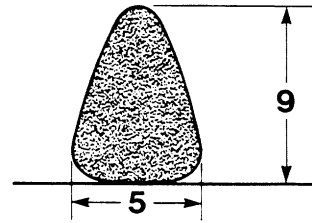
1. Install new spacing frame on body opening edge, checking for good seating. Coat tabs of sealing plugs with cement prior to installation.



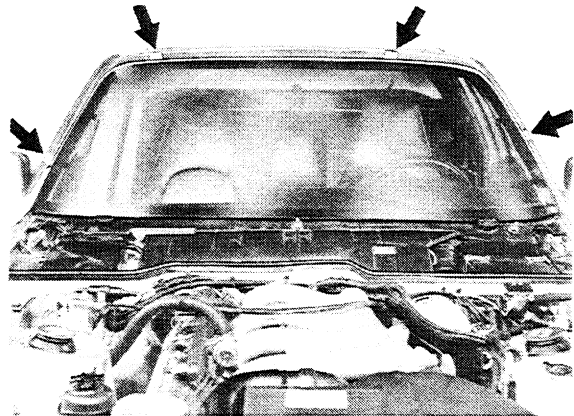
2. Clean spacing frame with a lintless rag and cleaning solution, and wipe off afterwards. Apply coat of body primer and allow it to air dry.



3. Heat cartridge in a water bath having a temperature of 40 to 60° C about 30 minutes prior to applying coat of cement. Apply a tapered bead of cement on the entire body opening edge for the windshield.



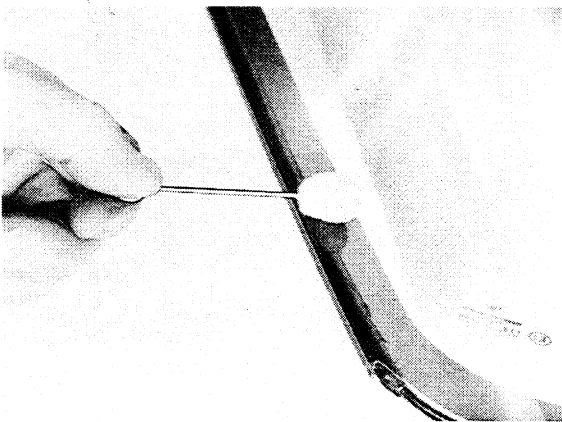
4. Mount spacers and insert eccentric. Install doublesuction cups on windshield on spacers and tilt into windshield frame. Adjust the windshield on the eccentrics to have a gap of 2 + 1 mm between the glass and body.



**Note**

The cement must have a drying temperature of at least + 15° C, since lower temperatures would impair the process considerably. High moisture or sprinkling water on the cement will accelerate drying. In spite of this, the car must not be moved or operated before 3 hours drying time.

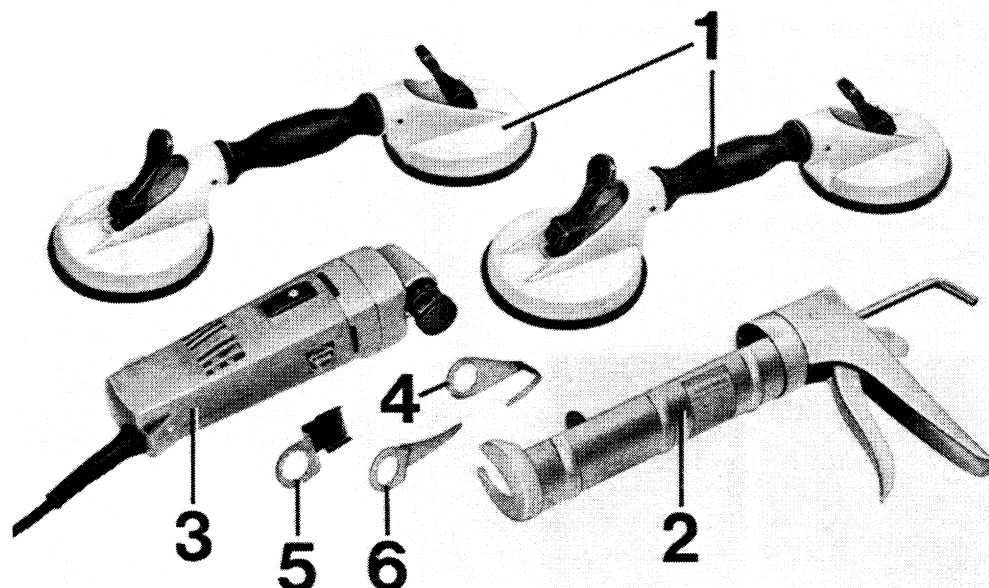
5. Press cover strip into holder.
6. Clean glass to remove residual cement. Install A pillar trim panels, roof beam trim panel, sun visors, windshield wipers and engine hood.
7. When installing a new windshield, the glass must be cleaned with a cleaning solution and coated with glass primer in the area of the filter print. The coat of primer must not extend beyond the filter print.

**Note**

Sekuriflex windshields must not be prime coated!

# REMOVING AND INSTALLING WINDSHIELD (SEKURIFLEX WINDSHIELD AND VEHICLES EQUIPPED WITH AIRBAGS)

## Tools

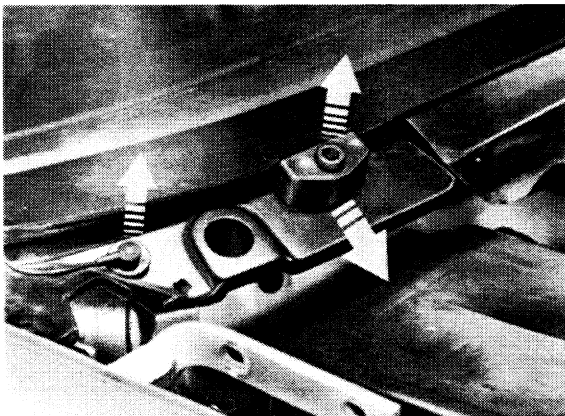


No.	Description	Special Tool	Remarks
1	Double suction cup	V.A.G. 1344	VW Co. Ltd. Customer Service Equipment Sales
2	Cartridge adhesive gun	V.A.G. 1344/1	
3	Cutting tool	V.A.G. 1561	
4	U-shaped blade	Commercially available	639 031 140 14*
5	Scraper	Commercially available	639 031 130 22*
6	Cranked blade	Commercially available	639 030 720 17*
			* Items 4-6 e.g. C. & E. Fein GmbH & Co. P.O.Box 172 7000 Stuttgart 1



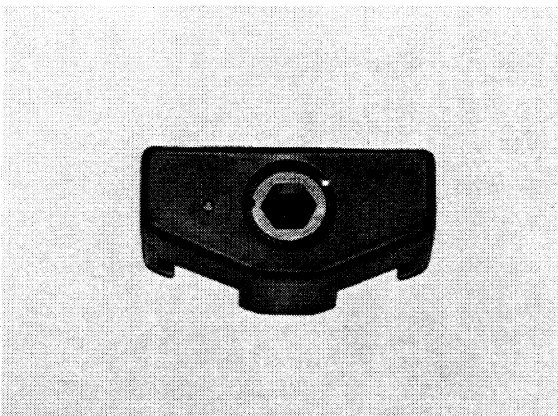
## Removing

1. Remove engine compartment hood, windshield wipers, cover strip for antenna cable, sun visors, rear-view mirror, trim panel on front roof beam and trim panels on A pillars.
2. Unplug windshield antenna. Unscrew eccentrics and lift off. Remove spacers by pushing forward.

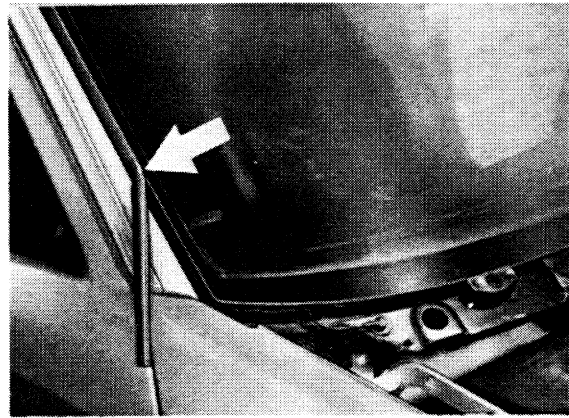


### Note

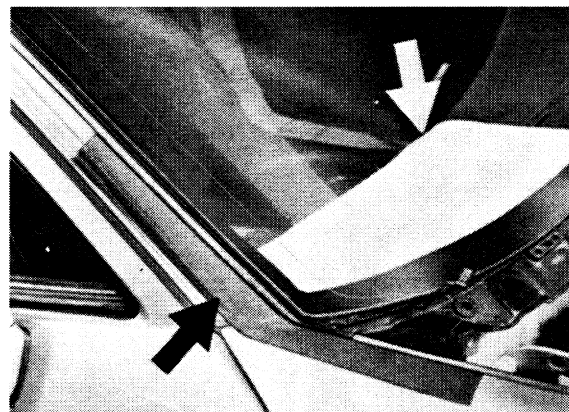
When eccentric is lifted off, notch must point toward mark on spacer.



3. Pull cover strip from holder.



4. Cover exposed areas and open side windows to avoid damage.



### Note

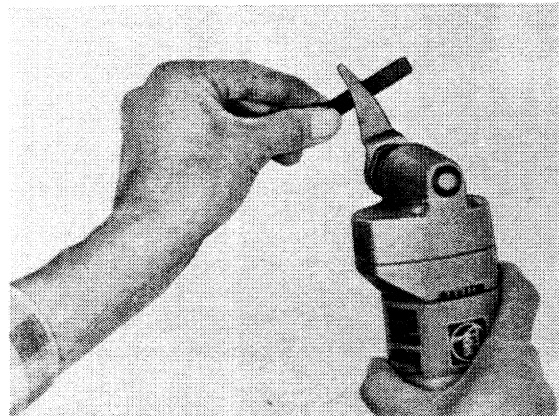
Do not reclose the side windows until the cement curing time has elapsed.

5. Fit cranked blade in cutting tool and set vibration regulator to stage 3. Working from inside the car, cut through bonding bead between windshield and body seam along the A pillars and the front roof beam.



#### N o t e

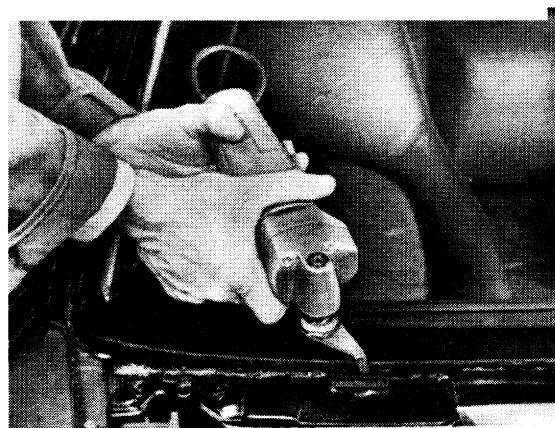
Always sharpen blades on the whetstone with cutting tool running immediately before use.



6. Working from outside the car, scrape all traces of cement off edge of windshield.

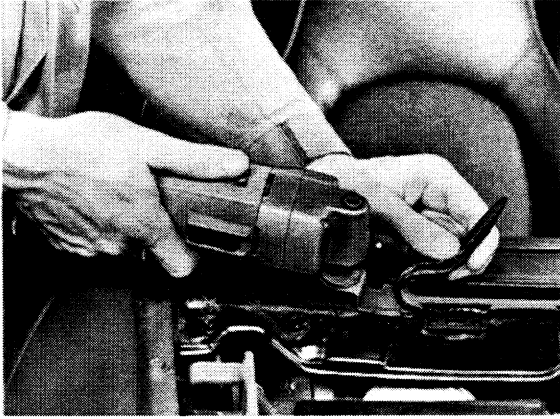


7. Fit U-shaped blade in cutting tool and set vibration regulator to stage 6. Insert the blade with the cutting edge parallel to the cutting tool. Working from outside, cut through the rest of the cement film along the scuttle.

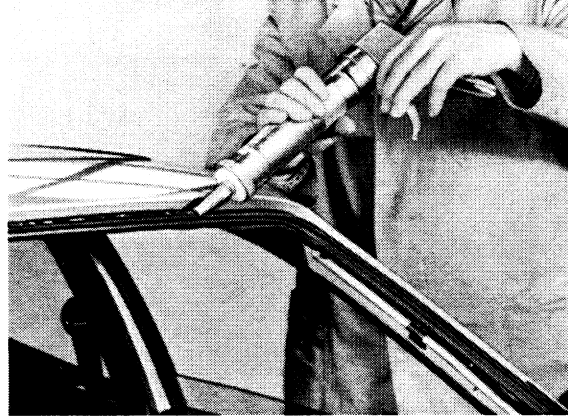


8. Lift glass out of frame.

9. Use scraper to remove remaining cement from body seam until only a thin film is left on the entire surface.



4. Apply a tapered bead of cement right round body seam.



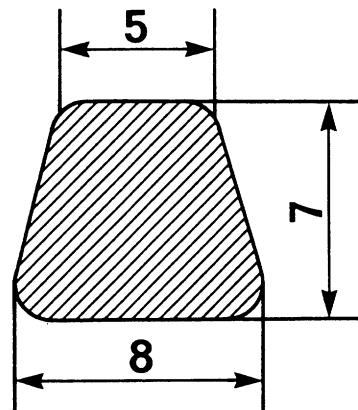
### I n s t a l l i n g

1. Clean body seam with cleaning solution and wipe off with a paper towel.

### N o t e

Ensure that no traces of cleaning solution are left on the bonding surface.

2. Apply primer to body seam. Do not prime painted areas which remain visible.
3. Apply activator to contact face of Betaseal sealing strip of Sekuriflex windshield. Wait for at least 10 minutes before proceeding to allow air to escape. Do not prime the Sekuriflex windshield (Betaseal sealing strip).



5. Install spacers and insert eccentrics. Set windshield on spacers and lower into frame. Adjust eccentrics to position windscreen so that at the top, a gap of approx. 2 mm is left between glass and body.
6. Press cover strip into holder.
7. Clean all traces of cement from glass and connect windshield antenna. Mount A-pillar panels, roof-beam panel, sun visors, windshield wipers, rear-view mirror, antenna cable cover and engine-compartment hood.

#### N o t e

To assure adequate strength in the adhesive bond, the following boundary conditions must be observed before the car leaves the workshop:

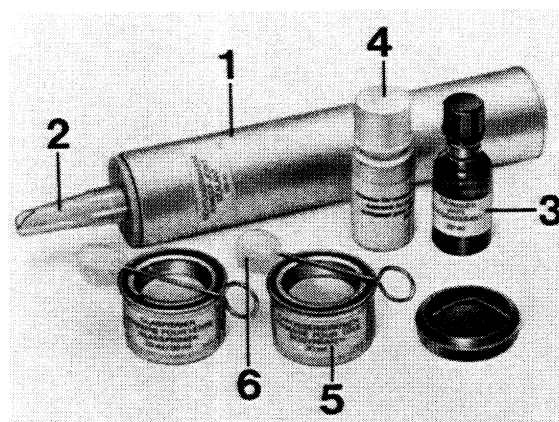
Curing time	min. 10 h
Temperature	min. 15°C
Relative air humidity	min. 40%

If temperatures or relative air humidity are lower, more time must be allowed for curing.

Do not move the car or start the engine until the curing time has elapsed.

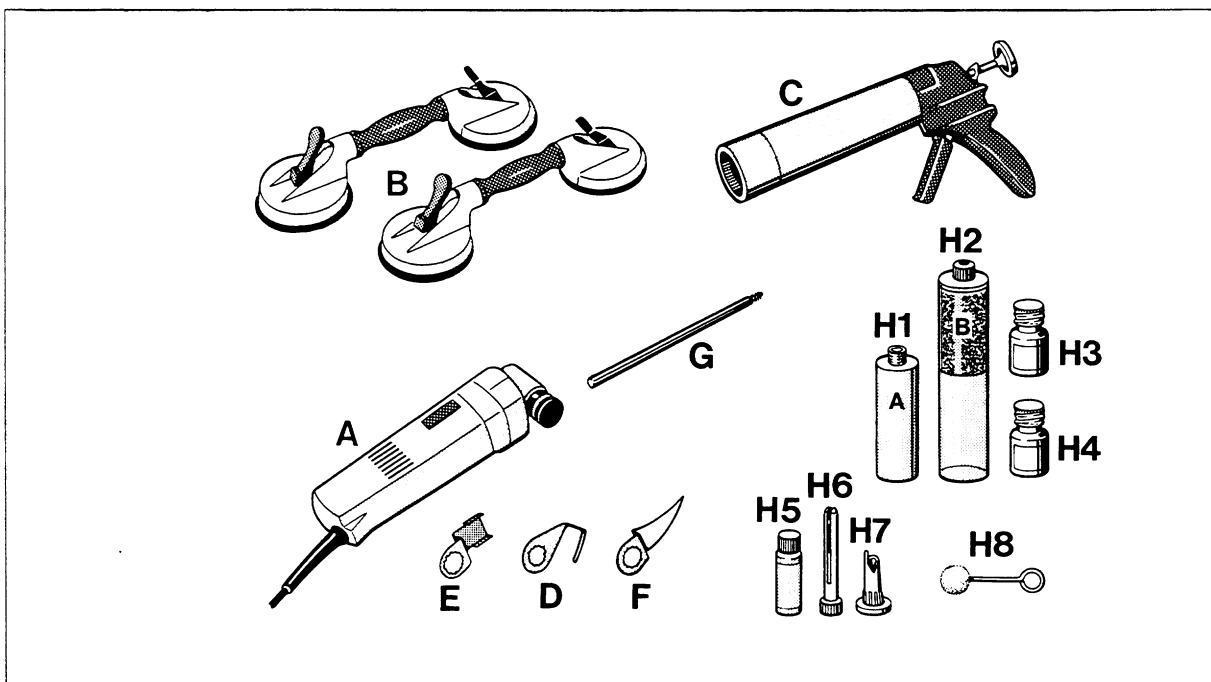
#### Adhesive sealing set:

- 1 Adhesive sealing material cartridge
- 2 Injection nozzle
- 3 Cleaning solution
- 4 Activator
- 5 Body primer
- 6 Swab



## Removing and installing windshield – 2-pack adhesive

The following tools and materials are required for removal and installation of the windshield:



745 - 64

A	Cutter	VAG 1561	e.g. VW Werk AG
B	Twin-cup suction puller	VAG 1344	Service equipment supply
C	Bonding gun	VAG 1628	
D	Cutting knife, U-shape	639.031.140.14	e.g. C & E FEIN GmbH & Co.
E	Flashing knife	639.031.130.22	P.O. Box 172
F	Cutting knife, cranked	639.030.720.17	7000 Stuttgart 1
G	Mixing rod 9528	000.721.952.80	Porsche Parts Department
H	Adhesive set	000.043.038.01	
H1	- Cartridge component A		
H2	- Mixing cartridge comp. B		
H3	- Primer		
H4	- Activator		
H5	- Cleaning solution		
H6	- Injector nozzle		
H7	- Application nozzle		
H8	- Touch-in tool		

## Removing and installing windshield – 2-pack adhesive

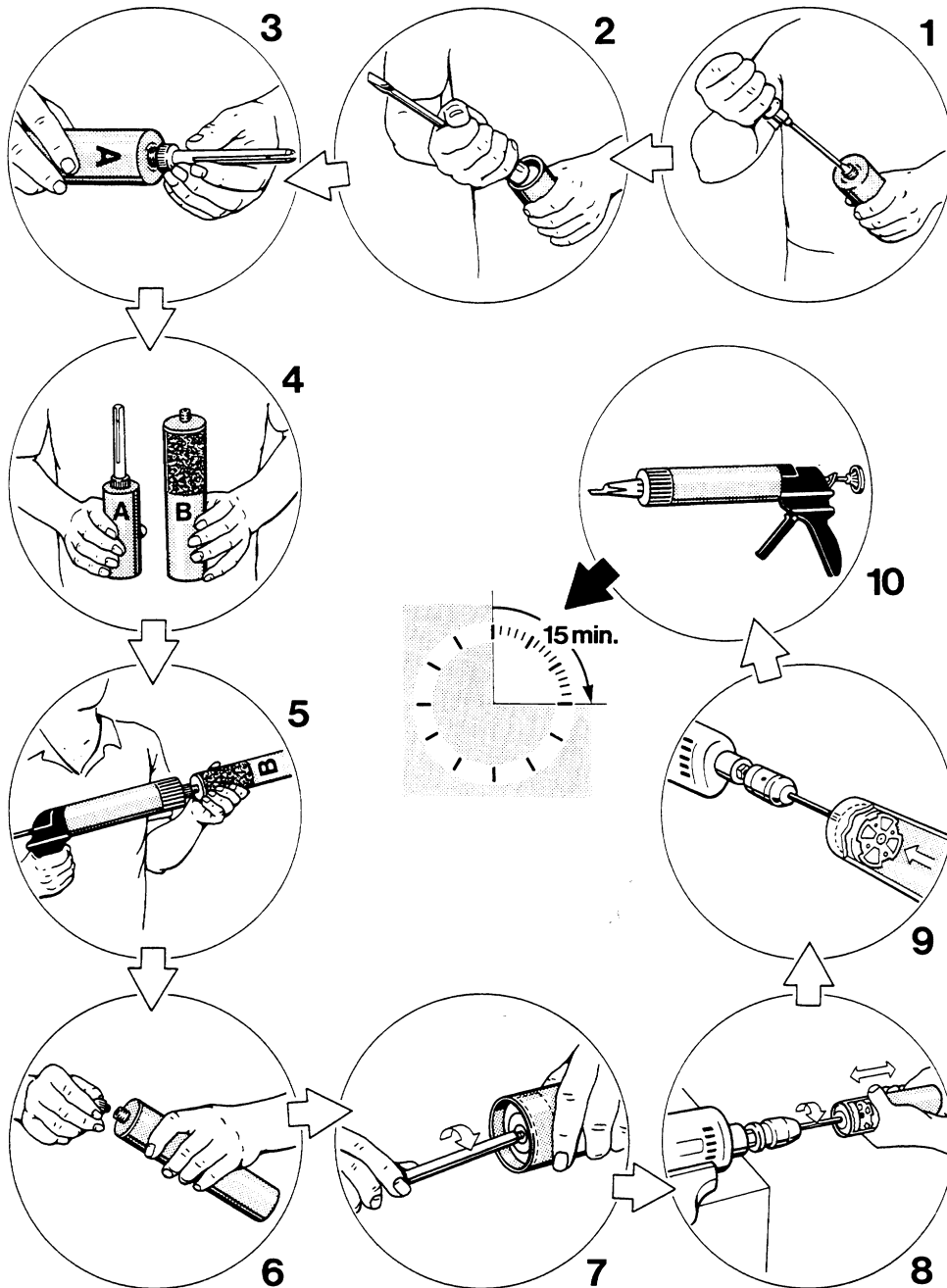
Removal of the windshield is identical to "Removing and installing the bonded windshield, page 64 - 8 to 64 - 10".

No.	Operation	Instructions
	Remove interior in the windshield area	Remove sun visors, interior rearview mirror, front roof rail lining and A-post lining.
	Remove exterior parts in the windshield area	Remove front cover, windshield wipers, antenna cable cover molding and spacers. Disconnect windshield antenna connector and remove windshield cover molding.
	Spread protective cover over instrument panel	Cover instrument panel to avoid staining or damaging the panel.
	Open door windows	<b>Caution: The door windows must not be closed before the adhesive has cured completely!</b>
	Cut out windshield in roof rail and A-post area	Insert cranked knife (F) into cutter (A). Set vibration regulator to stage 3. Cut bonding between windshield and body from inside (passenger compartment) along A-posts and roof rail. Cut off protruding adhesive from outside directly along edge of windshield.
	Cut out windshield in instrument panel area	Insert U-shaped cutting knife (D) into cutter (A). Insert cutting knife in such a manner that the cutting edge is parallel to the cutter. Set vibration regulator to stage 6. Cut through remaining bonding of the windshield from outside along the instrument panel.

No.	Operation	Instructions
	Remove windshield	
	Apply adhesive to body	Insert flashing knife (E) into cutter (A) and remove adhesive only to the extent that the remaining adhesive cover the whole area in a uniform manner.
	Clean windshield aperture of bodywork	Clean windshield aperture of body thoroughly using cleaning solution (H5). <b>Caution: Make sure no residue of the cleaning solution remain on the bodywork.</b>
	Apply primer to damaged areas of bodywork	Use primer (H3) to coat damaged areas in non-visible section of windshield aperture.
	Activate bonding section of windshield	Apply activator (H4) to bonding section of pre-coated windshield. <b>Caution: Allow a flash-off time of at least 10 minutes!</b>

## Removing and installing windshield – 2- pack adhesive

### Preparing the adhesive cartridge for application of adhesive



746 - 64



No.	Operation	Instructions
<b>Preparing the adhesive cartridge for application of adhesive</b>		
1	Open nozzle fitting of cartridge containing component A	Use a screwdriver to pierce the diaphragm in the nozzle fitting of the cartridge containing component A (H1).
2	Open flanged cover of cartridge containing component A	Use a screwdriver to pierce the flanged cover at the end of the cartridge containing component A (H1).
3	Screw injector nozzle to cartridge containing component A	Screw injector nozzle (H6) to cartridge containing component A (H1).
4	Insert cartridge containing component A into bonding gun	Insert cartridge containing component A (H1) into bonding gun (C). Remove screw-on cap from mixing cartridge containing component B (H2).
5	Press component A into mixing cartridge containing component B	Insert injector nozzle (H6) of cartridge containing component A (H1) into mixing cartridge containing component B (H2). Use bonding gun (C) to press component A into mixing cartridge (H2) containing component B.
6	Close mixing cartridge	Pull injector nozzle out of mixing cartridge and close mixing cartridge with screw-on cap.
7	Screw mixing rod into mixing cartridge	Screw mixing rod (G) manually into internal thread of mixing disc in the mixing cartridge. Clamp other end of mixing rod into a drill chuck. Fit the drill into a suitable clamp.

No.	Operation	Instructions
8	Mix component A and component B	Turn on drill (700 to 900 rpm) and rotate mixing cartridge approx. 25 times from stop to stop. Perform all 25 double strokes fairly rapidly.
9	Engage mixing disc into piston	Pull back mixing cartridge until a rattling sensation is felt. Turn off drill and screw mixing rod out of mixing cartridge. The mixing disc will then engage into the piston of the mixing cartridge.
10	Insert mixing cartridge into bonding gun	Insert mixing cartridge with mixed 2-pack windshield adhesive into bonding gun. Screw application nozzle (H7) onto mixing cartridge.

**Caution: Open time is 15 minutes!**

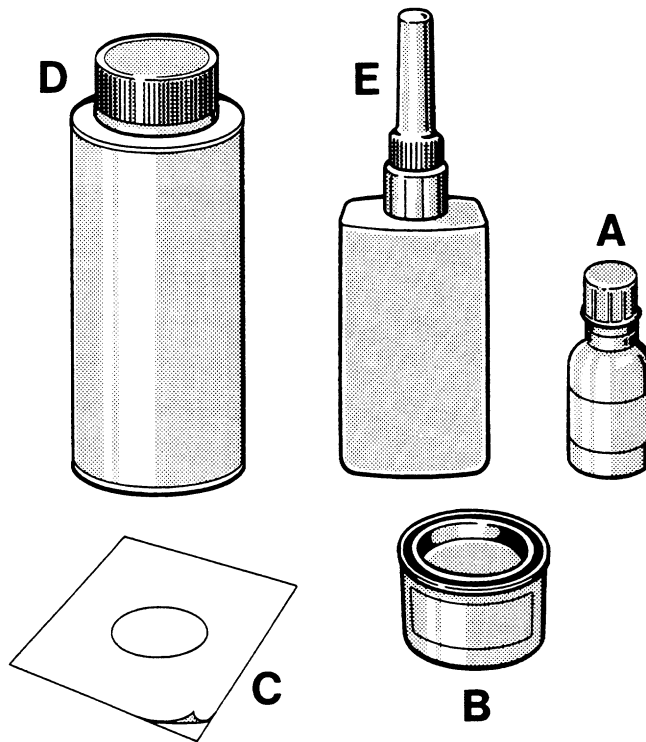
**Open time is the time available for application of the adhesive and for installing the windshield into the body aperture.**

Apply adhesive to the bodywork	Apply a trapezoidal continuous bead of 2-pack adhesive to the body flange using the bonding gun.
Install spacers	Push on spacers and insert eccentric adjusters.
Insert windshield into body aperture	Set up windshield on spacers and tilt into windshield aperture. Use the eccentric adjusters to adjust the spacers in such a manner that a 2 mm gap remains in the roof area between windshield and bodywork.
Clean visible areas	Remove adhesive that has squeezed out immediately and clean the visible areas affected using cleaning solution (H5).



## Bonding the interior rearview mirror in place

The following materials are required for bonding of the complete interior rearview mirror:



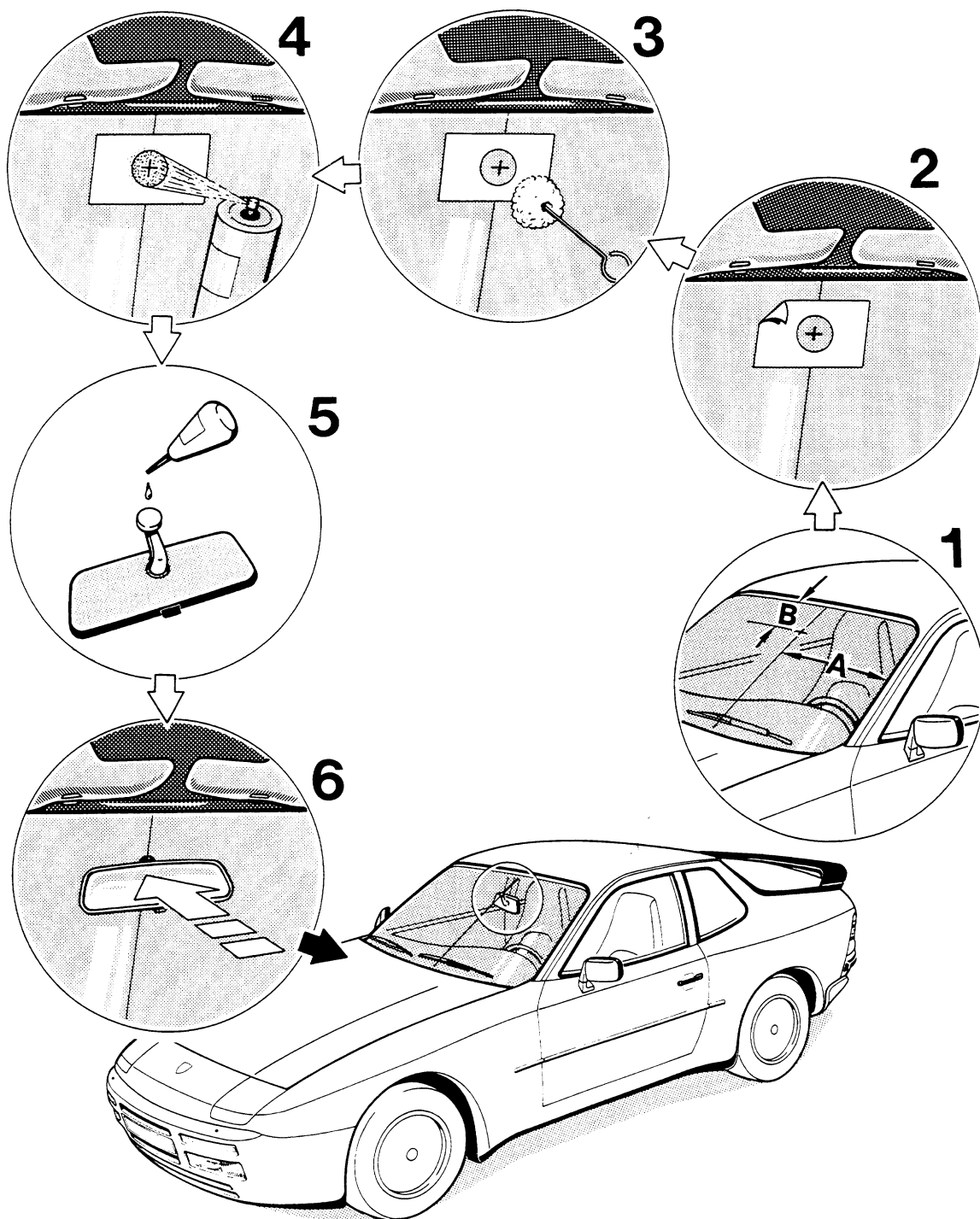
752 - 64

- A = Cleaning solution (000.043.157.00)\*
- B = Primer (000.043.158.00)\*
- C = Cover sheet (000.043.177.00)\*
- D = Activator (000.043.052.00)\*
- E = Adhesive (000.043.051.00)\*

\* Porsche part no.

## Bonding the interior rearview mirror in place

Bonding the fully assembled interior mirror to the windshield



## Bonding the interior rearview mirror in place

### Bonding the fully assembled interior mirror to the windshield

No.	Operation	Instructions
1	Mark position of interior rearview mirror	Mark position of adhesive plate on outside of windshield. <b>Cabriolet:</b> Dimension A = 623 mm Dimension B = 84 mm <b>Coupé :</b> Dimension A = 623 mm Dimension B = 142 mm
	Remove adhesive residue	Remove adhesive residue from windshield mechanically using a scraper. Remove adhesive residue from bonding plate of rearview mirror mechanically using a scraper.
	Roughen bonding plate of rearview mirror	Roughen bonding plate of rearview mirror mechanically using sanding paper.
	Clean bonding plate of rearview mirror	Clean bonding plate of rearview mirror using <b>cleaning solution (A)</b> .
	Clean bonding area of windshield	Clean bonding area of windshield using <b>cleaning solution (A)</b> .
2	Mask off bonding area of windshield	Mask off bonding area of windshield using <b>primer template</b> (cover sheet C). The position mark of the interior rearview mirror must be visible in the middle of the primer template.
3	Prime bonding area of windshield	Apply a thin coat of <b>primer (B)</b> to the masked bonding area of the windshield.  <b>Caution: Allow a flash-off time of 15 to 20 minutes!</b>
4	Activate bonding area of windshield	Spray activator (D) onto bonding area of the windshield.  <b>Caution: Allow a flash-off time of 2 minutes!</b>

No.	Operation	Instructions
	Remove primer template	
5	Apply adhesive to bonding plate	Apply a drop of <b>adhesive</b> (E) to the bonding plate of the rearview mirror.
6	Bond rearview mirror in place	Press bonding plate of rearview mirror against primered and activated windshield area.

**Note: Press mirror in place for approx. 40 – 50 sec.!**

**Note:**

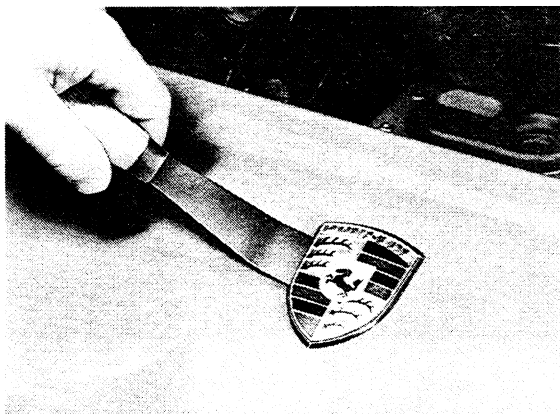
**Bonding strength**

**60 % after 1 hour**

**100 % after 24 hours**

## REMOVING PORSCHE EMBLEMS

Slide a suitable tool between the PORSCHE emblem and liner and lift off from above.



Important!

Be careful not to damage the paint!

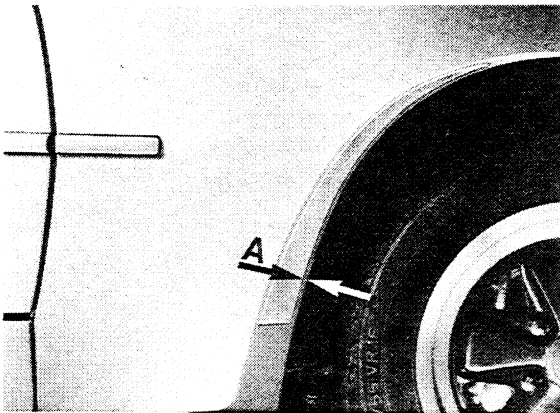


## REPLACING STONE PROTECTION SHEETS

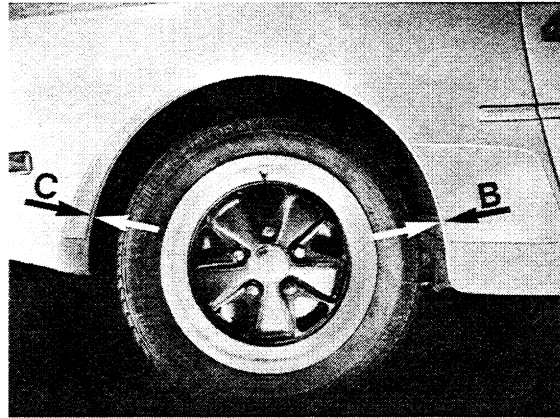
1. An industrial hot air blower or similar would be suitable for the removal of stone protection sheets. Heat entire adhesive surface and pull off stone protection sheets.
2. Remove dirt from entire adhesive surfaces and then clean with alcohol.
3. Moisten adhesive surfaces with a mixture of 50 % alcohol and water, so that the sheet will not adhere too tight immediately.
4. Pull off paper backing on adhesive surface and paste sheet according to specified dimensions.

## Dimensions:

Distance A = approx. 3 mm  
(parallel to wheel opening)



Distance B = approx. 3 mm  
Distance C = approx. 3 mm  
(parallel to wheel opening)



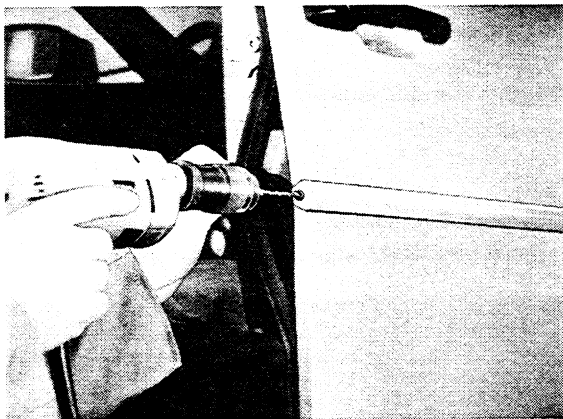
5. Paste sheets so that each pertinent lower edge of sheet is applied on PVC guard.
6. Rub out moisture from center to the edges with a plastic spatula or similar tool. Make sure that no air bubbles remain trapped.
7. Pull off external paper backing and remove any trapped air by puncturing with a pin. Then press on sheet again.

## Note

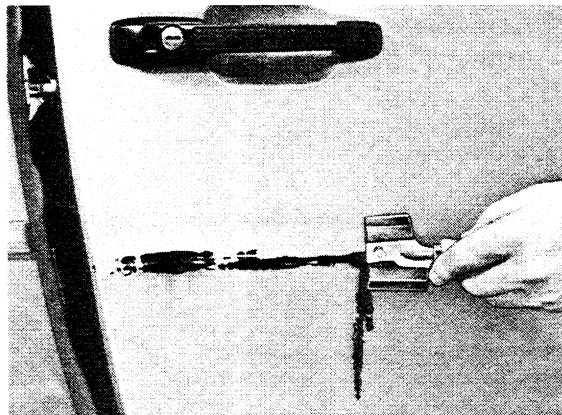
Sheet and car temperature must not be below  
+ 20 °C (70 °F).

## REMOVING SIDE MOULDINGS

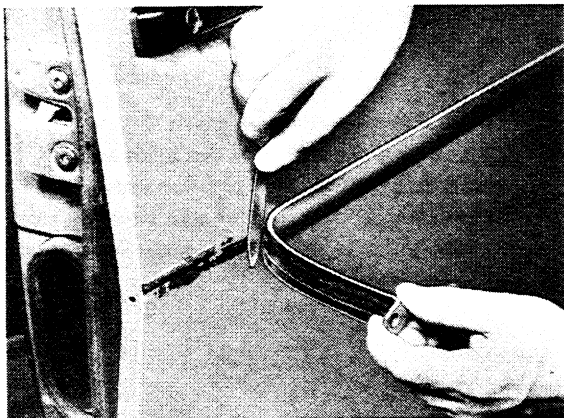
1. Remove rubber door weatherstrip at rear in area of lock. Drill through plastic rivet with a 4 mm dia. drill.



3. Remove remaining adhesive strips on body carefully with a special knife. Wrap tape around edges of special knife to avoid paint damage. (Special knife is available from paint store outlets.)



2. Pull off side moulding carefully. If necessary, help with a sharp knife.



## Note

As much of the adhesive strip should be removed from the body as possible, without damaging the paint.

## INSTALLING SIDE MOULDINGS

## Note

The following points are important to assure good adhesion of the side mouldings.

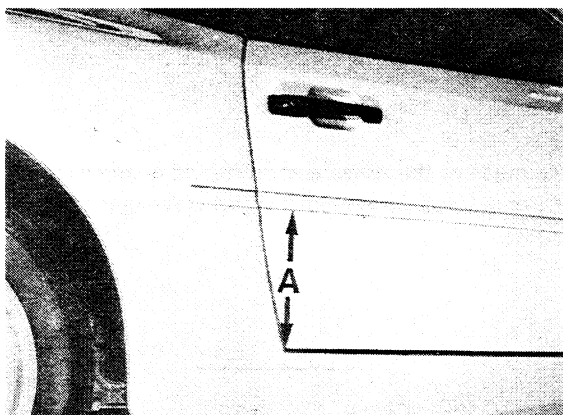
1. Wash car. Clean body thoroughly in area of installation to remove dirt, grease, wax and other sealing compounds; using alcohol or gasoline and acetone. Acetone may only be used once.
2. Do not install side mouldings outside in cold or moist weather. Car and ambient temperature should be about + 20 °C (70 °F).

## Installing

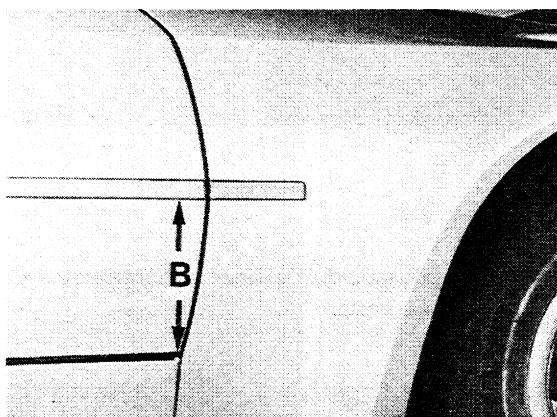
1. First mark location of door strip according to the specified dimensions.

