Workshop manual

911

DR. ING. h. c. F. PORSCHE KG
STUTTGART-ZUFFENHAUSEN

This publication contains the essential removal, installation and adjustment procedures for the Porsche 911 vehicles sold in the USA and Canada. Components and procedures described in this manual are identical for all types unless differences are pointed out in the text. It is assumed that the reader is familiar with basic automotive repair procedures. Special tools required in performing certain service operations are identified in the manual and recommended for use. Use of tools or procedures other than those recommended in this repair manual may be detrimental to the vehicle's safe operation as well as the safety of the person servicing the vehicle.

The Workshop Manual 911 - from model 1972 on - is subdivided into 10 Assembly Groups, delivered in supplements to volume I and II.

Survey of the individual Assembly Groups:

Engine and Clutch	Code No. 1
Fuel System	Code No. 2
Transmission	Code No. 3
Front Axle	Code No. 4
Rear Axle	Code No. 5
Brakes, Wheels, Tires	Code No. 6
Pedal Controls and Manual Controls	Code No. 7
Maintenance Jobs, Technical Data	Code No. 0
Body	Code No. 8
Electrical System	Code No. 9

For identification of the volumes, the back of the folders is provided with a transparent pocket at the top for insertion of the pertinent type.

To find the individual repair steps quickly, each Assembly Group of this Workshop Manual is subdivided into "Main Groups", "Chapters" and "Sections" and provided with a very detailed list of contents; refer to example on next page.

Technical Information sheets should be filed at the beginning of their respective groups. The contents of the Technical Informations will be incorporated into the Workshop Manual at suitable intervals. The List of Contents will be edited whenever extensions and supplements are published.

Motor und Kupplung
Engine and Clutch
Moteur et Accouplement
Motore e Frizione

1
1
1
1
1
1
1
1
1
1
1

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.1 Description

Engine changes - 1972 model 0.1 - 1/1
Oil tank changes - 1972 model 0.1 - 2/1
Oil cooler system and oil circuit schematic 0.1 - 2/2
Oil cooler schematic - 1973 model 0.1 - 3/1
Oil cooler schematic with cooling coil - 1974 model 0.1 - 3/2
Engine, front view cross section 0.1 - 4/1
Engine, side view cross section 0.1 - 4/3
Specifications for 2.7 liter-engine where differ 2.4 liter-engine 0.1 - 5/1
Engine changes - 1974 model 0.1 - 6/1
Cross section of engine with emission control equipment 0.1 - 7/1
Layout of exhaust gas recirculation system 0.1 - 7/2
Engine cross section with emission control - 1978/1979 models 0.1 - 7/3
Emission control layout - 1980 model 0.1 - 7/4

0.2 Technical data

General data 0.2 - 1/1
Power performance curves 0.2 - 1/7
Technical data, Type 911 T - Continuous Injection System (CIS) 0.2 - 3/1
Technical data, Type 911/S/Carrera - 1974 model 0.2 - 4/1
Full-power performance - 1974 model 0.2 - 4/4
Technical data, Type 911 S and Carrera - 1975 model 0.2 - 5/1
Engine tightening data 0.2 - 5/2
Technical data, Type 911 - 1976 model 0.2 - 6/1
Technical data, Type 911 S - 1977 model 0.2 - 7/1
Technical data, Type 911 SC - 1978 model 0.2 - 7/3
Technical data, Type 911 SC - 1980 model 0.2 - 7/5
Technical Data, Type 911 SC - from 1981 Models 0.2 - 7/7

2 - COOLING SYSTEM, EXHAUST SYSTEM, EMISSION CONTROL

2.1 Cooling system

Fan drive belt, replacing/adjusting 2.1 - 1/1

2.2 Exhaust system and heating

Exhaust system and heater blower, removing and installing 2.2 - 1/1

Exhaust system - 1978 model 2.2 - 1/5

2.3 Emission control

Air injection components, removing and installing 2.3 - 1/1

Air pump belt, tensioning 2.3 - 1/4

Reactors and EGR equipment, removing and installing 2.3 - 2/1

Exhaust gas recirculation system 2.3 - 2/6

Reactor, checking for leaks 2.3 - 3/1

Exhaust gas recirculation system, checking 2.3 - 3/2

Air injection system, checking 2.3 - 3/3

3 - OIL CIRCULATION

3.1 Oil circulation

Oil tank, removing and installing 3.1 - 1/1

Oil tank, removing and installing - 1973 model 3.1 - 1/2

Auxiliary pressure relief valve, removing and installing 3.1 - 1/3

Auxiliary pressure relief valve, disassembling and assembling 3.1 - 1/4

Oil cooler coil, removing and installing 3.1 - 1/5

Oil cooler, removing and installing 3.1 - 2/1

3.2 Oil tank, removing and installing - 1974 model 3.2 - 1/1

3.3 Pressure relief valve cooling coil, removing and installing - 1974 model 3.3 - 1/1

3.4 Pressure relief valve, disassembling and assembling - 1974 model 3.4 - 1/1

3.5 Oil cooler coil, removing and installing - 1974 model 3.5 - 1/1

Cooling coil oil lines, service installing - 1974 model 3.5 - 1/3

Replacing oil lines to front oil cooler or to cooling coil 3.5 - 1/5

Oil cooler, removing/installing 3.6 - 1/1

Auxiliary pressure relief/safety valves 3.6 - 2/1

5 - CAMSHAFT HOUSING AND CYLINDER HEAD

5.1 Camshaft housing

Injection tube in camshaft housing, removing and installing 5.1 - 1/1

Chain tensioner, overhauling 5.1 - 2/1

Sealing cylinder head/camshaft housing mating surfaces 5.1 - 2/7

5.2 Cylinder head

Valve springs, installed length 5.2 - 1/1

Adjusting timing 5.3 - 1/1

6 - CYLINDERS AND PISTONS

6.1 Cylinders and pistons

Piston changes - 1972 model 6.1 - 1/1

Piston and cylinder dimensions - 1972 model 6.1 - 1/2

Piston and cylinder dimensions - 1973 model 6.1 - 2/1

Piston and cylinder dimensions - 1974 model 6.1 - 3/1

"LS" cylinders and pistons, installation instructions 6.1 - 3/2

Pistons and cylinders, measuring 6.1 - 4/1

Piston and cylinder sizes, 911 SC - 1978 model 6.1 - 6/1

Piston weight classes - 911 SC from 1981 models 6.1 - 6/3

7 - CRANKCASE AND CRANKSHAFT

7.1 Crankcase and crankshaft

Crankcase, measuring and reconditioning 7.1 - 1/1

Modified flywheel installation - 1978 model 7.1 - 2/1

Flywheel with pilot bearing - 1980 model 7.1 - 3/1

Oil filter screen and suction plate, removing/installing 7.1 - 4/1

7.3 Crankshaft

Crankshaft changes - 1972 model 7.3 - 1/1

Crankshaft dimensions 7.3 - 1/2

Connecting rod changes - 1972 model 7.3 - 1/3

Connecting rod weight groups 7.3 - 1/4

Connecting rod weight groups - 1978 model 7.3 - 1/5

Pistons for injection engines 7.3 - 2/1

Modified crankshaft drive - 1978 model 7.3 - 3/1

Crankshaft specifications, standard and undersize - 1978 model 7.3 - 3/6

9 - CLUTCH

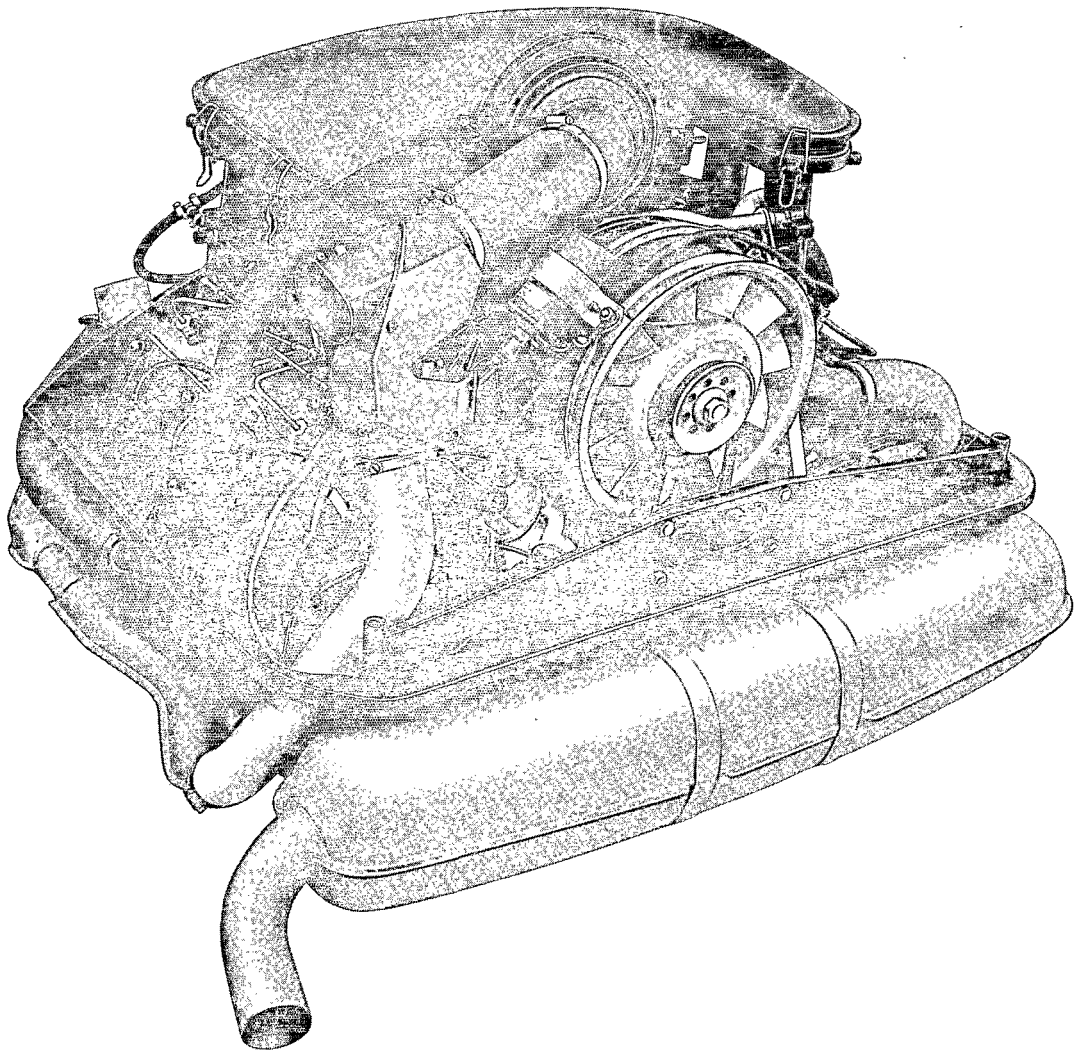
9.1 Clutch

Clutch changes - 1972 model	9.1 - 1/1
Clutch free play, adjusting	9.1 - 1/2
Throwout bearing, removing and installing	9.1 - 2/1
Clutch - 1975 model	9.1 - 3/1
Clutch modified - 1978 model	9.1 - 4/1

ENGINE CHANGES - BEGINNING WITH 1972 MODELS

General Information

Beginning with 1972 models, Type 911 engines have a cubic displacement of 2.4 liters (2341 c/142.8 cu.in.)



Individual changes and changed service operations are described on the pages that follow.

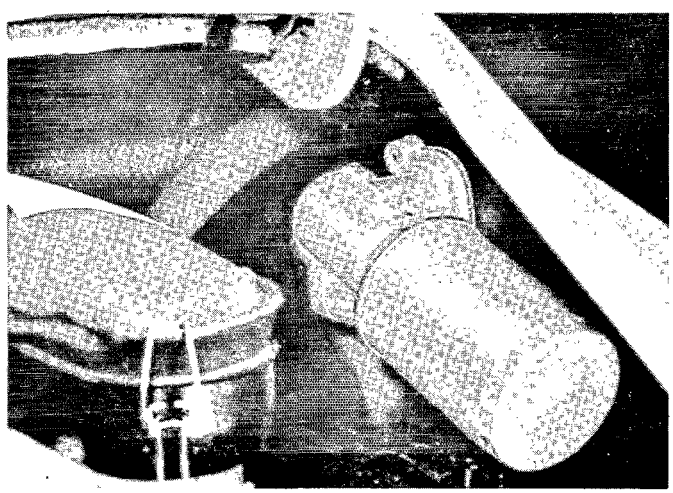
Summary of Changes:

1. Technical Data
2. Crankcase
3. Crankshaft
4. Connecting rods and bearings
5. Pistons
6. Location of oil tank and oil lines
7. Clutch pressure plate, throwout bearing, and clutch disc
8. Ignition - see Group 9 (Electrical System)
9. Fuel system - see Group 2

OIL TANK CHANGES - BEGINNING WITH 1972 MODELS

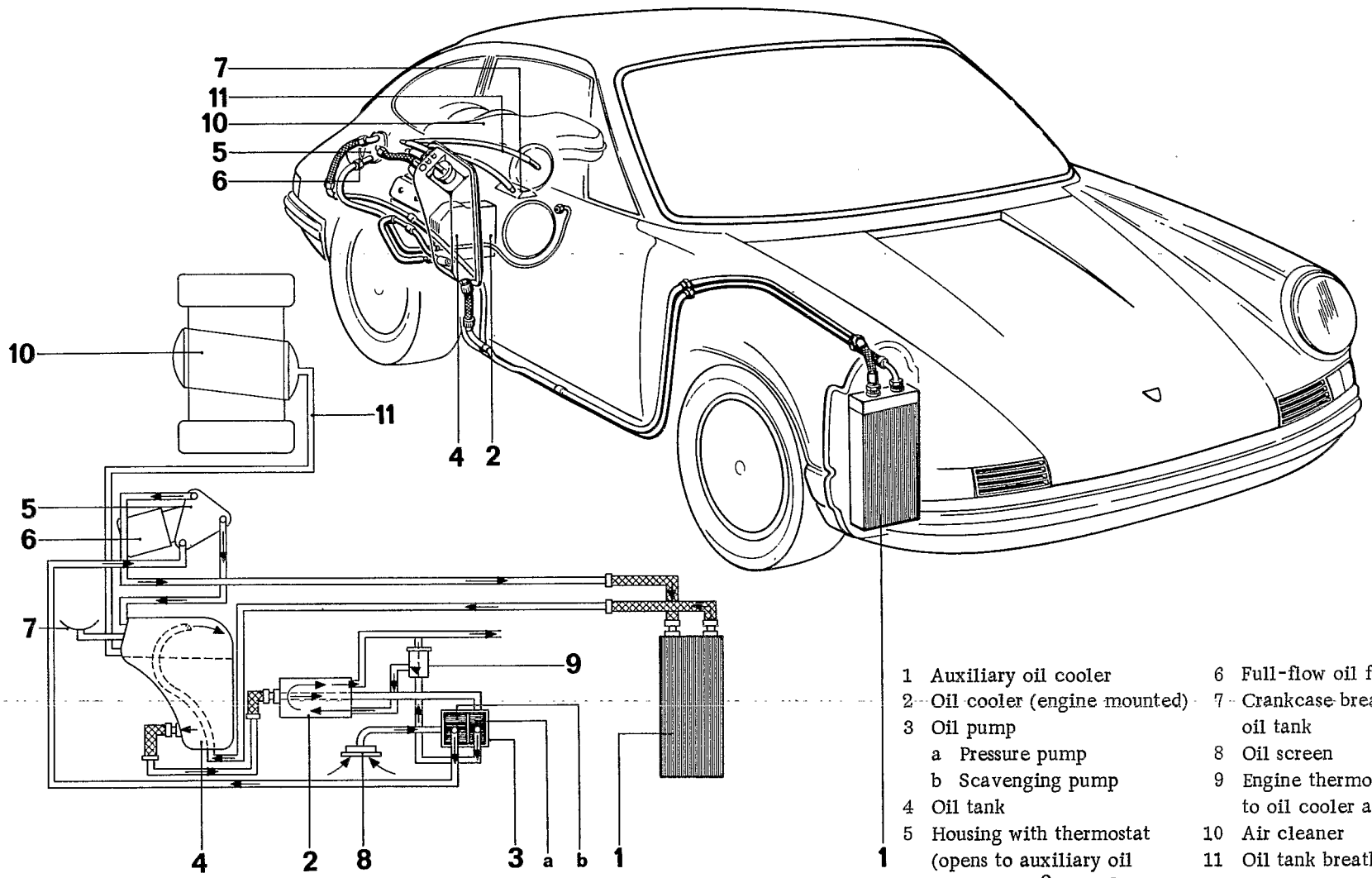
General Information

Beginning with 1972 models, the oil tank is located in right rear wheelhousing in front of the rear axle. The oil filler neck is now accessible from the outside. It is located under a hinged lid in the right rear fender. The oil filter housing is separated from the tank and mounted on the right engine compartment wall.
The auxiliary oil cooler under the right front fender continues to be standard equipment in Type 911S vehicles.



OIL COOLING SYSTEM AND OIL CIRCUIT SCHEMATIC

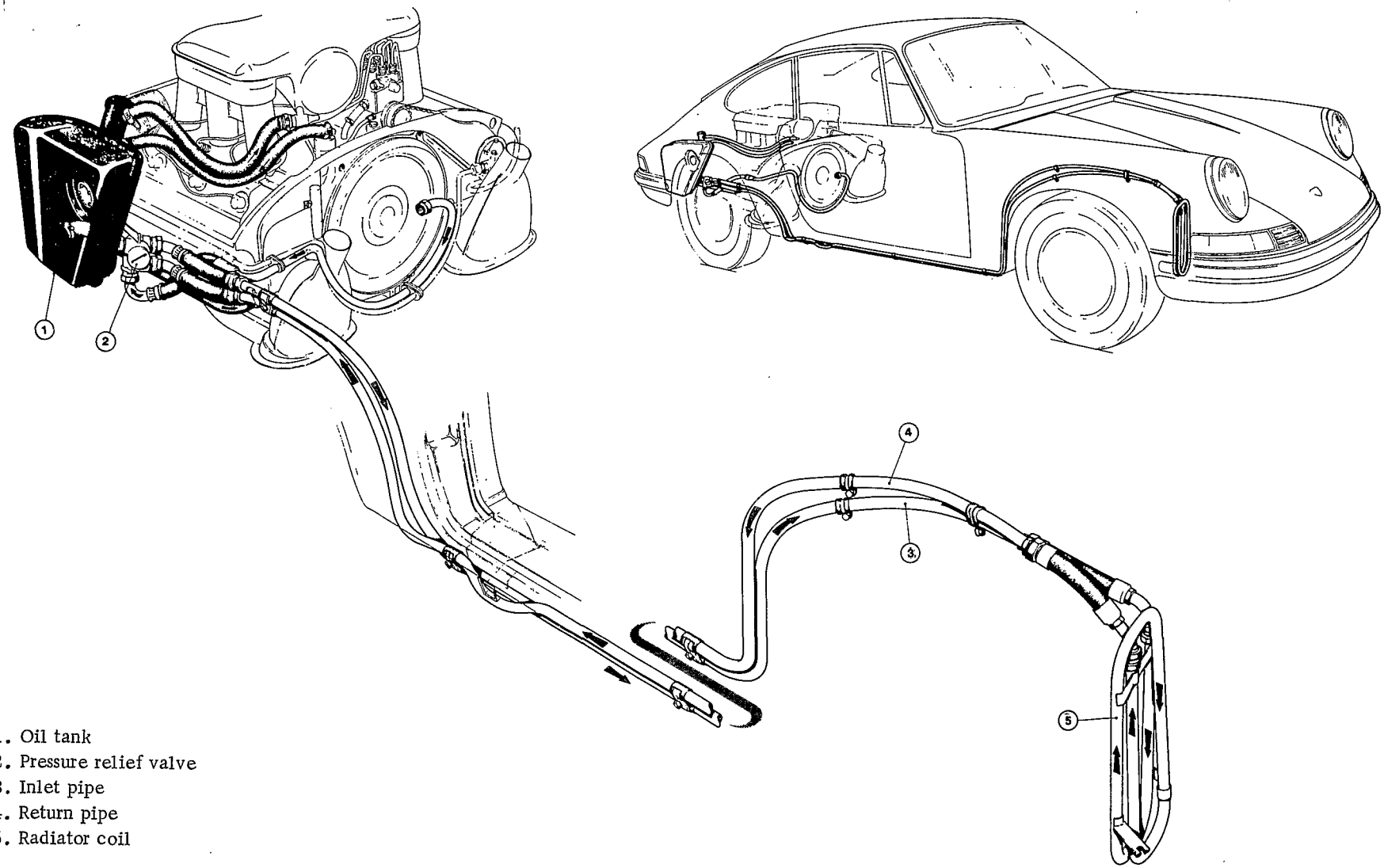
TYPE 911 S VEHICLES (FROM 72-MODELS)



1 Auxiliary oil cooler
2 Oil cooler (engine mounted)
3 Oil pump
  a Pressure pump
  b Scavenging pump
4 Oil tank
5 Housing with thermostat (opens to auxiliary oil cooler at 83°C/182°F
6 Full-flow oil filter
7 Crankcase breather to oil tank
8 Oil screen
9 Engine thermostat (opens to oil cooler at 83°C/182°F
10 Air cleaner
11 Oil tank breather to air cleaner

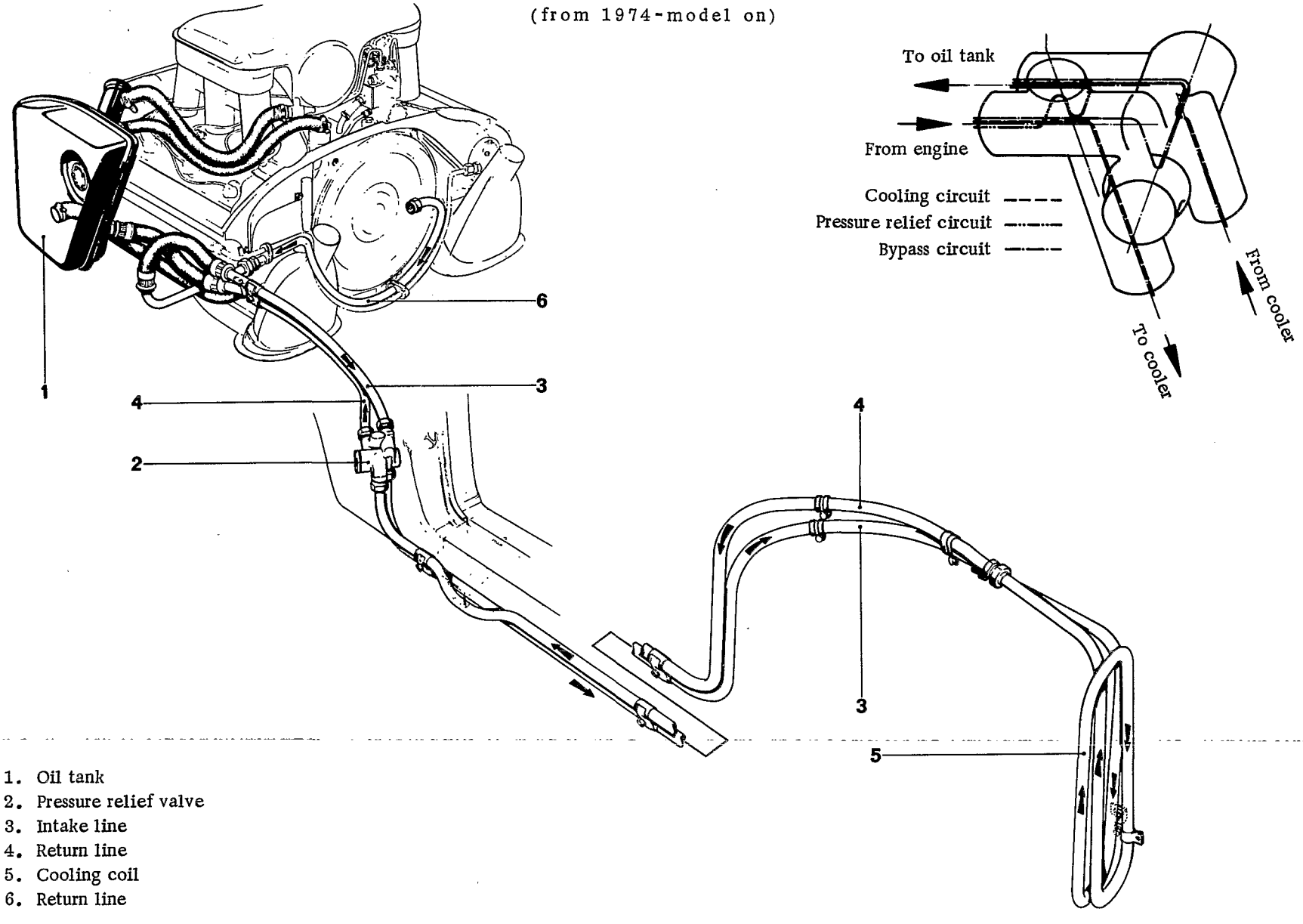
OIL COOLER SCHEMATIC

TYPE 911S VEHICLES (FROM 1973-MODEL ON)

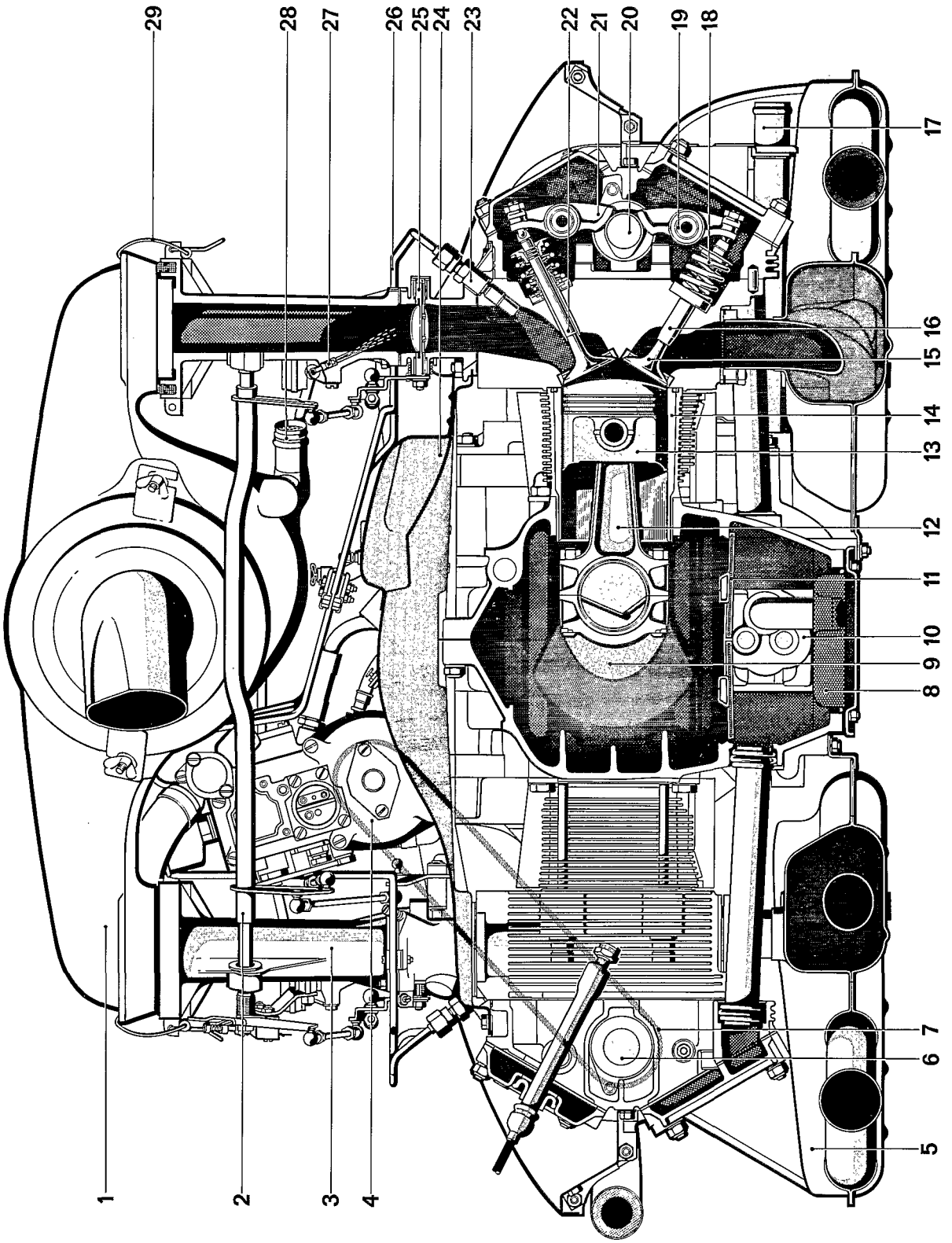


1. Oil tank
2. Pressure relief valve
3. Inlet pipe
4. Return pipe
5. Radiator coil

(from 1974-model on)

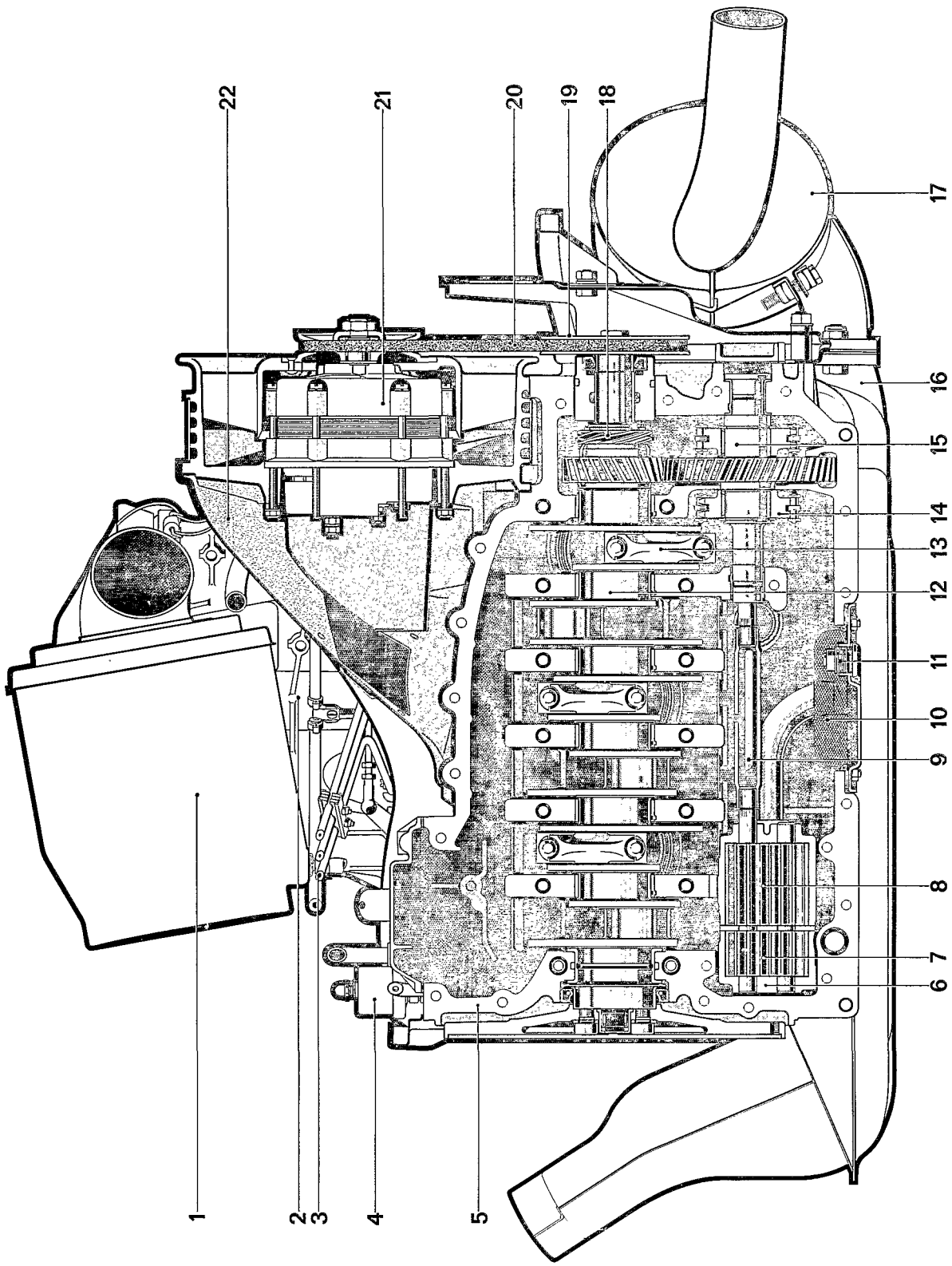


1. Oil tank
2. Pressure relief valve
3. Intake line
4. Return line
5. Cooling coil
6. Return line


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

ENGINE CROSS-SECTION

1. Air filter housing
2. Cross-shaft
3. Intake stacks
4. Fuel injection pump
5. Heat exchanger
6. Camshaft
7. Spur belt
8. Oil screen
9. Crankshaft
10. Oil pump
11. Oil screen in crankcase
12. Connecting rod
13. Piston
14. Cylinder
15. Exhaust valve
16. Valve guide
17. Oil hose connector (oil tank to oil pump)
18. Valve spring
19. Rocker arm shaft
20. Camshaft
21. Rocker arm
22. Intake valve
23. Fuel injector
24. Upper air shroud
25. Throttle valve housing
26. Fuel injection line
27. Cold start enrichment nozzle
28. Crankcase ventilation filter
29. Air filter housing retaining clips


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

ENGINE SIDE-SECTION

1. Air filter housing
2. Air inlet tube
3. Fuel injection lines
4. Oil pressure sensor
5. Crankcase
6. Oil pump
7. Pressure side (to lubrication points)
8. Suction side (to oil tank)
9. Connecting shaft
10. Oil screen
11. Oil drain plug (magnetic)
12. Crankshaft
13. Connecting rod
14. Sprocket gear
15. Intermediate shaft
16. Heat exchanger
17. Exhaust muffler
18. Distributor drive gear
19. Belt pulley
20. V-belt
21. AC generator
22. Upper air shroud

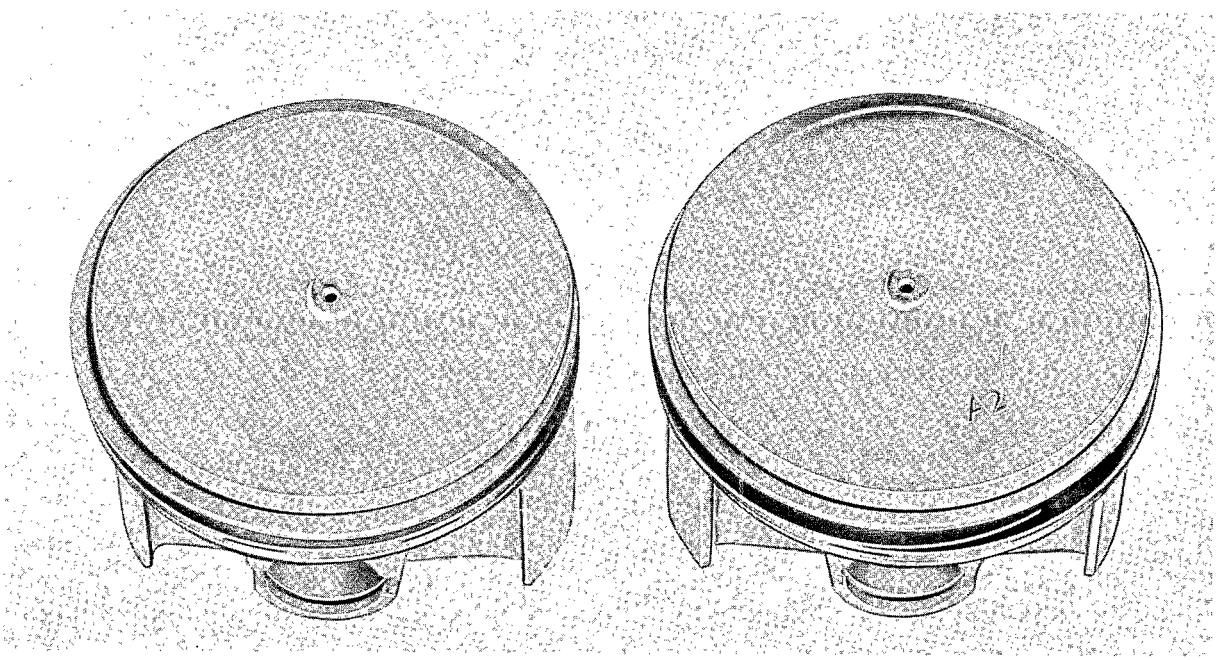
SPECIFICATIONS FOR THE 2.7 LITER ENGINE WHERE DIFFERING FROM THE 2.4 LITER ENGINE

Crankcase:	Cylinder base bore in crankcase increased from 92 mm dia to 97 mm dia.
Pistons:	90 mm dia instead 84 mm dia Piston pin offset by 0.4 mm instead 0.8 mm.
Cylinders:	Cylinder walls coated with NIKASIL compound. Cooling fins reduced from 15 to 11.
Ignition distributor:	Advance curve changed.
Ignition timing:	TDC at 850 - 950 rpm
Spark plugs: (gap in mm)	BOSCH W 265 P 21 (0.55) BOSCH W 260 T 2 (0.7) BERU 265/14/3P (0.55) BERU 260/14/3 (0.7)
Throttle valve housing:	Idle air ports enlarged from 3.3 mm dia to 4 mm dia.

ENGINE CHANGES - BEGINNING WITH 1974 MODELS

1. Type 911, 911 S, and Carrera engines are equipped with NIKASIL light-alloy cylinders with a 90 mm bore.

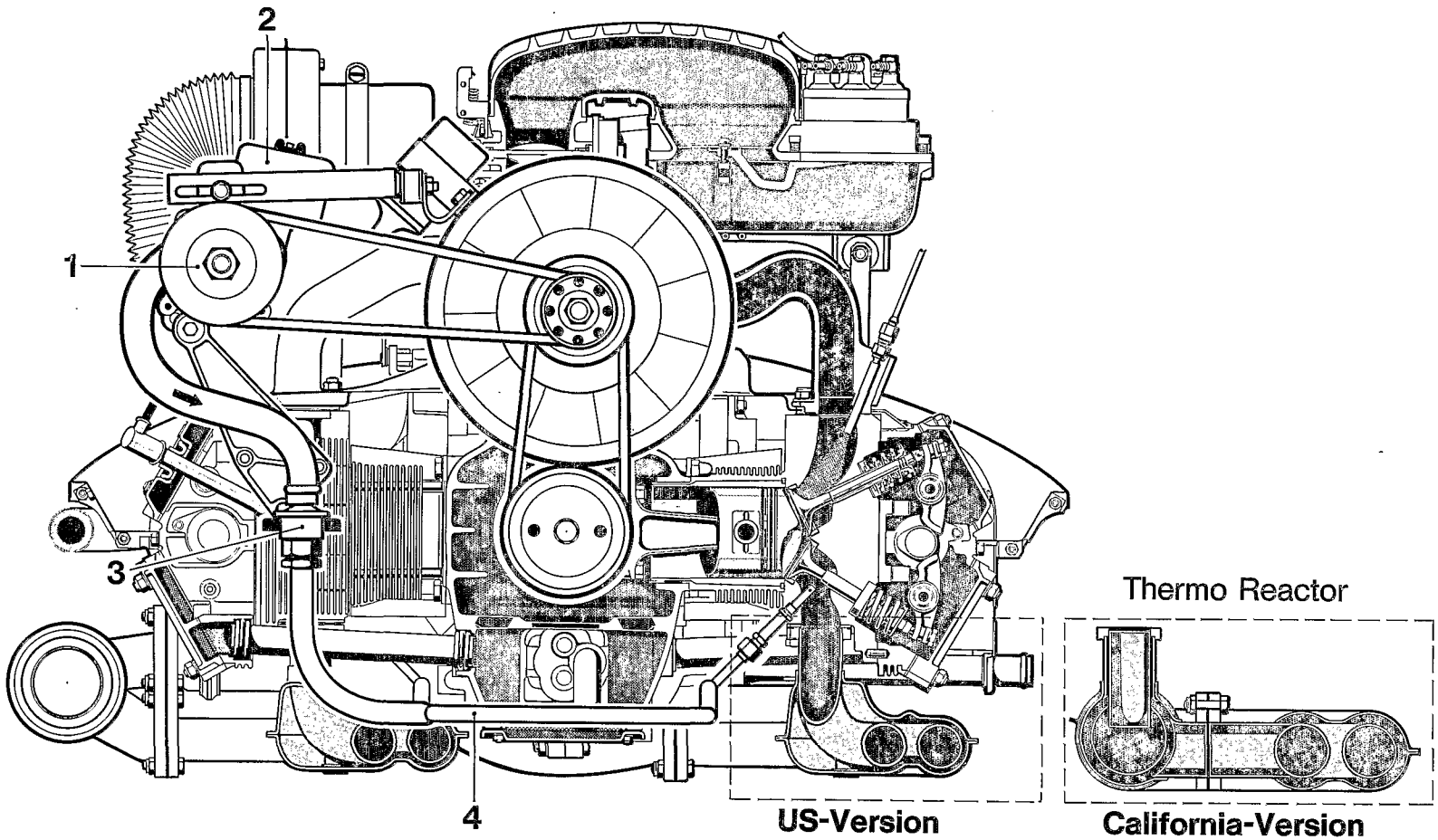
2. Pistons: Piston heads in Type 911 S engines are marked "A 2". Rype 911 pistons, by comparison, have a deeper depression and a higher protrusion, without special markings.



3. Cylinder head: The mounting orifice for the injection valve is discontinued since the valve is relocated to the intake stack.

