SAAB 99

SERVICE MANUAL

M 1975–1980

SAAB

Bin location	Type	Origin	Order No.	Pos. No.
A403P	10	GB	831115 151011	0014

GENUINE PARTS

Part No.	Customer Name
9337536	SHERDLEY HALL GARAGE

Description	Delivered qty.	Ordered qty	B.O. qty.
WATER PUMP	1	1	0

GENUINE PARTS

Bin location	Type	Origin	Order No.	Pos. No.
12E	10	SE	830711 132823	0001

Part No.	Customer Name
8348518	SHERDLEY HALL GARAGE

Description	Delivered qty.	Ordered qty	B.O. qty.
GASKET	2	2	0

SAAB 99TURBO BOTH FITTED AT 32,000mls.

CHASSIS Nº 99771008075 99GL.
ENGINE Nº B20P01. 0114878

SERVICE MANUAL

CHASSIS Nº 99803000 9021 99TURBO.
ENGINE Nº B5120P05001518

SAAB 99

MODEL1975–1980

Ordering No. 314914

SAAB–SCANIA AKTIEBOLAG
SAAB Car Division

NYKÖPING SWEDEN

FOREWORD

This Service Manual has been compiled for the use of service workshop as an aid to service and repair work which, we hope, will enable all concerned to do at thorough and correct job. The recommendations and directions contained in this Manual are based on experience gained up to date. As fresh experience becomes available, the relevant information will be passed on to Saab general agents and authorized service workshops in the form of "Service Information" (SI). These should be filed in the special binder "Service Information Saab 99".

The Service Manual is supplied in paperback edition with holes and should be inserted in the binder.

Like the Spare Parts Catalogue, the Service Manual is arranged in groups according to the same system as used in the Repair Catalogue issued by the Swedish Automobile Servicing and Retailing Employer's Association.

Each group begins with a brief design description followed by detailed descriptions of the service work relevant to that troup.

Technical data such as dimensions, tolerances, tightening torques, etc. are listed in Group 0.

SAAB–SCANIA AKTIEBOLAG
Saab Car Division
NYKÖPING
SWEDEN

Produktion: Tekniska Publikationer, Saab-Scania, Trollhättan.
Tryck: Gotab, Kungälv

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EXTERIOR, SAAB 99 GL

GENERAL

CHASSIS AND ENGINE NUMBERS

The illustrations below show the location of the chassis and engine numbers. For positive identification of a car or engine, these numbers and the odometer reading of the car must always be quoted in connection with complaints and other correspondence. When a car is fitted with a replacement engine, the number of the old engine must always be die-stamped in the place provided for the purpose. This is most important in order to avoid any complications if the car in question is later taken abroad.

CHASSIS NUMBERS

The chassis number consists of eleven digits. The meaning of the digits is shown in the following example:

99 75 2 000 001

Car model — 99
Year of model — 75
Place of manufacture: — 2
2 = Trollhättan (Sweden)
3 = Arlöv
6 = Nystad (Finland)
7 = Malines (Belgium)
Serial number. Each model year begins with 000 001. — 000 001

Cars made in Sweden

Trollhättan:

Model 1975: Chassis No. 99752000001–99752041733
Model 1976: Chassis No. 99762000001–99762040165
Model 1977: Chassis No. 99771000001–99771036086
Chassis No. 99772000001–99772008024
Model 1978: Chassis No. 99781000001–99781027837
Chassis No. 99782000001–99782011345
Model 1979: Chassis No. 99791000001–99791001493
Chassis No. 99792000001–99792006401
Model 1980: Chassis No. 99801
Chassis No. 99802

Arlöv:

Model 1978: Chassis No. 99783000001–99783002208
Model 1979: Chassis No. 99793000001–99793010090
Model 1980: Chassis No. 99803 TURBO'

Cars made in Finland

Model 1975: Chassis No. 99756000001–99756016176
Model 1976: Chassis No. 99766000001–99766018032
Model 1977: Chassis No. 99776000001–99776018461
Model 1978: Chassis No. 99786000001–99786013650
Model 1979: Chassis No. 99796000001–99796008264
Model 1980: Chassis No. 99806

Cars made in Belgium

Model 1975: Chassis No. 99757000001–99757006197
Model 1976: Chassis No. 99767000001–99767007740
Model 1977: Chassis No. 99777000001–99777004788
Model 1978: Chassis No. 99787000001–99787001800

MODEL VARIANTS

Model 1975:
Saab 99, 99 L, 99 EMS and 99 L Combi Coupé
As from model 1976:
Saab 99 L, 99 GL, 99 EMS, 99 GL Combi Coupé and 99 GLE.

ENGINE NUMBER

B 20 P01 000 001

Engine type: — B
"B"–gasoline engine, one carburetor
"BI"–gasoline engine, mechanical injection
"BT"–gasoline engine, twin carburetor
BSI – petrol engines, Turbo, mechanical injection
Cylinder volume in dl — 20

Model 1975 — P01
P01 Manual transmission, Europe
P02 Automatic transmission, Europe
P03 Automatic transmission, USA Federal
P04 Manual transmission, USA West
P05 Automatic transmission, USA West
P06 Manual transmission, USA Federal

Model 1976 — P01
P01 Manual transmission, Europe
P02 Automatic transmission, Europe (excl. Sweden)
P03 Automatic transmission, USA Federal
P03 Automatic transmission, Sweden "BT"
P04 Manual transmission, USA West
P05 Automatic transmission, USA West
P06 Manual transmission, USA Federal
P07 Automatic transmission, Sweden "BI"

Model 1977 — P01
P01 Manual transmission, Europe (excl. Sweden "B" and "BT")
P02 Automatic transmission, Europe (excl. Sweden)
P03 Manual transmission, Sweden "B"
P03 Automatic transmission, Sweden "BT"'
P03 Automatic transmission, USA Federal
P04 Manual transmission, Sweden "BT"
P04 Manual transmission,

000001

USA California
P05 Automatic transmission,
USA California
P06 Manual transmission,
USA Federal
P07 Automatic transmission,
Sweden "BI"
P01 Manual transmission,
Europe
P02 Automatic transmission,
Europe
P03 Automatic transmission,
USA Federal — Model 1979
P04 Manual transmission,
USA California
P06 Manual transmission,
USA Federal
P01 Manual transmission,
Europe
P02 Automatic transmission,
Europe
P03 Automatic transmission,
Sweden — Model 1980
P04 Manual transmission,
USA "BI"
P05 Manual transmission,
Europe "BSI" TURBO
Serial number 6 figures

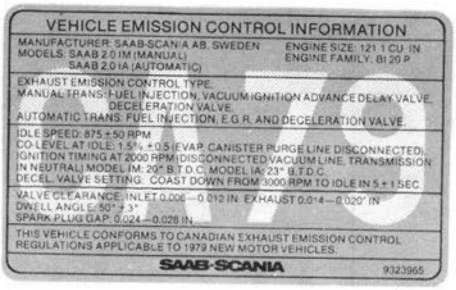
GEARBOX DESIGNATION (AS FROM 1979 MODEL).

G 3 4 4 01

Model (G = mechanical gear change) — G
Design (refers to engine combination) — 3
No. of forward gears — 4
Primary gear ratio (see table) — 4
Development stage, variant — 01

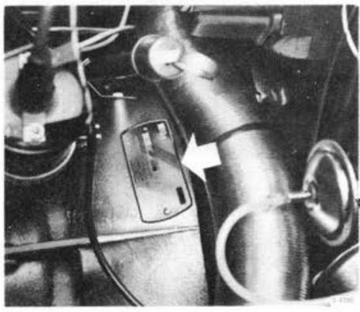
Primary gear	Ratio designation 4	5	6	7
No. of teeth in/ No. of teeth out	31/30	30/27	31/26	32/25
Ratio	0.97	0.90	0.84	0.78

As from 1979 model Standard G 344 01 (4-speed)
As from 1979 model Turbo G 446 01 (4-speed)
As from 1980 model Turbo G 457 01 (5-speed)

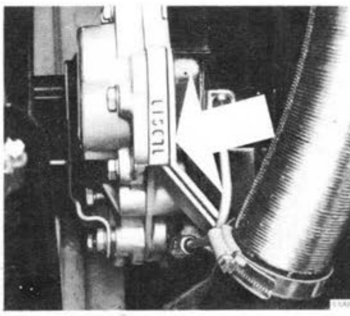


Exhaust emission control data

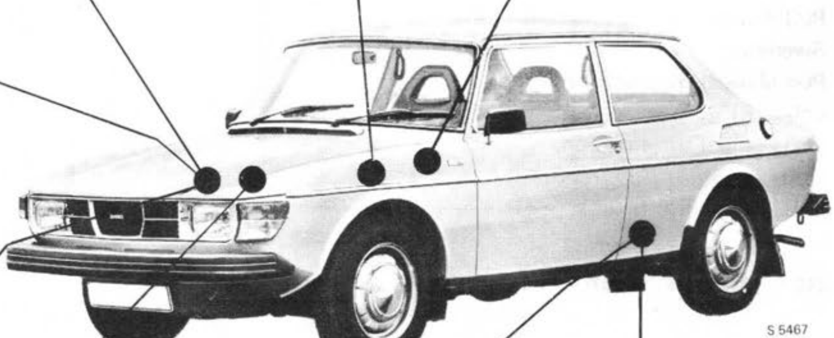
Color code and chassis number sign



Gear box number, automatic transmission



Gear box number, manual transmission, up to and incl. gear box No. 817.000



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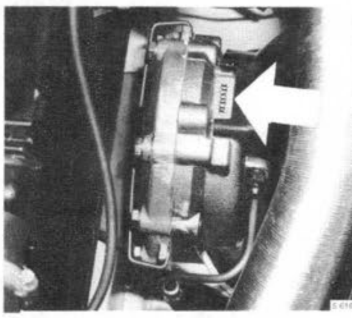
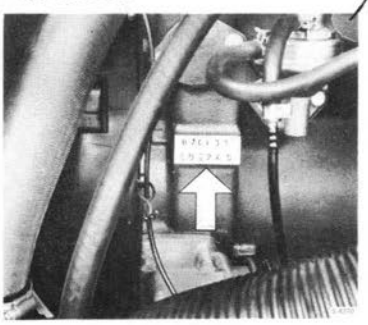
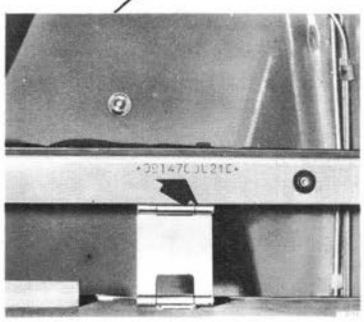


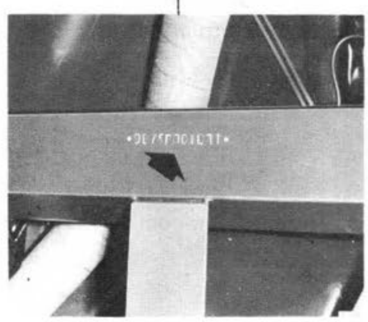
Gear box number, manual transmission, as from gear box No. 900.001 resp. S 00001



Engine number



Chassis number punched in car body, 2-door model (Placed under back seat cushion)



Chassis number punched in car body, 4-door model (Placed under back seat cushion)

GENERAL DATA

Model 1975

	Saab 99, 99 L and 99 EMS	Saab 99 L Combi Coupé
Overall length incl. bumpers	14' 6" (4420 mm)	14' 10.4" (4530 mm)
Overall width	5' 6.5" (1690 mm)	5' 6.5" (1690 mm)
Overall height (empty)	4' 8.5" (1440 mm)	4' 8.5" (1440 mm)
Road clearance (curb weight)	6.75" (175 mm)	6.75" (175 mm)
Track, front wheels	4' 6.75" (1390 mm) (Saab 99 EMS: 4' 7.25" (1400 mm)	4' 6.75" (1390 mm)
Track, back wheels	4' 7.75" (1410 mm) (Saab 99 EMS: 4' 8.25" (1420 mm)	4' 7.75 " (1410 mm)
Wheelbase	8' 1.5" (2473 mm)	8' 1.5" (2473 mm)
Turning radius	17' 5" (5.3 m)	17' 5" (5.3 m)
Curb weight (incl. fuel, coolant, tools, spare wheel)	2510–2690 lb (1140–1220 kg)	2600–2670 lb (1180–1210 kg)
Max. loaded vehicle weight	3460–3640 lb (1570–1650 kg)	3620–3690 lb (1640–1670 kg)
Load carrying capacity	950 lb (430 kg) Which means 5 persons plus 180 lb (80 kg) in luggage compartment	1020 lb (460 kg) Which means 5 persons plus 250 lb (110 kg) in luggage compartment
Weight distribution:		
Curb weight	Front 60–62 %	Front 58–60 %
Gross weight	Front 52–53 %	Front 49–50 %
No. of seats (incl. driver)	5	5
Trunk volume (SAE)	11.8 cu.ft. (347 dm^3)	13.5 cu.ft. (381 dm^3)
Max. roof rack load	220 lb (100 kg)	220 lb (100 kg)
Max. trailer weight	2650 lb (1200 kg)	2650 lb (1200 kg)

Model 1976

	Saab 99 L, 99 GL and 99 EMS	Saab 99 GL Combi Coupé
Overall length incl. bumpers	14' 6" (4420 mm)	14' 10.4" (4530 mm)
Overall width	5' 6.5" (1690 mm)	5' 6.5" (1690 mm)
Overall height (empty)	4' 8.5" (1440 mm)	4' 8.5" (1440 mm)
Road clearance (curb weight)	6.75" (175 mm)	6.75" (175 mm)
Track, front wheels	4' 7.25" (1400 mm) (Saab 99 L: 4' 6.25"/1390 mm)	4' 7.25" (1400 mm)
Track, back wheels	4' 8.25" (1420 mm) (Saab 99 L: 4' 7.75"/1410 mm)	4' 8.25" (1420 mm)
Wheelbase	8' 1.5" (2473 mm)	8' 1.5" (2473 mm)
Turning radius	17' 5" (5.3 m)	17' 5" (5.3 m)
Curb weight (incl. fuel, coolant, tools, spare wheel)	2540–2650 lb (1150–1200 kg)	2620–2650 lb (1190–1200 kg)
Max. loaded vehicle weight	3490–3600 lb (1580–1630 kg)	3640–3670 lb (1650–1660 kg)
Load carrying capacity	950 lb (430 kg) Which means 5 persons plus 180 lb (80 kg) in luggage compartment	1020 lb (460 kg) Which means 5 persons plus 250 lb (110 kg) in luggage compartment
Weight distribution:		
Curb weight	Front 60–62 %	Front 58–60 %
Gross weight	Front 52–53 %	Front 49–50 %
No. of seats (incl. driver)	5	5
Trunk volume (SAE)	11.8 cu.ft. (338 dm^3)	13.5 cu.ft. (381 dm^3)
Max. roof rack load	220 lb (100 kg)	220 lb (100 kg)
Max. trailer weight	3300 lb (1500 kg)	3300 lb (1500 kg)

Model 1977

	Saab 99 L, 99 GL, 99 GLE and 99 EMS	Saab 99 GL Combi Coupé
Overall length incl. bumpers	14' 6" (4420 mm)	14' 10.4" (4530 mm)
Overall width	5' 6.5" (1690 mm)	5' 6.5" (1690 mm)
Overall height (empty)	4' 8.5" (1440 mm)	4' 8.5" (1440 mm)
Road clearance (curb weight)	6.75" (175 mm)	6.75" (175 mm)
Track, front wheels	4' (7.25" (1400 mm)	4' 7.25" (1400 mm)
Track, back wheels	4' 8.25" (1420 mm)	4' 8.25" (1420 mm)
Wheelbase	8' 1.5" (2473 mm)	8' 1.5" (2473 mm)
Turning radius	17' 5" (5.3 m)	17' 5" (5.3 m)
Curb weight (incl. fuel, coolant, tools, spare wheel)	2520–2690 lb (1140–1200 kg)	2600–2780 lb (1180–1260 kg)
Max total weight	3510–3660 lb (1590–1660 kg)	3600–3750 lb (1630–1700 kg)
Weight distribution front:		
Curb weight	60.0–61.5 %	57.5–59.5 %
Max total weight	51.0–52.5 %	49.0–50.5 %
No. of seats (incl. driver)	5	5
Luggage compartment volume (SAE)	11.9 cu.ft. (0.338 m^3)	13.5 cu.ft. (0.381 m^3)
Recommended load carrying capacity in luggage compartment:		
With 5 passenger à 150 lb (70 kg)	180 lb (80 kg)	180 lb (80 kg)
For each reduction of the number of passengers in the rear seat the load can be increased with	70 lb (30 kg)	70 lb (30 kg)
Recommended load carrying capacity with dropped back seat	480 lb (220 kg)	480 lb (220 kg)
Max. roof rack load	220 lb (100 kg)	220 lb (100 kg)
Max. trailer weight	3.300 lb (1500 kg)	3300 lb (1500 kg)

Model 1978

	Saab 99 Sedan Models	Saab 99 Combi Coupé Models
Overall length incl. bumpers	14' 6" (4420 mm)	14' 10.4" (4530 mm)
Overall width	5' 6.5" (1690 mm)	5' 6.5" (1690 mm)
Overall height (curb weight)	4' 8.5" (1440 mm)	4' 8.5" (1440 mm)
Road clearance (curb weight)	6.75" (175 mm)	6.75" (175 mm)
Track, front wheels	4' 7.25" (1400 mm)	4' 7.25" (1400 mm)
Track, back wheels	4' 8.25" (1420 mm)	4' 8.25" (1420 mm)
Wheelbase	8' 1.5" (2473 mm)	8' 1.5" (2473 mm)
Turning radius	17' 5" (5.3 m)	17' 5" (5.3 m)
Curb weight (incl. fuel, coolant, tools, spare wheel)	2490–2620 lb (1130–1190 kg)	2600–2760 lb (1180–1250 kg)
Max total weight	3480–3620 lb (1580–1640 kg)	3570–3750 lb (1620–1700 kg)
Weight distribution front:		
Curb weight	60.5–62.0 %	57.5–59.5 %
Max total weight	51.0–52.5 %	49.0–50.5 %
No. of seats (incl. driver)	5	5
Luggage compartment volume (SAE):	12.6 cu.ft. (0.356 m^3)	
With parcel shelf		12.4 cu.ft. (0.350 m^3)
Parcel shelf removed		15.4 cu.ft. (0.435 m^3)
Additional space under luggage compartment floor		1.1 cu.ft. (0.030 m^3)
Recommended load carrying capacity in luggage compartment:		
With 5 passenger à 150 lb (70 kg)	180 lb (80 kg)	180 lb (80 kg)
For each reduction of the number of passengers in the rear seat the load can be increased with	70 lb (30 kg)	70 lb (30 kg)
Recommended load carrying capacity with dropped back seat	480 lb (220 kg)	480 lb (220 kg)
Max. roof rack load	220 lb (100 kg)	220 lb (100 kg)
Max. trailer weight	3300 lb (1500 kg)	3300 lb (1500 kg)

Model 1979

	Saab 99 Sedan models	Saab 99 Combi Coupé models
Overall length incl. bumpers	14' 6" (4420 mm) (later production 14' 8.2" (4477 mm)	14' 10.4' (4530 mm)
Overall width	5' 6.5" (1690 mm)	5' 6.5" (1690 mm)
Overall height (curb weight)	4' 8.5" (1440 mm)	4' 8.5" (1440 mm)
Road clearance (curb weight)	6.75" (175 mm)	6.75" (175 mm)
Track, front wheels	4' 7.25" (1400 mm) (Turbo 4' 7.75" 1410 mm)	4' 7.25" (1400 mm) (Turbo 4' 7.75" 1410 mm)
Track, back wheels	4' 8.38" (1430 mm) (Turbo 4' 8.5" 1440 mm)	4' 8.38" (1430 mm) (Turbo 4' 8.5" 1440 mm)
Wheelbase	8' 1.5" (2473 mm)	8' 1.5" (2473 mm)
Turning radius	17' 5" (5.3 m)	17' 5" (5.3 m)
Curb weight (incl. fuel, coolant, tools, spare wheel and 150 lb. driver)	2645–2755 lb. (1200–1250 kg)	2711–2910 lb. (1230–1320 kg)
Max. total weight	3549–3615 lb. (1610–1640 kg)	3549–3725 lb. (1610–1690 kg)
Weight distribution, front		
Curb weight	60–61 %	58–59 %
Max. total weight	51–52 %	49–50 %
No. of seats (incl. driver)	5	5
Luggage compartment volume (SAE)	12.6 cu.ft. (0.356 m^3)	12.6 cu. ft. (0.356 m^3) with parcel shelf 15.3 cu.ft (0.435 m^3) without parcel shelf
Recommended load carrying capacity in luggage compartment:		
With 4 passengers à 150 lb. (70 kg)	180 lb. (80 kg)	180 lb. (80 kg)
For each passenger less in the rear seat the load can be increased by	70 lb. (30 kg)	70 lb. (30 kg)
Recommended load carrying capacity with rear seat squab down	485 lb. (220 kg)	485 lb. (220 kg)
Max. roof rack load	220 lb. (100 kg)	220 lb. (100 kg)
Max. trailer weight	3300 lb. (1500 kg)	3300 lb. (1500 kg)

Model 1980

	Saab 99 Sedan models
Overall length incl. bumpers	14' 8.25" (4470 mm)
Overall width	5' 6.5" (1690 mm)
Overall height (curb weight)	4' 8.5" (1440 mm)
Road clearance (curb weight)	6.75" (175 mm)
Track, front wheels	4' 7.25" (1400 mm) (Turbo 4' 7.75" (1410 mm))
Track, back wheels	4' 8.38" (1430 mm) (Turbo 4' 8.5" (1440 mm))
Wheelbase	8' 1.5" (2473 mm)
Turning radius	17' 5" (5.3 mm)
Curb weight (incl. fuel, coolant, tools, spare wheel and 150 lb. driver)	2545–2733 lb. (1200–1240 kg)
Max. total weight	3482–3571 lb. (1580–1620 kg)
Weight distribution, front	
Curb weight	60–61 %
Max. total weight	51–52 %
No. of seats (incl. driver)	5
Luggage compartment volume (SAE)	12.6 cu.ft. (0.356 m^3)
Recommended load carrying capacity in luggage compartment:	
With 4 passengers à 150 lb. (70 kg)	180 lb. (80 kg)
For each passenger less in the rear seat the load can be increased by	70 lb. (30 kg)
Recommended load carrying capacity with rear seat squab down	485 lb. (220 kg)
Max. roof rack load	220 lb. (100 kg)
Max. trailer weight	3300 lb. (1500 kg)

SPECIFICATIONS

Engine

GENERAL DATA

	Single-carbureted engine	Twin-carbureted engine
Type	4-cyl., 4-stroke with overhead camshaft	4-cyl., 4-stroke with overhead camshaft
Power rating, DIN (SAE net)	73 kW (100 hp)/5,200 rev/min	79 kW (108 hp)/5,200 rev/min
Max. torque, DIN	162 Nm (119 ft.lb., 16.5 kpm)/ 3,500 rev/min	164 Nm (121 ft.lb., 16.7 kpm)/ 3300 rev/min
Compression ratio	9.2:1	9.2:1
Cylinder bore	3.543" (90.0 mm)	3.543" (90.0 mm)
Stroke	3.071" (78.0 mm)	3.071" (78.0 mm)
Cylinder volume	121.0 cu.in. (1985 cm^3)	121.0 cu.in. (1985 cm^3)
Ordering of firing (No. 1 at rear)	1–3–4–2	1–3–4–2
Engine idling speed (warm engine and headlamps on low beam)	875 ± 50 rev/min	850 ± 50 rev/min
Weight incl. clutch, throttle valve housing, exhaust manifold, starter and oil filter	appr. 308 lb. (140 kg)	appr. 308 lb. (140 kg)
Fuel, octane number, min.	RON 97	RON 97

	Injection engine	Turbo engine
Type	4-cyl., 4-stroke with overhead camshaft	4 cyl., 4-stroke with overhead camshaft.
Power rating, DIN (SAE net)	87 kW (118 hp)/5,500 rev/min	107 kW (145 hp)/5,000 r.p.m.
Max. torque, DIN	167 Nm (123 ft.lb., 17.0 kpm)/ 3,700 rev/min	235 Nm (24 kpm)/3,000 r.p.m.
Compression ratio	9.2:1	7.2:1
Cylinder bore	3.543" (90.0 mm)	90 mm
Stroke	3.071" (78.0 mm)	78 mm
Cylinder volume	121.0 cu.in. (1985 cm^3)	121.0 cu. in. (1,985 cm^3)
Ordering of firing (No. 1 at rear)	1–3–4–2	1–3–4–2
Engine idling speed (warm engine and headlamps dipped).	850 ± 50 rev/min	875 ± 50 r.p.m.
Weight incl. clutch, throttle housing, exhaust manifold, starter and oil filter	appr. 308 lb. (140 kg)	approx. 308 lb. (140 kg)
Fuel, octane number, min.	RON 97	RON 97

CYLINDER BLOCK

Material	Specially alloyed cast iron
No. of main bearings	5
Cylinder bore:	
Standard (A)	90.000–90.010 mm
–"– (B)	90.010–90.020 mm
1st oversize	90.500 mm
2nd oversize	91.000 mm

CYLINDER HEAD

Max. grinding or facing of cylinder head surface	0.4 mm
Distance from cylinder head gasket to valve cover gasket surface, new cylinder head	92.75 ± 0.05 mm

PISTONS

Make	"MAHLE" or "KARL SCHMIDT" Pistons of different makes must not be fitted in the same engine.
Material	Light metal alloy
No. of rings per piston	2 compression rings 1 oil scraper (3-piece)
Width of ring grooves:	
Top	1.79–1.81 mm
Middle	2.03–2.05 mm
Bottom	4.01–4.03 mm
Piston diameter (measured 0.79"/20 mm from lower edge perpendicular to piston pin):	
Standard (AB)	89.980–89.986 mm
–"– (C)	89.999–90.010 mm
1st oversize	90.472–90.487 mm
2nd oversize	90.972–90.987 mm
Piston clearance	0.014–0.040 mm
Withdrawal of piston	From top of block
Piston orientation	Groove on top should be facing the engine transmission end
Pin diameter	23.996–24.000 mm
Fit of pin	0.005–0.014 mm Sliding fit under gentle pressure with thumb
Piston speed (average speed)	13 m/sec. at 5000 rev/min

PISTON RINGS

<u>Upper compression ring</u>:	
Thickness	1.73–1.75 mm
Gap, fitted in new cylinder	0.35–0.55 mm
Piston ring play in groove	0.050–0.082 mm
<u>Lower compression ring</u>:	
Thickness	1.98–1.99 mm
Gap, fitted in new cylinder	0.30–0.45 mm
Piston ring play in groove	0.040–0.072 mm
<u>Oil scraper</u>:	
Thickness (segment)	0.58–0.64 mm
Gap fitted in new cylinder (segment)	0.38–1.40 mm
Thickness, middle ring	2.63–2.73 mm

CONNECTING RODS

Material	Forged steel
Big-end bore	56.000–56.019 mm
Small-end bushing, installed	24.005–24.010 mm
Maximum allowed weight difference between connecting rods in same engine	6 g

CRANKSHAFT

Material	Forged steel	
Surface treatment	Tennifer-coated	
Pin hardness	HV appr. 800	
No. of main bearings	5	
Crank pin diameter:		
Standard	51.981–52.000 mm	
1st undersize	51.731–51.750 mm	
2nd undersize	51.481–51.500 mm	
3rd undersize	51.237–51.250 mm	
4th undersize	50.987–51.000 mm	
Main bearing pin diameter:		
Standard	57.981–58.000 mm	
1st undersize	57.731–57.750 mm	
2nd undersize	57.481–57.500 mm	
3rd undersize	57.237–57.250 mm	
4th undersize	56.987–57.000 mm	
Radius at pin end	2.2–2.5 mm	
Max. out-of-round of pins	0.05 mm	
Max. conicity of pins	0.05 mm	
Bearing material	Lead-bronze	
Crankshaft axial play	0.08–0.28 mm	
Main bearing play	0.020–0.062 mm	
Crank bearing play	0.026–0.062 mm	
Colour marks, main and crank bearing halves:	Thin	Thick
Standard	Red	Blue
1st undersize	Yellow	Green
2nd undersize	White	Brown

CAMSHAFT

	Carbureted engines, model 1975	Carbureted engine, as from model 1976
Number of bearings	5	5
Bearing diameter	Up to and incl. engine number B20PO1 45992 and B20PO2 10500: 25.94 mm With effect from engine number B20PO1 45993 and B20PO2 10501: 28.94 mm	28.94 mm
Camshaft axial play	0.08–0.25 mm	0.08–0.25 mm
Camlifting height at valve clearance 0:		
Inlet valve	10.4 mm	10.3 mm
Exhaust valve	10.6 mm	10.5 mm
Valve timing:		
Inlet (nominal valve clearance)	starts 12° BTDC ends 56° ABDC	starts 10° BTDC ends 54° ABDC
Exhaust (nominal valve clearance)	starts 56° BBDC ends 12° ATDC	starts 54° BBDC ends 10° ATDC

	Fuel-Injection engines	Turbo engine
Number of bearings	5	5
Bearing diameter	28.94 mm	28,94 mm
Camshaft axial play	0.08–0.25 mm	0.08–0.25 mm
Camlifting height at valve clearance 0:		
Inlet valve	10.7 mm	10.3 mm
Exhaust valve	11.0 mm	10.5 mm
Valve timing:		
Inlet (nominal valve clearance)	starts 10° BTDC ends 54° ABDC	starts 12° BTDC ends 40° ABDC
Exhaust (nominal valve clearance)	starts 46° BBDC ends 18° ATDC	starts 62° BBDC ends 2° ATDC

VALVE MECHANISM

Valve grinding angle, inlet and outlet	44,5°	
Valve seat angle in cylinder head, inlet and outlet	45°	
Valve seat width, inlet and outlet	1–2 mm	
Valve spindle diameter:		
Inlet	7.960–7.975 mm	
Outlet	7.955–7.980 mm	
Max. play valve spindle–valve guide	0.5 mm Measured on valve disc pulled 0.12" (3 mm) from seat	
Valve disc diameter:		
Inlet	42.0 mm	
Outlet	35.5 mm (34.5 mm later design)	
Valve guides:		
Length	46.65 mm	
Outer diameter	13.040–13.051 mm	
Bore for valve guides in cylinder head, diameter	13.000–13.018 mm	
Valve springs:	Model 1975	As from model 1976
Installed length	39.5 mm	39.5 mm
Free length	44.3 mm	43.1 mm
Length at full elevation	29.5 mm	29.5 mm
Load at full elevation	795–880 N (178–198 lb, 81–90 kp)	755–815 N (170–183 lb., 77–83 kp) (N.B. This valve spring (8358467) must only be installed in combination with camshaft 8358186 (carbureted engines as from model 1976) and camshaft 8356057 (injection engines as from model 1975).
Valve depressors:		
Diameter	37.87–37.98 mm	
Height	33 mm	
Bore in cylinder head for valve depressors (camshaft bearing assy.) diameter	38.000–38.016 mm	
Pallets for valve adjustment:		
Diameter	15.5 mm	
Thickness	1.77–2.89 mm There are 23 pallets of different thicknesses at intervals of 0.050 mm	

Material:	
Exhaust valve	Stellited steel Sodium-cooled exhaust valves are installed in cars model 1977 with fuel injection engines, as from engine Nos. BI 20 P01006201, BI 20 P02002615 BI 20 P04003376, BI 20 P05001556 BI 20 P07001001 (and P07000604–P07000625)

> N.B.
> Sodium-cooled valves for scrapping must under no circumstances be mixed with ordinary scrap before they have been specially treated, owing to the risk of explosion. Refer to Section 214 under "Scrapping of sodium-cooled valves".

Inlet valve	Steel (Valve spindles are chromium plated)
Valve guides	Cast iron
Valve seats	Sintered metal
Valve clearances, cold engine (30 minutes after driving the engine warm):	
Inspection tolerance zone:	
Inlet	0.006–0.012" (0.15–0.30 mm)
Exhaust	0.014–0.020" (0.35–0.50 mm) (Turbo 0.016–0.020" (0.40–0.50 mm))
Adjustment tolerance zone:	
Inlet	0.008–0.010" (0.20–0.25 mm)
Exhaust	0.016–0.018" (0.40–0.45 mm) (Turbo 0.018–0.020" (0.45–0.50 mm))
Idler shaft axial play	0.002–0.005" (0.05–0.13 mm)

LUBRICATION SYSTEM

Type	Forced-flow circulating oil system Dual-rotor type oil pump
Pressure-lubricated points	Camshaft, crankshaft, idler shaft, connecting rods, transmission chain
Splash-lubricated points	Piston pins, cylinder walls, valve depressors and valve spindles
Oil filter	Full-flow type
Crankcase ventilation, fully enclosed	From crankcase through valve cover–T-nipple to inlet manifold. The T-nipple is connected to atmospheric pressure via the air cleaner.
Lubricating oil, grade: SAE 10 W 30 or 10 W 40. If no oil meeting these specifications is available, oil with a viscosity of SAE 10 W 50 may be used. (In extremely cold conditions with temperatures constantly below –4°F (–20°C) oil with viscosity rating SAE 5 W 20, 5 W 30 or 5 W 40 should be used. Note! SAE 5 W 20, 5 W 30 or 5 W 40 must not be used at temperatures above +32°F (0°C).	Service SE in API-system or Ford spec. ESE–M2C–101C
Oil volume incl. filter	6 Imp. pints (3.5 liters)
Oil pump pressure-reducing valve opens at	4.0–5.0 bar (kp/cm^2, 57–71 psi.)
Oil pressure warning light comes on at	0.3–0.5 bar (kp/cm^2, 4.2–7.1 psi.)
Oil pressure at 2,000 rev/min (oil SAE 10 W 40 at 80°C)	Min. 3.0 bar (kp/cm^2, 43 psi.)
Oil pump:	
Axial clearance between rotor and housing	0.002–0.003" (0.05–0.09 mm)

FUEL SYSTEM, CARBURETED ENGINE

Single-carburetor

	Up to and incl. model 1976	As from model 1977
Make	Zenith	
Type	175 CD–2S(E)	175 CDSEVX
Diameter	1 3/4"	
Fuel needle	B1DS	
Float level	0.63–0.67 in. (16–17 mm) between the highest point of the float and the mating surface of the carburetor housing	
Float valve	0.08 in. (2.0 mm)	
Oil in carburetor damper	Automatic transmission oil to Ford specification M2C.33F or equivalent	
Quantity of oil in carburetor damper	Min. of 0.040 in. (10 mm) below top of damper	
Clearance between choke fast idling cam and adjustment screw	0.02–0.04" (0.5–1.0 mm) at idling speed without choke	
Normal idling speed (warm engine and headlights dipped).	850 ± 50 rev/min	
CO content:		
Vacuum pipe to distributor, crankcase ventilation hose and, where applicable, the vacuum pipe to the EGR valve disconnected.		
Up to and incl. 1976 model:	max. 3.5 % at 850 r.p.m.	
As from 1977 model EUROPE:	1.5 ± 1 % at 850 r.p.m.	1.0 ± 0.25 %
As from 1977 model SWEDEN:	1.75 ± 0.25 % at 2000 r.p.m.	
Fuel jet setting (adjustable up to and incl. model 1976)	0.098 ± 0.008 in. (2.5 ± 0.2 mm) between upper surface of fuel jet and jet bridge surface in carburetor housing	
Fuel jet installation setting (fixed as from model 1977)		Inserted to a distance of 0.098 in. (2.5 mm) from jet bridge surface
Fuel needle fitting in piston (initial setting for adjustment)	Lower part of groove for plastic washer level with the underside of vacuum piston	
Initial setting for adjustment of fuel needle as from model 1977		Turn the adjustment screw (in vacuum piston) clockwise down to the stop (needle in highest position). Then turn adjusting screw 1 1/2 turns anti-clockwise (initial setting for CO-setting)
Temperature compensator, opening at room temperature (+68°F/+20°C)	0.004–0.012" (0.1–0.3 mm)	

Twin-carburetors

	Up to and incl. model 1976	As from model 1977
Make	Zenith	
Type	150 CD–2S(E)	150 CDSEVX
Diameter	1 1/2"	
Fuel needle	B1DT	B5EJ (as from 1980 model B5EQ)
Float adjustment	0.63–0.67 in. (16–17 mm) between the highest point of the float and the mating surface at the carburetor housing	
Float valve	0.08 in. (2.0 mm)	
Damper oil	Automatic transmission oil to Ford specification M2C.33F or equivalent	
Quantity of oil in damper	Min. 0.39 in. (10 mm) under the upper part of the damper cylinder	
Clearance between fast idle cam and adjustment screw	0.04 in. (1 mm)	
Normal idling speed (warm engine and headlamps on low beam)	850 ± 50 rev/min	
CO content:		
Vacuum pipe to distributor, crankcase ventilation hose and, where applicable, the vacuum pipe to the EGR valve disconnected.		
1975 model	max. 3.5 % at 850 r.p.m.	
As from 1977 model EUROPE:	1.5 ± 1 % at 850 r.p.m.	
As from 1977 model SWEDEN:	1.0 ± 0.25 % at 2000 r.p.m.	
Fuel jet setting (adjustable up to and incl. model 1976)	0.098 ± 0.008 in. (2.5 ± 0.2 mm) between upper surface of fuel jet and jet bridge surface in carburetter housing	
Fuel jet installation setting (fixed as from model 1977)		Inserted to a distance of 0.098 in. (2.5 mm) from jet bridge surface
Fuel needle fitting in the piston (initial position when adjusting)	Lower part of groove for plastic washer appr. 0.016 in. (0.4 mm) below bottom of vacuum piston	
Initial setting for adjustment of fuel needle as from model 1977		Turn the adjustment screw (in vacuum piston) clockwise down to the stop (needle in highest position). Then turn adjusting screw 1 1/2 turns anti-clockwise (initial setting for CO-setting)
Temperature compensator opening at room temperature (+68°F/+20°C)	0.004–0.012 in. (0.1–0.3 mm)	
Return spring for vacuum piston, color	Blue	

Others

Fuel pump (mechanical) type	AC Delco No. 7990045
Static fuel pressure at starter speed	0.17–0.25 bar (kp/cm^2, 2.4–3.6 psi.)
Fuel tank capacity	12.1 Imp. gal. (55 liters)

FUEL SYSTEM, INJECTION ENGINE

Components

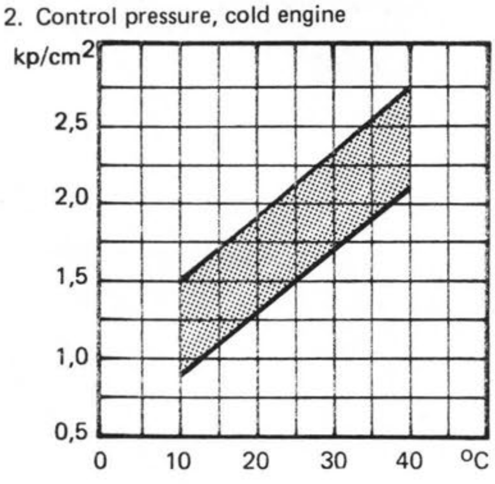
Injection valve	Bosch 0 437 502 004	(As from 1980 model 0 437 502 012)
Cold start valve	Bosch 0 280 170 401	
Mixture control unit:		
Up to and incl. model 1976	Bosch 0 438 040 004	
Model 1977	Bosch 0 438 040 034	
As from model 1978	Bosch 0 438 040 049	(Turbo 0 438 040 041)
Air flow sensor:		
Up to and incl. model 1976	Bosch 0 438 120 013	
Model 1977	Bosch 0 438 120 046	
As from model 1978	Bosch 0 438 120 071	(Turbo 0 438 120 087)
Fuel distributor:		
Up to and incl. model 1977	Bosch 0 438 100 005	
As from model 1978	Bosch 0 438 100 023	(Turbo 0 438 100 057)
Warm up regulator, up to and incl. model 1976	Bosch 0 438 140 013	
Warm up regulator, as from model 1977	Bosch 0 438 140 020	(Turbo as from 1980 model 0 438 140 070)
Auxiliary air valve	Bosch 0 280 140 107	
Fuel filter, up to and incl. 1978 model	Bosch 0 450 905 005	
Fuel filter as from 1979 model	Bosch 0 450 905 021	
Fuel accumulator:		
Up to and incl. model 1977	Bosch 0 438 170 001	
1978 model	Bosch 0 438 170 014	
As from 1979 model	Bosch 0 438 170 010	
Fuel pump:		
Up to and incl. model 1977 (ca)	Bosch 0 580 254 994	
As from model 1978 (ca)	Bosch 0 580 254 978	
Termo time switch:		
Up to and incl. model 1977*)	Bosch 0 280 130 214	
As from model 1977**)	Bosch 0 280 130 217	

*) Up to and incl. engine number: B120 P01–8201, B120 P02–3301, B120 P07–1626
**) As from engine number: B120 P01–8202, B120 P02–3302, B120 P07–1627

Test values

1. Fuel pump, capacity. (minimum flow against system pressure, i.e. measured in the return pipe).
   Up to and including 1977 model 750 cm^3/30 sec.
   As from 1978 model 900 cm^3/30 sec.

2. Control pressure, cold engine



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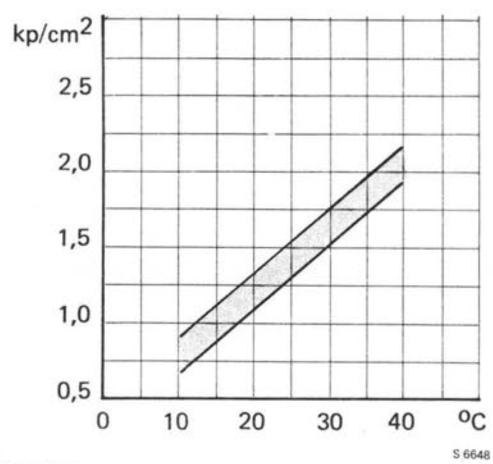

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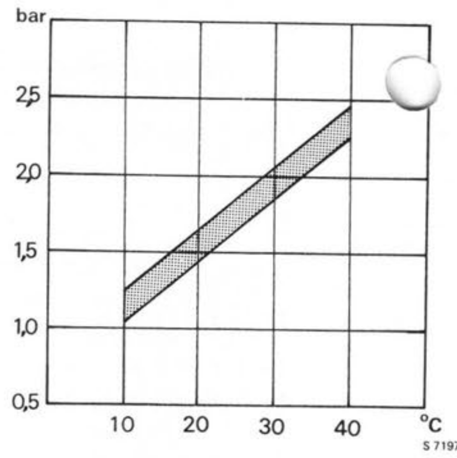


0 438 140 070

SAAB

3. Control pressure, warm engine	3.4–3.8 bar (≈ kp/cm^2, 48.5–54.0 psi.)
4. Control pressure, fully-laden Turbo 1978–1979 models:	
– throttle valve switch activated (62^o throttle opening)	2.5–2.9 bar (≈ kp/cm^2, 35.6–41.2 psi.)
– Speed function (80 m.p.h. (130 km/h)	2.5–2.9 bar (≈ kp/cm^2, 35.6–41.2 psi.)
1980 model:	
– Throttle valve switch activated (62^o throttle opening)	2.5–2.9 bar (≈ kp/cm^2, 35.6–41.2 psi.)
– Simulated charging pressure over 0.33–0.40 bar	2.5–2.9 bar (≈ kp/cm^2, 35.6–41.2 psi.)
5. Line pressure:	
Test value	4.5–5.1 bar (≈ kp/cm^2, 64.0–72.5 psi.) (Turbo 5.2–5.8 bar (≈ kp/cm^2, 74–82.5 psi.)
Setting value	4.7–4.9 bar (≈ kp/cm^2, 66.9–69.7 psi.) (Turbo 5.4–5.6 bar (≈ kp/cm^2, 76.8–79.7 psi.)
6. Leakage check:	
Minimum pressure after 20 minutes	1.0 bar (≈ kp/cm^2, 14.2 psi.)
As from 1978 model	1.5 bar (≈ kp/cm^2, 21.3 psi.)
7. Injection valve:	
Opening pressure up to and including date code 828 (1978)	2.5–3.6 bar (≈ kp/cm^2, 35.6–49.8 psi.)
Opening pressure as from date code 829 (≈ 1979 model)	2.7–3.8 bar (≈ kp/cm^2, 38.4–54 psi.)
Opening pressure ≈ 1980 model	3.0–4.1 bar (≈ kp/cm^2, 42.6–58.3 psi.)
Maximum variation between injection valves in same engine	0.6 bar (≈ kp/cm^2, 8.5 psi.)
8. Leakage check, injection valve	The system should maintain a pressure of 2.4 bar (≈ kp/cm^2, 34.1 psi.) for 15 sec.
9. Idling speed setting (warm engine and dipped headlights):	
RPM	875 ±50
CO content:	
– Up to and including 1976 model	Max. 3.5 %
– EUROPE as from 1976 model	1.5 ± 1 %
– SWEDEN as from 1976 model	1.5 ± 0.5 %

Tightening torques

Air flow sensor:	
Stop bracket retaining screws	4.7–5.3 Nm (3.4–3.8 ft.lb., 47–53 kpcm)
Counterweight retaining screw	4.7–5.3 Nm (3.4–3.8 ft.lb., 47–53 kpcm)
Air flow sensor plate retaining screw	5.0–5.5 Nm (3.6–4.0 ft.lb., 50–55 kpcm)
Fuel distributor retaining screws	3.2–3.8 Nm (2.3–2.7 ft.lb., 32–38 kpcm)
Line pressure regulator screw plug	13–15 Nm (9.4–10.8 ft.lb., 130–150 kpcm)
M 8 bolt	10–12 Nm (7.2–8.7 ft.lb., 100–120 kpcm)
M 10 bolt	13–15 Nm (9.4–10.8 ft.lb., 130–150 kpcm)
M 12 bolt	20–24 Nm (14.4–17.4 ft.lb., 200–240 kpcm)
M 14 bolt	15–20 Nm (10.8–14.4 ft.lb., 150–200 kpcm)
M 12 cap nut	15–20 Nm (10.8–14.4 ft.lb., 150–200 kpcm)
M 14 cap nut	25–30 Nm (18.1–21.8 ft.lb., 250–300 kpcm)

Turbo system

Turbo compressor make	Garrett AiResearch
Maximum charging pressure (see Measuring the charging pressure)	0.70±0.05 bar (kp/cm^2, 12.8±1.4 psi.)
Approximate length of spring in charge pressure regulator (basic setting	Approx. 18 mm (0.708 in.)
Pressure switch actuating pressure	0.9±0.1 bar (kp/cm^2, 12.8±1.4 psi.)
Play, turbo shaft bearings:	
Axial play	0.025–0.10 mm
Radial play	0.075–0.18 mm

Fuel boosting device, 1979 model:	
Type	Control of line pressure (CI system) using throttle valve switch and speed transmittor
Throttle valve switch (throttle opening when switch closes)	62° approx.
Speed transmitter (closing speed)	80±3 m.p.h. (130±5 km/h)
Pressure regulator (reduced control pressure)	2.5–2.9 bar (kp/cm², 35–41.2 psi.)
CO value with throttle valve switch depressed (CO value at idling speed set at 1.0–2.0 %)	4–6 % CO approx.
Fuel boosting device as from 1980 model:	
Type	Charging pressure activated fulload boosting. (Warm-up regulator and special control system)
Warm-up regulator	
Simulated charging pressure when the control pressure is reduced	0.33–0.40 bar (kp/cm², 4.7–5.7 psi.)
Reduced control pressure (with charging pressure over 0.4 bar (5.7 psi.)	2.5–2.9 bar (kp/cm², 35–41.2 psi.)
Throttle valve switch (throttle opening when the contact closes	62° approx.
Increased CO value at idling speed with simulated charging pressure over 0.4 bar (5.7 psi.)	4–6 % CO approx.

EXHAUST EMISSION CONTROL SYSTEM

EGR system

	On–off	Two port(Injection engine with automatic transmission, as from model 1978)
EGR cut-in speed (fast idling)	Around 1 900 rev/min	2 600 ± 300 rev/min
Vacuum necessary to open EGR valve	2.36 ± 0.20 in (60 ± 5 mm) Hg	2.36 ± 0.2 in (60 ± 5 mm) Hg
Opening temperature of PVS valve	Approx. 100°F (38°C)	Approx. 100°F (38°C)
Restriction diameter at EGR outlet in exhaust manifold	0.16 in (4 mm)	No restriction

Deceleration valve, carbureted engines (up to and incl. model 1977)

Setting:

1. Turn the valve screw clockwise until engine speed ceases to increase.
2. Turn the valve screw counter-clockwise until the engine has returned to idling speed and then turn the screw a further 1/2–3/4 turn clockwise from this position.

Checking:

Rev the engine and release the throttle. Check that the engine speed – after slight delay – returns smoothly and surely to idling speed.

Electrically controlled deceleration device (Carbureted engines as from model 1978)

Speed transmitter	Provides voltage to the solenoid when the speed of the car exceeds 19–22 mph/30–35 km/h. (The speed transmitter should be checked with a test lamp of 0.1 W max.)
Deceleration solenoid, adjusting	Increases the idling speed to 1 550 rev/min. (Turbo USA 1978–1979 model: 1400±50 r.p.m.), when the throttle is closed and the colenoid
	throttle is closed and the solenoid connected to battery voltage (at speeds above 19–22 mph/30–35 km/h)

> N.B.
> The solenoid cannot open the throttle valve but merely functions as a stop to prevent the throttle closing completely during engine overrun at speeds exceeding 19–22 mph/30–35 km/h.

Deceleration valve, injection engines

	Up to and incl. model 1976	As from model 1977
Time for engine speed to drop from 3000 rev/min to idling speed	4–5 s	3–6 s

Delay valve

Delay of vacuum signal to vacuum regulator in distributor	6±2 sec. (Turbo Sweden as from 1979 model: 20±4 sec.)
Dashpot, fuel injection engines	
Check. Deceleration time from 3000 r.p.m. to idling speed	3–6 sec.
Setting. R.p.m. when the dashpot rod hits the stop on the throttle spindle. (Vacuum pipe disconnected from the distributor, engine warm)	1979 model: 2600±100 As from 1980 model: 2000±100

EXHAUST SYSTEM

Exhaust pipe inner diameter	1.73" (44 mm)

COOLING SYSTEM

Type	Pressurized
Liquid capacity of cooling system incl. heating system	7 Imp. quarts (8 liters)
Thermostat opens at	$89^{o} \pm 2^{o}$
Radiator pressure cap opens at	0.9–1.2 bar (kp/cm^2, 12.8–17.0 psi)

WATER PUMP

Clearance between pump shaft and pump cover — No adjustment needed. Original gasket gives correct clearance.

Hammers must never be used when removing or installing the later version water pumps (impeller retained by nut). As from model 1977, the thread on the water pump shaft is only used during removal of the pump.
See Group 2.

TIGHTENING TORQUES

	Dimension	Nm	Torque kpm	ft.lb.
Main bearings	M 12	108	11	79
Crank bearing screws	M 10	54	5.5	40
Camshaft bearing caps	M 8	18	1.8	13
Valve cover	M 6 (M 8)	2.0	0.2	1.4
Crankshaft belt pulley	M 16	190	19	137
Sealing end (flywheel side)	M 8	20	2.0	14
Cylinder head screw	M 12	93	9.5	69
Flywheel	M 10	59	6.0	43
Water pump impeller (earlier version, screw)	M 8 (left-hand thread)	25	2.5	18
Water pump impeller (later version, nut)	M 12 (left-hand thread)	15	1.5	11
Oil pump	M 8	18	1.8	13
Spark plugs	M 14 x 1.25	28	2.8	20
Jackshaft keeper plate	M 8	20	2.0	14
Chainwheel, jackshaft	M 10	25	2.5	18
Chainwheel, camshaft	M 8	20	2.0	14
Inlet manifold	M 8	18	1.8	13
Thermostat housing	M 8	18	1.8	13
Throttle valve housing	M 8	18	1.8	13
Exhaust manifold(model 1975)	M 10	25	2.5	18
Exhaust manifold (as from model 1976)	M 8	20	2.0	14

For other bolts, use general tightening torques:

Dimension	Tightening torque Nm	kpm	ft.lb.
M 5	4.9	0.5	3.6
M 6	9.8	1.0	7.2
M 8	19.6	2.0	14.4
M 10	39.2	4.0	28.9

Electrical system

BATTERY

Voltage	12 V
Capacity	60 Ah

ALTERNATOR

Bosch 55 A

Type designation	Bosch K1 ⟶ 14 V 55 A 20
Rated voltage	14 V
Rated speed	2,000 r.p.m.
Max. permissable continuous load	55 A/14 V
Power rating	790 W
Stator connection	Star connection ⅄

SEV and Marchal 55 A

Up to and including 1978 model	with separate charging regulator
As from 1979 model	with intergrated charging regulator
Voltage/current at 5000 r.p.m.	14 V/55 A
Stator connection	Delta connection ▲

Bosch 65 A

Type designation	Bosch K1 ⟶ 14 V 65 A 21
Rated voltage	14 V
Rated speed	2,100 r.p.m.
Max. permissable continuous load	65 A/14 V
Power rating	840 W
Stator connection	Star connection ⅄

Motorola 70 A

Rated voltage	14 V
R.p.m./current produced at:	
1,800 r.p.m.	36.5 A
3,300 r.p.m.	62 A
5,000 r.p.m.	69 A
6,000 r.p.m.	71 A
8,000 r.p.m.	73 A
Power rating	950 W
Stator connection	Delta connection ▲
Direction of rotation	Clockwise
Pully ratio, engine/alternator	1:2.3

STARTER

Type designation	Bosch GF (R) 12 V 0 001 311 108
No. of cogs on pinion	9
No. of cogs on ring gear	142
Gear ratio	15.8:1
Output rating	0.8 kW (1.1 hp)

Test results

Mechanical:	
Brush spring pressure	11.3–12.8 N (41–46 oz., 1150–1300 p)
Backlash	0.014–0.024" (0.35–0.60 mm)
Distance from pinion to ring gear	0.098–0.118" (2.5–3.0 mm)
Contact reserve	0.039" (1 mm)
Axial play of rotor	0.002–0.012" (0.05–0.30 mm)
Rotor brake friction torque	0.25–0.40 Nm (2.2–3.5 in.lb., 2.5–4.0 kpcm)
Pinion free wheel torque	0.13–0.18 Nm (1.1–1.6 in.lb., 1.3–1.8 kpcm)
Electrical:	
No load, 11.5 V and 35–55 A	6,500–8,500 rev/min
Loaded, 9 V and 205–235 A	1,000–1,300 rev/min
Locked starter	6 V 325–375 A
Lowest engagement voltage for solenoid	8 V

DISTRIBUTOR (conventional)

Make	Bosch
Type designation	Bosch JFU 4
Ordering No.:	
Cars with carbureted engines, model 1975, with idler shaft of steel (12-tooth gear)	Bosch 0 231 170 115
Cars with carbureted engines with idler shaft of cast-iron and cars with injection engines as from model 1976 (20-tooth gear)	Bosch 0 231 170 145
Cars with injection engines, model 1975, with steel jackshaft (12-tooth gear)	Bosch 0 231 170 122
Cars with injection engines, model 1975, with cast iron jackshaft (20-tooth gear)	Bosch 0 231 170 158
Cars as from model 1977 (20-tooth gear)	Bosch 0 231 170 197 alt. Bosch B 231 041 079
Capacitor	Bosch 1 237 330 280
Capacitance	0.2 μF ± 10 %
Basic ignition advance:	
Model 1975	17° BTDC at 800 rev/min max. and with vacuum hose disconnected
Model 1976, manual transmission	24° BTDC 2 000 rev/min and vacuum hose disconnected
Model 1976, automatic transmission	27° BTDC 2 000 rev/min and vacuum hose disconnected
As from model 1977, manual transmission	20° BTDC 2 000 rev/min and vacuum hose disconnected
As from model 1977, automatic transmission	23° BTDC 2 000 rev/min and vacuum hose disconnected
Order of firing	1–3–4–2
Breaker gap	0.016" (0.4 mm) min.
Dwell angle	50 ± 3°
Contact pressure	4.9–6.2 N (18–23 oz, 500–630 p)
Rotation	Counter-clockwise
Axial play, distributor shaft	0.004–0.012" (0.10–0.30 mm)
Rotor resistance	5,000 ohm

Ignition advance curves, see Group 3.

IGNITION COIL (conventional)

Type designation	Bosch KW 12 V
Resistance of primary winding at 68°F (+20°C) (between connections 1 and 15)	2.6–3.1 ohm
Length of starting spark at 6 V 600 sparks/minute (150 distributor revolutions)	0.4" (10 mm)
Median current through primary winding at 4,000 sparks/minute (1,000 distributor revolutions)	1.9 A

DISTRIBUTOR (breakerless ignition system) Turbo

Make	Bosch
Type designation	JGFUD 4
Order number	Bosch 0 237 011 002
Direction of rotation	Clockwise
Firing order	1–3–4–2
Rpm governor	Rotor with built-in centrifugal switch which cuts out ignition when engine speed exceeds 6,000 + 200 r.p.m. –100 r.p.m.
Electronic control unit (brakerless ignition system)	TSZ-2g/1 4/SI
Electronic control unit, order no.	0 227 100 014
Compensating resistor	
With starter motor connected	0.6 ohm
Total, when driving	1.0 ohm
Basic setting (disconnected and plugged ignition vacuum pipe):	
Turbo, Sweden	20° BTDC at 2,000 r.p.m.
Turbo, Europe	23° BTDC at 2,000 r.p.m.
Rotor arm resistance	5, 000 ohm

IGNITION COIL (brakerless ignition system)

Type designation	Bosch kW 12 V
Order number	Bosch 0 221 122 014
Primary winding resistance at 68°F (+ 20°C) approx. (between connections 1 and 15)	1–1.4 ohm
Secondary winding resistance	5.5–8.5 kohm
Length of starting spak	Min. 0.47 in. (12 mm)
Median current through primary winding with distributor rotating at 1,000 r.p.m.	3.2 A

SPARK PLUGS

Type	NGK BP–6ES Hard driving (e.g. motorway/freeway) NGK BP-7ES Bosch W 175 T30 Champion N–8Y
Thread	M 14 x 1.25
Thread length	0.7" (19 mm)
Electrode gap	0.024–0.028" (0.6–0.7 mm)
Tightening torque	25–29 Nm (18.1–21.8 ft.lb., 2.5–3.0 kpm)

IGNITION CABLES

	Up to and incl. model 1976	As from model 1977
Resistance:		
Cables to cylinders 1 and 2	14,500 ohm ± 20%	3,250 ohm ± 20 %
Cables to cylinders 3 and 4	13,500 ohm ± 20%	3,000 ohm ± 20 %
Cable between ignition coil and distributor incl. connections	1,000 ohm ± 20%	1,000 ohm ± 20 %

FUSES

In the main fuse box:

Number, up to and incl. model 1976	Number, as from model 1977	Rated current	Lentgh x Diameter
2	4	5 A	1 x 0.25" (25 x 6 mm)
7	5	8 A	1 x 0.25" (25 x 6 mm)
3	3	16 A	1 x 0.25" (25 x 6 mm)

The 3 A glass tube fuse for the headlight wipers is located in a separate fuse holder.

DIRECTION INDICATOR FLASHER

Type	Tungsol 550–12 V Hella 91/1 P3 V 2 x 21 W – 12 V
Flashing frequency	60–120 impulses/minute

LIGHT BULBS

	Power	Cap	Qty.	
Headlights	60/55 W	p 43t–38	2	
Front direction indicators	21 W	BA 15 S	2	
Front direction indicators, as from model 1977	21/5	BAY 15 d	2	(Twin-filament lamp with one wire used)
Front parking light, up to and incl. model 1976	5 W	BA 15 S	2	
Cornering lights/parking light, as from model 1977	21/5	BAY 15 d	2	(Twin-filament lamp)
Rear direction indicators, stop and back-up lights	21 W	BA 15 S	6	
Rear direction indicators, as from model 1977	21 W	BA 15 S	2	
Tail lights, up to and incl. model 1976	5 W	BA 15 S	2	
Side reversing light, as from model 1977	21 W	BA 15 S	2	
Number plate light, Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS	5 W	BA 15 S	2	
Number plate light, Saab 99 Combi Coupé	5 W	SV 8.5–8	2	
Dome light	10 W	SV 8.5–8	1	
Trunk light, Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS	5 W	SV 8.5–8	1	
Trunk light, Saab 99 Combi Coupé	10 W	SV 8.5–8	1	
Heater control illumination	1.2 W	W2 x 4.6 d	1	
Ignition switch illumination	2 W	BA 9 S	1	
Rear view mirror light	5 W	SV 8.5–8	1	
Instrument and indicator lights	1.2 W	W2 x 4.6 d	9	
Hazard warning signal switch	1.2 W	W2 x 4.6 d	1	
Switch, electrically heated rear window Saab 99 Combi Coupé	1.2 W	W2 x 4.6 d	1	
(Model 1975: Only Saab 99 Combi Coupé. Model 1976: Not Saab 99 L) Switch cornering light	1.2 W	W2 x 4.6 d	1	

RELAYS

Electrically heated rear window	Bosch 0 332 204 109
Radiator fan	Bosch 0 332 204 109
Ignition lock	Bosch 0 332 204 109
Start interlock relay	Bosch 0 332 204 109
Fuel pump, CI-system	Bosch 0 332 204 109
Safety relay, CI-system	Bosch 0 332 204 109
Day-light (model 1976)	Stribel yellow
Cornering light (as from model 1977)	Bosch 0 332 204 109
Headlight wipers	Cartier 277S
Light relay	SWF R 601 alt. SWF R 601 173
Intermittent wiper function	Hella 002 450–10

DAY-LIGHTS

Up to and incl. model 1977 (Sweden) the day-lights are incorporated in the headlights. The voltage is reduced by means of series resistance.	
Resistors	IFÖ CRH 18 0.35 ohm ± 5 % (up to and incl. chassis No. 99762033700) IFÖ CRH 18 0.70 ohm ± 10 % (as from chassis No. 99762033701) IFÖ CRH 18 0.50 ohm ± 10 % (Sweden and Norway as from chassis Nos. 99771001769 and 99772000148, respectively)
As from model 1978 (Sweden), the day-lights are incorporated in the parking lights (twin-filament lamp).	IFÖ CRH 30 0.2 ohm ± 10 % as from model 1978. (Denmark, Finland and Norway)

HORN

Type	MIXO	TR 89	low
	KLAXON	KM 4	high

FUEL LEVEL TRANSMITTER

Type designation, steel tank	VDO K 221.826/4/5
Type designation, plastic tank	VEGLIA 67 95 021

HEATER FAN MOTOR

	Up to and incl. model 1976		As from model 1977	
Type designation	Elektrolux KP 50351 or SWF 401 313			
	rev/min	W	rev/min	W
Output and speed at free blowing and a voltage of 13 V:				
1/2-speed	2,300	58	2,300	80
1/1-speed	3,500	122	4,000	180

RADIATOR FAN MOTOR

Type designation	Elektrolux KP 50351 or SWF 401 313
Output	143 W
Speed	2,400 rev/min
Thermostat cut-in temperature, up to and incl. model 1976	194–212°F (90–100°C)
Thermostat cut-in temperature, as from model 1977	194–202°F (90–95°C)
Thermostat cut-out temperature, as from model 1977	185–194°F (85–90°C)

WINDSHIELD WIPER MOTOR

Type designation	Lucas 54 104 297	
Output rev/min (double strokes/min) and current consumption. Warm motor loaded with 1 Nm (10 kpcm, 8.7 in.lb.)	rev/min	W
and tension 13.5 V:	43	1.8
1/1-speed	64	2.6
Obstructed motor (e.g. frozen wiper blades)	–	about 15

HEADLIGHT WIPER MOTOR

Type designation	SWF 4E 3876/1	
Output rev/min (double strokes/min) and current consumption. Loaded with 0.25 Nm (2.5 kpcm , 2.2 in.lb.) and	rev/min	W
tension 13 V	46 ± 5	1.5–2
Obstructed motor (e.g. frozen wiper blades)	–	5–6
Make, model (left and right design)	Bosch, AHO 12 V	
Output rpm (strokes/min idling speed)	50–60 strokes	
Current consumption	0.75–1.5 A	
Current consumption, motor obstructed, e.g. wiper blades frozen in position	4.0–5.5 A	

(The motor is protected by an intergrated "PTC resistance" against damage should it's movement be obstructed).

WINDSHIELD WASHER/HEADLIGHT WASHER

Type designation	VDO
At cross flow of four jets, ø 0.7 mm:	
Pressure	about 1.3 bar (kp/cm^2, 18 psi)
Capacity	about 1,100 cm^3/min

ELECTRIC HEATING OF THE DRIVER'S SEAT

Thermostat cut-in temperature	+50°F ± 7°F (+10°C ± 3.9°C)
Thermostat cut-out temperature	+80.5°F ± 5°F (+27°C ± 2.8°C)
Heating elements, output:	
Cold	about 65 W
Warm	about 50 W

ELECTRICALLY HEATED REAR WINDOW

Output at 13 V:	
Saab 99 L, 99 GL, 99 GLE and 99 EMS	160 W
Saab 99 GL Combi Coupé	200 W

FUEL PUMP, CI-SYSTEM

Designation	0 580 254 994:
Output	approx. 95 W
Capacity	min. 750 cm^3/30 sec.
Designation	0 580 254 978
Output	approx. 120 W
Capacity	min. 900 cm^3/30 sec.

SPEED TRANSMITTER, DECELERATION DEVICE

Connection speed	19 mph $^{+3}_{-0}$ (30 km/h +5 –0 km/h)
Max. power at test lamp during operation testing	1 W

SPEED TRANSMITTER, HIGH-SPEED FUEL BOOSTING, TURBO 1979 MODEL

Connection speed	80 mph ± 3 mph (130 km/h ± 5 km/h)
Max. power at test lamp during operation testing	1 W

Transmission

CLUTCH

Make	Borg & Beck
Type	Single dry plate with spring-loaded hub
Operation	Hydraulically operated
Diameter, standard	8" (204 mm)
Diameter, Turbo	8 1/2" (217 mm)

RATIOS MANUAL TRANSMISSION AS FROM MODEL 1975

Model	Year	Gearbox design-ation	Tires	Dyn. diam.	Wheel	Primary gear	Counter-shaft	Final drive	Total gear ratio						Speed/1000 rpm				
									1 st	2nd	3rd	4th	5th	Back	1st	2nd	3rd	4th	5th
99	–77	Running No up to and incl.	Pirelli 155 SR 15	310	75: 4 1/2" 76–: 5"	1:1 1,00	18:33 1,83	9:35 3,89	13,9	8,1	5,4	3,9	–	14,7	8,7	14,5	21,6	30,0	–
"	"	"	Good year 155 SR 15	305	"	"	"	"	"	"	"	"	–	"	8,6	14,3	21,2	29,6	–
"	"	"	Pirelli, Good year 165 SR 15	312	"	"	"	"	"	"	"	"	–	"	8,8	14,6	21,7	30,2	–
"	"	"	Pirelli, Good year 175/70HR15	306	"	"	"	"	"	"	"	"	–	"	8,6	14,3	21,3	29,6	–
"	78	S+running No.	Pirelli 155 SR 15	310	5"	31:30 0,97	18:33 1,83	9:35 3,89	12,9	7,8	5,2	3,8	–	14,2	9,0	15,0	22,3	31,1	–
"	"	"	Good year 155 SR 15	305	"	"	"	"	"	"	"	"	–	"	8,8	14,7	22,0	30,6	–
"	"	"	Pirelli, Good year 165 SR 15	312	"	"	"	"	"	"	"	"	–	"	9,1	15,1	22,5	31,3	–
"	"	"	Pirelli, Good year 175/70HR15	306	"	"	"	"	"	"	"	"	–	"	8,9	14,8	22,1	30,7	–
99 Turbo	78	T+running No.	Pirelli, Good year 175/70HR15	306	5"	30:27 0,90	18:33 1,83	9:35 3,89	12,0	7,2	4,9	3,5	–	13,2	9,6	15,9	23,7	33,0	–
99	79–	63441	Pirelli 153 SR 15	310	5"	31:30 0,97	18:33 1,83	9:35 3,89	12,9	7,8	5,2	3,8	–	14,2	9,0	15,0	22,3	31,1	–
"	"	"	Good year 155 SR 15	305	"	"	"	"	"	"	"	"	–	"	"	"	"	"	–
"	"	"	Pirelli, Good year 165 SR 15	312	"	"	"	"	"	"	"	"	–	"	"	"	"	"	–
"	"	"	Pirelli, Good year 175/70HR15	306	"	"	"	"	"	"	"	"	–	"	"	"	"	"	–
99 Turbo	79–	G44601	Pirelli, Good year 175/70HR15	306	5 1/2"	31:26 0,84	17:33 1,94	"	11,9	7,2	4,8	3,3	–	13,1	9,7	16,1	23,9	35,3	
99 Turbo	80–	G45701	Pirelli, Good year 175/70HR15	306	5 1/2"	32:25 0,78	15:34 2,27	"	12,9	7,8	5,2	3,8	3,0	14,2	8,9	14,8	22,0	30,6	37,9

Oil quantity

4-speed (without dipstick)	5.3 pints (3.0 l)
4-speed (with dipstick)	4.4 pints (2.5 l)
5-speed	5.3 pints (3.0 l)

Types of oil

Up to and including 1979 model:
Engine oil SAE 10 W30 or 10W40 as per API service SE. Or Saab Special Transmission Oil "Esso SE 26" (Saab Special Transmission Oil does not need to be changed).
As from 1980 model:
Saab Special Transmission Oil "ESSO SE 26"
(– Saab Special Transmission Oil does not need to be changed
– Saab Special Transmission Oil can be mixed with other transmission and engine oils, e.g. when topping-up if the special oil is not available.
– The special oil should be used when refilling after repair work).

Weight complete with oil:

4-speed	approx. 120 lb. (55 kg)
5-speed	approx. 120 lb. (55 kg)

MODEL DESIGNATION, MANUAL GEARBOXES

The model designation is stamped next to the running gearbox number and indicates the following:

G 3 4 4 01

Model (G = mechanical gear change) — G

Design (refers to engine combination) — 3

No. of forward gears — 4

Primary gear ratio (see table) — 4

Development stage, variant — 01

Primary gear	Ratio designation			
	4	5	6	7
No. of teeth in/ No. of teeth out	31/30	30/27	31/26	32/25
Ratio	0.97	0.90	0.84	0.78

Bearing compression

Differential bearings:	
New, lightly oiled bearings	1.8–2.8 Nm (16–24 in.lb.,18–28 kpcm)
Bearings having run more than 1,200 miles (2,000 km)	0.8–1.3 Nm (7–11 in.lb., 8–13 kpcm)
Pinion bearing. Torque on spring balance with cord wound round bearing housing:	
New, lightly oiled bearings	48–71 N (10.4–15.4 lb., 4.7–7.0 kp)
Bearings having run more than 1,200 miles (2,000 km)	19–43 N (4.2–9.5 lb., 1.9–4.3 kp)
Intermediate wheel on primary gear: Torque on spring balance with cord wound round teeth on intermediate wheel	6.0–8.0 N (1.3–1.8 lb., 0.6–0.8 kp)

Tightening torques

All 8 mm screws	20–25 Nm (15–18 ft.lb., 2–2.5 kpm)
Engine and transmission drain plugs	39–59 Nm (29–44 ft.lb., 4–6 kpm)
Speedometer drive	29–49 Nm (21–36 ft.lb., 3–5 kpm)
Hexagon screw, release bearing sleeve	6–14 Nm (4–10 ft.lb., 0.6–1.4 kpm)
Plastic screw, clutch plate shaft	1–2 Nm (0.75–1.5 ft.lb., 0.1–0.2 kpm)
Pinion shaft nut nearest the needle bearing	40–60 Nm (30–45 ft.lb., 4–6 kpm)
Crownwheel screws	40–60 Nm (30–45 ft.lb., 4–6 kpm)

TRANSMISSION, AUTOMATIC

Type	BW model 393, BW model 399 or BW model 487.
Oil volume automatic transmission	7 Imp. quarts (8.0 liters) automatic transmission fluid according to Ford specification M2C 33F at ev. change. For topping up Automatic transmission oil type A, Suffix A or Dexron can be used.
Oil volume final drive	1.1 Imp. quarts (1.25 liters) EP oil SAE 75 or SAE 80, API–GL–4 or GL–5

Gear ratio

Torque converter ratio varies between	1.91:1–1:1
Primary gear ratio	0.97:1
1st gear	2.39:1
2nd gear	1.45:1
3rd gear	1:1
Reverse	2.09:1
Final drive ratio	3.89:1
No. of teeth pinion/crownwheel	9:35
Torque ratio range engine to wheel for each selector position	
Normal "stall" rev/min	1,900–2,300 rev/min
Idling speed, with selector in position P or N:	
Fuel injection engine	875 ± 50 rev/min
Carbureted engine	850 ± 50 rev/min
Weight incl. oil	appr. 84 kg

Shift speeds

Up to and incl. transmission No. 19999	Upshifts 1 – 2	Upshifts 2 – 3	Downshifts 3 – 2	Downshifts 2 – 1
Full throttle	24–32 mph (39–52 km/h)	45–52 mph (72–82 km/h)	–	–
With "kick-down"	32–40 mph (52–64 km/h	60–68 mph (96–110 km/h)	52–60 mph (82–96 km/h)	22–28 mph (35–45 km/h)

As from model 1976 (transmission No. 20000)	Upshifts 1 – 2	Upshifts 2 – 3	Downshifts 3 – 2	Downshifts 2 – 1
Full throttle	23–37 mph (37–59 km/h)	48–60 mph (78–96 km/h)	–	–
With "kick-down"	37–48 mph (59–77 km/h)	67–78 mph (108–125 km/h)	57–70 mph (91–112 km/h)	29–42 mph (46–68 km/h)

Springs for control system

Spring	Approx. free length		Number	Wire diameter		Major diameter	
	in.	mm	of turns	in.	mm	in.	mm
1–2 Shift valve	1.094	27.8	13 1/2	0.024	0.61	0.235	5.97
2–3 Shift valve	1.590	40.4	22 1/2	0.036	0.91	0.352	8.94
Primary regulator valve	2.850	72.4	14 1/4	0.054	1.37	0.600	15.24
Secondary regulator valve	2.593	65.9	21 1/2	0.065	1.65	0.485	12.32
Servo orifice control valve	1.005	25.53	17	0.024	0.61	0.203	5.16
Modulator valve	1.069	27.15	19	0.028	0.71	0.211	5.36
Throttle, inner spring	0.807	20.5	28	0.018	0.46	0.141	3.58
Throttle, outer spring	1.185	30.1	18	0.032	0.81	0.236	5.97

Bearing compression

Differential bearings:	
New, lightly oiled bearings	1.8–2.8 Nm (16–24 in.lb., 18–28 kpcm)
Bearings having run more than 1,200 miles (2,000 km)	0.8–1.3 Nm (7–11 in.lb., 8–13 kpcm)
Pinion shaft bearing. Torque on spring balance with cord wound round bearing housing:	
New, lightly oiled bearings	27–46 N (6.0–10.1 lb., 2.7–4.6 kp)
Bearings having run more than 1,200 miles (2,00 km)	15–24 N (3.3–5.3 lb., 1.5–2.4 kp)

Tightening torques

Brake bands

	Qty.	Nm	in.lb.	kpm
Front brake band		1.2	10	0.12
			ft.lb.	
Rear brake band (Back off adjusting screw 3/4 of a turn.)		14	10	1.40
Rear band adjusting screw locknut	1	39–53	30–40	4–5.4

Transmission

Converter to driveplate (flywheel)	4	33–39	25–30	3.4–4.0
Chain cover to converter housing	12	14–21	10–15	1.4–2.1
Transmission case to converter housing	10	14–21	10–15	1.4–2.1
Sprocket wheel to turbine shaft	1	26–33	20–25	2.7–3.4
Sprocket wheel to input shaft in gear box	1	33–40	25–30	3.4–4.1
Centre support to case	3	14–25	10–18	1.4–2.5
Cover for selector rod to casing	5	8–12	6–9	0.8–1.2
Oil pan to case	12	8–12	6–9	0.8–1.2
Valve body cover to converter housing	10	8–12	6–9	0.8–1.2
Oil pan drain plug	1	5–8	4–6	0.5–0.8

Final drive

Pinion nut	1	245–265	180–200	25–27
			in.lb.	
Pinion housing (Preload with spring balance 27–46 N (6.2–10.4 lb., 2.8–4.6 kp)		1.8–3.0	15–25	0.18–0.30
			ft.lb.	
Seal housing pinion bearing	2	8–12	6–9	0.8–1.2
Pinion bearing to case	4	26–33	20–25	2.7–3.4
Crown wheel screws	12	40–60	30–44	4.0–6.0

Oil pump

	Qty.	Nm	ft.lb.	kpm
Pump cover to pump housing	1	2.5–3.9	2–3	0.25–0.40
	5	23–29	17–22	2.3–3.0
Pump to converter housing	3	18–25	13–18	1.8–2.5

Governor valve

Governor valve inspection cover to case	2	7–11	5–8	0.7–1.1
Governor valve to counter weight	2	5–8	4–6	0.5–0.8
Governor cover plate to governor valve body	2	2–5	1.7–4.0	0.2–0.5

Valve body

			in.lb.	
Upper part to valve body	8	2–3	20–30	0.2–0.3
Manual valve lever bracket to valve body	4	2–3	20–30	0.2–0.3
Oil tube plate to valve body	8	2–3	20–30	0.2–0.3
End plate, primary and secondary regulating valves to valve body	3	2–3	20–30	0.2–0.3
Rear upper end plate to shift valve body	3	2–3	20–30	0.2–0.3
Front upper end plate to shift valve body	3	2–3	20–30	0.2–0.3
Down shift cam bracket to valve body	2	2–4	20–40	0.2–0.4
			ft.lb.	
Valve body to case	3	6–12	4.5–9.0	0.6–1.2
Down shift, throttle cable to case	1	11–14	8–10	1.1–1.4

Miscellaneous

Connector oil cooler	2	7–10	5–7	0.7–1.0
Nut connection oil cooler	2	13–16	10–12	1.3–1.6
Oil pressure gauge plug	1	5–7	4–5	0.5–0.7
Starter contact lock nut	1	5–8	4–6	0.5–0.8

Brakes

Make	Girling (as from chassis Nos. 99762022110, 99766008979 and 99767003806, the front wheel brakes and master cylinder are of Girling make and rear wheel brakes of ATE make).	
Type front and rear	Disc brake with vacuum servo Hydraulic, 2-circuit system acting on diagonally opposed wheelbrakes	
Handbrake	Mechanical, acting on the front brake discs. Self-adjusting.	
Dimensions:		
Disc diameter, front	11.024" (280 mm)	
Disc diameter, rear	10.614" (269.5 mm)	
Disc thickness, front	0.500" (12.7 mm)	
Disc thickness, rear	0.413" (10.5 mm)	
Minimum disc thickness, front	0.461" (11.7 mm)	
Minimum thickness of worn disc, front	11.2 mm	
Minimum disc thickness, rear	0.374" (9.5 mm)	
Maximum grinding allowance	0.020"/side (0.5 mm/side)	
Maximum permissible axial runout of mounted disc	0.004" (0.10 mm)	
Parallelity (maximal disc thickness variation	0.0006 in. (0.015 mm)	
Friction surface:		
Front	222 sq. in. (1,432 cm^2)	
Rear	Girling: 158 sq. in. (1,016 cm^2)	ATE: 165 sq. in. (1.065 cm^2)
Total	Girling: 380 sq. in. (2,448 cm^2)	Girling/ATE: 387 sq. in. (2,497 cm^2)
Brake lining surface:		
Front	4 at 5.75 sq. in. (4 at 37 cm^2)	
Rear	Girling: 4 at 2.95 sq. in. (4 at 19 cm^2)	ATE: 4 at 3.10 sq. in. (20 cm^2)
Master cylinder	7/8" (22.33 mm) diameter	
Wheel cylinder, front	2.126" (54 mm) diameter	
Wheel cylinder, rear	Girling: 1.063" (27 mm) diameter	ATE: 1,181" (30 mm) diameter
Brake fluid	According to specification DOT 3, DOT 4 or SAE J 1703	
Brake fluid volume	Appr. 1 Imp. pint (0.55 liter)	

BRAKE SERVO

Make	Girling
Type	Vacuum (poppet valve) servo
Diameter	9 inch.
Servo gain	3:1

Front assembly, steering mechanism

FRONT WHEEL ALIGNMENT

"King pin" angle		$11\ 1/2^{\circ} \pm 1^{\circ}$
Caster		Manual steering gear: $1^{\circ} \pm 1/2^{\circ}$ Power-assisted steering gear: $2^{\circ} \pm 1/2^{\circ}$
Camber		$1/2^{\circ} \pm 1/2^{\circ}$
Toe-in, measured at rims		0.04" ± 0.04" (1 ± 1 mm) 2±1 mm
Turning angles:		
Outer wheel		20°
Inner wheel		$20\ 1/2^{\circ} \pm 1^{\circ}$
"Slip radius"	165 SR 15, 4 1/2"	0.30"–0.35" (7.6–9 mm)
–"–	155 SR 15, 4 1/2"	0.37"–0.43" (9.5–11 mm)
–"–	165 SR 15, 5"	0.50"–0.55" (12.6–14 mm)
–"–	175/70 HR 15", 5"	0.61" (15.5 mm)

STEERING MECHANISM

		Power steering	Saab 99 EMS, as from Ch.nr. 99762018780 and 99766007925
Steering wheel turns, lock to lock	4.1	3,6	3,4

Steering gear adjustment:

Adjustment of plunger	Clearance between cover and plunger 0.002–0.006" (0.05–0.15 mm)
Steering gear torque (=pinion torque)	1.1–2.0 Nm (0.83–1.5 ft.lb., 0.11–0.20 kpm)
Adjustment of ball joint	The rod should be moveable to its full limit in all directions with a load of max. 30 N (6.6 lb., 3 kp) applied to the outer joint
Lubricating oil, type	API service GL 4 SAE 80–90
Lubricating oil, quantity	$0.23\ dm^3$ (8.1 fl.oz., 2.3 dl)
Lubricating oil, level	1. Jack up the car at the left, front jacking point until it is possible to remove the wheel without it catching the ground. 2. Loosen the rubber bellows clamp at the left tie-rod and turn the steering wheel to full right-hand lock. 3. Top up with oil between the bellows and the tie-rod until the level has reached the centre of the tie-rod. 4. Tighten the clamp which will be facilitated by turning the steering wheel back a short way.

Adjustment of power steering gear:

Adjustment of plunger	Screw plunger tight, then back off 1/12 turn. Check that the cog rod does not stick in any position.
Ball joints	Must not be adjusted. Replace if worn.

Lubricating oil, type	API service GL 5 SAE 75
Lubricating oil, quantity	0.19 dm^3 (6.5 fl.oz., 1.9 dl)
Lubricating oil, level	1. Jack up the car at the left, front jacking point until it is possible to remove the wheel without it catching the ground. 2. Loosen the rubber bellows clamp at the left tie-rod and turn the steering wheel to full right-hand lock. 3. Top up with oil between the bellows and the tie-rod until the level has reached the centre of the tie-rod. 4. Tighten the clamp which can be facilitated by turning the steering wheel back a short way.
Servo oil, type	Automatic transmission oil. (See specifications, automatic transmission.)
Servo oil, quantity	1.2 dm^3 (litre, 1.1 Imp. quarts)
Servo oil, level	0.4 in (1 cm) above the lower part of the filter in the oil container

<u>Tie rod ends:</u>

Max. distance from end of thread to lock nut	1" (25 mm)
Max. permissible difference between above measurements on both sides	0.08" (2 mm)

<u>Tightening torque:</u>

Tie rod end nut	49–69 Nm (36–50 ft.lb., 5–7 kpm)
Steering wheel nut	27 Nm (2.7 kpm)

REAR WHEEL ALIGNMENT

	Up to and including 1978 model	As from 1979 model
Camber	$0^o \pm 1^o$	$-1/2^o \pm 1/4^o$ (negative camber)
Toe-in, sum of both wheels: Measured at rims	0 ± 2 mm	2–6 mm (1–3 mm per side)
Max. difference between left hand and right hand wheelbase (front wheels aligned straight ahead)	0.6" (15 mm)	

Suspension system, wheels

Spring elements, front and rear	Coil springs	
Type of suspension:		
Front	Individually transverse control arms	
Rear	Rigid rear axle with four longitudinal links and one lateral load cross bar	
Front coil springs:	Up to and including 1978 model	As from 1979 model
Total number of turns	8 1/2 ± 1/8	8.25
Number of free turns	6 1/2	6.75
Wire diameter	0.55" (13.9 mm)	14.2 mm
Free length	15.08" (383 mm)	370 mm
Marking color	Green	White
	Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS up to and incl. chassis No. 99762018779, 99766007924 resp. 99767003175 Up to and incl. chassis No. 99762028994	Saab 99 (99 L), 99 L (99 GL) and 99 GLE As from chassis No. 99762028995
Rear coil springs:		
Total number of turns	10 ± 1/8	10 ± 1/8
Number of free turns	8	8
Wire diameter	0.55 in. (14 mm)	0.55 in. (14 mm)
Free length	12.7" (323 mm	12.9" (329 mm)
Marking color	Green	Yellow
	Saab 99 EMS As from chassis Nos. 99762018780 resp. 99766007925 and 99767003176	Saab 99 Combi Coupé
Total number of turns	9 ± 1/8	9 ± 1/8
Number of free turns	7	7
Wire diameter	0.56 in. (14.2 mm)	0.56 in. (14.2 mm)
Free length	12.4" (315 mm)	12.8" (324 mm)
Marking color	White	Blue
	As from 1979 model Sedan	As from 1979 model Combe Coupé
Total number of turns	9	9.5
Number of free turns	7	8
Wire diameter	14.2	14.5
Free length	315	323
Marking color	White	Light blue
	As from 1979 model EMS, Turbo	
Total number of turns	9	
Number of free turns	7.5	
Wire diameter	14.8	
Free length	308	
Marking color	Green	
Vertical wheel movement:		
From normal-weight compression to full compression:		
Front	4" (100 mm)	
Rear	4.4" (110 mm)	
Max. spring expansion:		
Front	6.3" (160 mm)	
Rear	7.1" (180 mm)	
Shock absorbers, front:		
Type	Telescopic, hydraulic, alt. gas type shock absorber	
Length between attachment lug centers:		
Max. fully compressed	10.2" (258 mm)	
Min. fully extended	14.9" (379 mm)	
Max. stroke installed in car	3.6" (91 mm)	

Shock absorbers, rear:

Type	Telescopic, hydraulic, alt. gas type shock absorber
Length between attachment point surfaces:	
Max. fully compressed	11.1" (282 mm)
Min. fully extended	18.5" (470 mm)
Max. stroke installed in car	6.2" (158 mm)

WHEELS

	Model 1975 (occurs on Saab 99 L, model 1976)	Fr.o.m. årsmo As from model 1976	Saab 99 EMS and 99 GLE	Saab 99 Turbo
Type	Disc wheels	Disc wheels	Light alloy wheels	Right alloy wheels
Rim dimensions	4.5 J FHA x 15"	5 J FHA x 15"	5 J FHA x 15"	5.5J x 15" H2
Max. permissible out-of-round at rim	0.047" (1.2 mm)	0.047" (1.2 mm)	0.032" (0.8 mm)	0.02" (0.5 mm)
Max. permissible rim throw	0.047" (1.2 mm)	0.047" (1.2 mm)	0.032" (0.8 mm)	0.02" (0.5 mm)
Wheel nuts:				
Width across flats	3/4" (19.05 mm)			
Thread	1/2" 20 UNF–2B			
Tightening torque	88–108 Nm (65–80 ft.lb., 9–11 kpm)			

HUBS

Maximum play of wheel bearings	0.08 in. (2 mm) measured at edge of rim
Tightening torque:	
Bolts, hub-brake disc, front	30–50 Nm (22–36 ft.lb., (3–5 kpm)
Hub nuts, front	340–360 Nm (246–261 ft.lb., 34–36 kpm)
Hub nuts, rear	Tighten first to a torque of 49 Nm (36 ft.lb./ 5 kpm). Then, after having undone nut, tighten to a torque of between 1.4 and 2.9 ft.lb. (2–4 Nm)

TIRES

Type	Radial, tubeless
Dimensions	
GL Nordic Countries and UK	155 SR 15
GL others and GLE	165 SR 15
EMS	175/70 HR 15
Turbo	165 HR 15 or 175/70 HR 15
Tire pressures	
Light load, front and rear	1.9 bar (kp/cm^2, 27 psi.)
Full load or high speed front	2.2 bar (kp/cm^2, 31.3 psi.)
rear	2.4 bar (kp/cm^2, 34.1 psi.)
Cars with air condition:	
Light load, front and rear	2.0 bar (kp/cm^2, 28.5 psi)
Full load, front and rear	2.1 bar (kp/cm^2, 30 psi)

Body

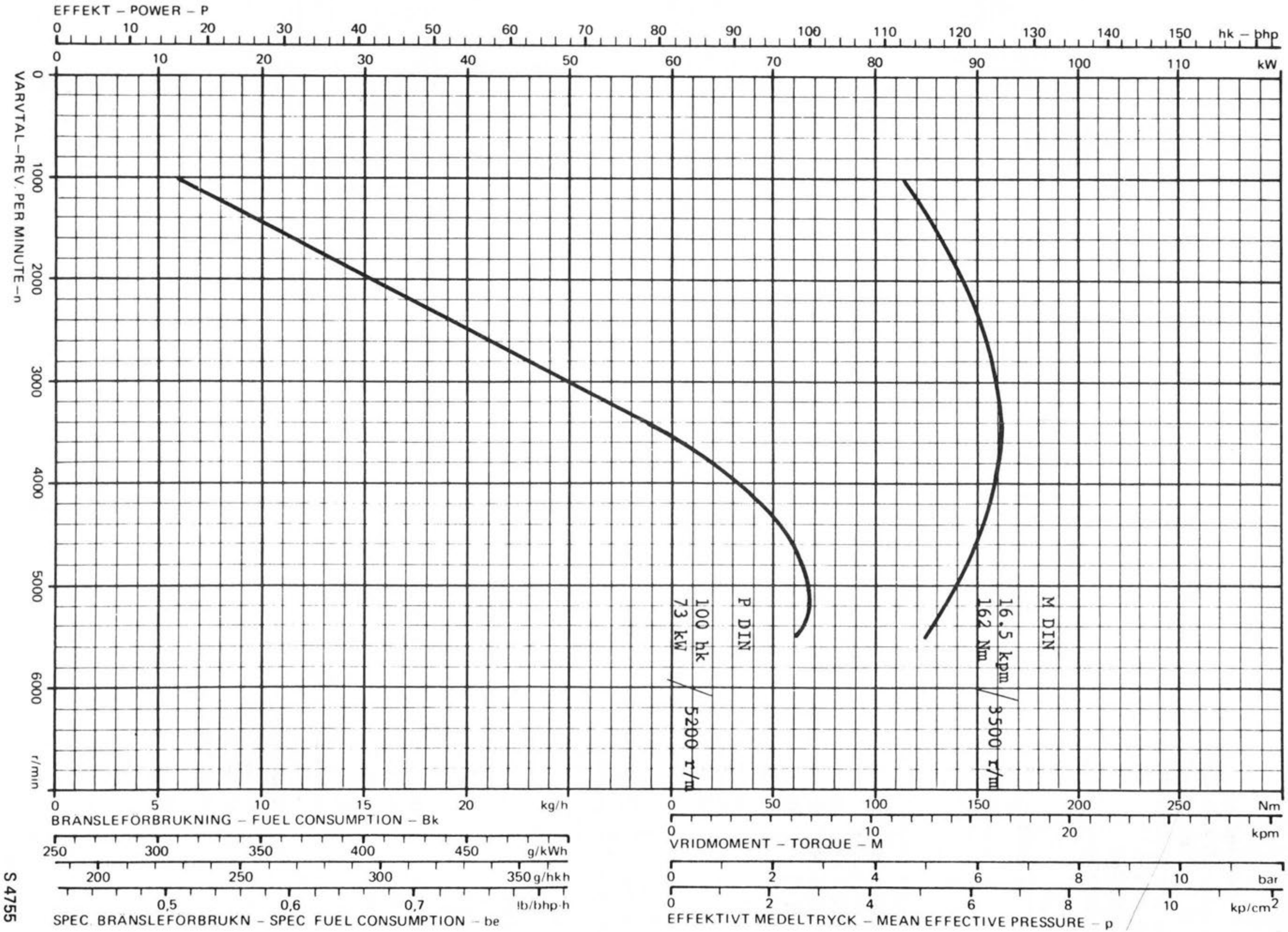
Approx. dimensions:	
Overall length, Saab 99 (99 L), 99 L (99 GL) and 99 EMS	13' 10" (4214 mm)
Overall length, Saab 99 Combi Coupé	13' 11.5" (4256 mm)
Overall width	5' 6" (1676 mm)
Overall height	4' 0.5" (1233 mm)
Total weight:	
2-doors	approx. 670 lb. (304 kg)
4-doors	approx. 715 lb. (325 kg)
Saab 99 Combi Coupé	approx. 795 lb. (360 kg)

ENAMEL

Color code	Color	Make
(BK 1) 170	Black	Beckers
(BK 2) 168	Dorado brown	Beckers
B 8	Caroline blue	Herberts
B 9	Cerulean blue	Herberts
B 10	Lagoon blue	Herberts
GN 10	Emerald green	Herberts
GN 11	Opal green	Beckers
GN 12	Jade green	Beckers
R 3	Sienna brown	Herberts
(R 4) 121	Cinnabar red	Beckers
(R 6) 123	Cardinal red (metallic)	Beckers
SK 1	Silver crystal (metallic)	Du Pont
SK 2	Charcoal gray (metallic)	Beckers
SK 3	Silver crystal (metallic)	Beckers
W 2	Orchid white	Herberts
Y 11	Indian yellow	Herberts
Y 12	Topaz yellow	Beckers
YR 2	Sepia metallic	Du Pont
YR 6	Antelope brown	Beckers
187	Alabaster yellow	
167	Chamotte brown	
136	Midnight blue	
152	Marble white	
148	Acacia green metallic	
137	Aquamarine blue mrtallic	
	Carmine red metallic	

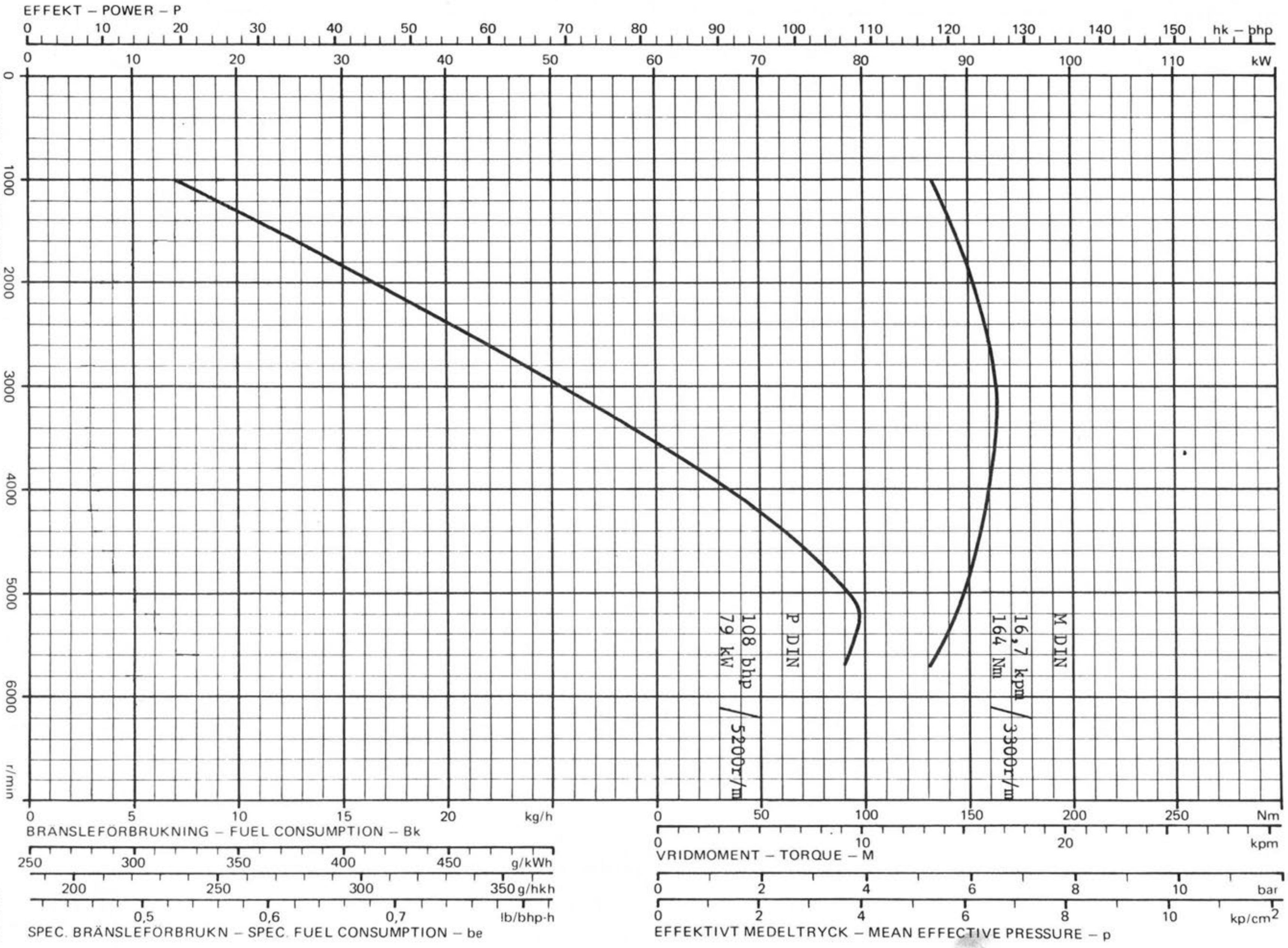
SAAB

ENGINE PERFORMANCE GRAPHS, SINGLE-CARBURETED ENGINE



S 4755

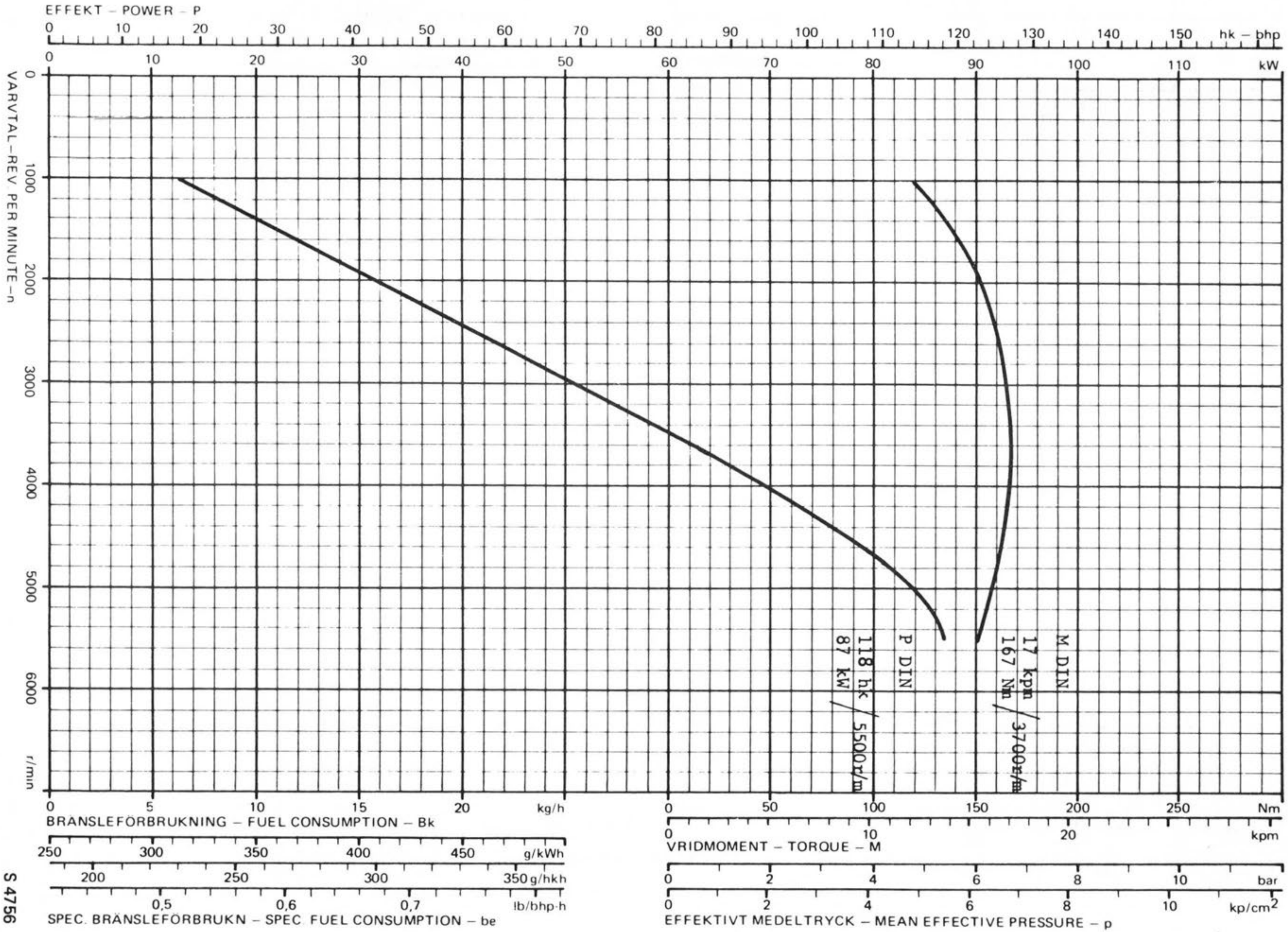
ENGINE PERFORMANCE GRAPHS, TWIN-CARBURETED ENGINE



S 5251

SAAB

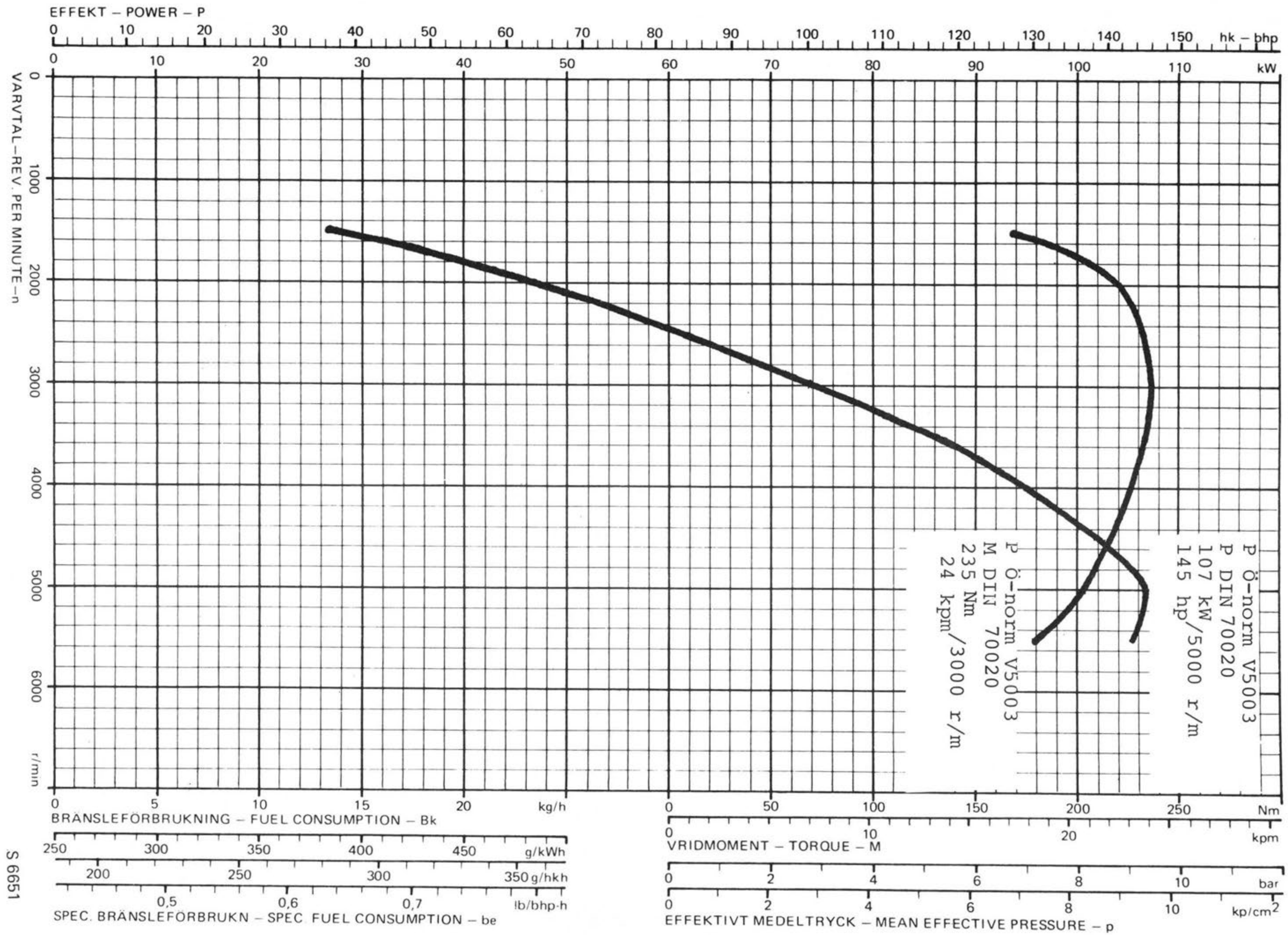
ENGINE PERFORMANCE GRAPHS, INJECTION ENGINE



S 4756

SAAB

ENGINE PERFORMANCE GRAPHS, TURBO



S 6651

CONTENTS

GENERAL HINTS

GENERAL

A neat and tidy workshop is essential for the proper servicing of vehicles. Some parts of the car need to be treated with special care and effectively protected against dirt and contamination while work is in progress. For the mechanic who may be new to the job should the following points may be of help:

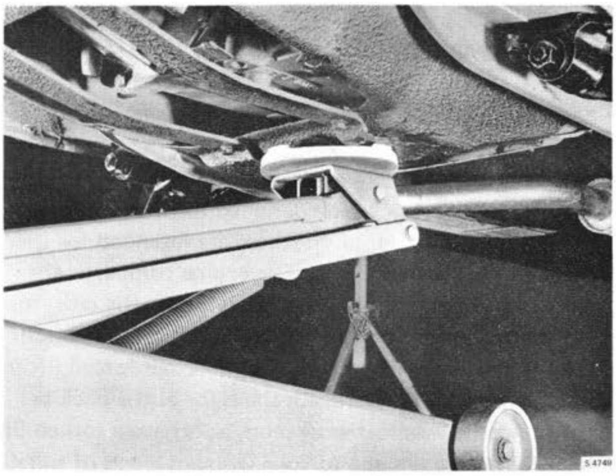
1. Protect fenders and other paintwork with suitable coverings.
2. Lay protective coverings over the seats and upholstery to save them from spots of oil and dirt.
3. Clean the insides of fenders and the space round the rear axle thoroughly before starting to work on wheel hubs and axles. This makes the job easier and prevents grit and dirt from getting into bearings and other susceptible parts.
4. Before unscrewing spark plugs, clean the recess round the plug thoroughly.
5. Every job must have its proper place. It is bad practice, for example, to disassemble an engine or transmission on a bench which is also used for filing, etc. or where filing is done in the immediate neighbourhood.

JACKING AND BLOCKING UP

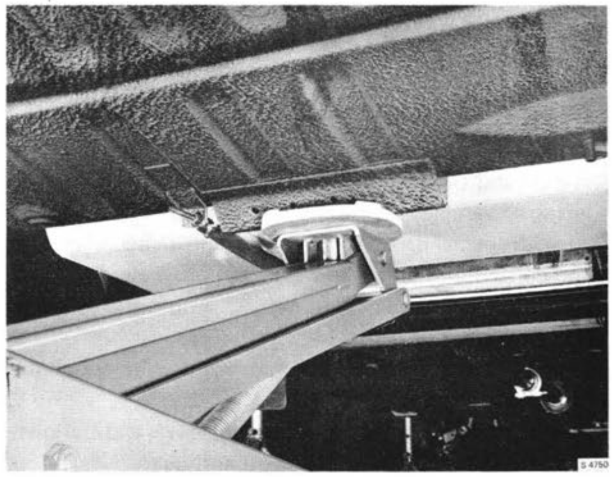
The car has a rigid self-supporting body and this lacks the neutral application points for a jack that a girder chassis provides. There are however two special engagement recesses on each side designed to fit the jack supplied with the car's tool kit; these are intended for use during wheel changing, etc. The engine compartment floor is also reinforced immediately under the cross member that supports the engine to provide an application point for the workshop jack. A similar reinforced lifting point is provided underneath the floor at the back behind the fuel tank. As most workshop jacks have a forked lifting head, it is advisable to lay a wooden block of suitable size across the fork to avoid damaging the floor of the car. For some jobs it is necessary to raise the front or rear end of the car. In such cases the jack engagement recesses under the sills should be utilized.

THREAD SYSTEM AND WRENCH SIZES

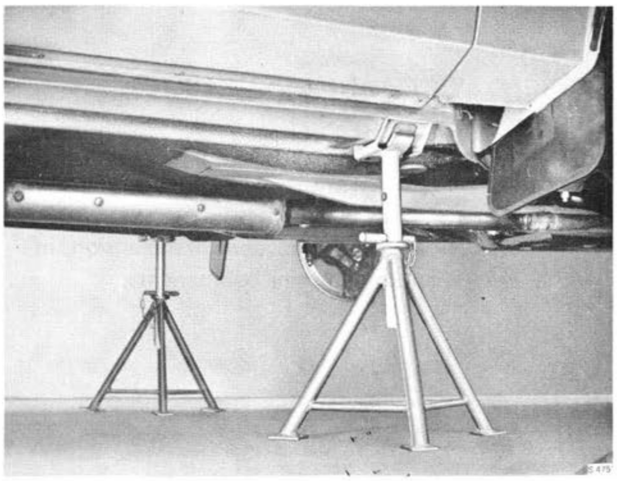
The standard thread system used in Saab cars is mainly the metric thread system ("M") and the width across flats is also measured in mm.
However, UNF and UNC threads with dimensions in inches are to be found in some components.



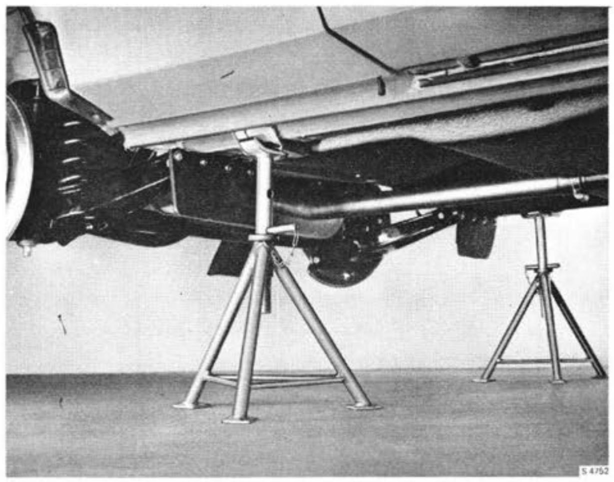
FRONT END RAISED



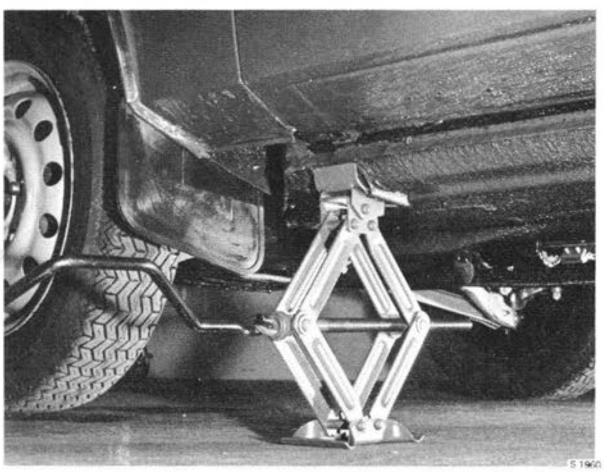
REAR END RAISED



FRONT END BLOCKED UP ON TRESTLES



REAR END BLOCKED UP ON TRESTLES



ONE SIDE JACKED UP

SPECIAL TOOLS

GENERAL

The 7-figure number quoted in the following list of special tools is the part number. The number which is also marked on the tools only includes the first six figures.

The special tools in the list are classified as follows:

Tools for engine, transmission and chassis work

Class	AO–1	=	Tools used very frequently in service work (e.g. adjustment of timing)
	AO–2	=	Tools used frequently in maintenance work (e.g. replacement of brake pads)
	A1	=	Tools necessary for simple repairs (e.g. replacing the clutch or valves)
	A2	=	Tools necessary for qualified repairs (e.g. reconditioning the gear box)
	A3	=	Tools which are mainly recommended for reasons of operational efficiency

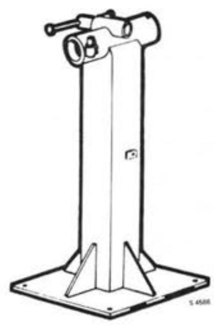
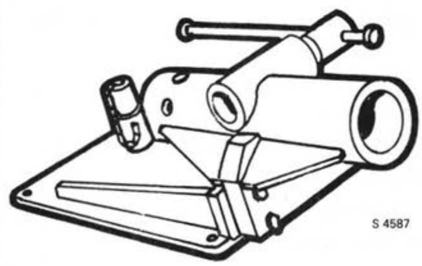
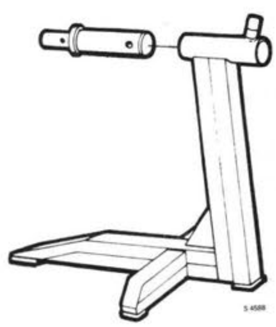
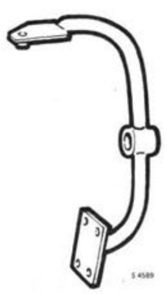
Tools for body work

Class	B1	=	Tools necessary for simple body work (e.g. replacement of front fenders)
	B2	=	Tools necessary for qualified body work (e.g. alignment work)
	B3	=	Tools which are mainly recommended for reasons of operational efficiency

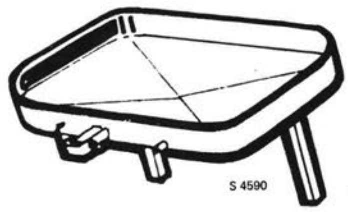
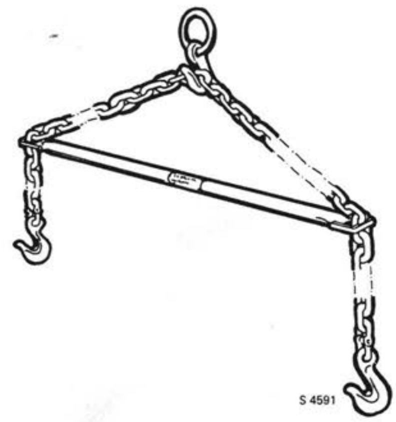
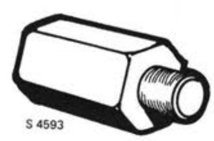
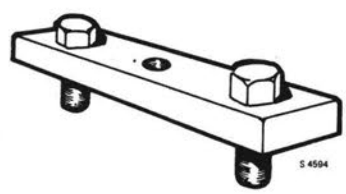
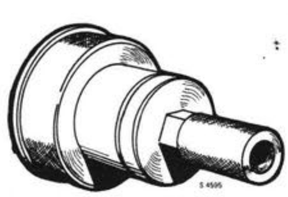
TOOL RACKS

It is most important that special tools be kept in a suitable place, where they will be readily accessible and easily found.

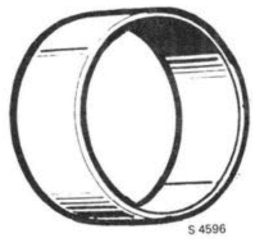
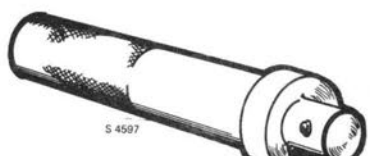
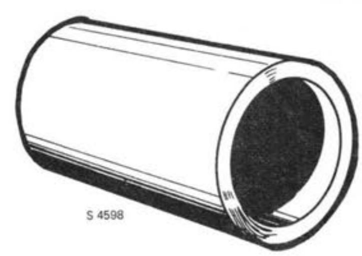
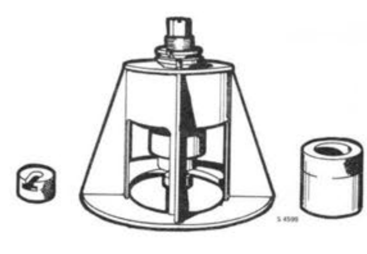
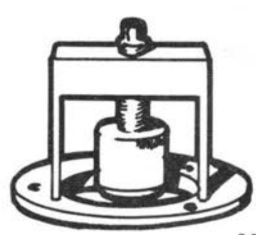
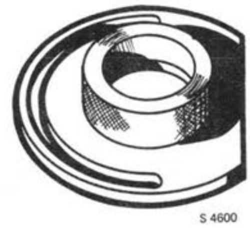
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
	210 Engine body			
7860794	Floor stand	A 2		
7860877	Bench stand	A 2		
7860885	Vice stand	A 2		
7861479	Stand	A 2		
8390478	Axle for stand	A 2		
8392169	Holder, engine	A 2		
8391849	Dolly, removal of chain wheel	A 2		

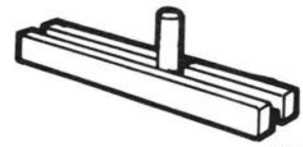
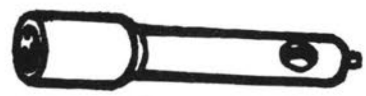
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
7860802	Oil pan	A 2		
8392409	Lifting yoke	A 1		
8390270	Slide hammer	A 1		See also 262 water pump
8392136	Spacing piece, removal water pump	A 1		See also 262 water pump
8392151	Puller, belt pulley	A 3		
8392540	Installation tool, crankshaft seal, flywheel end	A 1		

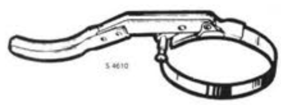
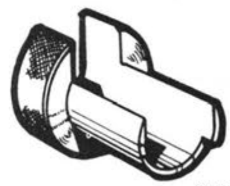
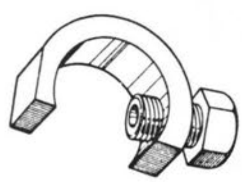
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
7862287	Piston installation tool	A 3	 S 4596	
8390445	Drift, installation of water pump housing	A 2	 S 4597	See also 262 water pump
8390536	Sleeve, installation of water pump	A 2	 S 4598	See also 262 water pump
8392490	Installation and removal tool, water pump (earlier design)	A 2		See also 262 water pump
8392649	Installation and removal tool, water pump (later design)	A 2	 S 5498	
8392664	Pressing sleeve water pump (later design)	A 2		
8392441	Dolly, water pump impeller (earlier design)	A 2	 S 4600	See also 262 water pump

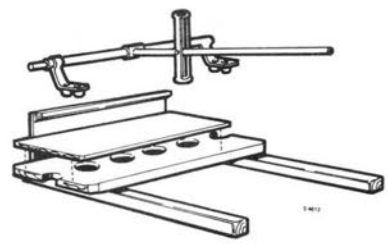
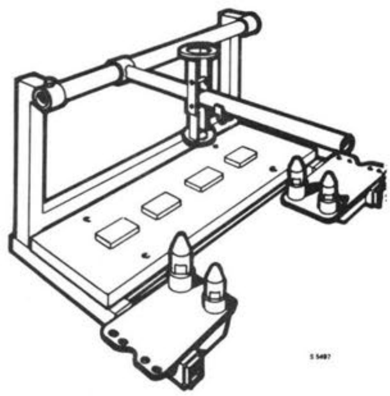
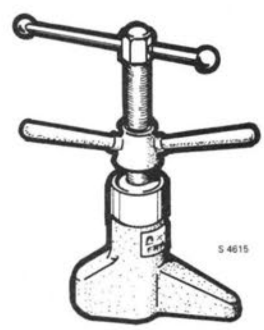
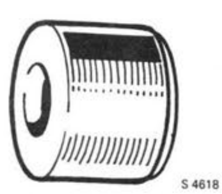
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
8392672	Dolly, water pump impeller (later design)	A 2	 S 5499	
8392524	Pressing sleeve, bearing, water pump shaft	A 2	 S 4601	
8392045	Adapter cpl. ignition setting	A 0–1	 S 4602	
8392185	Key, crankshaft screw	A 0–1	 S 4603	
8392128	Guide pin cylinder head	A 1	 S 4604	
8392326	Air nipple, spark plug hole	A 3	 S 4605	
8391260	Crank, transmission end	A 3		
7860513 8343808	Locktite stud lock Locktite quickset			
8809097	Tikatät, can, 1 pound			

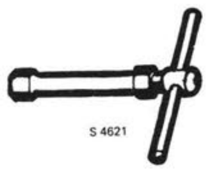
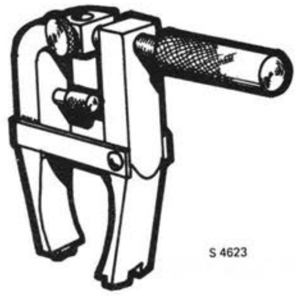
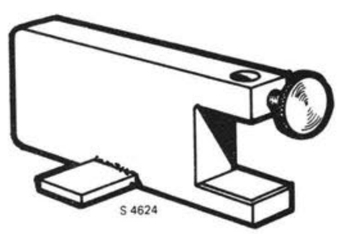
Special tools, engine

Artikel-nummer	Description	Class	Illustration	Remarks
8308454	Locquic activator grade T			
7862014	Key, oil filter	A 2		
8390130	Dynamometer	A 2	 S 4611	See also transmission
8391989	Key, distributor	A 0–1		
8790388	Tool, removing gear selector cable (automatic transmission)	A 1	 S 4701	See also transmission
7840838	Removal tool, taper pin, gear shift rod (manual transmission)	A 1	 S 5507	

Special tools, engine

Part No.	Description	Class	Illustration	Remarks
	214 Valve mechanism			
8392276	Installation and removal tool, valves (design I)	A 2		
8392300	Spring depressor (for use in car or on removed cylinder head)	A 2		
8392284	Table (design I)	A 2		
8392565	Removing – installing tool, valves (design II)	A 2		
8392581	Dolly plate for tool 8392565	A 2		
8392706	Stud for tool 8392565	A 2		
8392730	Depressor for tool 8392565	A 2		
8393050	Ditto (design III)			
8391401	Magnet tool	A 3		
8390437	Tool, valve guide (earlier design. Can be replaced by tool 8392631)	A 2	 S 4615	
8390502	Pull rod (for 8390437)	A 2	 S 4616	
8391377	Nut (for 8390437)	A 2	 S 4617	
8390379	Sleeve, exhaust (for 8390437)	A 2	 S 4618	
8392144	Sleeve, inlet (for 8390437)	A 2		

Special tools, engine

Part No.	Description	Class	Illustration	Remarks
8392631	Valve guide tool (for removal and installation in a press)	A 2	 S 5500	
8392193	Valve cutter assy.	A 2		
8392201	Cutter 75°	A 2	 S 4619	
8392219	Cutter 11°–45°	A 2		
7861057	Guide spindle	A 2	 S 4620	
7861065	T-key	A 2	 S 4621	
8392268	Reamer, valve guide ø 8 H8	A 2	 S 4622	
8391450	Measuring tool, valve play	A 0–2	 S 4623	
8392250	Measuring point			
8391633	Measuring plate, checking of adjusting pallets	A 0–2	 S 4624	

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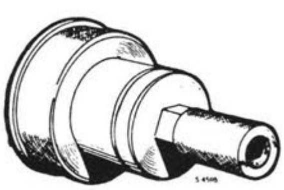
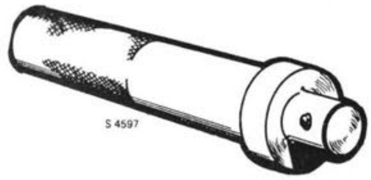
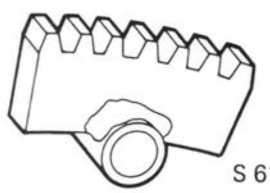
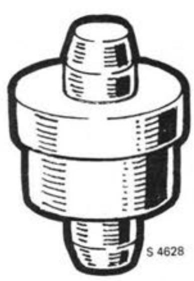
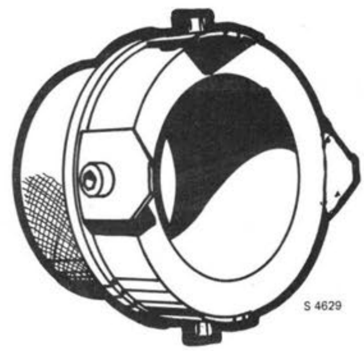
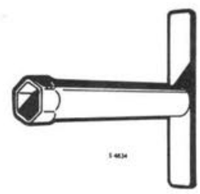
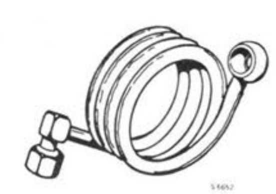
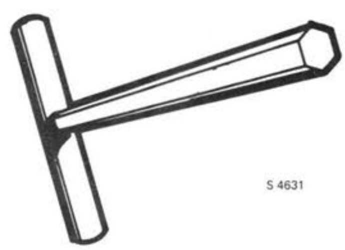
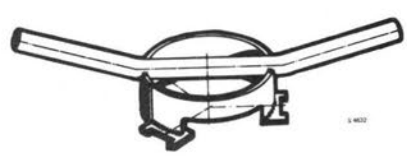
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
7840622	Dial indicator (0.01)	A 0–2		
	216 Crank mechanism			
7860505	Plastigage, measuring bearing clearance	A 2		
8392540	Installing tool, crankshaft seal, flywheel end	A 1		

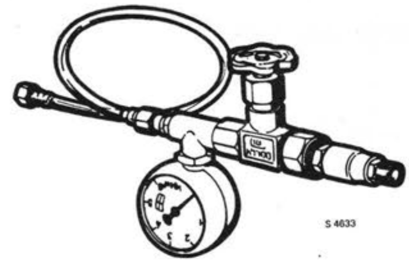
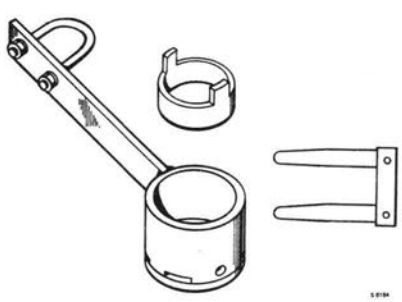
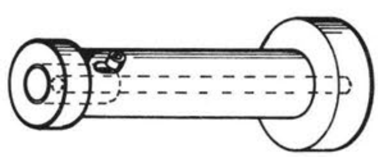
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
		A 1		
8390445	Drift	A 1	 S 4597	
8392961	Ring spanner, pulley bolt	A 1	 S 6181	
8392979	Sleeve, installation of seal on transmission side	A 1	 S 6182	
8392987	Locking segment for locking of crankshaft	A 1	 S 6183	
8391997	Drift, flywheel bearing	A 3	 S 4628	Also for clutch shaft seal as from model 1978

Special tools, engine

Part No.	Description	Class	Illustration	Remarks
	230/240 Fuel system			
8392474 8392623	Centering tool Shims for same (4)	A 2		
8392466	Key, deceleration valve	A 0–1		
8393183	Test hose	A 3		
8392482	Key, adjustment CO-value, injection engine	A 0–1		
8392433	Key, fuel pump bracket	A 0–2		

Special tools, engine

Part No.	Description	Class	Illustration	Remarks
8392516	Pressure testing equipment	A 0–2	 S 4633	
8392607	Hose			
8392615	Nipple			
8393126	Drive device, speedometer (for checking the fuel boosting function, Turbo Europe 1979 model)			
8392557	Bushings, synchrotester, twin-carburetors	A 1	 S 5254	
8392995	Adjustment tool, fuel needle (CO value adjustment) carburetors, up to and incl. model 1976	A 0–1		
8393001	Sleeve adjustment tool, fuel needle) twin-carburetor			
8393019	Feeler gauge set (adjustment tool, fuel needle)			
8393027	Measuring tool, fuel jet	A 0–1	 S 6185	
8392763	Adjustment tool, fuel needle (CO value adjustment) carburetor, as from model 1977. Cpl.	A 0–1		
8392771	Key (adjusting tool, fuel needle)		 S 5501	

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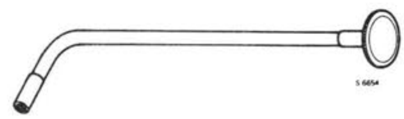
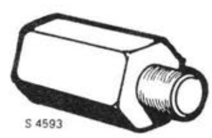
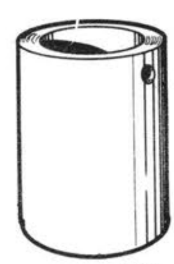
Special tools, engine

Part No.	Description	Class	Illustration	Remarks
8392896	Adjustment tool, fuel needle, later design, complete	A 0–1	 S 6186	
8392904	Adjustment tool, fuel needle, later design, key	A 0–1		
8393035	Adjustment tool, fuel needle (as from model 1978)	A 0–1	 S 6187	
8392953	Key, deceleration valve, carburetor	A 0–1	 S 6654	
8392789	Drift, jet installation		 S 6656	
	262 Water pump			
8390270	Slide hammer	A 1	 S 4592	Earlier design
8392136	Spacing piece, removal water pump	A 1	 S 4593	Earlier design
8390544	Dolly	A 2	 S 4635	Earlier design
8390585	Handle	A 2	 S 4636	Earlier design

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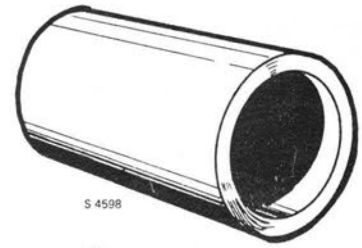
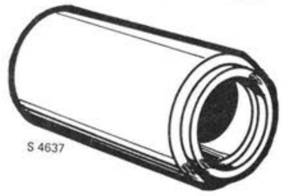
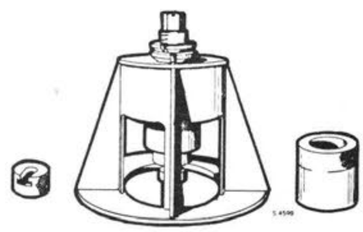
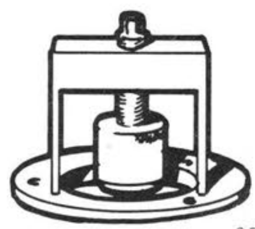
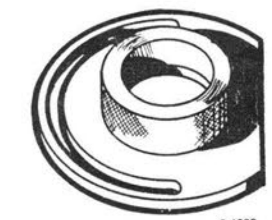
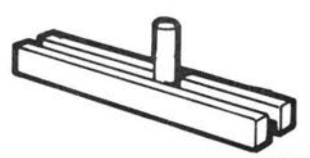
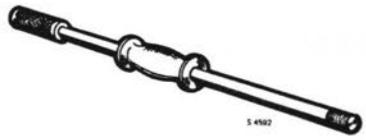
Part No.	Description	Class	Illustration	Remarks
8390536	Sleeve, ball bearing removal	A 2	 S 4598	Earlier design
8390551	Sleeve, ball bearing installation	A 2	 S 4637	Earlier design
8390569	Installation sleeve, thrower	A 2	 S 4638	Earlier design
8392490	Installation and removal tool, water pump	A 2		Earlier design
8392649 8392664	Removal – installation tool water pump Pressing sleeve, water pump tool	A 2 A 2	 S 5498	Later design
8392441	Dolly, water pump impeller	A 2	 S 4600	Earlier design
8392672	Dolly, water pump impeller	A 2	 S 5499	Later design

Special tools, chassis

Part No.	Description	Class	Illustration	Remarks
8392524	Pressing sleeve, bearing, water pump shaft	A 2	 S 4601	

Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
	411 Clutch			
8390270	Slide hammer	A 1	 S 4592	
8790529	Joint, removing clutch shaft	A 1	 S 4639	
8390023	Spacer ring, clutch	A 1	 S 4642	
8392060	Centering tool, clutch disc	A 3	 S 4643	
8790370	Key, special nut, gear lever housing	A 1	 S 4644	

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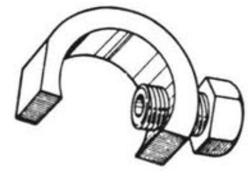
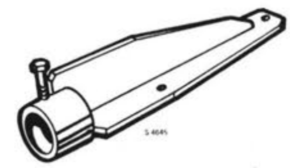
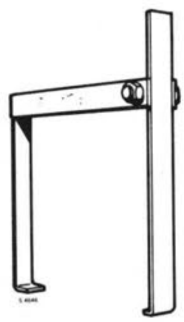
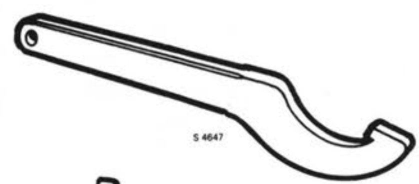
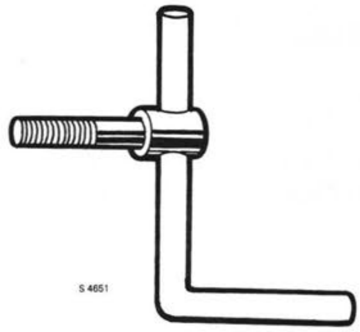
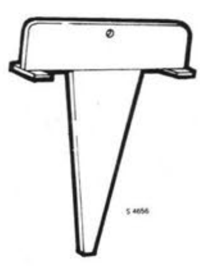
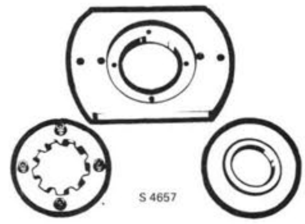
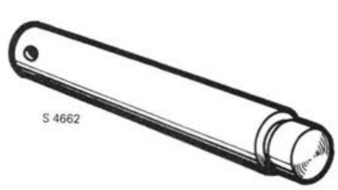
Special tools, manual transmission

Part No.	Description	Class	Illustration	Anmärkning
	471 Gear box			
7840838	Removal – installation tool taper pin gear shift rod (manual transmission)	A 1	 S 5507	
8390460	Holder, gear box	A 2		
8790776	Puller, inner drive shaft joint with bearing cap	A 1		
8790197	Hook wrench, intermediate shaft	A 2	 S 4647	
8390049	Puller, installation and removal of reverse gear shaft and intermediate shaft	A 2		
8790503	Catch, reverse wheel	A 2	 S 4649	
8790511	Puller, pinion shaft	A 2	 S 4650	

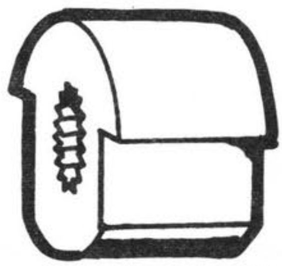
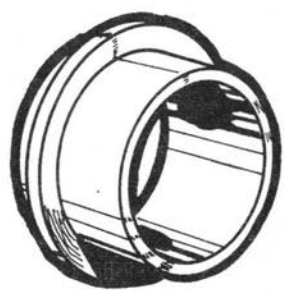
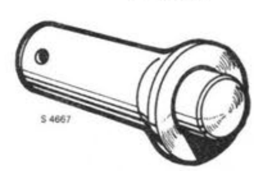
Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
7840853	Screw	A 2		
8390262	Guide pin, installation of intermediate shaft	A 2		
8790438	Guide pin, pinion bearing housing	A 2	 S 4653	
8390148	Sleeve, installation of pinion shaft unit, inner roller bearing, primary gear housing pinion roller bearing and intermediate shaft inner ring and outer bearing. Removal of primary gear roller bearing, bearing housing outer rings, countershaft inner ring and clutch shaft seal	A 2		
8390114	Sleeve, installation of 4th gear, bearing housing outer ring, pinion and pinion shaft unit	A 2		
8790552	Measuring device, pinion shaft housing position	A 2		

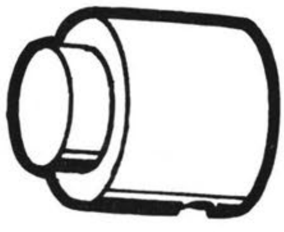
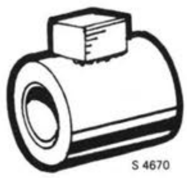
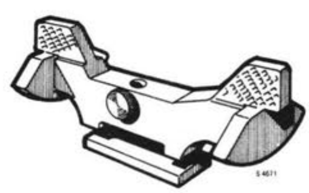
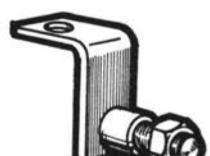
Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
8790636 8790651 8790644	Fixture, removal and installation of bearing from pinion Holder ring Installation ring	A 2 A 2 A 2		
8790453	Key, pinion shaft nut	A 2		
8390122	Drift, installation of bearing housing outer ring (pinion) and ball bearing on 4th gear, and removal of primary gear with bearing from bearing housing	A 2		
8390098	Dolly, installation and removal of primary gear, primary gear bearing, primary gear wheel bearing, fourth gear bearing, pinion bearing housing outer roller bearing rings, and pinion shaft	A 2		
8390106	Drift, removal of pinion roller bearing outer ring and installation of primary gear housing roller bearing	A 2		
8390189	Drift, installation of needle bearings in free wheel shaft and removal of free wheel shaft, free wheel shaft seal, free wheel shaft roller bearing input gear with ball bearing, outer bearing rings from bearing seats and steering knuckle housing outer ring and seal	A 2		

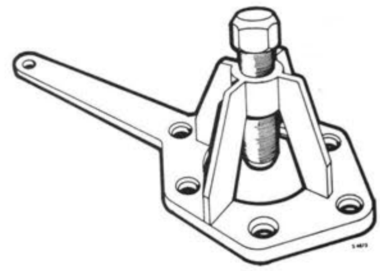
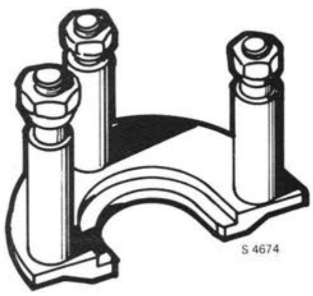
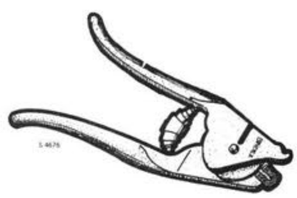
Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
8790461	Sleeve, bearing ring, pinion bearing housing	A 2	 S 4663	
8390064	Holder, pinion shaft	A 2	 S 4664	
8390247	Dolly, installation of primary gear and input gear and removal of primary gear wheel and gear bearings and input gear bearing	A 2	 S 4665	
8390213	Ring, removal of 4th gear with bearing	A 2	 S 4666	
8390320	Drift, installation of differential bearing seat seal, and primary gear roller bearing, clutch shaft seal	A 2		

Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
8790487	Sleeve bearing differential housing	A 2	 S 4668	
8390130	Dynamometer	A 2	 S 4611	
8790677	Puller, sealing ring gear shift shaft	A 1	 S 4669	
8790685	Installation tool, sealing ring, gear shift shaft	A 1	 S 4670	
8390155	Measuring tool cpl. pinion	A 2		
8390288	Dial indicator retaining tool, back lash, differential	A 2	 S 4672	

Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
8996084	Puller, removal of front and rear axle hubs, gear box differential housing bearing ring, and engine chain wheel	A 1		
8790768	Puller, removal of bearing ring, differential housing, gear box, chain wheel, engine	A 2		
8995177	Dolly, removal of bearing ring, differential housing	A 2	 S 5503	
8344582 8916967	Cover, inner driver Cover, driver shaft joint	A 1 A 1		
7844699	Pliers, bellows clamps	A 2		Also 95/96
7039381	Square pin, drain plug	A 1		

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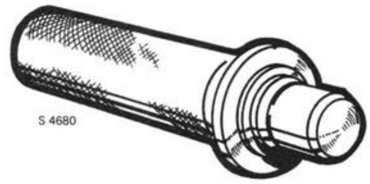
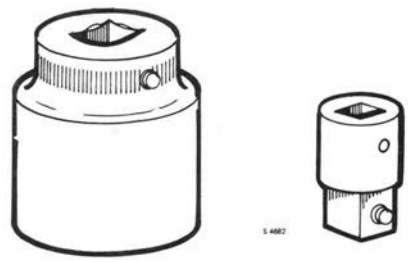
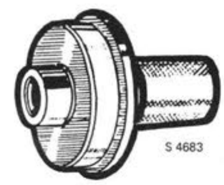
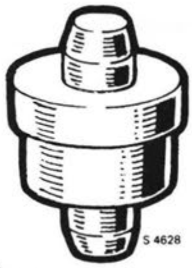
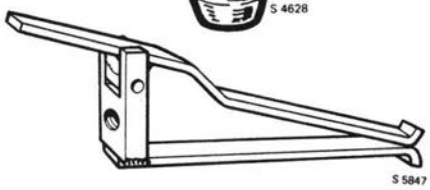
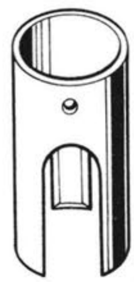
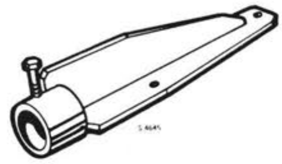
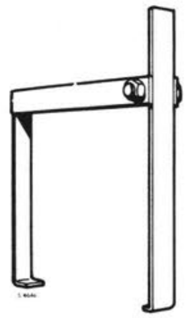
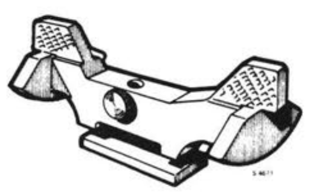
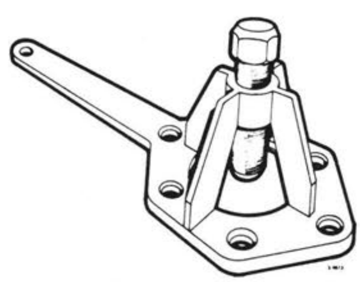
Special tools, manual transmission

Part No.	Description	Class	Illustration	Remarks
7861081	Square pin, drain plug	A 1	 S 4679	
8790800	Drift, pressing in sealing ring, differential bearing cap	A 2	 S 4680	
8790479	Washer, wheel, primary gear, installation of needle bearing, primary gear housing	A 2	 S 4681	
8390560 8390684 8790578	Sleeve cpl., end nut, pinion shaft Intermediate piece 3/4''—1/2'' Sleeve 42 mm	A 2 A 2 A 2	 S 4682	
7841141	Sleeve, pressing in ball bearing, differential bearing cap	A 2	 S 4683	Also 95/96
8790743	Key, oil fillter plug	A 1	 S 4684	
7841067	Sleeve, removal of ball bearing, differential bearing cap. Installation of bearing cap with ball bearing on inner driver	A 2	 S 4685	Also 95/96
8790818	Driver measuring differential bearing torque	A 2	 S 5256	

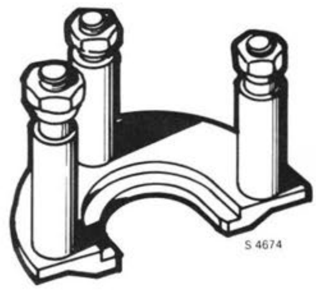
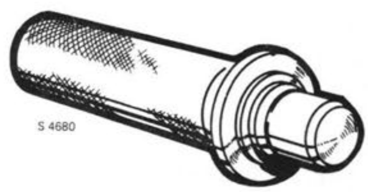
Special tools, manual transmission				
Part No.	Description	Class	Illustration	Remarks
8391997	Drift, clutch shaft seal (transmissions with chain-drive primary gear)	A 3	 S 4628	Also for fly-wheel seal
8790834	Upper sprocket extractor, primary gear	A 2	 S 5847	Used together with tapping-out hammer 8390270
8790842	Sleeve, removal of roller bearing in primary gear assembly	A 2	 S 5848	
8790859	Sleeve, fitting of roller bearing in primary gear set	A 2	 S 5849	
8790867	Ring, installation of roller bearing on input shaft to transmission	A 2	 S 5850	Used together with fitting sleeve 8390148

SAAB

Special tools, automatic transmission

Part No.	Description	Class	Illustration	Remarks
	440 Automatic gearbox			
8390460	Holder, gearbox	A 2		
8790776	Puller, inner drive shaft joint with bearing cap	A 1		
8790370	Key, special nut, gear lever housing	A 1		
8390130	Dynamometer	A 2		
8390155	Measuring tool cpl. pinion	A 2		
8996084	Puller, removal of hub, front and rear axles, bearing ring differential housing, chain wheel, engine	A 1		

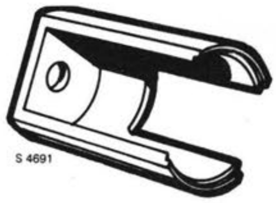
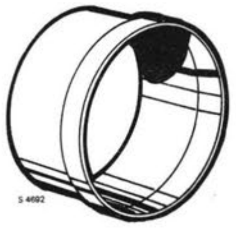
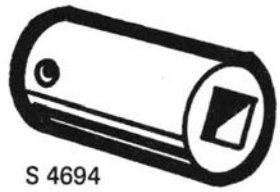
Special tools, automatic transmission

Part No.	Description	Class	Illustration	Remarks
8790768	Puller, removal of bearing ring differential housing gearbox, chain wheel, engine	A 2		
8344582 8916967	Cover for inner driver Cover for drive shaft joint	A 1 A 1		
7039381	Square pin, drain plug	A 1		
8790800	Drift, pressing in sealing ring, differential bearing cap	A 2		
7841067	Sleeve removal of ball bearing cap, installation of bearing cap with ball bearing on inner driver	A 2		
8790818	Driver, measuring the differential bearing torque	A 2		

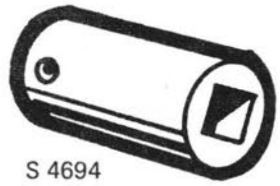
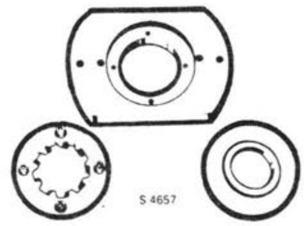
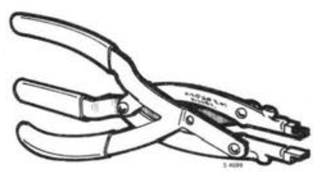
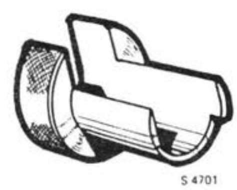
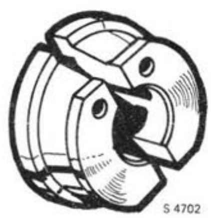
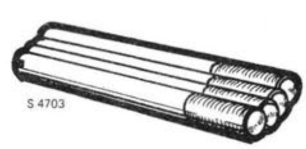
Special tools, automatic transmission

Part No.	Description	Class	Illustration	Remarks
8790016	Cpl. set tools for automatic transmission	A 2		
8790032	Pressure test equipment	A 1	 S 4686	
8790347	Manometer	A 2		
8790040	Hose	A 2	 S 4687	
8790057	Adapter	A 2	 S 4688	
8790727	Support, checking play in planet gear and gear backlash	A 2		
8790073	Spacer, adjustment of front band	A 1	 S 4690	

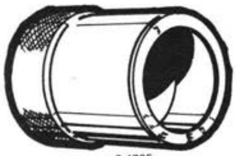
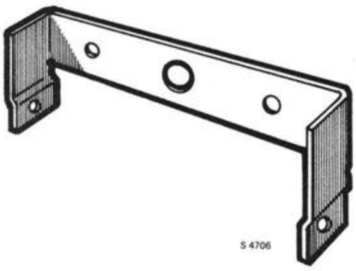
Special tools, automatic transmission

Part No.	Description	Class	Illustration	Remarks
8790081	Sleeve, removal and installation of spring, rear clutch	A 2		
8790693	Sleeve, installation of piston, rear clutch	A 2		
8790107	Sleeve, installation of piston, front clutch	A 2		
8790115	Sleeve, adjustment of rear band	A 1		
8790875	Key, adjustment of rear band	A 0–2		
8790123	Key, lock nut on switch, ignition and back-up light	A 0–2		
8790131	Torque wrench	A 1		
8790149	Skreuwdriver, adapter	A 2		

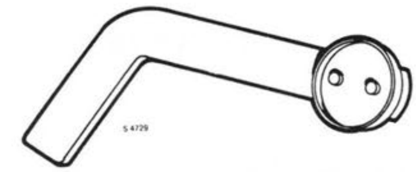
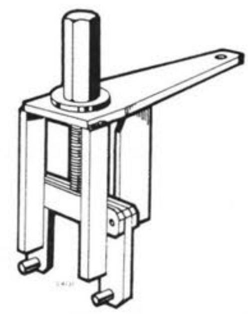
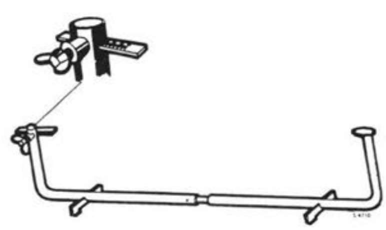
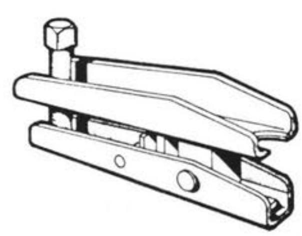
Special tools, automatic transmission

Part No.	Description	Class	Illustration	Remarks
8790156	Sleeve, adjustment of front band	A 1		
8790164	Sleeve, removal and installation of oil-seal, pinion housing	A 2		
8790636	Fixture, removal and installation of bear-ing from pinion	A 2		
8790651	Holder ring	A 2		
8790644	Installation ring	A 2		
8790180	Pliers	A 2		
8790297	Yaw	A 2		
8790388	Removal tool, gear selector cable	A 2		
8790537	Ring, removal and installation of outer ring,rear pinion bearing	A 2		
8790214	Ring, removal and installation of front pinion bearing	A 2		
8790222	Guide pins, pinion bearing housing	A 2		

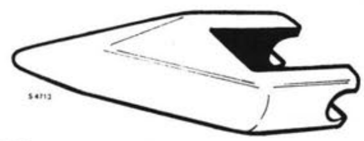
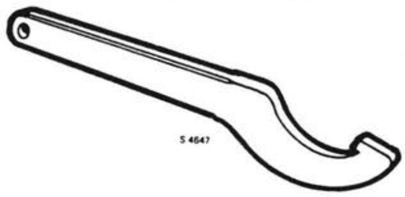
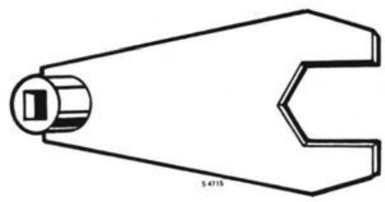
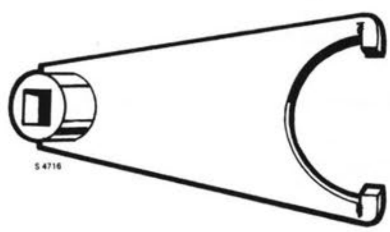
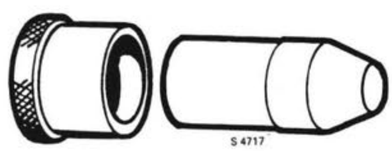
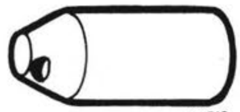
Special tools, automatic transmission

Part No.	Description	Klass	Illustration	Remarks
8790230	Sprocket holder, primary gear	A 2	 S 4704	
8790248	Centering sleeve, oil pump	A 2	 S 4705	
8790255	Transportation support, torque converter	A 2	 S 4706	
8790263	Sleeve (Bahco 2") nut, pinion bearing	A 2	 S 4707	
8790610	Drift, removal of ring gear	A 2	 S 4708	
8790487	Sleeve, bearing differential housing	A 2	 S 4709	

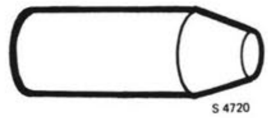
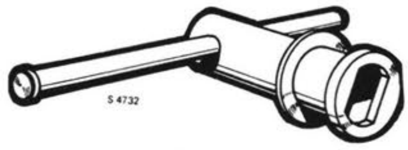
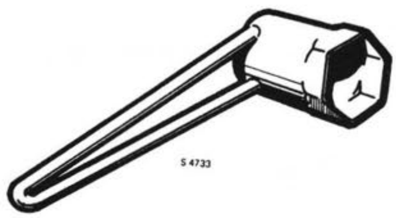
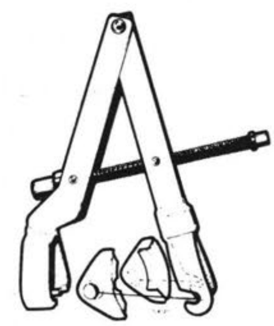
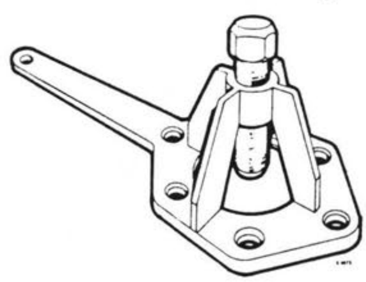
Special tools, chassis

Part No.	Description	Class	Illustration	Remarks
	500 Brakes			
8996043	Key, brake piston	A 0–2		
8995607	Tool removal and installation of brake spring	A 0–2		
8995771	Removing tool, brake pad	A 3		
8994782	Grease, lubrication of hand brake mechanism		 S 5506	
7990179	Grease, lubrication of sliding surfaces on brake yokes			
	601 Wheel alignment			
7840010	Tool measuring toe-in (with extension)	A 2		
8995698	Measuring rule	A 2		
8995763	Ratchet key, front wheel alignment	A 0–2		
	630 Ball joints			
8995409	Puller, removal of tie rod ends and ball joints	A 1		
7841331	Pressing tool, upper rubber bushing, control arm	A 3		
7841349	Pressing tool, lower rubber bushing	A 3		

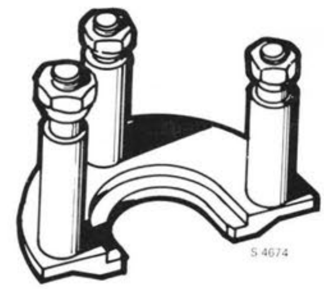
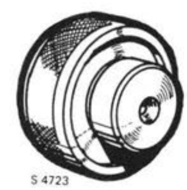
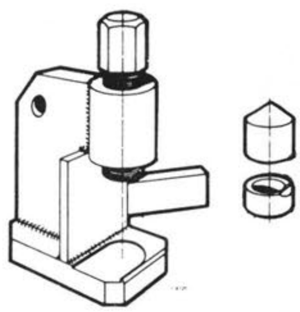
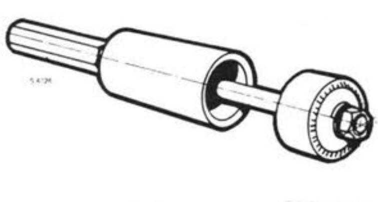
Special tools, chassis

Part No.	Description	Class	Illustration	Remarks
	640 Steering wheel — steering gear			
8996019	Steering wheel puller	A 0–2		
8995813	Installation tool, bellows steering wheel shaft	A 3		
8390197	Key, removal of outer bearing cap	A 2		
8995284	Puller pinion, steering gear. Used together with tapping hammer 8390270, see special tools transmission	A 2		
8995995	Key grip, end piece	A 2		
8995961	Key grip, round nut	A 2		
8995938 8995946	Installation tool, seal Seal protector	A 2 A 2		
8995953	Lock screw	A 2		
8995987	Thread guard, rack	A 2		

Special tools, chassis

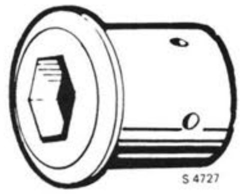
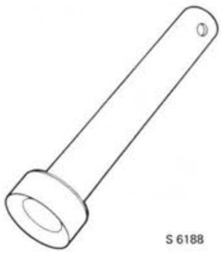
Part No.	Description	Class	Illustration	Remarks
8995979	Splines guard	A 2		
8995300	Key cpl. tightening of steering gear	A 2		
8995318	Handle	A 3		
8995326	Sleeve	A 3		
8995565	Key, lock nut, steering gear	A 2		
8995375	Drift, installation of bushing steering gear	A 3		
	700 Spiral spring – hub			
8995839	Spring tool cpl., removal and installation of front spring	A 2		
8995847	Spring scissors	A 3		
8995854	Spring cup L	A 3		
8995862	Spring cup R	A 3		
8995714	Screw cpl.	A 3		
8995128	Ball bearing	A 3		
8996076	Safety chain, spring scissors	A 3		
8996084	Puller, later design	A 2		Replaces 8995185
8996050	Extension (4) for puller 8995185	A 1		Can together with puller 8995185 replace puller 8996084.

Special tools, chassis

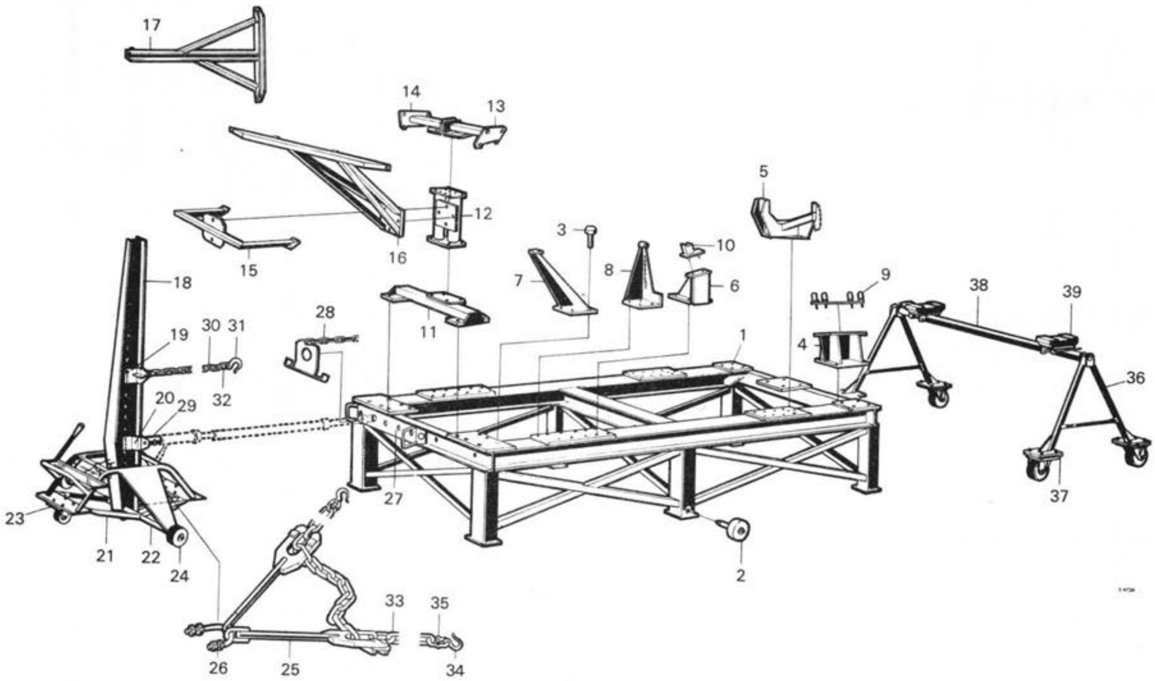
Part No.	Description	Class	Illustration	Remarks
8790768	Puller,bearing, front wheel hub	A 2		
8996068	Drift,front wheel bearing in steering knuckle housing	A 2		
8995169	Drift,outer ring rear wheel hub	A 2		
8995920	Tool, removal and installation of wheel screw	A 1		
7844699	Pliers,bellows clamp	A 2		
8995789	Tool,rubber bushing rear axle	A 3		

SAAB

Special tools, chassis

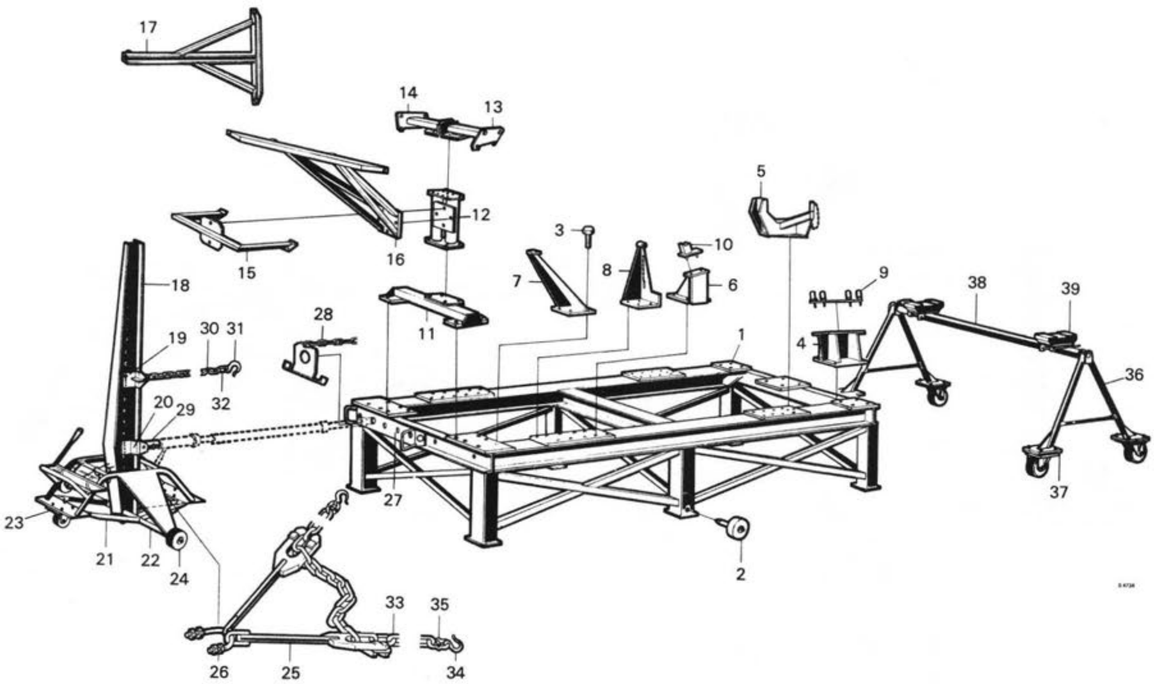
Part No.	Description	Class	Illustration	Remarks
8995805	Sleeve, wheel nut	A 0–1	 S 4727	
8995169	Drift, installation of outer rings and sealings, hub rear wheel	A 2	 S 4724	
8996167	Drift, trim cap, aluminium wheels	A 1	 S 6188	

Special tools, body



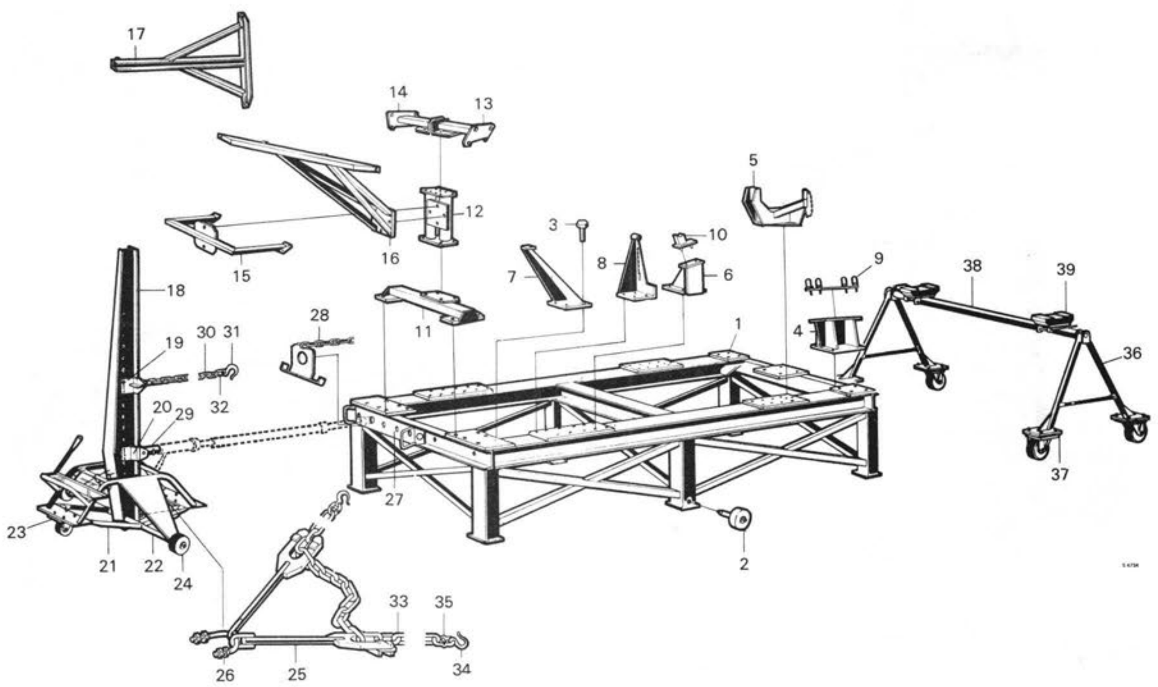
Part No.	Description	Class	Illustration	Remarks
8290140	Aligning bench assy. (earlier design)	B 2	Pos. 1. Positions, see illustration above	Also 95/96
8290157	Wheel	B 2	Pos. 2.	Also 95/96
7061559	Screw	B 2	Pos. 3	
8290363	Support set assy.	B 2	Pos. 4 up to and incl. 17.	
8290124	Front support L	B 2	Pos. 4.	
8290132	Front support R	B 2	Pos. 4.	
8290298	Scuff support L	B 2	Pos. 5.	
8290306	Scuff support R	B 2	Pos. 5.	
8290223	Support, middle floor L	B 2	Pos. 6.	
8290231	Support, middle floor R	B 2	Pos. 6.	
8290421	Support, rear floor	B 2	Pos. 7.	

Special tools, body



Part No.	Description	Class	Illustration	Remarks
8290470	Support, rear wheel housing L	B 2	Pos. 8. Positions, see illustration above.	
8290488	Support, rear wheel housing R	B 2	Pos. 8.	
8290439	Check support, front L	B 2	Pos. 9.	
8290447	Check support, front R	B 2	Pos. 9.	
8290165	Check support, rear	B 2	Pos. 10.	
8290652	Intermediate piece	B 2	Pos. 11.	
8290660	Pillar	B 2	Pos. 12.	
8290678	Support, front bearing bracket L	B 2	Pos. 13.	
8290686	Support, front bearing bracket R	B 2	Pos. 14.	
8291718	Fixture, steering gear bracket	B 2	Pos. 15.	
8291742	Fixture, front floor	B 2	Pos. 16.	

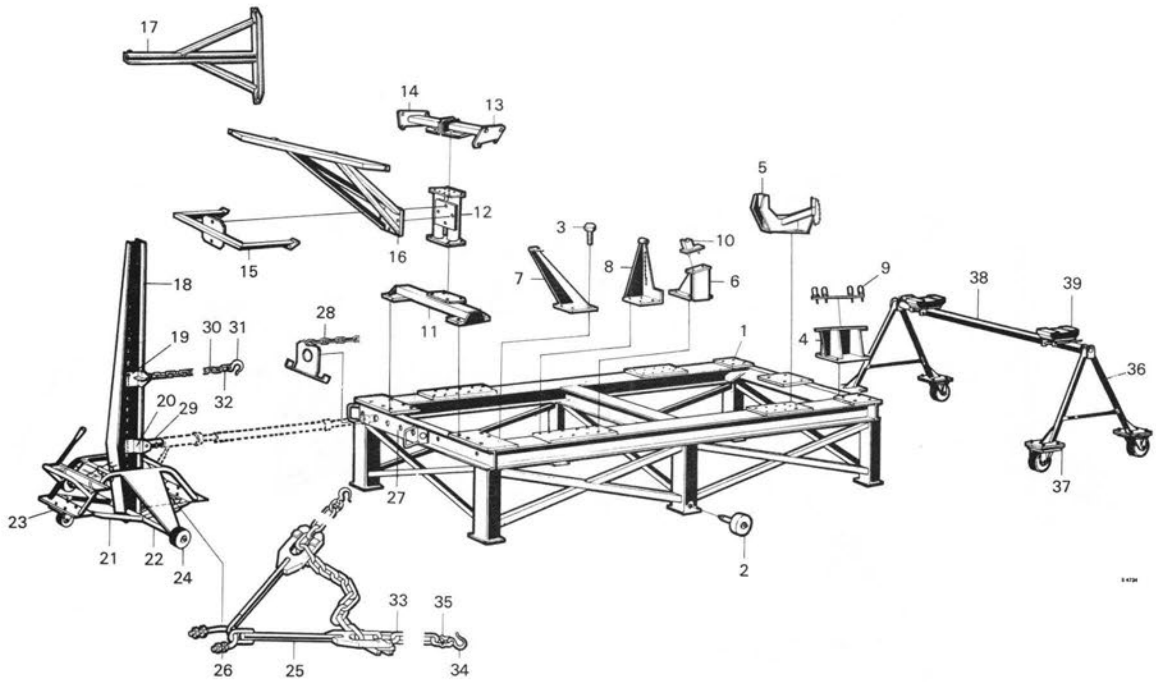
Special tools, body



Part No.	Description	Class	Illustration	Remarks
8290728	Fixture, engine supports	B 2	Pos. 17. Positions, see illustration above.	
8290322	Driving aligner cpl.	B 2	Pos. 18 up to and incl. 35.	Also 95/96
8290801	Lever	B 2	Pos. 18.	Also 95/96
8290256	Driver head	B 2	Pos. 19.	Also 95/96
8290330	Pressure head	B 2	Pos. 20.	Also 95/96
8290264	Trolley	B 2	Pos. 21.	
8290371	Shaft	B 2	Pos. 22.	
8290520	Link roller	B 2	Pos. 23.	Also 95/96
8290538	Iron wheel	B 2	Pos. 24.	Also 95/96
8290405	Ancorage head	B 2	Pos. 25.	Also 95/96
8291288	Fastening yoke	B 2	Pos. 26	

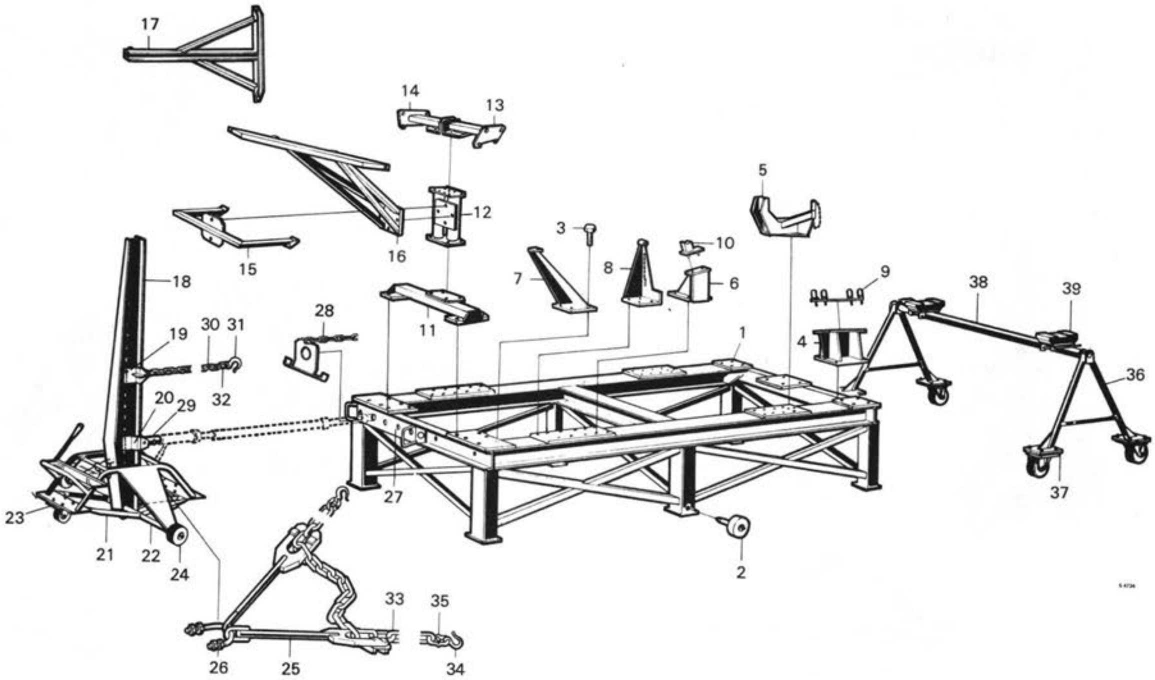
SAAB

Special tools, body



Artikel-nummer	Description	Class	Illustration	Remarks
8290173	Pressure piece	B 2	Pos. 27. Positions, see illustration above.	Also 95/96
8291270	Safety chain	B 2	Pos. 28.	
8290389	Sleeve for Bahco and Nike, hydraulic equipment	B 2	Pos. 29.	Also 95/96
8291320	Pulling chain	B 2	Pos. 30	
8291338	Hook	B 2	Pos. 31.	
8291346	Link	B 2	Pos. 32.	
8291361	Ancorage chain	B 2	Pos. 33.	
8291379	Hook	B 2	Pos. 34.	
8291387	Link	B 2	Pos. 35.	
8290272	Trestle assy. set	B 2	Pos. 36 up to and incl. 39.	Also 95/96
8290694	Trestle	B 2	Pos. 36.	Also 95/96

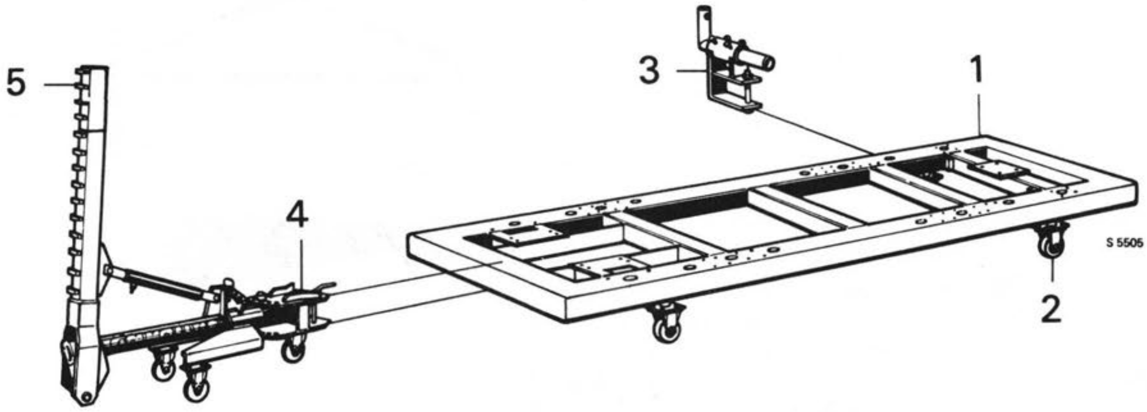
Special tools, body



Part No.	Description	Class	Illustration	Remarks
8290546	Link roll	B 2	Pos. 27.	Also 95/96
8290702	Yoke	B 2	Pos. 38.	Also 95/96
8290280	Wooden plate	B 2	Pos. 39.	Also 95/96

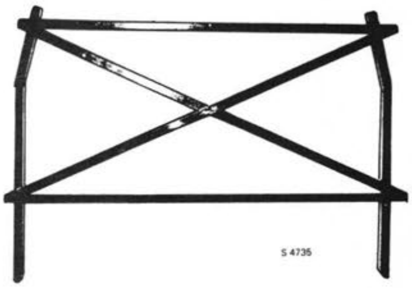
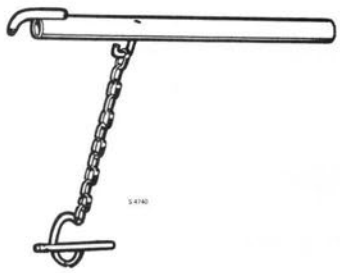
SAAB

Special tools, body



Part No.	Description	Class	Illustration	Remarks
8291908	Aligning bench (later design)	B 2	Pos. 1. Positions, see fig above.	Also 95/96
8291874	Wheels	B 2	Pos. 2.	–"–
8292088	Side support	B 2	Pos. 3	–"–
8291890	Support, aligner	B 2	Pos. 4.	–"–
8292153	Extension part, puller arm	B 2	Pos. 5.	–"–

Special tools, body

Part No.	Description	Class	Illustration	Remarks
8290637	Fixture, front fender	B 1		
8291023	Installing tool decor strip, window glass	A 2		
8996134	Spring to installing tool, windshield moulding, as from model 1976	A 2		
8996142	Spring to installing tool, rear side window moulding, 5-door Combi Coupé	A 2		
8996159	Spring to installing tool, windshield moulding, as from model 1975	A 2		
7884166	Holder, door	B 3		
8290561	Holder, door	B 3		
7884182	Stay, holder, door	B 3		
8291577	Tool, spring, luggage compartment lid	A 2		
8486276	Grease, door lock		 S 5506	
8291767	Pad, front window	A 2	 S 4741	
8291775	Pad, side window	A 2		
8291551	Pad, rear window	A 2		

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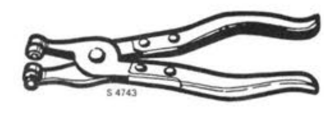
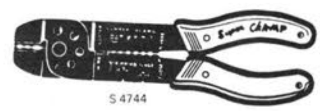
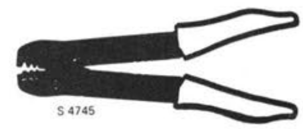
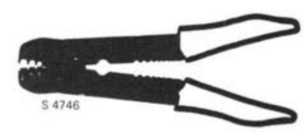
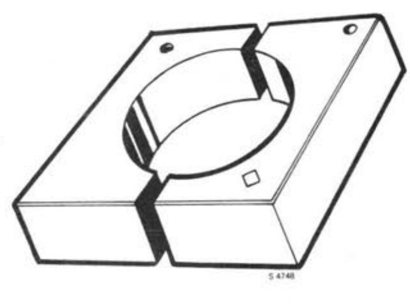
Special tools, others

Part No.	Description	Class	Illustration	Remarks
7843303	Pliers, hose clamp	A 1		
7840937	Pliers, splice crimping	A 1		
7860695	Pliers, unisulated cable terminals	A 1		
7860703	Pliers, uninsulated douglas plugs	A 1		
8291395	Sleeve wrench	A 3		
8580029	Holder, rotor	A 2		

SERVICE INSPECTIONS

Every new car is accompanied by a service card that should be stamped at every service occasion.
Guarantee service at 12,000 miles (2,000 km) is made free of charge (except for oils etc. for which a charge is made).
Other periodic servicing should be performed as per the periodic servicing, exhaust emission control, supplementary 5,000/10,000 mile (10 000, 15 000 km) and supplementary maintenance programmes.

EXHAUST EMISSION

The authorities' regulations governing the emission of carbon monoxide, hydrocarbons and nitric oxide in car exhaust fumes are becoming increasingly more stringent. Saab cars are designed and built to meet these requirements on the condition that the engines are correctly tuned.
The workshops hold a key position in being able to limit the emission of toxic gases from cars and therefore make a contribution to keeping pollution down. Remember that a correctly tuned engine also ensures that the car runs smoothly and with low fuel consumption.
The relevant adjustments are described in the service program. We would particularly like to emphasise the importance of adjusting the ignition system and the fuel system in accordance with the specifications.

DELIVERY INSPECTION

1. Check the engine oil level and if necessary replenish oil.
2. Check the gear box oil level and if necessary replenish oil. Check the differential oil level (cars with automatic transmission).
3. Check the level of the fluid in the power steering gear reservoir and top up as necessary.
4. Check level of coolant and its freezing point.
5. Check function of all locks, headlights, stop lights, direction indicators, warning flashers, back-up lights, indicator lights, windshield wipers/washer, headlight wipers/washer, heater fan and signal horns.
6. Check, if necessary, adjust the headlight alignment.
7. Check the battery electrolyte level and charging condition.
8. Tighten cable terminals at battery, starter motor, voltage regulator and alternator.
9. Check, if necessary, adjust V-belts.
10. Check, if necessary, adjust the ignition setting.
11. Check the fluid level and if necessary replenish brake fluid in the master cylinders for brakes and clutch.
12. Check brake hoses and lines for leakage.
13. Check function of all door locks and the hood lock.
14. Check, and if necessary, adjust the basic setting of the carburetor main jet and fuel needle.
15. Check, and if necessary, adjust synchronizing of carburetors (twin-carburetor engines only).
16. Tighten the wheel bolts.
17. Adjust the tire pressure incl. the spare wheel.
18. Check, if necessary, adjust toe-in.
19. Remove rubber plugs from vent holes in door sills.
20. Check the tool kit and that the Owners Manual and Service Card are in place.
21. Test run car on road and check its condition, especially the function of brakes and clutch.
22. Check, if necessary adjust engine idling/fast idling speed and the emission of carbon monooxide (CO).

GUARANTEE SERVICE AT 1,200 MILES (2,000 KM)

1. Check cylinder head nuts and bolts to prescribed torque.
2. Check and if necessary adjust valve clearance.
3. Check and tighten flange screws of inlet manifold and carburetor/valve housing.
4. Check and tighten exhaust manifold retaining screws and exhaust pipe flange nuts.
5. Check exhaust system for leaks; check and tighten exhaust pipe clamp and suspension screws.
6. Check and tighten screws on all engine mounts.
7. Change engine oil. Owner pays for oil.
8. Cars with manual transmission only:
   Change transmission oil and clean magnetic drain plug. Owner pays for oil.
9. Cars with automatic transmission only:
   Check and, if necessary adjust gear selector cable.
   Check the movement and play of the throttle cable.
   Check oil level in transmission and final drive.
10. Check the level of the fluid in the power steering gear reservoir, and top up if necessary.
11. Check radiator coolant level and test cooling system for leaks (pressure test).
12. Cars with manual transmission:
    Check fluid level in clutch master cylinder and top up if necessary.
13. Check function of all locks, headlights, stop lights, direction indicators, warning flashers, back-up lights, indicator lights, brake warning light, seat belt warning light, windshield wipers/washer, headlight wipers/washer, heater fan and signal horns.
14. Check battery electrolyte level and top up if necessary; grease cable clamps.
15. Check and if necessary adjust V-belt tension.
16. Check and if necessary adjust dwell angle of breaker points. Grease distributor breaker cam and lubricating felt. Check and if necessary adjust ignition timing.
17. Check fluid level in brake master cylinders; top up if necessary.
18. Check condition of rubber dust excluders on steering gear and inner and outer universal joints, and of rubber seals for ball joints and tie rod ends.

19. Check and tighten screws securing control arms to body (front suspension).
20. Check and if necessary tighten rear axle screws to the body.
21. Check and if necessary adjust wheel alignment, camber, caster and toe-in. Tighten the tie rod end nuts (both sides).
22. Check and if necessary adjust the engine idling speed.
23. Adjust the deceleration-valve.
24. Check engine and transmission for oil leakage.
25. Test-drive car on road and check operations of all system.
26. Check the charging pressure, Turbo.

CAUTION! The attachment screw of the engine bracket in the cylinder head is locked with locking fluid (as from chassis No. 99771032719, 99772006776, 99776016329, 9977003989), and should not be retightened.

REGULAR MAINTENANCE INSPECTION UP TO AND INCL MODEL 1979

Every 6,000 miles (10,000 km)

Engine

1. Change oil (at least twice a year) and oil filter.
2. Clean air cleaner insert.
3. Clean fuel pump filter (carburetor engine).
4. Check fuel lines in engine compartment for leakage.
5. Check and if necessary top up oil level in carburetor damping cylinder.
6. Check the exhaust system for condition and leaks.
7. Pressure test of the cooling system (check the condition of the hoses).
8. Check coolant freezing point.
9. Tighten cylinder head bolts (only first 6,000 miles/ 10,000 km).
10. Check and if necessary adjust carburetor synchronization (two-carburetor engine).
11. Adjust deceleration-valve (only first 6,000 miles/ 10,000 km as from model 1976).
12. Check and if necessary adjust engine idling speed and the emission of carbon monoxide (CO) at idling.

Electrical system

1. Check condition of V-belts and adjust belt tension if necessary.
2. Check and if necessary adjust headlight alignment. Inspect condition of headlights by eye.
3. Adjust spark plugs.
4. Check condition of breaker points. Lubricate distributor breaker cam and lubricating felt. Check and if necessary adjust dwell angle and ignition timing.
5. Check battery electrolyte level and top up if necessary. Tighten and grease cable shoes.
6. Check operation of parking, stop and tail lights, licence plate illumination, direction indicators, horn, back-up lights, hazard warning signal, interior lighting, control and indicator lights, windshield and headlight washers and wipers, brake warning light, instrument lighting, trunk lighting and ventilator fan.
7. Check condition of washer jets and rubber wiper blades.

Transmission

1. Manual transmission: Check fluid level and if necessary replenish brake fluid in clutch master cylinder.
2. Manual transmission: Check and if necessary adjust clutch release bearing play (only up to and incl. model 1975).
3. Check transmission oil level and top up if necessary (also final drive in automatic transmission).

Brake system

1. Check level in master cylinder, top up with brake fluid if necessary.
2. Check and if necessary adjust parking brake (only up to and incl. model 1974).
3. Remove wheels and check thickness of brake pads.
4. Check brake lines and hoses for condition and leaks.

Steering, front suspension and tires

1. Check and if necessary adjust toe-in.
2. Check condition of rubber bellows on steering gear and inner and outer universal joints, and of rubber seals for ball joints and tie-rod ends.
3. Check depth of tire tread patterns.

Body

1. Lubricate door stops, door hinges and hood lock mechanism.

Test driving

1. Test drive car on road and check operation of all systems, especially brakes and clutch and operation of automatic transmission.

SUPPLEMENTARY INSPECTION

Every 12,000 miles/20,000 km. To be carried out in connection with the regular 6,000 miles/10,000 km inspection.

1. Change spark plugs.
2. Change breaker points.
3. Change oil in manual transmission, clean magnetic drain plug (at least once a year).
4. Change oil in final drive of automatic transmission.
5. Check and if necessary adjust camber and caster.
6. Adjust deceleration-valve.

SUPPLEMENTARY INSPECTION

Every 24,000 miles/40,000 km. To be carried out in connection with the regular 6 000 miles/10,000 km inspection and the supplementary 12,000 miles/20,000 km inspection.

1. Check and if necessary adjust valve clearance.
2. Change air cleaner insert.
3. Change fuel filter (injection engine).
4. Check and if necessary replenish steering gear oil level.
5. Change brake fluid (at least once every second year).

PERIODIC SERVICING AS FROM MODEL 1980

The maintenance programme lists the most important things that need to be done to ensure enjoyable and trouble-free motoring at minimum cost. The 1,200 miles (2,000 km) coupon in your Service Card entitles you to guarantee check-ups (except for oils for which a charge is made). The guarantee is not valid if these check-ups are not made. Subsequent check-ups at 10 000 miles (15 000 km) intervals will be charged for. Take the Service Card with you when you turn your car in for servicing.
If less than 10 000 miles (15 000 km) are covered in one year, one engine oil change must be carried out and one complete service should in any case be carried out in the year.

5 000 MILES (7 500 KM) SERVICE

Change engine oil in Saab 99 Turbo cars and cars driven under unusually demanding conditions, such as driving in extremely hot weather, driving at high speeds for a considerable distance, and driving over short distances in extremely cold weather.

10 000 MILES (15 000 KM) SERVICE

To be carried out by authorized Saab Dealer.

Engine

1. Change oil and oil filter cartridge (at least once a year).
2. Clean air cleaner insert.
3. Clean fuel pump filter. (Carburetor engine).
4. Check fuelllines in engine compartment for leakage.
5. Check the damper oil level. Top-up if necessary. (Carburetor engine).
6. Check engine idling speed setting and check emission of carbon monoxide as prescribed by the authorities (where applicable).
7. Check the exhaust system for condition and leaks.
8. Pressure test the cooling system (check the condition of the hoses).
9. Check coolant freezing point.
10. Check hoses and nipples for the crankcase ventilation.
11. Adjust deceleration valve.
12. Check the synchronizing of the carburetors (twin-carburetor engine).
13. Check the choke control.
14. Check the tightness of the valve cover screws.
15. Saab 99 Turbo: Check the seal on the charge pressure regulator.
16. Saab 99 Turbo: Check the charging pressure and adjust as necessary.
17. Saab 99 Turbo: Check the pressure guard and the fuel enrichment device.

Electrical System

1. Check condition of V-belts and adjust belt tension if necessary.
2. Check and if necessary adjust headlight alignment.
3. Change the spark plugs.
4. Change the breaker points. Lubricate distributor breaker cam and lubricating felt. Check and if necessary adjust dwell angle and ignition timing.
5. Check battery electrolyte level and top up if necessary. Tighten and grease cable shoes.
6. Check operation of parking, brake and rear lights, number plate light, direction indicators, horn, reversing lights, hazard warning flashers, interior lighting, warning and indicator lights, windshield washers and wipers, brake warning light, instrument lighting, luggage compartment lighting and ventilator fan.
7. Check the vacuum hoses and their connections.
8. Check the condition of the ignition cables.

Transmission

1. Check transmission oil level and top up if necessary (also final drive in automatic transmission).

Brake system

1. Check level in master cylinder, top up with brake fluid if necessary.
2. Remove wheels and check thickness of brake pads.
3. Check brake lines and hoses for condition and leaks.
4. Lubricate the front wheel brake units.

Steering, front suspension and tyres

1. Check condition of rubber bellows on steering gear and inner and outer universal joints, and of rubber seals for ball joints and tie-rod ends.
2. Check depth of tyre tread patterns.
3. Check the tyre pressure in the spare wheel.
4. Check the fluid level in the power steering fluid container.
5. Check the wear in inner and outer steering joints.

Body

1. Lubricate door stops, door hinges and bonnet lock mechanism.
2. Check condition of washer jets and rubber wiper blades.

Test Driving

1. Test drive car on road and check operation of all systems, especially brakes and clutch.

20 000 MILES (30 000 KM) SERVICE

To be carried out in connection with the 10 000 miles (15 000 km) Service.
1. Saab 99 Turbo: Check and if necessary adjust valve clearance.
2. Saab 99 Turbo: Change air cleaner insert.
3. Change oil in automatic transmission, clean filter and magnet. Adjust gear selector cable, rear brake lining and throttle cable. Only first 20 000 miles (30 000 km).

30 000 MILES (45 000 KM) SERVICE

To be carried out in connection with the 10 000 miles (15 000 km) and 20 000 (30 000 km) Service.
1. Check and if necessary adjust valve clearance.
2. Change air cleaner insert.
3. Change fuel filter (injection engine)
4. Change oil in final drive of automatic transmission.
5. Change brake fluid (at least once every two years).
6. Check and if necessary adjust toe-in, camber and caster.
7. Saab 99 Turbo: Clean the charge pressure regulator.

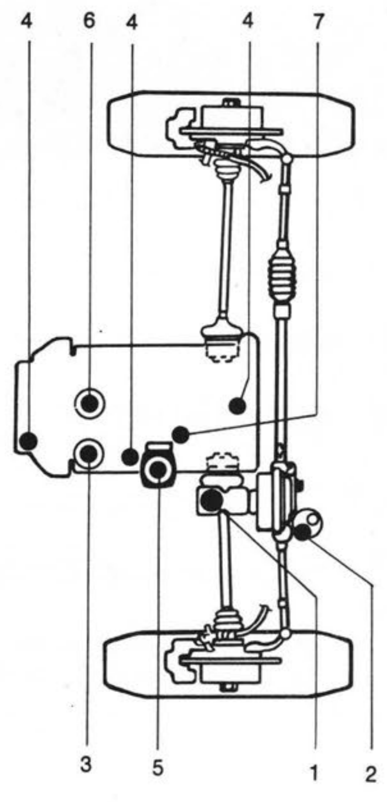
LUBRICATION

LUBRICATION CHART

Ref.	Lubrication point	Qty.	Lubricant	Direction
1	Brake system	1	Brake fluid, grade DOT3 or DOT4, earlier SAE J 1703	Brake fluid should be changed every 25,000 miles (40,000 km, up to and including 1978 model)
2	Hydraulic dlutch	1	Brake fluid grade as above	
3	Engine	1	Follow recommendations on page 120–2	Change oil and oil filter cartridge NOTE! Use only Saab original filter cartridge
4	Manual transmission		Follow recommendations on page 120–2	Up to and including 1978 model check level every 5,000 miles (10,000 km), change every 20,000 miles (30,000 km). As from 1979 model check level every 10,000 miles (15,000 km), change every 30,000 miles (45,000 km).
	Automatic transmission			Up to and including 1978 model check level every 5,000 miles (10,000 km). Change every 20,000 miles (30,000 km) (in conjunction with servicinb). As from 1979 check level every 10,000 miles (15,000 km).
	Final drive, automatic transmission		Follow recommendations on page 120–2	Up to and including 1978 model check level every 5,000 miles (10,000 km), change every 20,000 miles (30,000 km). As from 1979 model check level every 10,000 miles (15,000 km), change every 30,000 miles (45,000 km).
5	Carburetor (oil damper)	1	Oil for autom.transmission Ford M2C.33F or M2C.33G type A, Suffix A or Dexron	Check every 6,000 miles (10,000 km) at time of service, inspection
6	Distributor, breaker cam	1	Bosch Ft 1 v 4	Grease cam
	Distributor, lubr. felt under breaker plate	1	SAE 40 oil	Oil can, sparingly plate (the accelerator cable should not be lubricated).
7	Throttle control, wire bearing	1	SAE 40 oil	Oil can
	Hood lock mechanism	1	SAE 40 oil	Oil can
	Door hinges and door stops	4+4 (8+8)	SAE 40 oil	Oil can

NOTE

Saab Special chassis grease must be used with care, as it is apt to discolor the paintwork of the car.



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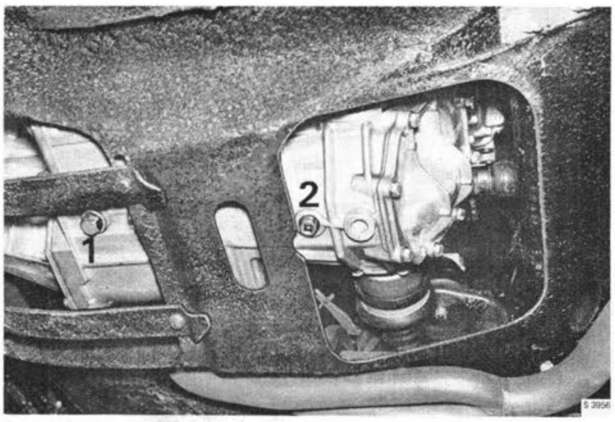
1. Brake system
   The brake fluid container must always be kept well filled. The level in the container should be checked every three months, when the filler cap should also be inspected to make sure that the holes are not blocked. Follow the brake fluid recommendations given in the lubrication chart.
2. Hydraulic clutch operation
   Check that the container is full.
3. Engine
   Oil volume 6 Imp. pints (3.5 liters).
   Oil recommendations, see group 0.
   The engine oil level should be checked regularly. This should be done when the engine has been at a standstill for about one minute. The oil level must not be allowed to fall below the lower mark on the dipstick, nor must it be topped up beyond the upper mark, as this may result in abnormal oil consumption. The distance between the upper and lower marks corresponds to a volume of one liter (roughly 1 3/4 Imp. pints). Top up as needed with oil of the recommended grade. Engine oil should be changed for the first time after 1,200 miles (2,000 km). Subsequent oil changes every 5,000 miles (10,000 km) (up to and including 1978 model) and every 10,000 miles (15,000 km) (as from 1979 model) respectively or at least once a year.



DRAIN PLUGS
1. Engine
2. Transmission

The oil filter cartridge should be replaced when changing the oil.

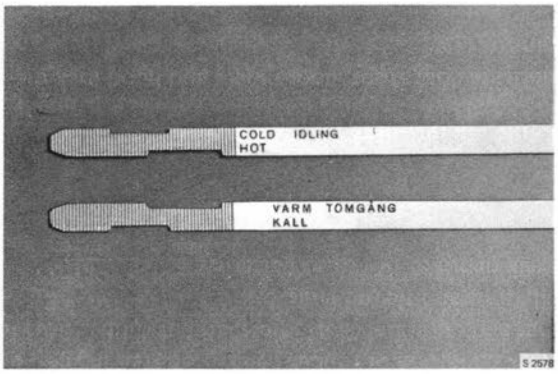
The engine drain plug has a hexagonal head.

Tightening torques	
Drain plug engine	30–45 ft.-lb., 40–60 Nm (4–6 kpm)
Drain plug gear box	30–45 ft.-lb., 40–60 Nm (4–6 kpm)
Level plug	22–30 ft.-lb., 30–40 Nm (3–4 kpm)

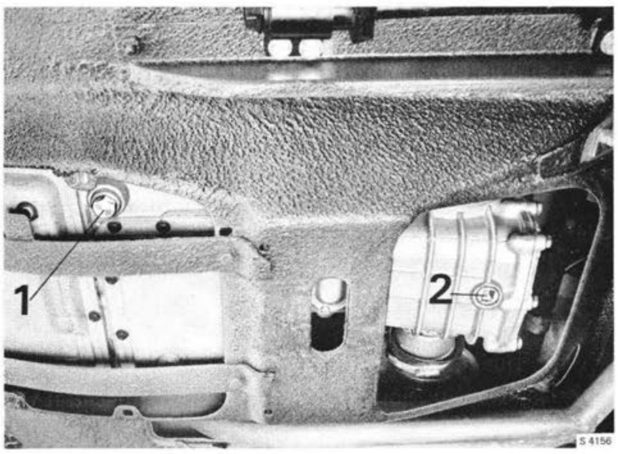
4. Manual transmission
   Check the oil level in conjunction with servicing (up to and including 1978 model every 5,000 miles (10,000 km) and as from 1979 model every 10,000 miles (15,000 km). Up to and incl. model 1977, check the level by removing the level plug. As from model 1978, check the level on the dipstick.
   When changing oil, drive the car for 15–20 minutes before draining off the old oil. Clean the magnetic drain plug, then add fresh oil through the transmission filler plug opening until it runs out of the level plug opening. Remember that it takes some time for the oil to run from the primary gear housing into the transmission case.
   Transmissions with gear-train primary gear hold 3.0 litres of oil, and transmissions with chain-drive primary gear, 2.5 litres. Oil should be changed for the first time after 1,200 miles (2,000 km) and thereafter:
   - up to and including 1978 model every 20,000 miles (30,000 km)
   - as from 1979 model every 30,000 miles (45,000 km)

   the oil prescribed in API service SE.

Automatic transmission
Check the oil level in the automatic transmission in conjunction with servicing (up to and including 1978 model every 5,000 miles (10,000 km) and as from 1979 model every 10,000 miles (15,000 km). Concerning oil change, see "Inspection of automatic transmission every 18,000 miles (30,000 km)". The filter tube with graduated dipstick is located immediately behind the radiator. The dipstick has different level graduations for hot and cold oil.
When the oil level is measured the car should be standing on a level surface with the selector at P and the engine idling. The oil level should then be somewhere between the top and bottom of the appropriate cutout on the dipstick (see illustration).
Use a nylon rag, lint-free paper or chamois leather to wipe off the dipstick – do not use rags that may leave fluff on the dipstick.
If the transmission needs topping up, use only special automatic transmission oil according to the following recommendations:
Automatic transmission oil according to Ford specification M2C.33F or M2C.33G.
Automatic transmission oil Type A, Suffix A and Dexron may also be used for topping up.
The most scrupulous cleanliness must be observed during filling.
The oil in the final drive unit must be checked:
- up to and including 1978 model every 5,000 miles (10,000 km)
- as from 1979 model every 10,000 miles (15,000 km) and changed:
- up to and including 1978 every 20,000 miles (30,000 km)
- as from 1979 model every 30,000 miles (45,000 km)



DIPSTICK, AUTOMATIC TRANSMISSION



DRAIN PLUGS, AUTOMATIC TRANSMISSION
1. Engine
2. Final drive

5. Carburetor damper.
   Oil for automatic transmission type M2C.33F or equal oil. The level should be min. 0.40 in (10 mm) under the damper cylinder lower end.
6. Distributor breaker cam
   Apply a small quantity grease at the rivet holding the notch to the breaker contact.
   Distributor lubricating felt under breaker plate: Impregnate the felt with a moderate quantity of grease.
   Throttle control: Wire bearing should be oiled. (the accelerator cable should not be lubricated).
   Hood lock mechanism: Door hinges and door stops. Oil the hinges by dropping oil into the groove in the head of the hinge pin. The hinges are accessible from the front when the hood is open.

INSPECTION OF AUTOMATIC TRANSMISSION EVERY 18,000 MILES (30,000 KM) (MAINTENANCE PROGRAM U3b)

To ensure the correct functioning and a long service life of automatic transmissions, the following additional actions are recommended in conjunction with the ordinary 18,000 miles (30,000 km) inspection service.

1. Drain the oil.
2. Remove the cover plate and front oil pan.
3. Clean the strainer and the magnet.
4. Check the adjustment of the gear selector. Adjust as required (adjusting nuts by transmission).
   a. Find the central position of the D position in the manual valve with the pawl button depressed.
   b. Release the pawl button. Move the lever backwards against the stop in the selector housing and note the play.
   c. Find the central position of the N position in the manual valve with the pawl button depressed.
   d. Release the pawl button. Move the lever forward against the stop in the selector housing and note the play.

   The play should be the same. For adjustment, follow the directions contained in Section 4 of the service manual.
5. Check and if necessary adjust the rear band.
6. Check the tension and adjustment of the throttle cable. The clearance between the clip on the cable and the threaded part of the sheath should be between 1 and 2 mm. Adjust as necessary.
7. Install the front oil pan and cover plate. Fill with new oil. Capacity: 3–3.5 litres.

STEERING GEAR, OIL LEVEL CHECKS

Check every 15,000 miles (20,000 km).

1. Lift the car in the left front jack support until the wheel is just free from the floor and remove the wheel.
2. Loosen the rubber bellows on the left tie rod and turn the steering wheel to full right lock.
3. Check that the oil level reaches the middle of the tie rod by inserting a screwdriver between tie rod and bellows.
   If necessary fill oil with the aid of an oil can.
4. Refit the clamp which is easier done if the steering wheel is turned a little towards the middle position.
5. Refit the wheel and lover the car.

Lubricant oil:
Manual steering gear: According to API-Service GL4 SAE 80–90.
Servo steering gear: According to API-Service GL5 SAE 75.

IN CONJUNCTION WITH RECONDITIONING

In conjunction with reconditioning, the following lubrication points should be repacked with chassis grease.
Tie-rod end assemblies plus upper and lower ball joints: Pack the bellows 3/4 full.
Lubricant: Saab special chassis grease.
Rear wheel bearings: Repack.
Lubricant: Saab special chassis grease.
Inner universal joint: Fill with grease. The quantity will be correct if the driver is completely filled. Wipe off excessive grease after the drive shaft has been installed.
Lubricant: Soft EP grease with a lithium-lead base, and which is capable of withstanding considerable variations in temperature and load. Consistency according to NGLI 1, ESSO Beacon EP 1, SHELL Alvania EP grease 1 type or equivalent.
Outer universal joint: The correct quantity of grease will be obtained if the cup with the balls inside is completely filled with grease.
Lubricant: Saab special chassis grease.
Clutch control: Coat the joint with grease.
Lubricant: Saab special chassis grease.
Release bearing: Fill the groove 3/4 full.
Lubricant: Saab special chassis grease.

STEERING GEAR

Manual steering gear

In conjunction with steering gear overhaul, fill 8.1 fl.oz. (0.23 dm^3, 2.3 dl) oil type EP 90.

Servo steering gear

Lubricant oil

When the steering gear is overhauled, add 6.5 fl.oz. (0.19 dm^3, 1.9 dl) of oil at one of the rubber bellows.
Oil grade: According to API-Service GL5 SAE 75.

Hydraulic oil

When making repairs on the hydraulic system, hydraulic oil is added as follows:

1. Add oil to a level 0.4 in. (1 cm) above the lower part of the strainer in the oil reservoir.
2. Start the engine and re-fill to the above-mentioned level.

Oil grade: Automatic transmission oil with the same specifications as that used for the automatic transmission.
The whole servo hydraulic system contains 2.0 pints (1.2 dm^3; liters).

FUEL

Recommended grade of fuel:

Carbureted engines	minimum 97 octane gasoline
Injection engines	minimum 97 octane gasoline.

SAAB

UNDERBODY AND RUSTPREVENTING TREATMENT

TOUCHING-UP OF UNDERBODY COATING

To retain the advantages afforded by underbody composition, the underbody, too, should be regularly inspected and the coating touched up as necessary. Apart from protecting against corrosion, the coating improves sound insulation. This protection is particularly important with regard to the fenders, which are continuously exposed to wear from a constant barrage of flying stones and gravel. Before covering worn or bare parts with fresh underbody composition, clean the metal thoroughly with a scraper and a steel-wire brush and then wash with gasoline or suchlike. Before applying fresh composition, coat the metal with a reputable make of rust inhibitive, and then apply about 0.06 in (1.5 mm) thick coating of composition before the rust inhibitive has dried. Excessive application will result in the composition running and it may even pull right away from the metal which it is intended to protect.
Naturally, new metal panels, such as fenders, must always be treated in a similar manner after fitting. If underbody coating is applied prior to spraying it is essential that all composition be washed off the surfaces which are to be enameled.

RUST-PREVENTING TREATMENT

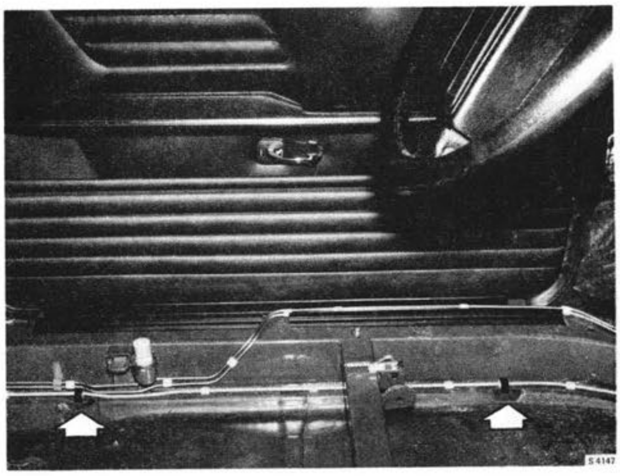
The cars are treated with a rust preventive agent before leaving the factory. Spraying with rust-preventive oil has been greatly increased. The underside of the floor is sprayed after the underbody compound is applied. The rust preventing treatment which the car receive at the factory should be repeated within 12 months after delivery. The reason for this is that some settlement of the electrophoretic paint may occur in the welded body joints after the car has been driven for some time. Provided that this treatment is performed in accordance with the instructions issued by Saab-Scania, further spraying with rust-preventive oil will only be necessary every second or third year.

HOLES AND RUBBER PLUGS IN THE BODY

The parts of the body which must be sprayed with rust-preventive oil are listed under the heading Points of Treatment. In the body, holes equipped with slitted rubber plugs are provided. Through these holes spraying of enclosed spaces is made.

PRELIMINARY WORK

1. Clean the underbody, wheel housings and engine compartment, panel welds in the front floor, wheel housings and front fenders.
2. Remove the scuff plates, turn up the floor mats at the sills and seal the four drain holes in the sills (two in each sill), see fig.
   Work site: Grease pit or lift.



DRAIN HOLES IN THE SILLS

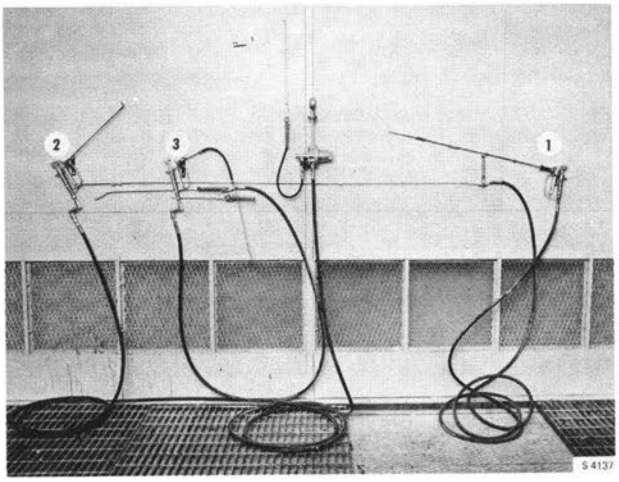
3. Remove the wheels.
4. Mask the brake discs.
5. The reel belts on 2-door models should be completely pulled out and remain out until the treatment is finished.

OIL, PRESSURE AND TEMPERATURE

About 3 1/2 pints (3 dm^3; liters) of oil are used in the treatment. Information on pressure for spraying should be obtained from the oil manufacturer. Use heavy oil for the underbody and wheel housings and light oil for the members, cavities and welds. Heavy oil should be used for application with a brush or oil can. In order to assure sufficient penetration, the temperature of the car should not be less than 50°F (+10°C).

EQUIPMENT

2 high-pressure compressors for airless spraying with a 40:1 pressure increase for heavy oil and 48:1 for light oil.
2 spray guns.
Nozzles which permit access to cavities, members, doors and through slitted rubber plugs.
Oil can and brush for treatment of welds between wheel housings and fenders.



EQUIPMENT FOR RUST-PREVENTIVE TREATMENT
1. Nozzle for spraying doors
2. Nozzle for spraying members and cavities
3. Nozzle with reduced pressure for treatment of welds between wheel housings and fenders. Can be substituted by brush or oil can.

OIL SPRAYING

The treatment is divided up into four groups. In group 1, the treatment is done from below, in group 2 from the sides and in groups 3 and 4 (horizontal reference line) from inside the engine compartment. The underbody and wheel housings are sprayed externally.
Cavities and members are sprayed internally. The welds between the front floor and the wheel housings are sprayed in the engine compartment.
Treated areas shall have a coat at least 30 μm thick. The points of attachment between Z-beams and the floor shall be oiled liberally. All doors are oiled through holes in the end, about 4 in. (100 mm) from the bottom edge. A thin coat of oil shall be applied to the inside of the doors.

TREATMENT WITH BRUSH OR OIL CAN

A brush or an oil can is used to treat the weld between the wheel housing and the front fender in the engine compartment and the weld between the wheel housing and the outer side panel in the luggage compartment. The oil is applied liberally to the uppermost point of the weld so it runs down along the weld.

POINTS OF TREATMENT

NOTE
Points of treatment with slitted plugs can be treated through the plug if the right nozzle is used.

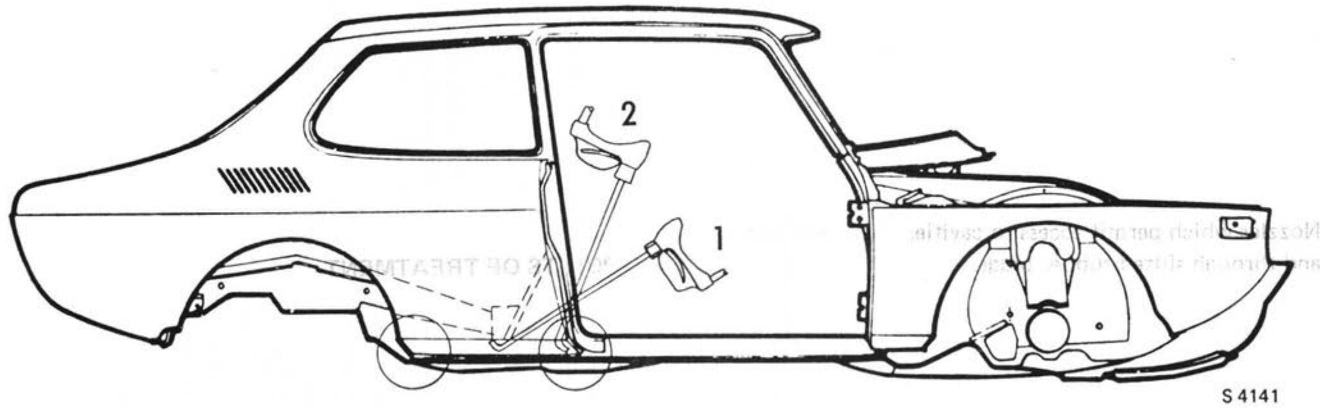
Group 1 (from below)

1.1. The cavity formed by the front engine member up against the front floor panel.
A hole 1.4 in. (35 mm) in dia. is provided in the front floor panel.
1.2. The front floor, the wheel housings and the entire underbody are sprayed with oil. Special care must be taken in treating Z-beams, the cross member in the engine compartment, jack attachment points (including the rear attachment point) and the linkage arm attachment point in the middle of the floor.
1.3. Cross bar member.
The cavity in the cross bar member is treated through the 0.4 in. (11 mm) dia. hole in the middle of the member.

Group 2 (from the sides)

2.1. The inside of the scuff plates is treated through the 0.8 in. (20 mm) holes in both ends on 2-door models.
2.2. The cavity formed by the outer side panel against the outer scuff plate is treated through the 0.8 in. (20 mm) dia. hole in the front edge.
Insert the nozzle through the hole in the end of the side panel. Hold the gun as in fig. 1 and spray, then twist the gun a half turn and spray again (fig. 2). The oil stream should hit the outlined areas. Any other spray direction will cause oiling of the seat belts, side boards and adjoining trim. Only airless spraying may be practised.

CAUTION
Point 2.2, 2-door models: Because of the location of the reel belt next to the side panel, only the lower part of the side panel may be sprayed.



S 4141

TREATMENT OF SIDE PANEL

2.3. Rear wheel housing bracket.
Two 0.8 in. (20 mm) holes are provided.

2.4. Doors.
2- and 4-door models are treated through the 0.8 in. (20 mm) holes in the rear ends.

2.5. 4-door models only: The cavity in the lower rear pillar is treated through the 0.4 in. (11 mm) hole.

2.6. 4-door models only: The cavity up near the door frame between the side panel, outer wheel housing and end panel is treated through the 0.8 in. (20 mm) dia. hole in the end panel.

Groups 3 and 4 (horizontal reference line)

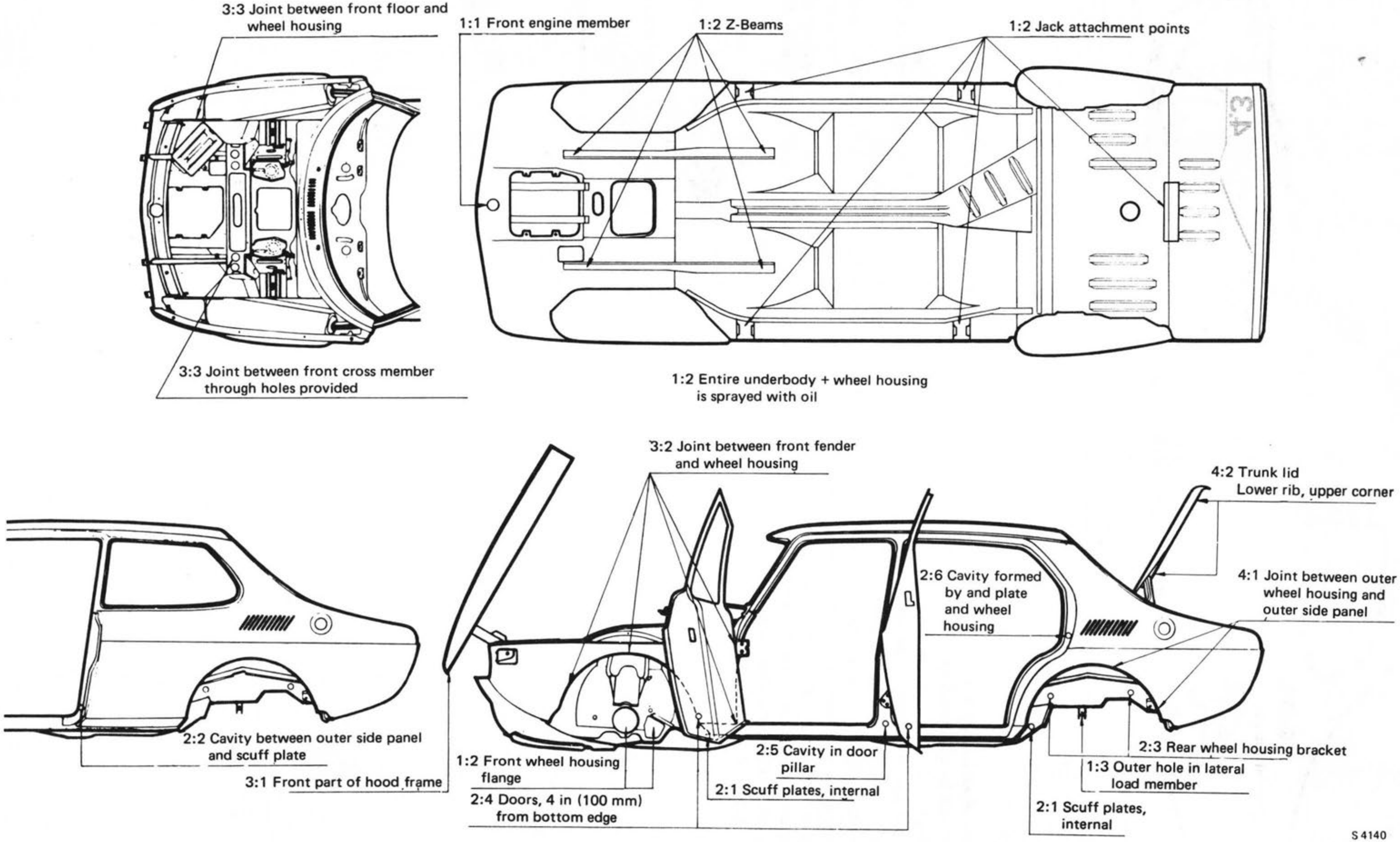
3.1. Hood.
The front part of the front hood frame is treated through the holes provided.

3.2. Treat the joint between the outer wheel housing and the front fender and between the front fender and the fender end and the reinforcing piece in the wheel housing panel beneath the bracket for the lower door hinge.

3.3. Treat the joint between the front floor and the inner wheel housing back towards the bearing bracket. Treat the cross member connected to the bearing brackets through the excisting holes.

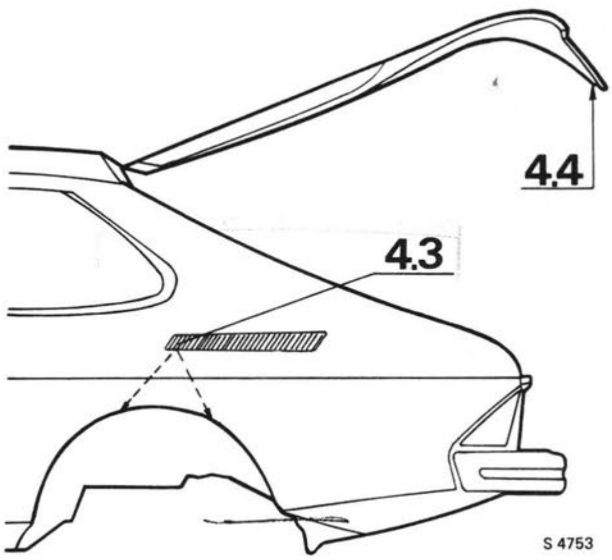
4.1. Treat the joint between the outer wheel housing and the outer side panel from the trunk.

4.2. Trunk lid.
Treat the lower rib, as well as the other corners, through the holes provided.


3:3 Joint between front floor and wheel housing
1:1 Front engine member
1:2 Z-Beams
1:2 Jack attachment points
3:3 Joint between front cross member through holes provided
1:2 Entire underbody + wheel housing is sprayed with oil
3:2 Joint between front fender and wheel housing
4:2 Trunk lid Lower rib, upper corner
2:6 Cavity formed by and plate and wheel housing
4:1 Joint between outer wheel housing and outer side panel
2:2 Cavity between outer side panel and scuff plate
3:1 Front part of hood frame
1:2 Front wheel housing flange
2:4 Doors, 4 in (100 mm) from bottom edge
2:5 Cavity in door pillar
2:1 Scuff plates, internal
2:3 Rear wheel housing bracket
1:3 Outer hole in lateral load member
2:1 Scuff plates, internal
S 4140

4.3. Treat the joint between the outer wheel housing and the outer side panel through the hole for the evacuation box after the latter has been removed.

4.4. Treat the trunk lid through the lower hole in the inner panel of the lid.



DEVIATIONS, SAAB 99 COMBI COUPE

SUBSEQUENT TREATMENT

Dry off the oil from the oiling points along the sides of the fenders and on the painted surfaces. Use a rag dipped in paint thinner. Remove the masking from the brake discs and fit the wheels. Remove the seals in the drain holes in the scuff plate members and clean off the oil which has run out. Put back the floor mats and fasten the scuff plates. Note! Oil draining must have ceased when the sealing plugs are removed. Oil which runs out through the scuff plate member drain holes will dissolve the insulation mat in the front and middle floor.

CONTENTS

GENERAL

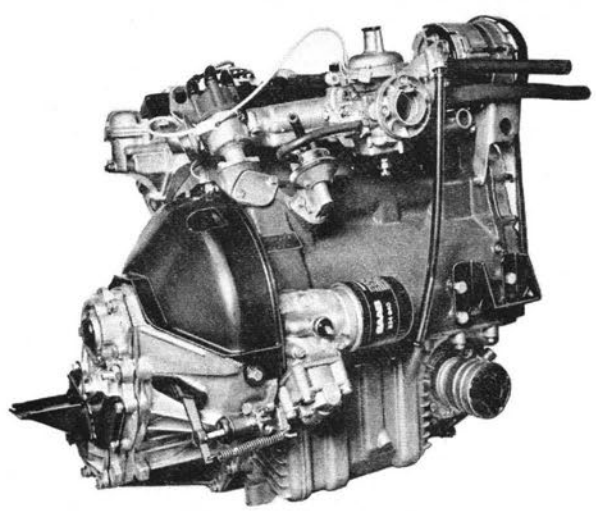
The car has a four-in-line cylinder, water-cooled overhead camshaft engine. The crankcase ventilation is totally enclosed. The cylinder block is inclined at an angle of 45° and the cylinder head is of the cross-flow type, i.e. with the inlet passages on one side and the exhaust passages on the other. The engine is mounted with the clutch towards the front of the car and with the transmission and No. 1 cylinder towards the rear. The engine is available in two versions: carbureted or with fuel injection.
The carburetor is a horizontal Zenith-Stromberg.
The injection system is manufactured by Bosch and has the designation CI. CI (continuous injection) means that the injection valves remain open when the engine is running. The air flow to the engine is measured continuously and this governs the supply of fuel to the engine. The fuel is injected into the inlet manifold upstream of the inlet valve.

CYLINDER BLOCK

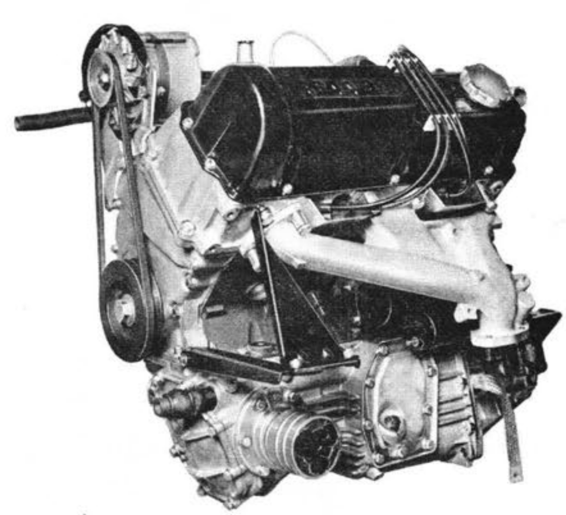
The cylinder block is made of special cast iron, cast in one piece. The cylinder bores, surrounded by cooling jackets, are drilled straight out of the block. The block also contains oil channels for the lubricating system.

CYLINDER HEAD AND VALVES

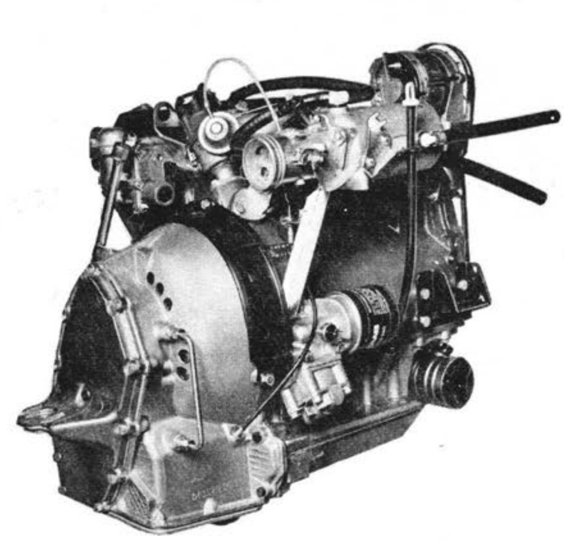
The cylinder head is made of aluminium. The cylinder head is bolted to the block. The camshaft is made of special casting and it is seated in bearings in the camshaft bearing assembly which is bolted to the cylinder head. The valves are of steel with chromium-plated spindles and the valve heads are induction hardened.



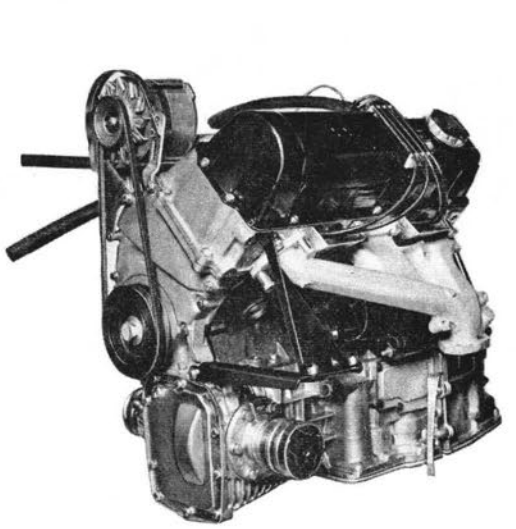
POWER PLANT, CARBURETED ENGINE AND MANUAL TRANSMISSION, SEEN FROM LEFT



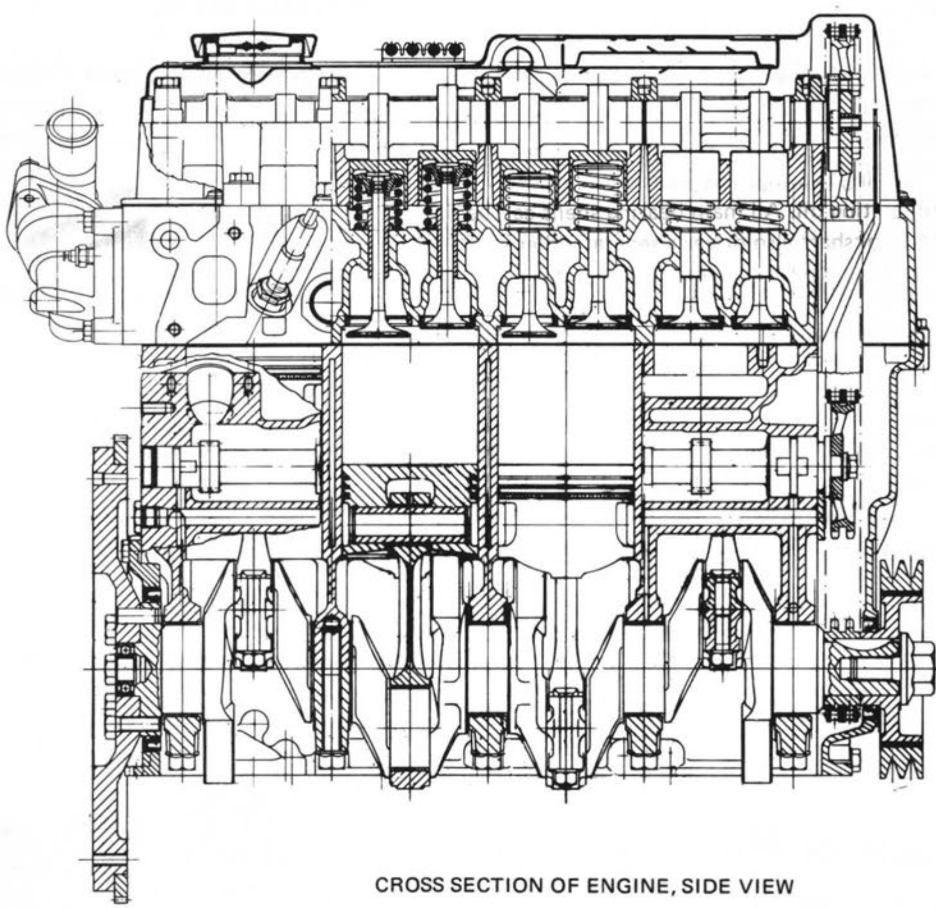
POWER PLANT, CARBURETED ENGINE AND MANUAL TRANSMISSION, SEEN FROM RIGHT



POWER PLANT, INJECTION ENGINE AND AUTOMATIC TRANSMISSION, SEEN FROM LEFT

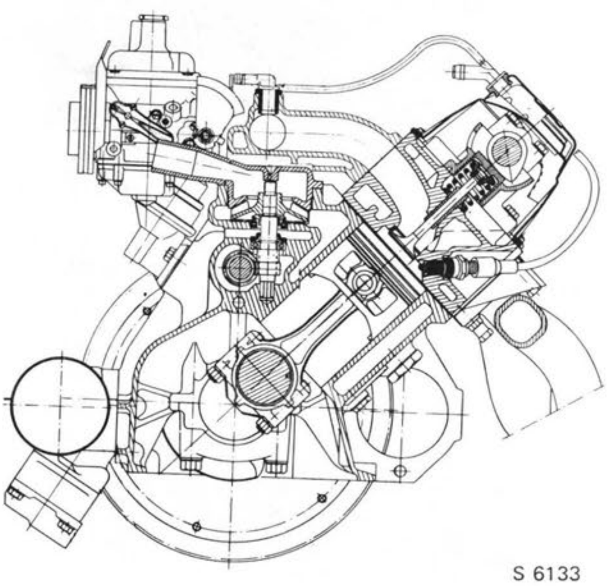


POWER PLANT, INJECTION ENGINE AND AUTOMATIC TRANSMISSION, SEEN FROM RIGHT



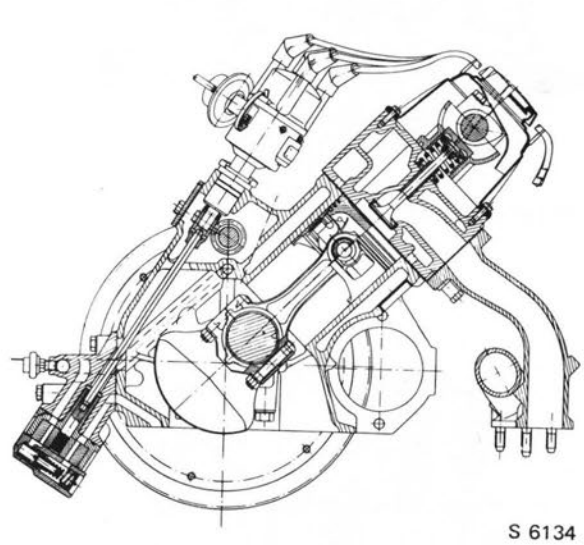
S 6132

CROSS SECTION OF ENGINE, SIDE VIEW



S 6133

CROSS SECTION OF ENGINE AT WATER PUMP

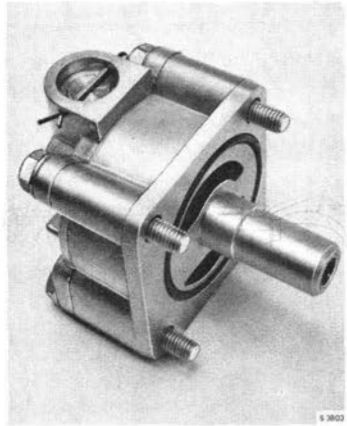


S 6134

CROSS SECTION OF ENGINE AT DISTRIBUTOR

CRANKSHAFT AND BEARINGS

The crankshaft is forged with ground journals which have been hardened by tenifer treatment which provides a hard non-metallic surface giving good protection against wear. There are five main bearings. The center bearing also acts as an axial locating bearing. The shaft contains drilled passages for lubricating oil. All main bearing shells can be replaced. The crankshaft also drives a separate idler shaft which powers the oil pump, water pump and distributor through cog gears and the fuel pump by a cam.



OIL PUMP

CAMSHAFT AND VALVE DEPRESSORS

The camshaft is cast and has hardened and phosphatized cams. It is driven by a chain from the crankshaft. The valves are directly actuated by the camshaft cam via valve depressors and adjusting pallets.

PISTONS AND PISTON RINGS

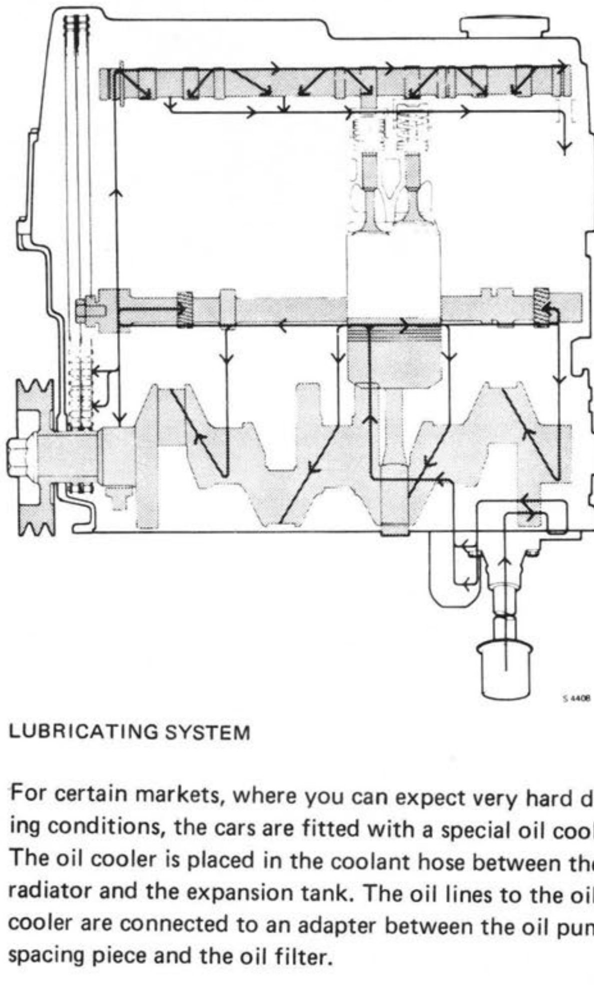
The pistons are made of light alloy and are provided with grooves for two compression rings and one oil scraper ring. The upper compression ring is flat with a chromed finish. The lower compression ring has oil-scraping characteristics and is somewhat wider than the upper one. The actual oil scraper is a three-piece ring.

CONNECTING RODS AND PISTON PINS

The connecting rods are forged and fitted with bushings for journaling the piston pins. The piston pin bushing and big-end bearing halves are exchangeable.
The piston pin makes a floating fit in the piston and connecting rod. Its axial movement is restricted by lock rings in the piston pin holes.

LUBRICATING SYSTEM, OIL FILTER

The engine has a forced lubrication system (see fig. below). Oil pressure is generated by a birotary pump driven from the idler shaft. The pump and oil filter are mounted on a special mounting. Its rotors force the oil through a reducing valve in the pump itself and on through the oil filter and oil channels to the various lubrication points. Each connecting rod bearing has a separate oil channel from the main bearings. The oil filter is of full-flow type, i.e. all oil force-fed to the lubrication points goes through the filter.



LUBRICATING SYSTEM

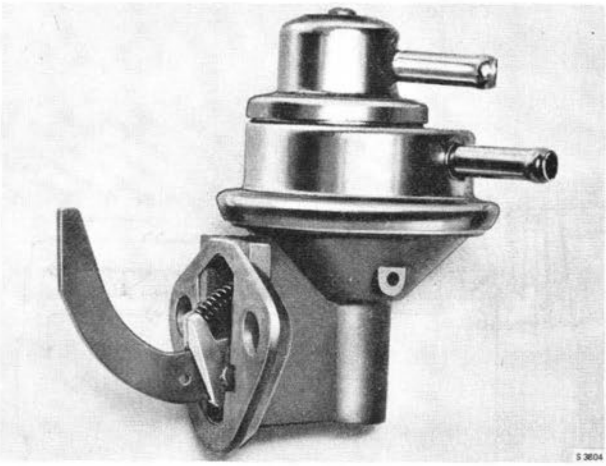
For certain markets, where you can expect very hard driving conditions, the cars are fitted with a special oil cooler. The oil cooler is placed in the coolant hose between the radiator and the expansion tank. The oil lines to the oil cooler are connected to an adapter between the oil pump spacing piece and the oil filter.

IGNITION SYSTEM

The distributor is driven by a gear transmission from the jackshaft. The rotor arm rotates anti-clockwise. The order of firing is 1–3–4–2, cylinder No. 1 being farthest to the rear. Ignition advance in relation to engine speed is regulated by a centrifugal governor and in relation to load by a vacuum regulator.

FUEL SYSTEM

The fuel tank is located between the back wheels. The fuel pump on carbureted engines, which is of diaphragm type, is driven by a special cam on the idler shaft. The pump is located on the left-hand side of the engine. The fuel passes through a nylon filter in the pump.
Cars with injection engines are fitted with an electric fuel pump which is mounted inside the fuel tank.



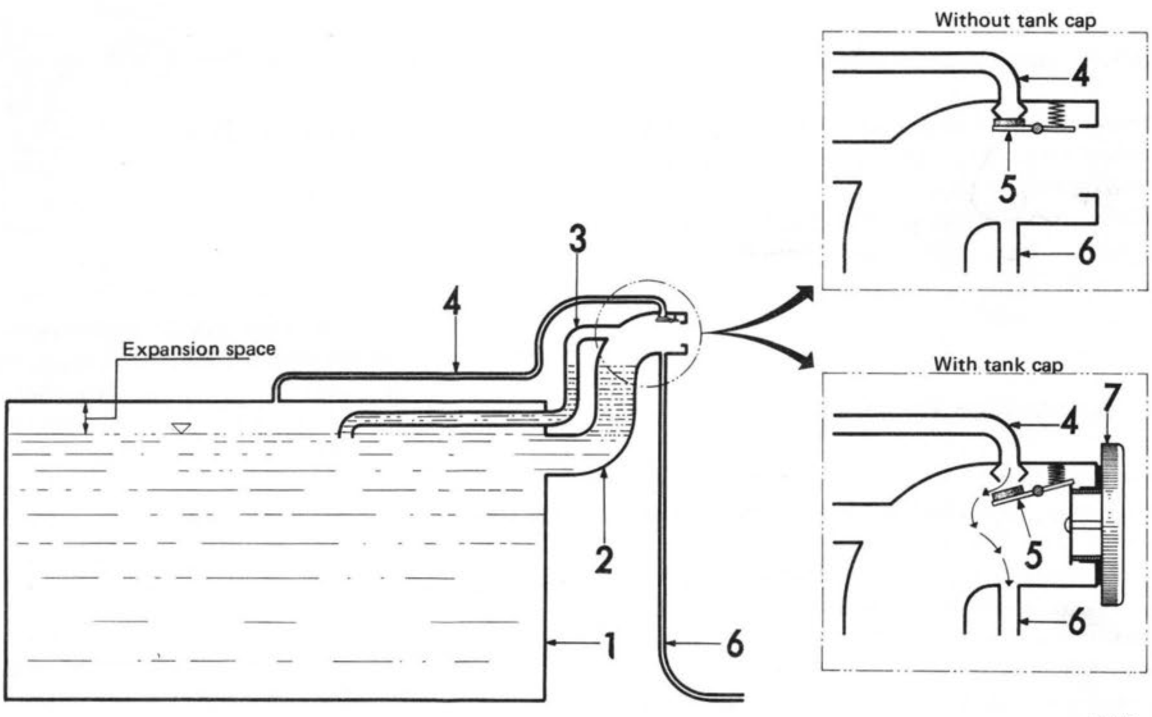
FUEL PUMP, CARBURETED ENGINE

Fuel tank

The fuel tank is designed so as to allow internal expansion of the fuel. The expansion space is opened by a valve which is actuated by the filler cap.

Fuel tank ventilation

When fuel is poured in, the tank (1) will not be completely filled, and instead the level rises only slightly above the lower opening on the venting tube (3). The reason for this is that an air cushion is formed above this level and prevents further filling of the tank.
The formation of this air cushion is due in its turn to the fact that a spring-loaded valve (5) located in the filler pipe (2) blocks the upper opening on the venting tube (4) from the upper side of the tank.
When the tank cap (7) is screwed on, a lever is actuated which opens the valve, thus providing a communication from the upper part of the tank to the surrounding air via the ventilation hose (6). The hose runs inside the roof channel, through the left windshield pillar and out into the engine compartment behind the left wheel housing. The fuel, which increases in volume when the temperature rises, is now able to expand inside the tank instead of being pressed up through the filler pipe (2). As the fuel level becomes lower in course of driving, air is drawn into the tank via the ventilation hose (6).



FUEL TANK VENTILATION, ARRANGEMENT DIAGRAM

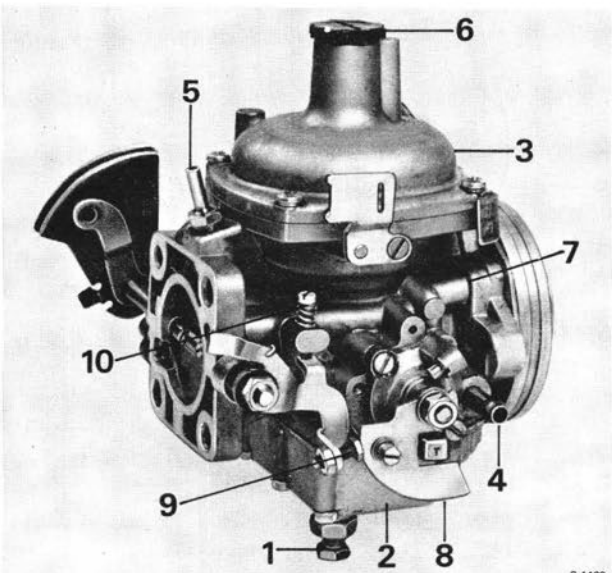
1. Fuel tank
2. Filter pipe
3. Venting tube
4. Venting tube
5. Spring-loaded valve
6. Ventilation hose
7. Tank cap

CARBURETOR

The engine is equipped with either one or two Zenith–Stromberg horizontal carburetors. The carburetor designation on a single-carburetor engine is 175 CD–2, and on a twin-carburetor engine, 150 CD–2. The carburetor has only one jet, the cross-section area of fuel flow being regulated by a moving tapered needle. The position of the needle is determined by the degree of depression in the carburetor housing, which acts upon a piston in which the needle is mounted. The needle is of self-centering type, i.e. it is suspended in springs; this makes it unnecessary to adjust the alignment of the carburetor jet.

The carburetor is made of light metal. It consists of three main sections, the central one being the carburetor housing. The bottom section is the float chamber, which surrounds the jet. Up to and including model 1976, the jet is equipped with an adjusting screw. As from model 1977, the jet is press-fitted in the carburetor housing and an adjusting screw for the height of the fuel needle has been fitted outside the carburetor. The top section is the vacuum chamber, the lower boundary of which is a diaphragm in which the piston is suspended. The vacuum chamber communicates with the carburetor inlet duct via two channels in the piston.

The depression in the carburetor housing determines the rate of fuel flow, which is controlled by the needle, as well as the rate of air flow, which is regulated by the position of the piston in the air duct. In this way the engine always receives correctly adjusted quantities of fuel and air under all load conditions.



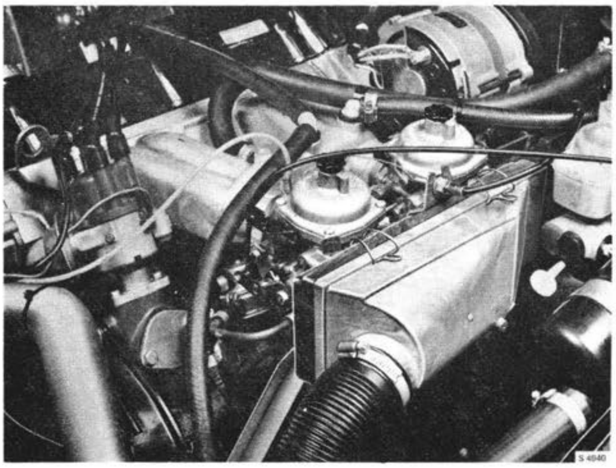
CARBURETOR

1. Jet adjusting screw
2. Float chamber
3. Cover for vacuum chamber
4. Fuel inlet
5. Vacuum nipple
6. Cap for oil damper
7. Carburetor body
8. Fast idle cam
9. Fast idle screw
10. Throttle screw

Twin-carburetors

In principle, carburetors on twin-carburetor engines are the same as on single-carburetor engines.

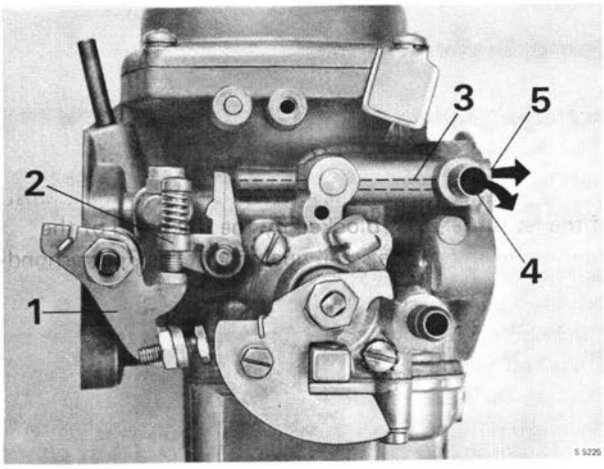
Located in front of the two carburetors is an air box which serves both carburetors and which is connected to the air cleaner by means of a hose. The inlet manifold passages from the rear carburetor go to number 1 and 2 cylinders and from the front carburetor to cylinders number 3 and 4. A connecting passage links the two manifolds and this serves to correct any minor variations in the fuel–air mixture from the two carburetors.



TWIN-CARBURETORS

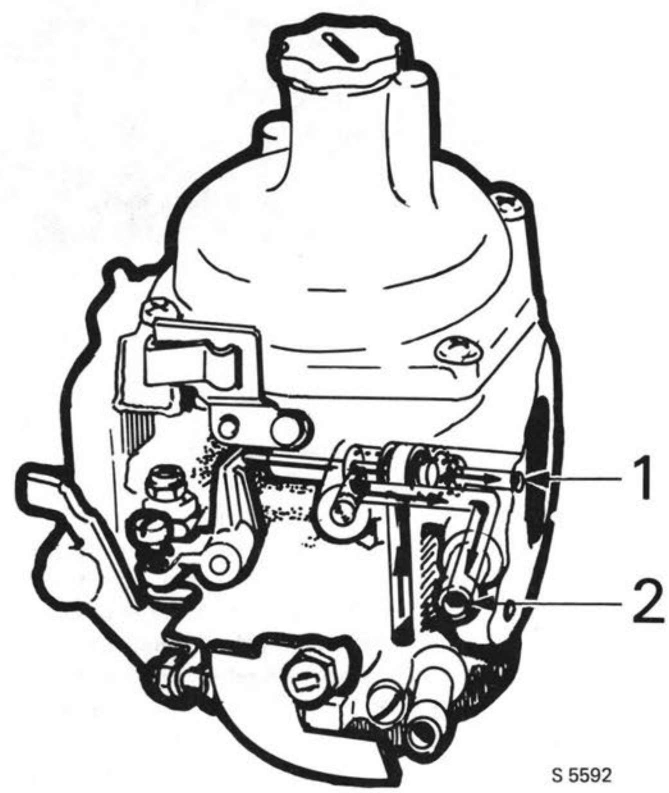
Float system

Fuel enters the float chamber through the float valve. The float, which is double, is located by a bridge on the underside of the carburetor housing. As the fuel level rises, the float rises with it, and when the correct level is reached, the float valve is closed by a tongue on the float arm. Fuel is also drawn into the jet, where the level will be the same as in the float chamber (engine at standstill). With effect from 1977 model cars, the jet is fixed in the carburetor housing. On earlier models, the jet could be adjusted. As from model 1977 (twin carburetors: model 1976), the carburetor is fitted with a special float chamber vent valve. When the throttle is closed, air is expelled directly through a venthole in the carburetor. When the throttle is opened, ventilation of the float chamber will be by means of the air cleaner connection. On earlier models, all ventilation is by means of the air cleaner.



FLOAT CHAMBER VENTILATION, TWIN-CARBURETOR

1. Driver, throttle valve
2. Link arm with throttle screw
3. Ventilation valve
4. Ventilation outlet, stopped engine
5. Ventilation outlet, running engine

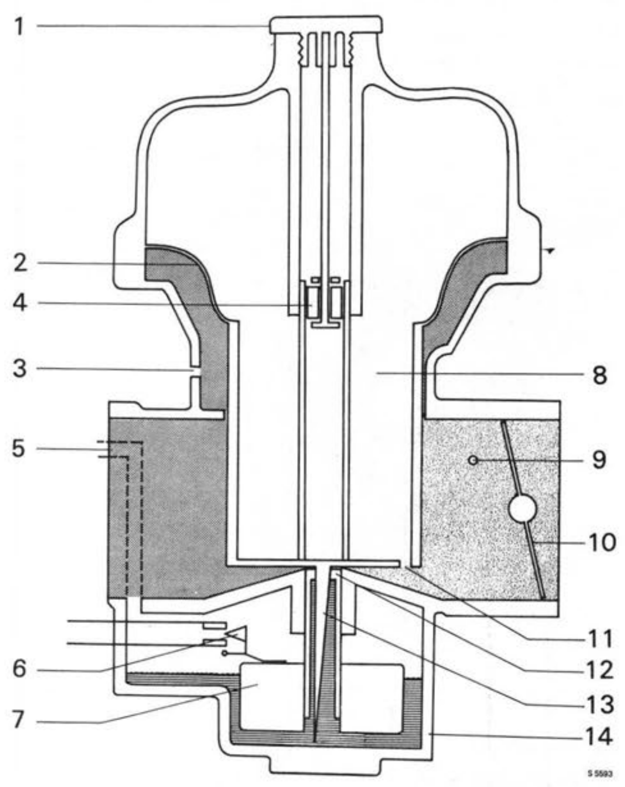


FLOAT CHAMBER VENTILATION

1. Ventilation through air cleaner
2. Ventilation from outside

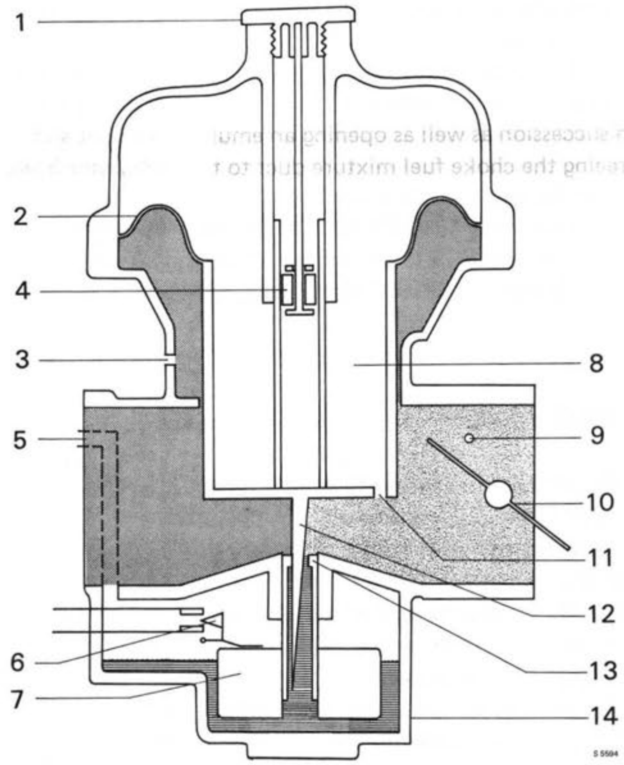
Choke and fast idling

The carburetor is equipped with a choke device for easier starting of cold engine.
The choke consists of a valve disc which, when the choke spindle is rotated, opens four fuel holes of different sizes in succession as well as opening an emulsion air duct and freeing the choke fuel mixture duct to the carburetor head. When the choke button is pulled right out, all four fuel holes are in operation and the emulsion air duct is wide open. At intermediate choke positions one or more of the fuel holes are closed, but the emulsion air duct remains open as long as any of the fuel holes is open. When the choke button is pushed right home, this closes both fuel and emulsion air ducts as well as the starting fuel hole in the carburetor housing.
Emulsion air is drawn in through a jet from the carburetor housing. Its function is to improve the distribution of the choke fuel mixture among the cylinders.
The choke spindle carries a cam to which the pull wire of the choke control is attached. When the car is driven on the choke, this cam acts upon the throttle control to raise the engine idling speed during starting and warm-up.
In the case of twin-carburetor engines, the carburetors are fitted with separate choke mechanisms, coupled by means of a connecting rod.



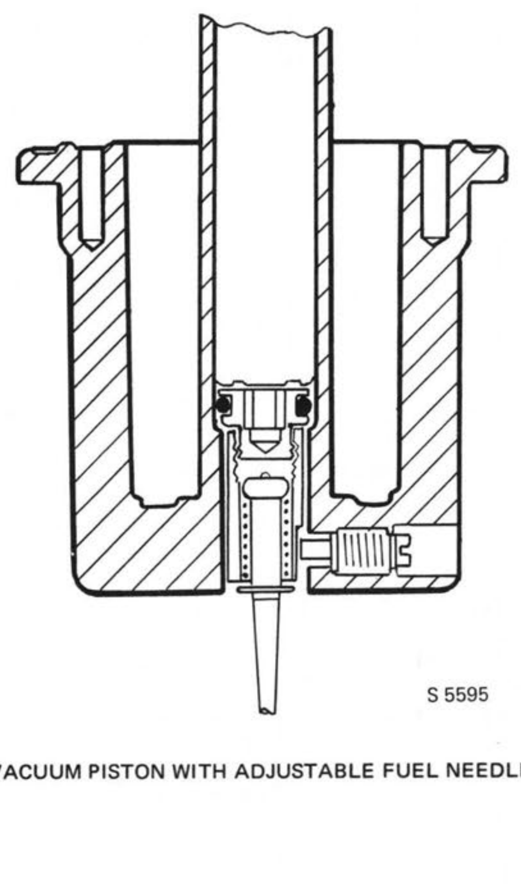
CARBURETOR WITH THROTTLE CLOSED

1. Damper cap
2. Diaphragm
3. Compensating hole
4. Oil damper
5. Float chamber ventilation
6. Float valve
7. Float
8. Spring
9. Fuel holes
10. Adjusting screw
11. Vacuum piston
12. Starting fuel hole
13. Throttle
14. Vacuum hole
15. Fuel needle
16. Jet
17. Float chamber



CARBURETOR WITH THROTTLE OPEN

1. Damper cap
2. Diaphragm
3. Compensating hole
4. Oil damper
5. Float chamber ventilation
6. Float valve
7. Float
8. Spring
9. Fuel holes
10. Adjusting screw
11. Vacuum piston
12. Starting fuel hole
13. Throttle
14. Vacuum hole
15. Fuel needle
16. Jet
17. Float chamber



VACUUM PISTON WITH ADJUSTABLE FUEL NEEDLE

Idling

The carburetor has no special idling system. When the engine is idling, the negative pressurization in the vacuum chamber of the carburetor is low, with the result that the gap between the vacuum piston and bridge is small. Most of the jet is therefore blocked by the thick end of the fuel needle and only a small quantity of fuel, corresponding to the idling demand, is drawn into the engine. For engine idling speeds, the fuel-to-air ratio is controlled by the jet and the fuel needle and applies to the whole of the engine speed range. The idling is adjusted by means of the throttle spindle stop adjusting screw. In the case of twin-carburetor engines, the idling speed is set by adjustment of the adjusting screw on the front carburetor only. An adjusting screw is located between the throttle spindles of the two carburetors for synchronization of the two throttles valves.
In order to maintain a constant fuel/air mixture regardless of engine temperature, the carburetor is equipped with a temperature compensator. The temperature compensator consists of an air valve controlled by a bi-metal strip. The valve opens when the carburetor temperature reaches approx. +50°F (+10°C). The additional air is introduced via a passage which opens in front of the piston.

Normal driving

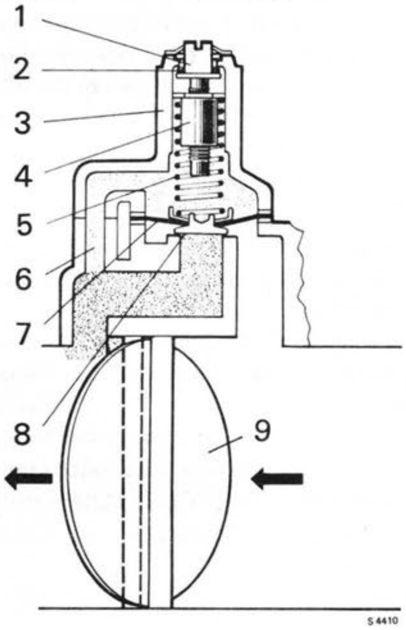
When the throttle is opened, a vacuum is generated in the vacuum chamber which is equal to that in the inlet manifold due to equalization via the holes in the piston. As atmospheric pressure prevails on the underside of the diaphragm, the piston is pulled up and the airflow through the carburetor is increased. At the same time the fuel flow also increases as the tapered needle, which is attached to the piston, is withdrawn from the jet.

Acceleration

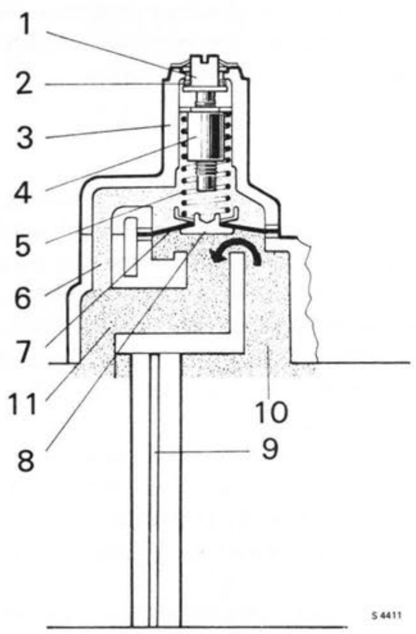
In order to produce a temporarily richer fuel mixture on rapid opening of the throttle (acceleration), a damping device is provided in the spindle of the vacuum piston. This consists of a small piston called the oil damper mounted on a rod. The damper runs in oil. When the throttle is opened quickly, the negative pressurization in the vacuum chamber is abruptly increased. When the vacuum piston is raised, the oil damper is pressed against its seating and prevents oil from flowing past from below the damper to above it; this brakes the movement of the vacuum piston, temporarily generating a harder vacuum above the jet and momentarily enriching the fuel-air mixture.
The downward movement of the vacuum piston is assisted by a spring. The oil level in the hollow spindle of the vacuum piston, should be so high that the oil damper dips into oil before the thread of the screw cap engages the vacuum chamber cover. (For twin-carburetors, the oil level should be at least 1.38 in (35 mm) above the bottom of the damper.) NOTE! Do not fill the space above the spindle. Use oil for automatic transmission according to Fords specification M2C.33F or M2C.33G.

Overrun braking

As from model 1977, the carburetor is equipped with a deceleration valve which ensures satisfactory combustion during engine overrun. As from model 1978, the carburetor is equipped with an electrically controlled deceleration device (see Section 254).



DECELERATION VALVE, UP TO AND INCL MODEL 1977, NORMAL DRIVING



DECELERATION VALVE, UP TO AND INCL. MODEL 1977, ENGINE OVERRUN

1. Adjusting screw
2. Rubber ring
3. Cover
4. Nut
5. Spring
6. Channel to top of diaphragm
7. Diaphragm
8. Valve
9. Throttle
10. Inlet channel for fuel-air mixture
11. Outlet channel for fuel-air mixture

FUEL SYSTEM, INJECTION ENGINES

The engine is fitted with a Bosch, CI (continuous injection) injection system.
An electric fuel pump provides fuel at a constant pressure to the mixture control unit. The latter consists of an air flow sensor which measures the flow of air to the engine and which acts mechanically on the fuel distributor. The fuel distributor provides the injection valves with the correct amount of fuel. The fuel is injected continuously into the inlet manifold immediately upstream of the inlet valve. Refer to section 240 for a detailed description.

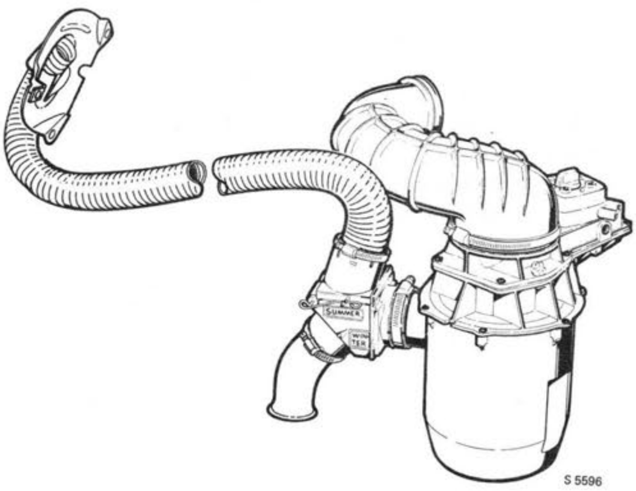
AIR CLEANER

The air cleaner is mounted at the front of the left-hand wheel housing. In addition to cleaning the incoming air, it also absorbs the suction noise. The air cleaner element which consists of a special paper cartridge must not be washed or moistened. The only servicing measures permitted are to blow the cartridge clean by means of compressed air or to replace it.
On cars with carbureted engines, the air cleaner is connected to the carburetor by means of a hose.
On cars with injection engines, the mixture control unit is bolted directly onto the air cleaner.

AIR PREHEATER

Manually adjustable, up to and incl. model 1977

Cars with carburetor engines (and injection engines as from model 1977) are equipped with a preheater valve with two settings.
In the "Summer" setting, the air is drawn in direct from outside, while in the "Winter" setting, air is drawn in

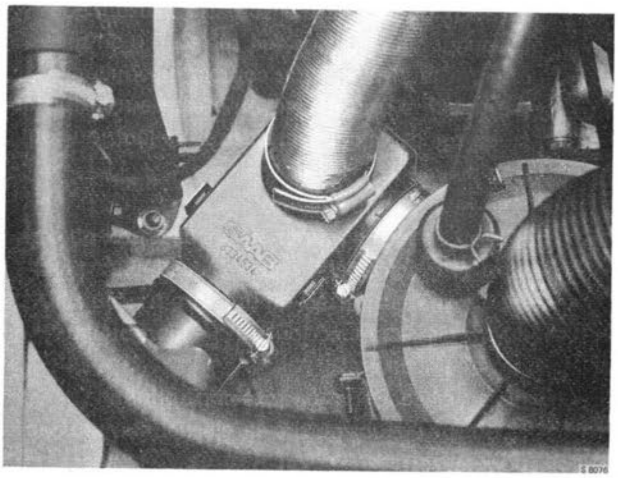


AIR PREHEATER, INJECTION ENGINE, MODEL 1977

through a hose from the covers surrounding the exhaust manifold.
When the outside temperature is regularly below 10°C, the valve should be in the winter setting.
For checking and adjusting the CO-setting, the valve should be in the summer position.

Thermostatically controlled air preheating, as from model 1978

A thermostatically controlled valve which governs the air preheating according to the ambient air temperature is located in the intake of the air cleaner.
The valve housing has two air intakes, one for cold air and one for heated air which is drawn in through a hose running from a cover on the exhaust manifold.
The valve is actuated by a thermostat in the cold-air intake which senses the temperature of the ambient air.
At temperatures under 43°F (8°C) (Saab 99 Turbo 23°F (–5°C)) only heated air is inducted into the engine.
At temperatures above 65°F (18°C) (Saab 99 Turbo 41°F (5°C)) only cold air is inducted into the engine.
At temperatures between 43°F (8°C) and 64°F (18°C) (Saab 99 Turbo 23°F and 41°F (–5°C and +5°C)) the valve admits varying proportions of heated and cold air.



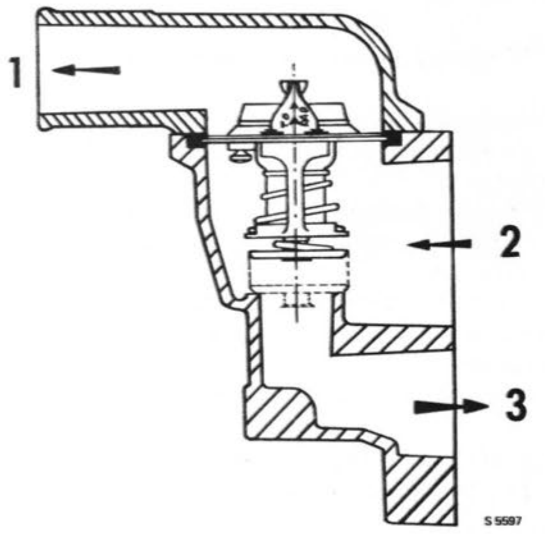
THERMOSTATICALLY CONTROLLED AIR PREHEATING, AS FROM MODEL 1978

EXHAUST SYSTEM

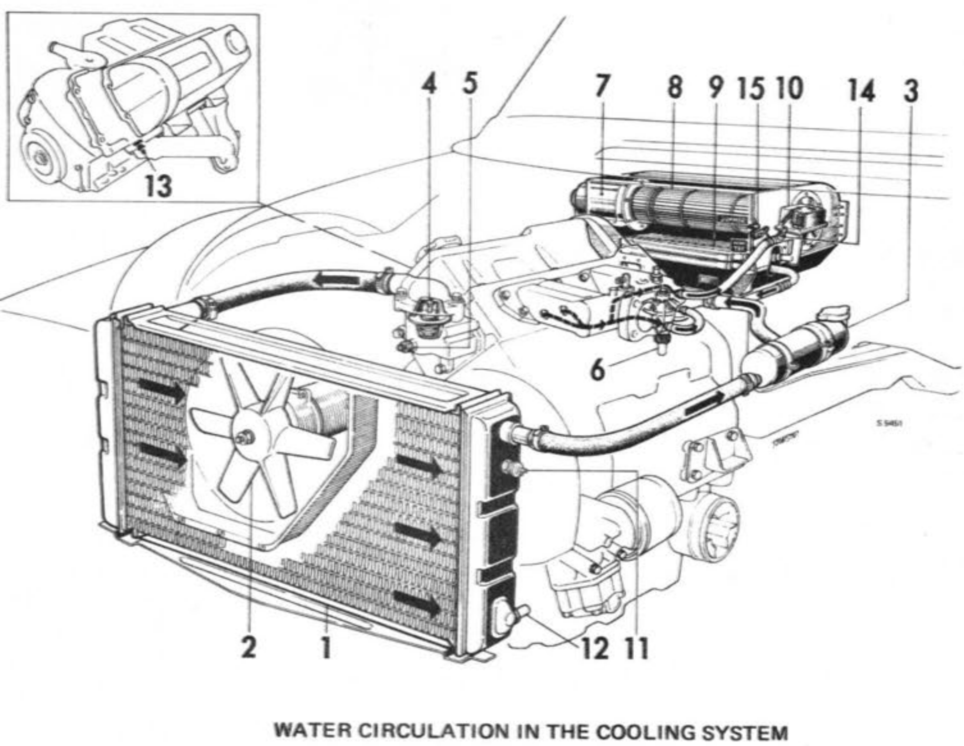
The exhaust system comprises three parts. A muffler is mounted in the front pipe. The middle section consists of a pipe and a muffler mounted crosswise in front of the rear axle. The rear pipe runs above the rear axle and emerges on the left-hand side of the car below the rear bumper.
Earlier 1975 model cars are fitted with the same exhaust system as that of the model 1974.

COOLING SYSTEM

The cooling system is of pressurized type with a cross-flow radiator and expansion tank. The water pump is located in the engine block and is powered by a bevel gear from the idler shaft. The thermostat is located in a housing bolted to the front end of the cylinder head. The radiator fan is electrically driven and controlled by a thermostat. When the pump is working and the thermostat is closed, coolant circulates through the cylinder block, cylinder head, inlet manifold and then through a by-pass passage back to the water pump. When the heater valve is open, coolant will also circulate through the heat exchanger. When the thermostat is open, coolant will also circulate from the thermostat housing, through the radiator, expansion tank and back to the water pump.
As from model 1977, the engine is equipped with a 3-way thermostat. When the engine is running at a very high temperature (i.e. when the thermostat is practically wide open), the by-pass passage to the water pump will be closed. This forces all coolant to circulate through the radiator.



3-WAY THERMOSTAT, AS FROM MODEL 1977
1. To radiator
2. From engine block
3. To water pump



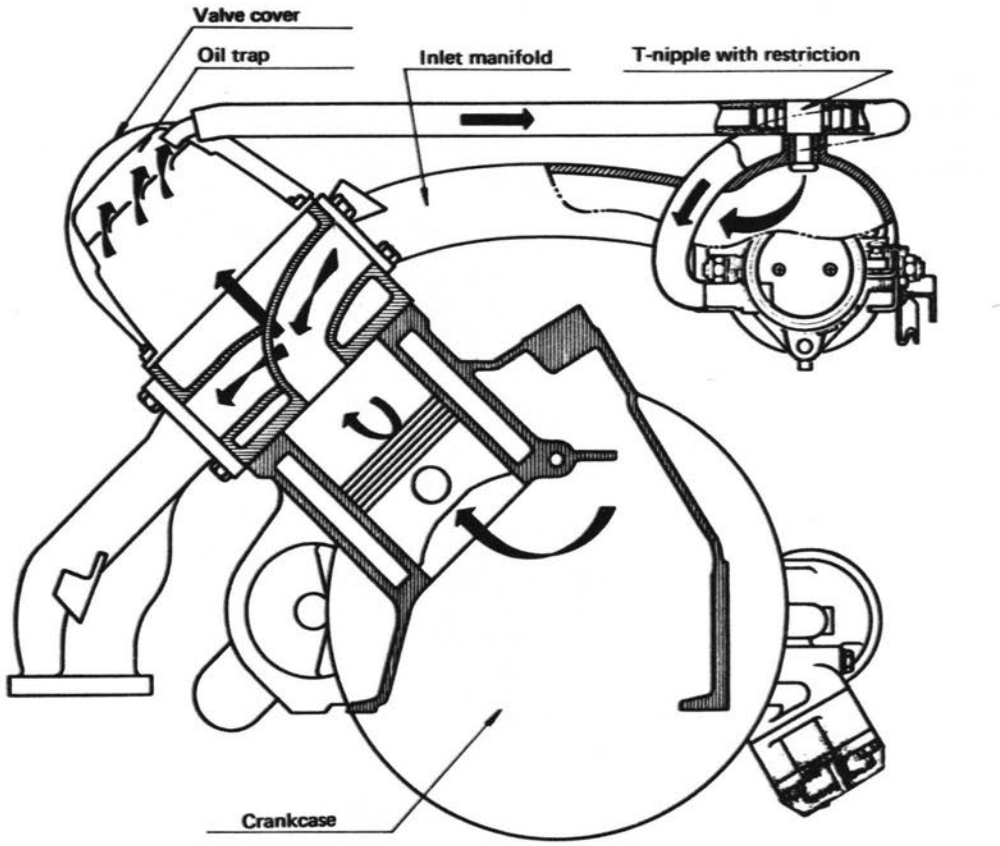
WATER CIRCULATION IN THE COOLING SYSTEM

1. Radiator
2. Radiator fan
3. Expansion tank with pressure cap
4. Thermostat
5. Temperature transmitter
6. Coolant pump
7. Fan motor
8. Impeller
9. Heater core
10. Thermostat controlled valve
11. Thermostat switch, radiator fan
12. Radiator drain cock
13. Engine drain cock
14. Bleeder nipple (as from model 1976)
15. Cold air valve (as from model 1977)

CRANKCASE VENTILATION

Model 1975

The crankcase ventilation is completely enclosed. The ventilation system consists of a hose running from the valve cover to a T-nipple on the inlet manifold. From the T-nipple, the hose goes to the air cleaner (to the throttle valve housing in cars with injection engines). There is a calibrated restriction in the branch of the T-nipple connected to the inlet manifold which is designed to ensure efficient evacuation of the gases in the crankcase into the engine under all running conditions. The gases are evacuated via the T-nipple into the inlet manifold under all conditions except when the engine is at full load, in which case the gases enter the engine through the air cleaner (throttle valve housing). In cars with carbureted engines, a flame guard is fitted at the connection of the ventilation hose to the air cleaner.



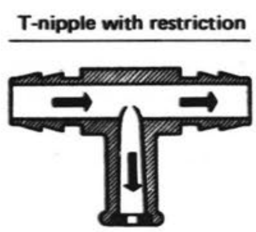


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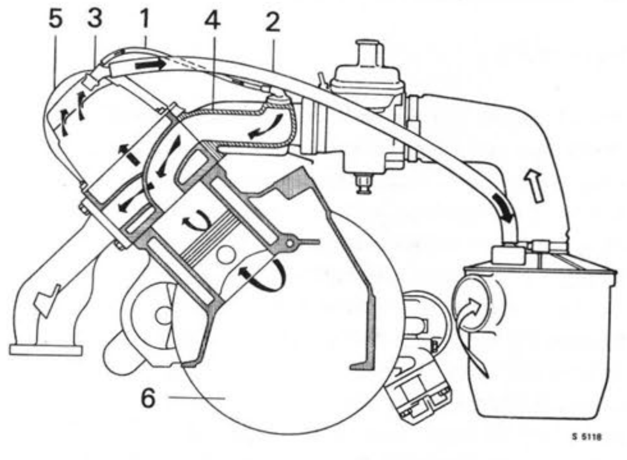
DIAGRAM OF CRANKCASE VENTILATION, MODEL 1975

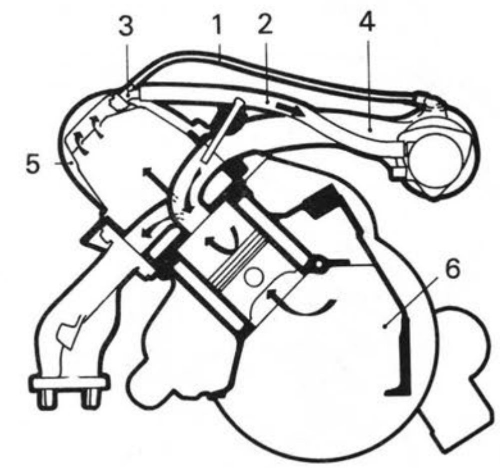
As from model 1976

The crankcase ventilation is completely enclosed. The ventilation system consists of a 3-way nipple on the valve cover from which a small-bore hose runs to the inlet manifold and a large-bore hose to the intake system in front of the carburetor (throttle disc). The large-bore hose is connected as follows:
Carbureted engines: To the top of the air cleaner.
Injection engines: To the throttle housing. (One exception – on the 1977 model the hose is connected between the air cleaner and the mixture control unit.
Injection engines, as from model 1977: To the connecting piece between the air flow meter and the air cleaner. An angle-nipple is located inside the connecting piece and from this a hose runs to the lower section of the air cleaner.
The sizes of the various hoses and connections are designed to ensure efficient evacuation of the gases in the crankcase into the engine under all running conditions. The gases are evacuated through the smaller hose directly into the inlet manifold under all running conditions with the exception of when the engine is at full load, in which case the gases are evacuated through the larger hose to the air cleaner and thence to the engine.
Carbureted engines are equipped with a flame guard at the ventilation hose connection to the air cleaner.



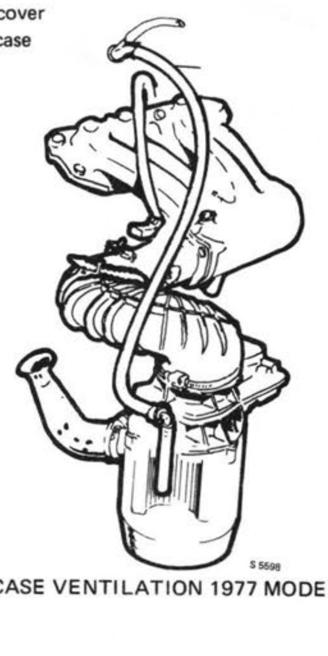
CRANKCASE VENTILATION, CARBURETED ENGINES AS FROM 1976 MODEL

1. Hose 3-way nipple-inlet manifold
2. Hose to air cleaner
3. 3-way nipple
4. Inlet manifold
5. Valve cover
6. Crankcase



CRANKCASE VENTILATION, FUEL INJECTION ENGINES 1976 MODEL AND AS FROM 1978 MODEL

1. Hose, 3-way nipple – inlet manifold
2. Hose to throttle housing
3. 3-way nipple
4. Inlet manifold
5. Valve cover
6. Crankcase



CRANKCASE VENTILATION 1977 MODEL

EXHAUST EMISSION CONTROL

A number of measures have been taken to meet the exhaust emission requirements applicable on certain markets while at the same time maintaining the good running properties. Some of these measures are:

The engine is designed in the light of existing regulations governing exhaust emission. Special consideration has been given to the regulations in the design of the combustion chamber, the camshaft, and the compression ratio, etc.

Both injection engines and carburetor engines are equipped with a deceleration valve to reduce the unburnt gases during engine overrun.

Cars with automatic transmission are equipped with EGR (exhaust gas recirculation). A small portion of the exhaust gases are returned to the inlet side of the engine as a result of which the combustion temperature is reduced, in turn reducing the amount of nitric oxide emitted in the exhaust.

A temperature compensator on the carburetor ensures that the fuel-to-air ratio stays constant, regardless of temperature. The compensator consists of a valve, governed by a bi-metallic strip, which opens to admit additional air when the temperature increases.

In some version a delay valve is attached to the vacuum hose between the carburetor and the vacuum regulator on the distributor, delays the formation of a vacuum in the vacuum regulator. This means that during acceleration, the ignition advance is delayed and this helps to reduce the emission of nitric oxides.

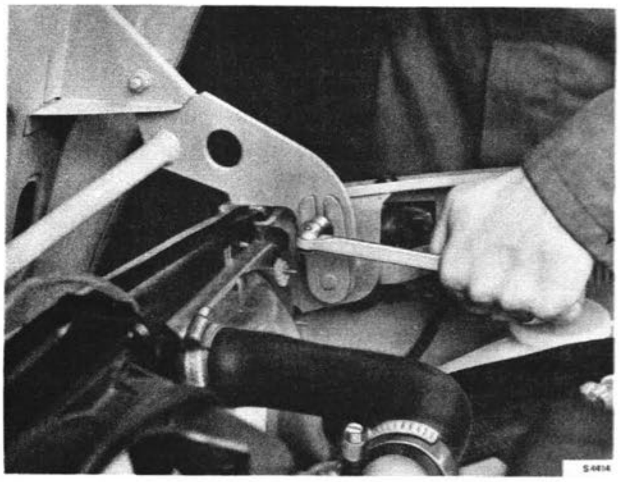
As from model 1977, the fuel—to—air mixture adjusting screw should either be sealed or modified so that adjustment can only be made by means of a special tool, in accordance with the European ECE regulations (tamperproof adjustment). On cars with carburetor engines, this requirement is met by means of a top-adjusted fuel needle which can only be adjusted by means of a special tool. On cars with injection engines, the adjusting hole in the air flow meter is equipped with a brass sleeve and sealed by means of a plastic plug. Before any adjustments can be made, the plastic plug must be removed whereupon it will be destroyed. After adjustment, a new plug must be installed. Service workshops are supplied with red plastic plugs while the factory uses blue plugs.

REMOVAL AND INSTALLATION

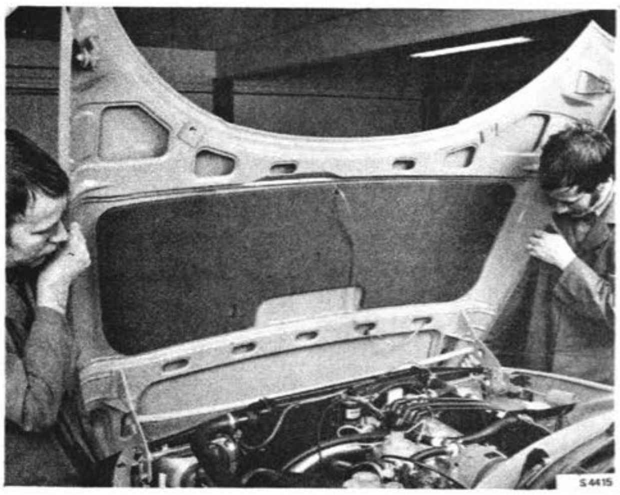
REMOVING THE POWER PLANT

For major work on the engine and transmission, the entire power plant should be lifted out. Removal of the engine by itself is not recommended.

1. Remove the hood as follows:
   Back off both the hood fastening screws. Lift off the hood. For this you need a helper to hold one side of the hood and help to lift it clear.

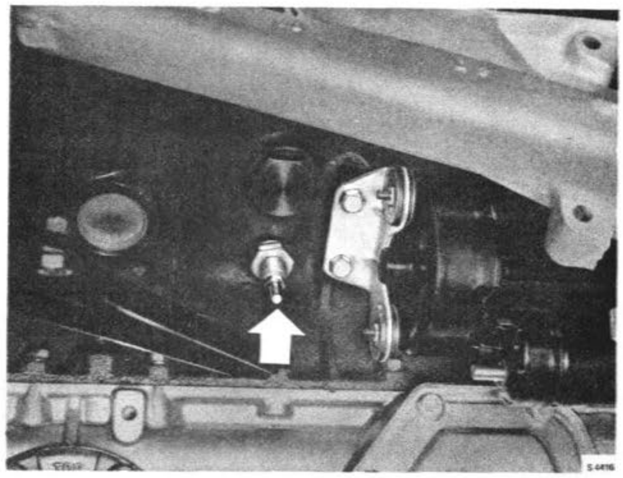


REMOVING THE HOOD FASTENING SCREWS

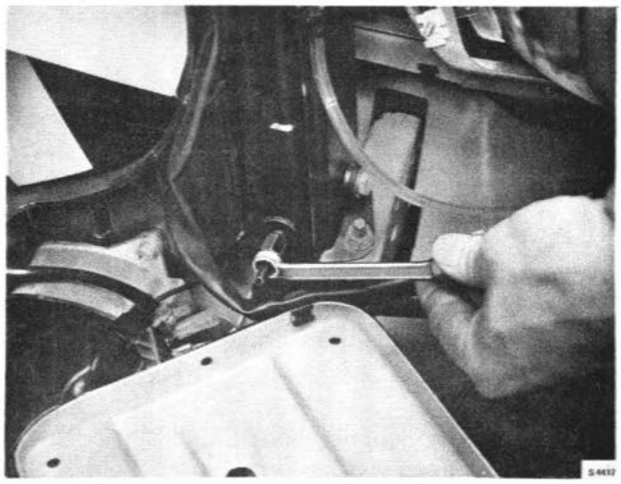


LIFTING OFF THE HOOD

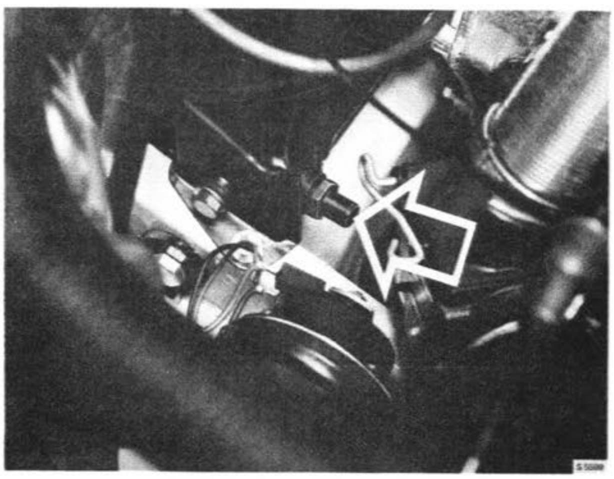
2. Detach the battery cables. Unclamp and lift out the battery.
3. Drain off coolant through the radiator and engine block drain cocks.



ENGINE BLOCK DRAIN COCK (SUPERSEDED BY A DRAIN PLUG ON LATER CARS OF MODEL 1977)



RADIATOR DRAIN COCK, UP TO AND INCL. MODEL 1976



RADIATOR DRAIN COCK, AS FROM MODEL 1977

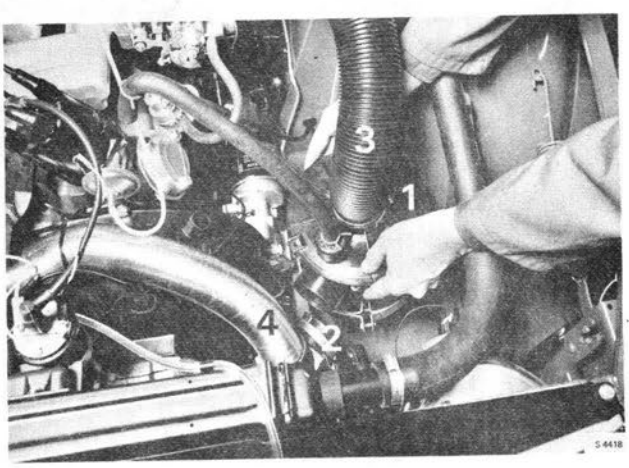
4. Carbureted engine:
   Detach the vacuum hose of the servo cylinder from

the inlet manifold and pull the fuel hose off the suction side of the fuel pump.

4. Injection engines:
   a. Detach the vacuum hose of the servo cylinder from the inlet manifold and remove the rubber bellows between the air flow sensor and inlet manifold.
   b. Thoroughly clean the areas around the fuel line connections on the fuel distributor and detach the lines. Plug the holes and blank off the fuel line ends in a suitable manner.
   c. Disconnect the electrical connection on the air flow sensor.
   d. Undo the clamps on the air cleaner and remove the air cleaner and mixture control unit.
5. Carbureted engine:
   Undo the cable connections to the ignition coil, temperature transmitter, oil pressure transmitter, radiator fan, thermostat contact, headlights, headlight wipers and the switch on the gear box on cars with automatic transmission.
5. Injection engine:
   a. Undo the cable connections to the ignition coil, temperature transmitter, oil pressure transmitter, radiator fan, thermostat contact, headlights, headlight wiper motor and the switch on the gear box on cars with automatic transmission.
   b. Disconnect the cables of the injection system at the warm-up regulator, auxiliary air valve, cold start valve and thermo-time switch.

CAUTION
Do not detach the connections by pulling the cables. Grip the connecting pieces.

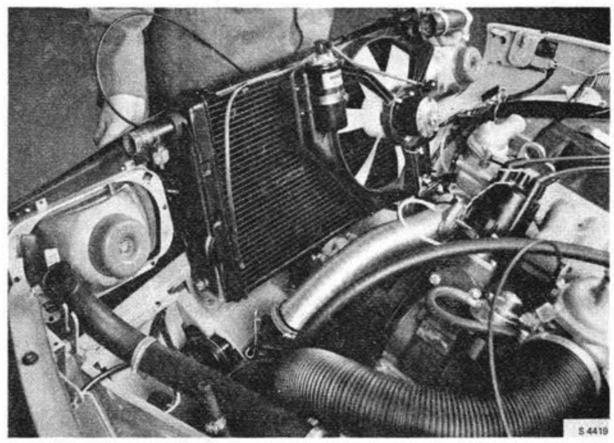
6. Carbureted engine:
   a. Remove the air cleaner, the inlet hose and the preheater complete with hose.
   b. Detach the throttle control wire from driver and bracket.



AIR CLEANER WITH HOSES, CARBURETED ENGINE

1. Air cleaner
2. Valve housing
3. Inlet hose
4. Preheater hose

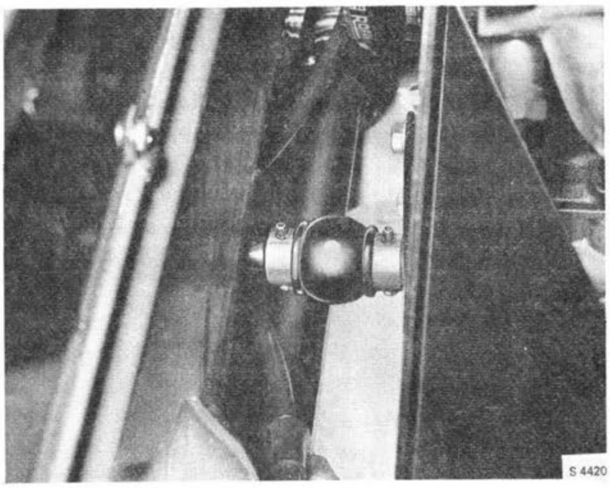
   c. Detach the choke control wire and sheath from the carburetor.
6. Injection engine:
   Detach the throttle control wire from driver and bracket on the throttle valve housing.
7. Detach the hoses at the connections to the thermostat housing, radiator, inlet manifold and water pump.
8. a. Remove the grille.
   b. Remove the hood lock operating cable from its fastenings at the dash panel and wheel housing.
   c. Remove the two front sheet retaining screws and nuts, and the four screws holding the headlights to the body.
   d. Remove the front sheet, lifting forward and upward.
9. Manual transmission:
   Model 1975: Remove the slave cylinder and hang it up in a convenient place. As from model 1976:



REMOVING THE FRONT SHEET

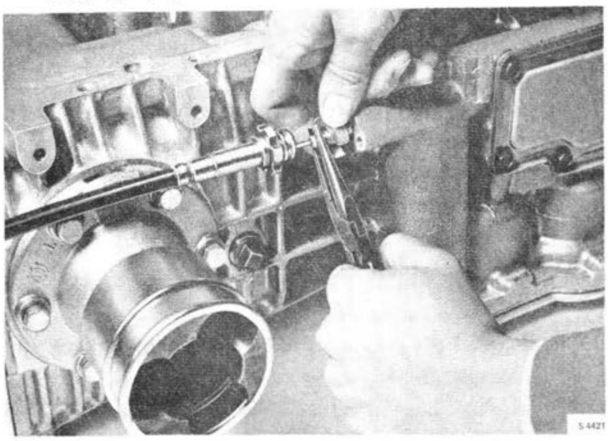
   Disconnect the clutch hose from the slave cylinder. Plug the hose and the hole in the slave cylinder.
9. Automatic transmission:
   Remove the protective cover from the exhaust manifold.
10. Disconnect the hose pipe from the exhaust manifold.
11. a. Disconnect the ground cable from the transmission.
    b. Remove the alternator.
12. Jack up the front end of the car and place blocks under the body.
13. Manual transmission:
    a. Put the gear lever in neutral.
    b. By means of tool 7840838, tap out the front taper pin from the gear shift rod joint and pull the rubber bellows free of the groove in the gear selector rod. The rubber bellows is discontinued during model 1977 and need not be installed in older cars in connection with repair. Separate the gear selector rod joint from the gear selector rod.

CAUTION
Both steel and plastic versions of the gear selector rod joint are available. The taper pin must not be tapped out in the case of plastic gear selector rod joints.



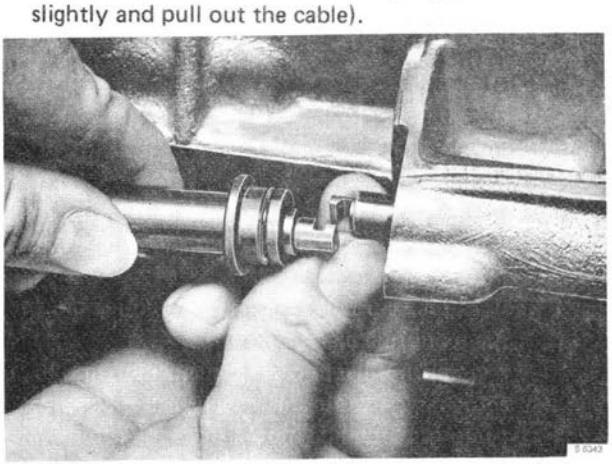
GEAR SHIFT ROD JOINT TAPER PIN

13. Automatic transmission:
    Remove the gear selector cable retaining screw from the gear box and position the gear selection lever in "P".



REMOVING THE GEAR SELECTOR WIRE
Tool 8790388

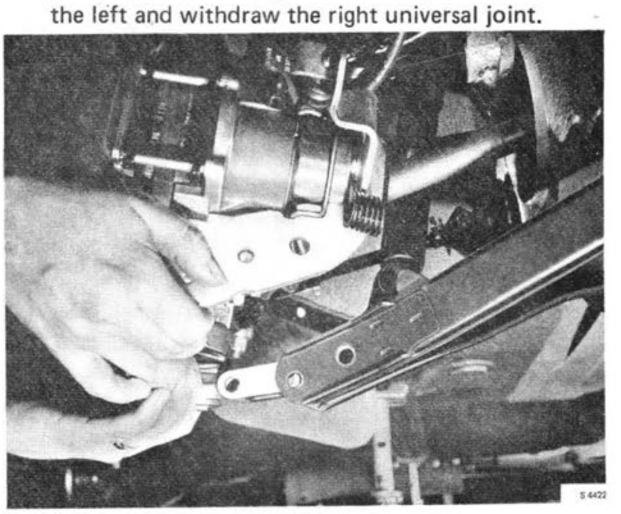
Earlier design: detatch the spring which holds the cable to the gear selector lever using tool 87 90 388. (Insert the tool in the end of the spring, rotate it slightly and pull out the cable).



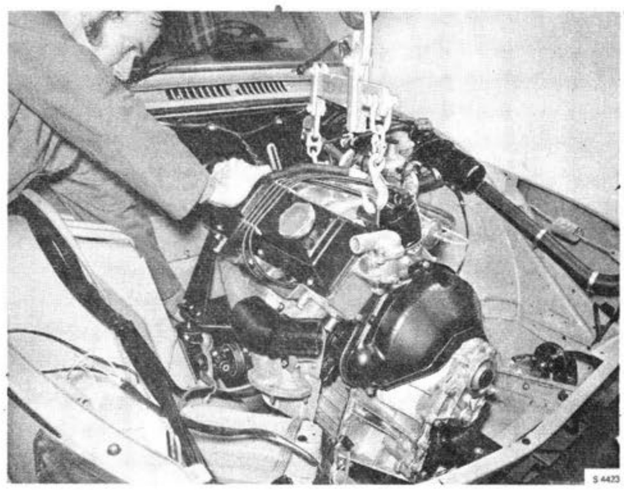
REMOVING THE GEAR SELECTOR WIRE

Later design: push back the spring loaded-sleeve on the gear selector lever and release the end of the cable.

14. Detach the speedometer cable from the transmission.
15. Undo the engine brackets.
16. Undo the larger clips round the rubber bellows on the inner universal joints.
17. Fit the lifting yoke to the two engine lifting lugs.
18. Undo the lower end piece from the control arm on the right-hand side and turn the steering wheel to the left. Raise the power plant from the rear engine cushions (the front bracket may rest on the cushion) and withdraw the left universal joint, by moving the power plant to the right. Move the power plant to the left and withdraw the right universal joint.

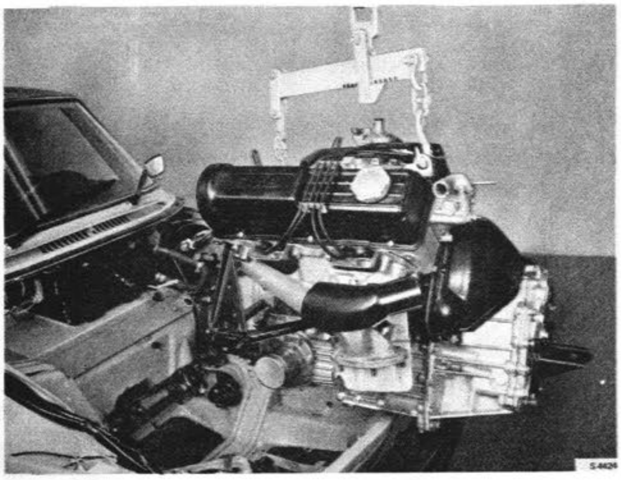


UNDOING LOWER END PIECE FROM CONTROL ARM

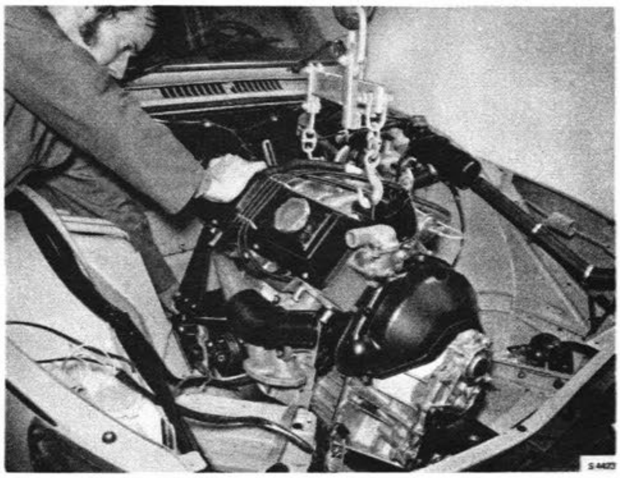


SEPARATING THE INNER UNIVERSAL JOINT

19. Lift the power plant to a convenient height for access to the cable connections on the starter. Disconnect the cables.
20. Hoist out the power plant. Fit protective caps over the inner drivers and rubber bellows.



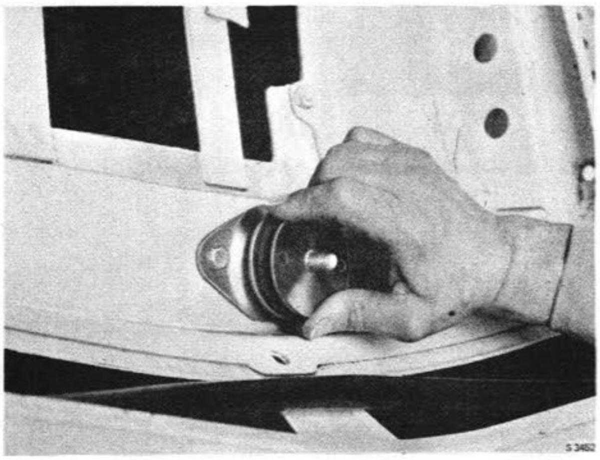
LIFTING OUT THE POWER PLANT



ASSEMBLING THE RIGHT INNER UNIVERSAL JOINT

INSTALLING THE POWER PLANT

1. a. Check that the inner universal joints are packed with grease.
   b. Check the front engine cushion. Make sure that the washer is properly tightened.



FRONT ENGINE CUSHION

2. Raise the power plant with the lifting yoke (tool 8292177) balancing the engine in such a way that the engine mounting at the flywheel end comes into position before the other two mountings. Position the power plant in the engine compartment.
3. Lower the power plant to a convenient height for fitting the starter. Connect the cables.
4. Assemble the inner universal joints as follows: Hang the clips on the inner drivers. Lower the power plant until it is about 2–2 1/2" (50–60 mm) from the engine cushions. Assemble the right-hand universal joint, then lower the power plant until it is about 1" (20–30 mm) above the engine cushions while guiding the left-hand universal joint into place. Connect the end piece to the lower control arm.
5. a. Align the engine brackets.

> Cars with servo-assisted steering are equipped with special rear engine cushions. The cushions are designed to prevent the power plant from hitting the steering gear and damaging it in the event of a collision. A wire runs between the rear edge of the upper retaining plate and the front edge of the lower retaining plate in the cushions. The position of the cushions is determined by guides in the engine bracket and the cushion.

   b. Bolt the power plant to the engine cushions.
6. Remove the lifting yoke.
7. a. Push the rubber bellows over the inner universal joint drivers and fit the clamps.
   b. Wipe any surplus grease off the rubber bellows and check that the bellows are not deformed.
8. Manual transmission:
   a. Connect the gear shift rod joint to the gear selector rod and insert the taper pin.
   b. Model 1975: Fit the slave cylinder and adjust the clutch. As from model 1976: Connect the hose to the slave cylinder and bleed the clutch system.
8. Automatic transmission:
   Connect the gear selector wire to the transmission.
9. Connect the speedometer cable to the transmission.
10. Bolt the exhaust pipe to the exhaust manifold.
11. Lower the front end of the car.
12. a. Connect the ground cable.
    b. Fit the alternator.
13. Mount the front sheet complete with radiator and connect the hood lock operating cable to the attachment at the dash panel.
14. Fit the grille.
15. Reconnect the cables to the radiator fan, thermostat contact, headlights, headlight wiper motor and clip the bundle of wiring to the front sheet.
16. Connect the coolant hoses to the radiator, thermostat housing, water pump and inlet manifold.
17. Connect the vacuum hose and fuel hose and connect cables to the temperature transmitter, ignition coil and oil pressure transmitter.

18. a. Connect the throttle control wire to driver and bracket.
    b. Carbureted engine:
    Connect the choke control wire to the carburetor.
19. Carbureted engines:
    a. Mount the air cleaner and preheater complete with hoses.
    b. Connect the ventilation hose.
    c. Connect the cables between the distributor and ignition coil.
    d. Connect the fuel pipe.

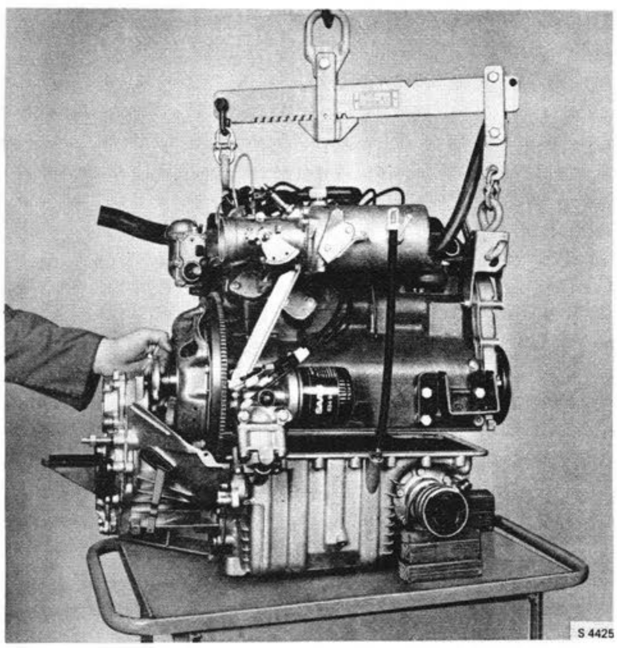
19. Injection engines:
    a. Mount the air cleaner and mixture control unit and connect the rubber bellows to the throttle valve housing and the air flow sensor.
    b. Fit the fuel lines.
    c. Fit the cables to the warm-up regulator, auxiliary air valve, cold start valve, thermo-time switch and air flow sensor.
20. Install the battery and connect the cables.
21. Close the radiator and engine block drain cocks, fill with coolant and oil.
22. Start the engine, checking oil pressure and coolant temperature. Check the operation of the transmission. Check the operation of the radiator fan by grounding the thermostat contact cable to the radiator.
23. a. Mount the hood and connect the windshield washer hose.
    b. Check the fit of the hood. Close the hood, open the doors, and check that the door jambs clear the rear edge of the hood.
    c. Check the headlight alignment.
24. Take the car out for a test run. Check the coolant level after driving.

SEPARATING ENGINE FROM MANUAL TRANSMISSION

1. Clean the power plant.
2. Drain the engine oil.
3. Take off the clutch cover.
4. Remove the starter.
5. Withdraw the clutch shaft (see instructions for disassembling the clutch).
6. Model 1975: Undo the three screws of the release bearing guide sleeve.
   As from model 1976: Remove the three retaining bolts for the slave cylinder.
7. Back off the adjusting screw and disconnect the clutch lever (model 1975).
8. Undo all screws in the mating flanges of engine and transmission.
9. Lift the engine carefully off the transmission (see illustration). At the same time remove the release bearing guide sleeve.

Reassemble in the reverse order.

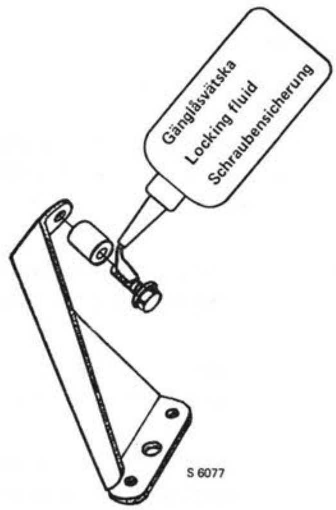
CAUTION
If the engine and transmission fail to separate, do not attempt to force them apart without first checking that all the screws have been taken out.



SEPARATING ENGINE FROM TRANSMISSION

Reassemble in the reverse order.

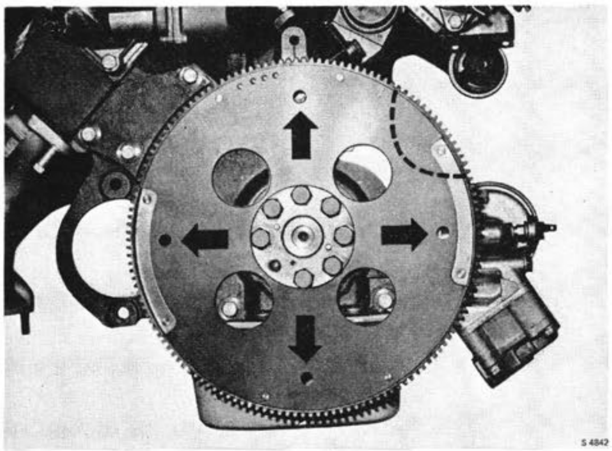
The threads of the following bolts through the mating flanges of the engine/transmission should be coated with a sealing compound (e.g. Permatex): 1, 2, 3, 6, 8 and 9 (refer to automatic transmission section for illustration). Lock the bolt securing the engine stay to the cylinder head by means of Loctite or equivalent.



LOCKING THE ENGINE STAY SCREW

SEPARATING ENGINE FROM AUTOMATIC TRANSMISSION

1. Clean the outside of the power plant.
2. Drain the engine oil.
3. Remove the cover over the flywheel ring gear.
4. Remove the starter.
5. Disconnect the throttle wire from the throttle valve housing (carburetor).
6. Remove all screws in the mating flanges of engine and transmission.
7. Remove the four screws securing the flywheel ring gear to the torque converter. The screws can be reached from above the oil pump mounting.



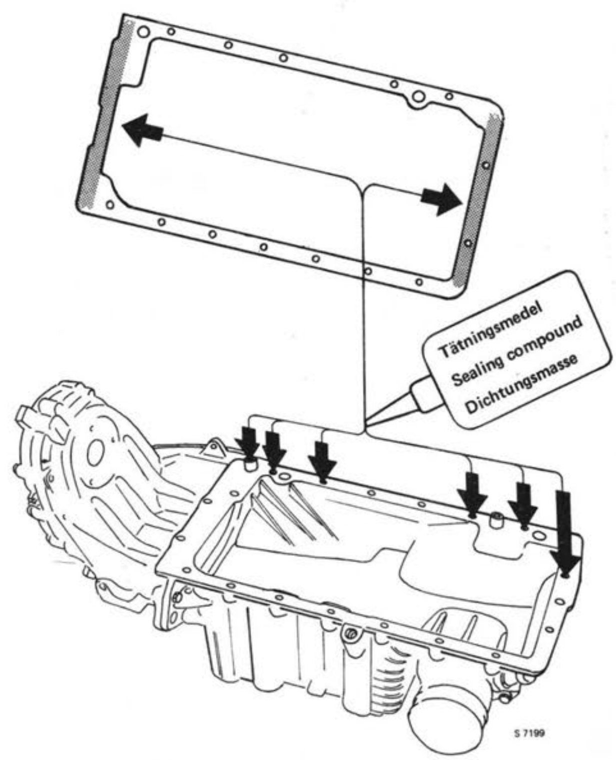
SCREW HOLES FOR FLYWHEEL RING GEAR – TORQUE CONVERTER

8. Turn the driver disc, so that the plate angles will be horizontal. Lift the engine carefully off the transmission.
9. Fit the torque converter support (special tool 8790255).

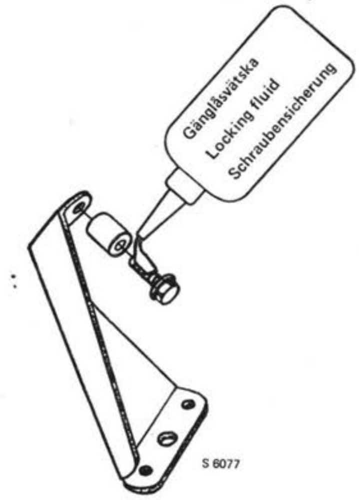
Reassemble in the reverse order.

Reassemble in the reverse order.

When fitting together the engine and transmission:
- Ensure that the mating flanges between the engine and transmission are absolutely clean.
- Check that the two dowels are fitted in the transmission casing.
- Fit a new gasket on the transmission housing. Apply sealing compound to both sides of the gasket as shown in the illustration above.
- Apply thread locking compound to the six bolts in the holes as indicated in the lower illustration.



Lock the bolt securing the engine stay to the cylinder head by means of Loctite or equivalent.

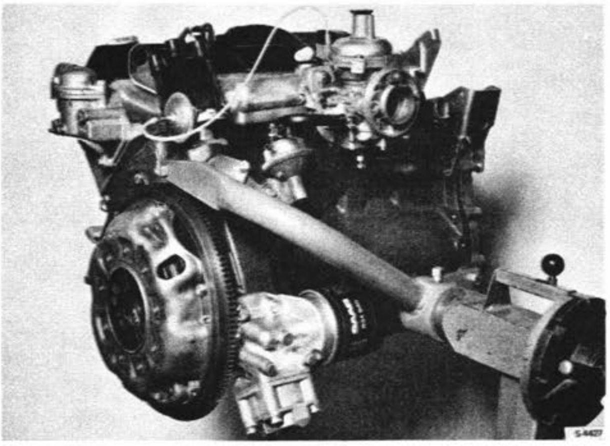


LOCKING THE ENGINE STAY SCREW

ENGINE BODY

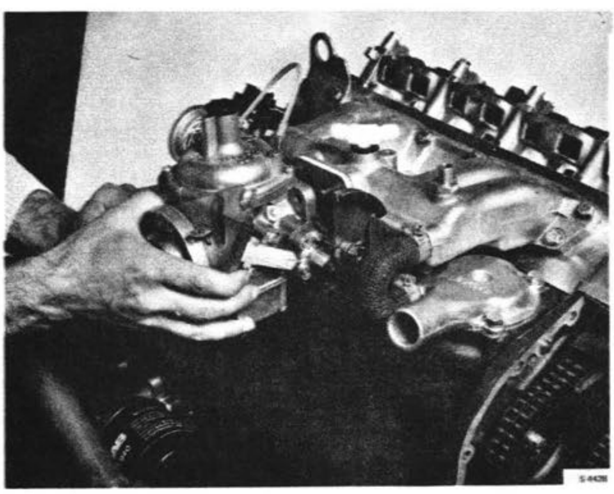
DISASSEMBLING THE ENGINE

1. Mount the engine in a work stand.



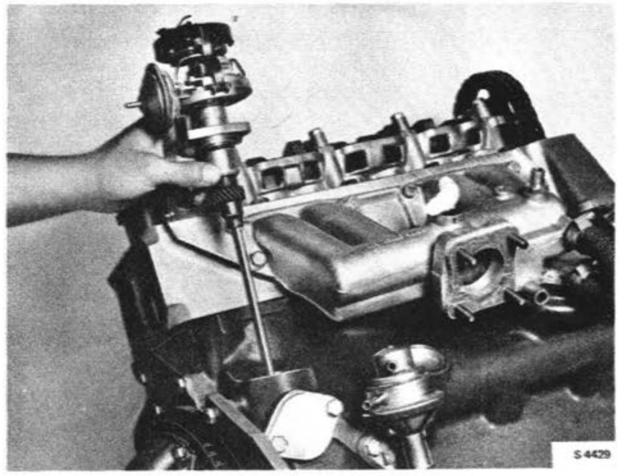
ENGINE MOUNTED IN WORK STAND

2. Remove the distributor cap and disconnect the ignition cables.
3. Carbureted engine:
   Remove the carburetor.
3. Injection engine:
   Remove the throttle valve housing.



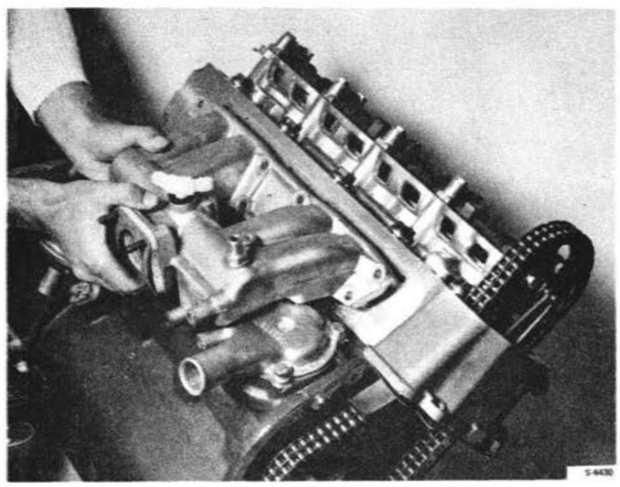
REMOVING THE CARBURETOR

4. Undo the hose connections from the water pump, by-pass system and crankcase ventilation circuit.
5. Remove the valve cover.
6. Remove the distributor.



REMOVING THE DISTRIBUTOR

7. a. Remove the inlet manifold together with the front lifting lug.
   b. Remove the alternator bracket.

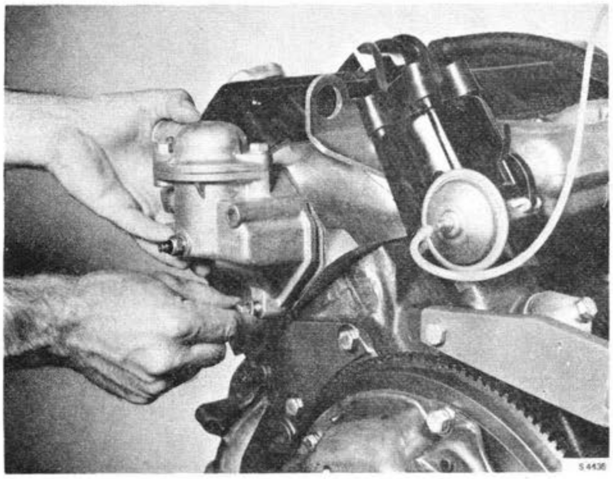


REMOVING THE INLET MANIFOLD

8. a. Remove the oil filter.
   b. Remove the oil pump.
   c. Remove the oil pump spacing piece.
   d. Remove the suction line to the pump.
9. Remove the water pump (see section 262).

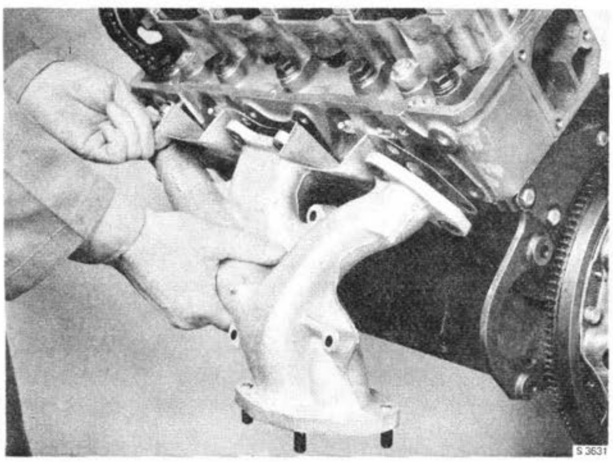
> **CAUTION**
> The water pump is available in two versions and the procedure for removal and assembly of each is different. Under no circumstances must tapping-out hammers or the like be used during the removal or assembly of pumps of versions II and III.

10. Remove the thermostat housing.



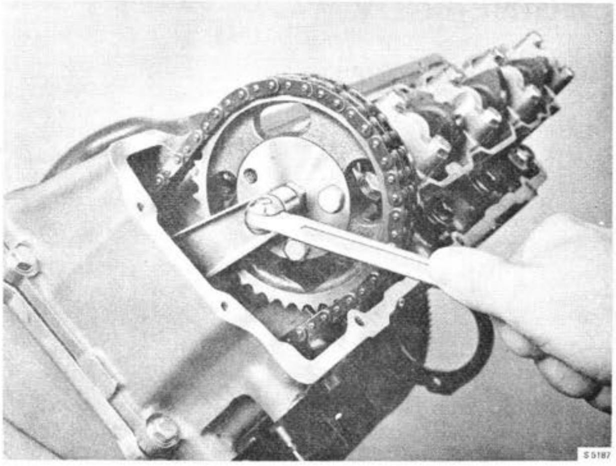
REMOVING THE THERMOSTAT HOUSING

11. Remove the exhaust manifold with radiation shield. (As from model 1976, the exhaust manifold is of a 2-branch type.)



REMOVING THE EXHAUST MANIFOLD

12. Remove the camshaft sprocket as follows:
    a. Turn the crankshaft to ignition position for No. 1 cylinder.
    b. Model 1975: Screw a M8 nut on to the threaded center stud of the camshaft sprocket and tighten the center stud against the mounting plate provided for the purpose.
    b. As from model 1976: Bolt the mounting plate to the center of the camshaft sprocket using one of the camshaft sprocket retaining screws.

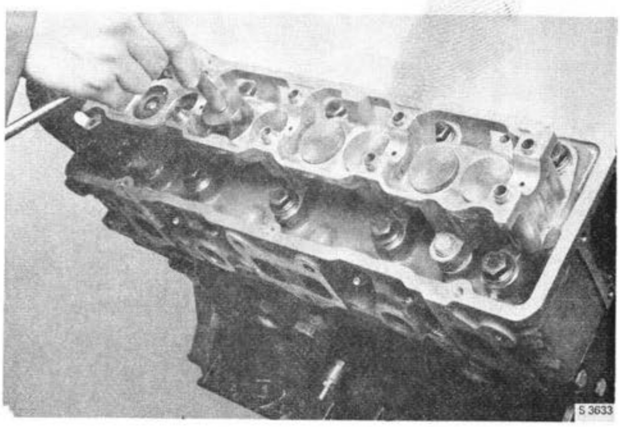


NUT (SCREW) MOUNTED ON THE CENTER STUD

CAUTION
Tighten the nut (screw) securely to immobilize the center stud. Otherwise the chain tensioner will tighten the chain and lock in a new position so that the sprocket cannot be replaced in position.

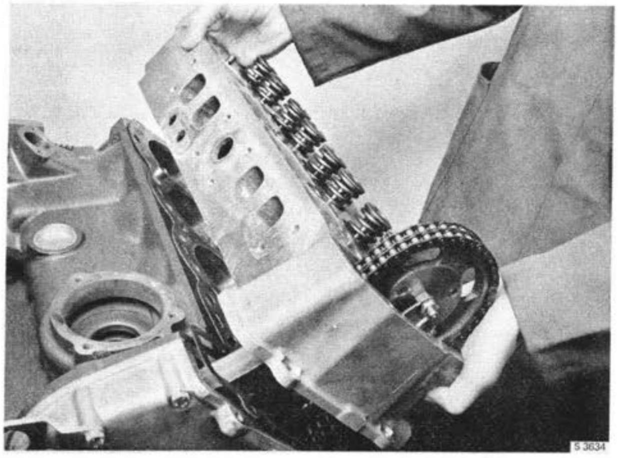
    c. Undo the retaining screws from the camshaft sprocket. Separate the wheel from the camshaft plate until it hangs free on the center stud in the mounting plate.

13. Remove the camshaft bearing caps and lift out the camshaft.
14. Remove the valve depressors and adjusting pallets.



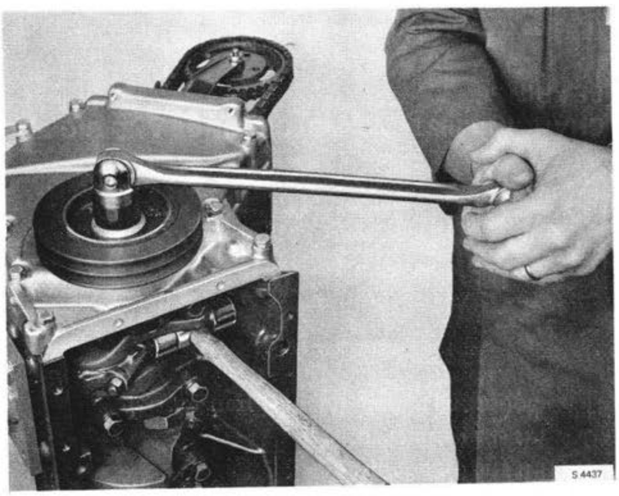
REMOVING THE VALVE DEPRESSORS
Tool 8391401

15. Remove the camshaft bearing assembly.
16. Unscrew all cylinder head screws.
17. Lift off the cylinder head and remove the gasket.

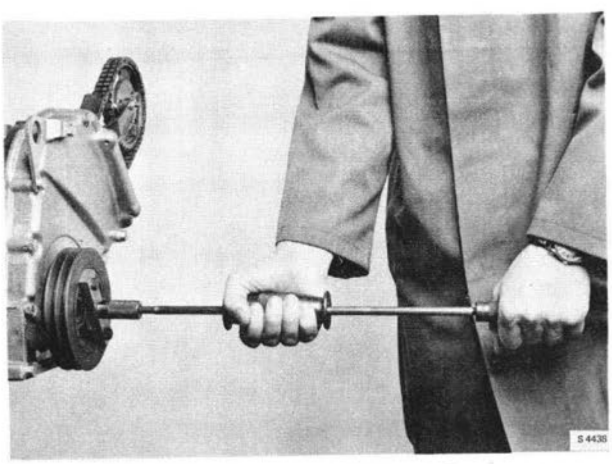


REMOVING THE CYLINDER HEAD

18. Remove the belt pulley screw and the pulley, using when necessary puller 8392151.

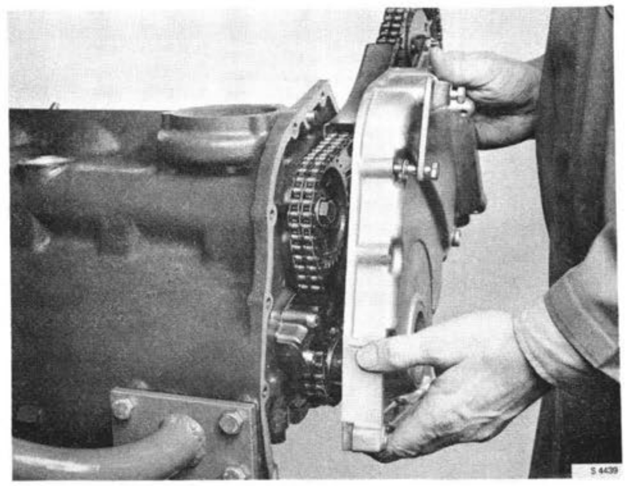


REMOVING THE BELT PULLEY SCREW



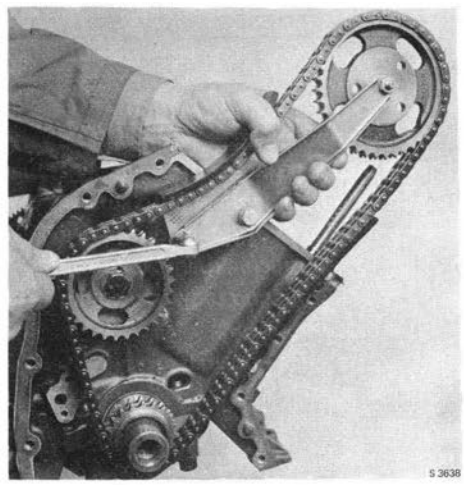
REMOVING THE BELT PULLEY
Tools 8390270 and 8392151

19. Remove the chain transmission cover.



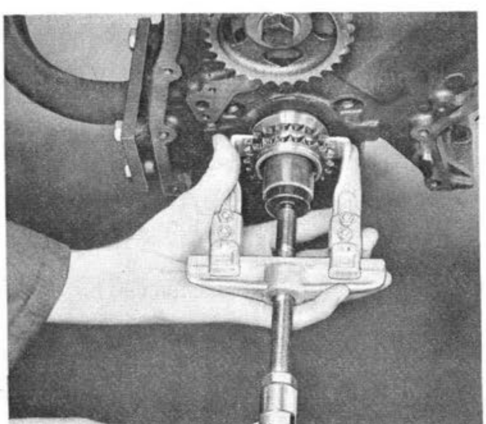
REMOVING THE CHAIN TRANSMISSION COVER

20. Remove the chain tensioner.
21. Undo the chain guides, the mounting plate with the camshaft sprocket and transmission chain.



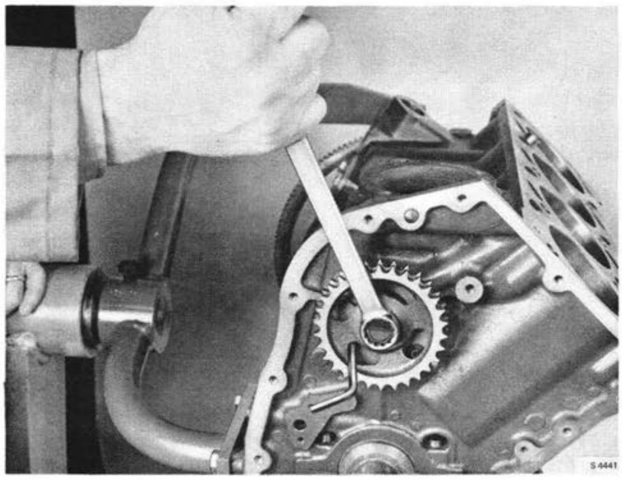
REMOVING THE TRANSMISSION PLANT

22. Remove the crankshaft sprocket. Universal puller and tool 8391849 may be used, if necessary.



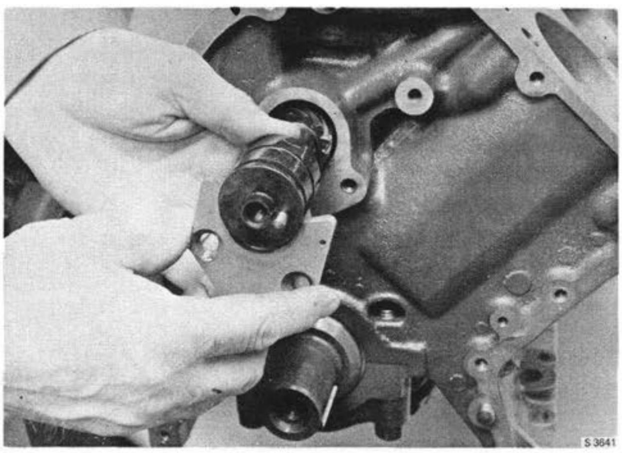
REMOVING THE CRANKSHAFT SPROCKET
Universal puller and tool 8391849

23. Remove the idler shaft sprocket.



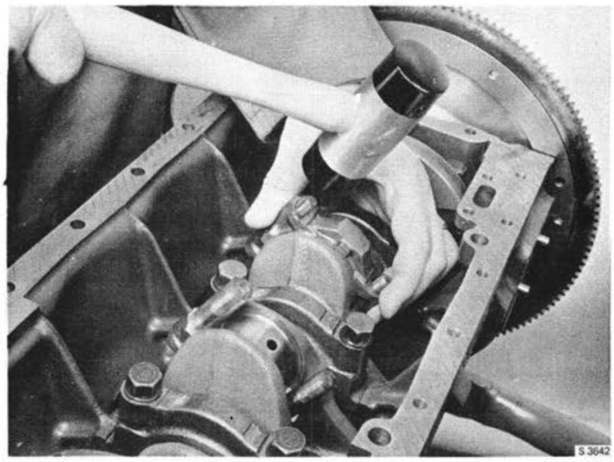
REMOVING THE IDLER SHAFT SPROCKET

24. Unscrew the idler shaft keeper plate and carefully withdraw the idler shaft.

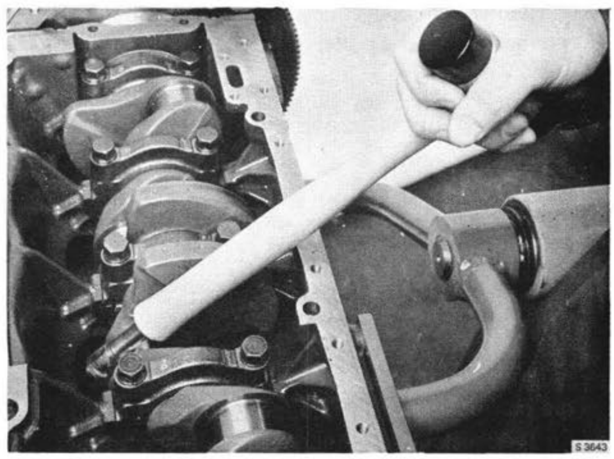


REMOVING THE KEEPER PLATE

25. Carefully remove any crusts and deposits of soot from the top ends of the cylinders.
26. Note the markings on the connecting rods and big-end bearing caps so that they can be reassembled later in their original positions. Remove the nuts and bearing caps and push the pistons complete with connecting rods out of the cylinders (see illustration). Protect the stud threads with pieces of plastic hose when dismantling pistons and connecting rods.
    For instuctions with regard to exchanging pistons see page 210–10.

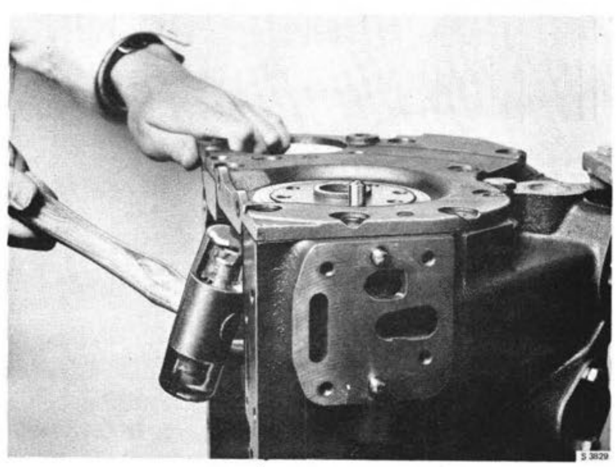


REMOVING THE BEARING CAPS



REMOVING PISTON AND CONNECTING ROD

27. Replace the big-end bearings and caps loosely on the connecting rods from which they came.
28. Manual transmission:
    Dismantle the clutch and flywheel.
28. Automatic transmission:
    Remove the driver disc.
29. Remove the gable plate and shaft seal.



REMOVING THE GABLE PLATE

SAAB

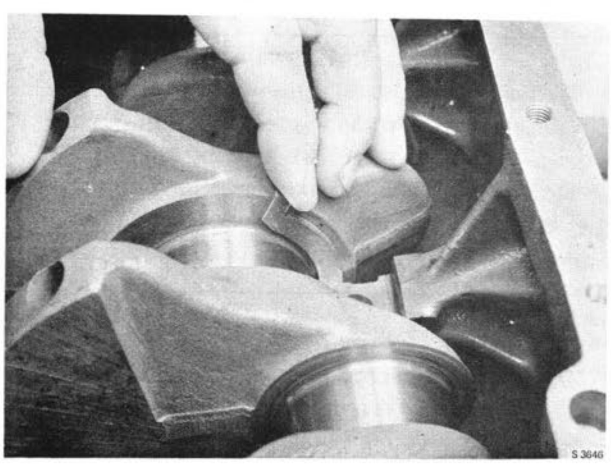
30. Undo the main bearing screws and remove the bearing caps.
31. Lift out the crankshaft.
32. Remove the bearing halves and thrust bearing washers and put them carefully aside so that they can be reassembled in their original positions.

ASSEMBLING THE ENGINE

Instructions for measuring the main bearing and big-end bearing clearance and choice of bearing halves, see section 216.

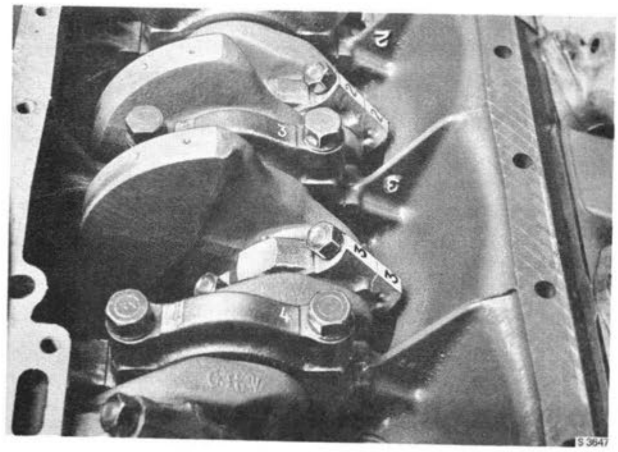
1. Place the bearing halves in the main bearing journals and lubricate the bearings with engine oil.
2. Locate the crankshaft carefully in the bearing journals.
3. Locate the thrust bearing washers. Check the axial play with a feeler gauge.

