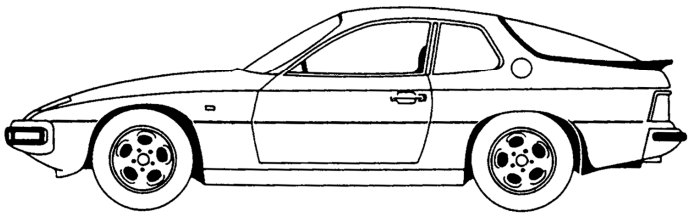
Technical specifications

924 models 78-85
925 turbo models79-84
924 Carrera GT models 81

PORSCHE



Torque Specifications - Manual Transmission 924 turbo (Types G31/01, G31/02, G31/03)

Location	Thread	Tightening torque Nm (ftib)
Drive shaft	M 30 x 1.5	220 (162)
Driving shaft	M 24 x 1.5	220 (162)
Flange shaft to diff. gear	M10x1.5	46(34)
Shift lock/rear axle and wheel housing	M10x1.5	18(13)
Mounting of casing and cover	M 8x1.25	25(18)
Crown gear/diff. gear	M 12 x 1.25	150(111)
Locking pawl/rear axle casing	M6x1	10 (7.5)
Reversing light switch/ wheel housing	M18x1.5	30(22)
Oil filler screw/wheel housing	M24X1.5 (tapered)	25(18)
Oil drain screw/rear-axle casing	M25x1.5 (tapered)	25(18)
Tension plate, rear axle casing, wheel housing	M 8x1.25	25(18)
Joint shaft to joint flange	M 8x1.25	42(31)

Torque Specifications - Clutch, Central Tube, Transmission Suspension, Shift Actuation 924 turbo (Type G31/01, G31/02, G31/03)

Location	Thread	Tightening torque Nm (ftib)
Clutch		
Guide tube to clutch housing	M7	12(9)
Clutch and ring gear mounting	M8	25(18)
Flywheel to crankshaft	M12	100 (74)
Clutch housing to engine	M12 M10	75(55) 45 (33)
Clutch release shaft with clutch casing	M6x35 M6	9.5 (7) 7.5(5)
Clutch operating cylinder to clutch housing	M8x28	21 (15)
Central tube		
Central shaft to transmission input shaft	M10x46	80 (59)
Central tube flange to clutch housing	M10x35	42(31)
Central tube flange to transmission case	M12	85 (63)
Transmission suspension		
Transmission bearing to rear axle transverse tube	M10	42(31)
Transmission bearing to transmission	M10	42(31)
Shift actuation		
Bearing support to center of floor unit	M6x10	9(7)
Shifting rod to transmission	M8	18(13)
Angled joint to guide rod	BM 10	23(17)

Torque Specifications - Manual Transmission 924 turbo (Type 016G)

Location	Thread	Tightening torque Nm (ftib)
Oil filler screw to transmission case	M24	25(18)
Oil drain screw to transmission case	M24	25(18)
Cover for shifting shaft to transmission case	M6	6...10 (4.5...7.5)
End shield to transmission case	M8	24(18)
Bait bearing to transmission input shaft	M10	50 (37)
Cover to end shield	M8	25(18)
5th gear wheel to driving shaft	M10	50(37)
Shifting lock to end shield and transmission case	M18	30(22)
Shift travel limiter to end shield	M18 M14	30(22)
Reverse-transfer lever to end shield	M10	35(26)
Reverse gear pin to end shield	MS	20(15)
Flange shaft to differential	M8	25(18)
Transmission side cover to transmission case	M8	25(18)
Crown gear to differential casing	M10	85...100 (63...74)
Reversing light switch to transmission case	M18	30 (22)
Joint shaft to joint flange	M8	42(31)

Torque Specifications - Clutch, Central Tube, Transmission Suspension and Shift Actuation 924 turbo (Type 016G)

Location	Thread	Tightening torque Nm (ftib)
Clutch Guide tube to clutch housing	M7	12(9)
Clutch and ring gear mounting	M8	25(18)
Flywheel to crankshaft	M12	100 (74)
Dutch housing to engine	M12 M10	75(55) 45(33)
Clutch release shaft with clutch housing	M6x35 M6	9.5 (7) 7.5 (5)
Clutch operating cylinder to clutch housing	M8x28	21 (15)
Central tube		
Central shaft to transmission input shaft	M10x46	80 (59)
Central tube flange to clutch housing	M10x35	42(31)
Central tube housing to transmission housing	M12x75 M12x80 M10X60	85(63) 85(63) 42(31)
Transmission suspension		
Transmission bearing to body	M10	42(31)
Bearing to support bracket	M8	23(17)
Support bracket to	M8	25(18)
Transmission Shift actuation		
Joint rod to transmission case	M8	14(10)
Joint rod to intermediate shifting lever	M8	21 (15)
Shifting rod mounting	M8	21 (15)
Shift lever plate to central tube	M8x12	21 (15)
Intermediate shifting lever to shifting shaft	M8	22.5 (17)

Technical Data- 5-Speed Manual Transmission G 31/01, G31/02* and G31/03

Ratios	
1st gear	10:36 i= 3.6000
2nd gear	16:34 i= 2.1250
3rd gear	24:35 i=1.4583
4th gear	28:31 i=1.1071
5th gear	37:27 i = 0.7297
R.gear	12:42 i= 3.5000
Final drive	Hypoid drive, 12 mm offset
Final drive ratio	9:35 i = 3.8889
Power transmission	Front engine and transmission (at rear) bolted together by means of a connecting tube to form a rigid drive unit. Front engine, clutch, torsionally elastic shaft (Ø 25 mm) to transmission mounted in 3 bearings, rear transmission interlocked with drive axle, twin articulated drive shafts to rear wheels
Transmission weight (dry)	55 kg (121 lbs)
Filling capacity	Approx. 2.5 liters multi-grade transmission oil, SAE 75 W-90, API classification GL 5 (or MIL-L21O5 B)

Technical Data - 5-Speed Manual Transmission 016G

Ratios	
1st gear	12:38 i= 3.1666
2nd gear	18:32 i=1.7777
3rd gear	23:28 i=1.2174
4th gear	29:27 i = 0.9310
5th gear	34:24 (35:21) i = 0.7059 (0.6000)
R.gear	12:16-22:48 i= 2.9091
Final drive	Helical bevel gear differential
Final drive ratio	8:33 i = 4.1250 (7:33 i= 4.7143)
Power transmission	Front engine and transmission (at rear) bolted together by means of a connecting tube to form a rigid drive unit. Front engine, clutch, torsionally elastic shaft (Ø 25 mm) to transmission mounted in 3 bearings, rear transmission interlocked with drive axle, twin articulated drive shafts to rear wheels
Transmission weight (dry)	45 kg (99 lbs)
Filling capacity (specifications for USA in brackets)	Approx. 2.5 liters multi-grade transmission oil, SAE 75 W-90, API classification GL 5 (orMIL-L2105B)

REMOVING AND INSTALLING CYLINDER HEAD

The cylinder head can be removed with engine installed in car.

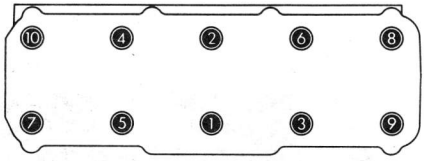
The engine block has two centering sleeves to facilitate installation of head.

Note

To avoid damage to valves, cylinder head must be installed with cylinder 1 at TDC and camshaft sprocket at timing mark.

Cylinder Head Bolt Tightening Instructions

Requirement: engine cold



Tightening Order: see figure
Loosening Order: opposite

1. Coat threads of cylinder head bolts with oil and tighten bolts in order in steps of 40 Nm (29 ft lb), 80 Nm (58 ft lb) and 110 Nm (80 ft lb).

2. Tighten cylinder head bolts again no sooner than 30 to 60 minutes later (cylinder head gasket has to settle). Loosen bolts by approx. 30° and tighten again in specified order in steps of 40 Nm (29 ft lb), 80 Nm (58 ft lb) and 110 Nm (80 ft lb).

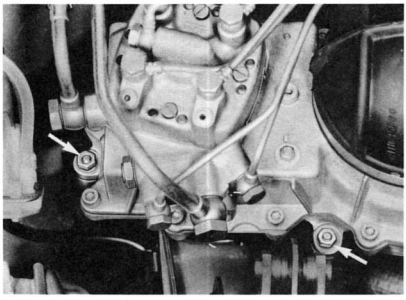
3. Run engine to operating temperature (oil temperature approx. 80° C/176° F).

4. Let engine cool down and tighten cylinder head bolts to final torque as described in 2.

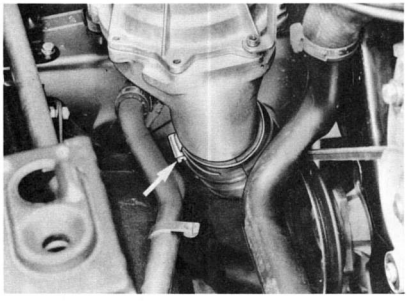
Note

The cylinder head bolts do not have to be re-tightened during subsequent maintenance services.

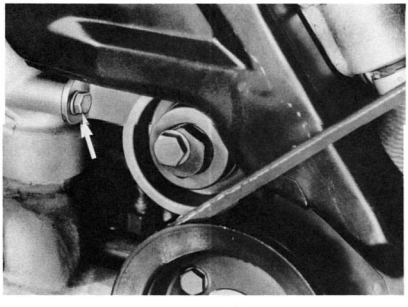
17. Remove the three mounting nuts from bottom of fuel distributor.



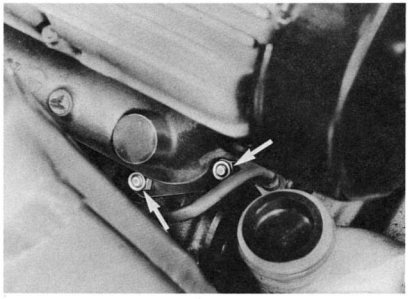
18. Loosen hose clamps on dust cover and move fuel distributor to one side.



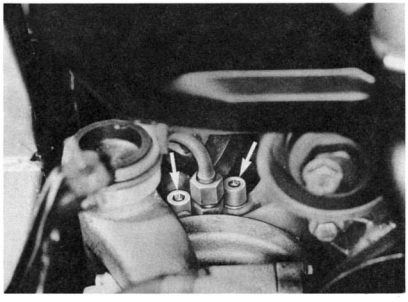
19. Unscrew mounting bolt on pressure duct and take off pressure duct.



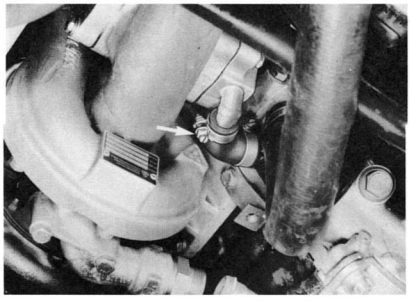
20. Remove nuts (arrows) holding exhaust manifold/turbocharger.



21. Unscrew Allen head nuts.



22. Loosen hose clamp (arrow).



Spark Plug Connectors

Type/Model	Version	Remarks
924 turbo		Without air gap

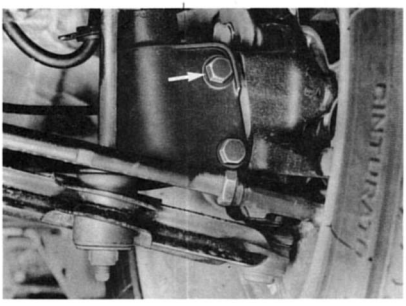
AXLE ALIGNMENT

Use optical axle alignment equipment. Refer to operating instructions supplied with equipment.

FRONT AXLE

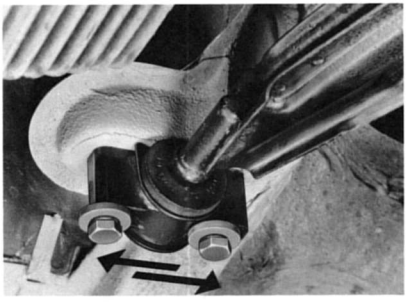
Camber

Adjust camber by turning eccenter bolt (arrow).



Caster

Adjust caster by moving rear control arm mount sideways.



Toe

Center steering gear with Special Tool 9116 and adjust toe with tie rods.

Toe Difference Angle

Toe difference angle cannot be adjusted, but can be influenced by exchanging the steering arm.

REAR AXLE

Height

The rear car height can be adjusted with two-piece spring strut without removal of the torsion bars.

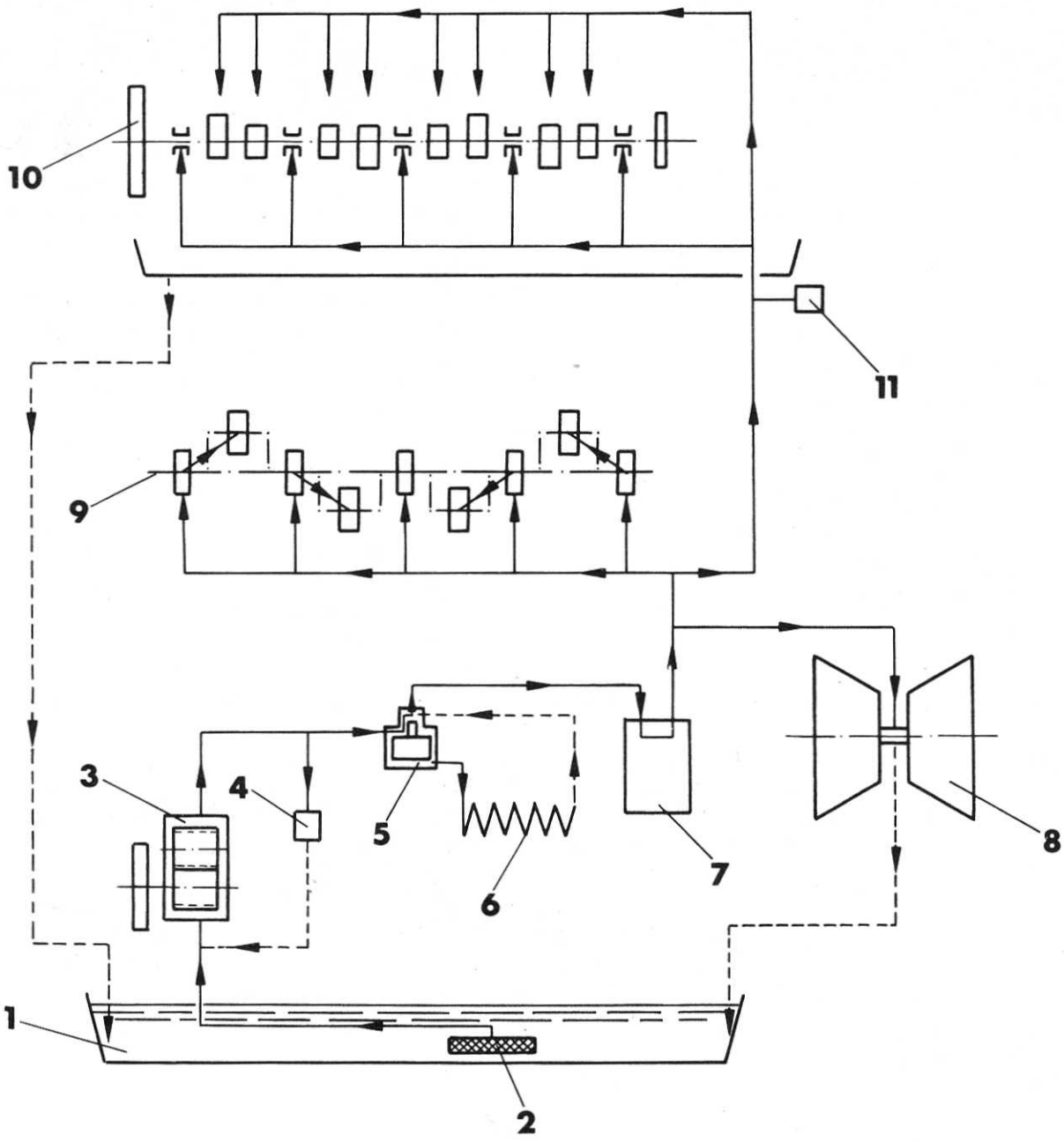
Car height is correct when spring strut inclination corresponds with specifications.

Current Flow Diagram
Type 924 turbo USA
Model 80, Part II

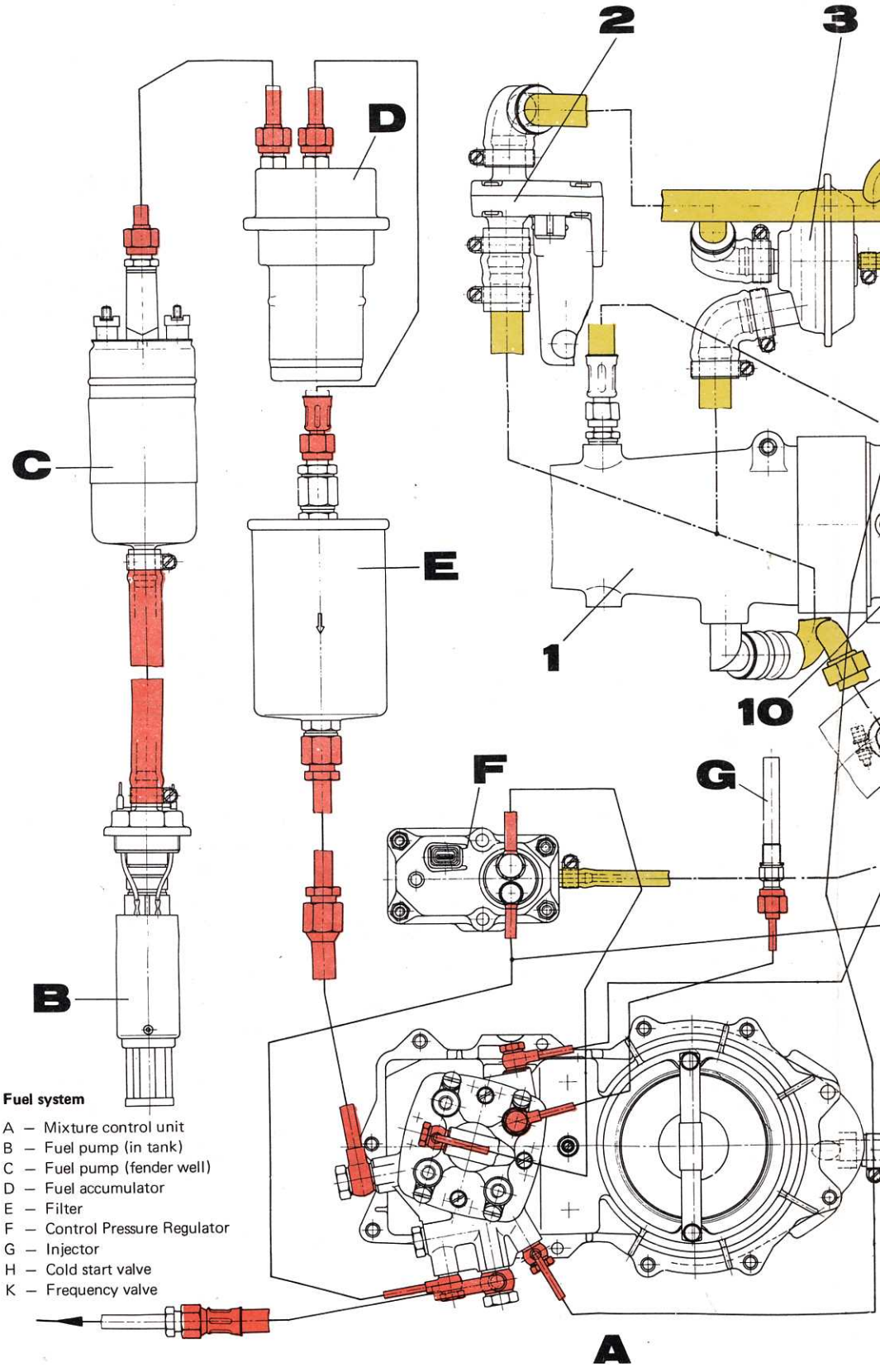
OXYGEN SENSOR SYSTEM

FAN

The lubrication system of the 924 turbo engine includes the following new components: an oil cooler in front; oil filter flange with a thermostat for the oil cooler; delivery and return lines for the turbocharger.



1 – Oil pan
2 – Oil strainer
3 – Oil pump
4 – Pressure relief valve (opens at 5.9 bar)
5 – Thermostat (opens for oil cooler at 87°C)
6 – Oil cooler
7 – Full flow oil filter
8 – Exhaust gas turbocharger
9 – Crankshaft
10 – Camshaft
11 – Oil pressure sending unit



Fuel system

A – Mixture control unit
B – Fuel pump (in tank)
C – Fuel pump (fender well)
D – Fuel accumulator
E – Filter
F – Control Pressure Regulator
G – Injector
H – Cold start valve
K – Frequency valve

Front Suspension

Standard: The front control arms are offset toward the center of the car by 6 mm, similar to the 1979 924.

M 471: The steering knuckle is changed with a 6.5 mm longer steering arm. The spindles are new and the front wheel bearings are from the 911 SC.

Stabilizer: Standard: 21 mm dia. M 471: 23 mm dia.

Rear Suspension

Standard: The rear control arms are reinforced at the trailing arm attachment points.
Torsion bar: 23,5 mm dia.

Stabilizer: Standard: none M 471: 14 mm dia.

Shock Absorber

The front and rear axle shock absorbers are re-calibrated

Wheels

Standard	Optional	M 471
6 J x 14 (standard design with 4-bolts)	6 J x 15 (turbo design with 4-bolts)	6 J x 16 (turbo design with 5-bolts and 21 mm spacers at the rear)

Tires

Standard	Optional	M 471
185/70 HR 14	185/70 VR 15	205/55 VR 16

Alignment Specifications	Standard	M 471
Front wheels		
Toe-in total (at 150 N load)	0° + 5′ −15′	0° + 5′ −15′
Camber	−20° ± 15′	−20′ ± 15′
Max. camber difference left and right	10′	10′
Track difference angle at 20° lock	−1° ± 20′	−1° ± 20′
Caster	2° 45′ ± 30′	2° 45′ ± 30′
Max. difference left and right	30′	30′
Rear wheels		
Toe-in total	0° ± 5′	0° ± 5′
Max. difference left and right	10′	10′
Camber	−1° ± 30′	−25′ ± 30′
Max. difference left and right	30′	30′
Height adjustment		
Centre of torsion bar below wheel centre	8 ± 10 mm	8 ± 10 mm
Max. difference left and right	10 mm	10 mm

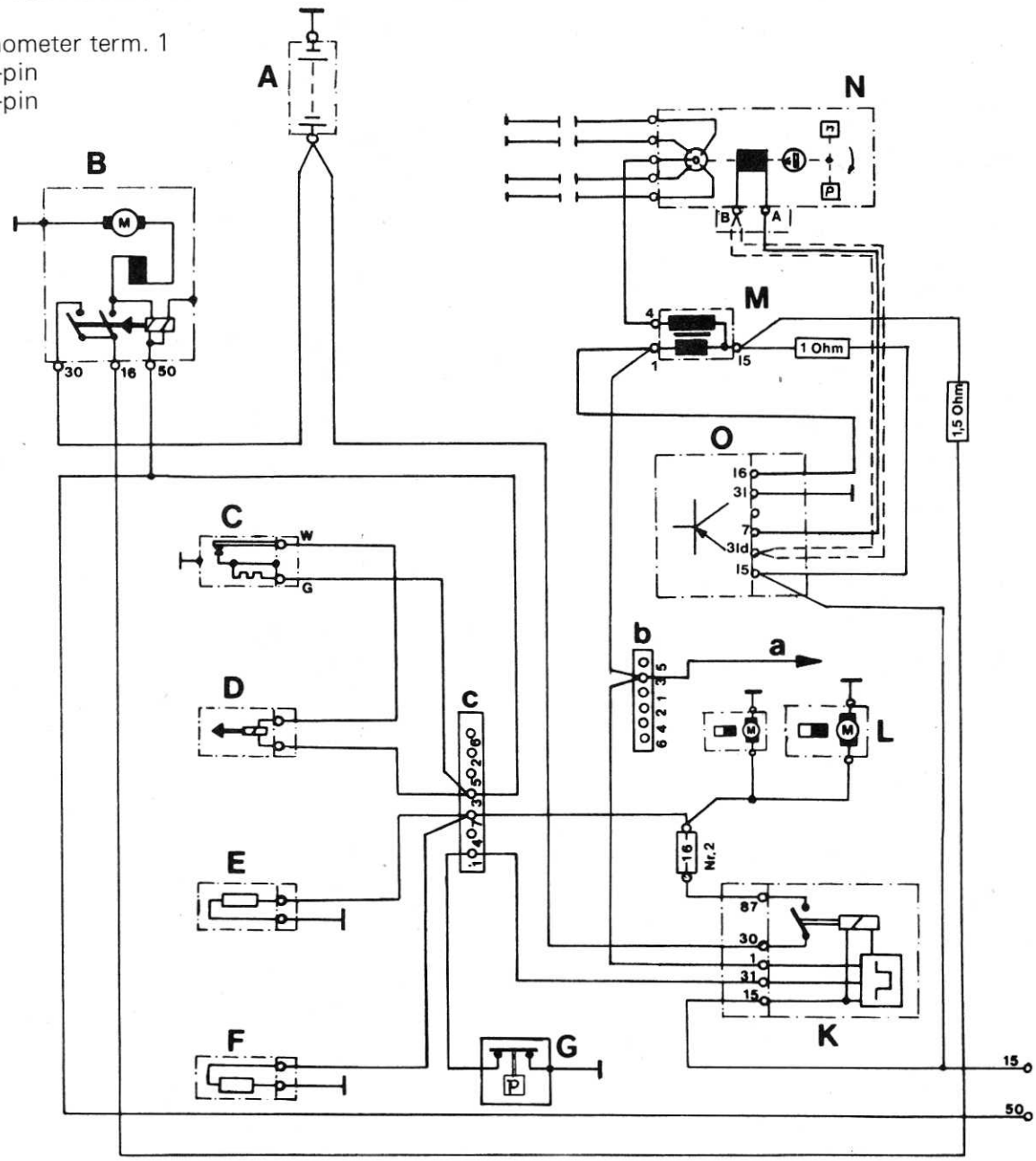
Electric Circuit of Fuel Pump and Ignition System – 924 Turbo