4. Type 911 and 911 S engines received modified camshafts with changed valve timing.

CROSS SECTION OF ENGINE WITH EMISSION CONTROL EQUIPMENT



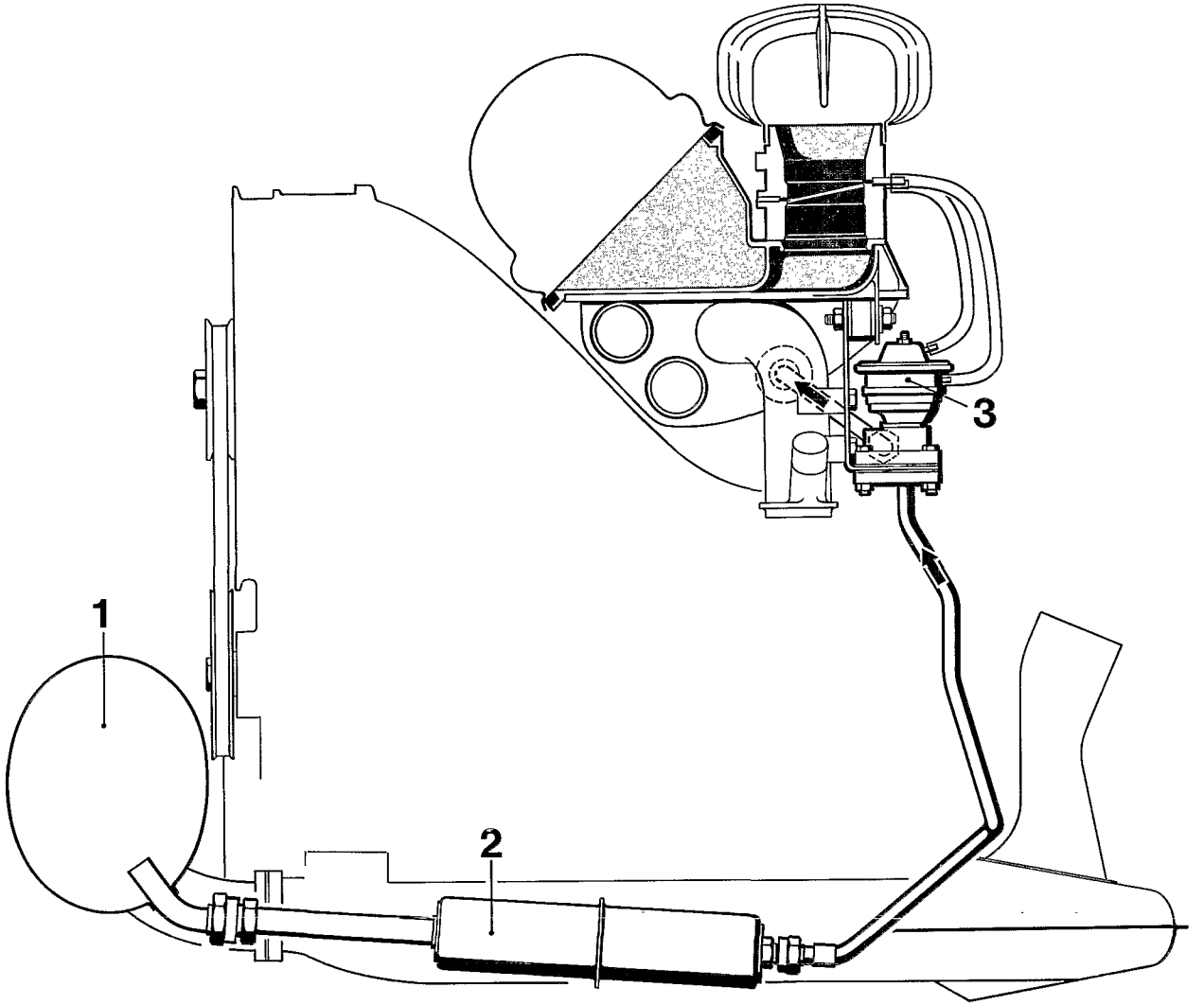
1 Air pump

2 Air pump filter

3 Check valve

4 Exhaust port air line

LAYOUT OF EXHAUST GAS RECIRCULATION SYSTEM



1 Muffler

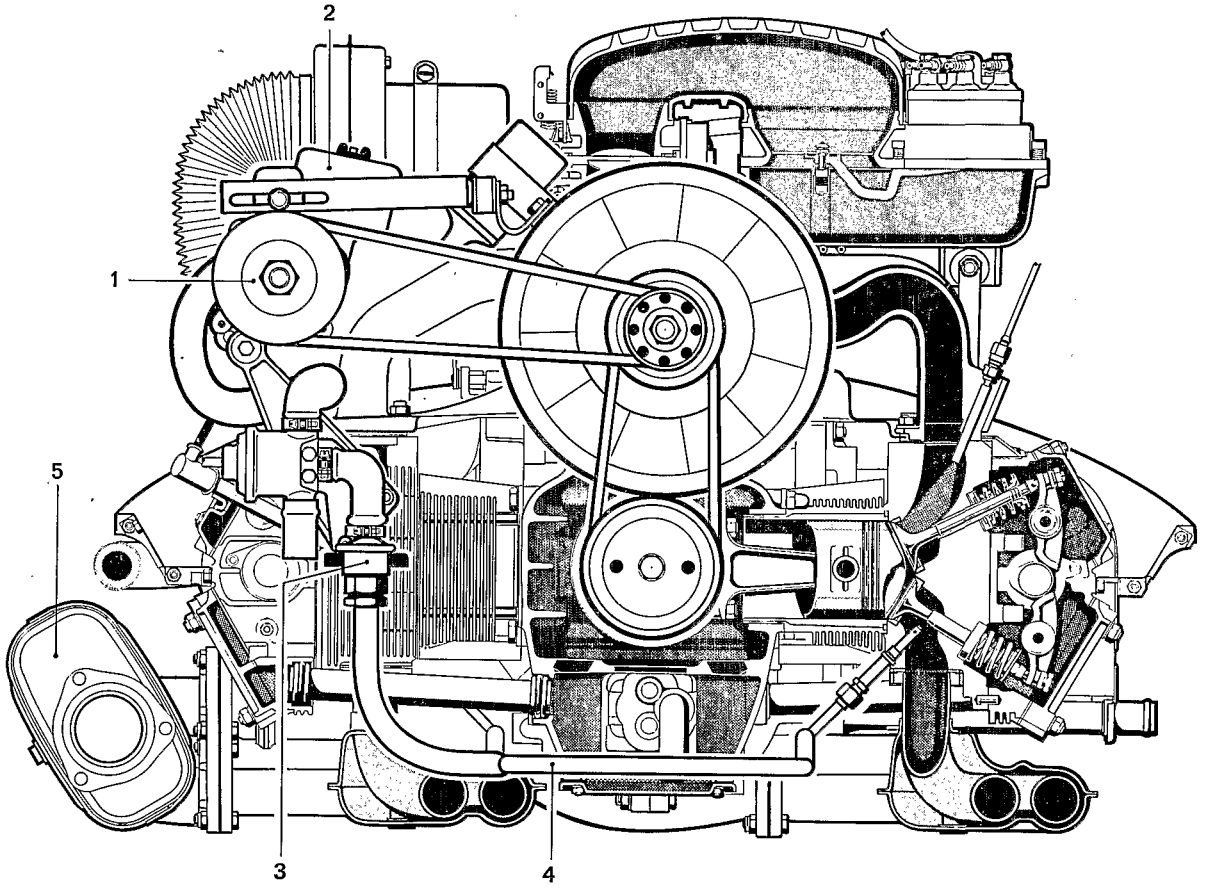
2 EGR filter

3 EGR valve

Operation: The EGR valve is opened by vacuum from the intake manifold in two stages at partial throttle. In this way exhaust gases flow into the intake housing and are mixed with fresh gas. The amount of nitrogen oxide - NO_x - in the exhaust gas is reduced through the controlled dilution of the fuel-air mixture.

CROSS SECTION VIEW OF ENGINE WITH EMISSION CONTROL 911 SC

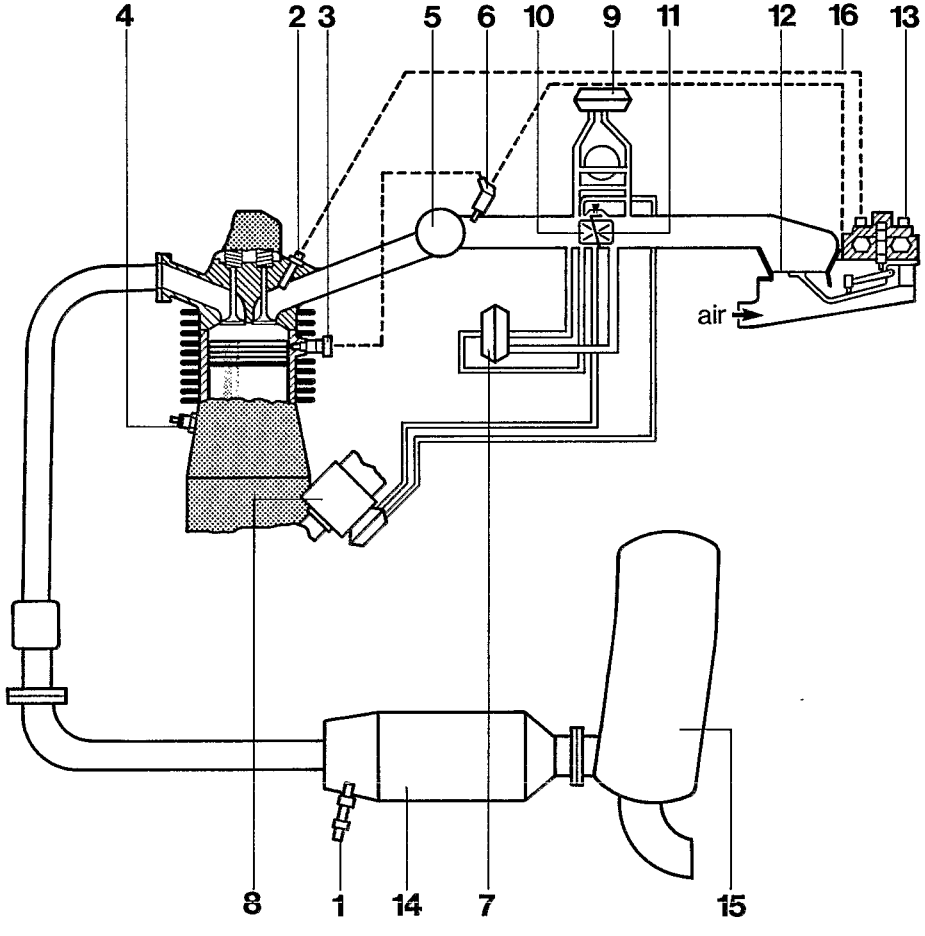
(1978/1979 Models)



1 - Air pump
2 - Air pump filter
3 - Check valve
4 - Air line to exhaust port
5 - Catalytic converter

LAYOUT DRAWING OF EMISSION CONTROL 911 SC

(1980 Model)



1 Oxygen sensor
2 Fuel injector
3 Thermo time switch
4 Oil temperature switch
5 Intake housing
6 Cold start valve
7 Vacuum control
8 Ignition distributor
9 Auxiliary air valve
10 Throttle valve switch
11 Throttle housing
12 Sensor plate
13 Mixture control unit
14 3-way catalytic converter
15 Muffler
16 Fuel injection line

TECHNICAL DATA - TYPE 911 VEHICLES BEGINNING WITH 1972 MODELS

	911 T	911 E	911 S
ENGINE			
Type	four-stroke gasoline engine with two opposing cylinder banks		
Number of cylinders	6	6	6
Cylinder arrangement		horizontal, three cylinders per bank	
Bore	84 mm (3.31 in.)	84 mm (3.31 in.)	84 mm (3.31 in.)
Stroke	70.4 mm (2.77 in.)	70.4 mm (2.77 in.)	70.4 mm (2.77 in.)
Engine displacement	2341 cc (142.8 cu. in.)	2341 cc (142.8 cu. in.)	2341 cc (142.8 cu. in.)
Compression ratio	7.5 : 1	8.0 : 1	8.5 : 1
Horsepower rating (DIN)	140	165	190
(SAE Net)	137	157	181
Maximum torque (DIN)	20 mkp	21 mkp	22 mkp
(SAE)	166 ft/lb	174 ft/lb	181 ft/lb
@ engine speed	4000 rpm	4500 rpm	5200 rpm

	911 T	911 E	911 S
Specific power output per liter (DIN HP)	60	70	81
(SAE Net HP)	67	79	90
Nominal piston speed @ maximum power	13.1 m/sec	14.5 m/sec	15.2 m/sec
Maximum engine revolutions	6500 rpm	7100 rpm	7300 rpm
Required fuel rating	91 octane	91 octane	91 octane
Cooling	air cooled by fan on alternator shaft	air cooled by fan on alternator shaft	air cooled by fan on alternator shaft
Cooling fan drive	by V-belt from crankshaft	by V-belt from crankshaft	by V-belt from crankshaft
Crankshaft/blower ratio	1 : 1.3	1 : 1.3	1 : 1.3
Air flow rate	approx. 1230 ltr/sec @ 5800 rpm	approx. 1380 ltr/sec @ 6500 rpm	approx. 1380 ltr/sec @ 6500 rpm

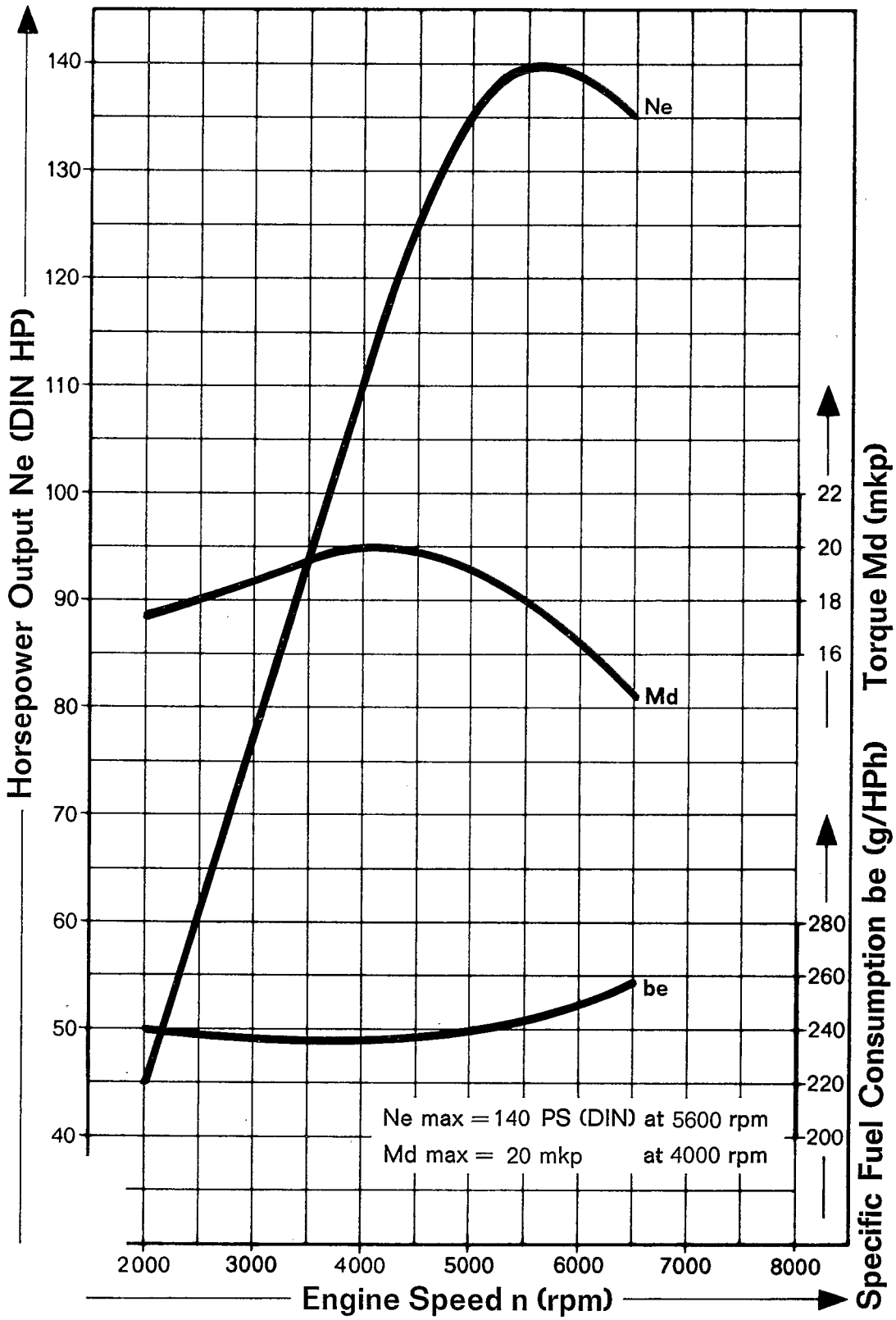
	911 T	911 E	911 S
Lubrication	dry sump	dry sump	dry sump
Oil cooling	oil cooler on crankcase in fan air stream	oil cooler on crankcase in fan air stream	oil cooler on crankcase in fan air stream; auxiliary cooler in front of vehicle
Oil filter	full flow	full flow	full flow
Oil consumption	1,5 - 2 ltr/1000 km 1,5 - 2 US qts/600 mi	1,5 - 2 ltr/1000 km 1,5 - 2 US qts/600 mi	1,5 - 2 ltr/1000 km 1,5 - 2 US qts/600 mi
Crankcase	two-piece pressure casting of aluminum/magnesium alloy	two-piece pressure casting of aluminum/magnesium alloy	two-piece pressure casting of aluminum/magnesium alloy
Crankshaft	forged, surface-hardened	forged, surface-hardened	forged, surface-hardened
Intermediate shaft bearings	two, plain-journal	two, plain-journal	two, plain-journal
Crankshaft bearings	eight, plain-journal	eight, plain-journal	eight, plain-journal
Main bearings 1-7	split inserts, 3-layer	split inserts, 3-layer	split inserts, 3-layer
Main bearing 1	thrust bearing	thrust bearing	thrust bearing
Main bearing 8	one-piece bushing, hard-lead lined	one-piece bushing, hard-lead lined	one-piece bushing hard-lead lined

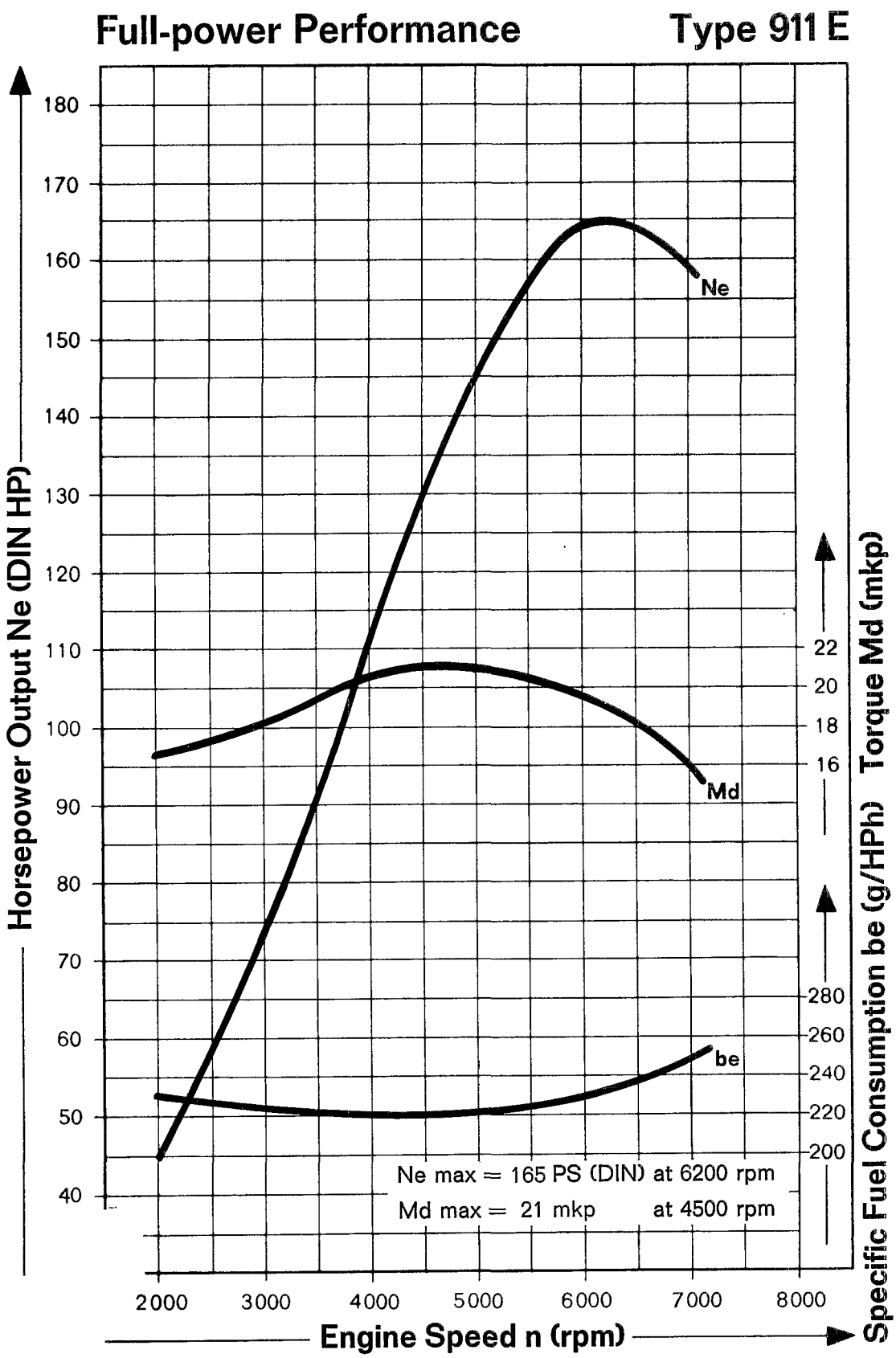
	911 T	911 E	911 S
Connecting rods	forged steel	forged steel	forged steel, surface-hardened (Tenifer)
Connecting rod bearings	split inserts, 3-layer	split inserts, 3-layer	split inserts, 3-layer
Piston pin bushings	bronze, pressed-in	bronze, pressed-in	bronze, pressed-in
Pistons	light alloy, die-cast	light alloy, die-cast	light alloy, forged
Piston pins	floating, with circlips	floating, with circlips	floating, with circlips
Piston rings	two compression rings one oil scraper	two compression rings one oil scraper	two compression rings one oil scraper
Cylinders	individual, grey cast iron with integral cooling fins	individual, grey cast iron sleeve with finned light alloy jacket	individual, grey cast iron sleeve with finned light alloy jacket
Cylinder heads	light alloy, finned individual castings for each cylinder	light alloy, finned individual castings for each cylinder	light alloy (Y-alloy), finned individual castings for each cylinder
Valve seat inserts	shrunk-in, grey-cast iron	shrunk-in, grey-cast iron	shrunk-in, grey-cast iron
Valve guides	shrunk-in, special bronze	shrunk-in, special bronze	shrunk-in, special bronze

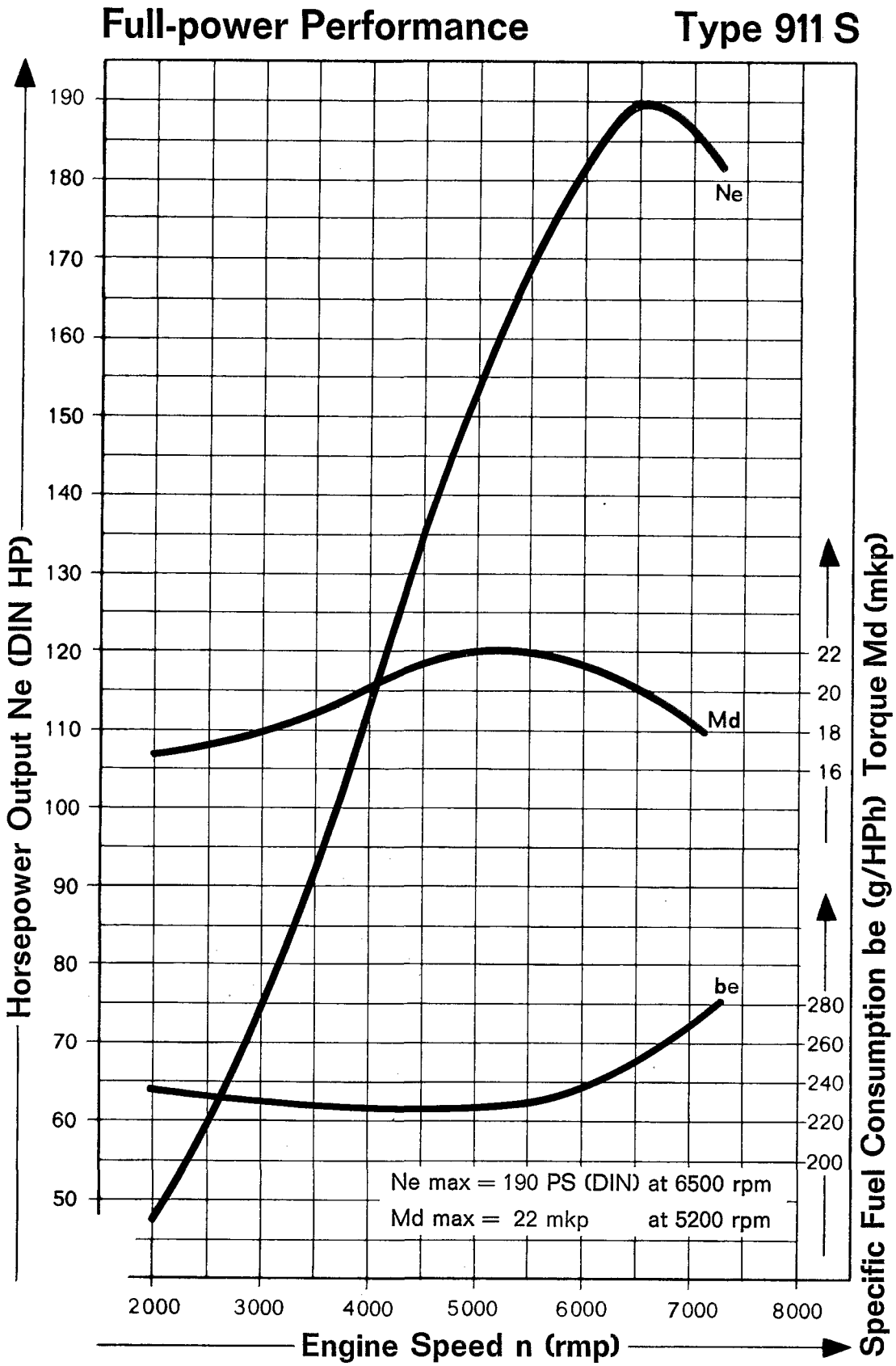
	911 T	911 E	911 S
Spark plug threads	M 14 x 1, 25, machined into cylinder heads	M 14 x 1, 25, machined into cylinder heads	M 14 x 1, 25, machined into cylinder heads
Valves	1 intake, 1 exhaust valve per cylinder	1 intake, 1 exhaust valve per cylinder	1 intake, 1 exhaust valve per cylinder
Valve arrangement	overhead in "V"	overhead in "V"	overhead in "V"
Exhaust valves	sodium cooled, with reinforced seat	sodium cooled, with reinforced seat	sodium cooled, with reinforced seat
Valve springs	2 coil springs per valve	2 coil springs per valve	2 coil springs per valve
Valve timing	OHC, 1 camshaft per cylinder bank	OHC, 1 camshaft per cylinder bank	OHC, 1 camshaft per cylinder bank
Camshafts	cast steel, in three plain bearings in base metal of camshaft housing	cast steel, in three plain bearings in base metal of camshaft housing	cast steel, in three plain bearings in base metal of camshaft housing
Camshaft drive	by chain	by chain	by chain
Valve clearance, cold, intake and exhaust	0.10 mm (0.004 in.) measured between valve stem and rocker arm	0.10 mm (0.004 in.) measured between valve stem and rocker arm	0.10 mm (0.004 in.) measured between valve stem and rocker arm

	911 T	911 E	911 S
Valve timing with 1 mm (0.040 in.) valve clearance			
inlet opens	16° BTC	16° BTC	38° BTC
inlet closes	30° ATC	30° ATC	50° ATC
exhaust opens	42° BTC	42° BTC	40° BTC
exhaust closes	4° BTC	4° BTC	20° ATC
Intake valve lift at overlap TC with 0.1 mm (0.004 in.) valve clearance	2,4 - 2,8 mm	2,4 - 2,8 mm	5.0 - 5.4 mm
Ignition type	capacitive discharge system (CDS)	capacitive discharge system (CDS)	capacitive discharge system (CDS)
Firing order	1-6-2-4-3-5	1-6-2-4-3-5	1-6-2-4-3-5
Ignition transformer	BOSCH	BOSCH	BOSCH
Distributor (either kind)	MARELLI 50.10.974.1 BOSCH JFUDR6 0231169003	MARELLI 50.10.974.2 BOSCH JFUDR6 0231169004	MARELLI 50.10.974.3 BOSCH JFUDR6 0231169005
Spark advance	centrifugal and vacuum	centrifugal and vacuum	centrifugal and vacuum
Basic ignition timing	5° ATC @ 900 rpm	5° ATC @ 900 rpm	5° ATC @ 900 rpm
Dwell angle	BOSCH 38° ± 3° MARELLI 40° ± 3°	BOSCH 38° ± 3° MARELLI 40° ± 3°	BOSCH 38° ± 3° MARELLI 40° ± 3°

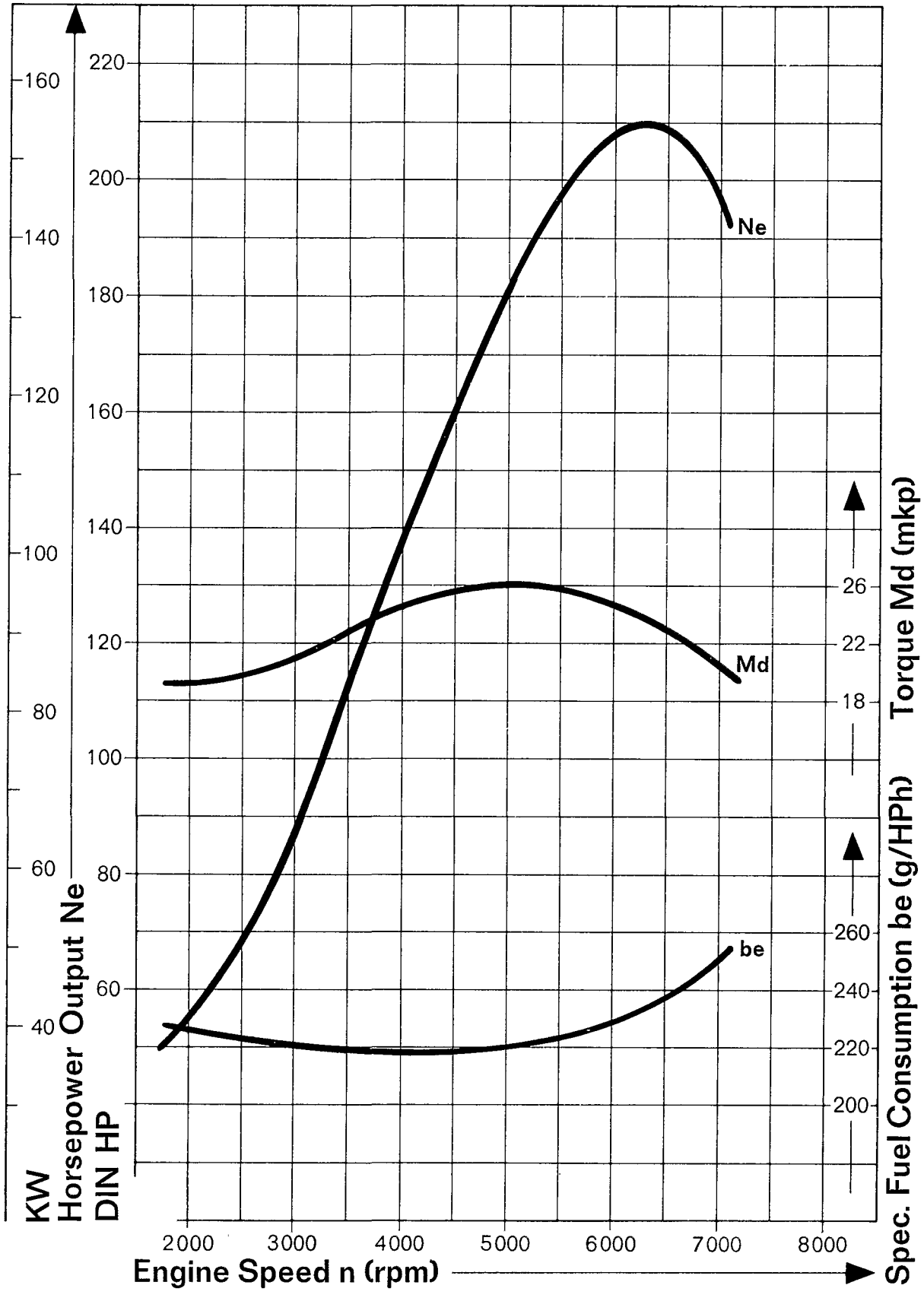
Full-power Performance Type 911 T USA




Full-power Performance
Type 911 E
Horsepower Output Ne (DIN HP)
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
Ne
Md
be
Ne max = 165 PS (DIN) at 6200 rpm
Md max = 21 mkp at 4500 rpm
2000
3000
4000
5000
6000
7000
8000
Engine Speed n (rpm)
Torque Md (mkp)
22
20
18
16
Specific Fuel Consumption be (g/HPh)
280
260
240
220
200


Full-power Performance
Type 911 S
Horsepower Output Ne (DIN HP)
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
Ne
Md
be
22
20
18
16
280
260
240
220
200
Specific Fuel Consumption be (g/HPh) Torque Md (mkp)
Ne max = 190 PS (DIN) at 6500 rpm
Md max = 22 mkp at 5200 rpm
2000
3000
4000
5000
6000
7000
8000
Engine Speed n (rmp)

Full-power Performance Carrera



TECHNICAL DATA FOR CARRERA 2.7 FROM 1973 MODEL

Engine

Number of cylinders	6
Bore, mm	90
Stroke, mm	70.4
Displacement, actual, cc	2687
Displacement, tax formula, cc	2653
Compression ratio	8.5 : 1
Max. horsepower, DIN HP or KW	210/154
at crankshaft rpm	6300
Max. torque, DIN kpm or Nm	26/255
at crankshaft rpm	5100
Specific power output, DIN HP/1 or KW/1	78/57
Required fuel rating, min. RON	91
Nominal fuel consumption, ltr/100 km	10.8
Engine weight, kg or lbs	approx. 182/402

Cylinders and Pistons

Cylinder material	Light alloy with NIKASIL-coated cylinder bore
Piston material	Forged, aluminum alloy

Ignition

Ignition distributor	BOSCH Nr. 023 116 9011 MARELLI Nr. 610 15 155
Breaker point gap	0.35 BOSCH and MARELLI
Dwell angle	BOSCH 38 $\pm$ 3° MARELLI 37 $\pm$ 3°
Basic ignition adjustment	TDC at 900 $\pm$ 50 rpm
Spark plugs (gap in mm)	BOSCH W 265 P 21 (0.55) BOSCH W 260 T 20 (0.7) BERU 265/14/3P (0.55) BERU 260/14/3 (0.7)
Fuel injection pump	BOSCH No. 0408 126 019 PORSCHE No. 911 110 254 00

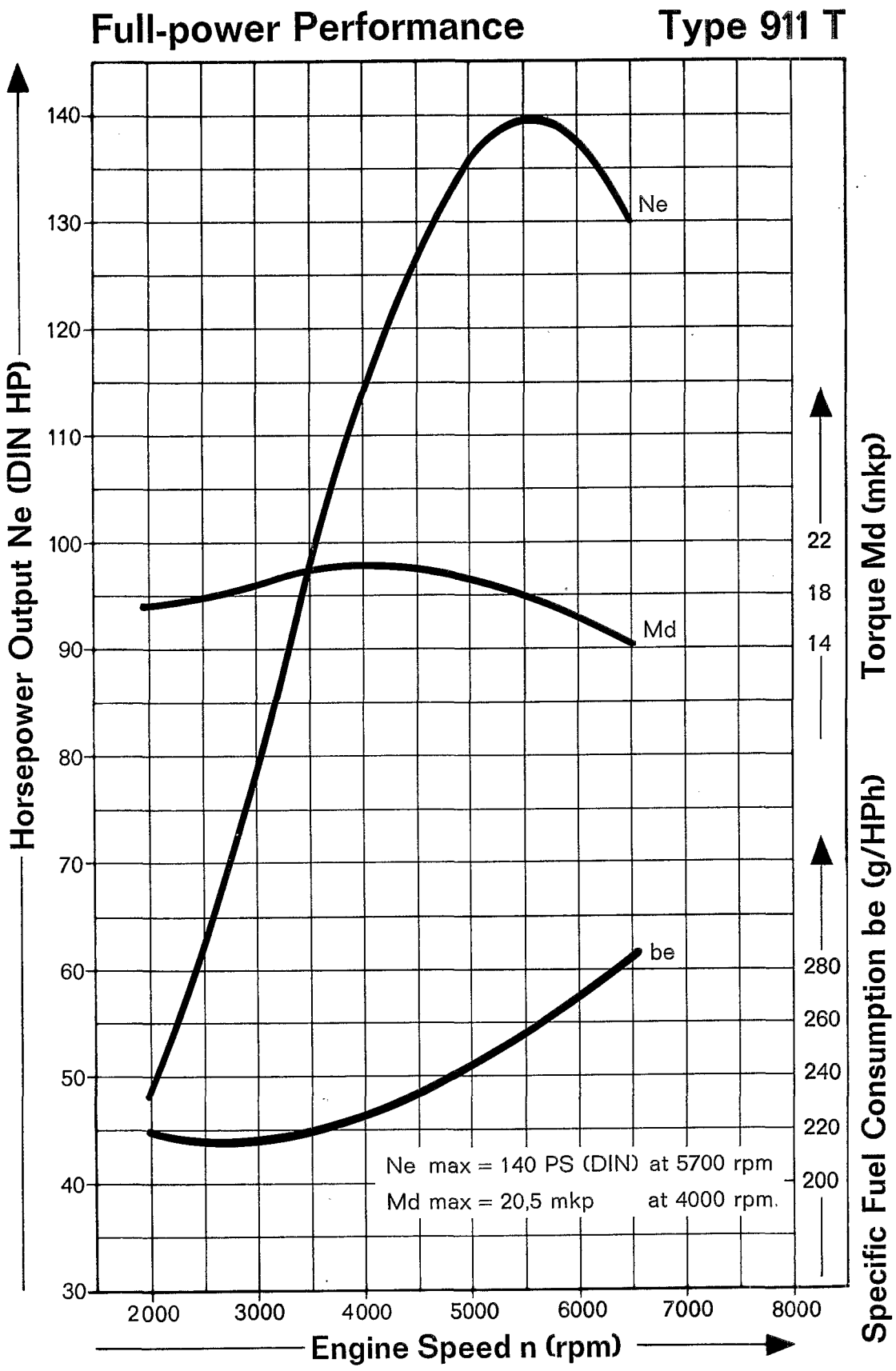
TECHNICAL DATA, TYPE 911T - USA CONTINUOUS INJECTION SYSTEM

Internal designation
911/91 with manual transmission
911/96 with Sportomatic

Horsepower rating (DIN) in HP or KW	max.	140/103
@ crankshaft rpm		5700
Torque (DIN) in kpm or Nm		20.5/201
@ crankshaft rpm		4000
Specific power output (DIN) in HP/liter or KW/liter	max.	60/44
Compression ratio		8.0 : 1
Required octane rating - research		91
Nominal fuel consumption (DIN) in ltr/100 km		9.0
Engine weight in kg or lb	approx.	183 (404)

Valve Timing

Camshaft, left, part number	911 105 141 00
Camshaft, right, part number	911 105 142 00
Camshaft identification, left	141.00
Camshaft identification, right	142.00
Cam height and base circle radius, intake	38.43 mm
Cam height and base circle radius, exhaust	37.38 mm
Intake valve lift at TDC overlap, with 1 mm valve clearance	
intake valve	9.6 mm
exhaust valve	8.8 mm
Valve timing with 1 mm valve clearance, in degrees of crankshaft rotation	
exhaust opens	30° BBC
exhaust closes	10° BTC
intake opens	0° BTC
intake closes	32° ABC
Ignition timing	5° ATC
at idle speed (engine warm)	900 ± 50 rpm
Spark plugs	
BOSCH	W 235 P 21
BERU	235/14/3P
Electrode gap	0.55 mm


Full-power Performance
Type 911 T
Horsepower Output Ne (DIN HP)
Torque Md (mkp)
Specific Fuel Consumption be (g/HPh)
Engine Speed n (rpm)
Ne
Md
be
Ne max = 140 PS (DIN) at 5700 rpm
Md max = 20,5 mkp at 4000 rpm.
140
130
120
110
100
90
80
70
60
50
40
30
22
18
14
280
260
240
220
200
2000
3000
4000
5000
6000
7000
8000