INSTALLING THE THRUST BEARING



LOCATION OF THRUST BEARING WASHERS

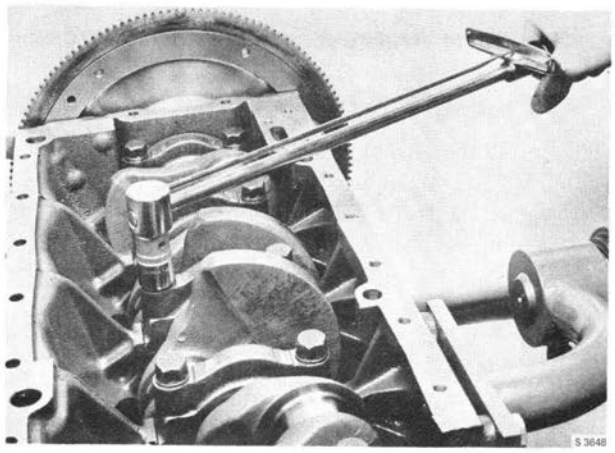
4. Mount the main bearing caps with bearing halves already in position and oiled. (NOTE! Make sure the markings match up!) The main bearing caps are numbered; No. 1 goes at the transmission chain end and the others run consecutively to the flywheel end with the bearing locks facing each other. To each number on the bearing caps, corresponds a cast number on the crankcase.



MARKS ON CONNECTING RODS, MAIN BEARINGS AND CYLINDER BLOCK

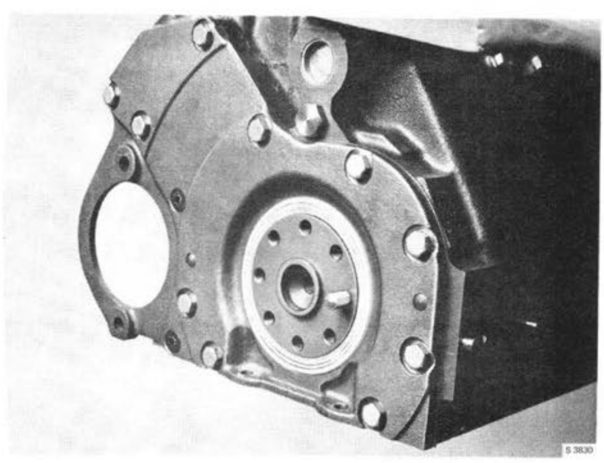
5. Tighten the main bearing bolts to the specified torque.

Torque	108 Nm (79 ft.lb./11 kpm)



TIGHTEN THE MAIN BEARING SCREWS

6. Fit the gable plate with the crankshaft seal towards the mating surface of the engine block. Grease the inner circlip of the sealing ring. Fit a new gasket on the gable plate and trim it flush with the mating surface of the transmission.



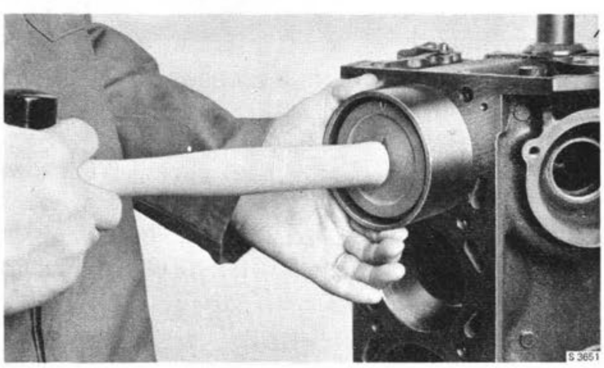
GABLE PLATE FITTED

7. Fit the flywheel (driver disc). Apply Loctite Pipe Sealant 68 or the equivalent to the screw threads.

Torque	60 Nm (44 ft.lb./6,0 kpm)

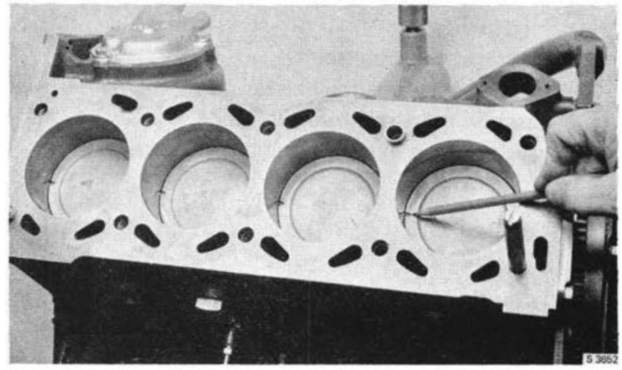
TIGHTEN THE FLYWHEEL SCREWS TO SPECIFIED TORQUE

8. Install the pistons and connecting rods using tool 7862287. Make sure that the studs are still protected by their plastic sleeves. The connecting rods and big-end bearing caps are numbered to match the corresponding cylinders. Instructions for fitting piston rings are given on page 210–10.



INSTALLING PISTON AND CONNECTING ROD
Tool 7862287

NOTE
The groove on top of the piston should be facing the transmission end.



PISTON MARKINGS

9. a. Fit the big-end bearing caps so that the figures face the same way as those on the connecting rod, i.e. away from the idler shaft.
   b. Tighten the nuts to the specified torque.

Torque	54 Nm (40 ft.lb./5.5 kpm)

10. a. Install the idler shaft and fit the keeper plate.

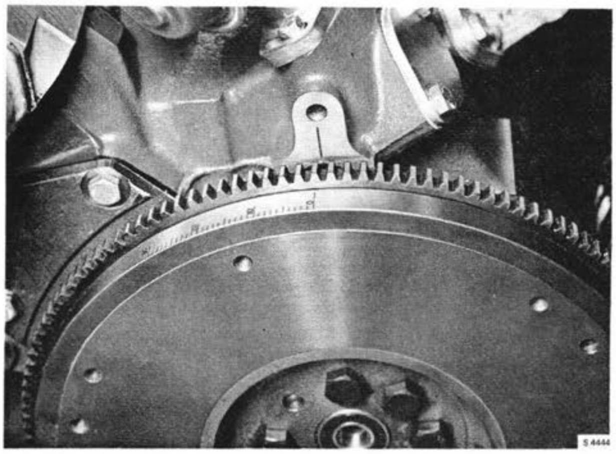
CAUTION
The idler shaft is available in two versions which must not be confused.
Idler shafts of the later version are made of cast-iron and the gears for the distributor and water pump have a larger number of cogs.

   b. Mount the sprocket on the idler shaft.

11. Fit the water pump (see section 262).

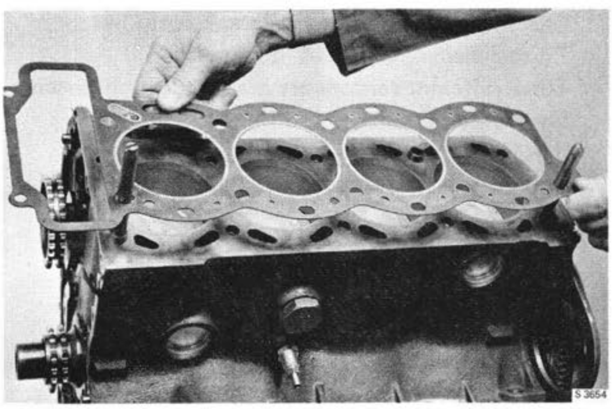
CAUTION
The water pump is available in two versions. Later version pump shafts are made of cast-iron and the gear for the idler shaft is of different design.
The two types of pump must never be confused.
Tapping-out hammers or the like must never be used in the assembly of pumps of the later version.

12. a. Mount the sprocket on the crankshaft.
   b. Align the 0 degree mark on the flywheel with the mark on the cylinder block.



FLYWHEEL AND CYLINDER BLOCK MARKINGS

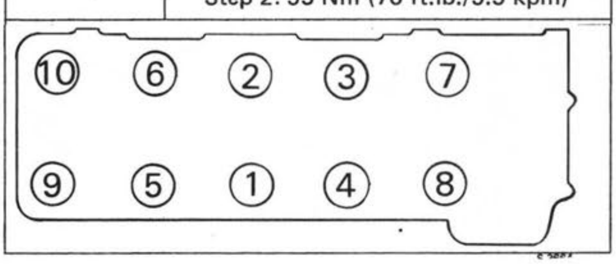
13. Fit the cylinder head gasket. Fit two locating pins, tool 8392128.



FITTING THE CYLINDER HEAD GASKET
Tool 8392128

14. a. Mount the cylinder head.
    b. Tighten the screws in two steps.

Torque	Step 1: 60 Nm (44 ft.lb./6.0 kpm) Step 2: 95 Nm (70 ft.lb./9.5 kpm)

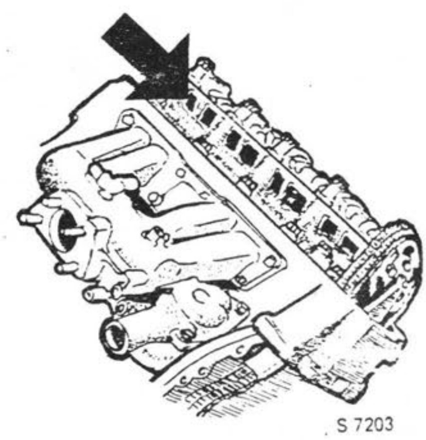


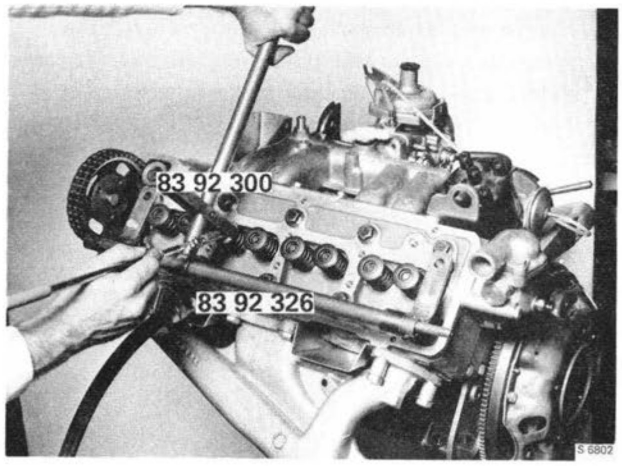
c. Do the final tightening after the engine has been allowed to cool for about 30 minutes.

15. Mount the camshaft bearing assembly.

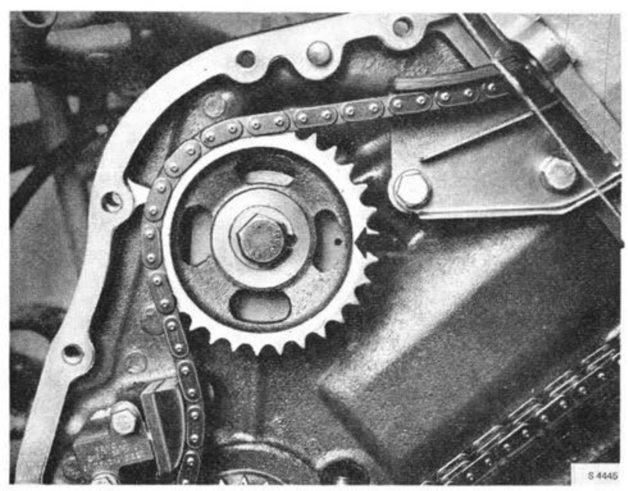
If the camshaft bearing assembly is fitted the wrong way round the camshaft bearings will not be lubricated.

> NOTE
> Turn the camshaft bearing assembly so that the feeler gauge orifices point upwards.

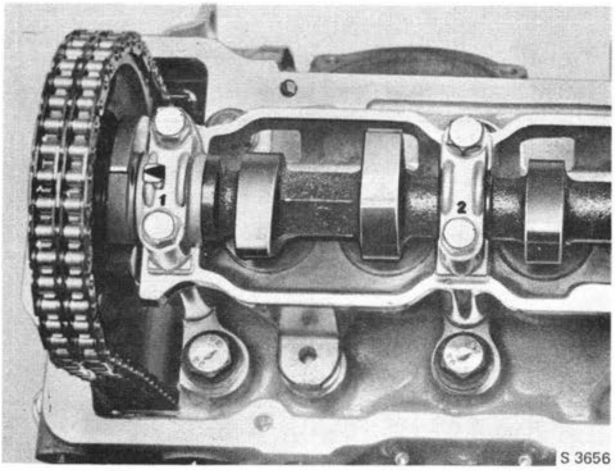




16. Mount the adjusting pallets and valve depressors.
17. Fit the camshaft.
18. Fit the camshaft bearing caps. Note the marks.
19. Mount the straight chain guide plate.
20. Check that the setting marks on the crankshaft, camshaft and idler shaft are in the right position, i.e. the ignition position for the first cylinder.

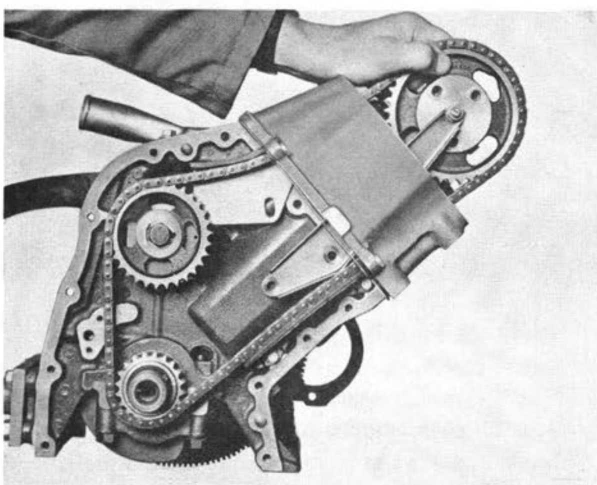


IDLER SHAFT MARKING. THE BULGE IN THE HOLE ON THE IDLER SHAFT CHAINWHEEL SHOULD LINE UP WITH THE SMALL HOLE IN THE KEEPER PLATE.



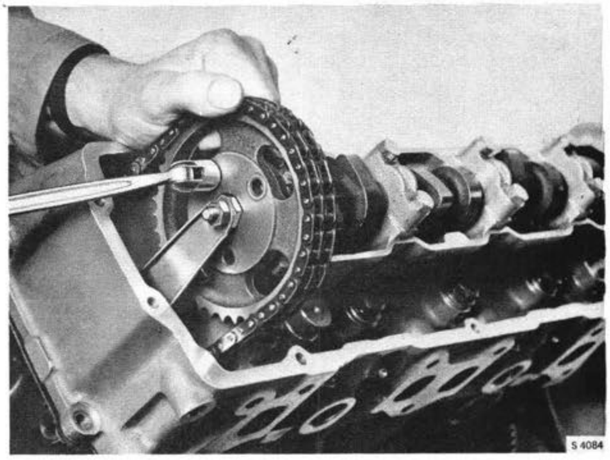
CAMSHAFT MARKINGS

21. Assemble the camshaft sprocket and mounting plate if they have been disassembled, fit the transmission chain over the camshaft sprocket, and lower the transmission chain and mounting plate past the camshaft flange until the center stud of the sprocket is lined up with the camshaft.



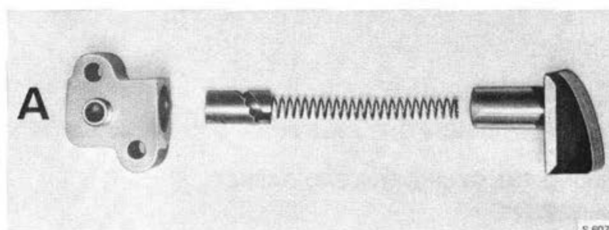
INSTALLING THE TRANSMISSION CHAIN

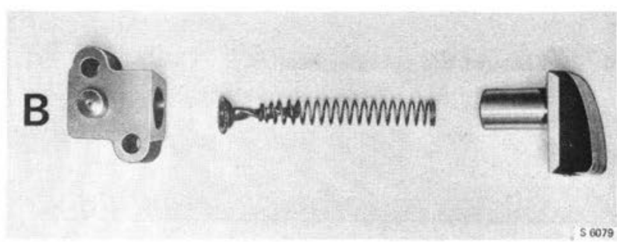
22. Rotate the camshaft sprocket until the screw holes match the threaded holes in the camshaft flange.
23. Fit the transmission chain over the other sprockets so that it hangs straight from the camshaft to the crankshaft.
    NOTE! The shaft settings must not be altered.
24. Guide the center stud of the camshaft sprocket into the camshaft. Fit the screws.

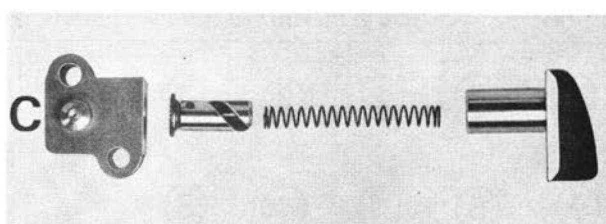


FITTING THE CAMSHAFT SPROCKET

25. Mount the curved chain guide plate together with the mounting plate (the chain guide plate nearest the block) with two screws and stretch the chain somewhat.
26. Check the setting "camshaft-crankshaft-idler shaft".
27. Fit the chain tensioner as follows:
    Three different versions are available and the assembly procedure for each is different.
    Version A:
    a. Before installation, remove the tensioner neck

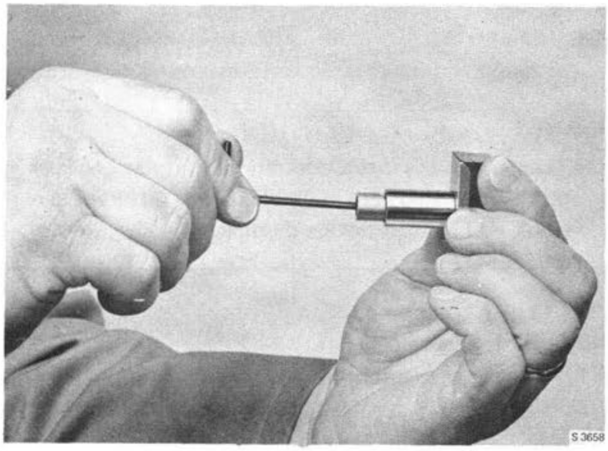






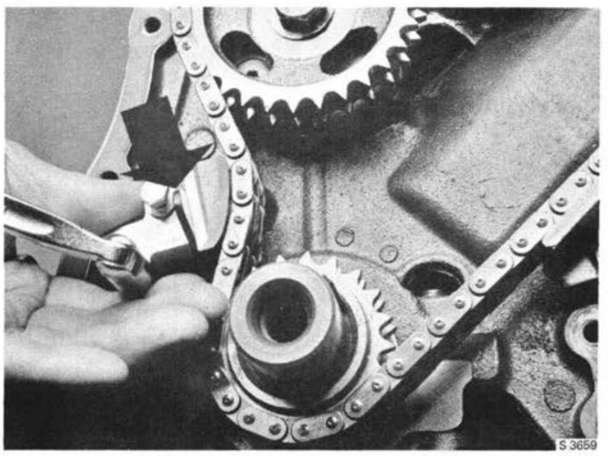
CHAIN TENSIONER
Version A. (Reynolds)
Version B. (Jwis, earlier design)
Version C. (Jwis, later design)

b. Tension the spring, by turning the ratchet sleeve (actuated by the spring) clockwise and at the same time pushing it until it locks in its innermost position.



LOCKING THE RATCHET SLEEVE, VERSION A

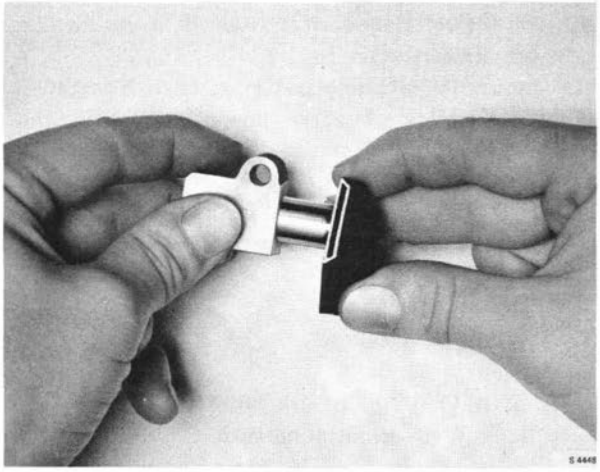
c. Fit the tensioner neck and a spacer piece, so that the tensioner neck will not bottom in the chain tensioner housing and release the self-adjuster.



CHAIN TENSIONER WITH SPACER PIECE

Version B and C:

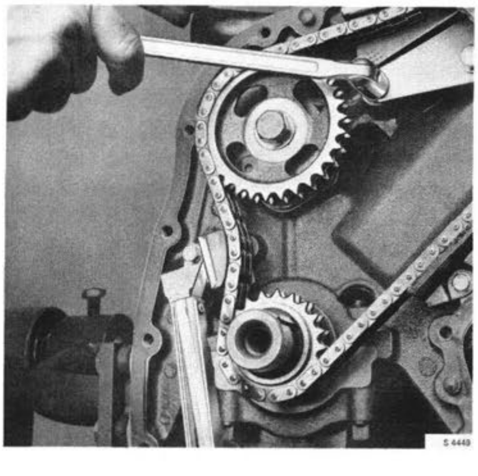
a. Place the lock washer with the spiral rod (ratchet sleeve) in the chain tensioner housing. Place the lock washer with the spiral rod in the chain tensioner housing.
b. Version B:
   Fit the spring with the smaller diameter against the lock washer.
c. Fit the tensioner neck in the housing by simultaneously pressing and turning it into its inner position. The tensioner neck must be held depressed while the chain tensioner is being fitted, right until the chain has been tensioned.



ASSEMBLING THE CHAIN TENSIONER, VERSION B AND C

Version B and C:

d. Mount the chain tensioner with guide plate on the engine block.
e. Press the curved chain guide against the chain to stretch it and push the tensioner neck against the spacer piece. Remove the spacer piece while the chain is kept tensioned. Then adjust to leave a clearance of 0.02" (0.5 mm) between the housing and the tensioner neck.
   Tighten the chain guides.

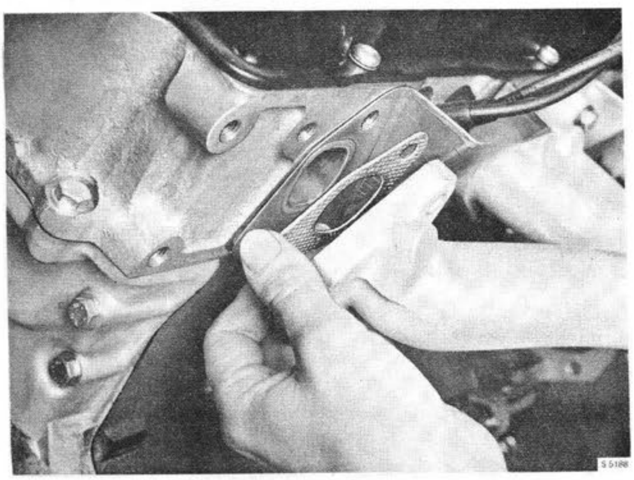


ADJUSTING THE PLAY

f. Rotate the crankshaft one full turn in its normal sense and check the chain tension. The movement of the tensioner neck from its butted position must be at least 0.02" (0.5 mm) and not more than 0.06" (1.5 mm).

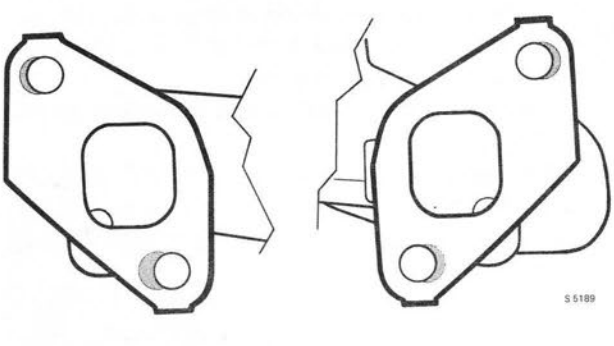
28. Remove the nut (screw) from the camshaft sprocket center.
29. Fit the transmission chain cover and the alternator bracket. Install a new gasket on the transmission chain cover and trim the gasket flush with the mating surface of the transmission.

30. Fit the belt pulley and tighten the screw with the prescribed torque.
31. Mount the oil pump spacing piece with gasket.
32. Fit the oil pump suction line. Make sure that the suction tube gasket is the right way round.
33. Fit the oil filter.
34. Fit the inlet manifold. Connect water hoses and crankcase ventilation hoses. Screw in the engine lifting eye.
35. Carbureted engine:
    Mount the carburetor.
35. Injection engine:
    Mount the throttle valve housing.
36. Mount the thermostat housing.
37. Fit the exhaust manifold and radiation shield. As from model 1976 (2-branch exhaust manifold), grind the sealing surfaces of the manifold using a face plate, and fit special gaskets (two smaller and one larger) between the flanges of the exhaust manifold and the radiation shield.



FITTING THE EXHAUST MANIFOLD GASKETS (AS FROM MODEL 1976)

In cars with 2-branch exhaust manifolds, difficulty due to contraction may arise when the outer flange is to be secured. In such cases, use a file to make the bolt holes in the flange oval so that the bolts can be installed.



MODIFYING THE EXHAUST MANIFOLD

38. Mount the distributor with drive shaft for the oil pump and make basic ignition setting. See Group 3.

> **CAUTION**
> The gear on the distributor and corresponding gear on the idler shaft are available in two different versions, which must not be confused.

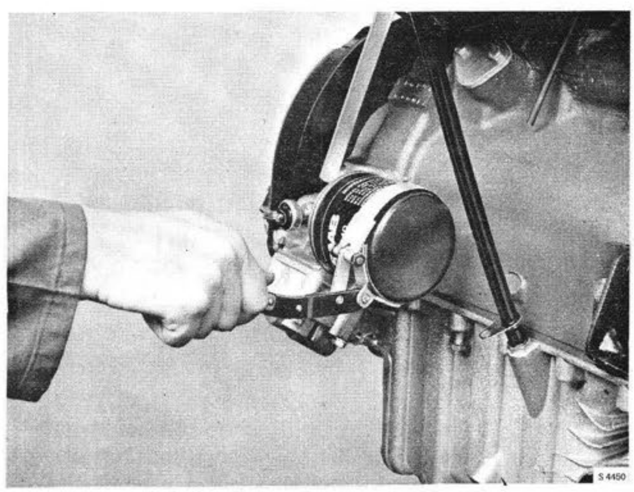
39. Fit the oil pump.
40. Fit the valve cover.
41. Mount the clutch. (Manual transmission)

CHANGING PISTONS, PISTON RINGS AND BIG-END BEARINGS

(Engine mounted in work stand)

Disassembly

1. Remove the oil filter.



REMOVING THE OIL FILTER
Tool 7862014

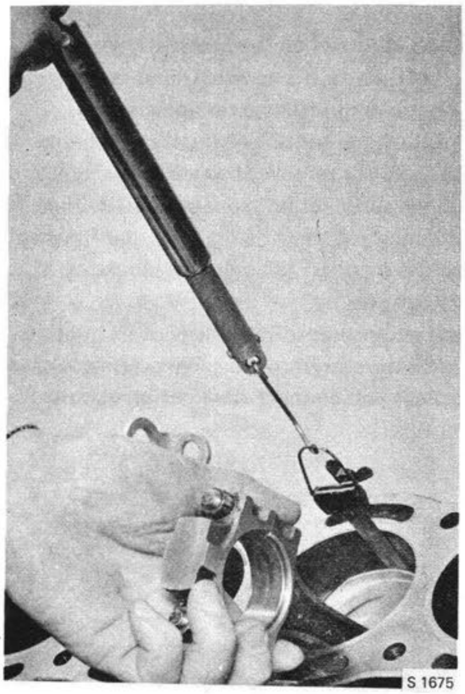
2. Remove the valve cover.
3. Remove the camshaft sprocket as follows:
   a. Turn the crankshaft to ignition position for No. 1 cylinder.
   b. Screw an M8 nut onto the threaded centre stud of the camshaft sprocket (model 1975) or use a camshaft sprocket retaining screw (as from model 1976) and clamp the sprocket against the mounting plate provided for the purpose.

> **CAUTION**
> Tighten the nut (screw) securely to immobilize the center stud. Otherwise the chain tensioner will tighten the chain and lock in a new position so that the sprocket cannot be refitted.

c. Undo the retaining screws from the camshaft sprocket. Separate the wheel from the camshaft plate until it hangs freely by its center stud in the mounting plate.
4. a. Unscrew all cylinder head screws.
   b. Remove the cylinder head screws and mount two guide pins.
   c. Remove the screws from the transmission chain cover.
5. Disconnect the hoses from the inlet manifold and the carburetor/throttle valve housing. Unscrew the spark plugs.
6. Lift off cylinder head with carburetor/throttle valve housing, inlet manifold, exhaust manifold and valve mechanism.
7. Remove the big-end bearing caps and push the pistons complete with connecting rods out of the cylinders. Protect the studs with pieces of plastic hose.
   NOTE! Remove any crusts and deposits of soot from the top ends of the cylinders.

Fitting pistons

To fit pistons to the cylinder bores, use a feeler gauge 1/2" wide. To measure, first oil the cylinder lining lightly and insert the piston without rings in the cylinder in the position in which it will ultimately be working. Attach the feeler gauge to a spring balance and place it between the piston and cylinder bore at right angles to the axis of the piston pin (see illustration). At a tractive force of 8–

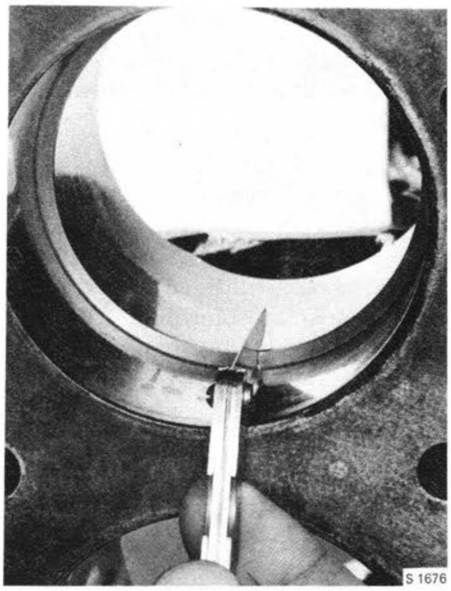


MEASURING PISTON CLEARANCE

12 N (1.8–2.6 lb., 0.8–1.2 kp), the mean value of the clearance equals the thickness of the feeler gauge. Repeat the test with the piston at several different depths on the piston. Spare pistons are stocked in both standard and oversize diameters. Where the latter are used, the cylinder bore must be honed or rebored to obtain the correct piston clearance. Concerning piston clearance, see Group 0.

Fitting piston rings in a new or rebored cylinder

1. Push the piston rings down into the cylinder one at a time, using an inverted piston head to position them correctly.
2. Measure the ring gap with a feeler gauge (see illustration). Correct gap sizes are given in the specifications. If necessary, widen the gap with a special file.



MEASURING PISTON RING GAP

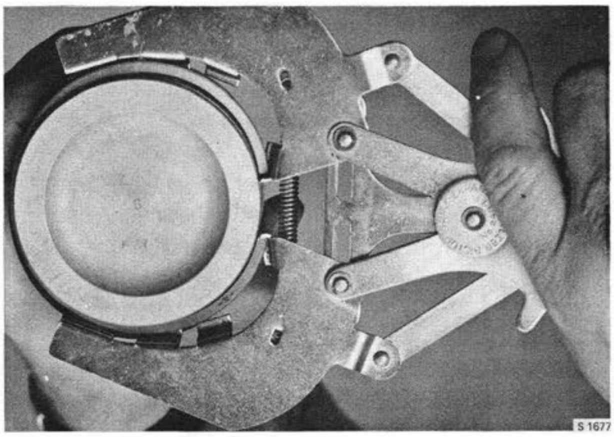
3. Try the piston rings in their respective grooves by rolling. Measure the clearance at a few points too.

Fitting piston rings in worn cylinders

Rings to be fitted in a worn cylinder must be tried at the lower limit of travel of the piston, as the bore will be narrowest at this point.

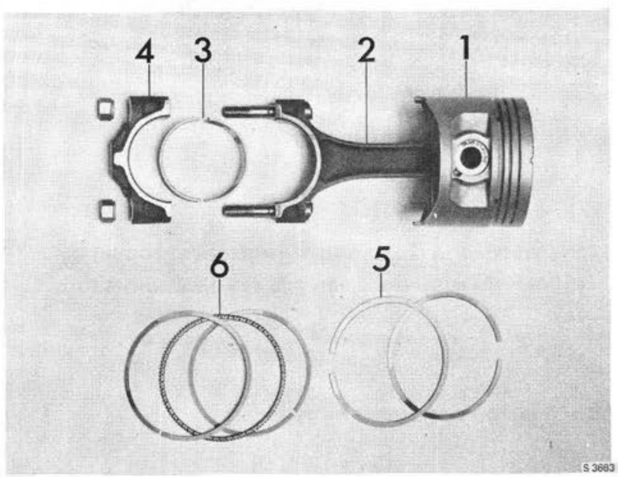
Assembly of piston rings

Use a piston ring tool to position the rings as illustrated. Place the lower compression ring with the side marked "top" uppermost. Oil the piston and rings before assem-



PISTON RING TOOL

bling. Rotate the compression rings so that gaps in alternate rings will be at 180° to each other, positioned alternately over the two ends of the piston pins.
Make sure, too, that the spring gaps of the top and bottom rings in the three-piece scraper ring are staggered.



PISTON AND CONNECTING ROD WITH BEARINGS AND PISTON RINGS

1. Piston
2. Connecting rod
3. Bearing
4. Bearing cap
5. Compression rings
6. Three-piece oil scraper ring

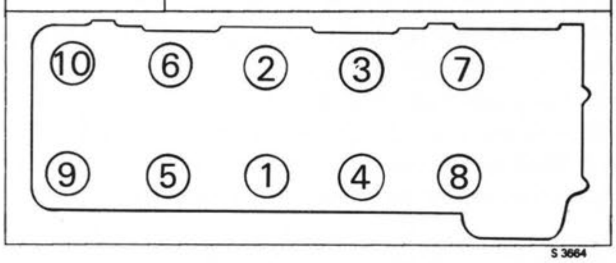
Installation

1. Install pistons and connecting rods using the piston installing tool 7862287.

NOTE
The groove on top of the piston should be facing the transmission end.

2. Mount big-end bearing caps with bearing halves.
3. Fit the cylinder head gasket.
4. Mount the cylinder head. Remove the guide pins and refit the screws. Tighten the cylinder head screws to the specified torque in two steps; first to 59 Nm (6 kpm, 43 ft.lb.) and then 93 Nm (9.5 kpm, 69 ft.lb.). The order of tightening is illustrated below. Tighten finally after the engine has been warmed up and then cooled off for about 30 minutes. Insert and tighten the transmission chain cover screws.
Screws are re-tightened after 2.000 km (1.200 miles).

Torque	Step 1: 60 Nm (44 ft.lb./6.0 kpm) Step 2: 95 Nm (70 ft.lb./9.5 kpm)



5. Fit the camshaft sprocket to the camshaft, making sure that the notches on the camshaft and bearing cap are in line. Tighten and lock the retaining screws. Remove the nut on the camshaft sprocket retaining screw (model 1975) or remove the retaining screw and remount it to the sprocket (as from model 1976). Check at the same time that the mark on the flywheel is in line with the mark on the cylinder block.
6. Mount the valve cover.
7. Connect hoses and cables to the valve cover, inlet manifold and carburetor/throttle valve housing. Screw in the spark plugs and connect the ignition cables.
8. Install the oil filter.

CYLINDER HEAD

DISASSEMBLY

(Engine in car)

1. Disconnect the battery cables.
2. Drain off coolant through the radiator and enginé block drain cocks.
3. Carbureted engine:
   Remove the inlet hose and disconnect the throttle and choke cables from the carburetor.
3. Injection engine:
   Remove the rubber bellows from between the air flow sensor and the throttle valve housing, and disconnect the throttle cable from the throttle valve housing.
4. Disconnect the cable from the temperature transmitter.
5. a. Detach the vacuum hose of the power assist cylinder from the inlet manifold.
   b. Carbureted engine:
   Detach the fuel hose and the vacuum hose from the carburetor.
   b. Injection engine:
   Disconnect the fuel lines from the fuel distributor to the injection valves. Tape the ends of the lines to prevent dirt from entering. Remove the stay from the throttle valve housing mounting.
6. Undo the hose clamps at the connections to the thermostat housing, water pump and inlet manifold.
7. Unbolt the exhaust pipe from the exhaust manifold.
8. Remove the distributor cap and ignition cables.
9. Remove the valve cover.
10. Remove the camshaft sprocket as follows:
   a. Model 1975:
   Screw a M8 nut on to the threaded center stud of the camshaft sprocket and clamp the center stud against the mounting plate provided for the purpose.
   a. As from model 1976:
   Bolt the mounting plate to the center of the camshaft sprocket using one of the camshaft sprocket retaining screws.

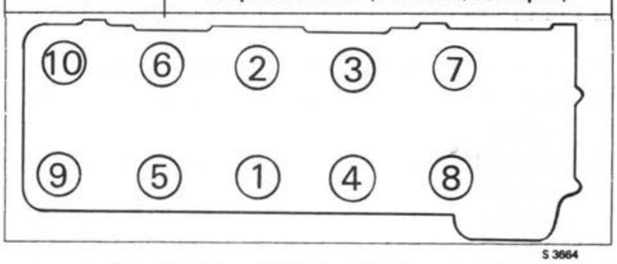
> CAUTION
> Tighten the nut (screw) securely to immobilize the center stud. Otherwise the chain tensioner will tighten the chain and lock in a new position so that the sprocket cannot be refitted. The chain tensioner cannot be reset without lifting the engine out of the car.

   b. Undo the retaining screws from the camshaft sprocket. Separate the wheel from the camshaft plate until it hangs free in the mounting plate by the center stud.
11. a. Unscrew and remove all cylinder head screws.
   b. Mount two guide pins (tool 8392128), in two of the cylinder head screw holes.
   c. Jack up and place blocks under the rear end of the power plant. Remove the engine mounting screw in the cylinder head.
   d. Remove the screws at the transmission cover.
   e. Lift off the cylinder head.

ASSEMBLING

1. Carefully scrape off old gasket material from the contact surfaces (emery cloth must not be used). Check that the contact surfaces are plane.
2. Fit the new cylinder head gasket over the two guide pins.
3. Make sure that the markings on the camshaft and bearing cap are in line with each other.
4. Check that the flywheel mark is in line with the mark on the cylinder block and that the ignition is set on No. 1 cylinder.
5. a. Mount the cylinder head. Tighten the cylinder head screws to the specified torque in two stages. The order of tightening is shown in the illustration. Insert and tighten the transmission chain cover screws. Retighten after the engine has been warmed up and then cooled off for about 30 minutes.

Torque	Step 1: 60 Nm (44 ft.lb./60 kpm) Step 2: 95 Nm (70 ft.lb./9.5 kpm)

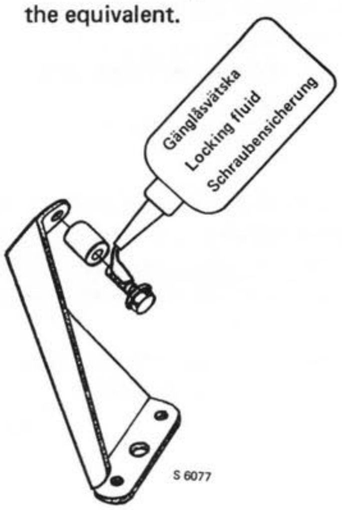


   b. Screws are retightened after 2,000 km (1,200 miles)
6. Mount the camshaft sprocket on the camshaft. Unscrew the nut (screw) from the center of the sprocket.

> CAUTION
> The nut (screw) on the camshaft sprocket center must not on any account be unscrewed before the sprocket is tightly screwed to the camshaft.

7. Mount the engine mounting screw in the cylinder

head. Remove the blocks under the power plant. Lock the bolt by means of Loctite 242 or 270 or the equivalent.



LOCKING THE ENGINE STAY SCREW

8. Fit the valve cover. Undamaged gasket can be remounted.
9. Fit the distributor cap complete with ignition cables.
10. Bolt the exhaust pipe to the exhaust manifold.
11. Connect the throttle control cable (choke control cable).
12. Connect the hoses to the thermostat housing, water pump and inlet manifold and tighten the hose clamps.
13. Connect the vacuum hose from the inlet manifold to the servo cylinder. Connect the fuel hoses. Mount the stay at the throttle valve housing.
14. Connect the cables to the ignition coil and temperature transmitter.
15. Mount the inlet hose (rubber bellows).
16. Close the drain cocks and fill with coolant.
17. Connect the battery cables.

VALVE MECHANISM

VALVE COVER

Removing

1. Disconnect the crankcase ventilation hose.
2. Detach the ignition cables from the valve cover and spark plugs.
3. Back off the screws and lift off the cover.

Replacing

If the screws have been tightened too hard so that the contact surface around the screw holes has been depressed, the surface should be restored before the cover is fitted. If this is neglected, the contact pressure between the holes will be reduced.

1. Fit the gasket. The original gasket may be reused if undamaged.
2. Fit the cover.
3. Connect the ignition cables.
4. Connect the crankcase ventilation hose.

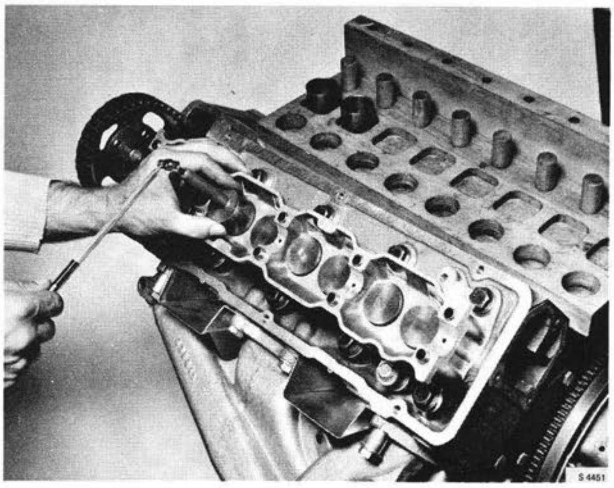
> NOTE
> Do not tighten the screws so hard that the cover is deformed – see tightening torques, Group 0.

VALVES

Disassembling

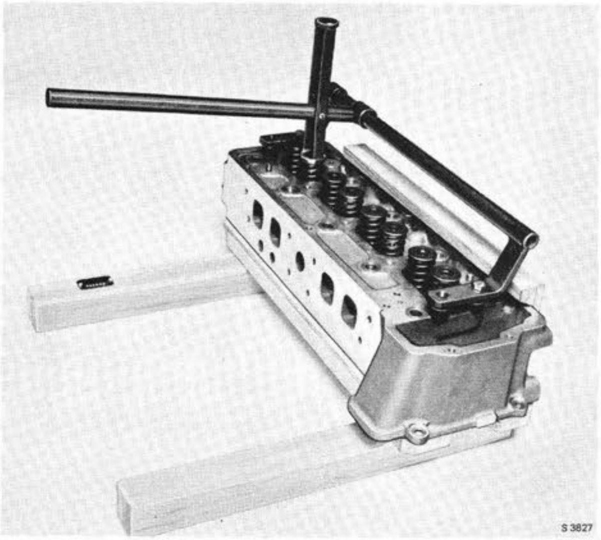
(Cylinder head removed from cylinder block)

1. Remove the camshaft bearing caps.
2. Lift out the camshaft.
3. Withdraw the valve depressors, using the magnetic tool, and lay them aside in the correct order.



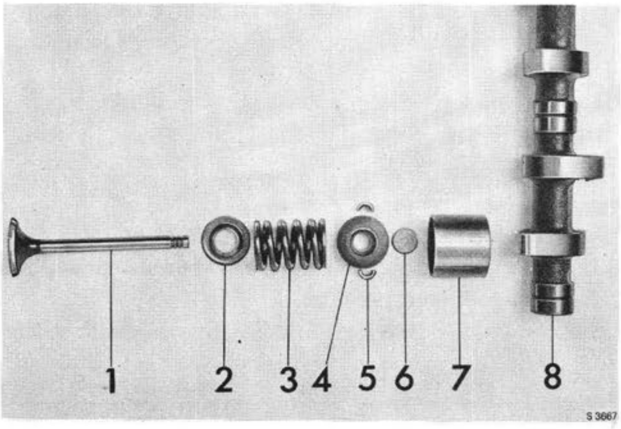
REMOVING THE VALVE DEPRESSORS
Tool 8391401

4. Remove the adjusting pallets. Be careful not to mix them up.
5. Remove the camshaft bearing assembly.
6. a. Depress the valve spring using valve spring tool 8392300.
   b. Remove the valve locks (clips), loosen the spring tension and withdraw the tool.



REMOVING THE VALVES
Tool 8392300

7. Remove the top valve retainer, valve spring and guide sleeve.
8. Withdraw the valve.



VALVE MECHANISM
1. Valve
2. Valve spring seat
3. Valve spring
4. Retainer
5. Lock
6. Adjusting pallet
7. Valve depressor
8. Camshaft

Assembling

1. Insert and oil the valve spindles.
2. Insert the guide sleeve before the spring.
3. Insert the springs and top retainers.
4. Depress the spring, using a valve spring tool, and fit the valve locks (clips). Then release the pressure on the spring and check that the clips are correctly positioned on the spindle. Remove the tool.
5. Mount the camshaft bearing assembly.
6. Insert adjusting pallets, replacing them in their original positions.
7. Insert the valve depressors, lubricating the bearing surfaces with engine oil.
8. Install the camshaft.
9. Install the bearing caps. (NOTE the markings!)

> CAUTION
> Do not turn or tip the cylinder head after inserting the valve depressors, as these will then slide out and the adjusting pallets will fall out of position and be randomized.

Scrapping of sodium-filled exhaust valves

> CAUTION
> Never allow discarded sodium-filled valves to become mixed with normal scrap before they have been properly treated. Failure to observe this will result in a serious risk of explosion when the scrap is melted.

Sodium-filled exhaust valves (introduced during model 1977) are fitted in injection engines as from engine Nos.:

BI 20 P01006201, BI 20 P02002615, BI 20 P04003376, BI 20 P05001556, BI 20 P07001001 (and BI 20 P07000604–625)

Valves to be scrapped should be treated as follows:
1. Drill a hole through the centre of the valve head down to the sodium compound.
2. Drill an additional hole in the stem or cut off the stem about 25 mm from the bottom.

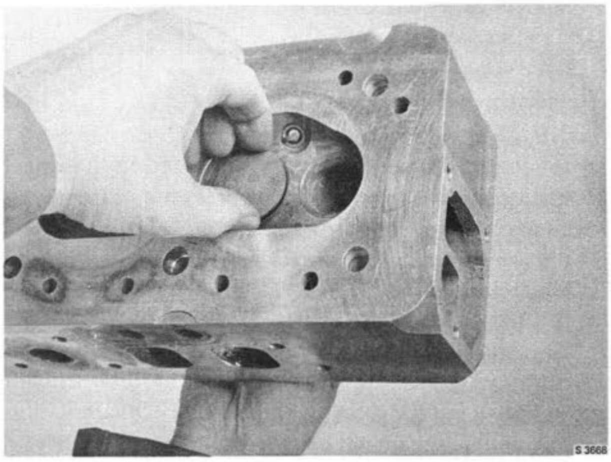
> CAUTION
> Keep the valve and sodium compound well away from water when drilling or cutting the valves or exposing the sodium compound in any other way, as contact with water is likely to cause an explosion.

3. Throw the valve into a bucket of water. This will cause an explosive chemical reaction. The manufacturer recommends that you should withdraw to a distance of at least 3 metres from the bucket. After a period of one or two minutes, the reaction will die down and the valve may be scrapped in the normal way.

VALVE GUIDE

Checking the wear

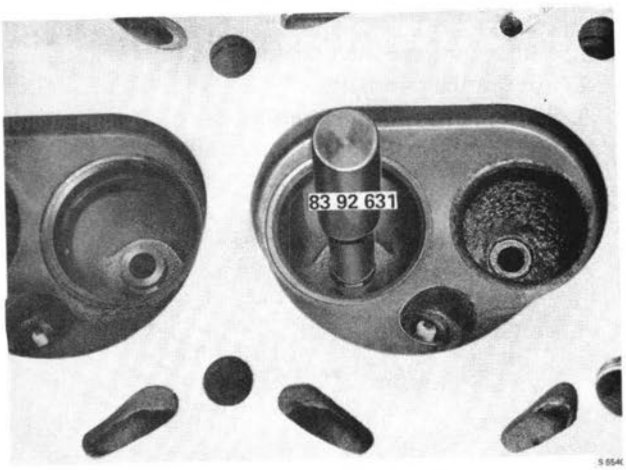
Pull out the valve about 0.12" (3 mm) from its seat and check the radial play of the valve, by rocking the valve disc. If the play at the disc exceeds 0.02" (0.5 mm), the valve guide is to be exchanged.



CHECKING THE VALVE GUIDE WEAR

Removal

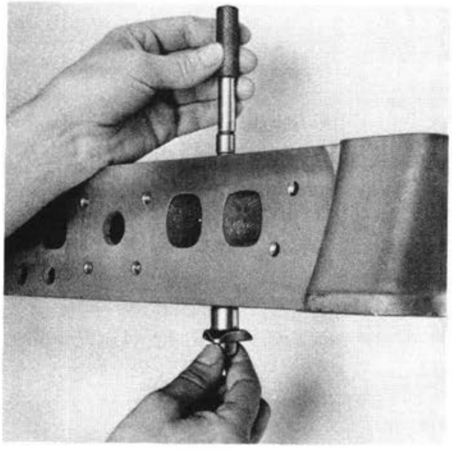
Before removing a valve guide, flush the cylinder head with warm water. The guide should be pressed out using a press and the drift belonging to valve guide tool 83 92 631. (Valve guide tool 83 90 437 can be used as an alternative).

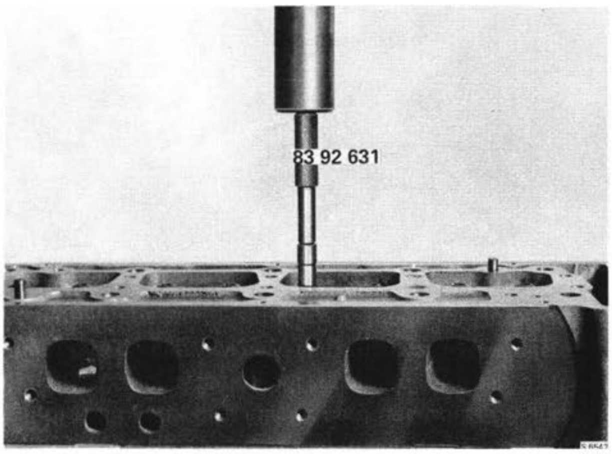


PRESSING OUT THE VALVE GUIDE
Drift for tool 8392631

Installation

First flush the cylinder head with hot water. Insert the guide from the camshaft by using a press and valve guide tool 83 92 631 (valve guide tool 83 90 437 can be used as an alternative).

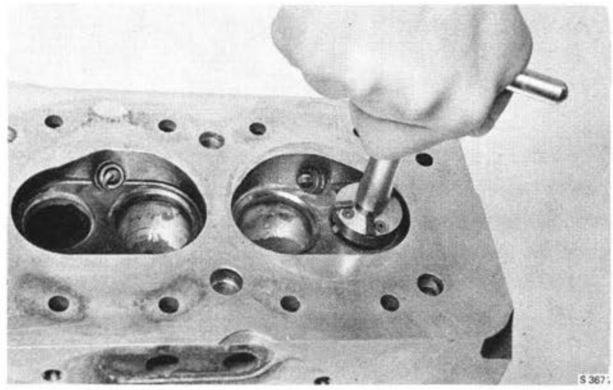




INSTALLING THE VALVE GUIDE
Tool 8392631 and press

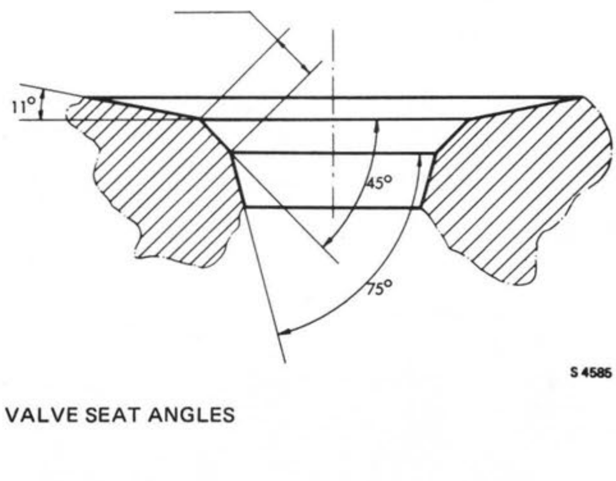
MILLING VALVE SEATS

Clean all parts and remove all traces of soot and dirt from the valve and cylinder head duct.
Insert the centering guide for the set of cutters into the valve guide from the valve seat end and tighten the clamping screw until the centering guide is securely clamped in the valve guide. The valve seats in the cylinder head are to be milled clean with a 45° cutter. It may be necessary



MILLING VALVE SEATS
Tool 8392193

to break up the hard surface of the exhaust valve seat first with an emery cloth. After being ground clean, the valve seat will usually be found to be too wide and must therefore be reduced. Reduce from inside with a 75° correcting cutter and from outside with an 11–12° correcting cutter. Adjust the reduction so that the contact surface of the valve seat touches the valve plate as close as possible to the center of the seat. This can conveniently be checked by the use of a marking dye. After adjustment, the seat width of both inlet and exhaust valves should be 0.040–0.080" (1–2 mm).
avgasventilerna.



VALVE SEAT ANGLES

The condition of the valve will decide whether it can be machine ground or must be exchanged. The valve plate angle must be 44.5°.

GRINDING VALVES

Smear a thin coat of grinding paste on the valve seat and insert the valve in the cylinder head. Make a few grinding movements with the grinding tool, clean all traces of paste off the seat, and check the fit with marking dye. Grind once more if required and finish by milling if necessary.

VALVE CLEARANCE

General

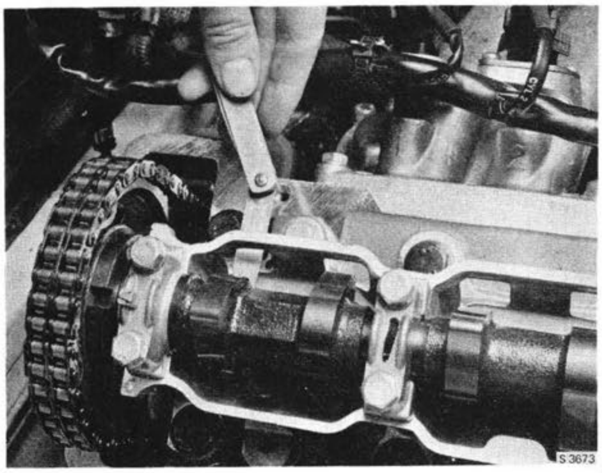
The valve clearance is stable and adjustment is only needed after long periods or when the valves are being reconditioned. However the valve clearance should be checked as follows:

1978 model every 25,000 miles (40,000 km)
1979 model every 30,000 miles (45,000 km)
Turbo every 20,000 miles (30,000 km)

Checking

Check the valve clearance with a feeler gauge, comparing with the maximum and minimum tolerances. The tolerance limits for purposes of valve clearance checking are 0.006" – 0.012" (0.15–0.30 mm) for inlet valves and 0.014" – 0.020" (0.35–0.50 mm) for exhaust valves.
The procedure is as follows:

1. Remove the valve cover.
2. Cars with manual transmission:
   Engage 3rd gear. Push the car forward or backward to bring the camshaft cams into the correct measuring positions, i.e. with the cam of the valve to be measured pointing 180° away from the valve stem. Two cams will be in the measuring position at the same time.
2. Cars with automatic transmission:
   Rotate the crankshaft using special wrench 8392185 to bring the camshaft into position for measurement. This special wrench fits the center screw of the crankshaft belt pulley at the dash panel.
3. Try the maximum and minimum clearances with feeler gauge. The minimum feeler should slip in, but the maximum feeler should not. If this result is not obtained, the clearance must be measured for adjustment.
4. Refit the valve cover.

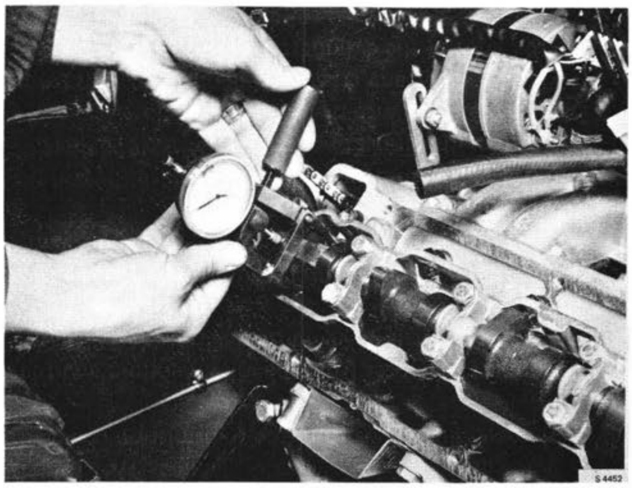


CHECKING VALVE CLEARANCE

Measuring and adjusting

If the clearance of any valve is found on checking to be outside the permissible limits, the clearance of all valves must be measured.
Adjustment of valve clearance is to be based on actual measurement. Measurements are made with tool 8391450 and a dial indicator.
Adjust the deviation of the valve clearance from the correct value by changing the adjusting pallet.
The procedure for measurement and adjustment is as follows:

1. Turn the cam to the measuring position (180° from the valve stem).
2. Mount tool 8391450 and screw it on so that its triple claw grips the valve depressor.



MEASURING THE VALVE CLEARANCE
Tool 8391450 and dial indicator

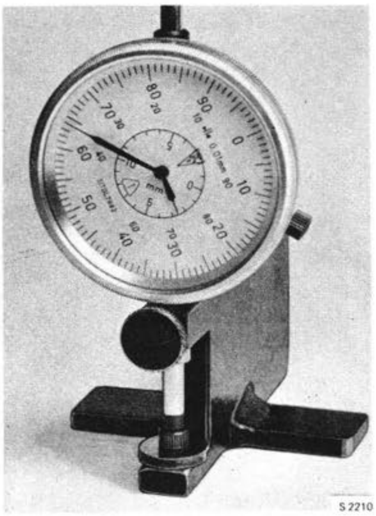
3. Mount the indicator dial in the tool so that the measuring point rests on the tip of the cam; zero the dial.
4. Lift the valve depressor with the measuring tool and read off the deflection of the instrument pointer, which indicates the valve clearance. Note the reading.
5. Measure and note down the clearances of all valves in the same manner. Proceed to adjust the clearance of any valves in which it does not lie within the following limits:

   Inlet valves 0.008"–0.010" (0.20–0.25 mm)
   Exhaust valves 0.016"–0.018" (0.40–0.45 mm)
   (Turbo 0.018"–0.020" (0.45–0.50 mm)
6. Remove the camshaft and the valve depressors and adjusting pallets of any valves needing adjustment.

7. Measure and make a note of the thickness of the pallet. (Special tool 8391633.) This thickness plus the valve clearance adds up to the total distance between the valve and the cam.

   Example:

Measured valve clearance	0.005" (0.13 mm)
Measured pallet thickness	0.100" (2.54 mm)
Total distance	0.105" (2.67 mm)



MEASURING ADJUSTING PALLETS
Tool 8391633

The choice of adjusting pallet is determined by the measured total distance between the valve depressor and the cam less the specified valve clearance for an intake or exhaust valve as the case may be.

Example:

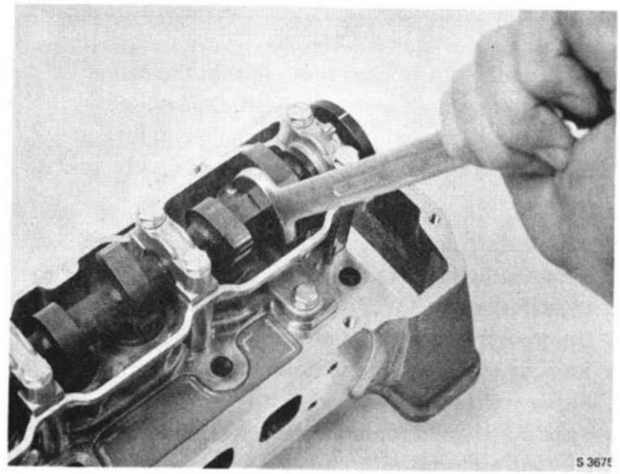
Total distance	0.105" (2.67 mm)
Less specified inlet valve clearance	0.008"–0.010" (0.20–0.25 mm)
Required pallet thickness	0.097" (2.44 mm)

Choose a pallet with thickness 0.096" (2.43 mm).

8. Insert the new adjusting pallet and the valve depressor and install the camshaft.
9. Repeat the measurement procedure to check that the clearances are now correct.

MEASURING AND ADJUSTING VALVE CLEARANCE AFTER VALVE RECONDITIONING

1. Install adjusting pallets with a minimum thickness of 0.070" (1.77 mm).
2. Insert depressors and install the camshaft.
3. Measure the valve clearances, note the reading for each valve and calculate the total distance.



TURNING THE CAMSHAFT ON A REMOVED CYLINDER HEAD

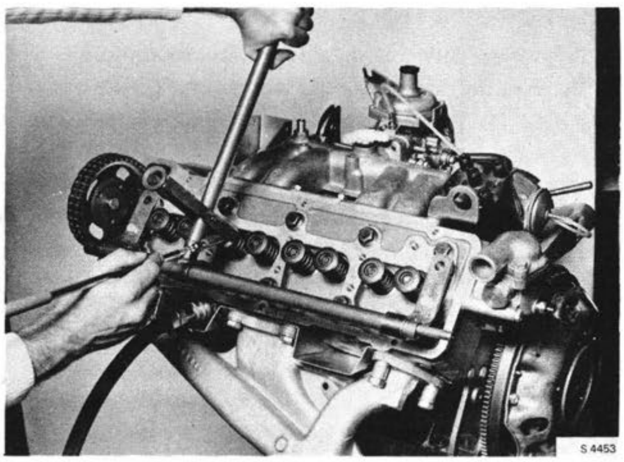
4. Select new pallets to give the correct clearances.
5. Remove the depressors and the camshaft, take out the 0.070" (1.77 mm) pallets and insert new pallets to give the correct clearances.
6. Replace the depressors and reinstall the camshaft.
7. Check clearance measurements once more with the dial indicator. To make your choice of adjusting pallets easier, use the table on the next page.

REPLACEMENT OF VALVE SPRINGS WITHOUT REMOVING CYLINDER HEAD

1. Remove the valve cover.
2. Rotate the crankshaft until the No. 1 cylinder is in the ignition position.
3. Fit a nut (screw) to the camshaft sprocket center and tighten the camshaft sprocket against the retaining plate.

> WARNING
>
> Tighten the nut (screw) fully, so that the center stud is held securely immobilized. Otherwise the chain tensioner will tighten the chain and lock in a new position so that the sprocket cannot be refitted.

4. Remove the screws holding the camshaft sprocket to the camshaft.
5. Unscrew the camshaft caps and remove the camshaft.
6. Remove the valve depressors and adjusting pallets.
7. Remove the camshaft bridge.
8. Take out the spark plug for the cylinder requiring a new valve spring and fit an air hose connector (tool 8392326) in the spark plug hole. Connect the cylinder to a compressed air supply to prevent the valve dropping into the cylinder.
9. Apply the valve spring tool (tool 8392300) as shown



REMOVING VALVE SPRINGS
Tools 8392300 and 8392326

in the illustration. Compress the valve spring and pick up the valve spring retainers using a magnetic tool. Remove the valve spring and the valve spring seat.

Reassemble in the reverse order.

> NOTE
>
> When the camshaft is fitted the installation marks for the camshaft and the crankshaft must be in the firing position for no. 1 cylinder.
> A fully-opened exhaust valve can strike the piston at top dead centre.

Valve clearance measured with dial indicator (mm)																											
0,00	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77									
0,02	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77								
0,05	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77								
0,07	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77							
0,10	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77							
0,12	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77						
0,15	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77						
0,17	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77					
0,20	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77					
0,22	2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77				
0,25	2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77				
0,27		2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77			
0,30		2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77			
0,32			2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77		
0,35			2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77		
0,37				2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77	
0,40				2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77	
0,42					2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77
0,45					2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77
0,47						2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82
0,50						2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82
0,52							2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88
0,55							2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88
0,57								2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93
0,60								2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93
0,62									2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98
0,65									2,39	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98
0,68										2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03
0,70										2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03
0,72											2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08
Measured pallet thickness, inlet (mm)	2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77				
Measured pallet thickness, exhaust (mm)					2,89	2,84	2,79	2,74	2,69	2,64	2,59	2,54	2,48	2,43	2,38	2,33	2,28	2,23	2,18	2,13	2,08	2,03	1,98	1,93	1,88	1,82	1,77

HOW TO USE THE VALVE ADJUSTMENT TABLE

The following example illustrates how the table is used: The inlet valve clearance is 0.13 mm and therefore needs adjustment. The measured thickness of the adjusting pallet for this valve is 2.54 mm.
Starting from 0.12 mm, which is the closest figure in the table to the measured clearance, go horizontally across the table to the column above the inlet pallet thickness of 2.54 mm. The correct pallet thickness, 2.43 mm, can be read from the table at the intersection of the horizontal line from 0.12 mm and the vertical column from inlet 2.54 mm.

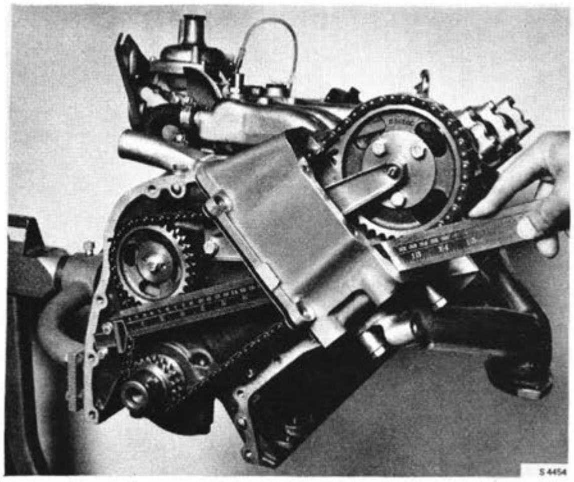
TRANSMISSION

Instructions for transmission chain, camshaft and idler shaft settings will be found in section 210.

CHECKING THE CHAIN TENSIONER

In order to prevent transmission damage caused by the chain tensioner running out to far, the position of the chain tensioner can be checked with the engine mounted in the car.

1. Remove the valve cover.
2. Insert a steel rule down against the rubber neck on the chain tensioner and measure the distance to the level of the cylinder head cover.
3. The distance should be more than 11.8" (300 mm). If the distance is less than 11.8" (300 mm), the engine should be removed as soon as possible for correction. For completely tight chain tensioners (newly adjusted transmissions) the distance should be about 12.3" (313 mm).



CHECKING THE CHAIN TENSIONER

CRANKSHAFT (CRANK MECHANISM)

MEASURING THE CRANKSHAFT

Clean the crankshaft and measure its journals with a micrometer. Measurements should be made at several points round the surface. Out-of-round at the main bearing journals and big-end bearing journals should not exceed 0.002" (0.05 mm).
If the measurements are close to or over the started limit of wear, the crankshaft should be ground down to undersizes according to specification.
The journals can be ground down one step below nominal size without re-hardening. If they are ground more than one step, the shaft must be "tenifer-hardened" again. Check that the crankshaft is straight to within 0.002" (0.05 mm) by indicating it; mount the shaft in two V-blocks, place an indicator against the center journal, and rotate the shaft.

MEASURING THE CLEARANCE

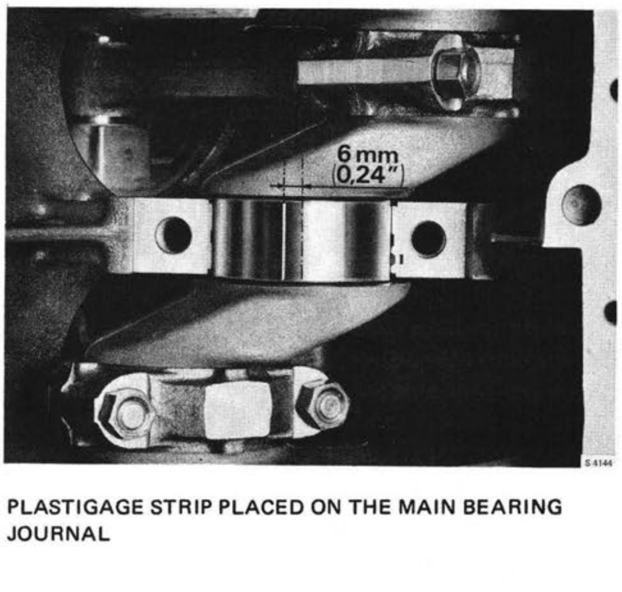
Before the bearing clearance is measured in connection with the fitting of new bearings, the out-of-round and taper of the big-end bearing journals should be checked. This clearance can be measured with a "Plastigage" which can be obtained as spare parts number (45) 300 65 58. The Plastigage is available in three thicknesses. Type PG–1 (green) should be used.

Instructions for use of Plastigage

Main bearings

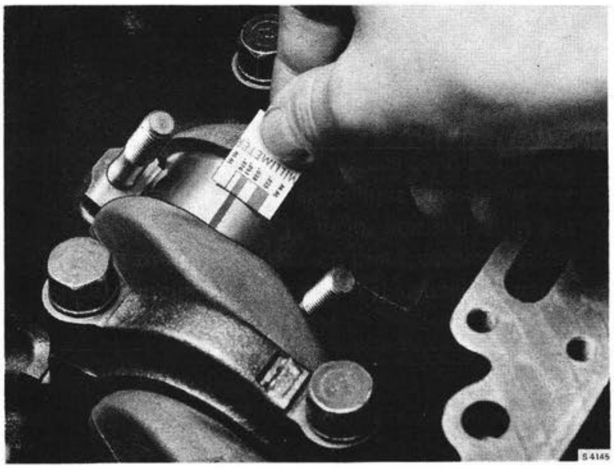
The Plastigage can be used to measure both out-of-round and clearance.

1. Place the engine with the cylinder head plane downwards to prevent the weight of the crankshaft from affecting the measurement.
2. Ensure that the parts which are to be measured are free from oil and dirt. Put a strip of Plastigage about 0.24" (6 mm) to the side of the centreline.



PLASTIGAGE STRIP PLACED ON THE MAIN BEARING JOURNAL

3. Fit the cap and tighten to a torque of 108 Nm (79 ft.lb., 11 kpm). The crankshaft must not be turned during the measurement.
4. Remove the cap. The strip should by now have been firmly pressed into the bearing cap or onto the big-end bearing journal.
5. Measure the width of the Plastigage strip using the scale printed on the Plastigage package and read off the clearance. One side of the package gives the dimension in mm, the other side in thousandths of inches. Measure the strip at its widest point, but do not touch it with your fingers.

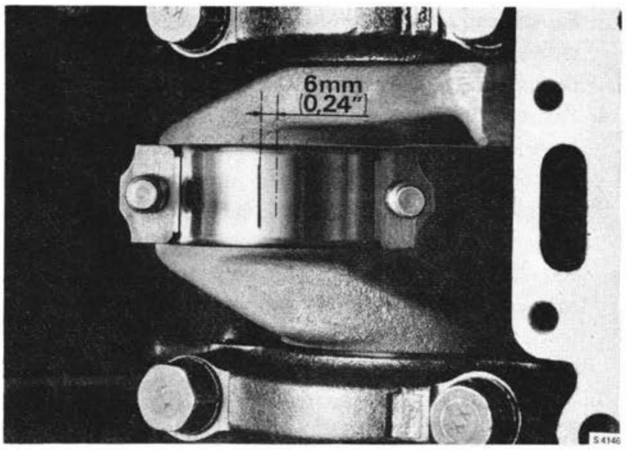


READING THE CLEARANCE

Big-end bearings

Plastigage strips cannot be used to measure out-of-round with the pistons fitted in the block. A micrometer should be used instead.
Big-end bearing clearance can be measured in connection with the fitting of new bearings as follows.

1. Turn the crank which is to be measured to a position about 60° before the top dead centre.
2. Ensure that those parts which are to be measured are dry and free from oil and dirt. Place a strip of Plastigage 0.24" (6 mm) to the side of the centreline.



THE PLASTIGAGE STRIP PLACED ON THE BIG-END BEARING JOURNAL

3. Fit the cap and tighten to a torque of 54 Nm (39 ft.lb., 5.5 kpm). The crankshaft must not be turned during the measurement.

See further in points 4 and 5, main bearings.

CHOICE OF BEARING HALVES FOR MAIN AND BIG-END BEARINGS

Bearing halves are available in two different classes for standard size, 1st undersize and 2nd undersize. The two classes are of different thickness and can be combined to obtain the proper clearance. For the 3rd and 4th undersizes, bearing halves are only available in one thickness.

The classified bearing halves are colour-coded as follows:

Standard size:
Red – thin bearing half, gives INCREASED clearance
Blue – thicker bearing half, gives REDUCED clearance
1st undersize:
Yellow – thin bearing half, gives INCREASED clearance
Green – thicker bearing half, gives REDUCED clearance
2nd undersize:
White – thin bearing half, gives INCREASED clearance
Brown – thicker bearing half, gives REDUCED clearance

Example:
First try to obtain the proper clearance by fitting two thin bearing halves. If the clearance is too large between two thin bearing halves, fit a thin and a thick or two thick halves to reduce the clearance.

If the clearance is too large even after two thick bearing halves have been fitted, the crankshaft must be ground down to the next possible undersize and bearing halves of corresponding size fitted. See Group 0.

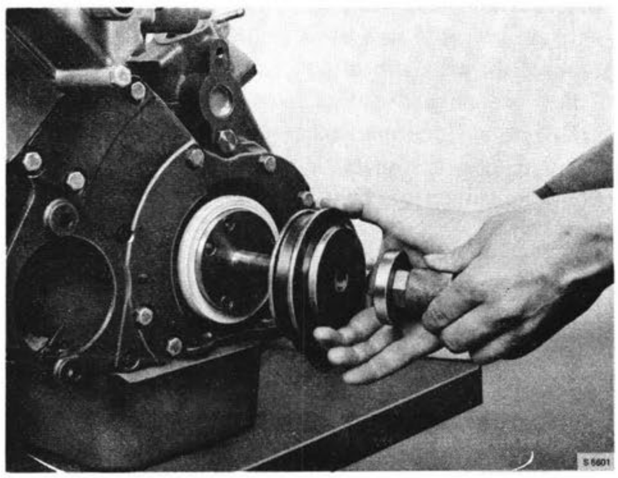
NOTE

The crankshaft journals may be ground down one undersize (0.25 mm) without necessitating hardening of the shaft. If the crankshaft is ground down more than one undersize, the shaft must be tenifer-hardened again.

CHANGING THE CRANKSHAFT SEAL (SEAL RING) AT THE FLYWHEEL END

The seal can be changed with the engine in place in the car. The clutch and flywheel must first be removed.

1. Remove the old seal ring, using a screwdriver.
2. Fit a new seal with the spring ring turned inwards towards the crankshaft. Grease the sealing surfaces of the seal prior to fitting. Use installing tool 8392540 or earlier tools 8391971 and 8391922.



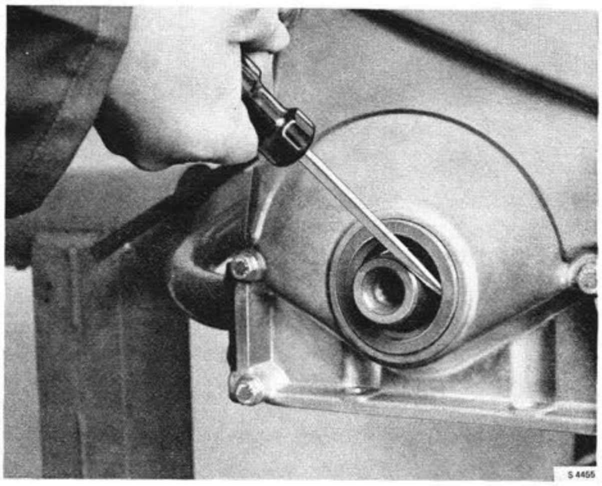
FITTING THE SEAL
Tool 8392540 (or 8391971, 8391963 and 8391922)

3. Press the seal ring into the seal cap by knocking the drift with a heavy mallet.

CHANGING THE CRANKSHAFT SEAL (SEAL RING) AT THE TRANSMISSION END

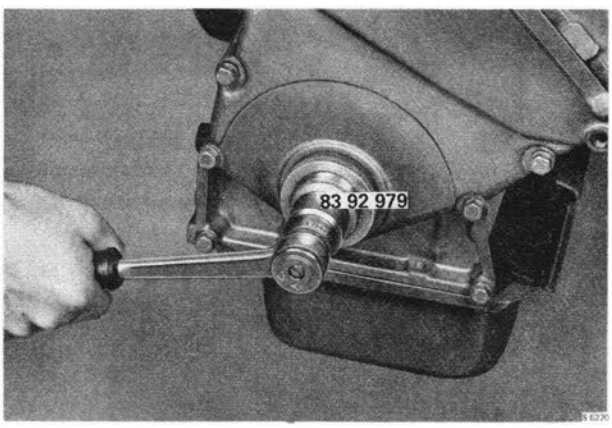
Power unit out of car and pulley removed.

1. Remove the seal ring.



REMOVING THE SEAL RING

2. Lubricate the lips of the new seal liberally with grease.
3. Use installing tool 8391880 and drift 8390445. Make sure that the keyway on the installing tool is in line with the key on the end of the crankshaft. Press the seal ring into the transmission cover.



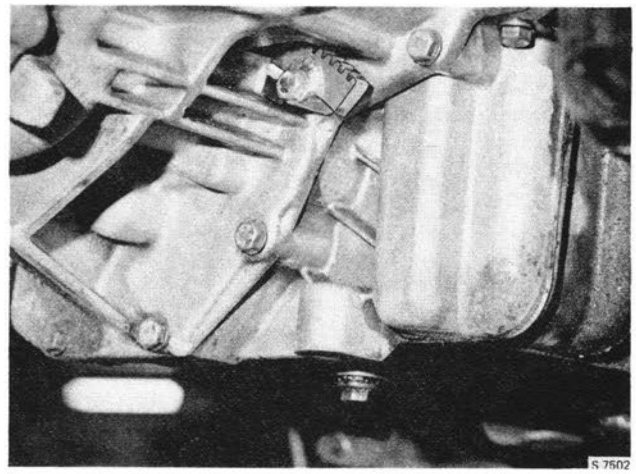
INSTALLING THE SEAL RING
Tools 8391880 and 8390445

Power unit mounted

1. Remove the fan belt (and the V-belt for the pump in cars with power assisted steering and the V-belt for the compressor in cars with air conditioning).
2. Move the power unit slightly forward by inserting two wooden wedges between the bulkhead and the engine. This will be easier if the engine mounting nuts are first removed.
3. Insert the seal using insertion tool 83 92 979 and the pully bolt.

Lock the crankshaft against the sprocket using tab washer 83 92 987.

- Manual gear box: fit the tool into the aperture on the lower side of the primary gear housing.

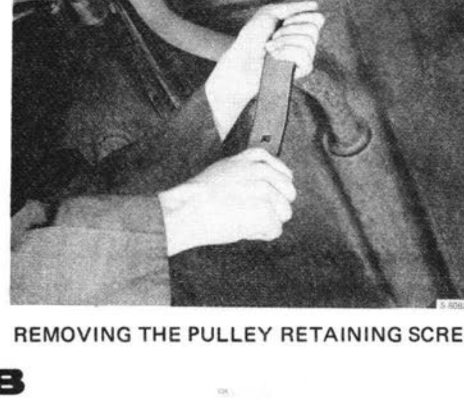


LOCKING SEGMENT FITTED

- Automatic transmission: remove the torque converter cover and fit the tool.

Tool 8392987

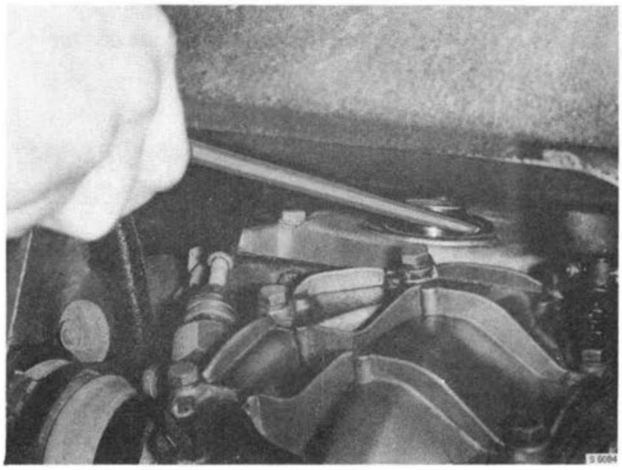
4. Raise the car by means of a hoist.
5. From beneath the car, remove the pulley retaining screw using special wrench 83 92 961 and remove the pulley.



REMOVING THE PULLEY RETAINING SCREW

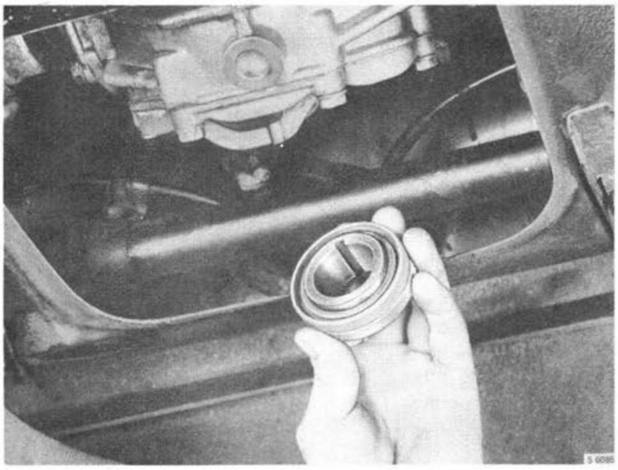
REMOVING THE PULLEY

6. Prize off the old seal ring by means of a screwdriver.

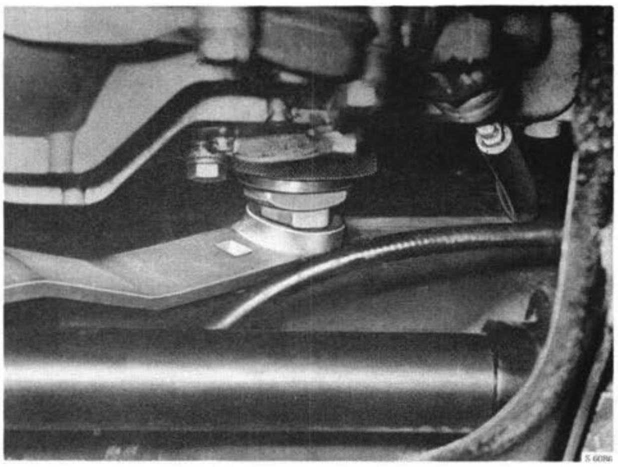


REMOVING THE OLD SEAL RING

7. Grease the sealing lip of the new ring and press it into position using sleeve 83 92 979 and the pulley retaining bolt.



SEAL INSTALLING SLEEVE 83 92 979

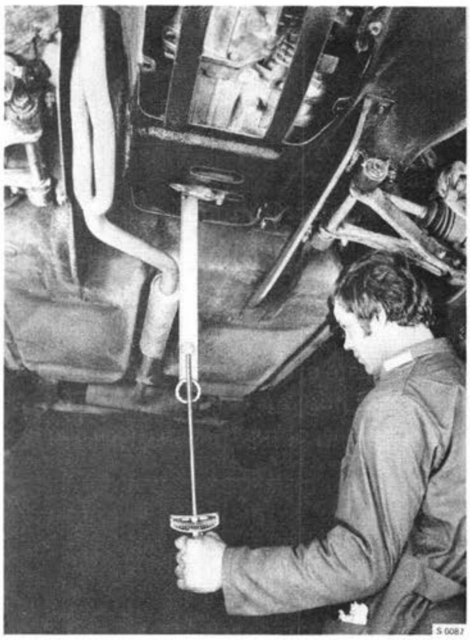


INSTALLING THE SEAL RING

8. Fit the pulley and tighten the retaining bolt to the specified torque using special wrench 83 92 961 and a torque wrench.

Tightening torque with torque wrench, length 15.8 in. (400 mm) attached to special wrench 83 92 961:

2.0 l engine	70 Nm (51.7 ft.-lb., 7.0 kpm) which gives a torque of 190 Nm (137.7 ft.-lb., 19 kpm) at the screw
1.85 l engine	35 Nm (25.8 ft.-lb., 3.5 kpm) which gives a torque of 83 Nm (61 ft.-lb., 8.3 kpm) at the screw)



TIGHTENING THE RETAINING SCREW
Special wrench 83 92 961 and torque wrench

9. From the engine compartment:
   Remove the wooden wedges, refit the engine mounting nuts (when applicable) and fit the fan belt (or V-belts).

Variation depending on length of torque key:

2.0 l engine:	
Length, torque key	Torque approx.
11.8 in. (300 mm)	55 Nm (40.6 ft.-lb., 5,5 kpm)
15.8 in. (400 mm)	70 Nm (51.7 ft.-lb., 7.0 kpm)
19.7 in. (500 mm)	80 Nm (59.0 ft.-lb., 8.0 kpm)
1.7 and 1.85 l engine:	
Length, torque key	Torque approx.
11.8 in. (300 mm)	30 Nm (22.1 ft.-lb., 3.0 kpm)
15.8 in. (400 mm)	35 Nm (25.8 ft.-lb., 3.5 kpm)
19.7 in. (500 mm)	35 Nm (25.8 ft.-lb., 3.5 kpm)

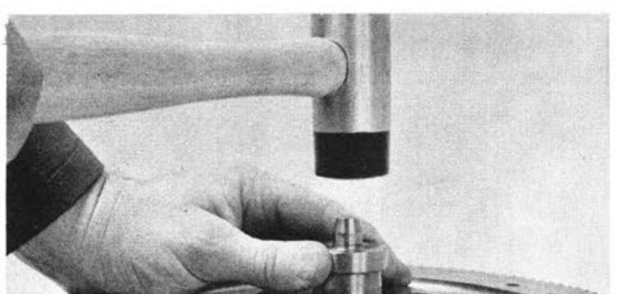
CHANGING THE SEAL RING ON REMOVED TRANSMISSION COVER

1. Remove the old seal ring.
2. Put the cover on a level surface to avoid damaging the sealing surface. Press the seal ring into the cover, using installing tool 8390445.

> **NOTE**
> If the transmission cover is removed or fitted when the engine is fitted to the gearbox, the seal between the cover and the gearbox will be damaged.

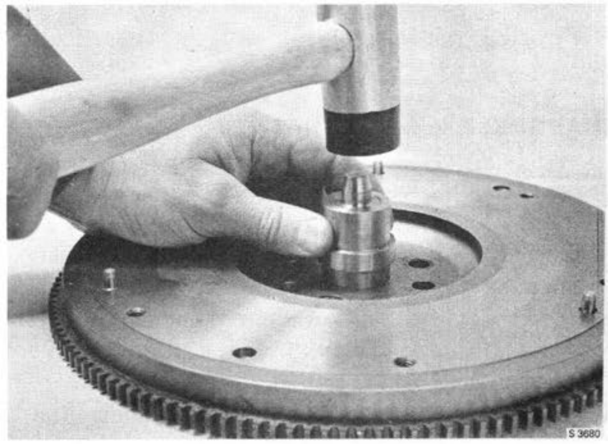
CHANGING THE CLUTCH SHAFT BEARING

1. Remove the flywheel.
2. Remove the clutch shaft bearing from the flywheel, using drift 8391997.



REMOVING THE CLUTCH SHAFT BEARING
Tool 8391997

3. Fit a new clutch shaft bearing in the flywheel, using drift 8391997.

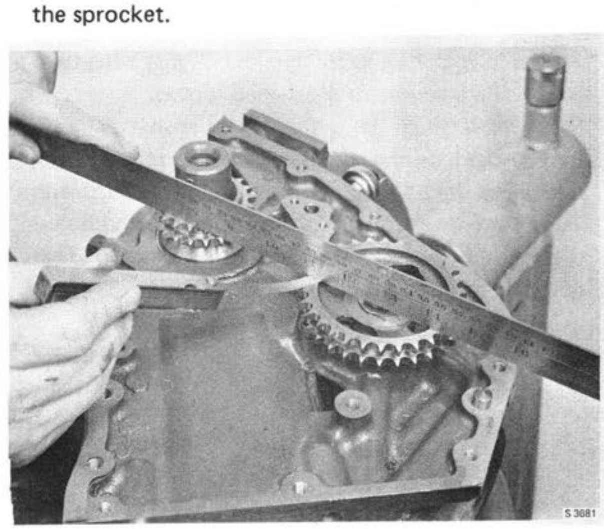


FITTING THE CLUTCH SHAFT BEARING
Tool 8391997

MEASURING AND SHIMMING THE CRANKSHAFT SPROCKET ON CRANKSHAFT AFTER INSTALLATION OF NEW PARTS

When a new crankshaft, idler shaft or sprocket has been installed, the crankshaft sprocket must be shimmed to align it with the idler shaft sprocket, as there will otherwise be excessive wear on the chain transmission.
Measure the sprocket alignment as follows:

1. Lay the edge of a rule against the idler shaft sprocket as close as possible to the center of the sprocket and lying across the crankshaft sprocket. Make sure that the edge of the rule butts flat against the idler shaft sprocket across its full width and press it hard against the sprocket.



CHECKING ALIGNMENT OF CRANKSHAFT SPROCKET

2. Adjust the axial position of the crankshaft sprocket if necessary, using shims or grinding to align the idler

shaft sprocket and the camshaft sprocket in the same plane.
If the crankshaft sprocket is grinded, great care must be taken, so that no axial throw will occur.

CHANGING THE IDLER SHAFT

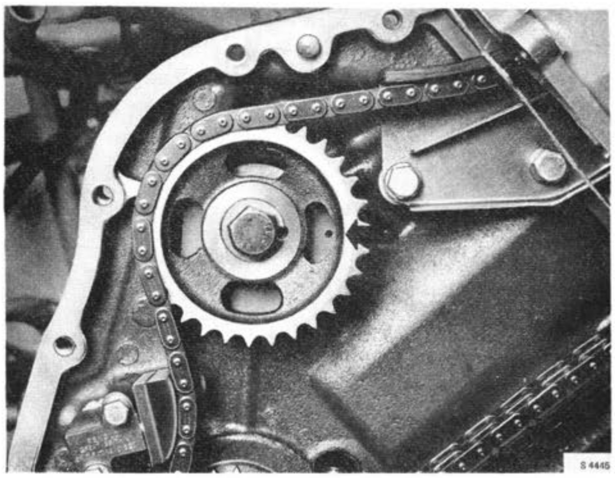
Disassembling

1. Take off the alternator drive belt and the crankshaft belt pulley.
2. Undo the transmission cover screws and tap the cover gently forward to unseat it from the locating studs without damaging the gaskets.
3. Turn the crankshaft to TDC for No. 1 cylinder. The distributor rotor arm should then also be in the ignition position for No. 1 cylinder.
4. Remove the distributor.
5. Remove the sprocket from the idler shaft. Do not turn the crankshaft as the setting must not be disturbed. NOTE! Hold the idler shaft sprocket when the centre screw is to be removed. The idler shaft must never be held by means of the water pump or distributor drive.
6. Undo the two screws from the chain tensioner and twist the tensioner up out of the way.
7. Remove the idler shaft.

If the transmission casing gasket is damaged in the course of assembly or disassembly, a new gasket piece must be cut to shape and glued in place with Tikatät 2. Apply the adhesive to the transmission casing flange at the gasket joints. Allow the adhesive to harden for a while, then position the gasket piece and let it dry on thoroughly before mounting the transmission cover.

Assembling

1. Fit the idler shaft and fixing plate. Tighten the two countersunk screws to prescribed torque.
2. Fit a new locating pin in the new idler shaft.
3. Fit the chain on the sprocket in the correct position relative to the hole in the fixing plate (see illustration). Turn the idler shaft until the locating pin and hole corresponds and the sprocket can be mounted. Then check that the guide sleeve is flush with the sprocket.



IDLER SHAFT MARKING. THE BULGE IN THE HOLE ON THE IDLER SHAFT CHAINWHEEL SHOULD LINE UP WITH THE SMALL HOLE IN THE KEEPER PLATE.

4. Mount the locking plate with the retaining screw. Place a suitable dolly through one of the holes in the sprocket and tighten the screw. Lock the screw with the locking plate.
5. Turn the chain tensioner self-adjuster into its innermost position. Mount the chain tensioner and stretch the chain. Adjust the chain to obtain play of 0.02–0.04" (0.5–1 mm) between the tensioner and the pad.
6. Fit the transmission cover. NOTE! Before fitting the cover, knock the guide studs a fraction of an inch (a few mm) deeper into the cylinder block.
7. Fit the belt pulley and alternator drive belt.
8. Mount the distributor and adjust the ignition timing. See section "Installing of engine".

OIL PUMP

REMOVAL

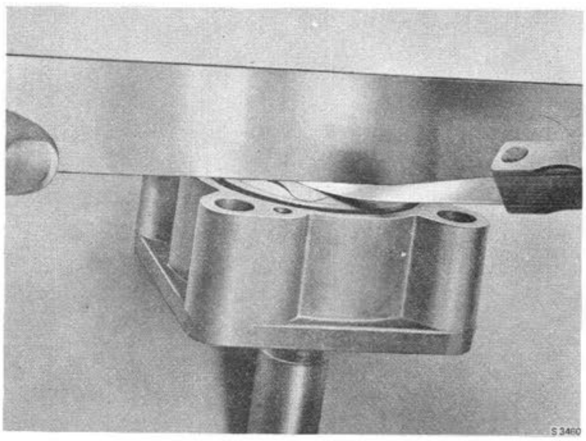
1. Undo the four retaining screws that pass through the corners of the pump.
2. Remove the pump and the sealing ring between the pump and the intermediate plate.

DISMANTLING

1. Remove the two screws holding the cover and the pump housing together.
2. Separate the cover and the pump housing.
3. Remove the rotors and the O-ring from the housing.
4. Remove the pressure reducing valve located in the cover by pulling out the locking pin first and then removing the plug, the O-ring, the spring and the valve piston.

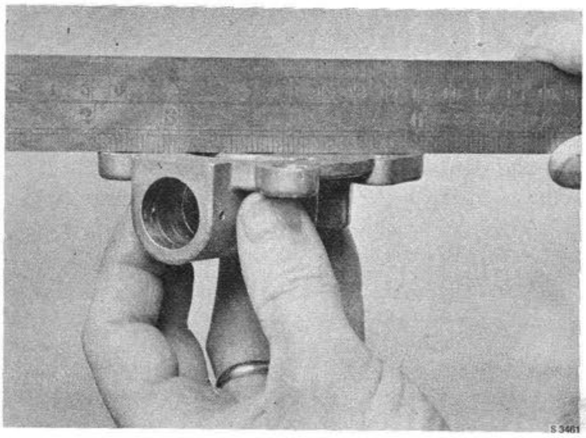
CHECKING CLEARANCE AND WEAR

Check the axial clearance of the inner and outer rotors to the rotor housing with a rule and feeler gauge. The clearance should be 0.00197–0.00354" (0.05–0.09 mm).



CHECKING THE AXIAL CLEARANCE

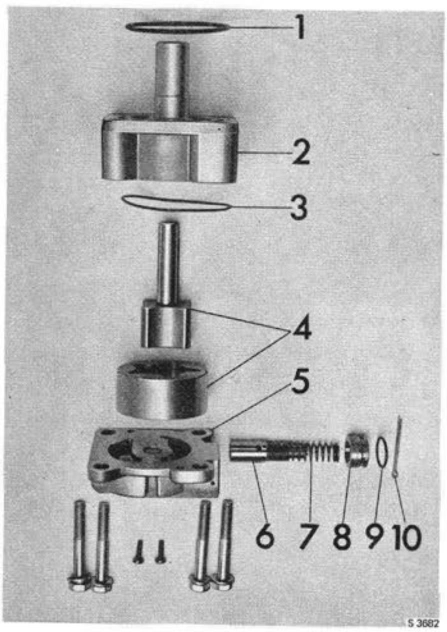
If the clearance must be adjusted, grind the sealing surface of the housing or the sides of the rotor with fine emery cloth on a flat wheel.
Check the evenness of the cover with a rule, see illustration. All deformities, scratches and pits are to be removed by grinding.



CHECKING EVENNESS OF COVER

REASSEMBLY

1. Lubricate the rotors with engine oil and refit. NOTE! The camfered edge of the outer rotor faces inwards in the pump housing (towards the drive shaft).
2. Fit the pressure reducing valve in the pump cover:
   a. Fit the valve piston, the spring and the plug with the O-ring.
   b. Fit the locking pin.
3. Fit the pump housing O-ring and the cover.



OIL PUMP

1. O-ring	6. Valve piston
2. Pump housing	7. Spring
3. O-ring	8. Plug
4. Rotors	9. O-ring
5. Cover	10. Locking pin

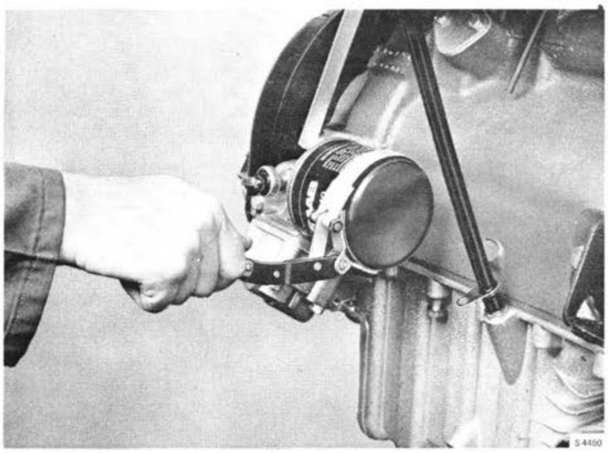
ASSEMBLY

1. Fit the O-ring between the pump and the intermediate plate, push in the pump and turn it so that the pump drive engages in the rotor.
2. Fit and tighten the four retaining screws.

OIL FILTER

REPLACEMENT OF FILTER CARTRIDGE

1. Free the oil filter cartridge with a special wrench (tool 7862014).



REMOVAL OF OIL FILTER CARTRIDGE
Tool 7362014

2. Lubricate the rubber seal of the new cartridge and screw in the cartridge until the seal is in place up against the intermediate piece. Then tighten an additional half turn.

NOTE
If the filter cartridge is tightened too hard there is a risk that oil will leak out, as the rubber seal may be twisted in its rack.

OIL COOLER

REMOVAL AND INSTALLATION

1. Drain the coolant through the radiator drain cock.
2. Undo the oil hoses.
3. Undo the hose clamps and remove the oil cooler.

Install in the reverse order.

ADAPTER

Removal and installation

1. Remove the oil filter.
2. Undo the oil hoses at the oil cooler.
3. Unscrew the adapter.

Install in the reverse order. Make sure that the O-ring isn't damaged. Tighten the adapter somewhat harder than the oil filter, avoiding the adapter to come loose when changing oil filter.

CARBURETOR

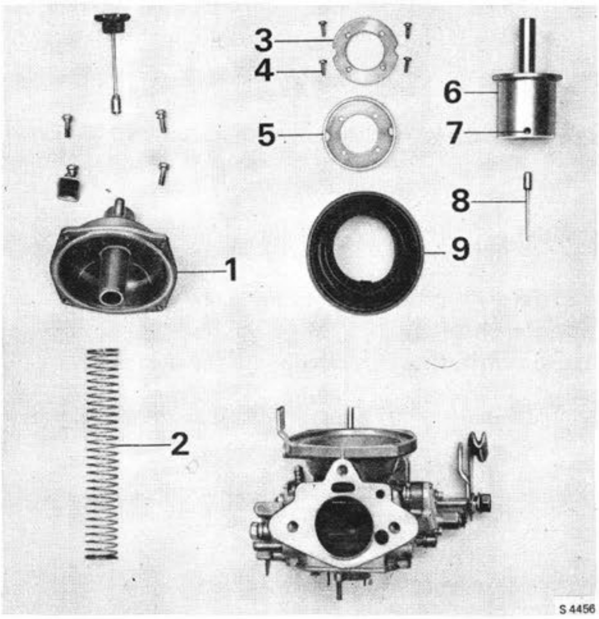
Single-carburetor

REMOVING

1. Disconnect the inlet hose from the carburetor.
2. Disconnect the fuel line, throttle and choke control cables and vacuum hose to the distributor.
3. Remove the screw for the dip stick tube.
4. Back off the four retaining nuts and lift off the carburetor.

DISASSEMBLY

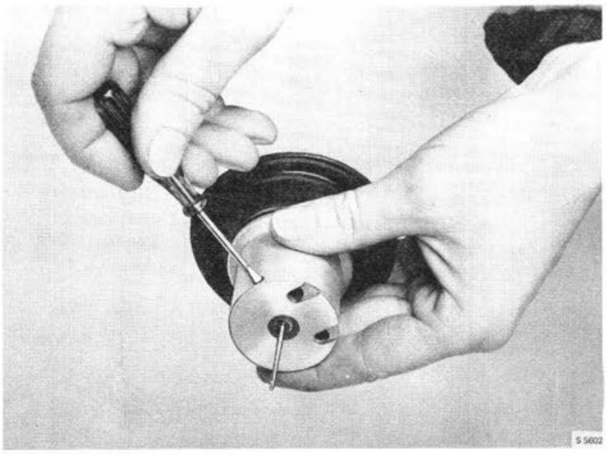
1. Take off the vacuum chamber cover (1), see illustration, and take out the spring (2).



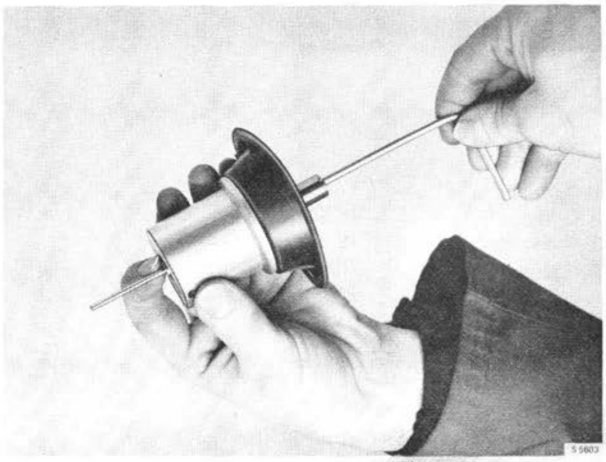
CARBURETOR

1. Vacuum chamber cover
2. Spring
3. Metal washer
4. Screw
5. Plastic washer
6. Vacuum piston
7. Locking screw
8. Fuel needle
9. Diaphragm

2. Remove the piston (6) with membrane (9).
3. Loosen the screw (7) and remove the fuel needle (8). As from 1977 model the fuel needle sleeve should be removed using the CO adjustment key.

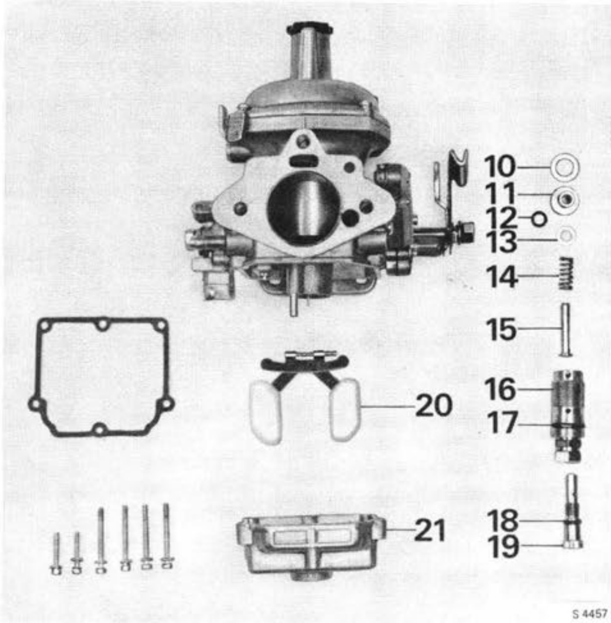


REMOVING THE FUEL NEEDLE STOP SCREW



REMOVING THE FUEL NEEDLE (as from 1977 model)
Tool 83 92 763 or 83 92 896 (Allen key)
Tool 83 93 035 (recessed slot)

4. Remove the screws (4), the plastic and metal washers (5, 3) and the diaphragm (9).
5. Remove the float chamber (21).
6. Carefully disengage the float spindle from the bridge and remove the float (20).
7. Up to and incl. model 1976:
   Unscrew and remove the jet retainer (16) with adjusting screw (19), jet (15), spring (14), bushings (11 and 13), washer (10). Save O-ring (12).
7. As from model 1977:
   The jet is press-fitted in the carburetor and normally need not be removed.
8. Remove the float valve and washer.
9. Remove the choke mechanism.



CARBURETOR

*10. Washer
*11. Bushing
*12. O-ring
*13. Guide bushing
*14. Spring
*15. Jet
*16. Jet retainer
*17. O-ring
*18. O-ring
*19. Adjusting screw
20. Float
21. Float chamber

*Up to and incl. model 1976.

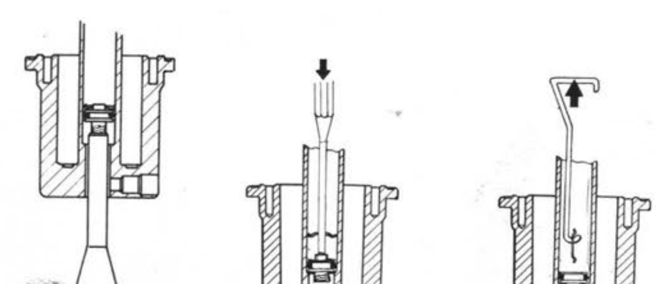
Wash carburetor parts with paraffin oil or gasoline.

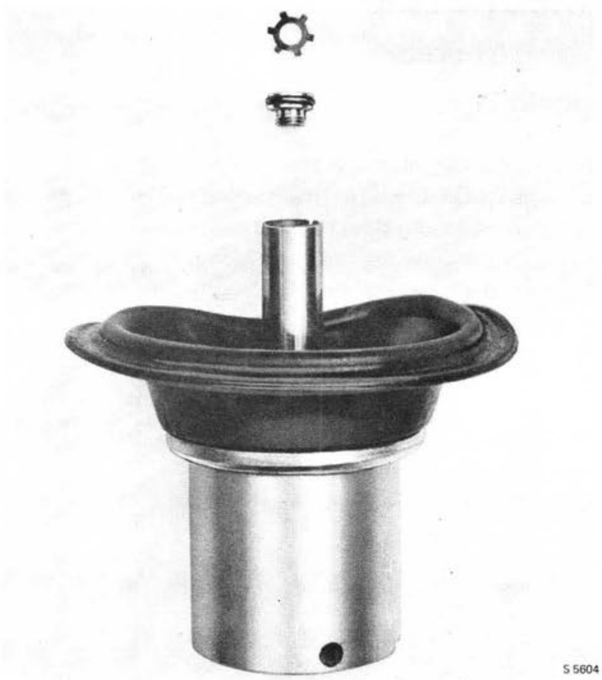
> NOTE
> Use only paraffin oil for washing the diaphragm. Avoid the use of volatile cleaning fluids such as trichloroethylene.

REPLACING THE ADJUSTING SCREW IN THE VACUUM PISTON AS FROM 1977 MODEL

Removal

1. Using a drift, press out the adjusting screw a few centimetres at the bottom of the piston.
2. Press in the adjustment screw again.
3. Turn the locking clip loose and remove it by means of a bent piece of wire. The adjustment screw can now be removed.

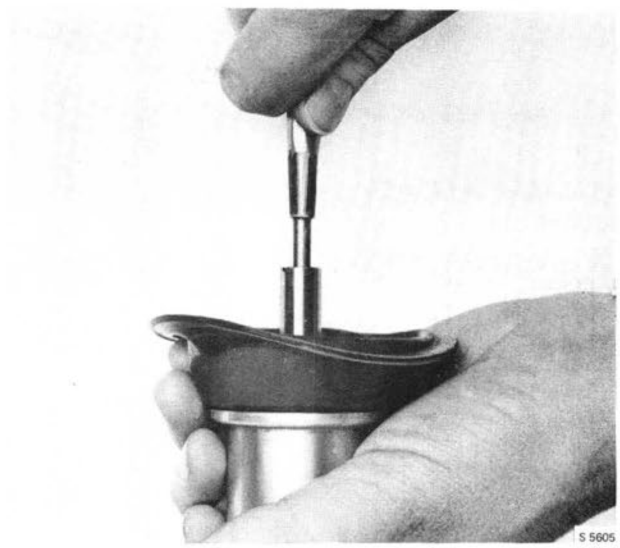




VACUUM PISTON WITH CIRCLIP AND ADJUSTING SCREW

Assembly

1. Using a drift, press the adjusting screw with O-ring into the piston.
2. Using a drift, fit a new circlip into the damper.



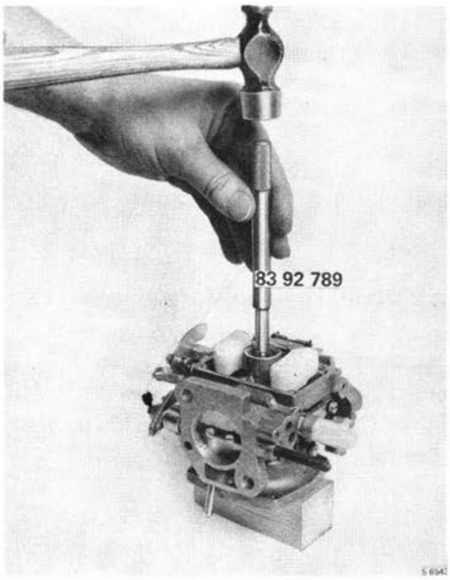
PRESSING THE CIRCLIP INTO THE DAMPER

SAAB

CHANGING THE JET, AS FROM 1977 MODEL

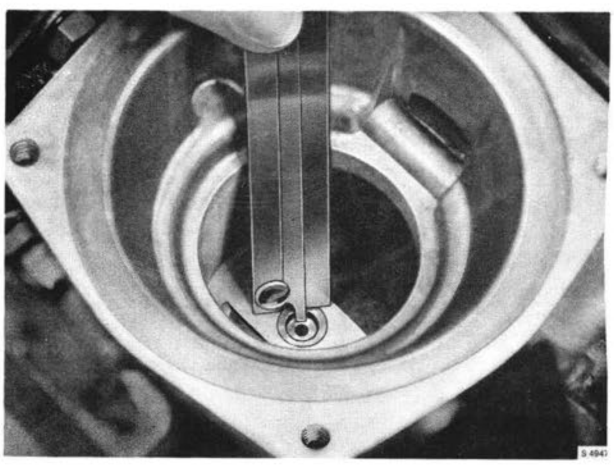
The jet is press-fitted in the carburetor housing and should not be moved from the position in which it is installed. However, the jet can be changed using tool 83 92 789 as follows.

1. Remove the carburetor and then take off the vacuum chamber cover and remove the vacuum piston and float chamber cover.



THE JET IS FITTED
Tool 8392789

2. Press out the jet using tool 83 92 789.
3. Using the tool press in the new jet from the float chamber side until the jet is 2.5 mm below the level of the bridge in the carburetor housing. If you happen to press the jet in too far, it can be pushed back from above using the same tool.



MEASURING THE JET HEIGHT POSITION

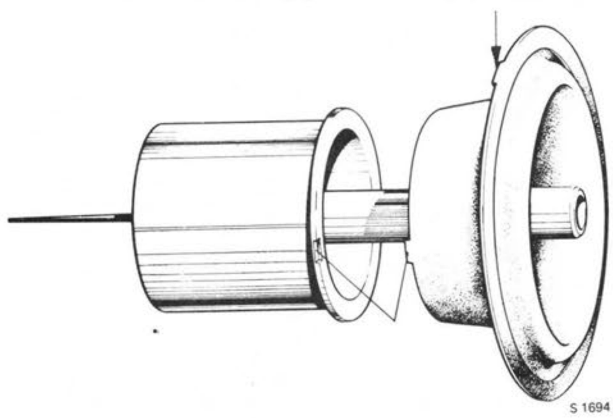
> CAUTION
> Avoid resting any type of measuring tool against the upper, inner surface of the jet when pressing it into position. Even the slightest deformation of the surface can affect the hole in the jet.

CLEANING AND CHECKING

Use compressed air to clean the holes in the valve plate of the choke mechanism. Check that the diaphragm is undamaged. If the diaphragm is distended or burst it must be exchanged for a new one. Check the fuel needle for wear; if it is bent or worn, fit a new one. Check that all contact and sealing surfaces are undamaged. Check that the choke plate of the choke mechanism and the matching surface of the carburetor housing are free from scratches. Clean the temperature compensator and check that the valve moves freely.

ASSEMBLING

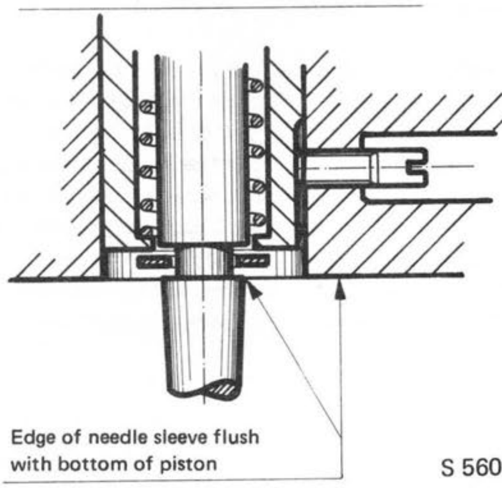
1. Mount the diaphragm on the vacuum piston so that the locating lip (see illustration) engages the corresponding recess in the piston and the inner edge fits easily into the matching groove in the piston.



FITTING THE DIAPHRAGM

> NOTE
> If the diaphragm is so distended that it will not fit into the piston, exchange it for a new one.

Place the plastic washer (5 , see illustration) and the metal washer (3) carefully in position, lining up the screw holes with those in the piston and diaphragm without twisting the washer and matching the groove in the washer to the locating edge of the diaphragm.
Secure the washers with the screws (4).
Fit the fuel needle as follows:
Up to and incl. model 1976:
Place the flat milled jacket surface of the spring housing so that it faces the stop screw, i.e. the needle should spring away from the throttle valve when the piston is fitted.
The needle should be fitted so that the sleeve (at the recess for the plastic washer) is flush with the bottom of the piston.
This position is the initial setting for subsequent CO-adjustment.

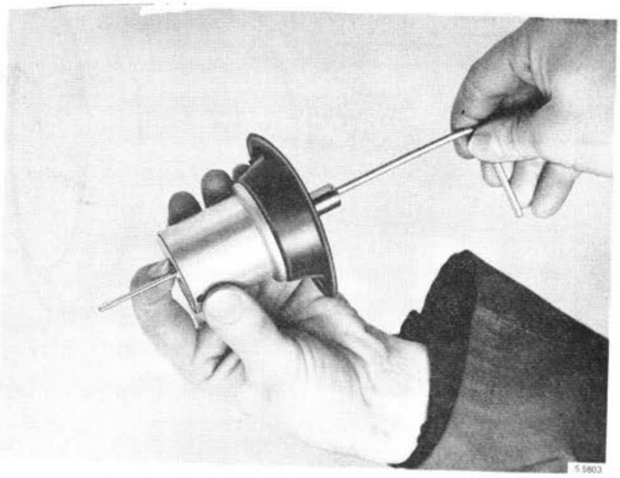


S 5606

FITTING THE FUEL NEEDLE, UP TO AND INCL. MODEL 1976

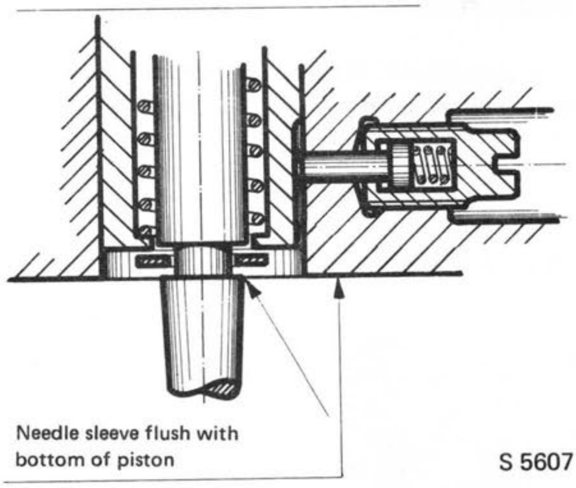
As from model 1977:

a. Insert the spring housing of the needle in the vacuum piston. Screw the spring housing onto the adjuster by turning the latter using the CO adjustment tool.



FITTING THE FUEL NEEDLE, AS FROM 1977 MODEL
Tool 83 92 763 or 83 92 896 (Allen key)
Tool 83 93 035 (recessed slot)

b. Screw in the stop screw so that the spring-loaded locking pin presses against the spring housing.
c. Use the CO adjustment tool to turn the spring housing so that the locking pin engages the milled groove.
d. Tighten the stop screw.
e. Use the CO adjustment tool to adjust the height of the needle so that the edge of the sleeve (at the recess for the washer) is flush with the bottom of the piston.

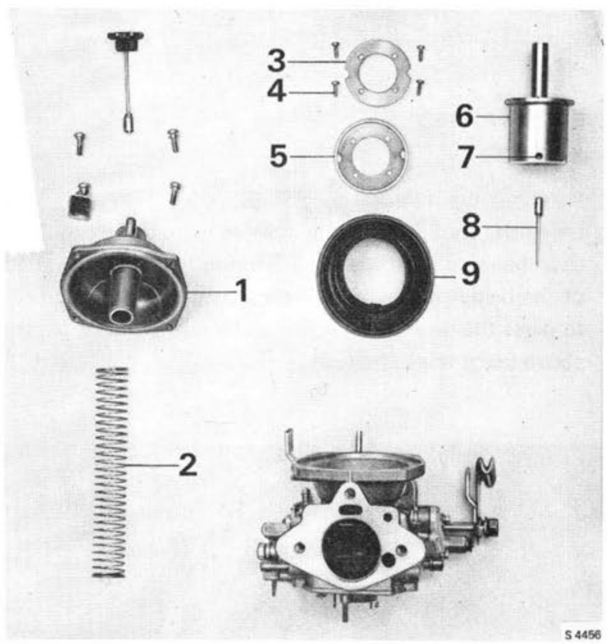


S 5607

FITTING THE FUEL NEEDLE, AS FROM MODEL 1977

This position is the initial setting for subsequent CO-adjustment.

2. Up to and incl. model 1976:
Insert the adjusting screw (19) with a new O-ring (18) in the jet retainer (16). Fit a new O-ring (17) on the jet retainer. See fig.

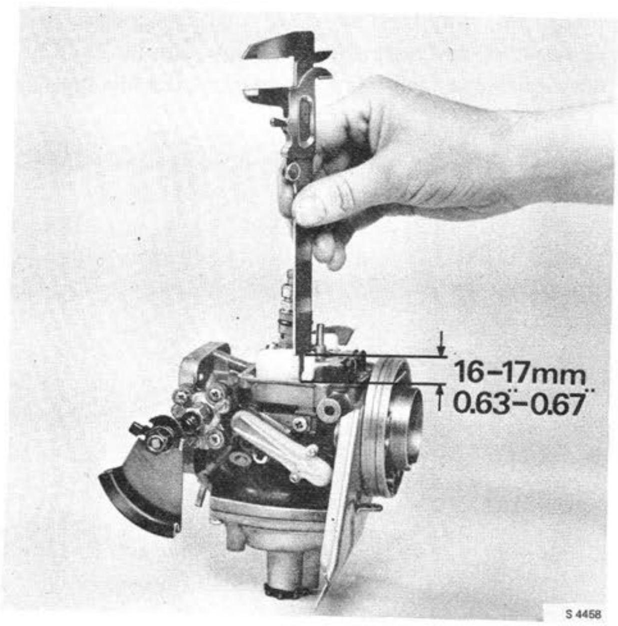


CARBURETOR

1. Vacuum chamber cover
2. Spring
3. Metal washer
4. Screw
5. Plastic washer
6. Vacuum piston
7. Locking screw
8. Fuel needle
9. Diaphragm

3. Up to and incl. model 1976:
Place the spring (14), guide bushing (13), bushing (11),
Place the spring (14), guide bushing (13), bushing (11),
O-ring (12) and aluminium washer (10) on the jet (15) and install the complete assembly together with the jet retainer (16) and adjusting screw (19) in the carburetor housing. (Figures refer to illustration on previous page.) Screw in and tighten the jet retainer.

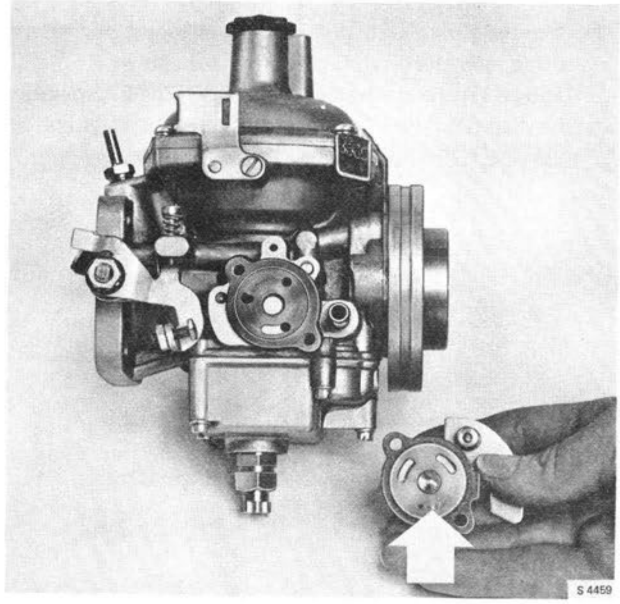
4. Up to and incl. model 1976:
   Screw in the adjustment screw until the top of the jet is at a level 0.098 ± 0.008" (2.5 ± 0.2 mm) below the level of the jet bridge. Check the dimension by means of vernier calipers or using tool 8393027. (If the jet is set at exactly 0.098" (2.5 mm), then a quarter turn in either direction is permitted during the subsequent CO setting. One quarter turn equals 0.008" (0.2 mm) vertical adjustment.)
5. Install the piston complete with diaphragm and spring in the carburetor housing. Make sure that the outer lip of the diaphragm engages the matching recess in the housing. Place the vacuum chamber cover carefully in position according to the markings. The groove and locating rim should be a good fit; if not exchange the diaphragm. Tighten the screws.
6. Mount the float (20) with spindle. The flat side of the float faces away from the carburetor housing.
7. Check the float level as follows:
   a. To check the float level the carburetor must be removed from the engine, and inverted with the float chamber off.
   b. For the level to be correct the highest point of the float should be 0.63–0.67" (16–17 mm) above the edge of the carburetor housing (see illustration) when the float valve is closed. If the level is not correct, adjust by bending the tongue at the float valve.



MEASURING FLOAT LEVEL

> NOTE
> Do not bend the arm between the float and the spindle.

8. Fit a new gasket and slide the float chamber on until it cushions against the O-ring. First insert all screws and give them a few turns, then push down the float chamber until it butts firmly and tighten the screws.
9. Mount the choke mechanism. (If the mechanism has been removed, fit the choke plate, choke shaft and cam plate as illustrated.) The calibrated hole should face away from the cable securing point on the cam plate.

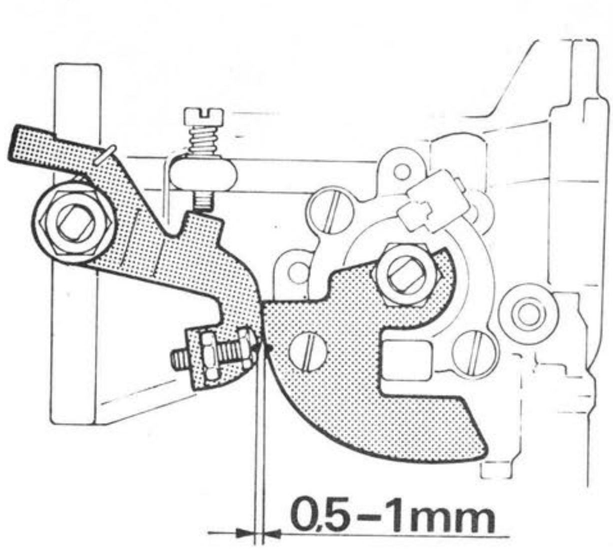


FUEL HOLES IN CHOKE MECHANISM

ADJUSTMENT

Choke control

Check that the distance between the adjustment screw on the throttle shaft carrier and the choke cam disc is 0.020–0.039" (0.5–1.0 mm). Make sure that the choke control is pushed in and that the throttle disc is completely closed. See illustration.

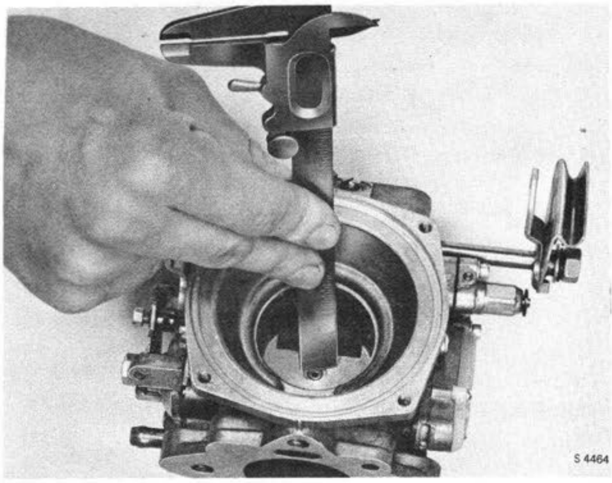


ADJUSTING THE CHOKE CONTROL

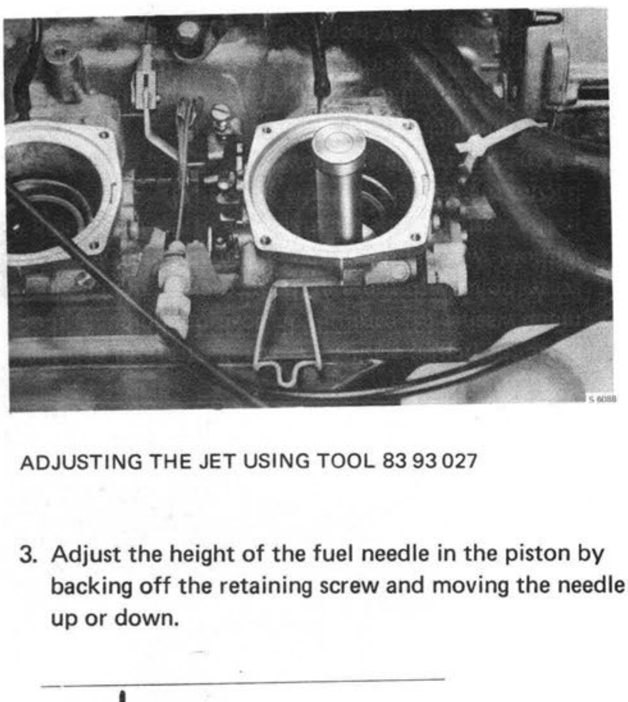
Basic setting up to and incl. model 1976

The vertical location of the fuel jet in relation to the level of the jet bridge has been carefully tested in view of the load conditions likely to be experienced. No further adjustment of the jet screw – apart from the adjustments described below – should be attempted. If additional adjustment should be required, the vertical position of the fuel needle in the piston should be modified.

1. Remove the vacuum chamber cover together with the spring, and the vacuum piston and diaphragm.
2. Using a vernier or measuring tool 83 92 027, measure the distance between the jet bridge and the jet and adjust to 0.098 in (2.5 mm).

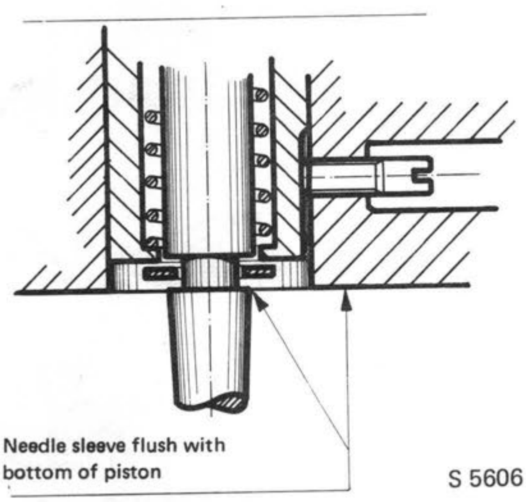


ADJUSTMENTING THE MAIN JET USING A VERNIER



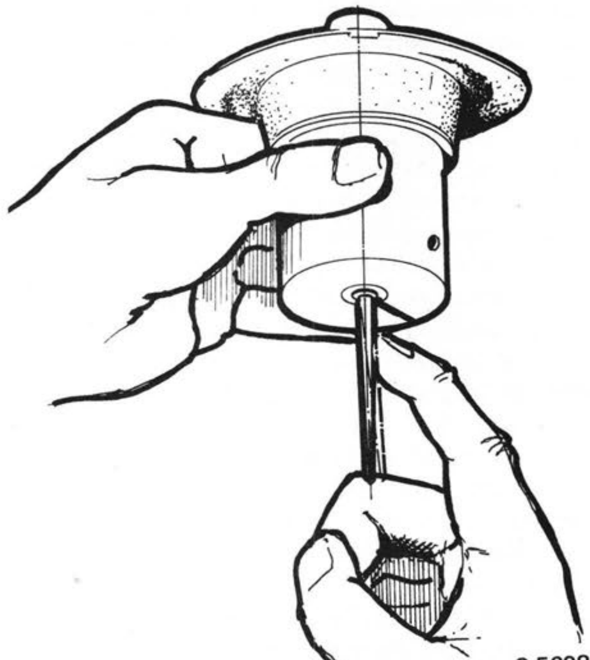
ADJUSTING THE JET USING TOOL 83 93 027

3. Adjust the height of the fuel needle in the piston by backing off the retaining screw and moving the needle up or down.



S 5606

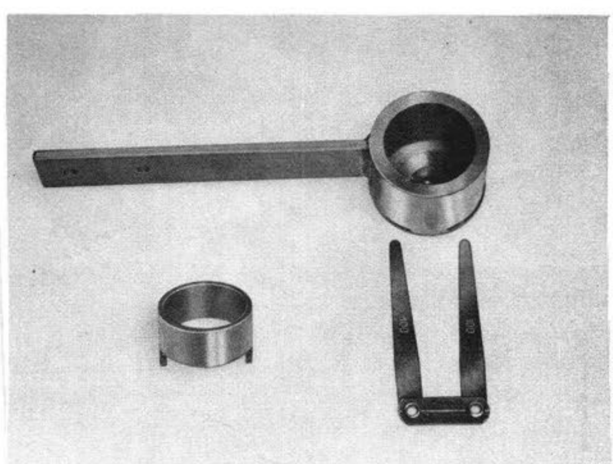
HEIGHT SETTING OF FUEL NEEDLE



S 5608

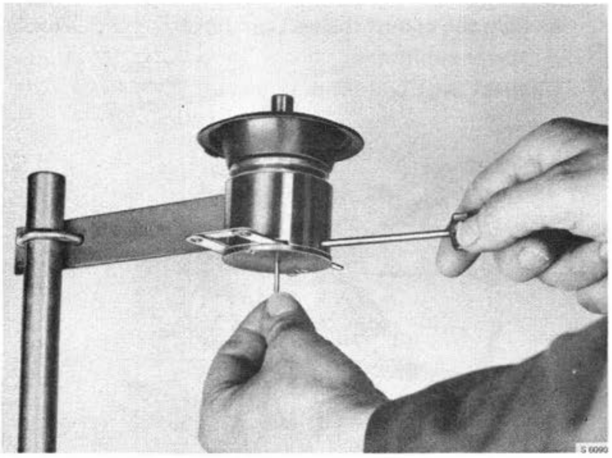
KEEP THE NEEDLE PERPENDICULAR TO THE BOTTOM OF THE PISTON DURING CHECKING

Up to and incl. model 1976, a special adjusting tool, No. 83 92 995, with insert No. 83 93 001 (designed for twin carburetors) and a set of feeler gauges, No. 83 93 019, are available to facilitate adjustment of the fuel needle.



TOOL FOR ADJUSTING THE FUEL NEEDLE

Insert the vacuum piston into the tool, with the feeler gauges inserted in the slots of the tool.
The tool is preset to 0.04 in. (1.0 mm) and consequently 0.04 in. (1.0 mm) feeler gauge will provide the basic setting for the fuel needle (i.e. the needle sleeve flush with the bottom of the piston).
If during subsequent adjustment of the CO setting it proves necessary to lower the fuel needle, use a thicker feeler gauge, and to raise the needle, use a thinner feeler gauge.



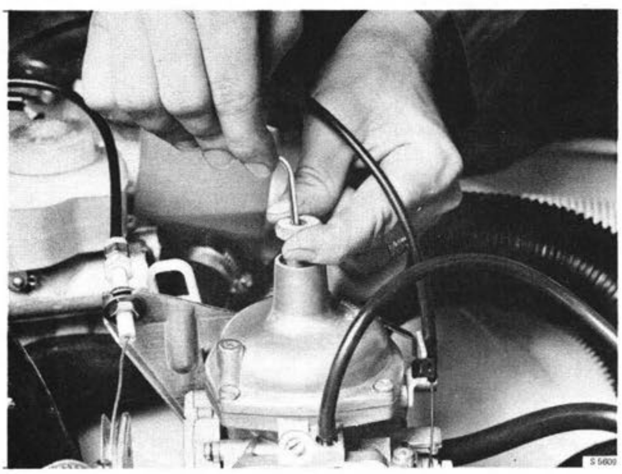
ADJUSTING THE FUEL NEEDLE
Tool 83 92 995

4. Fit the vacuum piston with the diaphragm, spring and vacuum chamber cover.

Basic setting, as from model 1977

The jet is fixed in the carburetor. Adjust the height of the fuel needle by means of the special tool.

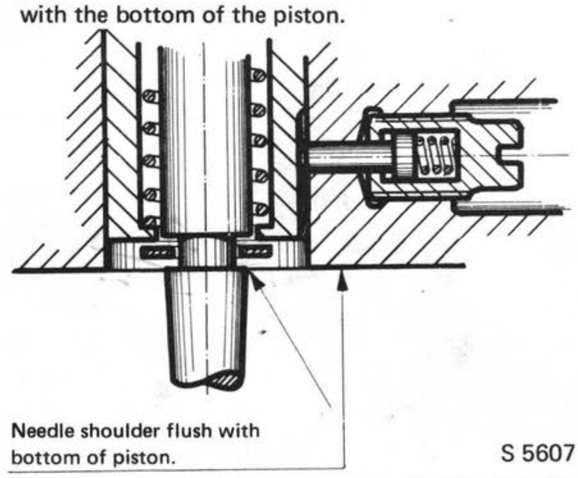
1. Remove the plastic cover and damper piston.
2. a. Insert the CO adjustment tool through the dashpot onto the vacuum piston and adjusting screw.



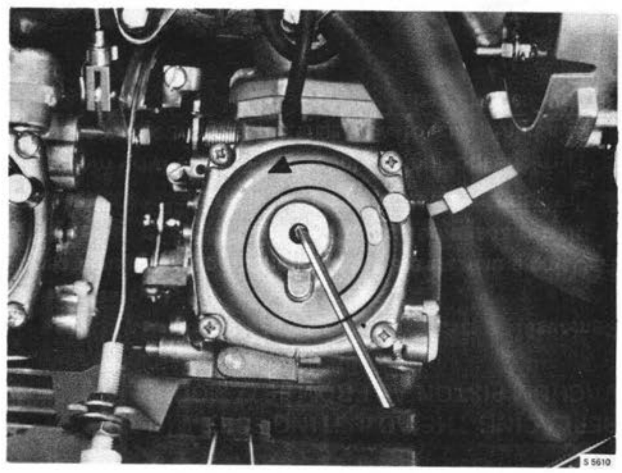
INSERTING THE TOOL THROUGH THE DAMPER
Tool 83 92 763 or 83 92 896 (Allen key)
Tool 83 93 035 (Recessed slot)

b. Use the sleeve of the tool to support the damper piston to prevent the diaphragm being damaged.
c. Turn the adjusting key clockwise until resistance is felt (needle in highest position).

NOTE
If the adjustment screw seizes it can be difficult to detect when the needle is lying in its highest position, C. Should this be the case it is recommended that the vacuum pistons are removed for basic setting.
In such a case the needle shoulder should be flush with the bottom of the piston.



d. Rotate the screw 1 1/2 turns counter-clockwise.



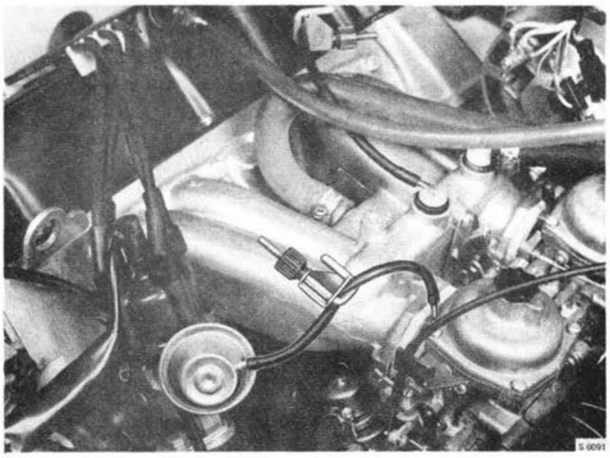
THE ADJUSTMENT SCREW IS TURNED 1 1/2 TURNS COUNTER-CLOCKWISE

3. Check the oil in the damper, topping up if necessary, and then replace the cover with piston. Fine adjustment should be made during the subsequent CO-setting.

CO setting

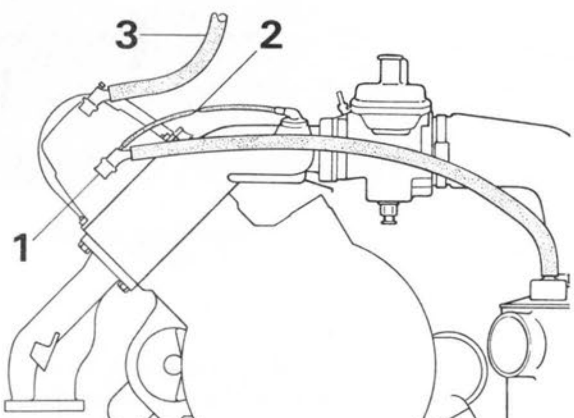
To obviate the possible influence of hydrocarbons on the CO setting (caused by the presence of fuel in the engine oil), the crankcase ventilation should be disconnected while adjustment work is being carried out.

1. Preparing to measure the CO setting:
   a. Run the engine until it is warm so that the CO reading (item 4) may be carried out after the radiator fan has cut in for the second time.
   b. Up to and incl. model 1977: Check that the pre-heater valve is in the "Summer" position.
   c. Check that the choke control is fully depressed.
   d. Check that the float chamber ventilation valve is correctly adjusted.
   e. Check that the ignition timing is set correctly.
   f. Plug or clamp shut the vacuum hose to the vacuum control unit on the distributor.



THE DISTRIBUTOR HOSE CLAMPED

   g. Disconnect the crankcase ventilation as follows:

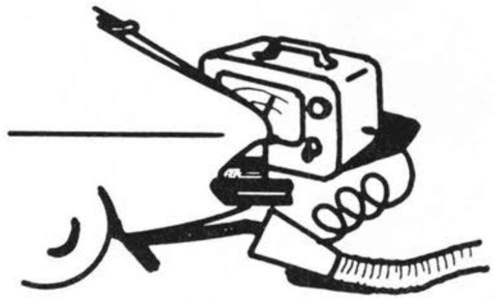


DISCONNECTION OF CRANKCASE VENTILATION, AS FROM MODEL 1976

1. The hose removed from valve cover
2. The small-bore hose plugged (as from model 1977)
3. Evacuation hose connected to valve cover

Evacuate the crankcase gases from the opening in the valve cover by connecting a hose to the workshop's evacuation hose, slightly behind the probe of the CO-meter to ensure that the readings will not be affected.

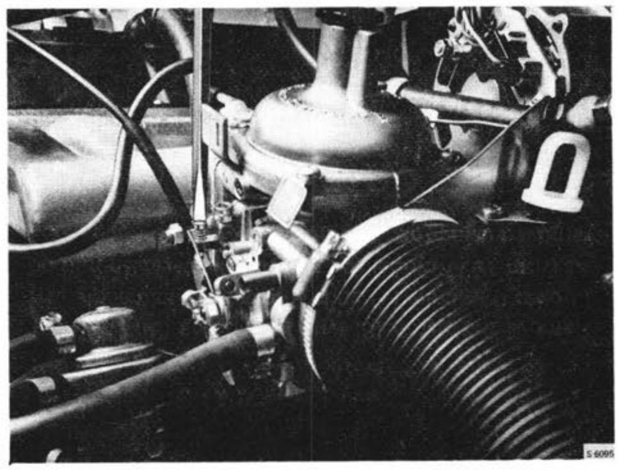
   h. Plug the end of the vacuum hose to the EGR valve where applicable.
2. Connect the CO-meter and tachometer.



S 5202

CHECKING THE CO-CONTENT

3. Set the idling speed to: up to and incl. Model 1976: 850 ± 50 rev./min.
   As from model 1977: 2000 rev./min.



ADJUSTMENT OF IDLING SPEED

4. Read off the CO-value.

CO setting with the crankcase ventilation, vacuum controls and EGR disconnected	
Up to and including 1976 model	max. 3.5%/850 rpm
As from 1977 model Sweden	1.75±0.25%/2000 rpm
As from 1977 model Europe	1.5±1%/850 rpm

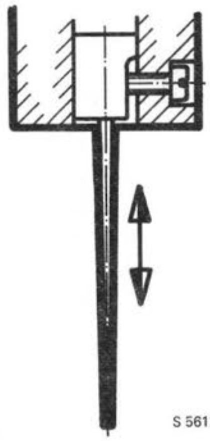
Up to and incl. model 1976:
To adjust the CO-setting, raise or lower the fuel needle to increase or reduce the CO-value, respectively. Do not turn the jet adjusting screw more than 1/4 of a turn from the basic setting.

Rotate clockwise (A) to increase CO-value (fuel needle raised).

Rotate counter-clockwise (B) to reduce CO-value (fuel needle lowered).

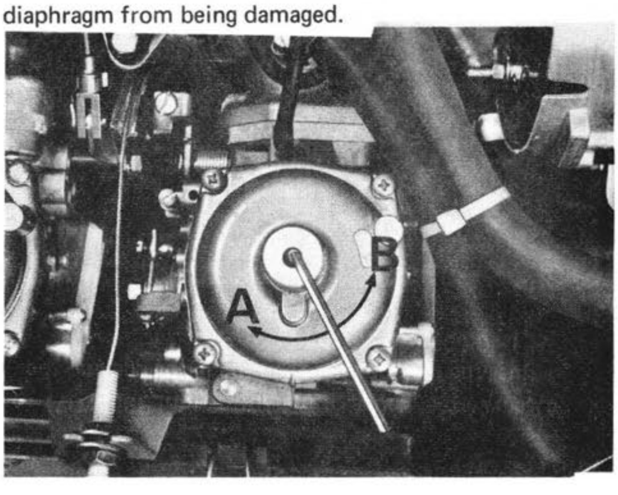
5. Remove the plugs and connect up the crankcase ventilation, the EGR hose and the vacuum hose to the distributor.
6. Set the idling speed to 850 ± 50 rev/min.
7. Check the CO-value at idling speed. If the value exceeds 4.5 %, it is likely that fuel has penetrated the engine oil, necessitating an oil change.

CAUTION
Check the calibration of the CO-meter regularly.

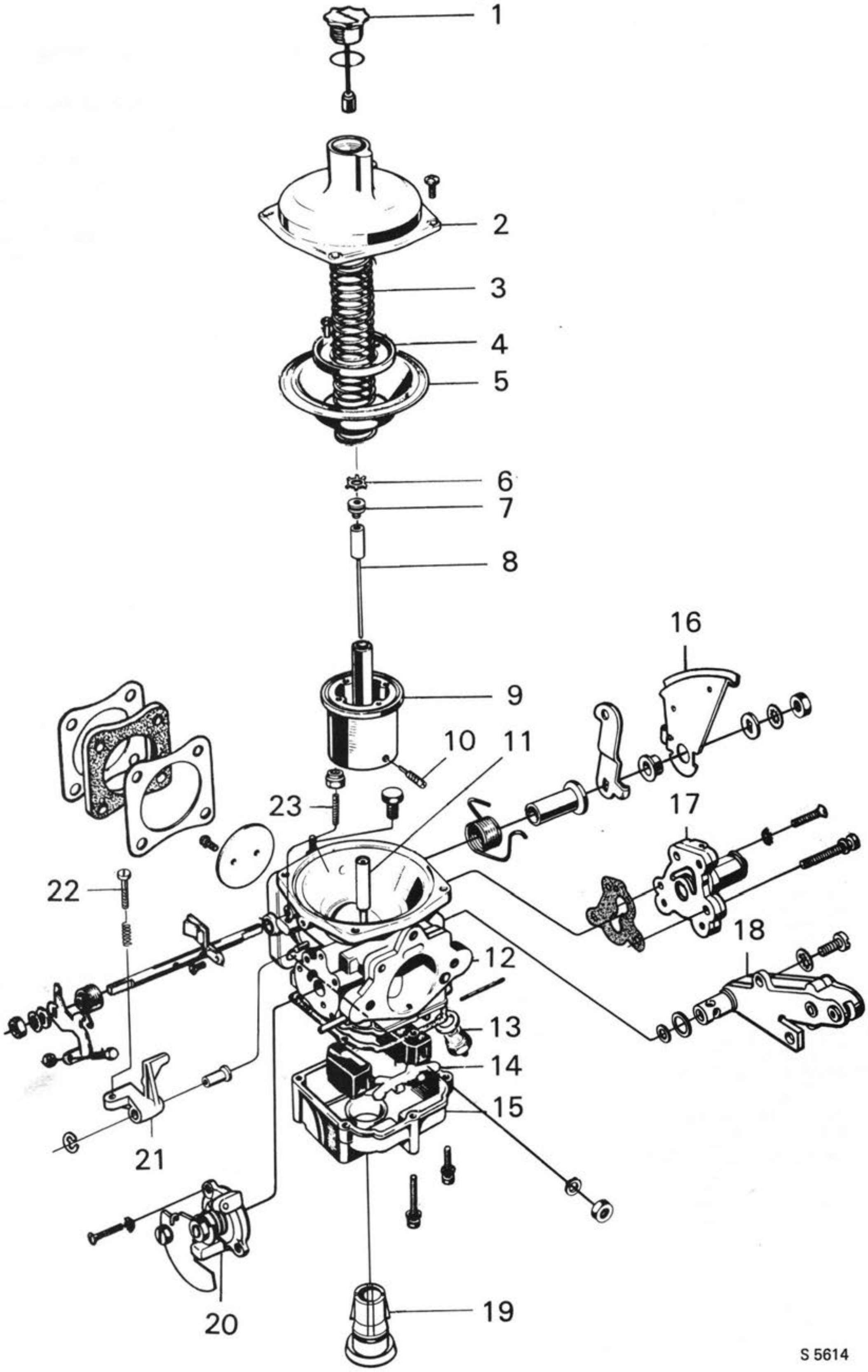


THE FUEL NEEDLE IS RAISED OR LOWERED

As from model 1977:
To adjust, remove the damper piston which allows the fuel needle adjustment screw to be rotated using the CO adjustment tool. Support the vacuum piston by means of the sleeve of the tool to prevent the rubber diaphragm from being damaged.



CO SETTING ADJUSTMENT
Tool 83 92 763 or 83 92 896 (Allen key)
Tool 83 93 035 (recessed slot).



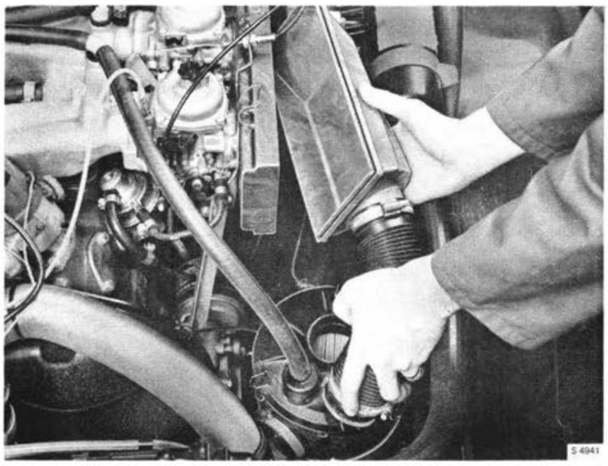
CARBURETOR

1. Cover with damper piston
2. Vacuum chamber cover
3. Spring
4. Washer
5. Diaphragm
6. Circlip
7. Adjustment screw
8. Fuel needle
9. Vacuum piston
10. Lock screw with spring loaded plunge
11. Jet
12. Carburetor housing
13. Float valve
14. Float
15. Float chamber
16. Driver
17. Deceleration valve
18. Temperature compensator
19. Plug
20. Cold start device with cam disc
21. Arm, float chamber ventilation
22. Adjustment screw idling
23. Adjustment screw, float chamber ventilation

Twin-carburetors

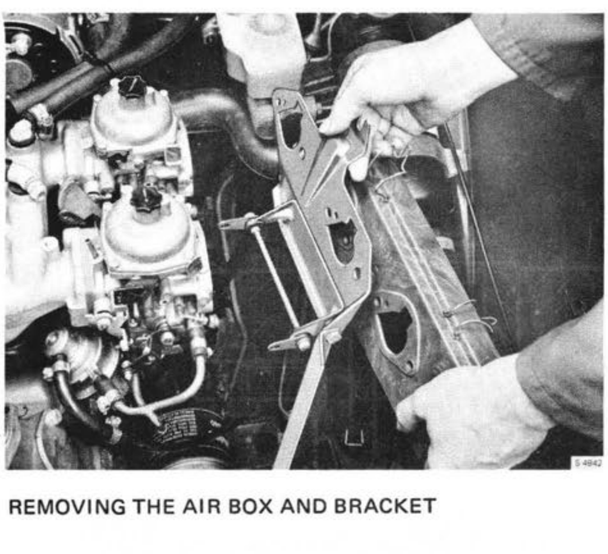
REMOVAL

1. Unclip the four wire clips for the air box cover, undo the hose clip at the air cleaner and remove the cover together with inlet hose.



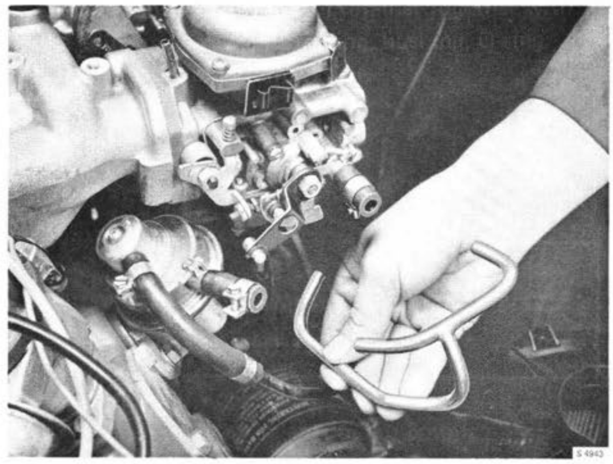
REMOVING THE AIR BOX COVER

2. Disconnect the throttle and choke cables from the carburetors.
3. Remove the clips from the choke links and remove the links from the connecting rods.
4. Remove the air box retaining screws and remove the box together with flange washers, the throttle cable bracket and choke connector and the gasket.



REMOVING THE AIR BOX AND BRACKET

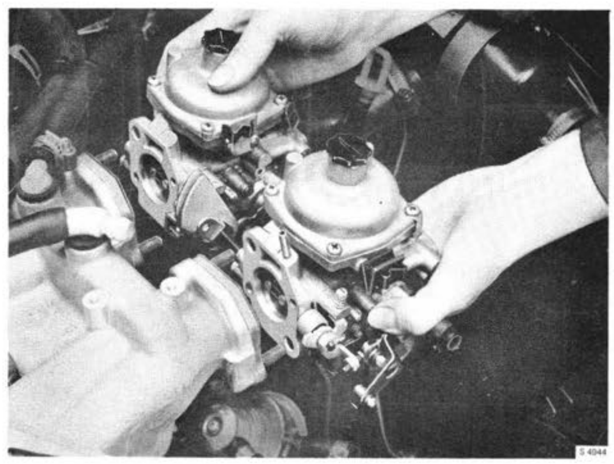
5. a. Undo the clips and remove the fuel pipes.



REMOVING THE FUEL PIPE

b. Pull off the vacuum hose from the front carburetor.

6. Remove the carburetor retaining nuts and remove both carburetors simultaneously.



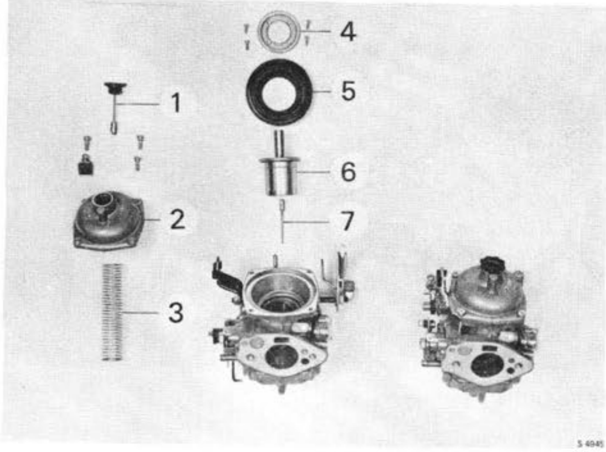
REMOVING THE CARBURETORS

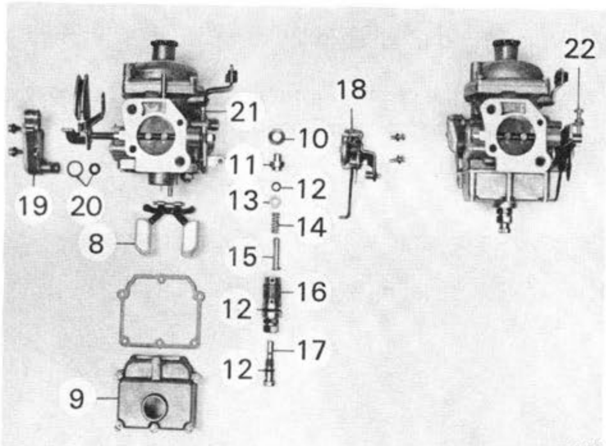
DISMANTLING

1. Remove the vacuum chamber cover and spring.
2. Remove the vacuum piston and diaphragm.
3. Undo the locking screw (7) and take out the fuel needle (8).

   As from 1977 model (externally adjustable fuel needle) first remove the stop screw and then turn the needle adjuster (at the bottom of the dashpot) anti-clockwise using the CO adjustment tool, se enabling the fuel needle to be removed. (Clamp the needle sleeve to prevent it turning).
4. Remove the screws, aluminium washer and diaphragm.
5. Remove the float chamber.
6. Carefully separate the float spindle from the retainer and remove the float.
7. Up to and incl. model 1976:
   Unscrew and remove the jet retainer together with the adjusting screws, jet, spring, bushing, O-ring, bushing and aluminium washer.

7. As from model 1977:
   The jet is press-fitted into the carburetor and normally does not need to be removed.





CARBURETOR

1. Damper
2. Vacuum chamber cover
3. Spring
4. Aluminium washer
5. Diaphragm
6. Piston
7. Fuel needle
8. Float
9. Float chamber
*10. Aluminium washer
*11. Bushing
*12. O-ring
*13. Washer
*14. Spring
*15. Fuel jet
*16. Jet retainer
*17. Adjusting nut
18. Choke mechanism
19. Temperature compensator
20. Seal
21. Idling speed adjusting screw
22. Synchronization screw

*Up to and incl. model 1976.

8. Remove the float valve and washer.
9. Remove the choke mechanism.
10. Remove the temperature compensator. Save both rubber gaskets.

Wash the carburetor parts in paraffin.

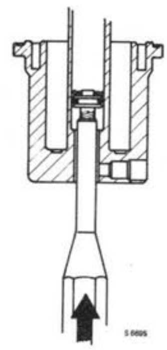
> CAUTION
>
> The diaphragm should only be cleaned with paraffin.
> Avoid using volatile cleaning agents such as trichloroethylene.

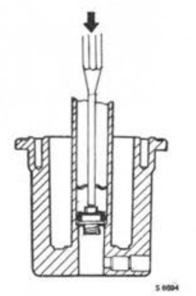
CLEANING

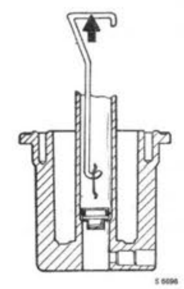
Clean the hole in the choke valve disc by means of compressed air. Check that the diaphragm is not faulty. If the diaphragm is distorted or has cracked, it should be replaced. Check the fuel needle for wear; bent or worn needles should be replaced. Check that the contact and sealing surfaces are not damaged. Check that the contact surfaces of the choke device are free of scratches. Clean the temperature compensator and check that the valve moves freely.

Changing adjustment screw in the piston
(as from model 1977)

1. Using a drift, press out the adjusting screw a few centimetres at the bottom of the piston.
2. Press in the adjustment screw again.
3. Turn the locking clip loose and remove it by means of a bent piece of wire. The adjustment screw can now be removed.





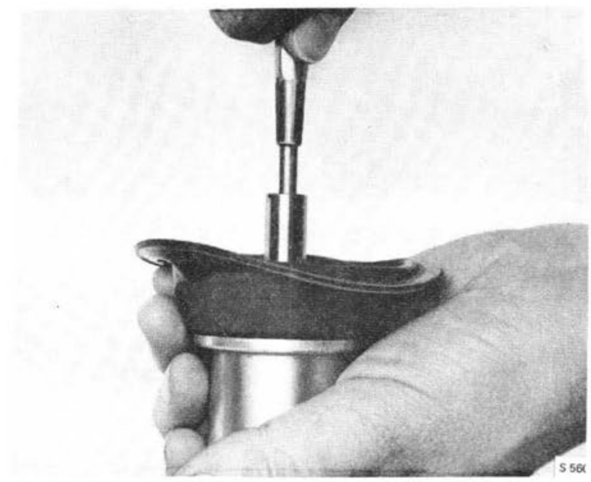


Installation

1. Press the adjustment screw with the aid of a drift into the piston.

> Grease the O-ring with Vaseline or the equivalent to prevent the ring from being damaged on fitting by any scoring on the cylinder bore.

2. With the aid of a drift press in a new circlip in the damper cylinder.

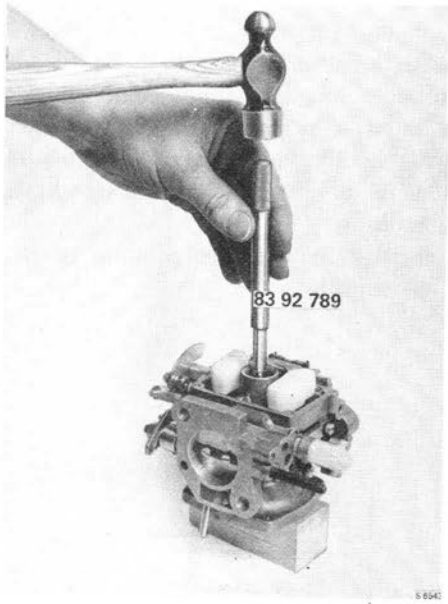


THE CIRCLIP IS PRESSED INTO THE PISTON

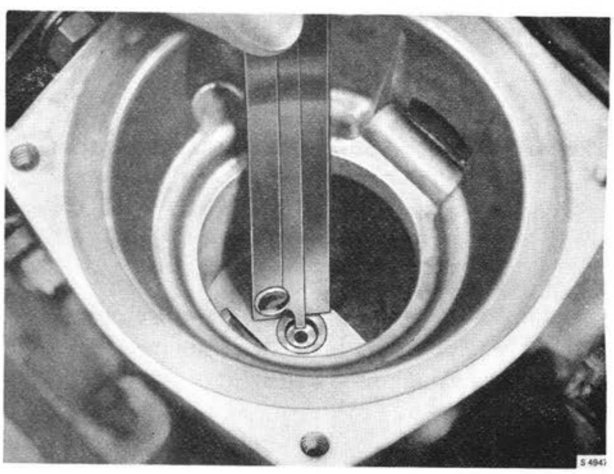
CHANGING THE FUEL JET AS FROM MODEL 1977

The fuel jet is press-fitted in the carburetor housing and should not be moved from the specified position. However, the jet can be changed using tool 8392789 as follows.

1. Remove the carburetor and then take off the vacuum chamber cover and remove the vacuum piston and float chamber cover.
2. Press out the jet using tool 8392789.



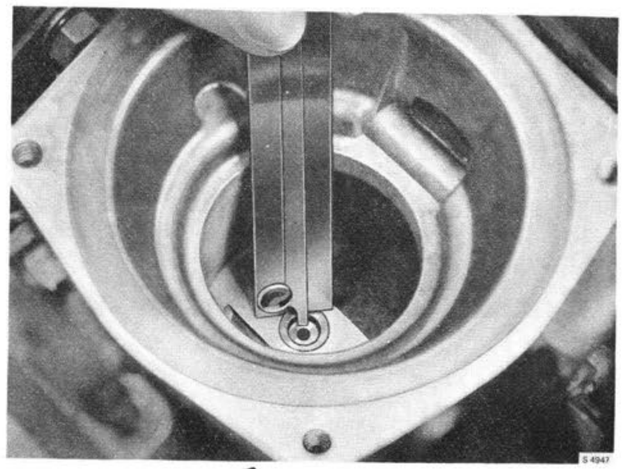
3. Using the tool, press in the new jet from the float chamber side until the jet is 2.5 mm below the level of the bridge in the carburetor housing. If you happen to press the jet in too far, it can be pushed back from above using the same tool.



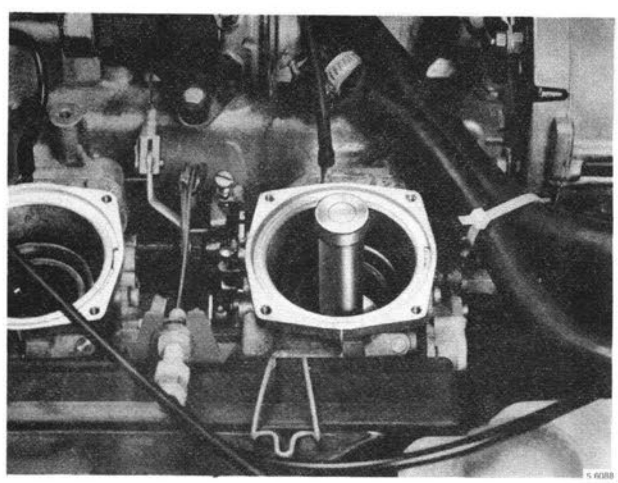
CAUTION
Avoid resting any type of measuring tool against the upper, inner surface of the jet when pressing it into position. Even the slightest deformation in the surface can affect the hole in the jet.

ASSEMBLY

1. Mount the float valve.
2. Up to and incl. model 1976:
   Using a new O-ring, screw the adjusting screw into
3. Up to and incl. model 1976:
   Fit the spring, washer, O-ring, bushing and aluminium washer to the jet and mount them together with the jet retainer and adjusting screw in the carburetor housing. Screw in and tighten the jet retainer. Screw down the adjusting screw until the jet is 0.098 in. (2.5 mm) below the level of the bridge. The measurements should be read by means of a vernier or measuring tool 83 93 027.



MEASURING THE HEIGHT OF THE JET BY MEANS OF A VERNIER



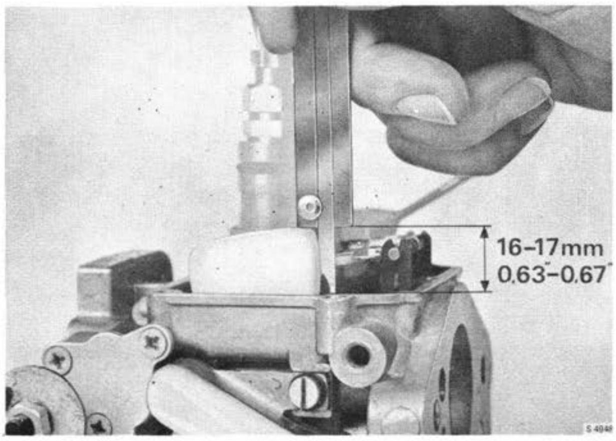
MEASURING THE HEIGHT OF THE JET BY MEANS OF TOOL 83 93 027

4. Mount the float and spindle. The flat side of the float should be turned away from the carburetor housing.
5. Check the float level as follows:
   a. In order to check the float level, the carburetor must be removed from the car and inverted with the float chamber off.

b. For the level to be correct, the highest point of the float should be 0.63–0.67 in. (16–17 mm) above the edge of the carburetor housing (with gasket removed). See the illustration for when the float valve is closed. In the event of the level not being correct, adjust by carefully bending the tongue at the float valve.

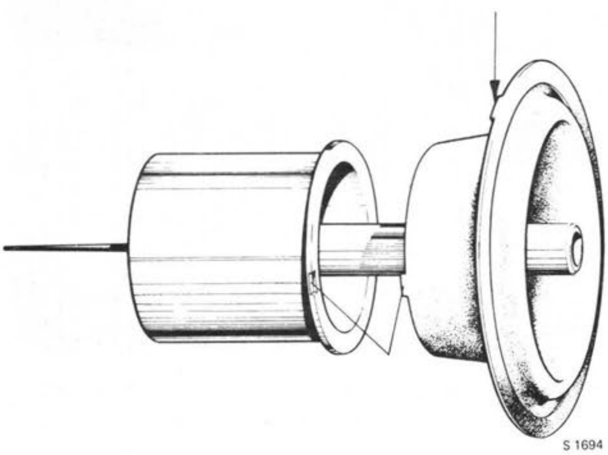
CAUTION

Do not bend the arm between the float and the spindle.



MEASURING THE FLOAT LEVEL

6. Fit a new gasket and slide on the float chamber until it makes contact with the O-ring. Tighten all screws about two turns and slide the float chamber into position and tighten the screws.
7. Mount the diaphragm on the vacuum piston so that the locating lip engages in the corresponding recess in the piston and the inner edge fits easily into the matching groove in the piston.



FITTING THE DIAPHRAGM

CAUTION

If the diaphragm is distorted and will not fit the groove then it should be renewed.

Place the aluminium washer carefully in position, checking that the screw holes align with the corresponding holes in the piston and diaphragm and without twisting the washer. Secure the washer by means of the screws.

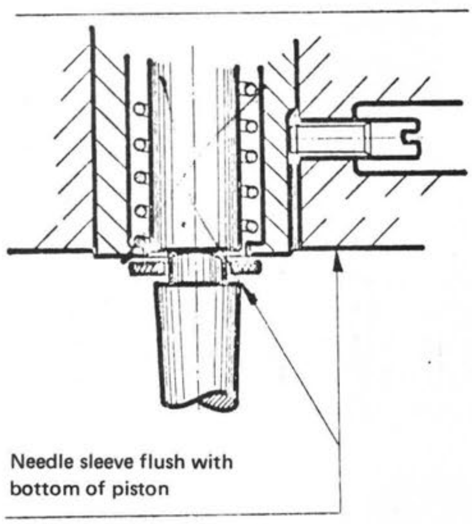
Fit the fuel needle according to the following description.

Up to and incl. model 1976:

The flat milled surface of the spring housing should be pushed by spring action away from the butterfly when the piston is fitted to the carburetor.

The fuel needle should be installed so that its plastic washer lies 0.016" (0.4 mm) under the lower surface of the vacuum piston.

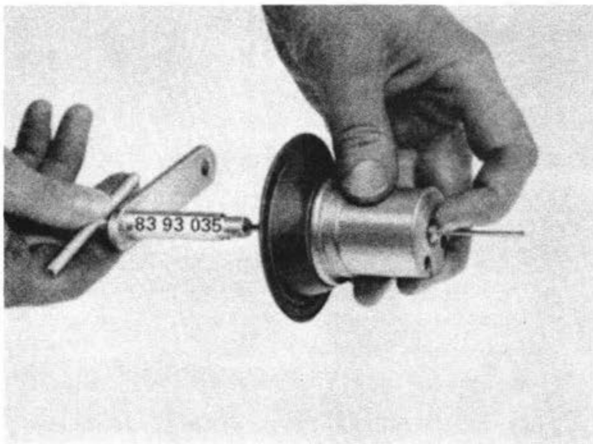
This way of installation gives initial position for the coming CO-adjustment.



FITTING THE FUEL NEEDLE, UP TO AND INCL. MODEL 1976

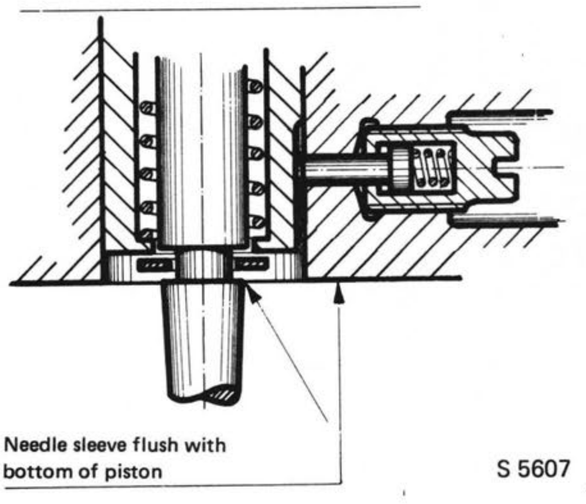
As from model 1977:

Push the needle spring housing into the vacuum piston. Use the CO adjustment tool to rotate the spring housing so screwing it onto the adjuster.



FITTING THE FUEL NEEDLE AS FROM 1977 MODEL
Tool 83 92 763 or 83 92 896 (Allen key)
Tool 83 93 035 (recessed slot)

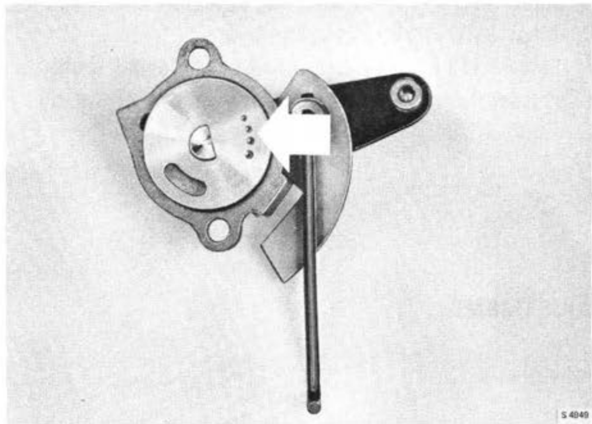
b. Screw in the lock screw so that the spring loaded pin presses against the spring housing.
c. Turn the spring housing with the aid of tool 8392763 so that the pin enters the groove.
d. Tighteen tbe lock screw.
e. Adjust the height of the needle using the CO adjustment tool so that the shoulder of the needle (at the groove for the washer) is flush with the bottom of the piston.



FITTING THE FUEL NEEDLE, AS FROM MODEL 1977

This way of installation gives initial position for the coming CO-adjustment.

8. Install the piston together with diaphragm and spring in the carburetor housing. Ensure that the outer lip of the diaphragm engages the matching recess in the carburetor housing (see illustration). Place the vacuum chamber cover carefully into position as indicated by the markings, insert and tighten the screws.
9. Install the choke mechanism. (If the choke mechanism has been dismantled, fit the disc, spindle and cam as shown in the illustration. The calibrated holes should face the link fixing point).



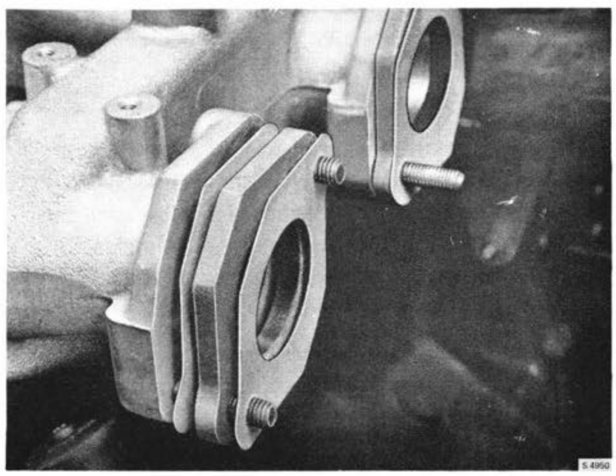
FUEL HOLES IN CHOKE MECHANISM FACING THE LINK FIXING POINT

10. Check the setting of the temperature compensator and that it operates freely (see section "temperature compensator"), and mount it together with the two rubber gaskets.

Fill the damper cylinder with oil once the carburetor has been fitted on the engine.

INSTALLATION

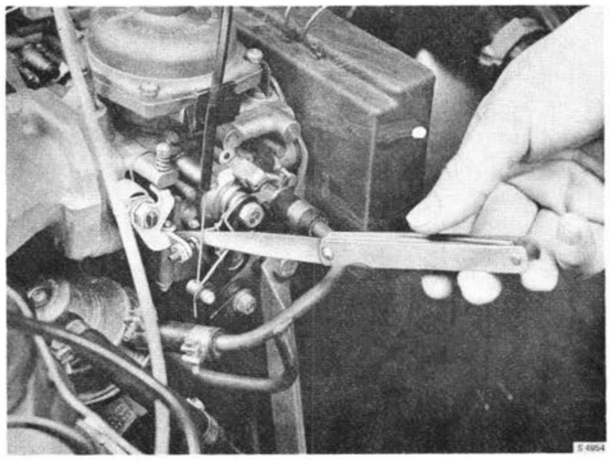
1. Fit the two gaskets with the insulation between them to each of the inlet manifold flanges.



FITTING THE INSULATION WASHERS AND THE GASKETS TO THE INLET MANIFOLD FLANGES

2. Mount the two carburetors simultaneously and secure by means of the nuts and washers. Ensure that the spring which keeps the rear carburetor arm and adjusting screw in contact with the arm of the front carburetor is fitted.

3. a. Connect the fuel pipe and fit the clips.
   b. Connect the vacuum hose.
4. Mount the gaskets, bracket, air box and flange washers to the carburetors.
5. Fit the choke links to the connecting rod and fit the clips.
6. Connect the throttle and choke cables.
7. Fit the air box cover and connect the inlet hose to the air cleaner. Avoid causing deformation of the flange by overtightening the clip.
8. Top up the damper with oil. The oil level should be at least 0.39 in. (10 mm) below the top of the cylinder.

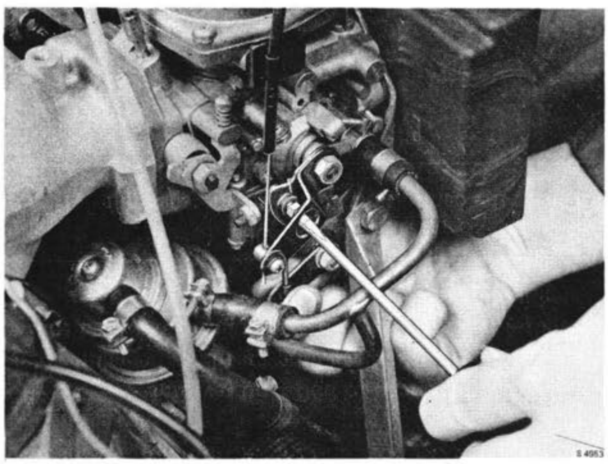


CHECKING THE CLEARANCE, FAST IDLING CAM—ADJUSTING SCREW

ADJUSTMENT

Choke mechanism

1. Check that the two choke mechanisms reach their stops simultaneously. If necessary, adjust the links to the connecting rod.

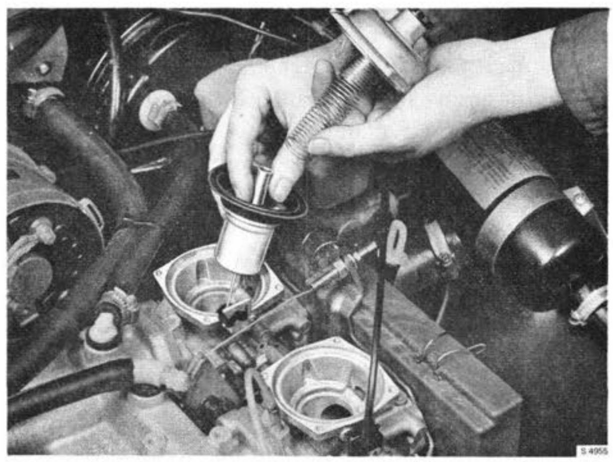


ADJUSTING THE CHOKE MECHANISM LINKS

2. Check that the clearance between the adjusting screw on the throttle shaft stop arm (front carburetor) and the choke mechanism cam is 0.04 in. (1 mm). The choke control should be pushed all the way in so that the valves are completely closed. After adjustment of the idling speed, check this dimension and adjust if necessary.

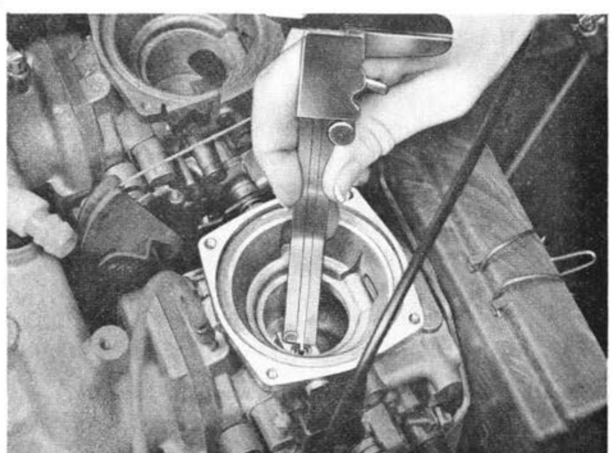
Basic setting, up to and incl. model 1976

1. Remove the vacuum chamber cover, spring, and piston complete with diaphragm.



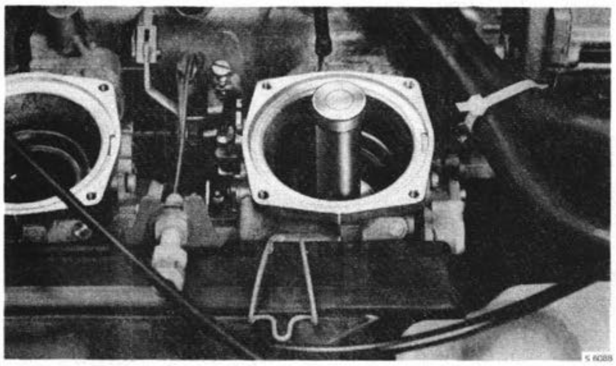
REMOVING THE VACUUM CHAMBER COVER, SPRING AND PISTON

2. Use a vernier gauge or measuring tool 83 93 027 to adjust the distance between the jet bridge and the jet to 0.098 in. (2.5 mm).

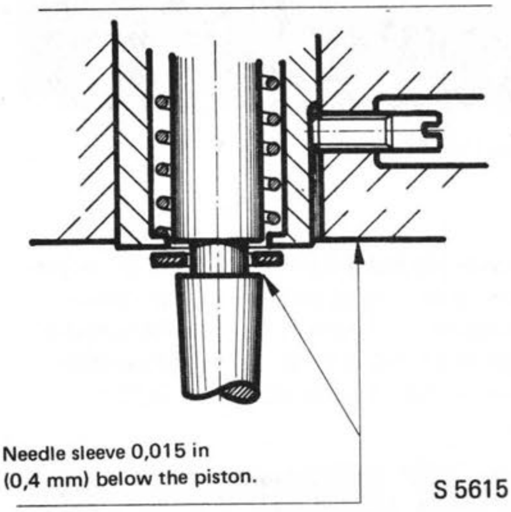


MEASURING HEIGHT OF JET

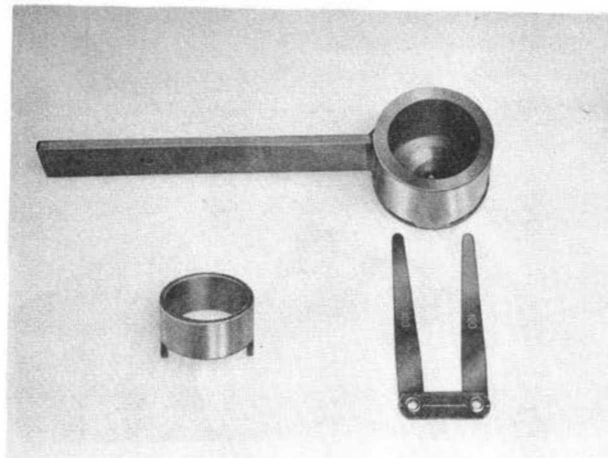
Up to and incl. model 1976, a special adjusting tool, No. 83 92 995, with insert No. 83 93 001 (designed for twin carburetors) and a set of feeler gauges, No. 83 93 019, are available to facilitate adjustment of the fuel needle.



3. Adjust fuel needle heigh position in the piston by loosening the screw and move the needle up or down.

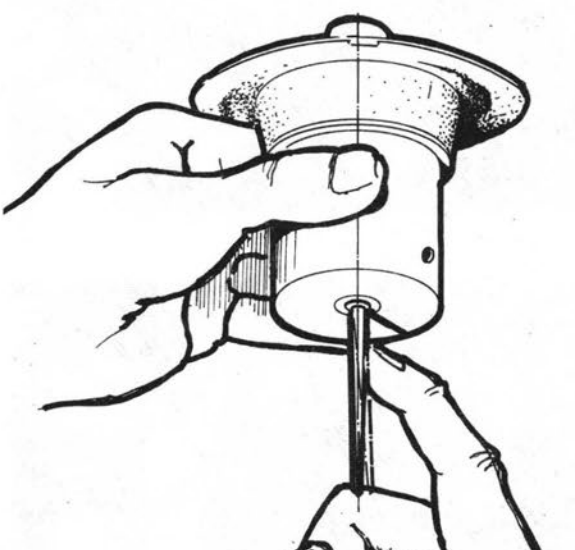


HEIGHT SETTING OF FUEL NEEDLE

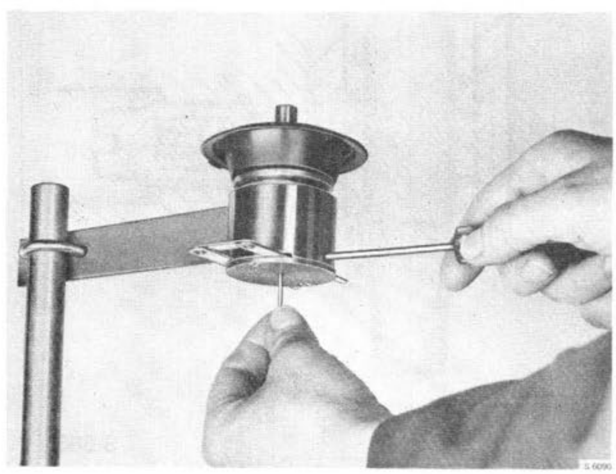


TOOL FOR ADJUSTING THE FUEL NEEDLE

Insert the vacuum piston into the tool, with the feeler gauges inserted in the slots of the tool.
The tool is preset to 0.04 in (1.0 mm) and consequently the 0.06 in (1.4 mm) feeler gauge will provide the basic setting (i.e. the needle sleeve approximately 0.015 in (0.4 mm) below the piston).
If during subsequent adjustment of the CO-setting it proves necessary to lower the fuel needle, use a thicker feeler gauge, and to raise the needle, use a thinner feeler gauge.



KEEP THE NEEDLE PERPENDICULAR TO THE BOTTOM OF THE PISTON DURING CHECKING



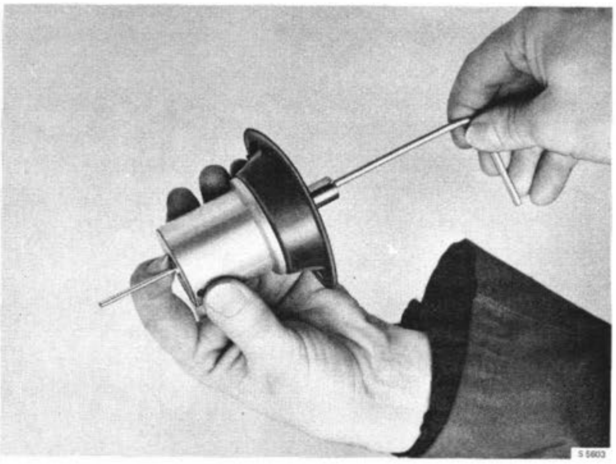
ADJUSTING THE FUEL NEEDLE
Tool 83 92 995

4. Install the piston complete with diaphragm and spring and mount the vacuum chamber cover.

Basic setting, as from model 1977

The jet is fixed in the carburetor. Adjust the height of the fuel needle by means of the special tool.

1. Remove the plastic cover and damper piston.
2. a. Insert the CO adjustment tool through the dashpot onto the vacuum piston and adjustment screw.



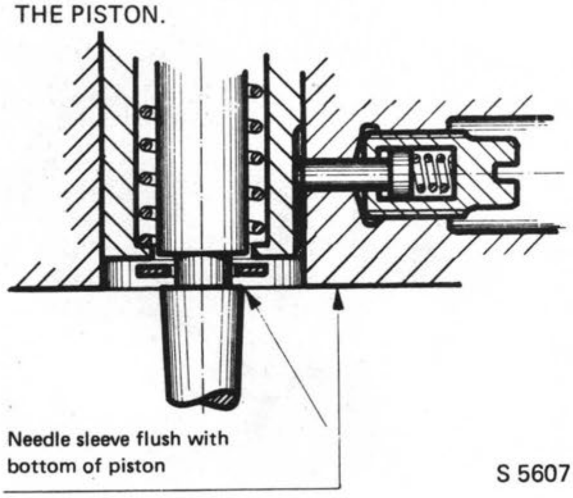
INSERTING THE TOOL THROUGH THE DASHPOT
Tool 83 92 763 or 83 92 896 (Allen key)
Tool 83 93 035 (recessed slot)

b. Use the sleeve of the tool to support the damper piston to prevent the diaphragm being damaged.

c. Turn the adjusting key clockwise until resistance is felt (needle in highest position).

NOTE

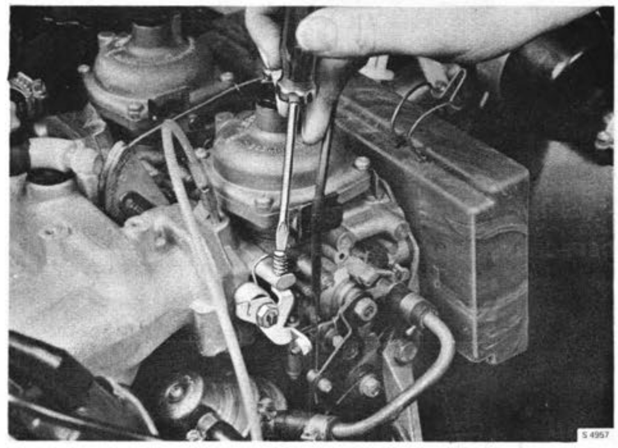
If the adjusting screw is seizing, it may be difficult to detect when the needle has reached its highest position, as described in item C above. In such cases, we recommend that the vacuum pistons be removed for making the basic setting. Accordingly, SET THE HEIGHT OF THE NEEDLE LEVEL WITH THE BOTTOM OF THE PISTON.



d. Rotate the screw 1 1/2 turns counter-clockwise.

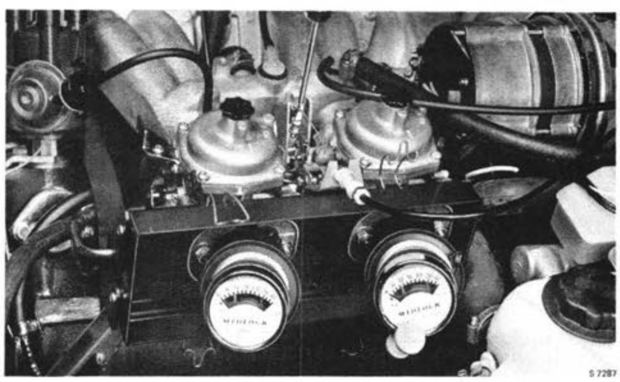
Synchronizing the carburetors

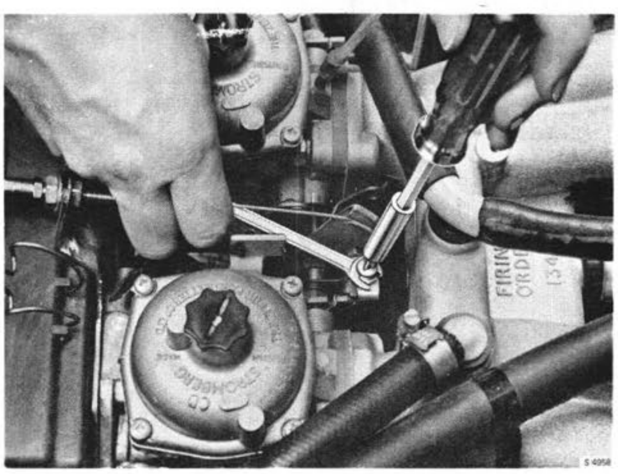
1. Run the engine until warm and then let it run at normal idling speed. The idling speed adjusting screw serves both carburetors and is located on the front carburetor.

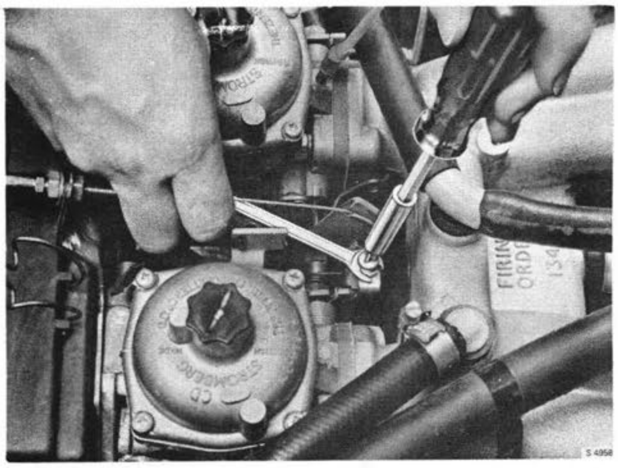


SETTING THE IDLING SPEED

2. Synchronize the carburetors by means of the adjusting screw on the linkage between the two carburetors. Compare the air flow through the carburetors by means of a synchro-tester. The adjusting screw should be locked by means of the lock nut after setting.







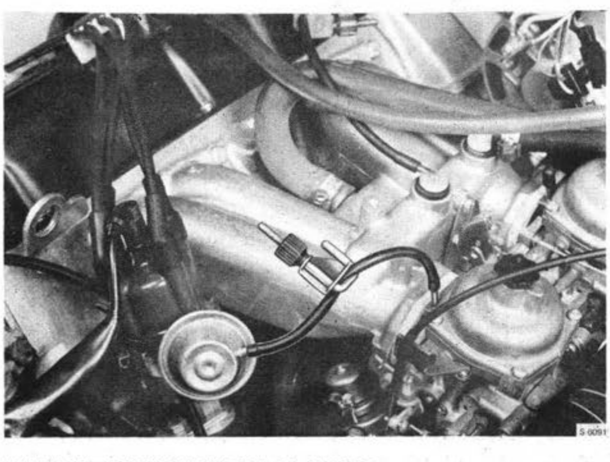
THROTTLE SYNCHRONIZATION SCREW

CO-setting

> As from model 1977:
> To minimize the possible effects on the setting of various engine and exhaust emission components, the CO-setting should be carried out at an engine speed of 2 000 rev/min.

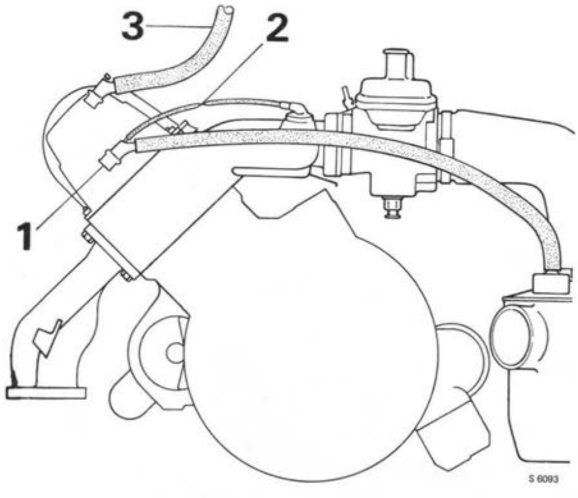
To obviate the possible influence of hydrocarbons on the CO-setting (caused by the presence of fuel in the engine oil), the crankcase ventilation should be disconnected while adjustment work is being carried out.

1. Preparing to measure the CO-setting:
   a. Run the engine until it is warm so that the CO-reading (item 4) may be carried out after the radiator fan has cut in for the second time.
   b. Up to and incl. model 1977: Check that the preheater valve is in the "Summer" position.
   c. Check that the choke control is fully depressed.
   d. Check that the float chamber ventilation valve is correctly adjusted.
   e. Check that the ignition timing is set correctly.
   f. Check the synchronization of the carburetors.
   g. Plug or clamp shut the vacuum hose to the vacuum control unit on the distributor.



THE DISTRIBUTOR HOSE CLAMPED

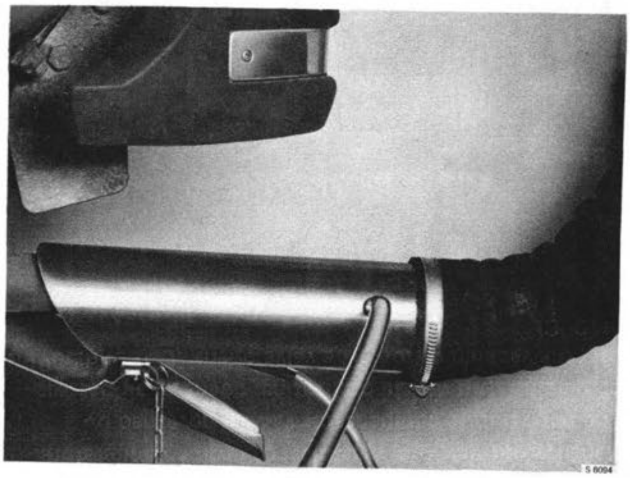
h. Disconnect the crankcase ventilation as follows:



DISCONNECTING THE CRANKCASE VENTILATION, AS FROM MODEL 1976

1. The hose removed from valve cover
2. The small-bore hose plugged (as from model 1977)
3. Evacuation hose connected to valve cover

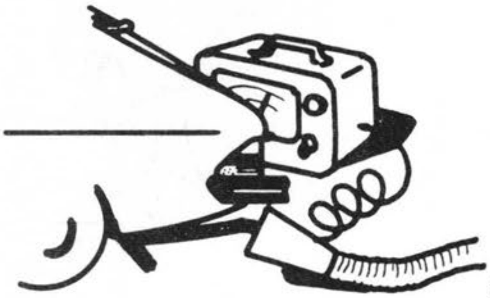
Evacuate the crankcase gases from the opening in the valve cover by connecting a hose to the workshop's evacuation hose, slightly behind the probe of the CO-meter to ensure that the readings will not be affected.



EVACUATION HOSE CONNECTED TO THE WORKSHOP'S EVACUATION SYSTEM

   i. Plug the end of the vacuum hose to the EGR avlve where applicable.

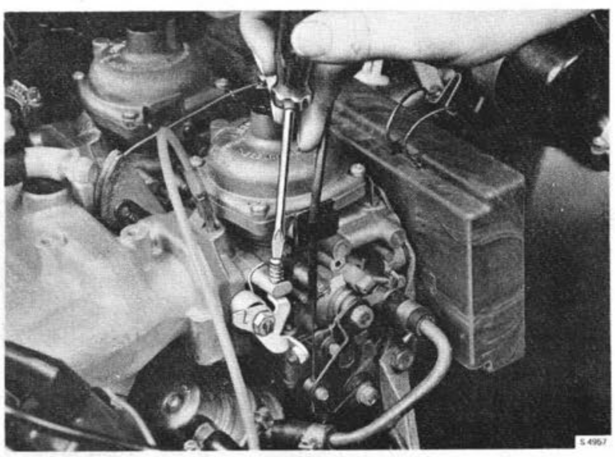
2. Connect the CO-meter and tachometer.



S 5202

CHECKING THE CO-CONTENT

3. Set the idling speed to up to and incl. model 1976:
   850 ± 50 rev/min.
   As from model 1977: 2000 rev/min.

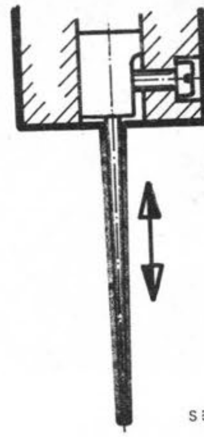


ADJUSTING THE IDLING SPEED

4. Read off the CO-value.

CO-setting with crankcase ventilation disconnected	
Up to and including 1976 model	max. 3.5% at 850 r.p.m.
As from 1977 model Sweden	1.75±0.25% at 2000 r.p.m.
As from 1977 model Europe	1.5±1% at 850 r.p.m.

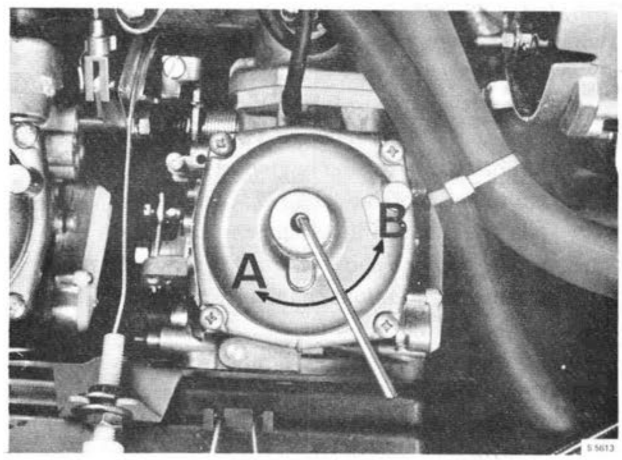
Up to and incl. model 1976:
To adjust the CO-setting, raise or lower the fuel needle to increase or reduce the CO-value, respectively. Do not turn the jet adjusting screws more than 1/4 of a turn from the basic setting.



S 5612

THE FUEL NEEDLE IS RAISED OR LOWERED

As from model 1977:
To adjust, remove the dashpot piston and then turn the fuel needle adjustment screw using the CO adjustment tool. Support the vacuum piston by means of the sleeve of the tool to prevent the rubber diaphragm from being damaged.



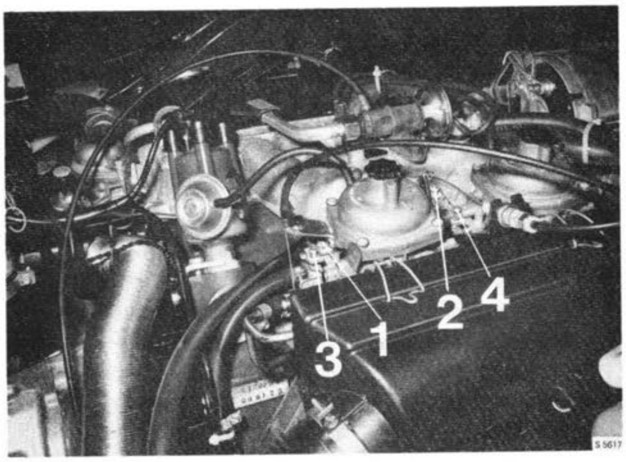
ADJUSTING THE CO-SETTING
Tool 83 92 763

Rotate clockwise (A) to increase CO-value (fuel needle raised).
Rotate counter-clockwise (B) to reduce CO-value (fuel needle lowered).

5. Remove the plugs and connect up the crankcase ventilation, the EGR hose and the vacuum hose to the distributor.
6. Set the idling speed to 850 ± 50 rev/min.
7. Check the CO-value at idling speed. If the value exceeds 4.5 %, it is likely that fuel has penetrated the engine oil, necessitating an oil change.

CAUTION
Check the calibration of the CO-meter regularly.

ADJUSTING SCREWS



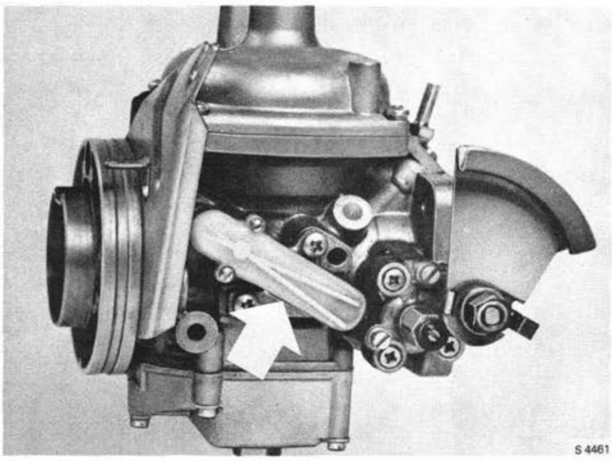
ADJUSTING SCREWS
1. Vent valve, float chamber, front carburetor
2. Synchronizing the throttle valve.
3. Idling setting.
4. Vent valve, float chamber, rear carburetor.

1. <u>Vent valve, float chamber, front carburetor</u>
   The setting is fixed and adjustment is not normally necessary. In the event of any adjustment being made, this will affect the settings of adjusting screws 2, 3 and 4. These must therefore be readjusted in the given order.
2. <u>Synchronizing the throttle valve</u>
   This is carried out in conjunction with checking the idling speed and CO-setting. Any adjustment will affect the settings of adjusting screws 3 and 4, which must also subsequently be readjusted in the given order.
3. <u>Idling setting</u>
   If any adjustment is made it will affect the setting of adjusting screw 4, which should also be checked.
4. <u>Vent valve, float chamber, rear carburetor</u>
   This should be checked if any of the adjusting screws 1, 2 or 3 have been moved.

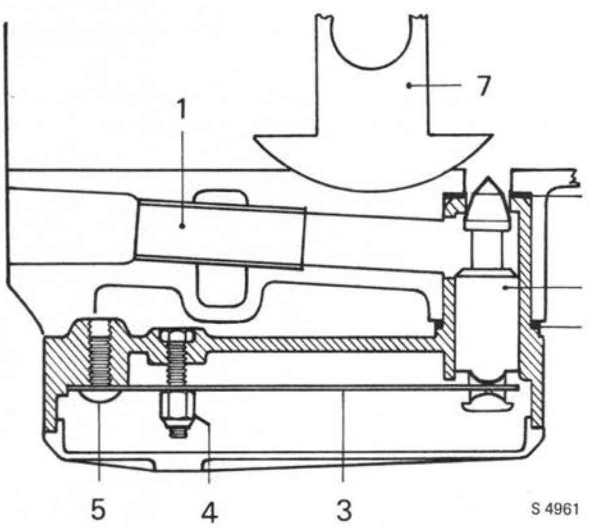
Single- and twin-carburetor

TEMPERATURE COMPENSATOR

The temperature compensator serves to maintain a constant fuel-air mixture, regardless of engine temperature. The temperature compensator valve is governed by a bi-metallic strip which, on heating, opens an air passage past the vacuum piston. The valve opens at around 50°F (+10°C).



TEMPERATURE COMPENSATOR



TEMPERATURE COMPENSATOR

1. Air passage
2. Valve
3. Bi-metallic strip
4. Adjusting nut
5. Bi-metallic strip retaining screw
6. Seal
7. Jet bridge

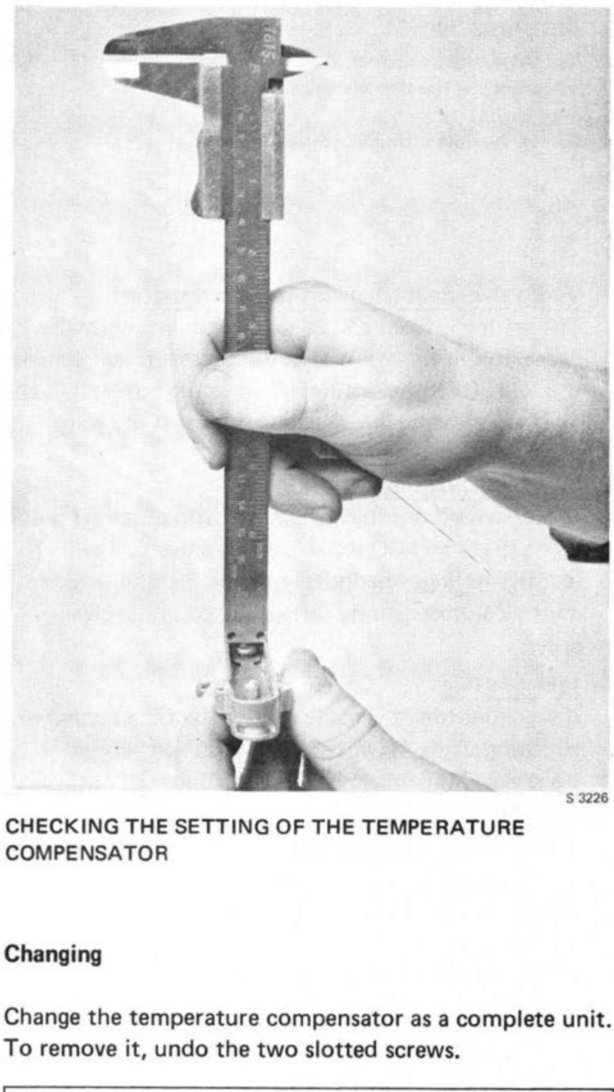
In the event of the idling speed dropping rapidly when the engine is idling and particularly in warm weather, check the operation of the temperature compensator by removing the plastic cover and pressing the valve, whereupon the idling should become less smooth. If the valve is stiff or sticks it can be adjusted. This is on the condition that it is not scratched or coated. Should this prove to be the case, it should be completely renewed.

Adjustment

Back off the bi-metallic strip retaining screw slightly and centre the valve by pressing it towards its seating and then tighten the screw.

Setting

At 68°F (+20°C) the valve should have opened 0.004–0.012 in. (0.1–0.3 mm). To check the setting, the temperature compensator should be removed from the carburetor and kept at a temperature of 68°F (+20°C) until it has acquired this temperature. Setting is by means of the bi-metallic strip adjusting nut.



CHECKING THE SETTING OF THE TEMPERATURE COMPENSATOR

Changing

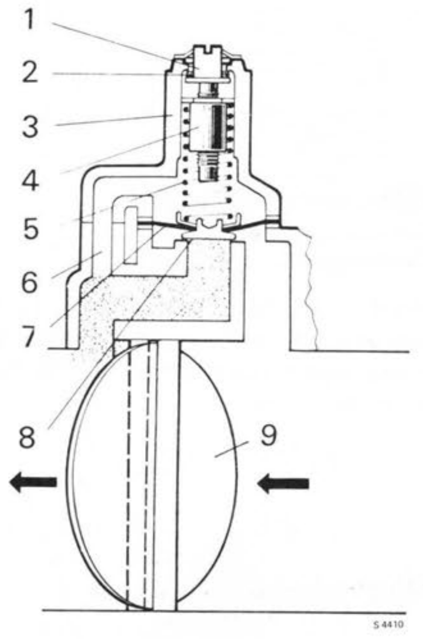
Change the temperature compensator as a complete unit. To remove it, undo the two slotted screws.

> **NOTE**
> Both the outer and inner rubber gaskets must be exchanged.

DECELERATION VALVE

The function of the deceleration valve is to improve combustion during engine overrun. The valve, which is a diaphragm valve, is opened as a result of the vacuum in the inlet duct. This ensures that the fuel—air mixture is correctly maintained to allow satisfactory combustion during engine overrun.

If the engine tends to idle too fast, the cause may be a faulty or badly adjusted deceleration valve.

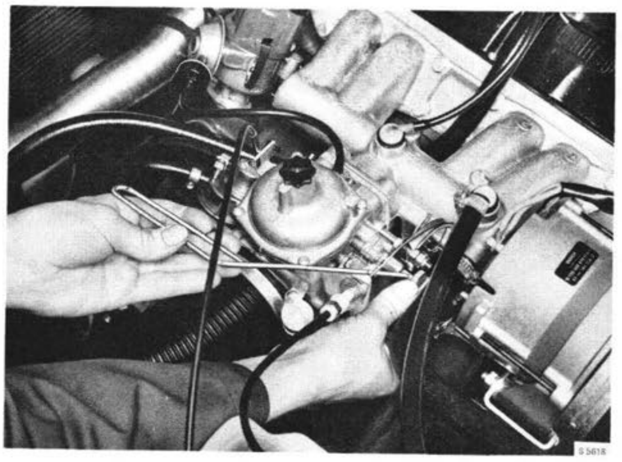


DELECERATION VALVE

1. Adjusting screw
2. Rubber ring
3. Cover
4. Nut
5. Spring
6. Channel to top of diaphragm
7. Diaphragm
8. Valve
9. Throttle

Adjustment

1. Run the engine and the carburetor up to working temperature. Note that the air preheater must be in the appropriate position for the time of year.
2. Run the engine at idling speed and check that the deceleration valve is closed. If there is any uncertainty as to this point, turn the deceleration valve adjustment screw a few turns counter-clockwise.



ADJUSTING THE DECELERATION VALVE
Tool 83 92 748 or 83 92 953.

3. Adjust the fuel quantity and engine speed to the recommended idling speed values. (If there is any uncertainty, check ignition timing.)
4. Open the deceleration valve completely by turning the adjustment screw clockwise until the engine speed no longer increases (approx. 1500—1800 rev/min.).
5. Close the deceleration valve carefully by turning the adjustment screw counter-clockwise until the valve just closes. (The engine will now have returned to its normal idling speed.) Then turn the deceleration adjustment screw an additional one-half to three-quarters of a turn counter-clockwise.
6. Check the above adjustments by racing the engine up to approx. 3000 rev/min and then releasing the throttle control to idling position again. The engine should return to a normal idling speed although there will be some slight delay. If this is not the case, the deceleration valve adjustment screw should be turned slightly more counter-clockwise.

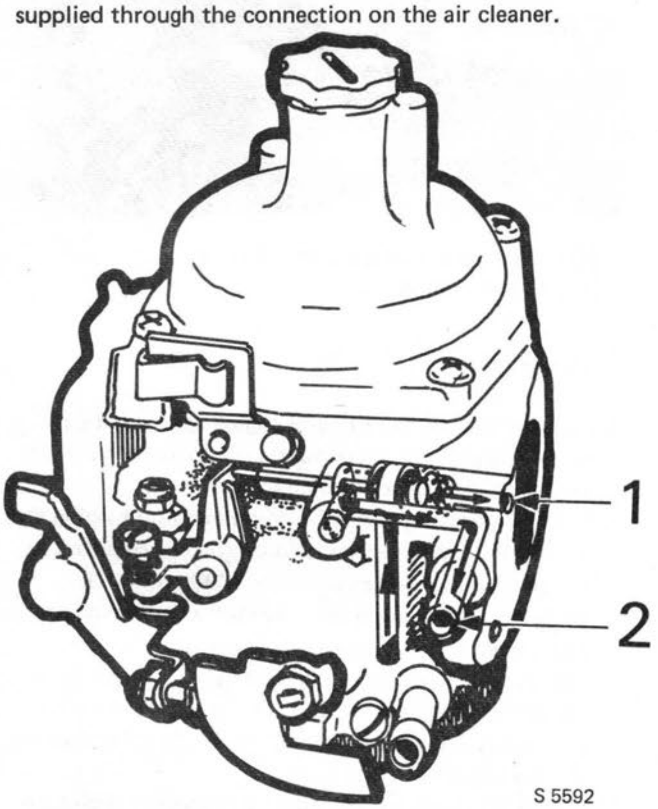
Removing and reassembling

To remove the valve unit, undo the three slotted screws. When reassembling, scrape any remaining fragments of gasket off the mating surfaces and always fit a new gasket.

VALVE FOR FLOAT CHAMBER VENTILATION

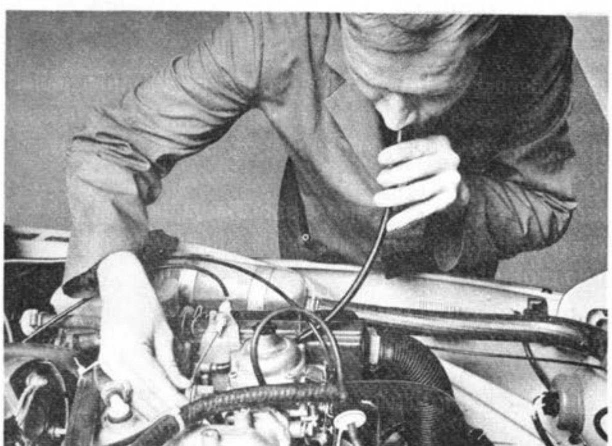
Checking and setting

The valve should be set so that air is drawn in from the outside when the throttle valve is closed (idling setting). When the throttle valve opens, ventilation should be supplied through the connection on the air cleaner.



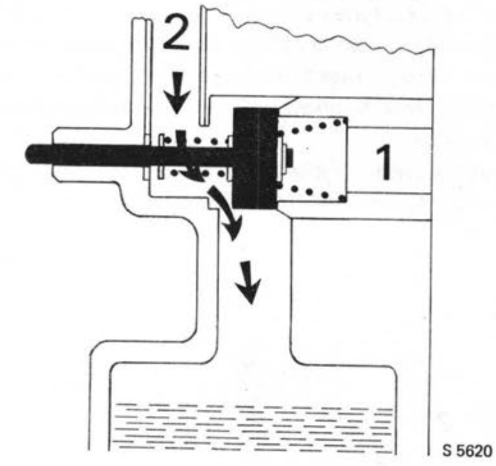
VALVE FOR FLOAT CHAMBER VENTILATION
1. Ventilation through air cleaner
2. Ventilation from outside

1. Connect a hose to the opening of the pipe for the outside ventilation.
2. Blow through the hose. If the fuel line is not fitted and connected to the pump, the fuel inlet nipple must be blanked off.



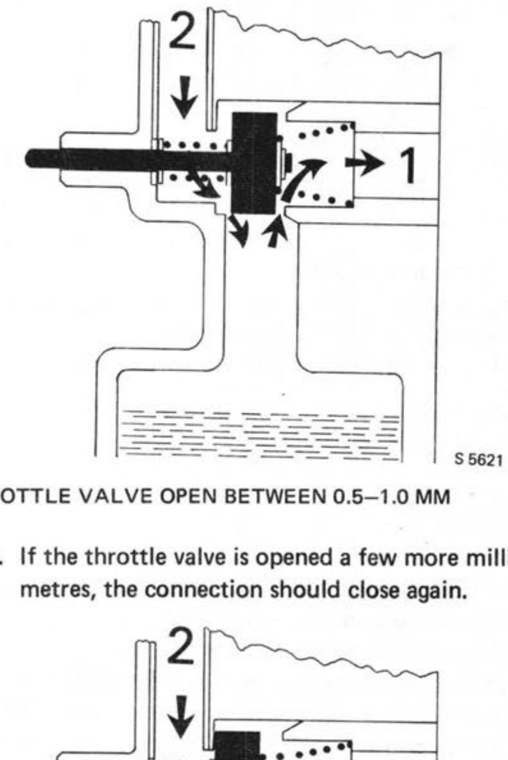
CHECKING VENTILATION FROM OUTSIDE

a. When the throttle valve is fully closed, it should not be possible to blow through the nipple (since the float chamber is an enclosed space).



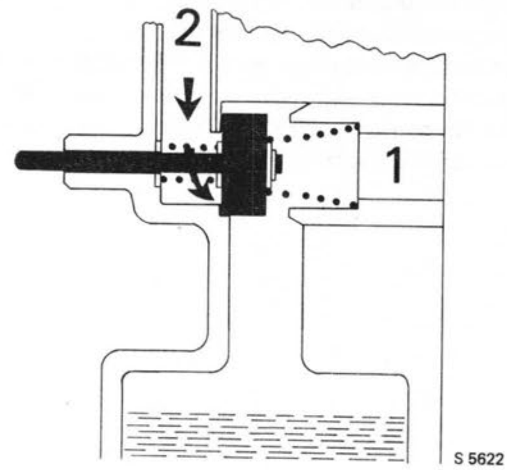
THROTTLE VALVE FULLY CLOSED
1. Ventilation from air cleaner
2. Ventilation from outside

b. If the throttle is opened between 0.5–1.0 mm (by means of cable on carrier), a passage will open to the inner ventilation, making it possible to blow through the nipple.



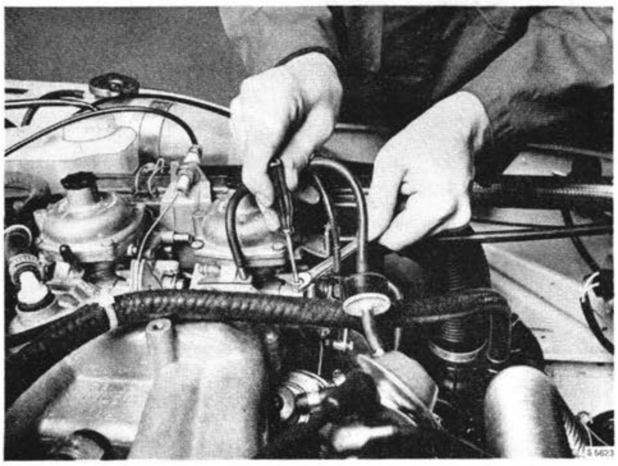
THROTTLE VALVE OPEN BETWEEN 0.5–1.0 MM

c. If the throttle valve is opened a few more millimetres, the connection should close again.

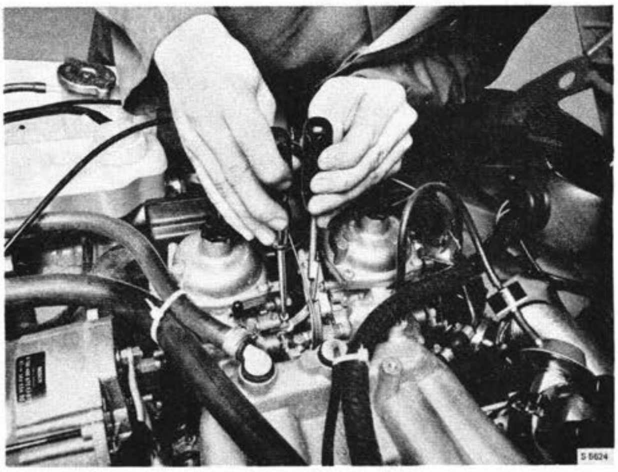


THROTTLE VALVE OPEN A FEW MORE MILLIMETRES

3. Undo the lock nut and adjust the flap regulating the valve. Adjust by means of the adjusting screw as described in 2a and 2b.



ADJUSTING SINGLE-CARBURETOR AND FRONT TWIN-CARBURETOR



ADJUSTING REAR TWIN-CARBURETOR USING SPECIAL SPANNER FOR LOCK NUT (1/4 IN. ACROSS FLATS)

4. Following the above adjustments, the idling speed, CO-setting and synchronization (twin-carbs.) must be checked and adjusted.

CHOKE CONTROL

Removing

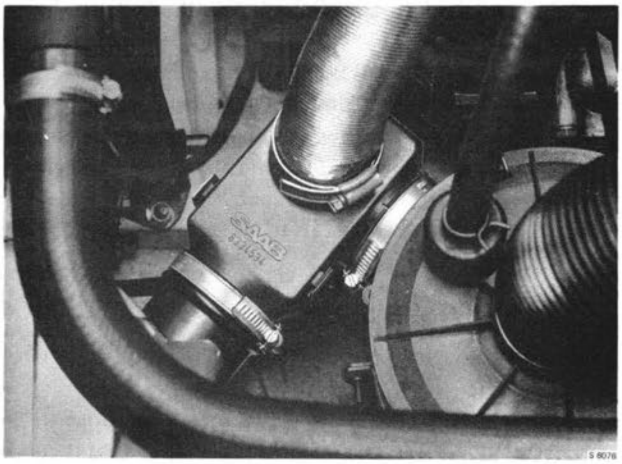
1. Undo the control cable and its sheath from the carburetor. Note how the cable is fitted. Free the cable in the engine compartment.
2. Remove the left-hand sheet below the instrument panel.
3. Remove the control button and remove the transparent plastic washer from above the warning light.
4. Unscrew the eye nut which holds the control onto the instrument panel and disconnect the warning light cable from the control contact.
5. Pull the control cable out of the grommet in the dash penel.

Installing

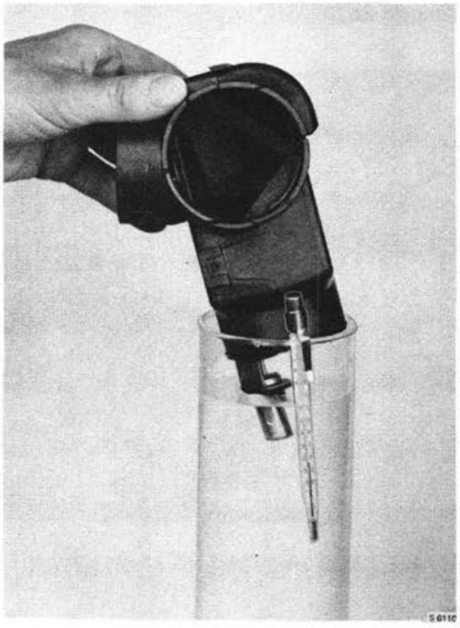
1. Check that the grommet is correctly positioned in the dash panel. Feed in the control cable, so that it can be fitted to the instrument panel.
2. Connect the warning-light cable to the control contact.
3. Fit the control to the instrument panel, fit the plastic washer above the warning light and screw on the button.
4. Refit the cable as far as the carburetor.
5. Fit the cable to the carburetor and adjust in accordance with "Choke control, adjustment"
6. Replace the panel under the instrument panel.

AIR CLEANER

Thermostatically controlled air preheating, as from model 1978



THERMOSTATICALLY CONTROLLED AIR PREHEATING, AS FROM MODEL 1978



CHECKING THE THERMOSTAT

Checking

A rough check of the operation of the valve is possible by comparison with the ambient air temperature:

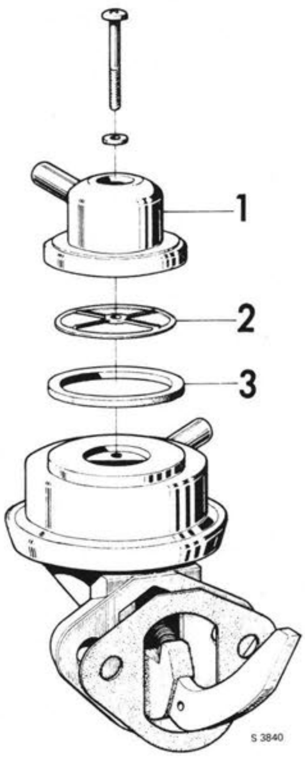
- At temperatures below +43°F (+8°C) (Saab 99 Turbo +23°F (–5°C)), only heated air is inducted into the engine.
- At temperatures between +43°F (+8°C) and +64°F (+18°C) (Saab 99 Turbo +23°F (–5°C) and +41°F (+5°C)), the valve admits varying proportions of heated and cold air.
- At temperatures above 64°F (+18°C) (Saab 99 Turbo +41°F (+5°C)), only cold air is inducted.

A more accurate check can be made by submering the thermostat body in warm water (glycol/water mixture) and checking that the valve operates.

FUEL PUMP

REMOVING AND REASSEMBLING

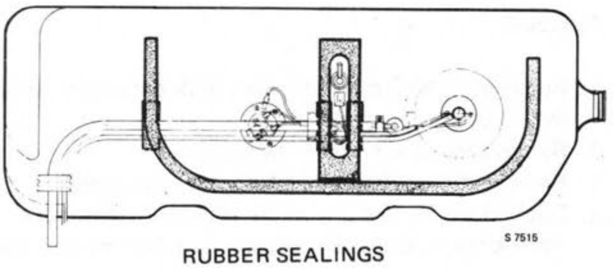
Pull the fuel line hose off the pump. Remove the retaining screws and washers, unship the pump and remove the old gasket. Always use a new gasket when reassembling.
The fuel pump cannot be dismantled and cannot be repaired if there is any defect in the diaphragm or the valves. If the pump is faulty, the whole unit must be replaced.
If the cover is removed the fuel filter can be replaced or cleaned. The gasket should also be replaced.



FUEL PUMP

1. Cover
2. Filter
3. Gasket

FUEL TANK AND FUEL LINES

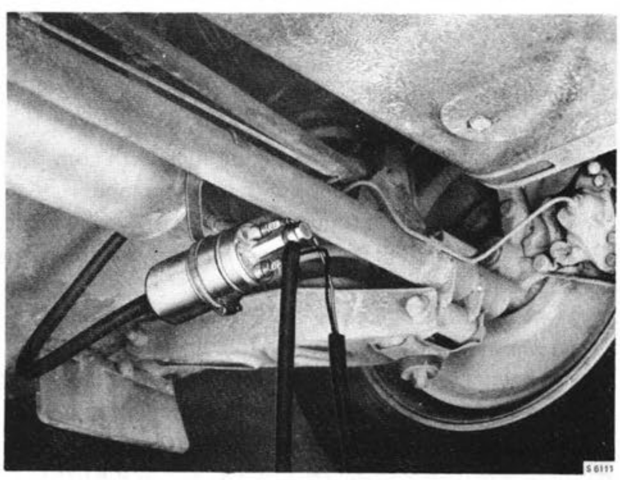


RUBBER SEALINGS

FUEL TANK

Removing

1. Disconnect the earth cable from the battery.
2. Jack up the rear end of the car.
3. Drain the fuel tank. To prevent unnecessary emission of hydrocarbons into the workshop, drain the tank by means of a closed system.
   Cars with carburetor engines: Connect an electric fuel pump (designed for injection engines) to the inlet line of the fuel tank and pump the fuel through a hose into a container. The work should be done with the car jacked up.
   Cars with injection engines: Disconnect the fuel line from the fuel pump and connect a special line with a banjo connection, with the other end connected to a container.
   The container should be enclosed and equipped with a vent hose which should be run back into the fuel filler pipe.



EMPTYING THE FUEL TANK BY MEANS OF AN ELECTRIC FUEL PUMP

4. Saab 99 (99 L), 99 L (99 GL) and 99 EMS: Remove the carpet in the trunk compartment.
   Saab 99 Combi Coupé: Remove the rear floor panel in the luggage compartment.
5. Remove the fuel level transmitter cover plate.
6. Remove all electrical connections from the tank.
7. Remove the filler pipe and ventilation hoses from the fuel pump.
   Cars with carbureted engines: Disconnect the fuel line from the tank.
   Cars with injection engines: Disconnect the pressure and return fuel lines from the fuel accumulator and the tank. Remove the fuel line clips.
8. Remove the securing strap nuts under the tank.
9. Lower the tank.

Installing

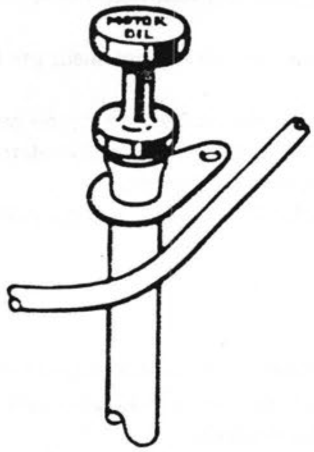
1. Check that the rubber seals are undamaged and that they are correctly fitted round the opening of the fuel level transmitter (fuel pump).
2. Check that the straps are properly mounted, and cover the filler and vent hose openings with masking tape.
3. Clamp the wires to the top of the tank. Lift the tank into position and suspend it in the two straps.
4. Center the tank and tighten the nuts. Remove the masking tape from the filler pipe and vent hose.
5. Connect the fuel line(s) and the hose to the filler pipe. Make sure that the rubber grommet is in place.
6. Connect the vent hoses to the upper filler pipe and to the top of the tank. Connect the wires to the fuel level transmitter (fuel pump) and replace the access panel. Relay the floor covering in the trunk.
   Saab 99 (99 L), 99 L (99 GL) and 99 EMS: Replace the carpet in the trunk compartment.
   Saab 99 Combi Coupé: Replace the floor panel and rear floor cover in the luggage compartment.
7. Lower the rear end of the car.
8. Connect the battery earth cable.

FUEL PIPES
RUNNING THE FUEL PIPES

Fuel pipes should not come into contact with any object that could result in wear through chafing.
The risk of wear from chafing is particularly great from contact with plastic components subjected to engine vibrations (e.g. other fuel pipes, dip stick sleeve, throttle cable, the lower section of the mixture control unit, etc.). It is therefore of special importance when working in the engine compartment that all fuel pipes are run clear of such equipment. Sheath the pipes with PVC sleeves if contact is unadvoidable.

Checking fuel pipes (every 5,000 miles (10,000 km) or 10,000 miles (15,000 km)

Follow the pipes and check to see if there is any evidence of wear through chafing.
Special care should be taken when checking pipes that intersect or are run near plastic components.

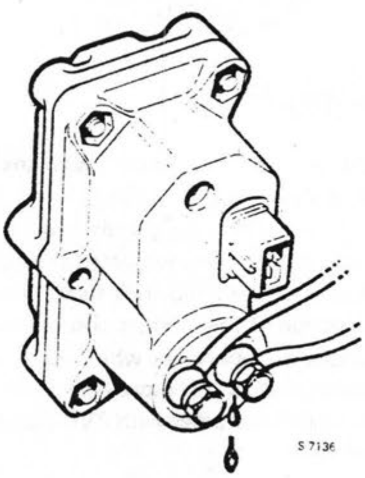


Pipe wall thickness, fuel pipes:	
Pipes to injection valves	– 2 mm
Other pipes	– 1 mm

Re-route the pipes and fit PVC sleeves if chafing is detected. If the wear is greater than half of the thickness of the pipe wall then the fuel pipe should be replaced.

Checking pipe connections (every 10,000 m. (15,000 km))

Check if banjo connections are leaking.
The seals should be replaced every time the connections are loosened.



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REPLACING FUEL LINES IN THE PASSENGER COMPARTMENT

The fuel line (fuel lines in cars with injection engines) from the tank to the engine compartment runs through the passenger compartment along the left-hand sill beam. In model 1975, cars with injection engines, the return fuel line runs along the right-hand sill beam.

Removal

1. Remove the kick plate and turn back the carpet from the sill beam.
2. Remove the tape holding the fuel line.
3. Remove the insulation felt from the dash panel.
4. Disconnect the fuel line in the engine compartment, remove the rubber grommet and pull the line into the passenger compartment.
   Cars with carbureted engines: Disconnect the connection at the fuel pump.
   Cars with injection engines:
   On the 1975 model, remove the return fuel line from the joint at the right hand side spring link bracket. As from model 1976, remove the return fuel line from the fuel distributor. Remove the pressure line from the fuel filter.
   In model 1975 and early 1976 model cars, the holes in the bulkhead and spring link bracket are too small for the banjo nipple on the fuel line. The nipple must therefore be removed before the line can be withdrawn (see under "Removing and fitting the fuel line nipple").
5. Model 1975:
   Lift the rear seat cushion, disconnect the angle connecting piece (pieces) at the point where it passes through the body, and remove the fuel line (lines).
   As from model 1976:
   Undo the clip and disconnect the fuel line from the fuel tank. In cars with injection engines, disconnect the fuel line from the fuel accumulator and from the fuel tank.

Installation

1. Clean the fuel line by blowing through with compressed air. Close the ends with masking tape.
2. Push the fuel line through the hole in the dash panel and the spring link bracket and connect the line in the engine compartment.
   In model 1975 and early 1976 model cars, the banjo nipple should be fitted to the fuel line after the line has been inserted through the bulkhead and the spring link bracket (see under "Removing and fitting the fuel line nipple").
3. Insert the rubber grommets in the hole in the dash panel and in the front hole in the spring link bracket.
4. Push the fuel line into position and connect it at the rear where it passes through the body. Secure the line with tape in two places along the sill beam.
5. Fit the insulation felt on the dash panel. Replace the carpet and kick plate.

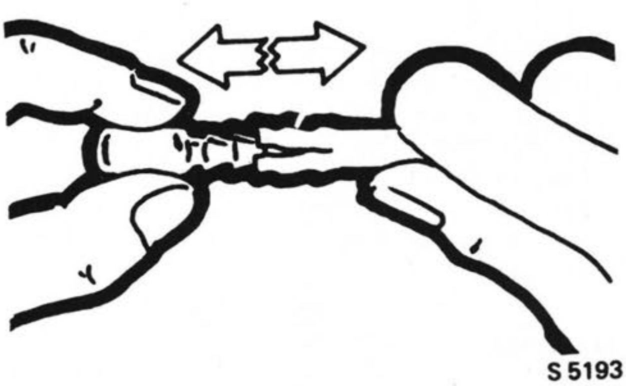
REMOVAL AND INSTALLATION OF NIPPLE ON FUEL LINE

1. Remove the old nipple as follows:
   a. Burn a notch in the fuel line by means of a soldering iron.

S 5192

BURNING OFF THE OLD FUEL LINE

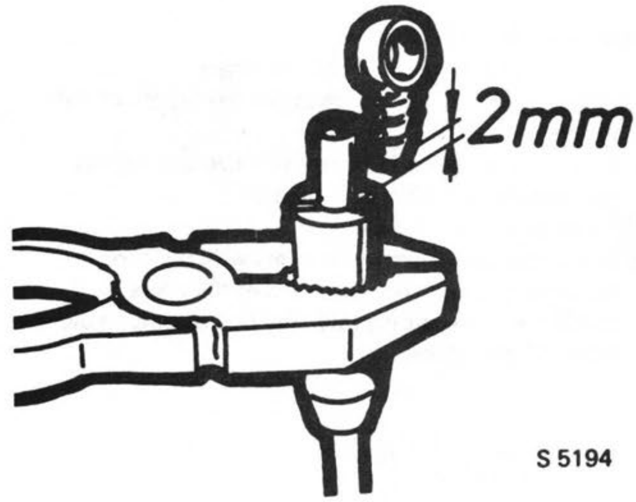
   b. Withdraw the fuel line from the banjo coupling. (Do not cut the fuel line by means of a knife as this may damage the banjo coupling and cause leakage.)



S 5193

REMOVING THE FUEL LINE

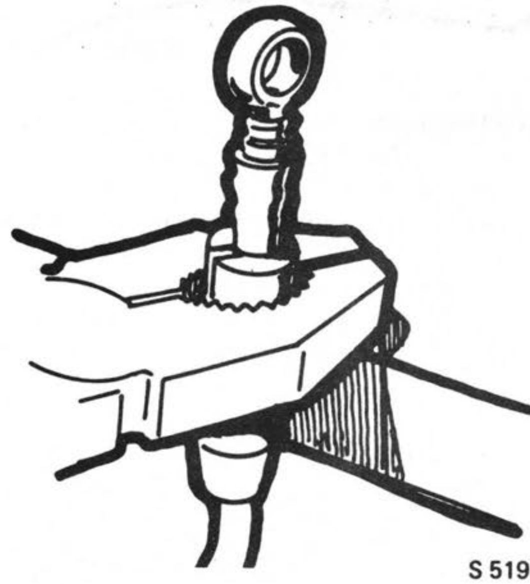
2. Mount the nipple to the fuel line as follows:
   a. Cut the fuel line with a knife, cutting off as short a piece as possible.
   b. Secure the fuel line in the fitting tool in such a way that the protruding length is the same as the length of the banjo coupling plus 0.08 in. (2 mm).



S 5194

POSITION OF FUEL LINE IN TOOL

   c. Knock down the nipple with a hammer. Hold the tool against a firm base to prevent upsetting the nipple.



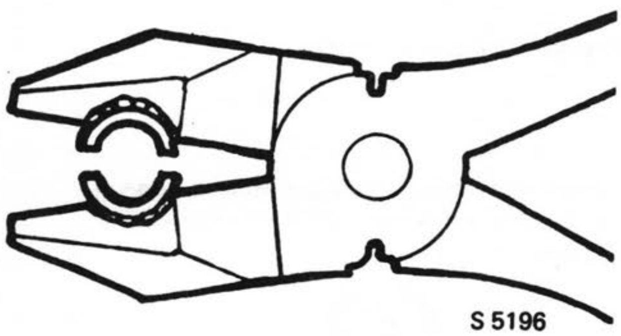
S 5195

FITTING THE FUEL LINE

MAKING A FUEL LINE FITTING TOOL

Material: One pair of pliers
One valve guide (2.0 l engines)

1. Using a hacksaw, saw off the guide to a length of 1.0 in (25 mm).
2. Split the valve guide by means of a hacksaw so that two cup-shaped halves are obtained.
3. Carefully deburr all edges.
4. Solder the two halves to the pliers with the parting line running along the centre line of the pliers. Guide the halves during soldering by inserting an old valve between them.

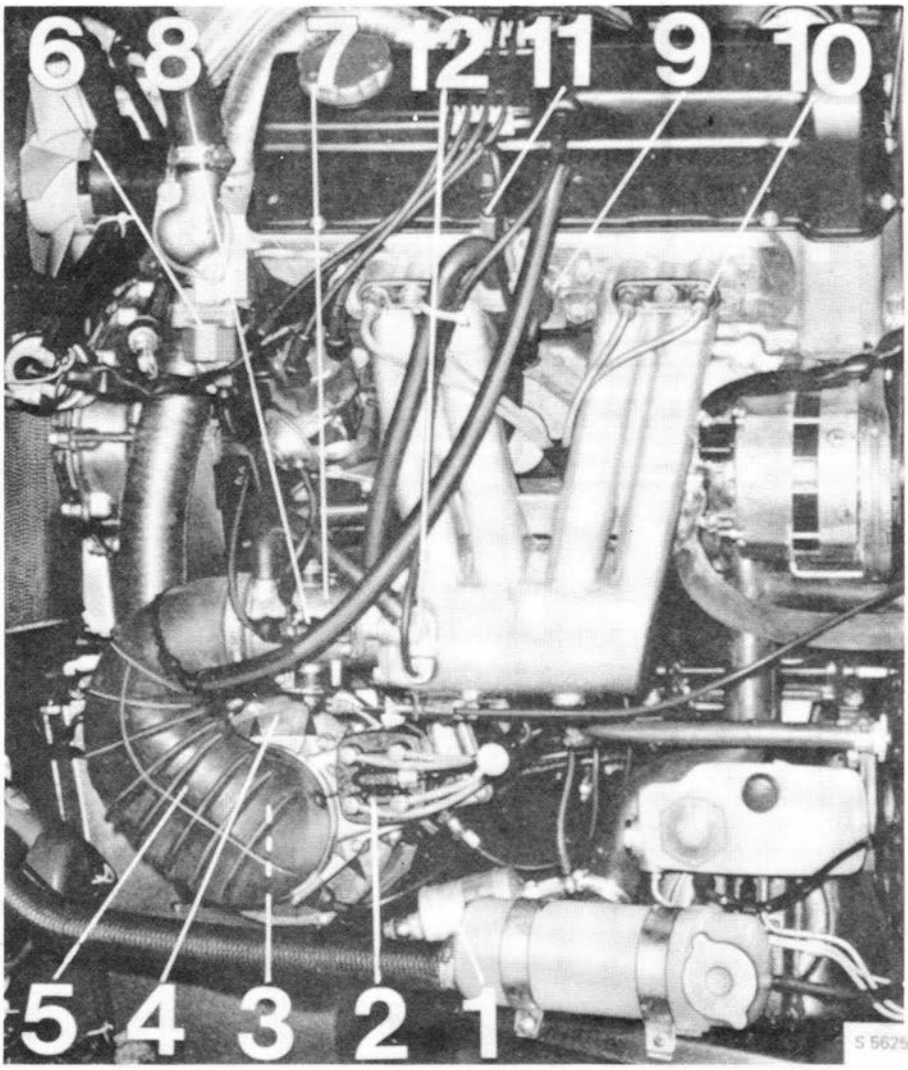


FUEL LINE FITTING TOOL

FUEL INJECTION – THE CI SYSTEM

The CI system (Continuous Injection), manufactured by Bosch, is a mechanical injection system which is based on the measurement of air flow.

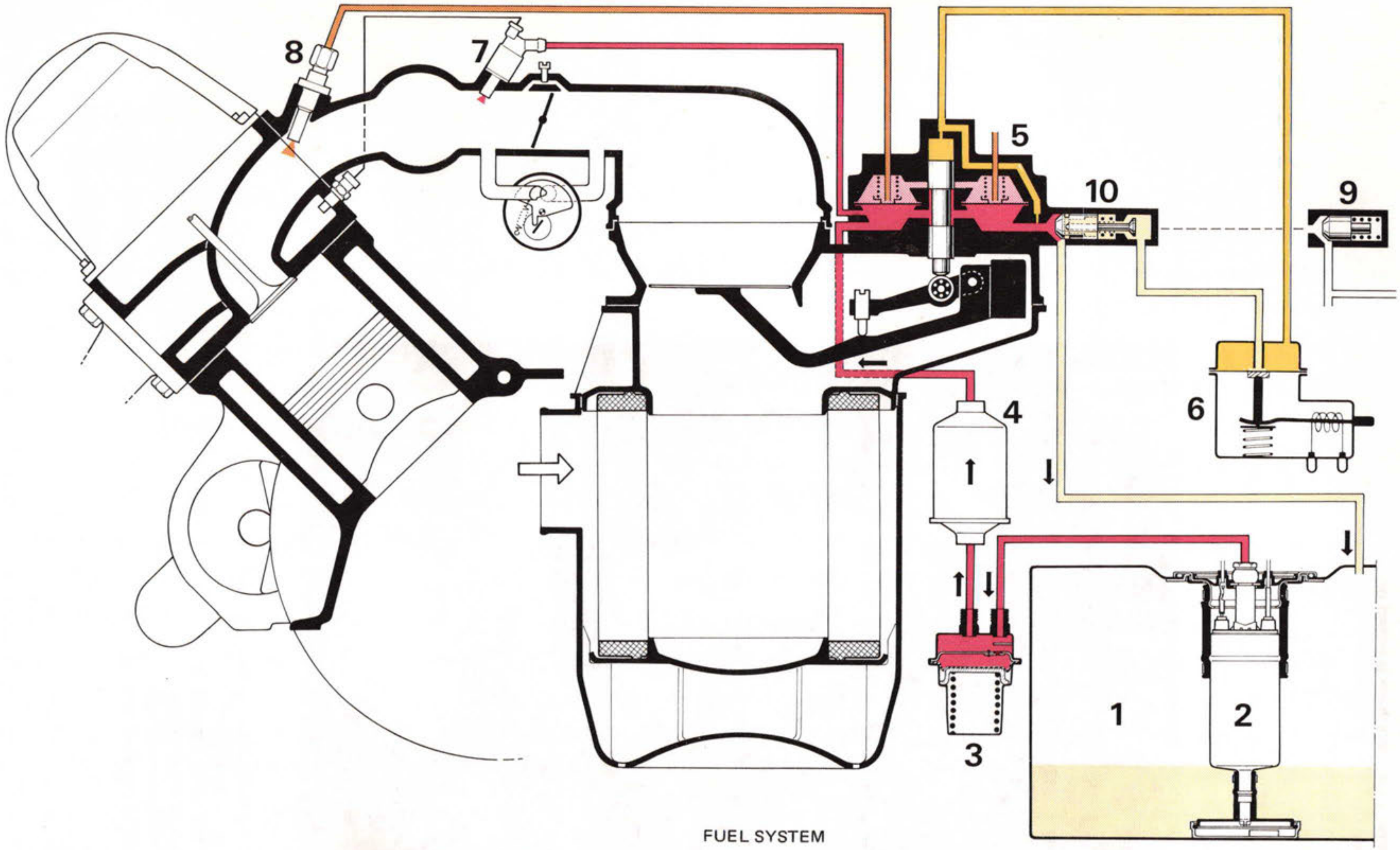
Description



FUEL INJECTION ENGINE

1. Fuel filter
2. Fuel distributor
3. Air flow sensor
4. Air cleaner
5. Rubber bellows
6. Warm-up regulator
7. Throttle valve housing
8. Cold start valve
9. Thermo-time switch
10. Injection valve
11. Auxiliary air valve
12. Deceleration valve

SAAB



FUEL SYSTEM

1. Fuel tank
2. Fuel pump
3. Fuel accumulator
4. Fuel filter
5. Fuel distributor
6. Warm-up regulator
7. Cold start valve
8. Injection valves
9. Line pressure regulator (up to and including 1977 model)
10. Line pressure regulator with stop valve (as from 1978 model)

Line pressure

Line pressure –0.1 bar (1.4 psi)

Injection pressure

Control pressure

Return, no pressure

FUEL TANK, FUEL PUMP

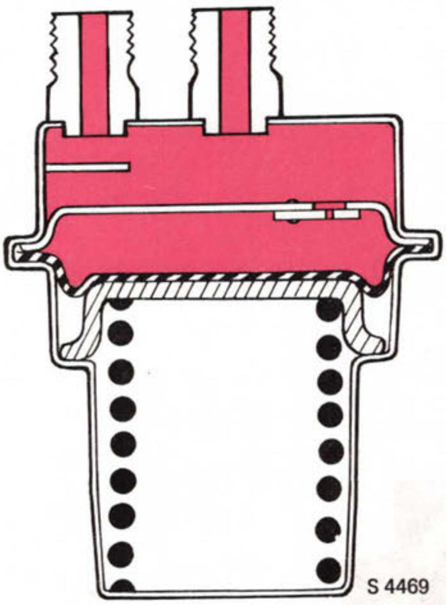
The fuel pump is an electric rotary pump and is mounted inside the tank. The pump and motor are totally enclosed and cannot be dismantled for repair. A relief valve is fitted to the fuel pump and is actuated when the pressure is too high. A check valve in the fuel pump outlet ensures that the supply pressure in the fuel circuit will not fall to zero immediately after the pump has stopped.

FUEL ACCUMULATOR

The fuel accumulator is connected to the fuel pipes between the fuel pump and the fuel filter.
Up to and including 1979 model the fuel accumulator is situated on the left end of the fuel tank.
As from 1980 model the fuel accumulator is positioned on the under side of the body in front of the fuel tank.

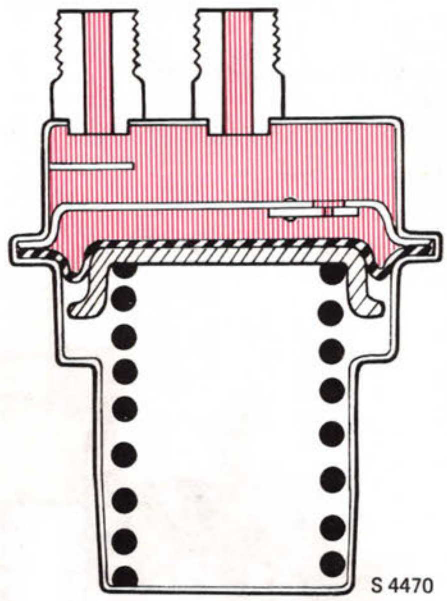
The fuel accumulator has three functions:

1. When the engine stops, the fuel pressure in the system will drop to approximately 2 bar (kp/cm^2, 28 psi). This pressure will be maintained as a result of the fuel accumulated in the fuel accumulator. This means that the system will remain pressurized at the "rest pressure" while the engine is cooling, and this prevents the fuel from vaporizing, thus facilitating starting when the engine is warm.
2. The accumulator absorbs pressure fluctuations or surges occurring in the system.
3. When the engine is being started, the fuel accumulator delays the pressure rise in the fuel system so that the control plunger in the fuel distributor will have time to reach its lower position before the injection valve opens. This prevents too much fuel being injected into the cylinders.



THE FUEL ACCUMULATOR WHEN THE FUEL PUMP IS WORKING

Line pressure



THE FUEL ACCUMULATOR WHEN THE ENGINE HAS BEEN STOPPED

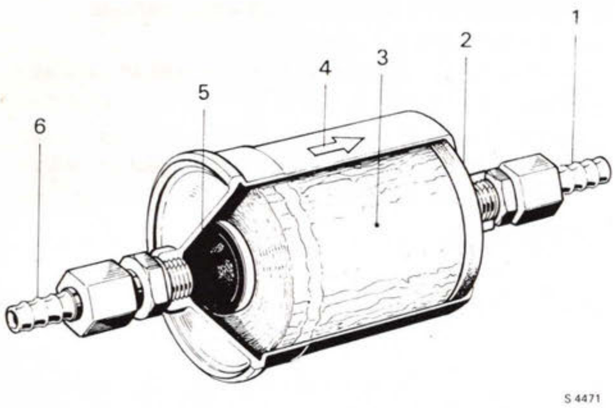
Rest pressure

FUEL FILTER

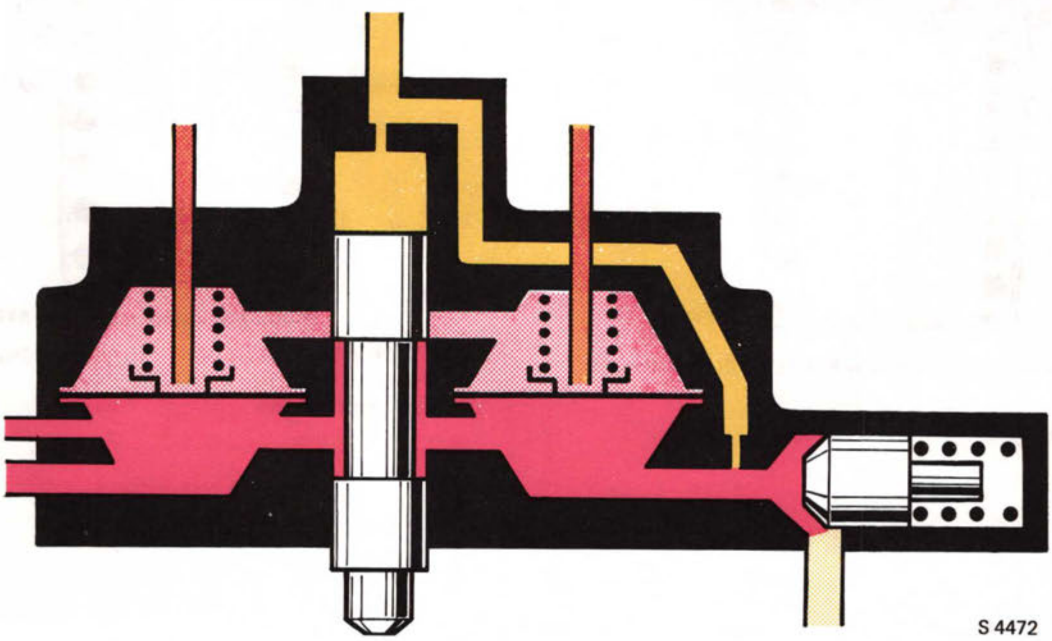
The fuel filter is fitted to the circuit between the fuel accumulator and the fuel distributor. The filter has a paper element and a nylon strainer.

FUEL DISTRIBUTOR

The fuel distributor distributes the fuel to the injection valves. The fuel distributor consists of a fuel control unit and four pressure regulating valves, one for each cylinder.

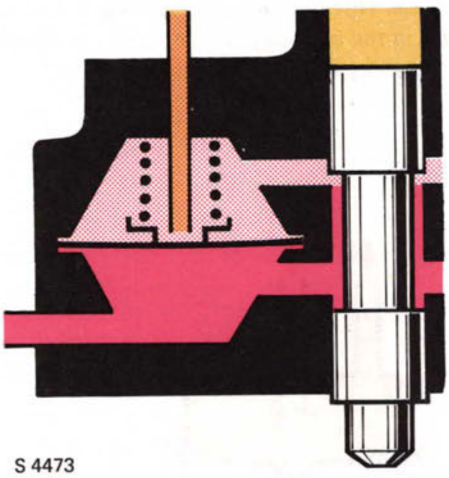


FUEL FILTER
1. Outlet
2. Nylon strainer
3. Paper element
4. Arrow, marking the cross flow direction
5. Rubber cone
6. Inlet



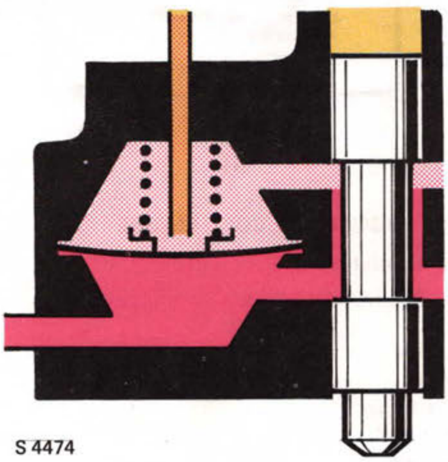
FUEL DISTRIBUTOR
- Line pressure
- Line pressure –0.1 bar (1.4 psi)
- Injection pressure
- Control pressure
- Return, no pressure

The skirt of the control plunger is in continuous contact with the line pressure which also acts on the bottom of the pressure regulating valve. When the control plunger is raised by the lever from the air flow sensor plate, four metering slots (one for each cylinder), which feed the fuel to the top of the pressure regulating valve, will be opened. The pressure above the spring-loaded diaphragm acts on the latter, deflecting it downwards and opening the outlet to the injection valve. A pressure differential of 0.1 bar (kp/cm^2, 1.4 psi) is maintained between the line pressure and the pressure above the diaphragm. This constant pressure differential is required to ensure that the injected quantity of fuel always remains proportional to the open area of the metering slots and that this is the same for all four cylinders.



S 4473

PRESSURE REGULATING VALVE, PARTIAL LOAD



S 4474

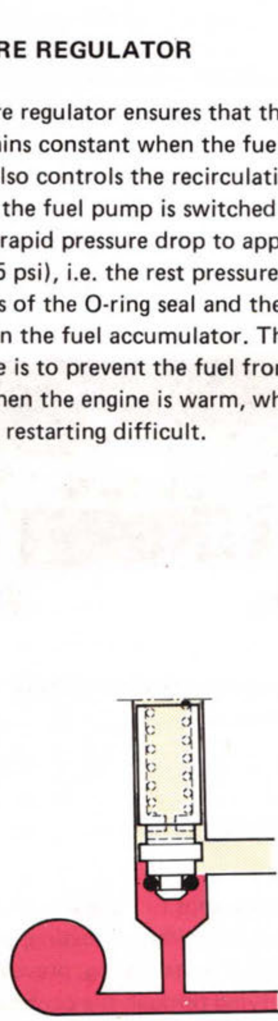
PRESSURE REGULATING VALVE, FULL LOAD

Line pressure
Line pressure –0.1 bar (1.4 psi)
Injection pressure
Control pressure

The fuel distributor also contains a line pressure regulator, passages for the control pressure, and fuel inlets and outlets.

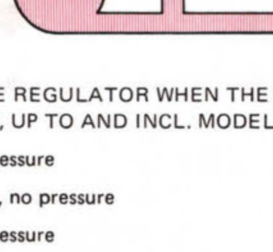
LINE PRESSURE REGULATOR

The line pressure regulator ensures that the pressure in the circuit remains constant when the fuel pump is in operation and also controls the recirculation of fuel to the tank. When the fuel pump is switched off, the regulator will cause a rapid pressure drop to approximately 2.5 bar (kp/cm^2, 35 psi), i.e. the rest pressure, which is maintained by means of the O-ring seal and the quantity of fuel contained in the fuel accumulator. The purpose of the rest pressure is to prevent the fuel from vaporizing in the circuit when the engine is warm, which would otherwise make restarting difficult.



S 7372

LINE PRESSURE REGULATOR WHEN THE FUEL PUMP IS WORKING, UP TO AND INCL. MODEL 1977

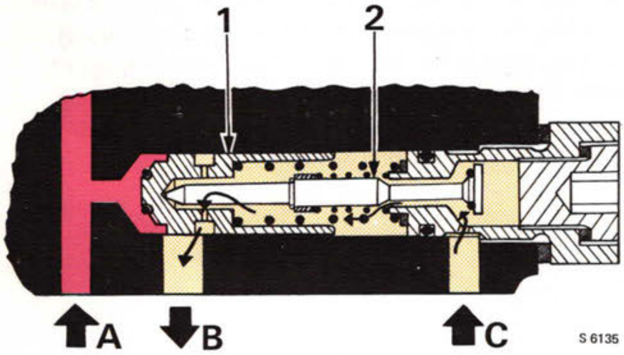


S 7373

LINE PRESSURE REGULATOR WHEN THE ENGINE IS SWITCHED OFF, UP TO AND INCL. MODEL 1977

Line pressure
Return, no pressure
Rest pressure

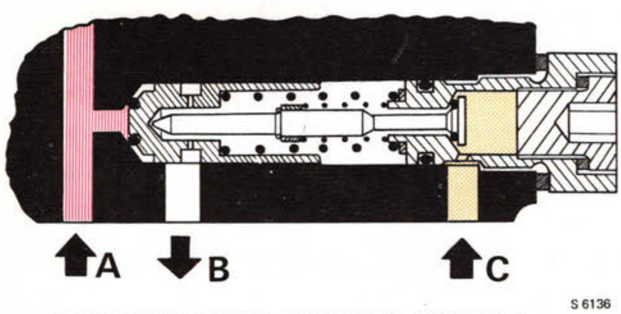
As from model 1978, the line pressure regulator forms an integral unit with a shut-off valve to which the return fuel line from the control pressure regulator is connected. When the fuel pump is operating, the shut-off valve is actuated mechanically by the control pressure regulator, whereupon the return fuel from the control pressure regulator, whereupon the return fuel from the control pressure regulator by-passes the shut-off valve to the return line.



LINE PRESSURE REGULATOR, FUEL PUMP OPERATING

1. Line pressure regulator
2. Shut-off valve
A. Line pressure
B. Return line
C. Control pressure return

When the fuel pump stops running and the line pressure regulator valve is pressed into its seating, the shut-off valve is also pressed into its seating, preventing the fuel system from emptying through the control pressure return.

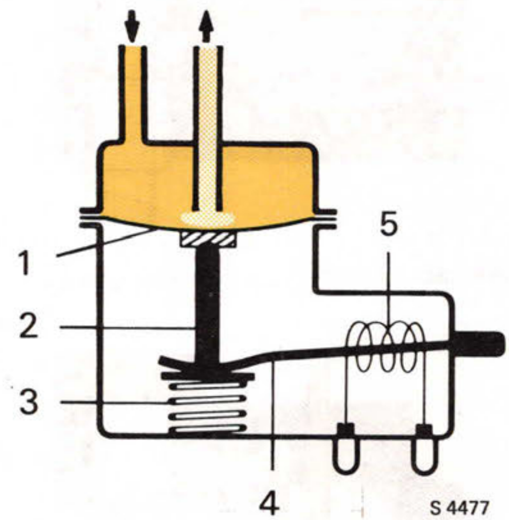


LINE PRESSURE REGULATOR, FUEL PUMP IDLE

A. Line pressure
B. Return line
C. Control pressure return

WARM-UP REGULATOR

When the engine is warm, the warm-up regulator maintains a constant control pressure above the control plunger. When the engine is cold and requires a richer fuel/air mixture, the control pressure is decreased, allowing the control plunger in the fuel distributor to rise, and more fuel to flow to the injection valve.
The warm-up regulator consists of a spring-loaded diaphragm valve.
When the engine is cold, a bi-metal strip reduces the spring load of the diaphragm. This causes the diaphragm to open and more fuel to flow through the recirculation line to the fuel tank, thus lowering the control pressure. When the engine is running, current flows through the coil which surrounds the bi-metal strip. As the bi-metal strip heats up, it will bend away from the spring, and the pressure on the diaphragm, and thus the control pressure, will increase. When a warm engine is started, there is no reduction in the control pressure, as the bi-metal strip is then affected by the engine temperature.

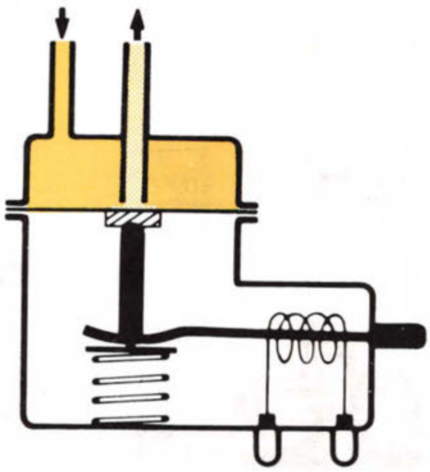


WARM-UP REGULATOR, COLD ENGINE

Control pressure

Return, no pressure

1. Diaphragm
2. Push rod
3. Pressure spring
4. Bi-metal strip
5. Heating coil



S 4478

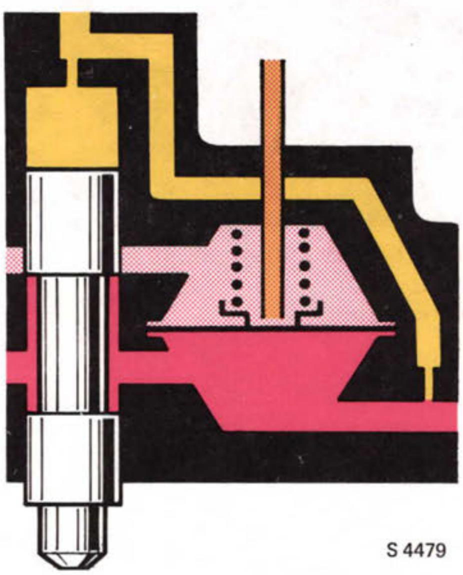
WARM-UP REGULATOR, WARM ENGINE

Control pressure

Return, no pressure

CONTROL PRESSURE REGULATION

Some of the fuel from the fuel distributor is diverted via a restriction. The control pressure is reduced to 3.7 bar (kp/cm^2, 52.5 psi) in the control pressure regulator or to 0.5–3.7 bar (kp/cm^2, 7–52.5 psi) during the warm-up period. A further restriction is located between the control pressure passage and the top of the control plunger, and this is designed to eliminate any fluctuations which may occur in the air flow sensor lever.



S 4479

CONTROL PRESSURE REGULATION

Line pressure

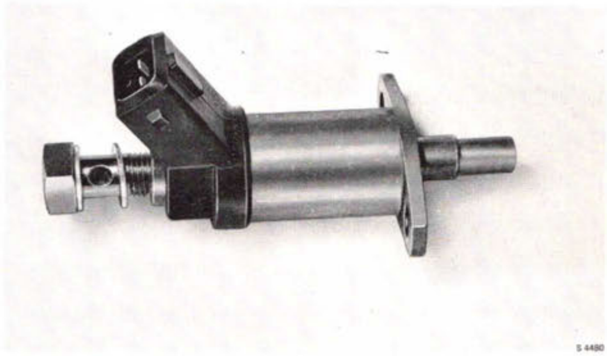
Line pressure –0.1 bar (1.4 psi)

Injection pressure

Control pressure

COLD START VALVE

The cold start valve is mounted in the throttle valve housing and is connected to the line pressure. The valve, which is operated by a solenoid coil, is actuated by a thermo-time switch which is controlled by the engine temperature. The cold start valve only injects fuel when the starter motor is running. At temperatures lower than –4°F (–20°C), the valve can inject fuel for a maximum of 8 seconds (9.5 seconds in later versions). At temperatures higher than –4°F (–20°C), the injection time is gradually reduced up to a temperature of approx. 95°F (35°C) at which temperature the valve is no longer actuated (up to approx. 113°F (45°C) on later versions).

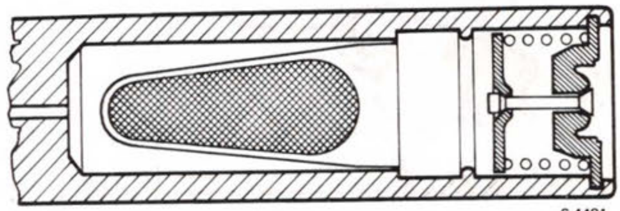


S 4480

COLD START VALVE

INJECTION VALVES

The injection valves are mounted in the inlet manifold at the cylinder head, and continuously inject atomised fuel upstream of the inlet valves.
A spring-loaded valve is contained in each injector and these open at a fuel pressure of 3.3 bar (kp/cm^2, 47 psi). The valves also contain a small fuel filter.



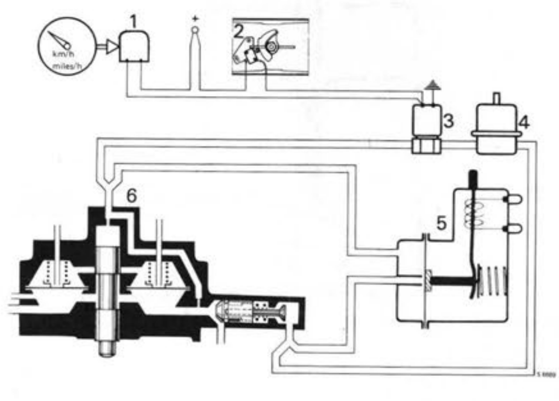
S 4481

INJECTION VALVE

FUEL BOOSTING SYSTEM, 1979 MODEL

Checking the fuel-boosting function, turbo 1979 model

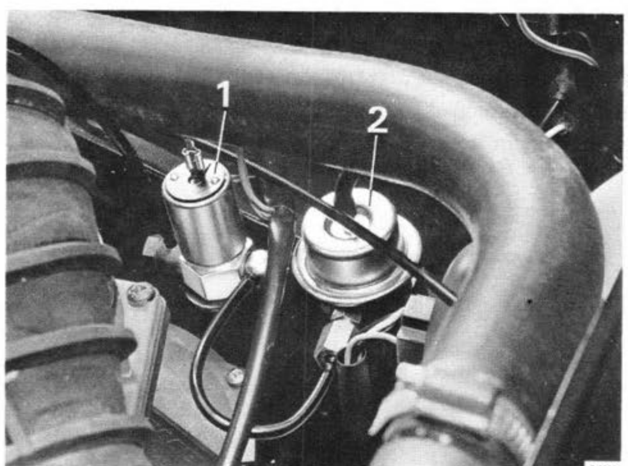
Turbocharged engines are equipped with a special device to provide the necessary boost in the fuel supply to the engine under heavy loads and to improve the cooling of the engine when running at sustained high speeds.
The device consists of a solenoid valve and a pressure regulator. The valve and pressure regulator are connected in parallel with the control pressure regulator in the control pressure system.



DEVICE FOR FUEL BOOSTING

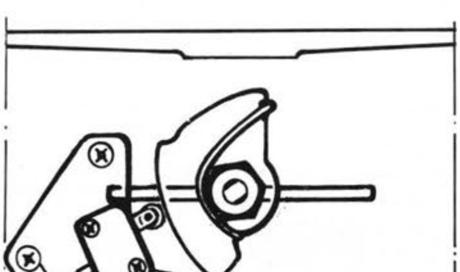
1. Speed transmitter
2. Throttle valve switch
3. Solenoid (valve)
4. Pressure regulator
5. Control pressure regulator
6. Fuel distributor

The pressure regulator is preset to a pressure approximately 1 bar lower than that of the control pressure regulator (warm engine), which means that the control pressure will drop from about 52.6 psi (3.7 bar) to about 38.4 psi (2.7 bar) when the solenoid valve opens. This pressure drop raises the position of the control plunger, which, in turn, implies a boost in the fuel supply to the engine. The solenoid valve is energised either by a switch at the throttle valve which makes the circuit when the throttle opening is greater than about 144^{o}F (62^{o}C), or by means of a transmitter which is connected to the speedometer cable and which closes the circuit at speeds in excess of about 80.0 mph (130 km/h).



SOLENOID SWITCH AND PRESSURE REGULATOR

1. Solenoid
2. Pressure regulator

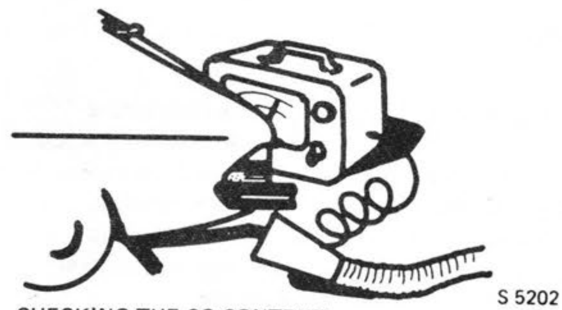


S 5738

VALVE SWITCH

Checking the fuel-boosting function, turbo

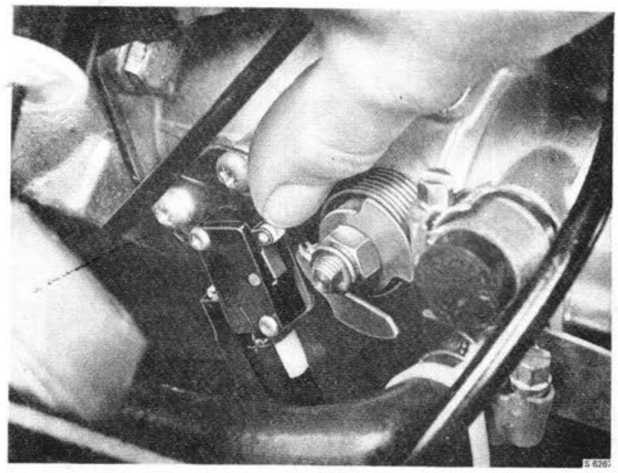
A. Checking the throttle valve switch, solenoid valve and pressure regulator should be carried out in conjunction with measuring of the CO emission as follows:
   1. Run the engine until hot, connect the CO meter and check that the CO content in the exhaust gases is as specified (1.5 ± 0.5 %)



S 5202

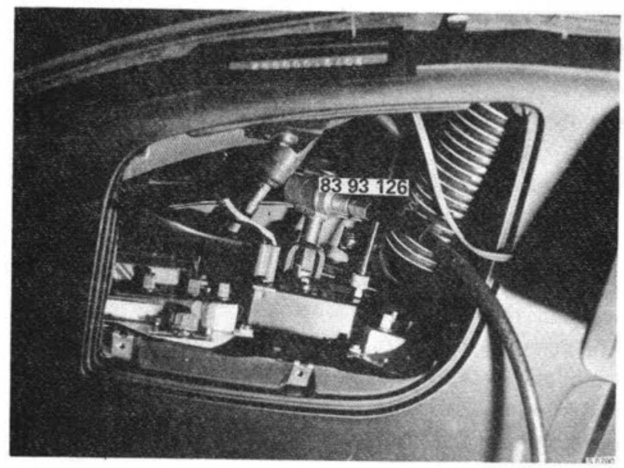
CHECKING THE CO CONTENT

   2. Press in the actuating arm on the throttle valve switch and keep it depressed. The CO value should now increase to about 4–6% CO.
   3. Release the actuating arm and check that the CO value is 1.5 ± 0.5 %.



THE THROTTLE VALVE SCHWITCH ARM IS ACTUATED

B. Checking of the speed transmitter should be carried out in conjunction with checking of the CO setting as follows. 1979 model.
   1. Run the engine until it is warm, connect a CO meter and check that the CO value in the exhaust gases is within the prescribed limits (1.5 ± 0.5% CO).
   2. Disconnect the cable from the front of the speed transmitter and connect drive cable 83 93 126 to the speed transmitter.
   3. Connect a variable-speed portable drill to the other end of the drive cable. By means of the drill, set the cable rotating and observe the reading on the speedometer. At speeds in excess of 80 ± 3 mph (130 ± 5 km/h), the CO value should increase to approximately 4–6% CO.

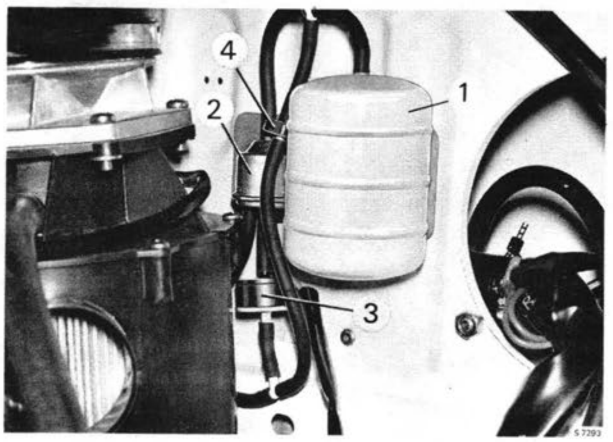


N.B.
Drive cable 83 93 126, is equipped with an angle drive unit which causes rotation in the reverse direction in order to produce a reading on the speedometer.

FUEL BOOSTING SYSTEM, TURBO MODELS 1980–

General

The fuel boosting device serves a double function: it assists in the internal cooling of the engine when it is subjected to sustained periods of high load and it also provides the extra fuel required for rapid acceleration. Fuel enrichment is achieved using a special warm-up regulator/boost control which is regulated by the compressor pressure through a control system.



FUEL BOOSTING SYSTEM

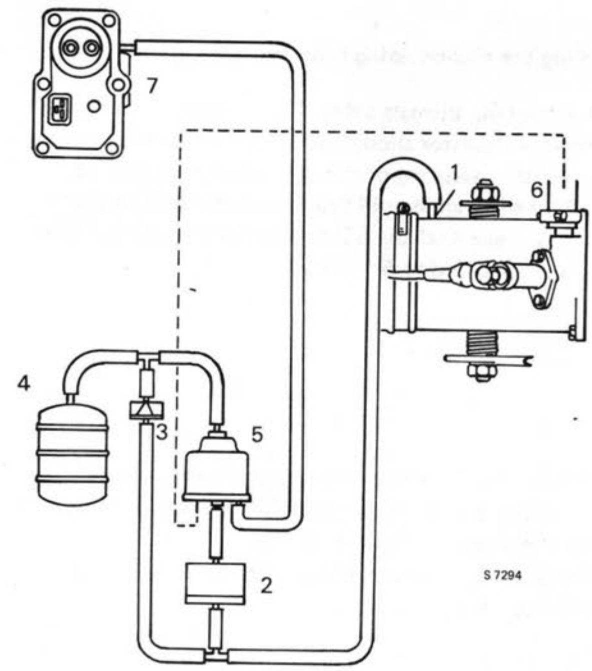
1. Pressure tank
2. Electric control valve
3. Delay valve (6 s)
4. Non return valve

The control system has the following two functions:

I. High load (partially-opened throttle)

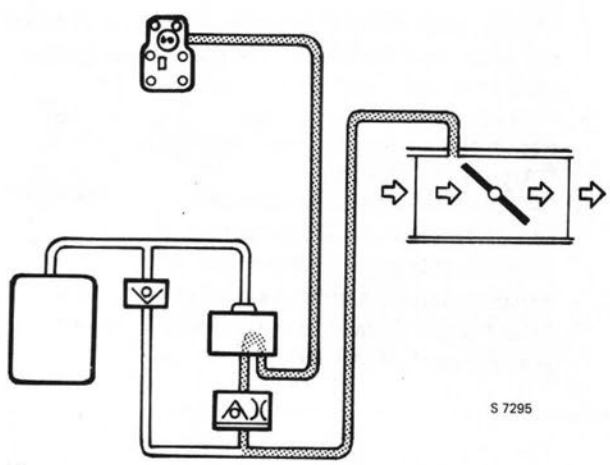
Pressurized air from the compressor passes via the delay valve through the electrical control valve which is its normal position passes the pressurized air on to the warm-up regulator/boost control.

The delay valve ensures that the fuel boosting system is not activated for temporary increases in load which would otherwise result in an unnecessarily high petrol consumption and unwarranted hydrocarbon emission.



The control system consists of:

1. Pressure outlet in the throttle housing (before the butterfly)
2. Delay valve (6 sec.)
3. Non-return valve
4. Pressure tank
5. Electrical control valve
6. Throttle valve switch (62° throttle opening)
7. Warm-up regulator/boost control

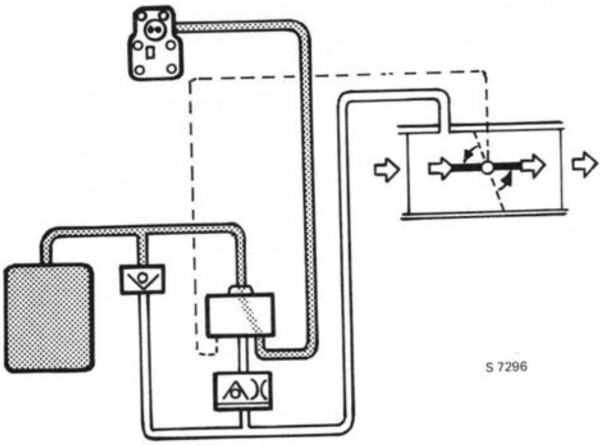


SAAB

II. Wide-open throttle

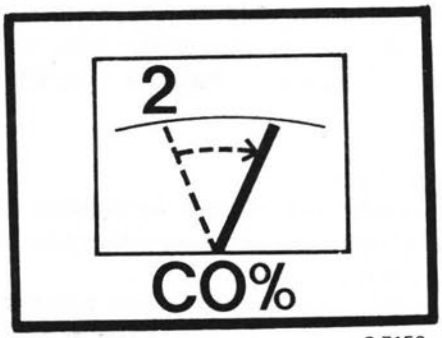
The pressure tank is connected to the compressor via a non-return valve which enables it to retain pressurized air for a long period.

When the throttle is wide open the throttle valve switch activates the electrical control valve, the residual pressurized air providing an immediate boost.



S 7296

In addition to the ordinary steel diaphragm valve the warm-up regulator/boost control has a rubber diaphragm which is activated by the boost from the compressor. The spring pressure of the steel diaphragm is reduced at approx. 0.4 bar charging pressure, thereby reducing the boost.

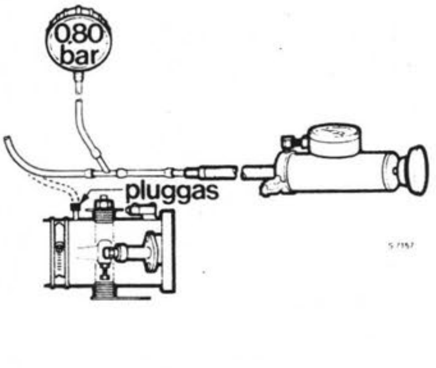


S 7156

Checking the operation of the fuel boosting device Turbo M80– (to be included in the 15,000 km (10,000 m) service

A. High load (partially-opened throttle)

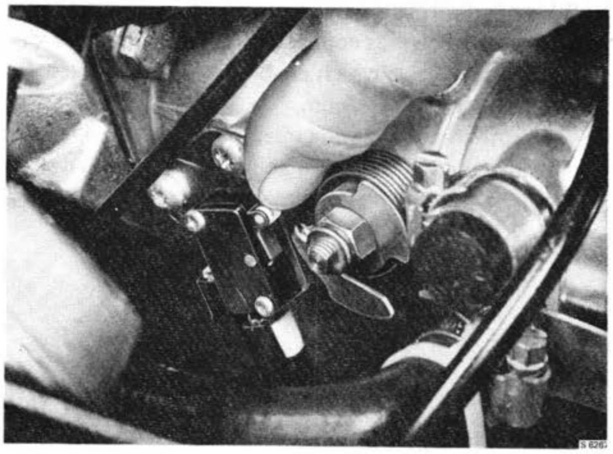
1. Run the engine at idling speed with the CO meter attached (engine warmed up)
2. Remove the pressure hose from the butterfly housing and connect meter 8392813 (pressure gauge for checking charging pressure) and a cooling system tester to the hose. Seal off the connection on the butterfly housing.



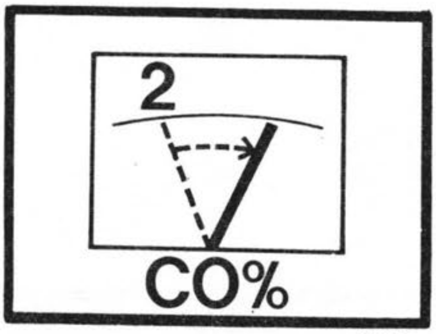
3. Increase the pressure to 0.80 bar (due to the presence of the delay valve the pressure should only be recorded once the level has stabilized).
4. Check that the CO reading has increased to 4–6 % approx.

B. Wide-open throttle

5. Remove the pump and note that the CO reading returns to the original figure recorded.
6. Depress the lever on the throttle valve switch.



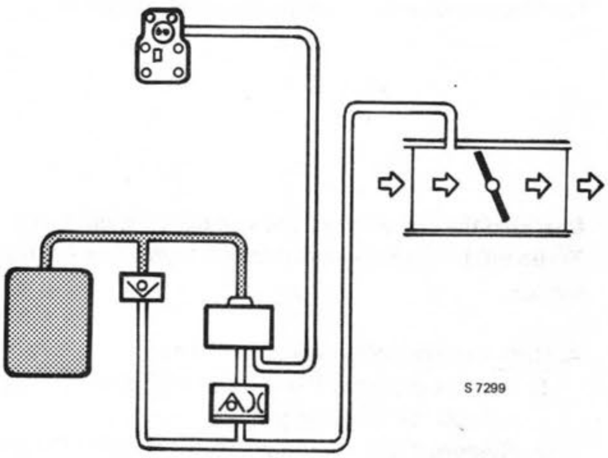
7. Check that the CO reading increases to 4–6 % approx.



S 7156

Residual pressure

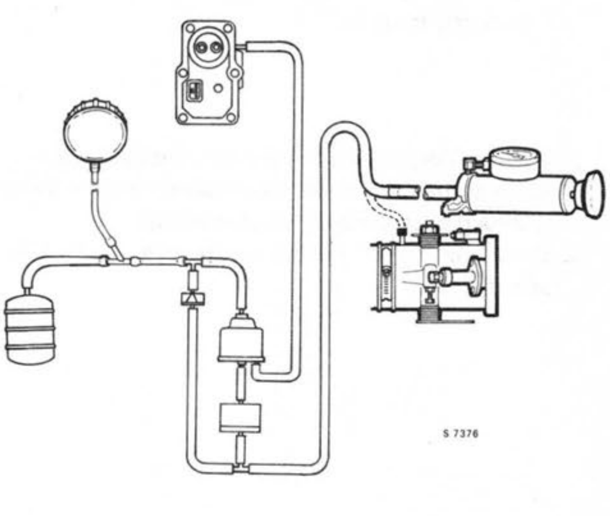
It is essential that the pressure tank and connections are completely air-tight in order that the fuel boost required in the initial stages of acceleration can be provided. Failure here means that fuel enrichment can first be achieved only once the charging pressure has reached a sufficiently high level.



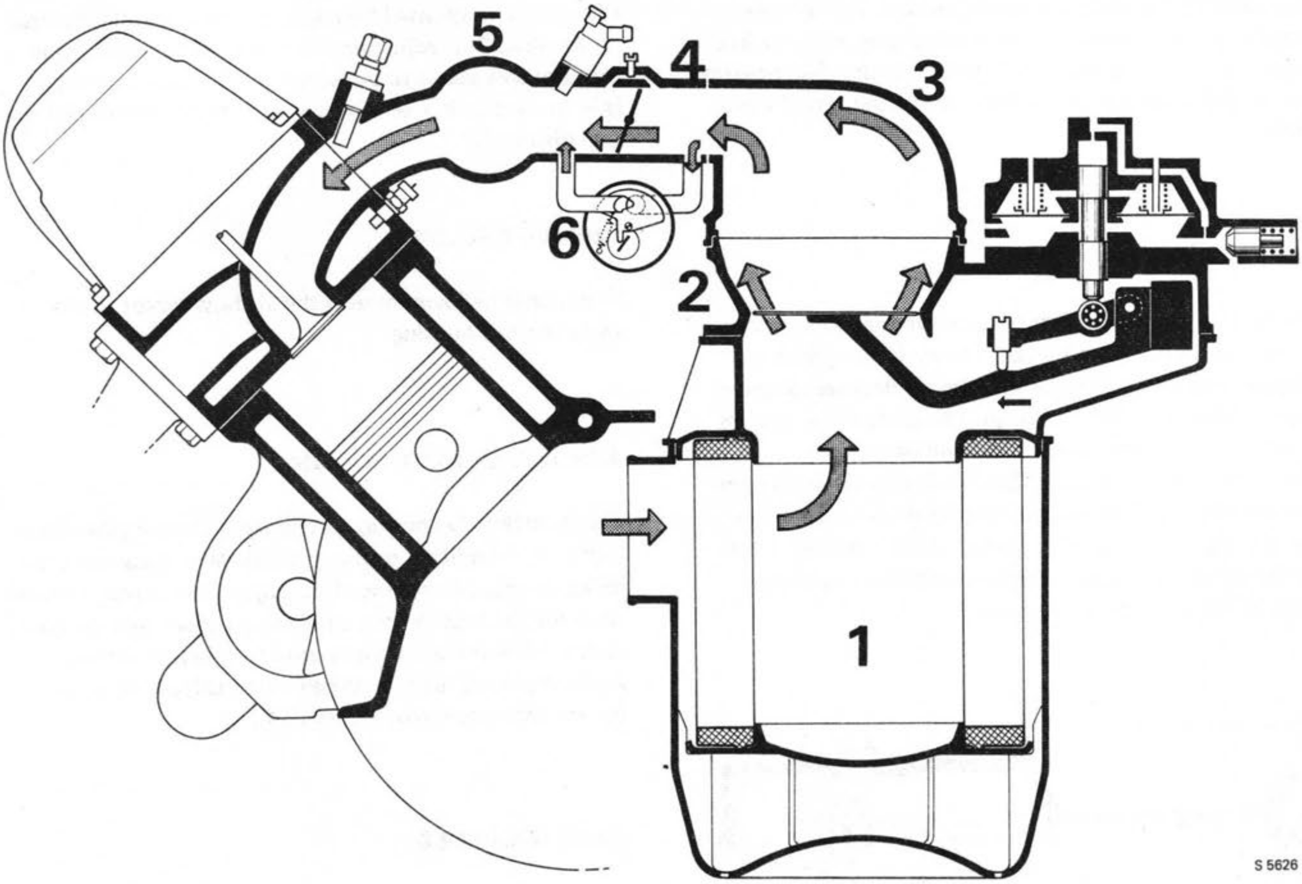
S 7299

Checking residual pressure

1. Connect pressure gauge 8392813 (for checking the charging pressure) between the non-return valve and the pressure tank.
2. Connect a cooling system tester in front of the non-return valve and increase the pressure to 0.8 bar.
3. Check that the pressure has not dropped below 0.6 bar after 5 min.



S 7376



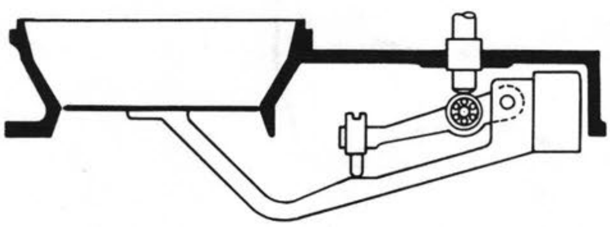
AIR SYSTEM
1. Air cleaner
2. Air flow sensor
3. Rubber bellows
4. Throttle valve housing
5. Inlet manifold
6. Auxiliary air valve

AIR CLEANER

The air cleaner is fitted to a bracket mounted on the front part of the left-hand wheel housing. The air cleaner contains a paper cartridge. The air flows through the inlet pipe into the air cleaner, through the air filter and upwards to the air flow sensor which is bolted to the top of the air cleaner.

AIR FLOW SENSOR

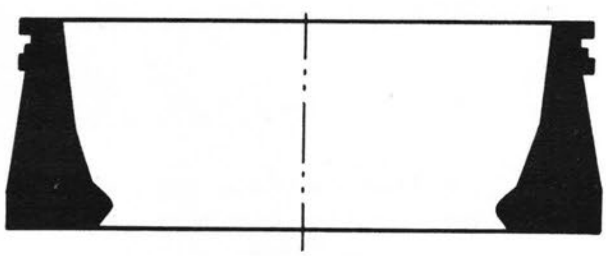
The air flow sensor consists of an air venturi tube in which an air flow sensor plate moves. The air flowing into the venturi from the air cleaner lifts the air flow sensor plate, allowing the air to flow through. The greater the amount of air, the higher the sensor plate will be raised.
The air flow sensor plate is fitted to a lever which is compensated by a counterweight. The lever acts on the control plunger in the fuel distributor which is pressed down by the control pressure, thus counteracting the lifting force of the air flow sensor plate.



S 4483

AIR FLOW SENSOR

The height to which the air flow sensor plate is raised is governed by the magnitude of the air flow.
The air/fuel mixture varies with the load. The inclination of the venturi walls therefore varies in stages in order to provide a correct fuel/air mixture at all loads. Thus, the mixture is enriched at full load.



S 4484

THE AIR VENTURI OF THE AIR FLOW SENSOR

The lever acts on the control plunger in the fuel distributor by means of an adjustable link with a needle bearing at the contact point. The basic fuel setting, and thus the CO setting, is adjusted by means of the adjustment screw on the link. This adjustment is made by means of a special tool and access to the screw can be gained through a hole in the air flow sensor between the air venturi and the fuel distributor.

RUBBER BELLOWS

The rubber bellows connect the air flow sensor to the throttle valve housing.

THROTTLE VALVE HOUSING

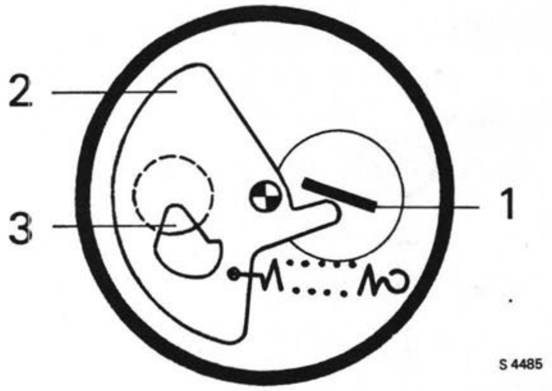
The throttle valve housing is connected to the inlet manifold and, in addition to the throttle valve, it contains the idling air passage and the idling adjustment screw, connections for the hoses to the auxiliary air valve, and the cold start valve and the vacuum outlet for ignition setting.
As from model 1976, an deceleration valve is fitted in the throttle valve (see section 254).

INLET MANIFOLD

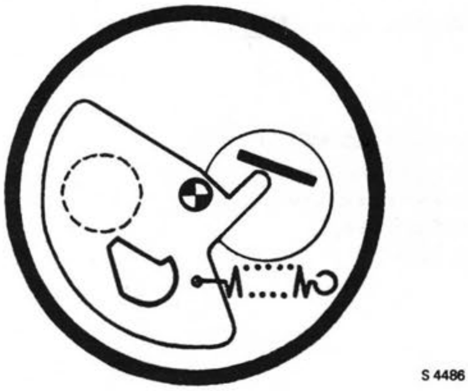
The injection valves are mounted in the inlet manifold. The valves inject the fuel into the inlet passages at the joint between the inlet manifold and the cylinder head.
A thermo-time is mounted inside the inlet manifold and this senses the temperature of the coolant in the cylinder. The manifold also contains outlets for pipes to the brake servo unit and outlets for crankcase ventilation.

AUXILIARY AIR VALVE

The function of the auxiliary air valve, together with the warm-up regulator, is to compensate for losses due to friction and condensation in the inlet manifold and combustion chamber on cold starting, so that the required idling speed will be obtained. The valve is located in a passage which by-passes the throttle valve. The air flowing through the auxiliary air valve has also flowed through the air flow sensor, so a fuel quantity is obtained which corresponds to the air flow.
The valve is actuated by a bi-metal strip which opens the valve completely when the engine is cold. When the engine is started, current flows through a coil and heats up the bi-metal strip, gradually closing the valve. When a hot engine is to be started, the engine temperature acts on the bi-metal strip and the valve remains closed.



AUXILIARY AIR VALVE, COLD ENGINE
1. Bi-metal strip with heating coil
2. Valve
3. Auxiliary air opening

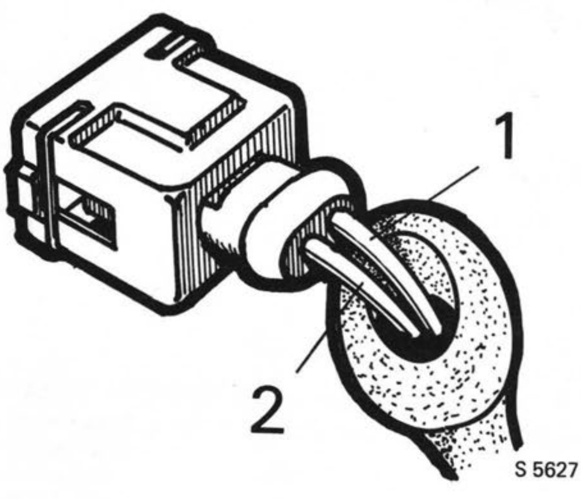


AUXILIARY AIR VALVE, WARM ENGINE

ELECTRICAL SYSTEM

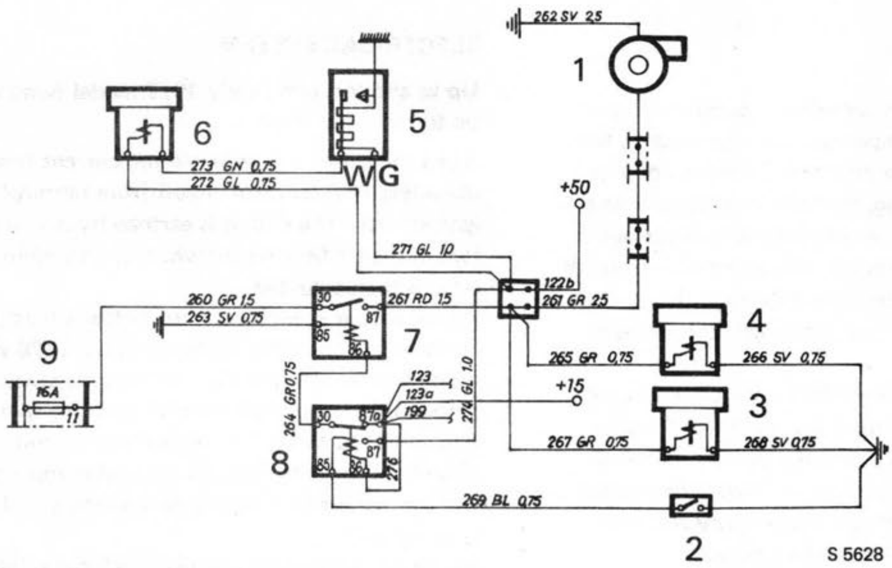
Up to and including early 1977 model (with safety switch on the air flow censor).

When the ignition is switched on, current flows through the safety relay control circuit from terminal 15 on the ignition coil. The circuit is earthed by means of the contact in the air flow sensor which is now closed. The safety relay is then actuated.
As the starter is engaged, current flows from terminal 50 to the cold start valve (as from model 1976 via terminal 16 on the starter) and the thermo-time switch, and through the safety relay contacts via the pump relay control circuit to earth. The pump relay circuit is thereby closed and current flows to the fuel pump and coils in the control pressure regulator, and the auxiliary air valve is energised.
As the air flow sensor plate is lifted, the safety relay control circuit in the air flow sensor will be de-energised. Current to the pump relay will flow via terminal 87a in the safety relay.
When the starter motor is switched off, current to the cold start valve and the thermo-time switch will be switched off.
Should the engine stop for any reason, the contact in the air flow sensor closes and the pump relay circuit is actuated. Since terminal 87 in the safety relay is dead, no current flows to the pump relay, and the pump switches off as a safety measure.

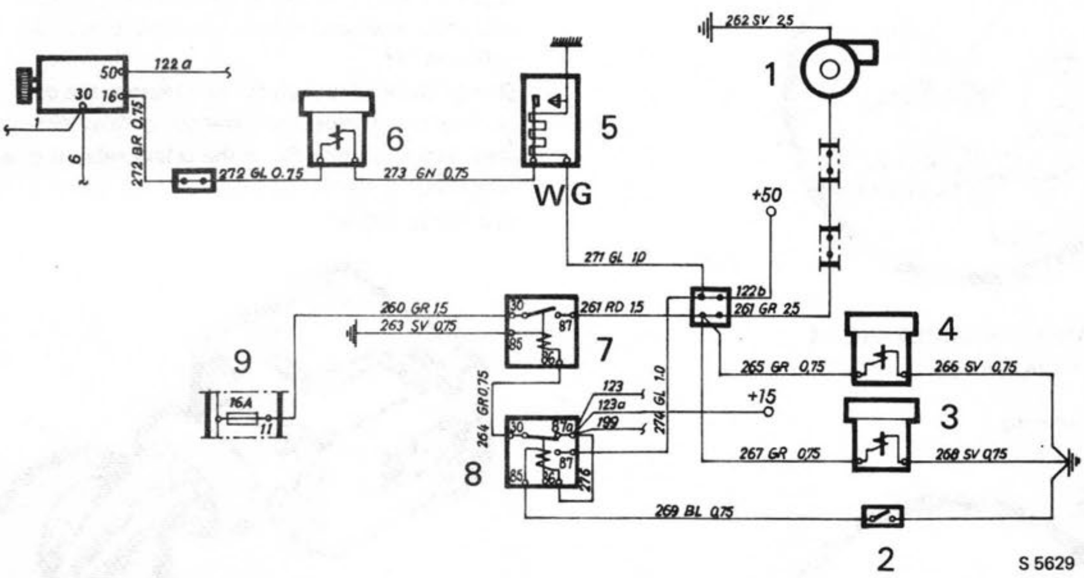


CONNECTOR, THERMO-TIME SWITCH
1. Green
2. Yellow

When the ignition is switched off and the engine stops, current will cease to flow through terminal 15 of the ignition coil and thus through the whole system.



ELECTRICAL SYSTEM, MODEL 1975

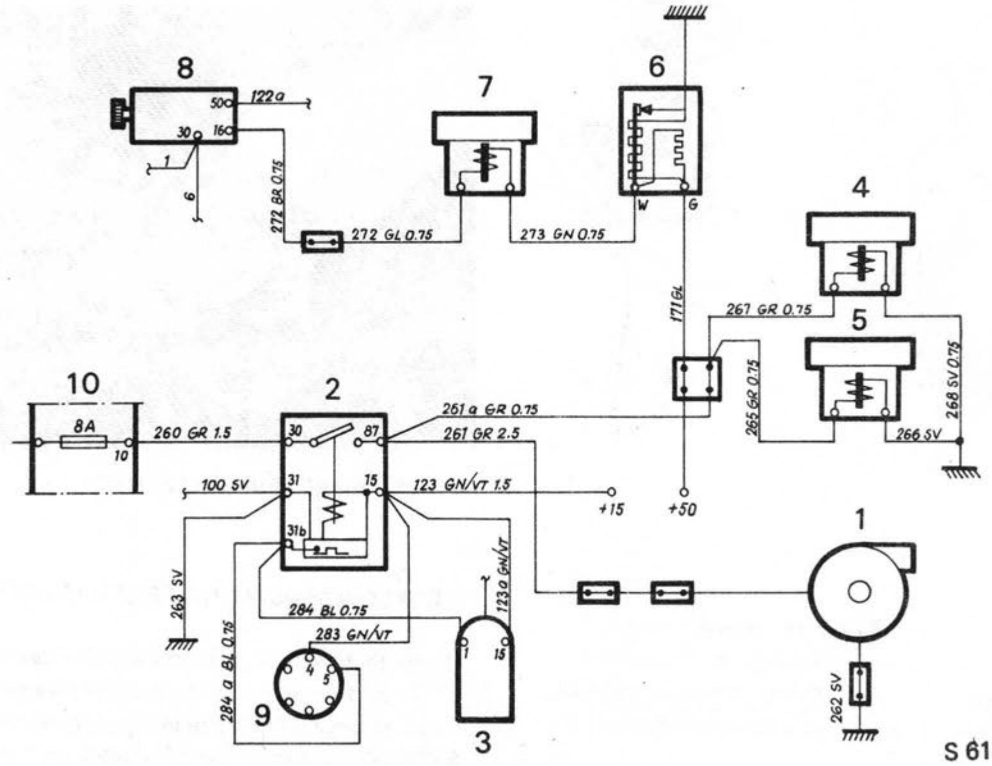


ELECTRICAL SYSTEM, MODEL 1976 UP TO EARLY MODEL 1977

1. Fuel pump
2. Contact, air flow sensor
3. Coil, warm-up regulator
4. Coil, auxiliary air valve
5. Thermo-time switch
6. Cold start valve
7. Fuel pump relay
8. Safety relay
9. Fuse

As from later 1977 model (with fuel pump relay with pulse sensor).

The safety function designed to break the circuit to the fuel pump when the engine stops consists of a pulse sensor in the pump relay which is actuated by the ignition pulses. If the ignition pulses fail to occur for a period of one second or more, the relay will break the circuit and current will cease to flow to the fuel pump and other components in the fuel system.

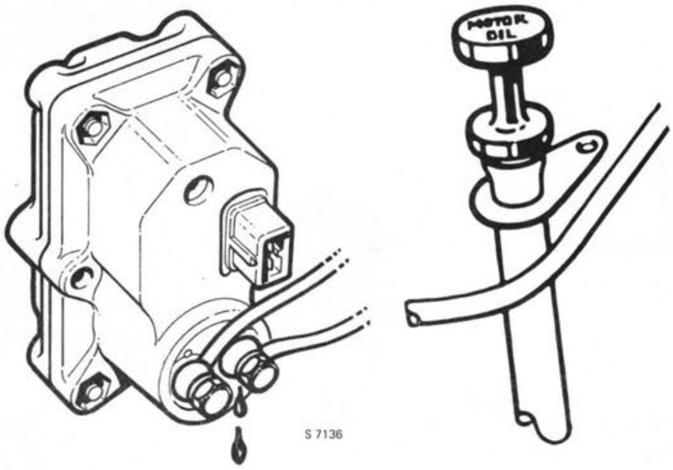


ELECTRICAL SYSTEM, AS FROM LATER 1977 MODEL

1. Fuel pump
2. Fuel pump relay with pulse sensor
3. Ignition coil
4. Heating coil, line pressure regulator
5. Heating coil, auxiliary air valve
6. Thermo-time switch
7. Cold-start valve
8. Starter motor
9. Service outlet, ignition setting (TSI)
10. Fuse

FUEL LEAKS

Check that there are no leaks at the connections and in the fuel pipes. Check around the fuel tank, in the passenger compartment and in the engine compartment.
New seals should be fitted to any leaking connections.
Damaged fuel pipes should be replaced.
Check that fuel pipes do not chafe against other objects (particularly plastic).
CONTINUOUS CHAFING against e.g. the dip stick sleeve, other fuel pipes or the throttle cable can result in damage to the fuel pipe.

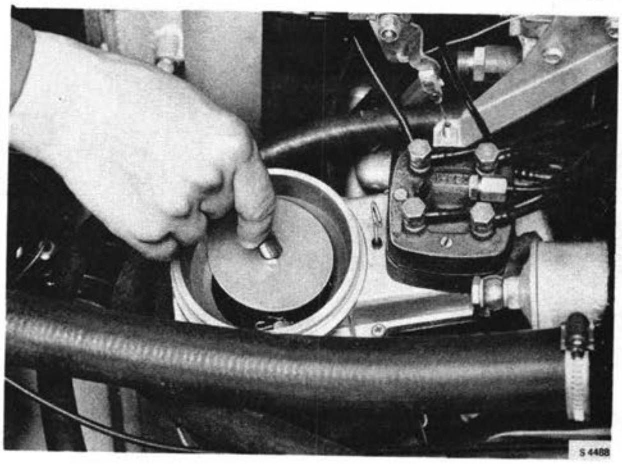


AIR LEAKAGES

Check for leakage in the inlet system between the air flow sensor and the engine. Air leaking into the system may result in poor engine performance, owing to the fact that it by-passes the air flow sensor, causing a lean mixture.
Leakage can occur in the following places:
At the rubber bellows between the air flow sensor and the throttle valve housing.
At the gasket on the flange of the cold start valve.
At the gasket between the throttle valve housing and the inlet manifold.
At the gasket between the inlet manifold and the cylinder head.
At the hose connections on the throttle valve housing, auxiliary air valve or inlet manifold.
Via the crankcase ventilation hose from the oil filler cap, dip stick or valve cover gasket.

LEVER MOUNTING

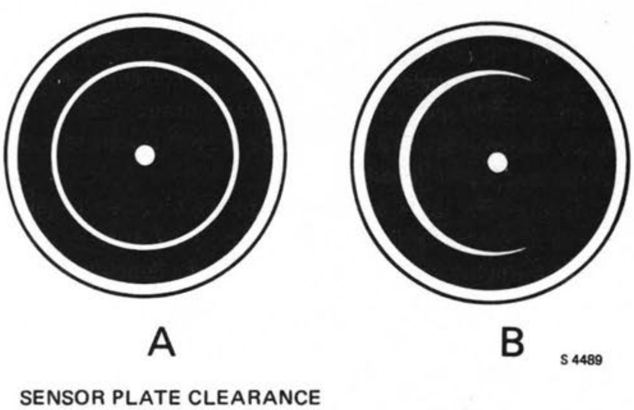
Remove the rubber bellows and check the movement of the lever in the air flow sensor. As the arm is lifted, a steady resistance should be felt as a result of the damping action of the control plunger. No resistance should be felt when the arm is suddenly pushed down and is not acting on the plunger. If the air flow sensor has not been dismantled, a pair of pliers or a magnet should be used to lift the lever. If any binding is felt, the air flow sensor must be repaired.



CHECKING THE LEVER MOUNTING

AIR FLOW SENSOR PLATE CLEARANCE

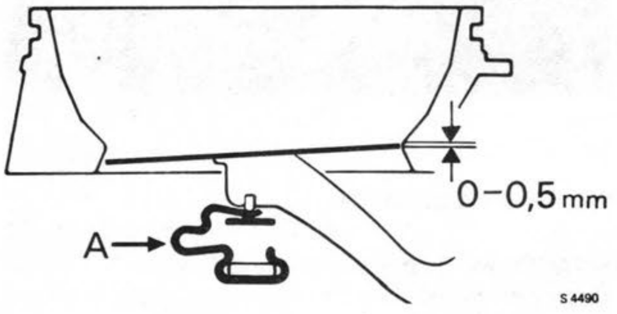
Check that there is uniform clearance between the edge of the air flow sensor plate and the air venturi. The correct clearance will be obtained automatically when tool 8392474 is used to mount the plate on the lever.



SENSOR PLATE CLEARANCE
A. Correct
B. Faulty

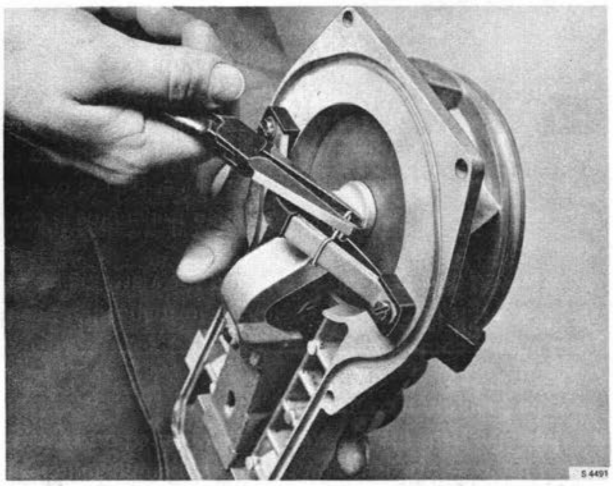
REST POSITION OF AIR FLOW SENSOR PLATE

To check the rest position of the air flow sensor plate, switch off the ignition (to switch off the fuel pump). This prevents fuel being injected into the cylinders if the sensor plate is lifted from its rest position. The top of the sensor plate should be level with the bottom edge of the air venturi. This is the highest permissible position for the sensor plate. A position slightly beneath the lower edge of the venturi (0.02"/0.5 mm max.) is permissible. The position should be checked in line with the lever.



CHECKING THE REST POSITION OF THE SENSOR PLATE

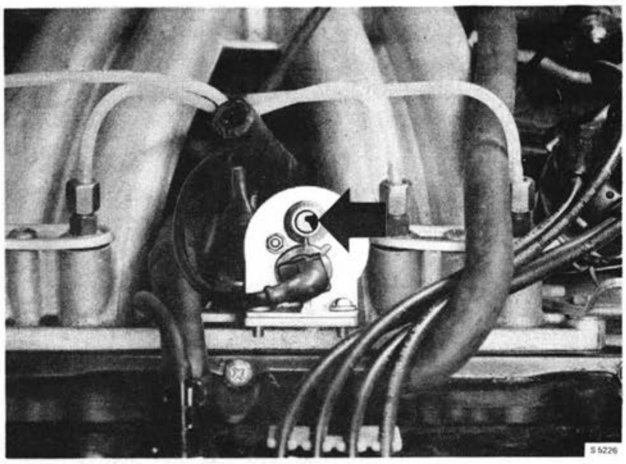
Rest position adjustment is carried out by bending the loop (A) on the wire underneath the sensor plate. The air flow sensor must first be dismantled.



ADJUSTING THE REST POSITION OF THE SENSOR PLATE

PERFORMANCE OF AUXILIARY AIR VALVE

(Checking can only be carried out when the engine is cold.) Isolate the safety circuit by disconnecting the terminal on the air flow sensor.
If the "COLD ENGINE CONTROL PRESSURE" (see below) is also to be checked, the terminals on the warm-up regulator should be disconnected to prevent the bi-metal strip from warming up.
Check by means of a torch and a mirror that there is a elliptical opening in the auxiliary air valve.



OPENING IN THE AUXILIARY AIR VALVE

Switch on the ignition. The opening should close completely after about 5 minutes.
If the auxiliary air valve does not close, check the power supply. If no fault is found, the auxiliary air valve should be replaced.

VOLTAGE ACROSS THE FUEL PUMP

Remove the round cover plate from the top of the fuel pump (located in the trunk compartment) and measure the voltage between the positive and negative terminals when the pump is operating. The lowest permissible voltage is 11.5 V. Disconnect the terminals connecting the pump to the air flow sensor and the warm-up regulator if these are to be checked later.

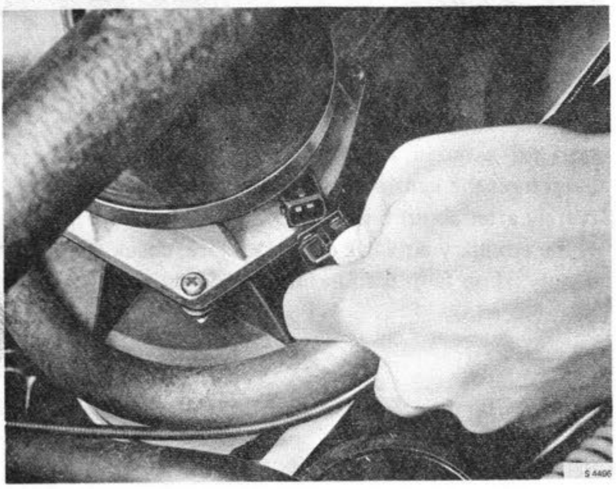
MEASURING THE VOLTAGE ACROSS THE FUEL PUMP

FUEL PUMP CAPACITY

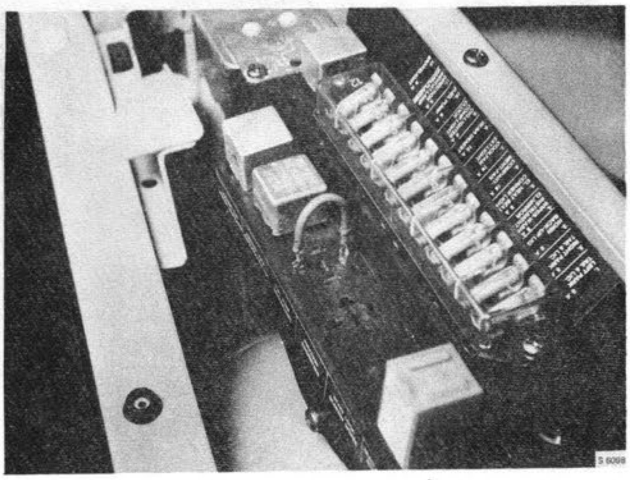
Provided that the fuel filter is not clogged and that the battery is properly charged, the pump capacity can be checked by measuring the return fuel in the following way.

Disconnect the return fuel pipe from the fuel distributor. Connect test pipe 83 93 183 to the fuel distributor and place the open end in a suitable vessel. Connect the fuel pump and allow it to run for 30 seconds as follows:

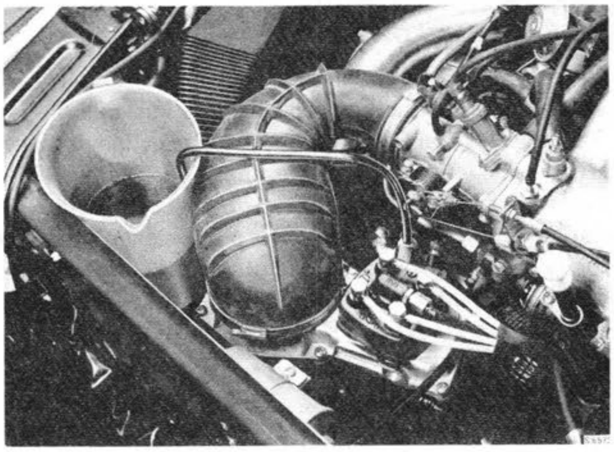
– CI system with safety switch on the air flow sensor (up to and including early 1977 model):
  Remove the switch connector from the air flow sensor.



– CI system with fuel pump relay with pulse sensor (from early 1977 model):
  Remove the fuel pump relay and connect a jump lead between terminals 15 and 87 in the relay holder.

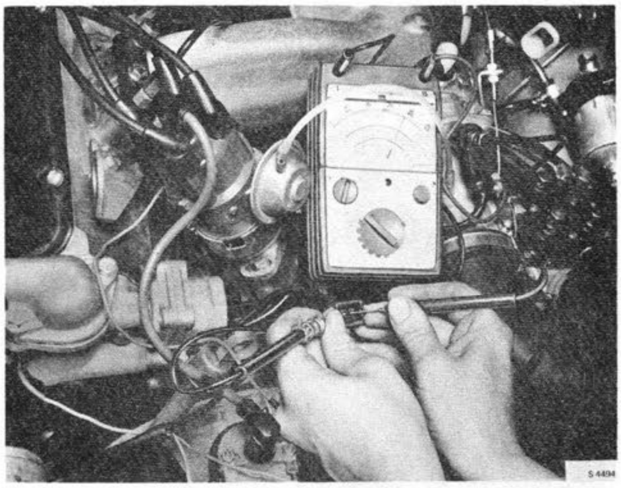


Switch on the ignition and allow the pump to run. Measure the quantity of fuel – see specification.



WARM-UP REGULATOR

Check the warm-up regulator line as follows:
Disconnect the terminal from the warm-up regulator and connect a voltmeter across the contacts in the connector. Ensure that the ignition is switched on and that the safety circuit connection at the air flow sensor has been withdrawn. The lowest permissible voltage is 11.5 V.

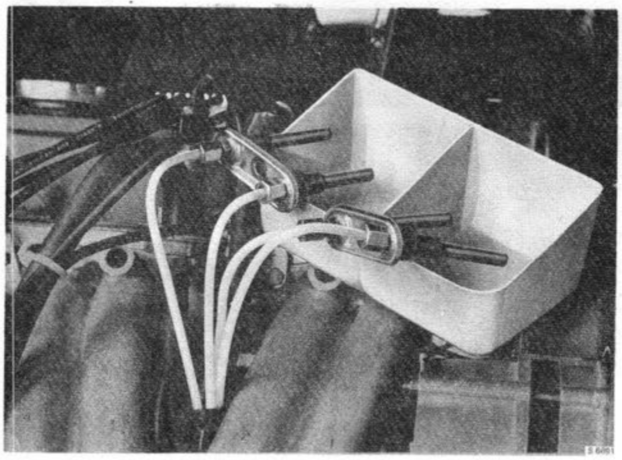


CHECKING THE WARM-UP REGULATOR LINES

Check that there are no brakes in the coil of the regulator by connecting a buzzer or test lamp in series with the coil. If the coil is found to be damaged, the warm-up regulator should be replaced.

PERFORMANCE AND TIGHTNESS OF INJECTION VALVES

The injection valves can be checked as follows:
1. Remove the rubber bellows from the air flow sensor.
2. Unscrew the injection valves from the inlet manifold and place them in a suitable container. The fuel lines should be left connected.



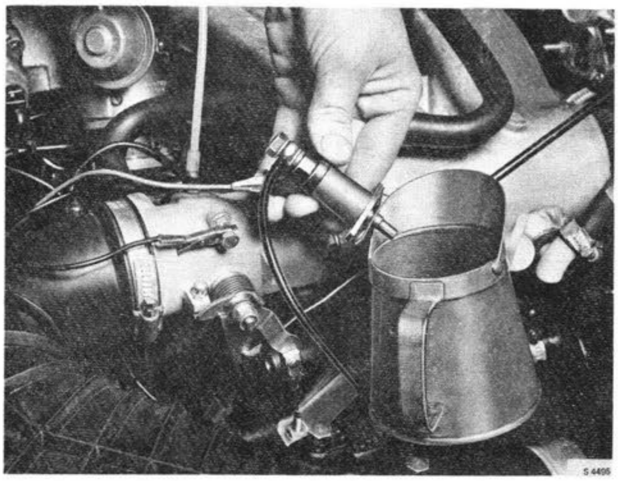
CAUTION
Due to the atomization of the fuel, there is an acute fire risk when the cold start valve is being tested.

3. Switch on the ignition and remove the plug from the air flow sensor (up to and including 1976 model) or connect a jump lead between terminals 15 and 87 in the relay holder (as from 1977 model).
4. Fuel atomization: Lift the lever in the air flow sensor and check the spray form emitted at the injection valves. If the atomization is poor, see under "Cleaning of injection valves" for further details.
5. Valve tightness: Switch off the ignition to obtain the rest pressure. Wipe dry the area around the injection valve nozzles. Lift the lever and check for leakage. It should not take less than 15 seconds for a drop to form. In the case of excessive leakage, see under "Cleaning of injection valves".

PERFORMANCE AND TIGHTNESS OF COLD START VALVE

Withdraw the plug of the cold start valve and unscrew the latter from the throttle valve housing, allowing the fuel line to remain connected.
Connect a wired plug to the cold start valve and connect the wires to the main beam terminal and body of one of the headlights.
Switch on the ignition and disconnect the electrical connection to the air flow sensor. The fuel pump is now running. Place the cold start valve in a container and have an assistant switch the headlights to main beam for a short period (30 seconds max.). Fuel should spray out of the valve during this period.
Dry the valve nozzle and let the fuel pump run for a further minute. No fuel should pass through the valve during this time.

CAUTION
Due to the atomization of the fuel, there is an acute fire risk when the cold start valve is being tested.



CHECKING THE PERFORMANCE AND TIGHTNESS OF THE COLD START VALVE

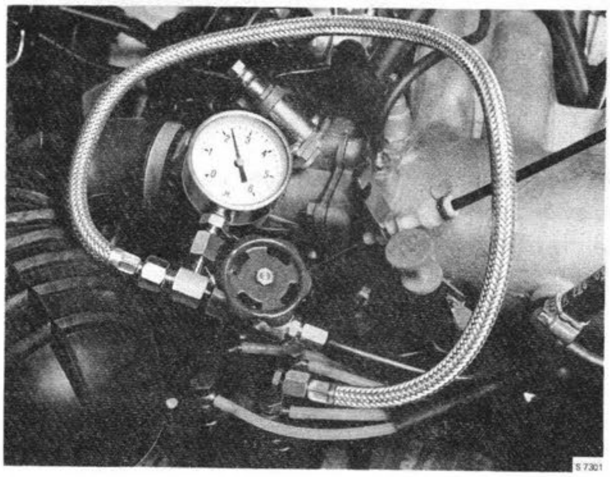
THERMO-TIME SWITCH

When the engine temperature is below approximately 113°F (+45°C), current is allowed to flow for a certain period (depending on the temperature) while the starter motor is running.
Check that the switch closes when the engine is started by means of connecting a test lamp in series across the contacts of the cold start valve plug.
It is not possible to make a more accurate check of the cut-in time or temperature. If the condition of the switch is at all in doubt, it should be replaced.

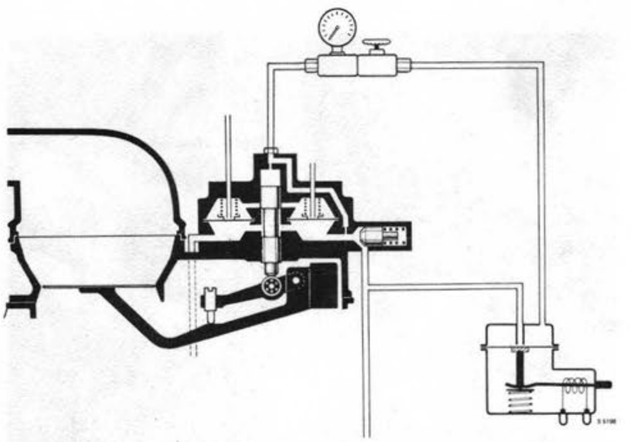
PRESSURE READING

General

Connect pressure gauge 83 92 516 as follows:
Disconnect the control pressure line from the fuel distributor and connect the pressure gauge between the fuel distributor and the line to the control pressure regulator.



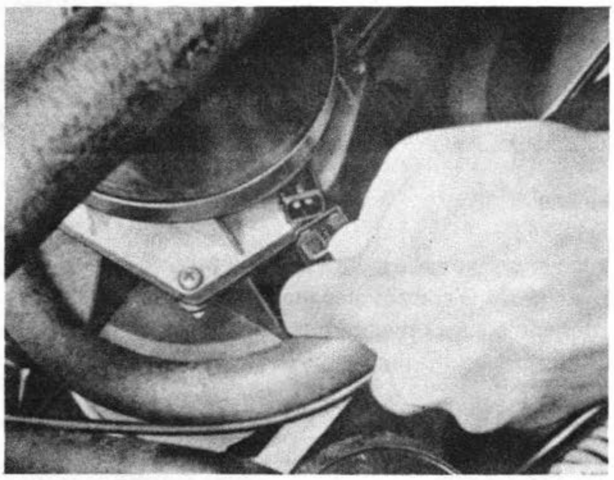
PRESSURE GAUGE



CONNECTION OF PRESSURE GAUGE

> CAUTION
> Up to early model 1977, the safety function governing the operation of the fuel pump is regulated by means of a switch on the air flow meter. As from model 1977, the safety function is governed by a pulse sensor in the pump relay which is actuated by the ignition pulses.

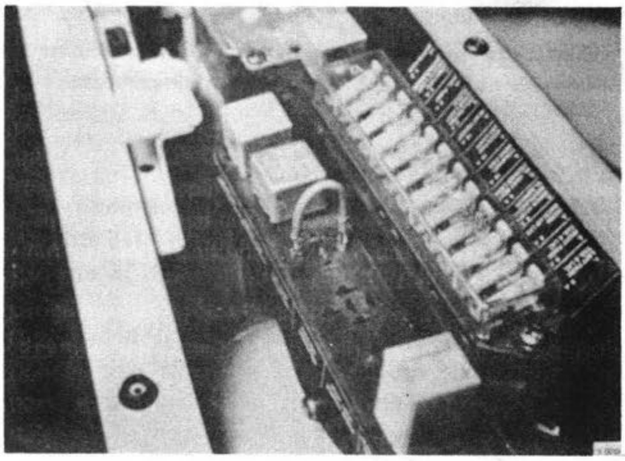
Up to early model 1977: Isolate the safety circuit by disconnecting the terminal at the air flow sensor. Thus, the fuel pump will cut in as soon as the ignition is switched on.



ISOLATING THE SAFETY CIRCUIT

As from later model 1977: Disconnect the fuel pump relay and connect a jump lead across terminals 30 and 87 in the relay holder. Thus, the fuel pump will cut in.

REMOVING THE FUEL PUMP RELAY



JUMP LEAD FITTED

Bleed the pressure gauge by repeated opening and closing of the valve with the pressure gauge directed downwards and the fuel pump connected.

Cold engine control pressure

Carry out this test if poor engine performance has been experienced during cold starting and the warming up period.
The test can only be carried out when the engine is cold. The engine should not be run for a longer period of time (e.g. overnight) before the test can be carried out, to ensure that the engine is at ambient temperature. The engine must not be run before this test.
Open the valve, disconnect the plug at the warm-up regulator and switch on the ignition.
Compare the pressure gauge reading with the recommended pressure given in the temperature/pressure graph. Refer to the test values in Group 0.
If the values should differ, replace the warm-up regulator.

Warm engine control pressure

Carry out this test when poor performance has been experienced when the engine is warm.
Open tne valve.
Connect the warm-up regulator plug.
Leave the ignition switched on until rest pressure is present.
Refer to the test values in Group 0.
If the value should differ, replace the warm-up regulator.

Line pressure

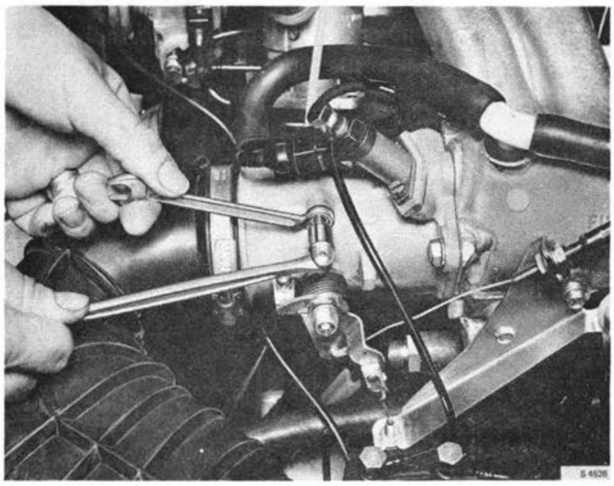
Close the valve.
Switch on the ignition.
Refer to the test values in Group 0.
If the line pressure should differ from the recommended values, this may be due to:
In the case of insufficient line pressure:
Insufficient pressure from the fuel pump
Blockage of the strainer in the tank
Leakage in the fuel line
Line pressure regulator being faulty
In the case of excessive line pressure:
Blockage of the return line
Line pressure regulator being faulty.
For adjustment of the line pressure see under "Mixture control unit, line pressure regulator".

Leakage tests on the whole system

The test should be carried out after unsatisfactory performance arising from warm-engine starting.
If the engine is cold, the bi-metal strip in the warm-up regulator must be heated and kept warm during the test.
Unplug the connector on the warm-up regulator and replace it with a plug connected directly to the battery.
Open the valve. Switch on the ignition until "warm engine control pressure" is reached, and then switch off the ignition.
Observe the pressure drop on the pressure gauge. Leakage can generally be established after 3 or 4 minutes. In cases of uncertainty, carry out the test for 20 minutes. Refer to the test values in Group 0.
If the pressure drops too rapidly, the fault can be located by conducting the test with the valve closed.
If the figures obtained from this test are correct, then the warm-up regulator (stop valve as from 1978 model) is faulty.
If the pressure drop is still excessive, the following components could be faulty:
The fuel pump
The fuel distributor
The injection valves
The cold start valve
If the O-ring of the line pressure regulator is damaged, leakage may occur. For replacement of the O-ring, see under "Mixture control unit, line pressure regulator".

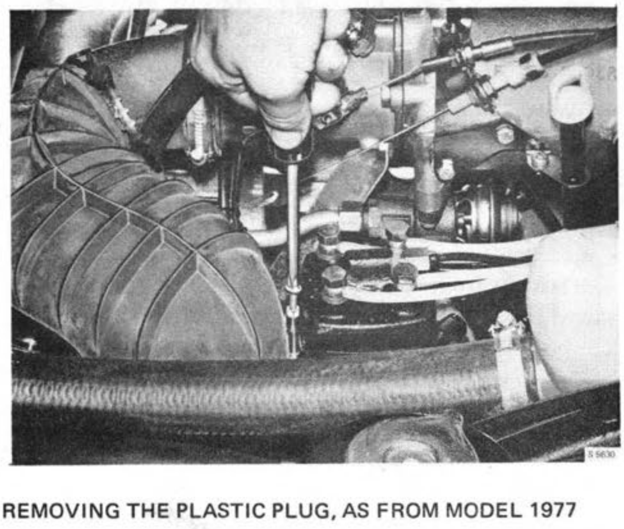
IDLING ADJUSTMENT (ENGINE SPEED AND CO VALUE)

Run the engine until it is warm and then connect the CO gauge and the tachometer.
Adjust the idling speed by means of the adjustment screw located on the by-pass passage at the throttle valve housing.



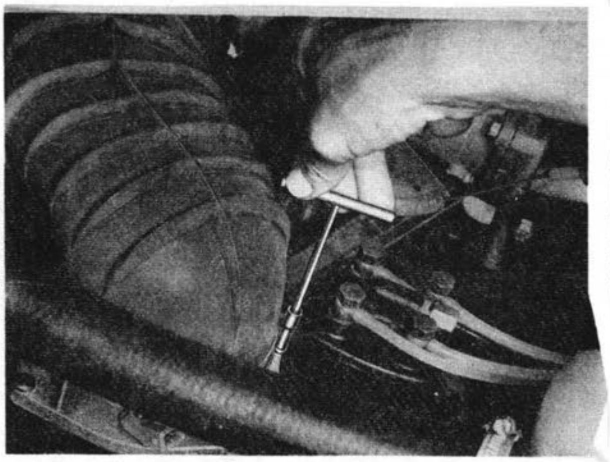
ADJUSTING THE IDLING SPEED

To adjust the CO value, remove the plug from the small hole located between the fuel distributor and the rubber bellows and insert Allen key 8392482.
As from model 1977, the plastic plug in the adjusting hole must be removed. A suitable tool can be made by brazing a 0.20 in. (5 mm) self-tapping screw onto a screwdriver. Grind a fine point on the screw and use the tool as an extractor. After completing the adjustment work, reseal the adjusting hole using a red plastic plug.



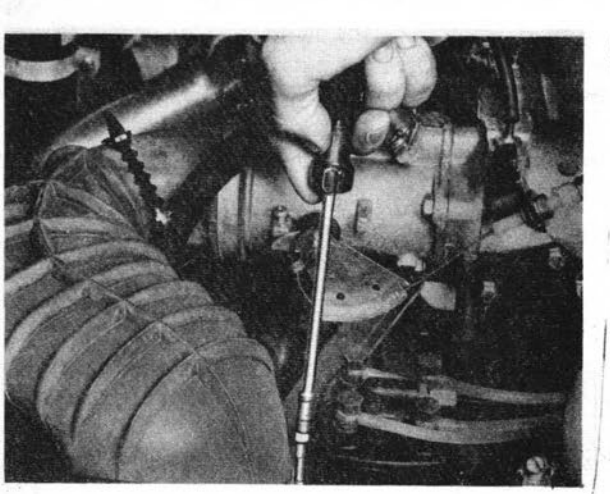
REMOVING THE PLASTIC PLUG, AS FROM MODEL 1977

Turning in a clockwise direction – richer mixture.
Turning in an anticlockwise direction – leaner mixture.



ADJUSTING THE CO-VALUE

CAUTION
Remove the Allen key from the adjustment screw after each adjustment. If the key is left in the screw and the engine revved up, the lever could be damaged.



FITTING A NEW PLASTIC PLUG

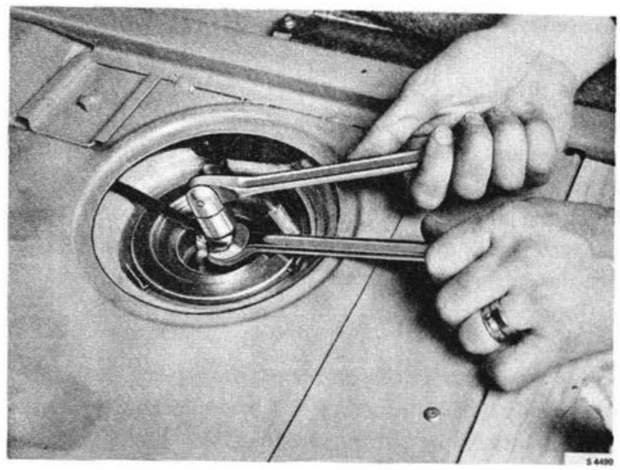
NB! As from model 1976:
If the idling speed is erratic or if difficulty is encountered in reducing the idling speed, check the setting of the overrun valve. See section 254.

Dismantling and assembly repairs and adjustments

FUEL PUMP

Removal, metal tank up to and including 1979 model

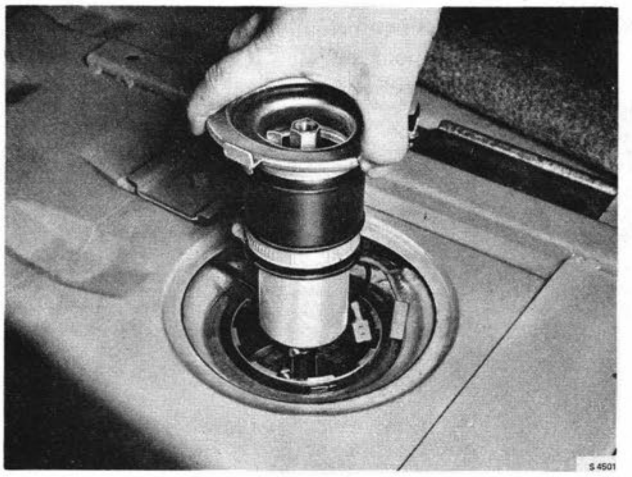
1. Disconnect the battery to prevent flashover and the risk of fire when the fuel tank has been opened.
2. Roll back the carpet in the trunk compartment (Saab 99 Combi Coupé: Remove the rear floor cover and floor panel in the luggage compartment), and remove the circular cover plate on top of the pump mounting.
3. Remove the rubber cover from the pump and disconnect the electric terminals at the pump.
4. Disconnect the fuel line from the pump. Hold the pump by means of an open-ended spanner when loosening the connection.