## Height Distances:

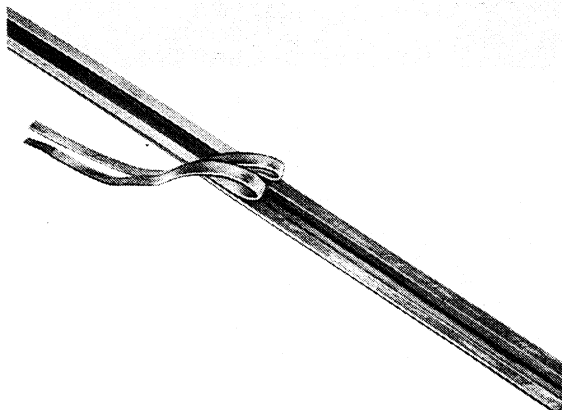
Distance A = 230 mm  
(rear door lower edge – strip lower edge)



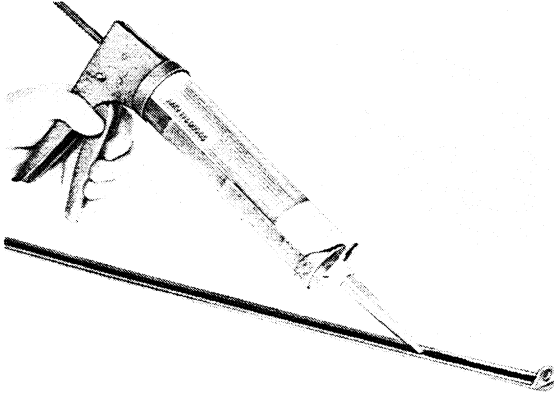
Distance B = 220 mm  
(front door lower edge – strip lower edge)



2. Prepare side mouldings for gluing.  
The side moulding has adhesive strips on both sides, which hold them in position until the adhesive has become hard. If side moulding does not have adhesive strips, clean adhesive side and glue adhesive strips.



3. Coat adhesive groove of side moulding with adhesive compound (Part No. AMV 176 000 05). The adhesive bead coat should be 1 mm higher than the side moulding contour. Strips must be installed no later than 10 minutes after application of adhesive coat.

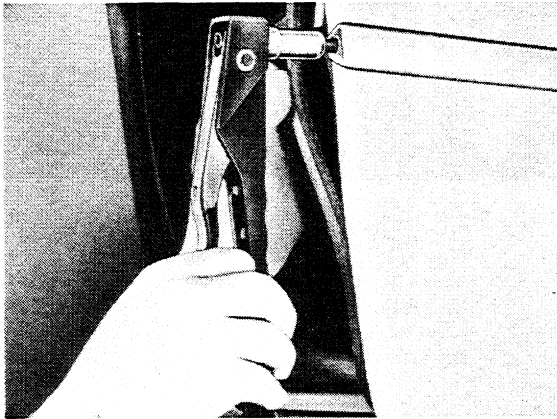


5. Center front and rear adjacent strips with door strip and install as described for door strip.

#### Caution!

Cars with newly glued strips must not be run through a car wash during the next 24 hours.

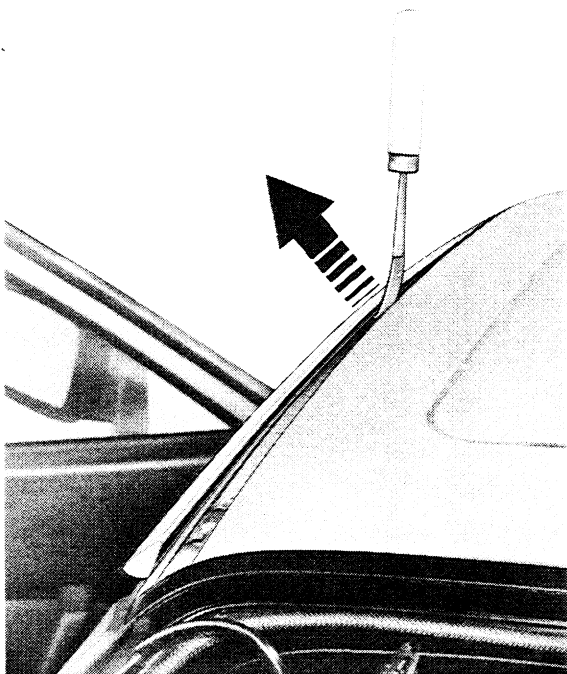
4. Pull off protective paper on adhesive surface. Do not touch adhesive surface. First lightly place strip directly on rear door edge and above marked distances, check positioning and correct if necessary, and then press on firmly with a rubber roller. Remove rear rubber door weatherstrip in area of lock. Drill a 4 mm dia. hole in strip and door from behind and secure with a plastic rivet.



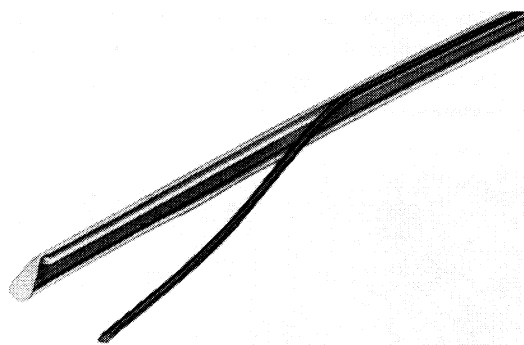
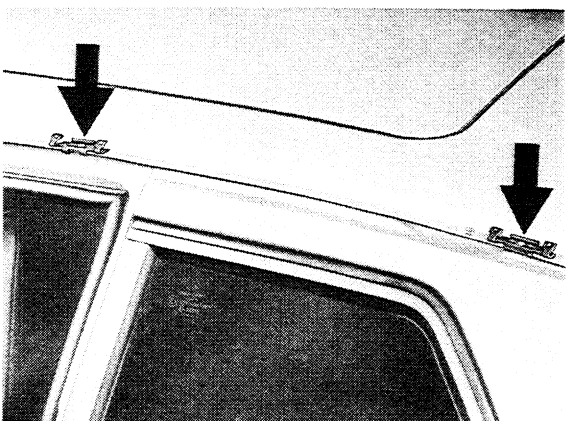
## REMOVING AND INSTALLING ROOF ORNAMENTAL STRIP

## Removing

1. Press off roof strip to side in area of holding clips carefully with a suitable tool.

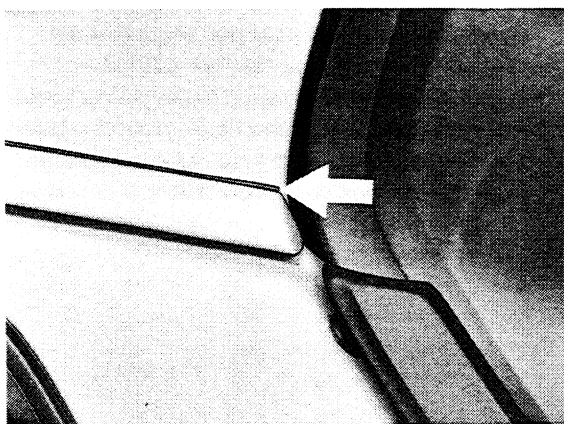


2. Check holding clips and seal, replacing if necessary.



## Installing

1. Place roof strip on roof flush with rear edge of roof and press into holding clips.



## BODY PAINT COLORS — 1982 MODEL

## Standard

mocca black	LM 9 V
gabun grey	LY 7 A
guards red	LM 3 A
gambia red	LA 3 B
mauritus blue	LY 5 A
alpine white	L 90 E
havana brown	LD 8 A

## Special

platinum metallic	LM 8 U
light blue metallic	LM 5 Z
black metallic	LM 9 Y
lhasa green metallic	LA 6 V
surinam red metallic	LA 3 Y
meteor grey metallic	LY 7 Z
diamond silver metallic	L 97 A

## BODY PAINT COLORS — 1983 MODEL

## Standard

guards red	LM 3 A
black	LO 41
alpine white	L 90 E
copenhagen blue	LY 5 B
pasadena yellow	LY 1 L

## Special

platinum metallic	LM 8 U
moss green metallic	LM 6 V
light bronze metallic	LM 1 V
sapphire metallic	LY 5 V
montego black metallic	LY 9 V
sienna red metallic	LD 3 V
gemini grey metallic	LZ 7 Z
zermatt silver metallic	LY 7 Y
sable brown metallic	LY 8 V

## BODY PAINT COLORS — 1984 MODELS

## Standard:

india red	LM 3 A
black	LO 41
alpine white	L 90 E
copenhagen blue	LY 5 B
pasadena yellow	LY 1 L

## Special:

platinum metallic	LM 8 U
light bronze metallic	LM 1 V
sapphire metallic	LY 5 V
montego black metallic	LY 9 V
ruby red metallic	LM 3 V
gemini gray metallic	LZ 7 Z
cermatt metallic	LY 7 Y
sobel metallic	LY 8 V

## BODY PAINT COLORS — 1985 MODELS

## Standard:

india red	LM 3 A
black	L 041
alpine white	L 90 E
copenhagen blue	LY 5B
pastell beige	LM 1 N

## Special:

sapphire metallic	LY 5 V
cermatt metallic	LY 7 Y
mahagoni brown metallic	LB 8 Z
crystall green metallic	LM 6 Y
granate red metallic	LM 3 Y
calahari beige metallic	LA 1 Y
slate gray metallic	LY 7 U
graphite metallic	LB 7 V

BODY PAINT COLORS - 1986 MODELS  
ONWARD

Standard:

India red	LM 3A
Black	L 041
Alpine white	L 90E
Copenhagen blue	LY 5B
Pastel beige	LM 1N

Special:

Saphire metallic	LY 5V
Zermatt silver - metallic	LY 7Y
Mahogany brown - metallic	LB 8Z
Crystal green - metallic	LM 6Y
Garnet red - metallic	LM 3Y
Kalahari beige - metallic	LA 1Y
Slate grey - metallic	LA 7U
Graphite - metallic	LB 7V
Pearl white - metallic	LO A9

BODY PAINT COLORS, 1987 MODELS  
ONWARD

Standard:

Black	L 041
Alpine white	L 90E
Lemon yellow	L M1A
Azurite blue	L Y5D
Malven red	L Y3E
India red	L M3A

Special:

Zermatt silver - metallic	L Y7Y
Slate grey - metallic	L Y7U
Satin black - metallic	L Y9Y
Nautic - metallic	L Y5Z
Flamingo - metallic	L Y4Z
Marachino red - metallic	L Y3V
Almond beige - metallic	L Y1Y
Nile green - metallic	L Y6Y
Diamond blue - metallic	L M5U
Nougat brown - metallic	L M8V



**Body paint colors as from Model 1988****Standard:**

Black	L 041
Alpine white	L 90E
Azurite blue	L Y5D
India red	L M3A

**Special:**

Zermatt silver metallic	L Y7Y
Slate grey metallic	L Y7U
Satin black metallic	L Y9Y
Nautic metallic	L Y5Z
Maraschino red metallic	L Y3V
Nile green metallic	L Y6Y
Almond beige metallic	L Y1Y
Nougat brown metallic	L M8V

**Body paint colors as from Model 1989****Standard:**

Black	L 041
Alpine white	L 90E
Azurite blue	L Y5D
India red	L M3A

**Special:**

Zermatt silver metallic	L Y7Y
Slate gray metallic	L Y7U
Satin black metallic	L Y9Y
Glacier metallic	L Y5U
Bamboo metallic	L Y1Z
Velvet red metallic	L M3U
Dove blue metallic	L M5P
Linen metallic	L M1U

### Body Paint Colors Beginning With 1990 Models

#### Standard Colors:

Black	L 041
Alpine white	L 90E
Azurite blue	L Y5D
Indian red	L M3A

#### Special Colors:

Crystal silver metallic	L Y7T
Titan metallic	L Y7P
Panthero metallic	L Y9Z
Glacier metallic	L Y5U
Zyclam-red pearl effect	L Z3T
Velvet-red metallic	L M3U
Dove-blue metallic	L M5P
Linen metallic	L M1U

### Body Paint Colors Beginning With 1991 Models

#### Standard Colors:

Brilliant black	LY9B
Alpine white	L 90E
Azurite blue	L Y5D
Indian red	L M3A
Star ruby	L M3B
Maritime blue	L M5A

#### Special Colors:

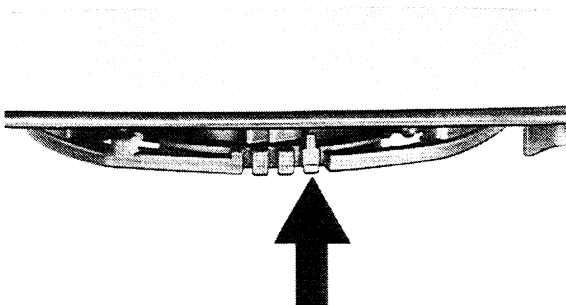
Crystal silver metallic	L Y7T
Titan metallic	L Y7P
Panthero metallic	L Y9Z
Glacier metallic	L Y5U
Zyclam-red pearl effect	L Z3T
Cobalt-blue metallic	L M5N

## REMOVING AND INSTALLING OUTSIDE MIRROR SINCE 1985 MODELS

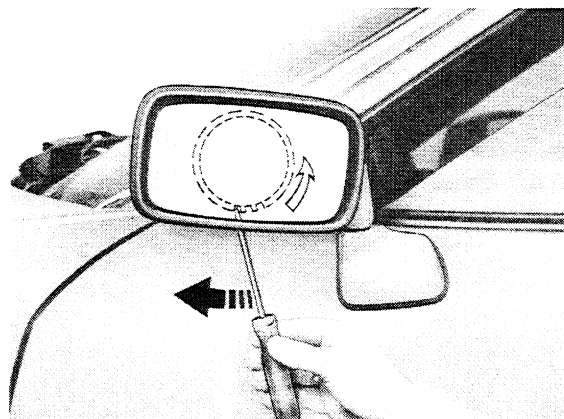
## Note

The mirror glass has a different mounting method which is similar to a bayonet fastener. The retaining ring on the mirror glass can be turned with the help of a screwdriver and unlocked or locked in this manner.

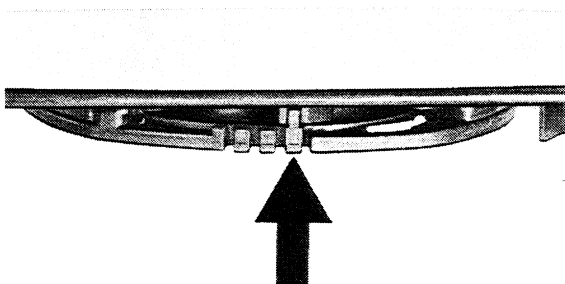
1. Press in mirror glass at bottom. Turn (unlock) retaining ring with a screwdriver applied on the teeth through bottom opening. The glass of left and right mirrors is identical.



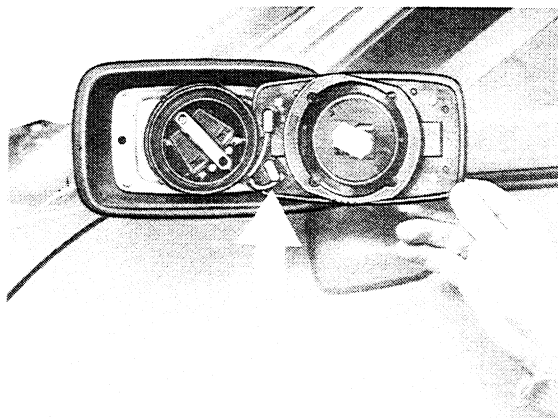
Retaining ring unlocked



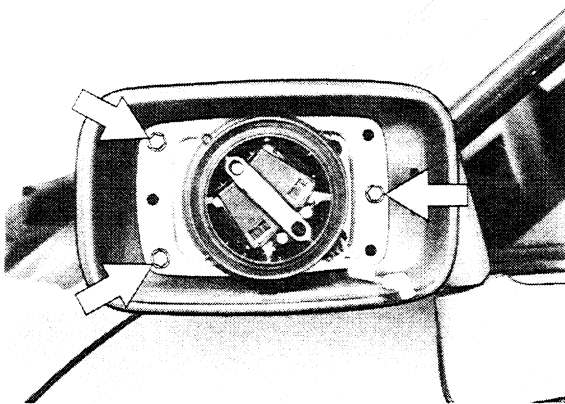
2. Take off mirror glass and pull off mirror heating plug.



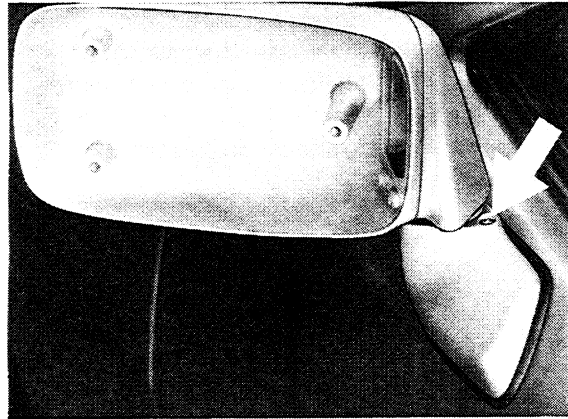
Retaining ring locked



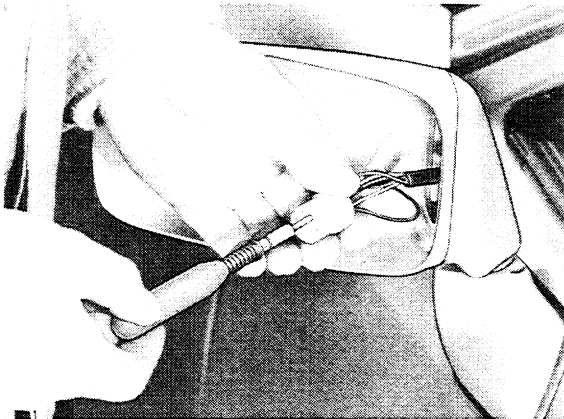
3. Remove mirror drive



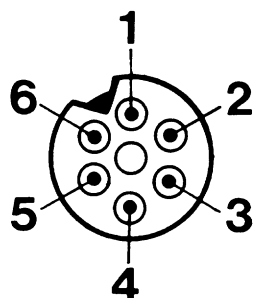
5. Unscrew mounting screws on mirror base and take off mirror housing.



4. Press round female plugs out of plug section with a pressing-out tool.



## Plug Connections (Rear View)



Terminal 1 = white

Terminal 2 = white/brown - black

Terminal 3 = black

Terminal 4 = black/brown

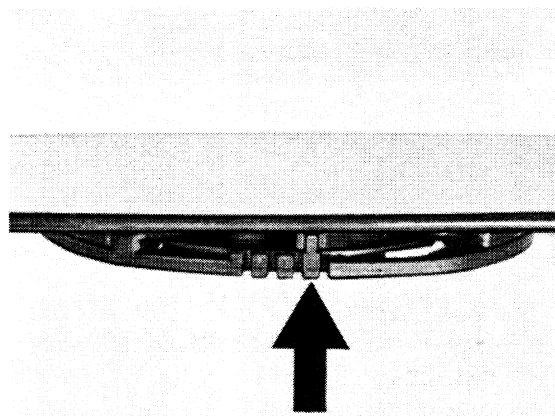
Terminal 5 = brown

Terminal 6 = brown/yellow

## Note

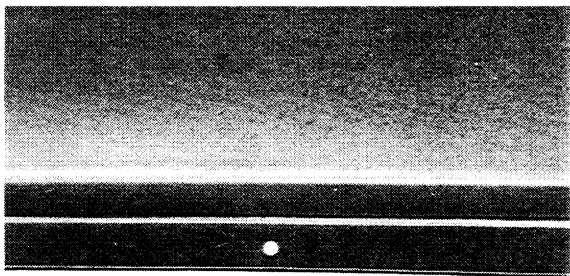
After installation of the mirror glass check, whether the retaining ring has been locked correctly.

This is done by pressing in the mirror glass at top and checking the retaining ring through the bottom gap.

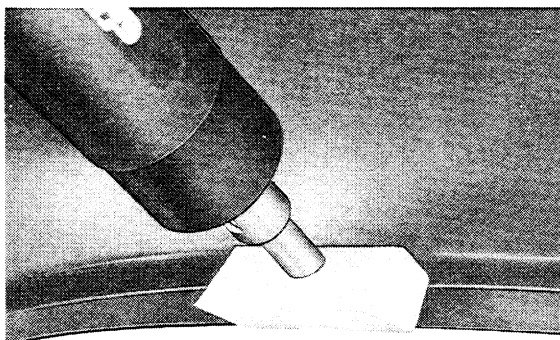


## FASTENING T-BOLTS TO SPOT-WELD ROOF FLANGE

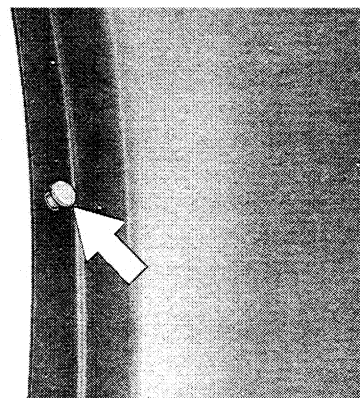
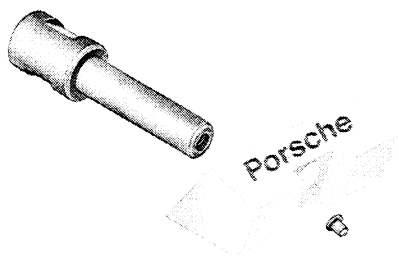
1. Clean fastening point on roof flange down to bare metal.



3. Set sheetmetal-working device on to roof flange and weld T-pin on to flange.



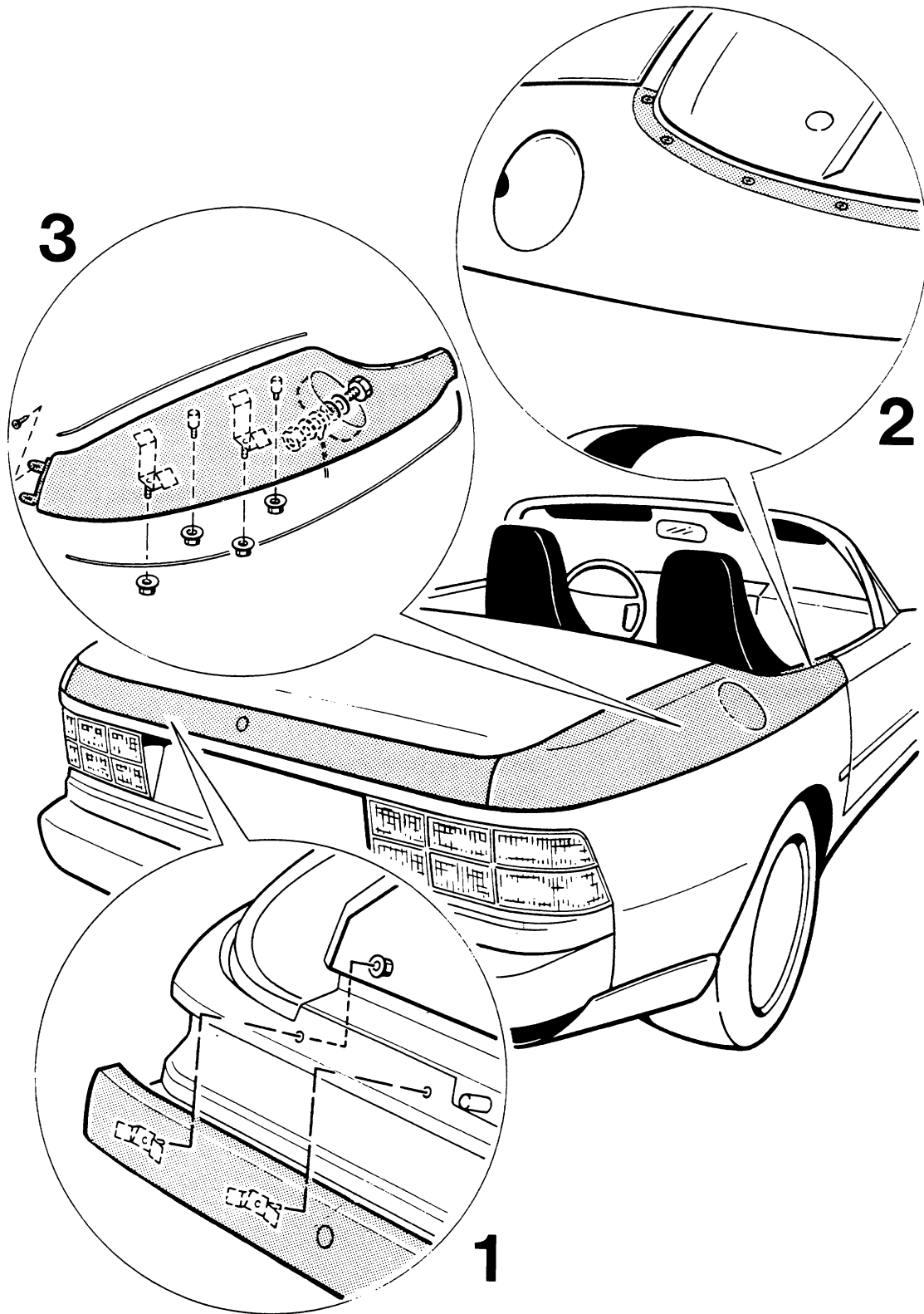
2. Mount contact pin, fitting piece, and T-pin onto sheetmetal-working device.



## N o t e

For sheetmetal-working device, fitting piece, and T-pins for welding on the T-pins, see workshop manual.

## Removing and installing plastic end and side applicates



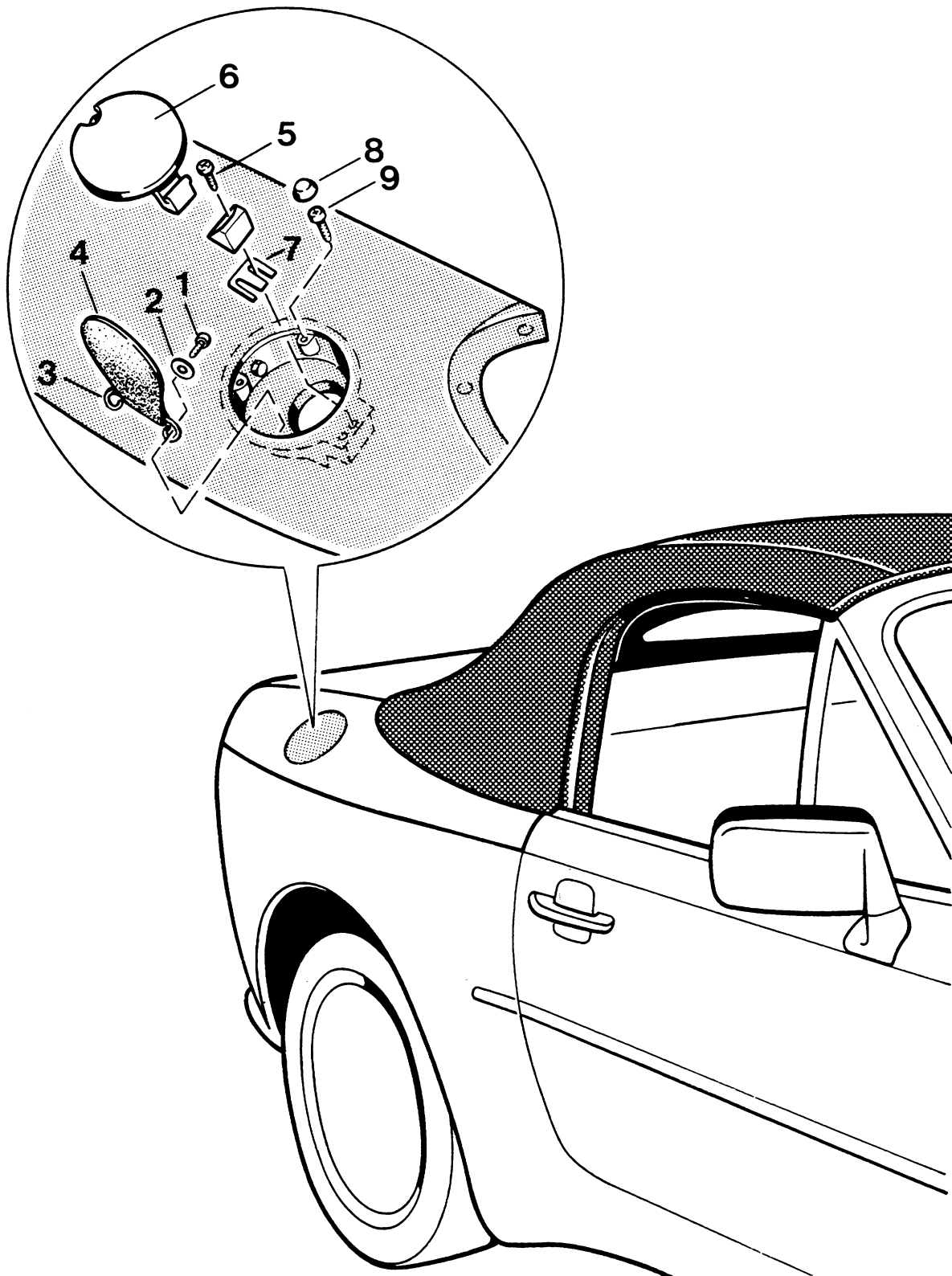
## Removing and installing plastic end and side applicates

### Note

Removing and installing the side applicates requires removal of folding top  
(see "Removing and installing folding top", 61-41)

No.	Task	Instructions
<b>Removal:</b>		
	Unclip luggage compartment lining	
1	Undo screw fastenings of end applicate	From the luggage compartment side, undo 4 fastening nuts of end applicate. Remove end applicate.
2	Undo fastening screws in area of folding top cover	Remove folding top gasket in area of side applicate from spot welding flange. Undo 8 screw fastenings of side applicate in area of folding top cover.
3	Undo fastening screws and nuts of side applicate Undo screw fastening of shear-off device	Undo two fastening screws in transition area of side applicate to end applicate. From luggage compartment side, undo 4 fastening nuts of side applicate. Undo screw fastening of side applicate. Undo screw fastening of shear-off device on tank filler neck cladding.
	Detach glued-on side applicate from body	Starting from rear, detach glued-on side applicate from body by pulling it cautiously away.
<b>Installation:</b>		
	Line side applicate with butyl tape	Seal screw fastenings with butyl tape. Tack side applicate to body with butyl tape.
	Screw side applicate to body	4 nuts M 6 2 sheet metal screws 4.2 x 13 8 countersunk sheet metal screws 4.2 x 16
	Fit folding top gasket on	Fit folding top gasket onto spot welding flange in area of side applicate.
	Bolt on end applicate	4 nuts M 6
	Clip in luggage compartment lining	



**Removing and installing tank flap – Cabrio**

## Removing and installing tank flap – Cabrio

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Sheet metal screw 4.2 x 14	2		
2	Washer A 5	2		
3	Bracket	1		
4	Tank tang	1		
5	Fillister head sheet metal screw 4.2 x 19	2		
6	Tank flap	1		
7	Spacer disk	0-2		Adjustment of the over- all height of the tank flap is by means of spacer disks (max. 2 pcs.)
8	Stop	2		Fit onto sheet metal screw
9	Sheet metal screw	2		The angle of inclination of the tank flap when closed is altered by ad- justing the sheet metal screws

## **Retrofitting new mirror generation for vehicles as of Model 85/2**

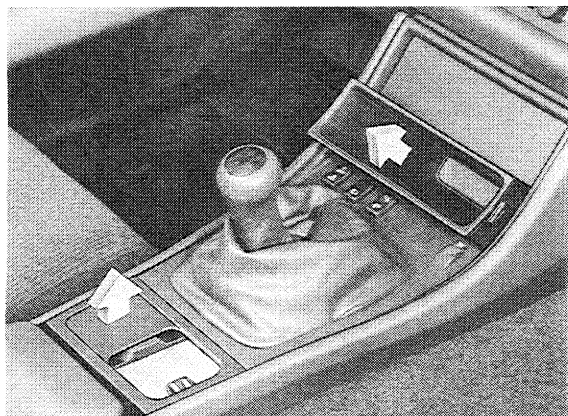
### **Note**

For vehicles fitted with driver's and passenger's side mirrors only.

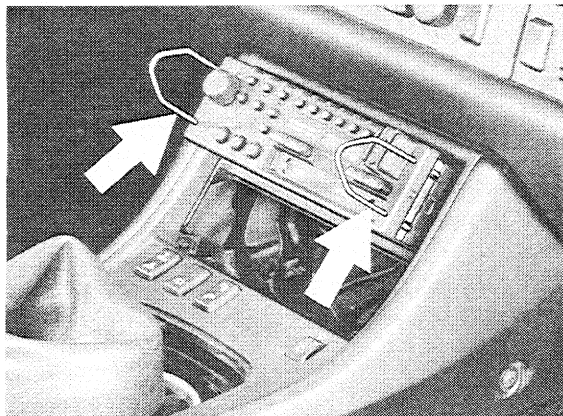
1. Remove door mirror.
2. Assemble new door mirror.
3. Cut mirror wire to required length.
4. Fit new connectors and engage into connector housing section according to below list:
  - 1 – white
  - 2 – blue
  - 3 – black
  - 4 – red
  - 5 – brown
  - 6 – brown
5. Fit mirror (route wire through stud into mirror housing).
6. Engage connector into connector housing section.
7. Assemble both connector housing sections and tie connector housing into place.
8. Fit mirror glass.

## REMOVING AND INSTALLING CENTER CONSOLE SINCE 1985/2 MODELS

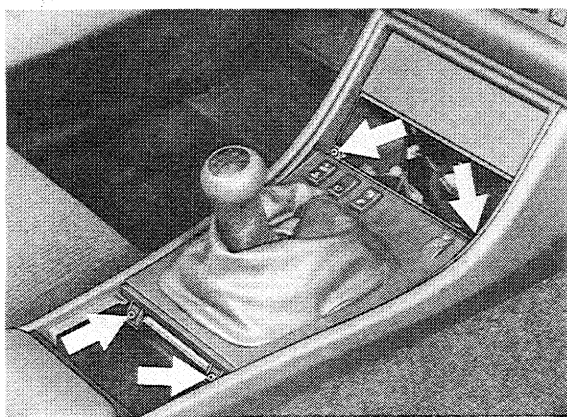
1. Pull out tray holder and ashtray.



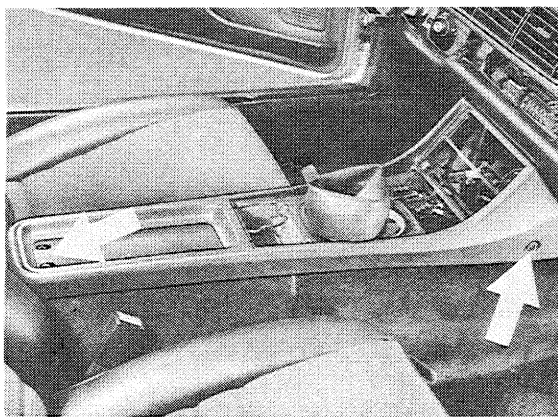
3. If car has a radio, it must be removed with help of the supplied assembly bar.



2. Loosen mounting screws on cover frame of center console.



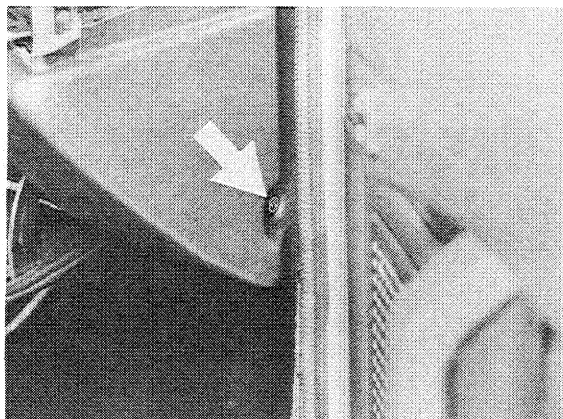
4. Unscrew mounting screws of center console and take off center console.



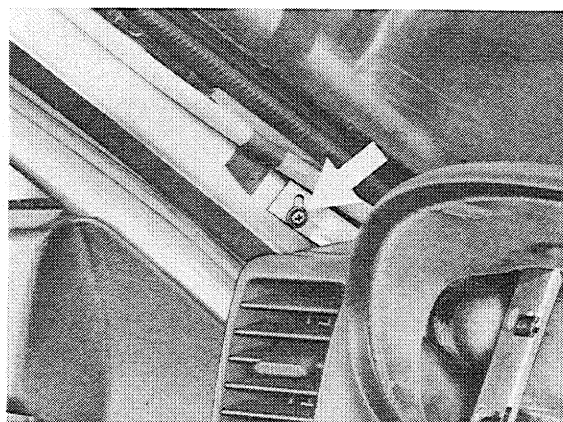
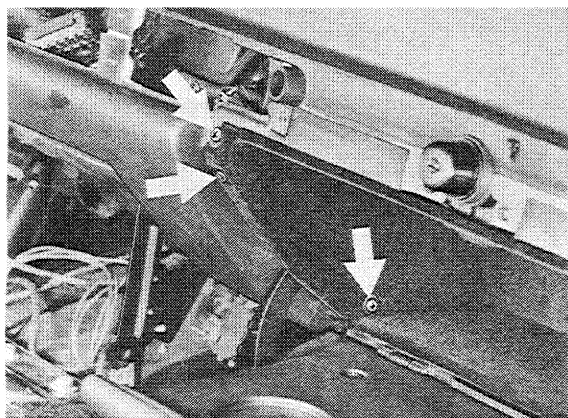
## REMOVING AND INSTALLING INSTRUMENT PANEL SINCE 1985/2 MODELS

## Removing

1. Remove instrument cluster and switch plates - see Group 90.
2. Remove sun visors, trim panel on front roof beam and trim panels on A pillars.
3. Unclip glove box light and disconnect plugs.
4. Unscrew glove box mounting screws, pull off vent hose and take out glove box.

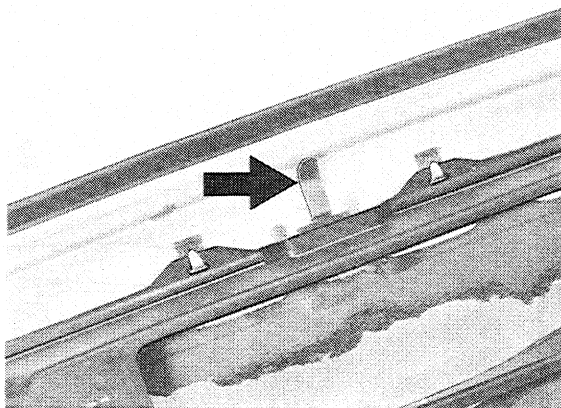
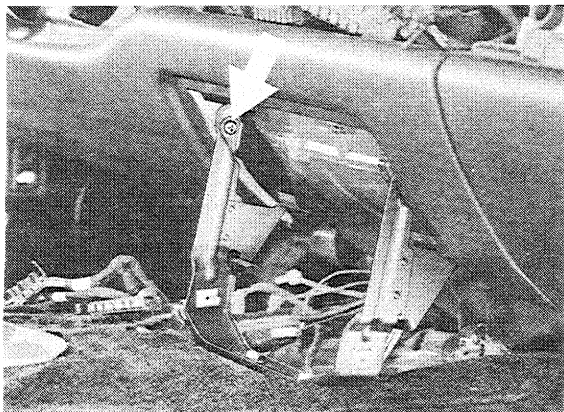


6. Unscrew mounting screws on A pillars.

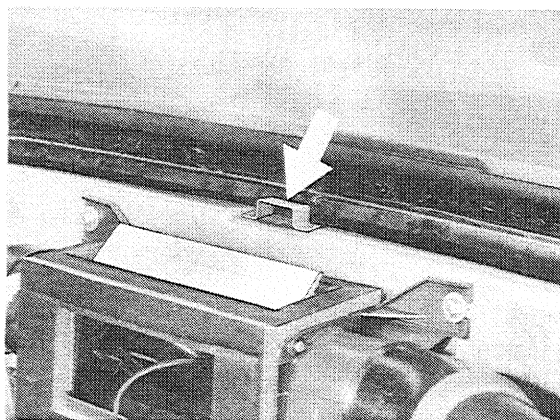
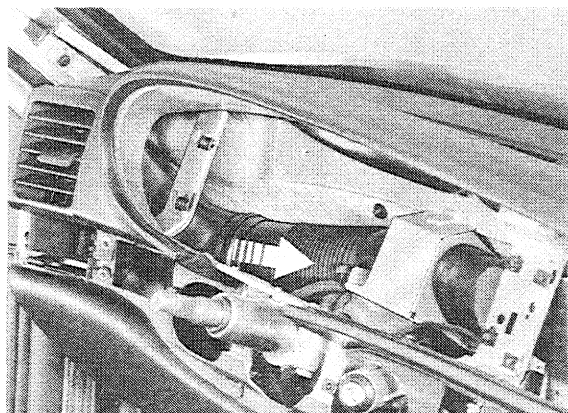


5. Unscrew mounting screws on hinge pillars.

7. Unscrew mounting screws on bracket.



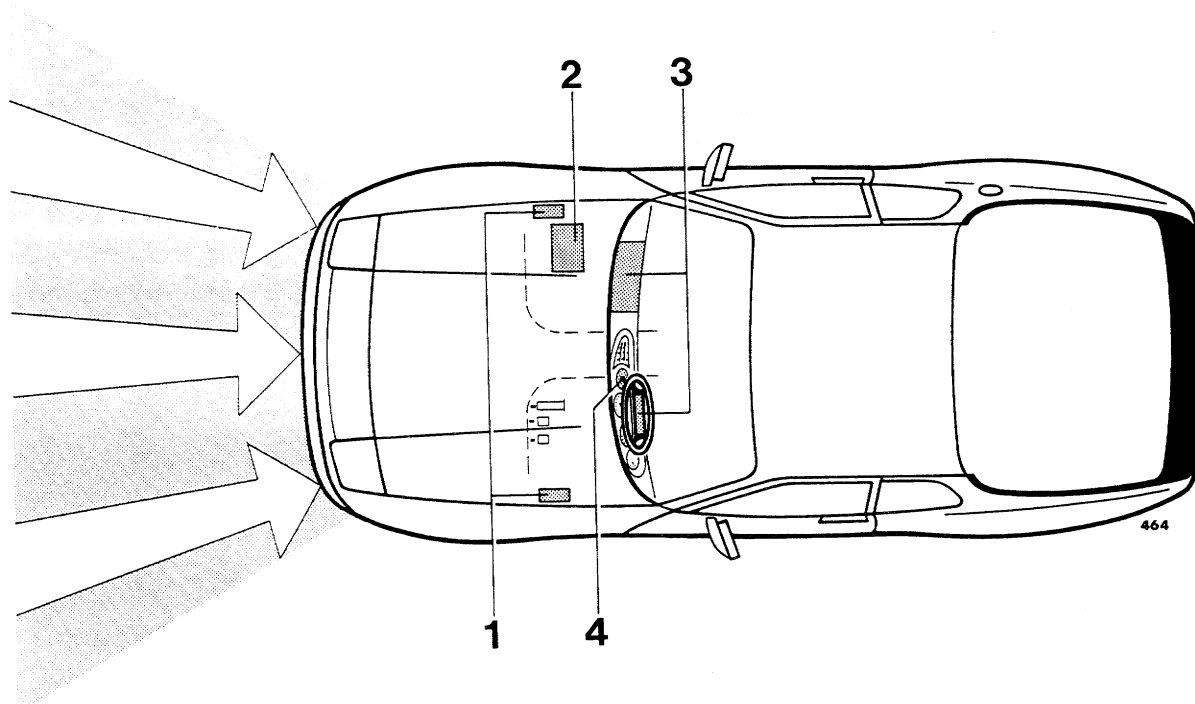
8. Pull air guides out of nozzles and take off instrument panel.