A – Battery
B – Starter
C – Thermo-time switch
D – Cold start valve
E – Auxiliary air regulator
F – Control pressure regulator
G – Boost pressure limiting switch
K – Fuel pump relay
L – Fuel pumps
M – Ignition coil
N – Distributor
O – Ignition control unit

a – To tachometer term. 1
b – Plug, 6-pin
c – Plug, 7-pin

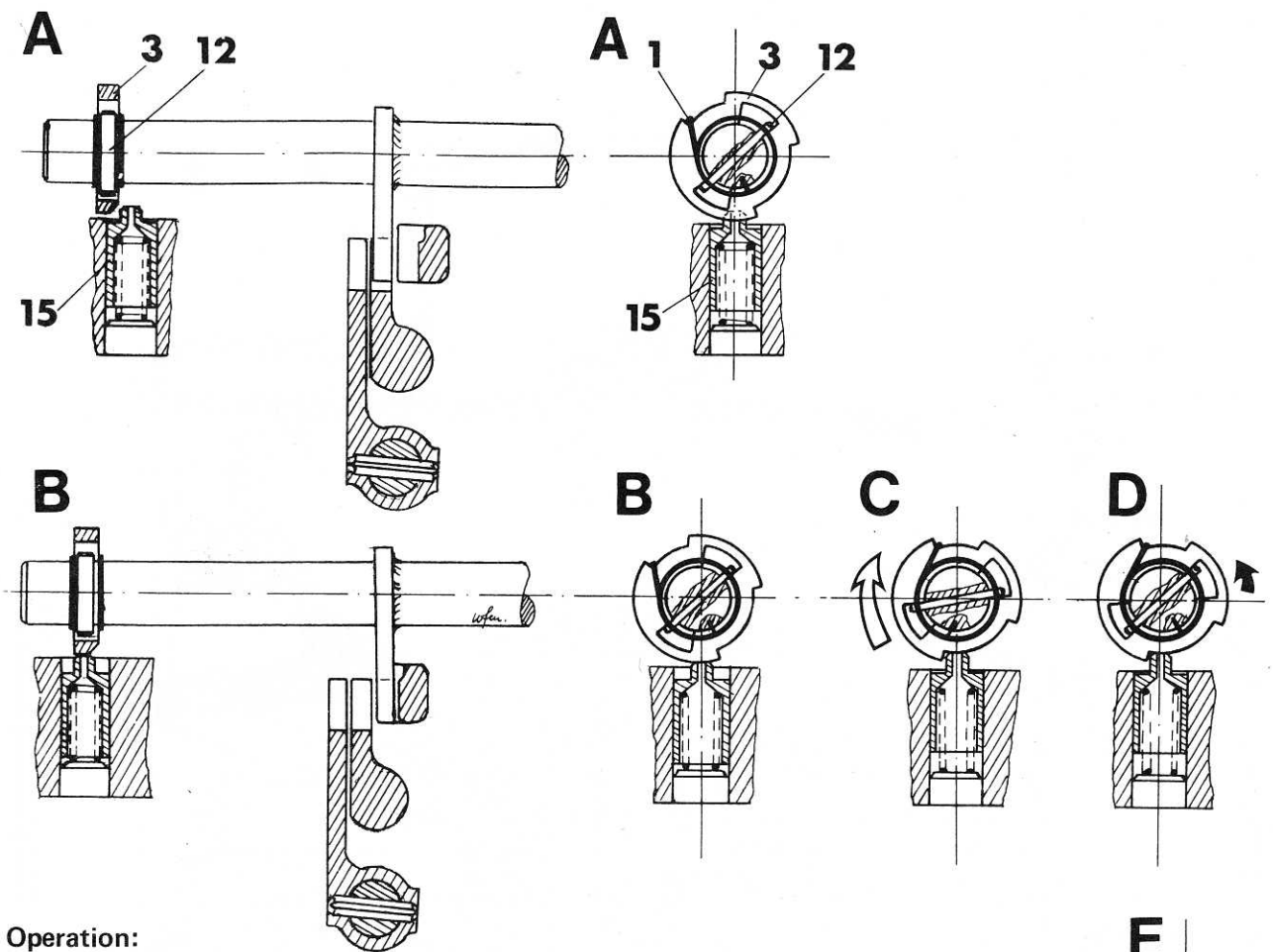
Adjustment Values:

Ignition timing:	20° before TDC at 2000 rpm ± 50 rpm vacuum hoses
Spark plugs:	Bosch WR 7 DS Champion N 8 GY Electrode gap: 0,6 mm 0.024") Ignition timing mark on flywheel



Reverse Gear Lock-Out

Since 5th gear and reverse gear are in the same shift gate, there must be a lock-out to prevent unintentional engagement of reverse gear when downshifting from 5th gear to 4th gear while moving forward. Washer (3) performs this function.



Operation:

A – **Neutral Position, 3rd – 4th Gear Shift Gate**
Spring (1) presses the washer (3) against cylindrical pin (12) constantly. The reverse gear lockpin (15) is free.

B – **Preselection, 5th Gear – Reverse Gear Shift Gate**
The selector shaft is moved and the reverse gear lockpin pressed down.

C – **Shift into 5th Gear**
The selector shaft is turned to the right, whereby the cylindrical pin turns the lock-out washer the reverse gear lockpin engages in an opening of the washer. Fifth gear is engaged.

D – **Shift out of 5th Gear**
The lockwasher remains in the position described in "C", i. e. the lockpin is engaged. When taking out 5th gear the selector shaft will turn to the left until the cylindrical pin rests on the drive surfaces of the lockwasher. It is not possible to shift into reverse gear, because the lockpin prevents any further turning. The preloaded spring (6) automatically presses the selector shaft into the 3rd – 4th gear gate.

E – **Shift into Reverse Gear**
The shift gate is selected as described in "B". Reverse gear is engaged by turning the selector shaft to the left, whereby the lockpin remains pressed down.

	Turbo	924
Wheel rims and tires	6 J x 15 (aluminum) with 185/70 VR 15 tire	6 J x 14 (aluminum) with 185/70 HR 14 tire
Winter tires	165 SR 15 M + S or 185/70 SR 15 M + S on rim 5 1/2 J x 15	165 SR 14 M + S or 185/70 SR 14 M + S on rim 5 1/2 J x 14
	185/70 SR 15 M + S on rim 6 J x 15	185/70 SR 14 M + S on rim 6 J x 14
	205/55 SR 16 M + S on rim 6 J x 16	185/65 SR 15 M + S on rim 6 J x 15
Tire pressure (for cold tire)	Front 2.0 bar Rear 2.5 bar	Front 2.0 bar Rear 2.0 bar
	Inflatable spare wheel, front and rear 2.2 bar	

WEIGHTS

DIN curbweight	kb/lbs	1280/2822	1245/2745
Max. total weight	kg/lbs	1500/3308	1400/3086
Max. axle load, front*	kg/lbs	720/1588	650/1433
Max. axle load, rear*	kg/lbs	880/1940	840/1852
Max. roof load**	kg/lbs	35/77	35/77

* The maximum total weight must not be exceeded.

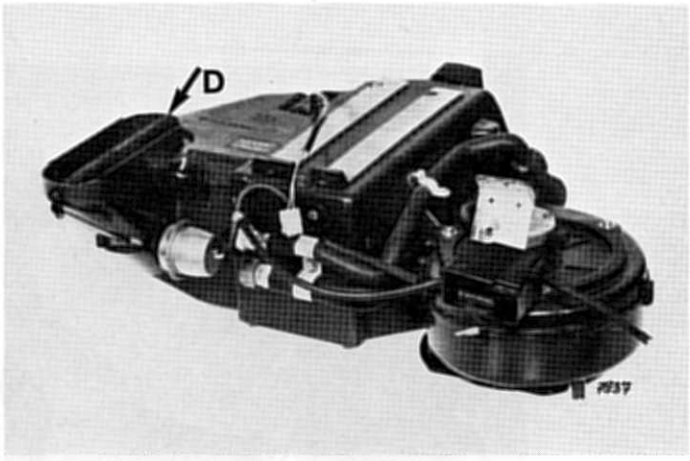
** Only applicable when using original Porsche parts.

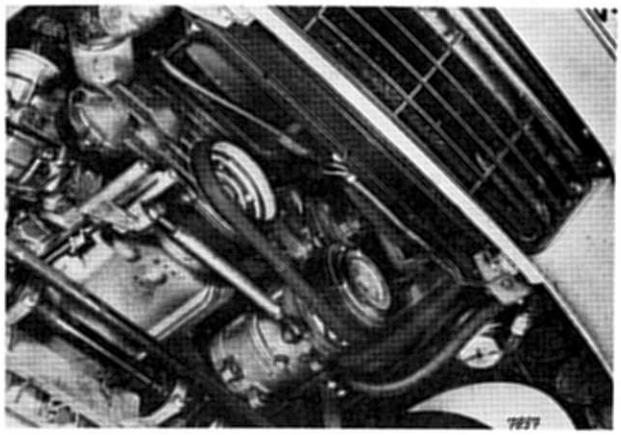
Note: The payload will be reduced accordingly when extra equipment (air conditioner, etc.) is installed.

Air Filter Cartridge (924)

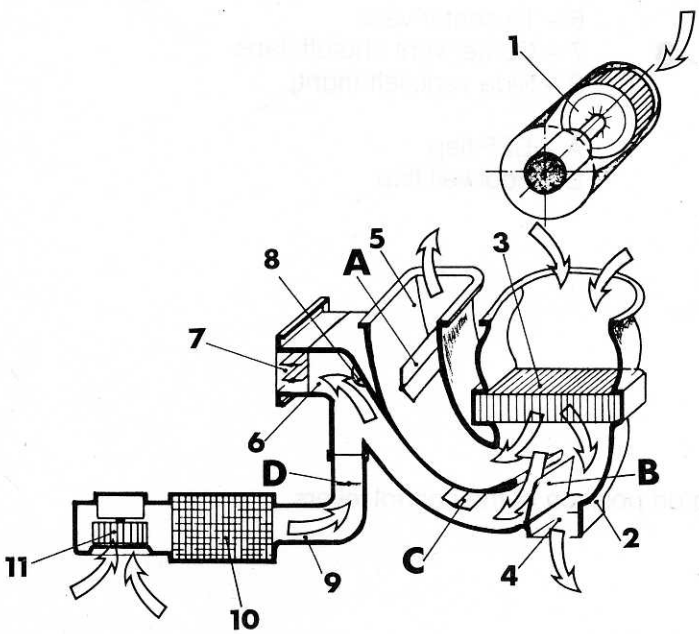
The instructions on the air cleaner cover – "Lettered side of air filter cartridge faces in direction of arrow". – are no longer applicable.
In the future the air filter cartridge must be turned 90° when installed, so that filter plates are vertical. Arrow and lettering will be changed.

In conjunction with the new heater, the air conditioner has been revised, in order to improve air conditioning in the passenger compartement.





With the air conditioner on, the supply of fresh air is stopped and switched to recirculated air. This is accomplished with 2 vacuum operated flaps (C and D).
Flap C shuts the fresh air duct to the center vent. Flap D opens the duct between evaporator (I) and the center vent recirculated air.
The air conditioned air can only flow out through the center vent and side vents. However, it is possible to mix in warm or cold fresh air via the DEF and footwell vents.



1 – Radial blower
2 – Heater
3 – Heat exchanger
4 – Footwell outlet
5 – To windshield
6 – To center vent
7 – Center vent shutoff flaps
8 – To side vents, left/right
9 – Air conditioner
10 – Evaporator
11 – A/C blower

A – DEF flap
B – Footwell flap
*C – Shutoff flap
*D – shutoff flap

*Vacuum controlled

Adjusting Values / Survey of Equipment *

Engine		Europe, Rest of World 924	Europe, Rest of World 924 Turbo	USA, California 924	USA, California 924 Turbo	Canada 924	Canada 924 Turbo	Japan 924	Japan 924 Turbo	Sweden 924	Sweden 924 Turbo	Australia 924	Australia 924 Turbo
Engine Type (RHD)		XK (XJ)	M 31/03	VC	M 31/04	VC	M 31/04	VC	M 31/04	XK	M 31/03	XJ	M 31/03
Valve play (warm)													
Intake	mm	0.20	=	=	=	=	=	=	=	=	=	=	=
Exhaust	mm	0.45	=	=	=	=	=	=	=	=	=	=	=
Camshaft part no.		046.109.021.	=	046.109.021	=	=	=	=	=	=	=	=	=
Bucket tappets		046.109.309 A	=	046.109.309 A	=	=	=	=	=	=	=	=	=
Ignition		TCI-i	DITC	TCI-h, EIS	DITC	TCI-h, EIS	DITC	TCI-i	DITC	TCI-i	DITC	TCI-i	DITC
Distributor		breakerless	=	=	=	=	=	=	=	=	=	=	=
Bosch code		0237 003 055	0237 501 001	0237 022 020	0237 501 001	0237 022 020	0237 501 001	0237 003 018	0237 501 001	0237 003 055	0237 501 001	0237 003 055	0237 501 001
Vacuum control		advance	none	advance/retard	none	advance/retard	none	advance/retard	none	advance	none	advance	none
Basic ignition setting		10° BTDC w/o vacuum	–	0° with vacuum, EIS disc.+bgd.	–	0° with vacuum EIS disc.+bgd.	–	3° ATDC with vacuum	–	10° BTDC w/o vacuum	–	10° BTDC w/o vacuum	–
at speed (idle)	rpm	950± 50	–	705 – 800	–	750 – 800	–	950 ± 50	–	950 ± 50	–	950 ± 50	–
Control value		36±2° BTDC	8–14° BTDC	–	6–10° BTDC	–	6–10° BTDC	max. 41° BTDC	6–10° BTDC	36±2° BTDC	8–14° BTDC	36±2° BTDC	8–14° BTDC
at speed	rpm	3500 w/o vac.	900	–	900	–	900	4500–5000 without vacuum	900	3500 w/0 vac.	900	3500 w/o vac.	900
Spark plugs	Bosch	W5D/W5DC 14-5 D/DU	W3DP/W4CS 14-4CS 1	WR 6 DS RS 37	WR 6 DS	WR 6 DS RS 37	WR 6 DS	WR 6 DS RS 37	WR 6 DS	W5D/W5DC 14-5 D/DU	W3DP/W4CS 14-4 CS 1	W5D/W5DC 14-5 D/DU	W3DP/W4DB 14-4 CS 1
	Beru	–	–	–	N 7 GY	–	N 7 GY	–	N 7 GY	–	–	–	–
	Champion	–	–	–	N 7 GY	–	N 7 GY	–	N 7 GY	–	–	–	–
Electrode gap	mm	0.7 + 0.1	0.6 . . . 0.7	0.7 + 0.1	0.7	0.7 + 0.1	0.7	0.7 + 0.1	0.7	0.7 + 0.1	0.6 . . . 0.7	0.7 + 0.1	0.6 . . . 0.7
Ignition coil, Bosch code		0221 122 008	0221 122 023	=		=	=	=	=	=	=	=	=
Ign. contr. unit, Bosch code		0227 100 010	0227 100 101	=	=	=	=	=	=	=	=	=	=
DITC contr. unit **		–	931 602 071 00	–	931 602 073 00	–	931 602 073 00	–	931 602 073 00	–	931 602 175 01	–	931 602 075 01
Oxygen contr. unit, Bosch		–	–	0280 800 037	0280 800 037	0280 800 037	0280 800 087	0280 800 006	0280 800 006	–	–	–	–
Engine lubrication/cooling													
Oil pressure at 5000 rpm and 80–90° C oil temp.	bar	up to approx. 6	=	=	=	=	=	=	=	=	=	=	=
Oil consumption in l/1000 km		approx. 0.8	=	=	=	=	=	=	=	=	=	=	=
Max. oil temperature		150° C	=	=	=	=	=	=	=	=	=	=	=
Coolant thermostat opens at		87° C	=	=	=	=	=	=	=	=	=	=	=

* The specified code numbers are important to be able to identify the different components easier. The equipment surveys are not kept up to date by supplements. Always use valid Porsche part numbers when ordering spare parts.

** DITC control unit: 931.602.071.01 for France, Great Britain, Belgium, Spain, Portugal, Greece and Luxemburg
931.602.075.01 for Sweden, Austria, New Zealand and Hongkong

Printed in Germany - X, 1982

Printed in Germany

Cylinder head		Light alloy
Valve seat inserts (shrink-fit)		Intake: gray cast iron Exhaust: cast steel
Valve guides		Press-fitted, special bronze
Valve arrangement		1 intake, 1 exhaust overhead, in-line
Exhaust valve		With reinforced seat
Valve springs		2 coil springs per valve
Valve timing		By overhead camshaft and cam followers
Camshaft		Case hardened steel
Camshaft bearings		In cylinder head without bearing shells
Camshaft drive		Toothed belt and tensioning roller
Valve clearance: engine warm, oil temp. about 80 °C (175 °F)	Intake mm Exhaust mm	0.20 0.45
Valve clearance: (cold engine)	Intake mm Exhaust mm	0.10 0.40
Timing with 1 mm valve clearance	Intake opens Intake closes Exhaust opens Exhaust closes	5 ° before TDC, * 4 ° BTDC 37 ° after BDC, * 44 ° ABDC 43 ° before BDC, * 44 ° BBDC 7 ° after TDC, * 4 ° ATDC
Engine cooling		Pressurized cooling system, electric fan with thermo switch
Engine lubrication		
Lubrication		Pressure lubricating system with rotary (sickle type) gear pump
Oil filter		Full flow
Oil pressure	bar/psi	5 to 7/ 71-100 at 80-100 °C (176-212 °F) and 5000 rpm
Oil pressure gauge		Indicator lamp and pressure gauge
Max. oil temperature		150 ° C (302 ° F)
Oil consumption	ltr/1000 km	up to 1.5
Exhaust system		Double pipes up to primary muffler; primary, center and final mufflers (California cars have catalytic converter instead of primary muffler) * all with catalytic converter
Heating		Warm water heater with heat exchanger and blower
Fuel system		CIS fuel injection
Fuel supply		Electric delivery pump

	1977		1977 1/2	
Emission Control	49 States + Canada	Calif.	49 States + Canada	Calif.
Air injection	X			X
Exhaust gas recirculation	X	X	X	X
Catalytic converter		X	X	X

Printed in Germany

		New Size	Wear Limit
Crankshaft and Crankcase			
Crankshaft (measured at 2nd, 3rd or 4th bearing, bearings 1 and 5 on V-blocks)	runout		max. 0.06 mm (0.0024 in.)
Connecting rod bearing journal	dia.	47.95 - 47.97 mm (1.888 - 1.889 in.)	
Connecting rod bearing/crankshaft	radial play	0.02 - 0.07 mm (0.0008-0.603 in.)	0.1 mm (0.004 in.)
	end play	0.05 - 0.08 mm (0.0020 - 0.0012 in.)	0.4 mm (0.016 in.)
Crankshaft bearing journal	dia.	63.95 - 63.97 mm (2.518 - 2.519 in.)	
Crankshaft bearing/crankshaft	radial play	0.02 - 0.08 mm (0.0008 - 0.0031 in.)	0.16 mm (0.006 in.)
Crankshaft bearing 3/crankshaft	end play	0.1 - 0.19 mm (0.004 - 0.007 in.)	0.25 mm (0.010 in.)
Cylinder bore	out-of-round		0.04 mm (0.0016 in.)
Crankcase main bearing bore	dia.	68.000 - 68.019 mm (2.6771 - 2.6779 in.)	
Clutch			
Clutch disc (measured at 200 mm dia.)	lateral runout		max. 0.6 mm (0.024 in.)
Clutch play at pedal		20 to 25 mm (0.79 - 0.98 in.)	

ENGINE - CRANKSHAFT, CAMSHAFT, CRANKCASE

Installing

Drive in needle bearing up to stop with Special Tool 9124.

For version II drive in seal up to stop with Special Tool 9123.

Grease capacity:
Use about 3 grams of lithium grease NLGI grade number 3 such as, for example, "Shell cyprina grease 3 ". Unsuitable greases would damage needle bearings.

REMOVING AND INSTALLING BEARING SLEEVE

Removing

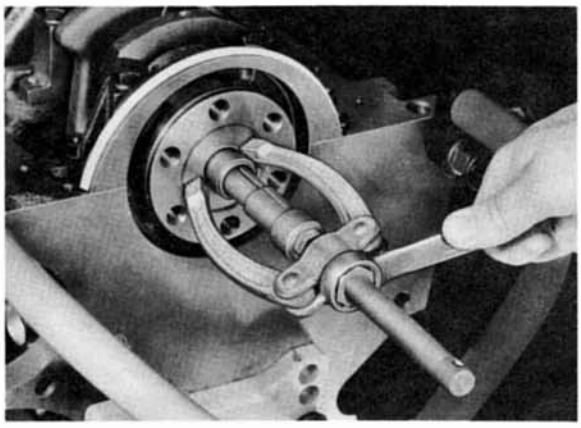
Note

Bearing sleeve can be replaced without removing engine. The following preparations are necessary.

a) Removal of clutch and flywheel
b) Lowering of rear axle support
c) Detachment of clutch bell housing. (see Repair Manual - Group 30)

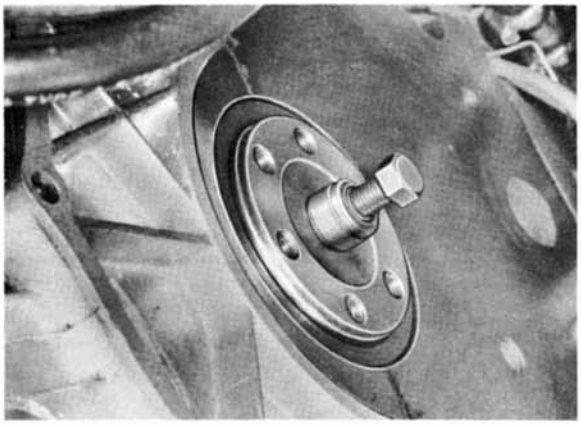
Version I

Pull out bearing sleeve with US 1088.



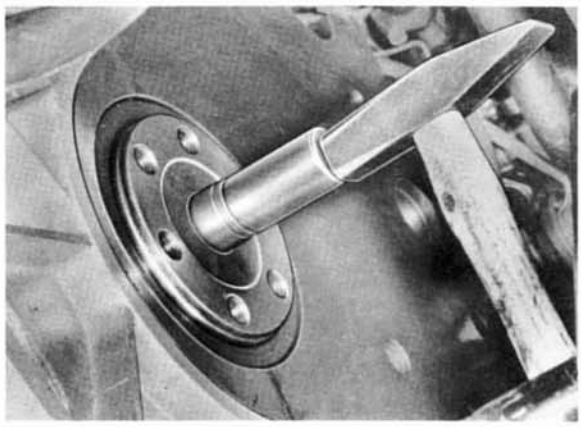
Version II

Pull out bearing sleeve with M 12 x 65 hexagon head bolt.

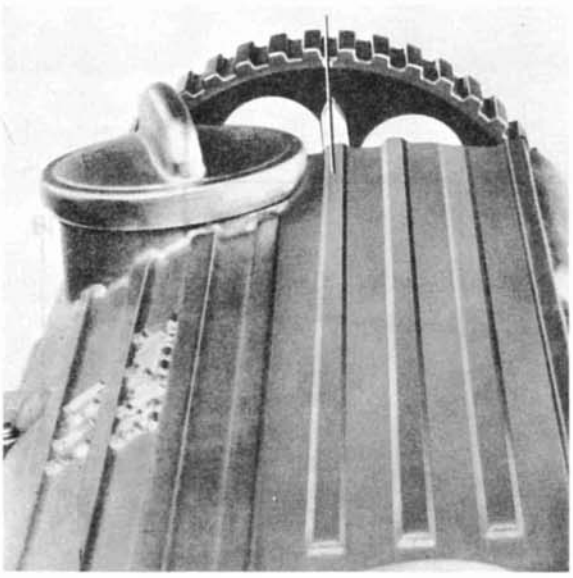


Installing

Drive in bearing sleeve up to stop with Special Tool 9123.

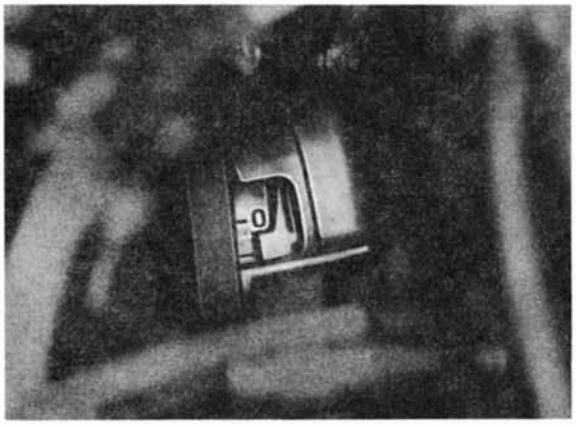


INSTALLING DRIVE BELT



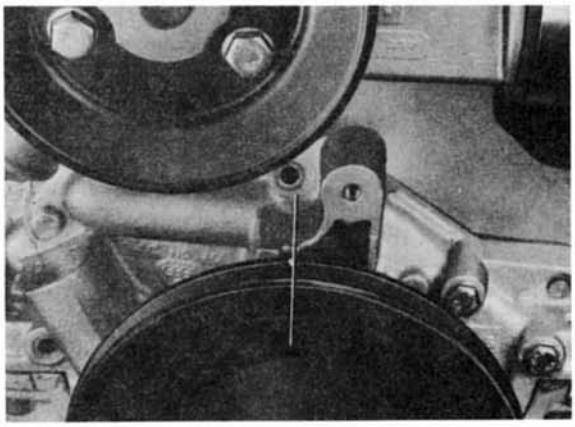
Camshaft sprocket position

Mark on camshaft sprocket and indicator on cylinder head cover must align with each other.



Crankshaft position (engine installed)

TDC mark on flywheel and clutch housing must align with each other.

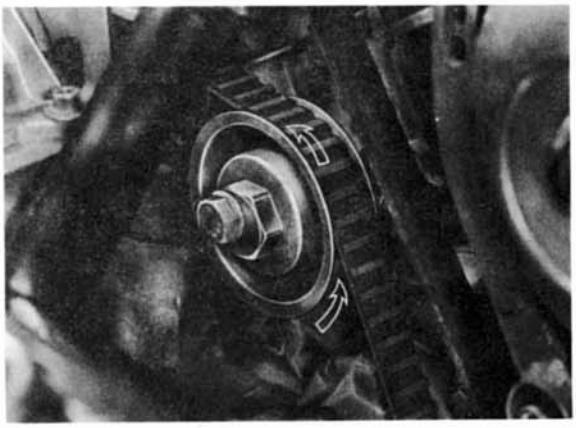


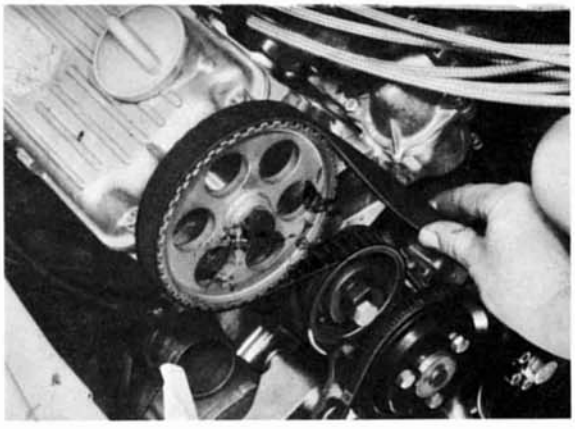
Crankshaft Position (engine removed)

Notch in pulley and pointer on oil pump housing must align with each other.