DISCONNECTING THE FUEL LINE

5. Using tool 8392433, turn the pump mounting anticlockwise to the nearest groove, to unlock the bayonet socket. Lift out the pump unit and save the O-ring.

TURNING THE FUEL PUMP
Tool 8392433



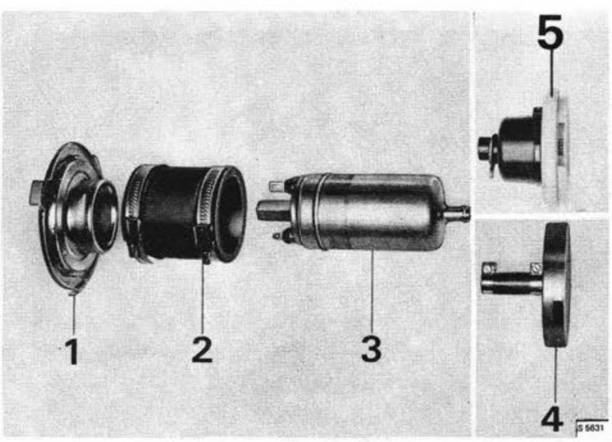
LIFTING OUT THE FUEL PUMP

NOTE
The pump can only be removed in one position, as one of the bayonet tongues are wider than the others.

6. Suitably cover the tank opening.

Dismantling, metal tank

Release the clips and remove the splash guard and pump mounting from the pump.



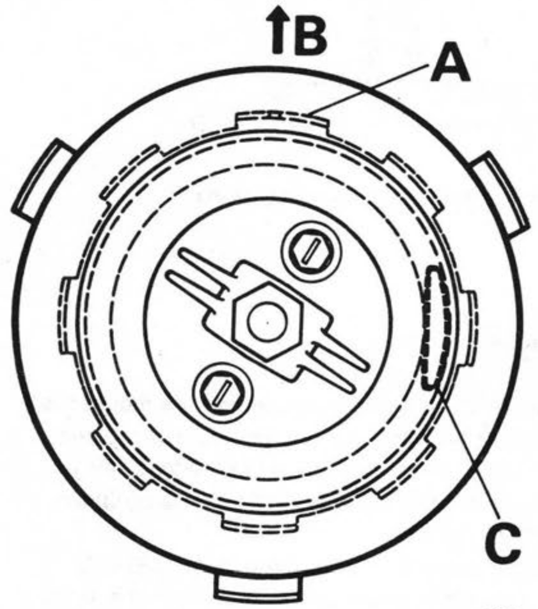
FUEL PUMP, DISMANTLED

1. Bayonet socket
2. Adapter
3. Fuel pump
4. Splash guard with suction strainer up to and incl. model 1976
5. Splash guard with suction strainer as from model 1977

Assembly, metal tank

Assemble the pump unit as shown in the figure.
Note the following:

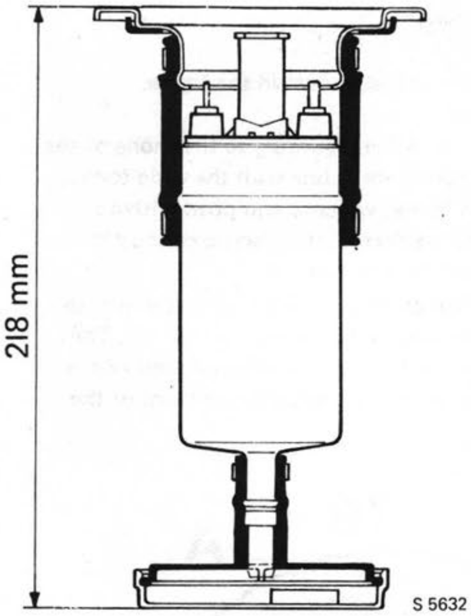
a. Rotate the pump in the mounting so that none of the electric connections are in line with the wide tongue of the bayonet socket which is equipped with a locking groove. If this is neglected, the electric connection will be in the way of the fuel line.
b. Rotate the splash guard so that the indent in it is to the right, looking towards the front of the car. The wide tongue of the bayonet socket equipped with a locking groove must point towards the front of the car.



MOUNTING POSITION OF THE SPLASH GUARD

A. Wide bayonet tongue, equipped with a locking groove
B. Driving direction of the car
C. Splash guard indent

c. The distance from the bottom of the splash guard to the top of the pump mounting should be 8.82" (218 mm).



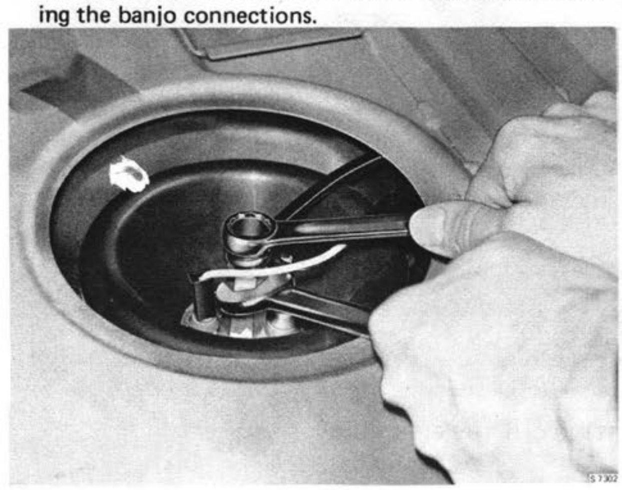
HEIGHT POSITION OF THE SPLASH GUARD

Installation, metal tank

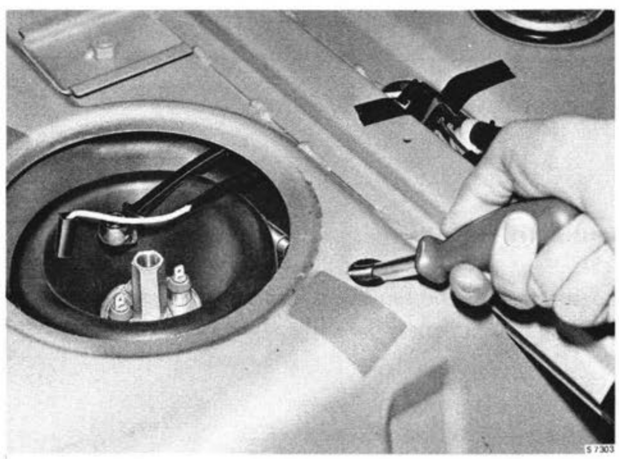
1. Place the O-ring over the tank opening and mount the pump unit. The pump unit can only be fitted in one position owing to the bayonet socket tongue being wider than the others. The wider tongue is equipped with a locking groove.
2. Tighten the pump unit by means of tool 8392433.
3. Connect the electric terminals and the fuel line to the pump and replace the rubber cover. Hold the pump by means of an open-ended spanner when tightening the connection screw.
4. Fit the cover plate for the pump opening in the floor and fit the carpet (Saab 99 Combi Coupé: Fit the floor panel and rear floor cover).
5. Connect the battery.

Removal (plastic tank 1980 model)

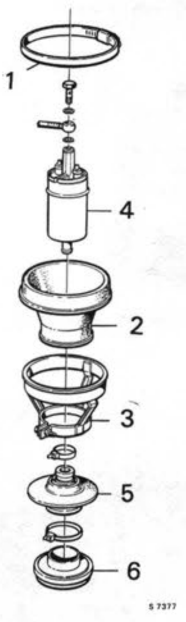
1. Disconnect the battery
2. Remove the rear floor panel in the luggage compartment and remove the valve cover from above the fuel pump.
3. Disconnect the fuel pump's electrical connections.
4. Detatch the fuel pipes from the pump. Use an open-ended spanner to hold the pump steady while loosening the banjo connections.



5. Use a jointed screw driver to undo the pump mounting clamp.



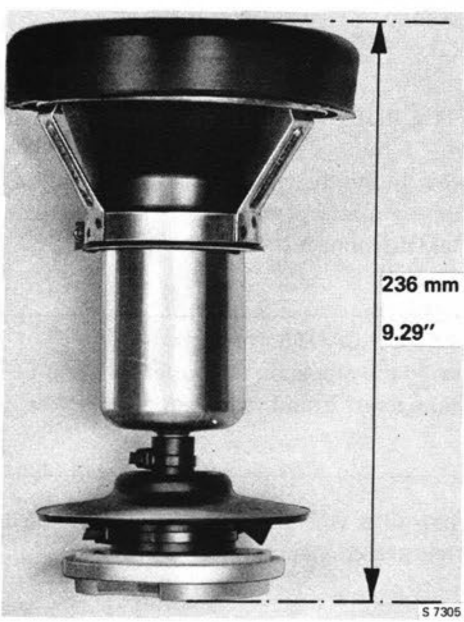
6. Lift out the pump.



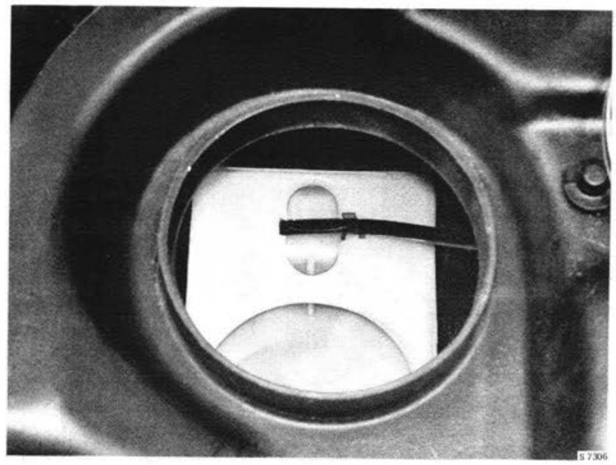
1. Clamp
2. Sealing collar
3. Pump support
4. Fuel pump
5. Bellows
6. Suction strainer
7. Splash guard
8. Fuel return pump

Installation (plastic tank, 1980 model)

1. Position the pump on the mounting so that the distance between the base of the suction strainer and the upper edge of the rubber mounting is 236 mm (9.2 in.)

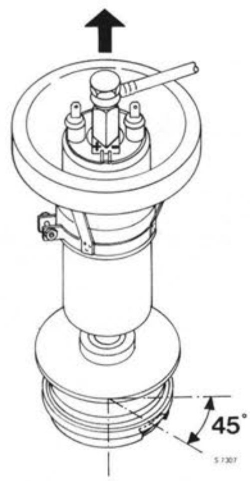


2. Check that the fuel return pipe is connected to the splash guard holder in the bottom of the fuel tank.



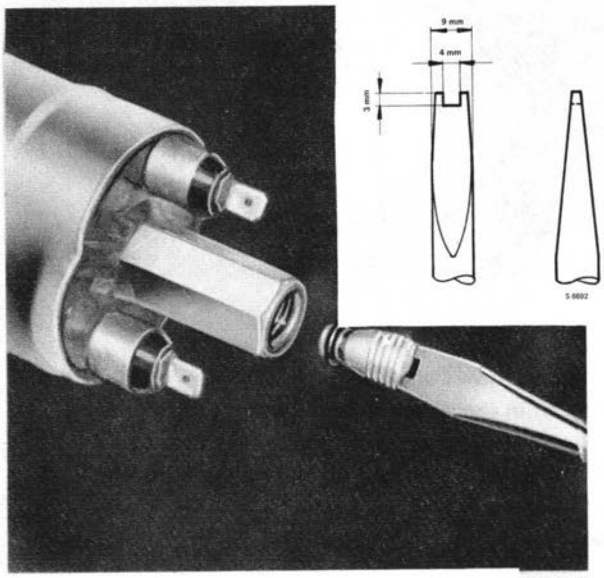
3. Install the pump unit in the tank as follows:
   - Tilt the + electrical connection to the left (as seen from the direction of movement of the car).
   - Tilt the suction strainer inlet 45^{o} backwards to the right (as seen from the direction of movement of the car).

Removal is in the reverse order.



Non-return valve (as from 1978 model)

The non-return valve in the fuel pump outlet pipe can be removed using a specially shaped screwdriver (see illustration).



S 6617

Installing the non-return valve

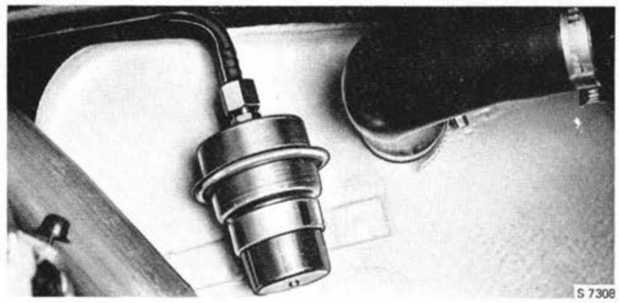
Avoid gripping the valve too tightly, as this may damage it.

Torque	0.4–0.6 Nm (2.9–4.3 ft. lb., 4–6 kpcm)

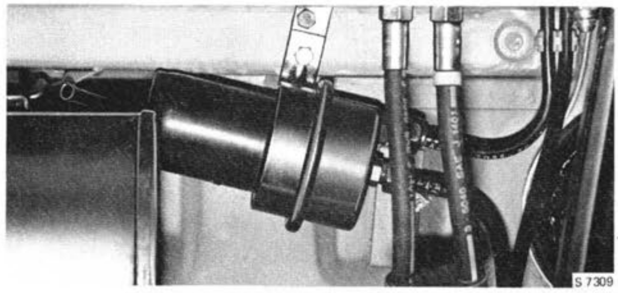
FUEL ACCUMULATOR

Removal

1. Clean the area around the fuel connections.
2. Disconnect the connections and remove the fuel accumulator.



FUEL ACCUMULATOR UP TO AND INCL. 1979 MODEL



FUEL ACCUMULATOR AS FROM 1980 MODEL

Installation

1. Mount the accumulator on the bracket.
2. Connect the fuel lines. The line from the fuel pump should be fitted to the connection nearest to the edge of the fuel accumulator.

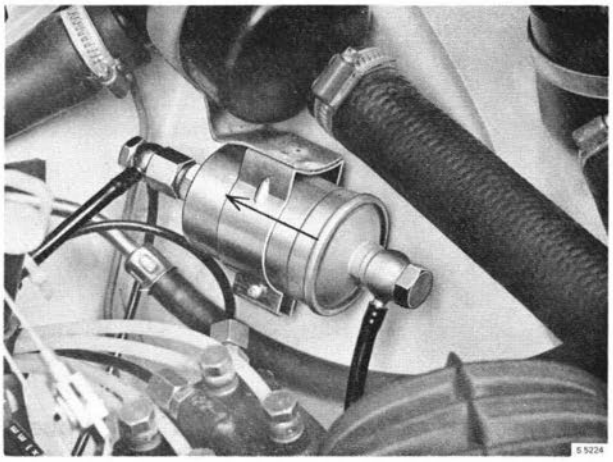
Make sure that the fuel line from the pump is not in contact with the body.

REPLACING THE FUEL FILTER

1. Clean the area around the two connections.
2. Hold the filter by means of the hexagons on the filter and nipple and disconnect the fuel lines. Remove the filter.

> CAUTION
> Avoid loosening the nipple on the outlet side to prevent aluminium swarf from the threads entering the system.

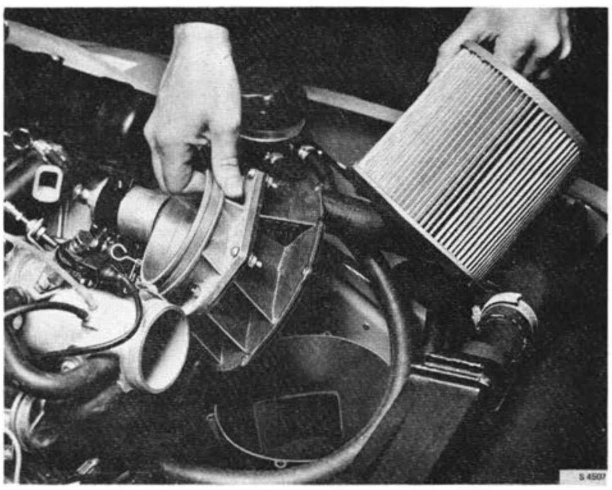
3. Mount the new filter with the arrow pointing in the direction of flow and connect the fuel line.



FUEL FILTER (NOTE ARROW IN DIRECTION OF FLOW).

REPLACING THE AIR CLEANER ELEMENT

1. Remove the rubber bellows from between the air flow sensor and the throttle valve housing.
2. Disconnect the return pipe from the fuel distributor and the retaining bolts holding the lower section of the air flow sensor to the air cleaner.
3. Raise the mixture control unit slightly and remove the cleaner element. Take care not to damage the fuel line.



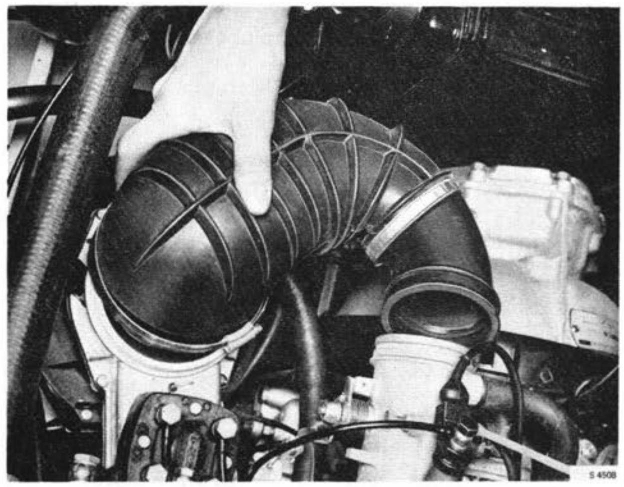
REMOVING THE AIR CLEANER

4. Remove the cleaner element holder from the bottom of the air cleaner and clean the air cleaner casing.
5. Fit the cleaner element holder and the new element.
6. Fit the air flow sensor to the air cleaner and connect the return pipe.
7. Fit the rubber bellows between the air flow sensor and the throttle valve housing.

MIXTURE CONTROL UNIT

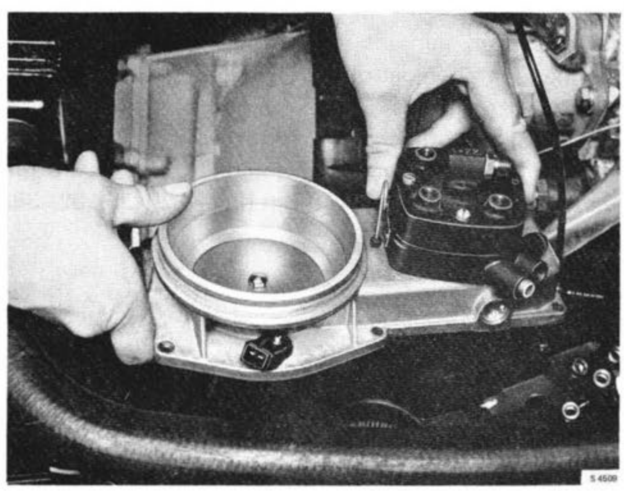
Removal

1. Thoroughly clean the area around the fuel connections on the fuel distributor.
2. Disconnect the fuel lines from the fuel distributor. Disconnect the lines to the injection valves before disconnecting the control pressure line, to avoid damaging the adjacent lines.
3. Remove the rubber bellows from between the air flow sensor and the throttle valve housing.



REMOVING THE RUBBER BELLOWS

4. Undo the retaining bolts, and remove the mixture control unit from the air cleaner.



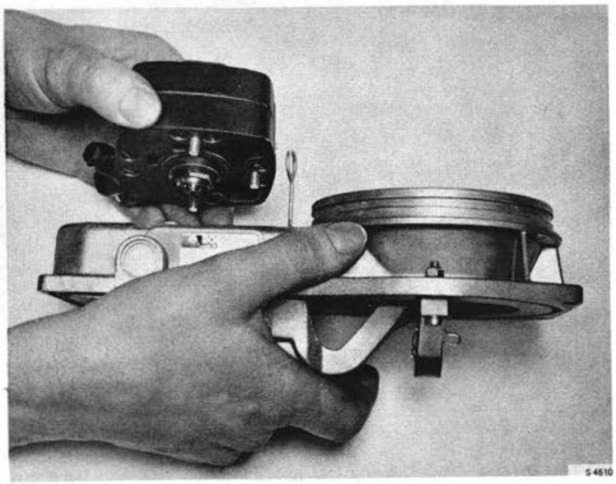
REMOVING THE MIXTURE CONTROL UNIT

Assembly

1. Make sure that the air cleaner element is in the correct position and then bolt the mixture control unit to the air cleaner.
2. Connect the fuel line to the fuel distributor.
3. Fit the rubber bellows between the air flow sensor and the throttle valve housing.

Fuel distributor

The fuel distributor must not be dismantled but should be replaced when faulty.
When separating the fuel distributor from the air flow sensor, ensure that the control plunger does not fall out.

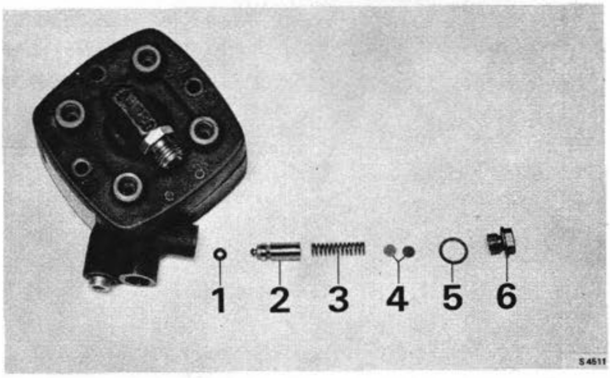


SEPARATING THE FUEL DISTRIBUTOR FROM THE AIR FLOW SENSOR

If the control plunger has been removed, it must be thoroughly cleaned in petrol and reassembled. Avoid touching the plunger with the fingers.
On assembly of the fuel distributor, ensure that the O-ring is located in its groove. Tighten the three retaining bolts to a torque of 3.2–3.8 Nm (2.3–2.7 ft.lb., 32–38 kpcm).

Line pressure regulator

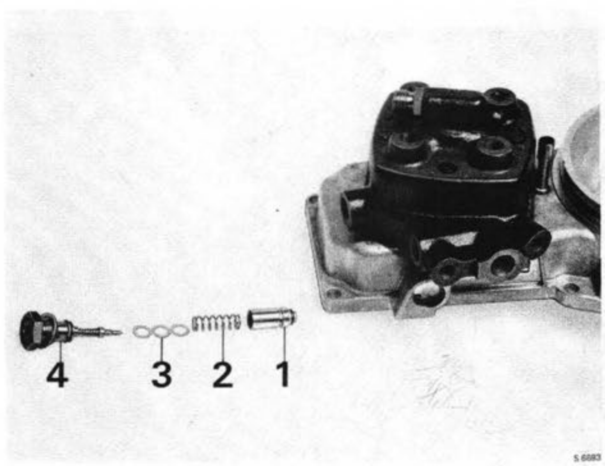
Up to and incl. model 1977
The line pressure regulator is located inside the screw plug at the return line on the fuel distributor. It consists of a plunger with O-ring, coil spring, shims, screw plug and copper washer.



LINE PRESSURE REGULATOR, UP TO AND INCL. MODEL 1977

1. O-ring
2. Piston
3. Coil spring
4. Shims
5. Copper washer
6. Screw plug

As from model 1978
The function and appearance of the line pressure regulator are the same as before. However, the shims are now annular.
The shut-off valve for return fuel from the control pressure circuit is located in the screw plug.



LINE PRESSURE REGULATOR, AS FROM MODEL 1978

1. Piston with O-ring
2. Spring
3. Shims
4. Screw plug with O-ring and sealing washer (contains stop valve for return fuel from control pressure circuit).

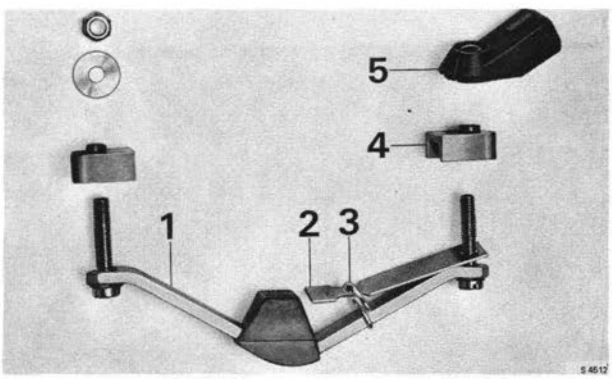
Adjusting the line pressure
After replacement of the O-ring, the line pressure must be checked and adjusted if necessary.
The pressure can be increased by fitting additional shims and decreased by removing shims.
The shims are available in thicknesses of 0.004" and 0.020" (0.1 and 0.5 mm). An 0.004" (0.1 mm) shim produces a change in pressure of 0.07 bar (kp/cm^2, 1 psi) and an 0.020" (0.5 mm) shim, a change in pressure of 0,35 bar (kp/cm^2, 5 psi).
A prerequisite for measuring and adjusting the line pres-

sure is that the fuel pump capacity is correct.
The screw plug should be tightened with a torque of 13–15 Nm (9.4–10.8 ft.lb., 130–150 kpcm).

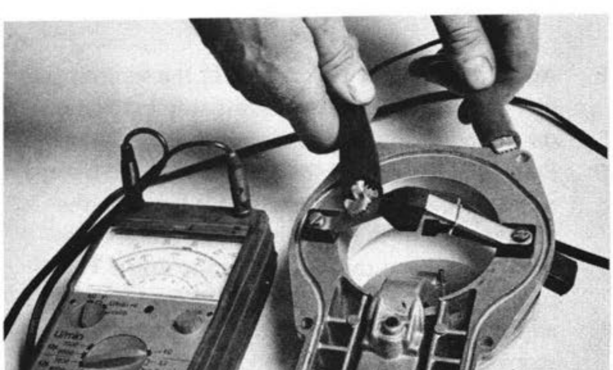
Replacement of stop bracket

1. Separate the mixture control unit from the air cleaner.
2. Remove the lower plastic section of the air flow sensor.
3. Remove the two stop bracket mounting screws and remove the bracket, spring, insulation and connectors.

Assemble in the reverse order. The order of the parts is shown in the illustration. Tighten the stop bracket with the prescribed torque of 4.7–5.3 Nm (3.4–3.8 ft.lb., 47–53 kpcm). After reassembly, check the insulation between the air flow sensor and the stop bracket by means of a buzzer or an ohmmeter (not applicable to later model 1977 with a pulse-sensing fuel pump relay). Finally, adjust the rest position of the sensor plate.



STOP BRACKET
1. Stop bracket
2. Stop spring
3. Wire loop
4. Insulation
5. Electric connector (up to early model 1977)

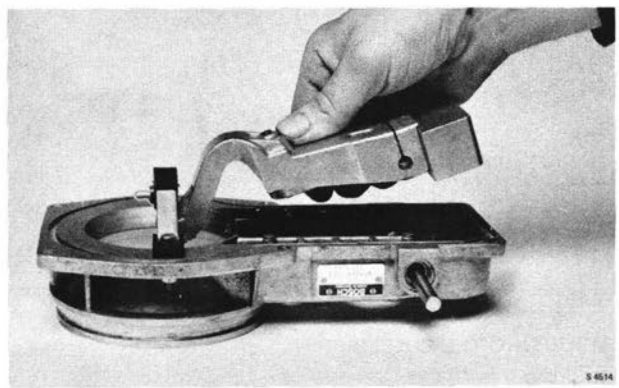


CHECKING THE STOP BRACKET INSULATION

Lever, adjustment arm and sensor plate

Removal

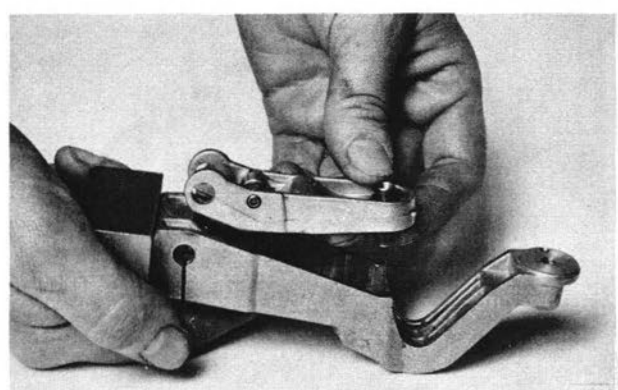
1. Remove the mixture control unit and remove the lower plastic section and the fuel distributor.
2. Remove the retaining screws and the sensor plate.
3. Remove the circlips from the lever seating and remove, the shims, rubber seals, spring (on one side) and balls.
4. Remove the counterweight retaining screw and press out the pivot.
5. Remove the lever with counterweight and adjustment arm.



REMOVING THE LEVER

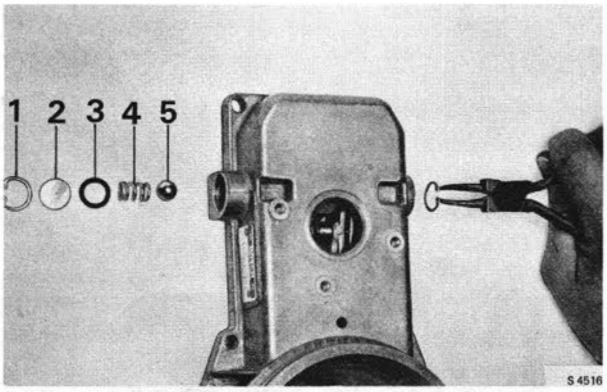
Assembly

1. Fit the counterweight to the lever but do not completely tighten the screw.
2. Place the adjustment arm in the lever in such a way that the socket head screw on the adjustment arm is visible.



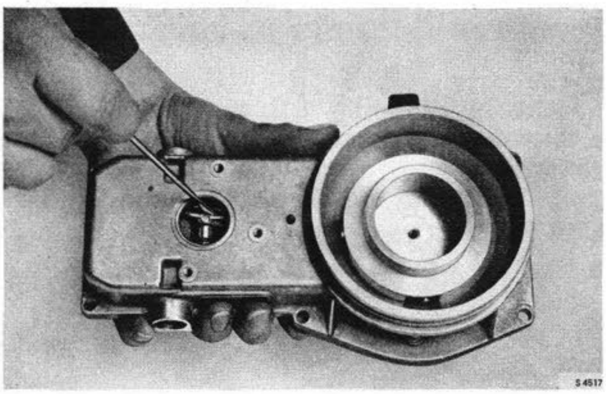
PLACING THE ADJUSTMENT ARM IN THE LEVER

3. Grease both bearings with Bosch Ft2v2 silicon grease.
4. Place the lever with adjustment arm in the air flow sensor housing and mount the pivot.
5. Grease the balls and then fit them together with the spring, seals, shims and circlips. Fit the spring to the side where the bearing seating is longest. Note! The circlips are pressed and should be fitted with the sharp edge facing outwards.



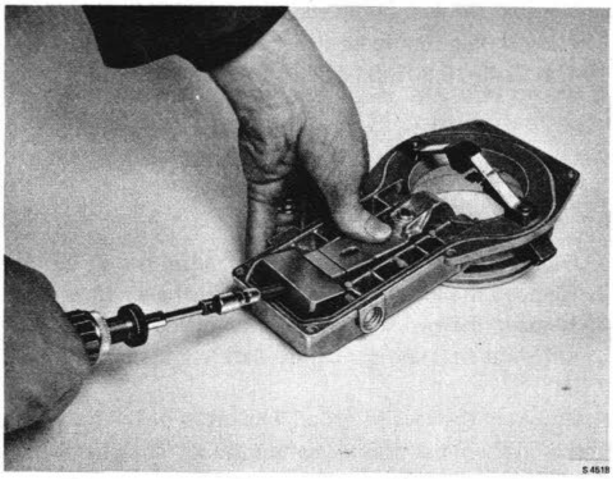
MOUNTING THE CIRCLIP
1. Circlip
2. Shims
3. Seal
4. Spring
5. Ball

6. Mount the sensor plate in the centring tool and place the tool and plate in the air venturi. Centre the lever so that the threaded hole is aligned with the hole in the sensor plate.



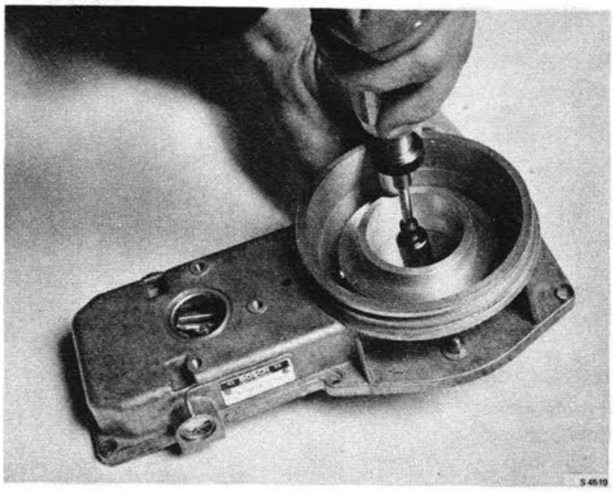
CENTERING THE LEVER

Tighten the counterweight retaining screw with a torque of 4.7–5.3 Nm (3.4–3.8 ft.lb., 47–53 kpcm).



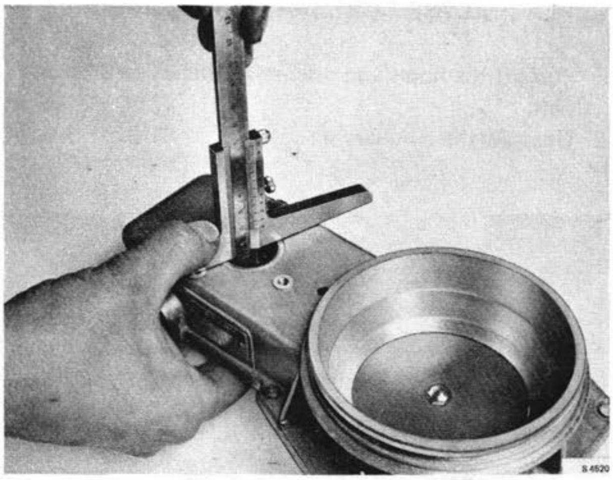
TIGHTENING THE COUNTERWEIGHT SCREW

7. Fit the sensor plate retaining screw and tighten it with a torque of 5.0–5.5 Nm (3.6–4.0 ft.lb., 50–55 kpcm) and check that the lever can be moved without any resistance being felt.



TIGHTENING THE SENSOR PLATE RETAINING SCREW

8. Adjust the rest position setting of the sensor plate by bending the wire loop on the stop bracket underneath the air flow sensor.
9. Preset the position of the adjustment arm. Using a depth gauge, measure the distance between the joint surface of the fuel distributor (across the screw holes) and the needle bearing roller. The dimension should be 0.71"–0.75" (18–19 mm). To adjust the dimension, turn the mixture adjustment screw by means of an Allen key.

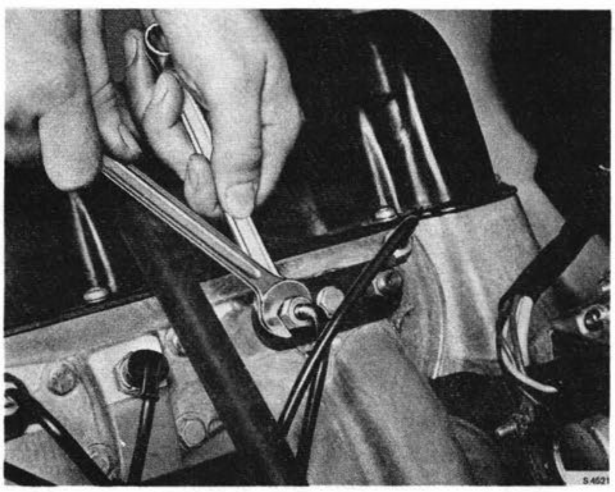


CHECKING THE POSITION OF THE ADJUSTMENT ARM

10. Fit the O-ring and the fuel distributor. The fixing screws should be tightened to a torque of 3.2–3.8 Nm (2.3–2.7 ft.lb., 32–38 kpcm). Fit the lower plastic section of the air flow sensor together with the gasket.
11. Mount the mixture control unit to the car. Fine adjustment of the basic fuel flow is made by means of a CO gauge after the engine has been warmed up.

REPLACING INJECTION VALVES

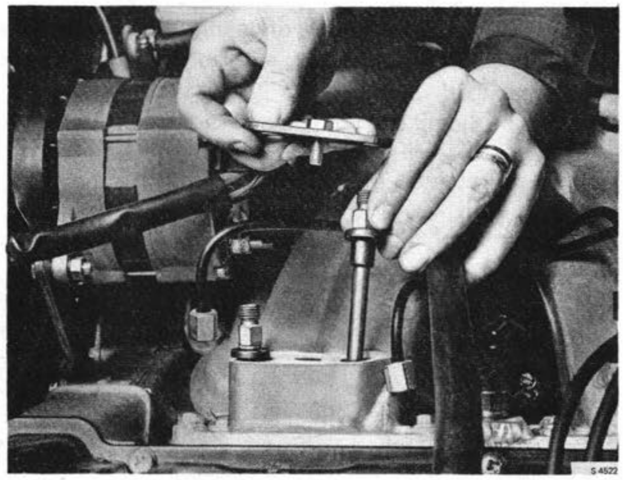
1. Clean the area around the injection valve and its connection.
2. Disconnect the fuel line from the valve. To prevent the valve turning, hold the hexagon with a spanner.



DISCONNECTING THE FUEL LINE

3. Remove the retaining plate.
4. Withdraw the injection valve and pull off the rubber seal.

Assembly is carried out in the reverse order.



REMOVING THE INJECTION VALVE

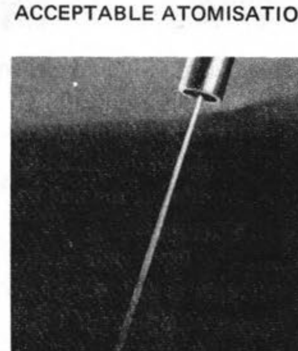
CLEANING OF INJECTION VALVE

If an injection valve is found to produce poor atomization of the fuel or to leak under pressure, this may be the result of particles of dirt having collected around the valve seating. In some cases, the dirt can be washed away by flushing the valve in the following manner:

1. Remove the rubber bellows from the air flow sensor.
2. Remove the injection valves from the inlet manifold and place them in a container. Do not disconnect the fuel lines.
3. Switch on the ignition and disconnect the plug for the safety circuit at the air flow sensor, allowing the fuel pump to operate.
4. Raise the lever in the air flow sensor a few times to its highest position so that the injection valves will be flushed by a powerful jet of petrol.

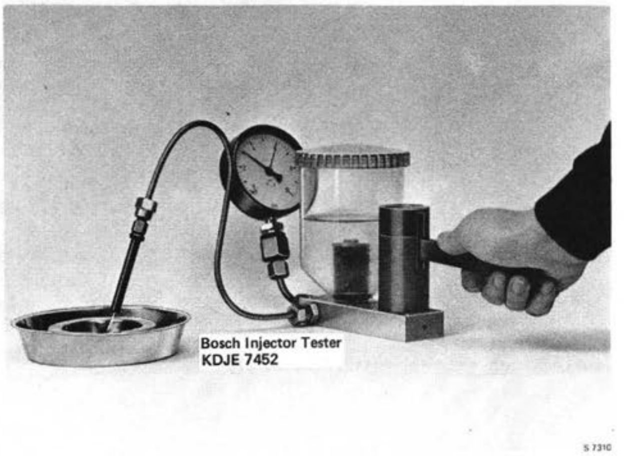
PERFECT ATOMISATION

ACCEPTABLE ATOMISATION



EXAMPLES OF BAD ATOMISATION

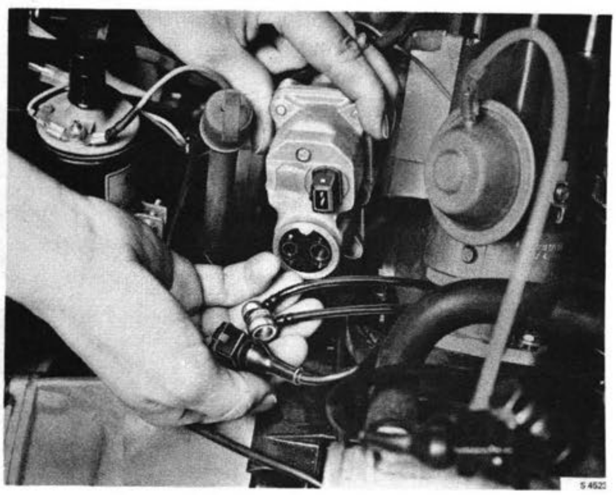
Injection valves which have been removed from the car can also be cleaned by means of an injector tester designed for diesel equipment. Cleaning with compressed air is not recommended.
If the fault should still remain, replace the injection valve.



CLEANING BY MEANS OF INJECTOR TESTER

REPLACING THE WARM-UP REGULATOR

1. Clean the area around the warm-up regulator and its connections.
2. Disconnect the electric terminals and both fuel lines from the regulator.
3. Dismantle the regulator.

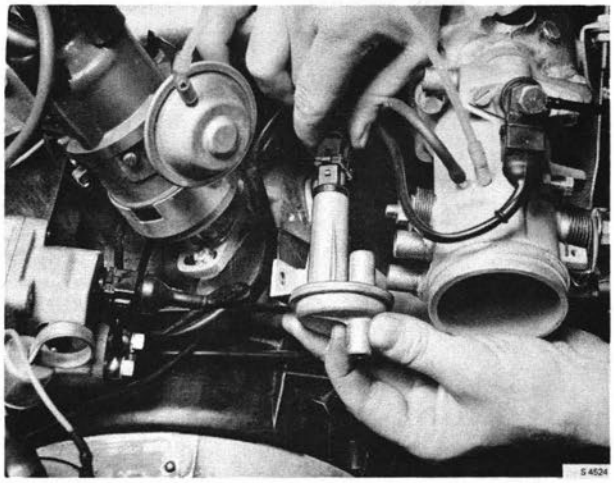


REMOVING THE WARM-UP REGULATOR

Assembly is carried out in the reverse order.

REPLACING THE AUXILIARY AIR VALVE

1. Pull off the hoses and disconnect the electric terminals.
2. Unscrew the auxiliary air valve.

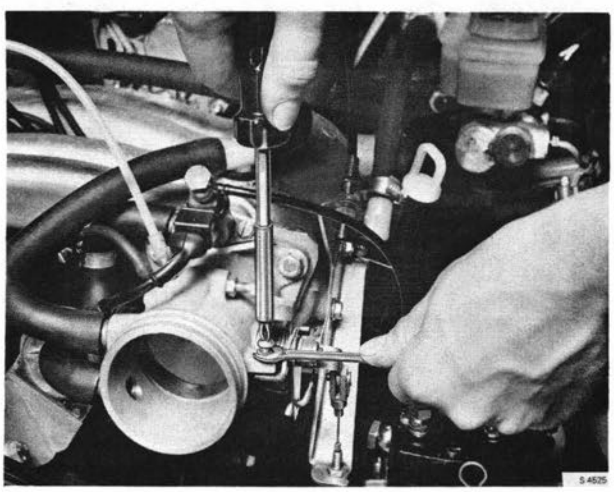


REMOVING THE AUXILIARY AIR VALVE

Assembly is carried out in the reverse order.

ADJUSTING THE THROTTLE VALVE STOP

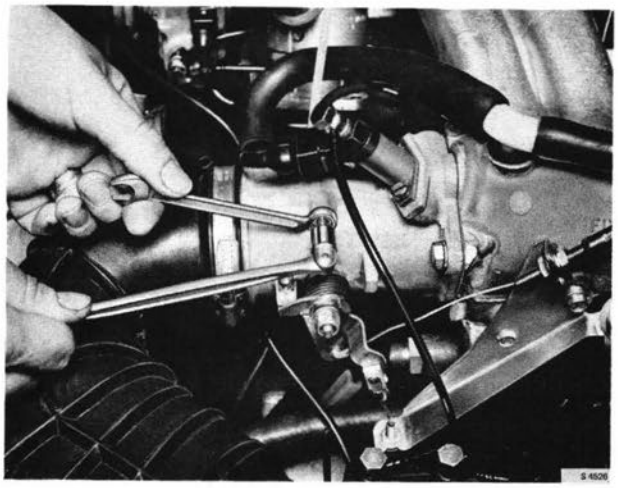
1. Check that the throttle valve is central in the housing.
2. Turn the adjustment screw until it just makes contact with the stop tongue (throttle valve completely closed).
3. Turn the adjustment screw another one-third of a turn and lock the screw. A clearance of approx. 0.002" (0.05 mm) will thus be obtained between the throttle valve and the housing.



ADJUSTING THE THROTTLE VALVE STOP

ADJUSTMENT OF IDLING SPEED

To adjust the idling speed, turn the adjustment screw on the throttle valve housing by-pass passage.
Adjustment should be made in connection with setting of CO-value. See adjustment of idling speed.



ADJUSTMENT OF IDLING SPEED

FAULT-TRACING

In the fault-tracing procedure described below it is assumed that the engine does not have any mechanical faults and that the ignition system is working properly.

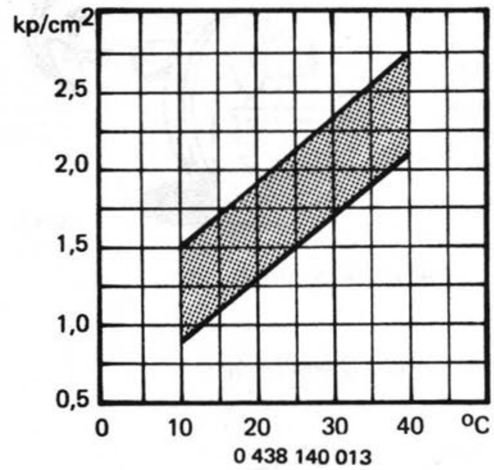
Starting difficulties, cold engine

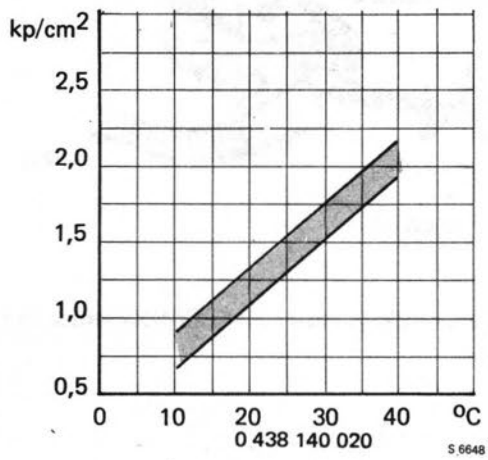
1. Check the operation of the cold start valve. Remove the valve and place it in a container. Fuel should be ejected from the valve when the starter motor is switched on and when the engine is colder than +113°F (+45°C). The injection time depends on the temperature.

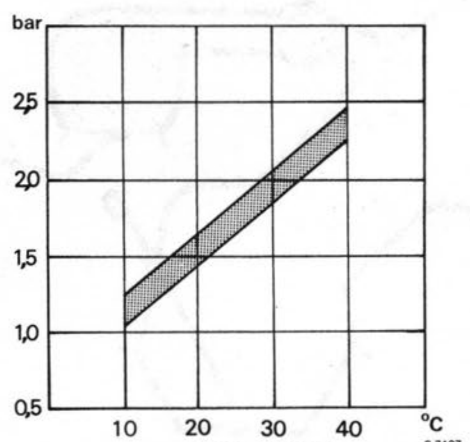
CHECKING THE COLD START VALVE

In the event of failure, check:
The cold start valve
The thermal time switch
The electrical system

2. Measure the control pressure with the engine cold.

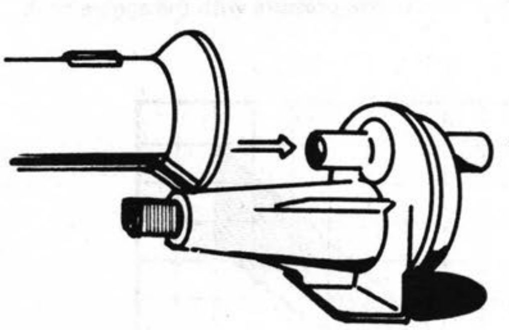






CONTROL PRESSURE, COLD ENGINE

3. Check that the auxiliary air valve is open when the engine is cold.

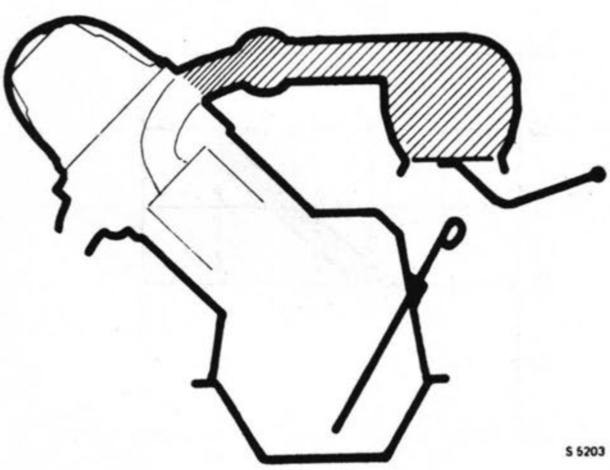


CHECKING THE AUXILIARY AIR VALVE

4. Check the CO-value (warm engine).

CHECKING THE CO-VALUE

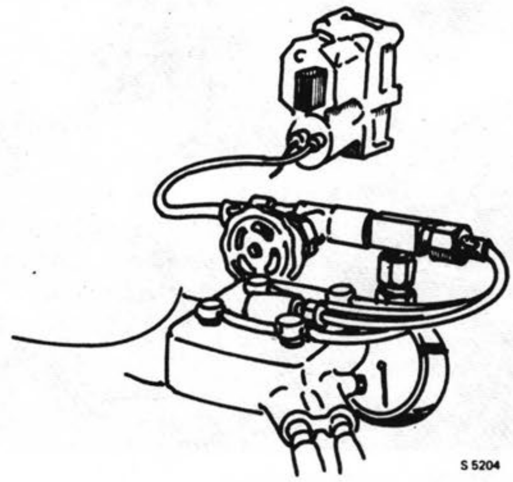
5. Check for air leakage between the air flow sensor and the engine.



CHECKING FOR LEAKING AIR

Starting difficulties, warm engine

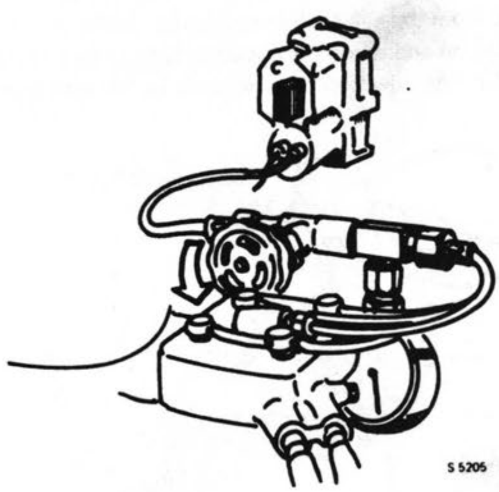
1. Check the residual pressure in the fuel system after the engine has been switched off. Excessively low pressure when the engine is still warm can cause vaporization in the fuel lines.
   Check the tightness of the system.
   Check first with the valve open. In the event of leakage, repeat the test with the valve closed (control pressure regulator disconnected).



CHECKING THE FUEL PRESSURE

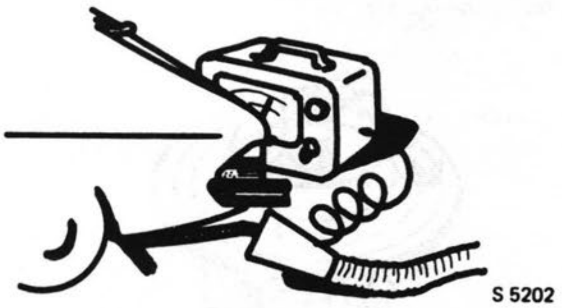
Possible leakage places:
- Control pressure regulator
- Non-return valve at fuel pump
- Cold start valve
- Line pressure regulator
- Injection valves
- External leakage

2. Check the control pressure with the engine warm.



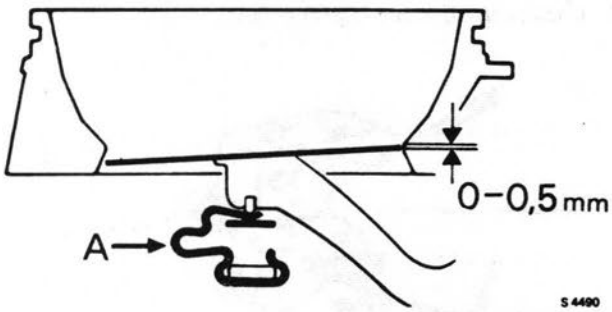
CHECKING THE CONTROL PRESSURE, WARM ENGINE

3. Check the CO-value (warm engine).



CHECKING THE CO-VALUE

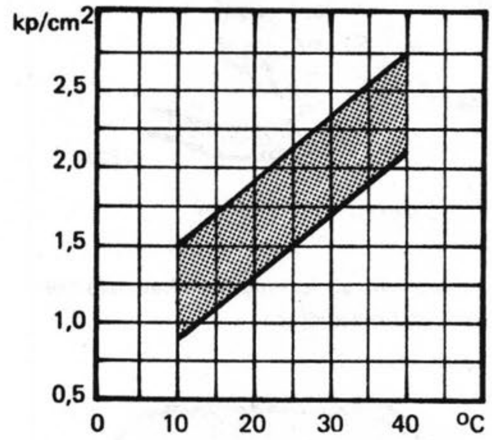
4. Check the rest position of the air flow sensor plate in the air flow sensor. (The top of the sensor plate should be level with or slightly lower than (max. 0.02 in., 0.5 mm) the lower edge of the air venturi.) Adjust by means of the wire loop (A).



SENSOR PLATE IN REST POSITION

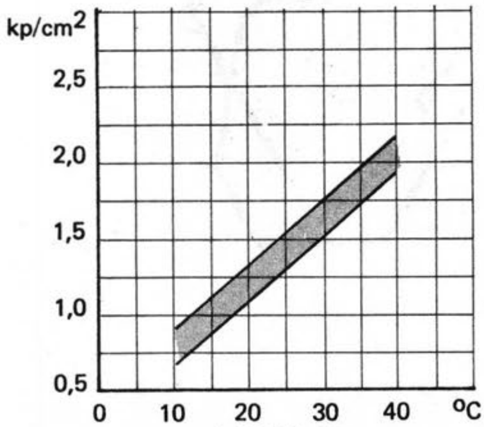
Poor running during the warming-up period

1. Check the control pressure with the engine cold. Excessive control pressure during the warming-up period produces a fuel-to-air ratio which is too lean.



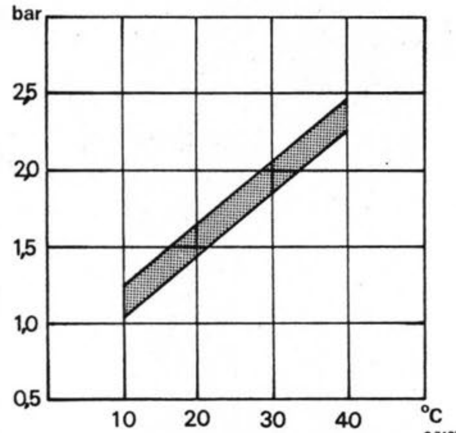
0 438 140 013

S 5200



0 438 140 020

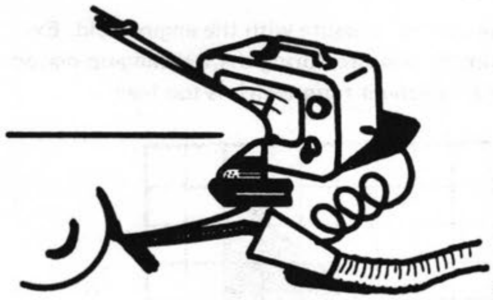
S 6648



0 438 140 070

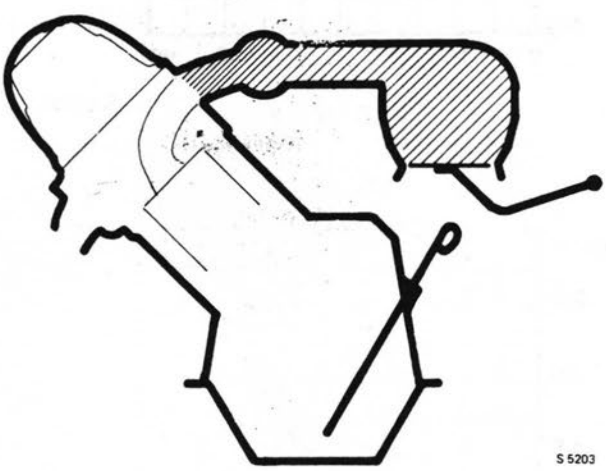
CONTROL PRESSURE, COLD ENGINE

2. Check the CO-value (warm engine).



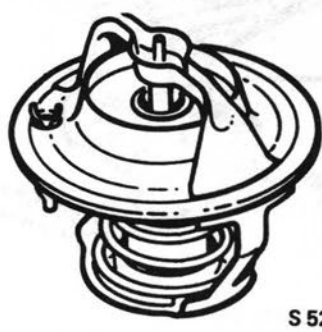
CHECKING THE CO-VALUE

3. Check that there is no air leaking from between the air flow sensor and the engine.



CHECKING FOR LEAKING AIR

4. Check that the warming-up period for the engine is normal by observing the temperature gauge. An abnormally long warming-up period may be caused by a faulty thermostat.



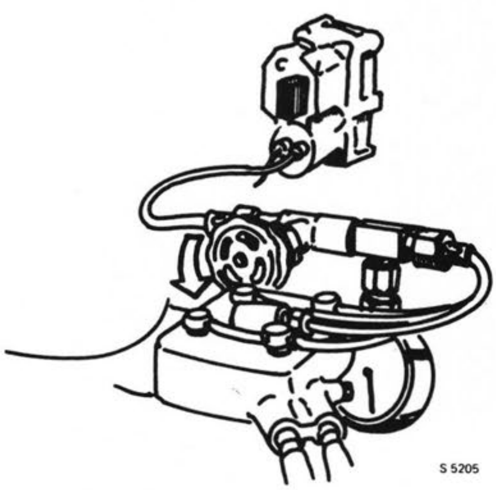
THERMOSTAT

Poor running, warm engine

1. Check the CO-value (warm engine).

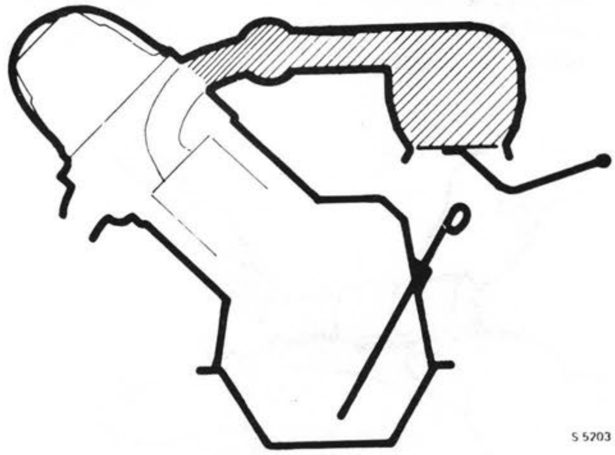
CHECKING THE CO-VALUE

2. Check the control pressure with the engine warm.



CHECKING THE CONTROL PRESSURE, WARM ENGINE

3. Check that there is no air leaking from between the air flow sensor and the engine.

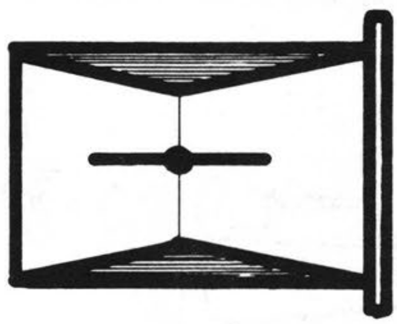


S 5203

CHECKING FOR LEAKING AIR

Poor performance, low top speed

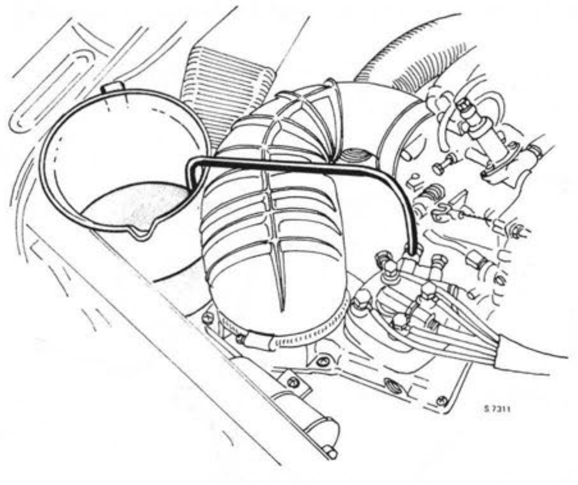
1. Check that the throttle valve opens fully when the pedal is fully depressed.



S 5206

CHECKING THE THROTTLE VALVE

2. Check that the fuel flow is sufficient by measuring the quantity of return fuel flowing during a 3-second period. See under "Fuel pump capacity".
Faults can be caused by:
– A faulty fuel pump
– Low voltage of the supply to the fuel pump
– A blocked filter or blocked fuel lines



S 7311

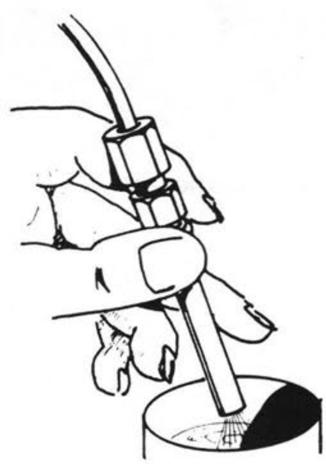
CHECKING THE FUEL FLOW

3. Check the CO-value (warm engine).

S 5202

CHECKING THE CO-VALUE

4. Check the fuel atomization of the injection valves. Deposits on the spark plugs can give an indication of poor atomization.

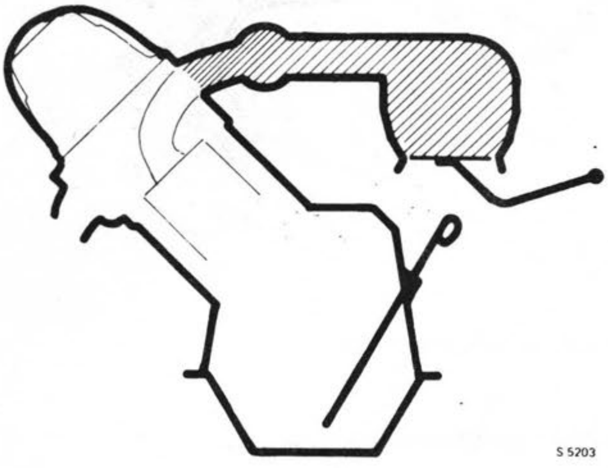


S 5209

CHECKING THE INJECTION VALVES

Irregular CO-value and idling speed, difficulty in adjusting

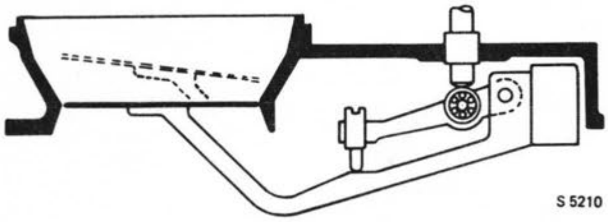
1. Check that no air is leaking from between the air flow sensor and the engine.



CHECKING FOR LEAKING AIR

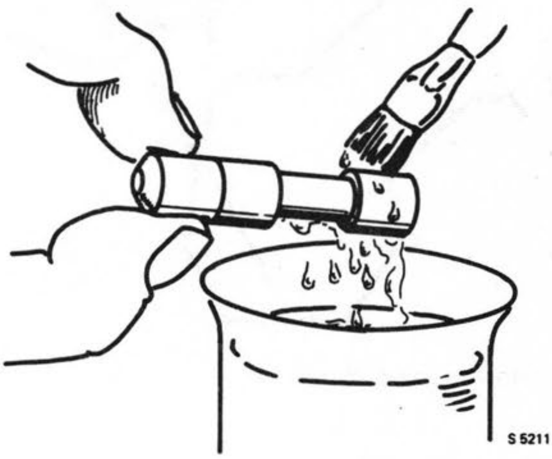
2. Check whether any parts of the air flow sensor are sticking as follows:
   - Run the engine until it is warm and then connect a CO-meter.
   - Switch off the engine and then restart it without touching the accelerator. Read off the CO-value.
   - Rev the engine to around 3.000 rev/min and then allow it to return to idling speed. If the CO-value is different now to the earlier reading, then either the control plunger or the lever is sticking.

   Check that the lever moves freely.



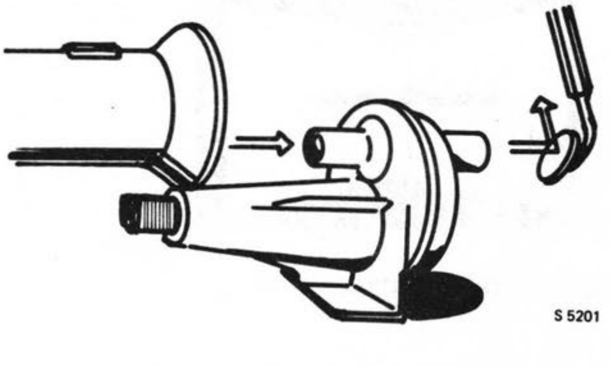
CHECKING THE AIR FLOW SENSOR

Disconnect the fuel distributor from the air flow sensor, ensuring that the control plunger does not fall out. Extract and inspect the control plunger (avoid handling the sealing surfaces). Clean the plunger in petrol, install it and mount the fuel distributor. Never dismantle the fuel distributor any further.



CLEANING THE CONTROL PLUNGER

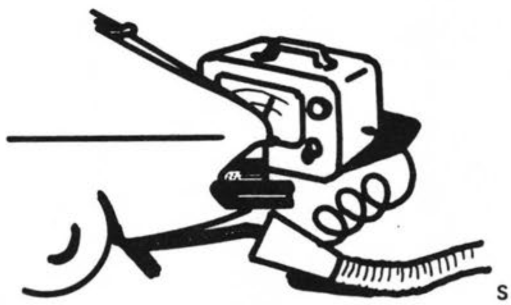
3. Check that the disc in the auxiliary air valve is not sticking.



CHECKING THE AUXILIARY AIR VALVE

High fuel consumption

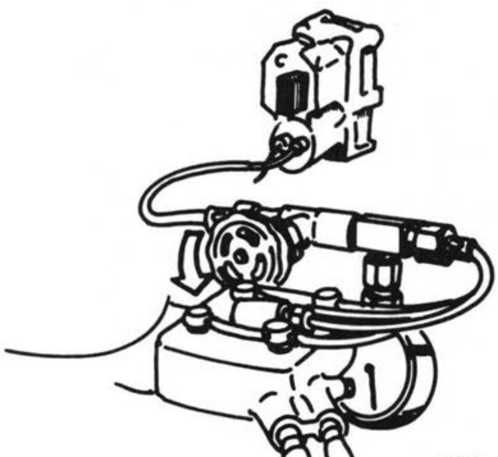
1. Check the CO-value (warm engine).



S 5202

CHECKING THE CO-VALUE

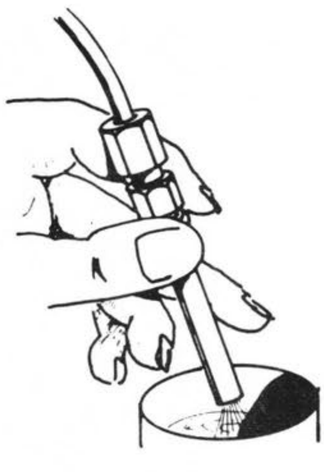
2. Check the control pressure with the engine warm. Insufficient control pressure implies a fuel-to-air ratio which is too rich.



S 5205

CHECKING THE CONTROL PRESSURE

3. Check that the injection valves atomize the fuel. Deposits on the spark plugs can give an indication of poor fuel atomization.



S 5209

CHECKING THE INJECTION VALVES

4. Check that the cold start valve is not leaking.

S 5212

CHECKING THE COLD START VALVE

5. Check that there is no external leakage of fuel.

EXHAUST SYSTEM

REMOVING THE FRONT MUFFLER

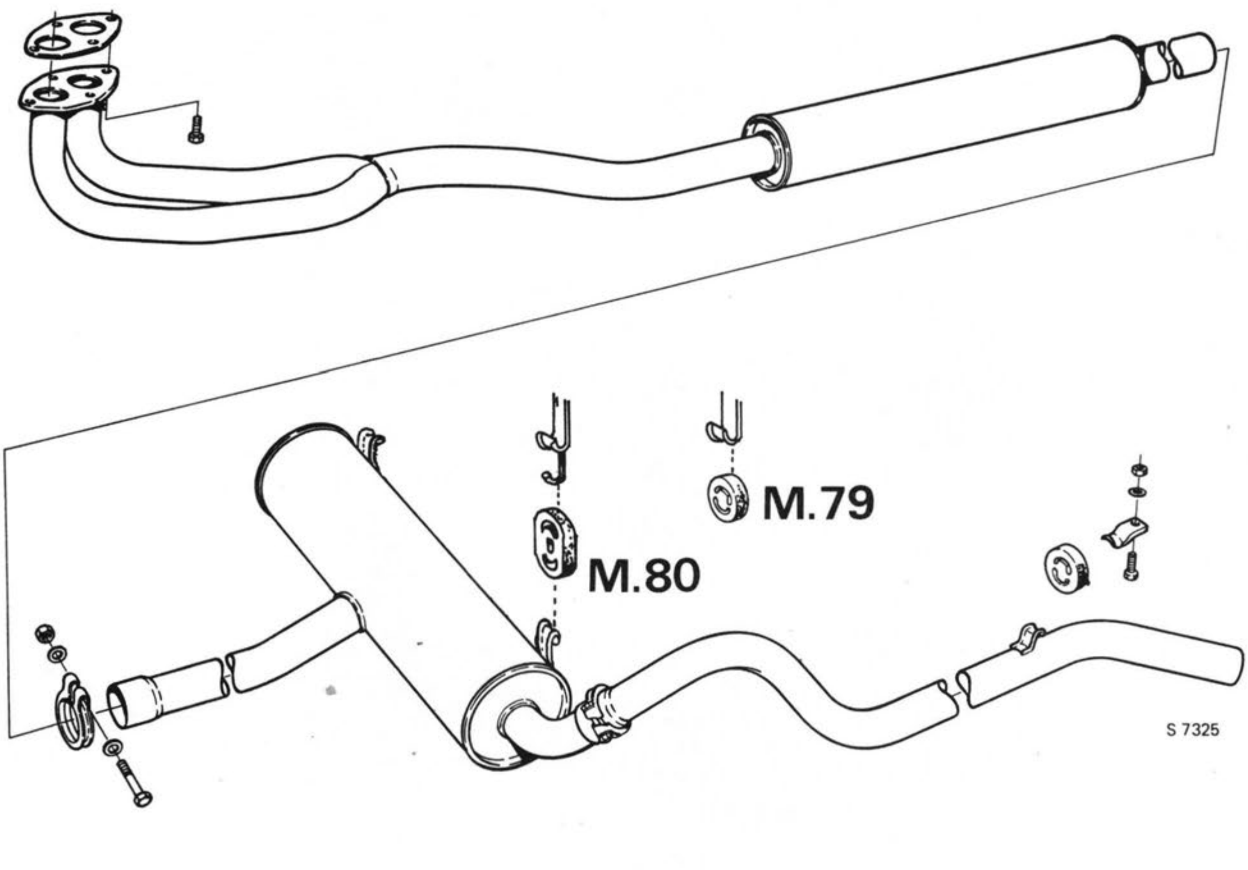
1. Jack up the car.
2. Unscrew the screws securing the front exhaust pipe to the exhaust manifold.
3. Undo the clamp holding the connecting ring at the joint with the middle exhaust pipe and separate the pipes.

To remove the rear muffler and the other sections of pipe, detach the rubber suspensions and clamps from the part to be removed.

REMOVAL OF CENTRE EXHAUST PIPE AND MUFFLER AND/OR REAR PIPE

To remove the middle exhaust pipe or the rear muffler it is best to begin by unclamping the joint between these two units.
To remove the entire system, first undo the front pipe from the exhaust manifold and then unclamp the rear pipe joint. Withdraw the rear pipe from the rear.
Reassemble in the reverse order.

NOTE
After assembling, check the exhaust system for leaks and make sure that the pipe is not in contact with the body.



EXHAUST SYSTEM

EXHAUST EMISSION CONTROL SYSTEM

Description

To meet the requirements governing the exhaust emission standards existing on certain markets, cars for these markets are equiped with special exhaust emission control systems. The following systems exist for exhaust emission control:

	Sweden Model 1975		Sweden As from model 1976				Europe As from model 1976		TURBO Europe and Sweden
	Carburetor engines	Fuel injection engines	Carbureted engines		Fuel injection engines		Carbureted engines	Fuel injection engines	
			Manual transmission	Automatic transmission	Manual transmission	Automatic transmission			
Deceleration valve	X[1]		X[2]	X[2]	X[3]	X[3]	X[1]	X[3]	X[4]
Temperature compensator	X		X	X			X		
Delay valve			X[5]		X[5]				X[6]
EGR				X[7]		X[8]			

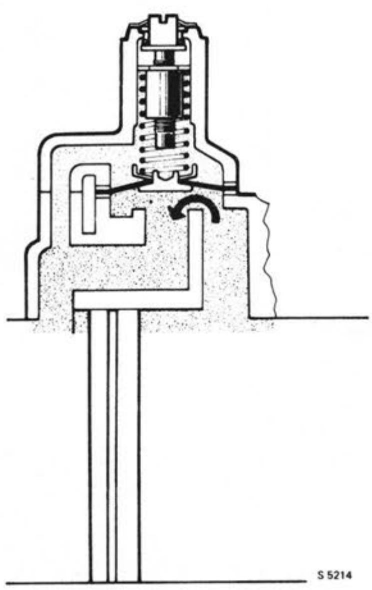
1) Vacuum-controlled
2) Up to and including 1977 model vacuum-controlled, as from 1978 model electrical speed control
3) Up to and including 1979 model vacuum-controlled, as from 1978 model dashpot
4) Dashpot
5) Delay 6 ± 2 secs.
6) Delay 20 ± 4 secs. (Sweden only)
7) "On-off" design
8) Up to and including 1977 model "on-off", as from 1978 model "two-step".

Deceleration device

The deceleration device is designed to maintain combustion during engine overrun to prevent the emission of unburned hydrocarbons.
The following designs of deceleration devices are available:
- Vacuum-controlled, carbureted engines
- Vacuum-controlled, fuel injection engines
- Electric speed control
- Dashpot

Vacuum controlled deceleration device, carbureted engines

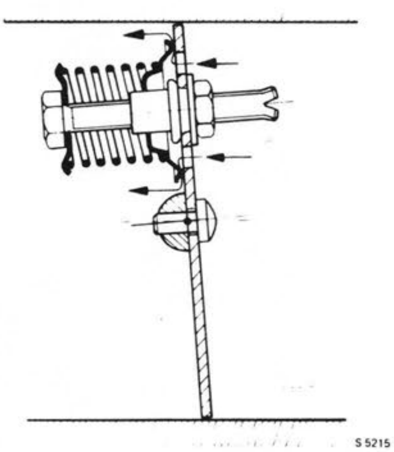
Cars with carbureted engines, (Sweden up to and including 1977 model) have a vacuum-controlled valve in the carburetor (see S section 231).



DECELERATION VALVE, CARBURETED ENGINES

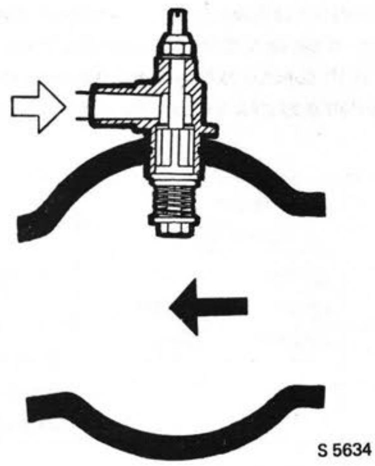
Vacuum-controlled deceleration device, CI

Cars with fuel injection engines, 1976 model, have a vacuum-controlled valve situated at the throttle butterfly.



DECELERATION VALVE, INJECTION ENGINE, 1976 MODEL.

Cars with fuel injection engines, 1977–1979 model have a vacuum-controlled valve located on the inlet manifold.



DECELERATION VALVE, INJECTION ENGINES AS FROM 1977 MODEL.

Deceleration valve, fuel injection engines

Checking
1. Run the engine until it is thoroughly warmed up.
2. Connect a tachometer and adjust the idling speed to 875 r.p.m.
3. Rev the engine to 3000 r.p.m. and measure the time (with a stop watch) between the release of the throttle and the moment at which the engine returns to 875 r.p.m.
   The deceleration time should be:

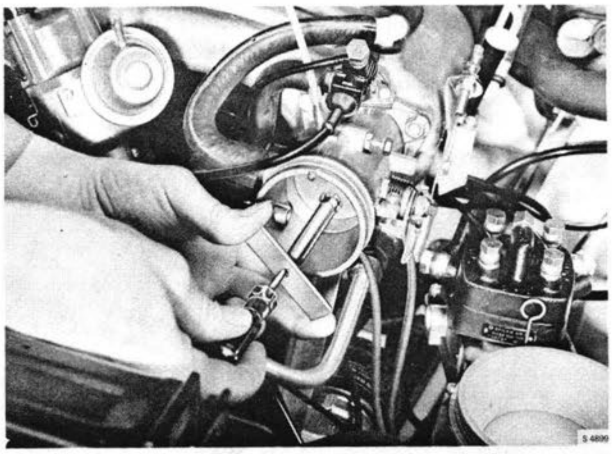
1976 model	4–5 sec
As from 1977 model	4–6 sec

CAUTION
The readings will be faulty if the radiator fan cuts in while the deceleration time is being measured. This can be avoided by disconnecting the wire to the thermo-switch for the fan for a few moments while the time is being recorded.

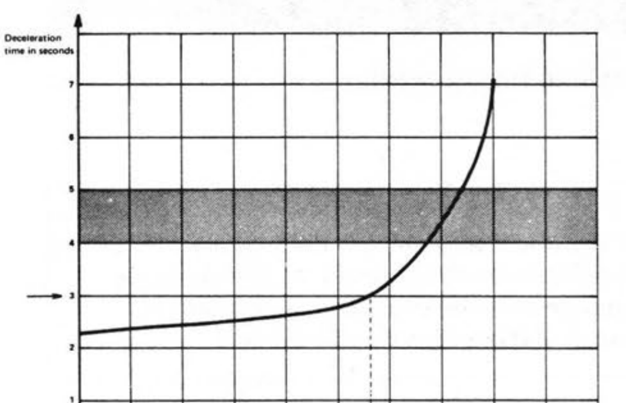
Adjustment, up to and including 1976 model

1. Remove the rubber bellows between the air flow sensor and the throttle housing.
2. Undo the lock nut on the valve screw and turn the adjustment screw the number of turns specified on the adjustment graph. Tighten the lock nut.
3. Fit the rubber bellows.
4. Repeat this procedure.

Example: On checking a deceleration time of 3 seconds is recorded. Locate the no. 3 on the time axis of the graph (the vertical axis). Follow 3 horizontally across the graph until it intercepts the curve and then read off the corresponding value on the horizontal axis. In this case the figures is 1 1/3 turns in a clockwise direction.



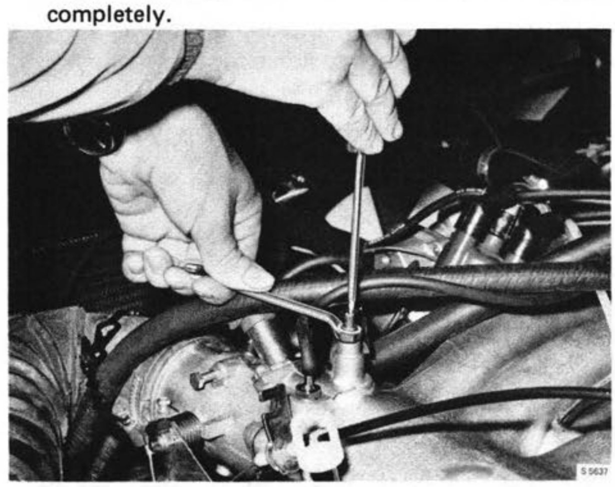
ADJUSTING THE DECELERATION VALVE, 1976 MODEL
Tool 83 92 466 and screwdriver



ADJUSTMENT GRAPH FOR DECELERATION VALVE

Adjustment, as from 1977 model

1. Connect the tachometer and run the engine until warm.
2. Unscrew the adjustment screw until the valve closes completely.

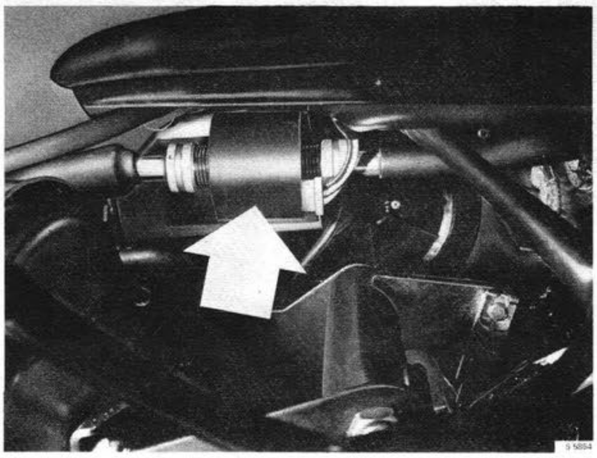


ADJUSTING THE DECELERATION VALVE, AS FROM 1977 MODEL

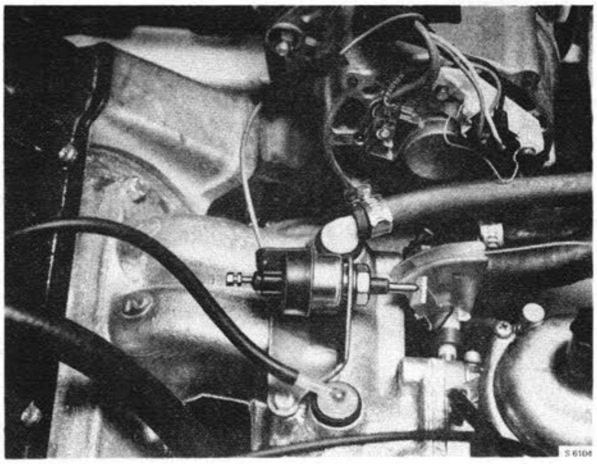
3. Adjust the screw on the throttle housing until the idling speed is correct.
4. Turn the adjustment screw until the engine is running at 1600 r.p.m.
5. Back off the adjustment screw two turns from this position.
6. Use the adjustment screw on the throttle housing to trim the idling speed.
7. Check the deceleration time and make any small adjustments necessary.

Electric speed-controll deceleration device

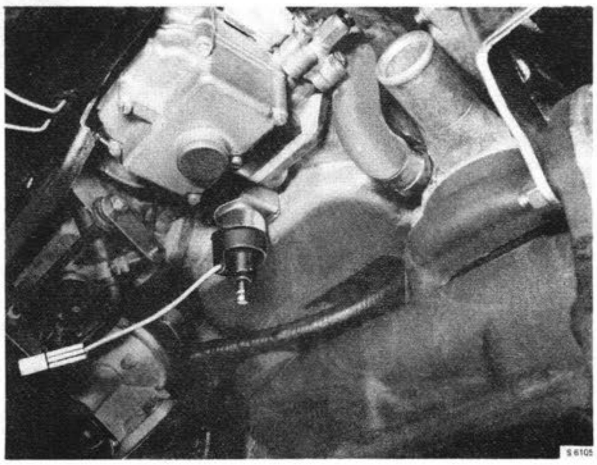
Cars with carbureted engines, as from 1978 model have an electrically-controlled deceleration device consisting of a speed transmitter connected to the speedometer cable and a solenoid at the carburetor (carburetors).



SPEED TRANSMITTER MOUNTED ON DASH PANEL SHELF TO THE LEFT OF THE FAN



SOLENOID LOCATED AT CARBURETOR, SINGLE CARBURETOR ENGINES



SOLENOID LOCATED AT CARBURETOR, TWIN CARBURETOR ENGINES

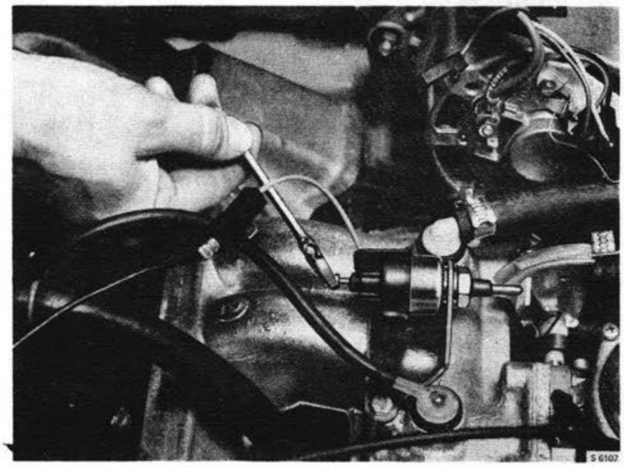
The solenoid serves as a variable idling stop. During engine overrun, the idling speed is increased (approx. 1550 r.p.m.) if the speed of the car exceeds 10 m.p.h. (30 km/h).

Checking

Checks should cover the setting of the deceleration valve (increased idling speed) and the function of the speed transmitter (cut-out speed).

A. Engine speed (solenoid setting):

1. Run the engine until it is warm and connect a tachometer.
2. Disconnect the + cable from the solenoid and connect battery voltage to the solenoid.
3. Rev the engine and then release the throttle. Check that the idling speed increases to 1500 r.p.m. Adjustments should be made on the solenoid adjustment screw and the new setting should be checked by revving the engine again.



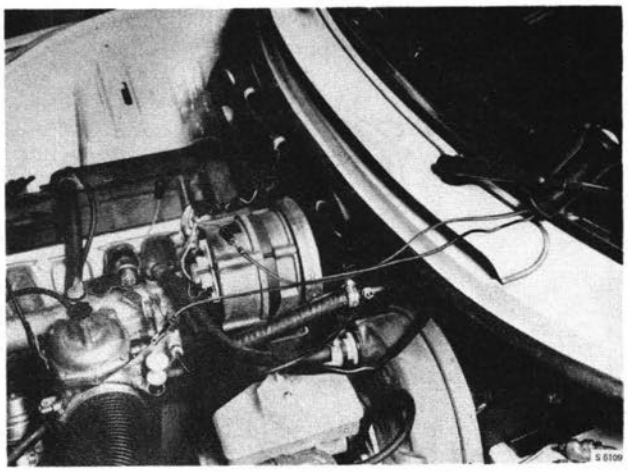
ADJUSTING THE SOLENOID

CAUTION

The solenoid does not open the throttle valve. It's function is merely to prevent the throttle closing completely during engine overrun at speeds in excess of about 18 m.p.h. (30 km/h)

B. Speed (functioning of speed transmitter).

1. Connect a test lamp (0.1 W max.) between the + cable of the solenoid and earth. Place the lamp so that it is visible from the driver's seat.

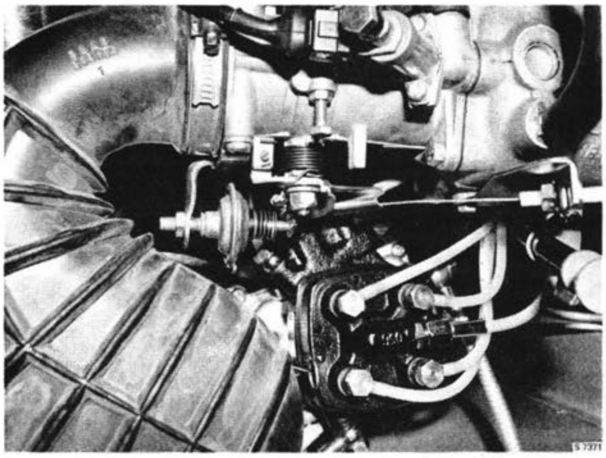


TEST LAMP VISIBLE FROM DRIVER'S SEAT.

2. Test drive the car, select neutral and let the car cruise at about 25 m.p.h. (40 km/h). Brake slightly and check that the test lamp goes out at about 18±3 m.p.h. (30±km/h). (The speed transmitter function can also be checked by listening for the time taken for the engine speed to drop or by using a tachometer).

DASHPOT

Cars with fuel injection engines as from 1980 model have a dashpot which mechanically dampens the throttle spindle when closing.



Checking

1. Run the engine until it is thoroughly warm.
2. Connect a tachometer and set the idling speed to 875 r.p.m.
3. Rev up the engine to 3000 r.p.m. and measure the time (with a stop watch) between the release of the throttle and the moment at which the engine return to 875 r.p.m.
   The deceleration time should be 3–6 secs.

Setting

To adjust the delay time, loosen the lock nut on the dashpot and screw the dashpot upwards (shorter delay time) or downwards (longer delay time).

Basic setting:

1. Run the engine until warm and check that the CO-value and the ignition are correctly set.
2. Disconnect the vacuum pipe to the distributor.
3. Rotate the throttle lever and check that the dashpot rod hits the stop at the specified r.p.m. (use a tachometer).

R.P.M. when dashpot hits throttle lever	
1979 model (Turbo)	2.600±100 r.p.m.
1980 model (Fuel injection)	2.000±100 r.p.m.

4. Rev up the engine and check that it returns to idling speed within the prescribed delay time.
5. Re-connect the vacuum pipe.

Temperature compensation

Carbureted engine cars have a temperature compensator installed which maintains a constant fuel/air ratio regardless of the engine temperature. See Section 231.

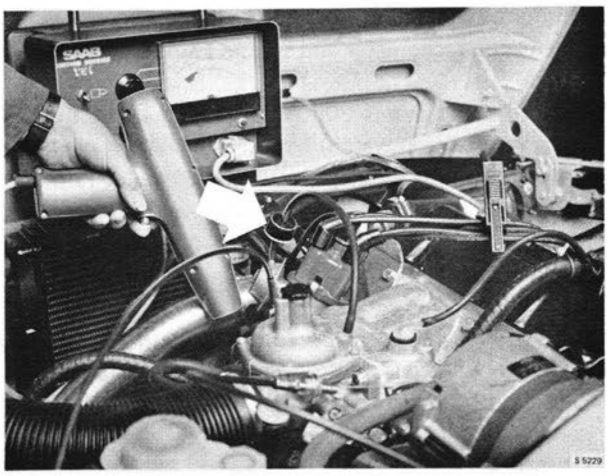
Delay valve

A delay valve is situated in the vacuum pipe between the carburetor (throttle housing) and the distributor vacuum control unit. The valve delays the formation of a vacuum by 6 seconds approx. (Turbo Sweden, 20 seconds approx). The ignition advance is therefore also delayed during acceleration and the emission of nitric oxide (NO_x is reduced.

Checking

Checking is carried out using a stop watch, a tachometer and a stroboscope.

1. Connect the tachometer and the stroboscope.



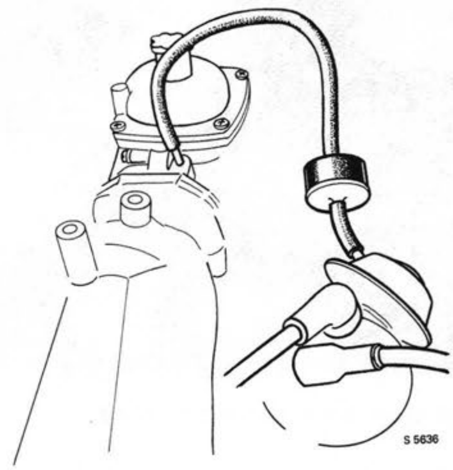
CHECKING THE DELAY VALVE

2. Let the engine run at normal idling speed.
3. a. Have an assistant open the throttle suddenly and let the engine run at 3000 r.p.m. approx. Start the stop watch when the throttle is open.
   b. Check the ignition firing point using the stroboscope light. The vacuum regulator should cut in after 6 seconds ± 2 seconds (Turbo 20 seconds ± 4 seconds) and the ignition advance should increase.

Faulty delay valves should be replaced.

CAUTION

The white end of the delay valve (Turbo Sweden, green) should be positioned towards the distributor vacuum control unit. It is also important that the valve is fitted with the shorter hose between the valve and the distributor vacuum control unit.



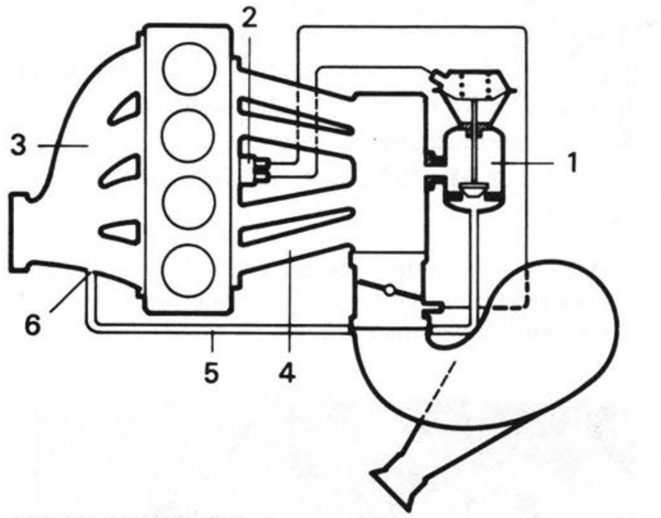
NOTE

When the vacuum pipe is connected, e.g. when checking the ignition timing, always disconnect the hose from the carburetor (throttle housing) to prevent dirt entering and obstructing the delay valve.

EXHAUST GAS RE-CIRCULATION SYSTEM (EGR)

Exhaust gas re-circulation (EGR on-off)

By allowing a small amount of the exhaust gases to re-circulate to the intake side of the engine, the combustion temperature is lowered, which in turn helps to reduce the emission of nitric oxide (NO_x).

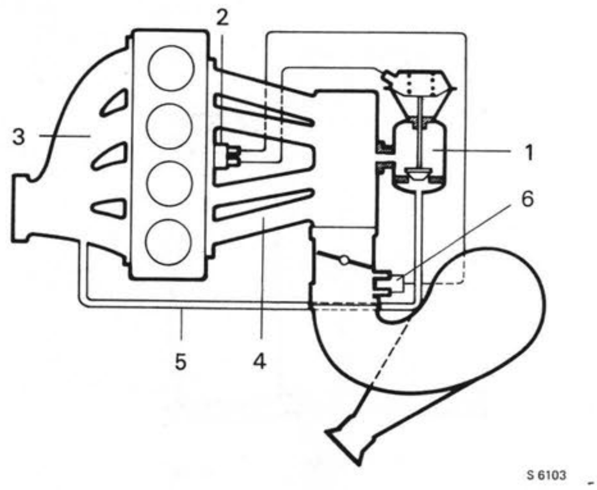


EGR ON-OFF SYSTEM

1. EGR valve
2. PVS valve
3. Exhaust manifold
4. Inlet manifold
5. EGR pipe
6. Restriction (0.16 in./4 mm diameter)

When the EGR valve opens a small quantity of the exhaust gases flows via the EGR pipe into the inlet manifold. The volume of exhaust gases is governed by the restrictions in the EGR outlet on the exhaust manifold. The EGR valve is controlled by the depression in the carburetor (throttle housing). The vacuum hole is positioned relative to the throttle so that the EGR valve opens at 1900 r.p.m. approx. (fast idling) or at a slightly higher speed. When the load is low the valve is fully open. At full throttle and slightly below, the depression is so weak that the valve shuts. The PVS valve sensors the temperature of the coolant and disconnects the depression at temperatures under 100^{o}F (38^{o}C) approx. so providing smoother running immediately after cold starting.

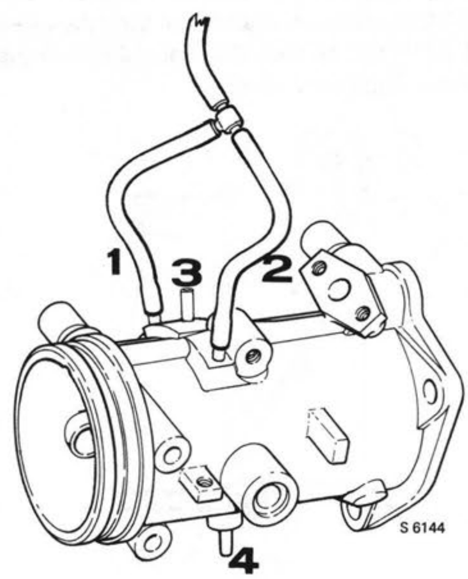
Exhaust gas recirculation (EGR, two-stage) (fuel injection engines as from 1978 model)



EGR. TWO-STAGE SYSTEM

1. EGR valve
2. PVC valve
3. Exhaust manifold
4. Inlet manifold
5. EGR pipe
6. Two-stage outlet

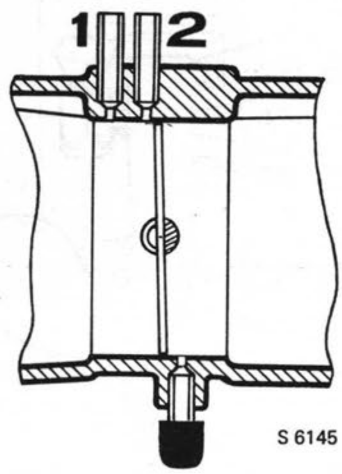
In contrast to the EGR on-off system this system has no restriction in the exhaust manifold outlet. Instead, the volume of exhaust gases returned is governed by the variable opening of the EGR valve.



VALVE HOUSING WITH OUTLETS FOR EGR TWO-STAGE

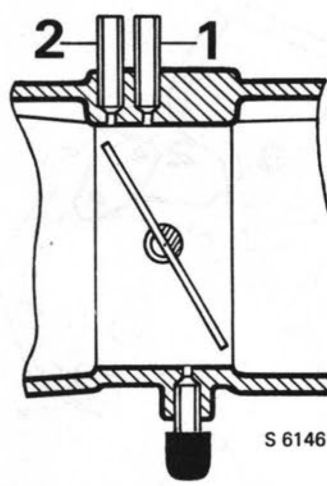
1.2. EGR outlets
3. Vacuum outlet, distributor
4. Plugged outlet

When the throttle is closed (at idling speed or during engine overrun) atmospheric pressure acts on both signal outlets and consequently no depression is obtained.



THE OUTLETS ON THE ATMOSPHERIC SIDE OF THE THROTTLE
1. 2. Outlets

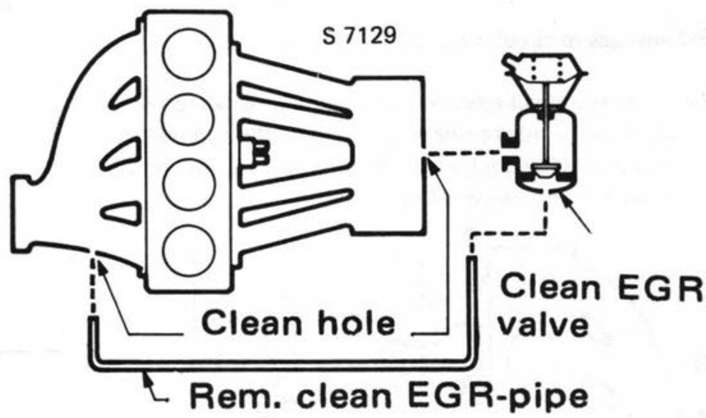
As the throttle passes the no. 1 outlet (steady low speed, light acceleration or light engine overrun), a depression is created at the EGR valve through no. 1 outlet. This is then partially offset by the fact that no. 2 outlet is subject to atmospheric pressure, so creating a greater depression at the EGR valve than would have been the case if only no. 1 outlet had existed. The reduced signal causes the EGR valve to partially open.



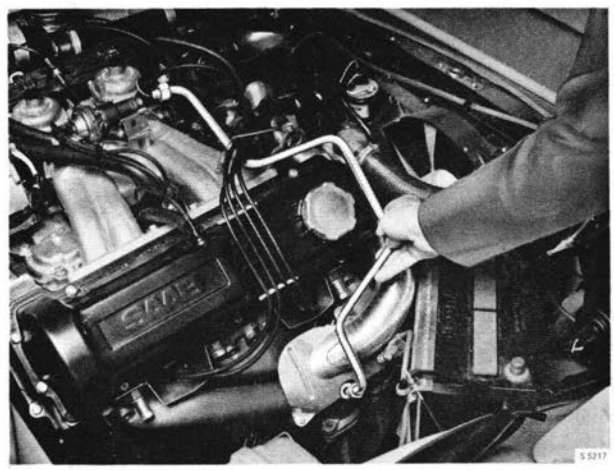
BOTH OUTLETS SENSE THE DEPRESSION
1. 2. Outlets

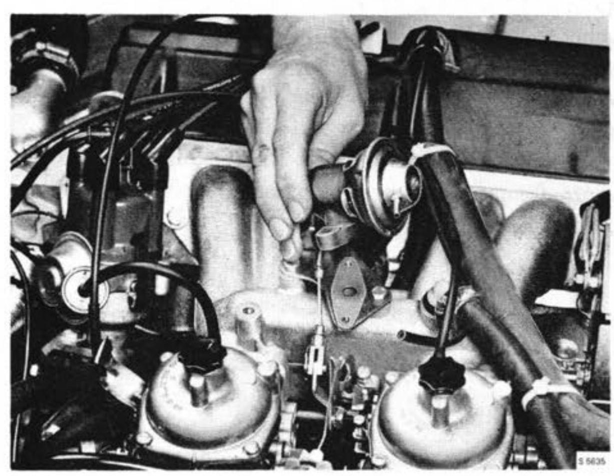
When the throttle passes no. 2 outlet both outlets are exposed to the engine's depression which results in maximum exhaust gas recirculation. The function of PVS valve is identical to that described in the EGR on-off system.

Cleaning the EGR system



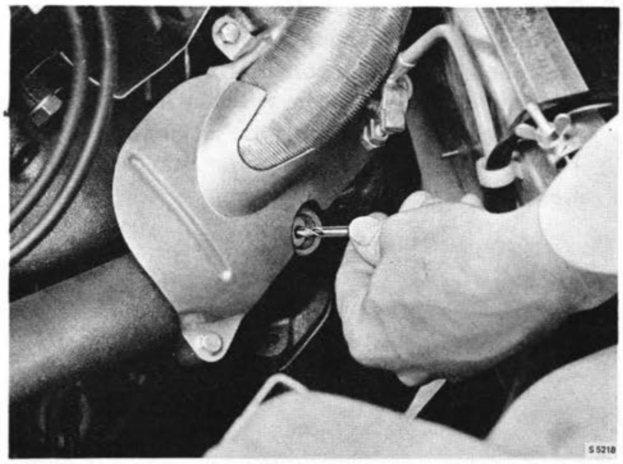
1. Remove the EGR pipe and EGR valve. The rubber bellows and throttle housing must first be removed on cars with fuel injection engines.





2. Clean the caliberated apterture in the exhaust manifold using a drill.
   "on-off" – ø 4 mm
   "two-stage" – ø 10 mm

SAAB



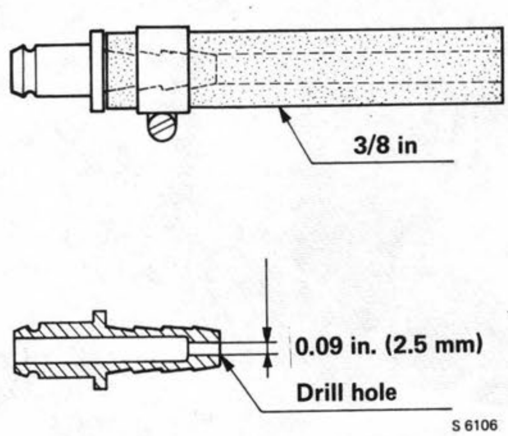
3. Clean the EGR aperture in the inlet manifold as follows:

CAUTION

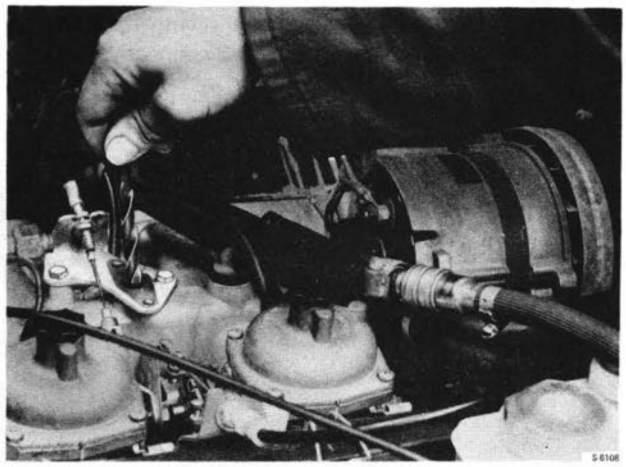
To prevent particals of soot from entering the inlet manifold when cleaning the EGR aperture, connect a compressed air line to the manifold via the nipple on the brake servo unit.

A special compressed air nipple with an internal restriction of 0.09 in. (ø 2.5 mm) and a length of 3/8 in. compressed air hose should be used to limit the pressure.

The compressed air nipple is made as shown in the illustration, e.g. by soldering up the nipple aperture and then drilling a 0.09 in. (ø 2.5 mm) hole.

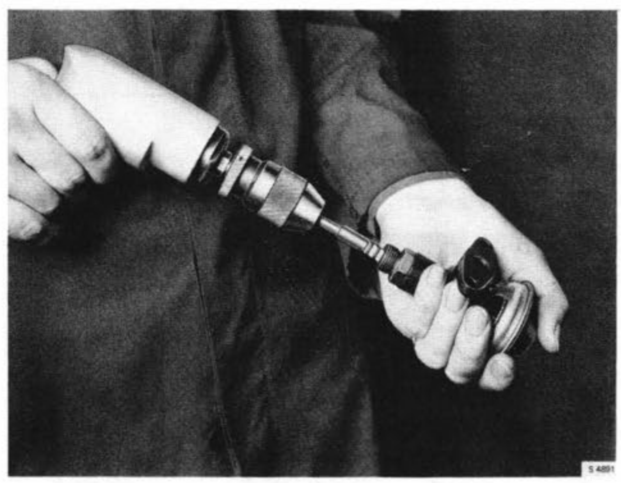


a. Disconnect the brake servo hose from the nipple on the inlet manifold.
b. Connect compressed air to the brake servo outlet on the inlet manifold using the special connecting nipple.
c. Clean the EGR aperture in the inlet manifold using a 0.40 in. (ø 10 mm) drill, so blowing out any soot particles.

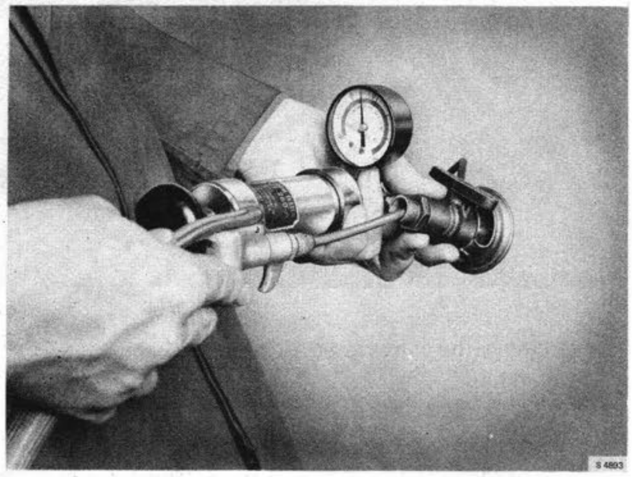


d. Remove the compressed air hose and refit the brake servo hose.

4. Wash and blow clean the EGR pipe. If the pipe is blocked with soot, clean it using a piece of wire.
5. Clean the inlet and outlet of the EGR valve with a rotary wire brush. Take care not to damage the valve spindle when cleaning the outlet side.



Rinse the valve with trichloroethylene and blow the valve clean with compressed air, keeping it open with a vacuum pump or by sucking through the hose connected to the valve.



USE VACUUM TO OPEN THE VALVE AND BLOW CLEAN WITH COMPRESSED AIR.

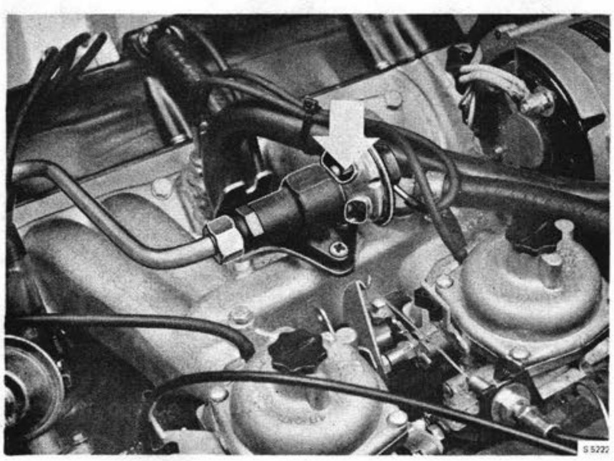
6. Re-fit the EGR valve with a new gasket and install the EGR pipe. Connect the vacuum hose. Cars with fuel injection engines: Re-fit the throttle housing and rubber bellows.

Checking EGR system

A. Opening engine speed

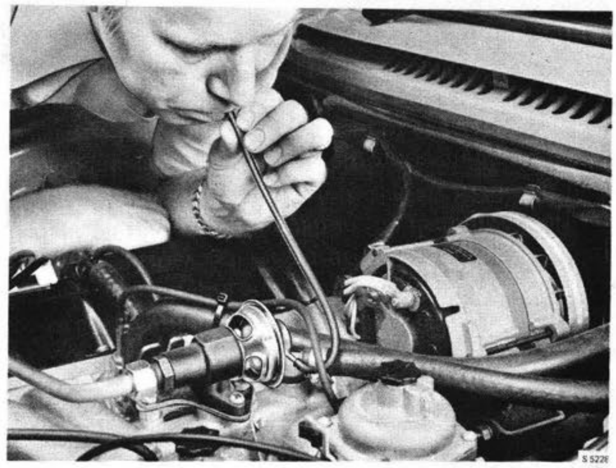
1. Run the engine until warm and connect a tachometer.
2. Rev up the engine and check when the EGR valve opens. The valve should open at fast-idling speed (see below). The valve spindle is visible between the valve casing and the vacuum bellows.

Type	Engine speed (fast idling) at which the valve should open
On-off	1900 r.p.m. approx.
Two-stage	2600 ± 300 r.p.m.



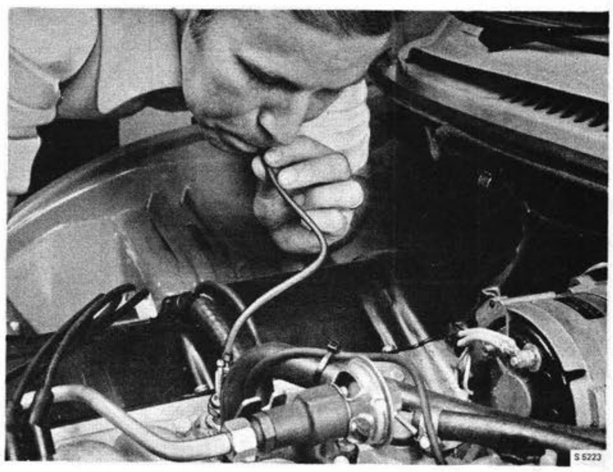
B. Blockage (soot or dirt in EGR pipe)

3. Run the engine at idling speed.
4. Disconnect the vacuum hose from between the PVS valve and EGR valve. Create a vacuum in the EGR valve using a vacuum pump or by sucking on the hose. The engine should then start to run erratically and eventually stop.



C. Checking the PVC valve

Check the PVS valve by blowing through it. When the engine is cold the valve should be closed and it should be open when the engine is warm.



RADIATOR AND COOLING SYSTEM

REMOVAL AND INSTALLATION

1. Drain off coolant.
2. Undo the water hose clips at the radiator and disconnect the hoses.
3. Undo the wiring terminals for the radiator fan and thermoswtich.
4. Remove the front sheet complete with radiator (see p. 201–2).

Reassemble in the reverse order.

TEST PRESSURIZATION

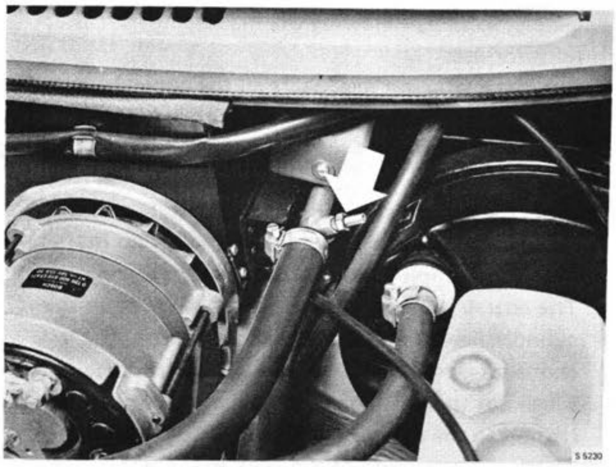
Leakage in the cooling system can often be difficult to detect because the system only develops full pressure when the car is actually being driven. A good method is to pressurize the system with a pressure tester, whereupon the radiator, hoses and seals can be checked out. The maximum permitted gauge pressure is 1.0 bar (kp/cm^2, 14 psi). A pressure tester can also be used to check the opening pressure of the radiator filler. Opening pressure, see Group 0.

INSPECTING THE RADIATOR

If the radiator has been removed from the car, it can be tested for leakage by being immersed in water with the tube opening plugged and supplied with compressed air. The maximum test pressure is 1.0 bar (kp/cm^2, 14 psi). Leaks, if any, can be repaired by soldering. The use of proprietary sealing agents added to the coolant should only be resorted to in emergencies, as these agents are apt to clog the jacket and tubes and interfere with free circulation. The cells of the radiator battery may sometimes become blocked with dust, insects, etc. with reduced air flow as a result. If so, wash the radiator and blow it clear with compressed air.

CHANGING COOLANT

1. Unscrew the pressure cap from the expansion tank.
2. Drain off the coolant through the radiator and engine block drain cocks. Set the heater control to maximum heat. As from model 1976: Open the bleeder nipple at the heater valve.
3. Close the drain cocks and fill the system with fresh coolant.
4. Start the engine and let it run until warm. Let it run at moderate speed with the heater control set to maximum heat. As from model 1976, air can be expelled from the system by means of the nipple at the heater valve. Top up with coolant as the air is expelled.



HEATER BLEEDER NIPPLE, AS FROM MODEL 1976

CAUTION

Be very careful if for any reason the coolant should be boiling when you are about to remove the radiator cap. Loosen the cap gently and allow steam to escape before taking the cap off. Never add large quantities of coolant when the engine is warm, as this may crack the cylinder block.

NON-FREEZING COOLANT MIXTURES

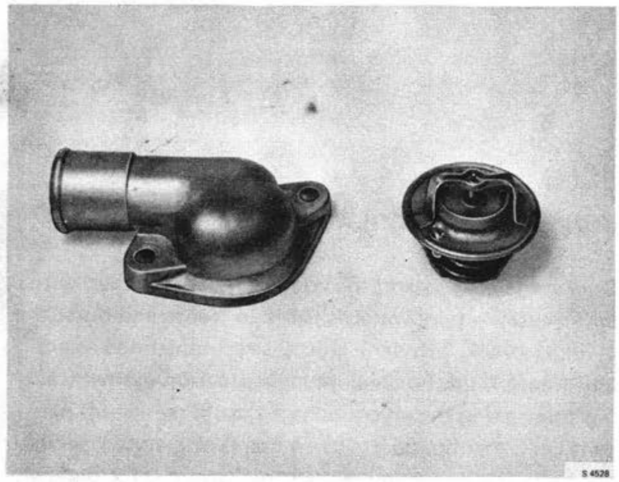
During the cold season the coolant must be mixed with anti-freeze, as pure water is liable to freeze and burst the cylinder block. Ethylene glycol is recommended as an anti-freeze fluid. For maximum protection against freezing and rusting the glycol dosage should be 40–50 per cent i.e. 3–4 imp. quarts (3–4 liters) of glycol. Use only the glycol grade recommended (see Group 0 for details). Saab glycol (catalog No. 8383622) can be used with good result all the year round for two years at a time. Other recommended glycol grades should be changed every year. If ordinary water is used in the summer season, an anti-rust agent should be addes. N.B. When anti-freeze is added, it must be premixed with a suitable quantity of water since full circulation of the coolant is not achieved before the thermostat has opened.

CLEANING THE COOLING SYSTEM

1. Drain off coolant.
2. Flush the system with clean water.
3. Fill the system with clean water containing a com-

mercial solvent, following the manufacturer's directions for use.

4. Run the engine warm to start all the coolant circulating.
5. Stop the engine and wait a few minutes before draining off the coolant.
6. Flush the system again with clean water; this time, flush the engine and radiator separately and in the reverse direction to the normal coolant circulation. The engine jacket should thus be flushed from the cylinder head down, and the radiator from the left connecting pipe. Remove the thermostat first.
7. Flush out the heater core, likewise in the reverse direction to the normal flow.
8. Check the operation of the cock in the line to the heater core.
9. Fit the thermostat, water outlet pipe and hoses and check the system for leakage. When cleaning the cooling system, check also that the radiator overflow pipe is not blocked by dirt. If the method of cleaning described here fails to clear the radiator of deposits, it should be removed from the car and sent to a radiator specialist.



THERMOSTAT AND WATER OUTLET PIPE

WINTER THERMOSTAT

A winter thermostat which opens at +198°F (+92°C) is available as a spare part.
This thermostat is only intended for use during the winter months in areas with very severe climates, i.e. Nordic countries, Canada and the northern states of the U.S.A. The ordinary +190°F (+88°C) thermostat should be refitted at the end of the winter. The winter thermostat MUST NOT BE FITTED TO TURBO ENGINES.

WATER PUMP

REMOVING

Engine in the car (engine removed as from point 5)

1. Drain off coolant through the engine and radiator drain cocks.
2. Remove the battery ground cable.
3. Dismantle the inlet manifold and cover the openings.
4. a. Remove the alternator.
   b. Remove the screw holding the alternator bracket to the pump cover.
   c. Unbolt both rear engine mountings.
   d. Place a jack fitted with a wooden block under the rear end of the power plant and raise the engine slightly until the upper screw bolting the alternator bracket to the transmission cover can be removed.
   e. Slacken the lower retaining screw slightly and turn the bracket so that it is as far from the engine as possible.
5. Remove the other two retaining screws from the water pump cover and remove the cover.

CAUTION

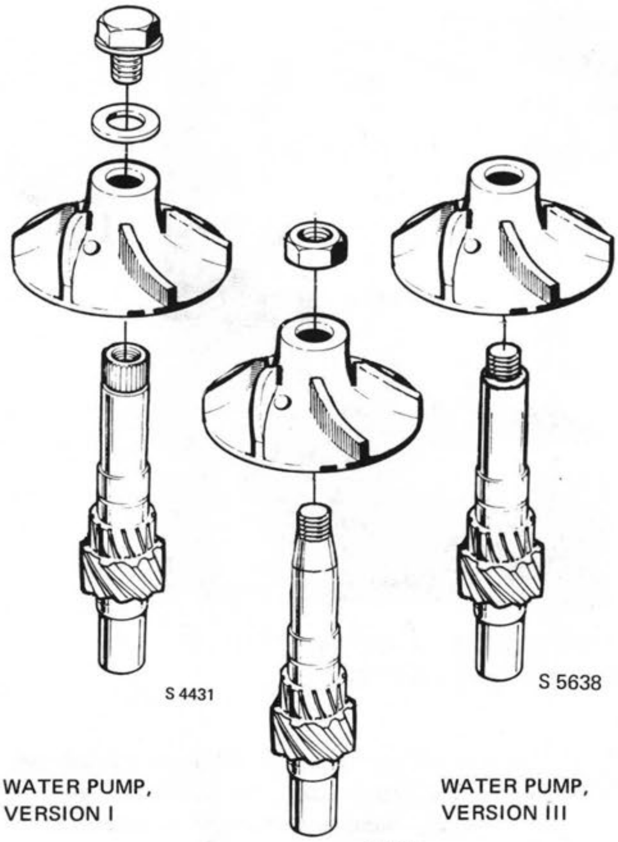
The water pump is available in three different versions which require different procedures for removal and assembly.

Version I: Impeller retained by means of a screw (cylindrical fitting on shaft).

Version II: Impeller retained by means of nut (conical fitting on shaft)

Version III: Impeller press-fitted on shaft. The thread on the end of the shaft is only provided for dismantling purposes. No nut is required.

Tapping-out hammers or the like must never be used under any circumstances during the removal or assembly of pumps of versions II and III.

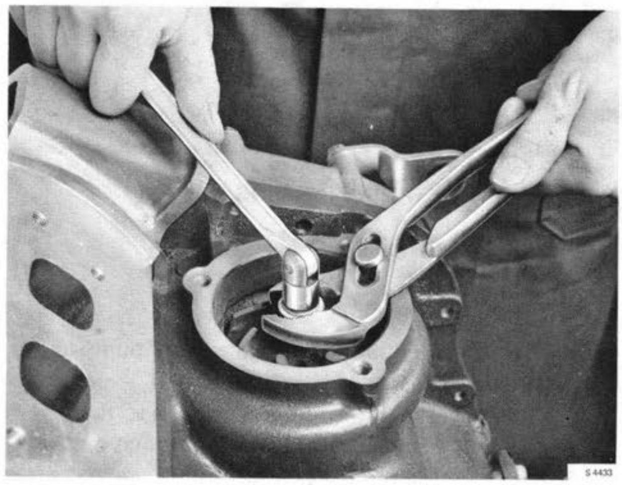


WATER PUMP, VERSION I

WATER PUMP, VERSION III

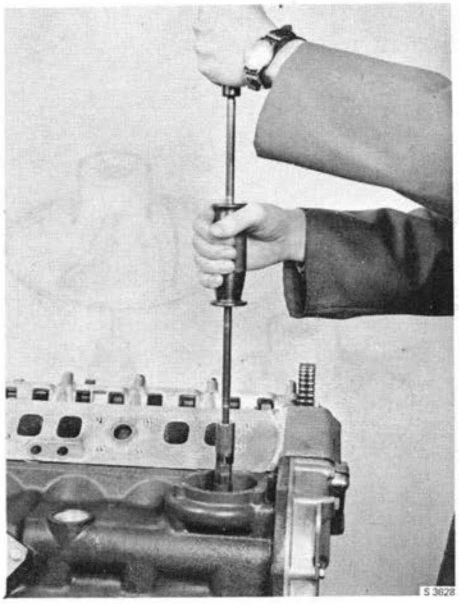
WATER PUMP, VERSION II

6. Version I:
   a. Remove the centre screw from the impeller. Hold the impeller with polygrip pliers and unscrew clockwise (left-hand thread). Save the washer.



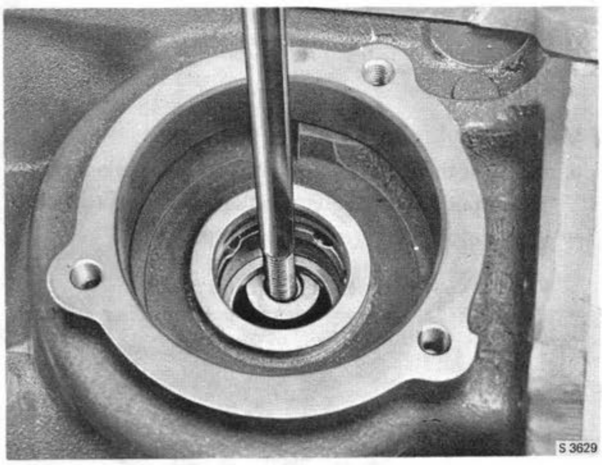
REMOVING THE IMPELLER CENTER SCREW

   b. Fit a tapping-out hammer with adapter 8392136 to the water pump shaft and withdraw the pump unit.



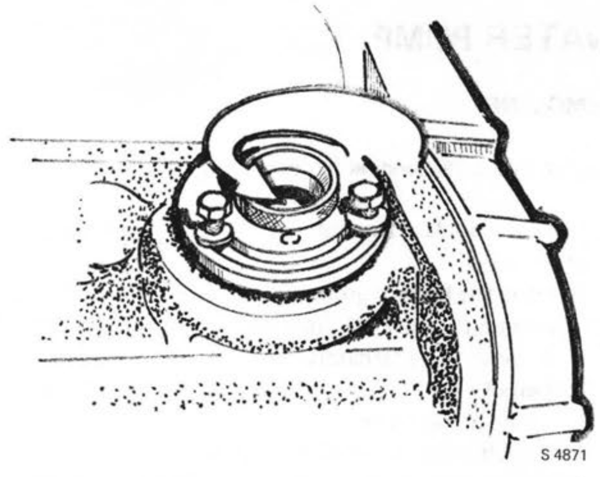
REMOVING THE WATER PUMP, VERSION I
Tools 8390270 and 8392136

c. The bearing housing may be left behind in the cylinder block. If so, extract the bearing housing with a tapping-out hammer fitted with a nut and flat washer, external diameter 1.0" (25 mm).



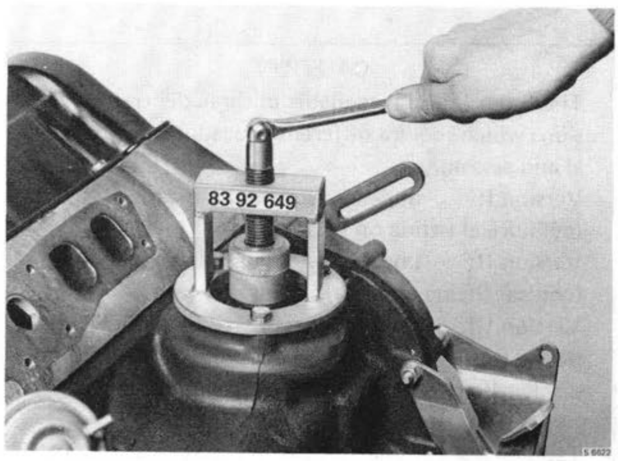
REMOVING THE BEARING HOUSING

6. Later version.
   a. Position tool 8392441 over the water pump and fit two screws without tightening.
      Then turn the tool counter-clockwise so that the peg on the tool engages and of the wings on the impeller. Tighten the two screws.
      Loosen the impeller center nut (left hand threaded).



THE TOOL IS TURNED COUNTER-CLOCKWISE
Tool 8392441

   b. Remove the water pump using 83 92 649 (or 83 92 490, older design).
      CAUTION. Hammers should never be used.



REMOVING THE WATER PUMP, VERSION II AND III
Tool 8392490

   c. The bearing housing may be left behind in the cylinder block. If so, extract the bearing housing by means of a tapping-out hammer fitted with a nut and flat washer with an external diameter of 1.0" (25 mm).

CAUTION

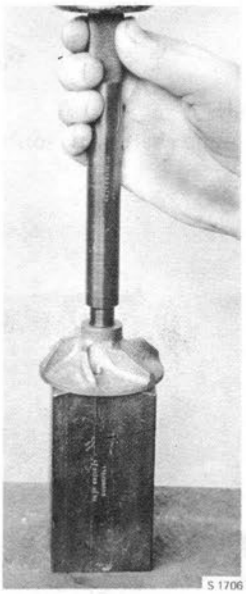
If the impeller is not immobilized while the center screw is unscrewed, the gear teeth on the pump shaft and idler shaft are liable to be damaged.
Up to and incl. model 1976 (versions I and II), the pump bearing and seals are mounted in a separate bearing housing, which in turn is mounted in the engine block.
As from model 1977 (version III), the pump bearing and seals are mounted directly in the engine block.
Up to the later model 1976, the bottom end of the pump shaft is seated in a bush. In later engines, the shaft end is seated directly in the engine block.

6. Version III:
   Dismantle the water pump using tool 83 92 649 (or 83 92 490, older design) which fits onto the threaded end of the shaft.
   CAUTION. Hammers should never be used.

DISASSEMBLING

(Pump removed from engine)

1. Mount the pump in tool 8390544 and push off the impeller using tool 8390585.



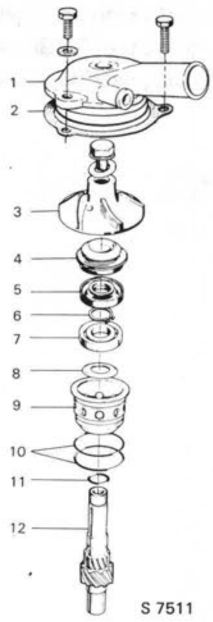
FORCING OFF THE IMPELLER
Tools 8390544 and 8390585

2. Up to and including 1976 model (design I and II): Press the pump shaft with seals and ball bearing from the bearing housing, using tool 83 90 544. Position the pump with the driving gear uppermost.

EXPELLING THE PUMP SHAFT
Tool 8390544

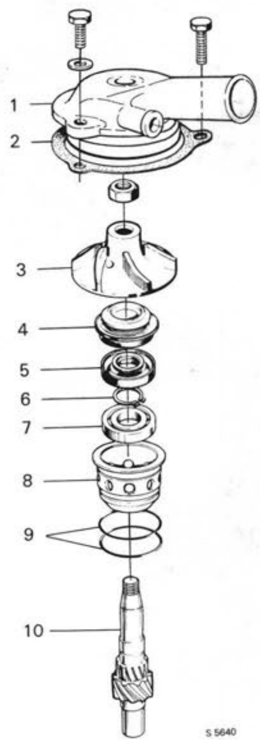
3. Remove the pump seal, O-ring, thrower (version 1) and seal ring.
4. Free the ball bearing lock ring.
5. Place the pump shaft and bearing in tool 8390536 with the drive end downward and press the shaft from the bearing.

EXPELLING THE SHAFT FROM THE BEARING
Tool 8390536



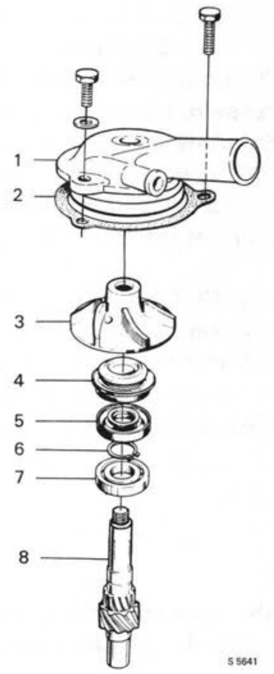
WATER PUMP, VERSION I

1. Pump cover
2. Gasket
3. Impeller
4. Water pump seal
5. Thrower
6. Seal ring
7. Ball bearing lock ring
8. Ball bearing
9. Oil thrower ring
10. Bearing housing
11. O-rings
12. Seal ring
13. Pump shaft



WATER PUMP, VERSION II

1. Pump cover
2. Gasket
3. Impeller
4. Water pump seal
5. Seal ring
6. Ball bearing lock ring
7. Ball bearing
8. Bearing housing
9. O-rings
10. Pump shaft



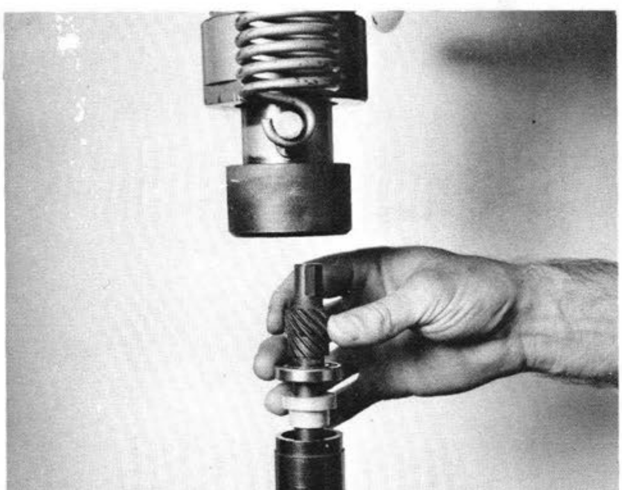
WATER PUMP, VERSION III (AS FROM MODEL 1977)

1. Pump cover
2. Gasket
3. Impeller
4. Water pump seal
5. Sealing ring
6. Ball bearing lock ring
7. Ball bearing
8. Pump shaft

ASSEMBLING

1. Fit the oil thrower ring (version I).
2. Press the ball bearing on to the pump shaft using tools 8390551 and:

Version I	8390569
Versions II and III	8392524



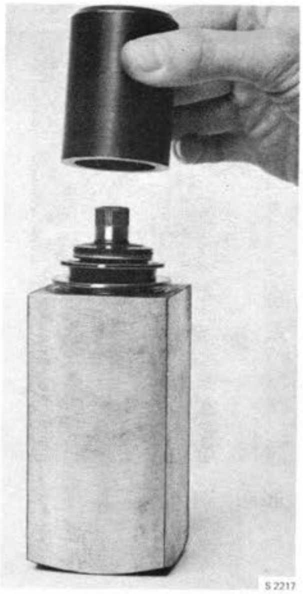
PRESSING THE BALL BEARING ONTO THE SHAFT

3. Fit the bearing lock ring.
4. Up to and including 1976 model (design I and II): Press the pump shaft complete with bearing into the bearing housing (see illustration) with the housing supported in tool 8390544. Press with tool 8390551.


S 1712

PRESSING THE PUMP SHAFT INTO THE BEARING HOUSING, UP TO AND INCL. MODEL 1976
Tools 8390544 and 8390551

5. Up to and including 1976 model (design I and II): Fit the seal ring using tool 83 90 551.
6. Fit the O-ring.
7. Up to and including 1976 model (design I and II): Fit the water pump seal using tools 83 90 544 and 83 90 536.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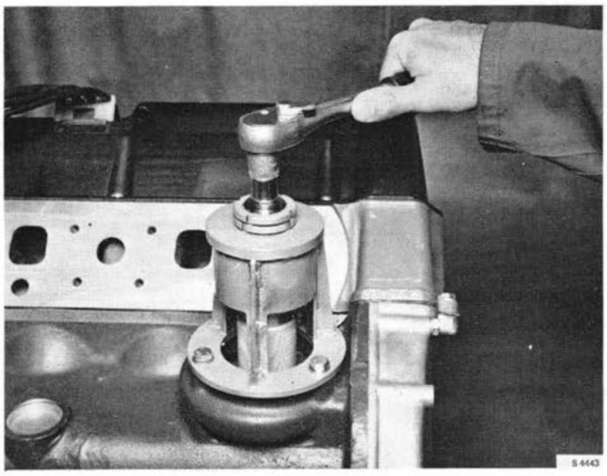
FITTING THE WATER PUMP SEA, UP TO AND INCL. MODEL 1976
Tools 8390544 and 8390536

INSTALLATION

> CAUTION
> Tapping-out hammers etc. must never be used during installation of water pumps of version II and III.

1. Version I:
   a. Mount the pump in the engine block, and check that the pump gear engages the gear on the idler shaft. Seat the bearing housing by means of sleeve 8390536. Ensure that the flange on the bearing housing butts against the plane of the engine block.
   b. Fit the impeller with washer and screw. Tighten the screw with the prescribed torque of 25 Nm (18 ft.lb., 2.5 kpm) counter-clockwise (left-hand thread).
1. Version II:
   a. Mount the pump in the engine block and check that the pump gear engages the gear on the jackshaft. Seat the bearing housing using tool 83 92 649 (or 83 92 490) and sleeve 83 90 536. This takes pressure off the driving gear during insertion.



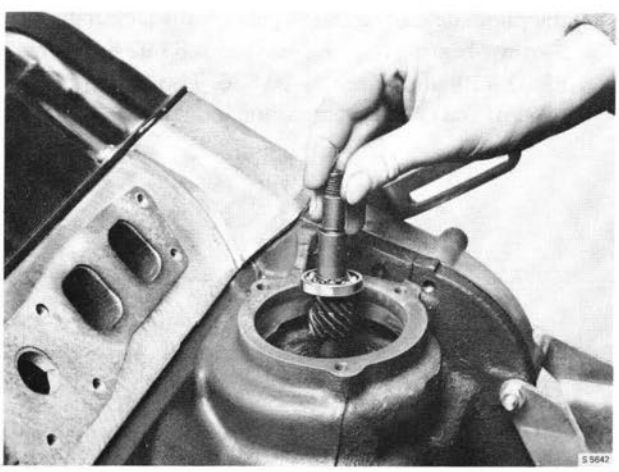
PRESSING IN THE BEARING HOUSING, VERSION II
Tool 8392490

b. Mount the impeller and the nut. Position tool 8392441 over the pump with two screws, do not tighten the screws. Then turn the tool clockwise so that the peg on the tool engages one of the wings on the impeller.
Tighten the two screws.

Torque	15±2 Nm (10.8±1.5 ft.lb./1.5±0.2 kpm)

CAUTION
If the prescribed torque is exceeded, this will damage the pump shaft.

1. Version III:
   a. Mount the pump shaft with bearing and circlip in the engine block by means of sleeve 8390551 and drift 8392490 (or 8392649, later version). Check that the pump gear engages the gear on the idler shaft before pressing the shaft into position.



MOUNTING THE PUMP SHAFT INTO THE ENGINE BLOCK

PRESSING IN THE PUMP SHAFT AND BEARING
Tool 8392490 (or 8392649 and 8390551)

   b. Fit the lower seal using sleeve 8390551).
   c. Fit the upper seal using tool 8390536 and a suitable plastic hammer.
   d. Press on the impeller using tool 8392490 (or 8392649, later version) and sleeve 8392524.

   Turn the tightening bolt 1/4 turn at a time, unscrew it and then tighten down 1/4 turn again until the impeller is finally in position.

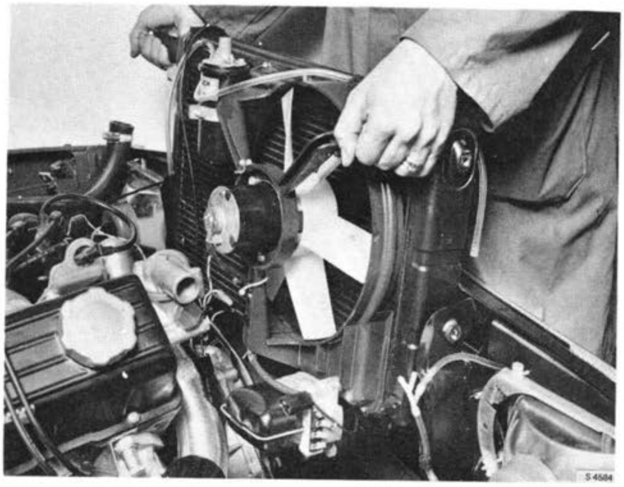
CAUTION
To avoid damaging the water pump bearing, do not use more force than necessary to fit the impeller. Ensure that the pump shaft and impeller hole have been thoroughly cleaned before assembly.

2. Fit the gasket and the water pump cover.
3. Fit the alternator mounting, lower the power unit and secure the engine mountings.
4. Fit the inlet manifold and alternator.
5. Connect the battery; fill the radiator with coolant.

FAN MOTOR

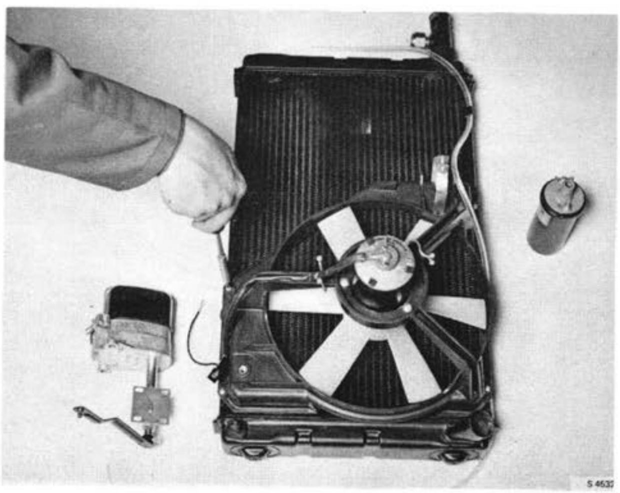
REMOVAL

1. Remove the battery.
2. Drain off the coolant through the radiator drain cock.
3. Disconnect the headlight wiper push rod from the crank arm in front of the radiator.
4. Undo the radiator retaining screws and the radiator hoses.
5. Disconnect the electric cables from the ignition coil, headlight wiper motor, fan and thermal switch. Disconnect the cable harness from the fan housing.
6. Lift the radiator and fan housing and wiper motor.



THE RADIATOR IS LIFTED AWAY

7. Unbolt the headlight wiper motor.
8. Remove the fan housing and dismantle the fan and fan motor.

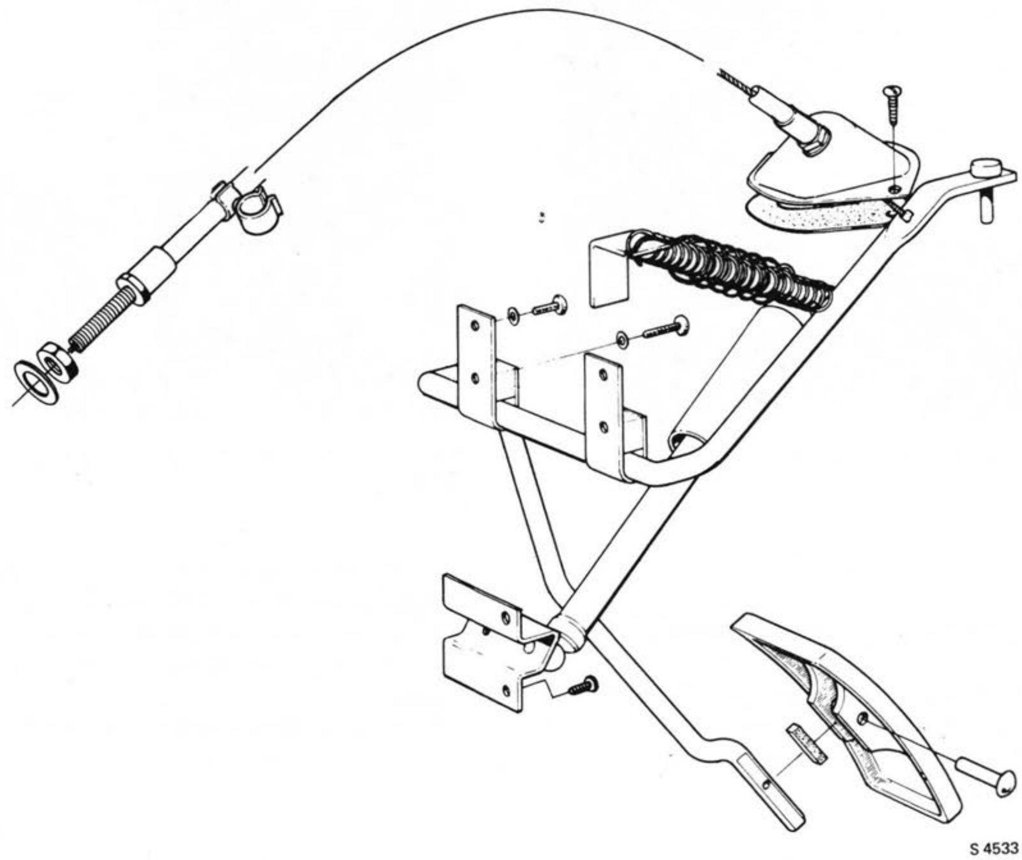


UNSCREWING THE FAN HOUSING

ASSEMBLY

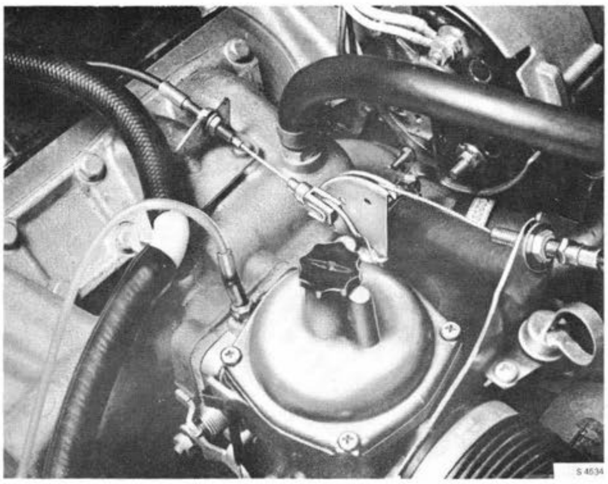
1. Mount the fan motor and fan in the fan housing.
2. Mount the fan housing on the radiator.
3. Mount the headlight wiper motor to the fan housing and radiator.
4. Mount the radiator and connect the hoses.
5. Connect the cables to the headlight wiper motor, fan, thermal switch and ignition coil and clamp the cable harness to the fan housing.
6. Fit the headlight wiper push rod.
7. Install the battery and fill the radiator with coolant.

THROTTLE CONTROLS

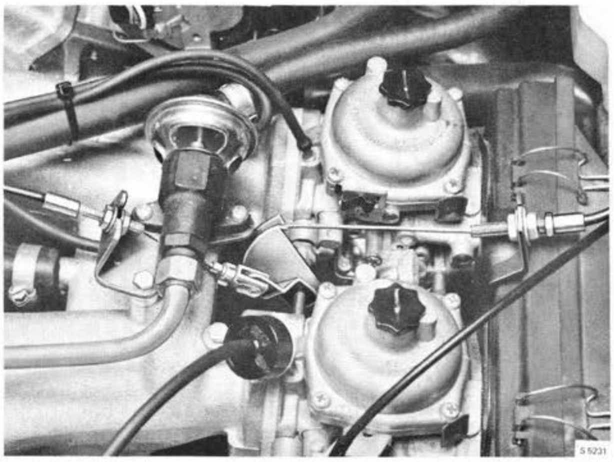


THROTTLE CONTROL

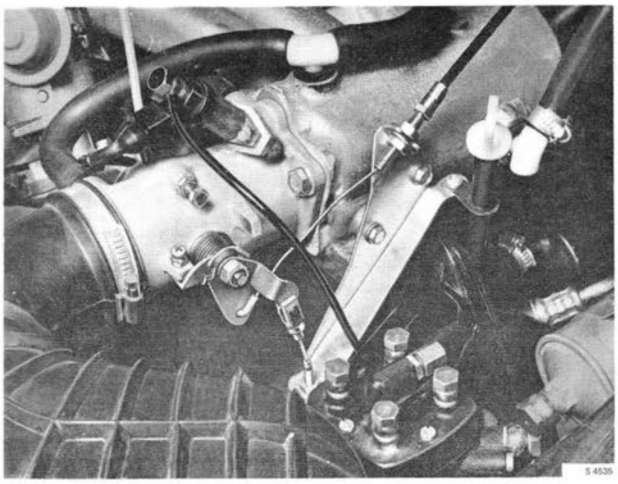
THROTTLE CONTROL CABLE



CABLE CONTROL, SINGLE-CARBURETOR ENGINE



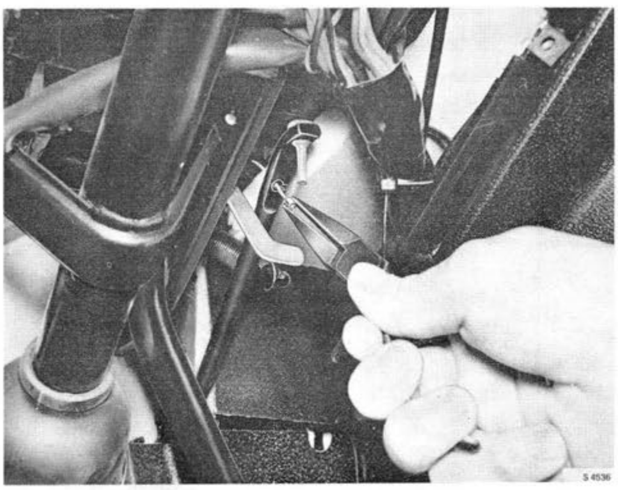
CABLE CONTROL, TWIN-CARBURETOR ENGINE



CABLE CONTROL, INJECTION ENGINE

Removal

1. Disconnect the cable at the carburetor (throttle valve housing) and from the retaining bracket.
2. Remove the left-hand (in RHD-cars the right-hand) panel from beneath the instrument panel.
3. Remove the locking pin from the accelerator pedal and disconnect the cable.

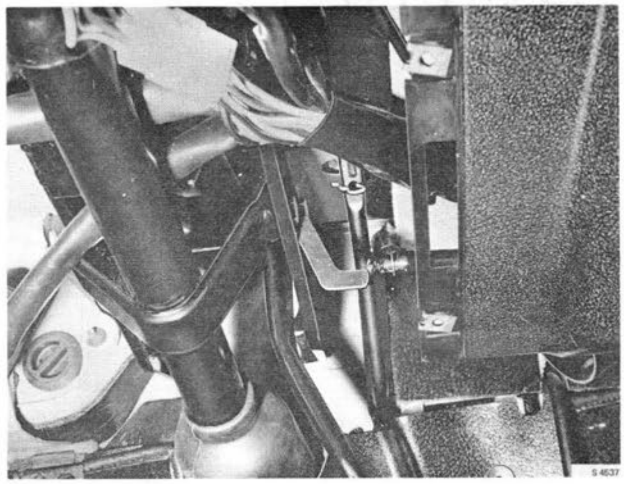


CONTROL WIRE LOOSENED FROM ACCELERATOR PEDAL

4. Unscrew the cable from the grommet in the dash panel.

Installation

1. Screw the cable to the grommet in the dash panel.
2. Connect the cable to the accelerator pedal and replace the locking pin.



THE CONTROL CABLE MOUNTED TO THE ACCELERATOR PEDAL

3. Fit the panel beneath the instrument panel.
4. Connect the cable to the driver (throttle arm).
5. Fit the cable anchorage to the bracket and adjust the cable tension to eliminate any play in the accelerator pedal.
6. Press the accelerator pedal right down to the floor and check that the throttle valve is fully open.

ACCELERATOR PEDAL

Removing

1. Remove the left (in R.H.D.-cars, the right) protective panelling from under the instrument panel.
2. Remove the throttle control damper assembly (does not apply to cars with automatic transmission).
3. Hook off the return springs.
4. Remove the locking pin at the anchorage point of the wire on the accelerator pedal.
5. Pull the wire loose from the accelerator pedal.
6. Undo the upper covering of the dash panel and fold it out of the way.
7. Remove the accelerator pedal from the dash panel.

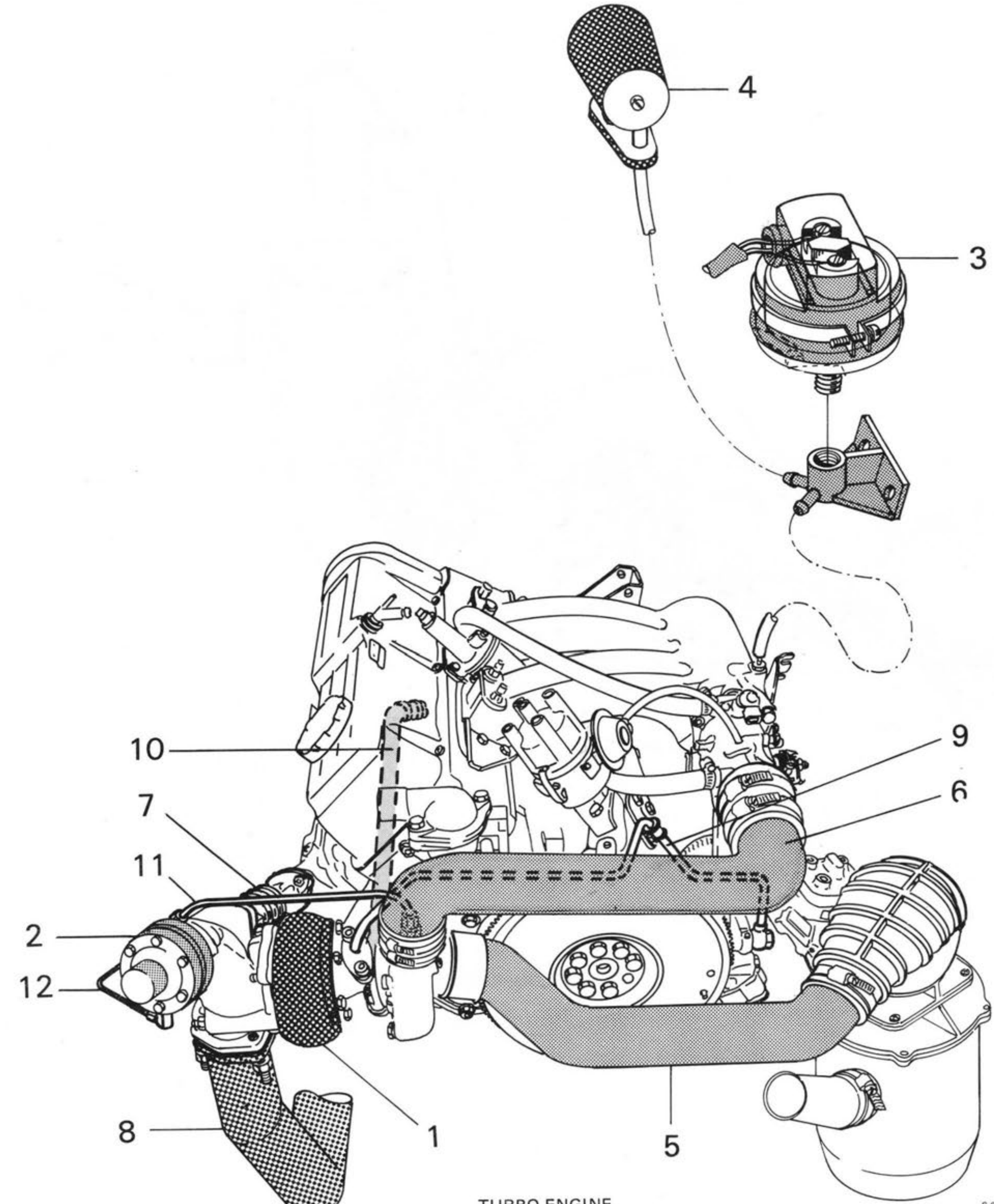
Installing

1. Mount the accelerator pedal onto the dash panel.
2. Fold back the dash panel covering.
3. Fit the wire to the accelerator pedal and insert the locking pin at the anchorage point of the wire on the accelerator pedal.
4. Hook on the return springs.
5. Fit the throttle control damper assembly (does not apply to cars with automatic transmission).
6. Replace the protective panelling under the instrument panel.
7. Make any necessary adjustments to the throttle control.

TURBO SYSTEM

Supercharging, general

In contrast to conventional engines, a supercharged engine provides improved charging on the induction stroke, which produces more effective combustion of the mixture and an increase in power output and torque. With a supercharged engine, it is possible to achieve performance that is comparable to that of a larger engine, while, at the same time, maintaining the advantages of a smaller engine with respect to fuel economy, space, weight, etc.

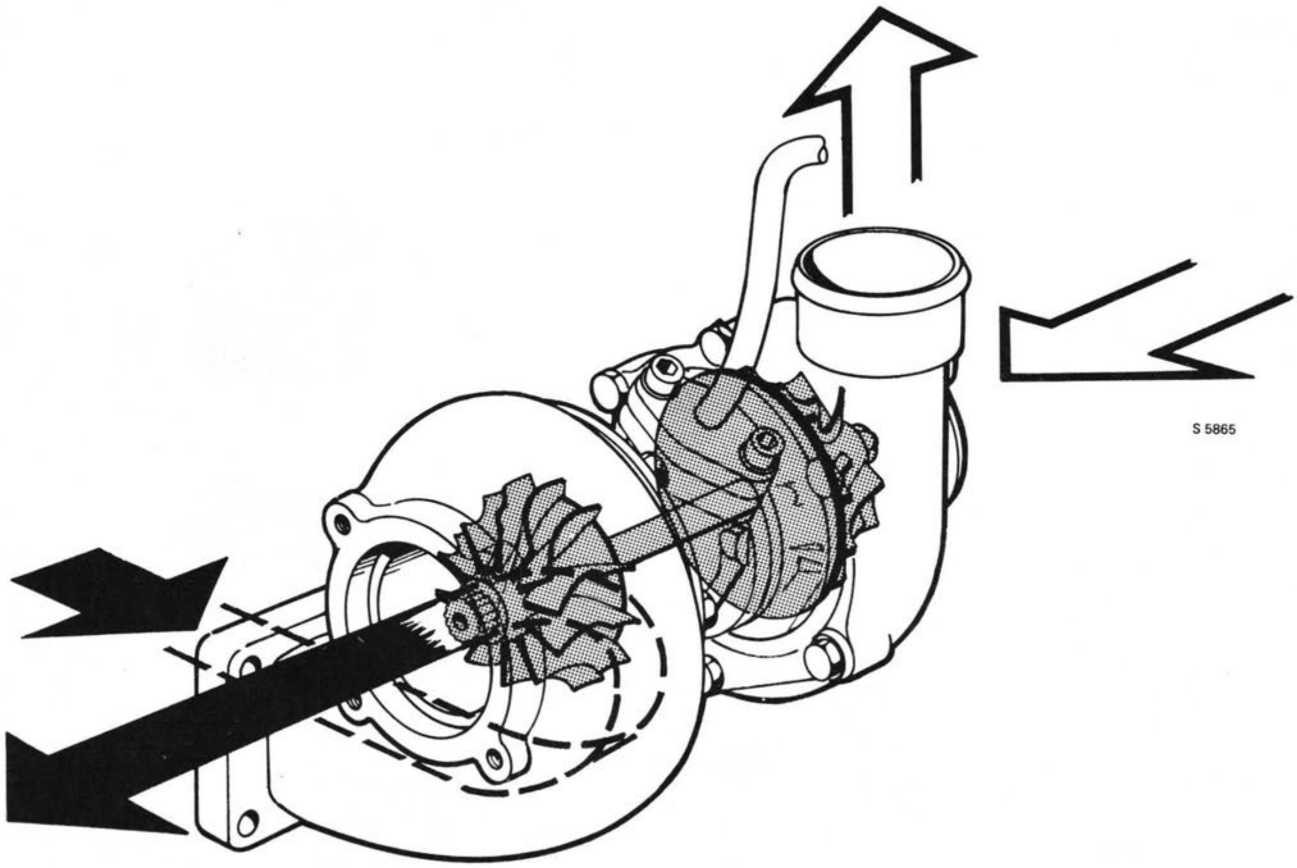


TURBO ENGINE

1. Turbocharger
2. Wastegate boost control
3. Pressure transducer
4. Turbo gauge
5. Hose, air cleaner to turbocharger
6. Hose, turbocharger to inlet manifold
7. Bellows
8. Exhaust outlet pipe
9. Oil supply line
10. Oil return line
11. Cooling air pipe
12. Exhaust pressure line

Turbocharging

Turbocharging is achieved by means of a turbo-compressor which implies utilizing the exhaust gases from the engine to drive the turbine.
The exhaust gases are led to an exhaust gas turbine, causing the turbine wheel to rotate. The turbine wheel is mounted on the same shaft as a compressor impeller which rotates at the same speed.
The compressor is located in the induction system where it effects an increase in the charging pressure in the combustion chamber.

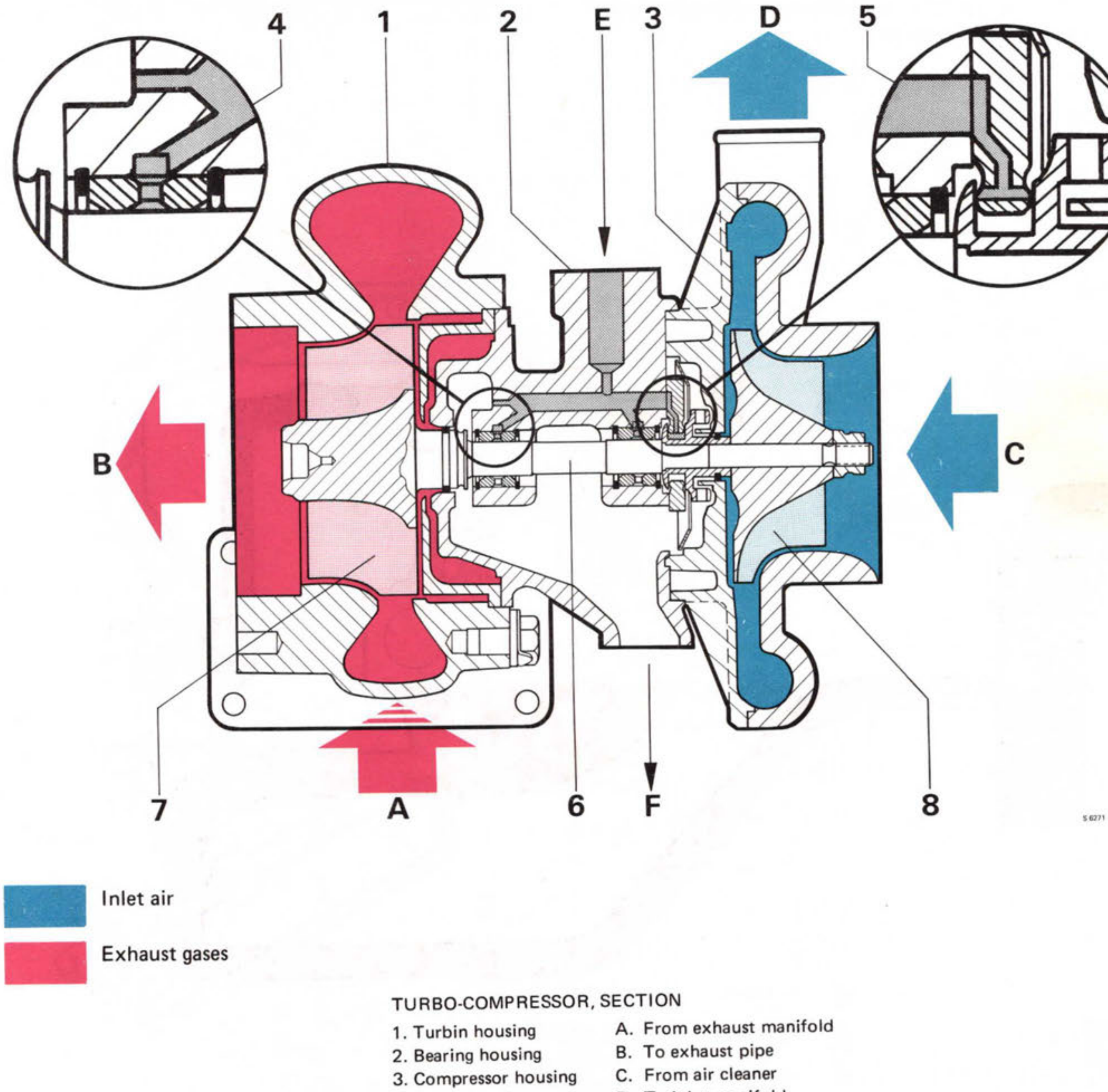


TURBO-COMPRESSOR

The Saab Turbo has been designed to start operating at relatively low engine speeds, in order to provide increased torque at engine speeds typical of normal driving conditions. In contrast to the Saab Turbo, earlier turbochargers have been designed po provide increased performance, which implies that they are only utilized at full throttle. The turbine shaft which rotates at very high speed has been very accurately balanced. The shaft is mounted in a floating sliding-contact bearing through which there is a relatively high oil flow. Thus, during rotation, the shaft floats on a film of oil.

The lubricating oil is supplied by the engine lubricating system through a special line running from the oil pump. Return oil flows through a relatively large-bore pipe back to the sump.

Sealing between the shaft and the bearing housing consists of sealing rings (piston ring type) installed in grooves in the shaft.



TURBO-COMPRESSOR, SECTION

1. Turbin housing
2. Bearing housing
3. Compressor housing
4. Radial bearing
5. Axial bearing
6. Turbo shaft
7. Turbine impeller
8. Compressor impeller

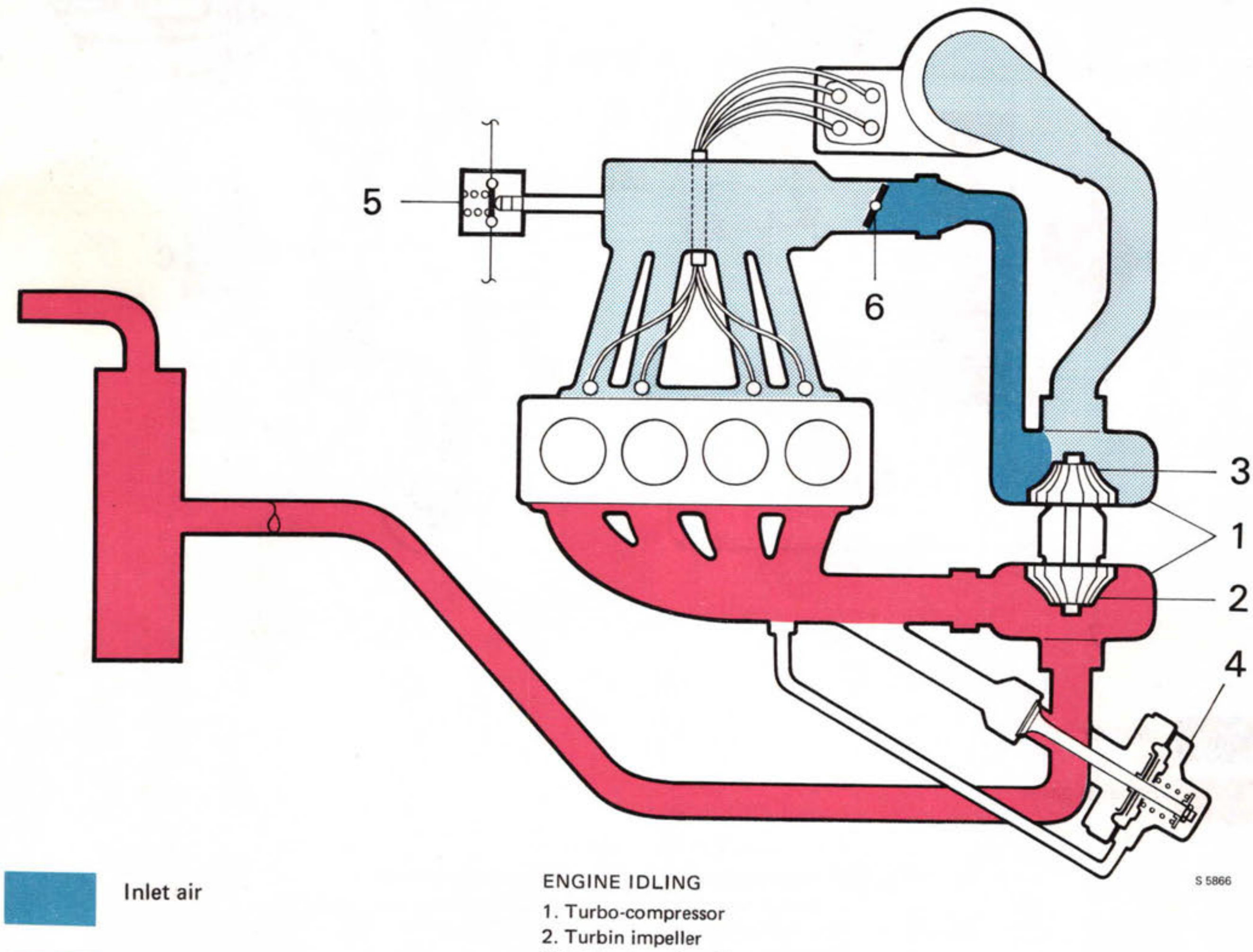
A. From exhaust manifold
B. To exhaust pipe
C. From air cleaner
D. To inlet manifold
E. Lubricating oil line
F. Lubricating oil return pipe

Charging pressure regulation

The charging pressure in the inlet manifold is governed mainly by the speed and loading of the engine. However, under high load conditions, the charging pressure is limited by a charge pressure regulator.
The charge pressure regulator is located on the exhaust side of the engine and controls the exhaust gas flow by means of a by-pass passage at the side of the turbine.
When the load on the engine is normal or below normal the charge pressure regulator valve (waste-gate) is closed. As the load increases and the charge pressure approaches the preset limit, the waste-gate opens, which decreases the load on the turbine by allowing exhaust gases to flow through the by-pass passage.

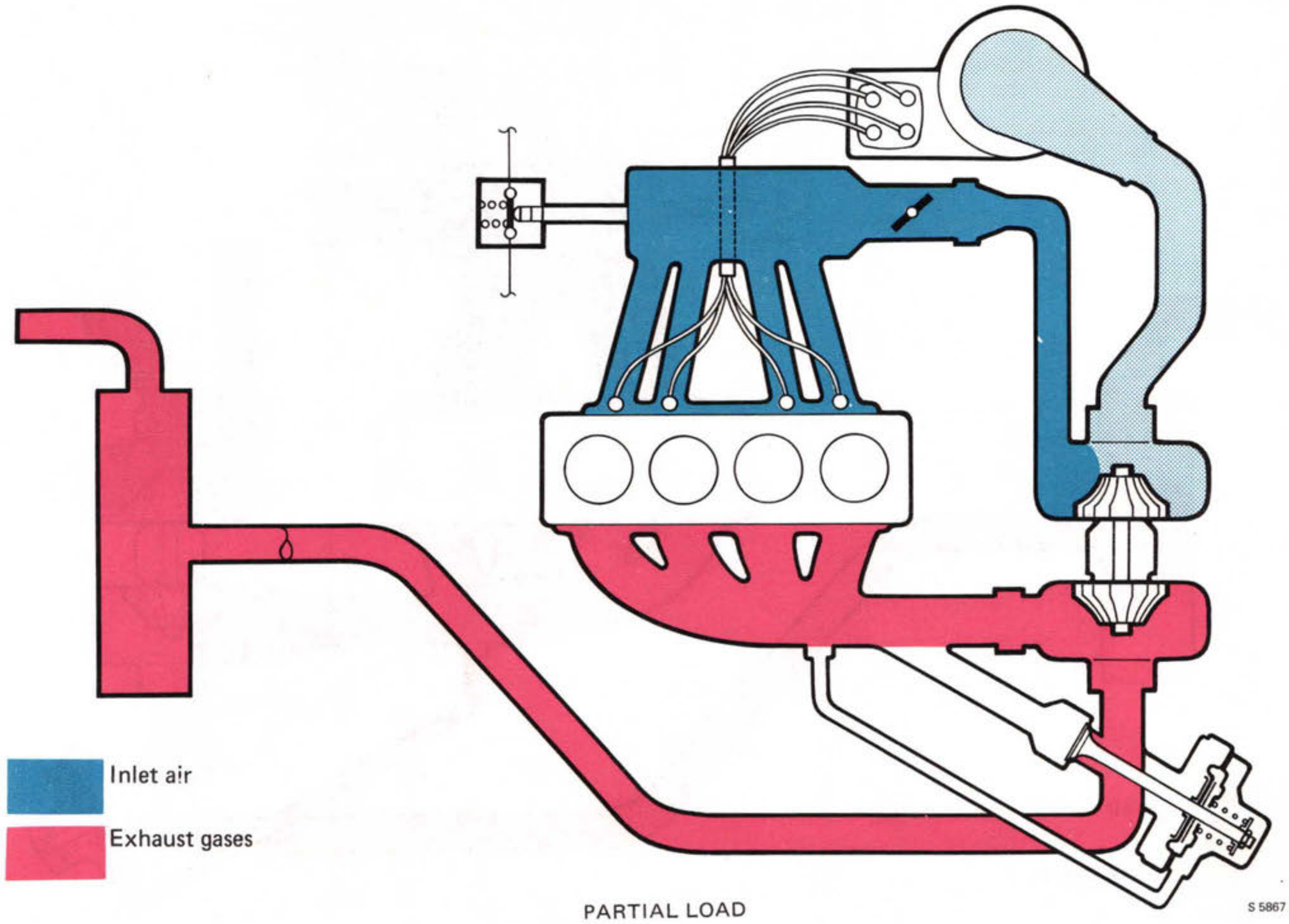
The charge pressure regulator contains a spring-loaded diaphragm valve which is kept closed under normal conditions by means of the spring. The valve is connected by means of a pipe to the exhuast manifold and is actuated by the exhaust gas pressure. Presetting of the charging pressure is achieved by adjustment of the spring.
The valve spindle of the charge pressure regulator is cooled by means of a pipe running from the compressor to the charge pressure regulator bearing housing.

CAUTION
Never increase the preset pressure as specified in section 0 as this is likely to damage the engine.

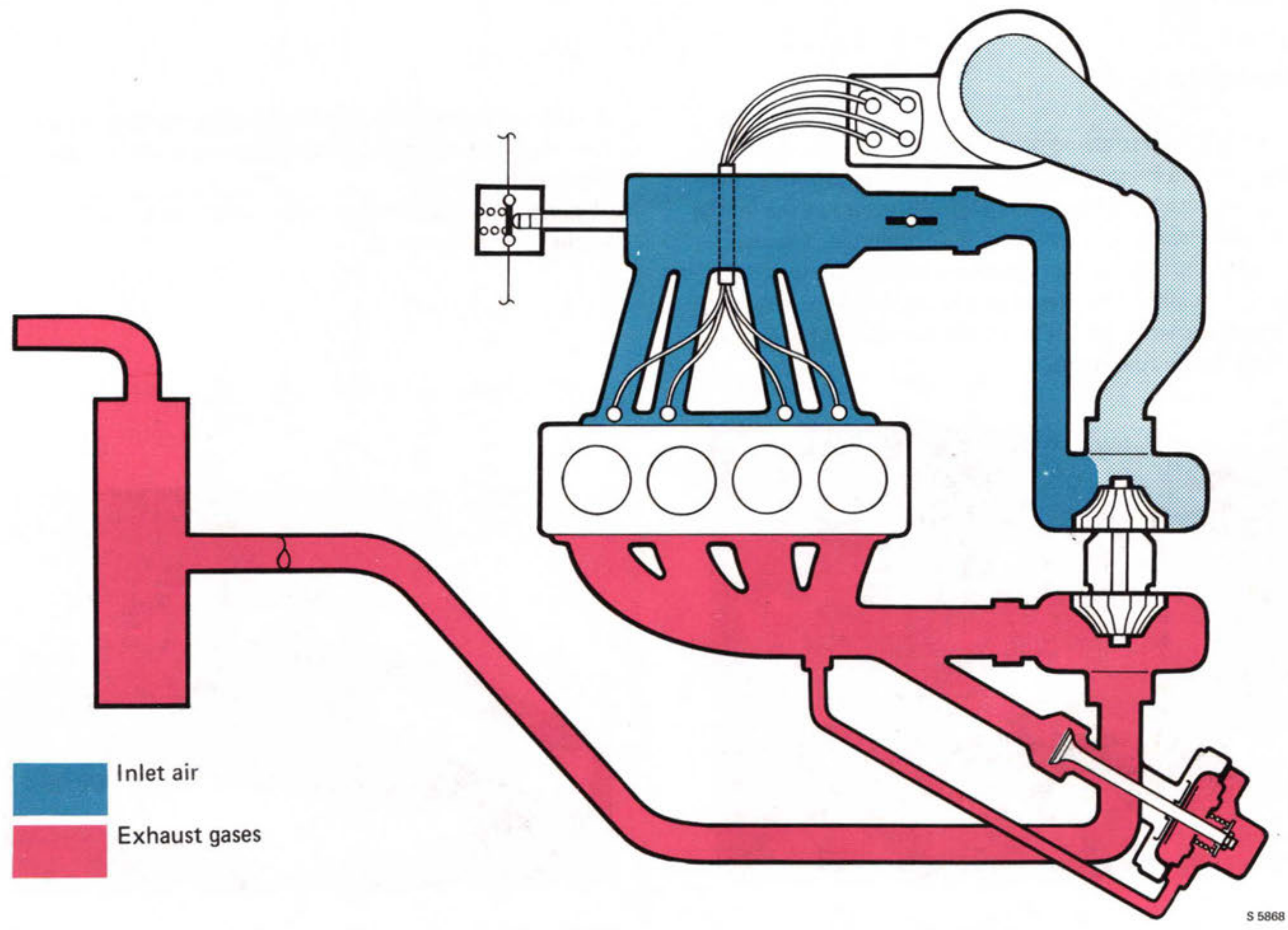


ENGINE IDLING

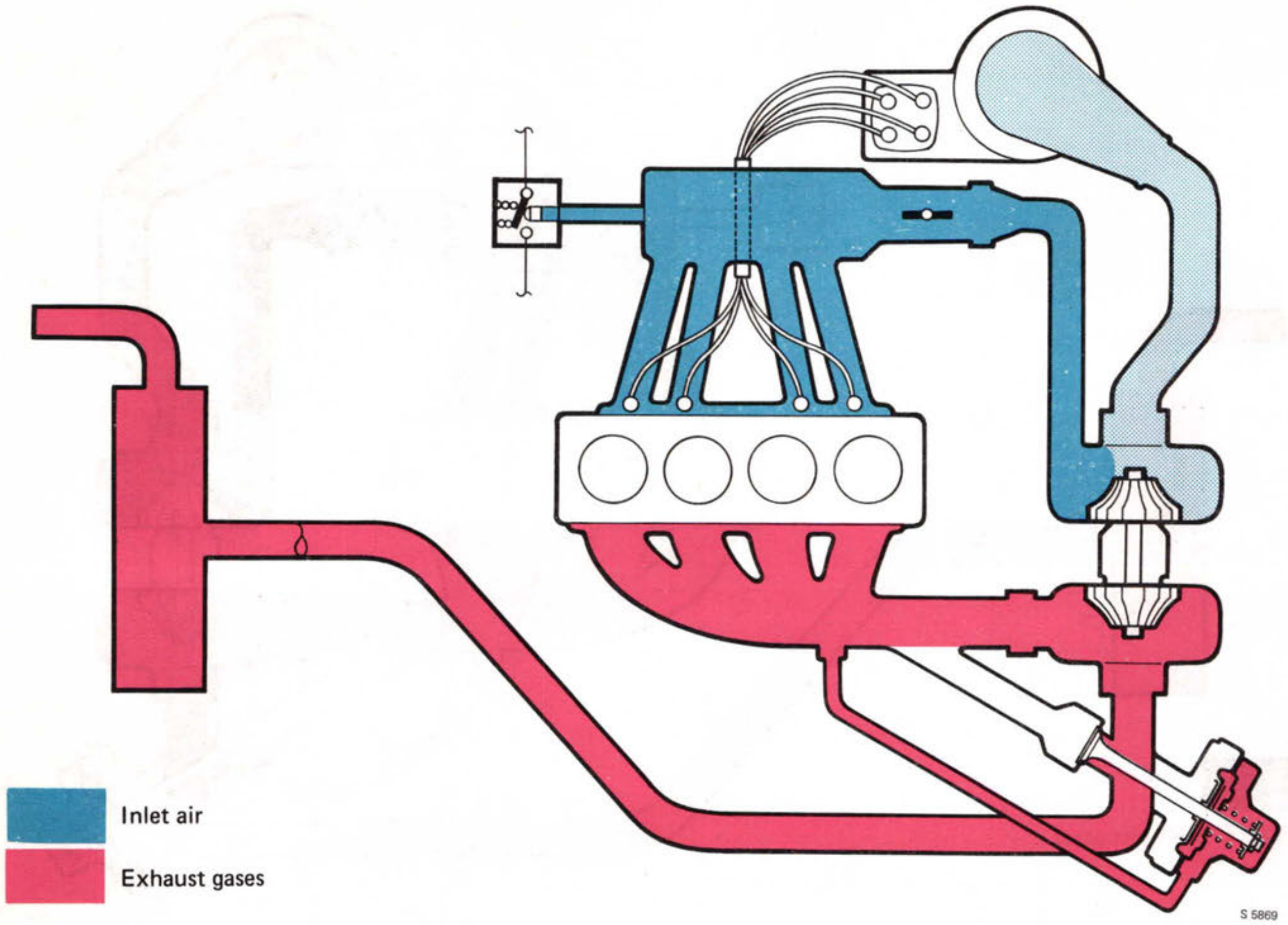
1. Turbo-compressor
2. Turbin impeller
3. Compressor impeller
4. Charge pressure regulator
5. Pressure switch
6. Throttle valve



PARTIAL LOAD



FULL LOAD



OVER-PRESSURE IN THE INLET MANIFOLD AT FULL LOAD (E.G. STICKING CHARGE PRESSURE REGULATOR)

Over-Pressure guard

To prevent overstressing of the engine in the event of failure of the charge pressure valve, an over-pressure guard, which is actuated when the charging pressure in the intake manifold exceeds the preset limit, is provided. The over-pressure guard comprises a pressure switch connected to the inlet manifold by means of a hose. When the charging pressure exceeds a preset limit, the switch will break the current to the fuel pump.

A rotor with a built-in centrifugal switch prevents over-revving of the engine by breaking the ignition at excessive engine speeds.

A pressure gauge showing the charing pressure is fitted in the instrument panel.

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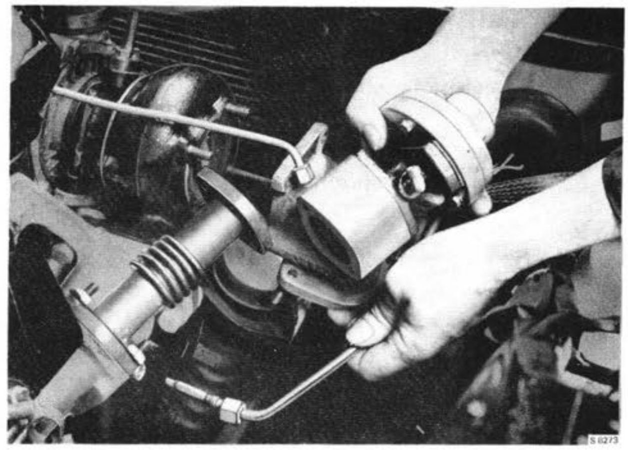
TURBOINSTRUMENT

Turbo unit

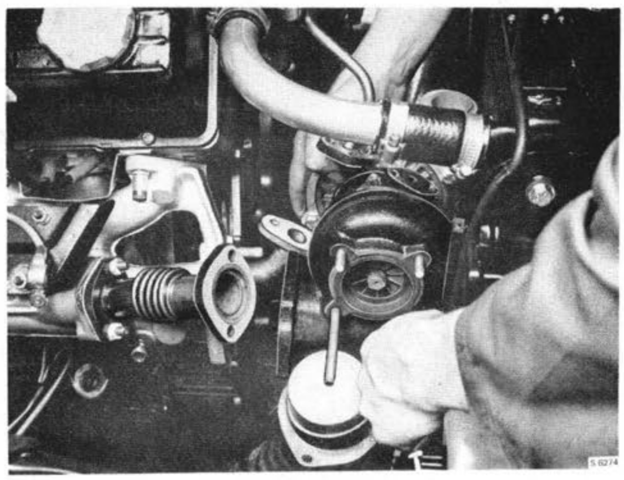
Removal

1. Remove the charge pressure regulator and blank off the exhaust pipe.
2. Disconnect the hose between the compressor and the throttle housing.



S 6273

3. Disconnect the oil supply line and the oil return line at the turbo unit.
4. Remove the bolts securing the turbo to the exhaust manifold and remove the turbo unit. Plug all holes in the turbo unit.



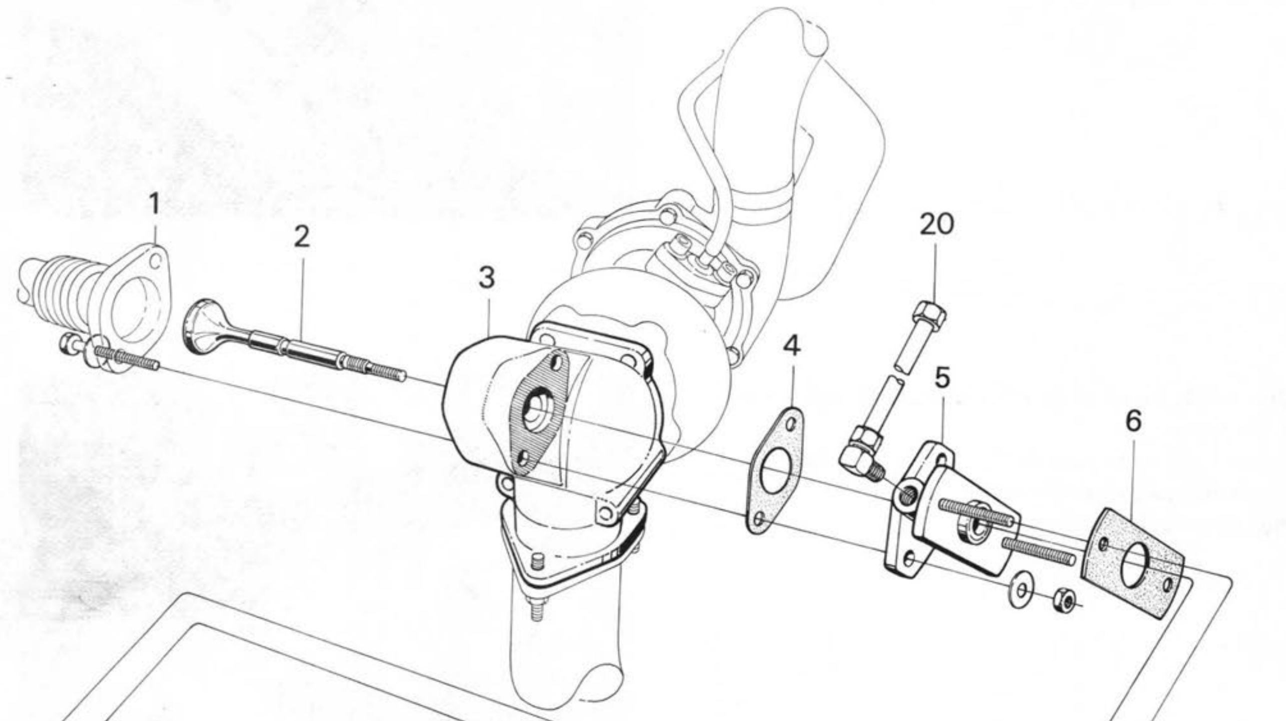
S 6274

Assembly

1. Secure the turbo unit to the exhaust manifold, fitting a new gasket between the mating flanges.
2. Fill the lubricating inflow of the turbo unit with engine oil and connect the oil return line at the turbo, using a new gasket.
3. Connect the oil supply line, using a new gasket and new seals.
4. Fit the hose between the compressor and throttle housing and the hose between the air flow meter and the compressor.
5. Fit the charge pressure regulator using new gaskets and locking plates.
6. Turn the engine on the starter for about 30 seconds with terminal 15 on the ignition coil disconnected, in order to fill the lubricating system of the turbo before the engine starts running.

Charge pressure regulator

The following operations are included:
- Removal, fitting
- Dismantling, assembly (charge pressure regulator removed)
- Grinding of valve (charge pressure regulator dismantled)
- Changing the diaphragm (in the car)
- Measuring the charging pressure
- Adjusting the charging pressure
- Cleaning the diaphragm housing (every 24 000 miles)
- Sealing the charge pressure regulator



CHARGE PRESSURE REGULATOR

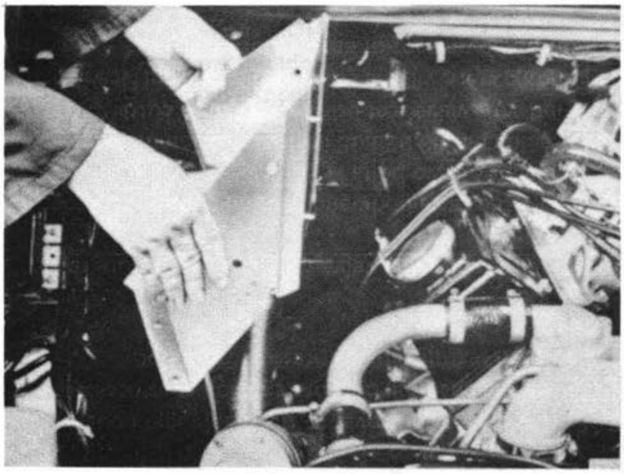
1. Bellows pipe
2. Valve
3. Regulator housing
4. Gasket
5. Bearing housing
6. Gasket
7. Heat shield
8. Gasket
9. Diaphragm housing
10. Flat washer
11. Inner diaphragm washer
12. Diaphragm
13. Outer diaphragm washer
14. Diaphragm nut
15. Inner spring seating (Model 1979 six holes, as from model 1980 four holes)
16. Spring
17. Inner spring seating
18. Lock nut
19. Diaphragm housing cover
20. Cooling air pipe

General

The charging pressure regulator's valve stem is cooled by a pipe which runs from the compressor to the regulator bearing housing.
The spring in the charging pressure regulator is canted slightly because the inner spring seat is intentionally offset in relation to the valve stem in order to reduce valve chatter. An uneven wear profile in the valve seat, valve guide and valve stem is therefore perfectly normal and is not detrimental to the operation of the unit.

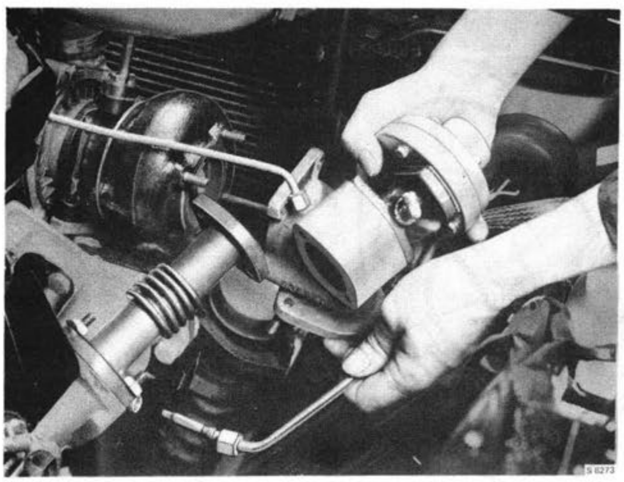
Removing the charge pressure regulator

1. Remove the battery, heat shield and battery shelf.



REMOVING THE BATTERY SHELF

2. Disconnect the exhaust and cooling air lines from the charge pressure regulator.
3. Unbolt the exhaust manifold flange. Save the taper seal ring and plug the exhaust pipe.
4. Prize up the locking plate and remove the bolts from the bellows pipe.
5. Prize up the locking plate, remove the bolts from the turbo and remove the charge pressure regulator.



REMOVING THE CHARGE PRESSURE REGULATOR

Fitting the charge pressure regulator

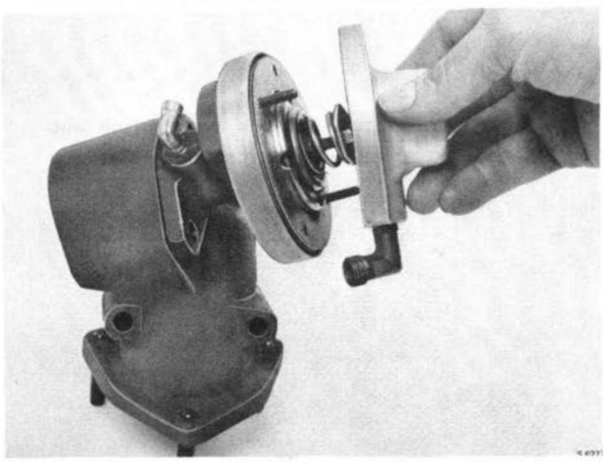
1. Bolt the charge pressure regulator to the turbo (fit new gasket) and lock the nuts by means of locking plates.
2. Fit the bellows pipe retaining bolts, locking them by means of the locking plate.
3. Remove the plug from the exhaust pipe and connect the pipe with taper seal ring to the charge pressure regulator housing.

> Lubricate the charge pressure regulator nipple with NEVER SEIZE or MOLYCOTE 1000 to prevent it welding stuck.

4. Connect the exhaust and cooling air lines.
5. Fit the battery shelf and the battery.
6. Test drive the car, checking the charging pressure and adjusting as necessary.
7. Seal the charge pressure regulator and fit the heat shield.

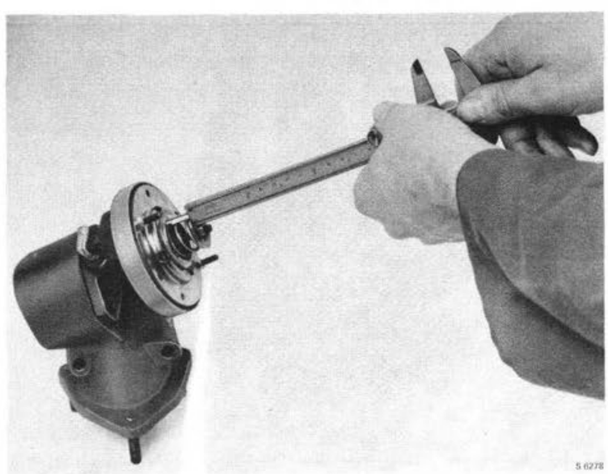
Dismantling the charge pressure regulator
(Charge pressure regulator removed)

1. Remove the diaphragm housing cover.

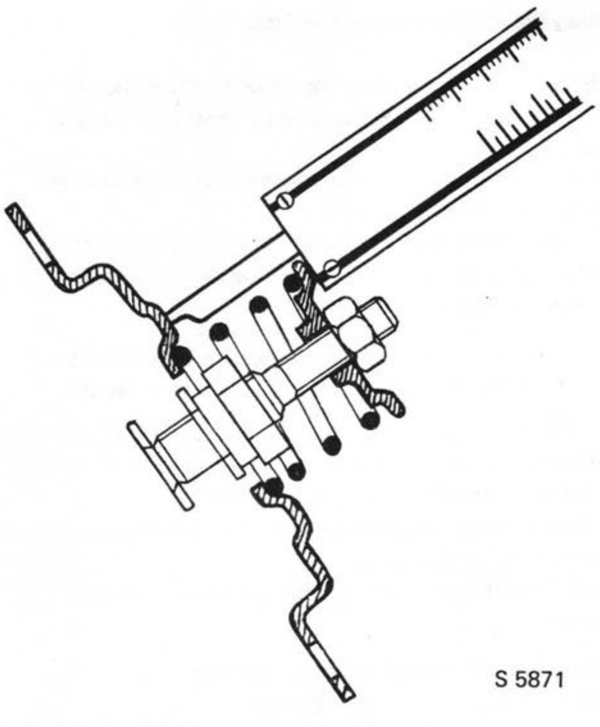


REMOVING THE DIAPHRAGM HOUSING COVER

2. Measure and note the length of the compressed spring (distance between the outer and inner spring seatings, see illustration). Measure the length at two diametrically opposed points and note the mean value.

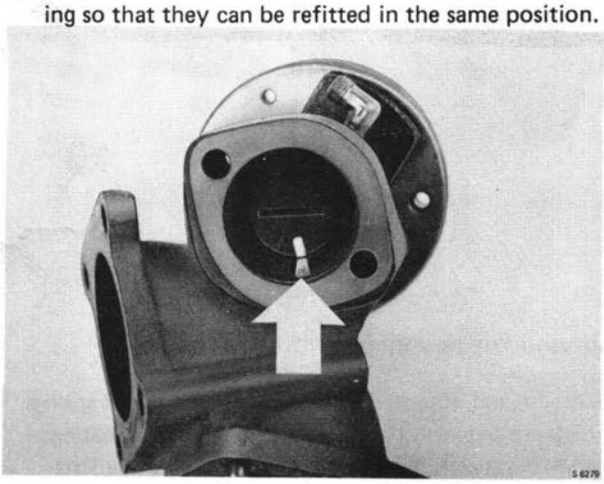


MEASURING THE LENGTH OF THE COMPRESSED SPRING

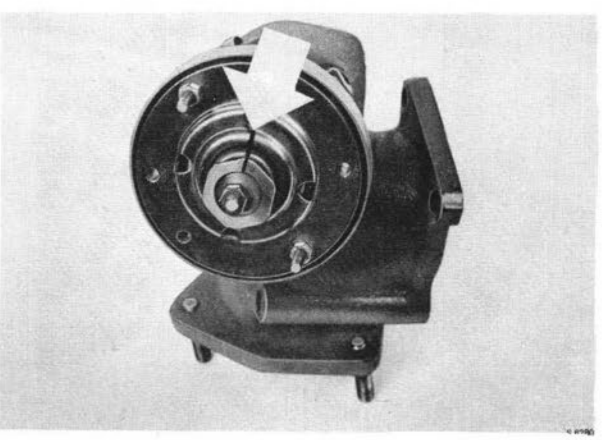


MEASURING THE LENGTH OF THE COMPRESSED SPRING

3. Mark the position of the valve and outer spring seating so that they can be refitted in the same position.



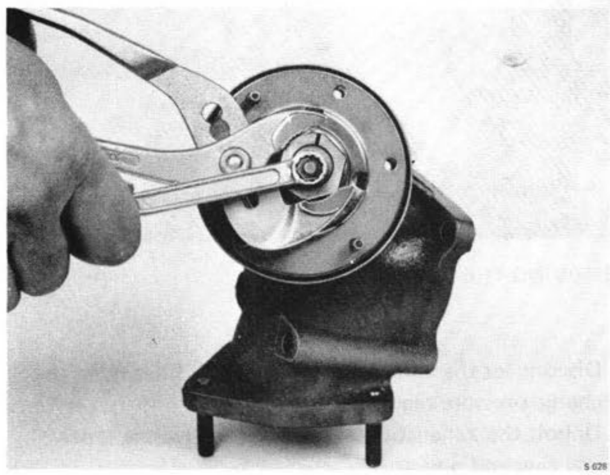
MARKING THE VLAVE FOR FITTING



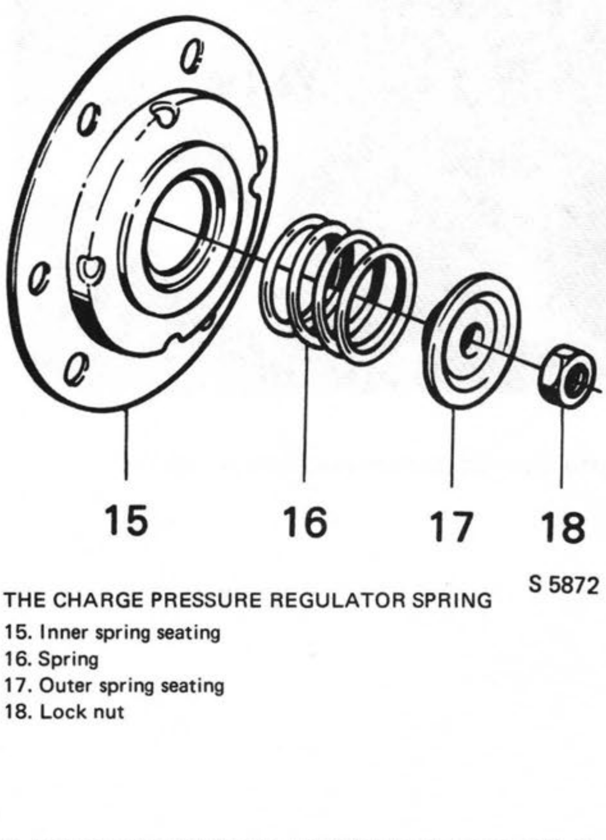
MARKING OF SPRING SEATING AND SPRING

4. Loosen the lock nut using a 10 mm ring spanner and polygrip pliers and then remove the nut, the outer spring seating, the spring and the inner spring seating.

CAUTION
Always grip the valve seat when removing the spindle nut to avoid damaging the diaphragm.



REMOVING THE LOCK NUT



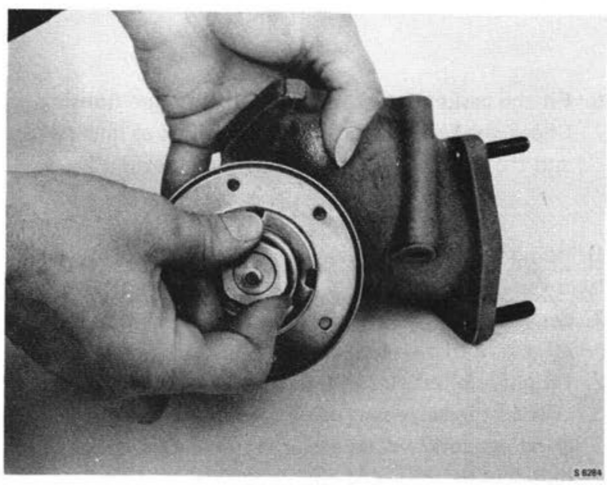
THE CHARGE PRESSURE REGULATOR SPRING

15. Inner spring seating
16. Spring
17. Outer spring seating
18. Lock nut

5. Remove the diaphragm nut (13 mm ring spanner). Insert a short thick-shafted screwdriver or an Allen key into the groove in the valve disc to prevent the valve turning.

REMOVING THE DIAPHRAGM NUT

6. Remove the parts (see illustration) in the following order:
   Diaphragm nut, outer diaphragm washer, diaphragm, inner diaphragm washer, flat washer, diaphragm housing, gasket, heat shield, gasket, bearing housing and gasket. Fit the valve assembly in the reverse order.



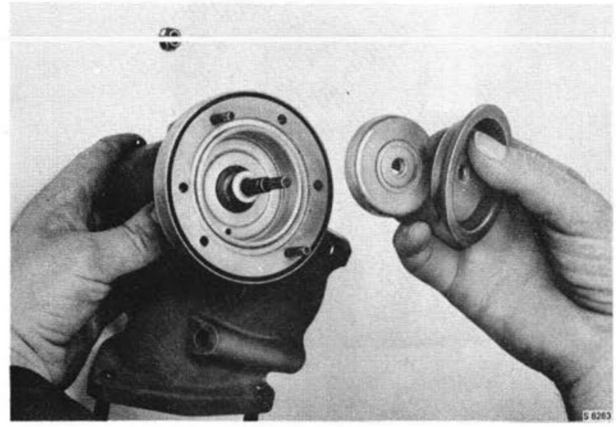
CHARGE PRESSURE REGULATOR

5. Bearing housing	10. Flat washer
6. Gasket	11. Inner membrane washer
7. Heat shield	12. Diaphragm
8. Gasket	13. Outer diaphragm washer
9. Diaphragm housing	14. Diaphragm nut

Assembly

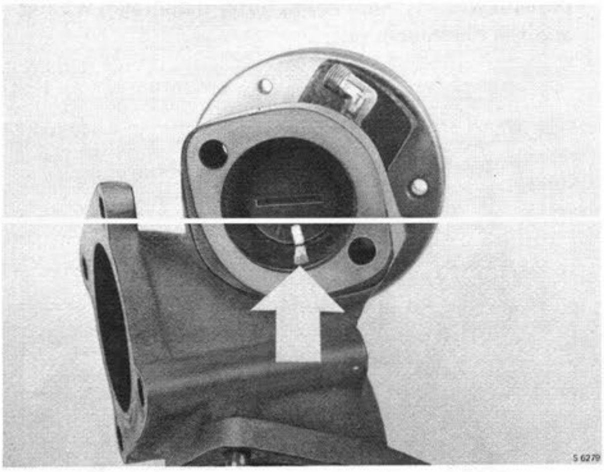
> Apply a thin layer of NEVER SEIZE or MOLYCOTE 1000 to the valve spindle and threads to prevent them welding stuck.

1. Insert the valve using one hand to hold it in position. Fit the gasket, bearing housing, gasket, heat shield, gasket, diaphragm housing, flat washer, inner diaphragm washer, diaphragm, outer diaphragm washer and the diaphragm nut.

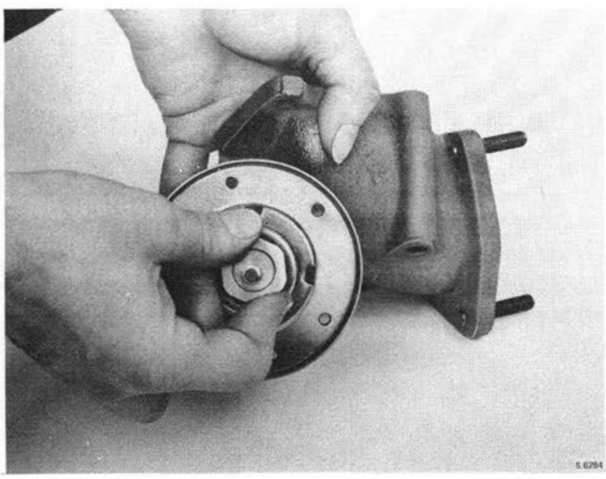


FITTING THE DIAPHRAGM

2. Check that the inner diaphragm ridge engages the groove in the diaphragm washer and tighten the diaphragm nut, preventing the valve from turning by inserting a short, thick screwdriver in the groove in the valve disc.
3. Align the valve with the previous markings and fit the inner spring seating, the spring and the outer spring seating. Check that the outer ridge on the diaphragm engages the groove in the diaphragm housing.

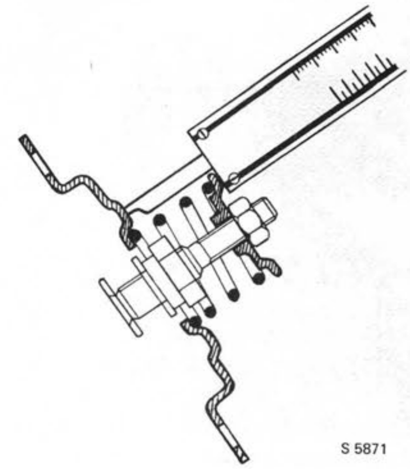


MARKING THE VALVE FOR FITTING



FITTING THE OUTER SPRING SEATING

4. Adjust the spring roughly by setting the compressed length to the same value as was noted before dismantling (or in accordance with the specifications).



MEASURING THE LENGTH OF THE COMPRESSED SPRING

5. Fit and tighten the lock nut, using polygrip pliers to hold the spring seating.

> Check that the spring is working correctly by pressing it together a few times. If it wobbles or cracks turn the spring to another position. The spring can otherwise give noise.

6. Fit the gasket and cover to the diaphragm housing. Check the charging pressure and adjust as necessary, and then seal the charge pressure regulator.

Grinding the valve and valve seat (charge pressure regulator removed)

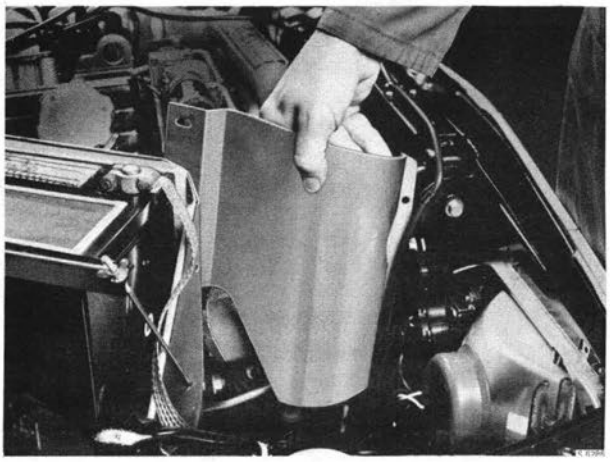
1. Secure the valve body and bearing housing together by means of two bolts.
2. Fit guide pin 83 92 805 in the valve spindle guide.
3. Grind the valve seat using a 45^{o} valve cutter. (The grinding work will be easier if the hard surface is first removed by means of emery cloth.)

GRINDING THE VALVE SEAT

4. Mount the valve in a valve grinding machine and clean the sealing surface (45°C).
5. Separate and thotoughly clean the valve body and bearing housing.

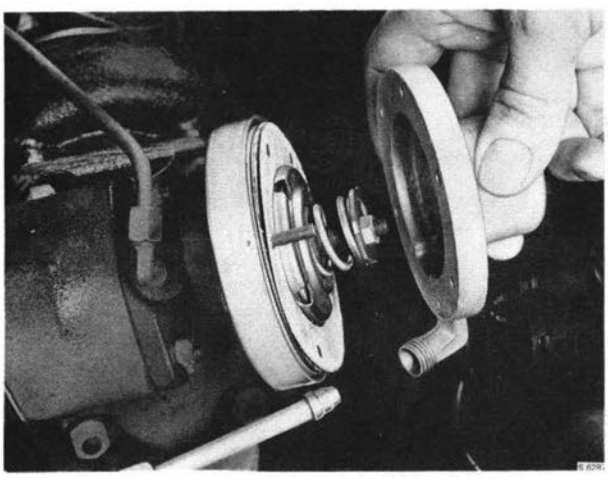
Changing the diaphragm (in the car)

1. Remove the heat shield.



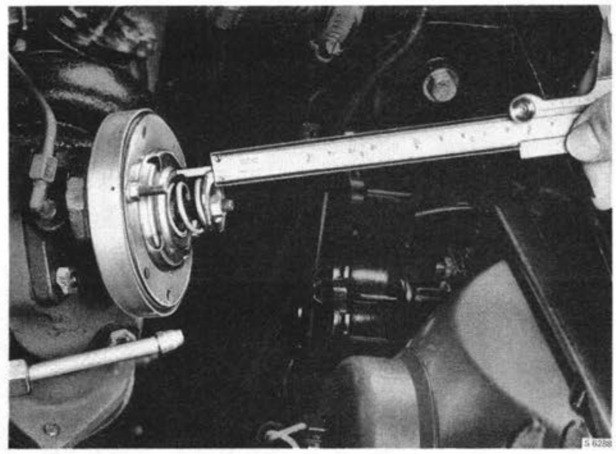
REMOVING THE HEAT SHIELD

2. Remove the diaphragm housing cover.



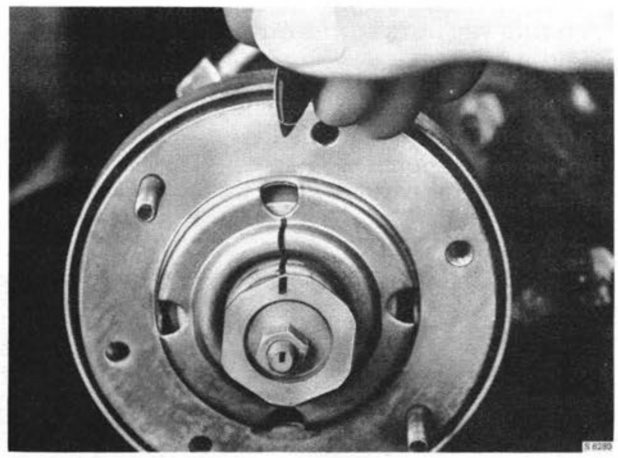
REMOVING THE DIAPHRAGM HOUSING COVER

3. Measure and note the compressed length of the spring (the distance between the outer and inner spring seatings). Measure the length at two diametrically opposed points and note the mean value.



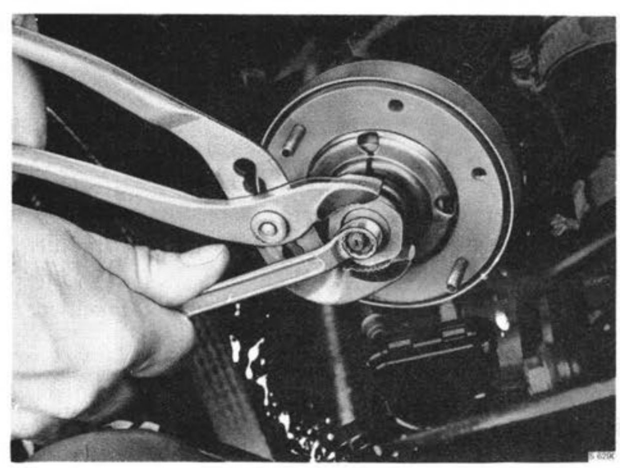
MEASURING THE LENGTH OF THE COMPRESSED SPRING

4. Mark the position of the valve to enable it to be refitted in the same position.



MARKING THE POSITION OF THE VALVE IN THE CAR

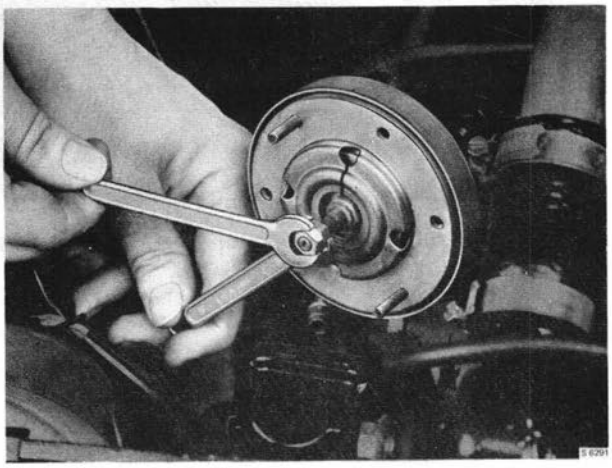
5. Loosen the lock nut (using a 10 mm ring spanner and polygrip pliers) and remove the nut, the outer spring seating, the spring and the inner spring seating.



REMOVING THE LOCK NUT

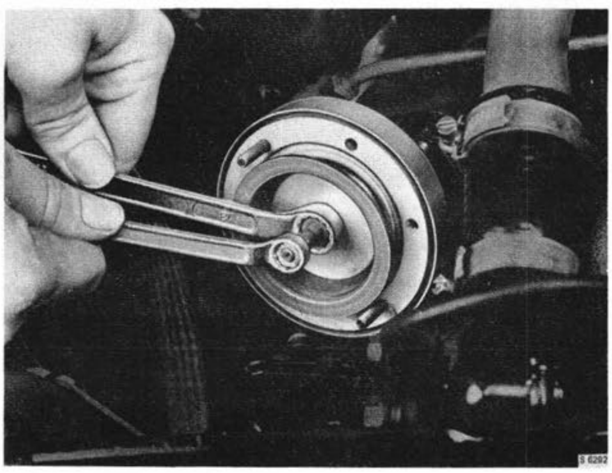
CAUTION
Always grip the valve seat when removing the spindle nut to avoid damaging the diaphragm.

6. Fit two nuts to the outer thread on the valve spindle and tighten both nuts.



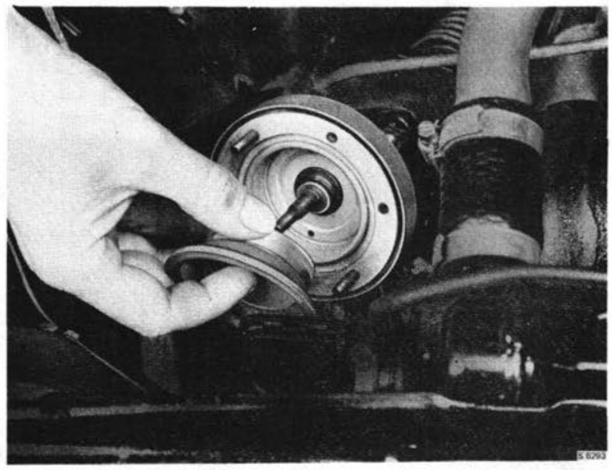
FITTING THE NUTS TO THE OUTER THREAD ON THE SPINDLE

7. Holding the two nuts, undo the diaphragm nut.



REMOVING THE DIAPHRAGM NUT WHEREUPON THE TWO NUTS ARE GRIPPED

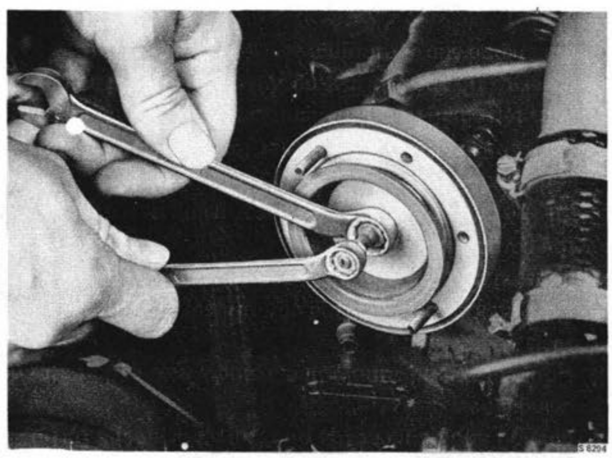
8. Remove the two nuts, the diaphragm nut, the outer diaphragm washer, the diaphragm and the inner diaphragm washer.
9. Clean the diaphragm housing and all dismantled parts.
10. Check that the flat washer inside the inner diaphragm washer is in position.
11. Fit the diaphragm with the two diaphragm washers. Ensure that the inner ridge on the diaphragm engages the groove in the diaphragm washer.



REMOVING THE DIAPHRAGM

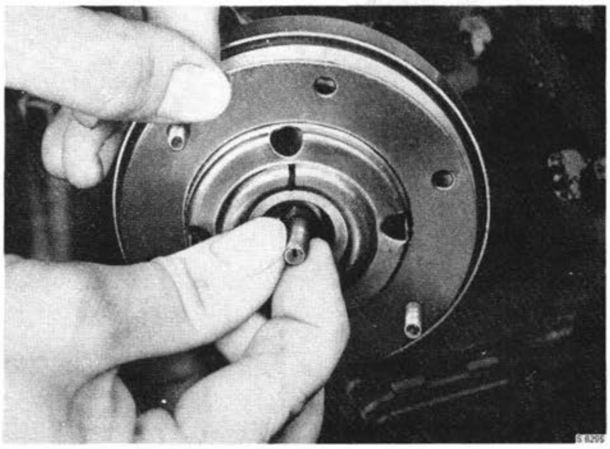
12. Fit the diaphragm nut and the two other nuts, and tighten the diaphragm nut. Remove the other two nuts.

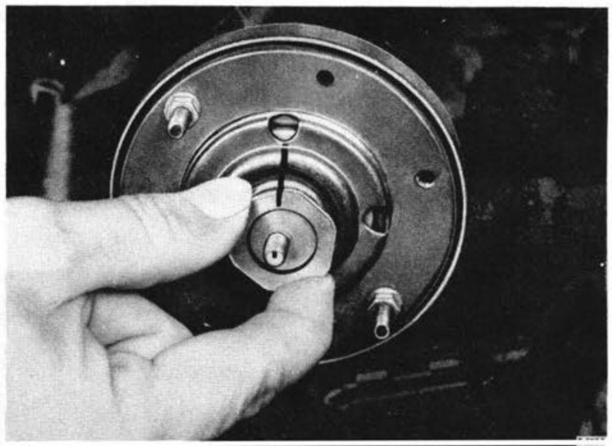
Lubricate the threads with NEVER SEIZE or MOLYCOTE 1000 to prevent them welding stuck.



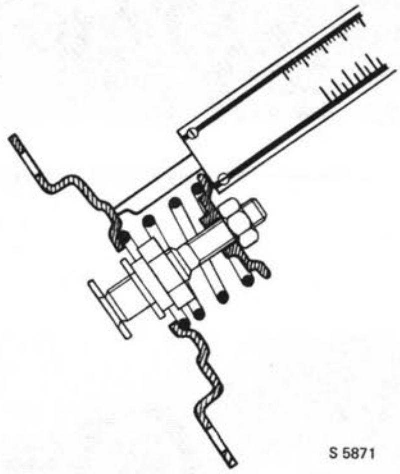
FITTING THE DIAPHRAGM NUT

13. Fit the inner spring seating and then align the valve with the previous markings.


TURNING THE VALVE ACCORDING TO THE MARKS

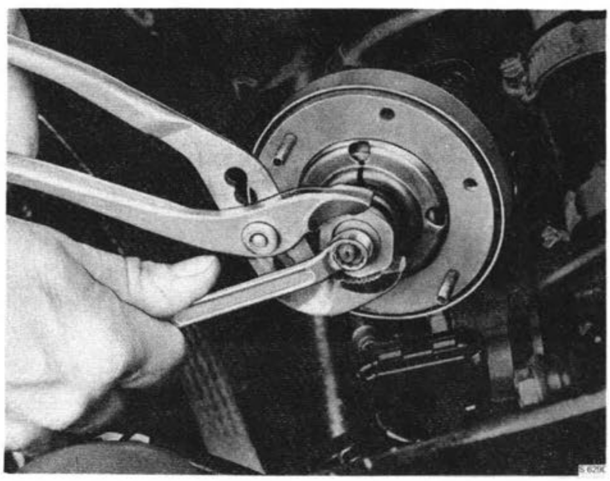

TURNING THE UPPER SPRING SEATING ACCORDING TO THE MARKS

14. Fit the spring and the outer spring seating.
15. Adjust the compressed length of the spring to the length measured on dismantling (the basic length given in the specifications is approximate). Replace and tighten the lock nut. Grip the outer spring seating by means of polygrip pliers.



FITTING THE DIAPHRAGM NUT

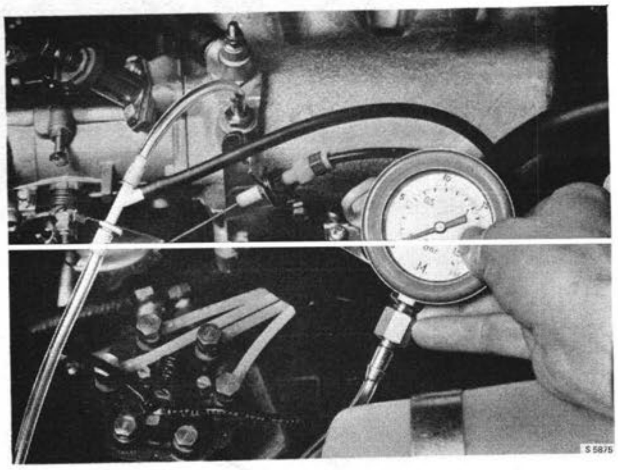
16. Fit the gasket and diaphragm housing cover.
17. Fit the heat shield.
    Check the charging pressure and adjust as necessary, and then seal the charge pressure regulator.


ADJUSTING THE COMPRESSED SPRING LENGTH

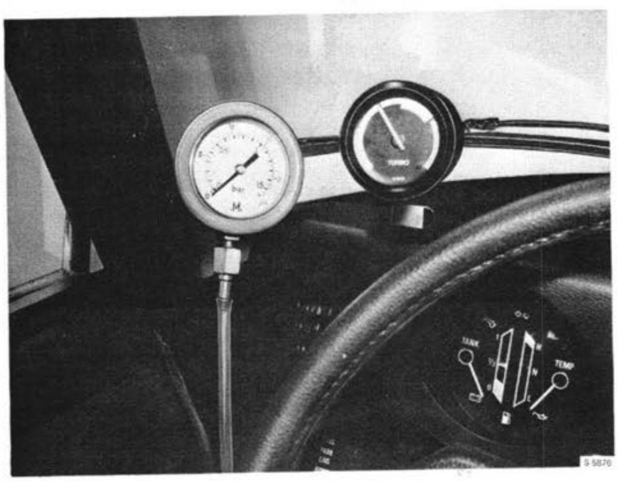
Measuring the charging pressure

The charging pressure is measured while the car is being test driven and is indicated by means of a special pressure gauge connected to the inlet manifold.

1. Connect pressure gauge 83 92 813 between the nipple on the inlet manifold and the line to the pressure switch. Run the hose into the passenger compartment and place the pressure gauge on the left-hand corner of the instrument panel.

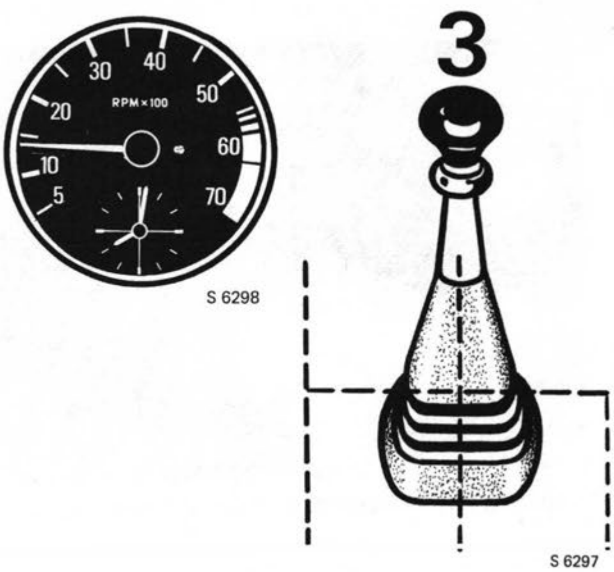


EQUIPMENT FOR MEASURING THE CHARGING PRESSURE



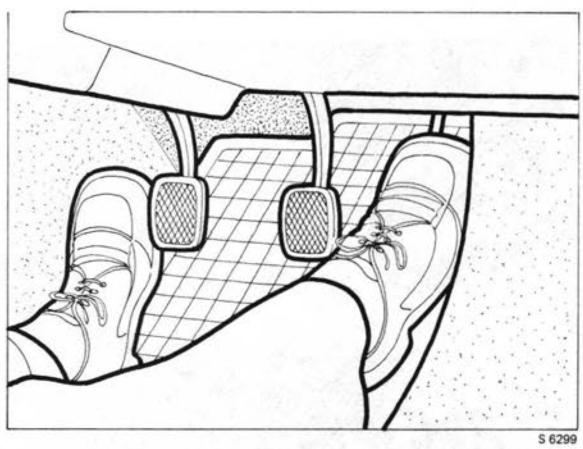
MEASURING THE CHARGING PRESSURE

2. Warm up the engine properly by driving the car on the road.
3. To start the test, drive the car in 3rd gear at an engine speed lower than 1 500 rev/min.



3RD GEAR, ENGINE SPEED LOWER THAN 1 500 REV/MIN

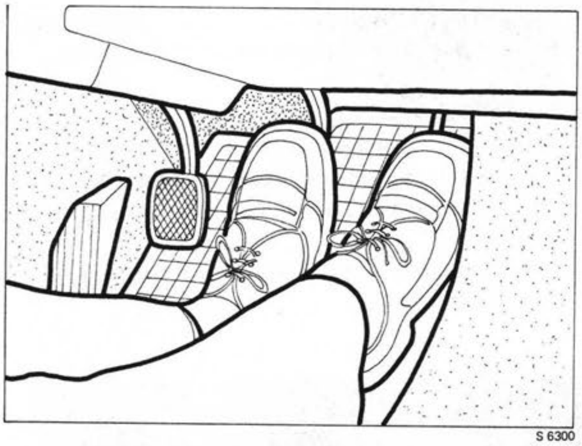
4. Accelerate at full throttle by pressing the accelerator down to the floor.



DEPRESSING THE ACCELERATOR TO THE FLOOR

5. As the engine speed approaches 3 000 rev/min, apply the brakes (still keeping the accelerator pressed down)

to put the car under full load at 3 000 rev/min and note the maximum pressure indicated by the pressure gauge.

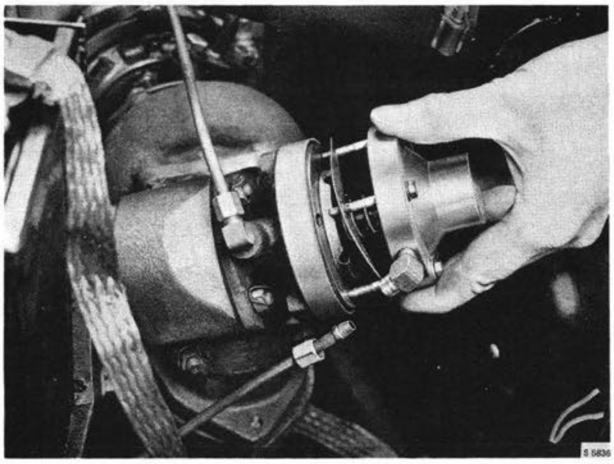


APPLYING THE BRAKES WITH THE ACCELERATOR DEPRESSED, ENGINE SPEED 3 000 REV/MIN

THE MAXIMUM PRESSURE IS INDICATED ON THE PRESSURE GAUGE

Adjusting the charging pressure
(After test driving)
If the reading on the pressure gauge during test driving deviates from the specified value, adjustment based on the readings recorded can be carried out as follows:

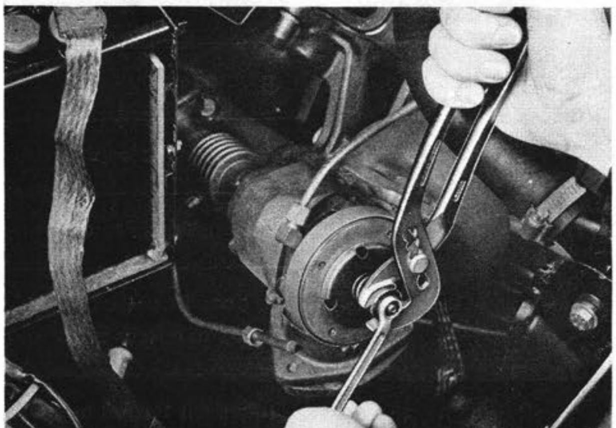
1. Remove the heat shield mounted in front of the charge pressure regulator.
2. Disconnect the exhaust line from the cover on the diaphragm housing cover.
3. Remove the diaphragm housing cover.



REMOVING THE DIAPHRAGM HOUSING COVER

4. Undo the lock nut using a 10 mm ring spanner. Grip the spring seating by means of polygrip pliers.

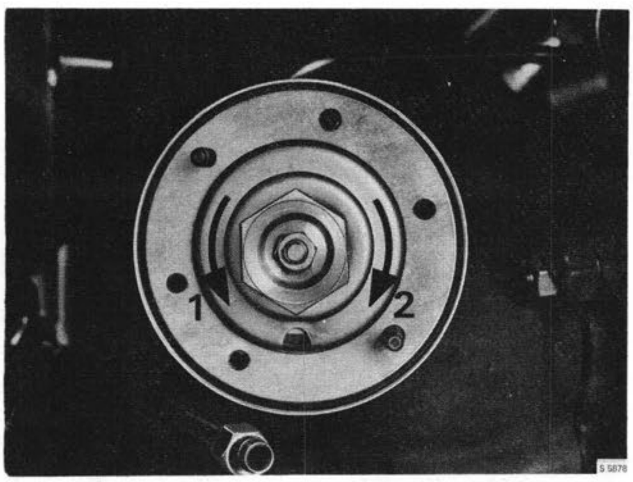
CAUTION
Always grip the valve seat when removing the spindle nut to avoid damaging the diaphragm. Never attempt to turn the valve.



LOOSENING THE LOCK NUT

5. Adjust the tension of the spring by rotating the spring seating clockwise (inwards) or counter-clockwise (outwards) in accordance with the following table. Ensure that the valve does not turn as the spring seating is rotated. Thereafter, retighten the lock nut.

Charging pressure	
Charging pressure reading from test driving (bar)	Screw the spring seating in or out the following number of turns
0.86	1 out
0.82	3/4 out
0.78	1/2 out
0.74	1/4 out
0.70	CORRECT VALUE
0.66	1/4 in
0.62	1/2 in
0.56	3/4 in
0.54	1 in

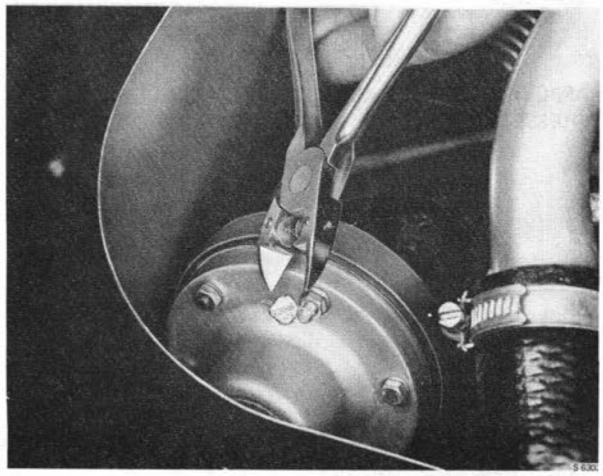


ADJUSTMENT
1. Counter-clockwise
2. Clockwise

6. Replace the cover and gasket, exhaust line and heat shield.
7. Test drive the car and check the charging pressure.
8. Seal the charge pressure regulator.

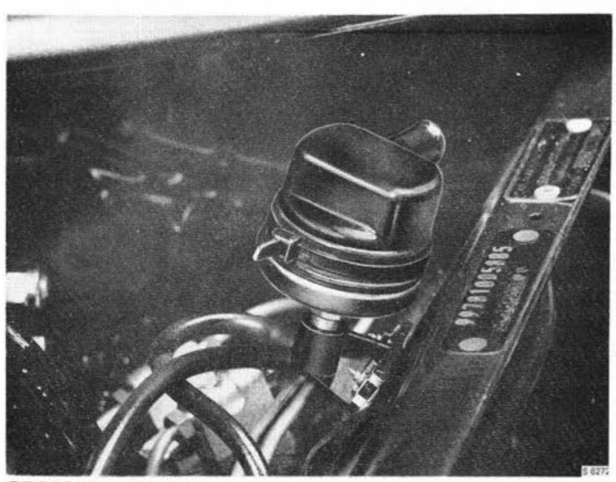
Cleaning the charge pressure regulator
(In conjunction with inspection)
1. Remove the heat shield.
2. Remove the exhaust line and the diaphragm housing cover.
3. Dry and clean the diaphragm housing using a brush.
4. Replace the cover, exhaust line and heat shield.

Sealing the charge pressure regulator
To avert unauthorised adjustment of the charging pressure, the charge pressure regulator must be sealed. Fit the seal to the long diaphragm bolt which has a hole for the purpose.
Authorized Saab workshops will be supplied with sealing pliers and special seals.



SEALING THE CHARGE PRESSURE REGULATOR

Pressure switch

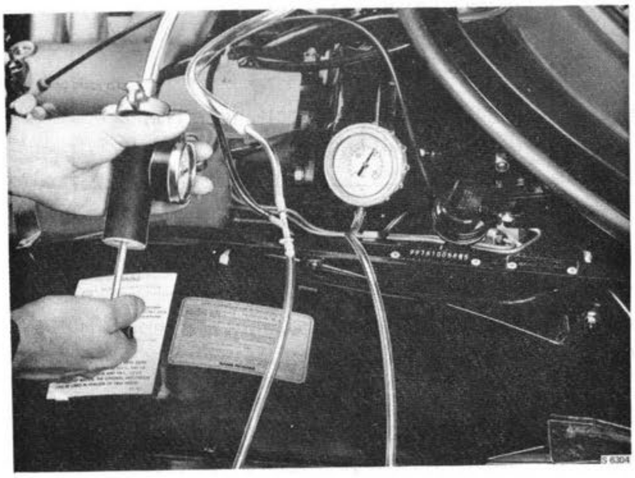


PRESSURE SWITCH

Checking
1. Start the engine and have it idle.
2. Disconnect the hose to the pressure switch at the inlet

manifold and connect gauge 83 92 813, together with a suitable pump (e.g. cooling system tester) to the pressure switch hose.

3. Increase the pressure by means of the pump and check the pressure at which the engine cuts out. Refer to the specifications in section 0.

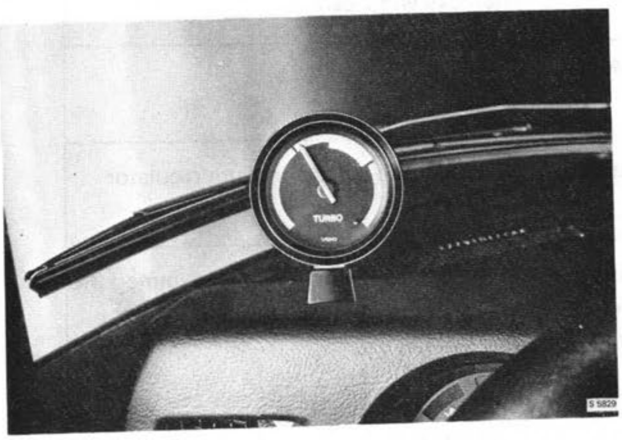


CHECKING THE PRESSURE SWITCH

Changing the pressure switch

To change the pressure switch, remove the rubber cover and cables and then unscrew the pressure switch from its mounting.

Turbo pressure gauge



TURBOINSTRUMENT

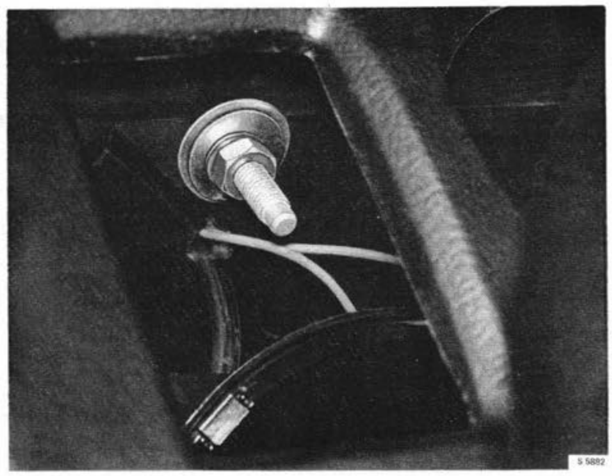
Checking

Check the turbo pressure gauge following the same procedure as that for checking of the pressure switch. At maximum charging pressure, the needle should be within the wide orange zone.

At the pressure switch actuating pressure, the needle should be in front of the limit between the orange and the red zones.

Removal and installation

1. Remove the three screws at the bottom of the safety padding on the instrument panel side of the car.
2. Pull the safety padding away to release the spring clips (see Service Manual, section 853).
3. Disconnect the hose at the joint below the padding and disconnect the electric cables. Undo the nut underneath the safety padding and remove the instrument.



TURBO PRESSURE GAUGE INSTALLATION

Refit in the reverse order.

To dismantle the instrument, e.g. to replace a bulb, etc., remove the screw at the front of the casing.

FAULT	CAUSE	REMEDY
Noise or vibration from the turbo compressor	Poor lubrication of the turbo shaft bearing	Check the oil pressure and flow to the turbo. If the fault should persist after remedial action (permanent bearing damage) exchange the turbo compressor.
	Leakage in the induction or exhaust system	Tighten leaking connections and replace defective seals and gaskets
	Unbalanced turbo shaft owing to damage	Exchange the turbo compressor
Insufficient charging pressure	Leakage between the compressor and cylinder head or between the cylinder head and turbine	Tighten leaking connections and replace defective seals and gaskets
	Incorrect setting of charging pressure	Adjust the charge pressure regulator
	Valve in charge pressure regulator sticks in open position	Overhaul the charge pressure regulator
	Partially clogged exhaust system	Clean or replace exhaust system
	Clogged air cleaner	Change cartridge
	Binding turbo shaft	Exchange turbo compressor
Excessive charging pressure	Leakage at exhaust pressure line connections	Tighten; if necessary, replace nipples
	Clogged exhaust pressure line	Remove and clean
	Damaged diaphragm in charge pressure regulator	Replace diaphragm
	Valve in charge pressure regulator sticks in closed position	Overhaul the charge pressure regulator
	Ice formation in exhaust pressure line. (Excessive pressure occurs 1–2 min after cold start when ambient temperature below freezing)	Avoid heavy loading of engine immediately after cold starting
	Incorrect setting of charging pressure	Adjust charge pressure regulator

FAULT	CAUSE	REMEDY
Metallic noise from charge pressure regulator	Play in regulator valve	Overhaul the charge pressure regulator
	Spring insufficiently offset in charge pressure regulator	Adjust position of spring (replace as necessary)
Engine knocking (pinking)	Excessive charging pressure	Adjust charging pressure
	Unsuitable fuel (octane too low)	Change fuel
	Ignition setting too far advanced	Adjust timing
Oil leakage at turbo shaft seals (oil fumes in exhaust)	Poor return flow from turbo: – Clogged return line – Excessive crankcase pressure	 Check return line Check crankcase ventilation
	Turbo unit seals damaged	Exchange turbo compressor

CONTENTS

GENERAL

The electrical system operates on 12 volts and the electrical equipment comprises the following units:
Battery, starter, alternator, voltage regulator, distributor, ignition coil, spark plugs, outside and inside lights, direction indicators, windshield wipers, windshield washer, horns, heater and ventilation fan motor, radiator fan motor, brake light switch, brake warning switch, handbrake switch, temperature transmitter, fuel level transmitter, cold start switch, radiator fan relay, hazard warning flasher switch, back-up light, clock, cigarette lighter, wiring harness and loose wires as well as switches and fuses.
Also provided on some models are headlight wipers, headlight washers, electrically heated driver's seat, a warning system for unfastened seat belts and electrically heated rear window.

BATTERY

The 12 volts battery is of lead-acid type with six cells. Its capacity is 60 ampere-hours (Ah). It is located on a shelf in the front right-hand corner of the engine compartment with the negative pole grounded to the bodywork of the car.

ALTERNATOR

The generator is of the AC-type. A signal light on the instrument panel shows whether or not the alternator is charging.

STARTER

The starter is rated at 0.8 kW (1.1 hp). Its drive pinion is moved into engagement by a control magnet operated by the ignition key.

IGNITION SYSTEM

The engine has a bettery ignition system consisting of an ignition coil and a distributor with a combined centrifugal and vacuum system for ignition advance. The system is energized by the ignition key.

LIGHTS

The outside lighting consists of headlights, front parking, direction indicators and side position lights, number plate light, and tail lights with rear direction indicators and side position lights, brake lights, and back-up lights which are automatically switched on when the gear shift lever is placed in reverse. As from 1980 model West German and UK cars are equpped with rear fog lights.
The headlight mountings are arranged for vertical and lateral adjustment of the beam.
Headlights are controlled by the same lever that operates the direction indicators. To dim the lights, the lever is pulled towards the steering wheel. A blue light on the instrument panel indicates when the headlights are at high beam.
When the headlights are on, the parking and tail lights are also lit.
During model 1975 for the Swedish market, a new headlight function has been introduced, namely, town lights. The town lights, together with the rear lights and license plate light, are switched on automatically when the engine is started.
Full headlight power at both high and low beam will be obtained when the headlights are switched on by means of the normal switch.
The instrument illumination is regulated with a rheostat switch, placed on the instrument panel.

OTHER ELECTRICAL EQUIPMENT

Interior lighting consists of dome lights and ignition switch illumination, controlled by the dome light switch, a contact at each door, and a switch at the gear lever housing.
The trunk is illuminated by a light controlled by a contact at the hinge of the trunk lid. On Saab 99 Combi Coupé the switch is located at the striker plate for the rear door.
A self-canceling lever under the steering wheel controls the current supply to the direction indicators. This lever also controls the headlights. A green light on the instrument panel indicates when direction indicators are operating. The warning flasher switch is located on the instrument panel. All four direction indicators flash together when this switch is actuated.
The windshield wipers are operated by a reciprocating flexible cable. The switch also actuates the windshield washer as well as the headlight wipers and washers fitted on cars on some markets. The windshield wipers have two speeds.
The horns are operated by a contact in the steering wheel safety padding.
The radiator fan is driven by an electric motor and is located behind the radiator. It is thermostat-controlled and operates only when the coolant temperature in the radiator exceeds the set cut-in temperature of the thermo-contact.
The backrest and cushion of the drivers seat have thermostat-controlled electric heating elements (see Group 8).

WIRING AND FUSES

The wires leading from the battery or alternator to the various current-consuming units are arranged in a wiring network divided into groups. The individual wires are color-coded for ease of identification. The terminals consist of solderless AMP connectors. Fuses are provided to protect the wiring, etc. against abnormally high current loads (e.g. short circuits) and to reduce the risk of fire in such an event. The fuses are grouped in a fuse box and the fuse box, relays and socket for ignition service instrument, "TSI", are mounted on the right wheel housing in the engine compartment. On cars not equipped with town lights, the panel has a place for a relay for extra equipment.

BRAKE LIGHT SWITCH

The brake light switch is mechanical and is actuated by the rod between the pedal and the servo unit. On braking, current flows to the brake lights.

BRAKE WARNING SYSTEM

Defects in the brake system, e.g. leakage from either of the two brake line circuits, are signaled by a brake warning light in the indicator light display instrument. Up to and incl. model 1977, the light is operated by a switch contained in the master cylinder. The switch is actuated by a plunger which is displaced in the event of a pressure difference between the two brake circuits.
The hydraulic system is in no way affected by the removal or installation of the switch.
As from model 1978, the switch is actuated by a float in the brake fluid container if the liquid level gets too low. The contact is incorporated in the filler cup of the brake fluid container.

BATTERY

GENERAL

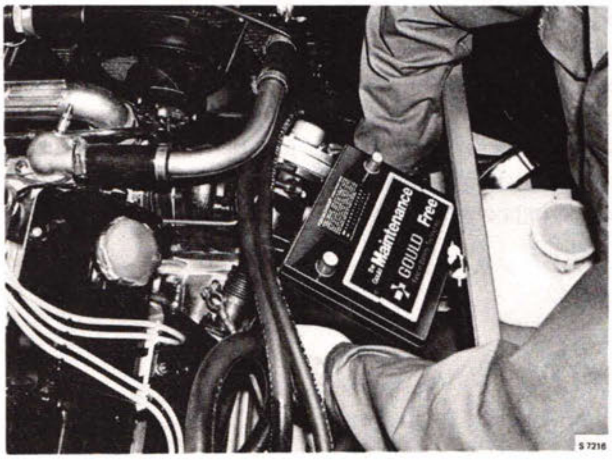
The battery is a 12 volt lead accumulator with six cells and a working voltage of about 2 volts per cell. The electrolyte used in the battery is dilute sulphuric acid with a spec. gravity of 1.28 at +68°F (+20°C) when the battery is fully charged. The capacity of the battery is 60 ampere-hours (Ah), i.e. it is rated to deliver a current of 3 amperes for 20 hours at +68°F (+20°C). The positive pole of the battery is connected to the starter and other current-consuming units and the negative pole is grounded to the bodywork of the car.

REMOVING AND INSTALLING

To remove the battery from the car, first disconnect the negative (ground) cable to prevent shorting, then disconnect the positive cable. Note that the engine must be stopped before the terminals are disconnected, as the alternator may otherwise be damaged.
Next unscrew the two wing nuts from the hooks, after which the battery can be lifted out of the car.
Before replacing the battery, make sure that the outside is clean and that the pole terminals and cable clamps are also clean so that they make proper contact. After connecting the cables, coat the pole terminals and clamps with acidfree vaseling.

BATTERY REMOVAL – TURBO

In order to remove the battery from Turbo cars the pressure pipe between the exhaust manifold and the boost control must first be disconnected.
If the car is equippped with AC then the hoses for the AC unit must also be disconnected by loosening the clips at the wall of the engine compartment.



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CAUTION

Do not misconnect the battery. Reversing the pole connections, even momentarily, will damage the alternator rectifier. Connect the positive cable to the positive pole of the battery (both marked +) and the negative cable (ground lead) to the negative pole (both marked –). If an external battery is temporarily connected to the car battery, connect the poles positive-to-positive and negative-to-negative. The battery must not be connected to or disconnected from the electrical system of the car while the engine is running. When quick-charging the battery, first disconnect the positive cable.

MAINTENANCE

As the ability of the battery to start the engine depends on its state of charge, regular checking and maintenance of the battery are important – especially in wintertime, when the load on the starter is heavier and the capacity of the battery is reduced by low temperature. Moreover, an undercharged battery is apt to freeze.

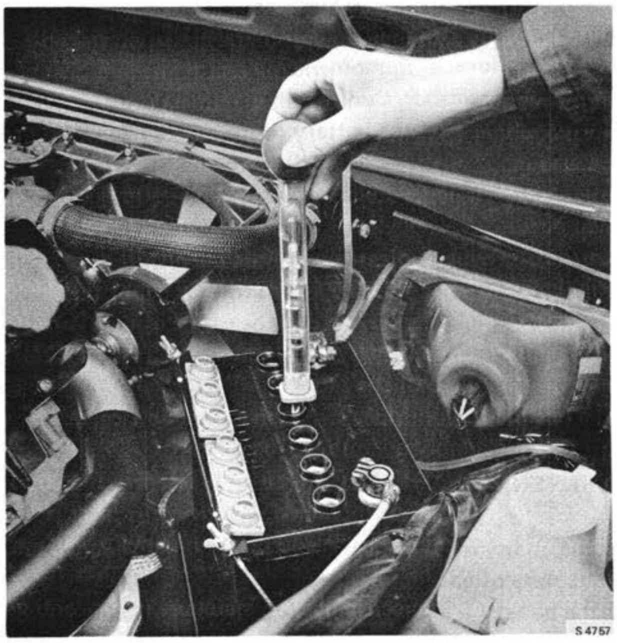
ELECTROLYTE LEVEL

The level of electrolyte in the battery tends to fall due to evaporation and electrolytic decomposition of water. Use only distilled water to top up. The surface of the electrolyte should be about 0.4" (10 mm) above the top edge of the plates.
Sulphuric acid of the correct concentration should only be added if the spec. gravity of the electrolyte needs to be corrected as a result of drainage or leakage from the battery.

ELECTROLYTE SPECIFIC GRAVITY

The spec. gravity of the electrolyte is measured with a hydrometer; the reading indicates the state of charge of the battery (see table).

State of charge	Spec. gravity
Full charge	approx. 1.28
Half charge	" 1.21
Discharged	" 1.12



TESTING THE BATTERY

CHARGING

Charging must be adjusted to the capacity of the battery. The battery is fully charged when the voltage per cell has reached 2.5–2.7 V, without load, and has remained constant during the last three hours of charging. Decomposition of water causes the electrolyte to boil. The filter caps must therefore be removed from the cells while charging is in progress.

MAINTENANCE-FREE BATTERY, SAAB TURBO

General

The maintenance-free battery is very similar to a conventional battery and also contains diluted sulphuric acid. The maintenance-free battery should therefore always be kept upright. The battery is provided with small vent holes, although considerably less gas is generated than in a conventional battery. Since the battery does not normally lose any distilled water, no filler holes are provided. The maintenance-free battery also holds its charge much longer than a conventional battery.

Testing

The maintenance-free battery is tested in the same way as conventional batteries, with the exception that the relative density of the acid cannot be measured.
By loading the battery (corresponding to the load during starting) for a period of 15 seconds, the capacity and charge of the battery can be determined by observation of the voltage. Use a battery tester with a rheostat.

Loading test:

Apply a load of about 200 A to the battery for 15 seconds, and check that the voltage does not drop below 9.6 V at a battery temperature of 27°C (80°F).
The permissible voltages at lower temperatures are as follows.

Battery temperature		Minimum voltage
27°C	(80°F)	9.6 V
16°C	(60°F)	9.5 V
4°C	(40°F)	9.3 V
−7°C	(20°F)	8.9 V
−18°C	(0°F)	8.5 V

If the voltage reading during this test is too low, this indicates that the battery either has a temporarily low charge or inadequate capacity.
The following chart should be used to assess batteries.
If it emerges that the battery is not defective, the temporary fault may be the result of an abnormally high load (e.g. electrical items left switched on) or of a fault in the electrical or charging system of the car.

Charging

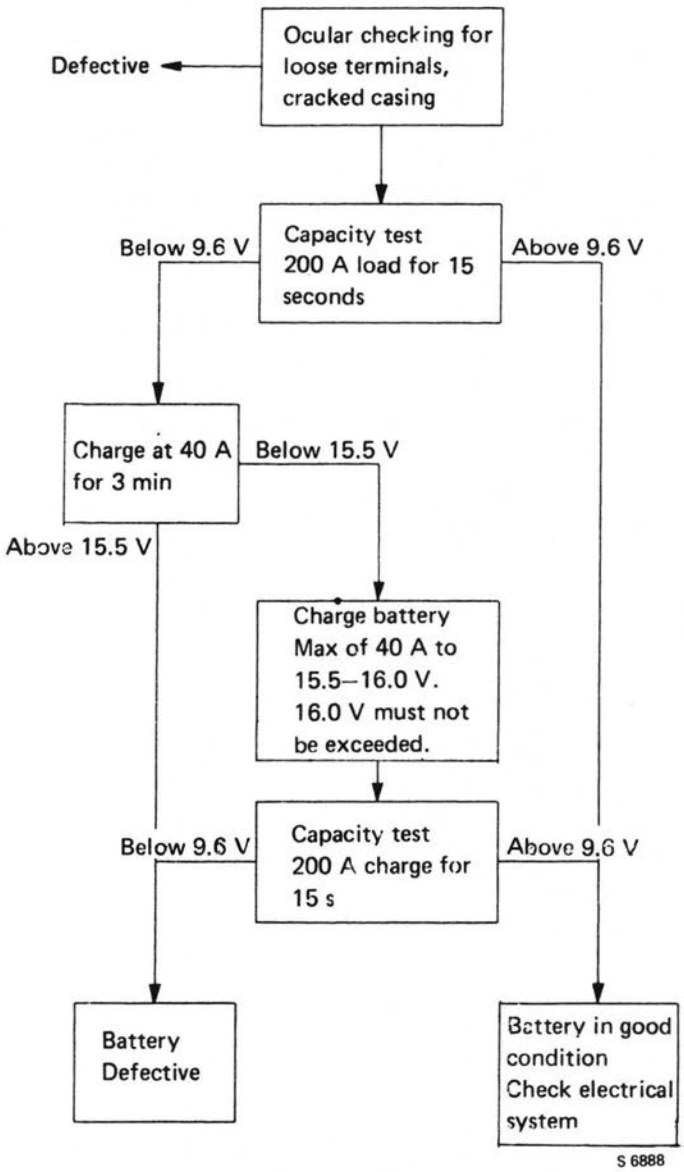
Temporary limited discharge.

The battery can be charged by means of a conventional battery charger. In rapid charging, the charging current must not exceed 50 A.

Totally discharged battery

If the battery becomes totally discharged, i.e. as the result of an electricity-consuming device being left on, then trickle-charging will be necessary to initiate the chemical process in the battery once more.
Where applicable start re-charging with a current of 3 Amp approx. (max. 5 Amp) for 24 hours or until the charging current drops to its lowest stable level. The charging voltage should never exceed 16 V in order to prevent a substantial loss of battery acid. If possible battery chargers supplying pulsating current should be used in such cases.

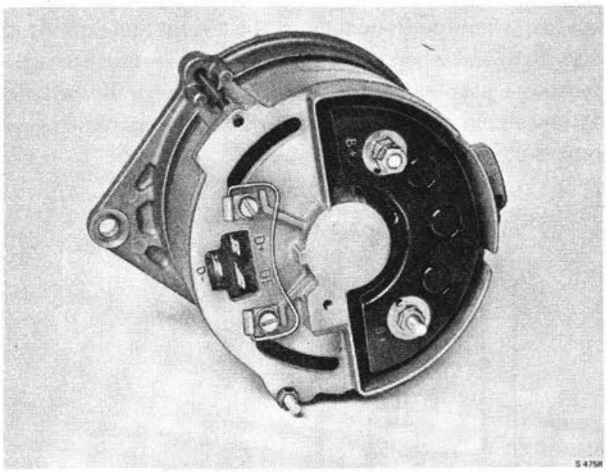
Test chart


Ocular checking for loose terminals, cracked casing
Defective
Capacity test 200 A load for 15 seconds
Below 9.6 V
Above 9.6 V
Charge at 40 A for 3 min
Below 15.5 V
Above 15.5 V
Charge battery Max of 40 A to 15.5–16.0 V. 16.0 V must not be exceeded.
Capacity test 200 A charge for 15 s
Below 9.6 V
Above 9.6 V
Battery Defective
Battery in good condition Check electrical system
S 6888

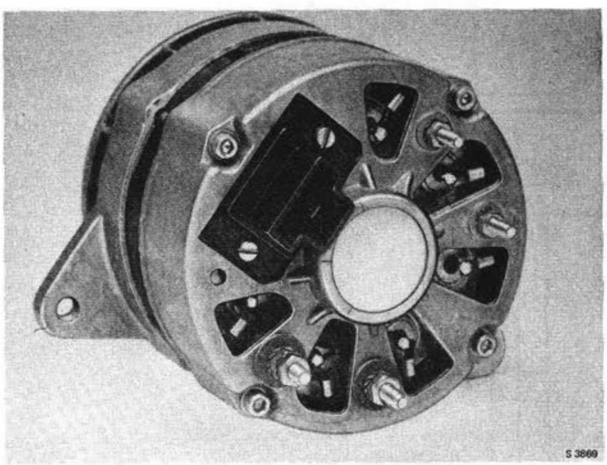
ALTERNATOR

GENERAL

While the car is running, the alternator supplies the current needed by the various items of electrical equipment and at the same time charges the battery.
To remove the heat generated in the alternator, its drive pulley is provided with fan vanes that draw air through the alternator as long as it is running.
The alternator is mounted on top of the engine and in front of the heat exchanger, and is driven by a V-belt from the crankshaft pulley.



ALTERNATOR, BOSCH MAKE (EARLY DESIGN)

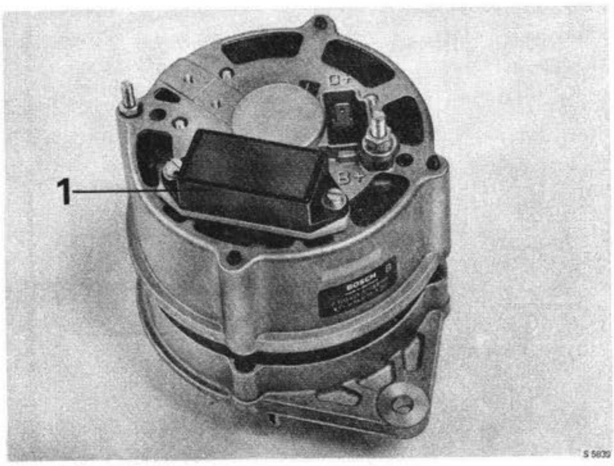


ALTERNATOR, SEV MAKE (LATER DESIGN)

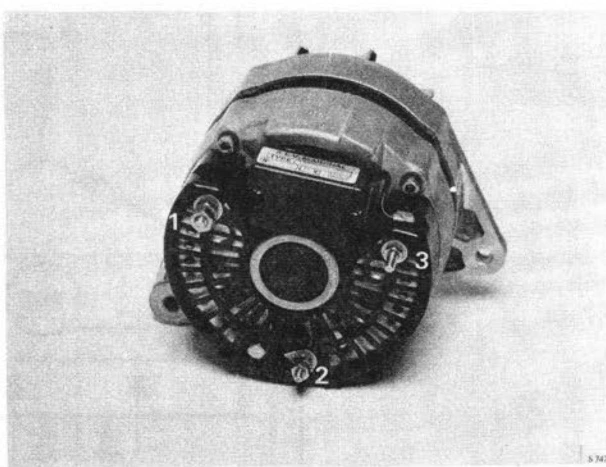
INTERNAL WIRING

The alternator is internally ventilated. It has a 12-pole rotor and six silicon diode rectifiers. An exciter diode is connected to each of the three stator windings, with a common junction point at terminal D + (+ 61). The stator windings are in three phases as in Bosch and in the earlier SEV alternators and are star-connected ( ) while the later SEV alternators are delta-connected ( ).
The six rectifier diodes are arranged and wired in an AC bridge, e.e. three diodes are wired for normal polarity (anode to the terminal) and the other three for reverse

According to polarity, the diode holder is insulated from the body or directly grounded by a body contact. The annular exciter winding is mounted on the rotor, which has pole claws, one half of the claw acting as a north pole and the other as a south pole. The ends of the exciter winding are connected to slip rings which transmit the exciting current.



ALTERNATOR, BOSCH MAKE (LATER DESIGN)



ALTERNATOR, SEV MAKE (LATER DESIGN)

FUNCTIONAL DESCRIPTION

When the ignition key is turned to the drive position (K), the circuit is energized.

The circuit runs from the ignition switch via the charge indicator light to terminal D + (+ 61) on the voltage regulator and thence over the breaker contact to terminal DF on the alternator, and finally through the bruschеs to the citer winding, after which the circuit is grounded.

The rotor is thus magnetized and a force field is generated in the rotor.

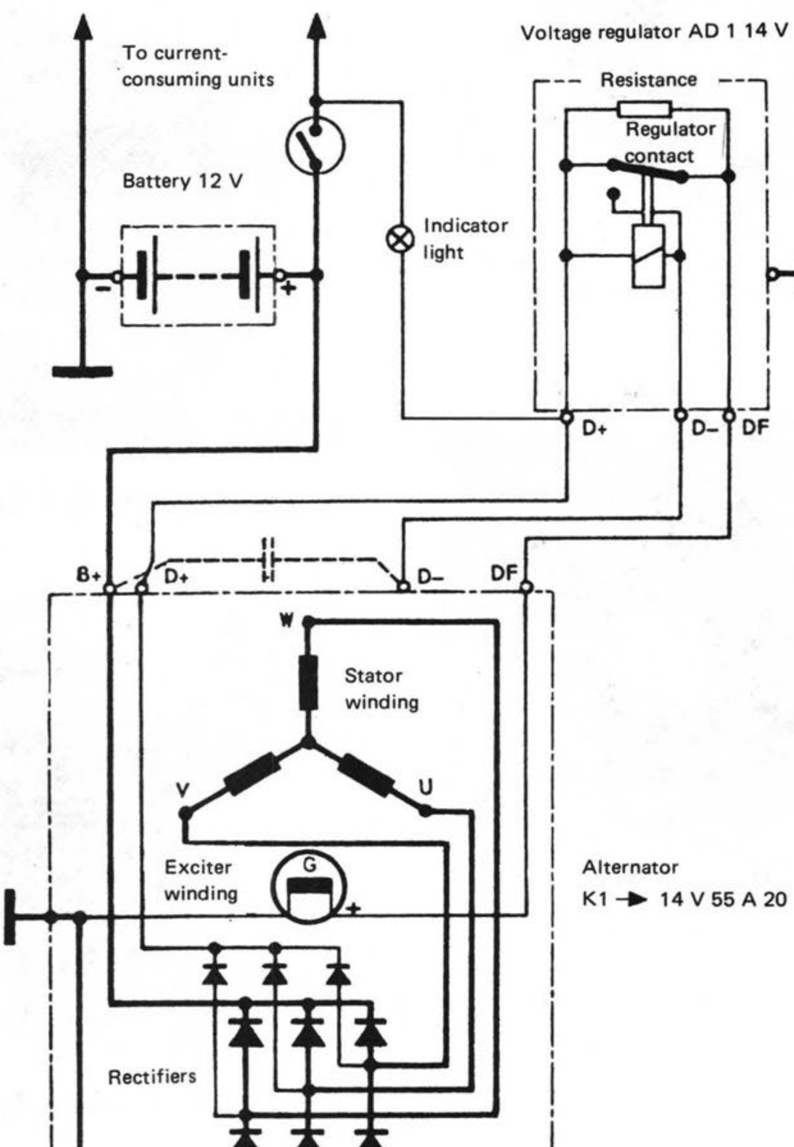
When the engine starts and the rotor begins to spin, an alternating current is generated in the stator winding; this current is rectified as it passes the diodes and is fed into the battery from terminal B+.

The voltage obtained from the stator winding also passes via the exciter diodes to the voltage regulator and acts upon the coil that controls the breaker. When the voltage rises to 14 V or above, the magnetic field of the coil becomes so powerful as to overcome the spring resistance of the regulating contact and break the circuit.

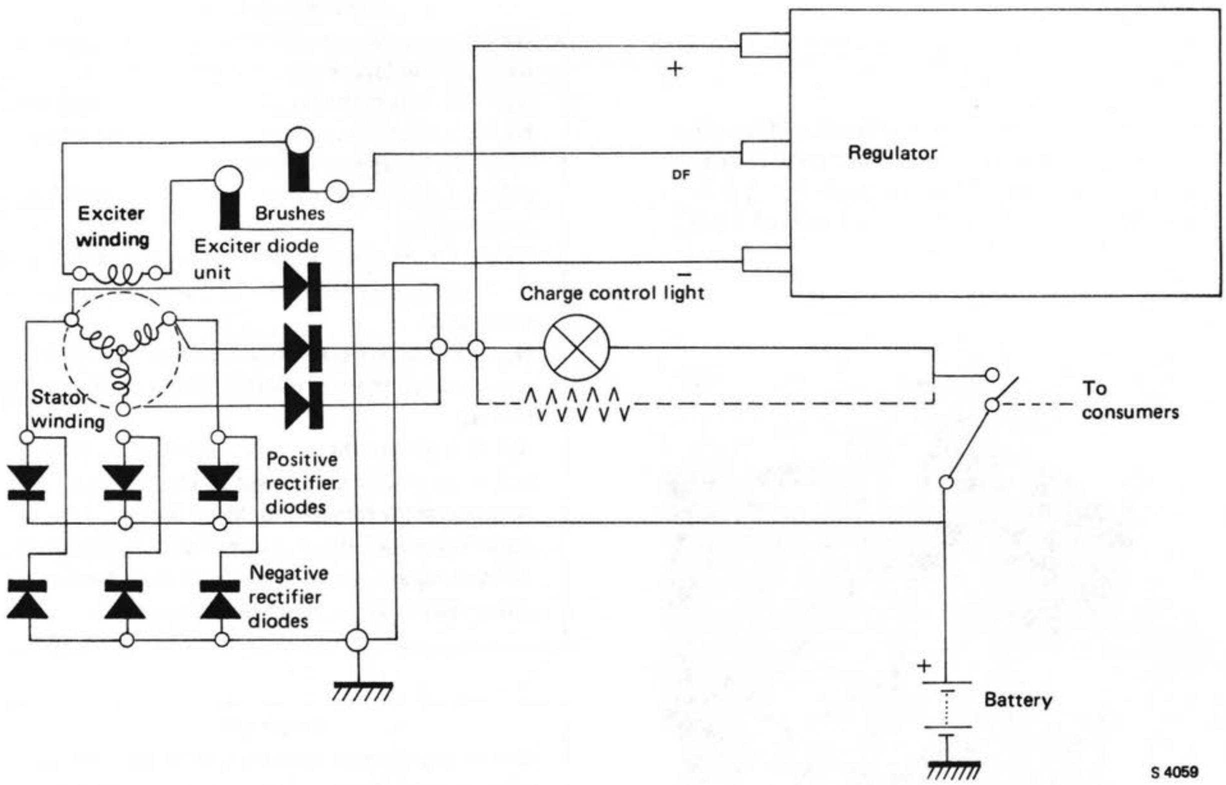
The current to the exciter winding is then forced to go through the resistance and is thus reduced, whereupon the magnetic field strength diminishes, and with it the strength of the alternating current generated in the stator winding. The voltage regulator thus governs the voltage to a maximum of about 14 V. Alternators of later design have an intergrated charging regulator with electronic breaker operation.

The charge indicator light is also influenced by the voltage output from the stator winding via terminal D+ on the regulator, in such a way that the voltage is equal on both sides of the light and the light is therefore extinguished. This is an indication that the alternator is charging.

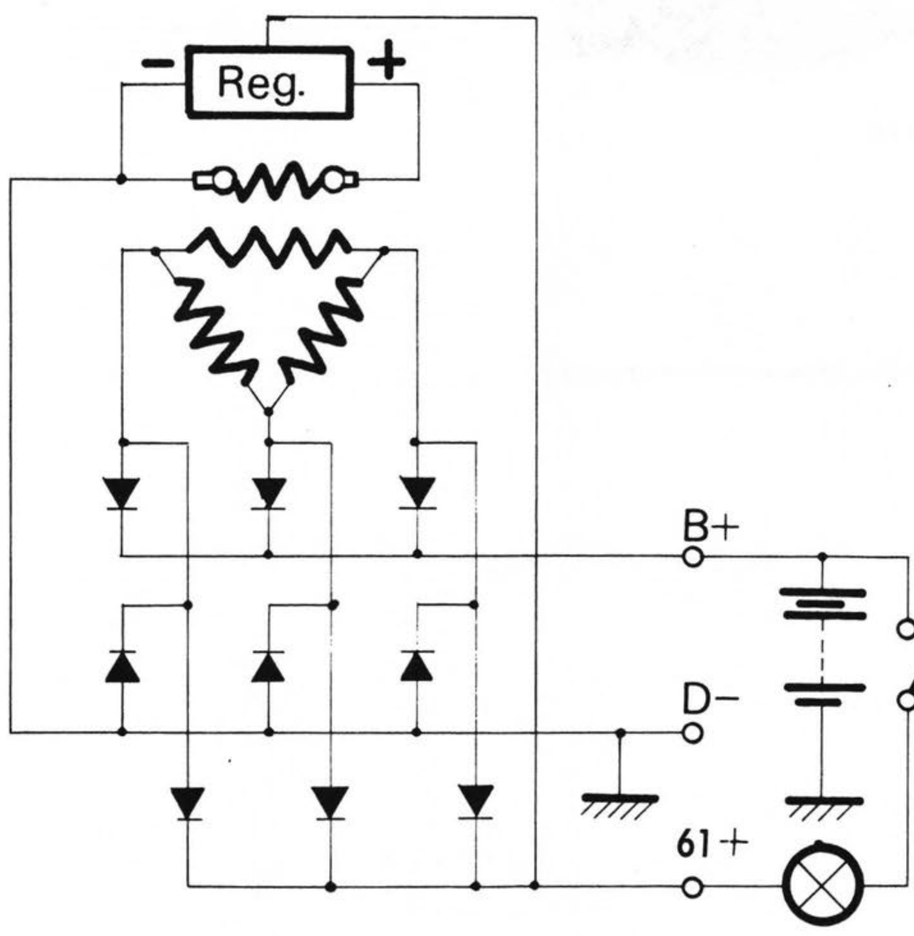
No current-limiting relay is needed, since the alternator itself governs the current intensity. At high alternator speeds, when the frequency of the alternating current is also high, and when the intensity of the output current reaches a given value, the resulting resistance (impedance) assumes such a magnitude that no further increase of current is possible.



ALTERNATOR WIRING DIAGRAM, MAKE BOSCH



ALTERNATOR WIRING DIAGRAM, SEV MAKE (EARLIER DESIGN)



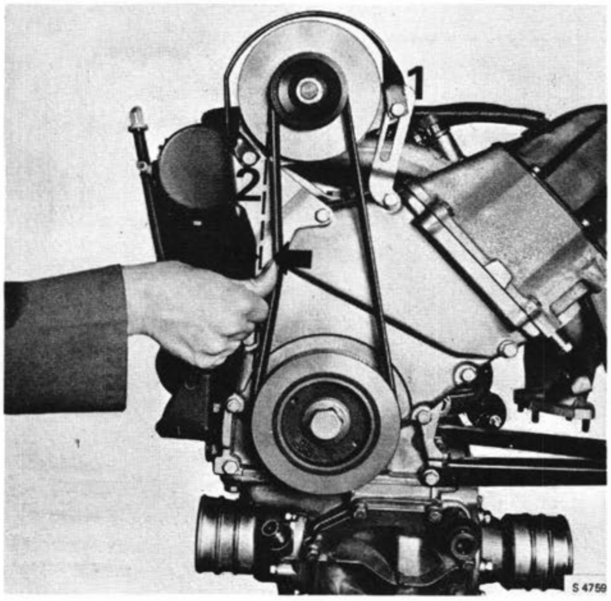
ALTERNATOR WIRING DIAGRAM, SEV MAKE (LATER DESIGN)

S 7501

MAINTENANCE

Alternator

No lubrication is necessary. The bearings are lifetime lubricated. Belt tension must be checked at regular intervals. The alternator drive belt should be so taut that it can be pressed in about 0.4" (1 cm) by a load of 3.3 lb. (15 N, 1.5 kp).



CHECKING BELT TENSION
1. Adjusting screw
2. Retaining screw

Regulator

The regulator needs neither adjustment nor maintenance.

IMPORTANTS DONT'S

NEVER ground the exciter terminals of the alternator or regulator or the connecting cable.
NEVER reverse the regulator wiring connections.
NEVER disconnect the regulator or the battery while the alternator is running.
NEVER dismantle the alternator while the battery is connected.
NEVER start the alternator unless the cable between "–" on the alternator and "–" on the regulator is connected.
NEVER test the alternator-regulator assembly in the car or on the test bench without the battery connected.
NEVER reverse the battery connections, since this will result in serious damage to the alternator.
Any necessary repairs should be done by a specialist electrical workshop; it is essential that disassembly and testing are properly carried out, as even small errors may result in extensive damage.

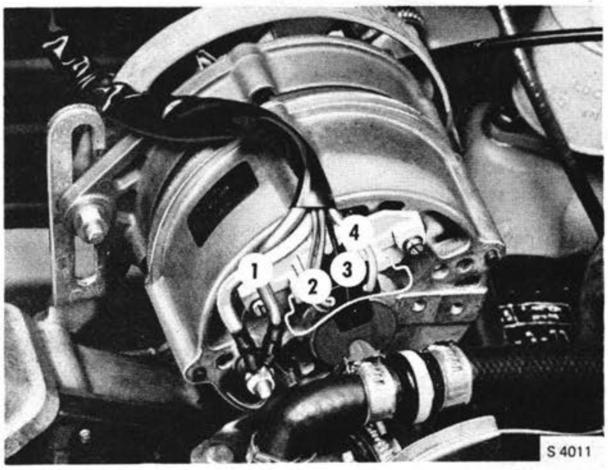
CAUTION

Before any electric welding is done on a car equipped with an AC generator (alternator), the battery ground cable and all wiring to the alternator must be disconnected, as the rectifier diodes may otherwise be damaged.

TERMINAL CLAMPS

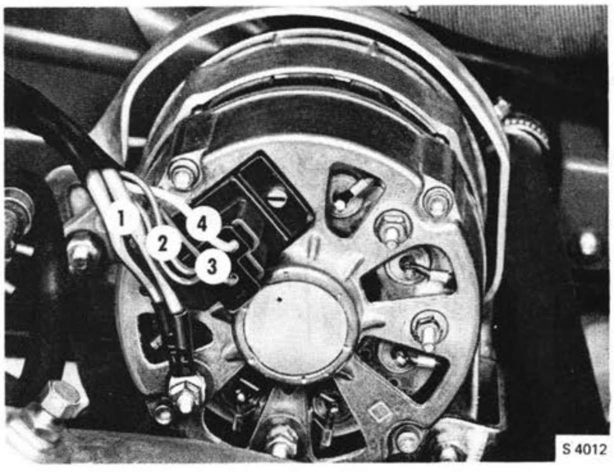
Alternator

D+: Exciter diode output, terminal for regulator D+.
DF: Terminal to exciter winding and for regulator DF.
B+: Battery connection.
The indicator light is wired to D+ on the voltage regulator. Connection to D– on the regulator is by a wire in the tripole joint housing.



ALTERNATOR WIRING CONNECTIONS AND COLOR CODE, MAKE BOSCH

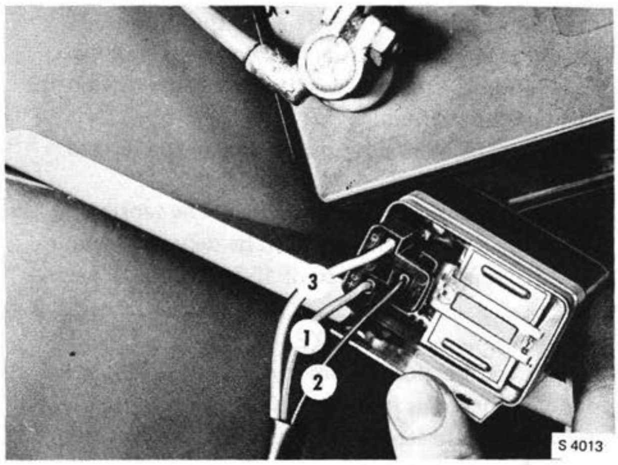
1. 74 gray to B+
2. 72 red to D+
3. 49 black to D–
4. 73 yellow to DF



ALTERNATOR WIRING CONNECTIONS AND COLOR CODE, MAKE SEV

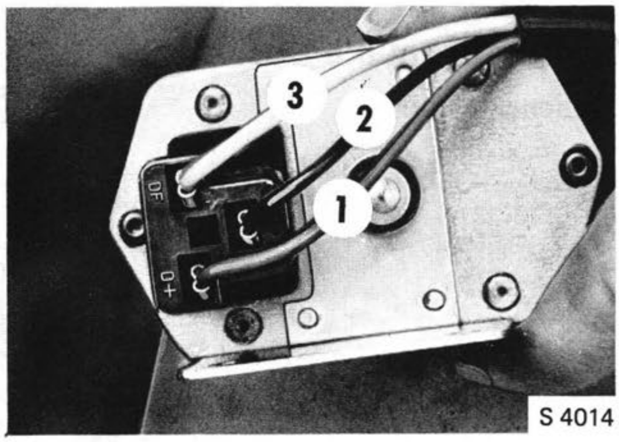
1. 74 gray to B+
2. 72 red to D+
3. 49 black to D–
4. 73 yellow to DF

Regulator



REGULATOR, MAKE BOSCH

1. 72 red to D+
2. 49 black to D–
3. 73 yellow to DF



REGULATOR, MAKE SEV

1. 72 red to D+
2. 49 black to D–
3. 73 yellow to DF

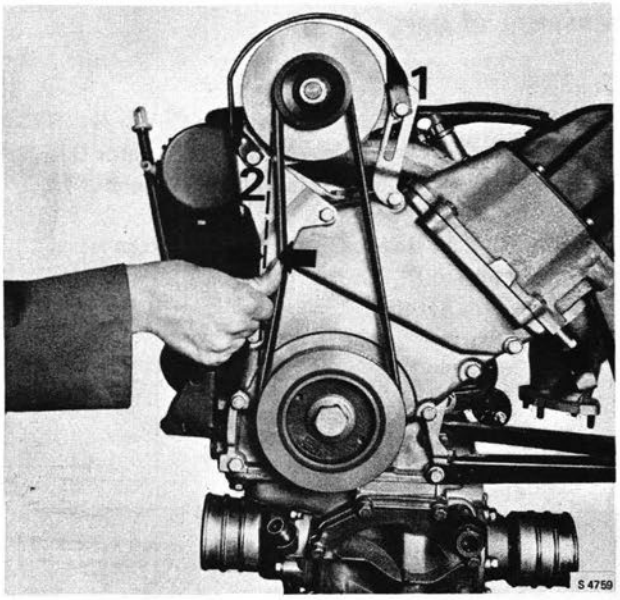
As from chassis Nos. 99752015230, 99756006328 and 99757002737, only regulators of Bosch manufacture will be installed.

Only alternators with integrated electronic charging regulators are supplied as from 1979 model.

REMOVING AND MOUNTING

1. Disconnect the negative battery lead. Remember that the engine must be stopped before this is done.
2. Undo the alternator wiring connections, retaining screw and adjusting screw and take off the drive belt.
3. Lift out the alternator.
4. Remount the alternator, proceeding in the reverse order.
5. Adjust the tension of the drive belt. The tension should be such that the belt can be depressed about 0.4" (10 mm) under a load of 15 N (3.5 lb., 1.5 kp).

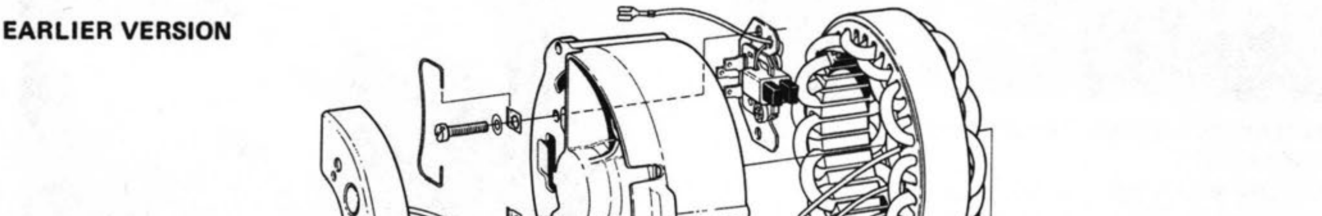
NOTE
To protect the diodes from overheating during soldering, proceed as follows: a. Use a well heated soldering iron with a fine tip to do the job quickly. b. Hold the wire between the body of the diode and the soldering point with pliers to conduct away as much heat as possible.



CHECKING BELT TENSION
1. Adjusting screw
2. Retaining screw

Alternator, make Bosch

EARLIER VERSION



ALTERNATOR, MAKE BOSCH (EARLIER VERSION)
1. Drive bearing assembly
2. Stator
3. Slip ring end bracket
4. Rotor

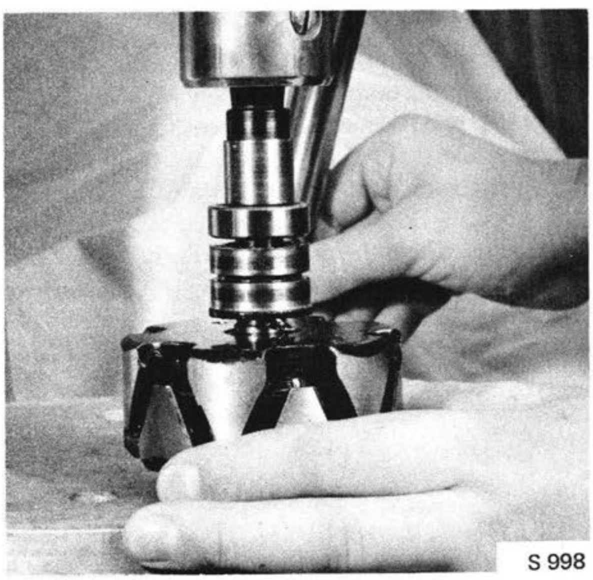
DISASSEMBLING

1. Hold the belt pulley securely in a suitable tool and unscrew the nut with a 3/4" (19 mm) wrench. Remove the pulley and fan disc.
2. Mark the position of the tension lug on the drive bearing housing. Undo the bearing housing retaining screws and withdraw the rotor together with the bearing housing from the stator.
3. Place the drive bearing housing on a suitable backing surface and carefully press out the rotor. The bearing can then be removed. Take care that the rotor does not fall to the floor and suffer damage when it comes free of the bearing housing.
4. Use a suitable puller to remove the ball bearing from the slip ring side.

ASSEMBLING

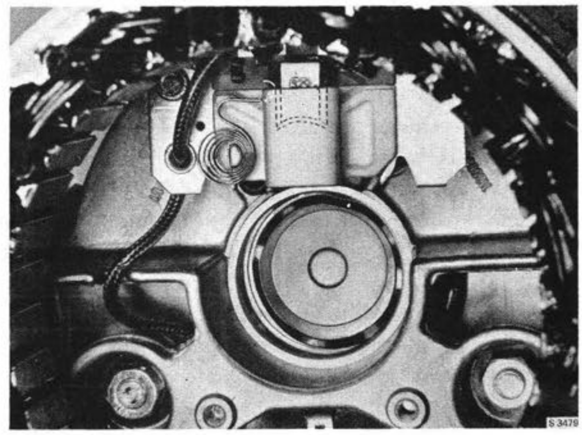
The length of the brushes must be checked before the alternator is assembled. The minimum is 0.354 in. (9 mm), but if they are under 0.551 in. (14 mm) they should be replaced. See section on "Changing brushes".

1. Pack the ball bearings with Bosch Ft 1 v 34 grease. Press the ball bearing into the housing with the enclosed side facing the drive end.
2. Press the drive bearing housing on to the rotor.
3. Press on the ball bearing on the slip ring side (see illustration). The enclosed side faces the slip rings.



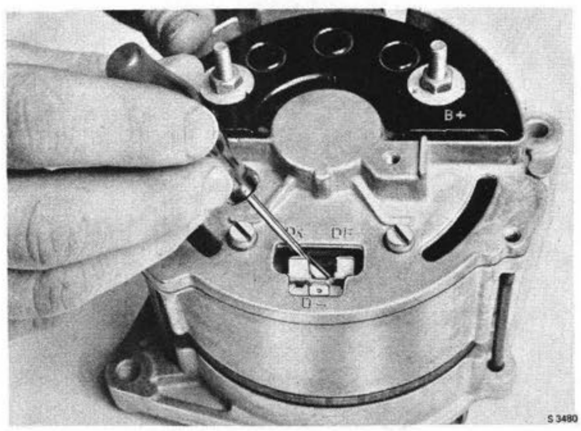
PRESSING THE SLIP RING BALL BEARING INTO POSITION

4. Put the spring washer into the bearing seat. Push up the brushes and secure them with the brush springs (this is easier if the brush unit assembly is removed).



BRUSHES PUSHED UP AND SECURED

5. Insert the rotor and screw the assembly together. Make sure that the drive bearing housing is correctly positioned relative to the slip ring bearing housing. Press the brushes down from the outside with a screwdriver or similar.



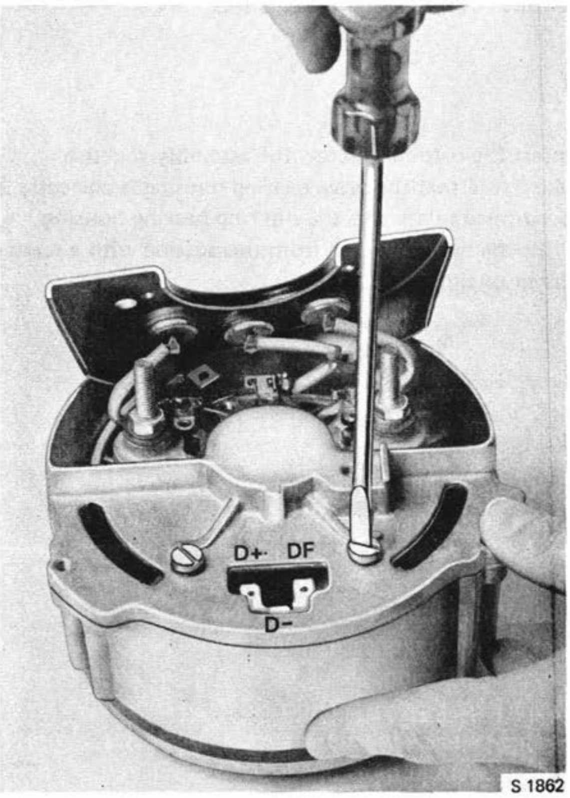
PRESSING DOWN THE BRUSHES

6. Fit the fan and belt pulley. Tighten the nut to a torque of 23–29 ft.lb. (34–39 Nm, 3.5–4 kpm). (If, at the time of overhaul, the fan has done more than 100 000 km, it should be replaced.)

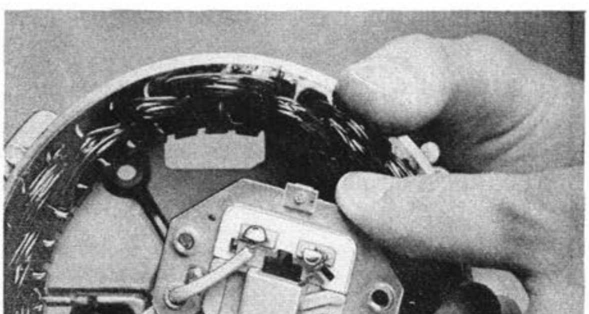
CHANGING BRUSHES

Min. length of the brushes is 0.354 in. (9 mm). If the alternator is overhauled the brushes shall be replaced if they are under 0.551 in. (14 mm).

1. Mark the position of the tension lug on the drive bearing housing. Undo the bearing housing retaining screws and remove the rotor with the bearing housing from the stator.
2. Undo both nuts holding the rectifier bridge in place.
3. Undo the terminal connecting wire to the brush unit assembly (AMP-connections).
4. Undo the brush unit assembly retaining screws and remove the assembly.

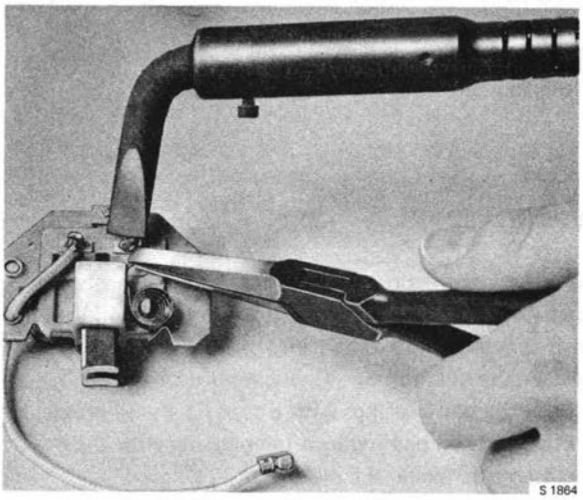


UNSCREWING THE BRUSH UNIT ASSEMBLY



REMOVING THE BRUSH UNIT ASSEMBLY

5. Disconnect the wires with the help of a soldering iron; the brushes can then be removed. When resoldering the wire connections, make sure that no solder flows into the wires.

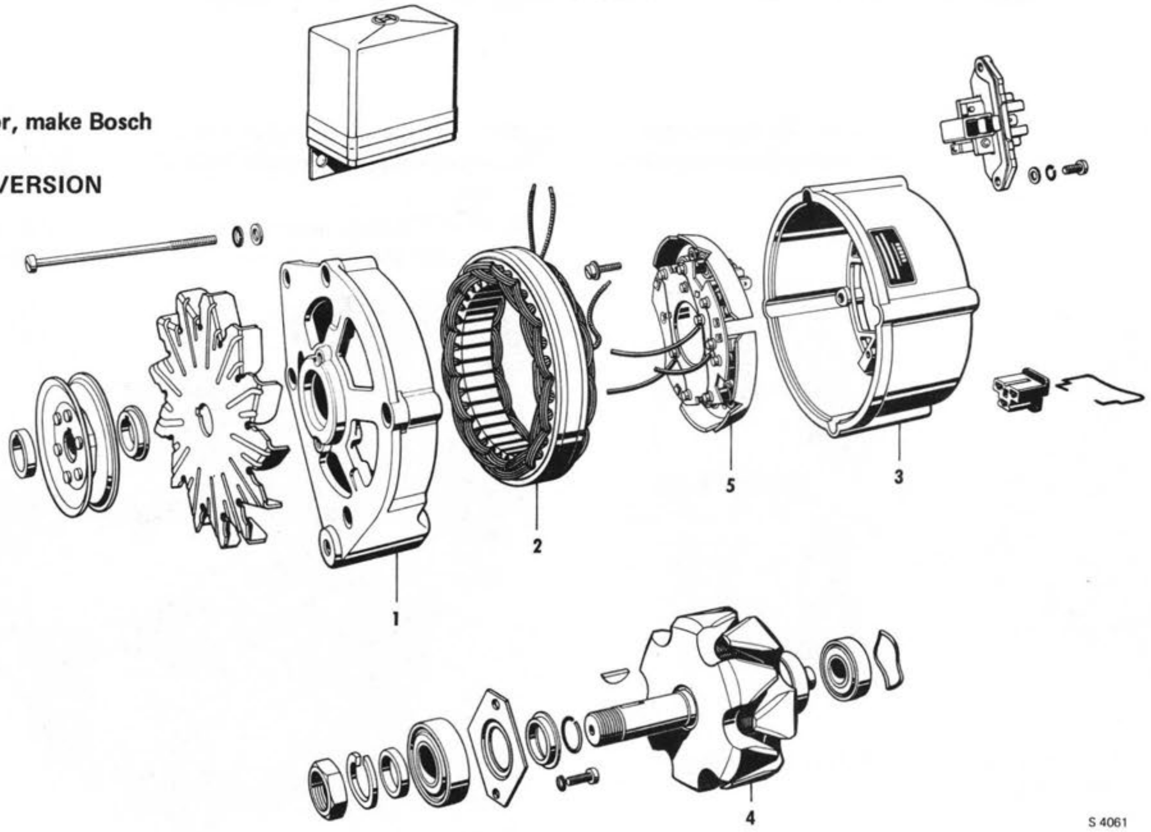


UNSOLDERING THE BRUSH UNIT TERMINALS

6. Push up the brushes and secure them with the brush springs. Fit the brush unit assembly and make sure that the spring washer is in its correct place in the bearing seat.
7. Insert the rotor and screw the assembly together. Make sure that the drive bearing housing is correctly positioned relative to the slip ring bearing housing. Press the brushes down from the outside with a screwdriver or similar.

Alternator, make Bosch

LATER VERSION

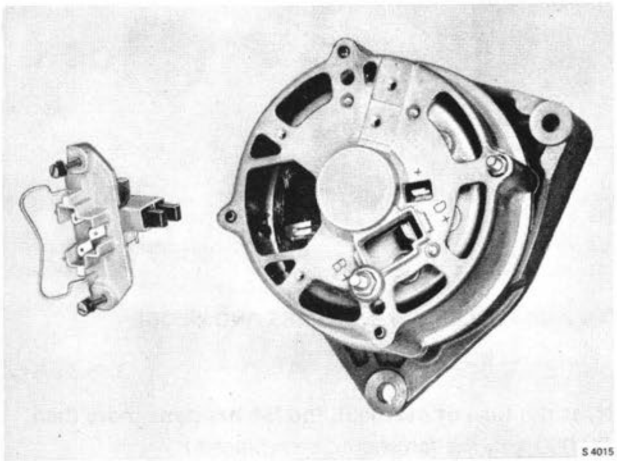


ALTERNATOR, MAKE BOSCH (LATER VERSION)

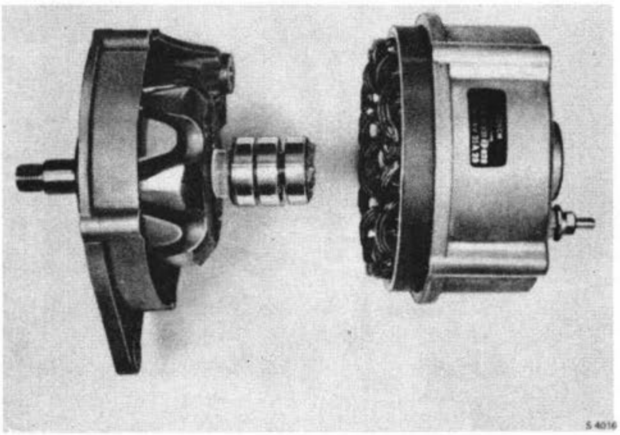
1. Drive bearing assembly
2. Stator
3. Slip ring end bracket
4. Rotor
5. Rectifier unit

DISMANTLING

1. Hold the pulley securely by means of a suitable tool and remove the nut using a 0.87 in (22 mm) wrench. Remove the pulley and fan.
2. Remove the brush unit assembly from the alternator.
3. Separate the stator and slip ring end bracket from the drive bearing assembly and rotor. Make a mark to indicate the position of the drive bearing assembly relative to the stator and slip ring end bracket.

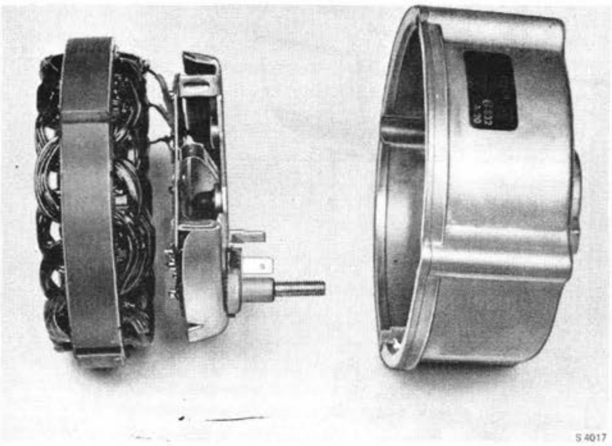


BRUSH UNIT ASSEMBLY REMOVED FROM ALTERNATOR



STATOR AND SLIP RING END BRACKET SEPARATED FROM ROTOR AND DRIVE BEARING ASSEMBLY

4. Remove the retaining screws and nut for the rectifier unit and separate the stator and the rectifier unit from the slip ring end bracket.



STATOR AND RECTIFIER UNIT SEPARATED FROM SLIP RING END BRACKET

5. Unsolder the stator cables from the rectifier unit.
6. Support the drive bearing assembly on a suitable base and carefully press out the rotor. The bearing can now be dismantled. Take care to ensure that the rotor does not fall and become damaged as it is pressed free from the bearing assembly.
7. Remove the ball bearing on the slip ring side using a suitable extractor.

ASSEMBLY

1. Pack the ball bearing with Bosch Ft 1 v 34 grease. Press the ball bearing into the bearing assembly with the capped side facing the drive.
2. Press the drive bearing assembly onto the rotor.
3. Press on the ball bearing on the slip ring side (see illustration). Ensure that the capped side faces the slip rings.

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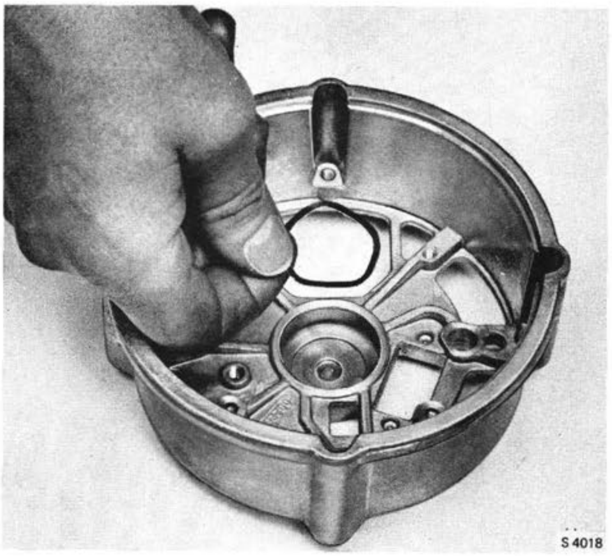
PRESSING THE BALL BEARING INTO PLACE ON THE SLIP RING SIDE

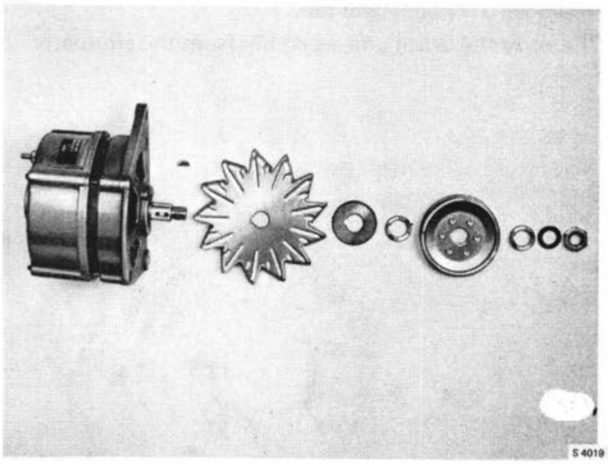
4. Solder the stator cables to the rectifier unit.
5. Reassemble the rectifier unit and the clip ring end bracket.
6. Place the snap ring for the bearing in the slip ring end bracket and refit the drive bearing assembly and rotor



PLACING THE SNAP RING IN THE SLIP RING END BRACKET

to the slip ring end bracket and stator as described earlier.

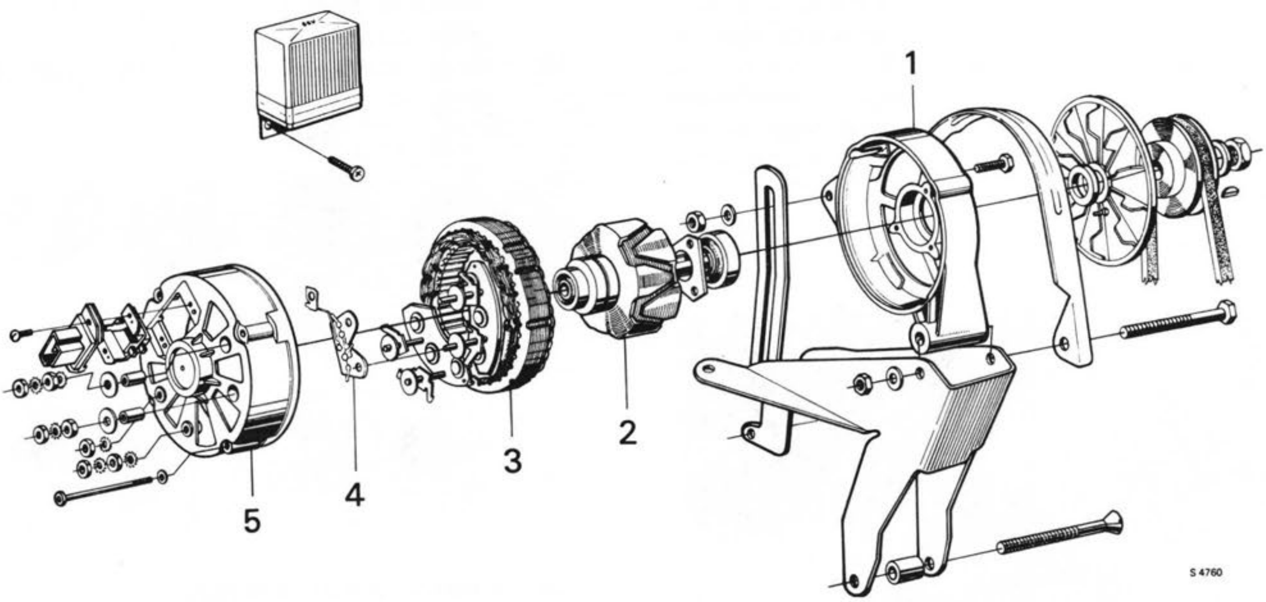
7. Check the lengths of the brushes (with the brush unit assembly removed, the brushes should protrude at least 0.20 in (5 mm) through the opening) and reassemble the brush unit assembly.
8. Fit the fan and pulley. Make sure that the washers are installed in the correct order (see illustration). Tighten the nut to a torque of 34–39 Nm (23–29 ft-lb., 3.5–4.0 kpm).



FAN AND PULLEY WITH SPACERS AND WEDGE

(If, at the time of overhaul, the fan has done more than 100 000 km, the fan should be replaced.)

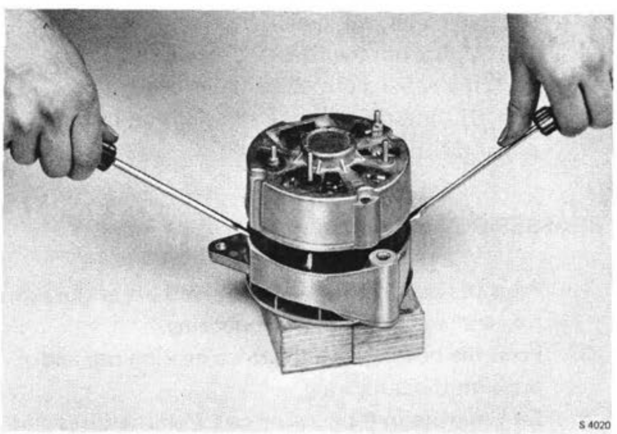
Alternator, SEV make (earlier design)



ALTERNATOR, MAKE SEV
1. Drive bearing cap
2. Rotor
3. Stator
4. Exciter diodes
5. Slip ring cap

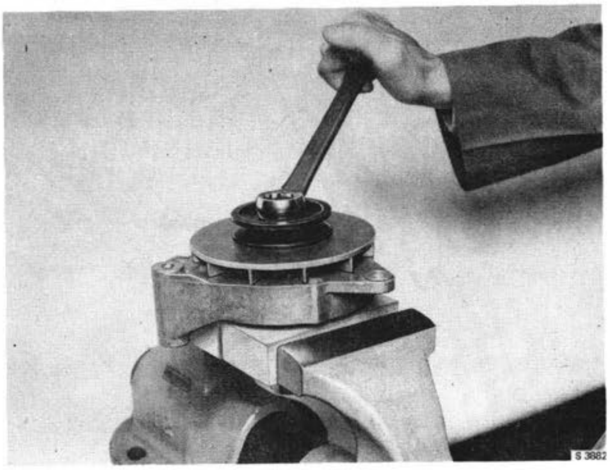
DISASSEMBLY

1. Remove the contact point retaining screws and brush holder.
2. Remove the four socket head screws with square nuts which hold the alternator together. Mark the position of the drive bearing housing in relation to the stator and slip ring cap.
3. Separate the slip ring cap and stator assembly from the drive bearing cap, rotor, fan and pulley assembly, using two screwdrivers inserted in the slots on both sides of the alternator between the stator and the drive bearing cap. Never insert the screwdrivers deeper than 0.08" (2 mm) as this may damage the stator windings.



SEPARATING THE STATOR AND SLIP RING CAP FROM THE DRIVE BEARING CAP AND ROTOR

4. Unscrew the nuts and remove the washers from the positive and negative diode holders.
5. Separate the slip ring cap from the stator, and at the same time insert the contact point and brush holder through the opening for the latter.
6. Clamp the rotor in a vise using the wooden blocks intended for the purpose (tool 8580029). Do not tighten any harder than necessary to avoid deforming the armature cores.

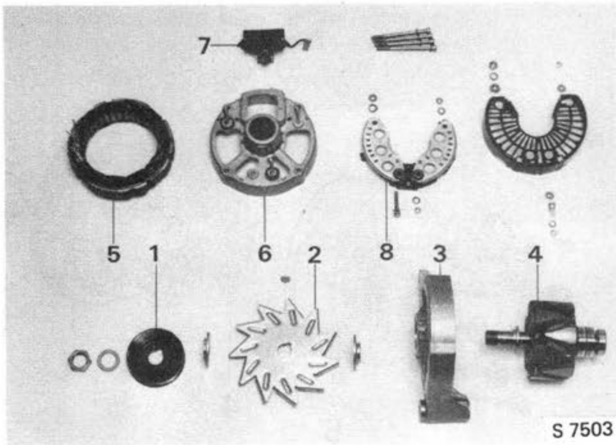


UNSCREWING THE PULLEY NUT; THE ROTOR IS HELD FAST BY TOOL 8580029

7. Unscrew the nut and remove the washer, belt pulley, fan, keypiece and spacer. Note which way the spacer faces.
8. Undo the three screws in the bearing cap.
9. Push the rotor shaft out of the bearing cap with a suitable puller, e.g. pinion bearing puller (tool 7841158) from the Saab V4 repair kit.
10. Push the bearing out of the drive bearing cap.
11. Pull off the bearing at the slip ring end using the puller mentioned above.

REASSEMBLY

1. Press the bearing firmly on to the shaft at the slip ring end and press on the inner ring.
2. Press the bearing into the drive bearing cap and press on the outer ring.
3. Fit the plate in the bearing cap with the three slotted screws.
4. Press the drive bearing cap complete with bearing firmly on to the rotor shaft.
5. Fit the spacer, keypiece, fan, belt pulley, washer and nut.
6. Tighten the nut to 29 ft.lb. (40 Nm, 4 kpm).
7. Assemble the slip ring cap and the stator, and at the same time insert the contact point and brush holder through the opening for the latter. Make sure that the insulating washers and sleeves on the positive diode unit are in place. Screw down the two diode plates.
8. Check that the O-ring in the slip ring cap bearing seat is fitted so that the vent hole is not blocked.
9. Assemble the drive bearing housing, rotor, fan belt pulley with slip ring housing and stator. Tighten the mounting screws with a torque of 2.2 ft.lb. (3 Nm, 0.3 kpm).
10. Fit the contact piece and the brush unit assembly.



ALTERNATOR SEV (LATER DESIGN)

1. Belt pulley	5. Stator
2. Fan	6. Slip ring end cap
3. Drive bearing cap	7. Charging regulator and brush holder
4. Rotor	8. Recetifier unit

ALTERNATOR, SEV MAKE (LATER DESIGN)

Changing the diodes, SEV alternator (earlier design)

Removal

1. Remove the contact points and brush holder retaining screws.
2. Remove the four socket head screws with square nuts which hold the alternator together. Unscrew the nuts and remove the washers from the positive and negative diode holders.
3. Separate the slip ring cap from the alternator using two screwdrivers inserted in the slots on both sides of the alternator between the stator and the drive bearing cap.
Never insert the screwdrivers deeper than 0.08" (2 mm) as this may damage stator windings. At the same time, guide the contact point and brush holder through the opening in the slip ring end bracket.
4. Unsolder the cables from the diodes to be replaced.

Assembly

1. Position the cable socket on the diode holder screws.
2. Place insulating washers, the exciter diode unit and insulating sleeve on the screws of the positive diode holder.
3. Solder the cables in position. Use a hot soldering iron so that the soldering will be quick to prevent heat spreading to the diode body. Insert a pair of flat nose pliers or suchlike between the soldering point and the diode to conduct the heat away.
The cables should be correctly positioned before they are soldered. If the diode connector should become bent, the diode may be damaged.
4. Check that the O-ring in the slip ring cap bearing seat is fitted so that the vent hole is not blocked.

5. Mount the slip ring cap and at the same time insert the brush holder and contact point through the opening. Tighten the screws to a torque of 2.2 ft.lb. (3 Nm, 0.3 kpm).
6. Fit the washers and nuts on the diode holders. Check the insulation.
7. Mount the brush holder and contact point.

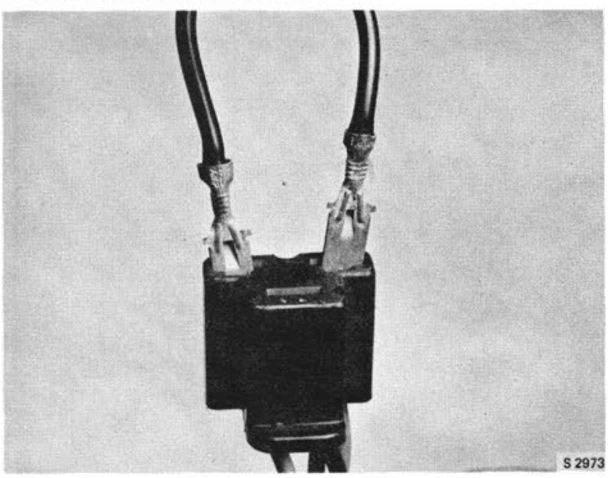
TESTING, MAKE BOSCH AND SEV

General

Note the following before testing the alternator or its component parts:
Only direct current with a maximum voltage of 40 V may be used to test the rectifiers.
A 40V/40W AC glow lamp should be used for insulation and short circuit tests on stator windings and rotor windings. (Do not use a mains voltage of 110 or 220 V, since this might damage the rectifiers.)
The battery cable must not be disconnected while the engine is running for the purpose of measuring the charging current.
If it is necessary to solder or unsolder diode connections, the diode connecting wire must be held in a pair of flat pliers to conduct away excess heat, on account of the heat sensitivity of the semiconductors. (Solder and unsolder the connections quickly with a hot soldering iron.)
Avoid mechanical strain at the point where the connecting wires issue from the heat sink assembly; the wire must not be bent or subjected to load at the point of attachment.
During repairs to the alternator, whether in the car or on a test bench, the battery must be disconnected.

Rapid check of alternator and charging regulator (applies only to earlier design with separate charging regulator)

If the charge indicator light does not go out, the first thing to do is to check that the alternator belt is not slipping and/or that the cable connections have not loosened. If the lamp still glows after checking in this way, the cause can be determined in the following manner:
Remove the connector from the charging regulator.
Connect a cable between the red cable's terminal D+ and the yellow cable's terminal DF.



TERMINALS DF AND D+ CONNECTED

Start the engine and let it run at max. 2,000 rev/min while watching the charge indicator light.

> **WARNING**
> Do not run the engine at a higher speed than 2,000 rev/min, as there is a risk of damage to the power consumers being caused by overvoltage.

If the indicator light goes out immediately, the charging regulator is defective and must be renewed.
If the indicator light flashes or lights continuously, the alternator must be overhauled.

Measuring the charging capacity

The charging voltage and charging current can be measured in the car or on the test bench.
Measure the voltage using a voltmeter connected between terminal B+ and the alternator ground.
Measure the current using an ammeter connected in series with the wire from terminal B+ on the alternator. See the test values on page 321–15.

Testing the alternator on a test bench

When on the test bench, the alternator must be driven by its belt pulley only.
Connecting wires must be fitted with cable shoes or pin connectors. Improvised connectors must not be used on the battery either.
During testing a 12 volt battery must be coupled in parallel with the alternator. The battery serves as a buffer to damp out the peak voltages that occur when the load is switched on and off. If these peaks exceed the permitted maximum voltage, the rectifier effect of the diodes will be lost. The voltage limit for silicon diodes is about 100 V.

Mounting the alternator

The alternator can be tested in most types of generator test bench. In some cases it may be necessary to provide suitable extra mounting and drive arrangements.

> **CAUTION**
> When mounted for testing the alternator must be secured by screws in the normal manner and not clamped in place or secured by other means.

Testing with the voltage regulator

Mount the alternator in the test bench and connect it to the voltage regulator. **Do not misconnect the terminals!** Connect the excitation ammeter to terminal DF on the alternator. Connect the battery and indicator lamp. Connect the voltmeter to terminal B+. For bias, increase the speed from zero until an alternator voltage of about 14 V is obtained, then reduce speed again.

Magnetization

Unlike a DC generator, the alternator does not demagnetize spontaneously after a long period of disuse. A 12 V indicator lamp with a power of at least 1.2–2 W must therefore be connected between terminals D+ and B+ (see wiring diagram). Bias current is then supplied to the exciter winding through the indicator light, alternator terminal D+, regulator terminal D+, the closed regulator contacts and terminal DF. It is important in this connection that the lamp wattage is at least as high as that stated above. Self-excitation begins as soon as the alternator voltage opens the exciter diodes, which occurs at 1–2 V. The voltage then rises rapidly and the potential difference across the indicator lamp gradually diminishes. The lamp remains lit until battery voltage has been attained.

Testing the components

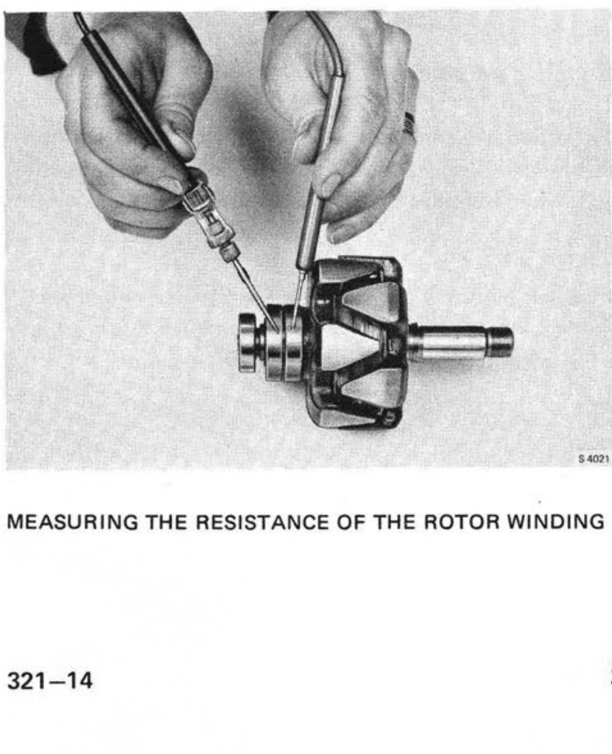
A. Rotor

Short circuit in the winding

Measure the resistance in the winding from slip ring to slip ring using an ohmmeter.

The resistance should be:

Bosch alternator	4.0–4.4 ohm
SEV alternator	4 ± 0.4 mm

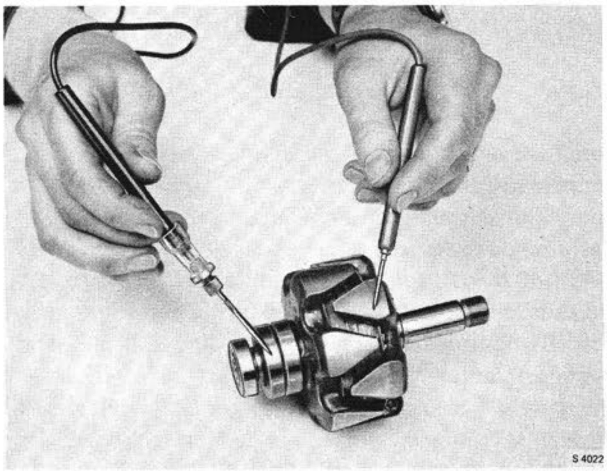


MEASURING THE RESISTANCE OF THE ROTOR WINDING

Short circuit to ground

Test the insulation of the exciter winding and the slip rings for a short circuit to ground.

Test equipments: 40V/40W AC glow lamp.



CHECKING THE INSULATION OF THE EXCITER WINDING AND THE SLIP RINGS

Slip rings

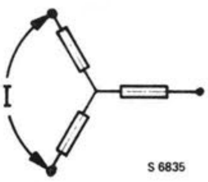
Check that the surface of the slip rings is not greasy, dirty or scratched. Clean using trichloroethylene. Avoid polishing the surface of the slip rings. A ring which is too highly polished may impair the electrical contact of the brushes.

B. Stator

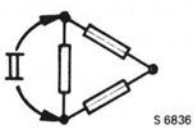
Short circuit in the windings (rectifiers unsoldered)

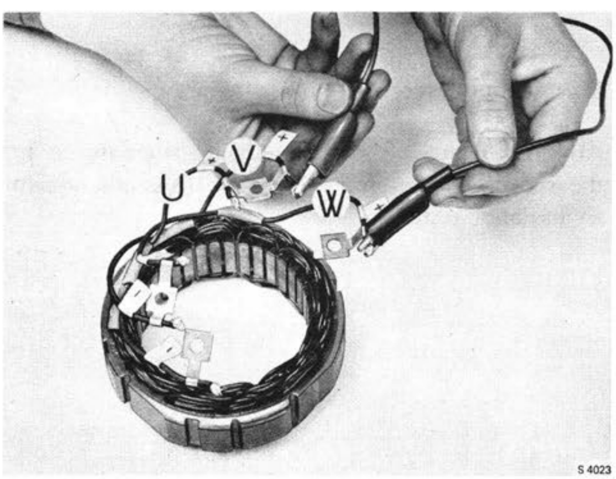
The test for a short circuit in the stator windings can be made by probing with a winding tester. This test can only be made when the alternator is disassembled. A further possibility is to measure the joint resistance in two phases. Three measurements will reveal any deviation in the resistance of the stator winding. If the phases are marked U, V and W, measure U–V, U–W and V–W. In each case the reading should be (at 68°F/20°C):

Bosch 55A	0.14 ohm ± 10 %
Bosch 65A	0.10 ohm ± 10 %
SEV 55A (earlier design)	0.18 ohm ± 10 %



SEV 55A (later design) 0.13 ohm ± 10 %

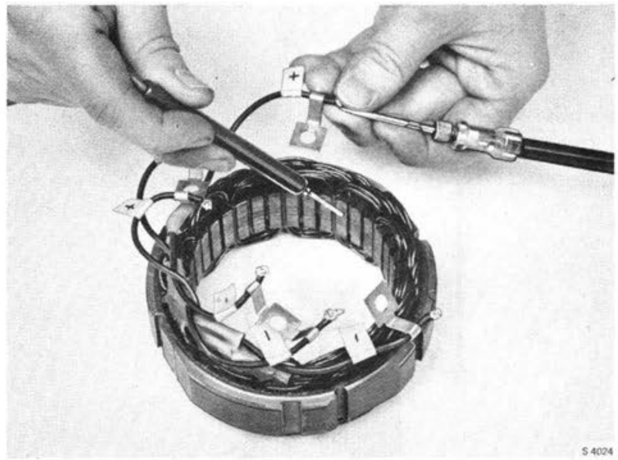




MEASUREMENT OF RESISTANCE ACROSS TWO PHASES (V–W)

Short circuit to ground (rectifiers unsoldered)

The test should be made with a 40V/40W AC glow lamp. Connect the glow lamp between the iron core of the stator and each of the disconnected stator cables.

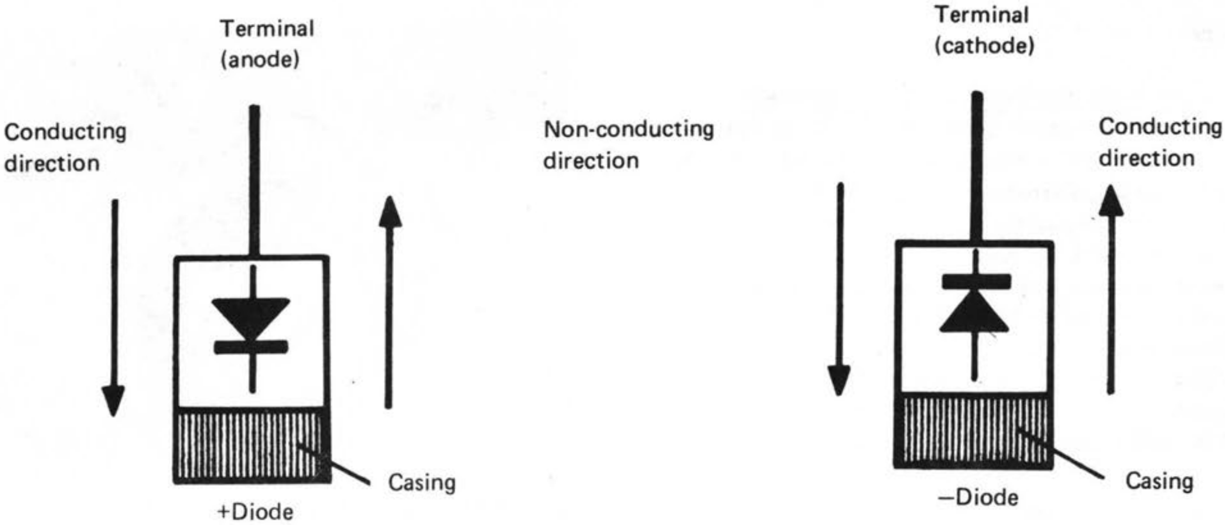


TEST OF STATOR WINDING

C. Rectifiers

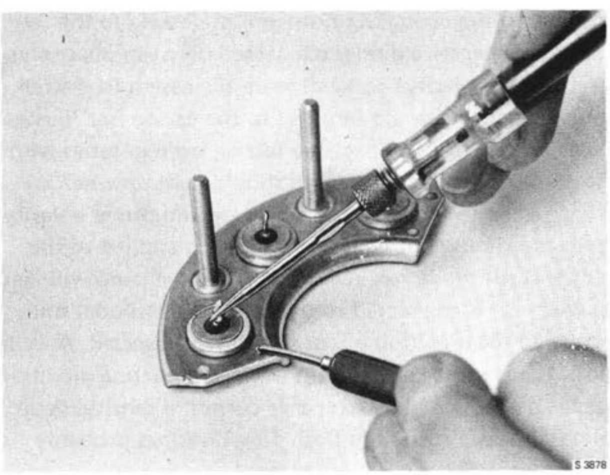
Testing the rectifiers

Use only a testing lamp of not more than 40 V direct current or an ohmmeter. To test the conducting and non-conducting directions of the silicon rectifiers, the phase terminals must first be disconnected, as it is otherwise impossible to tell which diode is faulty. The positive diodes between terminal B+ and phase conduct from the terminal to the casing but not from the casing to the terminal. The negative diodes connected between phase and B– (inverse polarity) conduct from the casing to the terminal but not from the terminal to the casing (see illustration). To test this, connect the testing lamp in series with the diode under test. The lamp should light up when B+ is connected to the anode of a diode with normal polarity. The lamp should not light up when B+ is applied to the casing. If the diode has inverse polarity, the lamp will light up when B+ is connected to the terminal (cathode) but not when the direction of current flow is reversed. A faulty diode that fails to pass current in the conducting direction has been overheated by excessive current intensity. A diode that passes current in both directions has probably been subjected to excessive voltage.



Testing rectifiers with an ohmmeter

The rectifiers can also be tested with an ohmmeter. In a properly working diode, resistance is low in the conducting direction (e.g. a few ohms) but much greater in the non-conducting direction (e.g. several kiloohms).



CHECKING THE DIODES

D. Checking the brush unit assembly and connections (brush unit assembly detached or rotor removed)

1. Check the movement of the brushes in the assembly.
2. Check the wear of the brushes. Compare with wear limits on page 321–15.
3. Check that the brushes are completely insulated from each other. Connect the testing instrument between two brushes.
4. Check that the contact between each of the brushes and the "–" and "DF" terminals is good.

E. Insulation test on assembled alternator

After disassembling and assembling the alternator, check the insulation between the B+ terminal and ground with an insulation tester.

TEST VALUES AND WEAR LIMITS

Ratio engine belt pulley—alternator, see Group 0.

Bosch alternator

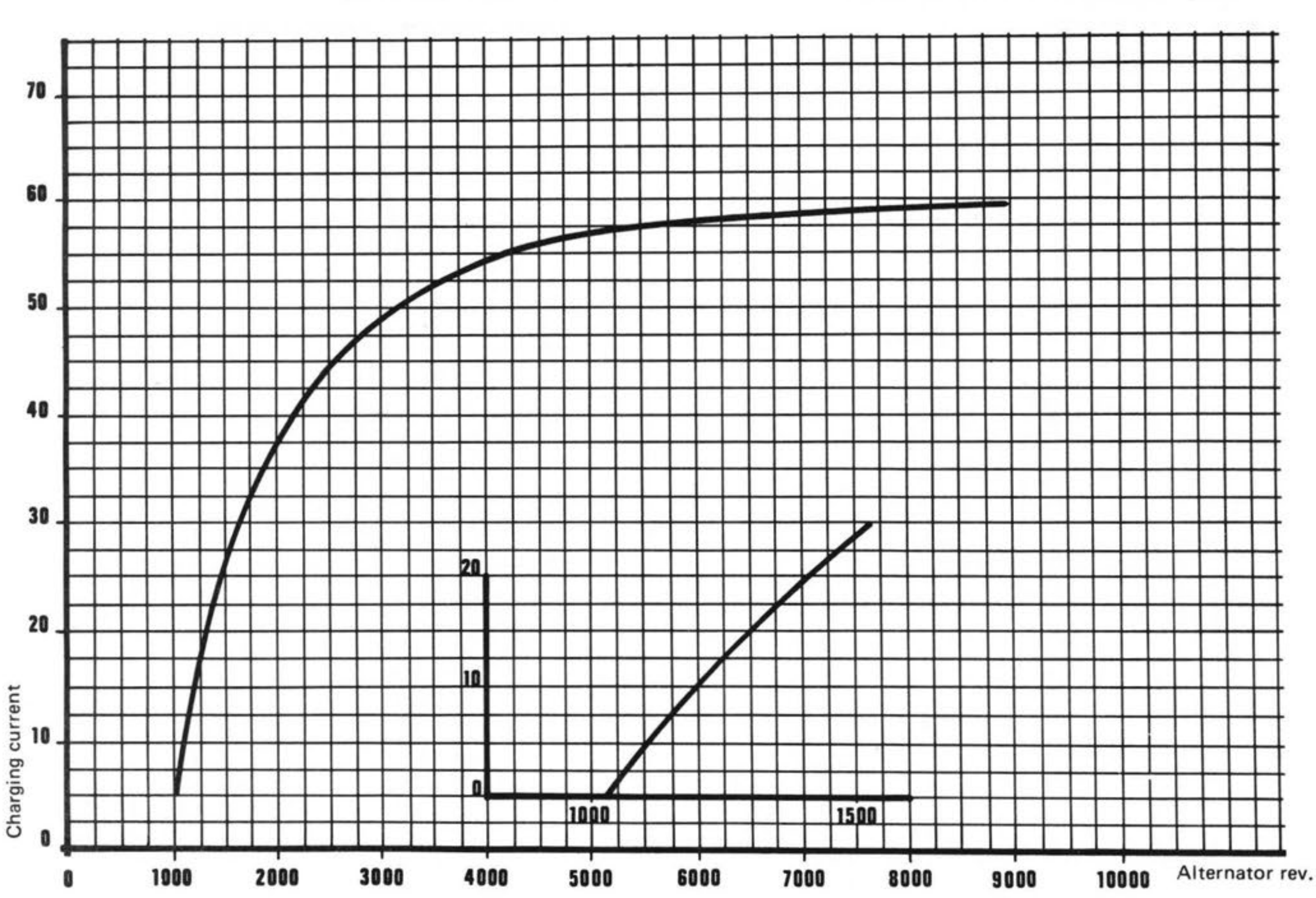
Testing at 2/3 maximum current
Connect the battery and load the alternator. Adjust the alternator speed to exactly 2,000 rev/min. The alternator must then deliver two-thirds of the maximum current = 36 A.

Checking speed for maximum output
Connect the battery. Load the alternator and run it until warm. Increase the speed. The maximum output 55A or 65A respectively at 14V should be obtained within the speed range 2,700–3,700 rev/min. (alternator speed).

Maximum permissible wear of the brushes
Earlier version: The minimum length of the brushes should be 0.35 in. (9 mm). However, during overhaul, the brushes should be replaced if the length is below 0.55 in. (14 mm).
Later version: With the brush unit assembly removed, the brushes should protrude by at least 0.20 in (5 mm) through the opening in the brush unit assembly.

SEV alternator

At 3,000 rev/min., the alternator should generate 14V/48A.
At 5,000 rev/min., the alternator should generate 14V/55A.
Maximum permissible wear of the brushes:
The brushes should project more than 0.16" (4 mm) from the brush unit assembly when the latter is removed.



AMPERAGE OUTPUT IN THE ALTERNATOR, MAKE SEV

TROUBLE SHOOTING

Alternator not charging

The cause may be
a. Slack drive belt
b. Break in charging circuit and return circuit to ground
c. Defective electric brushes
d. Shorted diodes
e. Break in exciter circuit
f. Faulty regulator
g. Broken rotor winding
h. Grounded stator
i. Exciter diode unit ground connection broken or shorted

Low or irregular amperage

The cause may be
a. Slack drive belt
b. Irregular breaking in the charging circuit
c. Worn electric brushes
d. Faulty regulator
e. Broken or shorted rectifier diode
f. Partly shorted rotor
g. Stator ground connection broken or partly shorted

Abnormally high amperage

The cause may be
a. Faulty regulator
b. Bad contact between regulator and alternator

Noise in alternator

The cause may be
a. Badly worn drive belt
b. Pulley loose or out of true
c. Crankshaft and alternator pulleys out of alignment
d. Worn or defective bearings
e. A shorted rectifier diode
f. Loose alternator retaining screws

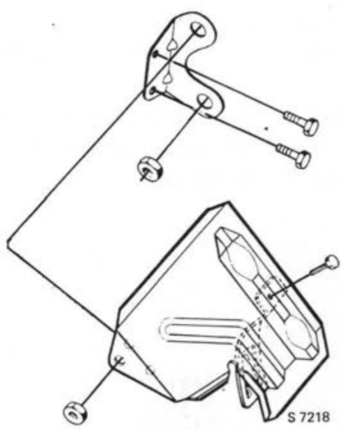
STARTER

GENERAL

The starter spins the engine flywheel by a starter pinion and a gear ring. The pinion slides on the rotor shaft of the starter and is brought into engagement with the gear ring by a solenoid which thereupon trips the switch that supplies current to the starter. As soon as the engine fires, the gear ring on the flywheel starts to drive the pinion. When this happens, the pinion is released from the driver shaft by a freewheel arrangement but remains in engagement with the ring gear as long as the solenoid is energized by the ignition key. It is disengaged by a return spring when current to the solenoid is cut off.

REMOVAL

1. Disconnect the battery
2. Disconnect the pre-heater hose
3. Remove the clutch cover (torque converter)
4. Remove the starter motor rear mounting and the radiation shield



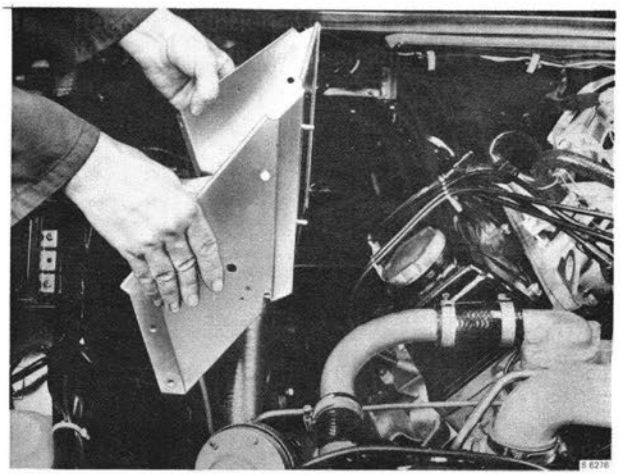
5. Disconnect the starter motor wires
6. Remove the starter motor front mounting bolts
7. Extract the starter motor until it clears the recess and then lift it out of the engine compartment

   Installation is in the reverse order.

REMOVAL, TURBO

1. Remove the battery and battery shelf
2. Remove the turbo suction pipe
3. Remove the oil return pipe between the turbo charger and the engine block.
4. Remove the pre-heater hose and the clutch cover
5. Remove the starter motor front mounting bolts
6. Disconnect the starter motor wires
7. Remove the starter motor rear mounting and radiation shield
8. Extract the starter motor until it clears the recess and then lift it out of the engine compartment.

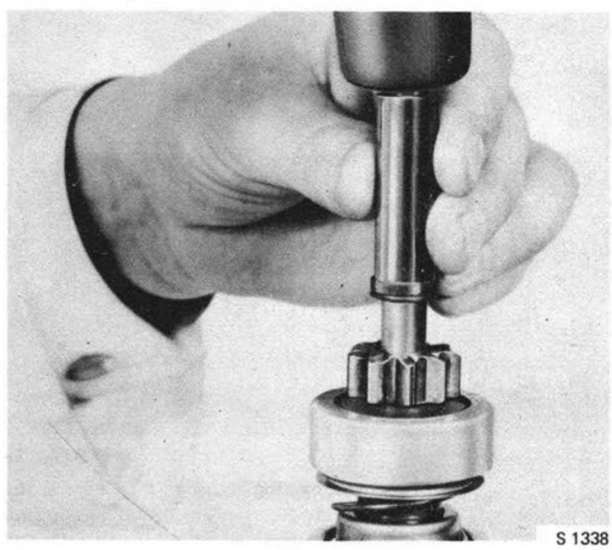
   Installation is in the reverse order



DISASSEMBLING

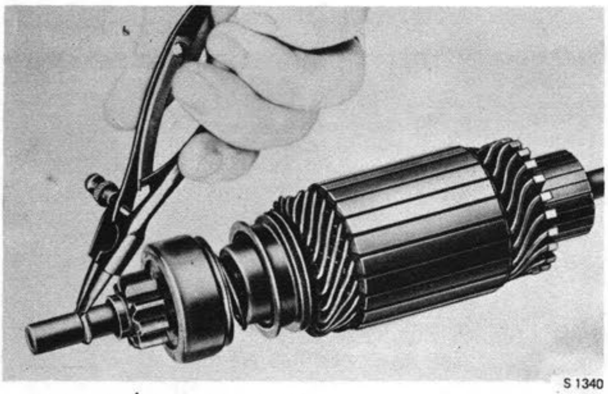
(See exploded view on the next page.)