## Installing

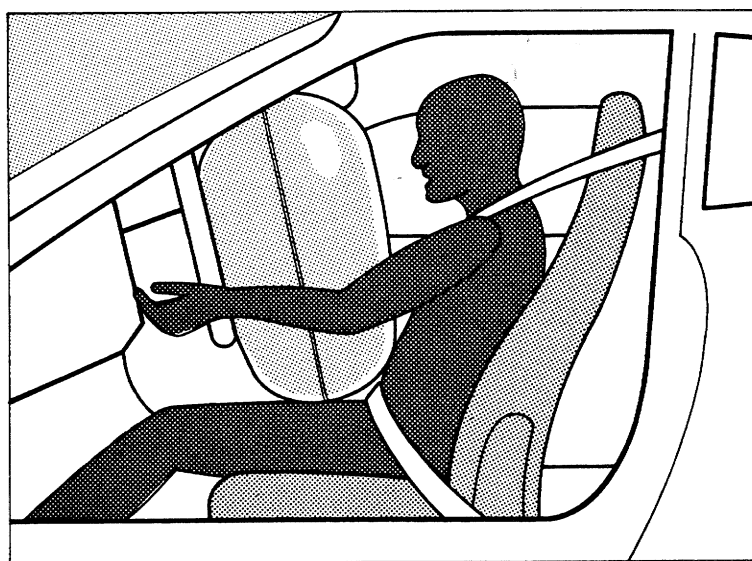
Installation is in reverse sequence. Make sure spring clamp engages in bracket.

## AIRBAG



- |                                     |  |
|-------------------------------------|--|
| 1 - Front sensors                   | 3 - Driver and front-passenger airbags |
| 2 - Control unit with safety sensor | 4 - Indicator lamp                     |

The airbag system is triggered only in the event of a frontal collision within the area identified by arrows.



## SAFETY REGULATIONS FOR WORK ON CARS WITH AIRBAG

The airbag units are pyrotechnic devices assigned to hazard category T 1. Handling, transport and storage are subject to the laws governing the handling of explosives.

The legal stipulations below are those in force in the Federal Republic of Germany. In all other countries, the applicable regulations must be observed.

The trade inspection authority (authority responsible) must be given 14 days notice before work with pyrotechnic devices commences.

## D e s p a t c h

Airbag units may only be despatched in the transport packaging officially approved for the purpose. The airbag units may not be transported with other hazardous goods.

Within the works facility, the units must always be transported in the case or in the goods compartment of a vehicle and the aforementioned transport packaging must be used. It is prohibited to transport the units in the passenger compartment.

## S t o r a g e

Airbag units must be stored in accordance with the 2nd ordinance of the industrial explosives act. This ordinance stipulates that materials and devices may be stored at certain locations without a special storage approval. In the case of pyrotechnic devices assigned to category T 1, the maximum is 20 kg (gross) in a working area and a maximum of 200 kg (gross) in a storage area. The airbag units must be stored in a locked room.

When the airbag units are stored, care must be taken to ensure that the upholstered side faces upward (if inadvertently triggered, the airbag unit may be thrown upward and could cause injury).

The airbag units may not be stored with other hazardous goods (paints etc.).



## Installation and Adjustment

Only trained personnel may inspect and install the units.

Before commencing working on the airbag system or adjacent parts where there is a danger of live parts being brought into the vicinity of the airbag system, the following safety precautions must always be taken:

1. Switch off ignition.
2. Disconnect cable from minus pole of battery and cover pole.

Once the battery has been disconnected, installation work or work with a hammer or similar tool may only commence after a waiting time of 20 minutes. This period is required to interrupt the power supply of the airbag system and assure that the airbag is not inadvertently triggered.

The airbag units must be installed immediately after removal from the store. Under no circumstances leave the units unsupervised. If work is interrupted, the airbag units must be immediately locked away.

Do not bring airbag units into contact with grease, oil, detergents or the like.

Do not expose airbag units to temperatures above 90°C, even for short periods.

Never install airbag units, front sensors or control units which have been dropped from a height of more than 0.5 m.

The steering wheel and the area around the passenger-side airbag must remain free of additional panels, stickers or the like.

Under no circumstances may the wiring or components of the airbag system be modified in any way.

Prior to commencement of straightening or welding operations with an electric welder, always disconnect the battery.

If it is necessary to weld in the immediate proximity of the forward sensors and the control unit, these must be removed beforehand.

Airbag components must not be repaired; they must always be replaced.

**Note**

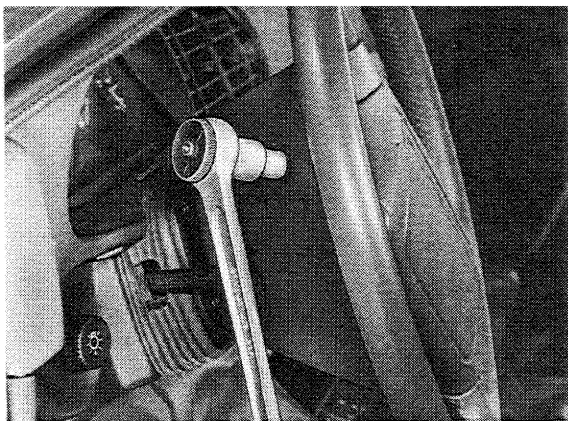
Wash your hands after touching airbag units which have triggered.

**Disposal of Airbag Units**

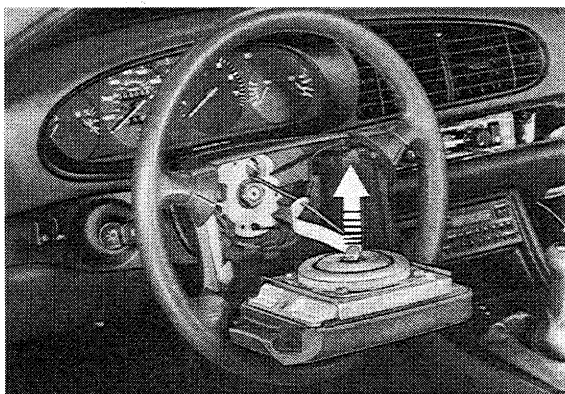
See page 68 - 31.

## REMOVING AND INSTALLING DRIVER AIRBAG UNIT

1. Disconnect battery and cover over pole/battery.
2. Loosen fastening screws (2 pieces) with a screwdriver for socket-head Torx T 30.

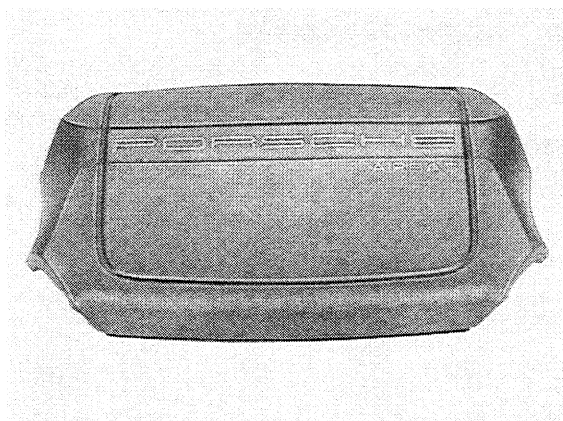


3. Take apart plug connector.



### N o t e

The airbag unit must always be put down so that the upholstered side is pointing upward.



The airbag unit must be stored under lock and key if removed for a lengthy period of time. Follow safety instructions.

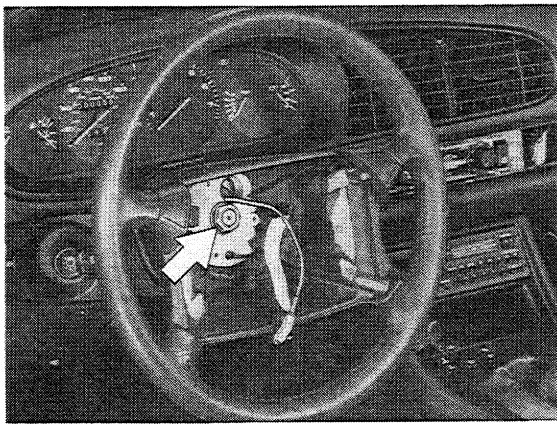
Tightening torque for fastening screws: 10 Nm (7.5 ftlb)

\_\_\_\_\_

## REMOVING AND INSTALLING AIRBAG STEERING WHEEL

### R e m o v a l

1. Disconnect battery and cover over pole/battery.
2. Remove driver airbag unit (see p. 68 - 8).
3. Loosen hexagon nut and take off with spring washer.



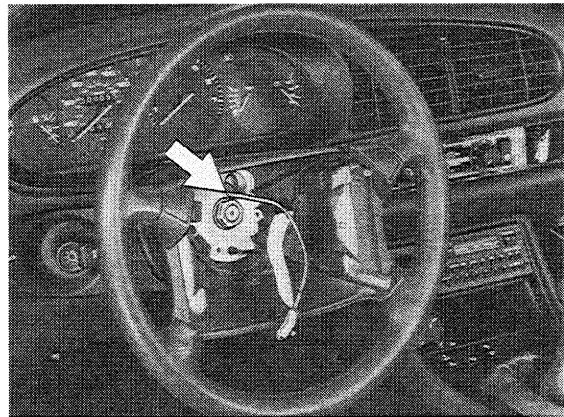
4. Mark position of steering wheel to steering shaft for re-installation

### I n s t a l l a t i o n

1. Put on steering wheel with wheels in straight-ahead position or in accordance with marking such that the upper steering-wheel spokes are horizontal.

### N o t e

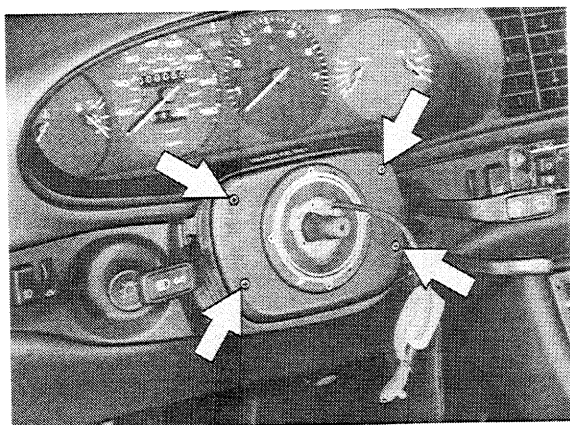
The steering wheel must be put on such that the cable of the contact unit is not jammed.



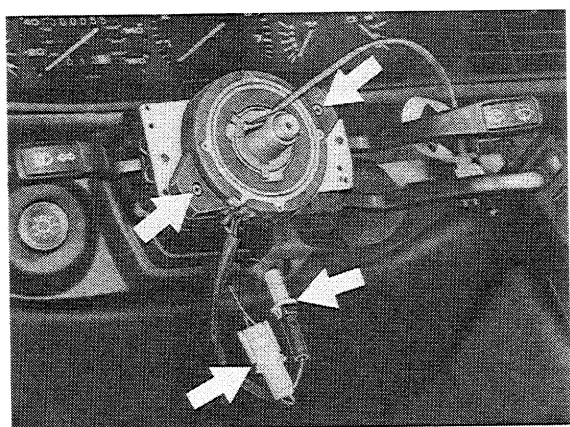
2. Mount hexagon nut with spring washer and tighten to 45 Nm (33.5 ftlb)
3. Install driver airbag unit (see p. 68 - 8).
4. Check operation of horn.

## REMOVING AND INSTALLING CONTACT UNIT

1. Remove airbag steering wheel  
(see p. 68 - 9).
2. Loosen and remove trim.



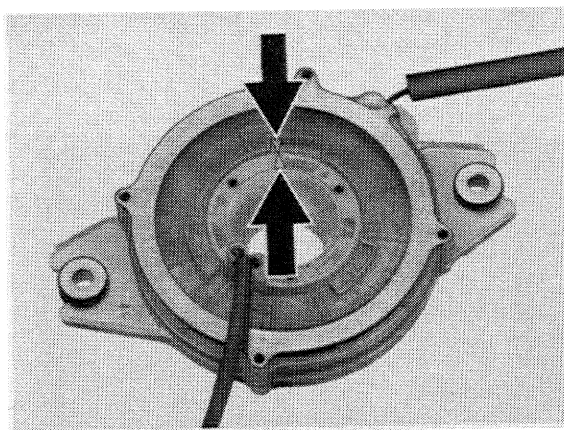
3. Remove right-hand switch panel
4. Take apart plug connectors.



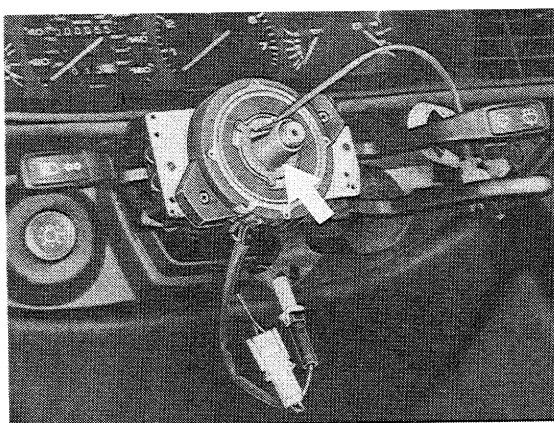
5. Loosen fastening screws.

## Note

Prior to installation of the contact unit, place the front wheels in the straight-ahead position and bring the contact unit into the center position (approx. 4 1/2 turns from left or right end stop). The precise center position is indicated by the two arrows.



A new contact unit is locked in the center position. The locking is not removed until after the contact unit has been installed.



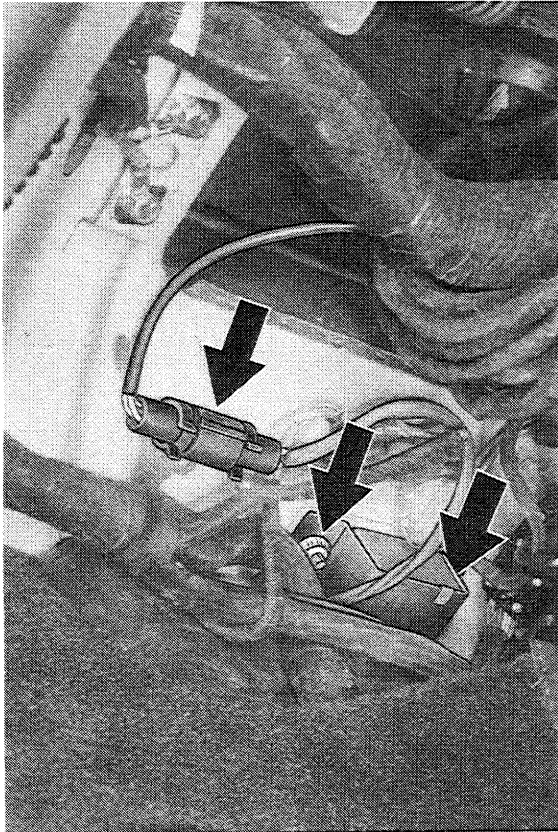
## REMOVING AND INSTALLING FRONT SENSORS

## N o t e

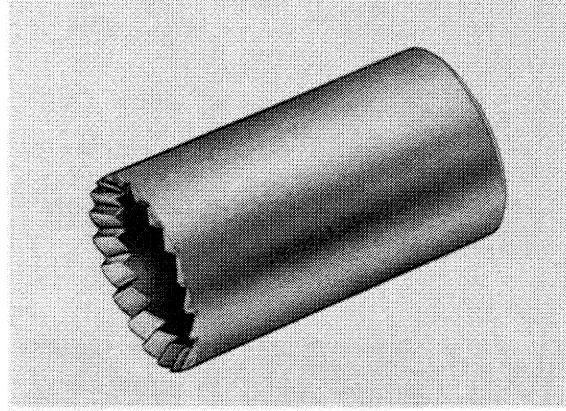
The front sensors are positioned on left and right in the driver and front-passenger footwells at the top on the wheelhouse wall.

The installation position is fixed by the method of mounting.

1. Disconnect battery and cover over pole/battery.
2. Take apart plug connector.



3. Loosen rip nuts with special tool P 9259.



Special tool P 9259

## N o t e

Use 1/4 inch inside hexagon for tightening the rip nuts.

Use specified washers.

The mounting points on the body must be bare down to the metal.

## REMOVING AND INSTALLING FRONT-PASSENGER AIRBAG UNIT

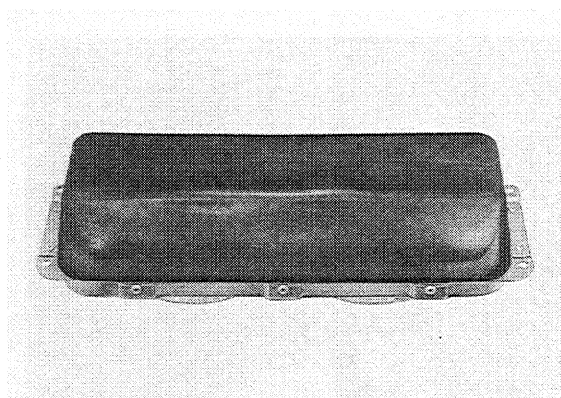
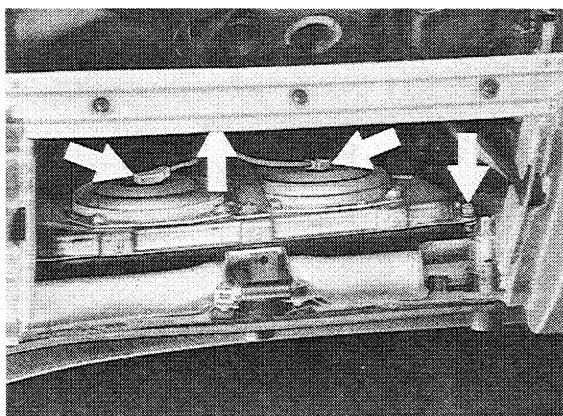
1. Disconnect battery and cover over pole/battery.
2. Remove glovebox.
3. Remove air-guide hose.
4. Disconnect plug connectors from the unit.

### N o t e

The hexagon-socket-head cap screws are micro-encapsulated. Use new screws when installing.

The M 8 nut is self-locking. Use new nut when installing.

The airbag unit must always be put down such that the airbag is pointing upward.



5. Loosen fastening screws (hexagon socket head 5 mm, 4 pieces).
6. Loosen fastening screw M 8.

---

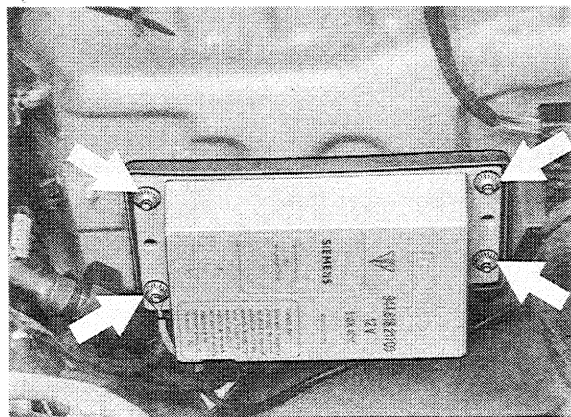
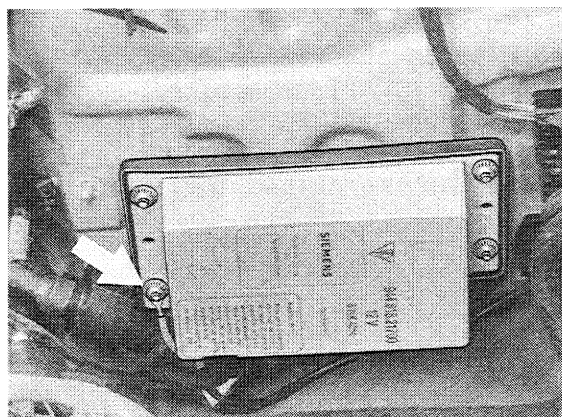


## REMOVING AND INSTALLING CONTROL UNIT

1. Disconnect battery and cover over pole/battery.
2. Remove glovebox.
3. Take apart plug connectors for left front sensor, contact unit, right front sensor, front passenger airbag unit and 7-pin plug connector to main wiring harness.
4. Remove fresh-air blower (access to wiring harness).
5. Loosen cable binders along wiring harness.
6. Loosen rip nuts with special tool P 9259.
7. Remove control unit with water-protection cap.

## N o t e

The ground cable is mounted on the front left-hand mounting point. No further ground cables may be connected at this point.



The fastening points on the body must be bare down to the metal.

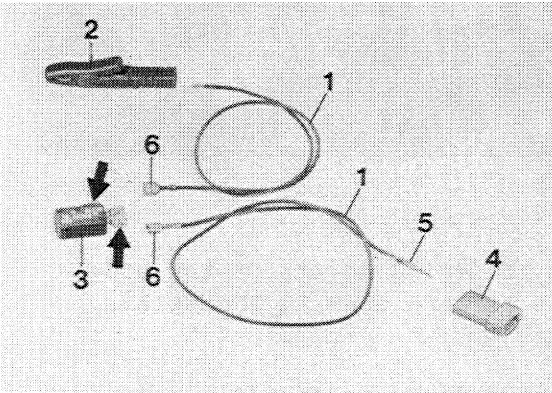
Use 1/4 inch inside hexagon for tightening the rip nuts. Use specified washers.



## DIAGNOSIS

The airbag system is monitored continuously by a diagnosis unit in the control unit. Any fault which may occur is indicated by the word "airbag" in the instrument cluster.

When the ignition is switched on, the airbag annunciator remains lit for approximately 5 seconds before going out. When the engine is started the annunciator lights up again for approx. 5 seconds. Any further response of the annunciator indicates a defect in the system. The fault can be output via the airbag annunciator when an excitation signal is applied to the diagnosis input line (application of an earth signal). For this purpose, an improvised tool must be used to input a code.

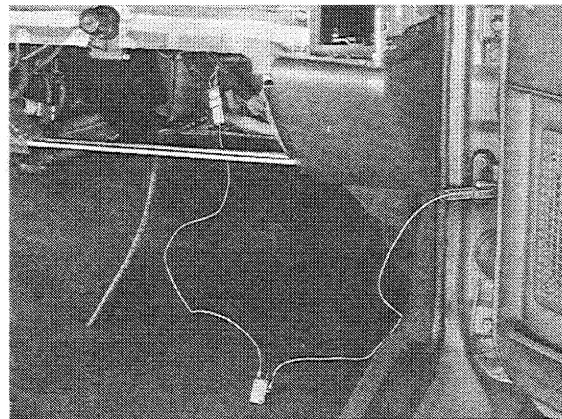


### Note:

The control unit needs a period of 2 minutes to detect all the faults in the system. To assure that every possible source of trouble is tested in a diagnosis, the ignition must remain switched on for at least 2 minutes.

- 1 - Wire (commercially available)  
approx. 0.5 m long
- 2 - Crocodile clip
- 3 - Pushbutton (e.g. limit switch  
for tilting sunroof, use  
closing function)
- 4 - Plug receptacle 171.971.998 B
- 5 - Round plug N 017.589.4
- 6 - Flat plug 6.3 x 0.8  
111.971.959

Connect the round plug to pin 2 of the plug receptacle.



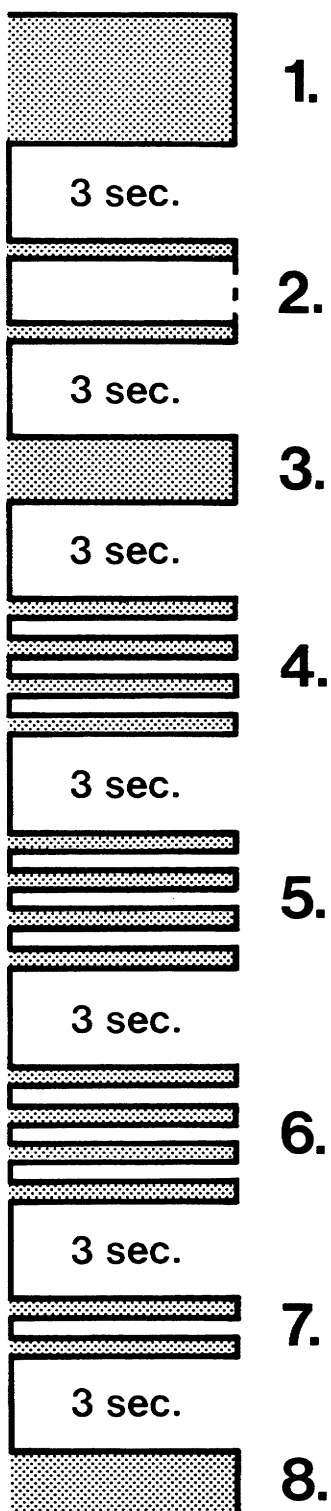
1. Switch off ignition.
2. Connect improvised tool.
3. Press switch.
4. Switch ignition on.
5. Release switch 3 seconds after  
ignition is switched on.

The flashing code then runs off as described below:

OFF

Lamp

ON



1. 5-second lamp test.
2. Flashes 1 or more times, depending on number of faults.
3. 3 seconds - start for fault code.
4. Flashes 1 to 4 times, depending on group in fault table.
5. Flashes 1 to 4 times, depending on line in fault table.
6. Flashes 1 to 4 times, depending on column in fault table.
7. Flashes 1 or 2 times  
1 = Short-time fault  
2 = Long-time fault
8. 3 seconds - start for fault code of a further fault.  
  
Light remains on - end of interrogation.

The flashing code interrogation can be repeated as often as desired.

The flashing pulses must be noted and the corresponding number must be read from the following table; e.g. flashing code 1 - 3 - 3 - 2 means the number 29 and signifies a long-time fault.

1 - Group

3 - Line

3 - Column

2 - Long-time fault

Fault table for lamp codes

	Group 1				Group 2				Group 3				Group 4				Line
	01	11	21	31	02	12	22	32	03	13	23	33	04	14	24	34	1
	05		25		06		26		07	17	27		08	18	28		2
	09	19	29		0A	1A	2A		0B	1B	2B		0C	1C	2C		3
	0D	1D	2D		0E	1E	2E			1F	2F			20	30		4
Column	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	

The fault can be found in the following fault code table with the help of the number found in the fault table for lamp codes; e.g. for number 29: ignition pill circuit 3 - break.

Fault Code Table

Hex-Code	Fault Description	
01	Front sensor left:	closed 1 time
02	Front sensor left:	closed several times
03	Front sensor right:	closed 1 time
04	Front sensor right:	closed several times
05	Front sensor left:	closed permanently
06	Front sensor right:	closed permanently
07	Front sensor lead left:	leaks against positive
08	Front sensor lead right:	leaks against positive
09	Front sensor lead left:	leaks against ground
0A	Front sensor lead right:	leaks against ground
0B	Front sensor lead left:	short circuit against positive
0C	Front sensor lead right:	short circuit against positive
0D	Front sensor lead left:	short circuit against ground
0E	Front sensor lead right:	short circuit against ground
11	Front sensor lead left:	break
12	Front sensor lead right:	break

Hex-Code	Fault Description	
13	Front sensor lead left:	excessive resistance
14	Front sensor lead right:	excessive resistance
17	Ignition capacitor 1:	insufficient capacitance
18	Ignition capacitor 2:	insufficient capacitance
19	Transition resistance to ignition capacitor 1:	excessive
1A	Transition resistance to ignition capacitor 2:	excessive
1B	Ignition pill circuit 1:	leak against positive
1C	Ignition pill circuit 2:	leak against positive
1D	Ignition pill circuit 3:	leak against positive
1E	Ignition pill circuit 1:	short circuit against positive
1F	Ignition pill circuit 2:	short circuit against positive
20	Ignition pill circuit 3:	short circuit against positive
21	Ignition pill circuit 1:	leak against ground
22	Ignition pill circuit 2:	leak against ground
23	Ignition pill circuit 3:	leak against ground
24	Ignition pill circuit 1:	short circuit against ground
25	Ignition pill circuit 2:	short circuit against ground
26	Ignition pill circuit 3:	short circuit against ground

Hex Code	Fault Description	
27	Ignition pill circuit 1:	break
28	Ignition pill circuit 2:	break
29	Ignition pill circuit 3:	break
2A	Ignition pill circuit 1:	insufficient resistance
2B	Ignition pill circuit 2:	insufficient resistance
2C	Ignition pill circuit 3:	insufficient resistance
2D	Ignition pill circuit 1:	excessive resistance
2E	Ignition pill circuit 2:	excessive resistance
2F	Ignition pill circuit 3:	excessive resistance
30	Failure warning lamp:	short circuit
31	Failure warning lamp:	broken filament
32	Control unit:	internal fault
33	Firing order correct	
34	Ignition current flowed	

Ignition pill circuit 1: driver's airbag

Ignition pill circuits 2 and 3: passenger's airbag

The following jobs must be performed when a fault occurs:

Faults 01 to 06

- Replace left or right front sensor.

Faults 07 to 0E

- Check front sensor with ohmmeter

1. Ohmmeter to terminals 1 and 2  
Reading: 10 kOhm

2. Ohmmeter to terminals 2 and 3  
Reading: 0 Ohm

If the readings are obtained, erase fault memory. If fault still present, replace control unit.  
If the readings are not obtained, replace front sensor.

Fault 11 or 12

- Check front sensor plug connection for correct tightness of plug contacts and correct tightness of plug connection.

- Check front sensor with ohmmeter (see faults 07 to 0E).

If ohmmeter shows  $\infty$  Ohm for point 1 or 2, replace the front sensor. If the readings are obtained, replace control unit.

Fault 13 or 14

- Check front sensor with ohmmeter (see faults 07 to 0E).

If front sensor is OK, replace control unit.

Faults 17 to 1A

- Replace control unit.

Faults 1B, 1E, 21, 24

- Try installing new contact unit.

Turn on ignition.

If fault still present, try installing airbag unit.

If fault still present, replace control unit.

Erase fault memory, if applicable, after re-assembling.

Faults 1C, 1D, 1F, 20, 22, 23, 25, 26

- Try installing new airbag unit.

Turn on ignition.

If fault still present, replace control unit.

Fault 27

- Check tightness of plug connection to airbag unit.

- Check tightness of plug connection to contact unit.

If plug connections are tight, try installing new contact unit.

Turn on ignition.

If fault still present, try installing new airbag unit.

Turn on ignition.

If fault still present, replace control unit.



## Fault 28 or 29

- Check tightness of plug connection to airbag unit.

If plug connection is OK, try connecting new airbag unit. If fault still present, replace control unit.

## Fault 2A

- Try connecting new airbag unit. If fault still present, replace control unit.

## Fault 2B or 2C

- Try connecting new airbag unit. If fault still present, replace control unit.

## Fault 2D

- Replace contact unit.
- Check plug contacts of plug connections to airbag unit and contact unit for corrosion.

If contacts are in good condition, try connecting new airbag unit. If fault is still present, replace control unit.

## Fault 2E or 2F

- Check plug contacts at plug connections to airbag unit for corrosion.

If contacts are in good condition, try connecting new airbag unit. If fault still present, replace control unit.

## Faults 30 and 31

Central warning lamp and belt symbol still light up after failure of the airbag sign.

- Remove and check control lamp, replacing if necessary.
- Check wiring harness for damage, replacing control unit if necessary.

## Fault 32

- Replace control unit.

## Faults 33 and 34

Fault indications 33 and 34 are displayed only after an accident with airbag activation. In this case, all components must be replaced.

The fault memory has to be erased after a disturbance in the airbag system and its elimination.

#### E r a s i n g   F a u l t M e m o r y

1. Turn off ignition.
2. Apply locally made tool on test plug.
3. Press switch button.
4. Turn on ignition. Switch remains pressed 5 seconds, is then released 5 seconds and pressed again 5 seconds.

#### N o t e :

The precision of a clock with a seconds needle is sufficient.

5. Turn off ignition.
6. Check whether fault memory is erased. Turn on ignition for this purpose. Airbag sign light must go out after 5 seconds.

#### N o t e :

The exchange of a component must be entered in the service booklet. This is done by pasting the documentation number label in a provided field. Documentation numbers are provided on replacement parts as tear-off labels.

The following components must be removed and replaced after an accident with activation of the airbag system.

- Control unit
- Both front sensors
- Contact unit
- Both airbag units

Removed parts must be sent to Porsche or the respective importer. Airbag units may only be shipped in officially be approved packaging.

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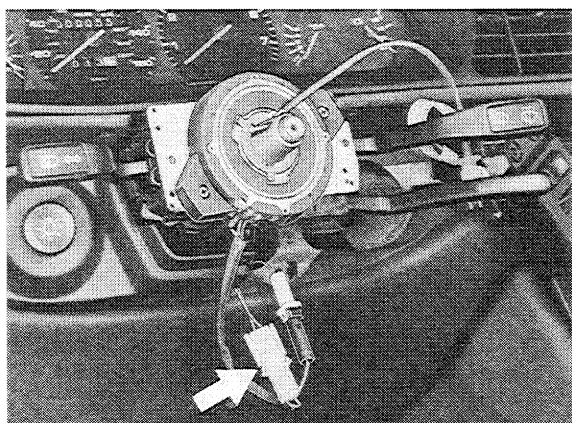
## Checking airbag system operation

### 1. Functional check of airbag lettering.

Turn on ignition. The airbag lettering must light up for approx. 5 seconds. If the lettering remains dim, check bulb and/or supply voltage.

### 2. Disconnect connector for contact unit (below instrument panel).

### 3. Turn on ignition.



### 3a. Alternate fault simulation: Remove fuse for power supply to the instrument cluster for approx. 30 seconds with the ignition switched on.

In this case, fault code 30 (with new control unit: 58) Warning light: short circuit to battery + or ground; fault currently not present, must be indicated.

### 4. Reconnect connector and erase fault memory.

### 5. Make sure no covers, decals or similar items are fitted to the steering wheel and in the passenger airbag area.

### 6. Visual inspection of components for damages and modifications.

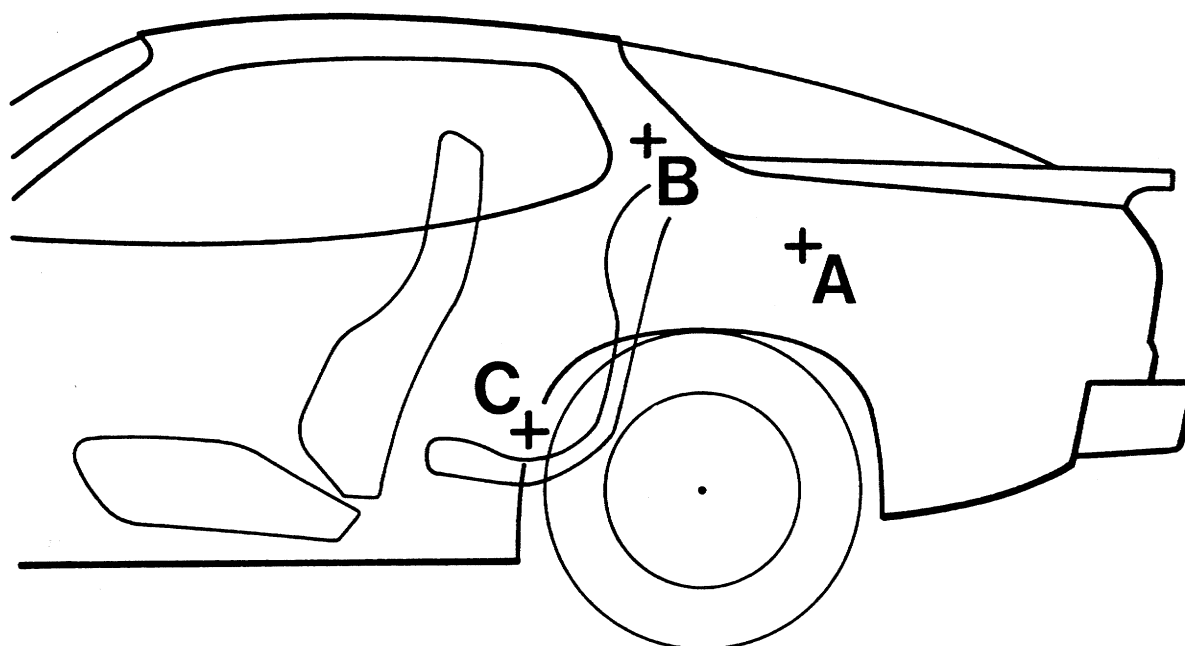
### 7. After checking the system, confirm the check in the appropriate fields of the warranty and maintenance booklet.

The airbag lettering must now indicate a fault. Read out fault memory and check if 27; Ign. pill circuit 1 - open circuit; is indicated (with new control unit: 49; refer to page D 68 - 1).

#### Note

In addition to the airbag lettering, the central warning lamp and the Fasten Seatbelts symbol (US models only) must light if a fault is stored in the fault memory.

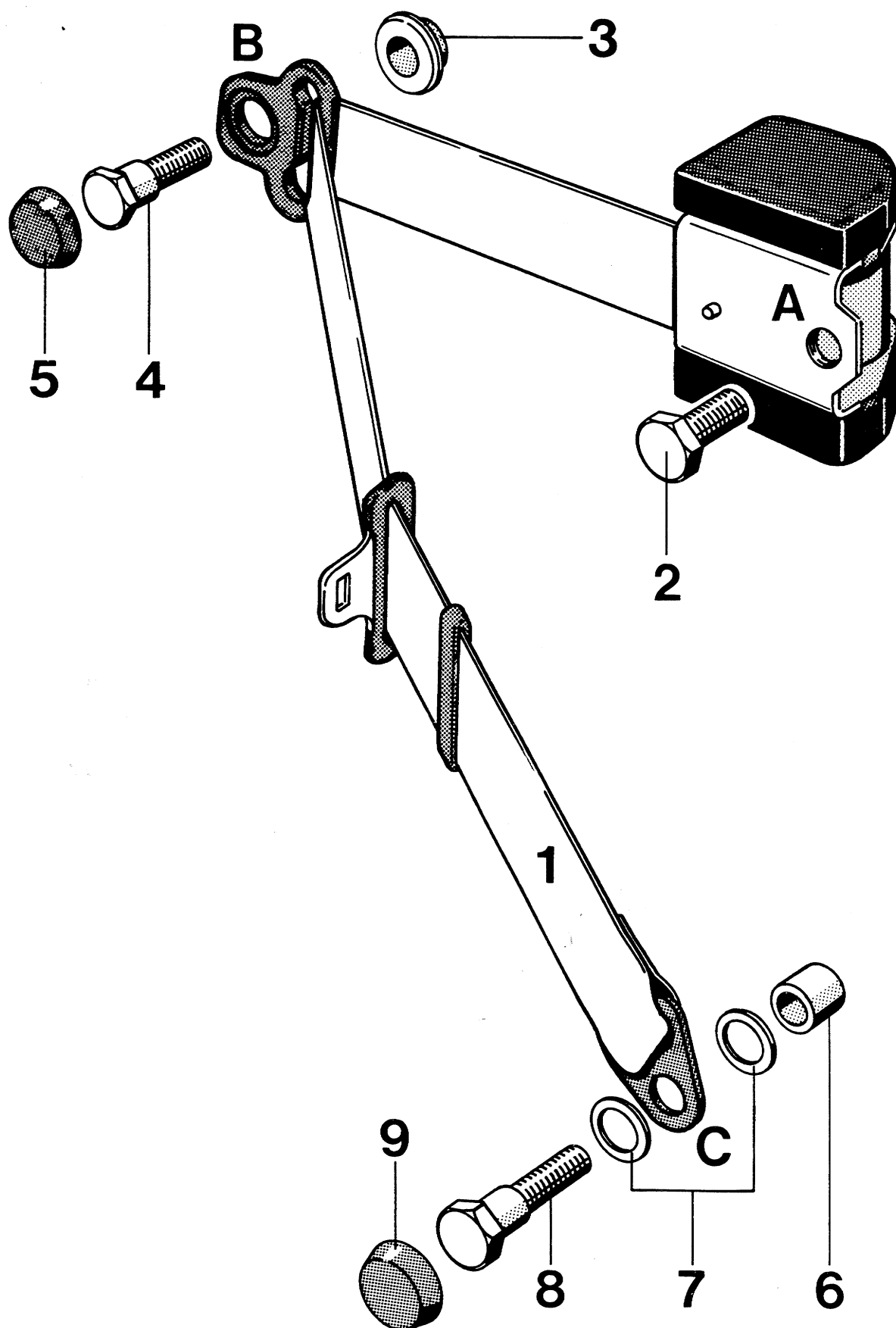
REMOVING AND INSTALLING INERTIA-REEL LAP-AND-SHOULDER SAFETY BELTS FOR  
REAR SEATS, USA CARS



A: Anchor point for inertia reel

B: Anchor point for upper attachment

C: Anchor point for lower attachment



No.	Description	Qty.	Note When:	
			Removing	Installing
1	Inertia-reel lap-and-shoulder safety belt	1	Remove sidewall panel far enough to give access	Feed belt with lower and upper attachments through rose in sidewall panel.
2	Hex bolt	1		Tightening torque 40 Nm (30 ftlb) (bolt without collar)
3	Spacer	1		
4	Shoulder bolt	1		Tightening torque 40 Nm (30 ftlb)
5	Cover			
6	Tubular spacer	1		
7	Washer	2		
8	Hex bolt	1		Tightening torque 40 Nm (30 ftlb)
9	Cover	1		
A	Inertia reel	1		Broad surface of cover must face down.
B	Upper attachment	1		
C	Lower attachment	1		

## Inspecting Seat Belts

### Checking Function

It must be possible to have the belt strap roll off of the automatic reel via the reversing fitting without hesitation when pulling the seat belt uniformly and the tongue of the seat belt must be heard engaging in the belt lock. The automatic reel must lock when the seat belt strap is pulled suddenly.