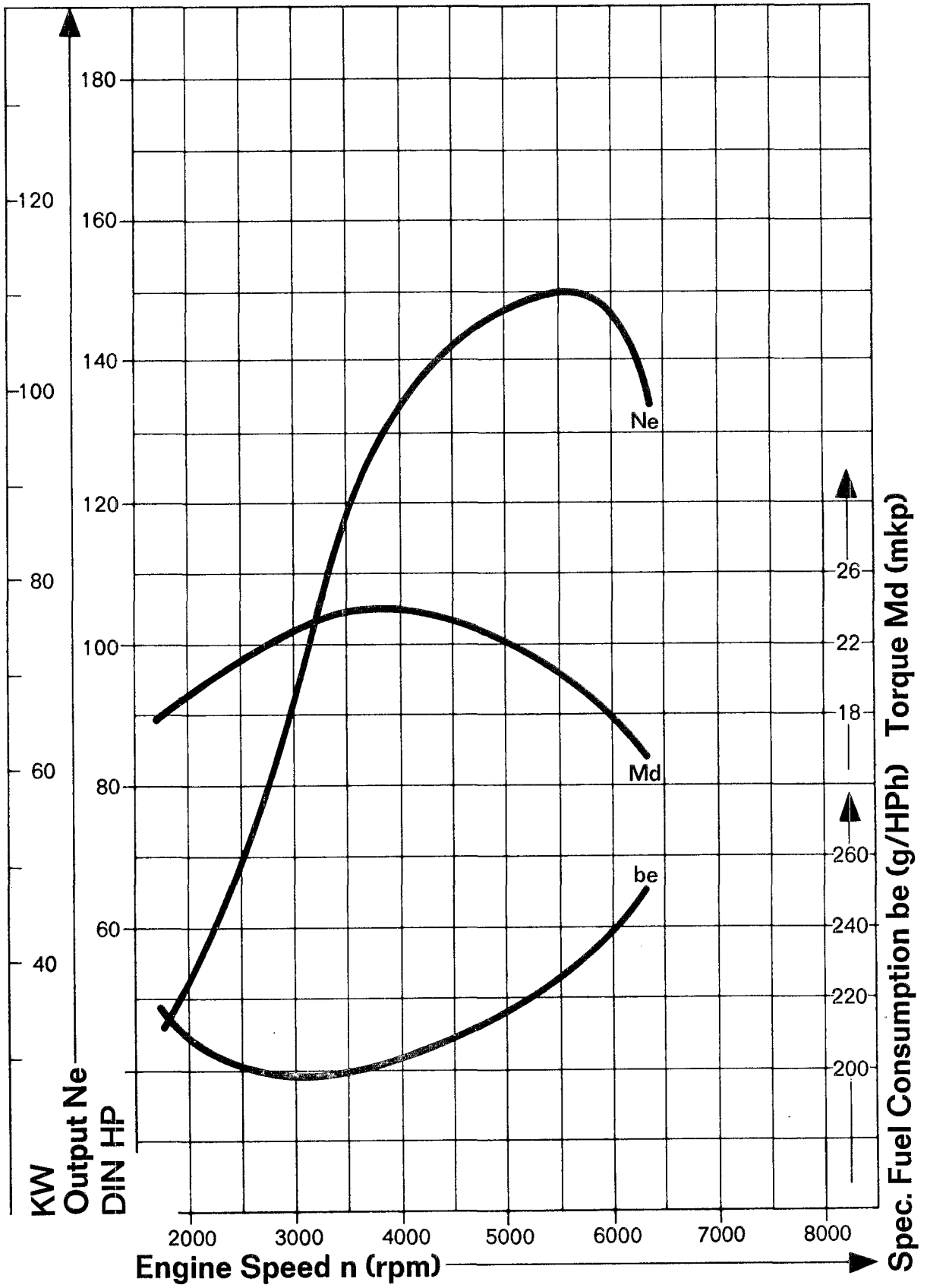
TECHNICAL DATA FOR TYPE 911 VEHICLES BEGINNING WITH 1974 MODELS

	911	911 S/CARRERA
MOTOR		
Type	four-stroke gasoline engine with two opposing cylinder banks	
Number of cylinders	6	6
Cylinder arrangement	horizontal, 3 cylinders per bank	horizontal, 3 cylinders per bank
Bore, mm (inch)	90 (3.54)	90 (3.54)
Stroke, mm (inch)	70.4 (2.77)	70.4 (2.77)
Displacement, actual, cc (CID)	2687 (163.97)	2687 (163.97)
Compression ratio	8 : 1	8.5 : 1
Horsepower rating, max.:		
according to DIN 70020, HP/KW	150/110	175/129
according to SAE J 245, net HP/KW	143/107	167/125
all at crankshaft rpm of	5700	5800

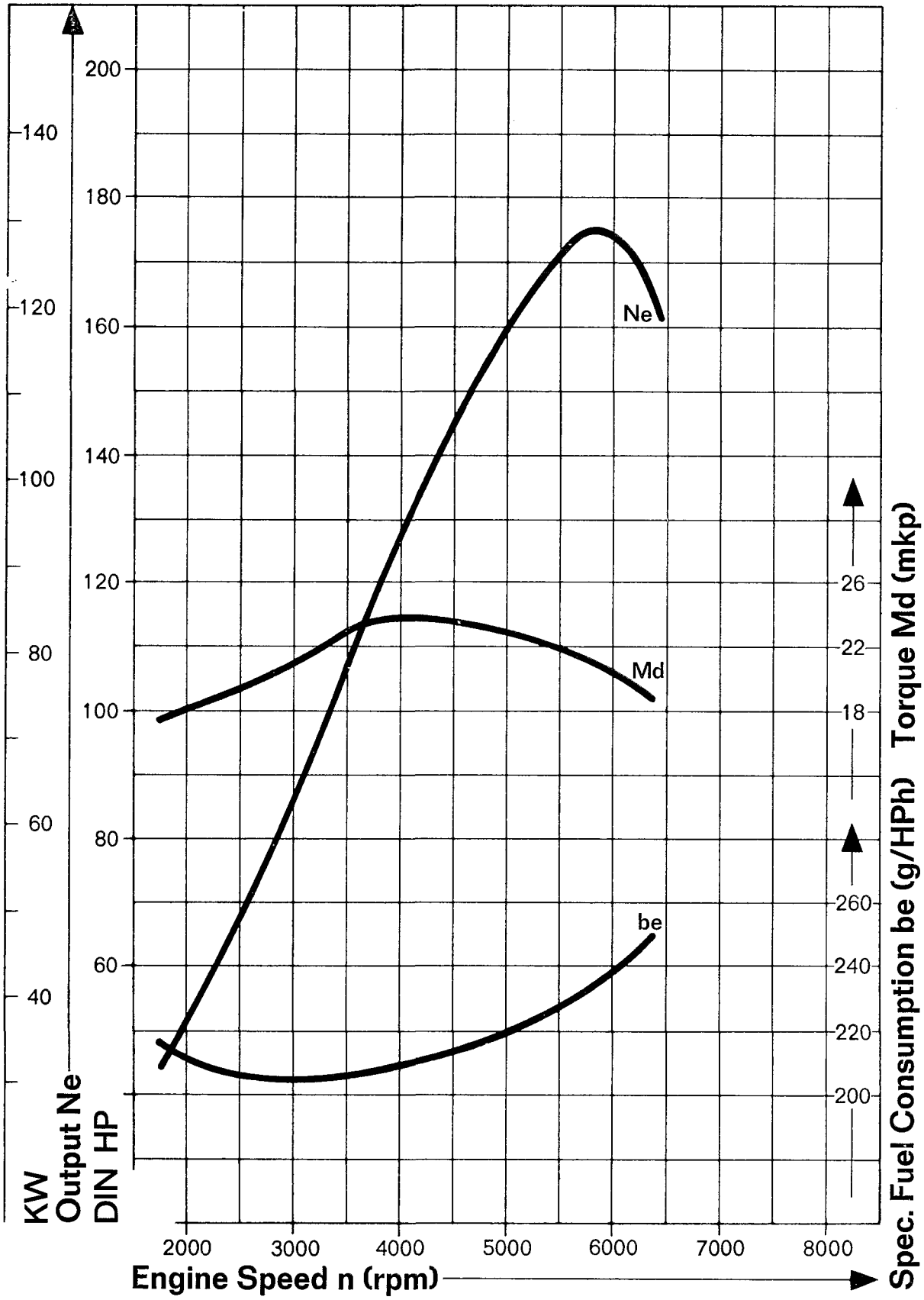
	911	911 S/CARRERA
Max. torque:		
according to DIN 70020, kpm/Nm	24/235	24/235
according to SAE J 245, net lb.ft./Nm	168/228	168/228
all at crankshaft rpm of	3800	4000
Specific power output:		
according to DIN 70020, HP/ltr or KW/ltr	55.8/41	65/48
according to SAE J 245, net HP/ltr or KW/ltr	53.2/39.8	62.2/46.5
Octane requirements, RON	91	91
Fuel consumption (MPG) under mixed traffic conditions, approx.	12 - 14	13 - 15
Engine weight, kg/lbs, approx.	182/402	182/402
Valve timing with 1 mm valve clearance:		
Intake opens	1^{o} ATC	6^{o} ATC
Intake closes	35^{o} ABC	50^{o} ABC
Exhaust opens	29^{o} BBC	24^{o} BBC
Exhaust closes	7^{o} BTC	2^{o} BTC
Intake valve stroke at TDC-overlap with 0.1 mm valve clearance	0.7 - 0.9	0.40 - 0.54
model 75	0,5 - 0,7	

	911	911 S/CARRERA
Valve lift with 0.1 mm valve clearance:		
intake valve mm	9.6	10.4
exhaust valve mm	8.8	8.8
Camshaft, right	911 105 142 00	911 105 144 00
Camshaft, left	911 105 141 00	911 105 143 00
Identification mark on end flank of camshaft:		
camshaft, left	911 141 00	911 143 00
camshaft, right	911 142 00	911 144 00
Installed length of valve springs:		
for intake valve mm	35 $\pm$ 0.3	35 $\pm$ 0.3
for exhaust valve mm	35.5 $\pm$ 0.3	35.5 $\pm$ 0.3

Full-power Performance 911



Full-power Performance 911 S



TECHNICAL DATA FOR 1975 911 S AND CARRERA MODELS

ENGINE	USA	California
Type	911/43/48	911/44/49
No. of cylinders	6	6
Bore in mm (in.)	90 (3.54)	90 (3.54)
Stroke in mm (in.)	70.4 (2.77)	70.4 (2.77)
Displacement in cm^3 ($in.^3$)	2687 (163.97)	2687 (163.97)
Compression ratio	8,5 : 1	8,5 : 1
Max. output:		
DIN HP or kW	165/121.5	160/118
SAE NET HP or kW	157/115	152/112
at crankshaft rpm	5800	5800
Max. torque:		
DIN in kpm or Nm	23/225	23/225
SAE NET ft lbs. or Nm	166/225	166/225
at crankshaft rpm	4000	4000
Max. output/liter:		
SAE NET in HP/liter or kW/liter	58.5/43.2	53.8/41.7
RON fuel specification	91	91
Fuel consumption (DIN) in liter/100 km	9.8	10.2
Approx. engine weight in kg (lbs.)	180 (397)	192 (423)
Valve timing with 1 mm valve clearance (in crankshaft degrees):		
Intake opens	6^{o} after TDC	6^{o} after TDC
Intake closes	50^{o} after BDC	50^{o} after BDC
Exhaust opens	24^{o} before BDC	24^{o} before BDC
Exhaust closes	2^{o} before TDC	2^{o} before TDC
Intake valve lift at overlap TDC with 0.1 mm valve clearance (in mm)	0.40 - 0.54	0.40 - 0.54
Valve lift at 0.1 mm clearance:		
Intake valve in mm	10.4	10.4
Exhaust valve in mm	8.8	8.8
Camshaft, right	911 105 144 00	911 105 144 00
Camshaft, left	911 105 143 00	911 105 143 00
Identification on face of camshafts:		
Camshaft, right	911 144 00	911 144 00
Camshaft, left	911 143 00	911 143 00
Valve spring sizes:		
Intake valve in mm	35 ± 0.3	35 ± 0.3
Exhaust valve in mm	35.5 ± 0.3	35.5 ± 0.3
Exhaust, heating	Single pipe system with new heat exchangers, heater blower, primary muffler and new exhaust muffler and air injection	Double pipe system with reactors and heat exchangers, heater blower and new exhaust muffler, exhaust gas recirculation and air injection

TIGHTENING TORQUES FOR ENGINE

Location	Threads	Torque Nm	Torque kpm
Connecting rod nuts	M 10 x 1.25	50	5
Crankcase bolts	M 10	35	3.5
All bolts on crankcase and camshaft housing	M 8	25	2.5
Hexagon nuts (oil filter screen cover)	M 6	10	1
Flywheel bolts	M 12 x 1.5	150	15
(from 1978 models)	M 10 x 1.25	90	9
Pilot bearing to crankshaft	M 6	10	1
Pulley to crankshaft (without air conditioner)	M 12 x 1.5	80	8
Double-belt pulley to crankshaft (with air conditioner)	M 12 x 1.5	170	17
Safety valve plug to crankcase	M 18 x 1.5	60	6
Pressure relief valve plug to crankcase	M 18 x 1.5	60	6
Adapter (oil pressure sender) to crankcase	M 12 x 1	35	3.5
Adapter in crankcase (oil return line)	M 12 x 1	120	12
Cylinder head nuts	M 10 socket head	33	3.3
Rocker arm shafts	M 6 socket head	18	1.8
Nut on camshaft	M 27 x 2	150	15
Hex. head bolt on camshaft	M 12 x 1.5	120	12
Cover to camshaft housing	M 8	8	0.8
Adapter to cylinder head (air injection)	M 10 x 1	15	1.5
Air line (coupling nut) to adapter	M 14 x 1.5	22	2.2
Reactor to cylinder head	M 8	20 - 23	2.0 - 2.3
Spark plugs	M 14 x 1.25	25 - 30	2.5 - 3.0

Location	Threads	Torque Nm	Torque kpm
Bracket for engine carrier	M 10	40	4
Wide clamp on fan housing	M 6	6.5	0.65
	M 8	12	1.2
Pulley to alternator	M 16 x 1	40 S.E.V. alternator (Motorola)	4
	M 14 x 1.5	40 Bosch	4
Oil pressure switch to crankcase	M 10 x 1	max. 20	max. 2
Temperature sender to crankcase	M 14 x 1.5	max. 25	max. 2.5
Oil pressure sender to adapter	M 18 x 1.5	max. 35	max. 3.5
Oxygen sensor to catalytic converter	M 18 x 1.5	50 - 60	5 - 6
Cap nut on catalytic converter	M 14 x 1.5	30	3.0
Oil drain plug (on cover for oil filter screen)	M 22 x 1.5	42	4.2
Oil drain plug (oil tank)	M 22 x 1.5	42	4.2

TECHNICAL DATA - TYPE 911 S, 1976 MODEL

		911 S
ENGINE		
Type		911/82/84/89
Bore	mm/in.	90/3.54
Stroke	mm/in.	70.4/2.77
Displacement	$cm^3/in.^3$	2687/164.0
Compression ratio		8.5 : 1
Horsepower SAE Net at engine speed	kW/HP rpm	117/157 5800
Torque SAE Net at engine speed	Nm/ftlb rpm	228/168 4000
Output per liter SAE Net J245	kW/HP	44/59
Max. engine speed	rpm	6700
Cutoff speed of speed limiter in distributor	rpm	6500 ± 200
Engine weight, dry	kg/lb	182/401
Valve Drive Valve clearance, cold engine measured betw. valve and adjusting screw:		
Intake	mm	0.10
Exhaust	mm	0.10
Valve timing at 1 mm clearance		
Intake opens		6° ATDC
Intake closes		50° ABDC
Exhaust opens		24° BBDC
Exhaust closes		2° BTDC
Intake valve lift at TDC overlap with 0.1 mm valve clearance	mm	0.40 - 0.54
Identifying number on cam end face		
Camshaft, left		911.143.00
Camshaft, right		911.144.00
No. of bearings		3

TECHNICAL DATA - TYPE 911 S, 1977 MODEL

		911 S
ENGINE		
Engine type		911/85/90
Bore	mm/inch	90/3.54
Stroke	mm/inch	70.4/2.77
Displacement	$cm^3/inch^3$	2687/164.0
Compression ratio		8,5 : 1
Power SAE Net at engine speed	kW/HP rpm	117/157 5800
Torque SAE Net at engine speed	Nm/lbft rpm	228/168 4000
Output per liter	kW/HP	44/59
Max. engine speed	rpm	6700
Cutoff speed of speed limiter in distributor	rpm	6500 $\pm$ 200
Engine weight (dry)	kg/lbs	182/401
Valve drive Valve clearance (on cold engine) measured betw. valve and adjusting screw: Intake Exhaust	 mm mm	 0.10 0.10
Valve timing with 1 mm valve clearance Intake opens Intake closes Exhaust opens Exhaust closes	 6° ATDC 50° ABDC 24° BBDC 2° BTDC	
Intake valve lift at TDC with 0,1 mm valve clearance	mm	0.40 - 0.54

		911 S
Identifying number on cam end face		
Left camshaft		911.143.00
Right camshaft		911.144.00
Bearing journals		3
Valve springs: free length		
Intake valve	mm	35 ± 0.3
Exhaust valve	mm	35.5 ± 0.3
Ignition Timing		
USA Version (vacuum hose permanently plugged, vacuum advance inoperable)		0° - Z1 mark - at 950 ± 50 rpm
* California Version (vaccuum hose connected)		15° ATDC at 1000 ± 50 rpm
Spark plugs		
Electrode gap	mm	Bosch W 225 T 30 -0.7- Beru 225/14/3A -0.7- *(Bosch W 235 P 21 -0.6-) * Beru 235/14/3P -0.55-)
Cooling - Fan Drive		
Crankshaft/fan ratio		1 : 1.8
Air delivery rate	ltr.	1265/sec. at 6000 rpm crankshaft speed
Engine Lubrication		
Oil pressure at 5000 rpm and 80° C/176° F	approx.	5 bar/73.5 psi
Oil consumption (per 600 miles)	approx.	1.5 - 2.0 ltr/qt

TECHNICAL DATA, TYPE 911 SC - 1978 MODELS

			911 SC
ENGINE			
Engine type			USA - 930/04 California - 930/06
Bore		mm/inch	95.0/3.74
Stroke		mm/inch	70.4/2.77
Total Displacement		$cm^3/inch^3$	2994/182.7
Compression ratio			8.5 : 1
Net Horse power, SAE at engine speed		kW/HP rpm	128/172 5500
Torque, SAE Net at engine speed		Nm/lb ft rpm	237/175 4200
Output per liter, SAE Net		KW/l, HP/l	43/57
Max. engine speed		rpm	7000
Cut-off speed (overrev protection)			Speed limited by cutting off fuel pump
		rpm	6700 to 7000
Engine weight (dry)		kg/lbs	approx. 200/441
Valve drive Valve clearance (cold engine) measured between valve and rocker arm adjusting screw	Intake Exhaust	mm mm	0.10 0.10
Valve timing with 1 mm valve clearance	Intake opens Intake closes Exhaust opens Exhaust closes		1° BTDC 53° ABDC 43° BBDC 3° ATDC
Intake valve lift at TDC overlap with 0.1 mm valve clearance		mm	0.9 to 1.1

		911 SC
Identification on camshaft face		
Left camshaft		930.147.08
Right camshaft		930.148.08
Number of bearings		4
Length of installed valve springs		
Intake valve	mm	34.5 ± 0.3
Exhaust valve	mm	34.5 ± 0.3
Ignition		CDI (breakerless)
Basic ignition timing (vacuum hose attached)		5° BTDC at idle of 900 to 1000 rpm (oil temp. 80° C/ 176° F)
Spark plugs/electrode gap	mm	Bosch W 145 T 30/0.8 (0,032 in.) Beru 145/14/3 /0.8 (0,032 inc.)
Emission control		930/04 air pump and catalytic converter 930/05, 930/15 and 930/06 air pump, catalytic converter and EGR
Cooling - Fan drive		
Crankshaft/fan ratio:	approx.	1 : 1.8
Air delivery rate		1380 l/s at 6000 rpm of crankshaft
Engine lubrication		
Oil pressure at 5000 rpm and oil temp. of 80° C (176° F)	bar/psi	approx. 4.5/66
Oil consumption	1/1000 km (US qt/600 mi.)	approx. 1.5 to 2.0

TECHNICAL DATA, TYPE 911 SC - from 1980 Model

			911 SC
Engine			
Engine type (internal code)			930/07
Bore		mm/inch	95.0/3.74
Stroke		mm/inch	70.4/2.77
Total displacement		$cm^3/inch^3$	2994/182.7
Compression ratio			9.3 : 1
Max. output per DIN 70020		kW/HP	132/180
Net horsepower per SAE J 245		kW/HP	128/172
at engine speed		rpm	5500
Max. torque per DIN 70020		Nm/kpm	245/25
Net torque per SAE J 245		Nm/ft lbs	237/175
at engine speed		rpm	4200
Max. output per liter DIN 70020		kW/l, HP/l	44/60
SAE J 245		kW/l, HP/l	42/57
Max. engine speed		rpm	7000
Cut-off speed (engine speed limiter)		rpm	Speed limited by switching off fuel pump 6300 to 6700
Engine weight (dry), approx.		kg/lbs	190/419
Valve train			
Valve clearance (cold engine) measured between valve and rocker arm adjusting screw	Intake	mm	0.10
	Exhaust	mm	0.10
Valve timing with 1 mm valve clearance			
Intake opens before TDC			7^o
Intake closes after BDC			47^o
Exhaust opens before BDC			49^o
Exhaust closes before TDC			3^o
Intake valve lift at TDC with 0.1 mm valve clearance		mm	1.4 to 1.7

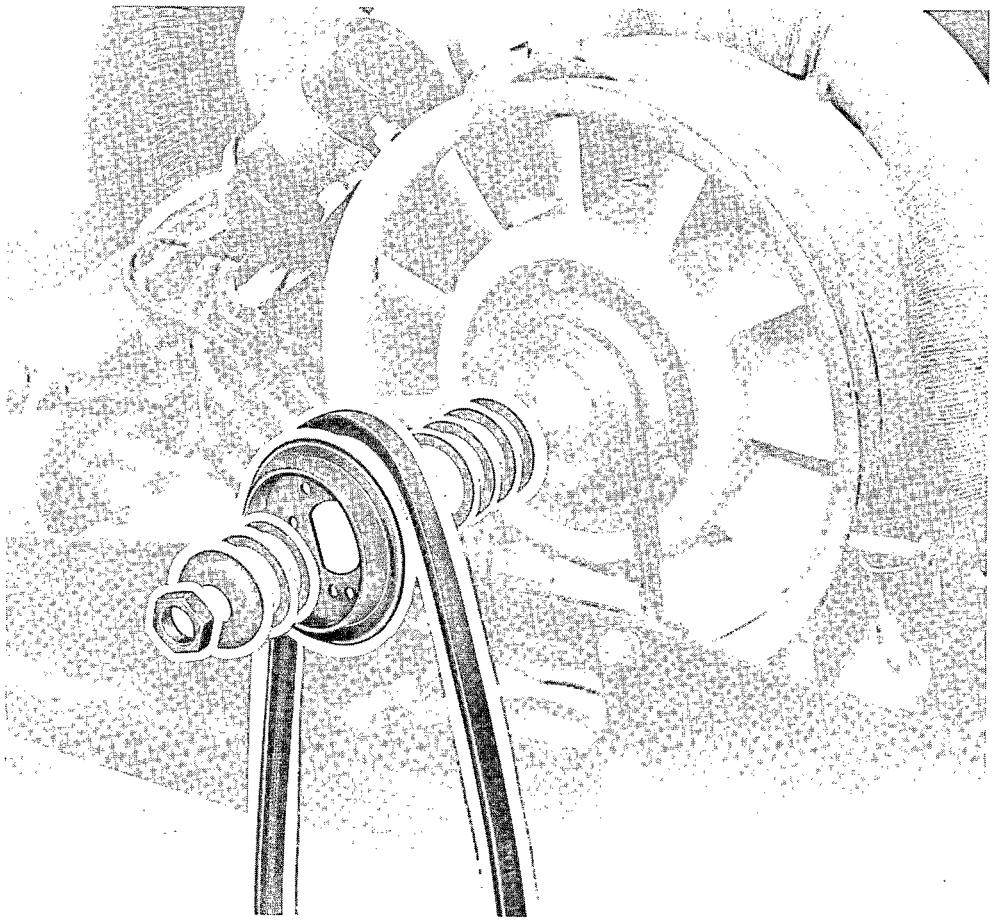
		911 SC
Identification on camshaft face		
Left camshaft		930.147.08
Right camshaft		930.148.08
Number of bearings		four
Valve spring installed length		
Intake valve	mm	34.5 $\pm$ 0.3
Exhaust valve	mm	34.5 $\pm$ 0.3
Ignition		CDI (breakerless)
Basic ignition timing		5° BTDC at 900 to 1000 rpm idle speed, vacuum hose disconnected, 90° C/195° F oil temperature
Spark plugs - electrode gap -	mm	Bosch W 5 D (W 225 T 30) - 0,7 - Beru 14/5 D (225/14/3 A) - 0,7 -
Emission Control		Oxygen sensor and 3-way catalytic converter
Cooling - fan drive		
Crankshaft/fan ratio	approx.	1 : 1.68
Air delivery rate		1500 l/sec. at 6000 rpm crankshaft speed
Engine lubrication		
Oil pressure at 5000 rpm and 90° C/ 195° F oil temperature	bar/psi	approx. 4.5/66
Oil consumption	1/1000 km (1 US qt./600 mi.)	approx. 1.5 to 2.0

TECHNICAL DATA, TYPE 911 SC - from 1981 Models

		911 SC
Engine		
Engine type (internal code)		930/16
Bore	mm/inch	95.0/3.74
Stroke	mm/inch	70.4/2.77
Total displacement	$cm^3/inch^3$	2994/182.7
Compression ratio		9.3 : 1
Max. output acc. DIN 70020	kW/HP	132/180
Net power acc. SAE J 245	kW/HP	128/172
at engine speed	rpm	5500
Max. torque acc. DIN 70020	Nm/kpm	245/25
Net torque acc. SAE J 245	Nm/ft lbs	237/175
at engine speed	rpm	4200
Max. liter output acc. DIN 70020	kW/l, HP/l	44/60
SAE J 245	kW/l, HP/l	42/57
Max. engine speed	rpm	6700
Cut-off speed engine speed limiter		Speed limited by switching off fuel pump
	rpm	6500 $\pm$ 200
Engine weight (dry)	kp/lbs	approx. 190/419
Valve train		
Valve clearance (cold engine): measured between valve and rocker arm		
Intake	mm	0.10
Exhaust	mm	0.10
Valve timing with 1 mm valve clearance		
Intake opens		7° before TDC
Intake closes		47° after BDC
Exhaust opens		49° before BDC
Exhaust closes		3° before TDC
Intake valve lift at TDC overlap with 0.1 mm valve clearance	mm	1.4 to 1.7

		911 SC
Identification on camshaft face		
Left camshaft		930.147.08
Right camshaft		930.148.08
Number of bearings		four
Installed length of valve springs		
Intake valve	mm	34.5 - 0.3
Exhaust valve	mm	34.5 - 0.3
Ignition		CDI (breakerless)
Basic ignition setting (vacuum hoses detached, oil temperature approx. 90°C/195°F)		5° before TDC at 950 rpm
Spark plugs - electrode gap -	mm	Bosch W 5 D (W 225 T 30) -0.7 - Beru 14/5 D (225/14/3 A) - 0.7 -
Emission control		Oxygen sensor with 3-way catalytic converter
Cooling - blower drive		
Crankshaft/fan ratio		approx. 1 : 1.68
Air delivery rate		1500 ltr./sec. at 6000 rpm crankshaft speed
Engine lubrication		
Oil pressure at 5000 rpm and approx. 90° C/195° F oil temperature	bar/psi	approx. 4.0/58
Oil consumption	ltr./1000 km (1 US qt/600 mi.)	approx. 1.5

REPLACING AND ADJUSTING FAN DRIVE BELT



Effective with the 1980 models all 911 SC engines have the larger fan from the 911 Turbo. New belt size: 9.5 x 710 mm.

Note

Only the approved belt from Goodyear, Part No. 999.192.176.50, may be used for these engines.

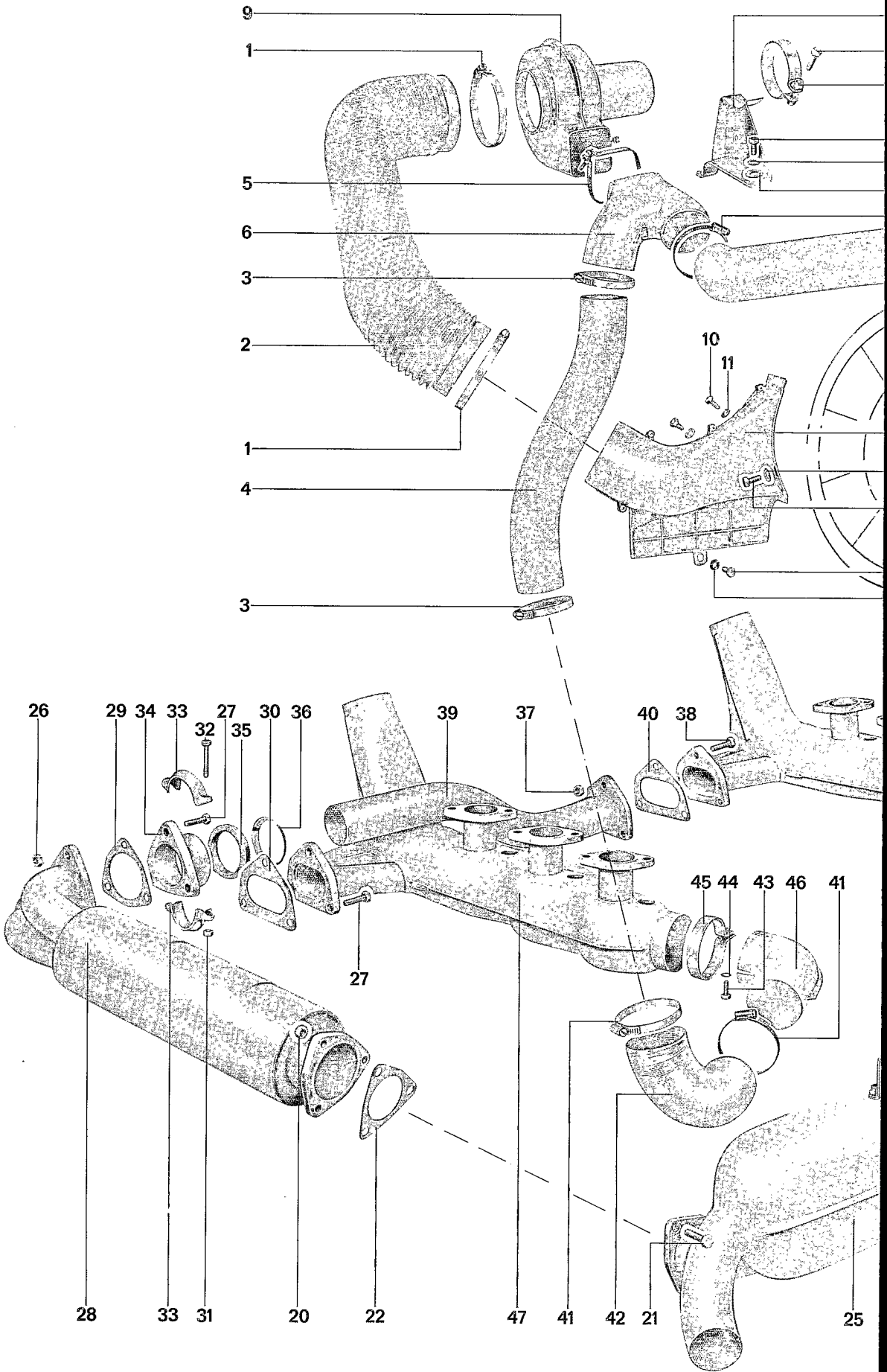
When installing the new belt for the first time, it must be much tighter than was formerly the case.

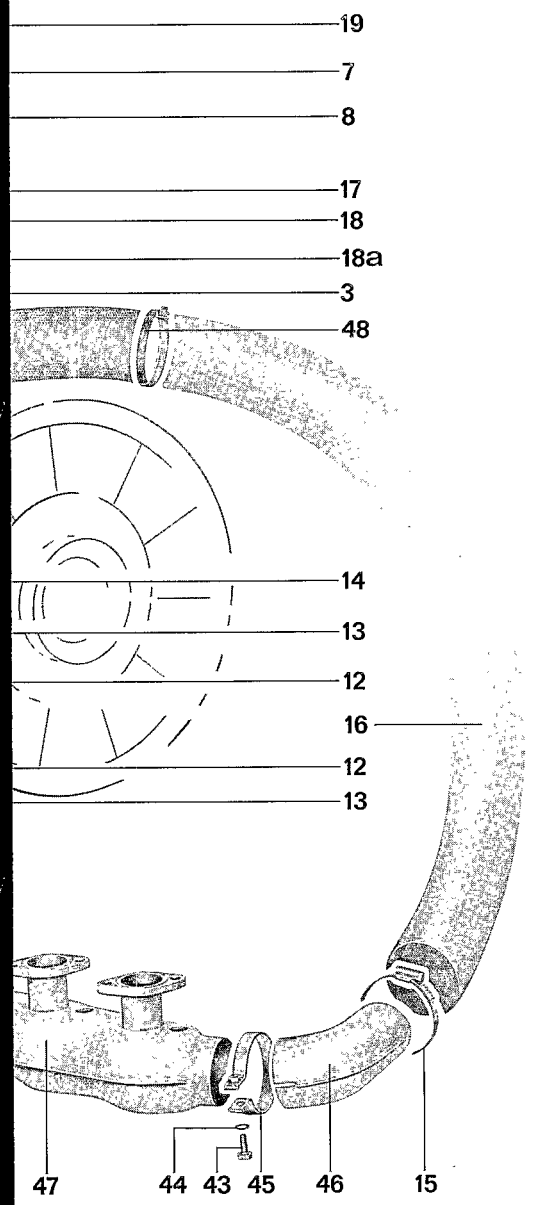
Approximate rule:
Tighten belt as in the past (belt deflects by 10 to 15 mm at point midway between two pulleys). Then remove 1 shim from the shims between the pulley sections (approx. 5 mm deflection).

Adjusting instructions for engine prior to 1980 models with small fan:

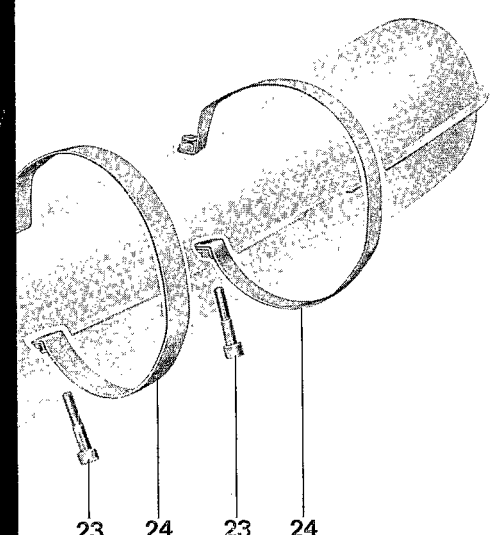
Check tightness by applying thumb pressure at point midway between both pulleys.
Deflection: approx. 10 to 15 mm.

REMOVING AND INSTALLING EXHAUST SYSTEM AND HEATER BLOWER




19
7
8
17
18
18a
3
48
14
13
12
16
12
13

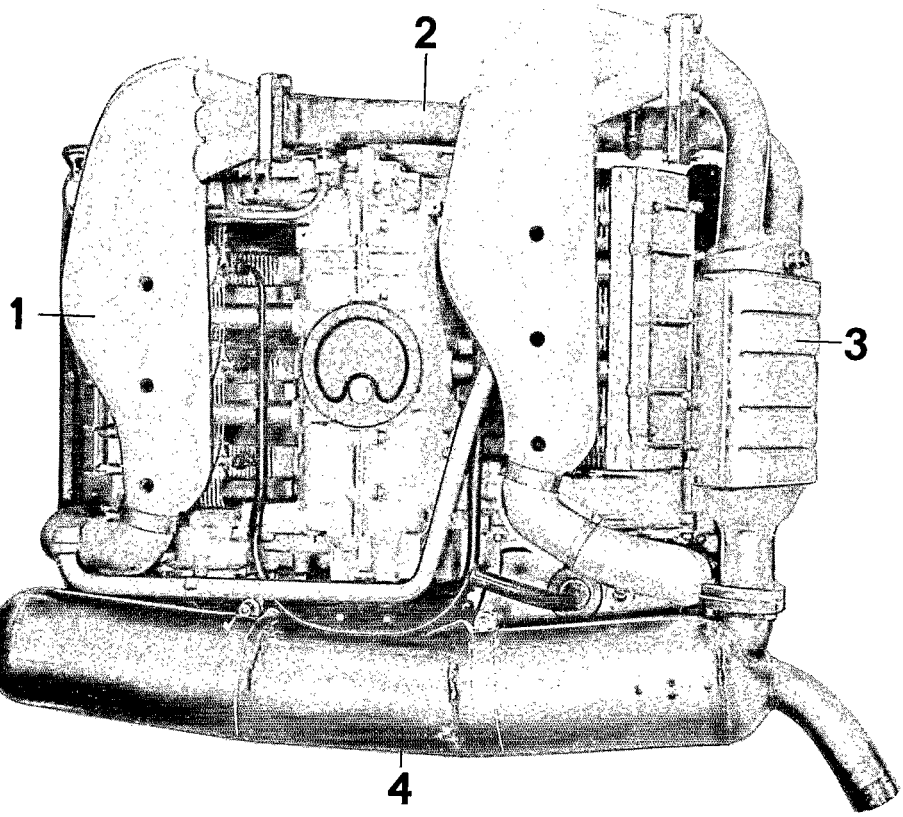
47
44
43
45
46
15

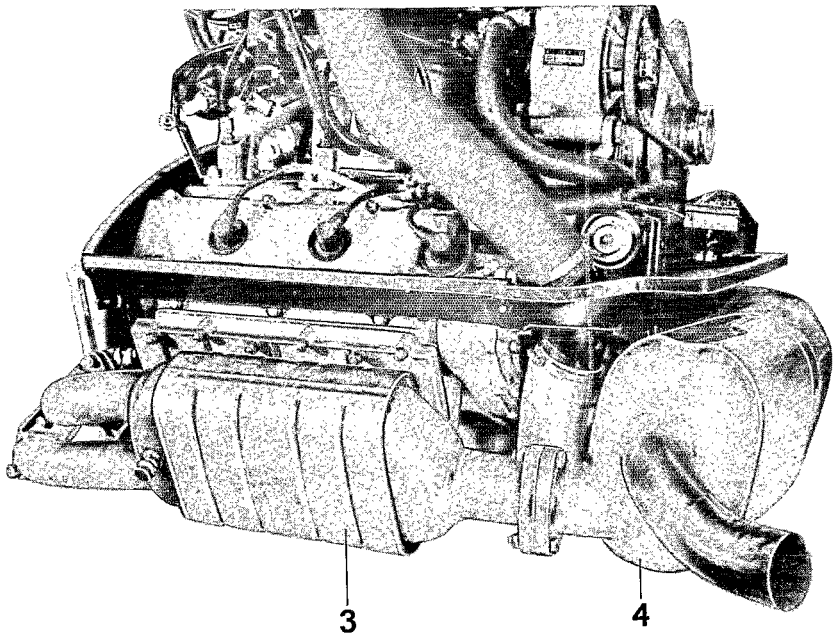

23
24
23
24

No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
1	Hose clamp	2			
2	Hose (heater air/blower)	1		Hose must not touch anything	
3	Hose clamp	3			
4	Heater hose, left	1			
5	Clamp, adapter	1			
6	Adapter	1			
7	Screw	1			
8	Clamp	1			
9	Blower	1		Install correctly	
10	Sheet metal screw	2			
11	Washer	2			
12	Bolt	2			
13	Washer	2			
14	Heater air adapter	1			
15	Hose clamp	1			
16	Heater hose, right	1			
17	Bolt	2			
18	Lock washer	2			
18a	Washer	1			
19	Clamp	1			
20	Nut (self-locking)	3		Replace if necessary	
21	Bolt	3			
22	Gasket	1		Replace	
23	Fillister head screw	2			
24	Clamp	2			

No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
25	Muffler	1		Check for leaks and damage	
26	Nut (self-locking)	6		Replace if necessary	
27	Bolt	6			
28	Primary muffler	1			
29	Gasket	1		Replace	
30	Gasket	1		Replace	
31	Nut	2			
32	Bolt	2			
33	Clamp	2			
34	Flange	1			
35	Seal	1		Replace	
36	Support disc	1			
37	Nut (self-locking)	3		Replace if necessary	
38	Bolt	3			
39	Adapter	1			
40	Gasket	1		Replace	
41	Hose clamp	2			
42	Flex hose	1			
43	Screw	2			
44	Washer	2			
45	Clamp	2			
46	Adapter	2			
47	Heat exchanger	2		Check for damage	
48	Cable strap	1			

EXHAUST SYSTEM - 1978 MODELS (Engine Type 930/04, 06)