1. Disconnect the solenoid feeder cable.
2. Remove the solenoid retaining screws.
3. Unhook and remove the solenoid.
4. Undo the two retaining screws from the capsule bracket.
5. Remove the capsule bracket, U-washer, spacers and rubber gasket (pos. 5–8).
6. Undo the screws from the commutator bearing housing (1).
7. Remove the commutator bearing housing (10).
8. Lift the brush springs off their retainers with a wire hook and remove the brushes.
9. Remove the brush plate (11).
10. Pull the starter assembly off the drive and bracket assembly.
11. Undo the engaging lever arm locating screw.
12. Remove the rubber and steel washers from the drive and bracket housing (15–16).
13. Remove the rotor and engaging lever arm.
14. Press the stop ring towards the cog with a piece of tubing.



PUSHING DOWN THE STOP RING

15. Remove the lock ring with lock ring pliers (see illustration). Remove the pinion.



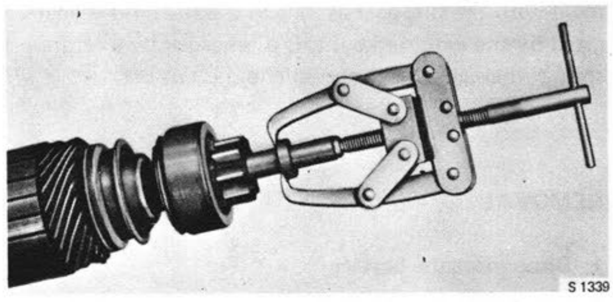
REMOVING THE LOCK RING

16. Inspect the spiral splines on the rotor shaft for burrs. If there are any, file them off.
17. Check the gear ring, starter drive cog and the bushings.

> NOTE
>
> Check all components and exchange or repair any that are damaged. Soak the bearing bushings in hot oil before reassembling.

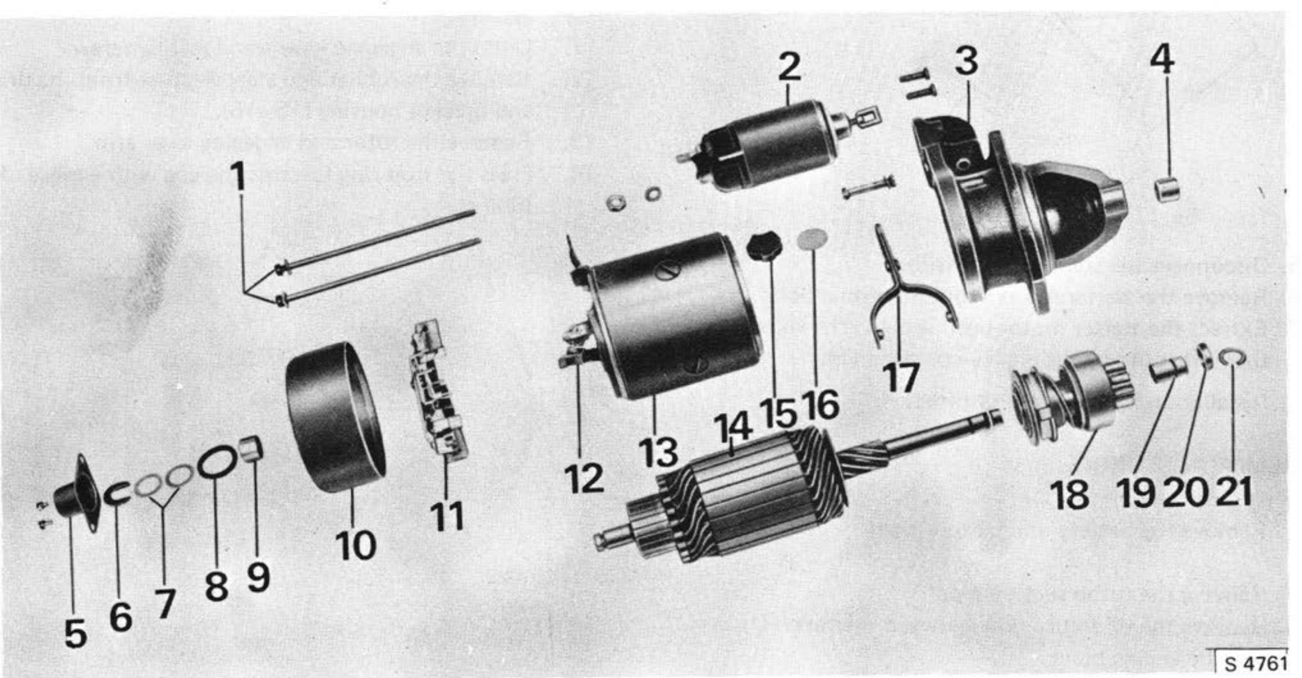
ASSEMBLING

1. Lubricate the spiral splines and the drive cog engaging ring with silicone grease.
2. Mount the pinion, stop ring and lock ring on the rotor shaft.
3. Use pliers to seat the lock ring in its groove in the rotor shaft.
4. Push up the stop ring using a press or claw puller.



PUSHING UP THE STOP RING

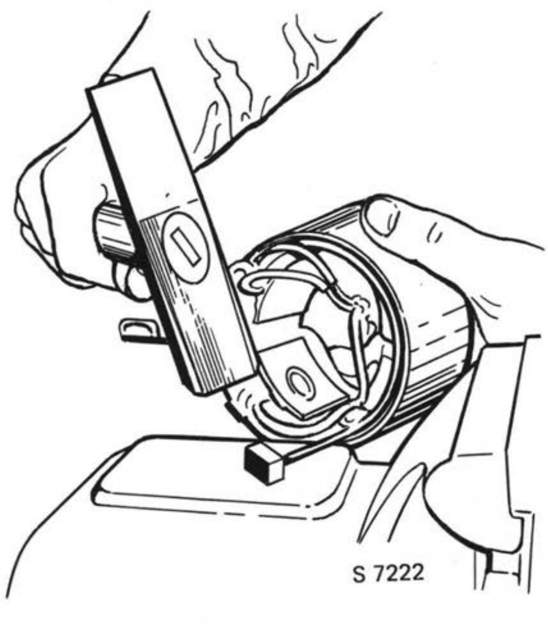
5. Fit the engaging lever arm to the cog engaging ring and insert the assembly, together with the rotor, into the drive housing.
6. Secure the engaging lever arm with its locating screw.
7. Place the washers in the drive housing, first the steel washer and then the rubber washer. The lips must be turned towards the rotor.



STARTER, DISASSEMBLED

1. Screws, bearing housing
2. Solenoid
3. Drive housing
4. Bushing, drive side
5. Capsule bracket
6. U-washer
7. Shim
8. Rubber gasket
9. Bushing, commutator side
10. Commutator bearing housing
11. Brush plate
12. Field winding
13. Starter housing
14. Rotor
15. Rubber washer
16. Steel washer
17. Engaging lever arm
18. Pinion
19. Bushing, pinion
20. Stop ring
21. Lock ring

8. Fit the starter housing with the notches above the guide pin and the lip of the rubber washer.
9. Fit the brush plate. Lift the brush springs with a wire hook and insert the brushes.
10. Mount the commutator bearing housing with the notches above the feed cable's rubber insulation.
11. Fit the rubber gasket, shims and U-washer.
12. Locate the capsule bracket and secure it with the two screws.
13. Insert and tighten the bearing housing screws.
14. Check the axial play of the shaft 0.002–0.012" (0.05–0.30 mm) and correct with shims if necessary.
15. Hook the solenoid to the engaging lever arm and secure with the two screws.
16. Connect the feeder cable.
17. Test the starter (see Group 0 for specifications and test values).


S 7222

SOLENOID

(Starter removed from car)

Removing

1. Disconnect the feeder cable.
2. Remove both retaining screws and remove the solenoid.

Refitting

1. Hook the solenoid to the engaging lever arm and secure it with the two screws.
2. Connect the feeder cable.
3. Test the starter (see Group 0).

BRUSHES

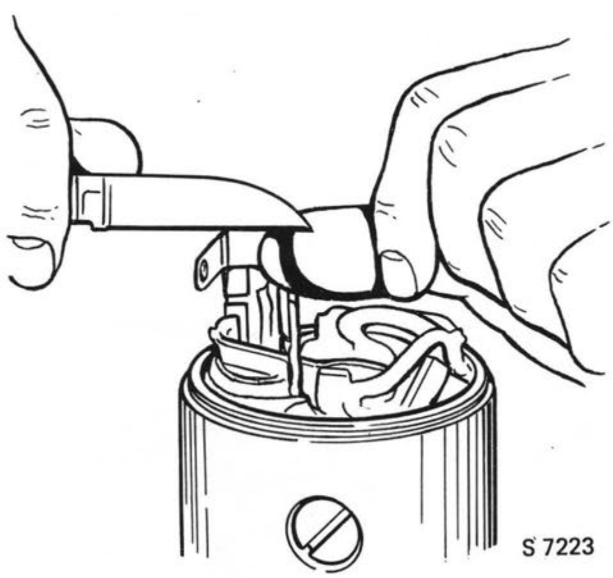
(Starter removed from car)

Removing

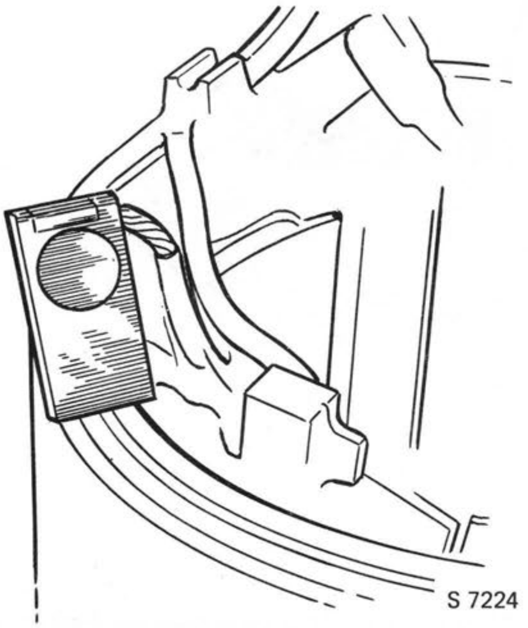
1. Remove the two screws from the capsule bracket.
2. Remove the capsule bracket, U-washer, shims and rubber gasket (pos. 5–8).
3. Remove the screws from the commutator bearing housing (1).
4. Remove the commutator bearing housing (10).
5. Lift the brush springs from the holders with a wire hook and take out the brushes.
6. Remove the brush plate.
7. Use a hammer to break up the worn bushes.

Installation

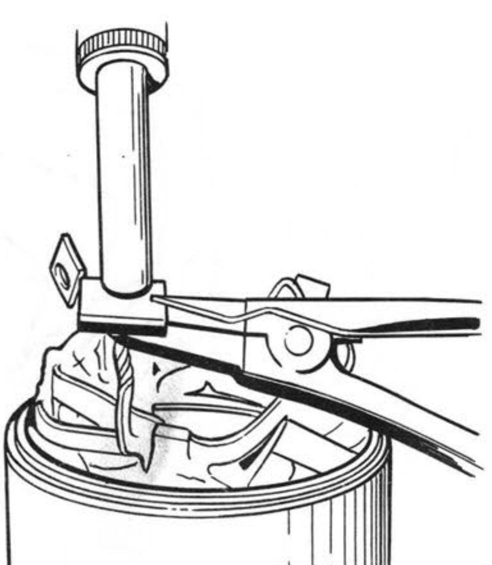
1. Wire the new brushes to the brush plate and field winding by soldering.
   a. Skrapa ren änden på anslutningsledningen så att den blir helt blank.


S 7223

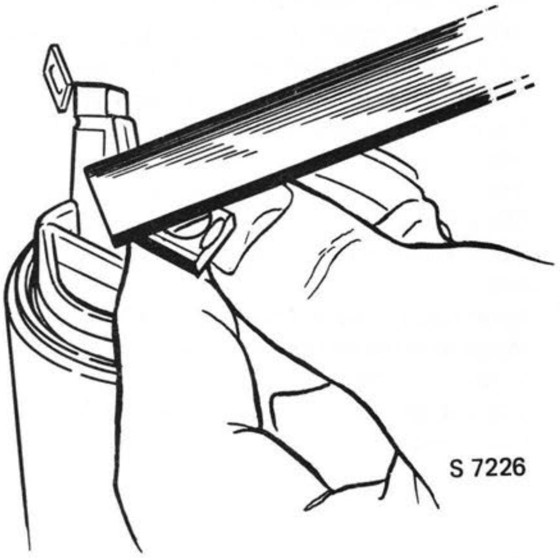
b. Stick in ledningen i hålet på den nya el-borsten och dela isär ledningstrådarna i fördjupningen i el-borsten.

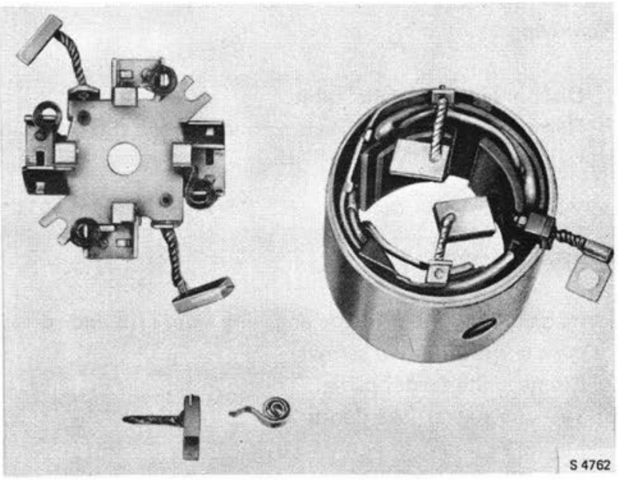


c. Löd fast el-borsten med lödkolv och tenn. Håll fast ledningen med en tång för att förhindra att tenn flyter ut i ledningen.



d. Fila bort ev utskjutande tennrester och tvätta bort eventuella rester av lödpastan med sprit.





BRUSH PLATE AND FIELD WINDING

2. Fit the brush plate in position. Lift the springs with a wire hook and insert the brushes.
3. Mount the commutator bearing housing with the notches above the feed cables rubber insulation.
4. Fit the rubber gasket, shims and U-washer.
5. Locate the capsule bracket and secure it with the two screws.
6. Insert and tighten the bearing housing screws.
7. Check the operation of the starter (see Group 0).

STARTER PINION

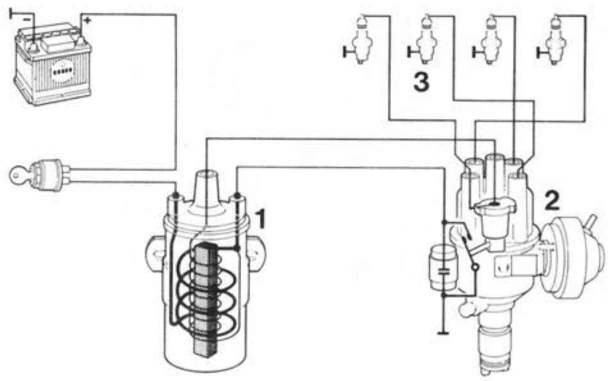
(Starter removed from car)

Dismanting

1. Disconnect the feeder cable from the solenoid.
2. Undo the solenoid retaining screws.
3. Unhook the solenoid and remove it.
4. Undo the engaging lever arm locating screw.
5. Remove the commutator bearing housing screws (1).
6. Pull off the drive housing. Save the rubber and steel washer (15–16).
7. Push down the stop ring towards the pinion.
8. Remove the lock ring with lock ring pliers.
9. Remove the stop ring and the pinion.
10. Check the spiral splines on the rotor shaft for burrs. If there are any, file them off.

IGNITION SYSTEM

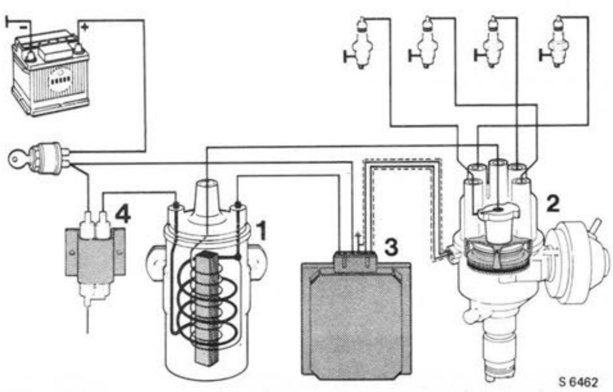
Two types of ignition system are used: a conventional version and a breakerless version.
A conventional ignition system with mechanical breaker contacts (points) in the distributor is installed in cars for the European markets (excluding Turbo cars).



S 6461

CONVENTIONAL IGNITION SYSTEM

The breakerless ignition system with an electromagnetic pulse generator in the distributor and an electronic control unit performing the task of conventional points is installed in cars for the USA market and in Turbo cars.

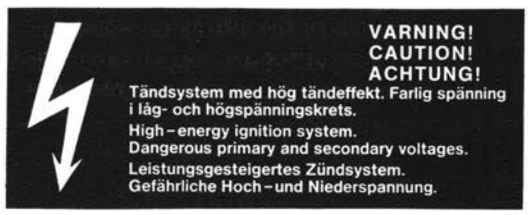


S 6462

BREAKERLESS IGNITION SYSTEM

BREAKERLESS IGNITION SYSTEM

This system differs from conventional ignition system as follows.
The breaker points in the distributor have been replaced by a transmission unit comprising an impulse transmitter, an induction coil and a rotor disc. The impulse transmitter is connected to an electronic control unit in which the signal from the distributor is converted and amplified.
The electronic control unit is connected to the ignition coil which is a high-voltage coil that has been specially adapted to the system.
The breaker function of the electronic control unit is therefore of the same character as that performed by the mechanical points in a conventional ignition system.
Thus, the advantage of the breakerless system is that, thanks to the pulse generator, there is not mechanical wear affecting the setting of the timing.



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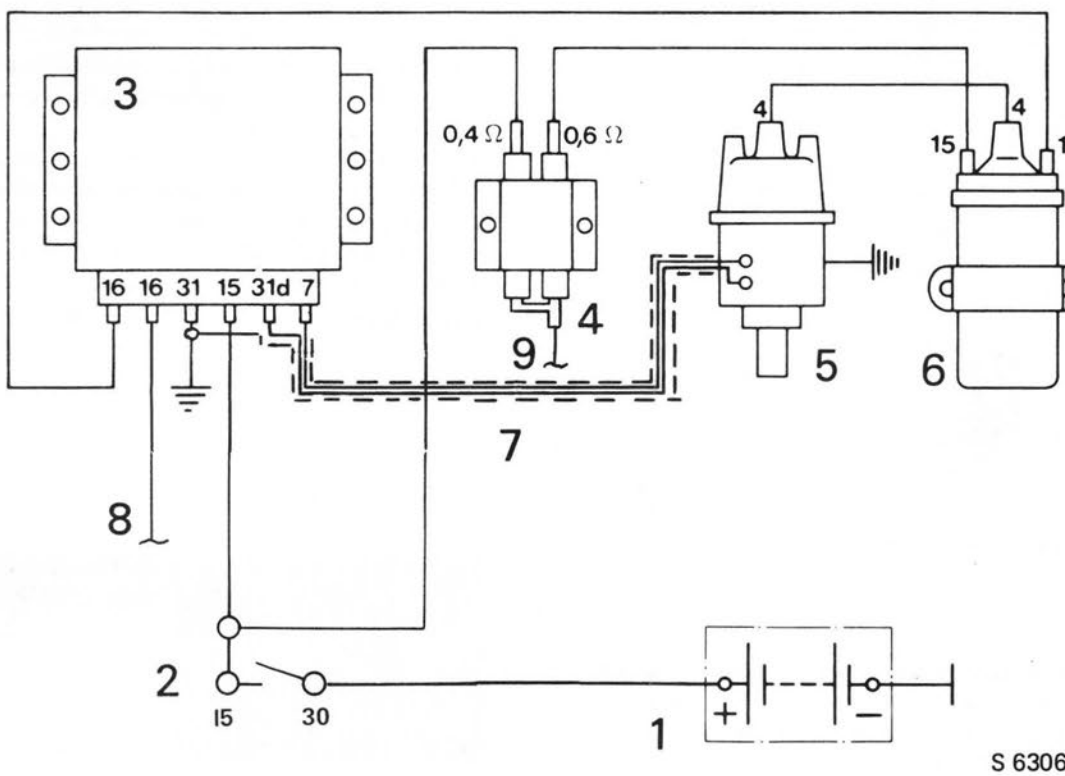
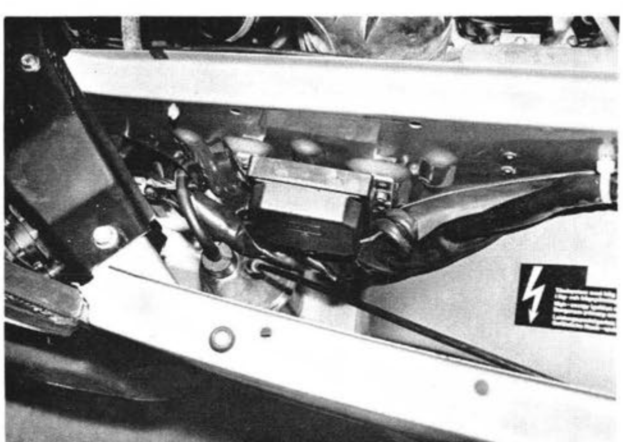
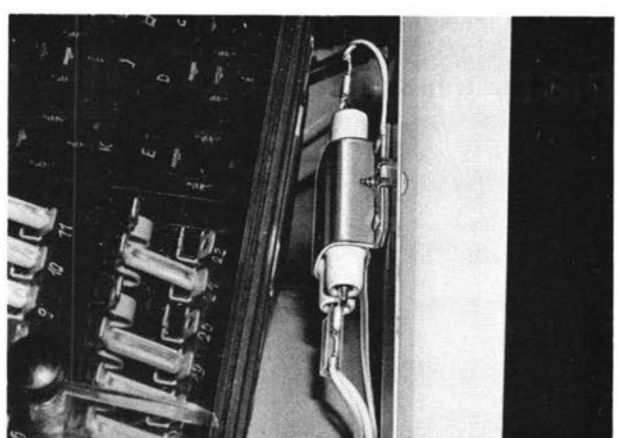


BREAKERLESS IGNITION SYSTEM

1. Battery
2. Ignition switch
3. Electronic control unit
4. Compensating resistor
5. Distributor
6. Ignition coil
7. Screened cable
8. To fuel pump relay, tachometer and TSI socket
9. To relay terminal 87a (connected at start)



ELECTRONIC CONTROL UNIT

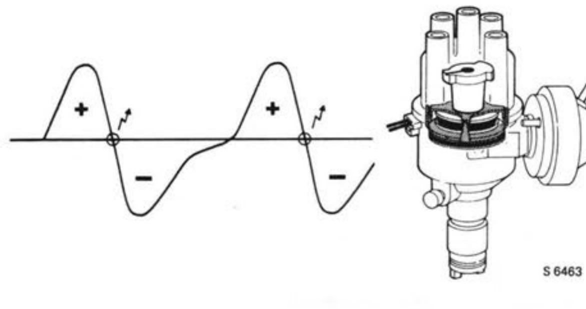


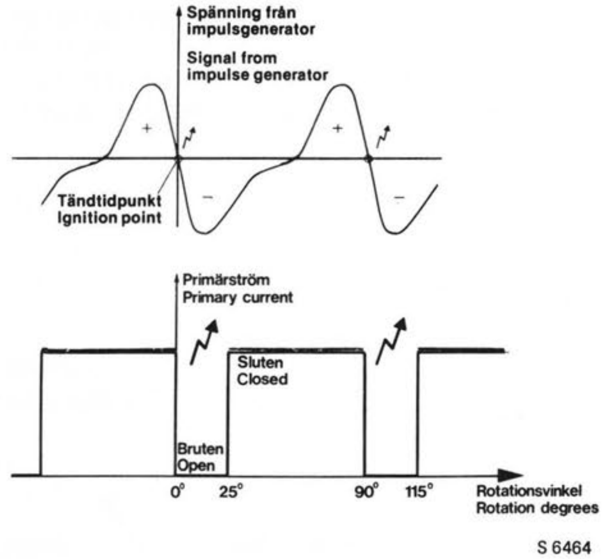
COMPENSATING RESISTOR

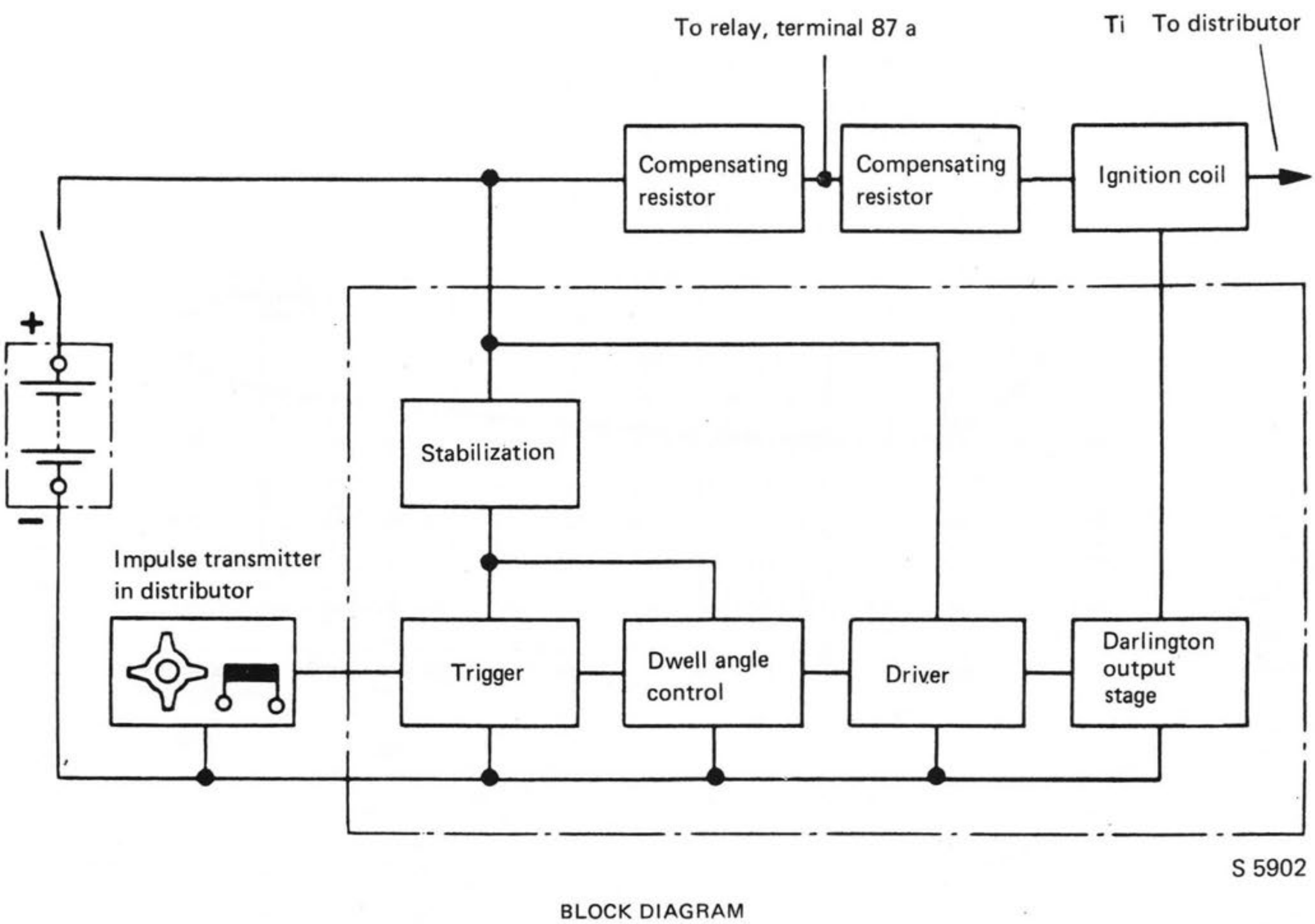
Operating principle

A sinusoidal control voltage is present in the induction coil, which alternates rapidly between positive and negative polarity. This alternation in polarity is utilized to transmit pulses. The pulse transmitted is governed by the engine speed and varies between 0.3 V and 100 V. The signal is then converted and amplified in the electronic control unit. When the sinusoidal voltage passes through zero, the ignition voltage is induced in the secondary circuit of the coil (when the rotor poles are in line with the stator poles).

This corresponds to the breaking of the points in a conventional ignition system.





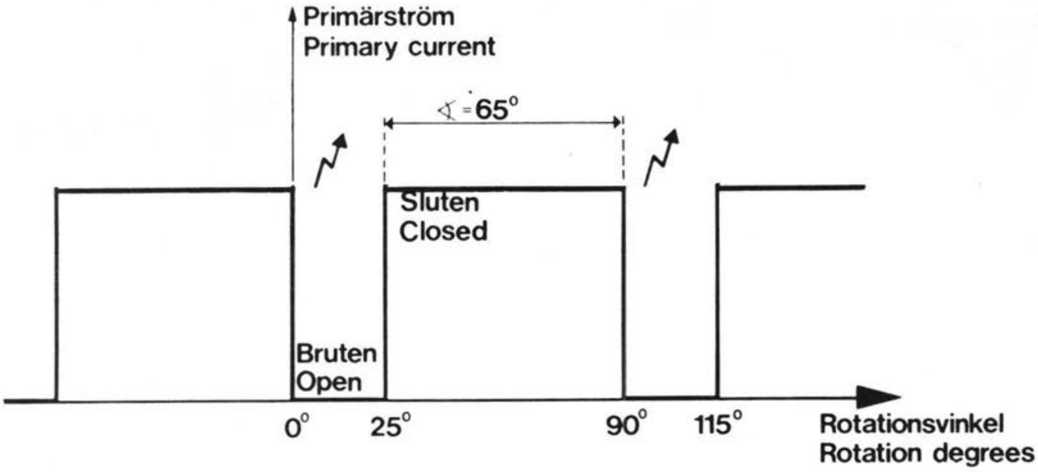


BLOCK DIAGRAM

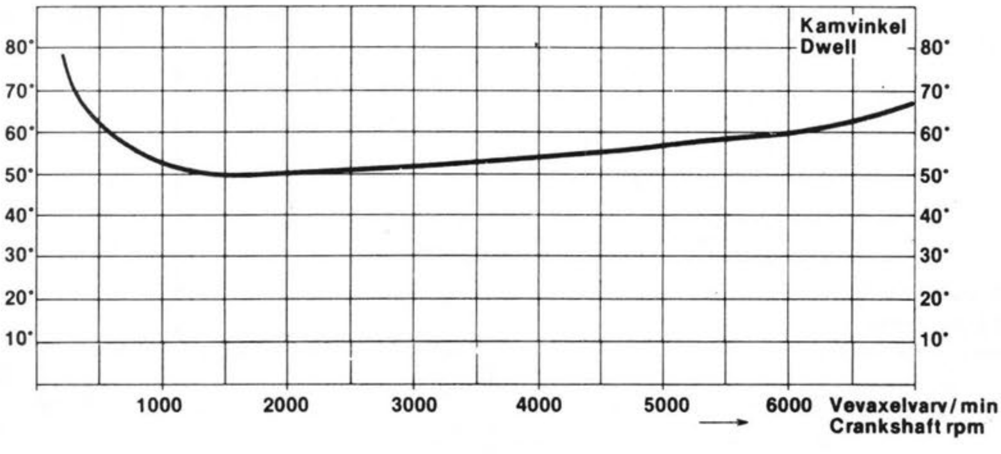
Block diagram to illustrate operating principle

In the input stage, which is designed in the form of a Schmitt trigger, the sinusoidal signal from the distributor is amplified and converted to a rectangular pulse. The regulation of the dwell angle adapts the time of the current flow through the output transistor and the ignition coil to the engine speed. In contrast to the constant dwell angle in a conventional ignition system, the electronic system increases the dwell angle with increasing engine speed, thereby providing a high ignition voltage even at high engine speed. At the driver, the signal is amplified once again and proceeds to the Darlington output stage. Current now flows through the primary circuit of the ignition coil.

At the moment of ignition, which occurs when the sinusoidal signal passes through zero, the ignition voltage is induced in the secondary circuit of the coil.



S 6660

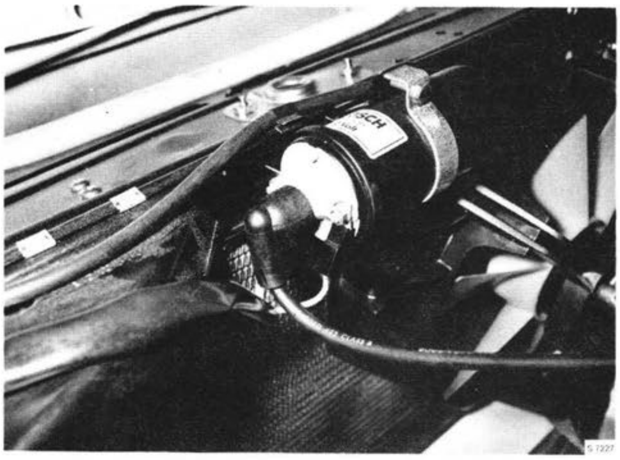


S 6661

IGNITION COIL

GENERAL

The ignition coil, manufactured by Bosch is mounted on the radiator fan housing.
The breakerless ignition system has a special ignition coil which should not be confused with conventional coils. This coil provides a voltage roughly 30 per cent higher than that provided by coils in conventional systems. The breakerless system also incorporates a compensating resistor designed to limit the primary current at low engine speeds. The compensating resistor is located between the electronic control unit and the side panel.



IGNITION COIL

REMOVING

1. Disconnect the wiring from the coil
2. Undo the clamping screws and withdraw the coil.

INSTALLING

1. Tighten the screw to clamp the coil in position.
2. Connect the wiring. See fig.

INSPECTING

1. Disconnect the wiring.
2. Connect test equipment and check the coil as follows:
   a. Measure the primary winding resistance between terminals 1 and 15. Test value, see Group 0.
   b. Measure coil performance in volts or spark lenght. Note: Check that the breaker gap and closing angle of the distributor are correct.

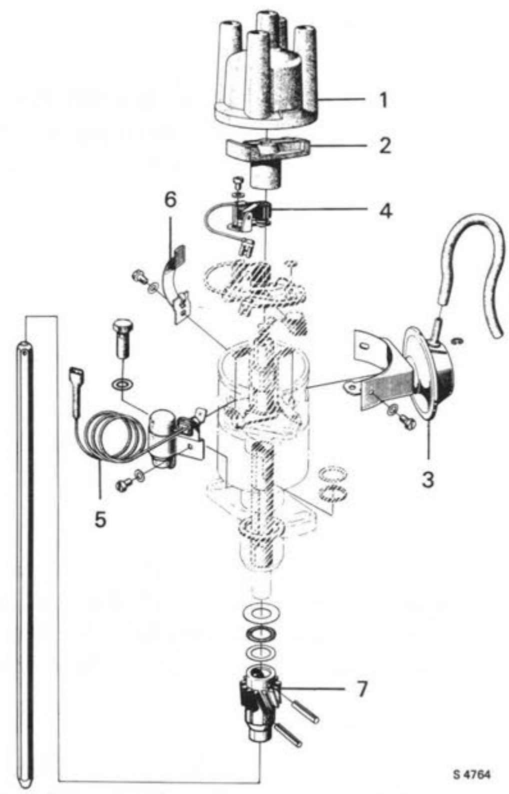
NOTE
Faults, if present, can often only be detected when the coil has warmed up. In case of doubt, leave the coil connected under load on the test bench for half an hour; it should still function perfectly at the end of this time.

DISTRIBUTOR

With mechanical breaker points

GENERAL

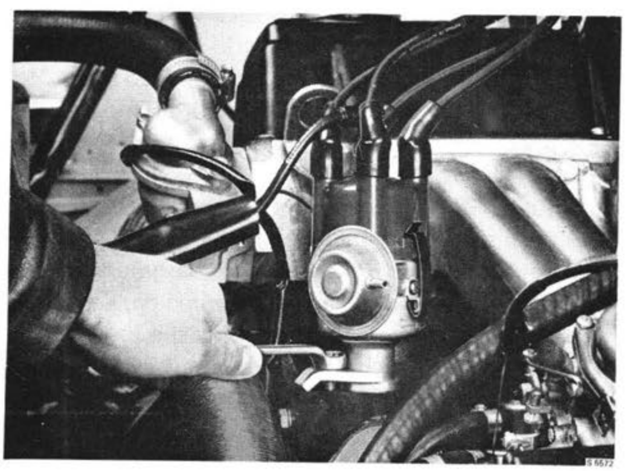
The distributor is made by Bosch and is mounted on the front of the engine block, i.e. at the clutch end of the engine. It rotates counter-clockwise and is driven by a worm gear from the idler shaft. The distributor is designed for centrifugal- and vacuum regulation; the centrifugal regulator controls the ignition setting relative to the engine speed, while the vacuum regulating system controls the ignition setting in relation to the load. The order of firing is 1–3–4–2 (cylinders numbered from rear to front).



DISTRIBUTOR
1. Distributor cap
2. Rotor
3. Vacuum control unit
4. Breaker points
5. Low-voltage wire
6. Spring clip
7. Drive gear

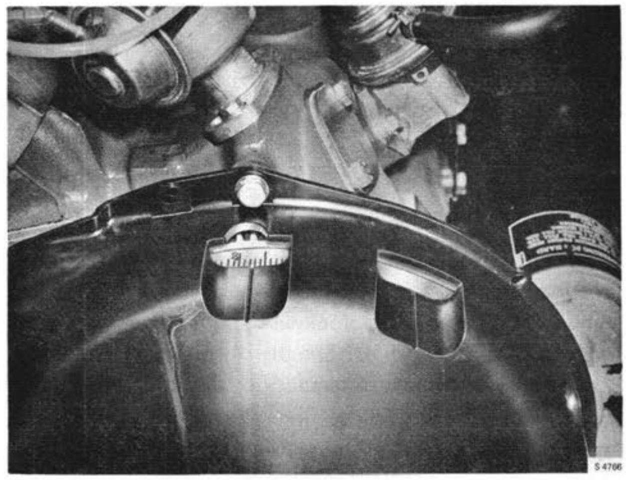
REMOVING

1. Disconnect the ignition cables.
2. Release the spring clips and take off the distributor cap.
3. Disconnect the low-voltage wire from the ignition coil.
4. Pull off the vacuum hose.
5. Crank the engine until the flywheel marking is at the ignition position on cylinder No. 1. (See Group 0, basic ignition advance.)
6. Remove the distributor mounting retaining screw (13 mm across flats).
7. Pull the distributor away from the engine.

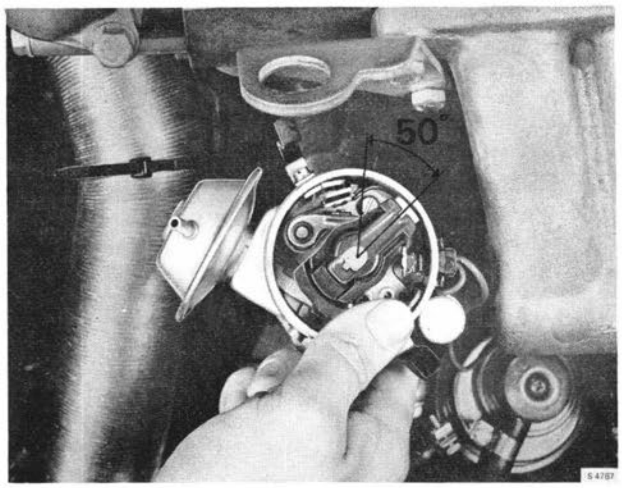


INSTALLING

1. Check the flywheel position, (see Group 0, basic ignition advance), which shall correspond with the ignition position on cylinder No. 1.

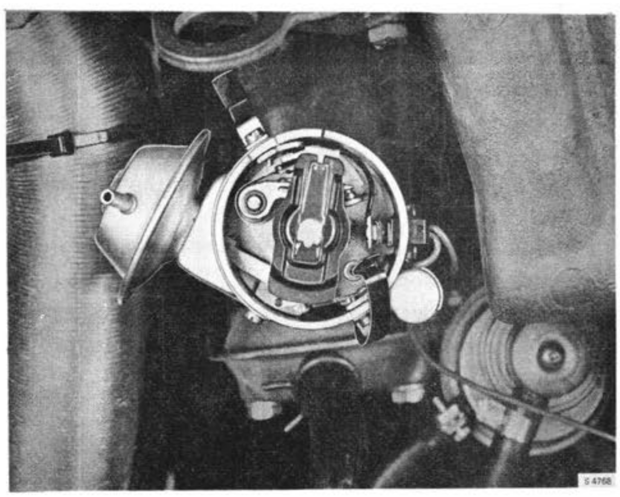


2. Rotate the distributor shaft so that the rotor (distributor arm) will point approx. 50° clockwise from the mark on the edge of the distributor housing which indicates the firing position for No. 1 cylinder.

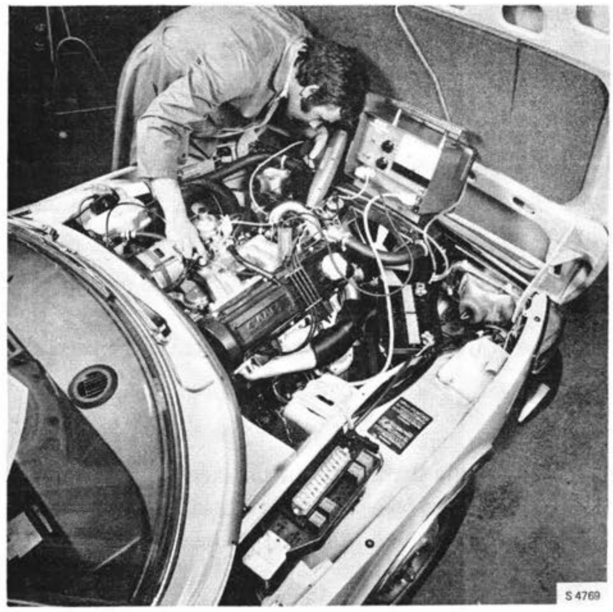


3. Fit the distributor with the mark on the edge of the distributor housing directed towards the cylinder head.
4. Engage the gears with each other and rotate the engine slightly forward and backwards until the distributor shaft engages the oil pump. On assembly, the rotor will be turned approx. 50° anti-clockwise owing to the pitch of the gear teeth.

5. Check that the basic setting mark for the flywheel coincides with the mark on the flywheel cover (firing position for No. 1 cylinder).
   Also check that the rotor can be pointed at the mark on the edge of the distributor housing, i.e. the breaker position of the breaker point for No. 1 cylinder.
6. Tighten the screw slightly (but not so hard that the distributor cannot be turned).
7. Connect the low-voltage wire to the ignition coil.
8. Connect the cam angle meter, switch on, and check and adjust the cam angle at starter speed.
9. Put on the distributor cap, secure it with the spring clips, and connect the ignition cables.



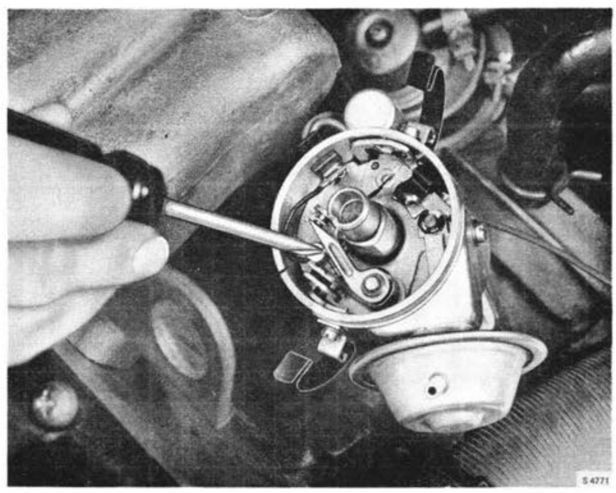
10. Connect a stroboscope or timing setting instrument and adjust the firing point.
11. Tighten the distributor retaining screw. Connect the vacuum hose.
12. Adjust the idling speed setting.

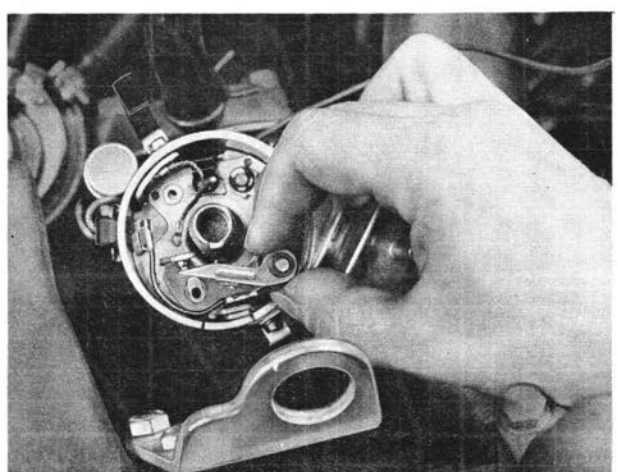


BREAKER CONTACT

Removal

1. Push aside the retaining springs and remove the distributor cap.
2. Withdraw the rotor arm.
3. Pull the breaker arm leads away from the contact plate.
4. Remove the fixed breaker contact retaining screw and remove the contact.

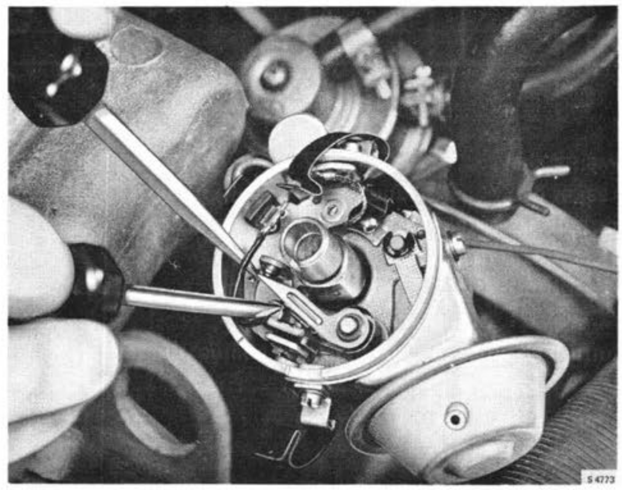




Assembly

CAUTION
The contact surfaces must not come into contact with oil or grease (risk of oxidation).

1. Insert the fixed breaker contact with attached breaker arm and insert the retaining screw but do not tighten it.
2. Connect the lead to the contact plate on the breaker arm.
3. Adjust the breaker gap.
   a. Breaker gap.
      Rotate the shaft until the breaker arm is lifted free of the fixed breaker contact. Insert a screwdriver between the two studs and in the groove in the fixed breaker contact and adjust the gap by turning the screwdriver. Tighten the retaining screw and check the gap once again.
   b. Dwell angle.
      Connect a cam angle meter, switch on the ignition and turn the engine over on the starter. Compare the indicated reading with the specification (see Group 0) and correct if necessary by adjusting the fixed breaker contact. Tighten the retaining screw and check the setting once again.

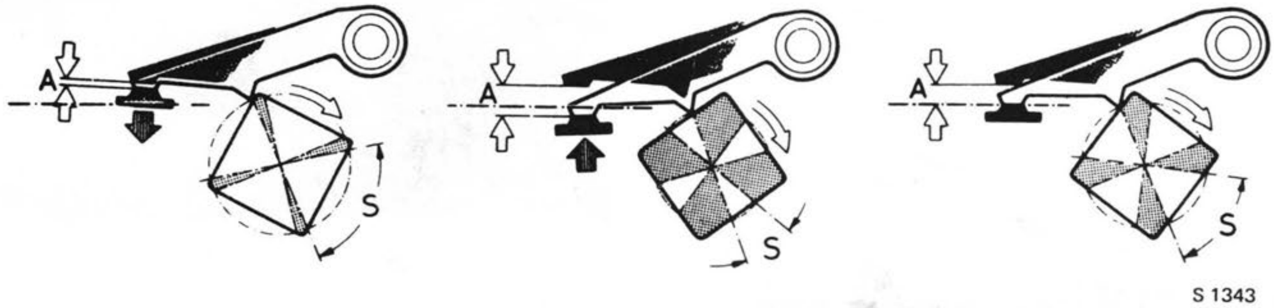


CAUTION
The lower setting should be used for new contacts as the angle increases with wear.

The relationship between the contact gap "A" and the closing angle "S" is shown by the three diagrams on this page. The shaded contact shows the contact gap at the highest position of the cam.

4. Fit the rotor arm.
5. Put on the distributor cap and secure it with the two spring clips.
6. Connect a stroboscope lamp and check the ignition point at starter speed or with the engine idling at not more than 800 rev/min. The vacuum hose must be disconnected during this operation. Adjust as necessary.

"A" = contact gap
"S" = closing angle



"A" = too small
"S" = too large

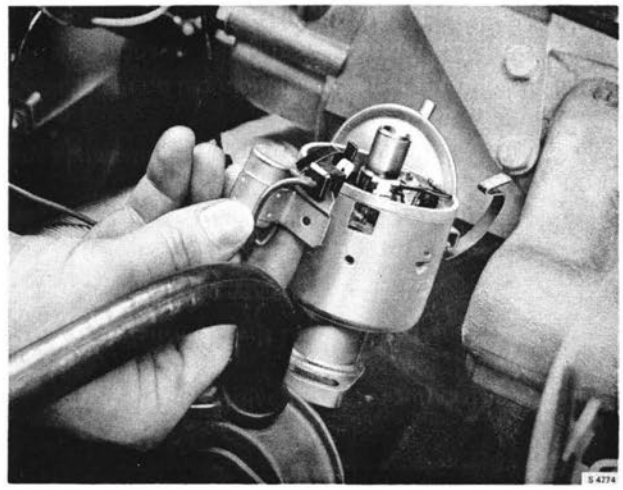
"A" = too large
"S" = too small

"A" = correct
"S" = correct

CAPACITOR

Removal

1. Push aside the retaining springs and remove the distributor cap.
2. Remove the two distributor retaining screws using tool 83 91 989 and rotate the distributor until the capacitor retaining screw becomes accessible.
3. Pull the breaker arm leads away from the contact plate, undo the retaining screw and remove the capacitor complete with contact plate and low tension lead.



Assembly

1. Screw on the capacitor complete with contact plate and low-tension lead.
2. Connect the lead from the capacitor from the contact plate on the breaker arm.
3. Rotate the distributor to its correct position and secure it by means of the retaining screws.
4. Fit the distributor cap.
5. Connect a stroboscope lamp; adjust the ignition point at a maximum idling speed of 800 rev/min, and with the vacuum hose disconnected.

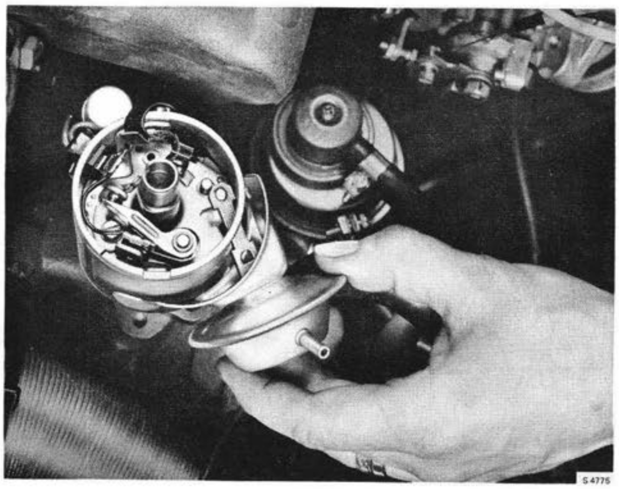
VACUUM REGULATOR

Removal and installation

1. Remove the distributor cap and disconnect the vacuum hose to the vacuum regulator.
2. Remove the two vacuum regulator retaining screws. One of the screws also retains the distributor retaining springs.

3. Remove the lock ring from the bearing pin of the regulating arm and remove the vacuum regulator.

Installation is carried out in the reverse order.



CHECKING AND SETTING THE IGNITION POING

1. Connect a cam angle meter and revolution counter.
2. Connect a stroboscope lamp.
3. Disconnect the vacuum hose at the carburetor (throttle housing).

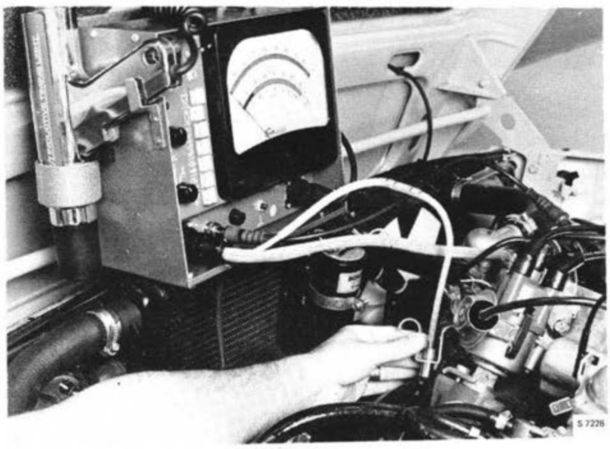
> If a delay valve is fitted in the vacuum line, the hose must not be disconnected at the distributor while the engine is running, as there is danger of dirt being drawn into the valve, which may become clogged, resulting in the engine running roughly and increase in fuel consumption.

4. Switch on the ignition and check the cam angle at starter speed and idling speed. Adjust as necessary.
5. Check the ignition point setting.
6. If necessary, adjust the ignition timing by rotating the distributor housing (clockwise for earlier ignition, counter-clockwise for later ignition).

   See section 023 for correct settings. Reconnect the vacuum hose. Adjust the engine idling speed.

CHECKING THE IGNITION TIMING USING AN INDICATOR

The engine is equipped for checking of the timing by means of an indicator.
The equipment in the car comprises a pin in the engine flywheel and a service socket in the clutch cover. (Flywheel markings have been retained for measuring by means of a conventional stroboscope lamp.)
The indicator is connected to the clutch cover by means of a special connector and to the plug lead for No. 1 cylinder by means of a terminal.



MEASURING THE TIMING BY MEANS OF AN INDICATOR

IGNITION SERVICE INSTRUMENT

The ignition service instrument (TSI) is connected to the ignition service socket at the fuse box and by means of an impulse transmitter at the plug lead for No. 1 cylinder. The instrument consists of a tachometer, cam angle meter, ohmmeter for the breaker contacts, stroboscope lamp and switch for operating the starter, and, in later versions, an ignition setting meter with graduated scale.

IGNITION SERVICE INSTRUMENT

CAUTION

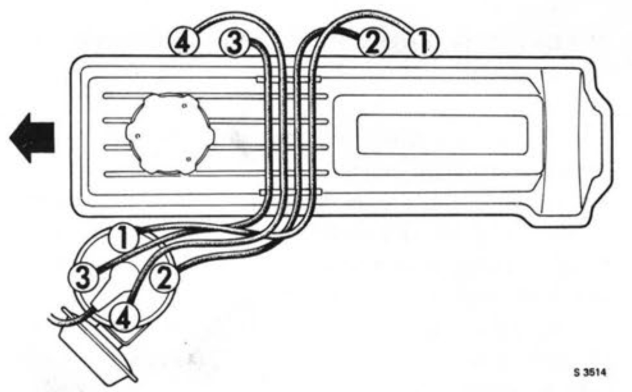
Check that the gear lever is in neutral before switching on the starter.

Since the ignition switch on the car is by-passed when the engine is run by means of the ignition service instrument, the fan is not actuated. If the engine is run for longer periods (more than around 10 mins.) the ignition system should therefore be switched on by means of the ignition key. If the engine gets too hot, incorrect values will be obtained for the carbon monoxide content in the exhaust.
Note! The ignition switched on, all other electrical equipment in the ignition switch circuit, as well as the fan, will be on.

DISTRIBUTOR CAP

Removing

1. Remove all ignition cables with rubber cups from the distributor cap.
2. Push the spring clips aside and take off the distributor cap.



S 3514

Installing

1. Put on the distributor cap and secure it with the spring clips.
2. Attach the ignition cables in the correct order of firing.

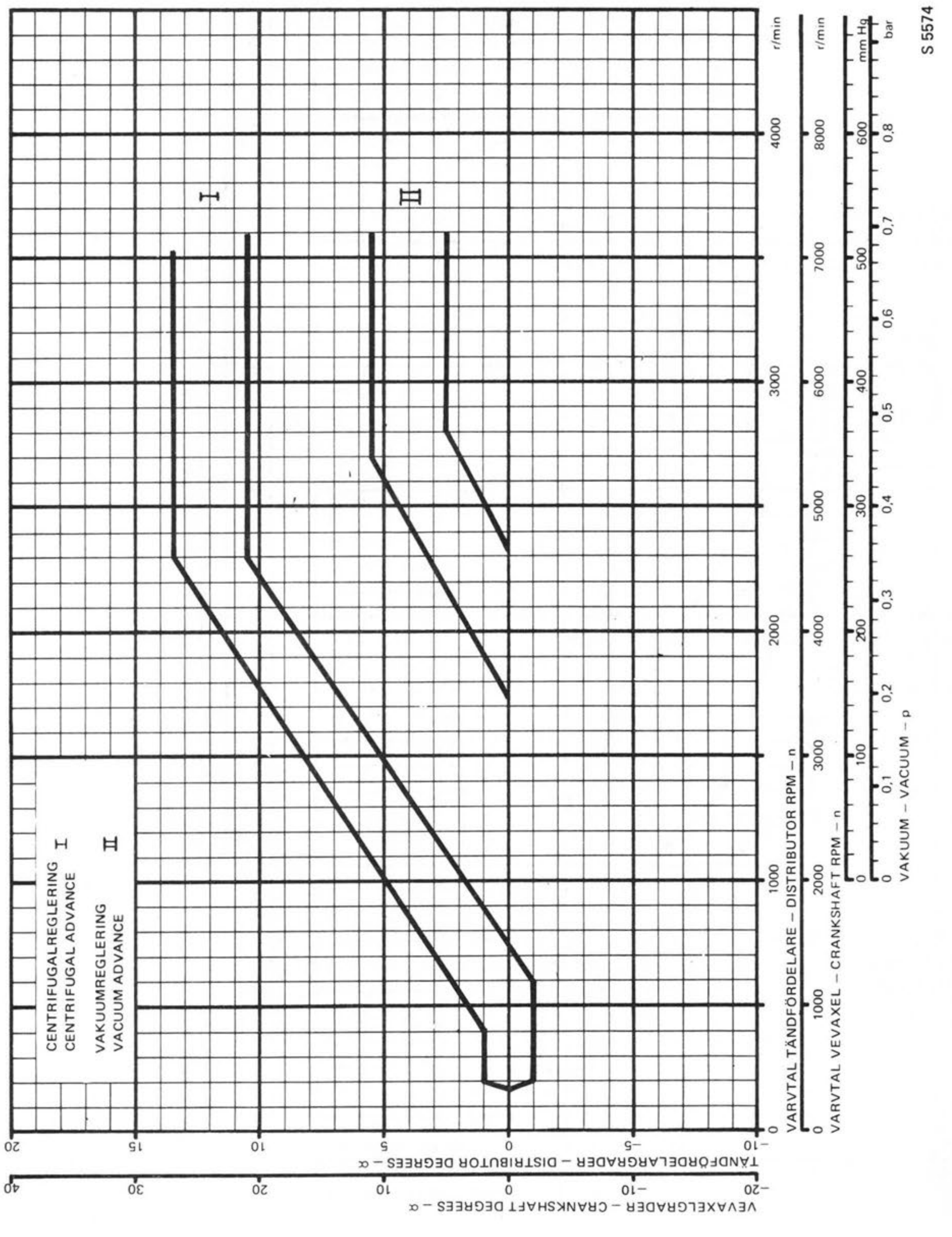
CHECKING OUT THE DISTRIBUTOR ON A TEST BENCH

Test according to the directions supplied with the test equipment. See ignition advance graph for correct settings.

> NOTE
> 1. The distributor rotates at half the speed of the engine.
> 2. The camshaft angle is half the crankshaft angle.

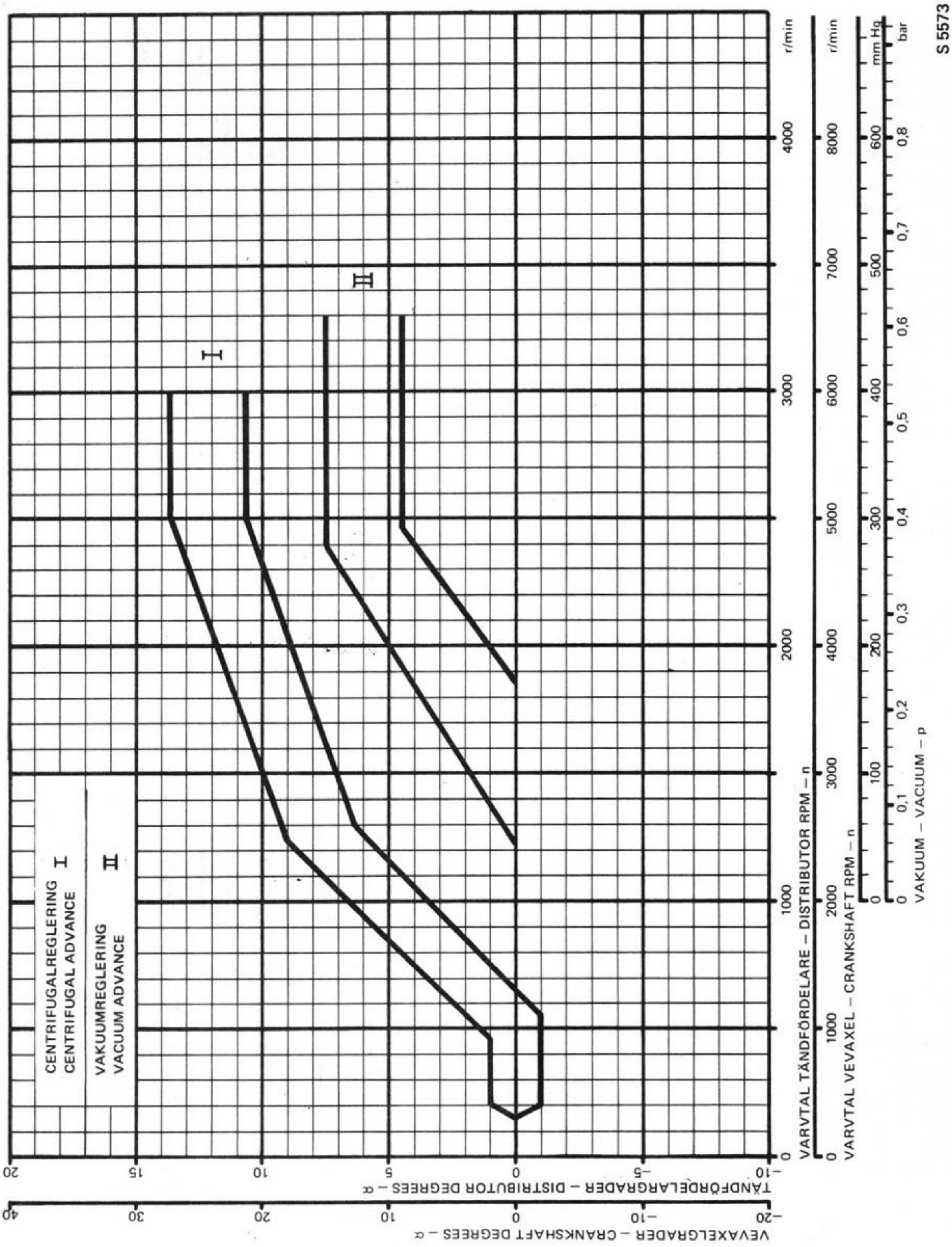
The contact pressure must be checked with a spring balance secured opposite the breaker arm contact.
Pressure too low – the contact bounce.
Pressure too high – undue wear on cam fender and cams.

If the distributor is tested when mounted on the engine, the main point to remember is that the advance angle and speed readings will be double those obtained on a distributor test bench. There may also be some deviation in the readings due to engine vibration.



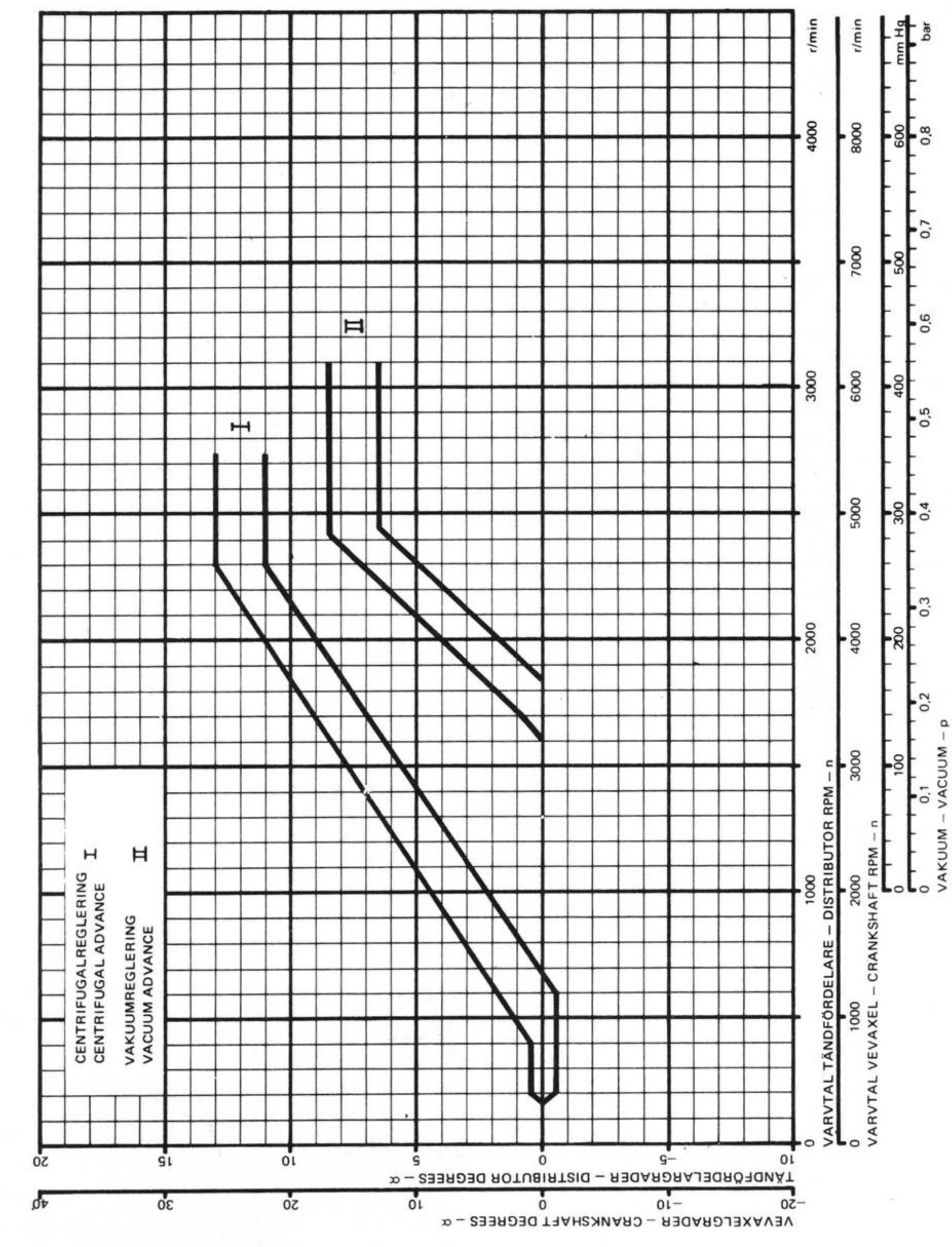
Ignition advance graphs, injection engine, model 1975

Distributor	Bosch 0 231 170 122
Checking on distributor test bench:	
Contact pressure	4.9–6.2 N (18–23 oz, 500–630 p)
Breaker gap	min. 0.016" (0.40 mm)
Dwell angle	$50^{\circ} \pm 3^{\circ}$



Ignition advance graphs, carbureted engine, up to and including model 1976, and injection engines model 1976

Distributor	Bosch 0 231 170 115, Bosch 0 231 170 145
Checking on distributor test bench:	
Contact pressure	4.9–6.2 N (18–23 oz, 500–630 p)
Breaker gap	min. 0.016" (0.40 mm)
Dwell angle	50 ± 3°



S 5575

IGNITION ADVANCE GRAPHS, CARBURETED ENGINE
AND INJECTION ENGINE AS FROM MODEL 1977

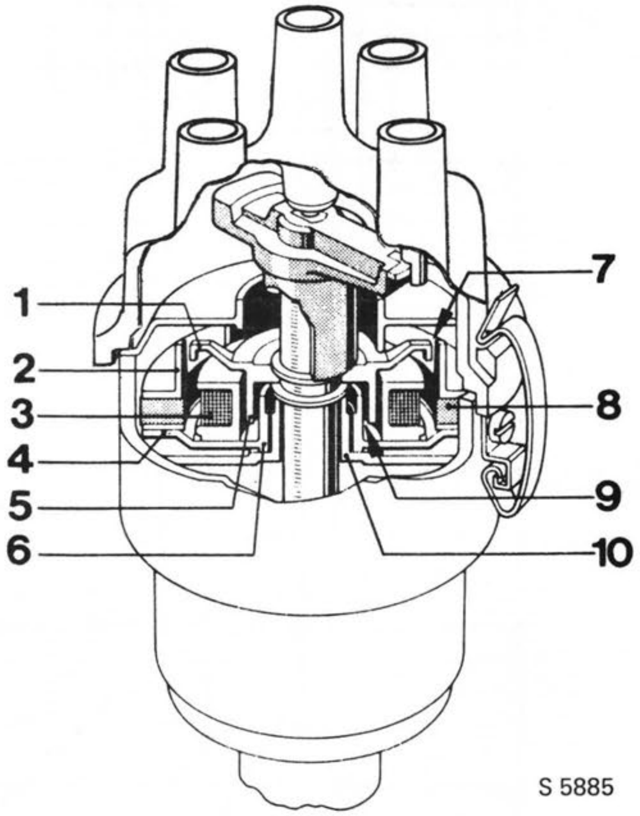
Distributor	Bosch 0 231 170 197, Bosch B 231 041 079
Contact pressure	4.9–6.2 N (500–630 p)
Breaker gap	min. 0.016″ (0.40 mm)
Dwell angle	$50^{o} \pm 3^{o}$

DISTRIBUTOR

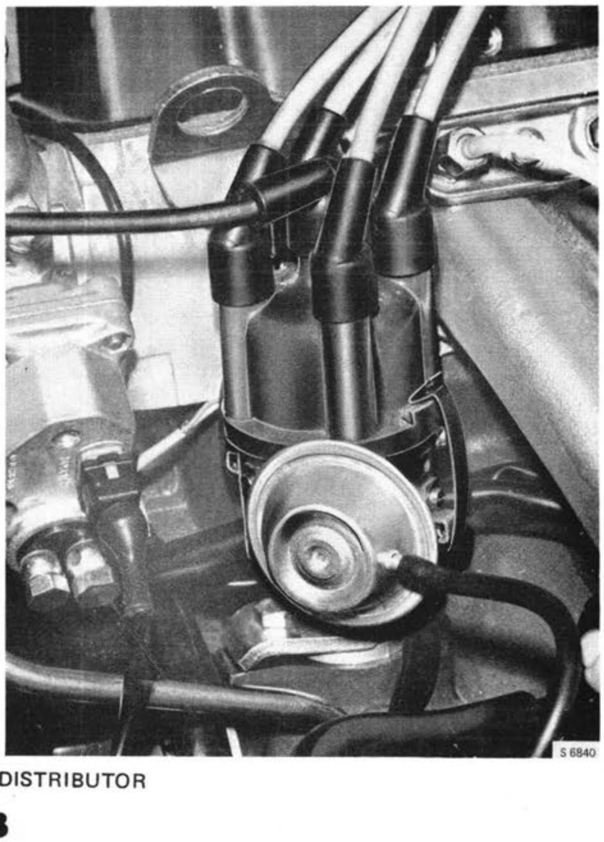
Breakerless ignition system

GENERAL

The size and shape of the distributor are the same as those of a conventional one. The distributor also has centrifugal and vacuum control of the ignition timing.
The vacuum control unit on turbo engines is double acting. When the engine works with under-pressure in the inlet manifold, the result is earlier ignition. At overloading (over-pressure in the inlet manifold), the result is later ignition. This prevents pinging.
The electrical transmission unit is similar to a generator. The rotor reverses the direction of the magnetic field built up by the permanent magnet. The change in the magnetic field is governed by the clearance between the rotor and the stator. Since the rotor has the same number of poles as the stator, a mean value of the gap between the poles on the rotor and those on the stator is achieved, which guarantees correct timing even if there is a certain amount of play in the moving parts of the distributor. Thus, the ignition timing is not affected by mechanical wear since the circuit is broken electronically.



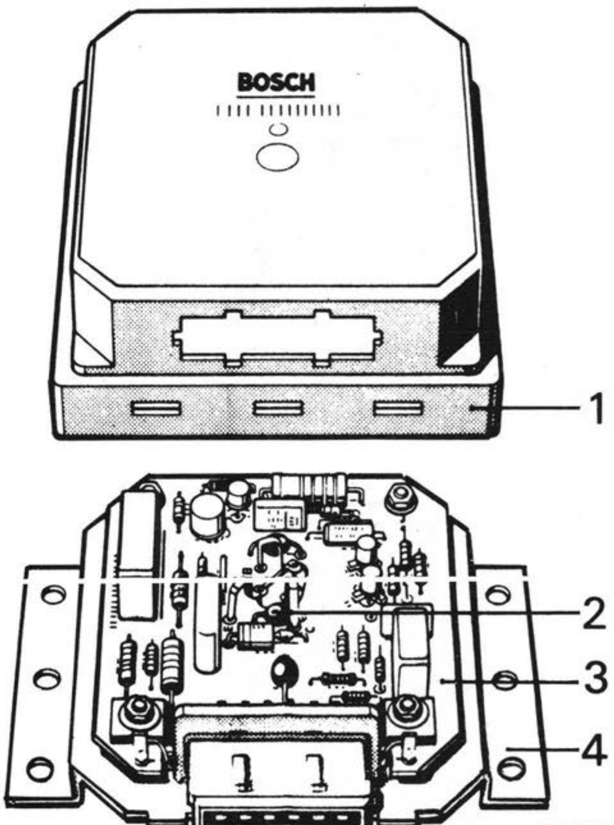
DISTRIBUTOR
1. Rotor
2. Stator
3. Induction coil
4. Stator plate
5. Rotor sleeve
6. Stator sleeve
7. Outer gap
8. Magnet
9. Inner gap
10. Retaining plate and sleeve



DISTRIBUTOR

ELECTRONIC CONTROL UNIT

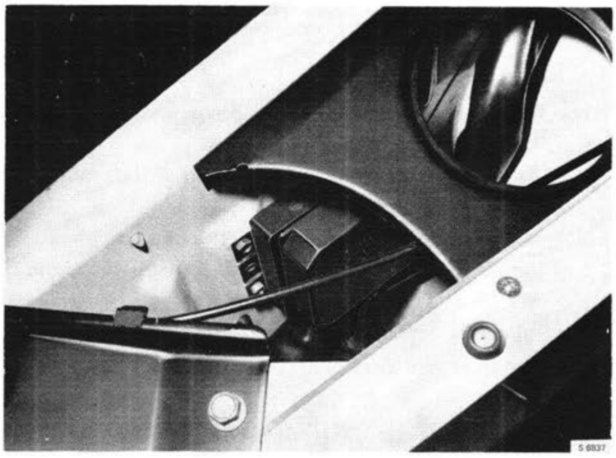
The control unit is the electronic part of the ignition system in which the pulse from the distributor is converted and amplified. Control and regulation of the dwell angle are automatic.
The control unit comprises a circuit board on which an integrated circuit, transistors, condensors, diodes and resistors are mounted.
The electronic control unit is mounted in front of the left hand wheel housing.



S 5886

ELECTRONIC CONTROL UNIT

1. Plastic cover
2. Power transistor
3. Printed circuit board
4. Base plate

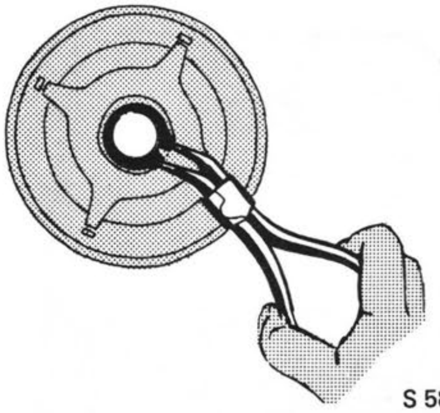


ELECTRONIC CONTROL UNIT

CHAINGING THE INDUCTION COIL

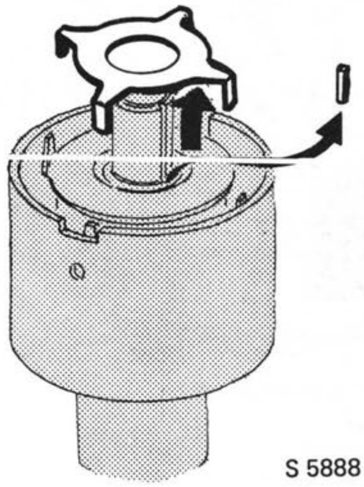
1. Remove the distributor.
2. Remove the distributor cap, rotor arm and condensate trap.
3. Remove the cable contact retainer and withdraw the contact.
4. Remove the vacuum control unit, the clip retainers and the three screws in the impulse transmitter plate.

5. Remove the rotor circlip.



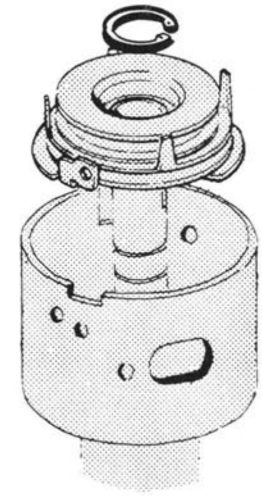
S 5887

6. Lift the rotor and save the pin and the shim.



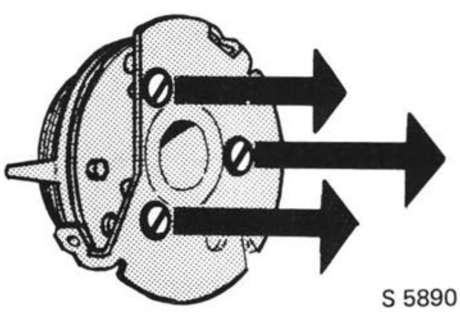
S 5888

7. Remove the circlip on the impulse transmitter and lift the latter.



S 5889

8. Remove the three screws securing the induction coil to the plate.

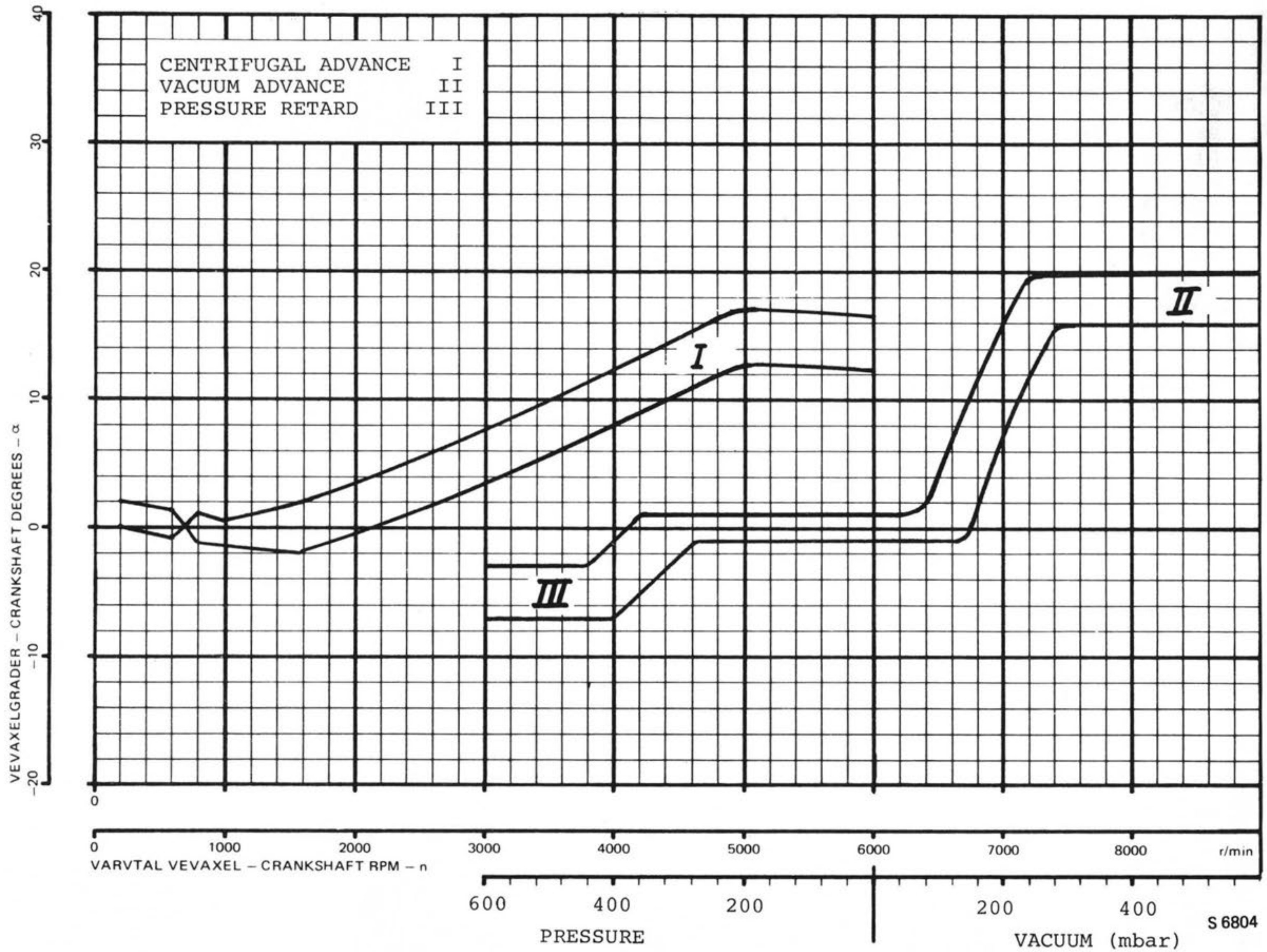


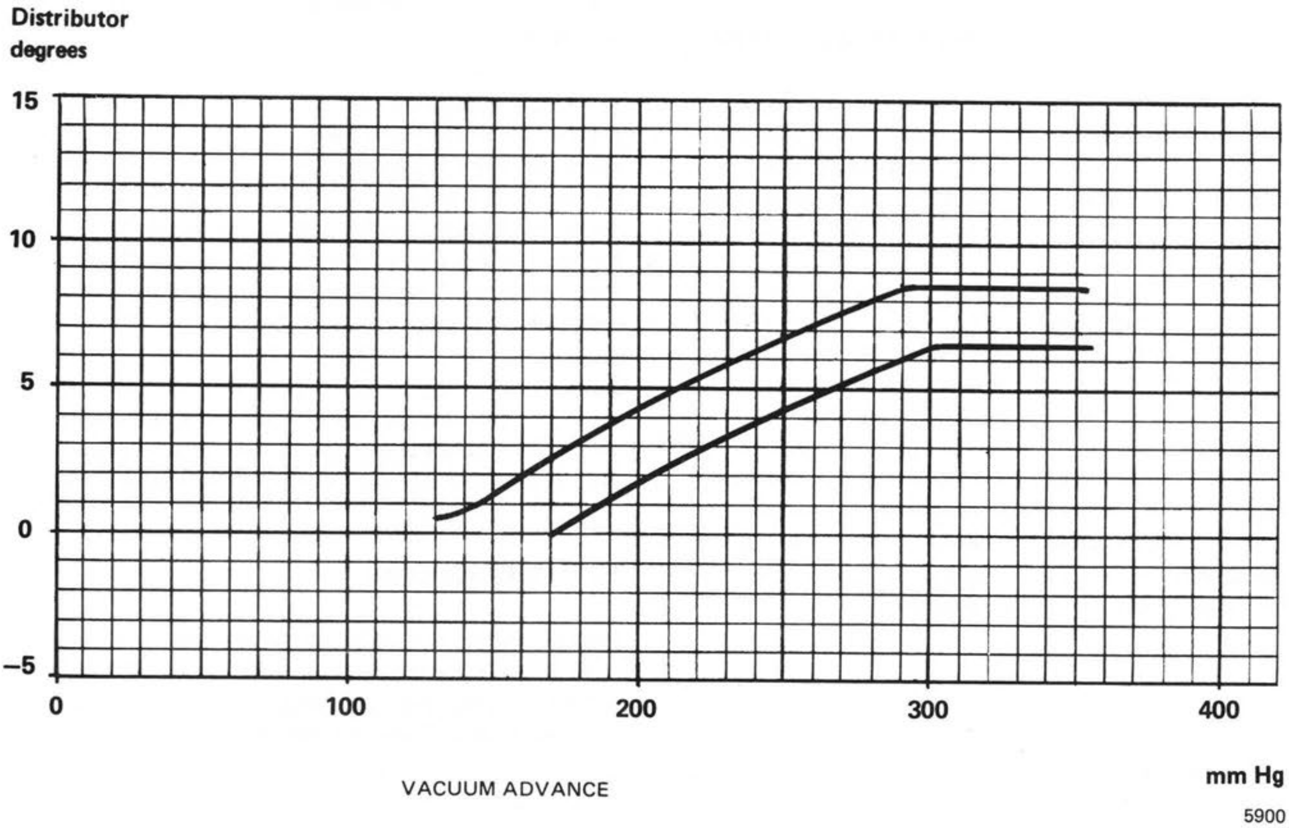
S 5890

Reassemble in the reverse order.

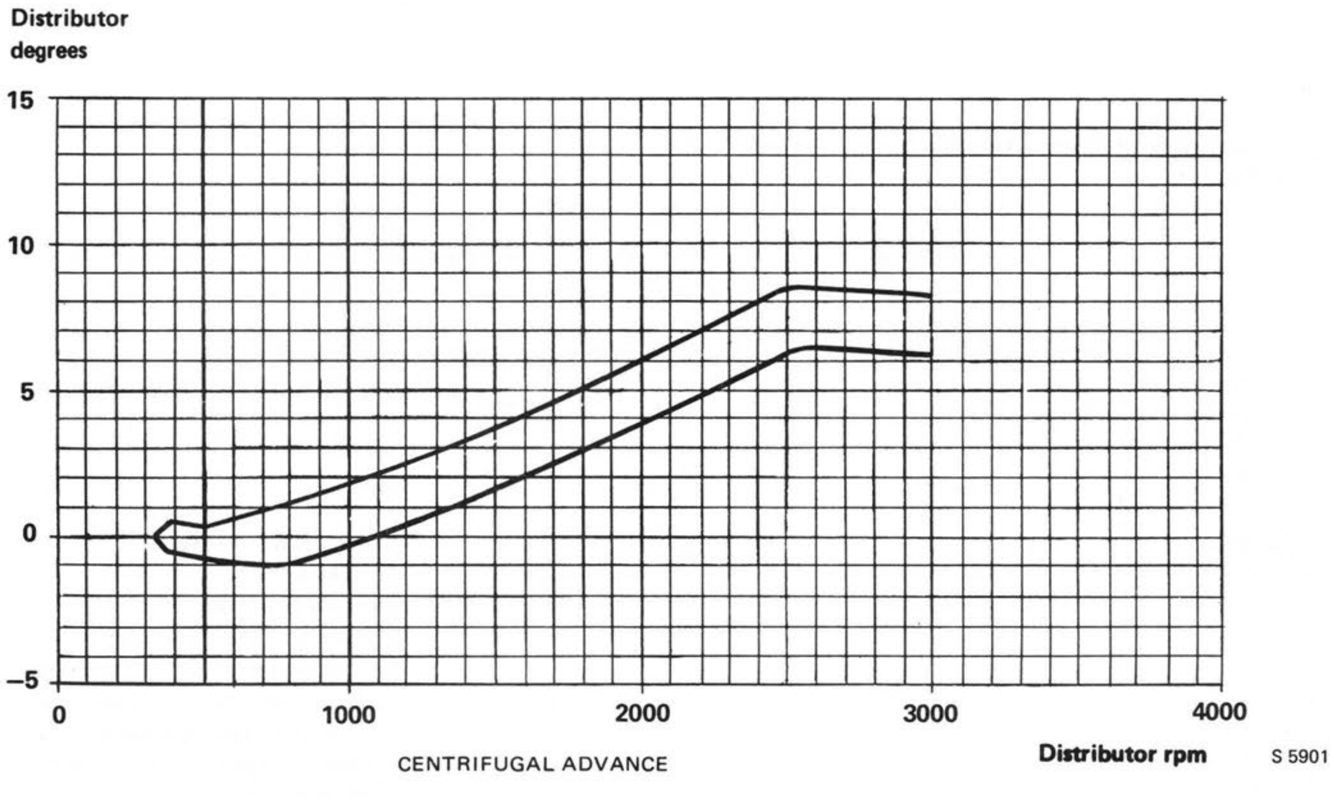
IGNITION ADVANCE GRAPHS, TURBO ENGINE AS FROM MODEL 1979

Distributor	Bosch 0237 011 002
Contact pressure	4,9–6.2 N (18–23 oz, 500–630 p)
Breaker gap	0.016" (0.40 mm)
Dwell angle	$50^{\circ} \pm 3^{\circ}$





VACUUM ADVANCE



CENTRIFUGAL ADVANCE

SOME CONSIDERATIONS OF VITAL IMPORTANCE TO WORK ON THE ELECTRONIC IGNITION SYSTEM

1. When the engine is running, dangerously high voltage which may prove fatal may be present in the primary circuit of the coil and in all cables connected to terminal 1. This is because the spark energy in the system is considerably higher than in conventional ignition systems.
2. When the ignition is switched on, full primary current will flow through the primary circuit of the coil. Consequently, always disconnect terminal 15 on the ignition coil before commencing work with the ignition on.
3. In conjunction with work on the screened impulse cable between the impulse transmitter in the distributor and the control unit, strict attention must be given to polarity. Should the polarity be reversed, a stable basic ignition setting will not be possible and timing and dwell will also be affected.

FAULT-TRACING IN THE ELECTRONIC IGNITION SYSTEM

The recommended steps must be performed one at a time and in the stated order. If on inspection components are found to be defective, these must be renewed before any further fault-tracing is carried out. If a fault is known to occur, for example, under certain temperature conditions, always attempt as far as possible to trace faults under similar conditions. Thus, if trouble with starting the car is experienced during cold weather, fault-tracing should be carried out on a thoroughly cold car. Such procedure is necessary because defective electronic components may operate perfectly under normal temperature conditions before breaking down completely. Bad connections can also be affected by temperature.

Fault-tracing equipment

Ignition setting instrument (preferably with a 90° dwell angle scale); volt-ohmmeter with scales for 15 V d.c. and 5 V a.c., minimum sensitivity of 10 000 ohm/V, 0–5 ohm midscale, 0–5 kohm midscale.

1. Engine completely dead, fires without starting or is difficult to start

CHECK	READING	CONDITION OF THE SYSTEM; PROBABLE FAULT	CHECK AND REMEDY AS NECESSARY
1. Turn the engine over on the starter and check the length of the spark between the high tension lead from the coil and ground	More than 12 mm	Starter circuit and starter relay probably working	Check 0.4 compensating resistor by means of ohmmeter. Check the ignition setting. Check for flashover in coil isolator, distributor cap, rotor, ignition leads and plugs. Check the fuel system.
	Less than 12 mm or no spark		Check that current flows from the starter relay circuit to the connection on the compensating resistor. When the starter is running, the voltage between the common connection and the + on the battery should be 0. If not, check relay and wiring. Proceed to step 2.
2. Switch on the ignition. Before proceeding, check that the battery charge is at least 11 V.	Less than 11 V		Charge the battery; readings taken with insufficient battery voltage will give faulty values.
	More than 11 V		Proceed to step 3.

CHECK	READING	CONDITION OF THE SYSTEM; PROBABLE FAULT	CHECK AND REMEDY AS NECESSARY
3. Measure the voltage between terminal 15 on the coil and ground	0 V	Break in compensating resistor or leakage from terminal 15 on ignition switch	Check compensating resistor by means of ohmmeter. Check that voltage from the ignition switch is present at the single terminal on the 0.4 ohm resistor. If not, check ignition switch and wiring.
	Less than 6 V	Short-circuit in primary winding of coil	Check resistance of primary winding (0.95–1.4 ohm)
	6–8 V	Primary coil winding and compensating resistor sound	Proceed to step 4.
	8–12 V	Bad ground connection	Check using ohmmeter that contact pin 31 on the control unit connector has good ground connection.
	12 V	Break in primary coil winding	Check using ohmmeter (0.95–1.4 ohm)
		Control unit not conducting	Check for battery voltage at contact pin 15, using voltmeter
4. Measure the voltage between terminal 1 on coil and ground	0 V	Short-circuit in control unit	Exchange control unit
	0.5–2 V	Power transistor in control unit sound	Proceed to step 5.
	12 V	Control unit not conducting	Change control unit. Check for faulty insulation on cables to terminal 16 on the control unit.

CHECK	READING	CONDITION OF THE SYSTEM; PROBABLE FAULT	CHECK AND REMEDY AS NECESSARY
5. Measure resistance in the secondary coil winding	Should be 5,5–8 k ohm		
	Appreciable deviation	Defective secondary winding in coil	Change the coil Proceed to step 6
6. Connect a dwell meter			
Check dwell angle	60–80° (65–90 %)	Control unit and impulse transmitter probably without fault	
	Maximum reading on scale	Dwell meter range insufficient (many dwell meters have maximum reading of 70°) and consequently no information is obtained	Connect a voltmeter across pins 7 and 31d of control unit cable connector. At starting speed (100 rev/min), a minimum reading of 1 V a.c. should be obtained. This indicates that impulses of sufficient strength are being generated. If there is no voltage or the voltage is too low, check the screened impulse cable. Thereafter, check the impulse transmitter in the distributor using an ohmmeter (895–1285 ohm). Check the air gap between the rotor and the stator and, if necessary, adjust to 0.25 mm using a non-magnetic feeler gauge. If the fault persists, change the impulse transmitter.
		The control unit does not react to impulses from the impulse transmitter	Change the control unit

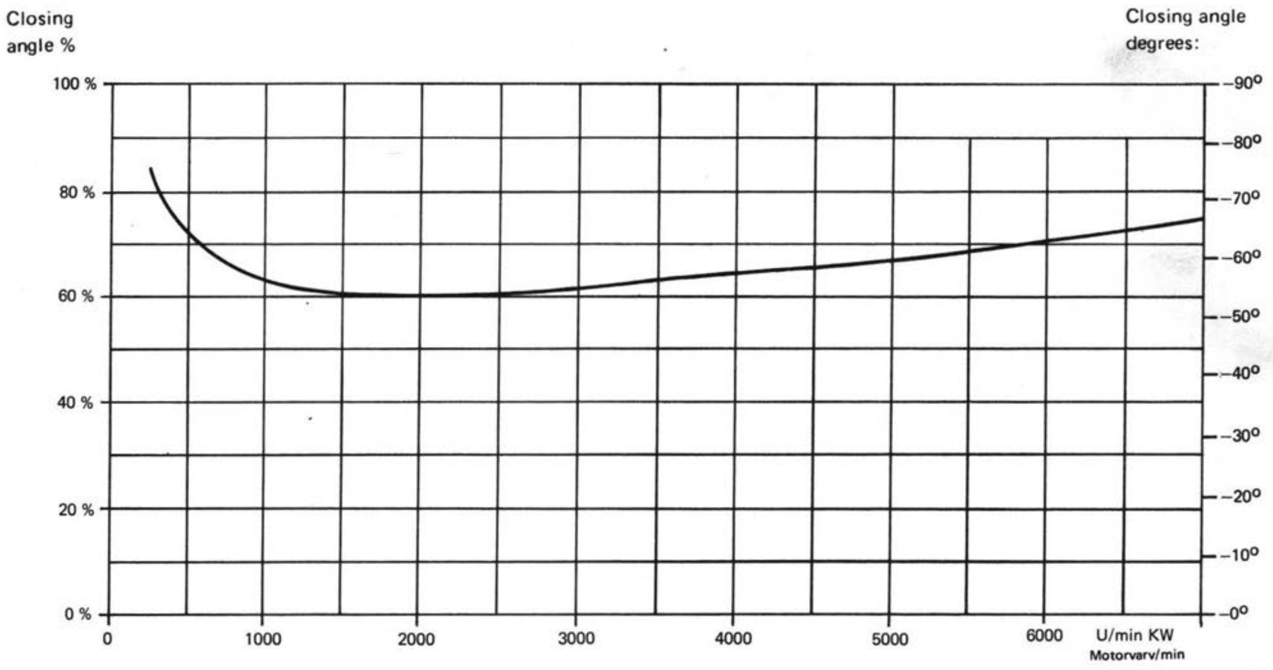
2. Poor running

Poor running of the engine is unlikely to be caused by faulty electronics.
Check the following items first:

1. Good connections throughout ignition system.
2. Ignition setting and centrifugal and vacuum advance.
3. General condition of spark plugs.
4. Rotor: check operation, insulation (burns, dirt) and contacts.
5. Distributor cap: insulation (cracks, flashover burns, dirt) and contacts.
6. Ignition leads.
7. Ignisiton coil: spark length at starting revs 12 mm minimum; insulation (burns, dirt).

8. Connect a dwell meter and check that the dwell angle varies with the speed as shown on the chart. At less than 2,000 rev/min, the dwell angle is largely regulated by the control unit. At speeds greater than 2,000 rev/min, the dwell angle is largely regulated by the shape of the impulses from the impulse transmitter. Thus wide deviations in the dwell angle can be traced either to the control unit or the impulse transmitter. Deviation of ± 10° is to be regarded as normal.
9. The fuel system.

In the case of faults occurring under extremes of temperature, the control unit may be suspected. Poor soldering and defective components probably become most evident at extremes of temperature. The conventional ignition condensor is incorporated in the control unit and may be faulty just as frequently as in conventional ignition systems – in other words, very rarely.



S 6309

SPARK PLUGS

REMOVING

1. Pull off the ignition cable.
2. Clean the cylinder head round the plug by blowing.
3. Unscrew the spark plug.

INSTALLING

1. Screw in the plug by hand.
2. Tighten with a spark plug wrench to 25–29 Nm (18–21 ft.lb., 2.5–3.0 kpm) torque.
3. Attach the ignition cable.

INSPECTING

(Removed from cylinder head)

1. Clean the spark plug by sandblasting.
2. Check the electrode gap and adjust if necessary by bending the side electrode.
3. Test the plugs under pressure in a test apparatus.

INTERFERENCE SUPPRESSORS

Installation kits for Blaupunkt and Philips car radios are available. These kits include all components for fitting the radio set as well as the necessary interference suppressing components.
The engines are delivered with suppressed ignition cables. Concerning resistance values, see Group 0.
As from model 1975, no alterations should be made in the ignition system. Completion may be made.

IGNITION INTERENCE

Allowed completions:
Capacitor, 2.2 µF, mounted on ignition coil (connection 15).
Earth lead, ignition coil bracket—engine (necessary at capacitor installation).
Earth lead, engine hood—body.
Installation of resistance connections for spark plugs.

ALTERNATOR INTERFERENCE

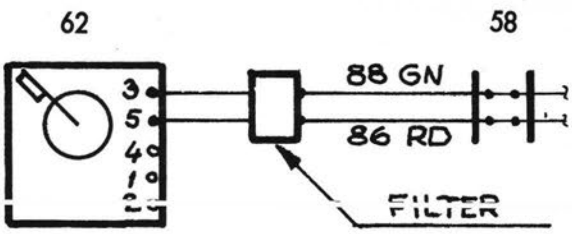
Allowed completion on alternator:
Capacitor 2.2 µF, mounted on B+ and to earth.

REGULATOR INTERFERENCE

Allowed completion on regulator:
Interference filter, mounted directly on the regulator.
Bosch No. 0 290 002 011

INTERFERENCE FROM THE WINDSHIELD WASHER MOTOR

Allowed completion on the windshield wiper motor:
Bosch No. 0 290 002 013 (normal interference supression).
BERU FK 225 (when further suppression is needed).



S 5168

INTERFERENCE SUPPRESSOR MOUNTED ON WINDSHIELD WIPER MOTOR

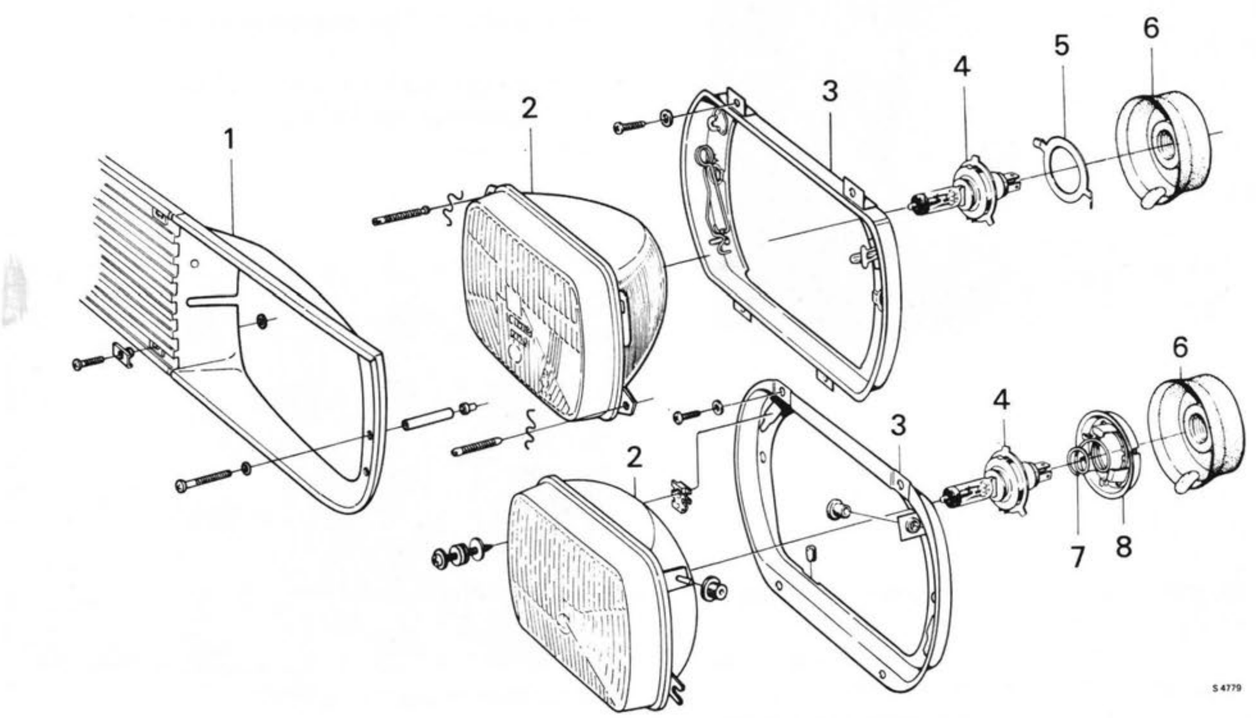
LIGHTING

HEADLIGHTS

General

The headlights are built into the front sheet. The left and right headlight inserts are identical and freely interchangeable. The headlight bulbs have two filaments for high and low beam respectively; the beam elevation is controlled by the combined headlight dimmer/flasher and direction indicator control lever on the steering column. A light on the instrument panel glows blue when the headlights are on at high beam. The standard version is fitted with asymmetric headlights with the beam canted to the right; export models destined for certain markets have asymmetric lights canted to the left or sealed beam headlights.

As from model 1976, the distribution of light from the headlights has been improved. For this improvement to be fully realised additional care must be taken in adjusting the headlight beams.
As from chassis Nos. 99752023575 and 99756007714, the headlights on cars for the Swedish market have an additional function, namely, town lights.
As from chassis nos. 99752023575 and 99756007714 respectively the day-lights are integrated into the headlight unit in the form of a reduced dipped beam. On the 1978–1979 models the day-light is part of the combination light unit. The town lights are designed to make the car more readily visible during the day when visibility conditions are generally poor as during rain, fog, at twilight, when there are bright oncoming lights, during snow, etc.
The town lights should not be used for driving at night when there is no adequate street lighting.
To safeguard against the driver forgetting to switch the headlights to full power, the headlights are connected in such a way that high beam can only be obtained with the headlight switch on.
For details of their functioning refer to section 364.



HEADLIGHT, EXPLODED VIEW

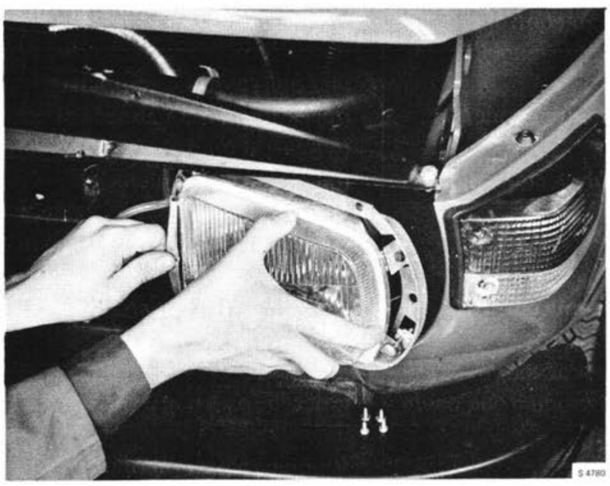
1. Headlight trim frame
2. Headlight insert
3. Mounting frame
4. Bulb
5. Bulb retainer (version 1)
6. Sealing cap
7. Spring (version 2)
8. Bulb retainer (version 2)

Changing headlight inserts

1. Open the hood and pull off the bulb connector.
2. Close the hood without locking it.
3. Remove the grille (see Group 8).
4. Undo the four headlight retaining screws and lift out the headlight complete with mounting frame.
5. Slacken the adjusting screws until they can be freed from the retainer lugs on the insert, and then separate the insert from the retainer plate.

Install in the reverse order.

> NOTE
> The headlight beam alignment must always be checked after a headlight insert or bulb has been exchanged.

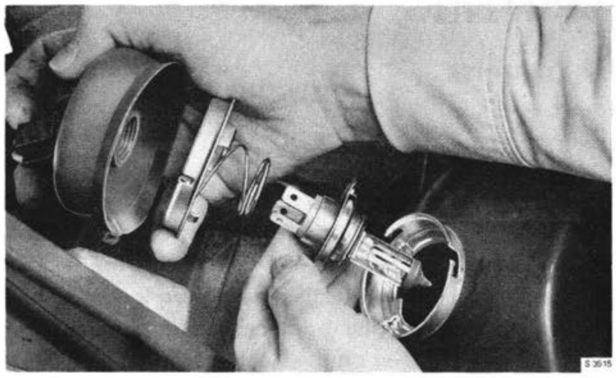


REMOVING THE HEADLIGHT

Changing headlight bulbs

The halogen bulbs have almost unchanged light output during the whole time of burning.
It is also essential that the reflectors are undamaged and that the wiring terminals make proper contact.

1. Open the hood and remove the contact housing and rubber sealing cap from the headlight.
2. Push in the bulb retainer and twist it counter-clockwise; the bulb can then be withdrawn.
3. Fit the new bulb. Do not touch the glass with your fingers. Note the three guide lugs and make sure that the bulb comes in its proper position.
4. Fit the bulb retainer. Make sure that the spring locates the bulb securely in its correct position.
5. Push on the connector. Fold down the edge of the sealing cap, making sure that it fits snugly round the bulb retainer and that the drain hole is at the bottom.

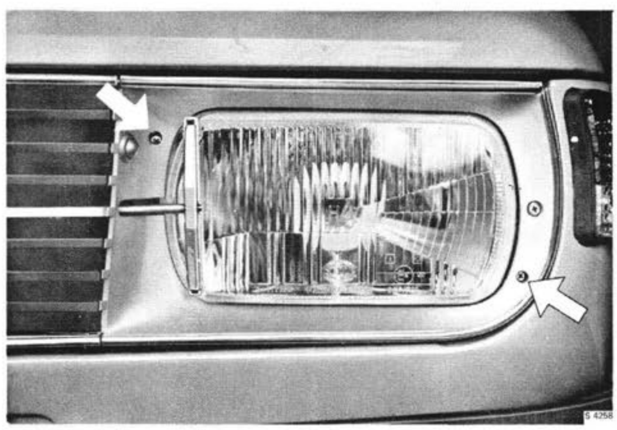


CHANGING A HEADLIGHT BULB, HALOGEN TYPE

> NOTE
> If the bulb is wrongly oriented in the reflector, the throw of the beam will be wrong.

Aligning right and left asymmetric beams

Headlight beams are normally adjusted with the help of special apparatus, but can also be made against a marked panel or a wall.



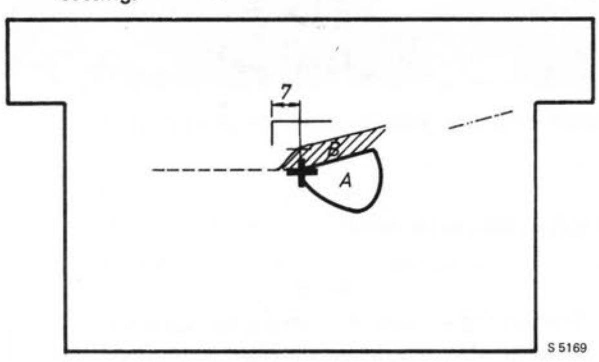
HEADLIGHT ADJUSTING SCREWS

Adjustment with beam aligning apparatus

1. Check the tire pressures and load the car as it would normally be loaded and place the car at right angles to the apparatus.
   Set the lens of the apparatus to the correct height relative to the headlight and to the correct lateral position relative to the asymmetrical part of the headlight glass.

> **CAUTION**
> If the lateral position is set incorrectly this can completely prejudice the alignment work.

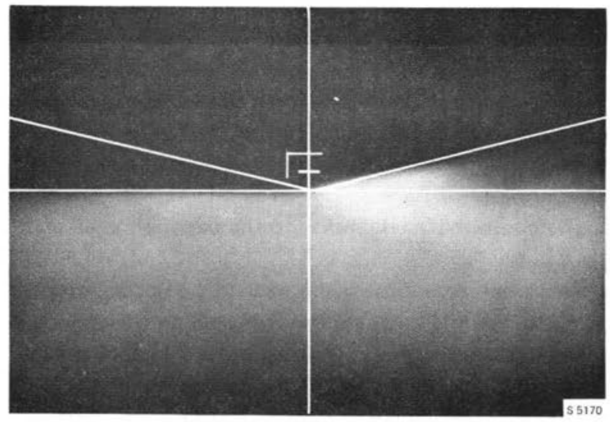
   a. When the apparatus is suspended from above:
      Place the left hand wheels of the car along the line. A maximum deviation of 1.2 in. (3 cm) in the distance of the front and rear wheels from the line is permitted.
   b. When the beam aligning apparatus is equipped with an aperture:
      Place the apparatus in front of one of the headlights, switch on the beam light and turn the apparatus until the beam strikes the same point on the front fenders (measured from the front edge).
2. Switch on the headlight at low beam.
   a. Adjust the height relative to the left-hand (left asymmetric light: the right-hand) horizontal line. Adjust the vertical alignment using as reference the light–dark border which is between 0 and 1.18 in. (0 and 30 mm) to the left (to the right for left asymmetric light) of the centre line.
   b. Adjust the lateral setting of the headlight in such a way that the zone with the highest intensity of light (A, see illustration) comes as near the centre as possible. The tolerance band (B) for the light–dark border can be used to obtain the optimum setting.



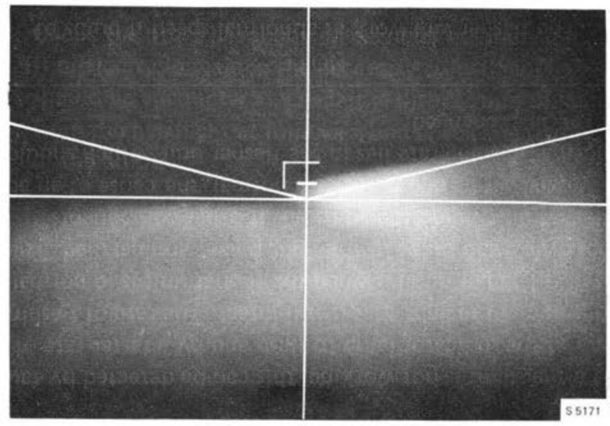
ALIGNMENT BY MEANS OF BEAM ALIGNING APPARATUS

A. High intensity zone

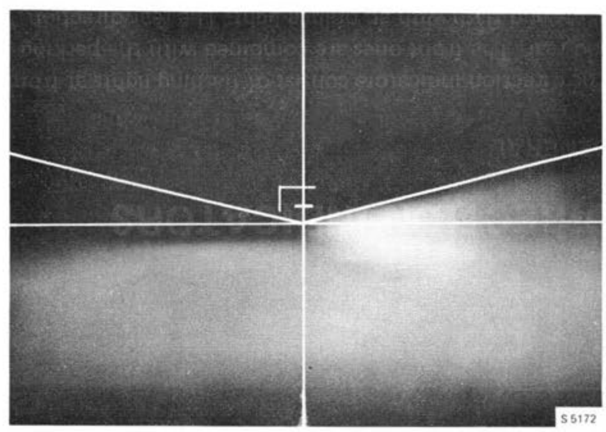
B. Tolerance band, light–dark border



CORRECT SETTING FOR HEADLIGHTS, MODEL 1975 (RIGHT ASYMMETRIC LIGHT)



CORRECT SETTING FOR HEADLIGHTS, AS FROM MODEL 1976 (RIGHT ASYMMETRIC LIGHT)



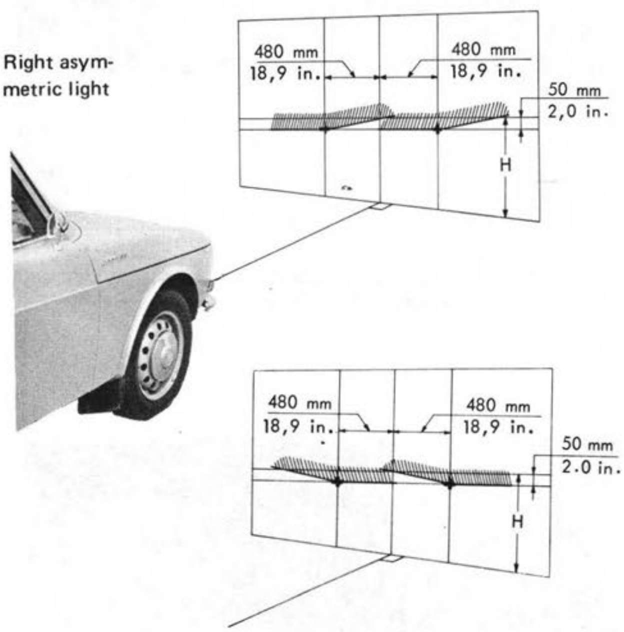
INCORRECT SETTING FOR HEADLIGHTS, AS FROM MODEL 1976 (RIGHT ASYMMETRIC LIGHT)

3. Check the other headlights in a similar manner.
4. If difficulty in making the necessary adjustments should be encountered, check the distribution of light from the headlight at full beam and check the seating of the bulbs.

Adjustment against panel or wall

1. Check the tire pressures and place the car, loaded in the same way as normally, on a flat surface and at a distance of 16 ft. 6 in. (5 m) from the panel.
2. Mark the height of the headlight center above the ground on the panel.
3. Switch on the headlights with the beam dimmed and mask one light.
4. Check and adjust the beam so that the horizontal part of the dividing line between light and darkness lies 2.0'' (50 mm) below the measured dead center of the headlight and to the left of the center (or to the right in the case of a left asymmetric beam) – see illustrations. The sloping part of the light-dark dividing line should lie fully to the right of the mark (to the left for a left asymmetric beam) and should thus meet the horizontal part immediately below the dead center.
5. Check the beam of the other light in the same way.
6. Check that the high beam has an even spread. If the light pattern is irregular or if any difficulty is experienced in setting the dimmed beam correctly, check that the bulb is properly mounted or, if necessary, fit a new bulb.

Right asymmetric light



Left asymmetric light

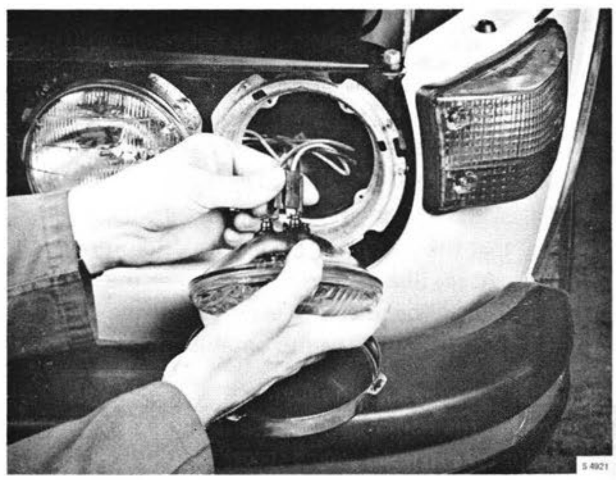
ADJUSTING THE BEAM AGAINST A MARKED PANEL, ASYMMETRIC LIGHTS
H = Height of headlight center above ground

Changing headlight inserts, Sealed Beam

1. Remove the two cover pieces from the joint in the trim strip.
2. Remove the two screws together with the expanding sleeve nuts.
3. Pull forward the outer edge of the headlight frame so that it is clear of the headlight insert and withdraw the frame from the groove in the centre section.

REMOVING THE HEADLIGHT TRIM FRAME

4. Remove the three screws in the retainer plate. Rotate the retainer plate slightly and remove the insert.
5. Disconnect the electrical connections from the headlight insert.



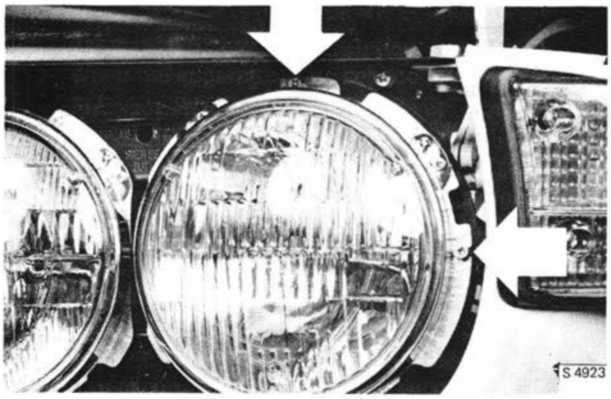
DISCONNECTING THE ELECTRICAL CONNECTION

Install in the reverse order.

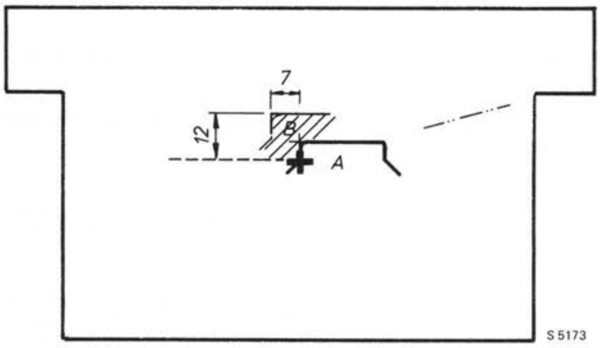
> NOTE
> The headlight beam alignment must always be checked after a headlight insert has been exchanged.

Adjustment of Sealed Beam headlights

Adjustment should normally be carried out by means of special beam-setting equipment. Should no equipment be available, adjustment of the light beams can be made against a wall or panel.



HEADLIGHT ADJUSTMENT SCREWS



ALIGNMENT BY MEANS OF BEAM ALIGNING APPARATUS

A. High intensity zone

B. Tolerance band, light–dark border

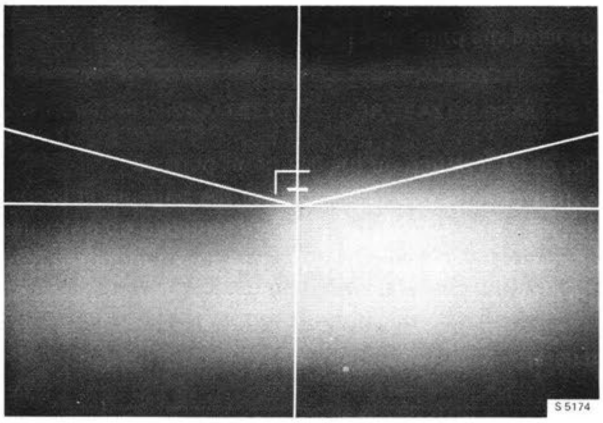
Adjustment with beam aligning apparatus

1. Check the tire pressures and load the car as it would normally be loaded and place the car at right angles to the apparatus.
   Set the lens of the apparatus to the correct height relative to the headlight and to the correct lateral position relative to the asymmetrical part of the headlight glass.

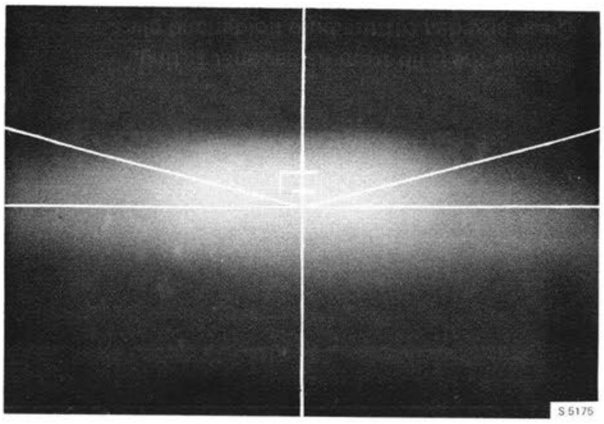
CAUTION

If the lateral position is set incorrectly this can completely prejudice the alignment work.

   a. When the apparatus is suspended from above:
      Place the left hand wheels of the car along the line. A maximum deviation of 1.2 in. (3 cm) in the distance of the front and rear wheels from the line is permitted.
   b. When the beam aligning apparatus is equipped with an aperture:
      Place the apparatus in front of one of the headlights, switch on the beam light and turn the apparatus until the beam strikes the same point on the front fenders (measured from the front edge).
2. Switch the headlight to low beam.
   a. Set the height by means of the upper cross on the check plate.
   b. Adjust the lateral setting of the headlight in such a way that the zone with the highest intensity of light (A, see illustration) comes as near the centre as possible. The tolerance band (B) for the light–dark border can be used to obtain the optimum setting.
3. Check the other headlight in a similar manner.
4. If difficulty is encountered in adjusting the beam, check the light distribution on high beam.



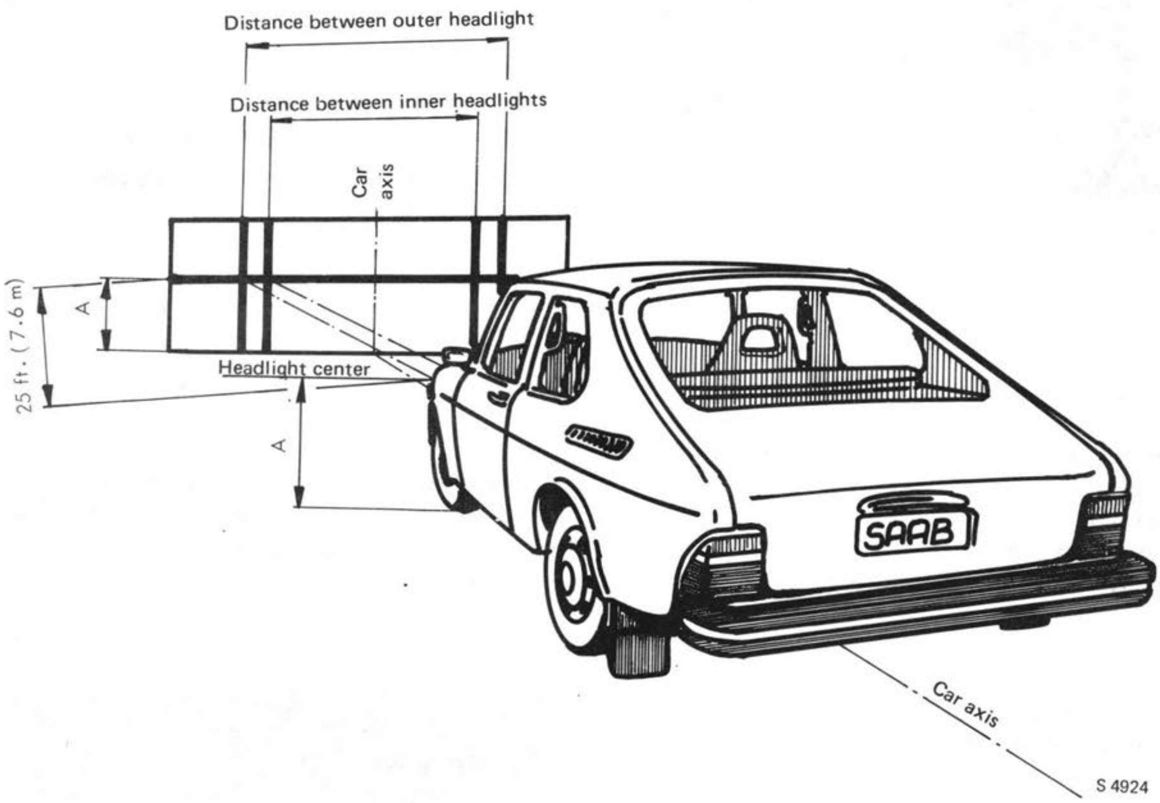
CORRECT LOW-BEAM SETTING FOR SEALED BEAM HEADLIGHT



CORRECT HIGH-BEAM SETTING FOR SEALED BEAM HEADLIGHT

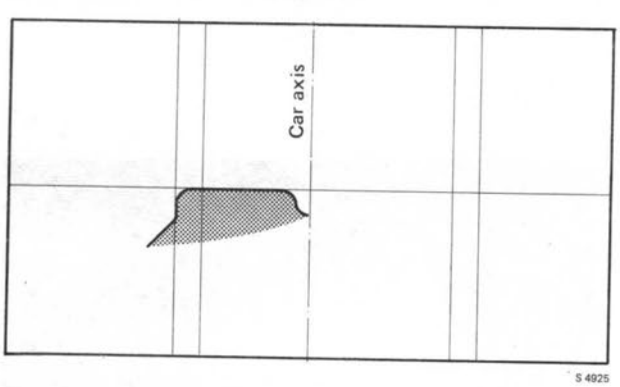
Adjustment against wall or panel

1. Check the tire pressures and place the car, loaded as normally, at a distance of 25 ft. (7.6 m) from the panel. Clean the headlight glass. The floor should be level and the centre line of the car should be at right angles to the centre line of the panel. The panel should be marked as shown in the illustration.



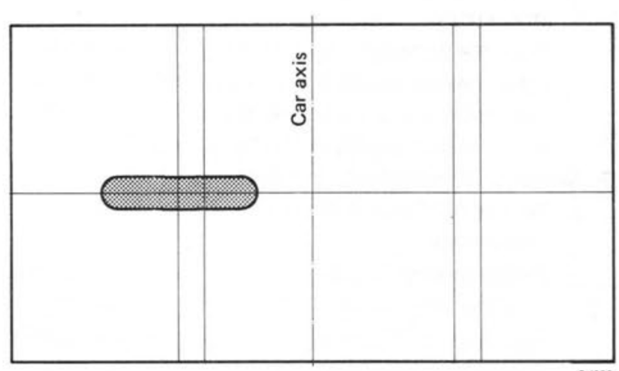
LOCATION OF CAR RELATIVE TO AXES OF THE PANEL

2. Remove the headlight trim frames, screen off three of the headlights and switch on the low beam.
3. Adjust the headlight insert so that the zone for the maximum light intensity is within the shaded field below the line.



LOW BEAM
(Shaded area indicates high intensity zone)

4. Adjust the high beam as shown in the illustration.



HIGH BEAM
(Shaded area indicates high intensity zone)

5. Repeat the procedure for the other three headlights. Refit the headlight trim frames.

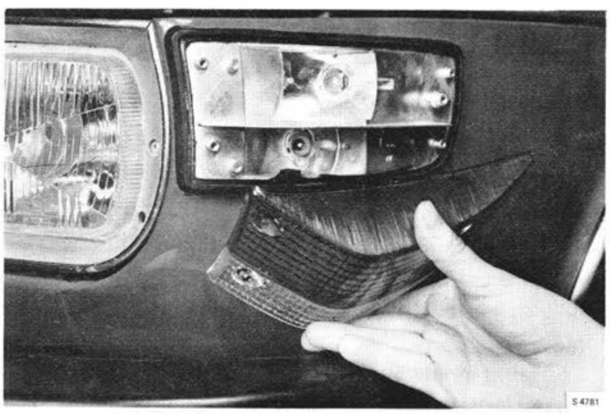
PARKING, BRAKING, BACK-UP, DIRECTION INDICATOR AND NUMBER PLATE LIGHTS

General

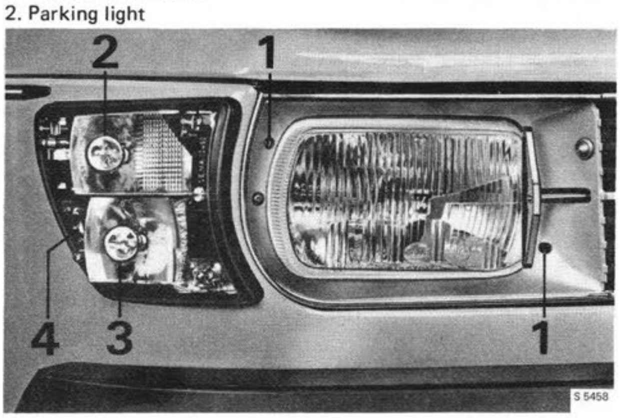
The front parking lights are recessed in the front fenders and are combined with the direction indicator lights. As from model 1977 two new functions are included in the housings. The upper part holds the direction indicators. The lower part of the front light contains parking light and cornering light in the same lampholder by means of a two-wire lamp. The lower part of the rear lights holds the side reversing light on the Saab 99 GLE and 99 EMS. In the rear lights, lamps for rear light, number plate light, brake light, back-up-light and direction indicators are mounted.
The brake light switch is mechanical and actuated by the twist rod between the brake pedal link and the servo assist.

Changing bulbs

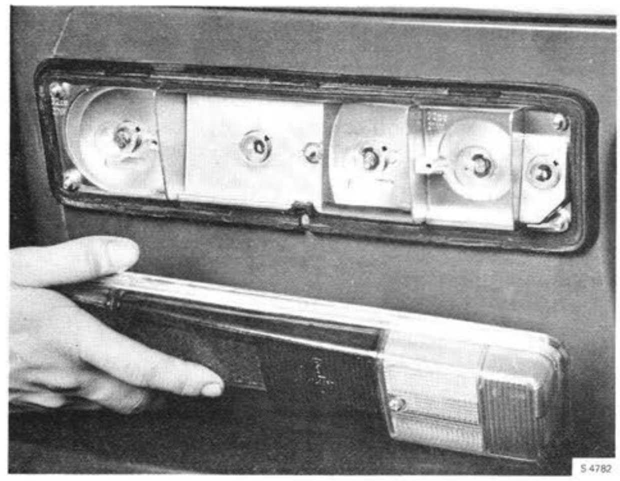
1. Undo the retaining screws and lift off the glass.



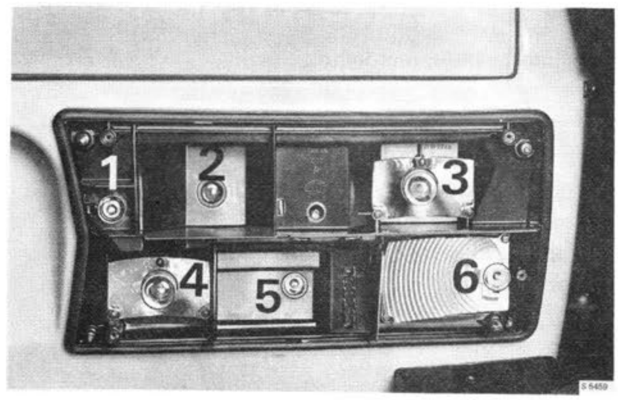
CHANGING BULBS, FRONT, UP TO AND INCL. MODEL 1976
1. Direction indicator
2. Parking light



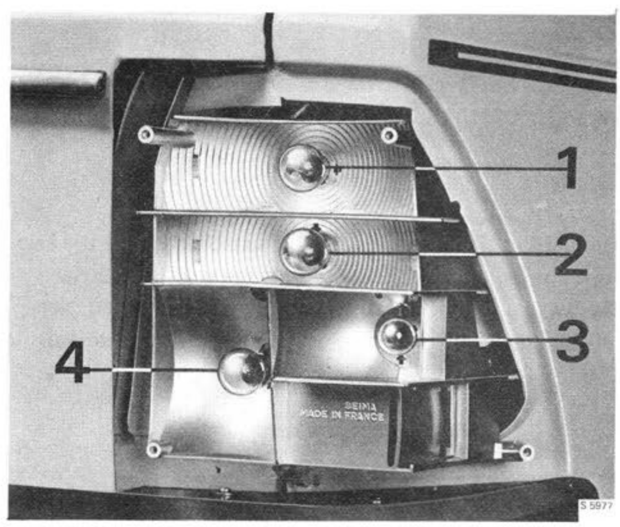
CHANGING BULBS, FRONT, AS FROM MODEL 1977
1. Adjusting screws, headlight
2. Bulb, direction indicator
3. Bulb, parking light and cornering light
4. Saab 99 GLE and 99 EMS: Bulb, side reversing light



CHANGING BULBS, REAR, SAAB 99 (99 L), 99 L (99 GL) AND 99 EMS, UP TO AND INCL. MODEL 1976



CHANGING BULBS, REAR, SAAB 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS, AS FROM MODEL 1977
Bulb for:
1. Number plate light. 2. Back-up light. 3. Direction indicator. 4. Stop light. 5 and 6. Tail light.



CHANGING BULBS, REAR, SAAB 99 COMBI COUPE

1. Direction indicator
2. Reversing light
3. Rear light
4. Brake light

2. Release the bulb from its bayonet fitting.
3. Clean any dirt off the bulb holder and glass.
4. Fit the bulb. Check that the bulb makes good contact, especially the ground contact.
5. Mount the glass.

INTERIOR LIGHTING

General

The interior lighting consists of a dome light mounted on the ceiling on the left-hand side and a light mounted to the rear-view mirror. The lights are switched on by either of the two door contacts, either of the switches at each light or by a switch on the gear lever housing.

Changing the bulb, rear light

1. Undo the two screws; then the bulb can be removed.
2. Snap in the new bulb, making sure that it is properly seated in both grips and securely held.
3. Mount the light and the two screws.

To repair or exchange faulty wiring, remove the light fittings as above.

Changing the bulb, rear view mirror

1. Lift off the transparent plastic glass to expose the bulb.
2. Change the bulb and press the glass back into place.

IGNITION SWITCH AND GEAR INDICATOR ILLUMINATION ON CARS WITH AUTOMATIC TRANSMISSION

General

The light at the ignition swtich is switched on by the two door contacts or by the switch on the gear lever cover. Cars with automatic transmission have illuminated gear selector scales. It is connected to the ignition terminal "15".

Changing the bulb

1. Undo the three retaining screws of the gear lever cover.
2. Raise the cover as far as it will go, insert a hand under the cover from the left and remove the bulb with holder from its fitting in the cover.
3. Pull out the bulb with holder and change the bulb.
4. Replace the bulb with holder in the fitting in the cover.
5. Insert and tighten the three cover retaining screws.

TRUNK ILLUMINATION

General

Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS

The trunk light, mounted on the front beam in the center of the trunk compartment, is switched on and off by a contact located on the left-hand side above the wheel housing. The contact is actuated by the left hinge of the trunk lid.

Saab 99 Combi Coupé

The trunk light, mounted on the right-hand side in the trunk, is switched on and off by a contact at the rear door striker. The contact is actuated by the door lock.

Changing the bulb

Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS

1. Remove the fitting by prying the left edge up carefully with a screwdriver, after which the bulb can be removed.
2. Snap in the new bulb, making sure that it is properly seated in both grips and securely held.
3. Mount the fitting by locating the right edge in the recess and pushing home the left edge.

Saab 99 Combi Coupé

1. Remove the two bulb holder retaining screws and pull out the holder somewhat.
2. Remove the bulb and fit a new one.
3. Remount the bulb holder.

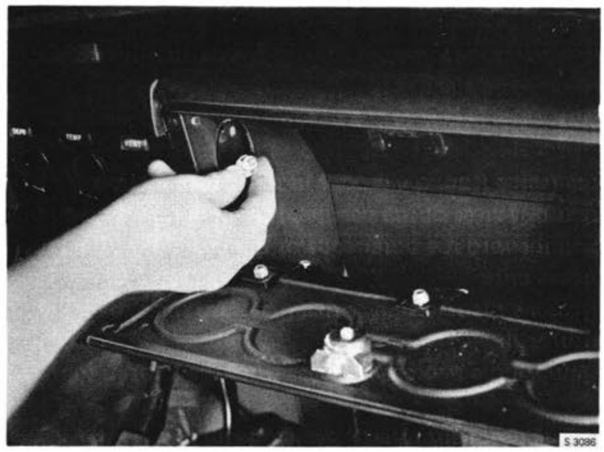
ILLUMINATION OF CONTROL SWITCHES AND HEATER CONTROLS

General

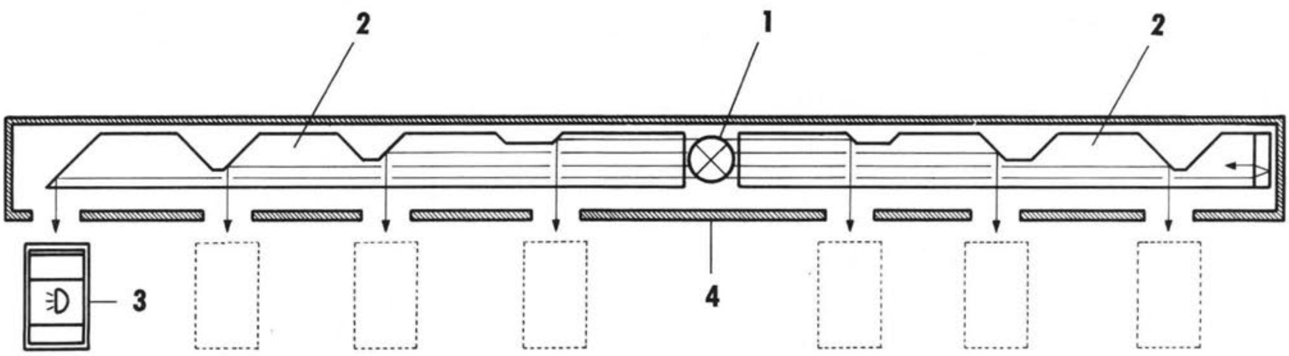
The control switches are illuminated by a light bulb located between two refractors in the instrument panel above the switches. The refractors, which are made of acrylic plastic, have recesses in line with each switch, the depth of the recess increasing with distance from the bulb. Light rays striking such a recess are refracted 90° to illuminate the switch through a hole in the panel. The heater controls are illuminated in the same way.

Changing bulbs

The control switch light bulb is located below the speedometer and can be reached after removal of the screen on the instrument side under the instrument panel. The heater control light bulb can be reached by removing the plastic cover inside the glove compartment.



CHANGING THE HEATER CONTROL LIGHT BULB



S 3140

CONTROL SWITCH ILLUMINATION (SCHEMATIC)

1. Bulb
2. Refractor
3. Control switch
4. Instrument panel

DIRECTION INDICATORS

GENERAL

The direction indicators consist of flashing lights at front and rear. The front ones are combined with the parking lights and flash with an orange light. The rear direction indicators have separate bulbs which also flash with an orange light.
The flasher unit is mounted under the instrument panel and is combined with a control relay which flashes a green light on the instrument to indicate that the direction indicators are on and that both front and rear lights are flashing.
If either light is not working, this can be detected by failure of the indicator lamp to flash and by a faster rate of flashing in the light that is still intact. The rate of flashing is 60–120 per minute when the flasher unit is in normal condition and bulbs of the right power are installed. The flasher unit cannot be adjusted. If other components (switch, wiring and bulbs) are normal, the cause of an abnormal flashing rate lies in the flasher unit, which should then be exchanged.

> NOTE
> The flasher will work at abnormal speed if bulbs of the wrong power are fitted.

SELF-CANCELING MECHANISM OF DIRECTION INDICATOR CONTROL LEVER

The play between the actuator and the "tooth" of the lever should be 0.008–0.024" (0.2–0.6 mm) when the lever is in neutral. Adjust the clearance by placing spacer washers between the lever and its mounting bracket.

> NOTE
> The actuator must be so placed that its centerline coincides with the centerline of the control lever housing when the front wheels are lined up fore-and-aft.

HORNS AND HORN CONTROLS

GENERAL

The horns are of the loud-tone type, and are a combination of one high and one low note horn.
One horn is mounted in the engine compartment on the outside of the left, inner bumper bracket. The other is on the outside, underneath the bumper.

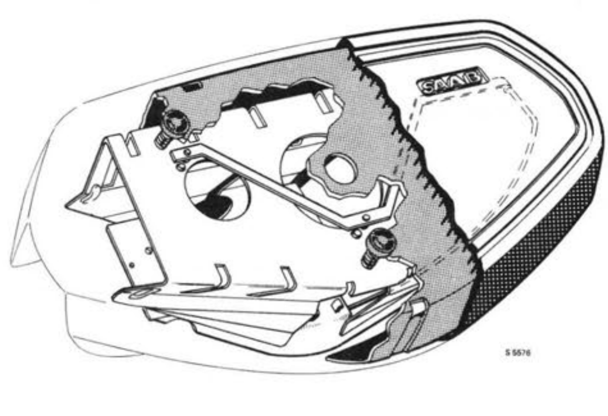
HORN CONTROL

The horns are operated by buttons in the steering wheel safety padding.

Removing and installing

Remove the safety pad with horn contact from the steering wheel by undoing the four screws, which are accessible from the underside of the wheel.
Disconnect the two cable ends to the horn contact from the back side of the safety pad and remove the contact from the safety pad. (Only earlier design.)
When removing the slip ring, the steering wheel must first be removed (see Group 6).

HORN CONTACT, EARLIER DESIGN

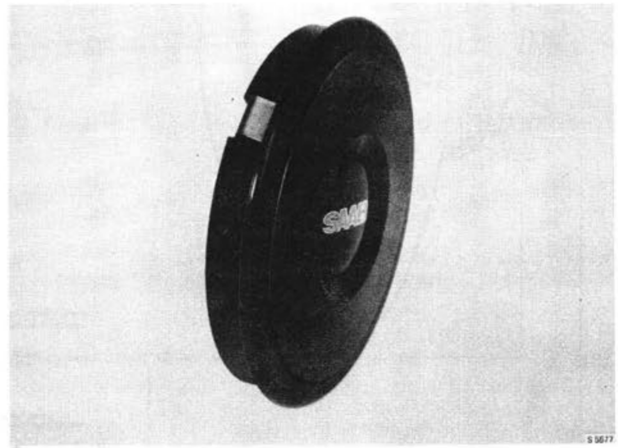


HORN CONTACT, LATER DESIGN

Montering sker i omvänd ordning.

Removal and installation, sporty-version steering wheel, up to and incl. model 1977

Carefully pry up the horn contact outer ring with the aid of a small screwdriver. Install the contact by pressing down the outer ring until the contact comes in position.

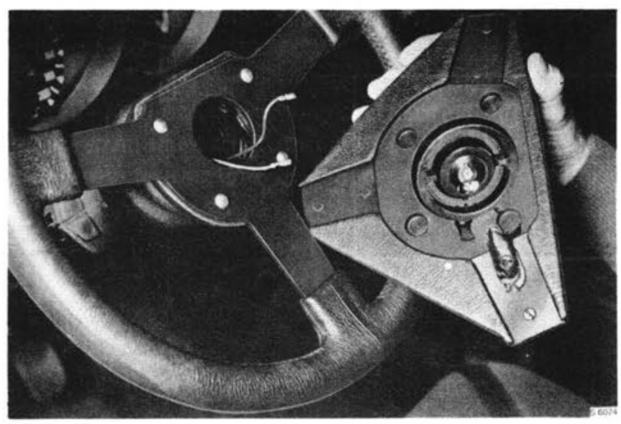


HORN CONTACT, SAAB 99 EMS, UP TO AND INCL. MODEL 1977

Install in the reverse order.

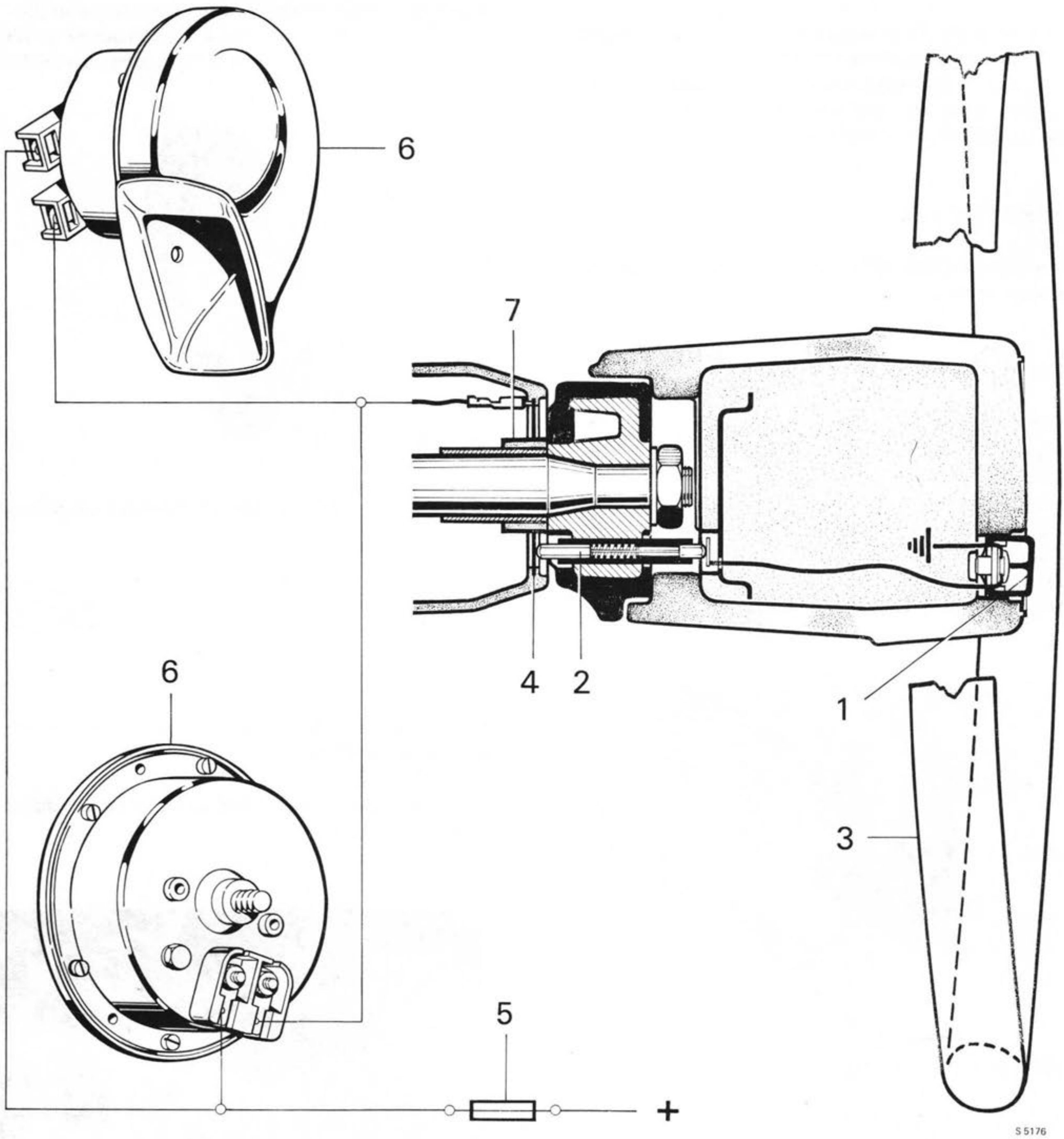
Removal and installation, sporty-version steering wheel, as from model 1978

Lift off the safety padding and horn contact and disconnect the two cables.



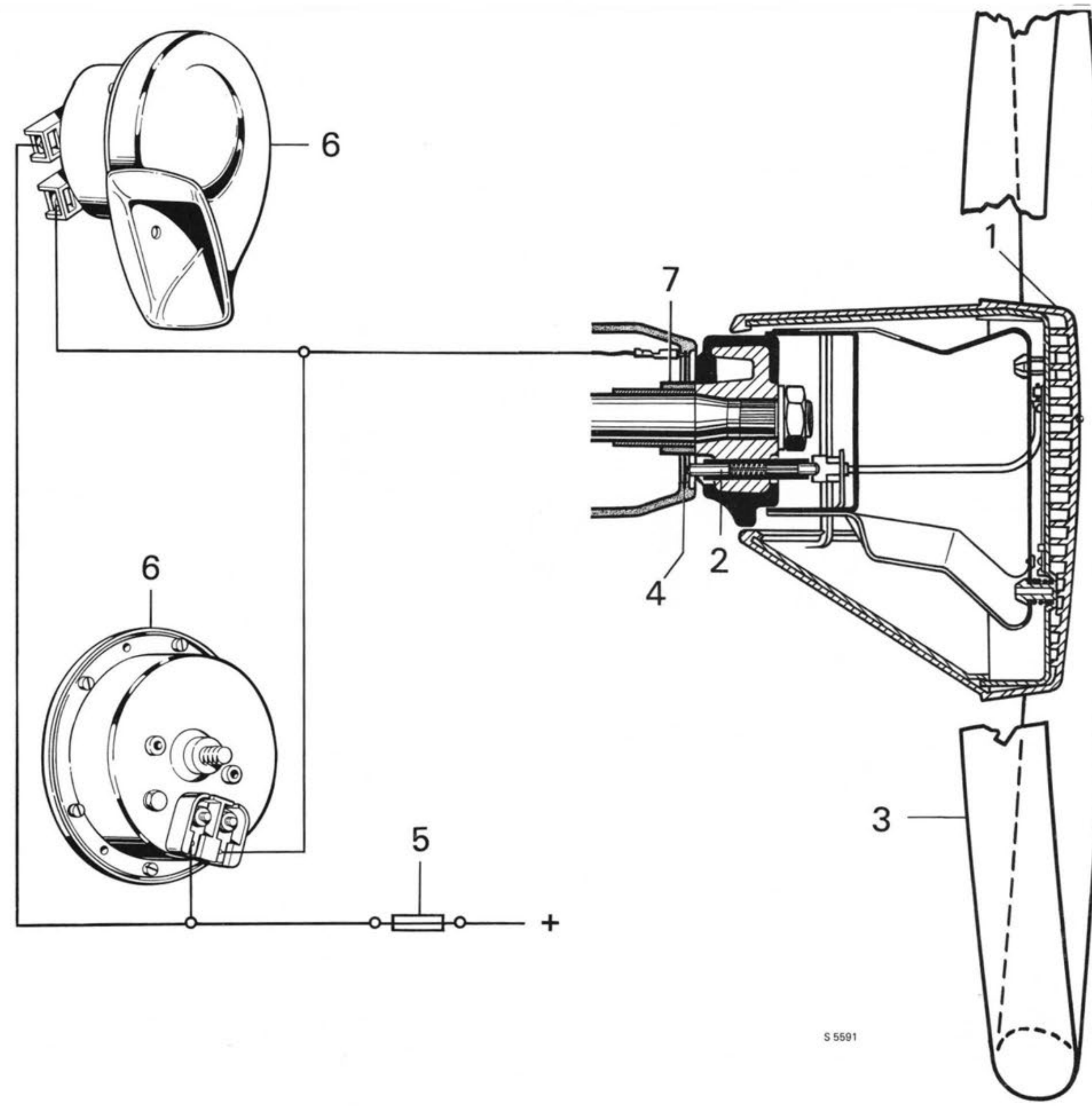
HORN CONTACT, SPORTY-VERSION STEERING WHEEL, AS FROM MODEL 1978

Install in the reverse order.



HORN CONTROL, EARLIER DESIGN

1. Horn contact
2. Contact finger
3. Steering wheel
4. Slip ring
5. Fuse, 8 amp
6. Horns
7. Spacer



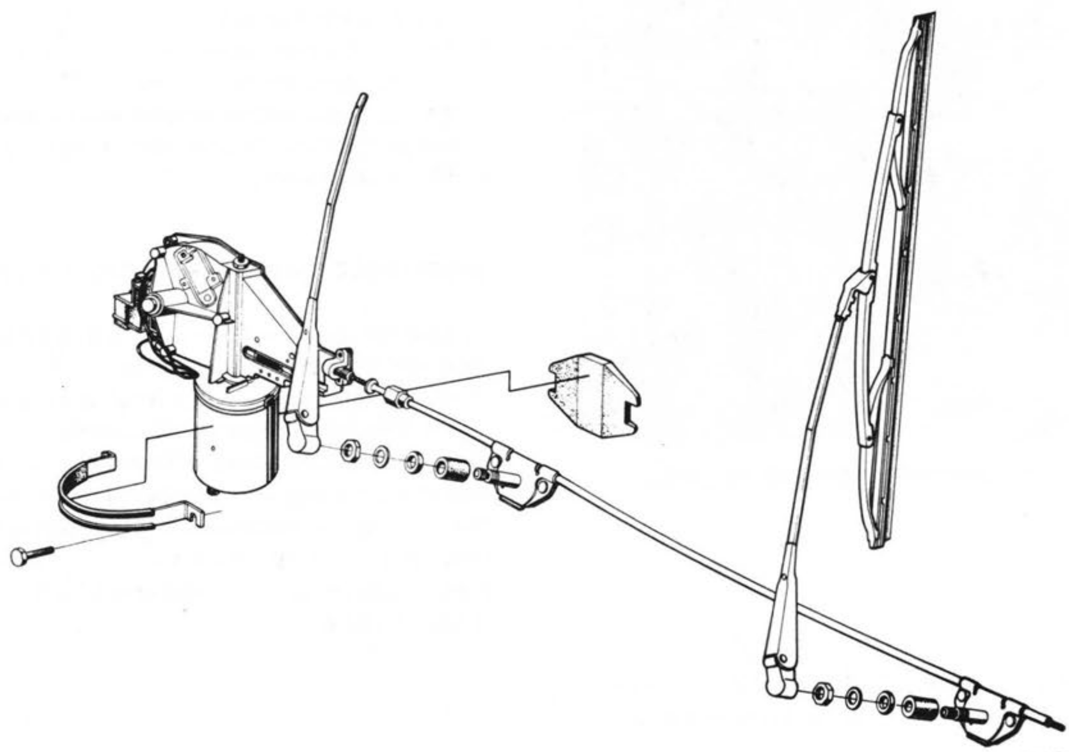
HORN CONTACT, LATER DESIGN

1. Horn contact
2. Contact finger
3. Steering wheel
4. Slip ring
5. Fuse, 8 amp
6. Horns
7. Spacer

WINDSHIELD WIPERS AND WASHERS

GENERAL

The windshield wiper motor is located on the right side of the dash panel. The movement is transmitted from the motor gear housing via a reciprocating flexible cable to gears attached to the wiper spindles. The cable runs in a steel tube between the wiper motor and the two spindles.
The motor is equipped with a self-parking device so that the wiper blades always come to rest at the bottom of the windshield no matter what position they are in when the motor is switched off.



WINDSHIELD WIPERS

WINDSHIELD WIPER MOTOR

Function

In the wiper motor, the drive is transmitted to the flexible cable through a gear housing. The motor is fed from the battery through the ignition contact and via a fuse, the switch and a contact device in the gear housing. This last is in action throughout the greater part of the blade stroke, giving the motor two alternative grounding routes while the wiper switch is on. Each time the blades reach the limit of travel at which they are normally parked, the contact in the gear housing breaks. If the switch is off when this happens, the motor and blades come to rest in that position.

Lubrication

The rotor of the wiper motor is journaled in self-lubricating bearings, and the gear housing is packed with grease at the factory. Regular lubrication is not necessary.

Removal

1. Remove the wiper arms from the wiper spindles.
2. Remove the nut that holds the steel tube to the wiper motor.
3. Release the wiper motor and remove the motor and the flexible cable. (Pull the cable out of the tube.)

REMOVAL OF WIPER MOTOR AND FLEXIBLE CABLE

Installation

1. Guide the wiper motor's flexible cable into the tube while twisting the tube so that the gears on the spindles mesh with the cable.
2. Mount the wiper motor on the dash panel and connect it to the steel tube.
3. Test run the wipers and note on which side the spindles rest when the motor is switched off. (This test is made to prevent the wiper arm from moving in the wrong direction when the wiper motor is switched on.)
4. Fit the wiper arms.

WIPER MECHANISM

Removal

1. Remove the wiper arms and the wiper motor.
2. Undo the base plates on the spindle housings with a 3/8" wrench so the tubes can be detached from the spindle housings.
3. Undo the retaining nuts on the top of the dash panel and remove the spindle housings. Put the washer and rubber bushings in a safe place.

Installation

1. Mount the spindle housings on the dash panel plate with the rubber bushings, washers and nuts. Do not tighten the nuts.
2. Guide the tubes into their positions between the spindle housings and their base plates.
3. Insert the flexible cable while twisting to facilitate meshing and check that it runs smoothly.
4. Tighten the spindle nuts.
5. Mount the wiper motor on the dash panel and connect it to the steel tube.
6. Test run the wipers and note on which side the spindles rest when the motor is switched off. (This test is made to prevent the wiper arm from moving in the wrong direction when the wiper motor is switched on.)
7. Fit the wiper arms.

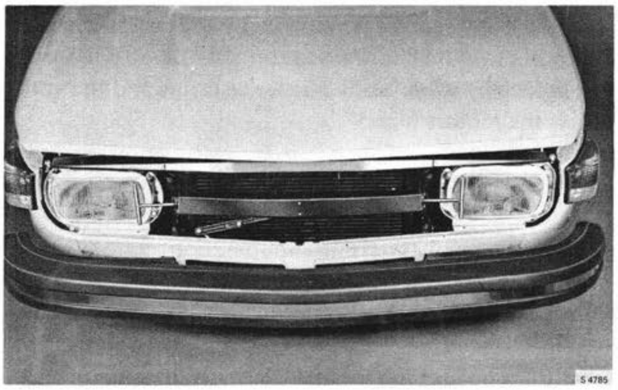
WINDSHIELD WASHER, HEADLIGHT WASHER

The washer equipment consists of a liquid container mounted in front of the right-hand wheel housing and an electric pump, mounted in front of the container. The suction side of the pump is connected to the container by means of a hose. A hose runs from the outlet side of the pump and this divides to run to the nozzle in the hood for the windshield, and to the grille for the headlights. A non-return valve is fitted in the hose to the hood to prevent the hose from emptying when the pump is not operating.

HEADLIGHT WIPER AND WASHER

GENERAL

Cars destined for certain markets are equipped with a headlight cleaning system. This consists of a wiper and washer unit powered by separate electric motors which are operated by the same control lever as the windshield wipers and washer.



HEADLIGHT WIPER MECHANISM

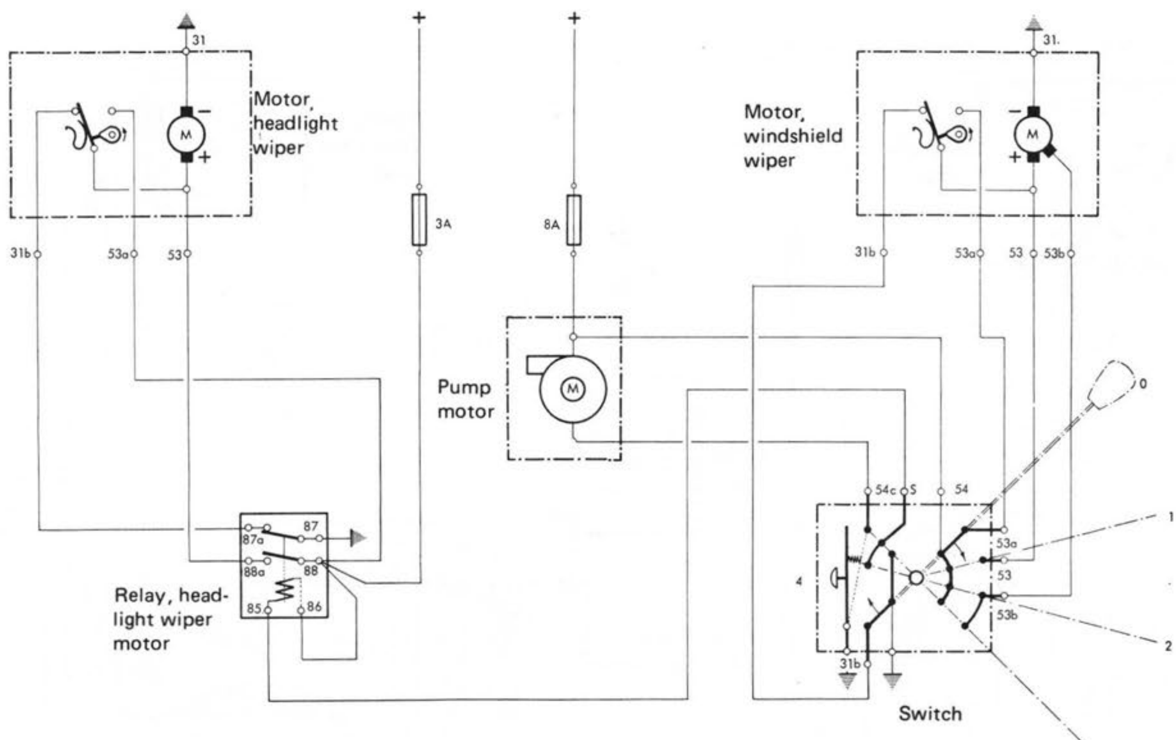
ELECTRIC WIRING AND OPERATION

Control lever in neutral (0)

When the ignition is switched on, current is supplied to terminal 53a of the wiper motor. The motor goes to the parking position when a spring-loaded contact device in the motor breaks the circuit between terminals 53a and 53. The contact device stops the motor very quickly by cutting in terminal 31b and thereby shorting out the rotor windings. This arrangement is necessary in order to stop the motor during the short time the contact is actuated by the cam; otherwise the motor would continue to run after being switched off, especially when blade resistance is low and the voltage across the motor is high.

Control lever at 1

Current is supplied to the windshield wiper motor only (low speed) via terminals 54 and 53 of the control switch. At the same time the circuit is broken between terminal 31b and ground in the switch to prevent shorting when the contact device in the motor makes the circuit between terminals 53 and 31b.



WIRING DIAGRAM, HEADLIGHT WIPER AND WASHER

Control lever at 2

Current is supplied to the windshield wiper motor (high speed) via terminals 54 and 53b of the switch. At the same time, the coil in the relay is energised by terminal S of the switch, whereupon the relay closes and current flows to the headlight wiper motor via terminals 88 and 88a.

Control lever at 3

The same functions operate here as in position 2, but the switch now grounds terminal 54c, thereby starting the pump motor.

Control lever at 4

When the control lever is pulled back towards the steering wheel, it trips a spring-loaded contact that starts the pump motor and headlight wipers by grounding terminals 54c and S.

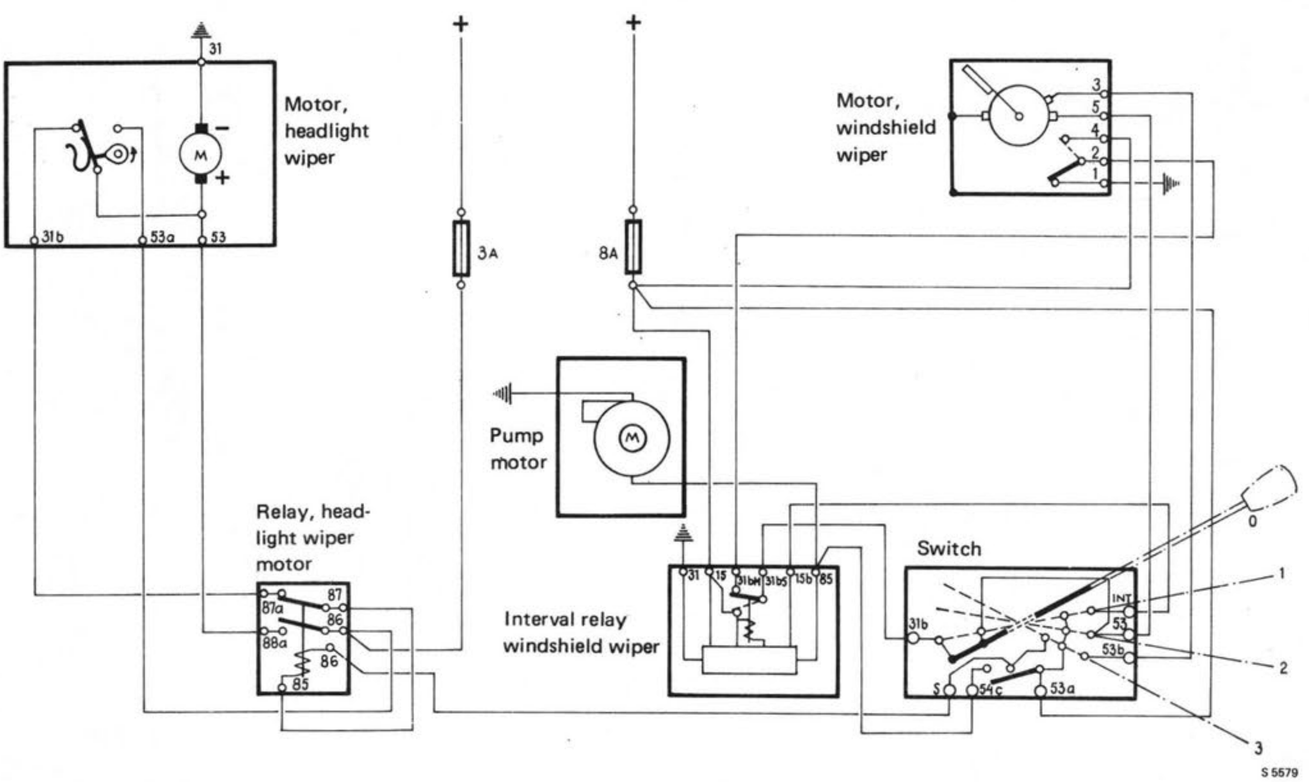
ELECTRIC WIRING AND OPERATION, SAAB 99 GLE

Control lever in neutral (0)

When the ignition is switched on, current is applied to terminal 53a of the headlight wiper motor and to terminal 4 of the windshield wiper motor. The motors go to the parking position when a spring-loaded contact device in each motor breaks the circuit between terminals 53a and 53, and 4 and 2, respectively. The contact device stops the motors very quickly by cutting in terminal 31b and thereby shorting out the rotor windings. This arrangement is necessary in order to stop the motors during the short time the contact is actuated by the cam; otherwise the motors would continue to run after being switched off, especially when blade resistance is low and the voltage across the motors high.

Control lever at 1 (intermittent operation)

Current is supplied to the intermittent operation relay terminal 15b via terminal 53a on the switch and the intermittent operation terminal. The current is supplied intermittently from terminal 31bs on the relay to terminal 5 on the wiper motor via terminals 31b and 53 on the switch. After each period in operation, the wipers return to the parking position when the circuit between terminals 4 and 2 on the wiper motor is broken.



WIRING DIAGRAM, HEADLIGHT WIPER AND WASHER, SAAB 99 GLE

Control lever at 2

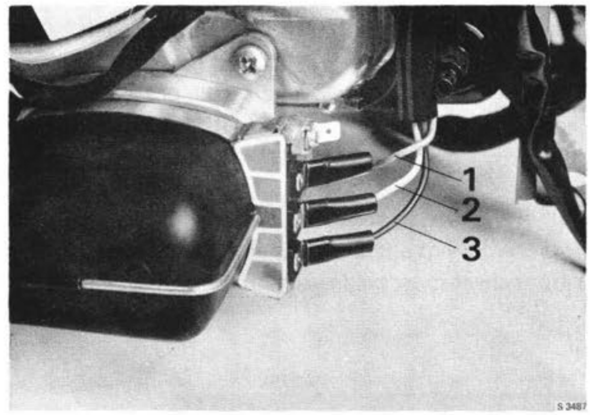
Current is supplied to terminal 5 on the windshield wiper motor only (low speed) via terminals 53a and 53 on the switch.

Control lever at 3

Current is supplied to terminal 3 (high speed) on the windshield wiper motor via terminals 53a and 53b on the switch. At the same time, current flows across S on the switch to terminal 86 on the headlight wiper relay, whereupon the relay closes and supplies current through terminals 86 and 88a on the relay to terminal 53 on the wiper motor.

Control lever at 4

When the control lever is pulled back towards the steering wheel, it trips a spring-loaded contact whereupon current is supplied from terminal 53a to the washer motor and headlight wiper motor through terminals 54c and S.



WIRE CONNECTIONS AND COLORS, HEADLIGHT WIPER MOTOR

1. Red to "53a"
2. Yellow to "31b"
3. Brown to "53"

NOTE

For normal use of the wipers, a fuse for a maximum current of 3 amp. is to be fitted in order to avoid damage to the wiper motor if the wipers freeze onto the glass.
While testing the assembly (dry headlight glass), an 8 amp. fuse may be temporarily fitted.

WIPER MOTOR

Removing and installing

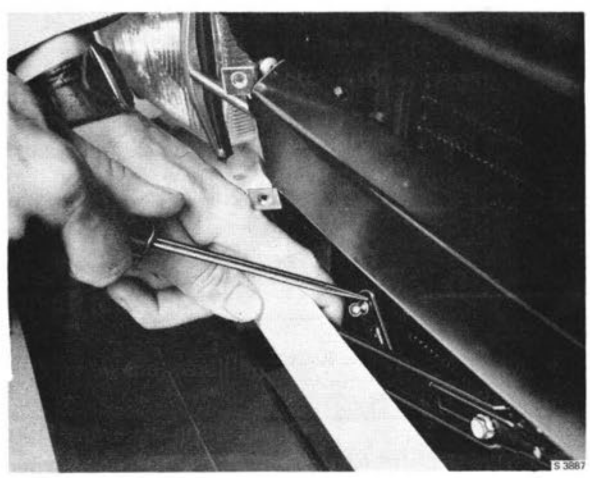
1. Remove the grille. See Group 8.
2. Remove the crank arm from the wiper motor and the nut from the shaft.
3. Remove the battery.
4. Disconnect the wires from the wiper motor.
5. Remove the screw which holds the wiper motor to the fan cover. The motor can then be removed. Take care of the spacers on the shaft.

Install in the reverse order.
NOTE! The screw in the wiper motor crank arm must be tightened to a torque of 10 Nm (7.2 ft.lb., 1.0 kpm) and locked with Loctite.

WIPER MECHANISM

Removing and installing

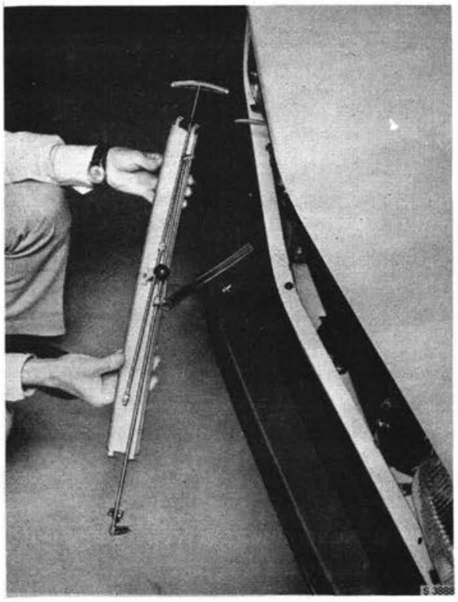
1. Remove the grille. See Group 8.
2. Prize apart the ball joint between the push rod and the crank arm of the motor.



LOOSEN THE CRANK ARM FROM THE PUSH ROD

3. Unhook the springs which hold the wiper shaft bushings to the front sheet.
4. Remove the four screws, holding the protecting cover and remove the cover together with the wiper mechanism.

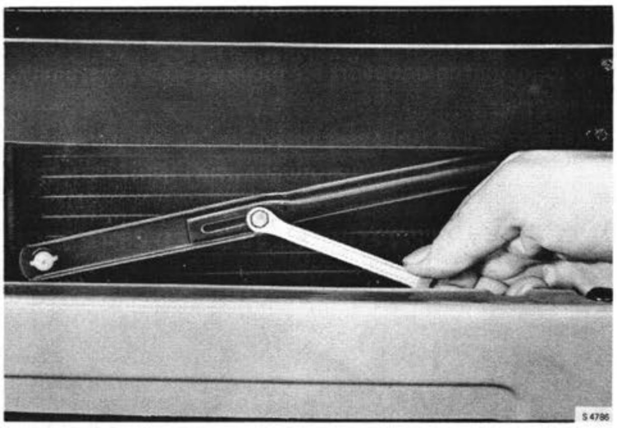
Install in the reverse order.
Before the springs and bushings are fitted, the recesses in the front sheet must be greased on both sides.



PROTECTING COVER WITH WIPER MECHANISM

Adjusting the parking position of the wipers

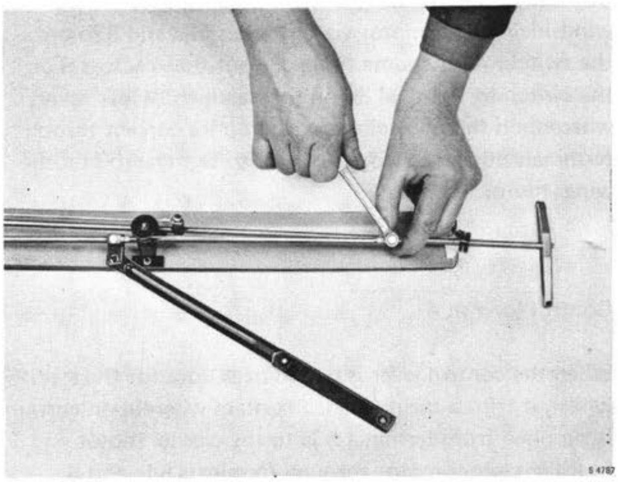
Adjust the parking position of the wipers by altering the length of the push rod.



ADJUSTING THE PARKING POSITION OF THE HEADLIGHT WIPERS

Adjusting the cord tension

1. Remove the protective cover and wiper mechanism.
2. Adjust cord tension by slackening the set screw in the cord attachment bushings and then moving the bushings to stretch the cords.



ADJUSTING CORD TENSION

Checking the pressure of the wiper blades

Check the pressure of the wiper blades on the headlight glasses and make sure that the bushing does not stick in the recesses in the front sheet. The pressure of the wiper blades, measured in the parked position, must not exceed 3 N (11 oz, 300 p).
CRC 5.56 or similar is a suitable lubricant for the bushings.

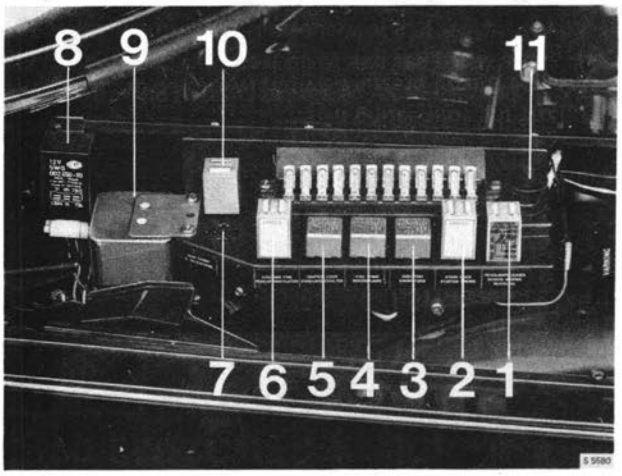
Changing wiper blades

1. Release the catch on the wiper shaft and pull off the wiper blade.
2. Fit a new wiper blade on the shaft and secure the catch.

ELECTRICAL CONTROLS AND SWITCHES

GENERAL

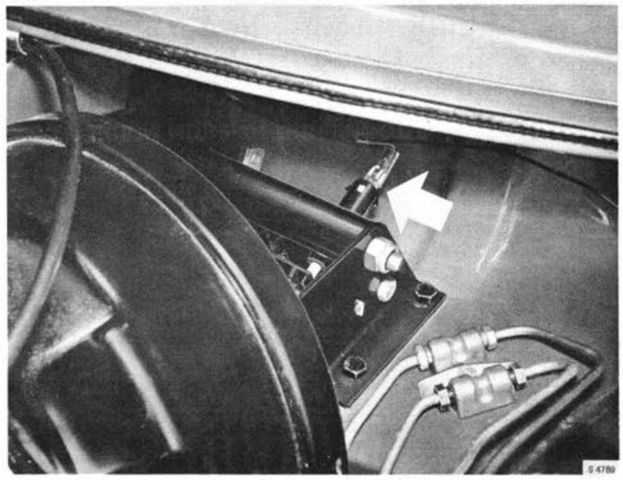
The ignition switch is located on the gear lever console and is combined with the starter switch and gear lever security lock.
To protect the ignition switch contacts against excessively high currents, an extra relay is fitted. The windshield wipers and washer, the radiator fan relay, the ventilator fan and the back-up lights are supplied with current via this relay, which is located by the fuse box.
In cars with fuel injection, the injection system of the engine incorporates a safety relay and a relay for the fuel pump.



RETAINER FOR FUSE BOX AND RELAYS

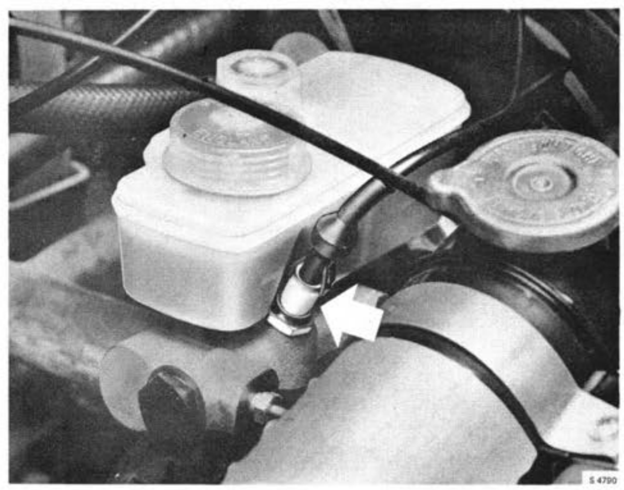
1. Headlight wiper relay
2. Start inhibitor relay, cars with automatic transmission
3. Safety relay, cars with CI-system
4. Fuel pump relay, cars with CI-system
5. Ignition switch relay ·
6. Radiator fan relay
7. Town light relay. (On cars without town lights, space for extra relay. As from model 1977: Cornering light relay.)
8. Interval relay, windshield wipers Saab 99 GLE.
9. Light relay
10. Relay electrically heated rear window
11. Service outlet, ignition system

The brake light switch is mechanical and is actuated by the rod between the pedal pivot and the brake servo unit. When the brake pedal is depressed, current flows to the brake lights.



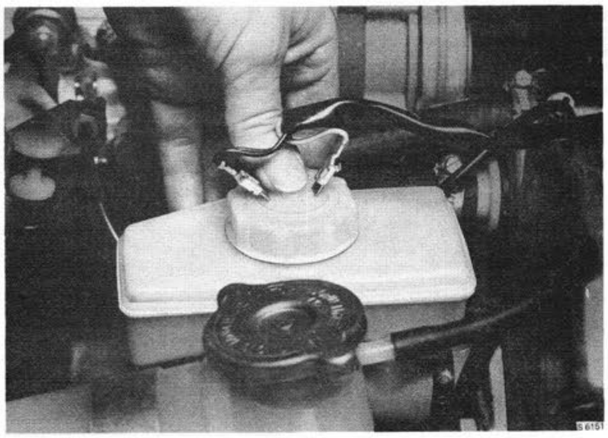
BRAKE LIGHT SWITCH

Up to and incl. model 1977, the brake warning light switch is mounted on the master cylinder, and is operated mechanically by means of a plunger which is actuated in the event of a pressure difference occurring between the brake circuits. The switch can be removed without having any effect on the hydraulic system.



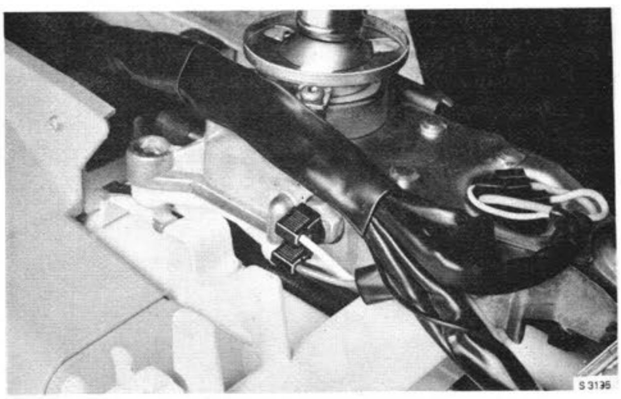
BRAKE WARNING LIGHT SWITCH, UP TO AND INCL. MODEL 1977

As from model 1978, the brake warning light switch is incorporated in the filler cup of the brake fluid container. The switch is actuated by a float which is governed by the fluid level in the container. In the event of the fluid level falling below a preset limit, the switch closes and the warning light comes on.
To check the operation of the warning function, depress the centre of the filling cup to move the float mechanically.



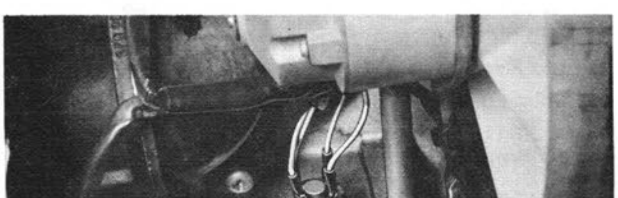
BRAKE WARNING LIGHT SWITCH, AS FROM MODEL 1978

In cars with manual transmission the back-up light switch is located to the left of the gear lever under the console and is tripped by the gear lever when reverse gear is engaged, whereupon the back-up lights light up.



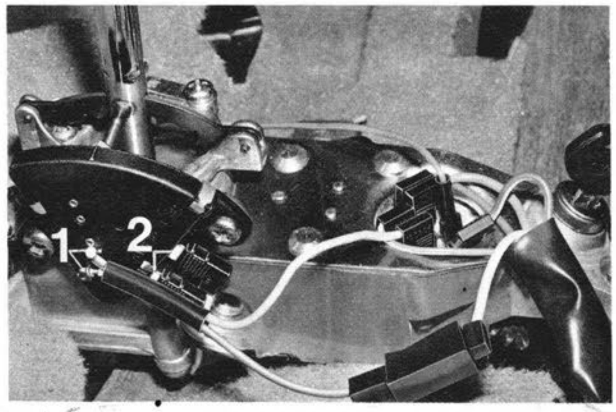
BACK-UP LIGHT SWITCH, MANUAL TRANSMISSION

In cars with automatic transmission up to and including 1979 model the contact is mounted on the front of the transmission casing and is combined with the starter interlock. With reference to the setting of the contact, see und "Automatic transmission" in Group 4.

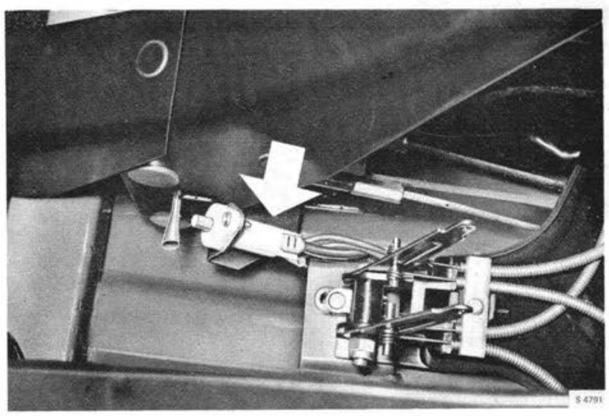


BACK-UP LIGHT SWITCH, AUTOMATIC TRANSMISSION

As from 1980 model cars with automatic transmission have the "reversing light/start interlock relay" contact mounted in the gear selector lever housing.

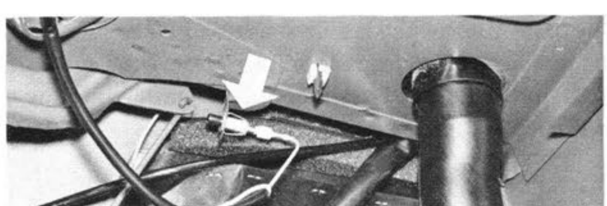


The switch that operates the handbrake warning light is located on the right of the handbrake lever under the console and is actuated by the movement of the handbrake lever.



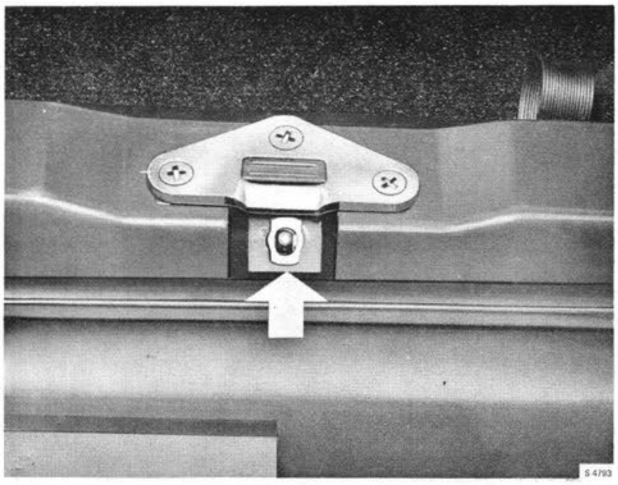
HANDBRAKE WARNING LIGHT SWITCH

The switch that operates the trunk light is on Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS located at the left hinge of the trunk lid.



TRUNK LIGHT SWITCH, SAAB 99 (99 L), 99 L (99 GL) 99 GLE AND 99 EMS

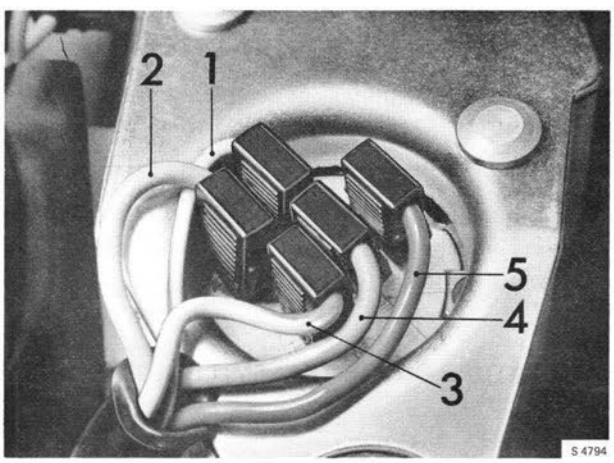
The switch that operates the trunk light is on Saab 99 Combi Coupé located at the rear door striker.



TRUNK LIGHT SWITCH SAAB 99 COMBI COUPE

IGNITION AND STARTER SWITCH

The ignition and starter switch is mounted in the gear lever housing. The switch has five terminals and the wires should be connected as shown below.



STARTER SWITCH

1. Brown/white to "54"
2. Yellow to "50"
3. Green/white to "15"
4. Gray to "30"
5. Red to "X"

LIGHTING RELAY

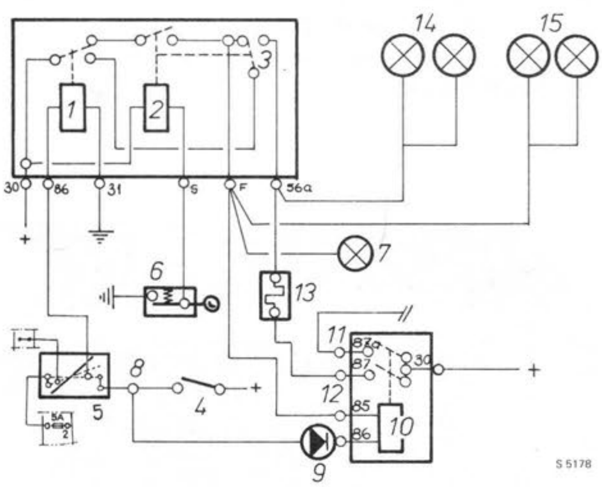
The lighting relay contains devices for flashing the high beam and switching between high beam and low beam. Function (see wiring diagram):

If the ignition switch (4) and the light switch (5) are on, current will pass through relay coil (1). The coil contact is pulled down and connects either high or low beam via contact (3). Contact (3) can change position as it is mechanically influenced by the contact at relay coil (2). This coil is connected with the headlight dimmer and flasher switch (6) (i.e. the same lever as the direction indicator switch). If either the ignition switch or the light switch – or both – are switched off, the high beam signal can be used. The contact at coil (1) is then in the upper position and the high beam is connected through the contact at coil (2), which is grounded through the light switch.

TOWN LIGHT RELAY, AS FROM CHASSIS NOS. 99752023575 AND 99756007714 AND UP TO AND INCL. MODEL 1977

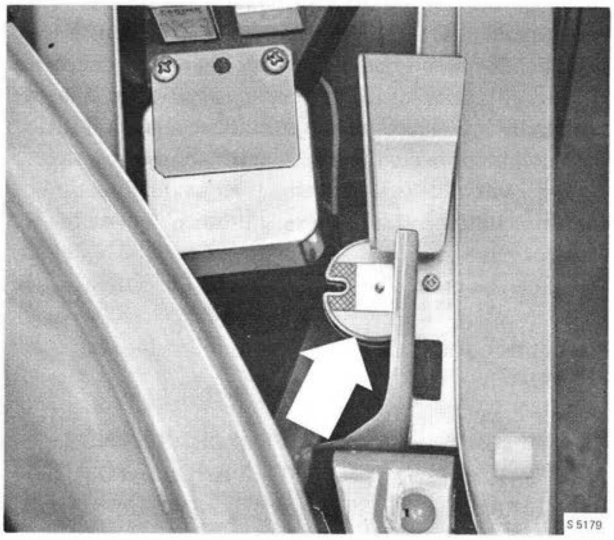
Function (see wiring diagram):

If the ignition switch (4) is on, current will flow through the town light relay coil (10). The contact (11, 12) is pulled down and the low-beam lights are connected via the resistor (13) which drops the voltage to around 10 V.



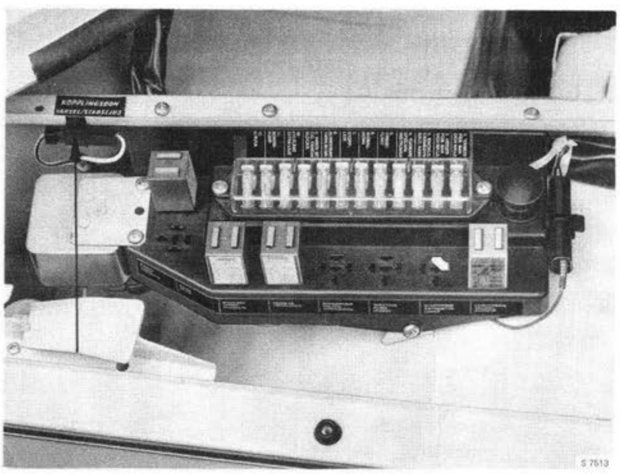
WIRING DIAGRAM, LIGHTING RELAY AND TOWN LIGHT RELAY

1, 2.	Relay coils
3.	Contact
4.	Ignition switch
5.	Light switch
6.	Low-beam/high-beam switch
7.	High-beam warning light
8.	Connecting piece
9.	Diode
10.	Relay coil
11, 12.	Switching contact
13.	Resistance
14.	Low beam
15.	High beam



RESISTANCE, TOWN LIGHT TO AND INCL. MODEL 1977

The town lights can be disconnected by removing the town light relay. The relay is located at the fusebox and is marked "EXTRA" on the panel.
As from model 1978, the town lights are incorporated in the parking lights.

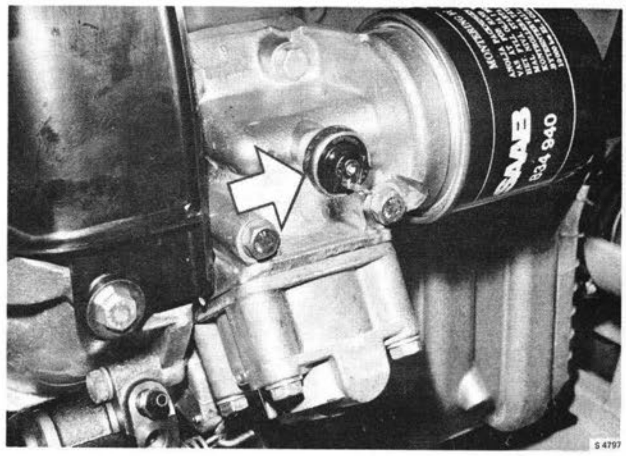


CONNECTION PIECE TOWN LIGHT AS FROM MODEL 1978

The 1978 and 1979 models have the day-light in the combination light unit.
As from 1980 model the day-light has been re-introduced in the form of a reduced dipped beam. The day-light resistance has, however, been replaced by a re-designed wiring harness which provides the required resistance.

OIL PRESSURE SWITCH

The oil pressure switch is located on the oil pump spacing piece. On earlier car models, the switch is located on the cylinder block below the water pump.



OIL PRESSURE SWITCH

Removing

1. Pull off the connecting wire.
2. Unscrew the oil pressure switch (width across flats 7/16").

Installing

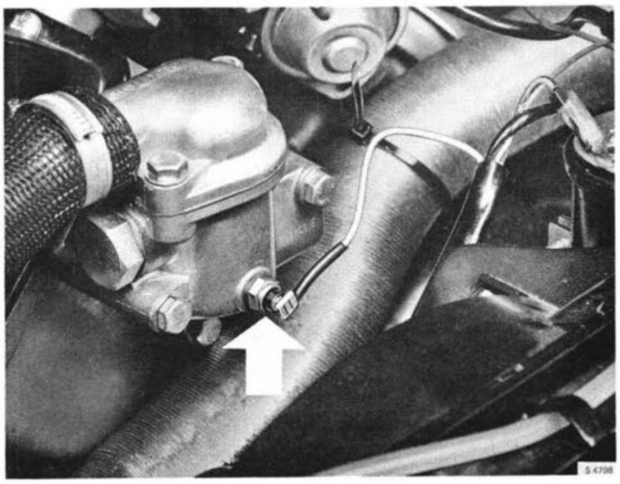
> NOTE
> Coat the threads with sealant compound before installing.

1. Screw in the oil pressure switch and tighten to 12–15 Nm (9–11 ft.lb., 1.2–1.5 kpm) torque.
2. Connect the wire.

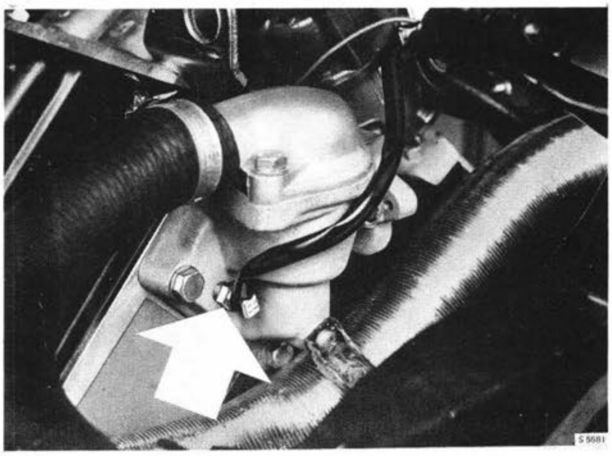
TEMPERATURE GAUGE TRANSMITTER

Remove

1. Drain the radiator and engine coolant system.
2. Pull off the connecting wire.
3. Unscrew the transmitter (width across flats 1/2").



TEMPERATURE GAUGE TRANSMITTER, UP TO AND INCL. MODEL 1976



TEMPERATURE GAUGE TRANSMITTER, AS FROM MODEL 1977

Installing

1. Screw in the transmitter.
2. Connect the wire.
3. Fill the system with coolant.
4. Warm up the engine and check the temperature transmitter deflection.
5. Check the coolant level and top up if necessary.

WARNING SYSTEM FOR UNFASTENED SEAT BELT

A warning lamp on the instrument panel lights up if the driver and/or the front seat passenger has not fastened his seat belt.
The following components are included in the warning system:
Warning lamp – in the middle of the panel
Belt contact – in the flap lock
Seat contact – in the passenger seat
Model 1975:
Handbrake contact (manual transmission)
Gear selector lever contact (automatic transmission)

The lamp lights up in the following cases:
If the ignition is on and, on model 1975, the handbrake (on cars with manual transmission) is released or the gear selector lever (on cars with automatic transmission) is moved from the "P" position and:
a. the driver has not fastened his seat belt
b. the front seat passenger actuates the seat contact but has not fastened his seat belt.

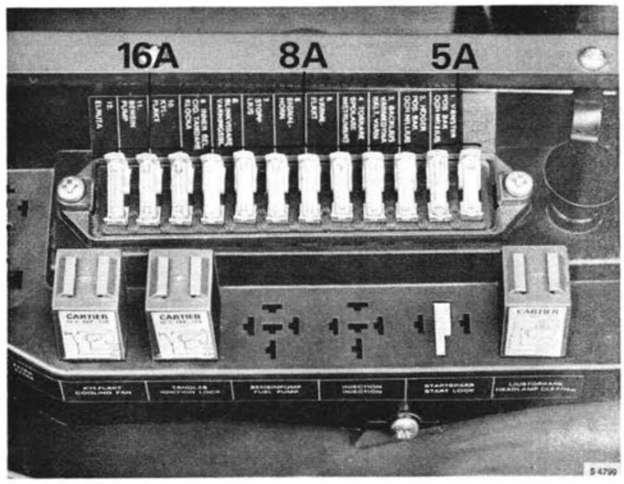
WIRING AND FUSES

WIRING

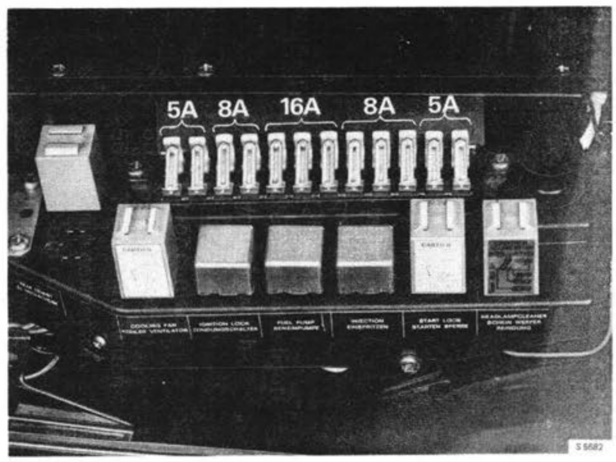
The wiring conducts current from the battery or alternator to the various items of electrical equipment. To protect the wiring and reduce the risk of short circuits, the wires have been grouped wherever possible in cable networks, i.e. a number of independently insulated wires surrounded by an outer plastic sheath.

The wiring networks are divided into two groups, one at the dash panel and in the engine compartment, and the other leading to the rear end of the car. The connections of the wiring are illustrated in the wiring diagram; it should not be too diffucult to remove or install wires if this diagram is used as a guide. The wires in a cable network are color coded.

The wires terminate in solderless AMP connectors. Check that wiring is properly connected to avoid undue potential drop. The insulation of the cable network should be tested if fuses blow frequently and damage to the insulation is suspected. Note that a fuse will not blow if a short occurs between it and the source of current. When installing new wiring, always take special care to make sure that the size of wire chosen can handle the current load for which it is intended, and that the wiring is well protected from wear and damage at points where it passes through steel partitions or is held by clamps.



FUSE BOX WITH FUSES, UP TO AND INCL. MODEL 1976



FUSE BOX WITH FUSES, AS FROM MODEL 1977

FUSES

To protect wiring, etc. against abnormally heavy current loads, e.g. in the event of a short circuit, and to reduce the fire hazard if this should occur, the electrical system is provided with fuses grouped in a fuse box on the right wheel housing in the engine compartment. All parts of the system are fused except the headlights and the ignition system. A label by the fuse box shows which fuses protect which circuits.

In addition to these fuses there is a 3-amp fuse for the headlight wiper system, placed in a separate holder.

> IMPORTANT
>
> As 3A, 5A, 8A and 16A fuses are the same length, there is a risk that they may be confused. If a heavier fuse than the correct one should be fitted by mistake, there will be a risk of electrical components and wires being damaged.

> NOTE
>
> Always check when putting in a new fuse that it makes proper contact. If a break in any circuit is suspected, check the fuse contacts first. If the test is made with a voltmeter, the maximum permitted potential drop is 0.1 V.

WIRING DIAGRAM, MODEL 1975

Details of wiring diagram, see p. 371–4 and 371–5.

1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, low beam
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up light contact
32. Back-up lights
33. Choke warning light
34. Choke control contact
35. Ventilator fan switch

COLOR CODE

BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

4 GR 1.5

CABLE CROSS-SECTION, MM^2

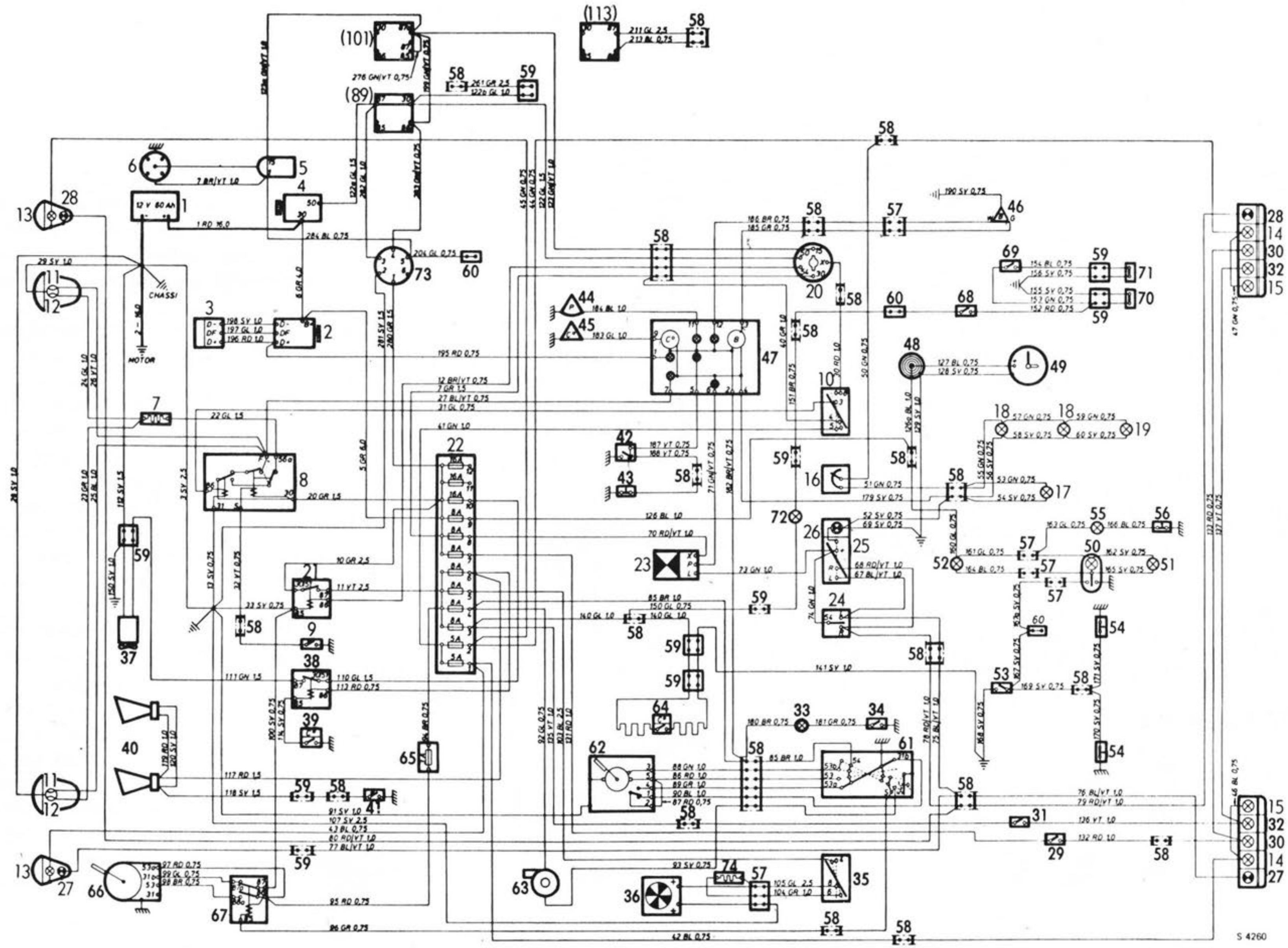
COLOR OF CABLE

CABLE REF.NO.

36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater.
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay
68. Handbrake contact
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R

Not in Great Britain

72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
89. Space for start inhibitor relay
101. Space for safety relay
113. Space for relay for electrically heated rear window



WIRING DIAGRAM, MODEL 1975

SAAB

DETAILS OF WIRING DIAGRAM, MODEL 1975

5. Ignition coil
15. Number plate light
18. Instrument panel light
20. Ignition switch
22. Fuse box
55. Trunk light
56. Trunk light switch
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
88. Gear selector switch
89. Start inhibitor relay
90. Start inhibitor and back-up light switch
91. Gear indicator light
92. Thermo-time switch
93. Air flow sensor switch
94. Cold start valve
95. Auxiliary air valve
96. Warm-up regulator
101. Safety relay
102. Pump relay
103. Fuel pump
110. Tachometer
113. Relay, electrically heated rear window
114. Switch, electrically heated rear window
115. Electrically heated rear window
116. Center panel light

COLOR CODE

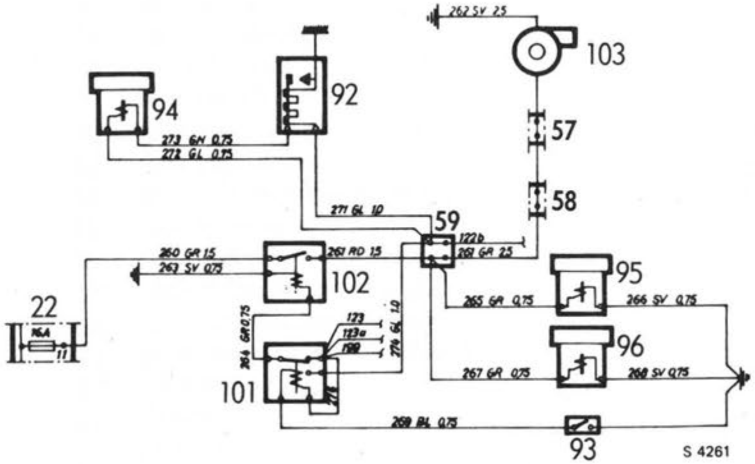
BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

4 GR 1.5

CABLE CROSS-SECTION, MM^2

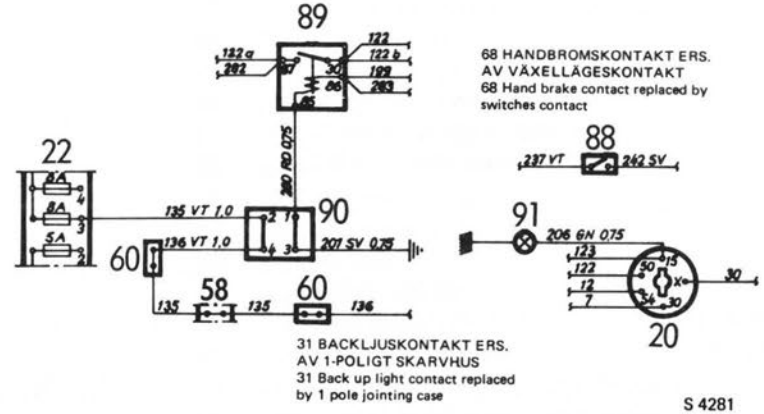
COLOR OF CABLE

CABLE REF.NO.



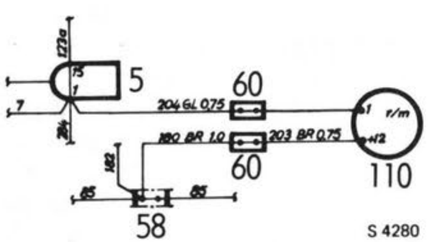
S 4261

DETAILS OF WIRING DIAGRAM, INJECTION ENGINE



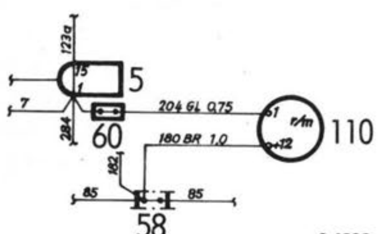
S 4281

DETAILS OF WIRING DIAGRAM, AUTOMATIC TRANSMISSION



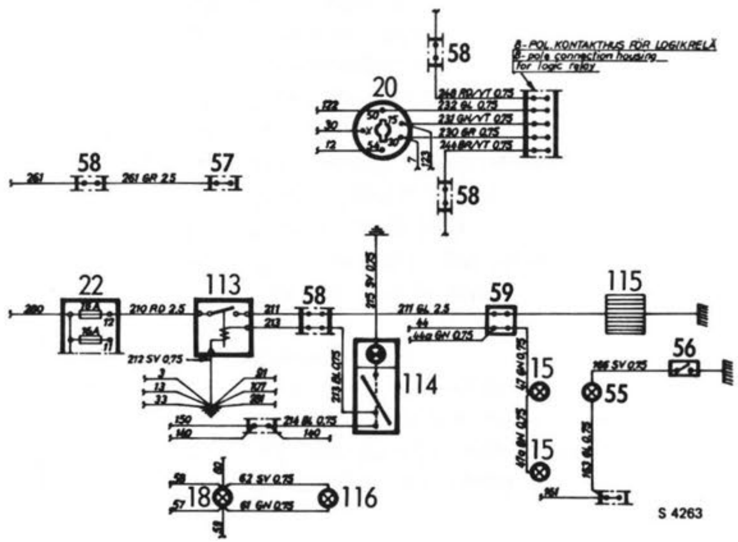
S 4280

DETAILS OF WIRING DIAGRAM, SAAB 99 EMS, LHD-CAR



S 4296

DETAILS OF WIRING DIAGRAM, SAAB 99 EMS, RHD-CAR



S 4263

DETAILS OF WIRING DIAGRAM, SAAB 99 COMBI COUPE

SAAB

WIRING DIAGRAM, MODEL 1976

Details of wiring diagram, see p. 371–8 and 371–9.

1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, town light
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up lights contact
32. Back-up lights
33. Choke warning light
34. Choke control contact
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor

COLOR CODE

BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

4 GR 1,5

CABLE CROSS-SECTION, MM^2

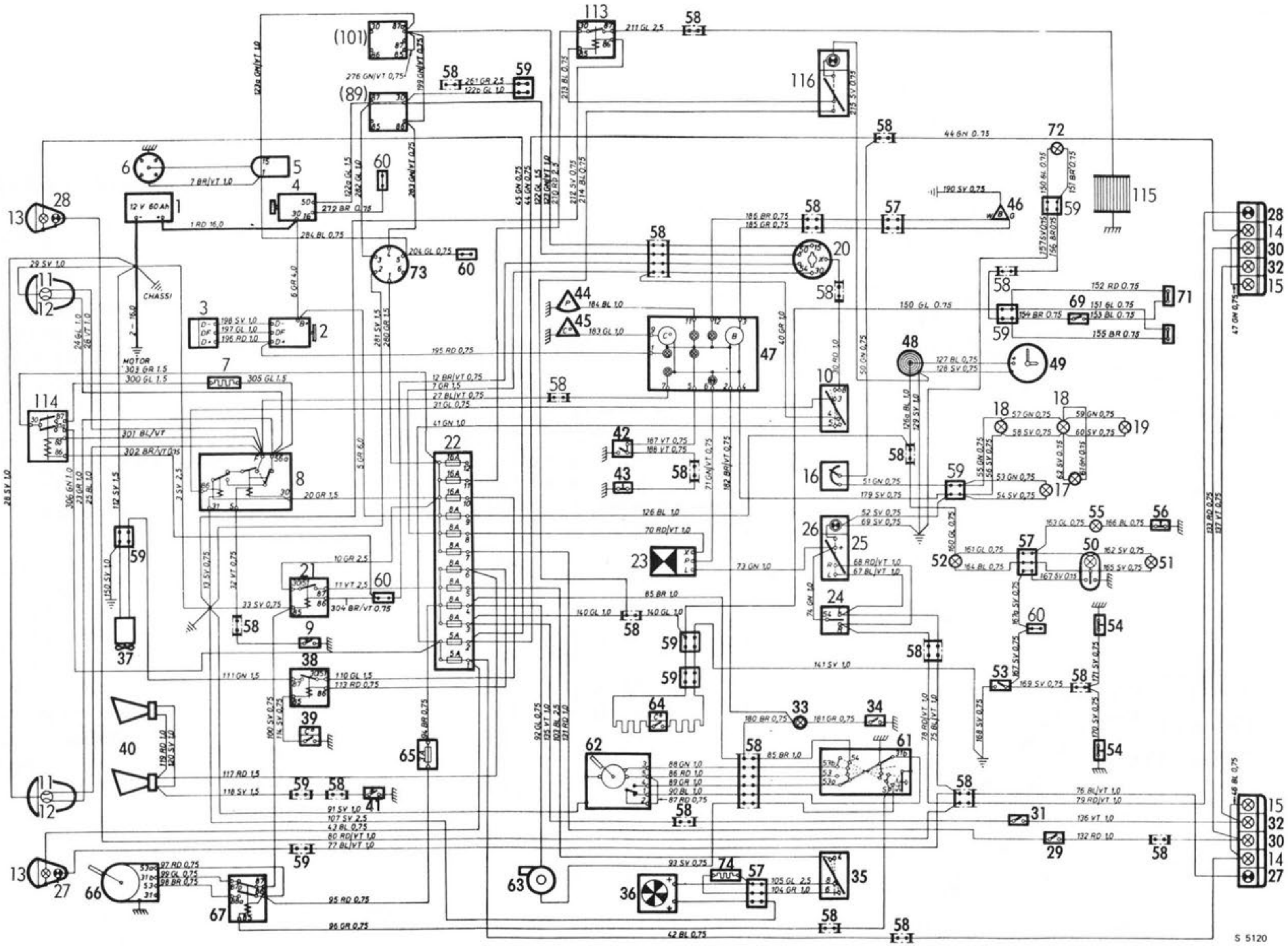
COLOR OF CABLE

CABLE REF.NO.

38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater.
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay

   (65–67: Not in Great Britain)
68. Handbrake contact
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
89. Space for start inhibitor relay
101. Space for safety relay
113. Relay for electrically heated rear window
114. Relay, town light
115. Electrically heated rear window
116. Switch, electrically heated rear window

SAAB



WIRING DIAGRAM, MODEL 1976

DETAILS OF WIRING DIAGRAM, MODEL 1976

4. Starter
5. Ignition coil
14. Tail light
15. Number plate light
20. Ignition switch
22. Fuse box
54. Door contact
55. Trunk light
56. Trunk light switch
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
89. Start inhibitor relay
90. Start inhibitor and back-up light switch
91. Gear indicator light
92. Thermo-time switch
93. Air flow sensor switch
94. Cold start valve
95. Auxiliary air valve
96. Warm-up regulator
101. Safety relay
102. Pump relay
103. Fuel pump
110. Tachometer
115. Electrically heated rear window

COLOR CODE

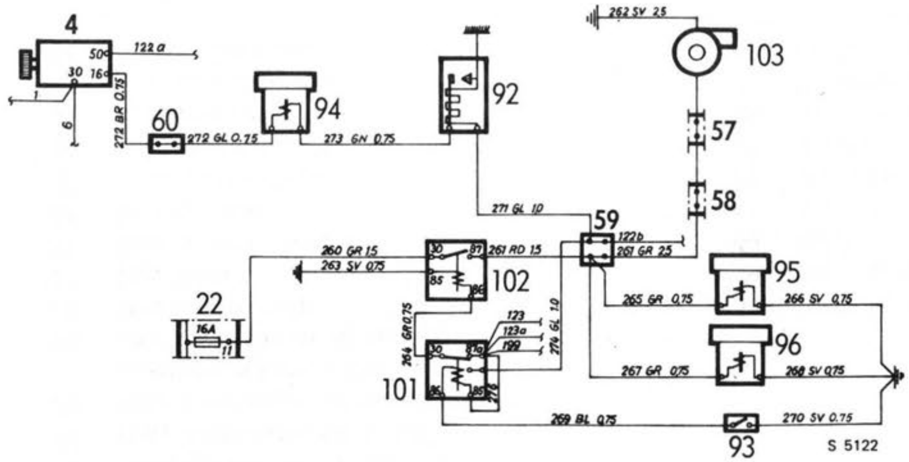
BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

4 GR 1,5

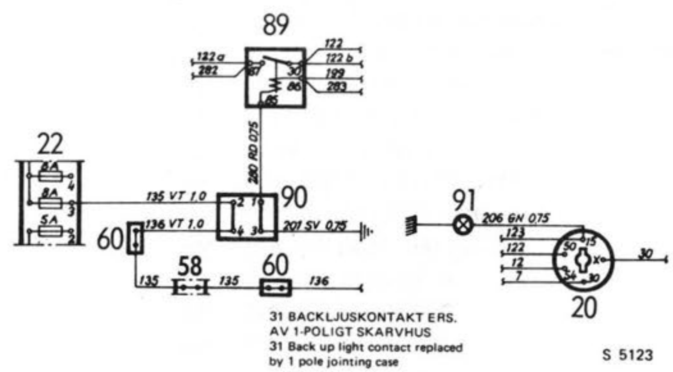
CABLE CROSS-SECTION, MM^2

COLOR OF CABLE

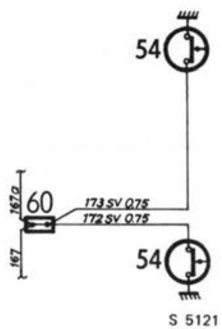
CABLE REF.NO.



DETAILS OF WIRING DIAGRAM, INJECTION

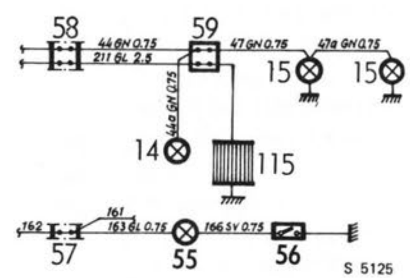


DETAILS OF WIRING DIAGRAM, AUTOMATIC TRANSMISSION

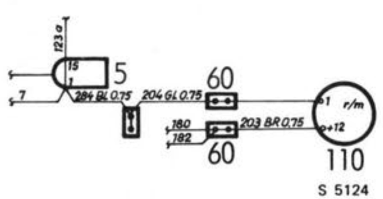


DETAILS OF WIRING DIAGRAM, 4-DOOR CARS

DETAILS OF WIRING DIAGRAM, SAAB 99 EMS, RHD-CAR



DETAILS OF WIRING DIAGRAM, SAAB 99 COMBI COUPE



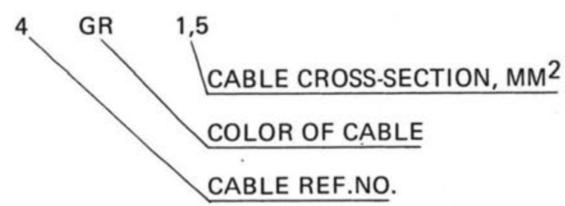
DETAILS OF WIRING DIAGRAM, SAAB 99 EMS, LHD-CAR

WIRING DIAGRAM, MODEL 1977

Details of wiring diagram, see p. 371–14 and 371–15.

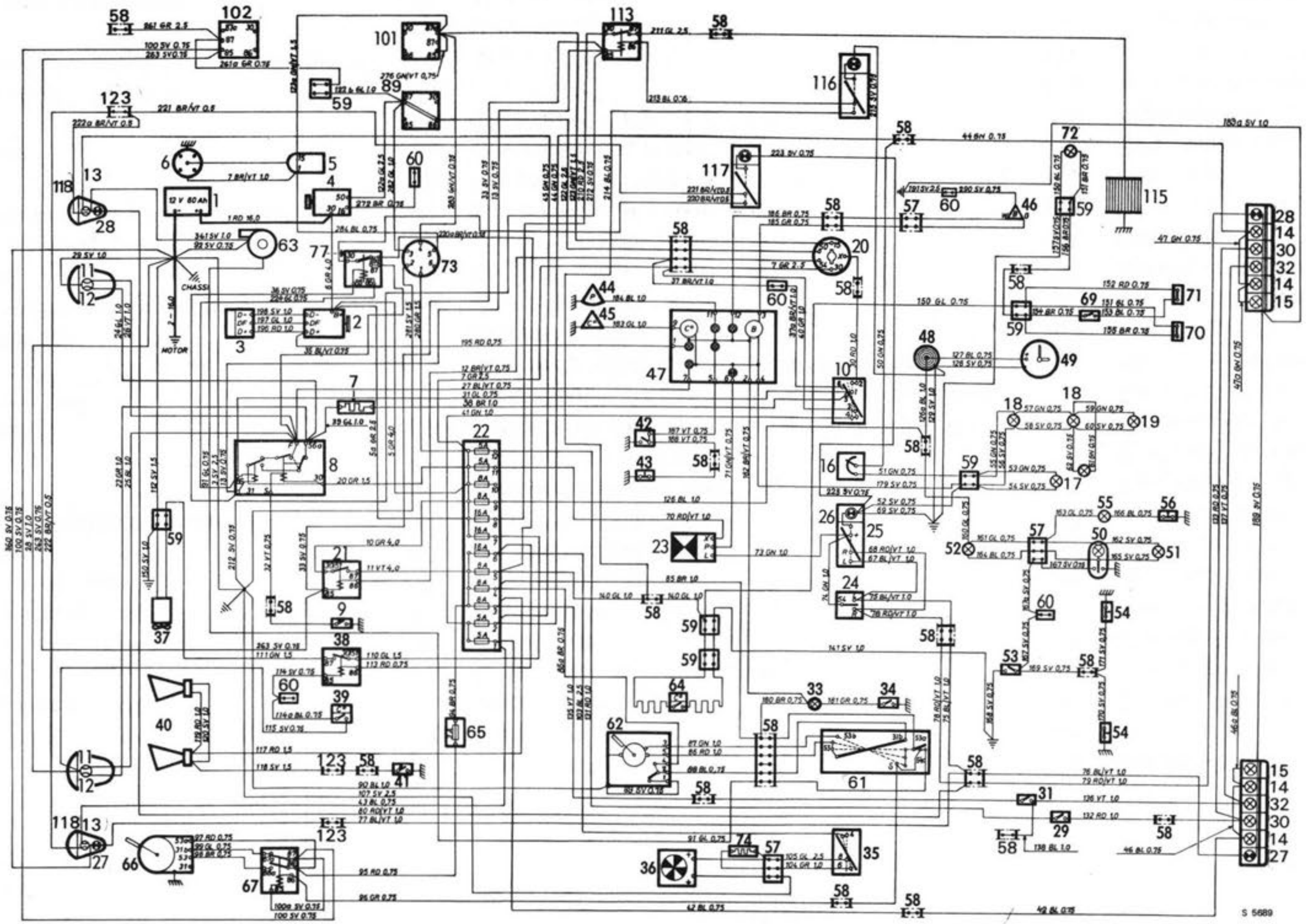
COLOR CODE

BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE



1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, town light
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up light contact
32. Back-up lights
33. Choke warning light
34. Choke control contact
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater.
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay
68. Handbrake contact
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
77. Relay, cornering light
89. Space for start inhibitor relay
101. Space for safety relay
113. Relay for electrically heated rear window
115. Electrically heated rear window
116. Switch, electrically heated rear window
117. Switch, cornering light
118. Cornering light

SAAB

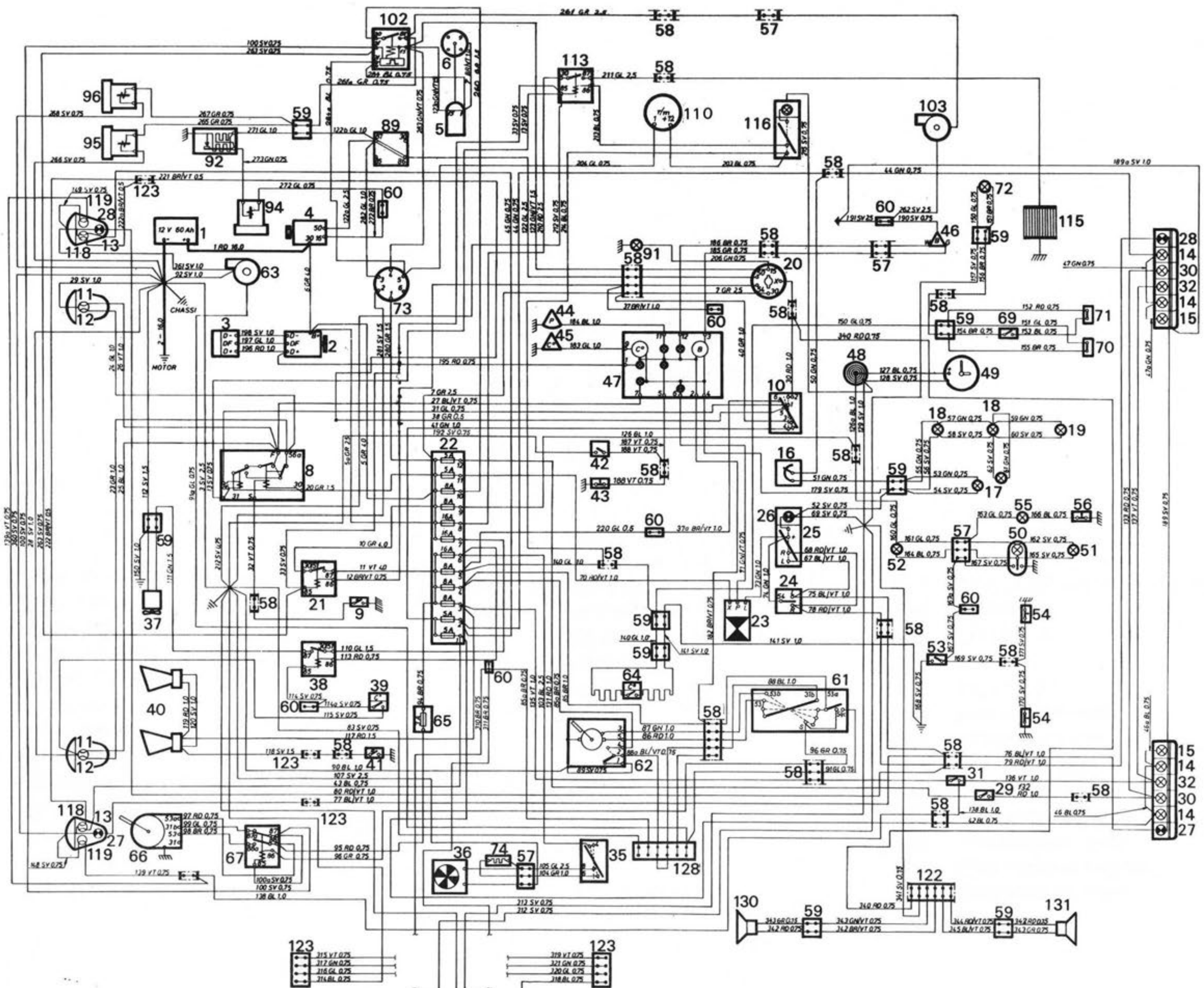


WIRING DIAGRAM, MODEL 1977

SAAB

WIRING DIAGRAM, SAAB 99 GLE, MODEL 1977

1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, town light
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch,headlight flasher and dimmer
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up lights contact
32. Back-up lights
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay
68. Handbrake contact
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
77. Relay, cornering light
83. Interval relay, windshield wipers
89. Start inhibitor relay
90. Start inhibitor and back-up light switch
91. Gear indicator light
92. Thermo-time switch
93. Air flow sensor switch
94. Cold start valve
95. Auxiliary air valve
96. Warm-up regulator
101. Safety relay
102. Pump relay
103. Fuel pump
113. Relay, electrically heated rear window
115. Electrically heated rear window
116. Switch, electrically heated rear window
117. Switch, cornering light
118. Cornering light
119. Side reversing light
120. Seat heating element with thermostat
121. Seat contact, heating element
122. 8-pole connector
123. 4-pole connector
124. Switch, electrically controlled outer mirror, L
125. Switch, electrically controlled outer mirror, R
126. Electrically controlled outer mirror, L
127. Electrically controlled outer mirror, R
130. Loud speaker, L
131. Loud speaker, R



S 5980

WIRING DIAGRAM, SAAB 99 GLE, MODEL 1977

DETAILS OF WIRING DIAGRAM, MODEL 1977

4. Starter
5. Ignition coil
14. Tail light
15. Number plate light
20. Ignition switch
22. Fuse box
54. Door contact
55. Trunk light
56. Trunk light switch
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector

COLOR CODE

BL	BLUE
GR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

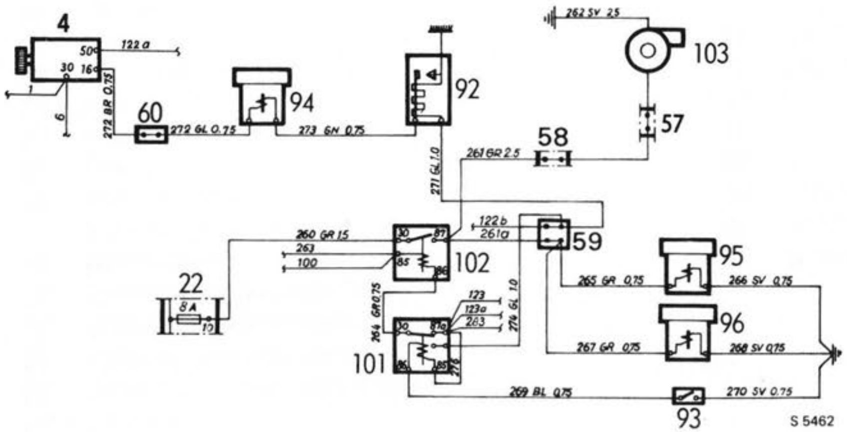
89. Start inhibitor relay
90. Start inhibitor and back-up light switch
91. Gear indicator light
92. Thermo-time switch
93. Air flow sensor switch
94. Cold start valve
95. Auxiliary air valve
96. Warm up regulator
101. Safety relay
102. Pump relay
103. Fuel pump
110. Tachometer
115. Electrically heated rear window

4 GR 1,5

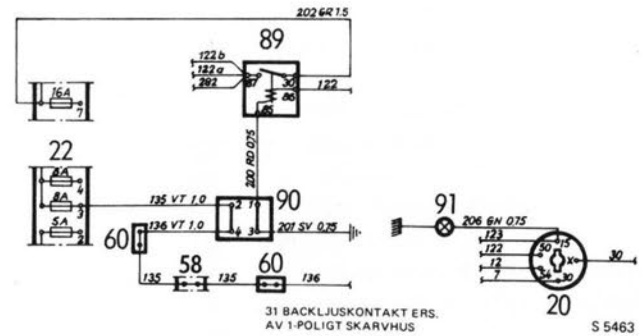
CABLE CROSS-SECTION, MM^2

COLOR OF CABLE

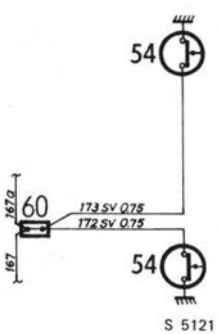
CABLE REF.NO.



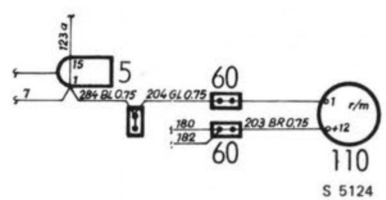
DETAILS OF WIRING DIAGRAM, FUEL INJ. ENGINE



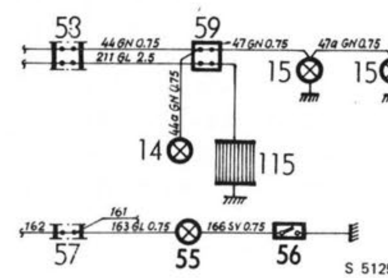
DETAILS OF WIRING DIAGRAM, AUTOMATIC TRANSMISSION



DETAILS OF WIRING DIAGRAM, 4-DOOR CAR



DETAILS OF WIRING DIAGRAM, SAAB 99 EMS



DETAILS OF WIRING DIAGRAM, SAAB 99 COMBI COUPE

WIRING DIAGRAM, MODEL 1978

Details of wiring diagram, see p. 371–22 and 371–23.

COLOR CODE

BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

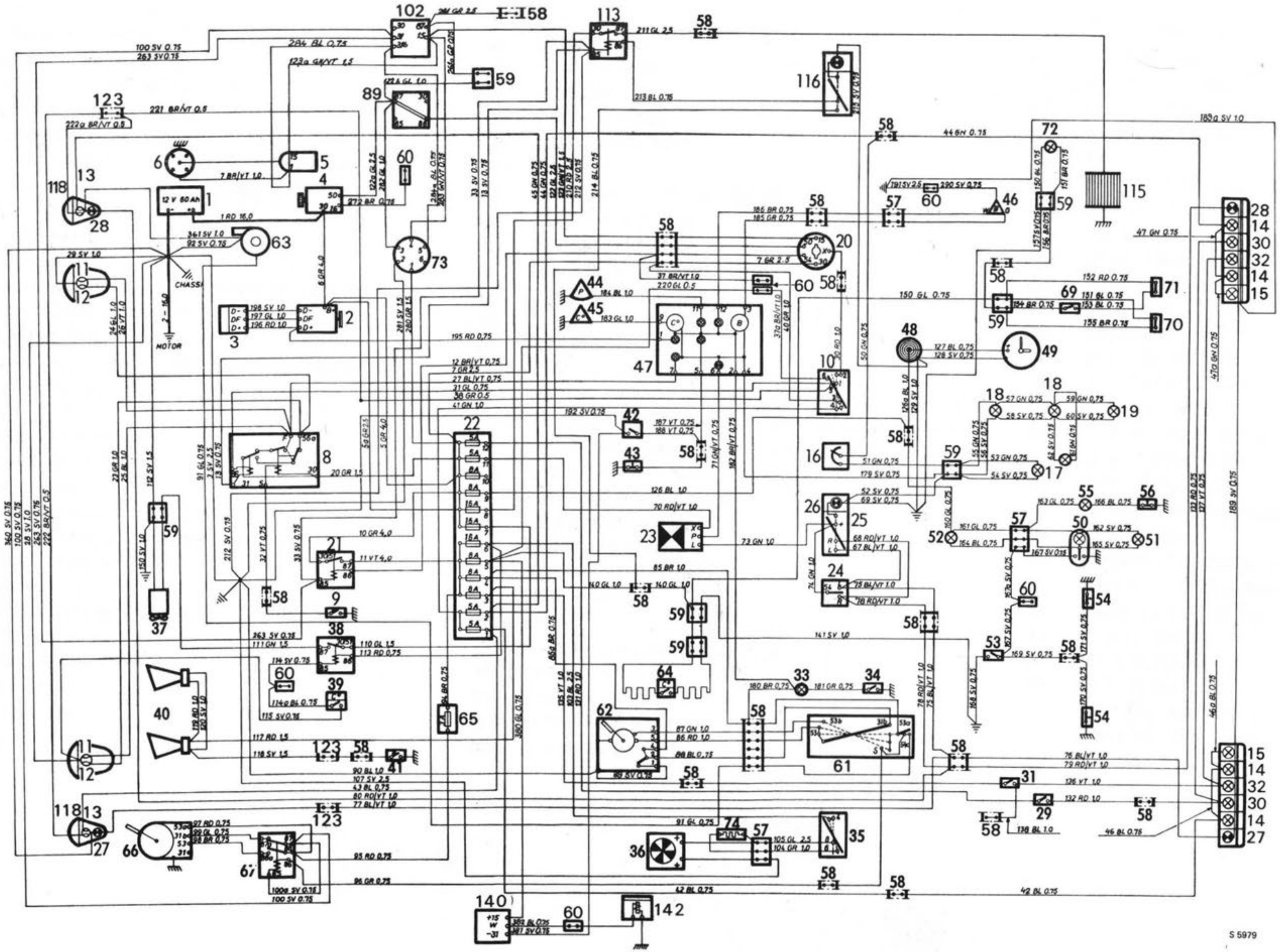
4 GR 1.5

1.5 — CABLE CROSS-SECTION, MM^2

GR — COLOR OF CABLE

4 — CABLE REF. NO.

1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, town light
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up light contact
32. Back-up lights
33. Choke warning light
34. Choke control contact
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater.
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
89. Space for start inhibitor relay
113. Relay for electrically heated rear window
115. Electrically heated rear window
116. Switch, electrically heated rear window
117. Switch, cornering light
118. Cornering light

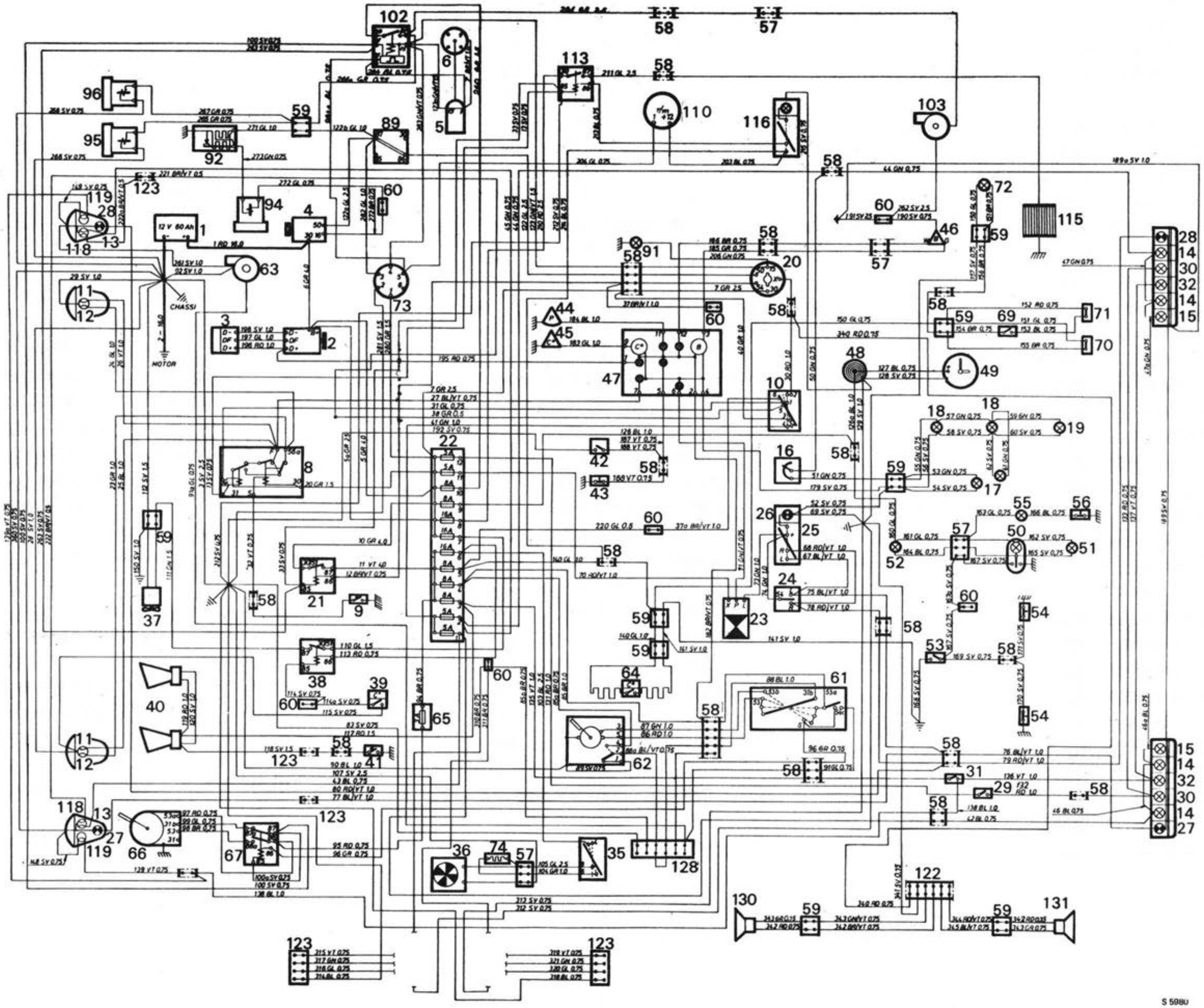


S 5979

WIRING DIAGRAM, MODEL 1978

WIRING DIAGRAM, SAAB 99 EMS, MODEL 1978

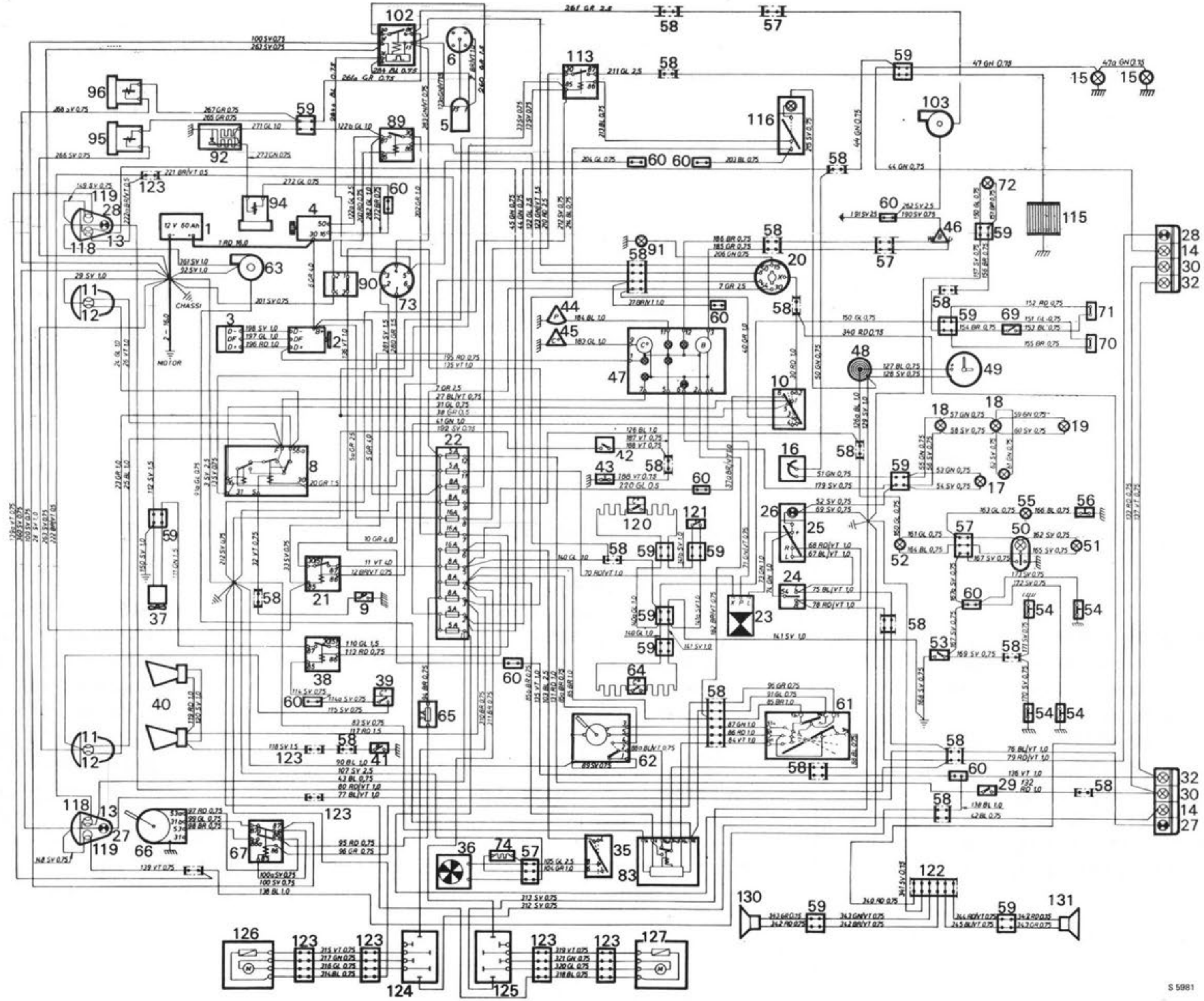
1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, town light
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch, headlight flasher and dimmer
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up lights contact
32. Back-up lights
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
87. Back-up light
89. Space for start inhibitor relay
91. Gear indicator light
92. Thermo-time switch
93. Air flow sensor switch
94. Cold start valve
95. Auxiliary air valve
96. Warm-up regulator
102. Fuel pump relay
103. Fuel pump
110. Tachometer
113. Relay, electrically heated rear window
115. Electrically heated rear window
116. Switch, electrically heated rear window
117. Switch, cornering light
118. Cornering light
122. 8-pole connector
123. 4-pole connector
128. 6-pole connector
130. Loud speaker, L
131. Loud speaker, R



WIRING DIAGRAM, SAAB 99 EMS, MODEL 1978

WIRING DIAGRAM, SAAB 99 GLE, MODEL 1978

1. Battery
2. Alternator
3. Voltage regulator
4. Starter motor
5. Ignition coil
6. Ignition distributor
7. Resistance, town light
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light
20. Ignition
21. Ignition relay
22. Fuse box
23. Direction indicator flasher unit
24. Direction indicator switch, headlight flasher and dimmer
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up lights contact
32. Back-up lights
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Temperature transmitter
46. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse hoider, headlight cleaning device
66. Headlight wiper motor
67. Headlight wiper motor relay
69. Seat contact
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
83. Interval relay, windshield wipers
87. Back-up light relay
89. Start inhibitor relay
90. Start inhibitor and back-up light switch
91. Gear indicator light
92. Thermo-time switch
93. Air flow sensor switch
94. Cold start valve
95. Auxiliary air valve
96. Warm-up regulator
102. Fuel pump relay
103. Fuel pump
113. Relay, electrically heated rear window
115. Electrically heated rear window
116. Switch, electrically heated rear window
117. Switch, cornering light
118. Cornering light
120. Seat heating element with thermostat
121. Seat contact, heating element
122. 8-pole connector
123. 4-pole connector
124. Switch, electrically controlled outer mirror, L
125. Switch, electrically controlled outer mirror, R
126. Electrically controlled outer mirror, L
127. Electrically controlled outer mirror, R
130. Loudspeaker, L
131. Loudspeaker, R



WIRING DIAGRAM, SAAB 99 GLE, MODEL 1978

SAAB

DETAILS OF WIRING DIAGRAM, MODEL 1978

4. Starter
14. Tail light
15. Number plate light
20. Ignition switch
22. Fuse box
54.. Door contact
55. Trunk light
56. Trunk light switch
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector

COLOR CODE

BL	BLUE
GR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

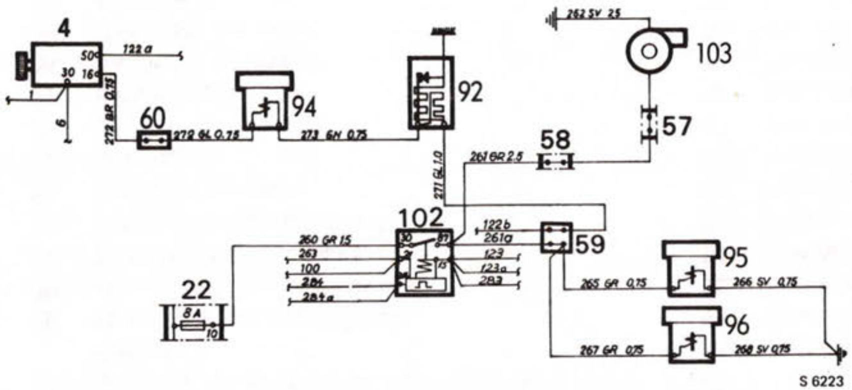
4 GR 1.5

CABLE CROSS-SECTION, MM^2

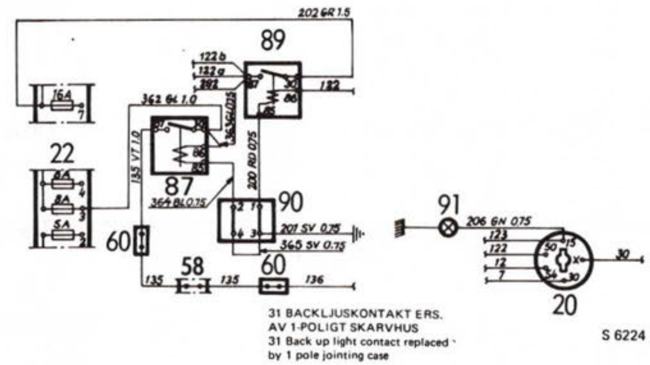
COLOR OF CABLE

CABLE REF. NO.

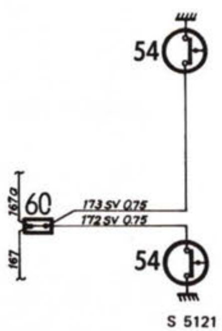
89. Start inhibitor relay
90. Start inhibitor and back-up light switch
91. Gear indicator light
92. Thermo-time switch
94. Cold start valve
95. Auxiliary air valve
96. Warm up regulator
102. Fuel pump relay
103. Fuel pump
115. Electrically heated rear window



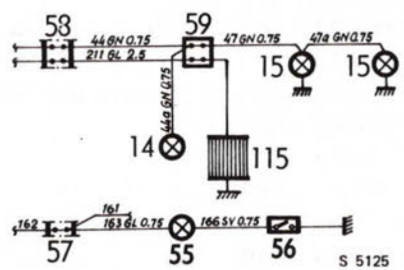
DETAILS OF WIRING DIAGRAM, FUEL INJECTION ENGINE



DETAILS OF WIRING DIAGRAM, AUTOMATIC TRANSMISSION



DETAILS OF WIRING DIAGRAM, 4-DOOR CAR

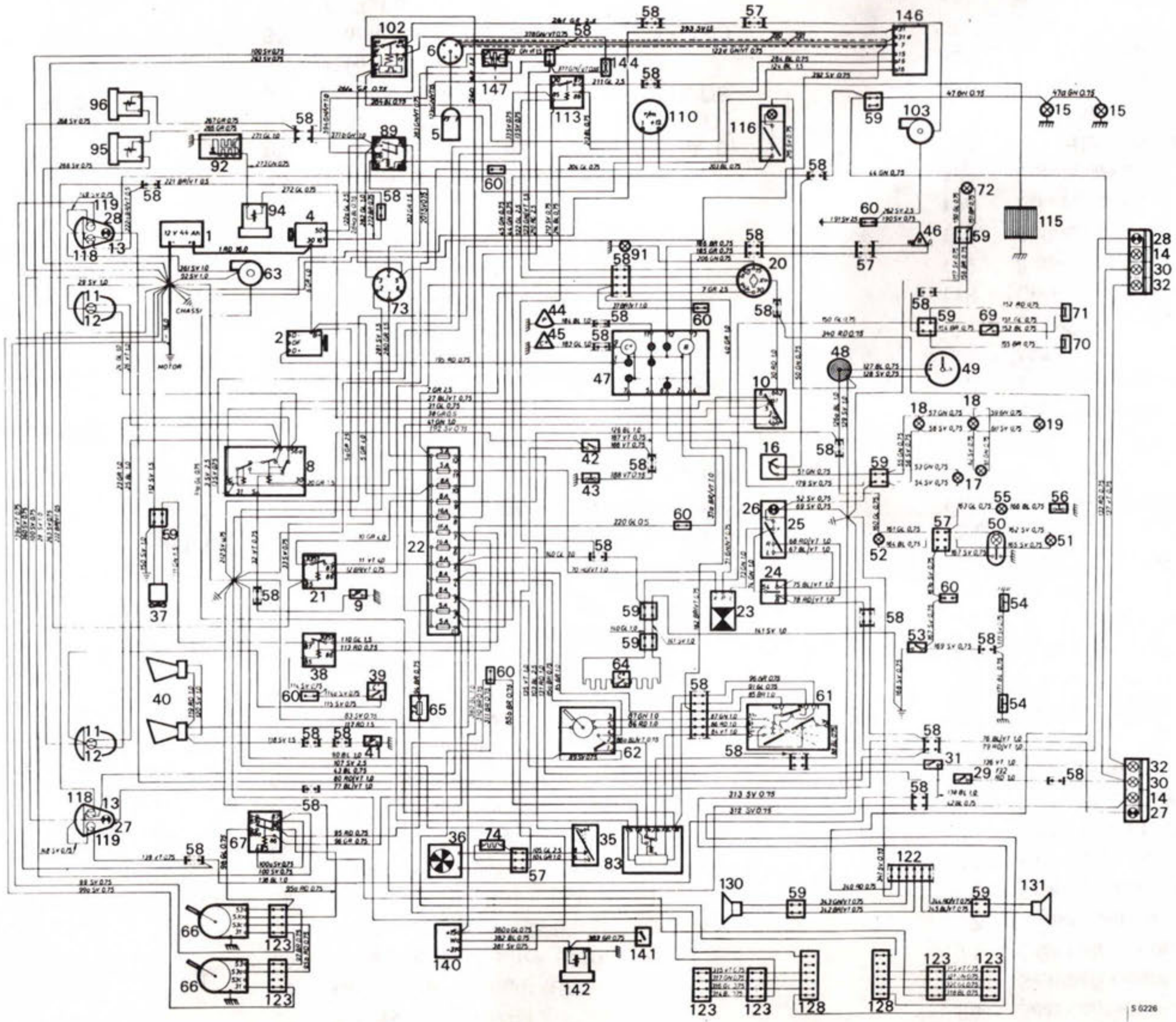


DETAILS OF WIRING DIAGRAM, SAAB 99 COMBI COUPE

WIRING DIAGRAM SAAB TURBO MODEL 1978

1. Battery
2. Alternator
4. Starter motor
5. Ignition coil
6. Ignition distributor
8. Lighting relay
9. Headlight dimmer/flasher switch
10. Light switch
11. High beam
12. Dimmed beam
13. Front parking light
14. Tail light
15. Number plate light
16. Resistance switch, instrument panel illumination
17. Switch light
18. Instrument panel light
19. Glove compartment and heater control light.
20. Ignition
21. Ignition relay
22. Fuse box
23. Flasher unit
24. Direction indicator switch, headlight flasher and dimmer
25. Hazard warning signal switch
26. Hazard warning signal repeater
27. Direction indicator lights, L
28. Direction indicator lights, R
29. Stop light contact
30. Stop lights
31. Back-up light contact
32. Back-up lights
35. Ventilator fan switch
36. Ventilator fan motor
37. Radiator fan motor
38. Radiator fan relay
39. Radiator fan thermostat contact
40. Horn
41. Horn contact
42. Brake warning contact
43. Handbrake contact
44. Oil warning contact
45. Fuel level transmitter
47. Combination instrument: fuel gauge, fuel warning light, temperature gauge, oil warning light, ignition light, brake warning light, high beam indicator light, direction indicator repeater
48. Cigarette lighter
49. Clock
50. Dome light, door pillar
51. Dome light, rear view mirror
52. Ignition switch light
53. Interior lighting switch
54. Door contact, interior lighting
55. Trunk light
56. Trunk light contact
57. 3-pin connector
58. 12-pin connector
59. 2-pin connector
60. 1-pin connector
61. Wiper and washer system switch
62. Windshield wiper
63. Washer motor
64. Seat heating element with thermostat
65. Fuse holder
66. Headlight washer motor
67. Headlight wiper motor relay
69. Seat contact, R
70. Seat belt contact, L
71. Seat belt contact, R
72. Warning light, seat belts
73. Service outlet, ignition setting
74. Resistance, low speed, fan
89. Socket for start inhibitor relay
92. Thermo-time switch
94. Cold start valve
95. Auxiliary air valve
96. Warm-up regulator
102. Pump relay
103. Fuel pump
110. Tachometer
113. Relay, electrically heated rear window
115. Electrically heated rear window
116. Switch, electrically heated rear window
117. Corner lamp switch
118. Cornering light
119. Side back-up light
122. 8-pole connector
123. 4-pole connector
130. Loud speaker, L
131. Loud speaker, R
140. Speed transmitter
141. Throttle valve switch
142. Magnet valve
144. Pressure switch
145. Electronic unit
147. Compensating resistance

SAAB



WIRING DIAGRAM SAAB 99 TURBO MODEL 1978

SAAB

Wiring Diagram Saab 99 GL model 1979

BL	Blue
BR	Brown
GL	Yellow
GN	Green
GR	Grey
RD	Red
SV	Black
VT	White
BL/VT	Blue/white
BR/VT	Brown/white
GN/VT	Green/white
RD/VT	Red/white

4 GR 1.5

Cable area in mm^2

Colour of cable

Cable ref. No.

1. Battery (B2)
2. Alternator (B3)
4. Starter motor (B2)
5. Ignition coil (B5)
6. Ignition distributor (A5)
8. Lighting relay (C7)
9. Headlight dimmer/flasher switch (F9)
10. Light switch (C8)
11. High beam (B1, E1)
12. Low beam (B1, E1)
13. Front parking light (A1, F1)
14. Tail light (A13, F13)
15. Number plate light (A13, F13)
16. Rheostat switch, instrument panel illumination (C11)
17. Switch light (D11)
18. Instrument panel light (D11)
19. Glove compartment and heater control lights (E11)
20. Ignition switch (B9)
21. Ignition switch relay (B6)
22. Fuse box,(C13, D5, D13)
23. Direction indicator flasher unit (F10)
24. Direction indicator switch (D10)
25. Hazard warning flasher switch (D10)

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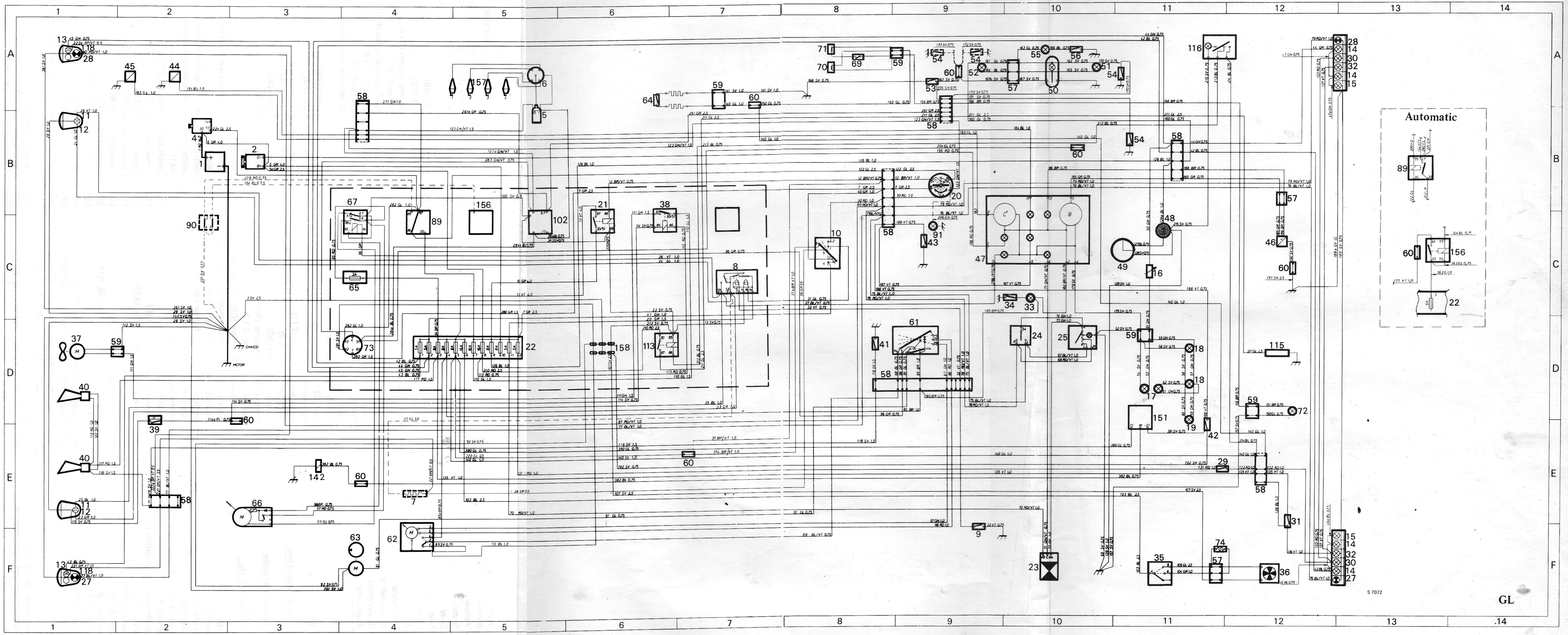
27. Direction indicator lights, L (F1, F13)
28. Direction indicator lights, R (A1, A13)
29. Brake light switch (E11)
30. Brake lights (A13, F13)
31. Reversing light switch (E12)
32. Reversing lights (A13, F13)
33. Choke warning light (C10)
34. Choke control switch (C10)
35. Ventilator fan switch (F11)
36. Ventilator fan motor (F12)
37. Radiator fan motor (D1)
38. Radiator fan relay (B6)
39. Radiator fan thermostat switch (E2)
40. Horn (D1, E1)
41. Horn switch (D8)
42. Brake warning switch (E11)
43. Handbrake switch (C9)
44. Oil warning switch (A2)
45. Temperature transmitter (A2)
46. Fuel level transmitter (C12)
47. Combination instrument (C9): fuel gauge, strål- fuel warning light, temperature gauge, oil warning light, charging light, brake warning light, high beam indicator light, direction indicator light
48. Cigarette lighter (C11)
49. Clock (C11)
50. Dome light, door pillar (A10)
51. Dome light, rear view mirror (A10)
52. Ignition switch light (A9)
53. Interior lighting switch (A9)
54. Door switch, interior lighting (A9, A11, B11)
55. Luggage compartment light (A10)
56. Luggage compartment light switch (A10)
57. 3-pole connector (A10, B12, C12, F11)
58. 12-pole connector (A4, B9, B11, C8, D8, D14, E2, E12)
59. 2-pole connector (A7, A9, B12, D2, D11, D12, F6, F7)
60. 1-pole connector (A7, A9, B10, C12, C13, D3, E4, E7)
61. Wiper system switch (D9, D14)
62. Windshield wiper motor (D13, F4)
63. Washer motor (E13, F4)
64. Seat heating element with thermostat (A6)
65. Fuse holder, headlight wiper (C4)
66. Headlight wiper motor (E3, F3)
67. Relay, headlight wiper motor (B4)
69. Seat contact (A8)
70. Seat belt contact, L (A8)
71. Seat belt contact, R (A8)
72. Lamp, seat belt warning system (D12)
73. Service outlet, ignition (D4)
74. Resistance, low speed, ventilator fan (F11)
83. Interval relay, wipers (D8, D13)
89. Start inhibitor relay (B13, C4)
90. Start inhibitor and reversing light switch (C2)
91. Selector indicator light (C9)
92. Thermo time switch (A3)
94. Starter valve (A4)
95. Auxiliary air regulator (B2)
96. Warming-up regulator (A2)
102. Fuel pump relay (C5)
103. Fuel pump (C12)
110. Tachometer (C11)
113. Relay, electrically heated rear window (D6)
115. Electrically heated rear window (D12)
116. Swithc, electrically heated rear window (A11)
117. Switch, corner lamp (C8, D8)
118. Corner lamp (A1, F1)
122. 8-pole connector (F7)
123. 4-pole connector (F7)
130. Loudspeaker, R (F8)
131. Loudspeaker, L (F6)
137. Throttle valve switch (E11)
142. Solenoid valve (E3)
144. Pressure switch (B5)
146. Electronic control unit, ignition system (A6)
147. Compensating resistor (A4)
151. Speed transmitter (E11)
156. Reversing light relay (B5, C13)
157. Spark plugs (A5)
158. Joint, earth cable (D6, E13)



WIRING DIAGRAM SAAB 99GL MODEL 1979

BL	Blue
BR	Brown
GL	Yellow
GN	Green
GR	Grey
RD	Red
SV	Black
VT	White
BL/VT	Blue/white
BR/VT	Brown/white
GN/VT	Green/white
RD/VT	Red/white

4 GR 1.5

Cable area in mm^2

Colour of cable

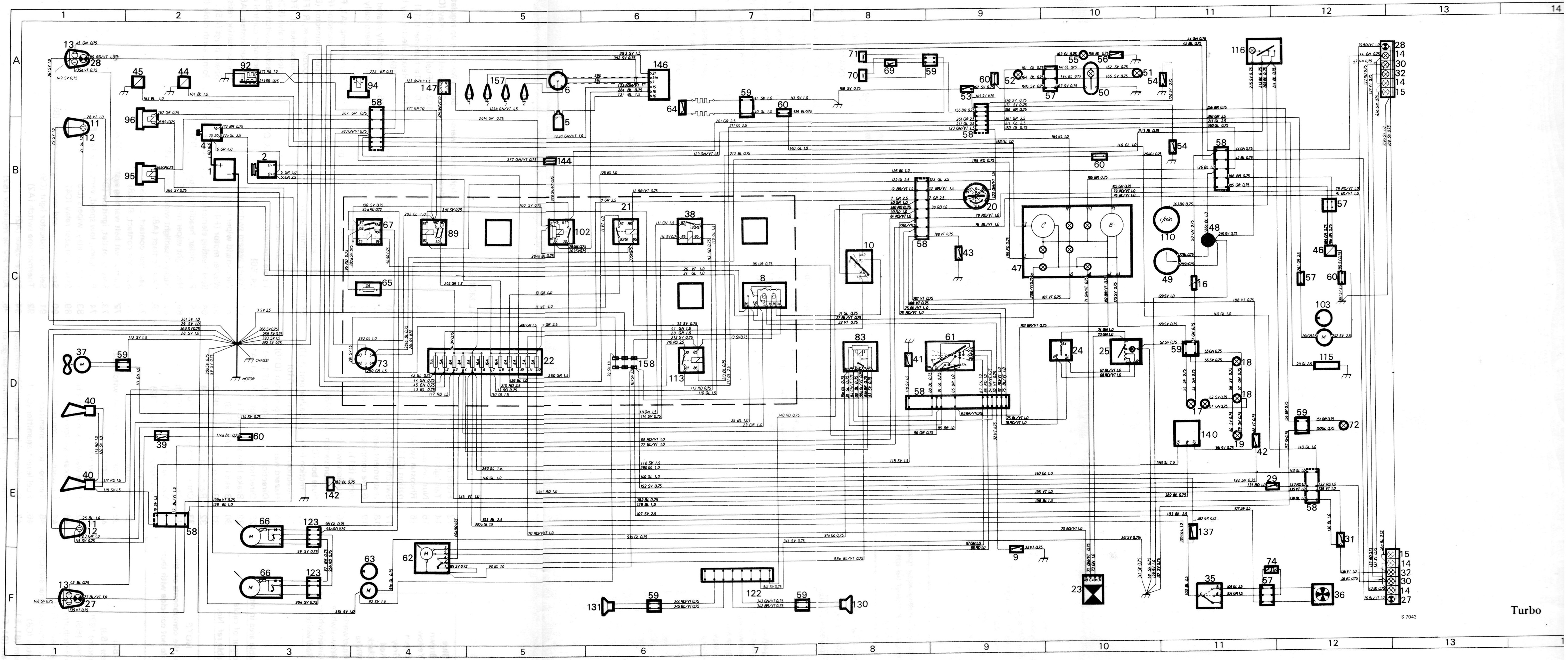
Cable ref. No.

SAAB

1. Battery (B2)
2. Alternator (B3)
4. Starter motor (B2)
5. Ignition coil (B5)
6. Ignition distributor (A5)
8. Lighting relay (C7)
9. Headlight dimmer/flasher switch (F9)
10. Light switch (C8)
11. High beam (B1, E1)
12. Low beam (B1, E1)
13. Front parking light (A1, F1)
14. Tail light (A13, F13)
15. Number plate light (A13, F13)
16. Rheostat switch, instrument panel illumination (C11)
17. Switch light (D11)
18. Instrument panel light (D11)
19. Glove compartment and heater control lights (E11)
20. Ignition switch (B9)
21. Ignition switch relay (B6)
22. Fuse box (C13, D5, D13)
23. Direction indicator flasher unit (F10)
24. Direction indicator switch (D10)
25. Hazard warning flasher switch (D10)
27. Direction indicator lights, L (F1, F13)
28. Direction indicator lights, R (A1, A13)
29. Brake light switch (E11)
30. Brake lights (A13, F13)
31. Reversing light switch (E12)
32. Reversing lights (A13, F13)
33. Choke warning light (C10)
34. Choke control switch (C10)
35. Ventilator fan switch (F11)
36. Ventilator fan motor (F12)
37. Radiator fan motor (D1)
38. Radiator fan relay (B6)
39. Radiator fan thermostat switch (E2)
40. Horn (D1, E1)
41. Horn switch (D8)
42. Brake warning switch (E11)
43. Handbrake switch (C9)
44. Oil warning switch (A2)
45. Temperature transmitter (A2)
46. Fuel level transmitter (C12)
47. Combination instrument (C9): fuel gauge, fuel warning light, temperature gauge, oil warning light, charging light, brake warning light, high beam indicator light, direction indicator light
48. Cigarette lighter (C11)
49. Clock (C11)
50. Dome light, door pillar (A10)
51. Dome light, rear view mirror (A10)
52. Ignition switch light (A9)
53. Interior lighting switch (A9)
54. Door switch, interior lighting (A9, A11, B11)
55. Luggage compartment light (A10)
56. Luggage compartment light switch (A10)
57. 3-pole connector (A10, B12, C12, F11)
58. 12-pole connector (A4, B9, B11, C8, D8, D14, E2, E12)
59. 2-pole connector (A7, A9, B12, D2, D11, D12, F6, F7)
60. 1-pole connector (A7, A9, B10, C12, C13, D3, E4, E7)

Wiper system switch (D9, D14)

62. Windshield wiper motor (D13, F4)
63. Washer motor (E13, F4)
64. Seat heating element with thermostat (A6)
65. Fuse holder, headlight wiper (C4)
66. Headlight wiper motor (E3, F3)
67. Relay, headlight wiper motor (B4)
69. Seat contact (A8)
70. Seat belt contact, L (A8)
71. Seat belt contact, R (A8)
72. Lamp, seat belt warning system (D12)
73. Service outlet, ignition (D4)
74. Resistance, low speed, ventilator fan (F11)
83. Interval relay, wipers (D8, D13)
89. Start inhibitor relay (B13, C4)
90. Start inhibitor and reversing light switch (C2)
91. Selector indicator light (C9)
92. Thermo time switch (A3)
94. Starter valve (A4)
95. Auxiliary air regulator (B2)
96. Warming-up regulator (A2)
102. Fuel pump relay (C5)
103. Fuel pump (C12)
110. Tachometer (C11)
113. Relay, electrically heated rear window (D6)
115. Electrically heated rear window (D12)
116. Swithc, electrically heated rear window (A11)
117. Switch, corner lamp (C8, D8)
118. Corner lamp (A1, F1)
122. 8-pole connector (F7)
123. 4-pole connector (F7)
130. Loudspeaker, R (F8)
131. Loudspeaker, L (F6)
137. Throttle valve switch (E11)
142. Solenoid valve (E3)
144. Pressure switch (B5)
146. Electronic control unit, ignition system (A6)
147. Compensating resistor (A4)
151. Speed transmitter (E11)
156. Reversing light relay (B5, C13)
157. Spark plugs (A5)
158. Joint, earth cable (D6, E13)



WIRING DIAGRAM SAAB 99 TURBO MODEL 1979

WIRING DIAGRAM SAAB 99 GL MODEL 1980

BL	Blue
BR	Brown
GL	Yellow
GN	Green
GR	Grey
RD	Red
SV	Black
VT	White
BL/VT	Blue/white
BR/VT	Brown/white
GN/VT	Green/white
RD/VT	Red/white

4 GR 1,5

Cable area in mm^2

Colour of cable

Cable ref. No.

NOTE

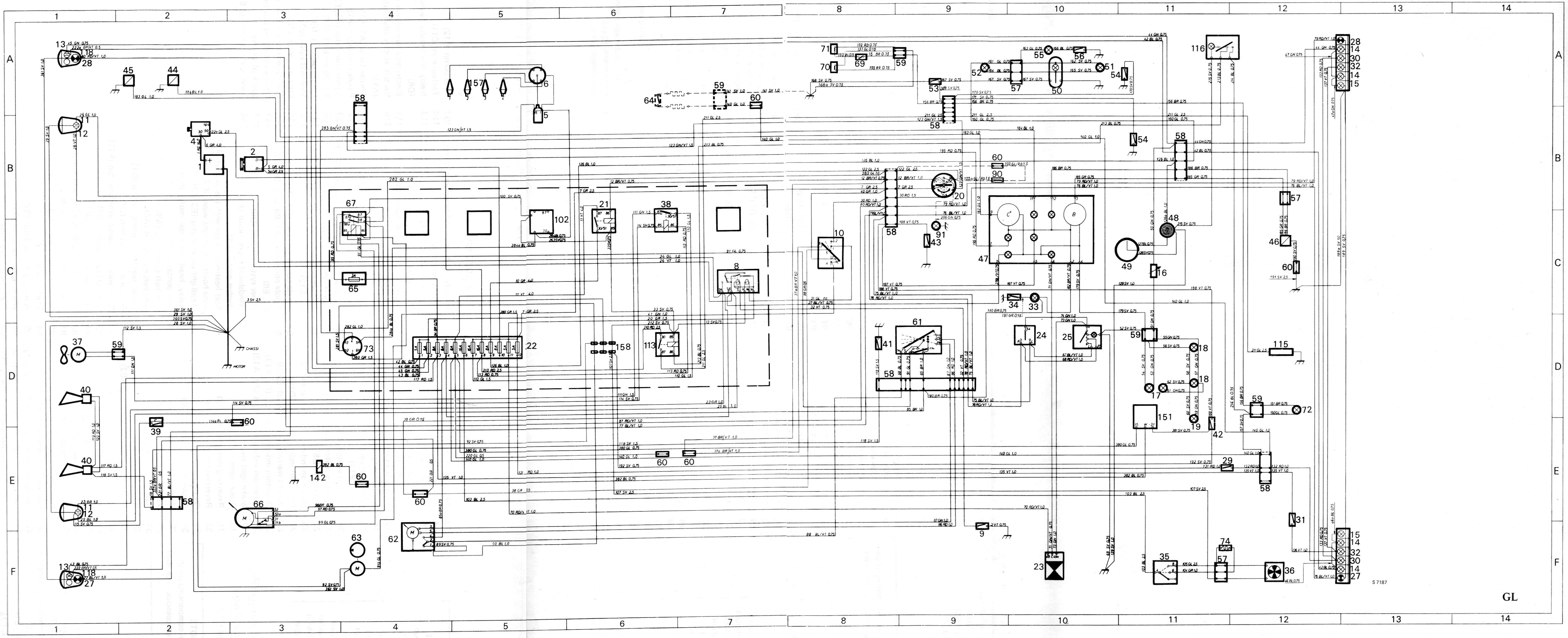
The positions of the components on the wiring diagram do not coincide with their siting in the car.

1. Battery (B2)
2. Alternator (B3)
4. Starter motro (B2)
5. Ignition coil (B5)
6. Ignition distributor (A5)
8. Lighting relay (C7)
9. Headlight dimmer/flasher switch (F9)
10. Light switch (C8)
11. High beam (B1, E1)
12. Low beam (B1, E1)
13. Front parking light (A1, F1)
14. Tail light (A13, F13)
15. Number plate light (A12, A13, F13)
16. Rheostat switch, instrument panel illumination (C11)
17. Switch light (D11)
18. Instrument panel light (D11)
19. Glove compartment and heater control lights (E11)
20. Ignition switch (B9)
21. Ignition switch relay (B6)
22. Fuse box (D5)
23. Direction indicator flasher unit (F10)
24. Direction indicator switch (D10)
25. Hazard warning flasher switch (D10)
27. Direction indicator lights, L (F1, F13)
28. Direction indicator lights, R (A1, A13)
29. Brake light switch (E11)
30. Brake lights (A13, F13)
31. Reversing light switch (E12)
32. Reversing lights (A13, F13)
33. Choke warning ligh (C10)
34. Choke control switch (C10)
35. Ventilator fan switch (F11)
36. Ventilator fan motor (F12)
37. Radiator fan motor (D1)
38. Radiator fan relay (B6)
39. Radiator fan thermostat switch (E2)
40. Horn (D1, E1)
41. Horn switch (D8)
42. Brake warning switch (E11)
43. Handbrake switch (C9)
44. Oil warning switch (A2)
45. Temperatur transmitter (A2)
46. Fuel level transmitter (C12)
47. Combination instrument (C9). fuel gauge, fuel warning light, temperature gauge, oil warning light, charging light, brake warning light, high beam indicator light, direction indicator light
48. Cigarette lighter (C11)
49. Clock (C11)
50. Dome light, rear view mirror (A10)
52. Ignition switch light (A9)
53. Interior lighting switch (A9)
54. Door switch, interior lighting (A11, B11)
55. Luggage compartment light (A10)
56. Luggage compartment light switch (A10)
57. 3-pole connector (A10, B12, F11)
58. 12-pole connector (A4, B9, B11, C8, D8, E2, E12)
59. 2-pole connector (D2, D11, D12)
60. 1-pole connector (A7, B9, C12, D3, D7, E4, E6)
61. Wiper system switch (D9)
62. Windshield wiper motor (F4)
63. Washer motor (F4)
64. Seat heating element with thermostat (A6)
65. Fuse holder, headlight wiper (C4, D5)
66. Headlight wiper motor (E3, F3)
67. Relay, headlight wiper motor (B4)
69. Seat contact (A8)
70. Seat belt contact, L (A8)
71. Seat belt contact, R (A8)
72. Lamp, seat belt warning system (D12)
73. Service outlet, ignition (D4)
74. Resistance, low speed, ventilator fan (F11)
83. Interval relay, wipers (D8)
89. Start inhibitor relay (C4)
90. Start inhibitor and reversing light switch (B9)
91. Selector indicator light (C9)
92. Thermo time switch (A2)
94. Starter valve (A2)
95. Auxiliary air regulator (B2)
96. Warming-up regulator (B2)

.02. Fuel pump relay (C5)

103. Fuel pump (C12)
110. Tachometer (C11)
113. Relay, electrically heated rear window (D6)
115. Electrically heated rear window (D12)
116. Switch, electrically heated rear window (A11)
118. Corner lamp (A1, F1)
122. 8-pole connector (F7)
123. 4-pole connector (E3, F3)
130. Loudspeaker, R (F8)
131. Loudspeaker, L (F6)
142. Solenoid valve (E3)
144. Pressure switch (B5)
146. Electronic control unit, ignition system (A6)
147. Compensating resistor (A4)
157. Spark plugs (A5)
158. Joint, earth cable (D6, E13)

SAAB



WIRING DIAGRAM SAAB 99 GL MODEL 1980

WIRING DIAGRAM SAAB 99 TURBO MODEL 1980

BL	
BL	Blå
BR	Brun
GL	Gul
GN	Grön
GR	Grå
RD	Röd
SV	Svart
VT	Vit
BL/VT	Blå/vit
BR/VT	Brun/vit
GN/VT	Grön/vit
RD/VT	Röd/vt

4 GR 1,5

Cable area in mm^2

Colour of cable

Cable ref. No.

NOTE

The positions of the components on the wiring diagram do not coincide with their siting in the car.

1. Battery (B2)
2. Alternator (B3)
4. Starter motro (B2)
5. Ignition coil (B5)
6. Ignition distributor (A5)
8. Lighting relay (C7)
9. Headlight dimmer/flasher switch (F9
10. Light switch (C8)
11. High beam (B1, E1)
12. Low beam (B1, E1)
13. Front parking light (A1, F1)
14. Tail light (A13, F13)
15. Number plate light (A12, A13, F13)
16. Rheostat switch, instrument panel illumination (C11)
17. Switch light (D11)
18. Instrument panel light (D11)
19. Glove compartment and heater control lights (E11)
20. Ignition switch (B9)
21. Ignition switch relay (B6)
22. Fuse box (D5)
23. Direction indicator flasher unit (F10)
24. Direction indicator switch (D10)
25. Hazard warning flasher switch (D10)
27. Direction indicator lights, L (F1, F13)
28. Direction indicator lights, R (A1, A13)
29. Brake light switch (E11)
30. Brake lights (A13, F13)
31. Reversing light switch (E12)
32. Reversing lights (A13, F13)
33. Choke warning ligh (C10)
34. Choke control switch (C10)
35. Ventilator fan switch (F11)
36. Ventilator fan motor (F12)
37. Radiator fan motor (D1)
38. Radiator fan relay (B6)
39. Radiator fan thermostat switch (E2)
40. Horn (D1, E1)
41. Horn switch (D8)
42. Brake warning switch (E11)
43. Handbrake switch (C9)
44. Oil warning switch (A2)
45. Temperatur transmitter (A2)
46. Fuel level transmitter (C12)
47. Combination instrument (C9). fuel gauge, fuel warning light, temperature gauge, oil warning light, charging light, brake warning light, high beam indicator light, direction indicator light
48. Cigarette lighter (C11)
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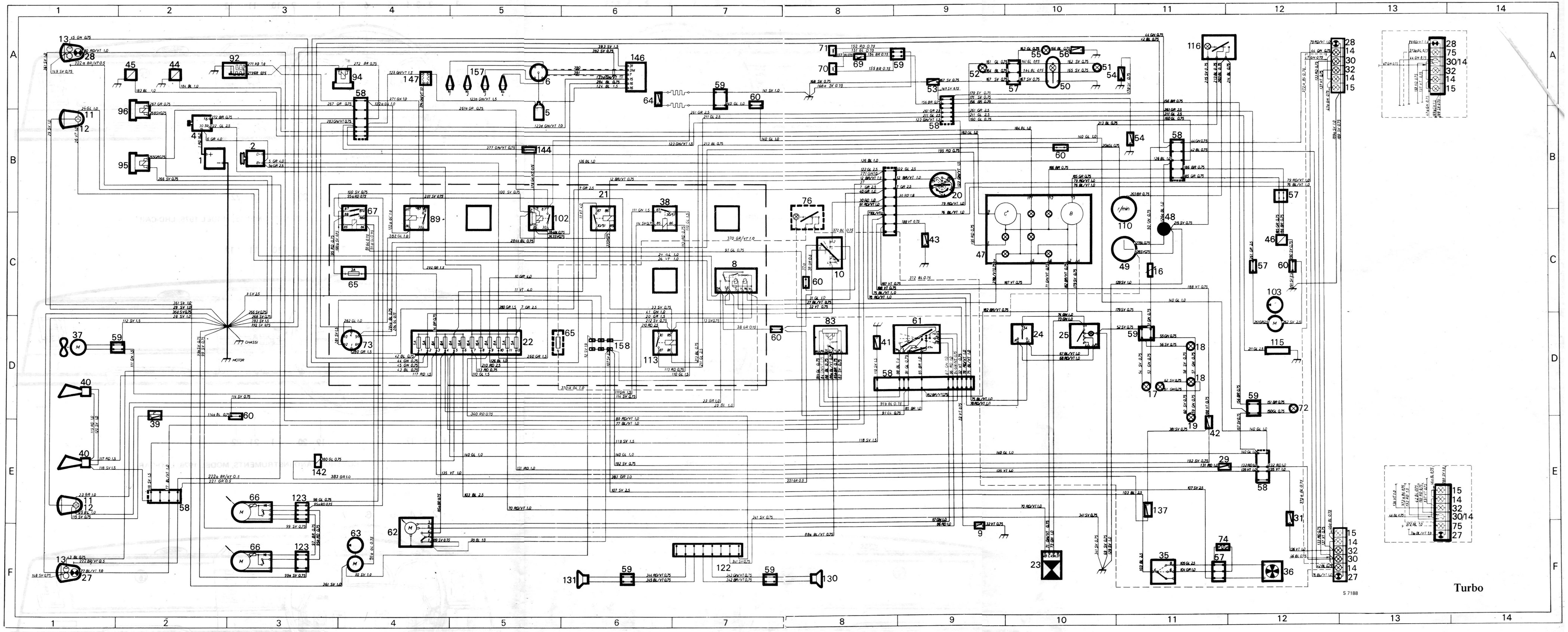
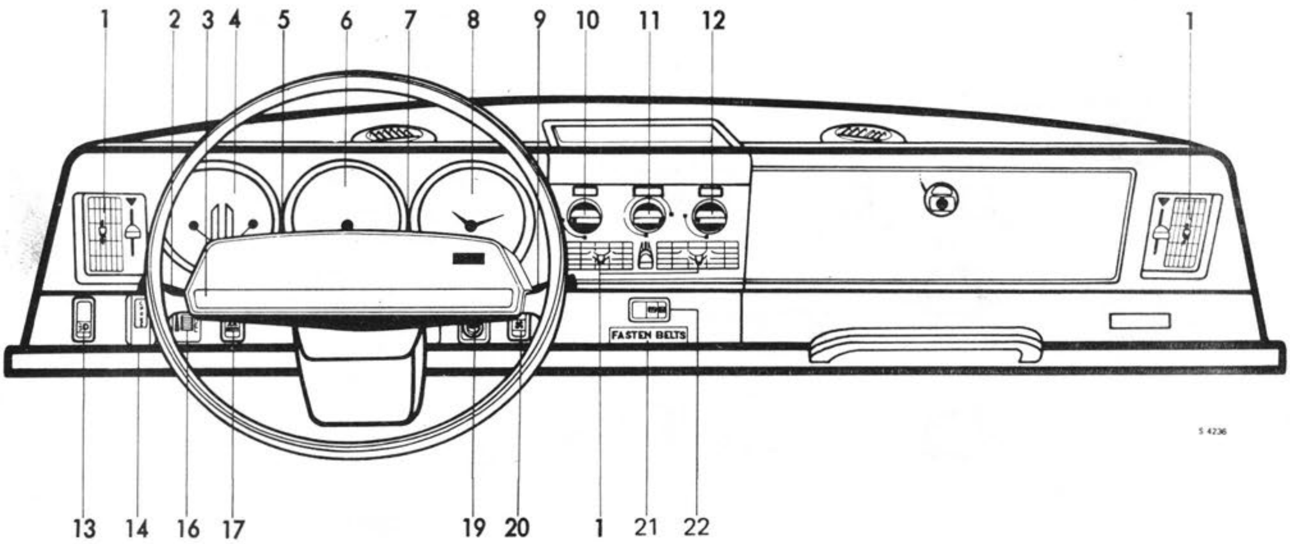
90. Start inhibitor and reversing light switch (B9)
91. Selector indicator light (C9)
92. Thermo time switch (A2)
94. Starter valve (A2)
95. Auxiliary air regulator (B2)
96. Warming-up regulator (B2)
102. Fuel pump relay (C5)
103. Fuel pump (C12)
110. Tachometer (C11)
113. Relay, electrically heated rear window (D6)
115. Electrically heated rear window (D12)
116. Switch, electrically heated rear window (A11)
118. Corner lamp (A1, F1)
122. 8-pole connector (F7)
123. 4-pole connector (E3, F3)
130. Loudspeaker, R (F8)
131. Loudspeaker, L (F6)
142. Solenoid valve (E3)
144. Pressure switch (B5)
146. Electronic control unit, ignition system (A6
147. Compensating resistor (A4)
157. Spark plugs (A5)
158. Joint, earth cable (D6, E13)



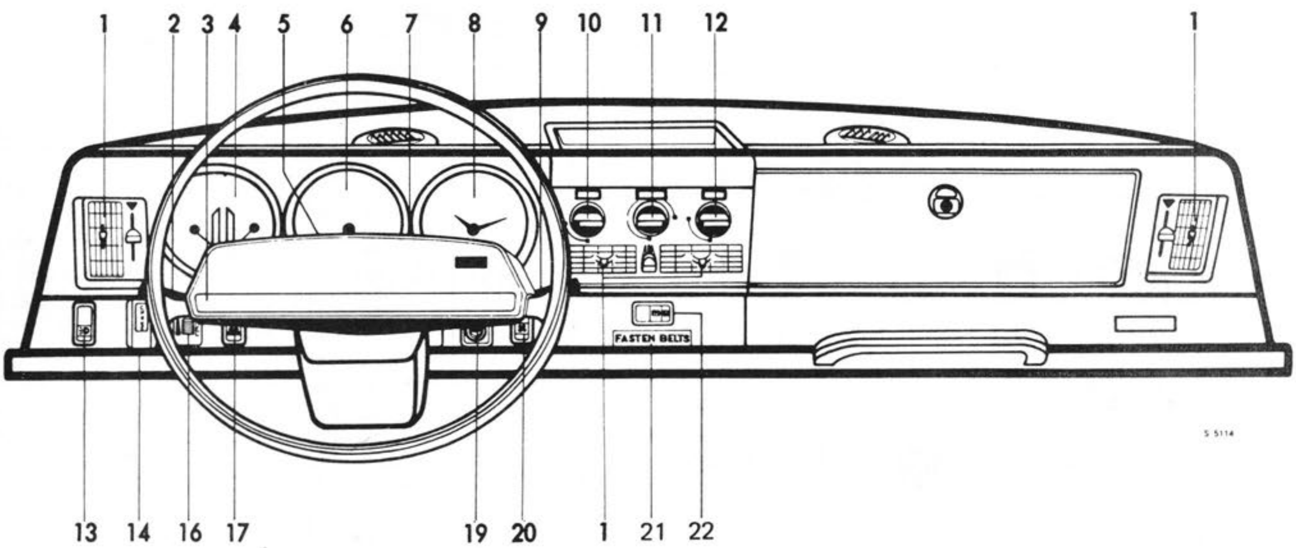
WIRING DIAGRAM SAAB 99 TURBO MODEL 1980

CONTROLS AND INSTRUMENTS

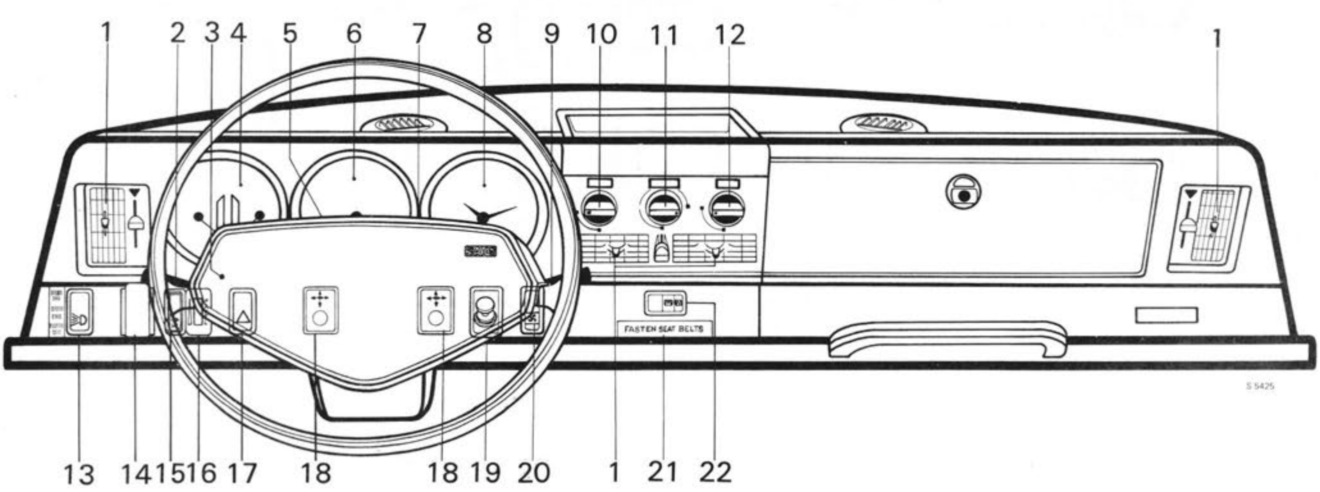
GENERAL



CONTROLS AND INSTRUMENTS, MODEL 1975, LHD-CAR

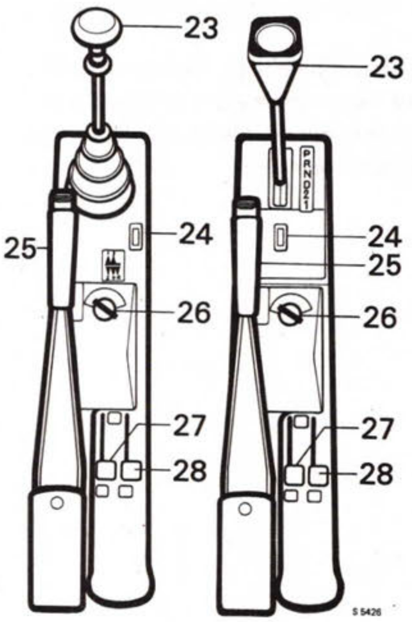


CONTROLS AND INSTRUMENTS, MODEL 1976, LHD-CAR



CONTROLS AND INSTRUMENTS, MODEL 1977, LHD-CAR

1. Fresh air vents
2. Combined direction indicator lever, headlight dimmer and headlight flasher switch
3. Horn control
4. Combination instrument
5. Zero button for trip meter.(Model 1975: Only cars with injection engines. Model 1976: Not Saab 99 L.)
6. Speedometer
7. Clock adjustment button
8. Clock
9. Windshield wiper and headlight wiper and washer control
10. Defroster control for windshield and front side windows
11. Temperature control
12. Ventilation control for front seat floor
13. Headlight and parking light switch
14. For cars with carbureted engines:
    Choke with warning light
    For cars with injection engines:
    Extra switch
15. Switch, cornering light
16. Rheostat for instrument and control illumination
17. Hazard warning flasher switch
18. Saab 99 GLE:
    Control for electrically operated rear view mirrors
19. Cigarette lighter
20. Ventilator fan switch
21. Warning light, seat belts (Not in Great Britain)
22. Switch for electrically heated rear window. (Model 1975: Only Saab 99 Combi Coupé. Model 1976 and 1977: Not Saab 99 L.)



MANUAL GEAR BOX AUTOMATIC GEAR BOX

23. Gear(selector) lever
24. Interior lighting switch
25. Handbrake lever
26. Ignition and gear(selector) lever lock
27. Ventilation control for rear seat floor
28. Defroster control for rear window

Headlight and parking light switch (13)

Model 1975:

The switch has three positions: off, parking lights on and headlights on.

When the switch is pushed in to the first stop the parking lights are turned on regardless of the position of the ignition switch.

Pushing in to the second stop turns on the headlights as well if the ignition key is at G or K.

NOTE! If the headlights are already on, i.e. if the switch is pushed in to the second stop, and the ignition key is turned back to L, all outside lights will be extinguished. If for any reason you want to have the parking lights on while the ignition switch is in position L, the light switch must be pulled back to the first stop.

As from model 1976:

The tangent switch has three positions:

Top pushed in

The town light (only Sweden, Norway and Denmark) is automatically turned on when the ignition key is turned to position "K" Drive. The headlights are then on low beam with reduced light intensity together with rear lights and number plate light. The town light increases the visibility of the car in day-light without dazzling.

Intermediate position

The parking light can be lit independent of the ignition key position.

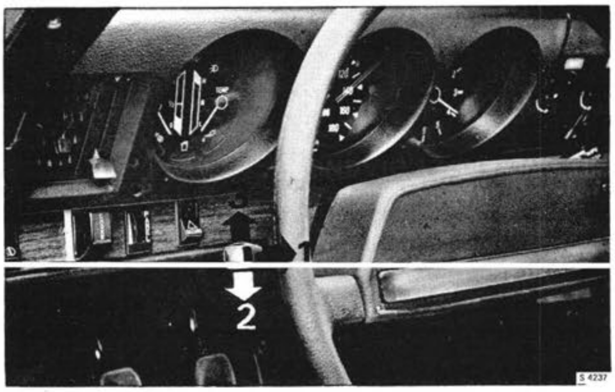
Bottom pushed in

The headlights are lit if the ignition key is in position "K" or "G".

Combined direction indicator lever and headlight dimmer and flasher switch (2)

To signal a turn, move the lever down for left, up for right.

When the headlights are switched off, you can flash the high beam by pulling the lever towards the steering wheel. When the headlights are on, pulling the lever towards the wheel shifts the beam from high to dimmed or vice versa.



DIRECTION INDICATOR, HEADLIGHT FLASHER AND DIMMER SWITCH

1. Left direction indicator
2. Right direction indicator
3. Headlight dimmer and flasher switch

A. B. C.

INSTRUMENTS, AS FROM MODEL 1976

Instrument lighting switch (15)

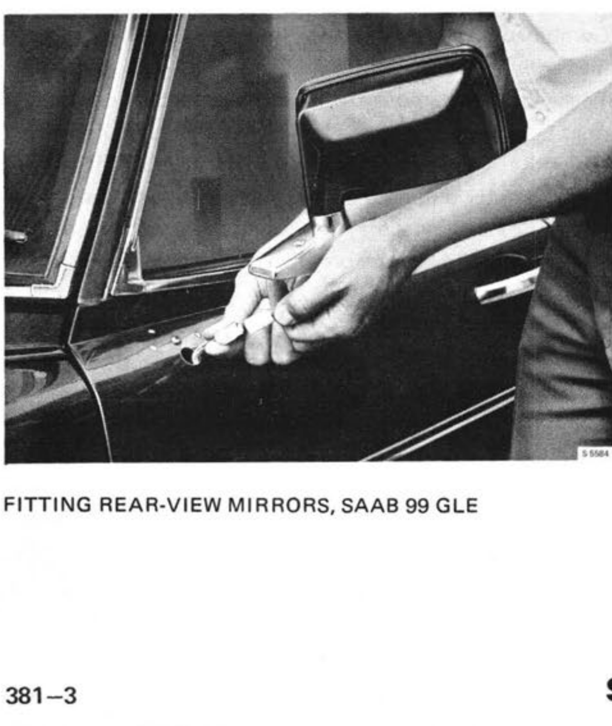
The instrument lighting can be regulated variably with a rheostat switch.
The instrument lighting cannot be turned on unless the parking lights or headlights are lit.

Hazard warning signal switch (16)

All direction indicator lights flash together when the button is pushed in. The hazard warning signal must only be used when the car is immobilized by accident, breakdown, etc. in a position where it is liable to endanger or obstruct traffic.

Electrically operated external rear-view mirrors

The Saab 99 GLE is equipped with electrically operated external rear-view mirrors. Two spring-loaded, 4-position switches are mounted on the instrument panel, and these control an electric motor in each rear-view mirror. Lateral adjustment of approx. 15^{o} and vertical adjustment of 10^{o} are possible using the switches.



FITTING REAR-VIEW MIRRORS, SAAB 99 GLE

Instruments and indicator lights

A. Combination instrument (4) comprising:

TEMP Temperature gauge for engine coolant.
The green zone indicates normal running temperature.

TANK Fuel gauge (Model 1975 and 1977)
FUEL Fuel gauge (Model 1976)

Brake warning light. A red light is shown when the handbrake is applied, or if there is leakage in the braking system. In the event of the light lighting up while the car is being driven, the cause should be investigated immediately and any faults or damage repaired as soon as possible by an authorized Saab dealer.

Direction indicator repeater light. Flashes green in time with the direction indicators.

High beam warning light. Shows a blue light when the headlights are on high beam.

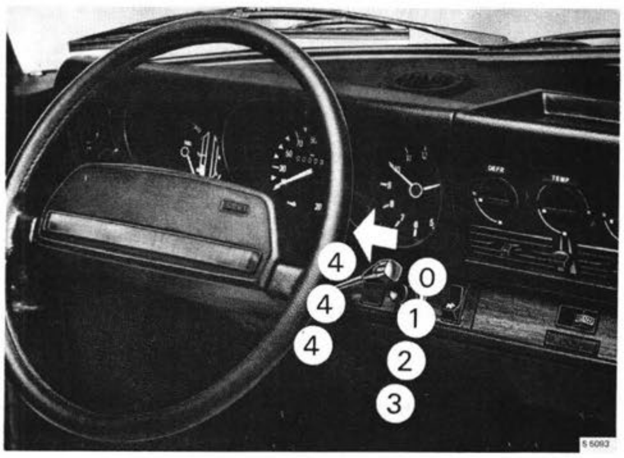
Charge indicator light. If this light glows yellow, the alternator is not charging.

Fuel reserve warning light. Shows a steady orange glow (red on model 1975) when the quantity of fuel remaining in the tank is less than 2 imp.gal. (10 liters).

Oil pressure warning light. Glows red to indicate dangerously low oil pressure or oil level. If it lights up while you are driving, switch off the engine at once and investigate the cause.

B. Speedometer, odometer and trip meter (6).
   Model 1975:
   The zeroing button for the trip meter is located to the left of the speedometer.
   Model 1976:
   All models except Saab 99 L have a trip meter with the resetting button located at the bottom of the speedometer.
C. Clock (8). The setting button is located to the left of the clock dial.

Windshield and headlight wiper and washer control (9)



SWITCH FOR WINDSHIELD WIPERS AND WASHERS, HEADLIGHT WIPERS AND WASHERS, AS FROM MODEL 1977, SAAB 99 GLE AS FROM MODEL 1976

0. Neutral position
1. Windshield wipers. Temporary operation: When the lever is held in the springloaded position the wipers make one double stroke. The function is suitable e.g. when it is drizzling. On Saab 99 GLE cars, the lever may be set to this position for intermittent operation*.
2. Windshield wipers, low speed
3. Windshield wipers, high speed
4. Windshield and headlight washers, headlight wipers. The washers will operate for as long as the lever is held in the springloaded position towards the steering wheel.

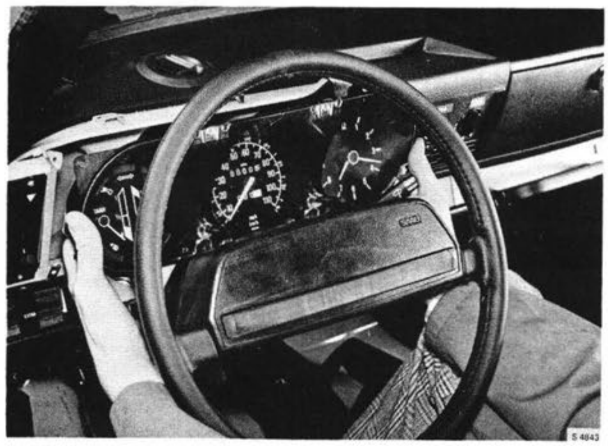
*With the arm set to intermittent operation, the wipers stop operating for a few seconds and then start again. This function is particularly suitable when it is drizzling.

Ventilator fan switch (18)
The switch has two positions, first for half speed and second for full speed.

INSTRUMENTS

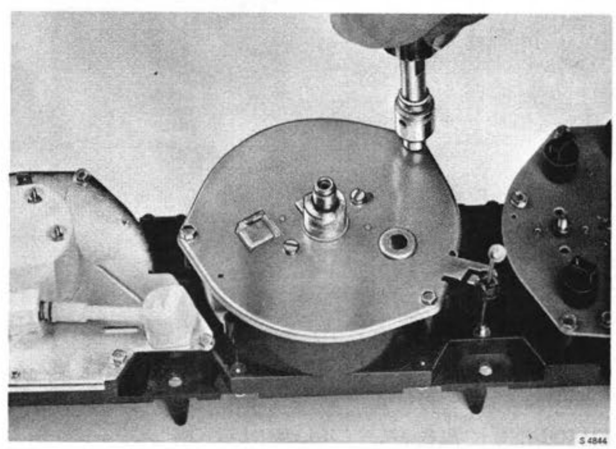
Removing the instrument panel

1–3. Remove the safety padding (see description in Group 8).
4. Undo the four self-tapping screws that secure the panel.
5. Disconnect the speedometer wire and the electric wiring to the clock and combination instrument. Pull out the instrument illumination bulb holder. The instrument set can then be lifted out.



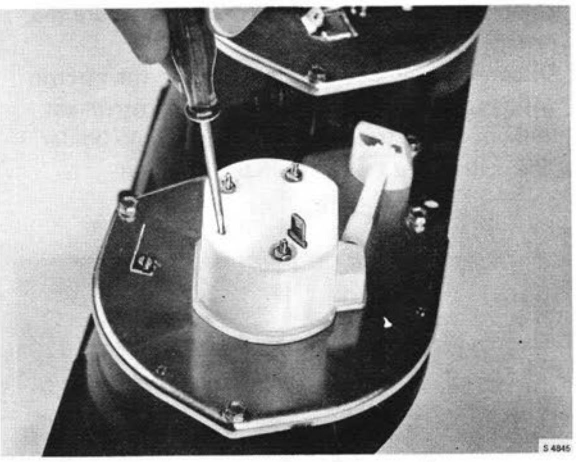
REMOVING THE INSTRUMENT UNIT

The instruments or the clock can then be separated from the panel by removal of the retaining screws. To remove the speedometer with built-in trip meter it is also necessary to disconnect the trip meter control wire from the instrument (only model 1975). Any repairs or adjustments to the instruments should be carried out by a specialist workshop.



REMOVING INSTRUMENTS FROM THE UNIT

There is a screw on the back of the clock for adjusting the movement. An arrow with plus and minus signs shows in which direction the screw must be turned to obtain the required result.



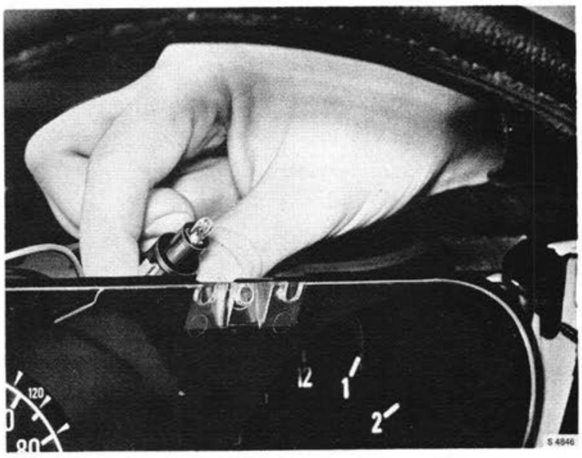
ADJUSTING THE CLOCK

Installing

Reassemble and reinstall the instrument unit in the reverse order.

Changing light bulbs

A. Instrument illumination.
   The two bulbs can be reached after removal of the safety padding (see Group 8).



CHANGING INSTRUMENT ILLUMINATION LIGHT BULB

B. Warning and indicator lamps.
   If the instrument panel unit is unscrewed and pulled forward, the indicator and warning lamps can be reached conveniently. The bulb holders have bayonet fittings.

Changing the speedometer cable

1. Disconnect the speedometer cable from the transmission.
2. Remove the safety padding and the instrument unit.
3. Remove the grommet from the dash panel.
4. Withdraw the cable.

Assembly is carried out in the reverse order.

Tachometer

The Saab 99 EMS is equipped with a tachometer, combined with a clock. The connecting cables to the tachometer are these:
86 yellow to "1" on the tachometer
99 brown to "+12" on the tachometer

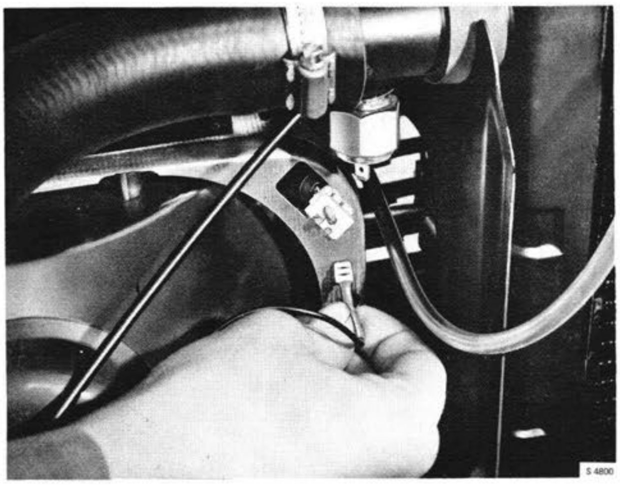
RADIATOR FAN

General

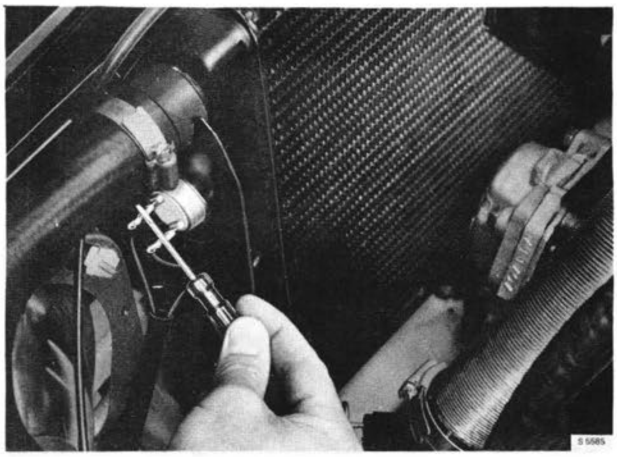
The radiator fan is driven by an electric motor and is located behind the radiator. The fan is thermostat-controlled. The thermoswitch is located on the left of the radiator. Instructions for removing and installing the radiator fan will be found in Group 2.

Checking operation of radiator fan, up to and incl. model 1976

To check the operation of the radiator fan, switch on the ignition and then disconnect the cable from the radiator fan thermoswitch and ground the cable shoe. The fan should then start. Exchange the thermoswitch if defective.



CHECKING RADIATOR FAN OPERATION, UP TO AND INCL. MODEL 1976



CHECKING RADIATOR FAN OPERATION, AS FROM MODEL 1977

NOTE
If the radiator fan fails to start, the reason may be faulty ground contact between the radiator and bodywork. The easiest way to check this is to touch the cable shoe first to the metal casing of the thermoswitch and then to some part of the body or engine.

FUEL LEVEL TRANSMITTER

The fuel level transmitter consists of a float which deflects the fuel gauge via a lever and a contact. When the volume of fuel in the tank falls below about 2 Imp. gal. (10 liters), a warning light in the fuel gauge lights up.
The transmitter is located on top of the fuel tank and is accessible for adjustment or repair when the trunk floor covering and floor are removed.

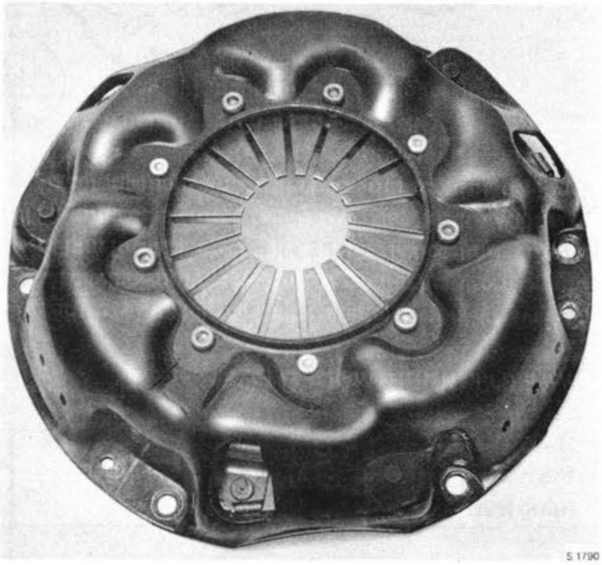
CONTENTS

CLUTCH

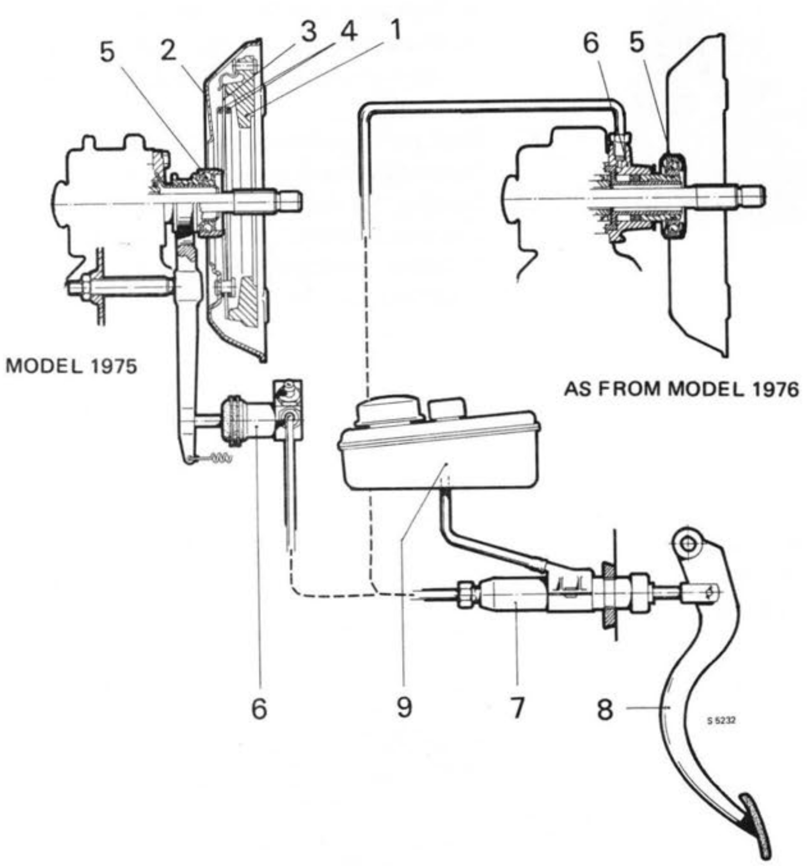
GENERAL

The car is fitted with a single dry plate clutch of diaphragm spring type. The principal clutch components are the disc, pressure plate assembly and release bearing. The clutch disc consists of a resilient steel plate attached to a hub which slides on splines on the clutch shaft. The clutch linings are riveted to both sides of the disc.
The pressure plate assembly consists chiefly of the pressure plate, pressure spring (diaphragm spring) and housing. The spring acts as a lever and as pressure spring. The pressure plate assembly is an integral unit and must not be disassembled.

The release bearing consists of a ball bearing with a specially designed elongated outer ring which presses directly against the diaphragm spring when the clutch is let out.
Operation of the clutch is hydraulic. The clutch pedal acts on a master cylinder which is connected by a hose to a slave cylinder mounted on the transmission case. In 1975 model cars, the slave cylinder is mounted on the clutch cover. Movement is transferred from the slave cylinder to the release bearing by means of a lever. The lever is jointed at an adjusting screw with which the play between the release bearing and the diaphragm spring can be adjusted. As from model 1976, the slave cylinder is annular and is mounted inside the clutch cover round the clutch shaft. The slave cylinder acts directly on the release bearing and adjustment of the clutch is automatic.



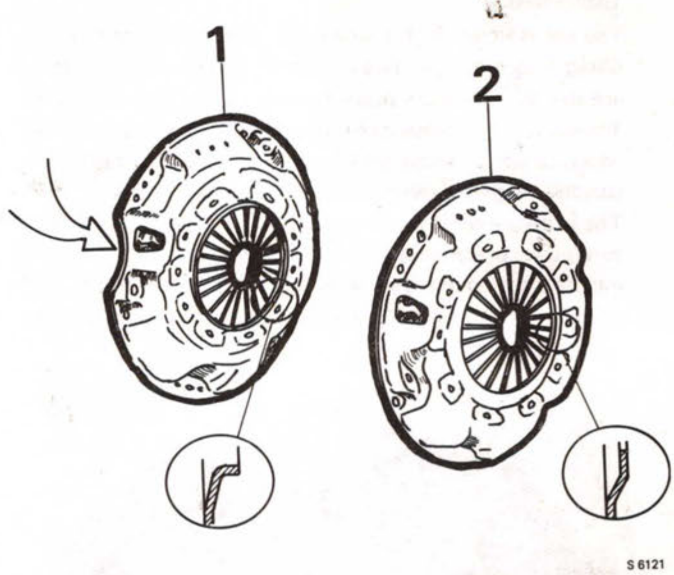
PRESSURE PLATE



CLUTCH OPERATION
1. Pressure plate
2. Housing
3. Diaphragm spring
4. Pressure bearing rings
5. Release bearing
6. Slave cylinder
7. Master cylinder
8. Clutch pedal
9. Clutch fluid container

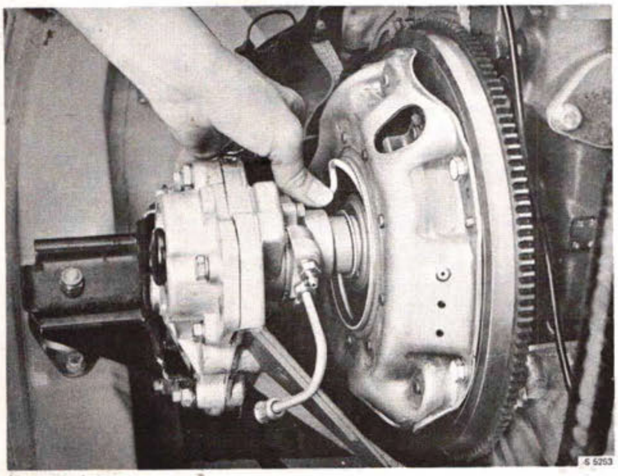
REMOVAL

1. Drain off the coolant through the radiator drain cock.
2. Remove the engine hood (see Group 2).
3. Disconnect the battery earth cable.
4. Disconnect the cable harness from the fan housing and the cables to the ignition coil, oil pressure switch, temperature transmitter, headlamp wiper motor and the fan thermal switch on the radiator.
5. Disconnect the hoses from the radiator.
6. Remove the grille.
7. Remove the front sheet and radiator.
8. Remove the clutch cover screws and remove the cover.
9. Mount spacer 8390023 between the clutch cover and the diaphragm spring. On fitting the spacer, have an assistant depress the clutch pedal.



CLUTCH HOUSING, DIFFERENT VERSIONS

1. Use spacer 83 90 023
2. Use spacer 87 90 826 (this type of clutch is only fitted to model 1976)

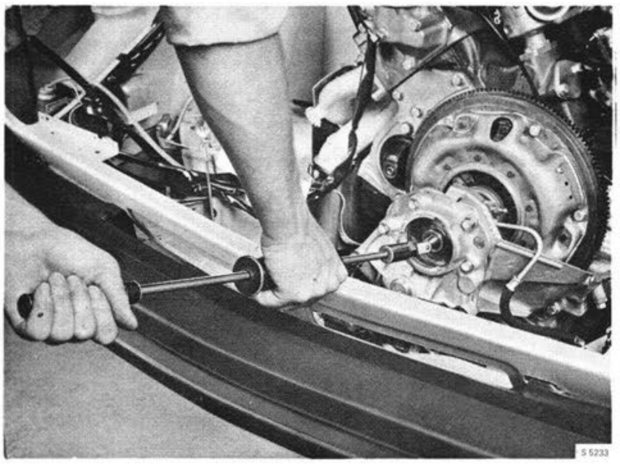


MOUNTING SPACER 8390023

If it is not possible to activate the slave cylindar in the normal manner the connection can be made using lever 83 93 175.

10. Model 1975:
    a. Remove the spring at the slave cylinder.
    b. Slacken the clutch adjustment by backing off the adjusting screw, undo and lower the clutch lever.
11. Remove the retaining clip (lock ring up to and incl. model 1977) and seal cap from the clutch shaft.
12. Remove the plastic propeller (and O-ring up to and incl. model 1977) from the clutch shaft.
13. Withdraw the clutch shaft by means of tool 8390270 and joint 8390015.

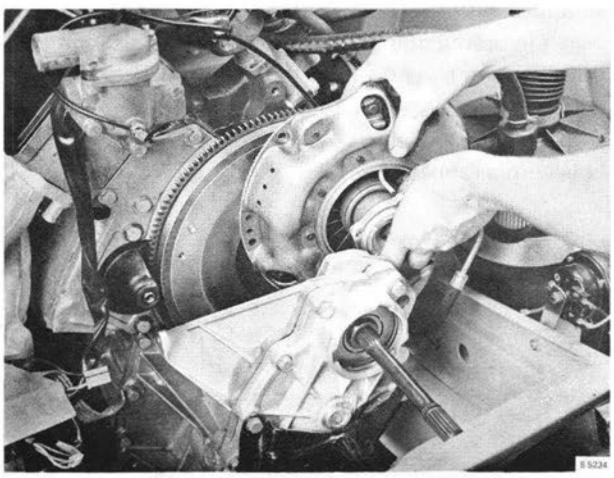
A clutch housing of a special design has been fitted to a small number of 1976 model cars. A special spacer, 8790826, which is deeper than the standard spacer, must be used to remove the housing.



REMOVING THE CLUTCH SHAFT
Tool 8390270 and joint 8390015

14. Remove the three bolts by which the slave cylinder (guide sleeve) is secured to the primary gear casing.
15. Remove the clutch retaining screws and remove together the clutch, clutch disc and slave cylinder (guide sleeve) and release bearing. It is not necessary to disconnect the hydraulic hose on the slave cylinder.

> CAUTION
> As from model 1976:
> Take care that the diaphragm spring does not damage the slave cylinder sleeve.



REMOVING THE CLUTCH DISC, SLAVE CYLINDER AND CLUTCH

ASSEMBLY

Before installing the clutch, check the clutch shaft seal:
- On model 1975, the seal is located in the guide sleeve
- På årsmodell 1975 är tätningsringen placerad i styr-

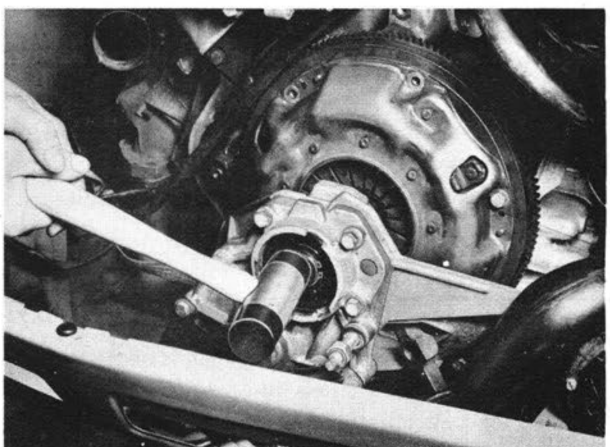
forming a seal with the sealing surface of the upper primary gear.
- On models 1976 and 1977, the seal is located in a special seal retainer inside the slave cylinder and forms a seal with the sealing surface of the upper primary gear.
- As from model 1978, the seal is located inside the slave cylinder in the primary gear case and forms a direct seal with the sealing surface of the clutch shaft.

Refer to section 471 for changing of the clutch shaft seal.

1. Install together the clutch, clutch disc and slave cylinder (guide sleeve) with release bearing in the clutch cover and loosely fit two of the clutch bolts.

> CAUTION
> As from model 1976:
> Take care that the diaphragm spring does not damage the slave cylinder sleeve during installation. Damage to the sleeve can result in the pistion seizing. Ensure that the hardened side of the release bearing is turned towards the diaphragm spring.

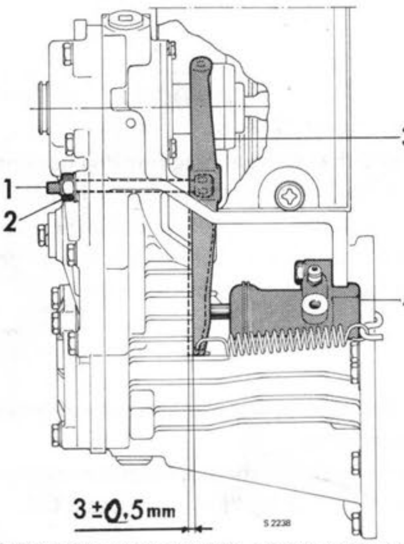
2. Bolt the slave cylinder (guide sleeve) to the primary gear casing.
3. Install the clutch shaft. Grease the splines for the primary gear using "Molycote pasta G".



FITTING THE CLUTCH SHAFT

N.B. In the case of early 1976 model cars, the clutch shaft is such that the splines only reach the clutch disc when the lock ring has engaged the primary gear. Therefore, when installing the clutch shaft, keep the clutch disc a short distance away from the flywheel.

4. Fit the plastic propeller and O-ring to the clutch shaft.
5. Fit the sealing cap and O-ring at the clutch shaft.
6. Screw the clutch assembly to the flywheel.
7. Up to and including model 1975:
   a. Install the clutch lever in the correct position and mount the slave cylinder.
   b. Tighten the adjusting screw so that the clutch is released when the clutch pedal is depressed and remove the spacer 8390023.
   c. Adjust the clearance between the diaphragm spring and the release bearing by means of the adjusting screw and tighten the lock nut. The clearance between the diaphragm spring and the release bearing should be 0.06 in. (1.5 mm), which corresponds to 0.12 ± 0.02 in. (3 ± 0.5 mm) when the measurement is made at the outer end of the clutch lever.



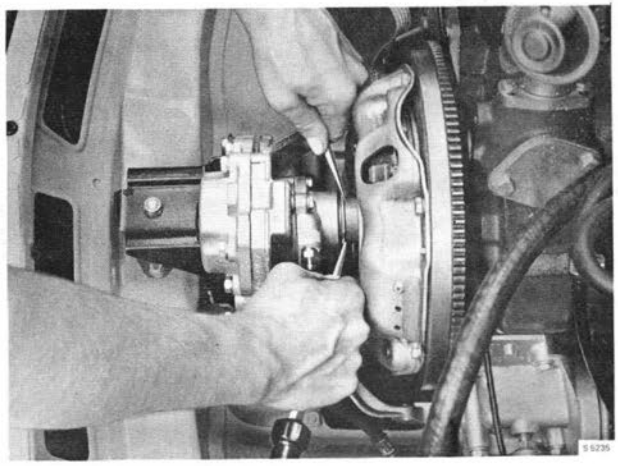
MEASURING CLUTCH CLEARANCE, UP TO AND INCL. MODEL 1975

1. Adjusting screw
2. Lock nut
3. Clutch lever
4. Slave cylinder

7. As from model 1976:
   Have an assistant depress the clutch pedal while you remove spacer 8390023.

CAUTION
Do not depress the pedal further than is necessary to release the tool. There is otherwise a danger of the lip seal being pressed out too far, with the result that hydraulic fluid will escape and the seal will be damaged.

8. With an assistant keeping the clutch pedal depressed, slide the sliding lock ring towards the slave cylinder.



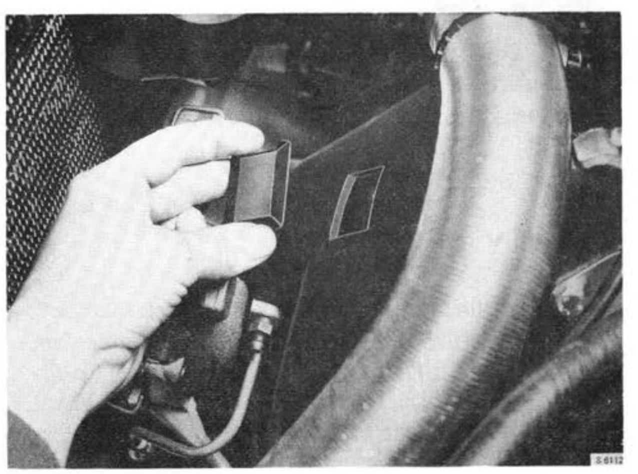
WITHDRAWING THE LOCK RING

9. Fit the clutch cover.
10. Fit the front panel and radiator.
11. Install the grille.
12. Connect the water hoses and electric cables. Fill the radiator with coolant.
13. Mount the engine hood and connect the battery.
14. Check the headlight alignment.

Checking clutch wear, as from model 1976

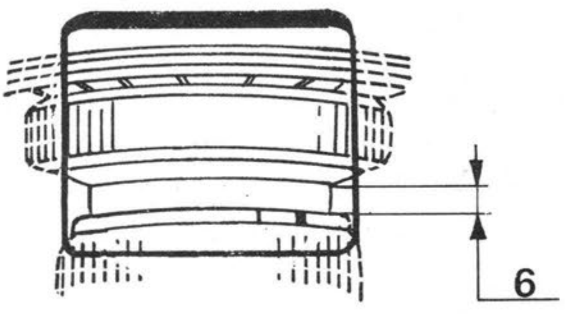
Wear on the clutch disc can be checked through an inspection hole in the clutch cover. The inspection hole, which is equipped with a rectangular cover plate, has been introduced in production as from model 1978 (cars with chain-drive primary gear).

On earlier models, cut a 1.0 in. (25 mm) dia. hole in the corresponding position by means of a hole saw. Seal the hole with a rubber plug.

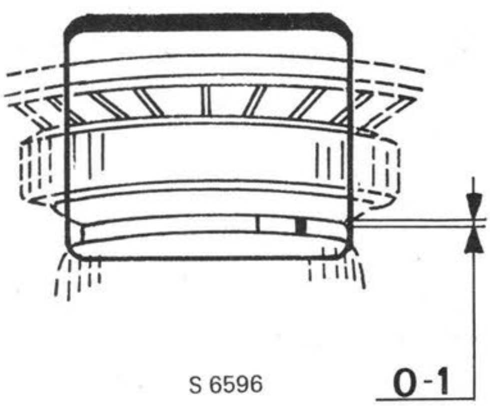


REMOVING THE COVER PLATE FROM THE CLUTCH COVER

1. Disengage the clutch and then release the pedal. The release bearing will then be in contact with the fingers on the pressure plate.
2. Through the inspection hole, check that the sliding lock ring on the piston in the slave cylinder is in contact with the cylinder walls.
3. Check the distance between the sliding lock ring and the lock ring behind the release bearing.



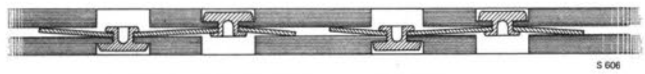
NEW CLUTCH DISC
1. Sliding lock ring
2. Lock ring



WORN DISC

CHANGING CLUTCH LININGS

1. Drill out the old rivets and remove the old linings.
2. Check that the seat of the tongues is regular and that the disc is not out of true. Check also that the rivets in the hub are secure and that there are no cracks. The disc must slide freely on the clutch shaft without any radial play.
3. Rivet on the new linings. Check the thickness of the linings (see below for check data for clutch discs)



CORRECT POSITION OF CLUTCH LINING RIVETS

CLUTCH DISC

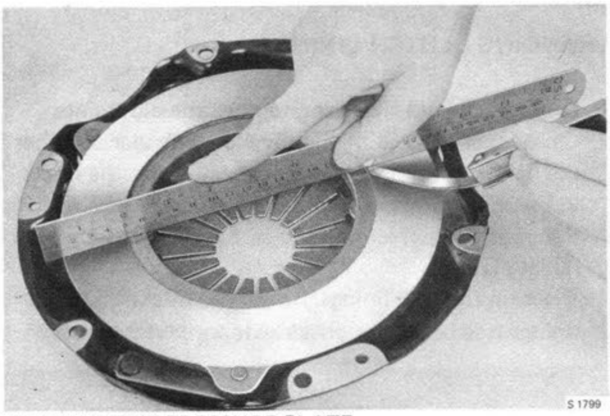
Inspection of dismantled clutch and changing clutch linings

1. Inspect the surface of the flywheel where the clutch disc makes contact. Blueing or small cracks on the surface are of no particular importance, but if there are any deep scratches the flywheel ought to be machined down or exchanged.
2. Check the pressure plate in the pressure plate assembly for scratches and distortion. If there are any irregularities the plate should be exchanged.
3. Check the release bearing for noise, wear, etc.
4. Check the disc for wear and fit new linings if necessary.
5. Before riveting on the new linings, check and if necessary adjust the set of the disc.

Check data for clutch disc:
- The thickness of the cltuch disc should be 0.28–0.30 in. (7.11–7.62 mm) Turbo cars: 0.27–0.29 in. (6.86–7.37 mm) under a compressive force of 4230 N, 948 lb. (430 kp) applied between two parallel surfaces. The clutch disc should clear the surfaces after they have been withdrawn 0.05 in. (1.27 mm) from the loaded position.

INSPECTING THE PRESSURE PLATE ASSEMBLY

Check the pressure plate for cracks and scratches. Check that the surface of the plate is not cambered, using a rule and feeler gauge as illustrated. A gap of not more than


S 1799

CHECKING THE PRESSURE PLATE

0.0012" (0.03 mm) is allowable at the inner edge of the friction surface, but there must be no gap at all between the rule and the outer edge of the friction surface. Make this check at several points. Check that the pressure spring is not cracked or otherwise damaged.
Check that the release bearing turns freely when rotated under slight axial pressure.

CLUTCH CONTROL

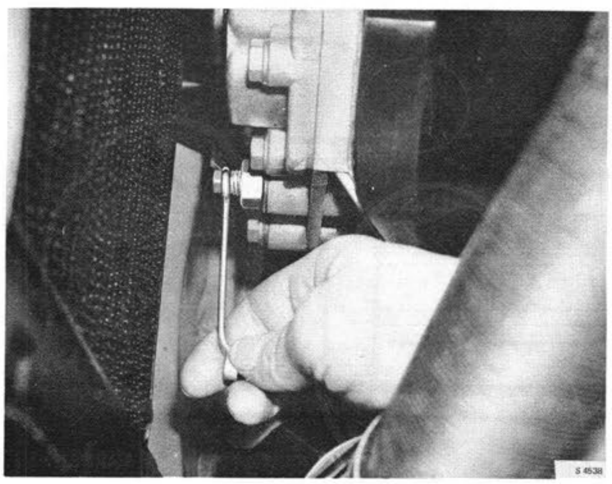
REMOVING AND INSTALLING THE CLUTCH PEDAL

1. Remove the split pin and washer and pull out the shaft bolt for the master cylinder push rod.
2. Unhook the clutch pedal return spring.
3. Remove the axle bolt and the pedal.
4. Remove the spring if necessary.
5. Lubricate the pedal bearing with chassis grease before reassembling.