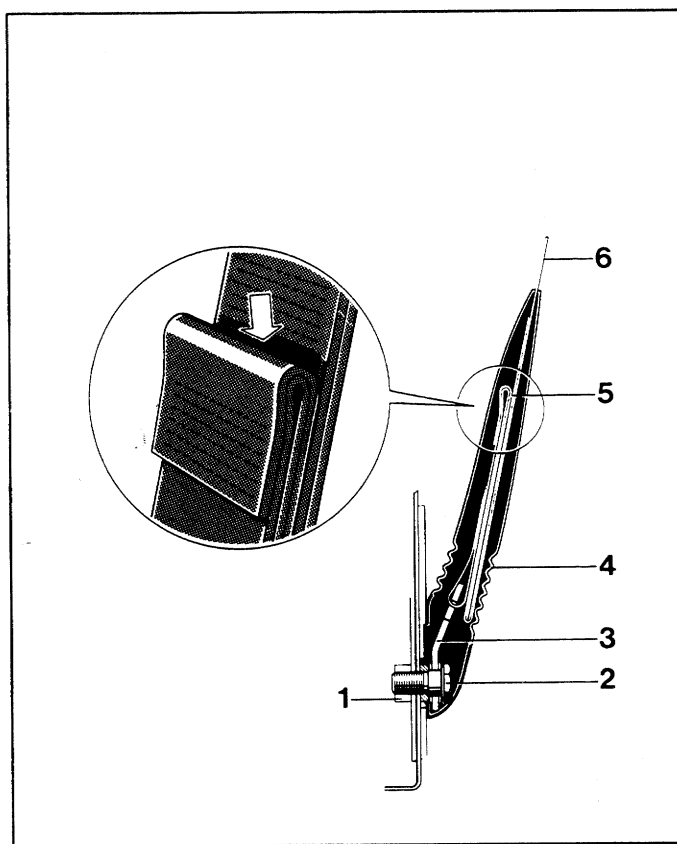
### Checking Condition

A visual inspection of the seat belt must not produce any damage or signs of wear on the belt strap. The seat belt must be replaced, if the belt strap is damaged in the form of cuts, fringing, torn seams, rubbing spots or similar conditions.

### Additional Checking for Seat Belts with Overload Indicators (Tear Seams) – Airbag Equipment

The tear seam on the belt strap above the holder must not be damaged in addition to the fact that these seat belts must have perfect function and condition. The tear seam serves as an overload indicator, which reports an overloaded condition and therefore the necessity to replace a seat belt.

- 1 = Anchorage point for holder
- 2 = Anchorage bolt
- 3 = Holder
- 4 = Plastic cap
- 5 = Indicator (tear seam)
- 6 = Belt strap



261 - 68

## **Correct disposal of airbag units**

Airbag units are pyrotechnic objects and can represent an environmental hazard on account of their character as explosion-risk bodies and because of the materials they contain.

For this reason, airbag units which have not yet been ignited, or complete vehicles containing such units must not be treated as "normal" waste or disposed of on any other final refuse dumps.

To avoid possible misuses, the airbag units must first be rendered harmless by electrical ignition, making sure that all the relevant precautions are complied with.

In the case of airbag units incapable of igniting or if ignition cannot be carried out in safety, the airbag units must in all cases be returned to Porsche or to the relevant importer in their original spare part packs and by the usual transport channels.

### **Note**

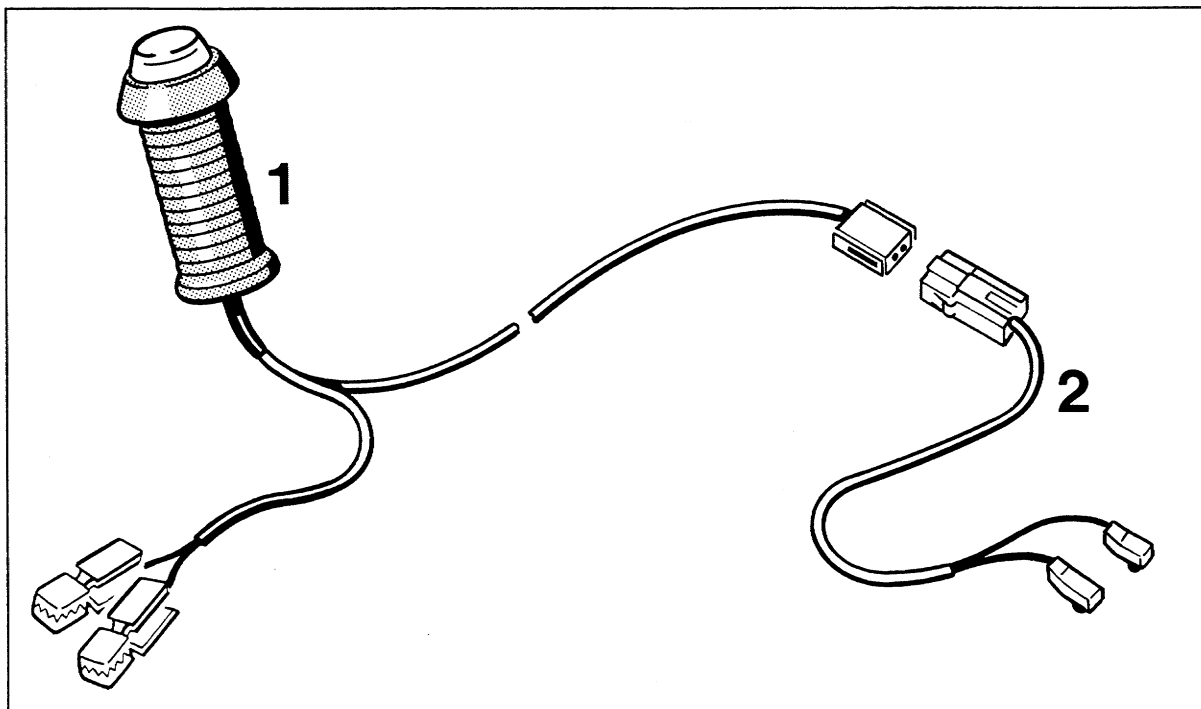
Any specific local or national regulations or legal verdicts which go beyond these instructions must be complied and given preference over these instructions.



## Safety measures

- Ignition and preparation should only be carried out by properly qualified personnel under the supervision of a second, responsible person.
- All other generally applicable accident prevention regulations must be complied with.
- Only ignite airbag units which are in original condition and properly installed.
- Ignite airbag units only in suitable open spaces.
- Use only the ignition equipment specifically intended for the purpose.
- First remove all loose objects from the airbag expansion area.
- Anyone likely to be affected should be warned about the noise in advance.
- Use the whole length of the ignition device's cable in order to maintain a safe distance from the airbag unit which is to be ignited.
- Do not connect the ignition device to the power source until everything else is ready.
- Position yourself and anyone else involved in front of the vehicle.
- Ignite the airbag unit with the vehicle's doors closed but the tailgate/trunk lid or side windows open.
- If ignition fails to occur, do not approach the vehicle until approx. 3 minutes have elapsed.
- Allow airbag units to cool down after ignition and observe them carefully.
- Avoid skin contact with airbag units which have been ignited.

## Tools



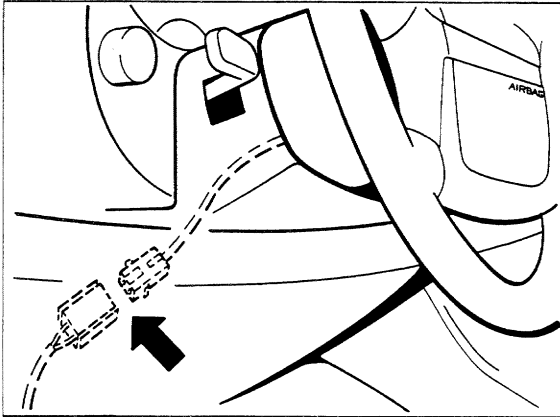
579-68

No.	Designation	Special tool	Order number	Explanation
1	Ignition device	9257*	000.721.925.70	one-way part
2	Ignition cable	9257/1*	000.721.925.71	

\* Order according to requirements

## Connect ignition device

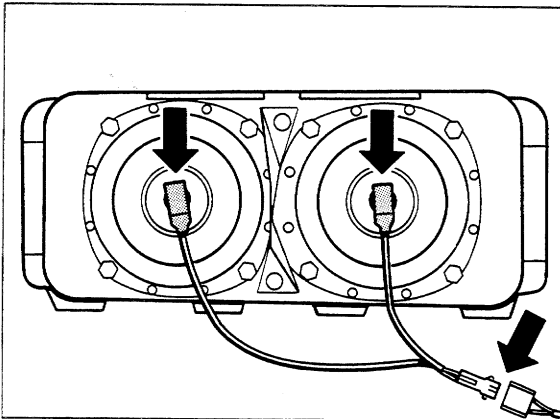
### Driver's side



580-68

Directly to two-pin connector of contact unit  
(below steering column).

### Passenger's side

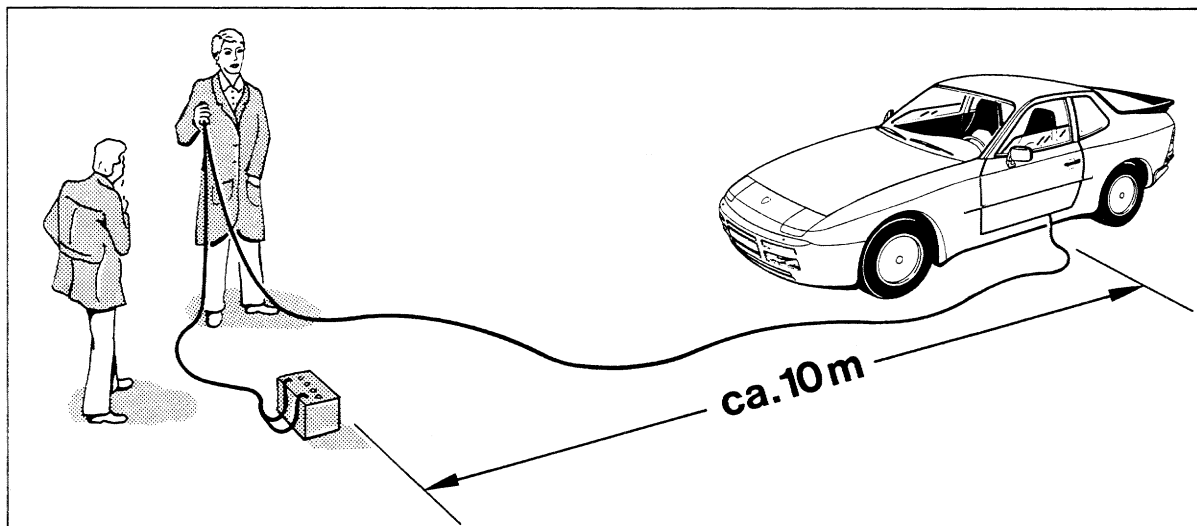


581-68

With ignition cable to both gas generators.

Place ignition device through door gap in  
front of vehicle.

## Ignition



582a-68

Connect ignition device to a car battery and actuate toggle switch.

### Note

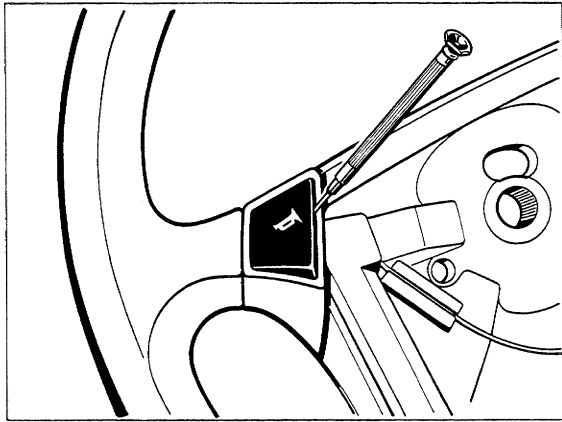
Actuate ignition separately for driver's and passenger's side.

After ignition on the passenger's side has occurred, check if both gas generators have ignited (smoldering marks visible on both ignition cable connectors).

## Repairing horn buttons of airbag steering wheel

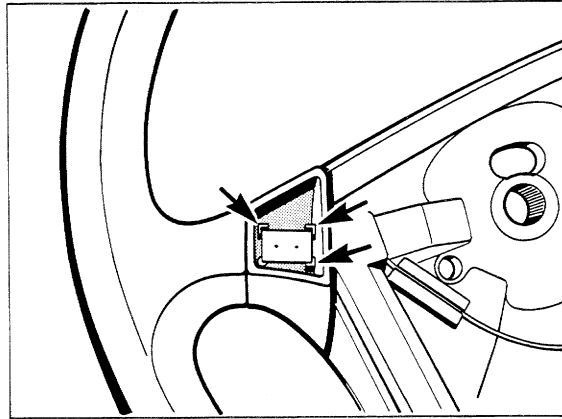
### Removal

1. Remove airbag steering wheel  
(refer to page 68-9).
2. Lever out horn button using a small  
screwdriver.



718-68

4. Insert contact spring into the guides.



719-68

5. Engage horn button, starting with the upper  
lug, and then press in all the way.

### Note

Make sure all lugs have engaged properly.  
When actuating the horn button it must spring  
back freely into the normal position.

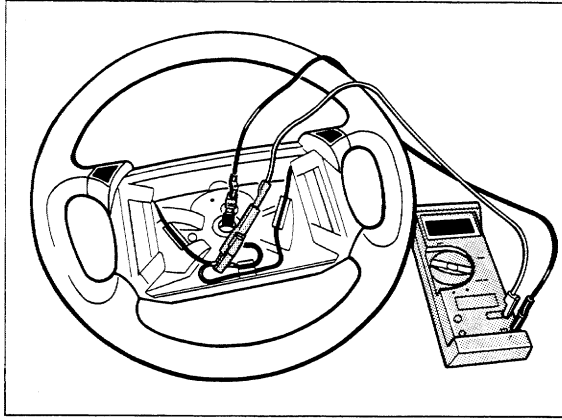
### Installation

#### Note

The silver contact in the middle of the contact  
spring must point down.

**Checking the function of the horn buttons.**

6. Connect an ohmmeter to the connector and to the steering wheel housing.



720-68

Display:  $\infty \Omega$

Push one horn button after another.

Display: 0 - 5  $\Omega$

## Diagnosis / Troubleshooting

For vehicles as of ... (refer to table below)

### USA/Canada

- 944 S2 Cabriolet MY '90
- 944 S2 Coupé

VIN: 94 MN 410402

### RoW

- 944 S2 MY '91

The airbag system is continuously monitored by a diagnosis unit in the control unit. If a fault occurs, it is indicated by a lettering in the instrument cluster.

In the event of a fault, the central warning lamp and the lettering come on. In cars for the USA, the fasten seat belts symbol also lights up.

The airbag lettering comes on for approx. 5 seconds when the ignition is switched on, and then goes out. When the engine is started, the lettering again comes on for approx. 5 seconds.

Should the warning lamp come on again later, this indicates a fault in the airbag system. The fault can be read out with System Tester 9288 and flashing code tester 9268.

### Note:

The control unit needs approx. 70 seconds to identify all faults in the system, and the ignition must therefore be switched on for at least this time.

After a fault in the airbag system has been identified and rectified, **the fault memory must be erased.**

If any components are exchanged, this must be noted in the warranty and maintenance booklet. The document number should be attached in the free space provided. The document number is shown on an adhesive label which can be torn off the spare part.

Following an accident in which the airbag system was activated, the following components must be removed and renewed:

- control unit
- both front sensors
- contact unit
- both airbag units

If non-activated airbag units have to be removed, they must be ignited electrically before being disposed of (see Page 68 - 13).

## Reading out the fault memory

System Tester 9288: see Repair Manual Group 03, Self-diagnosis

Tester 9268: see Technical Service Information, Model '90.

## Meaning of fault codes

1st figure:	3 = Airbag system
2nd figure:	1 = Fault still present
	2 = Fault no longer present
	3 = Failure time since first fault occurrence
3rd figure:	
	= Fault code
4th figure:	

## Before troubleshooting can be carried out correctly, the person concerned must

- be familiar with the component positions and the function and technical relationship of the systems to be checked (model information)
- be able to read and evaluate Porsche circuit diagrams
- understand the function of the electrical circuits and relays
- be capable of operating and assessing the information supplied by the test gear.

## Important:

If the tester display or the fault list indicates that a component is defective, the fault may not necessarily be found in the component indicated but may be in the associated control unit or the connecting circuits (electrical paths) between the component and the control unit. Before the fault memory has been read out, no troubleshooting involving the pulling off of plugs or similar is to be carried out, as this could also be stored as a fault in the memory.



**Note**

The fault code can show two types of fault:

- Fault still present
- Fault no longer present

Faults are stored as no longer present if they occur briefly while the ignition is switched on, but are no longer present when the ignition is switched off.

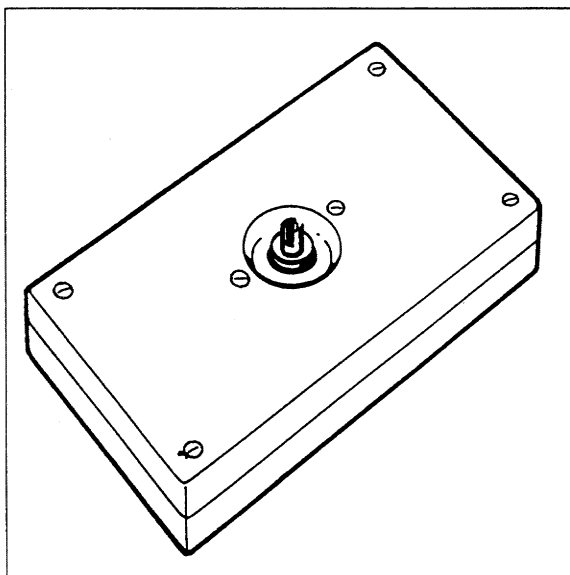
Faults still present are those which are permanent or remain present when the ignition is switched off.

Do not assume that the fault in the readout is actually present or clearly identifiable during the check.

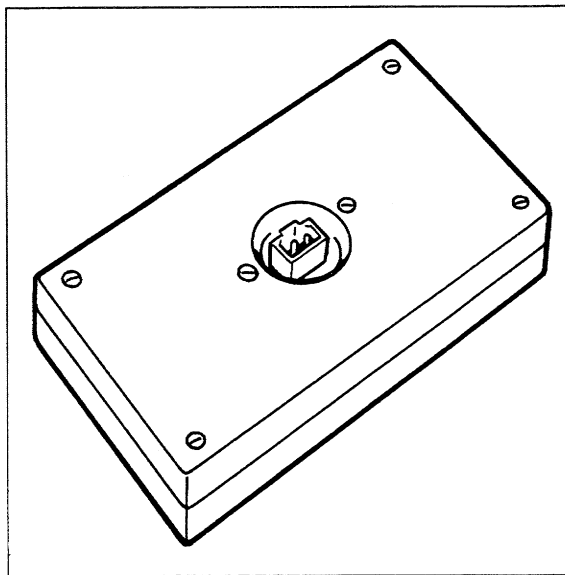
The cause of a fault being memorized may for example be undesirable interference with the airbag system wiring while the ignition was switched on.

It is therefore important in the case of faults no longer present to determine the cause of the fault in order to prevent it from recurring and to avoid renewing parts unnecessarily. Check the entire length of the airbag system wiring for damage (wires no longer intact or trapped).

## Tools



560-68



561-68

Special tools 9516 and 9516/1 are used to check the ignition pill circuits.

If there is a fault in the ignition pill circuits, attach special tool 9516 in place of the airbag units, then erase the fault memory. Switch the ignition off and on again.

The fault can then be localized by means of the diagnosis unit in the control unit.

If the warning light no longer indicates a fault, the airbag unit is defective and must be renewed.

If the warning light again indicates a fault, this is to be sought in the control unit or the wiring.

A fault in ignition pill circuit 1 may also be caused by the contact unit. Disconnect the wiring from the contact unit and attach special tool 9516/1 in place of the contact unit. Erase the fault memory.

Switch the ignition off and then on again. If the warning light no longer indicates a fault, the contact unit is defective; if the warning light again indicates a fault, this must be in the control unit or the wiring.

## Note

For safety reasons, never drive the vehicle with the special tools installed in place of the airbag units

**Fault code table**

<b>Fault code</b>	<b>Designation of fault</b>
11	Left front sensor: closed once
12	Left front sensor: closed several times
13	Right front sensor: closed once
14	Right front sensor: closed several times
15	Left front sensor: permanently closed*
16	Right front sensor: permanently closed
17	Left front sensor: contact resistance to U <sub>B</sub>
18	Right front sensor: contact resistance to U <sub>B</sub>
19	Left front sensor: contact resistance to earth/ground
20	Right front sensor: contact resistance to earth/ground
21	Left front sensor: short circuit to U <sub>B</sub>
22	Right front sensor: short circuit to U <sub>B</sub>
25	Left front sensor: resistance to earth/ground too high
26	Right front sensor: resistance to earth/ground too high
27	Left front sensor: break in feed wire**
28	Right front sensor: break in feed wire**
29	Left front sensor: line resistance too high
30	Right front sensor: line resistance too high
33	Ignition capacitor 1: capacitance too low
34	Ignition capacitor 2: capacitance too low
35	Ignition capacitor 1: contact resistance too high
36	Ignition capacitor 2: contact resistance too high
37	Ignition pill circuit 1: contact resistance to U <sub>B</sub>
38	Ignition pill circuit 2: contact resistance to U <sub>B</sub>

\* Fault code 60 respectively 105 is also shown with fault codes 15 and 16. Renew front sensor and erase fault memory. Repeat the diagnosis. If fault code 60 respectively 105 appears again, renew the control unit.

\*\* Fault code 25 or 26 also appears with fault code 27 or 28 respectively.

Fault code	Designation of fault
39	Ignition pill circuit 3: contact resistance to U <sub>B</sub>
40	Ignition pill circuit 1: short-circuit to U <sub>B</sub>
41	Ignition pill circuit 2: short-circuit to U <sub>B</sub>
42	Ignition pill circuit 3: short-circuit to U <sub>B</sub>
43	Ignition pill circuit 1: contact resistance to earth/ground
44	Ignition pill circuit 2: contact resistance to earth/ground
45	Ignition pill circuit 3: contact resistance to earth/ground
46	Ignition pill circuit 1: short-circuit to earth/ground
47	Ignition pill circuit 2: short-circuit to earth/ground
48	Ignition pill circuit 3: short-circuit to earth/ground
49	Ignition pill circuit 1: break
50	Ignition pill circuit 2: break
51	Ignition pill circuit 3: break
52	Ignition pill circuit 1: resistance too low
53	Ignition pill circuit 2: resistance too low
54	Ignition pill circuit 3: resistance too low
55	Ignition pill circuit 1: resistance too high
56	Ignition pill circuit 2: resistance too high
57	Ignition pill circuit 3: resistance too high
58	Warning lamp: short-circuit to U <sub>B</sub> or earth/ground
59	Warning lamp: break
60	Diagnosis unit: defective
61	Correct ignition sequence (after crash)
62	Correct ignition current (after crash)
65	Ignition pill current transmitted (after crash)
67 bis 105	Internal fault*

Ignition pill circuit 1: driver's airbag

Ignition pill circuit 2 and 3: passenger's airbag

\* When the airbag system is checked with the 9268 tester, fault code 60 is always indicated in the event of an internal fault.

Fault, Fault Code	Possible Causes, Elimination, Remarks
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**Note**

After any airbag system fault has been detected and rectified, the fault memory **must** be erased.

**Test point 1**

Left front sensor closed once Fault code 3 _ 11	– Renew front sensor.
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**Test point 2**

Left front sensor closed several times Fault code 3 _ 12	– Renew front sensor.
--	-----------------------

**Test point 3**

Right front sensor closed once Fault code 3 _ 13	– Renew front sensor.
--	-----------------------

**Test point 4**

Right front sensor closed several times Fault code 3 _ 14	– Renew front sensor.
---	-----------------------

**Test point 5**

Left front sensor closed permanently Fault code 3 _ 15	– Renew front sensor.
--	-----------------------

**Test point 6**

Right front sensor closed permanently Fault code 3 _ 16	– Renew front sensor.
---	-----------------------

Fault, Fault Code	Possible Causes, Elimination, Remarks
<b>Test point 7</b> Left front sensor Contact resistance to U <sub>B</sub> Fault code 3 _ 17	<ul style="list-style-type: none"><li>– Check front sensor at plug connection with ohmmeter. 1. Ohmmeter at terminal 1 and terminal 2 Display: 10 kΩ 2. Ohmmeter at terminal 2 and terminal 3 Display: 0...0.5 Ω If measured values are within tolerance, renew the control unit; if out of tolerance, renew the front sensor.</li></ul>
<b>Test point 8</b> Right front sensor Contact resistance to U <sub>B</sub> Fault code 3 _ 18	<ul style="list-style-type: none"><li>– See test point 7</li></ul>
<b>Test point 9</b> Left front sensor Contact resistance against earth/ground Fault code 3 _ 19	<ul style="list-style-type: none"><li>– See test point 7</li></ul>
<b>Test point 10</b> Right front sensor Contact resistance against earth/ground Fault code 3 _ 20	<ul style="list-style-type: none"><li>– See test point 7</li></ul>
<b>Test point 11</b> Left front sensor Short-circuit to U <sub>B</sub> Fault code 3 _ 21	<ul style="list-style-type: none"><li>– See test point 7</li></ul>

Fault, Fault Code	Possible Causes, Elimination, Remarks
<b>Test point 12</b>	
Right front sensor Short-circuit to U <sub>B</sub> Fault code 3 _ 22	– See test point 7
<b>Test point 13</b>	
Left front sensor Earth/ground resistance too high Fault code 3 _ 25	<ul style="list-style-type: none"> <li>– Check front sensor: plug contacts and plug connection must engage correctly.</li> <li>– Check front sensor with ohmmeter; see test point 7</li> <li>– Check mounting points; the metal must be bright for good electrical contact.</li> </ul>
<b>Test point 14</b>	
Right front sensor Earth/ground resistance too high Fault code 3 _ 26	– see test point 13
<b>Test point 15</b>	
Left front sensor Break in feed line Fault code 3 _ 27	<ul style="list-style-type: none"> <li>– Check front sensor plug connection: plug contacts and plug connection must engage correctly.</li> <li>– Check front sensor mit ohmmeter (see test point 7). If no fault is detected at front sensor, renew the control unit.</li> </ul>
<b>Test point 16</b>	
Right front sensor Break in feed line Fault code 3 _ 28	– see test point 15
<b>Test point 17</b>	
Left front sensor Line resistance too high Fault code 3 _ 29	<ul style="list-style-type: none"> <li>– Check front sensor mit ohmmeter (see test point 7). If no fault is detected at the front sensor, renew the control unit.</li> </ul>

Fault, Fault Code	Possible Causes, Elimination, Remarks
<b>Test point 18</b>	
Right front sensor Line resistance too high Fault code 3 _ 30	– See test point 17
<b>Test point 19</b>	
Ignition condenser 1 Capacitance too low Fault code 3 _ 33	– Renew the control unit.
<b>Test point 20</b>	
Ignition condenser 2 Capacitance too low Fault code 3 _ 34	– Renew the control unit.
<b>Test point 21</b>	
Ignition condenser 1 Contact resistance too high Fault code 3 _ 35	– Renew the control unit.
<b>Test point 22</b>	
Ignition condenser 2 Contact resistance too high Fault code 3 _ 36	– Renew the control unit.



**Fault, Fault Code****Possible Causes, Elimination, Remarks****Test point 23**

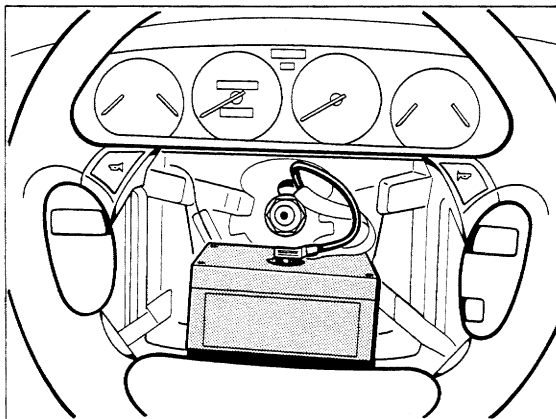
Ignition pill circuit 1

Contact resistance

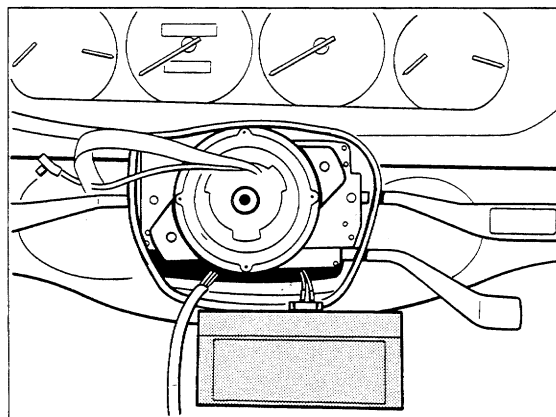
to UB

Fault code 3 \_ 37

1. Remove driver's airbag unit.
2. Attach special tool 9516 in place of the airbag unit.



3. Erase the fault memory.
4. Check whether fault is still present.
  - a) If fault is no longer present, renew the airbag unit.
  - b) If fault is still present, separate connections at contact unit and attach special tool 9516/1.



5. Erase the fault memory.
6. Check whether fault is still present.
  - a) If the fault is no longer present, renew the contact unit.
  - b) If the fault is still present, renew the control unit.

Fault, Fault Code	Possible Causes, Elimination, Remarks
	<b>Note</b>
	Ignition pill circuit 2 is the left of the two passenger-side airbag circuits, ignition pill circuit 3 the right circuit.
<b>Test point 24</b>	
Ignition pill circuit 2 Contact resistance to U <sub>B</sub> Fault code 3 _ 38	<ol style="list-style-type: none"> <li>1. Pull off plug at passenger-side airbag unit.</li> <li>2. Attach special tool 9516.</li> <li>3. Erase the fault memory.</li> <li>4. Check whether fault is still present.</li> </ol> <p>a) If fault is no longer present, renew passenger-side airbag.</p> <p>b) If fault is still present, renew the control unit.</p>
<b>Test point 25</b>	
Ignition pill circuit 3 Contact resistance to U <sub>B</sub> Fault code 3 _ 39	– see test point 24
<b>Test point 26</b>	
Ignition pill circuit 1 Short-circuit to U <sub>B</sub> Fault code 3 _ 40	– see test point 23
<b>Test point 27</b>	
Ignition pill circuit 2 Short-circuit to U <sub>B</sub> Fault code 3 _ 41	– see test point 24
<b>Test point 28</b>	
Ignition pill circuit 3 Short-circuit to U <sub>B</sub> Fault code 3 _ 42	– see test point 24

Fault, Fault Code	Possible Causes, Elimination, Remarks
<b>Test point 29</b> Ignition pill circuit 1 Contact resistance to earth/ground Fault code 3 _ 43	– see test point 23
<b>Test point 30</b> Ignition pill circuit 2 Contact resistance to earth/ground Fault code 3 _ 44	– see test point 24
<b>Test point 31</b> Ignition pill circuit 3 Contact resistance to earth/ground Fault code 3 _ 45	– see test point 24
<b>Test point 32</b> Ignition pill circuit 1 Short-circuit to earth/ground Fault code 3 _ 46	– see test point 23
<b>Test point 33</b> Ignition pill circuit 2 Short-circuit to earth/ground Fault code 3 _ 47	– see test point 24
<b>Test point 34</b> Ignition pill circuit 3 Short-circuit to earth/ground Fault code 3 _ 48	– see test point 24

**Fault, Fault Code****Possible Causes, Elimination, Remarks****Test point 35**

Ignition pill circuit 1

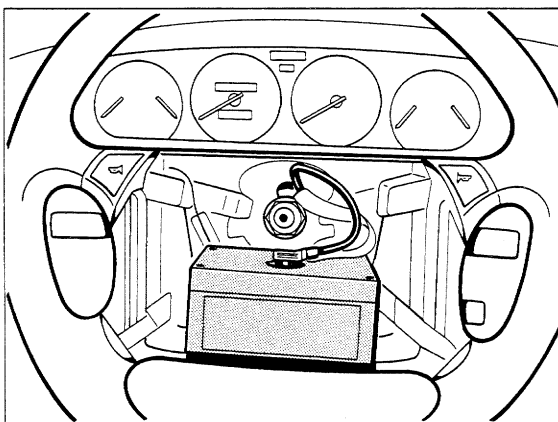
Break

Fault code 3 \_ 49

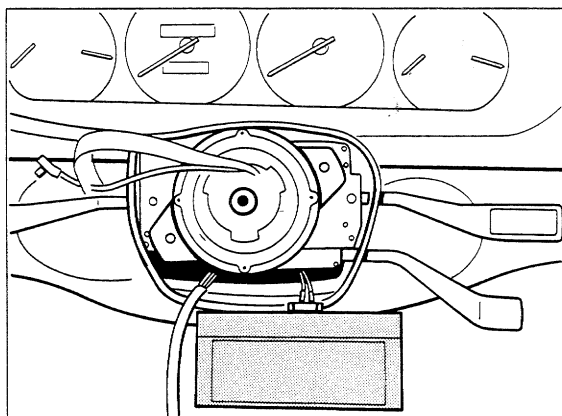
- Check that plug connection to airbag unit is correctly engaged.
- Check that plug connection to contact unit is correctly engaged.

If no fault is detected:

1. Remove driver's airbag unit.
2. Attach special tool 9516 in place of the airbag unit.



3. Erase the fault memory.
4. Check whether the fault is still present.
  - a) If the fault is no longer present, renew the airbag unit.
  - b) If the fault is still present, separate the plug connection to the contact unit and attach special tool 9516/1.



5. Erase the fault memory.

Fault, Fault Code	Possible Causes, Elimination, Remarks
	<p>6. Check whether fault is still present.</p> <p>a) If the fault is no longer present, renew the control unit.</p> <p>b) If the fault is still present, renew the control unit.</p>
<p><b>Test point 36</b></p> <p>Ignition pill circuit 2</p> <p>Break</p> <p>Fault code 3 _ 50</p>	<p>– Check that the plug connection to the airbag unit is correctly engaged.</p> <p>If no fault is detected:</p> <ol style="list-style-type: none"> <li>1. Pull off plug at passenger-side airbag unit.</li> <li>2. Attach special tool 9516.</li> <li>3. Erase the fault memory.</li> <li>4. Check whether fault is still present.</li> </ol> <p>a) If the fault is no longer present, renew the passenger-side airbag unit.</p> <p>b) If the fault is still present, renew the control unit.</p>
<p><b>Test point 37</b></p> <p>Ignition pill circuit 3</p> <p>Break</p> <p>Fault code 3 _ 51</p>	<p>– see test point 36</p>
<p><b>Test point 38</b></p> <p>Ignition pill circuit 1</p> <p>Resistance too low</p> <p>Fault code 3 _ 52</p>	<p>– see test point 23</p>
<p><b>Test point 39</b></p> <p>Ignition pill circuit 2</p> <p>Resistance too low</p> <p>Fault code 3 _ 53</p>	<p>– see test point 24</p>

Fault, Fault Code	Possible Causes, Elimination, Remarks
<b>Test point 40</b> Ignition pill circuit 3 Resistance too low Fault code 3 _ 54	– see test point 24
<b>Test point 41</b> Ignition pill circuit 1 Resistance too high Fault code 3 _ 55	– see test point 23
<b>Test point 42</b> Ignition pill circuit 2 Resistance too high Fault code 3 _ 56	– see test point 24
<b>Test point 43</b> Ignition pill circuit 3 Resistance too high Fault code 3 _ 57	– see test point 24
<b>Test point 44</b> Warning lamp: short-circuit to UB or earth/ground Fault code 3 _ 58	– Check wiring for damage. – Check instrument cluster.
<b>Test point 45</b> Break in circuit at warning lamp Fault code 3 _ 59	– Check power supply fuse for instrument cluster – Check warning lamp and renew if necessary. – Check wiring for damage.

Fault, Fault Code	Possible Causes, Elimination, Remarks
<b>Test point 46</b> Defective diagnosis unit Fault code 3 _ 60	– Renew the control unit
<b>Test point 47</b> Ignition sequence correct (after crash) Fault code 3_61	– All airbag components must be renewed after the airbag has been activated.
<b>Test point 48</b> Ignition current correct (after crash) Fault code 3 _ 62	– see test point 47
<b>Test point 49</b> Ignition pill current has flowed (after crash) Fault code 3 _ 65	– see test point 47
<b>Test point 50</b> Control unit defective Fault code 3 _ 67	– Renew the control unit

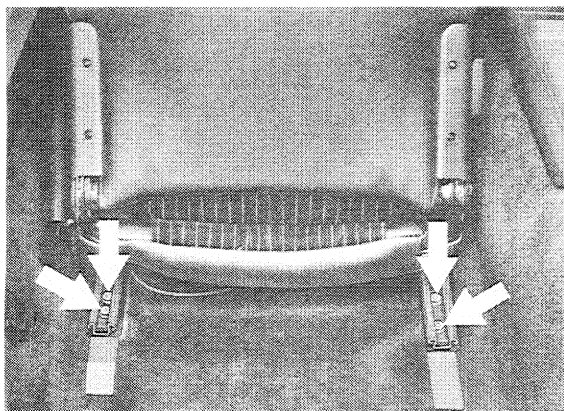
**Note on test point 50**

With the 9288 System Tester, a fault code can be displayed in the range from 67 to 105.  
On the 9268 Tester, code 60 is always displayed if the fault is in the range from 67 to 105.

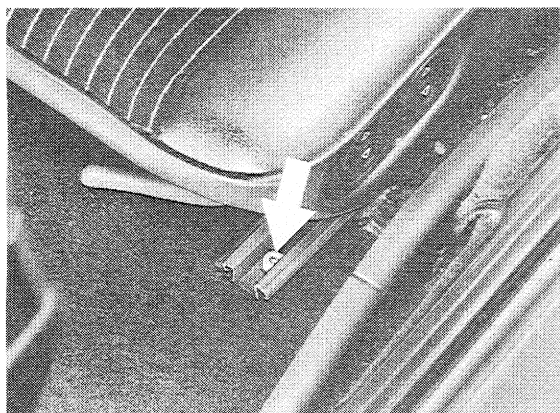
## REMOVING AND INSTALLING FRONT SEATS

### Removing

1. Slide seat forward and unscrew rear bolts.

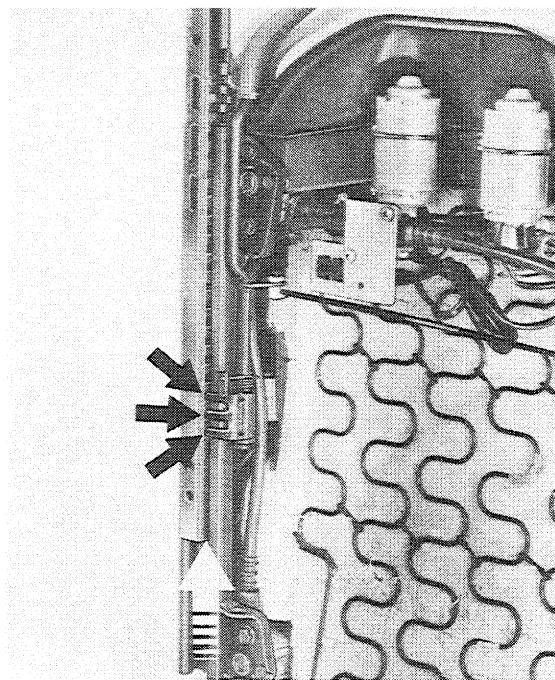


2. Slide seat back and unscrew front bolts. If car has power seats, disconnect plug. Take seat out of car.



### Installing

1. Check seat rails for wear and, if necessary, replace before installation of seat. Lubricate seat rails with grease.
2. Run out seat rails on seat forward and lock fully on both sides.



3. Place seat on seat rail carriers. If car has power seats, connect electric plug. Align front end of seat with hole pattern. Install and tighten front bolts slightly.
4. Slide seat forward and lock completely (visual check). Screw in and slightly tighten all 4 bolts.
5. Slide seat back and lock completely (visual check). Tighten bolts.
6. Slide seat forward and lock completely (visual check). Tighten bolts.



**Note**

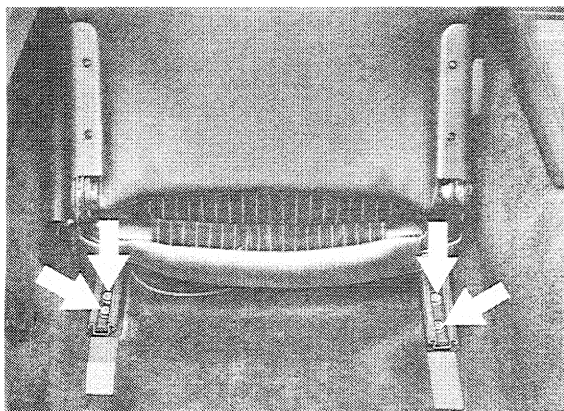
If locking behavior is not synchronous, loosen front bolt on outside, slide seat forward and lock completely (visual check). Loosen rear bolts on outside and eliminate residual tension by sliding seat accordingly. Tighten bolts. Slide seat back and tighten front outside bolt. Check whether seat rail locking engages fully in all possible locking positions.