Adjusting tension

Turn tensioning roller in direction of arrow. It must be just barely possible to twist the drive belt 90^{o} when holding belt at a point midway between the camshaft and crankshaft sprocket with thumb and index finger.

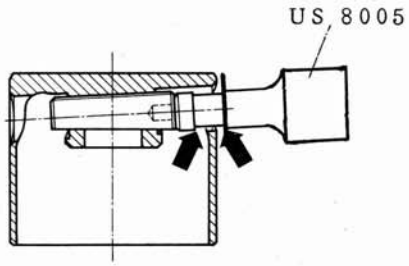




CHECKING LOCATION OF ADJUSTING SCREW

CAUTION

After adjusting valve clearance be sure that edge of tappet is in line with green area of US 8005.



Note

Camshaft must be removed to replace valve adjusting screws.

The following adjusting screws are available:

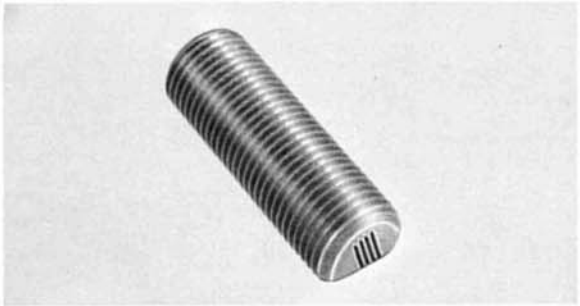
Note

After screws identified with paint are used up only screws with notch marks will be supplied.

The adjusting screw (part no. 046 109 453 C) however, will still be supplied without any identification (formerly dot of white paint).

New adjusting screw	Identification	Old adjusting screw	Identification
Part No.		Part No.	
046.109.453 D	1 notch	046.109.453 B	blue
046.109.453 E	2 notches	046.109.453 A	red
046.109.453 F	3 notches		
046.109.453 G	4 notches	046.109.453	yellow
046.109.453 C	no notches	046.109.453 C	white

The number of notches indicates thickness of valve adjusting screws.
High notch number = thick adjusting screw.



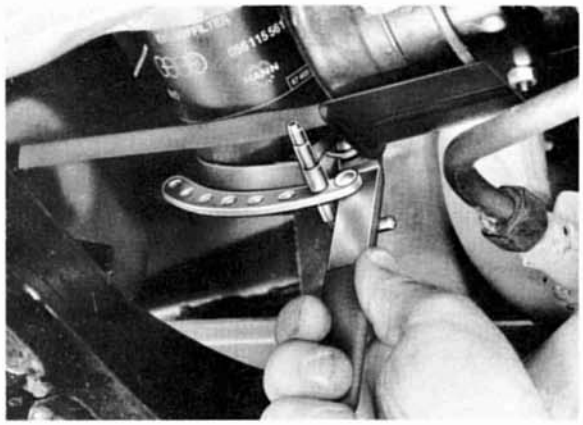
Note

If cylinder head has been repaired, i.e. valves replaced and ground or camshaft replaced, valve clearance must be checked and adjusted on warm engine after about 1,000 miles/1600 km. After repairs on cylinder head valve clearance can also be adjusted on cold engine. Final check must be on a warm engine.

REMOVING AND INSTALLING OIL FILTER

Removing

Loosen oil filter with US 4462 or equivalent.



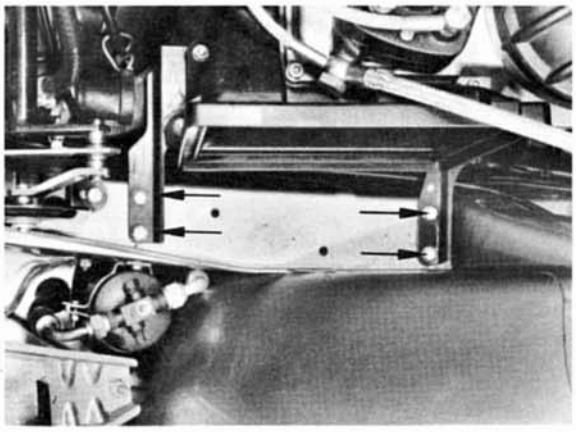
Installing

1. Check that sealing surface on engine block is in perfect condition.

2. Lubricate rubber seal lightly.

3. Screw in oil filter by hand and check for leaks.

7. Detach mixture control unit with filter housing and place to one side.



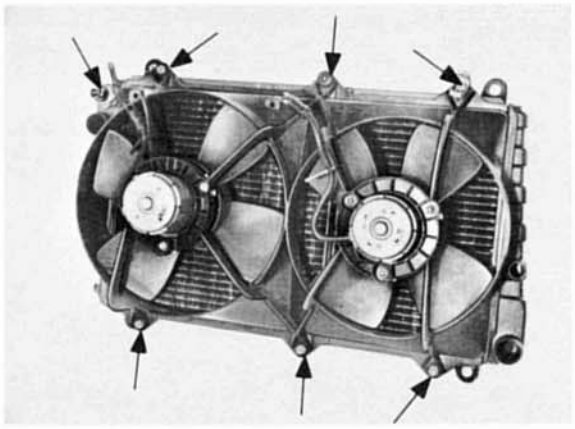
8. Take off air guide for alternator cooling.

9. Remove windshield washer tank and place to one side.

10. Disconnect wires, detach harness at radiator.

11. Loosen 4 mounting screws and remove radiator from above.

12. Unscrew fan housing with electric fan at radiator.



13. Unscrew thermoswitch.

Installing

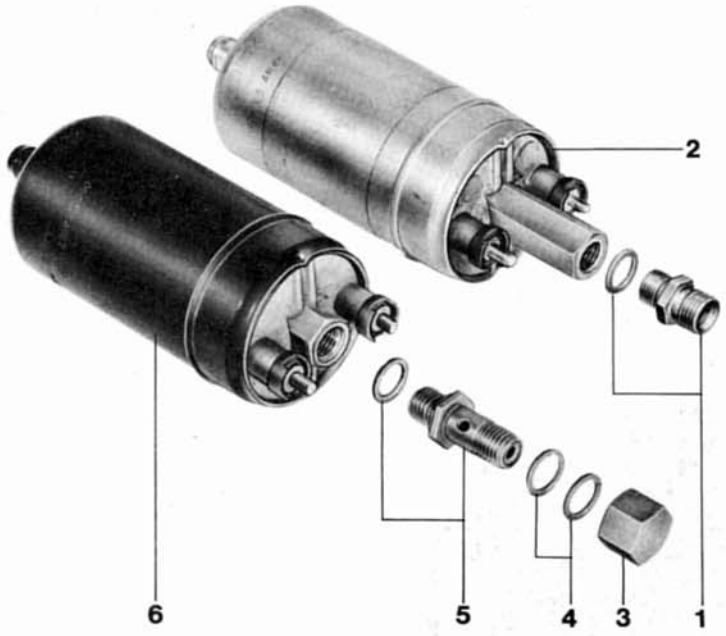
1. Replace thermoswitch seal.

2. Check hose connection and radiator for leaks.

Note

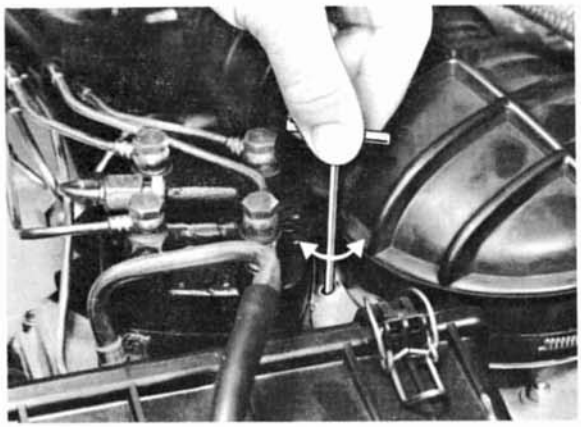
Always replace porous, brittle or swollen coolant hoses.

ARRANGEMENT OF CHECK VALVES ON FUEL PUMPS



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Check valve with seal (for pressure line with coupling nut)	1		Always replace seal; torque to 20 Nm (14 ft lb)	
2	Fuel pump, long neck version with integrated check valve	1			
3	Cap nut	11		Torque to 20 Nm (14 ft lb)	
4	Seal	2		Always replace	
5	Check valve with seal (for ring line)	1		Always replace seal; torque to 20 Nm (14 ft lb)	
6	Fuel pump, short neck version	1			

7. Insert adjusting wrench P 377.



CAUTION

Observe the following points:

a) Always make CO adjustments from lean to rich. For example, if the mixture is too rich, first turn the CO adjusting screw counterclockwise further than necessary and then clockwise to specified setting.

b) Never press down on adjusting wrench during adjustments (engine will stall).

c) Turn the CO adjusting screw only slightly, since the smallest turn will change the CO level considerably.

d) Make adjustments as quickly as possible to prevent intake ports from becoming too hot.

8. Turn clockwise for richer mixtures, counter-clockwise for leaner mixtures.

9. Remove wrench.

10. Accelerate engine briefly.

11. Wait until CO tester reacts (radiator fan not running).
See page 25 - 4 b for CO specifications.
Repeat adjusting procedures if necessary.

12. Recheck idle speed, correcting if necessary.

13. Insert plug again in mixture control and re-connect plug for oxygen sensor after completing adjustments.

14. Coat threads of capped nut for test connection on catalytic converter with Bosch VS 140 16 Ft grease.

REMOVING AND INSTALLING MIXTURE CONTROL UNIT

Removing

1. Disconnect battery.

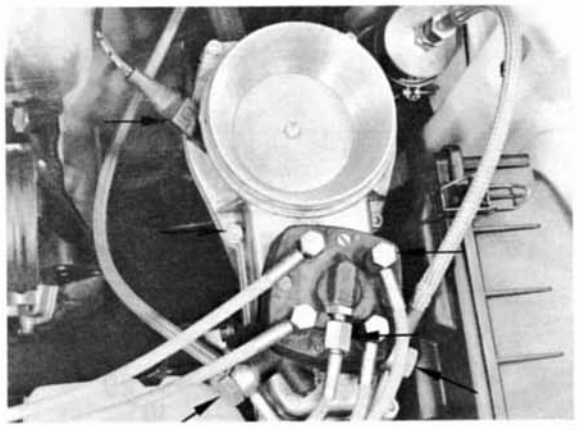
2. Remove rubber boot from air sensor.

3. Clean fuel distributor thoroughly in area of fuel connections.

4. Detach wire plugs, injection lines, control pressure line, fuel return line and fuel feed line.

   Note

   Catch escaping fuel.



5. Loosen 6 Allen head bolts and remove mixture control unit.

Installing

Always use new seals for fuel connections.

CHECKING OPERATION OF HOT START VALVE
(Reduction of Control Pressure During Hot Start)

Requirements:
Warm engine. Coolant temperature 60° C/140° F or more.

1. Connect pressure tester and set switching valve at position 2.

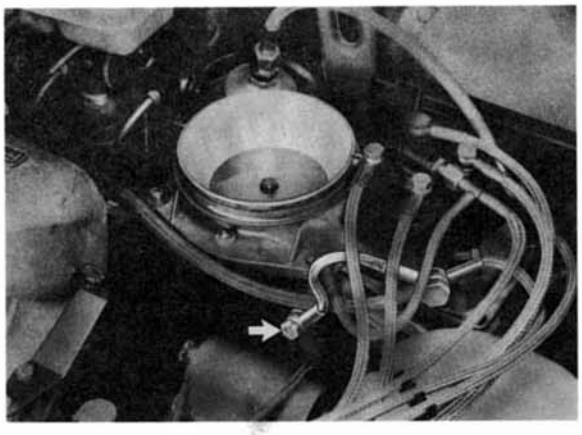
2. Operate starter to open hot start valve and drop control pressure. Specification: 0.5 to 0.7 bar/ 0.6 to 0.8 kg/cm^2 (note brief delay in time).

3. If necessary, replace hot start valve or check temperature switch, i.e. temperature switch must have open circuit.

CHECKING HOT START VALVE FOR LEAKS

1. Detach and plug fuel return line.

2. Bridge fuel pump relays.

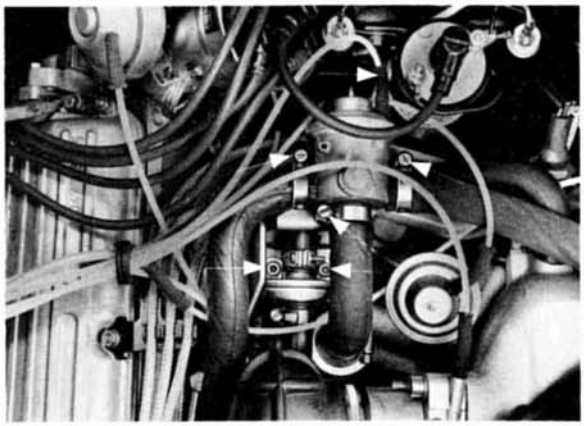


3. Hot start valve must be absolutely tight, i.e. no fuel should escape from fuel return connector.

CHECKING CHECK VALVE

Check valve must open only in direction of air injection and be closed in opposite direction.

REMOVING AND INSTALLING DIVERTER VALVE



Loosen vacuum hose, hose clamps and socket head screws, and remove valve.

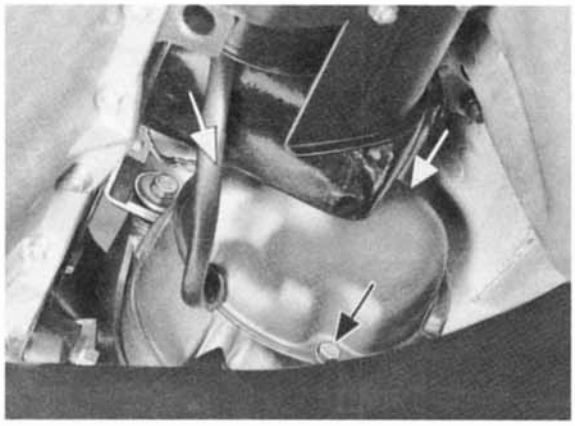
REMOVING AND INSTALLING VOLTAGE REGULATOR

1. Disconnect battery.

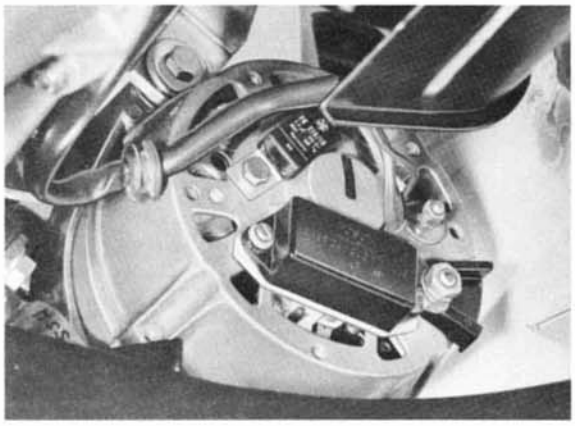
2. Pull hose off connector on alternator guard.

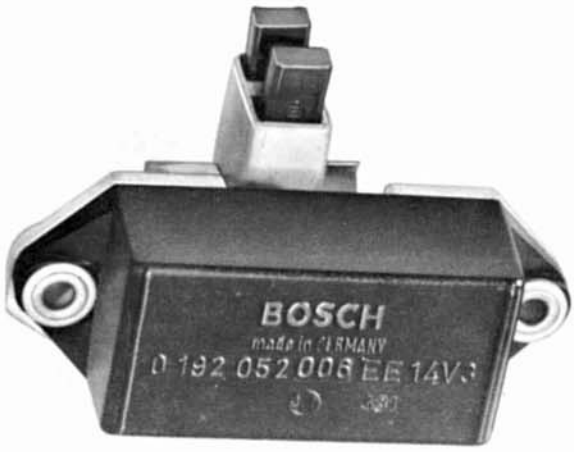
3. Unscrew oil filter.

4. Remove guard after unscrewing the three hexagon head screws.



5. Unscrew voltage regulator.





6. Be careful of ground strap when installing guard.

3. Check ignition timing

Timing good?

yes ↓

no → Adjust ignition timing

4. Check fuel system

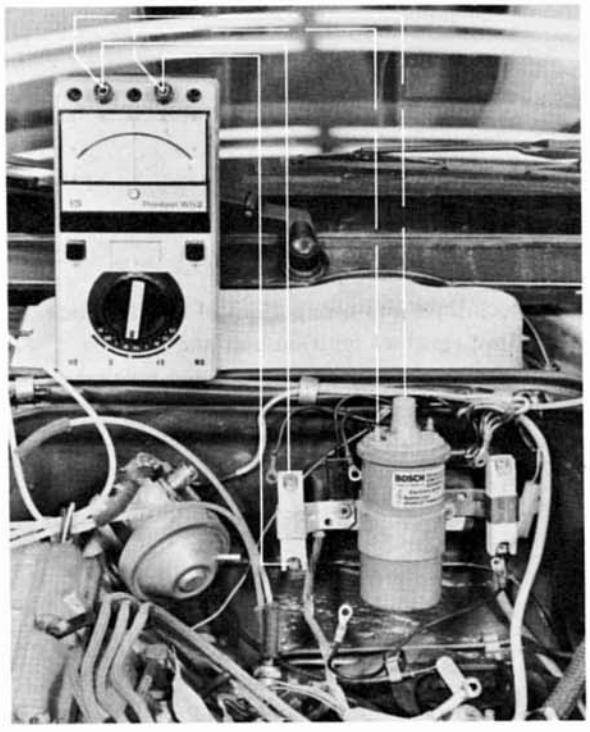
Engine receiving sufficient fuel?

yes ↓

no → Repair fuel system

5. Check ballast resistors and ignition coil
(Ignition off, wires disconnected at resistors
and ignition coil)

Ballast resistor (0.4 Ohm): 0.35 to 0.45 Ohm
Ballast resistor (0.6 Ohm): 0.55 to 0.65 Ohm
Ignition coil primary (between terminals 1 and 15: 1.0 to 1.35 Ohm
Ignition coil secondary (between terminals 1 and 4): 5.5 to 8.0 k Ohm



CHECKING IGNITION RETARD/ADVANCE - 1980 Models

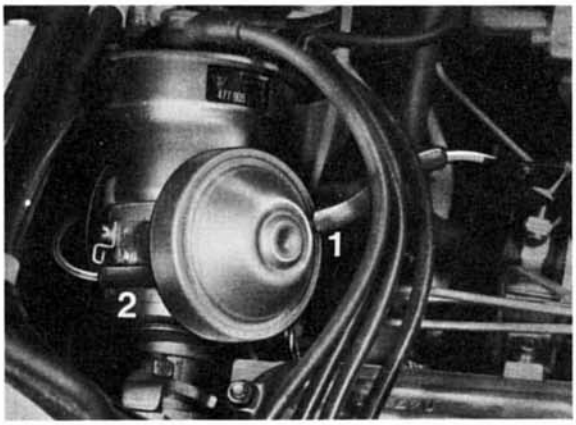
Requirements:
Ignition timing set to specifications.

1. Centrifugal Advance
(vacuum hoses disconnected)

At engine speed of approx. 2500 rpm ignition timing must be between 19 and 25° before TDC or between 29 and 35° before TDC at approx. 4500 rpm.

2. Vacuum Retard/Advance
(checked at idle speed)

Retard



1 - Advance
2 - Retard

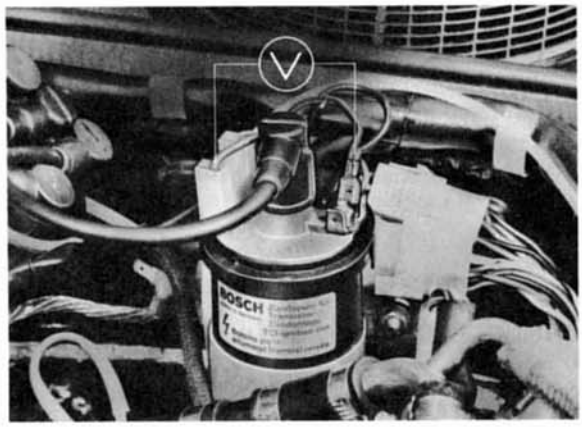
Pull off vacuum hoses.
Adjust speed to 950 ± 50 rpm. Ignition timing must be between 8 and 10° before TDC.

Advance

Move vacuum hose from connection 2 of vacuum unit to connection 1. Adjust engine speed to 950 ± 50 rpm. Ignition timing must be between 16 and 22° before TDC.

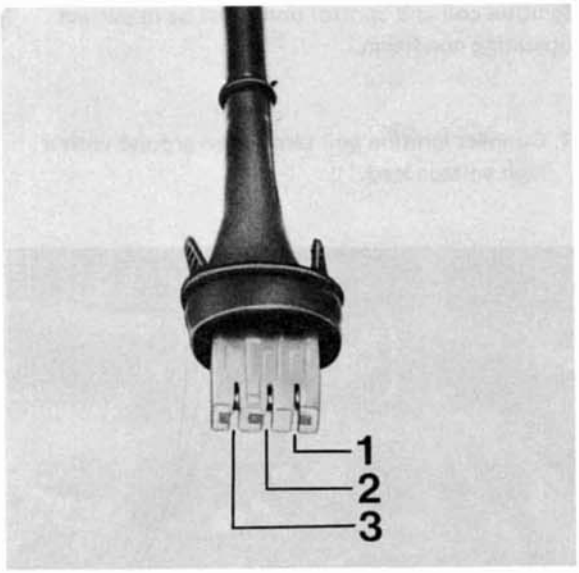
Adjust idle speed after connecting vacuum hoses.

If specified test values are not reached, remove and test distributor in a tester.



5. Turn on ignition.
   Voltmeter should display 5 to 6 volts for approx. 1 second and then drop to 0 volt.

6. Touch center wire (green) of Hall transmitter plug disconnected on distributor on ground briefly, using a piece of wire.
   Voltage should rise as for turning on ignition and then drop again to 0 volt.



1 H + (red/black)

2 H J (green)

3 H - (brown/white)

7. Measure voltage between both outside wires H + and H - on plug with ignition turned on.
   Voltage should be at least 10 volts.

Replace Hall control unit when measured values deviate from specifications.

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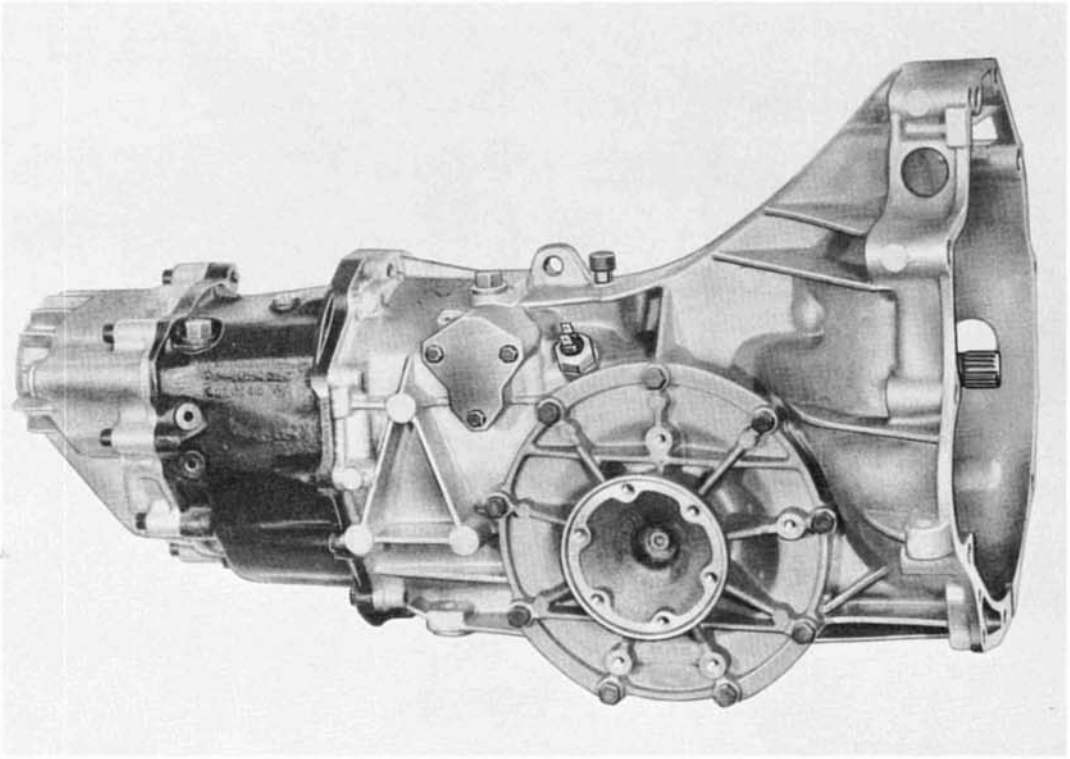
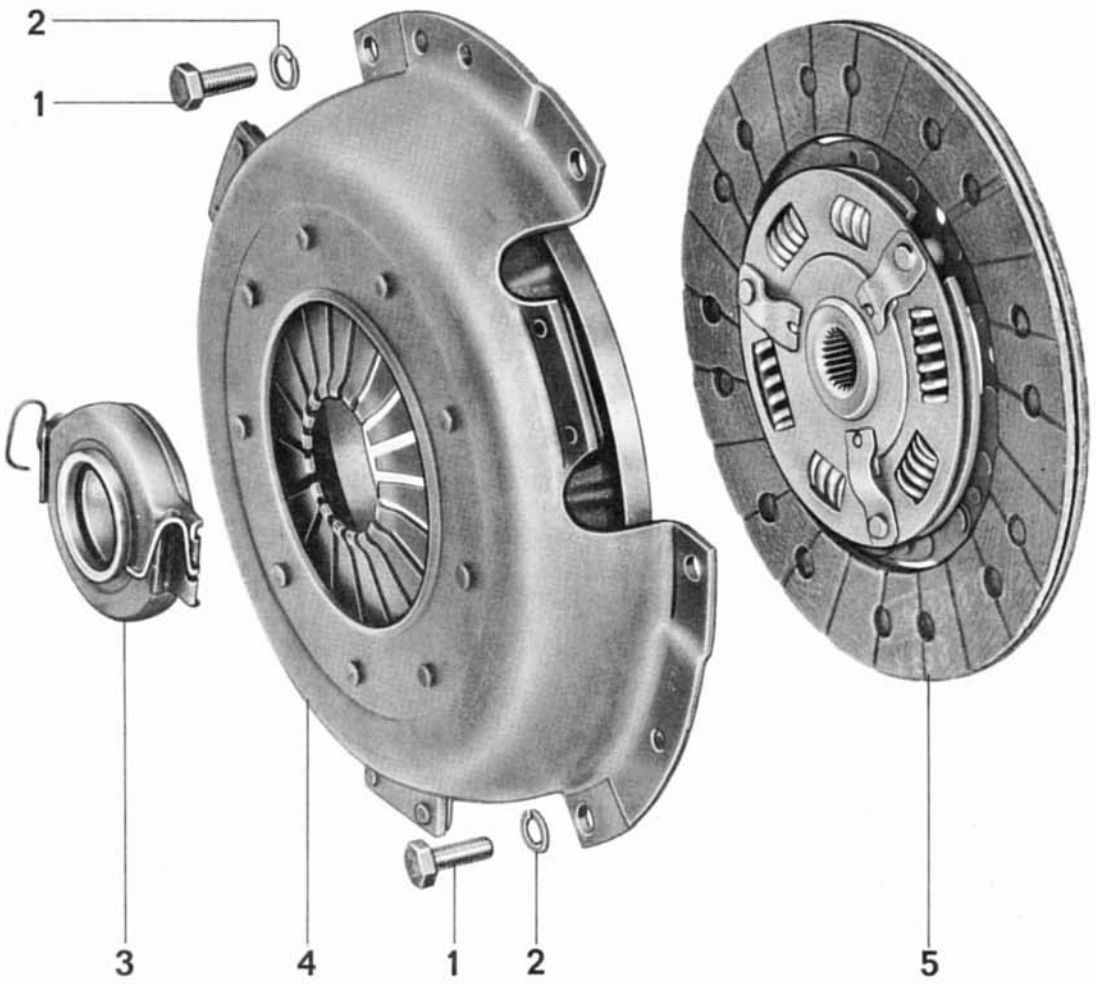
FIVE SPEED MANUAL TRANSMISSION - FROM 1981 MODELS