Reassemble in the reverse order.

ADJUSTING CLUTCH PLAY, MODEL 1975

The clutch play, i.e. the clearance between the release bearing and the diaphragm spring, is regulated by an adjusting screw that threads into the transmission case and acts as the fulcrum of the clutch lever. The gap is increased when the screw is backed off. The gap should be checked at the outer end of the clutch lever (see illustration), where it should be 0.12 ± 0.02" (3 ± 0.5 mm).



ADJUSTING THE CLUTCH PLAY, MODEL 1975

REMOVING THE RELEASE BEARING (AND CLUTCH LEVER), MODEL 1975

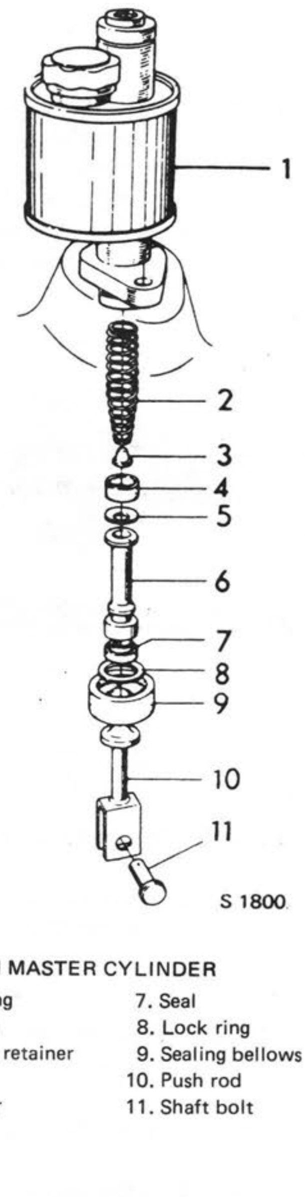
To remove the release bearing or clutch lever, proceed in the same manner as when removing the clutch.

Remove the release bearing together with the clutch and slave cylinder (guide sleeve).

MASTER CYLINDER, R.H.D.-CARS

General

The master cylinder consists of a cast housing surrounded by a sheet metal fluid container. The operating elements consist of a push rod, piston, piston seal and return spring (see illustration). The end of the push rod is sealed by a rubber bellows.



CLUTCH MASTER CYLINDER

1. Housing
2. Spring
3. Spring retainer
4. Seal
5. Washer
6. Piston
7. Seal
8. Lock ring
9. Sealing bellows
10. Push rod
11. Shaft bolt

Removing

1. Disconnect the hose from the slave cylinder and pump out the fluid into a clean container.
2. Disconnect the push rod from the clutch pedal by removing the split pin and shaft bolt.
3. Undo the retaining screws and remove the master cylinder.

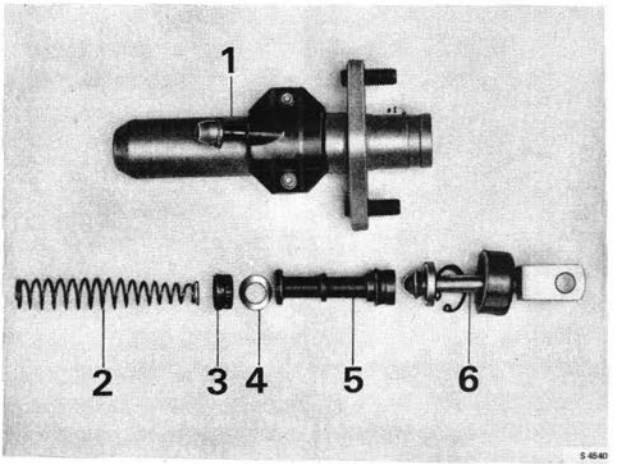
Installing

1. Mount the master cylinder.
2. Connect the push rod to the clutch pedal by inserting the shaft bolt through the holes in the fork of the push rod and the hole in the clutch pedal. Locate the push rod and secure with the split pin.
3. Connect the hose.
4. Bleed the system.

MASTER CYLINDER L.H.D. CARS

General

The master cylinder is placed under the servo unit and is actuated by a push rod from the clutch pedal. In the cylinder is besides the push rod, piston, piston seals and return spring. The clutch fluid container is incorporated in the brake fluid container completely separated from the brake fluid. From the container a hose leads to the clutch cylinder.



CLUTCH MASTER CYLINDER (L.H.D. CARS)

1. Housing
2. Spring with seat
3. Sealing
4. Washer
5. Piston and rear seal
6. Push rod with stop washers, lock ring and bellows

Removal

1. Detach the clamp holding the pipe from the clutch cylinder at the body and remove the pipe at the cylinder.
2. Remove the left hand screen under the instrument panel.
3. Remove the pin holding the push rod to the clutch pedal.
4. Remove the nuts inside the dash panel and remove the clutch cylinder from the engine compartment. Pull off the hose from the fluid container and hang it up so that the fluid is not coming out.

Installation

1. Connect the hose from the container to the cylinder.
2. Put the cylinder in place and install the nuts from inside the car.
3. Connect the push rod to the pedal.
4. Install the left hand screen under the instrument panel.
5. Connect the clutch pipe, fill fluid and bleed the system.

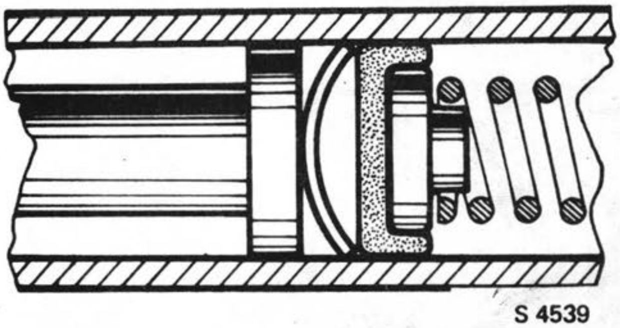
Disassembling (R.H.D. and L.H.D. versions)

Pull back the sealing bellows and remove the lock ring with a pair of pliers. Take out the push rod with the washer. The piston and its seal is now visible. Remove the piston, washer, piston seal and spring. Take the seal carefully off the piston. Examine the cylinder walls; if they are smooth and unscratched, new seals can be fitted, but if the surface of the cylinder bore is rough, a complete new cylinder should be installed. If the old seals on the piston are enlarged or swollen, they are probably contaminated with mineral oil; this is the most common cause of cylinder malfunction. Seals made of natural rubber are very sensitive to mineral oil, and even small quantities of oil can cause them to swell with time. If this is suspected, change all the seals and flush the system with clean hydraulic brake fluid.

Assembling (R.H.D. and L.H.D. versions)

Fit the return spring with its retainer. Lubricate the piston and seals thoroughly with Girling Rubber Grease 3 and fit the packing, washer and piston with seals.

> NOTE
> The washer must be fitted with the convex side facing the piston (see illustration).

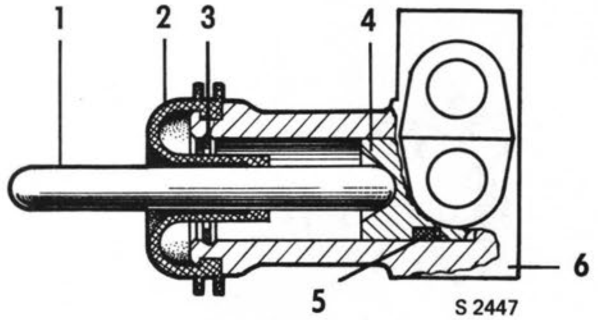


CORRECT POSITION OF THE WASHER

Fit the push rod into the cylinder, followed by the washer and lock ring, which are located in the cylinder housing groove. Replace the sealing bellows or fit a new bellows if the old one is damaged.

SLAVE CYLINDER, MODEL 1975

The slave cylinder is mounted on the left side of the clutch cover and comprises a cast-iron housing with an operating unit consisting of a push rod, piston, and piston seal. A rubber cap seals the end of the push rod. The cylinder housing is provided with a bleeder nipple.

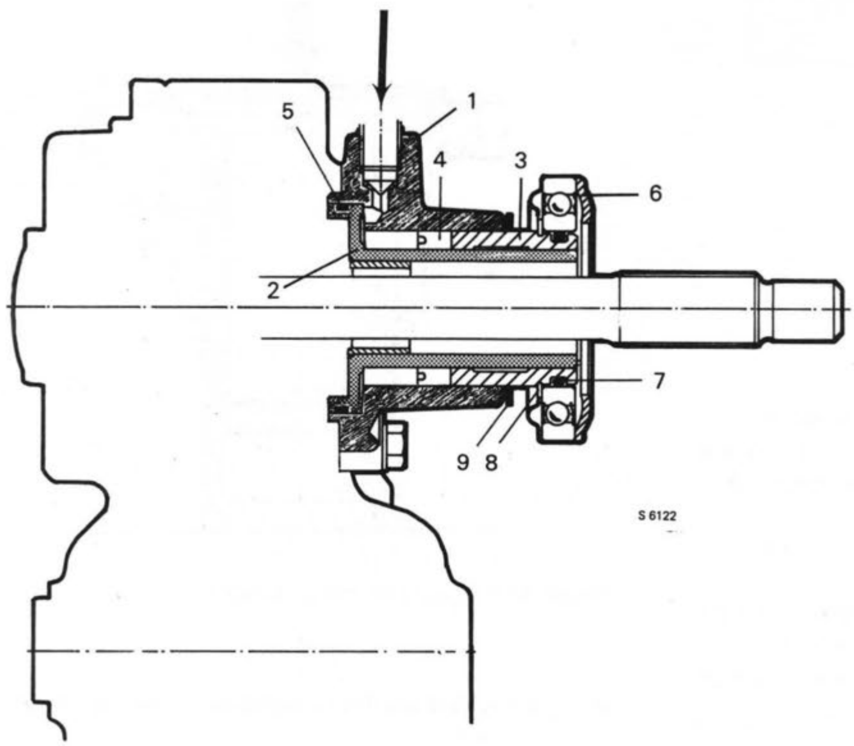


SLAVE CYLINDER, MODEL 1975

1. Push rod
2. Sealing cap
3. Lock ring
4. Piston
5. Piston seal
6. Housing

SLAVE CYLINDER, AS FROM MODEL 1976

The slave cylinder is an annular hydraulic cylinder mounted inside the clutch cover and enclosing the clutch shaft. The slave cylinder consists of an outer cylinder housing and an internal sleeve, between which there is an annular piston and a lip seal. The release bearing is locked to the piston by means of an O-ring and a lock ring. When the clutch pedal is depressed, the slave cylinder piston and release bearing act directly on the diaphragm spring of the clutch. When the pedal is released, the release bearing and pistons are returned by means of the diaphragm spring. Further return of the piston is prevented by the friction of the lip seal in the slave cylinder and by a sliding lock ring on the slave cylinder piston. This means that when the clutch pedal is in the rest position, the release bearing is in contact with the diaphragm spring. Adjustment of the clutch is automatic owing to the fact that the sliding lock ring on the piston moves along the piston in pace with the wear to the clutch lining.

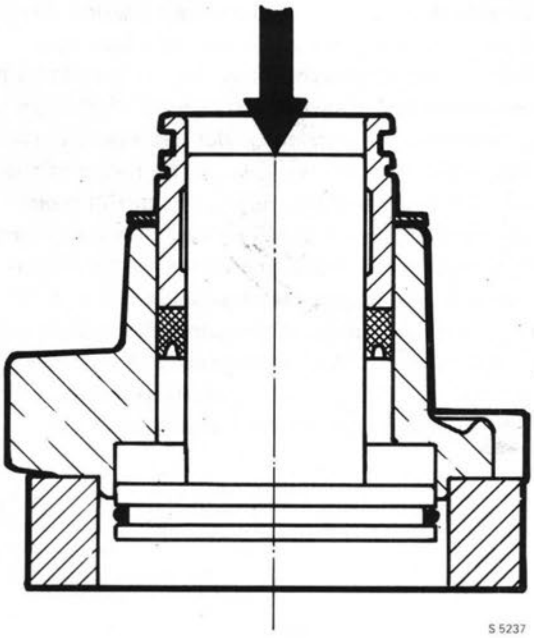


SLAVE CYLINDER, AS FROM MODEL 1976

1. Slave cylinder housing
2. Sleeve
3. Piston
4. Lip seal
5. O-ring
6. Release bearing
7. O-ring
8. Lock ring
9. Lock ring

DISMANTLING THE SLAVE CYLINDER

1. Remove the release bearing from the slave cylinder.
2. Press out the slave cylinder sleeve and remove the O-ring from the flange of the sleeve.



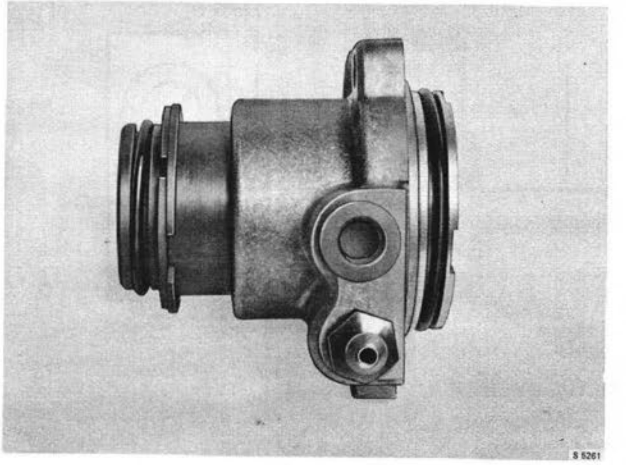
PRESSING OUT THE CYLINDER SLEEVE

3. Remove the piston and lip seal.

ASSEMBLY

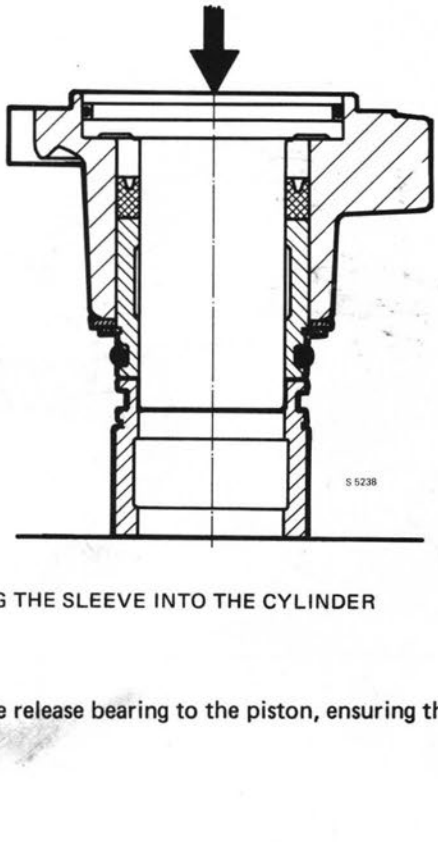
Make sure that the slave cylinder has been thoroughly cleaned. Wash the parts in brake fluid or a special cleaning fluid for hydraulic brake components, e.g. a mixture of cleaning spirit and acetone.
Thoroughly clean the slave cylinder using a mixture of 70 % cleaning spirit and 30 % acetone.
The lip seal should never be allowed to come into contact with mineral oil. Apply a thin coating of Castrol Rubber Grease to the lip seal (not in the groove) and to the piston (but not the O-ring).

1. Fit the O-ring to the flange of the sleeve.
2. Slide the lip seal onto the sleeve. Dip the flange of the sleeve in brake fluid and insert the sleeve into the cylinder. Insert the lip seal part of the way into the cylinder.
3. Guide the sleeve and the cylinder upwards by pushing in the piston. The two lock rings and the O-ring should be fitted to the piston.



THE SLEEVE IS GUIDED BY THE PISTON

4. Place the slave cylinder on a suitable support (e.g. a spare slave cylinder piston) and press the sleeve into the cylinder.



PRESSING THE SLEEVE INTO THE CYLINDER

5. Fit the release bearing to the piston, ensuring that the

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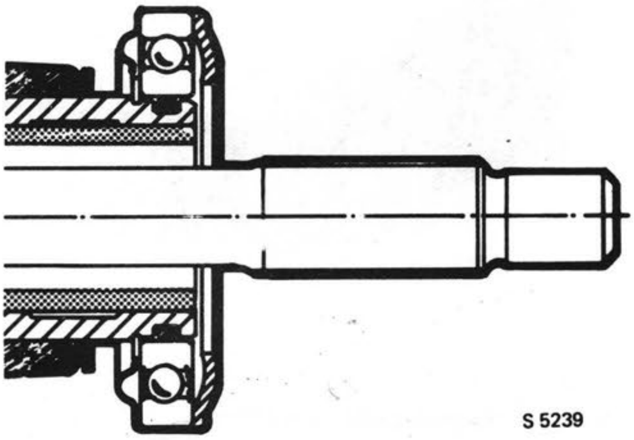
bearing is turned the right way (see illustration).



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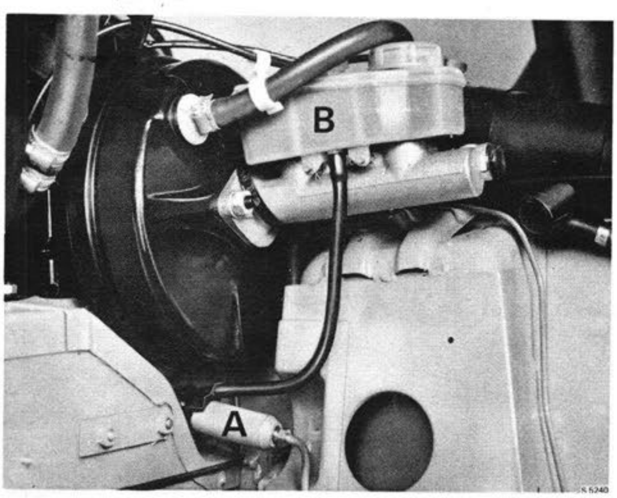
POSITIONING THE RELEASE BEARING

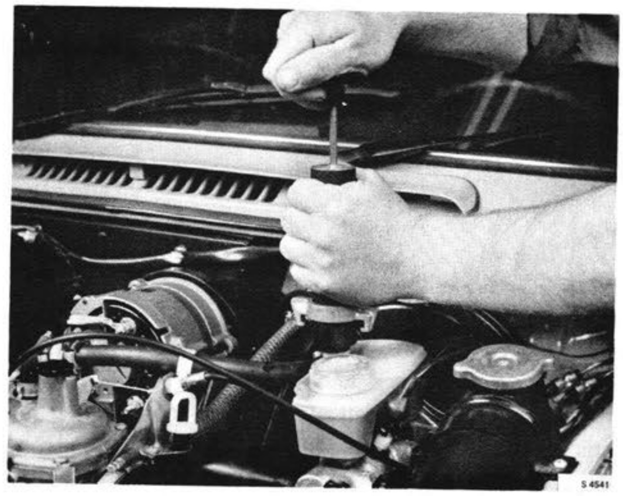
BLEEDING THE MASTER AND SLAVE CYLINDER

1. Connect a hose (about 1/4" or 6 mm ID) to the slave cylinder bleeder nipple, and place the free end in a collecting vessel part-filled with hydraulic brake fluid.
2. Fill the master cylinder header tank with brake fluid.



"A" Master cylinder, clutch
"B" Container for clutch fluid (combined with brake fluid container)

3. Open the bleeder nipple on the slave cylinder a half turn.
4. Place the coolant system tester over the filler opening of the master cylinder (see illustration).



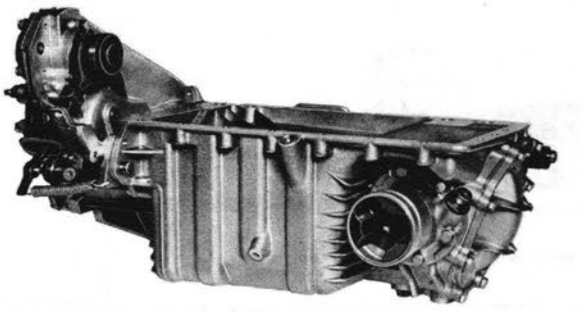
BLEEDING THE CLUTCH SYSTEM, L.H.D.-CAR

5. Pump one or more times until all air has been expelled from the system.
6. Close the slave cylinder bleeder nipple.
7. Check that all air has been expelled by pushing down the clutch pedal.

GENERAL

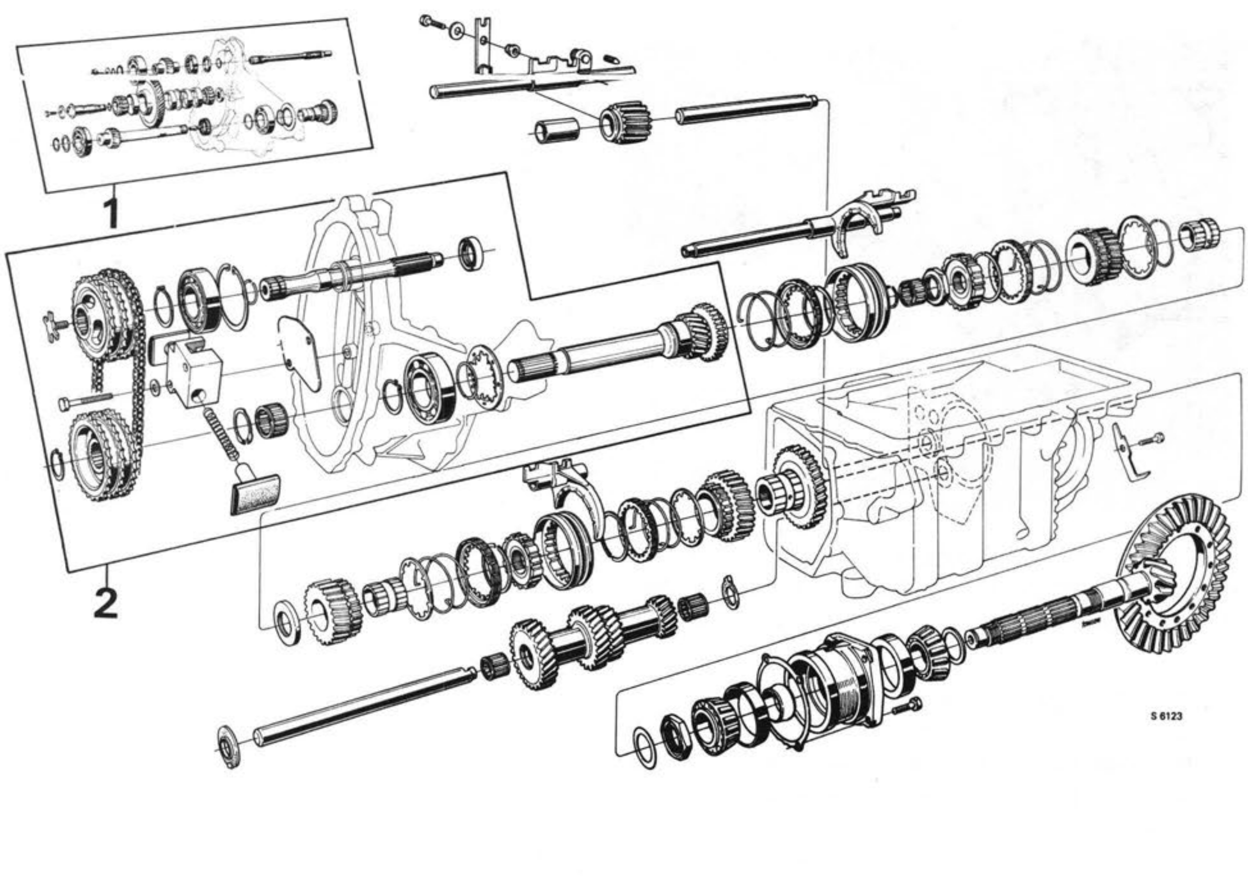
4-speed transmission

Manual transmission

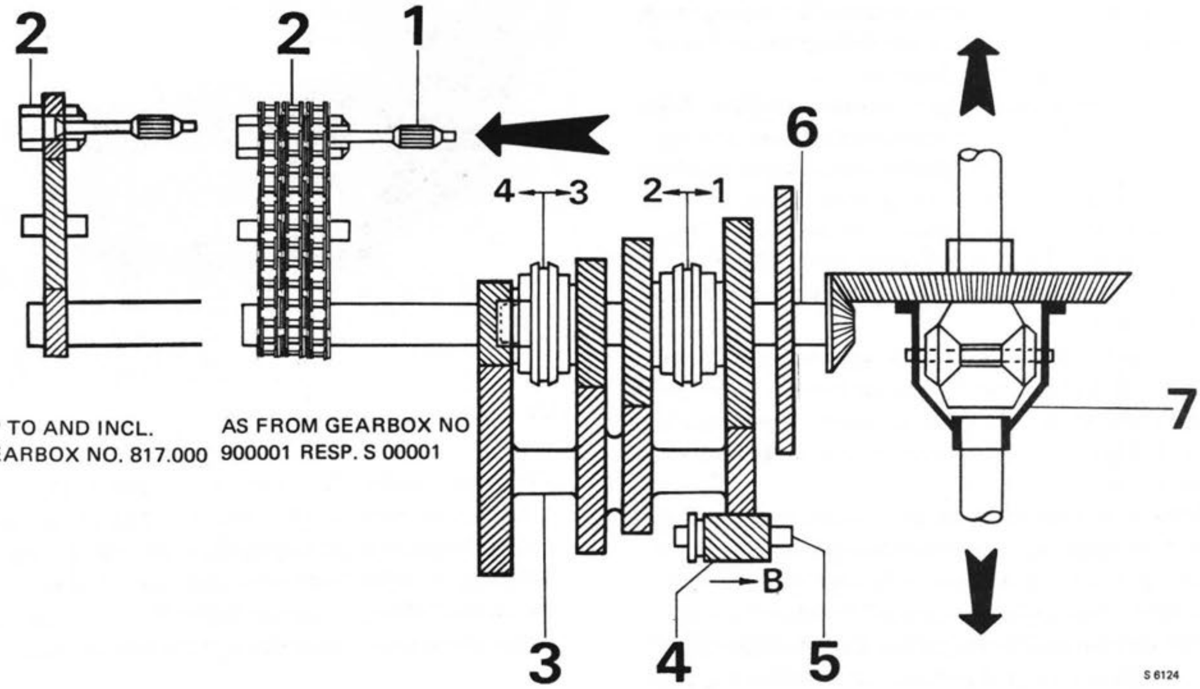


MANUAL TRANSMISSION, 4-SPEED

The transmission is designed for front-wheel drive in such a way that all shafts and gears, the differential and inner universal joints form an integral unit.
The transmission incorporates a four-speed gearbox. There is synchronization on all forward gears while reverse is engaged by a sliding gear. The shafts are journalled in the transmission case with ball and taper roller bearings. The pinion shaft gear wheels are journalled on bushes. All gear wheels except reverse are continuously engaged and have spiral-cut teeth.
The front of the transmission assembly consists of a primary gear which transmits the engine power via the clutch to the gearbox itself. The latter is located underneath the engine, and part of the transmission case serves as an engine oil sump.
The operation of the transmission is illustrated in the diagram. Shaft power is transmitted through the clutch and primary gear to the input gear in the gearbox. When the car is being driven in 1st gear, power is transmitted by the intermediate gear to the pinion shaft through the No. 1 gear, which is journaled on the pinion shaft and locked to it by a sliding muff.
For driving in 2nd or 3rd, power is transmitted to the pinion in the same way but with No. 2 or No. 3 locked to the pinion shaft by a coupling muff. For driving in top gear, the input shaft in the gearbox is locked to the pinion shaft direct by a coupling muff, i.e. in this case power is not transmitted through the intermediate gear. Reverse drive is provided by an extra reverse gear shaft. A gear



4-SPEED TRANSMISSION, EXPLODED VIEW
1. Up to and incl. gearbox No. 817.000
2. As from gearbox No. 900001 resp. S 00001



4-SPEED TRANSMISSION, SCHEMATIC DIAGRAM

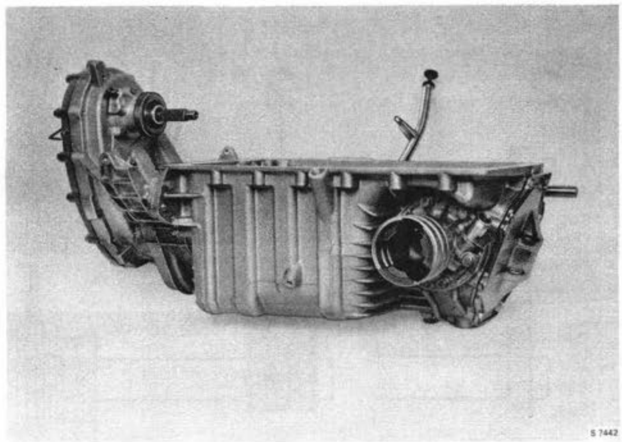
1. Clutch shaft
2. Primary gear
3. Free wheel
4. Intermediate gear
5. Reverse gear shaft
6. Pinion shaft
7. Differential housing

B=Reverse gear

journaled on this shaft is in constant engagement with 1st gear on the intermediate gear. The gear pinion can be engaged with a gear on the pinion shaft. This gear is placed behind the 1st gear on the pinion shaft. Thus when the car is being driven in reverse, power is transmitted from the intermediate gear to the reverse gear, and thence to the pinion shaft. This arrangement reverses the sense of rotation of the pinion shaft.

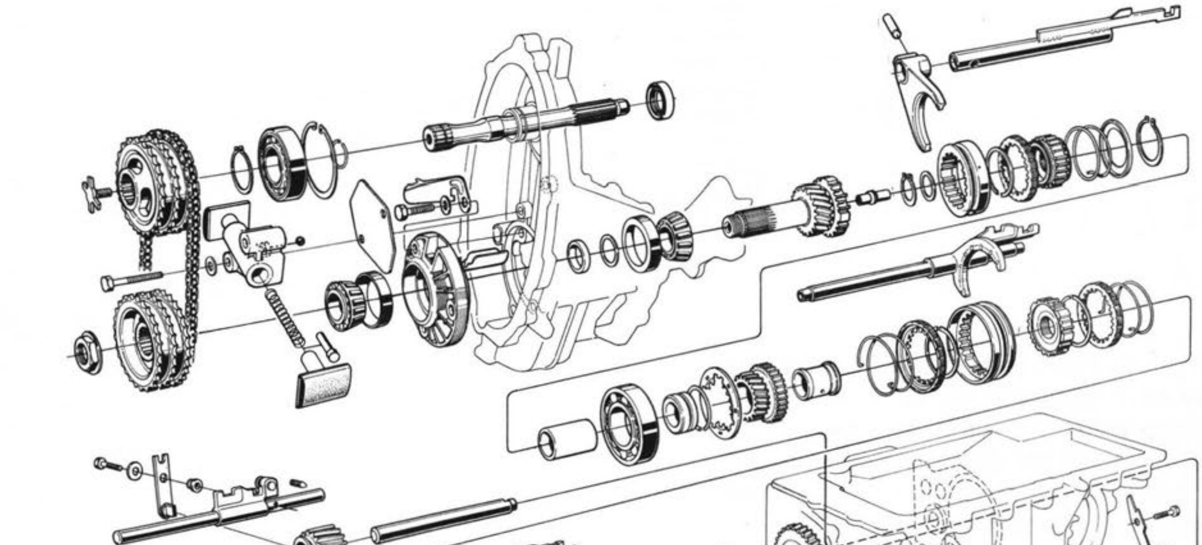
5-speed transmission

The transmission is designed for front-wheel drive in such a way that all shafts and gears, the differential and inner universal joints form an integral unit.
The transmission incorporates a five-speed gearbox. There is synchronization on all forward gears while reverse is engaged by a sliding gear. The shafts are run in ball bearings and conical roller bearings in the gearbox casing.
The countershaft gears are mounted on needle bearings, the constant gear is run on individual balls. All gear wheels except reverse are continuously engaged and have spiral-cut teeth.
The front of the transmission assembly consists of a primary gear which transmits the engine power via the clutch to the gearbox itself. The latter is located underneath the engine, and part of the transmission case serves as an engine oil sump.
The operation of the transmission is illustrated in the diagram. Shaft power is transmitted through the clutch and primary gear to the input gear in the gearbox. When the car is being driven in 1st gear, power is transmitted by the intermediate gear to the pinion shaft through the No. 1 gear, which is journaled on the pinion shaft and locked to it by a sliding muff.

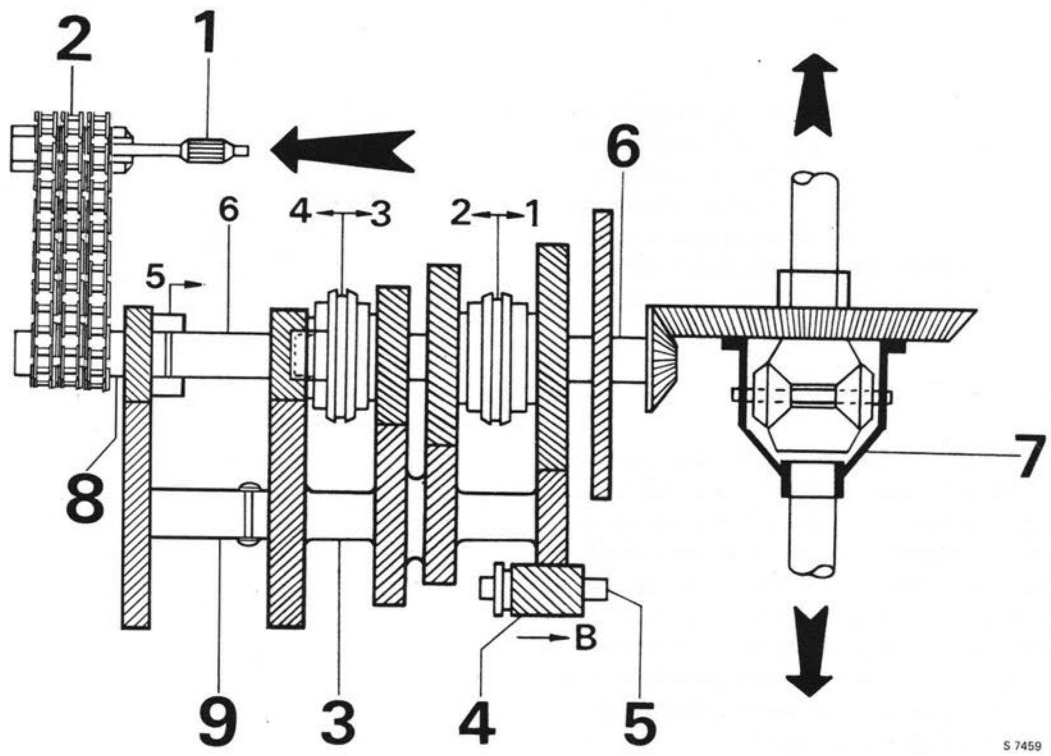


MANUAL TRANSMISSION, 5-SPEED

For driving in 2nd, 3rd or 4th power is transmitted to the pinion in the same way but with No. 2 or No. 4 locked to the pinion shaft by a coupling muff. For driving in the 5th gear, the input shaft in the gearbox is locked to the pinion shaft direct by a coupling muff, i.e. in this case power is not transmitted through the intermediate gear.



5-SPEED TRANSMISSION

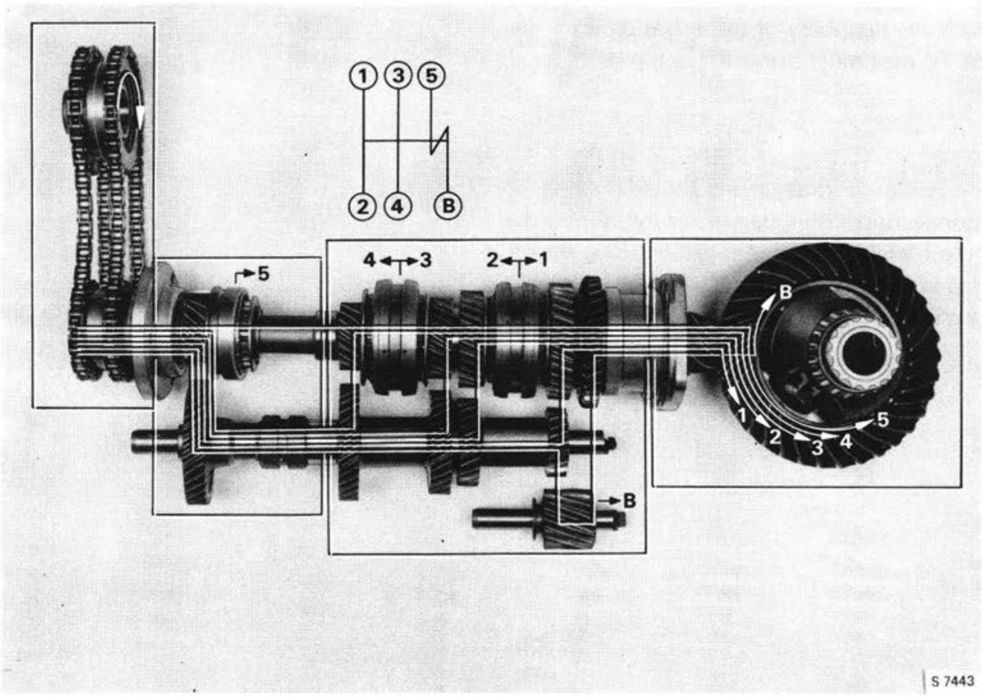


Reverse drive is provided by an extra reverse gear shaft. A gear journaled on this shaft is in constant engagement with 1st gear on the intermediate gear. The gear pinion can be engaged with a gear on the pinion shaft. This gear is placed behind the 1st gear on the pinion shaft. Thus when the car is being driven in reverse, power is transmitted from the intermediate gear to the reverse gear, and thence to the pinion shaft. This arrangement reverses the sense of rotation of the pinion shaft.

5-SPEED TRANSMISSION, SCHEMATIC DIAGRAM

1. Clutch shaft
2. Primary gear
3. Free wheel
4. Intermediate gear
5. Reverse gear shaft
6. Pinion shaft
7. Differential housing
8. Input shaft
9. Input countershaft gear

B= Reverse gear



TRANSMISSION OF POWER

5-SPEED GEARBOX, LUBRICATING SYSTEM

General

The gearbox components are lubricated by the oil in the gearbox sump. The oil is led through distribution channels to the same level in the primary gear housing, the gearbox housing and the final drive housing. A ball valve is installed in the primary gear housing to prevent changes in the level of the lubricant when driving downhill, thereby ensuring that the final drive unit is properly lubricated.

Lubrication

The crown wheel and the countershaft gears are partially submerged in oil. When the transmission is in motion the oil is delivered to the primary gear chain housing via an oil catcher. The oil collected here forms a sump which lubricates the chains, sprockets and input shaft bearing. Excess oil is returned to the primary gear housing and the gearbox housing via two oil catchers which lubricate the pinion shaft gear. The oil passes through drilled channels in the input and pinion shafts and via connecting pipes to 4 lubrication points on the pinion shaft for the gear bearings.

Ventilation

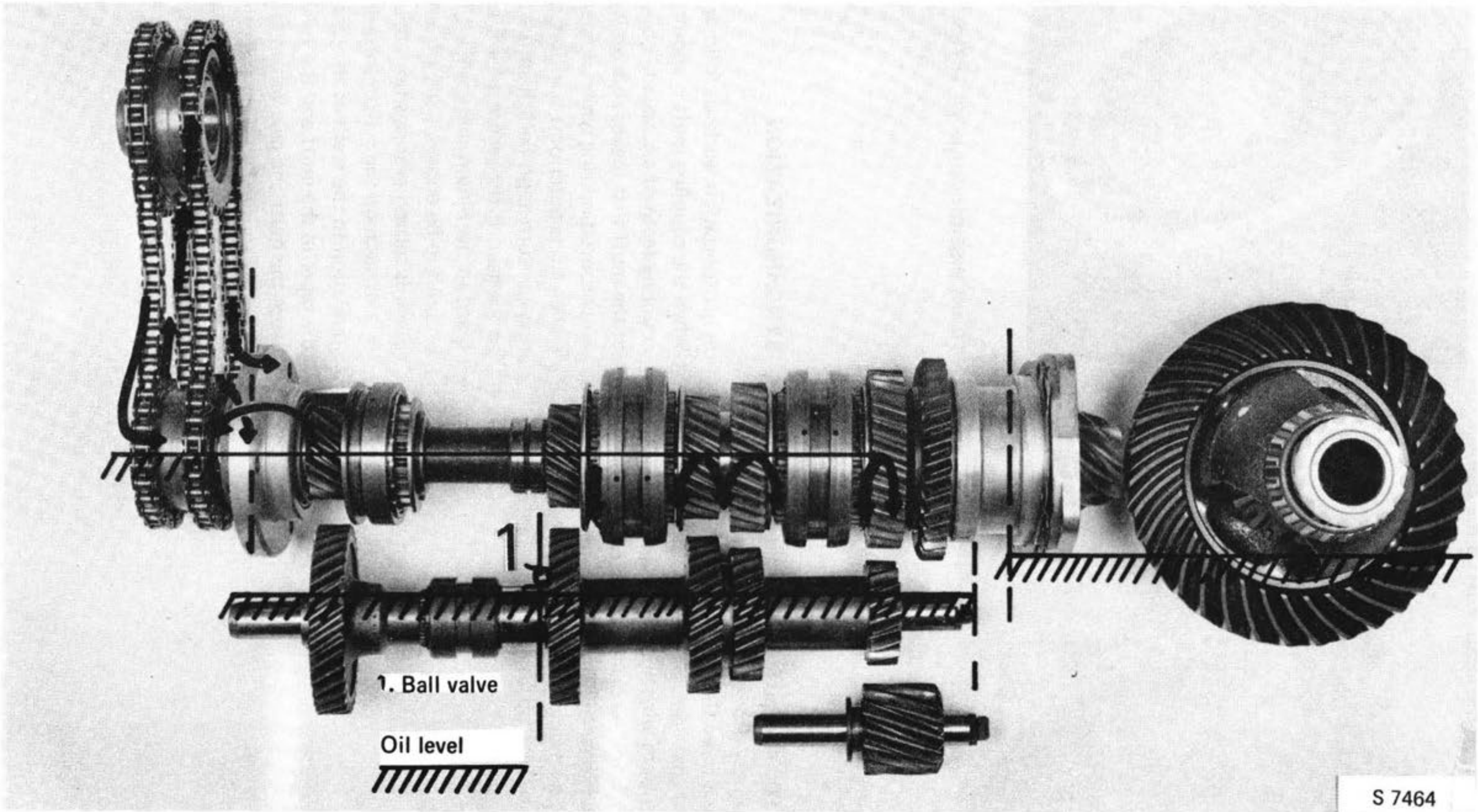
A vent in the panel on the chain house cover compensates the pressure changes in the gearbox.

Refilling the gearbox with oil after repair or reconditioning

Add 0.5 pint oil to the chain housing through the panel in the chain housing cover and the remaining 4.8 pints oil should be used to fill the gearbox. Approx. 4.6 pints oil will flow through the aperature into the primary gear housing. The lower periphery of the aperature is on the same level as the maximum mark on the dip stick.

Oil

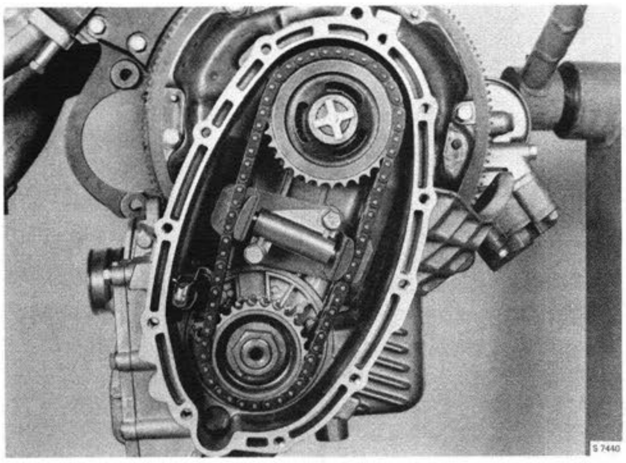
Engine oil is used for lubrication and should only be changed in connection with repair or recondition of the gearbox. The oil level should be topped-up using the oil recommended in the specification. The oil level should be checked using the dipstick on the right-hand side of the gearbox.



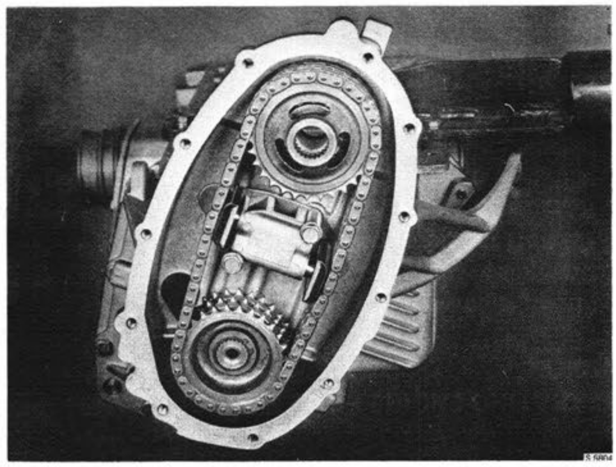
LUBRICATION SYSTEM

PRIMARY GEAR

Up to and incl. gearbox No. 817000, the primary gear consists of a gear transmission comprising a gear train which transmits the power from the clutch shaft, an intermediate gear and a gear on the input shaft to the gearbox.



PRIMARY GEAR

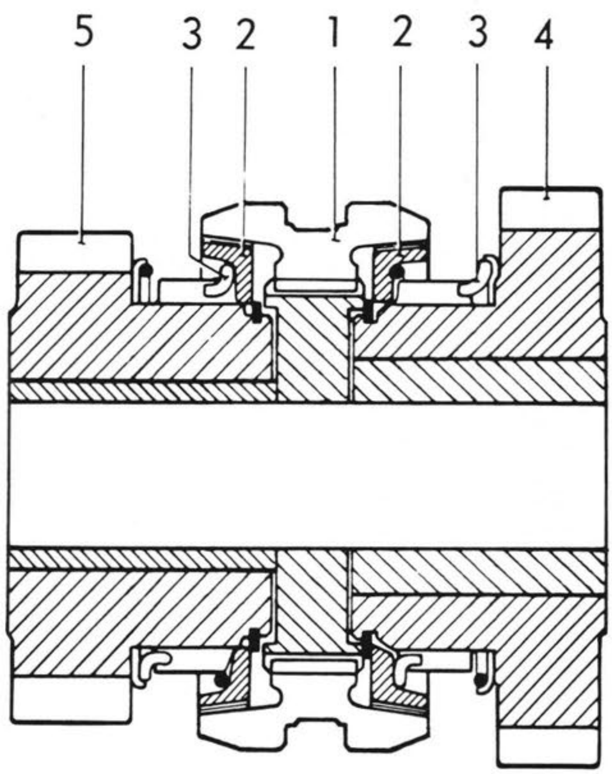


TRANSMISSION CHAIN WITH TENSIONER

As from gearbox No. 900001 and S 00001 (cars with turbo engines), the primary gear consists of a chain transmission comprising three simple chains. Located between the chains is a chain tensioner comprising two spring-loaded tensioner pads with hydraulic damping. Oil flows continuously from the primary gear case to the oil trap of the chain tensioner housing. Non-return valves providing an hydraulic damping function are located in the passages between the oil trap and the chain tensioner cylinders.

SYNCHRONIZATION

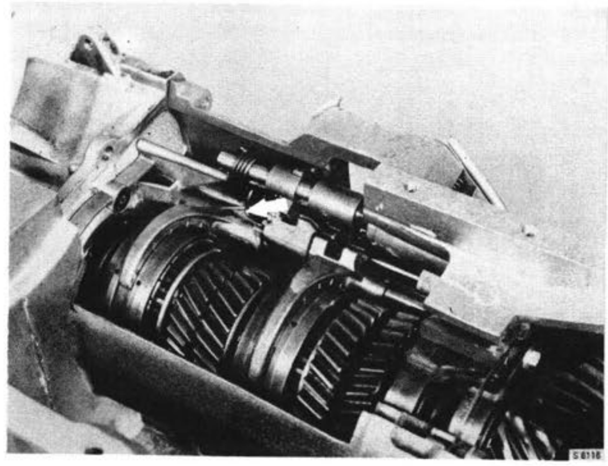
Synchronization works as follows (see illustration). When the coupling muff is about to engage with the coupling teeth of e.g. second gear, the internal tapering of the muff first makes contact with the spring-loaded synchronization ring which is engaged with the gear wheel. In its outermost position, the synchronization ring can turn appr. half the pitch of one tooth in relation to the gear. If the second gear is running at a different speed to the pinion shaft at the time when second gear is about to be engaged, and the muff is starting to move towards second gear position, the muff will be blocked by the teeth on the synchronization ring which turned in relation to the teeth of the pinion. Friction between the taper in the muff and the synchronization ring will cause the muff and gear to run at the same speed, whereupon the torque acting on the synchronization ring will be reduced. It will now be possible for the teeth on the synchronization ring and the coupling muff to slide in over the teeth on the pinion.



S 4545

SYNCHRONIZER UNIT

1. Synchronizer sleeve
2. Sunchronizer ring
3. Spring
4. 1st gear wheel
5. 2nd gear wheel



BRAKING DEVICE FOR REVERSE GEAR

As from gearbox Nos. 900001 and S 00001 (transmission with chain-drive primary gear), the gearbox has been fitted with a braking device which provides smoother gear-changing when reverse is selected. The device comprises a spring mounted on the gear selector rod. When reverse gear is selected, the spring applies a light pressure on the gear shift fork for 1st and 2nd gears, whereupon a braking effect on the gear is achieved by means of the 1st gear synchronization.

DIFFERENTIAL, ETC.

The differential assembly consists of two differential gears and two front axle gears, one for each front axle. All these gears have straight beveled teeth. The axle gears are splined to the ends of the inner drivers. The crown wheel, which is driven from the transmission by the pinion shaft, is screwed to the differential case.
The speedometer drive gear is secured to the differential case by a lock ring. Its rotation is transmitted by a worm gear to the speedometer cable attachment.

REMOVING THE POWER PLANT

Manual transmission

REMOVING

For major work on the engine and transmission, the entire power plant should be lifted out. Removal of the engine by itself is not recommended.

1. Remove the hood as follows:
   Back off both the hood fastening screws. Lift off the hood. For this you need a helper to hold one side of the hood and help to lift it clear.
2. Detach the battery cables. Unclamp and lift out the battery.
3. Drain off coolant through the radiator and engine block drain cocks.
3. (Later-version engine blocks are equipped with a drain plug.)
4. Carbureted engine:
   Detach the vacuum hose of the servo cylinder from the inlet manifold and pull the fuel hose off the suction side of the fuel pump.
4. Injection engines:
   a. Detach the vacuum hose of the servo cylinder from the inlet manifold and remove the rubber bellows between the air flow sensor and inlet manifold.
   b. Thoroughly clean the areas around the fuel line connections on the fuel distributor and detach the lines. Plug the holes and blank off the fuel line ends in a suitable manner.
   c. Disconnect the electrical connection on the air flow sensor.
   d. Undo the clamps on the air cleaner and remove the air cleaner and mixture control unit.
5. Carbureted engine:
   Undo the cable connections to the ignition coil, temperature transmitter, oil pressure transmitter, radiator fan, thermostat contact, headlights and headlight wipers.
5. Injection engine:
   a. Undo the cable connections to the ignition coil, temperature transmitter, radiator fan, thermostat contact, headlights and headlight wiper motor.
   b. Disconnect the cables of the injection system at the warm-up regulator, auxiliary air valve, cold start valve and thermo-time switch.

> CAUTION
> Do not detach the connections by pulling the cables. Grip the connecting pieces.

6. Carbureted engine:
   a. Remove the air cleaner, the inlet hose and the preheater complete with hose.
   b. Detach the throttle control wire from driver and bracket.
   c. Detach the choke control wire and sheath from the carburetor.
6. Injection engine:
   Detach the throttle control wire from driver and bracket on the throttle valve housing.
7. Detach the hoses at the connections to the thermostat housing, radiator, inlet manifold and water pump.
8. a. Remove the grille.
   b. Remove the hood lock operating cable from its fastenings at the dash panel and wheel housing.
   c. Remove the two front sheet retaining screws and nuts, and the four screws holding the headlights to the body.
   d. Remove the front sheet, lifting forward and upward.
9. Disconnect the clutch hose from the slave cylinder. Plug the hose and the hole in the slave cylinder. (Model 1975: Remove the slave cylinder and hang it up in a convenient place.)
10. Disconnect the exhaust pipe from the exhaust manifold
11. a. Disconnect the ground cable from the transmission.
    b. Remove the alternator.
12. Jack up the front end of the car and place blocks under the body.
13. a. Put the gear lever in neutral.
    b. Withdraw the front taper pin from the gear shift rod joint by means of special tool 7840838.
    Pull the rubber bellows free of the groove in the joint (rubber bellows have been discontinued during the 1977 model year and need not be fitted in earlier models in conjunction with repair work).
    Separate the gear selector rod joint from the gear selector rod.

> NOTE
> There are two types of gear shift rod joints, steel and plastic. The taper pin must not be knocked loose in joints made of plastic.

14. Detach the speedometer cable from the transmission.
15. Undo the engine brackets.
16. Undo the larger clips round the rubber bellows on the inner universal joints.
17. Fit the lifting yoke 8392177 to the two engine lifting lugs.
18. Undo the lower end piece from the control arm on the right-hand side and turn the steering wheel to the left. Raise the power plant and withdraw the left universal joint.
19. Lift the power plant to a convenient height for access to the cable connections on the starter. Disconnect the cables.
20. Hoist out the power plant. Fit protective caps over the inner drivers and rubber bellows.

INSTALLING

1. a. Check that the inner universal joints are packed with grease.
   b. Check the front engine cushion. Make sure that the washer is properly tightened.
2. Raise the power plant with the lifting yoke (tool 8292177. Position the power plant in the engine compartment.
3. Lower the power plant to a convenient height for fitting the starter. Connect the cables.
4. Assemble the inner universal joints as follows: Hang the clips on the inner drivers. Lower the power plant until it is about 2–2 1/2" (50–60 mm) from the engine cushions. Assemble the right-hand universal joint, then lower the power plant until it is about 1" (20–30 mm) above the engine cushions and push the power plant to the right. Lower the power plant and position it over the engine cushions while guiding the left-hand universal joint into place. Connect the end piece to the lower control arm.
5. a. Align the engine brackets.

> Cars built to U.S. specifications and other cars with servo-assisted steering are equipped with special rear engine cushions. The cushions are designed to prevent the power plant from hitting the steering gear and damaging it in the event of a collision. A wire runs between the rear edge of the upper retaining plate and the front edge of the lower retaining plate in the cushions. The position of the cushions is determined by guides in the engine bracket and the cushion.

   b. Bolt the power plant to the engine cushions.
6. Remove the lifting yoke.
7. a. Push the rubber bellows over the inner universal joint drivers and fit the clamps.
   b. Wipe any surplus grease off the rubber bellows and check that the bellows are not deformed.
8. a. Connect the gear shift rod joint to the gear selector rod and insert the taper pin.
   b. Connect the speedometer cable to the transmission.
9. Connect the hose to the slave cylinder and bleed the clutch system. (Model 1975: Fit the slave cylinder and adjust the clutch.)
10. Bolt the exhaust pipe to the exhaust manifold.
11. Lower the front end of the car.
12. a. Connect the ground cable.
    b. Fit the alternator.
13. Mount the front sheet complete with radiator and connect the hood lock operating cable to the attachment at the dash panel.
14. Fit the grille.
15. Reconnect the cables to the radiator fan, thermostat contact, headlights, headlight wiper motor and clip the bundle of wiring to the front sheet.
16. Connect the coolant hoses to the radiator, thermostat housing, water pump, inlet manifold and heater.
17. Connect the vacuum hose and fuel hose and connect cables to the temperature transmitter, ignition coil and oil pressure transmitter.
18. a. Connect the throttle control wire to driver and bracket.
    b. Carbureted engine:
    Connect the choke control wire to the carburetor.
19. Carbureted engine:
    a. Mount the air cleaner and preheater complete with hoses.
    b. Connect the ventilation hose.
    c. Connect the cables between the distributor and ignition coil.
    d. Connect the fuel pipe.
19. Injection engine:
    a. Mount the air cleaner and mixture control unit and connect the rubber bellows to the throttle valve housing and the air flow sensor.
    b. Fit the fuel lines.
    c. Fit the cables to the warm-up regulator, auxiliary air valve, cold start valve, thermo-time switch and air flow sensor.
20. Install the battery and connect the cables.
21. Close the radiator and engine block drain cocks, fill with coolant and oil.
22. Start the engine, checking oil pressure and coolant temperature. Check the operation of the transmission. Check the operation of the radiator fan by grounding the thermostat contact cable to the radiator.
23. a. Mount the hood and connect the windshield washer hose.
    b. Check the fit of the hood. Close the hood, open the doors, and check that the door jambs clear the rear edge of the hood.
    c. Check the headlight alignment.
24. Take the car out for a test run. Check the coolant level after driving.

SEPARATING ENGINE FROM MANUAL TRANSMISSION

1. Clean the power plant.
2. Drain the engine oil.
3. Take off the clutch cover.
4. Remove the starter.
5. Withdraw the clutch shaft (see instructions for disassembling the clutch).
6. Model 1975: Remove the three screws in the release bearing guide sleeve.
   As from model 1976: Remove the three slave cylinder retaining screws.
7. Model 1975: Remove the adjusting screw and the clutch lever.
8. Remove all bolts in the mating flanges of the engine and the transmission.
9. Lift the engine carefully off the transmission and remove the release bearing guide sleeve at the same time.

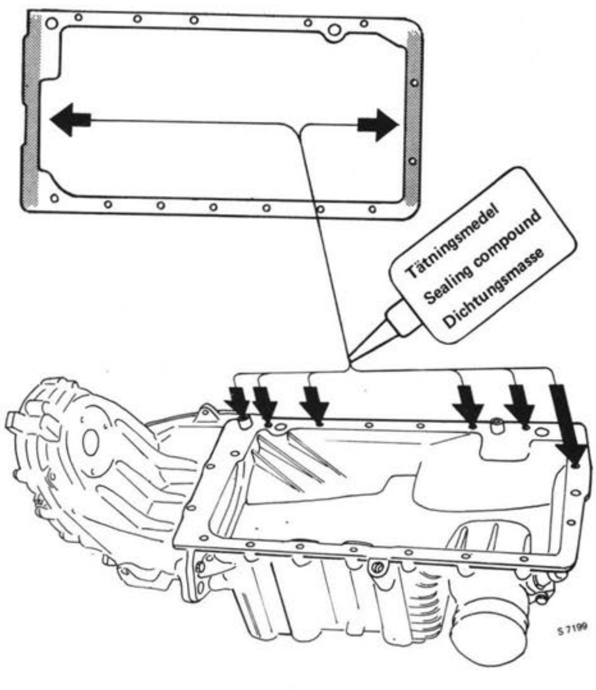
CAUTION

If the engine and transmission fail to separate, never attempt to force them apart without first checking that all bolts have been removed.

Reassemble in the reverse order.

As from model 1978 (primary gear with chain-drive), apply sealing compound to the three slave cylinder retaining bolts.

When fitting together the engine and transmission:
- Ensure that the mating flanges between the engine and transmission are absolutely clean.
- Check that the two dowels are fitted in the transmission casing.
- Fit a new gasket on the transmission housing. Apply sealing compound to both sides of the gasket as shown in the illustration above.
- Apply thread locking compound to the six bolts in the holes as indicated in the lower illustration.



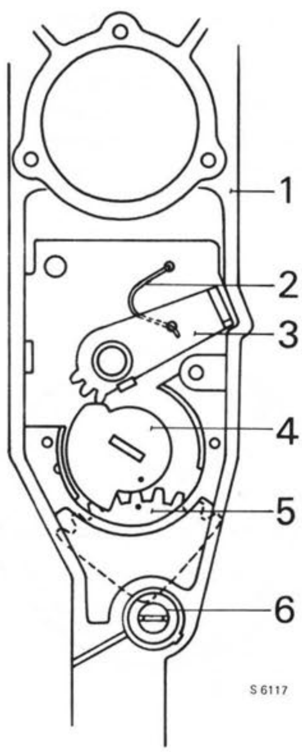
TRANSMISSION CONTROL

Manual transmission, 4-speed

GENERAL

Gear shifting is controlled by a floor-mounted lever located between the front seats.
The gear lever is fitted with a reverse gear catch which can be released by pulling the ring-shaped handle under the lever knob upwards. The lever is made in two parts, insulated from eachother by rubber bearings. The rest of the transmission control system consists of a gear lever housing recessed into the floor between the front seats and a rod that transmits gear lever movements to the gearbox.

Other gearbox controls include a top cover assembly recessed in the floor between the two front seats and a rod that transmits the movements of the gear lever to the gearbox.
The gear control is situated in the gear box and consists of stop studs in the gear selectors for 1:st, 2:nd and reverse gear.



GEAR LEVER LOCK
1. Housing
2. Spring
3. Locking tongue
4. Cogwheel
5. Toothed segment
6. Lock cylinder

ADJUSTING GEAR POSITIONS, 4 and 5-SPEED TRANSMISSIONS

1. Engage reverse gear and turn the ignition key to L (Locked).
2. Move the gear lever back and forth. The gear shift rod should then have an axial movement of 1.4±0.2 in (3.5±0.5 mm) Adjust by moving the gear lever housing forward or backward. The screws are removed by the aid of tool 8790370.

GEAR LEVER LOCK

General

The car is equipped with a combined ignition switch and gear lever lock. When the gear lever is placed in reverse and the ignition key withdrawn, the gear lever is locked.
The ignition switch has the following positions:

L. Locked. Reverse gear must be engaged before the key can be turned to L, and the key can only be withdrawn in this position.
Parking lights and hazard warning lights can be switched on.

G. Garage. All lights can be switched on.

K. Drive. All electrical systems including the ignition circuit are live.

S. Start. This position has a spring-loaded return to K.

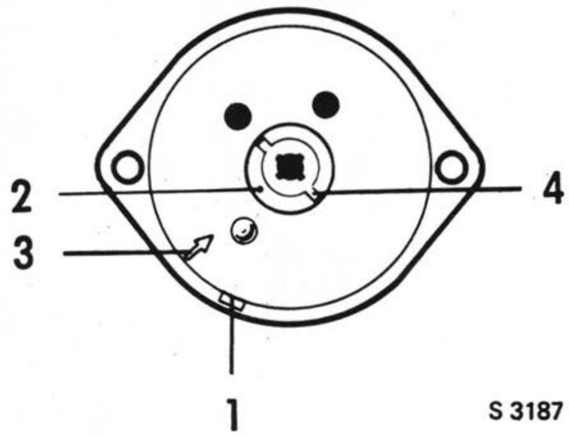
The gear lever lock consists of a tongue (3) and cogwheel (4) actuated by a toothed segment (5) mounted under the lock cylinder (6). The segment turns with the lock cylinder.

IGNITION AND STARTER CONTACT

Removal

1. Disconnect the battery cable.
2. Remove the driver's seat.
3. Pull up the rubber bellows and fold back the floor carpet.
4. Remove the fixing plate between the heater ducts in front of the gear lever housing.
5. Remove the buttons from the heater controls.
6. Remove the three gear lever cover retaining screws. Lift the cover and disconnect the ignition lock warning light and electrical connections to the switch. Remove the cover.
7. Disconnect the cables from the ignition lock and reversing light switch.

8. Remove the gear lever housing retaining screws using tool 8391237.
9. Raise the gear lever housing slightly and twist it so that the cover plate screws can be undone from underneath. Remove the cover plate.
10. Remove the two starter switch retaining screws.

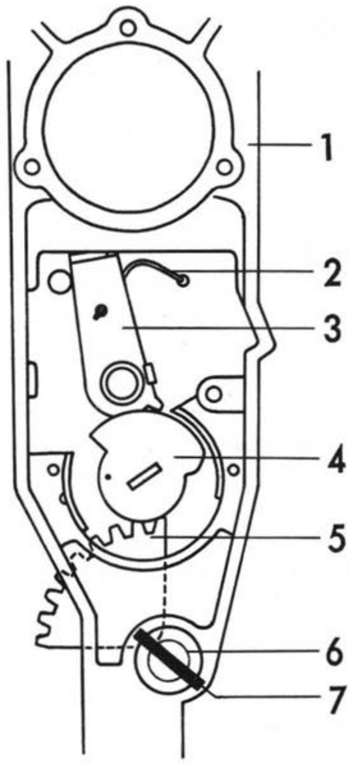


IGNITION AND STARTER CONTACT

1. Locating stud
2. Setting mark
3. Mark arrow
4. Gear wheel fitting groove

Assembly

1. Insert a screwdriver in the slot (4) and turn the contact to bring the mark (2) opposite the arrow (3) (see illustration).
2. Check that the ignition key is in position L (locked).
3. Mount the contact with the locating stud (1) in the matching groove in the gear lever housing.
4. Turn the ignition key back and forth to make sure that the gear lever lock does not stick or jam.
5. Fit the cover plate.
6. Mount the gear lever housing and adjust the gear position (see under "Adjustment of gear positions").
7. Connect the cable to the ignition switch and reversing light switch. Connect the switch and mount the lamp in the gear lever cover. Fit the cover.
8. Refit the buttons on the heater controls.
9. Mount the fixing plate between the heater ducts. Replace the floor carpet, and bellows on the gear lever.
10. Install the driver's seat.
11. Connect the battery.



S 6148

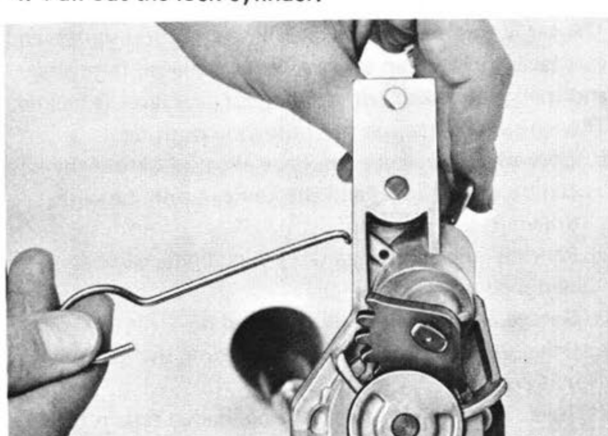
GEAR LEVER LOCK

1. Housing
2. Spring
3. Locking tongue
4. Cogwheel
5. Toothed segment
6. Lock cylinder
7. Ignition key

LOCK CYLINDER

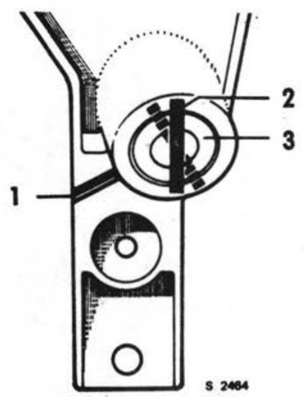
Removing

1. Take off the gear lever housing (see section on removing the gear lever housing).
2. Turn the key to a position between the locking- and garage position.
3. With the key in this position, the lock cylinder cotter pin can be pushed in to free the cylinder with the help of a wire lockpick or similar inserted through a hole under the gear lever housing (see illustration).
4. Pull out the lock cylinder.



PUSHING IN THE CATCH PIN

LOCK CYLINDER AND KEY
1. Key
2. Lock cylinder



PRESSING IN THE CATCH PIN
1. Hole for catch pin
2. Key
3. Lock cylinder

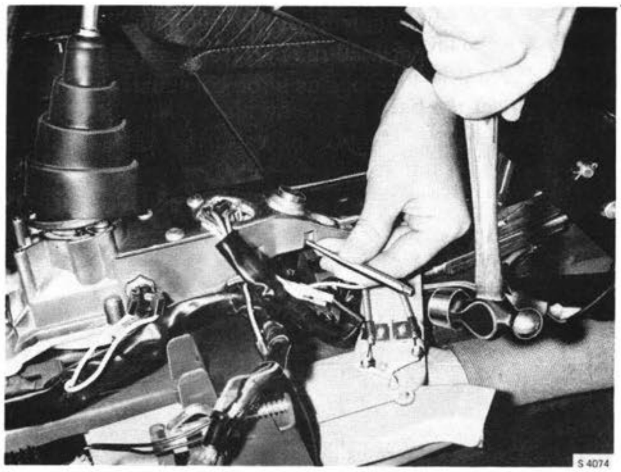
Assembling

1. Turn the key in the lock cylinder to a position between the locking- and garage positions.
2. Push in the lock cylinder catch pin. Check that the toothed segment driver pins are correctly positioned to fit in the lock cylinder. Push in the lock cylinder and check that it is engaged in the toothed segment.
3. Mount the gear lever housing according to the instructions given below.

Disassembly when key is missing

If the key is missing, the lock cylinder is removed from the gear lever housing as follows:
1. Lift out the left front seat and the gear lever housing protection casing.
2. Loosen the gear lever housing retaining nuts with the aid of special tool 8790370.
3. Drill out the plug covering the hole for the lock cylinder catch pin in the gear lever housing.
4. Drive in the catch pin with the aid of a drift approx. 0.08 in. (approx. 2 mm) and remove the lock cylinder.

Before installation, plug the hole in the gear lever housing again. The plug is made of a suitable screw or rivet that is cut to a length of approx. 0.19 in. (approx. 5 mm).



THE LOCK CYLINDER CATCH PIN IS DRIVEN IN WITH THE AID OF A DRIFT

GEAR LEVER HOUSING

Dismantling

1. Disconnect the battery cables.
2. Remove the driver's seat.
3. Pull up the rubber bellows on the gear lever, fold up the floor carpet and remove one of the heater ducts from in front of the gear lever housing.
4. Remove the taper pin from the joint between the gear shift rod and the heater ducts.
5. Remove the buttons from the heater controls.
6. Remove the three gear lever cover retaining screws, raise the cover and remove the ignition lock warning lamp and electrical connections to the switch. Remove the cover.
7. Disconnect the cable from the ignition lock and reversing light switch.
8. Remove the gear lever housing retaining screws using tool 8790370 and remove the housing.

Assembling

1. Install the gear lever housing in position and fit together the gear shift rod and the taper pin.
2. Secure the gear lever housing by means of the special nuts and tool 8391237, and adjust the gear positions. See under "Adjustment of gear positions".
3. Connect the cable to the ignition lock and reversing light switch and connect the switch. Fit the lamp in the gear lever cover. Fit the cover.
4. Replace the buttons on the heater controls.
5. Install the heater ducts, floor carpets and rubber bellows on the lever.
6. Install the driver's seat.
7. Reconnect the battery.

GEAR LEVER

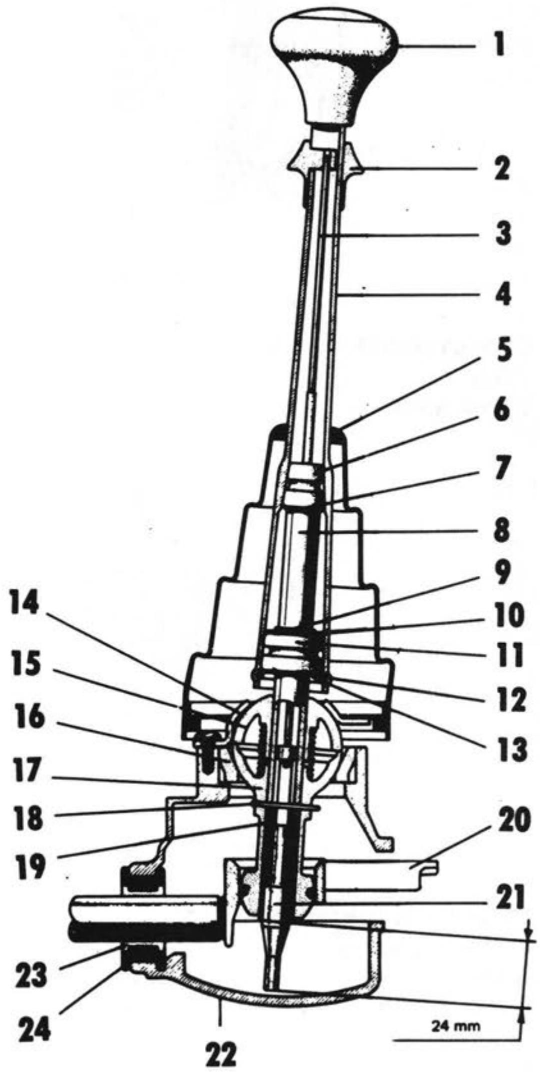
Removal

1. Undo the three screws under the rubber boot and remove the gear lever from the gear lever housing.
2. Pull out the tension pin from the carrier, screw out the catch stud and remove the spring.
3. Remove the carrier, the bearing and the cover.
4. Knock carefully with a plastic hammer on the knob, so that it will loosen from the gear lever and remove the carrier, the catch rod and the rubber boot.
5. Remove the lock ring, which holds the hollow lever and the gear lever together and pull out the hollow lever with its rubber bushing.

Replace damaged or weared parts.

Assembly

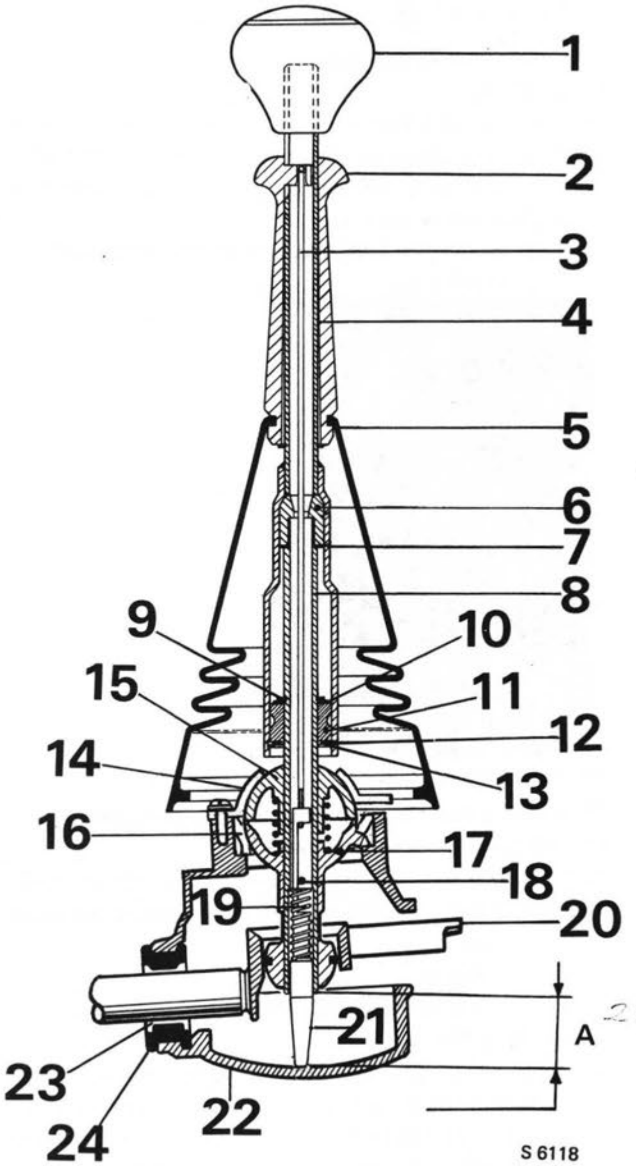
1. Fit slot ring, washers and rubber bushings on the hollow lever.
2. Fit the hollow lever in the gear lever and fit the lock ring.
3. Fit rubber boot, carrier and catch rod. Put the spring into the hollow lever and screw in the catch stud according to the fig., so that the measurement is obtained.
4. Fit cover, bearing, carrier and tension pin.
5. Press the knob on the gear lever.
6. Fit the gear lever on the gear lever housing.



S 5516

SECTION THROUGH GEAR LEVER HOUSING, UP TO AND INCL. MODEL 1977

1. Knob
2. Carrier
3. Catch rod
4. Gear lever
5. Rubber boot
6. Rubber bushing
7. Washer
8. Hollow lever
9. Slot ring
10. Washer
11. Rubber bushing
12. Washer
13. Lock ring
14. Cover
15. Bearing
16. Gear lever bearing
17. Carrier
18. Tension pin
19. Spring
20. Gear shift rod
21. Catch stud
22. Bottom part
23. Bearing
24. Rubber bushing



SECTION THROUGH GEAR LEVER HOUSING, AS FROM MODEL 1978

1. Knob
2. Carrier
3. Catch rod
4. Gear lever
5. Rubber boot
6. Rubber bushing
7. Washer
8. Hollow lever
9. Slot ring
10. Washer
11. Rubber bushing
12. Washer
13. Lock ring
14. Cover
15. Bearing
16. Gear lever bearing
17. Carrier
18. Tension pin
19. Spring
20. Gear shift rod
21. Catch stud
22. Bottom part
23. Bearing
24. Rubber bushing

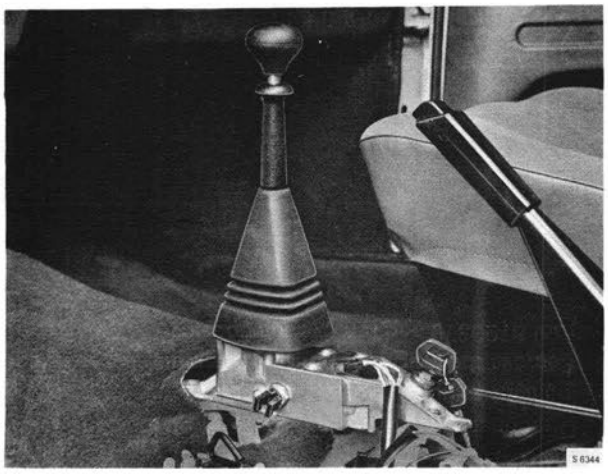
A = Up to and incl. model 1979: 0.94–1.0 in (24–25 mm), as from model 1980: 1.02–1.06 in (26–27 mm)

GEARBOX CONTROLS

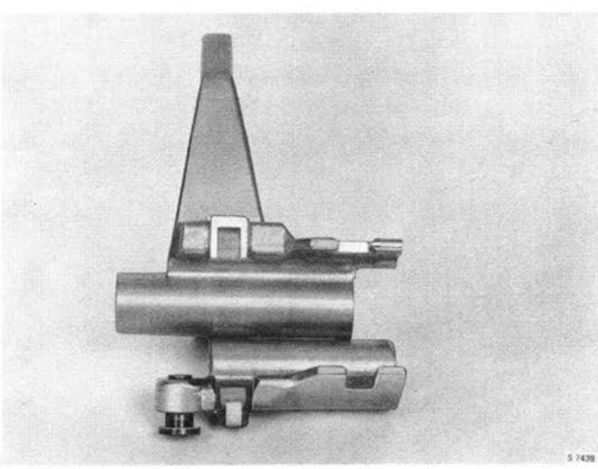
Manual 5-speed gearbox

General

The gears are changed by a floor-mounted gear lever positioned between the front seats. The gear lever is spring-loaded between 3rd and 4th gears with the result that there is a degree of resistance when selecting 1st, 2nd, 5th and reverse gears.
The gear levers is equipped with a reverse gear lockout which is linked to a lockout pin situated in the lower section of the gear lever housing. The lockout is overriden by raising the reverse gear lockout release rod which lies under the the gear lever knob. The gear lever is in two sections separated from each other by a rubber bushing.



Other gearbox controls include a top cover assembly recessed in the floor between the two front seats and a rod that transmits the movements of the gear lever to the gearbox. The gear selection controls are in the gearbox and comprises mechanical stops on 1st and 2nd speed selectors and the reverse gear actuator. The reverse lockout is, however, unchanged.



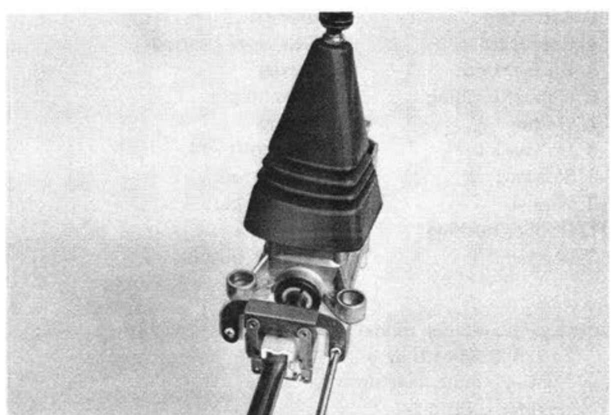
ADJUSTING GEAR POSITIONS

1. Engage reverse gear and turn the ignition key to L (Locked).
2. Move the gear lever back and forth. The gear shift rod should then have an axial movement of 0,14 ± 0,02" (3,5 ± 0,5 mm). Adjust by moving the gear lever housing forward or backward.
   Remove the gear lever housing nuts using special socket 87 90 370.

Adjusting the gear lever spring-loading

The adjustment is made on the control unit positioned in front of the gear lever housing.

1. Remove the right-hand front seat and fold back sufficient of the carpeting to allow the heating duct to be dismantled.
2. Select 3rd gear.
3. Remove the bolts holding the control unit onto the gear lever housing.
4. Adjust the control unit so that the rollers reach the bottom of the plunger's groove and the tension spring adopts its shortest length. Re-tighten the control unit.
5. Return the gear lever to neutral and check that the springloading moves the gear lever across the gate to a position opposite 3rd and 4th gears.
6. Refit the heating duct, the carpeting and the right-hand seat.



GEAR LEVER LOCK

General

The car is equipped with a combined ignition switch and gear lever lock. When the gear lever is placed in reverse and the ignition key withdrawn, the gear lever is locked. The ignition switch has the following positions:

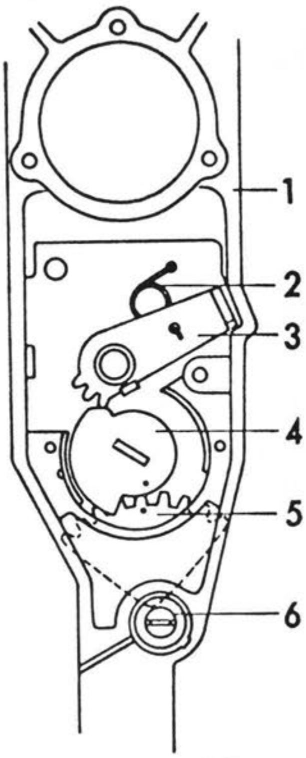
L. Locked. Reverse gear must be engaged before the key can be turned to L, and the key can only be withdrawn in this position.
Parking lights and hazard warning lights can be switched on.

G. Garage. All lights can be switched on.

K. Drive. All electrical systems including the ignition circuit are live.

S. Start. This position has a spring-loaded return to K.

The gear lever lock consists of a tongue (3) and cogwheel (4) actuated by a toothed segment (5) mounted under the lock cylinder (6). The segment turns with the lock cylinder.



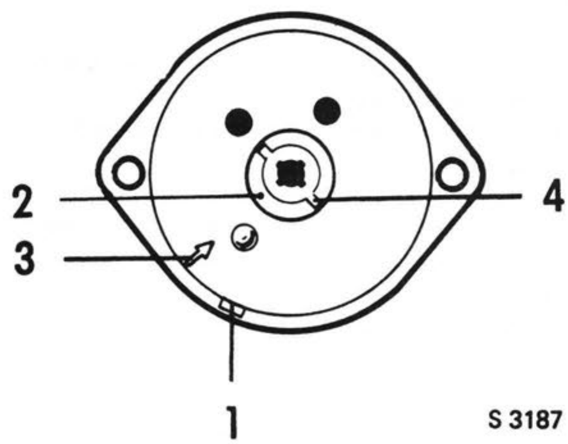
GEAR LEVER LOCK
1. Housing
2. Spring
3. Locking tongue
4. Cogwheel
5. Toothed segment
6. Lock cylinder

Removing the ignition and starter contact

1. Disconnect the battery cables.
2. Remove the left-hand seat (NOTE: disconnect the seat heating element wiring).
3. Select reverse gear, remove the ignition key and dismantle the cover from the gear lever housing.
4. Fold back the carpeting from the gear lever housing and the left-hand seat member.
5. Insert the ignition key and select 1st gear.
6. Disconnect the wires from the ignition lock and the reversing light switch.
7. Remove the three gear lever housing retaining screws.
8. Rotate the gear lever housing to the right, remove the three cover plate retaining screws and remove the cover plate.
9. Remove the two ignition lock switch retaining screws and remove the switch.

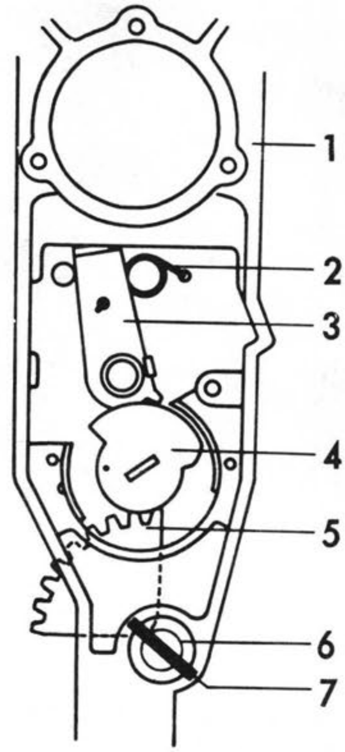
Assembly

1. Insert a screwdriver in the slot (4) and turn the contact to bring the mark (2) opposite the arrow (3) (see illustration).
2. Check that the ignition key is in position L (locked).
3. Mount the contact with the locating stud (1) in the matching groove in the gear lever housing.



IGNITION AND STARTER CONTACT
1. Locating stud
2. Setting mark
3. Mark arrow
4. Gear wheel fitting groove

4. Turn the ignition key back and forth to make sure that the gear lever lock does not stick or jam.
5. Fit the cover plate.
6. Mount the gear lever housing and adjust the gear position (see under "Adjustment of gear positions").
7. Connect the cable to the ignition switch and reversing light switch. Connect the switch and mount the lamp in the gear lever cover. Fit the cover.
8. Refit the buttons on the heater controls.
9. Mount the fixing plate between the heater ducts. Replace the floor carpet, and bellows on the gear lever.
10. Install the driver's seat.
11. Connect the battery.



S 4547

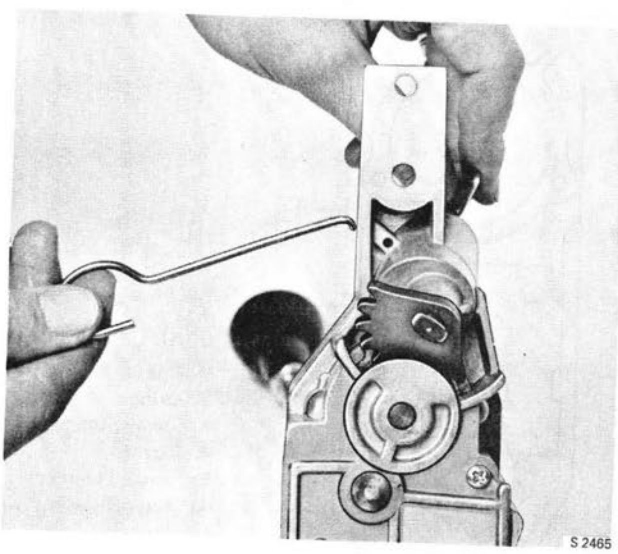
GEAR LEVER LOCK
1. Housing
2. Spring
3. Locking tongue
4. Cogwheel
5. Toothed segment
6. Lock cylinder
7. Ignition key

LOCK CYLINDER

Removing

1. Take off the gear lever housing (see section on removing the gear lever housing).
2. Turn the key to a position between the locking- and garage position.
3. With the key in this position, the lock cylinder cotter pin can be pushed in to free the cylinder with the help of a wire lockpick or similar inserted through a hole under the gear lever housing (see illustration).
4. Pull out the lock cylinder.

S 6615



S 2465

Assembling

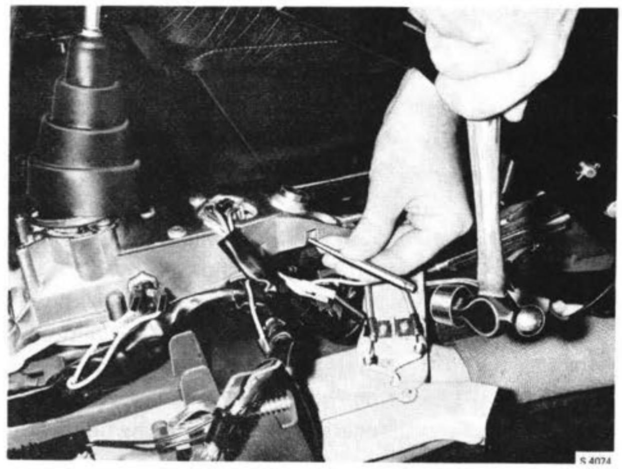
1. Turn the key in the lock cylinder to a position between the locking- and garage positions.
2. Push in the lock cylinder catch pin. Check that the toothed segment driver pins are correctly positioned to fit in the lock cylinder. Push in the lock cylinder and check that it is engaged in the toothed segment.
3. Mount the gear lever housing according to the instructions given below.

Disassembly when key is missing

If the key is missing, the lock cylinder is removed from the gear lever housing as follows:

1. Lift out the left front seat and the gear lever housing protection casing.
2. Loosen the gear lever housing retaining nuts with the aid of special tool 8391237.
3. Drill out the plug covering the hole for the lock cylinder catch pin in the gear lever housing.
4. Drive in the catch pin with the aid of a drift approx. 0.08 in. (approx. 2 mm) and remove the lock cylinder.

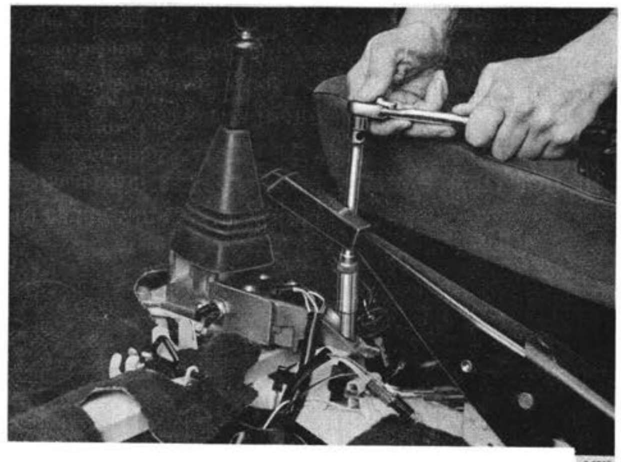
Before installation, plug the hole in the gear lever housing again. The plug is made of a suitable screw or rivet that is cut to a length of approx. 0.19 in. (approx. 5 mm).



GEAR LEVER HOUSING

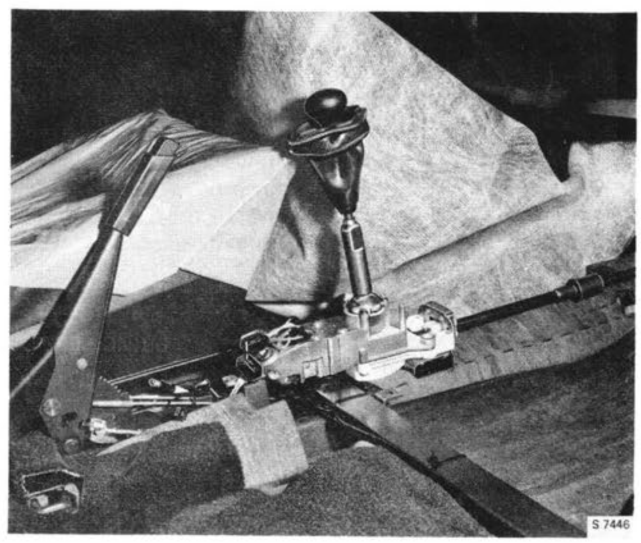
Dismantling

1. Disconnect the battery cables.
2. Remove the left-hand seat (NOTE: disconnect the seat heating element wiring).
3. Fold away the carpeting.
4. Remove the heating duct.
5. Remove the tapered pin and detach the rod from the gear rod assembly.
6. Dismantle the cover from the gear lever housing.
7. Disconnect the wires from the ignition lock and the reversing light switch.
8. Remove the three gear lever housing retaining screws and remove the housing together with the control unit and the gear rod. Use sleeve 87 90 370.



Installation

1. Introduce the rod through the dash panel aperture and place the gear lever housing and the control unit in position.
2. Install the rod in the gear rod assembly and fit the tapered pin.
3. Refit the gear lever housing. Use sleeve 87 90 370. Adjust the gear positions. See "Adjusting Gear Positions" and "Adjusting Spring-Loading".
4. Reconnect the wires to the ignition lock and the reversing light switch.
5. Refit the heating ducts and replace the carpeting.
6. Refit the gear lever housing cover and the rubber boot.
7. Refit the rihgt-hand seat.
8. Reconnect the battery cables.



GEAR LEVER

Removal

1. Undo the three screws under the rubber boot and remove the gear lever from the gear lever housing.
2. Pull out the tension pin from the carrier, screw out the catch stud and remove the spring.
3. Remove the carrier, the bearing and the cover.
4. Knock carefully with a plastic hammer on the knob, so that it will loosen from the gear lever and remove the carrier, the catch rod and the rubber boot.
5. Remove the lock ring, which holds the hollow lever and the gear lever together and pull out the hollow lever with its rubber bushing.

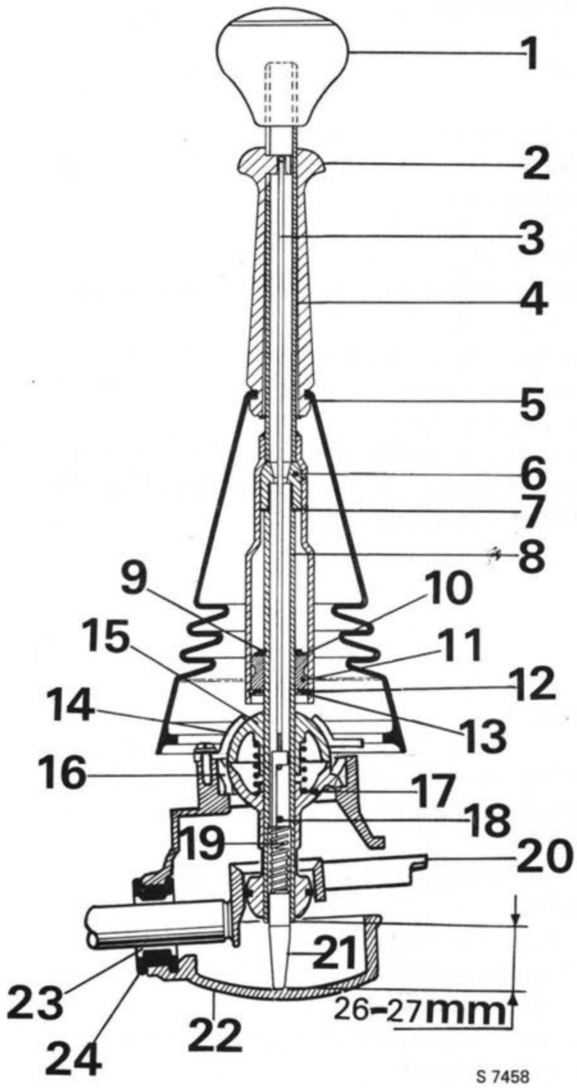
Replace damaged or weared parts.

Assembly

1. Fit slot ring, washers and rubber bushings on the hollow lever.
2. Fit the hollow lever in the gear lever and fit the lock ring.
3. Fit rubber boot, carrier and catch rod. Put the spring into the hollow lever and screw in the catch stud 1" (25 mm) see illustration.
4. Fit cover, bearing, carrier and tension pin.
5. Press the knob on the gear lever.
6. Fit the gear lever on the gear lever housing.

SECTION THROUGH GEAR LEVER HOUSING
MODEL 1978

1. Knob	13. Lock ring
2. Carrier	14. Cover
3. Catch rod	15. Bearing
4. Gear lever	16. Gear lever bearing
5. Rubber boot	17. Carrier
6. Rubber bushing	18. Tension pin
7. Washer	19. Spring
8. Hollow lever	20. Gear shift rod
9. Slot ring	21. Catch stud
10. Washer	22. Bottom part
11. Rubber bushing	23. Bearing
12. Washer	24. Rubber bushing



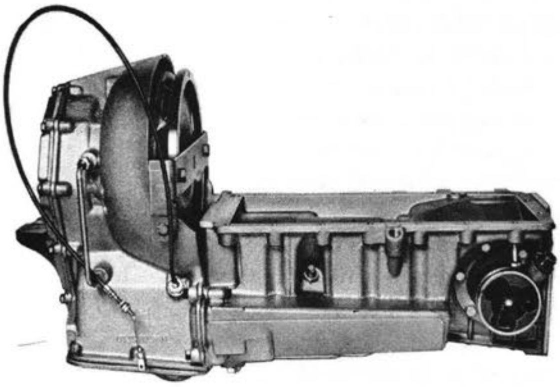
S 7458

SAAB

GENERAL

Automatic transmission

The Automatic Transmission consists of a three-element hydrokinetic torque converter, and a hydraulically operated gearbox comprising a planetary gear set providing three forward ratios and reverse.



S 4548

AUTOMATIC TRANSMISSION

OPERATION

'D' Range

This is provided for use when full performance of the car is required and when selected gives a first speed start with automatic up- and down change.

'2' Range

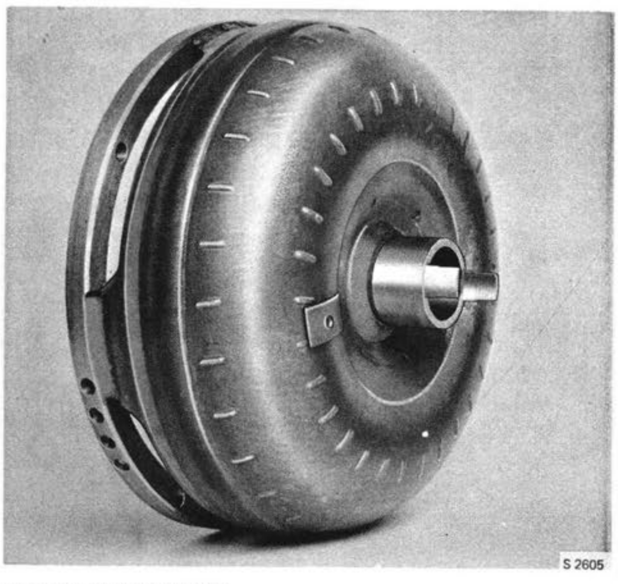
This is provided for use when only the first two ratios are required.
Automatic change from '1'–'2' is also provided.
Driving on 3rd is eliminated. Position 2 may not be selected at speeds above 55 mph (90 km/h).

'1' Range

This gives manual selection of 1st gear only. When this gear has been engaged it will remain in engagement until '2' or 'D' has been selected.
When selected at higher speeds, the transmission immediately changes to 2nd and when the speed has slowed down to a certain speed the 1st gear will engage.
Position 1 may not be selected at speeds above 90 km/h.

THE TORQUE CONVERTER

The feature of using a hydraulic converter in conjunction with a three speed automatic gearbox provides a means of obtaining a smooth application of engine power to the driving wheels and additional engine torque multiplication.
The converter also provides extreme low speed flexibility when the gearbox is in 3rd gear and, due to the ability of multiplying engine torque, it provides good acceleration from very low road speed without having to resort to a downshift in the gearbox. Torque multiplication from the converter is infinitely variable between the ratios of 2:1 and 1:1. The speed range, during which torque multiplication can be achieved, is also variable, depending upon the accelerator position.

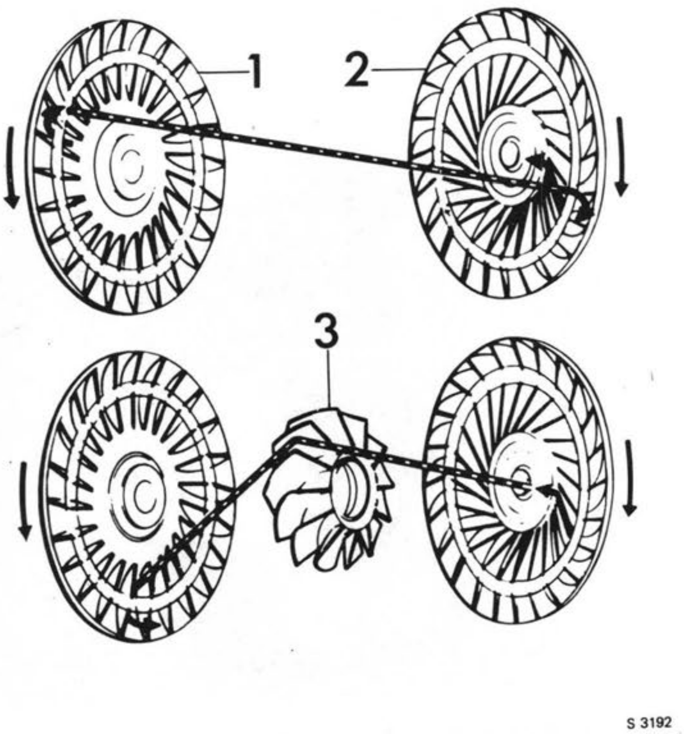


S 2605

TORQUE CONVERTER

The torque converter for use in conjunction with the gearbox, comprises an impeller connected to the engine crankshaft, a turbine connected to the input shaft of the gearbox, and a stator mounted on a sprag type oneway clutch supported on a fixed hub projecting from the converter housing.

The impeller is rotated by the engine and converts the engine power into hydrokinetic energy. The fluid flows from the impeller vanes to the turbine vanes and returns to the impeller through the stator vanes. The curvature of the various vanes is so designed that when a speed differential exists between the impeller and the turbine, the angle of the fluid flow from the turbine is changed by the stator vanes in such a way that the discharge of fluid from the stator assists in driving the impeller. Under such conditions, torque multiplication occurs and varies from 2:1 when the turbine is stalled to 1:1. The torque 2:1 is received when the vehicle is held stationary with the engine operating at maximum throttle opening and any one of the driving ranges selected. The torque 1:1 is received when the turbine reaches a speed approximately 90 % of the impeller. When this speed differential between the impeller and turbine is achieved, the fluid flow angle from the turbine is such that the stator is driven in the same direction as the turbine and the impeller. Under these circumstances, the converter becomes a fluid flywheel or coupling and there is no torque multiplication.



PRINCIPLES OF OPERATION, TORQUE CONVERTER

1. Impeller
2. Turbine
3. Stator

CHAIN TRANSMISSION

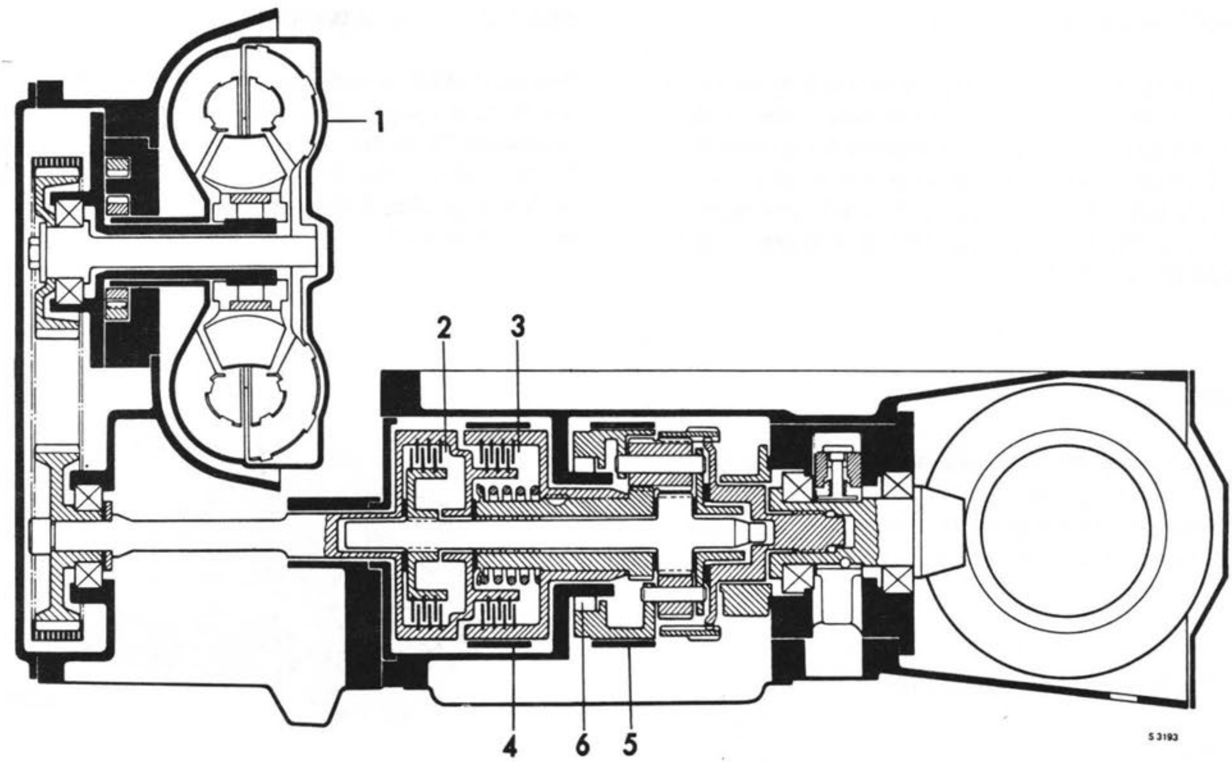
From the turbin shaft of the torque converter is the power transmitted via a chain to the input shaft of the transmission.

THE GEAR SET

The planetary gear set consists of two sun gears, two sets of pinions, a pinion carrier and a ring gear. Helical involute tooth forms are used throughout. Power enters the gear set via the sun gear. In all forward gears, power enters through the forward sun gear; in Reverse, power enters through the reverse sun gear. Power leaves the gear set by the ring gear. The pinions are used to transmit power from the sun gears to the ring gear. In Reverse, the sun gear carrier is braked, causing the ring gear to rotate in the opposite direction to the sun gear. In forward gears, a double set of pinions is used to cause the ring gear to rotate in the same direction as the sun gear. The carrier locates the pinions in their correct positions relative to the two sun gears and the ring gear (and also forms a reaction member for certain conditions). The various mechanical ratios of the gear set are obtained by the engagement of hydraulically operated multi-disc clutches and brake bands.

CLUTCHES

Multi-disc clutches operated by hydraulic pistons connect the converter to the gear set. In all forward gears the front clutch connects the converter to the forward sun gear; for Reverse, the rear clutch connects the converter to the reverse sun gear.



PRINCIPLES OF OPERATION, AUTOMATIC TRANSMISSION

1. Torque converter
2. Front clutch
3. Rear clutch
4. Front band
5. Rear band
6. One-way clutch

Application of bands and clutches for the various selected positions

Selector Position	Ratio	Applied	Driving	Held
1	1st	Front Clutch Rear Band	Rear sun gear	Planet Carrier
D and 2	1st	Front Clutch One-way Clutch	Rear sun gear	Planet Carrier
D and 2	2nd	Front Clutch Front Band	Rear sun gear	Reverse Sun
D	3rd	Front Clutch Rear Clutch	Rear sun gear	
R	Reverse	Rear Clutch Rear Band	Front sun gear	Planet Carrier

BRAKE BANDS

Brake bands, operated by hydraulic servos, hold elements of the gear set stationary to effect an output speed reduction and a torque increase. In '1' the rear band holds the pinion carrier stationary and provides the 1st gear ratio of 2.39:1 and, in Reverse, a ratio of 2.09:1. The front band holds the reverse sun gear stationary to provide the 2nd gear ratio of 1.45:1.

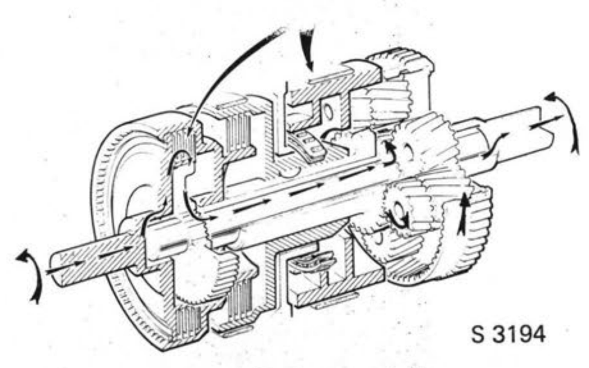
ONE-WAY CLUTCH

In 'D', a one-way clutch is used in place of the rear band, thus also providing a 1st gear ratio of 2.39:1. This one-way clutch, allowing the gear set to freeqheel in 1st gear, provides smooth ratio changes from 2nd to 1st.

THE MECHANICAL POWER FLOW

First Gear ('1' selected)

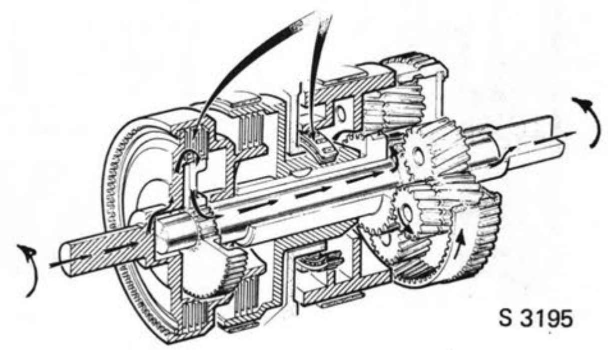
The front clutch is applied, connecting the converter to the forward sun gear. The rear band is applied, holding the planet carrier stationary; the gear set provides the reduction of 2.39:1. The reverse sun gear rotates freely in the opposite direction to the forward sun gear.



MECHANICAL POWER FLOW – FIRST GEAR '1' SELECTED

First Gear ('D' or '2' selected)

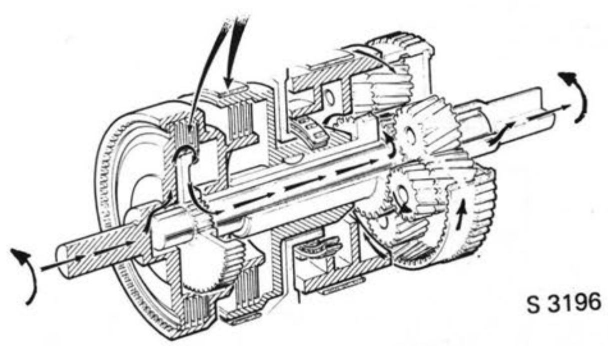
The front clutch is applied, connecting the converter to the forward sun gear. The one-way clutch is in operation, preventing the planet carrier from rotating anti-clockwise; the gear set provides the reduction of 2.39:1. When the vehicle is coasting the one-way clutch over-runs and the gear set freewheels.



MECHANICAL POWER FLOW – FIRST GEAR 'D' OR '2' SELECTED

Second Gear ('D' or '2' selected)

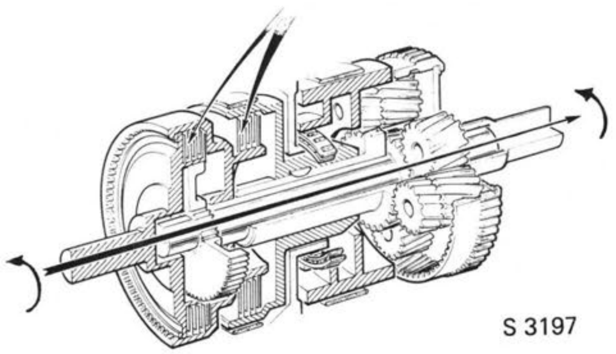
Again the front clutch is applied, connecting the converter to the forward sun gear. The front band is applied holding the reverse sun gear stationary; the gear set provides the reduction of 1.45:1.



MECHANICAL POWER FLOW – SECOND GEAR 'D' OR '2' SELECTED

Third Gear ('D' selected)

Again the front clutch is applied connecting the converter to the forward sun gear. The rear clutch is applied, connecting the converter also to the reverse sun gear; thus both sun gears are locked together and the gear set rotates as a unit providing a ratio of 1:1.



S 3197

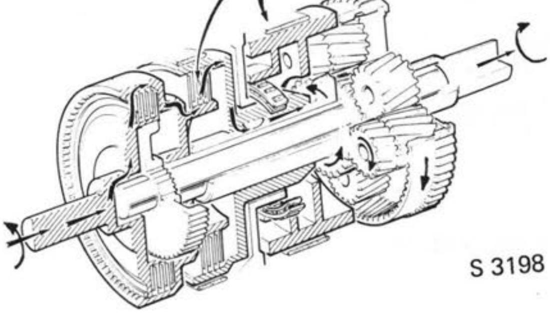
MECHANICAL POWER FLOW – THIRD GEAR 'D' SELECTED

Neutral and Park

In neutral the front and rear clutches are off, and no power is transmitted from the converter to the gear set. The front and rear bands are also released.

Reverse ('R' selected)

The rear clutch is applied, connecting the converter to the reverse sun gear. The rear band is applied, holding the planet carrier stationary; the gear set provides the reduction of 2.09:1 in the reverse direction.



S 3198

MECHANICAL POWER FLOW – REVERSE GEAR 'R' SELECTED

THE HYDRAULIC SYSTEM

The hydraulic system contains a pump of the internal/external gear pattern, picking up fluid from the oil pan through a strainer. Automatic control is provided by a centrifugally operated hydraulic governor on the transmission pinion shaft. This governor works in conjunction with valves in the valve bodies assembly located in the transmission. These valves regulate the fluid pressure and direct the pressure to the appropriate transmission components.

The Pump

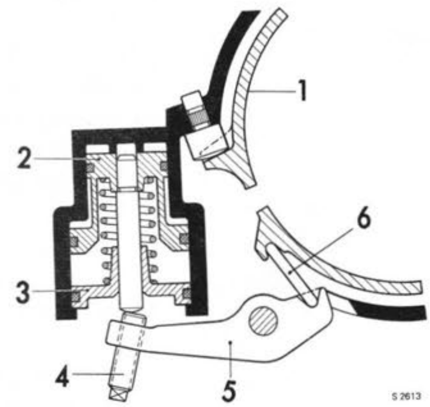
The pump, driven by the converter impeller, is in operation whenever the engine is running. This pump, through the primary and secondary regulator valves, supplies the hydraulic requirements of the transmission both with the engine idling and whilst the car is in motion.

The Governor

The governor, revolving with the output shaft is basically a pressure regulating valve which reduces line pressure to a value that varies with output shaft (i.e. vehicle) speed. This variable pressure, known as governor pressure, is utilized in the control system to effect up and down shifts through the 1–2 and 2–3 shift valves. Rotation of the governor at low speeds causes the governor weight and valve to be affected by centrifugal force. This outward force is opposed by an opposite and equal hydraulic force produced by pressure acting on the regulating area of the governor valve. The governor valve is a regulating valve and will attempt to maintain equilibrium. Governor pressure will rise in proportion to the increase in centrifugal force caused by higher output shaft speed.
As speed increases, the governor weight moves outwards centrifugally to a stop in the governor body, when it can move no further. When this occurs, a spring located between the weight and the governor valve becomes effective. The constant force of this spring then combines with the centrifugal force of the governor valve, the total then being opposed by governor pressure, thus rendering this pressure less sensitive to output shaft speed variations. Thus, the governor provides two distinct phases of regulation, the first being used for accurate control of the low speed shift points.

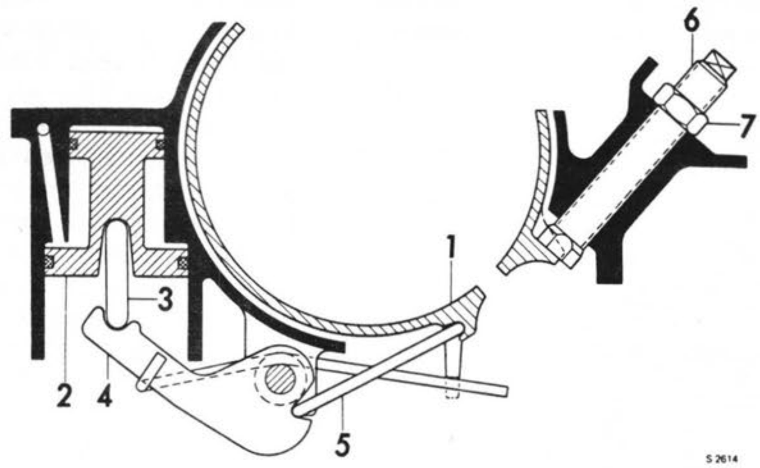
THE CONTROL SYSTEM

The control system utilizes three basic types of valves: regulating valves, shuttle valves and a manual valve.
Pressure control is provided by the primary and secondary regulator valves, the former operating in conjunction with downshift and throttle valve pressure acting upon the spring end and modulated throttle pressure acting on the opposite end.
Shift control is provided by the 1–2 and 2–3 shift valves operated by governor pressure acting upon one end and throttle pressure acting upon the spring end, line pressure acting, upon differential areas providing "shift speed hysteresis".
Manual control is provided by the manual valve which, according to the position of the selector, directs fluid to or provides an exhaust for, clutch and servo pistons.
For ease of reference, all hydraulic circuits are identified by numbers. See table on page 440–19.



PRINCIPLES OF OPERATION, FRONT SERVO

1. Brake band
2. Piston, inner
3. Piston, external
4. Adjusting screw
5. Lever
6. Push rod



PRINCIPLES OF OPERATION, REAR SERVO

2. Brake band
2. Piston
3. Push rod
4. Lever
5. Push rod
6. Adjusting screw
7. Locking nut

SAAB

Operation in 'N'

With the engine running, the primary regulator valve regulates line pressure (1) which is directed to the manual valve and throttle valve. It also permits fluid to reach the secondary regulator valve.
The secondary regulator valve regulates pressure to the converter and lubrication of the front end of the gear train (21). Identical pressure (23) is directed to the rear end of the gear train. The valve returns excess flow (24) to the oil pan.

Operation in 'P'

An internal linkage from the manual valve detent lever engages the parking pawl with teeth formed on the driven shaft ring gear.
With the engine running, the operation of the hydraulic system is identical to 'N' except that the manual valve directs line pressure (6) to the rear servo (13).
This arrangement is based upon the design of the hydraulic system without the rear servo or band performing any function in this selector position.

Operation in 'R'

Pressure control of the front pump is as in 'P' or 'N' but in accordance with accelerator pedal depression, throttle pressure (9) is directed to the spring end of the primary regulator valve thus increasing line pressure (1) in accordance with torque capacity requirements.
The manual valve directs line pressure (6) through the 1–2 shift valve to the rear servo (13) and line pressure (7) through the 2–3 shift valve to the rear clutch and front servo release (15). Due to absence of governor pressure the shift valves and servo orifice control valve perform no function in this selector position. The fluid passages (13) and (15) of other manual valve positions are utilised in 'R' to simplify the hydraulic circuit.

Operation in 'D' or '2' – First gear

Pressure control of the front pump will be as in 'R' but with the throttle valve in the full throttle position as illustrated, throttle pressure (9) regulated by the modulator valve plunger (8) acts upon the primary regulator valve opposing throttle pressure (9), thus modulating line pressure in the interest of shift quality.
The manual valve directs line pressure (5) to the front clutch, governor feed and 1–2 shift valve for the subsequent 1–2 shift. Line pressure (3) reaches the 2–3 shift valve for the subsequent 2–3 shift.

The front clutch applied in conjunction with the one-way clutch, permits the car to move off from rest, in first gear. The hydraulic circuit for 2 (1st gear) is the same as for position 'D' (1st gear) except that the system pressure (3) is prevented from reaching the 2nd–3rd shift valve by a flange on the shift valve.

Operation in 'D' or '2' - Second gear

Pressure control by the primary regulator valve will be off the front pump output. Throttle pressure (8–9) acts upon the primary regulator valve as in 'D' – 1st gear.
Shift control is provided by the 1–2 shift valve moving under influence of governor pressure (2), opposed by spring force and throttle pressure (10). This permits line pressure (5) to reach the apply side of the front servo (19). The front band thus applied, in conjunction with the front clutch, provides 2nd gear. With the down shift valve in the forced throttle position as illustrated, forced throttle pressure (11) acts upon the 1–2 shift valve and the 2–3 shift valve thus further delaying the upshift (or providing a 3–2 downshift or a 2–1 downshift at speeds when there is little governor pressure (2). The hydraulic circuit for 2 (2nd gear) is the same as position 'D' (2nd gear) except that the line pressure is prevented from reaching the 2nd–3rd shift valve from a flange or edge on the shift valve.
The figure D–2 shows the downshift valve actutated.

Operation in 'D' – 3rd gear

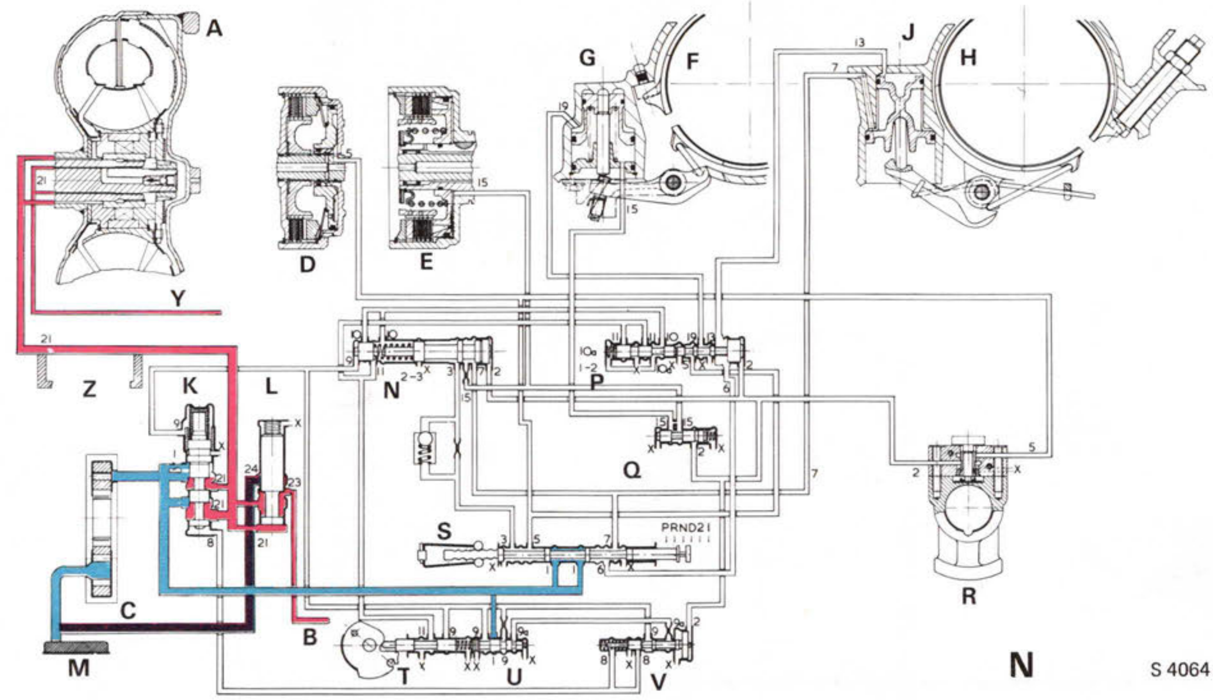
Pressure control is as in 'D' except that in the throttle valve position shown (minimum throttle) no throttle pressure or modulated throttle pressure acts upon the two ends of the primary regulator valve.
Shift control is provided by the 2–3 shift valve moving against spring force under influence of governor pressure (2). This permits line pressure (3) to reach the rear clutch (15) and the release side of the front servo through the servo orifice control valve. When governor pressure (2) is apparent, the servo orifice control valve closes, forcing

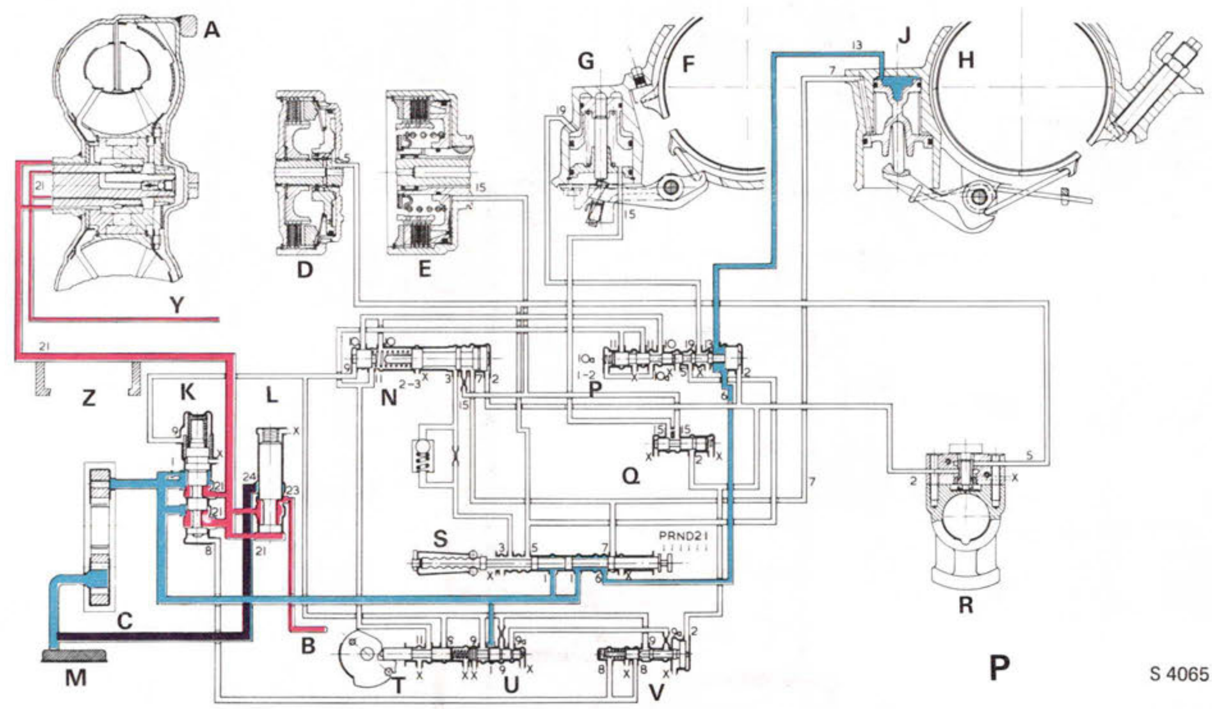
line pressure through a orifice which thus affects the relationship between rear clutch apply and front servo release in accordance with road speed. Because the release side of the front servo has a larger area than the apply side, the front servo will disengage the band. The rear clutch now engaged in conjunction with the front clutch provides 3rd gear.

The absence of throttle pressure as mentioned above will cause the 2–3 shift valve to move early under influence of governor pressure, thus providing a low-speed 2–3 shift.

Operation in '1'

Pressure control of the front pump will be as in 'D' or '2'. The manual valve directs line pressure (5) to the front clutch, governor feed and 1–2 shift valve. In the position governor pressure (2) to overcome spring pressure. The result is that the valve prevents line pressure (5) from reaching the apply side of the front servo but line pressure (6) is open to the rear servo.





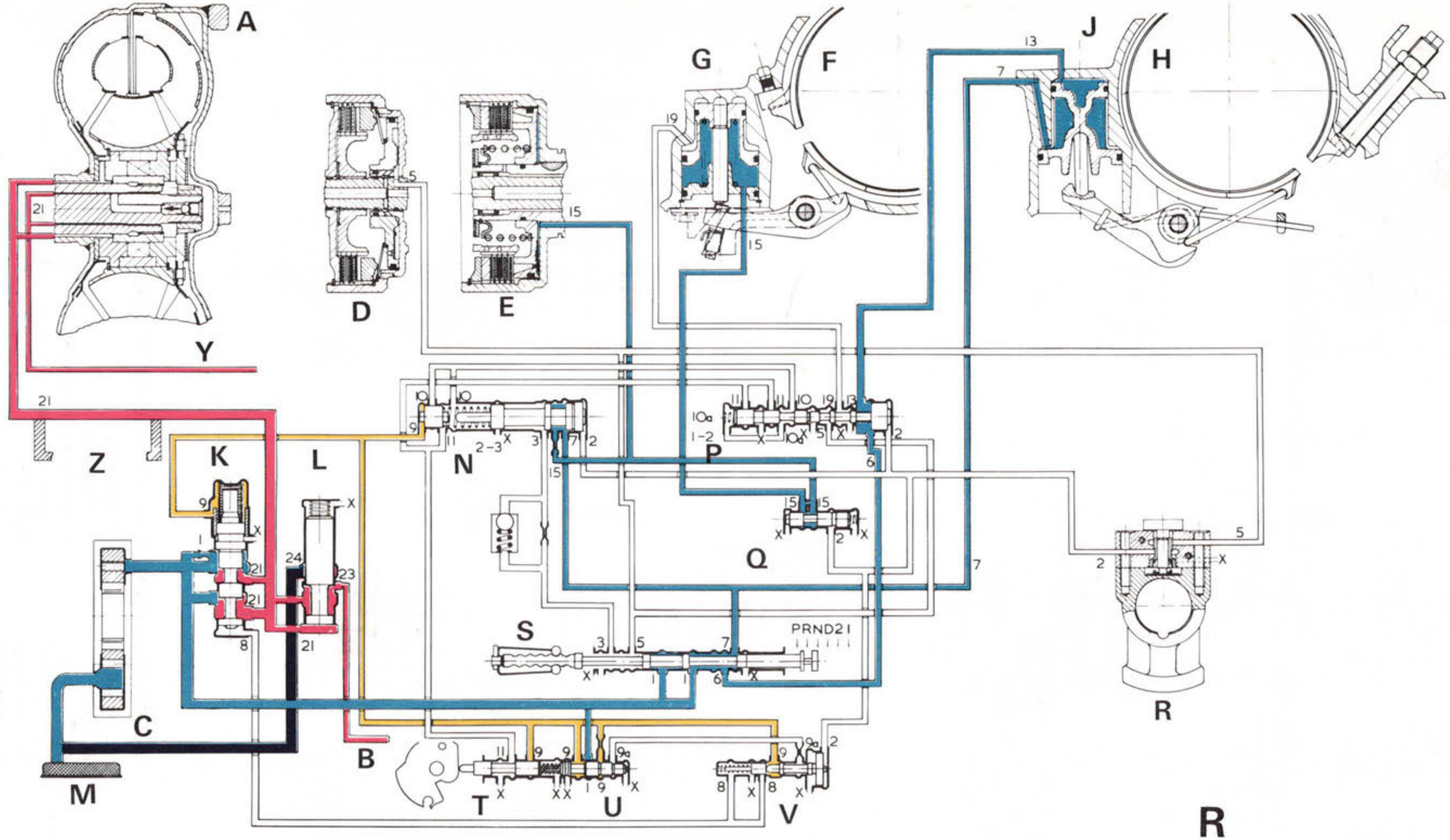
Line pressure

Converter pressure

Return from secondary regulator valve

HYDRAULIC CIRCUIT IN "N" NEUTRAL AND "P" PARK

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)

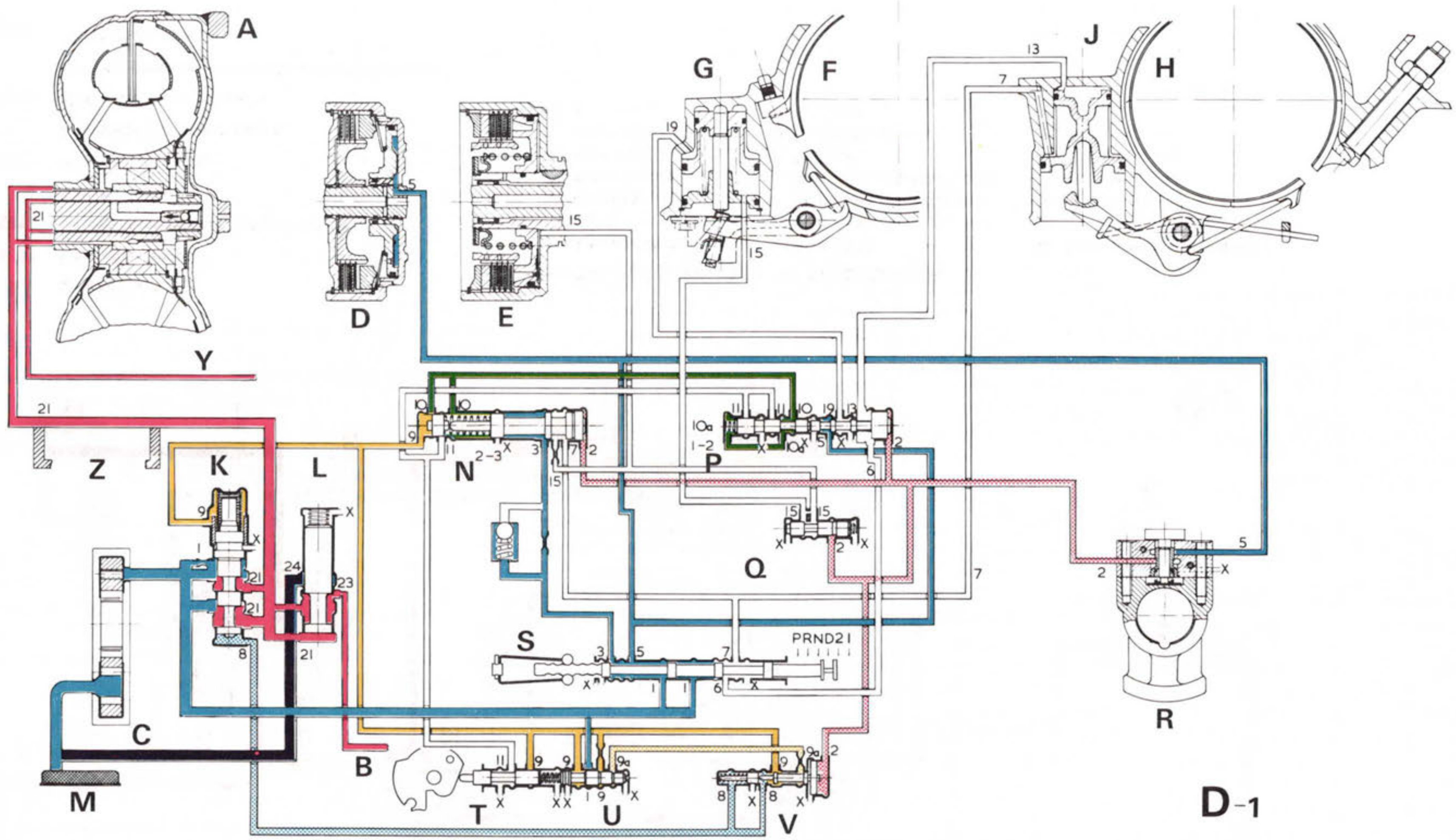


S 4066

Line pressure	
Converter pressure	
Return from secondary regulator valve	
Throttle pressure	

HYDRAULIC CIRCUIT IN "R" REVERSE

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)



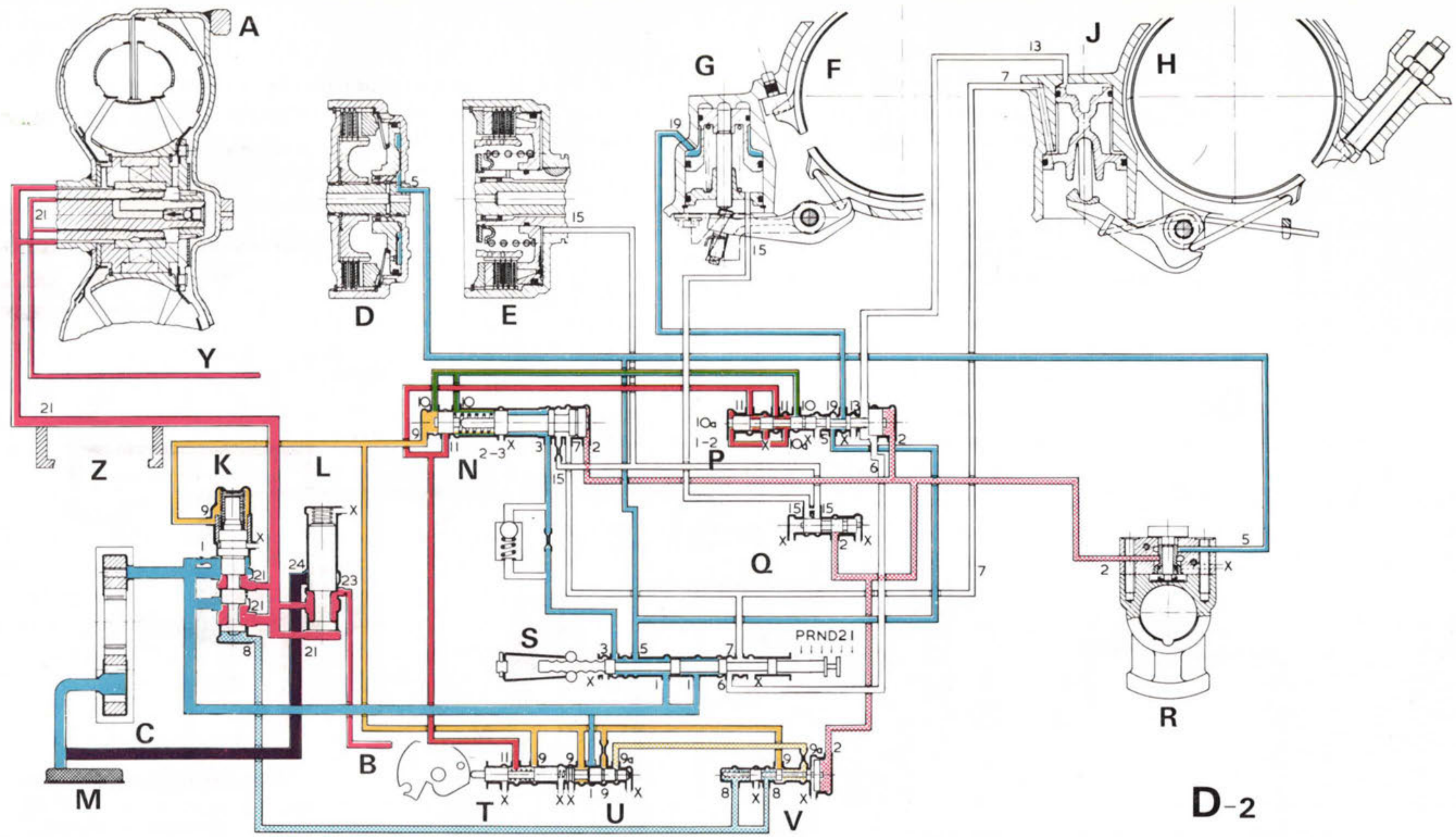
S 4067

	Line pressure
	Converter pressure
	Return from secondary regulator valve
	Throttle pressure
	Regulator pressure
	Modulated throttle pressure
	Shift valve piston pressure
	Throttle pressure controlled by modulator valve

HYDRAULIC CIRCUIT IN "D" FIRST GEAR

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)

SAAB

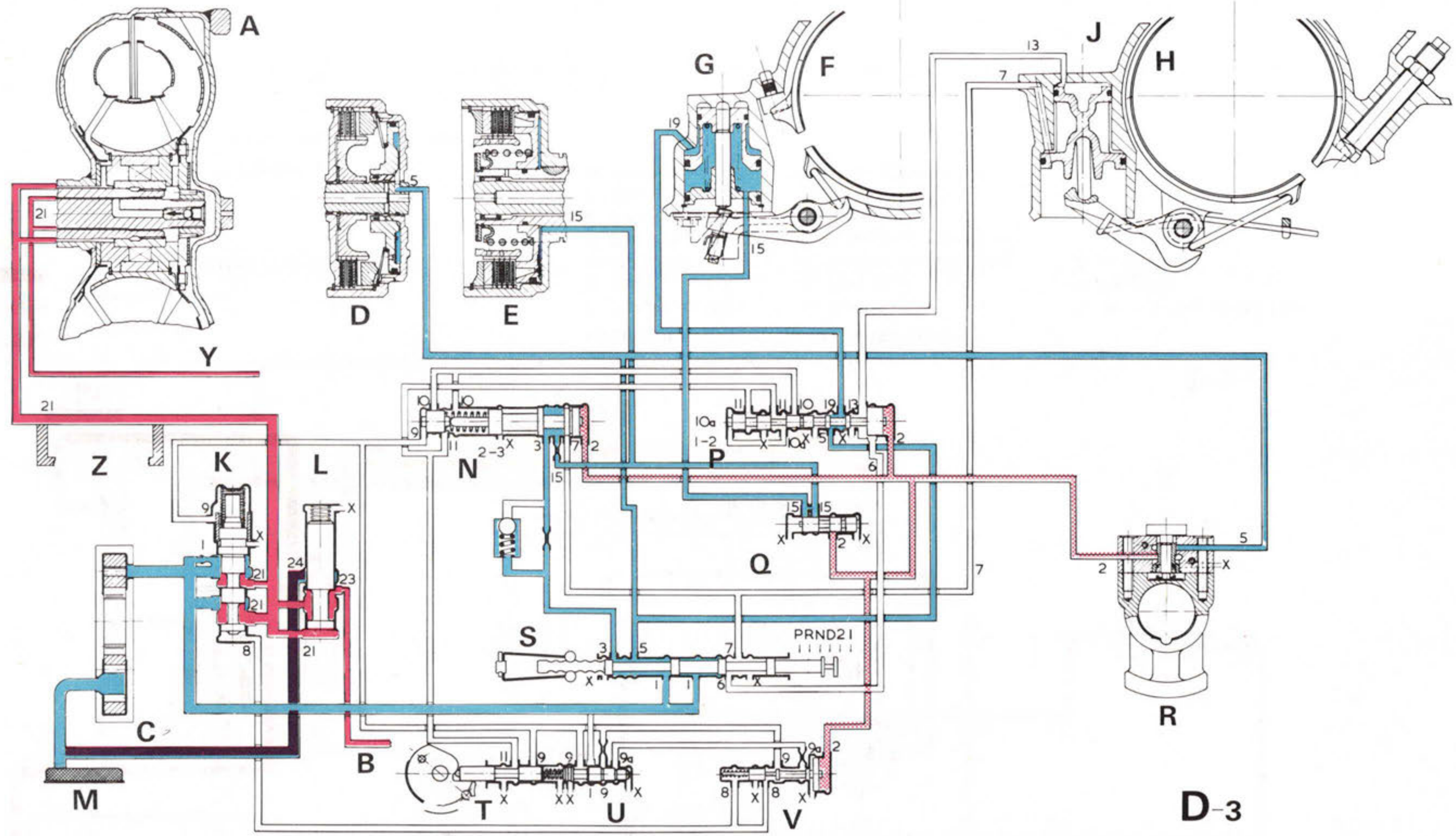


S 4069

- Line pressure
- Converter pressure
- Return from secondary regulator valve
- Throttle pressure
- Regulator pressure
- Modulated throttle pressure
- Shift valve Piston pressure
- Throttle pressure controlled by modulator valve
- "Kick-down" pressure

HYDRAULIC CIRCUIT IN "D" SECOND GEAR

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)

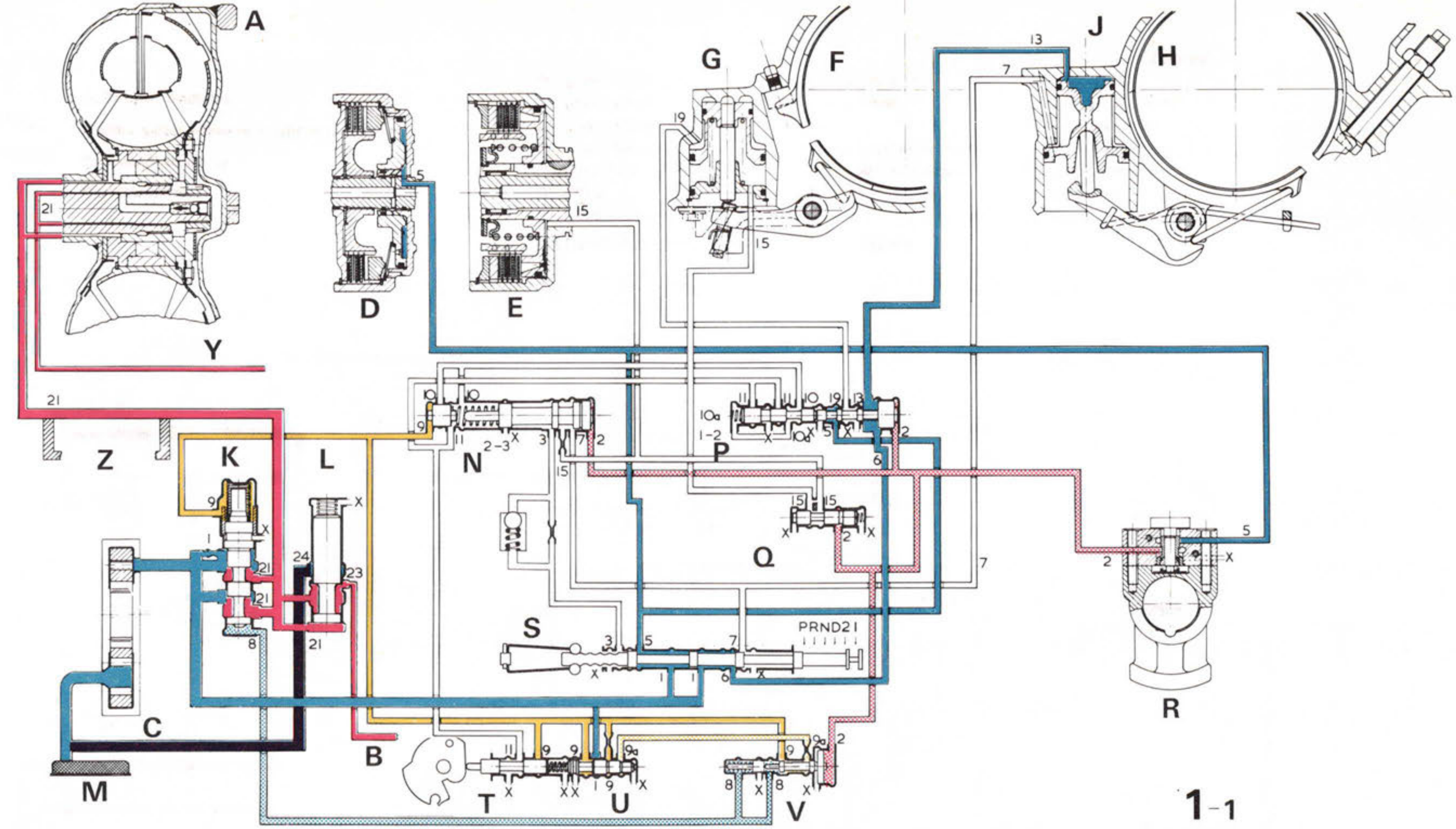


S 4071

HYDRAULIC CIRCUIT IN "D" THIRD GEAR

- Line pressure
- Converter pressure
- Return from secondary regulator valve
- Regulator pressure

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)

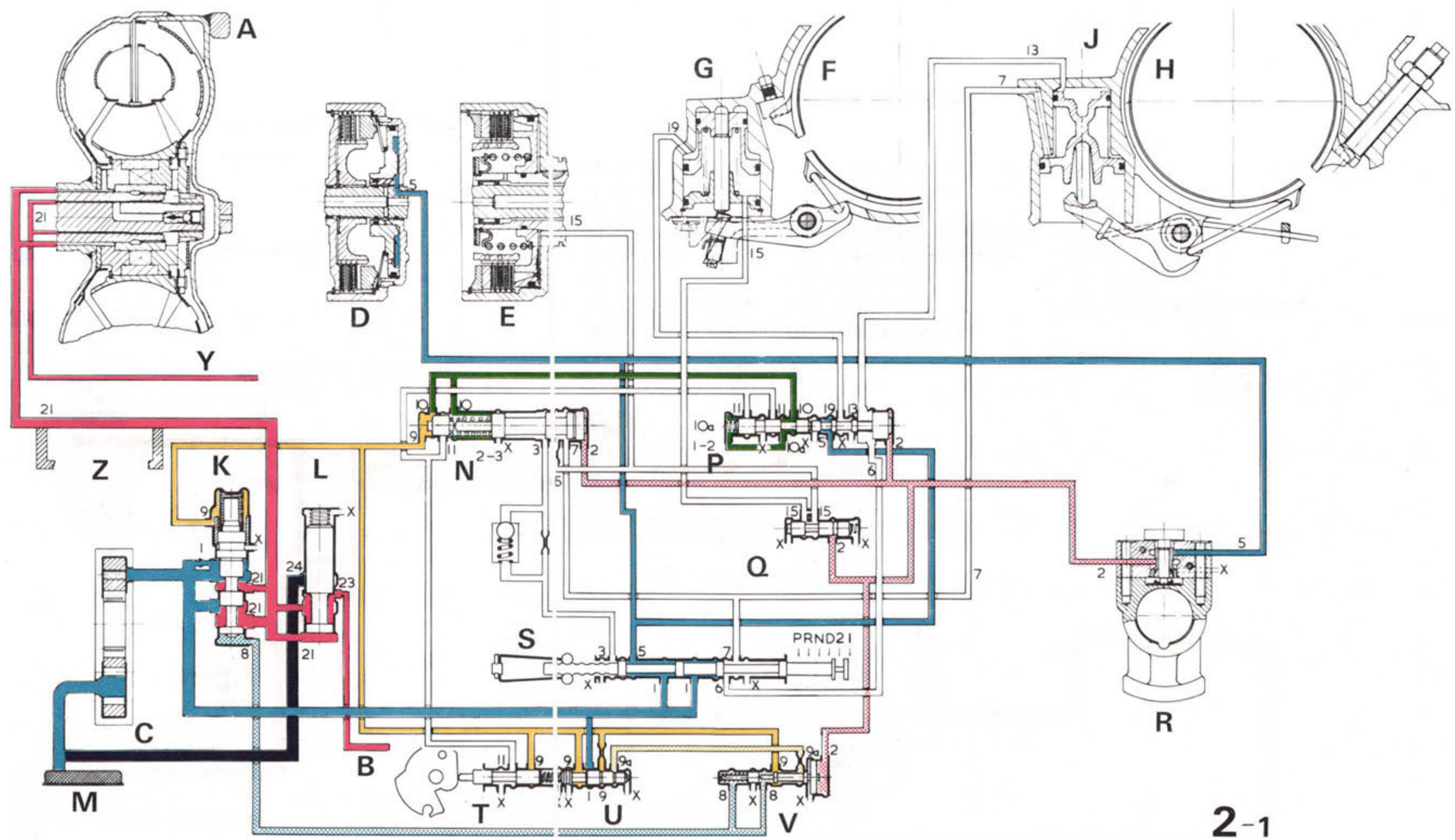


Line pressure
Converter pressure
Return from secondary regulator valve
Throttle pressure
Regulator pressure
Modulated throttle pressure
Throttle pressure controlled by modulator valve

HYDRAULIC CIRCUIT IN "1" FIRST GEAR

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)

S 4072

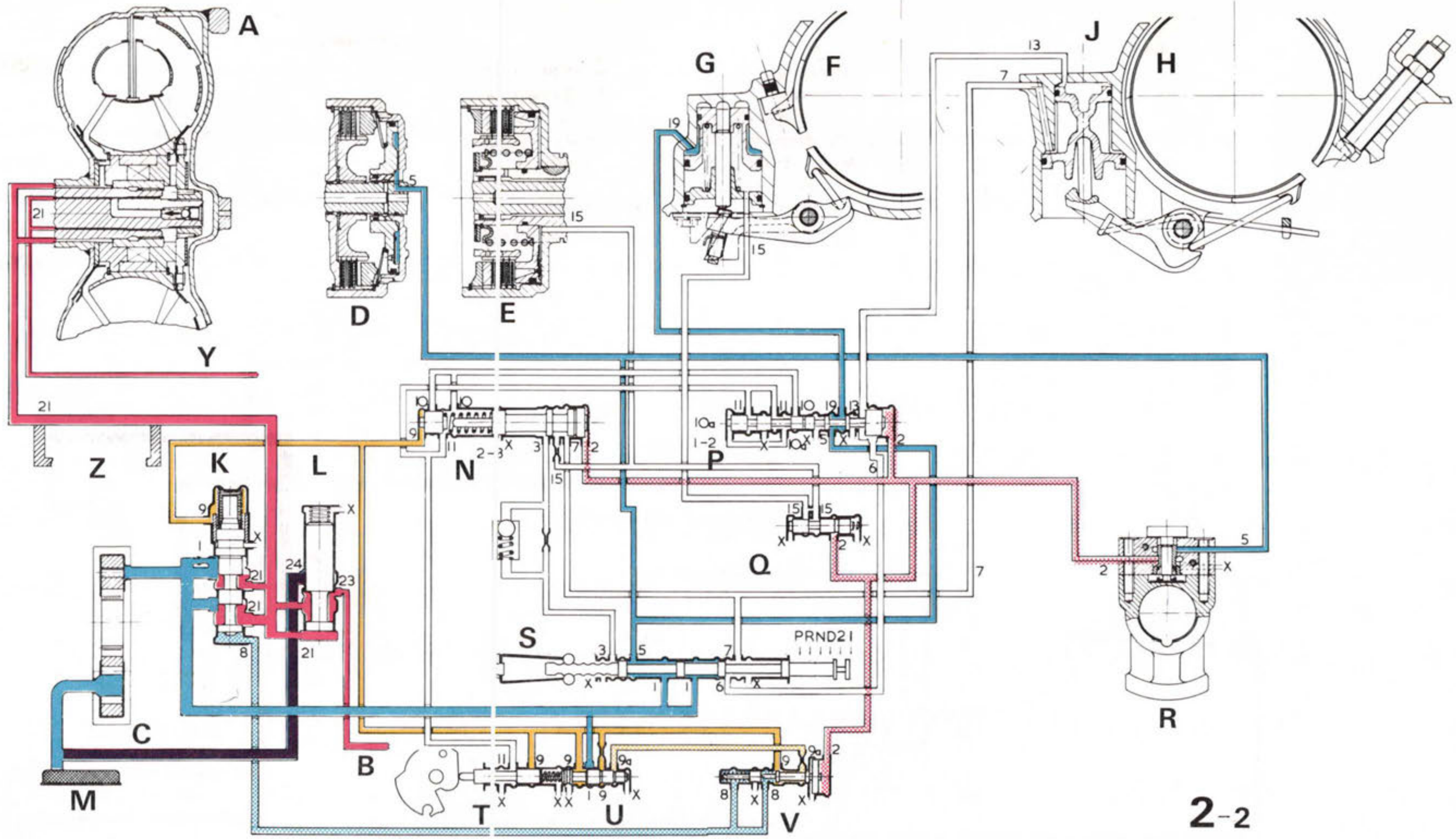


S 4068

- Line pressure
- Converter pressure
- Return from secondary regulator valve
- Throttle pressure
- Regulator pressure
- Modulated throttle pressure
- Gear shift valve piston pressure
- Throttle pressure controlled by modulator valve

HYDRAULIC CIRCUIT IN "2" FIRST GEAR

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)



Line pressure	
Converter pressure	
Return from secondary regulator valve	
Throttle pressure	
Regulator pressure	
Modulated throttle pressure	
Throttle pressure controlled by modulator valve	

HYDRAULIC CIRCUIT IN "2" SECOND GEAR

S 4070

A. Torque converter
B. Lube
C. Oil pump
D. Front clutch
E. Rear clutch
F. Front band
G. Front servo
H. Rear band
J. Rear servo
K. Primary regulator valve
L. Secondary regulator valve
M. Strainer
N. 2–3 shift valve
P. 1–2 shift valve
Q. Servo orifice control valve
R. Governor
S. Manual valve
T. Downshift valve
U. Throttle valve
V. Modulator valve
Y. To oil pan
Z. Oil cooler (optional)

OPERATION OF THE VALVES

Primary regulator valve

This valve regulates pump pressure during vehicle operation.
Line pressure (1), operating on a small area of the valve can be decreased by modulated throttle pressure (8) (described later) operating on one end of the valve. These forces are opposed by the primary regulator valve spring and throttle pressure (9) (described later) operating on the spring end of the valve. The line pressure thus produced varies with accelerator position as well as vehicle speed and provides the correct clutch and brake band capacity under all operating conditions. The line pressure (1) is directed to the manual valve and throttle valve.

Secondary regulator valve

This is a regulating valve which controls the values of converter pressure (21) and lubrication (23) for the components in the rear of the transmission case. Converter pressure operating on one end of the valve is opposed by spring force on the other end. When the pump capacity increases due to increased engine speed, the valve moves to open a port that directs fluid (24) to the suction side of the pump. Thus, at high speed, excess pump output is directed back to minimize pumping losses.

Downshift valve and throttle valve

The downshift valve is connected to the carburetter linkage via a cable-actuated cam. Movement of the downshift valve compresses the throttle valve spring located between the downshift valve and the throttle valve. This spring is opposed by the throttle return spring, combined with throttle pressure (9) acting (at low vehicle speed) on one area of this regulating valve, and at high speed on two areas (9 and 9a). Thus a throttle pressure is produced that is related to both engine torque and vehicle speed. This pressure (9) is directed to the spring end of the primary regulator valve to vary the basic line pressure (1) accordingly, thus providing correct clutch and brake band capacities and appropriate shift quality under all operating conditions.
Full movement of the downshift valve, which is a shuttle valve, directs throttle pressure (11–9) to the 2–3 shift valve and the 1–2 shift valve to further delay upshifts or effect a 3–2 downshift or a 2–1 downshift at a preset maximum vehicle speed.

Throttle pressure (9) is directed also to the 2–3 shift plunger which at part throttle openings reduces the value of throttle pressure by a fixed amount. This reduced pressure (10) is directed to the 1–2 and 2–3 shift valves to render the low speed shift points less sensitive to throttle pressure and, therefore, accelerator position. Throttle pressure (11–9) is also directed to the 1–2 shift valve enabling a 3–1 downshift to be made at a preset speed.

Modulator plug and valve

The modulator plug is a regulating valve that reduces throttle pressure (9) by a fixed amount. This modulated pressure (8) operating on one end of the plug, assisted by the modulator valve spring, is opposed by throttle pressure (9) operating on the opposite end. Modulated throttle pressure (8) is directed to the primary regulator valve to vary the rate of increase of line pressure (1) relative to throttle pressure.
The modulator valve is a shuttle valve. Governor pressure (2) operating on the large end is opposed by the modulator valve spring. As governor pressure rises, the valve moves, preventing the plug from regulating and modulated throttle pressure (8) then becomes equal to throttle pressure (9). Moreover this movement directs throttle pressure (9 and 9a) to a second area of the throttle valve opposing throttle valve spring force. This arrangement permits high throttle and line pressure under stall (and part-throttle) conditions with a reduction in these pressures after "cut-back".

Servo orifice control valve

A common line (15) supplies fluid to, or exhausts fluid from, the rear clutch and the release area of the front servo to effect the 2–3 and 3–2 shift.
The servo orifice control valve is a shuttle valve interposed in the front servo release circuit. Governor pressure (2) operating on an area of the valve is opposed by the valve spring. At a 2–3 shift with low governor pressure (i.e. low vehicle speed), fluid goes without restriction to the release side of the front servo piston. At a 2–3 shift with higher governor pressure, however, the valve moves and fluid is directed through an orifice to this side of the piston.
During upshifts, with the servo orifice in circuit, the front band does not release too quickly relative to rear clutch engagement, thus avoiding "run-up" during the transition from 2 to 3. During downshifts, the orifice in circuit ensures that the front band does not engage before the rear clutch releases thus avoiding "tie-up" on the 3–2 shift.
The servo orifice control valve, therefore, affects the relationship between the rear clutch and front servo to provide correct shift timing under all operating conditions.

1–2 shift valve and plunger

Both are shuttle valves and operate in unison in 'D' and '2' selector positions. In 1st gear governor pressure (2), operating on the large end of the valve, is opposed by line pressure (5) operating on an area of this valve, the 1–2 shift valve spring and reduced throttle pressure (10–10a) operating on the opposite end of the plunger. When governor pressure exceeds these opposing forces, the valve moves to the 2nd gear position and line pressure (5) is directed to the apply side of the front servo piston (19). The movement also results in an area of the valve being no longer subjected to line pressure (5). This allows the 2–1 downshift to occur at a lower speed than the 1–2 shift. The difference between the upshift and downshift speed is known as "shift point hysteresis". When governor pressure is less than the spring force combined with the reduced throttle pressure force, the valve moves to the 1st gear position and the apply side of the front servo (19) is opened to exhaust (x).
In '1'-Lock-up, with low governor pressure (2) the valve also moves to the 1st gear position; line pressure (6) thus directed to the rear servo (13) latches the valve hydraulically in the 1st gear position, preventing an upshift.
Forced throttle pressure can cause the 1–2 shift valve to give a 3–1 downshift below 30 m.p.h. (50 km/h) in the 'D' range or a 2–1 downshift in the 'D' or '2' range.

2–3 shift valve and plunger

The 2–3 shift valve plunger is a regulating valve that reduces the value of throttle pressure (9) by a fixed amount and therefore is inoperative when throttle pressure is below this fixed amount. Throttle pressure (9), operating on one end of the plunger, is opposed by this reduced throttle pressure (10) and the 2–3 shift valve spring located between the plunger and valve. This reduced pressure is directed to the 2–3 shift valve and the 1–2 shift plunger as described under "Downshift and throttle valve".
The 2–3 shift valve is a shuttle valve. In the 2nd gear position, and before the plunger begins regulating, governor pressure (2), operating on the large end of the valve, is opposed by line pressure (3) operating on an area of this valve, as well as the 2–3 shift valve spring. Once the plunger begins regulating, the spring no longer exerts a force on the valve but relays the force of the plunger to the valve. Under these conditions, governor pressure (2), operating on the large end of the valve, is opposed by line pressure (3) operating on an area of the valve, reduced throttle pressure (10) operating on the small end of the valve, and throttle pressure (9) operating on the end of the plunger. This last force is relayed to the 2–3 shift valve by the valve spring.
Movement of the shift valve to the 3rd gear position directs fluid via the common line (15) to the rear clutch and, via the servo orifice control valve, to the release side of the front servo. This pressure causes the rear clutch to be applied. Moreover, because the release area of the front servo is larger than the apply area it causes the front band to be released. The movement also results in an area of the valve being no longer subjected to line pressure (3); this movement prevents regulation of the plunger forced to the end of the valve bore. Thus reduced throttle pressure (10) is replaced by throttle pressure (9). This change in forces effects the shift point hysteresis and causes the 3–2 shift point to occur at a lower governor pressure (i.e. vehicle speed) than the 2–3 upshift.
When the manual valve is moved to the '2' position line pressure (15) which was directed to the 2–3 shift valve and consequently to the rear clutch and front servo release, is exhausted (7) through a port (x) at the opposite end of the manual valve collar. This inevitably results in an immediate downshift to 2nd gear regardless of the position of the 2–3 shift valve and no third gear is possible.
In Reverse, line pressure (7) is directed to the rear clutch and front servo release (15).

Manual control valve

This valve, actuated by movement of the selector, directs line pressure to, or exhausts from, the appropriate valves or components in accordance with control requirements.
P: Movement of the valve mechanically engages the parking pawl with the externally toothed ring gear on the driv-

en shaft, effectively immobilising the vehicle. No fluid is directed to the front clutch or 2–3 shift valve for the rear clutch, therefore the gear set is disconnected from the converter and no engine power is transmitted to the wheels. Because of the arrangement of the manual control valve ports for other selector positions, line pressure (6) is directed to the rear servo (13).

R: Line pressure (6) is directed to the rear servo (13) via the 1–2 shift valve and also (7) to the rear clutch (15) via the 2–3 shift valve. No pressure is directed to the governor.

N: The clutches and servos are not pressurised and exhausted, because circuits 3 and 5 are open to a port (x) nearest to the manual control valve collar. Therefore the gear set is disconnected from the converter and no engine power is transmitted to the wheels.

D: Line pressure (5) is directed to the front clutch, governor and 1–2 shift valve. It is also directed to the 2–3 shift valve. When there is sufficient governor pressure, it passes without obstruction to the 1–2 shift valve.

2: Line pressure (5) is again directed to the front clutch, governor and 1–2 shift valve. Governor pressure is directed to the 1–2 shift valve.

1: Line pressure (5) is directed to the front clutch, governor and 1–2 shift valve. Line pressure (6) is directed to a differential area of the 1–2 shift valve to lock it in position, and hence to the rear servo (13).

TABLE OF HYDRAULIC CIRCUITS

Circuit No.	Name of pressure	From	To
1.	Line pressure	Pump	Primary regulator valve Manual control valve Throttle valve
2.	Governor pressure	Governor	Modulator valve 1–2 shift valve 2–3 shift valve Servo orifice control valve
3.	Directed line pressure	Manual control valve	2–3 shift valve
5.	Direct line pressure	Manual control valve	Front clutch & governor feed 1–2 shift valve
6.	Directed line pressure	Manual control valve	1–2 shift valve
7.	Directed line pressure	Manual control valve	2–3 shift valve
8.	Modulated throttle pressure	Modulator valve	Primary regulator valve (piston end)
9.	Throttle pressure	Throttle valve	Modulator valve Primary regulator valve (spring end) 2–3 shift valve Shift valve plunger
9a.	Throttle pressure controlled by modulator valve	Modulator valve	Throttle valve
10.	Shift valve plunger pressure	Shift valve plunger	2–3 shift valve 1–2 shift valve
10a.	Shift valve plunger pressure	Shift valve plunger	1–2 shift valve
11.	Forced throttle pressure	Downshift valve	2–3 shift valve
13.	Line pressure	1–2 shift valve	Rear servo apply
15.	Line pressure	2–3 shift valve	Rear clutch and front servo release
19.	Line pressure	1–2 shift valve	Front servo apply
21.	Converter pressure	Primary regulator valve	Secondary regulator valve and converter
23.	Lubrication pressure	Secondary regulator valve	The mechanical part of the transmission

DRIVING INSTRUCTIONS

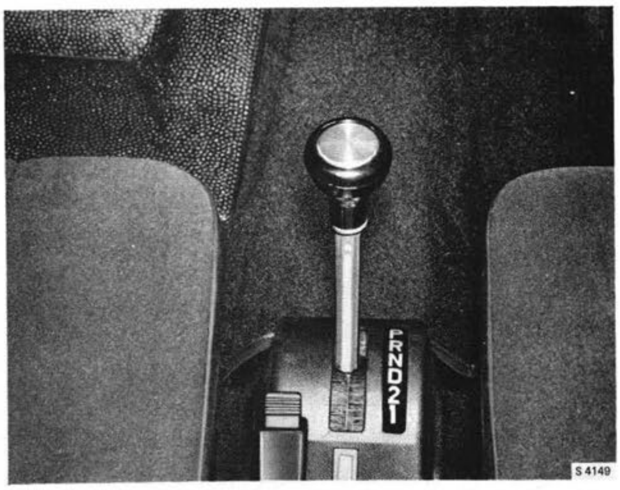
Gear selector lever

A scale beside the gear selector lever is marked with symbols indicating the different positions:

P = Park
R = Reverse
N = Neutral
D = Drive
2 = 2nd gear
1 = 1st gear

(D, 2, 1 = Forward gears)

Always press lightly on the footbrake or have the handbrake on when shifting the selector lever if the car is at a standstill with the engine idling. Otherwise the car will start to creep forward when a driving gear is selected.



GEAR SELECTOR LEVER

Driving

The selector lever must be in position N or P when you start the engine as the starter contact does not work if the lever is in any other position.

1. Apply the handbrake or tread lightly on the footbrake.
2. Turn the ignition key to S (Start) and let it spring back to K (Drive) when the engine fires.

Selecting gears

P. Position P (Park) is selected when the car has been parked, and the lever must be in this position before the ignition key can be turned to L (Locked) and withdrawn. The selector lever is then locked and the transmission is immobilized. The starter contact is operative in position P. Do not select position P when the car is in motion.

R. Position R (Reverse) must not be selected unless the car is stationary.

N. In position N (Neutral) no gear is engaged. The starter contact is operative in this position. The handbrake should be applied when the selector lever is in position N to avoid the car from moving if it is placed on a slope.

D. The D (Drive) position is for normal forward driving. Whichever of the three forward gears best matches the speed and load on the engine is automatically engaged. In the 'D' range downshifts will not occur automatically at speeds over 10 mph (16 km/h) (approximately) unless the accelerator pedal is depressed past the detent to the 'Full kick-down' position. This may result in a 3–1 change instead of the required 3–2 change.

"Kick-down"

To obtain maximum acceleration, e.g. for overtaking, it is possible to effect an instant downshift at speeds below 50–55 mph (80–85 km/h) by pushing the accelerator pedal hard down to the "kick-down" position. Upshift to the next higher gear is automatic as soon as the engine reaches maximum revs for the gear engaged or when the pedal is eased up.

2. Position 2 gives automatic shift between first and second gears but top gear cannot be angaged. If the lever is moved from D to 2, this gives an immediate manual downshift for more engine braking power. Position 2 must not be selected at road speeds above 55 miles per hour (90 km/h).
1. Position 1 is used to obtain maximum engine braking power on steep downgrades. Road speed must be reduced to below about 12 mph (20 km/h) before Ist gear is engaged. This position should also be used for uphill driving on very steep hills to avoid overheating the transmission oil. Second and top gears cannot be engaged when the lever is at 1. Position 1 must not be selected at road speeds above 55 mph (90 km/h).

Towing

The following rules must be observed if for any reason the car has to be towed:

1. The selector lever must be at N.
2. The transmission must have the correct oil level.
3. National speed limits for towing must of course be complied with, but in any event towing speed must not exceed 25 mph (40 km/h).
4. The car must not be towed more than about 25–30 miles (40–50 km). For longer distances, the front wheels must be raised off the ground.
5. The engine cannot be started by towing or pushing.

Towing lugs are provided at the front and rear bumper attachments.

Maintenance

It is most important that the following maintenance instructions are closely followed and absolute cleanliness is maintained when topping up or filling the transmission.
It is vitally important when checking the fluid level that no dirt or foreign matter enters the transmission otherwise trouble will almost certainly arise. Before removing the transmission dipstick, the surrounding area must be cleaned off to prevent dirt from entering the dipstick aperature. When filling the transmission with fluid ensure that the fluid container and funnel are perfectly clean.
In countries where temperatures are unusually high, dust and/or mud must not be allowed to decrease the effective areas of the transmission case. Also any foreign matter on the oil pan must be removed as it would act as a temperature insulator.

OIL COOLER, CARS WITH AUTOMATIC TRANSMISSION

If cars with automatic transmission are to be used for towing a trailer, they must be fitted with an oil cooler to prevent the transmission overheating in warm weather or in hilly country.
Cars used to tow heavier trailers must be fitted with an air oil cooler.
An installation kit for oil coolers is available as an accessory.

ROAD TEST AND FAULT DIAGNOSIS

It is important to gain as much information as possible on the precise nature of any fault. In all cases the following road-test precedure should be completely carried out, as there may be more than one fault.
It is essential when making a diagnosis, to be throughly familiar with the Operation section and Driving Instructions section.

TESTING THE CAR

Any condition of improper operation shown by the checks can be found, with its possible causes, in the "Fault diagnosis through road test" section.

> IMPORTANT
> When testing or making a diagnosis, it is important that the transmission fluid is at operating temperature and at the correct level as previously detailed in the "Maintenance" section.

1. Check that the starter will operate only with the selector in 'P' and 'N' and that the reverse light operates only in 'R'.
2. Apply the brakes and, with the engine at normal idling speed, select 'N-D', 'N-2', 'N-1', 'N-R'. Transmission engagement should be felt in each position selected.
3. Check the stall speed (see Stall Speed Tests), with the transmission in '1' and 'R'. Check for slip or clutch break-away.

> IMPORTANT
> To prevent damage to transmission through overheating do not stall for longer than 10 seconds.

4. With the transmission at normal running temperature select 'D'. Release the brakes and accelerate with a minimum throttle opening. Check for 1–2 and 2–3 shifts.
   Note: At minimum throttle opening the shifts may be difficult to detect. Confirmation that the transmission is in third gear may be obtained by selecting '2' when a 3–2 downshift should be felt.
5. a. From a standing start using full throttle acceleration, i.e. accelerator at the resistance point, check that 1–2 and 2–3 shifts are as shown on the chart. See page 020–14.
   b. At 25 mph (40 km/h) in 3rd gear, depress the accelerator to the resistance point. The car should accelerate in top gear but not downshift to second.
   c. At 30 mph (50 km/h) in 3rd gear depress the accelerator to the "kick-down" position (through the resistance point). The transmission should downshift to second gear.
6. a. Restart using "kick-down" (accelerator through the resistance point) and check for 1–2 and 2–3 shifts according to the table on page 020–14.
   b. At 40 mph (65 km/h) in top gear release the accelerator and select '2'. Check for 3–2 downshift and engine braking.
7. Stop in '1', release the brakes and using full throttle accelerate to 20 mph (30 km/h). Check for slip or clutch break-away noise.
8. Stop and select 'R'. Release the brakes and reverse, using full throttle if possible. Check for slip and/or clutch break-away noise.
9. Stop the car on a gradient facing downhill and select 'P'. Release the brakes and check that the parking pawl will hold the car. Re-apply the brakes before disengaging the parking pawl. Repeat with the car facing uphill. Make sure that the selector is trapped by the gate in 'P'.

CONVERTER TROUBLE SHOOTING

Inability to start on steep gradients combined with poor acceleration from rest indicates that the converter stator one-way clutch is slipping or that the stator support is damaged. This condition permits the stator to rotate in an opposite direction to the turbine and torque multiplication cannot occur.
Substandard acceleration in 3rd gear above about 30 mph (50 km/h), combined with a substantially reduced maximum speed, indicates that the stator one-way clutch has locked in the engaged position. The stator will then not rotate with the turbine and impeller, therefore the fluid flywheel phase of the converter performance cannot occur. This condition will also be indicated by severe overheating of the transmission, although the stalling speed will remain normal. The converter assembly must be replaced.
The torque converter is sealed by welding and cannot be dismantled; therefore it must be replaced as a unit. The ventilation holes in the converter housing must be kept free from dirt.

CHECKING THE STALLING SPEED

The stalling speed is the maximum speed at which the engine can drive the torque converter impeller while the turbine is held stationary. As the stalling speed is dependent both on engine and torque converter characteristics, it will vary with the condition of the engine. This must be borne in mind when investigating the cause of the low stalling speed.
To check the stalling speed, apply the handbrake, press down hard on the brake pedal, set the selector to "D", "1" or "R", and push the accelerator right to the floor. Normal stalling speed should be 2300 rpm up to and including 1978 model, 2150–2650 rpm as from 1979.
Use a revolution counter. If the engine stalling speed is down to 300 rev/min. below normal, the engine is not developing its full power. If it is more than 800 rev/min. below normal, the converter assembly must be renewed. A stalling speed substantially higher than normal indicates that the converter is not receiving its required supply or that slip is occurring in one of the gearbox clutches.

NOTE
When checking stalling speed ensure that the transmission is at normal operating temperature. Do not stall for longer than ten seconds, or the transmission will overheat.

Engine rpm stalling speed	Condition
1,900–2,300 rpm[1] 2,150–2,650 rpm[2]	Normal
1,600 rpm[1] 1,800 rpm[2]	Engine not developing full power
Below 1,100 rpm[1] Below 1,300 rpm[2]	Converter stator free-wheel slipping or stator support damaged
Over 2,500 rpm[1] Over 2,800 rpm[2]	Slip in gearbox
Positon D	Front clutch or one-way clutch slipping
Position 1	Front clutch or rear band slipping
Position R	Rear clutch or rear band slipping

1 Up to and including 1978 model
2 As from 1979 model

FAULT DIAGNOSIS THROUGH ROAD TEST

Use in conjunction with the "Key to Actions" at the end of the table.

No.	Fault	Action
1.	Starter will not operate in P or N.	19
	Starter operates in all selector positions	20
2.	Excessive bump on engagement of D, 1, 2 or R	4, 3
3.	If "stall" speed higher than specified:	
a.	With slip and break-away noise in 1	1, 2, 3, 13, 11
b.	With slip and break-away noise in R.	1, 2, 3, 13, 12
	If "stall" speed lower than specified.	Check engine performance
	If "stall" speed 600 rev/min lower than specified	21
4.	No drive in D or 2	1, 2, 3, 13, 11, 16
	No drive in D or 2 but normal in 1.	1, 2, 3, 16
	No drive in D, 2, 1 or R.	1, 2, 3, 13, 11, 17, 16
	Delayed or no 1–2 shift	3, 14, 13, 5, 6
	Slip on 1–2 shift	2, 3, 5, 6, 7, 13
	Delayed or no 2–3 shift	3, 14, 13, 5, 6, 12
	Delayed or no 2–3 shift but normal in R	3, 14, 13, 5, 6
	Slip or engine run-up on 2–3 shift	2, 3, 5, 13, 12
	Bumpy gear shifts	3
	Drag or binding on 2–3 shift	5, 6
5. a.	Slip, break-away noise or judder on full throttle take-off in D or 2	1, 2, 3, 13, 11
	Loss of performance and overheating in D–3rd (seized stator)	21
	Continue as for 4 above.	
b.	Transmission downshifts too easily	3
c, d.	Transmission will not downshift	3, 13, 14
6. a.	As for test 5a above	1, 2, 3, 13, 11
b.	No 3–2 downshift or engine braking	1, 5, 6, 7, 12
	No 2–1 downshift or engine braking	8, 9, 10
7.	Slip, break-away noise or judder on take-off in 1	1, 2, 3, 13, 11
	Transmission up-shifts	1
8.	Slip, break-away noise or judder on take-off in R.	1, 2, 3, 13, 12
	Slip but no judder on take-off in R	1, 2, 3, 8, 9, 10
	As above, with engine braking available in 1.	1, 2, 3
	Drag in R	5
	No drive in R	1, 2, 3, 8, 13, 9, 10, 12
	As above with engine braking available in 1st gear of 1	1, 2, 3, 13, 12
9.	No P	1, 15

Miscellaneous

Screech or whine increasing with engine speed	17
Grinding and grating noise from the gearbox	18
Knocking noise from torque converter area	22

KEY TO ACTIONS

1. Check manual linkage adjustment.
2. Check fluid level.
3. Check adjustment of downshift valve cable.
4. Reduce engine idling speed.
5. Check adjustment of front band.
6. Check front servo seals and fit of tubes.
7. Check front band for wear.
8. Check adjustment of rear band.
9. Check rear servo seal and fit of tubes.
10. Check rear band for wear.
11. Examine the front clutch and seals, also the forward sun gear shaft sealing rings. Verify that the cup plug in the driven shaft is not leaking or dislodged.
12. Examine rear clutch valve and seals. Check fit of tubes.
13. Strip valve bodies and clean.
14. Strip governor valve and clean
15. Examine parking pawl, gear and internal linkage.
16. Examine one-way clutch.
17. Strip and examine pump and drive tangs.
18. Strip and examine gear train.
19. Adjust starter inhibitor switch inwards.
20. Adjust starter inhibitor switch outwards.
21. Replace torque converter.
22. Examine torque converter drive plate for cracks or fracture.

QUICK-REFERENCE FAULT DIAGNOSIS CHART

(Numbers indicate the recommended sequence of Fault Investigation. Letters apply to the remedies on next page.)

Engagement of R. D. 2 or 1:	A	B	C	D	E	F	a	b	c	d	e	f	g	h	l	m	n	p	q	N	O	P	Q	R	S	T	U	V	W	X	Z
Bumpy		2		1					5	3		4									6		7								
Delayed	1		2	3			4	7	6	5									13	9		10			11					12	
None	1		2				3	4	5	6																		7	8	9	10
Starting from rest:																															
No forward			1					3	2											4						5					
No reverse			1			2	7	6	5							3	4					9			8						
Seizure reverse					1																2										
No neutral			1						3												2										
Upshifts:																															
No. 1–2			1		2		8	9	10			6	7	3		4								5							
No. 2–3			1				8	9	10			6	7	2			3	4				5									
Above normal shift speeds		1						8	9	10		2	7	3		4	5	6													
Below normal shift speeds		1						5	6			2		3				4													
Upshift quality:																															
Slip 1–2	1	2	3		4		8	9	10	6		7												5							
Slip 2–3	1	2	3		4		9	10	11	7		8										5		6							
Rough 1–2		1			2				10	3		4	5	6						9						7	8				
Rough 2–3		1			2				6	3		4											5								
Seizure 1–2						1		5	6														2			3	4				
Seizure 2–3					1		2	3	4																						
Downshifts:																															
No. 2–1		1												3		2									4						
No. 3–2		1												3		2							4	5							
Invlountary high speed 3–2	1						2															3									
Above normal shift speeds		1						5	6			4		2				3													
Below normal shift speeds		1						5	6			4		2		7	8	3													
Downshift quality:																															
Slip 2–1																										1					
Slip 3–2					1		6	7	8	4		5			3							9		2							
Rough 2–1								3												2						1					
Rough 3–2					1				5	3		4			2							6	7	8							
Line pressure:																															
Low, idling	1		2	3			6	8	5	4																			9		
High, idling		1		2						3	5	4																			
Low at stall	1	2					6	8	7	3		5	4	9																10	
High at stall									4	1		2	3																		
Stall speed:																															
Below 1,000 rev/min																															1
Over 2,400 rev/min	1		2			3	4	5	6	7										8		9			10	11		12			13
Overheating	1				2	3																									4

SAAB

FAULT INVESTIGATION KEY

Preliminary Adjustment Faults

A. Fluid level incorrect.
B. Downshaft valve cable incorrectly assembled or adjusted.
C. Manual linkage incorrectly assembled or adjusted.
D. Incorrect engine idling speed.
E. Incorrect front band adjustment.
F. Incorrect rear band adjustment.

Hydraulic Control Faults

a. Oil tubes missing or not installed correctly.
b. Sealing rings missing or broken.
c. Valve body assembly screws missing or not correctly tightened.
d. Primary regulator valve sticking.
e. Secondary regulator valve sticking.
f. Throttle valve sticking.
g. Modulator valve sticking.
h. Governor valve sticking, leaking or incorrectly installed.
l. Orifice control valve sticking.
m. 1–2 shift valve sticking.
n. 2–3 shift valve sticking.
p. 2–3 shift valve plunger sticking.
q. Converter "out" check valve missing or sticking.

Mechanical Faults

N. Front clutch slipping due to worn plates, faulty parts or leaking cup plug in driven shaft.
O. Front clutch seized or plates distorted.
P. Rear clutch slipping due to worn plates or faulty check valve in piston.
Q. Rear clutch seized or plates distorted.
R. Front band slipping due to faulty servo, broken or worn band.
S. Rear band slipping due to faulty servo, broken or worn band.
T. One-way clutch slipping or incorrectly installed.
U. One-way clutch seized.
V. Input shaft broken.
W. Pump drive tangs on coverter hub broken.
X. Pump worn.
Z. Converter blading and/or one-way clutch failed, stator support fractured.

REMOVAL AND INSTALLATION

Automatic transmission

REMOVAL

For major work on the engine and transmission, the entire power plant should be lifted out. Removal of the engine by itself is not recommended.

1. Remove the hood as follows:
   Back off both the hood fastening screws. Lift off the hood. For this you need a helper to hold one side of the hood and help to lift it clear.
2. Detach the battery cables. Unclamp and lift out the battery.
3. Drain the coolant through the radiator and engine block drain cocks (later versions: drain plug in engine block).
4. Carbureted engine:
   Detach the vacuum hose of the servo cylinder from the inlet manifold and pull the fuel hose off the suction side of the fuel pump.
4. Injection engine:
   a. Detach the vacuum hose of the servo cylinder from the inlet manifold and remove the rubber bellows between the air flow sensor and inlet manifold.
   b. Thoroughly clean the areas around the fuel line connections on the fuel distributor and detach the lines. Plug the holes and blank off the fuel line ends in a suitable manner.
   c. Disconnect the electrical connection on the air flow sensor.
   d. Undo the clamps on the air cleaner and remove the air cleaner and mixture control unit.
5. Carbureted engine:
   Undo the cable connections to the ignition coil, temperature transmitter, oil pressure transmitter, radiator fan, thermostat contact, headlights, headlight wipers and the switch on the gear box.
5. Injection engine:
   a. Undo the cable connections to the ignition coil, temperature transmitter, radiator fan, thermostat contact, headlights, headlight wiper motor and the switch on the gear box.
   b. Disconnect the cables of the injection system at the warm-up regulator, auxiliary air valve, cold start valve and thermo-time switch.

> CAUTION
> Do not detach the connections by pulling the cables. Grip the connecting pieces.

6. Carbureted engine:
   a. Remove the air cleaner, the inlet hose and the preheater complete with hose.
   b. Detach the throttle control wire from driver and bracket.
   c. Detach the choke control wire and sheath from the carburetor.
6. Injection engine:
   Detach the throttle control wire from driver and bracket on the throttle valve housing.
7. Detach the hoses at the connections to the thermostat housing, radiator, inlet manifold and water pump.
8. a. Remove the grille.
   b. Remove the hood lock operating cable from its fastenings at the dash panel and wheel housing.
   c. Remove the two front sheet retaining screws and nuts, and the four screws holding the headlights to the body.
   d. Remove the front sheet, lifting forward and upward.
9. Remove the protective cover from the exhaust manifold.
10. Disconnect the exhaust pipe from the exhaust manifold.
11. a. Disconnect the ground cable from the transmission.
    b. Remove the alternator.
12. Jack up the front end of the car and place blocks under the body.
13. Remove the screw for the gear selector wire at the transmission. Move the gear selector lever to position "1" and pull out the sheath from the transmission. Fit tool 8790388 on the wire, turn the tool a little and pull out the wire.
14. Detach the speedometer cable from the transmission.
15. Undo the engine brackets.
16. Undo the larger clips round the rubber bellows on the inner universal joints.
17. Fit the lifting yoke 8392177 to the two engine lifting lugs.
18. Undo the lower end piece from the control arm on the right-hand side and turn the steering wheel to the left and withdraw the universal joint. Lift the power plant a little and withdraw the left universal joint.
19. Lift the power plant to a convenient height for access to the cable connections on the starter. Disconnect the cables.
20. Hoist out the power plant. Fit protective caps over the inner drivers and rubber bellows.

INSTALLING

The front of the car should be supported on blocks during installation of the power plant.

1. a. Check that the inner universal joints are packed with grease.
   b. Check the front engine cushion. Make sure that the washer is properly tightened.
2. Raise the power plant with the lifting yoke and position the power plant in the engine compartment.
3. Lower the power plant to a convenient height for fitting the starter. Connect the cables.
4. Assemble the inner universal joints as follows: Hang the clips on the inner drivers. Lower the power plant until it is about 2–2 1/2" (50–60 mm) from the engine cushions. Assemble the right-hand universal joint, then lower the power plant until it is about 1" (20–30 mm) above the engine cushions and push the power plant to the right. Lower the power plant and position it over the engine cushions while guiding the left-hand universal joint into place. Connect the end piece to the lower control arm.
5. a. Align the engine brackets.

> Cars built to U.S. specifications and other cars with servo-assisted steering are equipped with special rear engine cushions. The cushions are designed to prevent the power plant from hitting the steering gear and damaging it in the event of a collision. A wire runs between the rear edge of the upper retaining plate and the front edge of the lower retaining plate in the cushions. The position of the cushions is determined by guides in the engine bracket and the cushion.

   b. Bolt the power plant to the engine cushions.
6. Remove the lifting yoke.
7. a. Push the rubber bellows over the inner universal joint drivers and fit the clamps.
   b. Wipe any surplus grease off the rubber bellows and check that the bellows are not deformed.
8. Connect the gear selector wire to the transmission.
9. Connect the speedometer cable to the transmission.
10. Bolt the exhaust pipe to the exhaust manifold.
11. Lower the front end of the car.
12. a. Connect the ground cable.
    b. Fit the alternator.
13. Mount the front sheet complete with radiator and connect the hood lock operating cable to the attachment at the dash panel.
14. Fit the grille.
15. Reconnect the cables to the radiator fan, thermostat contact, headlights, headlight wiper motor and clip the bundle of wiring to the front sheet.
16. Connect the coolant hoses to the radiator, thermostat housing, water pump, inlet manifold and heater.
17. Connect the vacuum hose and fuel hose and connect cables to the temperature transmitter, ignition coil and oil pressure transmitter.
18. a. Connect the throttle control wire to driver and bracket.
    b. Carbureted engine:
    Connect the choke control wire to the carburetor.
19. Carbureted engine:
    a. Mount the air cleaner and preheater complete with hoses.
    b. Connect the ventilation hose.
    c. Connect the cables between the distributor and ignition coil.
    d. Connect the fuel pipe.
19. Injection engine:
    a. Mount the air cleaner and mixture control unit and connect the rubber bellows to the throttle valve housing and the air flow sensor.
    b. Fit the fuel lines.
    c. Fit the cables to the warm-up regulator, auxiliary air valve, cold start valve, thermo-time switch and air flow sensor.
20. Install the battery and connect the cables.
21. Close the radiator and engine block drain cocks, fill with coolant and oil.
22. Start the engine, checking oil pressure and coolant temperature. Check the operation of the transmission. Check the operation of the radiator fan by grounding the thermostat contact cable to the radiator.
23. a. Mount the hood and connect the windshield washer hose.
    b. Check the fit of the hood. Close the hood, open the doors, and check that the door jambs clear the rear edge of the hood.
    c. Check the headlight alignment.
24. Take the car out for a test run. Check the coolant level after driving.

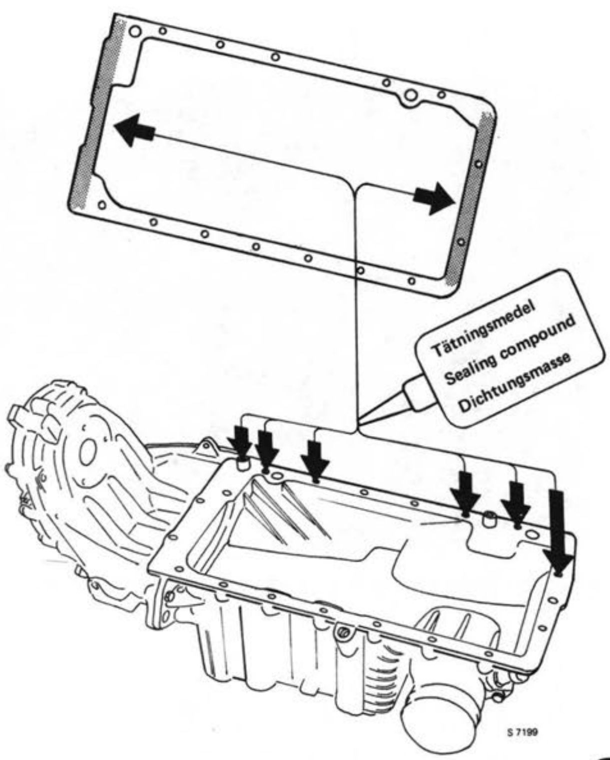
SEPARATING ENGINE FROM AUTOMATIC TRANSMISSION

1. Clean the outside of the power plant.
2. Drain the engine oil.
3. Remove the cover over the flywheel ring gear.
4. Remove the starter.
5. Disconnect the throttle wire from the throttle valve housing (carburetor).
6. Model 1975: Remove the three screws in the release bearing guide sleeve.
   As from model 1976: Remove the three slave cylinder retaining screws.
7. Model 1975: Remove the adjusting screw and the clutch lever.
8. Remove all bolts in the mating flanges of the engine and the transmission.
9. Lift the engine carefully off the transmission and remove the release bearing guide sleeve at the same time.

> CAUTION
> If the engine and transmission fail to separate, never attempt to force them apart without first checking that all bolts have been removed.

Reassemble in the reverse order.

When fitting together the engine and transmission:
- Ensure that the mating flanges between the engine and transmission are absolutely clean.
- Check that the two dowels are fitted in the transmission casing.
- Fit a new gasket on the transmission housing. Apply sealing compound to both sides of the gasket as shown in the illustration above.
- Apply thread locking compound to the six bolts in the holes as indicated in the lower illustration.



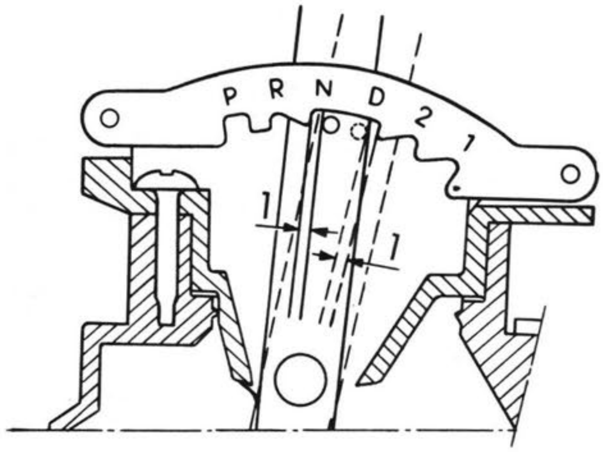
TRANSMISSION CONTROL

Automatic transmission

GEAR SELECTOR CABLE

Checking, types 393 and 399

1. Move the selector lever to N. Check the clearance against the segment.
2. Move the selector lever to D. Check the clearance against the segment. The clearance in N and the clearance in D should be the same. See illustration.
3. Check that P, R, 2 and 1 are in correct position.

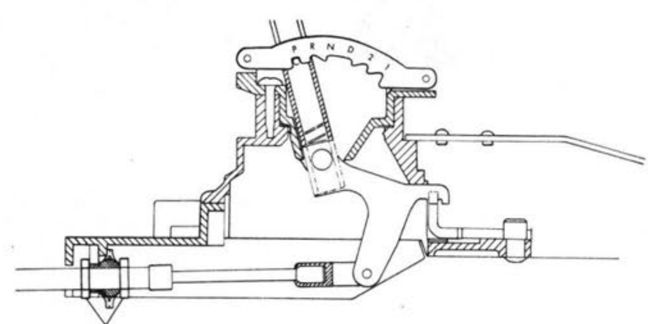


S 3199

ADJUSTING THE GEAR SELECTOR LEVER HOUSING

1. The clearance in N and in D are the same.

Adjusting, types 393 and 399

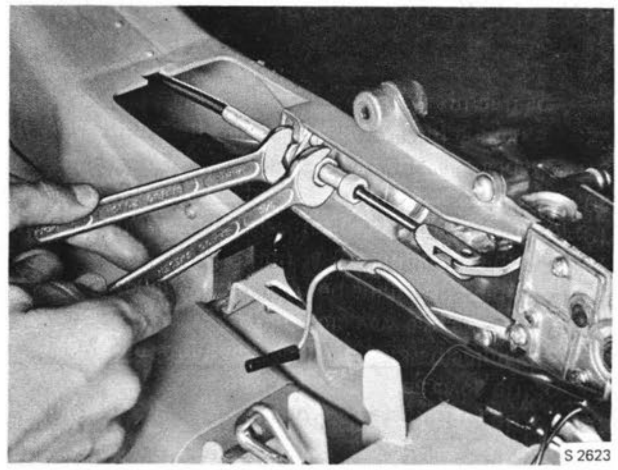


SECTION THROUGH GEAR SELECTOR LEVER HOUSING

P = Park
R = Reverse
N = Neutral
D = Drive 1, 2, 3rd
2 = Drive 1, 2nd
1 = Drive 1st

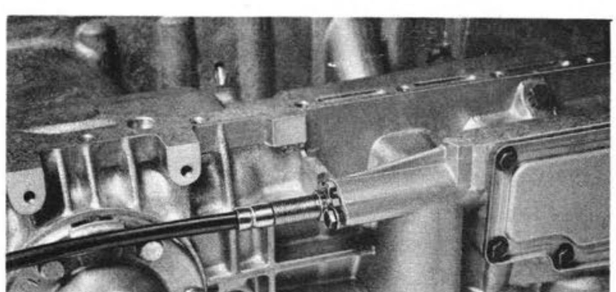
1. Adjusting the wire with nut

1. Remove the gear selector lever cover.
2. Slack off the gear selector lever housing nuts with tool 8391237.
3. Lift the gear selector lever housing and turn it so that the adjustment nuts of the wire will be accessible.
4. Adjust by screwing the nuts on the outer cover so that this will be displaced inwards or outwards.
5. After adjusting, the gear selector lever housing will be reassembled, and the clearance in N and D will be checked once again.



ADJUSTING THE GEAR SELECTOR LEVER CABLE

In the connect between the gear selector lever cable and the automatic transmission case a fine setting can be done. Fine setting of the gear selector lever cable is possible in the connection between the cable and the automatic transmission case. Undo the set screw and turn the adjusting nut.



FINE SETTING OF THE GEAR SELECTOR LEVER CABLE

TRANSMISSION CONTROL

Automatic transmission

GEAR SELECTOR CABLE

Change type 487

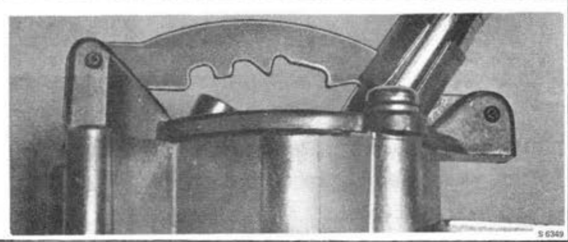
1. Move the selector lever to N. Press the pawl button and move the lever slightly back and forth until you hear a click and feel that the selector valve has locked in position N.

S 6631

2. Release the pawl button: the lever should now be exactly in position N.
   If the lever needs to be moved to engage postion N, adjustment is necessary.

S 6632

An additional notch has been incorporated in the lever segment for position N and is readily detechable when the pawl button is released. This is to enable adjustment of the lever position.



S 6349

Gear selector cable, adjustment, type 487

1. Move the selector lever to N. Press the pawl button and move the lever slightly back and forth until you hear a click and feel that the selector valve has locked in position N.

S 6631

2. Hold the lever completely still in this position, with the pawl button depressed.
3. Undo the cable attachment at the lever using hexagon bit adaptor 87 90 883.

4. Release the pawl button and move the lever to position N.

An additional notch, indicating the exact position of N, has been incorporated in the lever segment to facilitate adjustment of the gear selector cable.

S 6632

5. Tighten the set screw for the gear selector cable using a torque wrench and hexagon bit adaptor 87 90 883.

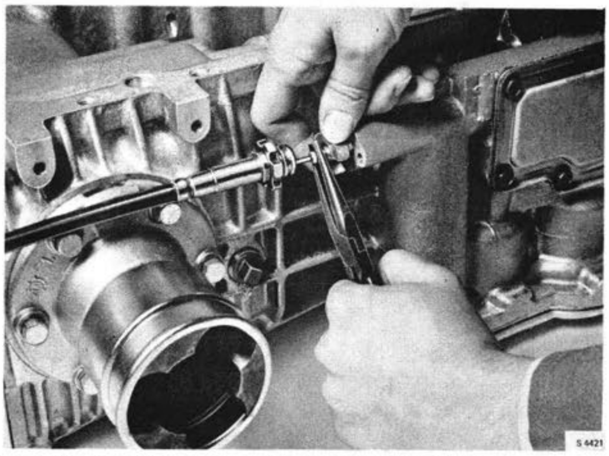
Tightening torque	2.5 Nm (1.8 ft.lb., 0.25 kpm)

S 6351

GEAR SELECTOR CABLE

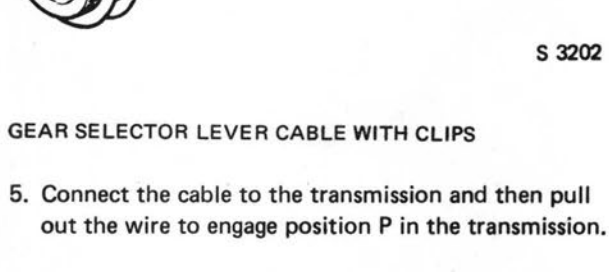
Change, types 393 and 399

1. Remove the gear selector housing so that the cotter pin securing the wire to the gear selector rod can be driven out. Then disconnect the cable from the housing by undoing the two screws holding the wire clamp.
2. Disconnect the cable from the transmission casing using the special tool 8790388.



REMOVING THE GEAR SELECTOR LEVER CABLE
Tool 8790388

3. Take off the heater duct and remove the old cable.
4. Fit a new cable, being sure to obtain a perfect seal where it passes through the toeplate, and replace the heater duct.



S 3202

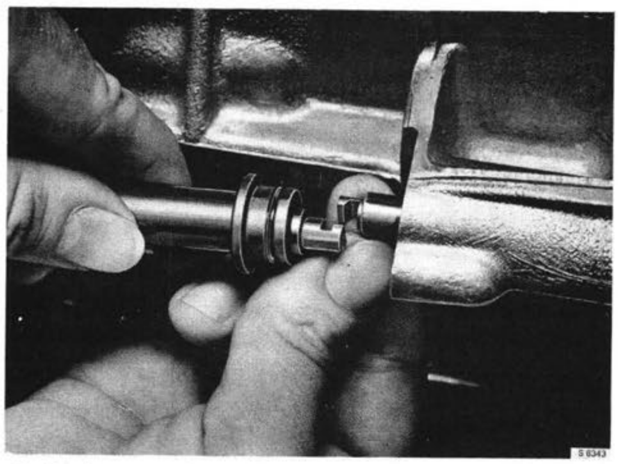
GEAR SELECTOR LEVER CABLE WITH CLIPS

5. Connect the cable to the transmission and then pull out the wire to engage position P in the transmission.
6. Connect the wire to the gear selector rod and the housing.
   Then adjust the cable to roughly the correct position with P engaged in the transmission.
7. Screw on the selector lever housing and check the selector lever in the various positions, readjusting if necessary (see directions for adjusting the gear selector cable).

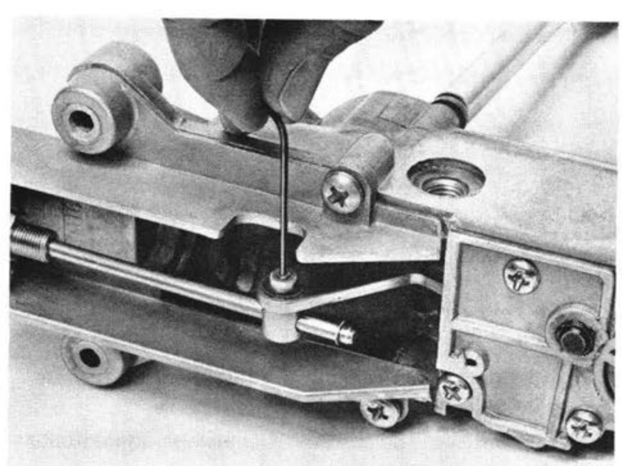
GEAR SELECTOR CABLE

Change, type 487

1. At the transmission casing:
   a. Remove the cable attachment bolt at the transmission casing.
   b. Pull the wire and the selector cable to the outer position (position P).
   c. Slide back the spring-loaded sleeve on the gear shift rod and unhook the cable end piece.

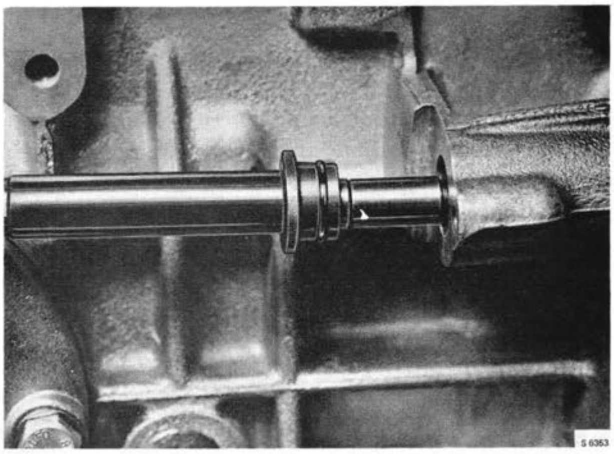


2. At the gear selector housing:
   a. Remove the gear selector housing using special sleeve 87 90 370.
   b. Remove the circlip from the end of the cable on the underside of the lever housing.



   c. Remove the locking screw where the cable is attached to the selector lever.

d. Loosen the cable sheath nuts and release the cable.
3. Remove the carpet, heater duct and the old cable and fit a new one. Make sure there is a good seal at the point where the cable passes through the bodywork.
4. At the transmission casing:
   a. Slide back the spring-loaded sleeve on the gear shift rod, hook together the links and release the sleeve.



   b. Insert the cable sheath and fit the retaining bolt.
5. At the selector lever housing:
   a. Insert the end of the cable in the attachment hole in the gear selector rod and fit the circlip.
   b. Secure the cable sheath to the housing.
6. Adjust the cable as follows:
   a. Withdraw the gear selector cable as far as possible (position P).
   b. Move the cable two notches (position N).
   c. Move the gear selector lever to N and tighten the bolt to the specified torque. The selector lever housing should be in an upright position.

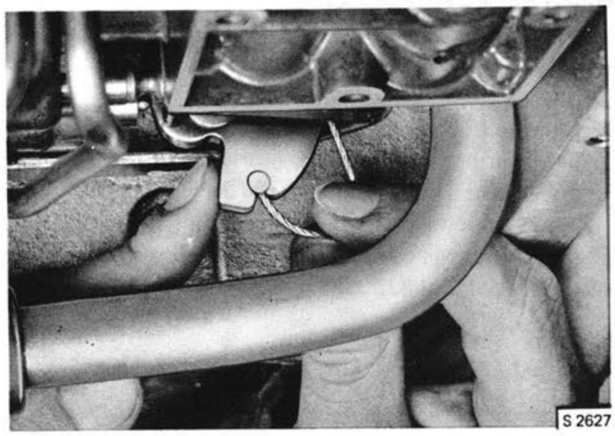
Tightening torque	2.5 Nm (1.8 ft.lb., 0.25 kpm)

7. Refit the selector lever housing.

THROTTLE CABLE

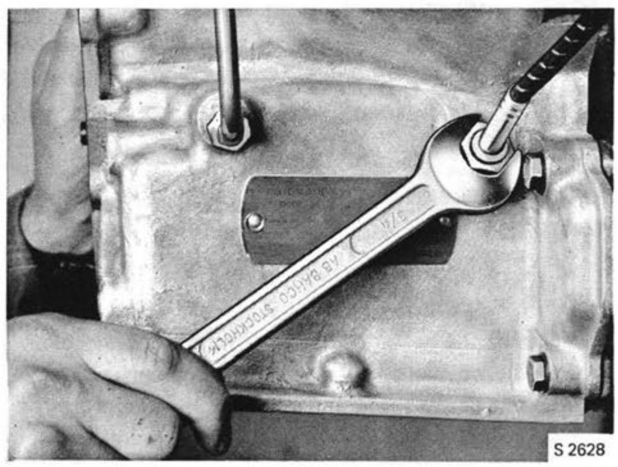
Change

1. Disconnect the wire from the throttle and from its attachment to the retaining plate.
2. Drain oil from the automatic transmission and take off the forward bottom cover.
3. Disconnect the throttle wire from its cam at the control valve on the valve housing and unscrew the cable from the transmission casing.



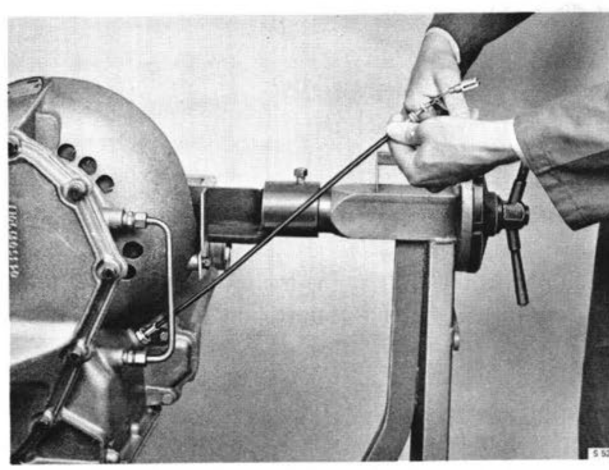
REMOVING THE THROTTLE CABLE FROM VALVE HOUSING

4. Connect a new cable to the transmission casing and hook it to its cam on the control valve, making sure that the wire is properly positioned on the guide pulley.



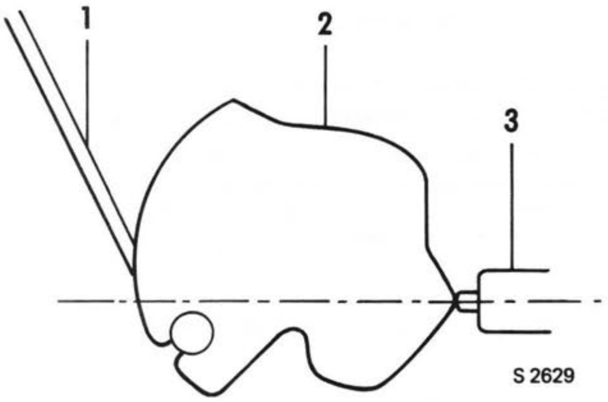
REMOVING THE THROTTLE CABLE FROM TRANSMISSION CASE

5. Keeping the cable straight, increase the tension in the wires until the cam moves, using a pair of pliers, clamp the stop clip to the threaded part of the cable.



CLAMPING THE STOP CLIP ONTO THE THROTTLE CABLE

6. Connect the wire to the throttle damper at the intake manifold and adjust the wire roughly by noting the position of the cam relative to the position of the throttle damper. When the accelerator pedal is fully depressed, i.e. in the "kick-down" position, the highest point of the cam should be in contact with the "kick-down" valve (see illustration).
7. Refit the bottom cover to the oil sump and fill the transmission with oil. For adjustment of the throttle wire, see the relevant directions.

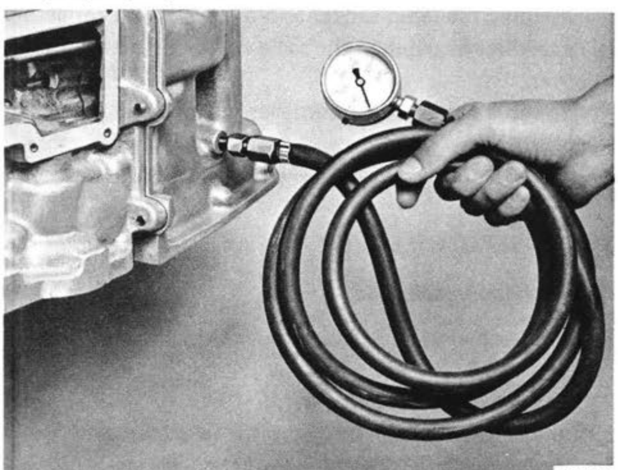


THE CAM IN "KICK-DOWN" POSITION
1. Throttle wire. 2. Cam. 3. Valve.

GEAR SELECTOR CABLE

Adjusting

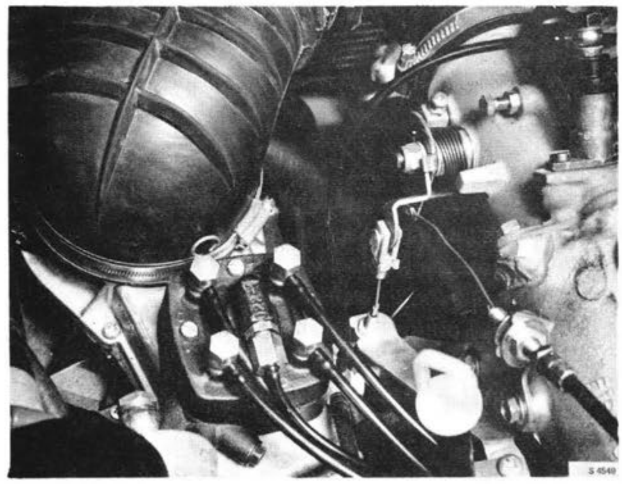
1. Connect a revolution counter to the engine and a pressure gauge to the transmission.
2. Immobilize the wheels by applying the brakes.
3. Start the engine and check that the idling speed is properly adjusted.



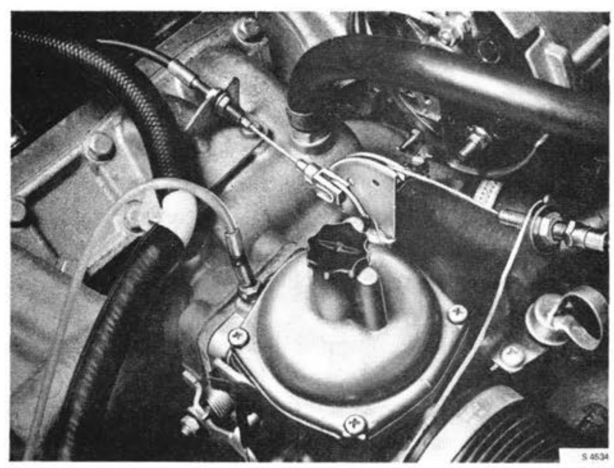
CONNECTING THE PRESSURE GAUGE

4. Move the selector lever to D.
5. Read off the pressure on the pressure gauge.
6. Rev up from idling by 500 rev/min.
7. Read off the pressure again. It should be up by 10–20 psi (0.7–1.4 bar, kp/cm^2). If the pressure rise is too little, the control cable must be adjusted outward, if the pressure rise is too high, the control cable must be adjusted inward.

NOTE
The pressure should be 50–70 psi (3.5–4.9 bar, kp/cm^2) in idling with gear selector lever in D.



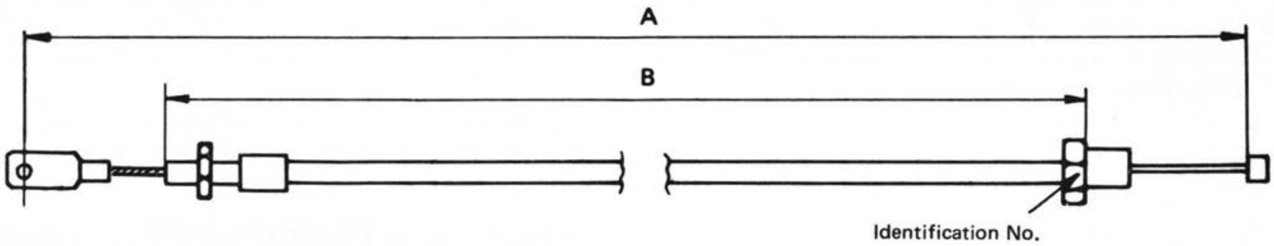
ADJUSTING THE THROTTLE CABLE, INJECTION ENGINE



ADJUSTING THE THROTTLE CABLE, CARBURETED ENGINE

Identification table

The table below of dimensions and identification numbers has been compiled to help you tell the cables apart. An identification number is stamped into the hexagon nut at the end of the cable which is connected to the transmission.



Transmission type	Cable No.	Identi-fication No.	Lengths A mm	A in.	B mm	B in.
393 (carburetor and injection engine versions with effect from chassis numbers 99752022710, 99756007809 and 99757003050 and type 487	8709107	210	1242.3	48.94	1029.9	40.55
399 (injection engine version up to and including chassis numbers 99752022709, 99756007808 and 99757003049	8709099	211	627.1	24.64	430.0	16.93

GEAR SELECTOR LEVER HOUSING

Removing

1. Disconnect the battery earth cable.
2. Move the selector lever to P and take off the ignition key.
3. Loosen the lock nut under the button of the gear selector lever and unscrew the button and nut.
4. Remove the scale cover. Before the cover can be removed, the switch cable connections must be loosened.
5. Remove the scale light reflector and the lamp socket for the scale light.
6. Remove the heater control lever button. The right one is accessible when the control lever is in its rear position and the right seat is in its front position.
7. Fold up the floor mat.
8. Remove the three gear cover retaining screws. Raise the cover and take off the ignition switch lamp. Remove the cover.
9. Remove the ignition switch cable and note its position.
10. Remove the retaining nuts for the gear selector lever with tool 8391237.
11. Raise the gear selector lever housing and twist it. Loosen the two bottom cover screws and take off the wire bracket tension pin.

Assembling

1. Move the ignition switch to Drive.
2. Assemble the gear selector housing with the bottom cover and connect the wire bracket.
3. Attach the house with one or two screws. Check and if necessary adjust the gear positions. See "Adjusting the gear selector cable". Assemble the house.
4. Assemble the ignition switch cable. Move the gear selector to P and take off the key.
5. Assemble the ignition switch light in the gear cover and attach the cover.
6. Assemble the lamp socket and the scale light reflector.
7. Assemble the cable in the scale cover and attach the cover.
8. Assemble the gear selector lever buttons and heater control.
9. Assemble the floor mat and battery cable.

GEAR SELECTOR LEVER

Removal and installation

1. Remove the gear selector lever housing. See this section.
2. Turn the ignition key to Drive.
3. Take off the tension pin from the ratch sector.
4. Remove the screws and take off the lever.

Reassemble in reverse order.

REMOVAL AND INSTALLATION

4-speed gearbox

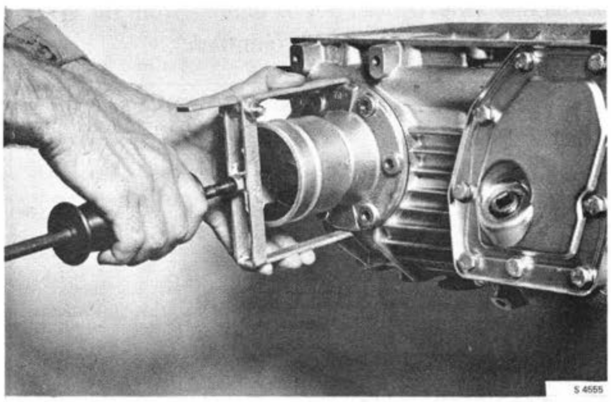
Disassembling and assembling of the gear box can be done without separating the engine and the gear box. The engine flywheel must first be removed.

> IMPORTANT
>
> Before disassembling the transmission, always measure up the positions of the pinion gear and crown wheel. This is to check whether there is any error in their locations. If the pinion and crown wheel assembly is relatively new, i.e. if it has done less than 6,000 miles (10,000 km), it can be adjusted, but if the mileage is any greater the gears will have worn themselves into a given position. In the latter case, they should be reassembled in the same measured positions which they occupied before disassembly.

DISASSEMBLING

(Proceed in the following order as far as necessary in order to remove whichever component needs attention:)

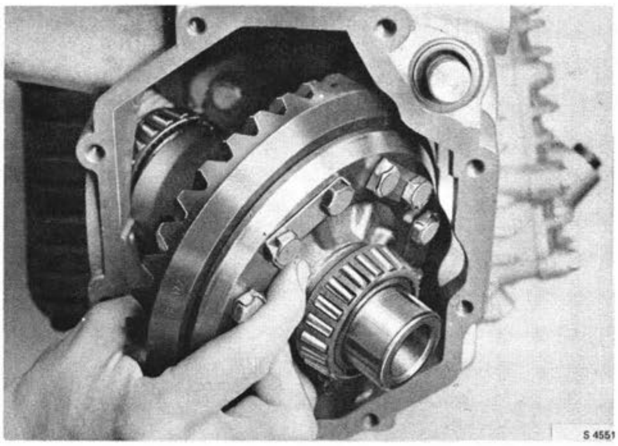
1. Clean off the transmission case and drain the oil.
2. Remove the differential bearing seat retaining screws and remove the seat and inner driver using tool 8390270 and extractor 8790776.



REMOVING THE DIFFERENTIAL BEARING SEATS
Tool 8390270 and 8790776

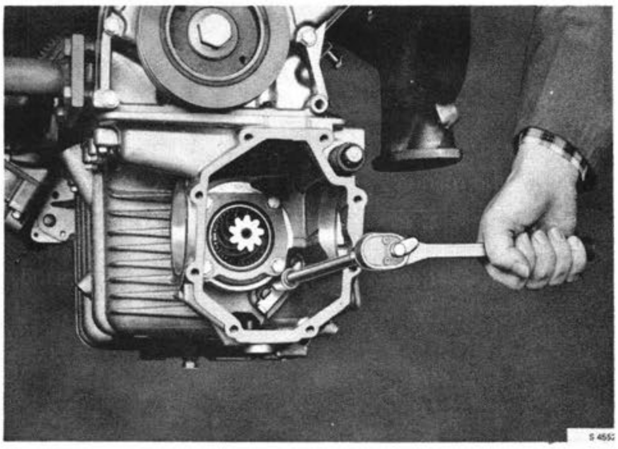
Save the spring and plunger at the shaft end of the driver, and the shims, which will be replaced on the condition that the differential gear backlash has not been altered by the exchange of some components.

3. Remove the differential assembly. For dismantling of the differential assembly see section 473.

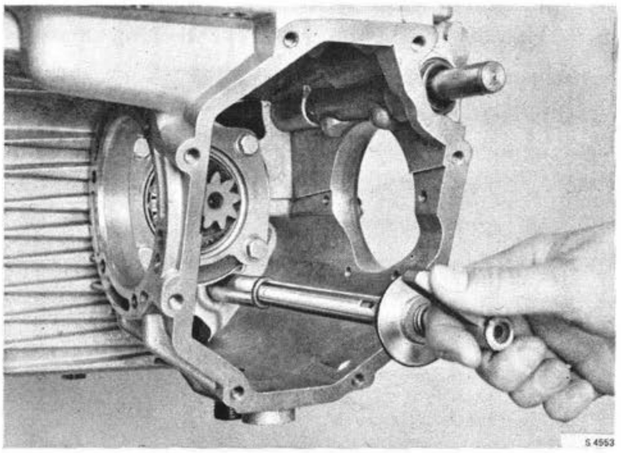


REMOVING THE DIFFERENTIAL ASSEMBLY

4. Remove the locking plate that holds the intermediate and reverse gear shafts in place (see illustration). Use tool 8390049 to withdraw the intermediate gear shaft so that the intermediate gear set drops down.

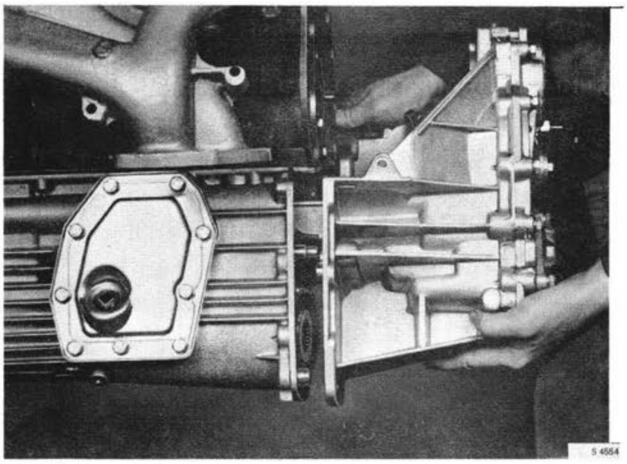


REMOVING THE LOCKING PLATE



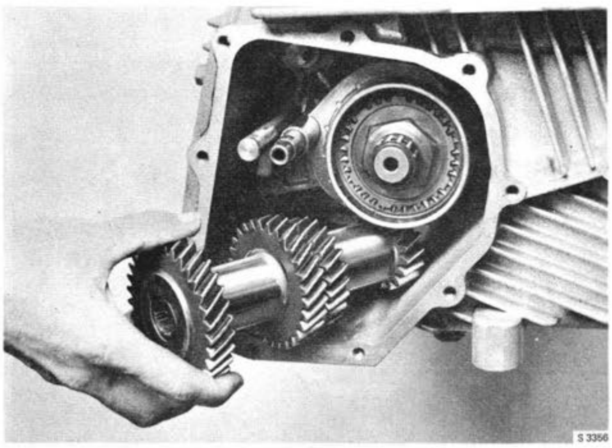
REMOVING THE INTERMEDIATE GEAR SHAFT
Tool 8390049

5. Separate the transmission at the joints between the gearbox and primary gear housing and lift away the primary gear housing (see illustration).



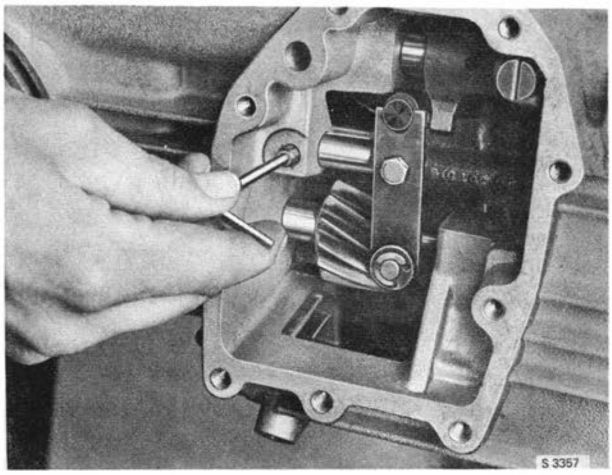
SEPARATING THE PRIMARY GEAR HOUSING FROM THE GEARBOX

6. Remove the intermediate gear set (see illustration).



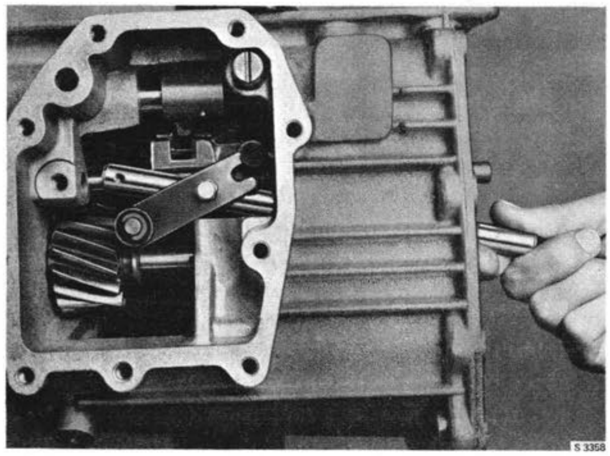
REMOVING THE INTERMEDIATE GEAR SET

7. Unscrew the transmission side cover, take out the spring and ball catch for the gear selector rod, and put them in a safe place.
8. Undo the reverse gear shift shaft retaining screw.



REMOVING THE REVERSE GEAR SHIFT SHAFT RETAINING SCREW

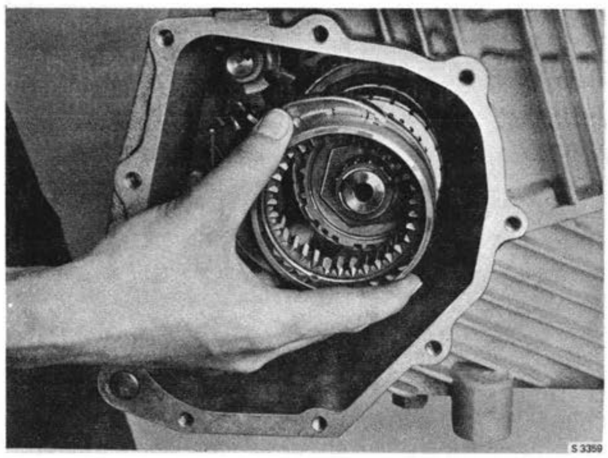
Turn the gear selector rod so that the driver is detached from the reverse gear shift and pull out the shaft.



REMOVING THE REVERSE GEAR SHIFT SHAFT

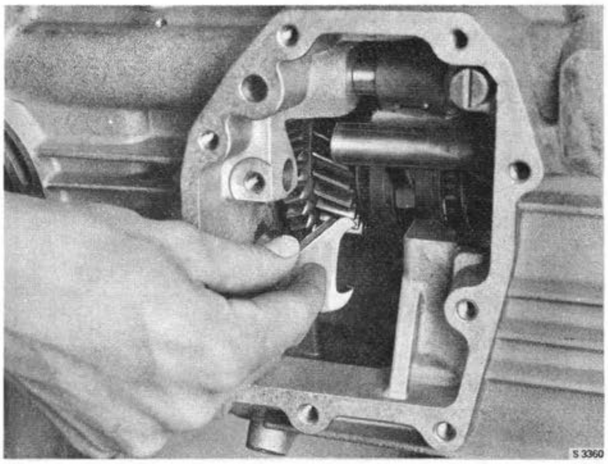
Remove the shift shaft for the 1st–2nd gear 3rd-top gear and shift forks and remove the shift fork and sliding muff for 3rd–top gear.

NOTE
The reverse lever need not be undone from the gear shift shaft when the shaft is removed.



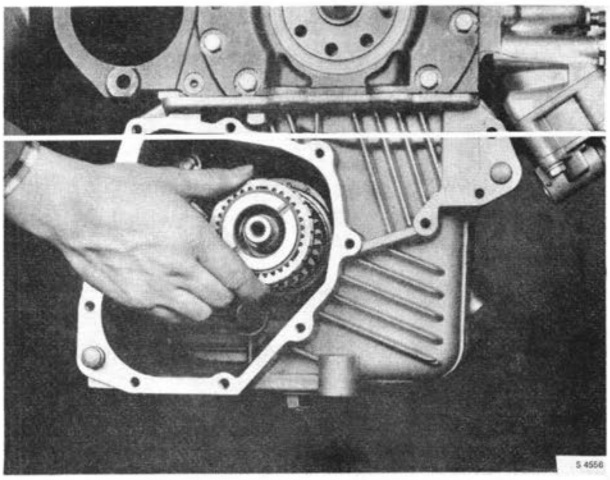
REMOVING THE SLIDING MUFF FOR 3RD–TOP GEARS

9. Pull out the reverse gear shaft. Use tool 8390049 to lift out the reverse gear.
10. Remove the needle bearing from the pinion shaft and install tool 8790503 as a lock for the reverse gear (see illustration), and undo the pinion shaft nut.



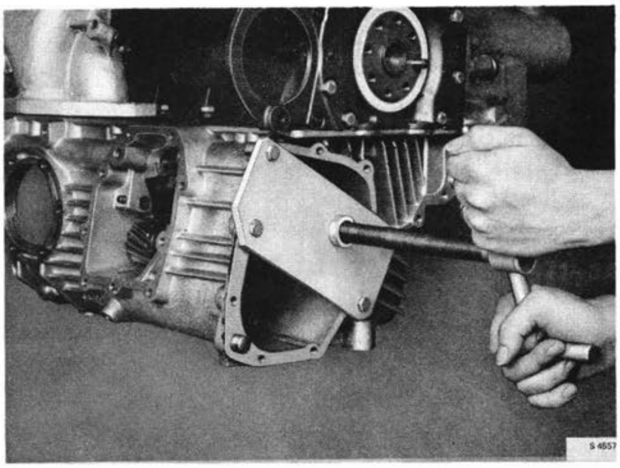
INSTALLING TOOL 8790503

11. Remove tool 8790503 and remove the 3rd–top gear synchronization hub and 3rd gear.



REMOVING 3RD GEAR

12. Undo the four pinion shaft bearing housing screws. Install tool 8790511 and press out the pinion shaft. Put the gears, sleeves, washers and shims in a safe place.



PRESSING OUT THE PINION SHAFT
Tool 8790511

Differences in number of cogs and outer diameter (measured on the cogs) between transmissions up to and incl. model 1972 and transmissions as from model 1973.

Primary gear	Transmission model 1972 Serial No. up to and incl. 437751		Transmission as from model 1973 Serial No. as from 500.000	
	No. of teeth	Outer diam.	No. of teeth	Outer diam.
Input gear	20	2.276" (57.8 mm)	20	2.318" (58.9 mm)
Intermediate gear	48	5.151" (130.8 mm)	48	5.118" (130.0 mm)
Output shaft	19	2.276" (57.8 mm)	20	2.318" (58.9 mm)
Intermediate gear (tooth surface engaged in first gear)	17	2.224" (56.3 mm)	16	2.181" (55.4 mm)
First gear	30	3.626" (92.1 mm)	30	3.665" (93.1 mm)
Sliding wheel, reverse	14	1.890" (48.0 mm)	14	1.906" (48.4 mm)
Reverse gear	34	4.166" (105.8 mm)	33	4.154" (105.5 mm)
Pinion	9	2.077" (52.75 mm)	9	2.205" (56.0 mm)
Crown wheel	38	6.914" (175.6 mm)	35	7.047" (179.0 mm)

ASSEMBLING

Having removed the component that needs attention, clean all fragments of old gaskets and all traces of old sealing compound off the covers and mating surfaces. Inspect the transmission case and all disassembled parts and wash them in kerosene or similar. Then reassemble the transmission, following the procedure described below:

1. Adjust the differential bearings to the correct compression. See section 473.
2. Screw the two locating studs (tool 8790438) into the transmission case. Then shim and locate the pinion shaft assembly. Tap the assembly gently into position, using a plastic metallet, drift 8390114 and sleeve 8390148. Then insert and tighten the four bearing housing screws.

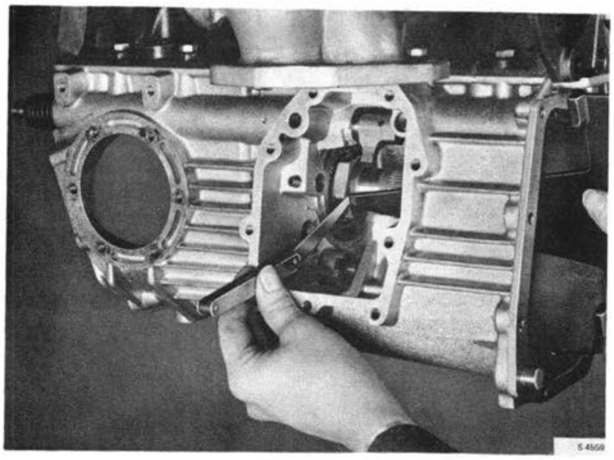
NOTE
Any measuring or adjusting of the pinion shaft must be done before the screws are secured with Loctite. See section 473.

3. a. Before mounting the reverse gear on the pinion shaft, the distance between the connecting surface for the primary gear housing and the pinion shaft nut must be checked. The distance must be 7.677"–7.681" (195.0–195.1 mm). If it is not this distance, shims must be placed between the nut and the reverse gear. Shims are available

MOUNTING THE PINION SHAFT
Locating studs 8790438, drift 8390114, sleeve 8390148

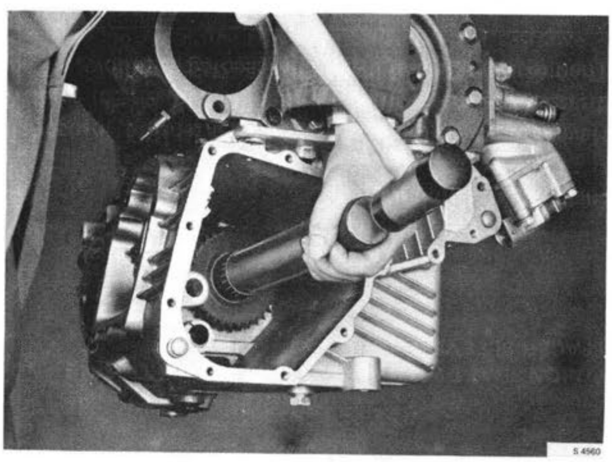
MEASURING THE POSITION OF THE PINION SHAFT IN THE GEARBOX HOUSING WITH DEEP GAUGE in thicknesses of 0.0118" (0.30 mm), 0.0157" (0.40 mm) and 0.0197" (0.50 mm). If the position of the pinion shaft is unchanged, the shims used earlier can be replaced.

b. When using measuring tool 8790552, the procedure of shimming is the following:
Install the measuring tool in the gearbox housing according to fig. and measure the distance between tool and nut with the aid of a feeler gauge. Fit shims with a thickness equvivalent to that of the used feeler gauge.



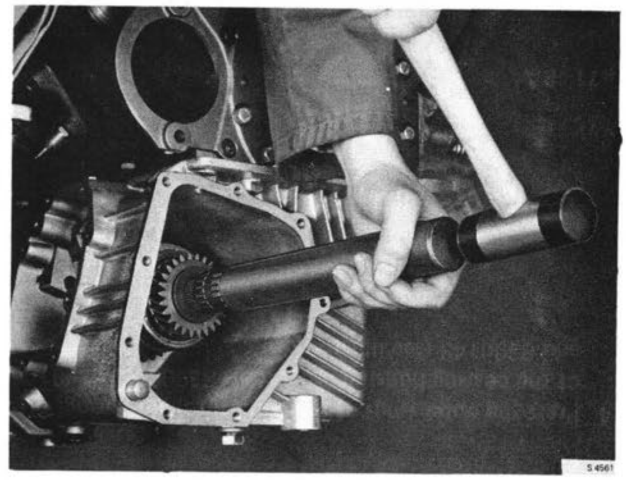
MEASURING THE POSITION OF THE PINION SHAFT IN THE GEARBOX HOUSING WITH THE AID OF TOOL 8790552

4. Install the reverse gear using sleeve 8390148.



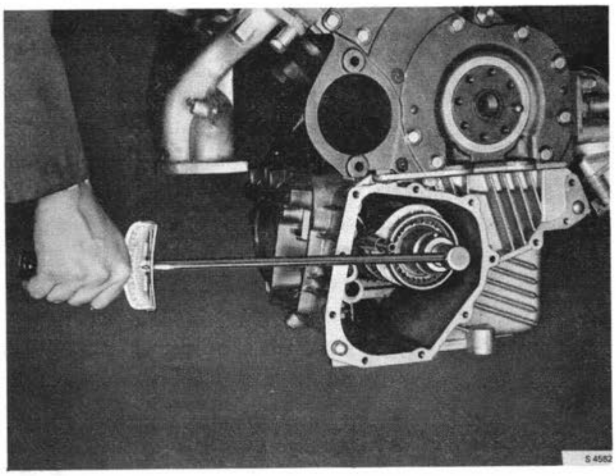
INSTALLING THE REVERSE GEAR
Sleeve 8390148

5. Fit the 1st gear on the bearing sleeve of the reverse gear.
6. Fit 1st–2nd synchronization hub. Fit 1st–2nd gear shift fork into 1st–2nd coupling muff and mount these on the synchronization hub. Fit 1st–2nd gear shift fork into 1st–2nd coupling muff and mount these on the synchronization hub.
7. Install the 2nd gear sleeve with tool 8390148 and mount the 2nd gear on the sleeve.
8. Fit the spacer, mount the sleeve for 3rd gear with tool 8390148 and mount the 3rd gear on this sleeve.



INSTALLING SLEEVE FOR THE THIRD GEAR
Sleeve 8390148

9. Fit 3rd–4th gear synchronization hub.(Fit the synchronization hub fitted with the three locking holes against the pinion nut.) Fit 3rd–4th gear shift fork into 3rd–4th gear coupling muff and mount these on the synchronization hub.
10. Install tool 8790503 at a lock for the reverse gear and tighten the pinion shaft nut to the prescribed torque of 40–60 Nm (30–45 ft.lb., 4–6 kpm) and secure the nut. Install the pinion shaft needle bearing and its locking ring. Remove tool 87 90 503.

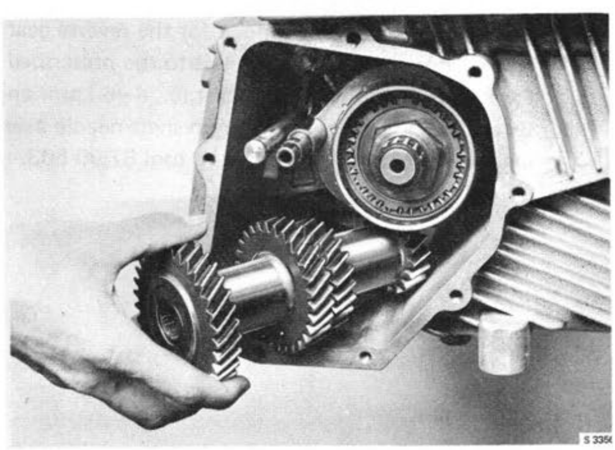


TIGHTENING THE PINION SHAFT NUT

11. Ease the coupling muffs on the pinion shaft in the neutral position and fit the gear shift shaft for 1st–2nd and 3rd–4th gear shift forks.
12. Turn the gear selector rod clockwise so that there is room to mount the reverse gear shift shaft. Mount the latter. Tighten the axle with the stop screw.

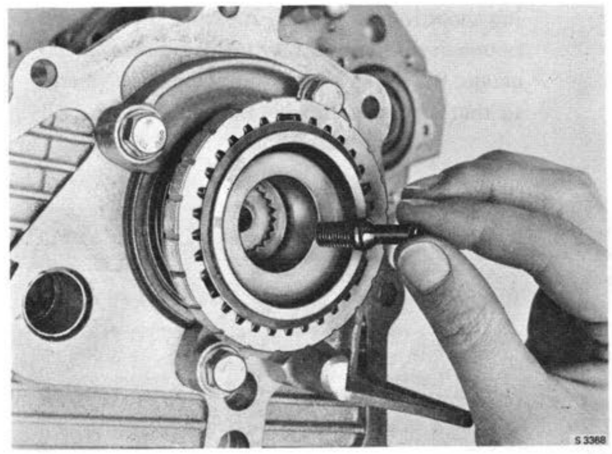
> NOTE
> The reverse lever can be fitted to the reverse gear shaft before the shaft is mounted in the gearbox.

13. Mount the needle bearings in the intermediate gear set with the help of grease so that they are held in place until the intermediate gear set is fitted. Place the intermediate gear set in the bottom of the gearbox.



INSTALLING THE INTERMEDIATE GEAR SET

14. Check that the thrust washer for the intermediate gear set is in the right place on the primary gear housing. The washer can be glued on to facilitate the fitting of the intermediate gear set. Check that the connecting tube is fitted in the output shaft of the primary gear.

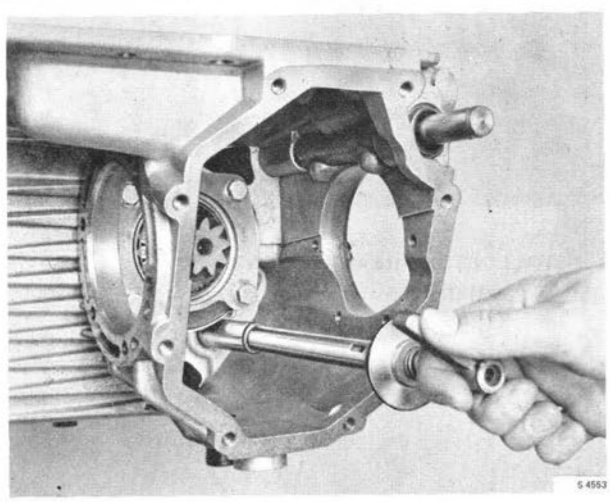


FITTING THE CONNECTING TUBE IN THE OUTPUT GEAR OF THE PRIMARY GEAR SET

15. Coat the mating flange of the primary gear housing with sealant compound, e.g. Tikatät No. 2, and screw the primary gear housing to the transmission case.

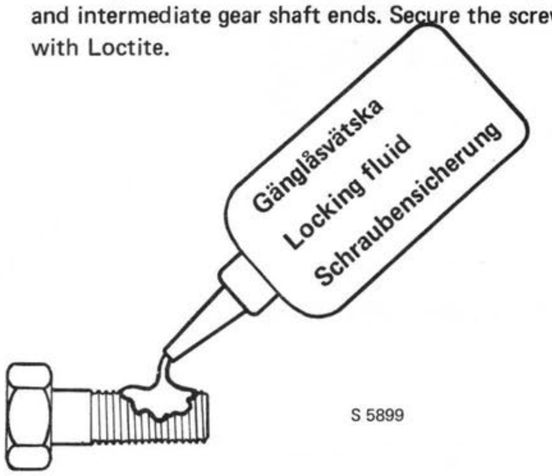
> NOTE
> Leave the screws slightly slack to avoid jamming the loose intermediate gear set in the wrong position before the intermediate gear shaft is inserted.

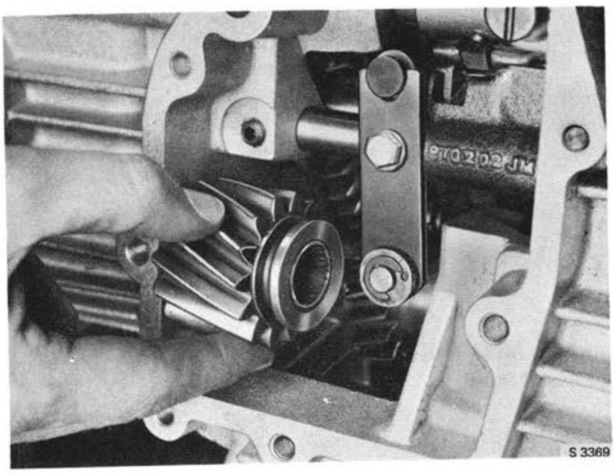
16. Ease the intermediate gear into its correct position either by turning the transmission housing or by lifting the intermediate gear. Fit the rear thrust washer and push in the intermediate gear shaft, using tool 8390049.



INSERTING THE INTERMEDIATE GEAR SHAFT
Tool 8390049

17. Tighten the primary gear housing screws.
18. Install the reverse gear and shaft, making sure that the reverse lever is fitted into the groove on the reverse gear. Fit the lock plate over the reverse gear and intermediate gear shaft ends. Secure the screw with Loctite.





INSTALLING THE REVERSE GEAR
Fixture 8790636, holder ring 8790651

19. Insert the spring and ball catch for the gear selector rod and fit the transmission housing cover together with its gasket.
20. Install the differential assembly (see section 473).
21. Inspect the shaft seals in the differential bearing seats and fit new ones if necessary. Adjust the crown wheel backlash if necessary (see section 473). Mount the two inner drive shafts complete with inner universal joints, taking care not to damage the shaft seals.
22. Fit the cover complete with gasket on to the transmission case.
23. Fill the transmission case with oil (5 Imp. pints, 3 liters).

PINION SHAFT, 4-SPEED GEARBOX

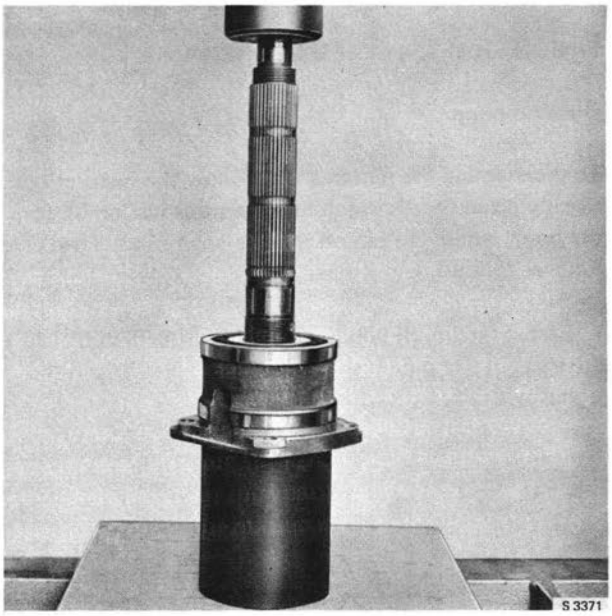
Disassembling

To disassemble the pinion shaft, follow the instructions already given for disassembling the transmission up to the point where the pinion shaft is unscrewed. Then continue as follows:

1. Fasten fixture 8790636 and holder ring 8790651 in a vice. Put the pinion shaft in the tool and loosen the nut with the aid of tool 8790453.

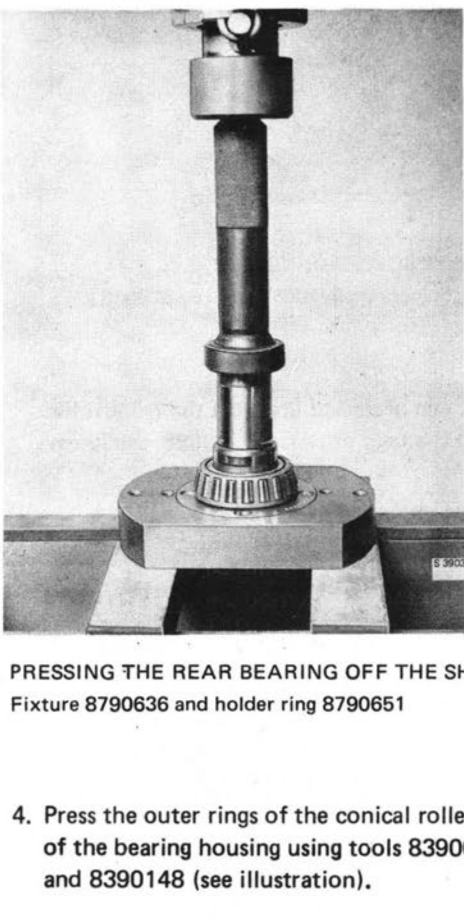
REMOVING THE PINION BEARING NUT
Fixture 8790636, holder ring 8790651 and key 8790453

2. Put the unit in a press and press off the front roller bearing with the help of sleeve 8390098, see illustration.



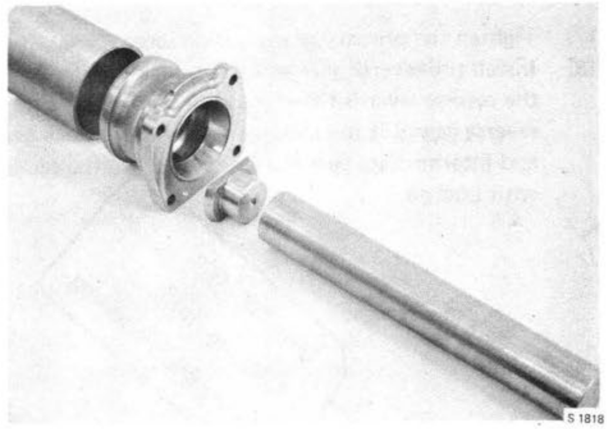
PRESSING THE SHAFT OUT OF THE BEARING HOUSING
Sleeve 8390098

3. Press off the rear roller bearing with the aid of tools 8790636 and 8790651.

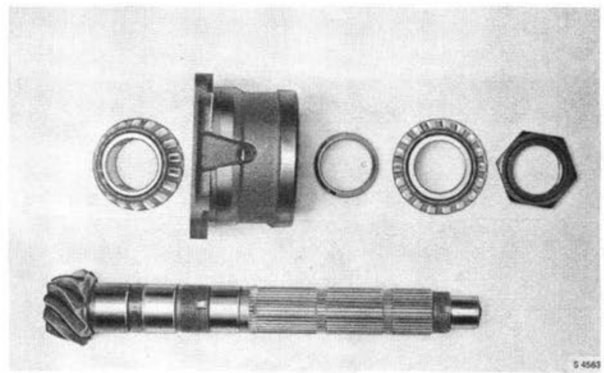


PRESSING THE REAR BEARING OFF THE SHAFT
Fixture 8790636 and holder ring 8790651

4. Press the outer rings of the conical roller bearings out of the bearing housing using tools 8390098, 8390106 and 8390148 (see illustration).



TOOLS 8390106, 8390148 AND 8390098



PINION SHAFT WITH BEARING, BEARING HOUSING AND SPACER SLEEVE

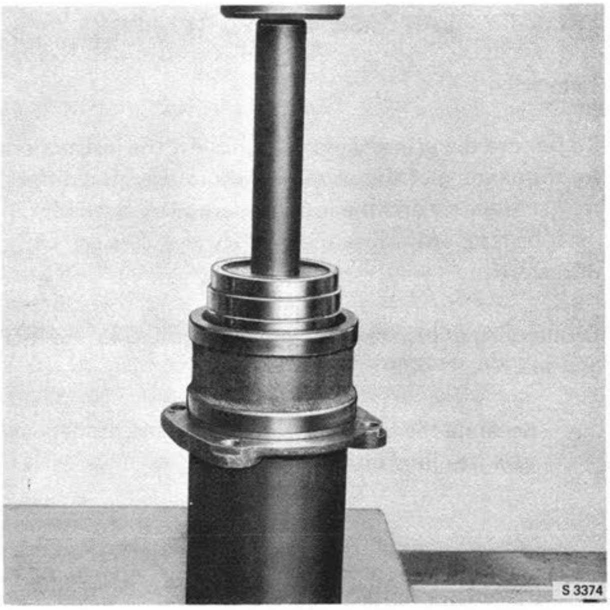
Installing the pinion shaft

Having removed the part that needs attention, inspect all disassembled parts and wash them in kerosene or similar. Then reassemble and install, proceeding as follows:

NOTE
The bearings must be oiled before being assembled.

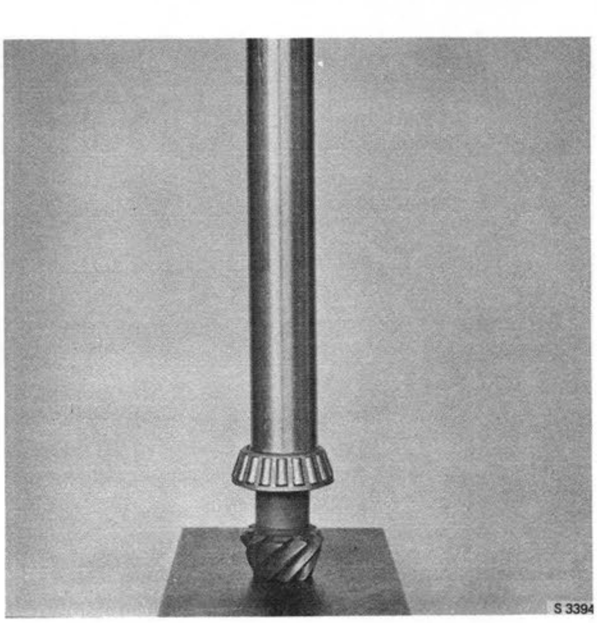
1. Press the outer races of the tapered roller bearings into the bearing housing, using tools 8390189 and 8790461.

SAAB



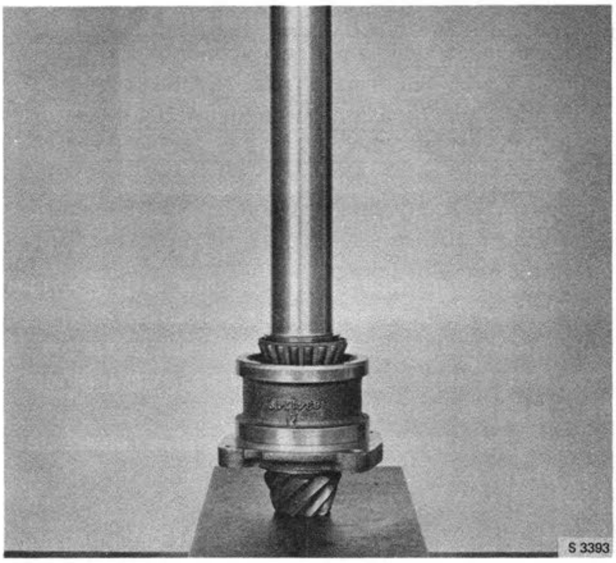
INSTALLING THE BEARING RACE IN BEARING HOUSING
Drift 8390189, sleeve 8790461

2. Fit the spacer washer and press on the roller bearing nearest the pinion gear until it butts against its stop, using tool 8390148 (see illustration).



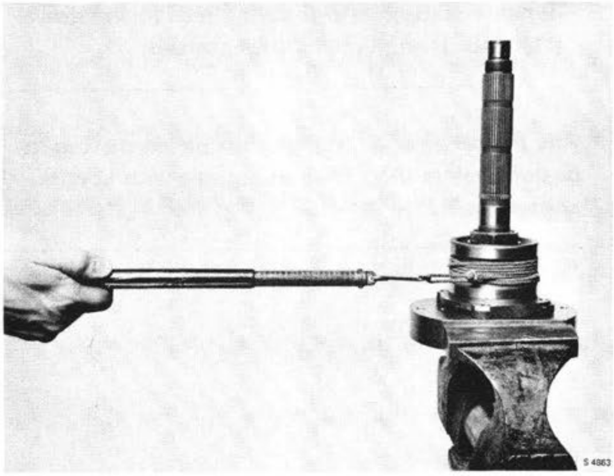
PRESSING ON THE ROLLER BEARING NEAREST THE PINION GEAR
Sleeve 8390148

3. Fit the spacer on the shaft.
4. Fit the bearing housing.
5. Fit the front roller bearing.



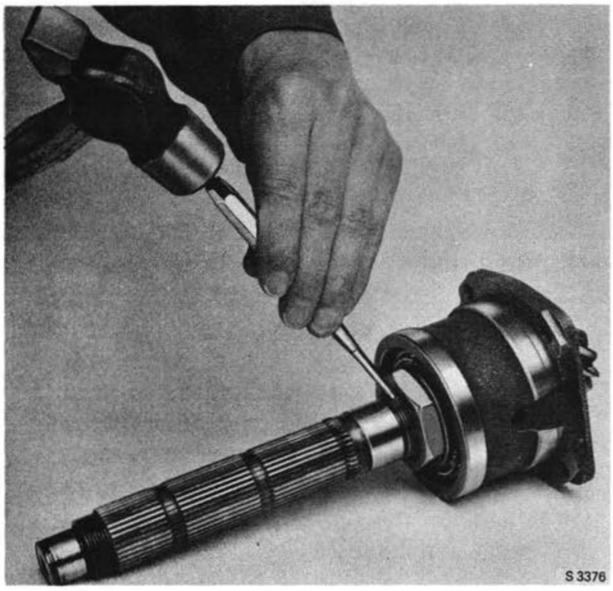
PRESSING IN THE FRONT ROLLER BEARING
Sleeve 8390148

6. Set up the shaft in a press (see illustration). Press the bearing housing slowly on, using tool 8390148, and twist it at the same time until resistance to twisting is felt.
7. Smear Loctite "stud lock" on the threads and put on the nut. Install fixture 8790636 with holder ring 8790651 in a vice. Place the bearing housing on the fixture. Pull the nut with key 8790453 until the correct torque is obtained.
   Measure the torque by pulling the bearing housing with the aid of a dynamometer. See fig. The bearings should be lightly oiled and tightened as follows:



CHECKING THE BEARING HOUSING TORQUE
Fixture 8790636, holder ring 8790651 and dynamometer

New bearings 47–71 N (10–15 lb., 4.7–7.0 kp) on the dynamometer which corresponds to a torque of 2.5 ± 0.5 Nm (2 ± 0.5 ft.lb., 25 ± 5 kpcm). Old bearings that have done more than 1,200 miles (2,000 km) 19–43 N (4.2–9.2 lb., 1.9–4.3 kp) dynamometer reading which corresponds to a torque of 1.3 ± 0.5 Nm (1 ± 0.5 ft.lb., 13 ± 5 kpcm). When the correct value is obtained, upset the flange of the nut with a drift.



LOCKING THE PINION BEARING NUT

8. Fit two locating pins, tool 8790438, in the gearbox housing. Then fit on the shims and mount the pinion shaft with bearing housing. Knock the bearing housing carefully into place using a plastic mallet or hammer together with drift 8390114 and sleeve 8390148. Then tighten the four screws.

> NOTE
> Any measuring or adjusting of the pinion shaft must be done before the screws are secured with Loctite. See section 473.

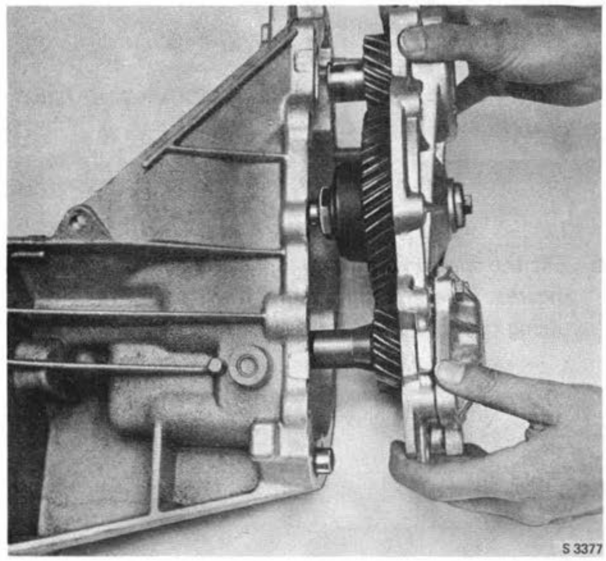
PRIMARY GEAR CASE, 4-SPEED GEARBOX

Removal

To remove the primary gear case, follow the instructions for dismantling of the gearbox. Accordingly, the differential assembly and the intermediate shaft assembly must be removed before the primary gear case can be dismantled.

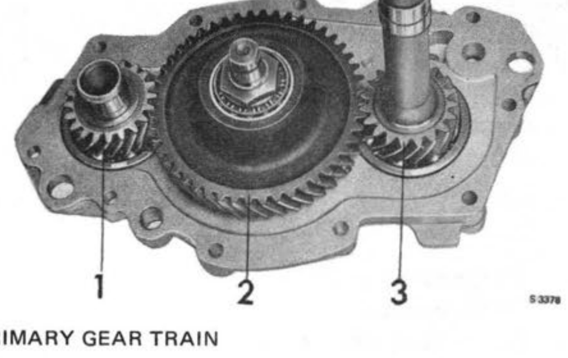
Dismantling of primary gear – gear train (up to and incl. gearbox No. 817000).

1. Separate the bearing housing from the primary gear case (see illustration).



OPENING THE PRIMARY GEAR HOUSING

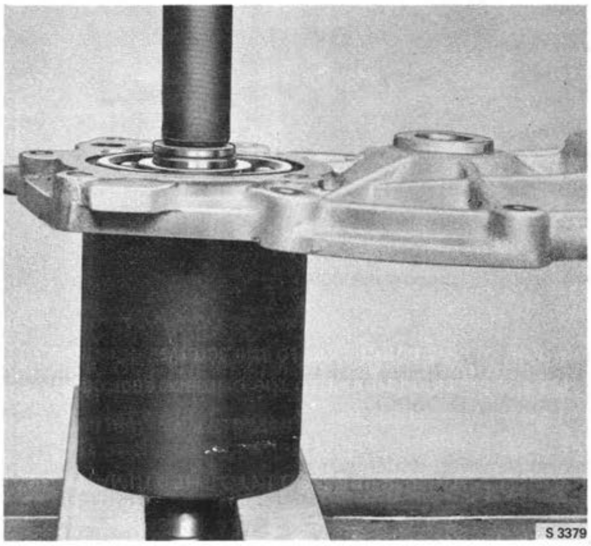
> NOTE
> Remember to undo the clutch adjustment nut.



PRIMARY GEAR TRAIN

1. Input gear
2. Center wheel
3. Output gear

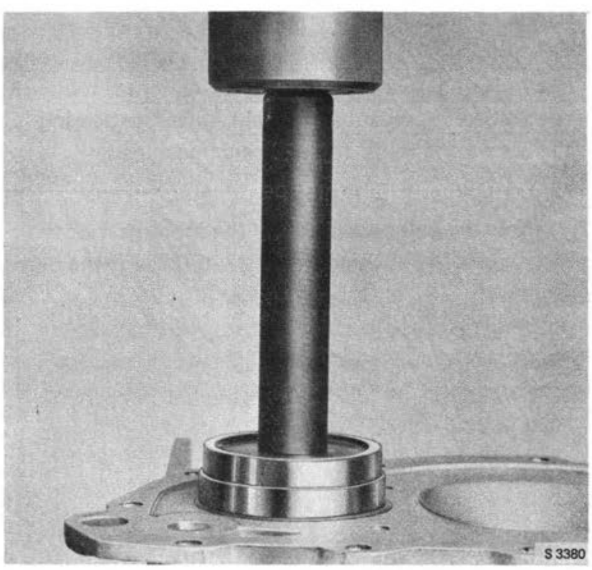
2. Remove the center wheel shaft from the bearing housing and back off the center shaft nut so that the center wheel can be taken off.
3. Press the outer races of the tapered roller bearings out of the center wheel with drift 8390189 and sleeve 8790478, using tool 8390098 as a support.



PRESSING OUT THE GEAR
Drift 8390189, support 8390098

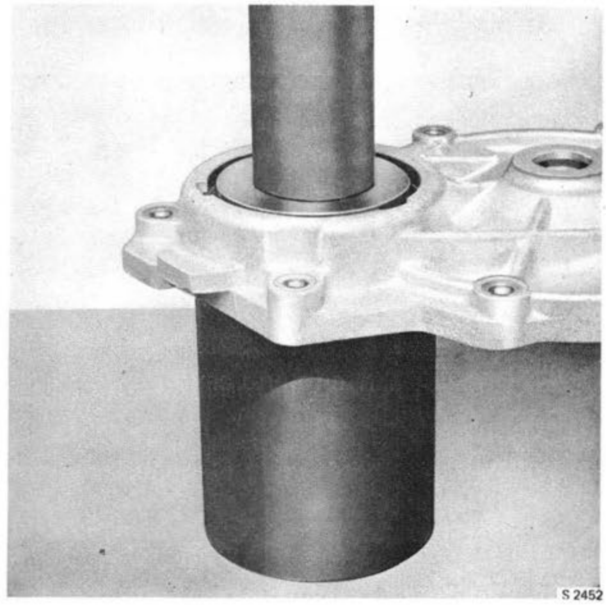
4. Remove the cap from the bearing housing, free the lock ring from the shaft and press the output gear out of the bearing, using tool 8390098 as a support and pressing with drift 8390189 (see illustration). Then press the bearing out of the bearing housing.

   Use tools 8390189 and 8790460 (see illustration).



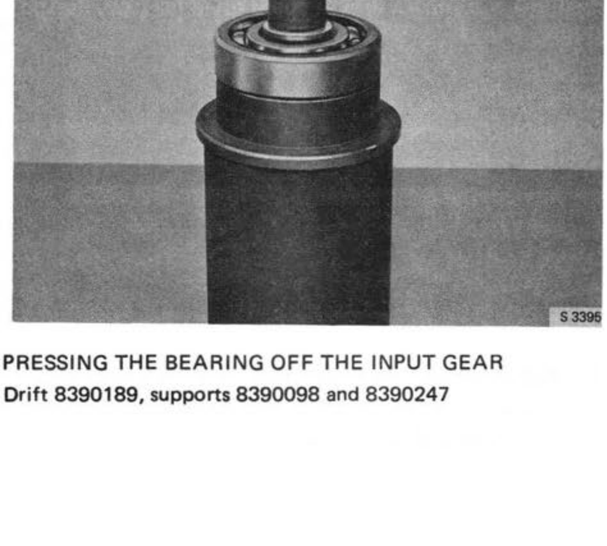
PRESSING OUT THE BEARING FROM THE BEARING HOUSING
Drift 8390189, sleeve 8790460

5. Press the input gear complete with ball bearing out of the bearing housing, using drift 8390122, sleeve 8390148 and support 8390098 (see illustration).



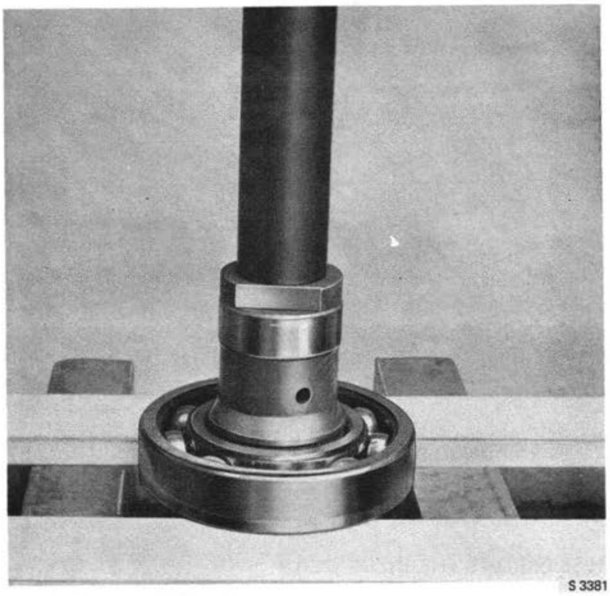
PRESSING OUT THE INPUT GEAR
Drift 8390122, sleeve 8390148, support 8390098

6. Undo the lock ring from the input gear and press the ball bearing off the gear, using supports 8390098 and 8390247 and drift 8390189 (see illustration).



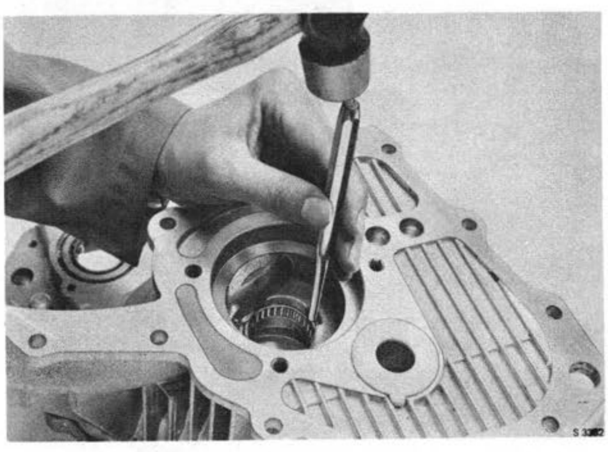
PRESSING THE BEARING OFF THE INPUT GEAR
Drift 8390189, supports 8390098 and 8390247

7. Remove the bearing support that retains the gearbox input gear (4th) with bearing.
8. Press the gearbox input gear (4th) out of the primary gear housing, using ring 8390213 and drift 8390189. Release the lock ring and press the bearing off the shaft, using ring 8390213 and drift 8390189.



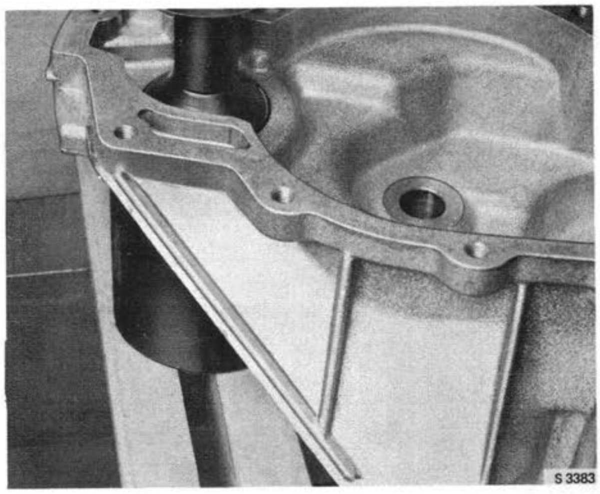
REMOVING THE BEARING FROM THE INPUT GEAR
Drift 8390189, ring 8390213

9. If necessary, remove the oil collector and needle bearing from the primary gear housing.
   The needle bearing has been discontinued with effect from 1976 model cars.



REMOVING THE NEEDLE BEARING

10. Press out the input gear roller bearing from the primary gear housing, using tool 8390320 and support 8390098 (see illustration).



REMOVING THE ROLLER BEARING
Drift 8390320, support 8390098

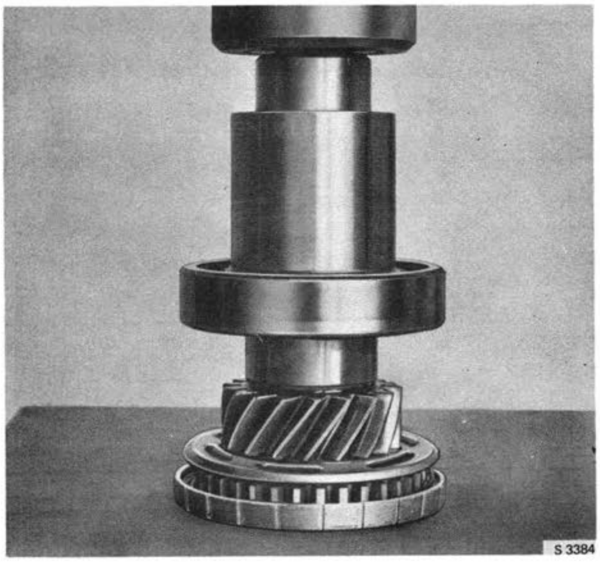
Assembly of primary gear – gear train (up to and incl. gearbox No. 817000).

Having removed whichever part needs attention, clean the mating flange surfaces of the cover to remove gasket fragments and traces of sealant compound. Inspect all disassembled parts and wash them in kerosene or similar. Then reassemble as follows:

1. Fit the needle bearing with tool 8790479 and drift 8390189, and the oil collector into the primary gear housing if they have been removed.
1. Fit the oil collector into the primary gear housing if removed.

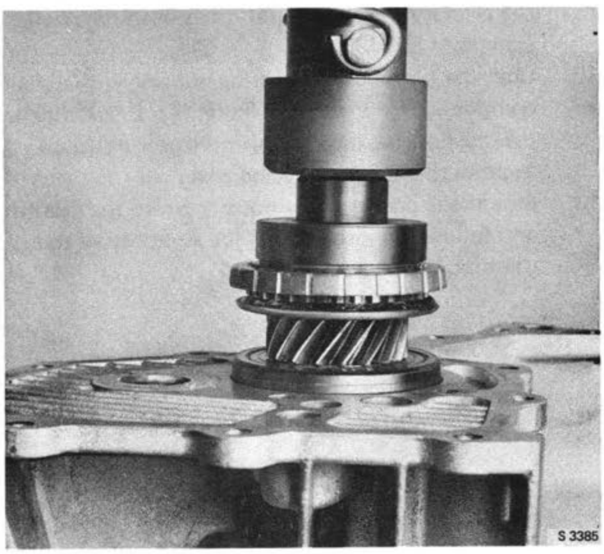
> NOTE
> The needle bearing in the primary gear housinq has been discontinued in cars as from model 1976.
> It is no longer necessary to install the bearing in conjunction with the overhaul of transmissions of earlier design.
> When the gears in the primary gear assembly in transmissions of earlier design are to be replaced, the needle bearing must be removed, since the bearing surface on the shaft has not been machined.

2. Press the ball bearing on to the input gear of the gearbox (4th), using sleeve 8790487. Fit the bear-



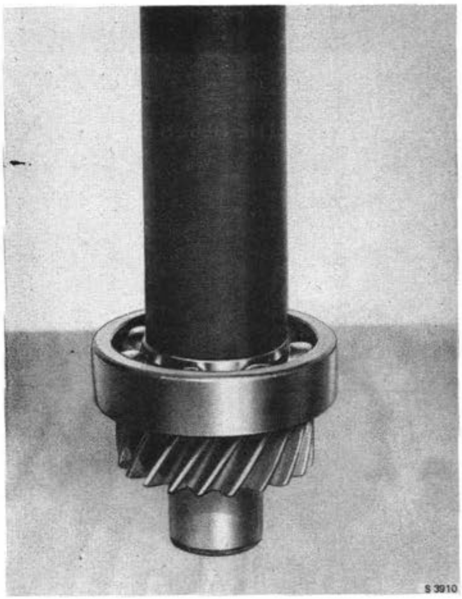
MOUNTING THE BEARING ON THE INPUT GEAR
Sleeve 8790487

ing lock ring and press the gearbox input gear (4th) complete with bearing into the primary gear housing, using tool 8390122.



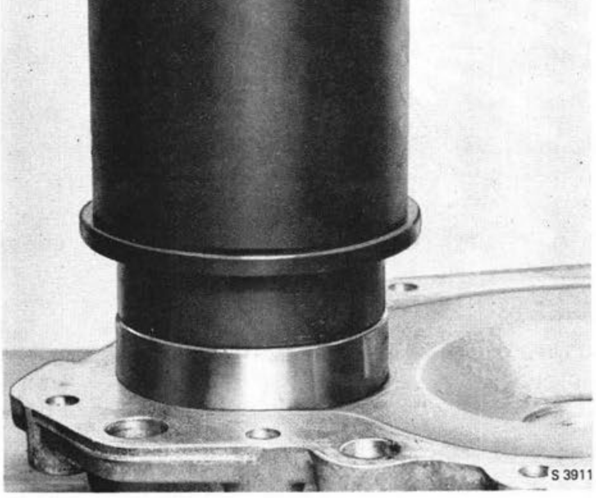
MOUNTING THE INPUT GEAR AND ITS BEARING INTO THE PRIMARY GEAR HOUSING
Sleeve 8390122

3. Mount the bearing support for the ball bearing of the gearbox input gear to the primary gear housing. Apply sealing compound to the screws.
4. Press the ball bearing on to the input gear of the primary gear unit, using sleeve 8390148, see illustration. Fit the lock ring.



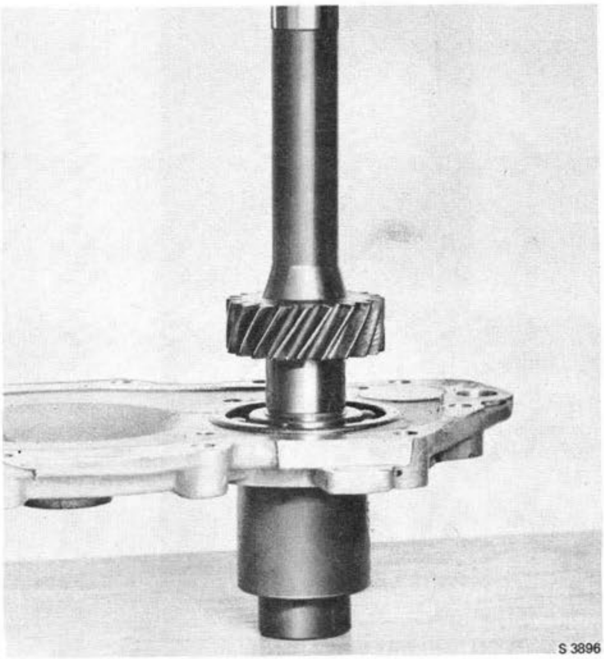
PRESSING ON THE BALL BEARING
Sleeve 8390148

5. Press the primary input gear complete with ball bearing into the bearing housing, using sleeve 8390098 and ring 8390247 and a suitable support between the sleeve and the press head. The bearing must be pressed in until it lies flush with the mating surface of the bearing housing.



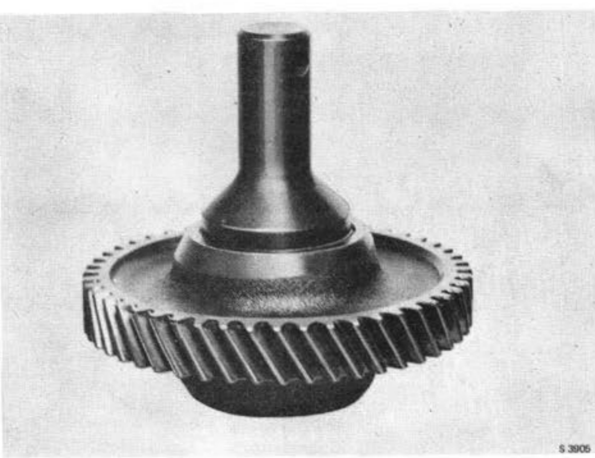
PRESSING IN THE GEAR AND BALL BEARING IN THE BEARING HOUSING
Sleeve 8390098 and ring 8390247

6. Press the output gear ball bearing into the bearing housing, using tools 8390148 and 8390114. Then press the output gear into the ball bearing, using sleeve 8790487 as support (see illustration). Then fit the washer and lock ring.



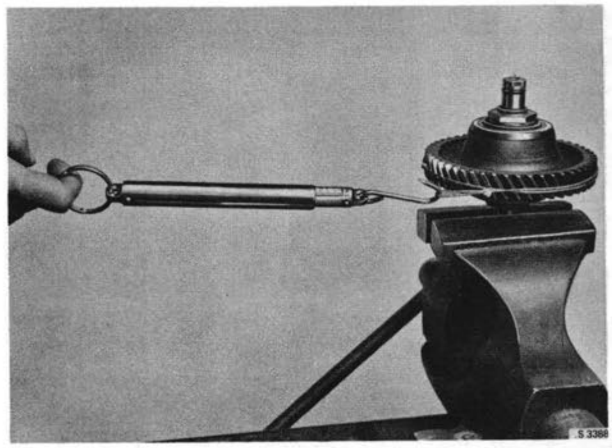
FITTING THE OUTPUT GEAR INTO THE BEARING HOUSING
Support, sleeve 8790487

7. Fit the outer roller bearing race in the center wheel, using tool 8390320.



FITTING THE BEARING RACE IN THE CENTER WHEEL
Drift 8390320

8. Fit the front roller bearing on to the center wheel shaft. Then fit the center wheel and the outer roller bearing.
9. Set up the center wheel complete with shaft and bearing in a vice. Wind the cord round the cog-wheel and pull the wheel round with a dynamometer (see illustration).



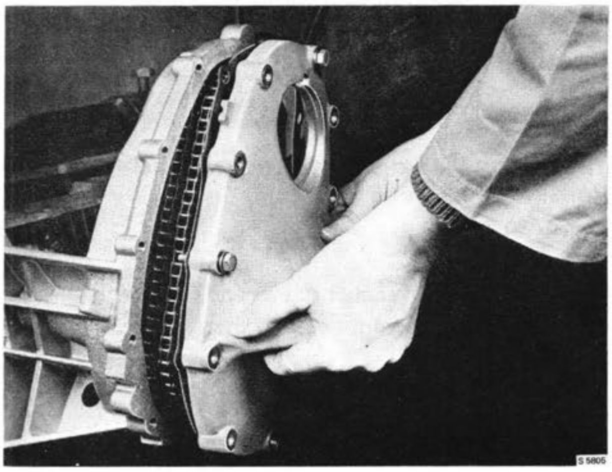
MEASURING THE TORQUE OF THE CENTER WHEEL
Dynamometer 8390130

Tighten and secure the nut with Loctite and upset the flange of the nut with a drift when the dynamometer reading is 6–8 N (1.3–1.8 lb., 0.6–0.8 kp) which corresponds to a torque of 0.4–0.5 Nm (3–4 in.lb., 4–5 kpm).

10. Fit the center wheel into the bearing housing and tighten the screw and secure it with Loctite.
11. Press in the primary input gear roller bearing into the primary gear housing if it has been removed, using tool 8390320.
12. Coat the flange of the bearing housing with a sealing compound, for example Tikatät No. 2, and fit the bearing housing into the primary gear housing. Tighten the bearing housing cover.
13. Mount the primary gear housing on to the gearbox and follow the instructions for assembly of the gearbox.

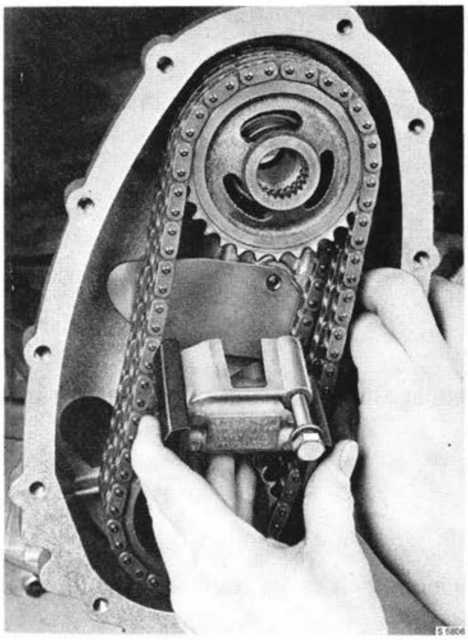
Dismantling of primary gear — chain-drive (as from gearbox Nos. 900001 and S 00001).

1. Undo the retaining bolts and remove the primary gear housing cover.



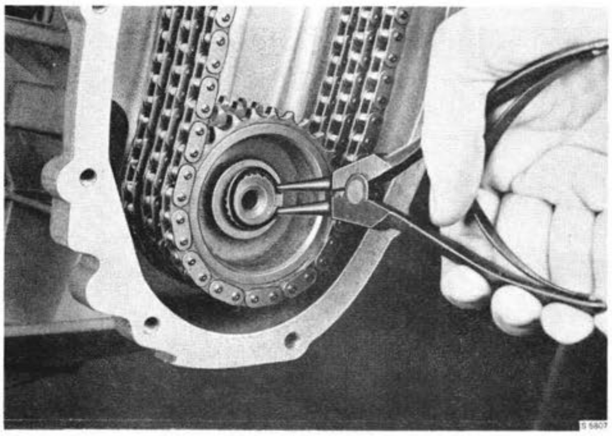
REMOVING THE COVER

2. Remove the chain tensioner.

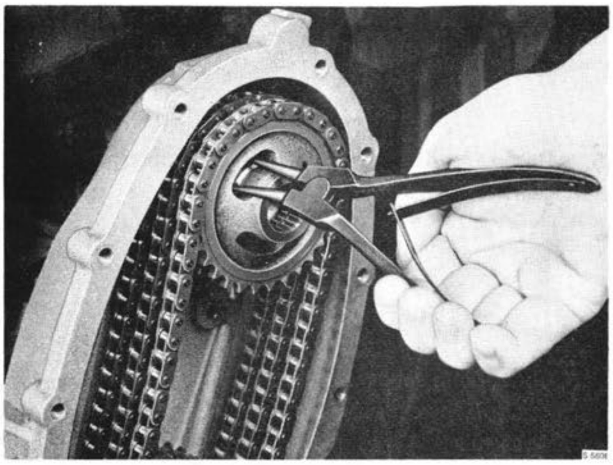


REMOVING THE CHAIN TENSIONER

3. Remove the circlip from the lower sprocket wheel and remove the circlip on the upper sprocket gear through the opening in the sprocket.

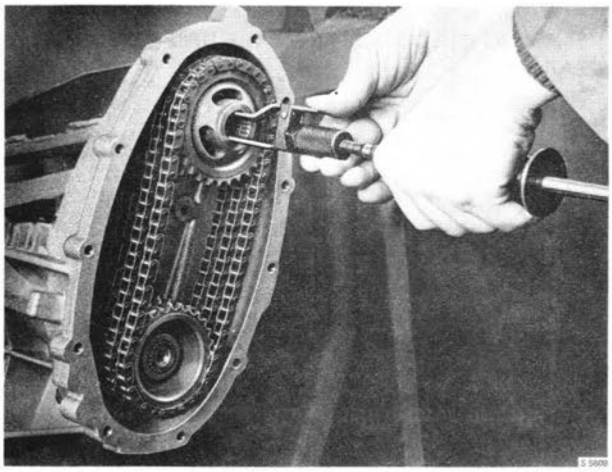


REMOVING THE LOWER CIRCLIP

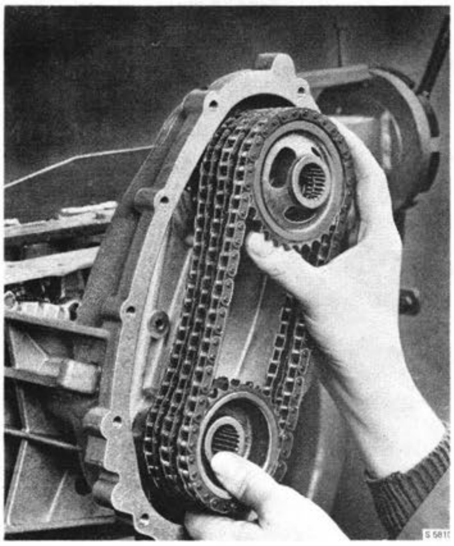


REMOVING THE UPPER CIRCLIP

4. Remove the 2 sprockets and the chains simultaneously. It may be necessary to use tapping-out hammer 83 90 270 and tool 87 90 834 to remove the sprocket



REMOVING THE SPROCKET WHEEL
Tool 83 90 270 and 87 90 834

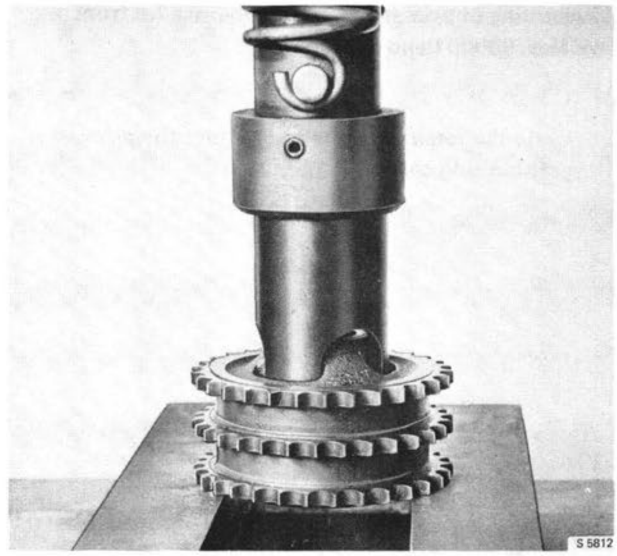


REMOVING SPROCKETS AND CHAINS

5. Remove the bearing circlip on the upper primary gear.

REMOVING THE CIRCLIP FROM THE UPPER PRIMARY GEAR

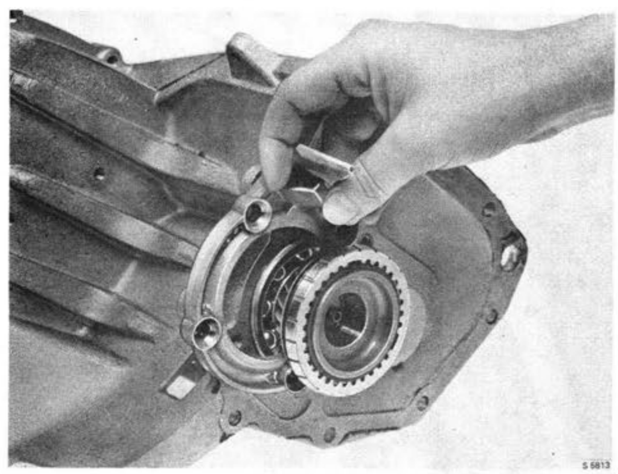
6. Press the bearing out of the upper primary gear using sleeve 87 90 842.



THE BEARING IS PRESSED OUT OF THE PRIMARY GEAR HOUSING

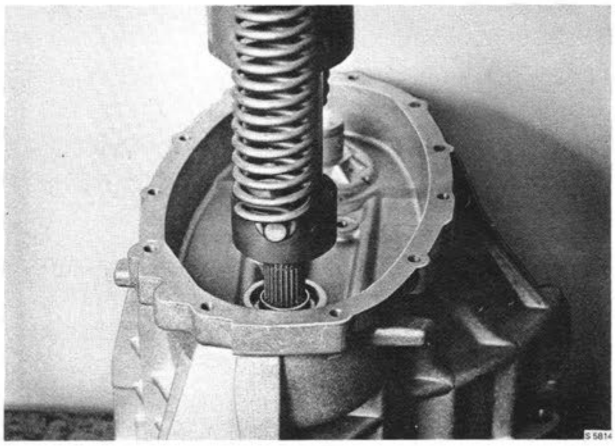
Tool 87 90 842

7. Remove the 4 socket screws and remove the bearing retainer at the input gear to the gearbox.



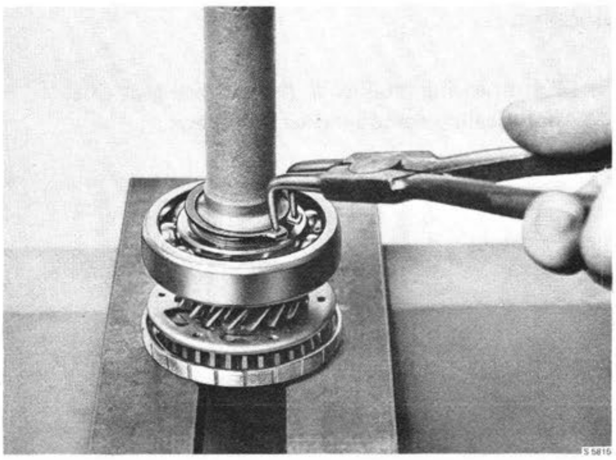
REMOVING THE BEARING RETAINER AT THE INPUT GEAR

8. Press the input shaft to the gearbox out of the primary gear case.

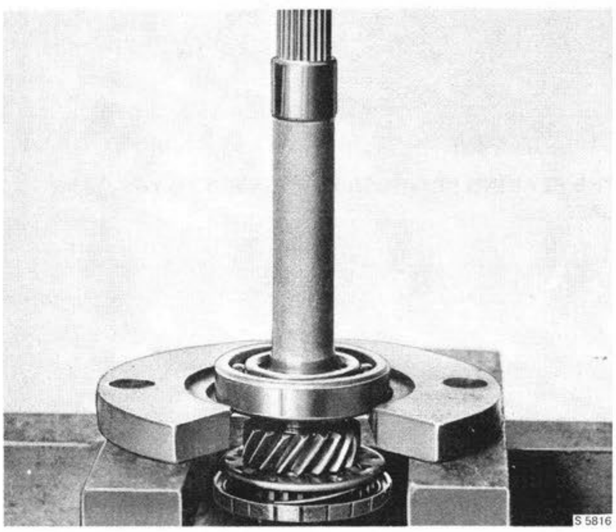


THE INPUT SHAFT IS PRESSED OUT OF THE PRIMARY GEAR CASE

9. Remove the circlip and press the ball bearing off the input shaft.

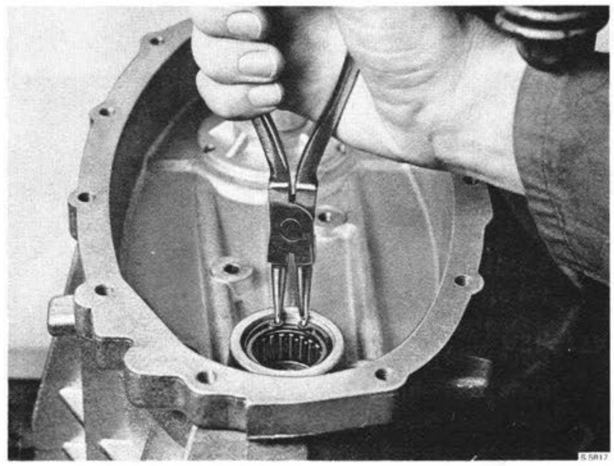


THE CIRCLIP IS REMOVED



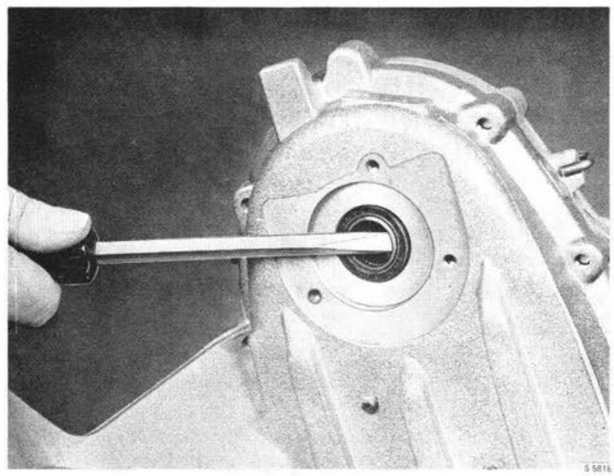
THE BALL BEARING IS PRESSED OFF THE INPUT SHAFT

10. Remove the needle bearing circlip and use a drift to knock the needle bearing out of the primary gear case.



THE NEEDLE BEARING LOCK RING IS REMOVED

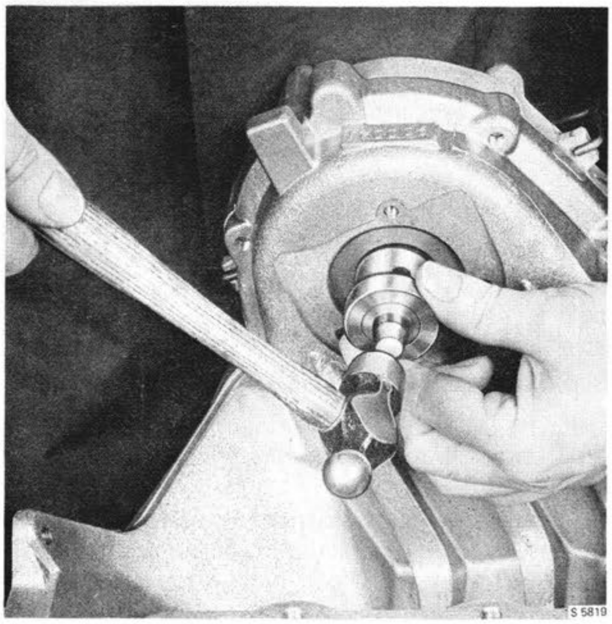
11. Remove the clutch shaft seal by means of a screw-driver.



THE CLUTCH SHAFT SEAL IS REMOVED

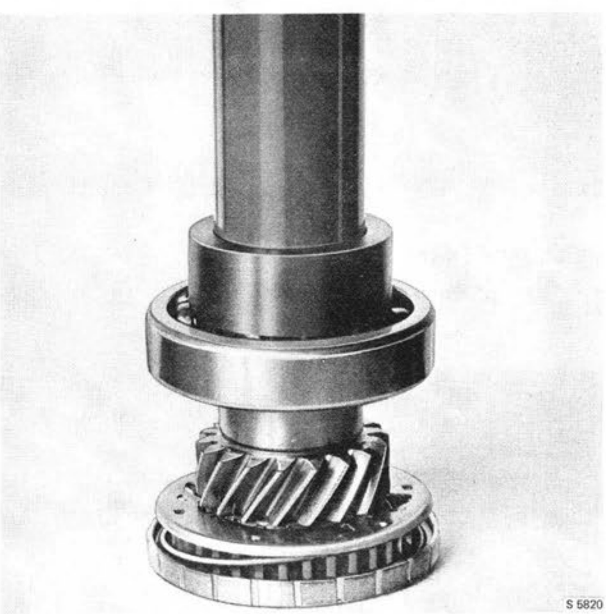
Assembly of primary gear — chain-drive (as from gearbox Nos. 900001 and S 00001)

1. Install a new clutch shaft seal using drift 83 91 997.



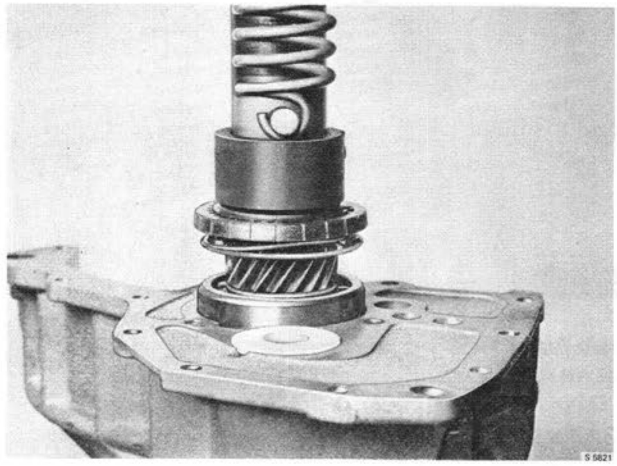
INSTALLATION OF CLUTCH SHAFT SEAL
Tool 83 91 997

2. Using drift 83 91 997, install the needle bearing with circlip in the primary gear case, with the mark on the needle bearing facing outwards.
3. Press the ball bearing onto the input shaft to the gearbox and fit the circlip. Use sleeve 83 90 148 and ring 87 90 867



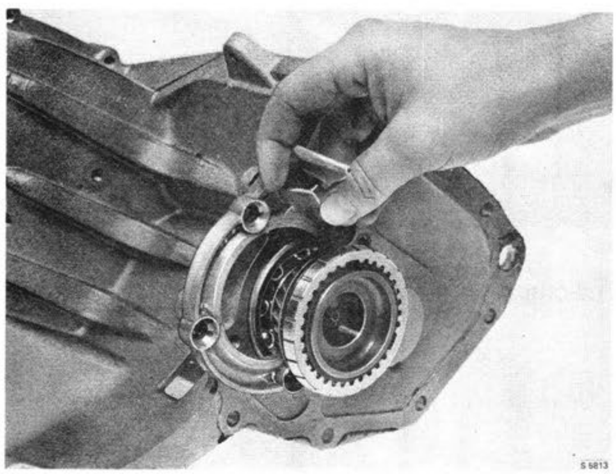
THE BALL BEARING IS PRESSED ONTO THE INPUT SHAFT
Tools 83 90 148 and 87 90 867

4. Press the input shaft with bearing into the primary gear case.



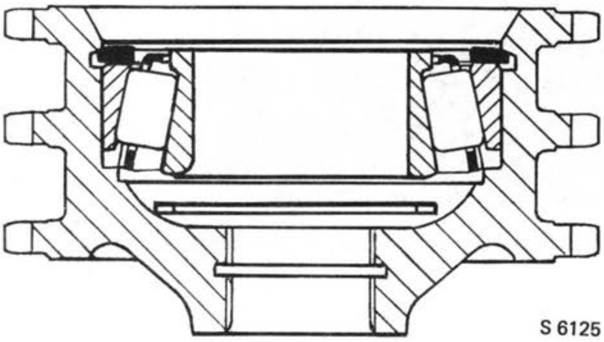
THE INPUT SHAFT IS PRESSED INTO THE PRIMARY GEAR HOUSING

5. Fit the bearing retainer to the primary gear case. Apply sealing compound to the screws.



THE BEARING RETAINER IS MOUNTED TO THE GEAR CASE

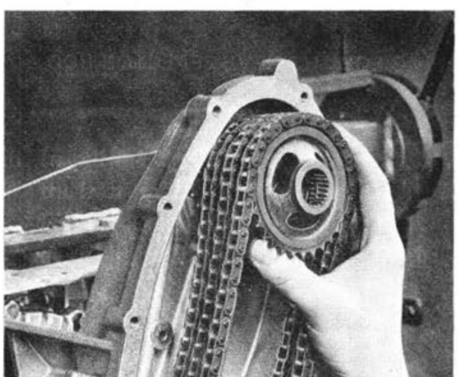
6. Install the circlip in the upper sprocket and press in the bearing (see illustration). Use sleeve 87 90 859. Fit the circlip for the outer bearing ring in the sprocket, with the chamfer facing outwards.



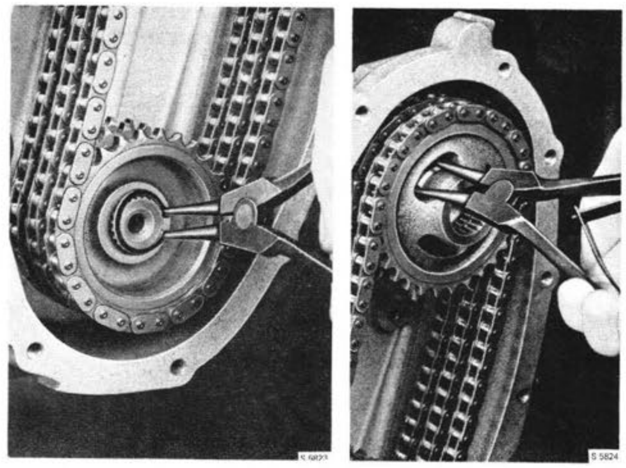
S 6125

INSTALLING THE CIRCLIP FOR THE BEARING OUTER RING

7. Mount the chains on the sprockets and mount the latter onto the splines and stud, respectively, in the primary gear case. Fit the two circlips.

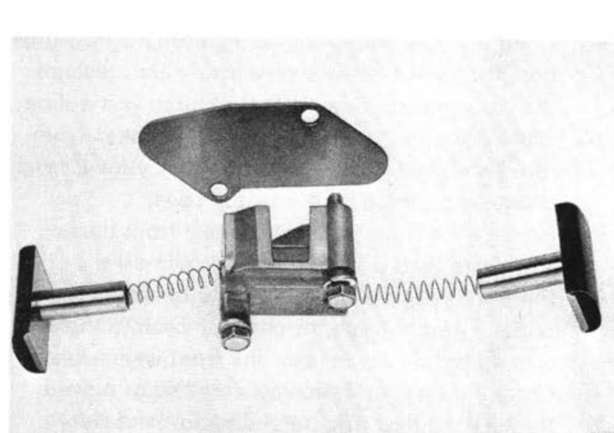


MOUNTING THE SPROCKETS AND CHAINS



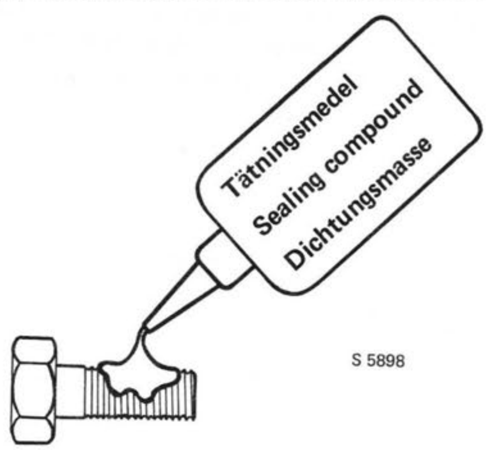
MOUNTING THE CIRCLIPS

8. Install the chain tensioner. Install the chain tensioner housing with the oil passage at the top and place the backing plate so that its top edge is in line with the top edge of the chain tensioner housing.



CHAIN TENSIONER

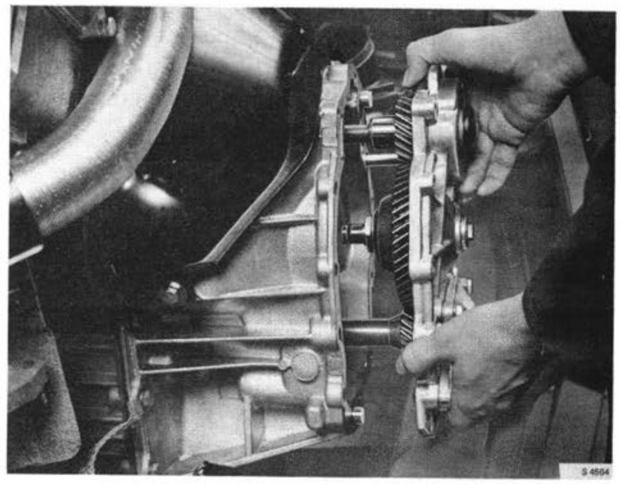
Apply thread sealant to the chain tensioner bolts.



S 5898

9. Fit the gasket and the primary gear case cover.

> NOTE
> Before mounting the clutch slave cylinder, apply thread sealant to the bolts.



SEPARATING THE PRIMARY GEAR HOUSING IN CAR

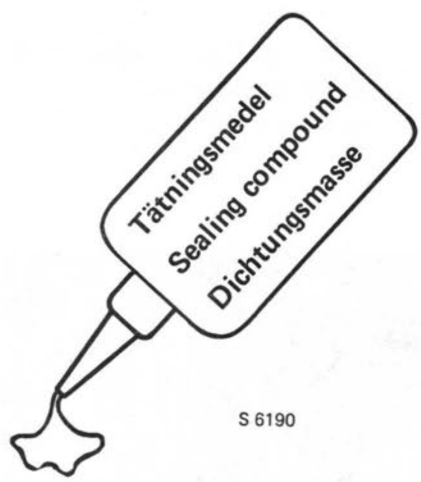
REMOVAL OF PRIMARY GEAR WITH POWER PLANT INSTALLED IN THE CAR

Removal

1. Remove the hood, battery and front sheet (see section 201).
2. Unbolt the exhaust pipe from the exhaust manifold and disconnect the intake hose from the carburetor (rubber bellows from throttle housing, on cars with injection engines).
3. Remove the alternator.
4. Undo the nuts on the engine mountings and engage the lifting yoke in the engine lifting lugs. Balance the yoke in such a way that the clutch end will be lifted first and that the weight will be taken from the rear end immediately, before the cylinder head comes into contact with the bulkhead.
5. Remove the front engine mounting from the engine beam (and transmission for chain-drive).
6. Raise the power plant sufficiently to enable the primary gear housing,the cover on chain transmission, to be withdrawn over the front engine beam. Check that no parts become stretched or nipped.
7. Remove the lock ring (retaining clip) and clutch shaft sealing cover. (O-ring) at the clutch shaft.
8. Unscrew the plastic propeller and remove the O-ring at the clutch shaft end.
9. Withdraw the clutch shaft using tool 8390270 and joint 8790529.
10. Remove the primary gear case retaining bolts and bearing housing (cover) and separate the bearing housing (cover) from the primary gear case.

Assembly

1. Check the mating surfaces of the primary gear housing/cover and bearing housing for damage and ensure that they are clean. Coat the sealing surfaces with a sealing compound.



2. Mount and bolt the bearing housing cover to the primary gear housing.
3. Mount the front engine mounting to the transmission (gear-train) and its rubber cushions to the engine beam.
4. Lower the power plant and bolt it to the engine mountings.
5. Install the clutch shaft and plastic propeller.
6. Fit the cover, O-ring with lock ring, (lock clip) to the clutch shaft.
7. Mount the alternator, exhaust pipe and intake hose (rubber bellows on cars with injection engines).
8. Mount the front sheet, hood, and battery, and fill the radiator with coolant.

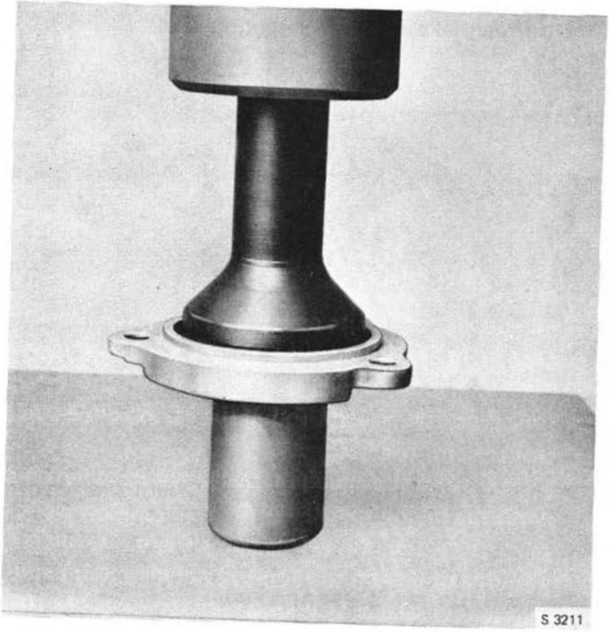
CHANGING THE CLUTCH SHAFT SEALING RING

Remove the clutch, clutch plate, release bearing and slave cylinder (guide sleeve) as described on page 411–2.

Model 1975

Removal
Pry the sealing ring from the guide sleeve using a screwdriver, for example.

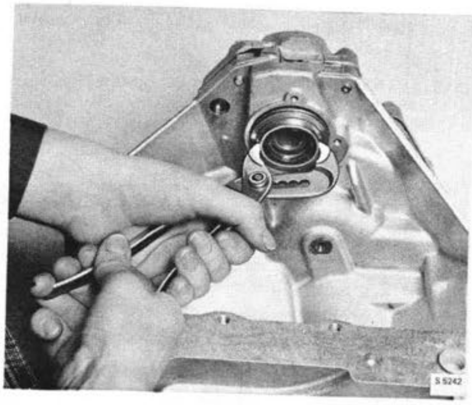
Installation
Press the sealing ring into the guide sleeve using tool 83 90 320.



INSTALLING THE SEALING RING IN THE GUIDE SLEEVE
Model 1975, drift 83 90 320

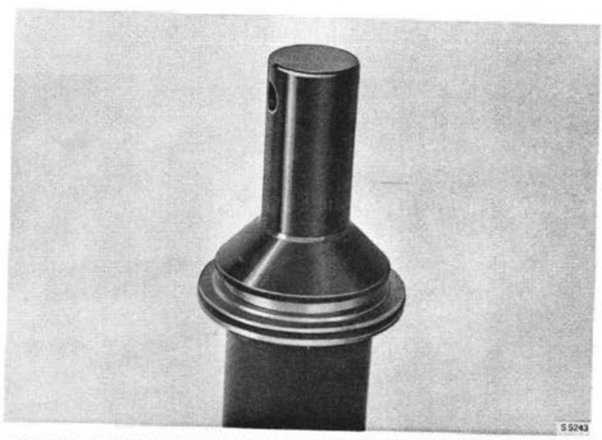
Models 1976–1977 (and model 1978 with gear-train primary gear)

Removal
Remove the washer and sealing ring from the primary gear casing by means of polygrip pliers. Then separate the sealing ring and O-ring from the washer.



REMOVING THE SEALING RING, MODEL 1976–1977

Installation
Press the sealing ring into the washer by means of tool 83 90 320. Use a piece of tubing which fits into the groove for the primary gear case bearing as a support.



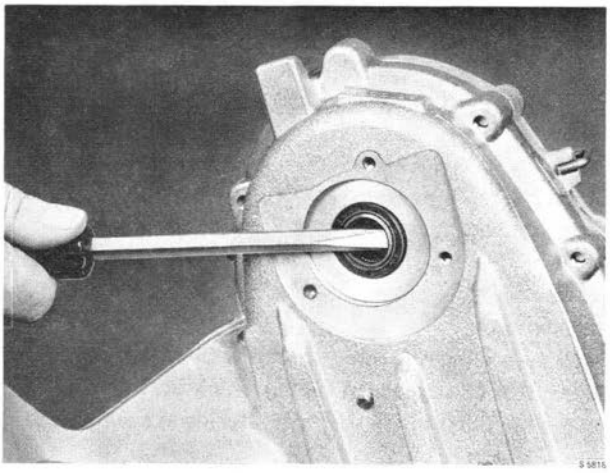
INSTALLING THE SEAL RING IN THE SEALING WASHER
Model 1976–1977, drift 83 90 320

Fit the O-ring in the groove in the outside of the sealing washer. Grease the lip of the sealing ring and fit the sealing washer.

As from model 1978 (transmission with chain drive primary gear).

Removal

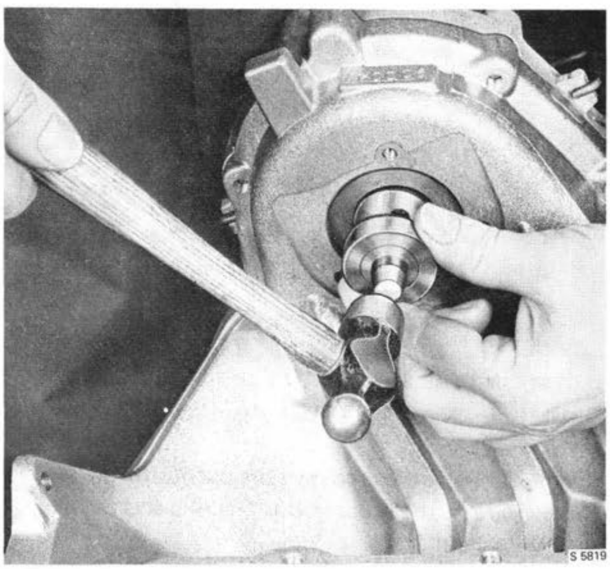
Remove the clutch shaft seal by means of a screw-driver.



THE CLUTCH SHAFT SEAL IS REMOVED

Assembly

1. Install a new clutch shaft seal using drift 83 91 997.



INSTALLATION OF CLUTCH SHAFT SEAL
Tool 83 91 997

All models

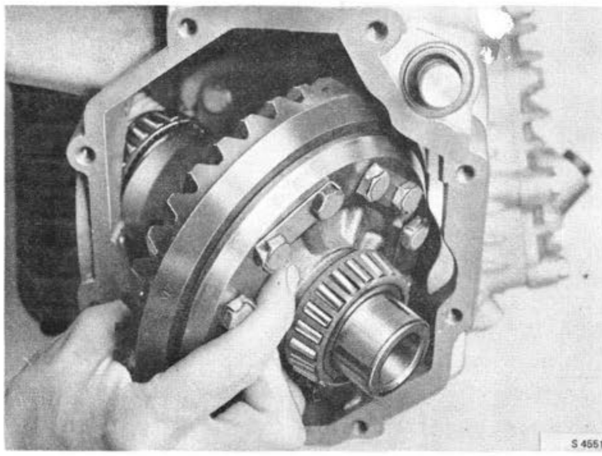
Refit the clutch, clutch disc, release bearing and guide sleeve according to description on page 411–3.

GEAR SHIFT MECHANISM

The gear shift mechanism consists of gear shift forks, shafts and a selector rod with a spring-loaded ball catch.

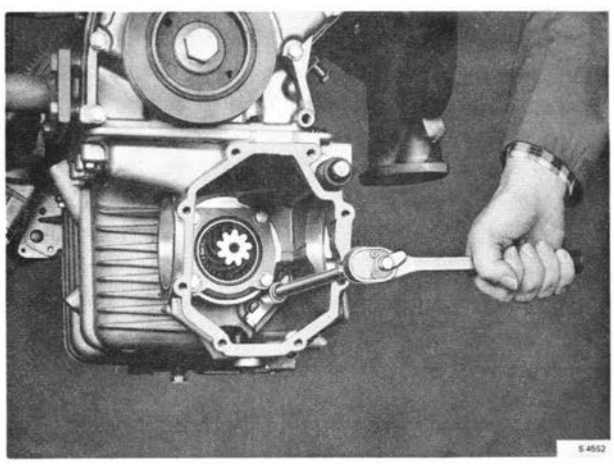
Disassembling

1. Clean off the transmission case and drain the oil.
2. Remove the differential bearing seat retaining screws and remove the seat and inner driver using tool 8390270 and extractor 8790776. Save the spring and plunger at the shaft end of the driver and the shims, which will be replaced on the condition that the differential gear backlash has not been altered by the exchange of some components.
3. Remove the differential assembly. For dismantling of the differential assembly see section 473.

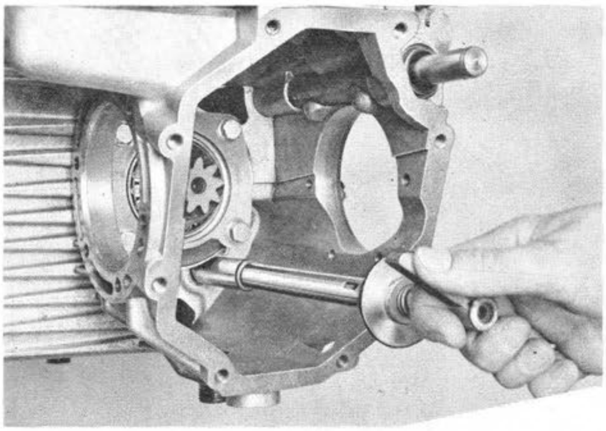


DISASSEMBLING THE DIFFERENTIAL

4. Remove the lock plate that holds the intermediate and reverse gear shafts and pull out the intermediate gear shaft, using tool 8390049, so that the intermediate gear drops out.

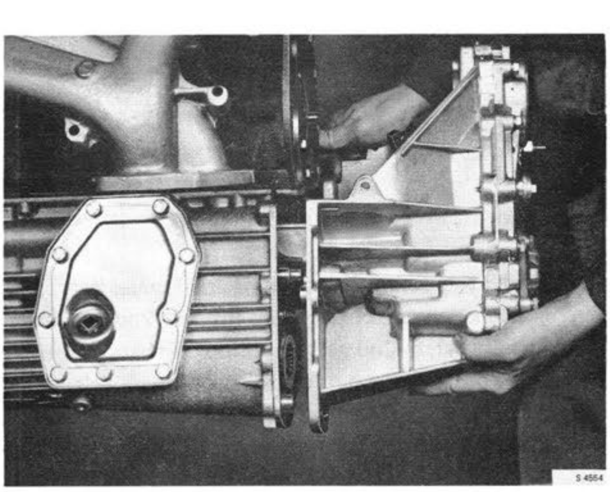


REMOVING THE LOCK PLATE



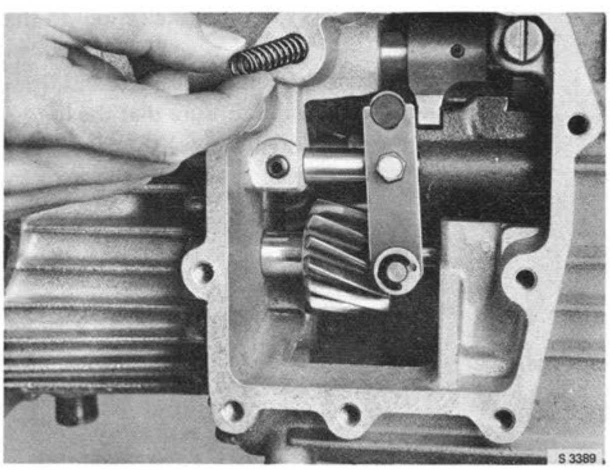
REMOVING THE INTERMEDIATE GEAR SHAFT
Tool 8390049

5. Separate the primary gear housing from the transmission case and lift it off. Remove the intermediate gear.



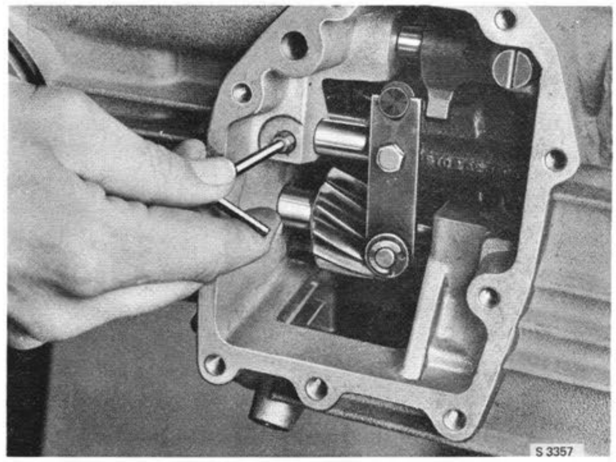
SEPARATING THE PRIMARY GEAR HOUSING FROM THE TRANSMISSION CASE

6. Unscrew the transmission side cover, take out the spring and ball catch for the gear selector rod, and put them in a safe place.

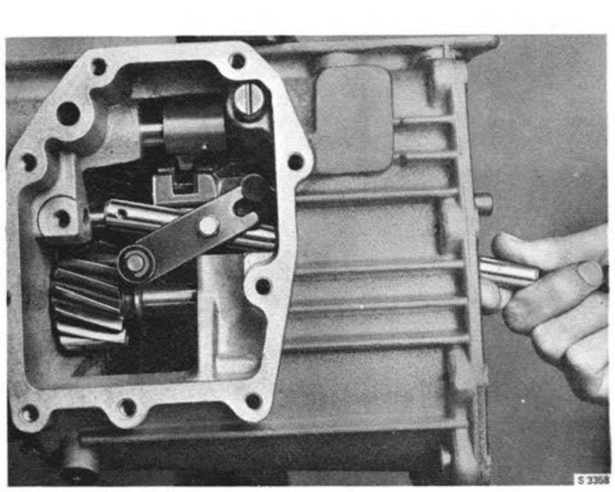


REMOVING THE GEAR SELECTOR ROD SPRING

7. Undo the reverse gear shift shaft retaining screw. Turn the gear selector rod to free the driver from the reverse gear shift and pull out the shaft.



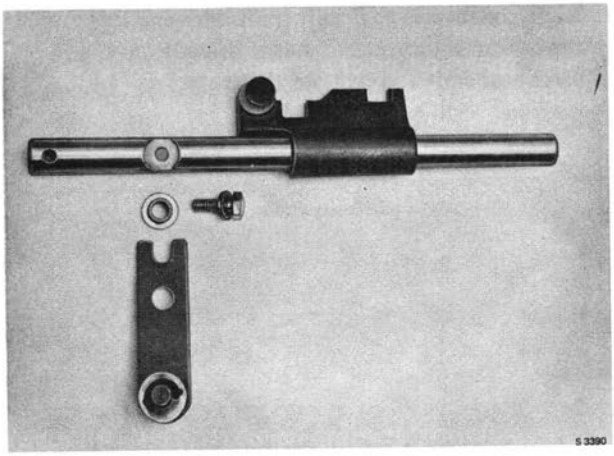
REMOVING THE REVERSE GEAR SHIFT SHAFT RETAINING SCREW



REMOVING THE REVERSE GEAR SHIFT SHAFT

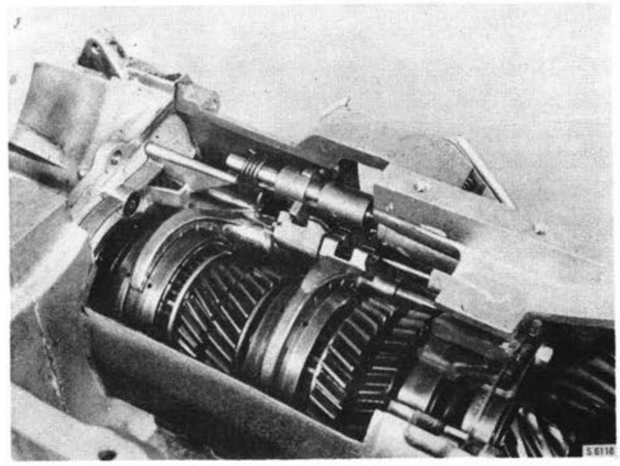
Remove the shift shaft for the 1st–2nd gear and 3rd–top gear shift forks together with the shift fork for 3rd–top gear.

NOTE
The reverse lever need not be undone from the gear shift shaft when the shaft is removed, but can be removed afterwards by undoing the screw which holds the reverse lever to the shaft.



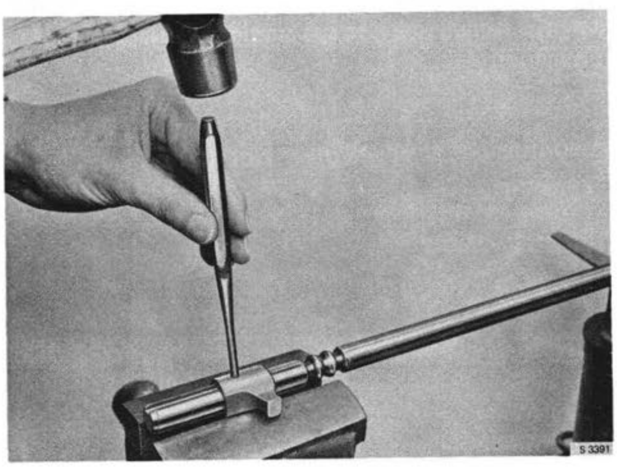
GEAR SHIFT MECHANISM FOR REVERSE GEAR

8. Remove the locating stud for the pawl shaft and remove the latter by withdrawing it from the gear selector rod. The gear selector rod can be removed from the transmission case without the driver being taken away. The cotter pin in the driver can then be removed by using a drift or similar tool.



REVERSE-BRAKE DEVICE

9. If the gear shift fork for 1st–2nd gear has to be removed, the pinion shaft must be removed (see section on disassembling the transmission).

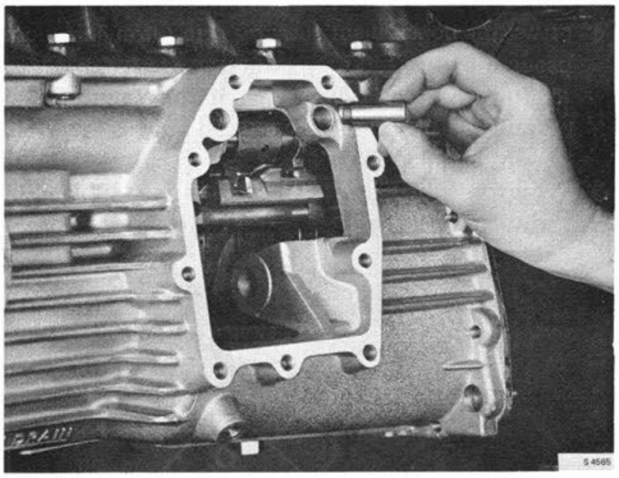


REMOVING THE COTTER PIN FROM THE DRIVER

As from gearbox No. 900001 (and S 00001) in model 1978 with chain-drive primary gear, the reverse-brake spring is also fixed to the gear selector rod.

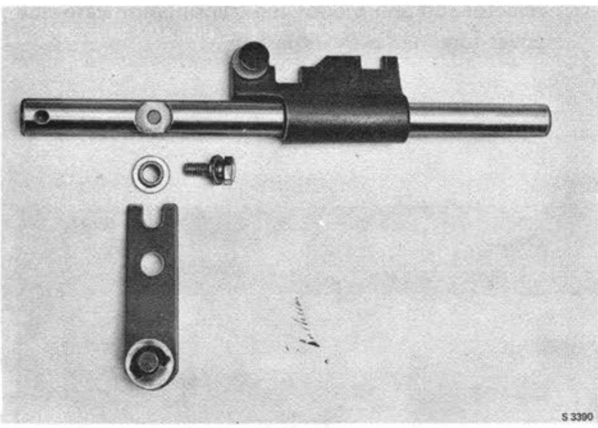
Assembling

1. Install the pinion shaft, shims and reverse gear, 1st gear and synchronizing hub. Fit 1st–2nd gear shift fork into 1st–2nd gear coupling muff and mount these on to the synchronizing hub. Install sleeve and 2nd gear, spacer and sleeve and 3rd gear and 3rd–4th gear synchronizing hub. (As from gearbox No. 500.001 the synchronization hub locking holes are turned against the nut.) Put 3rd–top gear shift fork into 3rd–top gear coupling muff and mount these on to the synchronizing hub. Smear Loctite on the threads and tighten the pinion shaft nut to a torque of 40–60 Nm (30–45 lb., 4–6 kpm) and secure it. Install the needle bearing and lock ring on to the pinion shaft.
2. Fit the driver (pawl and reverse-brake spring) to the gear selector rod.
   Insert the gear selector rod in the gearbox and fit the (pawl and) locating stud. Ensure that the locating stud is the right way up, since the gear selector rod will otherwise be jammed when the cover is fitted.

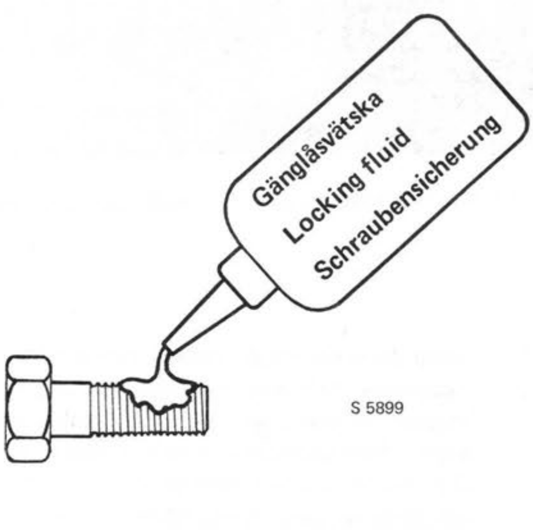


FITTING THE LOCATING STUD

3. Slide the coupling muffs on the pinion shaft to their neutral position and fit the gear shift shaft for 1st–2nd gear and 3rd–top gear shift forks.
4. Fit the bearing sleeve and reverse lever to the reverse gear shift shaft and tighten the screw.
   med låsvätska. Montera backens växelförare till

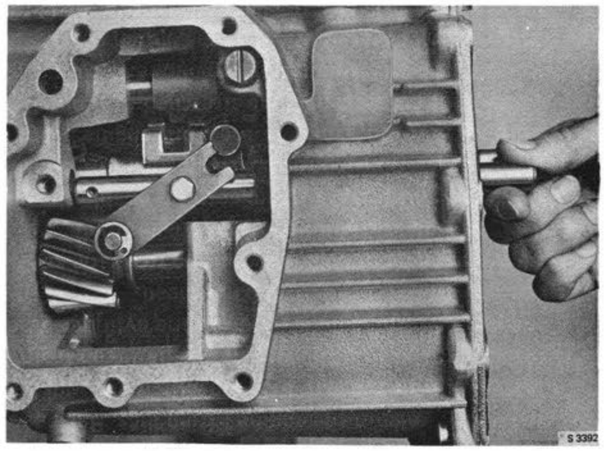


GEAR SHIFT MECHANISM FOR REVERSE GEAR



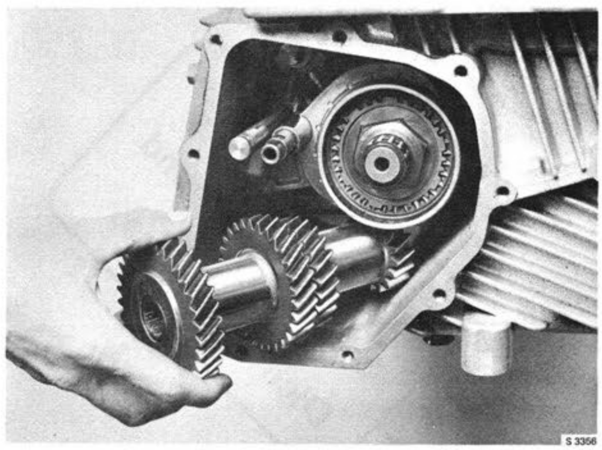
S 5899

Fit the reverse gear shift to the shaft. Turn the selector rod clockwise so that there is room to mount the reverse gear shift shaft. Mount the latter. Make sure that the reverse lever engages the groove on the reverse gear.
Tighten the shaft with the stop screw. Seal the screw with Loctite.



INSTALLING THE REVERSE GEAR SHIFT SHAFT

5. Fit the needle bearing into the intermediate gear with the help of grease so that it will be held in place until the intermediate gear shaft is installed. Then place the intermediate gear set in the bottom of the transmission case.

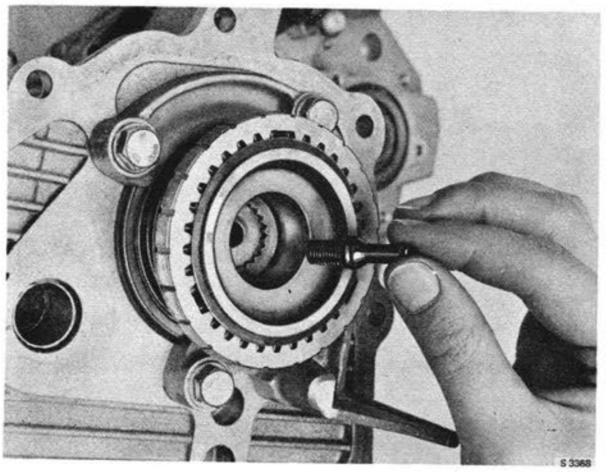


INSTALLING THE INTERMEDIATE GEAR SET

6. Make sure that the thrust washer for the intermediate gear is in the correct place in the primary gear housing. The washer can be glued in place to facilitate the installing of the intermediate gear. Check also that the connecting tube is fitted into the output shaft of the primary gear.