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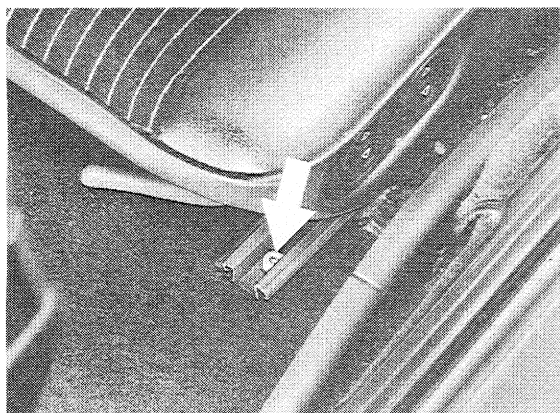
## REMOVING AND INSTALLING FRONT SEATS

### Removing

1. Slide seat forward and unscrew rear bolts.

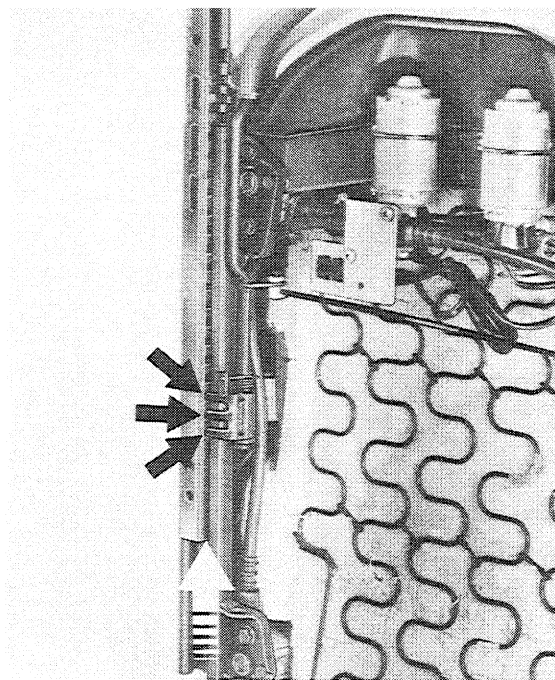


2. Slide seat back and unscrew front bolts. If car has power seats, disconnect plug. Take seat out of car.



### Installing

1. Check seat rails for wear and, if necessary, replace before installation of seat. Lubricate seat rails with grease.
2. Run out seat rails on seat forward and lock fully on both sides.



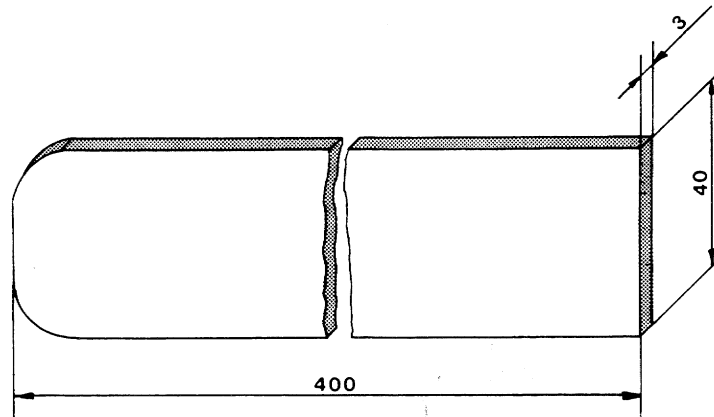
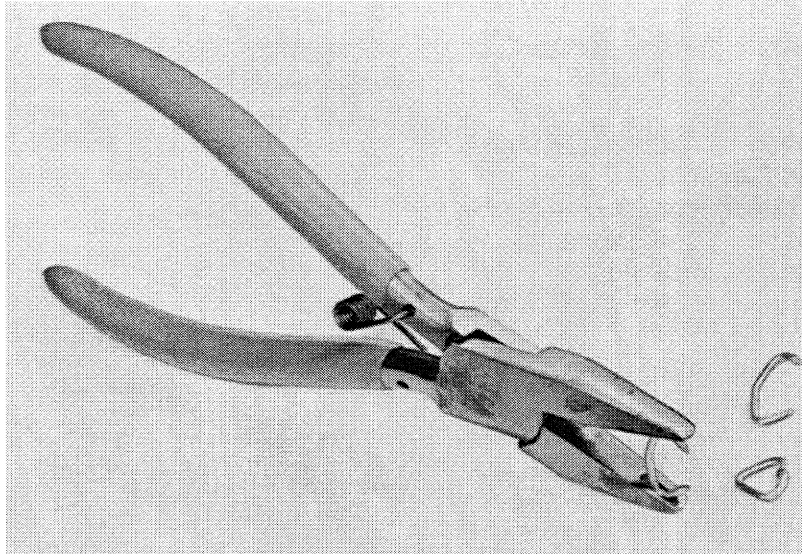
3. Place seat on seat rail carriers. If car has power seats, connect electric plug. Align front end of seat with hole pattern. Install and tighten front bolts slightly.
4. Slide seat forward and lock completely (visual check). Screw in and slightly tighten all 4 bolts.
5. Slide seat back and lock completely (visual check). Tighten bolts.
6. Slide seat forward and lock completely (visual check). Tighten bolts.

**Note**

If locking behavior is not synchronous, loosen front bolt on outside, slide seat forward and lock completely (visual check). Loosen rear bolts on outside and eliminate residual tension by sliding seat accordingly. Tighten bolts. Slide seat back and tighten front outside bolt. Check whether seat rail locking engages fully in all possible locking positions.

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## TOOLS



No.	Description	Special Tool	Remarks
1	Upholsterer's pliers		Commercially available e.g. Binder
2	Pulling tool	Improvised tool	

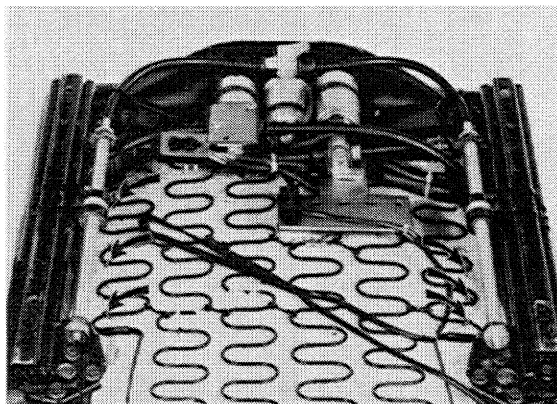
## REPLACING HEATING ELEMENT FOR SEAT CUSHION HEATING

1. Move seat to highest position.
2. Remove seat (see Repair Manual, page 72 - 1).
3. Disconnect plug of seat heating (seat back and cushion). Use ohmmeter to check conductance of heating element. If element is defective, resistance is infinity.
5. Lay seat on backrest and use side nippers to cut through staples beneath seat cushion. Straighten tabs on frame and remove tensioning wire. Unhook seat cover and pull up. Disconnect cable connector and retainer.

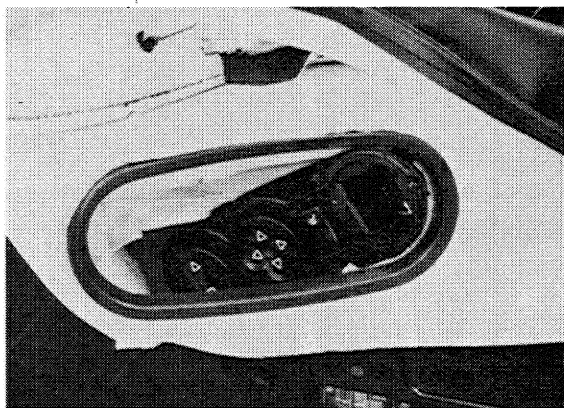
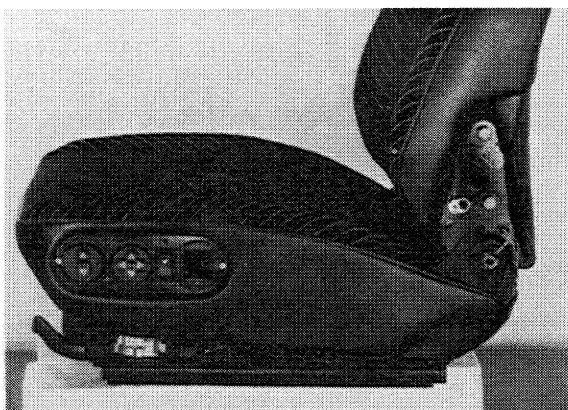
### Note

The cushion and backrest heating elements are connected in series: do not apply more than 6 V to either part (see also Quality Information Group 7, 1/86 dated 18th April 1986).

4. Remove switch cover. Remove attachment screws of backrest hinge covers and remove covers by pulling toward rear.



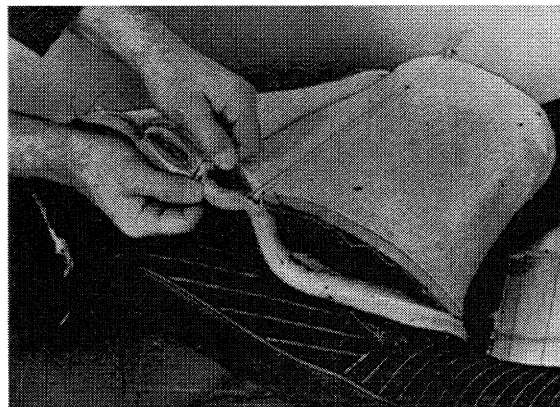
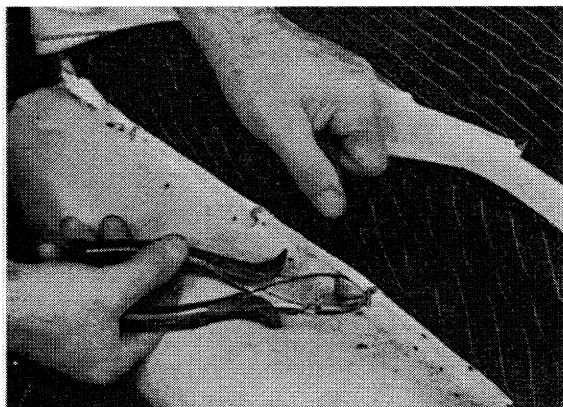
6. Remove cushion complete with upholstered cover from frame. Push switch unit through hole in cushion.



7. Cut through remaining staples. Break adhesive bond between upholstered cover and cushion. Remove cover.

#### N o t e

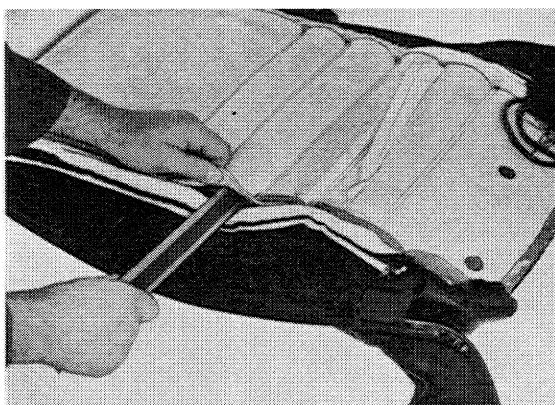
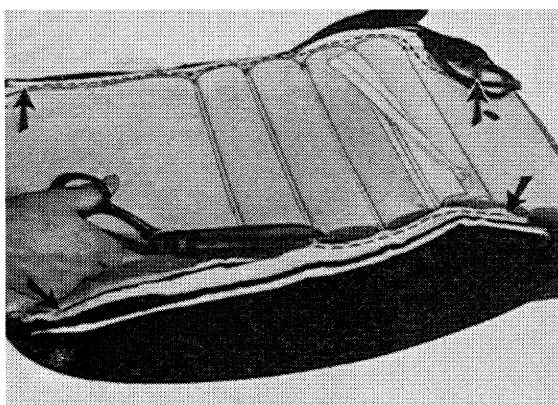
Do not cut past the cross seams. Do not cut through the cross seams.



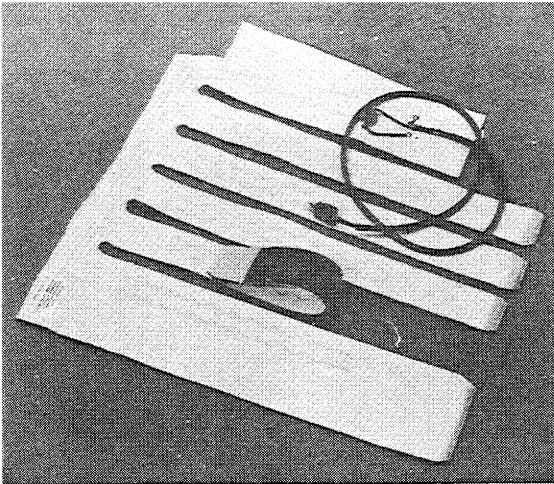
8. Cut through inside of cover beside right-hand and left-hand seams.

Caution: Do not damage outer cover.

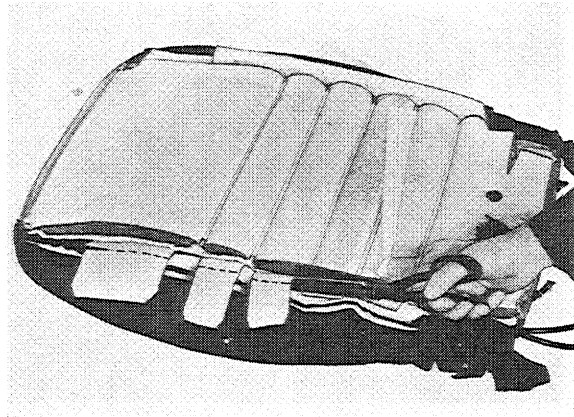
9. By twisting and pushing with the improvised tool, carefully break adhesive bond between outer cover and padding material or heating element. Sever cable of defective heating element.



Heating element for seat cushion.



11. Cut off excess material (push-in loops).  
Caution: Do not damage heating wire



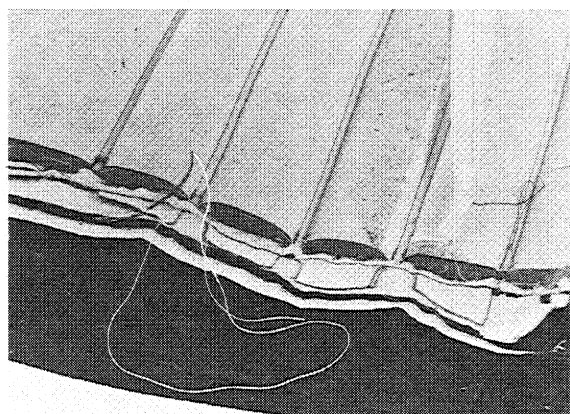
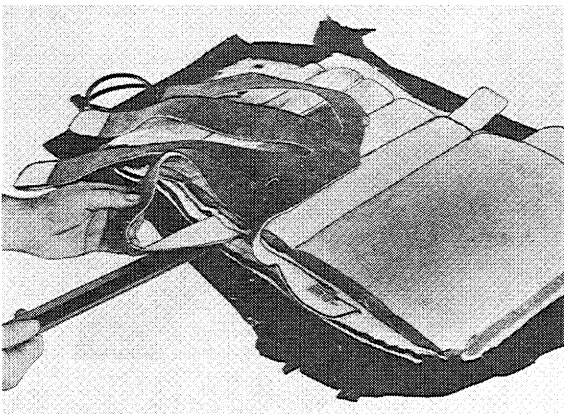
#### N o t e

Install liner with grey felt pointing toward outer cover.

10. With improvised tool, push heating element between outer and inner covers (or defective heating element) into the pocket.

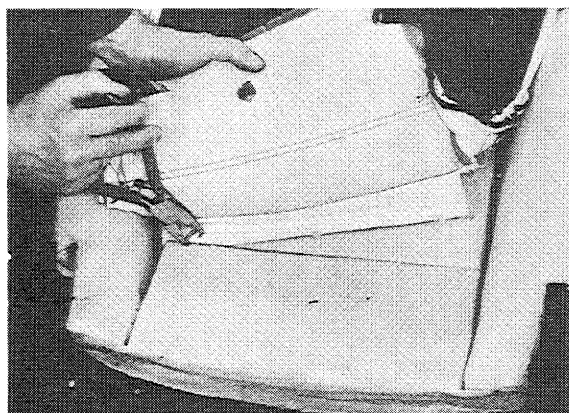
12. Check conductance of heating element.

13. Stitch or glue (latex) new heating element to outer cover on left and right.

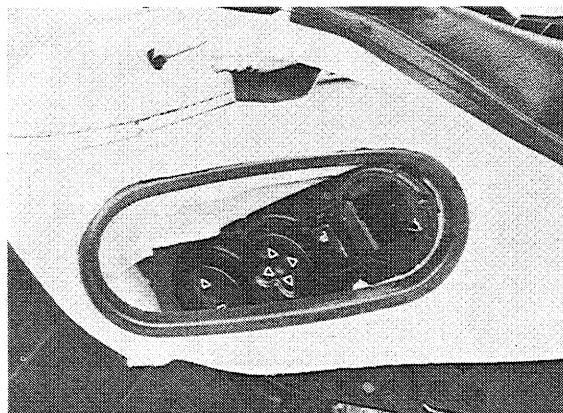




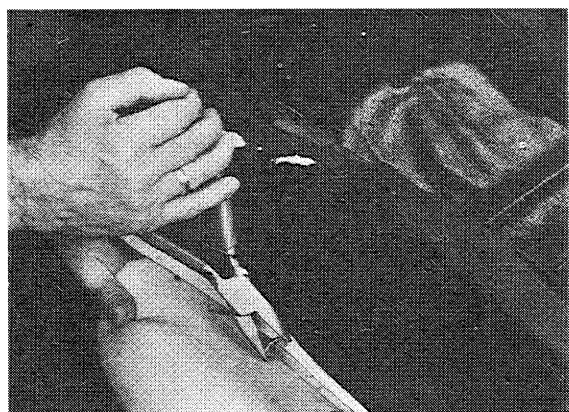
14. Lay cover on cushion and, starting at the cross strip, tack in place with 3 staples.



16. Place cover with seat cushion on frame and push switch unit through opening in cushion.



15. Insert 5 staples in each length-wise strip to hold cover at sides. Use glue to fix cover at backrest hinge.



17. Hook cover over tabs at front and sides. Bend tabs slightly to hold cover in this position.

18. Attach tensioning wire to seat springs.

19. Insert two staples, one at the rear left and one at the rear right of the cover.

20. Hook rear of cover over tabs.

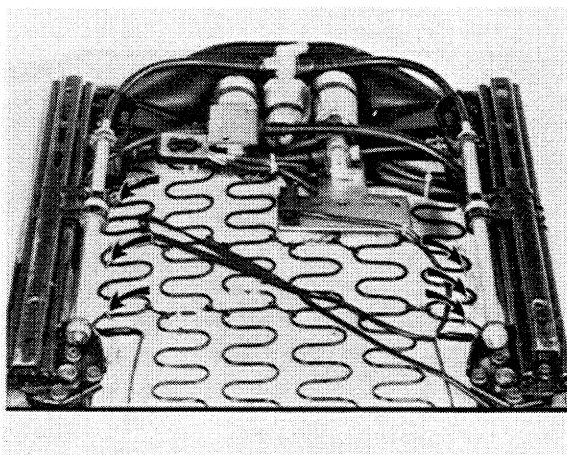
21. Press all tabs down fully.

#### N o t e

To improve accessibility to the tabs and for attaching the cover, place the seat frame in the highest position.



22.Route cable and attach retainer.



23.Install switch cover and  
backrest hinge cover.

24.Install seat (see Repair Manual,  
page 72 - 1).

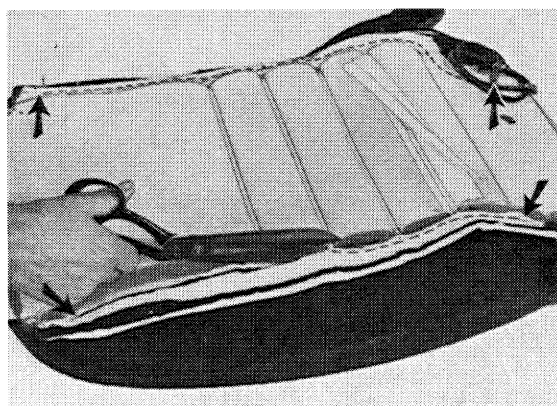
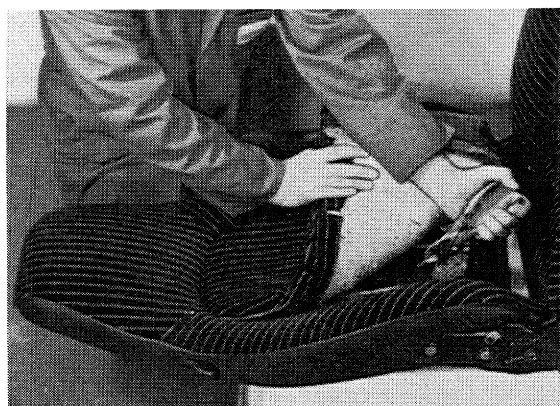
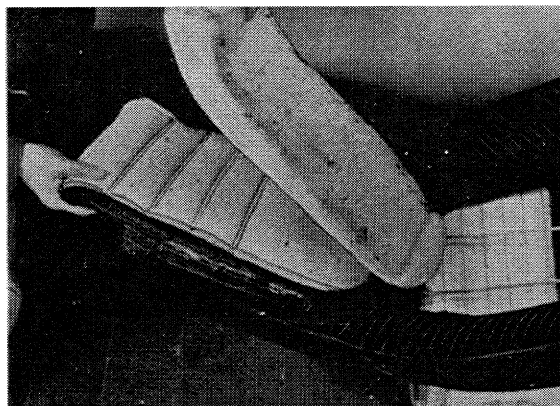
## REPLACING HEATING ELEMENT FOR BACKREST HEATING

1. Move seat to highest position.
2. Remove seat (see Repair Manual, page 72 - 1).
3. Disconnect plug of seat heating (seat back and cushion). Use ohmmeter to check conductance of heating element. If element is defective, resistance is infinity.
6. Break adhesive bond between cover and backrest padding. Remove padding.

### N o t e

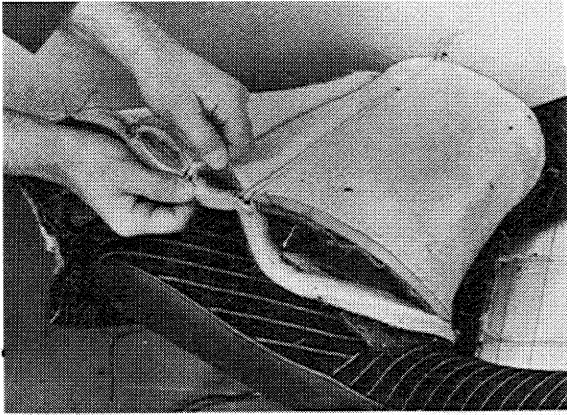
The cushion and backrest heating elements are connected in series: do not apply more than 6 V to either part (see also Quality Information Group 7, 1/86 dated 18th April 1986).

4. Straighten tabs on seat frame and unhook cover.
5. Pull up cover with backrest padding and cut staples with side nippers.
7. Cut open inside of cover beside right-hand and left-hand seams. Caution: Do not damage outer cover.

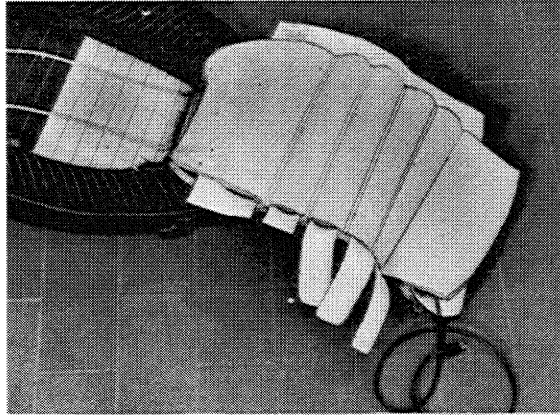


## N o t e

Do not cut the cover past the cross seams. Do not cut through the cross seams.

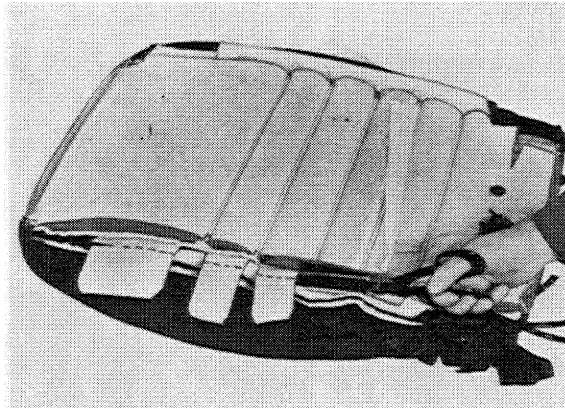
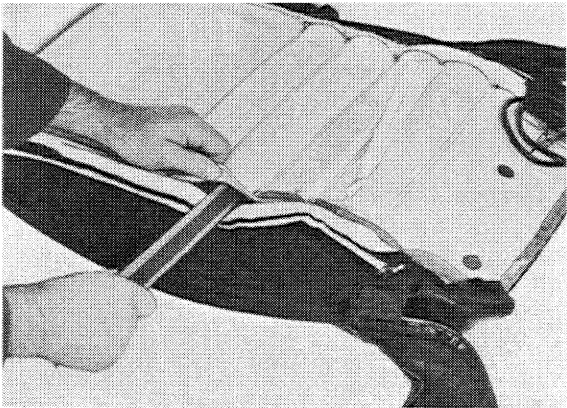


9. With the aid of the improvised tool, push heating element between outer and inner covers (or defective heating element) into the pocket.



8. By twisting and pushing with the improvised tool, carefully break the adhesive bond between outer cover and padding or heating element. Cut off cable from defective heating element.

10. Cut off excess material (push-in loops).  
Caution: Do not damage heating wire.

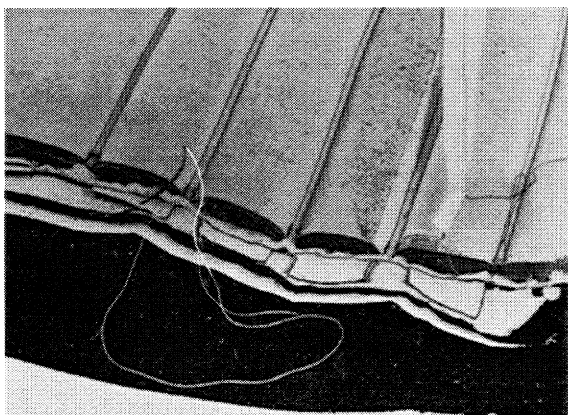


## N o t e

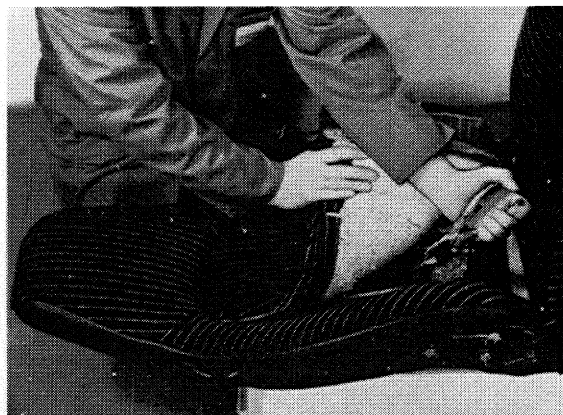
Install the heating element with the grey felt liner pointing toward the outer cover.

11. Check heating element for conductance.

12. Stitch or glue (latex) new heating element to outer cover on left and right.

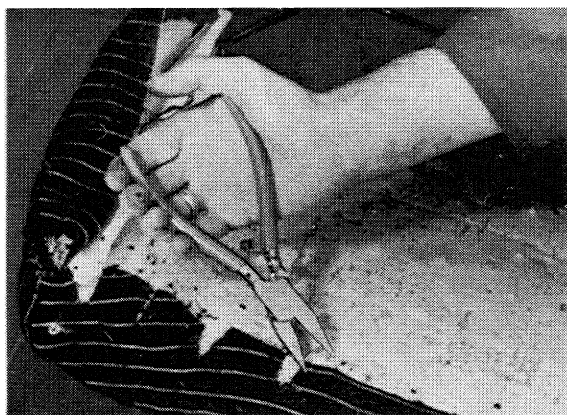


15. Attach padding to backrest springs with 4 staples.



13. Glue cover and padding together at top.

14. Attach cover at the sides and bottom without creases and insert staples.



16. Route cable and attach.

17. Hook cover over tabs.

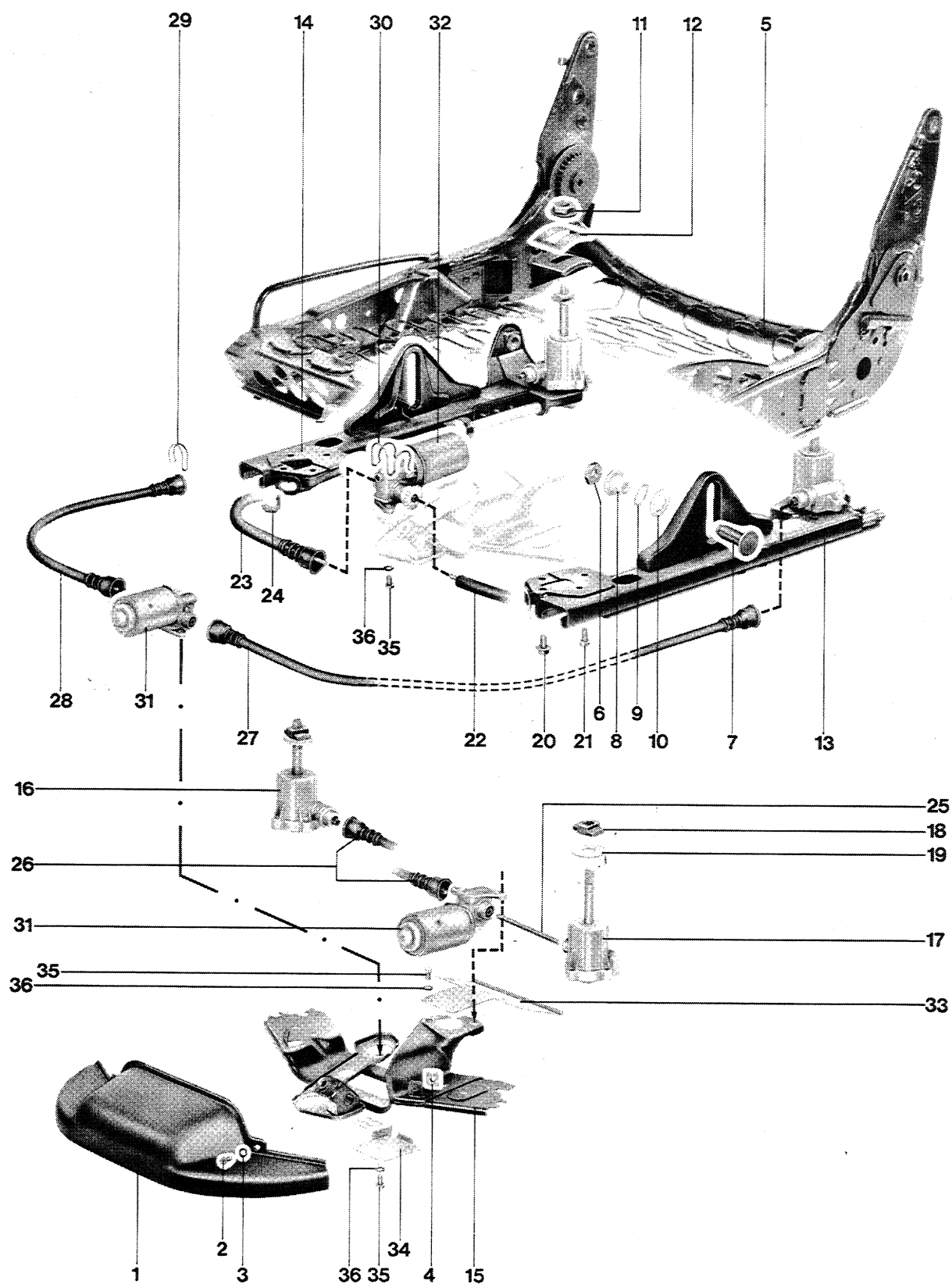
18. Press tabs down.

19. Install seat (see Repair Manual, page 72 - 1).

\_\_\_\_\_

SEAT FRAME

## SEAT FRAME



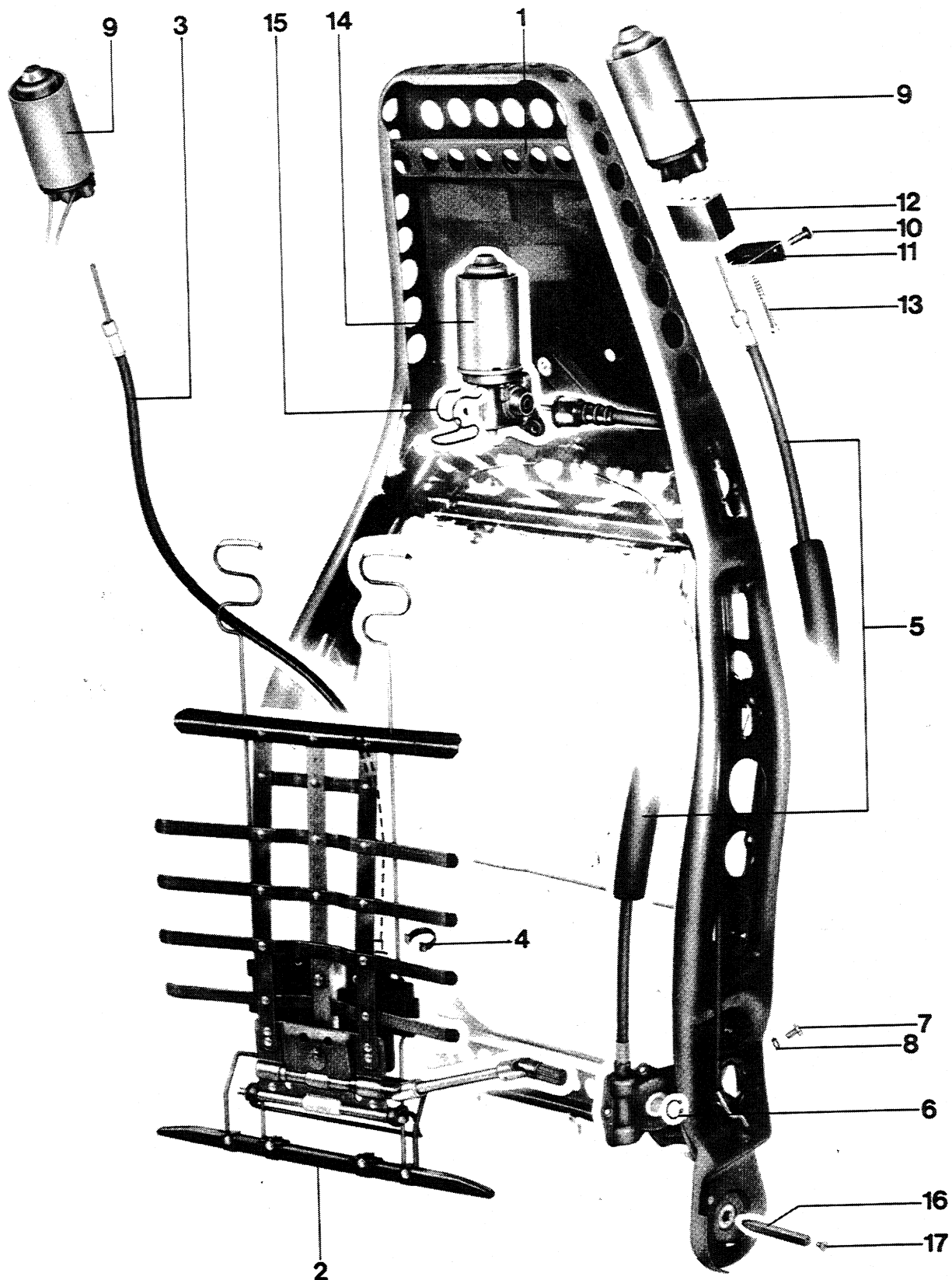
No.	Description	Qty.	Note When:	
			Removing	Installing
1	Cover	1		
2	Tapping screw	2		
3	Washer	2		
4	Sheet-metal nut	2		
5	Seat frame	1		
6	Hex nut	2		
7	Pin	2		
8	Friction sleeve	2		
9	Spring washer	2		
10	Plastic washer	2		
11	Hex nut	4		
12	Guide spring	4		
13	Seat rail, left	1		
14	Seat rail, right	1		
15	Transverse strut	1		
16	Up/down drive gear, front right and rear left	2		
17	Up/down drive gear, front left and rear right	2		

No.	Description	Qty.	Note When:	
			Removing	Installing
18	Slide	4		
19	Washer	4		
20	Hex bolt	8		
21	Hex socket-head bolt	4		
22	Shaft, seat adjustment, left	1		
23	Shaft, seat adjustment, right	1		
24	Staple	3		
25	Shaft, height adjustment, front left	1		
26	Shaft, height adjustment, front right	1		
27	Shaft, height adjustment, rear left	1		
28	Shaft, height adjustment, rear right	1		
29	Shaped spring	3		
30	Shaped spring	3		
31	Electric motor	2		
32	Electric motor	1		
33	Holder	1		
34	Holder	1		



No.	Description	Qty.	Note When:	
			Removing	Installing
35	Hex bolt	6		
36	Serrated washer	6		

## BACKREST



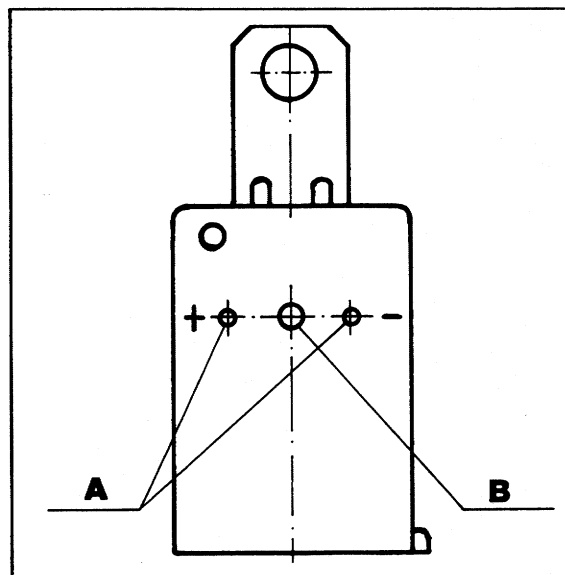
No.	Description	Qty.	Note When:	
			Removing	Installing
1	Backrest frame	1		
2	Lumbar support	1		
3	Shaft, lumbar support, height adjustment	1		
4	Circlip	1		
5	Shaft, lumbar support, shape	1		
6	Circlip	1		
7	Cross-recessed bolt, M 5 x 8	2		
8	Serrated washer	2		
9	Electric motor	2		
10	Cross-recessed bolt, M5 x 16	6		
11	Angle holder	2		
12	Spacer	2		
13	Hex bolt	4		
14	Electric motor, backrest adjustment	1		
15	Shaped spring	1		
16	Guide	1		
17	counterfunk screw with hex socket head	2		

## Calibrating controllable seat heating

### Model 89 onward Control units

#### Note

The seat heating must be calibrated after the control unit or heating elements have been replaced.



*Control unit for seat heating without  
seat-position control*

165 - 72

A = Measuring points

B = Adjustmet potentiometer

**Tools**

1. Digital-voltmeter with an internal resistance ( $R_i$ )  $\geq 1 \text{ M}\Omega$ .
2. Two measuring probes with a maximum diameter of 2 mm.
3. Thermometer (as recommended in the Workshop Handbook).
4. 2 mm wrench.
5. Two auxiliary cables to supply voltage to the removed seat (terminals 15 and 31). Use adapter cable 9269 for seat-position control.

**Calibration procedure**

1. Store the seat to be calibrated in the working area until it has assumed the ambient temperature.

2. Provide power supply.

**Note**

Do not switch on the seat heating. If switched on unintentionally, the seat must cool down until the heating elements have again adopted the ambient temperature.

3. Measure the ambient temperature and refer to the table for the relevant voltage value.
4. Connect the voltmeter to the control unit (A).
5. Set the voltage value on the calibration potentiometer (B) so that it corresponds to the appropriate value for the ambient temperature.

**Table**

Ambient temperature in °C      Voltage in V

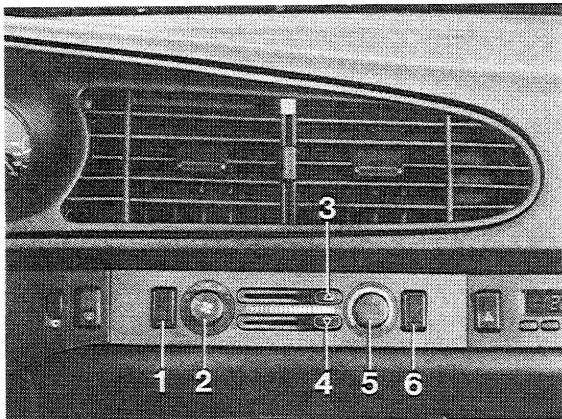
0	1.50
2	1.55
4	1.60
6	1.65
8	1.70
10	1.75
12	1.80
14	1.85
16	1.90
18	1.95
20	2.00
22	2.05
24	2.10
26	2.15
28	2.20
30	2.25
32	2.30
34	2.35
36	2.40
38	2.45
40	2.50
42	2.55
44	2.60
46	2.65
48	2.70

**Functional check**

Switch on seat heating for approx. 10 sec. with maximum heating power. After switching off, measure the voltage at the control unit. The value measured now must be considerably higher.

## HEATING SYSTEM FROM 85/2 MODEL

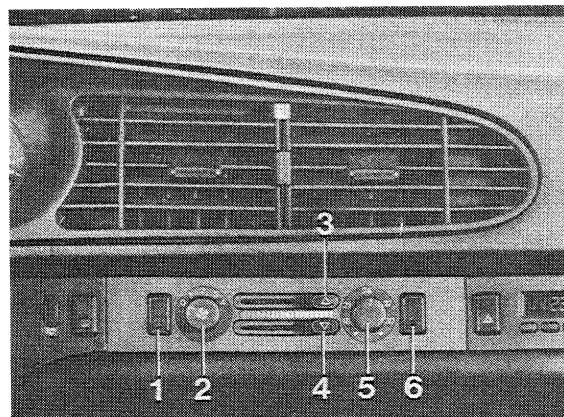
Starting with the 85/2 model, all 944 vehicles received a new heating system.



- 1 Defrost switch
- 2 Outside air blower switch
- 3 Defrost slide switch
- 4 Footwell slide switch
- 5 Temperature switch
- 6 Ventilation switch

The new heating system differs from the old in that all control of the flaps is accomplished via electric control motors or by vacuum pressure.

As a special option, there is an automatic heating system with which the interior temperature can be preselected via a temperature-preselection switch. The heating system then independently controls the interior temperature and maintains it at the preselected value, as long as the outside temperature is lower than the preselected interior temperature.