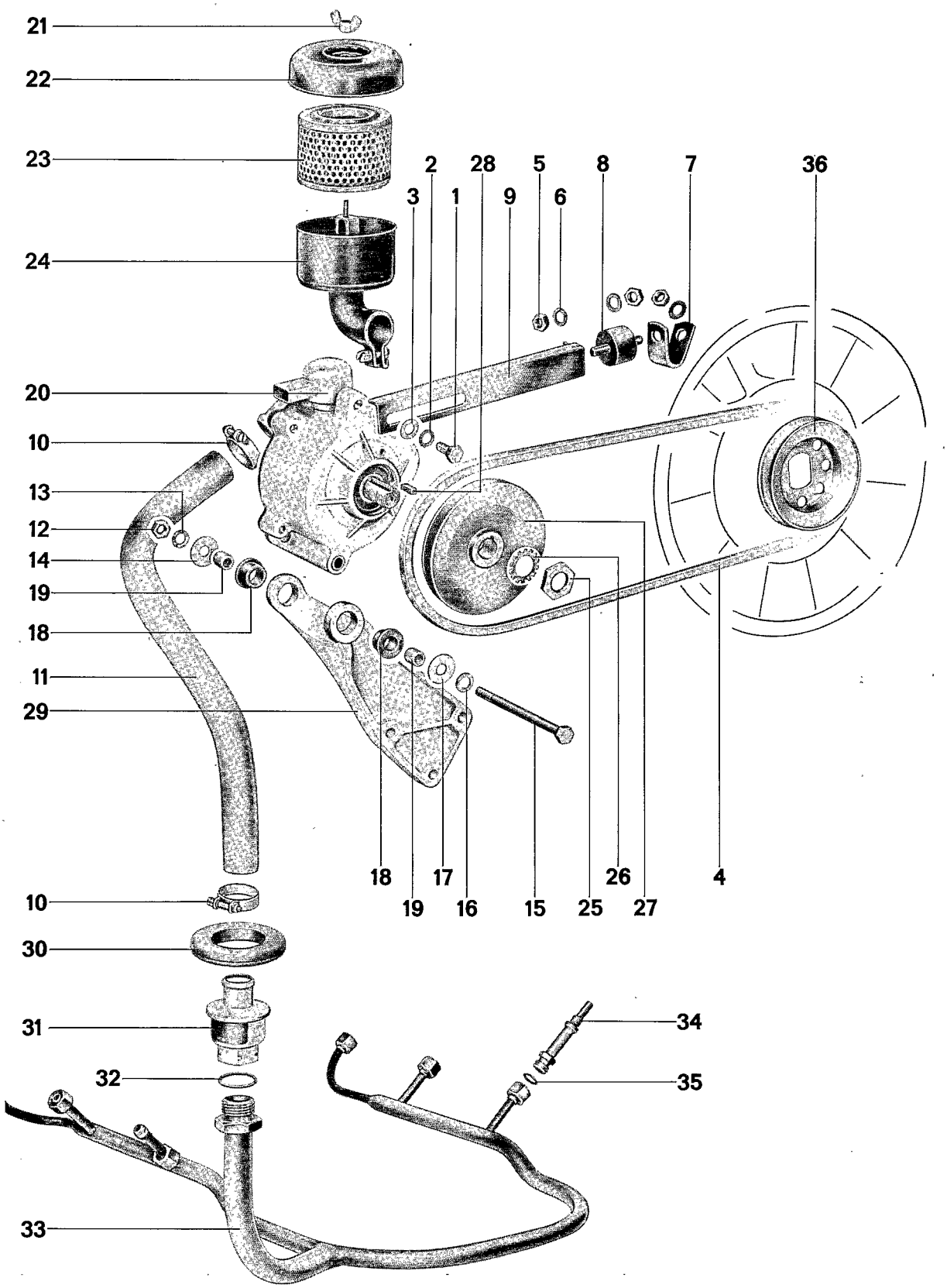
1 - Heat exchanger

2 - Exhaust pipe

3 - Catalytic converter

4 - Exhaust muffler

REMOVING AND INSTALLING AIR INJECTION



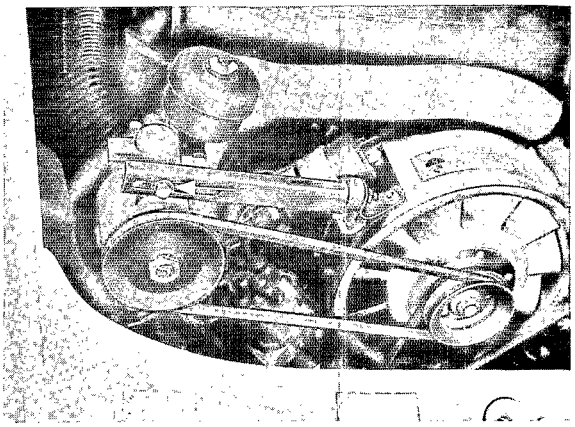
No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
1	Bolt	1			
2	Washer	1		Replace if necessary	
3	Plain washer	1			
4	V-belt	1		Check tension	Refer to page 2.3-1/4
5	Nut	3			
6	Washer	3		Replace if necessary	
7	Bracket	1			
8	Rubber/metal pad	1		Check, replacing if necessary	
9	Holder, air pump	1			
10	Hose clamp	2			
11	Hose	1		Check, replacing if necessary	
12	Nut	1			
13	Washer	1		Replace if necessary	
14	Plain washer	1			
15	Bolt	1			
16	Washer	1		Replace if necessary	
17	Plain washer	1			
18	Rubber bushing	2		Install correctly, lubricate lightly	
19	Spacer	2			
20	Air pump	1			
21	Winged nut	1			
22	Filter cover	1			
23	Filter cartridge	1		Replace if necessary	
24	Filter housing	1			

No.	Description	Qty.	Notes Removal	Notes Installation	Remarks
25	Nut	1			
26	Lock washer	1			
27	Pulley	1			
28	Flat key	1			
29	Carrier, air pump	1			
30	Seal	1			
31	Check valve	1			
32	Seal	1		Replace	
33	Air line	1			
34	Jet	6		Torque 1.0 - 1.2 mkp	
35	Seal	6		Replace	
36	Pulley, engine	1			

TENSIONING AIR PUMP BELT

Adjusting

1. Loosen bolt.

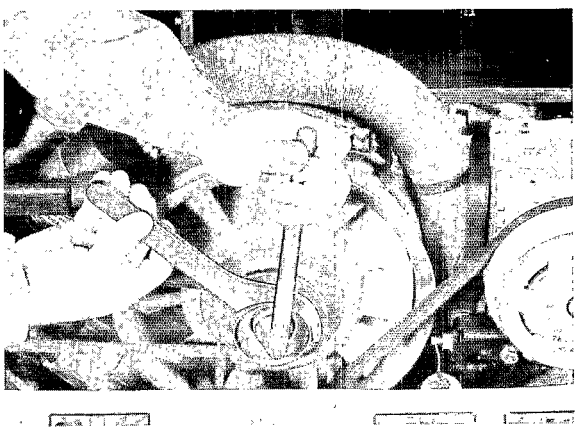


2. Move air pump to left.

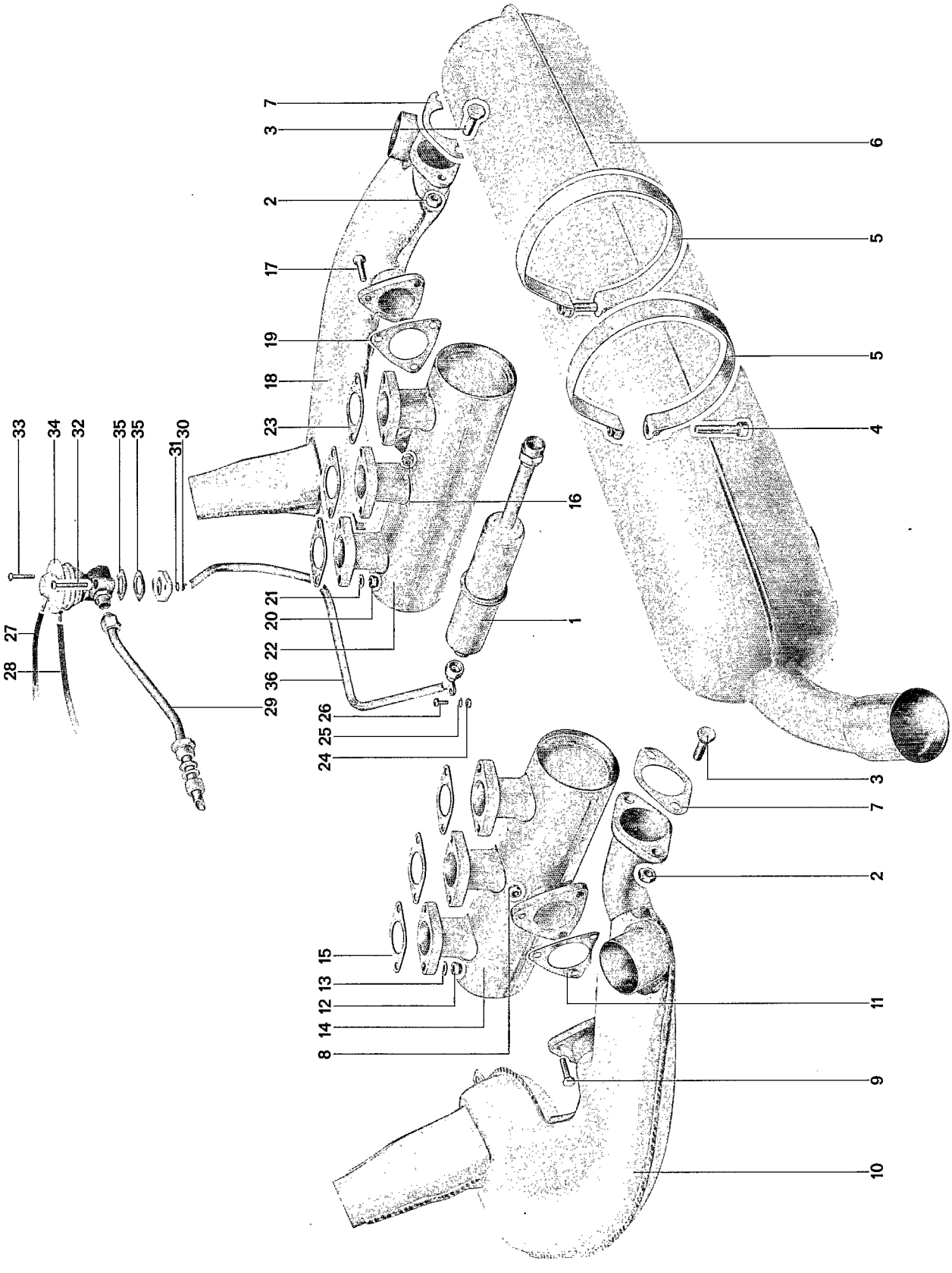
3. Tighten bolt.

4. The belt tension is correct, if the belt can be pressed together about 15 mm (5/8 in.) at its centerpoint with considerable thumb pressure.

Removing/installing pulley (California version).



REMOVING AND INSTALLING REACTORS AND EGR EQUIPMENT



No.	Description	Qty.	Note when removing	Note when installing	Remarks
1	EGR filter	1		Replace every 30,000 miles	
2	Nut (copper pltd.)	4		Replace	
3	Bolt	4		Replace, if necessary	
4	Socket head screw	2			
5	Clamp	2			
6	Muffler	1		Check for leaks and damage	
7	Gasket	2		Replace	
8	Nut (copper pltd.)	3		Replace	
9	Bolt	3		Replace, if necessary	
10	Heat exchanger	1		Check for leaks and damage	
11	Gasket	1		Replace	
12	Nut (copper pltd.)	6		Replace, torque to 2.3 mkp	
13	Washer	6			
14	Reactor	1	Allow it to cool down to room temperature. Remove heat exchanger and oil return line	Check for leaks	2.3-3/1
15	Seal	3		Replace, install with blue side facing toward cylinder head	
16	Nut (copper pltd.)	3		Replace	
17	Bolt	3		Replace, if necessary	
18	Heat exchanger	1		Check for leaks and damage	

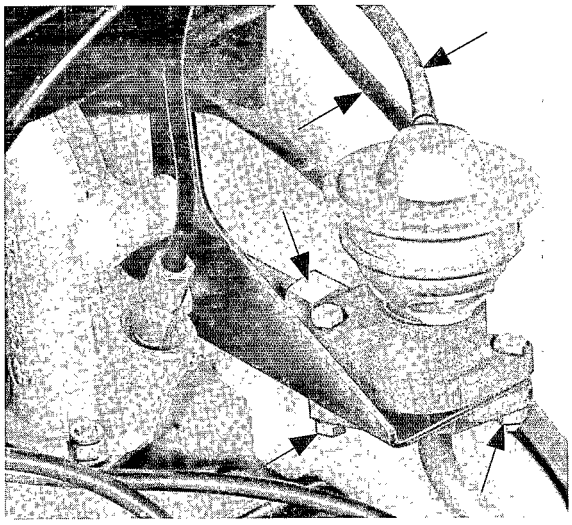
No.	Description	Qty.	Note when removing	Note when installing	Remarks
19	Gasket	1		Replace	
20	Nut (copper pltd.)	6		Replace, torque to 2.3 mkp	
21	Washer	6			
22	Reactor	1	Allow it to cool down to room temperature. Remove heat exchanger	Check for leaks	2.3-3/1
23	Seal	3		Replace, install with blue side facing toward cylinder head	
24	Nut	1			
25	Washer	1			
26	Bolt	1			
27	Vacuum hose for stage I	1		Connect to top vacuum chamber	
28	Vacuum hose for stage II	1		Connect to bottom vacuum chamber	
29	EGR valve outlet pipe	1	Only detach at EGR valve		
30	Nut	2			
31	Washer	2			
32	Bolt	1			
33	Bolt	1			
34	EGR valve	1		Check, replacing if necessary	2.3-2/6 2.3-3/2
35	Gasket	2		Replace, install one betw. holder and EGR line and the other betw. valve and holder	

No.	Description	Qty.	Note when removing	Note when installing	Remarks
36	EGR line	1	The right engine cover must be removed to replace EGR line	Check passage, cleaning if necessary	2.3-3/2

EXHAUST GAS RECIRCULATION SYSTEM

Component parts of the exhaust gas recirculation system are subject to a certain amount of wear and must therefore be inspected and/or replaced after operation for 30,000 miles (also refer to Group 9).

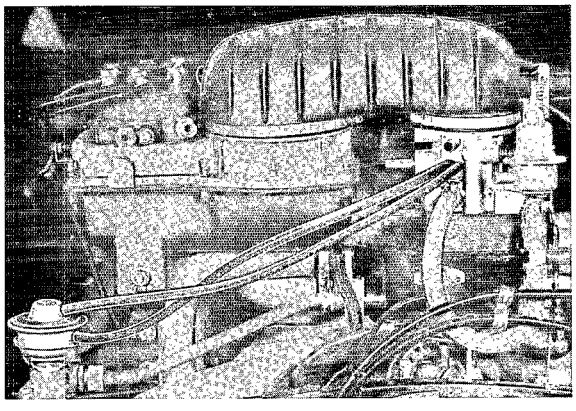
REMOVING AND INSTALLING EGR VALVE



Removing

1. Disconnect vacuum hoses.
2. Detach EGR valve outlet pipe at valve.
3. Remove mounting bolts.

Note: The replacement of gaskets requires detaching the EGR line at the EGR filter and clamp.



Installing

1. Replace gaskets.

Connect vacuum hoses as follows:

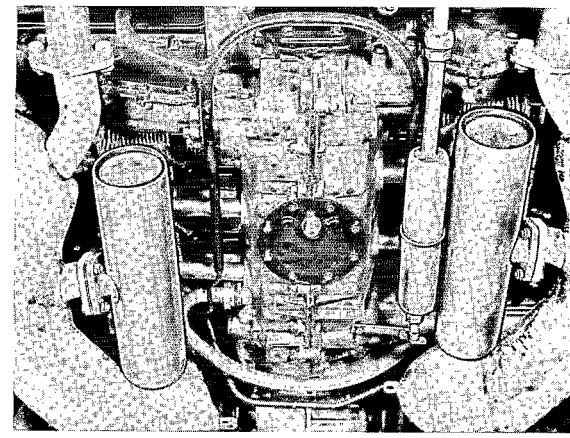
Stage I - Upper chamber to left connection on throttle housing (as seen in driving direction).

Stage II - Lower chamber to right connection on throttle housing (as seen in driving direction).

CHECKING REACTOR FOR LEAKS

Note

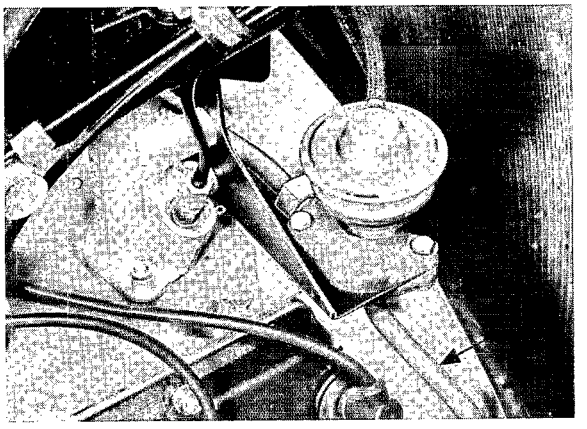
The reactor's operation need not be checked. It only needs to be checked for leaks.



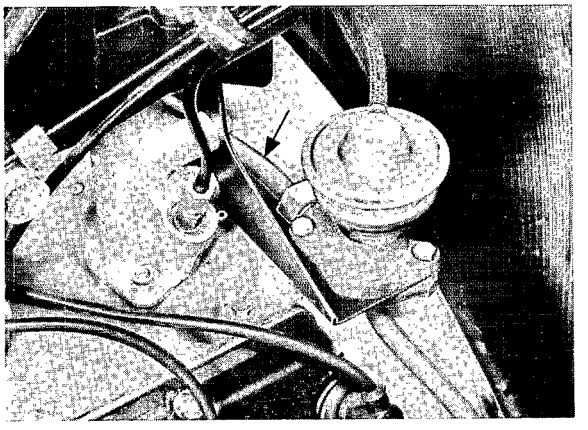
1. Let engine run at idle.

2. Insert appropriate plug in outlet pipe of muffler and check reactors for leaks by listening. Replace a leaky reactor.

CHECKING EXHAUST GAS RECIRCULATION SYSTEM



1. Let cold engine run at slightly higher idle. This will heat the outlet pipe from EGR filter to EGR valve.



2. Increase engine speed to about 4, 000 rpm. The outlet pipe from the EGR valve to the intake housing must now be hot, too.

If the outlet pipe between the EGR valve and intake housing is not hot, the following conditions could be causing this:

a) EGR valve defective

b) EGR lines plugged

c) Vacuum bores in throttle valve housing plugged

d) Vacuum hoses plugged or leaking

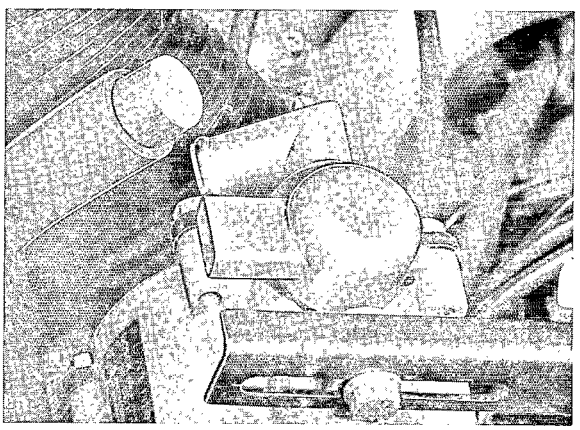
e) EGR filter between muffler and EGR valve clogged

CHECKING AIR INJECTION SYSTEM

1. Clean air filter of secondary air pump with compressed air. Replace if severely clogged.

2. Check air pump belt tension (max. deflection: 10-15 mm).

3. Loosen and disconnect air injection hose at air pump. Insert plug in hose.



4. Connect CO tester according to manufacturer's instructions.

Note

The CO should be checked immediately after a test drive as long as the engine is still at operating temperature.

5. Adjust CO to 1.5 - 2.0 % at idle speed of 900 ± 50 rpm.

6. Reconnect air injection hose to air pump.

7. The CO must now drop below 1.0 % with the engine idling at 900 ± 50 rpm. If the CO is still above 1.0 %, there is a defect in the air injection system. Of course, the engine must be in perfect working condition in every other aspect. If necessary, install a new pump to determine cause.

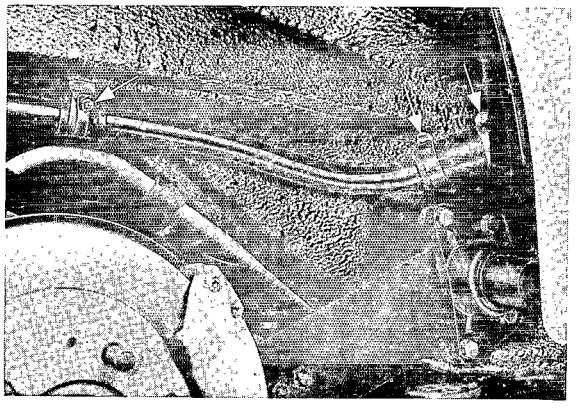
REMOVING AND INSTALLING OIL TANK

1. Remove right rear wheel.

Caution
Cover brake disc to prevent oil spillage during removal of tank.

2. Drain oil from tank.

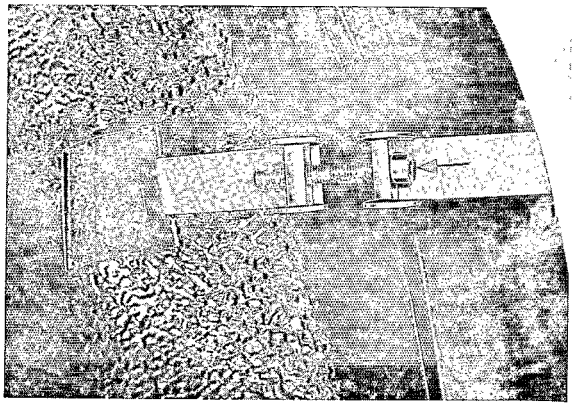
3. Loosen hose clamps and retaining clamp of return line.



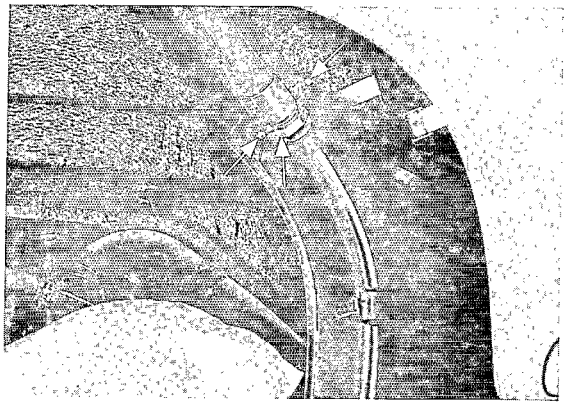
4. Detach return hose from oil tank.

5. In Type 911 S also detach the oil hose from bottom of tank.

6. Loosen retaining strap.



7. Pull tank partially out of the wheelhousing and remove oil line, breather hoses, and oil level gauge wires. Remove tank.



Make sure during installation that plastic caps between tank and body, and retaining strap liner are correctly seated.

Coat oil hose connections with Molykote or similar lubricant when assembling.

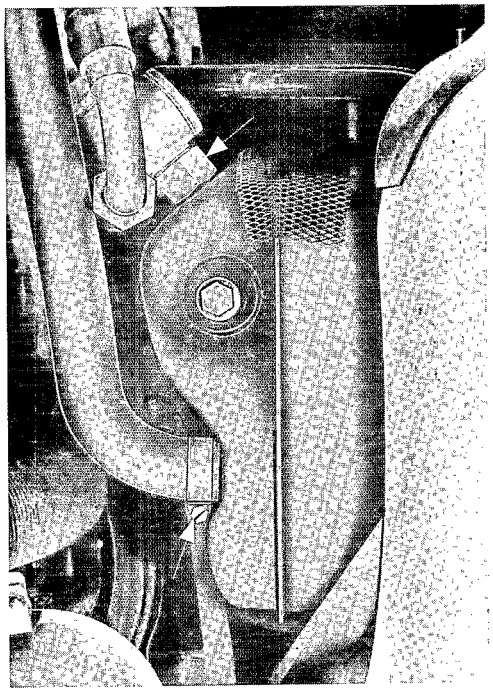
REMOVING AND INSTALLING OIL TANK (FROM 1973 MODEL ON)

General:

Beginning with the 1973 models, the oil tank is located in the right rear wheelhouse behind the rear axle.

Removing

1. Remove right rear wheel.
2. Drain oil.
3. Detach oil hoses and pressure relief valve.



4. Detach ground straps from batteries. Disconnect electrical wires from the oil level sensor.
5. Detach tubular support from bumper outer part and longitudinal support. Turn support to the side.
6. Unscrew oil filter.
7. Disconnect oil breather hoses from oil tank.
8. Remove oil tank retaining nuts (accessible from engine compartment).
9. Remove oil tank.
10. Remove oil filter base.

Installing

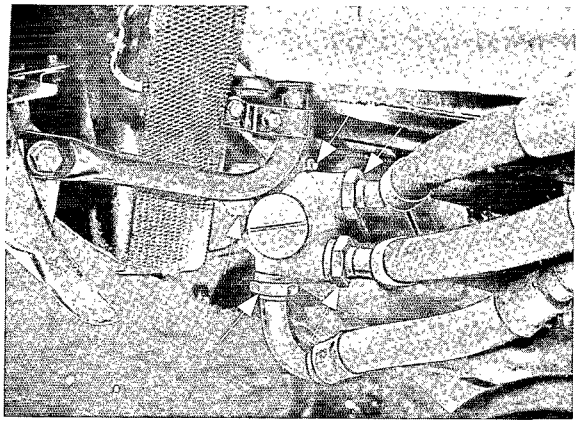
Note the following during reassembly:

1. Properly position rubber seal fitting between wheelhouse panel and oil tank. Glue seal to the oil tank.
2. Make sure that O-ring is properly seated in the oil filter base.

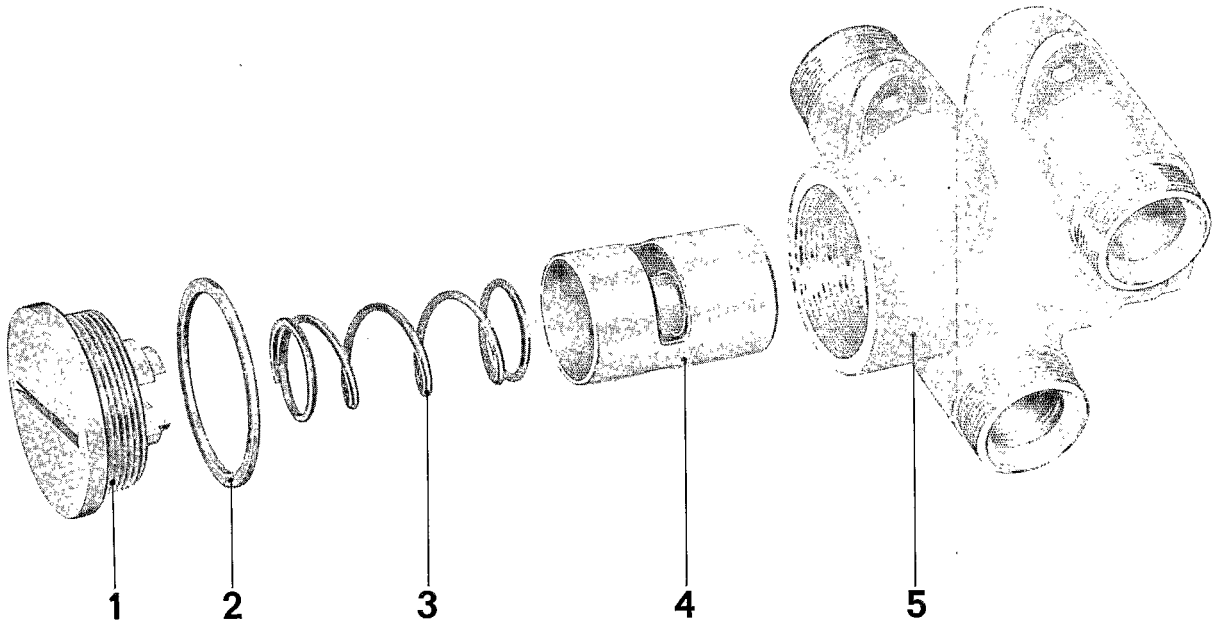
REMOVING AND INSTALLING AUXILIARY PRESSURE RELIEF VALVE

1. Disconnect oil hoses.

2. Remove pressure relief valve from oil tank.
   Remove support bracket.



DISASSEMBLING AND REASSEMBLING AUXILIARY PRESSURE RELIEF VALVE



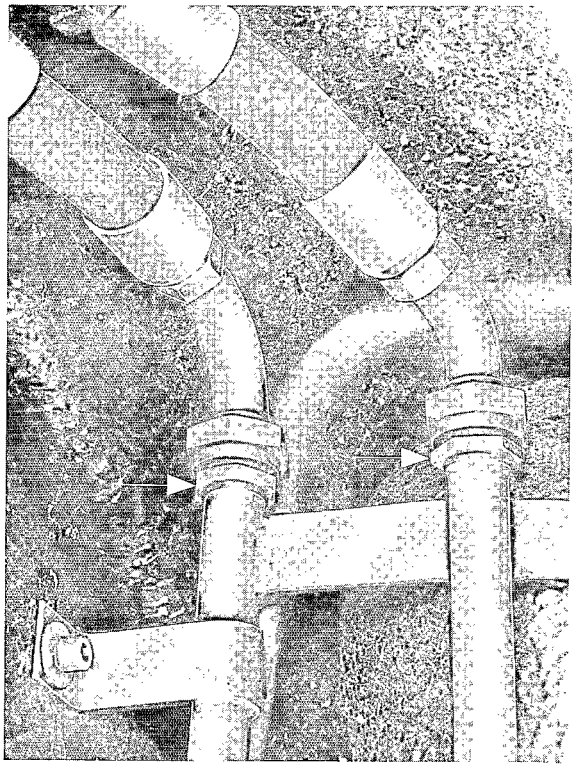
Nr.	Description	Qty	Note when: removing	Note when: installing	Remarks
1	Plug	1			
2	Seal ring	1		Replace	
3	Spring	1			
4	Relief valve plunger	1			
5	Relief valve housing	1			

REMOVING AND INSTALLING OIL COOLER COIL

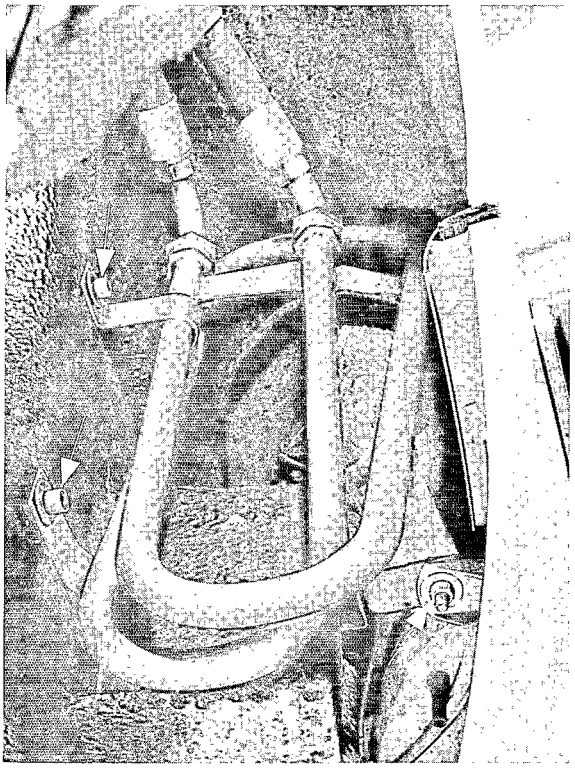
Removing

1. Remove right front wheel.

2. Disconnect oil hoses.
   Caution:
   Counter with a second open-end wrench.



3. Remove Allen bolts and retaining screw from the right bumper bracket.



4. Remove oil cooler coil.

Installing

Apply counter-force at the oil lines during installation to prevent damage.

Coat oil hose connectors with Molybdenum disulfide grease during installation.

REMOVING AND INSTALLING OIL COOLER

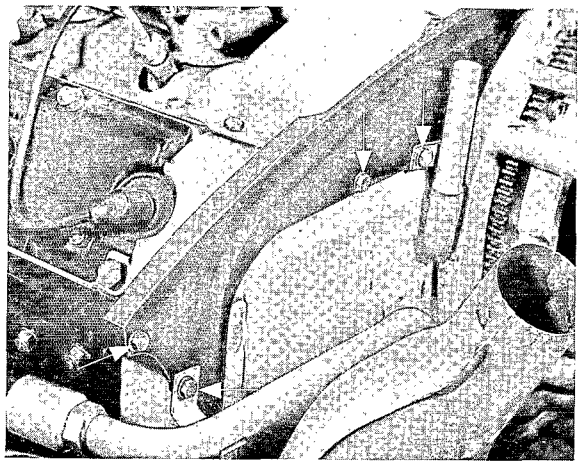
General:

Beginning with the 1973 models, all six-cylinder engines are equipped with a two-piece air shroud which simplifies the removal and installation of the oil cooler.

Removing

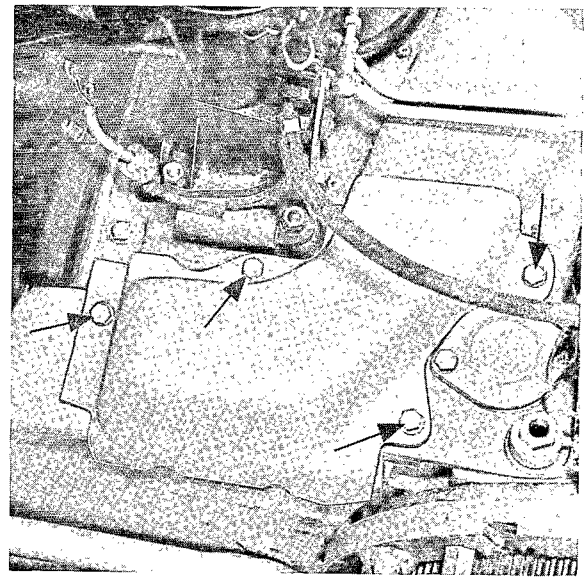
1. Remove air filter top.

2. Remove front engine shroud.



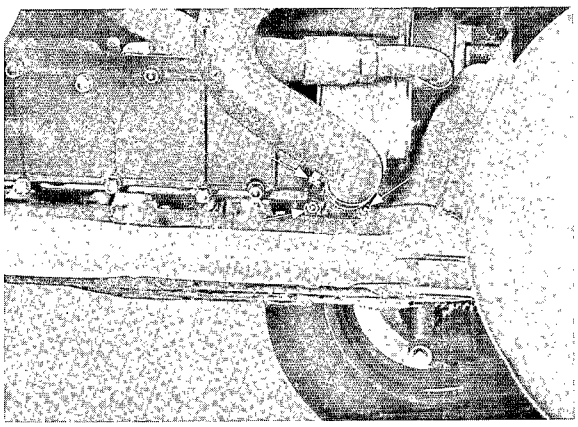
3. Remove right engine shroud.

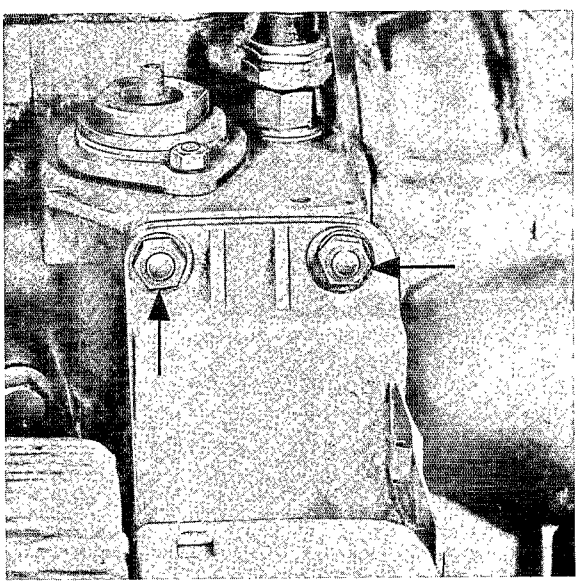
4. Remove oil cooler air duct.



5. Drain oil.

6. Detach oil hose from oil cooler and remove upper retaining nuts.





Installing

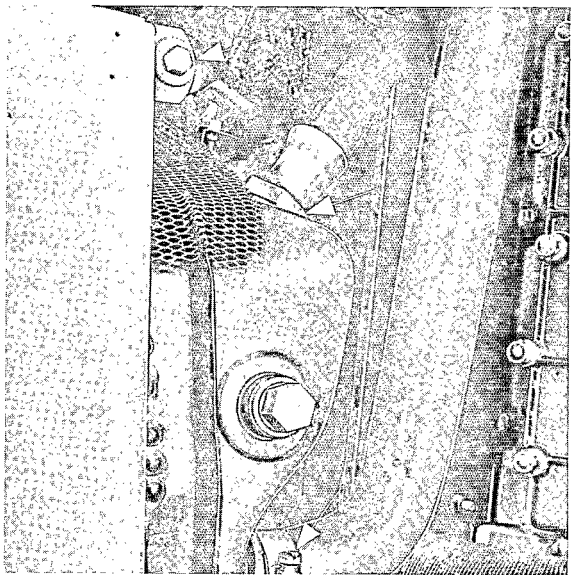
Install new sealing rings at the oil cooler.

NOTE: When positioning the oil cooler on crankcase, make sure that sealing rings are properly seated.

REMOVING AND INSTALLING OIL TANK BEGINNING WITH 1974 MODELS

Removal

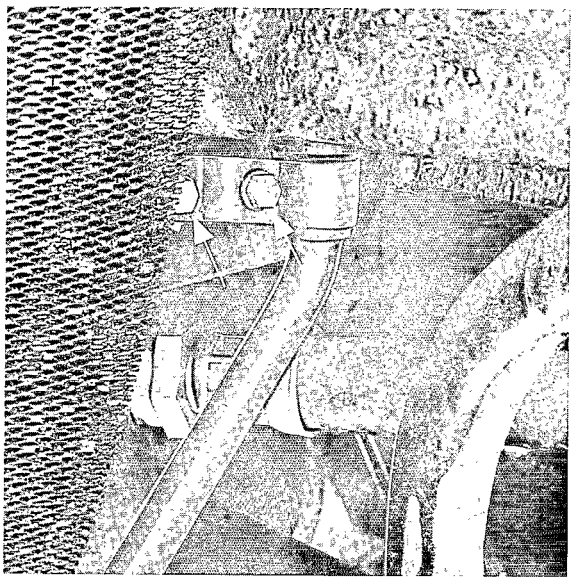
1. Remove right rear wheel.



2. Drain oil.

3. Detach oil hoses and remove bolt from support tube of lower fender section.

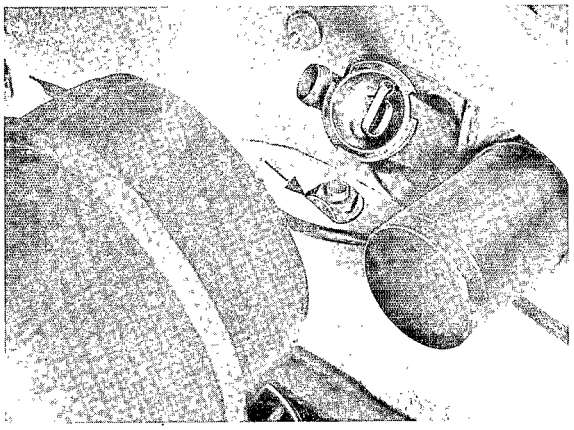
4. Remove screws from support tube and turn it to the side.



5. Detach wires from oil level sender.

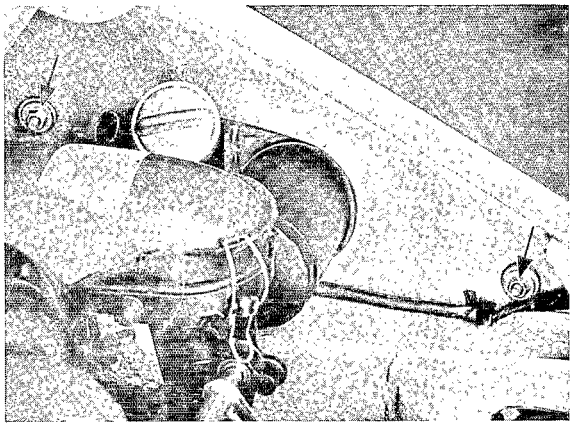
6. Detach breather hoses and remove tank cover from tank.

7. Unscrew oil filter.



8. Open the lock plate, remove nut, and pull out support tube through the bottom.

9. Remove oil tank retaining nuts and washers.



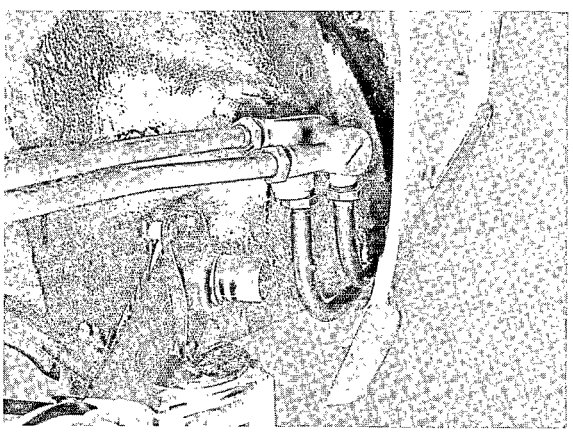
Installation

1. Glue wheelhouse gasket to oil tank in proper position.

REMOVING AND INSTALLING PRESSURE RELIEF VALVE OF COOLING COIL BEGINNING WITH 1974 MODELS

Removal

1. Drain oil from tank.



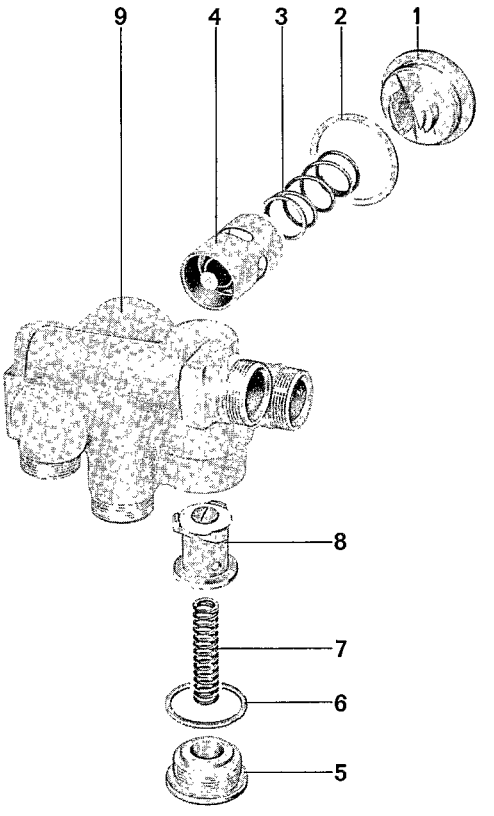
2. Detach oil lines.