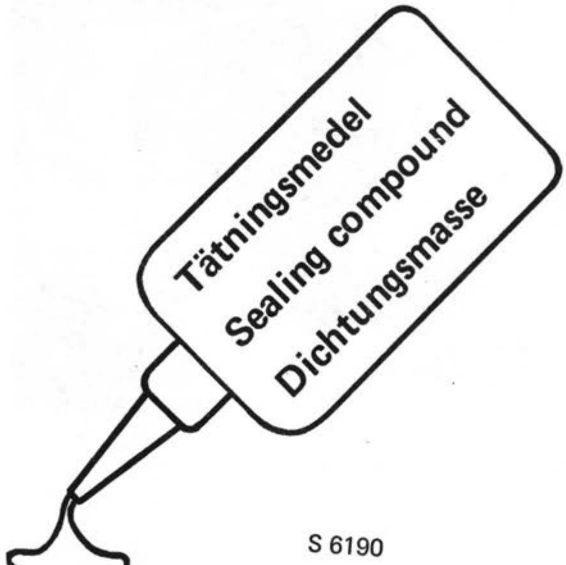
CAUTION

Intermediate shafts of later design (as from gearbox No. 75818) are not provided with lubricating holes, lubrication being effected by means of the washers. When installing intermediate shafts not provided with lubricating holes, always use thrust washers with oil grooves.



INSTALLING THE CONNECTING TUBE

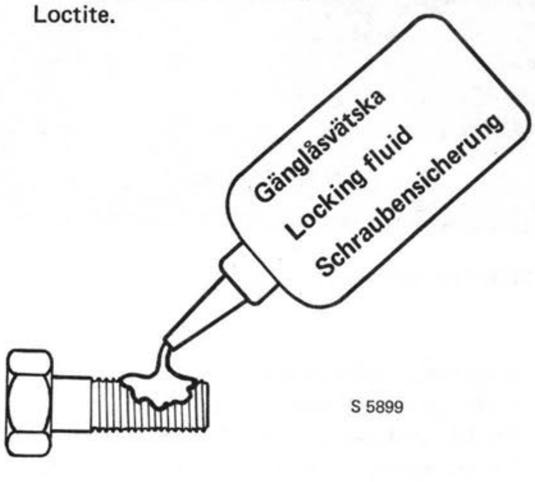
7. Coat the flange of the primary gear housing with a sealant compound, e.g. Tikatät No. 2, and fit the primary gear housing on to the transmission case.



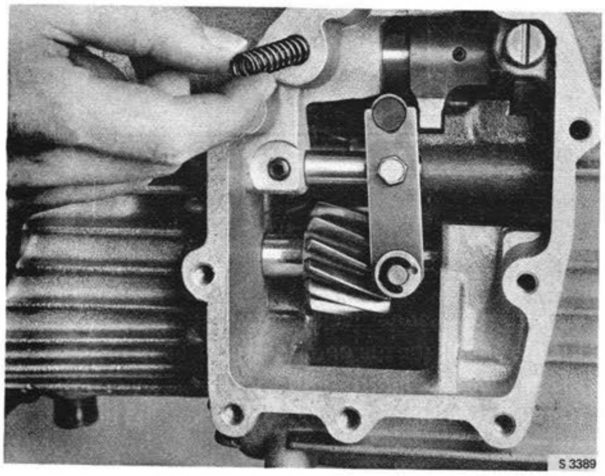
NOTE

Leave the screws slightly slack to avoid jamming the loose intermediate gear set in the wrong position before the intermediate shaft is inserted.

8. Ease the intermediate gear into its correct position either by turning the transmission housing or by lifting the intermediate gear. Fit the rear thrust washer and push in the intermediate gear shaft, using tool 8390049.
9. Fit the lock plate over the reverse gear and intermediate gear shaft ends. Secure the screw with Loctite.



10. Tighten the primary gear housing screws.
11. Insert the spring and the ball catch for the gear selector rod and mount the transmission case side cover together with its gasket.



FITTING THE SPRING FOR THE GEAR SELECTOR ROD

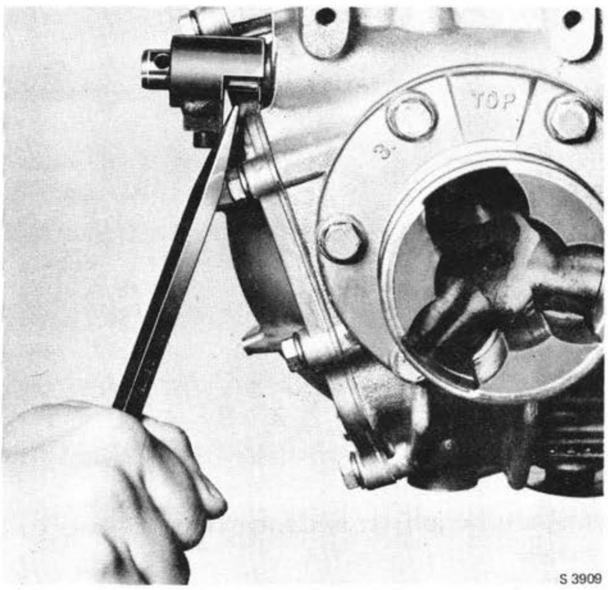
12. Install the differential assembly (see section 473).
13. Inspect the shaft seals in the differential bearing seats and fit new ones if necessary. Adjust the crown wheel backlash if necessary (see section 473). Mount the two inner drive shafts complete with inner universal joints taking care not to damage the shaft seals.

14. Fit the cover complete with gasket to the transmission case.
15. Fill the transmission case with oil (5 Imp. pints, 3 liters).

CHANGING THE SEALING RING, GEAR SHIFT ROD
(Can be done in car or on a removed gearbox)

Removal

1. Knock off the front taper pin from the gear shift joint and separate the joint from the rod.
2. Pull off the rubber bellows from the collar on the sealing ring.
   As from gearbox No. 780678 (with metal cover on differential housing), the differential housing cover must also be removed when the sealing ring is to be changed.
3. Put the removing tool 8790677 over the collar on the sealing ring and screw in the screw of the tool against the shaft.

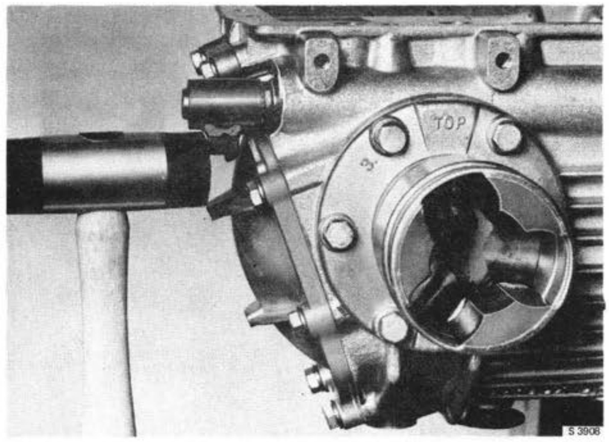


REMOVING TOOL 87 90 677
N.B. As from gearbox.No. 780678, the differential housing cover must also be removed.

4. Pry off the sealing ring with the aid of a screwdriver held between the tool and one of the screw heads on the rear cover.

Installation

1. Fit the new sealing ring with the aid of installing tool 8790685 and a suitable hammer.



INSTALLING TOOL 8790685

2. Fit the rubber bellows on the sealing ring.
3. Put together the gear shift rod joint and the gear shift rod and fit the taper pin.
4. As from gearbox No. 780678, fit the differential housing cover.

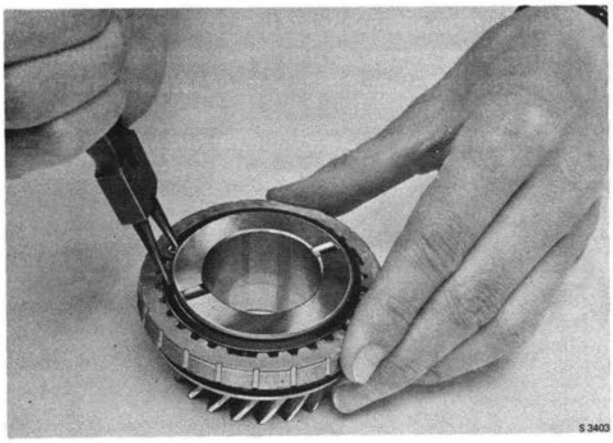
SYNCHRONIZATION

Synchronizing rings

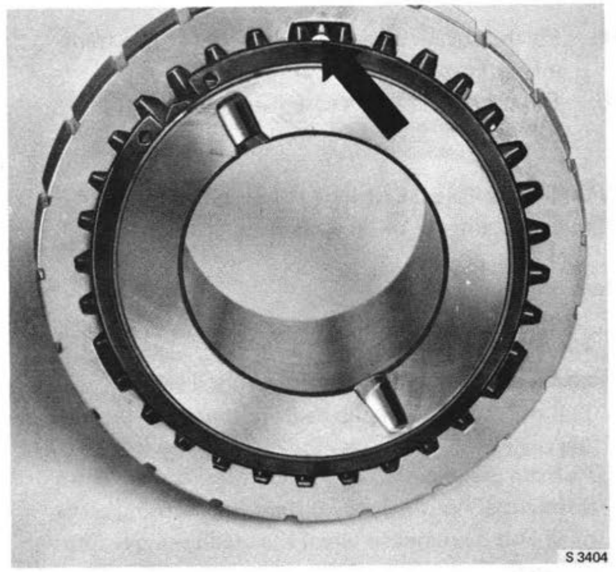
When changing the synchronizing rings, follow the instructions for the dismantling of the gear box. The differential unit must be removed and the intermediate gear disconnected so that the primary gear housing can be removed. When changing the synchronizing ring for top gear, no further dismantling is necessary.
When changing the synchronizing ring for 1st and 2nd gear, the pinion shaft must be taken out of the transmission housing, so that the gears can be removed from the shaft.

Disassembling

The synchronizing ring is removed by undoing the lock ring which attaches the synchronizing ring to the gear.



REMOVING THE SYNCHRONIZING RING FOR 3RD GEAR

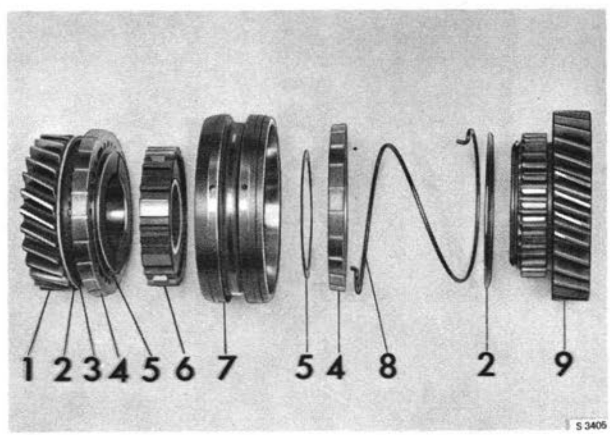


POSITIONING OF A SPRING END IN THE SPACE BETWEEN THE TEETH OF THE RING

Assembling

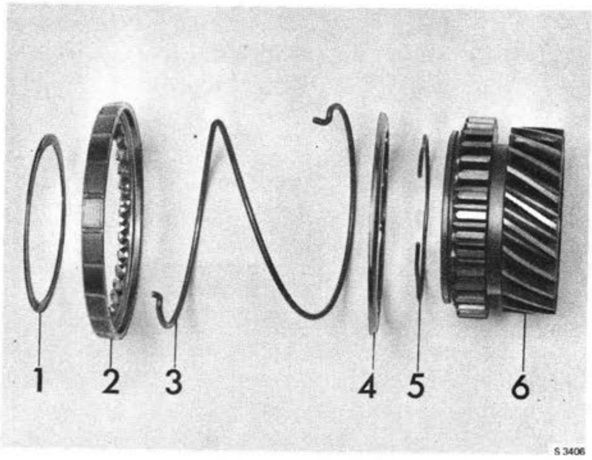
First fit the guide rings for the retaining springs, and the lock rings for the guide rings on 3rd and 4th gear. First and second gear have no lock rings for the guide rings. The retaining spring is fitted with a long wire end nearest the guide ring, and the spring is placed so that there are eleven teeth between the ends of the spring. The zynshronizing ring is placed so that the ends of the retaining spring fit into the spaces between the teeth, after which the lock ring is fitted.

CAUTION
The guide rings on the third and fourth gears are assembled during production and are peened in position by a special tool after the lock ring has been fitted. The guide rings supplied as spare parts should not be peened.



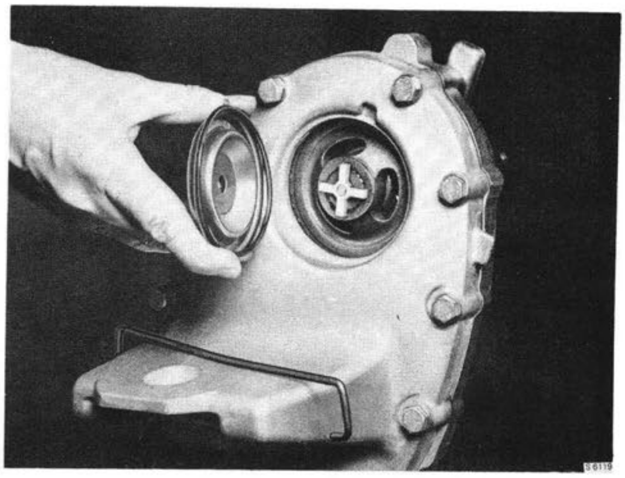
SYNCHRONIZATION, 1ST AND 2ND GEARS

1. 2nd gear
2. Guide ring
3. Retaining spring, 2nd gear
4. Synchronizing ring
5. Lock ring
6. Synchronizing hub
7. Coupling muff
8. Retaining spring, 1st gear
9. 1st gear



SYNCHRONIZATION, 3RD GEAR

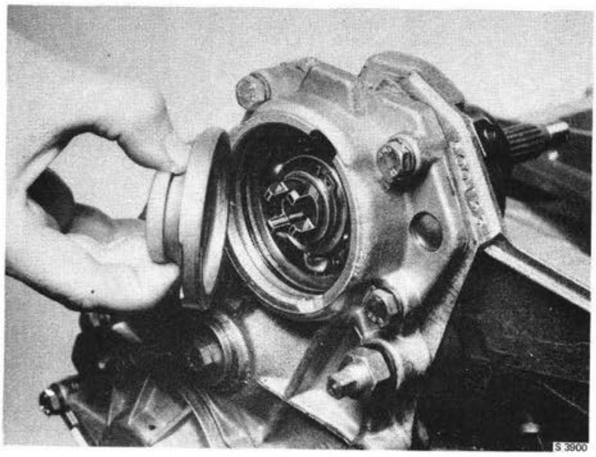
1. Lock ring
2. Synchronizing ring
3. Retaining spring, 3rd gear
4. Guide ring
5. Lock ring guide ring
6. 3rd gear



VENTILATION, AS FROM MODEL 1978

VENTILATION

Ventilation of the transmission is by means of a hole through the top cover in the primary gear. The hole emerges at the centre of a plastic propeller which is bolted to the clutch shaft.
As the clutch shaft rotates, the oil is flung away from the hole by the propeller.
When the shaft is stationary, the oil level in the primary gear is considerably below the hole.
With effect from transmission numbers 649792 (cars from the latter half of 1975 model), a washer has been installed between the vent cover and the bearing. This is to prevent leakage occurring as a result of the oil level having been raised in the primary gear housing.



VENTILATION, UP TO AND INCL. MODEL 1977

REMOVAL AND INSTALLATION

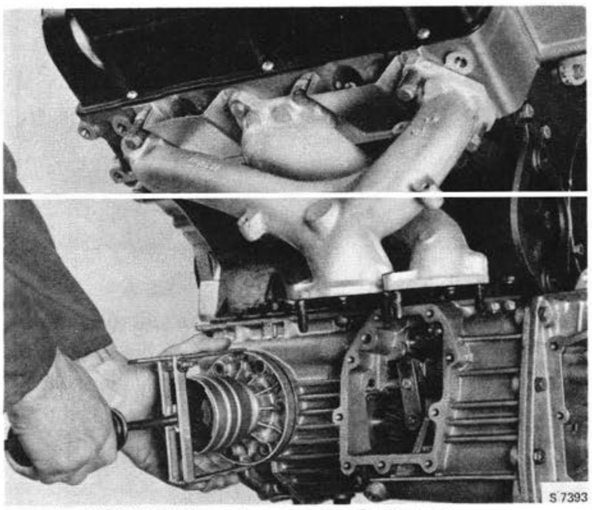
5-speed transmission

Disassembling and assembling of the gear box can be done without separating the engine and the gear box. The engine flywheel must first be removed.

DISASSEMBLING

(Proceed in the following order as far as necessary in order to remove whichever component needs attention:)

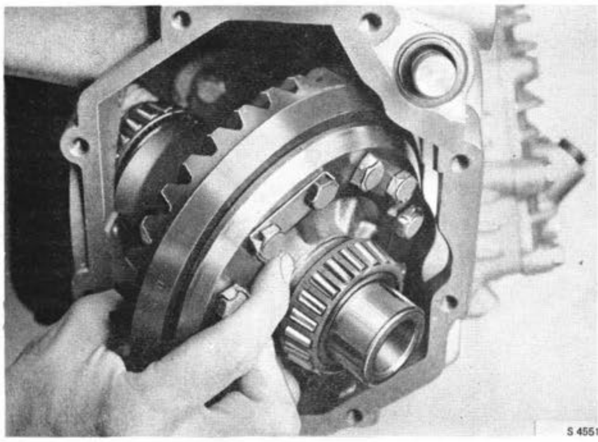
1. Clean the gearbox and drain the oil.
   a) in a horizontal position
   b) in a vertical position. Let the oil drain out of the primary gear housing.
2. Remove the following covers:
   front cover on the primary gear housing
   side cover on the primary gear housing (there will be some oil remaining in the primary gear housing).
   Cover containing the oil filler plug.
   Final drive cover.
3. Measure the backlash between the pinion and crown wheel, see Section 473.
4. Clean off the transmission case and drain the oil. Remove the differential bearing seat retaining screws and remove the seat and inner driver using



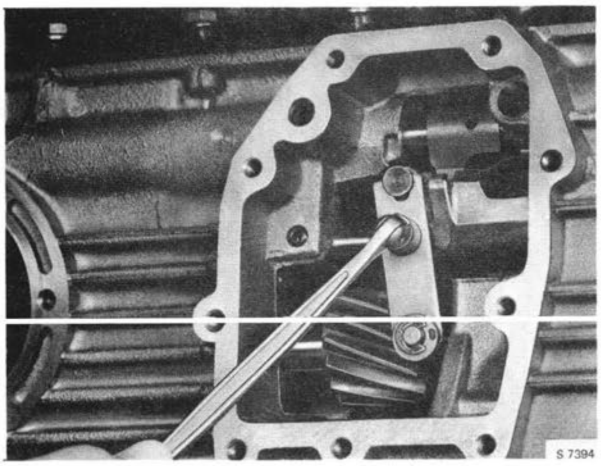
   tool 8390270 and extractor 8790776.
   Save the spring and plunger at the shaft end of the driver, and the shims, which will be replaced on the condition that the differential gear backlash has not been altered by the exchange of some components.

> IMPORTANT
>
> Before disassembling the transmission, always measure up the positions of the pinion gear and crown wheel. This is to check whether there is any error in their locations. If the pinion and crown wheel assembly is relatively new, i.e. if it has done less than 6,000 miles (10,000 km), it can be adjusted, but if the mileage is any greater the gears will have worn themselves into a given position. In the latter case, they should be reassembled in the same measured positions which they occupied before disassembly.

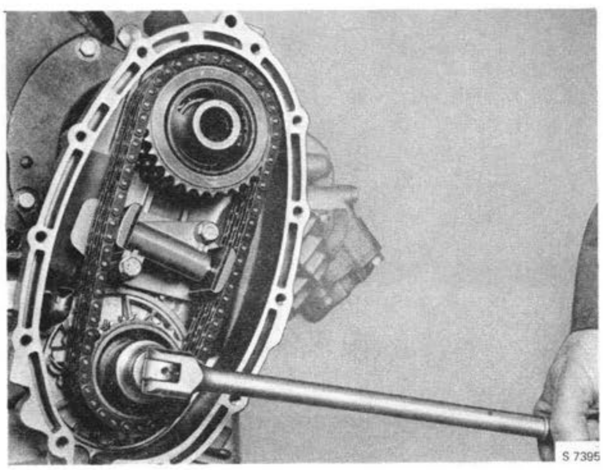
5. Remove the differential assembly. For dismantling of the differential assembly see section 473.



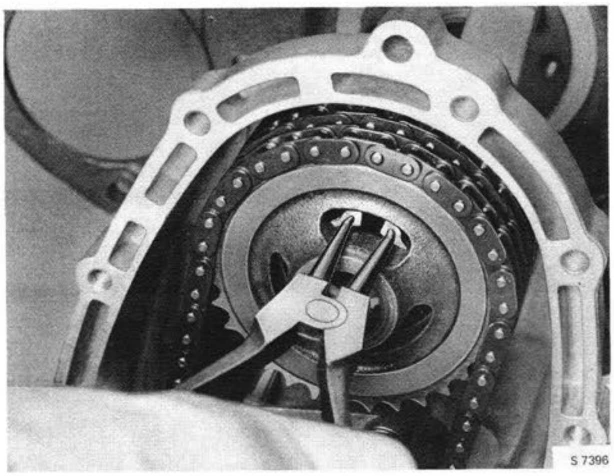
6. Measure the distance of the pinion to the centre of the crown wheel. See Section 473.
7. Remove the reverse operating lever.



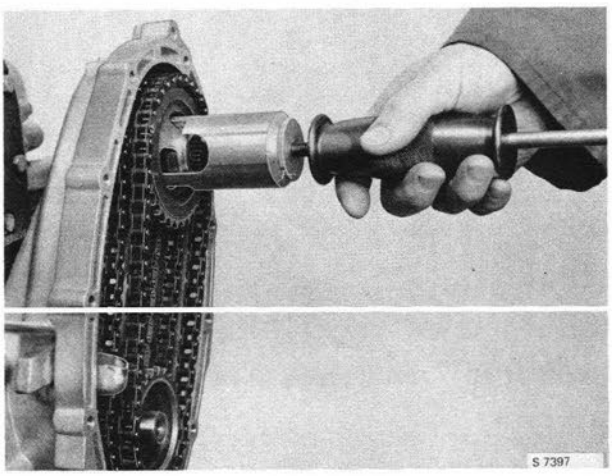
8. Engage the reverse wheel in the reverse gear position. Place the 5th gear wheel in gear.
9. a) Free the shaft (lower sprocket) tab washer from the input.
   b) Remove the nut.

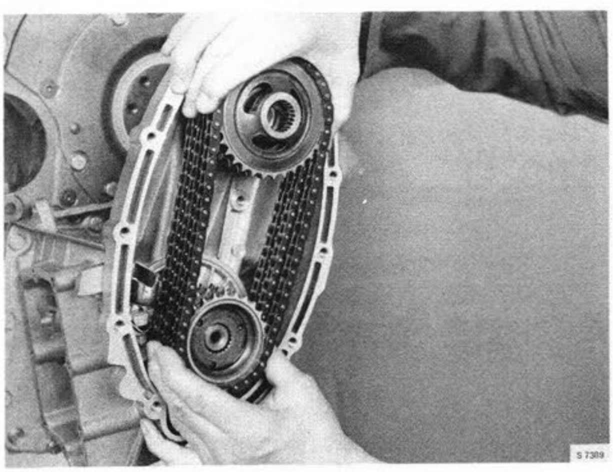


10. Remove the chain tensioner.
11. Remove the circlip from in front of the upper chain-wheel bearing.

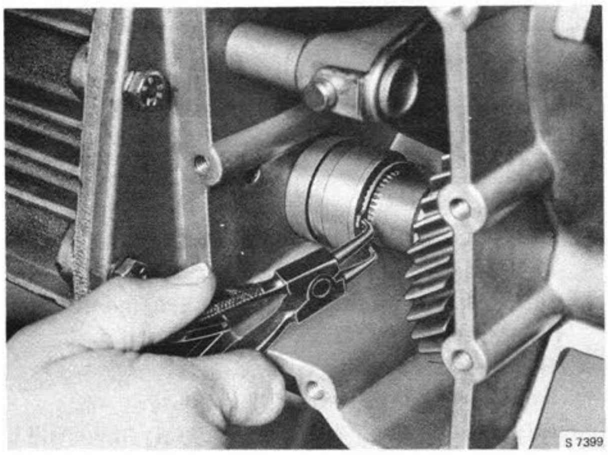


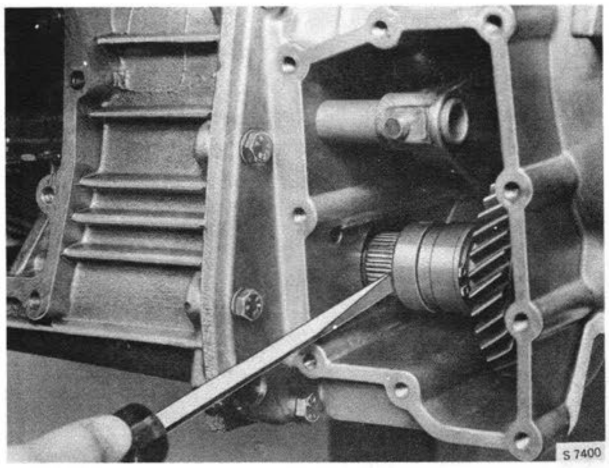
12. Remove the chainwheels and the chains simultaneously. Slide hammer 8390270 and puller 8390891 may need to be used to remove the chainwheels.



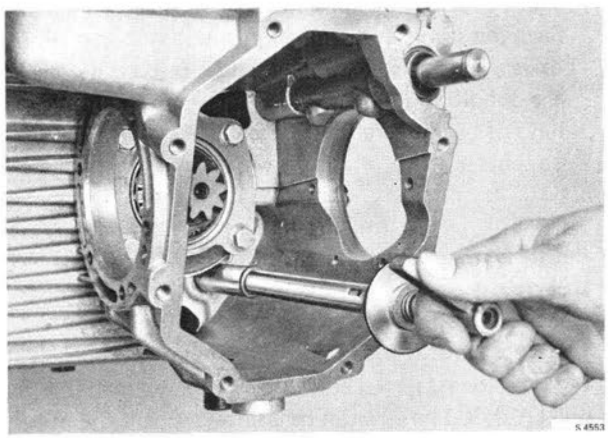


13. Remove the countershaft wheel from engagement with the countershaft by loosening the circlip and slide the muff against the cog wheel.

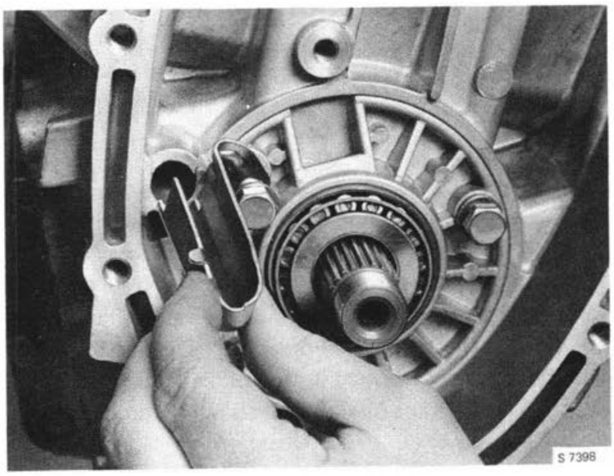


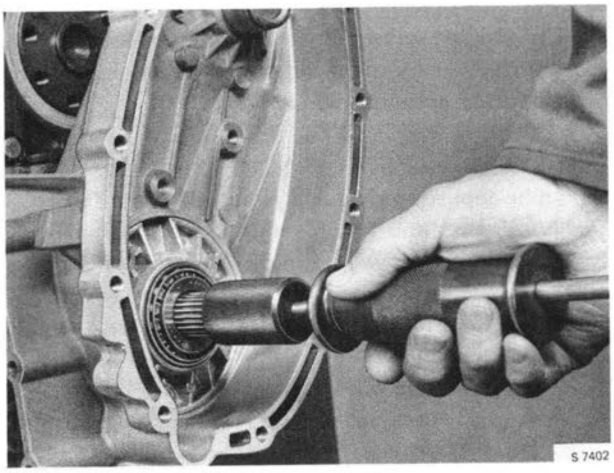


14. Remove the countershaft and reverse spindle retaining plate. Use tool 8390049 to extract the countershaft so that the countershaft cog-wheel, the muff and pressure washer can be taken out through the side cover.

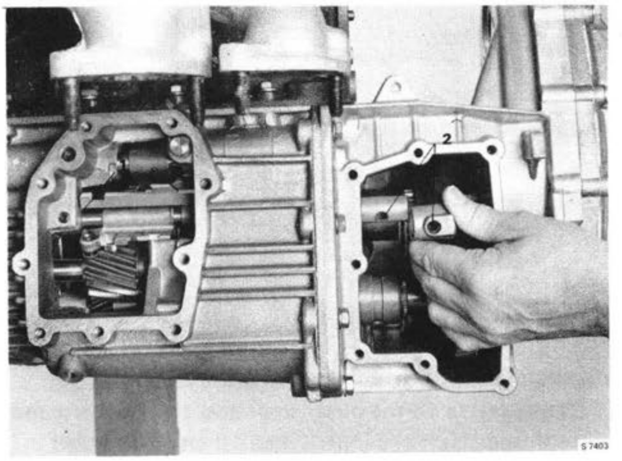


15. Remove the screws and the oil catcher.for the input shaft's bearing housing. Then remove the bearing housing using slide hammer 8390270 and adapter 8790917.

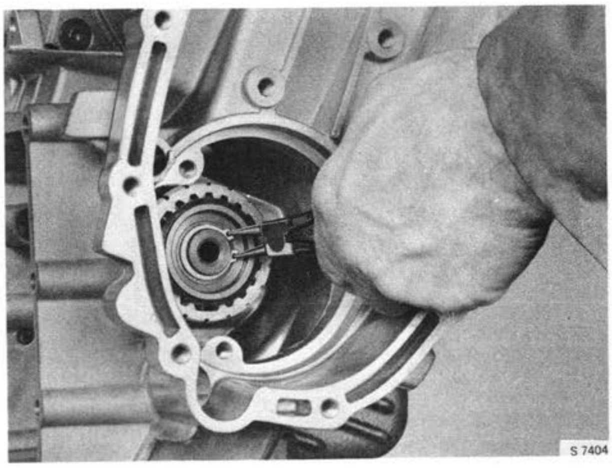




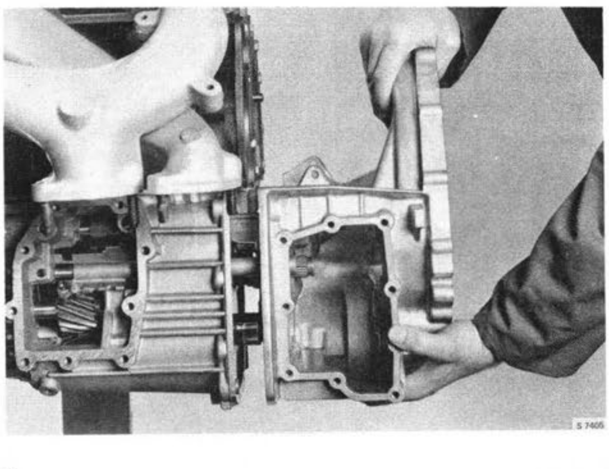
16. Remove the locking stud from the 5th speed selector fork and push the gear selector until it stops. The fork and can then be removed.



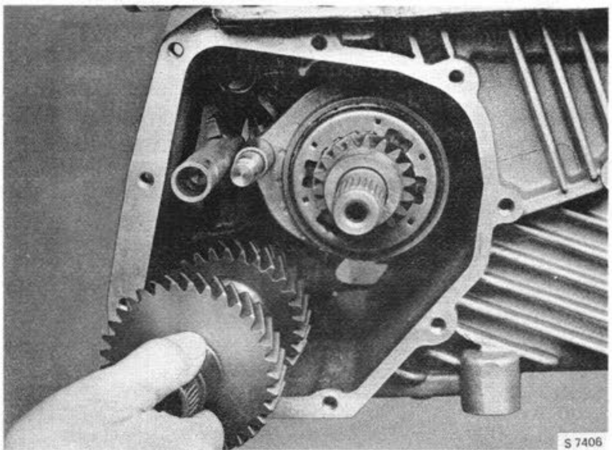
17. Remove the circlip and shims from the 5th speed synchro hub. Remove the synchro hub and then the distance piece lying behind it from the pinion shaft.



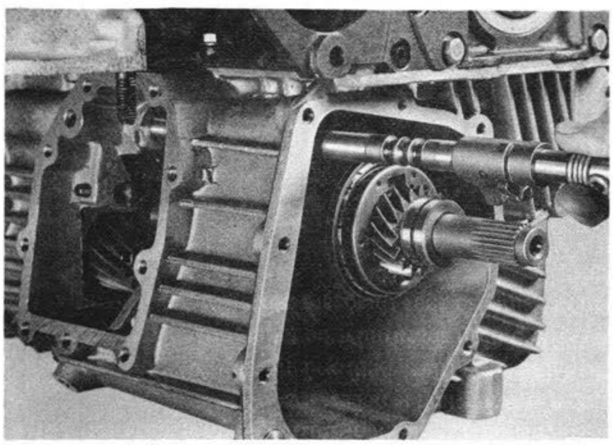
18. Remove all primary gear housing retaining bolts and drift in the dowels so that the primary gear housing can be separated from the gearbox housing. (The 5th speed selector will remain in the housing and can be remove later). File away any burrs there may be round the hole in the shaft so that the aperture in the gear housing will not be damaged when reassemblying the primary gear to the gearbox.



19. Remove the countershaft and the countershaft gears. Retain the needle bearings and thrust washer for re-use.

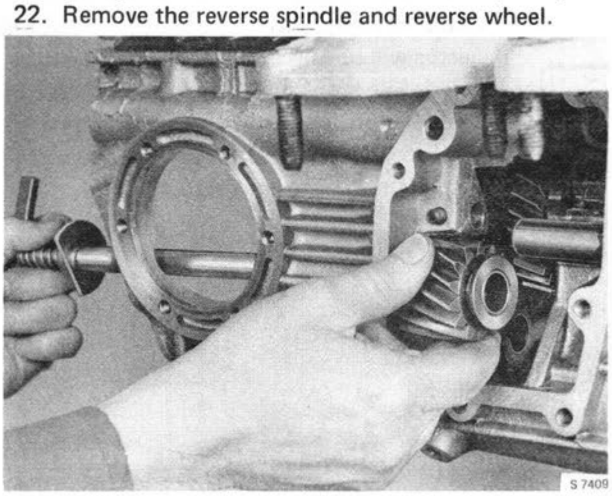


20. Remove the selector shaft and the selectors (5th and reverse on the outer shaft and 1st, 2nd, 3rd and 4th speeds on the inner). The 1st and 2nd speed selectors should be removed together with their synchronizing unit. The reverse selector should be removed while still attached to the reverse selector shaft.
21. The selector shafts should be removed from the front. The aperture for the tapered pin should be filed so that it is free of burrs so that the aperture is not da-

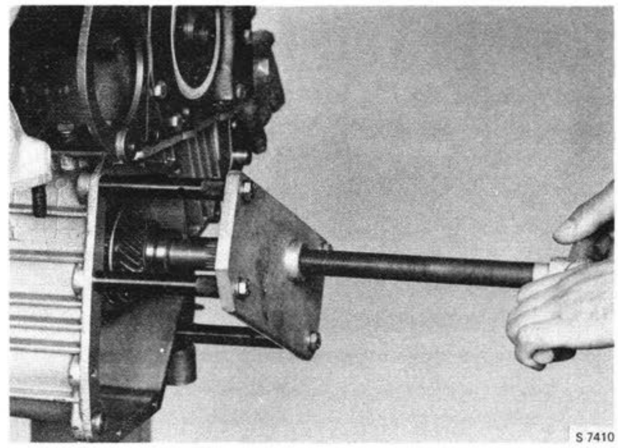


maged. Remove the selector, double lockout and spring later. Retain the selector ball and guide pin.

22. Remove the reverse spindle and reverse wheel.



23. Remove the four screws holding the pinion shaft bearing housing. Install tool 8790909 and press out the pinion shaft. Keep the wheel, sleeves, washers and shims.



ASSEMBLING

Having removed the component that needs attention, clean all fragments of old gaskets and all traces of old sealing compound off the covers and mating surfaces. Inspect the transmission case and all disassembled parts and wash them in kerosene or similar. The parts should be lubricated as described in the following list. Then reassemble the transmission, following the procedure described below:

Apply Esso Nubula EP 2 grease to the following points:

1. Inner drive shaft seals and clutch shaft seal, space between seal lips.
2. Clutch shaft splines and journal in flywheel should be lubricated (very sparingly) before assembling the engine and transmission unit.

Sealing compound TIKATÄT NO. 2 part no. (45) 3007176 should be applied to the surfaces between the primary gear housing and the gearbox housing. Thread locking compound (Loctite, part no. (45) 3009081) should be applied to the following points:

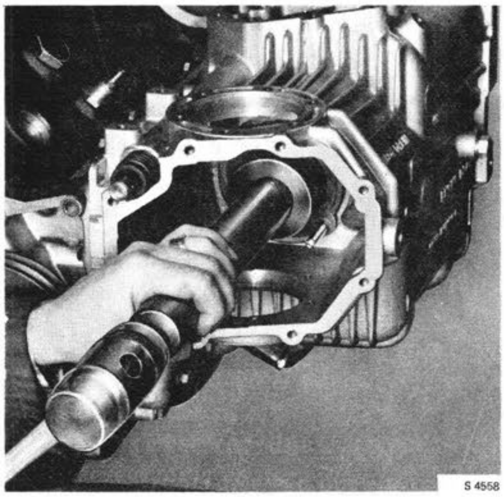
1. On the 12 differential bearing seat bolts
2. On the drain plug
3. On the chain tensioner bolts
4. On the two upper countersunk bearing retainer bolts
5. On the slave cylinder housing bolts
6. On the three bolts passing through the gearbox housing cover

NOTE. Ensure that the surfaces are dry before applying the sealing compound.
Locking fluid (Loctite, part no. (45) 3007200) should be applied to the following points:
1. The reverse spindle stop screw
2. The reverse gear actuator bolt
3. Hexagon screw on the reverse gear and countershaft locking plate

Locking fluid (Loctite, part no. (45) 3007200) should be applied to the following points:
1. The 12 Hexagon screws on the crown wheel.

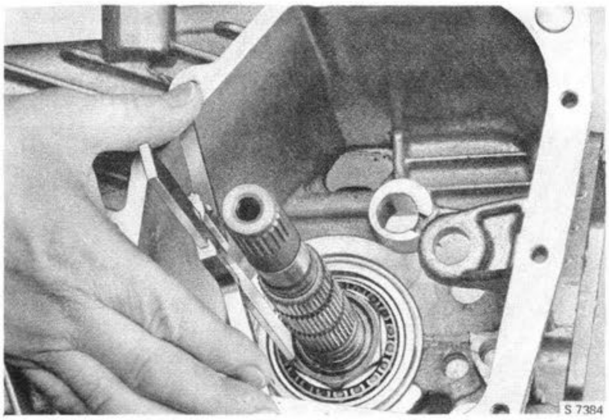
Locking fluid (Loctite, part no. (45) 3007218) should be applied to the pinion nut.
The following parts should be lubricated with transmission oil:
1. All countershaft gear needle bearings
2. The synchro hub outer splines
3. The synchro cups
4. Running wheel end surface and pinion shaft hole
5. Gear selector lever
6. Reverse gear
7. Countershaft
8. Speedometer drive shaft
9. Differential shaft
10. Differential bearing seats L and R (O-ring)
11. Clutch shaft seal (when inserting in housing)
12. Outer drive shaft seals when inserting in differential bearing retaining housings
13. Input shaft nut

The following slave cylinder parts should be lightly lubricated with Castrol UBCF 11 oil:
Inner and outer surfaces of the cylinder, cylinder housing, seal and inner surface of the piston and its end surface against the seal.
1. Adjust the differential bearings to the correct compression. See section 473.
2. Screw the two locating studs (tool 8790438) into the transmission case. Then shim and locate the pinion shaft assembly. Tap the assembly gently into position, using a plastic metallet, drift 8390114 and sleeve 8390148. Then insert and tighten the four bearing housing screws.



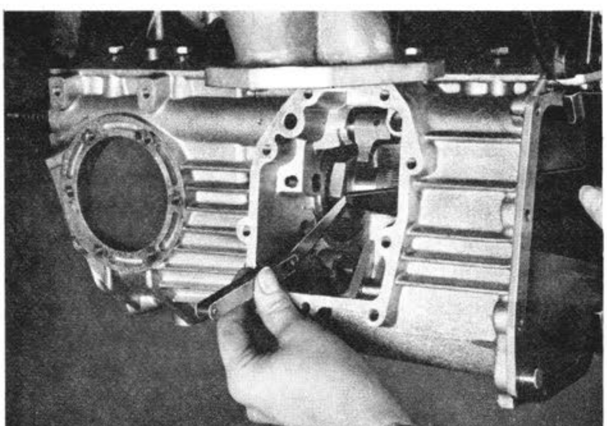
MOUNTING THE PINION SHAFT
Locating studs 8790438, drift 8390114, sleeve 8390148

3. a. Before mounting the reverse gear on the pinion shaft, the distance between the connecting surface for the primary gear housing and the pinion shaft nut must be checked. The distance must be 7.677"–7.681" (195.0–195.1 mm). If it is not this distance, shims must be placed between the nut and the reverse gear. Shims are available in thicknesses of 0.0118" (0.30 mm), 0.0157" (0.40 mm) and 0.197" (0.50 mm). If the position of the pinion shaft is unchanged, the shims used earlier can be replaced.



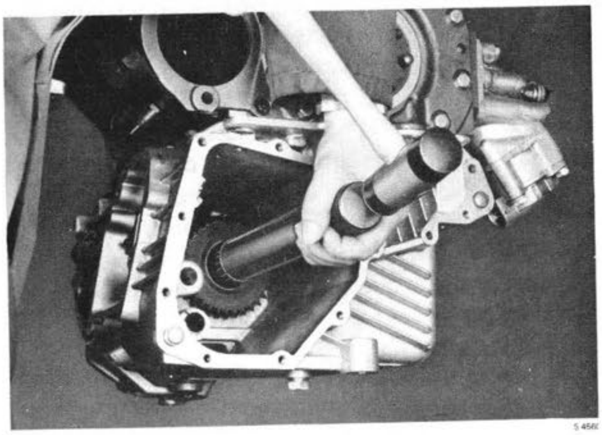
MEASURING THE POSITION OF THE PINION SHAFT IN THE GEARBOX HOUSING WITH DEEP GAUGE

b. When using measuring tool 8790552, the procedure of shimming is the following:
Install the measuring tool in the gearbox housing according to fig. and measure the distance between tool and nut with the aid of a feeler gauge. Fit shims with a thickness equvivalent to that of the used feeler gauge.

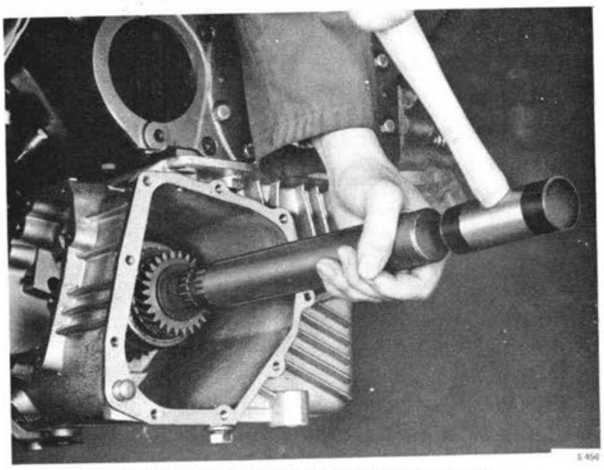


MEASURING THE POSITION OF THE PINION SHAFT IN THE GEARBOX HOUSING WITH THE AID OF TOOL 8790552

4. Install the reverse gear using sleeve 8390148.
5. Fit the 1st gear on the bearing sleeve of the reverse gear.
6. Fit 1st–2nd synchronization hub. Fit 1st–2nd gear shift fork into 1st–2nd coupling muff and mount these on the synchronization hub. Fit 1st–2nd gear shift fork into 1st–2nd coupling muff and mount these on the synchronization hub.
7. Install the 2nd gear sleeve with tool 8390148 and mount the 2nd gear on the sleeve.

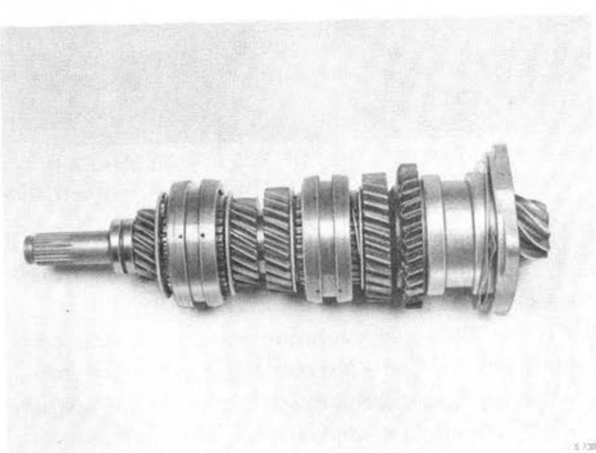


INSTALLING THE REVERSE GEAR
Sleeve 8390148

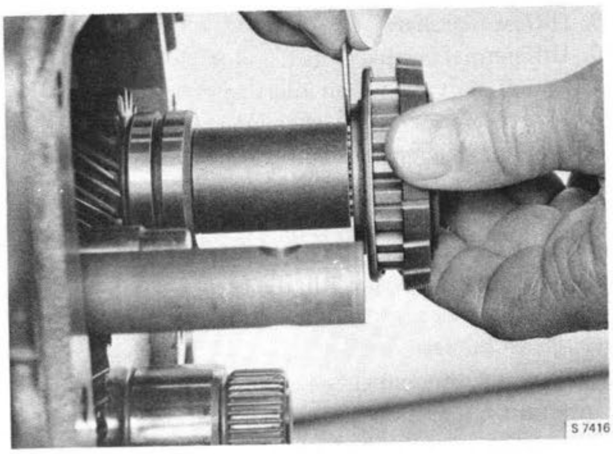


INSTALLING SLEEVE FOR THE THIRD GEAR
Sleeve 8390148

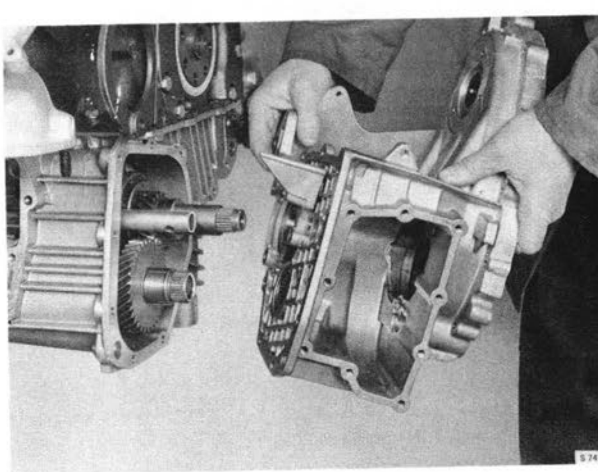
8. Fit the spacer, mount the sleeve for 3rd gear with tool 8390148 and mount the 3rd gear on this sleeve.
9. Fit 3rd–4th gear synchronization hub. (Fit the synchronization hub fitted with the three locking holes against the pinion nut.) Fit 3rd–4th gear shift fork into 3rd–4th gear coupling muff and mount these on the synchronization hub. Fit the bush for the 4th speed gear and fit the gear onto the bush. Install the ball bearing bush.
10. If the selector shaft has been removed, refit it together with the double lockout guide pin.



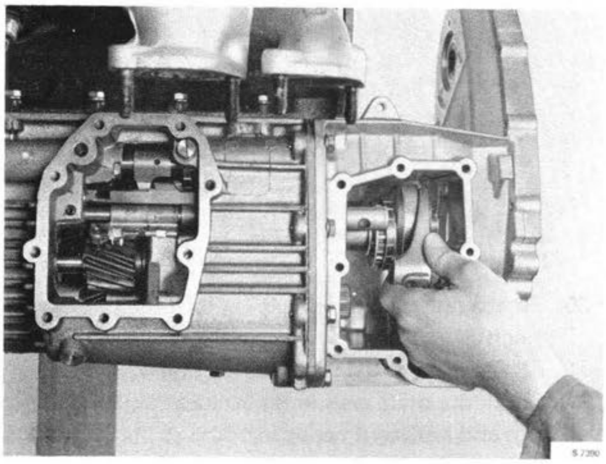
11. Ease the coupling muffs on the pinion shaft in the neutral position and fit the gear shift shaft for 1st–2nd and 3rd–4th gear shift forks.
12. Refit the reverse selector shaft with reverse operating lever. Seal the shaft stop bolt with Locite and tighten.
13. Fit the 5th speed selector on the reverse selector shaft.
14. Fit the needle bearing in the countershaft gear and install in the gearbox housing.
15. Fit the countershaft and raise the countershaft gears so they are aligned for fitting to the shaft. Insert the shaft sufficient to hold the gears in position. The thrust washer is to be installed later.
16. Fit the distance piece, the 5th speed synchro hub and the locking ring on the pinion shaft. Fit the requisite shims between the hub and sleeve so that there is no play between the parts on the pinion shaft. The shim thicknesses available are 0.30 mm and 0.40 mm. The locking ring on the hub and distance piece should then be removed.



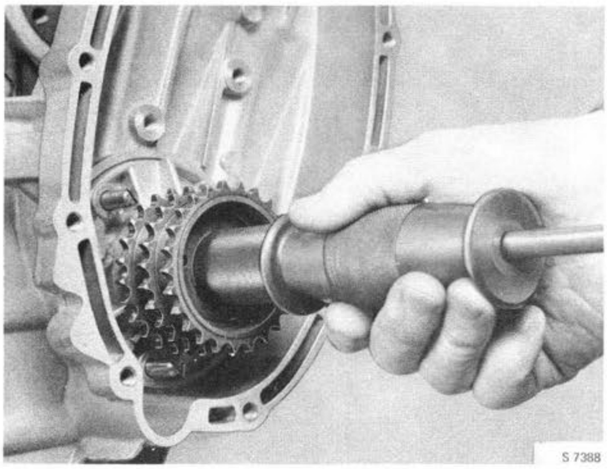
17. Apply sealing compound, e.g. Tikatät no. 2, to the surfaces of the primary gear casing which contact the gasket and fit the casing to the gearbox housing. Fit the distance piece to the pinion shaft. Fit the 5th speed synchro hub.



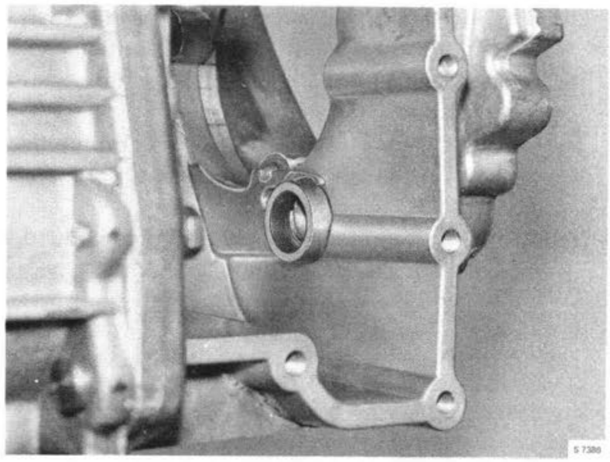
18. Fit the shims which were previously tested to the hub so that the is no axial play once the locking ring has been fitted.
19. Fit the 5th speed operating sleeve and selector fork.



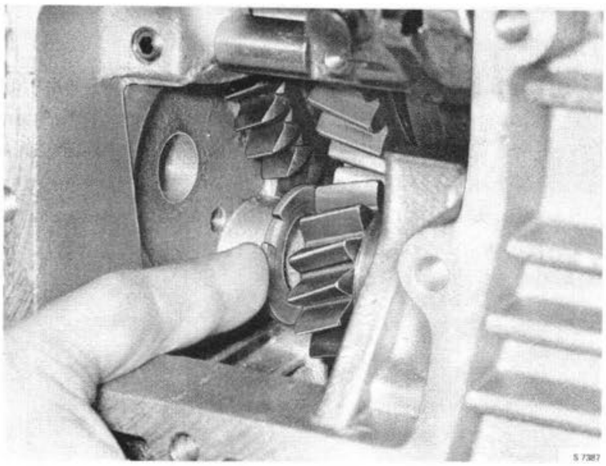
20. Fit the mainshaft together with the bearing housing, oil catcher and connecting pipes. Use three guide pins 8790438 for alignment and the sprocket as a distance piece between the adapter 8790917 and bearing housing.
Insert the bearing housing sufficient so that the shaft meets the operating sleeve. The bearing housing should then be driven into place using the slide hammer 8390270.
NOTE the compression of the bearing should be checked before installation.



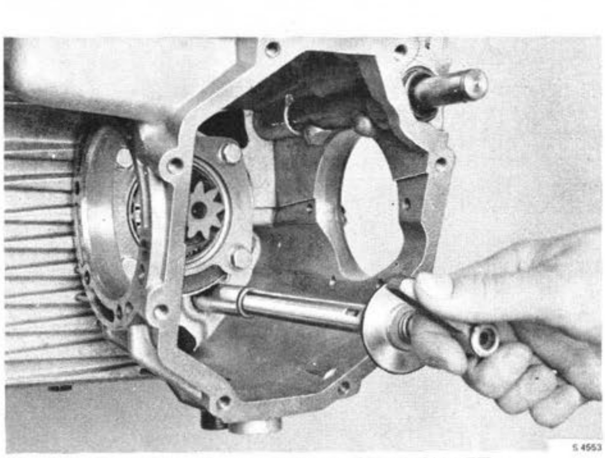
21. Fit the thrush washer for the countershaft constant gear. Cover the washer with grease and place it so that the tab fits into the recess provided.



22. Fit the countershaft constant gear complete with sleeve, lock ring and bearing rollers. Push the countershaft backwards so that the gear can be aligned for installation without altering the position of the thrust washer.
23. Push the operating sleeve onto the countershaft and insert the locking ring in its recess.

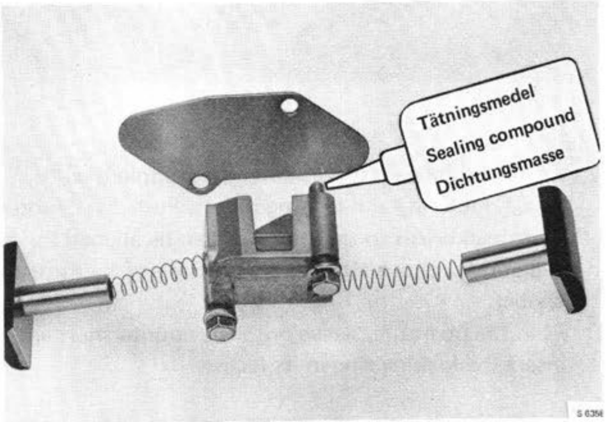


24. Fit the countershaft thrust washer. Extract the countershaft and insert the washer in its position. Then use tool 8390049 to insert the shaft so that it locks in position.

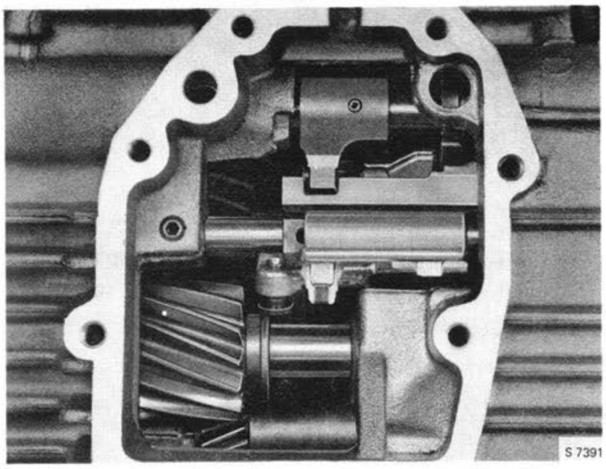


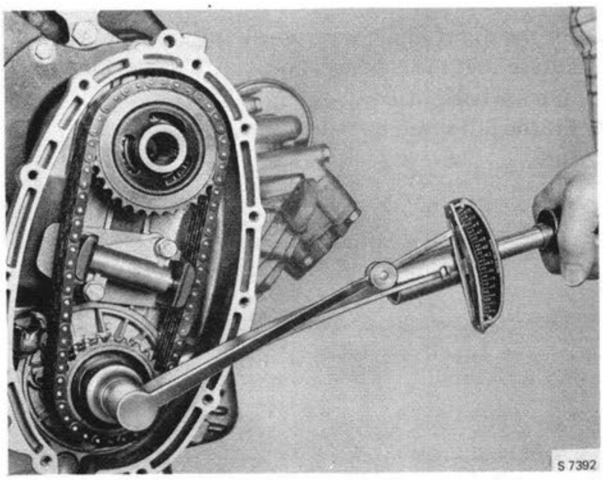
INSERTING THE INTERMEDIATE GEAR SHAFT
Tool 8390049

25. Fit the reverse wheel and spindle. Insert the shaft using tool 8390049 until it locks in position.
26. Fit the locking plate and seal with Loctite. Seal the bolts with Loctite.
27. Fit the primary gear wheel and chains. Ensure that the hole for the tab washer on the lower primary gear wheel is facing outwards.
28. Fit the chain tensioner. Apply sealing compound to the bolts prior to installation.



29. Fit the nut onto the input shaft. Before torque tightening select reverse and 5th speed gears at the same time so locking the input shaft. Then tighten the nut to the prescribed torque and bend one of the nut tabs into the hole provided in the gear wheel using a round-headed drift.





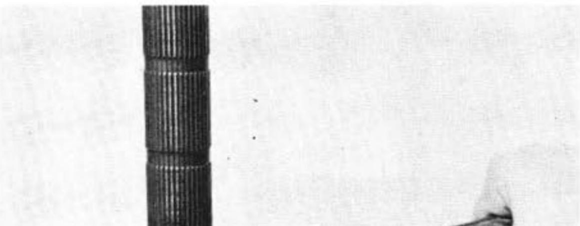
30. Fit the reverse operating lever. Seal the bolt with Loctite.
31. Fit the differential unit. See Section 473.
32. Check the shaft seals in the bearing retaining housings and replace if necessary. Adjust the crownwheel if necessary. See Section 473. Then fit both inner axle shaft and inner universal joints. Ensure that the seals are not damaged. Fit the selector ball and spring and install the gearbox top cover assembly and gasket.
33. Fit the final drive unit cover and gasket, the primary gear housing and chain cover with gaskets.
34. Fill with oil. See instructions on p. 430–5 "Oil filling after repairs".

PINION SHAFT

Disassembling

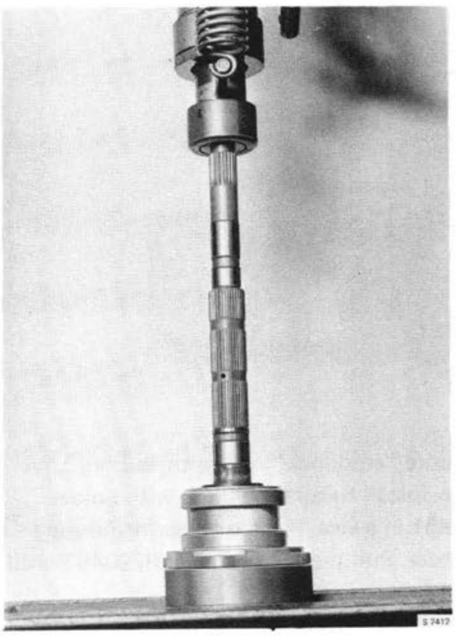
To disassemble the pinion shaft, follow the instructions already given for disassembling the transmission up to the point where the pinion shaft is unscrewed. Then continue as follows:

1. Fasten fixture 8790636 and holder ring 8790651 in a vice. Put the pinion shaft in the tool and loosen the nut with the aid of tool 8790453.



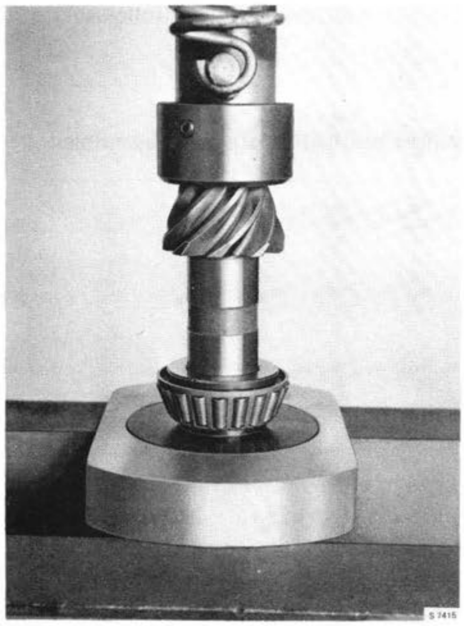
REMOVING THE PINION BEARING NUT
Fixture 8790636, holder ring 8790651 and key 8790453

2. Put the unit in a press and fixture 8790636 and press off the shaft from the bearing housing.



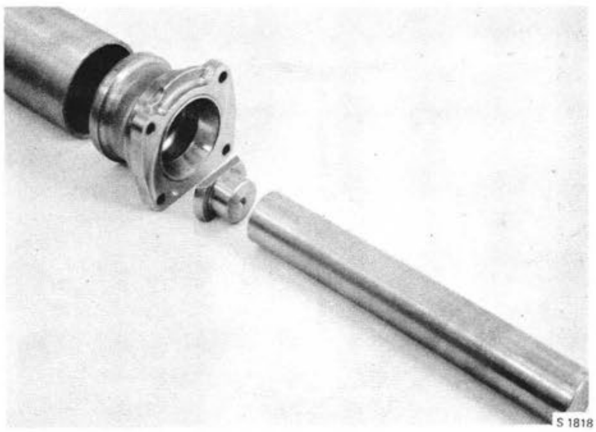
PRESSING THE SHAFT OUT OF THE BEARING HOUSING

3. Press off the rear roller bearing with the aid of tools 8790636 and 8790651.



PRESSING THE REAR BEARING OFF THE SHAFT
Fixture 8790636 and holder ring 8790651

4. Press the outer rings of the conical roller bearings out of the bearing housing using tools 8390098, 8390106 and 8390148 (see illustration).

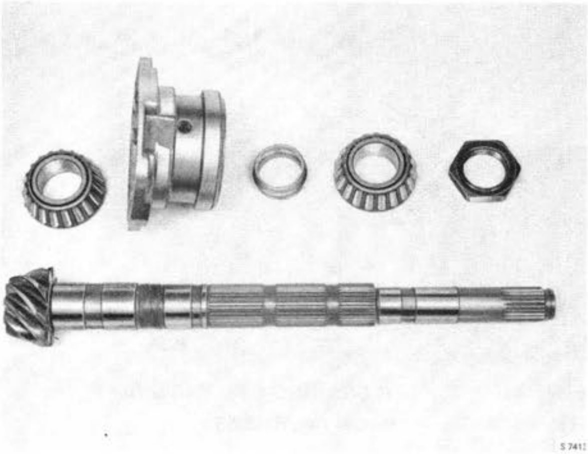


TOOLS 8390106, 8390148 AND 8390098

Installing the pinion shaft

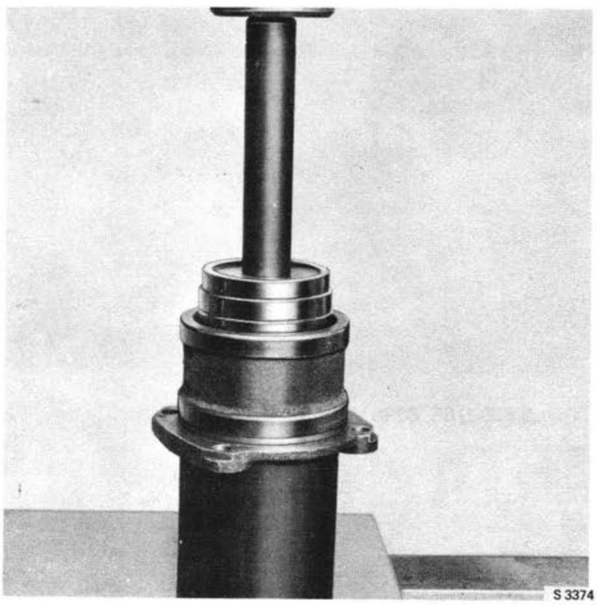
Having removed the part that needs attention, inspect all disassembled parts and wash them in kerosene or similar. Then reassemble and install, proceeding as follows:

NOTE
The bearings must be oiled before being assembled.



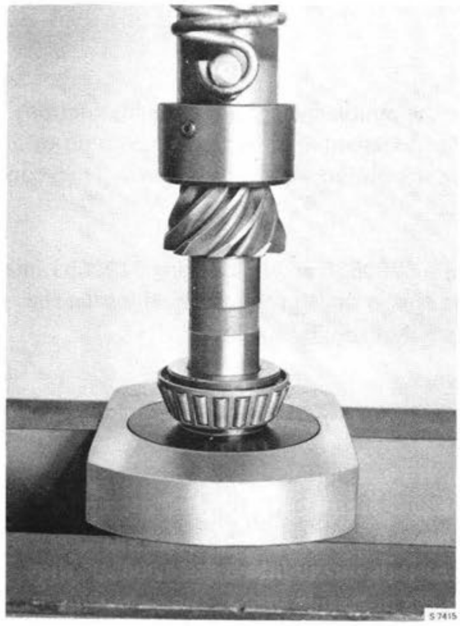
PINION SHAFT WITH BEARING, BEARING HOUSING AND SPACER SLEEVE

1. Press the outer races of the tapered roller bearings into the bearing housing, using tools 8390189 and 8790461.

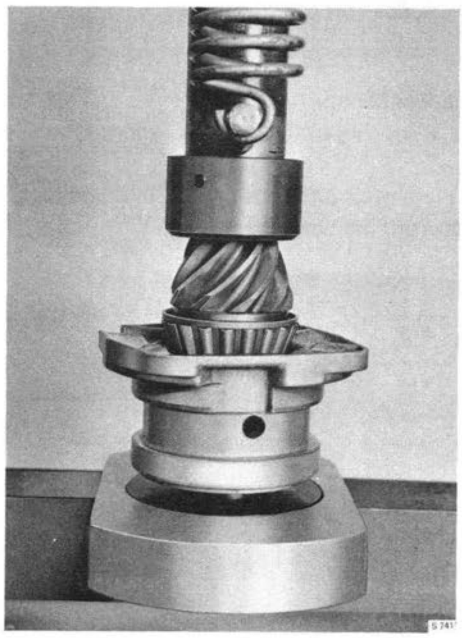


PRESSING ON THE ROLLER BEARING NEAREST THE PINION GEAR
Sleeve 8390148

2. Press the ball bearing nearest the pinion gear to stop. Use fixture 8790636 and holder ring 8790925.
3. Fit the spacer on the shaft.
4. Fit the bearing housing.
5. Fit the front roller bearing.

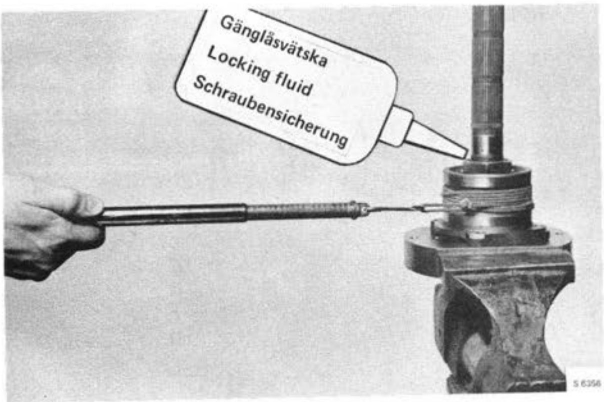


6. Set up the shaft in a press (see illustration). Press the bearing housing slowly on, using tool 8390148, and twist it at the same time until resistance to twisting is felt.



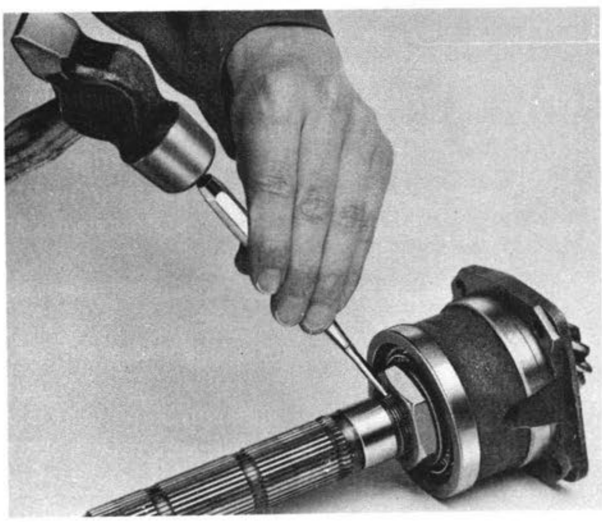
7. Smear Loctite "stud lock" on the threads and put on the nut. Install fixture 8790636 with holder ring 8790651 in a vice. Place the bearing housing on the fixture. Pull the nut with key 8790453 until the correct torque is obtained.
Measure the torque by pulling the bearing housing with the aid of a dynamometer. See fig. The bearings should be lightly oiled and tightened as follows:
New bearings 47–71 N (10–15 lb., 4.7–7.0 kp) on the dynamometer which corresponds to a torque

of 2.5 ± 0.5 Nm (2 ± 0.5 ft.lb., 25 ± 5 kpcm). Old bearings that have done more than 1,200 miles (2,000 km) 19–43 N (4.2–9.2 lb., 1.9–4.3 kp) dynamometer reading which corresponds to a torque of 1.3 ± 0.5 Nm (1 ± 0.5 ft.lb., 13 ± 5 kpcm).



When the correct value is obtained, upset the flange of the nut with a drift.

8. Fit two locating pins, tool 8790438, in the gearbox housing. Then fit on the shims and mount the pinion shaft with bearing housing. Knock the bearing housing carefully into place using a plastic mallet or hammer together with drift 8390114 and sleeve 8390148. Then tighten the four screws.



PRIMARY GEAR CASE

5-speed transmission

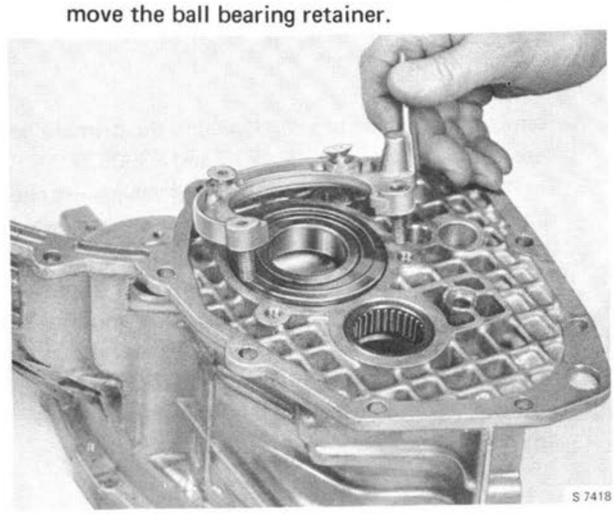
The primary gear housing should be removed when dismantling the gearbox. Remove the primary gear housing complete with the following components from the gearbox:

A. Ball bearing
B. Needle bearing
C. Clutch shaft seal
D. Level control ball valve

These parts are to be removed as follows:

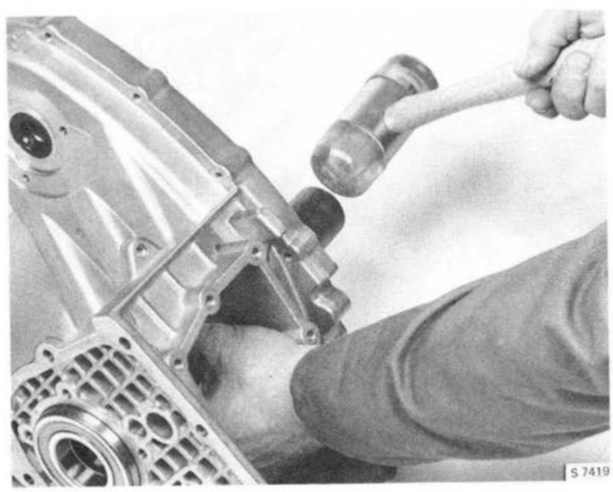
Dismantling

1. Remove the four countersunk Allen screws and remove the ball bearing retainer.

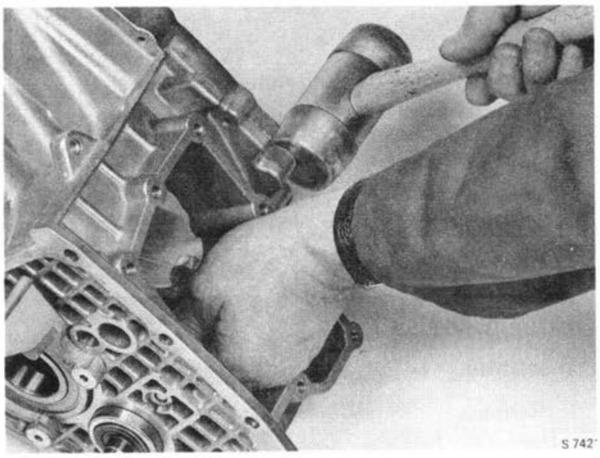


S 7418

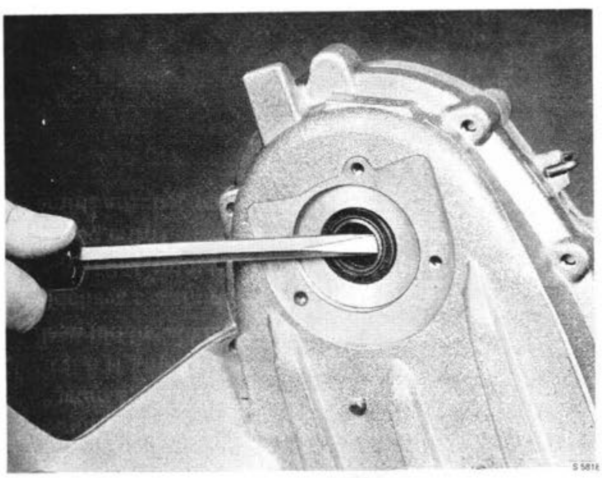
2. Drift out the ball bearing. Use drift 8390106 and sleeve 8390148.



S 7419

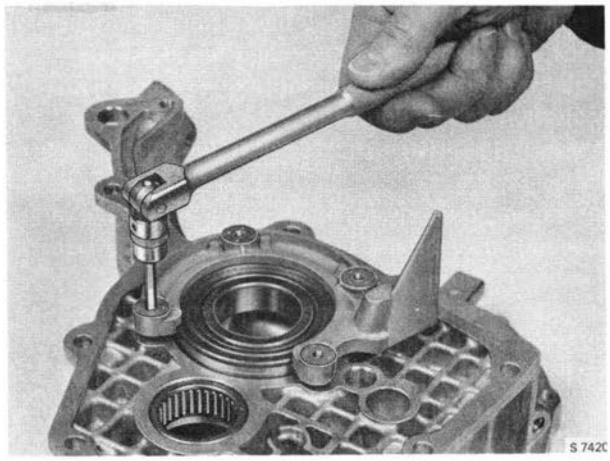


3. Remove the needle bearing sleeve in the primary gear case by means of drift 8391997 and 8390577.
   Do not remove the level control ball valve. Just check that the ball can be removed and that sits securely on its seat.
   The ball valve acts at low speeds downhill to prevent the oil from running out of the gearbox and into the primary gear housing, so ensuring proper lubrication of the differential and final drive units.
4. Remove the clutch shaft seal by means of a screw-driver.

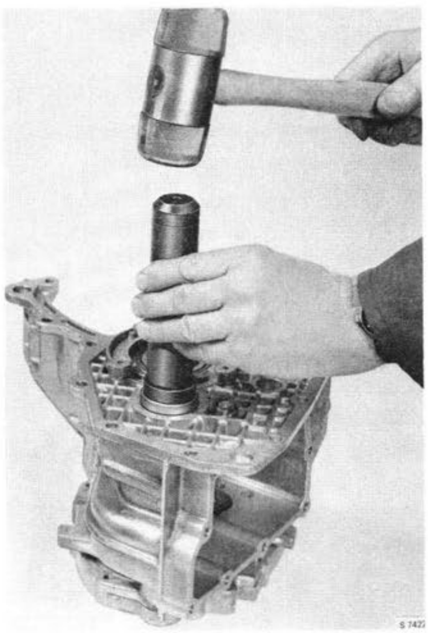


Installation

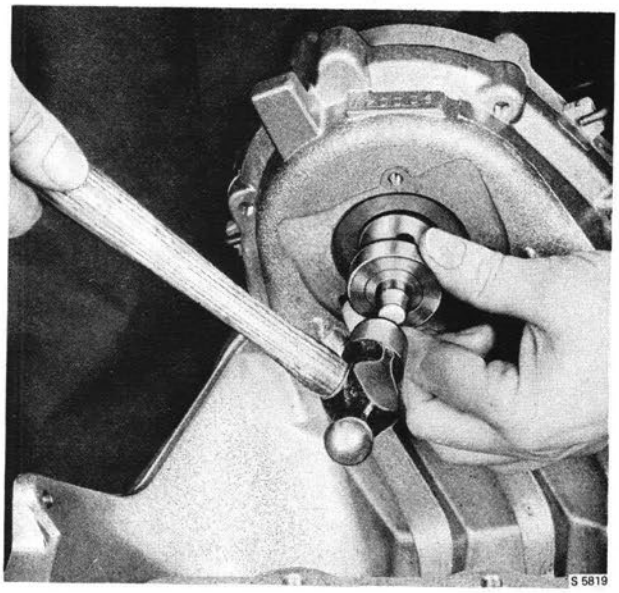
1. Fit the ball bearing with the bearing retainer. Seal the two retaining bolts with thread sealant. Gradually pull down the bolts alternately until the bearing is in position.



2. Fit the needle bearing race with the numbered end pointing out towards the primary gear housing.
   Use drift 8391997 and sleeve 7841067.



3. Install a new clutch shaft seal. Installation tool 8399997 Grease the lips of the seal after the installation. See Lubricant Specification.

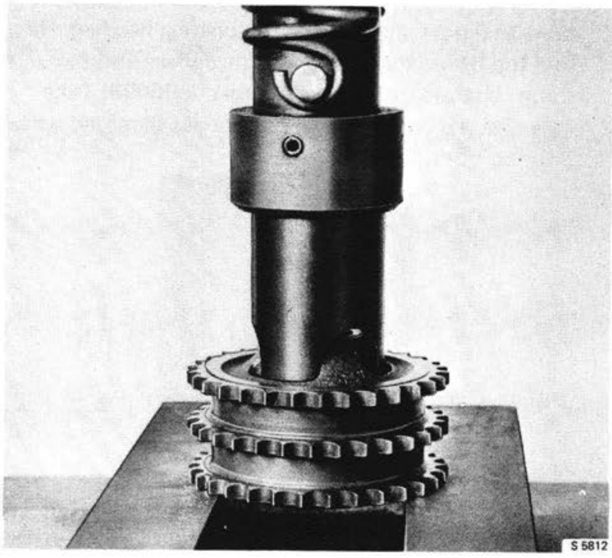


PRIMARY GEAR – CHAIN DRIVE

Dismantling

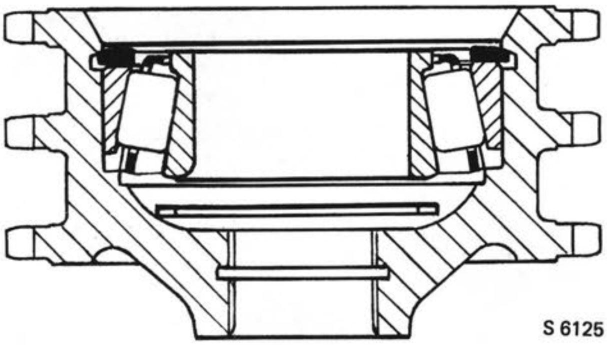
1. To dismantle the primary gear separately. Remove the front cover from the primary gear housing and the gearbox cover. Otherwise follow the instructions under "Dismantling the gearbox".
2. Remove the circlip from the upper primary gear wheel.

3. Use hollow drift 8790891 to press out the bearing from the primary gear wheel.



Assembly

1. Fit the circlip to the upper primary gear wheel and press the bearing into the wheel, see illustration. Tool, hollow drift 8790859. Fit the circlip for the bearing's outer race with the bevel facing outwards.

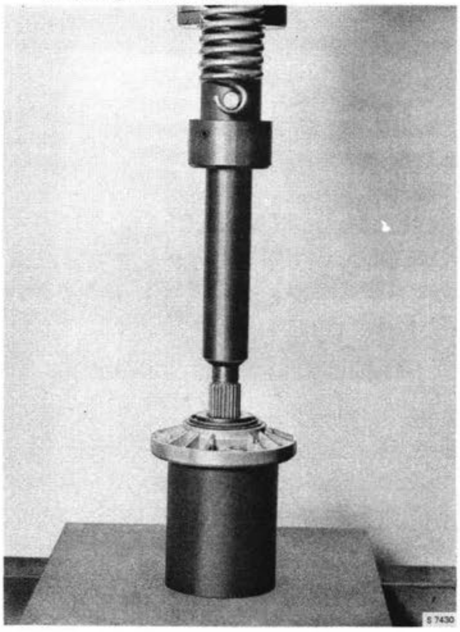


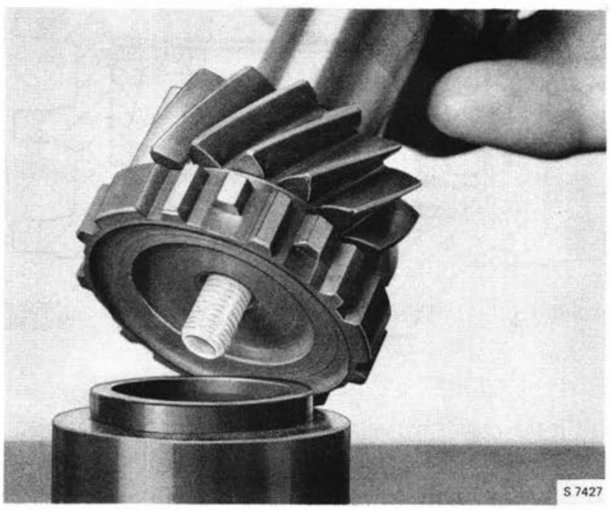
2. Fit the chains, wheels and chain tensioner as described under "Gearbox assembly".
3. Top up with oil.

INPUT SHAFT BEARING HOUSING

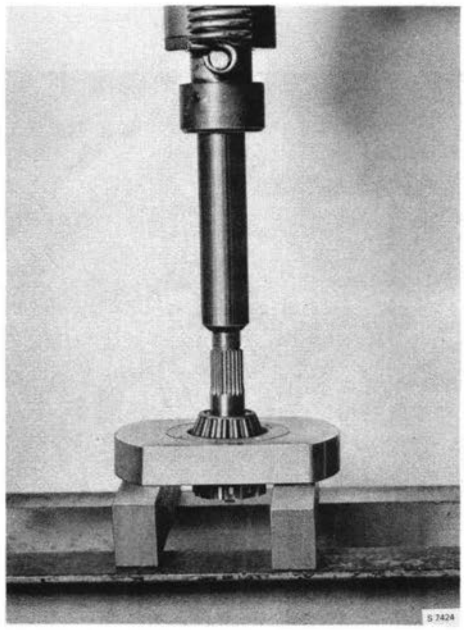
Removing

1. Remove the oil catcher from the bearing housing and press the input shaft out of the bearing housing. Retain the front bearing, the distance piece and the shims. Use the ringshaped support 8390098. Take care that the connection pipes are not damaged when pressing out the shaft.

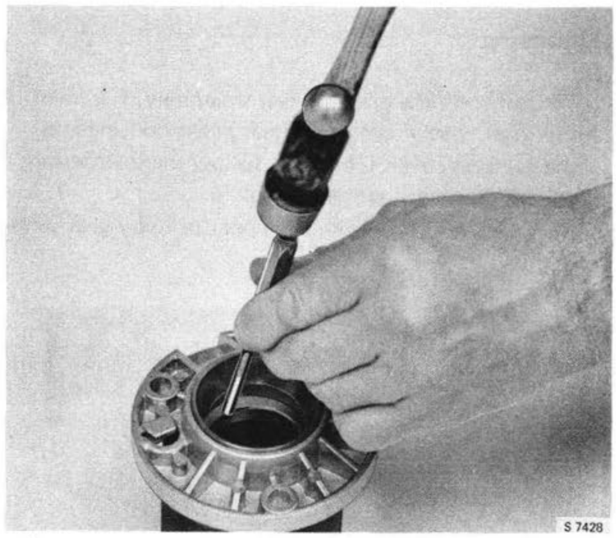


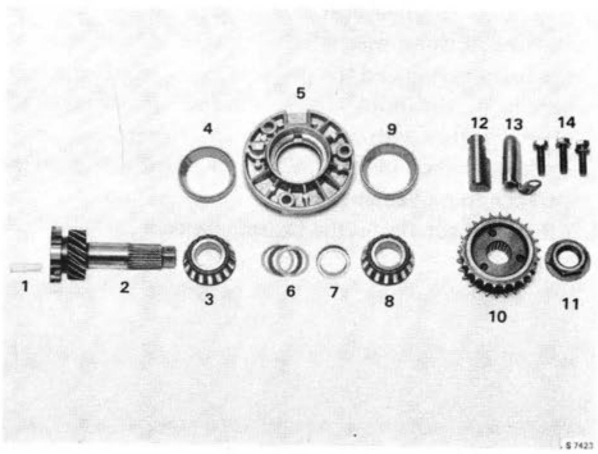


2. Press the rear bearing off the input shaft. Use support 8790636 and ring 8790933.



3. Remove the bearing races from the housing with a drift. Rest the housing on the ring-shaped support.



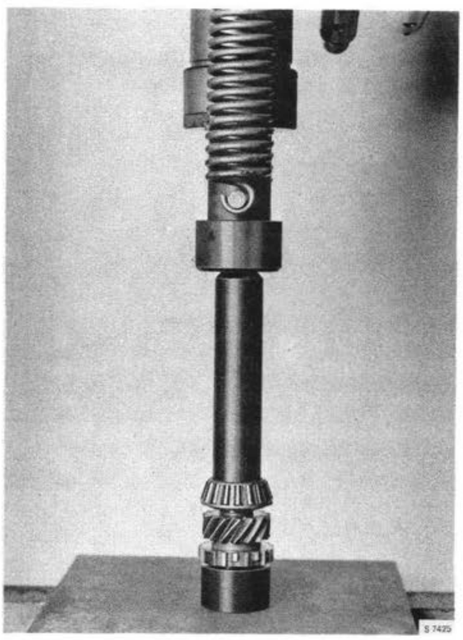


PRIMARY CHAIN DRIVE

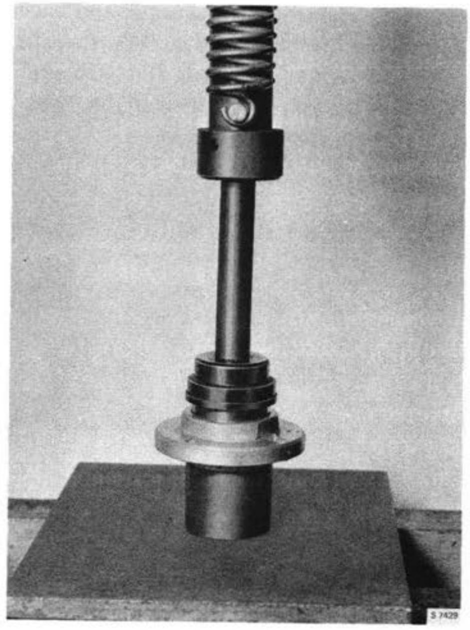
1. Connecting pipe, lubrication
2. Input shaft
3. Ball bearing
4. Race
5. Bearing housing
6. Shims
7. Distance piece
8. Ball bearing
9. Race
10. Chainwheel
11. Nut
12. Rear oil catcher
13. Front oil catcher
14. Bolts

Assembly

1. Press the rear bearing onto the shaft. Use drift 7841075 and the ring-shaped support.

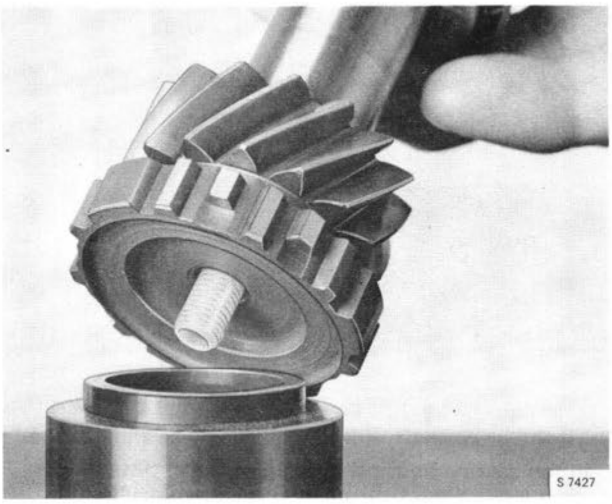


2. Press the bearing races into the bearing housing. Use tool 8390312, 8390189 and the ring-shaped support.

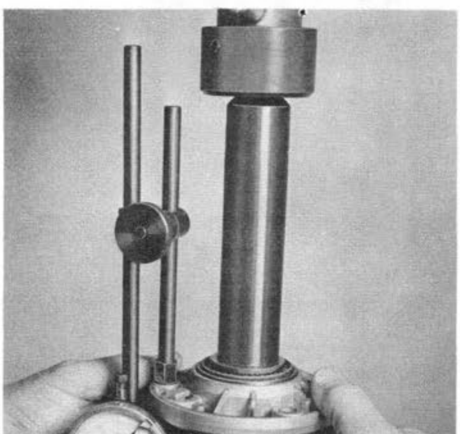


3. Fit the input shaft, shims, distance piece and bearing in the bearing housing. Select shims and distance piece of known size so deliberately giving axial play. Place the shims between the rear bearing and the distance piece.

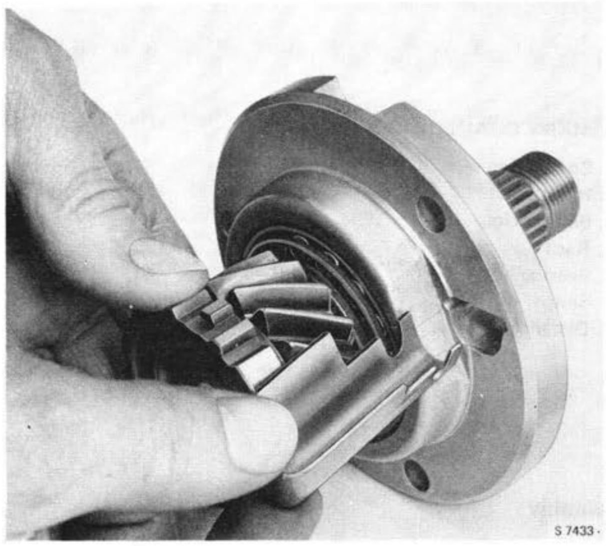
4. Lubricate the bearings and press them together until they meet the distance stop with 3 tons pressure applied.
   While the bearings are being pressed together rotate the bearing housing, against both the upper and lower bearings, 40 times in both directions so that the balls become properly positioned. Use drift 7841075 and the ring-shaped support to avoid damaging the connecting pipes. Maintain the 3 tons pressure.



5. Install the gauge in the bearing housing bolt hole. First put the bearing housing under load on the upper bearing and then on the lower bearing while reading off the axial play.

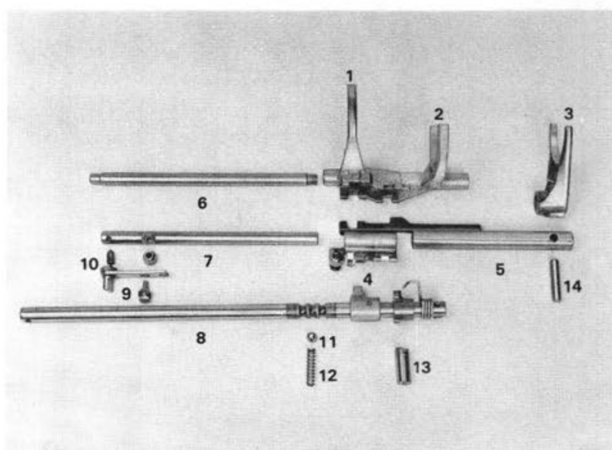


6. Press the front bearing off the input shaft and fit the number of shims estimated. Place the shims between the rear bearing and the distance piece. Refit the front bearing on the input shaft in the bearing housing and press together with 3 tons pressure. Rotate the bearing as described in point 4. Ensure that there is no resistance to movement or play in the bearing.
7. Fit the oil catcher in the bearing housing.



GEAR SELECTOR MECHANISM

The gear selector mechanism consists of a system of selector shafts, selectors, selector forks with plungers, selector balls, ball springs and taper setscrews.

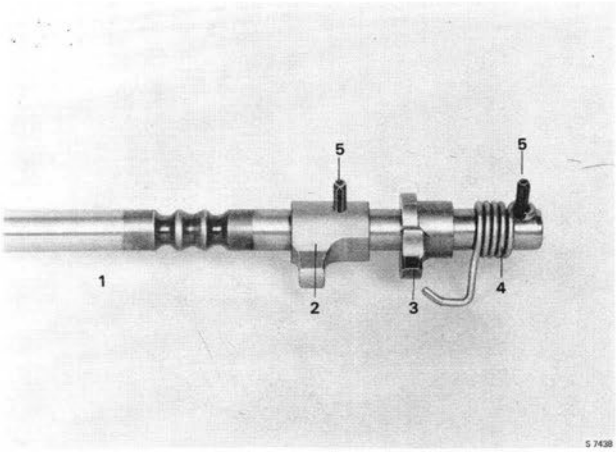


1. Selector fork 1st and 2nd speeds
2. Selector fork 3rd and 4th speeds
3. Selector fork 5th gear
4. Actuator, reverse gear
5. Actuator, 5th gear
6. Shaft, 1st and 2nd, 3rd and 4th speed selector forks
7. Shaft, reverse actuator and 5th speed selector
8. Selector shaft
9. Reverse operating lever
10. Taper setscrew, shaft item 7
11. Ball, selector
12. Spring, ball
13. Plunger
14. Locking stud

SELECTOR SHAFTS

Dismantling

Knock out the dowel with a 4 mm drift. Remove the spring, double lockout and selector.



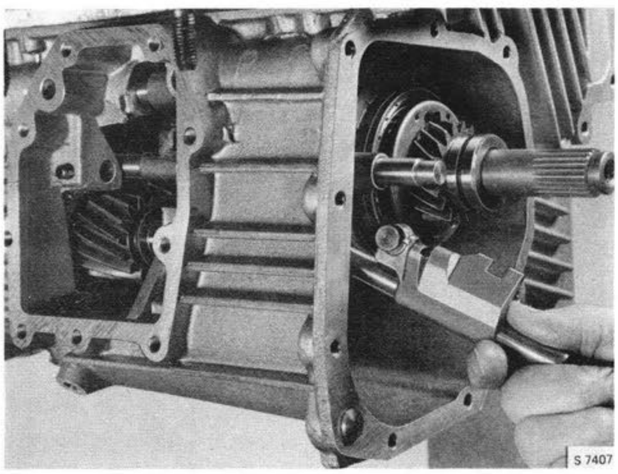
1. Shaft
2. Tooth
3. Double lockout
4. Spring
5. Actuator

Assembly

Assembly is in the reverse order. For positioning of parts see illustration. Fit new dowels.

Reverse actuator and 5th speed selector

Remove the 5th speed selector. The reverse actuator is removed complete with selector shaft.
The countershaft gears and shaft plus the reverse wheel and spindle must also be removed in order to refit the reverse actuator and 5th speed selector.



Remove the axial play by inserting shims. These are available in thicknesses 0.10, 0.15, 0.25 and 0.50 mm. With the correct shims the bearing should not have the slightest resistance to rolling or play. If the axial play cannot be removed by inserting shims, the distance piece is to be replaced. The distance piece is available in the following lengths: 8.08, 8.09, 8.10, 8.11 mm.

Gear selector forks 1st, 2nd, 3rd, 4th and shaft

Se removal, installation

GEAR SELECTOR FORKS 5TH GEAR

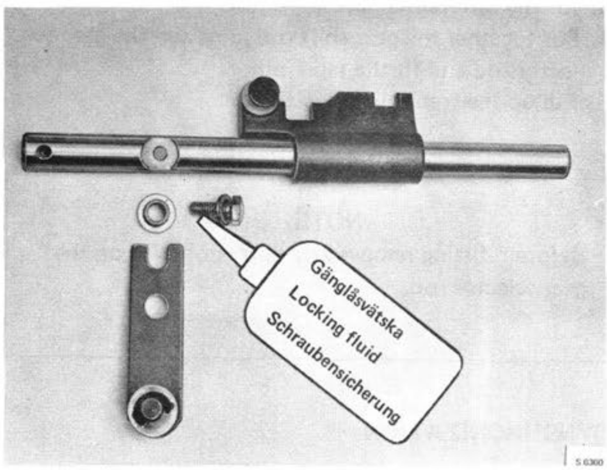
Reverse gear lever, ratchet ball, retaining spring and guide lug.

Dismantling (can be performed with the gearbox in situ or removed from the car)

1. Run off the oil.
2. Remove the gearbox side cover.
3. Remove the double lock out and the ball bearing. Remove the ball using a magnetized rod.
4. Remove the reverse operating lever pivot bolt and remove the lever from the actuator.
5. Push the reverse actuator rearwards on its shaft and let it hang downwards.
6. Remove the primary gear housing side cover.
7. Remove the taper setscrew from the selector fork.
8. Rotate the 5th speed selector so that it points outwards and then push it rearwards until it stops. The fork can now be released from the shaft and removed.

Installation

Assembly is in the reverse order. Lock the reverse operating lever pivot bolt with locking fluid.

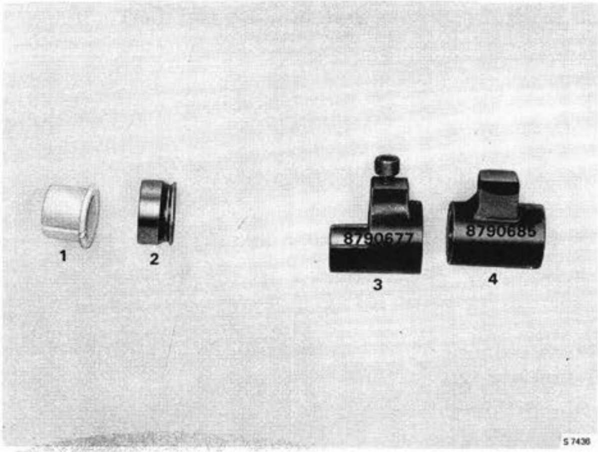


REPLACING THE SEAL AND PLASTIC BEARING ON THE GEAR SELECTOR ROD

(Can be done in car or on a removed gearbox)

Removal

1. Knock off the front taper pin from the gear shift joint and separate the joint from the rod.
2. Pull off the rubber bellows from the collar on the sealing ring.
   As from gearbox No. 780678 (with metal cover on differential housing), the differential housing cover must also be removed when the sealing ring is to be changed.



1. Plastic bushing
2. Sealing ring
3. Removing tool
4. Installing tool

3. Put the removing tool 8790677 over the collar on the sealing ring and screw in the screw of the tool against the shaft.
4. Pry off the sealing ring with the aid of a screwdriver held between the tool and one of the screw heads on the rear cover.
5. The plastic bearing is now accessible for dismantling.

Fitting

1. Fit the plastic bearing.
2. Fit the new sealing ring with the aid of installing tool 8790685 and a suitable hammer.
3. Fit the differential housing cover.
4. Put together the gear shift rod joint and the gear selector rod and fit the taper pin.
5. Fill up the transmission with oil.

NOTE

Before refitting remove any burrs or marks on the gear selector rod.

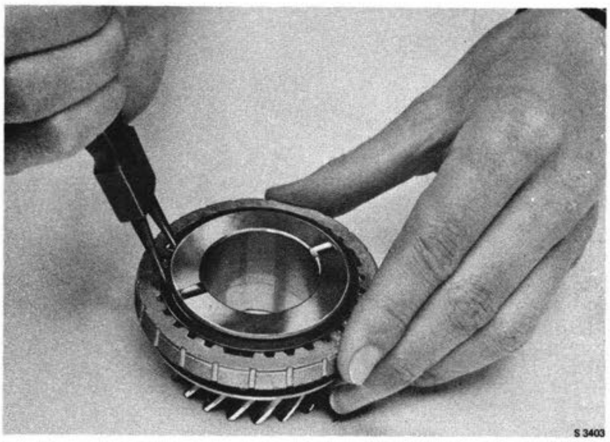
SYNCHRONIZATION

Synchronizing rings

When changing the synchronizing rings, follow the instructions for the dismantling of the gear box. The differential unit must be removed and the intermediate gear disconnected so that the primary gear housing can be removed. When changing the synchronizing ring for top gear, no further dismantling is necessary.
When changing the synchronizing ring for 1st and 2nd gear, the pinion shaft must be taken out of the transmission housing, so that the gears can be removed from the shaft.
The 5th speed synchro cup can be replaced once the input shaft has been removed. It is consequently not necessary to remove the primary gear housing.

Disassembling

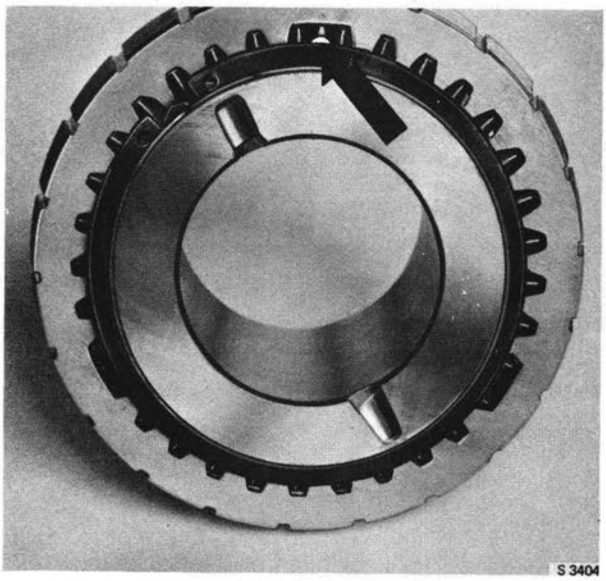
The synchronizing ring is removed by undoing the lock ring which attaches the synchronizing ring to the gear. The 5th speed synchro cup is dismantled by removing the circlip in front of the guide ring. The circlip retaining the synchro cup should not be removed.



REMOVING THE SYNCHRONIZING RING FOR 3RD GEAR

Assembling

First fit the guide rings for the retaining springs, and the lock rings for the guide rings on 3rd and 4th gear. First and second gear have no lock rings for the guide rings. The retaining spring is fitted with a long wire end nearest the guide ring, and the spring is placed so that there are eleven teeth between the ends of the spring. The zynshronizing ring is placed so that the ends of the retaining spring fit into the spaces between the teeth, after which the lock ring is fitted.

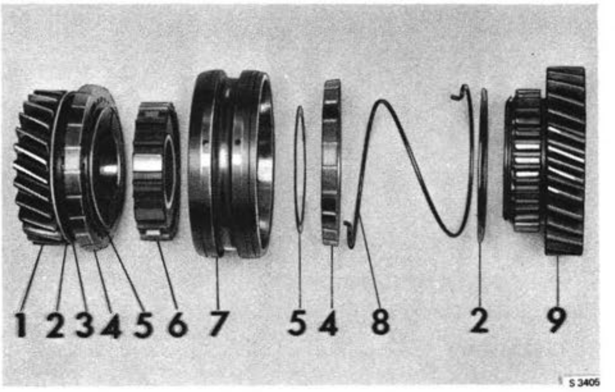


POSITIONING OF A SPRING END IN THE SPACE BETWEEN THE TEETH OF THE RING

> CAUTION
> The guide rings on the third and fourth gears are assembled during production and are peened in position by a special tool after the lock ring has been fitted. The guide rings supplied as spare parts should not be peened.

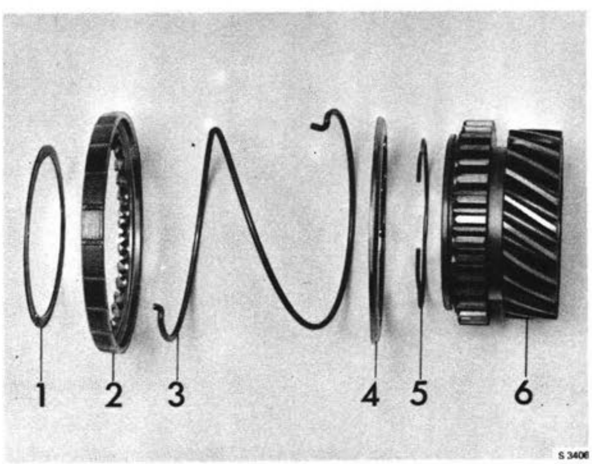
Fit the 5th speed synchro ring. The retaining spring should be positioned so that there are 5 teeth between the ends of the spring. Then fit the guide ring and the circlip.

> NOTE
> The 2nd speed synchro cup has its synchronizing surface covered with molybdenum and this, together with a difference in the machining, enables it to be distinguished from the other synchro cups.



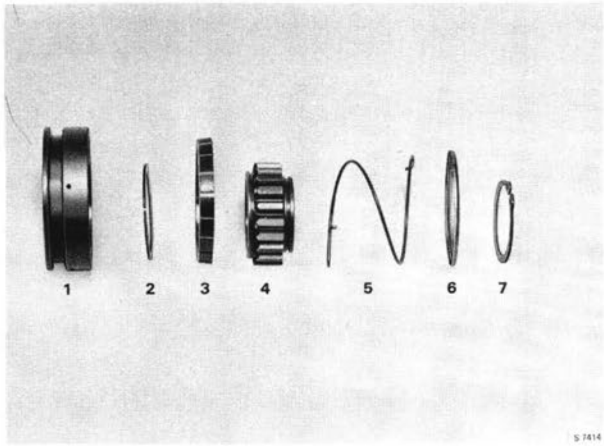
SYNCHRONIZATION, 1ST AND 2ND GEARS

1. 2nd gear
2. Guide ring
3. Retaining spring, 2nd gear
4. Synchronizing ring
5. Lock ring
6. Synchronizing hub
7. Coupling muff
8. Retaining spring, 1st gear
9. 1st gear



SYNCHRONIZATION, 3RD GEAR

1. Lock ring
2. Synchronizing ring
3. Retaining spring, 3rd gear
4. Guide ring
5. Lock ring guide ring
6. 3rd gear



1. Operating sleeve
2. Circlip
3. Synchro cup
4. Synchro hub
5. Retaining spring
6. Guide ring
7. Circlip

VENTILATION

Ventilation of the transmission is by means of a hole through the top cover in the primary gear. The hole emerges at the centre of a plastic propeller which is bolted to the clutch shaft.
As the clutch shaft rotates, the oil is flung away from the hole by the propeller.
When the shaft is stationary, the oil level in the primary gear is considerably below the hole.
With effect from transmission numbers 649792 (cars from the latter half of 1975 model), a washer has been installed between the vent cover and the bearing. This is to prevent leakage occurring as a result of the oil level having been raised in the primary gear housing.

DISASSEMBLY, ASSEMBLY,

ADJUSTMENT

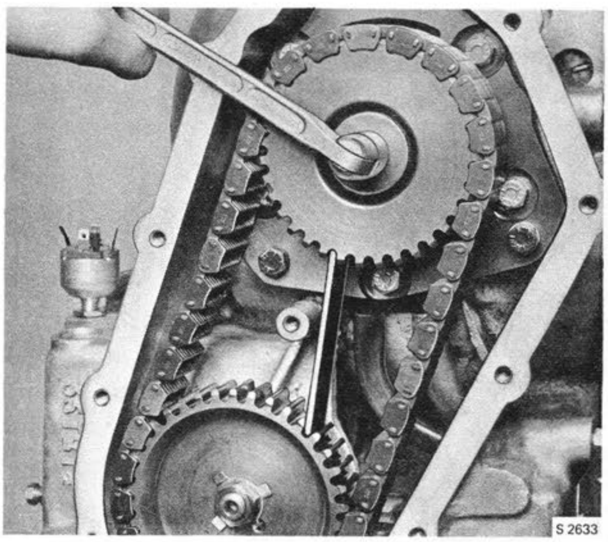
Automatic transmission

Concerning removal and installation of power plant, see section 442.

The following special operations are described at the end of this section:
- Dismantling and checking the governor (transmission in car)
- Dismantling and assembling the valve housing (transmission in car)
- Dismantling and fitting the front band and rear clutch.

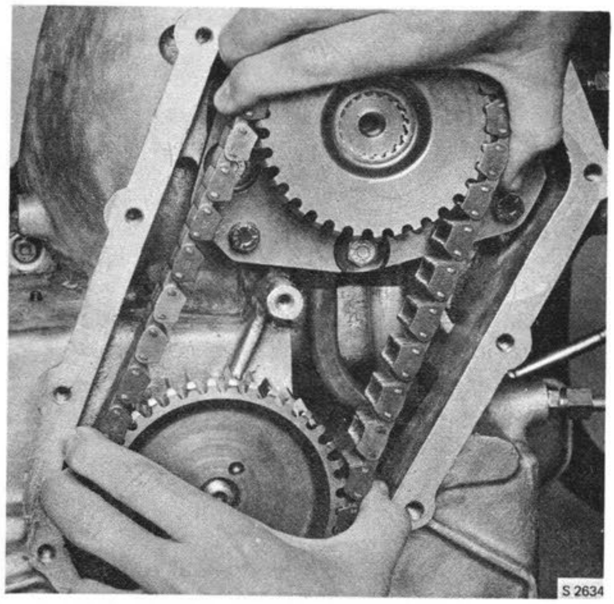
DISASSEMBLY

1. Drain oil.
2. Invert gearbox and remove front and rear bottom covers.
3. Remove front cover.
4. Undo retaining screw and nut for sprocket wheels, using tool 8790230 to lock.



UNDOING THE SCREW FOR PRIMARY GEAR
Support 8790230

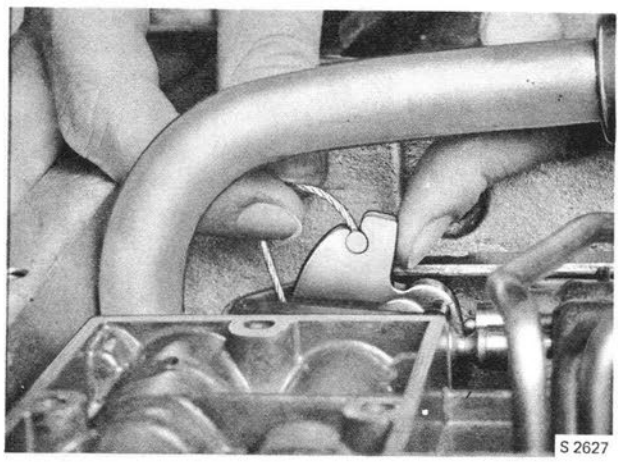
5. Remove the wheels.



REMOVING THE PRIMARY GEAR

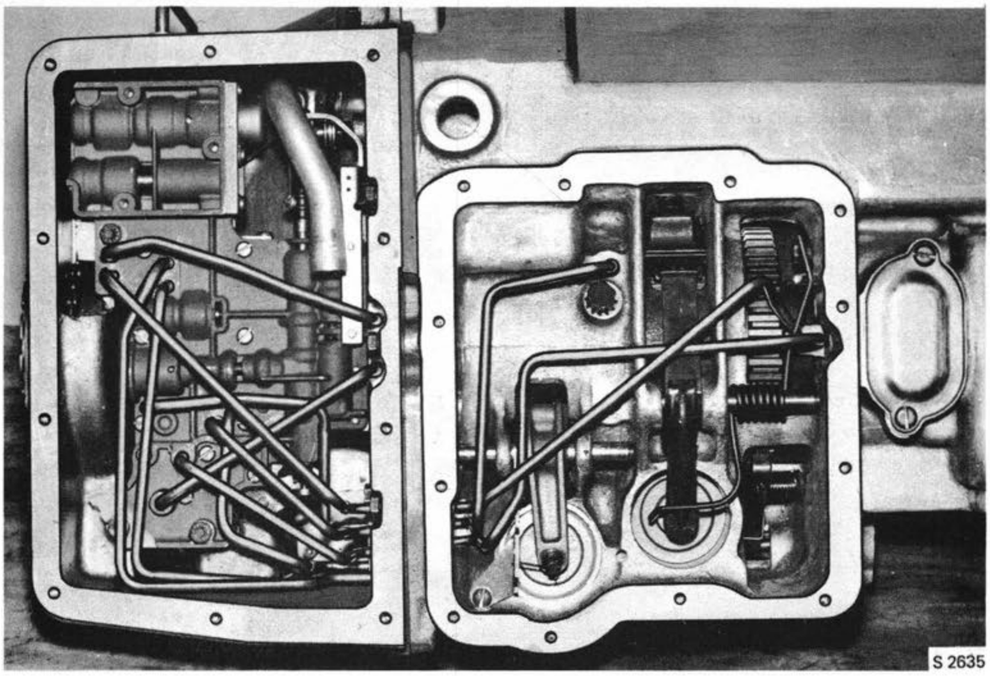
> NOTE
> Gear unit axial clearance must be checked before each disassembly.

6. Remove cover on right-hand side.
7. Disconnect throttle valve control cable.

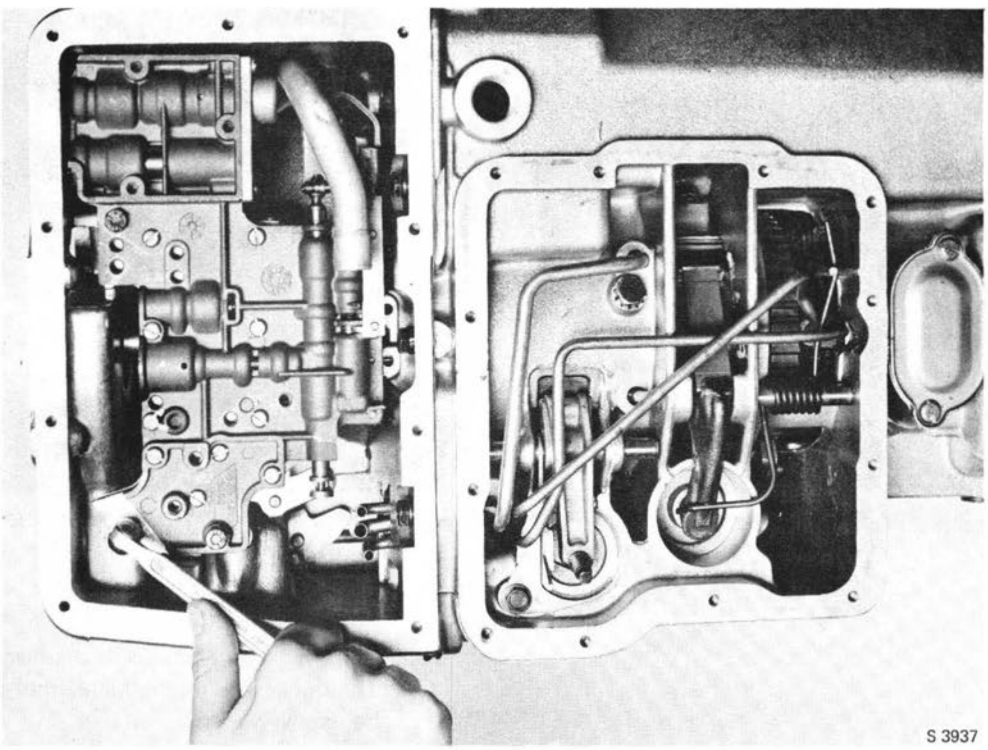


REMOVING THE THROTTLE CABLE FROM VALVE HOUSING

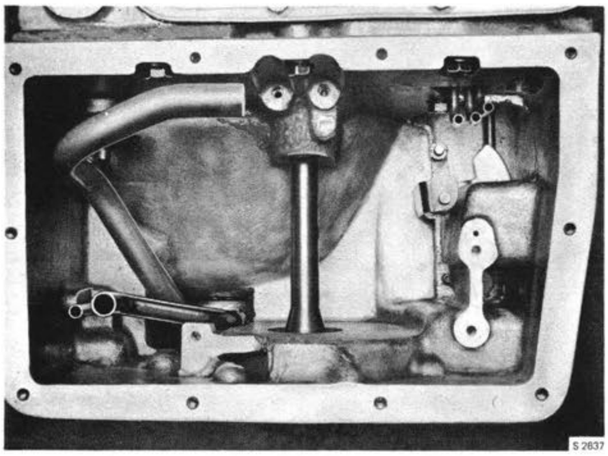
8. Remove all oil pipes inside the front bottom cover. The three pipes inside the rear bottom cover is to be removed later.
9. Undo the three retaining screws from the valve housing, lift the housing straight up and remove the two large oil pipes from the pump.



LOCATION OF OIL PIPES

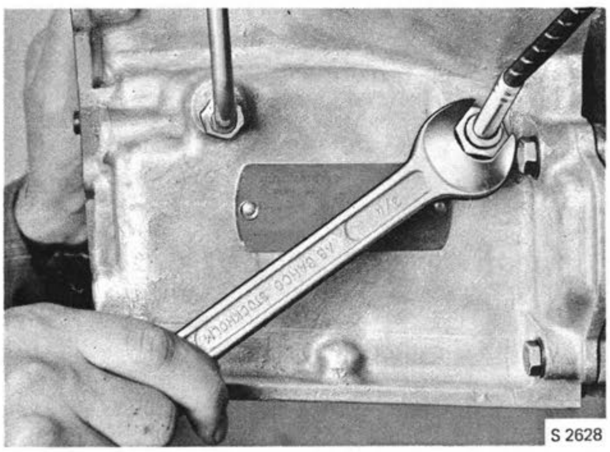


REMOVING THE RETAINING SCREWS OF THE VALVE HOUSING



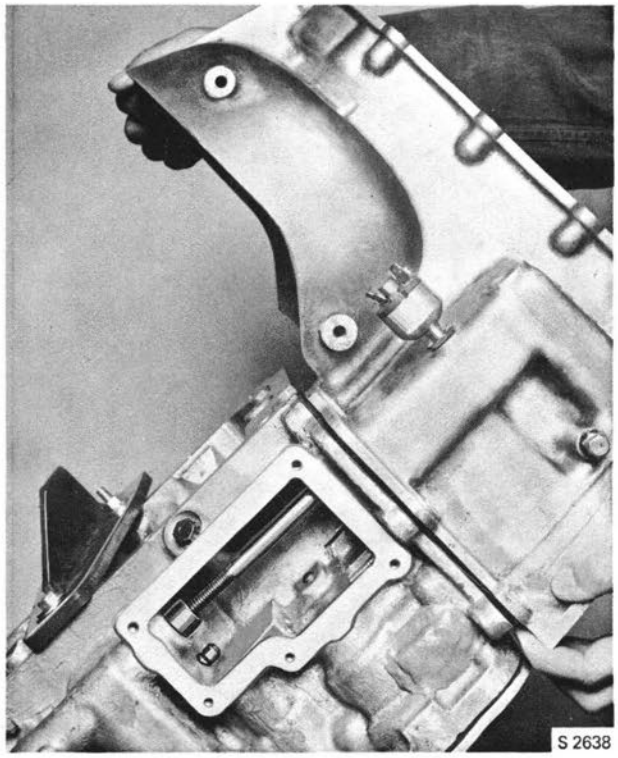
OIL PIPE BETWEEN VALVE HOUSING AND OIL PUMP

10. Turn gearbox right way up, undo the three oil pump retaining screws, and remove the pump. Lift the torque converter at the same time to make the work easier.
11. Lift out the torque converter.
12. If necessary, disconnect throttle cable.



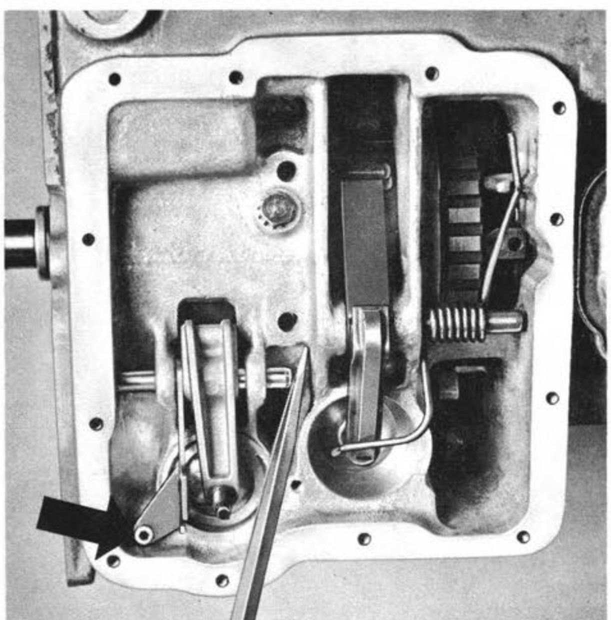
REMOVING THROTTLE CABLE FROM TRANSMISSION CASING

13. Remove retaining screws from torque converter housing (five outside and five inside).
14. Before lifting out the housing, pull the gear selector rod as far forward as possible. Remove the three remaining oil pipes and at the same time remove the converter housing.



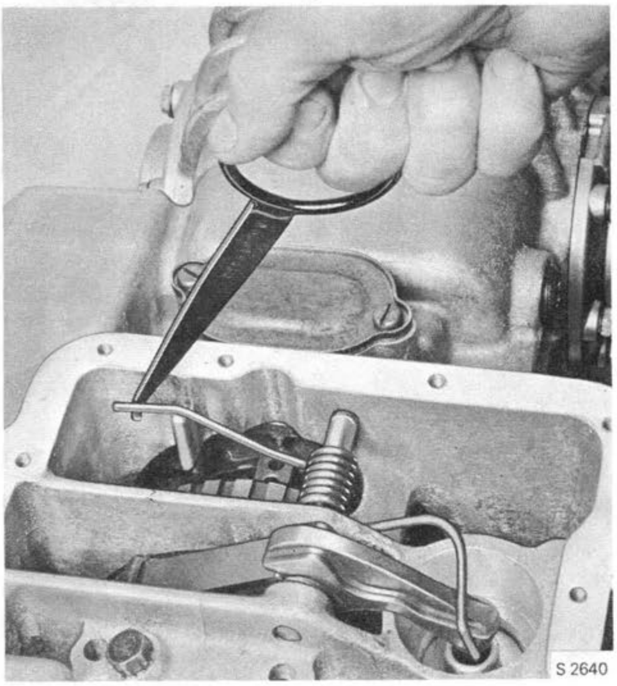
REMOVING TORQUE CONVERTER HOUSING

15. Remove gasket.
16. Undo automatic adjustment screw, see illustration.
17. Remove front band lever shaft.



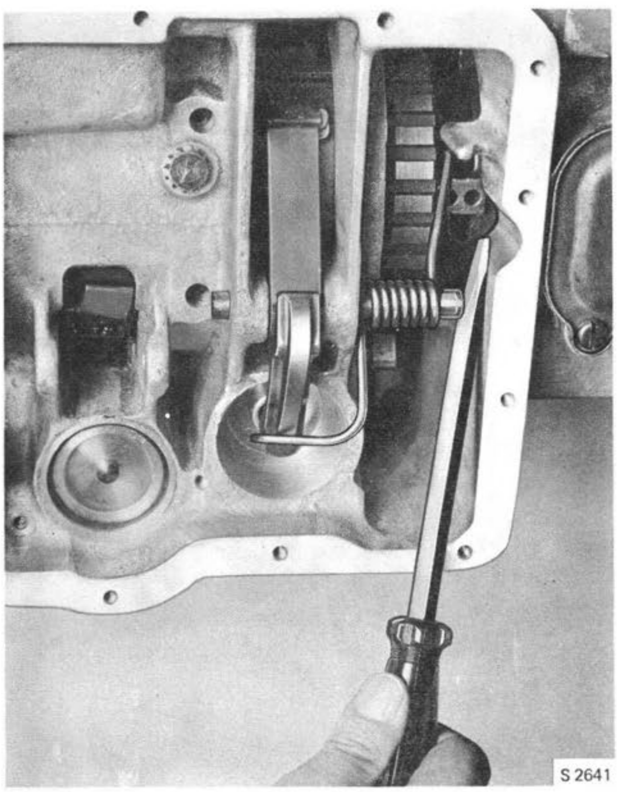
REMOVING FRONT BAND LEVER SHAFT

18. Unhook rear band spring.



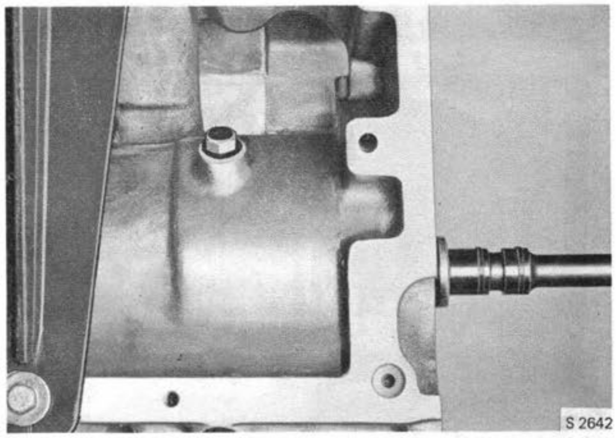
REMOVING THE SPRING

19. Remove rear band lever shaft, removing the spring at the same time.



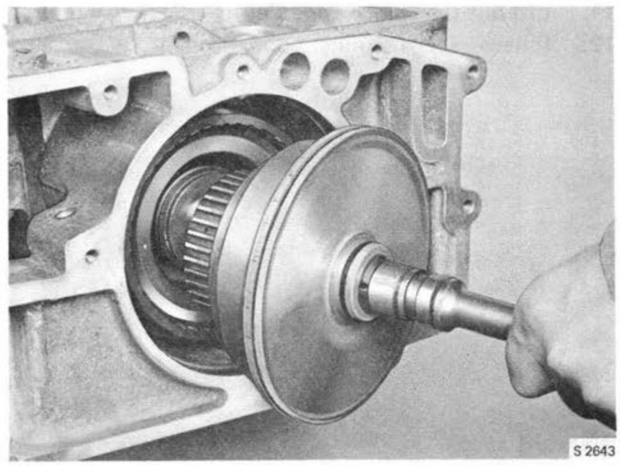
REMOVING REAR BAND LEVER SHAFT

20. Undo the three screws securing the centre support. Note that the screw in the engine oil sump is provided with a rubber gasket.



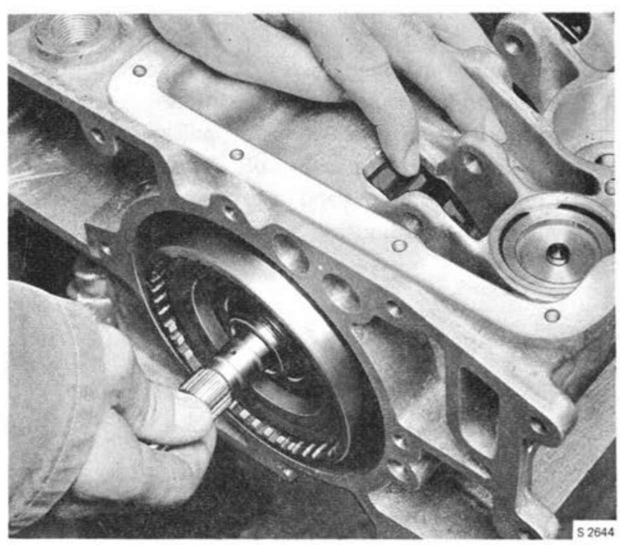
SCREW FOR CENTRE SUPPORT

21. Remove the front clutch. Take care of the axial washer (washers). There are two different designs, the one washer of the later design is thicker and supersedes the two washers on the earlier design as spare part.



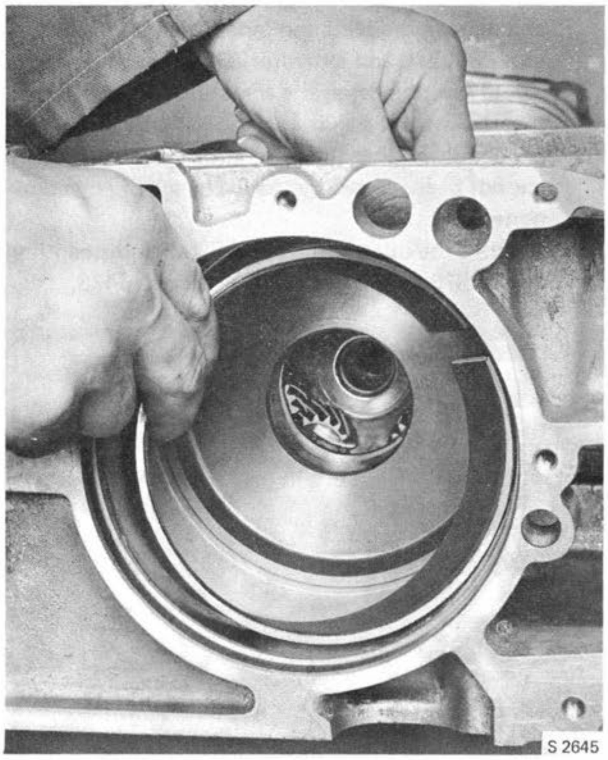
REMOVING THE FRONT CLUTCH

22. Remove the rear clutch with the shaft for the forward sun gear, holding the front band securely to prevent it from falling over.



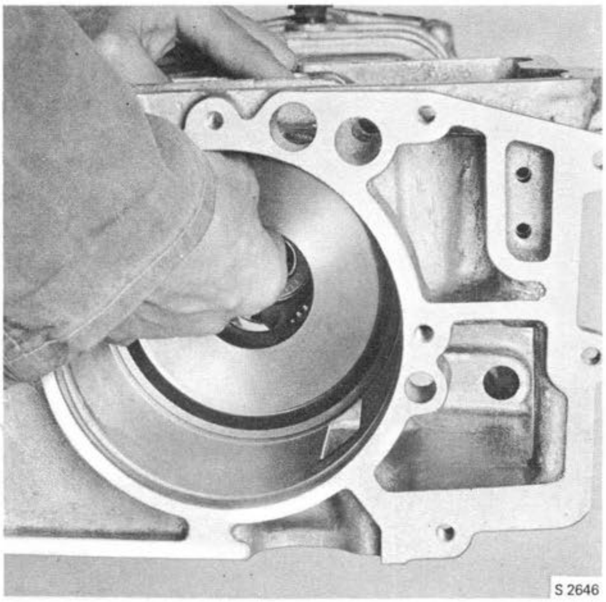
REMOVING THE REAR CLUTCH

23. Remove front band.



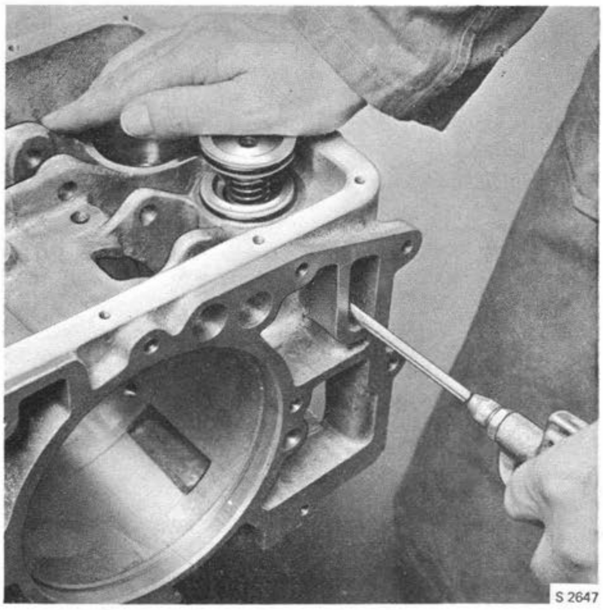
REMOVING THE FRONT BAND

24. Remove centre support, holding the planet carrier in place by compressing the rear band.



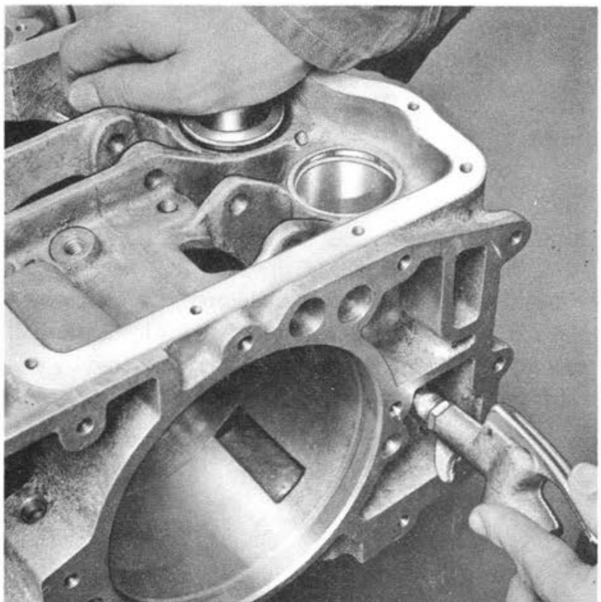
REMOVING THE CENTRE SUPPORT

25. Remove the planet carrier, save the thrust washer and bearing.
26. Remove rear band.
27. Remove the ring gear (valid only for earlier design). On automatic transmissions of later design the ring gear is removed together with the pinion bearing housing.



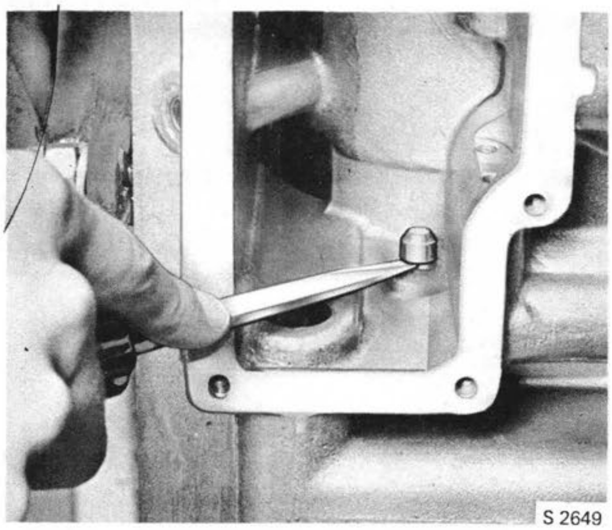
REMOVING THE FRONT PISTON

28. Dismantle lock ring from front piston and remove the piston with aid of compressed air.
29. Remove the rear piston with aid of compressed air.

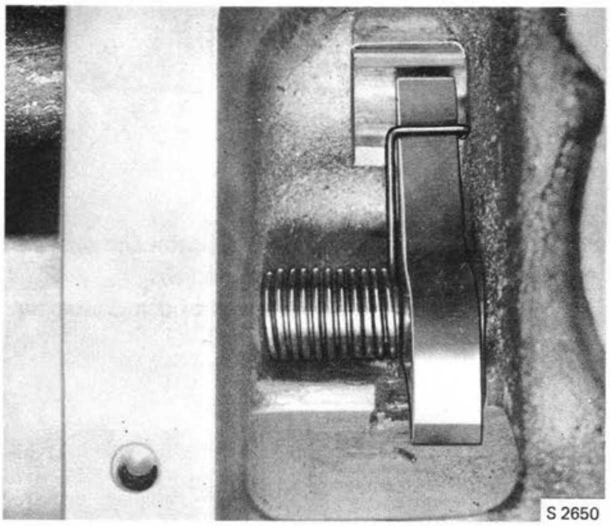


REMOVING THE REAR PISTON

30. If necessary dismantle the parking pawl shaft and remove the parking pawl and spring.



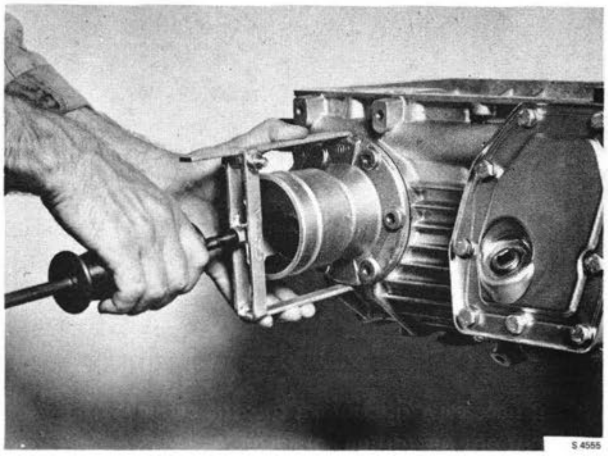
REMOVING THE PARKING PAWL SHAFT



PARKING PAWL

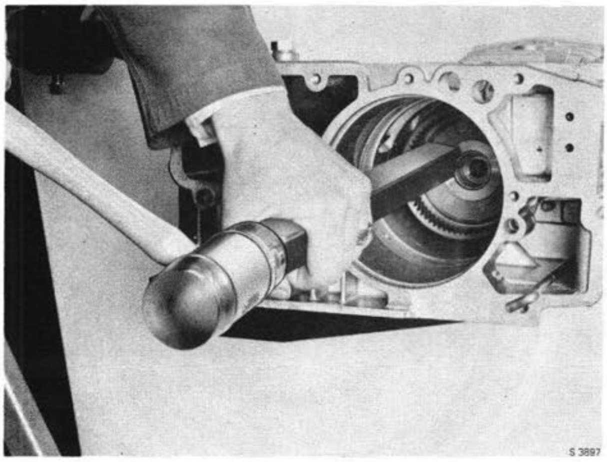
> NOTE
> If overheating or the like has occurred, the differential and pinion must be disassembled for inspection of the front pinion bearing, which is lubricated by oil from the automatic transmission.

31. If necessary take off bearing houses and remove differential and pinion shaft as stated below. Remove the differential bearing seat retaining screws and remove the seats and inner driver by means of tool 8390270 and extractor 8790776. Save the spring and plunger at the shaft ends of the drivers together with the shims, which will be reused on the condition that the differential gear backlash has not been altered by the exchange of any components.
Remove the differential assembly. For dismantling of the differential assembly, see section 473.



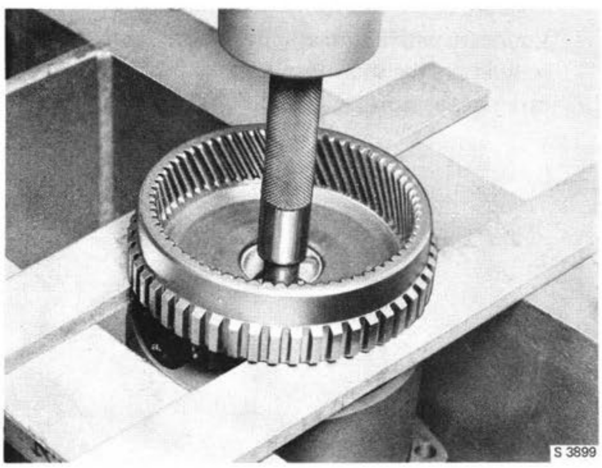
REMOVING DIFFERENTIAL BEARING SEATS
Puller 8790776, tapping-out hammer 8390270

32. The pinion and its bearing housing are removed as follows:
Undo the four screws securing the pinion bearing housing and free the housing by tapping gently, using a wooden drift to avoid damaging the surfaces.



REMOVAL OF PINION BEARING

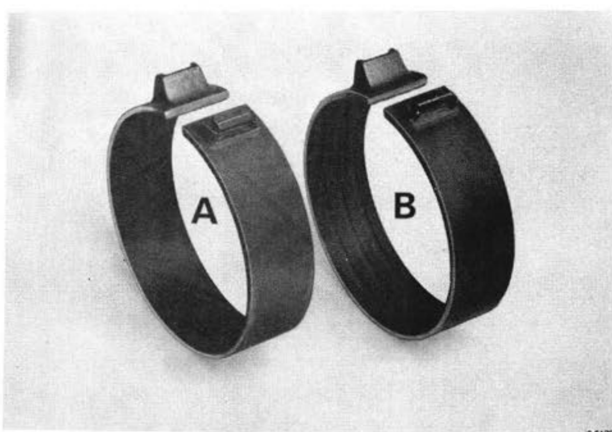
33. Place the ring gear and the pinion bearing housing in a press and use the press to separate the splines of the ring gear hub and the pinion. The press drift and its retainer 8790610 are introduced through the hole in the ring gear hub so as to make contact with the pinion. See illustration.



SEPARATION OF RING GEAR AND PINION UNDER PRESSURE
Drift 8790610

ASSEMBLY

1. The following procedure should be used when pressing the ring gear hub and the pinion together. Lubricate the seal rings with automatic transmission oil and ensure that they move freely in their grooves. Slacken the two screws holding the seal housing and hold the housing away from the seal rings, while pressing the ring gear and the pinion together to avoid damaging the seal rings.
2. Screw the seal housing to the pinion bearing housing using the two screws.
3. Fit the O-ring on the pinion housing.
4. Screw in the locating studs 8790222 and put on the necessary number of shims. Locate the pinion housing and tighten the screws to the correct torque.
5. If the parking pawl previously has been removed, fit parking pawl and spring and put in the shaft so that the spring will be locked in the shaft groove.
6. Invert the transmission casing so that the underside is uppermost.
Automatic transmission of earlier design: Check that the seal rings on the ring gear turn freely in their grooves. Lubricate the ring gear with automatic transmission oil and refit it. Fit the rear brake band.
There are two types of rear brake band: One serrated and the other smooth. Note: The smooth

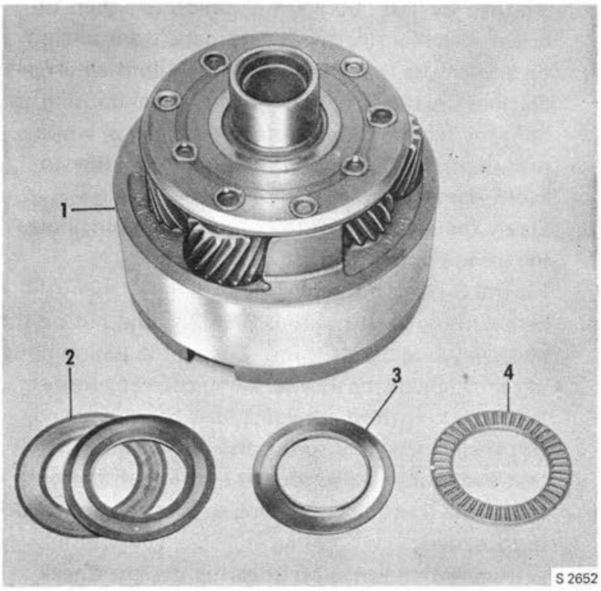


A. BRAKE BAND WITH SMOOTH SURFACE FOR REAR DRUM
THE FOLLOWING DESIGNATIONS MAY OCCUR: 004 N, 3004 OR 1606
B. BRAKE BAND WITH THREE GROOVES FOR FRONT DRUM
DESIGNATION: 005 K

band is very similar to the front band but must not be confused with it. (As from model 1976, the front brake band is serrated.) The smooth rear band has "1606" stamped on the outside.

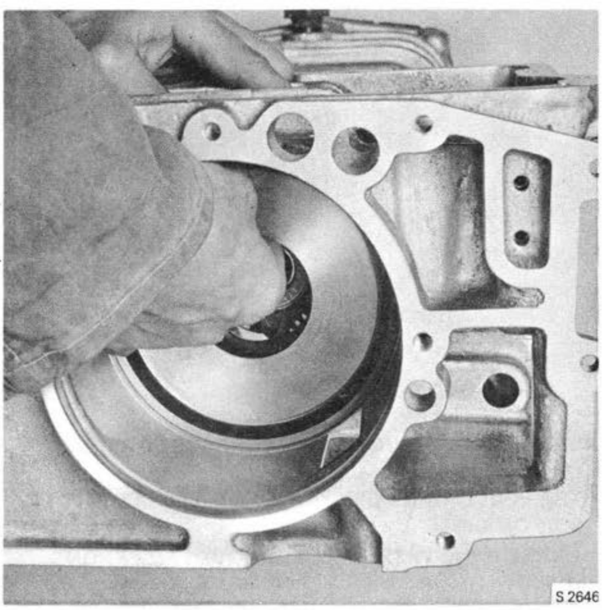
7. Place the shims, thrust bearing and thrust needle bearing on the planet gear carrier. Grease the small thrust bearing washer and the sun wheel rear thrust needle bearing with vaseline and attach tehm to the inside of the planet gear carrier. NOTE! The flange on the small thrust bearing washer must point inwards the planet gear carrier.

8. Fit the planet gear carrier and centre support.



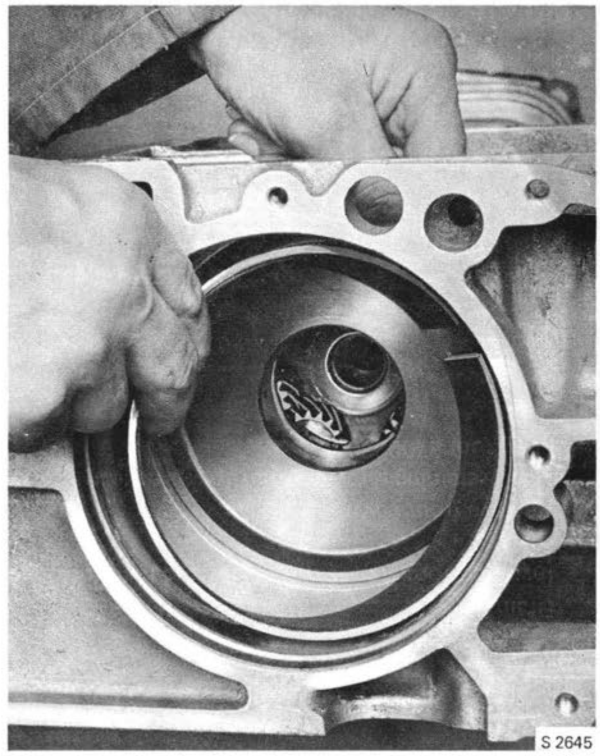
PLANET GEAR CARRIER WITH SHIMS AND THRUST NEEDLE BEARING

1. Planet gear
2. Shims
3. Thrust bearing washer
4. Thrust bearing



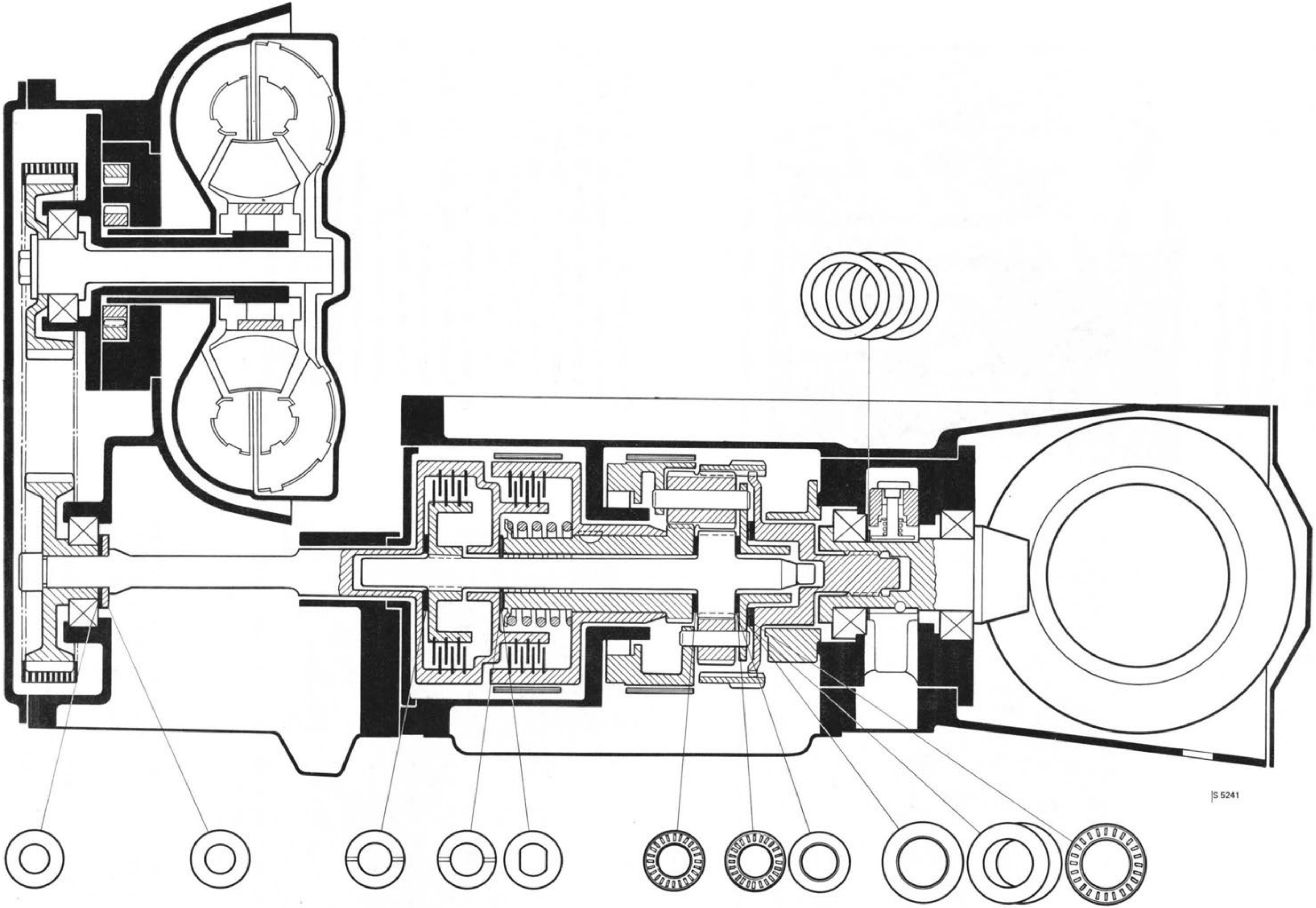
FITTING THE CENTRE SUPPORT

9. Fit the front brake band. As from model 1976, the front brake band is serrated.



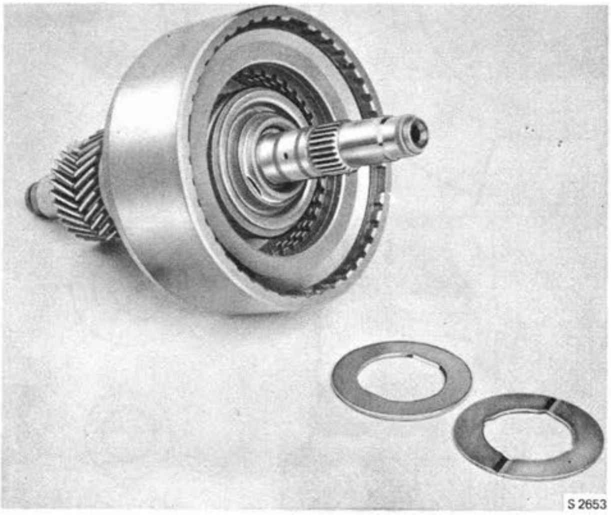
FITTING THE FRONT BAND

10. Place the thrust needle bearing between the two sun wheels on the rear sun wheel shaft. Use Vaselin to keep the bearing in place. Check that the seal rings are intact and move freely in their grooves. Lubricate with automatic transmission oil. Carefully insert the shaft through the rear clutch, taking care not to damage the seal rings.

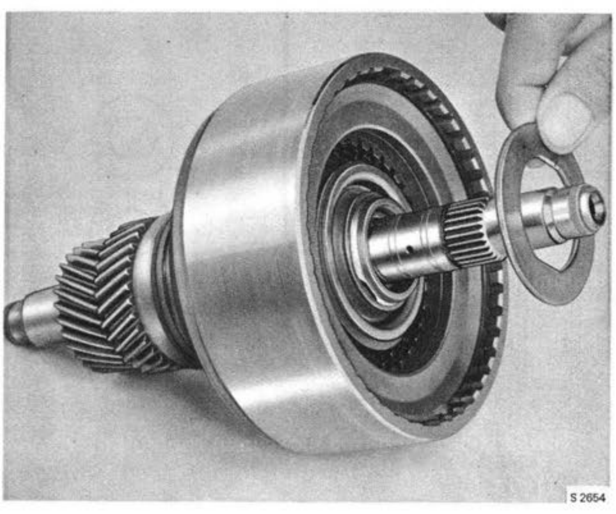


SHIMS, THRUST BEARING AND THRUST BEARING WASHER

11. Locate the steel washer (with the two flat sides in the hole) on the rear clutch hub. Mount the bronze washer and the front clutch.



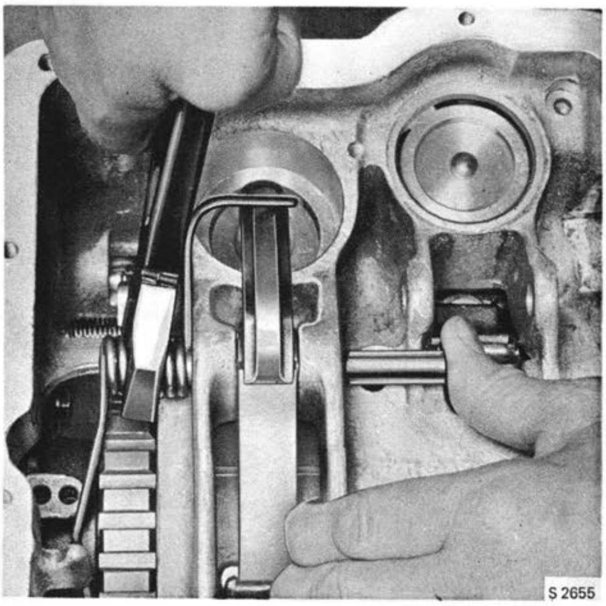
REAR CLUTCH HUB WITH WASHERS, EARLIER DESIGN



LOCATION OF THE WASHER ON REAR CLUTCH HUB, EARLIER DESIGN

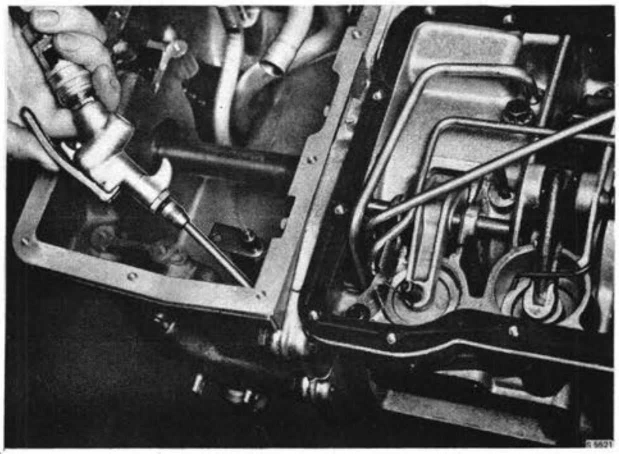
12. Insert the complete clutch assembly (front and rear clutch) and fit the end plate. Check that the O-ring is in place and intact. Check also the small O-ring on the hub of the end plate.
13. Clean, inspect and if necessary exchange pistons and piston seals. Lubricate the servo pistons and insert in the servo cylinders.

14. Place the long pressure rod against the rear band, place the lever in pǒsition and insert the shaft from side, at the same time holding the spring in place so that the shaft engages. NOTE! One end of the spring must lie against the lever throughout to avoid scratching the cylinder.



FITTING SHAFT AND SPRING FOR LEVER REAR BAND

15. a. Place the short pressure rod against the front band, place the lever in position, and place the automatic adjustment carrier against the front band. Insert the shaft from the side through the carrier and lever simultaneously. Adjust the spring on the adjusting screw so that it lies 1.5–2 thread flights from the lever.
    b. Make basic adjustment of front and rear band. See section "Front band, adjustment" resp. Rear band, adjustment".
    Check the function of the automatic adjustment by repeated operation of the servo for the front brake band by means of compressed air. The adjusting screw should therewith be turned towards the stop (when initially unadjusted). Poor functioning may be caused by the threads sticking or insufficient force exerted by the adjusting spring.

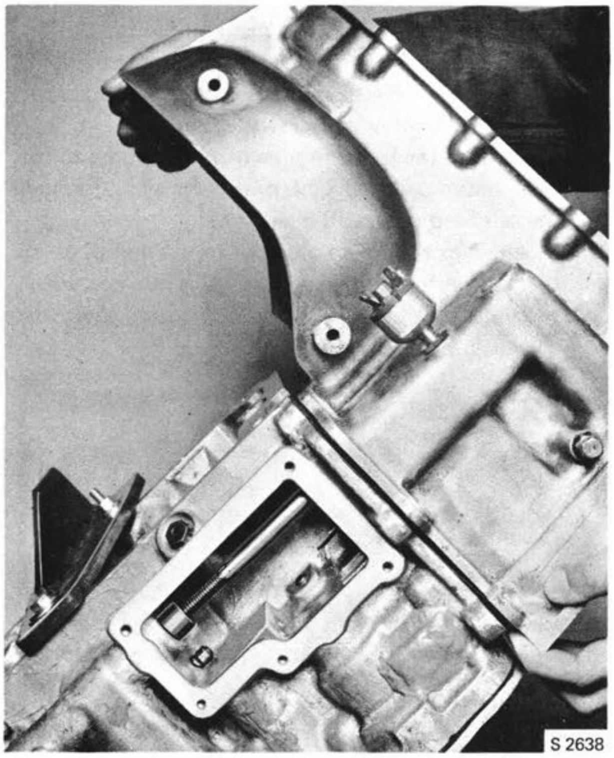


CHECKING THE AUTOMATIC ADJUSTMENT BY FORCING COMPRESSED AIR THROUGH THE HOLE FOR APPLYING THE SERVO

To ensure that the correct axial play is obtained in subsequent measuring, the bearing in the torque converter housing should be tapped up to its lock ring. (In transmissions of later design, the outer ring of the bearing is accessible through two holes in the torque converter housing.)

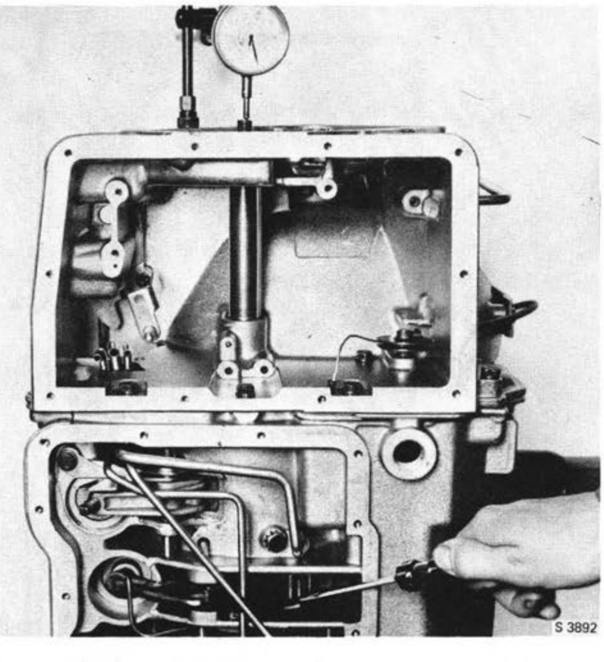
16. Place the gasket for the torque converter housing in position. Mount the housing while simultaneously fitting the contact washer onto the input shaft and the three pipes inside the rear bottom cover. See page 472–13.
    The washer must be located between the bearing and the step on the input shaft. Tighten the screws to the specified torque. Fit the lower sprocket so as to true up the shaft radially.

NOTE
Do not tighten the sprocket wheel before checking the play in the gear train.



FITTING TORQUE CONVERTER HOUSING

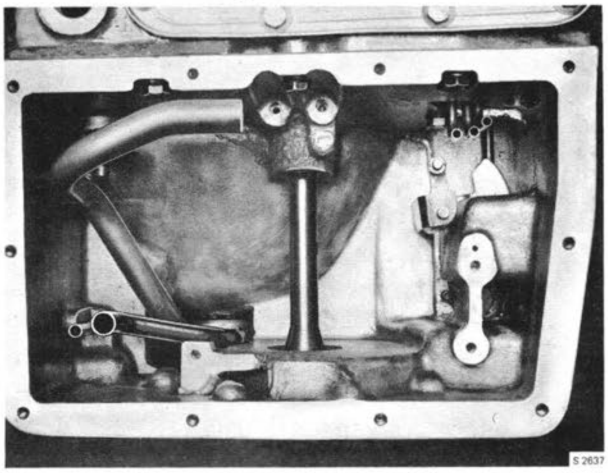
17. Mount the indicator dial and prize up under the planet carrier with a screwdriver. The play should be 0.01–0.03" (0.25–0.75 mm); if it is not within these limits, adjust by shimming between the ring gear and the forward sun gear, or between the washer and bearing on the input shaft.



MEASURING THE PLAY

18. Mount the torque converter and oil pump. This must be done with great care to avoid damaging the seal ring. Tap the pump housing with a plastic mallet and tighten the screws.
Check that the pressure pipe from the pump to the valve housing not have become deformed. Compare the removed pipe with a new one.

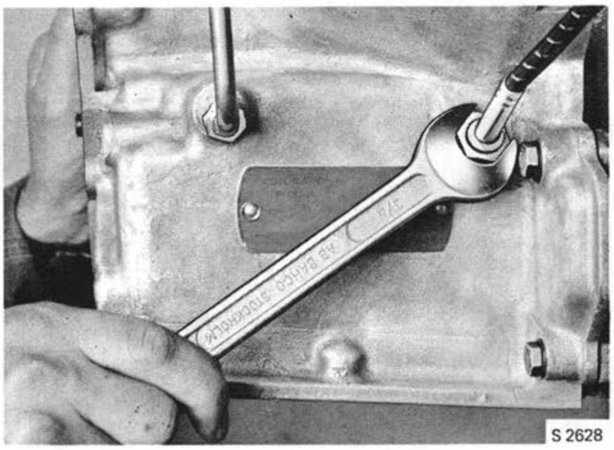
19. Fit the two wide-bore oil pipes to the pump. Check that the O-ring to the suction line is in place. Fit the short pipe between the valve housing and torque converter housing.



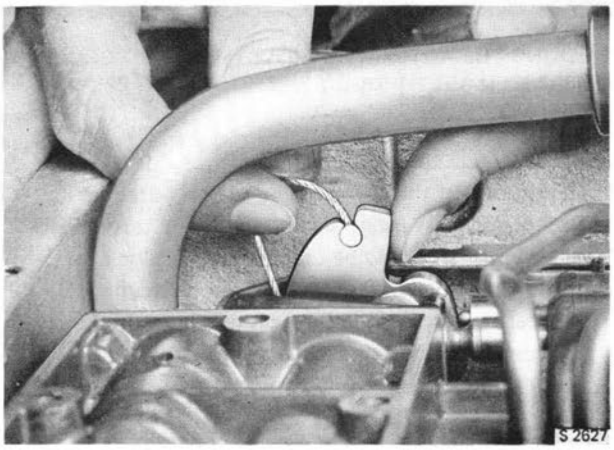
OIL PIPE BETWEEN VALVE HOUSING AND OIL PUMP

The suction line is secured by means of two clips on later version transmissions.

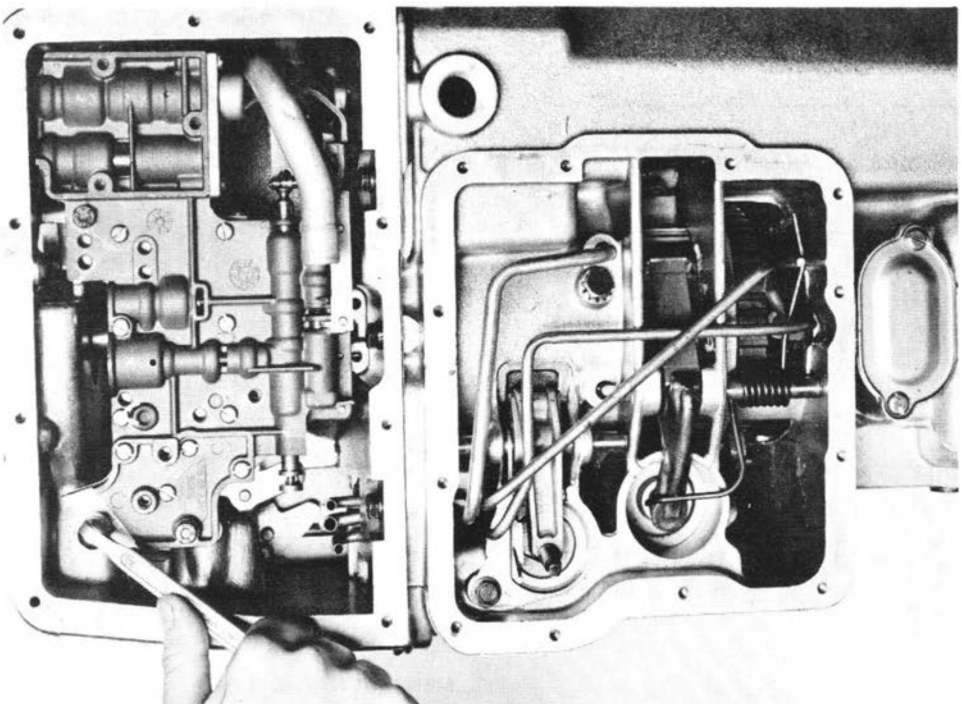
20. Locate the valve housing and check that the pipes engage the housing. Check that the manual gear selector is connected.



FITTING THE THROTTLE CABLE



FITTING THE THROTTLE CABLE TO VALVE HOUSING



FITTING VALVE HOUSING

SAAB

21. Secure the throttle valve wire and connect the inner wire.
22. Tighten the three screws securing the valve housing.

The following pipes are fitted on conjunction with step 16 (in the following order):

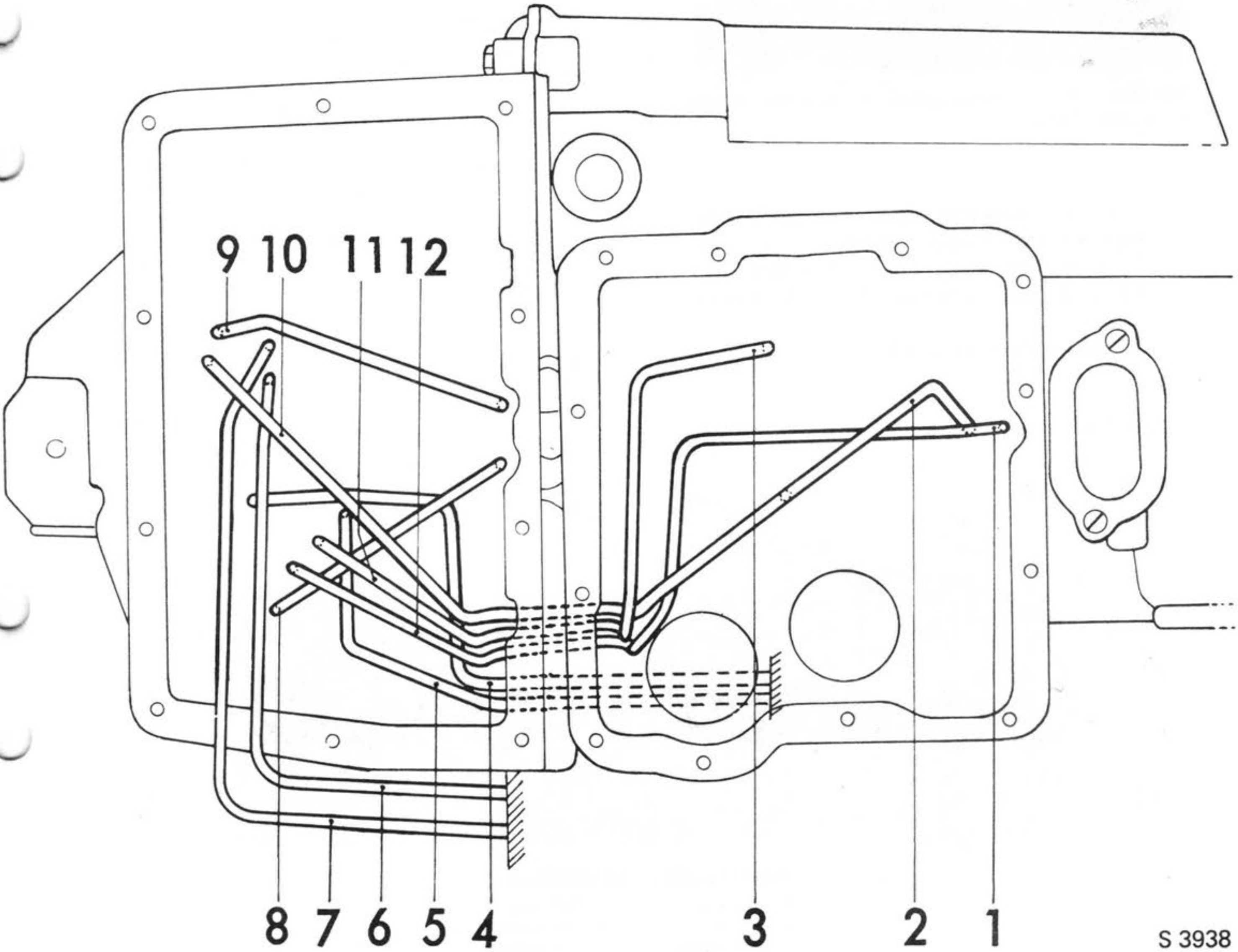
Return from the governor	No. 1
Main lubrication	No. 2
Rear clutch	No. 3

These are located under the rear bottom cover.

23. Fit the remaining oil pipes in the following order:

Oil pipe for rear brake band (inner hole)	No. 4
Oil pipe for rear brake band (outer hole)	No. 5
Oil pipe for front brake band (application, "lower" hole in inverted transmission)	No. 6
Oil pipe for front brake band (releasing, "upper" hole in inverted transmission)	No. 7
Front clutch and governor	No. 8
Front lubrication	No. 9

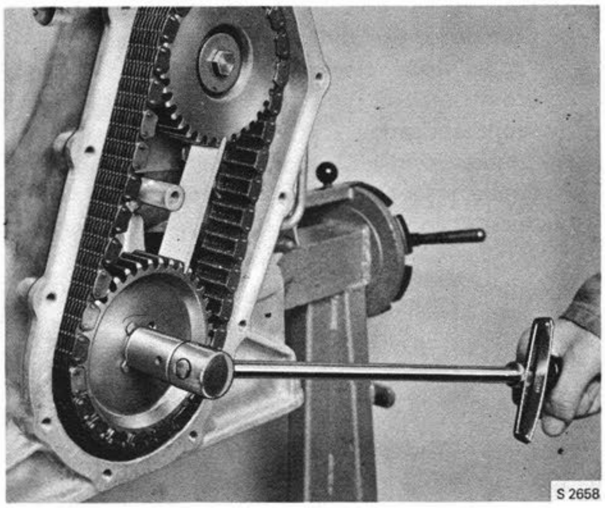
Connect main lubrication from No. 2 to No. 10
Connect rear clutch from No. 3 to No. 11
Connect governor return line from No. 1 to No. 12



FITTING OIL PIPES

1. Return line from governor
2. Main lubrication
3. Rear clutch
4. Rear brake band, inner hole
5. Rear brake band, outer hole
6. Front brake band, application "lower" hole (transmission inverted)
7. Front brake band, releasing "upper" hole (transmission inverted)
8. Front clutch and governor
9. Front lubrication
10. Main lubrication from 2
11. Rear clutch from 3
12. Return line-governor from 1

24. Fit the chain and sprockets and tighten.

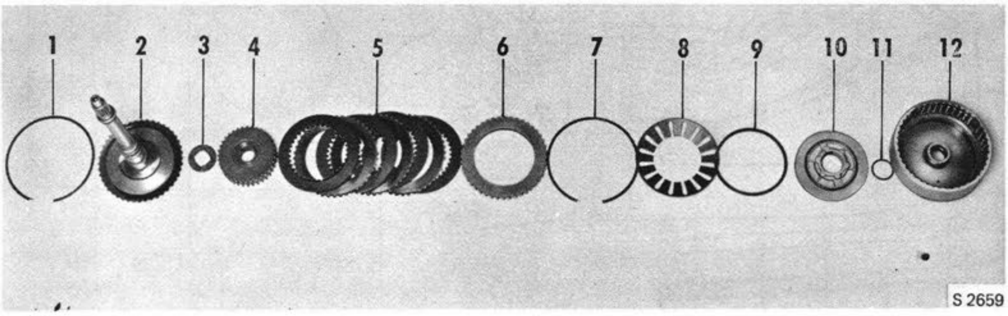


TIGHTENING THE SPROCKET, THE WHEELS ARE LOCKED WITH TOOL 8790230

25. Mount the pinion shaft, crown wheel and differential assembly with bearing housing.
26. Check the backlash adjustment, and readjust if necessary (see directions for assembly of pinion bearing).
27. Fit bottom covers and cowlings.

FRONT CLUTCH

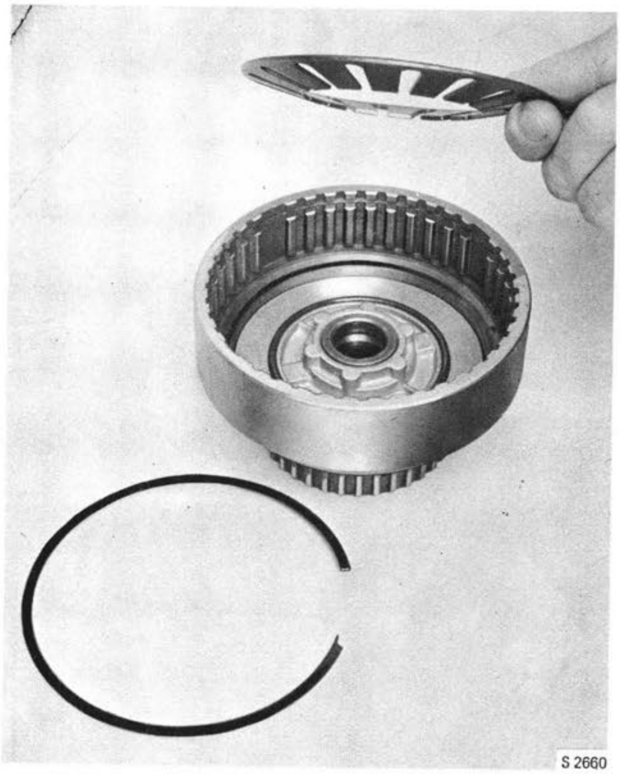
Dismantling



FRONT CLUTCH DISASSEMBLED

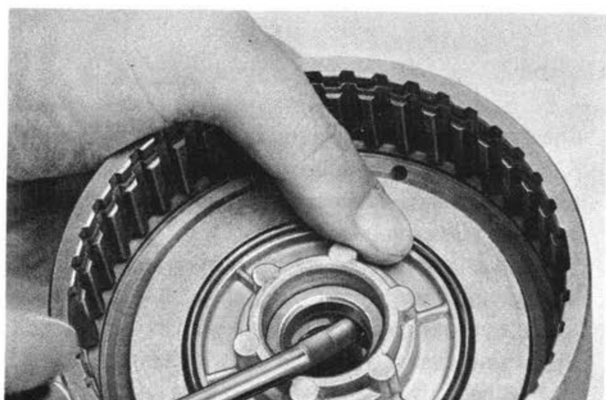
1. Lock ring
2. Input shaft
3. Thrust washer
4. Hub
5. Discs
6. Spacer
7. Lock ring
8. Return spring
9. Piston sealing
10. Piston
11. Sealing ring
12. Front clutch housing

1. Remove plate.
2. Remove lock ring from input shaft, saving the thrust washer.
3. Lift out the forward clutch hub.
4. Remove clutch discs.
5. Remove lock ring for return spring and remove spring.



REMOVING RETURN SPRING

6. Remove the piston with aid of compressed air.

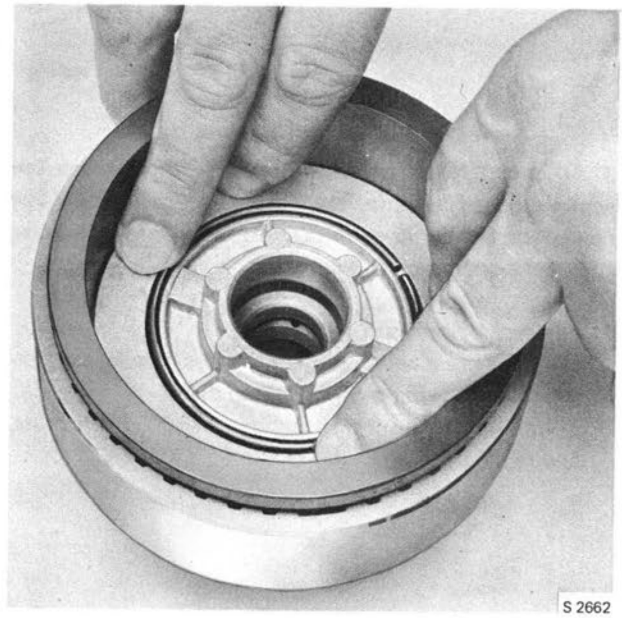


REMOVING FRONT CLUTCH PISTON WITH THE AID OF COMPRESSED AIR

7. Check all seals and clutch discs for damage and wear, replacing damaged parts. Do not forget the small O-ring on the cylinder hub. Check the small leaf valve on the back of the piston; spring movement should be 0.020–0.039" (0.5–1.0 mm).

Assembling

1. Before beginning assembly, lubricate all components with automatic transmission oil.
2. Fit O-ring to cylinder hub.
3. Insert piston using tool 8790107.

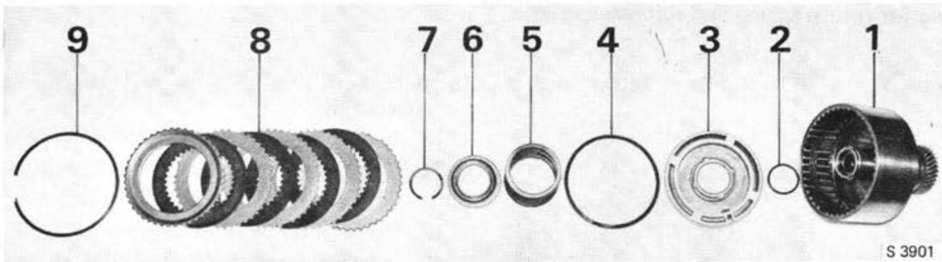


INSERTING PISTON IN FRONT CLUTCH
Tool 8790107

4. Check that steel ring on piston is properly seated.
5. Fit return spring with convex part downward on piston.
6. Fit pressure plate with flat side upward, checking that outer plates are flat; if not, they must be exchanged for new ones.
7. Place hub, clutch discs and thrust washer in position.
8. Check that the bushing on the input shaft is intact. At the same time, check that the seal rings on the shaft rotate freely in their grooves. If the rings stick, check that the housing is not damaged.
9. Lay the input shaft in the clutch disc housing and fit the lock ring.

REAR CLUTCH

Dismantling

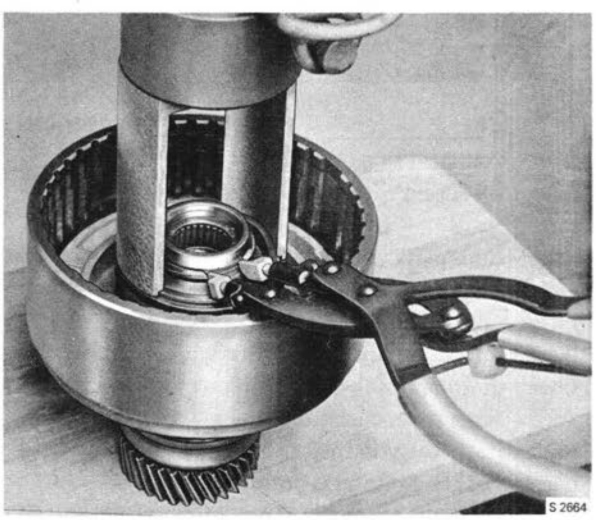


REAR CLUTCH DISMANTLED

1. Rear clutch housing with forward sun gear
2. Sealing ring
3. Piston
4. Piston sealing
5. Spring
6. Washer
7. Lock ring
8. Discs
9. Lock ring

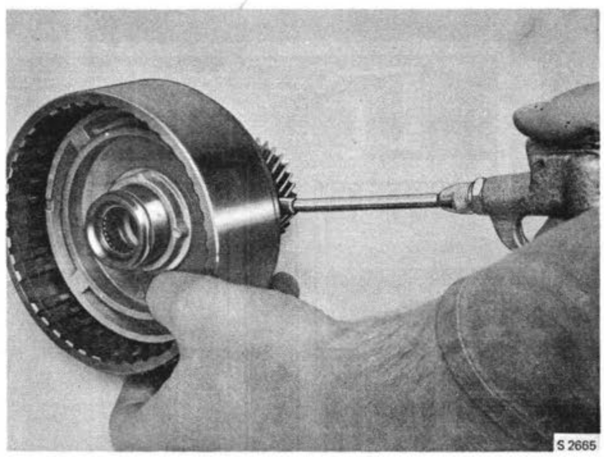
The rear clutch is fitted with three lock ring grooves. The center groove is used for the standard disc assembly. The new disc assembly has a thicker pressure plate and one of the steel discs has been removed.

1. Pull out forward sun gear shaft.
   NOTE! Thrust bearings on both sides of gear.
2. Remove lock ring securing clutch discs.
3. Compress return spring using tool 8790081 in a press, and remove the lock ring.



REMOVING LOCK RING FOR RETURN SPRING IN REAR CLUTCH
Socket 8790081

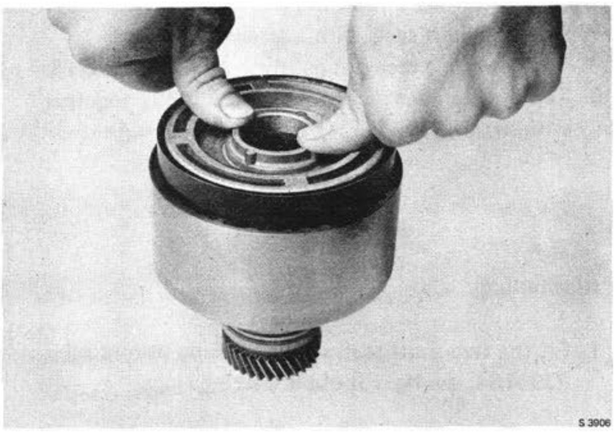
4. Remove the piston with the aid of compressed air.



REMOVING REAR CLUTCH PISTON WITH THE AID OF COMPRESSED AIR

Assembling

1. Check the needle bearing and bushing in the hub. Make sure there are no scratches on the drum. If scratches are found, the drum must be exchanged. Small blue-annealed areas can be accepted.
   Check that the cylinder is free from scratches. Check all seals and clutch discs; If the clutch has been subjected to heat replace all the seals. Small scratches on the pistons can be smoothed off with a fine cleaning cloth. Check the small O-rings on the clutch housing hub. Small scratches on the piston can be smoothed off with a fine cleaning cloth. Check the small O-ring on the clutch housing hub.
2. Insert the piston flat side downward using tool 8790099.

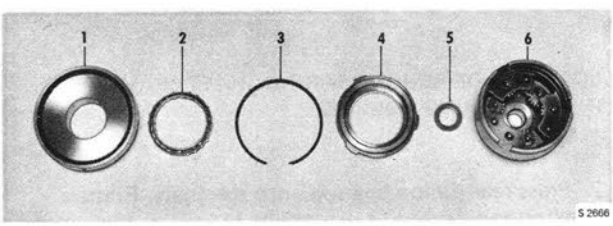


SLEEVE 8790099

3. Place the return spring on the piston. If the spring has been subjected to intensive heat it should be replaced.
4. Place the spring seat on the spring.
5. Compress the spring in a press with tool 8790081 and fit the lock ring. See page 472—16.
6. NOTE! The outer clutch discs are cambered, and the cambers must face the same way.
   Begin assembly of clutch discs with an outer disc, finishing with a spacer disc and pressure plate.
7. Fit lock ring.

PLANET GEAR

Dismantling



PLANET GEAR WITH CENTRE SUPPORT AND FREE WHEEL
1. Centre support
2. Free wheel
3. Lock ring
4. Free wheel carrier
5. Thrust washer
6. Planet carrier

1. Pull out centre support from planet carrier and take out free wheel.
2. Remove lock ring from planet carrier with a screwdriver and pull out free wheel carrier.

Assembling

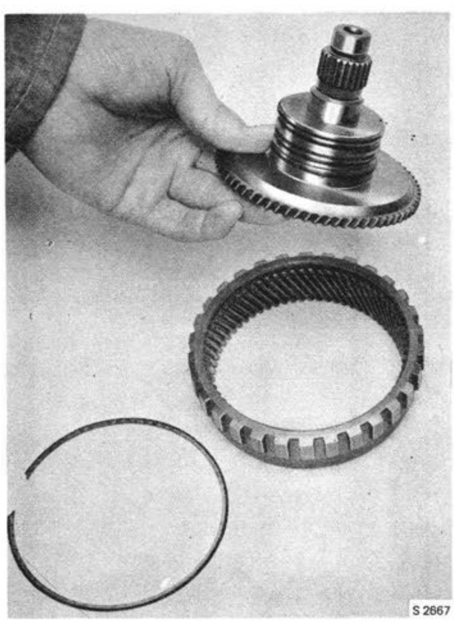
1. Insert free wheel carrier and secure with lock ring.
2. Fit free wheel. NOTE! Flange on inner roller retainer faces outwards.
3. Insert centre support in the planet carrier and check that it can be rotated clockwise.

NOTE
There are two versions of the rear sun wheel and the planet gear carrier and planet gear. The sun wheel of one version and the planet gear carrier/planet gear of the other version cannot be used together. Identification grooves are used on the later version to enable the two designs to be distinguished. The rear sun wheel has a groove cut into the tops of the cogs while the planet gear carrier has a groove round its perimeter.

RING GEAR

Exchanging

It may be necessary to exchange the ring gear if its male teeth have been damaged, e.g. by misuse of the parking pawl.
NOTE! If the ring gear has jammed on the pinion splines, the latter can be removed together with the pinion bearing housing.
Remove lock ring and pull out shaft.
Reassemble in reverse order.
NOTE! Check that the seal rings rotate freely in their grooves.



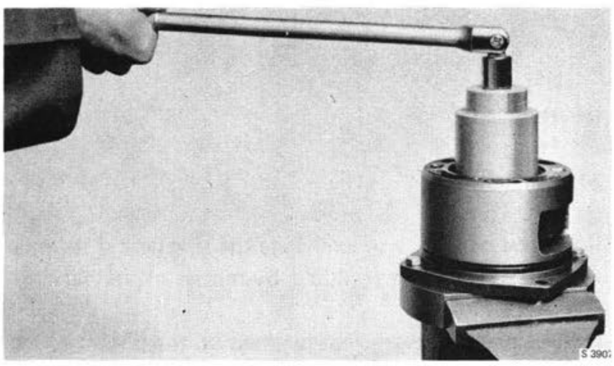
CHANGING RING GEAR

PINION BEARINGS

Dismantling

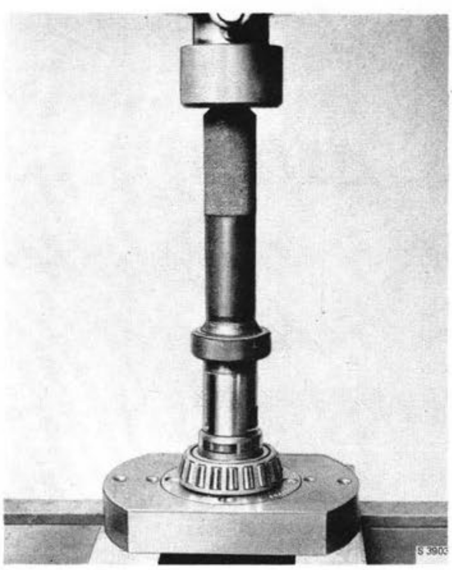
When dismantling the pinion bearing the description "dismantling the transmission" will be followed until the pinion with its bearing housing has been removed. Then the dismantling continued as follow below.

1. Undo the two screws securing the seal housing over the pinion nut.
2. Fit the pinion housing to fixture 8790636 and its associated retainer ring 8790651.
3. Remove O-ring.
4. Clamp tool in a vice and unscrew pinion nut.



UNSCREWING THE PINION NUT
Fixture 8790636, retainer ring 8790651, sleeve 8790263

5. Withdraw pinion from bearing housing.
6. Press off the rear pinion bearing. Use the fixture and the retainer ring as a support (see point 2).

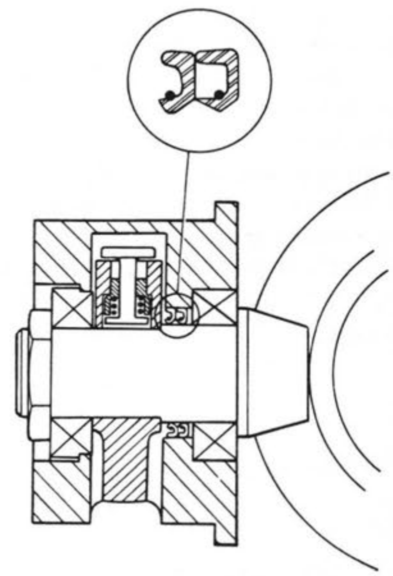


PRESSING OFF THE REAR PINION BEARING
Support, fixture 8790636, retainer ring 8790651

7. Remove shaft seals with a screwdriver.
8. Tap the front race out gently with tool 8790214.
9. Tap out the rear race with tool 8790537 together with drift 8390445.

Assembling

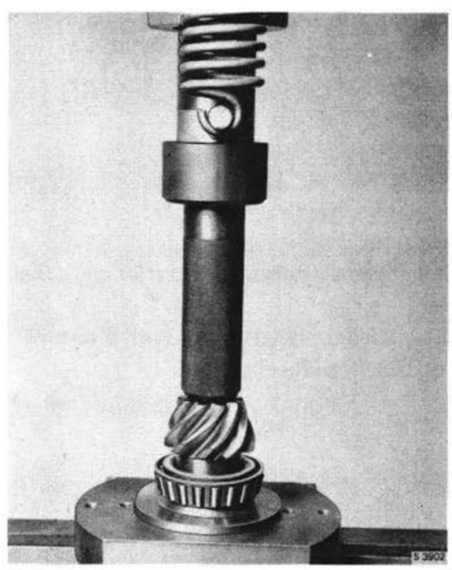
1. Fit the two shaft seals in the housing using tool 8790164, see fig. Fit outer bearing rings.



S 3206

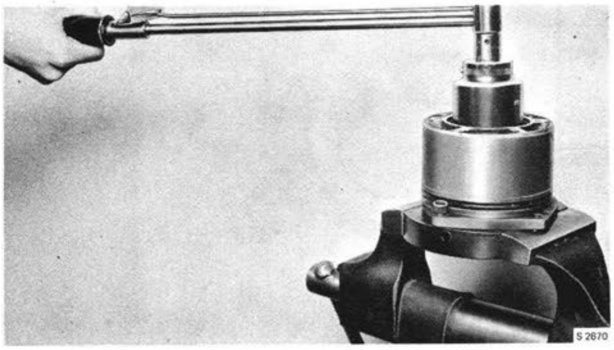
LOCATION OF PINION BEARING SHAFT SEALS IN THE BEARING HOUSING

2. Press rear pinion bearing onto the shaft. Fixture 8790636 and press ring 8790644 are used as a support.



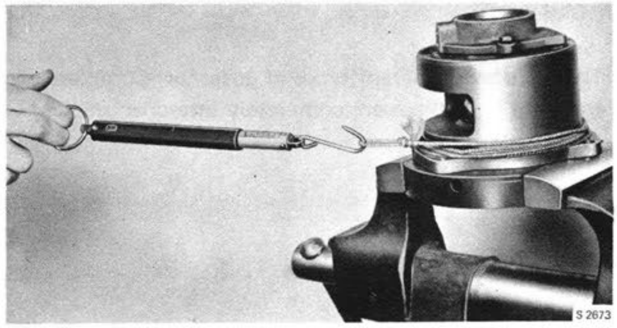
PRESSING ON THE REAR PINION BEARING
Support, fixture 8790636, ring 8790644

3. Fit governor in housing with cover plate facing forward.
4. Hold the shaft horizontal with the driver ball in position and insert the shaft in the bearing housing so that the ball engages the track in the governor.
5. Shim between governor and front bearing.
6. Screw on nut and tighten to prescribed torque of 245–265 Nm (165–200 ft.lb., 25–27 kpm).



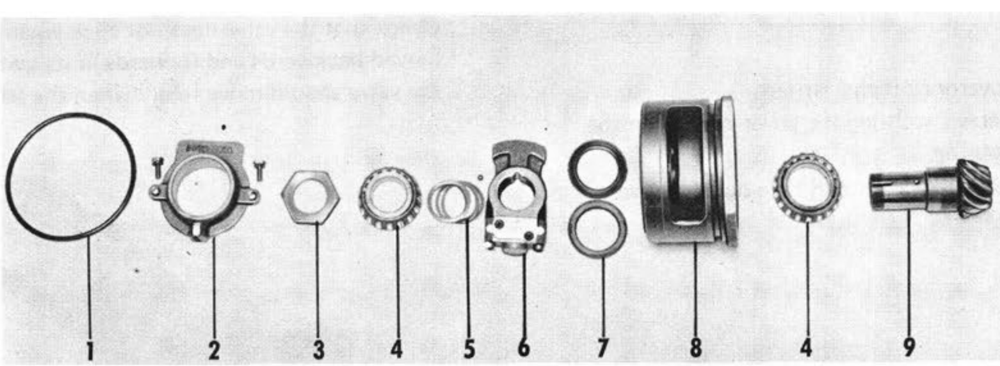
TIGHTENING THE PINION NUT
Fixture 8790636 with retainer ring

7. Check the pre-load with a dynamometer. Adjustment of the pre-load is carried out by placing shims between the front bearing and the governor housing.
Lubricate the bearing sparingly.
New bearings 27–46 N (6.1–10.3 lb., 2.7–4.6 kp) dynamometer reading which corresponds to a torque of 1.8–3.0 Nm (15–25 in.lb., 0.18–0.30 kpm). Old bearings that have done more than 1,200 miles (2,000 km): 15–24 N (3.3–5.3 lb., 1.5–2.4 kp) dynamometer reading which corresponds to a torque of 0.9–1.5 Nm (7.5–12.5 in.lb., 0.09–0.15 kpm).



CHECKING PRE-LOAD WITH SPRING BALANCE
Fixture 8790636 with retainer ring

8. Fit seal housing and O-ring to bearing housing.



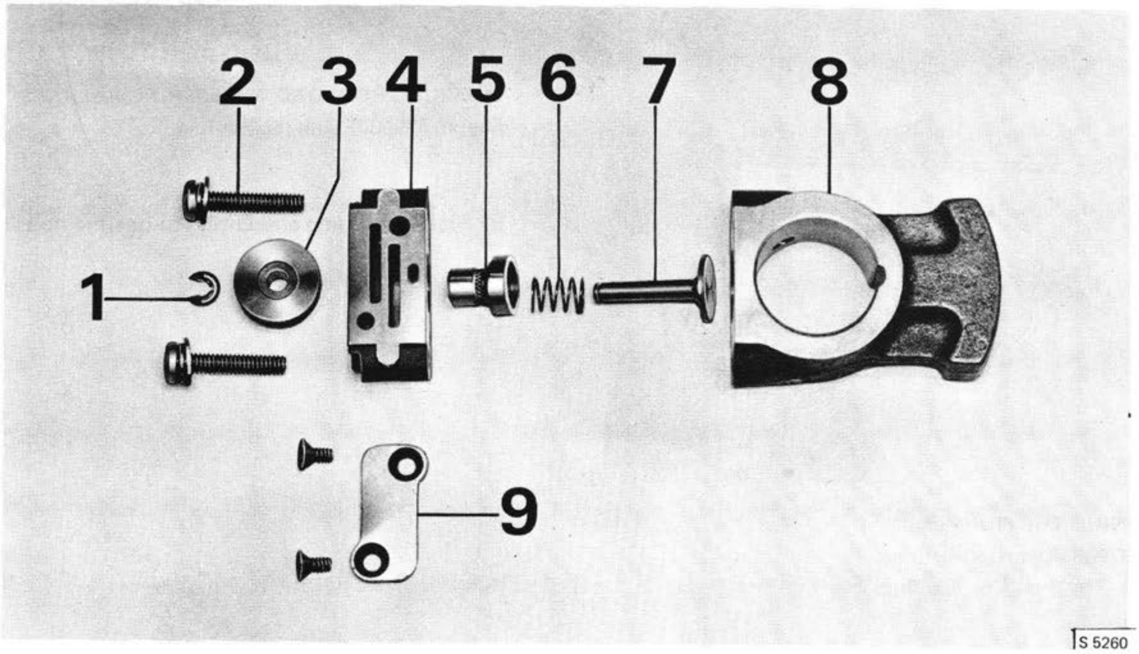
S 3207

PINION BEARING DISASSEMBLED
1. O-ring
2. Seal housing
3. Nut
4. Bearing
5. Shims
6. Governor
7. Shaft seals
8. Bearing housing
9. Pinion shaft

GOVERNOR

There are two different types of governor. Complete governors of both types are completely interchangeable.

As from model 1975 (gearbox No. 20.000) a new governor that gives altered shift speeds is introduced. The new governor can be separated from earlier types by the "X" knurles around the governor valve waist.



GOVERNOR

1. Lock washer for the governor weight
2. Screws
3. Governor weight
4. Governor housing
5. Governor valve
6. Spring
7. Shaft
8. Governor carrier
9. Washer

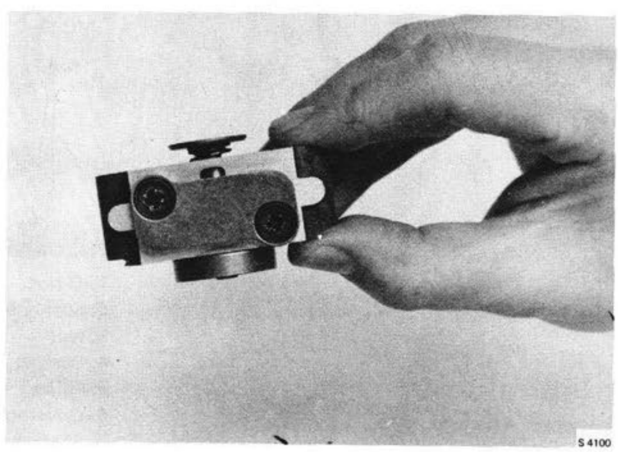
Dismantling

1. Take the governor off the carrier.
2. Undo the screws securing the cover washer on the governor housing.
3. Remove the lock washer and take out the governor weight and valve.

Assembling

Before reassembling, lubricate all parts with transmission oil.
Reassemble in reverse order of dismantling.

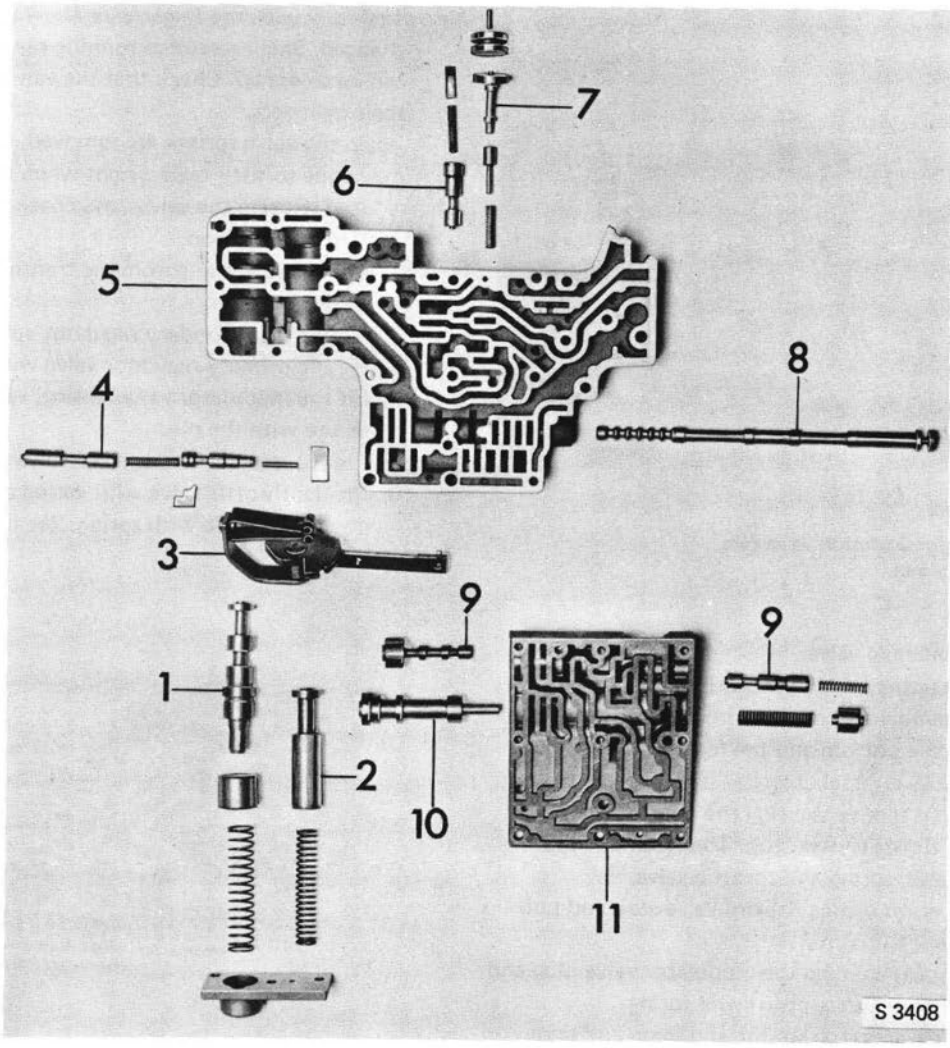
Check that the valve does not stick when it is turned and moved backwards and forwards in its seating. After fitting, the valve should move freely when the governor is shaken.



CHECKING THAT THE GOVERNOR VALVE MOVES FREELY

VALVE HOUSING

At the moment there are two different types of valve housing. Complete valve housings of both types are completely interchangeable.



VALVE HOUSING DISASSEMBLED

1. Primary regulator valve
2. Secondary regulator valve
3. Carrier and cam for kick-down valve
4. Kick-down and throttle valve
5. Lower part of valve housing
6. Servo orifice control valve
7. Modulator valve
8. Manual valve
9. Shift valve for 1st–2nd gear
10. Shift valve for 2nd–3rd gear
11. Upper part of valve housing

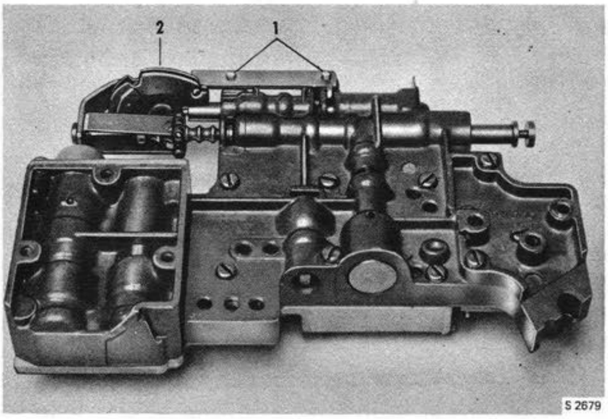
Springs for control system

Spring	Approx. free length		Number	Wire diameter		Major diameter	
	in.	mm	of turns	in.	mm	in.	mm
1–2 Shift valve	1.094	27.8	13 1/2	0.024	0.61	0.235	5.97
2–3 Shift valve	1.590	40.4	22 1/2	0.036	0.91	0.352	8.94
Primary regulator valve	2.850	72.4	14 1/4	0.054	1.37	0.600	15.24
Secondary regulator valve	2.593	65.9	21 1/2	0.065	1.65	0.485	12.32
Servo orifice control valve	1.005	25.53	17	0.024	0.61	0.203	5.16
Modulator valve	1.069	27.15	19	0.028	0.71	0.211	5.36
Throttle valve, inner spring	0.807	20.5	28	0.018	0.46	0.141	3.58
Throttle valve, outer spring	1.185	30.1	18	0.032	0.81	0.236	5.97

Dismantling

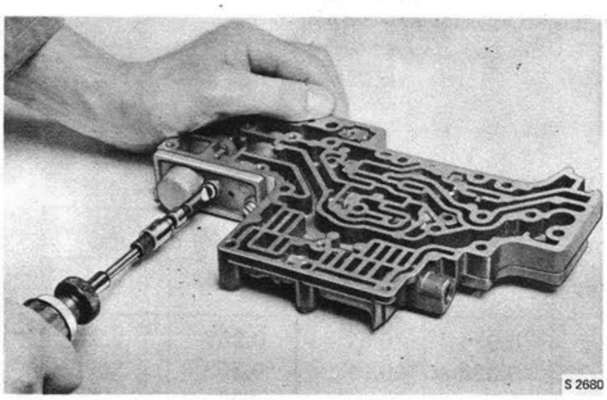
NOTE! All work on the valve housing should preferably be done in a diesel test room or clean room of equivalent standard.

1. Undo both carrier screws and the cam for the downshift valve



VALVE HOUSING
1. Screws, carrier for downshift valve cam
2. Downshift valve cam

2. Pull out the manual valve.
3. Separate the upper and lower sections of the valve housing by removing six screws from the top and two screws from the bottom and the four screws for the manual valve lever bracket.
4. Undo the eight screws securing the oil tube plate.
5. Remove the throttle valve stop. Then pull out the downshift valve, spring and throttle valve.
6. Remove the servo orifice control valve stop and pull out the valve.
7. Remove the pin retaining the modulator valve plug and take out the plug, valve, piston and spring.
8. Undo the three screws from the end plate and take out the primary regulator valve spring, sleeve and valve and the secondary regulator valve.



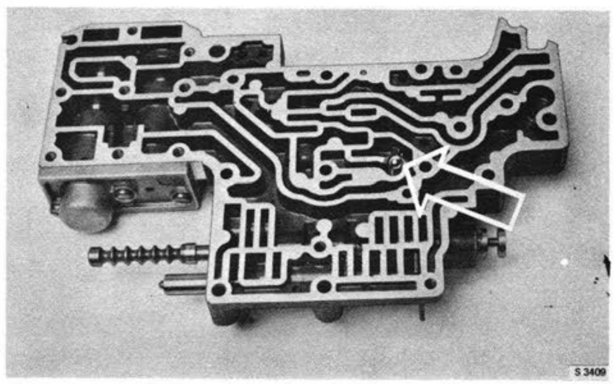
REMOVING THE END PLATE

9. Remove the screws from the cover on the top section of the valve housing and take out the 1–2 and 2–3 shift valves.

Assembling

NOTE! Before assembling, make sure that all components are thoroughly clean and free from scratches. If the valves are scratched they can be smoothed with a fine emery cloth. Small lengtwise scratches in the housing can be tolerated, but if the scratches are big enough to be felt distinctly with the fingernails, the housing must be exchanged. Small scratches running right round the cylinder can be tolerated. Check that the valves move freely in their cylinders.
When the valve springs are removed, the valves should move due to their own weight when the valve housing is tilted. Rotate the valves and check that they do not stick in any position.

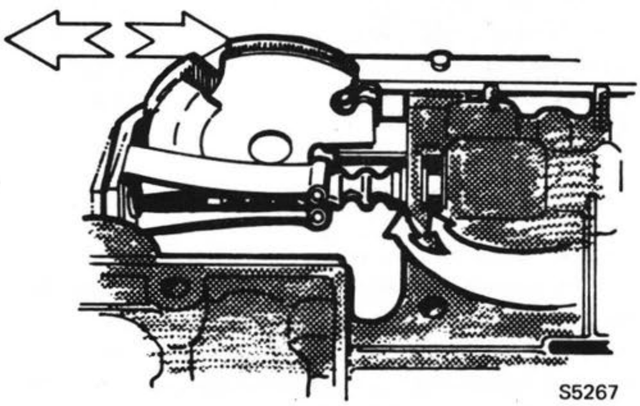
1. Dip the valves in automatic transmission oil before inserting them.
2. Mount the secondary regulator valve and spring.
3. Fit the primary regulator valve with sleeve and spring.
4. Fit the modulator valve, spring, valve and plug and secure with the pin.
5. Fit the servo orifice control valve with spring and stop.
6. Fit the throttle valve with spring and stop and the downshift valve with spring. See illustration.



LOCATION OF BALL VALVE IN VALVE HOUSING

7. Screw the top and bottom housing sections together.
8. Fit the manual valve.
9. Fit the detent spring carrier and the downshift valve cam.
10. Check the position of the manual valve as follows: Slide the valve into the neutral position i.e. the third locking position from the inside of the valve (see illustration). In this position, the cylindrical sealing surface closest to the locking end of the

valve should be centred around the cast bridge between the end plate and the opening through which the valve is visible. (See illustration)



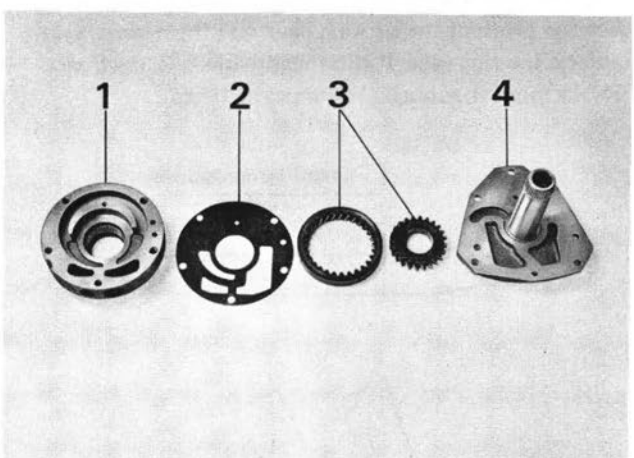
MANUAL VALVE IN NEUTRAL POSITION

Where necessary, adjustment can be made by bending the spring on the locking device.

OIL PUMP

Dismantling

1. Undo the five screws and the slotted head screw holding the pump housing together and separate the housing.
2. Check that the back plate is free from scratches and otherwise undamaged.
3. Mark the pump gears with a pencil or similar and remove them.
4. Check that the pump gears are free from scratches and other damage.
5. Check the bearing in the pump housing and the seal.

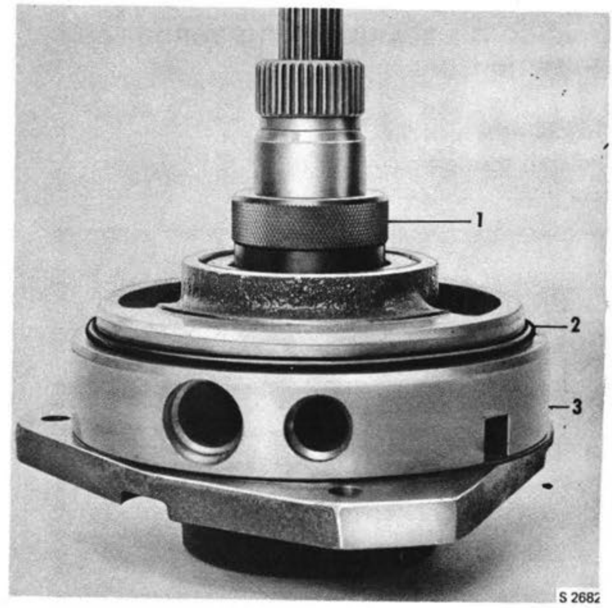


OIL PUMP DISASSEMBLED

1. Pump housing
2. Back plate
3. Pump gears
4. Pump housing, front

Assembling

Reassemble in the reverse order. Use tool 8790248 to center the pump.
Check the O-ring on the outside of the housing.



OIL PUMP

1. Tool for centering the pump at assembling, 8790248
2. O-ring
3. Housing

Changing the bearing

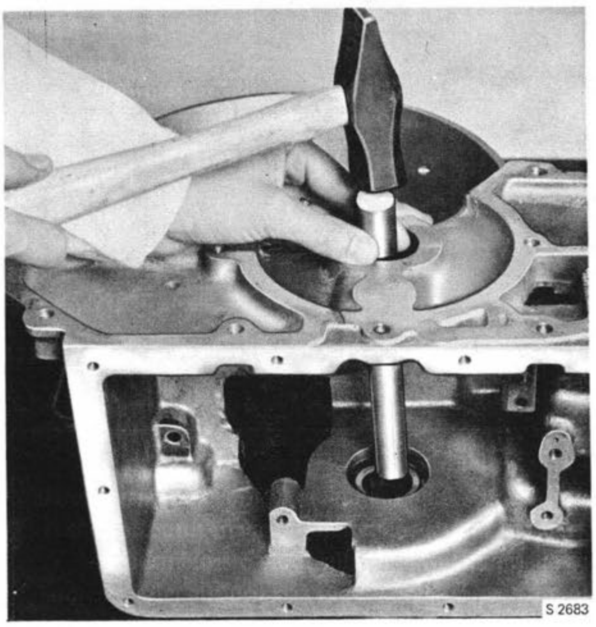
1. Remove the lock ring.
2. Tap the narrow end of the shaft gently with a plastic mallet to free the shaft with the bearing.
3. Knock off the bearing with a piece of tubing of 1.46" (37 mm) inner diameter and 5.9" (150 mm) long.
4. Reassemble in the reverse order.

Changing the seal ring

Remove the seal with a screwdriver. Fit the new seal using tool 8790164.
Note that this seal has to withstand the system pressure; thus care must be taken when assembling the oil pump and torque converter.

CHANGING THE BEARING IN THE TORQUE CONVERTER HOUSING

1. Remove the lock ring.
2. Pull out the bearing using a drift.



REMOVING THE BEARING IN THE TORQUE CONVERTER HOUSING

Reassemble in the reverse order using tool 8790164.

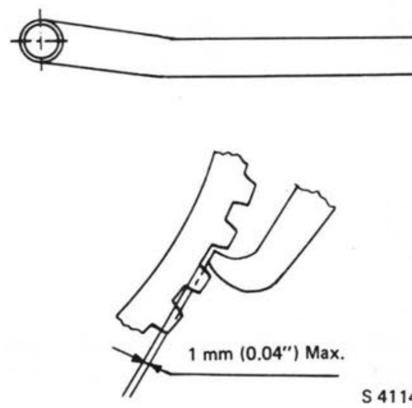
INSTALLING THE BEARING IN THE TORQUE CONVERTER HOUSING
Sleeve 8790164

PARKING PAWL

In order to ensure the functioning of the parking pawl it has been necessary to provide two gear selector rods, one of which is 0.1" (2.5 mm) longer than the other. Variations in length due to assembly tolerances can thus be eliminated. Both rods can be identified as the longer one is grooved, see illustration. When fitting, make the following checks:

A. Short rod (without groove)

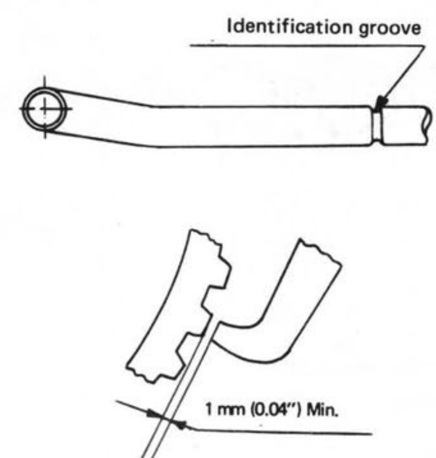
Fit the rod and move it to gear selector position P. Press the rod forward towards the torque converter so that the play on the rod is eliminated. Measure the distance between the tooth of the parking pawl and the bottom of the clearing between the teeth of the ring gear where the pawl engages. If this measurement is greater than 0.04" (1 mm), the longer rod must be fitted.



SHORT ROD (WITHOUT GROOVE)

B. Long rod (with groove)

Fit the rod and move it to gear selector position R. Press the rod backward (towards the final drive) so that the play on the rod is eliminated. Measure the distance between the tooth of the parking pawl and the nearest tooth crown on the ring gear. If this measurement is less than 0.04" (1 mm), the shorter rod must be fitted.



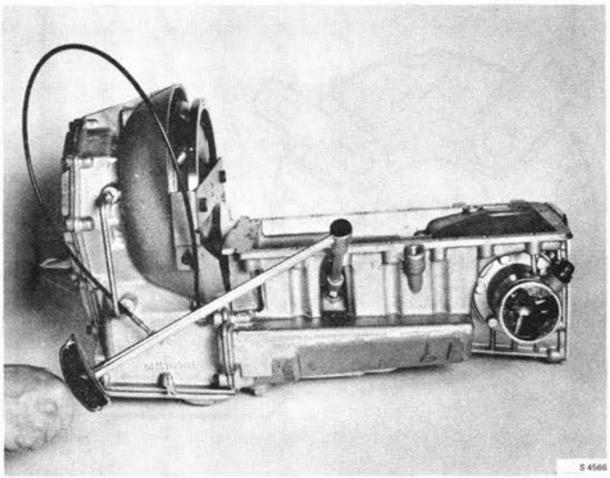
LONG ROD (WITH GROOVE)

REAR BAND

Adjusting

The rear band adjusting screw is located outside the transmission casing on the left-hand side.

1. Slacken the lock nut a few turns.
2. Tighten the adjusting screw to the prescribed torque 13–14 Nm (10 ft.lb., 1.3–1.4 kpm), using tool 8390115 (square socket). Then back off 3/4 turn.
3. Hold the adjusting screw in that position and tighten the lock nut.

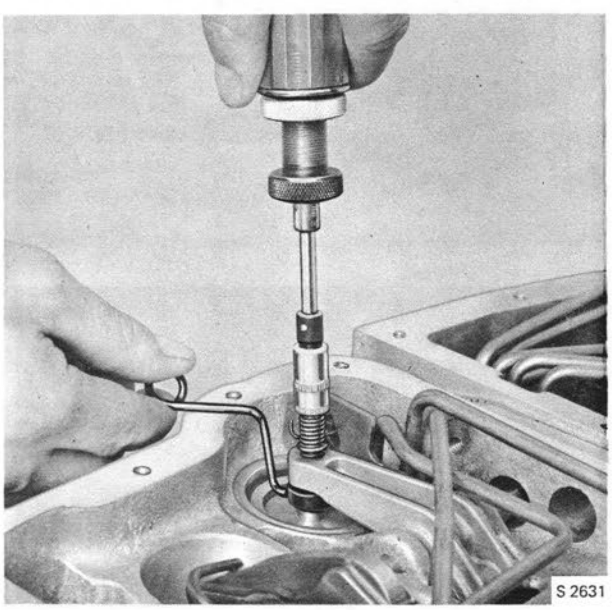


ADJUSTING THE REAR BAND

FRONT BAND

Adjusting

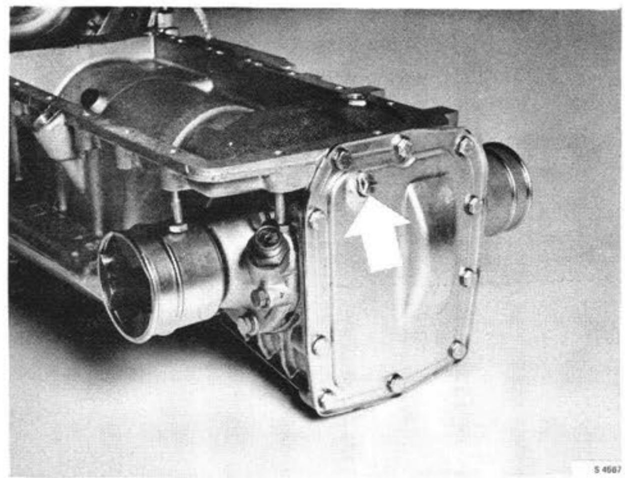
1. Place the spacer 8790073 1/4" (6.35 mm) between the adjusting screw and the boss on the piston.



ADJUSTING THE FRONT BAND
Spacer 8790073

2. Tighten the adjusting screw to a torque of 1.3 Nm (10 in.lb., 12 kpcm).
3. Check that the gap between the self-adjusting spring and the lever is 1.5–2 thread flights.

For adjustment of the throttle cable and gear selector cable, refer to section 444 "Transmission control".



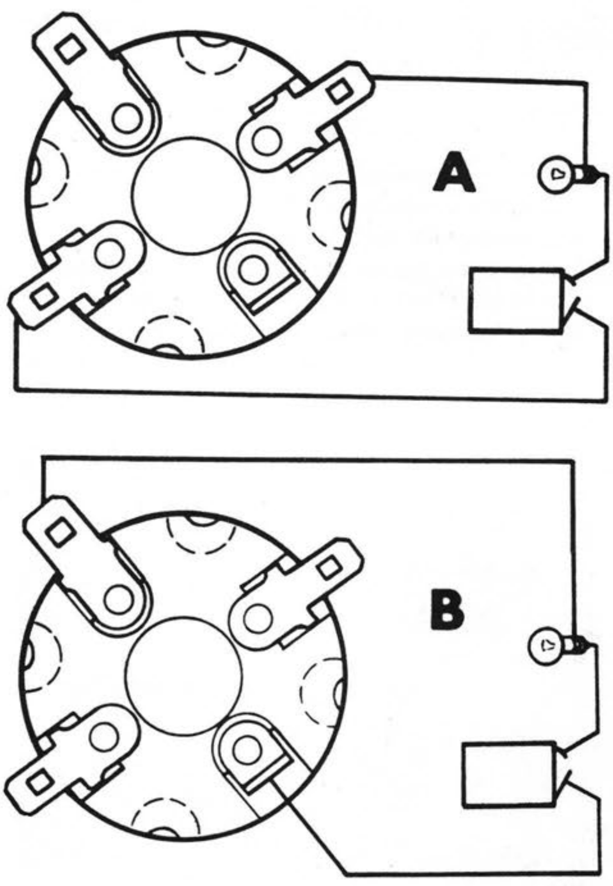
DIFFERENTIAL BLEEDER

CONTACT FOR BACK-UP LIGHTS AND STARTER

(Situated on the gearbox and from 1979 model)

Disconnect the cable. The wide terminals are for reversing lights and the narrow ones for starter motor.

1. With the selector lever at D and the inhibitor switch screwed out, connect a test lamp between the narrow terminals (starter motor) via a battery. The lamp should light up.
2. Screw in the inhibitor switch until the lamp goes out. Mark the position on both the inhibitor switch and the transmission. Move the test lamp to the wide (reversing light) terminals and screw in the inhibitor switch until the lamp lights up again. Count the number of turns between these two positions, and back off to a point half-way between them.
3. Secure the lock nut with tool 8790123 tightening to the correct torque. NOTE! If the inhibitor switch is locked too hard, it may be damaged.

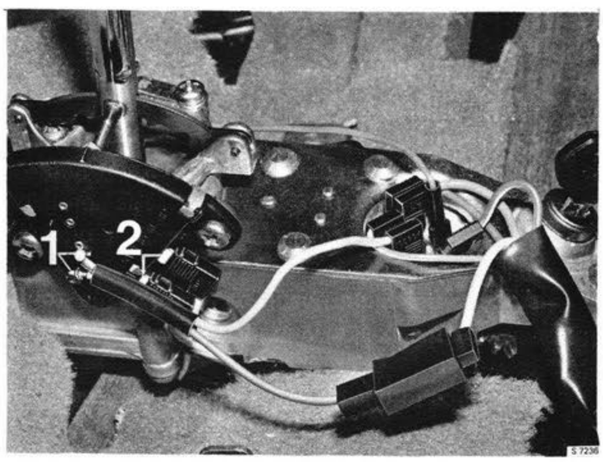


ADJUSTING THE CONTACT FOR BACK-UP LIGHTS AND STARTER MOTOR

A. Lamp connected to the starter motor switch
B. Lamp connected to the back-up light switch

REVERSING LIGHT AND START INTERLOCK RELAY CONNECTOR AS FROM 1980 MODEL

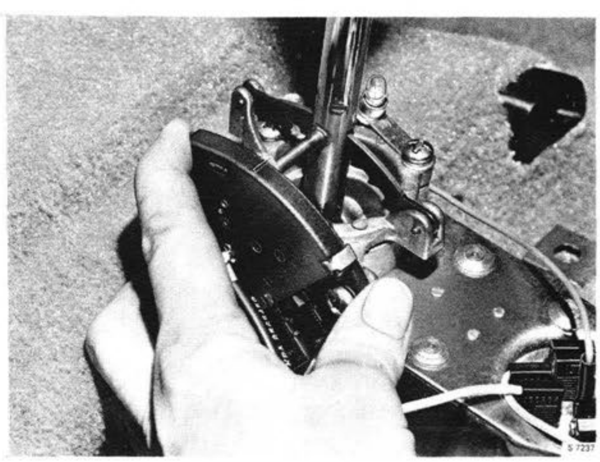
(as from 1980 model the connector is situated in the gear lever housing).



1. Start interlock relay connector
2. Reversing light connector

Setting:

Set the gear selector lever in neutral. Rotate the connector body so that the lever is exactly opposite the mark on the connector body. Tighten the two connector body mounting bolts.

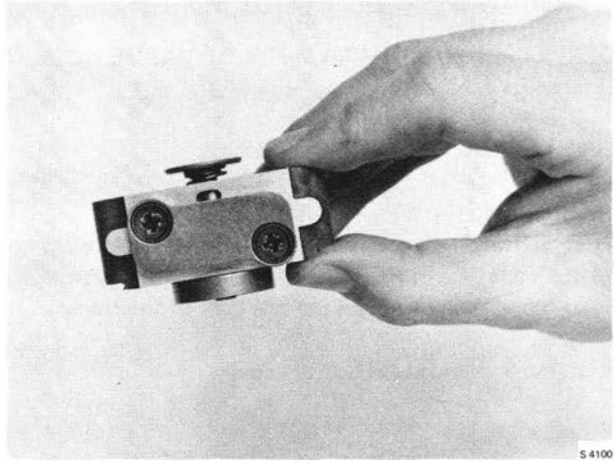


DISASSEMBLING AND CHECKING THE GOVERNOR
(Transmission in car)

1. Jack up the car. Remove the small cover (two slotted screws) and let the oil run out (about 1 pint = 1/2 liter).
2. Revolve the wheels so that the governor's two retaining screws are accessible.
3. Undo the retaining screws so that the governor can be removed.

THE GOVERNOR SCREWS ARE REMOVED

4. Check that the governor valve moves freely; i.e. that the valve moves when the governor is shaken.
   If the valve is stuck it must be disassembled and the parts thoroughly cleaned. Check afterwards that the valve does not stick when it is turned and moved to-and-fro in its seating. Scratches on the valve can be smoothed with a whetstone or fine emery cloth. Before the parts are reassembled they should be lubricated with automatic transmission oil.



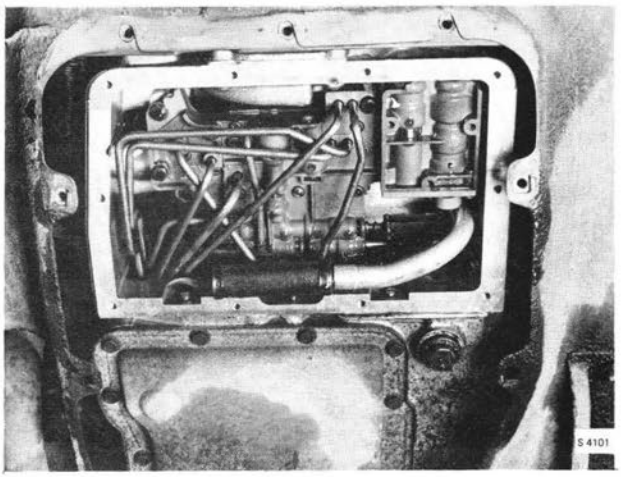
CHECKING THAT THE VALVE IS NOT STUCK

5. Replace the governor and cover.

DISASSEMBLY AND ASSEMBLY OF VALVE HOUSING
(Transmission in car)

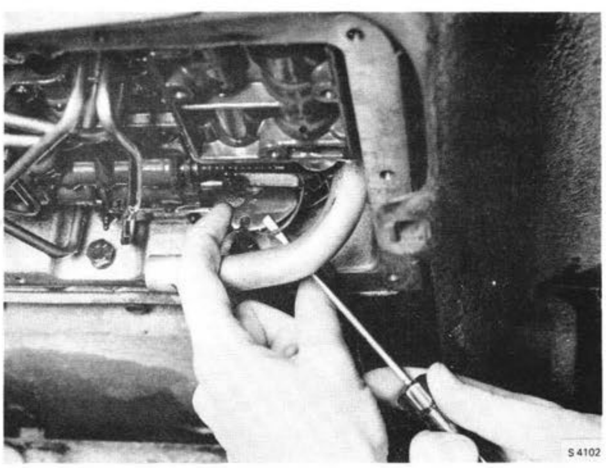
Disassembling

1. Jack up the car and remove the guard plate.
2. Drain the oil and clean carefully round the forward bottom cover. If the car is rocked a further quantity of oil will run out from the rear part of the transmission.
3. Remove the forward bottom cover.



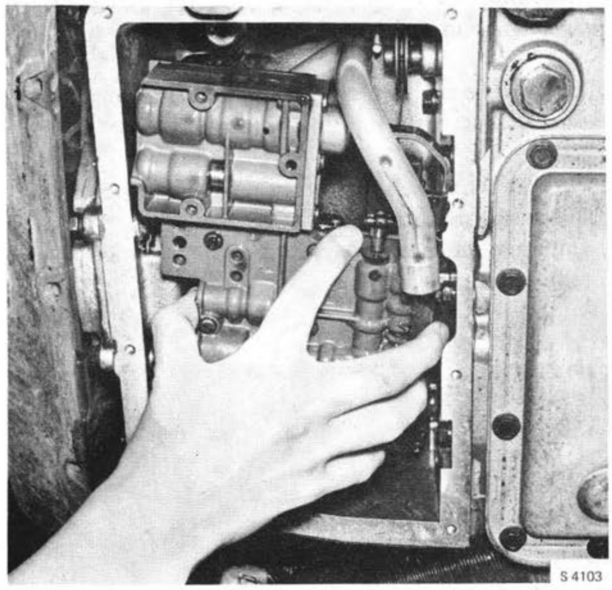
FORWARD BOTTOM COVER REMOVED

4. Disconnect all the oil pipes.
5. Disconnect the throttle wire.



DISCONNECTING THE THROTTLE WIRE

6. Undo the three valve housing retaining screws. The valve housing should now only be supported by the pressure pipe from the oil pump. Lift out the valve housing.

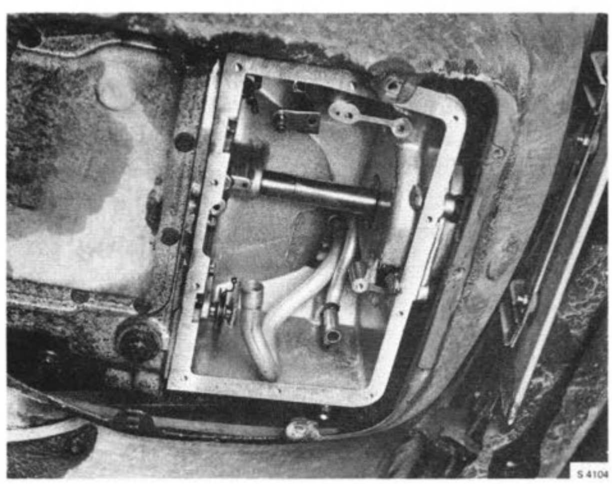


LIFTING OUT THE VALVE HOUSING

7. Remove the large suction pipe from the pump. Check the O-ring.

Assembling

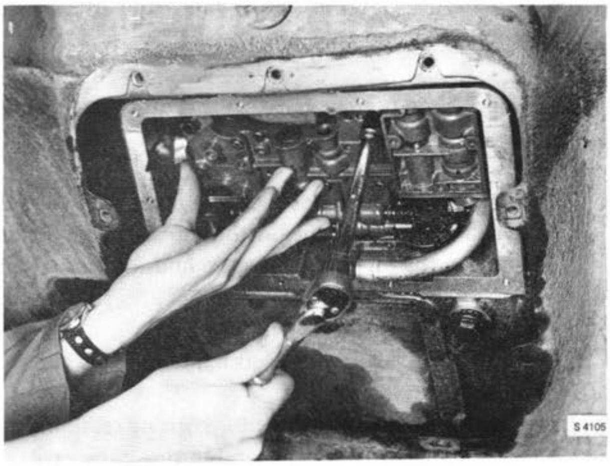
1. Fit the large suction pipe (with a fault-free O-ring) together with the pressure pipe into the oil pump. Both pipes are secured with a clip.



SUCTION PIPE AND PRESSURE PIPE CONNECTED TO THE OIL PUMP

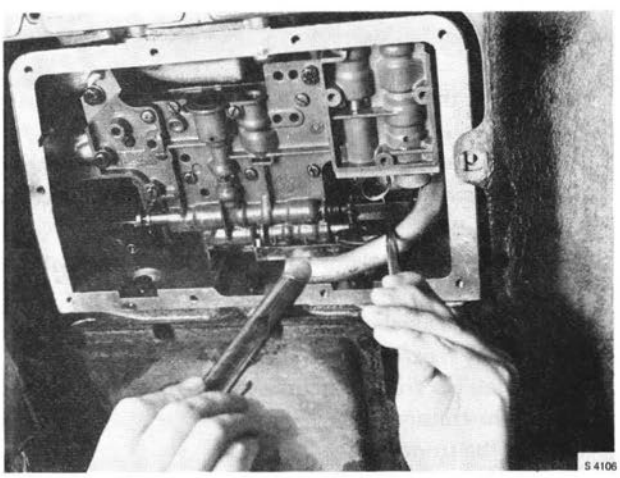
2. The small pipe which provides the torque converter with oil pressure and the pressure pipe are also attached with a clip. These pipes must be in line with each other.

3. Lift up the valve housing. Guide both the pipes into their respective holes in the valve housing. The pipes must go freely into the valve housing. If force is used during assembly, the pressure pipe will be deformed.
4. Tighten the three retaining screws.



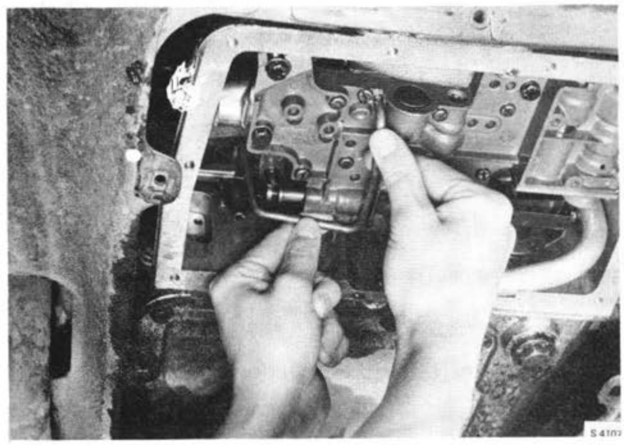
SCREWING ON THE VALVE HOUSING

5. Check with the help of a small mirror that the pipes are in place.



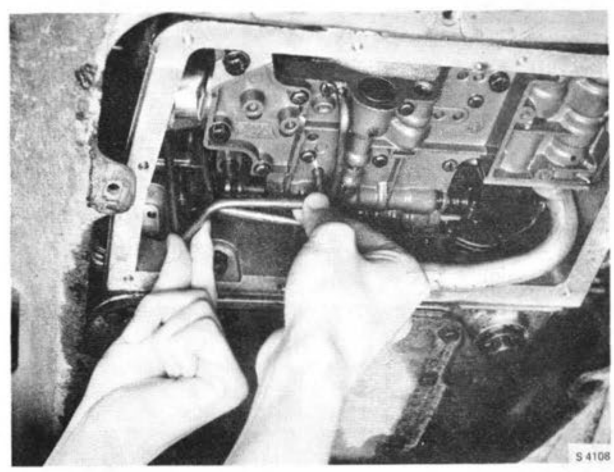
THE PIPE CONNECTIONS ARE CHECKED WITH THE AID OF A MIRROR

6. Fit the throttle cable and make sure that it is correctly placed on the blade wheel.
7. Then continue with the fitting of the pipes. Various problems can arise, and we therefore suggest that you refer to the diagram in the Service Manual (page 472–13), which can be of great help.
8. Start with pipe No. 4. It is necessary to feel around for the hole in the transmission housing, as it is difficult to remove the side cover with the transmission in the car.



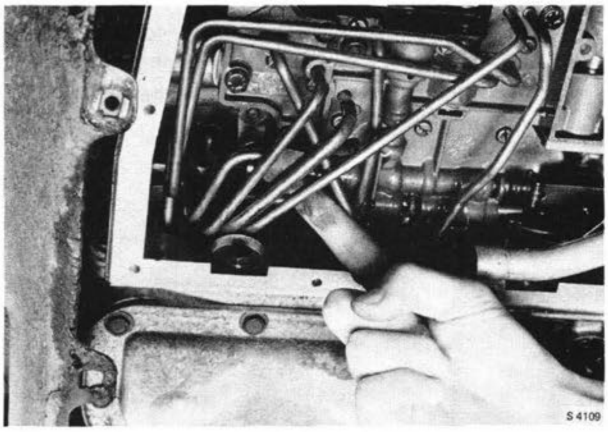
PIPE NO. 4 IS INSTALLED

9. Then fit pipe No. 5, which must not be confused with pipe No. 11, in the valve housing.



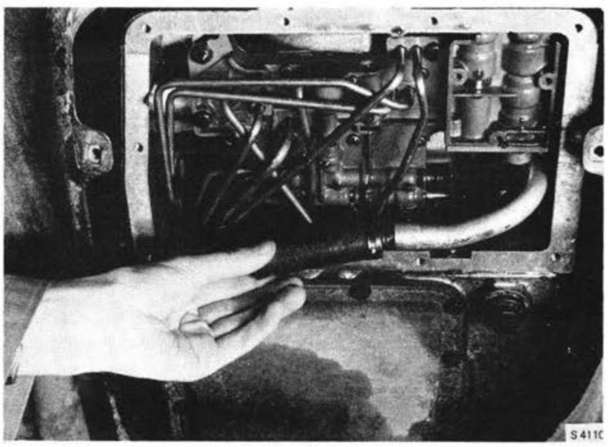
PIPE NO. 5 IS INSTALLED

10. If the diagram is followed the remaining pipes should not present any difficulty in fitting.
11. Do not forget to place the littre magnet above pipes No. 11 and 12.



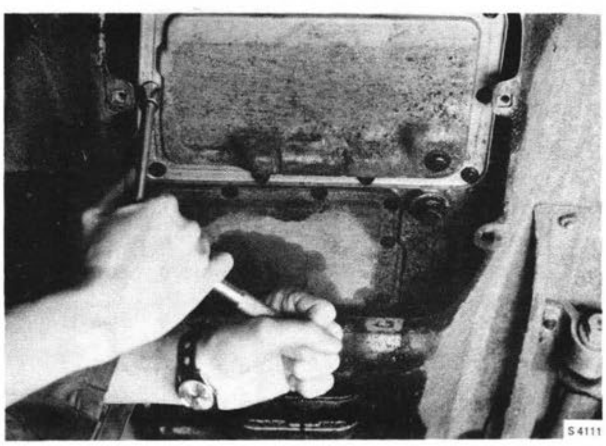
THE MAGNET IS PUT IN PLACE

12. Secure the filter to the suction pipe.



THE FILTER IS SECURED TO THE SUCTION PIPE

13. Check that the bottom cover is not deformed at the screw holes. If such is the case it must be straightened.
14. Fit the bottom cover with a new gasket without adhesive.



THE BOTTOM COVER IS INSTALLED

15. Screw on the guard plate.
16. Fill with oil to correct level.
17. Adjust the oil pressure with the throttle cable.

CHANGING THE REAR CLUTCH AND FRONT BRAKE BAND

Dismantling

1. Lift out the power plant, place it on a trestle and drain the transmission oil.
2. Wash the power plant.
3. Remove the ring gear cover, the front cover and the two large covers at the bottom of the transmission.
4. Remove the oil pipes and valve housing (see special section).
5. Remove the sprockets and chain.
6. Remove the four bolts securing the torque converter to the driver disc.
7. Remove the torque converter housing retaining bolts and lift the housing and torque converter away from the engine.
8. Remove the driver disc from the crankshaft.
9. Lift out the front clutch and front drum with the rear clutch from the transmission housing.
10. Remove the front band from the transmission housing.

For clutch overhaul refer to special section.

Assembly

1. Mount the front band in position in the transmission housing.
2. Place the needle bearing washer and needle bearing in the planet gear carrier, keeping them in place by means of Vaseline.
3. Install the sun gear shaft and front drum as one unit.
4. Keep the axial washers in place on the front drum hub by means of Vaseline.
5. Install the front clutch assembly with input shaft in the transmission.
6. Fit the front cover.
7. Check and adjust the front and rear bands. (See special section.)

8. Mount the driver disc on the crankshaft. Coat the threads with Loctite sealant 68 or an equivalent sealing agent.
9. Install the torque converter housing and the torque converter.
10. Measure the axial play in the transmission. Make any necessary adjustments by means of the front axial washers.
11. Mount the torque converter on the driver disc.
12. Fit the suction and pressure pipes, valve housing, oil pipes, filter and magnet in the transmission. (See special description.)
13. Fit the bottom covers.
14. Install the primary gear sprockets, chain and the front cover.
15. Fit the cover over the ring gear.
16. Fill the automatic transmission with oil.
17. Install the power plant in the car.

DIFFERENTIAL AND PINION–CROWN WHEEL GEAR

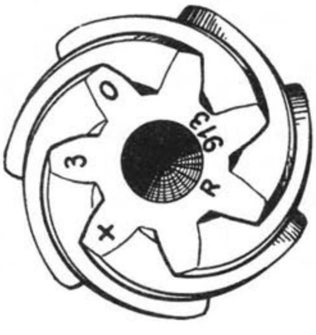
GENERAL

The crown wheel and pinion are a matched pair, so if one is exchanged the other must be exchanged too. The parts are tested together for noise and the optimum setting for minimum noise output is measured. The key measurements as far as the pinion and crown wheel are concerned are firstly the distance from the end face of the pinion to the center of the crown wheel, and secondly the backlash between the teeth. These measurements and the mating number are stamped into both parts at the time of noise testing. When the pinion and crown wheel are installed, these measurements must be accurately adjusted with shims and a special measuring instrument. The pinion gear shims are placed next to the bearing housing of the pinion shaft bearings, and the crown wheel (differential) shims are distributed between the two differential bearing seats.

ADJUSTING THE POSITION OF THE PINION GEAR

General

Data for adjustment of the distance from the pinion gear to the center of the crown wheel are stamped into the end face of the pinion (an example is illustrated below).



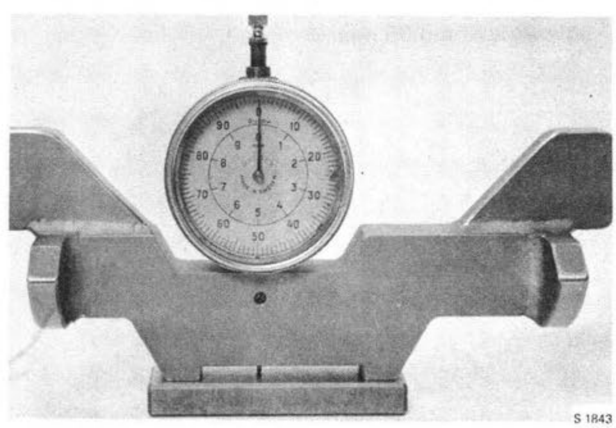
END FACE OF PINION

+3	=	measurement for pinion setting
R 913	=	mating number, also stamped on crown wheel
0	=	pinion not offset – shaft centerline intersects crown wheel centerline (all pinions are marked 0 and this datum has no relevance to the adjustment)

> IMPORTANT
>
> Before disassembling the transmission, always measure the positions of the pinion and crown wheel. This provides a check on whether the setting may have been wrong. If the pinion shaft and crown wheel assembly has done less than 6,000 miles (10,000 km), the setting can be adjusted, but after longer mileage, when the gears will have worn themselves into a certain position, the parts should be reassembled with the same settings as were measured prior to disassembly.

Before measuring

The following preparations must be made prior to measuring the pinion gear setting:
The following applies to manual transmissions: The pinion shaft bearings must be compressed until the torque required to rotate the pinion shaft in the housing is 2.5 ± 0.5 Nm (25 ± 5 kpcm), corresponding to a dynamometer reading of 47–71 N (10.4–15.4 lb., 4.7–7.0 kp). These figures apply to new, lightly oiled bearings. The corresponding figures for older bearings (which have done more than 1,200 miles (2,000 km) are 1.3 ± 0.5 Nm (13 ± 5 kpcm), the dynamometer readings being 19–43 N (4.2–9.5 lb., 1.9–4.3 kp).
In the case of automatic transmissions the following is applicable:
The pinion shaft nut must be tightened to 245–265 Nm (180–200 ft.lb., 25–27 kpm). The torque required to rotate the pinion shaft in the housing must be 1.8–3.0 Nm (16–26 in.lb., 18–30 kpcm), corresponding to a dynamometer reading of 27–46 N (5.9–10.1 lb., 2.7–4.6 kp). These figures refer to new, lightly oiled bearings. For bearings that have done more than 1,200 miles (2,000 km) the torque should be 0.9–1.5 Nm (8–13 in.lb., 9–15 kpcm), corresponding to a dynamometer reading of 15–24 N (3.3–5.3 lb., 1.5–2.4 kp).
The differential unit must be removed to permit installation of the measuring instrument (tool 8390155), which consists of a measuring jig with attached indicator dial. A ground gauge block is provided for calibration of the



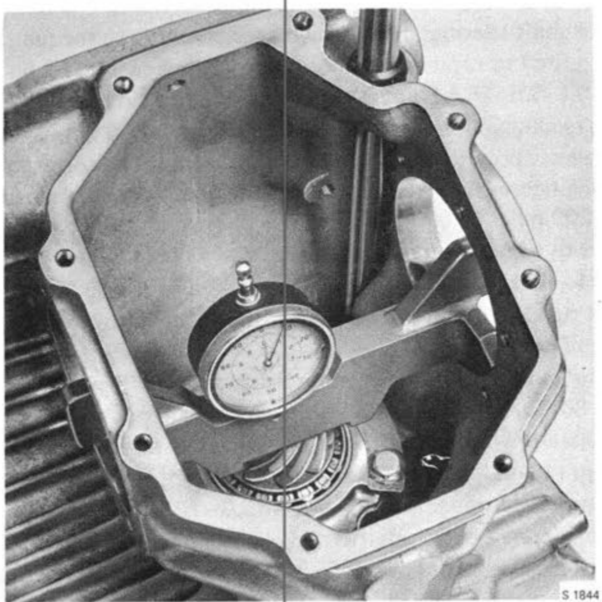
CALIBRATING THE INSTRUMENT DIAL
Measuring instrument 8390155

dial; the block is laid against the calibration stops of the instrument, and the distance between these stops and the centerline of the tool is exactly 2.362" (60.000 mm), equal to the distance from the end face of the pinion shaft to the center of the crown wheel (see illustration). The procedure for measuring the pinion gear position is as follows:

Measuring

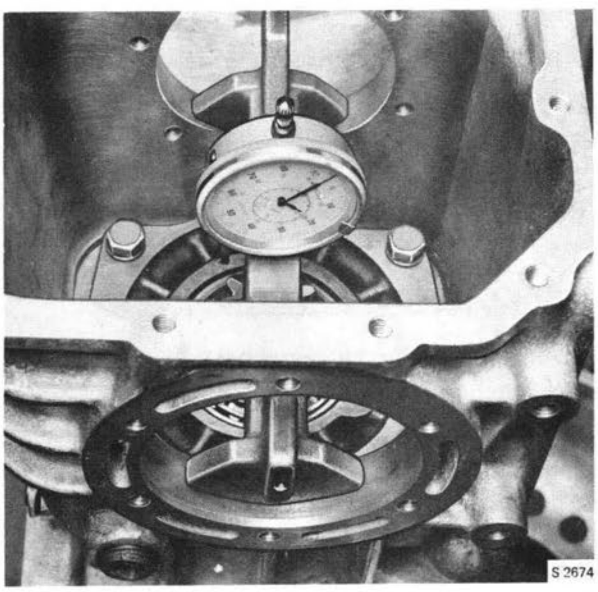
1. Check that the pointers of the instrument are zeroed when the measuring point touches the gauge block (see illustration).

2. Place the instrument in the differential housing with the point applied to the flat end of the pinion gear and take a reading (see illustration).

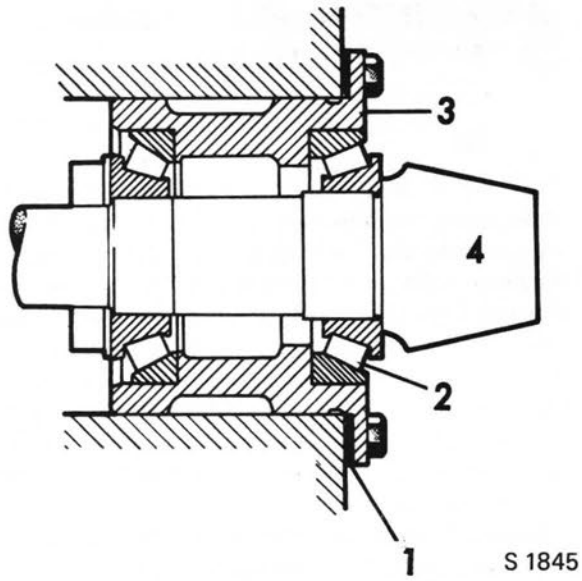


MEASURING TOOL LOCATED IN DIFFERENTIAL BEARING OPENINGS, MANUAL TRANSMISSION

3. When the pinion gear is correctly positioned, the dial should show the number of hundredths of a millimeter (+ or −) stamped into the pinion with a permitted tolerance of ± 0.05 mm.



MEASURING TOOL LOCATED IN AUTOMATIC TRANSMISSION

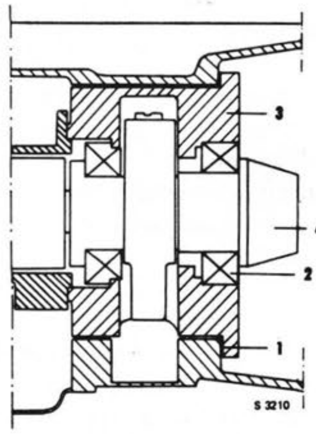


ADJUSTING THE PINION GEAR, MANUAL TRANSMISSION

1. Shim
2. Roller bearing
3. Bearing housing
4. Pinion

SHIM TABLE, MANUAL TRANSMISSION

Location	Shims Thickness mm	Shims Spare part No.
Pinion shaft between bearing housing and transmission case	0.10 0.15 0.30 0.50	8341752 8341760 8341778 8344723



ADJUSTING THE PINION GEAR, AUTOMATIC TRANSMISSION

1. Shims
2. Roller bearing
3. Bearing housing
4. Pinion gear

Shimming

If the measured reading is outside the permitted tolerance, the pinion shaft must be adjusted. This is done with shims placed between the pinion shaft bearing housing and the transmission case (see illustration).

SHIM TABLE, AUTOMATIC TRANSMISSION

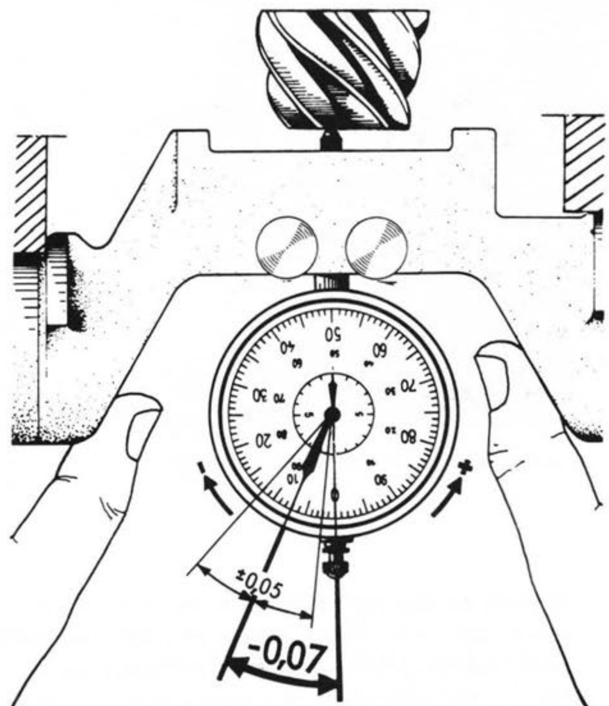
Location	Shims	
	Thickness mm	Spare part No.
Pinion shaft between bearing housing and transmission case	0.10 0.15 0.30	8707481 8707499 8707507

Procedure for shimming is as follows:

1. Undo the four screws from the pinion shaft bearing housing and tap the pinion shaft gently out of the transmission case.
2. Change the shimming according to the following rules:
   a) If the dial reading is higher than the correct value, increase the shim combination.
   b) If the dial reading is lower than the correct value, reduce the shim combination.

   NOTE! + reads counter-clockwise and – reads clockwise on the dial.

   Reduce or increase the shim combination by the difference between the measured and correct values.



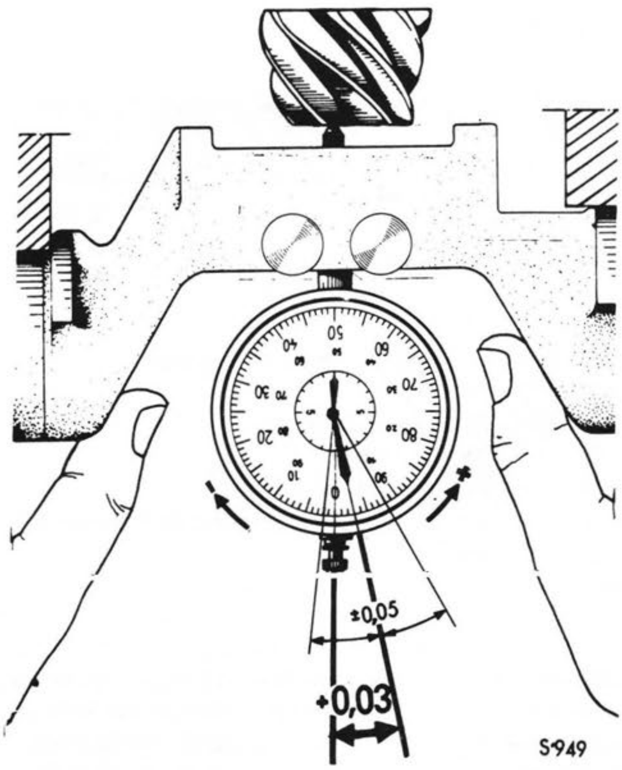
S 948

If the pinion is stamped –7, the pointers should indicate –0.07 mm. A deviation of ± 0.05 mm from this reading is permitted.

3. Having selected the correct combination of shims, place them in the transmission case with aid of the locating pins. Mount the pinion shaft to the transmission case using sleeve 8390148 and arbor 8390114. Remove the locating pins and tighten the screws to the prescribed torque and lock them with Loctite.

Rechecking

After shimming, replace the measuring jig in the differential housing and check that the dial now gives the correct reading to within ± 0.05 mm. If it does not, the shimming procedure must be gone through again.

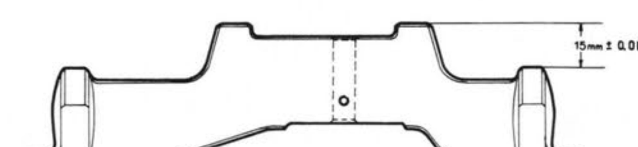


S 949

If the pinion is stamped +3, the pointers should indicate +0.03 mm. A deviation of ± 0.05 mm from this reading is permitted.

Checking the measuring jig

The measuring jig is a precision-made tool. It should be handled with care to avoid knocks and deformation. If there is reason to suspect that the jig may have been damaged in such a way that it gives wrong readings, it can be measured as a check. The dimension indicated in the illustration on the right should be measured for this purpose.

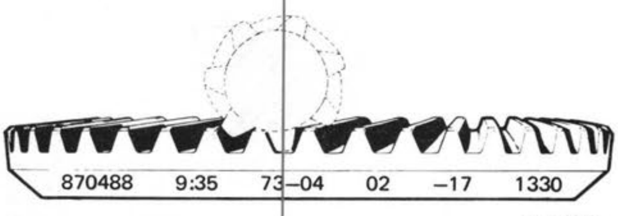


S 1847

CHECKING THE MEASURING JIG

ADJUSTING CROWN WHEEL BACKLASH, MANUAL AND AUTOMATIC TRANSMISSION

Certain data for adjustment of crown wheel backlash are stamped into the crown wheel as illustrated below.



CROWN WHEEL MARKINGS

870488	=	Part number (not article number)
9:35	=	Ratio
73–04	=	Date of manufacture
02	=	Material code
–17	=	Backlash of 0.17 mm
1330	=	Mating number which is also stamped on the pinion

The backlash should be checked at four points round the circumference of the crown wheel and must not deviate by more than ± 0.05 mm from the stated measurement. Crown wheel backlash is adjusted with shims. Up to four shims may be used in suitable combinations.

TABLE SHIMS

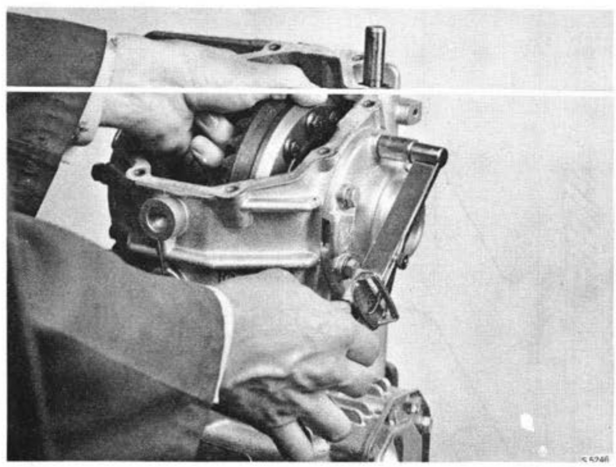
	Shims	
	Thickness mm	Spare part No.
Between differential bearing seat and transmission case	0.10 0.15 0.30 0.50	8341604 8341612 8341620 8341638

MEASURING AND SHIMMING, AUTOMATIC AND MANUAL TRANSMISSION

Adjustment of differential bearings

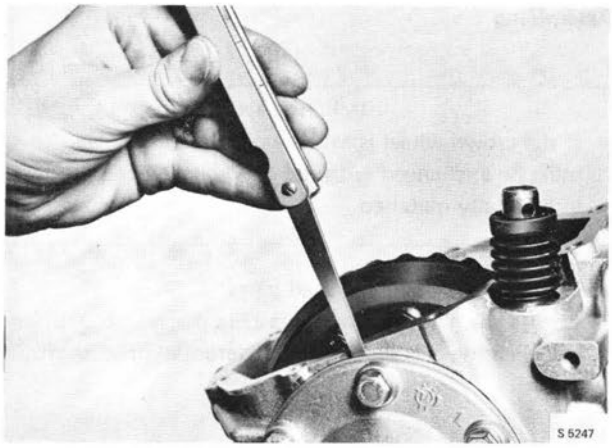
> CAUTION
>
> Adjustment must be carried out before the pinion shaft is mounted. (If only the final drive has been dismantled for the replacement of the differential bearings, the crown wheel must also be dismantled before the bearings can be adjusted.)

1. Place the differential assembly complete with crown wheel in the transmission case.
2. Mount the left bearing seat (the one with the speedometer drive) without shims and tighten the screws to the prescribed torque of 20–25 Nm (14–18 ft.lb., 2.0–2.5 kpm).
3. Oil the differential bearings and mount the right bearing seat. If the inner driver is mounted in the bearing seat, remove the spring and plunger before mounting the seat. Tighten the screws, in two or three stages, with a torque of about 2.2 Nm (19 in.lb., 22 kpcm). Rotate the differential while tightening the screws.



TIGHTENING THE RIGHT BEARING SEAT

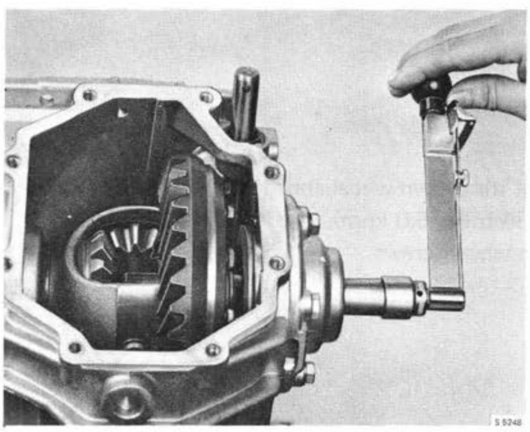
4. Measure the gap between the transmission case and bearing seat with a feeler gauge at two points opposite each other and take an average of the two measurements. Then select shims corresponding to this result plus an increment of <u>0.20</u> mm to obtain the correct bearing compression.



MEASURING BEARING SEAT GAP

> NOTE
> The method described above applies to both new and old bearings.

The torque obtained in this way can be measured by means of a torque wrench and driver 8790818.



MEASURING THE DIFFERENTIAL BEARING TORQUE
Torque wrench and driver 8790818

Ensure that you adjust to the correct values. The following values apply for the rolling torque:
New, lightly oiled bearings 1.8–2.8 Nm (16–24 in.lb., 18–28 kpcm).
Bearings having run more than 1.200 miles (2.000 km) 0.8–1.3 Nm (7–11 in.lb., 8–13 kpcm).

Shims of four different thicknesses can be suitably combined. The available thicknesses are shown in the table below.

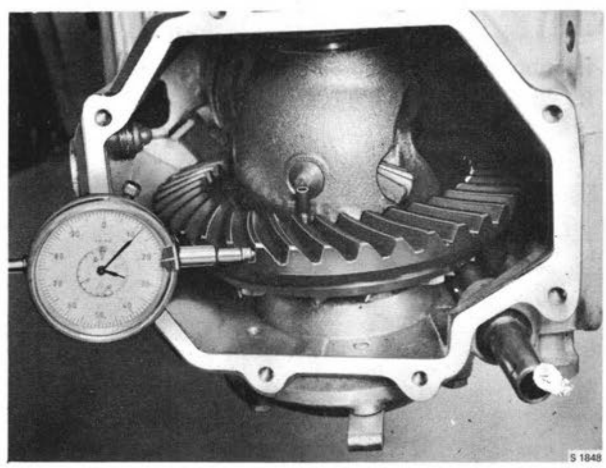
TABLE SHIMS, MANUAL AND AUTOMATIC TRANSMISSION

Location	Shims	
	Thickness mm	Spare parts No
Between differential bearing seat and transmission case	0.10 0.15 0.30 0.50	8341604 8341612 8341620 8341638

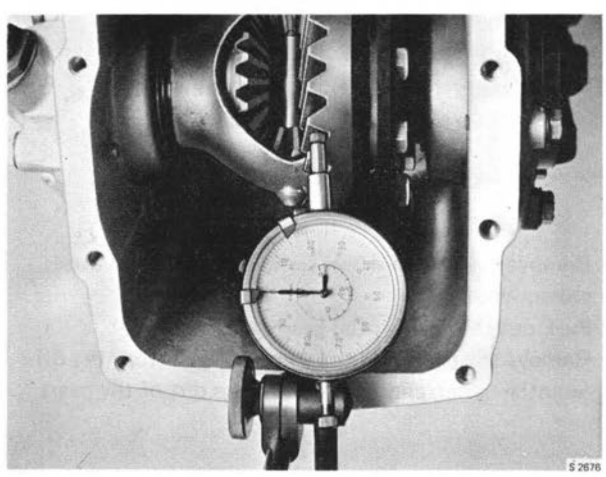
> NOTE
> The resulting set of shims should then be distributed between the right and left sides to give the correct gear backlash.

ADJUSTING CROWN WHEEL GEAR BACKLASH

1. Place the differential assembly complete with crown wheel in the transmission case.
2. Mount the left bearing seat (the one with the speedometer drive) without shims and the right bearing seat with the selected set of shims, tightening the screws to the prescribed torque of 20–25 Nm (14–18 ft.lb., 2.0–2.5 kpm).
3. Mount the indicator dial, see illustration, and measure the gear backlash.
4. Calculate the difference between the measured backlash and the desired gear backlash, and then move shims of suitable thickness over to the left bearing seat. Measure again afterwards as a check.



MEASURING GEAR BACKLASH, MANUAL TRANSMISSION



MEASURING GEAR BACKLASH, AUTOMATIC TRANSMISSION

NOTE

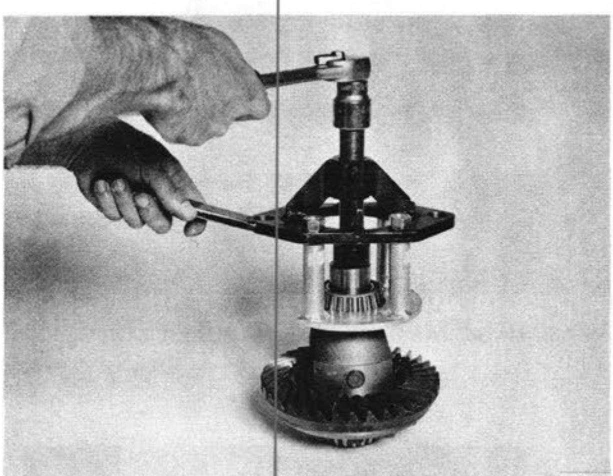
The preselected set of shims must be used for adjusting the backlash. The total thickness of the set must not be altered.

DIFFERENTIAL, MANUAL AND AUTOMATIC TRANSMISSION

Removing

To replace parts inside the differential, remove one of the lock rings on the differential drive shaft. The shaft, drive and wear washers can be removed without the differential having to be dismantled.

1. Remove the differential housing cover.
2. Remove the two differential bearing seats together with inner drivers. Save any shims and remove the differential.
3. If necessary, press the outer bearing rings out of the bearing seats (see Dismantling of the inner driver with differential bearing cap). Remove the speedometer drive and press both journal bearings off the differential housing using tools 89 95 185, 87 90 768 and 89 95 177.



REMOVING DIFFERENTIAL JOURNAL BEARINGS
Pullers 8995185 and 8790768 and drift 8995177

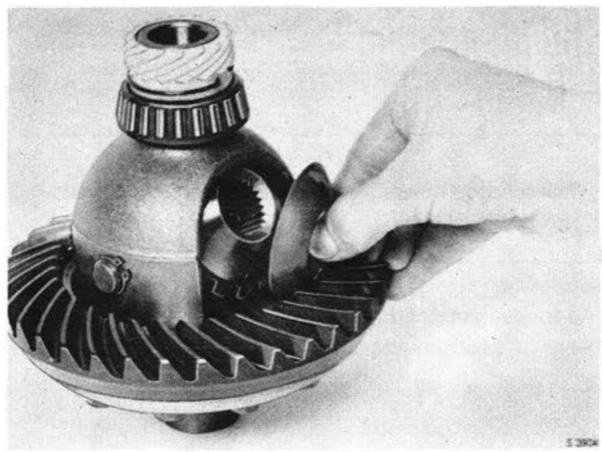
4. Remove the crown wheel screws and take off the crown wheel.
5. Push out the differential gear shaft.
6. Remove the gears and the wear washers from the differential casing and take the springs out of the gears.

Assembling

IMPORTANT

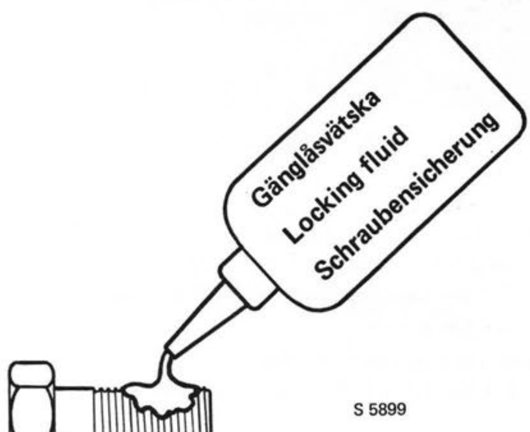
If the crown wheel is exchanged, the pinion gear must be exchanged with it, as these two parts are individually matched.

1. Exchange worn or damaged parts.
2. Locate the gears and wear washers if any in the differential casing and slide in the differential drive shaft.

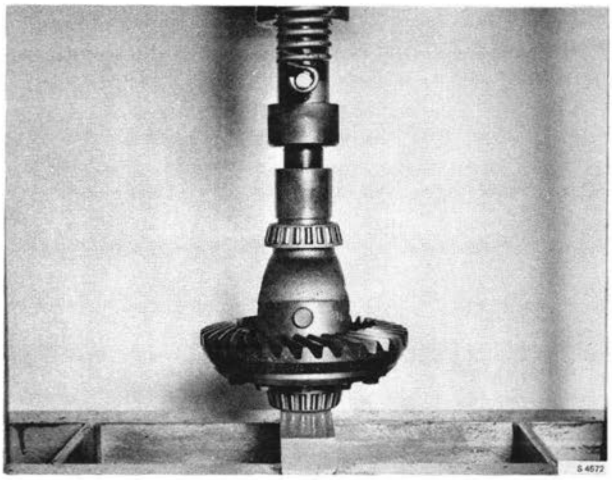


WEAR WASHERS

3. Mount the crown wheel and tighten the screws to 50 Nm (36 ft.lb., 5.0 kpm). Use locking fluid for the crown wheel screws.

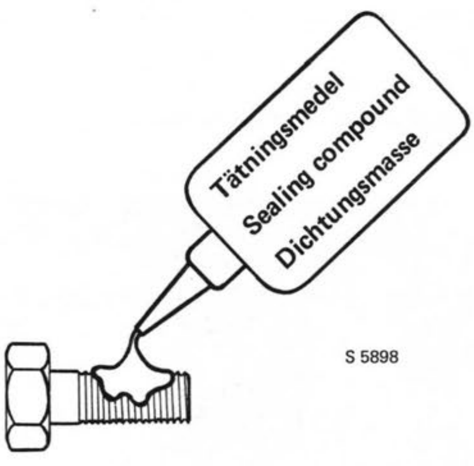


4. Press on the journal bearings and the speedometer drive, if these have been previously removed, using tool 8790487.



PRESSING ON THE DIFFERENTIAL JOURNAL BEARINGS
Tool 8790487

5. Locate the differential assembly in the transmission case. If any part affecting the overall width of the differential assembly – e.g. the bearings – has been exchanged, the crown wheel backlash must be adjusted. This is done by alteration of the combination of shims. See section "Adjusting crown wheel gear backlash".
6. For fitting of the outer bearing rings in the bearing seats, see under "Inner driver with differential bearing seats – assembly". Fit the differential bearing seats and the inner driver. Coat the threads of the 12 bolts with sealing compound.



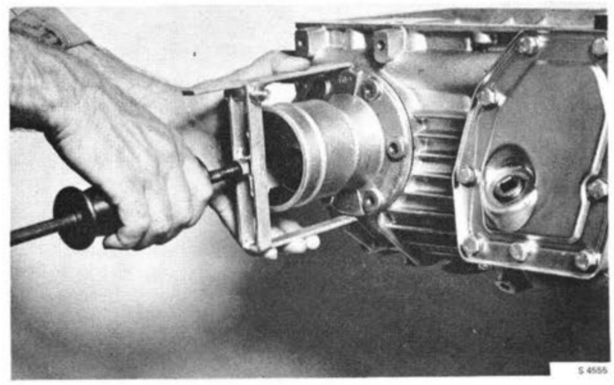
Tightening torque, differential bearing cap	40–60 Nm 30–45 ft.lb. (4.0–6.0 kpm)

7. Mount the rear cover of the diffferential housing.

INNER DRIVER WITH DIFFERENTIAL BEARING SEATS

Removal

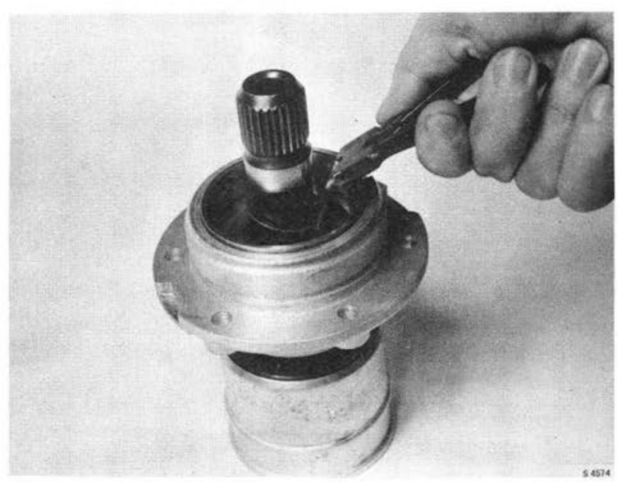
Remove the differential bearing cap retaining screws and remove the cap and inner driver using tool 8790776 and tool 8390270. Save the shims.



REMOVING THE DIFFERENTIAL BEARING CAP
Tool 8790776 and 8390270

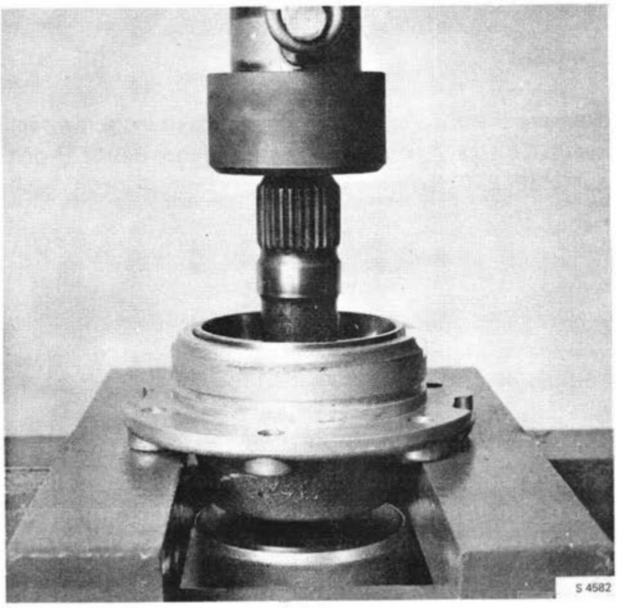
Dismantling

1. Remove the circlip from the driver using circlip pliers.



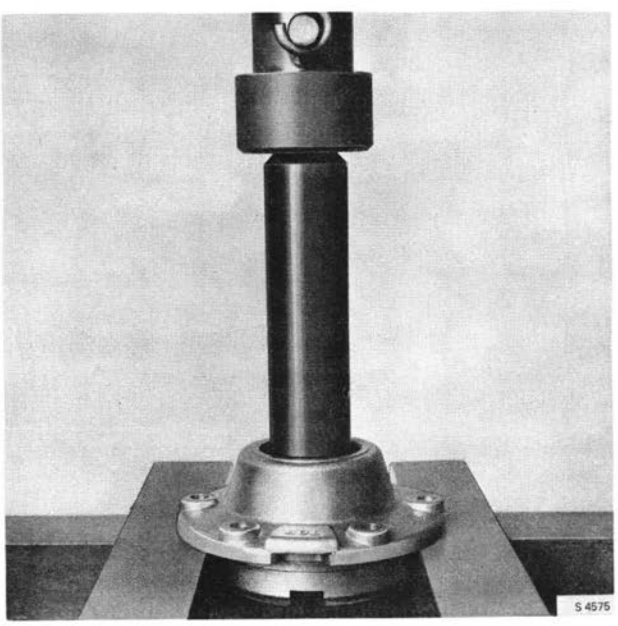
REMOVING THE CIRCLIP

2. Press out the driver from the differential bearing cap.



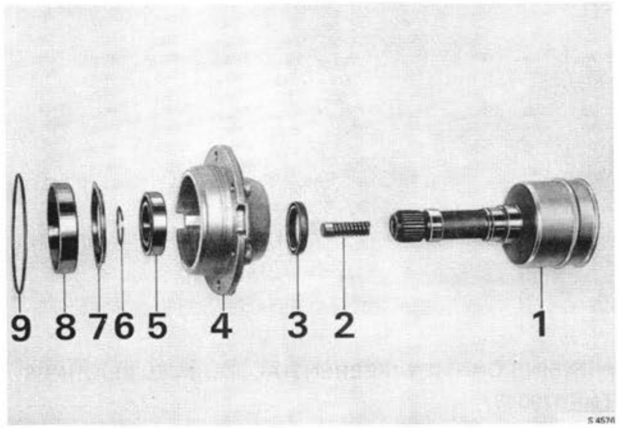
PRESSING OUT THE DRIVER

3. Using a screwdriver, remove the seal ring taking care not to damage the bearing cap.
4. Remove the speedometer drive from the left bearing cap.
5. Press out the ball bearing using tool 7841067.
6. Remove the bearing tracks for the differential bearings by means of a suitable drift. A washer is located inside the bearing track for the right-hand differential bearing cap (cap without speedometer drive) and the purpose of this is to improve the bearing lubrication.



PRESSING OUT THE BALL BEARING
Tool 7841067

7. Remove the O-ring from the groove in the bearing cap.

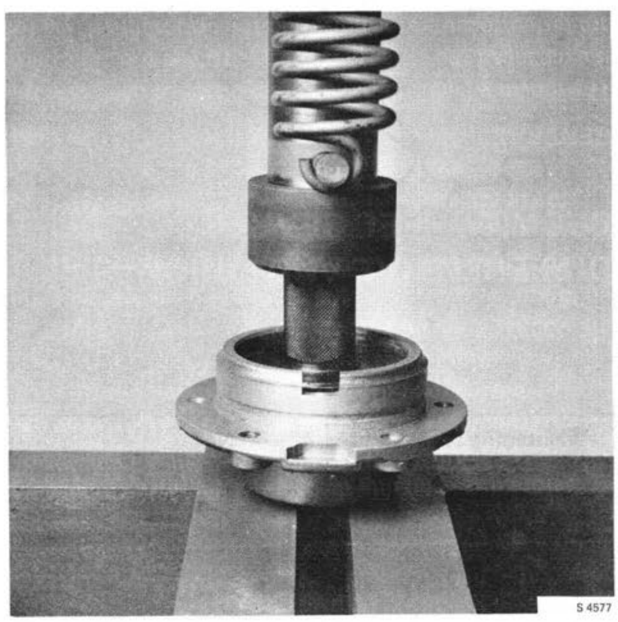


INNER DRIVER AND BEARINGS

1. Inner driver
2. Spring with plunge
3. Sealing ring
4. Cap
5. Ball bearing
6. Lock ring
7. Oil level washer
8. Bearing track
9. O-ring

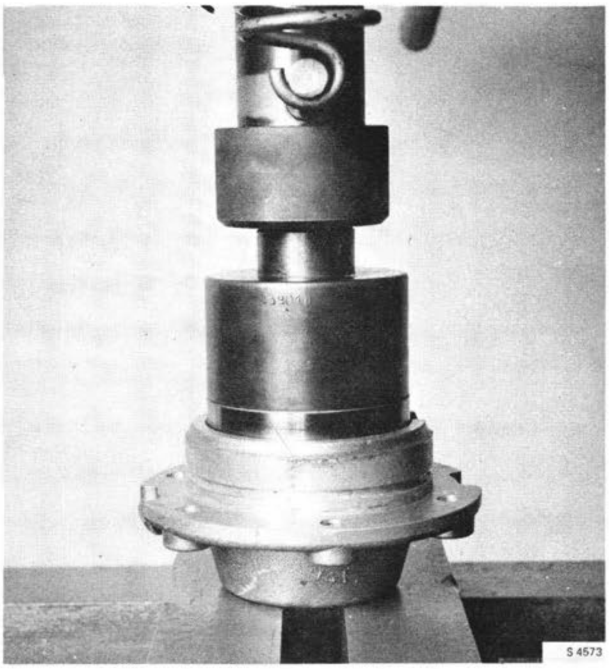
Assembly

1. Press the ball bearing into the bearing cap using tool 7841141.



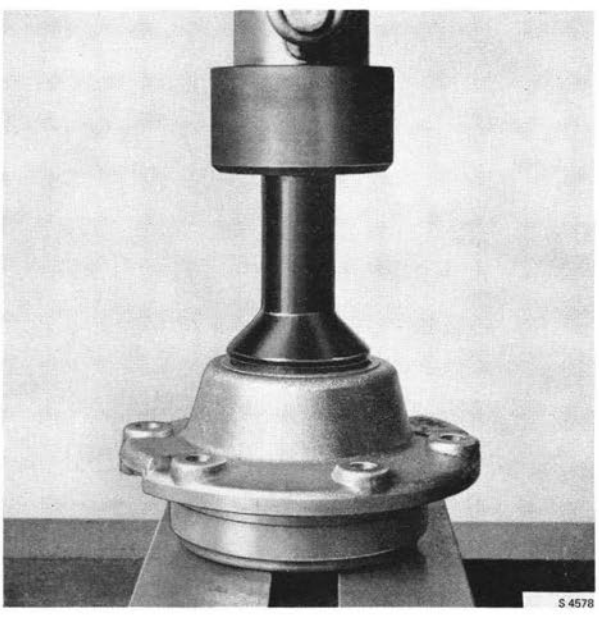
PRESSING IN THE BALL BEARING
Tool 7841141

2. Place the washer inside the bearing track in the right-hand bearing cap and press in the bearing tracks using tool 8390114.



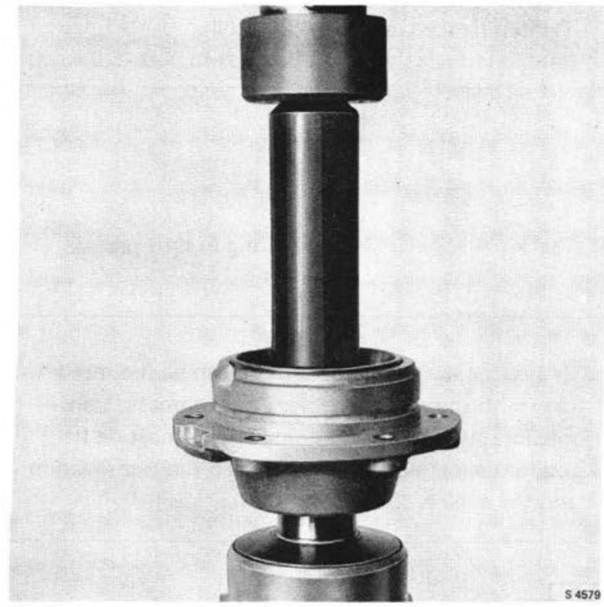
PRESSING IN THE BEARING TRACKS
Tool 8390114

3. Using drift 8790800, press in the seals in such a way that they will project approximately 0.08 in. (2 mm) above the plane of the bearing cap.



PRESSING IN THE SEALS
Tool 8790800

4. Adjust the bearing clearance and the backlash (see page 473–4).
5. Press the bearing cap onto the driver shaft using tool 7841067.



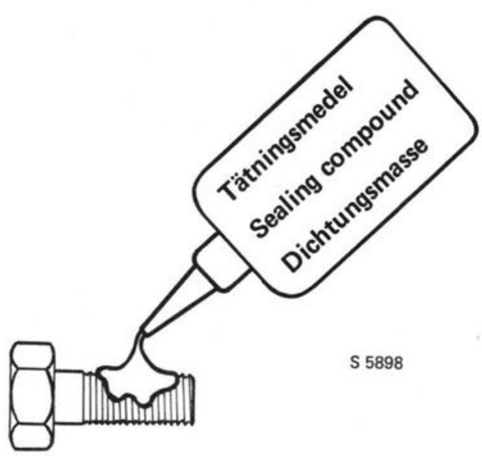
MOUNTING THE CAP IN A PRESS
Tool 7841067

6. Fit the circlip using circlip pliers.
7. Mount the speedometer drive.
8. Mount the O-ring in the groove in the bearing cap.

Installation

See page 473–4 for adjustment of the differential bearing clearance and adjustment of backlash.

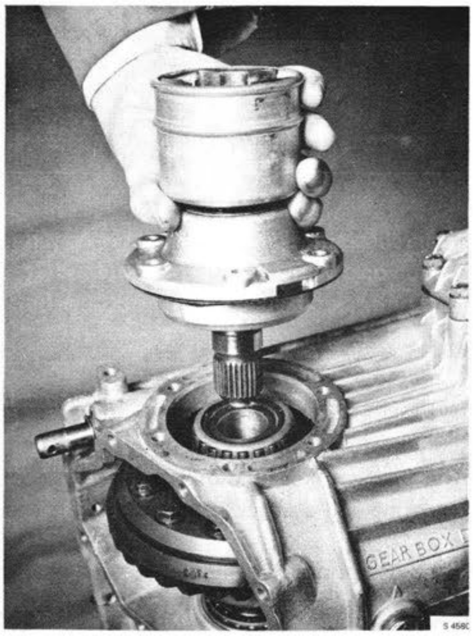
1. Check that the O-ring is mounted on the bearing cap and place the spring and plunger in the hole in the end of the driver shaft.
2. Fit a suitable combination of shims to the two bearing caps and mount the caps, together with inner driver, to the transmission.
3. When securing the bearing cap, check that there is backlash. Tighten the retaining screws to the prescribed torque. Use sealing compound on the threads of the 12 screws.



Tightening torque, differential bearing cap	40–60 Nm 30–45 ft.lb.(4.0–6.0 kpm)

4. Check the backlash by measuring in four places.

CAUTION
Before the left-hand bearing cap can be mounted (cap with speedometer drive) on automatic transmissions, two of the retaining screws must be fitted in the mating surfaces between the transmission and the engine. (See illustration)

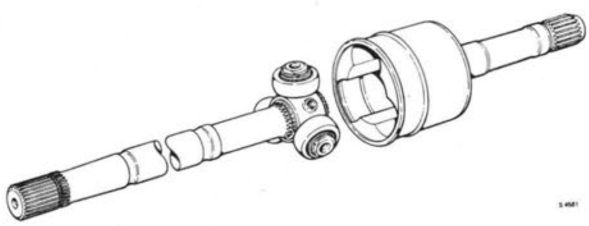


DIFFERENTIAL BEARING CAP WITH INNER DRIVER

UNIVERSAL JOINTS

INNER UNIVERSAL JOINT

The inner universal joint consists of a driver journalled on a ball bearing in the differential bearing seat and splined onto the differential gear. The driver is locked axially by means of a circlip inside the ball bearing and by a spring and plunger at the end of the driver which bears against the differential shaft.
The driver is removed from the transmission complete with the differential bearing seat.

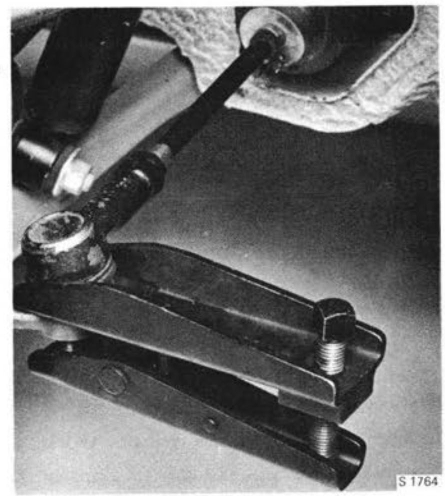


INNER UNIVERSAL JOINT

The external design of the driver is in the form of a sleeve in which there is a recess for the three-bearing universal joint of the inner drive shaft. When the car is in motion, the joint which is journalled in needle bearings can slide axially in the driver sleeve as well as being jointed. The joint is packed with grease and is protected by a rubber bellows. Lubrication of the joint is only necessary when the joint is to be reconditioned or removed for some reason.

Removing

1. Jack up the front of the car and take off the wheel.
2. Remove the brake housing and hang it up by the wheel housing to avoid strain and damage to the brake hose; then remove the brake disc and parking brake assembly with cable.
3. Undo the large clamp from the rubber bellows on the inner universal joint.
   To separate the inner universal joint, fit cover 7323736 in the rubber bellows to stop the needle bearings falling out and to keep dirt out of the joint. Fit protective cap 7838469 on the inner driver.
4. Disconnect the tie rod from the steering arm using tool 8995409 and undo the nut on the upper ball joint. Remove the screws from the lower control arm bracket.



REMOVING THE STEERING ARM
Tool 8995409

5. Pull out the drive shaft through the wheel housing and remove the entire front axle assembly.
6. See page 473–7 for the removal and installation of the inner driver from the transmission.
7. If the rubber bellows on the inner or outer universal joint needs renewing, detach the shaft from the outer joint (see "Outer universal joints"). The rubber bellows can then be slipped off the shaft.

Mounting

1. Make sure that the inner driver is washed clean, and then pack the needle bearing seats with grease. The right amount will be obtained if the driver is filled with grease.

GREASE
Use soft EP grease with a lithium-lead base designed to withstand wide variations in temperature and loading. Consistency in accordance with NGLI 1: ESSO Beacon EP 1; Alvania EP grease 1 or equivalent.

2. Slip the rubber bellows over the drive shaft and mount the shaft and rubber bellows to the outer universal joint (see "Outer universal joints").
3. Pack the needle bearings with grease and fit the bearings over the ends of the drive shaft. Mount cover 73 23 736 in the rubber bellows to protect the bearings and prevent them from falling off. Then insert the shaft complete with rubber bellows through the wheel housing.

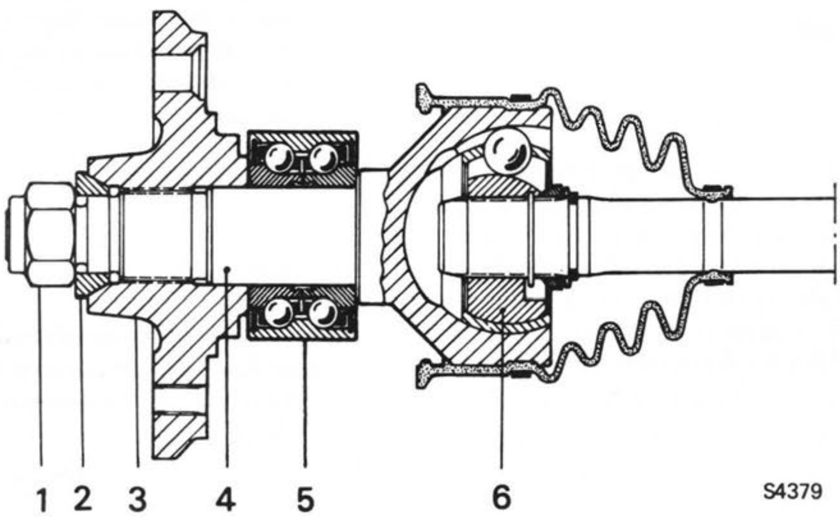
4. Take the cover out of the rubber bellows and slide the drive shaft complete with needle bearings into the inner driver. Locate the rubber bellows and put on the clamps.
5. Mount the steering knuckle housing and steering arm.
6. Mount the parking brake assembly with handbrake wire, the brake disc and the brake housing.
7. Mount the wheel and lower the front of the car.

IMPORTANT
After the brake housing has been mounted the brake pads must be advanced to their correct positions close do the disc by repeated pumping of the footbrake pedal. Otherwise the footbrake will not work.

OUTER UNIVERSAL JOINT

General

The outer universal joint transfers the power from the intermediate to the outer drive shaft. The outer drive shaft terminates in a bell with a spherical track in which six balls transmit the driving power from a hub. The intermediate drive shaft is splined onto the hub and is locked axially by means of a circlip accessible through a recess in the hub. The hub, balls and outer shaft are individually matched and are not interchangeable. Lubrication of the joint is only necessary when the joint is to be reconditioned or removed for some reason.



OUTER UNIVERSAL JOINT

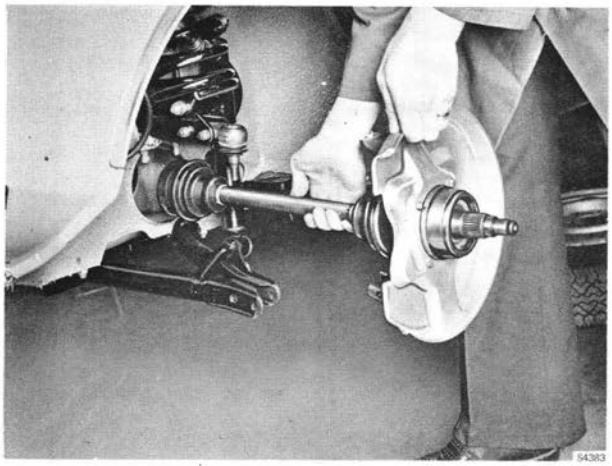
1. Lock nut
2. Washer
3. Wheel hub
4. Outer drive shaft
5. Bearing with seals
6. Outer drive shaft joint

Dismantling

1. Remove the hub cap and hub nut. Back off the wheel nuts.
2. Block up the front of the car and remove the wheel.
3. Rotate the disc so that one of the recesses in the edge of the disc will be in line with the brake pads. Disconnect the handbrake cable and remove the brake housing. Suspend the brake housing to avoid damage to the brake hose or line.
4. Remove the hub and disc from the shaft by means of extractor 8995185 and four extension sleeves 8996050.

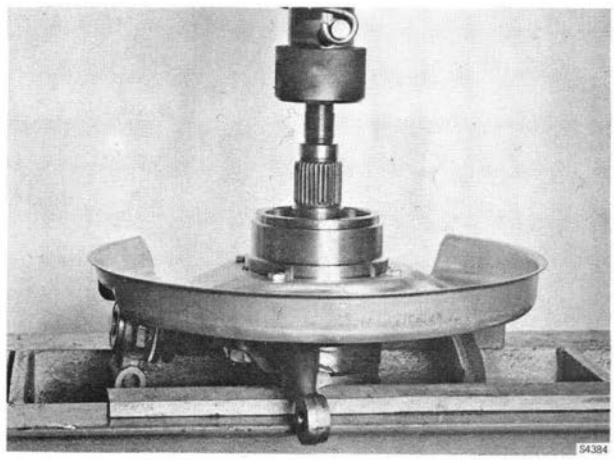
REMOVING THE BRAKE DISC
Tool 8995185 and 4 extensions 8996050

5. Remove the large clamp round the rubber bellows on the inner universal joint.
6. Free the steering arm and the upper ball joint using tool 8995409. Undo the screws on the lower control arm bracket.
   After separation of the inner universal joint, fit a cover to the rubber bellows to prevent the needle bearings from falling out and to keep dirt out of the joint. Fit a protective cap over the inner drive.
7. Withdraw the drive shaft through the wheel housing and remove the entire front axle assembly, which should then be cleaned thoroughly.



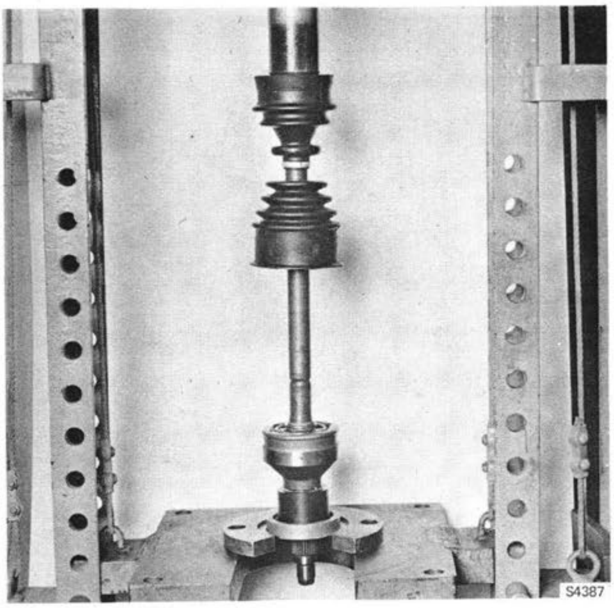
REMOVING THE FRONT AXLE ASSEMBLY

8. Mount the steering knuckle housing in a press and press out the outer drive shaft.



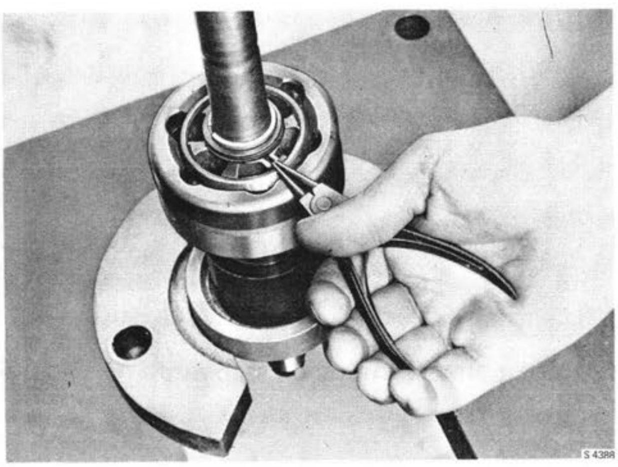
THE OUTER DRIVE SHAFT IS PRESSED OUT

9. Remove the intermediate drive shaft from the outer universal joint hub as follows:
   a. Loosen the rubber bellows on the outer universal joint and slide it along the shaft.
   b. Mount the shaft in a press and press together the two conical washers so that the circlip inside the hub can move in its groove.



COMPRESSING THE WASHERS

c. Open the circlip by means of circlip pliers and release the pressure.



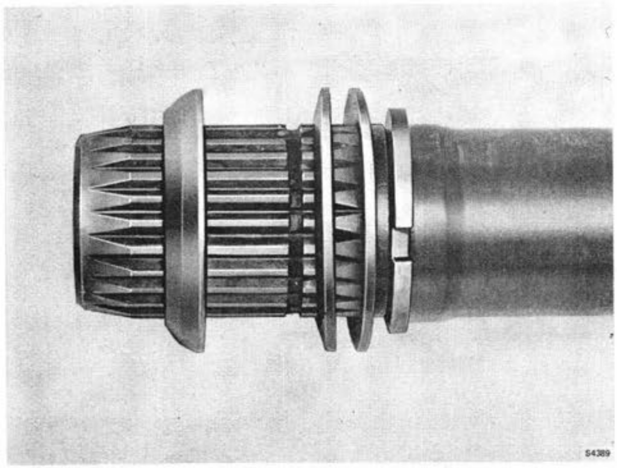
OPENING THE CIRCLIP

d. Withdraw the intermediate shaft from the hub together with the spherical shaped washer, the two conical washers and the shaft locking ring. The circlip on the hub remains in the groove.

Installation

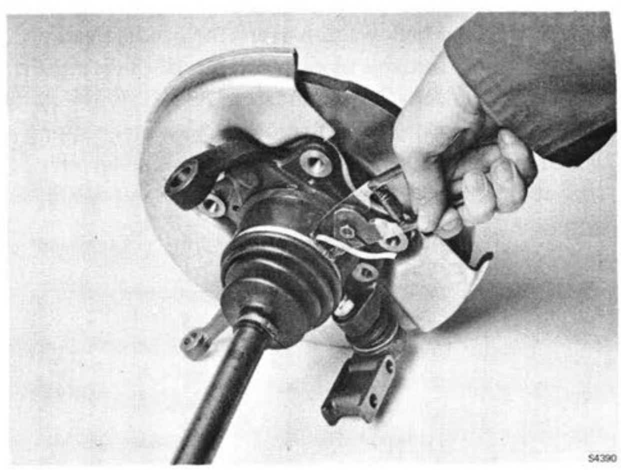
1. Assemble the intermediate drive shaft to the outer universal joint as follows:
   a. Pack the joint with grease.
   b. Fit the shaft locking ring, the two dished spring washers, (with concave sides facing inwards) and the spherical washer. Insert the shaft in the universal joint hub.

N.B.
Pack the joint with grease before fitting the intermediate shaft.



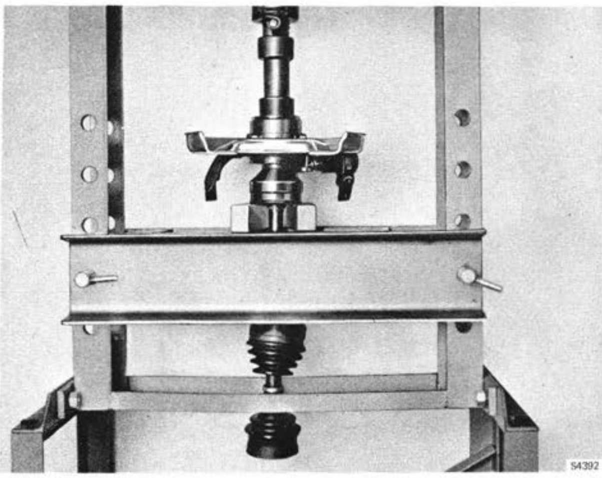
SHAFT WITH LOCK RING AND WASHERS

   c. Mount the unit in a press and press together the dished washers so that the circlip inside the hub snaps into the groove in the shaft. Pull the shaft to check that it is held securely.
   d. Pack the joint with grease and assemble the rubber bellows. Fit the clips with tool 7844699.



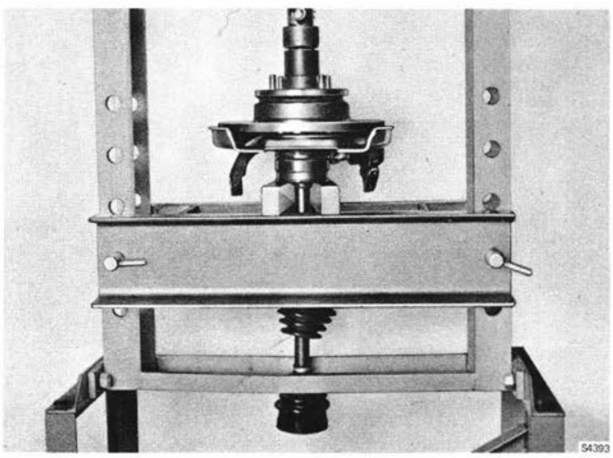
FITTING THE CLIPS
Tool 7844699

2. Mount the outer drive shaft in the press and press on the knuckle housing and the bearing. Press on the inner race of the bearing.



PRESSING ON THE INNER RACE OF THE BEARING

3. Press the wheel hub and disc onto the drive shaft splines and fit the conical washer and locking nut. The nut should be locked later.



PRESSING THE WHEEL HUB ONTO THE SHAFT

4. If the inner universal joint needle bearings have been removed, grease them and mount them on the stubs of the shaft. Fit the cover to protect the needle bearings and insert the drive shaft through the wheel housing. Ensure that the inner driver is clean and packed with grease.
5. Assemble the inner universal joints. Fit the upper ball bolt to the steering knuckle housing and fit the lower control arm bracket. Secure the inner universal joint bellow clips.
6. Mount the steering arm.
7. Mount the brake housing.
8. Fit the wheel and lower the car.
9. Tighten the hub locking nut to the prescribed torque and secure the nut by peening the flange in the locking groove.
10. Tighten the wheel nuts securely and fit the hub cap.

CAUTION

The brake pads must be advanced to their proper position close to the disc which is done by pumping the brake pedal repeatedly. Otherwise the brake will not work.

CONTENTS

GENERAL

The car has two independent brake systems: the footbrake or driving brake, which is hydraulic and acts on all four wheels, and the handbrake or parking brake, which is mechanical and acts on the front wheels.

FOOTBRAKE OR DRIVING BRAKE SYSTEM

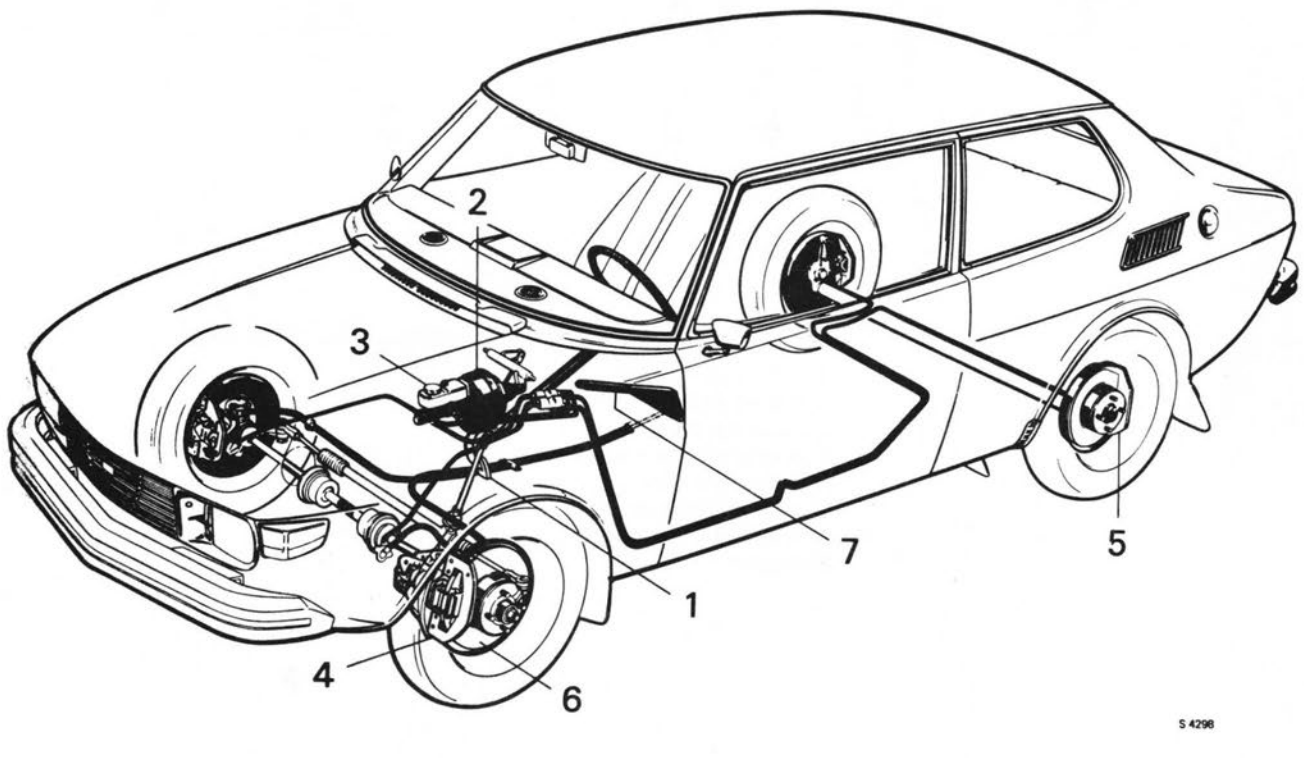
When the brake pedal (1) is depressed, it acts on two pistons in the master cylinder (3) via the servo unit (2); the latter increases the pedal pressure and transmits the motion to the master cylinder which acts simultaneously but independently on two hydraulic circuits to the front (4) and rear (5) wheel brakes. Each circuit acts on a diagonally opposed pair of wheels, i.e. right front and left rear, and left front and right rear.

The pressure is transmitted through the brake lines and hoses to the wheel cylinders, where the pistons force the brake pads against the discs (6). The braking effort is greater on the front wheels, and this reduces the risk of the rear wheels locking. If there is a leak in the system, braking effort will be lost on one diagonal pair of wheels only, the other pair being unaffected. The reduced pressure in the leaking circuit then acts on the brake warning valve in the master cylinder and the brake warning light on the instrument panel lights up.

As from model 1978, the master cylinder contains a float which senses the level of the fluid in the container. In the event of leakage, the float actuates a switch in the cover of the brake fluid container and the brake warning light will go on.

HANDBRAKE OR PARKING BRAKE SYSTEM

The action of the handbrake lever (7) is transmitted mechanically by a link mechanism and two wires to the front wheel brakes (4) where a push rod acts mechanically on the pistons which force the brake pads against the discs.



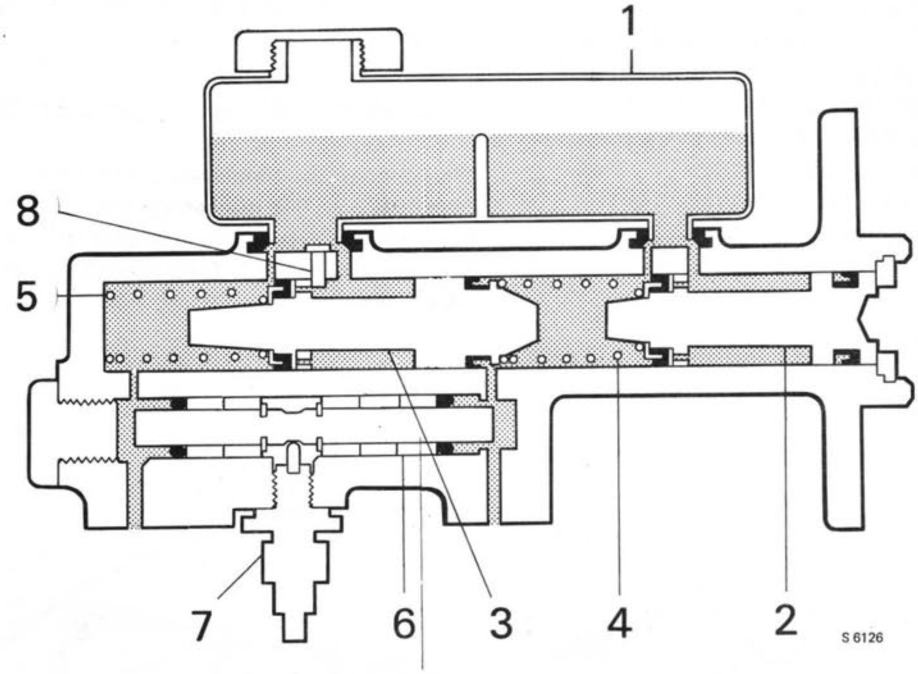
BRAKE SYSTEM

1. Brake pedal
2. Servo unit
3. Master cylinder
4. Brake housing, front wheel
5. Brake housing, rear wheel
6. Brake discs
7. Handbrake lever

MASTER CYLINDER

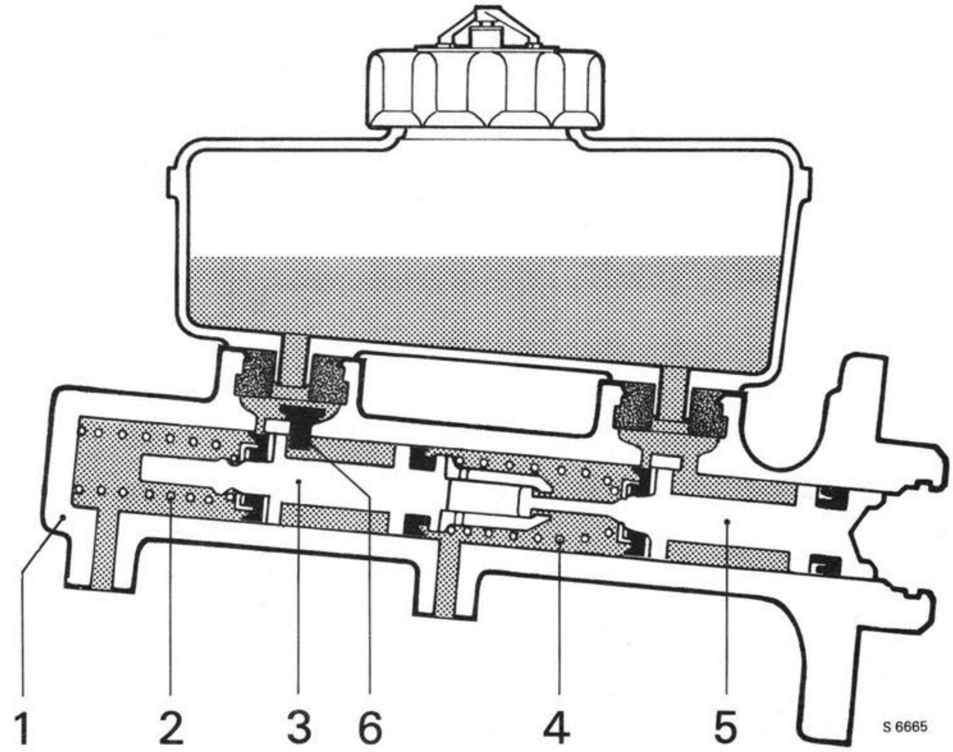
The master cylinder comprises a cylinder housing in which two pistons, one for each brake circuit, transmit the force from the push rod hydraulically. In model 1975–1977, the leakage warning system consists of a piston in the main cylinder which actuates an electric switch, in the event of a pressure drop in one of the circuits, whereupon the brake warning light will come on.

As from model 1978, a float mechanism in the cover of the brake fluid container senses the level of the fluid in the container. Should the level drop below a preset limit, the movement of the float will actuate a switch in the cover, whereupon the brake warning light will come on.



SECTION THROUGH MASTER CYLINDER, MODEL 1975–1977

1. Brake fluid reservoir
2. Primary piston
3. Secondary piston
4. Return spring, primary piston
5. Return spring, secondary piston
6. Brake warning piston
7. Brake warning switch
8. Stop pin



SECTION THROUGH MASTER CYLINDER, AS FROM MODEL 1978

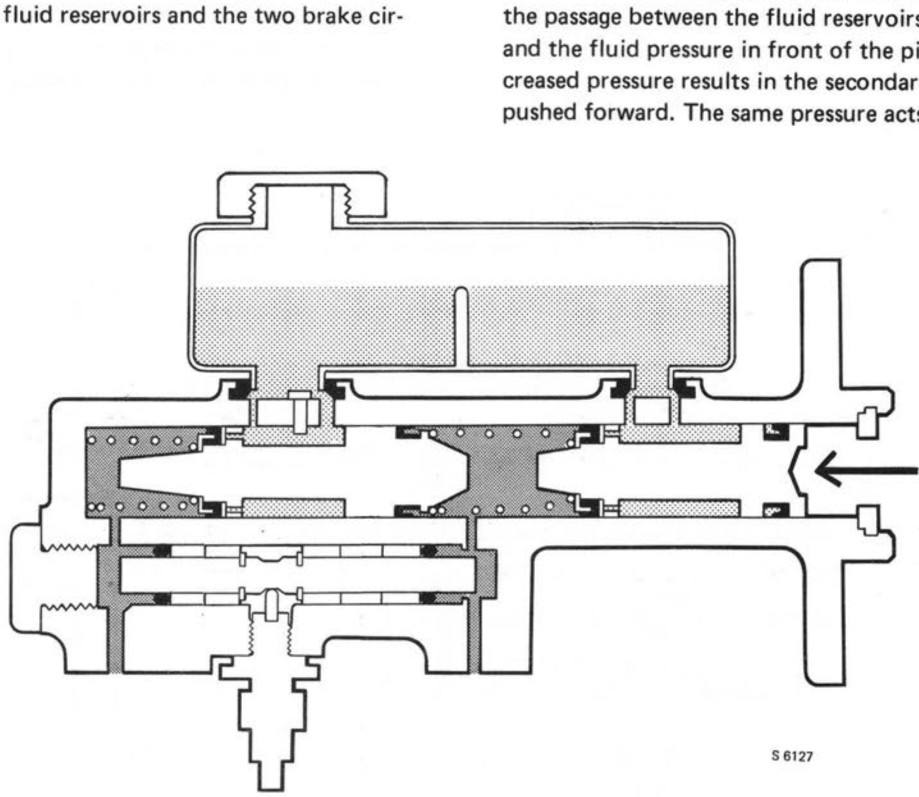
1. Cylinder housing
2. Return spring, secondary piston
3. Secondary piston
4. Return spring, primary piston
5. Primary piston
6. Stop pin

Rest position

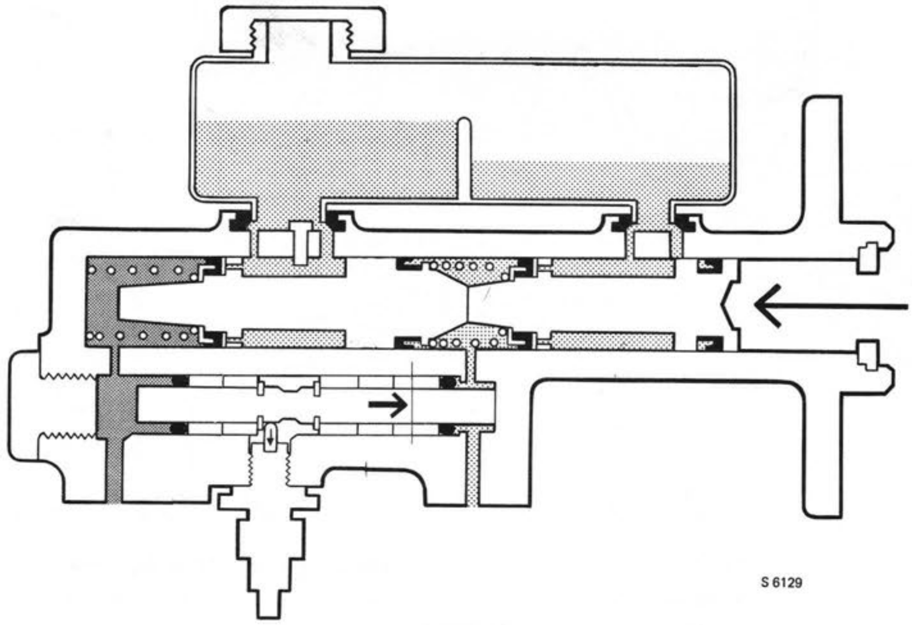
In the rest position, the two pistons are held at the rear end of travel by means of the return spring. The passages between the brake fluid reservoirs and the two brake circuits are open.

Braking

When the brake pedal is depressed, the primary piston is pushed forward by the push rod. This movement closes the passage between the fluid reservoirs and the cylinder and the fluid pressure in front of the piston rises. The increased pressure results in the secondary piston being pushed forward. The same pressure acts on the front of



MASTER CYLINDER, BRAKING, MODEL 1975–1977 both pistons and the pressure is transmitted to the brake. In the event of a leakage occurring, for example, in the primary circuit, the primary piston spring is compressed until the piston acts on the secondary piston, and the brakes in the secondary circuit function normally. In master cylinders with a brake warning piston, the pressure drop in the faulty circuit will give rise to a difference in pressure which will cause the brake warning piston to move towards the outlet on the primary side. The movement of the piston causes the pin from the brake warning switch to be pressed into the switch, whereupon the electrical circuit to the brake warning light is closed.



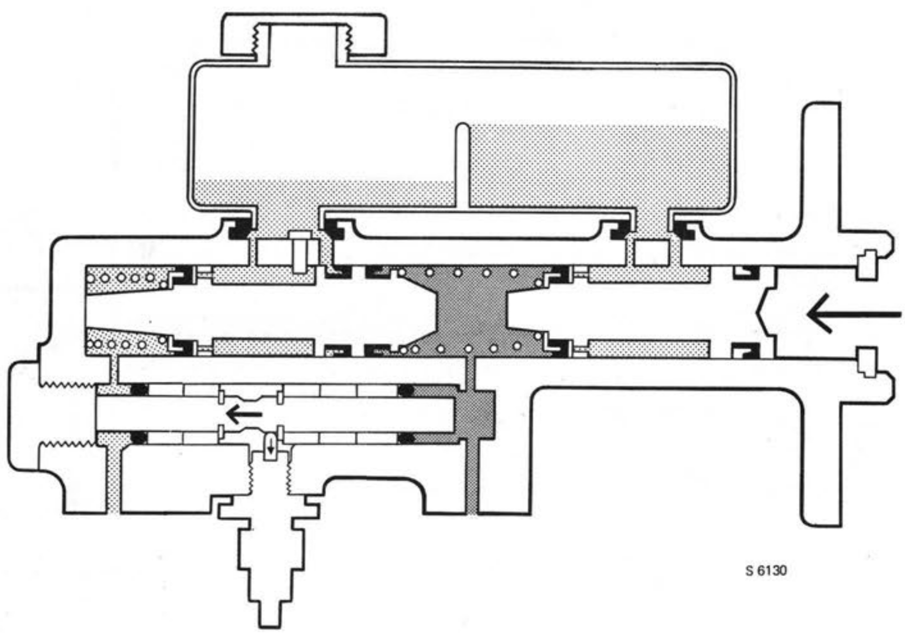
MASTER CYLINDER, LEAKAGE IN THE PRIMARY CIRCUIT, MODEL 1975–1977

In the event of leakage in the secondary circuit, the secondary piston is pushed forward, compressing the return spring and coming into contact with the end of the cylinder. The reduced pressure in the secondary circuit causes the brake warning piston to move towards the secondary side, and the brake warning switch lights up the warning lamp. The primary circuit is unaffected.

In the event of a leakage occurring in a brake circuit in cars with master cylinders containing a brake warning float, the float will drop as the fluid level sinks, whereupon the switch in the cover will close the circuit to the brake warning light.

The brake fluid reservoir comprises two mutually independent compartments. In the event of leakage in one circuit, only one of the compartments will therefore be emptied.

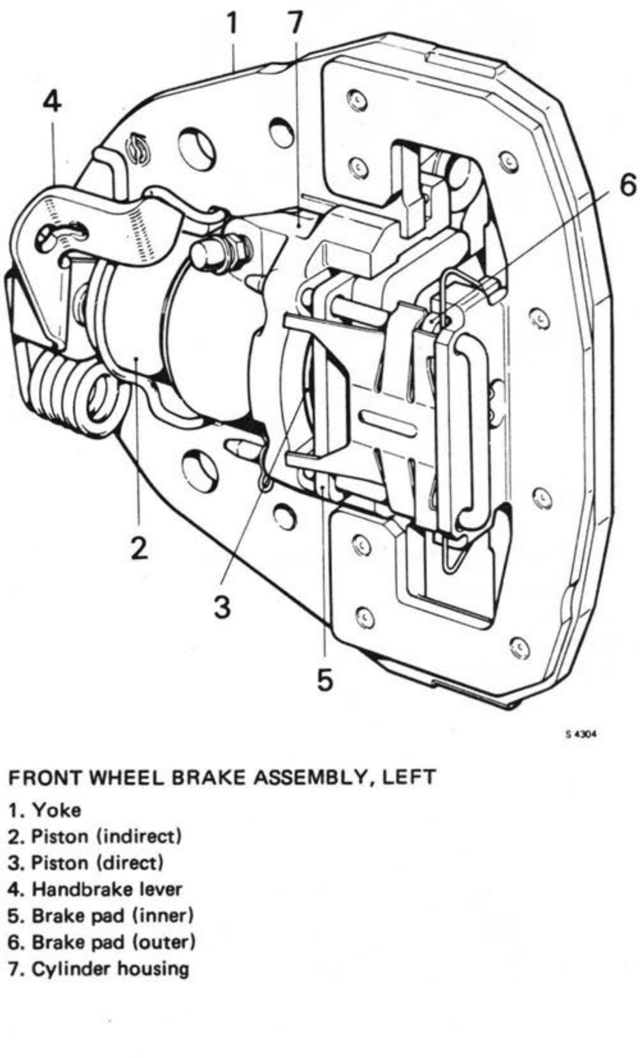
The fluid remaining in the undamaged circuit is sufficient to drive the car safety to a workshop. As the two brake circuits act diagonally, about half of the braking effect always remains in the event of leakage in one of the circuits. This also provides greater safety in steering the car as one front and one rear wheel always run free and do not lock.



MASTER CYLINDER, LEAKAGE IN THE SECONDARY CIRCUIT, MODEL 1975–1977

WHEEL BRAKES

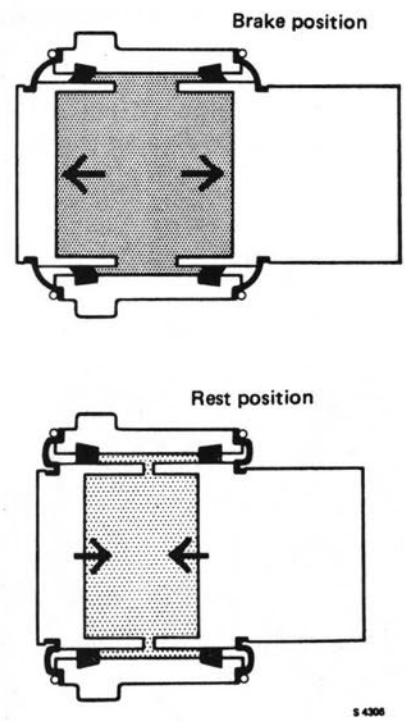
Each wheel brake assembly comprises a brake housing with two pistons, a yoke and two brake pads. The front brake housings contain the handbrake mechanism and are securely mounted on the steering knuckle housings. The rear brake housings are mounted to special mounting points on the rear axle. The yokes slide in grooves in the brake housings. When the brake pedal is depressed, the fluid pressure is transmitted to both pistons in the cylinder. One of the pistons acts directly on one of the brake pads while the other presses on the yoke which indirectly transfers the pressure to the other brake pad. In this way, the pressure will be the same on both sides of the disc.



FRONT WHEEL BRAKE ASSEMBLY, LEFT

1. Yoke
2. Piston (indirect)
3. Piston (direct)
4. Handbrake lever
5. Brake pad (inner)
6. Brake pad (outer)
7. Cylinder housing

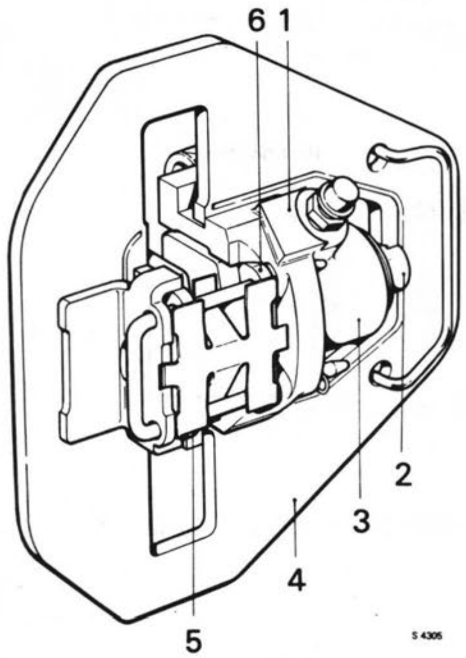
When the brake pedal is released, the piston seals in the cylinder return the pistons to the rest position. Adjustment as a result of brake pad wear is thus automatic.



PISTON SEALS, REST POSITION AND BRAKING

Rear wheel brake assembly, Girling make

Each wheel brake assembly comprises a brake housing with two pistons, a yoke and two pads. The yoke slides in grooves incorporated in the body of the brake housing. When the brake pedal is depressed, hydraulic pressure is directed between the two pistons in the cylinder. One of the pistons acts directly on one of the brake pads while the other presses on the yoke which indirectly transfers the pressure to the other brake pad. In this way, the pressure will be the same on both sides of the disc.

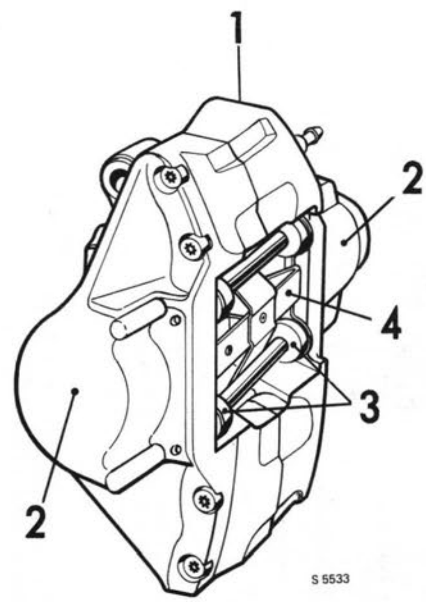


REAR WHEEL BRAKE ASSEMBLY, LEFT

1. Cylinder housing
2. Piston (indirect)
3. Piston (direct)
4. Yoke
5. Brake pad (outer)
6. Brake pad (inner)

Rear wheel brake assembly, ATE make

Each wheel brake assembly consists of a brake housing comprising two parts which are bolted together. Each half is equipped with a brake cylinder. When the brake pedal is depressed, both pistons act directly on the brake pads, pushing them against the disc.

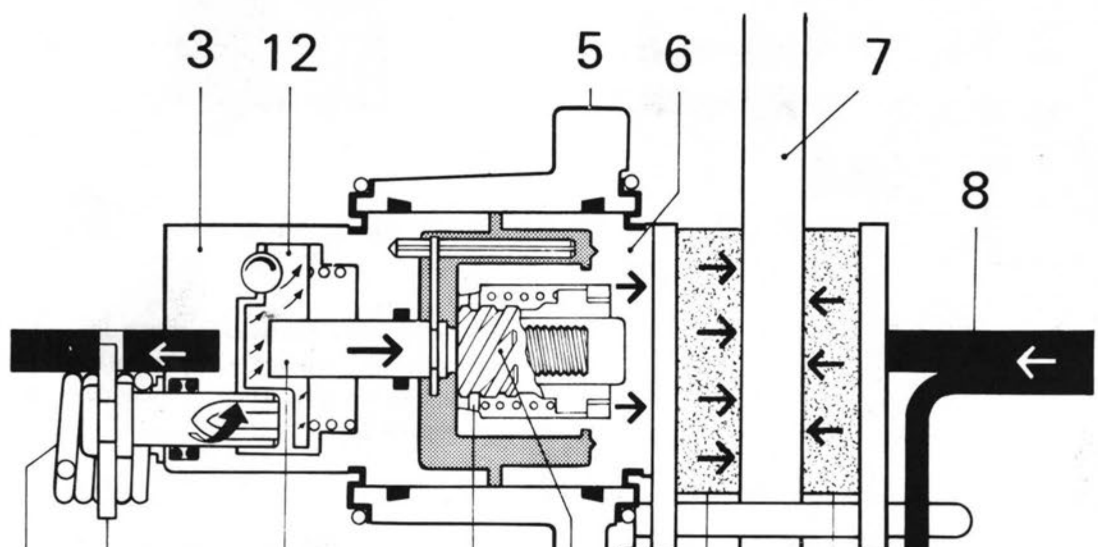


REAR WHEEL BRAKE ASSEMBLY, LEFT

1. Cylinder housing
2. Piston
3. Brake pad
4. Retaining spring

HANDBRAKE MECHANISM

The handbrake mechanisms and their automatic adjustment devices are combined with two brake pistons. The handbrake lever acts on a thrust plate which mechanically actuates the two pistons by means of a push rod. The automatic adjustment device is built into the direct piston and consists of a sleeve with internal and external threads. The push rod is screwed into the internal thread and a drive ring fitted to a conical hole in the brake piston runs on the external thread which is specially designed with a coarse pitch.
When the brake is applied, the increase in hydraulic pressure between the pistons acts on the threaded end of the push rod. As the other end of the push rod is not affected by the pressure, the push rod and the direct piston will be forced apart. The play between the push rod thread and the internal thread of the sleeve even out and the same applies to the external thread of the sleeve and the drive ring. The pressure of the drive ring against the conical hole increases, and as a result of its special shape, the sleeve turns in relation to the indirect piston and the push rod. As the brake is released, the brake pistons are returned in the cylinder as a result of the seals. The sleeve and push rod are returned by spring washers, the drive ring makes contact with the other side of the thread on the sleeve and the pressure against the conical seating is reduced with the result that the drive ring revolves on the external thread of the sleeve. When the pistons are pressed further apart in the cylinder as a result of wear on the brake pads, rotation of the sleeve in relation to the push rod results in the latter being fed out, and this ensures constant adjustment.

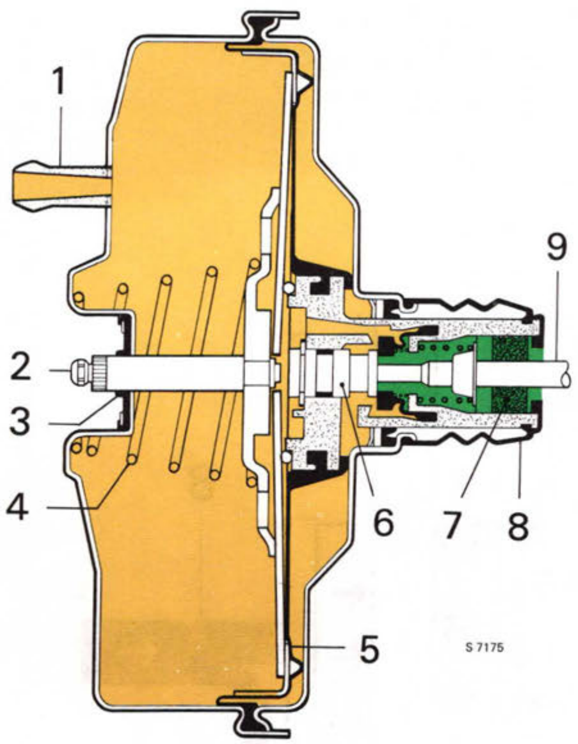


ADJUSTMENT DEVICE, HANDBRAKE MECHANISM

1. Handbrake lever
2. Return spring
3. Brake piston (indirect)
4. Drive ring
5. Brake cylinder housing
6. Brake piston (direct)
7. Brake disc
8. Yoke
9. Brake pad
10. Sleeve
11. Push rod
12. Thrust plate

SERVO UNIT

The servo unit is mechanical and designed to increase the pedal pressure when the brakes are applied. The increase in pressure from the servo unit is obtained from the vacuum in the inlet manifold of the engine. The inlet manifold is connected to the servo unit by means of a hose. The master cylinder is fitted between the brake pedal and the brake master cylinder and connected to these parts by means of push rods. If a leak should occur in the servo unit, the two push rods then act as a simple push rod. The brakes still work as usual, but considerably more pressure on the brake pedal is required.