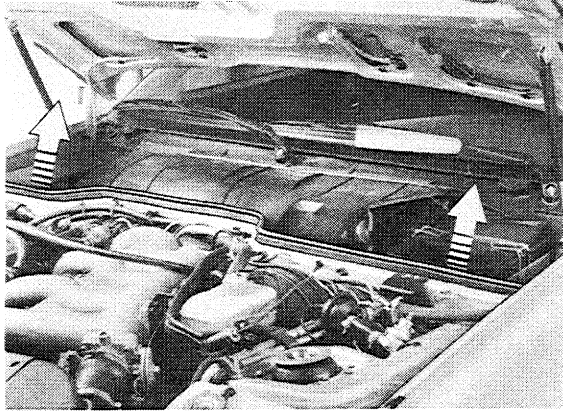
- 1 Defrost switch
- 2 Outside air blower switch
- 3 Defrost slide switch
- 4 Footwell slide switch
- 5 Temperature setting switch
- 6 Ventilation

For the removal, installation, disassembly, and assembly of the heating unit, see Repair Group 87.

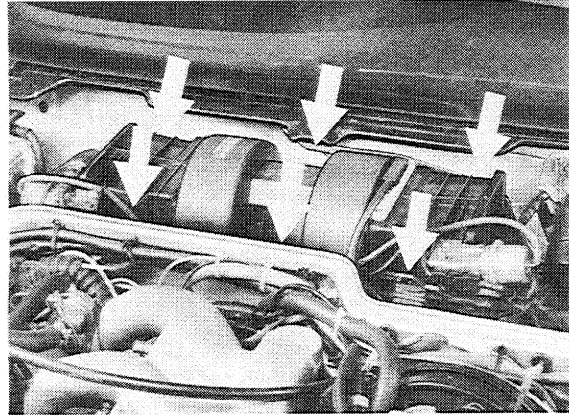
Several assembly parts do not apply to vehicles not having air conditioning.

## REMOVING AND INSTALLING FRESH AIR BLOWER SINCE 1985/2 MODELS

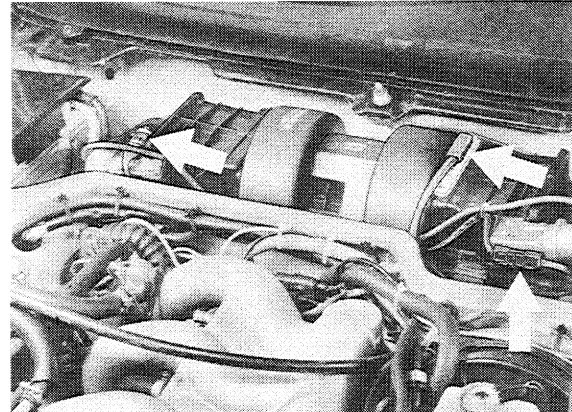
1. Remove fresh air well cover.  
This is done by disconnecting and pulling off windshield wiper arms. Pull off rubber seal from above and loosen cement of cover underneath the windshield.



2. Unscrew fresh air blower mounting screws.

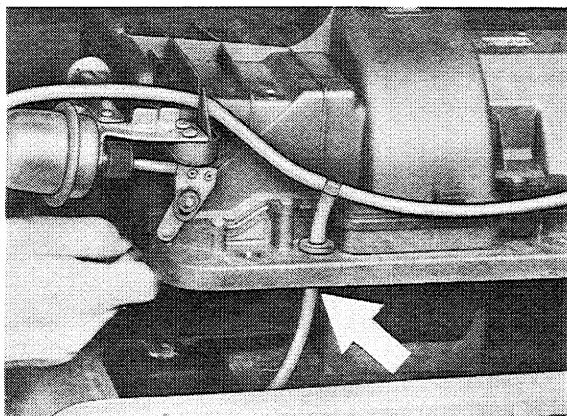


3. Disconnect plugs.



When performed carefully, the cover can be folded up to the windshield. It is then not necessary to remove the wiper arms.

4. Lift fresh air blower slightly. Pull off inner vacuum line.

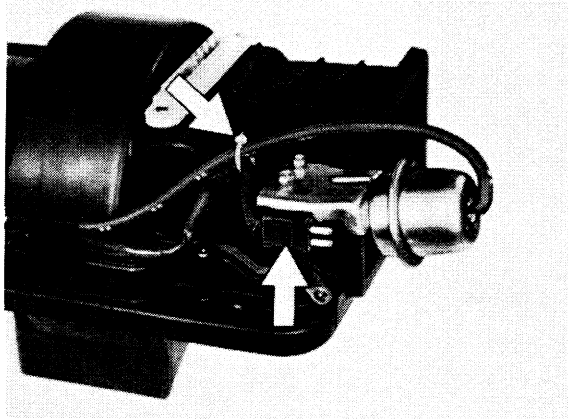


5. Check sealing cord of fresh air blower, replacing if necessary.

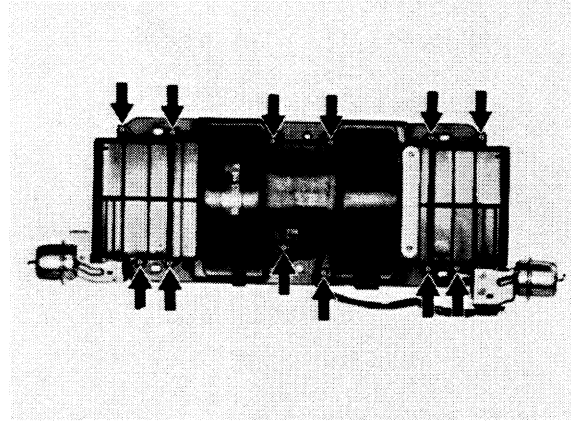


## Removing and installing the fresh air blower motor

1. Remove the fresh air blower.
2. Unlatch the plug connector in the holder.
3. Undo cable straps.
4. Pull off the vacuum hose.
5. Undo the fastening screws.

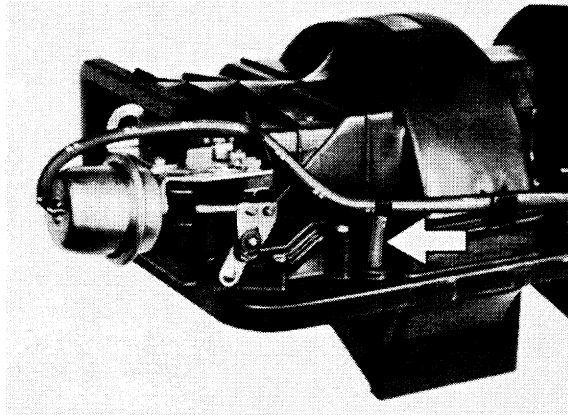


88/11

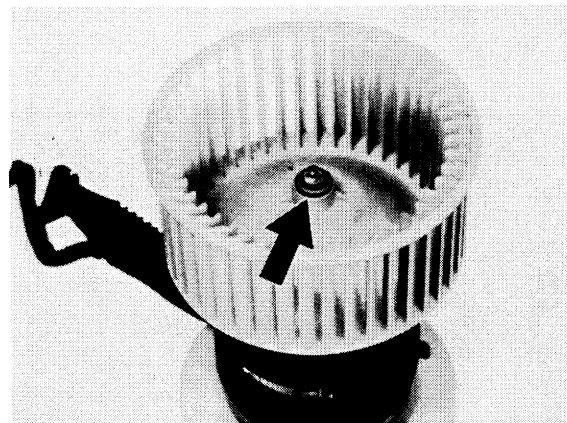


88/8

6. Lay the blower housing on the upper part and lift the lower part.
7. Take out the blower with fan wheels.
8. Undo the nut.



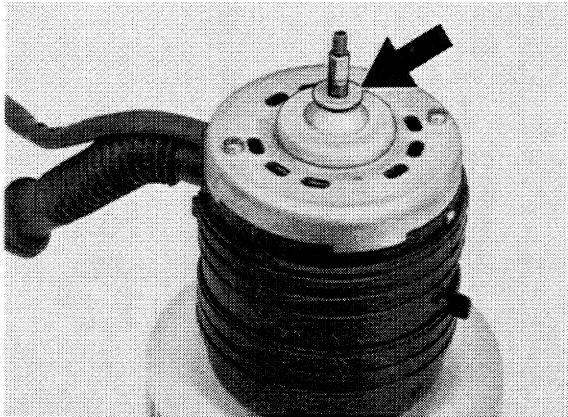
88/9



*Tightening torque: 300 Ncm*

88/7

9. Take off the fan wheel.
10. Remove the disk.
3. Carry out a functional check on the air circulation flaps before installing in the vehicle.



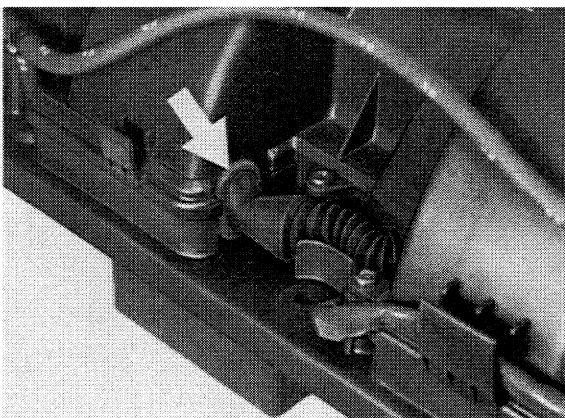
88/6

11. Remove the second fan wheel

**Note**

When assembling, ensure that:

1. The air circulation flaps are seated correctly.
2. The engine ventilation hose is correctly fitted between the upper and lower parts of the housing.

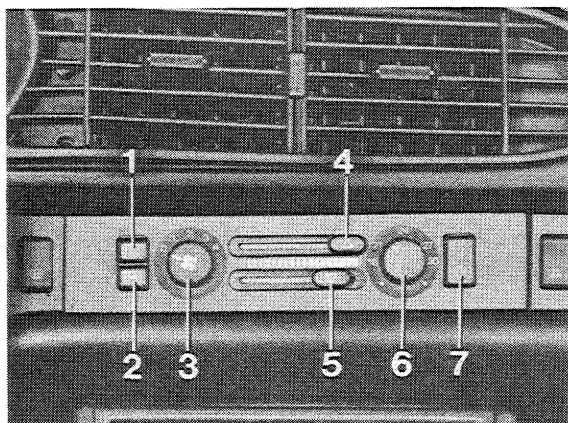


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## AIR-CONDITIONING SYSTEM FROM 85/2

Starting with the 85/2 model, the air-conditioning system was revised. The evaporator is located together with the heat exchanger in one housing. Temperature control is automatic. The flaps, which are actuated by electric control motors, are regulated via 3 temperature sensors. The preselected temperature is maintained over the entire period of travel.

The electronics which process the signals are located in the control switch.



- 1 Ventilation switch
- 2 Defrost switch
- 3 Outside air blower switch
- 4 Defrost slide switch
- 5 Footwell slide switch
- 6 Temperature setting switch
- 7 A/C switch

When switch 1 is pressed, the outside-air openings are closed and conversion is made to air-circulation.

When switch 2 is pressed, irrespective of the sliding switch position (4 and 5), the footwell flap is closed and the defrost flap opened. At the same time, the heater is turned all the way up, the outside air blower switched to level 4, and the A/C compressor switched on.

The outside air switch 3 has 5 positions. In position 0, the outside air blower starts upon ignition at the lowest speed.

## Slide switch 4

Left stop - defrost flap closed

right stop - defrost flap open

## Slide switch 5

left stop - footwell flap closed

right stop - footwell flap open

## Temperature setting switch 6

Left stop - maximum cooling

Right stop - maximum heating

When switch 7 is pressed, the A/C compressor is switched on.

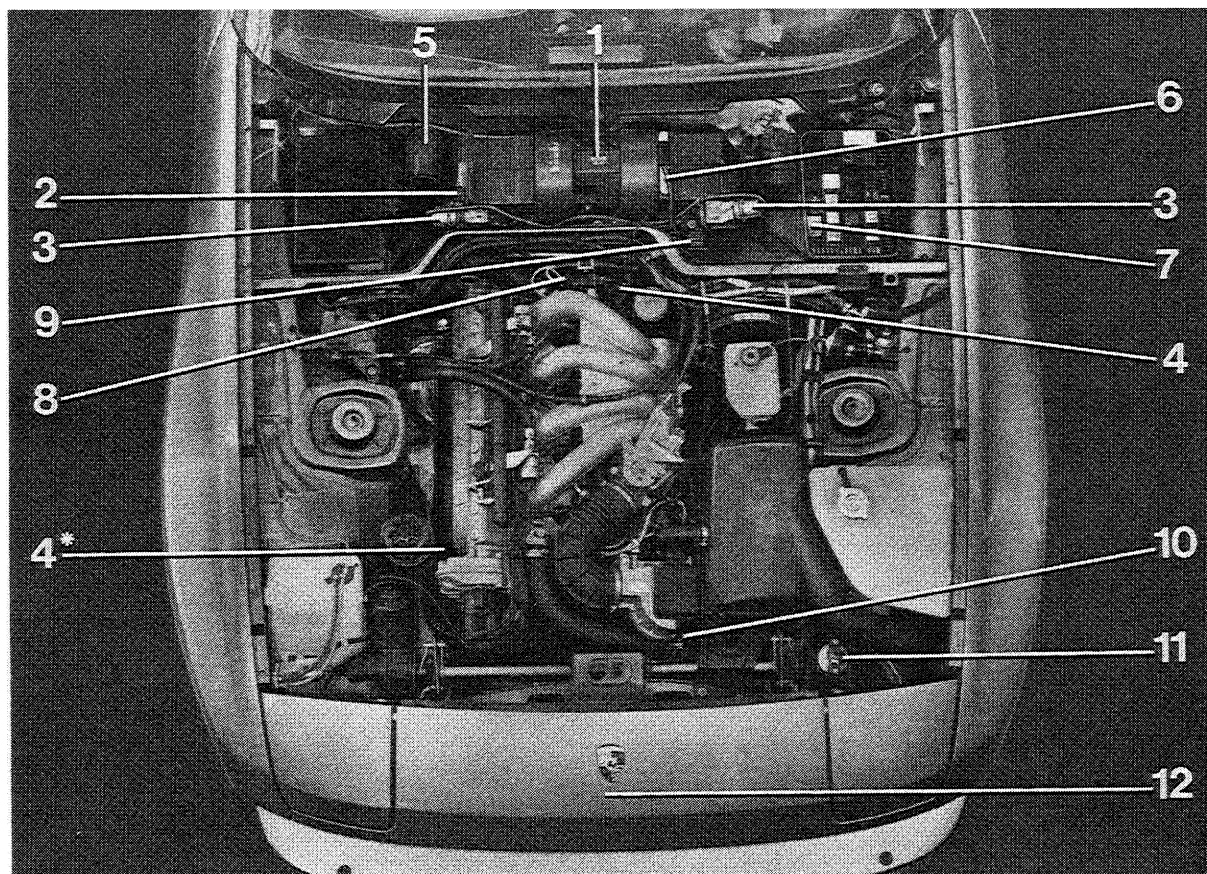
## AIR-CONDITIONER TECHNICAL DATA

Refrigerant capacity	950 g refrigerant R 12
Refrigerator oil in compressor	80 cm <sup>3</sup> $\pm$ 20 cm <sup>3</sup> Densoil
Rupture seal on fluid reservoir	The fusible element of the rupture seal opens at approx. 30 bar over pressure.
Compressor coupling power consumption	Approx. 40 watt

## T i g h t e n i n g   T o r q u e s

Location	Designation	Thread	Tightening Torque
Compressor	Hex bolt	M8	28
Evaporator	Hex bolt	M6	6
Fluid reservoir	Union nut	5/8" x 18 UNF	17
Condensor intake	Union nut	11/16" x 14 UNF	44
Condensor outlet	Union nut	5/8" x 18 UNF	17

## Location of components



1 Fresh air blower

2 External sensor

3 Vacuum unit for fresh/circulation air flaps

4 Heating valve

4\* Heater valve, as of MY '87  
(16-valve engine)

5 Vacuum supply reservoir

7 Relay for A/C compressors

8 Vacuum unit for heating valve

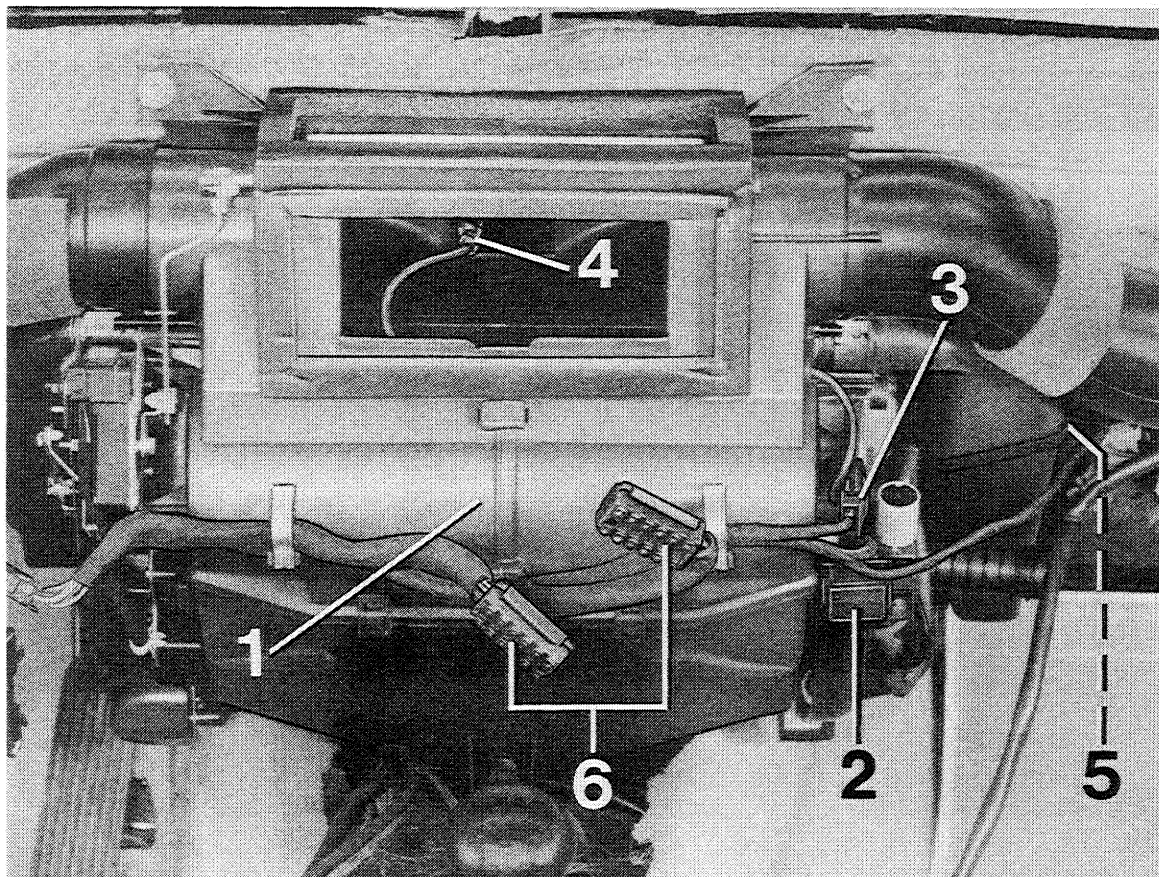
9 Plug connection for fresh air blower

10 Compressor

11 Fluid reservoir

12 Condenser

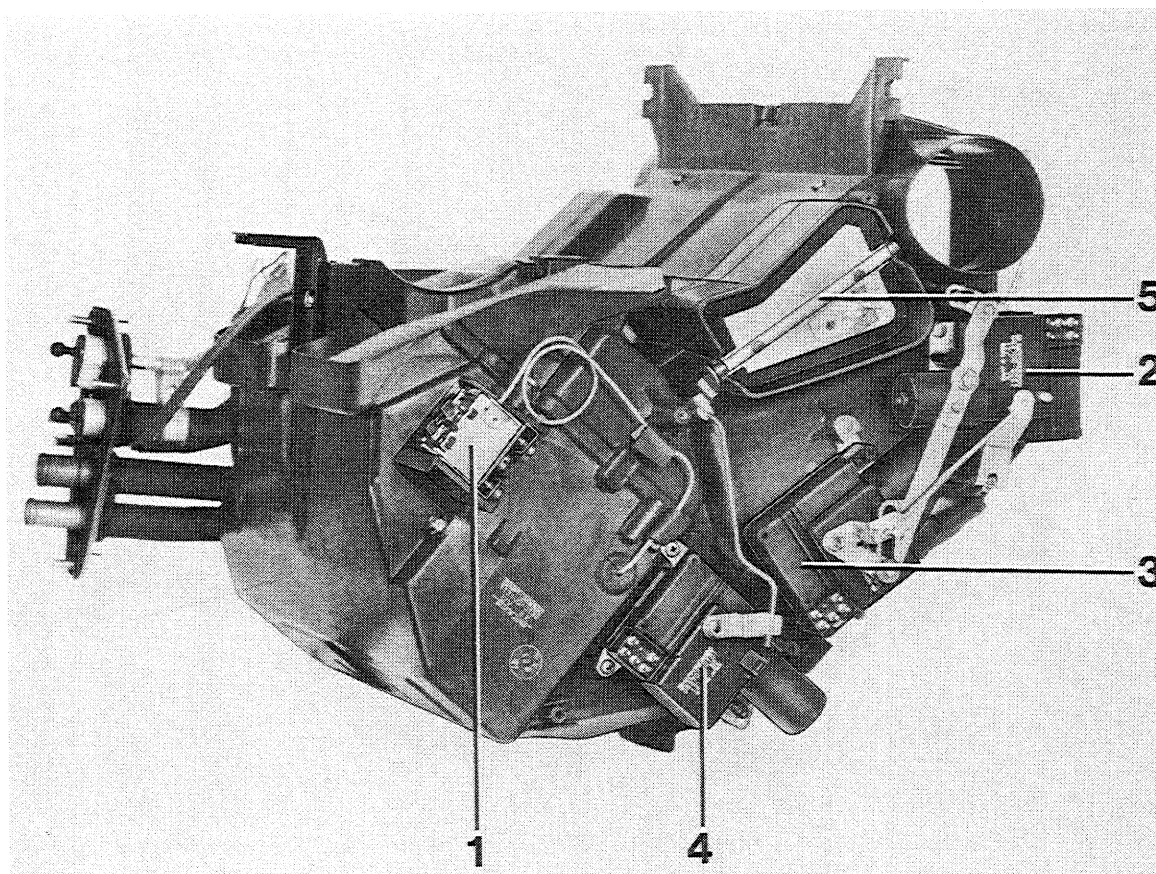
## LOCATION OF COMPONENTS



- 1 Heater - A/C unit
- 2 Plug connection for solenoid valves
- 3 Plug connection for mixing chamber sensor
- 4 Mixing chamber sensors
- 5 Interior sensor
- 6 Connection plug

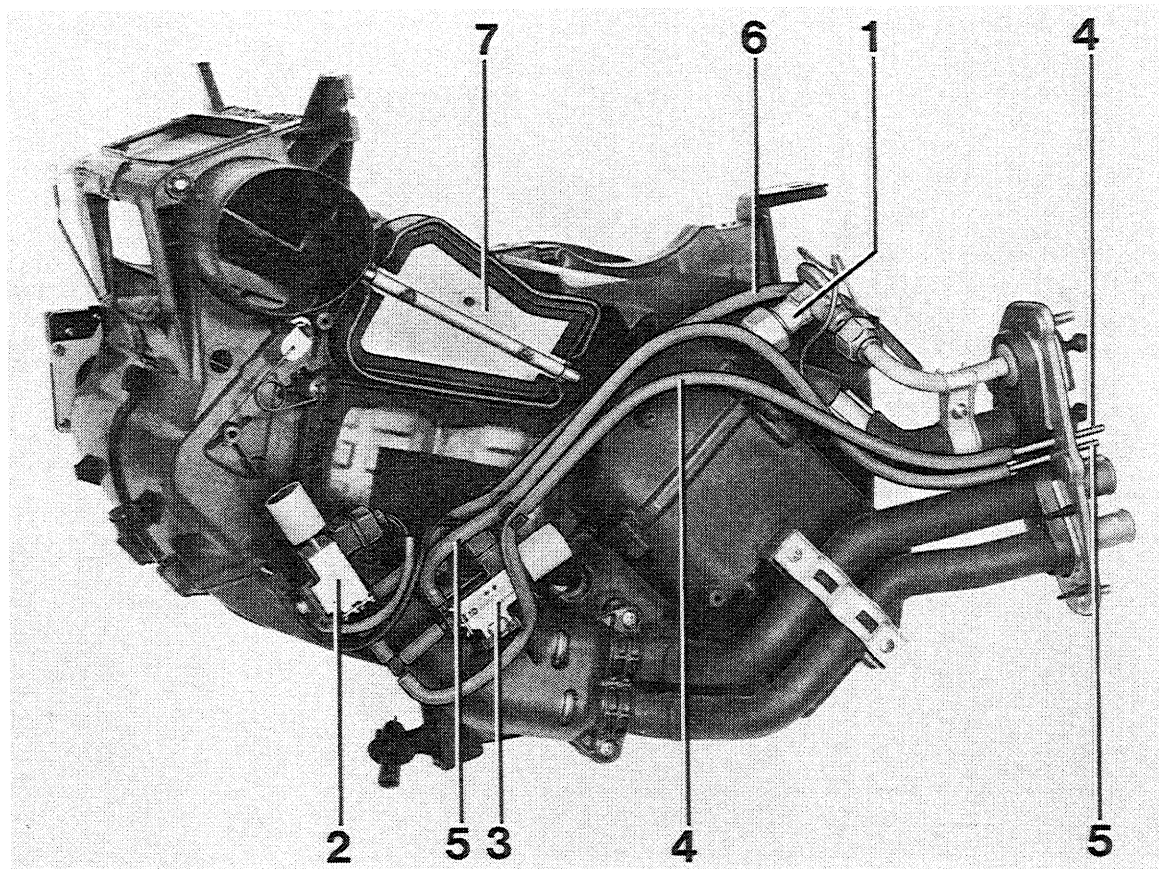


## LOCATION OF COMPONENTS



- 1 Freeze protection
- 2 Defrost flap control motor
- 3 Control motor for temperature mix flap and baffle flap
- 4 Footwell flap control motor
- 5 Left footwell flap

## LOCATION OF COMPONENTS



- 1 Expansion valve
- 2 Solenoid valve for fresh/circulation air flaps
- 3 Solenoid valve for heating valve
- 4 Vacuum supply line
- 5 Vacuum line for heating valve
- 6 Vacuum line for fresh circulation air flaps
- 7 Right footwell flap



## Safety regulations for handling the refrigerant R12

The refrigerant used R12 is known as a safety refrigerant. In other words, this refrigerant is non-combustible, non-explosive, non-toxic, non-irritating, odorless and tasteless. Nevertheless, you should observe the following points:

1. All contact with liquid or gaseous refrigerant must be avoided. Affected areas of the skin must be treated like frostbite; wash off immediately with cold water and then consult a physician. Protective goggles must be worn to protect the eyes. If refrigerant nevertheless enters the eyes, consult a physician immediately. Rubber gloves must be worn to protect the hands.
2. When performing repairs on the air-conditioning system, all refrigerant must be extracted from the system and the refrigerant cleaned. Refrigerant must not be allowed to escape into the environment, because it attacks the ozone layer of the earth.
3. Welding must not be performed on parts of the closed air-conditioning system or in its close proximity under any circumstances. Irrespective of whether the system is filled with refrigerant or not, a very high pressure is produced by heating up which may lead to damage to the system or even to an explosion. R12 is completely non-toxic at normal temperatures, but decomposes into hydrogen chloride and hydrogen fluoride after contact with a flame or at high temperature. These decomposition products contain, among other things, chlorine and phosgene. Since these products are injurious to health, corresponding care must be taken.
4. Refrigerant bottles must not be thrown and must not be exposed to direct sun or other sources of heat for long periods. The maximum permitted temperature of a filled refrigerant bottle must not exceed 45°C.

## Installation work with intervention in the refrigerant system

The content of the refrigerant system must be properly disposed of before all work on the air-conditioning system which necessitates opening of the refrigerant system. The safety regulations must be observed here.

Dirt and moisture must be kept away from the piping system of the air-conditioning system. For this reason, extreme cleanliness must be ensured during all work. No parts of the system must be cleaned internally with hot steam under any circumstances. Only nitrogen must be used for cleaning.

When a component is replaced, all openings must be sealed with suitable stoppers.

### Note

After the air-conditioning system has been re-filled, the firsttime switching-on of the air-conditioning compressor must be performed only with the engine idling. After initial startup, the compressor is fully operable under all operating conditions.

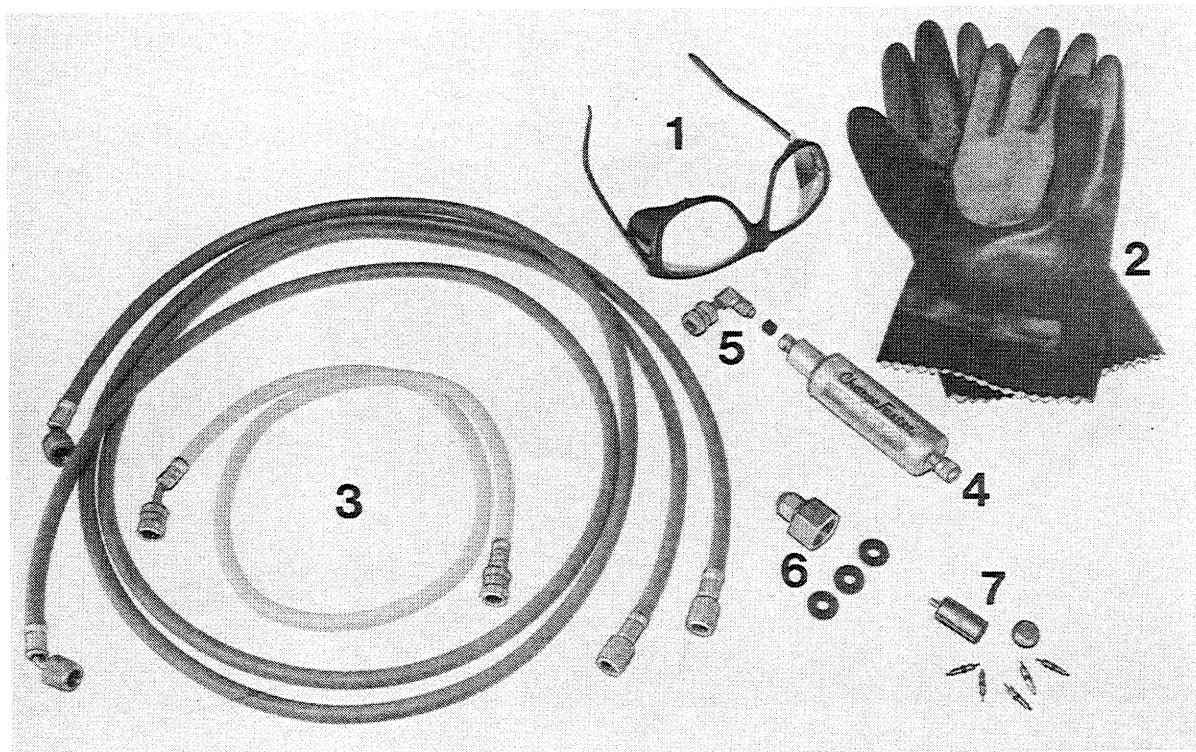
### General work sequence

1. Extract refrigerant
2. Remove fault part.
3. Evacuate.
4. Check system for leaks.
5. Flush with refrigerant.
6. Perform extraction again.
7. Evacuate.
8. Fill.

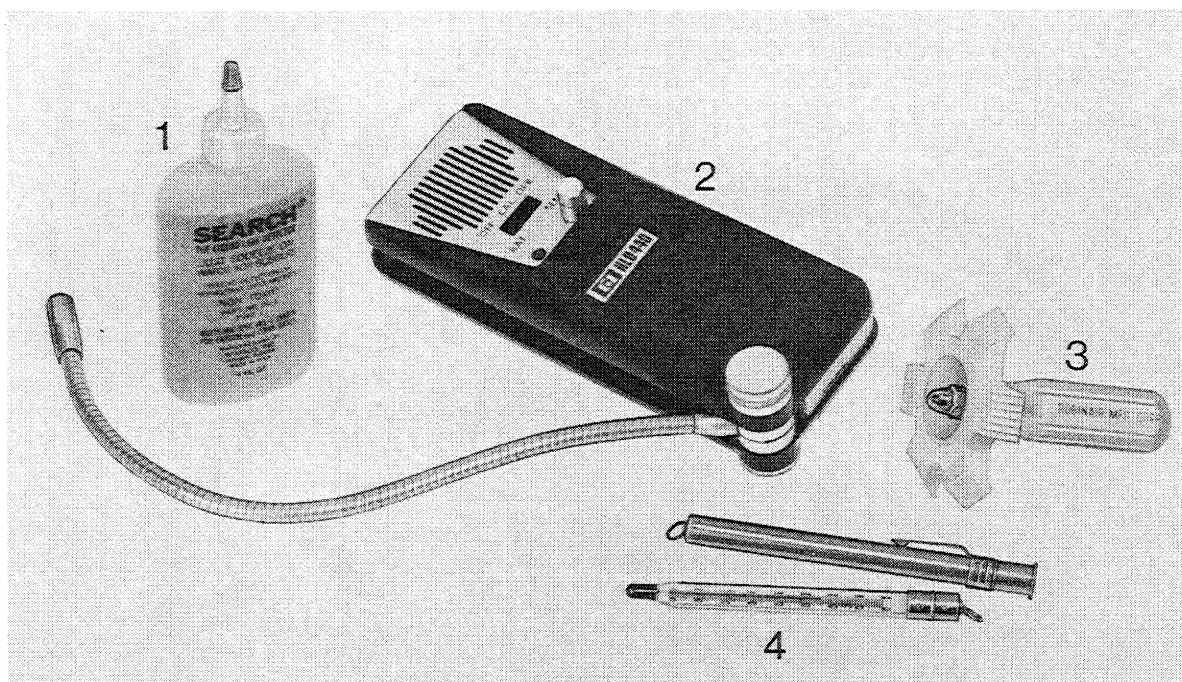
### Note

Pay attention to the sealing rings when disconnecting the hose connections.

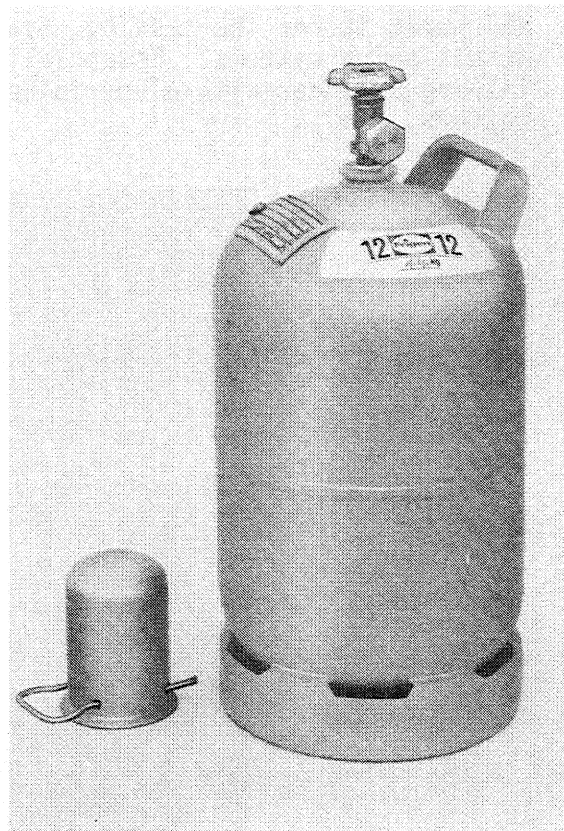
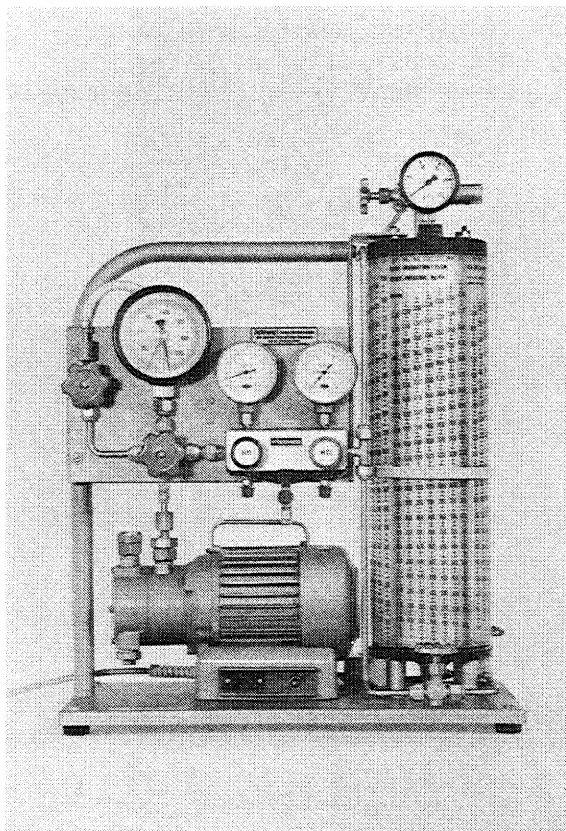
## TOOLS



No.	Description	Special Tool	Remarks
1	Protective goggles	-	Commercially available
2	Rubber gloves	-	Commercially available
3	Fill hose	-	Commercially available 2 pcs, length 1200 mm 1 pcs, length 500 mm Thread 7/16 Inch UNF
4	Filling aid "chargefaster"	-	Commercially available
5	Angle piece for filling aid with replacement seal	-	Commercially available
6	Flask-connection piece with replacement sealing rings	-	Commercially available
7	Spring valve opener with replacement spring valves	-	Commercially available



No.	Description	Special Tool	Remarks
1	Leak-detector fluid	-	Commercially available
2	Electronic leak detector	-	Commercially available
3	Comb	-	Commercially available
4	Thermometer	-	Commercially available



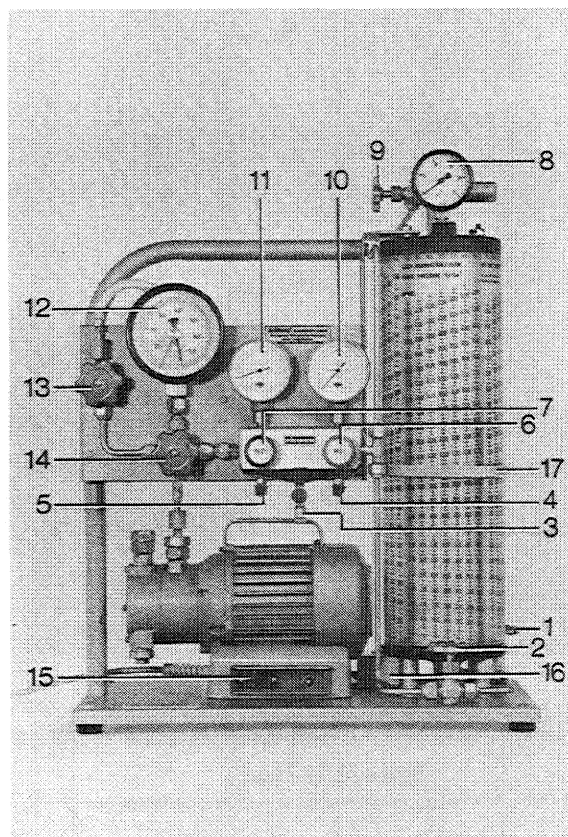
No.	Description	Special Tool	Remarks
1	Evacuating and filling unit FSV - 102	-	Commercially available
	Steel flask for refrigerant R 12	-	Commercially available filling weight 14 kg

#### N o t e

All tools and devices listed can be obtained from refrigerant firms, and are required for all air-conditioning repair work necessitating work on the refrigerant system.

## USING THE FSV 102 SERVICE UNIT

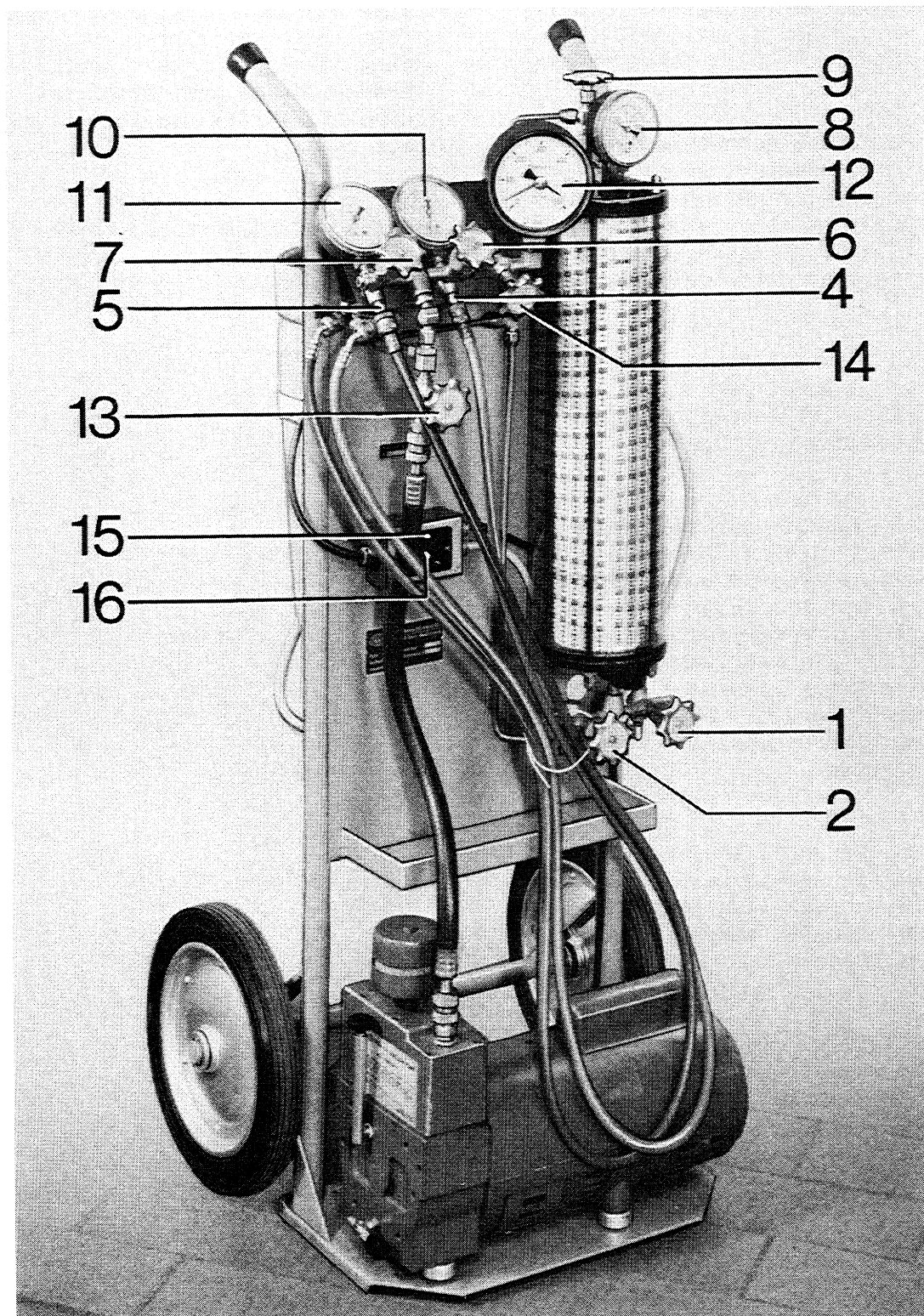
This unit is for the testing, evacuation, flushing and filling of air-conditioning systems. Essentially, the unit consists of a vacuum pump filling cylinder with electric heating, measurement instruments, and valve battery.