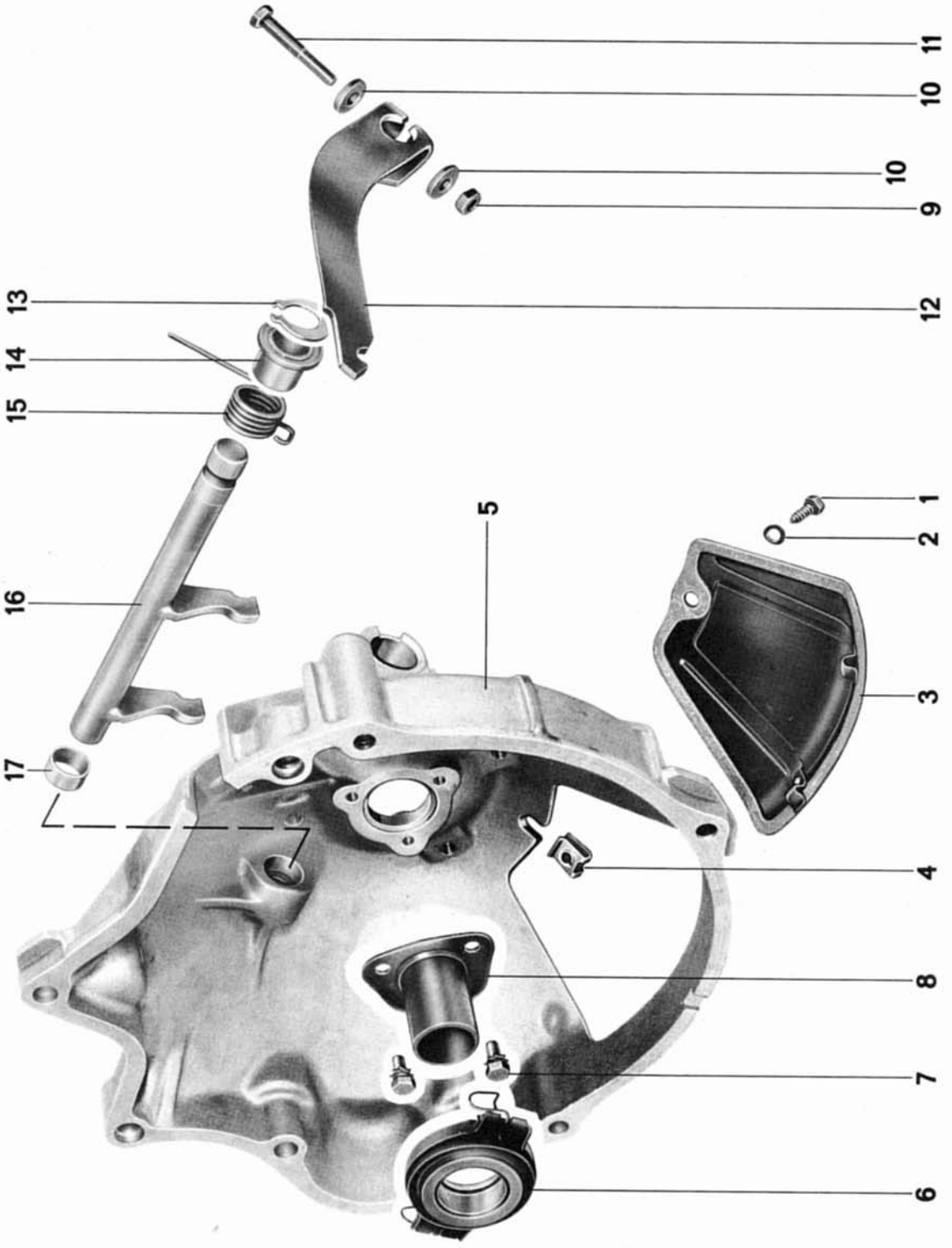
The following transmission types are installed from 1981 models on.

016/9, code letters MF
016/9, code letters 5Q = with limited slip differential (1982 model)

These transmission deviate only slightly from 1980 models as far as repairs are concerned.



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Bolt	6	Loosen evenly and remove	Tighten to specified torque evenly	
2	Circlip	6		Replace	
3	Release bearing	1	Do not wash Only wipe dry	Coat sliding surface for guide tube with MoS_2 all-purpose grease	
4	Pressure plate	1		Check for wear	
5	Clutch disc	1		Check for wear	


11
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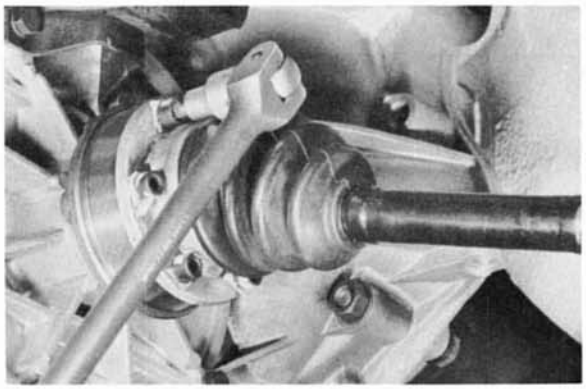
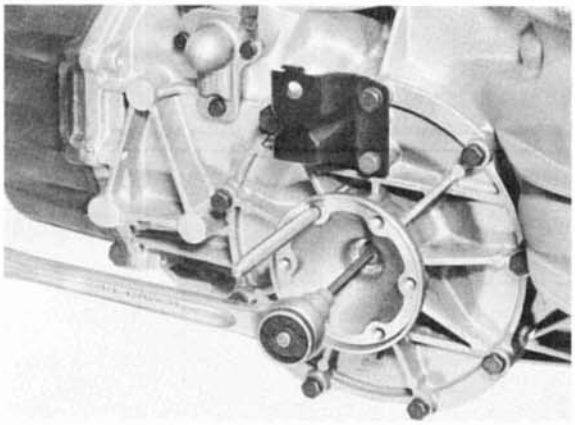
REPLACING FLANGED SHAFT SEAL (TRANSMISSION IN CAR)

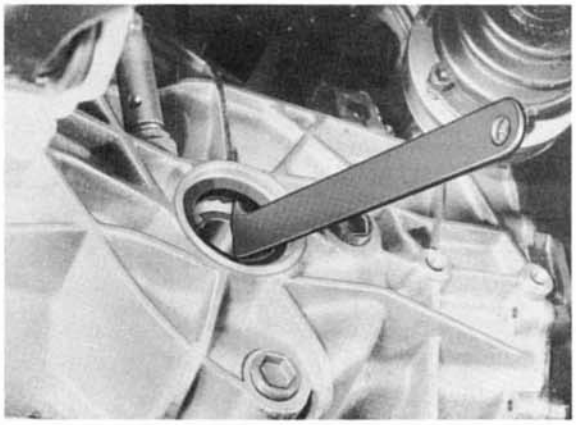
1. Unscrew axle shafts at transmission end and detach at transmission flanges.



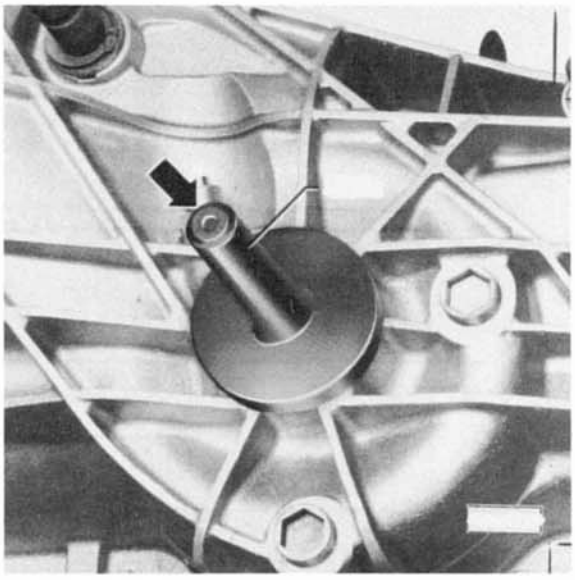
2. Unscrew flange; counterhold with a punch. Place a support underneath the oil pan and pull out the drive flange.

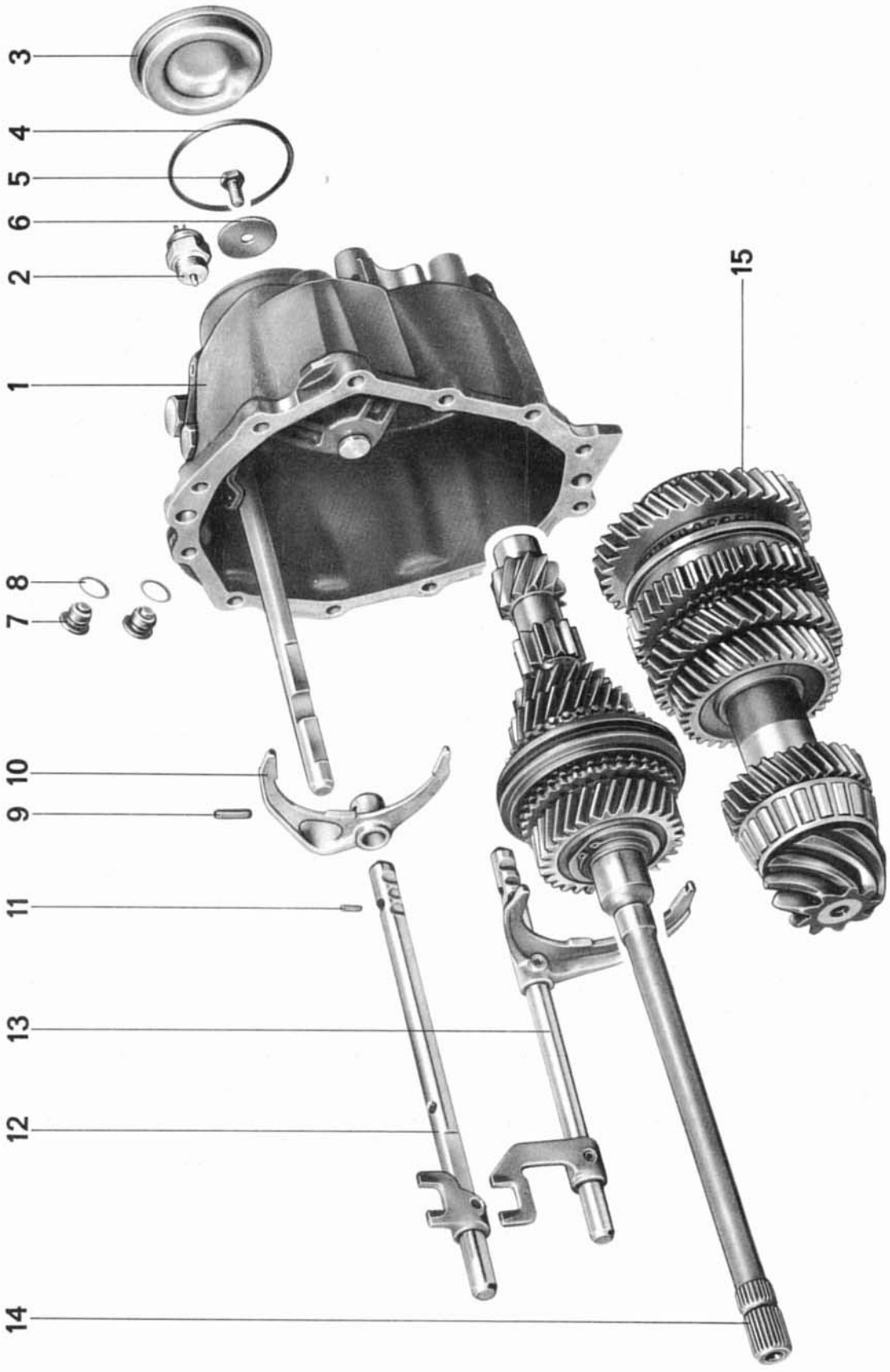


3. Remove the seal with Special Tool VW 681.



4. Drive in flange, seal with Special Tool VW 195. Fill cavity between the sealing and dust lips with a MoS_2 multi-purpose grease.

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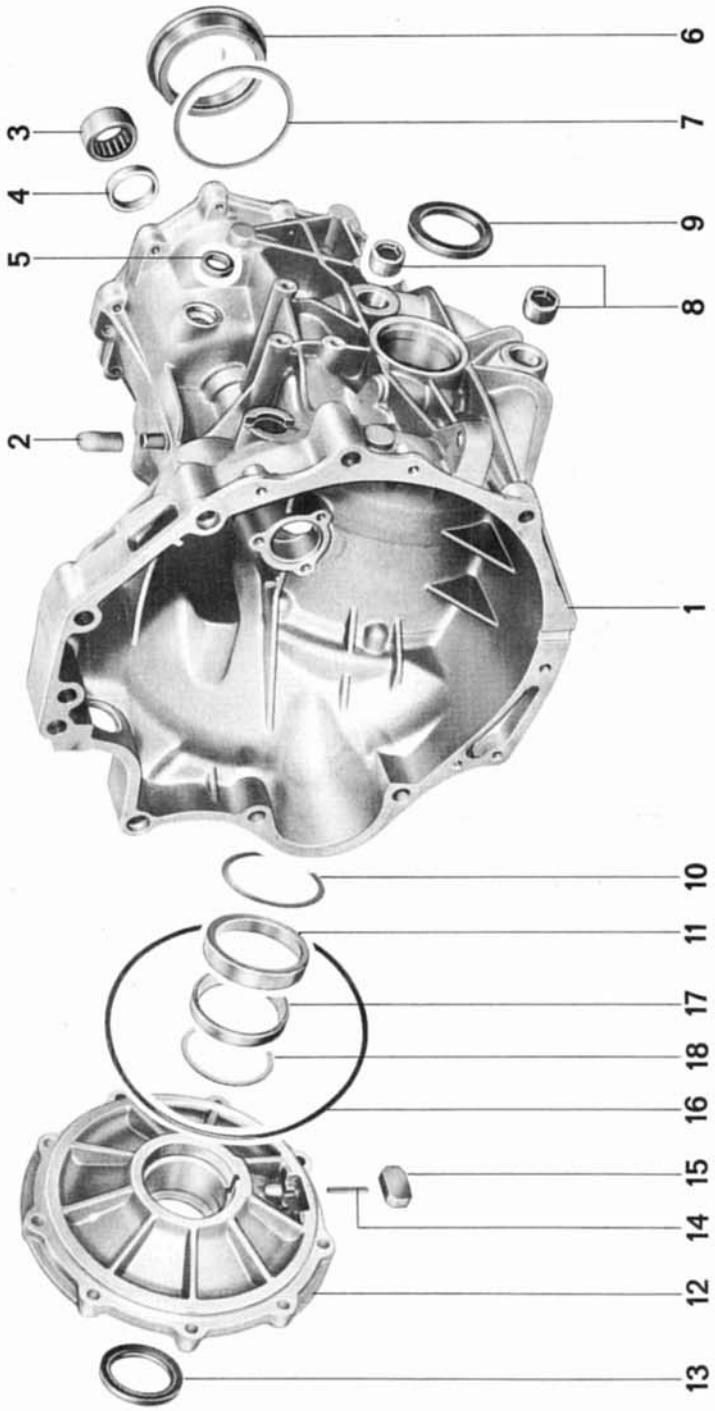
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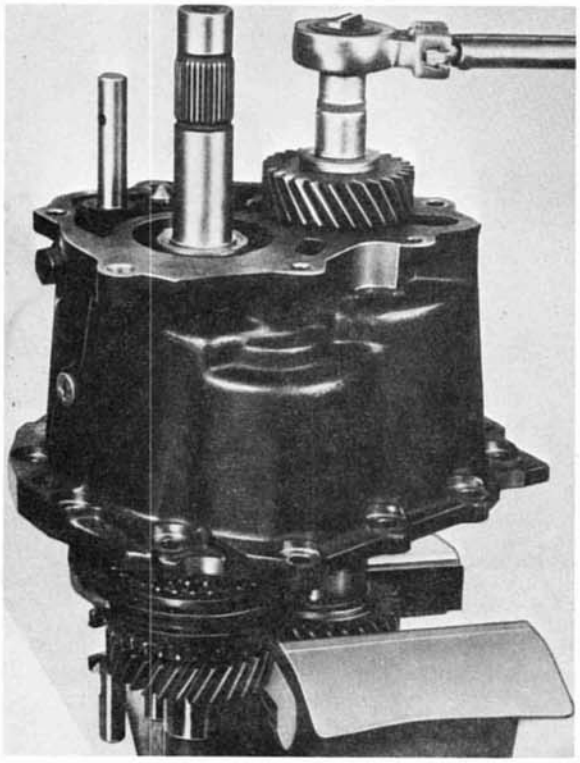
No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Bolt M 8 x 30	9		Tighten to specified torque	
2	Washer	10			
3	Bolt M 8 x 55	1		Tighten to specified torque	
4	Front case cover	1			
5	Bolt	1		Tighten to specified torque	
6	Spring	1			
7	Lock	1			
8	Collar nut	1	Engage 1st and 5th gear	Tighten to specified torque and lock by punching collar	
9	Selector rod for 1st and reverse gear	1			
10	Sliding gear for 1st and reverse	1			
11	Thrust washer	1			
12	Double reverse gear	1			
13	Needle cage	1			
14	Spacer	1			
15	Needle cage	1			
16	Thrust bearing	1			
17	Thrust washer	1			
18	Inner shift rod	1			
19	Spring pin	2			

No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Shaft	1		Drive in to correct position	
2	Snap ring	2	Remove with small screwdriver	Make sure that it fits correctly	
3	Bearing outer race with snap ring	1	Drive out with P 254 and P 254 b	Heat case to approx. 120° C/248° F and drive in with P 254 and P 254 b	
4	Bearing outer race with snap ring	1	Drive out with P 254 and P 254 b	Heat case to approx. 120° C/248° F and drive in with P 254 and P 254 b	
5	Plug	1			
6	Lock	1			
7	Plug	1		Tighten to specified torque	
8	Case	1			

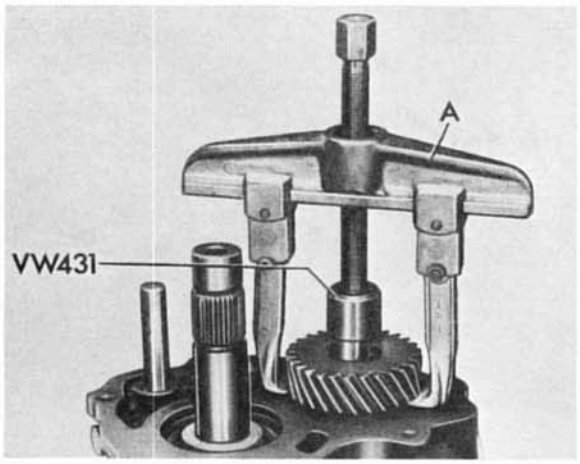
No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Bolt with lockwasher (M 7 x 16)	2		Tighten to 10...16 Nm (7...12 ft lb)	
2	Oil seal tube	1			
3	Seal	1		Replace	
4	Oil seal	1	Knock out carefully with a suitable screwdriver	Drive in against stop in correct position with spec. tool 9119	
5	Bolt M 6 x 16	1		Tighten to 10 Nm (7 ft lb)	
6	Washer	1			
7	Bolt M 6 x 70 without washer	2		Tighten to 10 Nm (7 ft lb)	
8	Cover	1			
9	Gasket	1		Replace	
10	Selector shaft	1		Coat sealing surface with VW sealant D 3	
11	Dowel pin	2			
12	Bolt M 8 x 32 without washer	8		Tighten to 25 Nm (18 ft lb)	
13	Bolt M 8 x 58	4		Tighten to 25 Nm (18 ft lb)	
14	Gear carrier	1		Coat sealing surface with VW sealant D 3	
15	Allen head bolt	2		Tighten to 25 Nm (18 ft lb)	
16	Drive flange	2			

10. Remove stop screws for selector rods.

11. Clamp 4th gear/pinion in a vise and loosen pinion bolt.
Always use soft jaw covers!



12. Pull off 5th gear.

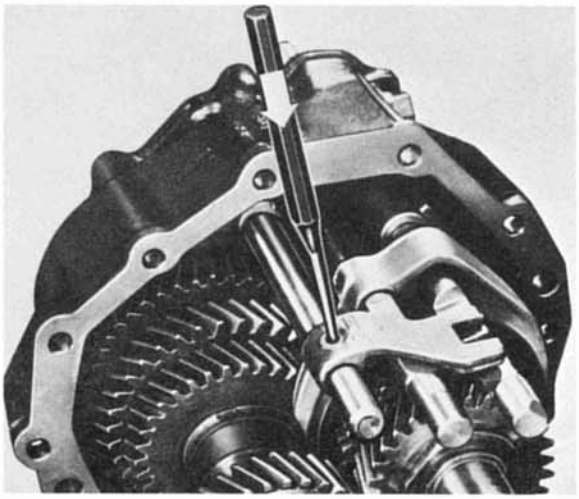


A - US 1078

13. Remove shim for 5th gear.

14. Clamp gear carrier housing (with shafts forward) in a vise.

15. Drive out roll pin for selector shaft fork on 1st and 2nd gear selector rod. Counterhold with a hammer. Turn up selector shaft fork.



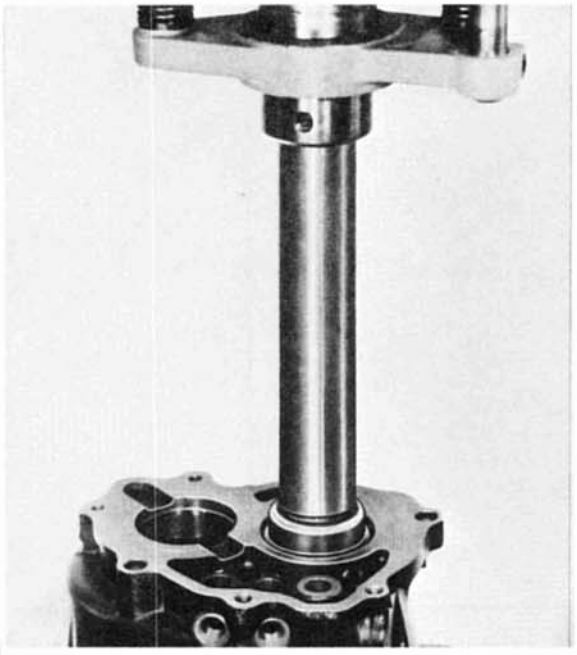
16. Drive out roll pin for 3rd and 4th gear shift fork, counterholding with a hammer.

No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
20	Outer race roller bearing	1	Press out with US 8050	Press in to correct position with US 8050	
21	Outer race/tapered roller bearing	1	Press out with suitable piece of pipe (e. g. VW 473)	Press in with VW 472	
22	Shim S_4	X	Note thickness	If necessary, redetermine thickness	
23	Gear carrier housing	1		When replacing, redetermine thickness of shim S_4	

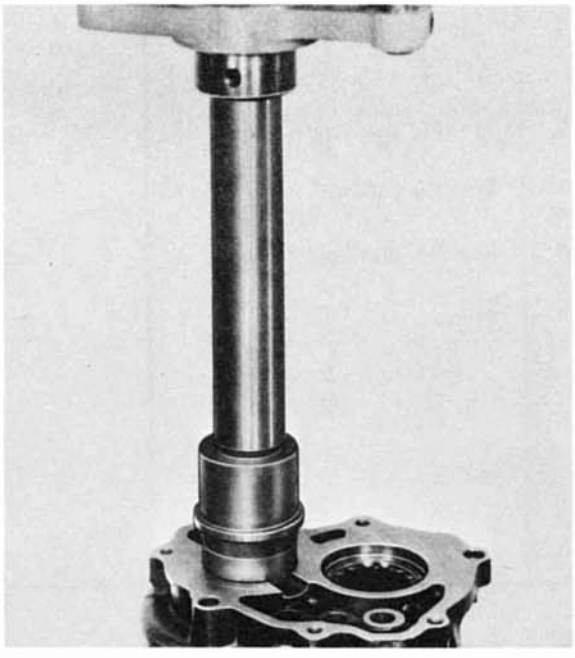
DISASSEMBLING AND ASSEMBLING GEAR CARRIER HOUSING

Disassembling

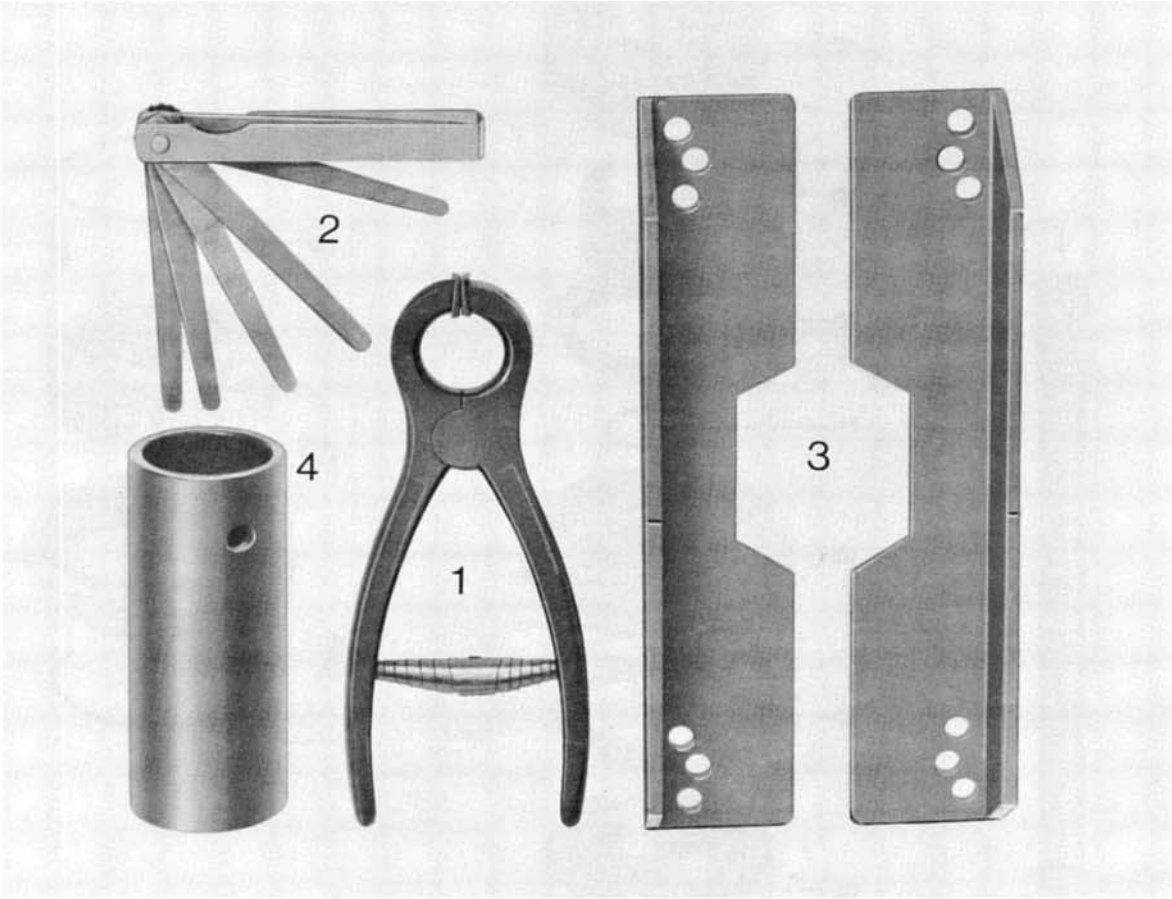
1. Press out roller bearing outer race with Special Tool US 8050.