3. Remove retaining clamp from upper oil lines.

4. Remove the valve.

Caution:
Catch spilling oil.

DISASSEMBLING AND REASSEMBLING PRESSURE RELIEF VALVE
Beginning with 1974 Models



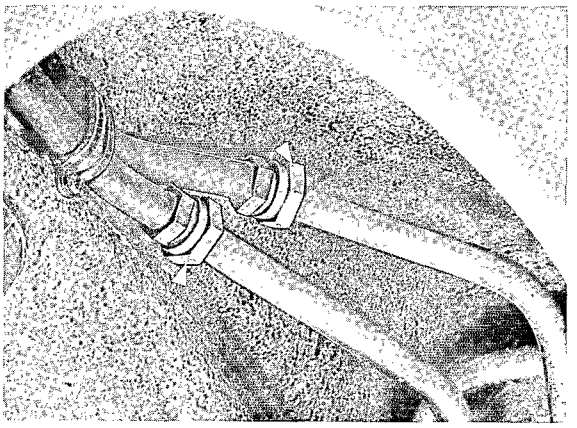
No.	Description	Qty	Note when: removing	Note when: installing	Remarks
1	Plug	1			
2	Gasket	1		Replace	
3	Spring	1			
4	Plunger	1			
5	Plug	1			
6	Gasket	1		Replace	
7	Spring	1			
8	Plunger for pressure relief valve	1			
9	Valve housing	1			

REMOVING AND INSTALLING OIL COOLER COIL

Beginning with 1974 models

Removal

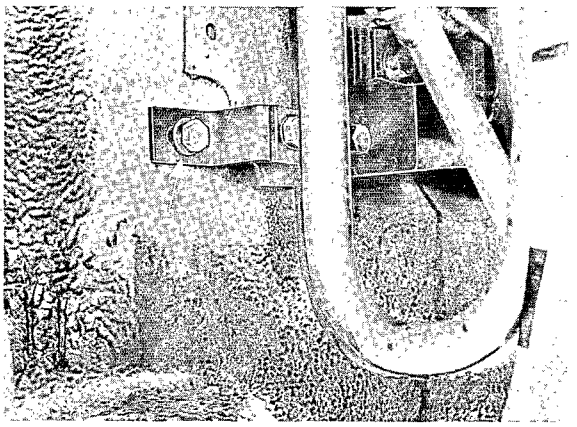
1. Remove right front wheel.



2. Disconnect oil hoses.

   Caution:
   Counterhold with a second open-end wrench.
   Catch spilling oil.

3. Remove retaining bolt and take cooler coil out.



4. Remove attaching bracket.

Installation

1. Apply counter force when connecting oil lines to prevent damage.

2. Coat oil hose connectors with MOLYKOTE-A during installation.

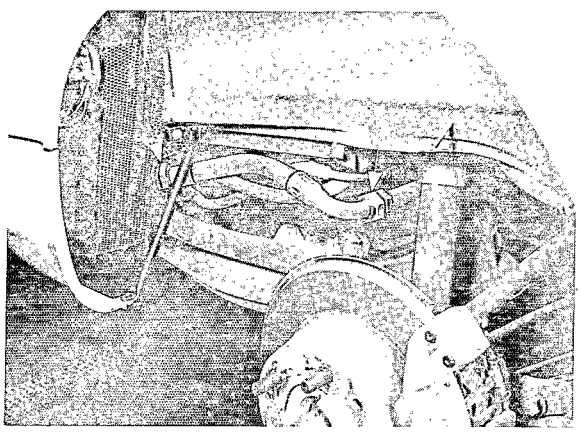
3. Mount cooler coil without stress.

SERVICE INSTALLATION OF COOLING COIL OIL LINES BEGINNING WITH 1974 MODELS

1. Raise car on hoist. Remove wheels on right side of car.

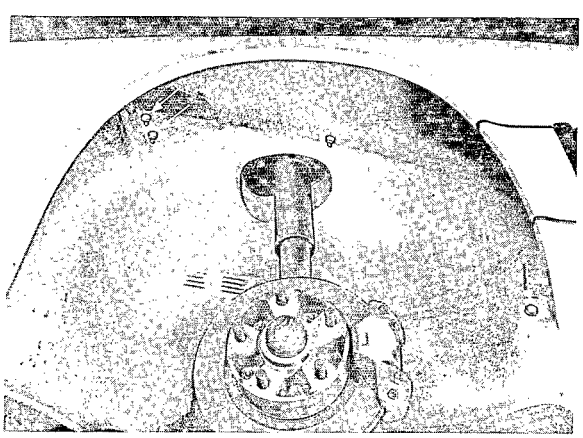
2. Drain oil from oil tank.

3. Disconnect oil return hose from engine to oil tank.



4. Remove rocker panel cover.

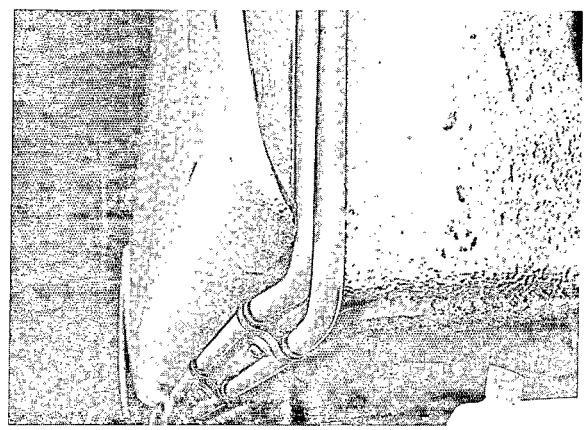
5. Remove plugs in oil line and cooling coil mounting points on front wheelhousing.



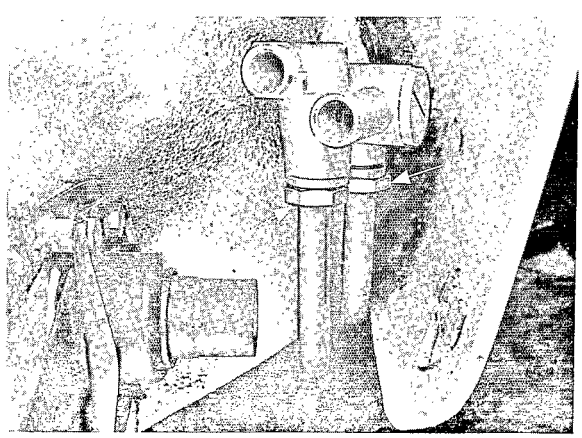
6. Grind down or saw present spacers (three plastic bushings) to a thickness of 5mm (3/16 in.)

7. Place rubber guards on oil lines.

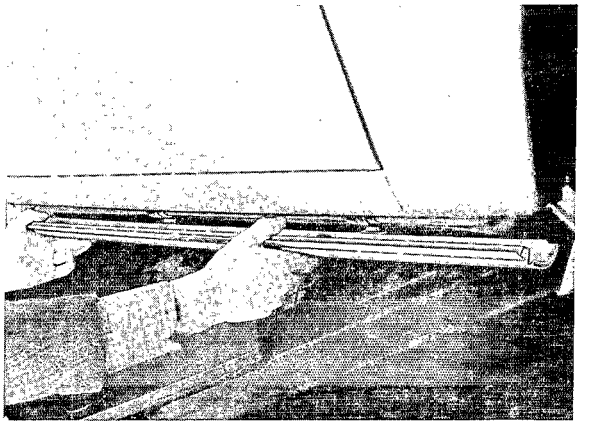
8. Place both oil lines along rocker panel. The top line must rest on fender connector plate. Install spacers and mounting clips. Only tighten mounting screws slightly.



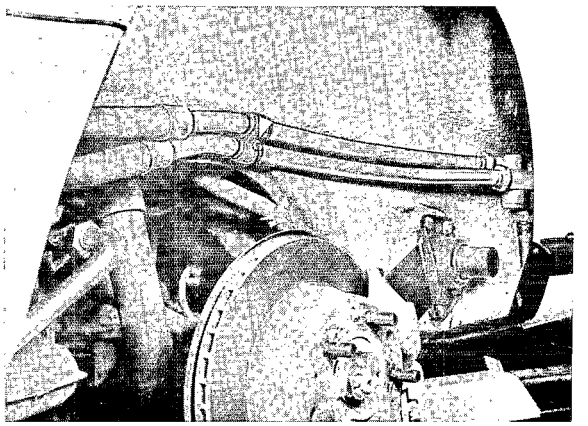
9. Connect pressure relief valve housing to oil lines.



10. Slide in rocker panel cover between spacer and washer. Tighten cover.



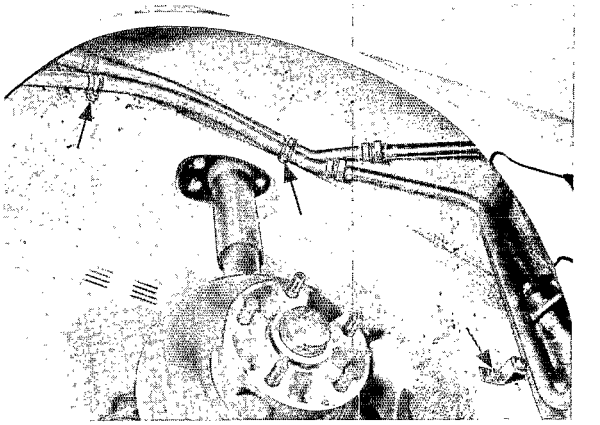
11. Place oil hoses along rear wheelhousing and connect. If necessary, cut threads on stud.



12. Connect cooling coil to oil lines.

13. Fasten cooling coil and lines to wheelhousing.

14. Tighten all oil line connections.

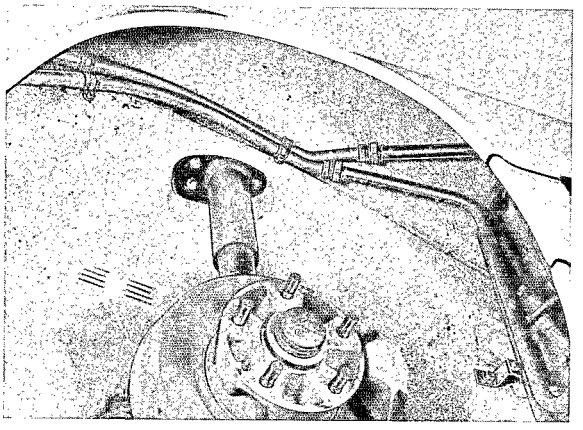


15. Check for leaks. This requires the engine oil temperature to be at least 83°C (182°F), so that the pressure relief valve will release the flow of oil to the cooling coil.

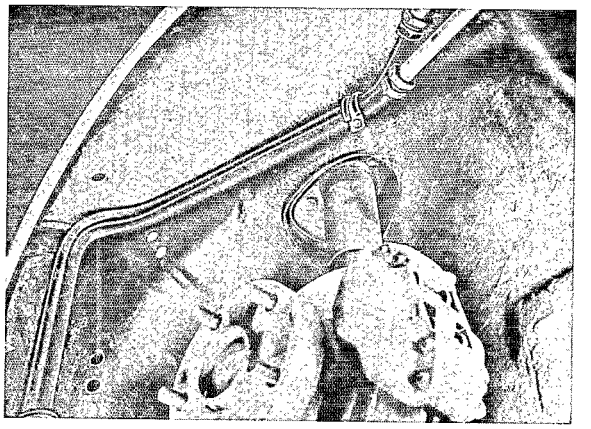
REPLACING OIL LINES TO FRONT OIL COOLER OR TO COOLING COIL

Installation of side turn signals from 1981 models on made it necessary to change the oil lines to the front oil cooler or cooling coil in the front wheel well area.

Only new version lines will be available from Parts after using up the former version oil lines. Changes made necessary when installing new lines in cars with old oil lines (without side turn signals) are described in the following instructions.



Old oil lines

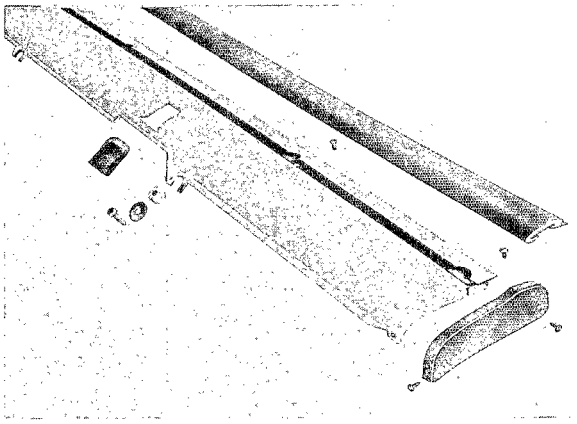


New oil lines

Removing

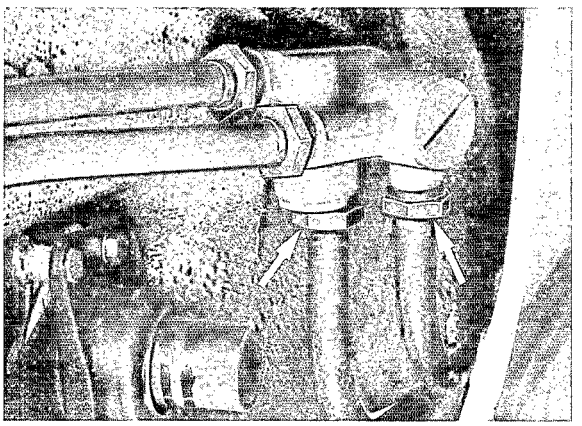
1. Lift car on platform hoist. Remove wheels on right side of car. Spray rust removing solution on oil line connections.

2. Remove rocker panel cover by
   - unscrewing end at front and rear,
   - pulling off rubber guard and removing cover for jack support,
   - removing metal screws at top and loosening metal screws at bottom.

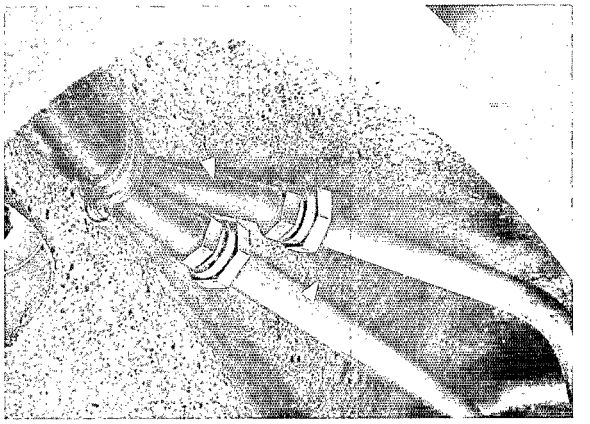


3. Disconnect wires of automatic antenna (optional extra equipment) inside of car. Unplug antenna wire on radio; removing right floor plate for this purpose. Pull both wires out of holes in wheel well.

4. Disconnect oil lines on pressure relief valve housing. Catch escaping oil.



5. Disconnect oil lines on cooling coil or at oil hoses for cars with a front oil cooler. Counterhold with a second open-end wrench.

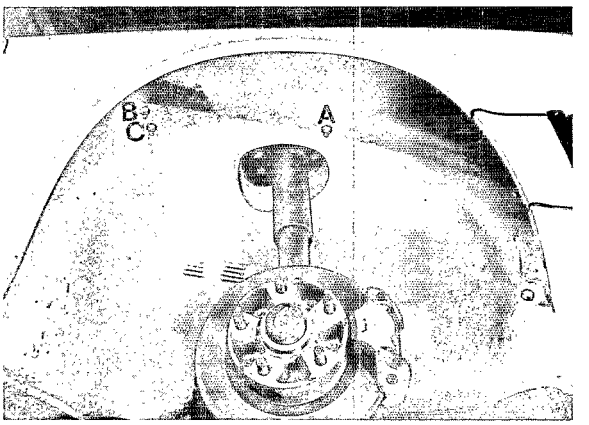


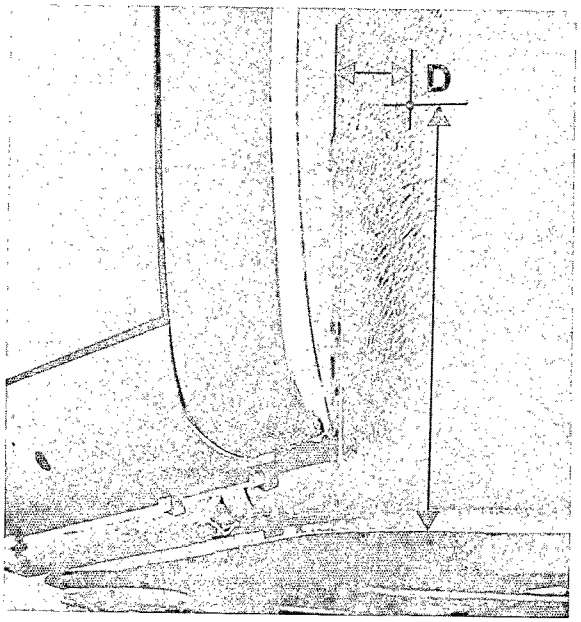
6. Unscrew mounting bracket and clamps. Remove oil lines.

Installing

1. When installing new lines in cars without side turn signals proceed as follows with the mounting points in the wheel well.

Point A	Is still applicable.
Point B+C	Not applicable; plug with 6 x 10 mm hex. head bolts used in conjunction with a body sealing compound.
Point D	New (drill a 5 mm dia. hole 255 mm/10 in. from wheel house/floor plate joint and 75 mm/3 in. from fender joint plate).





2. Install hoses on oil lines for protection.

3. Route both oil lines along side member trim. Upper line must be on fender joint plate. Install spacers and clamps. Tighten mounting bolts only finger tight.

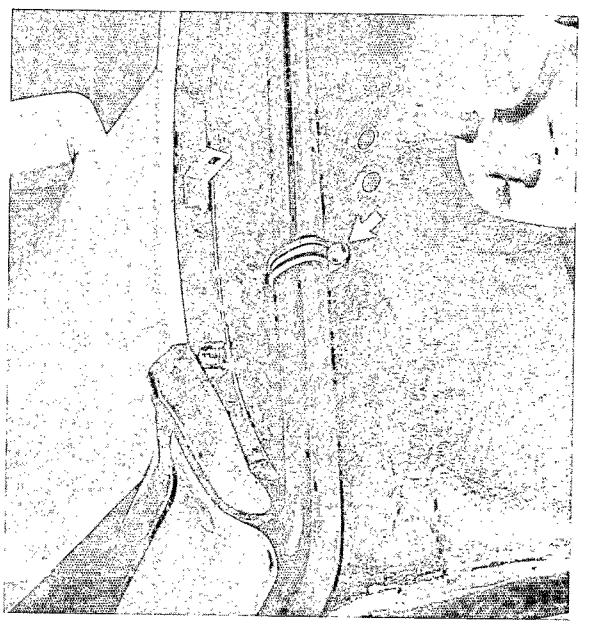


4. Connect oil lines on pressure relief valve housing and cooling coil or oil hoses for cars with a front oil cooler.

Note

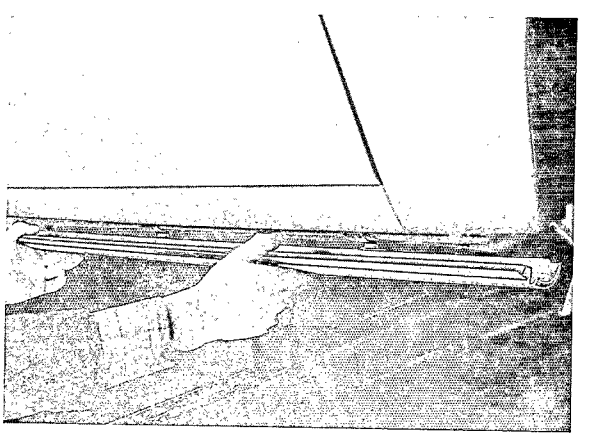
Coat oil line connection threads with Optimoly HT or Molykote A prior to installing. Make sure cooling coil remains installed without stress. If necessary, change installed position so that wheel does not scrape on cooling coil when turned to full lock position.

5. Mount oil lines on wheel well. Use 6.3 x 19 mm hex. head metal screw at new mounting point when installing new oil lines in a car without side turn signals.

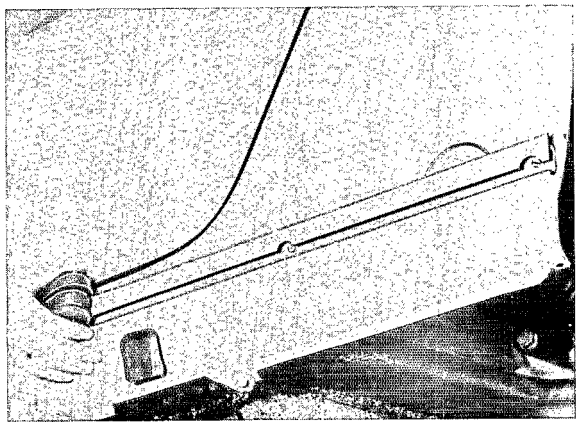


6. Reconnect automatic antenna wires. Check function of radio and antenna.

7. Push in rocker panel cover between spacer and washer.



8. Finish installation of cover. Connect rubber guard on one end, bend back sharply and press on continuously. Lip must fit tightly on body at top. If necessary, realign.



9. Check system for leaks. This requires that engine oil temperature be at least 83° C/181° F so that the governor can release flow to the cooling coil or front oil cooler. Correct oil level.

REMOVING AND INSTALLING FRONT OIL COOLER (1980 Model)

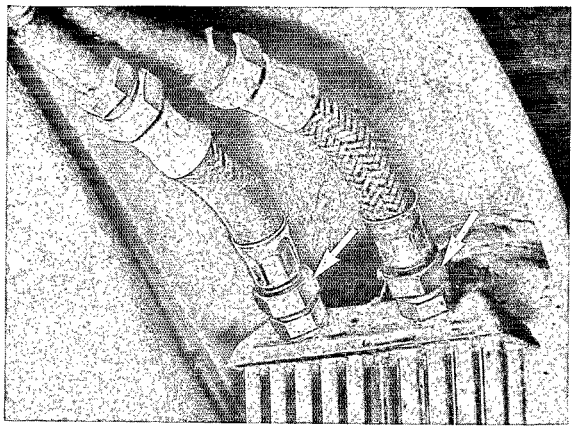
Removing

1. Remove right front wheel.

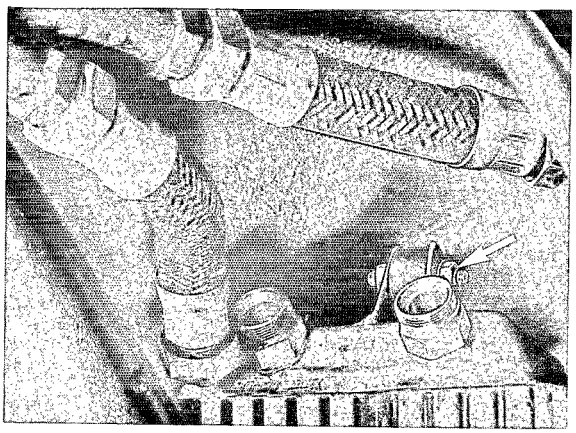
2. Disconnect oil hoses.

Note

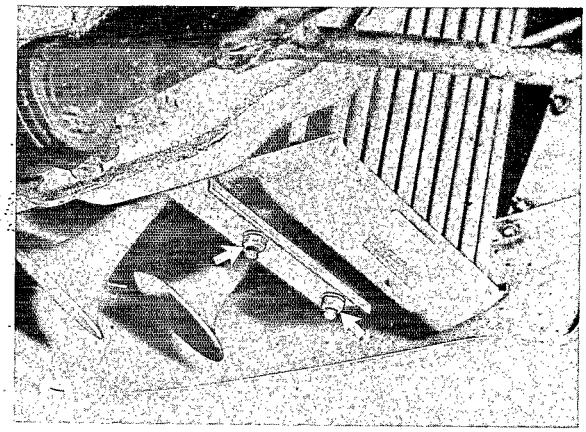
Use a second wrench as a counterhold. Catch escaping oil.



3. Loosen outer nut on upper rubber mount.



4. Loosen lower nuts and remove oil cooler upward.



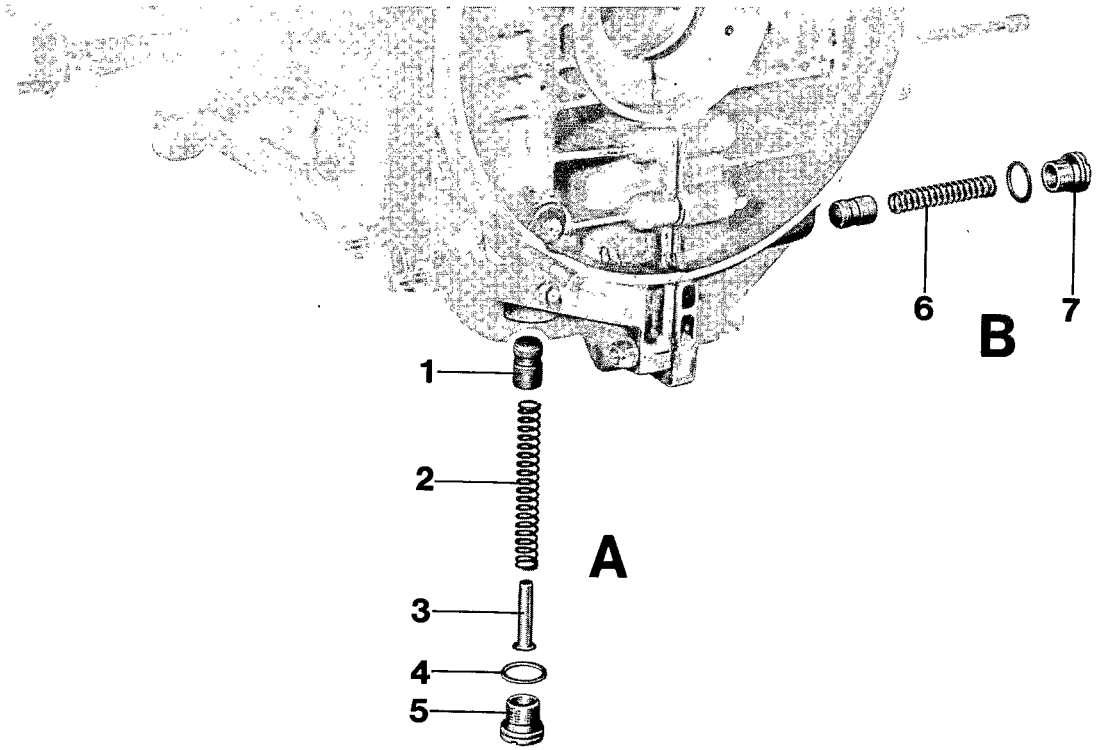
Installing

1. When installing counterhold at the cooler connections to prevent damage.

2. Coat connections with Optimoly HT.

3. Check connections for leaks. This requires that the regulator for the front oil cooler be open to have oil flowing through the cooler (engine oil temperature above 83° C/181° F).

SPRINGS FOR PRESSURE RELIEF AND SAFETY VALVES OF ENGINE OIL CIRCUIT



No.	Description	Part No.	Pressure Relief Valve to 1977	Pressure Relief Valve from 1978	Safety Valve
1	Piston pressure relief valve	911.107.512.00	X	X	
2	Spring - old - 70 mm long	901.107.531.00	X		
2	Spring - new - 86 mm long	930.107.531.01		X	
3	Spring guide	930.107.533.00		X	
4	Gasket	900.123.071.30	X	X	X
5	Plug - old - without groove	999.064.010.02	X		
5	Plug - new - with groove	999.064.016.02		X	
6	Spring, safety valve	901.107.531.00			X
7	Plug - new - with groove	999.064.016.02			X

Installation Note

The (86 mm long) spring for pressure relief valve may only be installed together with the spring guide.

REMOVING AND INSTALLING INJECTION TUBE IN CAMSHAFT HOUSING

Removing

1. Drill 9 mm deep hole in plug with a 4.8 to 5 mm dia. drill bit. Then cut M 6 threads with a bottoming tap. Pull out plug with an M 6 screw and spacer.

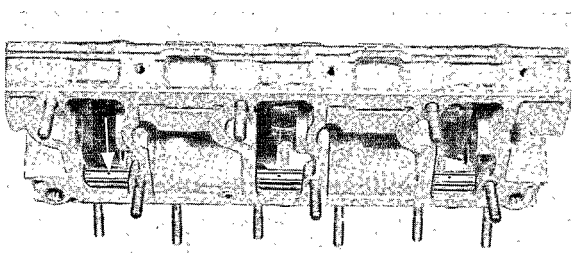
   CAUTION Be careful not to damage sealing surface when removing plug.

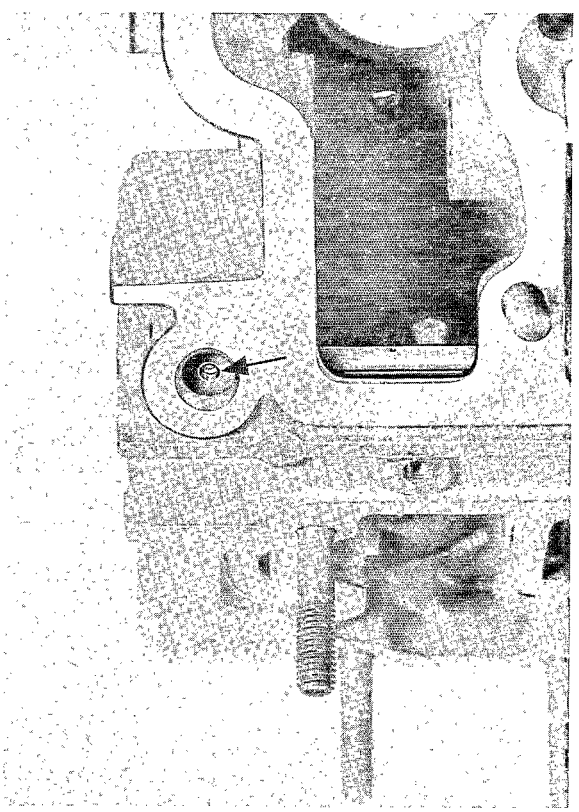
2. Loosen centering screws and slide injection tube out.

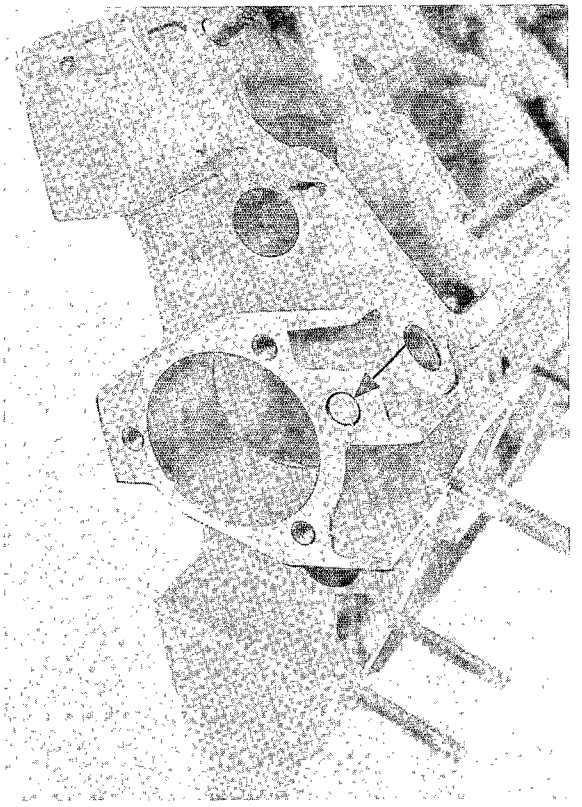
Installing

1. Install injection tube, making sure that locating bore for plug is positioned correctly.

   CAUTION Separate bores must face upward toward intake valve covers. Double bores, not shown in illustration, face cam bearing surface.







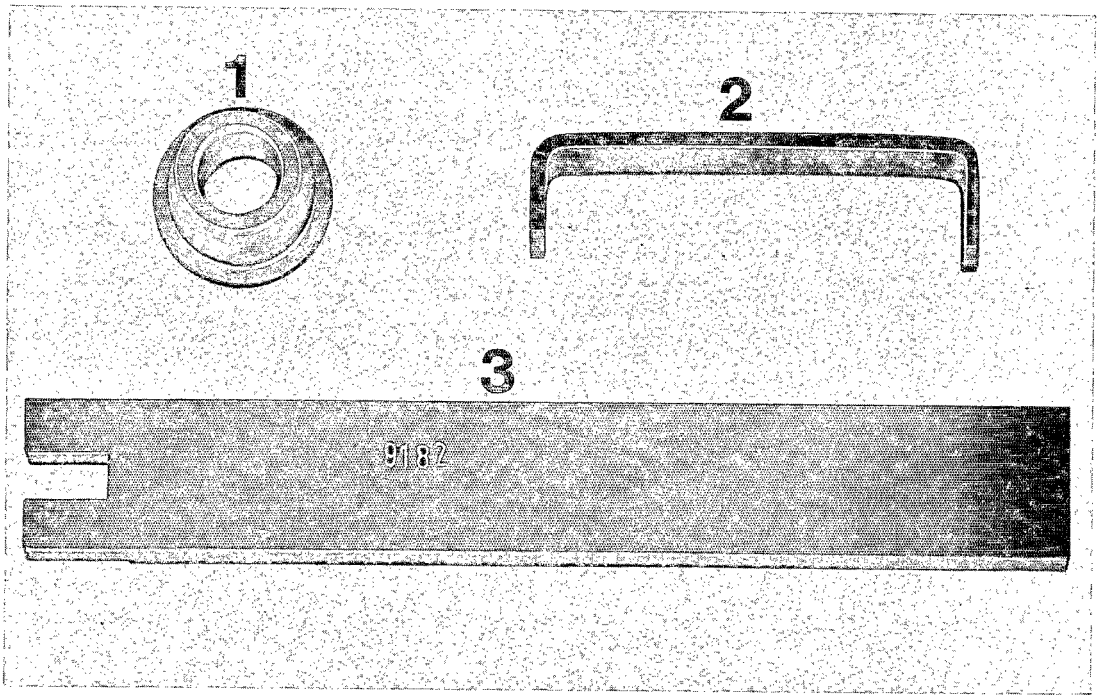
2. Lubricate new plug and hole, coat with a double component adhesive and install plug.

   CAUTION Upset plug before installation if it does not fit tightly in housing.

3. Plug is pressed in about 0.3 mm deeper than sealing surface.

OVERHAULING CHAIN TENSIONER

TOOLS



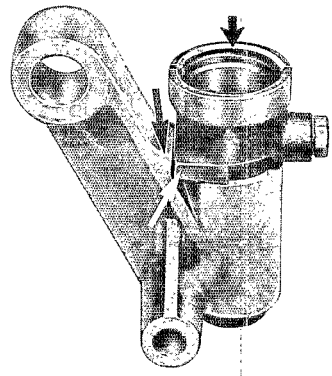
No.	Description	Special Tool	Remarks
1	Adjusting ring	P 214 c	For chain tensioner 930 105 049 00
2	Clamp	P 214	
3	Assembly lever	9182	

OVERHAULING NEW VERSION CHAIN TENSIONER

General Information

Only the chain tensioner having Part No. 930.105.049.00 or the repair kit having Part No. 911.105.901.01 with modified parts are available from parts.

Only the new version chain tensioners may be repaired.

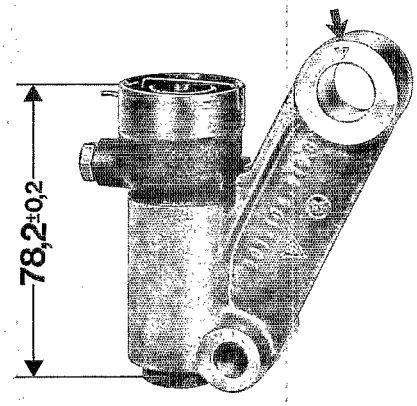


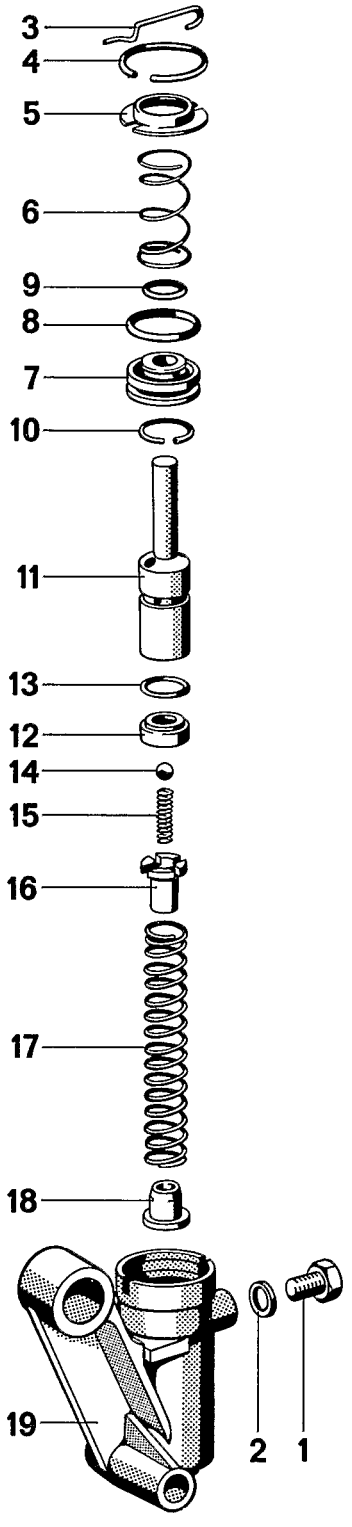
New Version Identification:

a) Chamfer on upper part of housing

b) Total height: 78.2 $\pm$ 0.2 mm and Porsche trademark

c) Mounting boss and housing have a stop




3
4
5
6
9
8
7
10
11
13
12
14
15
16
17
18
19
2
1

No.	Description	Qty.	Note When: Removing	Note When: Installing	Special Instructions
1	Bleed screw	1			
2	Sealing ring	1		Replace	
3	Clamp	1			Clamp only with complete new part
4	Snap ring	1		Replace	
5	Spring retainer	1			
6	Spring	1		Replace	
7	Piston (alum.)	1			
8	O-ring	1		Replace	
9	O-ring	1		Replace	
10	Snap ring	1		Replace	
11	Piston	1			
12	Intermediate piece	1		Replace	
13	O-ring	1		Replace	
14	Ball, 5 mm	1		Replace	
15	Spring	1		Replace	
16	Cage	1		Replace	
17	Spring	1			
18	Spring guide	1		Replace	
19	Chain tensioner housing	1			

DISASSEMBLING AND ASSEMBLING CHAIN TENSIONER

Disassembling

1. Clamp chain tensioner in a vise and remove upper circlip.

Note

Spring retainer under pressure.

2. Remove spring retainer and spring.

3. Remove bleed screw and sealing ring.

4. Pull out aluminum piston carefully with a suitable tool.

5. Push lower snap ring out of groove with a small screwdriver inserted through bleed screw bore.

6. Remove piston, intermediate piece with O-ring valve ball (5 mm) with spring, cage for ball, spring and spring guide.

Note

The intermediate piece could be stuck in the piston. If so, remove intermediate piece by lightly tapping piston against piece of wood.

Assembling

1. Clean parts thoroughly, check for wear and replace if necessary.
Inspect piston spring for wear and deformation (bent), replacing if necessary.

2. Push chain tensioner piston with mounted aluminum piston, without O-rings, into chain tensioner housing. Both pistons must move easily. It is especially important that the chain tensioner piston moves easily in the lower piston position. Remove any pressure spots on the pistons with emery cloth.

3. Install spring guide, spring, cage, spring, ball, intermediate piece with O-ring as well as piston and secure with snap ring.

Note

When installing intermediate piece in the piston make sure O-ring fits properly in groove. Give O-ring a light coat of oil.

4. Fill chain tensioner to upper edge with 15 W/50 engine oil and bleed.
Bend the end of an approx. 1 mm dia. steel wire to make an inclined step and push it through the piston bore against the ball (see Workshop Manual 911, Volume 1, Page E 106).

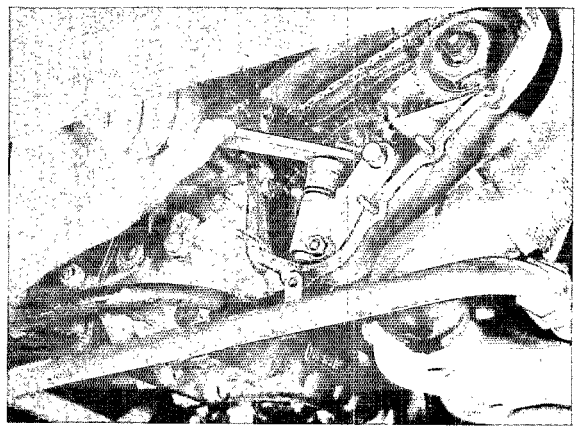
Move piston up and down slowly within the stroke range until no more air bubbles escape at the bores.