1-Flask-connection valve	7-Low-presssure cut-off valve	13-Evacuating valve
2-Filling valve (liquid)	8-Pressure gauge (filling cylinder)	14-Torrmeter meter cutoff valve
3-Bleed nipple	9-Filling valve (gaseous)	15-Pump switch
4-High-pressure connection nipple	10-Pressure gauge (high-pressure)	16-Heating switch
5-Low-pressure connection nipple	11-Pressure gauge (low pressure)	17-Adjustment ring for refrigerant level
6-High-pressure cut-off valve	12-Torrmeter	



## SERVICE UNIT, ROBINAIR 95 302



## INITIAL OPERATION

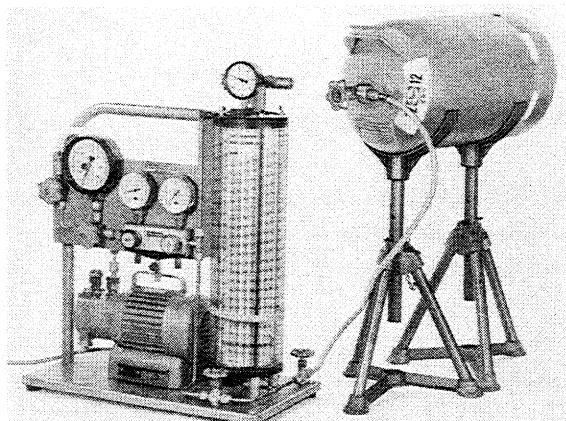
1. Plug in electric cable (220 V, 50 Hz). Switches 15 and 16 switched off, all valves closed.
2. Screw flask-connection piece onto refrigerant flask. Connect refrigerant flask and flask connection valve 1 with fill hose. Flask valve closed, flask connection valve 1 opened.
3. Open the cap on bleed nipple 3 for a short period and close it again, in order to remove any excess pressure.
4. Open evacuating valve 3 and torr-meter cutoff valve 14. Switch on vacuum pump (switch 15). At an ambient temperature under + 10° C, before switching on unscrew quick-release connection so that pump can warm up without drawing vacuum. After 1 or 2 minutes, re-close quick-release connection.
5. Evacuate until the maximum final vacuum is reached (depending on prevailing air pressure). Set torr-meter index indicator this reading.
6. Open valves 2 and 9, and evacuate further until the maximum vacuum is once again reached.

## CHECKING SERVICE UNIT FOR LEAKAGE

1. Close evacuating valve 13. The pressure on the torr-meter must not rise; if it does, this indicates leakage in the unit or at the refrigerant-flask valve. If so, rectify.
2. Switch off pump, close valves 2, 9, and 14.



## Filling service unit



1. Place refrigerant flask at some height, preferably place upside down (make frame). Open flask valve and allow fluid refrigerant to flow into the filling flask. The fill quantity must not exceed the maximum value (2200 g) on the lowest scale.
2. If the flask pressure is not adequate to fill the cylinder, the pressure building up can be released by opening valves 9 and 6 or 9 and 7.
3. If the cylinder is full, close the flask valve and valve 1. The unit is now ready for operation.
4. When refilling the cylinder, it is not necessary to evacuate again, if refrigerant is already flowing through the fill hose when screwing on to valve 1 (slightly open flask valve beforehand).

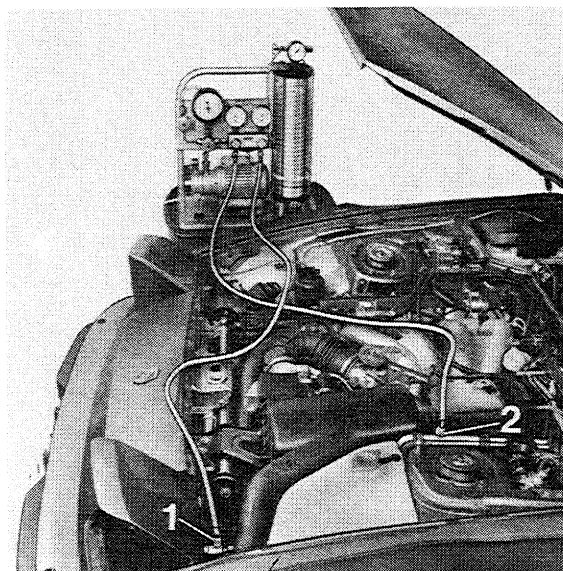
## Connecting service unit to airconditioning system

1. Connect the two long fill hoses to connection nipples 4 and 5 of the service unit. All service unit must be closed.

### Note

If the "Chargefaster" filling aid is already connected to connection nipple 5, connect the fill hose to the filling aid.

2. Unscrew protective caps on valves.
3. Connect fill hose from connection nipple 4 to valve 1.
4. Connect fill hose from connection nipple 5 to valve 2.



### Important

As from model year '87, the arrangement of the connection valves has been modified. The high-pressure valve is located on the line from the fluid reservoir to the evaporator in the area of the left-hand spring strut; the low-pressure valve is located directly at the compressor. See Quality Information Bulletins 1/86 and 2/86

## Emptying the air conditioning

The refrigerant must be extracted using appropriate recycling equipment. See page 87 - 42c.

## Evacuating air-conditioning system

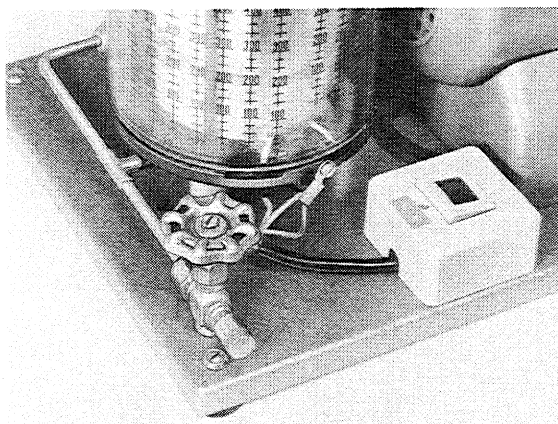
1. Connect service unit.
2. Extract refrigerant.
3. Switch on vacuum pump.
4. Open low-pressure valve 7, high-pressure valve 6, torr-meter cutoff valve 14, and evacuating valve 13.
5. Leave vacuum pump switched on for at least 15 minutes.
6. At a pressure of approx. 0.1 bar (absolute), close evacuating valve 13 and torr-meter cutoff valve. The latter is particularly important, as the torr-meter would otherwise be destroyed in subsequent flushing.
7. Switch off vacuum pump.

### Note

If the vacuum pressure is unattainable or can be reached only after a very long time, or if the pressure increases to above 0.2 bar (absolute) approx. 10 minutes after turning off the pump, the circulation system leaks and must be sealed.

### Flushing air-conditioning system

1. Connect service unit.
2. Evacuate.
3. Open filling valve 2 and high-pressure valve 6. Allow enough fluid refrigerant to flow until a pressure of approx. 2 bar (absolute) is indicated. The liquid refrigerant vaporized in the system and takes up any traces of water present.
4. Extract refrigerant.
5. Evacuate.



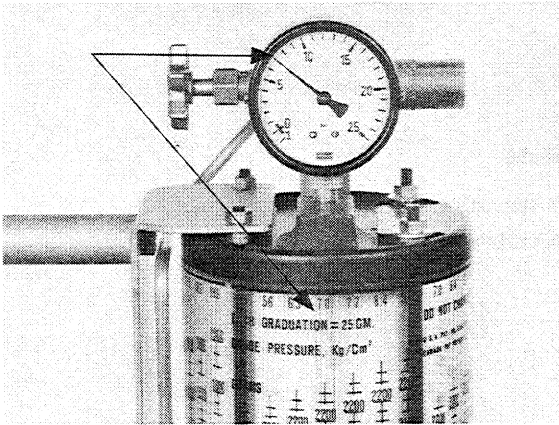
#### Note

A pressure rise of 1 bar takes approx. 10 minutes.

### Filling air-conditioning system

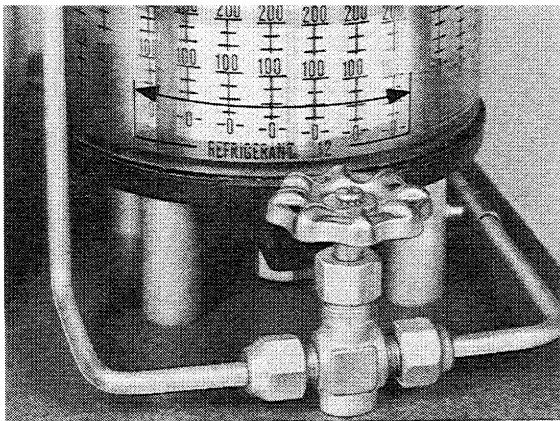
1. All procedures described so far must have been carried out, i.e., the system must be evacuated, flushed, evacuated once more, and must be sealed.
2. Close all valves on service unit. The filling cylinder must contain sufficient refrigerant; if not, refill.
3. To fill the system, there must be positive pressure of approx. 7 bar in the filling cylinder. To reach this pressure, switch on the filling cylinder heating.

4. Depending on the value displayed on the pressure gauge (e.g. 7 bar), set the filling cylinder scale so that the value indicated on the upper edge of the scale comes to rest over the viewing glass.



It should be noted that this scale is designed for use with more than one refrigerant. The refrigerant designations are found on the lower edge of the scale.

For automotive air-conditioning systems, only the scales for R 12 can be used.



5. Set the required refrigerant quantity on the filling cylinder with the sliding ring (difference from previous refrigerant level).

6. Again check to see that all valves - particularly the torr-meter cutoff valve 14 - are closed.

7. Open the filling valve 2 and high pressure valve 6.

8. Observe the fluid display in the viewing glass of the filling cylinder. When the level of liquid has reached the setting ring, close valve 2. Open filling valve 9 for a short period, in order to force the quantity remaining in fill hose into the air-conditioning system. Close high-pressure valve

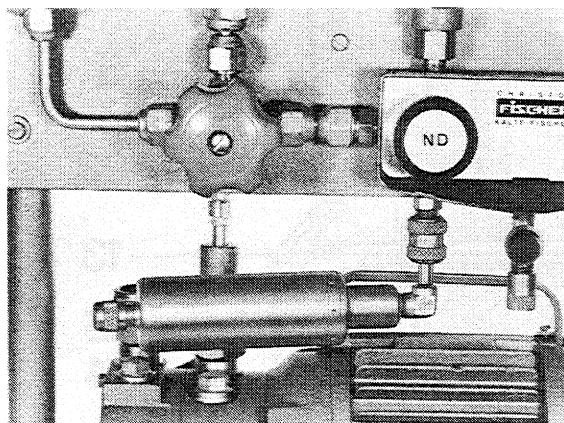
9. Switch off heating. Disconnect fill hoses from compressor. Screw protective cap on to valves.

## REFILLING AIR-CONDITIONING SYSTEM

If gas bubbles are visible in the fluid tank viewing glass when the system is on, the system does not contain sufficient refrigerant. The system must not be drained in order to refill.

1. Rectify any leakage.

2. Fasten "Chargefaster" filling aid to connection nipple 5 (low pressure) with the help of the angle piece.



The filling aid can remain permanently connected as a component of the service unit.

3. Connect fill hose between filling aid on service unit and valve on vacuum line. Slightly open valves 2 and 7 on the service unit in order to evacuate the fill hose through the refrigerant flowing out. All other valves on the service unit must remain closed.

4. Switch on air conditioner.

Engine speed approx. every 2000/1 min. Open filling valve 2 and low-pressure valve 7.

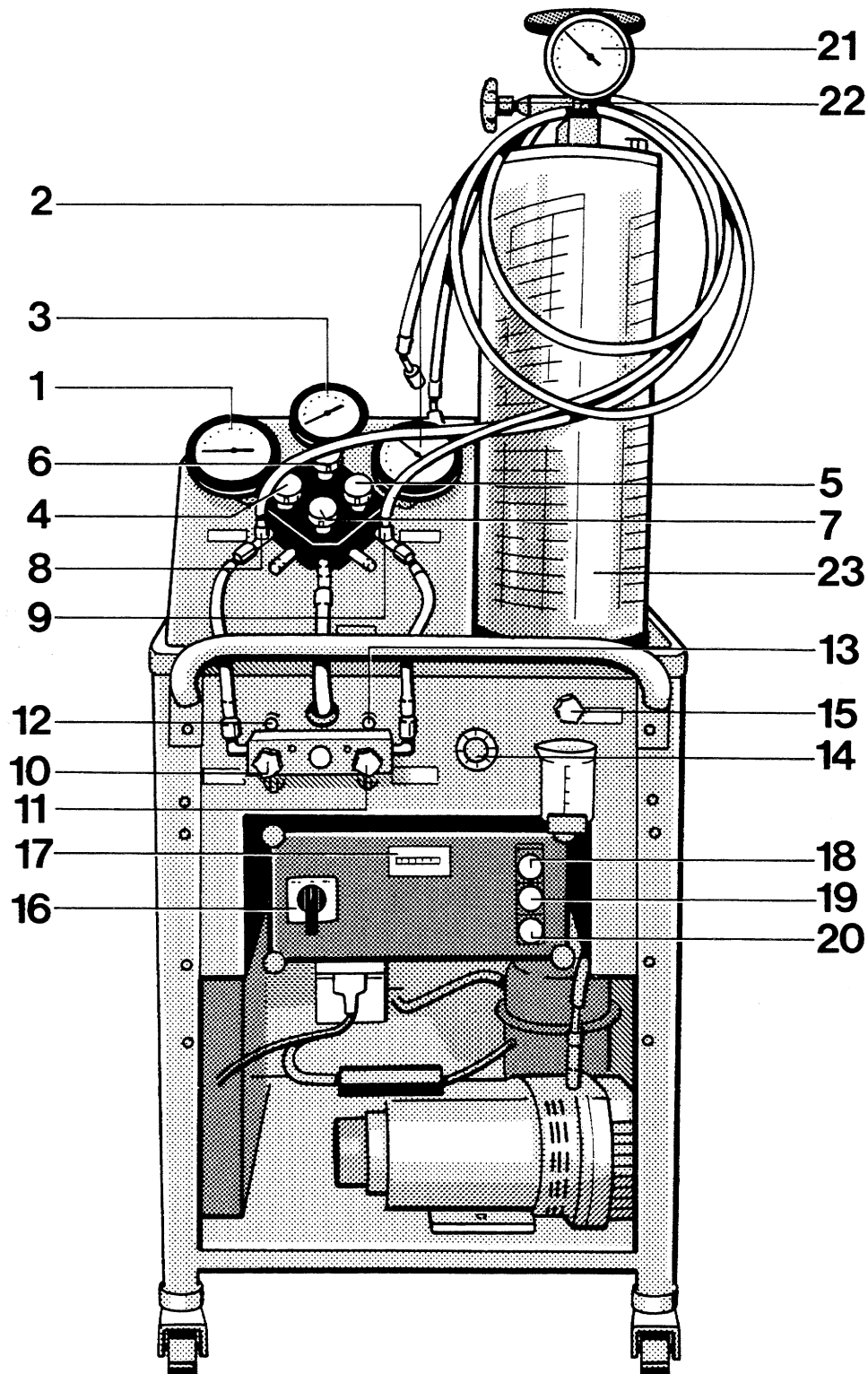
5. Observe viewing glass in fluid reservoir. When there is no longer any gas-bubble formation, refill is complete.

### Note

While the compressor is running, valves 6 and 7 must never be opened simultaneously.

## Installation work on the air-conditioning system

Service unit SECU



303-87

- 1 - Pressure gauge, low pressure
- 2 - Pressure, high pressure
- 3 - Torr meter
- 4 - Shut-off valve, low pressure (blue)
- 5 - Shut-off valve, high pressure (red)
- 6 - Shut-off valve, formerer (black)
- 7 - Shut-off valve, vacuum pump (yellow)
- 8 - Connection piece, low pressure
- 9 - Connection piece, high pressure
- 10 - Shut-off valve, refrigerant inlet
- 11 - Shut-off valve, refrigerant outlet
- 12 - Connection piece, refrigerant inlet (from refrigerant bottle)
- 13 - Connection piece, refrigerant outlet (to refrigerant bottle)
- 14 - Moisture indicator
- 15 - Drain valve, refrigerating oil
- 16 - Main switch
- 17 - Operating hours counter
- 18 - Pilot lamp, yellow
- 19 - Pilot lamp, red
- 20 - Pilot lamp, green
- 21 - Pressure gauge, filling cylinder
- 22 - Shut-off valve, filling cylinder
- 23 - Filling cylinder with weight scale

## Refrigerant extraction

1. Connect service unit to the system.

### Hinweis

Check at the liquid reservoir whether the sight glass is still transparent. If the sight glass shows signs of brown discoloration on the inside, the refrigerant should be pre-filtered by means of a cleaning drier installed in-between in the extraction hose. In this case, extract only via the high-pressure side.

2. Open the shut-off valve, low pressure (4) shut-off valve, high pressure (5) and shut-off valve, refrigerant inlet (8).
3. Turn the main switch (16) fully to the right. The green pilot lamp lights up.

### Note

Extraction takes place automatically. The unit is switched off when all refrigerant has been extracted from the circuit. The red pilot lamp then lights up.

4. Close shut-off valves 4,5 and 8.
5. Open the refrigerating oil drain cock (15) and drain extracted refrigerating oil.
6. Determine the volume of the refrigerating oil.

### Note

The refrigerating oil is now sucked into the system via the high-pressure side.

7. Fill system with new refrigerating oil (extracted volume + 10 cm<sup>3</sup>).

## Filling refrigerating oil

1. Unscrew the red hose on the service unit at connection piece 9 and hold in the container with new refrigerating oil.
2. Switch on vacuum pump.
3. Open shut-off valve for low pressure (4) and vacuum pump (7).

### Note

The refrigerating oil is now sucked into the system via the high pressure side..

4. After filling the refrigerating oil, close the shut-off valves and switch off the vacuum pump.



### Evacuating the air-conditioning system

1. Extract any pressure still present.
2. Switch on vacuum pump (turn main switch to left).
3. Open shut-off valves for low pressure (4), high pressure (5), torr meter (6) and vacuum pump (7).
4. Leave vacuum pump switched on for at least 15 minutes.
5. Close shut-off valves 6 and 7 at a pressure of approx. 0.1 bar (absolute).
6. Switch off vacuum pump.

#### Note

If the vacuum cannot be attained or can be reached only after a very long time or if the pressure increases over 0.2 bar (absolute) approx. 10 minutes after the pump is switched off, there is a leak in the circuit and this must be sealed.

### Flushing the air-conditioning system

#### Note

Flushing the air-conditioning system serves the purpose of drying the circuit.

1. Evacuate.
2. Open the shut-off valve for high pressure (5) and the refrigerant outlet (11).
3. Allow refrigerant to flow in until a pressure of approx. 2 bar (absolute) is indicated.
4. Close shut-off valves 5 and 11.
5. Extract refrigerant again.
6. Evacuate.

## Filling the air-conditioning system

### Note

The air-conditioning system must be evacuated and free of leaks. There must be sufficient refrigerant in the filling cylinder. Top up if necessary.

1. All valves on the service unit must be closed.
2. A pressure of approx. 7 bar is required to fill the system. If the pressure is lower, the pressure can be increased by cleaning the refrigerant (refer to Page 87 - 25). If the pressure is higher than 10 bar (end of the weight scale), the pressure in the filling cylinder can be lowered by opening the shut-off valve 22.

### Note

The pressure increases by approx. 1.5 bar in 10 minutes.

3. In accordance with the value read off on the pressure gauge 21, adjust the rotating scale of the filling cylinder so that the value specified at the top edge of the scale is positioned over the sight glass.

### Note

It must be noted that the rotating scale is designed for the use of different refrigerants. The refrigerant designations are specified at the bottom scale edge.

Only the scales for R12 are applicable for automobile air-conditioning systems.

4. Set the required refrigerant quantity on the filling cylinder with the rubber ring (difference to refrigerant level in filling cylinder).
5. Open the shut-off valves for high pressure (5) and the refrigerant outlet (11)
6. Observe the fluid level indication in the sight glass of the filling cylinder. When the filling level has reached the setting ring, close shut-off valves 11 and 5.
7. Check the refrigerating capacity (refer to Page 87-60).
8. Disconnect filling hoses at compressor.
9. Screw protective caps onto the valves.

## Topping up the air-conditioning system

### Note

If gas bubbles are visible in the sight glass of the fluid reservoir when the air-conditioning system is switched on, there is not sufficient refrigerant in the system.

1. Extract refrigerant from air-conditioning system.
2. Determine the volume of the refrigerating oil extracted as well.
3. Fill system with new refrigerating oil.
4. Evacuate.
5. Check system for leaks.
6. Fill system with prescribed filling quantity.

## Filling service unit with refrigerant

1. Connect refrigerant bottle with the connection piece at the refrigerant inlet (12).
2. Open the valve on the refrigerant bottle and shut-off valve 10.
3. Switch on the service unit with the main switch (16). The green panel lamp lights up.
4. If there is sufficient refrigerant in the service unit, close the bottle valve. The system switches off automatically when the refrigerant is extracted up to the bottle valve.
5. Close the shut-off valve at the refrigerant inlet (10).

## Emptying the service unit

### Note

If the filling cylinder is full with refrigerant and it is still necessary to extract further refrigerant, the clean refrigerant can be filled into a refrigerant bottle. Pay attention to the maximum filling weight here. **The refrigerant bottle must not be overfilled.**

1. Connect the refrigerant bottle with the connection piece at the refrigerant outlet (13).
2. Increase the pressure in the filling cylinder to approx. 8 bar by cleaning the refrigerant.
3. Open the bottle valve and the shut-off valve at the refrigerant outlet (11).
4. After completing the emptying operation, close the bottle valve and shut-off valve.

### Note

Do not completely empty the filling cylinder, otherwise moisture may enter the service unit.

## Cleaning the refrigerant

### Note

If the extracted refrigerant is heavily contaminated, it must be pumped through the filter systems several times.

The state of cleaning can be seen at the moisture indicator (14).

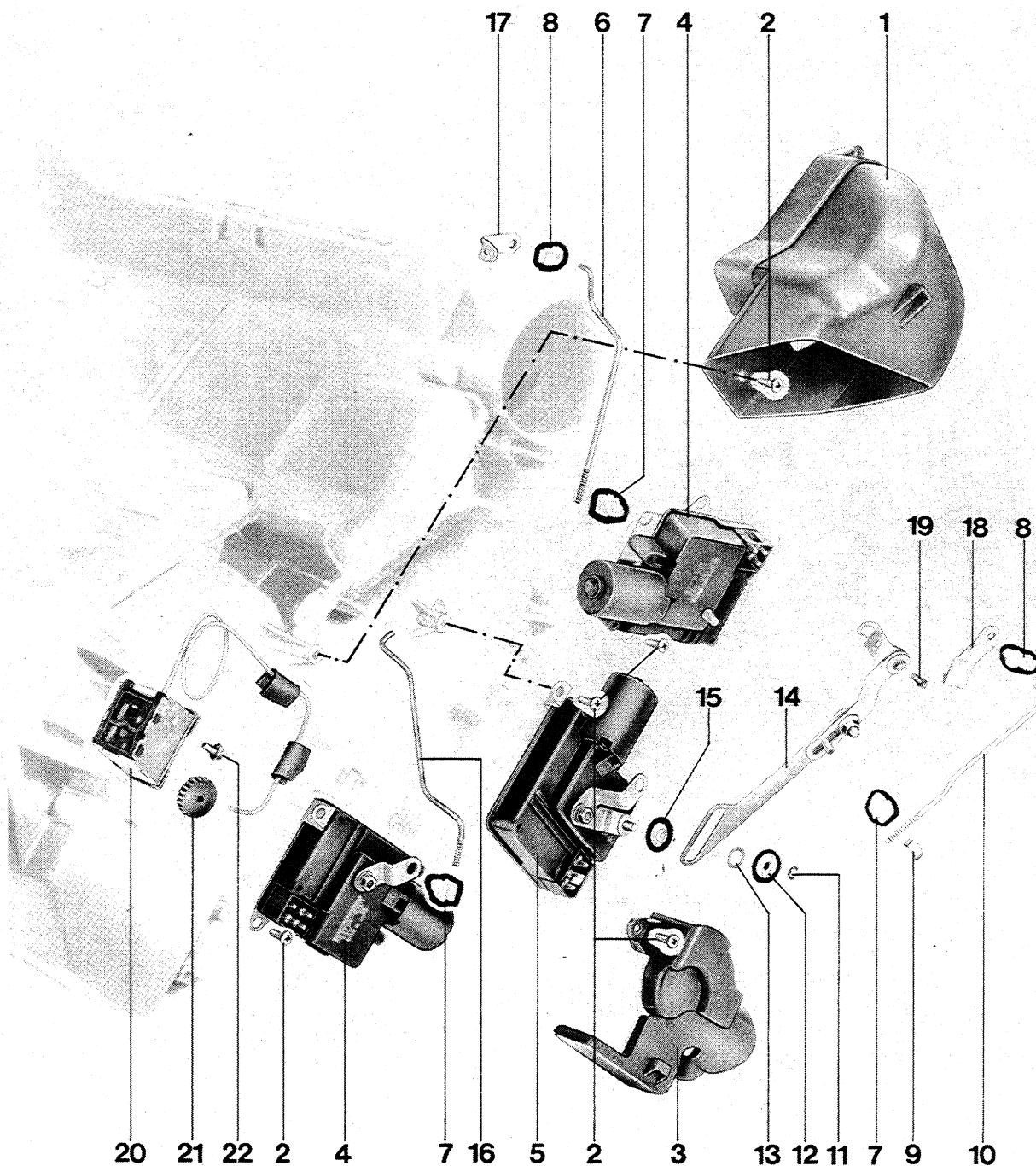
1. Open the shut-off valve for the filling cylinder (22).
2. Switch on the service unit. The green pilot lamp lights up.
3. After cleaning the refrigerant (state visible at the moisture indicator), close the shut-off valve.

### Note

The unit switches off automatically when all refrigerant has been pumped into the filling cylinder (red pilot lamp lights up). The pressure then increases in the filling cylinder.

## Disassembling and assembling heating - A/C unit

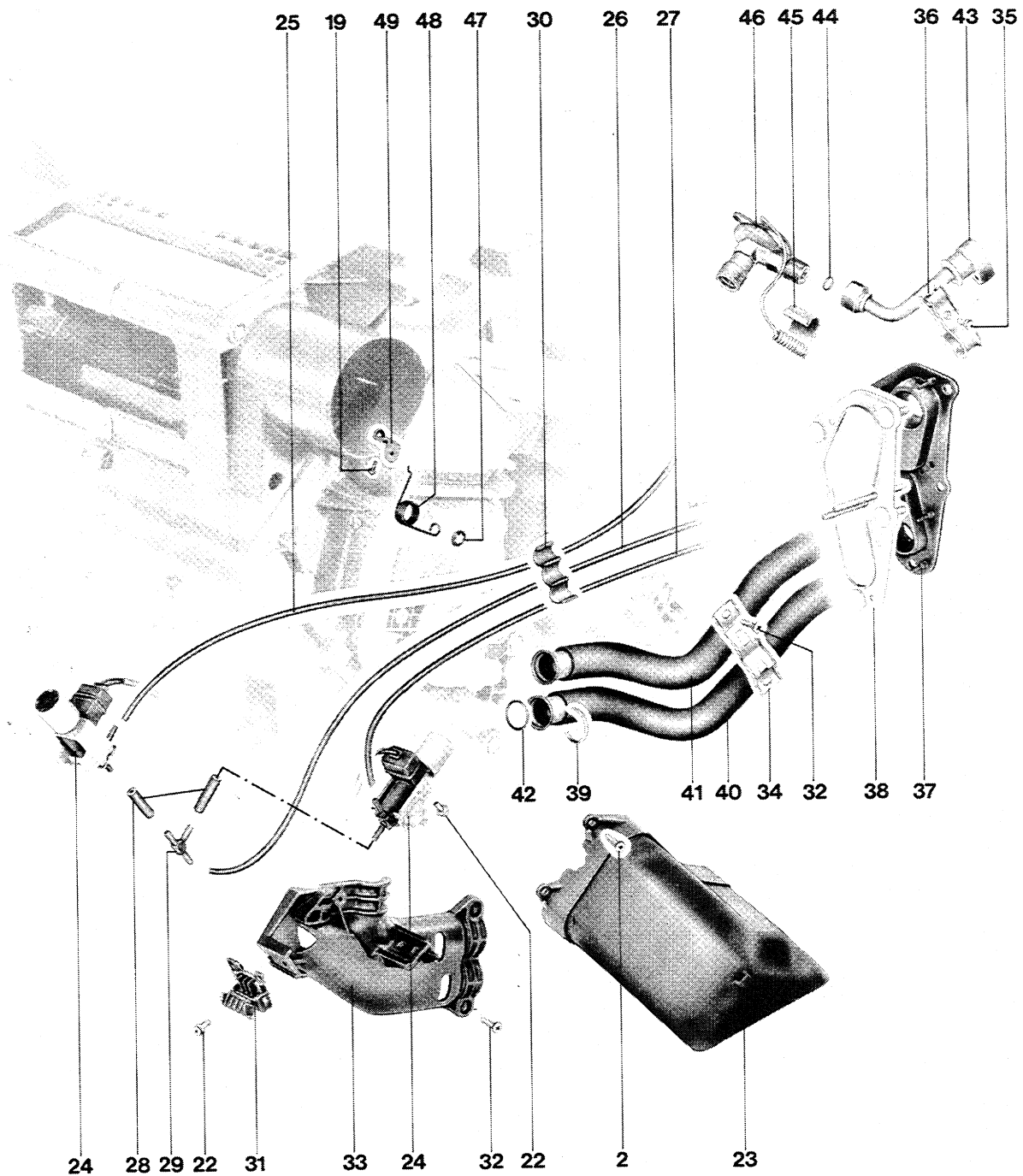
# Disassembling and assembling heating - A/C unit



No.	Description	Qty.	Note When:	
			Removing	Installing
1	Left footwell vent	1		
2	Sheet-metal screw	17		
3	Cover	1		
4	Control motor	2		
5	Control motor	1		
6	Linkage	1		
7	Plastic bearing	4		
8	Plastic bearing	4		
9	Tab washer	1		
10	Linkage	1		
11	Retaining ring	2		
12	Plastic ring	2		
13	Shaft ring	2		
14	Linkage	1		
15	Plastic bearing	2		
16	Linkage	1		

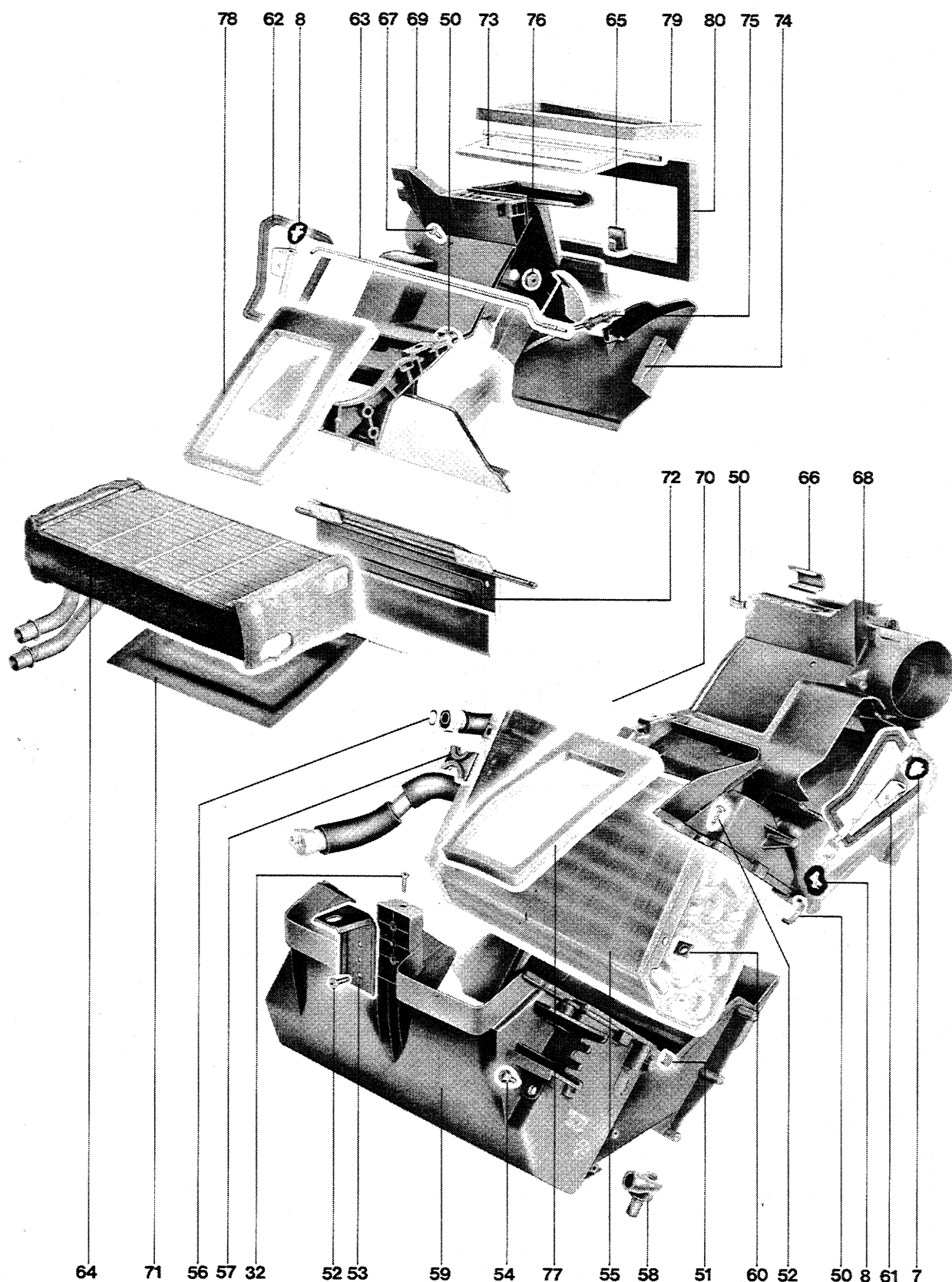
No.	Description	Qty.	Note When:	
			Removing	Installing
17	Angle bracket	1		
18	Angle bracket	1		
19	Screw M 3 x 7 with spring washer	4		
20	De-icer	1	Do not damage capillary tube	Push in up to marking
21	Rubber grommet	1	Turn by 90°	
22	Screw M 4 x 8 with spring washer and collar	4		





No.	Description	Qty.	Note When:	
			Removing	Installing
23	Right footwell vent	1		
24	Solenoid valves	2		
25	Vacuum line	1		
26	Vacuum line	1		
27	Vacuum line	1		
28	Vacuum line	2		
29	Branch piece	1		
30	Bracket	1		
31	Plug housing	1		
32	Sheet-metal screw, long	6		
33	Cover	1		
34	Bracket	1		
35	Screw M 4 x 10 with spring washer and collar	1		
36	Bracket	1		
37	Seal	1		

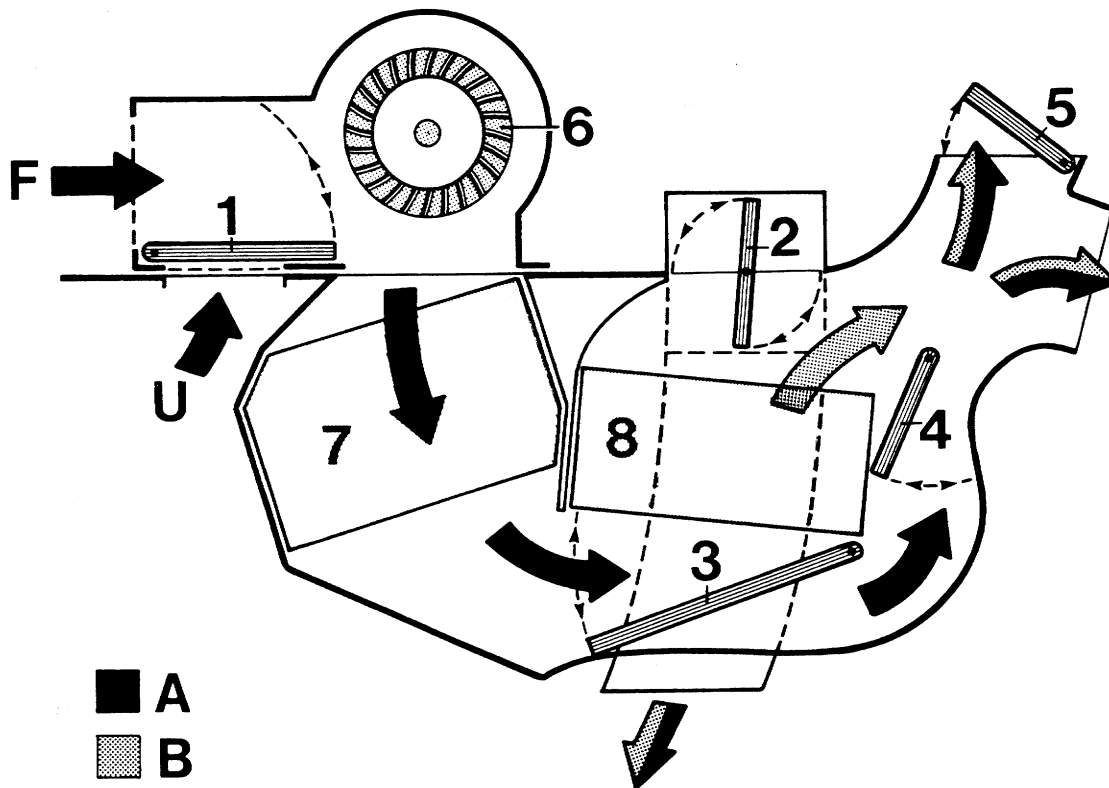
No.	Description	Qty.	Note When	
			Removing	Installing
38	Mounting plate	1		
39	Clip	2		
40	Refrigerant tube	1		
41	Refrigerant tube	1		
42	Seal	2		
43	Refrigerant line	1		
44	Seal	1		Replace and moisten with refrigerator oil
45	Clamp	1		
46	Expansion valve	1		
47	Fuse	1		
48	Spring	1		
49	Angle bracket			



No.	Description	Qty.	Note When	
			Removing	Installing
50	Clamp	13		
51	Clamp	1		
52	Sheet-metal screw	5		
53	Angle bracket	1		
54	Sheet-metal screw	2		
55	Vaporizer	1	Do not damage discs	Do not damage discs
56	Seal	1		Replace and moisten with refrigerator oil
57	Spacer	1		
58	Water drain hose	1		
59	Lower part of housing	1		
60	Sheet-metal screw	2		
61	Left footwell flap	1		
62	Right footwell flap	1		
63	Linkage	1		
64	Heat exchanger	1		
65	Clamp	1		

No.	Description	Qty.	Note When:	
			Removing	Installing
66	Clamp	1		
67	Sheet-metal screw	2		
68	Left upper housing half	1		
69	Right upper housing half	1		
70	Plate nut	1		
71	Temperature-mixing flap	1		
72	Baffle flap	1		
73	Defrost flap	1		
74	Air ducting	1		
75	Mixing-chamber sensor	1		
76	Rubber grommet	1		
77	Foam sealing	1		Replace
78	Foam sealing	1		Replace
79	Foam sealing	1		Replace
80	Foam sealing	1		Replace

## POSITIONING OF FLAPS, AIR FLOW



A - Cold air

B - Warm air

F - Fresh air

U - Circulating air

1 - Fresh/circulating air flap

2 - Footwell flap

3 - Temperature-mixing flap

4 - Baffle flap

5 - Defrost flap

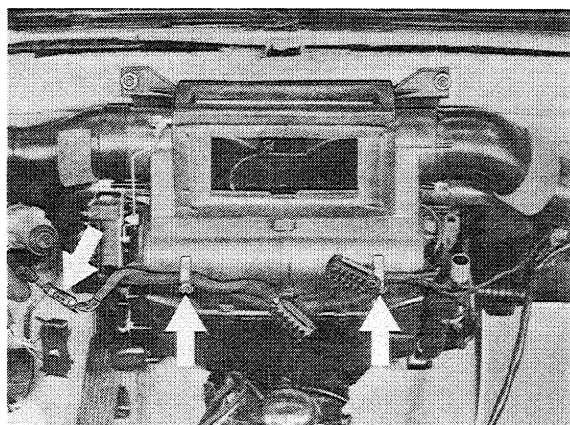
6 - Blower

7 - Vaporizer

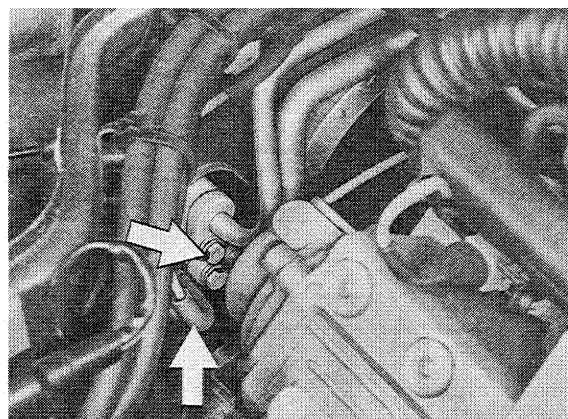
8 - Heat exchanger

## REMOVING AND INSTALLING HEATING - A/C UNIT

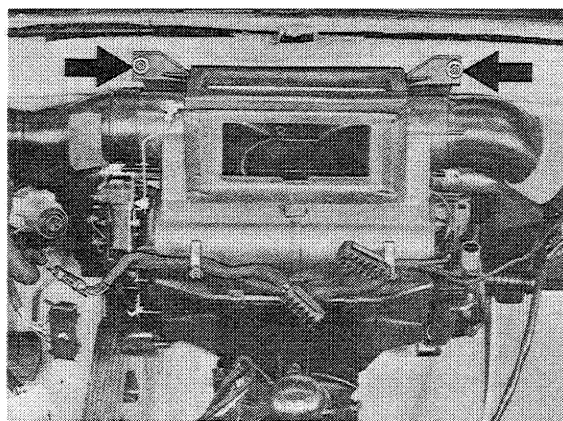
1. Drain air-conditioning system.
2. Drain refrigerant.
3. Remove fresh air blower (see repair group 85).
4. Remove center console (see repair group 68).
5. Remove instrument panel (see repair group 68).
6. Unclip instrument-panel wiring harness.