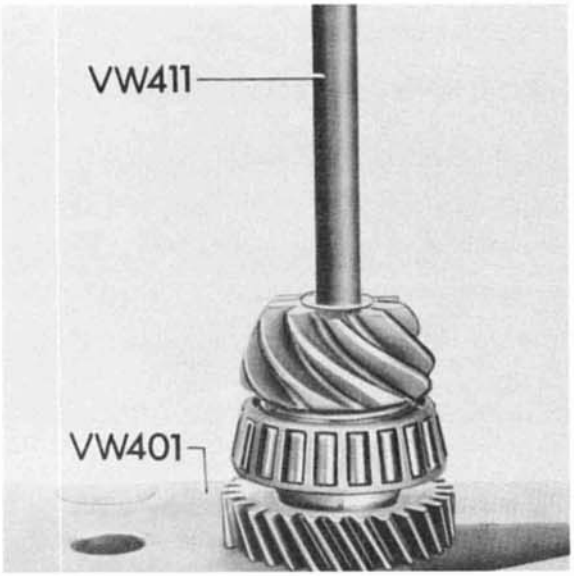
2. Press out tapered roller bearing outer race with a suitable piece of pipe (or Special Tool VW 473).

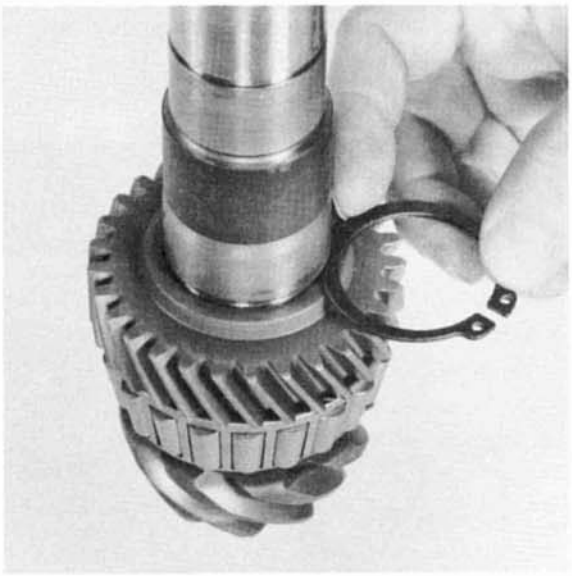


TOOLS

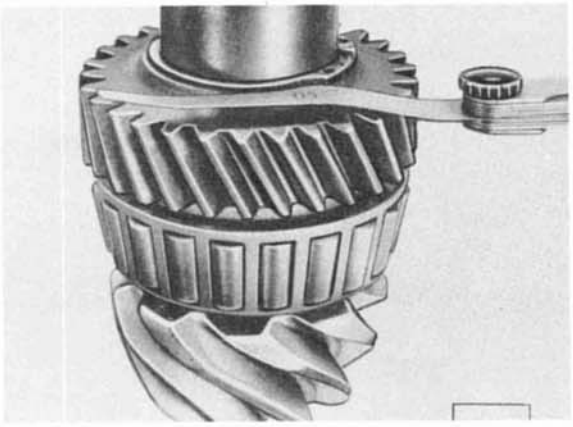


No.	Description	Special Tool	Remarks
1	Circlip pliers	VW 161 a	
2	Feeler gauge		standard
3	Holding rails	VW 457	
4	Pipe	VW 519	





3. Adjust 4th gear end play. The 4th gear end play is extraordinarily important for the proper function of the hypoid pinion, since it also gives the axial position of the taper roller bearing behind the pinion head. The end play must be between O and 0.02 mm, whereby the lower value is ideal. A rough selection of circlips can be followed by a check with a feeler gauge.



If the approximate value has been found, an attempt should be made with the thickest circlip which can still be inserted in the groove safely.

The following circlips are available.

Part No.	Thickness (mm)
088 311 363	1.59
088 311 363 J	1.60
088 311 363 A	1.61
088 311 363 K	1.62
088 311 363 B	1.63
088 311 363 L	1.64
088 311 363 C	1.65
088 311 363 M	1.66
088 311 363 D	1.67
088 311 363 N	1.68
088 311 363 E	1.69
088 311 363 P	1.70
088 311 363 F	1.71
088 311 363 Q	1.72
088 311 363 G	1.73
088 311 363 R	1.74
088 311 363 H	1.75

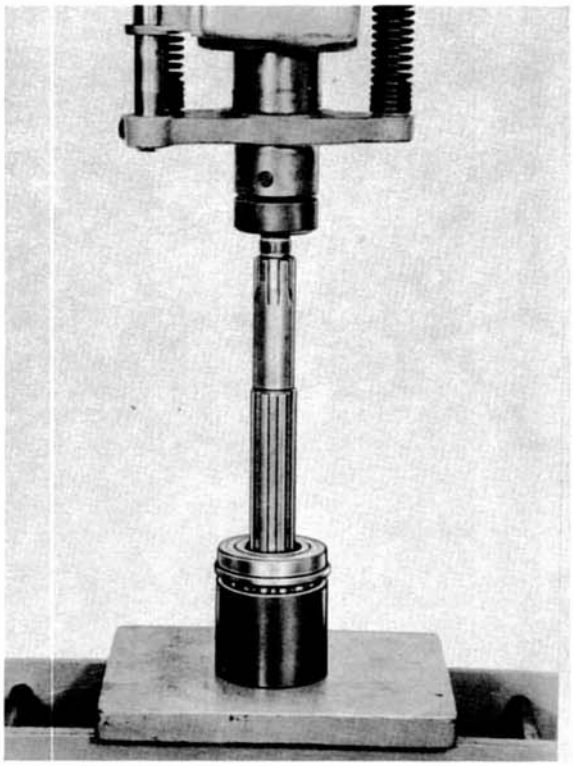
DISASSEMBLING AND ASSEMBLING PINION

Disassembling

Note

The blow-up drawing shows a complete pinion without clamping plate for better understanding. The parts up to Pos. No. 20 can be removed and installed with pinion in installed state (see "Disassembling and Assembling Transmission").

Press off roller bearing and ball bearing with Special Tool P 255 a.



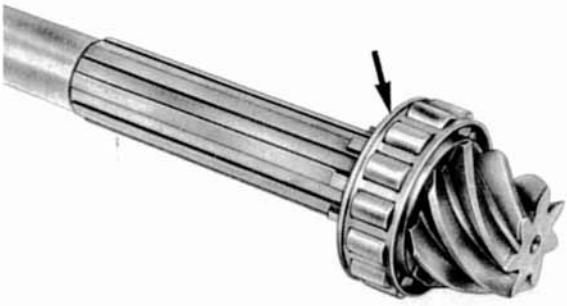
Assembling

Install all parts of pinion dry, so that oil cannot go between the bearing surfaces.

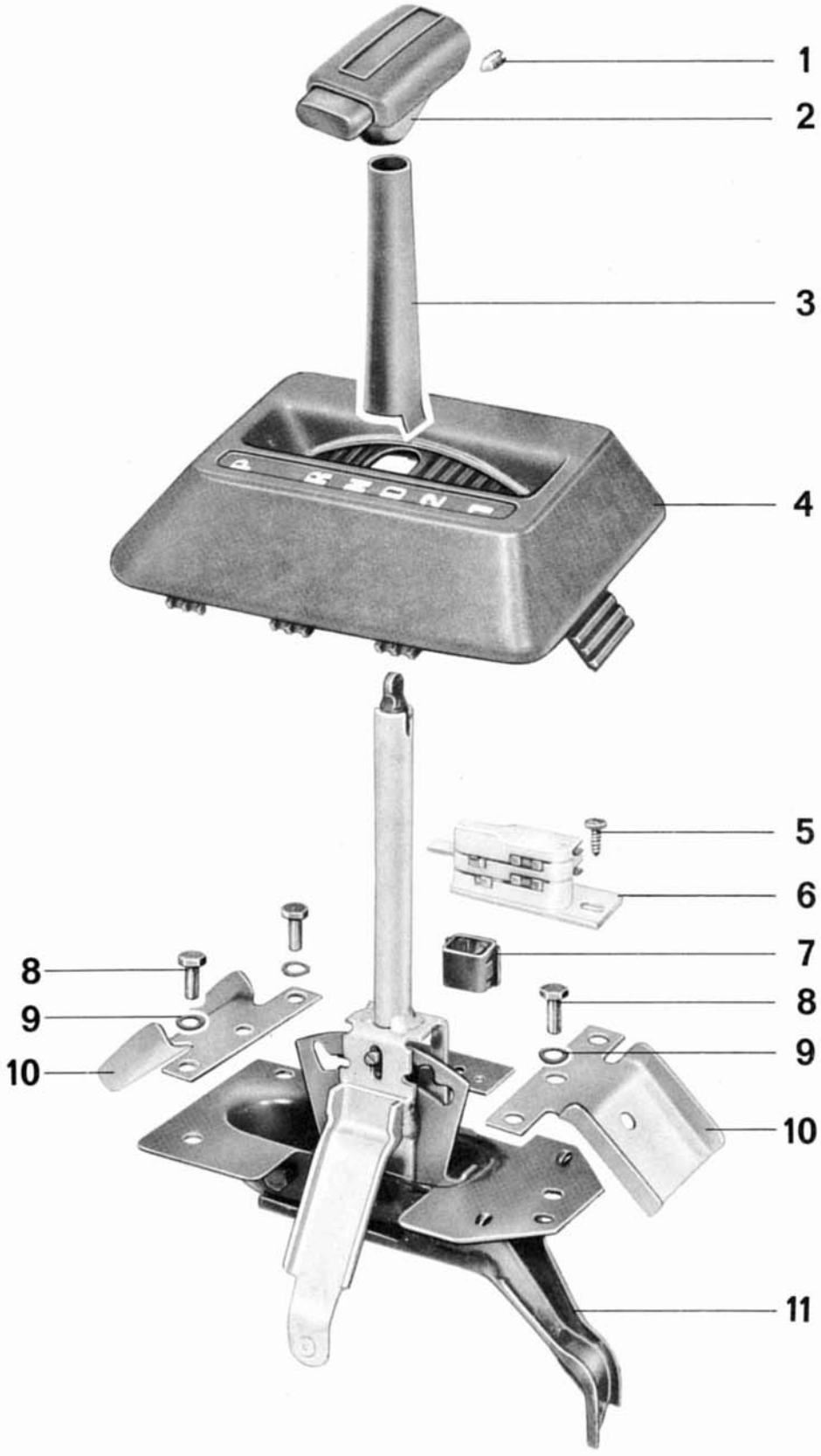
Heat roller bearing to approx. 120° C/248° F and drive on.

Note

Install bearing so that collar of metal cage faces set of gears.



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
11	3rd gear	1		Check for wear. Install warm and press on. Large collar faces 2nd gear. Adjust end play	
12	Circlip	1		Thickness always 2.4 mm	
13	Circlip	1		Determine thickness	
14	4th gear	1		Check for wear. Install warm and press on. Large collar faces 3rd gear. Adjust end play	
15	Tapered roller bearing	1	Press off with separator	If necessary, replace	
16	Pinion	1		Check for wear. Matched with ring gear. When replacing, adjust pinion and ring gear	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REMOVING AND INSTALLING AUTOMATIC TRANSMISSION

Removing

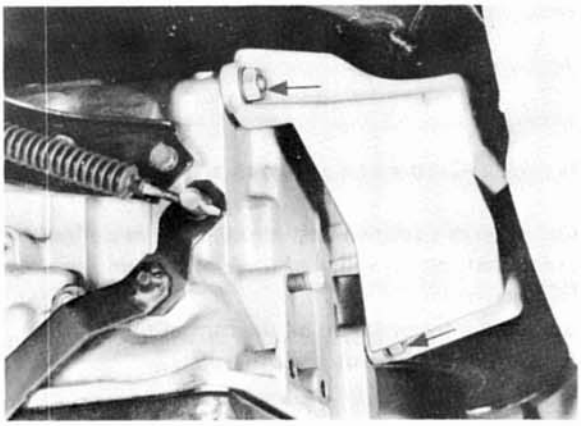
1. Remove heat shield and rear muffler bracket.

2. Detach axle shafts at transmission.

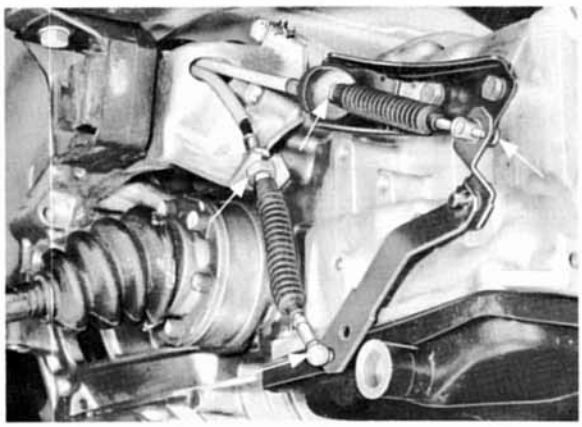
Note

Suspend axle shafts from car in horizontal position to prevent damage to dust covers.

3. Remove protective shield for transmission oil filler.



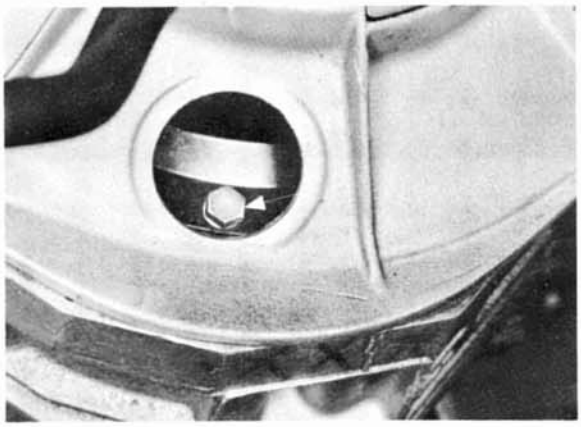
4. Detach selector lever and transmission lever cables.



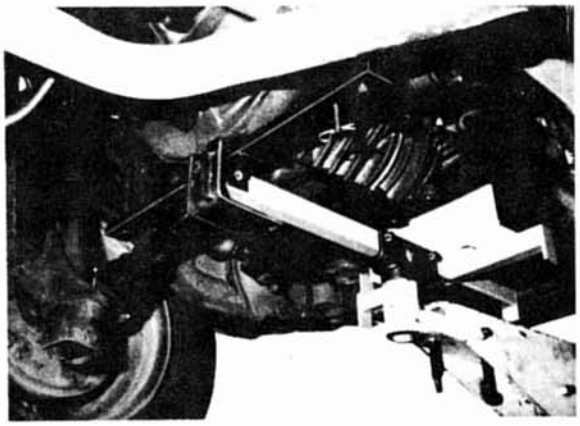
Note

Transmission lever cable has a lock at ball head to prevent it from springing off.

5. Open inspection hole in rear bell housing and remove converter mounting bolts.

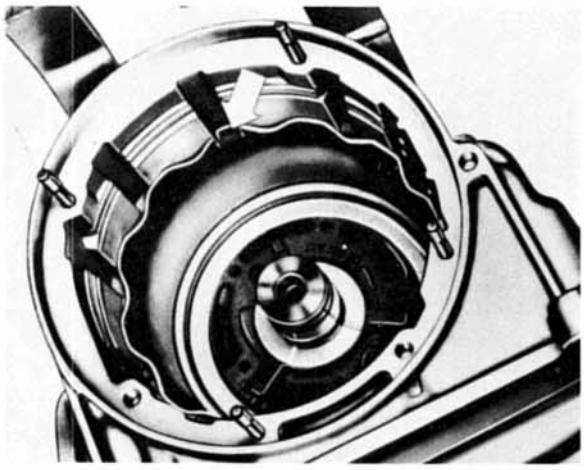


6. Mount Special Tools US 618, 618/1, 618/2 and 5001 on universal floor jack and lift the transmission slightly.



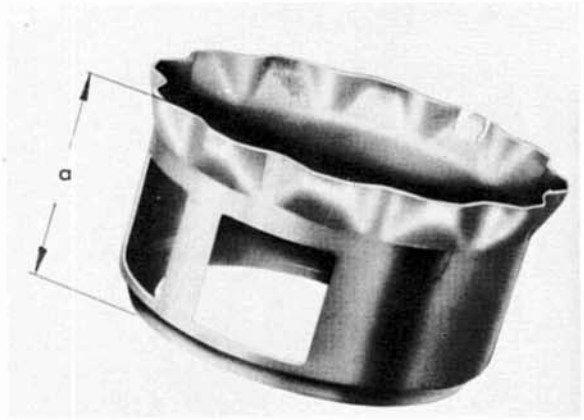
7. Remove transmission bell housing flange bolts and transmission mounts.

2. Install apply shell for 1st and reverse gear brake in proper position (see arrow).

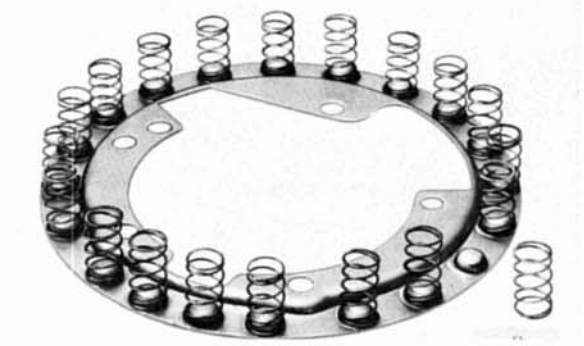


Note

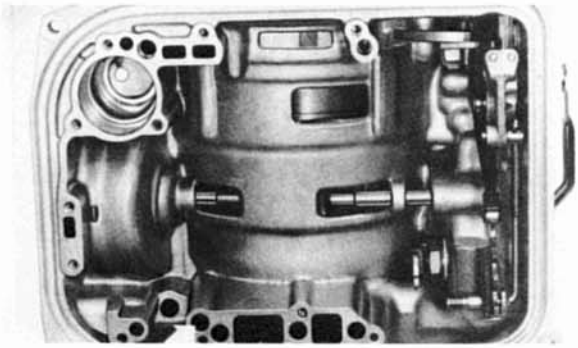
Note shell length "a" = 91.4 mm.



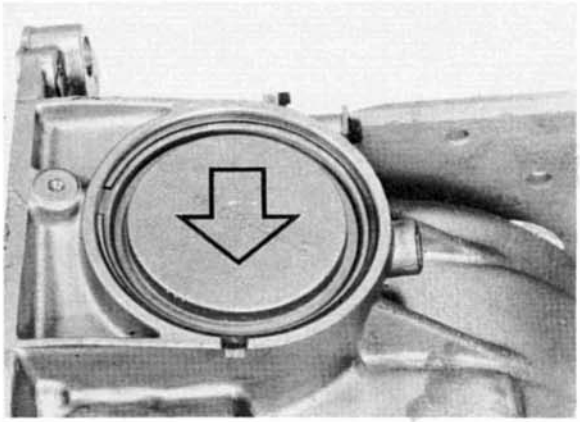
3. Place springs on spring plate, install plate in case with springs facing down and bolt tight.

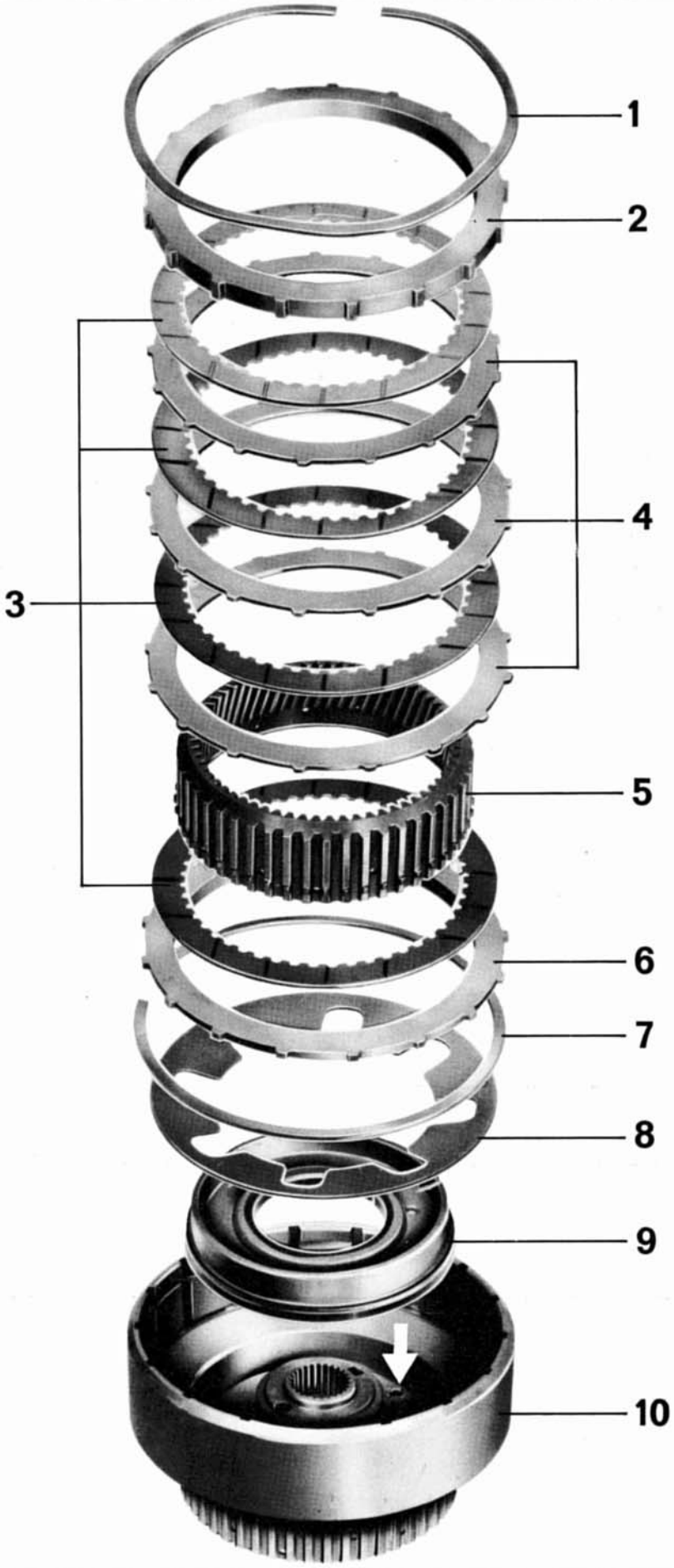


4. Check operating of 1st and reverse gear brake. Inject compressed air into pressure bore (arrow) for this purpose. Piston must compress the springs. Without air pressure piston must return to initial position.