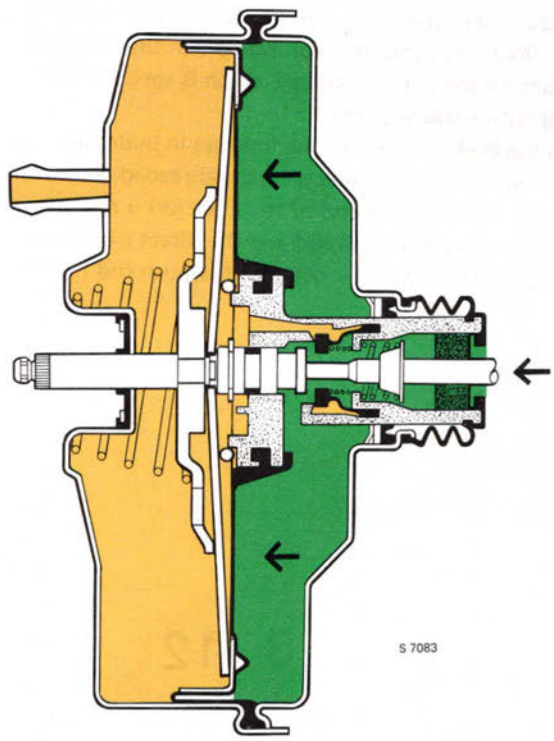
SERVO UNIT, REST POSITION
1. Non-return valve
2. Push rod (master cylinder)
3. Seal
4. Return spring
5. Diaphragm
6. Valve piston
7. Filter
8. Dust cover
9. Push rod (brake pedal)

Rest position

In the rest position the diaphragm and valve piston are held at the rear limit of travel by the return spring. The same vacuum acts on both sides of the diaphragm since the by-pass passage in the diaphragm is open.

Braking

When the brake pedal is depressed, the push rod pushes the valve piston and diaphragm forward, closing the by-pass passage. The valve piston then opens a passage which enables air at atmospheric pressure to flow through the filter and to the rear of the diaphragm.



SERVO UNIT, BRAKING

The power boost is derived from the difference between the vacuum in front of the diaphragm and the atmospheric pressure behind it. The maximum power boost is of the order of 3:1.

When the brake pedal is released, the by-pass passage opens immediately and the air flows from behind the diaphragm to the front and on through the non-return valve to the inlet manifold. The atmospheric passage closes and the return spring returns the diaphragm, valve piston, and push rod to the brake pedal, to the rest position. The non-return valve prevents air at atmospheric pressure from being drawn from the inlet manifold to the servo unit. The valve opens only when the vacuum in the inlet manifold is greater than that in the servo cylinder.

BRAKE DISCS

CHECKING

The condition of the discs should be inspected when checking the thickness of the brake pads' linings. Small scores will be present on the brake discs after normal use and should be ignored. Intermittent and irregular braking action as a result of lateral throw or variations in lining thickness should be rectified by grinding with sanding blocks (refer to the separate section on this). In more severe cases, grinding in a special machine or replacement must be considered. Consideration must then be given to the amount of wear of the disc, which implies that check measurements must first be made. Where wear is more pronounced turning in a special machine or replacement should be considered. In such cases measurements must be taken to determine the degree of wear on the disc. Corrosion and signs of wear on the edge of the disc can be removed by a scraper (refer to the section on sanding block).

Check measurements

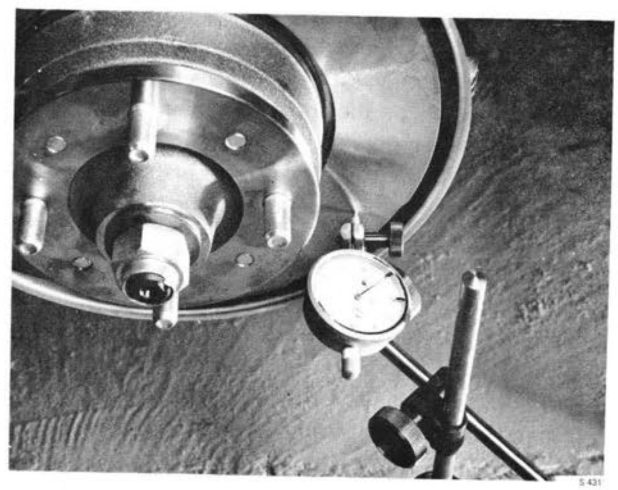
Use a dial indicator to measure the lateral throw of the brake disc. The maximum permissible throw is 0.004 in (0.10 mm). Measuring of the amount of wear of the disc can be made with the disc in position or removed from the car. If measuring is to be carried out with the disc fitted in the car, the brake assembly must be slackened and any corrosion or signs of wear scraped off. Vernier calipers and a straightedge should be used to make the measurements. The following dimensions should be checked.

Brake disc with hub:

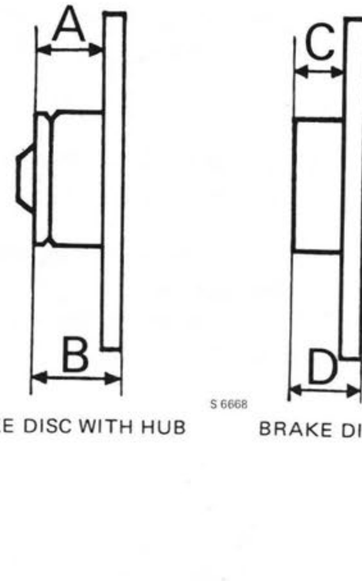
Dimension A	New brake disc	2.075 in (52.7 mm)
	Maximum after grinding	2.095 in (53.2 mm)
	Worn brake disc	2.102 in (53.4 mm)
Dimension B	New brake disc	2.575 in (65.4 mm)
	Minimum after grinding	2.555 in (64.9 mm)
	Worn brake disc	2.547 in (64.7 mm)

Brake disc removed from car:

Dimension C	New brake disc	1.366 in (34.7 mm)
	Maximum after grinding	1.386 in (35.2 mm)
	Worn brake disc	1.394 in (35.4 mm)
Dimension D	New brake disc	1.866 in (47.4 mm)
	Minimum after grinding	1.846 in (46.9 mm)
	Worn brake disc	1.838 in (46.7 mm)



MEASURING THE BRAKE DISC THROW



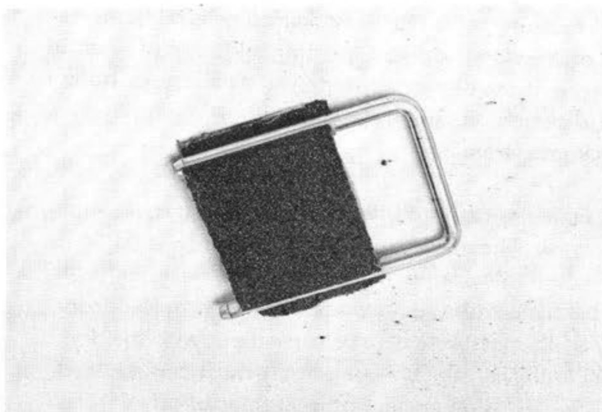
BRAKE DISC WITH HUB BRAKE DISC

Dimensions for grinding and replacing of brake discs

Thickness, new brake discs	0.500 in (12.7 mm)
Minimum thickness, worn brake discs	0.441 in (11.2 mm)
Maximum wear per side (See check measurements)	0.028 in (0.7 mm)
Grinding of brake discs, minimum thickness	0.461 in (11.7 mm)
Maximum grinding cut per side (See check measurements)	0.020 in (0.5 mm)

Grinding with sanding blocks

1. Lift the front suspension and remove the wheels. The front suspension must be positioned horizontally in order to avoid damage to the differential through improper lubrication.
2. Remove the brake pads and the parking brake cable. See section 517.
3. Reset the automatic adjustment mechanism for the handbrake by screwing back the direct-acting brake piston.
4. Fit a piece of No. 50 grain emery cloth to each of the sanding blocks included in grinding kit 899691. Clamp the emery cloth to the block by means of a pad retaining pin, as shown in the illustration.
5. Fit the sanding blocks with the deeper groove up and press the hub cover onto the wheel studs.
6. Lock the wheel on the opposite side of the car by applying the handbrake.
7. Set the automatic adjusting mechanism for the handbrake in the operating position on the side of the disc to be ground.
8. Start the engine and engage 1st gear. Use the idling screw to adjust the idling speed. The brake disc should rotate as slowly as possible. The grinding effect deteriorates at higher speeds. Cars fitted with automatic transmission will require a higher rpm to avoid slipping in the automatic transmission.
9. Grind the disc by pressing on the handbrake lever.



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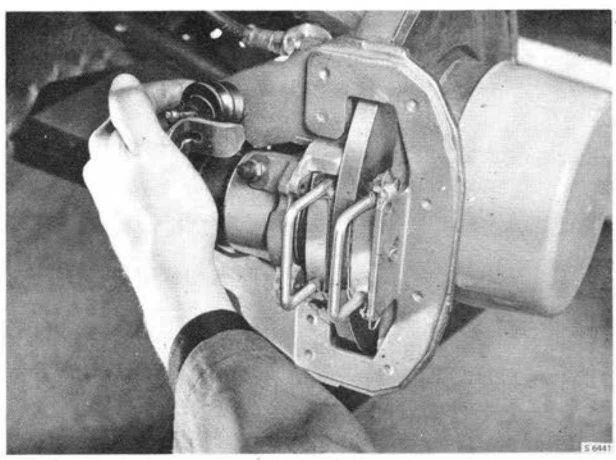

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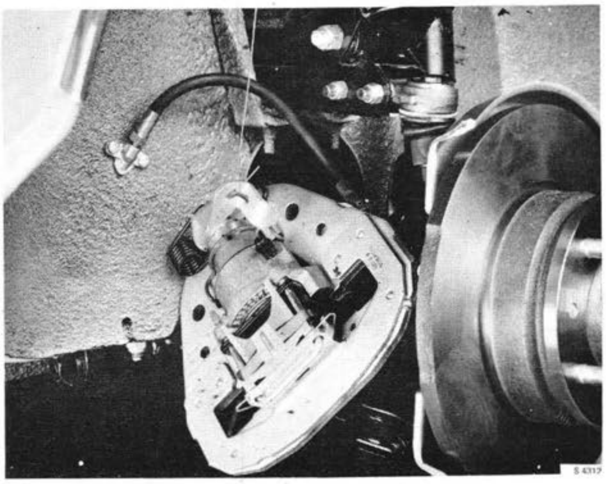
> NOTE
>
> Apply enough pressure to cause the brake assembly to oscillate up and down. This indicates that the thickest part of the disc is being ground. Excessive pressure on the handbrake lever will reduce the grinding effect.

10. After about 30 seconds of grinding, withdraw the sanding blocks to clear them of grindings and then return them.
11. Repeat the procedure until the oscillating movement of the brake assembly has ceased.
12. Fit the brake pads and reset the footbrake and handbrake (refer to section 517).

REMOVAL

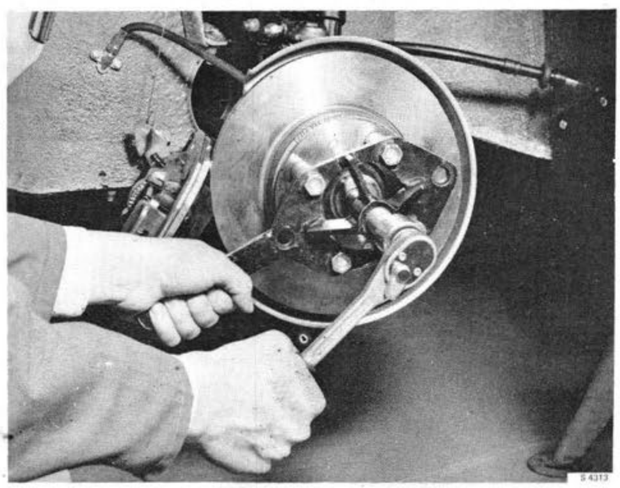
Front brake discs

1. Apply the handbrake and remove the nut on the pivot pin.
2. Release the brake. Remove the brake pads (see section 517).
3. Remove the two screws holding the brake housing to the steering knuckle housing.
4. Lift the brake hose or handbrake cable. Suspend the brake housing on steel wire to avoid damage to the brake hose.



BRAKE HOUSING SUSPENDED ON STEEL WIRE

5. Remove the brake disc from the shaft using puller 8995185 and 4 extensions 8996050 or puller 8996084 (later design).



REMOVING THE BRAKE DISC

Tool 8995185 and 8996050 or as alternative tool 8996084 (later design)

6. Remove the four screws holding the brake disc to the hub.

Rear brake discs

1. Disconnect the brake hose at the brake housing.
2. Remove the two screws holding the brake housing to the rear axle.
3. Remove the two disc retaining screws and remove the disc.

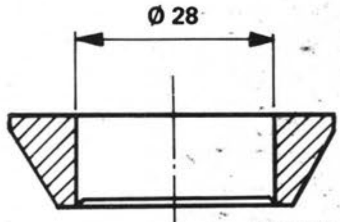
ASSEMBLY

Lock the nut by peening it into the groove in the shaft. Always use a new locking plate for the screws in the brake housing. Assembly is carried out in the reverse order. Always use a new locking plate for the screws in the brake housing. Tighten the hub nut to the correct torque by means of conventional spanners or wrenches to prevent the threads being damaged.

Tightening nut with pneumatic nut tightener

If the nut is tightened using a pneumatic nut tightener, a modified dished washer with an enlarged inside diameter must be used as a special tool (see illustration).

1. Mount the modified dished washer between the hub and the nut.
2. Tighten the nut.
3. Back off the nut and remove the modified washer.
4. Mount the standard washer.
5. Replace the nut and tighten to the correct torque.



DISHED WASHER WITH ENLARGED INNER DIAMETER

BRAKE PADS

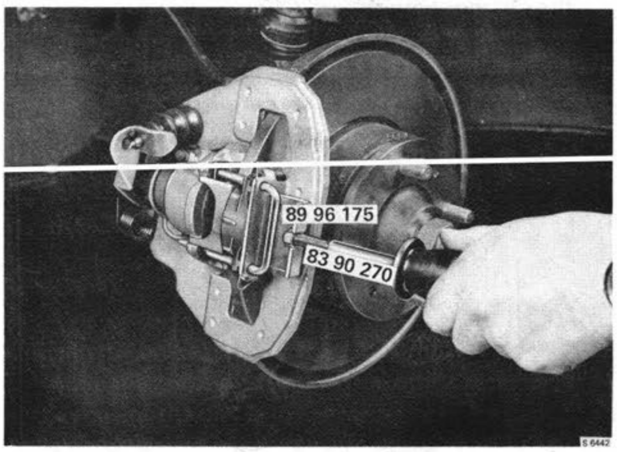
CHECKING

Because both the footbrake and handbrake are self-adjusting, it is not possible to judge by the pedal stroke or by the lever movement whether the brake linings are worn. It is therefore most important to remove the wheels at the interval stated in the service program and to check the thickness of the linings. The brake pads must be replaced when the thickness of the lining is less than 0.080" (2.0 mm).

Brake assembly, Girling make

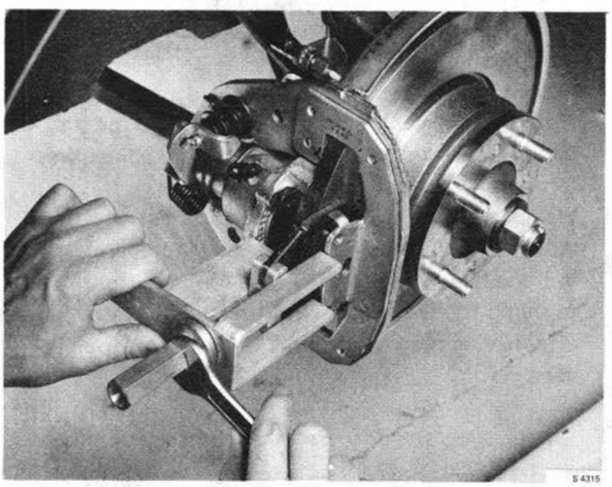
REMOVAL

1. Clean the brake housing.
2. Rotate the brake disc so that one of the recesses in the edge of the disc is in line with the brake pads.
3. Remove the damper spring, pin retaining clip and U-pin. If the U-pin has seized hammer 8390270 and tool 9396175 may be used to facilitate removal.



REMOVAL OF PAD RETAINING PIN

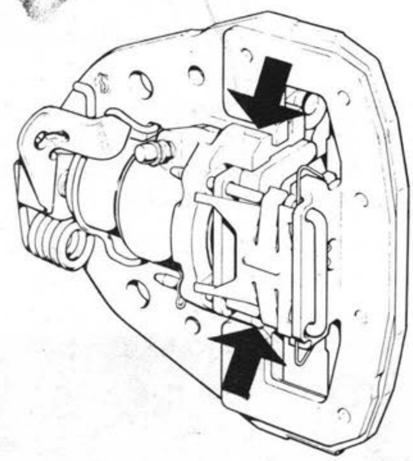
4. Withdraw the brake pads. If the pads are seated firmly, extractor 8995771 can be used.



REMOVAL OF BRAKE PADS WITH EXTRACTOR 8995771

5. Lubricate the brake yoke's bearings by moving the yoke backwards and forwards against the yoke spring while the lubricant is applied on the sliding surfaces.

Lubricant	Gleitmo 540, part no (45) 3008612



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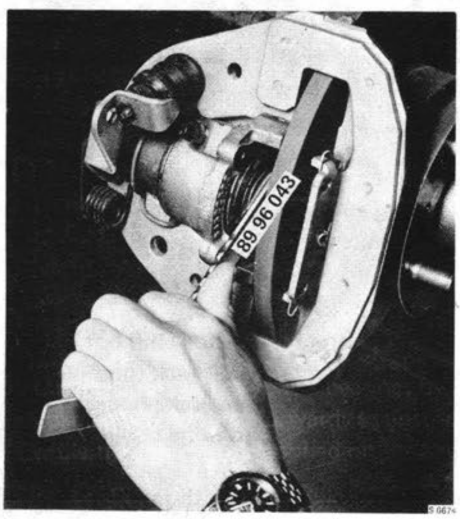
ASSEMBLY

1. Check that the dust cover retainer is properly in position and is in good condition. Loose, damaged or split dust covers should be replaced. If there are signs of dirt having entered or of the pistons having corroded new pistons and seals should be installed. Corroded pistons should never be polished.
2. To fit new brake pads the brake pistons must be pushed back in the cylinder. On the front wheel brake, this can be done by rotating the direct piston by means of tool 8996043 at the same time as the piston is pressed into the cylinder.
   In this way, the automatic handbrake adjustment is reset. The same is achieved on rear wheel brakes by pushing the direct piston into the cylinder using the handle to tool No. 8996043. The pistons should be pressed into the cylinders just far enough to allow new pads to be fitted. A small quantity of brake fluid will flow out of the bleeder nipple.



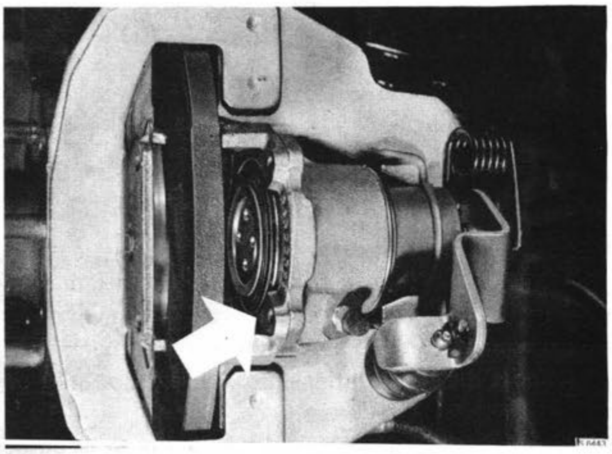
SCREWING THE BRAKE PISTON INTO THE FRONT BRAKE HOUSING WITH TOOL 8996043

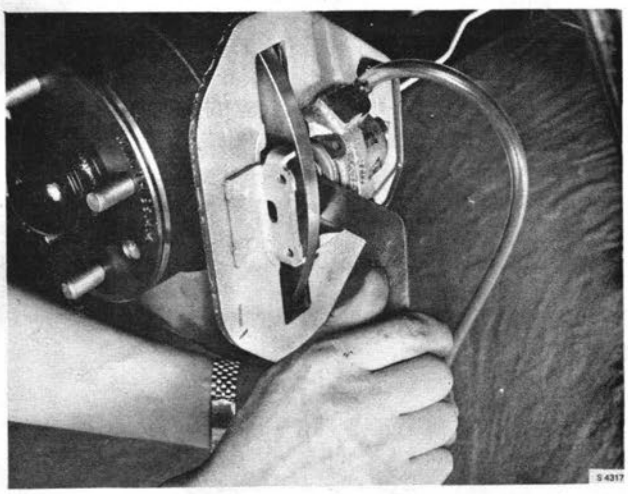
CAUTION

When the brake pistons are pushed back into the cylinder, the level in the brake fluid container will rise. If the container is full, some of the fluid must therefore be siphoned off before the pistons are screwed into the cylinder housing.

CAUTION

The piston seal can be damaged if the direct-acting piston is recessed too far. The piston should therefore not be pressed in further than the level of the U-pin's aperture on the brake housing.



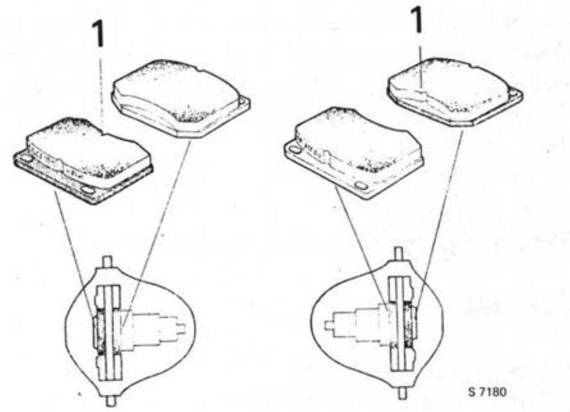


THE BRAKE PISTON IS PRESSED INTO THE REAR BRAKE HOUSING TOOL 8996043

3. Check that the position of the pistons has not moved the dust cover. At the same time, check that the yoke moves easily in the groove on the brake housing. Remove any rust or worn edges from the periphery of the disc.
4. Fit the new brake pads together with the U-pin, pin retaining clip and damper spring.

CAUTION

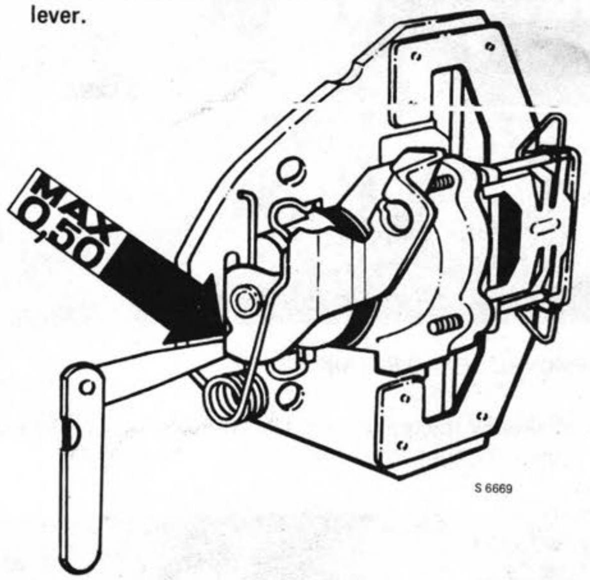
The inner and outer brake pads have different friction properties and are not interchangeable. To avoid confusion the pads are provided with differently shaped grooves. See illustration.



BRAKE PAD MARKINGS

1. V groove in the outer brake pads.

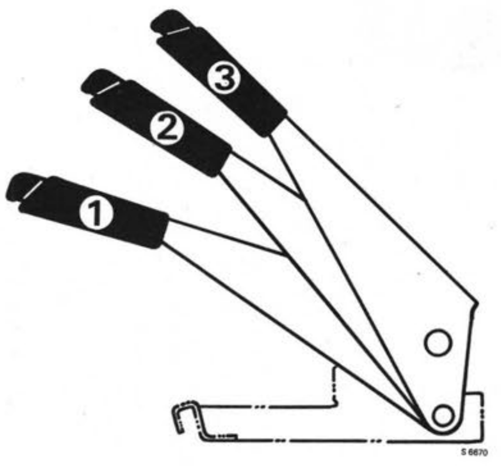
5. Check the adjustment of the handbrake cable. Check the distance between the handbrake lever and the yoke: the clearance should be a maximum 0.019 in. (0.50 mm) and should be equal on both sides. Adjust as necessary using the adjustment nut on the handbrake lever.



Note that the cables cross over, therefore the right-hand adjustment nut should be used to adjust the left-hand brake mechanism and vice versa.

6. With the engine switched off, pump the brake pedal repeatedly until the footbrake starts to operate.
7. Pull the handbrake lever up five notches. Continue to pump the brake pedal until the handbrake operates after having been pulled up a further two—four notches.

> CAUTION
> The car must not be driven before both the foot-brake and the handbrake are functioning properly.



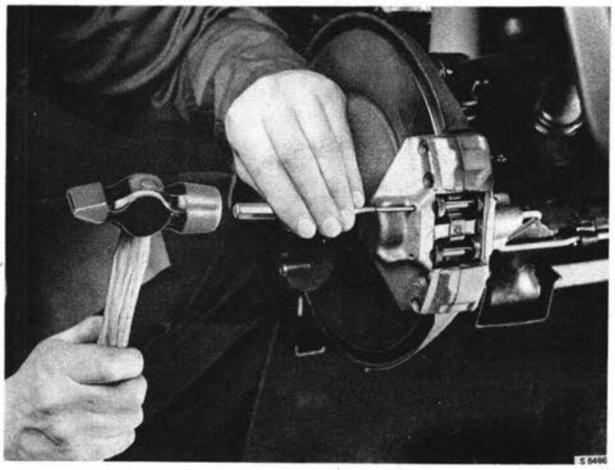
HANDBRAKE LEVER

1. Neutral position
2. Adjustment position (5 notches)
3. Full brake efficiency (7–9 notches)

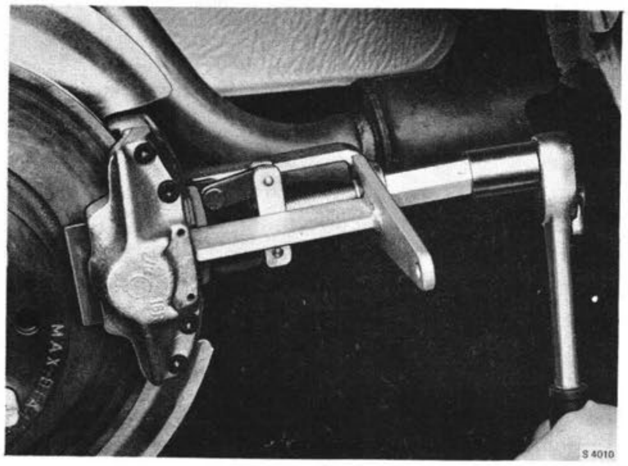
Brake assembly, ATE make

REMOVAL

1. Clean the brake housing.
2. Rotate the brake disc so that one of the recesses in the edge of the disc is in line with the brake pad.
3. Remove the cover plate, the locking pins and spring which retain the brake pads.



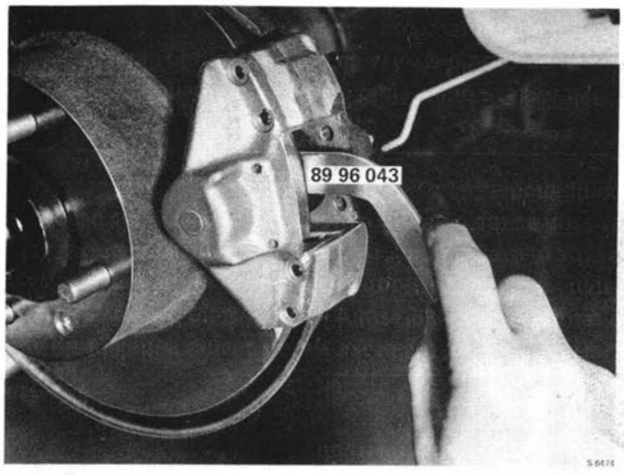
4. Remove the brake pads. For pads which have seized, use extractor No. 8995771.



REMOVAL OF BRAKE PADS WITH EXTRACTOR 8995771

ASSEMBLY

1. Check that the dust cover retainer is properly in position and that the cover is in good condition. Loose, damaged or split covers should be replaced. If there are signs of dirt having entered or of pistons having corroded new pistons and seals should be used. Corroded pistons should never be polished.
2. To fit new brake pads, the brake pistons must be pushed back into the cylinder. The pistons should be pressed into the cylinder far enough to allow new pads to be fitted without binding. Use the shaft of tool 8996043.



> CAUTION
> When the brake pistons are pushed back into the cylinder, the level in the brake fluid container will rise. If the container is full, some of the fluid must therefore be siphoned off before the pistons are screwed into the cylinder housing.

3. Fit the spring, locking pins and cover plate. Repeat the same procedure on the opposite wheel and then top up the brake fluid container as necessary.

CAUTION

Before the car can be driven, the brake pads must be brought out to the brake disc. This is achieved by repeated pumping of the brake pedal with the engine switched off until the foot brake and hand brake are functioning properly.

Refrain from depressing the pedal after the hand brake has started to operate, as this will cause over-adjustment of the hand brake mechanism and may cause the brakes to seize.

HYDRAULIC FOOTBRAKE SYSTEM

INSTRUCTION FOR OVERHAUL

Scrupulous cleanliness is essential when the brake system or any part of it is dismantled. Clean any dismantled parts in brake fluid or in a special cleaning solution for hydraulic brake components. Wipe the parts with a clean, lint-free cloth. All rubber parts and seals, etc., are available in repair kits and should be replaced. Before a unit is installed, all component parts should be dipped in clean brake fluid of the recommended specification.

CHANGING BRAKE FLUID

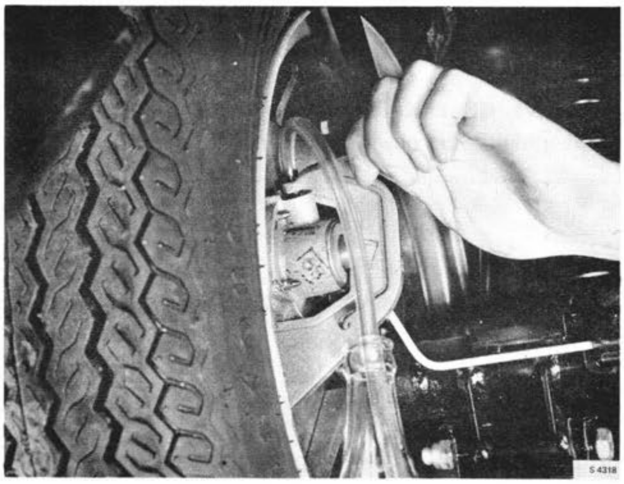
All brake fluids deteriorate with time through oxidation and water absorption. The boiling point is lowered and a build-up of vapour is possible after repeated hard braking and this may result in brake failure. The brake fluid should therefore be replaced at regular intervals. If the car is used for normal driving this should be every other year or every 25,000–30,000 miles (40,000–45,000 km). If the car is used for competition or alpine driving, the fluid should be changed every year.

1. Open the bleeder nipples for the secondary circuit (right front wheel—left rear wheel) one turn and connect suitable hoses to them placing the other ends in a container.
2. Pump the brake pedal until the front half of the fluid reservoir is nearly empty.
3. Top up with new fluid and continue pumping until the reservoir is nearly empty.
4. Top up the reservoir once again and close the bleeder nipples.
5. Repeat the same procedure for the primary circuit.
6. Bleed the brake system.

BLEEDING

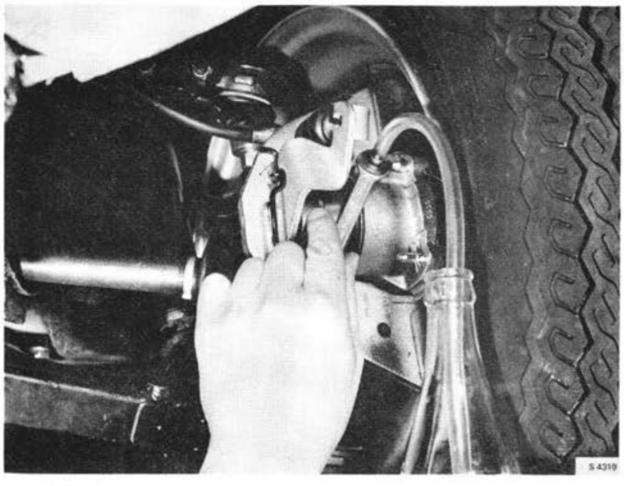
If air has entered the system, this can be detected by sponginess in the brake pedal, the need to press the pedal several times before the brake grips or by a lack of resistance. Checking by depressing the pedal should be carried out with the engine switched off and with no assistance from the servo unit. If small quantities of air are present in one of the circuits, this may result in uneven braking of the car but without sponginess in the brake pedal. Bleeding must be carried out after any component in the system has been removed. It is usually sufficient to bleed the brake housing or the circuit in which work has been carried out. A bleeder nipple is fitted to each brake housing. The best and fastest results are achieved with bleeding equipment, in which case the manufacturer's instructions should be followed.

1. Place chocks under the wheels and release the handbrake.
2. Make sure that the brake fluid reservoir is well filled and that the vent holes in the cap are not blocked.
3. Pump the brake pedal repeatedly.
4. Connect a hose to the bleeder nipple at the left rear wheel. Place the free end of the hose in a container part filled with brake fluid. The end of the hose must be kept below the surface of the liquid in the container at all times. Open the bleeder screw one to two turns.



BLEEDING THE LEFT REAR WHEEL

5. Fully depress the brake pedal, and then release it after a pause of a few seconds. Wait a few seconds then repeat the procedure. Continue in this way until all air bubbles have been expelled from the hose. Tighten the nipple immediately after the last forward stroke.
6. Repeat the procedure described in points 4 and 5 with the right front wheel. Then change to the primary circuit by bleeding first the right rear wheel and then the left front wheel.



BLEEDING OF FRONT WHEEL

7. Top up the fluid reservoir.

Up to and incl. 1977 model:

During bleeding, the brake warning lamp will light up as a result of uneven pressure in the system. However, the lamp will go out as soon as the piston in the brake valve of the master cylinder returns to its central position, i.e. as soon as the brakes are used after bleeding has been completed.

CAUTION

New clean brake fluid of the recommended specification should always be used for topping up the brake fluid reservoir.
The brake fluid which has been pumped out during bleeding should never be reused.

MASTER CYLINDER

INSTRUCTIONS FOR OVERHAUL

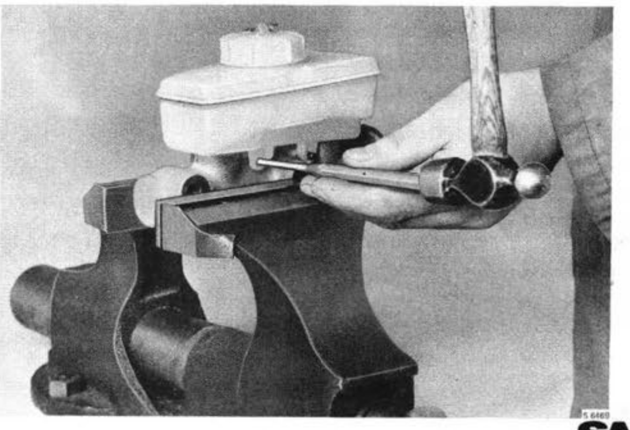
Scrupulous cleanliness is essential when the brake system or any part of it is dismantled. Clean any dismantled parts in brake fluid or in a special cleaning solution for hydraulic brake components. Wipe the parts with a clean, lint-free cloth. All rubber parts and seals, etc., are available in repair kits and should be replaced. Before a unit is installed, all component parts should be dipped in clean brake fluid of the recommended specification.

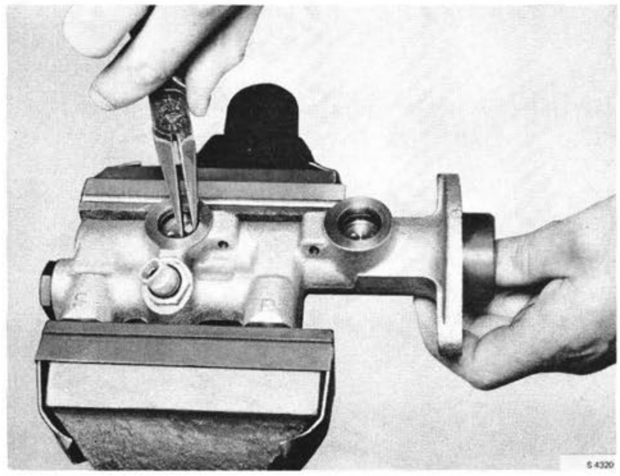
REMOVAL

1. Lay a suitable protective material over the front fender and place rags under the master cylinder to avoid damage to the paintwork in case the brake fluid should be spilt.
2. Disconnect the electric connection to the brake warning switch.
3. Disconnect the hose from the clutch master cylinder to the fluid reservoir. Insert a plastic stopper in the nipple of the reservoir.
4. Disconnect the two brake line connections to the master cylinder.
5. Remove the two nuts which hold the master cylinder to the servo unit and remove the master cylinder.

DISMANTLING

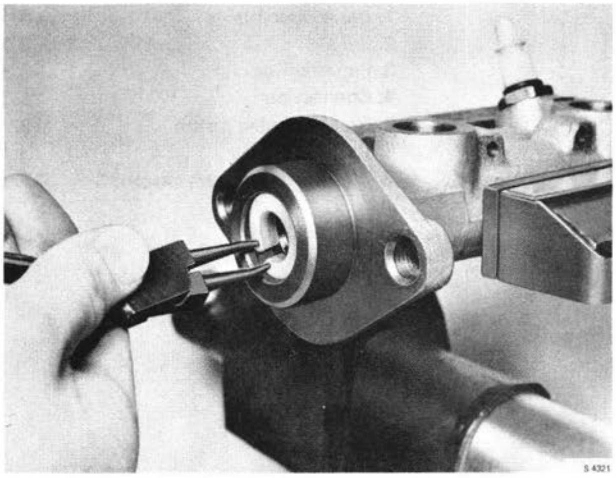
1. Empty the brake fluid reservoir and mount the master cylinder in a vice.
2. Remove the pins securing the container to the cylinder body. As from model 1978, drive out the pins by means of a drift.
3. Remove the reservoir and by means of a small screwdriver remove the rubber seals from the hole for the fluid reservoir.
4. Push the primary piston into the master cylinder and pull up the stop pin on the secondary piston.





REMOVING THE STOP PIN ON THE SECONDARY PISTON

5. Remove the circlip on the primary piston and take out the primary piston together with the spring and the seals.

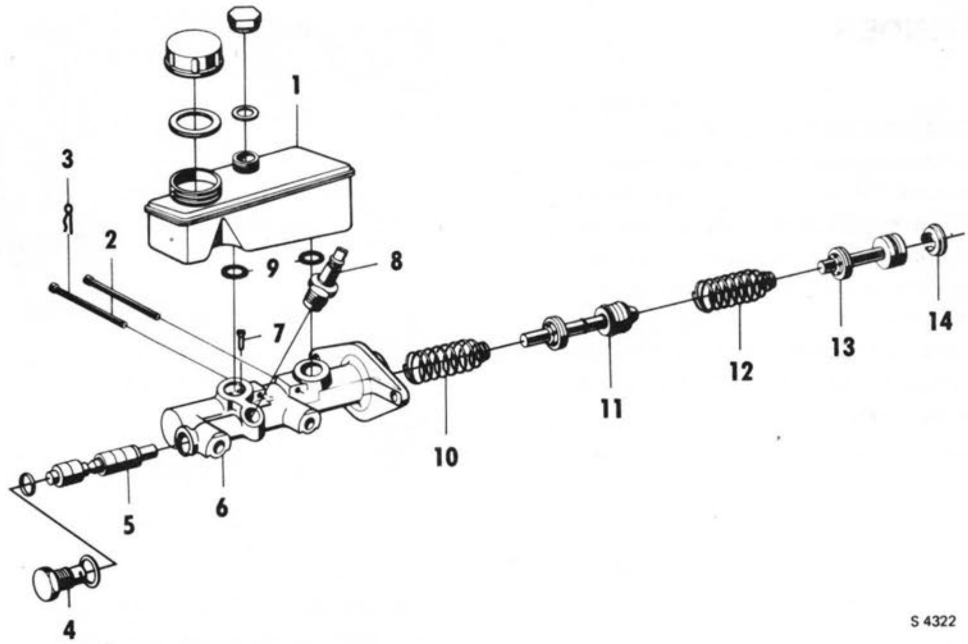


REMOVING THE CIRCLIP ON THE PRIMARY PISTON

6. Remove the cylinder housing from the vice and knock it carefully against a wooden surface so that the secondary piston falls out. Alternatively, the secondary piston can be forced out with compressed air.
7. Remove the springs and seal rings from the two pistons. Keep the pistons and their rings apart so that they can be fitted back into the cylinders from which they have been removed.

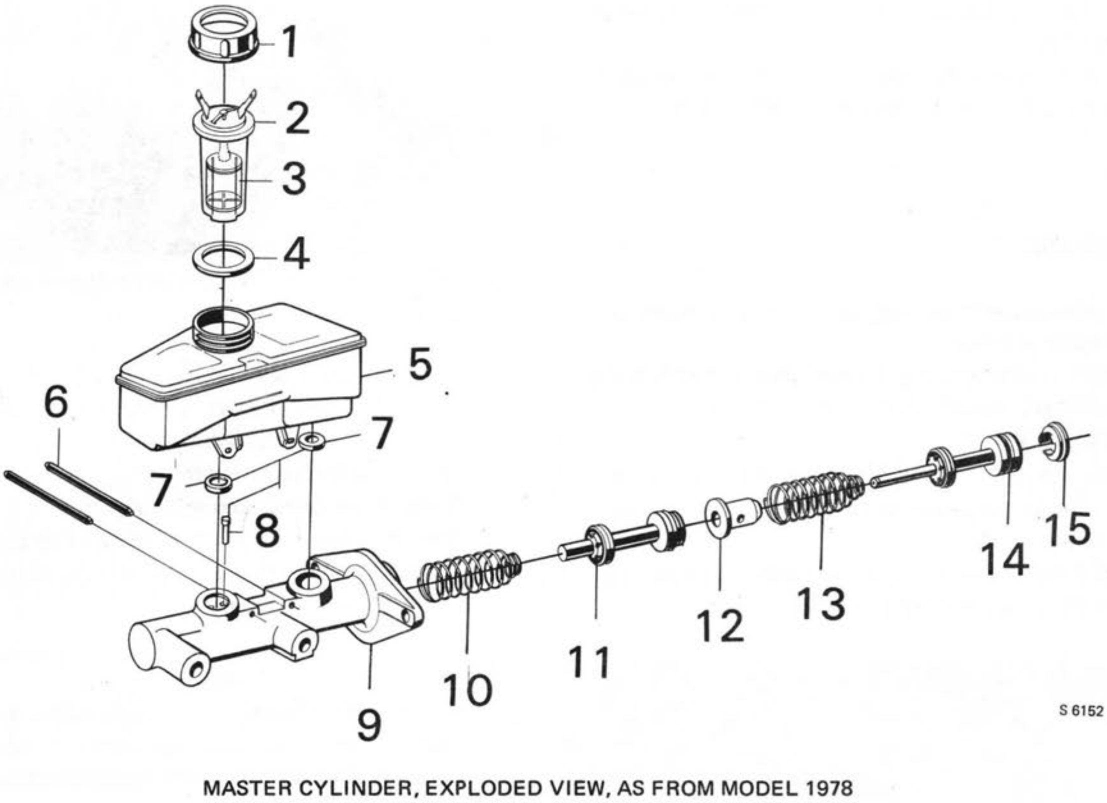
CAUTION

Never attempt to extract the seals with sharp-edged tools which may scratch the pistons. If necessary, use a small screwdriver with smoothly rounded edges.



MASTER CYLINDER, EXPLODED VIEW, MODEL 1975–1977

1. Fluid reservoir
2. Pin
3. Pin retaining clip
4. Connection
5. Brake warning piston
6. Cylinder housing
7. Stop pin (secondary piston)
8. Brake warning switch
9. Sealing ring
10. Return spring (secondary piston)
11. Secondary piston
12. Return spring (primary piston)
13. Primary piston
14. Lock ring

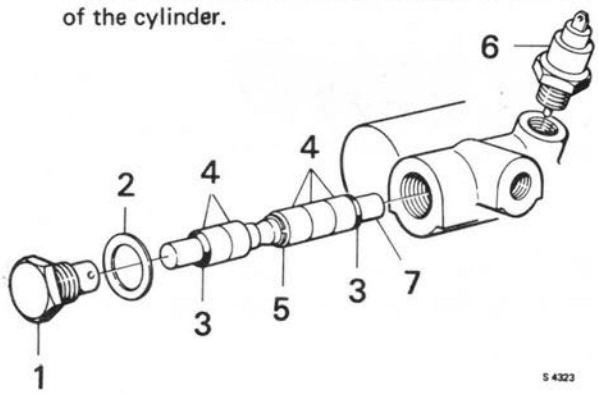


MASTER CYLINDER, EXPLODED VIEW, AS FROM MODEL 1978

1. Cap
2. Fluid level contact
3. Float
4. Sealing ring
5. Brake fluid container
6. Pin
7. Sealing ring
8. Stop pin
9. Cylinder housing
10. Spring, secondary piston
11. Secondary piston
12. Sleeve
13. Spring, primary piston
14. Primary piston
15. Lock ring

Brake warning valve, model 1975–1977

8. With the cylinder housing still in the vice remove the switch assembly.
9. Remove the screws in the front part of the cylinder housing.
10. Remove the cylinder housing and knock it gently against a wooden surface so that the valve piston and sleeve fall out.
11. Remove the inner O-ring by means of a bent piece of steel wire. Take care not to damage the surface of the cylinder.



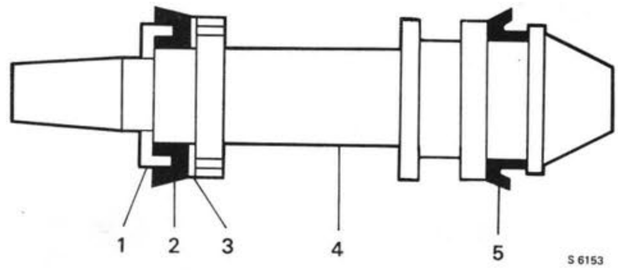
BRAKE WARNING VALVE, EXPLODED VIEW

1. End plug
2. Copper gasket
3. O-ring
4. Sleeves
5. Circlip
6. Brake warning switch assembly
7. Valve piston

ASSEMBLY

1. After cleaning, check that the cylinder bore and pistons are free from scratches and corrosion. Worn or damaged parts should be replaced.
2. Fit new piston seals to the secondary piston. This is made easier if the piston and seals are first dipped in brake fluid. Check that the seals are turned the correct

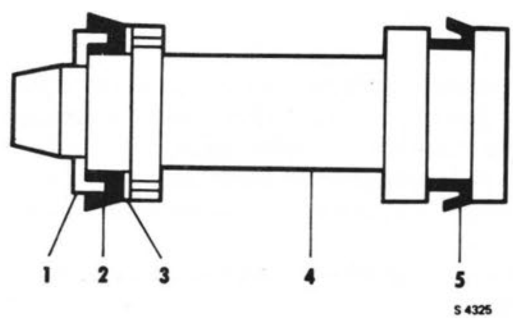
> NOTE!
> Up to and incl. chassis No. 99752040987 was an intermediate piston seal mounted on the secondary piston. This seal is no longer mounted and should not be installed in master cylinder in connection with overhaul.



SECONDARY PISTON WITH SEALS, MODEL 1975–1977

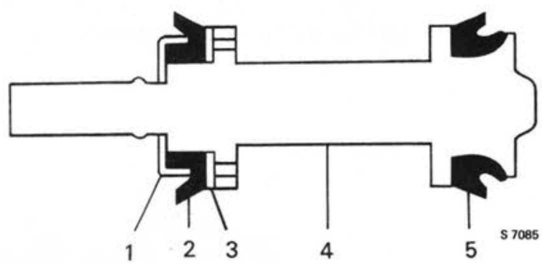
1. Spring seat
2. Piston seal
3. Washer
4. Primary piston
5. Piston seal

3. Fit new seals to the primary piston in the same way.



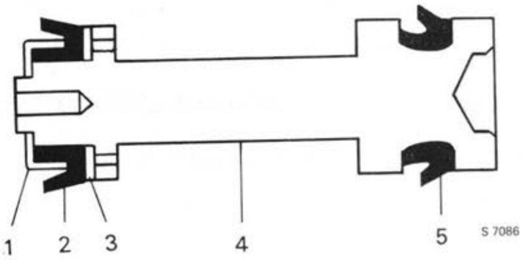
PRIMARY PISTON WITH SEALS, MODEL 1975–1977

1. Spring seat
2. Piston seal
3. Washer
4. Primary piston
5. Piston seal



SECONDARY PISTON WITH SEALS, AS FROM MODEL 1978

1. Spring seat
2. Piston seal
3. Washer
4. Piston
5. Piston seal



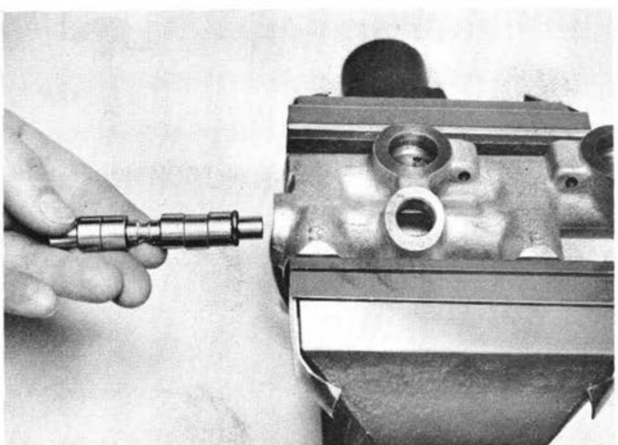
PRIMARY PISTON WITH SEALS, AS FROM MODEL 1978

1. Spring seat
2. Piston seal
3. Washer
4. Primary piston
5. Piston seal

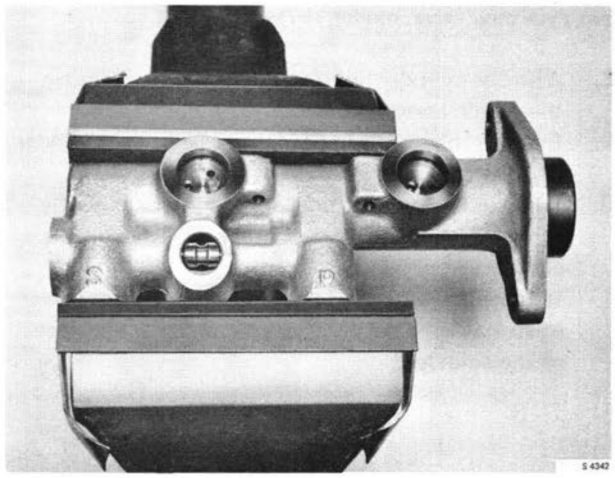
4. Mount the master cylinder in a vice, thoroughly lubricate the cylinder bore and carefully insert the complete secondary piston with the spring. Great care must be taken to avoid damage to the piston seals. Push in the secondary piston by means of a clean screwdriver and insert the stop pin.
5. Insert the complete primary piston in the same way and fit the circlip.

Brake warning valve, model 1975–1977

6. Fit new circlips to the valve piston. Fit the sleeves and new O-rings.
7. Lubricate the piston thoroughly with brake fluid and insert it in the cylinder. The groove for the brake warning switch should be in line with the contact connections.



INSERTING THE VALVE PISTON IN THE CYLINDER



THE GROOVE IN THE VALVE PISTON

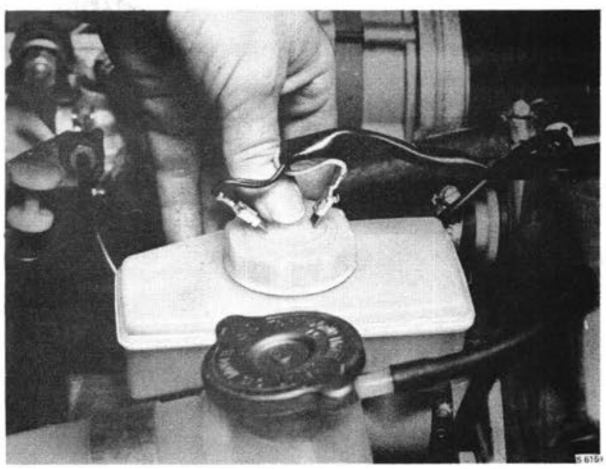
8. Screw in the brake warning switch.
9. Fit a new copper gasket and screw in the end plug.

FITTING

1. Screw the master cylinder to the servo unit.
2. Connect the brake line connections, the hose from the clutch master cylinder and the electrical connection for the brake warning switch.
3. Bleed the brake system.

Level warning system, as from model 1978

Check the level warning system by using a finger to depress the switch in the fluid container cover.



CHECKING THE LEVEL WARNING SYSTEM

BRAKE LINES

CHECKING

For reasons of safety, all pipes, rubber hoses, connections, etc., in the brake line system must always be kept in first class condition. It is therefore essential that these parts are checked regularly in conjunction with the service program. Brake pipes fitted to the body by means of clips must not be corroded or fitted in such a way that they can chafe against other parts; nor should there be any visible signs of damage. All hoses and connections should be tightened securely without any leaks. Damaged parts should be replaced.

REMOVAL

1. Clean all connections to the damaged pipe.
2. Unscrew the connecting nuts on the pipe together with any clips.
3. Insert plastic stoppers in the open ends and then remove the damaged pipe.

FITTING

1. Clean a new brake pipe internally by blowing clean, moisture-free compressed air through it.
2. Position the pipe, remove the plastic stoppers and tighten the connecting nuts.
3. Bleed the brake system.

> CAUTION
>
> When fitting brake hoses, it is highly important to position them correctly, thereby ensuring that steering or suspension movements do not bring them into contact with other parts of the car. The brake hoses must not be twisted. The front brake hoses must be fitted with the wheels hanging free and should be pointed straight ahead. The brake pipes must not be bent or twisted after they have been secured.

WHEEL CYLINDERS AND BRAKE HOUSINGS

INSTRUCTIONS FOR OVERHAUL

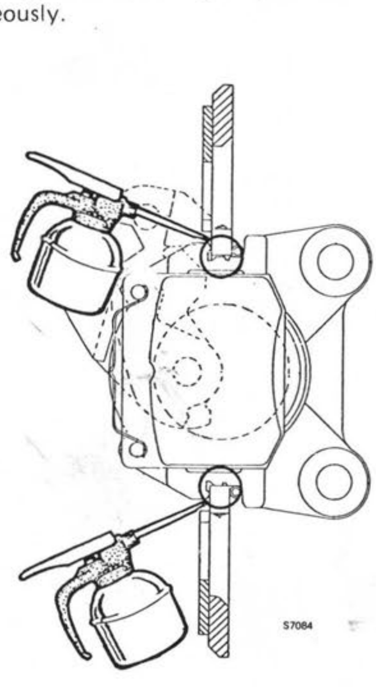
Scrupulous cleanliness is essential when the brake system or any part of it is dismantled. Clean any dismantled parts in brake fluid or in a special cleaning solution for hydraulic brake components. Wipe the parts with a clean, lint-free cloth. All rubber parts and seals, etc., are available in repair kits and should be replaced. Before a unit is installed, all component parts should be dipped in clean brake fluid of the recommended specification.

FRONT BRAKE HOUSING

Lubrication

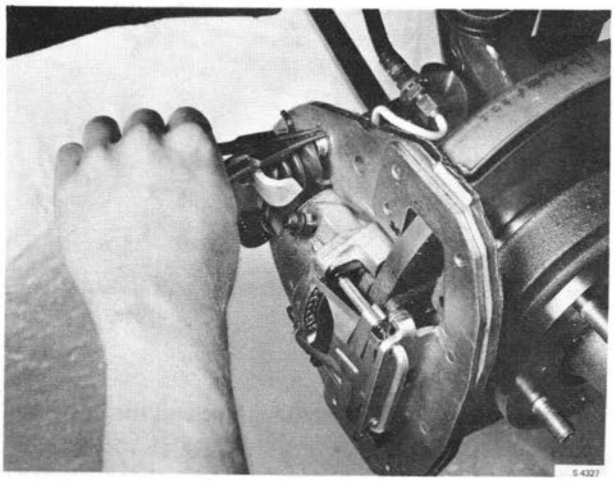
The sliding surfaces between the yoke and the brake housing should be lubricated in accordance with the service inspection programme and whenever work is carried out on the front brake assemblies. Lubrication can be carried out without removing the assemblies of brake pads.

1. Scrape away any dirt around the sliding surfaces of the yoke on the brake housing.
2. Apply drops of Gleitmo 540, Part No. (45) 3008612, to the sliding surfaces, sliding the yoke back and forth simultaneously.



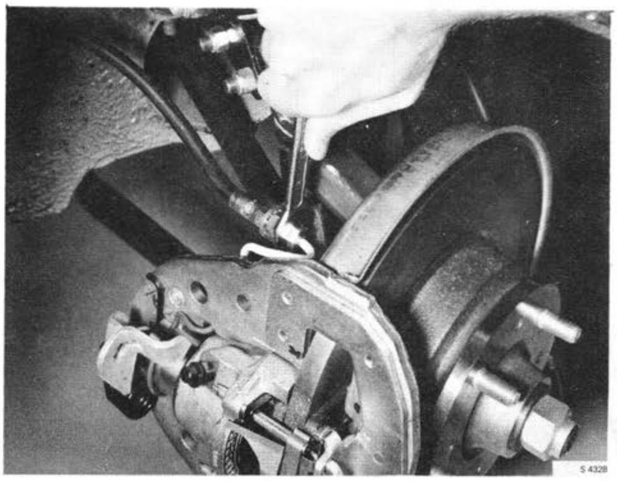
Removal

1. Remove the brake pads. See Section 517.
2. Disconnect the handbrake cable from the brake housing.



REMOVING THE CIRCLIP FROM THE HANDBRAKE CABLE

3. Unscrew the brake pipes to the brake housing at the hose connection. (See illustration). Insert a rubber stopper in the connection to avoid spillage from the pipe.

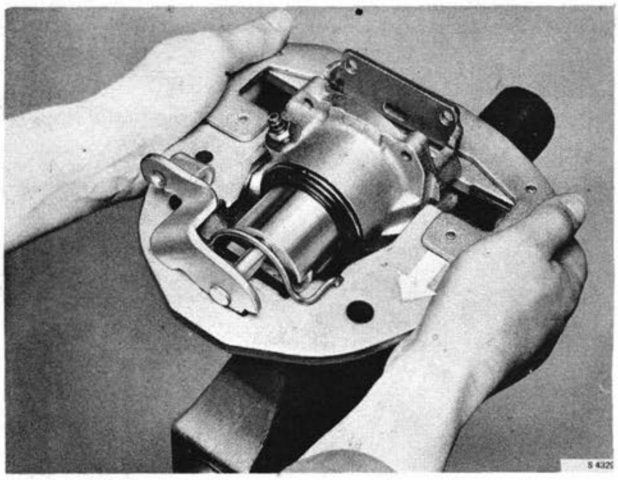


DISCONNECTING THE BRAKE PIPE

4. Remove the two screws which hold the brake housing to the steering knuckle housing.

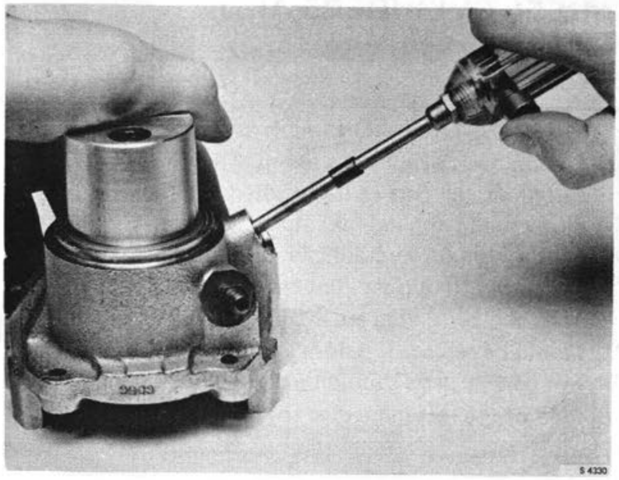
Dismantling

1. Clean the brake housing and mount it in a vice.
2. Remove the return spring on the handbrake lever.
3. Remove the yoke from the brake housing and remove the spring and the handbrake lever.



REMOVING THE YOKE

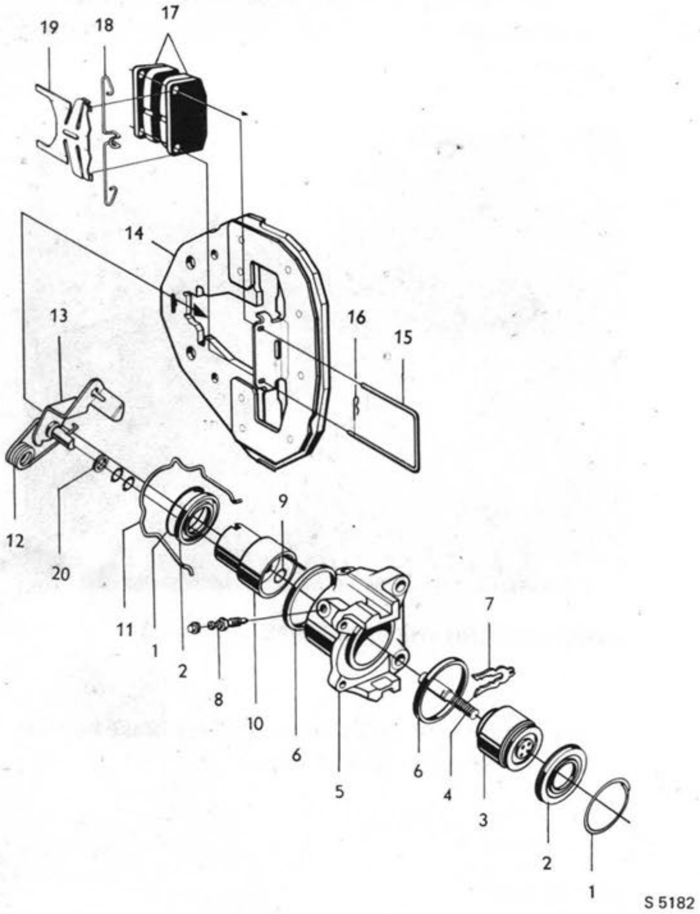
4. Remove the dust cover retaining ring and the dust cover.
5. Force out the indirect piston by means of compressed air.



FORCING OUT THE INDIRECT PISTON WITH COMPRESSED AIR

6. Press the push rod by hand so that the direct piston is separated from the cylinder.
7. Remove the O-rings and seal rings from the piston and from the cylinder bore. The O-ring retainer in the handbrake lever should only be removed if it is damaged.

NOTE
The indirect piston and internal parts comprise a complete unit and must not be rinsed in brake fluid or any other cleaning fluid but should only be wiped clean; the lubricating grease for the handbrake mechanism will otherwise be washed off.

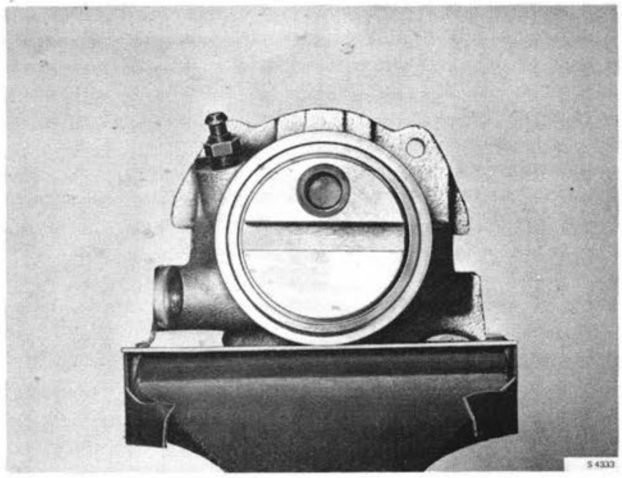


FRONT BRAKE HOUSING, EXPLODED VIEW

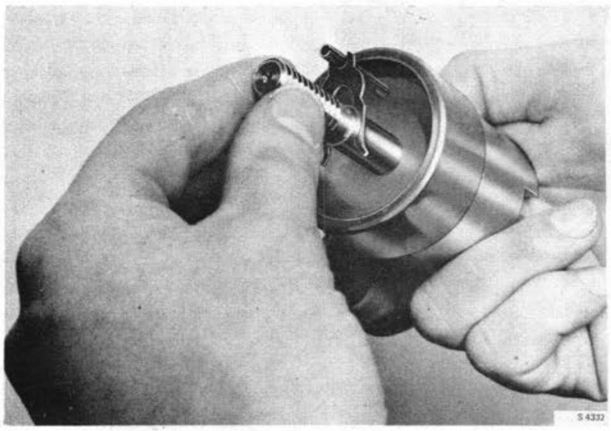
1. Dust cover holder
2. Dust cover
3. Piston (direct)
4. Push rod
5. Brake housing
6. Piston seal
7. Guide clip
8. Bleeder nipple
9. O-ring
10. Piston (indirect)
11. Spring (left–green, right–red)
12. Spring (handbrake lever)
13. Handbrake lever
14. Yoke
15. Pad retaining pin
16. Lock clip
17. Brake pads
18. Spring
19. Damper spring
20. Retainer (two O-rings)

Assembly

1. Replace any worn, damaged or corroded parts.
2. In the case of the indirect piston, exchange the O-ring on the push rod and the O-ring retainer at the handbrake lever.
3. Mount the brake housing in a vice. Lubricate the cylinder bore with brake fluid and fit new piston seals.
4. Fit the anchor plate to the push rod and push the latter into the hole in the indirect piston. Make sure that the recess in the anchor plate comes immediately over the spring pin in the piston.



BRAKE HOUSING WITH PISTON



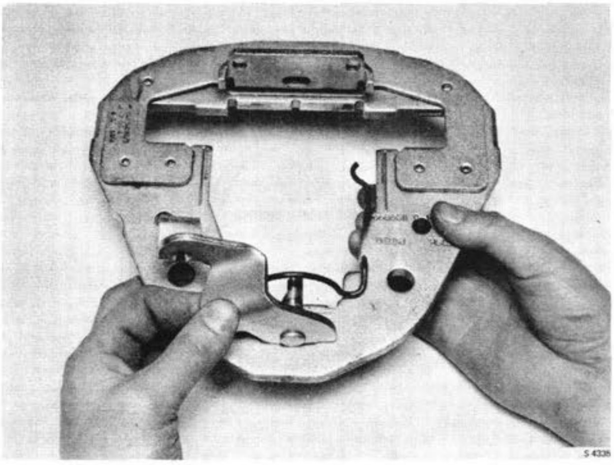
THE INDIRECT PISTON AND PUSH ROD

5. Lubricate the indirect piston and insert it in the brake housing so that the recess for the yoke is directly in line with the groove in the cylinder housing.

6. In the same way push the direct piston into the cylinder and, by means of tool **8996043**, screw together the piston and push rod. Screw and push in the two pistons until the edges of the dust cover grooves are flush with the brake housing.

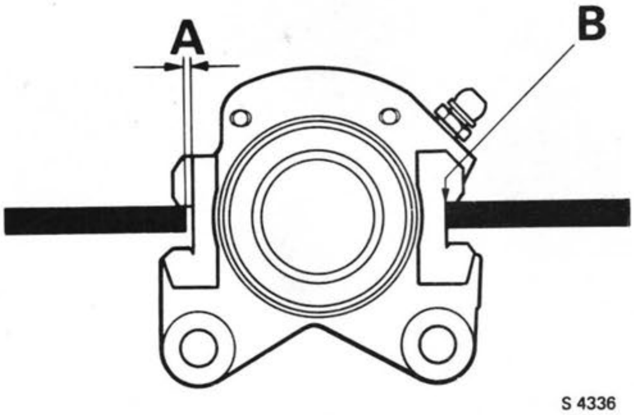
BRAKE HOUSING WITH PISTONS
Tool 8996043

7. Fit new dust covers and retaining rings.
8. Mount the spring and handbrake lever to the yoke. The green spring should be on the left and the red on the right.



YOKE WITH YOKE SPRING AND HANDBRAKE LEVER

9. Apply special grease No. 7990179 by means of a brush to the sliding surfaces of the yoke. Also apply grease to the seating of the pad retaining disc in the brake housing.
10. Align the yoke guide edges with the grooves in the brake housing. Lift the handbrake lever and fit the end of the axle pin into the hole in the indirect piston. At the same time, ensure that the yoke fits into the recess in the indirect piston.
11. Fit the handbrake lever return spring.
12. Check the clearance between the sliding surfaces of the yokes and the brake housing as shown in the diagram. Greater play can result in vibration and noises on braking.

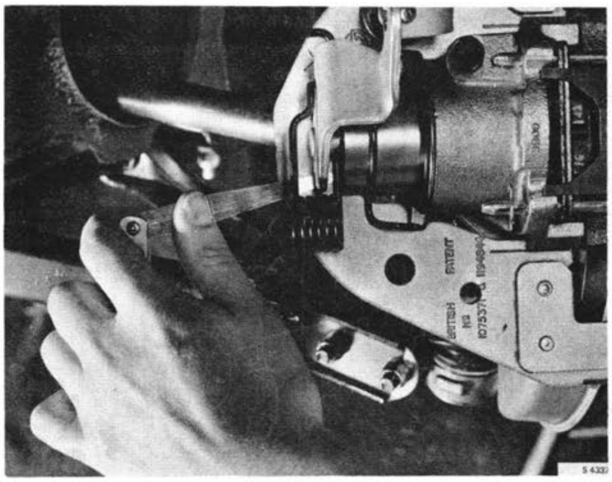


CLEARANCE BRAKE HOUSING–BRAKE YOKE, FRONT WHEEL BRAKE

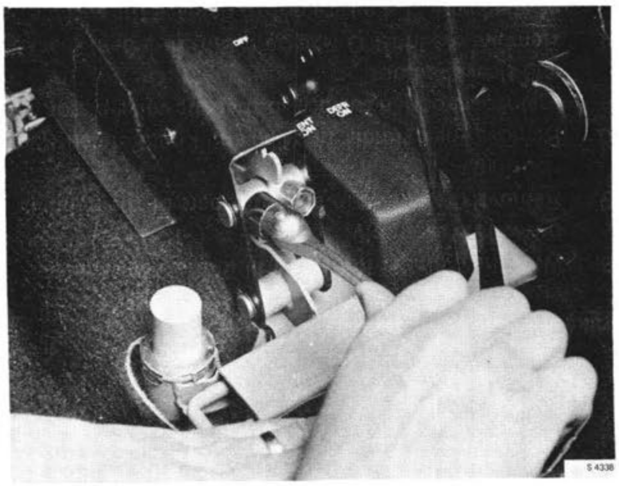
A = 0.006–0.012 in. (0.15–0.30 mm)
B = No clearance

Fitting

1. Check that the dust cover has not slipped out of position. Screw the complete brake assembly to the steering knuckle housing or rear axle respectively. Use a new locking plate.
2. Connect the brake lines.
3. Adjust the handbrake cable so that the distance between the lever and the yoke is 0.019 ± 0.003 in. (0.5 ± 0.1 mm) when the handbrake is in the off position. First apply the handbrake lever a few times to stretch the cable. Adjustment is made at the lever. The cables are crossed which means that adjustment of the left handbrake mechanism is made by means of the right adjustment nut and vice versa.



CLEARANCE BETWEEN LEVER AND YOKE



ADJUSTING THE HANDBRAKE CABLE

4. Fit the brake pads.
5. Top up the brake fluid, bleed the system and check all connections for leakage.

> CAUTION
>
> Before the car can be driven the brake pads must be brought out to the brake disc. This is achieved by repeated pumping of the brake pedal until both the footbrake and the handbrake function effectively.

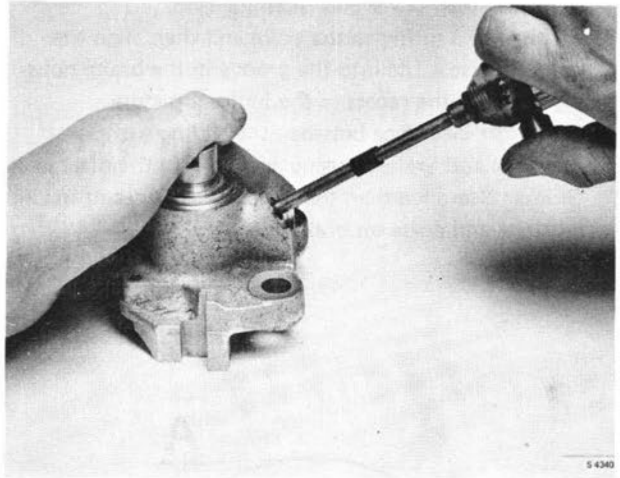
REAR WHEEL BRAKE ASSEMBLY, GIRLING MAKE

Removal

1. Remove the brake pads. See Section 517.
2. Disconnect the brake pipes at the connection to the brake housing. Insert a plastic stopper in the end of the pipe to avoid spillage from the brake system.
3. Remove the two screws which hold the brake housing to the rear axle.

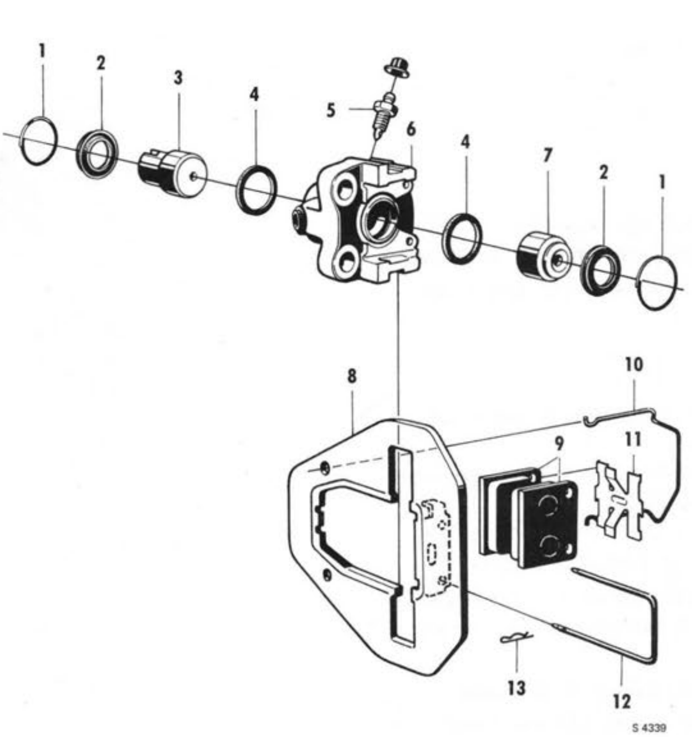
Dismantling

1. Clean the brake housing and mount it in a vice.
2. Remove the yoke from the brake housing by lifting it towards the bleeder screw. Remove the yoke spring.
3. Remove the retaining ring and dust cover.
4. Force out the indirect piston using compressed air.



FORCING OUT THE INDIRECT PISTON WITH COMPRESSED AIR

5. Push out the direct piston by hand.
6. Remove the brake housing from the vice and carefully remove the piston seals from the cylinder bore.

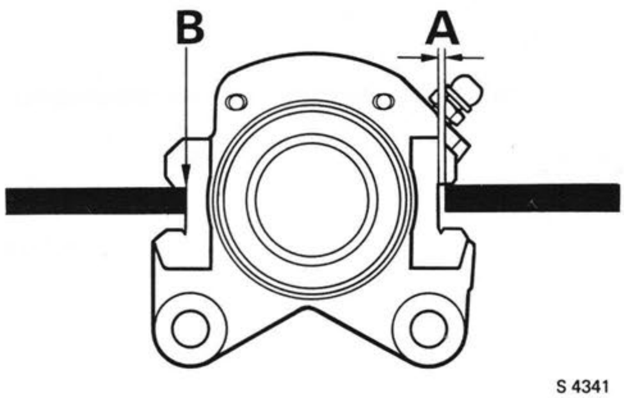


REAR BRAKE HOUSING, EXPLODED VIEW

1. Dust cover holder
2. Dust cover
3. Piston (indirect)
4. Piston seal
5. Bleeder nipple
6. Brake housing
7. Piston (direct)
8. Yoke
9. Brake pads
10. Spring (green–left, red–right)
11. Damper spring
12. Pad retaining pin
13. Pin retaining clip

Assembly

1. Worn, damaged or corroded parts should be replaced.
2. Mount the brake housing in a vice. Lubricate the cylinder bore with brake fluid and fit new piston seals.
3. Push the pistons into the cylinder. Rotate the indirect piston so that the recess for the yoke is in line with the groove in the brake housing.
4. Fit a new dust cover and retaining ring.
5. Fit the yoke spring to the yoke and then align the yoke so that it fits into the groove in the brake housing and into the recess in the indirect piston.
6. Check the clearance between the sliding surfaces of the yoke and brake housing as shown in the diagram. Greater clearance than that specified can result in vibrations and noise on braking.



CLEARANCE BRAKE HOUSING–BRAKE YOKE, REAR WHEEL BRAKE

A = 0.006–0.012 in. (0.15–0.30 mm)
B = No clearance

Fitting

1. Check that the dust cover has not slipped out of position. Screw the complete brake assembly to the steering knuckle housing or rear axle respectively. Use a new locking plate.
2. Connect the brake lines.
3. Fit the brake pads.
4. Top up the brake fluid, bleed the system and check all connections for leakage.

> CAUTION
>
> Before the car can be driven, the brake pads must be brought out to the brake disc. This is achieved by repeated pumping of the brake pedal with the engine switched off until the foot brake and hand brake are functioning properly.
> Refrain from depressing the pedal after the hand brake has started to operate, as this will cause over-adjustment of the hand brake mechanism and may cause the brakes to seize.

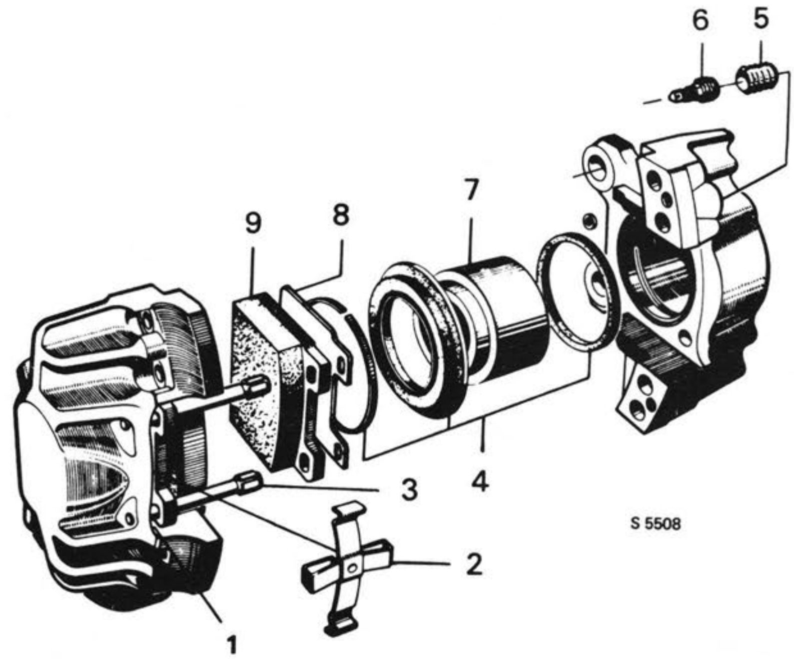
REAR-WHEEL BRAKE ASSEMBLY, ATE MAKE

Removal

1. Remove the brake pads (see section 517).
2. Disconnect the brake pipe at the connection to the brake housing. Plug the end of the pipe to prevent fluid leaking from the brake system.
3. Remove the two screws securing the brake housing to the end assembly of the rear axle.

Assembly

1. Replace any worn, damaged or corroded parts.
2. Lubricate the cylinder bore with brake fluid and fit a new seal.
3. Lubricate the piston with brake fluid and insert carefully into the cylinder.
4. Fit new dust covers and holders to the piston. Press in the cylinder using clamp No. 7841323.



REAR BRAKE HOUSING, EXPLODED VIEW

1. Brake housing	6. Bleeder nipple
2. Damper spring	7. Piston
3. Lock pin	8. Twist stop
4. Piston seal	9. Brake pad
5. Rubber cap	

> CAUTION
> The two sections of the brake housing should never be separated.

Dismantling

1. Clean the wheel brake assembly.
2. Secure clamp No. 7841323 to one of the pistons and press out the other by means of compressed air blown through the brake pipe connection.
3. Carefully remove the seals from the cylinder using a screwdriver with a rounded blade. Take particular care not to damage the sealing groove and cylinder bore.
4. After the seal and piston have been fitted (see assembly) the other piston can be removed. The method is the same for both pistons.

Hopsättning

1. Förslitna, skadade eller svårt korrosionsangripna delar skall bytas.
2. Smörj cylinderloppet med bromsvätska och montera nya tätningsringar.
3. Smörj kolvarna med bromsvätska och tryck in dem försiktigt i cylindern.
4. Montera nya dammskydd och tryck in kolvarna i botten.
5. Vrid kolvarna med hjälp av kolvtång 89 98 367 så att urtagen i kolvarna kommer rätt. Kontrollera läget med mall 89 95 342. Se bild.

BRAKE OPERATION

BRAKE PEDAL

Removal

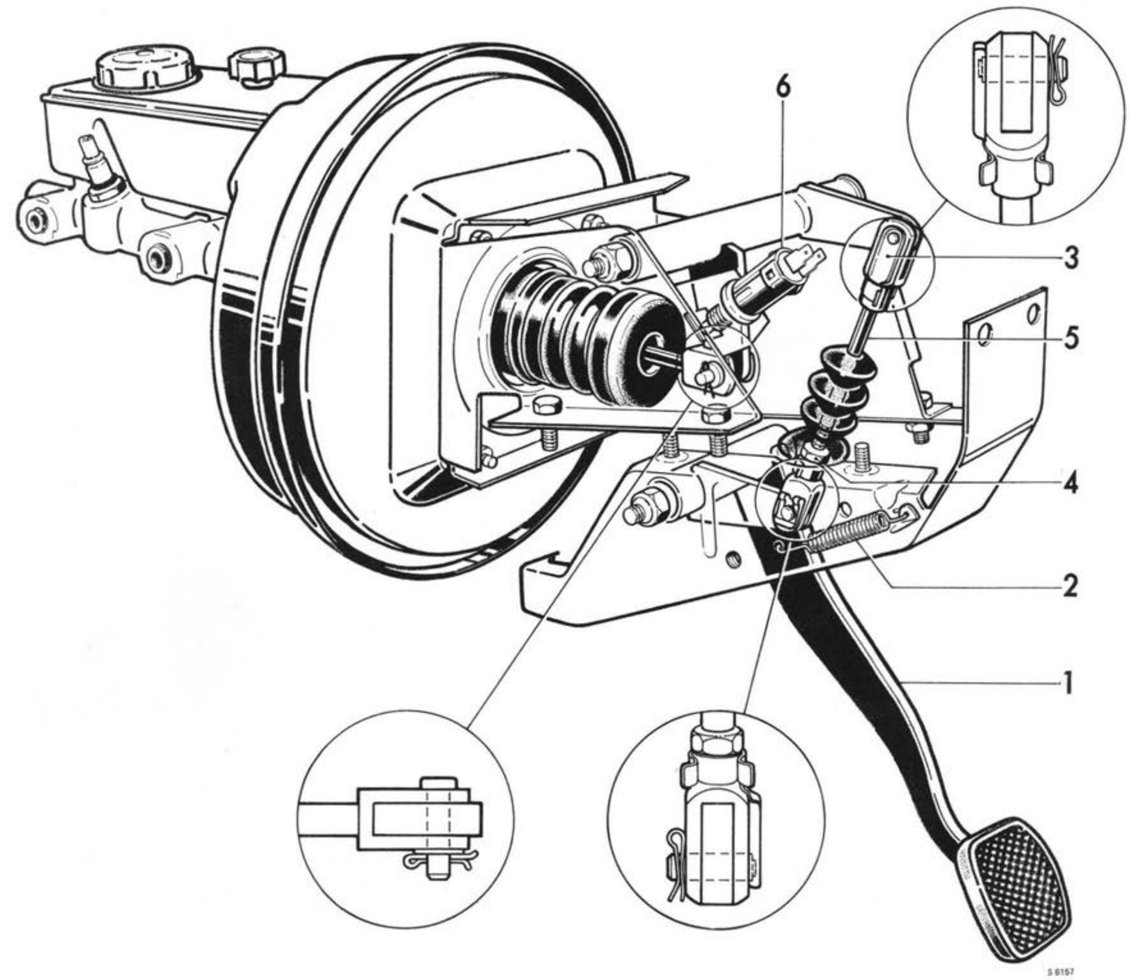
1. Remove the pedal-return spring.
2. Remove the lower circlip on the brake pedal pull rod.
3. Remove the lock nut from the end of the pedal pin and push out the latter.
4. If the bushes are worn these can be pressed out and replaced with new ones. New bushes must be carefully greased with ball bearing grease.

Assembly

Assembly is carried out in the reverse order.

Adjustment of the position of the brake pedal in relation to the clutch pedal is carried out by shortening or lengthening the pull rod from the brake pedal.

1. Remove the lower circlip on the pull rod and the return spring on the pedal.
2. Pull up the rubber bellows in the dash panel and remove the lock nut on the push rod. The rubber bellows and lock nuts can be reached from the engine compartment.
3. Rotate the lower fork of the pull rod to obtain the required length.
4. After completed adjustment tighten the lock nut and then reassemble the pull rod, circlip and return spring.



BRAKE PEDAL (WITH PEDAL AND PUSH ROD)

1. Brake pedal
2. Return spring
3. Circlip
4. Lock nut
5. Pull rod
6. Stop light switch

VACUUM SERVO UNIT

REMOVAL

1. Remove the upper circlip on the brake pedal push rod. (Reached from the engine compartment.) See illustration Section 524.
2. Pull off the two electric cables from the brake light switch.
3. Remove the vacuum hose from the non-return valve on the servo unit.
4. Disconnect the brake hoses and the electric cables for the brake warning switch from the master cylinder and also the hose to the clutch master cylinder from the fluid reservoir. Insert plastic stoppers in the hoses to avoid spillage of the brake fluid.
5. Remove the servo unit together with the master cylinder and bracket. The bracket is fitted to the dash panel by means of four screws. Three of the nuts for these are accessible from underneath in the passenger compartment after removal of the screen section and parts of the dash panel insulation felt below the instrument panel. The fourth nut is accessible from the engine compartment by the bracket.
6. Unscrew the master cylinder and bracket from the servo unit.

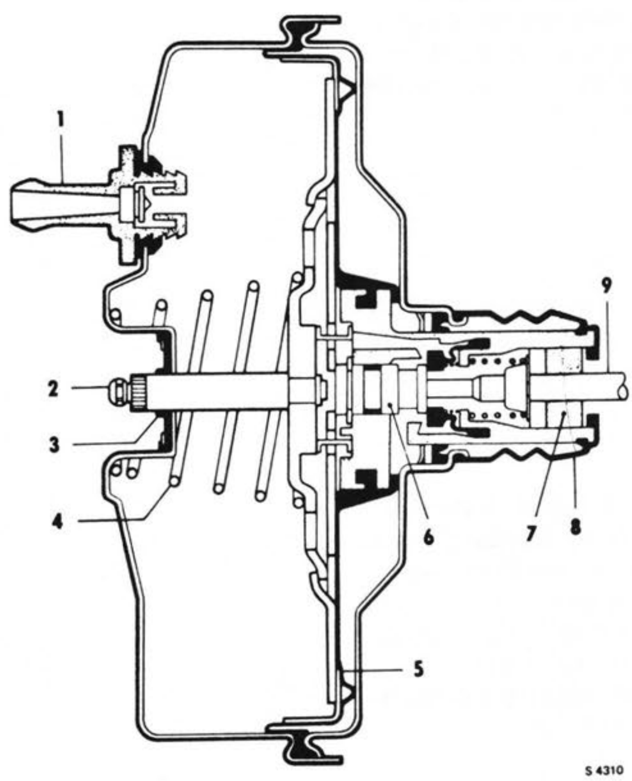
The servo unit comprises one complete unit and cannot be taken apart. Only the non-return valve, dust cover, filter and one seal ring can be removed and replaced.

To fit new air filters these must be slit with a knife to enable them to fit over the input push rod.

> NOTE
> The dome nut on the output push rod is correctly set by the manufacturer and must never be adjusted.

ASSEMBLY

1. Screw the master cylinder and the bracket to the servo unit.
2. Fit the servo unit together with the bracket and master cylinder.
3. Connect the brake hose and the electric cable to the master cylinder and connect the hose from the clutch master cylinder to the brake fluid reservoir.
4. Connect the hose from the inlet manifold.
5. Connect the cable for the brake warning switch and fit the circlip to the brake pedal push rod.
6. Bleed the brake system.



SERVO UNIT

1. Non-return valve
2. Push rod (master cylinder)
3. Seal
4. Return spring
5. Diaphragm
6. Valve piston
7. Filter
8. Dust cover
9. Push rod (brake pedal)

HANDBRAKE SYSTEM

HANDBRAKE CABLE

Removal

1. Remove the driver's seat and fold back the floor carpeting to expose the air ducts for the heating system.
2. Remove the gear lever cover. Observe the ignition switch light and the cables for interior lighting.
3. Remove the plate over the air ducts and remove the air ducts.
4. Disconnect the cable from the adjustment nut on the handbrake lever.
5. Remove the clip holding the two cables to the floor.
6. Remove the rubber bush in the side of the wheel housing and disconnect the cable from the handbrake lever at the brake cylinder housing.
7. Pull out the cable. The simplest method is to pull out each cable and from underneath in the engine compartment.

Fitting

1. Fitting is carried out in the reverse order. The cables should cross each other on the floor of the passenger compartment.
2. After the cables have been fitted the handbrake lever should be applied a few times, in order to stretch the cables. The cables are then adjusted with the adjustment nut at the handbrake lever and the yoke on the brake housing so that the distance between the yoke and the handbrake lever is 0.019 in. ± 0.003 (0.5 mm ± 0.1) when the handbrake is in the off position. (See illustration on page 523–4.)

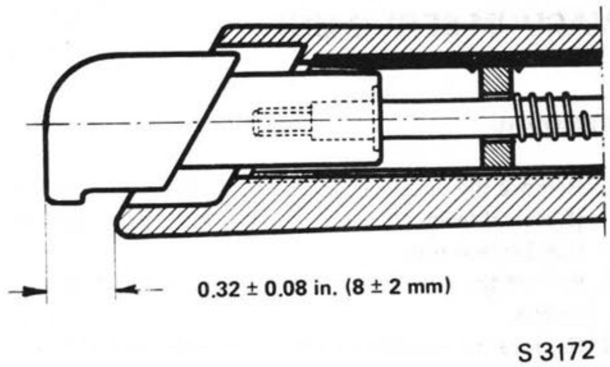
HANDBRAKE LEVER

Removal

1. Disconnect the two cables from the adjustment nuts.
2. Remove the locking pin from the pivot pin and pull out the latter.

Assembly

Assembly is carried out in the reverse order. If the pawl button, pawl rod or any other part contained in the handbrake lever has been removed the position of the pawl button must be checked. After the lever has been fitted and the brake applied, the distance between the top edge of the button and the handbrake lever should be 0.32" ± 0.08" (8 ± 2 mm). The pawl button can be adjusted by screwing or unscrewing it on the push rod.

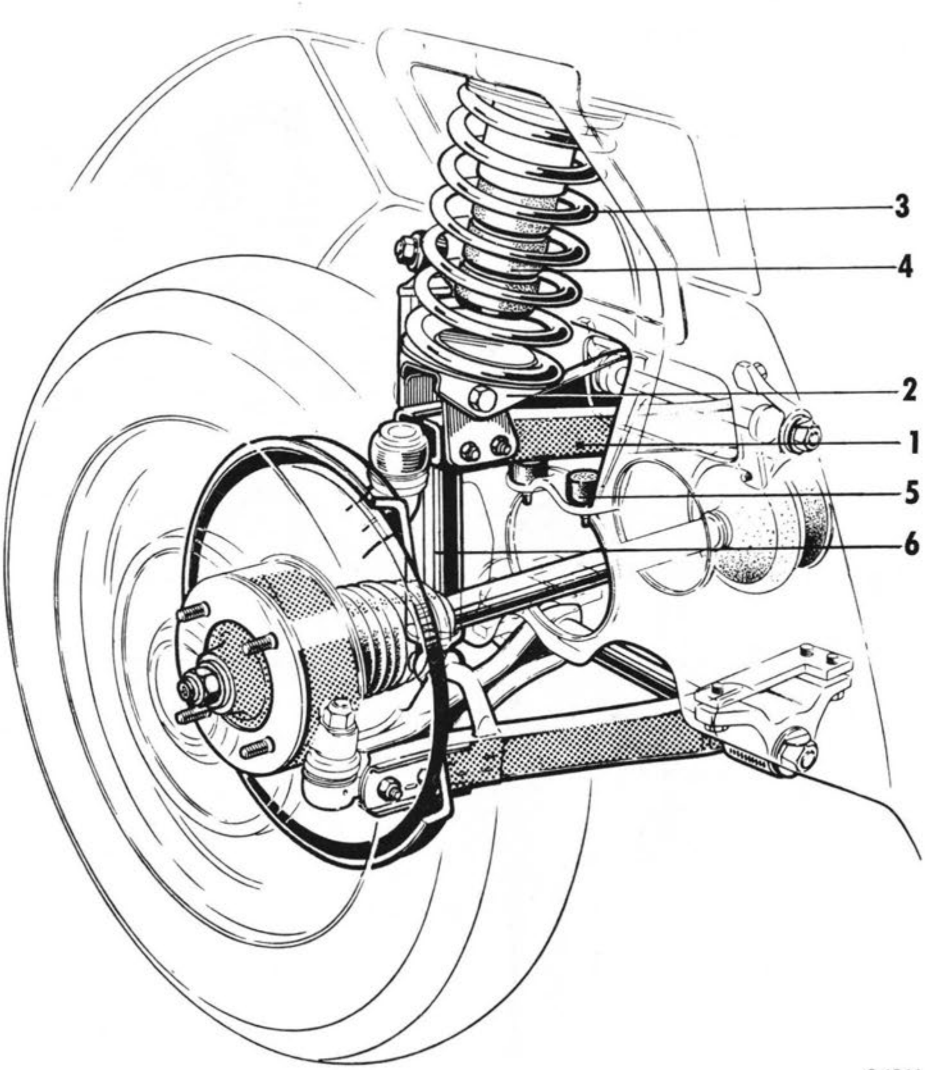


CHECKING MEASURE ON HANDBRAKE LEVER PAWL BUTTON

CONTENTS

GENERAL

All wheels are equipped with coil springs. The front wheels are individually suspended and are mounted on the steering knuckle housings, which are connected to the control arms by permanently lubricated ball joints. The inner ends of the control arms are journaled to the body in rubber bearings. The spring movement of the wheels is limited by rubber buffers. The lower front spring supports are pivot suspended.



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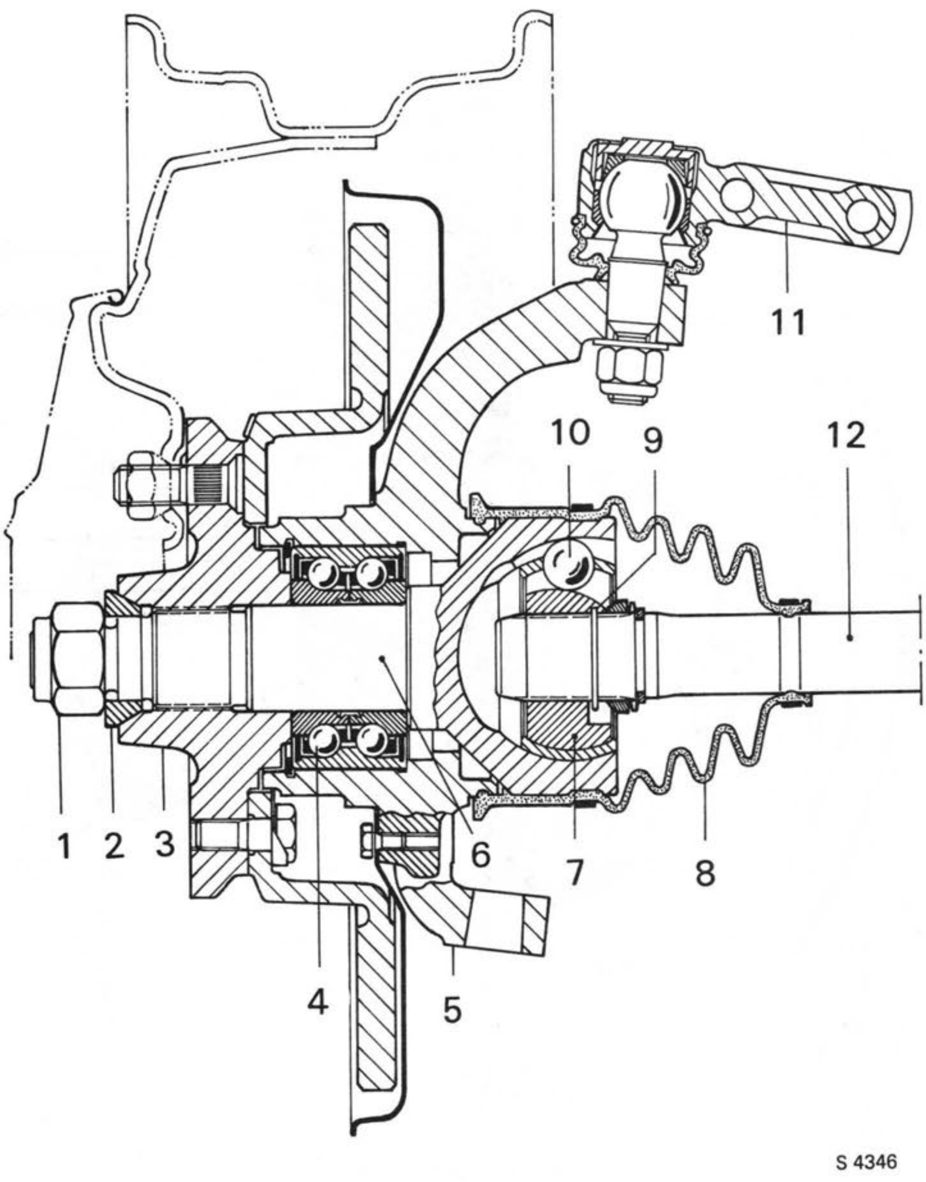
FRONT SUSPENSION

1. Upper control arm
2. Lower spring support
3. Coil spring
4. Rubber buffer
5. Rubber buffers
6. Shock absorber

STEERING KNUCKLE HOUSING

The front suspension consists of separate left-hand and right-hand units. The steering knuckle housing, on which the wheel is mounted, consists of a bearing housing with two inward-curving pivot arms. The wheel is journaled on a double-row angular contact bearing. The outer drive shaft is splined and force-fitted to the hub. The brake disc is mounted on the hub, and the brake shield is bolted to the steering knuckle housing. The steering arm is fastened to the steering knuckle housing by two screws. In steering, the steering knuckle housing pivots about an imaginary axis, the "king-pin" or steering knuckle axis, which passes through the centers of both the ball joints and intersects the ground at a point close to the center line of the wheel. The outer and inner drive shafts are connected by the outer universal joint, which is protected from dirt by a rubber bellows.

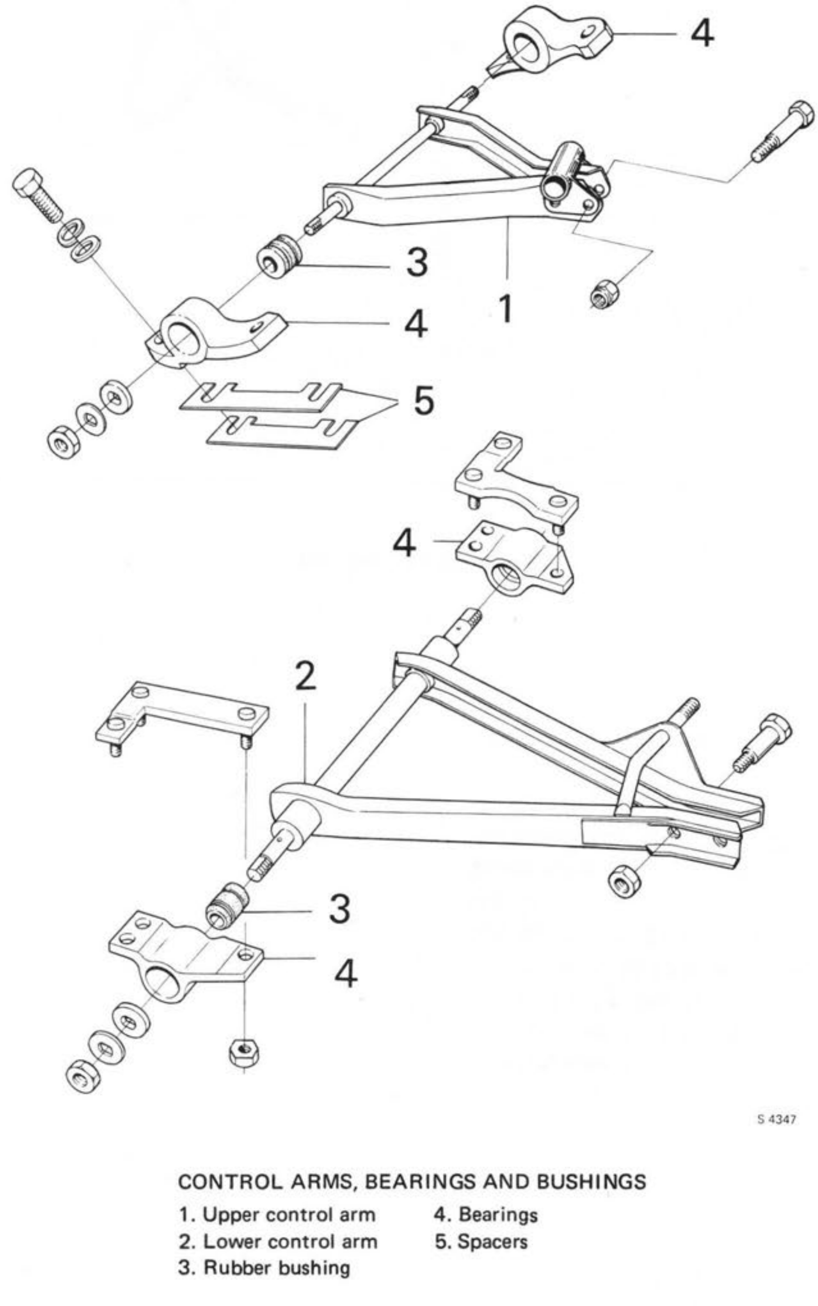


FRONT AXLE ASSEMBLY

1. Lock nut	5. Steering knuckle housing	9. Lock ring
2. Washer	6. Outer drive shaft	10. Ball
3. Wheel hub	7. Hub	11. Upper ball joint (upper end piece)
4. Wheel bearing	8. Rubber bellows	12. Inner drive shaft

CONTROL ARMS

The front axle, forming a separate unit on each side, is bolted to ball joints forming the outer ends of the control arms. There are two control arms on each side, each journaled in rubber bushings in two bearing brackets. The upper control arms carry the coil spring supports, which also serve as compression stops for the rubber buffers.

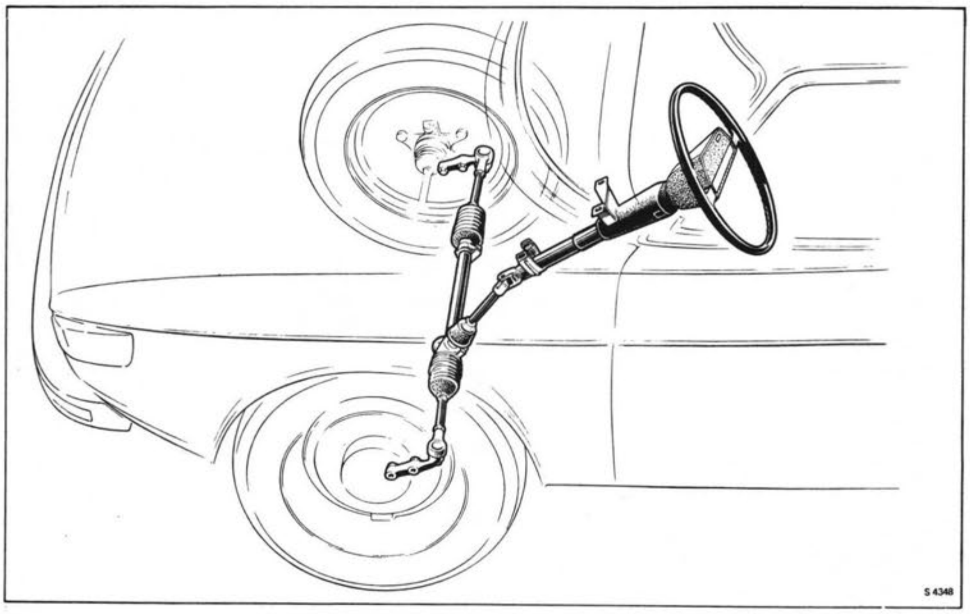


CONTROL ARMS, BEARINGS AND BUSHINGS

1. Upper control arm
2. Lower control arm
3. Rubber bushing
4. Bearings
5. Spacers

STEERING MECHANISM

The steering mechanism is of the rack and pinion type with a helical spur gear which engages a mesh on the rack. The rack is journaled in a housing of cast light-alloy in which a steel tube is press fitted.
The pinion bearing is provided with a spring-loaded plunger that presses the rack against the pinion. The other end of the rack is journaled in a bushing. Steering-wheel movement is transmitted to the pinion by a two-piece steering column and two joints. This imparts an axial movement to the rack, which moves the two tie rods connected by ball joints to the ends of the rack. The tie rods in turn move the steering arms fastened to the steering knuckle housing and connected by ball joints to the tie rods.



STEERING MECHANISM

POWER STEERING GEAR

Some models are equipped with a hydraulic power steering gear.
The assembly consists of a rack-and-pinion steering gear with a servo valve which regulates the oil flow to a servo plunger on the rack. The hydraulic pressure is generated by an oil pump which is driven by a V-belt from the belt pulley on the crankshaft. A separate oil tank by the left wheel housing supplies the system with hydraulic oil. The steering gear is permanently lubricated with oil. A tube running between the two ends of the steering gear housing leads the lubricating oil past the hydraulic portion of the rack.

WHEEL ALIGNMENT

CHECKING AND ADJUSTMENT

If there is reason to suspect that the front wheel alignment is faulty, which manifests itself through abnormal tyre wear, impaired steering and road-holding characteristics, etc., the following action should be taken:

1. Check that the tires are inflated to the correct pressure and that one front tire is not much more heavily worn than the other.
2. Check the front wheel bearings, control arm bearings, steering knuckle joints and tie-rod joints, and adjust or exchange parts as necessary to eliminate any faults of alignment that may be due to worn components.
3. Check the steering gear and make good any defects (see section 642).
4. Check the operation of the shock absorbers and exchange damaged shock absorbers and rubber bushings.
5. If the car has been involved in a collision, crash, etc., any resulting damage must be repaired before wheel alignment is measured. If the suspension control arms are bent, no attempt must be made to straighten them, they must be replaced by new ones.
6. Just before the measurements are made, the car should be driven without hard cornering and with normal suspension movement to work the wheels into their natural positions. For the same reason, the car should be rocked up and down a few times on its springs.

When the measurements are made, the car should be empty and should be standing on a flat horizontal surface; this is the only way to get reliable readings. Adjustment with the help of spacers must be kept within reasonable limits. If there are any deformations due to body damage, the body must be straightened up properly. If the suspension control arms are bent out of true, they must be replaced by new ones. For checking the wheel alignment there are various instruments, which are fitted either on the rim or directly on the axle. Each instrument has its own instruction manual explaining exactly how it is to be used.

NOTE

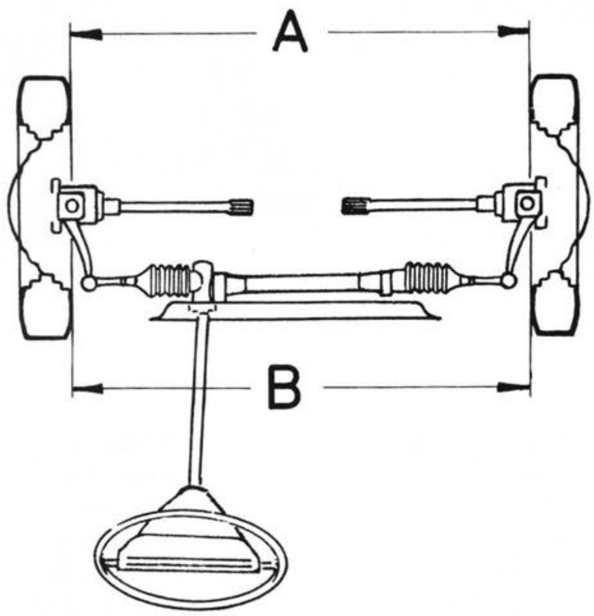
With front-wheel-drive cars it is important that the wheels are immobilized by the brakes while the measurements are being made in cases where the wheels are set up on turntables or the like, or when a measuring instrument is mounted on the end of the axle.

WARNING

When the car is on a hoist, do not seize a front wheel and twist it by main force to full steering-wheel lock. There is a very serious risk of damaging the steering mechanism if this is done, as the rack-and-pinion gear will cause the steering wheel to spin at high speed, imposing a severe torsional strain on the steering column when the rotation is arrested by the stop in the steering gear.

Toe-in

Seen from above, the wheels run at a certain angle to each other. Measurements A and B, made from rim to rim level whith the axles, must bear a given relationship to each other (see illustration). If A is smaller than B, the wheel are said to converge or toe in, and if A is greater than B, the wheels diverge or toe out.
Wheel toe-in or toe-out is expressed in fractions of an inch or milimeters, being the difference between A and B.
Toe-in is zero if the wheels are parallel, in which case both measurements are exactly the same.
The correct toe-in is 0.08 ± 0.04 in. (2 ± 1 mm) i.e. A is less than B by this much.

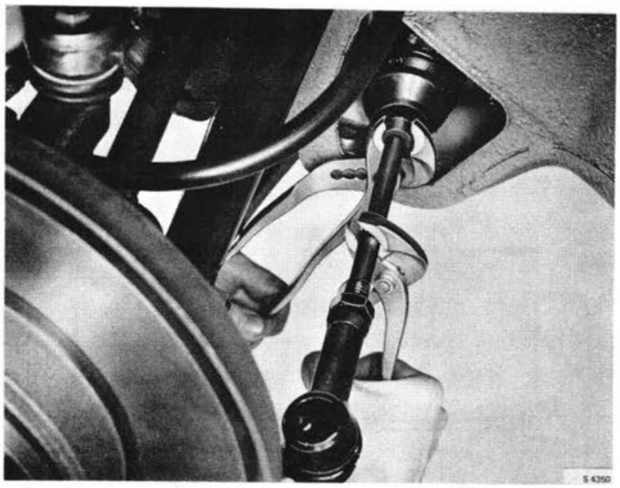


TOE-IN

Checking and adjustment by means of measuring tool:

1. Roll the car straight forward on a level floor and stop it without using the brakes. It must not be moved backward after this.
2. Take a reading of measurement A with the toe-in gauge between the front wheel rims level with the axles. Mark the measurement points with chalk. Roll the car forward until the chalk marks are level with but behind the axles, and take a reading of B. Any necessary adjustment is made by altering the length of the tie rod.
3. Undo the nut on the outer end of the tie rod and the outer clip on the steering gear rubber bellows.
4. Use a suitable pair of grippers to twist the tie rod right or left; adjust until the toe-in is right. Hold the bellows during the twisting.

For adjustment using toe-in equipment refer to the instructions accompanying the equipment.



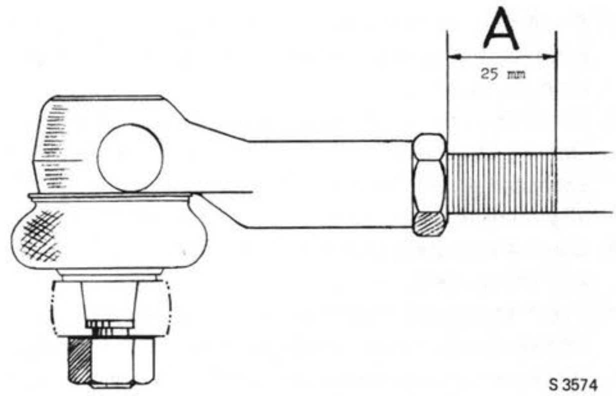
ADJUSTING THE TIE ROD

NOTE

With the correct toe-in and the wheels lined up straight ahead, both tie rods should be the same length – or so adjusted that both wheels have the same clearance to the fenders and wheel housings at full right and left lock respectively. Check also that the steering wheel spokes are horizontal when the front wheels are pointing straight ahead. Do not forget to tighten the tie rod nut after adjusting.

NOTE

After adjustment of toe-in, the free length of thread on the tie rod (length A, see illustration) must not on any account be more than 1" (25 mm) (power steering gear 26 mm). The free thread lengths (A) on both tie rods must not differ from each other by more than 0.08" (2 mm).

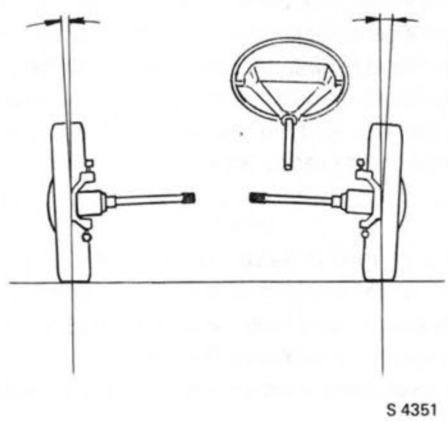


CHECKING THE LENGTH OF THE TIE ROD

A = 1 in. (25 mm), power steering gear max 26 mm

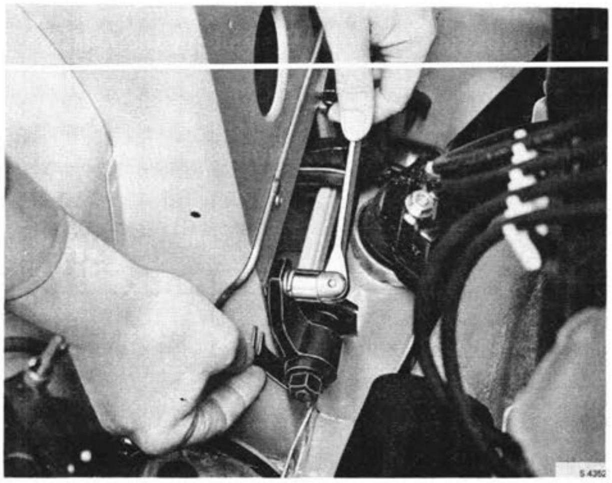
Camber

Camber ist the angle by which the centerlines of the wheels lean from the vertical (see illustration). The camber is positive (+) if the wheels lean outward, and negative (–) if they lean inward. The correct front-wheel camber is $1/2 \pm 1/2^{\circ}$.



CAMBER

The camber, and with it the "king pin" angle, can be adjusted with spacers placed under the two bearing brackets of the upper control arms. The desired result can thus be obtained by increasing or reducing the number of spacers used. To increase or reduce camber, use the same number of spacers under both brackets. The rear bearing bracket is available in a lower design that gives bigger adjustment possibilitys. See the spare parts catalogue.

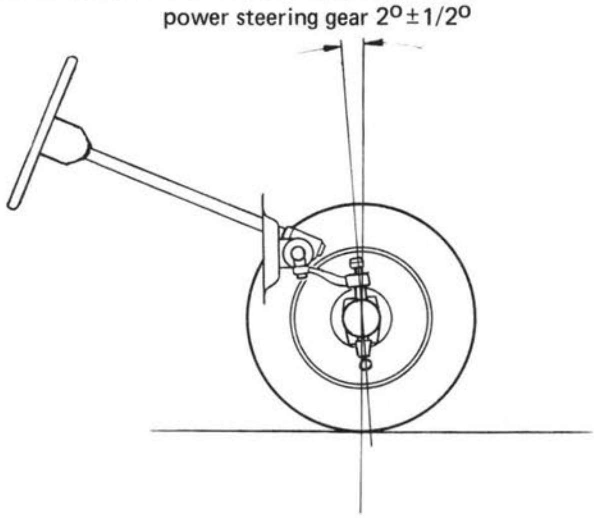


LOCATION OF CAMBER ADJUSTMENT SPACERS

Caster

The caster is the angle by which the king pin axis (or, in the case of the models 99, the steering knuckle axis) departs from the vertical when viewed from the side and is generally expressed in degrees. Caster varies a great deal from one type of car to another, although in most cases the "king pin" leans backward as illustrated below; in such cases the caster is said to be positive (+), whereas if the "king pin" leans forward the caster is negative (–). If the "king pin" is vertical, the caster is zero. The correct caster angle is: manual steering gear $1^{\circ} \pm 1/2^{\circ}$

power steering gear $2^{\circ} \pm 1/2^{\circ}$



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CASTER

If the caster angle needs adjusting, this is done with the help of spacers placed under the bearing brackets of the upper control arms.

To increase the caster, transfer spacers from the front bracket to the rear bracket.

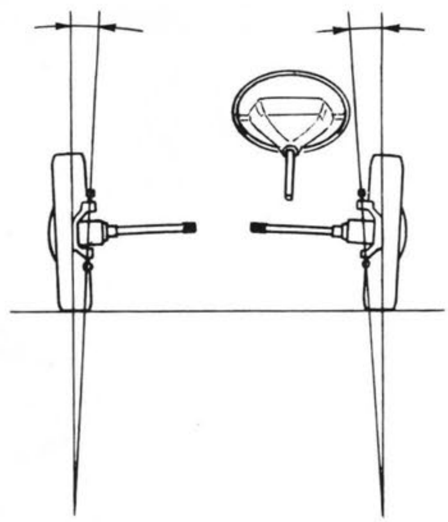
To reduce the caster, transfer spacers from the rear bracket to the front bracket.

In either case, the total spacer thickness removed from one bracket must be added to the other one.

Spacers for caster adjustment are supplied in thicknesses of 0.5, 1.0 and 2.0 mm (0.02", 0.04" and 0.08").

"King pin" angle

The car does not have king pins as such; the wheels pivot on two ball joints instead. It is thus more correct in this case to speak of the steering knuckle axis, i.e. the line passing through the centers of the ball joints and intersecting the ground near the wheel centerline. The steering knuckle axis should incline sideways from the vertical by $11\ 1/2 \pm 1^{\circ}$.



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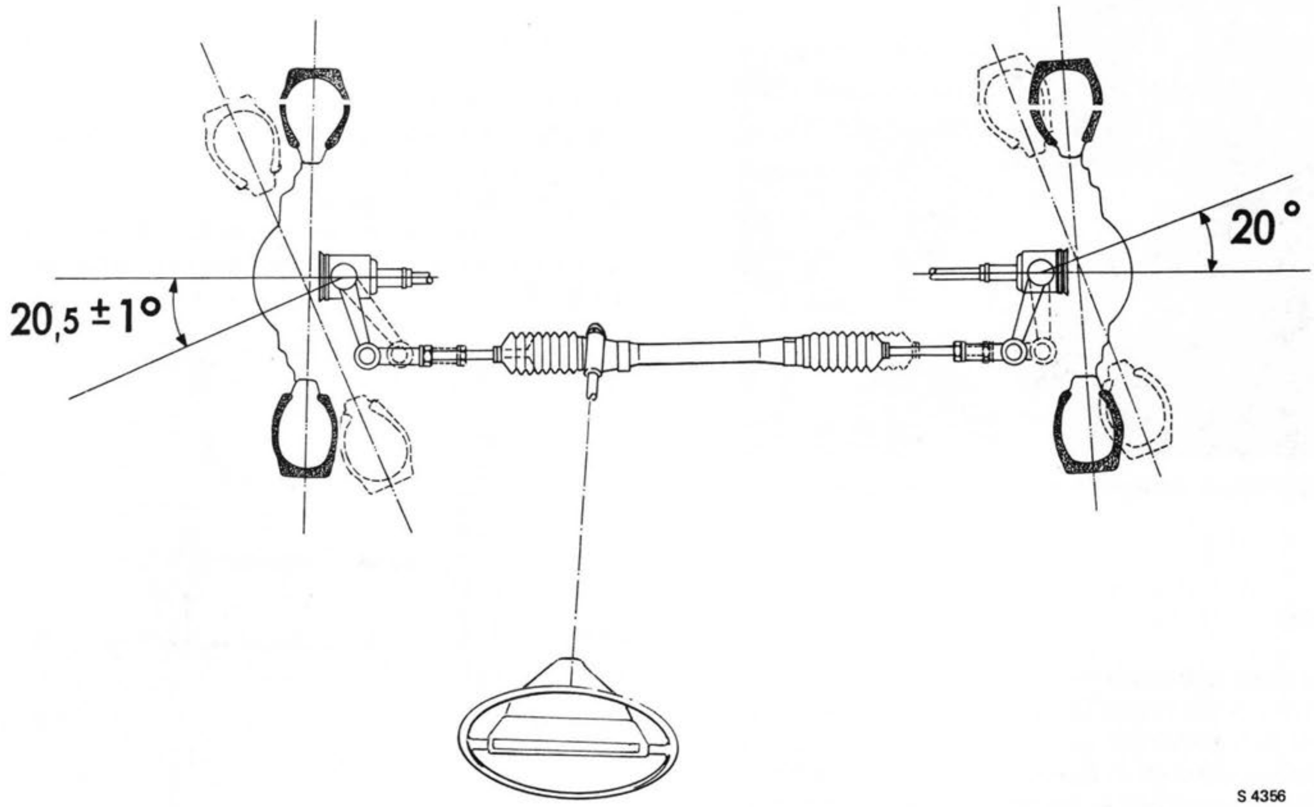
"KING PIN" ANGLE

When the wheel camber is adjusted, the inclination of the steering knuckle axis is automatically altered by the same amount at the same time. The latter angle cannot be adjusted independently, as it is determined by the dimensions of the steering knuckle housing. If the steering knuckle axis is found to be out of true when the camber is correctly adjusted, this indicates that there is something wrong with the steering knuckle housing, which should therefore be exchanged.

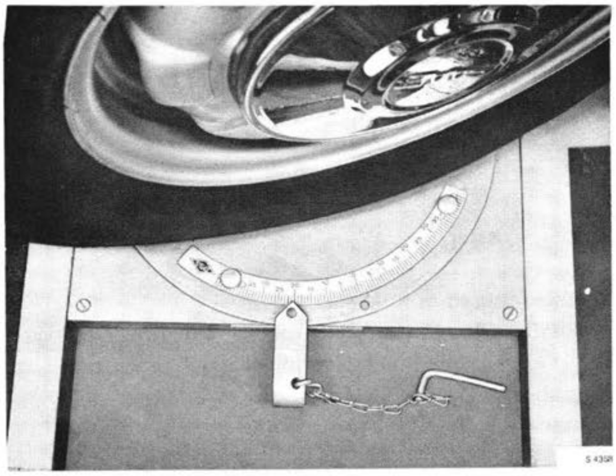
Wheel turning angles

Wheel alignment which allows perfect running of all four wheels on bends varies somewhat depending on speed and the sharpness of the bend owing to suspension movement and tire deformation.
The turning angles have been adapted to the most common driving conditions.
As the tie-rods point slightly inwards in relation to the travelling direction (driving straight ahead), the steering angle of the inside wheel on a bend will be slightly greater.

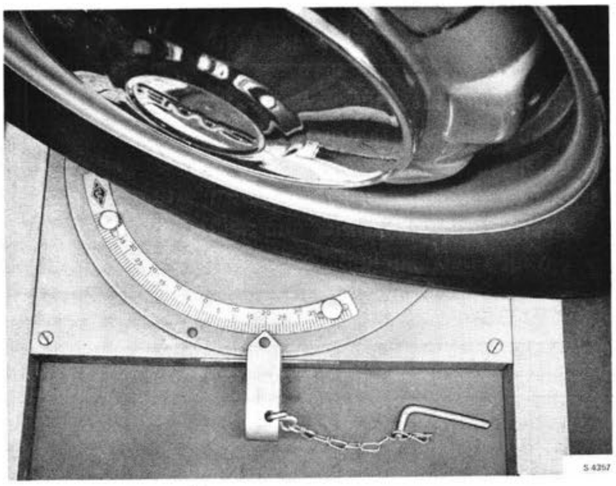


CORNERING POSITIONS OF FRONT WHEELS

Before the wheel turning angles are measured, the toe-in must be correctly adjusted. To measure the turning positions, use two turntables of standard type with scale graduations combined with optical measuring equipment (see illustration).
The centers of the turntables must be placed as close as possible under the pivoting centers of the wheels.
Turn the steering wheel to the left until the right wheel, i.e. the outer wheel, shows a deflection of 20°. If the cornering adjustment is correct, the inner wheel should show a deflection of $20\ 1/2 \pm 1^{\circ}$. Then make the same measurement with the wheels turned to the opposite side. If the measurements reveal that the cornering adjustment is wrong, one or both steering arms be out of

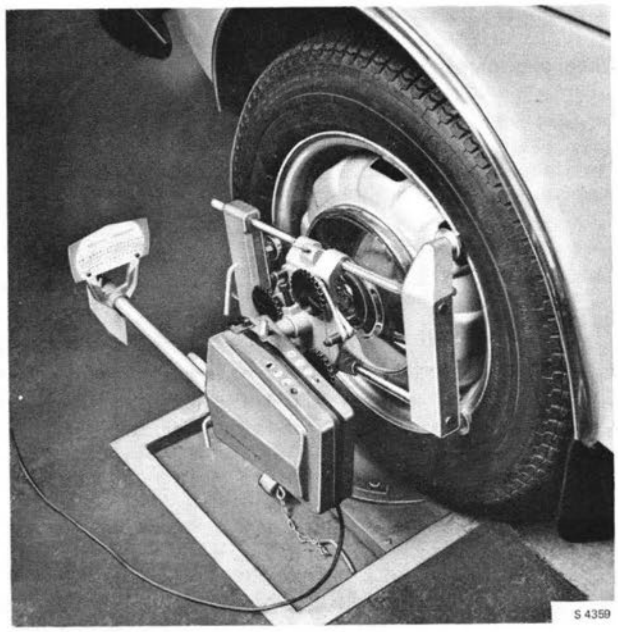


INNER WHEEL $20\ 1/2 \pm 1^{\circ}$



OUTER WHEEL 20°

true. Defective steering arms must not be bent back to shape, they must be replaced.



OPTICAL MEASURING EQUIPMENT

Wheel alignment table

The following table can be used as an aid to the adjustment of wheel alignment angles.

Camber – caster

The table is used as follows:

1. Measurement of the front wheel angles gives readings of, for example (man. steering gear)
   camber = 1 1/4°
   caster = 1 1/2°

> Caster ° – for manual steering gear use the figures on the upper axis and the figures on the lower axis for power-assisted steering.

> For caster angle up to and incl. model 1978 use the upper scale in the box. The lower scale is valid as from model 1979.

2. Find the box in the table where the row and column respectively for these two values intersect, and read off
   F + 5
   B + 3
   which means:
   (F) Front bearing bracket spacers to be increased (+) by 5 mm.
   (B) Back bearing bracket spacers to be increased by 3 mm.
3. Changing the spacers as indicated will correct both camber and caster angles simultaneously.
4. > The figures enclosed by the broken lines in the table are within the permitted tolerances; no adjustment is needed in these cases.

Wheel alignment table

	Caster reading °, manual steering gear												
Camber reading °	−1/2	−1/4	0	1/4	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2
1 3/4	F+3 B+7,5	F+3 B+7	F+3,5 B+6,5	F+4 B+6,5	F+4,5 B+6	F+5 B+6	F+6 B+6	F+6,5 B+5	F+7 B+5,5	F+7 B+5	F+7,5 B+5	F+8 B+4,5	F+8 B+4
1 1/2	F+2 B+6,5	F+2 B+6	F+2,5 B+5,5	F+3 B+5,5	F+3,5 B+5	F+4 B+5	F+5 B+5	F+5,5 B+4,5	F+6 B+4	F+6 B+3,5	F+6,5 B+3,5	F+7 B+3	F+7 B+2,5
1 1/4	F+1 B+5	F+1,5 B+5	F+1,5 B+4,5	F+2 B+4,5	F+2,5 B+4	F+3 B+4	F+4 B+4	F+4,5 B+3,5	F+5 B+3	F+5 B+2,5	F+5,5 B+2,5	F+6 B+2	F+6 B+1,5
1	F−0,5 B+4	F±0 B+4	F+0,5 B+3	F+1 B+3	F+1 B+2,5	F+1,5 B+2,5	F+2 B+2	F+3 B+2	F+3,5 B+2	F+4 B+1,5	F+4,5 B+1,5	F+4,5 B+1	F+5 B+0,5
3/4	F−1,5 B+3	F−1 B+2,5	F−1 B+2	F−0,5 B+2	F±0 B+1,5	F+0,5 B+1,5	F+1 B+1	F+1,5 B+1	F+2 B+0,5	F+2,5 B+0,5	F+3 B±0	F+3,5 B−0,5	F+4 B−1
1/2	F−3 B+2,5	F−3 B+2	F−2,5 B+1,5	F−2 B+1	F−1 B+0,5	F−0,5 B+0,5	Rätt värde	F+0,5 B−0,5	F+1 B−0,5	F+2 B−1	F+2,5 B−1,5	F+3 B−2	F+3 B−2,5
1/4	F−4 B+1	F−3,5 B+0,5	F−3 B±0	F−2,5 B−0,5	F−2 B−0,5	F−1,5 B−1	F−1 B−1	F−0,5 B−1,5	F±0 B−1,5	F+0,5 B−2	F+1 B−2	F+1 B−2,5	F+1,5 B−3
0	F−0 B−0,5	F−4,5 B−1	F−4,5 B−1,5	F−4 B−1,5	F−3,5 B−2	F−3 B−2	F−2 B−2	F−1,5 B−2,5	F−1 B−2,5	F−1 B−3	F−0,5 B−3	F±0 B−4	F+0,5 B−4
−1/4	F−6 B−1,5	F−6 B−2	F−5,5 B−2,5	F−5 B−2,5	F−5 B−3	F−4,5 B−3,5	F−4 B−4	F−3 B−4	F−2,5 B−4	F−2 B−4,5	F−1,5 B−4,5	F−1,5 B−5	F−1 B−5
−1/2	F−7 B−2,5	F−7 B−3	F−6,5 B−3,5	F−6 B−3,5	F−6 B−4	F−5,5 B−4,5	F−5 B−5	F−4 B−5	F−3,5 B−5	F−3 B−5,5	F−2,5 B−5,5	F−2 B−6	F−2 B−6,5
−3/4	F−8 B−4	F−8 B−4,5	F−7,5 B−5	F−7 B−5	F−7 B−5,5	F−6,5 B−5	F−6 B−6	F−5 B−6	F−4,5 B−6	F−4 B−6,5	F−3,5 B−6,5	F−3 B−7	F−3 B−7,5
	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2
	Caster reading °, power steering gear												

SAAB

Toe-in (toe-out) measured on the rim

Reading value of toe-in		Screw tie rod in or out the following turns
Toe-in in mm	6	1 3/5 ut
	5	1 2/5 ut
	4	1 1/5 ut
	3	1 ut
	2	4/5 ut
	1	3/5 ut
	C	2/5 ut
	1	1/5 ut
	2	correct value
Toe-out in mm	3	1/5 in
	4	2/5 in
	5	3/5 in
	6	4/5 in
	7	1 in
	8	1 1/5 in
	9	1 2/5 in
	10	1 3/5 in

REAR WHEEL ALIGNMENT

Checking

If the rear axle has been subjected to abnormal strain in a collision or similar circumstances, it must be checked carefully for signs of failure and deformation.
Rear wheel alignment is not normally adjusted. However, if the rear axle has been subjected to such abnormal strain that the wheels may have been knocked out of true, the wheel angles should be measured.

Rear wheel alignment
Up to and including 1978 model:

Toe-in (measured at rims)	0 ± 2 mm
Wheelbase, left and right sides respectively, max. difference (front wheels pointing straight ahead)	15 mm max.
Camber	$0^{\circ} \pm 1^{\circ}$

As from 1979 model:

Toe-in	2–6 mm (if possible both sides should be measured individually, i.e. 1–3 mm on each side)
Camber	$-1/2^{\circ} \pm 1/4^{\circ}$ (negative)

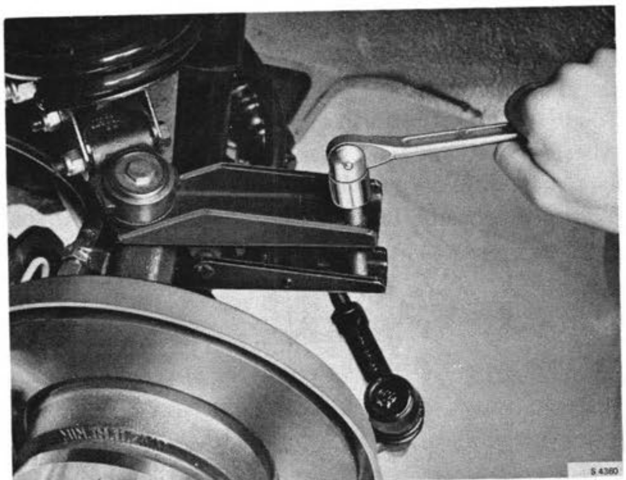
> NOTE
> To be able to measure deviations in toe-in/toe-out, special equipment is needed for angle measurement.

> NOTE
> If the difference between the left and right wheelbases is more than 0.2" (5 mm), the wheel angles must be checked.
> The wheel angles can however be out of true without the wheelbase being affected.

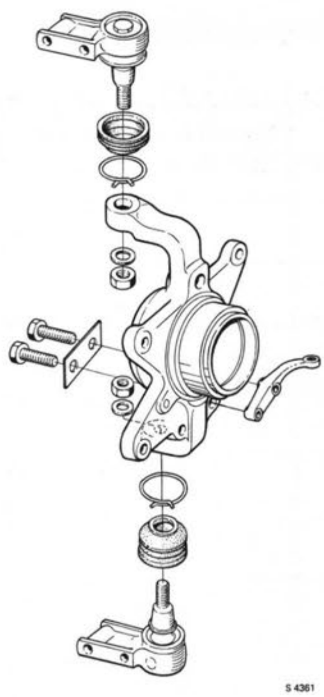
BALL JOINTS

CHANGING BALL JOINTS

1. Jack up the car and remove the wheel. Wash the ball joint and adjacent parts clean.
2. Unscrew the brake housing and hang it up in such a way that the brake hose or pipe not be damaged.
3. Undo the nut that holds the ball bolt in the steering knuckle housing, and remove the bolt using tool 8995409.
4. Remove the ball joint from the control arm.



REMOVING THE UPPER BALL JOINT
Tool 8995409



STEERING KNUCKLE HOUSING AND BALL JOINT FASTENINGS

5. Mount a new ball joint, connect the bolt to the steering knuckle housing and tighten the nut.
6. Fasten the ball joint to the control arm (use new lock nuts).
7. Mount the brake housing.
8. Put on the wheel and lower the car.

> NOTE
> Ball joints must not be disassembled but replaced as complete units.

CHANGING BALL JOINT SEALING BELLOWS

The ball joints are fitted with sealing bellows to protect them from abrasion by dirt. The bellows must be exchanged if damaged.

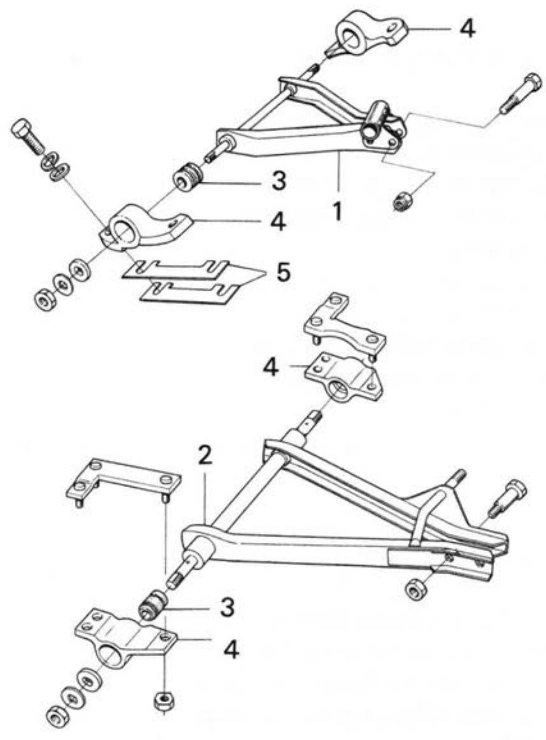
CONTROL ARMS

CHANGING THE UPPER CONTROL ARM

Removal

> NOTE
> To change the left upper control arm, the power plant unit must be taken out of the car.

1. Jack up the front of the car and remove the wheel.
2. Remove the shock absorber.
3. Compress the coil spring using tool 8995839.
4. Back off and remove the two screws securing the upper ball joint and lower spring seat to the upper control arm.
5. Undo the screws from both upper control arm bearing brackets.
6. Remove the compressed coil spring.
7. Remove the control arm and bearings. Save the spacers under the bearings and note the number of spacers under each bearing.
8. Undo both bearing nuts, after which the bearings and bushings can be removed from the control arm (see illustration).



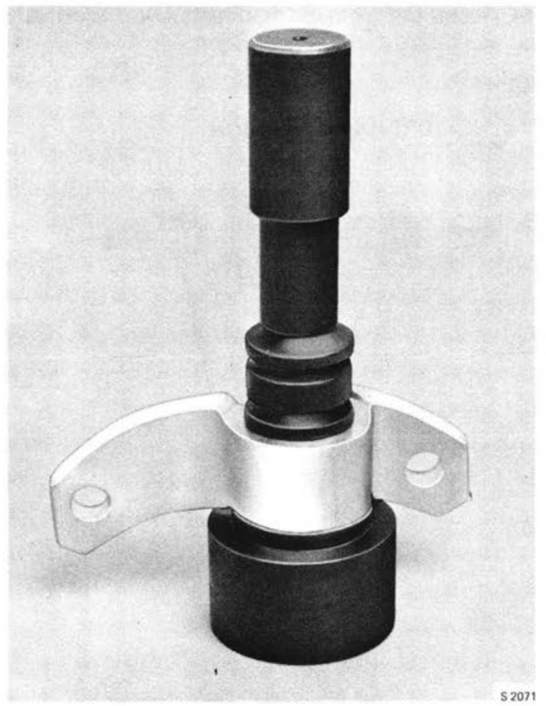
UPPER AND LOWER CONTROL ARMS, FRONT SUSPENSION

1. Upper control arm
2. Lower control arm
3. Rubber bushing
4. Bearing
5. Spacers

Installation

The parts must be well cleaned before they are assembled. Worn or damaged parts should be replaced by new ones.

1. Fit the rubber bushings. The bushing should be forced into the bearing with the aid of tool 7841331. Soap the bushings before inserting.

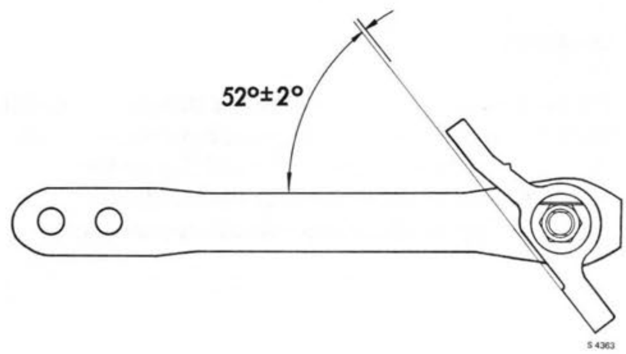


INSERTING A ONE-PIECE RUBBER BUSHING
Tool 7841331

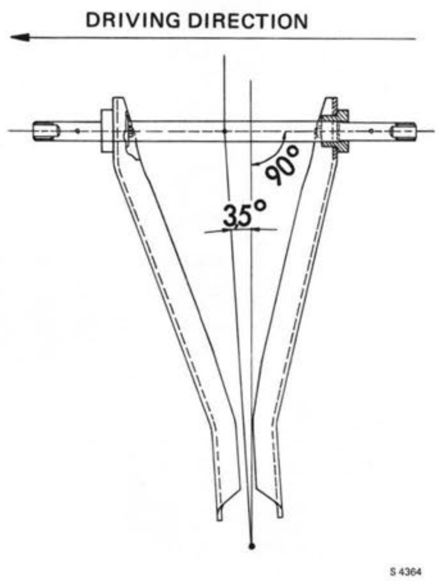
> NOTE
> On no account should oil or grease be used to assist insertion of rubber bushings. If lubrication is needed, use soapy water.

2. Mount the bearings to the control arm. When both nuts are tightened and locked, the angle between arm and bearing should be 52 ± 2^{o}.

> NOTE
> The control arm is asymmetrical (see illustration).



ANGLE BETWEEN UPPER CONTROL ARM AND BEARING



CONTROL ARM, ASYMMETRICAL

3. Locate the control arm but do not insert the bearing screws.
4. Check that the spacer and support ring of the top spring seat are in place and that the rubber buffers under the control arm are mounted.
5. Locate the compressed coil spring with rubber buffer and mount the ball joint and lower spring seat on the control arm.
6. Screw the control arm bearings to the body, not forgetting the spacers.
7. Gradually slacken the screw of the spring compression tool until the tool can be removed.
8. Mount the shock absorber.
9. Mount the wheel and lower the front of the car.
10. Take the car out for a test run, then check and if necessary adjust the wheel alignment (see section 601).

CHANGING THE LOWER CONTROL ARM

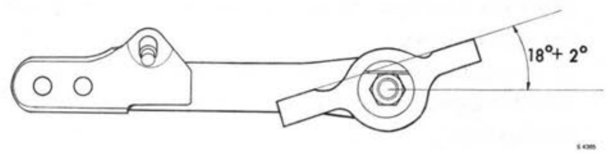
Removal

1. Jack up the car and remove the wheel.
2. Disconnect the lower end of the shock absorber.
3. Back off and remove the two screws that secure the ball joint to the control arm.
4. Undo the lower control arm attachment screws under the engine compartment floor. The control arm and brackets can then be removed.
5. Undo both control arm bearing nuts and remove the bearings.

Installation

The parts must be well cleaned before they are assembled. Worn or damaged parts should be replaced by new ones.

1. Fit the rubber bushings. The bushing is force-fitted with the help of tool 7841349. Soap the bushings before inserting. When both nuts are tightened and locked, the angle between the control arm and bearing should be 18 ± 2°.



ANGLE BETWEEN LOWER CONTROL ARM AND BEARING

2. Mount the control arm by screwing the bearings to the body.
3. Secure the ball joint to the control arm.
4. Mount the wheel and lower the car.
5. Take the car for a trial run.
6. Check and if necessary adjust the wheel alignment (see section 601).

> NOTE
>
> On no account should oil or grease be used to assist insertion of rubber bushings. If lubrication is needed, use soapy water.

Adjusting the control arms

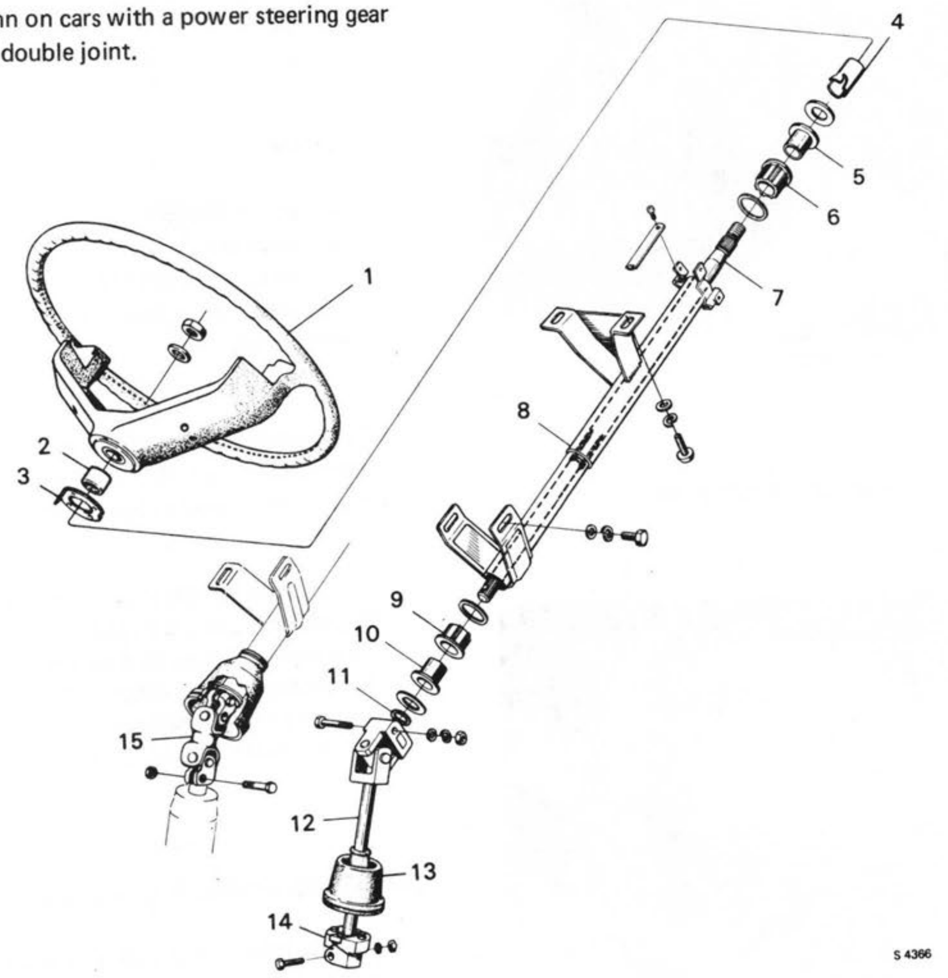
If the control arms have been subjected to severe strain in a collision or similar circumstances, they must be checked carefully for failure and distortion. If the arms are out of true, they must be exchanged.

STEERING WHEEL, STEERING COLUMN TUBE WITH SUPPORT AND STEERING COLUMN

GENERAL

The steering column is journaled in metal bushings surrounded by rubber bushings in a tube, the steering column tube or steering wheel bearing support, which is fixed to the pedal bracket and the body. An intermediate shaft jointed at both ends transmits the movement of the steering column to the steering gear.
The steering column and tube are of telescopic type, i.e. the steering column and tube collapse when subjected to a certain critical axial force.
The steering column on cars with a power steering gear is equipped with a double joint.

> **WARNING**
>
> When the car is on a hoist, do not seize a front wheel and twist it by main force to full steering-wheel lock. There is a very serious risk of damaging the steering mechanism if this is done, as the rack-and-pinion gear will cause the steering wheel to spin at high speed, imposing a severe torsional strain on the steering column when the rotation is arrested by the stop in the steering gear.



STEERING COLUMN ASSEMBLY

1. Steering wheel
2. Plastic sleeve
3. Slip ring
4. Driver
5. Bushing
6. Rubber bushing
7. Steering column
8. Steering column tube
9. Rubber bushing
10. Bushing
11. Rubber washer
12. Intermediate shaft
13. Rubber bellows
14. Joint half
15. Double joint

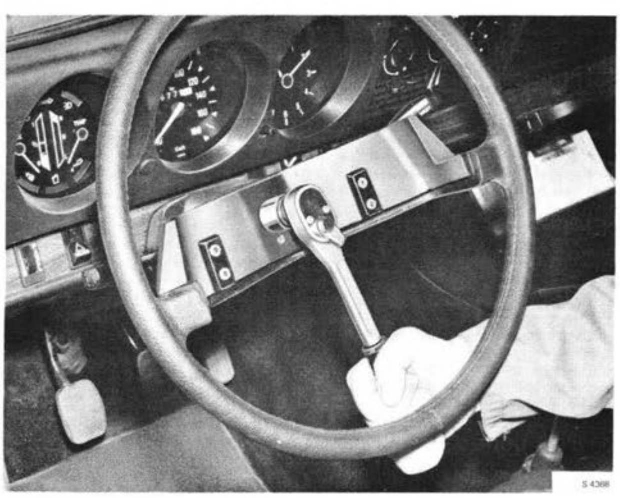
STEERING WHEEL

Removal

1. Take the bottom cover off the steering wheel bearing by undoing the three screws holding it in place.
2. Remove the steering wheel safety pad by undoing the four screws under the spokes (see illustration). Remove the horn contact finger.

REMOVING THE SAFETY PAD

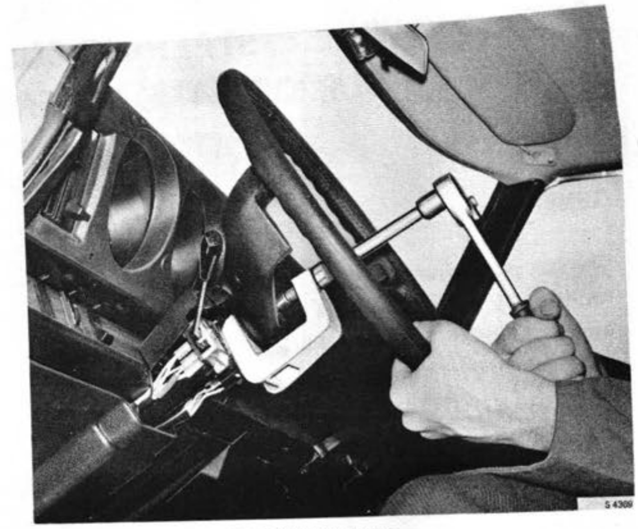
3. Back off the nut and remove the washer.



REMOVING THE STEERING WHEEL NUT

4. Mount the puller, 8995680, on the wheel (see illustration) and pull the wheel off.

If necessary, the direction indicator switch actuator can nov also be removed.



REMOVING THE STEERING WHEEL
Tool 8995680

Installation

1. Replace the direction indicator switch actuator if it has been taken out. Make sure that its center line coincides with the center line of the switch housing when the front wheels are straight ahead. Fit the plastic sleeve on the driver.

> CAUTION
> The actuator is so designed that it is located on the steering column with a certain grip. On no account must it be welded to the column.

2. Fit the steering wheel on to the steering column. The front wheels should be aligned straight ahead and the steering wheel mounted with the spokes horizontal.
3. Mount the bottom cover of the steering wheel bearing, checking that the slip ring is properly seated.
4. Fit the steering wheel safety pad.

STEERING WHEEL, SAAB 99 EMS

During the 1976 model year a special steering wheel has been introduced for Saab 99 EMS cars. The wheel has a smaller diameter and the horn mechanism is of new design.

Removal and fitting, earlier design

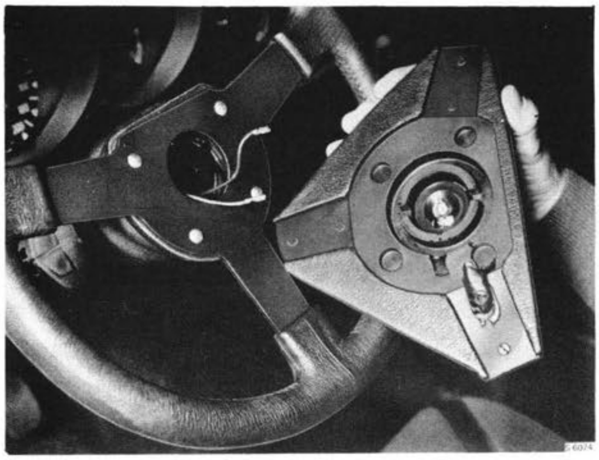
1. Remove the horn contact by means of a pointed chisel.
2. Remove the steering wheel nut.
3. Remove the steering wheel by means of an extractor ring, spacer sleeve and a universal extractor.

Fitting is carried out in the reverse order.

Removal and installation, later design

STEERING WHEEL, SAAB 99 EMS, LATER DESIGN

1. Remove the signal contact by taking away the padding from the steering wheel spokes. Pull the electric cables loose from the signal contact.



REMOVAL OF SAFETY PADDING

2. Remove the steering wheel nut.
3. Pull off the steering wheel with the aid of puller ring, spacer stud and a universal puller.

Installation is carried out in the reverse order.

> WARNING
>
> The collapsible steering wheel shaft must be handled with care. It must not be subjected to impacts, jolts or other rough treatment liable to alter the adjusted length of the telescope joint or impair its shock absorbing effect.
> When installing the steering wheel shaft, take special care to ensure that the splined lower end is pushed into the intermediate shaft until the clamping screw comes opposite the groove in the shaft. The intermediate shaft should normally slide freely on the shaft. If the splines stick, do not on any account knock on the top end of of the steering wheel shaft. This also applies to removing and fitting the steering wheel. The wheel must not be knocked off or on. When the car is on a hoist, do not seize a front wheel and twist it by main force to full steering-wheel lock. There is a very serious risk of damaging the steering mechanism if this is done, as the rack-and-pinion gear will cause the steering wheel to spin at high speed, imposing a severe torsional strain on the steering column when the rotation is arrested by the stop in the steering gear.

STEERING COLUMN TUBE

Removal

1. Undo the locking screw at the joint.
2. Undo the two lower retaining screws at the pedal bracet and the two upper retaining screws. (Steering column tube-instrument panel.)
3. Detach the quick-release wiring connection and lift out the steering column assembly.

Installation

Installation must be carried out in the following order to avoid tension between the steering wheel and steering gear.
(This is particularly important on cars with power steering.)

1. Install the steering column tube in position with the steering column and steering wheel mounted.
2. Mount the steering column to the joint. Ensure that it is inserted so that the clamping screw comes opposite the groove in the shaft. Tighten the screw. Check that there is no excessive play in the bearing and that it does not stick.

> CAUTION
>
> If the steering wheel is mounted after the steering column has been mounted to the joint, tension may be caused between the steering wheel and steering column tube.

3. Mount the steering column tube to the pedal bracket

and body. Check that no tension is caused when it is secured. Connect the electric cable harness.

4. If necessary, adjust the steering wheel.

STEERING COLUMN

Dissasembling and assembling

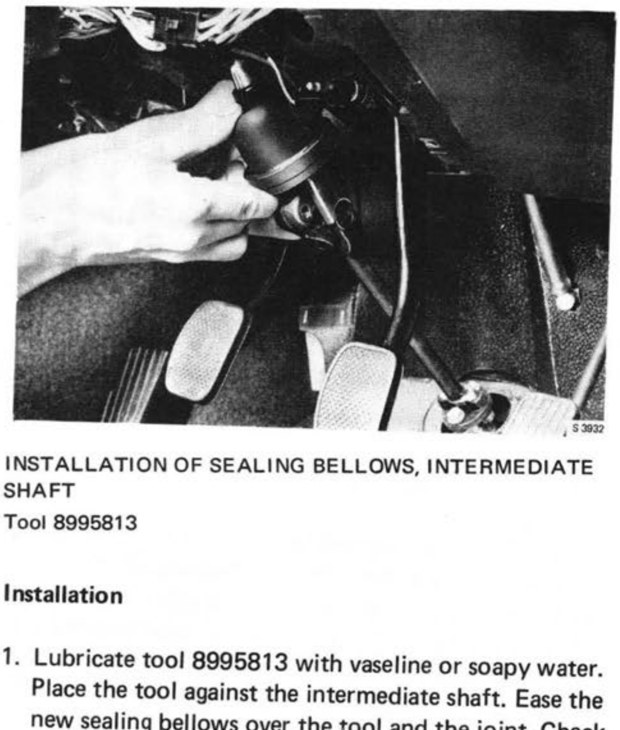
1. Undo the three retaining screws and remove the plastic cover under the steering wheel.
2. Pull the steering wheel shaft out of the tube.
3. Remove the two rubber bushings with associated steering wheel shaft bushings and washers.

Reassemble in reverse order.

REPLACEMENT OF SEALING BELLOWS ON INTERMEDIATE SHAFT

Removing

1. Remove the cover under the instrument panel.
2. Undo the screw, which holds the steering column to the intermediate shaft.
3. Undo the four screws, which fasten the steering column tube to the body.
4. Withdraw the steering column from the intermediate shaft.
5. Cut off the old sealing bellows.



INSTALLATION OF SEALING BELLOWS, INTERMEDIATE SHAFT
Tool 8995813

Installation

1. Lubricate tool 8995813 with vaseline or soapy water. Place the tool against the intermediate shaft. Ease the new sealing bellows over the tool and the joint. Check that the bellows are undamaged.
2. Refit the steering column into the intermediate shaft. Make sure that it is pushed in so that the screw is located directly opposite the groove. Tighten the screw.
3. Fasten the steering column to the body.
4. Check the position of the steering wheel and adjust if necessary.
5. Fit the bellows in the dash panel.
6. Refit the cover under the instrument panel.

STEERING GEAR

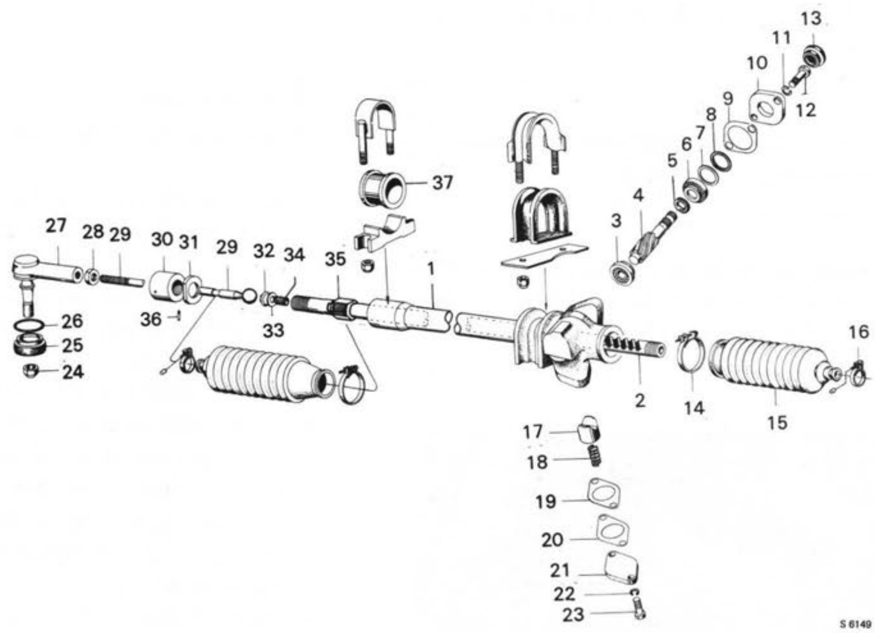
GENERAL

The steering gear is precision adjusted before delivery and should not be disassembled unless absolutely necessary. Disassembly and reassembly of the steering gear, see the following pages.

The steering gear is sealed for life. As from the middle of 1978 model production the steering gear is lubricated with FLUID GREASE while oil lubrication was used previously. FLUID GREASE should be used in future (this also applies to earlier oil-lubricated steering gears) in conjunction with repair work on the steering gear. FLUID GREASE is compatible with the oil.

Check occasionally that the steering gear rubber bellows are intact.

If the steering gear is noisy, it must be adjusted (see section "Adjustment of steering gear"). The illustration shows the steering gear of a left-hand-drive car. As the steering gear of the right-hand-drive model is essentially similar, the instructions given here apply to both types. Regarding the power steering, see page 644–1.



STEERING GEAR

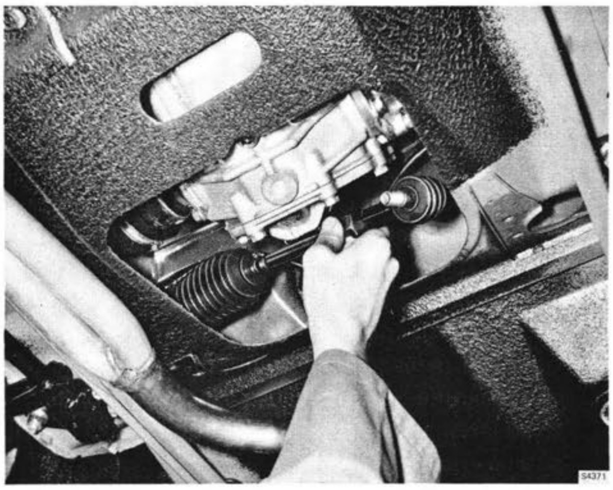
1. Steering gear housing assembly	13. Seal ring	26. Ring
2. Rack	14. Clip	27. Tie rod end
3. Ball bearing	15. Rubber bellows	28. Lock nut
4. Pinion	16. Clip	29. Tie rod
5. Sealing ring	17. Plunger	30. Outer bearing cup
6. Ball bearing	18. Spring	31. Lock nut
7. Shim	19. Shim	32. Inner bearing cup
8. Spacer	20. Gasket	33. Washer
9. Gasket	21. Cap	34. Spring
10. Cap	22. Washer	35. Bushing
11. Washer	23. Screw	36. Cotter pin
12. Screw	24. Nut	37. Rubber bushing
	25. Rubber bellows	

REMOVAL

1. Remove the left (R.H.D. cars the right) screen under the instrument panel and loosen the rubber bellows at the body lead-through for the steering gear intermediate shaft.
2. Jack up the car and remove the screw holding the joint to the steering gear pinion.
3. Loosen the steering column tube from the body and separate the steering column joint from the pinion. Hang up the steering column so that the wiring harness is not damaged.
4. Remove the front wheels.
5. Remove the tie rod ends at the steering arms with the aid of tool 8995409.
6. Remove the two steering gear clamps.
7. Move the rack as far as possible to the right. (R.H.D. cars to the left.)

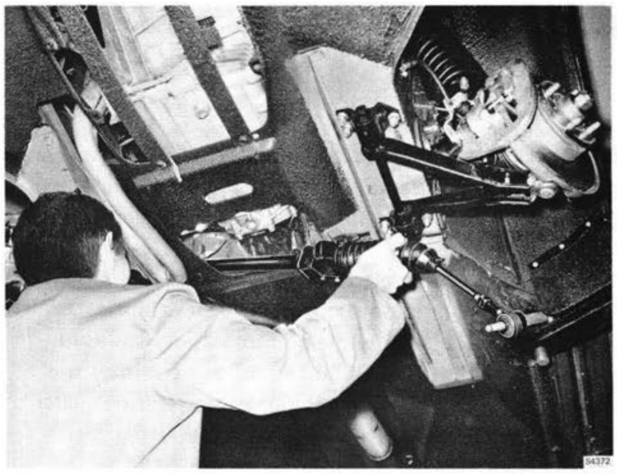
NOTE
Be careful so that the rubber bellows are not damaged against the edges of the body.

8. Lift the steering gear so far to the right that the tie rod can be bent down in the opening in the engine compartment floor. (R.H.D. cars, lift the steering gear to the left.)



BENDING THE TIE ROD DOWN THROUGH THE OPENING IN THE BODY

9. Pull the rack maximal stroke to the left (R.H.D. cars ro the right) and lift the steering gear down through the opening in the engine compartment floor.



REMOVAL OF STEERING GEAR ASSEMBLY

INSTALLATION

(R.H.D. cars, opposite direction in instructions)

1. Pull the rack maximal stroke to the left and lift up the steering gear through the hole in the engine compartment floor.
2. Pull the rack maximal stroke to the right and bend up the left tie rod through the opening in the engine compartment floor.
3. Put the steering gear in place and fit the two clamps.
4. Fit the steering column joint to the steering gear. Make sure that the retaining screw is situated in the groove in the steering gear pinion shaft. Fit the steering column tube to the body.
5. Mount the tie rod ends to the steering arms and fit the front wheels.
6. Fit the rubber bellows at the intermediate shaft and install the screen under the instrument panel.
7. Check, if necessary adjust, toe-in and steering wheel alignment.

WARNING

The collapsible steering wheel shaft must be handled with care It must not be subjected to impacts, jolts or other rough treatment liable to alter the adjusted length of the telescope joint or impair its shockabsorbing effect.

When installing the steering wheel shaft, take special care to ensure that the splined lower end is pushed into the intermediate shaft until the clamping screw comes opposite the groove in the shaft. The intermediate shaft should normally slide freely on the shaft. If the splines stick, do not on any account knock on the top end of the steering wheel shaft. This also applies to removing and fitting the steering wheel. The wheel must not be knocked off or on.

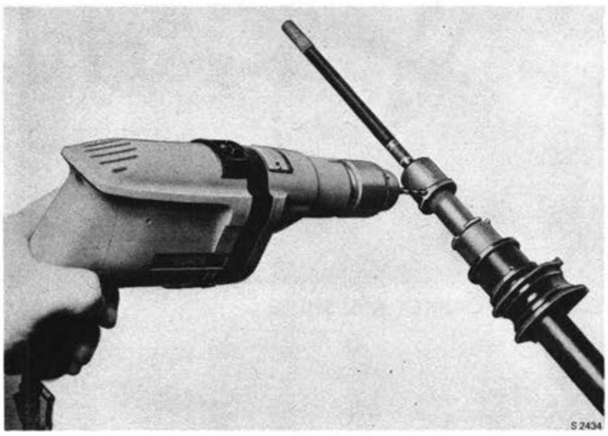
When the car is on a hoist, do not seize a front wheel and twist it by main force to full steering-wheel lock. There is a very serious risk of damaging the steering mechanism if this is done, as the rack-and-pinion gear will cause the steering wheel to spin at high speed, imposing a severe torsional strain on the steering column when the rotation is arrested by the stop in the steering gear

DISASSEMBLY

1. Back off the lock nuts and unscrew the tie-rod ends.
2. Undo the clips and remove the rubber bellows.
3. Drill out the cotter pins from the inner ball joints using a 4 mm bit. The pins are 3/8" (9.4 mm) long (see illustration).

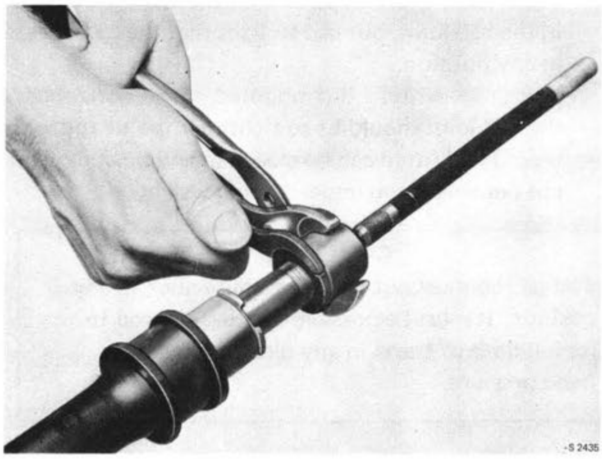
CAUTION

Do not drill too deep.



DRILLING OUT THE COTTER PIN

4. Remove the outer bearing cups and lock nuts using tool 8390197 and polygrip pliers.



REMOVING OUTER BEARING CUP AND LOCK NUT
Tool 8390197 and polygrip pliers

5. Undo the rack adjustment screw and remove the cap, shims, spring and plunger.
6. Undo the pinion screws and remove the pinion with cap, gasket, shims and upper bearing.
7. Pull the rack out of the steering gear housing.
8. Remove the lower pinion bearing by tapping the housing on a porous surface. The bushing in the steering gear housing end can be replaced if necessary.

ASSEMBLY

Ensure that all parts are scrupulously clean prior to assembly.

LUBRICATION

Lubricate the steering gear moving parts and fill the gear with 150 cm^3 (1.5 dl) FLUID GREASE part no. (45) 30 08 703.

1. Seat the lower pinion bearing.

CAUTION

Make sure that both pinion bearings are the right way up. The extended parts of the inner bearing tracks should face each other.

2. Assemble the inner ball joint on the pinion end of the rack as follows:
   Thread the lock nut on to the rack. Oil the parts and fit the outer bearing cup on the rack. Insert the spring washer and inner bearing cup and tighten the bearing cup.

LUBRICATION

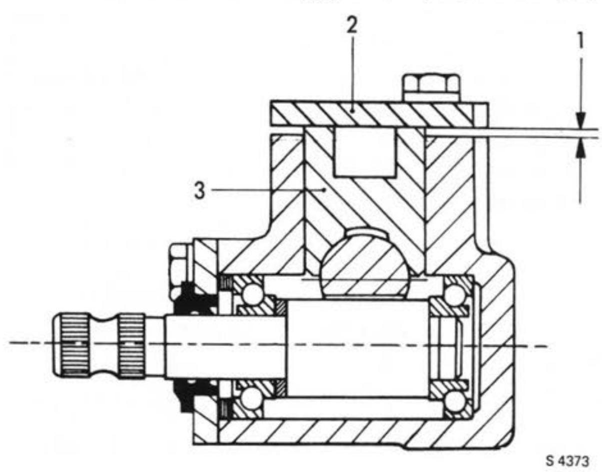
Lubricate the ball and bearing cups with Molybdenum paste, part no. (45) 30 06 632.

3. Tighten the bearing cup so that there is no looseness in the ball joint, but not so tight that the ball sticks in any position.
   If the rack with tie rod mounted is held horizontal, the ball joint should be so tight that the tie rod with tie-rod end fitted can be placed in any position without bending down under its own weight.

CAUTION

The tie rod must not on any account stick in any position. It must be possible to move the rod to its full limit of travel in any direction by light hand pressure.

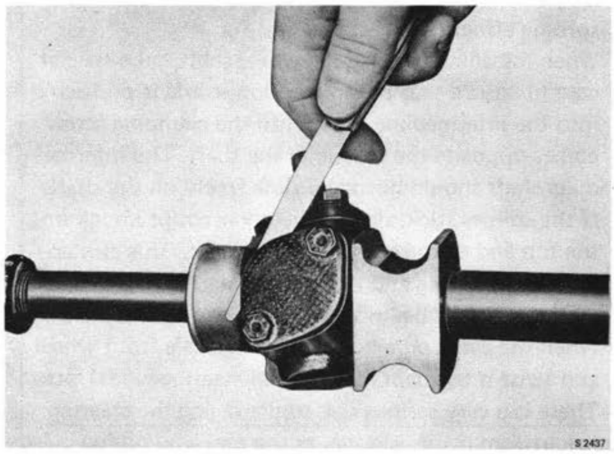
4. Tighten the lock nut against the bearing cup using tool 8390197 and polygrip pliers, and check again that the ball joint is neither too tight nor too slack. Drill a new hole for the cotter pin 4 mm in diameter and 3/8" (9.4 mm) deep and insert a new cotter pin, securing it by four center punch blows at the edge of the hole. Be extremely careful that no drill shavings get into the steering gear.
5. Insert the rack in the housing. Then fit the pinion and upper bearing. Adjust the pinion with shims so that there is no axial play when the gasket and cap are mounted. Shims are available in thicknesses of 0.005, 0.007 and 0.01 in. (0.13, 0.19 and 0.25 mm). A 0.09 in. (2.33 mm) spacer is also available.
6. Adjust the radial play of the rack as follows:
   a. Fit the plunger without the spring and screw on the cap without the gasket by hand until it butts against the plunger (see illustration). If a wrench is used, the cap will be deformed.
      It is also possible to adjust the radial play of the rack when the steering gear is in place in the car.



CAP AND PLUNGER FITTED FOR MEASUREMENT OF PLAY

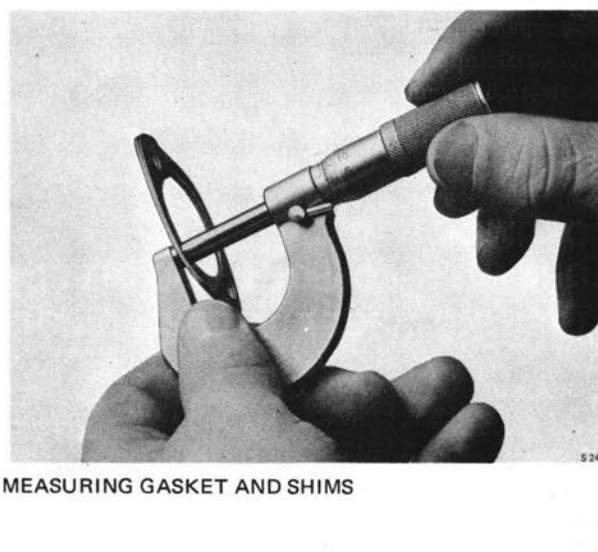
1. Clearance to be measured with feeler gauge
2. Cap
3. Plunger

   b. Measure the clearance between the cap and housing with a feeler gauge.



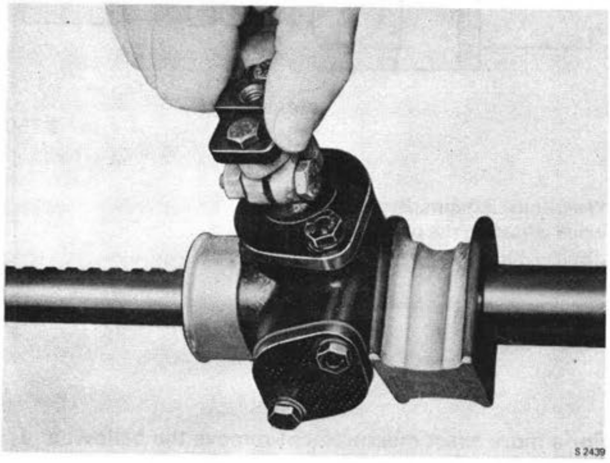
MEASURING CLEARANCE BETWEEN CAP AND HOUSING

   c. Add 0.002" – 0.006" (0.05 – 0.15 mm) to the measured clearance to allow for the play to be left between the plunger and cap after assembly.
      If for example the feeler gauge measurement is 0.022" (0.55 mm), the total thickness of gasket and shims should be 0.024" – 0.028" (0.60 – 0.70 mm).
      Measure the thickness of the gasket and shims with a micrometer (see illustration).
      Shims are available in thicknesses of 0.005", 0.0075", 0.010", 0.015" and 0.020" (0.13, 0.19, 0.25, 0.38 and 0.51 mm).



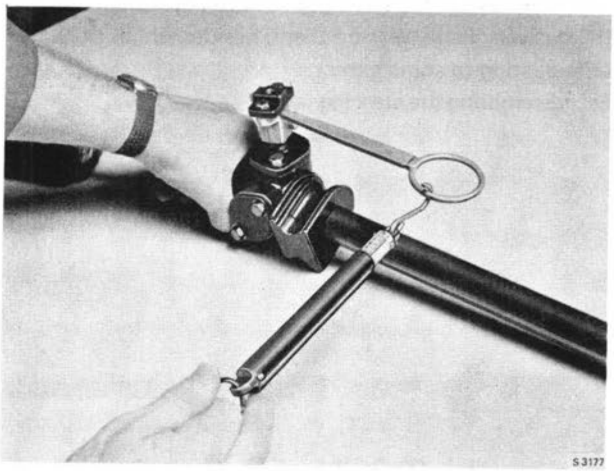
MEASURING GASKET AND SHIMS

7. Fit the plunger, spring, shims, gasket and cap.
8. Check that the rack does not stick in any position by rotating the pinion with tool 8995284.



CHECKING THAT THE RACK DOES NOT STICK
Tool 8995284

9. In the correct adjusted steering gear, the torque should be 1.1–2.0 Nm (0.83–1.5 ft.lb., 11.5–20.7 kpcm). This is checked with the aid of a dynamometer, brake spring tool 8995607 and tool 8995284. Connect the brake spring tool according to figure. A lever arm of about 6.03" (16 cm) is then obtained which corresponds 7–14 N (5.5–11 ft.lb., 0.7–1.4 kp) on the dynamometer.



CHECKING THE STEERING GEAR TORQUE
Tool 8995607 and dynamometer

10. Assemble the other ball joint and adjust in the same manner as before.
11. Fit the rubber bellows and tighten the clips. Lubricate the contact surface between the rubber bellows and the tie rod with silicone grease. The ends of the clamp screws should be provided with rubber covers to protect the bellows from chafing.
12. Screw on the lock nuts and mount the tie rod end assemblies on the tie rods.

CHANGING THE STEERING GEAR RUBBER BELLOWS

It is suggested that the steering gear is removed from the car should either of the bellows required replacement.

> LUBRICATION
> Introduce approx. 50 cm^3 (0.5 dl) FLUID GREASE to each side when fitting new bellows. Part no. (45) 30 08 703.

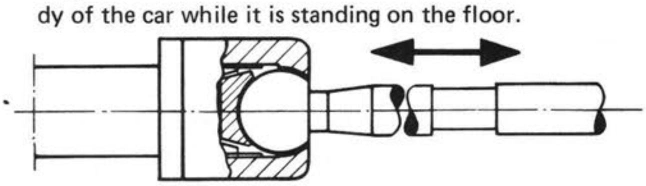
Fit the rubber covers to the ends of the clamp screws (protection against chafing).

CHECKING FOR WEAR, INNER BALL JOINT

From the point of view of road safety it is particularly important that the wear on the inner ball joint on older cars is checked.
The check covers both the PLAY in the ball joint and WEAR. **If the wear tolerances have been exceeded there is a risk that the tie rod will detatch from the rack.**

> LUBRICATION
> Checks for wear should be performed even if there is no play in the steering joints. The steering joints can previously have been "over-adjusted".

Play: Oscillate the wheel towards and away from the body of the car while it is standing on the floor.

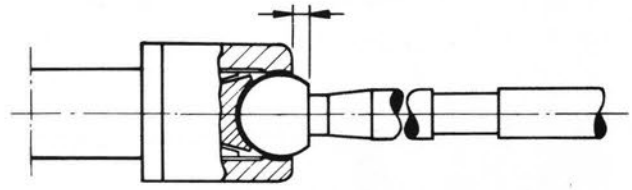


S 7504

Max. permissible play 1.0 mm
(Noise is audible at 0.1–0.2 mm play)

A vernier gauge on a magnetic attachment should be used for more exact measurement. Attach the gauge above the tie rod end with the point against the wheel housing. Raise the front suspension unit so that the tie rod is aligned with the rack.

Wear: Feel the exterior of the gaiter to detect whether the ball of the steering joint is not sitting in the cup. Take the angle of the tie rod into consideration.



S 7505

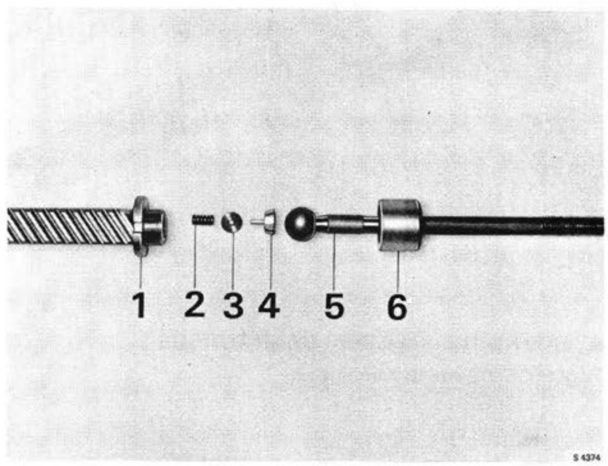
Wear limit, 3.0 mm. Replace the parts when adjusting the play if the ball is displaced more than 2.0 mm.

For a more exact measurement remove the bellows and use a slide gauge to measure the position of the ball.

ADJUSTMENT OF STEERING GEAR

The adjustments that may be required are as follows:
1. Adjustment of rack radial play.
2. Adjustment of tie-rod inner ball joints.

The steering gear assembly must be removed from the car for adjustment of the inner ball joints, but the radial play of the rack can conveniently be adjusted with the steering gear in place, unless it has had to be removed for some other reason.
The inner ball joints will seldom need adjustment, as there is very little wear on them, besides which they are selfadjusting to some extent.
See, assembling the steering gear.

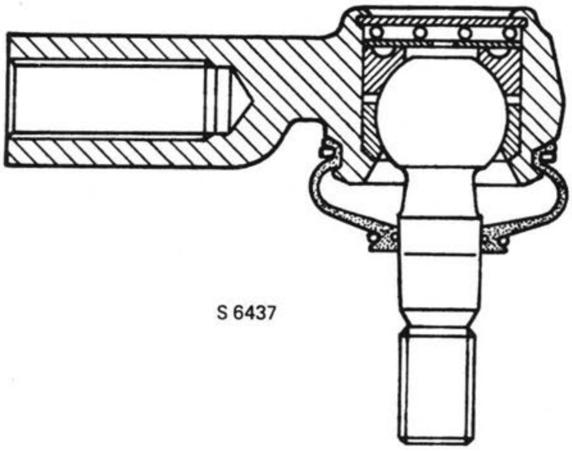


BALL JOINT, DISASSEMBLED
1. Rack
2. Spring
3. Washer
4. Bearing cap
5. Tie rod
6. Outer bearing cap

TIE ROD END ASSEMBLIES

GENERAL

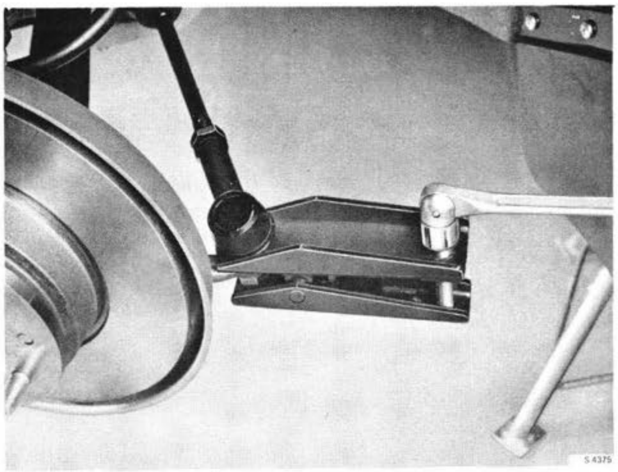
The outer ball joints, the tie rod end assemblies, are screwed on to the tie rods and secured by lock nuts. By backing off the lock nuts and twisting the tie rods clockwise or counterclockwise, it is possible to reduce or extend the length of the tie rod. This is how the toe-in of the front wheels is adjusted.
The tie rod is connected to the steering arm of the steering knuckle housing by a tapered ball bolt, which is secured by a self-locking nut. The tie-rod end assemblies cannot be disassembled; they adjust themselves to moderate wear and therefore seldom need exchanging.
However, damage caused by external force, as in a collision or crash, may make it necessary to renew both the tie rods and end assemblies. These components are vital to vehicle safety and must therefore be checked over with the utmost care if there is any reason to suspect that they are damaged or bent.



CHANGING TIE ROD END ASSEMBLIES

The tie rod end assemblies cannot be disassembled and must therefore be exchanged complete if they have worn loose.

1. Jack up the front of the car and take off the wheel.
2. Remove the nut.
3. Disconnect the ball bolt from the steering arm using puller 8995409 (see illustration). Do not knock the ball bolt out, as this is liable to damage the ball bolt and other parts.
4. Back off the nut that locks the end assembly to the tie rod.



DISCONNECTING THE STEERING ARM FROM THE TIE ROD
Tool 8995409

5. Unscrew the end assembly from the tie rod.
6. Screw a new end assembly on to the tie rod, but do not lock it by tightening the nut yet.
7. Connect the ball bolt to the steering arm. Mount the nut and tighten it to a torque of 35–50 Nm (25–36 ft.lb., 3.5–5.0 kpm).
8. Mount the wheel and lower the car.
9. Check and adjust the toe-in (see section 601).

IMPORTANT
Do not forget to tighten the lock nut on the tie rod after adjusting.

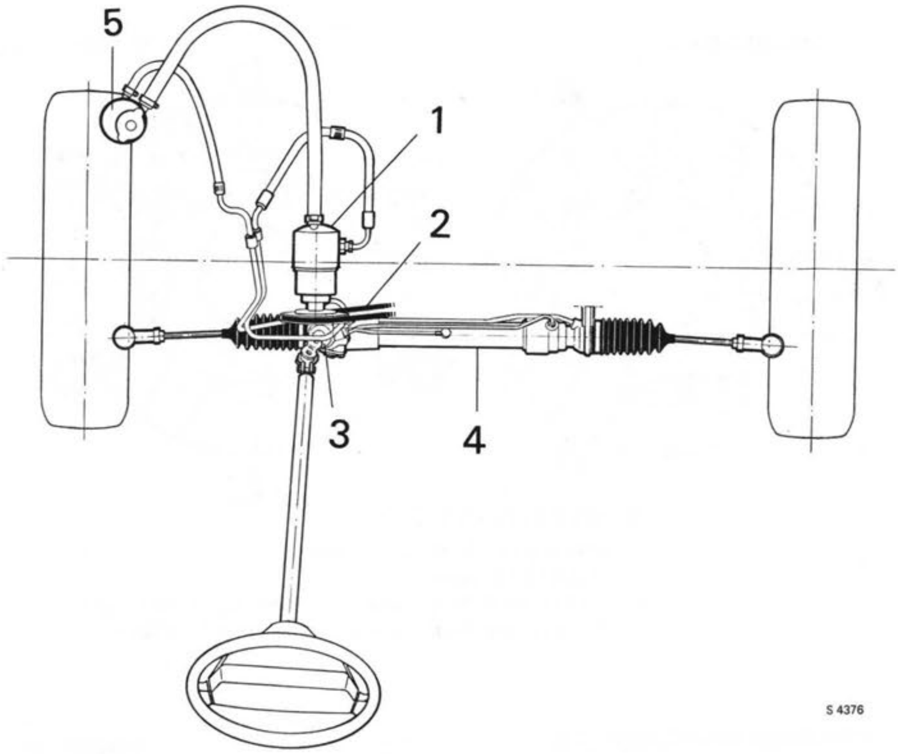
CHANGING RUBBER BELLOWS

Each ball joint is protected by a rubber bellows. If this is damaged and no longer makes a tight seal, it must be exchanged. The procedure is as follows:

1. Jack up the car and take off the wheel.
2. Remove the nut under the ball bolt of the tie-rod end assembly.
3. Free the ball bolt from the steering arm, using puller 8995409 (see illustration). Do not attempt to knock the bolt out, as this is liable to damage both the bolt and other parts.
4. Remove the damaged bellows from the ball bolt and fit a new bellows.

5. Connect the ball bolt to the steering arm and put on the nut, tightening it with a torque wrench to 35–50 Nm (25–36 ft.lb., 3.5–5.0 kpm).
6. Put on the wheel and lower the car.

POWER STEERING



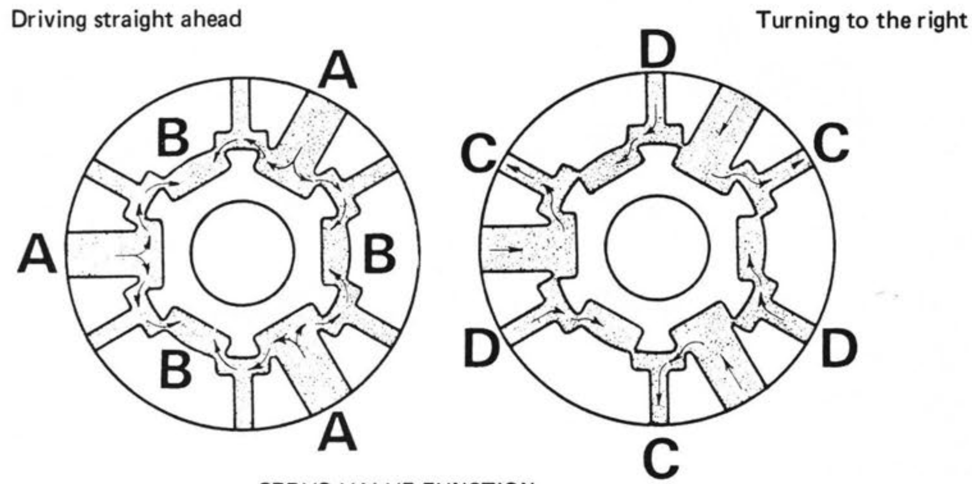
POWER STEERING GEAR

1. Servo pump
2. V-belt
3. Servo valve
4. Steering gear
5. Oil tank

COMPONENTS

1. Oil tank, located on the right hand side wheel housing in the engine compartment near the rear of the wheel housing. The capacity of the hydraulic system is 1.1 Imp. quarts (1.2 dm^3, liters).
2. Oil pump, located under the alternator, driven by a V-belt from the crankshaft.
   The pump has built-in flow control and an overflow regulator. This means that the flow increases as the pressure increases. Max. pressure: 56.0 bar (kp/cm^2). Max. flow: 7.04 Imp. quarts/min. (8.0 dm^3/min/;l/min.)
3. Delivery hose between pump and servo unit which is reinforced with textile fibre cord to resist the high pressures occurring in the hose.
4. Steering gear with power assistance unit, attached to the engine brackets with a yoke on the right and with bolts on the left.

The servo valve is located between the steering column and the pinion. The valve consists of a torsion rod connected to the steering column and a valve which reacts to the twist of the torsion bar. The valve controls the flow of oil to each side of the servo piston, which is connected to the rack.



SERVO VALVE FUNCTION

A Servo pressure from the oil pump
B Return to oil reservoir
C To the servo cylinder (power assistance for turning right)
D To the servo cylinder (power assistance for turning left)

The seals separate the hydraulic servo system of the steering gear from the mechanical gearing and the inner ball joints.
The gear section and the inner ball joints are oiled separately. A bleeder line joins the two sides of the steering gear and enables lubricating oil to bypass the hydraulic section. The steering gear contains 6.5 fl.oz. (0.19 dm^3, 1.9 dl) of oil.

WARNING

The oil pump can be damaged by the following causes:

1. If the steering wheel is kept against one of the end positions with a strong torque and the engine is running at the same time can the oil pump be overheated and damaged.
2. If dirt is entering the hydraulic system, for example when checking or filling oil.
3. If the pump is allowed to run without oil in the hydraulic system.

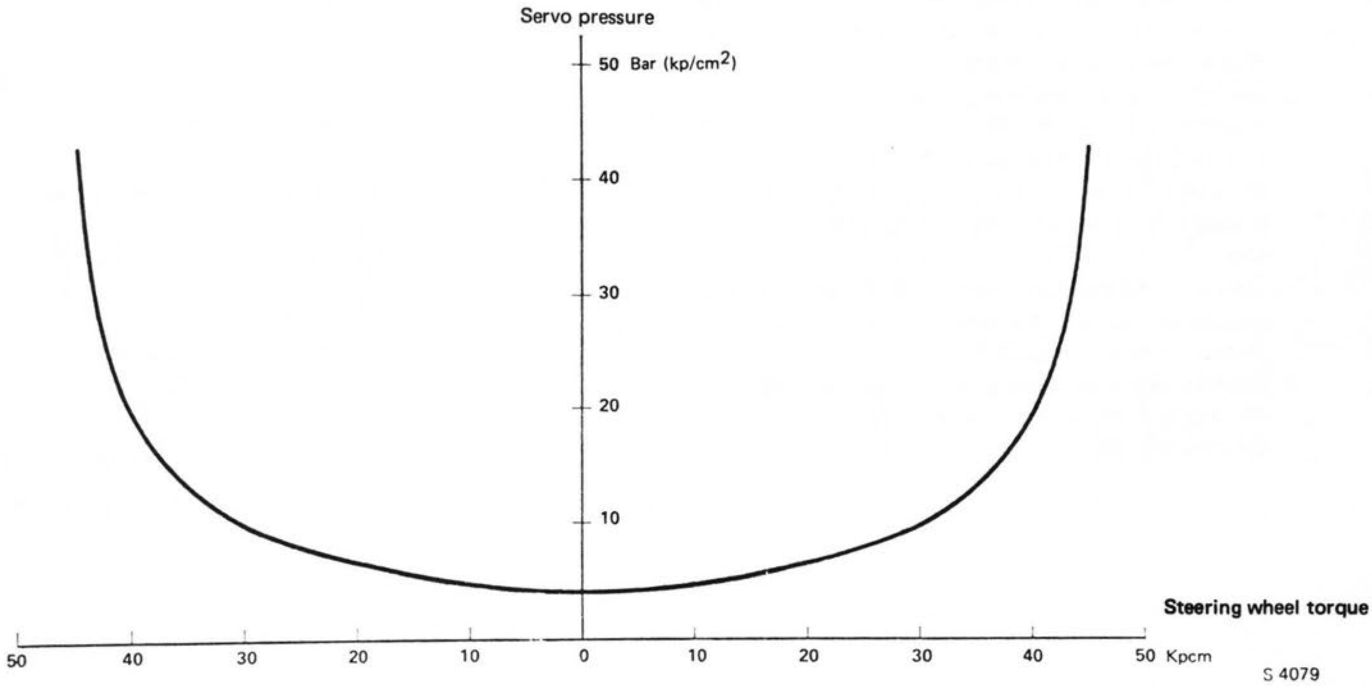


DIAGRAM STEERING WHEEL TORQUE – SERVO PRESSURE

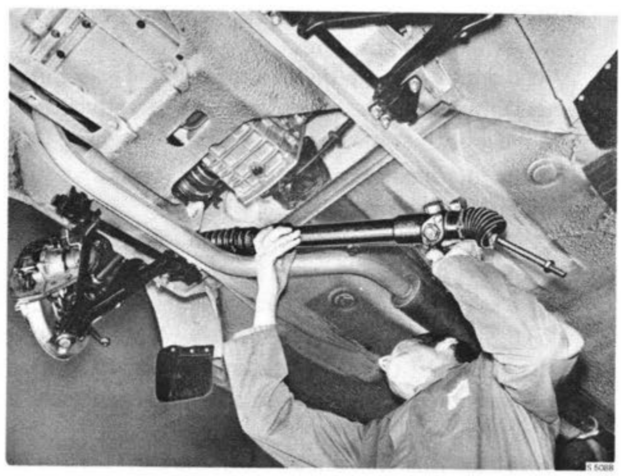
REMOVAL

Clean the area around the hydraulic connections before disconnecting them.

1. Siphon the oil out of the reservoir.
2. Loosen the servo pump and lift it away from its mounting so that the double joint and servo valve become accessible.
3. Block up the engine and remove the left-hand engine mounting.
4. Turn the steering wheel to full left lock and remove the clamp screw which holds the dubble joint on the intermediate shaft to the steering gear.
5. Remove the pipe clamps at the front suspension panel.
6. Jack up the car and remove the front wheels.
7. Undo the tie-rod ends at the steering arm by means of tool 8995409. Unscrew the left-hand tie-rod end.
8. Disconnect the speedometer cable from the gear box and disconnect the left-hand handbrake cable at the brake yoke and wheel housing. Remove the right-hand handbrake cable clamp on the steering gear.
9. Undo the steering gear mounting to the body. Left-hand side: Remove the two retaining bolts and remove the intermediate piece. Right-hand side: Remove the yoke and intermediate piece.
10. Disconnect the delivery and return lines from the servo valve.
11. Pull the steering gear downwards and slightly to the right so releasing the intermediate shaft.
11. Move the steering gear to the right until the left-hand tie rod can be bent down through the opening in the body (see the picture), at the same time, twisting the valve housing backwards.

BEND THE LEFT TIE ROD DOWN THROUGH THE OPENING IN THE BODY

12. Remove the steering gear by guiding it down and to the left.

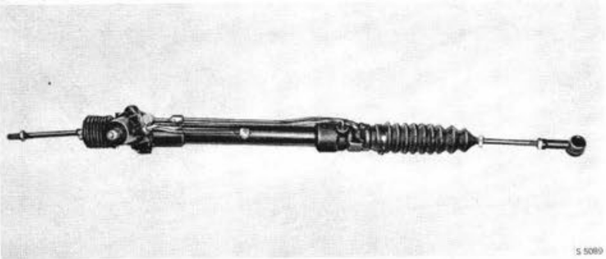


REMOVING THE STEERING GEAR FROM THE CAR

INSTALLATION

Clean the hydraulic fluid container and pipes before fitting a new or reconditioned steering gear.
It may also be necessary to remove the servo pump and flush it with hydraulic fluid.

During the installation of the power steering gear, the left tie-rod end assembly should be removed and the rack should be moved all the way over to the right.



STEERING GEAR READY FOR INSTALLATION

1. Move the steering gear up to the right through the bottom opening in the body with the valve housing pointing backwards. Turn the valve housing upwards through the body opening and lift the steering gear over to the right so that the left tie rod can be bent up.
2. Put the steering gear in place and make sure that the speedometer cable and the handbrake cables are in the right position.
3. Fit the intermediate shaft to the steering gear splines. Ensure that the clamp screw is correctly fitted in the groove at the end of the shaft.
4. Fit the intermediate pieces, yoke and bolts and tighten the steering gear.
5. Connect the speedometer cable and the left-hand handbrake cable and secure the right-hand handbrake cable to the steering gear by means of a plastic clip.
6. Attach the left tie-rod end assembly and attach the end assemblies to the steering arms with new lock nuts.
7. Mount the wheels and jack down the car.
8. Clamp the pipe to the front suspension panel.
9. Mount the steering bearing bracket to the body and install the rubber bellows at the dash panel opening.
10. Fit the trim panel below the instrument panel.
11. Fit the engine mounting.
12. Install the servo pump.
13. Adjust the toe-in and, if necessary, the steering wheel.
14. Fill the servo unit with oil (see group 1).

DISASSEMBLY

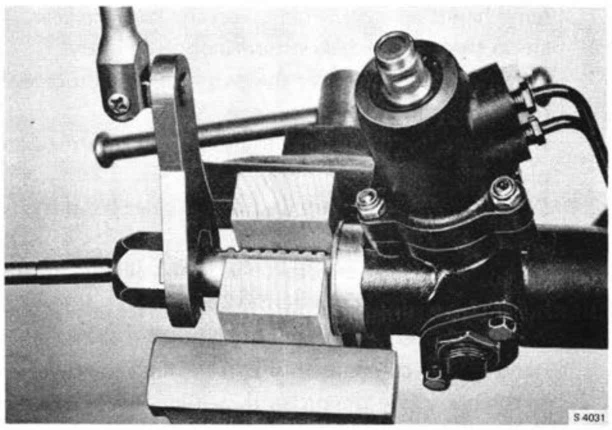
Before disassembly, wash the steering gear thoroughly on the outside. When working on the servo-assisted steering gear, cleanliness is of the utmost importance. Be especially careful of the servo valve and the sealing surfaces on the rack.

1. Back off the lock nut and remove the tie-rod end assemblies.
2. Loosen the clamps and take off the rubber bellows.
3. Bend up the lock plate between the end piece and the rack.

IMPORTANT

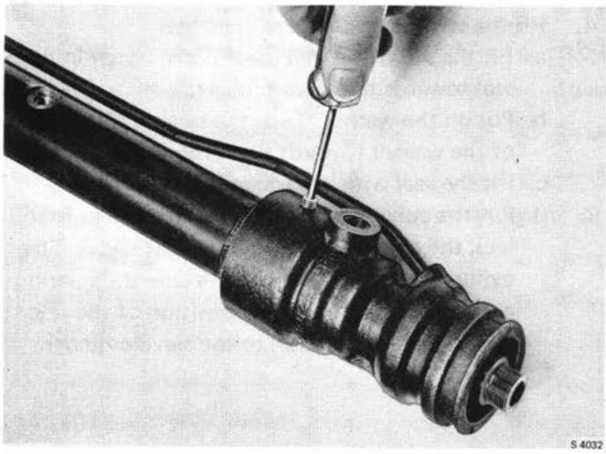
When the end piece is loosened and tightened, the torque in the rack must not be taken up by the pinion.
The rack must not be clamped in the servo end. Clamp the rack in the toothed end with suitable soft jaws (wooden blocks).

4. Clamp the toothed end of the rack in a vice between two wooden blocks and unscrew the end pieces. Set the spring and washer aside.



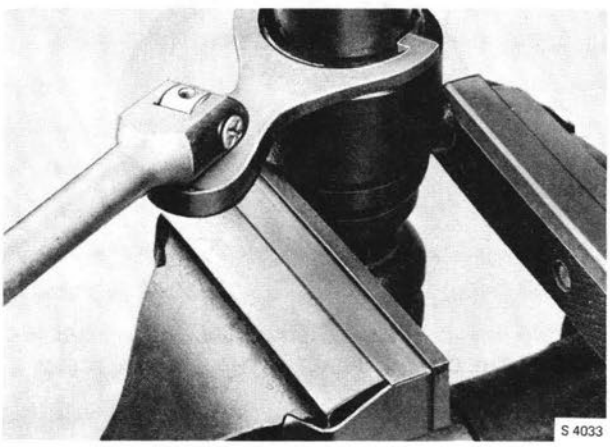
THE END PIECES ARE REMOVED FROM THE RACK
Tool 8995995

5. Undo the lock nut for the radial adjustment of the rack and undo the adjusting screw. Remove the adjusting screw retaining plate, the spring, the O-ring and the plunger.
6. Remove the tubes between the servo valve and the two sides of the servo cylinder.
7. Undo the three lock nuts and detach the valve housing and servo valve with pinion. Keep the servo valve in a clean plastic bag.
8. Remove the locking screw for the ring nut with a hexagon wrench.



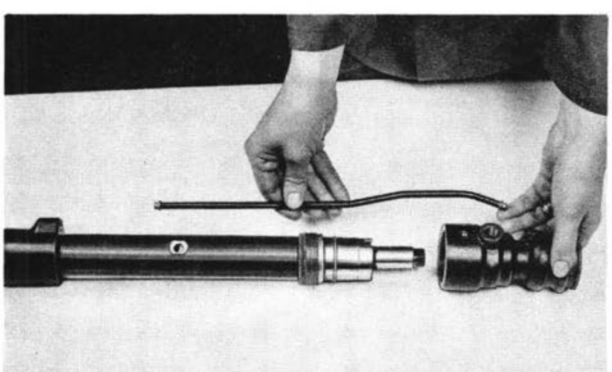
REMOVING THE RING NUT LOCKING SCREW

9. Clamp the steering gear end in a vice and remove the ring nut with C spanner 8995961.



REMOVING THE RING NUT
Tool 8995961

10. Remove the steering gear end from the cylinder and the rack while removing the bleeder tube. Set aside the loose cone in the hole for the oil tube. Remove the sealing ring, washer and servo seal from the steering gear end.



REMOVING THE STEERING GEAR END FROM THE CYLINDER

11. Pull the rack out of the steering gear housing. Remove the knurled sleeve, the servo seal and the washer from the cylinder. Remove the plunger seal and snap ring.

NOTE
The plunger cannot be detached from the rack.

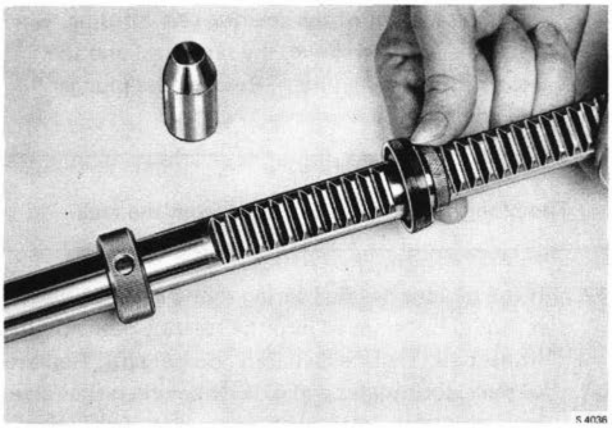
12. If the pinions needle bearing shows signs of wear, it should be removed into the steering gear housing. Inspect and replace damaged components. Replace all seals, lock plates and gaskets between the valve housing and the steering gear housing. The rubber bellows should also be replaced.

ASSEMBLY

LUBRICATION IN CONNECTION WITH ASSEMBLY
Oil the hydraulic components of the steering gear with hydraulic oil.
Oil the rack, pinion and other bearings with lubricating oil (according to API Service GL4 SAE 75 or SAE 80–90). Topping up, see pos. 12.
Lubricate the inner ball joints if disassebled with molybdenum paste (part No. (45) 3006 632

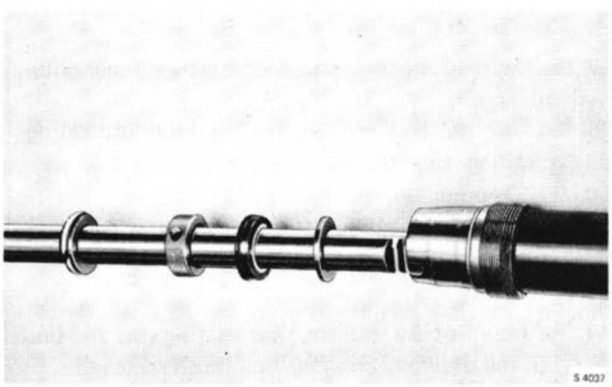
1. Apply Loctite to the needle bearing seat and push in the needle bearing, if it has been removed.
2. a. Fit the snap ring and new teflon ring on the rack plunger.
   b. Slide the knurled sleeve onto the rack.
   c. Fit the servo seal on the fitting sleeve using the cone. (Special tools 8995938 and 8995946). Slide the sleeve with seal past the teeth on the rack. Remove the tool. Turn the notch in the seal towards the servo plunger.

SLIDE THE SERVO SEAL ONTO THE FITTING SLEEVE USING THE FITTING CONE (SPECIAL TOOLS 8995938 AND 8995946)



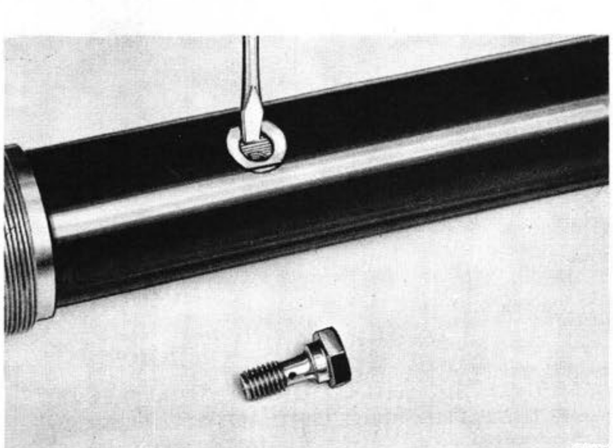
SLIDE THE FITTING SLEEVE 8995946 WITH SEAL PAST THE TEETH ON THE RACK

d. Slide the washer onto the rack.



PUSH THE RACK WITH WASHER, SERVO SEAL, SLEEVE AND PLUNGER SEALS INTO THE SERVO CYLINDER

3. Push the rack into the servo cylinder until the knurled sleeve can be seen in the hole for the tube connection. Use a screwdriver to turn the sleeve to expose its threaded hole. Screw in the connecting screw temporarily to hold the washer in place. (Do not tighten the screw all the way or the rack may be damaged.)

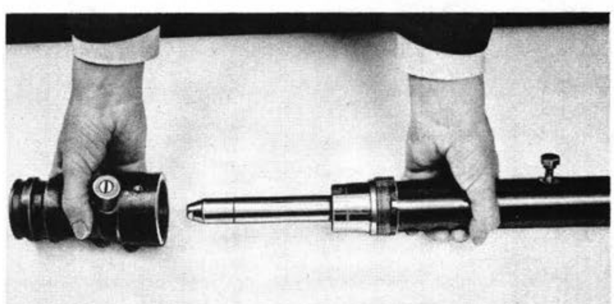


TURN UP THE HOLE IN THE KNURLED SLEEVE

4. Fit the steering gear end as follows:
   a. Fit the servo seal in its seat. Turn notch in the seal towards the servo plunger.
   b. Put on the washer. Turn the smaller diameter of the washer towards the servo seal.
   c. Fit the seal with the square profile.
   d. Put the cone into the tube connection hole and lock the cone using special tool 8995953. The cylindrical part of the cone (inside the steering gear end) serves to fix the position of the steering gear end in relation to the servo cylinder.

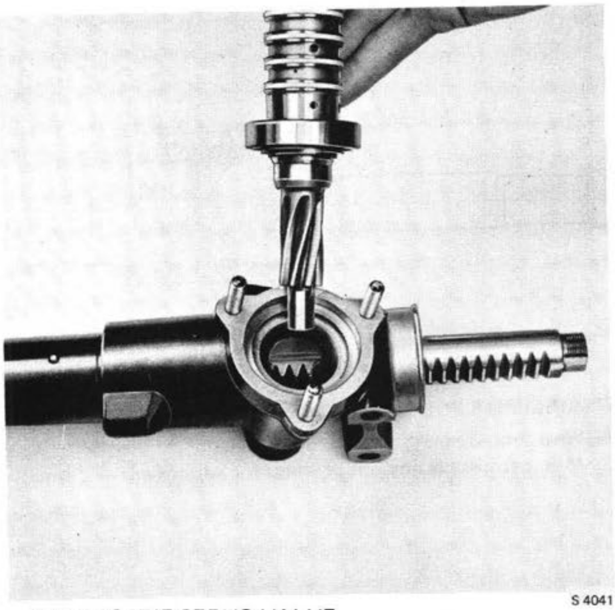
LOCKING THE CONE IN PLACE WITH A SPECIAL SCREW Tool 8995953

   e. Screw fitting cone 8995987 onto the rack end and fit the steering gear end onto the rack and servo cylinder while inserting the vent tube. The cylindrical portion of the cone fits into the U-shaped recess in the end of the servo cylinder. Tighten the ring nut with a torque wrench connected to special tool 8995961 with a torque of 120–125 ft.lb. (16.5–17.5 kpm, 165–175 Nm), corresponding to a torque of 130–135 ft.lb. (18–19 kpm, 180–190 Nm) at the nut. Lock the nut with the socket head screw.



FITTING THE STEERING GEAR END. THE RACK END IS FITTED WITH FITTING CONE 8995987

5. Fit the washer and the seal between the pinion and the servo valve in the steering gear housing.
6. Fit the servo valve in the gear housing.

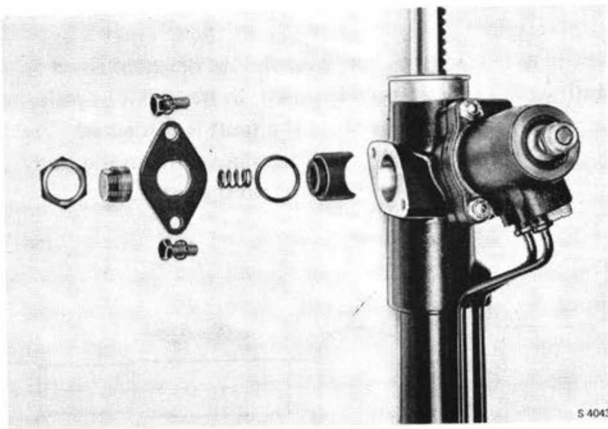


FITTING THE SERVO VALVE

7. Fit the gasket (earlier design) or the O-ring (later design) between the valve housing and the steering gear housing. Fit the sealing ring, dust protection and lock ring in the valve housing. Apply silicone grease between the seal and the dust protection. Place the fitting tool 8995979 over the shaft end of the valve. Fit the valve housing. Tighten the lock nuts with a torque of 16.6 ft.lb. (2.3 kpm, 23 Nm).

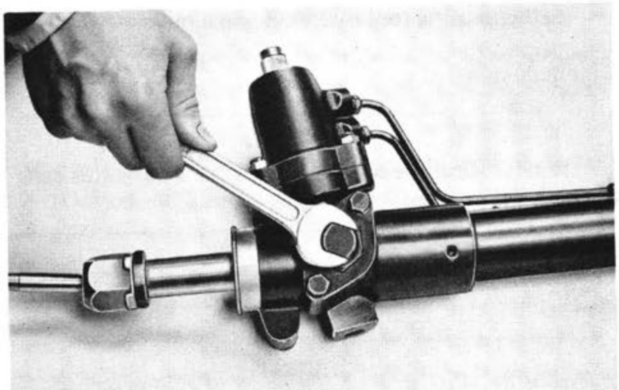
FITTING THE VALVE HOUSING. THE VALVE SHAFT IS FITTED WITH FITTING CONE 8995979

8. Remove tool 8995953 from the connection hole in the steering gear end. Fit the tubes between the servo valve and the two sides of the cylinder. Fit new gasket on the banjo connection of the shorter tube to the cylinder.



RADIAL ADJUSTMENT OF THE RACK

9. Fit plunger, O-ring, spring, cover, adjusting screw and lock nut for the radial adjustment of the rack.
10. Clamp the toothed end of the rack in a vice between two wooden blocks and fit the complete end pieces with thrust washer, spring and lock washer. Tighten the end piece with a torque wrench connected to tool 8995995 to 42.6–59.1 ft.lb. (5.9–6.8 kpm, 59–68 Nm), corresponding to a torque of 47.0–54.2 ft.lb. (6.5–7.5 kpm, 65–75 Nm) at the end piece. Check the play in the inner ball joint and adjust if necessary. See "adjustment of inner ball joint".
    Lock the shim.
11. Adjust the radial play of the rack as follows:
    a. Screw in the adjusting screw all the way until the resistance of the twisting steering gear is felt.
    b. Back off the adjusting screw 1/12 turn.
    c. Check that the steering gear can be turned from lock to lock in both directions without jamming.
    d. Tighten the lock nut with a torque of 50–60 ft.lb. (7.0–8.3 kpm, 70–83 Nm).



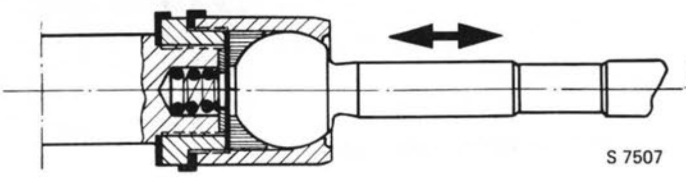
ADJUSTING THE RADIAL PLAY OF THE RACK

12. Fit the rubber bellows. Fit all clamps except one at one of the tie rods. Hold the steering gear vertical and using an oil can, inject 6.5 fl.oz. (0.19 dm^3, 1.9 dl (as per API service GL4, SAE75 or SAE80–90) between the bellows and tie rod. Fit the clamp.
13. Fit lock nuts and tie-rod end assemblies.

CHECKING THE INNER BALL JOINT (IN SITU)

The play in the inner ball joint should be checked when setting the front wheel alignment, in the event of noise from the front suspension or if a fault is suspected.

- Oscillate the wheel towards and away from the body of the car while it is standing on the floor.



Max. permissible play 1.0 mm
(Noise is audible at 0.1–0.2 mm play).

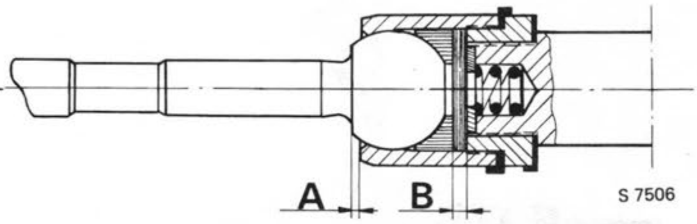
- A vernier gauge on a magnetic attachment should be used for more exact measurements. Attach the gauge above the tie-rod end with the point against the wheel housing. Raise the front suspension unit so that the tie-rod is aligned with the rack.

INNER BALL JOINT ADJUSTMENT (STEERING GEAR REMOVED AND DISMANTLED)

1. Bend back the tab washer at the end piece.
2. Clamp the end piece in a vice and remove the outer ball cup using tool 8995995 and a puller.

> CAUTION
> Do not clamp the outer ball cup in a vice as this can deform it.

3. Clean and check the parts.



WEAR LIMITS FOR REPLACEMENT OF TIE-ROD

A. Wear limit 3 mm
B. Max. permissible amount of shims for adjustment – 2 mm.

> NOTE
> It may be necessary to replace the tie-rod assembly if grooves are worn in the surfaces of the ball and/ or cups. After adjustment the tie-rod should move freely in all angles.

4. Assemble and adjust the end piece:
   a. Apply molybdenum paste (part no. (45) 30 06 632) to the ball and cups.
   b. Assemble the end piece using new shims and a new tab washer. Insert the shims so that there is no play in the steering joints and that they do not seize in any angle once the nut and outer ball cup have been tightened to the prescribed torque.

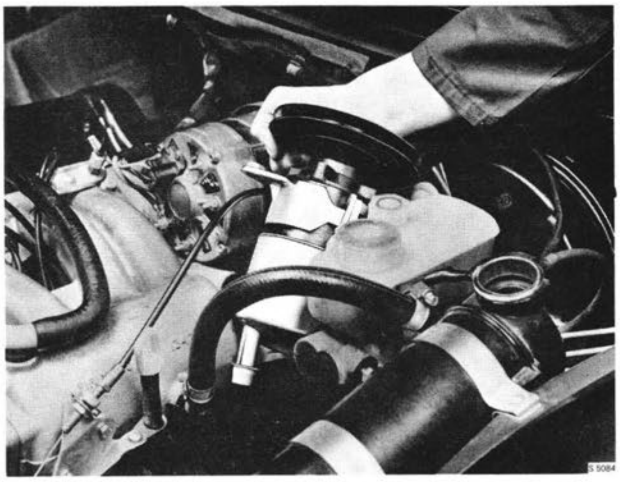
Torque	69–88 ft. lb. (95–122 Nm (9.5–12.2 kpm))

Check: Tighten the tie-rod end. Hold the end piece at right angles. It should be possible to place the tie-rod in all positions and drop it to facilitate applying pressure to the tie-rod end. Over-tightening can rupture the tie-rod.

SERVO PUMP

Removal

1. Suck the oil out of the oil tank.
2. Drain the coolant through the drain cock on the engine block and disconnect the hose from between the expansion tank and the water pump.
3. Disconnect the suction hose and delivery line from the pump. Grip the hexagonal nipple on the pump when removing the delivery line.
4. Unbolt the pump unit from the bracket and engine mounting. Lift off the V-belt and remove the pump complete with mounting.



REMOVING THE SERVO PUMP

5. Dismantle the pulley and pump mounting from the pump.

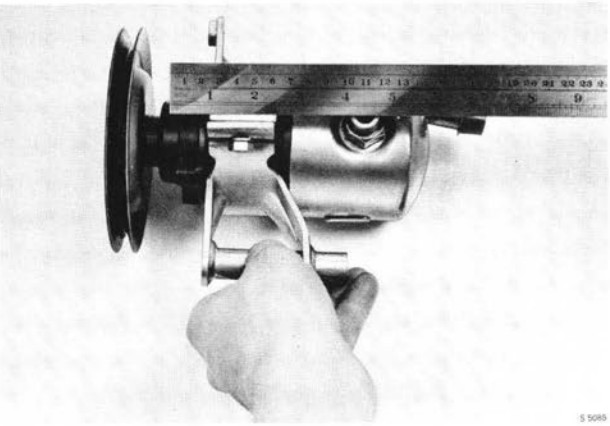
> CAUTION
> Never knock the pulley off the shaft as this may damage the pump. If necessary, use a press or extractor.

Assembly

1. Mount the pump mounting to the pump without completely tightening the screw.
2. Mount the pulley and key and tighten the pulley bolt.

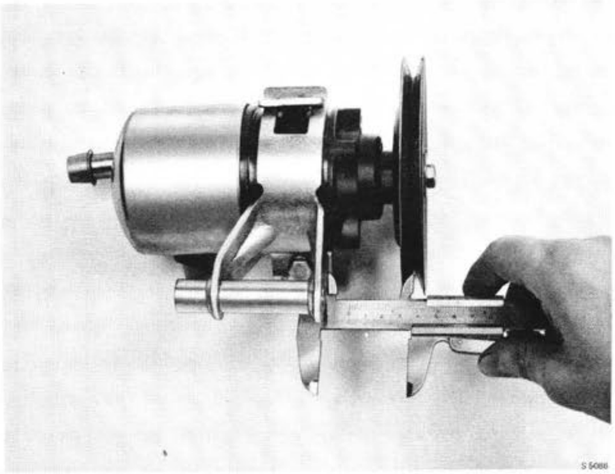
> CAUTION
> Never knock the pulley onto the shaft as this may damage the pump. Slide the pulley onto the shaft by tightening the bolt.

3. Adjust the position of the pump mounting on the pump as follows:
   a. Twist the pump mounting so that the clamp tightening screw is aligned with the delivery line connection.



MOUNTING POSITION FOR PUMP IN LINE WITH DELIVERY LINE CONNECTION

   b. Slide the pump mounting so that the distance berween the lower lug on the mounting and the centre of the pulley is 1.93 ± 0.02 in. (49 ± 0.5 mm).



DISTANCE BETWEEN PUMP MOUNTING AND PULLEY CENTRE

   c. Tighten the pump mounting.
4. Mount the pump unit to the engine mounting and the bracket. Fit the V-belt and adjust the tension. Check that the V-belt is clear of the alternator belt and engine.
5. Connect the delivery line and suction hose to the pump.
6. Connect the coolant hose and refill with coolant.
7. Fill the tank with oil. Start the engine and then top up to a level about 0.4 in. (1 cm) above the bottom of the filter.
   Bleed the system by turning the steering wheel from lock to lock two or three times.

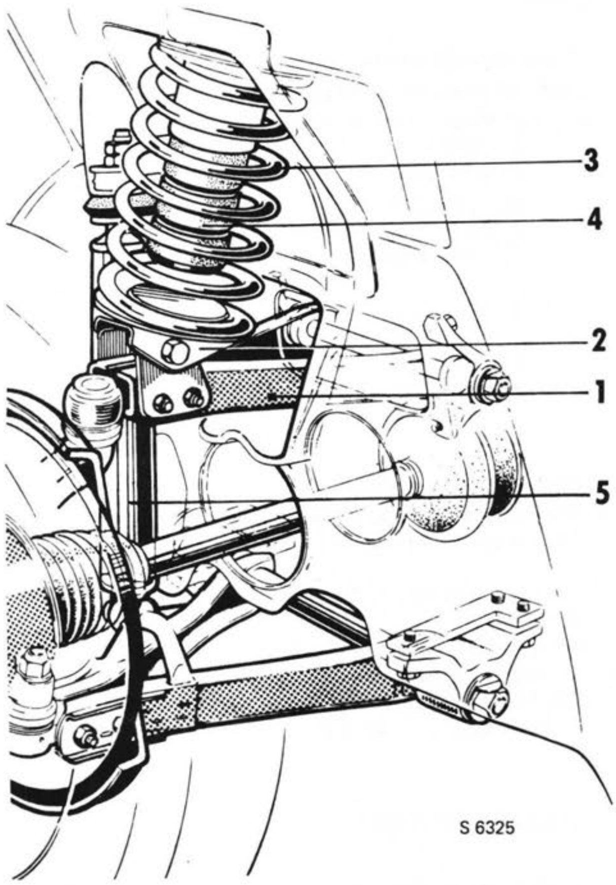
> CAUTION
> Never keep the steering wheel at full lock by force at the same time as the engine is running as this can give rise to overheating of the servo pump and subsequent damage.

CONTENTS

GENERAL

FRONT SUSPENSION

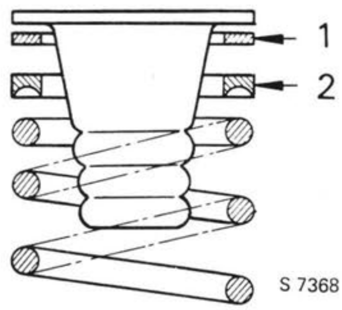
The front suspension has coil springs, transverse rubber-seated control arms and double-acting hydraulic shock absorbers.
The coil springs operate between the upper control arm and the wheel housing. The top seat consists of a steel cone held in place in the wheel housing by the pressure of the spring itself and located in a pressed boss in the wheel housing. A rubber ring is placed between the steel cone and the spring. This rubber ring is supplied in different sizes which are fitted according to the equipment and weight of the vehicle. The lower spring seat is attached by a rubber bearing to the control arm.
The downward stroke is limited by two rubber bearings at both ends, to the bodywork at the top and to the lower control arms at the bottom.



FRONT SUSPENSION
1. Upper control arm
2. Lower spring support
3. Coil spring
4. Rubber buffer
5. Rubber buffers

SPRING SUPPORTS AND DISTANCE PIECES, FRONT SUSPENSION

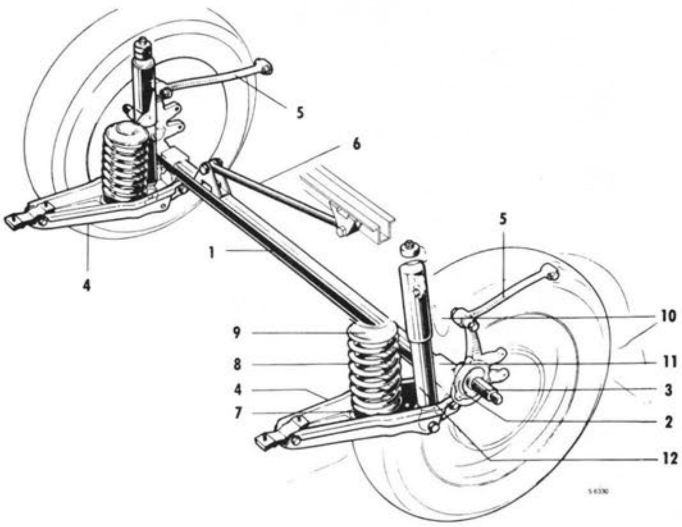
A distance piece and two upper spring supports of different thicknesses of rubber are provided to adapt the front suspension to the weight differences between the different models.



1. Distance piece 8933889
2. Thin spring support (rubber) 8919862
   Thick spring support (rubber) 8921108

REAR SUSPENSION

The rear suspension comprises a rigid rear axle with coil springs and double-acting telescopic shock absorbers. The rear axle is a straight tube carrying end pieces into which the stub axles are force-fitted. The wheel hubs are journaled to the stub axles on conical roller bearings. The disc brake shields are bolted to the outside of the end pieces. The rear axle is movable with respect to the body, being attached to the latter by two spring links with their front ends journaled to the body and their rear ends connected by two rubber bushings to the rear axle tube. There are also two links connected between the end pieces of the rear axle and the body behind the rear axle. These links take up torsional stresses in the axle. Lateral forces are taken up by a cross bar with one end journaled in a rubber bearing in a bracket fixed to the underbody. The other end of the bar is attached to a bracket on the axle.



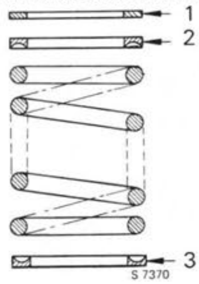
REAR SUSPENSION

1. Rear axle
2. End piece
3. Stub axle
4. Spring links
5. Rear links
6. Cross bar
7. Spring seat
8. Coil spring
9. Spring insulator
10. Rubber buffer
11. Stop
12. Shock absorber

The spring links carry seats for the lower ends of the coil springs, the upper seats being attached by spring insulators to the body. Upward movement of the rear wheels is limited by rubber buffers screwed into the body which at extreme spring compression strike a stop on the rear axle, while downward movement is limited by the shock absorbers.
The rear shock absorbers are journaled in rubber bearings at both ends, the upper ends being attached to the body and the lower to the back axle spring links.

SPRINGS, SPRING SUPPORTS AND DISTANCE PIECES

A distance piece and two different spring supports of rubber are provided to adapt the rear suspension to the weight differences between the different models.



1. Distance piece 89 33 897
2. Thin upper spring support 89 35 330
   Thick upper spring support 89 22 304

3. Up to and including 1978 model lower spring support 89 35 926
3. As from 1978 model lower spring support 89 35 926
3. As from 1978 lower spring support 89 35 33 (thin)

NOTE. The thick spring support must not be installed in the lower position as from 1979 model.

AUXILIARY SPRINGS

Auxiliary springs are fitted on Saab 99 vans (available on certain markets). The auxiliary spring consists of an air-filled rubber bladder mounted in the rear coil spring. The pressure in the auxiliary spring should be checked in conjunction with checking of tire pressures.

WHEELS

The basic version of the Saab 99 is equiped with wide-base steel wheels. Conical wheel nuts are used. Aluminium wheels are provided on some EMS, TURBO and GLE models. As opposed to the steel wheels, cylindrical wheel nuts are used. There are several different designs of centring the wheels as from 1978 model. (See section WHEEL CENTRING).

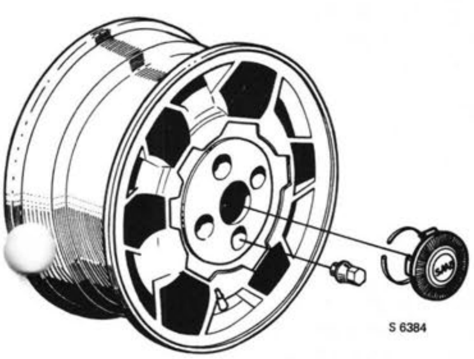
Steel wheel:

S 3495

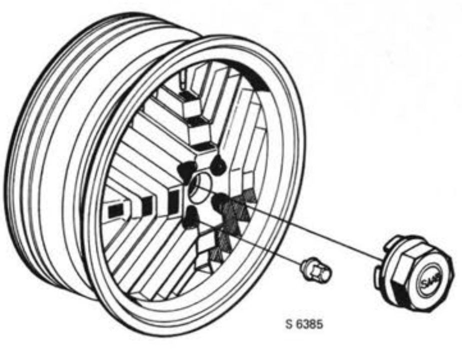
1975 MODEL 4 1/2" J x 15" FH
1976–1978 MODEL 5" J x 15" FH

1979 MODEL 5" J x 15" FH

Aluminium wheel:



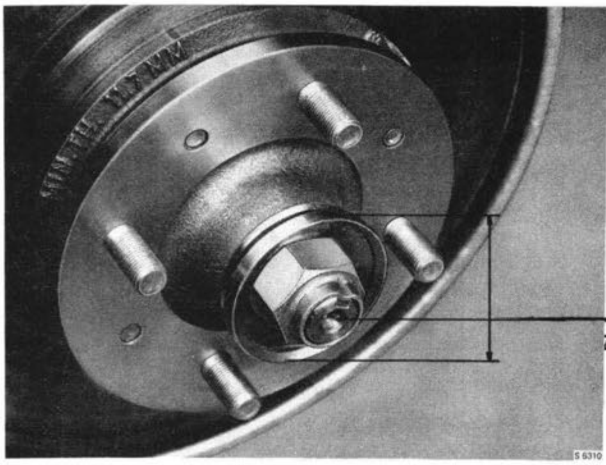
5" J x 15" FH



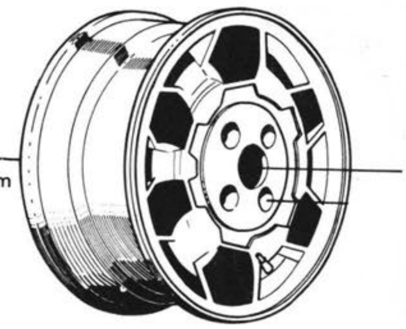
5 1/2" J x 15" H2

WHEEL CENTRING

Wheel centring on the hub was introduced in 1978 model to improve the positioning of aluminium wheels.
WHEEL CENTRING IS USED ON THE FOLLOWING THREE WHEEL DIAMETERS

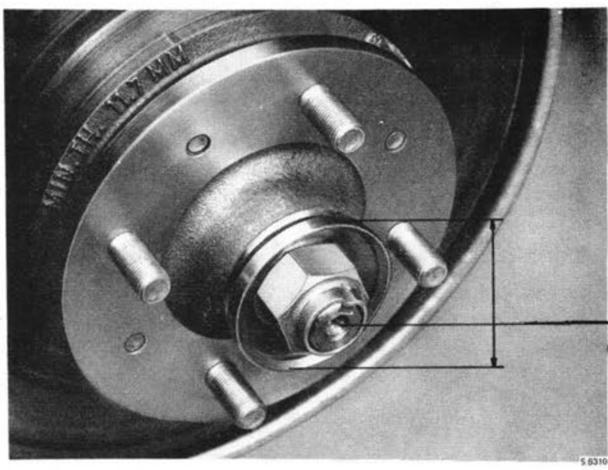


Ø 59,9 mm

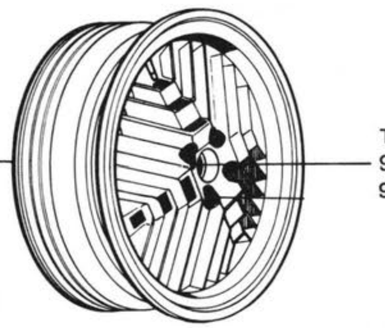


EMS and GLE between chassis nos.
99781012809––22772
99782004948–8921
99786006869–10290

I
8° MV conical ring Ø 59.9 mm

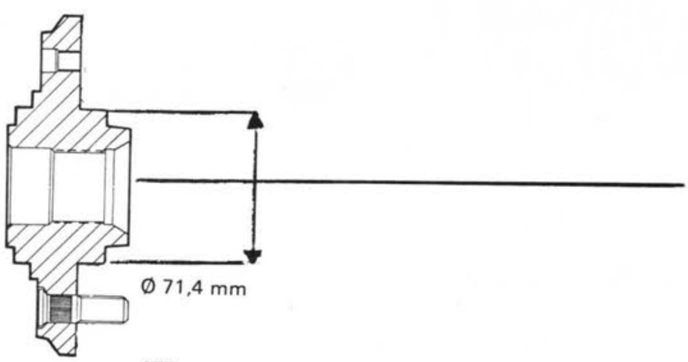


Ø 65,0

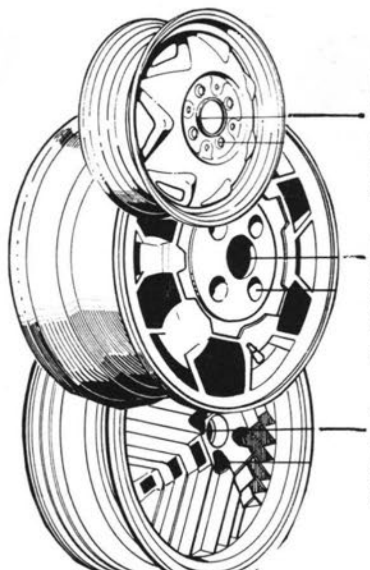


TURBO between chassis nos:
99781000000––22420
99786600000- –10290

II
8° MV conical ring Ø 65.0 mm



III
Hub with 8° MV Ø 71.4 mm



GL as from chassis nos:
99781023444–
99782009103–
99783000901–
99786010291–

EMS, GLE as from chassis nos:
99781022773–
99782008922–
99786010291–

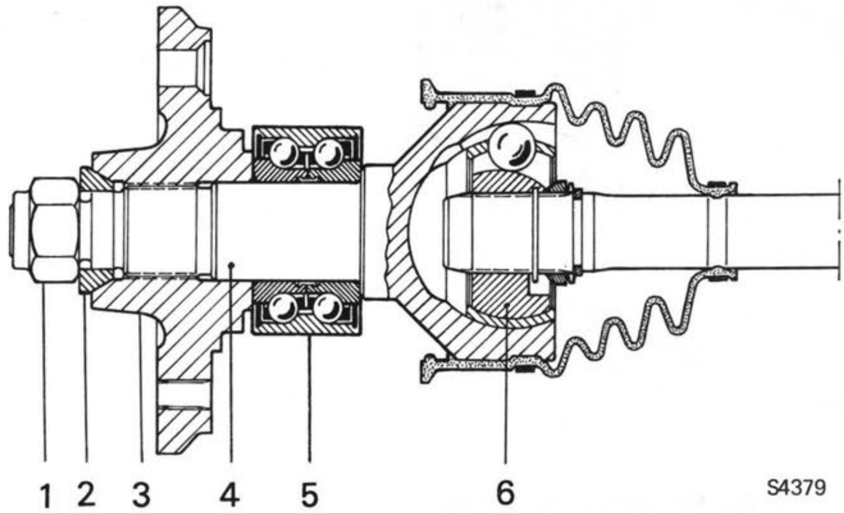
TURBO, as from chassis nos:
99781022421–
99786010291–

> NOTE. Replacing steel wheels with aluminium can result in:
> - damage to the centre of the wheel and the centring arrangement
> - wheels incorrectly centred.
>
> IF IN DOUBT CHECK THE CENTRING DIAMETERS OF THE WHEELS IN QUESTION.

Steel wheels can be fitted irrespective of their centring diameters. However the following should be noted: THE HUB DIAMETER OF EARLIER DESIGN STEEL WHEELS (up to and including 1978 model) SHOULD BE INCREASED IF THEY ARE TO BE FITTED TO THE LATEST HUBS (Ø 71.4 mm). Otherwise the insufficient clearance may cause the wheels to corrode onto the hubs.

HUBS

The front wheel hub is mounted on a double-row, angular contact bearing in the steering knuckle housing.
The rear wheel hubs are of conventional design with the two outer rings of the roller bearings forcefitted to the hub.
The front hub bearings are provided with moulded seals while the rear hub bearings have a removable sealing ring.
Each hub, front and rear, carries four force-fitted bolts for attachment of the wheel.

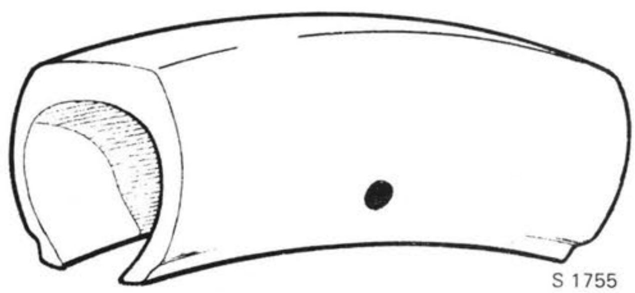


FRONT WHEEL HUB

1. Lock nut
2. Washer
3. Hub
4. Outer drive shaft
5. Bearings with seals
6. Outer drive shaft joint

TIRES

The tires are tubeless, size 165 x SR 15 in on most cars, but some cars are fitted with tires size 155 x SR 15 and 175/70 HR 15.



BALANCE MARK ON TIRE

The tire designation gives the following information:

175 70 H R 15

Tread width (mm) — 175

Height/width of tread (only given if different from standard) — 70

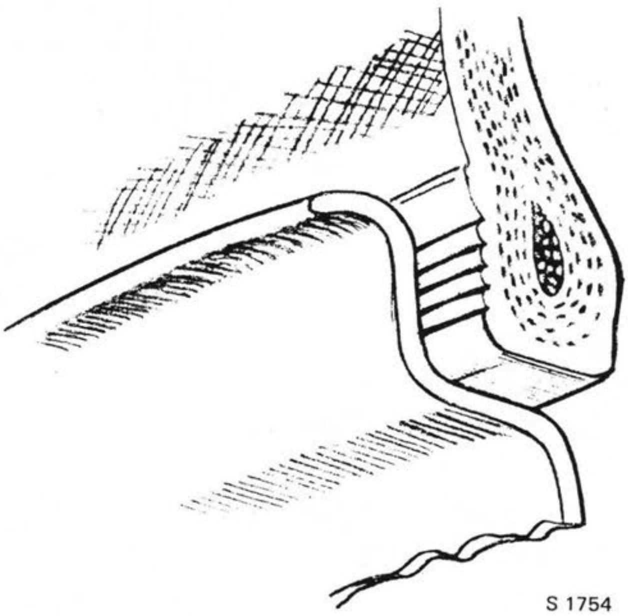
Speed designation — H

Type (radial) — R

Wheel diameter — 15

The tires are provided with a balancing mark on one side in the form of a round colored spot (see illustration); this indicates the lightest side of the tire and should be placed above the valve when the tire is mounted on the wheel.

The illustration below shows how the outside of the fluted tire bead seales against the inside of the wheel rim, the bead seating.



TIRE BEAD AND RIM

The tires incorporate a profile depth indicator; when the tread pattern is worn down to 1/16" (1.6 mm), unpatterned cross bars appear. This is a signal that it is time to fit a new tire.
NOTE! Avoid fitting tires of different type or make on the same axle, the same is also valid for tires which are sightly different worn.

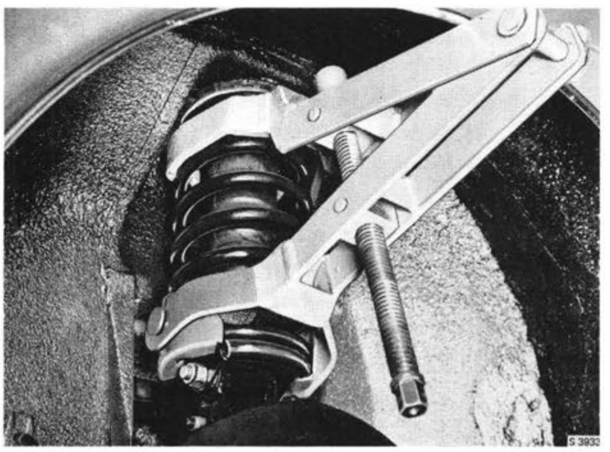
COIL SPRING SUSPENSION, FRONT

CHANGING COIL SPRINGS AND RUBBER STOPS

As already stated, all wheels have coil spring suspension. Under no circumstances must the front and rear springs be interchanged, as the rear springs are shorter and much softer than the front ones. Concerning differences between the springs see group 0. The springs are delivered with a rustproof coating. If this coating has been rubbed off, it should be touched up before the spring is installed.

Removal

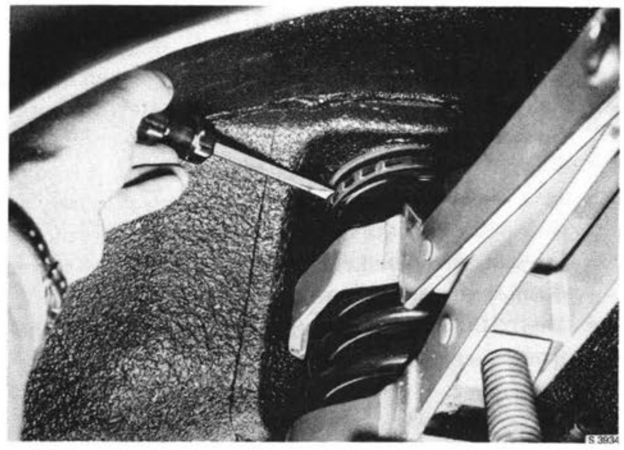
1. Raise and block up the front of the car and take off the wheel.
2. Apply spring compression tool 8995839, engaging the upper shanks direct in the spring at the second free turn from the top and the lower shanks round the spring cups. These are located on the last turn of the spring with the color-coded cup right beside the end of the coil.



REMOVING THE FRONT COIL SPRING
Tool 8995839

3. Compress the spring to give 30–40 mm (roughly 1 1/2") clearance at the top end. If the upper spring attachment or the steel cone is left behind in the wheel housing, glued there by the underbody coating, chip it out of the housing with a chisel or similar tool.

> NOTE
> Do not overload the tool. This can happen if the two cheeks of the tool are tightened hard against each other with the aid of a nut runner.

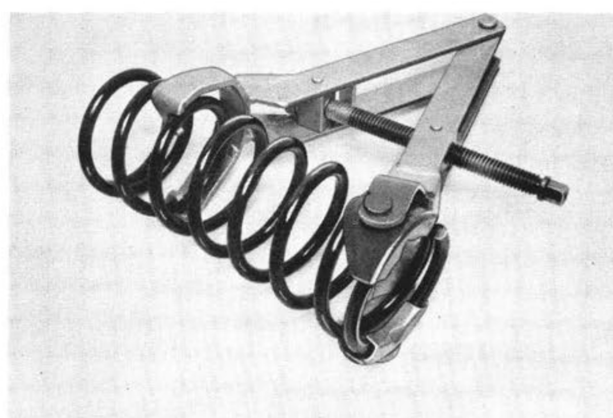


REMOVING THE UPPER SPRING ATTACHMENT

4. Remove the spring and steel cone.
5. Check, and if necessary, change rubber ring or steel cone with rubber buffer.
6. Check the two rubber buffers forming the bottom limit-of-stroke stop and change them if defective. Check and if necessary renew the bottom spring seat and bearing.

Installation

1. If the spring has been taken out of the compression tool or when fitting a new spring, apply the compression tool with the spring cups in the correct position, i.e. locate the color-coded cup right beside the end of the coil, and hook the upper shanks of the tool over the second turn from the top.



TOOL 8995839 APPLIED ON THE COIL SPRING

2. Compress the spring. Place the steel cone and rubber ring in the top of the coil.
3. Locate the spring on its bottom seat. Slacken off gradually on the compression, guiding the steel cone into its seat in the wheel housing. Remove the compression tool. If the bottom seat has been removed, it is advisable when reassembling to mount the seat loosely and wait until after the spring is in place before securing the seat, which will automatically take up the correct position due to pressure from the spring.
4. Mount the wheel. Remove the blocks and lower the front wheels to the ground.

COIL SPRING SUSPENSION, REAR

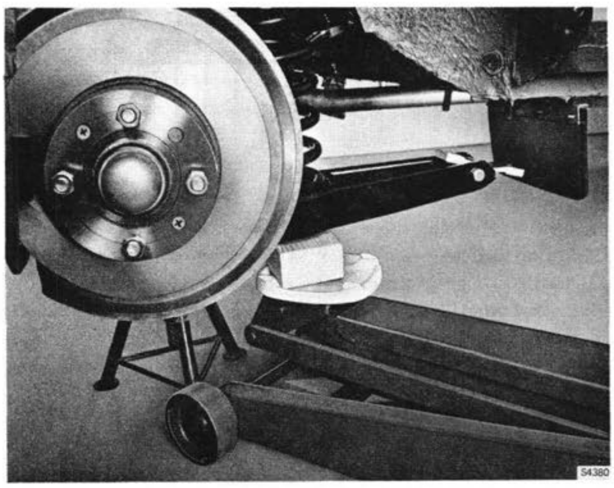
CHANGING COIL SPRINGS

Removal

1. Apply the handbrake. Remove the rear hub cap and slacken the wheel nuts. Jack up the car and place trestles under the rear end.

CAUTION
The jack must not be placed under the rear axle, as this is liable to deform the axle.

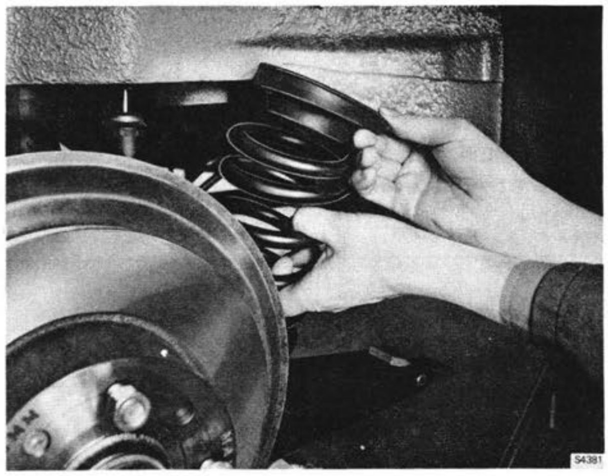
2. Take off the wheel. Apply a jack under the spring link and disconnect the lower end of the shock absorber Remove from underneath the two lock nuts that secure the front spring link bearing to the body.



LOCATION OF JACK UNDER SPRING LINK

3. Place a trestle of suitable height under the rear axle to prevent the brake pipes between the body and the rear axle being stretched and damaged.
4. Lower the spring link so that the spring can be removed together with the upper spring support held in place by the spring tension.

   As from chassis Nos. 99771029045 and 99772005399, a rubber cushion is also fitted at the lower spring seat. A distance piece is provided above the upper spring support on some versions.



REMOVING THE REAR WHEEL COIL SPRING

Installation

Proceed in the reverse order. Fit new lock nuts at the front spring link bearing attachment in the body.

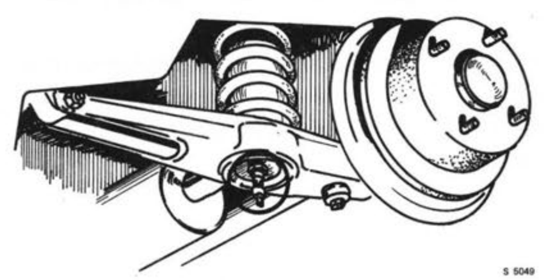
AUXILIARY SPRINGS

Removal

Remove the rear springs (see removal of rear coil springs), unscrew the valve and remove it from the spring link. Remove the auxiliary spring.

Assembly

Ensure that the washers at the ends of the auxiliary springs are properly in position. The lower washer is secured at the spring link and the upper one should be placed above the rubber seat on the coil spring.
Assembly is carried out in reverse order.
The auxiliary spring should be pumped to a pressure of 28.5 psi (2.0 bar, kp/cm^2) after assembly.



POSITION OF THE AIR VALVE

REAR AXLE

Removal

1. Apply the handbrake. Jack up the rear end of the car, place two trestles under the body and take off the rear wheels.

> NOTE
> It is absolutely forbidden to jack up the car with the jack applied direct to the rear axle.

2. Disconnect the brake hoses in front of the rear axle. Disconnect the lower shock absorber attachments and the cross bar.
3. Place a jack under the rear axle. Lower the axle and lift out the rear springs.
4. Undo the screws of the spring link rear bushings and lift away the rear axle assembly.

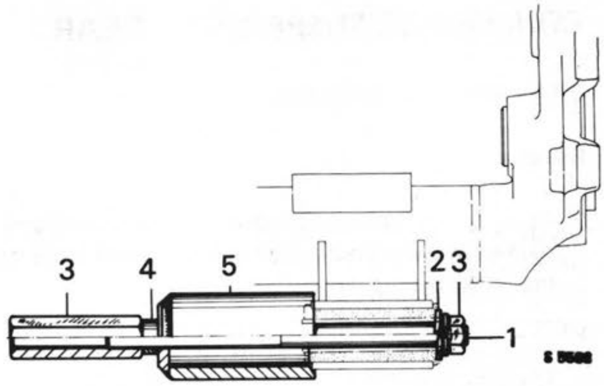
Installation

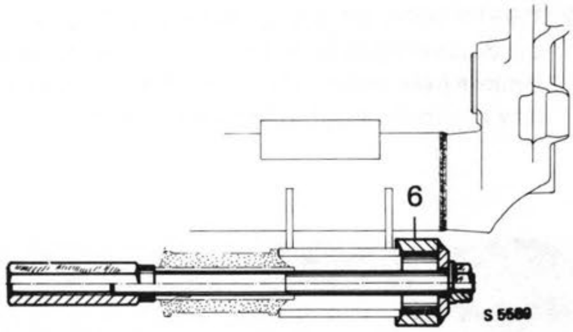
Clean all parts thoroughly, inspect them, and exchange any that are worn or damaged. Install in the reverse order to the above. Note that the jack is not to be placed on the middle of the rear axle when this is put into position for installation. Use two jacks or a trestle at one side when the other is lifted to the correct position with the jack. Note that the rubber bearings must be mounted in such a way that no strain occurs when the weight of the car is supported by the wheels, i.e. the rubber bearings must be drawn tight only when the car is standing empty on its four wheels.
The screw at the cross bar attachment to the body shall be installed with the nut facing forwards.

> NOTE
> Do not forget to bleed the brakes.

Changing the rubber bushing, rear axle-spring link

Once the spring link has been removed from the axle, the bushing can be pressed in or out by means of tool No. 8995789.
The tool can also be used for changing the bushing for the pivot plate bearing at the front spring mountings. The various components of the tool are shown in the illustration.





TOOL NO. 8995789
1. Axle
2. Spring washer
3. Nuts
4. Brass washer
5. Removing sleeve
6. Fitting sleeve

Removal
Position the tool as shown in the illustration and withdraw the bushing which will be pressed into the removing sleeve of the tool.
(N.B. Make sure that the thread of the tool and the contact surfaces of the nut and brass washer are thoroughly greased.)

Fitting
1. Grease the outside of the bushing, e.g. with soapy water, to facilitate fitting.
2. Press in the bushing, positioning the tool as shown in the illustration.
3. After fitting ensure that the bushing protrudes the same amount on both sides of the bushing holder.

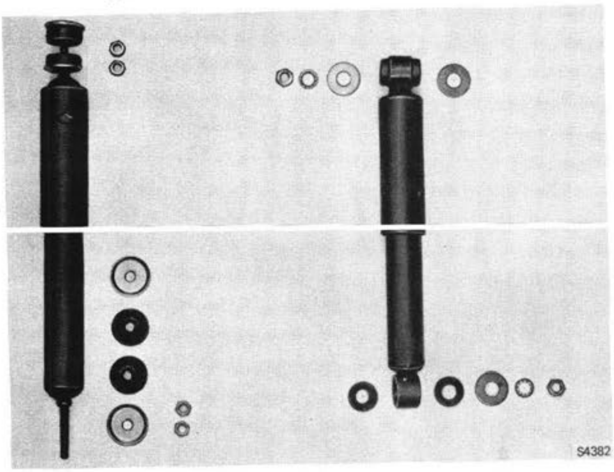
SHOCK ABSORBERS

GENERAL

Defective shock absorbers should be exchanged. This is extremely important, as the shock absorbers contribute largely to the good roadholding and steering characteristics of the car.
Shock absorbers on the same axle should be exchanged in pairs.
As from model 1976, pneumatic shock absorbers will be available as an alternative.
As from the middle of 1976 model production Saab 99 EMS and TURBO are fitted with special rally-type pneumatic shock absorbers, front and rear.

REMOVAL

1. Jack up the car and take off the wheel.
2. Unscrew the shock absorber, saving the washers and rubber parts.



SHOCK ABSORBERS

INSTALLATION

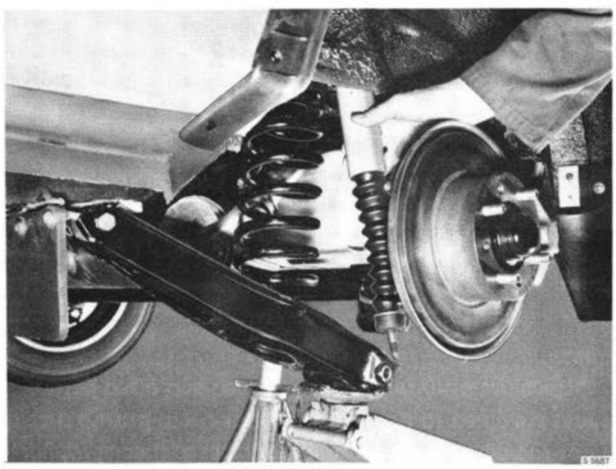
Inspect the rubber parts and exchange any that are defective. Use only original Saab rubber parts and washers at the upper and lower attachment points when installing shock absorbers; poorly fitting substitutes can cause body noise when the car is on the road. Before a shock absorber is installed, any air present in it must be expelled. To bleed the shock absorber, hold it upright in the same position as when installed, pump it up and down for a few full strokes, and then install it in the car. If the shock absorber is laid flat, more air can enter through the valve system.
Fit rubber bushings and washers. Note the positions of the washers as illustrated opposite. The nuts of the front shock absorbers should be tightened hard, while those on the back shock absorbers should be tightened enough to provide suitable tension against the rubber bushings.

REAR SHOCK ABSORBERS, SAAB 99 EMS

Owing to the high compression of rally-type shock absorbers, the procedure for changing them is slightly more involved than that for hydraulic shock absorbers.

Removal and installation

1. Raise and block up the car at the rear jacking point.
2. Place an additional trestle under the rear axle to prevent it dropping and stretching the brake lines.
3. Insert a jack at the rear of the spring link.
4. Remove the shock-absorber nuts.
5. Remove the bolts in the spring-link mounting on the rear axle.
6. By means of the jack, lower the spring link so that the shock absorber can be removed.



REMOVAL OF PNEUMATIC SHOCK ABSORBER, REAR

Fitting is carried out in the reverse order.

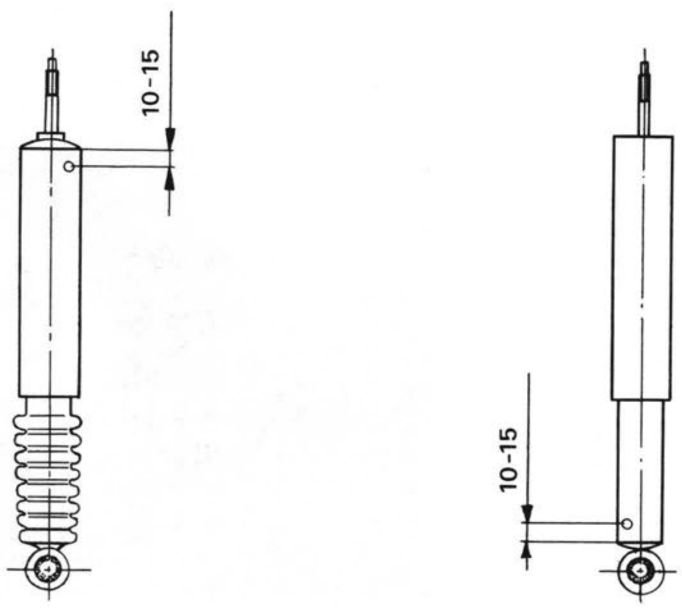
CHECKING OF SHOCK ABSORBERS INSTALLED IN CAR

Check the condition of the shock absorbers as follows:

1. Check for leakage of oil from the shock absorbers.
2. Check for external damage, extensive corrosion or bends in the plungers.
3. Check that the nuts are tight.
4. Check the condition of the rubber bushings.
5. Test the functioning of the shock absorbers by rocking the car or in conjunction with test driving.

REGULATIONS FOR SCRAPPING PNEUMATIC SHOCK ABSORBERS

Pneumatic shock absorbers contain gas under a pressure of 30–40 bars which can cause personal injury if not handled properly.
In order to avoid the risk of personal injury pneumatic shock absorbers should emptied of gas prior to being scrapped. This is effected by drilling a Ø 2 mm approx. hole in the pressure chamber 10–15 mm from the edge. See illustration below.



S 7312

Pneumatic shock absorber with rubber bellows, gas chamber at top

Drill a Ø 2 mm hole 10–15 mm from the edge.

Pneumatic shock absorber with plastic or steel casing, gas chamber at bottom.

Drill a Ø 2 mm hole 10–15 mm from the edge.

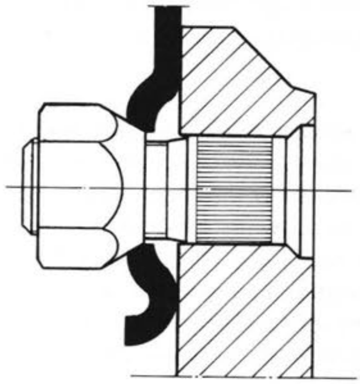
WHEELS

FITTING OF WHEELS

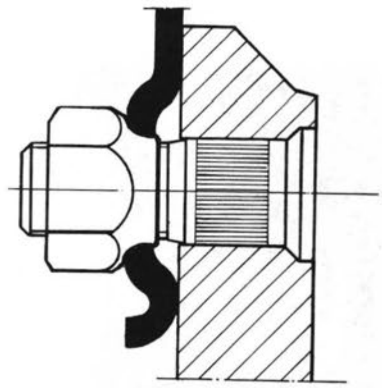
From the viewpoints of comfort and safety, it is important that the wheels be fitted correctly. The following procedure is recommended.

Steel wheels

1. Check the taper and threads of the nuts. Nuts which seize or on which the taper is worn should be replaced.



S 5992



S 5993

NUT WITH WORN TAPER

2. Mount the wheel on the hub and tighten the nuts so that the wheel locates correctly.
3. Tighten the nuts to a torque of 88–108 Nm (65–80 ft.lb., 9–11 kpm).

> NOTE
> Pneumatic nut tighteners may only be used in combination with a torque wrench. Nuts which have been overtightened can damage the wheel and make it impossible for the motorist to remove the nuts in the event of a puncture.

Aluminium wheels

1. Check the nuts and threads for damage.
2. Mount the wheel on the hub and tighten the nuts so that the wheel locates correctly.
   If the wheel has been removed and fitted on frequent occasions, the seating between the nut and the wheel may be worn, making centring difficult. Particular attention should be given to this in conjunction with complaints concerning vibration. The following procedure is recommended in such cases.
   Guide the wheel onto the hub by means of two nuts with cones (89 19 656) located at 180° from each other. Tighten the wheel with the conventional nuts in the two remaining holes and then change the cone nuts.
   As from 1978 model the hubs are used to centralize the wheels. The surfaces coming into contact with the centre of the wheel should be coated with rust-preventive oil.
3. Tighten the nuts to a torque of 88–108 Nm (65–80 ft.lb., 9–11 kpm).

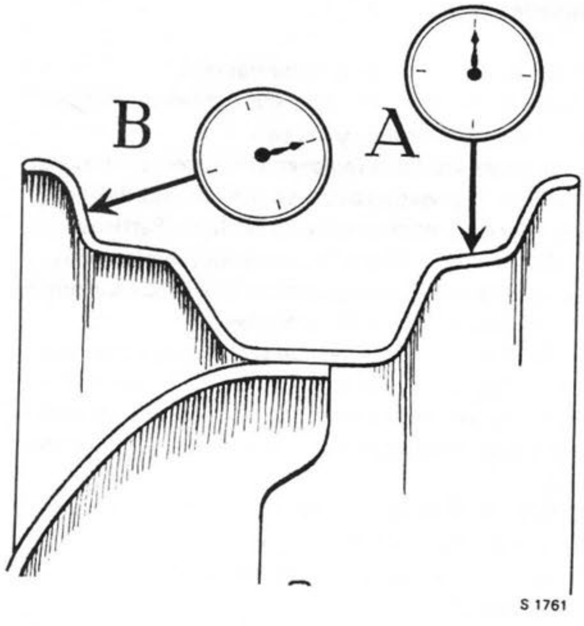
> NOTE
> Pneumatic nut tighteners must not be used for final tightening of the nuts.

ADJUSTING AND REPAIRING WHEELS

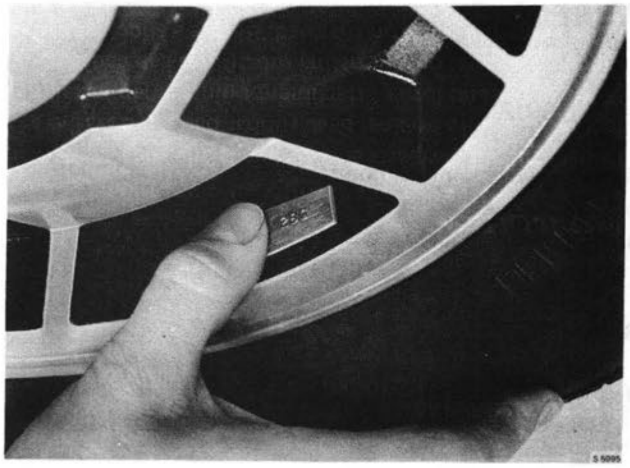
Wheels may be damaged in collisions or if the car runs off the road or is driven on underinflated tires. As the tubeless tires seal direct against the wheel rims, air will leak out if the rim is deformed or otherwise damaged. If a leak occurs due to rim deformation, the tire should be taken off so that the wheel can be inspected and adjusted if necessary. If the rim is rusty at the bead seating, the rust must be removed; this can suitably be done with a steel brush or a pad of steel wool. If rust has pitted the rim, a file should be used. Any minor pits remaining after adjustment should be coated with thick rubber solution; the tire is then coated in the same way and mounted on the wheel before the solution dries.

> NOTE
> Check before mounting the tire that the rim is not out-of-round or out-of-true.

On a correctly journaled rotating rim, the difference between the highest and lowest point measured at A (see illustration) must not exceed 0.047"/1.2 mm (Saab 99 EMS: 0.032"/0.8 mm). The side throw B (see illustration) should be measured in the same way and must not exceed 0.047"/1.2 mm (Saab 99 EMS: 0.032"/0.8 mm). When these measurements are made, the rim should be mounted in the usual way, either on a wheel hub or in a special apparatus, so that the rim can be rotated.



MEASUREMENT POINTS ON THE WHEEL RIM

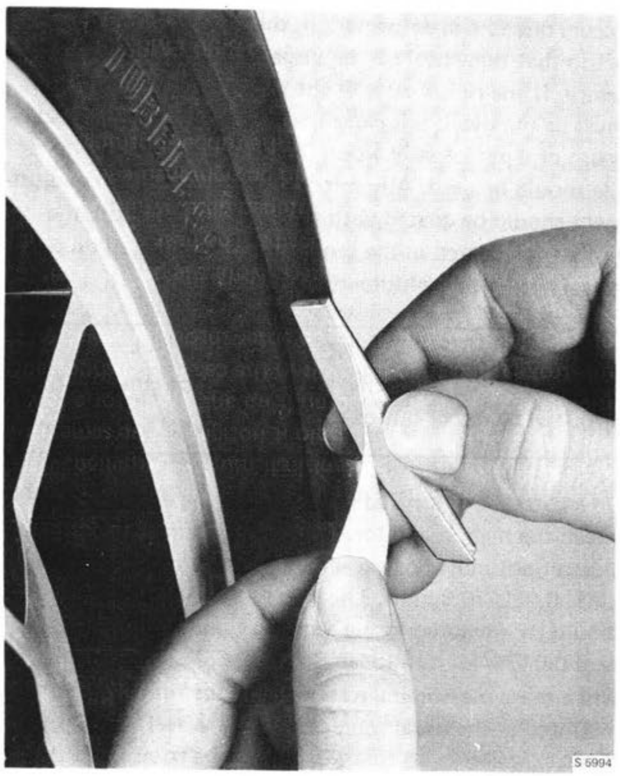


FITTING WEIGHTS TO ALUMINIUM WHEELS

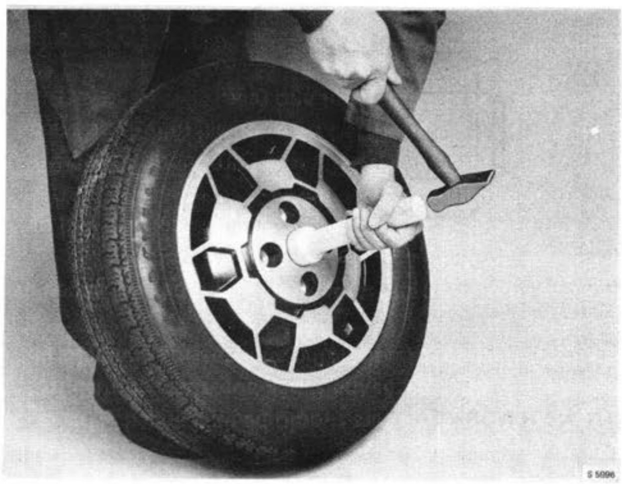
Aluminium wheels

For the balancing of aluminium wheels, special weights that are glued to the wheel must be used. Ensure that the surface has been thoroughly cleaned and dried before glueing.

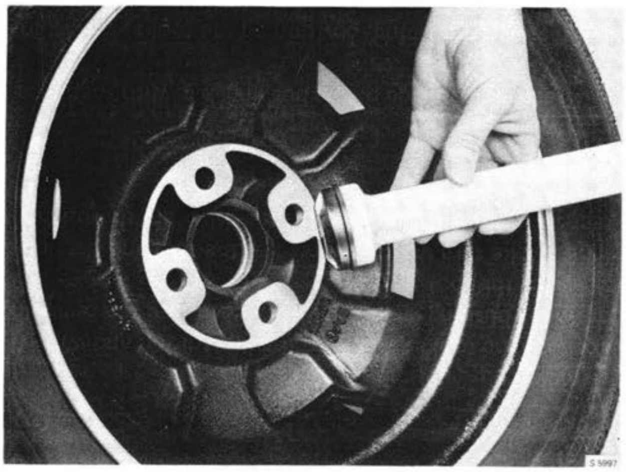
Since the wheel-balancing weights are placed about 1/2 in inside the wheel in the case of aluminium wheels, allowance must be made for this in the case of wheel-balancing machines set to the wheel width. Accordingly, the machine should be set for 4 1/2 in in the case of 5 1/2 in wheels. In the case of certain types of balancing machines, the emblem at the centre of the wheel must first be removed. Use special drift 8996167 to remove and refit metal emblems.



FITTING WEIGHTS TO ALUMINIUM WHEELS



REMOVING THE METAL EMBLEM

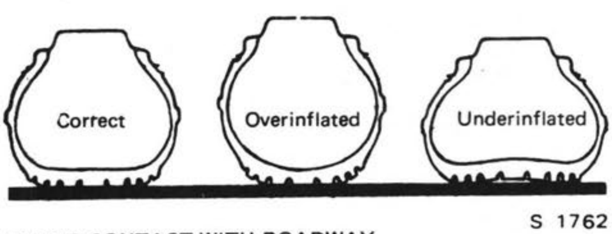


FITTING THE EMBLEM
Tool 89 96 167

TIRE MAINTENANCE

The working life of a tire depends very much on the care it receives and the conditions under which it has to work. Some of the factors affecting tire wear are listed below.

1. Inflation pressure. It is important to maintain the correct inflation pressure and to adjust the pressure according to load. For correct tire pressures, see under Specifications, Group 0.



TREAD CONTACT WITH ROADWAY

2. Wheel balancing is necessary to avoid vibration and consequent wear. Wheels must be balanced both statically and dynamically.
3. Wheel alignment. Faulty alignment of the wheels can cause heavy wear on the tires.
4. Speed. Tire mileage diminishes sharply with rising speed, mainly due to the greater friction heat generated.
5. Engine power. Powerful engines give rapid acceleration and high speed, which in turn demand powerful brakes. This contributes to faster wear on the tires.
6. Road surface. Dry roads offering a good grip for the tires cause a great deal of wear.
7. Manner of driving. The temperament of the driver may weigh more heavily than any other factor. If the acceleration and braking resources of the car are regularly utilized to the limit, this will quickly wear down the tires.

A statically balanced wheel should be able to come to rest in any position when suspended and free to rotate.

A dynamically balanced wheel should rotate in a plane perpendicular to the axis of rotation, i.e. it should have no tendency to skew during rotation.

The balancing operation should not be performed on new wheels, but only after some 600–900 miles (1,000–1,500 km) motoring; this is to give the tire time to "shake down" on the rim.

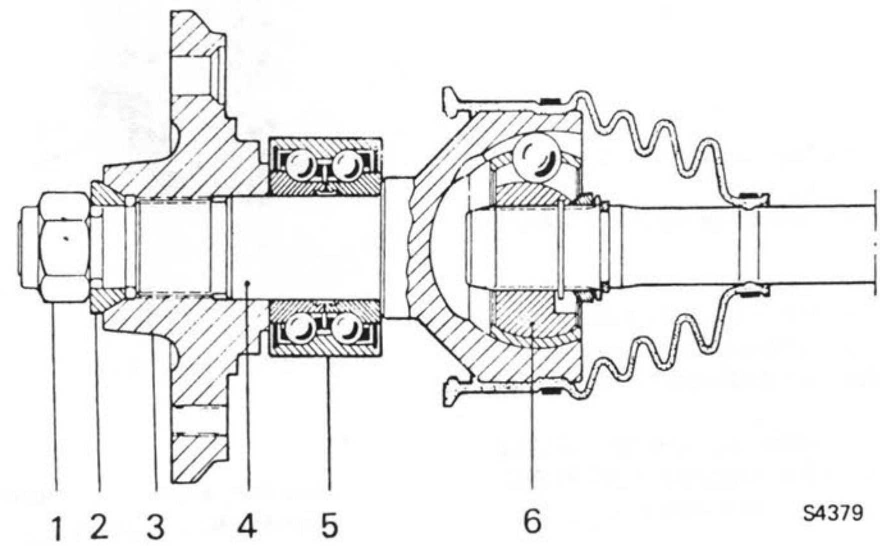
Wheels need rebalancing after long mileage because tire wear alters the distribution of weight.

NOTE
When a wheel spinner is used, the speedometer reading must not exceed 40 mph (70 km/h).

HUBS

FRONT WHEEL HUBS

The hub and brake disc constitute two separate cast components, held together by four screws, locked by means of a locking plate. The front wheel hub is splined to the outer drive shaft and is secured by a nut with a flange which is upset in the locking groove in the axle.
The four wheel bolts are forcefitted in the hub.



S4379

FRONT WHEEL HUB

1. Lock nut
2. Washer
3. Hub
4. Outer drive shaft
5. Wheel bearings with seals
6. Outer drive shaft joint

WHEEL BEARINGS

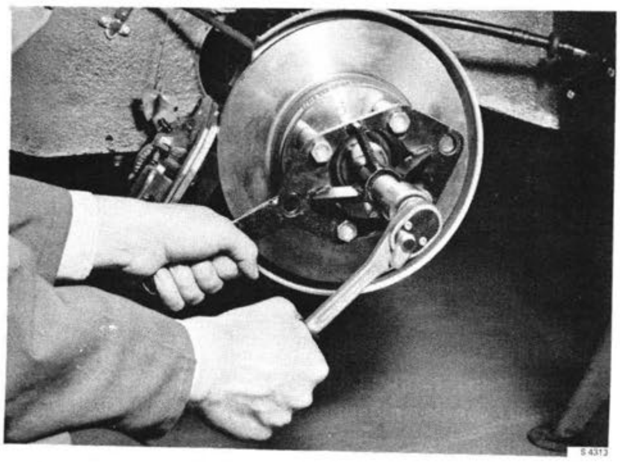
Changing front wheel bearings

In time wheel bearings may become so worn that they develop play. If the play measured at the wheel rim exceeds 0.08" (2 mm), the wheel bearing must be renewed. Under no circumstances must wheel bearings be subjected to impact, as this may damage them.

> NOTE
> Use only original bearings as listed in the Spare Parts Catalogue.
> The bearings cannot be taken apart.

Removal

1. Take off the hub cap and remove the lock nut. Slacken the wheel nuts.
2. Block up the front of the car on trestles and remove the wheel.
3. Turn the brake disc so that the recess in the edge of the disc is in line with the brake pads. Loosen the handbrake cable and remove the brake housing. Hang up the brake housing to avoid damage to the brake hose.
4. Remove the hub and brake disc from the axle using puller 89 95 185 and four spacer screws 89 96 050 or with puller 89 96 084 (later design).

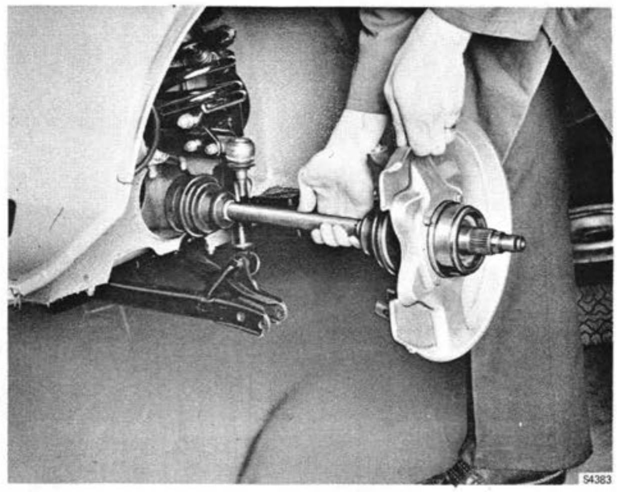


REMOVING THE BRAKE DISC FROM THE HUB
Puller 8995185 and spacer screws 8996050 or as alternative, tool 8996084 (later design)

5. Undo the large clamp round the rubber bellows of the inner universal joint.
6. Remove the steering arm and upper ball joint using tool 8995409. Undo the screws on the lower control arm bracket.

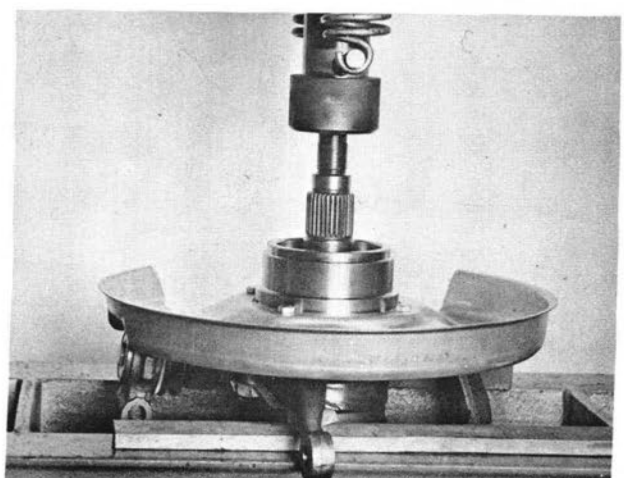
When separating the inner universal joint, fit a cover in the rubber bellows to stop the needle bearings from falling out and to keep dirt out of the joint, and fit a cover over the inner driver.

7. Pull out the drive shaft through the wheel housing, remove the entire front axle assembly and clean it thoroughly.



REMOVING THE FRONT AXLE ASSEMBLY

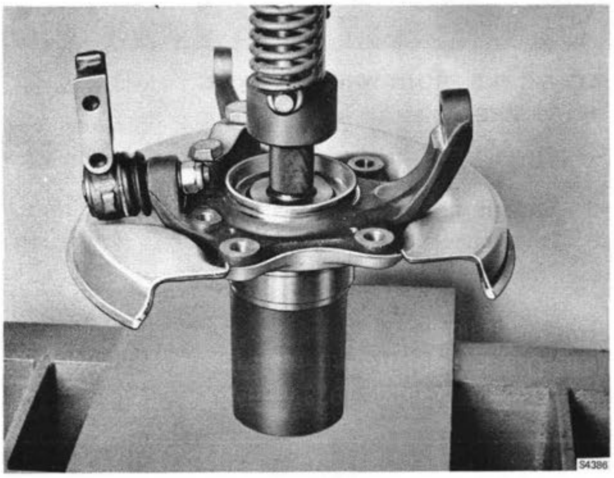
8. Place the steering knuckle housing in a press and press out the drive shaft.



REMOVING THE DRIVE SHAFT FROM THE HUB

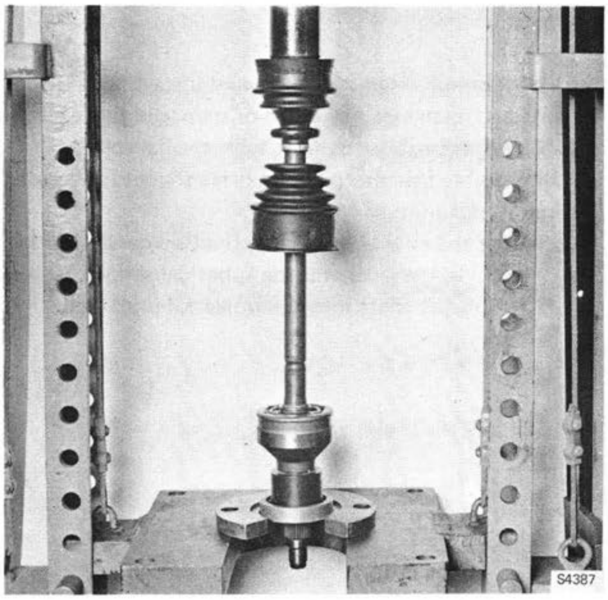
9. Remove the lock ring and press out the bearing using a suitable drift. The bearing must not be taken apart.

REMOVING THE CIRCLIP



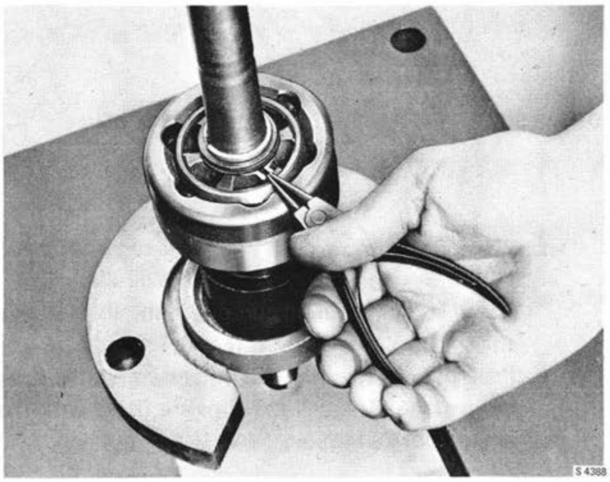
REMOVING THE BEARING

10. Remove the intermediate drive shaft from the outer universal joint hub as follows:
    a. Loosen the outer universal joint bellows and move the bellows along the shaft.
    b. Place the shafts in a press and press together the two conical spring washers so that the circlip inside the hub can rotate in the groove.



RELEASING PRESSURE ON THE CIRCLIP BY PRESSING THE TWO WASHERS TOGETHER

    c. Open the circlip using circlip pliers and release the pressure.



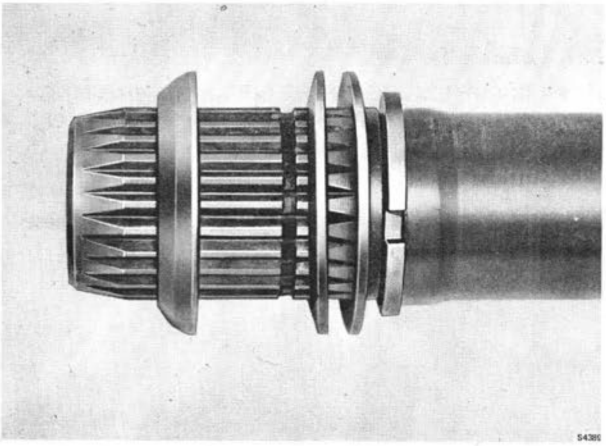
OPENING THE CIRCLIP WITH CIRCLIP PLIERS

    d. Pull the intermediate shaft out of the hub together with the spherical shaped washer, the two coneshaped spring washers and the shaft locking ring. The circlip on the hub remains in the groove.

Installation

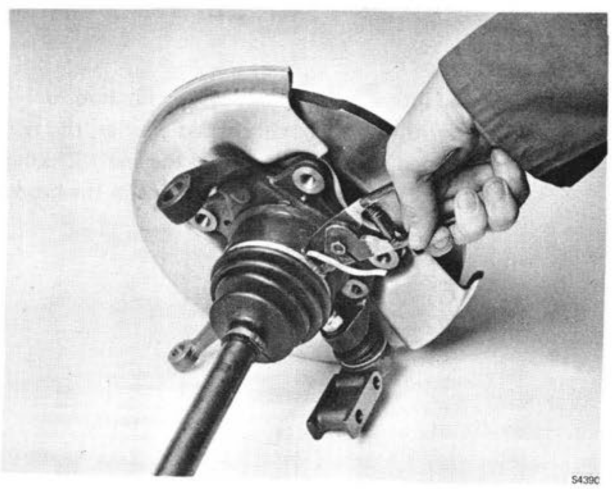
Before beginning assembly, clean and inspect all axle components and exchange any worn or damaged parts for new ones. Check the rubber bellows with special care.

1. Assemble the intermediate drive shaft to the outer universal joint as follows:
   a. Fit the axle locking ring, the two concave sides facing inwards) and the spherical-shaped washer. Push the shaft into the universal joint hub.



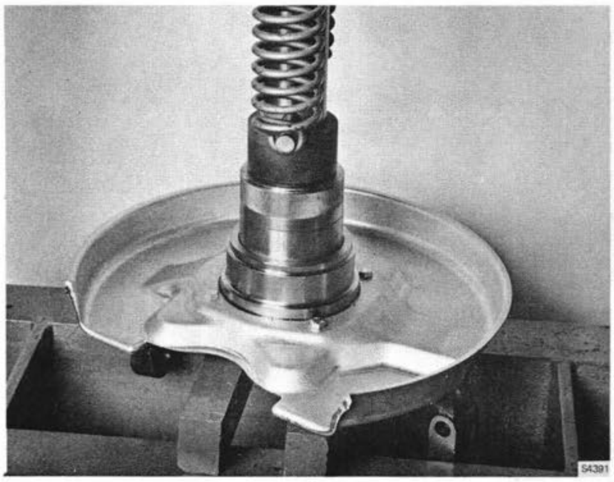
DRIVE SHAFT WITH LOCK RING AND WASHERS

   b. Place the unit in a press and press together the conical spring washers so that the circlip inside the hub clicks into the groove in the shaft. Pull the shaft to check that it is held securely.
   c. Pack the joint with grease and assemble the rubber bellows. The bellows clips are fitted with the aid of tool 7844699.



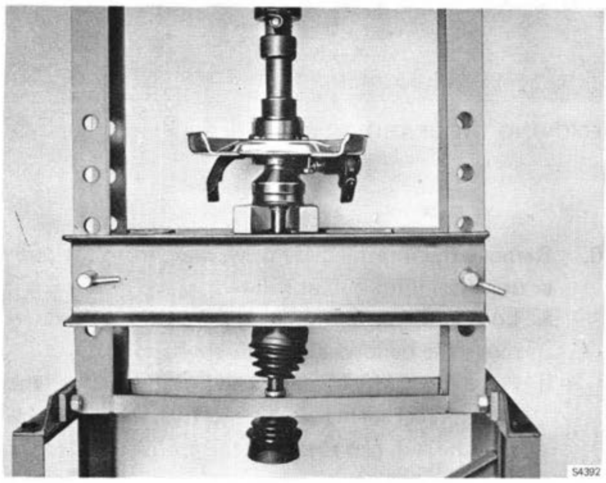
FITTING THE OUTER BELLOWS CLAMP
Pliers 7844699

2. Press the front wheel bearing into the steering knuckle housing using tool 8996068. Fit the locking ring.
   Before fitting, grease the bearing with "Molycote, Paste G".



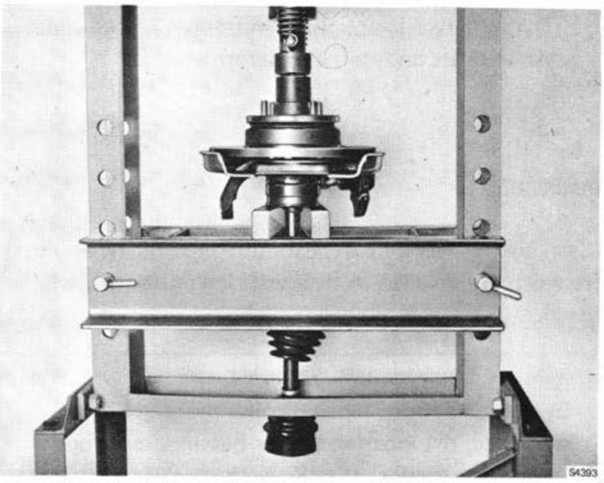
FITTING THE FRONT WHEEL BEARING
Drift 8996068

3. Mount the outer drive shaft in the press and press the knuckle housing and bearing on to it. Press on the inner sealing ring.



FITTING THE STEERING KNUCKLE HOUSING AND BEARING TO THE OUTER DRIVE SHAFT

4. Press the wheel hub and brake disc onto the drive shaft splines and fit the conical washer and lock nut. The nut is locked later.



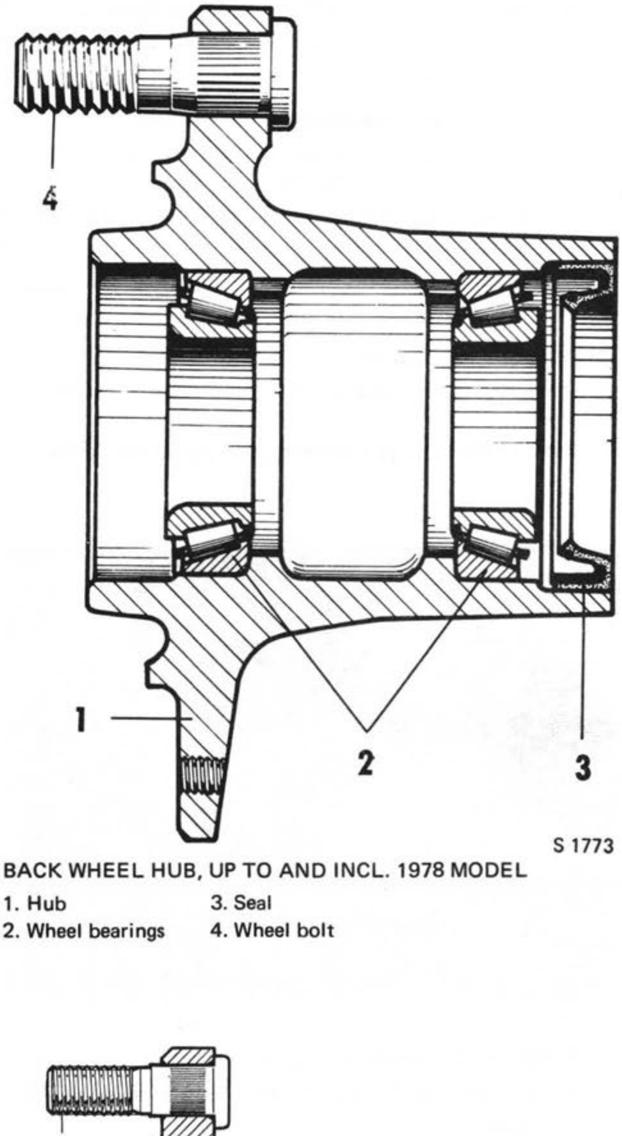
FITTING THE HUB AND BRAKE DISC TO THE SHAFT

5. If the inner universal joint needle bearings have been removed, grease them and mount them on the ends of the tee piece. Fit protective cover to protect the needle bearings and insert the drive shaft through the wheel housing. Make sure that the inner driver is clean and packed with chassis grease.
6. Assemble the inner universal joint. Fit the upper ball bolt to the steering knuckle housing and fit the lower control arm bracket.
   Then secure the clamp round the drive joint bellows.
7. Mount the tie rod end to the steering arm.
8. Mount the brake housing.
9. Fit the wheel and lower the car.
10. Tighten the hub locking nut to the prescribed torque and secure the nut by upsetting the flange in the locking groove.
11. Tighten the wheel nuts securely and fit the hub cap.

> CAUTION
> The brake pads must be advanced to their proper position close to the disc, which is done by pumping the brake pedal repeatedly. Otherwise the brake will not work.

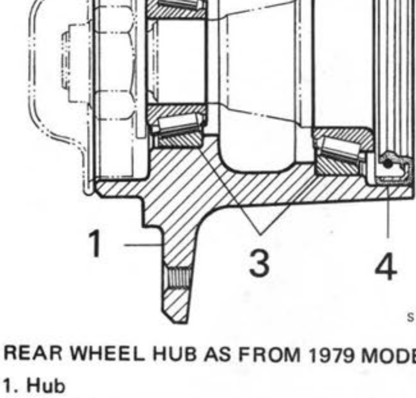
REAR WHEEL HUBS

Each rear wheel hub runs in two tapered roller bearings. Up to and including 1978 model these two bearings were of the same size. As from 1979 model the inner bearing has a larger diameter than the outer.



BACK WHEEL HUB, UP TO AND INCL. 1978 MODEL

1. Hub
2. Wheel bearings
3. Seal
4. Wheel bolt



REAR WHEEL HUB AS FROM 1979 MODEL

1. Hub
2. Wheel bolt
3. Wheel bearings
4. Seal

Removal

Wash thoroughly under the fenders before starting work and scrape off any dirt that could fall into the bearings.

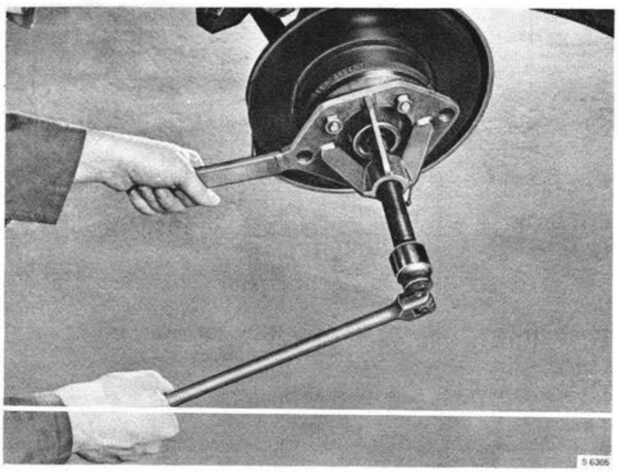
1. Jack up the car and remove the wheel.

CAUTION
It is absolutely forbidden to apply the jack under the rear axle, as this is liable to deform the axle.

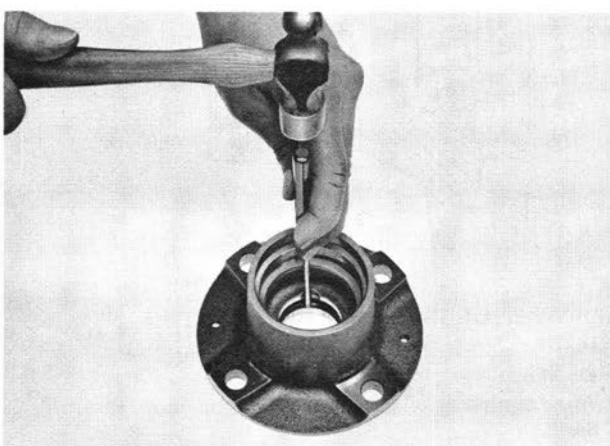
2. Remove the brake housing and brake disc.

NOTE
The brake housing must be supported to avoid damage to the brake pipe.

3. Prize out the dust cap with a screwdriver.
4. Remove the lock nut secured by upsetting and the washer.
5. Pull off the hub. If necessary, use puller 8995185.



6. Break out the seal ring with a screwdriver (it cannot be removed intact) and remove the inner rings of both bearings.
7. Place a suitable drift in the milled recesses in the hub and drive out the outer bearing rings. While doing this, it is advisable to place a wooden board under the hub to avoid deforming the end faces.



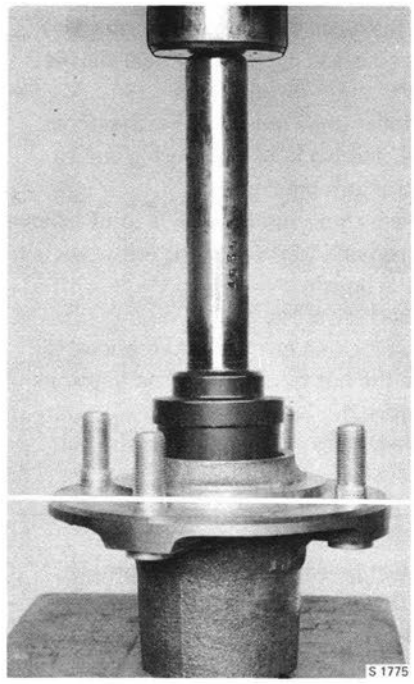
Det är därvid lämpligt att en träplatta läggs under navet så att ändytorna ej deformeras.

Installation

Clean and inspect all parts carefully, and renew any that are worn or damaged. A new seal ring must always be fitted.

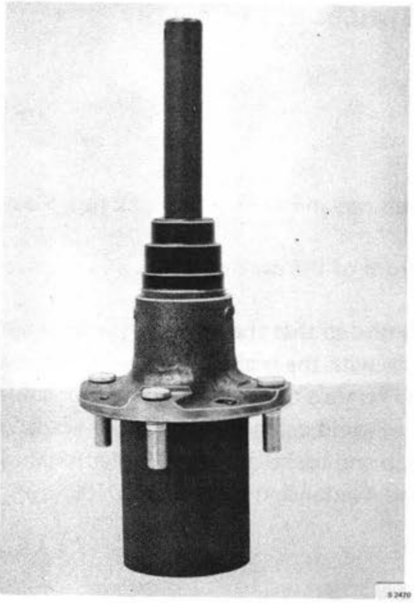
IMPORTANT
Even though both tapered roller bearings are the same size, the inner and outer bearings must not be interchanged, as they wear themselves into a given fit after a time in use.

1. Up to and including 1978 model.
   a. Use drift 8995169 to insert the bearing outer races in the hub.



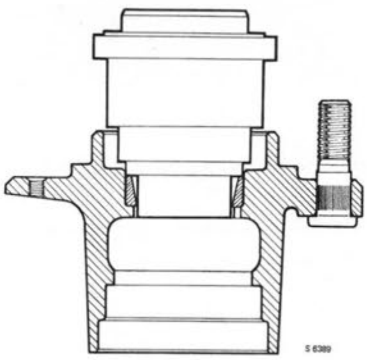
PRESSING IN THE BEARING OUTER RINGS
Tool 8995169

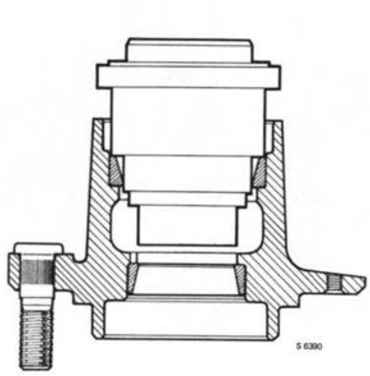
   b. Fill half the space between the outer rings with Saab Special chassis grease and grease the inner rings.
   c. Locate the inner ring of the inner bearing and fit a new shaft seal, which should first be lubricated with grease or thick oil.



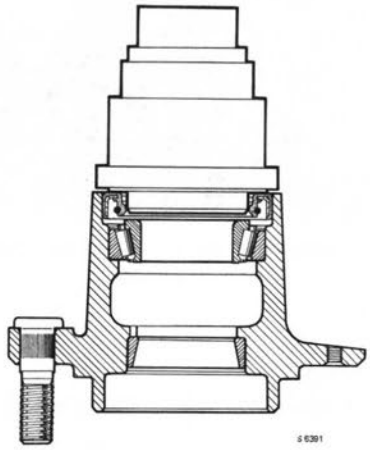
PRESSING IN THE SEAL RING
Tool 8995169

1. As from 1979 model:
   a. Use drift 8996241 to press the bearing outer races in the hub.



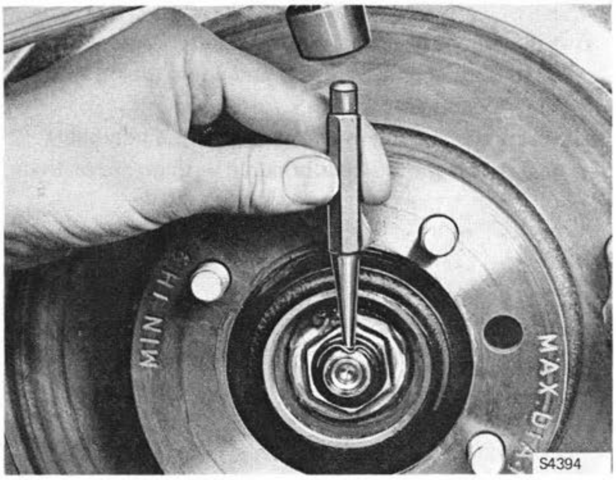


   b. Fill half the space between the outer races with Saab Special chassis grease and apply grease to the inner bearing races.
   c. Insert the bearing inner races and fit a new shaft seal which should be lubricated with grease or thick oil.



2. Check that the bearing surface for the seal ring on the stub axle is perfectly smooth. If it is damaged, it must be smoothed and polished with a very fine emery cloth. Lubricate the bearing surface with consistent grease.
3. Fit the hub to the stub axle, insert the inner ring of the outer bearing and mount the washer and nut. Tighten the lock nut to a torque of 36 ft.lb. (49 Nm/ 5 kpm). Then slacken the nut completely. Finally tighten the nut to a torque of 1.4–2.9 ft.lb. (2–4 Nm/ 0.2–0.4 kpm).
   If the old securing at the nut flange will be at the locking groove, change the nut. Secure the nut by upsetting the flange in the locking groove, using a rounded drift so that cracks will not occur when securing.

Torque	Stage I: 35 ft. lb. (49 Nm (5 kpm)) Stage II: Loosen the nut Stage III: 1.5–3 ft. lb. (2–4 Nm (0.2–0.4 kpm))



UPSETTING THE FLANGE OF THE LOCKING NUT

6. Fit the dust cap.
7. Mount the brake disc, brake housing, wheel and wheel nuts.

> **CAUTION**
> The brake pads must be advanced to their proper position close to the disc, which is done by pumping the brake pedal repeatedly. Otherwise the brake will not work.

8. Lower the rear of the car, tighten the wheel nuts securely and fit the hub cap.

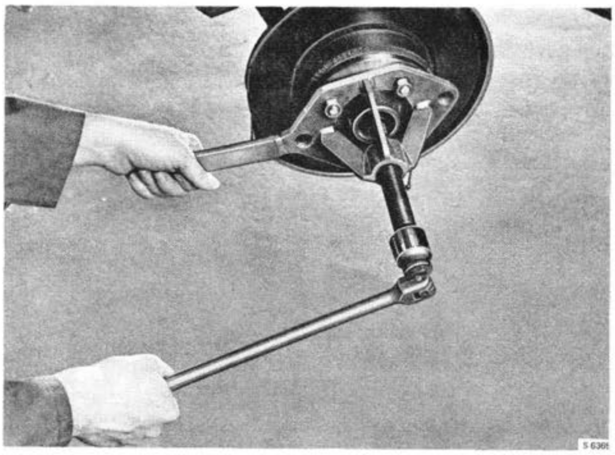
> **NOTE**
> A torque wrench should always be used if a pneumatic tightener is used to tighten the wheel nuts. The use of excessive force can damage the nut and the wheel.

CHANGING THE WHEEL BOLTS

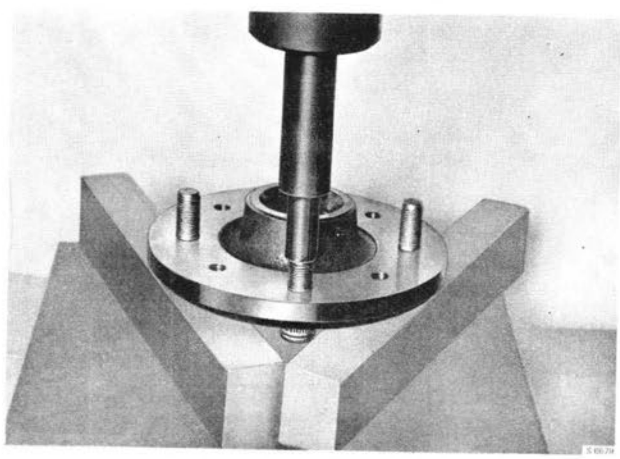
Front wheels

Removal

1. Take off the hub cap and remove the lock nut. Slacken the wheel nuts.
2. Block up the front of the car on trestles and remove the wheel.
3. Turn the brake disc so that the recess in the edge of the disc is in line with the brake pads. Loosen the handbrake cable and remove the brake housing. Hang up the brake housing to avoid damage to the brake hoses.
4. Remove the hub and brake disc using puller 8996084 or 8995185 and 4 extension pieces 8996050.



5. Remove the lockings and the screws holding the brake disc to the hub.
6. Press out the wheel bolts, using a press or tool 8995920 and removal sleeve.



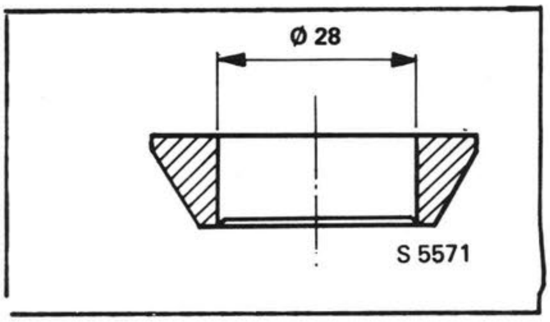
Installation

1. Press in the new bolts using a press or using pressing tool 8995920 and installation sleeve.
2. Assemble the hub and brake discs. Tighten the bolts to the prescribed torque and secure them with the locking plates.

Torque	22–36 ft. lb. (30–50 Nm (3–5 kpm))

3. Mount the hub and brake disc on the drive shaft. Fit the washer and lock nut.

NOTE
Tighten the lock nut with an ordinary spanner or wrench to avoid damaging the thread. If a pneumatic nut tightener is used, a dished washer with an enlarged inside diameter should be used as an assembly washer.



ASSEMBLY WASHER WITH ENLARGED INSIDE DIAMETER

Tightening the wheel nuts with a pneumatic nut tightener

1. Mount the assembly washer.
2. Mount the lock nut and tighten it.
3. Back off the lock nut and remove the assembly washer.
4. Mount the standard dished washer.
5. Tighten the lock nut.

Tighten the lock nut to the prescribed torque and secure the nut by upsetting the flange in the locking groove.

Torque	250±7 ft. lb. (350±10 Nm (35±1 kpm))

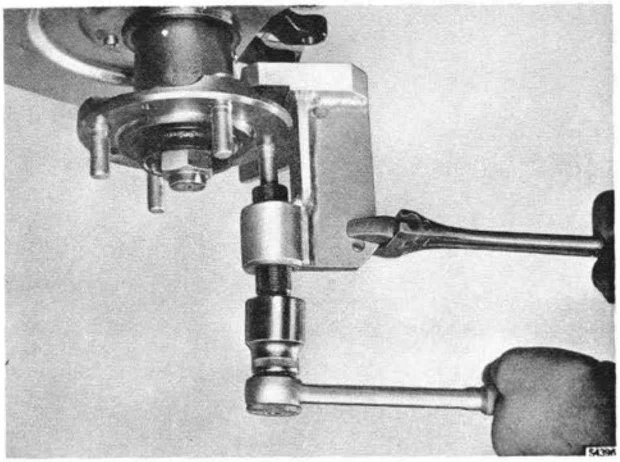
4. Mount the brake housing. Pump the brake pedal repeatedly so that the brake pads advance to their proper position close to the disc.
5. Fit the wheel and lower the car.

NOTE
A torque wrench should always be used if a pneumatic tightener is used to tighten the wheel nuts.
The use of excessive force can damage the nut and the wheel.

Rear wheels

Removal

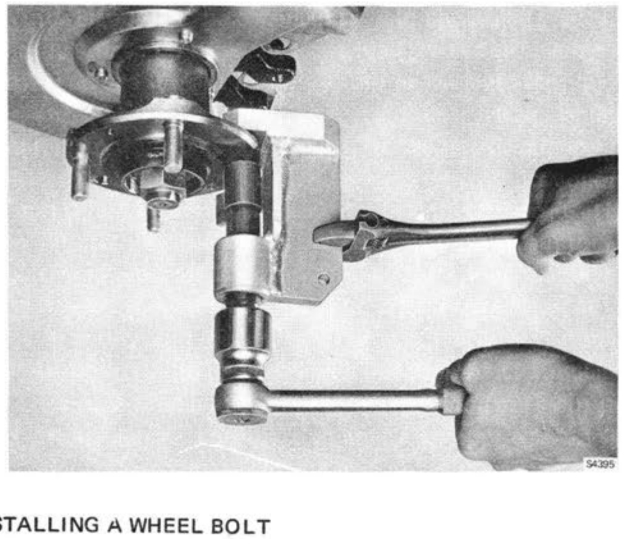
1. Block up the rear of the car on trestles and remove the wheel.
2. Remove the brake housing and then remove the brake disc, see group 5.
3. Press out the wheel bolts using pressing tool 8995920 with the removal sleeve on the inside of the hub.



REMOVING A WHEEL BOLT
Tool 8995920

Installation

1. Press in the new bolts with pressing tool 8995920 with the installation sleeve on the outside of the hub.
2. Mount the brake disc and brake housing and bleed the brakes, see group 5.
3. Fit the wheel and lower the car.



INSTALLING A WHEEL BOLT
Tool 8995920

CONTENTS

GENERAL

The car has an all-welded cantilever steel unit body. The doors, engine hood and trunk lid are removable, while the front and rear fenders are welded on to form integral load-carrying parts of the body.
The body is constructed of a relatively small number of sections of pressed steel sheeting. These are joined together mainly by spot-welded overlapped joints. Body rigidity is achieved by longitudinal and transverse floor beams, heavy-gauge windshield pillars and profiled stiffeners round the roof. Moulded stiffening frames reinforce the windshield and back window. All doors are equipped with a reinforcement beam that gives improved protection if the car is involved in a side collision. Reinforcing pieces and brackets are welded to the engine and chassis unit mountings to take up prevailing forces.
The floor comprises front and center sections, cross members and rear section, together with a number of reinforcing plates and beams. The front floor section, also called the engine compartment floor, is welded at the dash panel to the center section, which forms the floor of the passenger compartment. The rear section forms the floor of the trunk compartment. The center and rear floor sections are joined by a cross member forming a tunnel for the rear axle.

BODY INSULATION

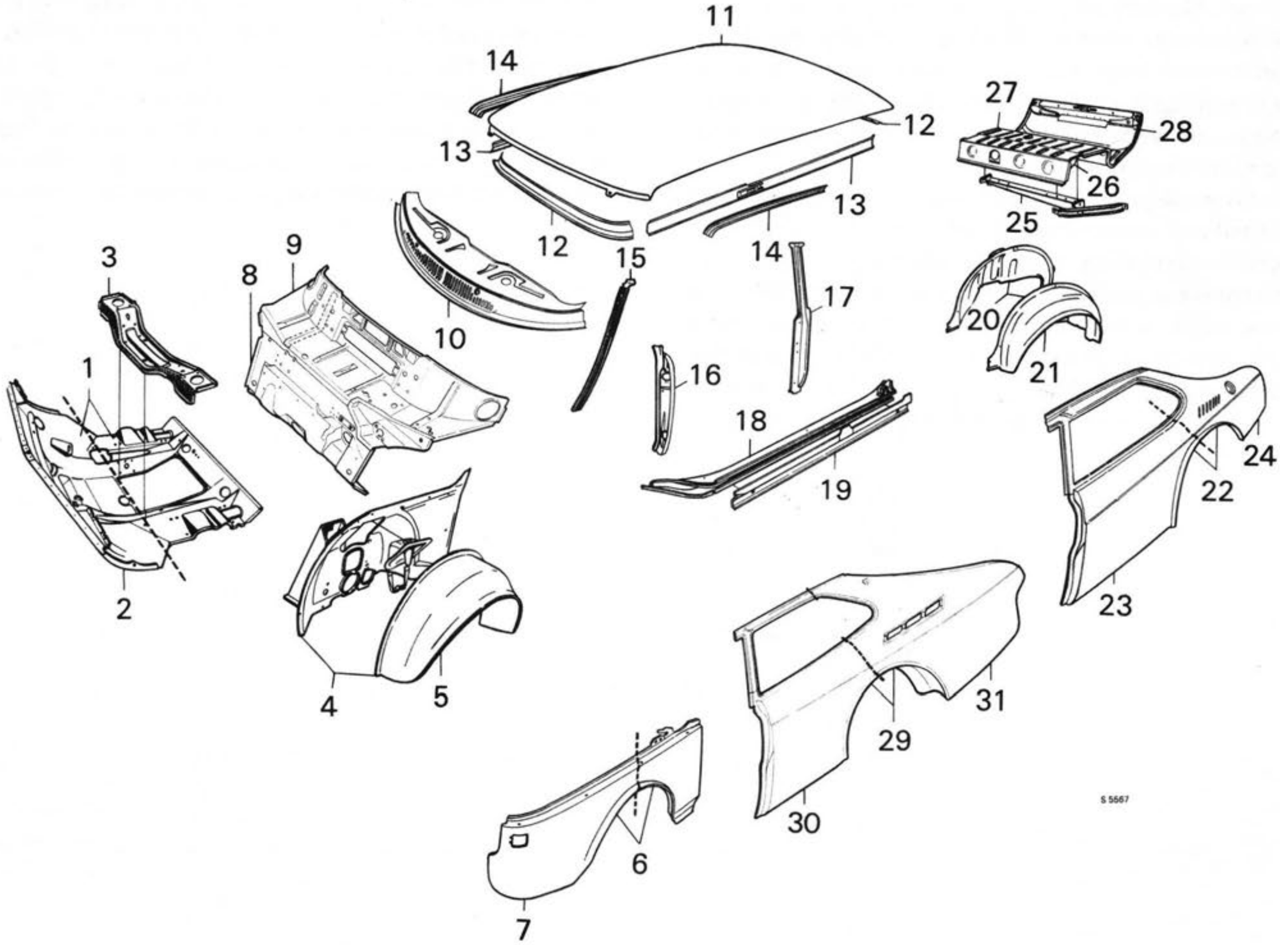
The underbody, i.e. the floor, wheel housings and fenders, is sprayed with a sealing composition which serves to protect the metal from flying stones and rust and to insulate the body from road noise.
The upper surface of the floor in the passenger and trunk compartments is covered with an asphalt mat. This is laid before the body goes into the lacquering oven and therefore melts on to the steel, providing excellent rust protection and contributing to the sound insulation.
The rear wheel housings and fenders are covered with plastic coating asphalt matting. Thick asphalt matting faced with nylon fiber matting is bonded to the parts of the front wheel housing that lie inside the passenger compartment.
The dash panel and engine compartment are insulated with glass wool, and the roof is insulated with pressed glass wool.
Waffleboard is bonded to the insides of the doors and valances.

BODY ASSEMBLY

GENERAL

If any part of the body is deformed in a crash and the damage is so extensive that the part cannot be straightened out, it can be exchanged for a new part instead. Indeed, in many cases of minor damage it may actually prove quicker, cheaper and more satisfactory to renew all or part of the damaged section rather than straigten it.

The pressed section with reinforcements will normally be available as a replacement part, but in addition, certain "economy spares" are stocked. Examples of these are the front ends of fenders, the front end of the engine compartment floor, and a divided rear valance. For details, see the Spare Parts Catalogue.



– – – – – – PARTING LINE FOR ECONOMY SPARES

EXAMPLE OF INTEGRAL BODY DETAILS AVAILABLE AS SPARE PARTS

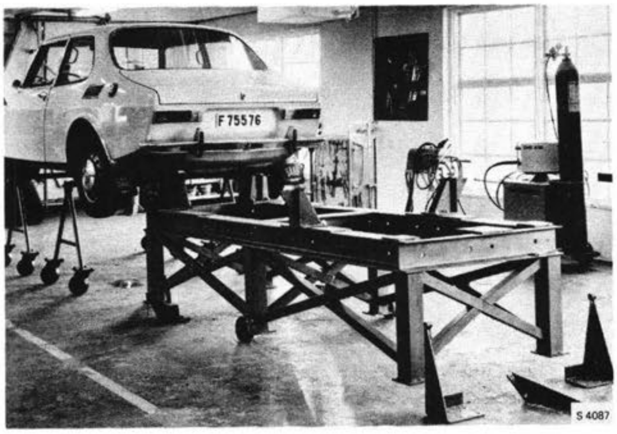
1. Front floor (engine compartment floor)
2. Front floor front part (economy spare part)
3. Floor member
4. Front wheel housing cpl.
5. Front wheel housing outer part
6. Front fender
7. Front fender front part (economy spare part)
8. Dash panel, lower part
9. Dash panel, upper part
10. Windshield member
11. Roof panel
12. Roof members
13. Side members
14. Water channels
15. Front pillar
16. Plate front pillar
17. Rear pillar
18. Scuff plate, inner part
19. Scuff plate, outer part
20. Rear wheel housing cpl.
21. Rear wheel housing, outer part
22. Outer valance
23. Outer valance front part (economy spare part)
24. Outer valance rear part (economy spare part)
25. Side member
26. Cross member
27. Rear floor
28. Rear plate
29. Outer valance, Saab 99 Combi Coupé
30. Outer valance front part (economy spare part) Saab 99 Combi Coupé
31. Outer valance rear part (economy spare part) Saab 99 Combi Coupé

ALIGNMENT JIG FOR ACCIDENT-DAMAGED BODIES

An alignment jig with trueing-up tools and accessories to fit both Saab 95/96 and Saab 99 cars has been designed to facilitate the repair of car bodies damaged in road accidents.
There are two types of alignment jigs, an earlier version, and a later and more up-to-date version.

Alignment jig

The alignment jig consists of a rigidly constructed frame with plane surfaces containing a series of precision-drilled holes. Fixtures for accurate location of body parts can be screwed into these holes. Special checking fixtures are also provided; these are placed on top of the locating fixtures. When the car is set up on the alignment jig, it is possible with the help of the checking fixtures to measure any deformation of the chassis attachment points without having to remove parts of the chassis.
The alignment jig is provided with a pair of wheels to make it mobile. It need not be secured to the floor, but when in use it should be placed on a level surface with the wheels removed.



ALIGNMENT JIG

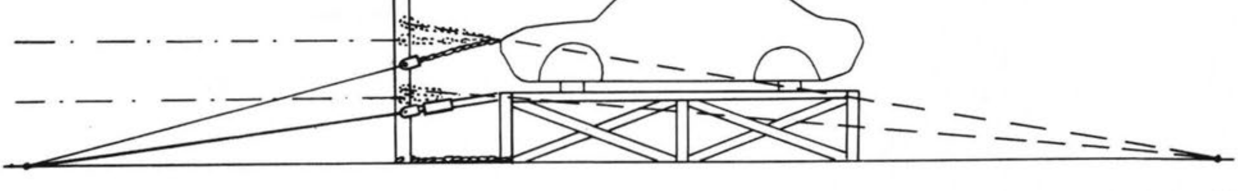
Trueing-up tool

The trueing-up tool is used to straighten out deformed portions of the car body. It consists of a lever which is secured at the bottom by a chain to two of the legs of the alignment jig. A hydraulic pressure cylinder is attached to the middle of the lever, and a draw chain is attached to the top. This arrangement makes the tool compact (and easily portable) and also allows the direction of pull to be varied within very wide limits. Neither the alignment jig nor the trueing-up tool need be anchored to the floor.
Before the trueing-up tool is used it is mounted on the alignment jig in the following manner:

1. Select the desired direction of pull, first laterally by positioning the trueing-up tool accordingly, and then vertically by attaching the draw chain at a suitable height on the lever.
2. Secure the trueing-up tool to the alignment jig by fastening both ends of the anchor chain to two of the legs of the jig in such a way that tension will be applied to both halves of the chain.
3. Place the pressure cylinder against the pressure beam and alignment jig, first locating it laterally with respect to the jig so that the cylinder comes just about vertically below the draw chain. Then adjust the vertical position of the cylinder on the lever so that the lines of the draw chain and pressure cylinder, if extended, will intersect at the same point on the floor or will be almost parallel (see illustration).
4. Adjust chain lengths as necessary, prize apart the quick-release extension of the pressure cylinder, and wrap the safety chain one turn around the beam of the alignment jig.

Application of trueing-up tool

The draw chain and hydraulic cylinder must be placed so that the extended lines drawn through them intersect at the same point on the floor or are nearly parallel. There are then no free forces tending to lift the tool or the alignment jig.



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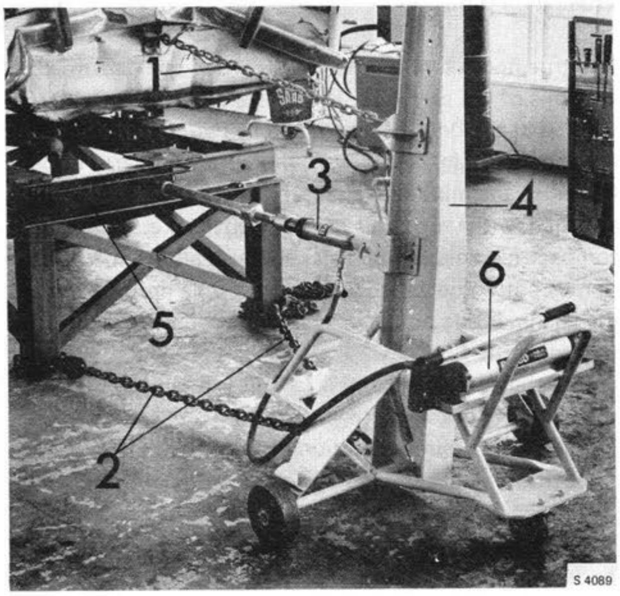
APPLICATION OF TRUEING-UP TOOL



TRUEING-UP TOOL

1. Draw chain
2. Anchor chain
3. Pressure cylinder
4. Lever
5. Pressure beam
6. Hand pump

Hoisting gear, etc.

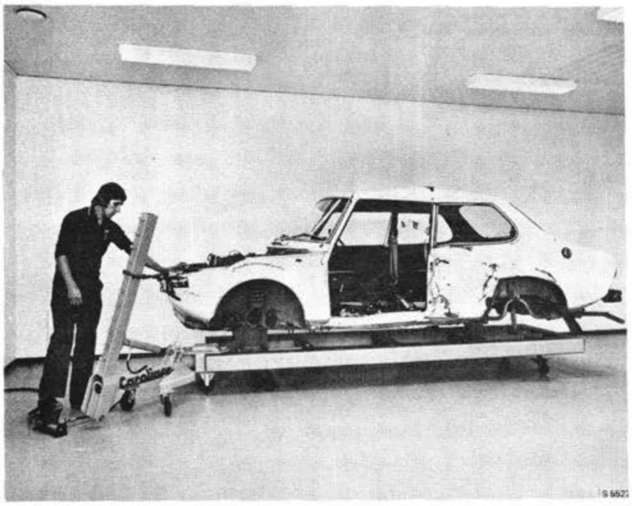
Before the alignment jig can be used, the car body or complete car must be lifted on to it. The best method is to use a fork-lift trolley or overhead traveling crane. If these are not available, the job can be done with a high-lift garage jack and a mobile collapsible trestle set consisting of four legs on wheels and two cross-pieces. The trestles can also be used for assembly and disassembly work on chassis, etc. and for blocking up and moving cars with the wheels off.
The procedure for mounting the car body on the jig is as follows:
Place the cross-piece on the jack and then push the latter under the car from the side at the rear edge of the threshold. Raise the rear of the car so that the legs can be fitted to the cross-piece. Then repeat the same procedure at the front. The car can then be maneuvered over the jig with the trestle legs straddling the jig and lowered into position with the jack.
A suitable bench or platform about 450–600 mm (1 1/2–2 ft.) high should be available for work on the roof of the car or upper parts of the body.

Description of alignment jig and trueing-up tool

A description of the alignment jig and accessories and trueing-up tool is available and can be ordered from Saab-Scania in Nyköping under the ordering number 101733.

Alignment jig, later version

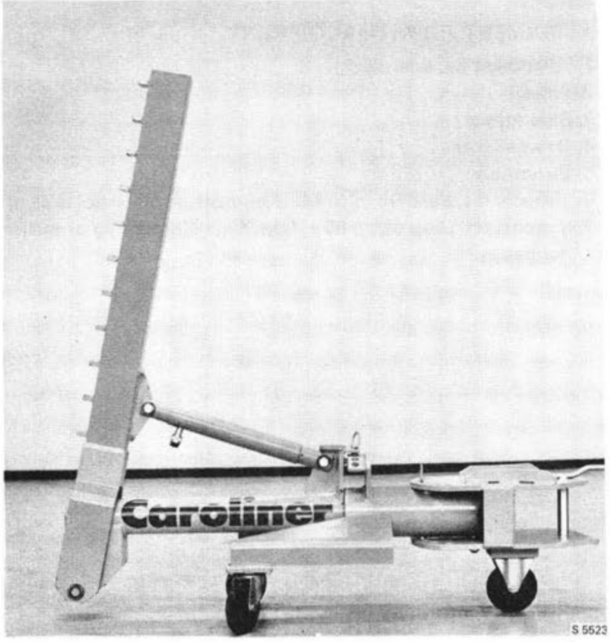
The alignment jig of the later version has the same clamp sets as the earlier jig, but is lower, providing a more favourable working height and simplifying mounting. The draw aligner is secured directly to the jig, which makes it easier to work with.
The jig is mounted on 4 castors and is designed to stand on these even during the aligning work.



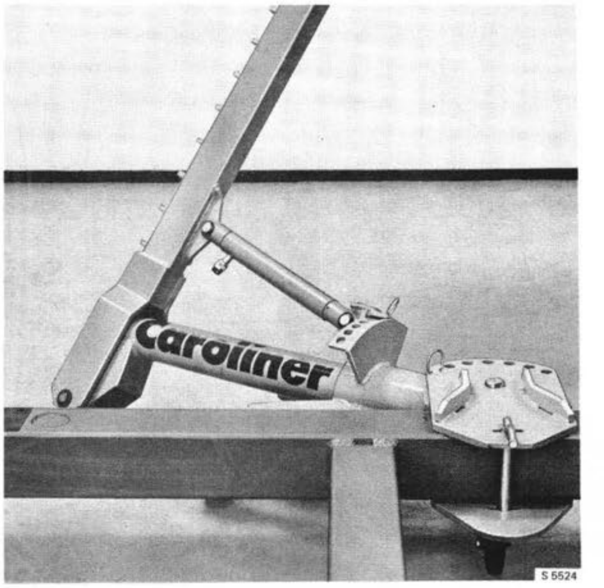
ALIGNMENT JIG

Draw aligner, later version

The Caroliner draw aligner, in a version designed specially for this alignment jig, is equipped with a hydraulic cylinder which can apply a load of ten tons. The draw aligner is mounted on castors and can be secured at any point round the frame of the jig. It is secured to the jig by means of a forked bracket and a locking pin. It is of the utmost importance that this always be locked securely during operation of the draw aligner.



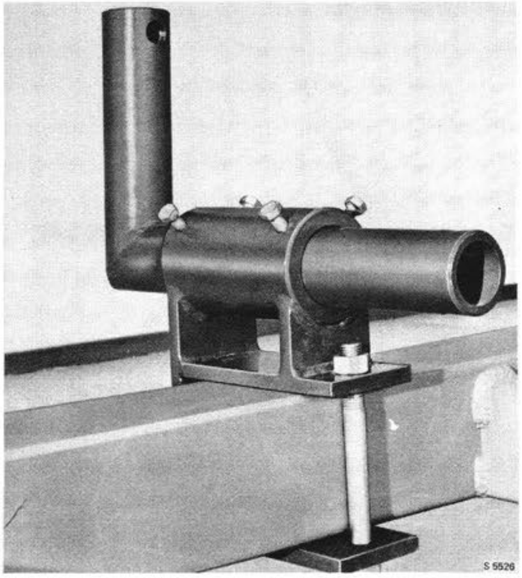
DRAW ALIGNER, LATER VERSION



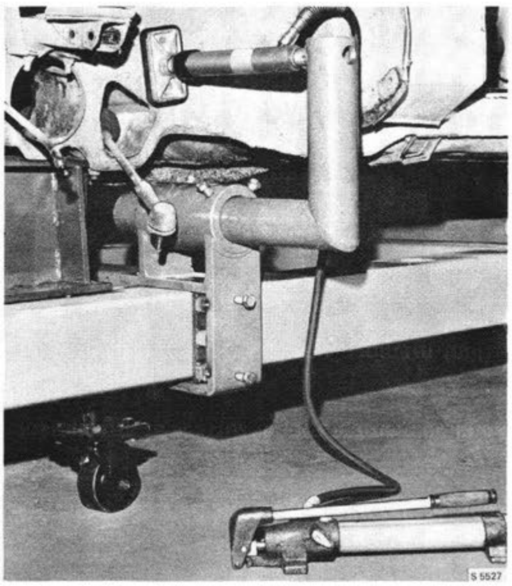
DRAW ALIGNER, LATER VERSION

EXTENSION PIECE MOUNTED TO DRAW-ALIGNER ARM FOR THE APPLICATION OF LOADS AT ROOF HEIGHT

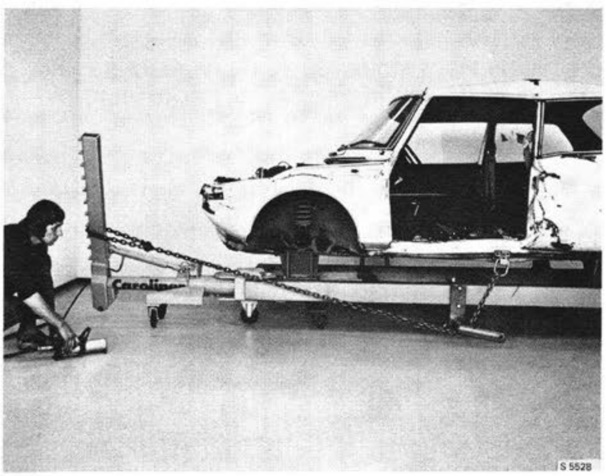
Equipment, later design



SIDE SUPPORT

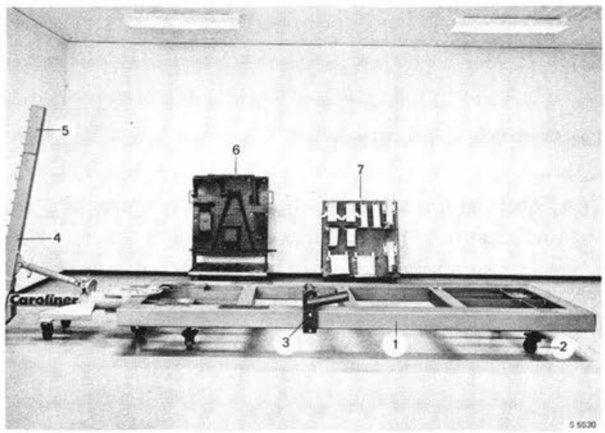


SIDE MOUNTING FOR USE WITH A 4-TON HYDRAULIC CYLINDER



SIDE MOUNTING USED FOR APPLICATION OF DOWNWARD LOAD

LOADS MAY BE APPLIED IN AN UPWARD DIRECTION BY MEANS OF AN ADDITIONAL HYDRAULIC CYLINDER AND AN EXTENSION PIECE

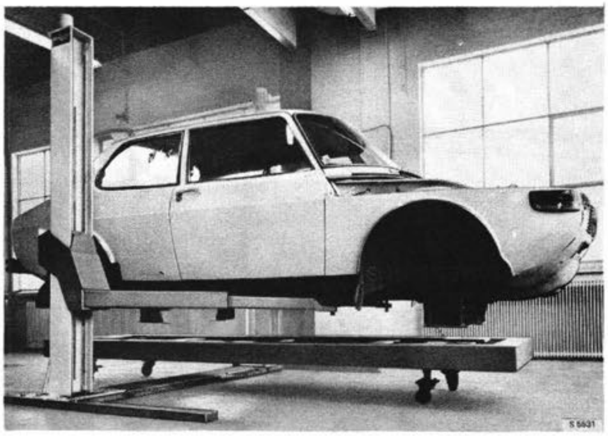


ALIGNMENT JIG WITH EQUIPMENT

1. Alignment jig, later design
2. Wheels
3. Side support
4. Draw aligner
5. Extension
6. Support set, Saab 99 (also for alignment jig of earlier design)
7. Support set, Saab 95 L, 96 L (also for alignment jig of earlier design

Mounting the car in the jig

The simplest method of mounting the car in the jig is to use a side car lifting ramp with one or two pillars.



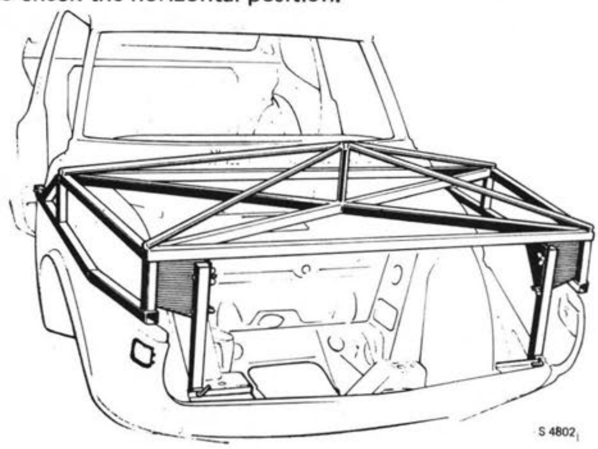
MOUNTING THE CAR IN THE JIG

The car can also be mounted in the jig by hoisting it onto high trestles by means of a high-lift jack, and then rolling the jig in under the car. A side lifting ramp should then be used to lift the car onto the jig mountings.

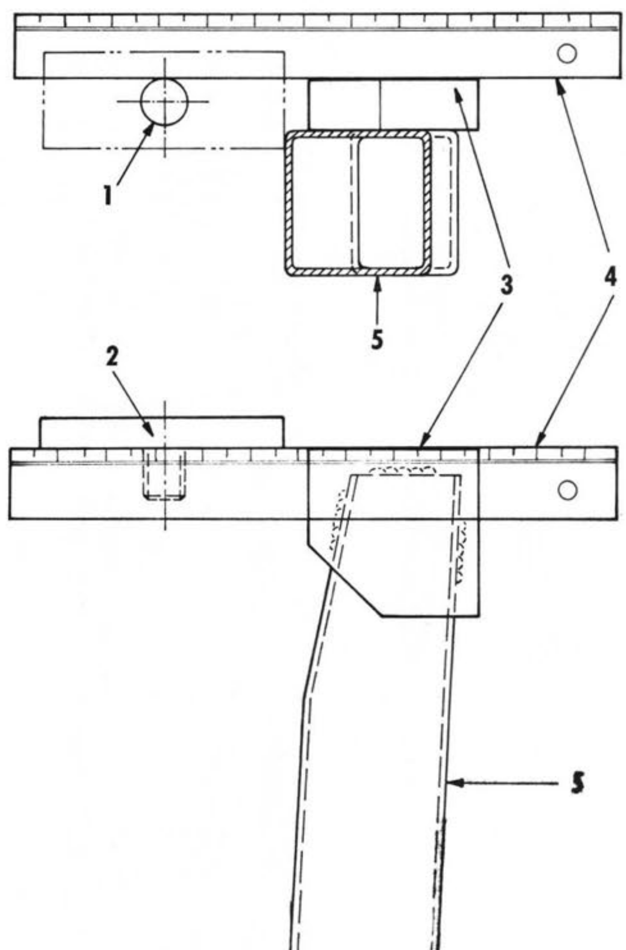
LIFT WITH TRESTLES AND JACK

Front fender fixture

Front fender fixture 8290637 is intended for checking and location of the front fender in connection with collision damage repairs.
Figure 1 illustrates how it is used.
The fixture also has location studs for the purpose of checking the position of the top hinge attachment in the windshield post. A ruler is first placed as shown in Fig. 2 to check the vertical position, and then is shown in Fig. 3 to check the horizontal position.