5. Clean inner and outer grooves of aluminum piston. Install new, lubricated O-rings and make sure they are not twisted. Install aluminum piston until the O-ring seals with the housing. Now open the bleed screw slightly and push down with Special Tool P 214 c until the tool rests on the edge of the chain tensioner. Then tighten bleed screw again without delay.

   Install spring, spring retainer and snap ring.

INSTRUCTIONS FOR INSTALLATION OF CHAIN TENSIONER

To prevent damage on the chain tensioner housing, it is not permitted to pre-load the timing chain with a screwdriver. Force from the screwdriver could deform the chain tensioner housing, which in turn would cause the the aluminum piston (7) to seize. Only use Special Tool 9182 for pre-loading.



SEALING CYLINDER HEAD/CAMSHAFT HOUSING MATING SURFACES

Note

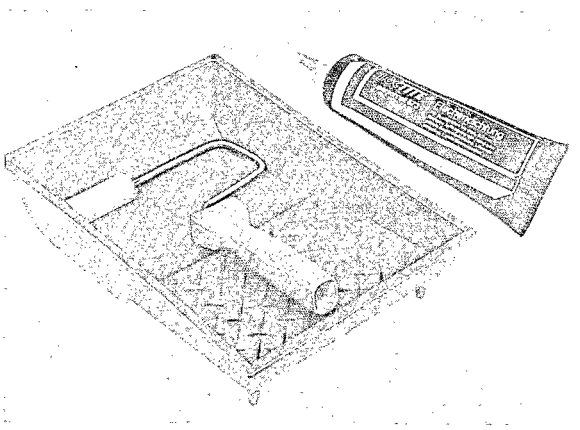
Only Loctite No. 573 (green color) should be used as a sealing compound.
Loctite No. 573 hardens only in conjunction with metal and exclusion of air. Not more than 10 minutes should elapse between application of sealing compound coat and assembly of parts, otherwise the sealing compound on metal would start to harden.

Removing Old Sealing Compound

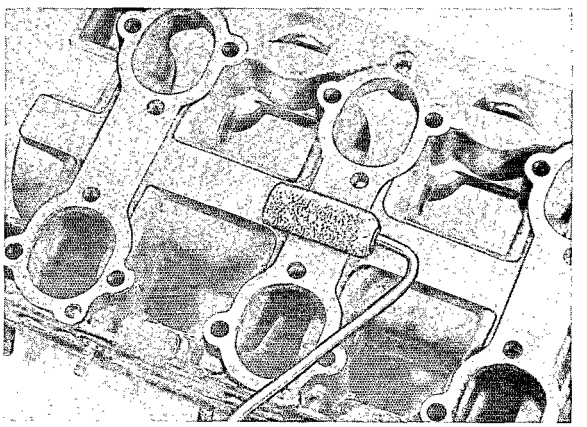
During repairs the old sealing compound does not have to be removed. Only grease has to be removed from the surface. A new coat of sealing compound should be applied immediately after the cleaning solution has dried. The new Loctite will dissolve the old compound remaining in the surface finish and become hard again after assembly.
Should it be necessary to remove the old sealing compound, the use of a fine steel brush is recommended for this work.

Applying Sealing Compound

1. When applying the sealing compound by hand it is recommended to use a short-pile velour roller. In addition, a tray will be required for the sealing compound with a ribbed surface for scraping off the roller.

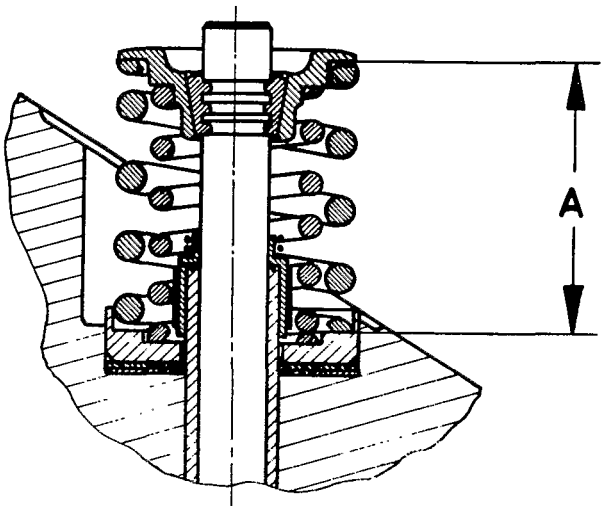


2. Apply a very thin coat of sealing compound on the mating surface of the camshaft housing.



CHECKING INSTALLED LENGTH OF VALVE SPRINGS

Check distance A with Special Tool P 10 C. If necessary, correct by adding or removing chims.



Note

Make sure spring retainer has perfect fit in special tool, machining special tool if necessary.

INSTALLED DIMENSIONS FOR 2.4 LITER ENGINE

Vehicle Type	911 T	911 E	911 S
Engine Type	911/51 911/61	911/52 911/62	911/53 911/63
Intake Valve Exhaust Valve	35 $\pm$ 0.3 mm 35 $\pm$ 0.3 mm	34 $\pm$ 0.3 mm 34 $\pm$ 0.3 mm	35.5 $\pm$ 0.3 mm 34.5 $\pm$ 0.3 mm

NOTE

The above values can also be applied to the 2.2 liter engines in the course of repair.

INSTALLED DIMENSIONS FOR 2.7 AND 3.0 LITER ENGINES

Vehicle Type	911/911 S	911 SC
Engine Type	911	930
Intake Valve Exhaust Valve	35 ± 0.3 mm 35.5 ± 0.3 mm	34.5 - 0.3 mm 34.5 - 0.3 mm

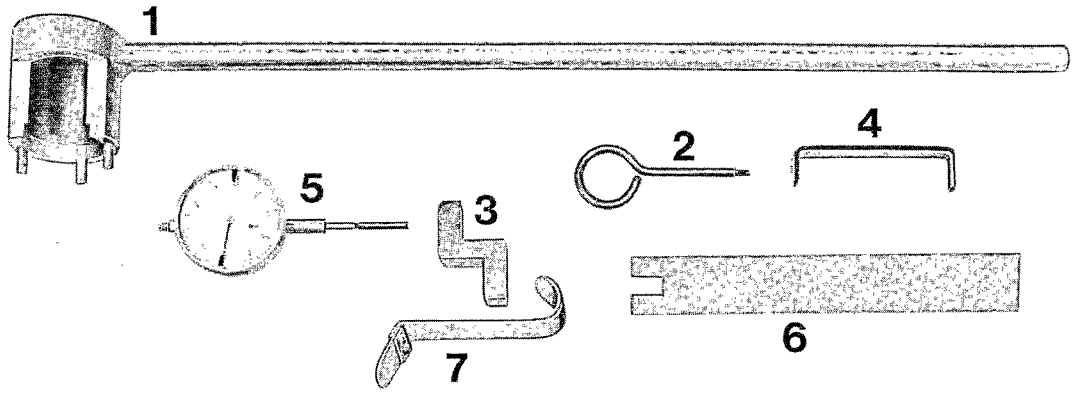
Note

The tolerances for cylinder heads of Carrera 3.0 and 911 SC models have been limited for manufacturing reasons. The distance of 34.5 mm must not be exceeded; the lower tolerance value would be ideal.

ADJUSTING TIMING

(Camshafts with Hexagon Head Mounting Bolts for Sprocket)

TOOLS



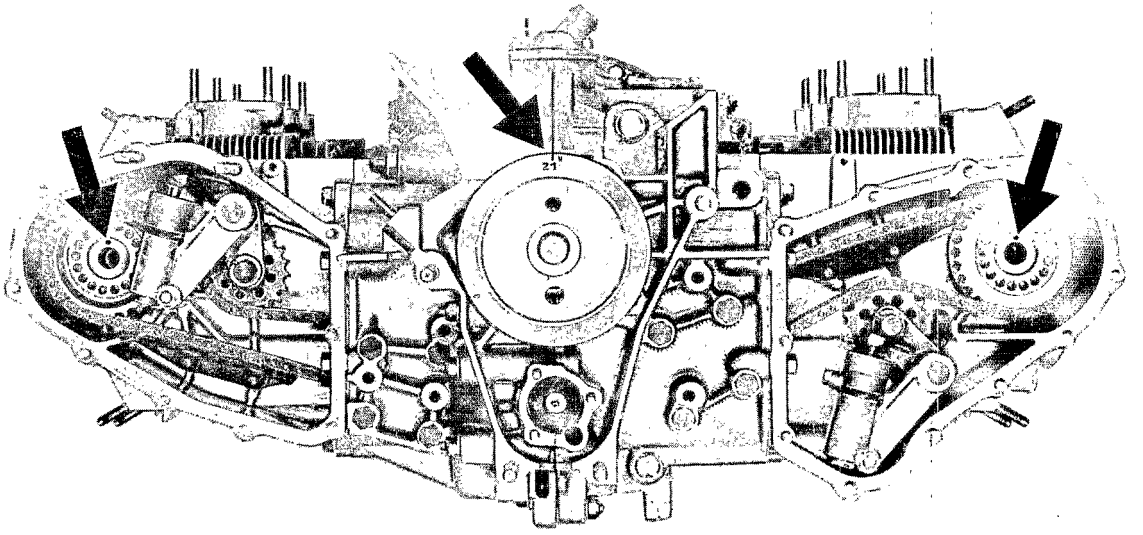
No.	Description	Special Tool	Remarks
1	Holding wrench for sprockets	9191	
2	Puller	P 212	
3	Dial gauge holder	P 207	
4	Clamp for chain tensioner	P 214	
5	Dial gauge with tip		Standard Tip length: approx. 40 mm
6	Assembly lever	9182	
7	Feeler gauge	P 213	

ADJUSTING TIMING

(Camshafts with Hexagon Head Mounting Bolts for Sprocket)

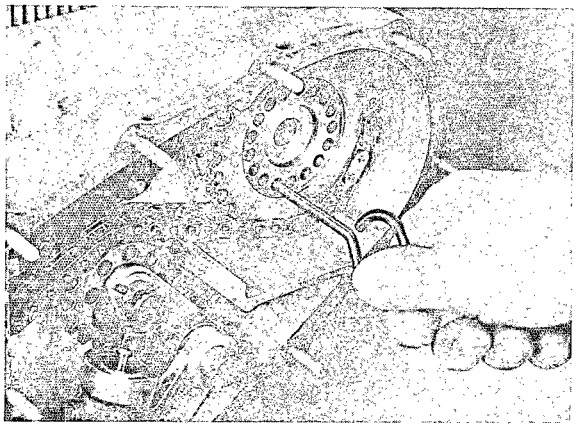
Basic Setting

1. Turn crankshaft until mark Z 1 on pulley is aligned with joint of crankcase or stripe on fan housing.

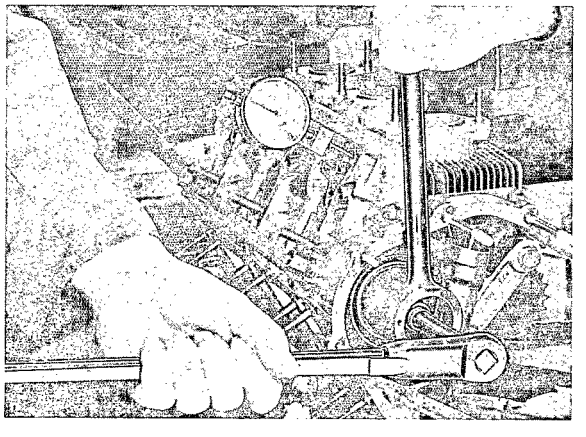


2. Position both camshafts so that punch marks face up. Engine has its basic setting (cylinder no. 1 = TDC and cylinder no. 4 = overlap) by adjusting mark Z 1 on pulley to joint and punch marks on camshafts to face up.

3. In the position described above on bore in the sprocket will be exactly aligned with a bore in the sprocket flange. Insert a locating pin in these exactly aligned bores.



4. Tighten hexagon bolts for sprockets finger tight hold with Special Tool P 9191.

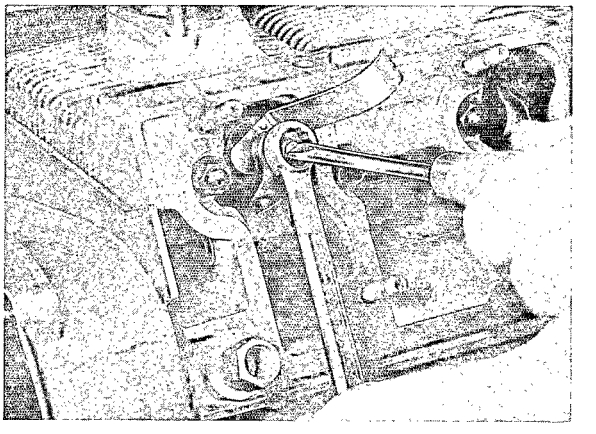


Note

Should one of the camshafts be turned out of basic setting position, proceed as follows. Remove locating pin from camshaft in basic setting position so that it cannot turn during the following adjustment. Turn mislocated camshaft to basic setting position (punch mark faces up) with Special Tool 9191. Then remove sprocket mounting bolt and locating pin, and turn crankshaft to mark Z 1 again.

Fine Adjustment

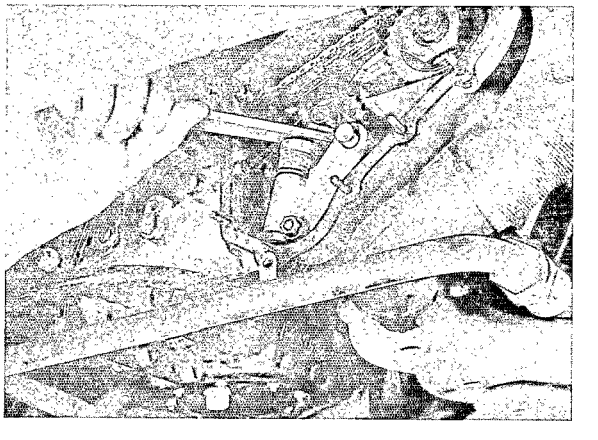
1. Check valve clearance and, if necessary, adjust exactly to 0.10 mm with Special Tool P 213. Exact valve clearance for intake valves of cylinders no. 1 and 4 is sufficient for timing adjustments.



2. Pre-load timing chains.

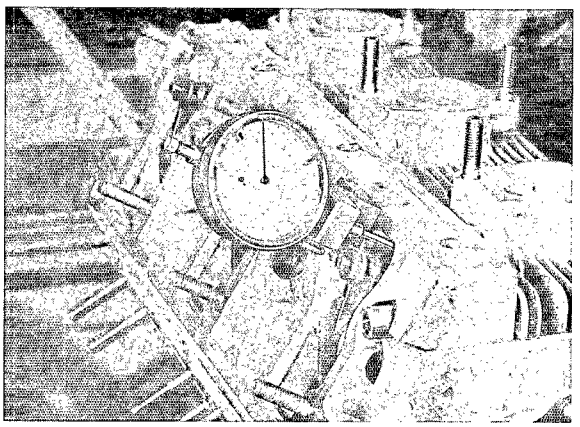
Note

To avoid damage on chain tensioner housing, it is not permitted to pre-load timing chains with a screwdriver. Supporting the screwdriver on the chain tensioner housing could deform the latter and cause seizure of the aluminum piston. Only use Special Tool 9182 for pre-loading.



Left Camshaft Adjustment (Cylinder No. 1)

3. Mount dial gauge on stud of camshaft housing with Special Tool P 207. Set dial gauge to zero on spring retainer of intake valve for cyl. no. 1 with valve closed and approx. 10 mm pre-load.



4. Now slowly turn crankshaft clockwise from Z 1 (TDC) by about 1 turn and observe dial gauge at same time.
Continue turning until the mean value of the adjusting tolerance, e.g. 0.10 mm valve lift (for 930/16 engine), is reached.

Adjusting Values

Engine 930/16	1.4 - 1.7 mm
Ideal value	1.55 mm

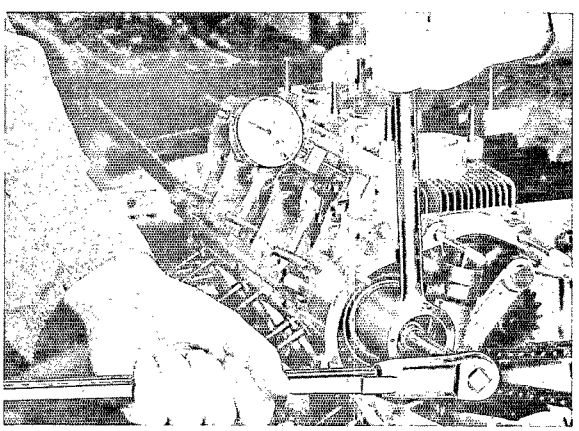
5. Unscrew and remove mounting bolt on left sprocket and pull out locating pin with Special Tool P 212.

6. Turn crankshaft accordingly until mark Z 1 on pulley is exactly aligned with joint of crankcase or stripe on fan housing.

7. Install locating pin again and tighten bolt finger tight, while holding.

8. Turn crankshaft clockwise two turns (720°) and re-check setting. Indicated value should be within tolerances.

9. Tighten bolt of left camshaft to final torque of 120 Nm (86 ft lb), having a 2nd person hold with Special Tool P 9191.



Right Camshaft Adjustment (Cylinder No. 4)

1. Set cylinder no. 4 to TDC (cyl. no. 1 overlaps).

2. Repeat adjusting procedures described in points 3 through 9 on cylinder no. 4.

PISTON CHANGES - BEGINNING WITH 1972 MODELS

1. New pistons with flatter piston tops to reduce compression ratio:

911 T	=	7.5 : 1
911 E	=	8.0 : 1
911 S	=	8.5 : 1

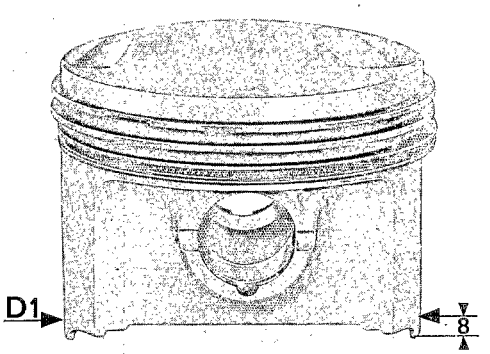
Required fuel octane rating = 91

2. Changed piston ring.

3. New table of dimensions for pistons and cylinders beginning with 1972 models.

PISTON AND CYLINDER DIMENSIONS
Beginning with 1972 models

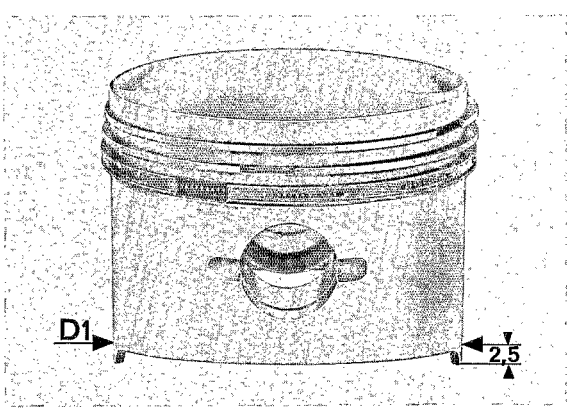
Type 911 S Pistons



Cylinder markings	Cylinder bore dia.	Piston diameter D 1
		Tolerances ± 0.005 mm
Standard		
0	84.000-84.010	83.950
1	84.010-84.020	83.960
2	84.020-84.030	83.970
1st oversize		
0 KD 1	84.250-84.260	84.200
1 KD 1	84.260-84.270	84.210
2 KD 1	84.270-84.280	84.220
2nd oversize		
0 KD 2	84.500-84.510	84.450
1 KD 2	84.510-84.520	84.460
2 KD 2	84.520-84.530	84.470

Cylinder/piston clearance: 0.045-0.065
Piston weight: 354 ± 3 g

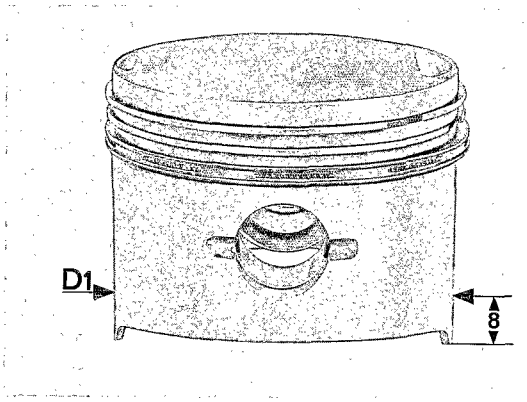
Type 911 E Pistons



		Tolerances ± 0.005 mm
Standard		
0	84.000-84.010	83.970
1	84.010-84.020	83.980
2	84.020-84.030	83.990
1st oversize		
0 KD 1	84.250-84.260	84.220
1 KD 1	84.260-84.270	84.230
2 KD 1	84.270-84.280	84.240
2nd oversize		
0 KD 2	84.500-84.510	84.470
1 KD 2	84.510-84.520	84.480
2 KD 2	84.520-84.530	84.490

Cylinder/piston clearance: 0.025-0.045
Piston weight: 371 ± 3 g

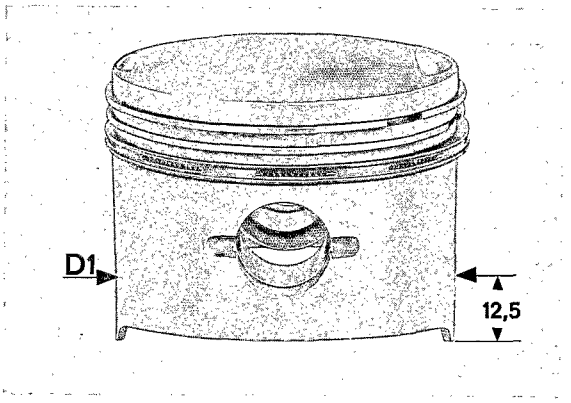
Type 911 T



Cylinder markings	Cylinder bore dia.	Piston diameter D 1
Standard (MAHLE)		Tolerances ± 0.005
0	84.000-84.010	83.970
1	84.010-84.020	83.980
2	84.020-84.030	83.990
1st oversize		
0 KD 1	84.250-84.260	84.220
1 KD 1	84.260-84.270	84.230
2 KD 1	84.270-84.280	84.240
2nd oversize		
0 KD 2	84.500-84.510	84.470
1 KD 2	84.510-84.520	84.480
2 KD 2	84.520-84.530	84.490

Cylinder/piston clearance: 0.025-0.045
Piston weight: 376 ± 3g

Type 911 T



Standard (SCHMIDT)		Tolerances + 0.007 - 0.008
0	84.000-84.010	83.970
1	84.010-84.020	83.980
2	84.020-84.030	83.990
1st oversize		
0 KD 1	84.250-84.260	84.220
1 KD 1	84.260-84.270	84.230
2 KD 1	84.270-84.280	84.240
2nd oversize		
0 KD 2	84.500-84.510	84.470
1 KD 2	84.510-84.520	84.480
2 KD 2	84.520-84.530	84.490

Cylinder/piston clearance: 0.023-0.048
Piston weight: 375 ± 4g

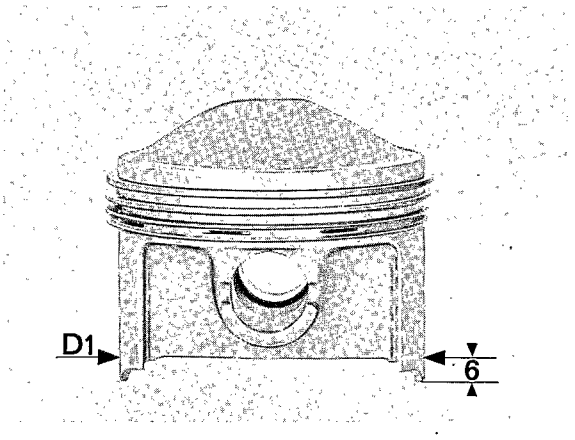
For piston and wear limits see page 6.1 - 4/1

CYLINDER HEIGHT TOLERANCE GROUPS
1972-models, 2.4 liters

	Code mark		
Cylinder Installation Height		85.400 - 85.425	Standard Cylinder Height
		85.425 - 85.450	
	R 5	85.150 - 85.175	Reconditioned Cylinder Height
	R 6	85.175 - 85.200	

PISTON AND CYLINDER DIMENSIONS
Beginning with 1973 models

Type Carrera 2.7 Pistons



Standard stamped	Cylinder markings	Cylinder bore dia.	Piston diameter D 1 Tolerances ± 0.005
0		90.000-90.010	89.950
1		90.010-90.020	89.960
2		90.020-90.030	89.970

Cylinder/piston clearance: 0.025 - 0.045

Piston weight: 392 ± 3 kg

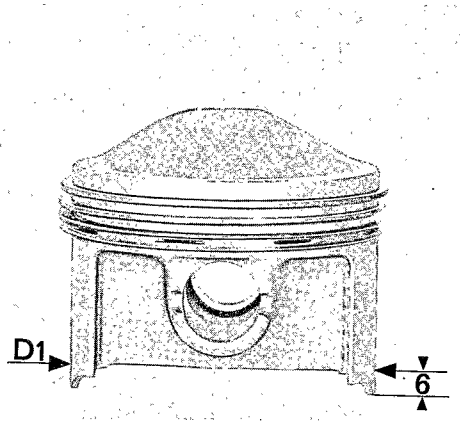
CYLINDER HEIGHT TOLERANCE OF 2.7 LITER ENGINES

	Code		
Cylinder Installation Height	5	85.400 - 85.425	Standard Cylinder Height
	6	85.425 - 85.450	

Oversize pistons and cylinders are not provided.

PISTONS AND CYLINDER DIMENSIONS - BEGINNING WITH 1974 MODELS

Type 911 and 911 S Pistons

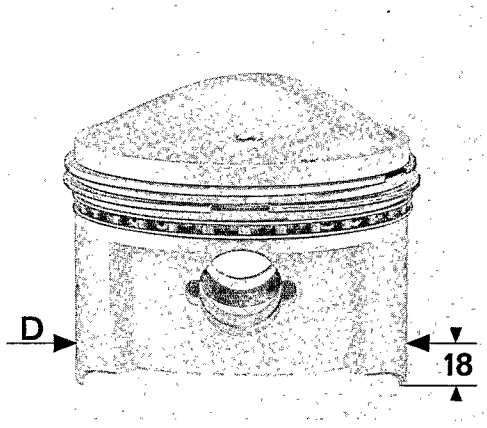


Cylinder markings	Cylinder bore dia.	Piston diameter D 1
Standard stamped		Tolerances ± 0.0005
0	90.000-90.010	89.970
1	90.010-90.020	89.980
2	90.020-90.030	89.990

Cylinder/piston clearance: 0.025 - 0.045

PISTON AND CYLINDER DIMENSIONS "LS" Version

Type 911 Pistons



Cylinder markings	Cylinder bore diameter	Piston diameter D1
Standard stamped		
0	90.000-90.010	89.952-89.967
1	90.010-90.020	89.962-89.977
2	90.020-90.030	89.972-89.987

Cylinder/piston clearance: 0.035-0.060

Permissible weight difference in pistons of one set: 6 g max.

INSTALLATION INSTRUCTIONS FOR "LS" CYLINDERS AND PISTONS

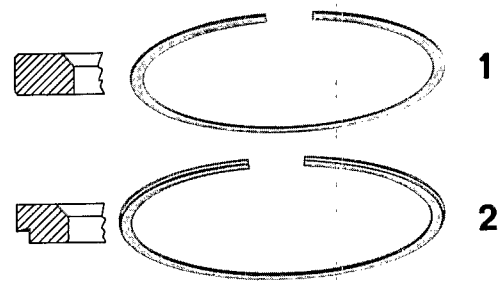
The ALUSIL cylinder (eutectic aluminum-silicon alloy) and FERROCOAT piston combination is known as "LS" Cylinders and Pistons.
In this system the surface coating is applied to the piston.

The assembly of the cylinder and piston must be made with particular care to avoid breaking the piston rings; the rings are chrome-plated and are thus harder and more brittle.

When resistance is met while tightening the piston ring compressor, it is an indication that the rings are not seating properly in the grooves. In such case remove the ring compressor, check the piston rings for location, and repeat the procedure, carefully pushing the cylinder onto the piston.

Installing Piston Rings

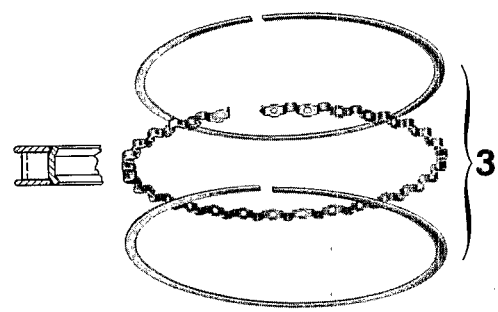
The piston rings can be installed in their grooves by hand and without the use of tools. When installing rings 1 and 2, make sure that the rings are placed in the sequence and position shown in the illustration.



Installing Three-Part Oil Ring

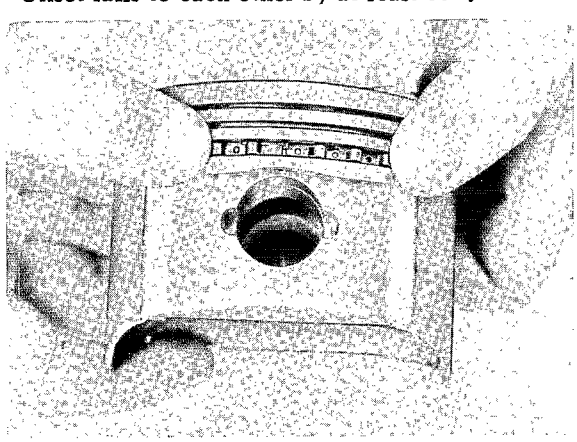
The oil ring is made up of three parts, with each part installed separately. Install the expander first, then follow with the upper and lower rails.

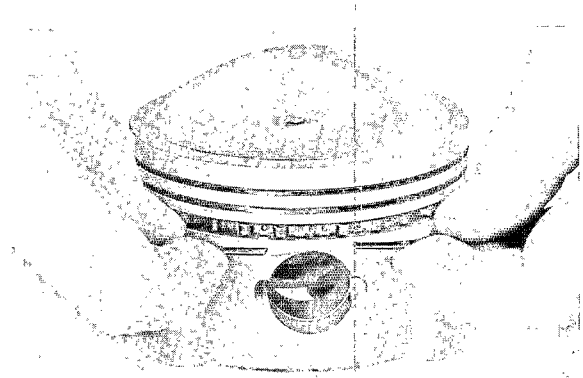
After installation check visually if the expander ends meet.



Note

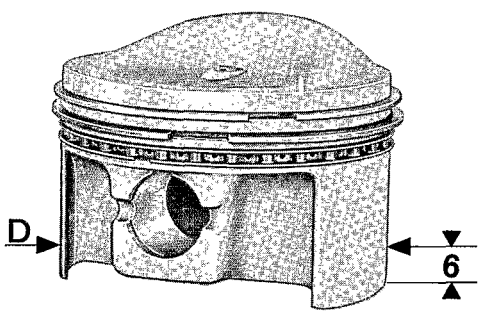
Install gaps of individual ring parts as follows:
Offset expander to rails by at least 45°.
Offset rails to each other by at least 90°.





PISTON AND CYLINDER SIZES - "LS" MAHLE

Piston Type 911 S



Cylinder Code	Cylinder Diameter	Piston diameter D 1
Standard Size stamped		
0	90.000-90.012	89.960-89.972
1	90.012-90.024	89.972-89.984
2	90.024-90.036	89.984-89.996

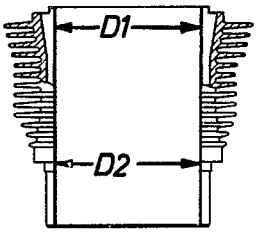
Cylinder/piston clearance: 0.028 - 0.052 mm

GAP OF "LS" PISTON RINGS

Make	Piston Ring		Gap in mm	Gap wear limits in mm
MAHLE + SCHMIDT	R ring	Top	0.2 - 0.4	1.0
	N ring	Center	0.15 - 0.35	1.0
	SS 50 ring (3-piece consisting of expander and 2 rails)	Bottom	0.4 - 1.4	2.0

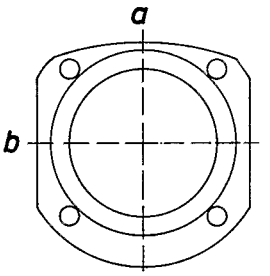
CHECKING PISTONS AND CYLINDERS

Cylinder
D1 Measuring point for wear and ovality



30 mm below top edge of cylinder

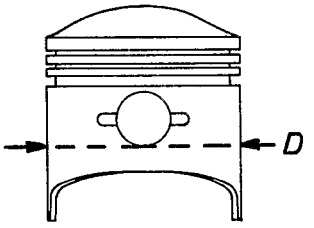
The cylinder is worn if this measurement is 0.08 mm more than the new size specifications. Ovality is checked by measuring in directions a and b. The difference between a and b may not be more than 0.04 mm.



D2 = Measuring point for piston ring end gap clearance

Rings slid in to height of cylinder base gasket.

Piston
D = Measuring point for wear



At height of lower edge of piston pin bore.

Caution
Replace pistons and cylinders if clearance exceeds 0.15 mm.

PISTON RING END GAP

Piston Ring	End Gap mm (new size)	End Gap mm (wear limit)
Compression ring, I and II	0.1 - 0.2	0.8
Oil scraper ring, III	0.15 - 0.3	1.0
Oil scraper ring, III, 3-piece "LS" ring (see checkpoint "D 2")	0.4 - 1.4	2.0

PISTON RING SIDE CLEARANCE

Piston Ring	SIDE Clearance in mm (new size)	SIDE Clearance in mm (wear limit)
Compression ring, I	0.070 - 0.102	0.2
Compression ring, II	0.040 - 0.072	0.2
Oil scraper ring, III	0.020 - 0.052	0.1

PISTON AND CYLINDER SIZES - 911 SC (from 1978 Model)
Mahle

Cylinder marking	Cylinder bore diameter mm	Piston diameter D mm
Standard size stamped		
0	95.000 - 95.007	94.965 - 94.975
1	95.007 - 95.014	94.972 - 94.982
2	95.014 - 95.021	94.979 - 94.989
3	95.021 - 95.028	94.986 - 94.996

Clearance between cylinder and piston: 0.025 - 0.042 mm

PISTON AND CYLINDER SIZES - 911 SC (from 1978 Model)
KS

Cylinder marking	Cylinder bore diameter mm	Piston diameter D mm
Standard size stamped		
0	95.000 - 95.007	94.963 - 94.977
1	95.007 - 95.014	94.970 - 94.984
2	95.014 - 95.021	94.977 - 94.991
3	95.021 - 95.028	94.984 - 94.998

Clearance between cylinder and piston: 0.023 - 0.044 mm

PISTON WEIGHT GROUPS - from 1980 Model

Installation Instructions:

1. Only pistons of one make and appropriate weight group may be used in one engine.

2. Piston pins must always remain with the corresponding pistons and should not be mixed up within an engine set. Watch this when disassembling and assembling an engine, marking parts if necessary.

Weight groups MAHLE Pistons

Pistons weighed with attachments (piston pins, piston rings, snap rings)

	Total Piston Weight in g Weight group within a set	Marking
Engine type	930/07	
Standard production	636 to 640	− −
	640 to 644	−
	644 to 648	+
Max. difference in weight 4 g	648 to 652	+ +
For installation	636 to 644	−− or −
Max. difference in weight 8 g	644 to 652	+ or ++

PISTON WEIGHT CLASSES - 911 SC from 1981 Models

Weight Classes MAHLE Pistons

Pistons weighed with attachments (piston pins, piston rings, snap rings)

	Total Piston Weight in g Weight Class Within a Set	Code
Engine type	930/16 (USA/Japan)	
Standard production	636 to 640	- -
	640 to 644	-
Max. difference in weight 4 g	644 to 648	+
	648 to 652	+ +
For Service Sector Max. difference in weight 8 g	636 to 644	- - or -
	644 to 652	+ or + +

Weight Classes KS Pistons

Pistons weighed with attachments (piston pins, piston rings, snap rings)

	Total Piston Weight in g Weight Class Within a Set	Code
Engine Type	930/16	
Standard Production	673 to 677	- -
	677 to 681	-
Max. difference in weight 4 g	681 to 685	+
	685 to 689	+ +
For Service Sector	673 to 681	- - or -
Max. difference in weight 8 g	681 to 689	+ or + +

MEASURING AND RECONDITIONING CRANKCASE

General

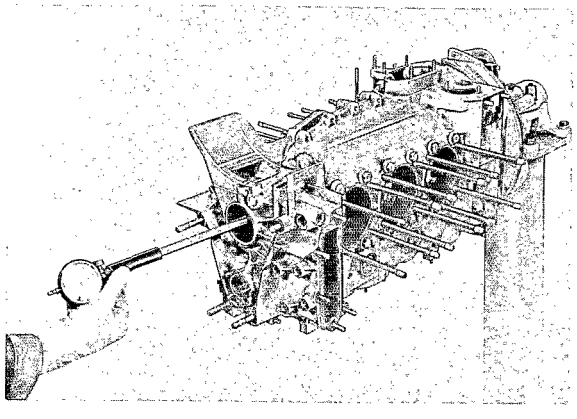
The main bearing bores must be measured whenever the crankcase is disassembled for repair. These instructions apply as well to all pre-1972 model engines.

Measuring

1. Attach crankcase half to bench mount and assemble both halves without the intermediate shaft.
   Lightly tighten all crankcase studs and two M8 retaining nuts at Bearing 1.

2. Align both crankcase halves with the aid of a plastic mallet. The joint in Bearing 8 must not be offset in relation to each half.

3. Using the inside micrometer, cross-check bore of Bearing 8. Realign bore if necessary.



4. Tighten all crankcase studs and both M8 nuts to proper torque.

5. Measure all 8 main bearing bores with the inside micrometer.

   If the bores are too tight, they should be reamed with the main bearing reamer to standard diameter of 62.000 mm.

   Bore diameter for main bearings 1 - 8 is 62.000 to 62.019 mm.

   If the bores are too large, they should be reamed to B-bearing oversize of 62.25 mm diameter.

   Control dimension for the B-bearing is 62.25 mm to 62.269 mm diameter.

Reconditioning

General

This procedure requires special tools and should only be performed by qualified personnel.

Light-alloy (SILUMIN) crankcases must be reamed in two steps when reaming to the B-bearing size. Lubricate reamer with cutting oil during this procedure.

1. Step 1 = 62.15 mm diameter
2. Step 2 = 62.25 mm diameter (B-bearing installation dimension)

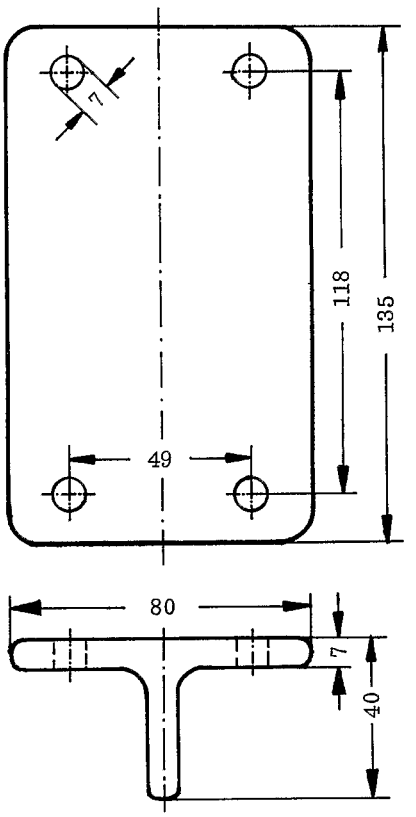
Pressure-cast crankcases can be cut in one step and without oil to 62.25 mm diameter.

Reaming

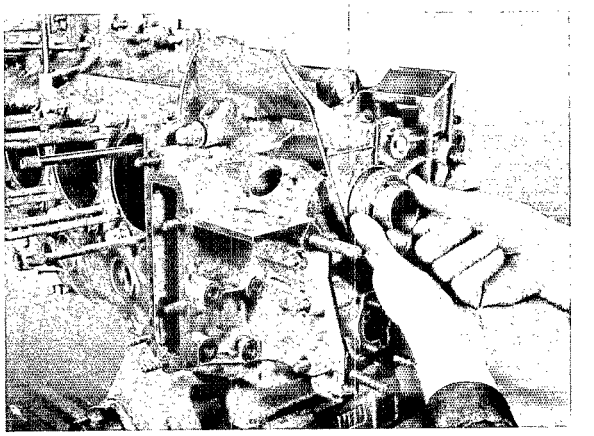
1. Attach self-made tool (see sketch below) to 4 oil screen attaching studs and fasten in bench vise.