5. Install piston and cover for 2nd gear brake. Press down piston and cover with appropriate tool. Insert circlip.

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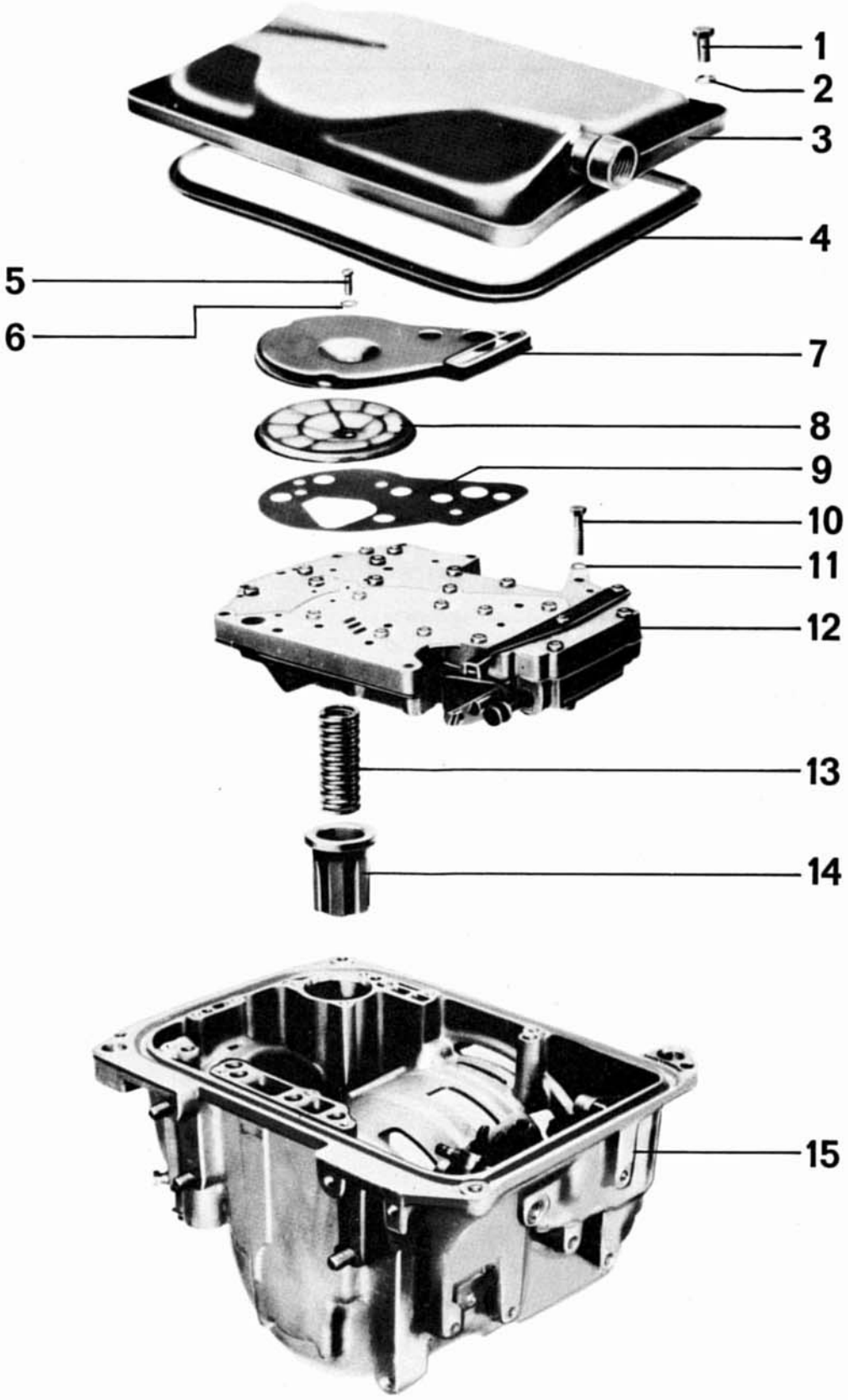
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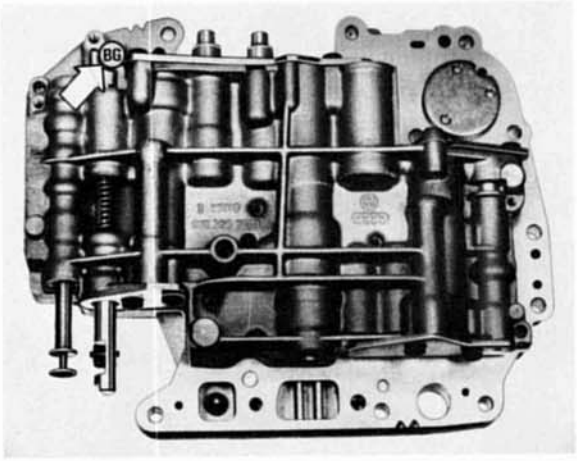
No.	Description	Qty.	Note when Removing	Note when Installing	Special Instructions
38	Main pressure limiting valve spring	1		Same size as spring for throttle pressure limiting valve, but do not mix up	
39	Main pressure limiting valve	1			
40	Throttle pressure limiting valve adjustung screw	1		Do not turn, can only be adjusted on test stand	
41	Throttle pressure limiting valve spring	1		Same size as spring for main pressure limiting valve, but do not mix up	
42	Throttle pressure limiting valve with spring seat	1			
43	Governor plug 1 - 2	1			
44	Body	1			

4. Valve body code:
   = "BG" on cast boss (arrow).



MANUAL TRANSMISSION - DIFFERENTIAL

Adjust drive pinion.

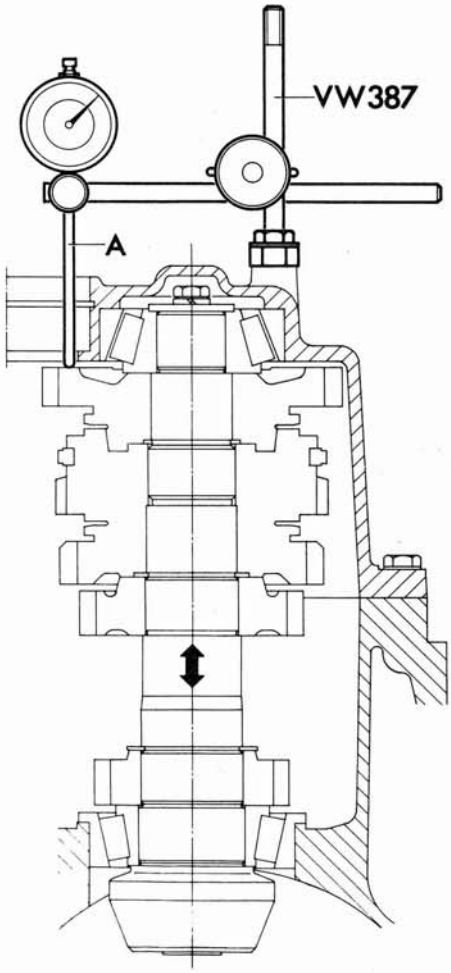
The drive pinion and ring gear set need only be adjusted if the set itself is replaced. If other parts have been replaced which also influence the drive pinion, adjustments are made by way of the previously determined location (actual measurement).

Determine total shim thickness " S tot." (S 3 plus S 4).

1. Adjust pre-load for taper roller bearing/drive pinion. Install taper roller bearing outer race in transmission case or end plate without shims.

2. Install completely assembled drive pinion, mount end plate and torque bolts to 2.5 mkg (18 ft lb).

3. Turn drive pinion about 20 full turns by hand to place a load on both taper roller bearings, lifting and dropping the drive pinion at the same time.



4. Install gauges.
   Set dial gauge (3 mm range) at O with a pre-load of 1 mm. Use 50 mm long dial gauge extension.

5. Move drive pinion up and down, read and note amount of play on dial gauge. Do not turn the drive pinion to avoid incorrect readings.

Example: 1.30 mm play.

6. Reinstall end plate.

Determine total shim thickness " S tot." (S 3 plus S 4).

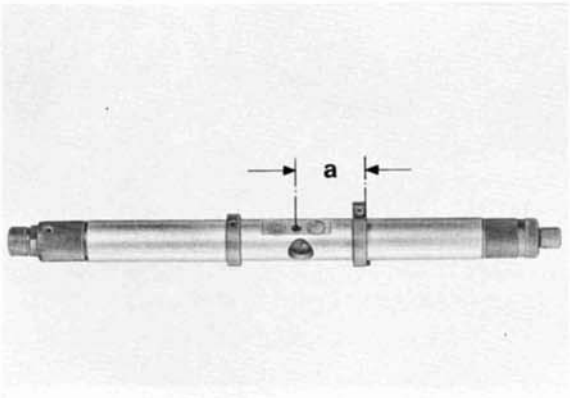
S tot. = Measurement + pre-load
Pre-load = 0.30 mm (given for 924 transmission)
Measurement = 1.30 mm (example)

S tot. = 1.60 mm

Determine deviation " e ".

1. Place shim of determined thickness (1.60 mm in the example) in the end plate behind the taper roller bearing outer race. (S tot. as S 4 for the following measurement) Mount end plate again, bolt and turn drive pinion about 20 times each in both directions.

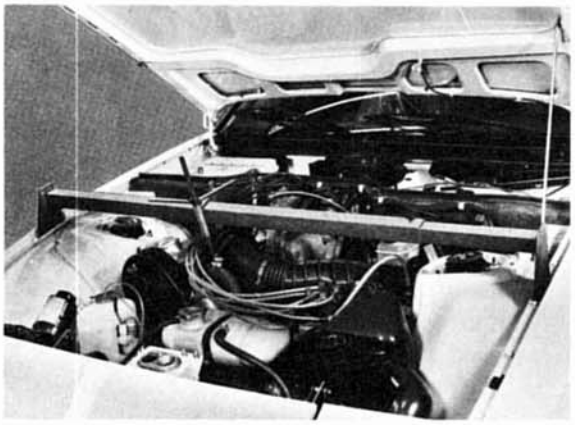
2. Set adjusting ring of universal gauge VW 385/1 at distance " a " (a = about 50 mm).



REMOVING AND INSTALLING CENTRAL TUBE
(Five Speed Transmission Type 016/9)

Removing

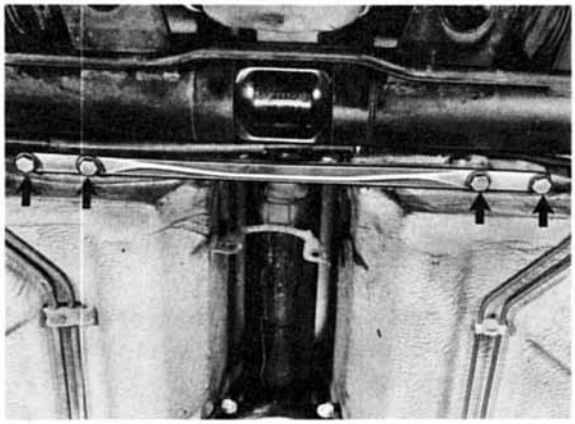
1. Suspend engine from front eyelet with Special Tool VW 10-222 and hold tight in installation position.



2. Remove rear wheels. Disconnect parking brake cable at parking brake lever and pull out of guide toward rear.

3. Remove catalytic converter together with muffler.

4. Detach reinforcement strut.



5. Move both exhaust pipe holders with rubber mounts out of the brackets bolted on the central tube, but only after removing the two front exhaust pipe mounting bolts.

6. Remove heat shields, if applicable.

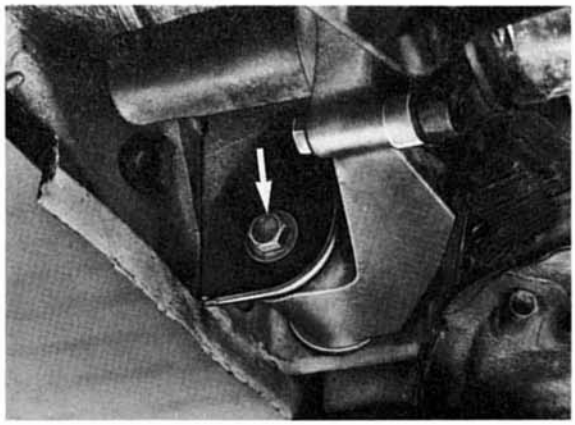
7. Remove transmission (page 34-101). In addition to these instructions, remove the gear shift lever after unscrewing two mounting bolts on the base.

8. Remove rear axle assembly, keeping to the following work procedures.

   a) Detach brake lines and brake hoses at control arms.

   b) Disconnect shock absorber at control arms.

   c) Remove bolts on left and right mounting flanges and upper mounts.



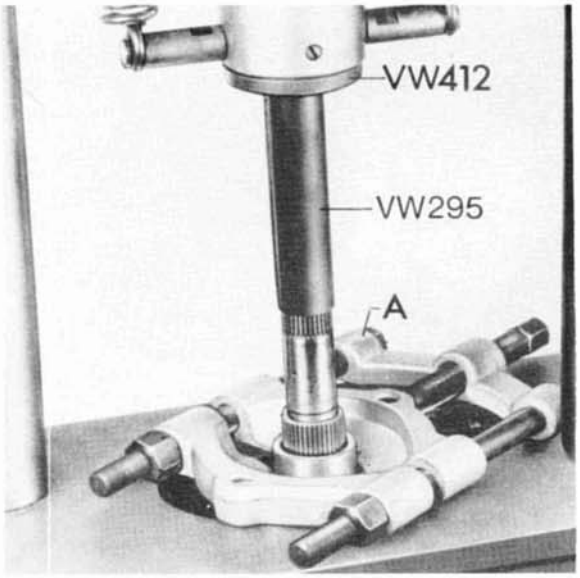
No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Cap	1			
2	Nut	1		Torque to 20 Nm (14 ft lb)	
3	Spacer	1			
4	Lever	1			
5	Circlip	1			
6	Support	1			
7	Nut	1		Torque to 17 Nm (12 ft lb)	
8	Spring washer	1			
9	Lever for kickdown valve	1		Position correctly	
10	Shaft	1			
11	Seal	1		Coat with ATF	
12	Lock washer	1			
13	Nut	1		Torque to 20.5 Nm (15 ft lb)	
14	Spring washer	1			
15	Stop washer	1			
16	Ratchet	1		Check for wear	
17	Lock washer	1			
18	Engaging lever	1		Check rollers for easy movement	
19	Lock washer	1			
20	Operating rod	1			
21	Bolt	1		Torque to 3.5 Nm (2,5 ft lb)	
22	Spring washer	1			

DISASSEMBLING AND ASSEMBLING PINION

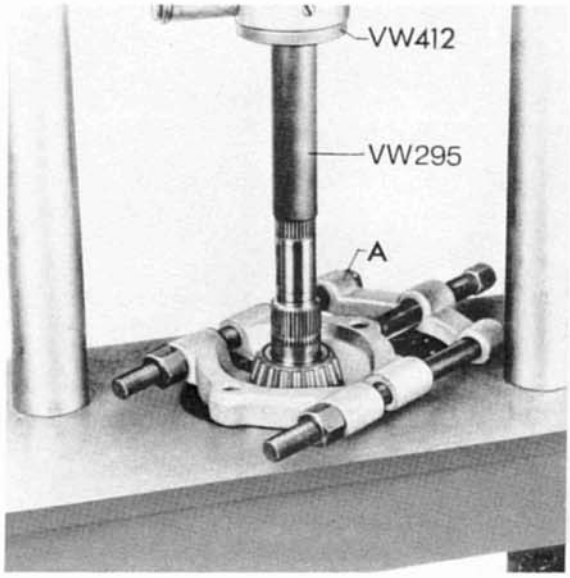
Disassembling

1. Press off inner race (small bearing).

2. Press off sleeve for seals.
   A = US 1103

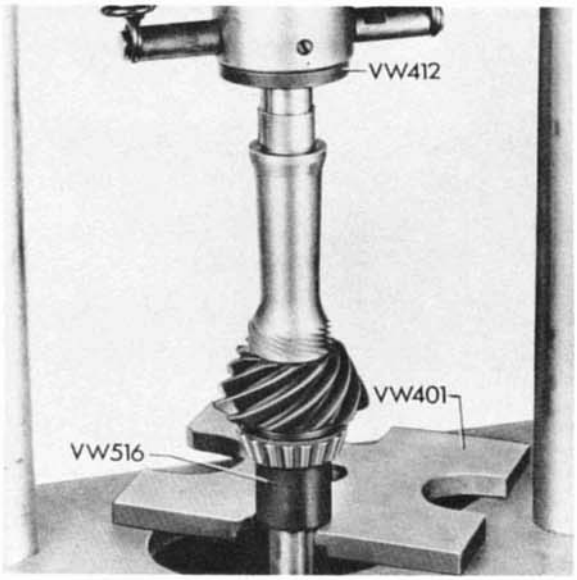


3. Press off inner race (large bearing).
   A = US 1103



Assembling

1. Heat large bearing inner race to approx. 100° C (212° F) and install. Then press on tight.



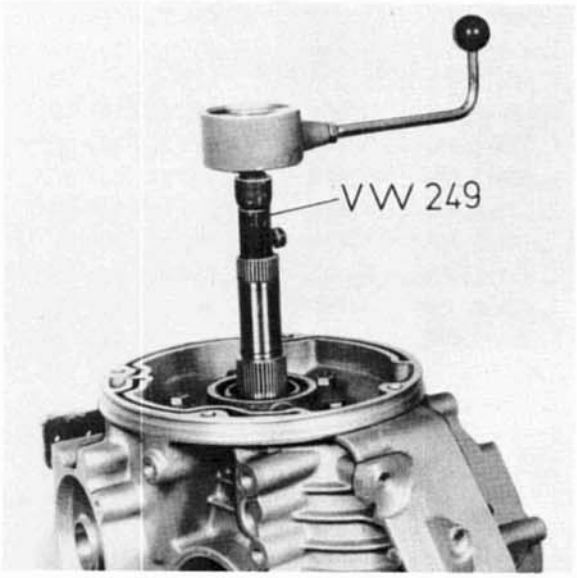
23. Check shim thickness at several positions with a micrometer. Check shims for burrs and damage. Only install perfect shims.

24. Install selected shims.
"S_3" behind pinion.
"S_4" opposite pinion.

25. Install pinion and lubricate bearings with hypoid gear oil.

26. Check measurements.
Install universal gage. Set dial gage at 0 with 3 mm preload. If proper shims have been installed, dial gage reading must be specified deviation " r " within a tolerance of $\pm$ 0.04 mm.

27. After installation of pinion with the selected shims the turning torque must also be measured. It must be 25 to 55 cmkg (23 - 48 in. lb).
Use US 1064.

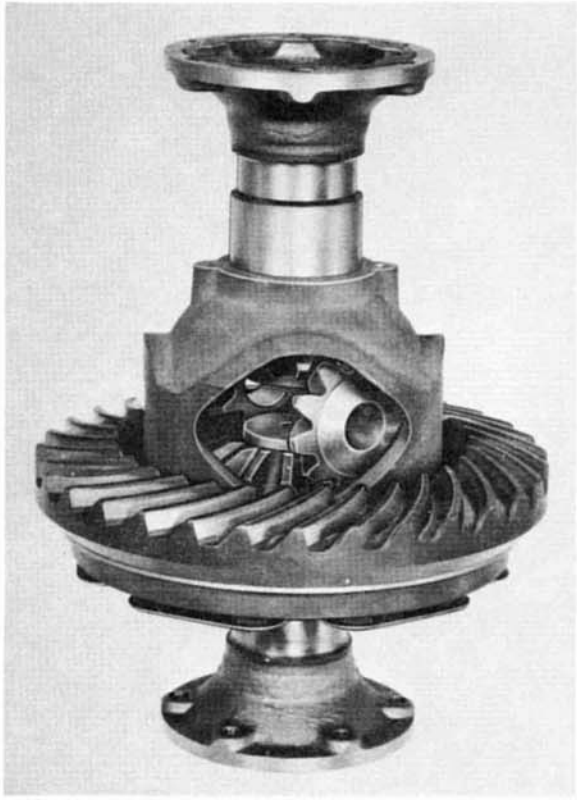


Note

This value applies to new bearings. Measure actual turning torque before disassembly if used bearings are to be installed again.

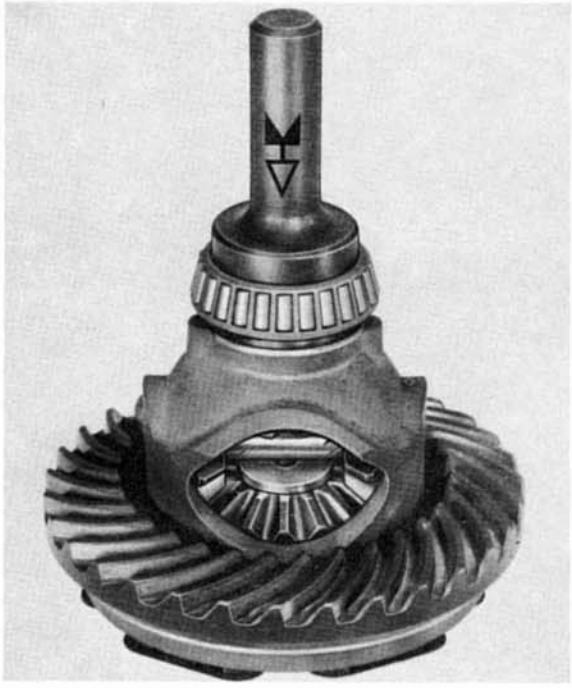
3. Coat thrust surface of differential gears with MoS_2 paste.

4. Insert large differential gears with press-fit flange nuts through large opening in differential housing and fix with joint flanges.



6. Drive on tapered roller bearing inner race with P 264 b.

5. Install small differential gears between the large differential gears and turn until holes in gears align with holes in case.



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Bolt M 7 x 16 with lockwasher	2		Tighten to 10 to 16 Nm (7 to 12 ft lb)	
2	Oil seal tube	1			
3	Seal	1		Replace	
4	Oil seal	1	Drive out carefully with suitable screwdriver	Drive in against stop in correct position with 9119	
5	Bolt M 6 x 16	1		Tighten to 10 Nm (7 ft lb)	
6	Washer	1			
7	Bolt M 6 x 70 without washer	2		Tighten to 10 Nm (7 ft lb)	
8	Cover	1			
9	Gasket	1		Replace	
10	Selector shaft	1		Coat sealing surface with original VW sealing compound D 3	
11	Dowel pin	2			
12	Bolt M 8 x 32 without washer	8		Tighten to 25 Nm (18 ft lb)	
13	Bolt M 8 x 58	4		Tighten to 25 Nm (18 ft lb)	
14	Gear carrier	1		Coat sealing surface with original VW sealing coumpound D 3	
15	Bolt	2		Tighten to 25 Nm (18 ft lb)	
16	Drive flange	2			
17	Bolt M 8 x 35 with washer	9		Tighten to 25 Nm (18 ft lb)	

Adjustment Survey

When repairing the final drive it will only be necessary to adjust the pinion and/or ring gear if parts have to be replaced which directly influence pinion/ring gear settings. The chart below will help you in avoiding unnecessary adjustments.

Replaced Part	Ring Gear ($S_1 + S_2$)	Pinion Dev. r	Pinion Actual	Pinion only Shim "S_4"
Final drive housing	X		X	
Gear carrier housing				X
Differential housing	X			
Tapered roller bearing for pinion			X	
Tapered roller bearing for differential	X			
Pinion/ring gear	X	X		
Final drive cover	X			

Determining Actual Installation Position of Pinion

This operation will only be necessary when deviation "r" is not given on the ring gear and parts have to be replaced which directly influence the pinion position. These would be both tapered roller bearings for the pinion and final drive housing.

Remove differential

Assemble measuring bar as shown in the tool list, insert it in final drive housing and measure difference to "Ro" (max. deflection/reversing point). The measured value is equal to deviation "r". Note the value.

After replacing parts, adjust the pinion as described. Use the measured deviation "r" for determination of the thickness for shim "S_3".

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No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Nut, self-locking	1	Compress coil spring with VW 340	Replace and tighten to specified torque	
2	Stop	1			
3	Seal	1		If necessary replace	
4	Bearing flange	1			
5	Ball bearing	1		Check. If necessary replace	
6	Spring retainer	1			
7	Coil spring	1			
8	Rubber buffer	1			
9	Protective sleeve	1			
10	Shock absorber	1		Check operation. If necessary replace	

REAR WHEEL SUSPENSION , SHAFTS AND AXLE

No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	O-ring	1		Replace	
2	Rubber bushings	2	Drive out alternately with a chisel	Replace and press in	
3	Rear wheel shaft	1	Remove with double arm extractor	Press in	
4	Bearing inner race	1		Press in with VW 415a	
5	Spacer, inner	1			
6	Seal	1	Lever out	Replace and fill cavity with multi-purpose grease	
7	Circlip	1		Check for proper fit	
8	Grooved ball bearing	1	Drive out with soft drift	Press in	
9	Spacer	1			
10	Roller bearing	1	Drive out with soft drift		
11	Trailing arm	1		Fill cavity in wheel hub and ball bearings with about 80 grams of multi-purpose grease	

AXLE ALIGNMENT

Check the axle alignment with optical equipment. Consult manufacturer's instructions for proper test procedures.
Requirements for checking axle alignment.

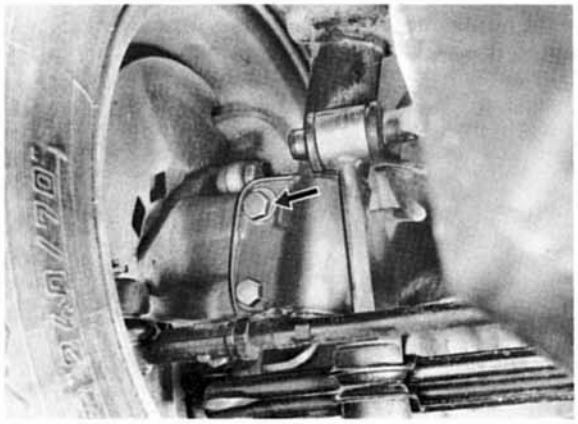
- Car at curb weight acc. DIN 70020 (car with full fuel tank and spare wheel)
- Joint and bearing play correct
- Specified tire inflation pressure
- Uniform tire treads

If front and rear axle alignment has to be checked, first check and adjust the rear axle alignment.
Steering wheel and steering gear must be in center position when adjusting camber and toe.

FRONT AXLE

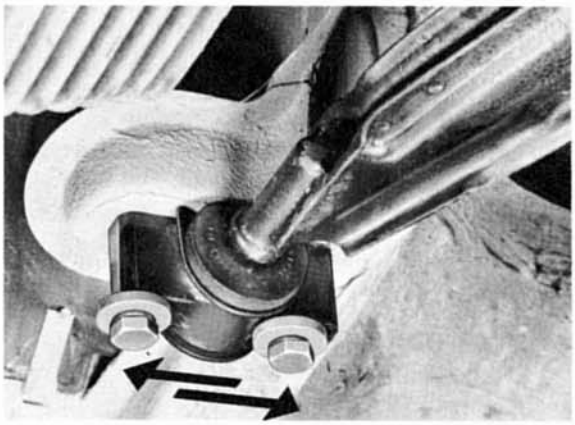
Adjusting Camber

Adjust camber by turning eccentric bolt (arrow).



Adjusting Caster

Adjust caster by moving the rear of suspension control arm from side to side.