7. Disconnect plug.
8. Disconnect plug at interior-sensor blower.
9. Pull out air ducts.
10. Pull out drainage hose.
11. Unscrew A/C lines.



12. Remove vacuum lines.
13. Unscrew refrigerant hoses.
14. Unscrew fastening nuts on the outside (4 pcs.).



15. Unscrew fastening nuts on the inside.
16. Unscrew bracket for instrument panel.
17. Run out heating-A/C unit.

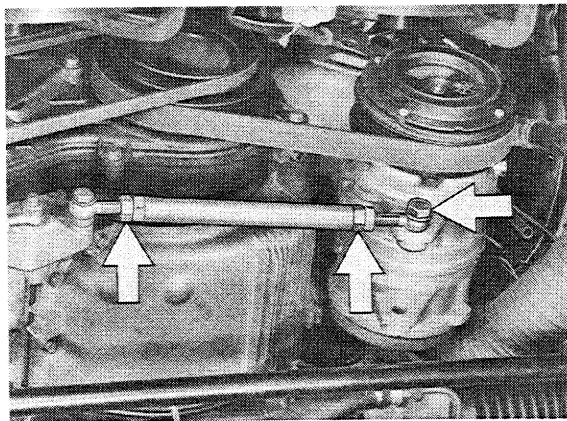
## N o t e

During installation, make sure that water drainage pipe is reinserted.

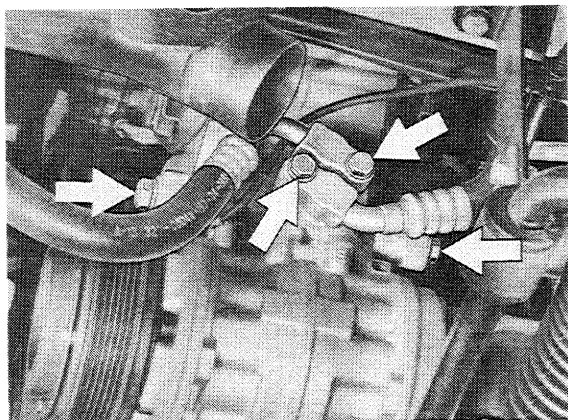


## REMOVING AND INSTALLING COMPRESSOR

1. Drain air-conditioning system.
2. Loosen both lock nuts on clamp clip.



3. Loosen V-belt.
4. Loosen clamp clip fastening and remove V-belt.
5. Disconnect plug.



6. Loosen hose connections.

## N o t e

The fastening screws are micro-encapsulated. Use new screws during installation. In order to facilitate installation, remove the generator ventilation hose.

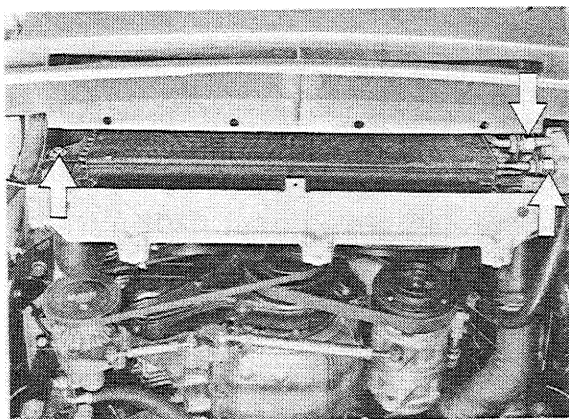
7. Unscrew compressor fastening screws.

A d j u s t i n g P o l y -  
R i b B e l t

1. Prepare special tool 9201 for testing.
2. Turn tensioner until the set value of 9.5 scale units is reached. From this position, turn tensioner another 2 turns (increase tension, see also p. 13-1).

## REMOVING AND INSTALLING CONDENSOR

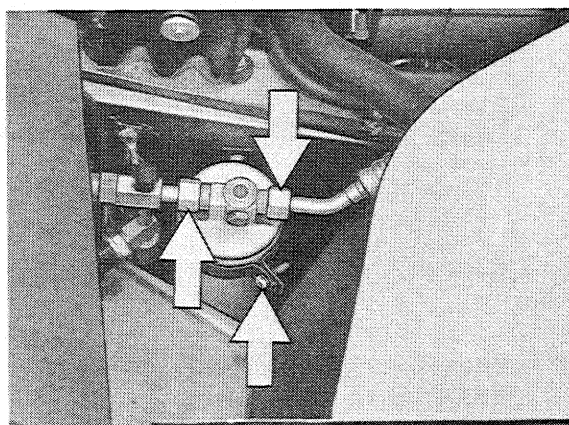
1. Drain air-conditioning system.
2. Unscrew underbody protection.
3. Unscrew air duct.
4. Loosen hose connections.



5. Unscrew fastening screws (2 pcs.).
6. Pull condensor out of rubber holders from below.

## REMOVING AND INSTALLING REFRIGERANT TANK

1. Drain air-conditioning system.
2. Loosen hose connections.
3. Loosen clamp.
4. Pull tank out from above.

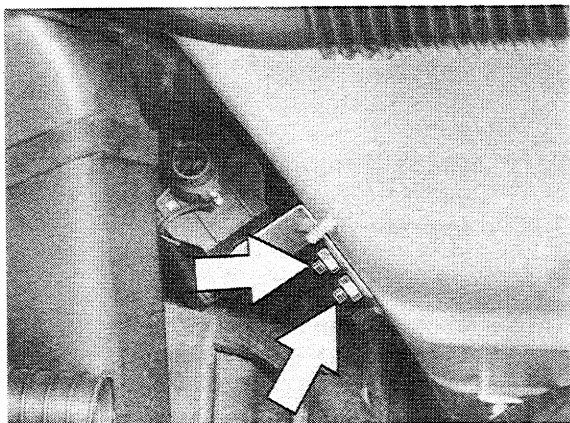


## N o t e

During installation, make sure that the connection nipple marked "IN" points forward.  
The tank must be replaced in case of system malfunction and after every opening of the refrigerant system.

## REMOVING AND INSTALLING INTERIOR SENSOR BLOWER

- 1.Remove glove compartment.
- 2.Pull hose from interior sensor.
- 3.Loosen fastening nuts.



- 4.Disconnect plug.

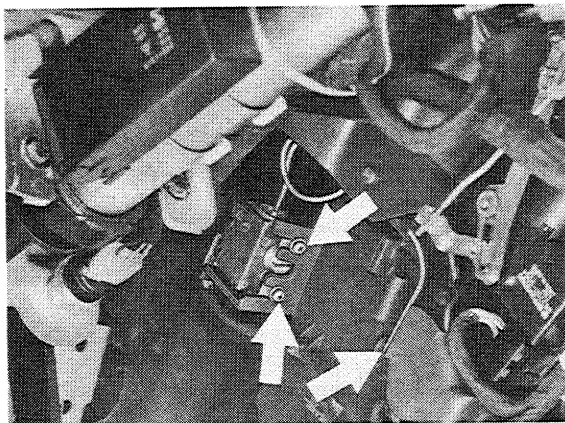
### N o t e

Make cable connection before installation.

\_\_\_\_\_

## REMOVING AND INSTALLING THE DE-ICER

- 1.Remove left footwell vent.
- 2.Loosen but do not entirely unscrew fastening screws.



- 3.Carefully pull capillary tube out of vaporizer.

### N o t e

When installing, push capillary tube into marking.

- 4.Pull off cable

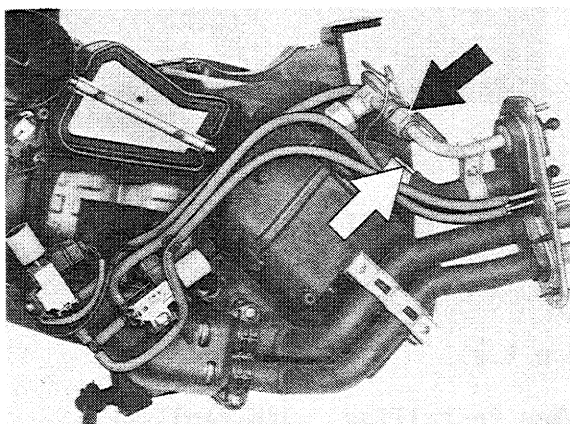
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## REMOVING AND INSTALLING EXPANSION VALVE

### Note

The expansion valve can only be removed and installed when the heating - A/C unit is removed.

1. Pull off cold-insulating band on expansion valve.
2. Press off bracket for capillary tube.



3. Unscrew union nuts and remove expansion valve.

## OIL DISTRIBUTION IN REFRIGERATION CYCLE

### Compressor

40% = approx. 30 cm<sup>3</sup>

### Vaporizer

35% = approx. 30 cm<sup>3</sup>

### Condensors

15% = approx. 10 cm<sup>3</sup>

### Refrigerant tank/lines

10% = approx. 10 cm<sup>3</sup>

These proportions should be maintained.

When a component is replaced, the oil in the system must be added to by the amount in the component replaced.

The proper quantity can be directly filled into the new component.

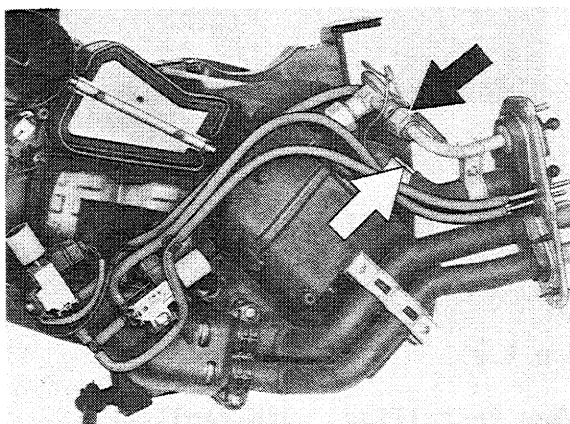
If the compressor is replaced, 60 % = approx. 50 cm<sup>3</sup> oil must be released from the new compressor, since this contains the oil for the entire system.

## REMOVING AND INSTALLING EXPANSION VALVE

### Note

The expansion valve can only be removed and installed when the heating - A/C unit is removed.

1. Pull off cold-insulating band on expansion valve.
2. Press off bracket for capillary tube.



3. Unscrew union nuts and remove expansion valve.

## OIL DISTRIBUTION IN REFRIGERATION CYCLE

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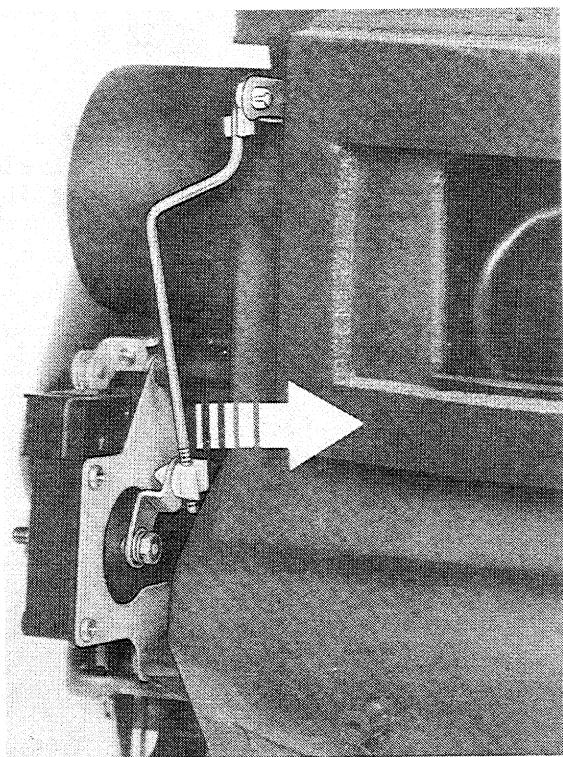
When a component is replaced, the oil in the system must be added to by the amount in the component replaced.

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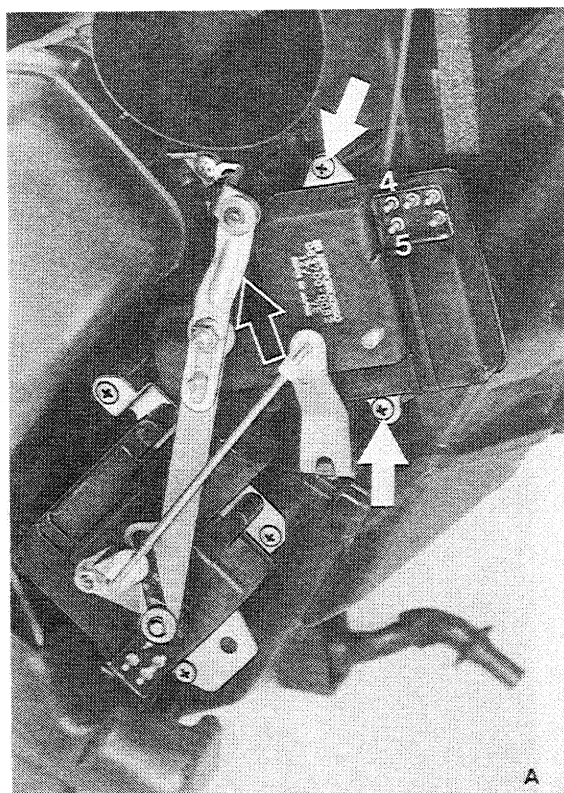
# REMOVING AND INSTALLING CONTROL MOTOR FOR DEFROST FLAP

1. Unclip linkage.



2. Remove plug housing.

3. Unscrew the three fastening screws.



## Adjusting Defrost Flap

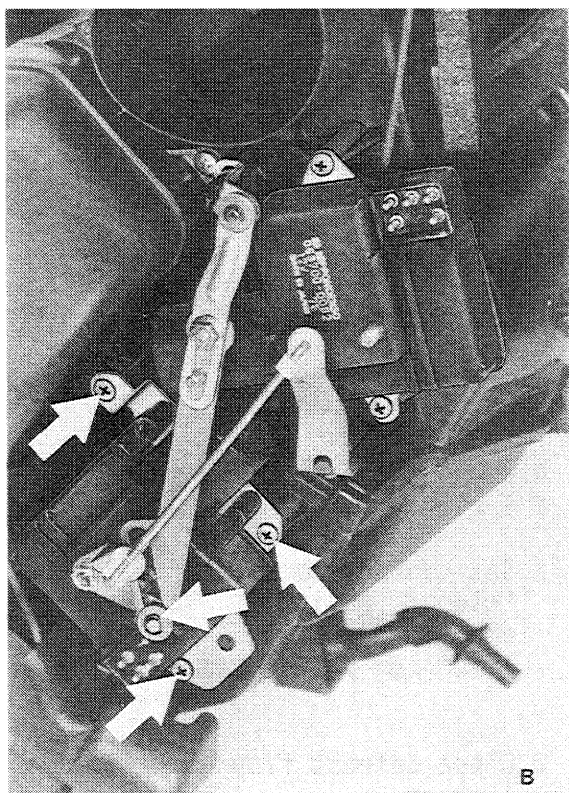
1. Set control motor to final "closed" position. To do this, connect pin 4 with + and pin 5 with - of a 12 voltage source.

2. Close defrost flap and clip on linkage.



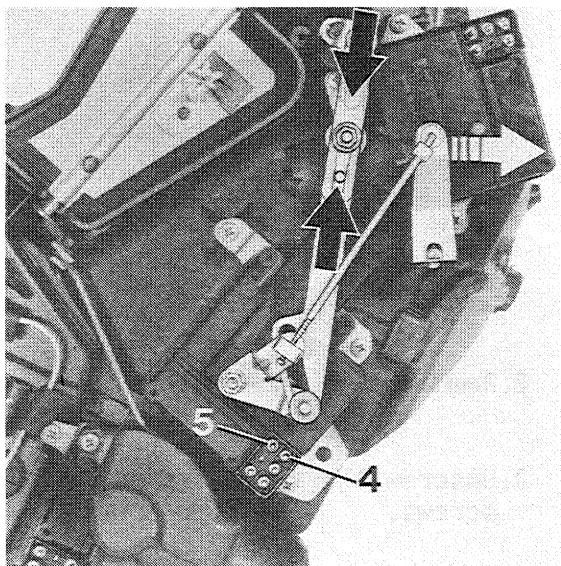
# REMOVING AND INSTALLING CONTROL MOTOR FOR TEMPERATURE-MIXING FLAP AND BAFFLE FLAP

1. Unclip temperature-mixing flap linkage.
2. In order to disconnect the linkage of the baffle flap, remove retaining ring, plastic washer, and shaft ring.



# Adjusting the Temperature - Mixture Flap and Baffle Flap

1. Set the control motors to the final "cool" position. To do this, connect pin 4 with + and pin 5 with - of a voltage source of 12 V.
2. Press temperature-mixing flap lever upward until the flap is at the stop. Clip on the linkage in this position.
3. Loosen nut M 5 on baffle flap linkage.
4. Press together the two linkage halves and tighten nut M5.

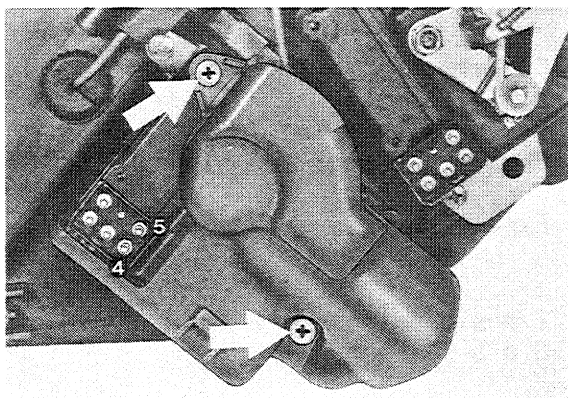


3. Unscrew fastening screw.

## REMOVING AND INSTALLING CONTROL MOTOR FOR FOOTWELL FLAPS

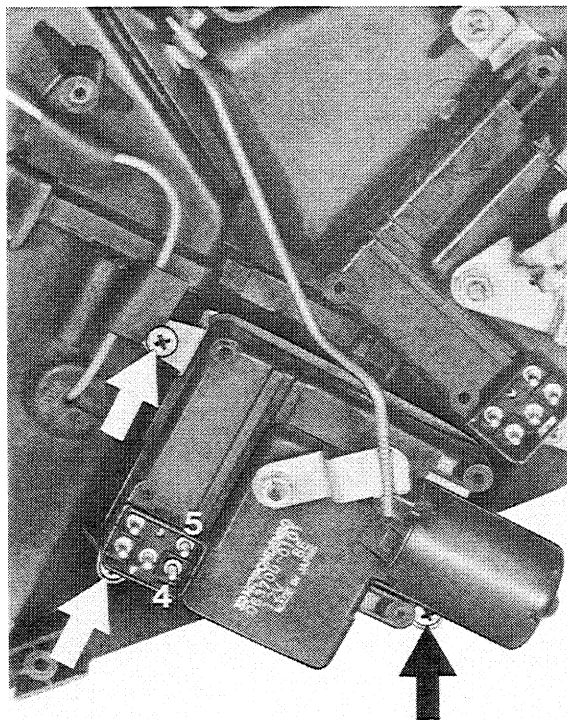
1. Remove plug housing.

2. Unscrew cover.



3. Unclip linkage.

4. Unscrew fastening screws.



## Adjusting the Footwell Flaps

1. Set control motor to final "closed" position. To do this, connect pin 4 with + and pin 5 with - of a 12 voltage source.

2. Close footwell flaps and connect linkage.

\_\_\_\_\_



## AIR-CONDITIONING SYSTEM TROUBLE-SHOOTING

### General Requirements

Heating is off. Polyrib belt correctly tensioned.

At an engine speed of 2000 1/min, an ambient temperature of approx. 20° C, and with the compressor running, the following pressures must be attained:

Low pressure: approx. 0.5 - 2.0 bar

High pressure: approx. 10 - 20 bar

Temperature at center nozzle: approx. 2 - 4° C.

### Complete Cooling Failure

1. When bursting seal on refrigerant tank has been destroyed.

The system was overheated. Check direction of rotation of cooler and condensor blowers. If the blowers do not run, check fuses, relays.

2. Connect service unit and read off pressure values.

Low pressure: too low  
High pressure: too low

No refrigerant in system. Look for leakage. Fill air-conditioning system.

3. Turn on air-conditioner and read off pressures.

Low pressure: too high  
High pressure: too low

Compressor is defective.

Low pressure: too low  
High pressure: too high

Expansion valve is defective.

### Insufficient Cooling

1. Low pressure: normal  
High pressure: high

System is too full. Drain and refill system.

2. Low pressure: too low  
High pressure: too low

Insufficient refrigerant in system. Look for leakage. Refill system.

3. Low pressure: too high  
High pressure: normal

Expansion valve is defective.

### Inadequate Cooling After Short Period of Operation

Cooling is OK at first, but then decreases in effectiveness during operation.

Vaporizer is iced up. De-icing switch does not turn off compressor. Check capillary tube for damage and correct seating.

or

Expansion valve iced up. Warm expansion valve. The cooling effect of the air-conditioner should start back up.

Cause: Moisture in refrigerant. Replace refrigerant tank. Refill system.

### Heater heats continuously and can no longer be regulated

Interruption in sensor series. Check outside sensor, interior sensor, and mixing chamber sensor.

Remove control switch and pull plug A.

Outer sensor: Connect ohmmeter with term.9 and ground

Reading: at 0°C - 34 kohm  $\pm$  10%  
at 10°C - 20 kohm  $\pm$  10%  
at 25°C - 10 kohm  $\pm$  10%

Interior sensor: Connect ohmmeter with term.2 and ground

Reading: As for outside sensor

Mixing chamber sensor: Connect with term.1 and ground

Reading: As for outside sensor

## Heating not Controllable

1. The heating regulates in the direction of maximum cooling and heats only starting from a temperature-switch position of approx. 27°.

There is a short circuit in the sensor series.

To check the 3 temperature sensors, see "heater heats continuously and can no longer be regulated".

2. Defrost flap not controllable.  
Pull plug on control motor, switch on ignition and set defrost slide switch to "closed" position.

Voltmeter at term. 1 and term. 2

Reading: approx. 6 V

Voltmeter at term. 2 and term. 3

Reading: approx. 0.1 V

Defrost slide switch in "open" position.

Reading: approx. 6 V

Voltmeter at term. 2 and term. 4

Reading: approx. 0.1 V

Defrost slide switch in "closed" position

Reading: approx. 10 V

Voltmeter at term. 2 and term. 5

Reading: approx. 0.1 V

Defrost slide switch in "open" position

Reading: approx. 10 V

3. Temperature mixing flap and baffle flap not controllable.

Pull plug on control motor, switch on ignition and set temperature pre-selector to maximum cooling.

Voltmeter at term. 1 and term. 2

Reading: approx. 6 volts

Voltmeter at term. 1 and term. 3

Reading: approx. 2.5 volts

Voltmeter at term. 1 and term. 4

Reading: approx. 10 volt

Set temperature pre-selector to maximum heating

Reading: approx. 0.1 volts

Voltmeter at term. 1 and term. 5

Reading: approx. 10 volts

Set temperature pre-selector to maximum cooling.

Reading: approx. 0.1 volts.

4. Footwell flaps not adjustable.

Pull plug on control motor, switch on ignition, and set footwell slide switch to "closed" position.

Voltmeter at term. 1 and term. 2  
Reading: approx. 6 V

Voltmeter at term. 2 and term. 3  
Reading: approx. 0.1 V

Footwell slide switch in "open" position  
Reading: approx. 6 V

Voltmeter at term. 2 and term. 4  
Reading: approx. 0.1 V

Footwell slide switch in "closed" position  
Reading: approx. 10 V

Voltmeter at term. 2 and term. 5  
Reading: approx. 0.1 V

Footwell slide switch in "open" position.  
Reading: approx. 10 V

## Sluggish Interior Temperature Regulation

The system overheats and reacts only very sluggishly.

Interior sensor not functioning.

Pull plug on interior sensor blower and switch on ignition.

Voltmeter at term. 1 and term. 3  
Reading: battery voltage

If no voltage present, check fuse No. 17.

## Magnetic Coupling switching

1. Check voltage at compressor plug.

Voltage present

→ Replace magnet coil.

no voltage present

→ Check low-pressure switch.

2. Check voltage at low-pressure switch.

Voltage only at one pin

→ Check system fill quantity.

System correctly filled

→ Replace low-pressure switch.

No voltage present  
→ Check A/C relay.

3. Check A/C relay.

There must be voltage at term. 3.  
No voltage present  
→ Check de-icer.

There must be no ground potential  
at term. 2.  
Ground present  
→ Check water-temperature switch.

4. Check voltage at de-icer.

Voltage at only one pin  
→ Replace de-icer.

No voltage  
→ Replace control switch.

### Checking Vacuum System

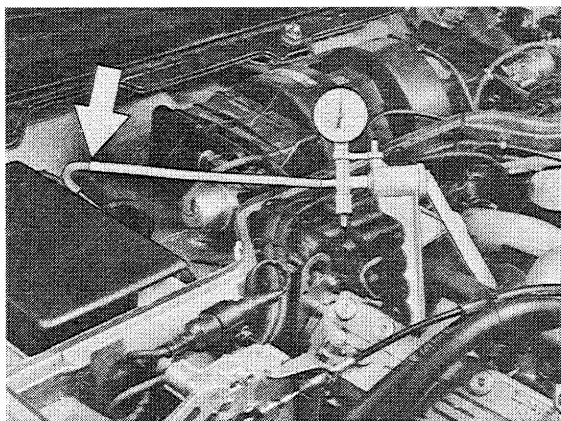
1. Pull off vacuum hose on vacuum reservoir.

2. Switch on vacuum hand pump.

3. Switch on ignition.

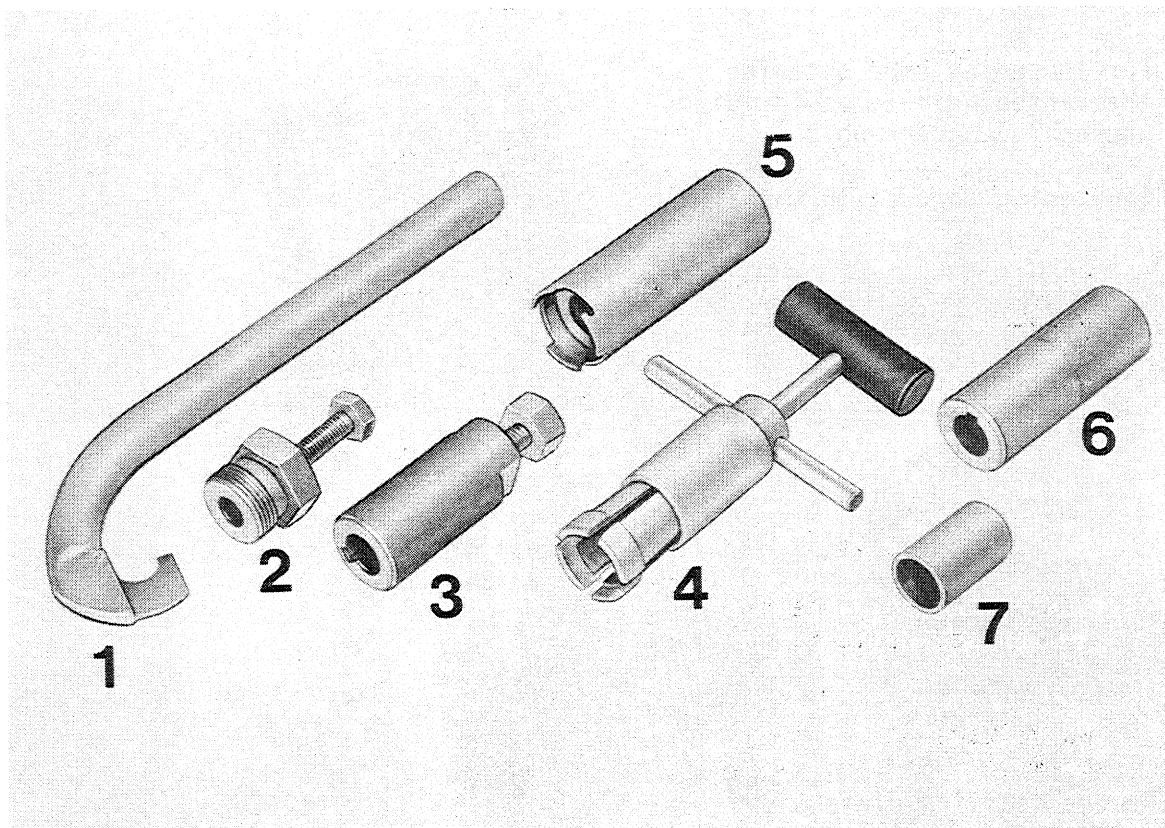
4. Press air-circulation button and set temperature pre-selector switch to maximum cooling.

5. Generate vacuum. The fresh/circulation air flaps should close, as well as the heating valve.



6. If the fresh/circulation air flaps and the heating valve do not close, although the vacuum system has no leakage, check voltage at solenoid valves

## Tools



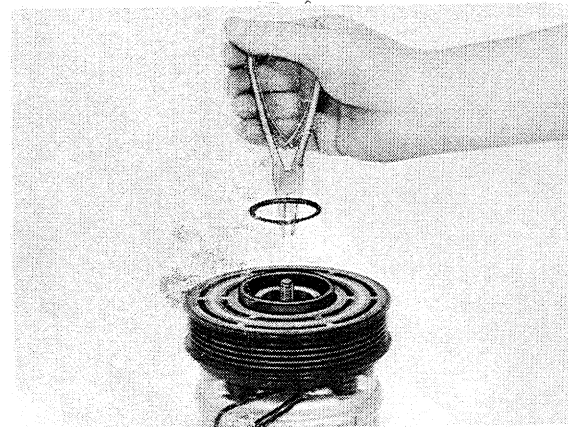
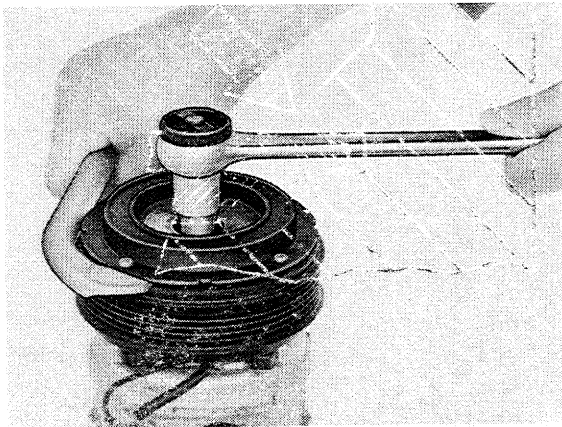
No.	Description	Special Tool	Remarks
1	Holding wrench	95047-10040	Suppliers: see Workshop Manual
2	Coupling plate puller	95047-10060	
3	Key puller	95042-10160	
4	Friction washer puller	95042-10150	
5	Axial face seal puller	95042-10130	
6	Key inserter	95042-10190	
7	Thrust member	95042-10250	

# INSTALLING AND REMOVING MAGNETIC COUPLING

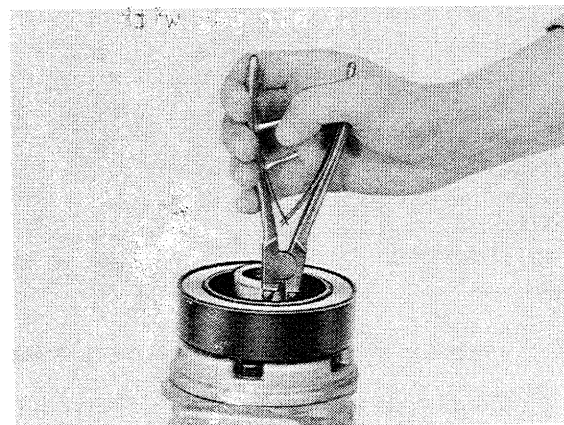
4. Remove retaining ring and belt pulley.

1. For loosening or tightening the fastening nut, use holding wrench to counter-hold.

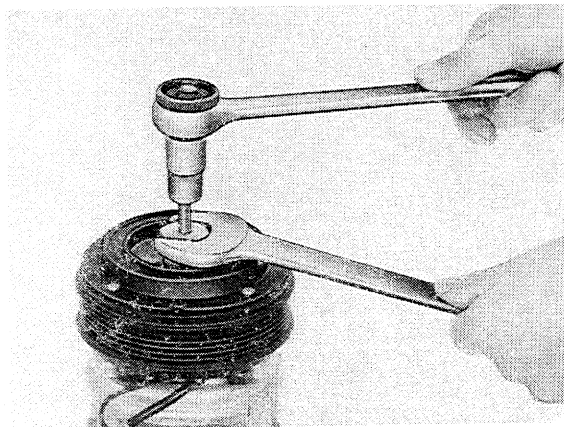
Tightening torque: 16 Nm/12 ftlb



5. Remove retaining ring and magnet coil.



2. Remove coupling plate with puller.



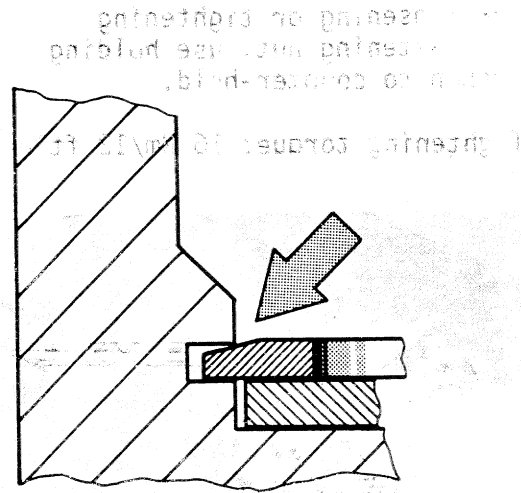
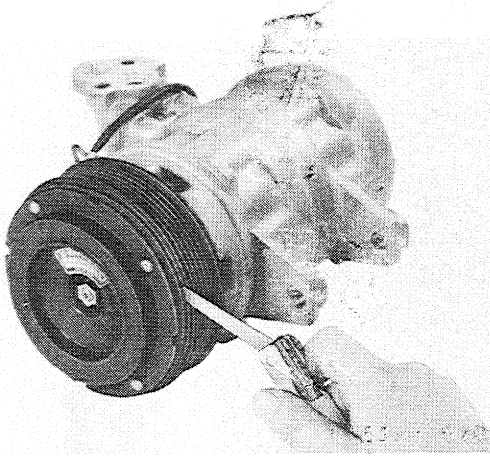
## Note

Coil resistance is  
 $3.8 \pm 0.2 \text{ ohm}$ .

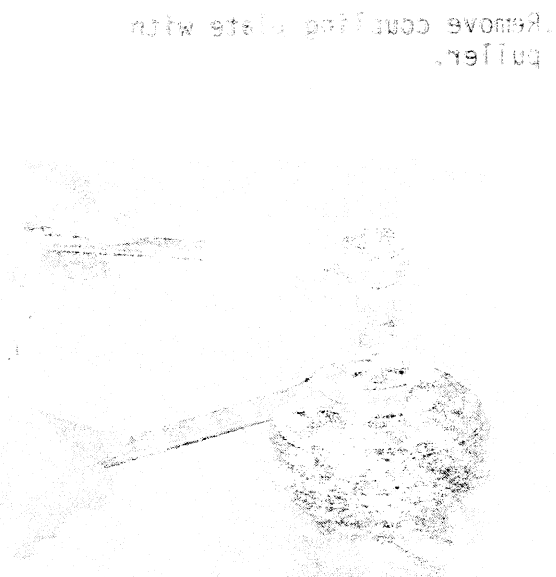
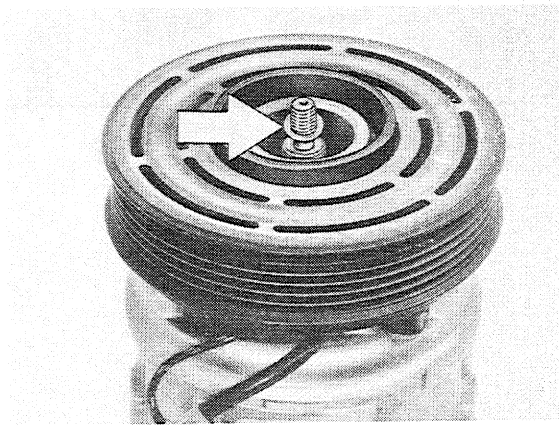
3. Remove shims.

Installation instructions: Install the two retaining rings so that the diagonal points upwards.

The air gap between the coupling plate and belt pulley is 0.4 - 0.7 mm.



If required, adjust air gap with shims.



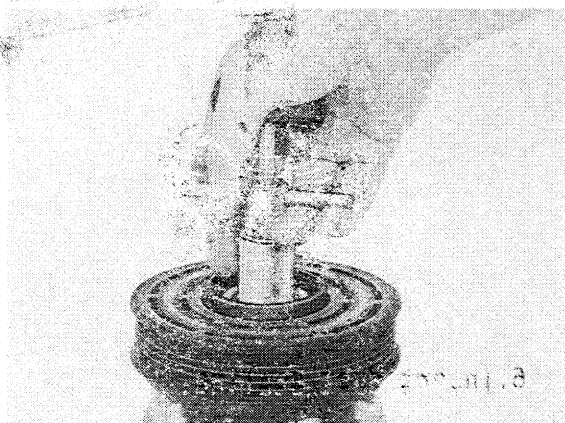


## REMOVING SHAFT SEALING

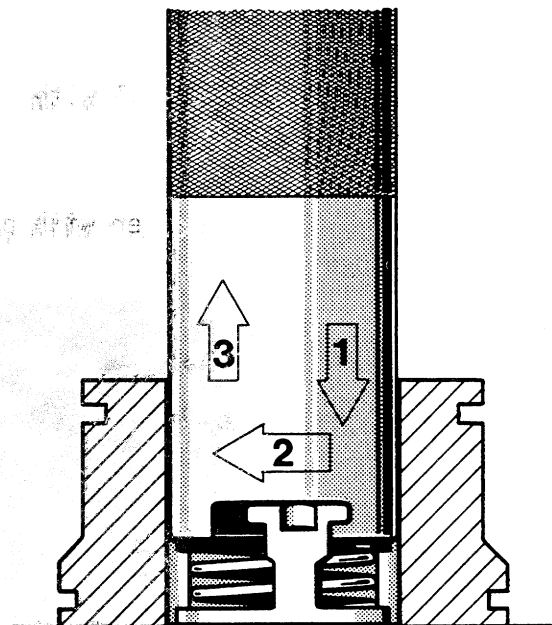
## Note

Briefly loosen vent plugs on line connections, so that any remaining gas can escape.

1. Remove coupling plate.
2. Remove dust seal with blunt object.
3. Remove key with key puller.
4. Remove shaft seal retaining ring.
5. Pull out friction washer using puller.



6. Remove axial face seal with puller. Introduce puller. Push down the axial face seal spring with the puller and simultaneously turn to the right, until the seal catches.



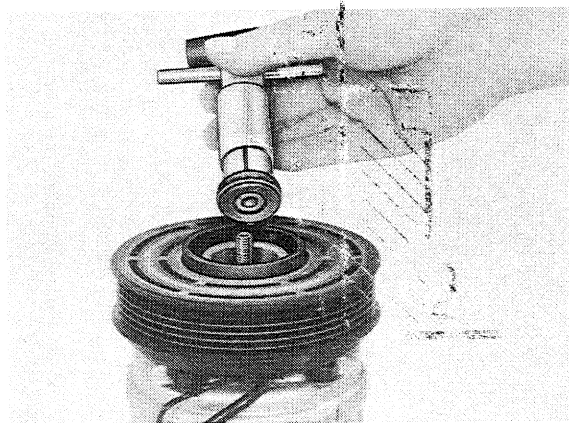
# INSTALLING SHAFT SEALING

## Note

Prior to installation, coat axial face seal and friction washer with refrigerator oil.

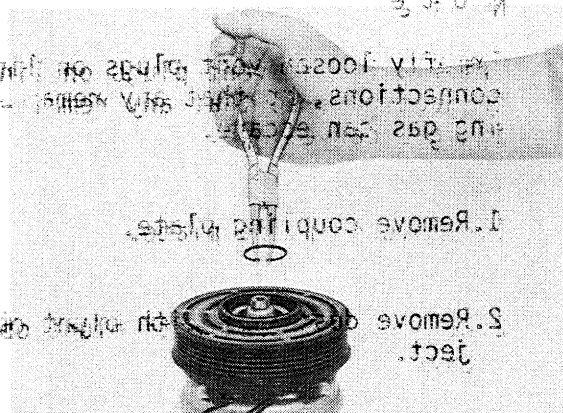
Do not damage the sealing faces of the shaft sealing.

1. Install axial face seal with pulling tool.
2. Install friction washer with pulling tool.

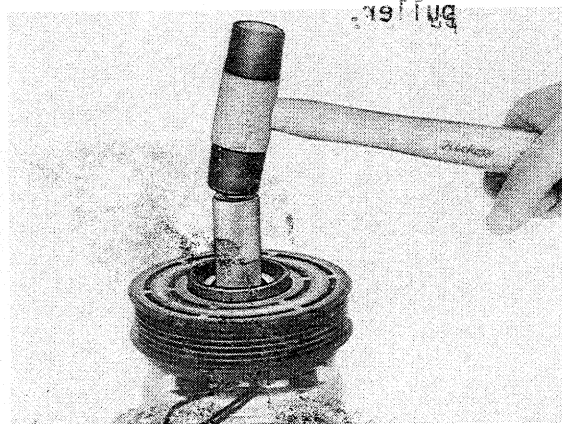


3. Using thrust member and nut, push friction washer to where the groove for the retaining ring is fully visible.

4. Insert retaining ring and remove thrust member.



5. Insert key, apply key inserter, and drive in the key.



6. Insert dust sealing.
7. Install coupling plate.

Tightening torque: 16 Nm/12 ftlb