Sketch for Self-Made Tool

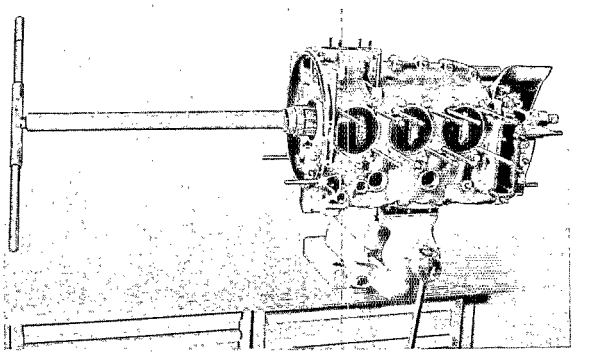
T-bar 40 x 80 x 7 mm
All edges beveled



2. Insert end bearing bushing EL35 in bore of Bearing 8.

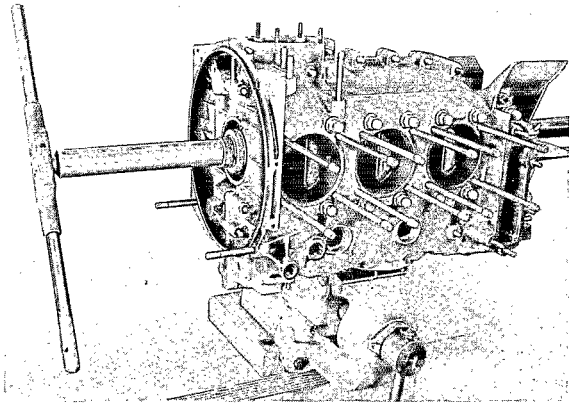


3. Insert rod (35 x 1200 mm) with main bearing reamer and ream Bearing 1 until Bearing 2 is guided (reamer centers automatically in bore of Bearing 1).



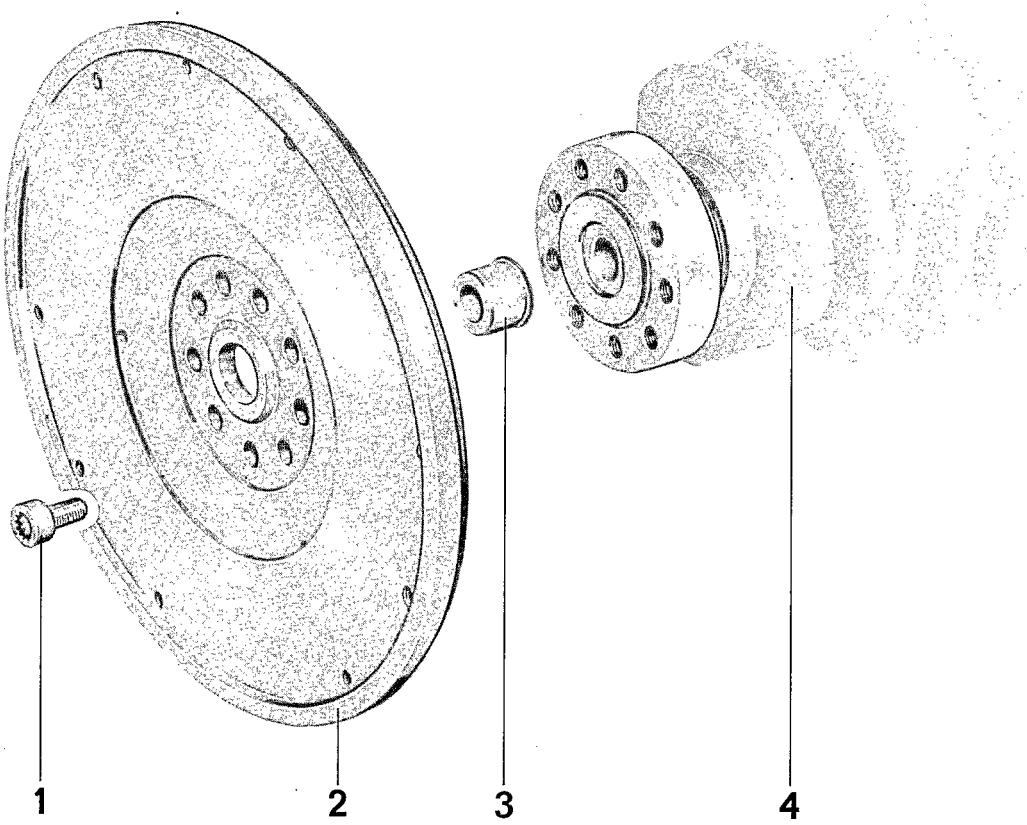
4. Insert end bearing bushing EL35 in bore of Bearing 1.

5. Ream all bearing bores until reamer reaches end bearing bushing of Bearing 8.



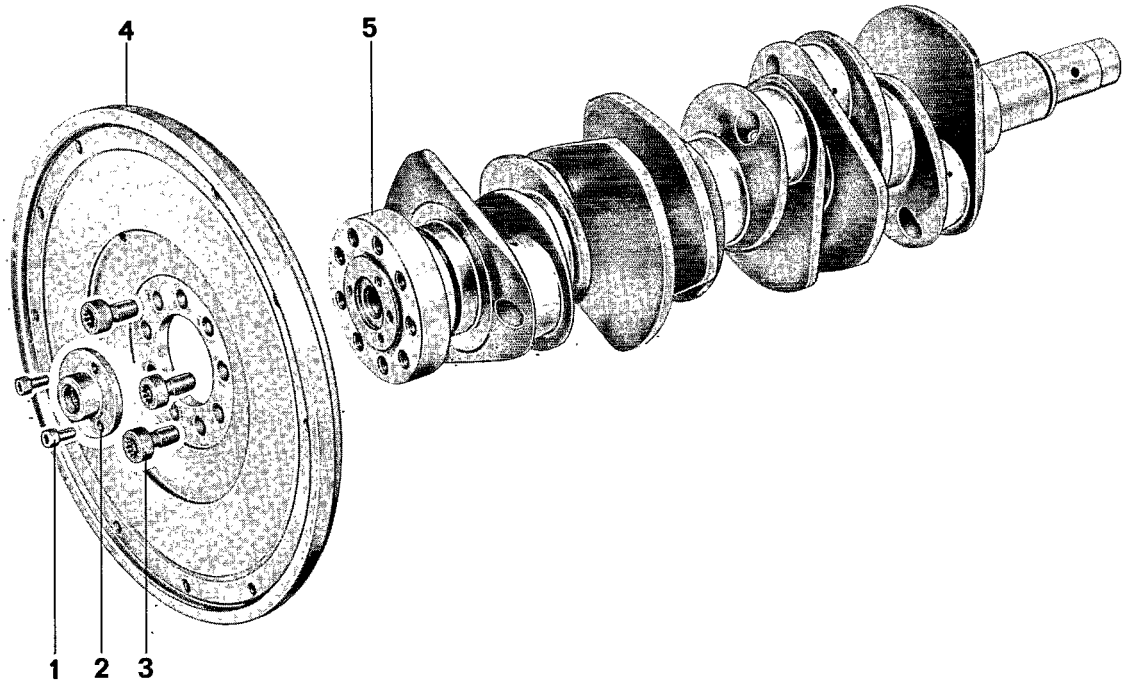
6. Remove-end-bearing bushing from bearing bore # 8 and fully ream Bearing 8.

MODIFIED FLYWHEEL INSTALLATION - 1978 MODELS



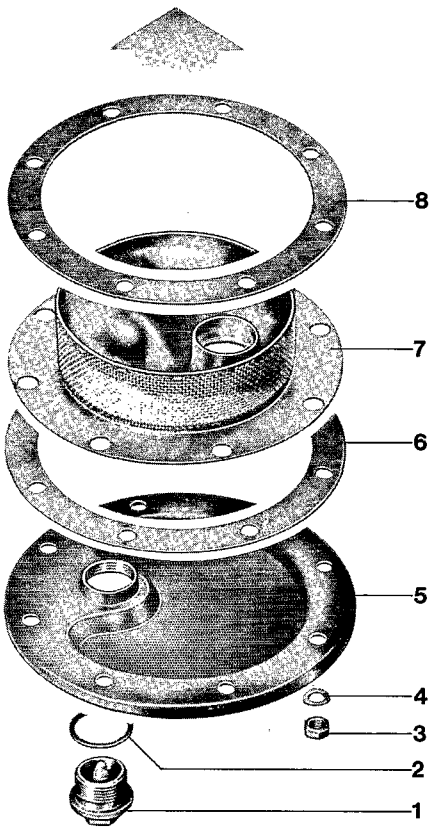
No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Socket head	9		Torque 9 mkg	
2	Flywheel	1			
3	Bushing	1			
4	Crankshaft	1			

FLYWHEEL WITH PILOT BEARING/BUSHING FOR INPUT SHAFT - from 1980 Model



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Screw M 6x12	3		Tighten to specified torque, lock with Loctite 270	
2	Bushing with needle bearing	1		First secure flywheel, then bushing	
3	Bolt	9		Tighten to specified torque	
4	Flywheel	1			
5	Crankshaft	1			

REMOVING AND INSTALLING OIL FILTER SCREEN AND SUCTION PLATE



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Oil drain plug	1			
2	Seal	1		Replace	
3	Nut	8		Tighten to about 10 Nm/ 7 ft lb	
4	Washer	8			
5	Cover for oil filter screen	1		Check for deformation, replacing if necessary. Watch installed position; oil drain plug must face in recess of suction plate	
6	Gasket	1		Replace	
7	Oil filter screen with suction plate	1			
8	Gasket	1		Replace	

ASSEMBLY INSTRUCTIONS

SEALING CRANKCASE MATING SURFACES

Note

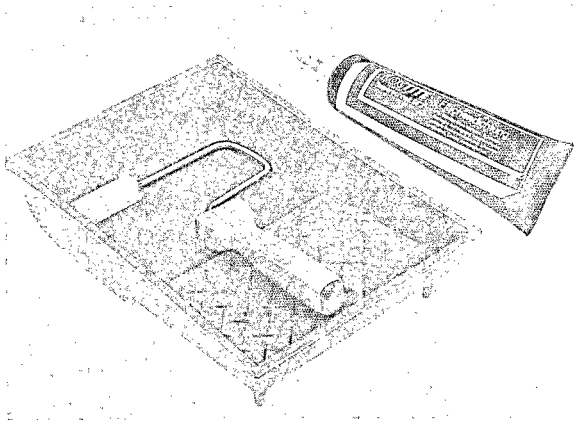
Only use Loctite No. 573 (green color) as a sealing compound.
Loctite No. 573 hardens only in conjunction with metal and exclusion of air. Never wait longer than about 10 minutes between applying coat of sealing compound and assembling parts, since the sealing compound applied directly on the metal would begin to harden.

Removing Old Sealing Compound

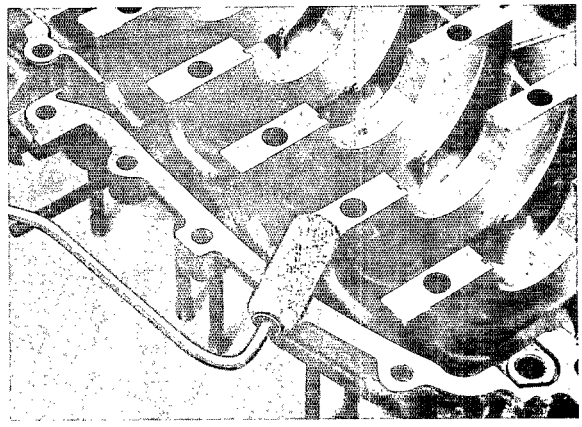
During repairs the old compound need not be removed. It is only necessary to remove grease from the surface and to apply a coat of new sealing compound after the grease removing solution has dried. The new Loctite will dissolve the old compound in the surface finish and harden again after assembly.
Should it be absolutely necessary to remove the old sealing compound, a fine steel brush is recommended for this work.

Applying Sealing Compound

1. When applying sealing compound by hand use a short-pile velour roller. In addition, a tray with a ribbed surface for scraping off the roller will be required for the sealing compound.

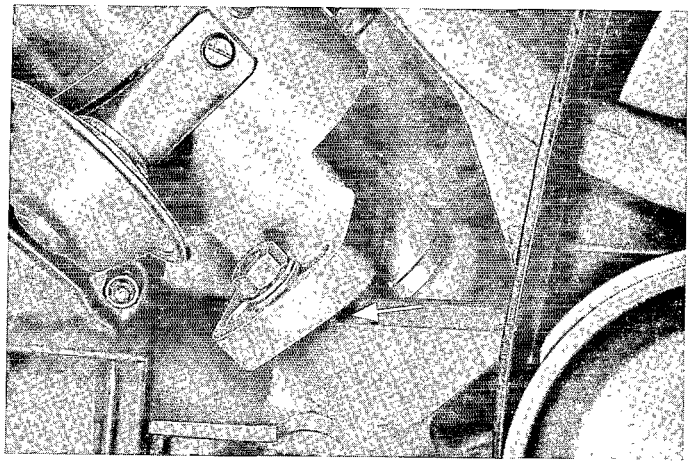


2. Apply a very thin coat of sealing compound with the velour roller.



CRANKCASE CHANGES - BEGINNING WITH 1972 MODELS

Distributor mounting flange.



CHANGED CRANKSHAFT - BEGINNING WITH 1972 MODELS

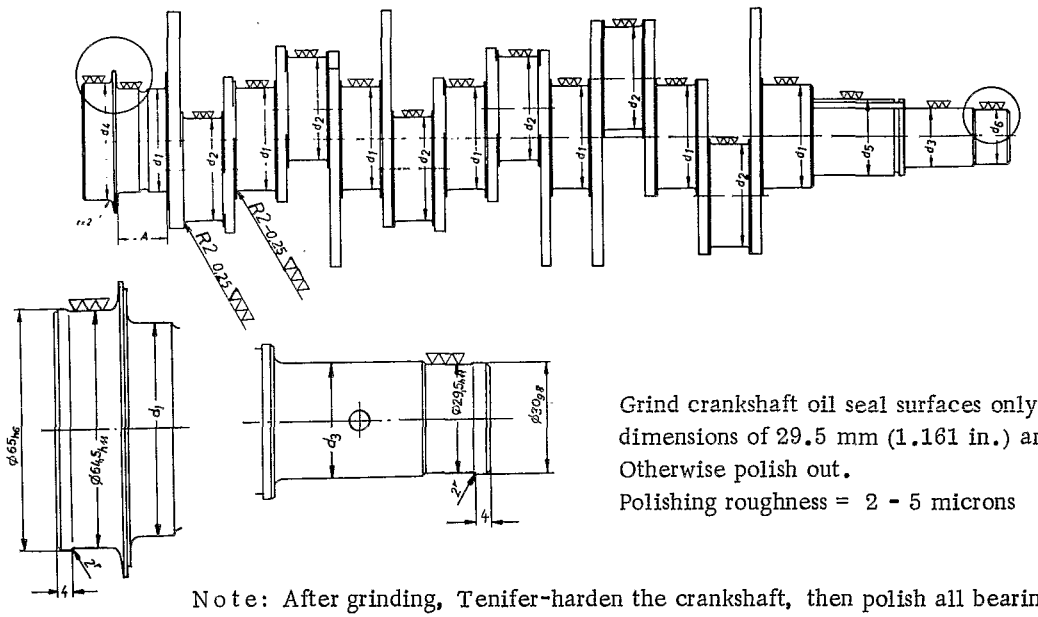
Stroke	=	70.4 mm
Crankpin diameter	=	51.990 - 51.971
Crankpin width	=	24 mm

Beginning with 1972 models, all crankshafts have counterweights.

See next page for crankshaft dimensions.

CRANKSHAFT DIMENSIONS - STANDARD AND RECONDITIONED

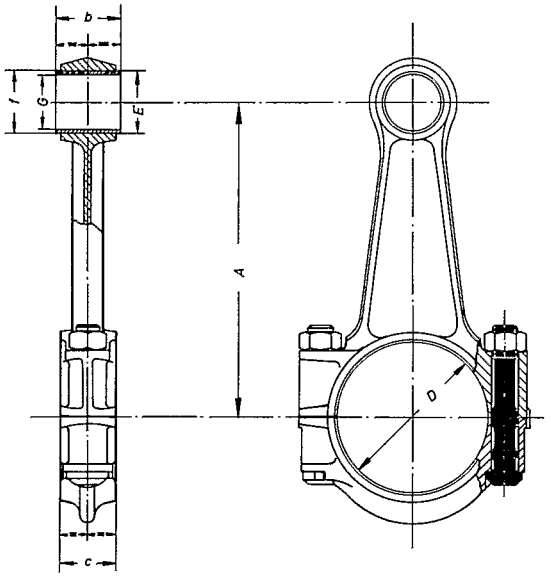
Step	Crankshaft diameter Bearings 1-8		All main bearings d 1	Connecting rod bearings d 2	Main bearing diameter d 3 on crankshaft Bearing 8	Shoulder diameter d 4	Timing gear seat diameter d 5	Crankshaft pulley seat diameter d 6	Thrust bearing Width A
Standard	Standard 62.000-62.019 mm (2.4409-2.4417 in.)	mm	56.990-56.971	51.990-51.971	30.993-30.980	65.000-64.981	42.013-42.002	29.993-29.960	28.000-28.06
		in.	(2.2437-2.2429)	(2.0468-2.0461)	(1.2202-1.2197)	(2.5591-2.5583)	(1.6541-1.6536)	(1.1808-1.1795)	(1.1024-1.1047)
-0.25 mm (-0.0098)		mm	56.740-56.721	51.740-51.721	30.743-30.730				
		in.	(2.2339-2.2331)	(2.0382-2.0363)	(1.2104-1.2098)				
-0.50 mm (-0.0197)	Oversize 62.269-62.250 mm (2.4515-2.4508 in.)	mm	56.490-56.471	51.490-51.471	30.493-30.480	64.500-64.310		29.500-29.370	
		in.	(2.2240-2.2233)	(2.0272-2.0264)	(1.2005-1.2000)	(2.5394-2.5319)		(1.1614-1.1563)	
-0.75 mm (-0.0295)		mm	56.240-56.221	51.240-51.221	30.243-30.230				
		in.	(2.2142-2.2134)	(2.0173-2.0166)	(1.1907-1.1902)				



Grind crankshaft oil seal surfaces only when deeply scored. Grind to dimensions of 29.5 mm (1.161 in.) and 64.5 mm (2.539 in.)
Otherwise polish out.
Polishing roughness = 2 - 5 microns

Note: After grinding, Tenifer-harden the crankshaft, then polish all bearing journals and thrust surface A. Magnaflux to check for cracks.
Maximum vertical runout = 0.04 mm (0.002 in.), measured at Bearing 4 and 8, with Bearing 1 and 7 on V-blocks.
Maximum crankshaft unbalance = 10 cmg. Journal 3 and 5 must not be straightened after the Tenifer treatment.

CONNECTING ROD CHANGES - BEGINNING WITH 1972 MODELS



A	Distance between centers	127.8 - 0.05 mm (5.03) - (0.002 in.)
b	Width of piston pin bushing	26.0 - 0.2 mm (1.02) - (0.008 in.)
c	Big end width	23.8 - 0.1 mm (0.9370) - (0.004 in.)
D	Big end diameter (without bearing insert)	56.019 - 56.000 mm (2.2055) - (2.2047 in.)
E	Small end diameter	25.021 - 25.000 mm (0.9851) - (0.9843 in.)
f	Piston pin bushing dia. (before installation)	25.035 - 25.055 mm (0.9856) - (0.9864 in.)
	(Press-fit interference in rod)	0.014 - 0.055 mm (0.0006) - (0.0022 in.)
G	Inside diameter of installed piston pin bushing (finished)	22.033 - 22.020 mm (0.8674) - (0.8669 in.)
	Piston pin clearance in bushing	0.020 - 0.039 mm (0.0008) - (0.0015 in.)
	Wear limit	0.055 (.0022)

CONNECTING ROD WEIGHT GROUPS

Connecting rods are assigned to weight groups.

The pertinent weight group can be identified in spare part end numbers.

The end number is stamped into connecting rods furnished as spare parts.

Weight more than grams	Weight up to grams	Weight group for KD	KD connecting rod spare part number	Identification in connecting rod
645	654	1	911.103.015.31	31
654	663	2	911.103.015.32	32
663	672	3	911.103.015.33	33
672	681	4	911.103.015.34	34
681	690	5	911.103.015.35	35
690	699	6	911.103.015.36	36
699	708	7	911.103.015.37	37
708	717	8	911.103.015.38	38
718	727	9	911.103.015.39	39

Weight variation between connecting rods in any engine may not exceed 9 g.

To determine weight group, weigh complete connecting rod without big end inserts.

CONNECTING ROD WEIGHT GROUPS - from 1978 Model

Connecting rods are in different weight groups.

The weight group is indicated by the final digit of the part number.

For connecting rods, which are supplied as spare parts, these final digits are stamped on the shank.

Weight above g	Weight to g	Weight group for installation	Service installation connecting rod Part No.	Connecting rod marking
633	642	1	930.103.015.51	51
642	651	2	930.103.015.52	52
651	660	3	930.103.015.53	53
660	669	4	930.103.015.54	54
669	678	5	930.103.015.55	55
678	687	6	930.103.015.56	56
687	696	7	930.103.015.57	57
696	705	8	930.103.015.58	58
705	714	9	930.103.015.59	59

Note

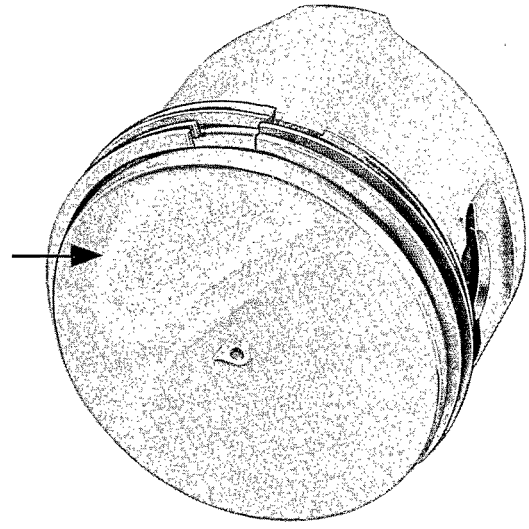
Only connecting rods, which do not differ in weight by more than 9 g, may be installed in one engine. To determine a weight group, weigh the complete connecting rod (without bearing shells).

PISTONS FOR K - JETRONIC ENGINES

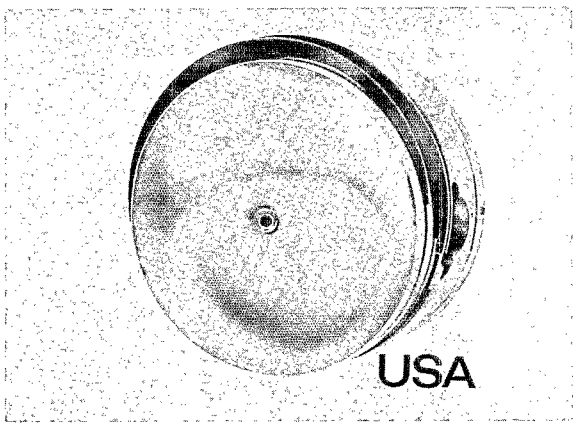
Pistons for K - Jetronic-equipped engines of Type 911/91 and 911/96 have a turbulence (whirl) cavity in the piston top. This provision ensures a particularly thorough blending of the fuel/air mixture.

Installation note:

The piston must always be installed so that the flat spot in the piston top faces upward (towards the intake valve).



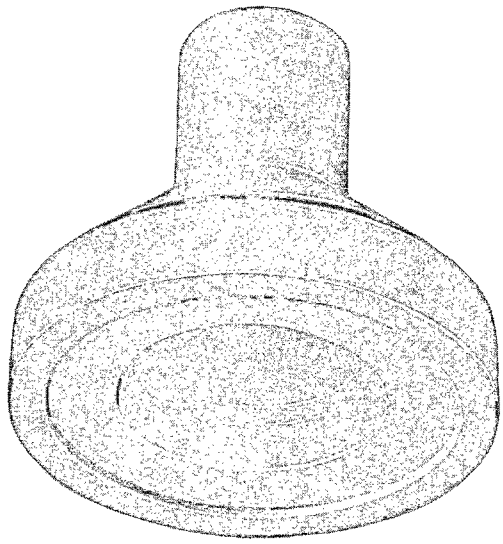
ASSEMBLY INSTRUCTIONS FOR PISTONS ON 911 SC (1981 Models)



Domed surface on piston must face intake valve.

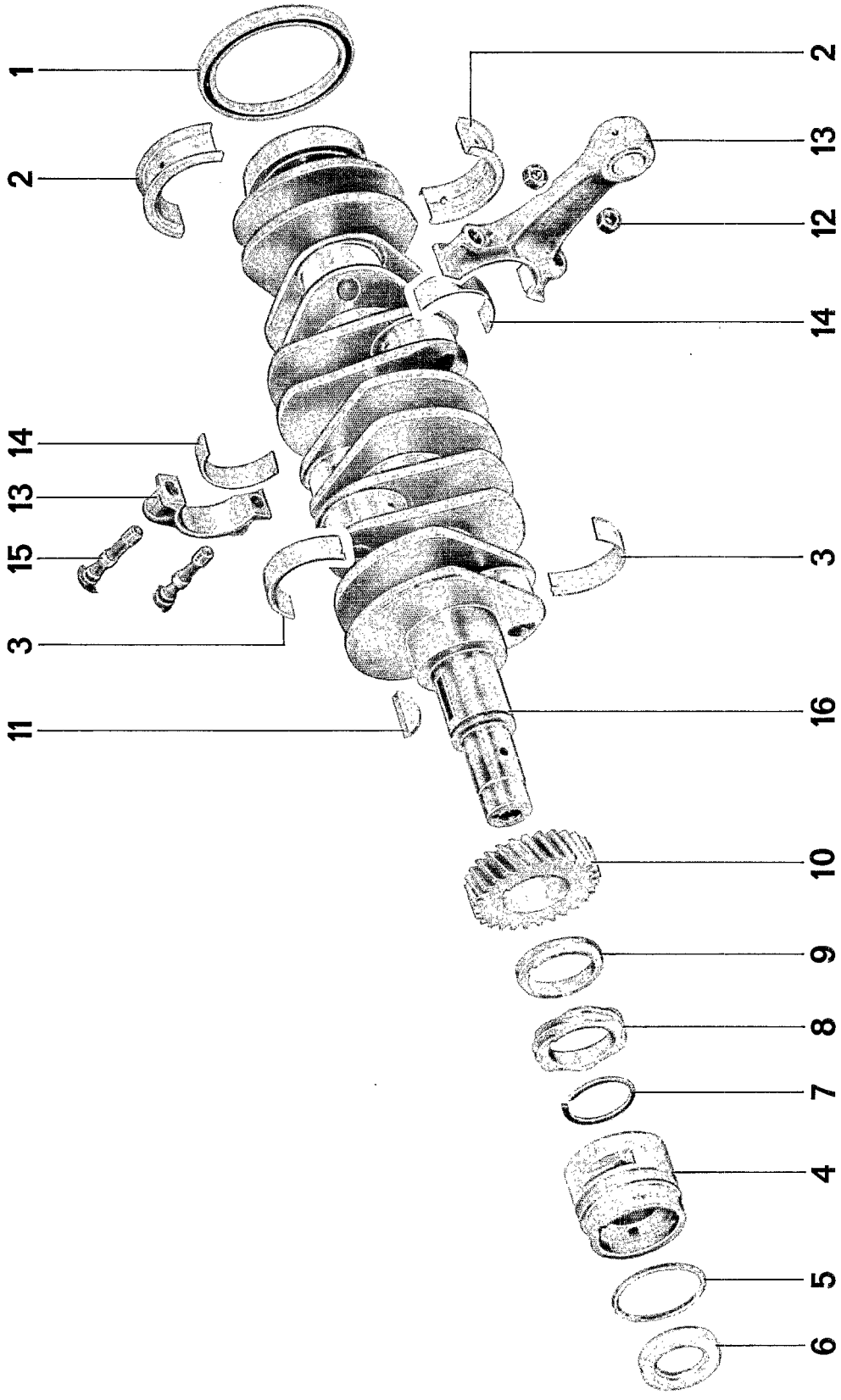
MODIFIED CRANKSHAFT DRIVE - 1978 MODELS

TOOLS



No.	Description	Special Tool	Note
1	Installer for crankshaft seal	9126	

MODIFIED CRANKSHAFT DRIVE - 1978 MODELS

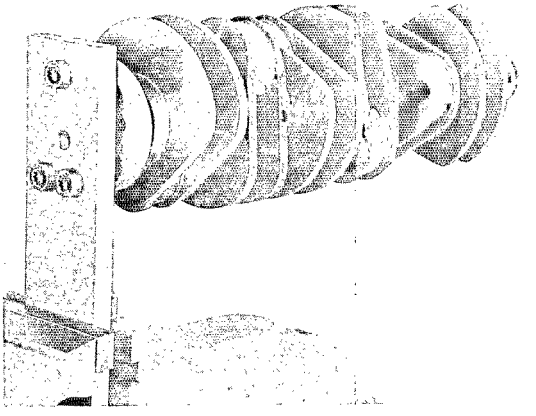


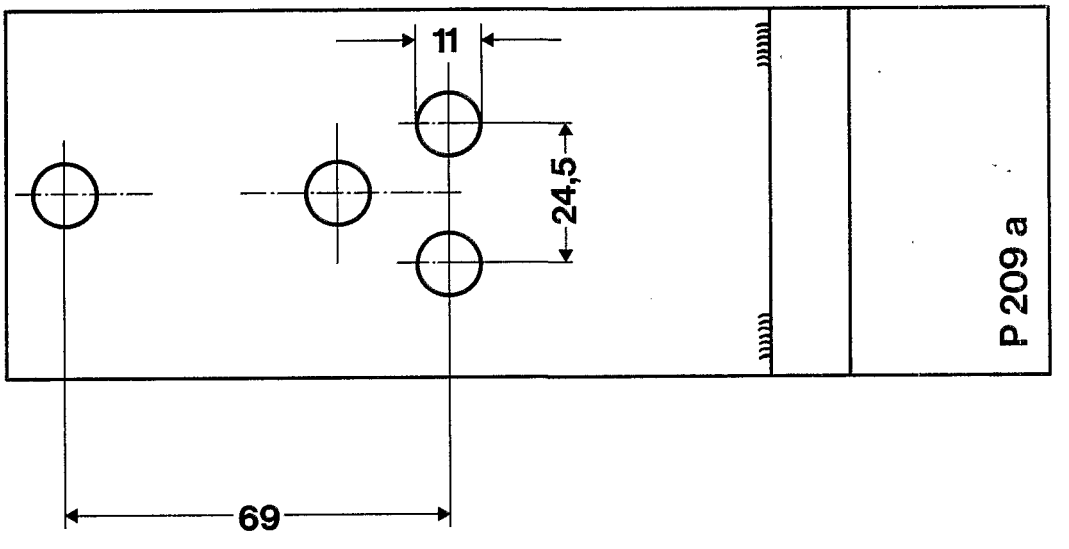
No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Oil seal	1		Replace	
2	Thrust main bearing shells 1	2	Check for wear	Lubricate	
3	Main bearing shells 2 - 7	12		Lubricate	
4	Bearing sleeve, bearing 8	1		Lubricate	
5	O-ring	1		Replace	
6	Oil seal	1		Replace	
7	Circlip	1			
8	Drive gear for distributor	1			
9	Spacer	1		Note installed position	
10	Timing gear	1			
11	Woodruff key	1			
12	Connecting rod nut	12		Tighten to specified torque. Lubricate bearing surface.	
13	Connecting rod	6		Note installed position and weight	
14	Connecting rod bearing shell	12	Check for wear	Lubricate	
15	Connecting rod bolt	12			
16	Crankshaft	1	Check for wear		

INSTALLATION INSTRUCTIONS FOR MODIFIED CRANKSHAFT DRIVE - 1978 MODELS

Clamping Crankshaft

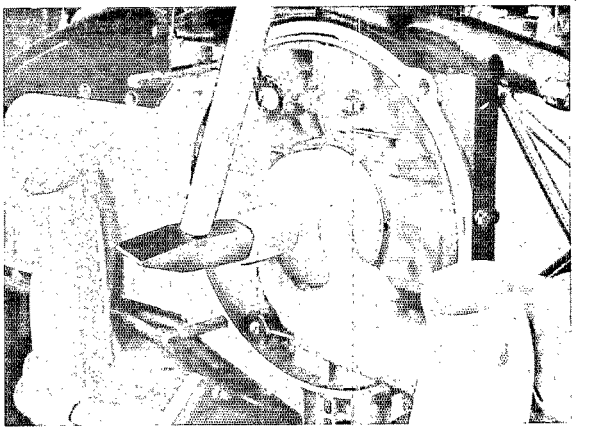
Special Tool P 209 a must be modified for new crankshaft.





Installing Seal

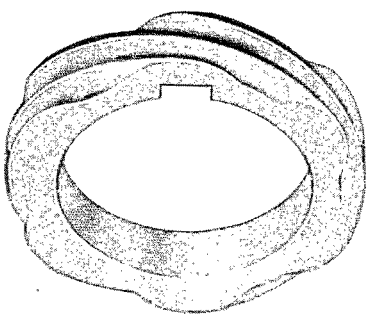
Drive in seal with Special Tool 9126.



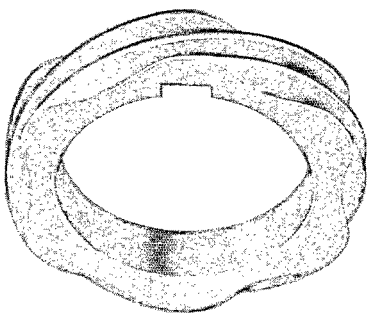
Installing Crankshaft Drive Gear for Counterclockwise Rotating Distributor

Note

As of the 1978 model year, the engines are equipped with a counterclockwise rotating distributor. Therefore a new crankshaft drive gear with modified teeth is required.



For counterclockwise rotating distributor (with Porsche emblem)



For clockwise rotating distributor (with VW emblem)

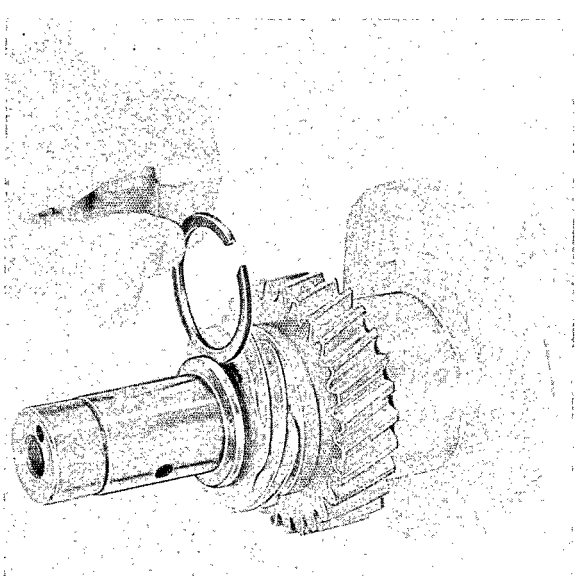
Installing Circlip on Crankshaft

Circlips are available in various thicknesses to take up axial play between distributor and drive gear.

The following circlips are available:

Part No.	Thickness mm	Code
901.102.148.00	2.4	0
901.102.148.01	2.3	1
901.102.148.02	2.2	2
901.102.148.03	2,1	3

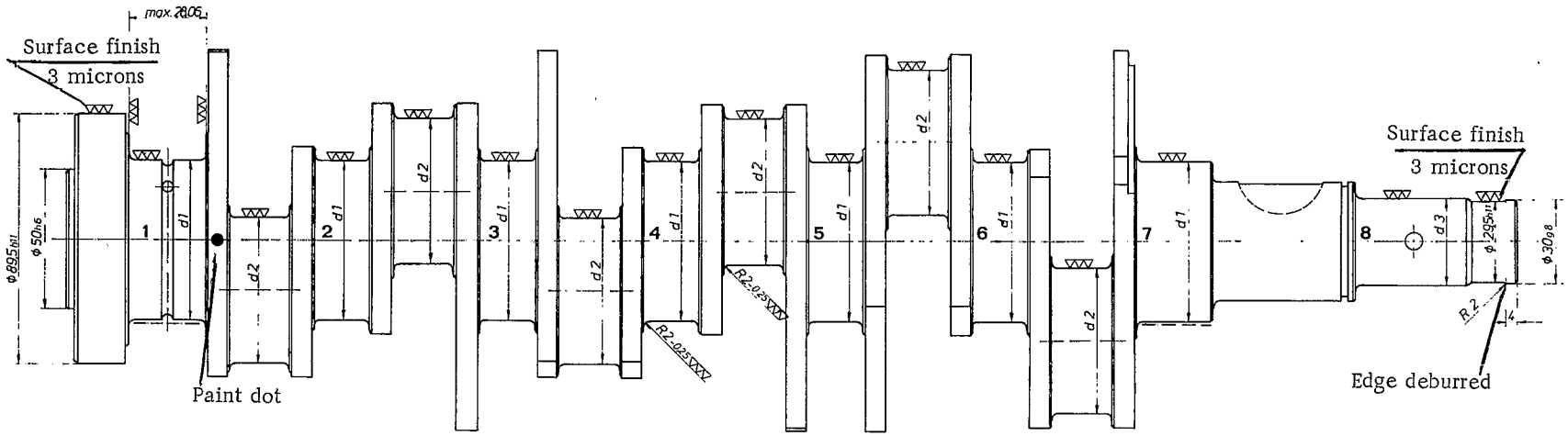
Install timing gear, spacer and drive gear for counterclockwise rotating distributor on crankshaft up to stop. Select proper circlip by first inserting it to check its thickness. Circlip must take up play.



CRANKSHAFT - Standard and Undersizes

(1978 Models)

Size mm	Crankcase bore dia. bearings 1-8	All main bearing journals d 1	Connecting rod bearing journals d 2	Main bearing journal d 3 of crankshaft bearing 8	Oil seal journal dia. d 4	Seat for timing gear dia. d 5	Crankshaft pulley seat dia. d 6	Thrust bearing width A
Standard	Standard 65.000...65.019 Oversize 65.250...65.269	59.971...59.990	52.971...52.990	30.980...30.993	89.780...90.000	42.002...42.013	29.960...29.993	28.000...28.060
- 0.25		59.721...59.740	52.721...52.740	30.730...30.743				
- 0.50		59.471...59.490	52.471...52.490	30.480...30.493	89.280...89.500		29.370...29.500	
- 0.75		59.221...59.240	52.221...52.240	30.230...30.243				
- 1.00		58.971...58.990	51.971...51.990	29.980...29.993				



Grind crankshaft oil seal surfaces only when deeply scored. Grind to dimensions of 29,5 mm and 89.5 mm respectively. Otherwise polish out to 3 microns.

After grinding, chamfer oil holes to 0,5 mm radius. Break all sharp edges to 0.2 - 0.5 mm radius. Maximum radial runout measured at bearings 1 and 7 is 0.04 mm.

Tenifer treat crankshaft after grinding. Magnaflux to check for cracks.

Do not straighten main bearing journals 3 and 5 after Tenifer treatment. All other main bearing journals can be straightened by applying pressure to the bearing journal webs.

Undersize color codes

1st undersize	blue paint dot
2nd undersize	green paint dot
3rd undersize	yellow paint dot
4th undersize	white paint dot

CLUTCH CHANGES - BEGINNING WITH 1972 MODELS

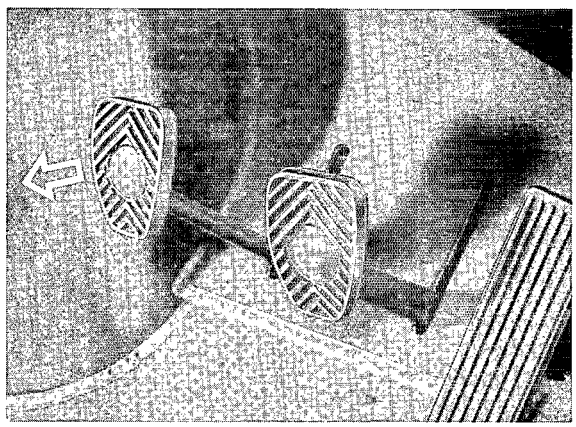
1. Clutch operating system has been redesigned. The throw-out fork and clutch lever are mounted and secured with lock rings on a shaft which is splined on both ends and located in the transmission housing. The clutch lever is now pulled by the clutch cable instead of the cable housing.

2. Pressure of the pressure plate (MFZ 225 KL) has been increased to a range of 650-720 kp (1430-1584 lbs.)

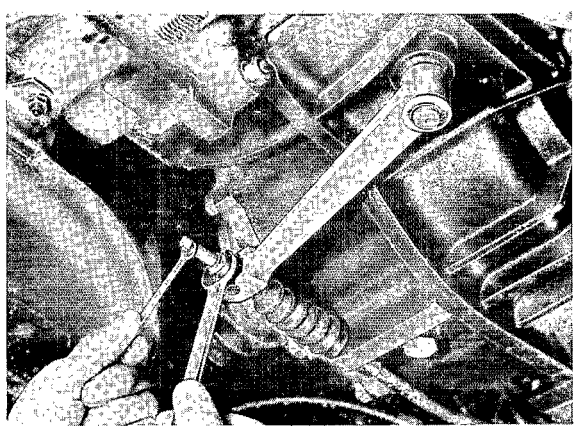
3. Clutch disc splines have been changed from 24 to 20 (an SAE designation).