FRONT FENDER FIXTURE, FIG. 1

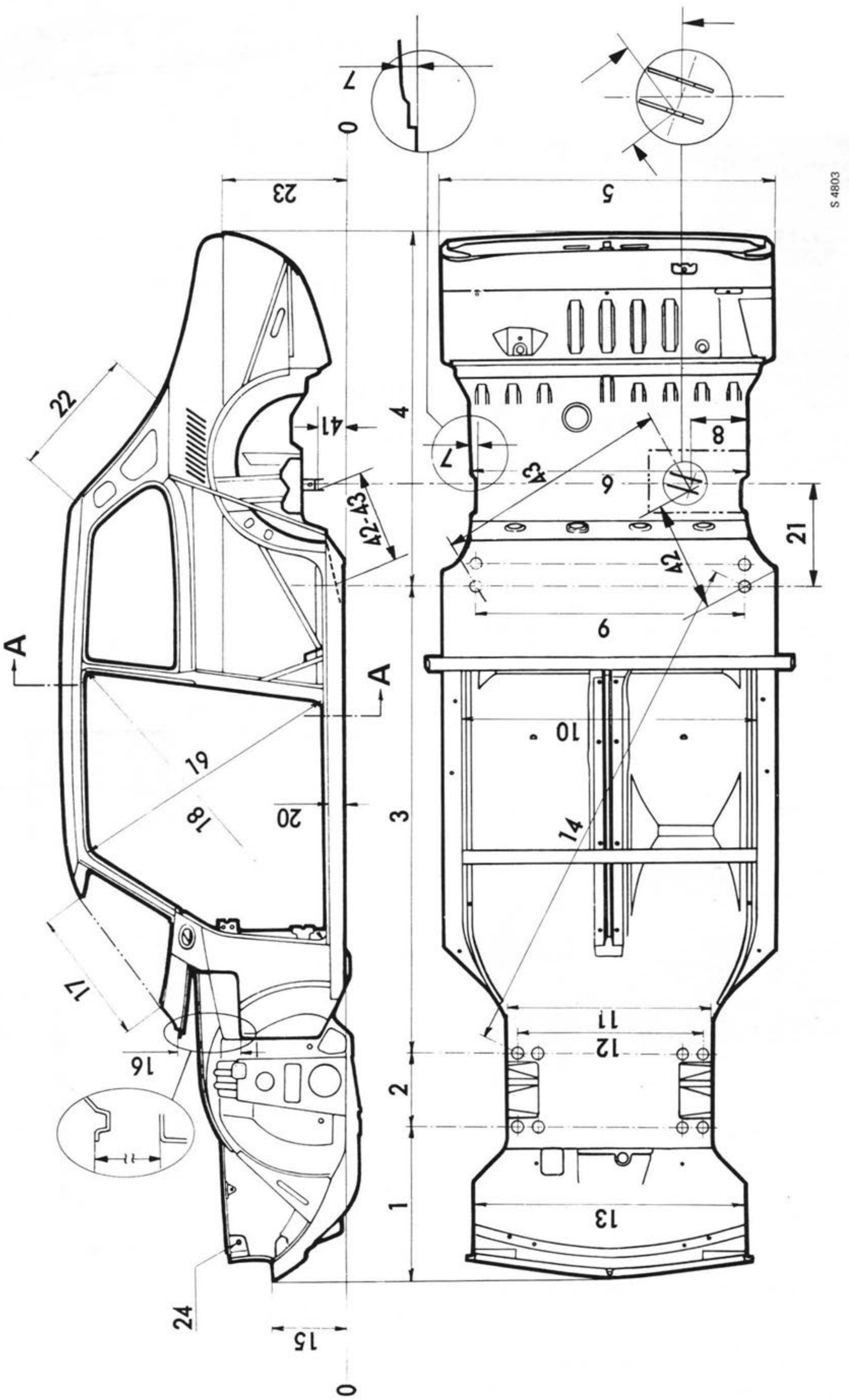


FRONT FENDER FIXTURE, FIG. 2 AND 3

1. Hinge screw
2. Plate nut for hinge screw
3. Locating stud
4. Ruler
5. Front fender fixture 8290637

CHECKING BODY DIMENSIONS

If any part of the body has had to be renewed or straightened, it is important to check the measurements of the door openings and the attachment points of the suspension and power unit. Diagonal measurements should also be made to check that there is no residual skew or asymmetry after repairs.

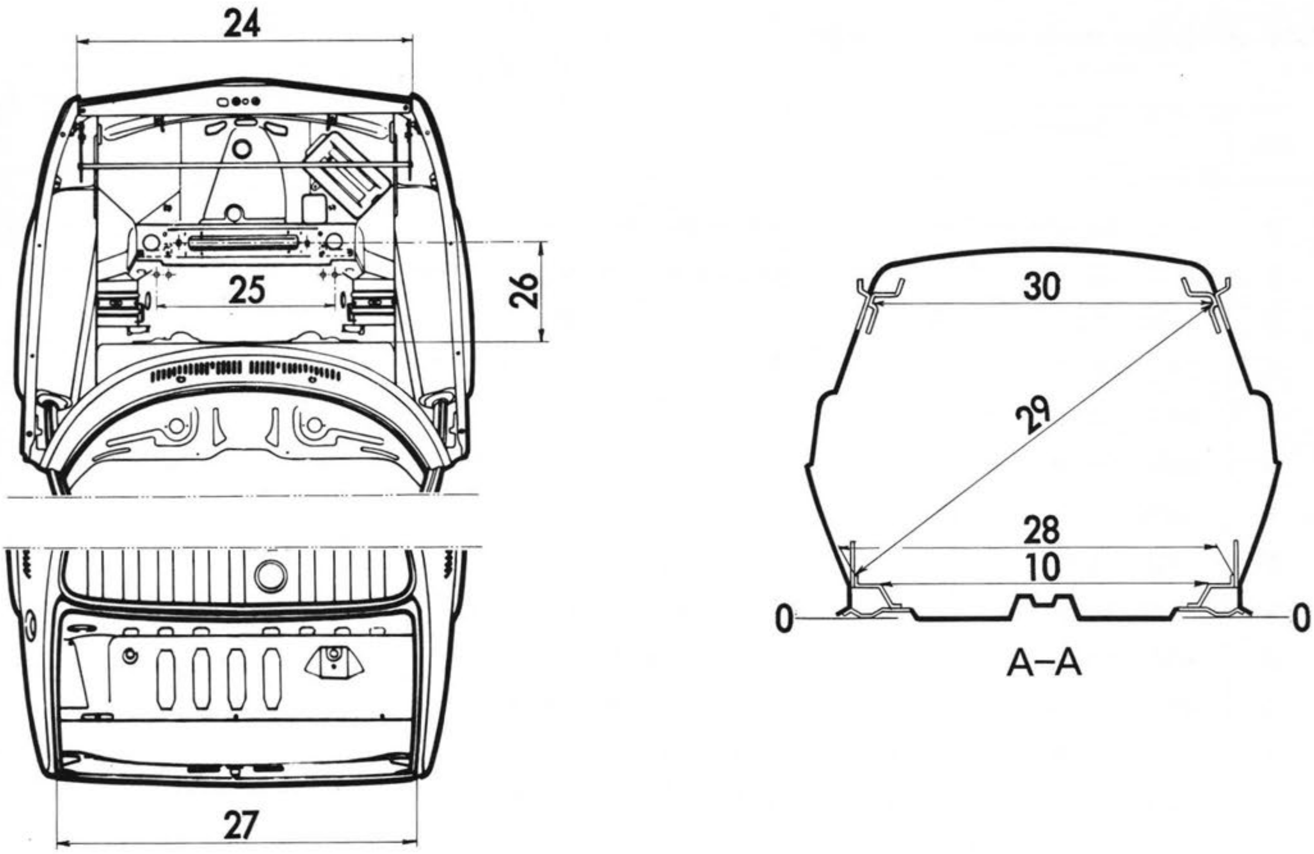


SAAB

Dimension data (see also drawings on next page)

Ref.	Measurements in.		mm		Measurement points
0	Horizontal reference line				Underside of scuff plate
1	24.6	± 0.12	625	± 3	Centerline – forward hole[1], control arm
2	10.61	± 0.04	269.6	± 1	Forward hole[1] – rear hole[1]
3	74.1	± 0.08	1883	± 2	Rear hole[1], front – forward hole[1], rear
4	55.9	± 0.16	1421	± 4	Front hole[1] – centerline
5	52.8	± 0.12	1340	± 3	Rear floor
6	44.00	± 0.12	1117.5	± 3	Rear floor
7	1.3	± 0.06	33	± 1.5	Recess, rear floor
8	6.46	± 0.08	164	± 2	Hole[1], spring linkage – hole centerline in the middle between the holes
9	41.7	± 0.12	1060	± 3	Hole[1], spring linkages
10	46.5	± 0.16	1180	± 4	Scuff plate, inside top edge
11	32.2	± 0.08	817	± 2	Front floor
12	30.7	± 0.08	779	± 2	Outer holes[1], control arms
13	43.3	± 0.12	1100	± 3	Front floor
14	82.5	± 0.12	2096	± 3	Diagonal, rear outer hole[1], control arm – forward hole, spring linkage
15	12.30	± 0.12	312.5	± 3	Horizontal reference line – front floor upper surface on centerline
16	9.34	± 0.12	236.9	± 3	Dash panel – windshield member, top front on centerline
17	21.48	± 0.12	545.5	± 3	Surface of glass down centerline
18	57.3[2]	± 0.24	1457[2]	± 6	Diagonal, door frame
19	47.1[2]	± 0.74	1197[2]	± 6	Diagonal, door frame
21	16.40	± 0.12	416.5	± 3	Forward hole[1], spring linkage – side member on centerline
22	23.5	± 0.12	596	± 3	Surface on glass down centerline
23	20.1	± 0.12	511	± 3	Horizontal reference line – rear floor, upper surface on centerline
24	49.6	± 0.12	1260	± 3	Holes[1] for hood attachment
25	26.67	± 0.12	677.5	± 3	Top forward attachment points of upper control arm
27	50.7	± 0.12	1288	± 3	Rear floor, upper surface
28	52.6	± 0.16	1336	± 4	Scuff plate, inside top edge
29	62.4	± 0.12	1585	± 3	Diagonal, bottom of roof side member – inside outer edge of scuff plate
30	46.6	± 0.08 0.24	1170	± 2 6	Side member, bottom edge
41	43.3	± 0.08	136	± 2	Horizontal reference line – hole[1] side member
42	17.7	± 0.12	448	± 3	Forward hole[1], spring linkage V – forward hole[1], side member attachment
43	38.8	± 0.12	986.6	± 3	Forward hole[1], spring linkage H – forward hole[1], side member attachment

[1] Center of hole.
[2] Tolerance to give best door fit.



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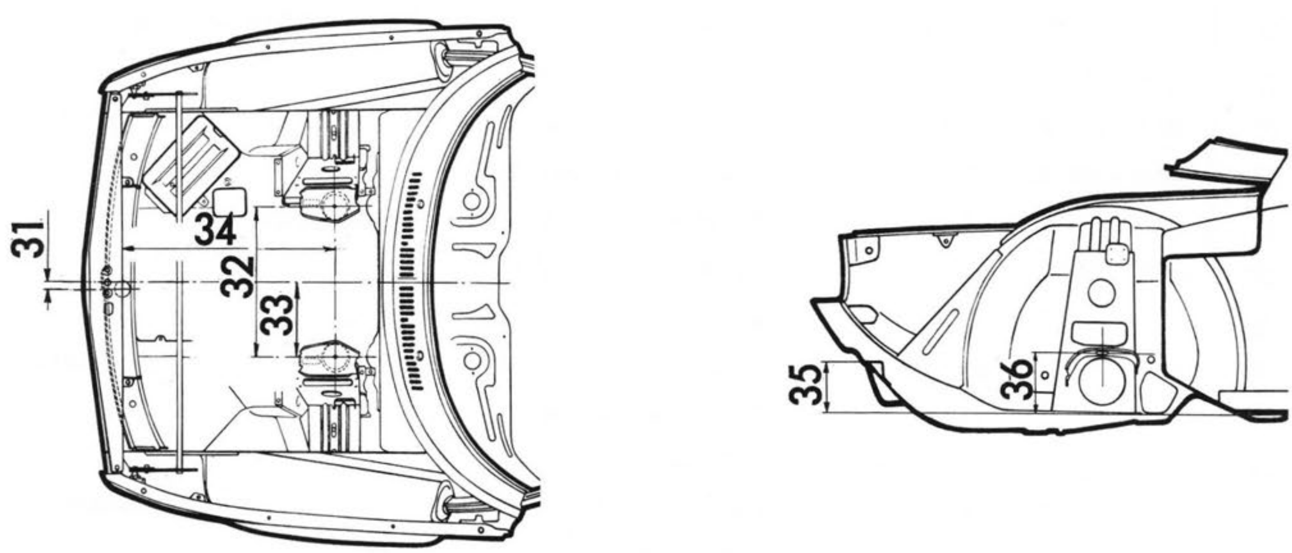
REFERENCE DATA FOR CHECKING BODY DIMENSIONS

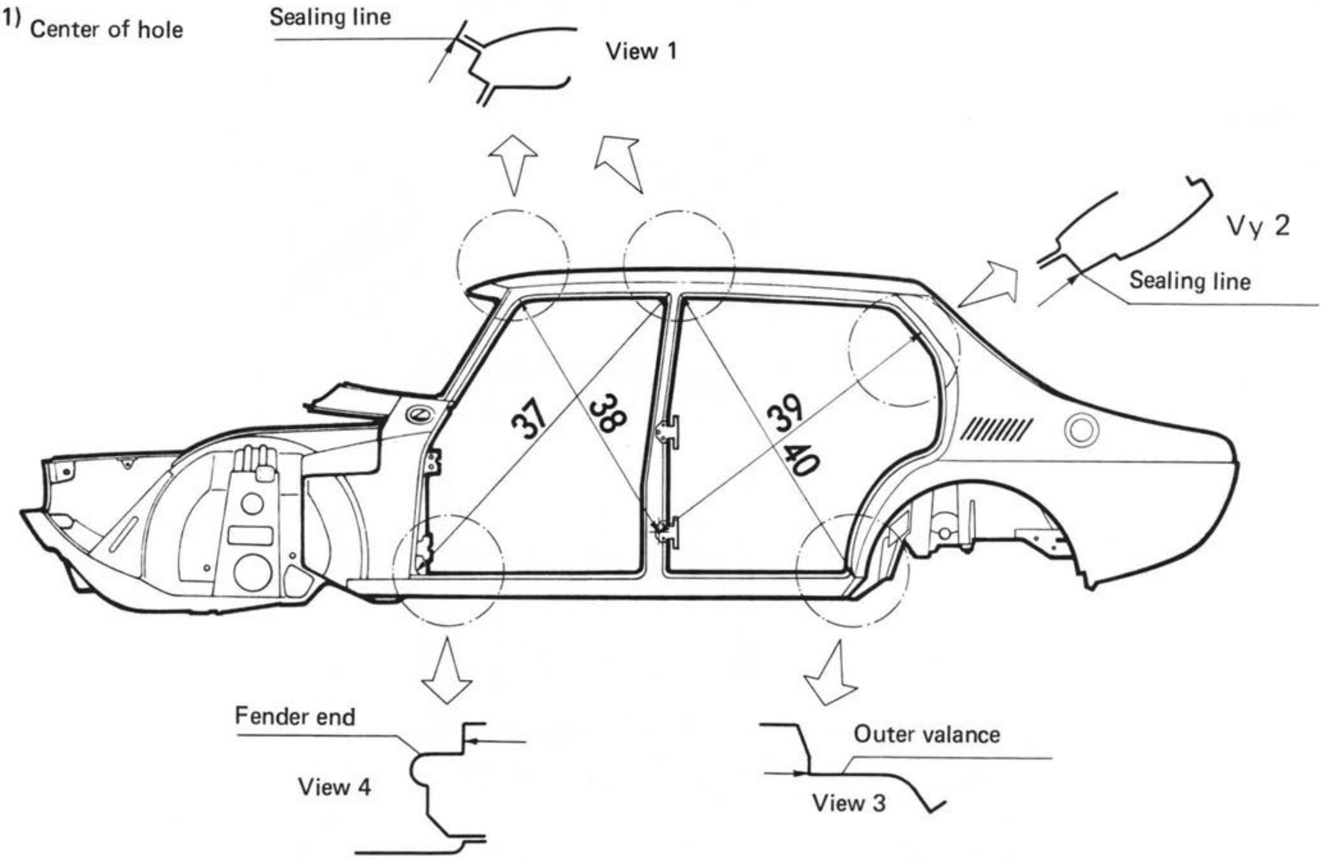


ENGINE SUSPENSION

Engine suspension

Ref.	Measurements in.		mm		Measurement points
31	1.2	±0.08	30	± 2	Centerline – hole[1], forward engine attachment point
32	20.3	±0.12	516	± 3	Holes[1], rear engine attachment points
33	10.2	±0.08	258	± 2	Hole[1], rear engine attachment point – centerline
34	27.1	±0.12	687	± 3	Hole[1], forward engine attachment point – centerline between holes, rear engine attachment points
35	5.6	±0.12	143	± 3	Horizontal reference line – engine member, upper surface at attachment point
36	6.6	±0.12	167	± 3	Horizontal reference line – floor member, upper surface at attachment point

1) Center of hole



VARIANT DIMENSIONS, 4–DOOR MODEL

Variant dimensions, 4-door model

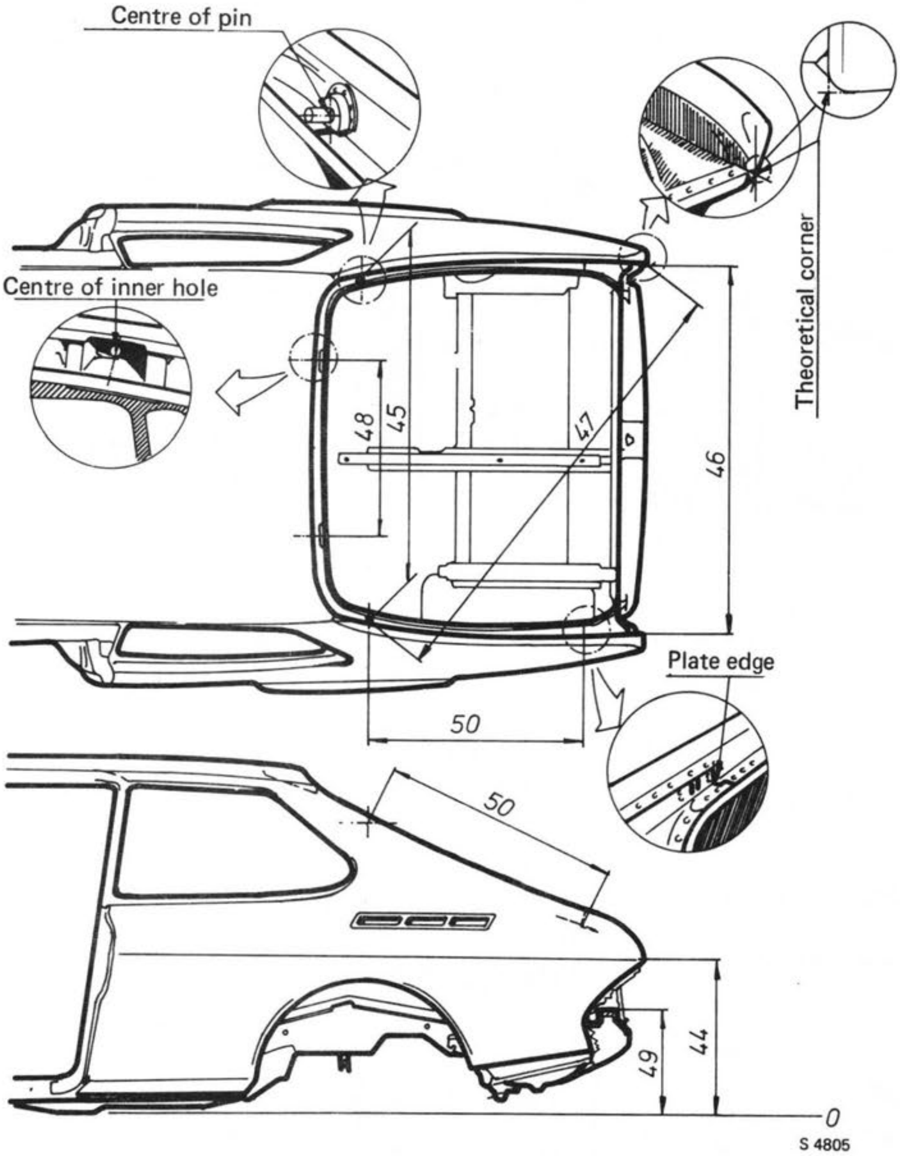
Ref.	Measurements in.	mm	Measurement points
37	51.5[2]	1307[2]	View 1 – View 4
38	38.2[2]	970[2]	View 1 – Forward hole[1], hinge
39	43.3[2]	1099[2]	View 2 – Forward hole[1], hinge
40	45.6[2]	1157[2]	View 1 – View 3

1) Center of hole
2) Tolerance to give best door fit

Deviations from the nominal body dimensions of the Saab 99 Combi Coupé

Ref.	Measurements in.	Measurements mm	Measurement points
44	19.8	504	Horizontal reference line – rear floor, upper surface on centre line
45	45.8	1164	Mounting of the pneumatic springs
46	48.8	1240	Width of door opening at the height of the rear floor, upper surface on centre line
47	64.1	1628	Diagonal, pneumatic spring mounting – rear edge of door opening at height of the rear floor, upper surface on centre line
48	23.62	600	Centre of hinge pin[1)]
49	11.81	300	Reference line – top of rear sill plate
50	33.1	840	Pneumatic spring mounting – plate edge in the door gutter
51	59.0	1499	Front hole – rear edge of bolt line

[1)] Centre of hole



VARIANT DIMENSIONS, SAAB 99 COMBI COUPE

Mouldings and emblems

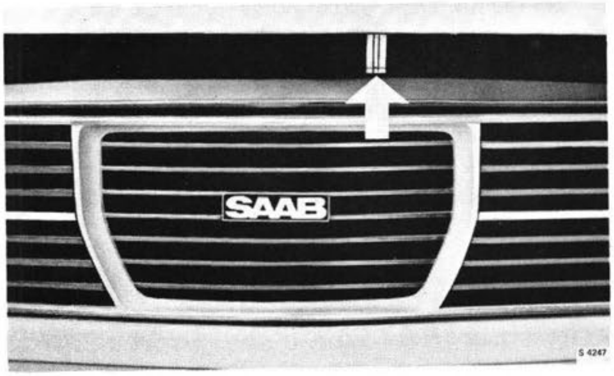
Before emblems or mouldings are to be mounted on the car, ensure that the bodywork is free from grease and dust. Clean the surface using a commercially pure petrol or equivalent cleaning agent. In conjunction with this work, the temperature inside the premises should not be below 65°F (18°C).
Remove the protective backing and press each item into position by hand.

HOOD, FRONT, FENDERS

HOOD

Removing

1. Pull the handle located under the instrument panel on the left-hand side. The hood will then spring open to the semi-locked position, retained by a safety catch under the front end.



HOOD SAFETY CATCH

2. Push the catch backward and swing the hood forward and up.
3. Disconnect the hose from the windshield washer pump.
4. If only the hood is to be exchanged, remove the two through screws from the top end of the hinges. If the front sheet assembly is also to be removed, undo the two lower hinge screws, after which the hood can be lifted off.

HOOD RETAINING SCREWS

LIFTING OFF THE HOOD

Mounting

Locate the hood in the open position and tighten the through screws. If the lower hinge screws have been removed, locate the hood with the retaining screws in the hinge slots. In the latter case the position of the hood must be adjusted before the retaining screws are finally tightened.

Adjusting

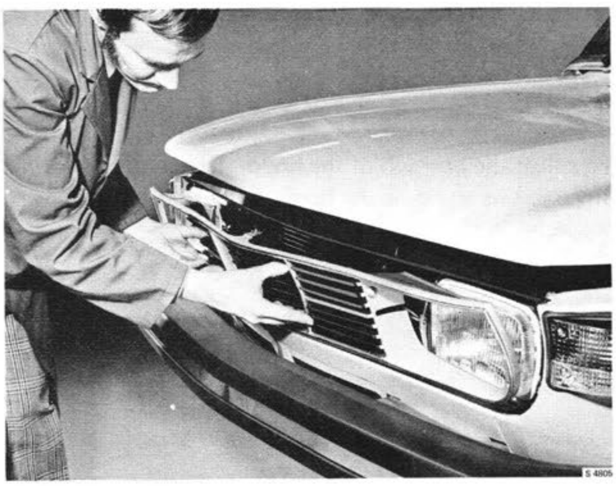
To adjust the position of the hood, slacken the two lower hinge screws and slide the hood in the slots until it fits properly on its seating.

Hood lock

The hood is fitted with a locking pin of adjustable length secured by a lock nut. This adjustment can be used to obtain the correct tension on the hood when it is locked. The lock assembly can be aligned with the pin mounted in the hood by slackening the two lock assembly retaining screws in the front member.
If anything goes wrong with the lock mechanism so that the hood cannot be opened from inside the car, proceed as follows: Insert a suitable tool through the grille immediately under the lock and push the mechanism control arm to the right; the hood can then be opened. Be careful not to damage the radiator.

GRILLE

The grille comprises three sections. The centre section comprises the radiator screening and the two outer sections surround the headlights. The three sections are removed and installed as one unit. The grille is retained by means of seven screws. One self-tapping screw, which is accessible from above, is located in the front member in front of the hood lock, and four screws are located in the edges of the radiator screening section and are accessible from the front. The other two screws, located outside the headlights, pass through spacers and screw into brass nuts which are vulcanized in rubber bushes.
The pipes to the headlight washers should also be disconnected.



REMOVING THE GRILLE

FRONT MEMBER

Removal and installation

1. Remove the hood.
2. Remove the grille.
3. Undo the self-tapping screws that secure the headlights to the front member and the screws at the top outer corners of the front member.
4. Undo the screw joint that secure the front member to the front floor on both sides of the radiator.
5. Undo the radiator retaining screws.
6. Disconnect the hood lock release wire and disconnect the headlight washer hoses from their attachment points on the front member. Lift the front member away slightly to reach the ball joint of the wiper mechanism and take it apart. The front member can then be removed.

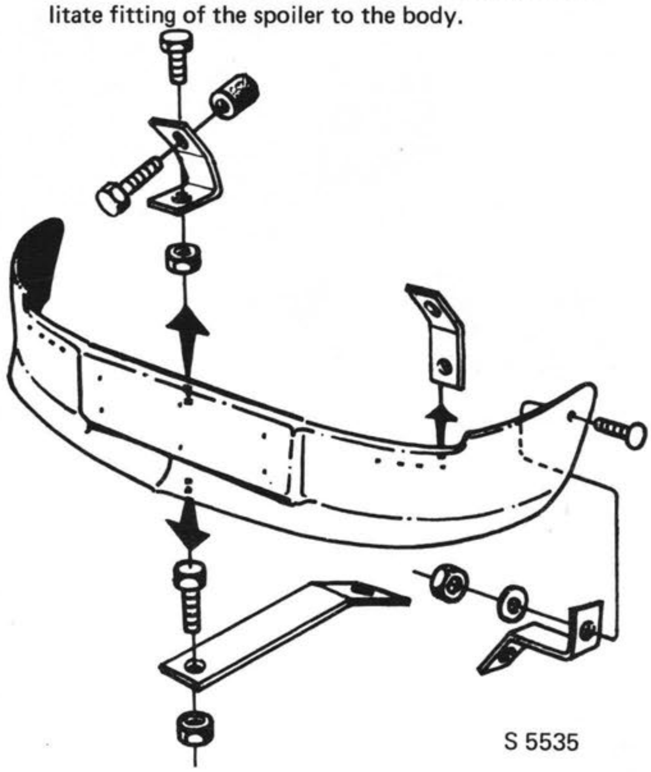
Installation is made in the reverse order.

SPOILER

As from chassis Nos. 99762018780, 99766007925 and 99767003176, front spoilers are supplied with Saab 99 EMS cars. For transportation reasons, the spoilers are supplied loose with the car, together with an assembly kit. The spoiler should be fitted in conjunction with the delivery inspection and the following procedure should be followed.

Fitting

1. Screw the mountings included in the assembly kit to the spoiler. Lightly tighten the screws. There should be a certain amount of play in the mountings to facilitate fitting of the spoiler to the body.



SPOILER WITH MOUNTING

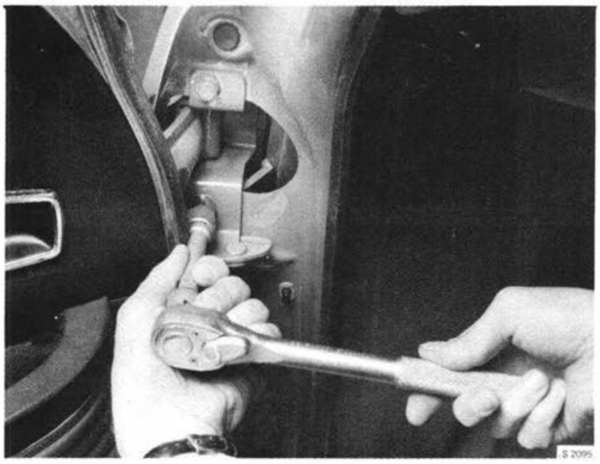
2. There are five pre-drilled holes in the body for the expanding rubber nuts. The nuts should be fitted with the rubber flange outwards. Place the spoiler in position and then bolt it to the rubber nuts.
3. Undo the front, centre screw in the cover plate under the engine then use the same screw to secure the lower support of the spoiler.
4. Check that the spoiler is positioned correctly in relation to the bumper and body. It may prove necessary to adjust the position of the horn and/or the towing lug. Finally, tighten all screws.
5. Fit the number plate to the intended place on the spoiler.

DOORS AND LIDS

REMOVING AND FITTING OF DOORS

Front door, 2-door and 4-door models

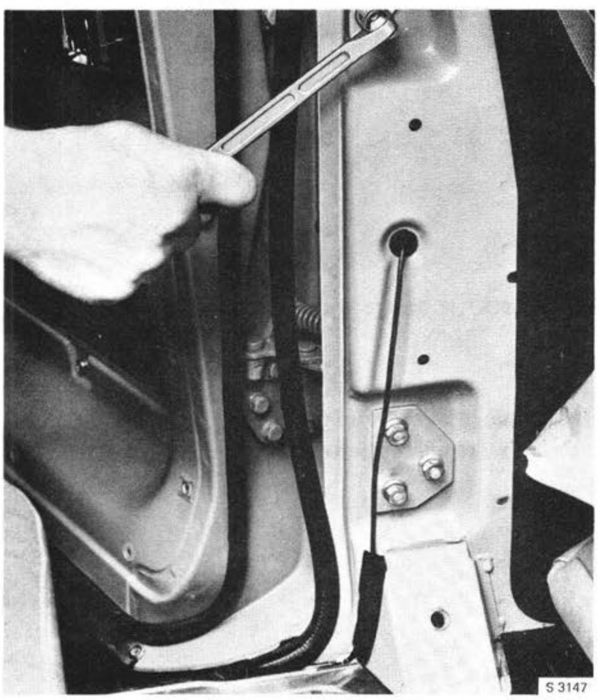
To remove the door, undo the six screws fastening the hinges to the body. The door can then be taken out complete with hinges.
Hang the door in the reverse order.



UNSCREWING THE DOOR HINGES

Rear door, 4-door model

To remove the rear door, pull avay the trim from the bottom of the door pillar and unscrew the nuts on the through bolts.

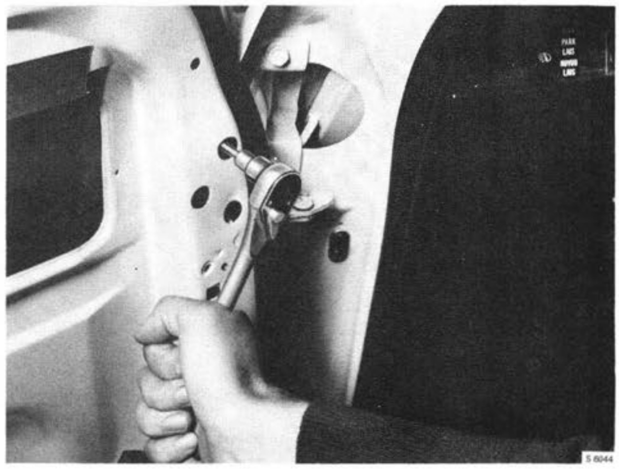


REMOVING REAR DOOR, 4-DOOR MODEL

ADJUSTING OF DOORS

Front door, 2-door and 4-door models

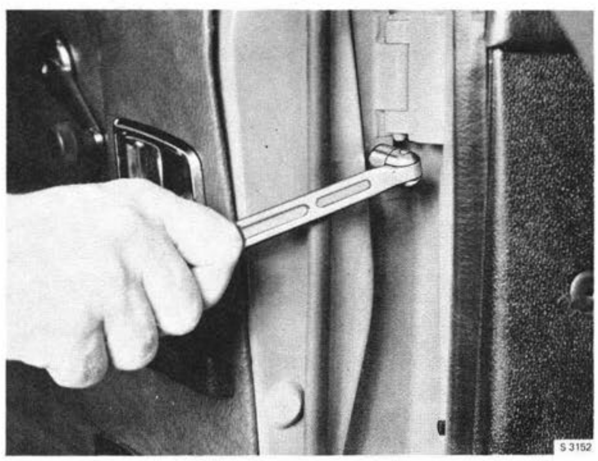
To adjust the flush fit of a door, slacken the hinge screws on the body side. The door can then be moved outward or inward on the slotted holes in the hinges. To adjust the position of the door upward, downward, forward or backward, slacken the hinge screws in the door. These screws can be reached if the inside door trim is removed.
Use the sleeve with Higrip no. 8. (An Allen key can also be used but it grips less well).



ADJUSTING VERTICAL AND FRONT- AND-REAR FIT OF FRONT DOOR

Rear door, 4-door model

The flush fit and vertical position of the door can be adjusted after that the hinge screws on the door jamb side have been slackened. The door can also be adjusted slightly if the nuts on the hinge bolts through the door pillar are slackened. These nuts can be reached if the trim is removed from the bottom of the door pillar.

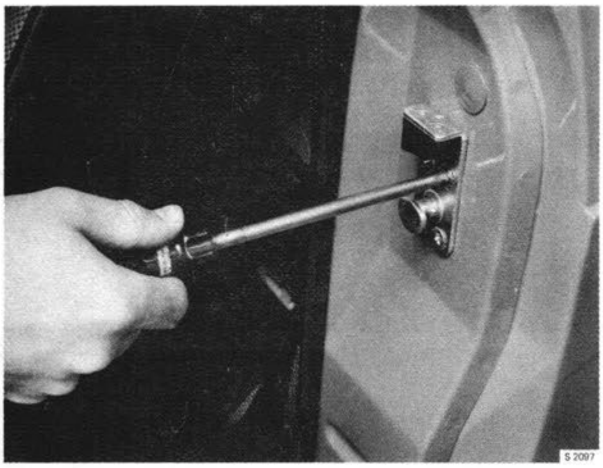


ADJUSTING VERTICAL AND FLUSH FIT OF REAR DOOR

ADJUSTING DOOR STRIKER PLATES

2-door and 4-door models

The striker plate is adjustable and can be moved if the retaining screws are slackened. Adjust the plate so that it does not force the door either upward or downward. Check at the same time that the door opens and closes easily.

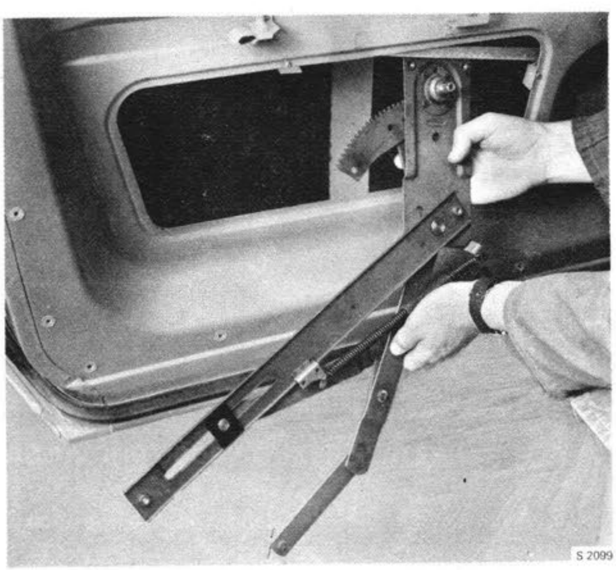


ADJUSTING THE STRIKER PLATE

REMOVING AND FITTING WINDOW REGULATORS

Front doors, 2-door and 4-door models

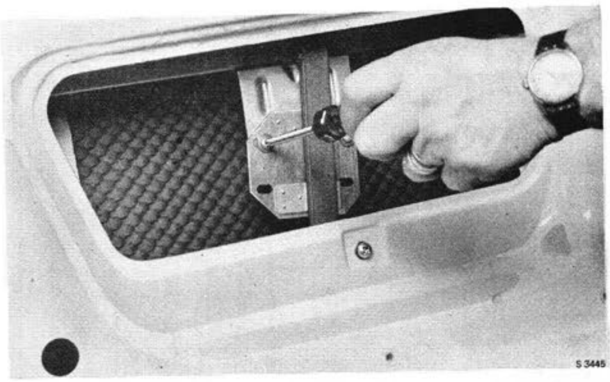
Remove the door trim and the window. Undo the four screws fastening the window regulator to the door and lift out the regulator.
Fitting is made in the reverse order.



REMOVING THE WINDOW REGULATOR

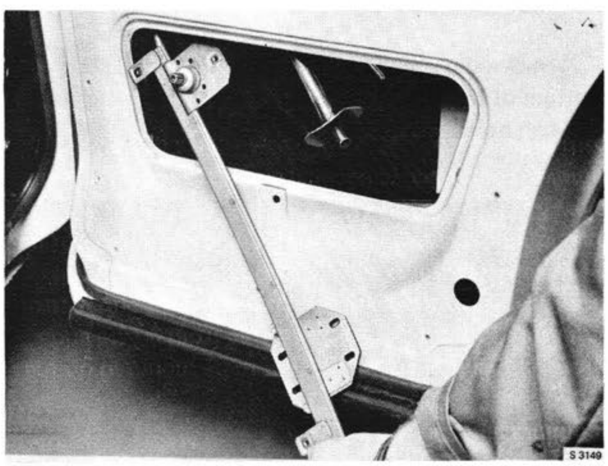
Rear door, 4-door model

1. Crank the window right down and remove the inside door trim.
2. Undo the regulator retaining screws at the crank pivot and the bottom of the door frame.
3. Remove the screws from the window retainer. Save nuts and washers. (On later versions the nuts are welded to the retainer.)



REMOVING SCREWS FROM THE WINDOW RETAINER

4. Pull the window regulator down and out, taking care not to scratch the window pane.



REMOVING THE REAR-DOOR WINDOW REGULATOR

Reassemble in the reverse order. Check the operation of the window regulator before refitting the inside trim.

CHANGING DOOR LOCKS

2-door model

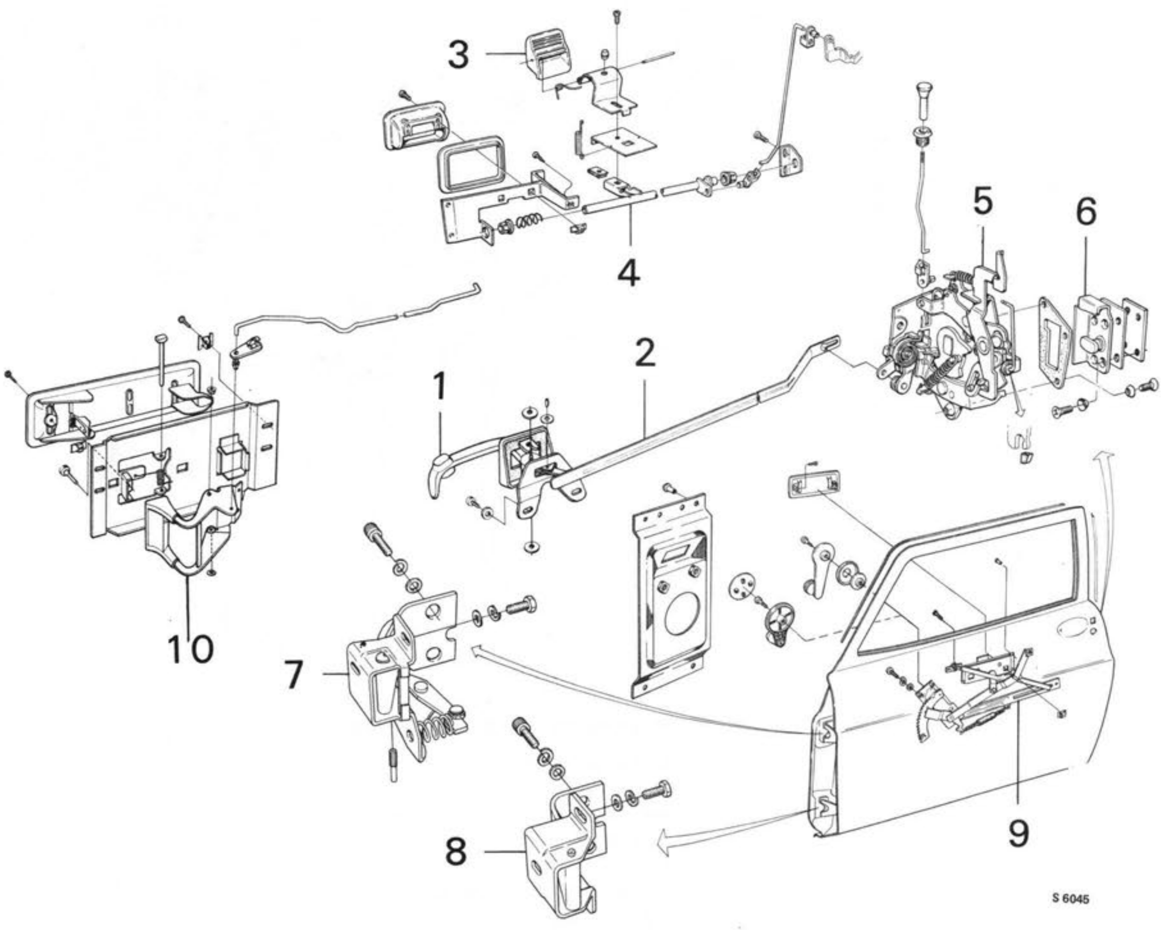
1. Crank the window all the way up.
2. Remove the lock button and the inside door trim.
3. Turn the lock mechanisms to the closed position and unscrew the three retaining screws from the lock.
4. Door lock with drawing rod operation: Unhook the rear part of the operating link on the door lock. Unfasten the link to the lock cylinder.
4. Door lock with angle rod operation: Unfasten the clip and unhook the link between the door lock and the angle rod.
5. Remove the lock. Back off the outer handle retaining screws slightly so that the handle can be wiggled when the mechanism is removed. One of the screws is inside the door and the other is on the rear edge of the door.
6. If necessary, the outer door handle can be removed.

To fit handles and locks, proceed in the reverse order. Check before fitting that the moving parts and springs of the lock are well lubricated with Saab Special chassis grease.

Front door, 4-door model

1. Crank the window all the way up.
2. Remove the inside door trim.
3. Turn the lock mechanism to the closed position and unscrew the three retaining screws from the lock.
4. Unscrew the bottom of the rear runner so that it can be bent forward when the door is removed.
5. Unhook the operating link to the inside handle at the lock and remove the link to the lock button. Unfasten the link to the lock cylinder.
6. Remove the door lock.
7. If necessary, the outside door handle can be removed.

To fit handles and locks, proceed in the reverse order. Check before fitting that the moving parts and springs of the lock are well lubricated with Saab Special chassis grease.



FRONT DOOR WITH COMPONENT PARTS

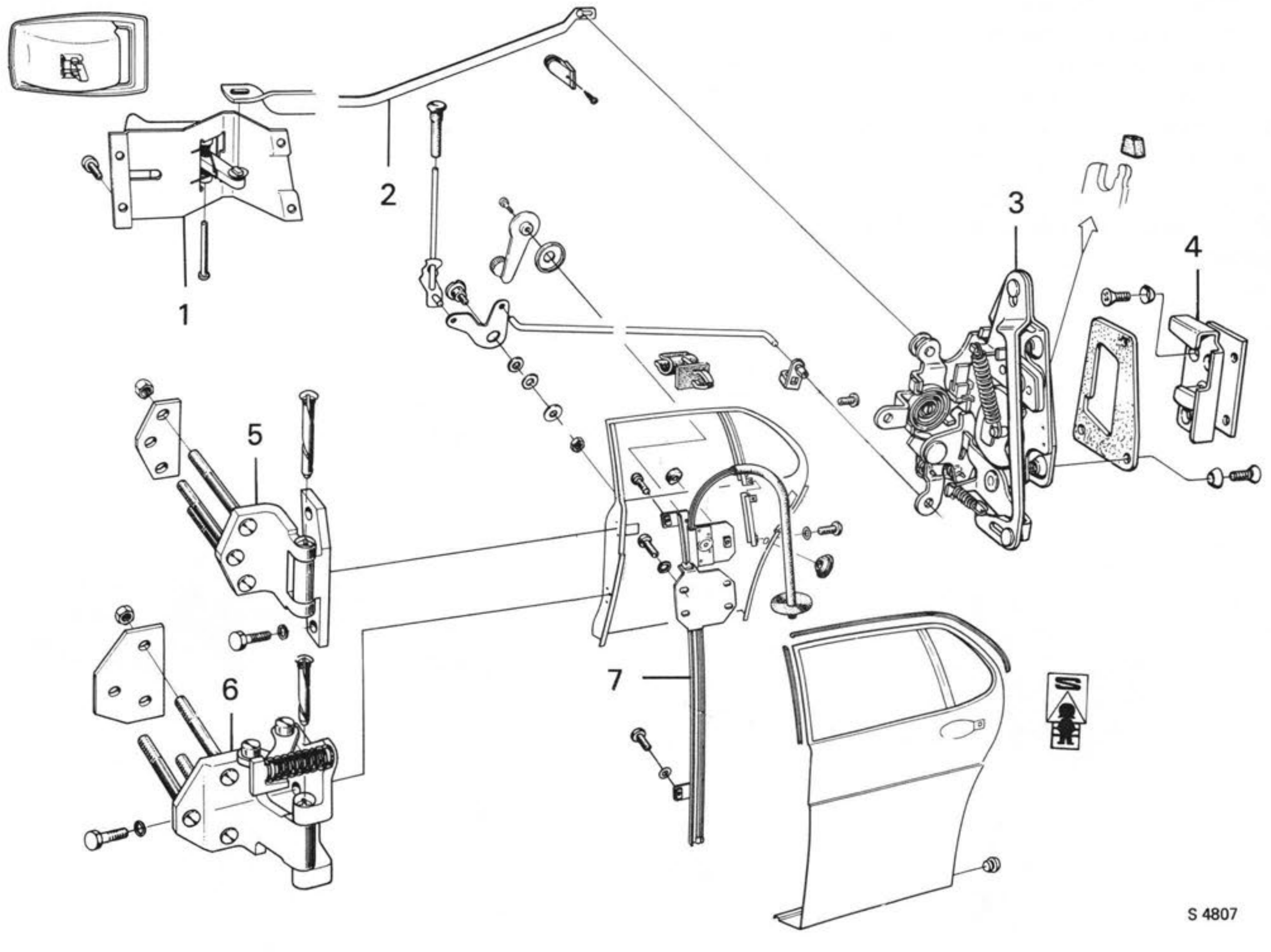
1. Inside door handle, Saab 99 (99 L) and 99 L (99 GL)
2. Operating link, Saab 99 (99 L) and 99 L (99 GL)
3. Inside door handle, Saab 99 EMS and 99 Combi Coupé
4. Angle rod, Saab 99 EMS and 99 Combi Coupé
5. Door lock
6. Striker plate
7. Top hinge with door stop
8. Bottom hinge
9. Window regulator
10. Inside door handle, Saab 99 EMS as from model 1978

Rear door, 4-door model

The rear doors of the 4-door model are provided with safety catches to prevent that the doors unintended are opened from the inside by, for example children.

1. Crank the window all the way up.
2. Remove the inside door trim.
3. Turn the lock mechanism to the closed position and unscrew the three retaining screws from the lock.
4. Unhook the link to the lock button on the door lock.
5. Unfasten the outer handle by removing the forward screw inside the door and back off the rear screw behind the weather-strip on the edge of the door halfway.
6. Unscrew the inside door handle and unhook the front end of the operating link.
7. Push the lock into the door frame and unhook the operating link at the lock. The lock can now be removed.
   The outer handle must be wiggeld slightly when the lock is removed.
8. If necessary, the outer door handle can be removed.

To fit handles and locks, proceed in the reverse order. Check before fitting that the moving parts and springs of the lock are well lubricated with Saab Special chassis grease.



REAR DOOR WITH COMPONENT PARTS

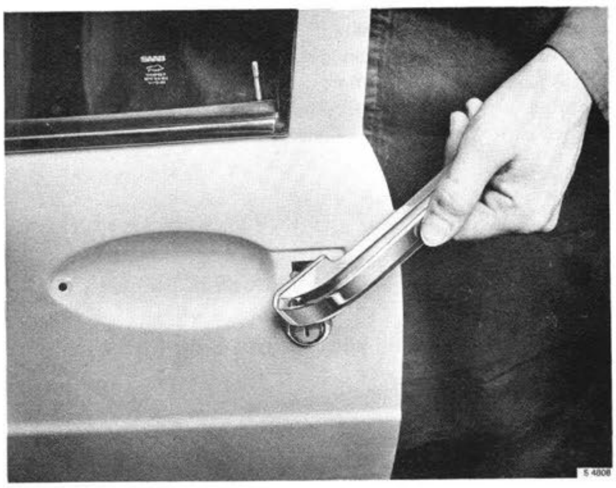
1. Inside door handle
2. Operating link
3. Door lock
4. Striker plate
5. Top hinge
6. Bottom hinge with door stop
7. Window regulator

DOOR HANDLE

There are two types of door handles, an earlier and a later version. The later version was introduced in early cars of model 1976.

Removal and installation

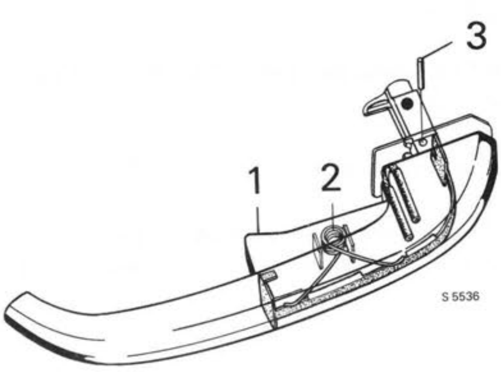
1. Remove the door trim.
2. Remove the front screw of the door handle inside the door. Back off the rear screw of the door handle (in door edge) about four turns.
3. Separate the handle from the door using tool **8995607** to draw the door lock lever to the side. Turn the handle and withdraw it diagonally upwards and towards the rear.



REMOVING DOOR HANDLE

Installation is carried out in the reverse order.

Dismantling and assembly, earlier design



DOOR HANDLE, EARLIER DESIGN

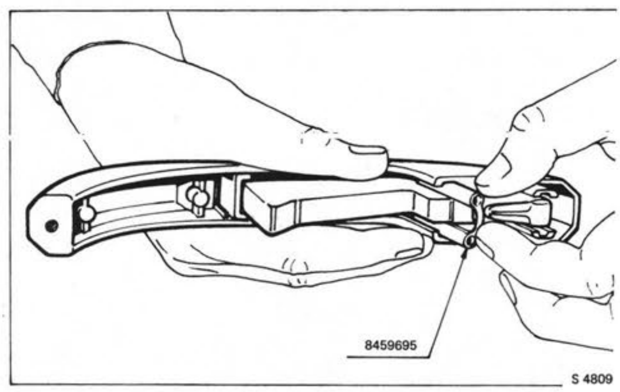
1. Manouvre part
2. Spring
3. Lock pin

Dismantling

Knock out the pin in the handle and remove the lever. Save the dust cover, return spring and the four balls.

Assembly

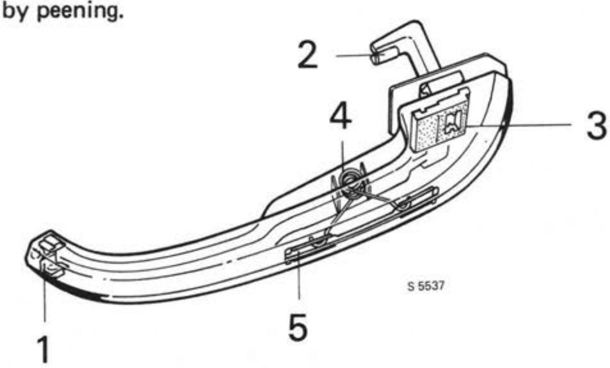
1. Mount the lever, return spring, balls and pin in the door handle.
   Before assembly, grease all springs and moving parts with chassis grease.
2. Fit the dust cover in the handle.



DUST COVER

Dismantling and assembly, later design

The manouvre part of the handle is kept in position by means of a plastic retainer, which is fixed to the handle by peening.



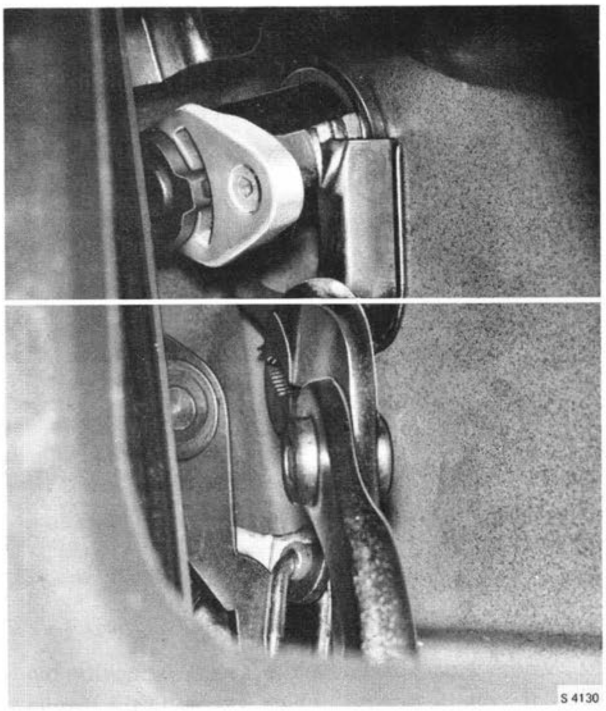
DOOR HANDLE, LATER DESIGN

1. Bearing
2. Slide pad
3. Guide
4. Spring
5. Spring guide

DOOR LOCK CYLINDER

Removing

1. Crank the window all the way up.
2. Remove the inside door trim.
3. Unhook the link rod from the plastic arm of the lock cylinder.
4. Remove the lock clip using polygrip pliers and remove the entire lock cylinder.



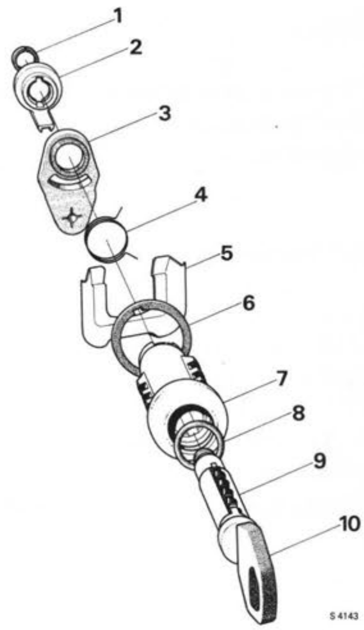
THE LOCK CLIP IS REMOVED

Disassembly and assembly

1. Pry off the driver and remove its lock ring.
2. Remove the plastic arm and the spring.
3. Withdraw the lock cylinder from the lock sleeve. Leave the key in the lock cylinder as long as it is withdrawn from the lock sleeve or the lock cylinder may fall apart.
4. Remove the O-ring.

> NOTE
> The key in the new lock cylinder must not be withdrawn before the lock cylinder is fitted in the lock sleeve.
> The lock ring should be changed after having been removed.

Re-assemble in reverse order.



DOOR LOCK

1. Lock ring
2. Driver
3. Plastic arm
4. Spring
5. Lock clip
6. Gasket
7. Locking sleeve
8. O-ring
9. Lock cylinder
10. Key

KEYS

Two keys are supplied with the car. Both fit the ignition switch and all locks.

SPARE PARTS

If the lock cylinder in the ignition switch, the trunk lock or any door is damaged, a replacement cylinder can be ordered by quoting the serial number of the key and the spare part number (see Spare Parts Catalogue). The system of master keys fitting all locks can thus be maintained without the need to fit a complete new set of locks to the car.

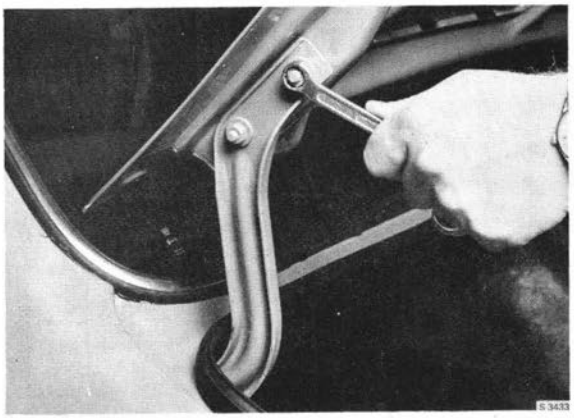
TRUNK LID, SAAB 99 (99 L), 99 L (99 GL, 99 GLE AND 99 EMS

Removal and installation

Open the lid and undo the four screws by which the lid is fastened to its hinges. The lid can then be lifted up.

Adjustment

The position of the trunk lid can be adjusted upward and downward or forward and backward by loosening and retightening the hinge screws in the oversized holes.



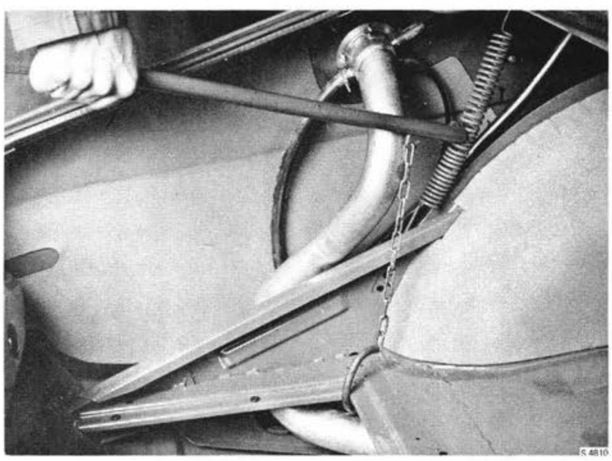
ADJUSTING THE TRUNK LID

Adjusting the striker plate

The striker plate is secured by screws in oversized holes and can be adjusted when the screws are loosened.

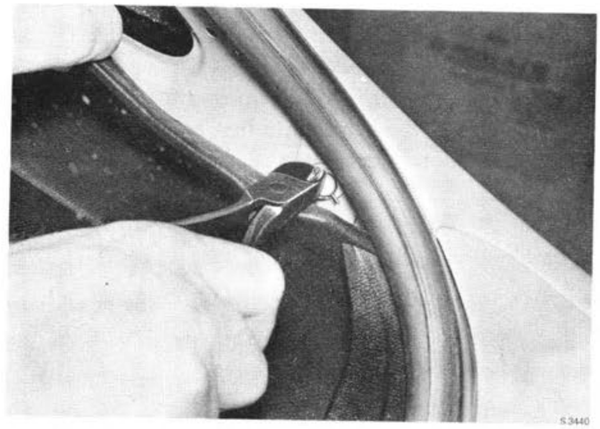
Changing the hinges

1. Remove the trunk lid.
2. Remove the hinge springs by means of tool 8291577. As from model 1976, the side trim must first be removed.



REMOVAL OF SPRING, TRUNK LID
Tool 8291577

3. Remove the side padding guards and remove lock pins and washers from the hinge pins. The hinges can now be removed.

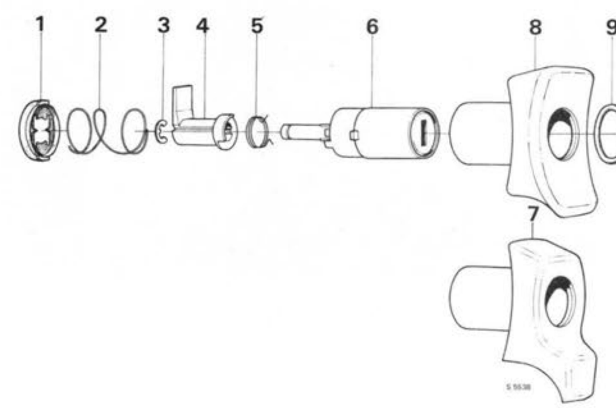


REMOVAL OF LOCK PINS

4. Fit the new hinges with new plastic bushings on the pins.
5. Install the springs at the hinges with the aid of tool 8291577.
6. Install and adjust the trunk lid.
7. As from model 1976, refit the side trim in the luggage compartment.

Changing the lock cylinder

1. Open the trunk lid and remove the lock mechanism by undoing the two retaining screws.
2. Undo the two screws securing the handle to the lid.
3. a. Pry the plastic disc loose with a suitable tool and remove the compression spring and push button from the handle.
   b. The driver and the torsion spring can be removed after the lock ring has been taken off.



TRUNK LOCK

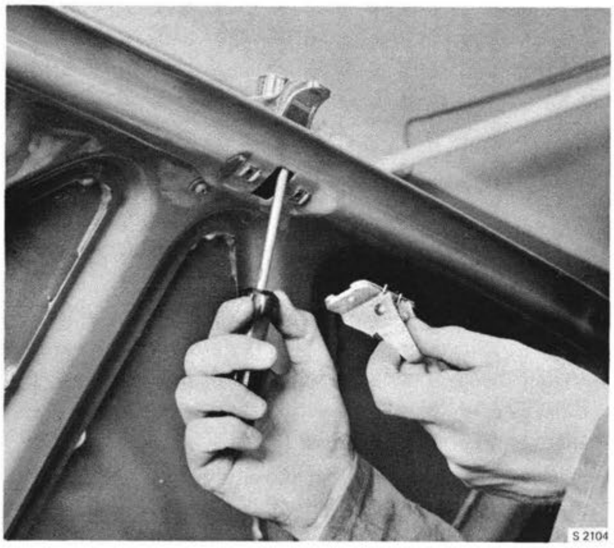
1. Plastic disc
2. Compression spring
3. Lock ring
4. Driver
5. Torsion spring
6. Push button sleeve with lock cylinder
7. Handle, up to and incl. model 1976
8. Handle, as from model 1977
9. O-ring

c. If the lock cylinder is withdrawn from the push button sleeve, the key must first be inserted in the lock cylinder so the cylinder does not fall apart.

Reassemble in reverse order.

NOTE

If the lock cylinder is to be removed from the push button sleeve, the key should first be inserted in the lock cylinder to prevent the latter from falling apart.



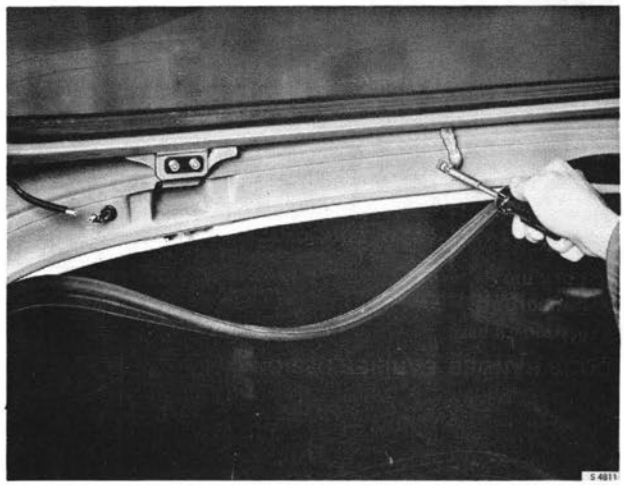
REMOVING THE LOCK FROM THE TRUNK LID

ADJUSTING THE STRIKER PLATE

LUGGAGE COMPARTMENT DOOR, SAAB 99 COMBI COUPE

Dismantling

1. Remove the cable clip and cut off the cable between the body and the door, and disconnect the main connection from the body.



DISCONNECTING THE MAIN CONNECTION

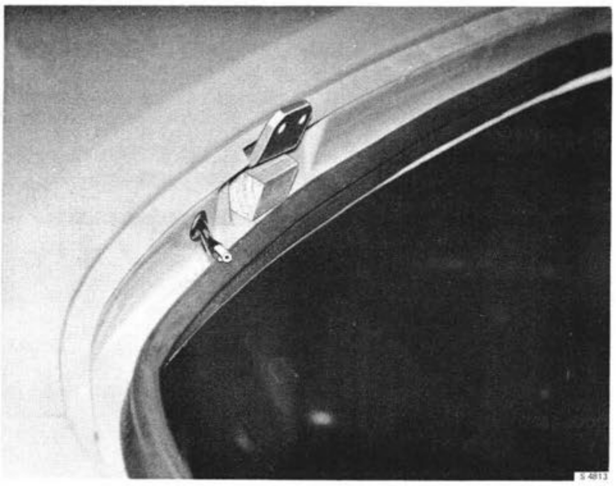
2. Mark the position of the door at the hinge mounting if the door is to be refitted, and back off the insex screws slightly.
3. Remove the two pneumatic springs and place a suitable support at the rear edge of the door.
4. Remove the insex screws and lift away the door with the aid of an assistant.

LIFTING OFF THE LUGGAGE COMPARTMENT DOOR

> NOTE
> The pneumatic springs must not be dismantled. The pressure in the spring is more than 60 bar (kp/cm^2, 850 psi.),which means that in the event of the lock ring being removed, the internal components will be forced out at a force sufficient to cause injury.

Fitting

1. Place suitable spacers under the hinge plates.



SPACERS UNDER THE HINGE PLATES

2. With the help of an assistant, lift the door and secure it to the hinges. Simplify the lift by placing a suitable support at the rear edge of the door.
3. Remove the spacers under the hinges before lowering the door.

> NOTE
> The pneumatic springs can be damaged if they remain fitted to the body and if the door is closed without the springs being secured to the door.

4. Adjust the fit of the door at the hinges, and if necessary, adjust the lock mechanism.
5. Fit the pneumatic springs.
6. Connect the electric cable by means of joint sleeves and insulate the joint with black insulating tape. Clamp the table to the body. Connect the main connection.

DOOR LOCK CYLINDER

Removal

1. Remove the trim from the inside of the door.
2. Unhook the link rod from the arm of the lock cylinder.
3. Remove the two lock cylinder retaining screws from the inside of the trunk door and remove the complete cylinder.

Install in the reverse order.

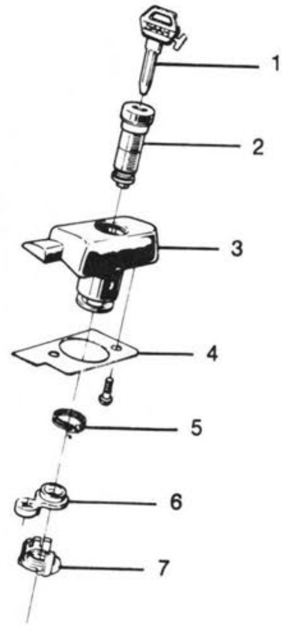
Dismantling and assembly

1. Insert the key in the lock cylinder.
2. Pry off the driver and remove the circlip.
3. Remove the control arm and spring.
4. Withdraw the lock cylinder from the sleeve. Ensure that the key remains in the lock cylinder for as long as the latter is withdrawn from the sleeve. There will otherwise be a danger of the cylinder coming apart.

Assemble in the reverse order.

> CAUTION
> Do not withdraw the key from the new lock cylinder until the cylinder has been inserted in the lock sleeve.

> CAUTION
> Once the circlip has been removed it should be exchanged for a new one.



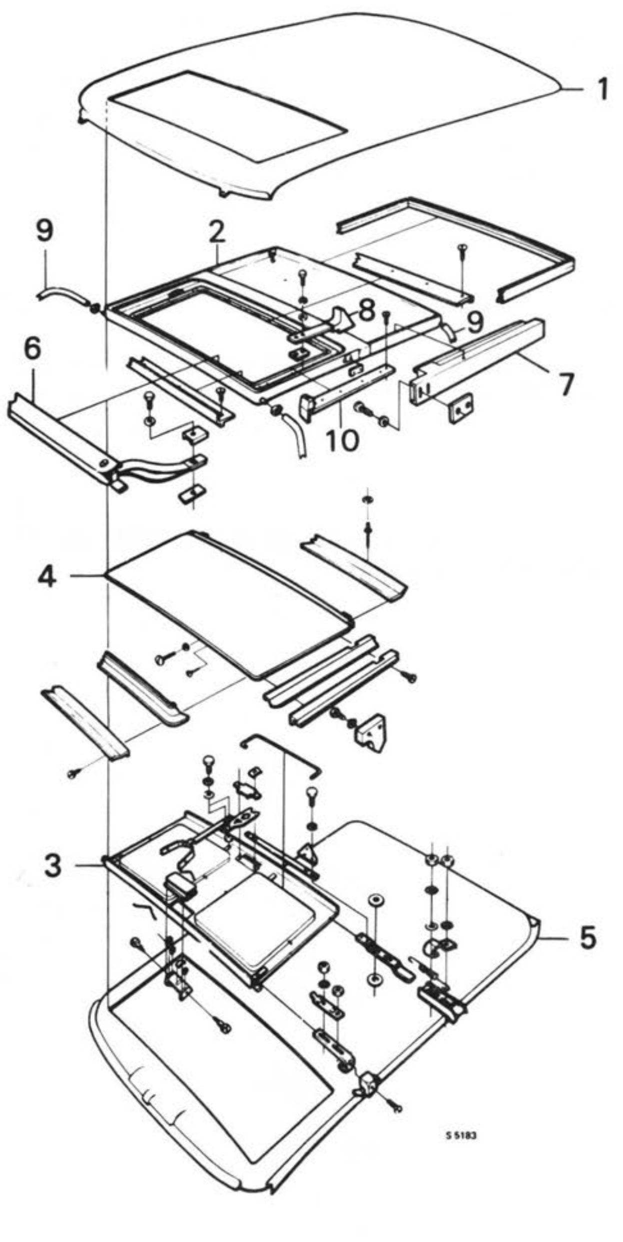
LOCK CYLINDER

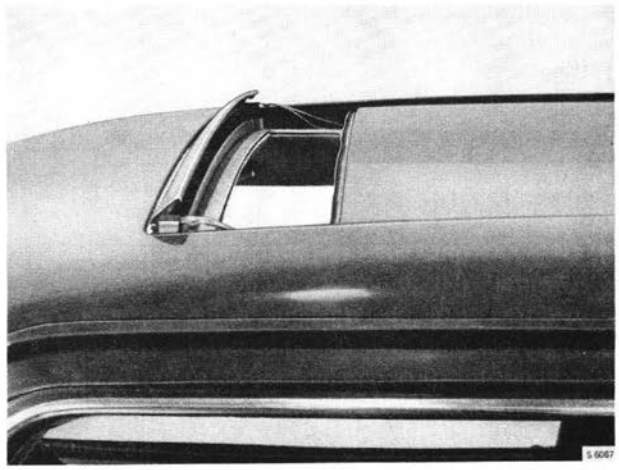
1. Key
2. Lock cylinder
3. Lock cylinder bracket
4. Gasket
5. Spring
6. Control arm
7. Driver

SUNROOF

Sunroofs are available in two different versions:

A. Earlier versions have a movable windbreak fitted at the front edge of the opening. The windbreak is raised as the sunroof is opened. This version is only fitted to cars manufactured in Belgium (and, as from model 1978, only to Saab 99 GL and 99 EMS).



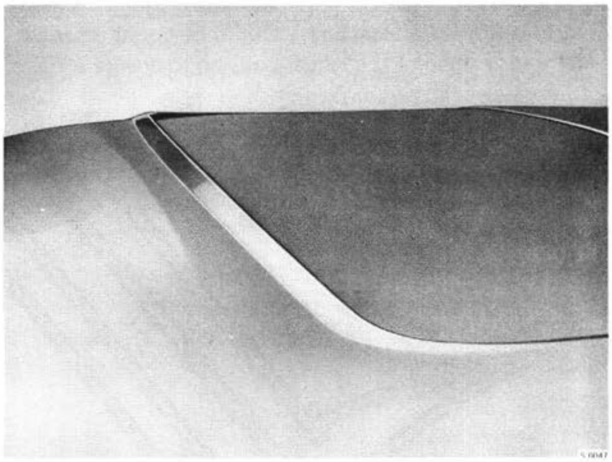


WINDBREAK, EARLIER VERSION

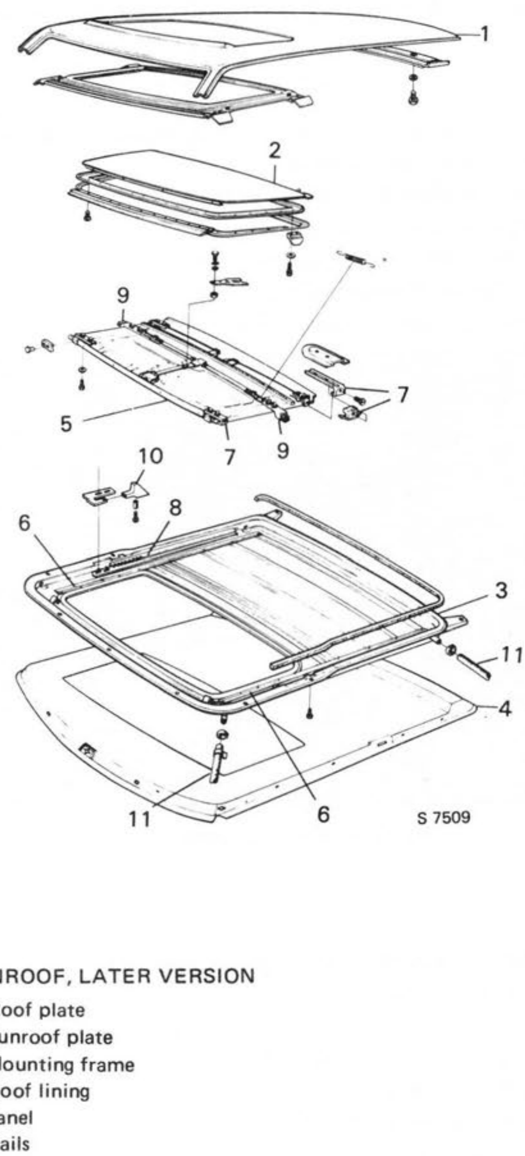
SUNROOF

1. Roof plate
2. Sunroof plate
3. Panel with locking device and guides
4. Cover plate
5. Roof lining
6. Windbreak
7. Toothed guide rails
8. Fastening irons with Plastic wedges
9. Drainage hoses
10. Guides

B. Later versions are equipped with a windbreak in the form of a raised section in the roof plate at the front edge of the opening. The later version is fitted to Saab 99 Combi Coupé cars as from model 1978.



WINDBREAK, LATER VERSION

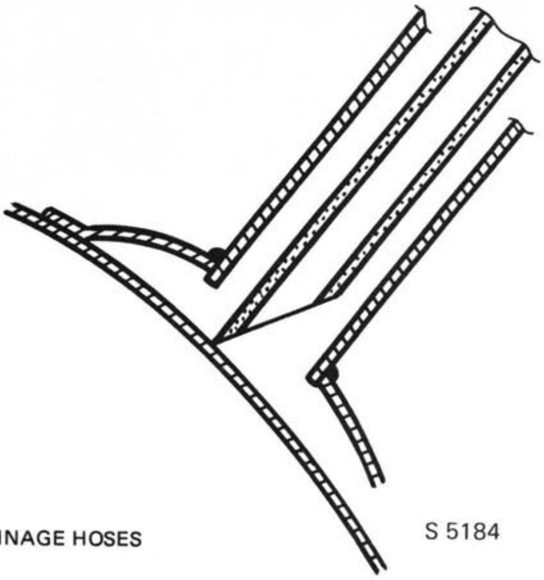


SUNROOF, LATER VERSION

1. Roof plate
2. Sunroof plate
3. Mounting frame
4. Roof lining
5. Panel
6. Rails
7. Guide clamps with sliding pins
8. Locking arms (serrated)
9. Catch (serrated)
10. Lifting knobs
11. Drainage hoses

The sunroof is opened and closed by sliding the handle backwards or forwards. Once the handle is released, it will spring back to its central position (locking position) whereupon two locking devices, equipped with toothed segments, will extend outwards to engage in the toothed guide rails, mounted one on each side of the opening. The sunroof consists of a panel equipped with a locking mechanism and guides, the top of which is covered by means of a cover plate. The underside of the panel is clad in the same material as that of the headlining. On earlier versions, the underside of the roof is equipped with a special frame, slotted onto the car roof. In the later versions, the sunroof frame is screwed to the car-roof which is equipped with a special mounting frame. Mounted in the frame are runners and toothed guide rails. Rubber drainage hoses run from the frame corners. The two front hoses run down through the corner pillars opening at the front wheel housing. The two rear hoses run down through the rear corner pillars and open in the evacuation boxes.
Access to the drainage hoses can be gained after the sun-roof lining has been removed.

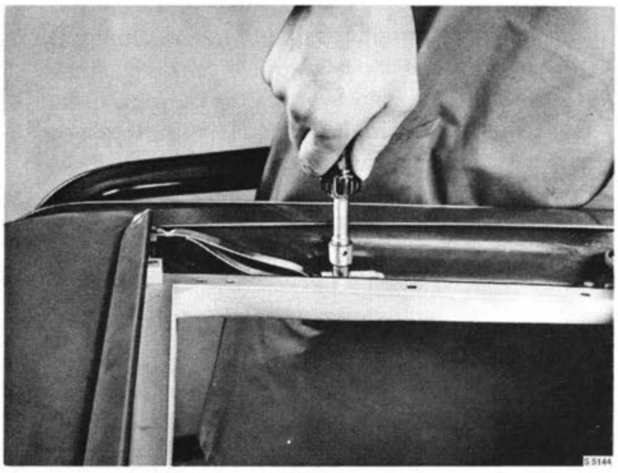
The two front drainage hoses should be cut at an angle where they open at the wheel housing to ensure efficient drainage (see illustration).



DRAINAGE HOSES S 5184

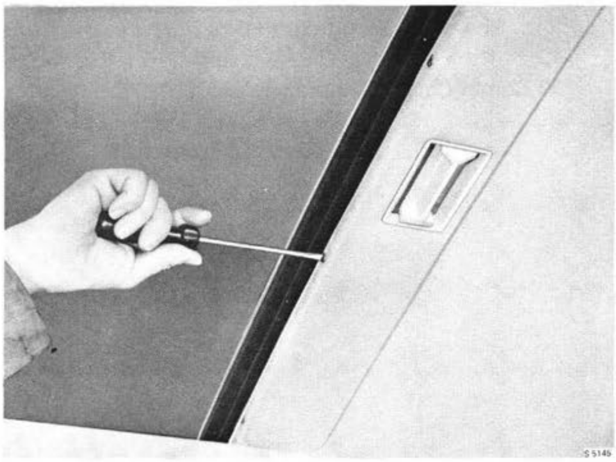
Removal, earlier version

1. Slide the sunroof back and unscrew the windbreak at the front of the opening.



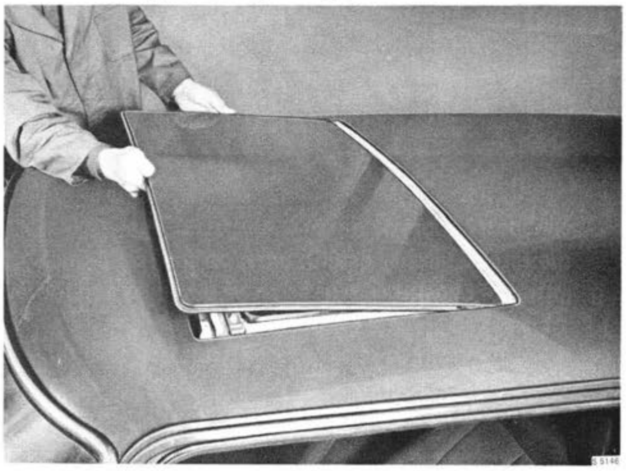
THE WINDBREAK IS REMOVED

2. Remove the four screws from the front edge of the sunroof.



REMOVAL OF THE FOUR SCREWS IN THE FRONT EDGE

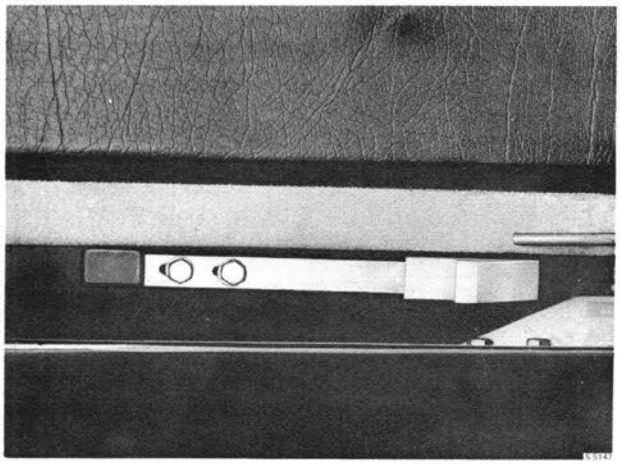
3. Slide the roof forward until it is around 1 in. (2 cm) from the closed position.
4. Gripping the front edge of the cover plate, remove it by pulling it forwards and upwards, thus releasing the retaining clips at the rear edge of the cover. Care should be taken to prevent the cover plate being damaged at the rear edge of the opening.



THE COVER PLATE IS PULLED AWAY

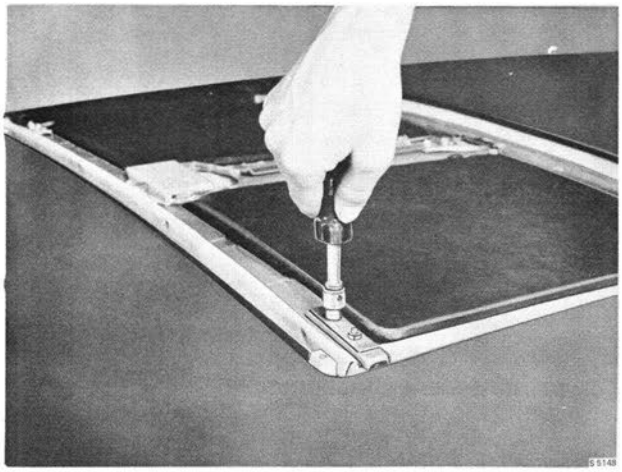
5. Remove the two fastening irons and plastic wedges at the side of the rails.

CAUTION
Before removing the screws, mark the position of the fastening irons to facilitate adjusting on re-assembly.



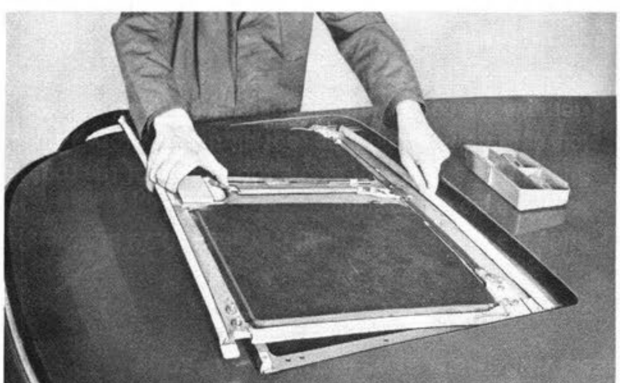
THE FASTENING IRONS WITH PLASTIC WEDGES ARE REMOVED

6. Unscrew the two front guide clips and guides and save the serrated lock washer from under the inner nut and securing plate.



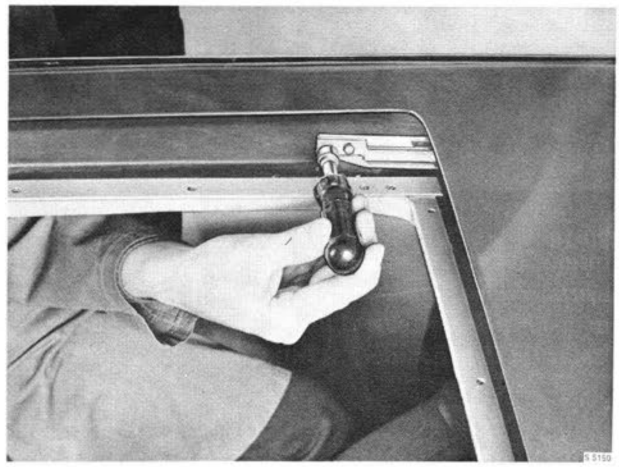
THE GUIDE CLIPS ARE REMOVED

7. Lift the front edge of the panel, press the handle to one side and pull the panel forward to free it from the guide rails. Remove the panel.



THE PANEL IS REMOVED

8. If necessary, it is now possible to dismantle the guide rails by removing the two screws in the front ends. Slide the rails forward to release them from the rear fastenings.

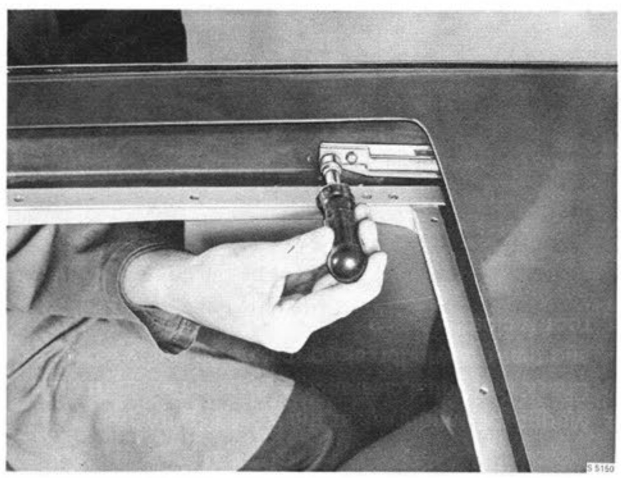


THE TWO SCREWS IN THE FRONT ENDS OF THE GUIDE RAILS ARE REMOVED

To gain access to the drainage hoses or insulation between the rear part of the sunroof and the car roof, the roof lining must be removed.

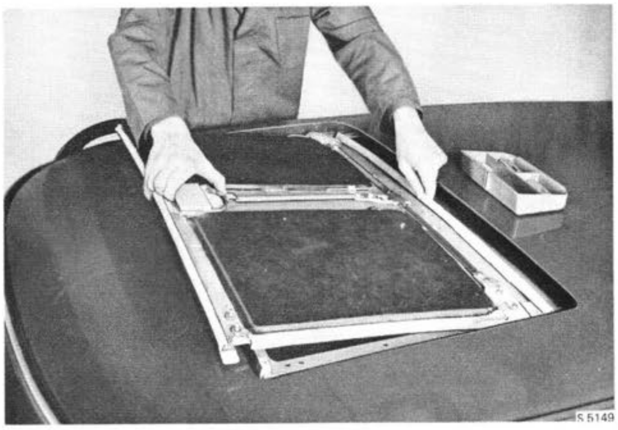
Installation, earlier version

1. Slide the guide rails into position and replace the retaining screws without tightening them completely.



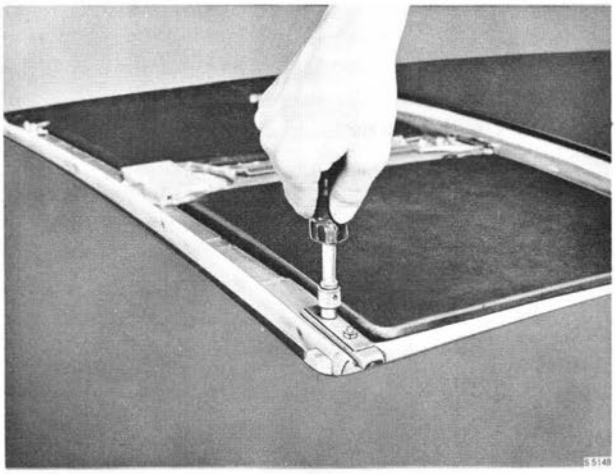
THE TWO SCREWS IN THE FRONT ENDS OF THE GUIDE RAILS ARE INSTALLED

2. Install the panel by pushing the handle to one side and sliding the rear part of the panel into the guide rails.



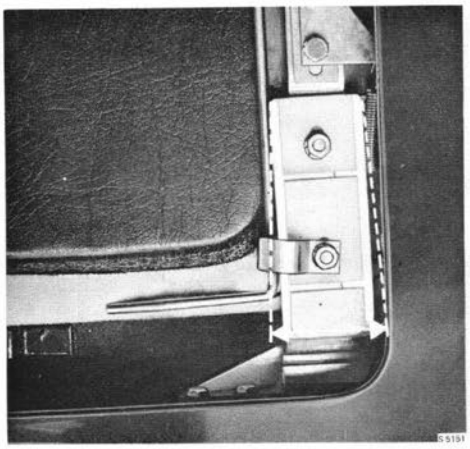
THE PANEL IS INSTALLED

3. Slide the panel forward to its forward position so that it will be parallel with the roof opening and touching the two stops.
4. Fit the front guide clips in such a way that the minimum possible play between the guides and the rail is obtained.



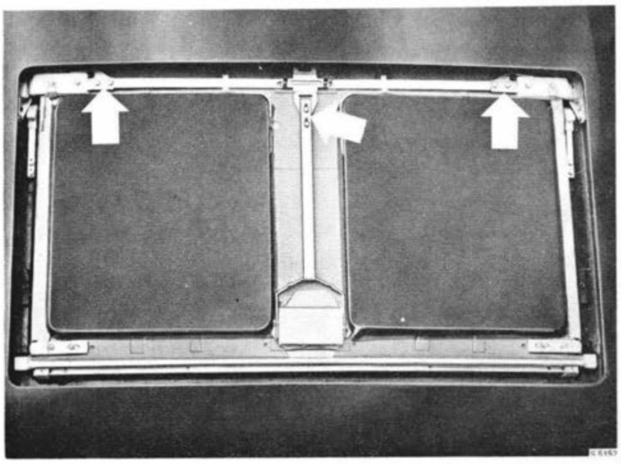
THE GUIDE CLIPS ARE INSTALLED

5. Adjust the height of the front of the guide rail so that it makes proper contact with the panel trim and the runners. Tighten the rail.
6. Adjust the locking device so that:
   a. The locking devices on both sides engage simultaneously by loosening and turning the devices slightly.



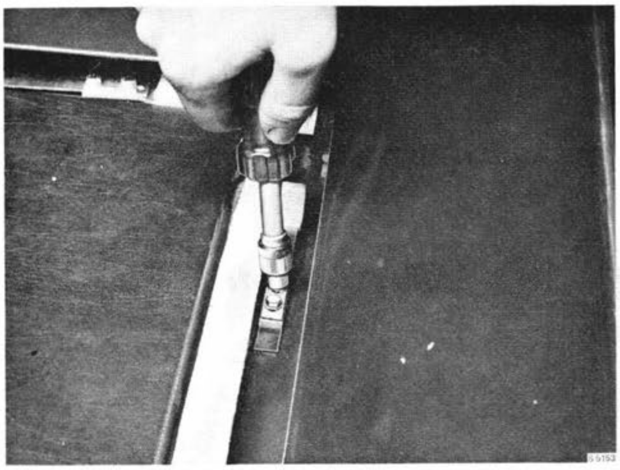
ADJUSTING THE LOCKING DEVICE

   b. The handle returns to its central position (locking position) when it is released.
   c. The sunroof slides smoothly without excessive play or sticking and without grating of the cogs.



ADJUSTING THE LOCKING DEVICE

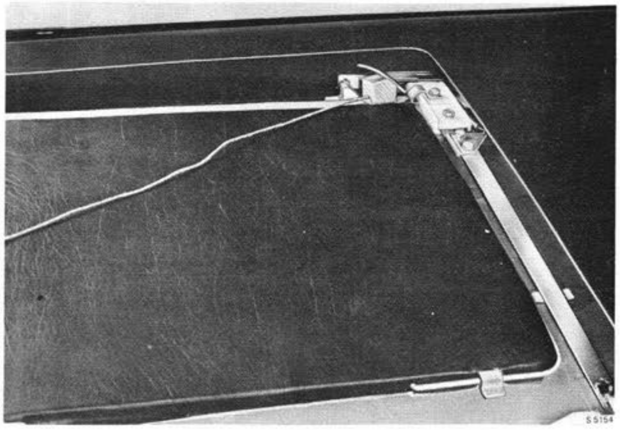
7. Fit the two fastening irons and plastic wedges at the side of the rails in the position marked on removal. The position of the guides governs the height of the rear edge of the roof when it is closed. Check the position and carry out any adjustments after the cover plate has been fitted.



THE FASTENING IRONS WITH PLASTIC WEDGES ARE INSTALLED

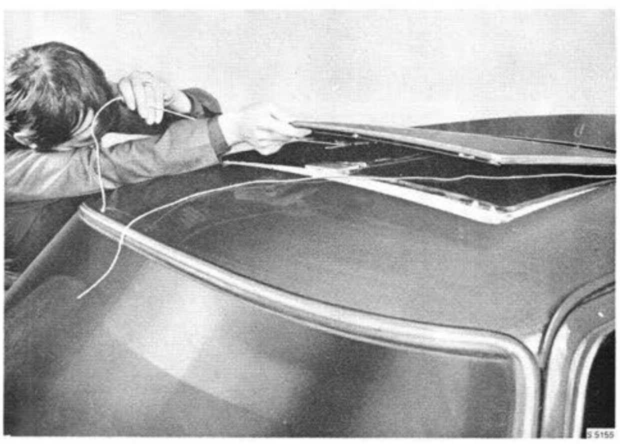
SAAB

8. Fit the cover plate as follows:
   a. Push back the two springs for the cover plate at the rear edge of the panel (with the sunroof around 2 cm from the closed position) by means of two blocks with string attached (see illustration).



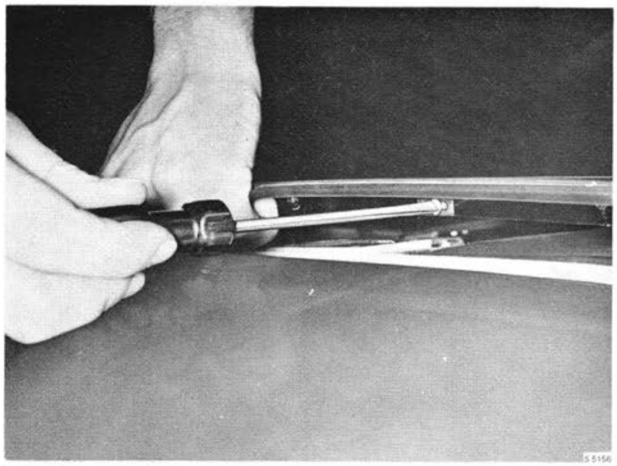
THE SPRINGS FOR THE COVER PLATE TENSIONED WITH BLOCKS EQUIPPED WITH STRINGS

   b. Install the rear edge of the cover plates so that the pins locate under the springs.
   c. Remove the blocks by means of the strings so that the springs make contact with the pins.



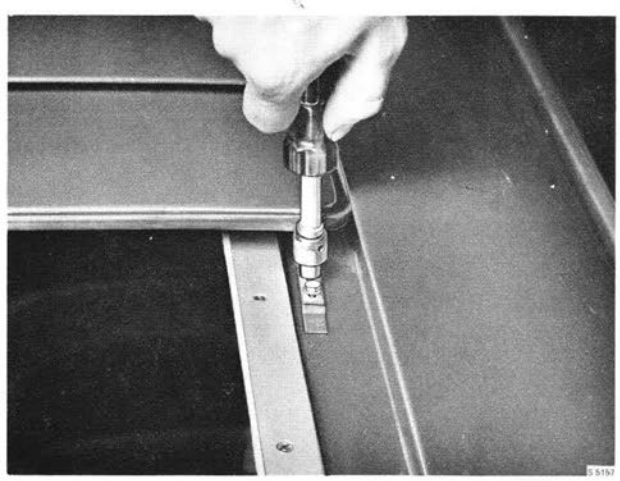
THE BLOCKS ARE REMOVED

   d. Check the alignment of the heads of the four spacer screws at the front edge of the cover and lower the cover.



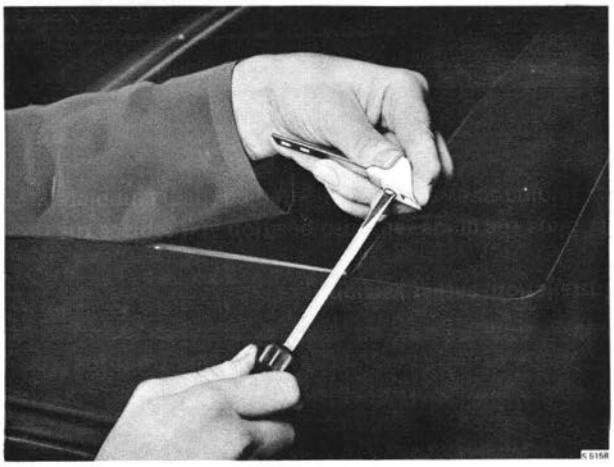
CHECKING THE SPACER SCREWS HEADS

   e. Slide back the sunroof (checking that it runs freely throughout its travel to prevent damage) and mount the four screws holding the cover to the panel. Where necessary, adjust the gap at the front edge of the cover by removing the four retaining screws and screwing the stop screws up or down. Ensure that the heads of the four spacer screws are in line so that contact is made with all screws, before fitting the retaining screws. Before tightening the retaining screws, adjust the height of the front edge of the cover so that it is slightly lower than the edge of the car roof.
   f. Close the sunroof completely and check that the rear edge is flush with the car roof.
      Adjustment is made by sliding the roof completely open and moving the fastening irons and plastic wedges forwards (to lower the sunroof) or back-



ADJUSTING THE FRONT EDGE IN HEIGHT

wards (to raise the roof). If this adjustment proves to be inadequate, remove the fastening irons and plastic wedges and make a rough adjustment by turning the spacer screw under the wedge out or in.

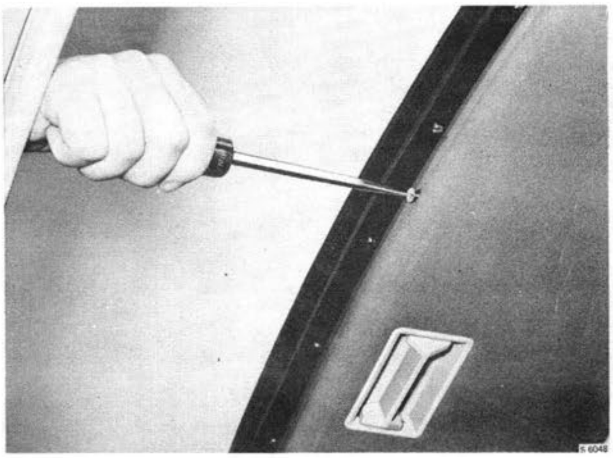


ADJUSTING THE SPACER SCREWS

9. Mount the windbreak at the front edge of the opening. Check that equal clearance is obtained on both sides and that the windbreak springs down freely when the roof is closed.

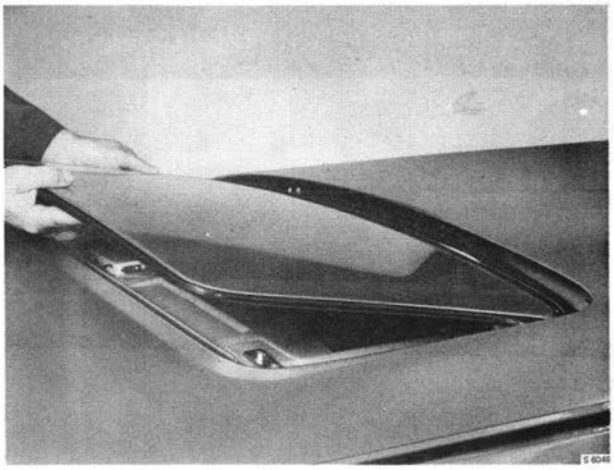
Removal, later version

1. Slide the sunroof back and remove the four screws in the front edge.



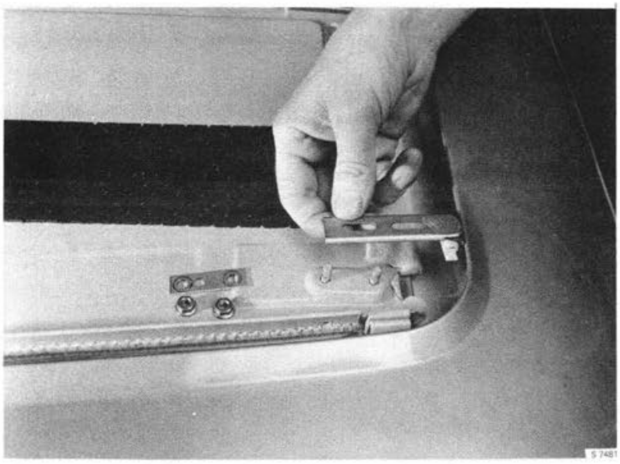
REMOVING THE SCREWS IN THE FRONT EDGE

2. Slide the roof forward until it is about 0.79 in. (2 cm) from the closed position.
3. Slightly raise the front of the top section of the roof (cover plate) and slide the roof all the way forward. Remove the cover plate by pulling it forward and upwards, thereby releasing the retaining clips at the rear of the cover.
   Take care not to scratch the paintwork of the cover or the bodywork.

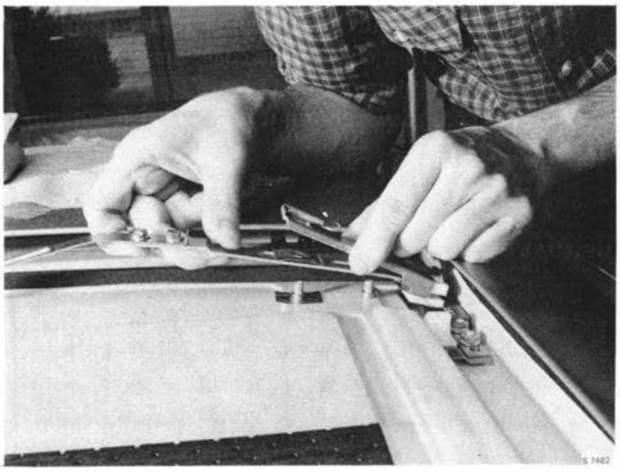


REMOVING THE COVER PLATE

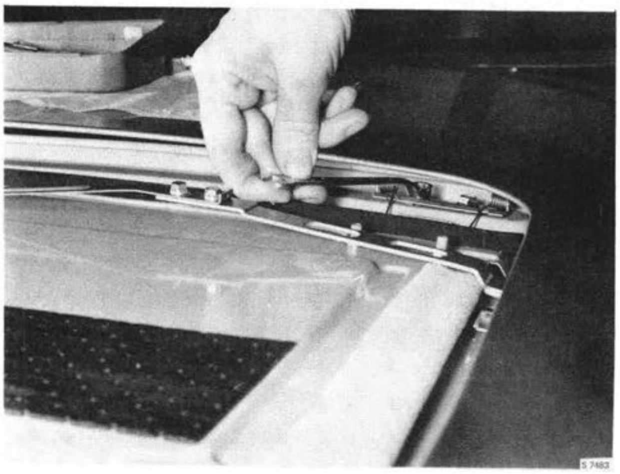
4. Remove the front guide clamps.



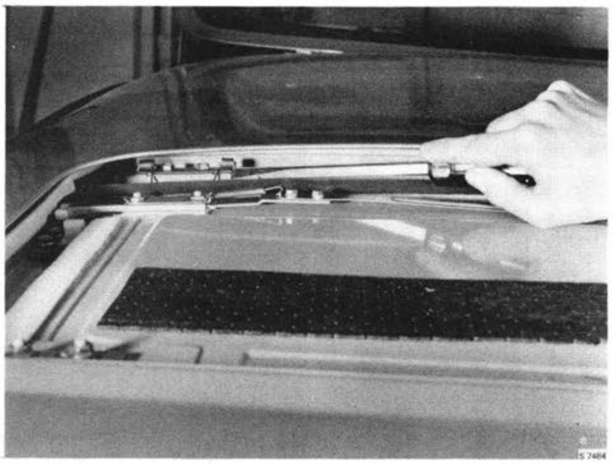
5. Bend back the locking plate and remove the nuts from the catch. Bend the pull rods up slightly and disengage the catches from the teeth. Retain the springs, leaf springs, mountings, plastic bushings and sleeves.



6. Push the panel forwards as far as it will go and loosen the screws (earlier desgin: nuts) on the rear guide clamps a couple of turns.



7. Push out the guide clamps.



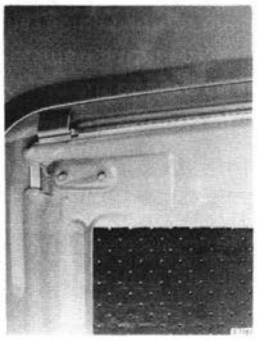
8. Raise the front edge of the panel, pull forwards and remove the entire panel.

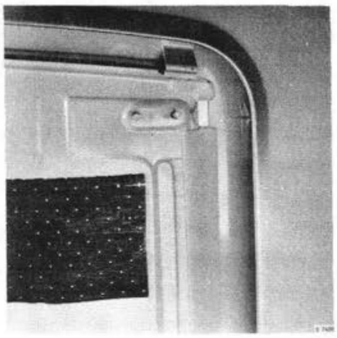
Installation, later version

Lubrication	Lubricate all bearing points with VASELINE.

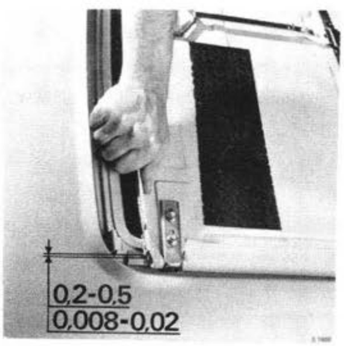
1. Place the panel in position with the rear guide clamps loosely fitted (extended) and the retaining springs for the sunroof plate installed.

2. Position the panel against the front stop pins. Centralize the panel laterally in relation to the stop pins and the sunroof plate aperture.



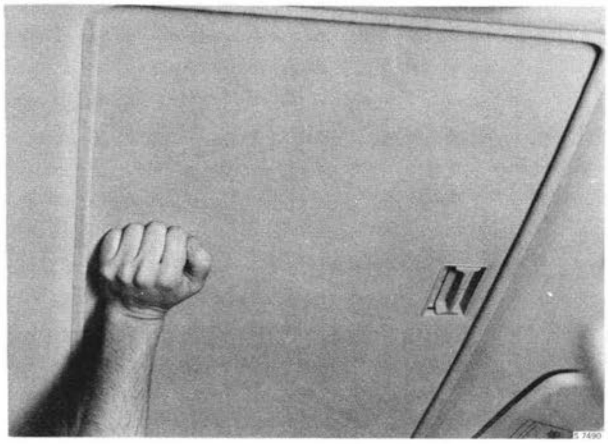


3. Insert the front guide clamp and tighten the nuts so that 0.2–0.5 mm play is obtained.

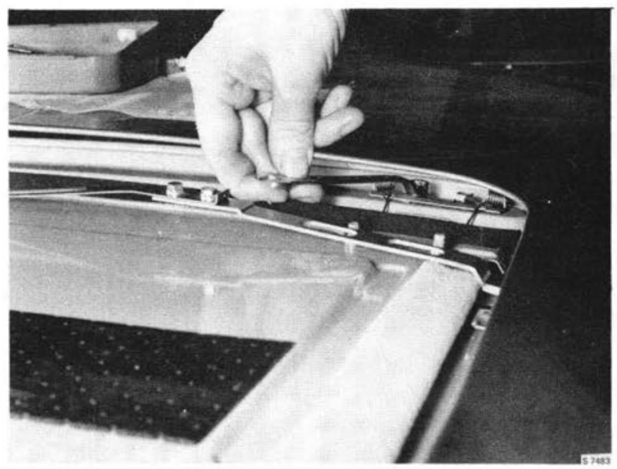


4a. Insert the rear guide clamp (while the front edge of the panel is still against the stop pins) and lightly tighten the screws.

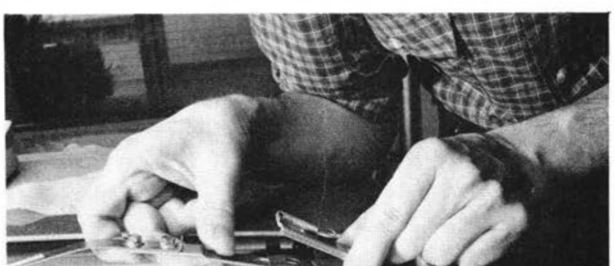
4b. Press gently from below against the rear edge of the panel so causing it to bend slightly sufficient to allow the guide clamps to partially extend enough to provide a little play.



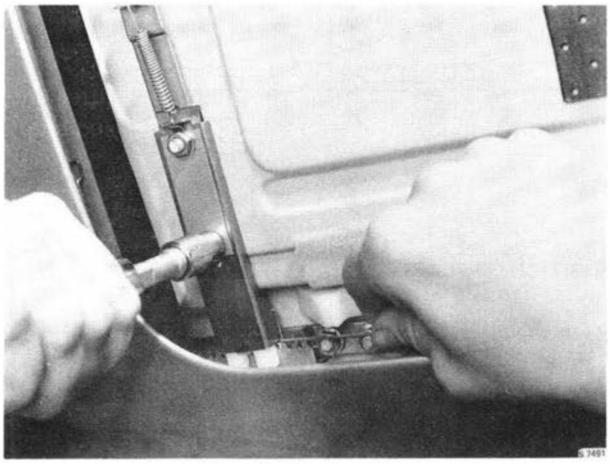
4c. Tighten the rear guide clamps.



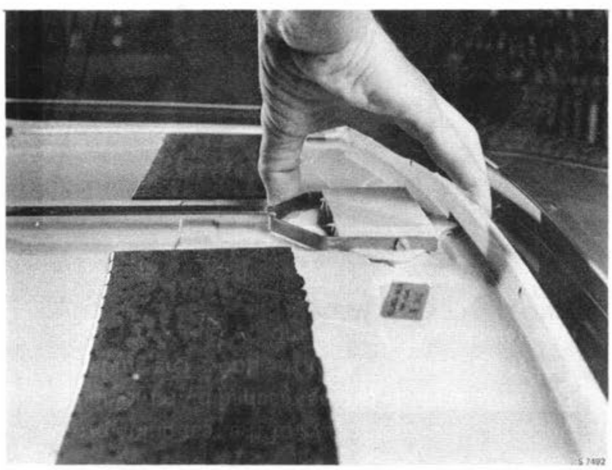
5. Fit the catches.

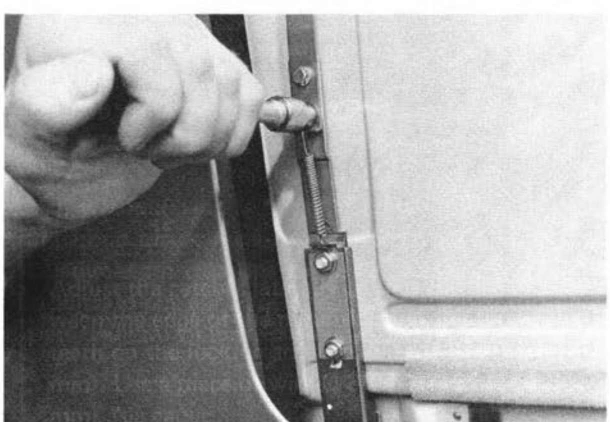


6a. Adjust the catches laterally so that the distance between the edge of the mounting and the top of the teeth on the locking arms is 3/64–1/16" (1–1.5 mm). Use a piece of wire Ø 3/64–1/16" (1–1.5 mm) as a gauge.

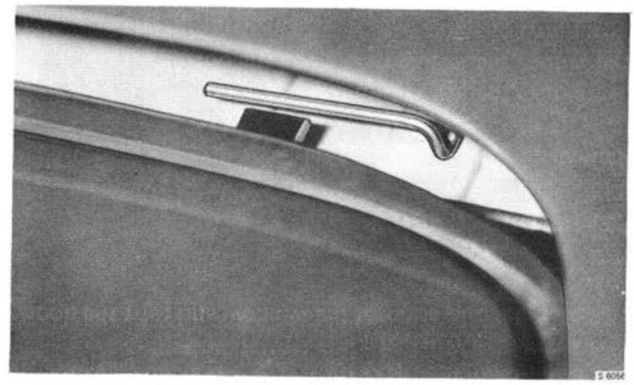


6b. Hold the catch handle as fas forward as it will go and check that the play between the top of the teeth on the locking arms and the catch is 3/64–1/16" (1–1.5 mm). Use a piece of wire as a gauge. Adjust the pull rods if required.





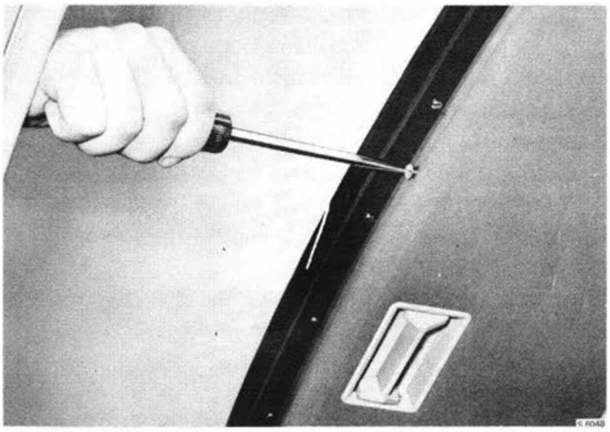
7. Check that the plate slides easily and that the catch functions correctly. (If the rails are not absolutely parallel adjust them so that the minimum play possible is obtained where they provide the most resistance).
8. Carefully slide the sunroof plate backwards. (NOTE. Ensure that the plate slides freely in the aperture). Fit the 4 screws to the front edge of the sunroof plate.



INSERTING THE COVER PLATE SPRINGS UNDER THE PANEL SPRINGS

FITTING THE COVER PLATE

9. Slide the sunroof open. (N.B. Check that the sunroof does not catch in the mounting frame.) Replace the four screws in the front edge of the sunroof.

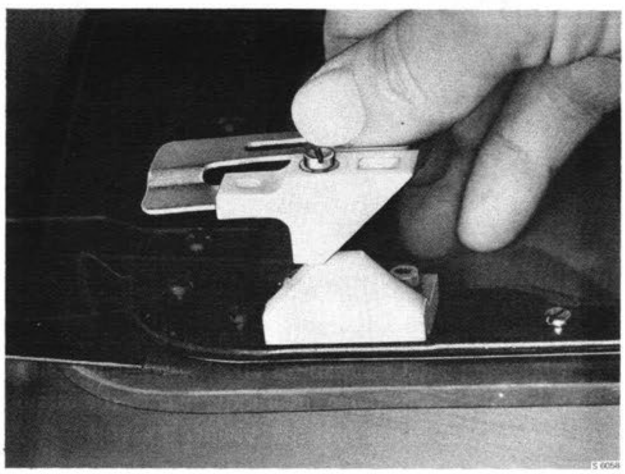


REFITTING THE FOUR SCREWS IN THE SUNROOF

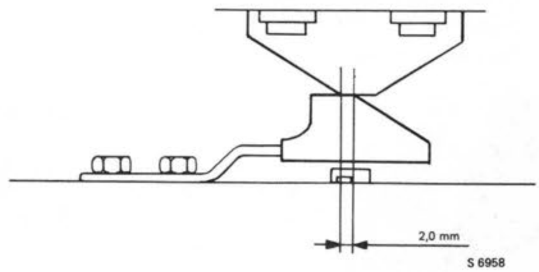
10. Close the sunroof completely and check that the gaps at the sides of the panel are equal.
   Check to make sure that the rear edge of the sunroof is flush with the roof of the car.

Adjusting the height of the rear edge of the sunroof during closing, later versions

Slightly before the sunroof closes, the rear end should slide up at the correct moment to come flush with the roof of the car. This is controlled by the plastic wedges on both sides of the sunroof.

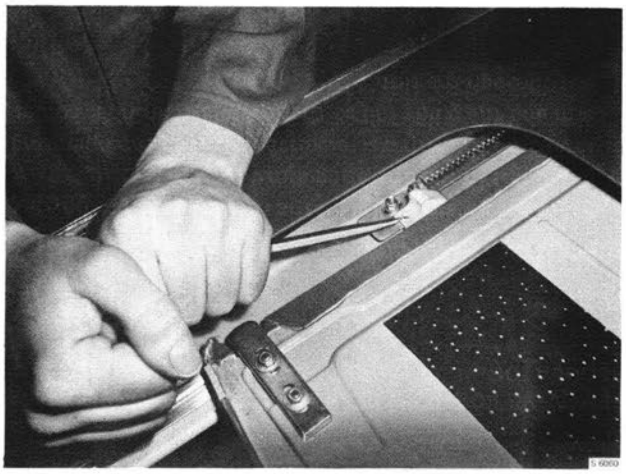


A. When the sunroof is closed, the movable wedge should overlap the top of the fixed wedge by about 0.08 in (2 mm).
   Check that the rear edge of the panel starts to drop once the sunroof has been opened to a gap of about 0.08 in. (2 mm.

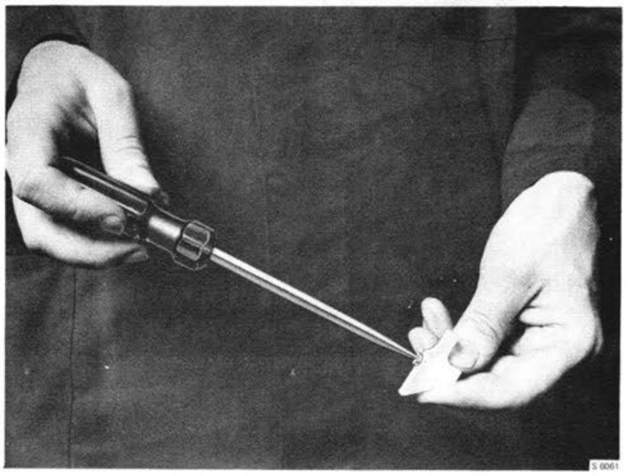


POSITION OF PLASTIC WEDGES, SUNROOF CLOSED

B. In the closed position, the rear edge of the sunroof should be flush with the roof of the car.
   Adjustment is made by removing the cover plate and adjusting the stop screw underneath the wedge. The plastic wedge slides out of its mounting.
   (NOTE. A piece of protective tape should be fitted to the contact surface of the stop screw).



SLIDING THE PLASTIC WEDGE OUT OF ITS MOUNTING

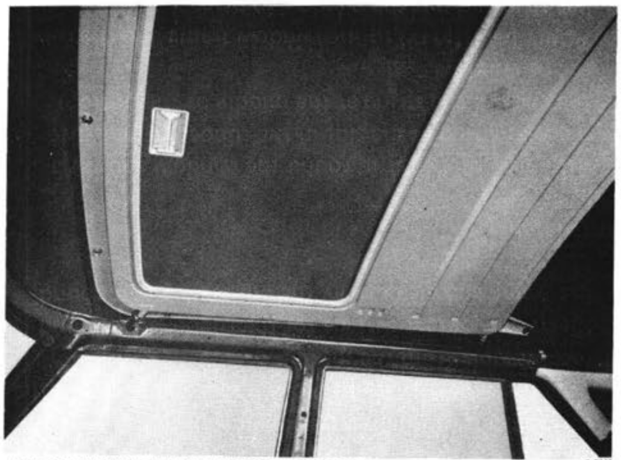


ADJUSTING THE STOP SCREW UNDER THE PLASTIC WEDGE


SLIDING THE WEDGE INTO ITS MOUNTING

Removing the sunroof assembly complete

After the headlining has been removed, the sunroof frame and entire assembly can be removed as follows:
Remove the four drainage hoses from the corners of the sunroof frame and remove the screws securing the sunroof frame to the roof mounting frame and then lower the sunroof frame.
When refitting, check that the weather strip between the sunroof frame and the car roof is undamaged and correctly fitted.


REMOVING THE SUNROOF FRAME

WINDOWS

GENERAL

The windshield is made of laminated glass and all other windows of toughened glass. When fitting new windows, use only Saab original parts to ensure approved glass quality and a perfect fit.

WINDSHIELD

To change the windshield without removing the rubber strip from the body, proceed as follows.

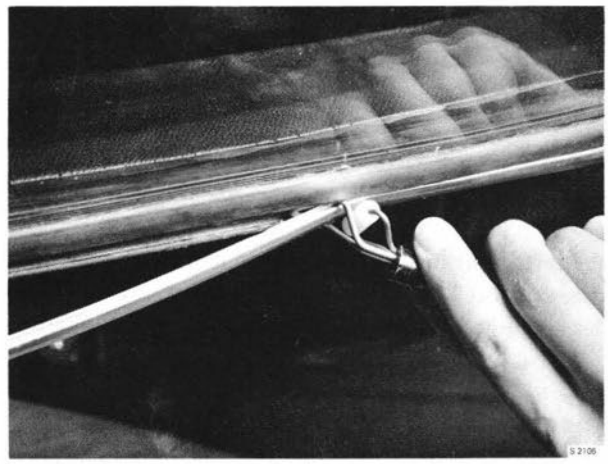
Removal

1. Raise the windshield wiper arms. Crank the door windows down.
2. Remove the joint piece from one side of the windshield moulding and mark the end position of the moulding on the rubber strip with a pen. Remove the moulding.
3. Remove the rubber strip from the windshield by inserting a properly bent special tool under the strip and moving it around the strip.
4. Push out the upper left corner of the windshield by pressing carefully from the inside.
5. Free the upper edge and the sides of the windshield from the rubber strip.
6. Free the bottom edge of the windshield. Remove the windshield.

Installation

1. Adjust the rubber strip so it follows the windshield frame.
2. Apply paraffin oil to the rubber strip to facilitate the installation of the windshield.
3. Place the new windshield on the rubber strip and align the windshield in its proper position in the frame.
4. Fit the windshield into the bottom edge of the rubber strip and the lower part of the short side using the special tool.
5. Fit the windshield in the top edge of the rubber strip. Begin by pulling out a small bit of the rubber edging from the inside of the windshield about 6 in. (15 cm) from a corner. Complete the fitting of the rubber strip and make any necessary adjustments.
6. Apply paraffin oil to the slot for the windshield moulding to facilitate fitting.
7. Fit the moulding using tool 8291023. Begin at the mark made previously on the rubber strip. Complete the fitting of the moulding.
8. Inject sealing compound between the rubber strip and the glass and between the rubber strip and the frame.
9. Clean off any excess sealing compound with a wooden putty knife.
10. Clean the glass and the strips with undiluted methylated spirits.
11. Clean the inside and the outside of the glass with window cleaning liquid.

If the rubber strip has been removed from the frame, the procedure used for the rear window should be followed.



APPLYING THE WINDSHIELD MOULDING
Tool 8291023

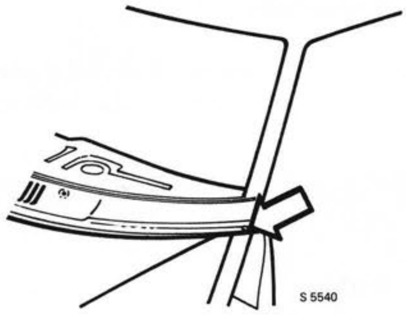
Tool 8291023 can be fitted with springs of varying width to suit the varying widths of the mouldings which exist. The springs are made of 0.08 in. (2 mm) dia. welding wire as shown in the illustration.

INSTALLING TOOL, WINDSHIELD STRIP
For windshield strips, earlier design: Width 0.67 in. (17 mm)
For windshield strips, later design: Width 0.79 in. (20 mm)

Windshield strips, later design

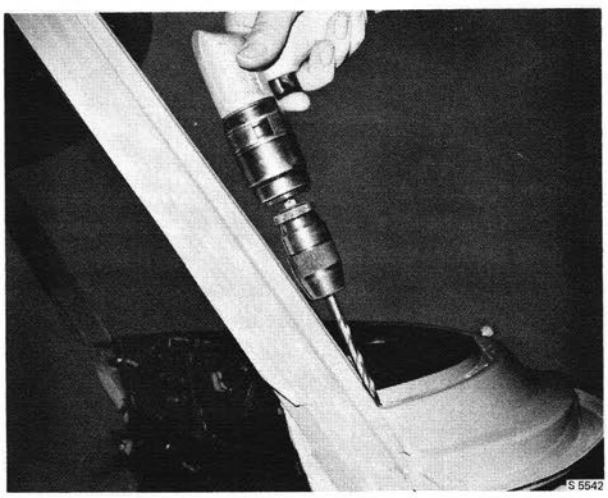
A new type of windshield strip with a wider moulding was introduced in model 1976.
The new strip is not intended to be sealed by means of

sealing compound but is equipped with drainage in the space between the outer and inner sealing flanges. Drainage holes have been provided in the rubber strip with corresponding holes in the body.



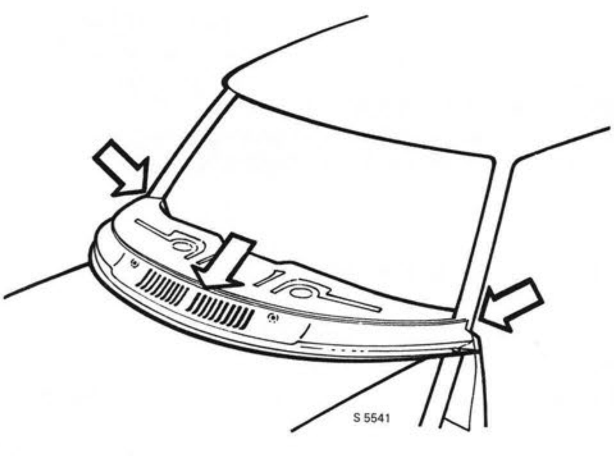
DRAINING HOLES IN THE BODY

Rubber strips of the latest design can also be installed in earlier cars if 0.31–0.39 in. (8–10 mm) dia. draining holes are drilled in the windshield member at the pillars.



DRAINING HOLES ARE DRILLED

The joints of the metal strip for the windshield member at the pillars and in the centre should also be sealed with sealing compound.



JOINTS IN THE WINDSHIELD MEMBER METAL STRIP

REAR WINDOW

Removal

1. Remove the padding around the rear window. Protect the headlining from becoming soiled by applying masking tape to the edge above the window.
   Saab 99 Combi Coupé: Disconnect the heating wire connections for the rear window.
2. Free the rubber strip from the frame and push out the rear window from the inside.
3. Clean the contact surface for the rubber strip round the frame and clean away the old sealing compound.

Installation

1. Fit a new rubber strip round the window and lay a piece of string in the slot in the rubber strip. Leave the ends of the string at the middle of the bottom of the window.
2. Apply paraffin oil to the window frame and the rubber strip and put the window in place.
3. Pull on the string from the inside of the car so that the edge of the rubber strip will be bent inwards and over the edge of the frame. Start from the middle and work towards the sides while pushing the glass down towards the edge of the frame. Continue around the whole rear window and ensure that the inside flange of the rubber strip overlaps the inside of the frame all the way around.
4. Fit the trim moulding using tool 8291023. Apply paraffin oil to the slot to facilitate fitting.
   Saab 99 Combi Coupé: Connect the heating wires for the rear window.
5. Inject sealing compound between the rubber strip and the glass and between the rubber strip and the frame.
6. Clean off any excess sealing compound with a wooden putty knife.
7. Clean the glass and the strip with undiluted methylated spirits.
8. Fit the padding.
9. Clean the inside and the outside of the window with window cleaning liquid.

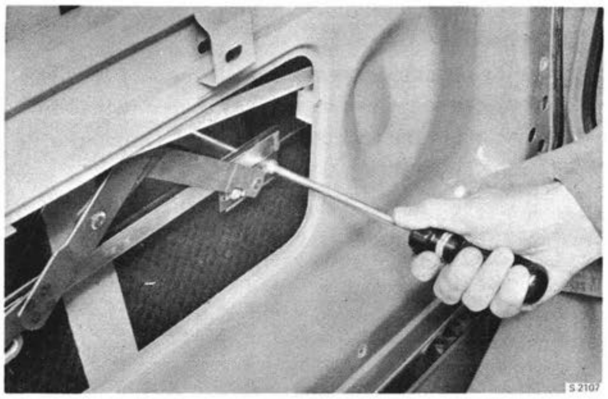
FRONT DOOR WINDOW

2-door and 4-door models

The door window is clamped at the bottom in a U-shaped retainer with a slot for the operating arms of the window regulator. The leading and trailing edges of the pane are located in U-shaped runners.

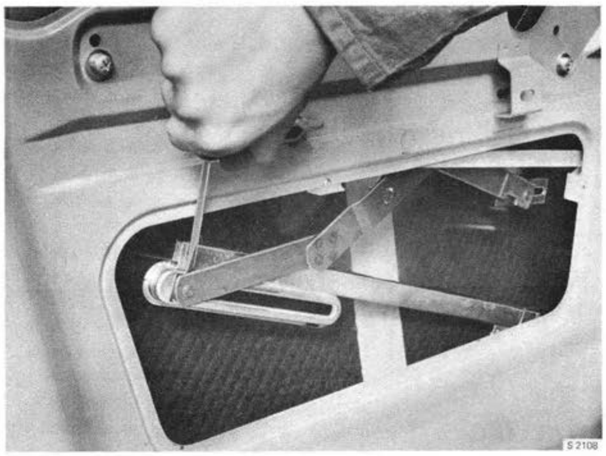
Removal

1. Take off the door inside trim.
2. Remove the inner longitudinal weatherstrip at the bottom of the window opening.
3. Undo the two screws fixing the front regulator arm to the window retainer.



REMOVING FORWARD OPERATING ARM OF WINDOW REGULATOR

4. Turn the pane so that its front part slopes down and move it forward so the plastic runner is facing the guide slot in the operating arm.
5. Pry carefully with a screwdriver between the operating arm and the guide rail so that the plastic runner comes out through the slot.



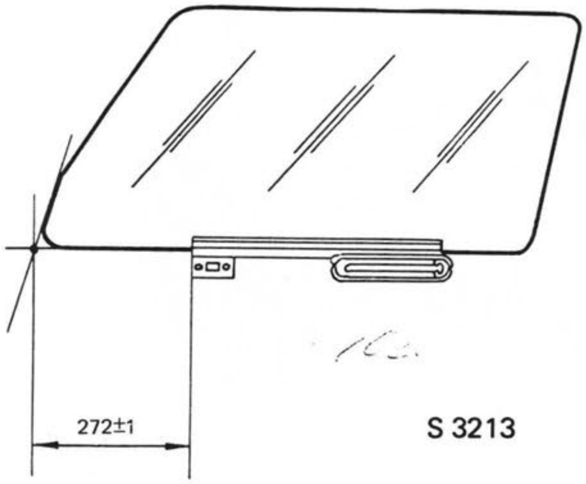
PRIZING THE PLASTIC RUNNER OUT OF THE SLOT

6. Turn the pane vertically and remove it.
7. If necessary, remove the pane from the retainer.

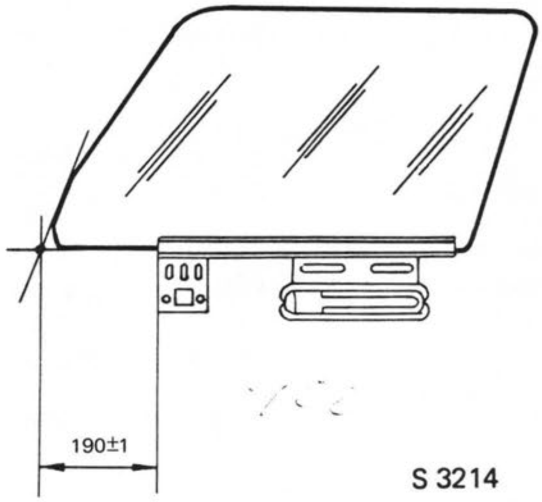
Installation

1. If the pane has been removed from its retainer, begin by placing the rubber pad in the U-shaped retainer and pressing in the pane. Make sure that the retainer grips the pane securely. The measurements stated on the sketch below must be followed carefully. If not, the function can be jeopardized.

When installing, check that the retainer is evenly pressed on. If for instance the middle part of the retainer is pressed harder on than the ends, the retainer can be curved. The glass can in that case slip out of the retainer.



MEASUREMENT FOR MOUNTING THE WINDOW PANE RETAINER, DOOR WINDOW OF 2-DOOR MODEL



MEASUREMENT FOR MOUNTING THE WINDOW PANE RETAINER, FRONT DOOR WINDOW OF 4-DOOR MODEL

2. Lower the pane vertically into the door with the retainer to the rear and work it into the horizontal position.

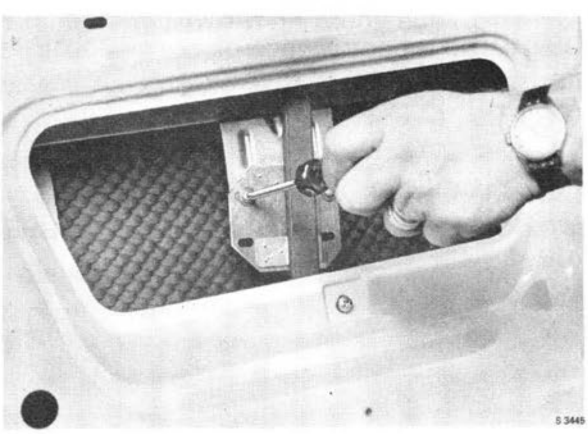
INSTALLING THE DOOR WINDOW

3. Push the plastic runner of the rear regulator arm into the slot and tighten the two retaining screws of the front regulator arm.
4. Fit the weatherstrip at the bottom edge of the window opening.
5. Check the operation of the window and refit the door trim.

REAR DOOR WINDOW

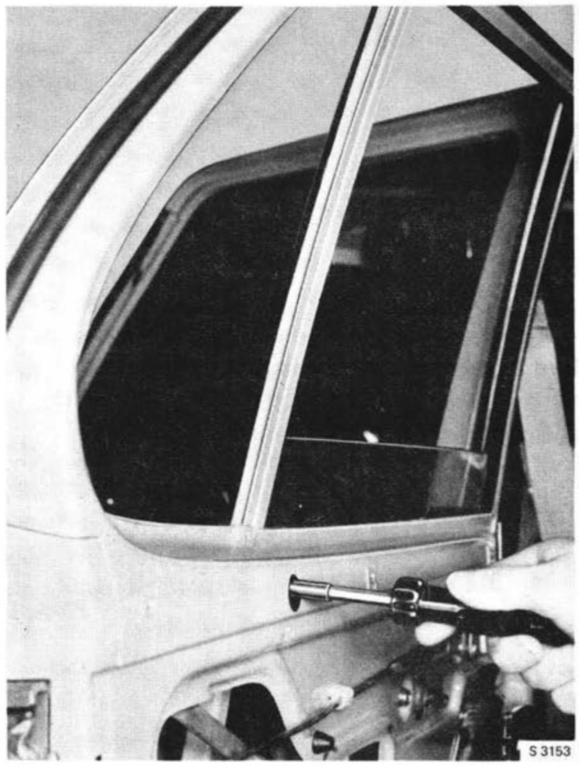
Removing

1. Remove the inside trim from the door.
2. Remove the sealing strip along the bottom of the window opening.
3. Take out the fixed rear door window (see under "Changing side windows").
4. Undo the window regulator screws from the window pane retainer.



REMOVING THE SCREWS FROM THE WINDOW PANE RETAINER

5. Remove the trim moulding from the window rear guide profile.
6. Undo the retaining screws of the rear guide profile. The bottom screw can be reached by removing the rubber plug in the rear of the door. The guide profile is fastened by a spring clamp.

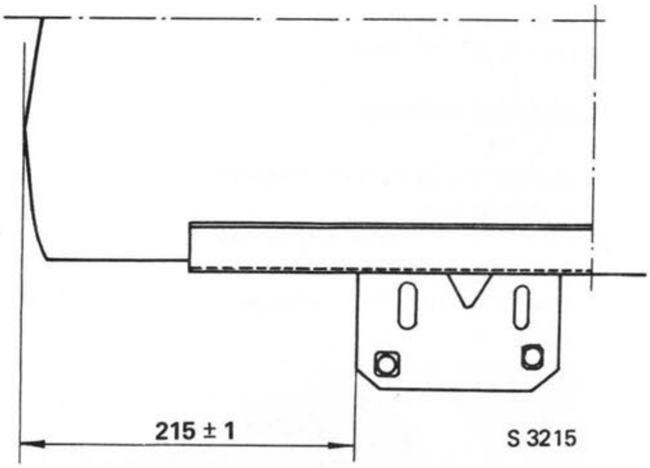


UNSCREWING THE RUNNER

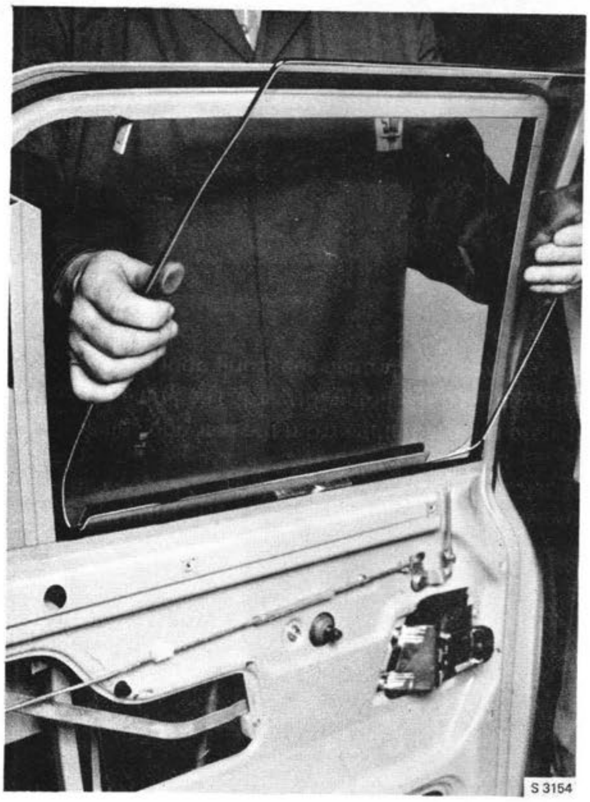
7. Free the guide profile from the door frame and push it backward. The window pane can then be lifted out.
8. Separate the pane from its retainer if required.

INSTALLING

1. If the pane has been removed from its retainer, start by fitting the rubber pad to the pane and pressing on the U-shaped retainer. Make sure that the retainer grips the pane securely. The measurement quoted in the illustration must be exact, as the window will otherwise be difficult to operate.
   When assembling, take care to press the retainer on evenly. If for example the middle is pressed on harder than the ends, the retainer is liable to be bent, and the pane is then apt to work loose from the retainer.



MEASUREMENT FOR MOUNTING THE WINDOW PANE RETAINER, REAR DOOR WINDOW



INSTALLING THE REAR DOOR WINDOW

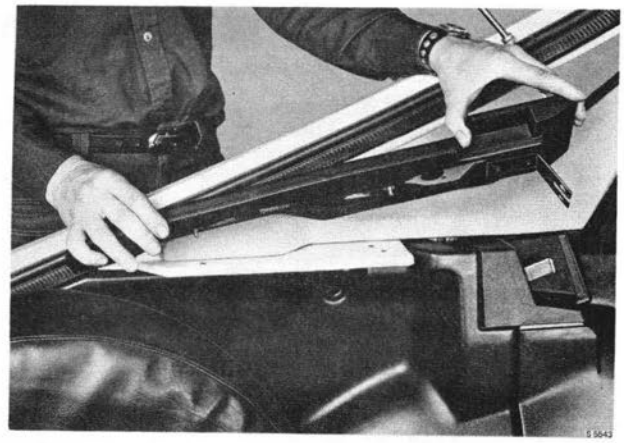
2. Lower the pane horizontally from the inside of the door.
3. Screw the window pane retainer to the mounting plate of the window regulator.
4. Fit the rear guide profile and insert the rubber plug in the rear jamb of the door.
5. Free the runner strip from the guide profile and mount the trim moulding. Then press the strip back into place.
6. Install the fixed window pane (see under "Changing side windows).

SIDE WINDOW

2-door cars (and rear side windows in 4-door Saab 99 Combi Coupé)

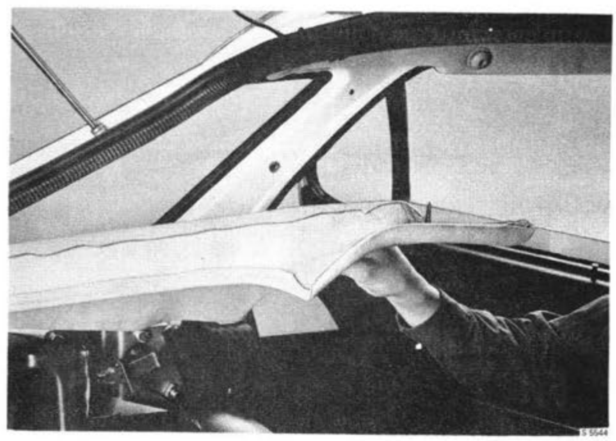
Removal and installation

1. 4-door Saab 99 Combi Coupé: First remove the trim at the rear side pillar as follows:
   a. Remove the backrest catch cover.
   b. Remove the parcel shelf bracket.



REMOVING PARCEL SHELF BRACKET

   c. Remove the seat belt guide.
   d. Carefully remove the clip at the top front corner by means of a screwdriver and remove the trim.



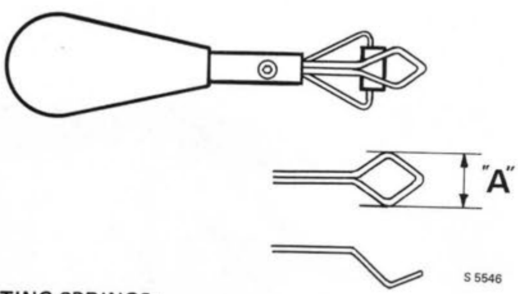
REMOVING THE TRIM

2. Push the pane outward from the inside, starting from the trailing edge and folding back the inside flange of the rubber moulding at the same time.
3. Fit the moulding round a new window pane of the prescribed quality. Lay a cord in the slot round the rubber strip, with the ends of the cord coming together at the rear.
   Fit the trim moulding with joint pieces to the rubber strip.
4. Install the pane and rubber strip using the cord as de-

scribed in the directions for installing the windshield, beginning at the trailing edge of the window. Tap the pane home gently with a rubber mallet.

5. Fit the trim mouldings with joint pieces to the rubber strip by means of tool 8291023. The tool can be fitted with springs of varying widths to suit the varying widths of the mouldings which exist. The springs are made from 0.08 in. (2 mm) dia. welding wire as shown in the illustration.

INSTALLING TOOL 8291023



MOUNTING SPRINGS:

FOR SIDE WINDOW STRIP, SAAB 99 (99 L), 99 L (99 GL) 99 GLE AND 99 EMS
Width "A" 0.67 in. (17 mm)

FOR SIDE WINDOW STRIP, SAAB 99 COMBI COUPE
Width "A" 0.51 in. (13 mm)

6. 4-door Saab 99 Combi Coupé:
   Fit the trim at the rear side pillar.

OPENING SIDE WINDOW

Removal and installation

1. Unscrew the window catch from the body mounting at the rear edge.
2. Remove the four retaining screws at the front edge of the window opening. (In Saab 99 Combi Coupé, the cover plates must first be removed by drilling out the pop rivets.)

REMOVING THE OPENING SIDE WINDOW

3. Lift out the side window.

Install in the reverse order.

UPHOLSTERY AND INTERIOR FITTINGS

DOOR TRIM, SAAB 99 (99 L) AND 99 L (99 GL)

Removing and installing

The door trim is stretched over a fiberboard backing and is secured to the door by screws and ordinary snap fasteners. To remove the door trim, proceed as follows:

1. Undo the window crank screw and remove the crank.
2. Remove the safety catch button.
3. Undo the screws from the door sill strip. (This does not apply to 2-door cars).
4. a. Unscrew the armrest.
   b. Unscrew the screw at the bottom of the front edge of the door (rear doors of 4-door models).
5. Remove the cover plate under the inner door handle (4-door model) and all the snap fasteners that holds the door lining by prying outwards with the fingers, whereafter the lining can be removed.

REMOVING THE DOOR TRIM

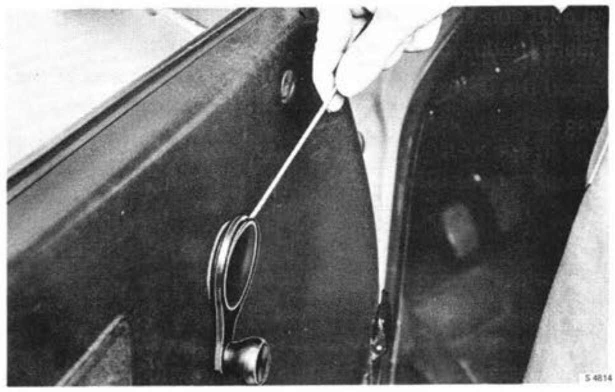
Refit the trim in the reverse order.
Make sure that the holes on the inside of the door are covered with protective paper with the bottom edge of the paper inside the door (to protect the inside trim from getting wet).

DOOR TRIM, SAAB 99 EMS AND SAAB 99 COMBI COUPE

Removal and installation

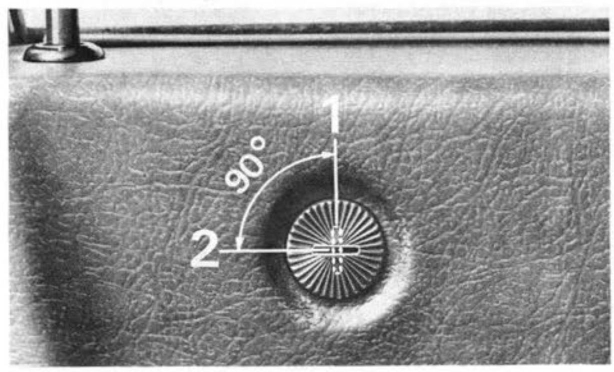
The door trim is made of hard polyurethane foam clad with foil. To remove the door trim, proceed as follows:

1. Remove the washer from the window crank by means of a small screwdriver. Undo the window crank screw and remove the crank.
2. Unscrew the safety catch button.
3. Unscrew the closing handle and cover inside the door handle.



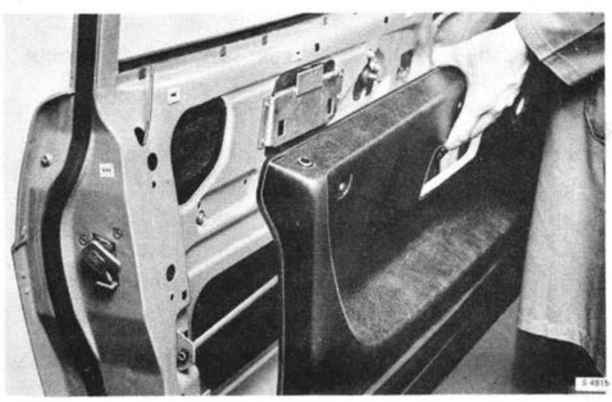
REMOVING THE WASHER

4. Remove the cover inside the door handle.
5. Remove the three Phillips screws together with plastic washers at the top of the door and the two quick-release screws at the bottom. All the screws are of the quick-release type on earlier EMS and Combi Coupé model cars. The quick-release screws are released by turning them through 90°.



QUICK-RELEASE SCREW, SAAB 99 EMS AND 99 COMBI COUPE
1. Installing position
2. Removing position

6. Remove the door trim.



REMOVING THE SIDE TRIM

Installation is carried out in the reverse order.

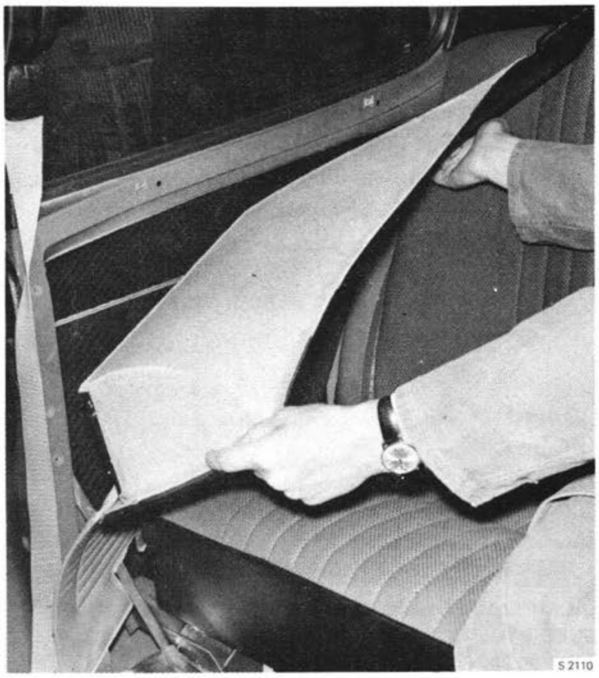
REAR SIDE TRIM

On the Saab 99 (99L) and 99L (99GL) the side trim is stretched over a frame consisting of a fibreboard sheet

at the bottom and moulded board at the top.
To remove the side trim, proceed as follows:

1. Remove the seat belt mounting at the floor and at the lug and remove the belt guide at the armrest.
2. Unsnap the snap fasteners holding the side trim in place and ease the trim out carefully without damaging the rear seat cushion and backrest. Withdraw the strap and lug and suspend it by means of the hole in the armrest.

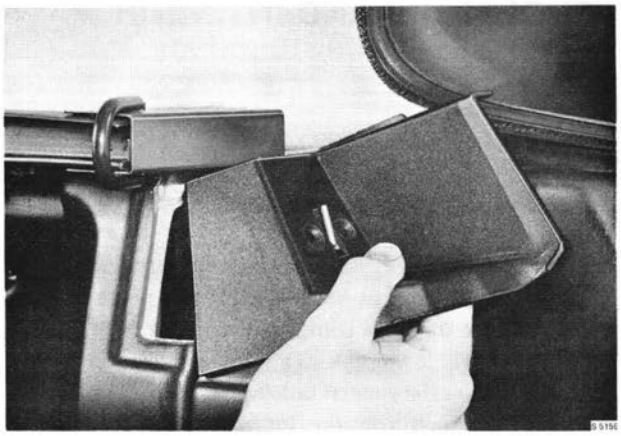
The rear side trim in Saab 99 EMS and 99 Combi Coupé is made of hard polyurethane foam clad with foil. The trim is retained by means of speed screws which are loosened by turning them through 90°. The removal procedure is otherwise the same as for Saab 99 (99L) and 99L (99GL) model cars.



REMOVING THE SIDE TRIM

Removing the side trim at the rear seat, Saab 99 Combi Coupé

1. Remove the floor plate and rear floor panel in the luggage compartment having first removed the self-tapping screws and the hinge screws for the rear seat backrest. Remove the backrest from the car.
2. Remove the rubber buffer and cover from the backrest catch, having first removed the two self-tapping screws.



REMOVING THE BACKREST CATCH COVER

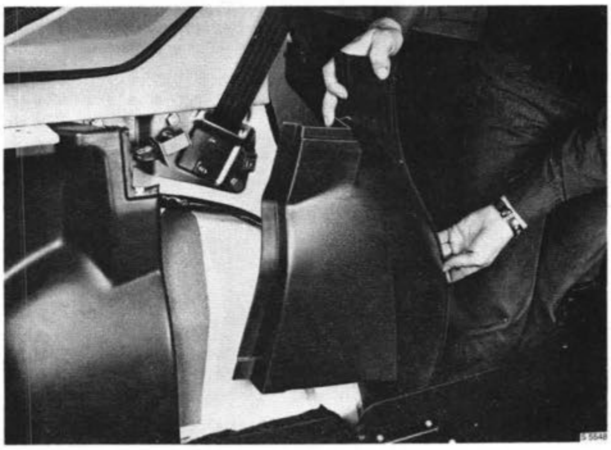
3. Unscrew the front strap of the seat belt from the mounting points on and below the door pillar.
4. Remove the ashtray and strap guide from the side trim and drop the strap inside the trim.
5. Remove the quick-release screws by turning them through 90° and lift away the trim.

REMOVING THE SIDE TRIM, LUGGAGE COMPARTMENT, SAAB 99 COMBI COUPE

Installation is carried out in the reverse order. Check the quick-release nuts for damage. The slots in the quick-release screws should be turned to the horizontal position when the screws are inserted.

Removal and installation of side trim by rear seat, 4-door Saab 99 Combi Coupé

1. Drop the seat forward and remove the lower side trim retaining screw.
2. Drop the backrest forward and remove the upper side trim retaining screw and backrest catch cover.
3. Remove the side trim.



REMOVING THE SIDE TRIM BY THE REAR SEAT, 4-DOOR
SAAB 99 COMBI COUPE

Installation is made in the reverse order.

Removal and installation of parcel shelf, Saab 99 (99 L), 99 L (99 GL), 99 GLE and 99 EMS

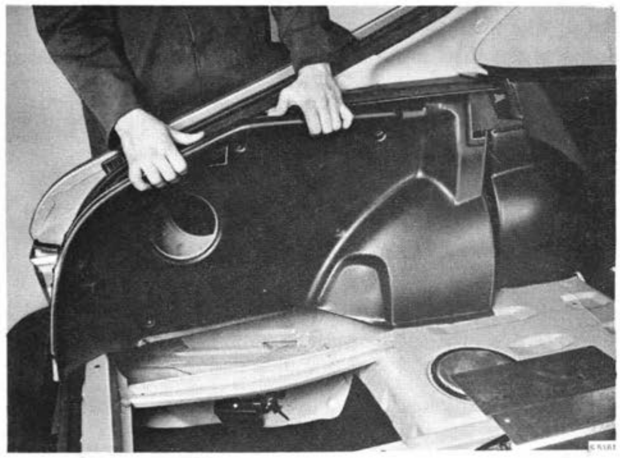
1. Drop the rear seat and backrest forward.
2. Remove the clips which hold the parcel shelf trim to the steel edge below the parcel shelf member.
3. Remove the seat belt reels from the parcel shelf.
4. Remove the plastic bushings from the catch opening.
5. Remove the seven quick-release screws which secure the parcel shelf by turning them through 90°.
6. Raise the front edge of the parcel shelf slightly and unscrew the control arm on the backrest catch from its pivot.
7. Lift out the parcel shelf.

THE PARCEL SHELF IS REMOVED

Installation is made in the reverse order.

Removal of side lining in luggage compartment Saab 99 Combi Coupé

1. Remove the floor plate and the rear floor panel in the luggage compartment having first removed the self-tapping screws and the hinge screws for the rear back-rest.
2. Left side: Remove the spare wheel cover and the spare wheel and its support bracket.
3. Remove the quick-release screws by turning 1/4 of a turn from the mounting position. Lift away the lining.

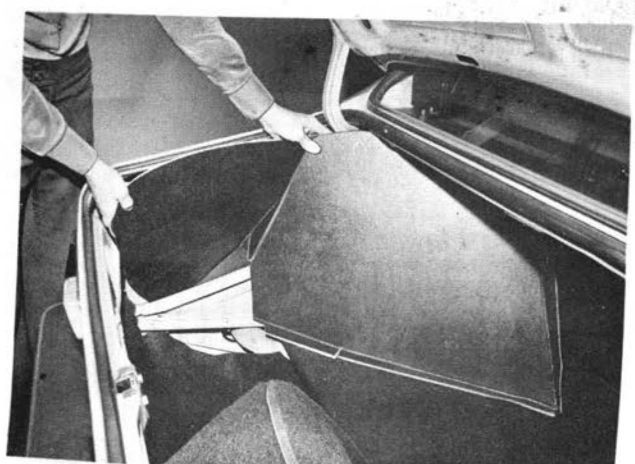


REMOVING THE SIDE TRIM, AT THE REAR SEAT,
SAAB 99 COMBI COUPE

Installation is made in the reverse order. Check that the quick-release screws are undamaged. The slots in the quick-release screws should be turned to the horizontal position when the screws are inserted.

Luggage compartment trim, Saab 99 GL, as from model 1976

As from model 1976 side trim has been installed in the luggage compartment of the Saab 99 GL. On removal, release the clips and remove the lower trim section first. Then carefully remove the large trim section by bending it slightly. Take care not to crack it.



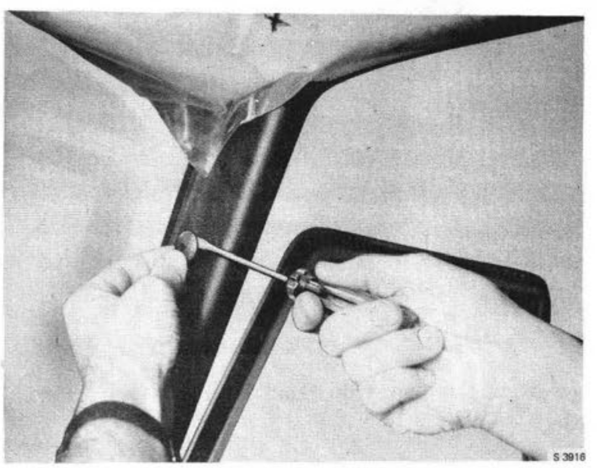
REMOVING THE LINING, LUGGAGE COMPARTMENT,
SAAB 99 GL

HEADLINING

The headlining is made of moulded glass fiber covered with velour. The lining is during the transportation covered with plastic which is to be removed after that the lining is mounted in the car. Because of its ridgidity, the lining is sensitive to breaking especially around the edges of the recesses for the roof lamps and the sun visors. The installation of the lining must therefore be made with greatest care. The way of installation differ on 2- and 4-door versions, and Saab 99 Combi Coupé.

Removal, 2-door model
(Some of the instructions in the text apply to 4-door cars.)

1. Open the left door. Remove the left seat and drop the backrest of the right seat back.
2. Put the gear lever in reverse.
3. Remove the rear view mirror, the dome lights, the sun visors, the curve handles and the coat hangers in four-door cars.
4. Remove the seat belt attachments in the door pillars and remove the safety pads.
5. Remove the screws and the clips from the safety pads at the windshield pillars and move the pads inwards.



REMOVING THE FRONT PILLAR SAFETY PADS

6. Remove the headlining from the pads at the rear window by moving the lining forwards. Than lift out the floor through the left door. On the 4-door model through the right door.

THE LINING IS LIFTED OUT THROUGH THE LEFT DOOR

Installing, 2-door model

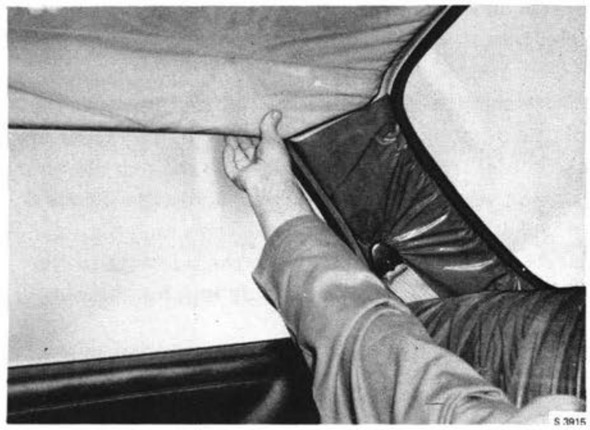
If the front or rear window is already removed, move the lining through the window opening. Note! Leave the plastic cover on the lining during the installation.

1. Put the gear lever in reverse. Move the lining in through the left door if the front or rear window is not removed.

THE LINING IS LIFTED INTO THE CAR

THE LINING IS MOVED IN POSITION

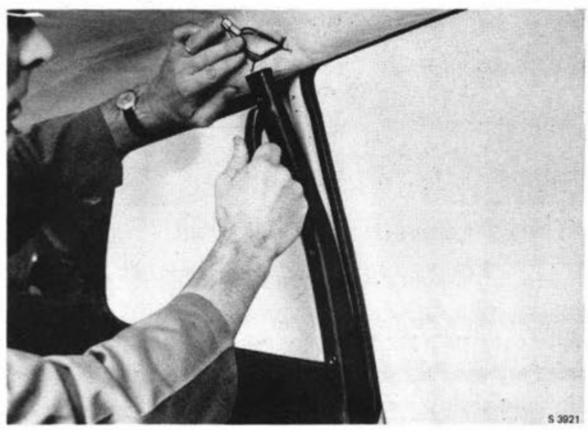
2. Lift the lining up on the upper ends of the front pillar safety pads and pull it backwards to stop above the rear safety pads. Pull out the electric cables for the roof lights through the recesses in the lining.



THE REAR EDGE IS POSITIONED

3. Screw the pads on to the windshield pillars and the door pillars.

THE FRONT DOOR PILLAR PADS ARE INSTALLED



DOOR PILLAR PADS ARE MOVED INTO POSITION

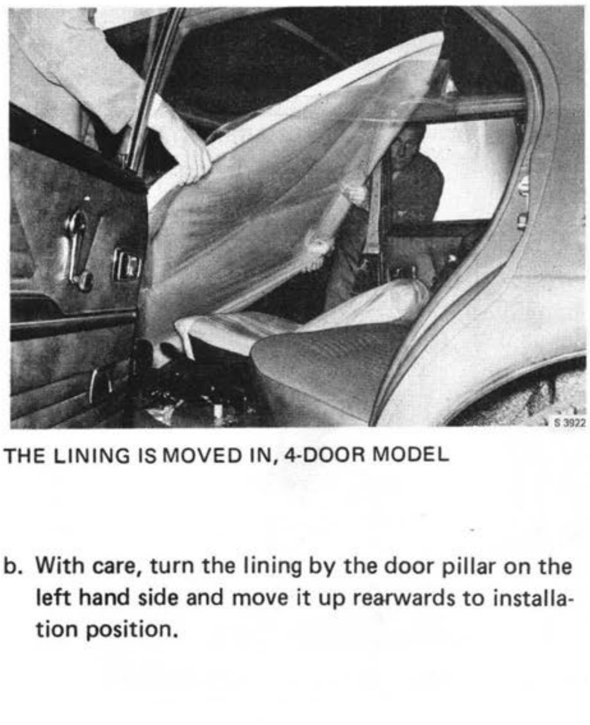
4. Install and connect up the roof lamps, install the rear view mirror, sun visors, and the coat hangers on the 4-door model.
5. Check that the lining is correctly fitted. Remove the plastic cover by removing the safety pins and tear off the cover from the sides and around the rear view mirror, sun visor attachment points and on the 4-door model around the coat hangers. Remaining plastic pieces can be folded in between the side edge of the lining and the roof plate. Suitable tool for this purpose is a putty spade.
   Note! When mounting window panes and glueing in connection with this, the lining must be protected against stains. The edge of the lining must then be masked with plastic.

Removal, 2-door model

1. Remove the driver's seat, steering wheel and gear shift lever. Drop the back rest on the right seat rearwards.
2. See position 3, 4 and 5, "Removal 2-door model".

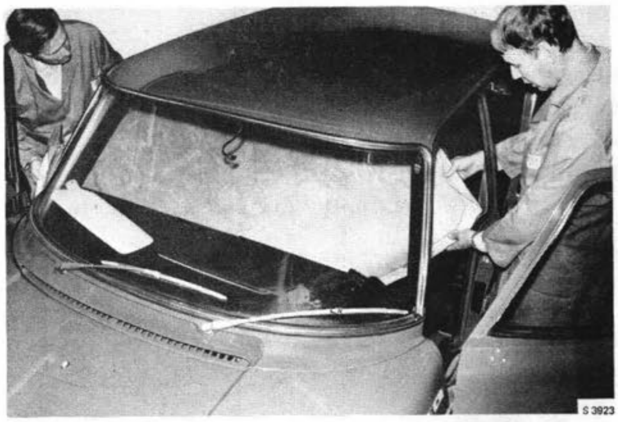
Installation, 4-door model

1. a. Move the lining in through the right front door, rear end first.



THE LINING IS MOVED IN, 4-DOOR MODEL

b. With care, turn the lining by the door pillar on the left hand side and move it up rearwards to installation position.

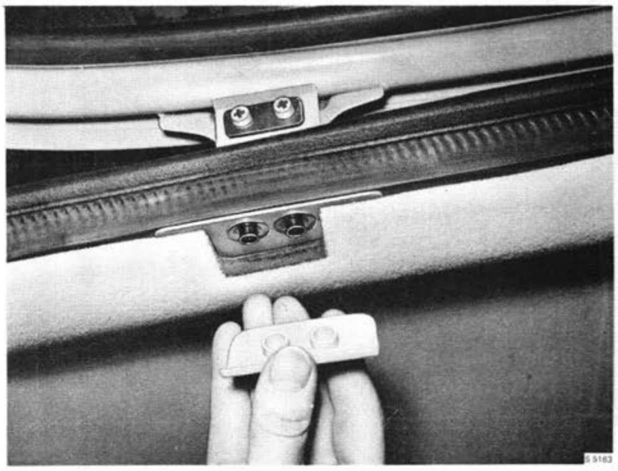


THE LINING IS MOVED INTO POSITION IN THE CAR

2. See position 2, 3, 4 and 5 under "Installation 2-door model".
3. Fit the steering wheel, gear shift lever and driver's seat.

Removal and installation, Saab 99 Combi Coupé

1. Open the trunk door and tip forward the rear seat cushion and backrest.
2. Follow points 3, 4 and 5 under "Removal, 2-door model".
3. Remove the two plastic covers below the hinge mounting for the luggage compartment door.



REMOVING THE PLASTIC COVERS AT THE HINGE MOUNTINGS

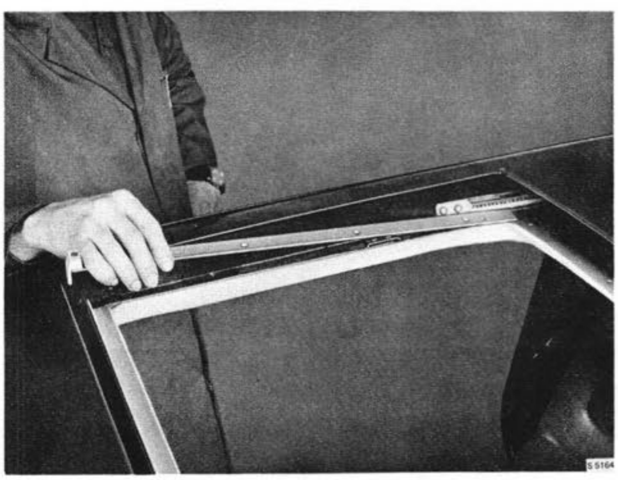
4. Separate the head lining from the rear door pillar trim by pulling the lining forward. The lining can then be lifted out through the trunk door.

REMOVING THE HEAD LINING

Install in the reverse order.

Removing and fitting of the headlining, cars with earlier-version sunroofs

1. Remove the sunroof (see special instructions).
2. Remove the rear window (see special instructions).
3. Unscrew the rails round the sunroof opening.



THE RAILS ARE REMOVED

4. Carefully remove the material which is glued to the sunroof frame.
5. Removal is then carried out in the same way as for cars without sunroofs with the exception that the lining should be lifted out through the rear window.

Installation is made in the reverse order.

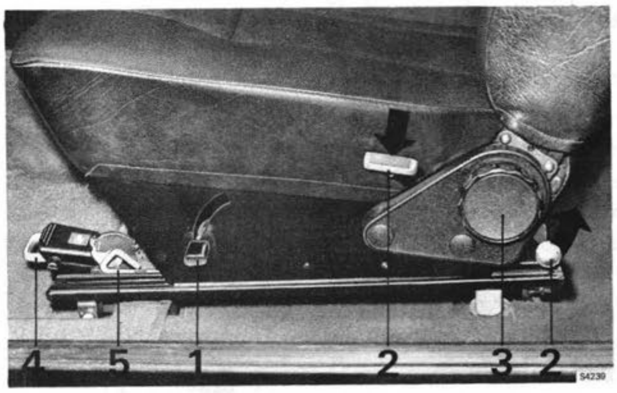
Removing the headlining, cars with later-version sunroofs

The headlining can be removed in the normal way once the plastic strip around the sunroof opening has been removed and the lining material bent down.

SEATS AND CARPETING

GENERAL

The front seats are built up on a sheet steel frame to which the backrest is mounted. The upholstery consists of moulded rubber cushions laid on rubber sheets and covered with textile and plastic-coated fabric. Both front seats are mounted on rails to allow legroom adjustment. At the front of the driver seat rails is an adjustment bolt with which the height of the seat can be adjusted.



FRONT SEAT
1. Legroom adjustment catch
2. Backrest release, to drop backrest forward
3. Backrest angle adjusting knob
4. Vertical adjustment handle (driver's seat only)
5. Catch

The rails are secured at the back ends by attachment hooks with two notches. The adjustment bolt can be manipulated to raise or lower the whole seat, raise the front and drop the back, or vice versa. A system of springs under the rails at the back helps to raise the seat.
The backrest is adjustable and can be set at various angles or in the fully reclining position by turning the knob. To enable passengers to enter or leave the back seat in the 2-door model, the front seat backrest can be folded forward by releasing the catch by means of one of the handles. The front handle is for use from the outside of the car while the rear handle is designed for rear seat passengers.
The driver's seat is electrically heated. Heating elements consisting of resistance wiring and reflectors held by a plastic net is mounted in seat and backrest cushions and via a thermostat connected to the ignition lock.
The elements are switched on when the seat temperature is below 50°F (+14°C). The thermostat, mounted in the seat cushion, cuts out the current when the temperature is higher than 81°F (+27°C).

DRIVER'S SEAT

Removing and installing

The driver's seat is installed and taken out complete with rails.

1. Release the seat by moving the adjustment bolt lever or handle to the intermediate position. Disconnect the cable connectors for the seat heating pads and, where applicable, the contacts for the seat belt warning system.
2. Push the catches back to release the adjustment bolt. Raise the leading edge of the seat, tip it backward and disengage from the hooks at the rear.

To install the seat, proceed in the reverse order.

PASSENGER SEAT

Release the seat by removing the retaining screws (insex screws) from the rails.

Legroom adjustment

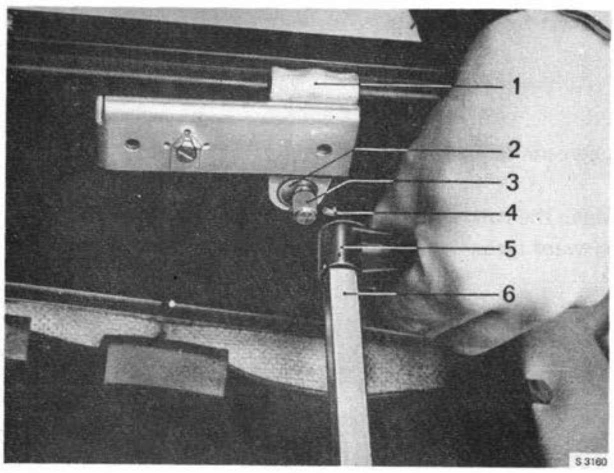
Move the catch 1 up, (see illustration) and slide the seat forward or backward to the desired position.

Adjustment mechanism

The front seat adjustment mechanism is continuously adjustable and features a friction device that locks the seat frame to the rails.
The friction device must lock equally hard on both sides when the release catch is in its normal position (i.e. locked). This is best checked with the seat mounted in the car. The release catch must not touch the stop when in this position. If the friction device is not working properly, the seat must be taken out and the adjustment mechanism readjusted. It is normally sufficient to adjust the inner side only, as follows.

1. Separate the splined joint with a screwdriver.

> NOTE
> Make sure that the eccentric does not slip out of the hole in the locking arm. If this happens, the eccentric shaft tension spring will lose its grip.



SPLINED JOINT, DISASSEMBLED

1. Lock arm	4. Spring
2. Eccentric	5. Twist ring
3. Splines	6. Intermediate tube

2. Turn the twist ring and intermediate tube counter-clockwise until all play is eliminated and the release button is about 0.4" (10 mm) above the stop. Put the splined joint together in this position.

> NOTE
> The foregoing instructions apply to the left-hand seat. In the case of the right-hand seat, turn the twist ring and intermediate tube clockwise.

Dropping the backrest forward

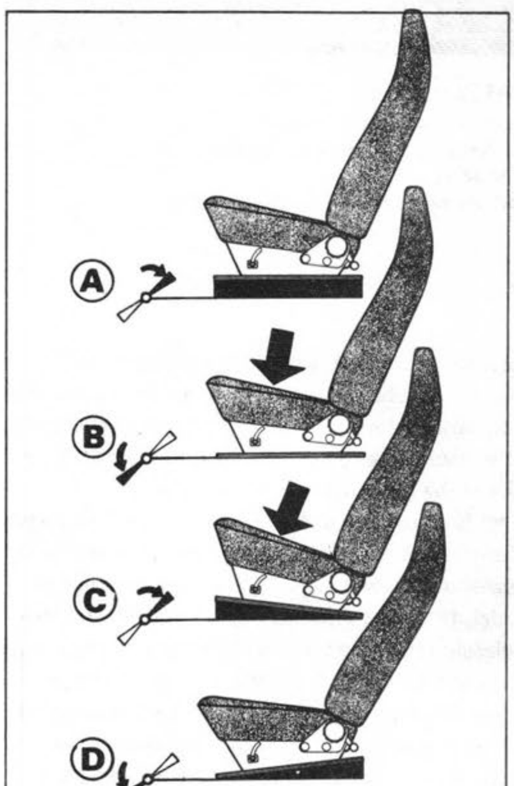
To drop the backrest forward, press down catch 2 (see illustration, page 852–1).

Backrest adjustment

Turn knob 3 (see illustration, page 852–1) forward to raise and backward to lower the backrest.
NOTE! Do not press on the backrest while adjusting.

Adjusting the height of driver's seat

The lever under the front of the seat, which is provided with a catch, is used to adjust the front and rear of the seat to two alternative heights. As the front and rear adjustments are independent of each other, four different combinations are possible. The lever has three positions – rear, front and middle.



VERTICAL ADJUSTMENT OF DRIVER'S SEAT

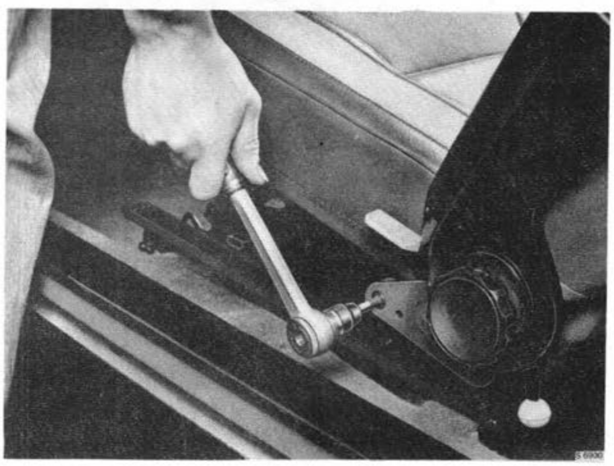
Adjusting seat cushion height and angle

Release the lever/handle catch by pulling the lever/handle and moving it to the central position. The seat can now be adjusted to the desired position as follows:

A. Front and rear raised:
   Move lever/handle back without weight on seat.
B. Front raised, rear dropped:
   Move lever/handle back, pressing down on seat.
C. Front and rear dropped:
   Move lever/handle forward, pressing down on seat.
D. Front dropped, rear raised:
   Move lever/handle forward without weight on seat.

Separating backrest—seat cushion

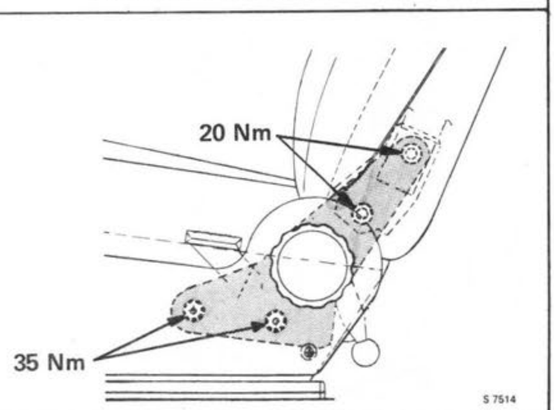
1. Remove the two screws as shown in the illustration.
   – earlier design, Phillips screws
   – later design, Higrip screws.

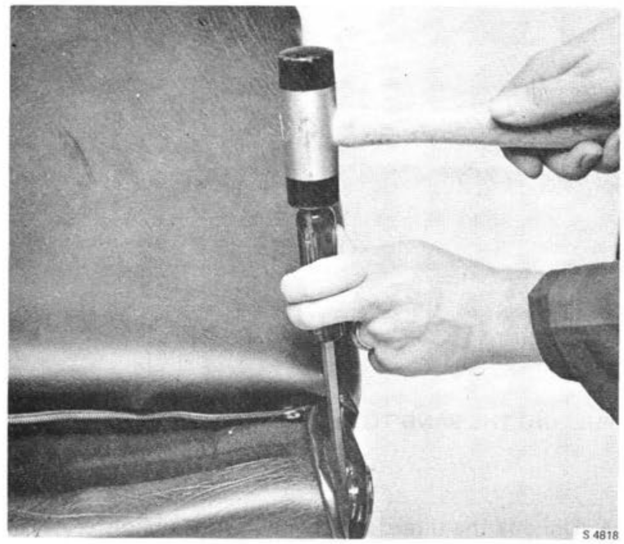


REMOVAL OF SCREWS FOR THE RECLINING CONTROL

2. Remove the lock ring on the opposite side. (The ring is holding the back rest frame stud to the seat frame.) Then the backrest can be hooked off from the seat.

Reclining controls torque

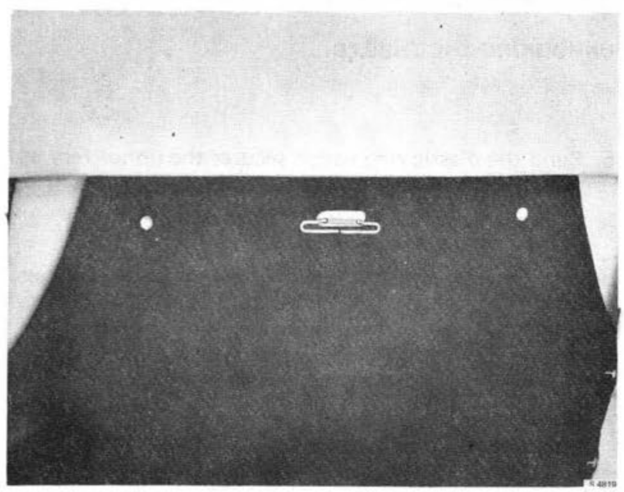




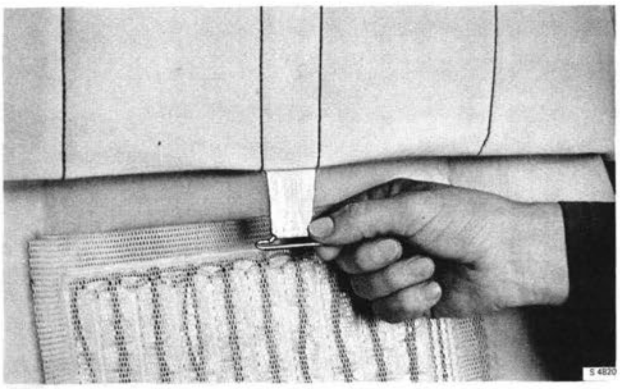
REMOVAL OF LOCK RING

Changing the squab upholstery up to and including 1979 model

1. Remove the seat from the car.
2. Undo the zip in the lower edge and unhook the hooks at the bottom on each side.
3. Roll up the upholstery as far as the band in the middle of the backrest. Undo the clip at the rear of the backrest and pull the band and clip to the front of the seat.

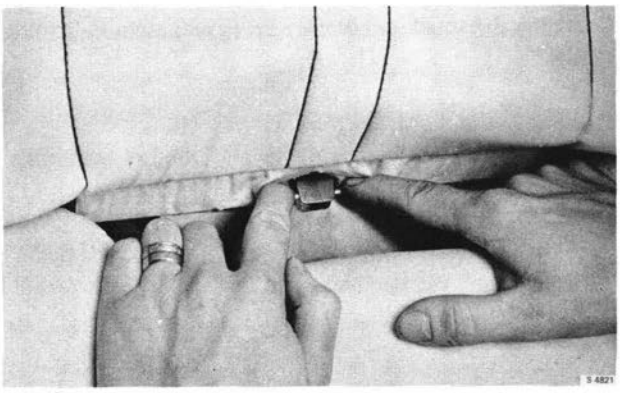


CLIP AT REAR OF BACKREST



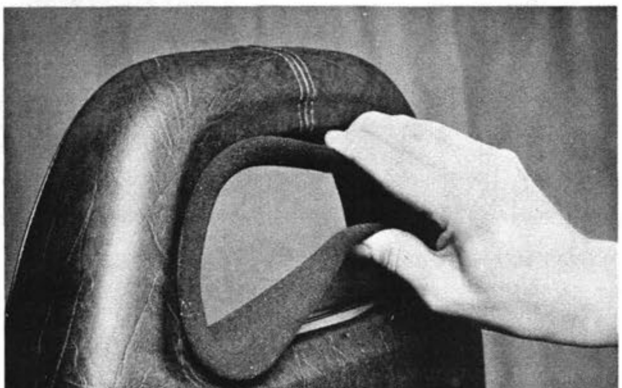
PULLING THE BAND TO THE FRONT

4. Unhook the thread which secures the upholstery at the front and below the hole in the backrest.



UNHOOKING THE THREAD

5. Bend the plastic ring which secures the upholstery at the hole and thread it through the hole from the back to the front.



COMPRESSING THE PLASTIC RING

THREADING THE PLASTIC RING OUT FORWARDS

6. Fold back the flaps in the grooves inside the hole.

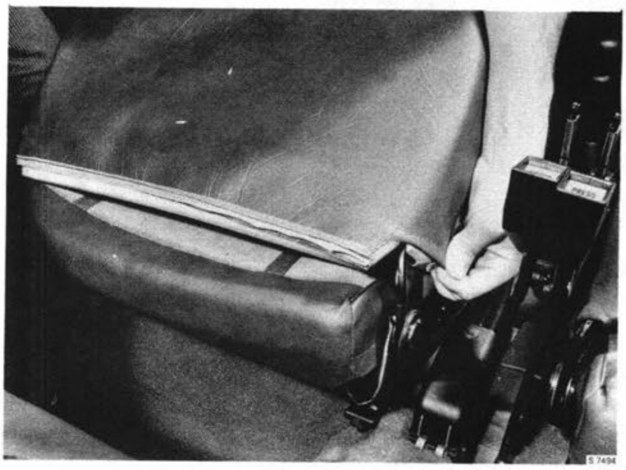
FOLDING BACK THE FLAPS

7. Remove the cover

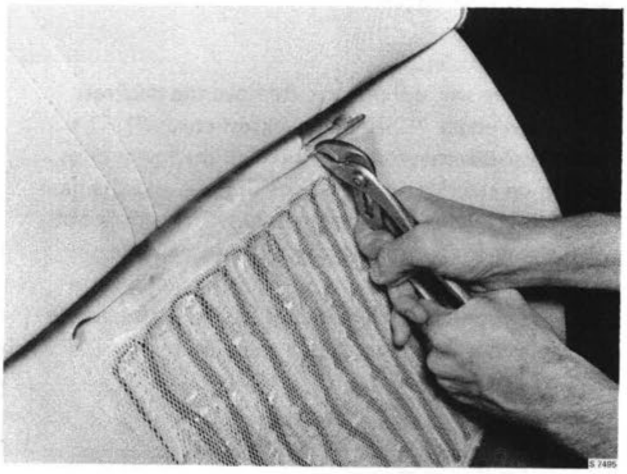
Fitting is carried out in the reverse order.

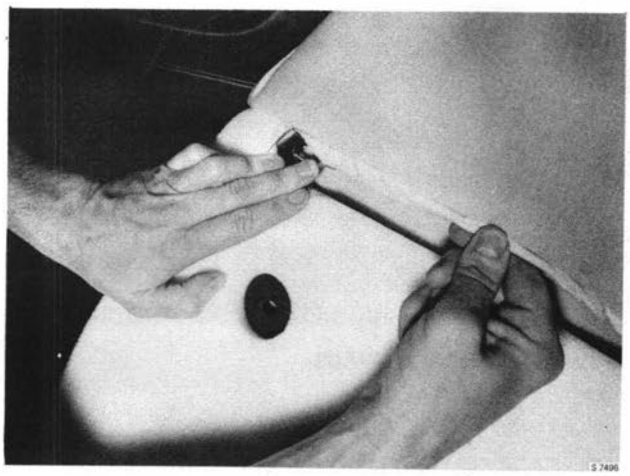
Changing the squab upholstery as from 1980 model

1. Undo the zip in the lower edge and unhook both the hooks at the bottom of each side of the squab.

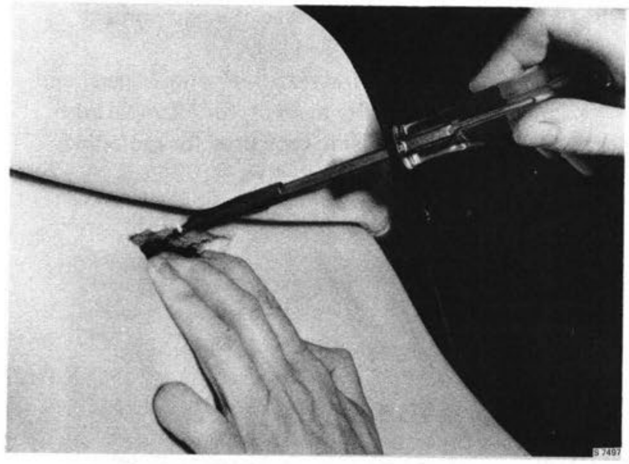


2. Roll up the upholstery and unhook both the wires which hold it to the front and rear sides.

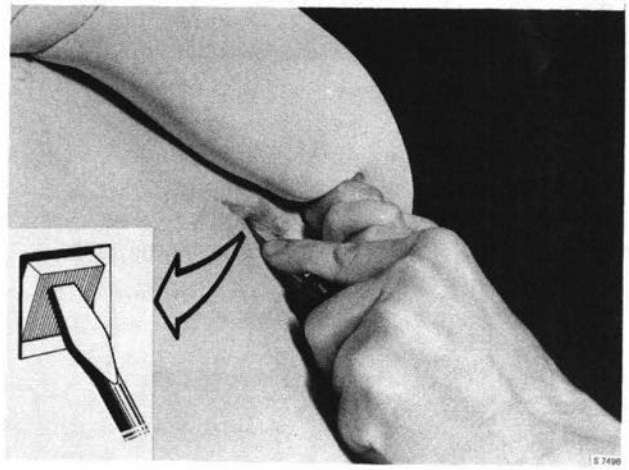




3. Fold back the material over the headrest which should be raised to the upper position.
4. Remove the headrest retaining screws.

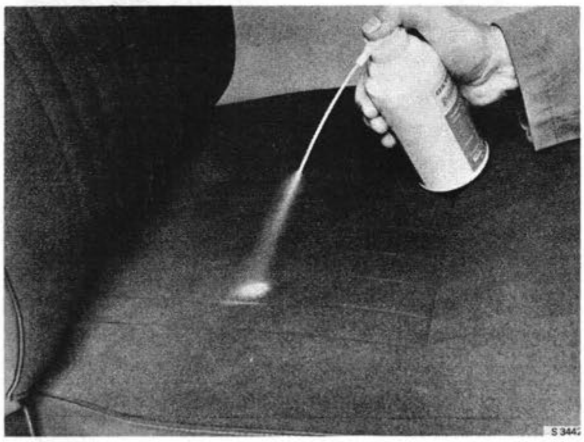


5. Depress the headrest mounting catch and pull up the headrest. The upholstery can then be removed.



Checking of heating pads

1. Undo the wire connection "140" (yellow wire) from fuse 3. Connect a test lamp between the wire connection and the fuse terminal.
2. Switch on the ignition. In cars with original heating pad fittings in the passenger seat, the seat contact should be closed during checking.
3. Find the thermostat in the seat (feel with fingers) and cool the area in a suitable manner, for example with a cooling spray of the same type used for radio and TV service.

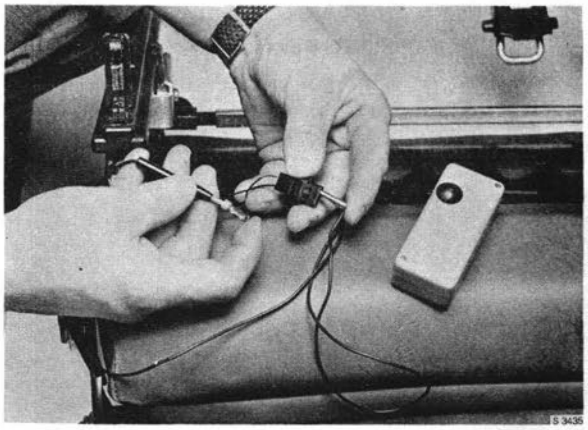


COOLING THE THERMOSTAT

After a while the thermostat will cut in and the lamp should light.
If the lamp does not light it may be due to:
Faulty fuse
Wire fracture in the wiring or the heating pads
Faulty thermostat
Faulty grounding
Defective test lamp

Possible wiring fracture in heating pads, check with the aid of a buzzer
(Disassembled, heated seat)

A. Backrest heating pad
Connect one of the leads of the buzzer to the pad leads (the splicing sleeve is pushed into the PVS tube). If there is no fault in the wiring, the buzzer will sound when its other lead is connected to one of the two pins in the dual-pole splice cover.

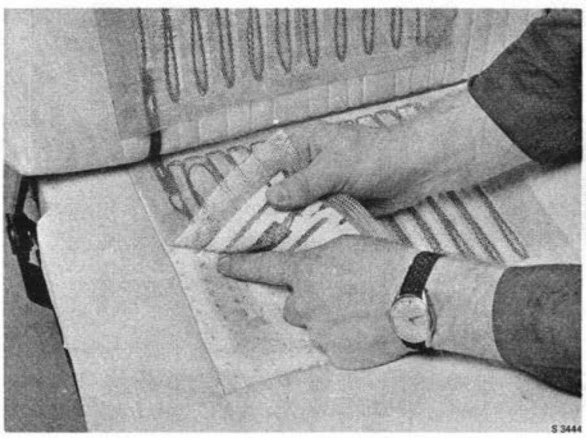


CHECKING WITH A BUZZER

B. Seat heating pad
Cool the thermostat until it is below the cut-in temperature and connect the buzzer as under A but to the other pin in the dual-pole splice cover. Note that even a thermostat fault can mean that the buzzer will not sound in this case.

Changing the heating pads

1. Take out the seat.
2. Remove the seat upholstery. Remove the backrest cover (see under "Changing backrest covers"). The seat cover is removed by undoing all the lower clips, the rib on the right-hand side of the seat and the base rib. Pull up the cover from the right, and tuck it out of the way so that the heating pad is accessible.
3. Remove the heating pad(s). Dissolve the glue with pure gasoline (cleaning gasoline) so as not to tear off large pieces of the foam rubber cushioning.

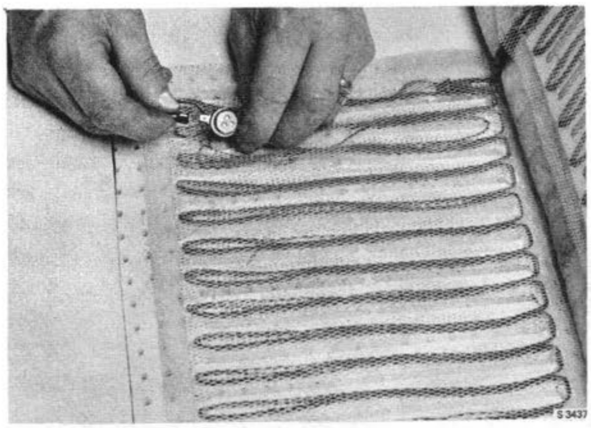


REMOVING THE HEATING PADS

4. Glue on the new heating pad(s) with suitable impact adhesive such as Bostik A3. Connect the wiring so that the pads are in series.
5. Replace the upholstery and mount the seat.

Changing the thermostat

Remove the seat cover, see points 1–2 "Changing the heating pads". Remove the binding threads from the thermostat connection wires, after which the thermostat can be pulled out and replaced. Fit binding threads to the new thermostat to eliminate the risk of the wires working loose after a time.



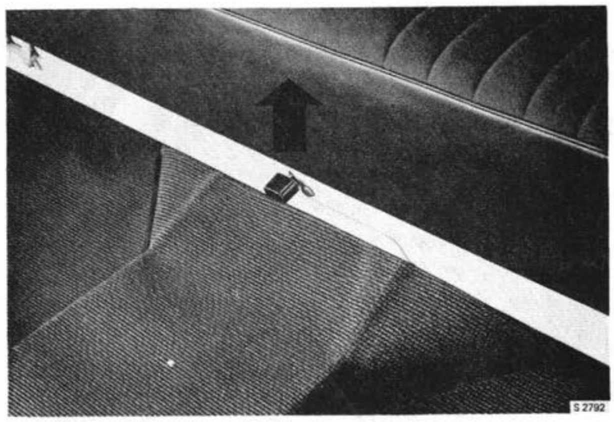
CHANGING THE THERMOSTAT

BACK SEAT

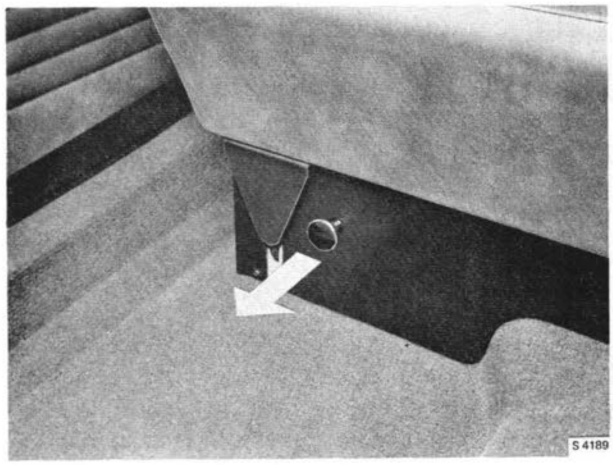
The back seat cushion and backrest are of spring interior construction with upholstery and covers. The cushion has a plywood base, while the backrest has a backing of pressed sheet steel. The cushion is attached to the body by two hinges at the front edge, while the backrest pivots on two hinges at the bottom. In the upright position, the backrest is secured by a catch so that it cannot be forced forward by loose objects in the trunk compartment if the brakes are applied hard.

The trunk can be extended into a larger cargo compartment at need by the following rearrangement of the back seat cushion and backrest:

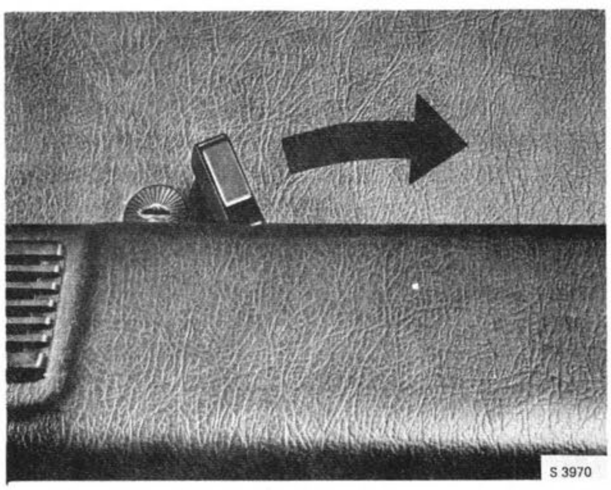
Press up the catch of the rear seat cushion. The catch lever is placed below in the edge of the cushion. On the 4-door model the catch is released by pulling the control to the right under the cushion. Raise the front edge of it, then pull it forward and downward to stand the cushion on edge behind the front seats. Next release the backrest catch and fold the backrest forward and down.



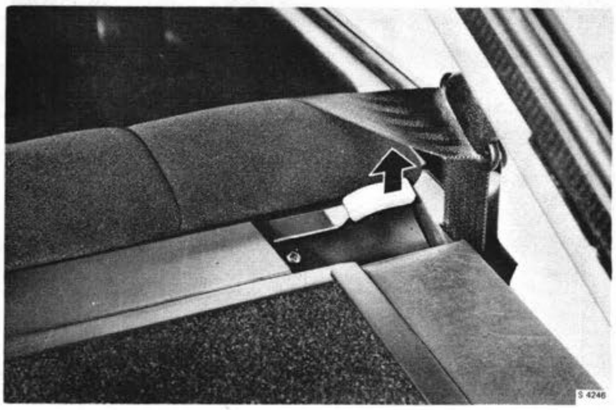
CATCH, SEAT CUSHION, BACK SEAT, 2-DOOR MODEL



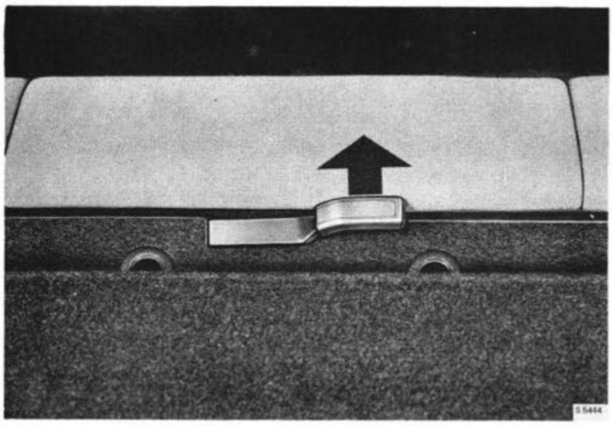
CATCH, SEAT CUSHION, BACK SEAT, 4-DOOR MODEL



BACKREST CUSHION CATCH, SAAB 99 (99 L), 99 L (99 GL), AND 99 EMS



BACKREST CUSHION CATCH, SAAB 99 COMBI COUPE, UP TO AND INCL. MODEL 1976



BACKREST CUSHION CATCH, SAAB 99 COMBI COUPE, AS FROM MODEL 1977

CARPETS

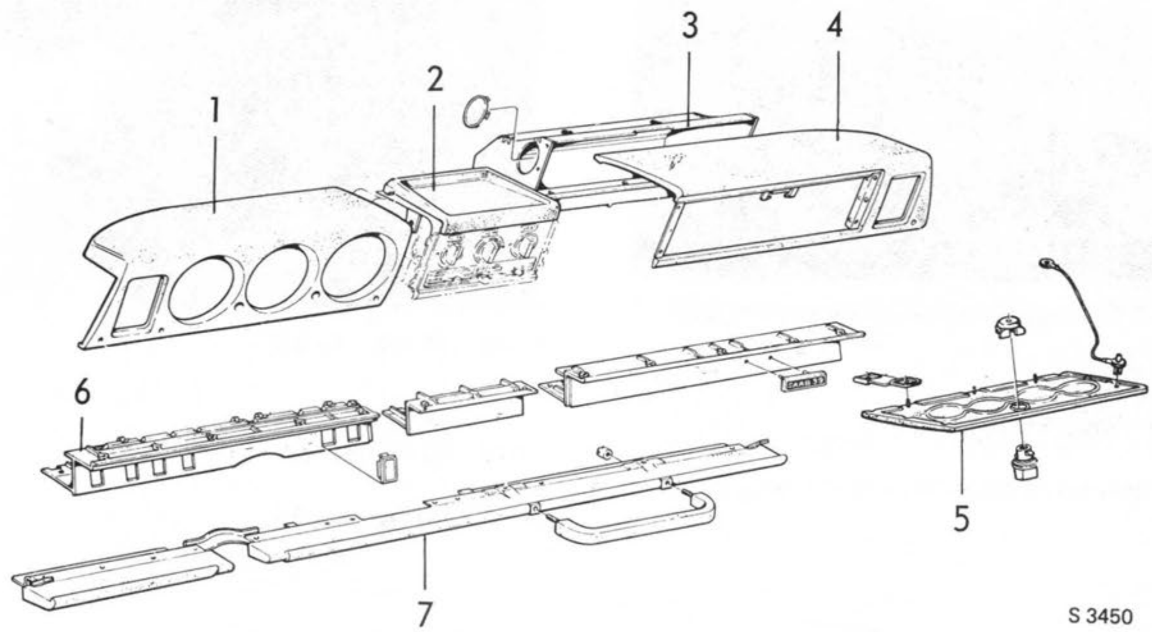
The floor carpets are of nylon fibre on fabric. The carpets are secured by means of press studs and tape fasteners. They are secured at the sides by the kick plates which are screwed to the sill beams by means of self-tapping screws. With effect from 1976 model cars, the front edge of the luggage compartment carpet is screwed down.

REMOVING THE KICK PLATES

INTERIOR EQUIPMENT

INSTRUMENT PANEL

The instrument panel is composed of several parts. The top consists of two safety pads with a tidy box mounted between them. The lower part is made up of a three-part switch panel and a knee quard mounted along the bottom edge of the switch panel. The knee guard also incorporates a courtesy handle located under the glove compartment.
A three-part screen is mounted under the instrument panel.



INSTRUMENT PANEL

1. Safety pad, instrument side
2. Tidy box
3. Glove compartment
4. Safety pad, glove compartment side
5. Glove compartment lid
6. Switch panel
7. Knee guard

PADDING, INSTRUMENT SIDE

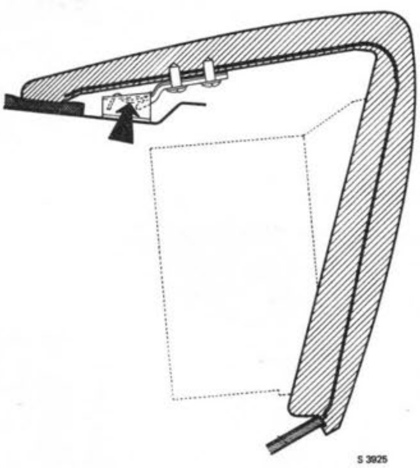
Removal and installation

1. Remove the three screws at the bottom and in the front of the safety padding.
2. Pull the padding backwards to release the spring clips.

REMOVING THE SAFETY PADDING, INSTRUMENT SIDE

3. Remove the safety padding.

Installation is carried out in the reverse order.

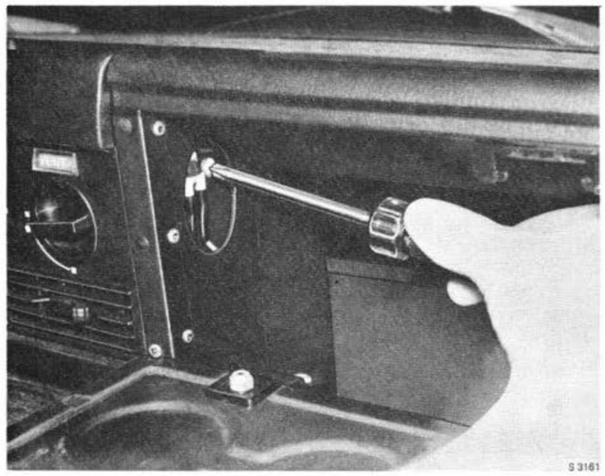


SAFETY PADDING, INSTRUMENT SIDE, SECURED WITH SPRING YOKE

TIDY BOX

Removal and installation

1. Remove the safety padding on the driver's side (see foregoing directions).
2. Remove the retaining screws from both sides of the tidy box. The screw on the passenger side can be reached by removing the cover inside the glove compartment.



REMOVING THE TIDY BOX

3. Lift out the tidy box.

Refit in the reverse order.

PADDING, GLOVE COMPARTMENT SIDE

Removal and installation

1. Remove the door of the glove compartment by removing the hinge screws inside the glove compartment.
2. Remove the two screws at the bottom of the compartment opening and the screw on the side nearest the door.
3. Remove the clip at the centre hinge.
4. Pull the safety padding backwards to release the spring clips.

REMOVING THE SAFETY PADDING, GLOVE COMPARTMENT SIDE

5. Remove the safety padding and glove compartment by lifting them backwards.

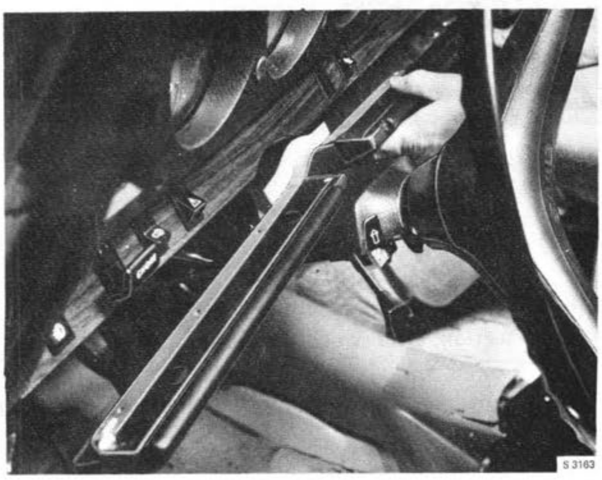
Installation is carried out in the reverse order.

KNEE GUARD

Removal and installation

1. Take away the three-piece screen under the panel.
2. Remove the two screws securing the top end of the steering column tube. Slacken the two screws at the bottom end of the tube slightly so that the steering column can be lowered.
3. Remove all the screws along the bottom of the knee guard and lift the guard away.

Install in the reverse order.



REMOVING THE KNEE GUARD

SWITCH PANEL

Removal and installation

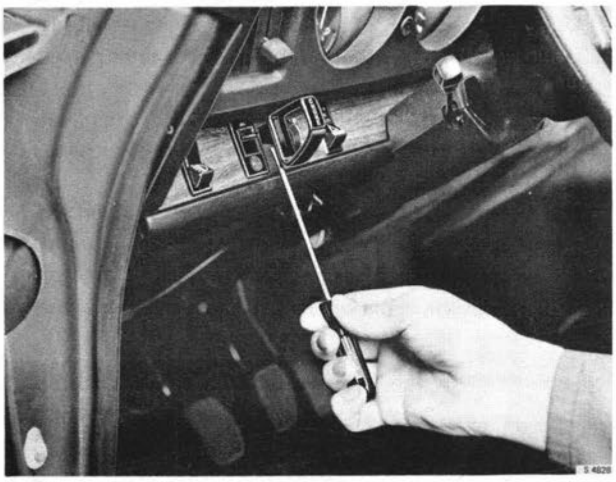
A. Center section
1. Take away the center screen section under the panel.
2. Undo the two top retaining screws of the panel section.
3. Remove the four retaining screws from the knee guard below the panel section.
4. Insert a hand from beneath and push out the panel section as illustrated. Replace the two outer knee guard screws.
   If the panel section is hard to push out, slacken more screws along the knee guard so that the knee guard can be pressed downward slightly.
5. Disconnect the cable to the seat belt warning light.

PUSHING OUT THE CENTER SECTION OF THE PANEL

B. Section on instrument side
1. Take away the screen section on the glove compartment side under the panel.
2. Remove the retaining screws from the knee guard under the section so that the knee guard can be lowered.
3. Undo the five retaining screws from the top of the section, after which the section can be removed.

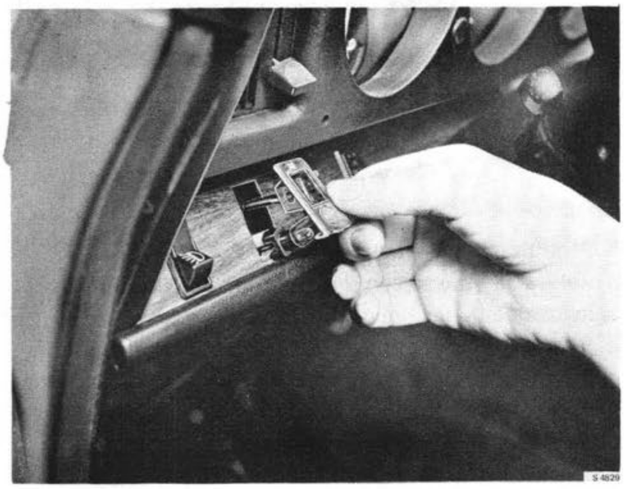
C. Section on glove compartment side
1. Take away the screen section on the instrument side under the panel.
2. Remove the two retaining screws from the top of the steering column tube and slacken the two screws at the bottom slightly so that the steering column can be lowered.
3. Remove the retaining screws from the knee guard under the section so that the knee guard can be lowered.

4. Cars with carburetor engines:
   a. Take off the choke control button by removing the screw underneath.



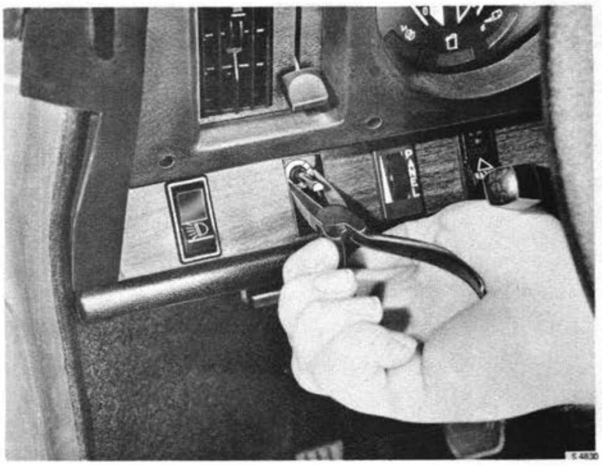
REMOVING THE CHOKE CONTROL BUTTON

   b. Remove the rectangular, transparent plastic washer from behind the choke control and withdraw the warning light holder.



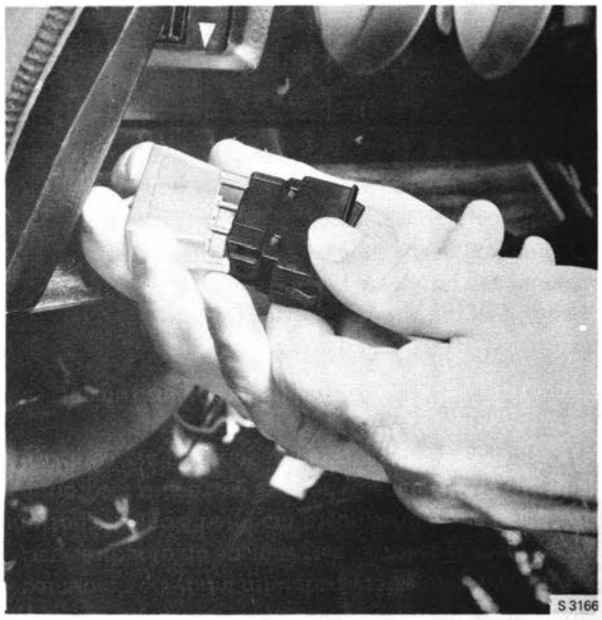
REMOVING THE PLASTIC WASHER

   c. Remove the choke control by unscrewing the retaining nut with a suitable tool. Disconnect the cable for the choke warning light.



REMOVING THE RETAINING NUT

5. Push out the switches from behind and pull the switches and contact pieces apart.
   Note the positions of the terminals on the hazard warning signal switch.



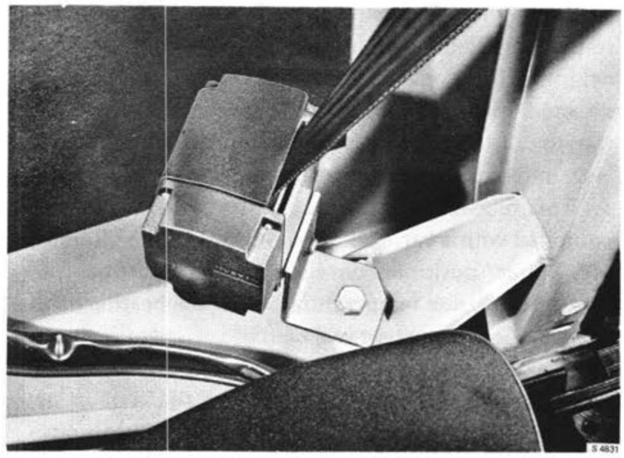
REMOVING THE SWITCH

6. Undo the five retaining screws from the top of the panel section, after which the section can be removed.

To reassemble panel sections, proceed in the reverse order.

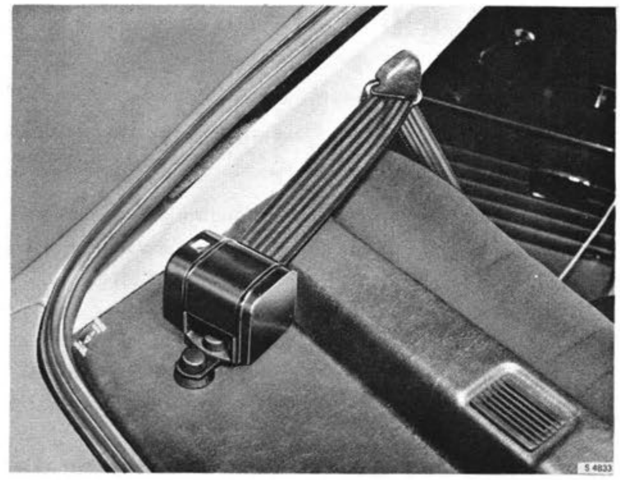
SEAT BELTS

In the front seats there are reel belts with buckle lock. The belt consists of a strap with one end secured at the bottom. The free end runs through an eye up on the door pillar and into the reel which, on 2-door cars, is located inside of the rear side trim and on 4-door cars, on the door pillar.
The belt is fastened by pulling the strap out and inserting it directly into the buckle lock and dropping the yoke, which locks automatically. The strap can run freely through the buckle lock and the running eye and is thereby automatically adjusted. The belt is released by pressing the key marked "press".
In the back seat, there are reel belts on the two outer seats. The reels are mounted on the parcel shelf (Saab 99 Combi Coupé inside the side trim) and the fixed end of the strap is anchored behind the outer end of the seat cushion. The strap is equipped with a sliding buckle which is secured in a locking device between the passengers.
The reels have two locking mechanisms. One mechanism is actuated by sudden acceleration of the reel (i.e. when the strap is pulled out with high speed). The other is actuated by a pendulum which senses the movements of the car. A two-point lap belt with manual adjustment is provided for the rear seat passenger in the middle of the rear seat.

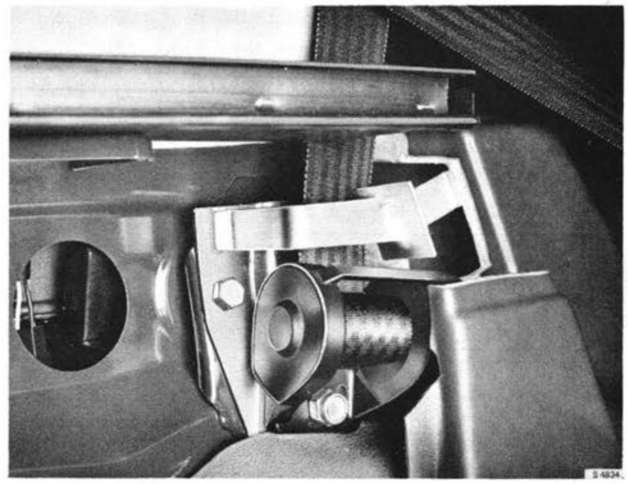


SEAT BELT, 2-DOOR MODEL, FRONT SEAT

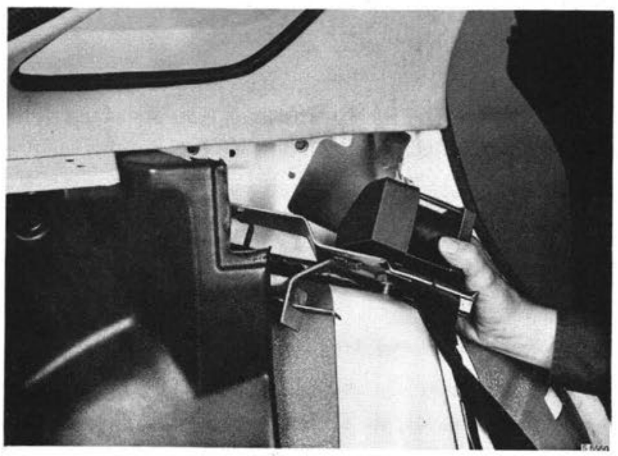
SEAT BELT, 4-DOOR MODEL, FRONT SEAT



SEAT BELT, 2-DOOR CAR, BACK SEAT, SAAB 99, (99 L), 99 L (99 GL) 99 GLE (UP TO AND INCL. MODEL 1977) AND 99 EMS



SEAT BELT, 2-DOOR SAAB 99 COMBI COUPE, BACK SEAT

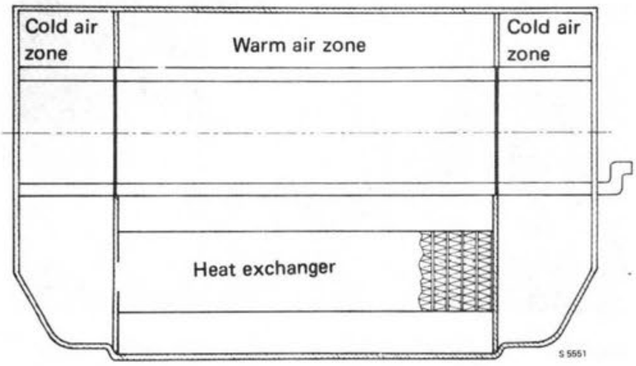


SEAT BELT, 4-DOOR SAAB 99 COMBI COUPE, BACK SEAT

HEATING AND VENTILATION SYSTEM

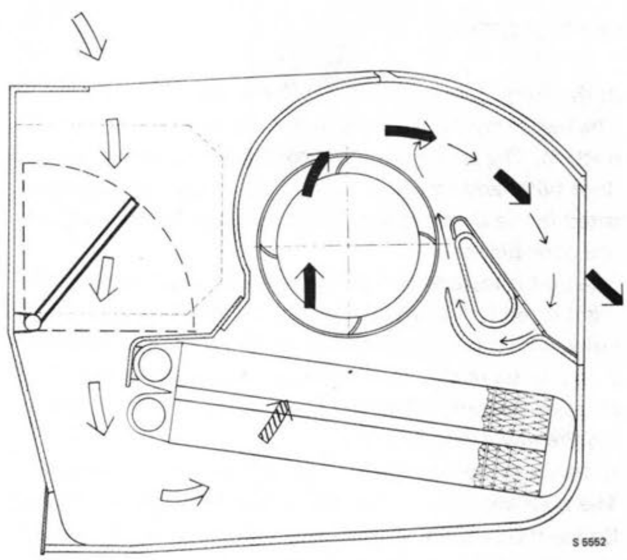
GENERAL

The heating and ventilation system consists of the following components:
Air intake and valve housing in the engine compartment. Located below the instrument panel are the valve housing, defroster nozzles, hoses to the side window defrosters, fresh air outlets and heater control.
In the passenger compartment are the warm air ducts and a valve housing for the rear seat and rear window defroster. Located in the trunk are the evacuation boxes with air outlets.
The fan casing contains both fan and heat exchanger. The casing is divided up into three zones with partitions. The two outer zones admit cold air and are connected to the fresh air channel and the three fresh air outlets. In the centre zone, the air passes through the heat exchanger which thereby supplies hot air to the coupé.



THREE ZONES OF THE FAN CASING AS SEEN FROM THE FRONT

The fan is a cross-flow fan with a common impeller for all three zones. The flow of the air is regulated by a pear-shaped guide vane around which the air circulates.



PATH OF AIR

The air passes into the fan casing through the air intake in the dash panel.
The air is distributed by a flap valve housing to the defroster nozzles and other outlets in the coupé. A continuous moulded plastic channel leads from the valve housing to the three fresh air outlets. The defroster nozzles to the rear window are located in a raised defroster channel in the front edge of the parcel shelf. The nozzles are directed towards the middle of the rear window so that the part of the window in the line of sight from the rear-view mirror is the first to be defrosted.
As from model 1977, the intake for the cold-air zones are equipped with a valve which can be set to the "Summer" or "Winter" position from the engine compartment.
When the outside temperature is low, the heating of the passenger compartment will be more efficient if the cold-air intake is closed (valve in "Winter" position), as this eliminates any warm air losses through the impeller or fresh-air ducts. However, when the valve is in this position, cold air cannot be admitted through the fresh air vents.

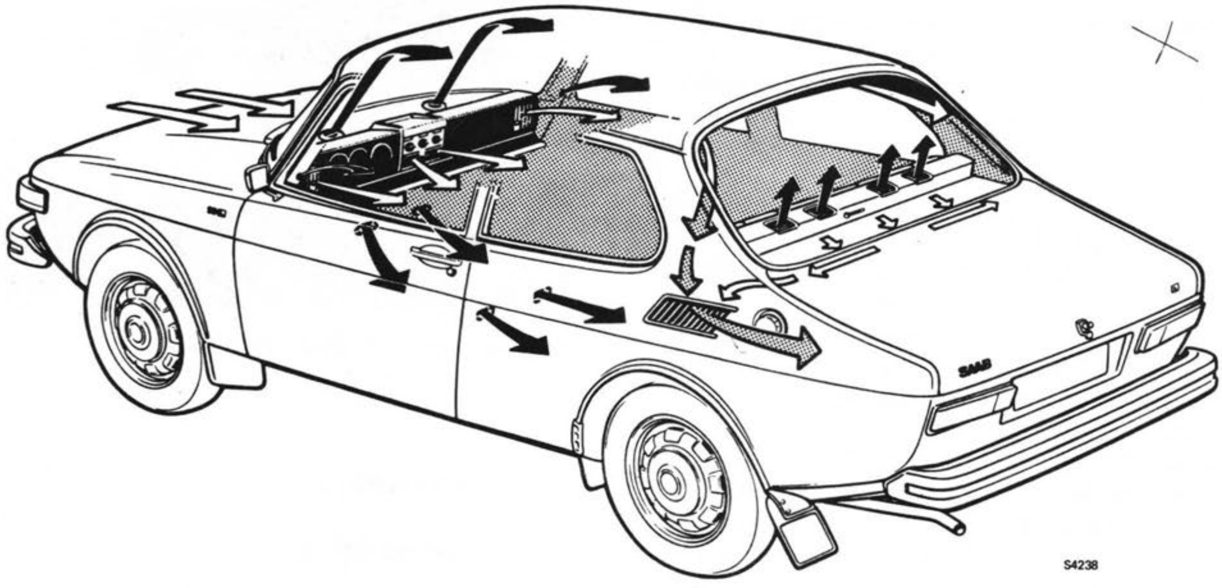
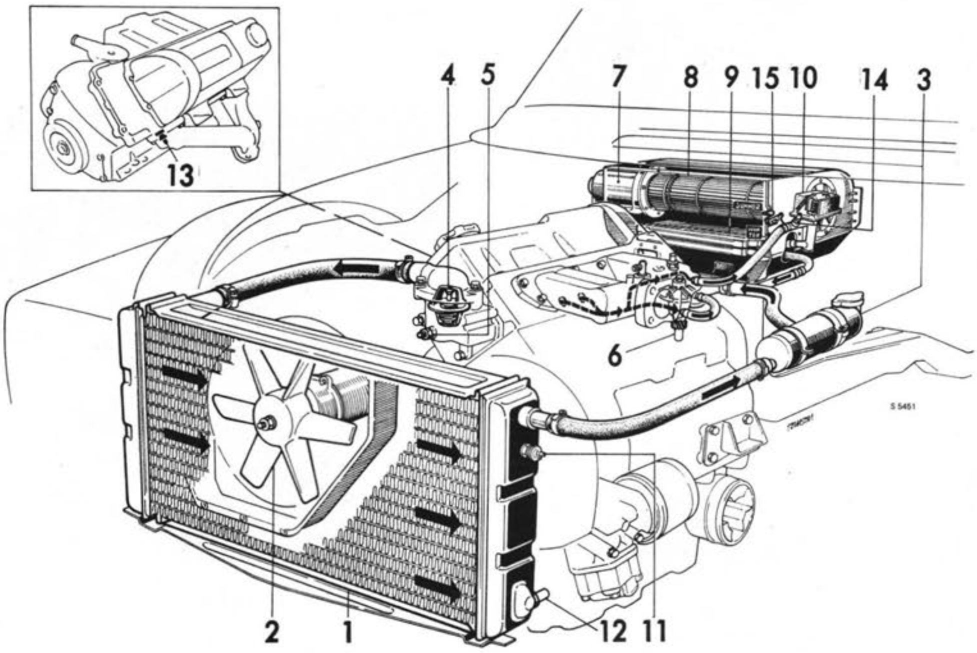


DIAGRAM OF HEATING AND VENTILATION SYSTEM

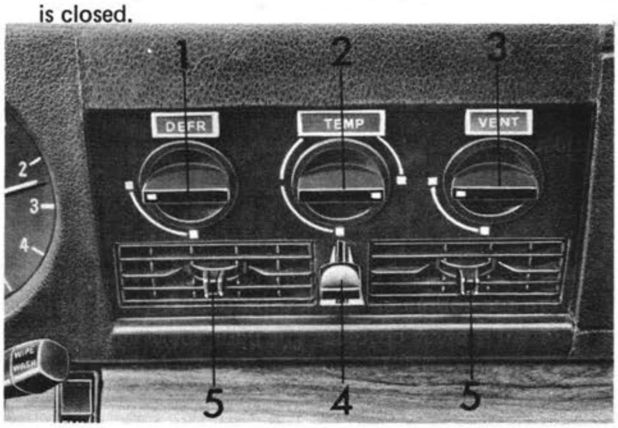


HEATING AND VENTILATION SYSTEM

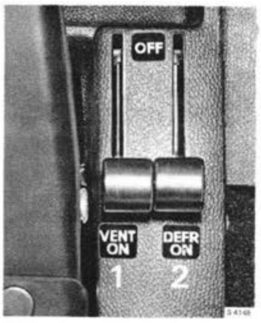
1. Radiator
2. Radiator fan
3. Expansion tank with pressure cap.
4. Thermostat
5. Temperature transmitter
6. Coolant pump
7. Fan motor
8. Impeller
9. Heater core
10. Thermostat controlled valve
11. Thermostat switch, radiator fan
12. Radiator drain cock
13. Engine drain cock
14. Bleeder nipple (as from model 1976)
15. Air valve, cold air regulation (as from model 1977)

The system is controlled as follows:

a. Defroster valve, windshield, controlled by the left-hand knob on the control panel.
b. Defroster valve, rear window, controlled by the right-hand control between the front seats.
c. The water valve is controlled by means of the centre knob on the control panel. The valve is thermostatically controlled to keep the warm air temperature constant.
d. Ventilation valve, front floor, controlled by means of the right-hand knob on the control panel.
e. Ventilation valve, rear floor, controlled by the left-hand control between the front seats.
f. The fresh air valve is controlled by the three controls adjacent to the outlets on the instrument panel. The fresh air outlets can be directed as desired.
g. As from model 1977:
   The valve for the intakes for the cold-air zones is mounted on the fan casing and is operated from the engine compartment. In the "Summer" position the valve is open and in the "Winter" position the valve is closed.

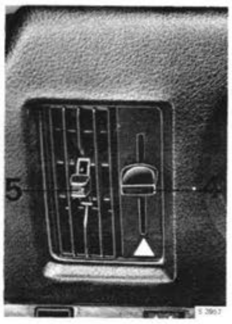


CONTROLS FOR:
1) Windshield and front side window defroster
2) Temperature control
3) Air flow to floor area
4) Fresh air flow
5) Flow direction



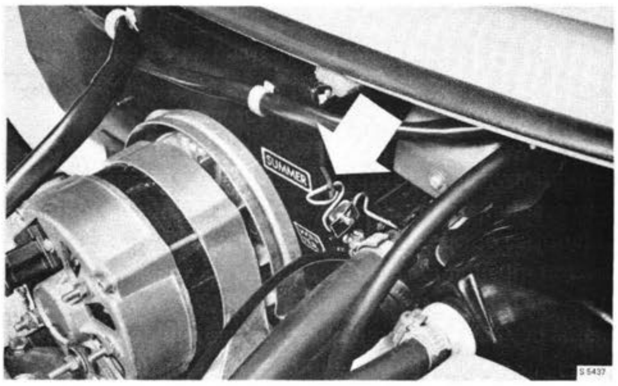
REAR CONTROLS FOR HEATING AND VENTILATION

1. Rear floor space controls. 2. Rear window defroster control



OUTER FRESH AIR VENT

4. Air intake control.
5. Flow direction control.

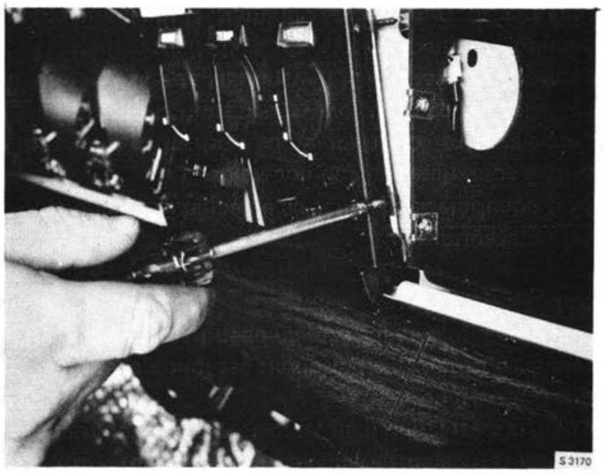


CONTROLS FOR COLD-AIR VALVES

HEATER CONTROLS

Removal and installation

1. Remove the safety padding on both sides and the tidy box from the instrument panel (see under "Interior equipment").
2. Disconnect the wires from the heater controls. Release the wire clamps by pulling them up and twisting them off at the same time.
3. Undo the four retaining screws from the heater control assembly.



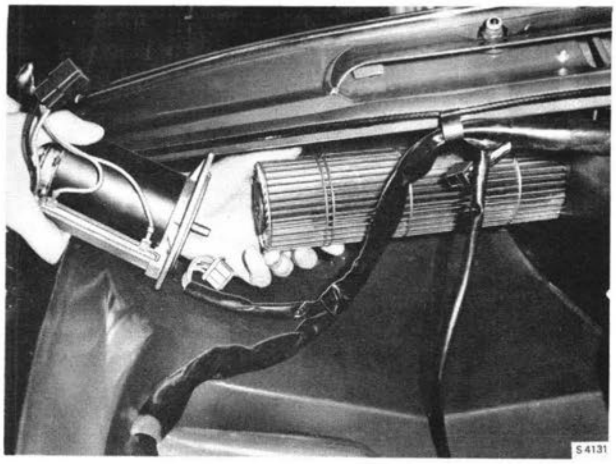
UNDOING THE HEATER CONTROL RETAINING SCREWS

4. Lift the control assembly up until it has detached itself from the fresh air channel. The control assembly can now be removed.

FAN MOTOR AND FAN

Removal

1. Remove the windshield wiper motor (see Group 3).
2. Disconnect the fan motor cables.
3. Undo the three fan motor retaining screws and pull out slightly the motor with the impeller. Separate the motor from the impeller at the rubber coupling, and first remove the motor and then the impeller.



REMOVING THE FAN MOTOR

4. Remove the plate with the fan bearing on the opposite side of the fan casing.

Installation

1. Push the impeller in slightly into the fan casing and connect the impeller and the motor to the rubber coupling.
2. Guide the fan into the casing and secure the motor to the casing.
3. Fit the plate with the fan bearing.
4. Connect the fan motor and check that the fan is rotating freely.
5. Fit the windshield wiper motor.

REMOVING THE HEATER CONTROLS

HEAT EXCHANGER AND WATER VALVE

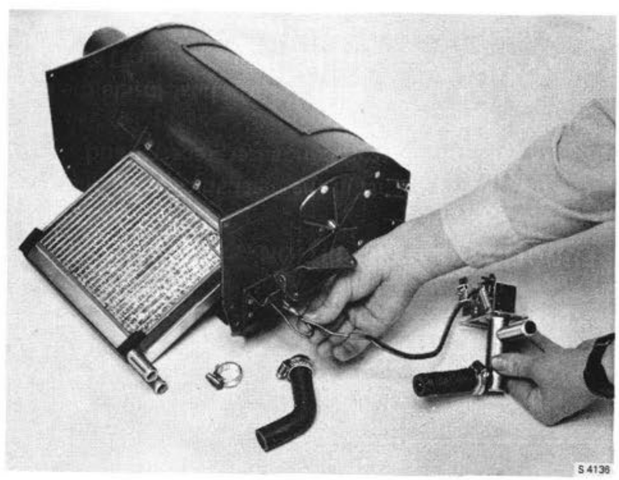
The components can be removed and installed with the fan casing in position in the car.

Removal and installation

1. Drain about 4 quarts (4 liters) of coolant. Remove the alternator and coolant fan relay.
2. Remove the front part of the fan casing. Then unscrew the heat exchanger retaining plate.

THE HEAT EXCHANGER RETAINING PLACE IS REMOVED

3. Remove the cap from the water valve, remove the control wire and remove the water valve retaining screws.
4. Loosen the hose clips on the heat exchanger and the water valve and disconnect the hoses.
5. Disconnect the thermostat coil from the heat exchanger and remove the water valve with coil.



THE THERMOSTAT IS REMOVED

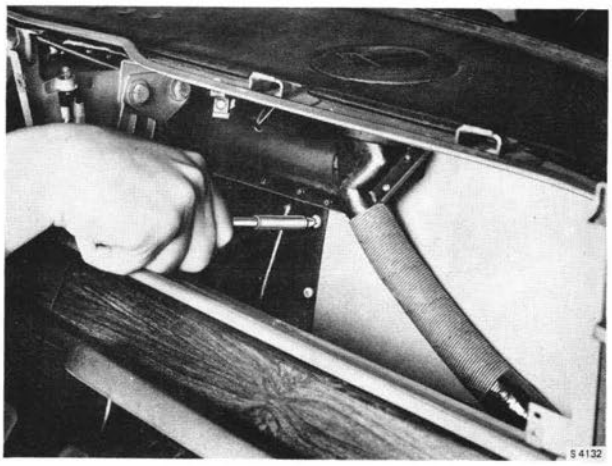
6. Withdraw the heat exchanger from the thermostat casing.

Install in reverse order.

FAN CASING

Removal and installation

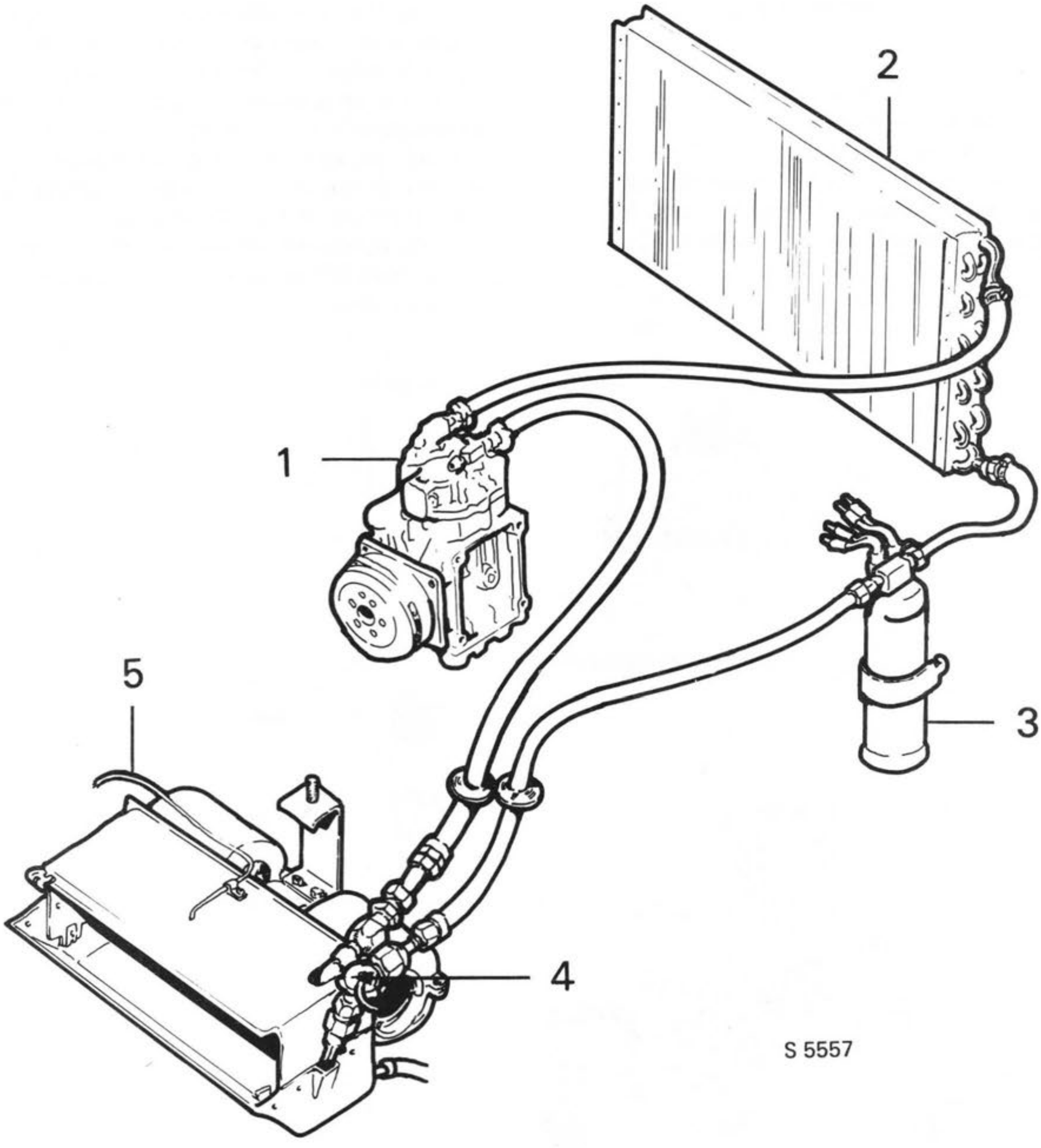
For removal or installation of the fan casing, it is recommended that the power plant be removed.
On installation, the insulating felt should first be glued to the fan casing. Siide the casing into position from the front. Check that the insulating felt does not slide out of position during installation. The fan casing retaining screws become accessible from inside the car once the safety padding with glove compartment and the instrument section have been removed.



FAN CASING RETAINING SCREWS

AIR CONDITIONING SYSTEM

The air conditioning system is designed to control the temperature, humidity, purity and circulation of air. The system cools and dries the air in the passenger compartment.



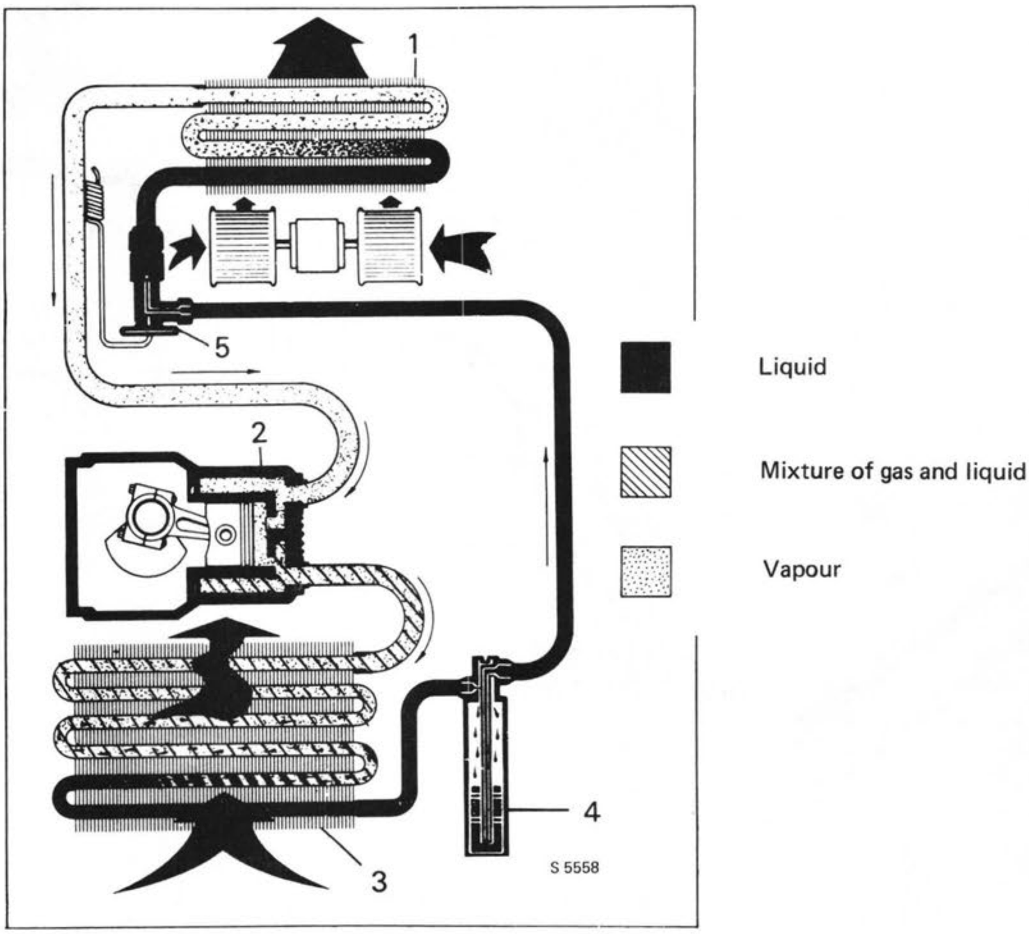
AIR CONDITIONING SYSTEM

1. Compressor
2. Condenser
3. Receiver/Drier
4. Expansion valve
5. Evaporator

FUNCTIONAL DESCRIPTION

The main components in the mechanical system are the evaporator, compressor, condenser, receiver and expansion valve.
A special refrigerant (R12) absorbs heat inside the evaporator by changing from a liquid to a vapour. The evaporator is located inside the passenger compartment. The air flows over the fins of the evaporator and, having been cooled, is directed into the passenger compartment.

The temperature of the evaporator should be as low as possible without ice forming on its surface.
The temperature of the refrigerant may be several degrees lower than that of the air passing through the evaporator owing to the temperature rise through the walls of the cooling fins and coils. The latter is sufficient to prevent the formation of ice.
The compressor pressurizes the heat-laden vapour until its temperature is considerably higher than the outside air. The vapour is then pumped to the condenser, where it gives up its heat and changes once again to a liquid.
The compressor and condenser are located in the engine compartment. On its way to the evaporator, the refrigerant passes through the receiver where it is filtered and dried.
The refrigerant in the form of gas in the condenser gives off heat which is carried off by air flowing over the condenser fins.
The refrigerant then changes state from a gas to a liquid (condenses). The liquid refrigerant is then filtered, dried and stored under pressure in the receiver for subsequent supply to the evaporator. The flow of refrigerant from the receiver to the evaporator is regulated by the thermostatic expansion valve. The expansion valve reduces the pressure, whereupon the refrigerant starts to boil — i.e. vaporize. At this point, the refrigerant absorbs heat from the air passing over the fins of the evaporator. By means of the compressor, the heat is transferred to the condenser where it is carried off by air flowing through the condenser fins.



SKETCH OF FUNCTION
1. Evaporator
2. Compressor
3. Condensor
4. Reciever
5. Expansion valve

Refrigerant

The refrigerant used in the system is R12 which is one of the safest refrigerants available. It is capable of withstanding high pressures and high temperatures without deteriorating or decomposing.
However, it can form a poisonous gas (phosgene) if allowed to come into contact with an open flame or very hot metal.

Safety precautions

R12 is odourless and cannot be detected in small quantities. It is colourless and will not stain.
Suitable eye protection should be worn when R12 is to be handled owing to its low vaporization temperature.
At atmosperic pressure, R12 vaporizes at -22^{o}F (-30^{o}C).
If liquid R12 enters the eye, the eyeball may freeze. If an eye freezes, it may cause blindness. If the liquid enters the eye, follow these instructions:

1. Do not rub the eye.
2. Splash large quantities of cool water into the eye to raise the temperature.
3. Apply clean petroleum jelly to the eye to help prevent infection.
4. Tape on an eye patch to prevent dirt entering the eye.
5. Without delay, visit a doctor or hospital as fast as possible.
6. Do not attempt to treat it yourself.

Frostbite may occur if R12 comes into contact with the skin. Always exercise great care when handling the refrigerant. If it should come into contact with any other part of the body, follow the same procedure as outlined above.
R12 is otherwise harmless unless released in a confined space, when it may cause drowsiness. However, the volume used in car air conditioning systems is not sufficient to give rise to any problems.
If R12 is allowed to come into contact withan open flame or very hot metal, phosgene gas will be formed. This gas is poisonous and potentially very dangerous. A person inhaling the gas can become very sick. Small quantities of phosgene gas inhaled over a period of time can accumulate in the body and may result in a toxic condition. Consequently, the greatest care should be taken when propane torch leak detectors are used. Always ensure that the premises are well ventilated and that the air circulation is good.
The following rules must be observed when R12 is being handled:

1. Above 129^{o}F (54^{o}C), liquid refrigerant will completely fill a container and hydrostatic pressure will build up rapidly with temperature rise. For this reason, never heat a container above 122^{o}F (50^{o}C).
2. Never apply an open flame to a refrigerant container Never place an electric resistance heater near to, or in direct contact with, a container.
3. Never handle a container carelessly. To avoid damage, always use an approved spanner or wrench to open and close the valves. Secure the containers in an upright position for storage and transport of the refrigerant.
4. Never handle the refrigerant without suitable eye protection.
5. Never overheat the container.
6. Never discharge refrigerant into an enclosed area where there is an open flame.
7. Always discharge the refrigerant slowly when draining the system.
8. Do not introduce anything but pure R12 and a refrigerant oil into the system.
9. Never touch a damp container with bare hands while a system is being charged. The hand may become frozen to the container. Should this happen, pour water onto the container to thaw and thereby free the hand.

Refrigerant oil

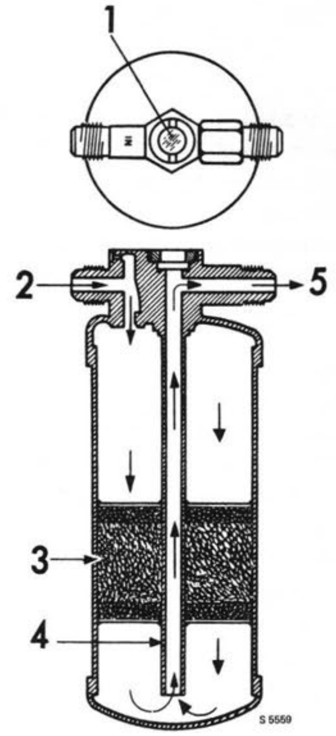
A small quantity of oil is circulated through the system with the refrigerant to lubricate the seals, gaskets and other moving parts of the compressor. The oil is necessary for keeping the thermostatic expansion valve in proper operating condition owing to the close design tolerances of the valve. Only non-foaming oil, with a viscosity of 500 SUS at 100^{o}F (+38^{o}C), specially designed for use in air conditioning systems should be used.

SYSTEM COMPONENTS

The following describes the circulation of the refrigerant through the system and the function of the various components.

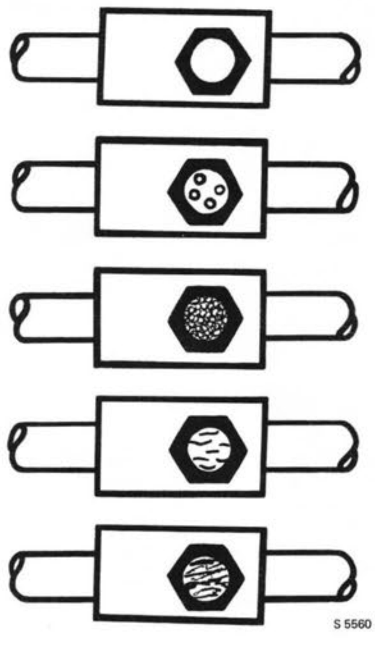
The receiver

The receiver is the part of the system in which the refrigerant is stored. It comprises a cylindrical metal container with fittings for inlet and outlet, and a sight glass. It is located in the high-pressure side of the system and, for the most part, contains liquid refrigerant. The receiver consists of two sections, namely, the receiver section and the drier section.
The receiver section accepts and stores the correct amount of excess refrigerant that the system requires to operate properly. It supplies a steady flow of liquid refrigerant to the thermostatic expansion valve. The drier section contains a bag of desiccant (silica gel), that absorbs and holds small quantities of moisture, and a filter, that collects particles that could otherwise affect the circulation in the system. The drier section is equipped with a sight glass which indicates whether there is sufficient refrigerant in the system.



THE DRIER SECTION

1. Sight glass
2. From condenser
3. Filter
4. Pickup tube
5. To expansion valve



Clear sight glass – system correctly charged or overcharged

Occasional bubbles – refrigerant charge slightly low

Oil streaks on sight glass – total lack of refrigerant

Heavy stream of bubbles – serious shortage of refrigerant

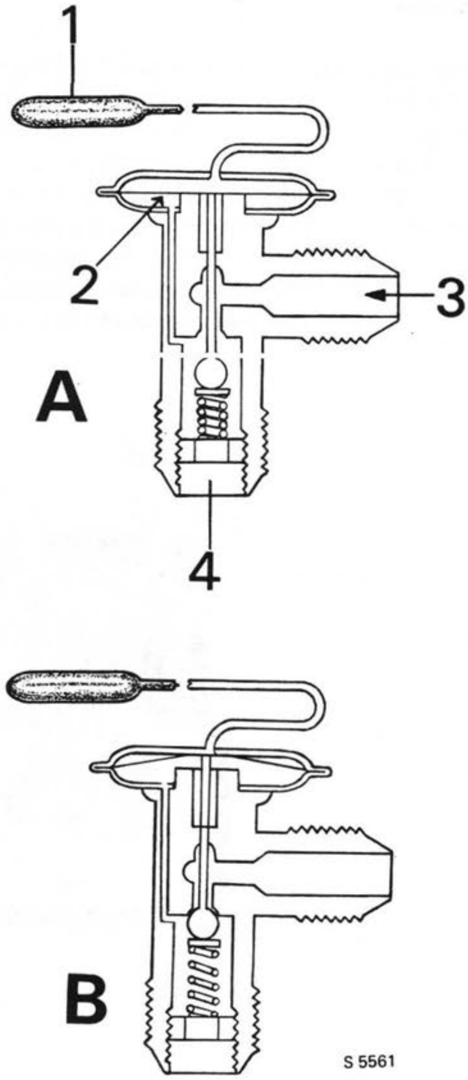
Dark or clouded sight glass – contaminent present

SIGHT GLASS

SAAB

Thermostatic expansion valve and evaporator

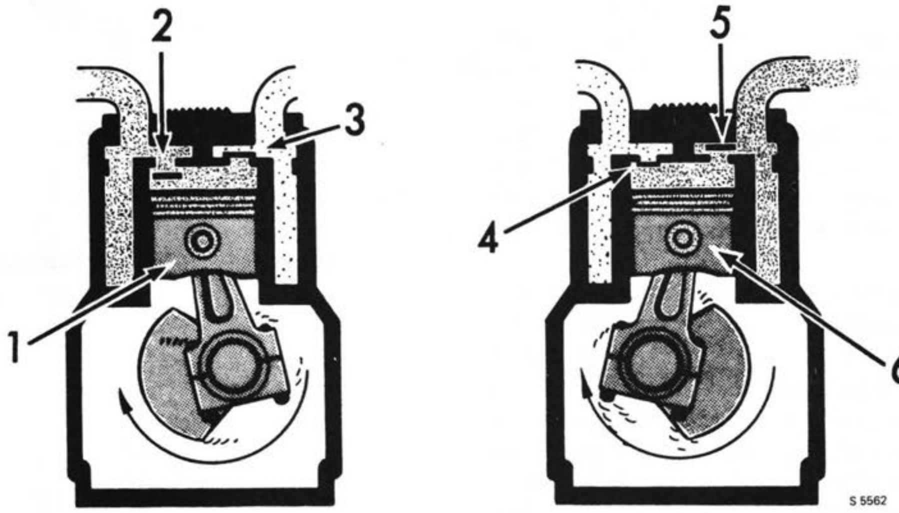
The thermostatic expansion valve is located at the inlet side of the evaporator. The expansion valve controls the system and serves to separate the low and high-pressure side of the system. The valve orifice (0.008 in./0.2 mm max.) only permits the passage of a small quantity of refrigerant. The evaporator temperature is regulated by means of the quantity of refrigerant entering.
The state of the refrigerant inside, and immediately after, the expansion valve is liquid, but, as soon as the pressure drops, it starts to boil, absorbing the heat from the air flowing over the fins on the evaporator. In other words, heat is removed from the surrounding air.
The quantity of refrigerant admitted to the evaporator must leave the latter as 100 % low-pressure vapour or gas. If too much refrigerant is metered to the evaporator, there will be no change of state from liquid to gas. Since the refrigerant pressure will be higher, it will not boil, since there is no space for vaporization. An excess of liquid refrigerant from the evaporator may also damage the compressor.
If too little refrigerant is metered into the evaporator, the system will be "starved". Again the unit will not cool. The refrigerant will vaporize or boil off before it reaches the evaporator. When a correct quantity of refrigerant is metered, it will be 100 % liquid immediately after the expansion valve, and 100 % gas (low-pressure gas) at the outlet or tailpipe. The low-pressure gas is then directed to the compressor inlet. The expansion valve is equipped with a capillary tube which monitors the outlet temperature and thus controls the flow of refrigerant.



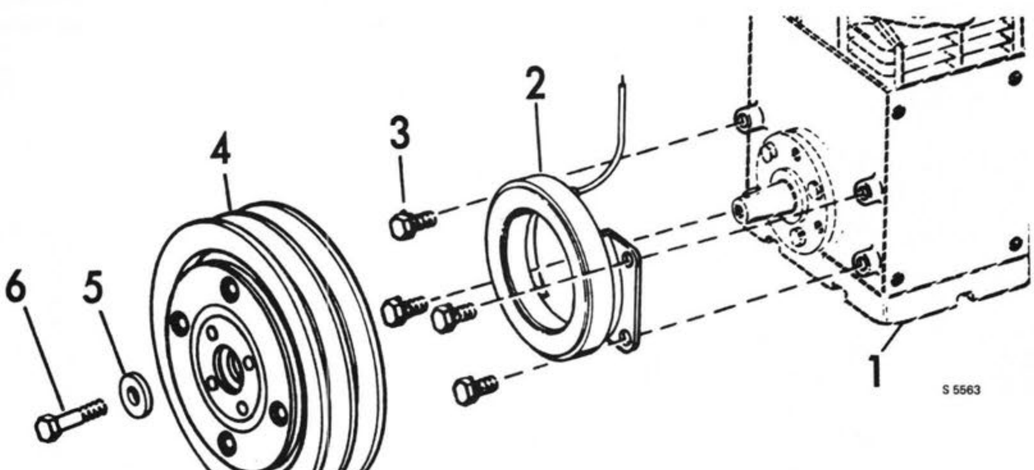
EXPANSION VALVE
1. Capillary tube
2. Diaphragm
3. From receiver
4. To evaporator
A = Open valve
B = Close valve

The compressor

The compressor pressurizes the refrigerant and directs it through the system. The pressure increase which occurs in the compressor causes more rapid condensation of the refrigerant in the condenser. The compressor is a 2-cylinder unit equipped with suction and discharge valves.
When the piston is on the down stroke, the pressure above the suction valve forces it open, and the discharge valve is closed. When the piston is on the up stroke, the suction valve is closed by increased pressure in the cylinder, the discharge valve starts to open and high-pressure gas is discharged into the system. While one piston is on the up stroke, the other is on the down stroke. The compressor separates the low-pressure side and the high-pressure side of the system.
The refrigerant enters the compressor as low-pressure gas and leaves as high-pressure gas. The compressor is equipped with service valves, facilitating the connection of pressure gauges, etc., during servicing of the air conditioning system.



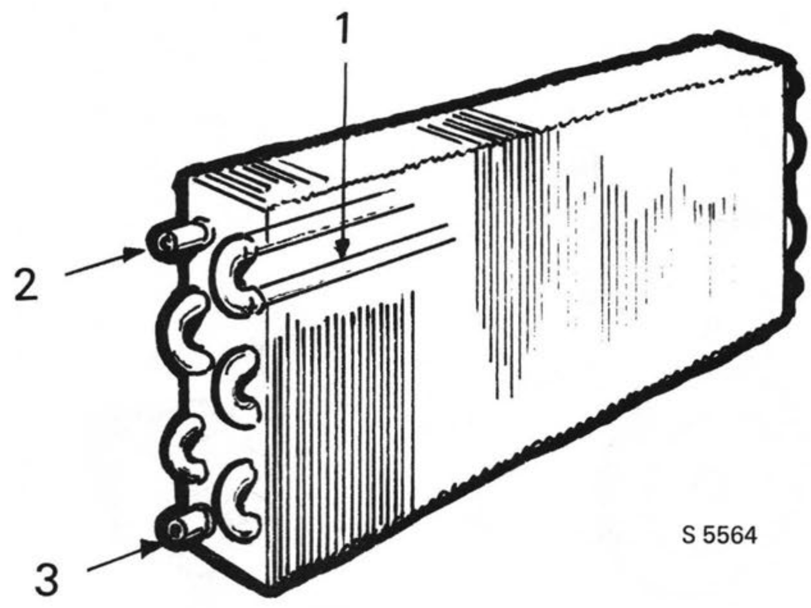
PISTON MOVEMENT
1. Piston on down stroke
2. Suction valve open
3. Discharge valve closed
4. Suction valve closed
5. Discharge valve open
6. Piston on up stroke.



COMPRESSOR WITH MAGNETIC CLUTCH
1. Compressor
2. Field coil
3. Retaining screw
4. Magnetic clutch, pulley
5. Washer
6. Screw

The condenser

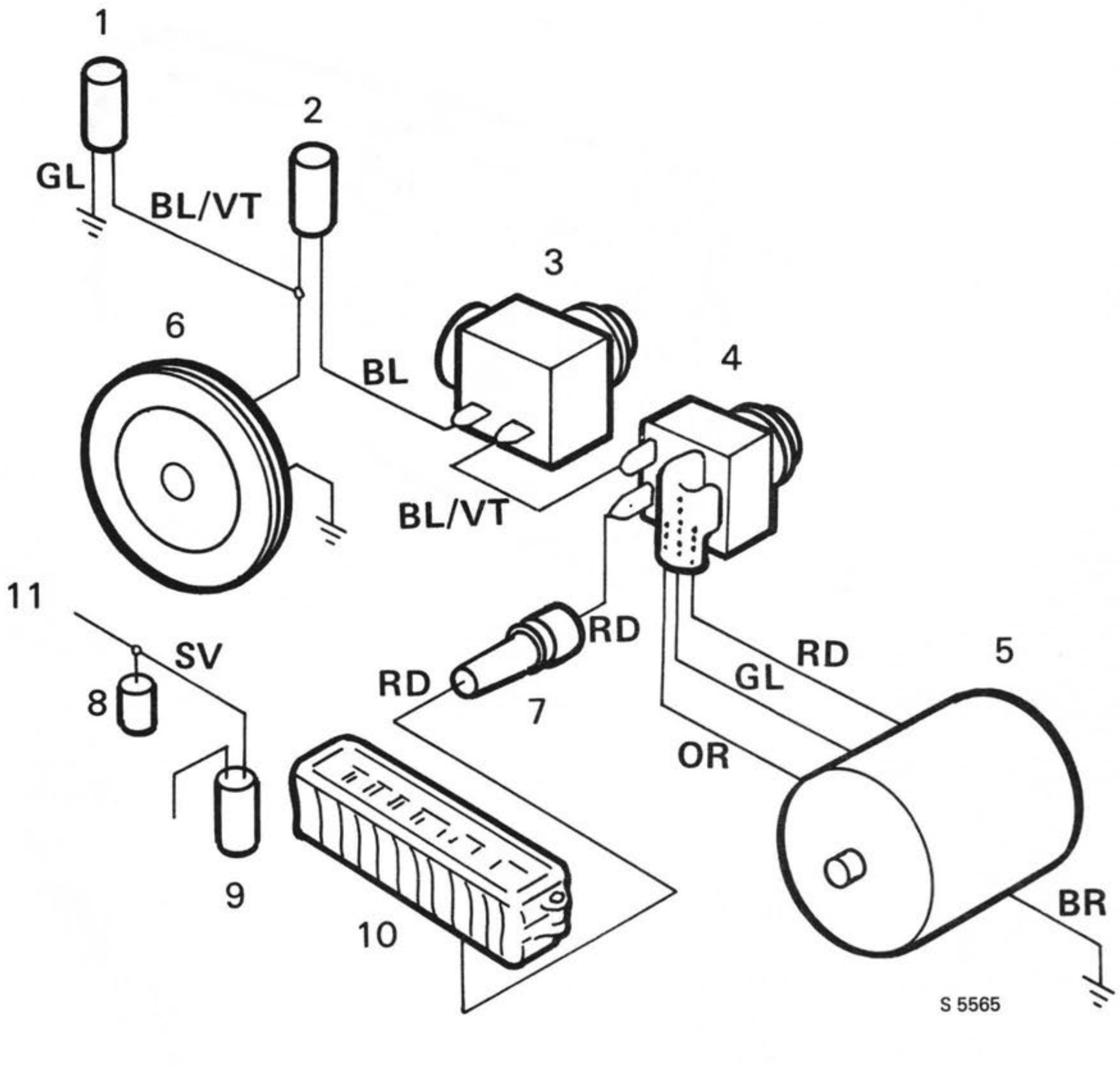
The condenser converts (condenses) the refrigerant in the gas state to that of a liquid. To do so it must give up its heat, which is carried off by the air flowing over the fins of the condenser. This heat which is now removed to cause a change of state from a gas to a liquid is the same heat which was absorbed in the evaporator to cause a change of state from a liquid to a gas, with the addition of the heat due to the pressure increase caused by the compressor.



CONDENSER
1. Copper tubing
2. Inlet
3. Outlet

The electrical system

The system is controlled from the instrument panel by means of two switches: one for the fan motor of the system and one for temperature control. To actuate the system, both switches must be on. Through a capillary tube from the evaporator, the thermostatic switch senses the temperature in the tube and controls the cutting in and out of the compressor.
Cars with injection engines are equipped with a device for increasing the idling speed. This supplies additional air to the engine through the crankcase pipe by means of a valve located in the inlet manifold on the engine, which opens when the compressor cuts in and starts running. Two switches are located on the receiver, a low-pressure and a high-pressure switch. The low-pressure switch actuates the car radiator fan when a preset pressure is reached in the system. If the system pressure should become too high, the high-pressure switch will break the circuit to the magnetic clutch on the compressor. Power to the electrical system is supplied from the fuse box on the car through a 30A fuse in a hanging fuse holder.



WIRING DIAGRAM
1. Solenoid valve "High Idle"
2. High-pressure switch
3. Thermostatic switch
4. Fan motor switch
5. Fan motor
6. Compressor clutch
7. 30A fuse
8. Thermostatic switch, radiator fan motor
9. Low-pressure switch
10. Fuse box
11. To radiator fan relay (cable 114)

Charging and discharging the system

Equipment: Portable servicing equipment comprising a vacuum pump, low-pressure gauge (pressure 30 in. Hg to + 220 psi/1 kp/cm^2 to + 15 kp/cm^2), high-pressure gauge (pressure range 0 psi to + 500 psi/0 kp/cm^2 to + 35 kp/cm^2), scales (for weighing gas cylinder).
Gas (refrigerant): Cooling medium R12
Consumption: 1.76–1.87 lb. (0.80–0.85 kg).

Discharging the system

1. Connect the high-pressure hose from the manifold gauge set to the high-pressure side of the compressor (marked DISCH) and open the high-pressure valve.
2. Carefully open the middle valve on the manifold gauge set and allow the refrigerant to discharge slowly. Rapid discharge will force excessive oil out of the system making it necessary to recharge the system with refrigerant oil.

N.B. If the system has been purged of refrigerant for any length of time, the receiver unit should be replaced.

> CAUTION
> When charging and discharging the system, always wear protective gloves and tightly fitting goggles to avoid injury due to frost.

Charging the system

1. Connect the low- and high-pressure hoses to the compressor and the yellow hose to the vacuum pump.
2. Start the vacuum pump.
3. Open both valves on the manifold gauge set and let the vacuum pump run for about 5 minutes.
4. Close the valve and switch off the vacuum pump after the low pressure gauge has indicated 29 in. Hg (0.95 kp/cm^2). The vacuum on the low pressure side should now not drop by more than 1 in. Hg (0.05 kp/cm^2)/five minutes if the system is tight.
5. Test for blockages in the system.
   a. Connect the yellow hose (central manifold line) to the gas cylinder. Loosen slightly the yellow hose connection at the manifold gauge set and purge the line of air by means of the gas cylinder (both valves closed).
   b. Open the valve on the gas cylinder and the low-pressure valve on the manifold gauge set. If the system is free of blockages, both the high-pressure and low-pressure readings will increase.
   c. Shut the low-pressure valve and the valve on the gas cylinder.
   d. Release any excess pressure in the system.
6. Connect the yellow hose to the vacuum pump. Start the vacuum pump and open both valves. Let the pump run for about thirty minutes.
7. Shut the valve and switch off the vacuum pump.
8. Connect the yellow hose to the gas cylinder. Purge the hose as described in point 5a.
9. Open the valve on the gas cylinder and then the low-pressure valve which should be adjusted so that the reading on the low-pressure gauge will be between +40 psi (2.8 and 3.0 kp/cm^2).
10. Run the engine and adjust the speed to 1250 rev/min. Short the radiator fan so that it runs continuously. Set the system to maximum cooling and maximum fan speed. Set the car heating system to maximum heat and maximum fan speed, with only the valve for the air supply to the front floor open.
11. Charge the system with 1.76 lb. (0.8 kg) R12 or until the sight glass is free from bubbles (clear liquid) for between 10–15 seconds.
12. Shut the low-pressure valve and then the valve on the gas cylinder.
13. Carefully disconnect the hose connections.
14. Connect the radiator fan for normal operation.

FAULT-TRACING

Inadequate cooling.	Blockage in the gas circuit. Incorrect quantity of gas.
No cooling. Compressor not running.	Fault in electrical system.
No cooling. Compressor running.	Insufficient refrigerant in system. Blockage in gas circuit.
Adequate cooling immediately after start but deterioration after the system has operated for a while.	Moisture in system. Blockage in gas circuit. Formation of ice in evaporator.
Magnetic clutch slipping.	Voltage drop. (Refer to section on changing the magnetic clutch.)

TESTING

Checking the pressure

Connect the manifold gauge set (see section on charging and discharging the system).

Testing by driving car

The normal readings when the car is being driven at 56 miles/h (90 km/h) and with an outside temperature of between 68 and 95°F (20 and 35°C) is 1–1.5 kp/cm^2 for the low-pressure side and 13–18 kp/cm^2 for the high-pressure side.

Workshop testing

A. Idling
At normal idling speed and with the system set to maximum, the high-pressure level should be between 15 and 18 kp/cm^2 at room temperature. The level on the low-pressure side may vary between 1.5 and 2.5 kp/cm^2. It is normal to observe bubbles in the sight glass.

B. 2500 rev/min
The pressure on the high-pressure side should normally be between 15 and 18 kp/cm^2, and between 0.9 and 1.5 kp/cm^2 on the low-pressure side. No bubbles should be observed in the sight glass.
Possible causes of excessive pressure on high-pressure side:
1. Excessive refrigerant in system.
2. Condenser clogged by external contaminants.
3. Defective operation of radiator fan.

Possible causes of insufficient pressure on high-pressure side:
1. Insufficient refrigerant in system.
2. Blockage in gas circuit.

Possible causes of excessive pressure on low-pressure side:
1. Defective compressor (valve).
2. Defective expansion valve.
3. Defective refrigerant.

Possible causes of insufficient pressure on low-pressure side:
1. Thermostatic switch not functioning. (Check that the capillary tube is correctly fitted in the evaporator.)
2. Moisture in gas circuit (formation of ice in thermostatic valve).
3. Incorrect quantity of refrigerant.

Check the functioning of the high- and low-pressure switches

(N.B. Both switches operate on the high-pressure side.)

The high-pressure switch (actuation range 21–25 kp/cm^2) is closed when non-pressurized and is electrically connected in series with the magnetic clutch on the compressor. If the pressure on the high-pressure side reaches 25 kp/cm^2 (21 kp/cm^2 in earlier versions) the circuit to the magnetic clutch on the compressor will be broken. When the pressure has fallen by between 3 and 6 kp/cm^2, the circuit will again be closed.
To test the functioning of the switch, run the engine at idling speed, set the system to maximum and temporarily isolate the radiator fan. (Check that the engine temperature does not become too high.)
The low-pressure switch is largely a device to control the car radiator fan which is an essential function if efficient cooling is to be achieved.
The low-pressure switch is closed when non-pressurized and is electrically connected in parallel with the conventional thermostatic switch of the cooling system. The actuation range for the low-pressure switch is between 16 and 18 kp/cm^2. When the pressure on the high-pressure side is within this range, the radiator fan will cut in. When the pressure has fallen by between 2 and 4 kp/cm^2, the radiator fan will cut out, unless the temperature of the engine coolant is sufficiently high for the fan to be switched on by the thermostatic switch.
The functioning of the switch can be checked by running the engine at idling speed with the air conditioning system set to maximum. No other action is necessary for the check.
When check-readings of the values are made, ensure that the pressure at the measuring points on the compressor is approximately 1 kp/cm^2 higher than at the connection of the switch in the receiver.

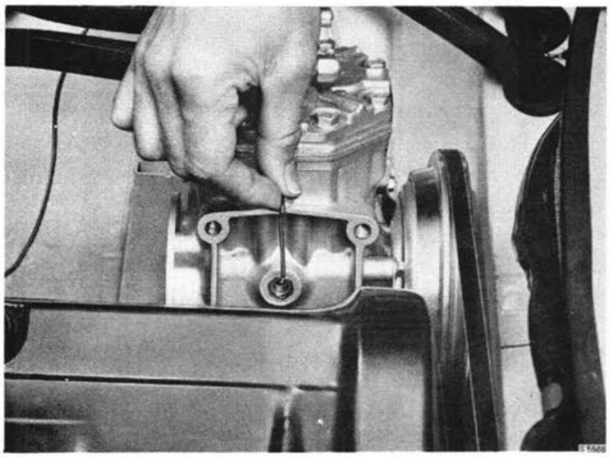
Belt tension

For satisfactory operation, the tension of the belt must be maintained within the prescribed limits.
The most accurate way of checking the tension is by means of a belt tension gauge.
When fitting a new belt, adjust the tension to 445 N (44.5 kp) and at subsequent services to 355 N (35.5 kp).

Checking oil level in compressor

Under normal conditions, the compressor oil level need not be checked when the system is operating satisfactorily. However, if there has been appreciable leakage in the system or it is suspected that the oil level is low, a check should be made. Remove one of the oil filler plugs in the crankcase of the compressor. Insert a bent wire into the hole until the end of the wire bottoms in the crankcase. Remove the wire and measure the oil level, which should be between 0.87 and 1.22 in. (22 and 31 mm).

CAUTION
If the system is charged with gas, the compressor crankcase will also be pressurized. The system must then be discharged before the oil level can be checked.



CHECKING THE OIL LEVEL

CHANGING THE MAGNETIC CLUTCH

The work can be carried out without the system having to be discharged of refrigerant (compressor connected). The best method but the most time consuming is to work with the compressor on the bench. This involves the additional operation of discharging, evacuating and charging with refrigerant.

Equipment

Torque wrench 0–5 kpm
Socket 1/2"
Ring spanners 3/8", 1/2", 9/16", 15/16"
Swivel socket wrench 9/16"
Clutch extractor (standard bolt 5/8" x 1 " UNC)
Voltage source 12 V (battery)
Two connecting cables, 0.75 mm^2 min. with insulated quick-release connectors[1])
Alternator V-belt

1) Applicable in the case of bench work.

Dismantling

1. Remove the 3/16" hexagonal centre bolt.
2. Remove the compressor from its suspension (9/16" ring spanner–swivel socket wrench).
3. Fit the extractor bolt in the centre of the clutch.
4. Actuate the clutch magnet (ignition switch in position "K"), air conditioning fan at low speed, cold control in position "On". It may be necessary to ground the compressor by means of a separate cable.
5. Insert the belt in the groove in the clutch pulley and lock it to prevent its turning (by hand).
6. Withdraw the clutch assembly from the compressor crankshaft by further tightening of the extractor bolt (15/16" ring spanner).
7. Switch off the ignition (key in position "G").
8. If necessary, dismantle the coil from the compressor (3/8" ring spanner).

Assembly

1. Fit the coil (3/8" ring spanner).
2. Install the clutch assembly. Check the condition of the screw and that the woodruff wedge is in its correct position on the compressor crankshaft (1/2" ring spanner).
3. Turn the ignition key to position "K".
4. Secure the coil and tighten the centre bolt to the correct torque: 19.6–22 Nm (2.0–2.25 kpm) (1/2" socket and torque wrench).
5. Switch off the ignition.
6. Mount the compressor in its mountings.
7. Loosen the alternator mountings and install the fan belt.

Adjusting and testing

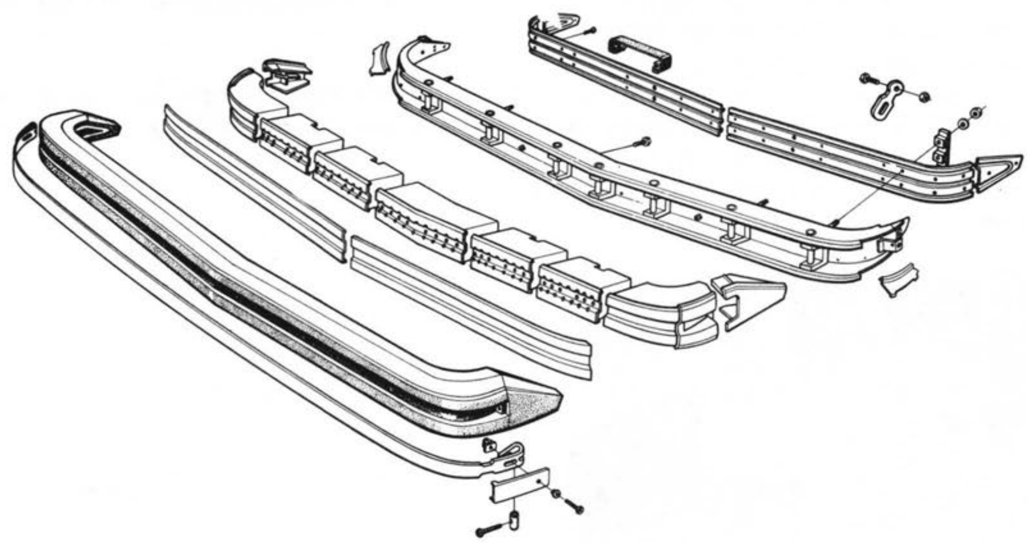
Equipment
Voltmeter 0–15 V with connecting cables
Tachometer to check engine speed

1. Start the engine and set the air conditioning system to maximum cold and maximum fan speed.
2. Set the engine idling speed to approx. 2500 rev/min.
3. Read the voltage across the coil (+ at connection to compressor, – to compressor housing).
4. For proper functioning, the voltage must not be below 11.8 V.
5. Insufficient voltage: Check the electric circuit (wiring diagram in assembly instructions) and determine the location of the greatest voltage drop.
6. Replace or adjust defective components.

BUMPERS

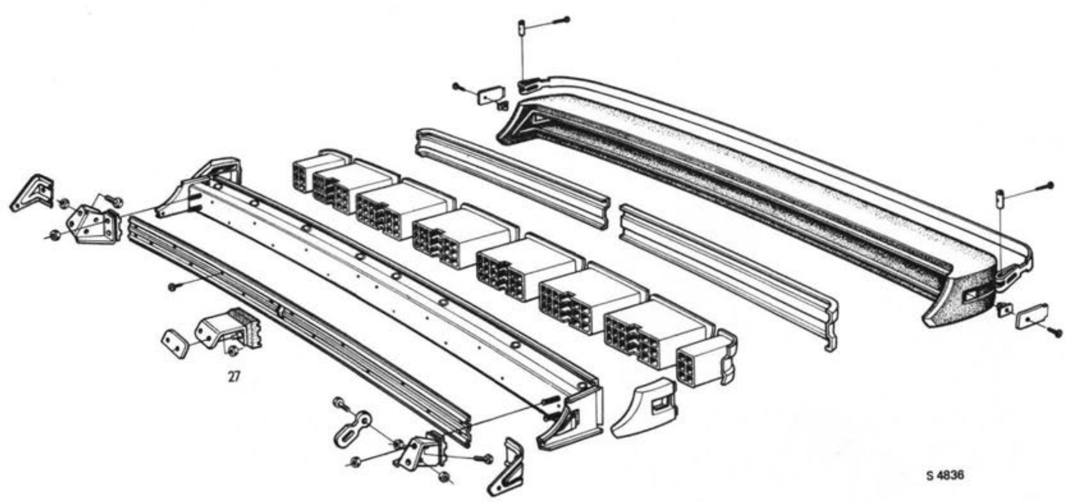
GENERAL

The shells of the bumpers consist of U-shaped aluminium bars to which the bumper brackets are mounted. There are shock-absorbant cellular blocks of polythylene in the bars (9 blocks in the front and 10 blocks in the rear bumper). Outside the blocks there are polyethylene braces and the bumpers are coated with a layer of rubber. This layer is provided with anchorage bars on the inside and a bracing strip on the outside. Up to and incl. model 1976, the bracing strip is of stainless steel and, as from model 1977, of rubber with a plastic strip with a chromium insert. Provision has been made on the front bumper for the attachment of license plates and additional lights.
The front bumper is mounted with four brackets and the rear bumper with three.



S 4835

FRONT BUMPER



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REAR BUMPER

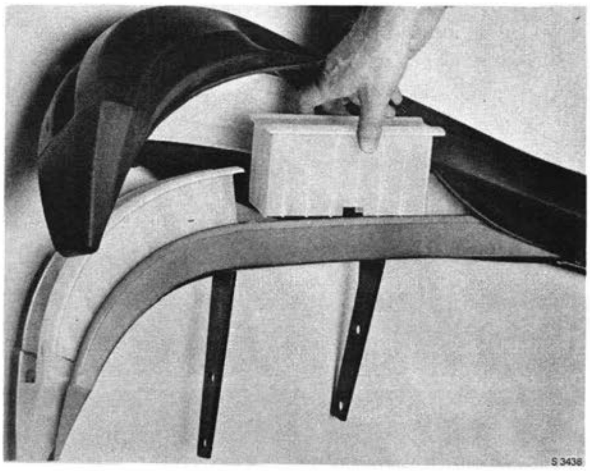
REMOVAL AND INSTALLATION

The front bumper is removed by undoing the eight screws which hold the bumper brackets to the reinforcement bars and the support plates in the engine compartment. The rear bumper is removed by undoing the screws which hold the bumper brackets to the bodywork.

Install in the reverse order.

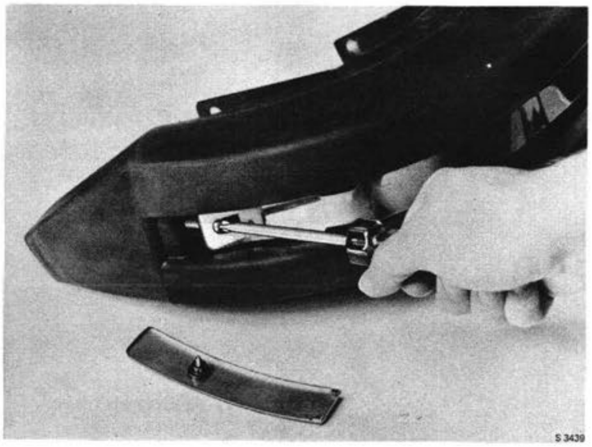
CHANGING THE CELLULAR BLOCKS

1. Remove the bumper.
2. Remove the bracing strip. Note the spacing sleeves under the filling plates at each end of the bracing strip.
3. Remove the anchorage bars on the side of the bumper where the cellular block is to be changed. (If the center block on the front bumper has to be changed, both the longer anchorage bars must be removed.)
4. Pull off the rubber layer, after which the cellular blocks are accessible and can be removed.



CHANGING THE CELLULAR BLOCKS

5. Refit the rubber layer and bracing strip.



FITTING THE BRACING STRIP, UP TO AND INCL. MODEL 1976

FITTING THE BRACING STRIP, AS FROM MODEL 1977

6. Mount the filling plates and their spacing sleeves together with the anchorage bars. Remount the bumper.

TECHNICAL DATA OF PAINT SYSTEM USED IN THE PRODUCTION OF CARS MANUFACTURED IN SWEDEN AND FINLAND (WITH FIFTH DIGIT OF CHASSIS NUMBER 1, 2, 3 OR 6)

Phosphatizing

Type of phosphatizing	Zinc phosphatizing
Weight of skin	approx. 2.5 g/m^2

Primer

Mode of application	Electrocoating
Curing	15 min at 175°C
Supplier	Dr Kurt Herberts
Skin thickness after stoving	23 µm

Intermediate stone-damage coat (below waist line of car only)

Spraying viscosity	22 s
Mode of application	Cold spraying
Curing	7 min at 170°C
Supplier	Svenska Herberts AB
Skin thickness	15 µm

Intermediate coat (sprayed wet-in-wet on intermediate stone-damage coat)

Spraying viscosity	30 s (Saab standard 860)
Mode of application	Hot spraying at 50°C
Curing	7 min at 170°C
Supplier	AB Wilhelm Beckers
Skin thickness after storing	25 µm

Top coat

Spraying viscosity	35–40 s (Saab standard 860)
Mode of application	Hot spraying at 50°C
Curing	15 min at 130–140°C
Supplier	AB Wilhelm Beckers, Dr Kurt Herberts
Skin thickness after stoving	40 µm

Total skin thickness after all coats have been applied and stoved: 90–110 µm.

INSTRUCTIONS FOR REPAIR OF PAINT WORK

When partly or completely re-spraying, the re-painted surfaces shall be repaired so that they equal the environmental and wear resistance of the original paint work, and so that the colour and finish match with the car in general.

The special techniques which are used for repair of paint work cannot be described in a short summary, therefore we will limit ourselves to giving instructions on material, and advice concerning the procedures which are the basis for fulfilling the repair requirements set.

Repair of paint work

All repair and re-spraying work shall be carried out using the material qualities given below.

Material for solid- and metallic paint

Primer	Self-etching zinc chromate primer
Filler	2-component filler/primer or alternatively EP filler/primer
Top coat	2-component acrylic paint

Paint of the 2-component type, together with thinner, can be ordered from Saab-Scania AB, Spare parts dept., against the original article number, and is delivered by the manufacturer. Other material should be ordered from the general agent for the paint supplier.

Painting procedure

All materials used should be of the same manufacture and suited to each other. The supplier shall provide data sheets with technical information and method of application.

Cars that have had paint work repaired shall be oven-dried at a temperature advised by the paint supplier. The paint shops' technical resources and knowledge of application methods are the basis for a satisfactory result.

With guarantee claims it is required that all materials used are supplied by the same manufacturer, and an advantage if the part numbers of products used can be given.

Panel edges at joints and seams should be covered with paintable sealing compound (e.g. door joints) before spraying.

All painted surfaces shall have paint coverage complying with the coat thicknesses given in the section "Paint system, technical data".

Removable parts shall be removed from the area, and the vicinity of the area which is to be painted. Rubber strips shall be lifted up with 6 mm (circum) string.

Otherwise, plastic parts should be removed and necessary masking carried out.

Undersealing

Compound	
Mode of application	Spraying
Curing	20 min at material temperature of 150°C
Skin thickness	200μ m min.
Binder	Polyester
Supplier	Sv Herberts AB

Anti-corrosion agent for cavities

Mode of application	Spraying
Type of material	Thixotropic, penetrating
Skin thickness	Covering

Anti-corrosion agent

Mode of application	Automatic spraying
Type of material	Thixotropic, non-penetrating
Skin thickness	Approx. 500μ m .

GENERAL DESCRIPTION OF BODYWORK TREATMENT

Phosphatizing

The entire car body undergoes the phosphatizing process. The layer of phosphate enhances the protection against corrosion provided by the other coats and also improves adhesion between the primer and the base metal. The layer of phosphate is also a good indication that the surface of the metal has been thoroughly degreased.

Primer

Application of the primer takes place in an electrocoating plant. This process ensures that all of the body parts receive a layer of primer of nigh-on uniform thickness. The method also makes it possible to apply the primer in the panel joints and cavitites.

Intermediate coat, stone damage protection

This coat is applied on the outside of the body below the waist line on the front panel, the bonnet and the upper section of the bulkhead. The elasticity of this layer increases the resistance of the paintwork to impacts and, consequently, more effectively prevents stones chipping the enamel down to the metal.

Intermediate coat

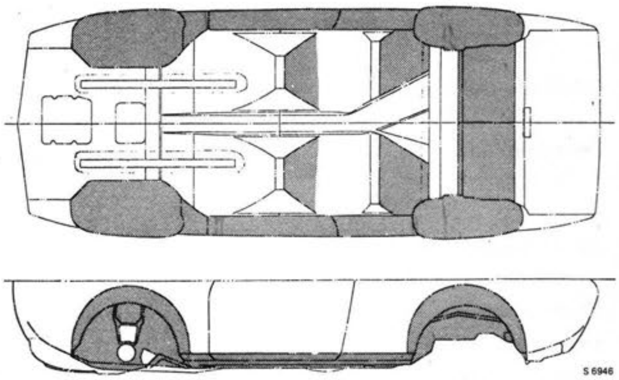
On surfaces already having received a coat for stone damage protection, this intermediate coat is applied wet on wet. In other cases, the coat is applied on top of the primer.

Top coat

An alkyd melamine is used as a binder in solid-colour enamels and an akrylate in metallic-effect enamels. Both types of enamel are of the one-coat type.

Norms for finished bodywork

All external and clearly visible interior surfaces are sprayed with top coat. The exceptions to this are piercings in the bonnet and luggage compartment door, the inside of the rear edge of the front wheel housing and the leading edges of the front doors.
Interior surfaces over which trim or upholstery has been fitted have not been sprayed with top coat. In versions where no cladding has been fitted to the wheel housing inside the luggage compartment, the primer will therefore be visible.



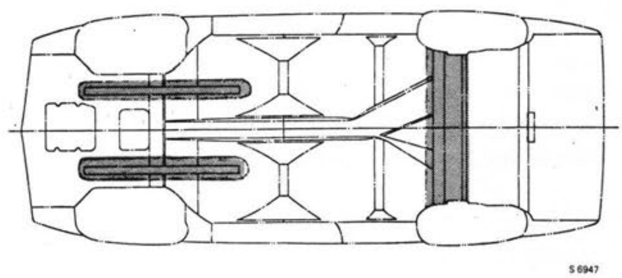
UNDERSEAL, POLYESTER TYPE

Underseal protection

The polyester-type underseal is applied under the wheel housings, sill beams and recesses in the bottom plate, and inside the rear axle shaft.

Anti-corrosion agent for cavitites

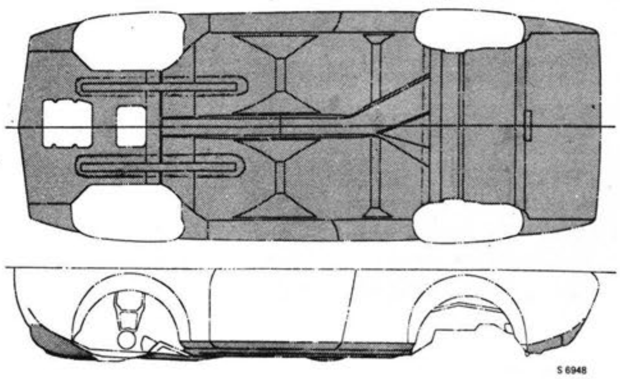
Thin penetrating oil is sprayed around the sub-frame member between the front and intermediate bottom panels, inside the rear axle shaft, inside the lower body cavities and inside the bottom parts of the doors.



ANTI-CORROSION OIL, PENETRATING

Anti-corrosion agent

Thick (non-penetrating) oil is applied to the underside of the car excluding the wheel housings.
Refer also to Group 1 section 141 and the section on anti-corrosion treatment.



ANTI-CORROSION OIL, NON-PENETRATING

TECHNICAL DATA ON PAINT SYSTEM USED IN THE PRODUCTION OF CARS MANUFACTURED IN BELGIUM WITH 7 AS FIFTH DIGIT IN THE CHASSIS NUMBER

Phosphatizing

Type of phosphatizing	Iron phosphatizing

Primer

Spraying viscosity	22 s (Saab standard 860)
Mode of application	Cold spraying
Curing	15 min or longer at 120–130°C, 15 min at 150–160°C
Supplier	Dr Kurt Herberts
Skin thickness after stoving	10 µm

Intermediate coat (sparyed wet-in-wet on primer)

Spraying viscosity	22 s (Saab standard 860)
Mode of application	Cold spraying
Curing	15 min or longer at 120–130°C, 15 min at 150–160°C
Supplier	Dr Kurt Herberts
Skin thickness after stoving	50 µm

Top coat

Spraying viscosity	35–40 s (Saab standard 860)
Mode of application	Hot spraying at 50°C
Curing	13 min or longer at 110°C, 13 min at 130°C
Supplier	AB Wilhelm Beckers, Dr Kurt Herberts
Skin thickness after storing	40 µm

Total skin thickness after all coats have been applied and stoved: 90–110 µm.

The same materials and methods are used in touched-up work in production as those employed in normal top-coat spraying.

TOUCH-UP AND REFINISH INSTRUCTIONS

General

For all touch-up or refinish jobs, use synthetic stoving or airdrying enamel of the same quality type as that for the original paintwork.
For perfect results, it is essential that the premises in which the work is to be done, i.e. the paintshop, be kept absolutely free of dust. It should also be free of drafts and must naturally not be used as a means of access to other departments. The floor should be kept thoroughly damp while spraying. A paint job ruined by dust cannot be restored by polishing — flatting and respraying will be necessary.

Body finishing

Before undertaking any partial refinishing, always spray a test area to check that the shade used is indentical with the color of the parts that are not to be refinished. Any deviations must be corrected by toning the paint. The painting job involves the following operations:
Removal of rust and old paint
Rubbing down
Cleaning with a solvent
Priming of bare metal surfaces, for instance with wash primer
Filling, if necessary
Flatting
Application of intermediate coat, for instance Surfacer or Non Sanding, if necessary
Flatting, if necessary
Finishing
Air-drying, stoving with infra-red radiant heat or in a drying oven, depending on the type of enamel used.

Cleaning

If the old paintwork shows defects such as cracking, pitting due to the impact of flying stones, etc., apply a paint remover or flatten down to the bare metal. After removal of the old paintwork by one or the other of these methods, degrease the metal with spirit, thinner or some other suitable solvent. In principle, the same procedure should be used even if the old paintwork has merely been rubbed down instead of being removed. Realign any distorted panels and grind, for instance with a disc grinder, if necessary, before flattening with wet abrasive paper P400. Finally, reclean the parts with spirit or cellulose thimmer. Thorough ness in this respect is vital to good adhesion.

Priming

Coat all bared metal surfaces with primer. The drying time and temperature for oven-drying or air-drying should be as prescribed by the paint suppliers. An infrared radiation lamp may also be used for drying, but care must be taken to keep it at a distance of not less than 16 in. (40 cm) from the metal. After drying, fill as necessary, applying the putty in thin layers and allowing the stipulated drying time for each layer before the next application.

Rubbing down

Rub down the primed and filled surface with wet abrasive paper P400 and then with grade P600. After removing all water, rewash the surfaces with spirit or cellulose and wipe with a piece of gauze drenched in slow-drying varnish (tack-ragging).

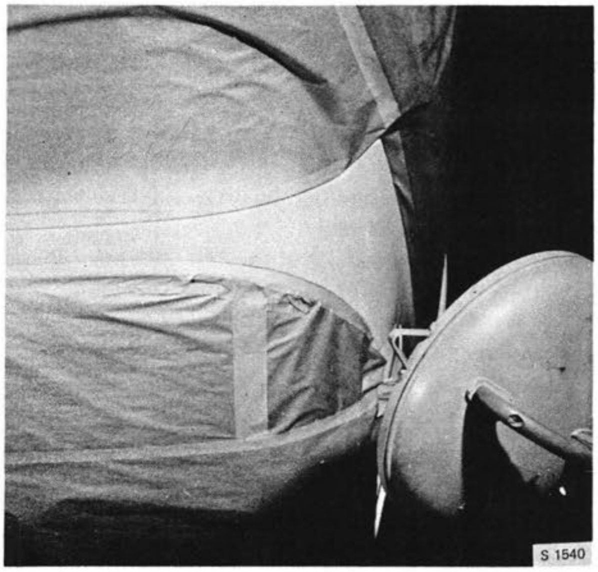
EQUIPMENT AND PROCEDURE FOR REFINISHING

A. Stoving touch-up enamel

Oven: A convection oven with an air temperature of 194–212°F (90–100°C) is needed. A radiation oven can be used, and in this case the metal temperature should be about 176°F (80°C). It is important for the air temperature to be even throughout the oven and for the temperature to be continuously checked. For this purpose, it is appropriate to use, for example, a calibrated max. and min. thermometer or a thermo-element with a compensator. Only this latter measuring method can be used to check the plate temperature.

Enamel: Hardener must be added to the touch-up paint used in the amount stipulated by the paint supplier. The enamel can be sprayed either hot or cold, and the viscosity should be adjusted accordingly with the thinner recommended by the paint supplier to the following:
Hot spraying — viscosity approx. 35 sec.
Cold spraying — viscosity approx. 21 sec.
Measure the viscosity with a beaker according to the method described in the Saab Standard 860 at a temperature of approx. 74°F (23°C).

MEASURING VISCOSITY WITH AN SIS BEAKER



USE OF RADIATION LAMP TO DRY REFINISHED PART

Procedure: First of all, clean the body and chassis of the car thoroughly, thus ensuring that dust will not spread in the spraying booth or drying oven. Before drying in the oven in connection with touch-up, certain parts of the car must be masked or removed to prevent them from beeing damaged by the heat. Which parts should be removed is partly depending on the oven temperature and partly the time under which the car is exposed to heat. The measures mentioned below consider a temperature of 194–212°F (90–100°C) during one hour.
The following details should be removed to prevent them from being damaged by the heat:
a. The plastic grilles of the front plate
b. The plastic strips of the fenders and the glasses of the rear clamps.
c. Saab 99 Combi Coupé: The pneumatic springs for the rear door.
Cover the insides of all glass windows with sheets of board or the like to prevent the temperature from becoming too high.
If the trunk compartment lid, engine hood or a door must be left open during the drying, the opening must be masked to prevent the heat in the car to rise above 167°F (75°C).
The fuel tank should contain only a small amount of fuel. The filler cap should be removed.
When the car is being pretreated and painted it should be at normal room temperature. When the car is placed in the oven, the latter should have reached the prescribed temperature of 194–212°F (90–100°C). Leave the car there for one hour.

> CAUTION
> The pneumatic springs on the rear door on Saab 99 Combi Coupé model cars must be removed before the car is placed in the oven. The high temperature causes a pressure increase in the springs and this can result in damage or injury.

B. Air-drying touch-up enamel (68–176°F/20–80°C)

When air-drying enamel is used, no special arrangements are necessary other than a well heated, dustless booth. The drying time can, however, be speeded up considerably by stoving the enamel with an infra-red radiation lamp or in an oven with an air temperature of not more than 176°F (80°C).
The enamel can be sprayed either hot or cold, and the viscosity should be adjusted accordingly with the thinner recommended by the paint supplier to the following:
Hot spraying – viscosity approx. 35 sec.
Cold spraying – viscosity approx. 21 sec.
Measure the viscosity with a beaker according to the method described in the Saab Standard 860 at a temperature of approx. 74°F (23°C).
The metal must have adopted normal room temperature prior to pretreatment and painting.

> CAUTION
> A label showing a code for the colour of the body enamel is located below the chassis number label. This code must be quoted when enamel is ordered. This is particularly important since there are different paint suppliers supplying enamel with the same colour designation.

GENERAL MAINTENANCE WORK

Proper care and maintenance of the care is necessary to retain the gloss and durability of the enamel finish and the protective proterties of the underbody sealing. Recommendations in these respects are given in Group 1.

METALLIC PAINTS

General remarks on metal-effect paints

Metal-effect paints, or metallic paints as they are more commonly called, consist of ordinary enamel paints doped with aluminum powder, which imparts a metallic lustre of the finish. Metal-effect paints can only be applied by spraying, and produce different color tones according to the spraying technique employed. Saturated wet spraying (with large quantities of paint) results in dark shades, while fog and dry spraying (with small quantities) give lighter shades. To make sure that spot repairs to paintwork match the original paint job, it is essential that the repair is made with recommended and tested qualities of paint.

Metallic paints can be divided into one-coat and two-coat types. Singlecoat metallic paint, as already mentioned, consists of enamel paint doped with aluminum powder. A two-coat application comprises an undercoat of enamel paint containing aluminum particles and a topcoat of transparent varnish giving a high-gloss finish.

Repairs to metallic paintwork call for a technique that differs in some respects from the conventional method of applying solid paints.

Now that we have acquired some experience of metallic painting in our production and obtained very good results with one-coat paints, we have discontinued production of two-coat painted cars. We have also found that repairs to two-coat paint jobs can be made with exellent results using the same technique as employed for cars with original one-coat paintwork.

Touch-up paints that match the original paint are essential to good repair results. Even so, slight differences in coloration are sometimes found between the original paint job and the repair. As a rule these differences can be ascribed to one of the folloqing causes:

Vehicle paintwork changes color with age under the influence of external factors such as solar ultraviolet radiation, extreme fluctuations in temperature, the chemical effects of atmospheric pollution and road salt in wintertime, and many others.

Car owners sometimes use unsuitable and excessively harsh cleaning and polishing compounds which discolor and bleach the paintwork.

A special problem arises in the case of metallic paints, as the finish and shade vary according to the type of paint and the application technique. The method of spraying influences the way in which the fine aluminum particles distribute themselves in the paint layer; this effect can be controlled to some extent by the choice of spraying technique. Repainting should therefore be extended out to the natural boundaries of the area in need of repair, and the car owner should be told in advance that there may be some difference in the shade of the repainted part.

To avoid trouble with complaints, we would advise all bodywork painters to follow the instructions given below:

a. Stir the paint thoroughly.
b. Check that all cans of paint used on the same car are marked with the same batch number.
c. Always test-spray a specimen piece. Comparison with the color of the paint in liquid form is not reliable, as the color changes during drying and may also be influenced by the method of application.
d. Always match up the colors in daylight (but not in direct sunlight) before you start painting.

General recommendations

1. The temperature in the paint shop should be less than 64°F (18°C). Vehicles that have stood out of doors must have come to room temperature before painting starts. The same applies to the paint itself.
2. Take care over the preparations. The surface must be free from rust and grease and must be dry. Degreasing with a damp rag is not good enough; wash the surface using plenty of grease dissolver. Take special care with areas close to trim and panel edges.
3. Do not touch degreased and sanded surfaces with bare hands. Perspiration contains salt compounds that will cause the finished coat of paint to swell. Old, blistered paintwork must be completely removed.
4. The water used for grinding must not exceed 5 German degrees in hardness. It may be necessary to soften the water in a desalination unit. In any event, great care must be taken and the surface must be thoroughly cleaned. Do not let any drops of grinding water dry on the surface – wipe them off with a chamois leather. Remove all traces of grinding dust. Before proceeding further, dry off all moisture thoroughly in a drying oven or with a heat lamp.
5. Compressed air must be dry and clean. Spraying pressure should be 45–70 psig (3–5 atmospheres gauge pressure) unless otherwise specified.
6. Spray boxes and drying ovens must be provided with fresh-air intake, dust filter and air extractor.
7. The top coat must not be applied until all traces of solvent have evaporated from the surface, as pores may otherwise form in the paintwork.

Products for paintwork spot repairs

Priming materials
Du Pont Hi-Speed Primer-surfacer 30 S (233—1940) air drying (gray)
Du Pont Thinner 3608 S (145010)
Du Pont Universal Putty 2284 R (228—BS 146)

Top coat materials
Du Pont Lucite[R] Spot Repair 945-line metallic

Coral Metallic YR1 & YR4	1/4 gal.	Ordering No. 8451148
Coral Metallic YR1 & YR4	1/8 lit.	Ordering No. 8470254
Sepia Metallic YR2	1/4 gal.	Ordering No. 8436800
Sepia Metallic YR2	1/8 lit.	Ordering No. 8470262
Sepia Metallic YR5	1 lit.	Ordering No. 8475204
Silver Crystal SK1	1 lit.	Ordering No. 8470486
Du Pont Thinner 3632	1 lit.	Ordering No. 8451155
Du Pont Thinner 3602	1 lit.	Ordering No. 8470270

Other materials
Prep-Sol[R] 3919 S
Emery paper No. 400 or finer
Metal conditioner 5717 S
Du Pont Rubbing Compound 202 (hand rubbing)
Du Pont Rubbing Compound 303 (machine rubbing)
Synthetic thinner 621 R (T—3810)
Adhesive rags
Preparakote[R] primer-surfacer 3012 S
Uniforming finish 200 S

Uses
Lucite[R] Spot Repair is intended for spot repairs, as well as partial and total respraying.

Surface preparation

Clean off old paint with Prep-Sol[R] 3919 S. Smooth edges of paintwork with emery paper No. 400 or finer. Treat bare metal surfaces with Metal conditioner 5717 S. Polish round the damaged spot with Du Pont Rubbing Compound 202 to remove grinding scratches and to obtain good adhesion to original paintwork. Wash off the whole surface with Synthetic thinner and wipe off with adhesive rags.

Priming

Prime all bare metal surfaces with Hi-Speed primer-surfacer (for whole panel painting, primer with Preparakote[R] primer-surfacer 3012 S). Fill as necessary with Universal Putty.

Cover painting

Topcoat with Lucite[R] Spot Repair acrylic paint, diluting with 100% thinner 3602 S. Apply three wet coats with flash-off between the first three coats and a fourth half-wet coat straight on top of the third. Each coat of cover paint and primer should be 30—50 microns thick.
One or two thicker coats cannot take the place of three or four thinner ones. Ground-through or almost ground-through spots must be reprimed with the recommended primer. Spray pressure should be 45—50 psi. (approx. 3.5 atmospheres) gauge.
To further enhance the initial gloss and make an invisible transition to the original paintwork, two or three coats of Uniforming Finish 200 S should be sprayed on and around the resprayed area.

Drying

Large areas should be allowed to air-dry for four hours, preferably overnight, before being polished.
Alternatively, the paint can be force-dried for 15 minutes at 175°F (80°C) before polishing of small areas (spot repairs) or for about 45 minutes before polishing of complete resprays.

Polishing

Lucite[R] Spot Repair has a high initial gloss and needs only light polishing to smooth off color edges and blend into the original paintwork. Polish small areas by hand with Rubbing Compound 202. Mashine-polish larger areas with Rubbing Compound 303.

Please note

Lucite[R] Spot Repair should not be applied by brushing as it contains metal particles. It can however be used to fill small pits by flying gravel.

TWO-CAN TOUCH-UP PAINT

2 K Standocryl – Autolack is a two-can acrylic enamel which is cured by means of a chemical reaction between a hardener and the binding agent (acrylic). This reaction will take place at room temperature. The enamel will also harden at lower temperatures but the reaction or curing will be slow. An increase in temperature will speed up the curing time for which reason forced drying or stoving may be used to advantage.

Product:
2 K Standocryl – Autolack
2 K Spezialhärter

Mixing:
2 K Standocryl – Autolack should be mixed at a ratio of 2:1 with
2 K Spezialhärter

Thinning:
Thin using approximately 20 % type 11012 Standox-thinner
Spraying viscosity:
Approx. 16 s at 68°F (20°C) (SIS 4)

Spraying pressure:
3–5 bar (kp/cm^2)

Nozzle:
0.04–0.047 in. (1–1.2 mm)

Can life:
Approx. 12 h at 68°F (20°C)

Surface:
Prepare the surface in the usual way. Old air-dried enamel must be thoroughly cured. All moisture resulting from wet flatting must be allowed to dry completely. Synthetic Non-Sanding products cannot be used as a base for 2 K Standocryl – Autolack.

Spraying:
Three coats are sprayed. Spray a saturated first coat but ensuring that there is satisfactory flow and then apply the next two coats quickly allowing only short airing times depending on the size of the area to be sprayed.

If the spraying is excessively slow and dry, the surface of the different coats will dry rapidly and, if the skin is fairly thick, this may result in blistering during stoving owing to residual solvent. No airing time is required before stoving. When only parts of the car are to be resprayed, the colours must first be matched.

Curing:

a. At a workshop temperature of 68°F (20°C):

Dust dry	20 min
Tack dry	90 min
Masking dry	8 h

b. Stoving (no airing time):

Masking dry	30 min at 140°F (60°C)
	15 min at 176°F (80°C)

Touching-up:
Flatting by means of wet abrasive paper (P 600) of any poor areas or runs can be carried out after air-drying overnight or after a cooling period following stoving, after which the surface may be polished or resprayed.

N.B.
Since 2 K products may react to moisture, all tools, mixing vessels, etc., must be scrupulously dried. Spraying at a relative humidity above 80 % must never be carried out.

Metallic paints

Metallic single coat:
Two generous coats should be sprayed with no consideration given to mist formation. Thin the remaining paint further using Standox type 11 and 12 thinners to a viscosity of 13 s/SIS 0.16 in. (4 mm). After an airing time of about 5 minutes, apply a coat of the thinned paint which will produce a mist-free and smooth surface without fog spraying being necessary. If the metallic effect achieved is not satisfactory, a further application of the same paint may be made after a short airing period. This applies to difficult metallic colours.
If it is desired to convert the coat into a double-coat application, then after drying but within 24 hours and without flatting, 2 K Standocryl – Klarlack may be sprayed on.

CONTENTS

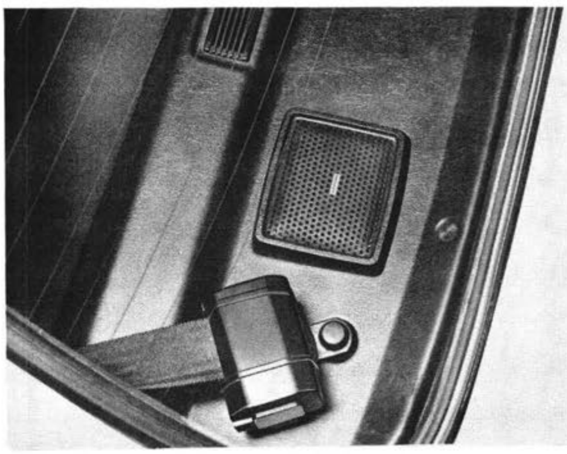
RADIO INSTALLATION

Mounting kits are available for Blaupunkt and Philips car radios. All necessary mounting details and suppression components are enclosed.

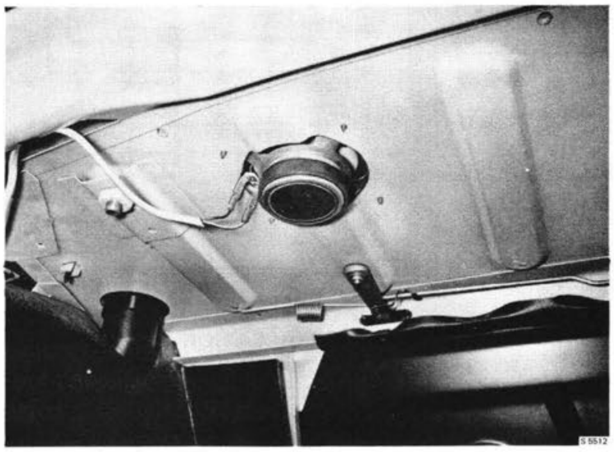
A special mounting panel has been produced for installation on the floor below the instrument panel. It has recesses for radio and loudspeaker, and is also provided with a storage compartment.

RADIO INSTALLATION

As from model 1977, Saab 99 L, 99 GL, 99 GLE and 99 EMS have been made ready for the fitting of recessed speakers in the parcel shelf through the provision of two holes in the parcel shelf frame member. For fitting fo the speakers, two holes must be cut in the parcel shelf.

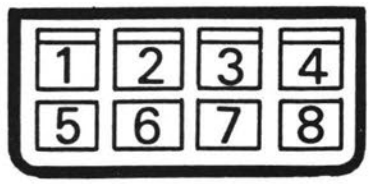


LOUDSPEAKER INSTALLATION, PARCEL SHELF



PARCEL SHELF MEMBER WITH HOLES FOR LOUD SPEAKERS

Saab 99 EMS (as from model 1977) and Saab 99 GLE cars have been provided with a special 8-pole junction box to facilitate the installation of a radio. Cables, which are part of the standard electrical system of the car, run to the + and – battery terminals and to the speakers located at the front doors. The junction box is located inside the right-hand trim panel below the instrument panel.



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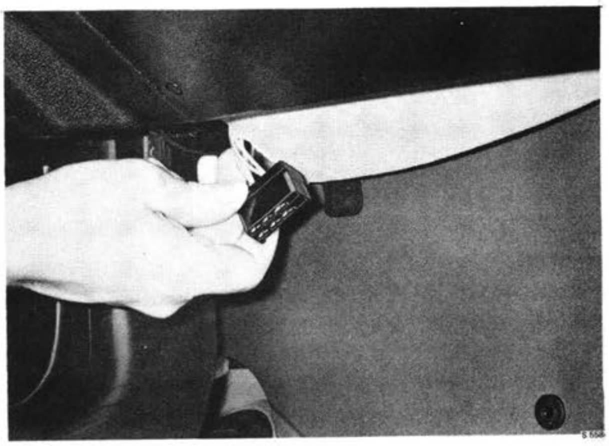
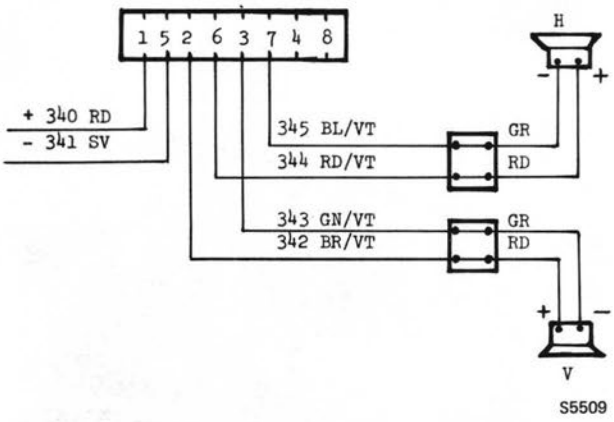
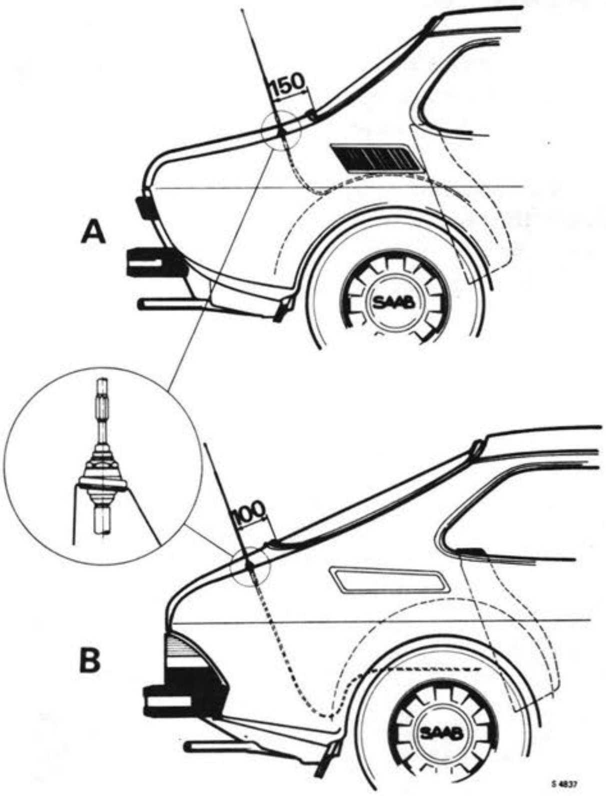
JUNCTION BOX, RADIO INSTALLATION, SAAB 99 EMS (AS FROM MODEL 1977) AND SAAB 99 GLE (FROM THE WIRE SIDE



JUNCTION BOX



WIRING DIAGRAM, RADIO INSTALLATION



SUITABLE ANTENNA LOCATION

A. SAAB 99 (99 L), 99 L (99 GL) AND 99 EMS

B. SAAB 99 COMBI COUPE

6 x 3"

TOWING ATTACHMENT

FITTING, SAAB 99 (99 L), 99 L (99 GL), 99 GLE AND 99 EMS

Towing attachments with ordering Nos. 117167007 and 117136002 (retractable) for Saab 99 Sedan cars are designed for a maximum trailer weight of 1 500 kg. Mounting holes are provided in the body, and the installation kit contains all the necessary parts.

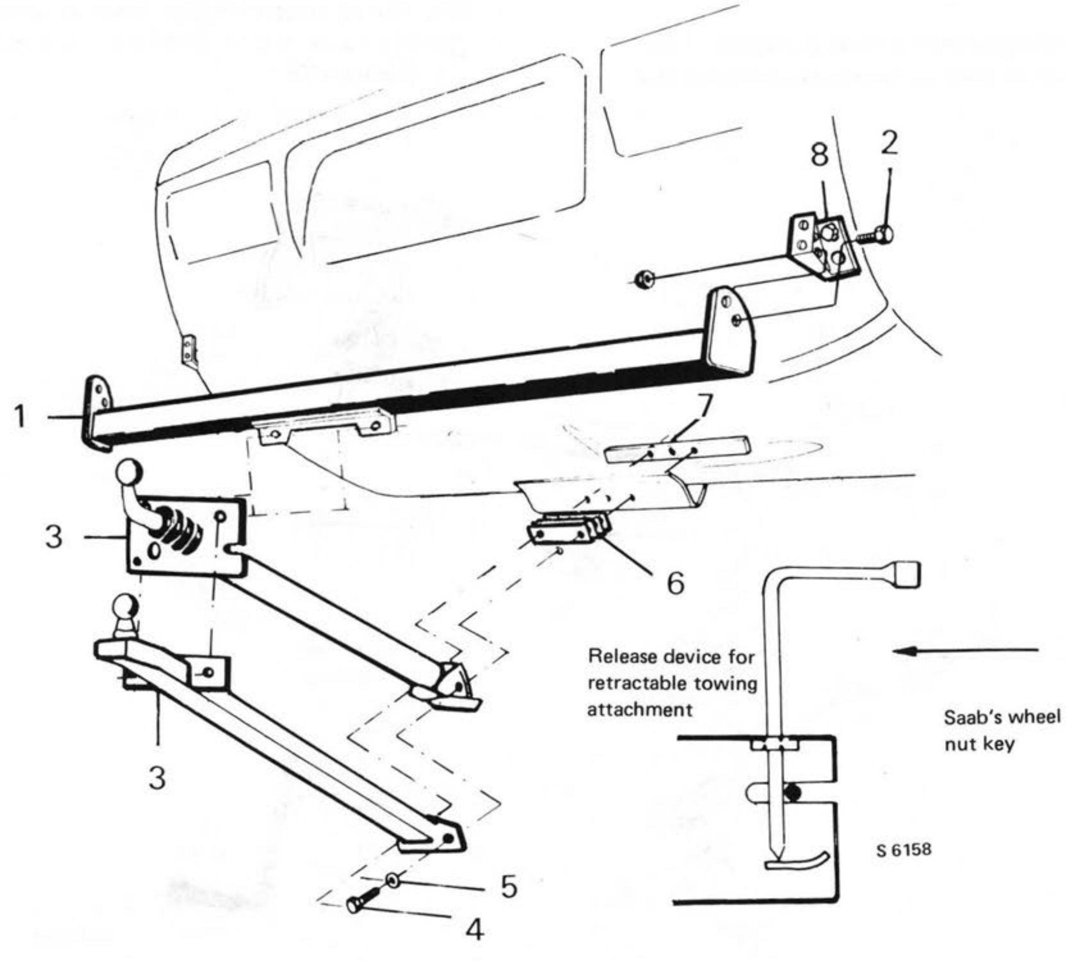
Fit the attachment as follows:

1. Remove the bumper bracket retaining bolts (8) and the rubber seals located between the brackets and the body, one side at a time. Refit the brackets loosely. N.B. Scrape away the underseal from all areas of the body coming into contact with the towing attachment.
2. Lift cross member (1) of the towing attachment into position, and fit bolts (2) and nuts in the bumper brackets first.
3. Leave the nuts slack to facilitate alignment of the towbar.
4. Fit towbar (3) to cross member (1) as shown in illustration.
5. Place tapped plate (7) behind the jacking point, install the necessary number of spacers (6), and fit bolts (4) with spring washers (5).
6. Tighten all bolts to the prescribed torque and apply sealing compound behind the bumper bracket mounting point in the body.

The wiring harness connecting kit for a 7-pole trailer connector is available as an accessory.
Fit the harness in accordance with the wiring diagram and fitting instructions included in the kit, and drill two holes in the body as directed (1.0 in./25 mm dia. and 0.15 in./3.8 mm dia.).

The assembly kit comprises:
7-pole socket
Bolt
Nut
Spring washer
Wiring harness
Grommet
Clip
Self-tapping screw

> N.B.
> Cars with automatic transmission to be used for towing a trailer must be fitted with an oil cooler (see Section 440).



TOWING ATTACHMENT, SAAB 99 (99 L), 99 L (99 GL), 99 GLE AND 99 EMS

FITTING, SAAB 99 COMBI COUPE AND 99 GLE

Towing attachments with order Nos. 117168005 and 117139006 (retractable) for the Saab 99 Combi Coupé are designed for a trailer weight of 1 500 kg. Mounting holes are provided in the car body and the installation kit contains all the necessary parts.

Fit the attachment as follows:

1. Remove bumper bracket retaining bolts (1) and the rubber seals between the brackets and the body, one side at a time. Replace the flat washers with the spring washers included in the installation kit. Tighten the bolts and seal the insides using a sealing compound. Remove the towing hook.
   N.B. Scrape away the underseal from all areas of the body coming into contact with the towing attachment.
2. Lift the cross member of the towing attachment into position and fit bolts (2) and nuts to the bumper brackets first. If the clearance at the bumper bracket is greater than 0.08 in. (2 mm), fit the necessary number of spacers (ø 0.40 in./10 mm x ø 0.71 in./18 mm x 2) on the bolts between the cross member and the bumper bracket.

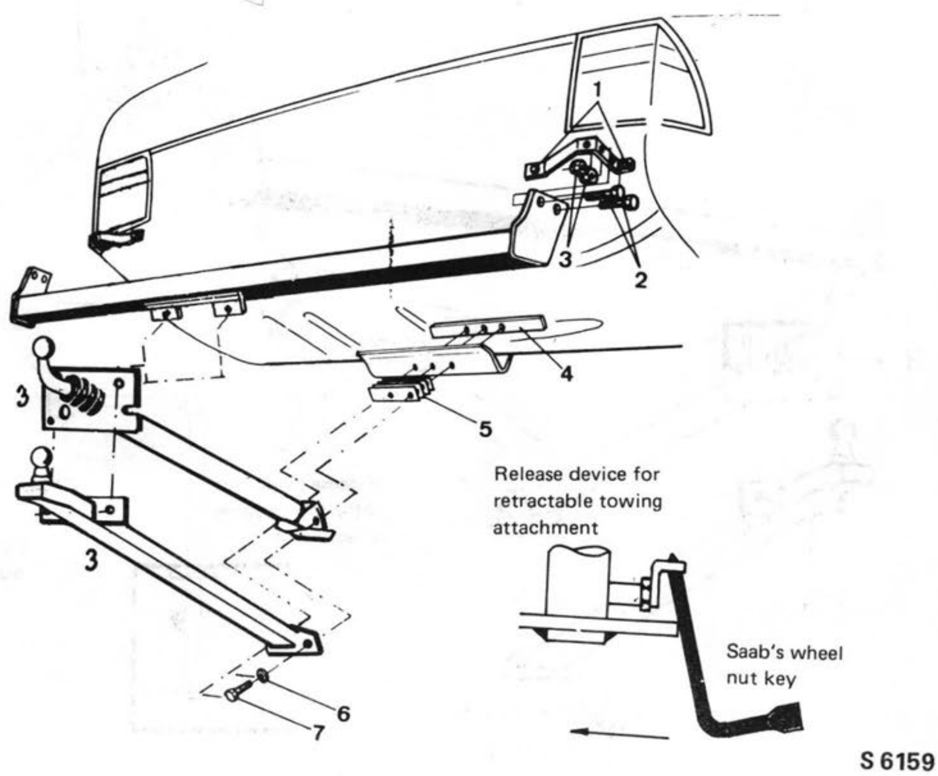
3. Leave the bolts slack to facilitate alignment of the towbar the bolts slack to facilitate alignment of the towbar.
4. Fit towbar (3) to the cross member as shown in illustration.
5. Position tap plate (4) behind the jacking point, fit the necessary number of spacers (5) and fit spring washers (6) and bolts (7).
6. Tighten all bolts to the prescribed torque.

The wiring harness connecting kit for a 7-pole trailer connector is available as an accessory.

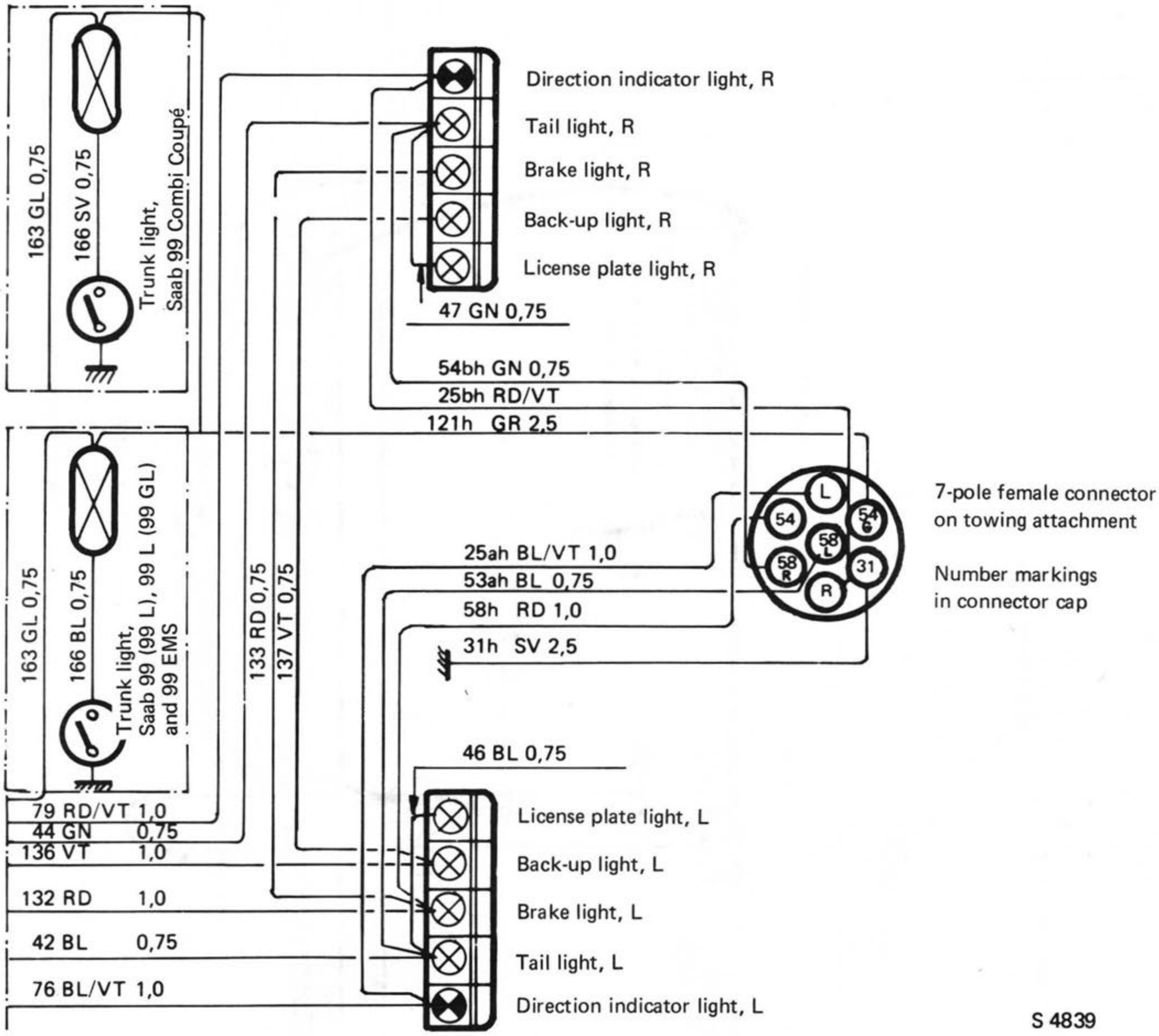
Fit the harness in accordance with the wiring diagram and fitting instructions included in the kit, and drill two holes in the body as directed (ø 1.0 in./25 mm, and ø 0.15 in./3.8 mm).

The assembly kit comprises:
7-pole socket
Bolt
Nut
Spring washer
Wiring harness
Grommet
Clip
Self-tapping screw

N.B.
Cars with automatic transmission to be used for towing a trailer must be fitted with an oil cooler (see Section 440).



TOWING ATTACHMENT, SAAB 99 COMBI COUPE AND 99 GLE



WIRING DIAGRAM

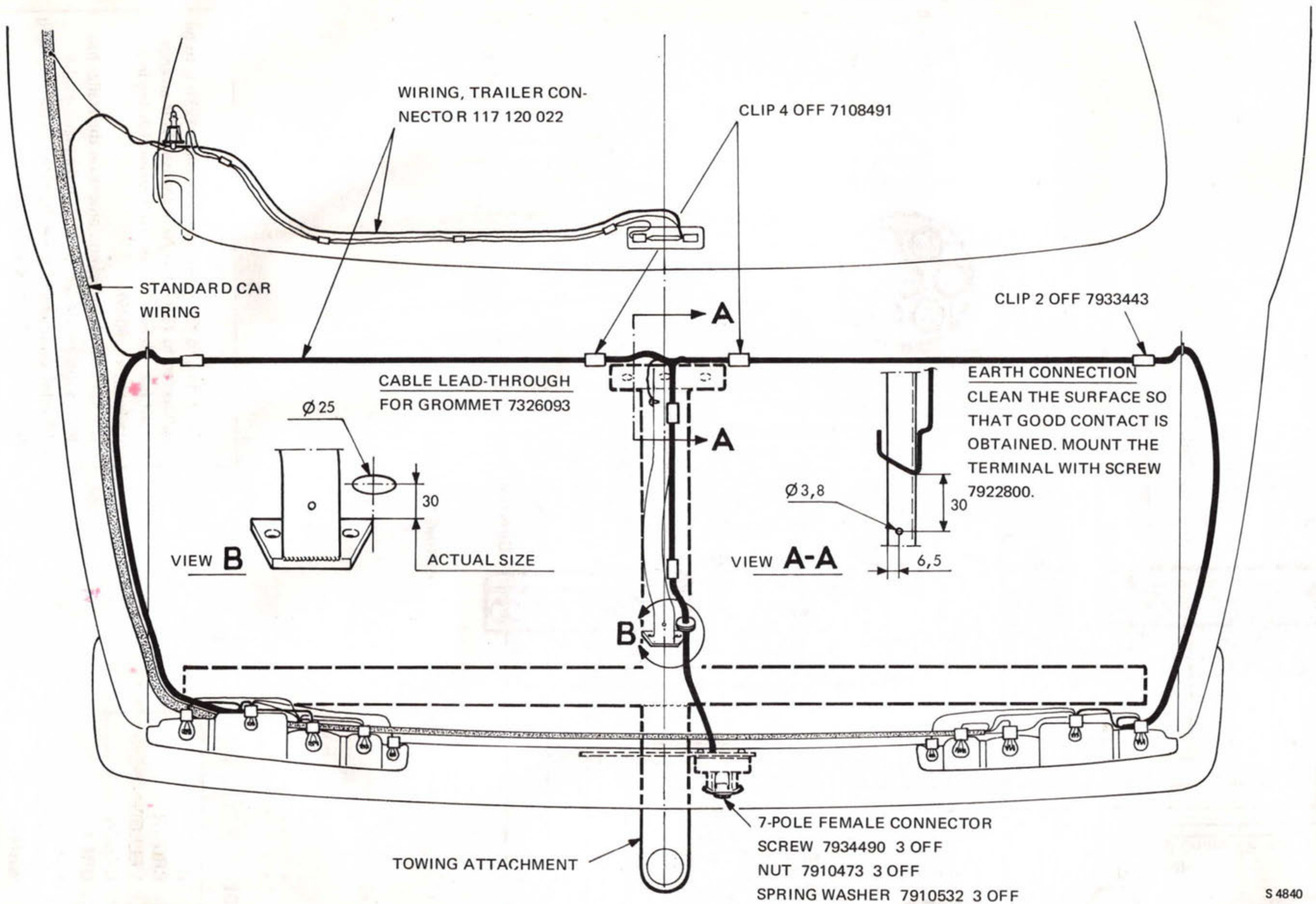
COLOR CODE

BL	BLUE
BR	BROWN
GL	YELLOW
GN	GREEN
GR	GREY
RD	RED
SV	BLACK
VT	WHITE
BL/VT	BLUE/WHITE
BR/VT	BROWN/WHITE
GN/VT	GREEN/WHITE
RD/VT	RED/WHITE

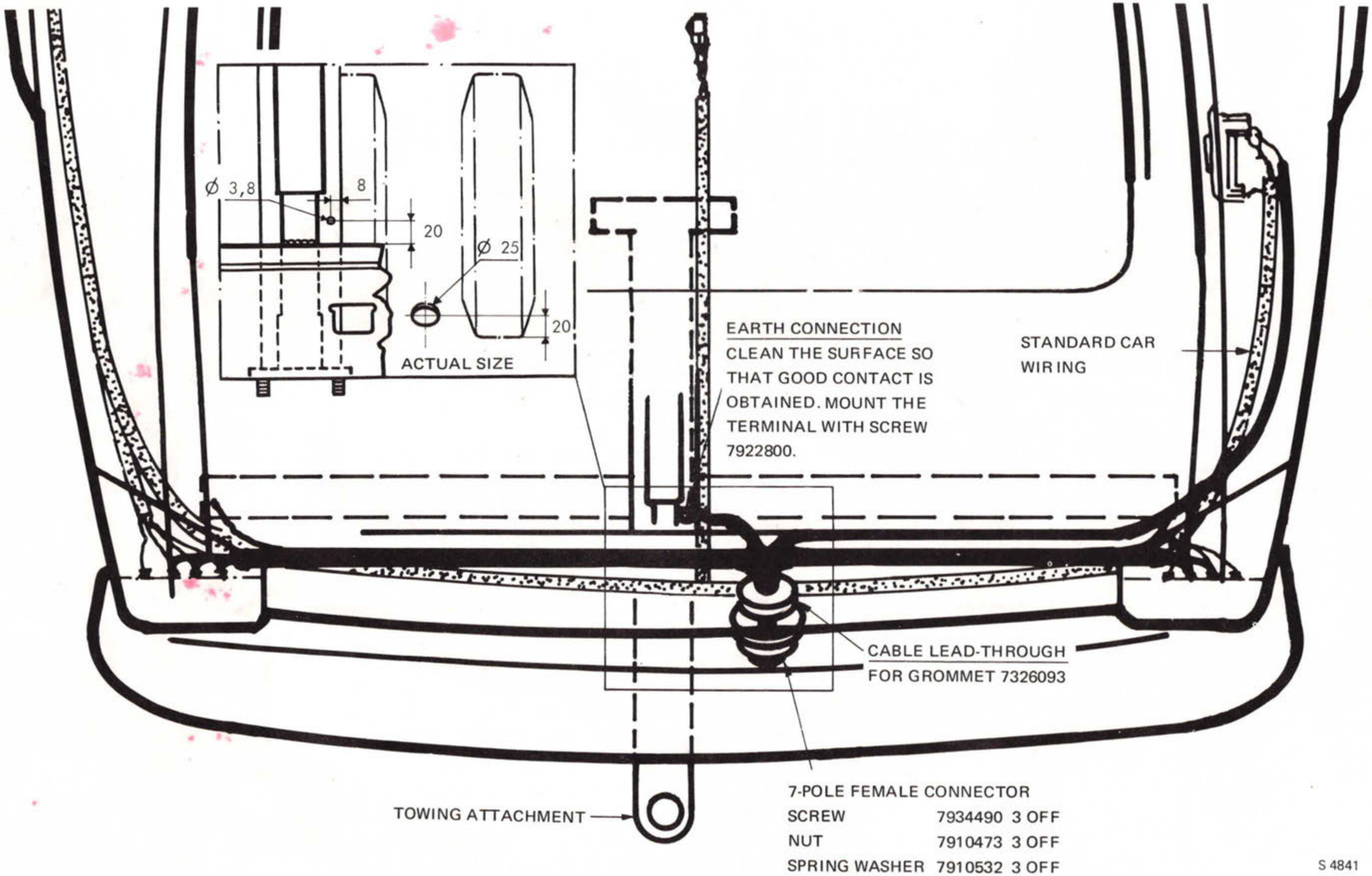
NOTE

According to the wiring diagram, cable 121h is to be connected to 163 GL 0.75 in the car. This arrangement is sufficient for normal interior lighting in a trailer (max. 50 W).

If additional electrical equipment on the trailer has to be supplied via cable 121h (extra lights etc.) a 2.5 mm^2 cable must instead be connected from 121h GR 2.5 direct to the car's extra fuse.



MOUNTING INSTRUCTIONS, WIRING HARNESS, SAAB 99 (99 L), 99 L (99 GL), 99 GLE AND 99 EMS



MOUNTING INSTRUCTIONS, WIRING HARNESS, SAAB 99 COMBI COUPE

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