SPECIFICATIONS

Description	Dimension	Wear Limit
Service (foot) brakes	Hydraulic dual-circuit diagonal brake system, brake booster, front axle with floating caliper disc brakes, rear axle with drum brakes	
Parking (hand) brake	Mechanical action on both rear wheels	
Brake disc dia.	257 mm	
Effective brake disc dia.	210 mm	
New brake disc thickness	13 mm	
Min. thickness after mach. *)	12 mm	11.5 mm
Eff. total brake disc area	470 cm^2	
Pad area of each front wheel	65 cm^2	
Lining area of each rear wheel	170 cm^2	
Caliper piston dia.	48 mm	
Front pad thickness	14 mm	2.0 mm
Brake drum dia.	230 mm	
Min. dia. after machining **)	231 mm	231.5 mm
Brake shoe width	38.6 mm	
Brake lining thickness	3.8 - 4.0 mm	2.5 mm
Oversize lining thickness	4.3 - 4.5 mm	2.5 mm
Rear wheel brake cylinder piston diameter	19.05 mm	
Master cylinder dia. (through 1979 model) (from 1980 model)	20.64 mm 23.81 mm	
Brake pressure booster (through 1979 model) (from 1980 model)	7 inch 9 inch	

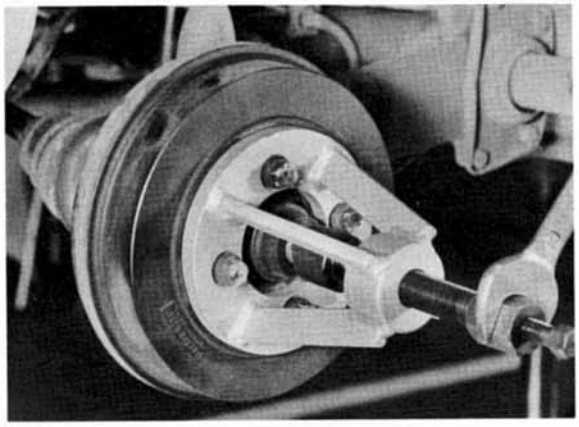
*) Only machine brake discs symmetrically, i.e. same amount off both sides

**) Use oversize brake linings

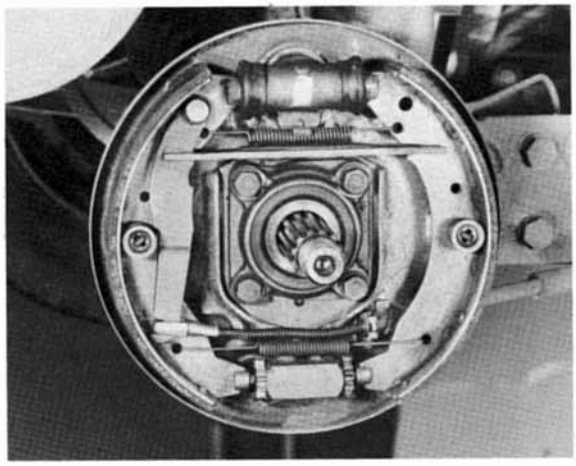
DISASSEMBLING AND ASSEMBLING REAR WHEEL BRAKES

Disassembling

1. Pull brake drum off axle shaft spline with a standard extractor.

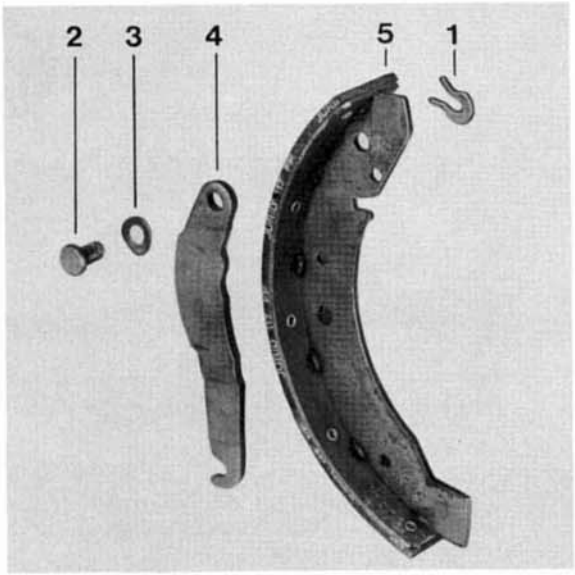


2. Install adjusting screws, brake shoes, return springs and pressure rod. Lubricate adjusting screws and sliding surfaces of brake shoes slightly.

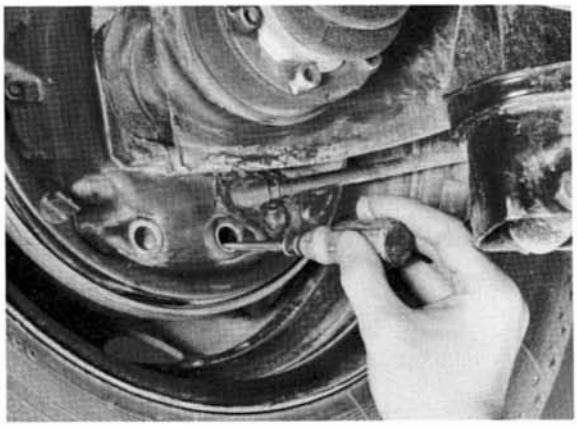


Assembling

1. Mount brake lever in proper position with a new bearing pin.



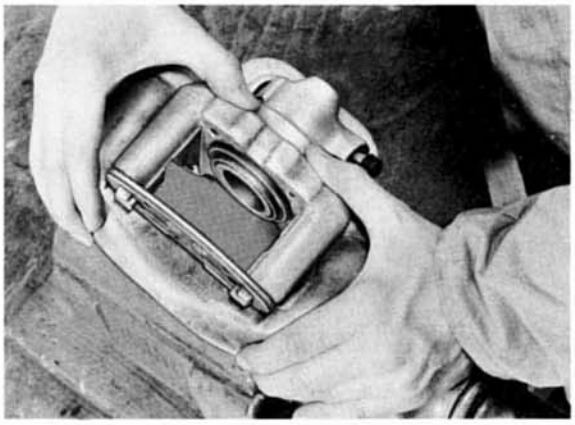
3. Adjust brake shoes. Adjust the adjusting pinion until the brake shoes rest against the brake drum. Then turn back until the wheel can be rotated freely by hand.



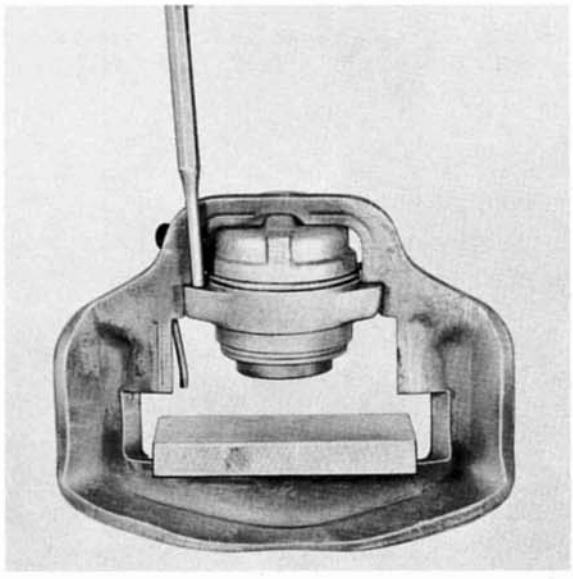
DISASSEMBLING AND ASSEMBLING BRAKE CALIPER

Disassembling

1. Press mounting frame off of caliper frame.



2. Drive brake cylinder off of caliper frame with a soft mandrel at different points all around. Place a piece of wood in caliper frame.

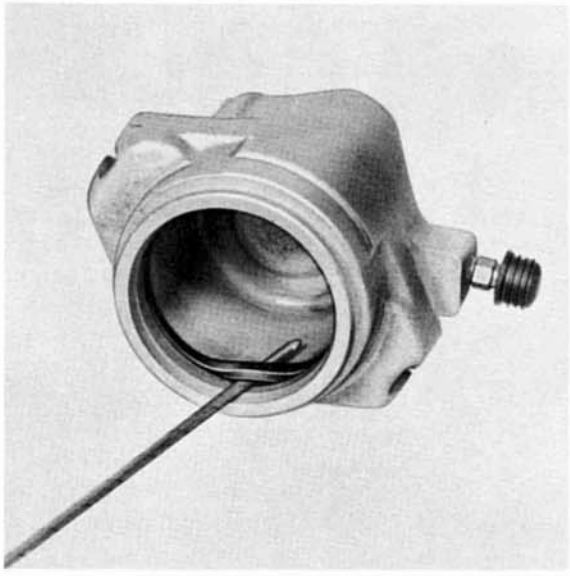


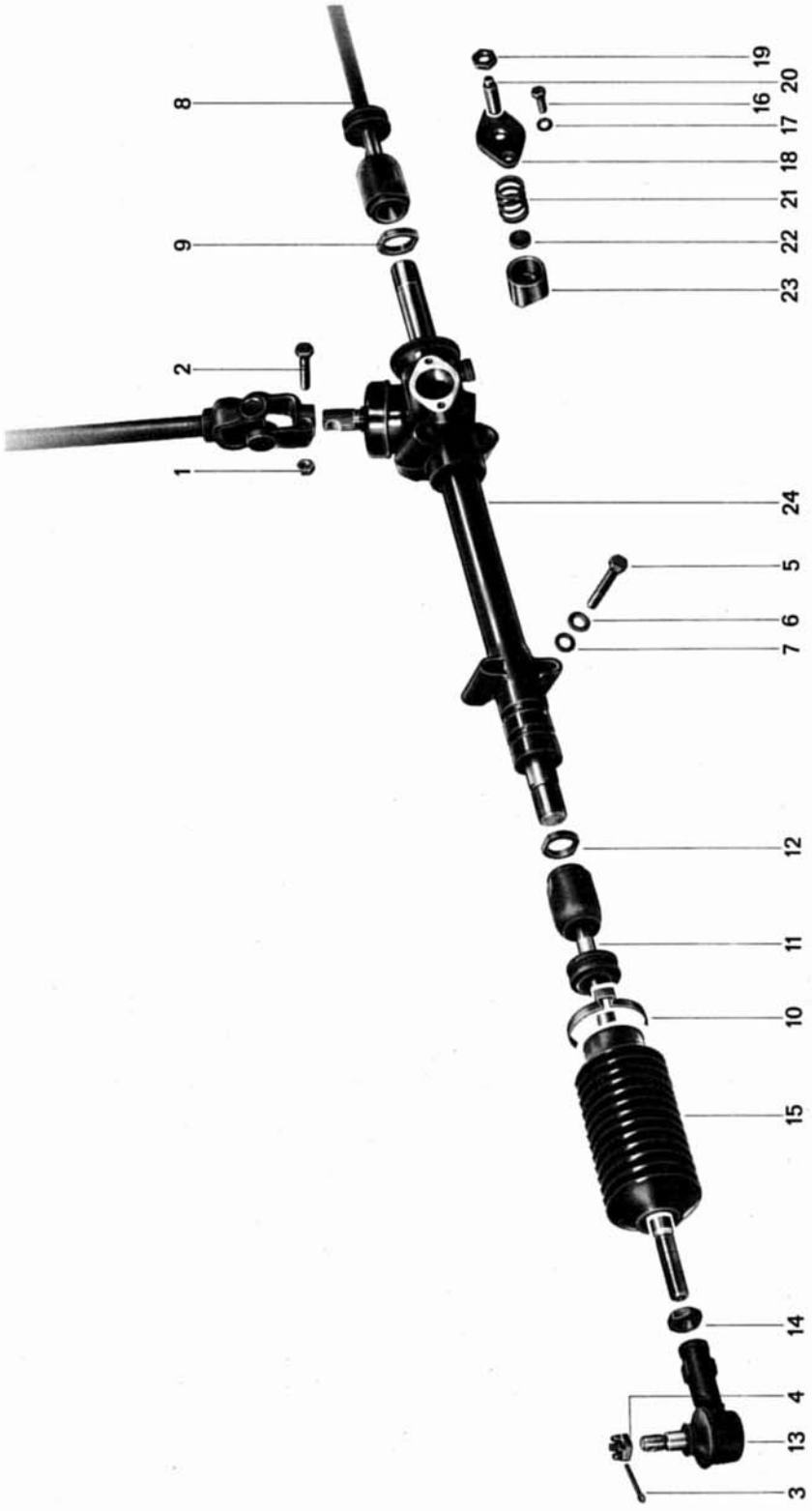
3. Press piston out of cylinder with compressed air.

WARNING

Support piston on piece of wood.

4. Remove seal with plastic rod.

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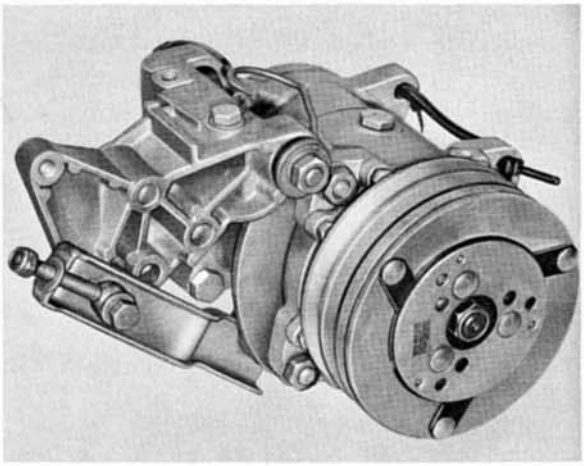
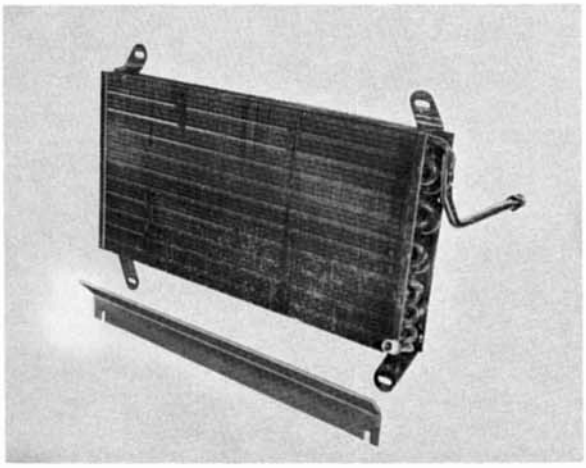
No.	Description	Qty.	Note When Removing / Installing	Special Instructions
23	Air outlet nozzle	1		
24	Air distributor with connector	1		
25	Metal screw	1		
26	Washer	1		
27	Oval head screw	1		
28	Washer	1		
29	Support	1		
30	Hose	1		
31	Air outlet nozzle	1		
32	Air distributor with connector	1		
33	Air jet	1	Pull out toward front, be careful not to break retaining tabs	
34	Nut	1		
35	Lockwasher	1		
36	Metal screw	1		
37	Washer	1		
38	Support	1		
39	Flap box assembly	1	Remove center console and detach right side of instrument panel. Pry off clamp	
40	Cover	1		

1. Compressor



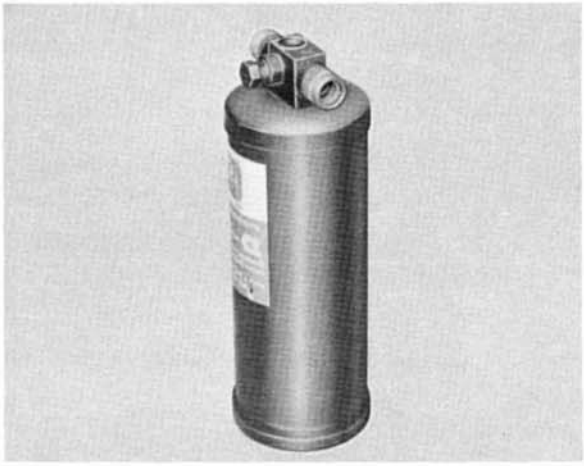
Driven by a V-belt from the engine through an electromagnetic clutch.
It draws in refrigerant vapor from the evaporator and pressurizes it (at the same time raising the refrigerant temperature) for circulation to the condenser.

2. Condenser



Receives the hot, high pressure vapor from the compressor. As the refrigerant vapor circulates through the condenser, it is cooled and condensed to a warm high pressure liquid.

3. Receiver-drier

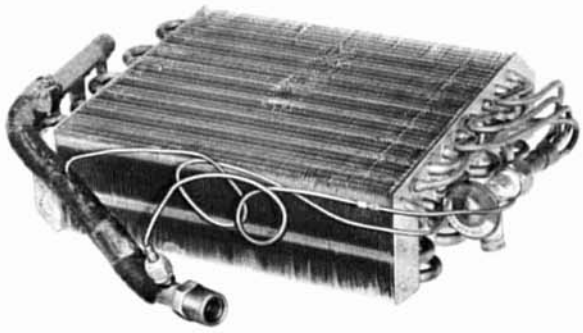


Receives warm high pressure liquid from condenser. Stores, filters and removes moisture from liquid refrigerant before delivery to the expansion valve. Provided with a sight glass (to monitor condition of refrigerant charge) and a safety seal (designed to rupture in the event of extremely high temperature).

4. Expansion valve

Reduces warm high pressure liquid from receiver-drier to a cold low pressure liquid for expansion in the evaporator. Together with temperature sensor coil (attached to outlet side of evaporator) expansion valve meters refrigerant flow in a continuous, automatic process.

5. Evaporator



Receives cold, low pressure liquid from the expansion valve. As the refrigerant expands and circulates through the evaporator coils, it absorbs heat from the warm blower air in the passenger compartment. During this heat transfer, the refrigerant changes to a cool, low pressure vapor.

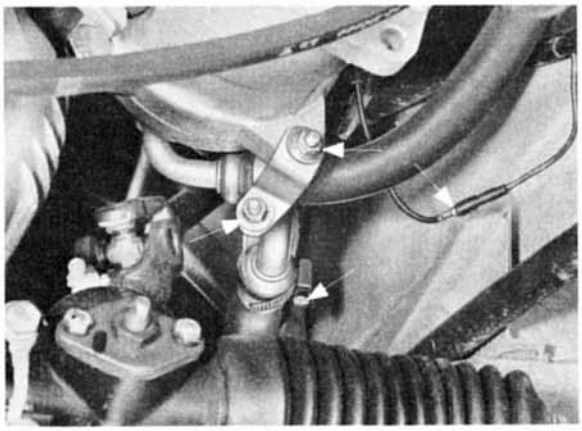
Removing and installing compressor

1. Remove coolant expansion tank.

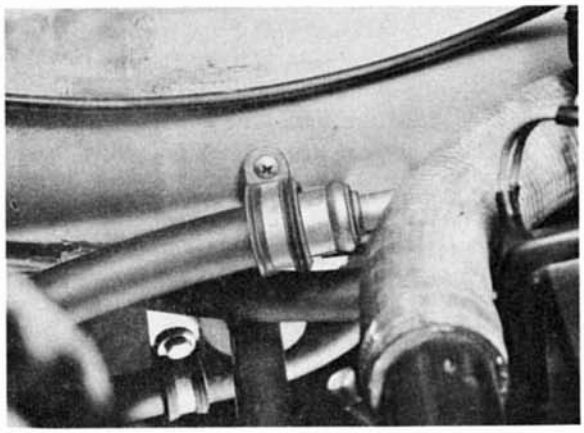
2. Remove mixture control unit (fuel lines remain connected) and move to one side.

3. Loosen and remove belt on compressor.

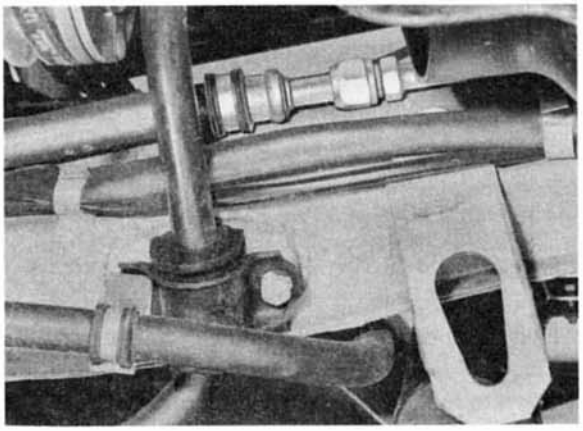
4. Unscrew refrigerant hose mounting bracket from compressor and disconnect electric plugs.



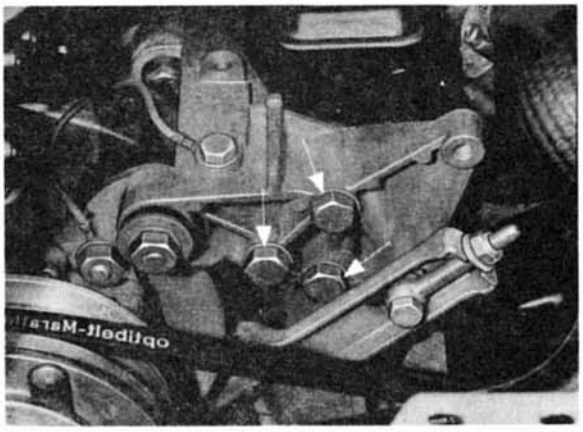
5. Unscrew hose clamp at condenser inlet.



Detach hose at condenser connection.

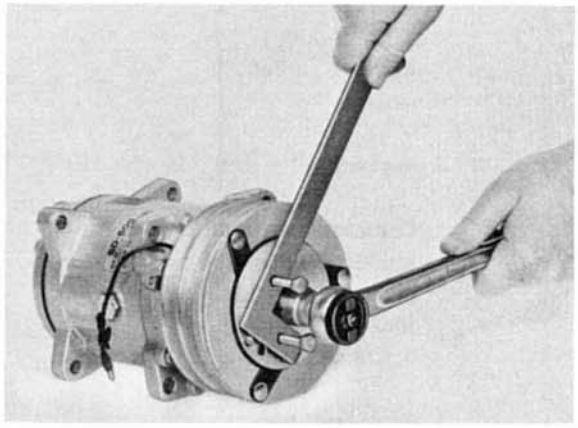


6. Remove compressor mounting bolts.

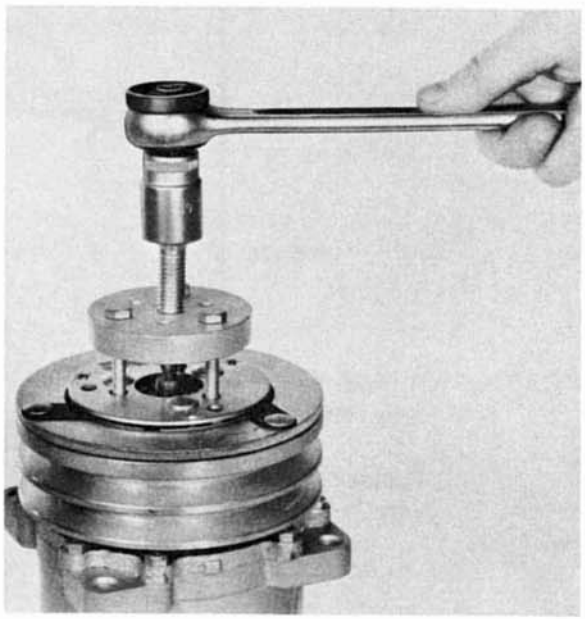


DISASSEMBLING AND ASSEMBLING COMPRESSOR

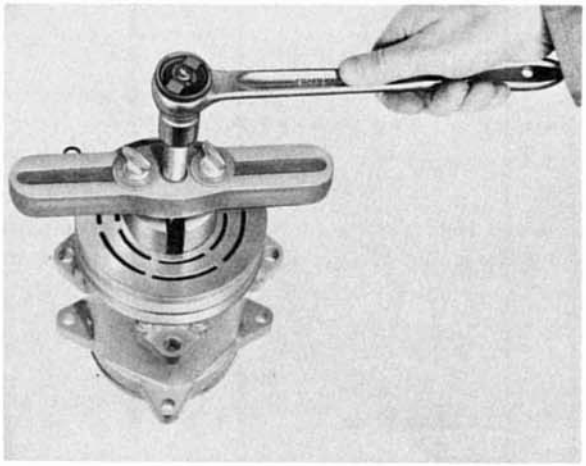
1. Use holding wrench to loosen or tighten nuts.

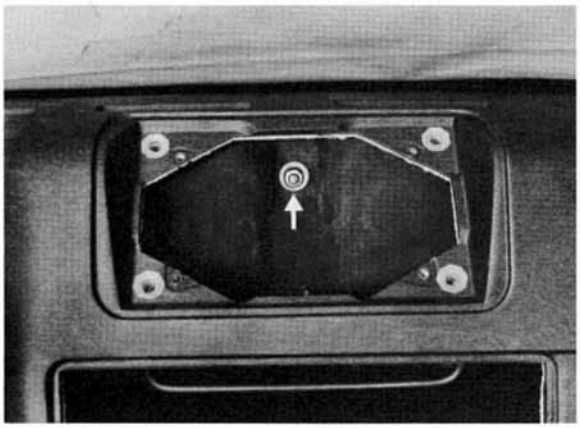


2. Remove clutch plate with puller.



3. Remove pulley with puller.





3. Remove instrument panel mounting screws on right side.

4. Drain coolant at plug in radiator.

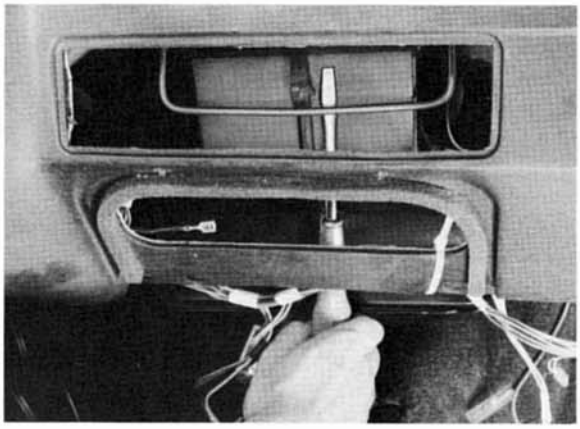
5. Remove ignition coil and place out of the way.

6. Disconnect cable on heater valve and pull in.

7. Disconnect and pull off heater hoses.

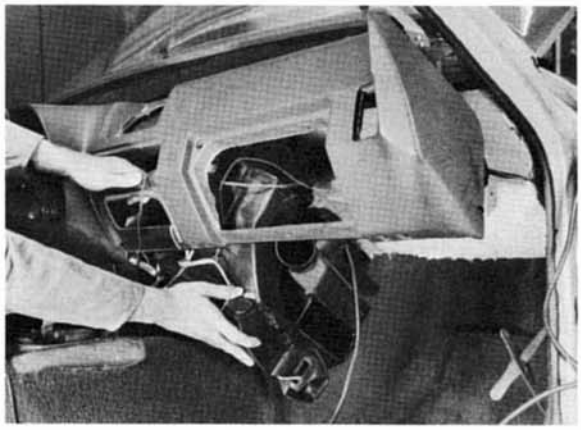
8. Remove left and right brackets for flap box on instrument panel.

9. Pry off holder for flap box upward.



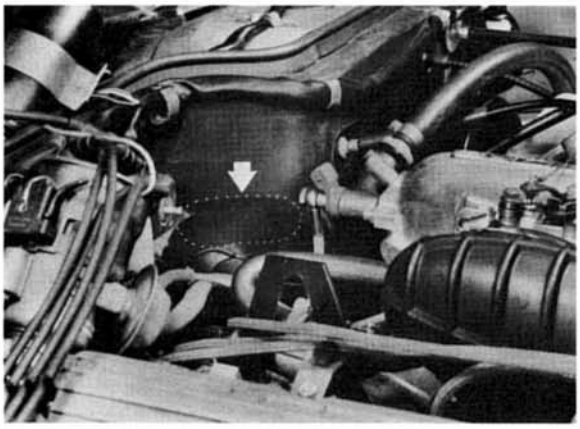
10. Pull off wires on fan switch.

11. Pull off instrument panel on right side and remove flap box with the fan switch.

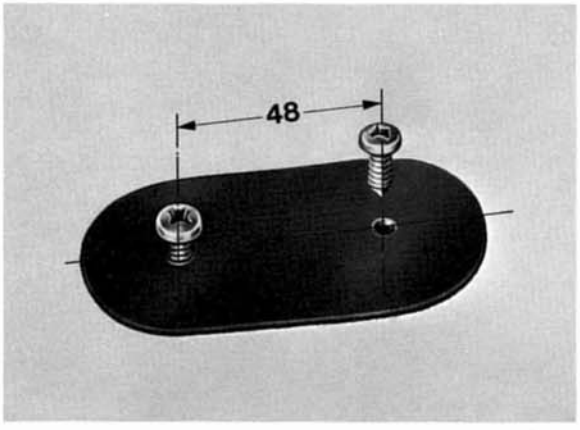


Drilling Holes for Hoses

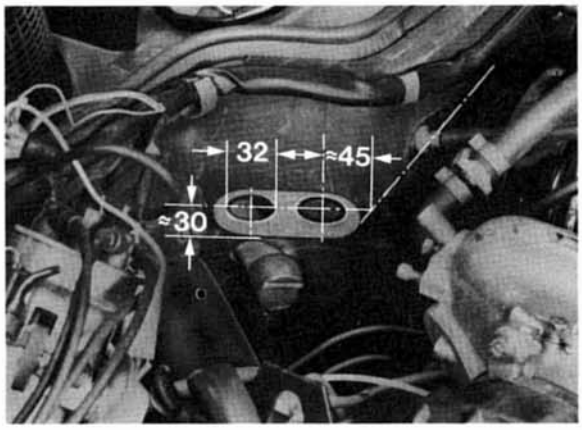
1. Cut out marked section in engine compartment insulation sheet.
   The insulation sheet opening is perforated from the inside and can be pulled off.



2. The removed section of insulation sheet can be used as a template together with 2 sheet metal screws to mark the location of both holes. The sheet metal screws must be pointed.
   Mark insulation sheet section as shown in sketch and screw in the sheet metal screws.
   To mark location of holes hold removed section in the opening and punch mark the locations by striking the heads of both screws with a hammer.



3. Rough drill punched locations with an angled drill and open up to 32 mm dia. with a reamer. Deburr both holes.



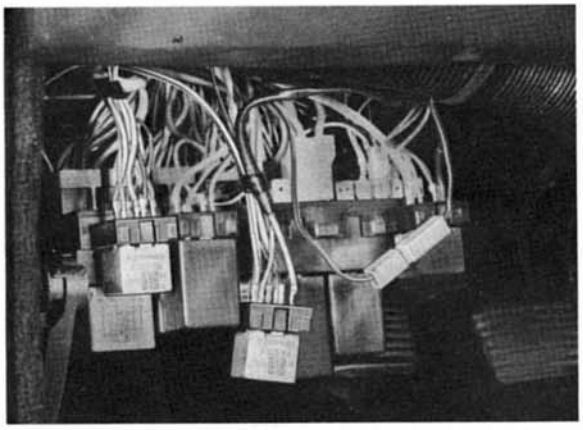
4. Insert rubber grommets for pressure and suction hoses in both holes.

Installing Hose Mounting Parts in Engine Compartment

1. Open up hole above the left control arm mount so that a M 6 welding nut can be inserted.

2. Weld in nut.

14. Remove relay for blower from the fuse/relay plate.



Blower Relay Socket

2 = term. 30 - red/brown

3 = term. 86 - brown

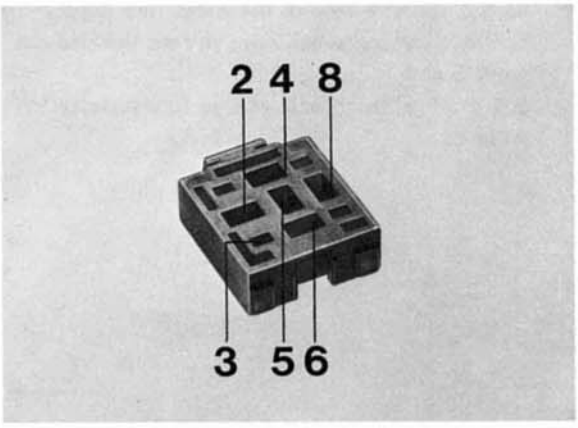
4 = term. A - black/white - 1,5 mm^2

5 = term. B - yellow/blue

6 = term. 85 - black/purple

8 = term. 87 - red/yellow

15. Remove and cut off flat female plug of brown wire on the relay socket. Install a new 2,8 x 1,0 mm flat female plug on the wire and connect on the blower relay socket according to plan.



16. Also remove and cut off flat female plug of black/purple wire. Install this wire together with the adjacent black/red wire in a 6,3 x 1,5 mm flat female plug. Reconnect the black/purple wire (term. 85).

17. Plug black/red wire in new air conditioner relay socket.

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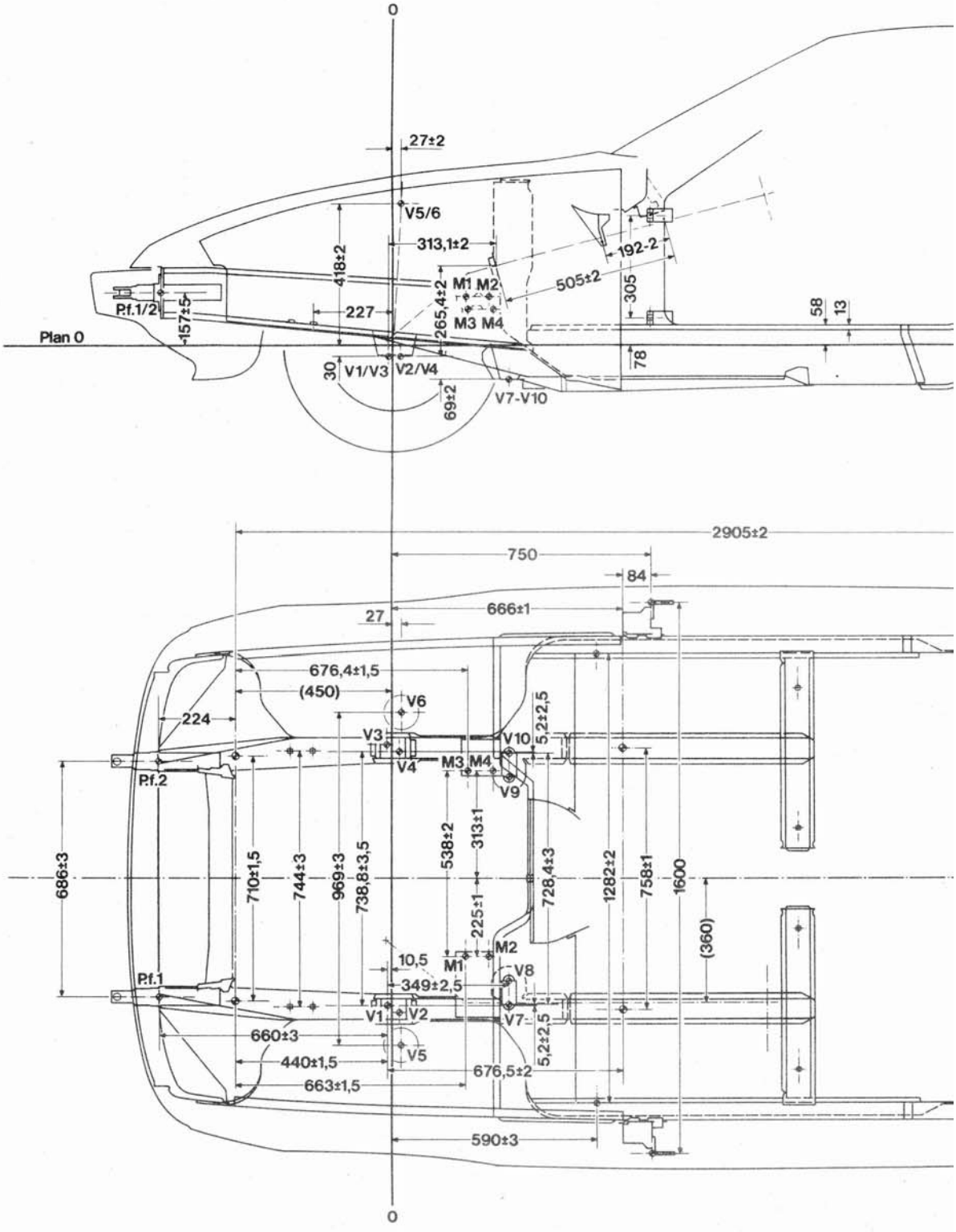

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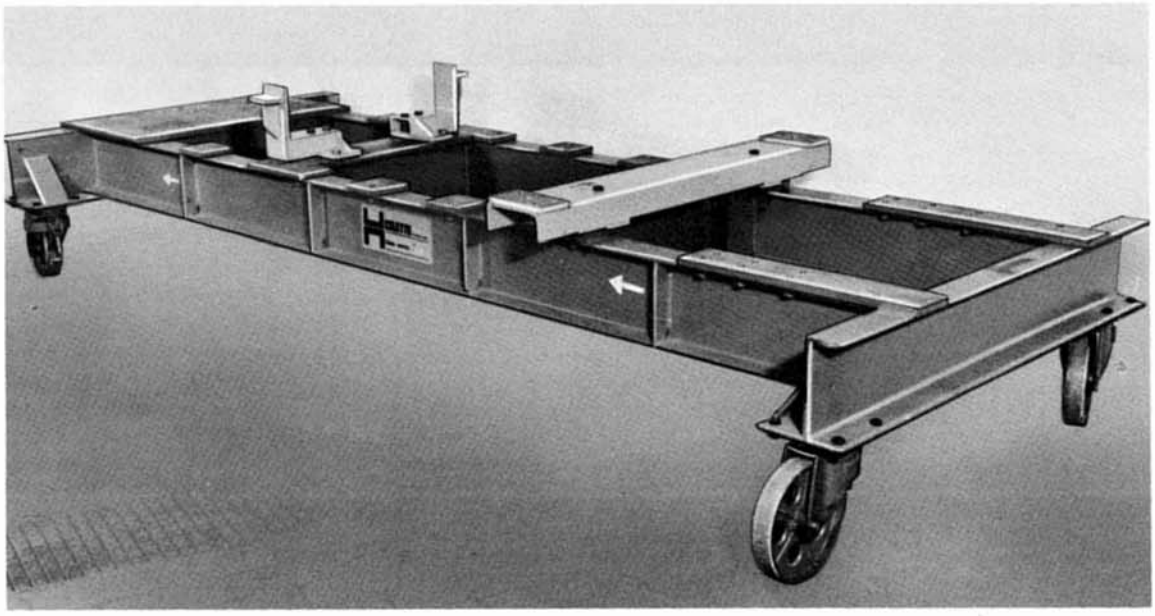
REPAIRS WITH SET ENS 224.300 ATTACHMENT

These attachments can be applied to simple repair jobs of bodies with medium front and rear end damage.

Preparing body

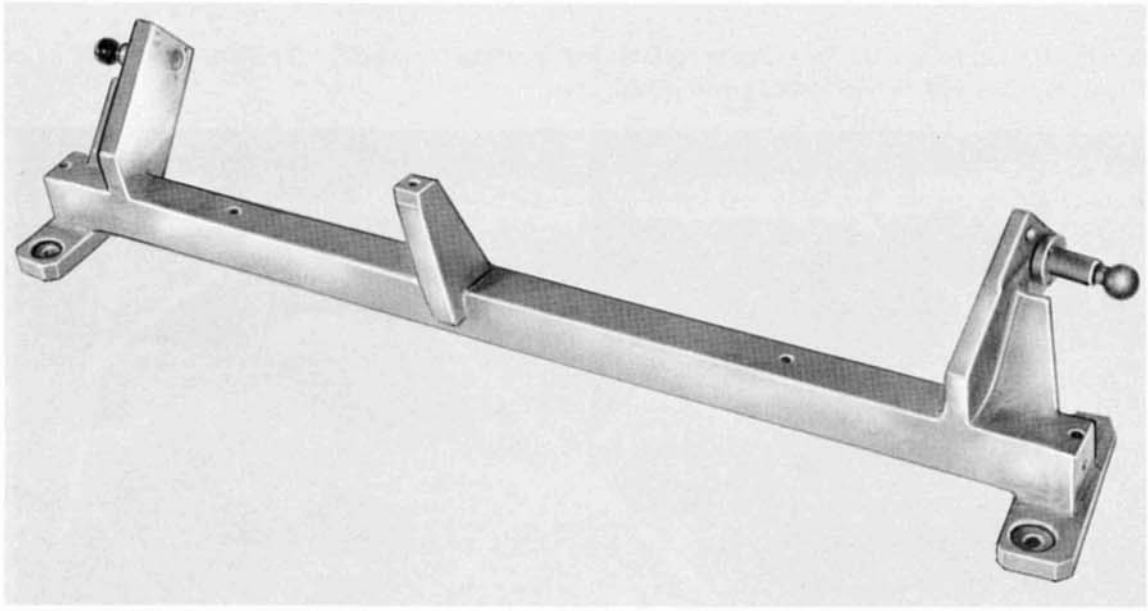
Remove: Front and rear bumpers with brackets
Front apron
All damaged body parts (as required by repair work)
Torsion plate covers and outer rubber mounts.
Also remove running gear and engine depending on type of damage.

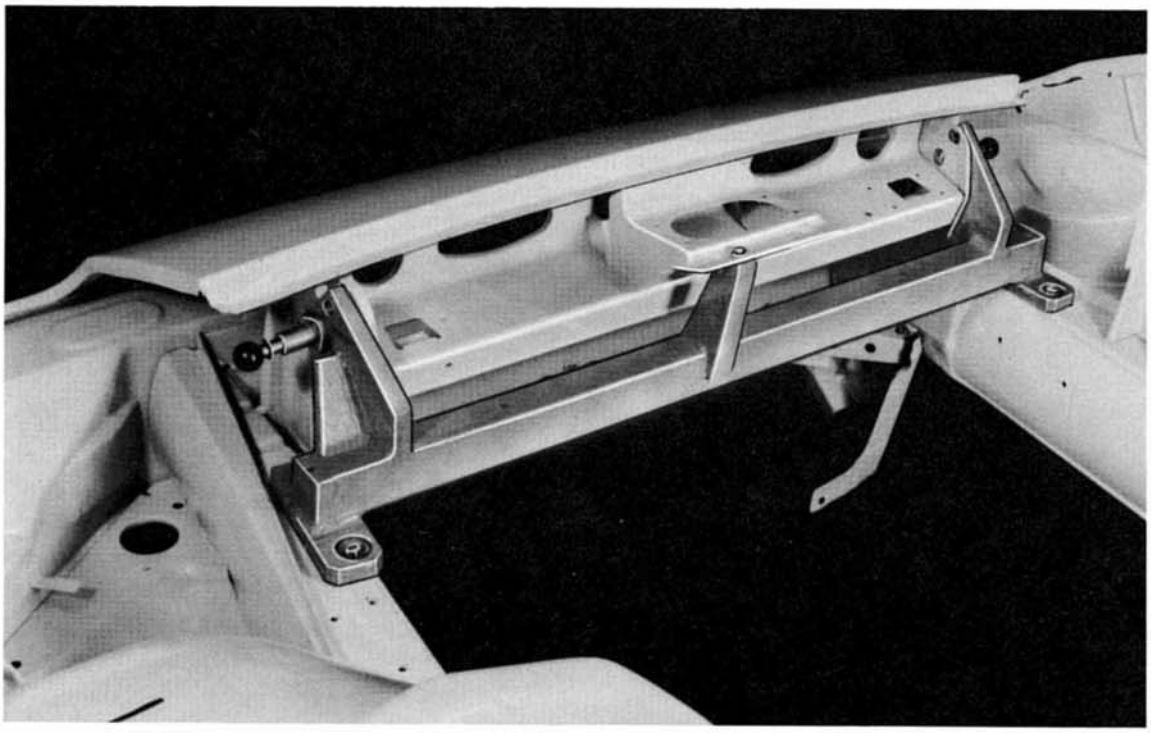
Preparing Celette stand: Mount cross member for rear axle attachments and supports for longitudinal member.



WELDING JIG 9117 FOR LOCK CARRIER

This jig is used for accurate welding of lock carrier. It can also be used to check for proper positioning of concealed headlight brackets.





INSTALLING NEW VERSION REAR SIDE PANELS ON CARS PRIOR TO 1980 MODELS

Only the new version rear side panels from 1980 models are available for replacements.

After using up stocks of old version parts in cars prior to 1980 models, the new version rear side panel will be applicable to all models.

The following additional procedures will be necessary to install the new version parts in cars prior to the 1980 models.

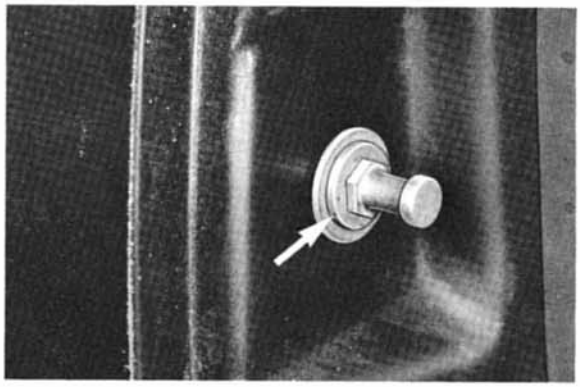
1. The striker pin base has been made 4,5 mm deeper so that the longer pin from the Type 928 door lock could be installed.

   Since the new striker pin is mounted with 3 bolts (previously one) the new version panel is delivered without bolt holes.

   Because of the deeper striker pin base, the reinforcement must be reworked slightly (inside broken line) on cars prior to 1980 models.

Or, depending on extent of damage, weld in a new reinforcement.

An additional spacer, Part No. 999.025.074.02, will be required when installing the old striker.



REMOVING AND INSTALLING DOOR

Removing

Pull off seal at door retainer.

Drive out pin.

Unscrew hinge bolts and remove door.

Installing

Bolt hinges to carrier plates.

Drive pins in door retainer.

Close door and adjust hinges that the door and body surfaces align.

Note

The front and rear door edges can be adjusted by inserting spacers between the hinges and carrier plate.

Paste seal around door retainer.

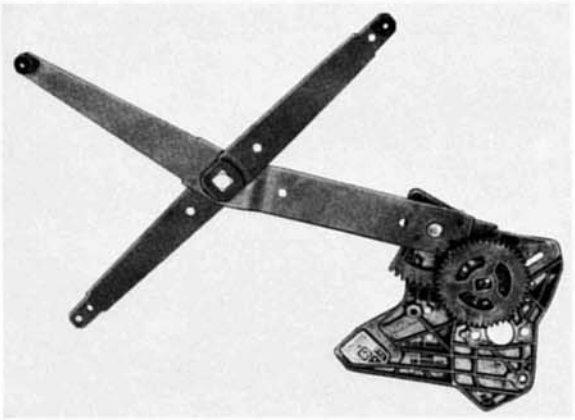
CHANGES ON ELECTRIC WINDOW CONTROLS

Different changes have been made on the electric window controls in the 1981 model year. Window controls of the new version should be used for repairs. Parts have been improved in the following points.

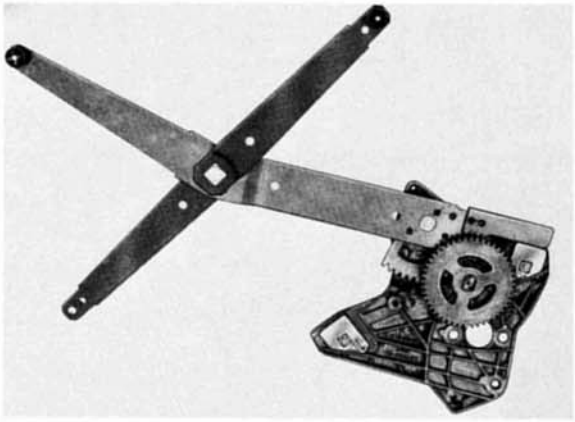
1. Welding of the support arm has been changed from 3-point to 4-point welding.

2. A reinforcement plate is welded in to lengthen the support arm and an adjustable stop bracket is bolted in position.

3. The electric window controls have a stronger baseplate starting with Chassis No. 92 BN 451 349



Old version



New version

No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
21	Bracket	2			
22	T-fitting	1			
23	Hose 890 mm (35 in.) long	1		Heat ends of new hoses when installing	
24	Hose 110 mm long (4 5/16 in.)	1			
25	Holder	1			
26	Screw M 6 x 15	2			
27	Metal nut	2			
28	Metal screw	2			

BODY COLORS - 1977

Standard colors		Special colors	
Mars red	L 31 B	Diamond silver metallic	L 97 A
Black	L 041	Copper metallic	95 F
Rally yellow	L 10 A	Turquoise metallic	96 Y
Brocade red	32 A	Reseda green metallic	95 E
Signal green	L 62 Y	Bahama blue metallic	99 F
Polar white	L 90 A		

GAUGES, INSTRUMENTS, RADIO

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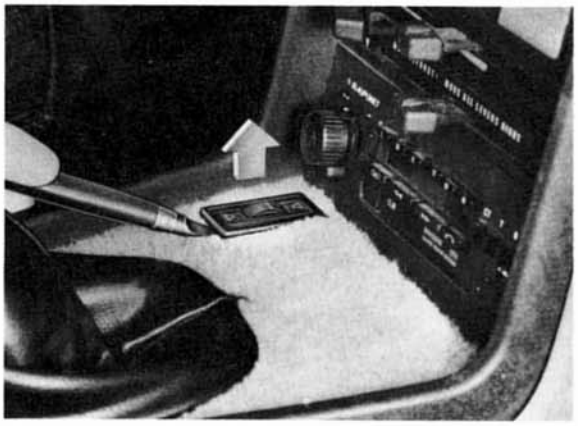
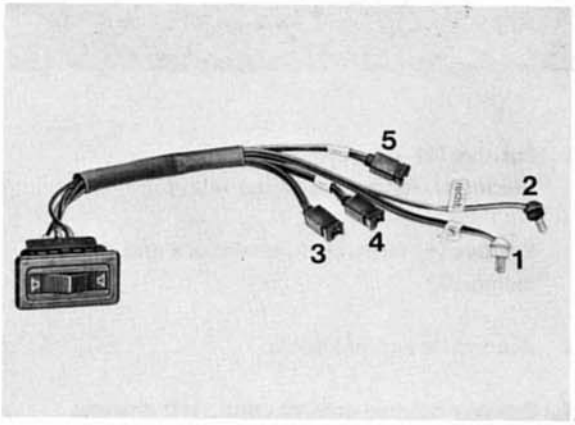
REMOVING AND INSTALLING SPEAKER BALANCE CONTROL

1. Detach speaker balance control in center console by pressing up with a putty knife.



2, Remove radio (Bamberg QTS digital radio). This is done by sliding assembly tool into openings of radio mask plate until it engages. Then pull radio out of center console.

Connections on Speaker Balance Control

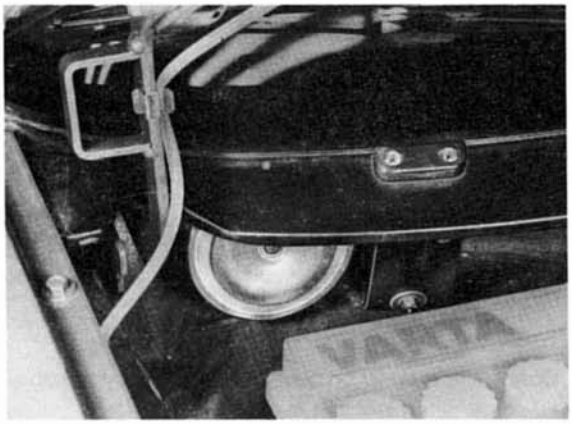


3. Disconnect plugs on radio and detach speaker plugs.

Removing and Installing Alarm Horn

1. Remove battery.

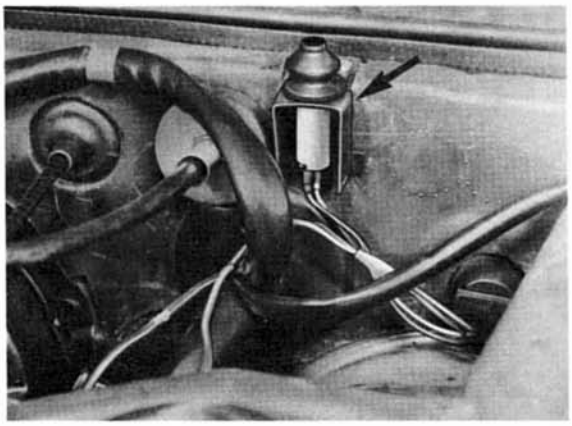
2. Unscrew alarm horn and pull off wire plugs.



Removing and Installing Engine Hood Contact

1. Push contact switch up out of holder

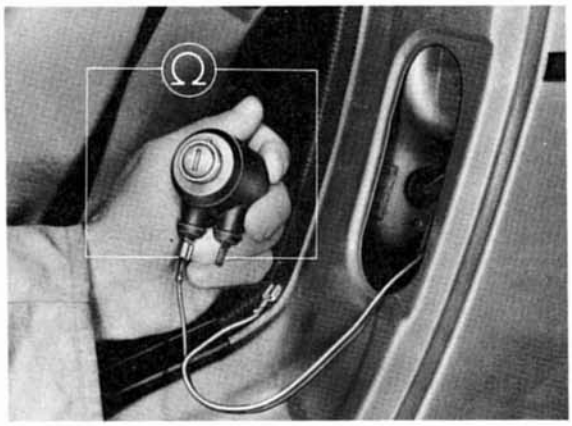
2. Pull off wire plugs.



TROUBLESHOOTING ALARM SYSTEM 924

Checking Alarm Switch

1. Remove alarm switch and measure resistance values between connections.



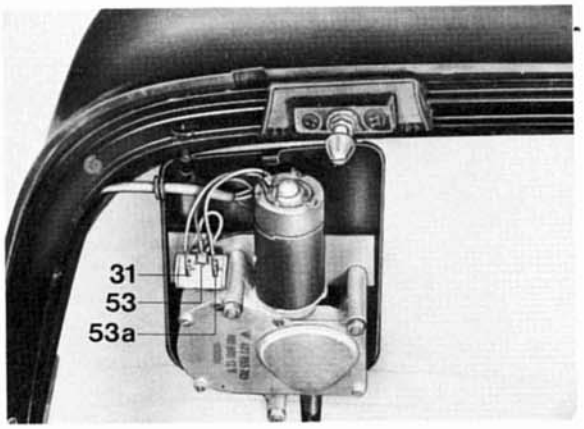
Alarm switch on (key horizontal) = 2 . . . 3 k-ohms.

Alarm switch off (key vertical) = 4 . . . 5.5 k-ohms.

Replace alarm switch when measured resistance is above or below specified values.

2. Insert guide pins in bores of trunk lid frame and mount wiper arm shaft in rear window.

3. Connect wires on wiper motor.



Term. 31 - brown
Term. 53 - green/black
Term. 53a - green

4. Turn rear window wiper motor on and check function.

5. Connect wiper arm on wiper arm shaft and align. Wiper arm should be parallel to car's longitudinal axis in off position.
Torque locknut to 2.0 Nm (1,5 ft lb).

6. Check off position after running wiper briefly on a wet window, correcting if necessary.