ADJUSTING CLUTCH

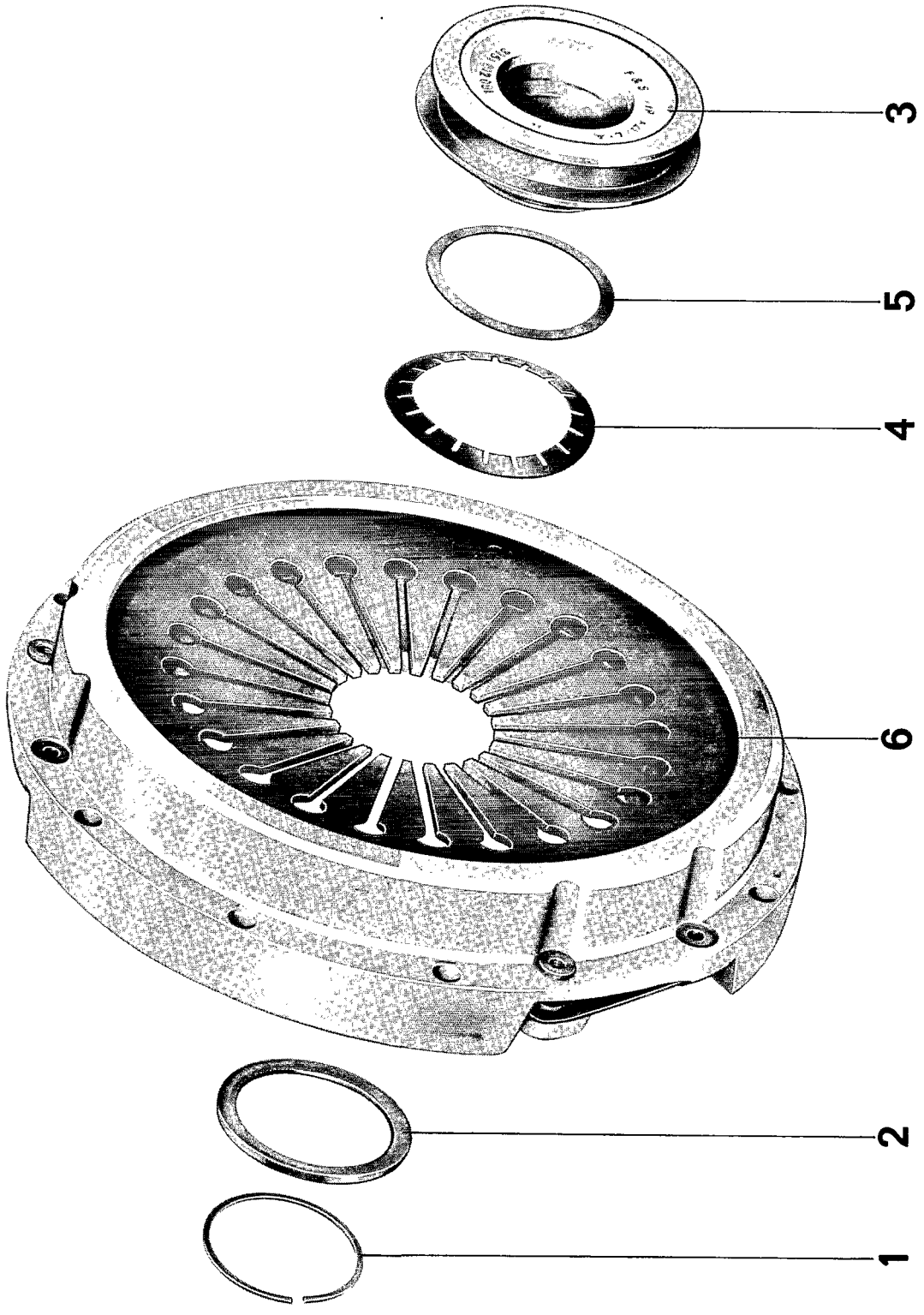
1. Turn self-locking adjusting nut until clutch pedal free travel is 20 - 25 mm (0.8 - 1.0 in.).



2. When checking, pull pedal in direction of arrow.



REMOVING AND INSTALLING THROWOUT BEARING

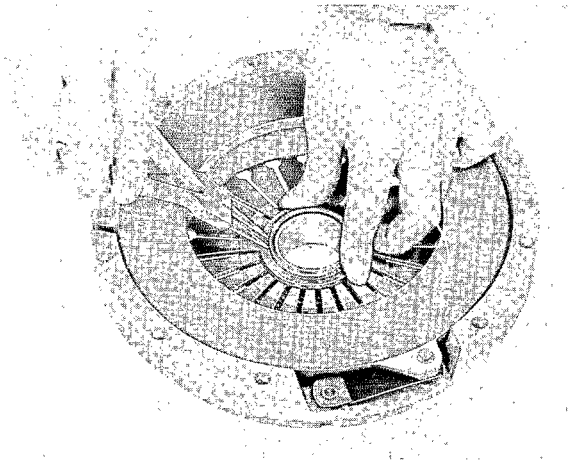


No.	Description	Qty	Note when removing	Note when installing	References
1	Snap ring	1	Remove with snap ring pliers while pushing pressure plate down.	Check for proper seating.	9.1-2/3
2	Thrust washer	1		Groove must face the snap ring.	9.1-2/3
3	Throwout bearing	1		Should not be washed, only wiped with dry rag. Grease guide tube contacting surface with multi-purpose grease with MoS_2 additive.	
4	Spring washer	1		Install in correct position.	9.1-2/3
5	Spacer	1			
6	Pressure plate	1		Check for wear and replace if necessary.	

INSTRUCTIONS FOR REMOVAL AND INSTALLATION

Removal

1. Lay the pressure plate onto the throwout bearing and push down by pressing against the thrust washer so that the snap ring can be reached.

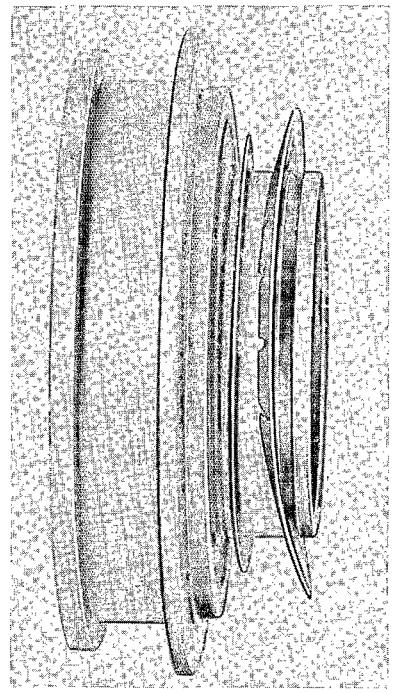


2. Remove snap ring with snap ring pliers and take the throwout bearing out together with the washers.

NOTE:
Throwout bearings are packed with special grease and therefore may not be washed.

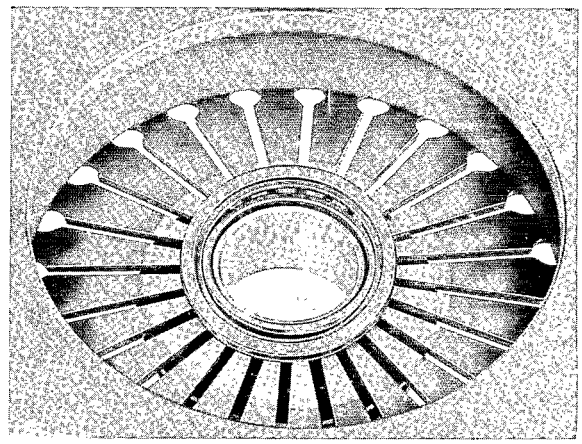
Installation

1. Place spacer and spring washer on the throwout bearing in proper position.



2. Insert the throwout bearing into the diaphragm spring of the pressure plate.

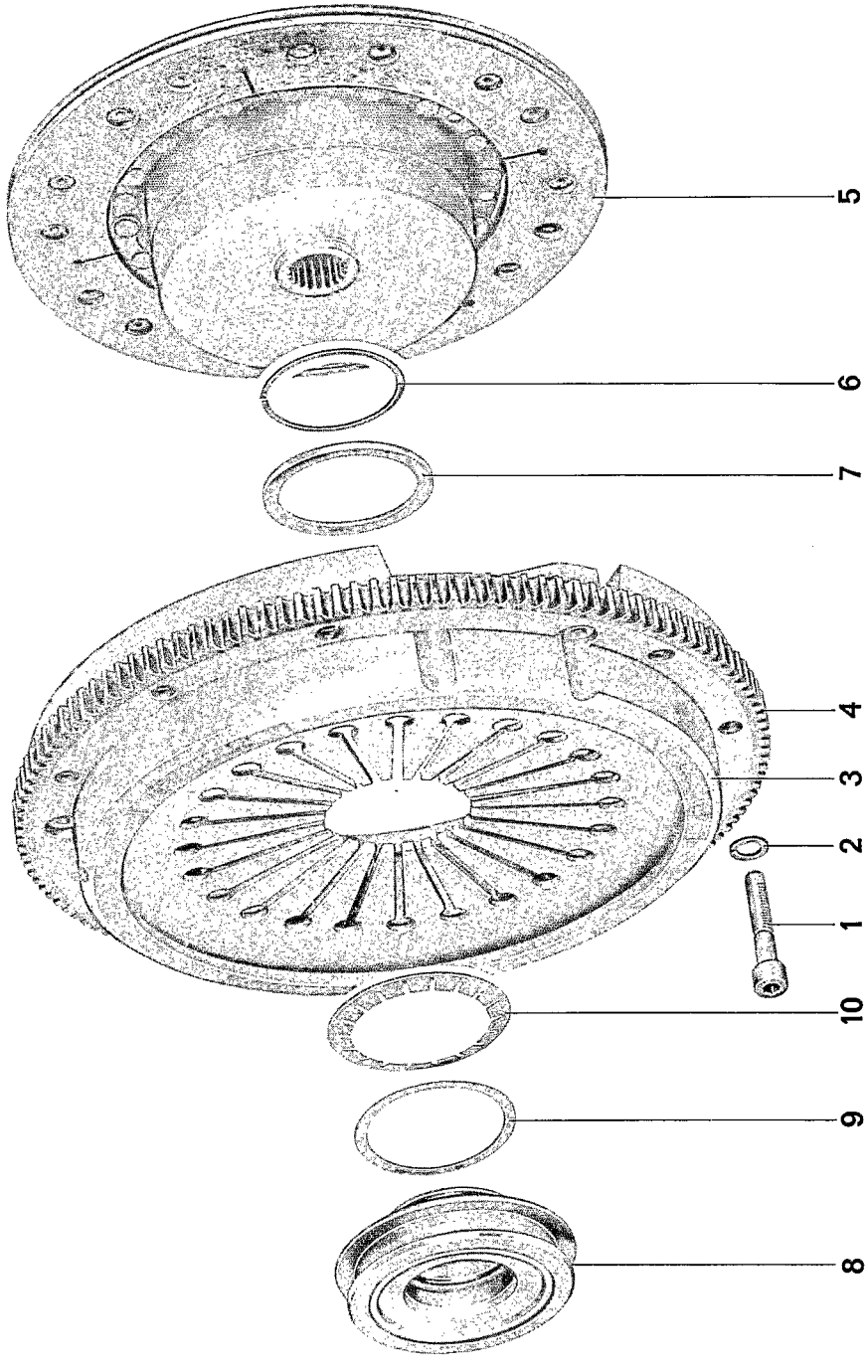
3. Install thrust washer with the groove facing the snap ring and install snap ring while pushing the pressure plate and thrust washer downward.



CLUTCH - 1975 MODELS

	911 S and Carrera
Pressure plate	MFZ 225 KSph
Pressure	714 - 785 kp
Spring No.	3027 056 000
Part No.	915.116.001.14
Drive shell	---
Part No.	915.116.011.013

CLUTCH MODIFICATIONS - 1978 MODELS



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Socket head screw	9			
2	Lock washer	9		Replace	
3	Pressure plate	1			
4	Starter gear ring	1			
5	Clutch disc	1			
6	Circlip	1			
7	Thrust washer	1			
8	Release bearing	1	Check		
9	Washer	1			
10	Spring washer	1		Install in correct position	

Kraftstoffanlage
Fuel System
Système d'alimentation
Sistema d'alimentazione

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.1 Description

Fuel system changes - 1972 model	0.1 - 1/1
Fuel injection pump changes - 1972 model	0.1 - 1/1
Throttle valve housing and intake manifold changes	0.1 - 1/3
Cold start enrichment system changes	0.1 - 1/3
Fuel injection system, schematic	0.1 - 1/4
Induction air preheating - 1972 model	0.1 - 2/1
Continuous injection system (CIS)	0.1 - 3/1
Engine cross section - 1974 model	0.1 - 3/11
Continuous injection system (CIS) - 1974 model	0.1 - 4/1
Fuel evaporative control system	0.1 - 5/1

1 - SYSTEM CHECKOUT

1.1 Continuous injection system (CIS)

General checkout procedure	1.1 - 1/1
Visual inspection	1.1 - 1/2
Initial checks	1.1 - 1/4
Pressure tests	1.1 - 1/6
Leakage checks	1.1 - 1/10
Injection valve, checking	1.1 - 1/11
Auxiliary air device, checking	1.1 - 1/12
CIS testing and adjustment specifications - 1974/75 models	1.1 - 1/13
CIS testing and adjusting specifications - 1976/77 models	1.1 - 1/14 a
CIS testing and adjusting specifications - 1978/79 models	1.1 - 1/14 c
CIS testing and adjusting specifications - 1980 model	1.1 - 1/14 d
Testing and adjusting values - 911 SC (1981 models with Oxygen Sensor Control)	1.1 - 1/14 e
Control pressure regulator (vacuum-controlled), checking	1.1 - 1/15
"Cold" control pressure (vacuum-controlled control pressure regulator), checking	1.1 - 1/16 a
Auxiliary air valve, checking	1.1 - 1/17
Safety switch, checking	1.1 - 1/18
CIS problems and remedies	1.1 - 2/1
Automatic choke, troubleshooting - 1976 model	1.1 - 2/3
Thermovalve, checking	1.1 - 1/19
Vacuum system layout - 1978 model	1.1 - 3/1

Vacuum hose layout - 1979 model 1.1 - 4/1

Fuel and vacuum lines layout - 1980 model 1.1 - 4/3

2 - SERVICING

2.1 Servicing information

Regulator housing, removing and installing 2.1 - 1/1

Induction air preheating system, checking 2.1 - 1/1

Fresh air flap, adjusting 2.1 - 1/2

Fresh air flap lever, replacing 2.1 - 1/3

Hose clamps for cold start enrichment, installing 2.1 - 1/4

Fuel injection nozzles, checking 2.1 - 1/5

2.2 Servicing continuous injection system (CIS)

CIS, disassembling and assembling 2.2 - 1/1

Mixture control unit, removing and installing 2.2 - 1/7

Throttle valve housing with control pressure regulator (throttle valve position), removing and installing 2.2 - 1/8

Control pressure regulator (warm running compensation), removing and installing 2.2 - 1/9

Start (enrichment) valve, removing and installing 2.2 - 1/10

Fuel filter, removing and installing 2.2 - 1/11

Fuel pressure accumulator, removing and installing 2.2 - 1/12

Injection valves, removing and installing 2.2 - 1/13

Plastic fuel lines, replacing 2.2 - 1/15

Fuel line system, bleeding 2.2 - 1/17

Mixture control unit, dismantling and assembling 2.2 - 2/1

Sensor plate, removing and installing 2.2 - 2/4

Air flow sensor housing, locating operating lever with follower 2.2 -2/6

Mixture control screw basic adjustment after replacement of follower 2.2 - 2/7

Fuel distributor pressure relief valve piston seal, replacing 2.2 - 2/8

Vacuum controlled (warm-up) control pressure regulator, removing and installing 2.2 - 2/9

Auxiliary air valve, removing and installing 2.2 - 3/1

Mixture control unit, disassembling and assembling - modifications from April 1976 2.2 - 2/8 a

Thermovalve, removing and installing 2.2 - 3/2

Diverter valve, removing and installing 2.2 - 3/3

2.3 Fuel tank

Fuel tank plug with CIS filter, cleaning 2.3 - 1/1

Fuel tank (80 liter), removing and installing - 1974 model 2.3 - 1/3

2.4 Fuel pump

Fuel pump, removing and installing - 1976 model 2.4 - 1/1

Layout drawing of Check valves on fuel pumps 2.4 - 1/3

Replacing check valve 2.4 - 1/4

2.5 Oxygen sensor

Oxygen sensor, removing and installing 2.5 - 1/1

Oxygen sensor control unit, removing and installing 2.5 - 1/3

Frequency valve for oxygen sensor, checking 2.5 - 1/4

Throttle valve switch, checking and adjusting 2.5 - 1/5

Removing and installing microswitch for acceleration enrichment of Oxygen Sensor control (from 1981 models) 2.5 - 1/7

Correcting CO level setting on mixture control unit - (from 1981 models) with shear-off screw 2.5 - 1/8

3 - ADJUSTMENT INSTRUCTIONS

3.1 Adjustment instructions for fuel injection system

Fuel injection pump, adjusting with emission tester 3.1 - 1/1

Idle, adjusting 3.1 - 1/2

Microswitch, adjusting - 1972 model 3.1 - 1/4

3.2 CIS adjustment instructions

Idle, adjusting 3.2 - 1/1

Full power position of throttle, adjusting 3.2 - 1/3

Microswitch, adjusting 3.2 - 1/4

Control pressure regulator (throttle valve position), checking and adjusting 3.2 - 1/5

Hand throttle, adjusting 3.2 - 1/6

Idle, adjusting - 1978 model 3.2 - 1/7

Idle, adjusting - 1980 model 3.2 - 1/11

Adjusting idle 911 SC - (from 1981 models) 3.2 - 1/14

FUEL INJECTION PUMP CHANGES - BEGINNING WITH 1972 MODELS

The 2,4 liter engines are equipped with changed injection pumps. The changes consist of a wider contoured cam and modified centrifugal weights and springs.

Pump designation (BOSCH number on data plate):

911 T = 0408 126015

911 E = 0408 126014

911 S = 0408 126013

CHANGES IN THROTTLE VALVE HOUSINGS AND INTAKE MANIFOLDS

Beginning with the 1972 models, throttle valve stops in the throttle valve housing are relocated to the lever side. The new levers require the use of modified protractors, special tool P 228 c.

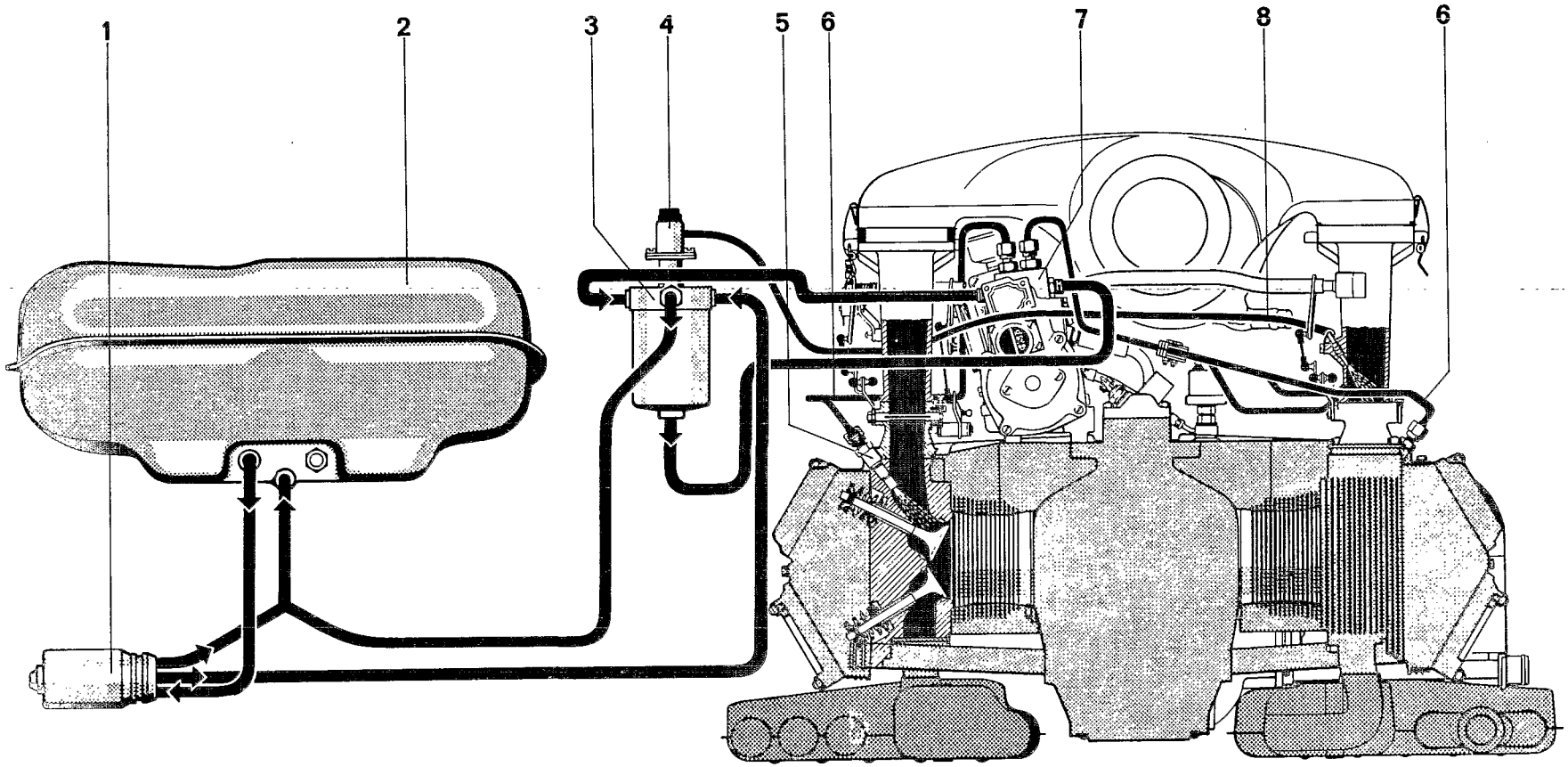
The protractor on the injection pump control lever has not been changed. The correlation checkout procedure remains same (see page SF 22).

The intake velocity stacks are made of plastic. They form a single unit together with the lower air assembly.

COLD START ENRICHMENT SYSTEM CHANGES

Fuel for cold start enrichment now is fed directly into each individual velocity stack.
The discharge nozzles are bonded and can not be exchanged.

SCHEMATIC VIEW OF THE PORSCHE FUEL INJECTION SYSTEM



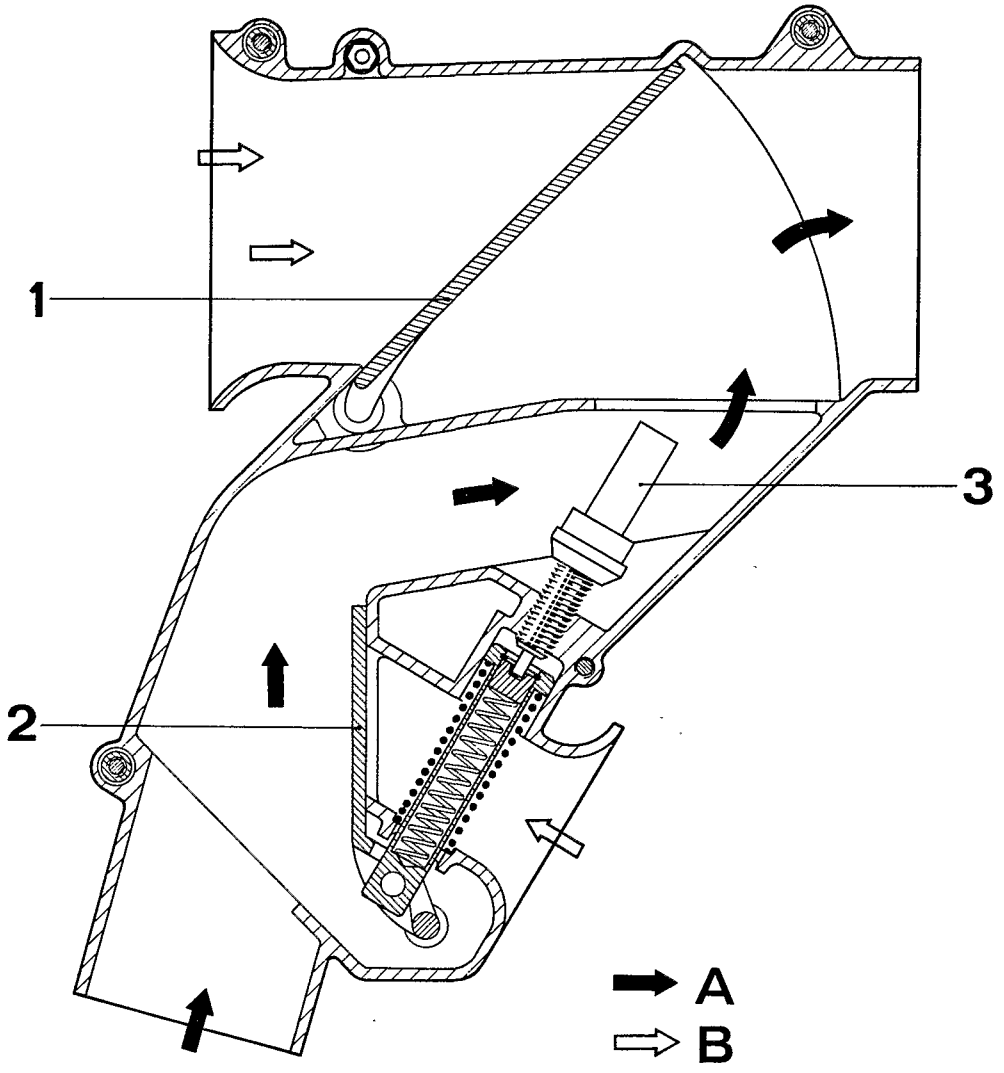
1 Fuel pump
2 Fuel tank
3 Fuel filter
4 Cold start enrichment solenoid
5 Injection valve(nozzle)
6 Injection line
7 Injection pump
8 Cold start enrichment hose

INDUCTION AIR PREHEATING - BEGINNING WITH 1972 MODELS

General Information

Beginning with the 1972 models, all 2.4 liter fuel injection engines are equipped with an induction air preheating system.

Induction air preheating provides even induction air temperatures in lower engine speed ranges resulting in improved performance, as well as lower exhaust emission values.



1 = Fresh air flap

2 = Hot air flap

3 = Thermostat

A = Hot air

B = Fresh air

Design

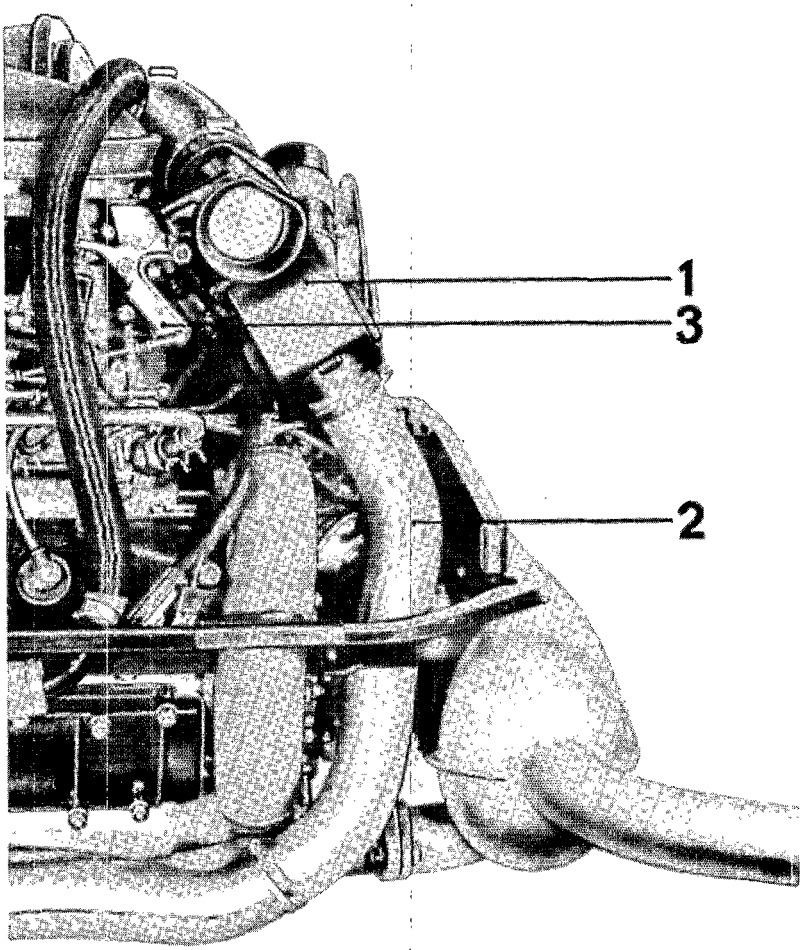
The induction air preheating system consists of:

1. A regulator housing which is attached to the left velocity stack by three 6 mm bolts. It contains two flaps and a thermostat.

   On of the flaps (the fresh air flap) is controlled by the throttle linkage. The other flap (hot air flap) is controlled by the thermostat.

2. A hose which feeds heated air from the left heat exchange.

3. A cam on the left throttle valve lever which controls the fresh air flap.



1 Control box
2 Hot air supply duct
3 Control lever

Function

A thermostat-controlled hot air flap maintains induction air temperature at 45°C (112°F). A second flap stops the flow of hot air from throttle valve position of about 20° and engine draws only fresh outside air at wide open throttle.

Engine started, cold (below 45°C (112°F)

Throttle at idle position (fresh air flap closed)

Hot air flap open, engine draws hot air from heat exchanger.

Engine cold (below 45°C (112°F) - throttle in partial load position

Hot air flap open. It opens according to position of cam. Fresh outside air is added.

Fresh air flap is fully open in full throttle position.

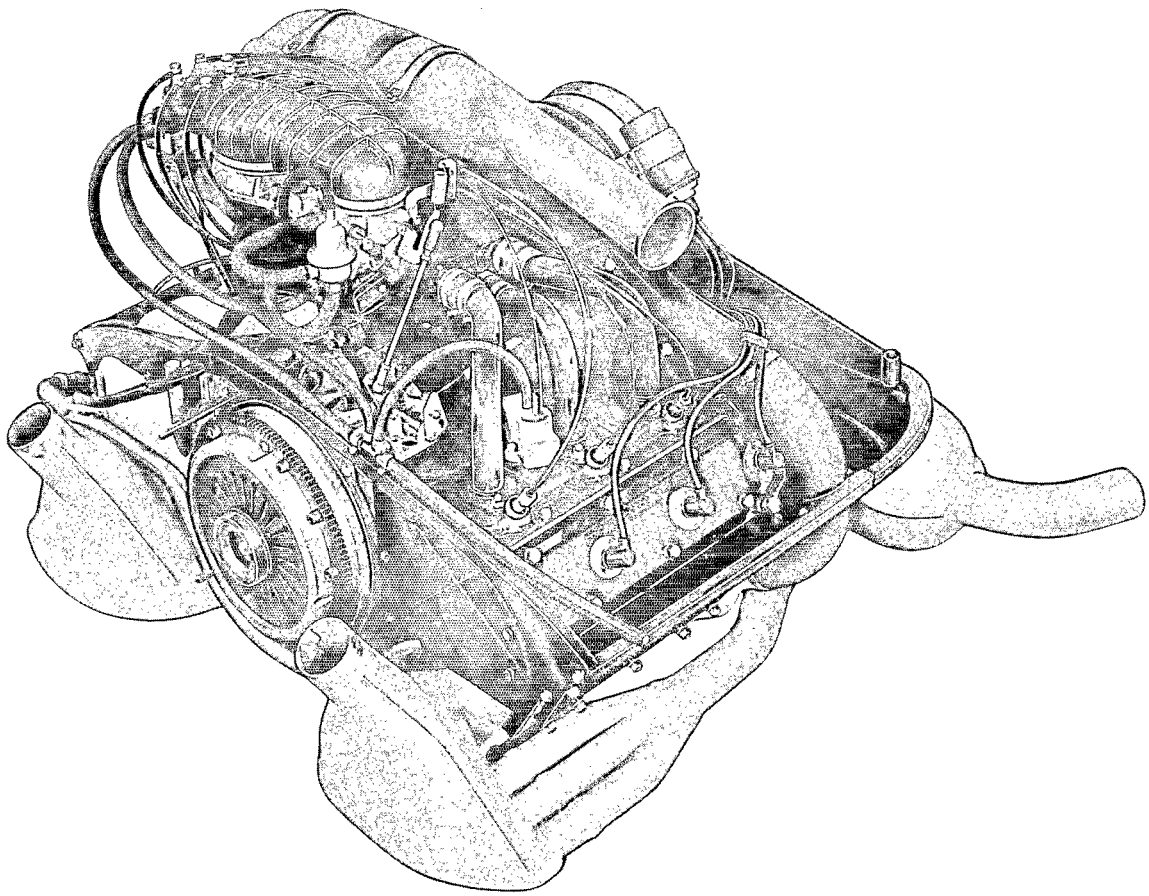
Air temperature rises to 45-50°C (112°F - 122°F)

Thermostat begins to close hot air flap at 45°C (112°F). It is fully closed at 50°C (122°F) and engine draws only fresh outside air.

A bypass duct, closed by the hot air flap when cold, feeds additional air with increasing temperatures.

CONTINUOUS INJECTION SYSTEM (CIS)

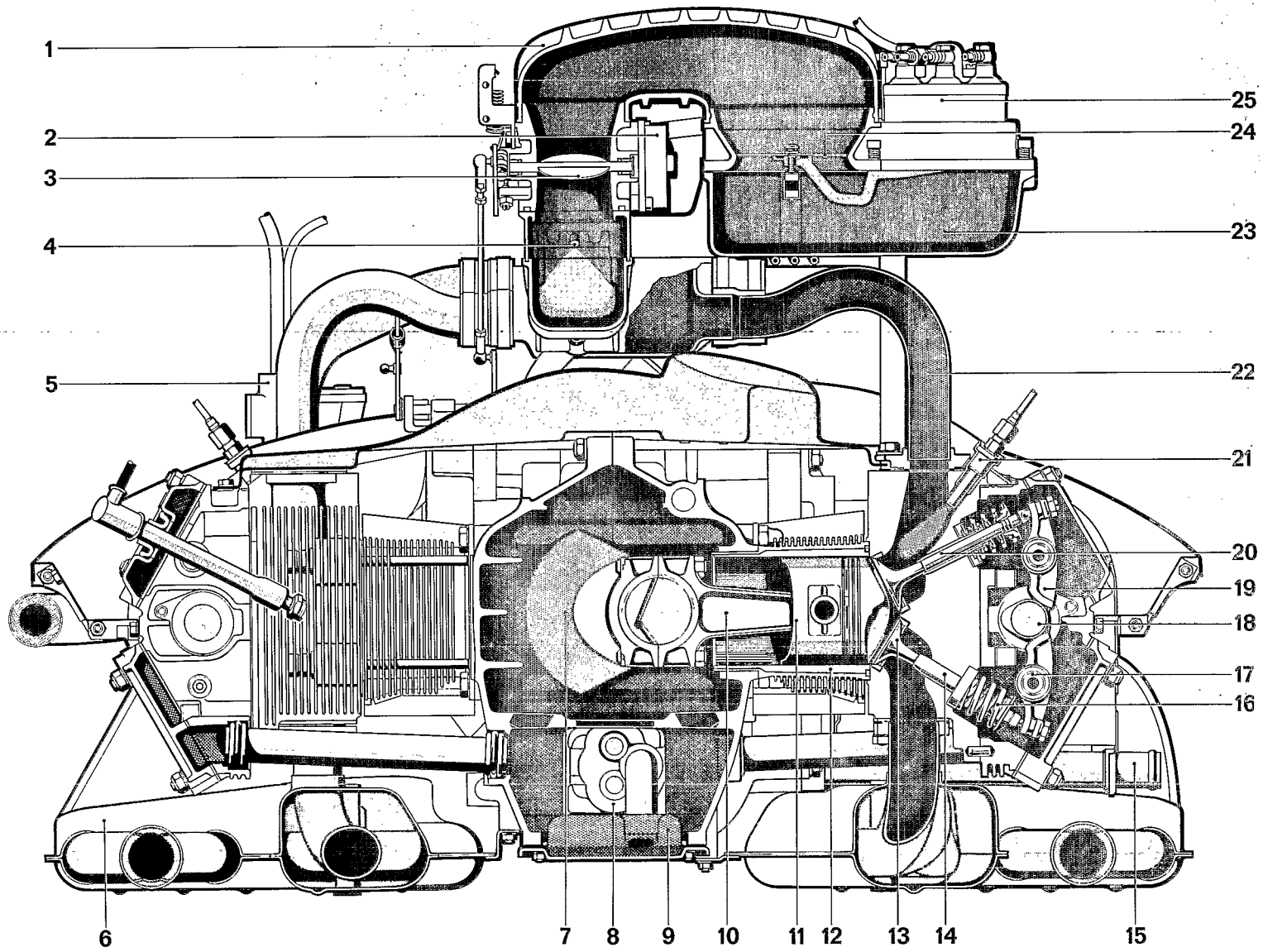
Beginning with the January 1973 production, Type 911 T vehicles are equipped with the continuous injection system (CIS).



The working principle of this system depends on measuring the intake air flow rate to determine the amount of fuel to be injected.

The fuel distributor determines the quantity of fuel to be delivered depending on air flow rate and engine loading conditions.

ENGINE CROSS SECTION



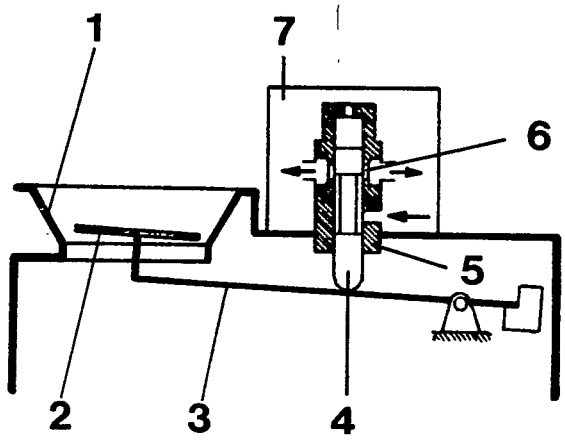
1 Air duct
2 Control pressure regulator (throttle valve position)
3 Throttle valve
4 Start (enrichment) valve
5 Control pressure regulator (warm running compensation)
6 Heat exchanger
7 Crankshaft
8 Oil pump
9 Oil screen
10 Connecting rod
11 Piston
12 Cylinder
13 Exhaust valve
14 Valve guide
15 Oil hose connection (oil tank - oil pump)
16 Valve spring
17 Rocker arm shaft
18 Camshaft
19 Rocker arm
20 Intake valve
21 Injection valve
22 Intake pipe
23 Intake housing
24 Air sensor plate
25 Mixture control unit

Mixture Control Unit

Air Flow Sensor and Fuel Distributor.

The air flow sensor consists of a venturi and a sensor plate which is attached to a lever.

The volume of intake air passing through the venturi determines the position of the sensor plate.



1 Venturi
2 Sensor plate
3 Lever
4 Control plunger
5 Slotted metering cylinder
6 Metering port
7 Fuel distributor

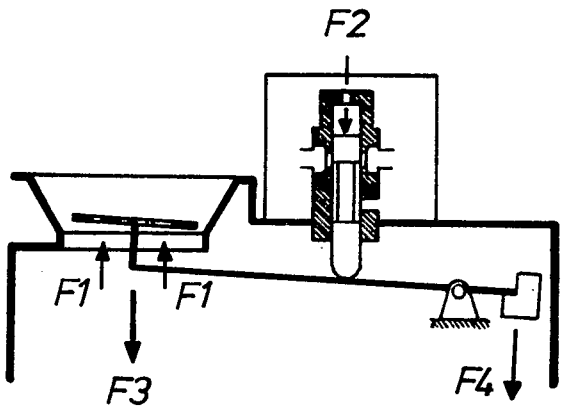
The control plunger and the slotted metering cylinder are located in the center of the fuel distributor. Machined into the metering cylinder are 6 rectangular slots which act as metering ports. They can be progressively opened by the control plunger.

The metering ports open depending on the position of the sensor plate whose movement is transmitted to the control plunger through a lever.

Intake air which passes through the air flow sensor exerts a pneumatic force F1 on the sensor plate.

The pneumatic force is countered in the fuel distributor by hydraulic force F2 which is exerted against the control plunger through a port.

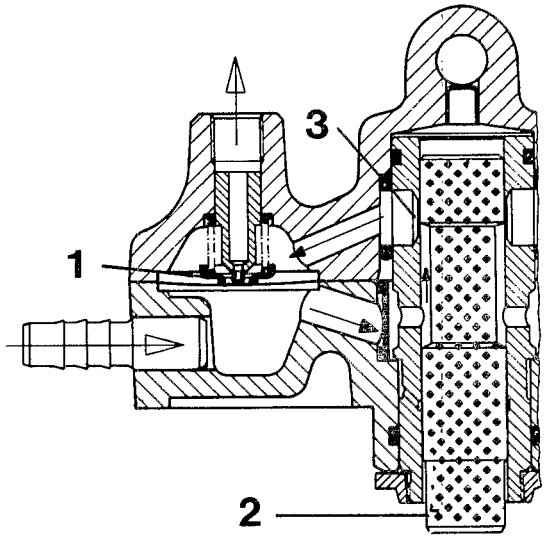
The sensor plate will yield until the pneumatic force and hydraulic force equalize.



The hydraulic pressure F2 will remain constant in a warm engine although it can be lowered through the reduction of control pressure, such as during warm-up or due to the given position of the throttle valve.

Weight of the sensor plate and lever F3 is equalized by the counter weight F4.

Each metering port in the fuel distributor is provided with a pressure regulating valve which keeps the pressure drop at the metering port constant (pressure difference = pressure ahead of the metering port less pressure after the metering port) independent of the fuel transfer rate, primary system fuel pressure, and injection valve opening pressure.



1 Pressure regulating valve
2 Control plunger
3 Metering port

The pressure regulating valves are flat seat valves with a steel diaphragm acting as a valve plate.

By maintaining the pressure difference constant, it is possible to control the fuel flow rate by means of the size of the metering port cross-section alone.

The injection valves have no metering function.

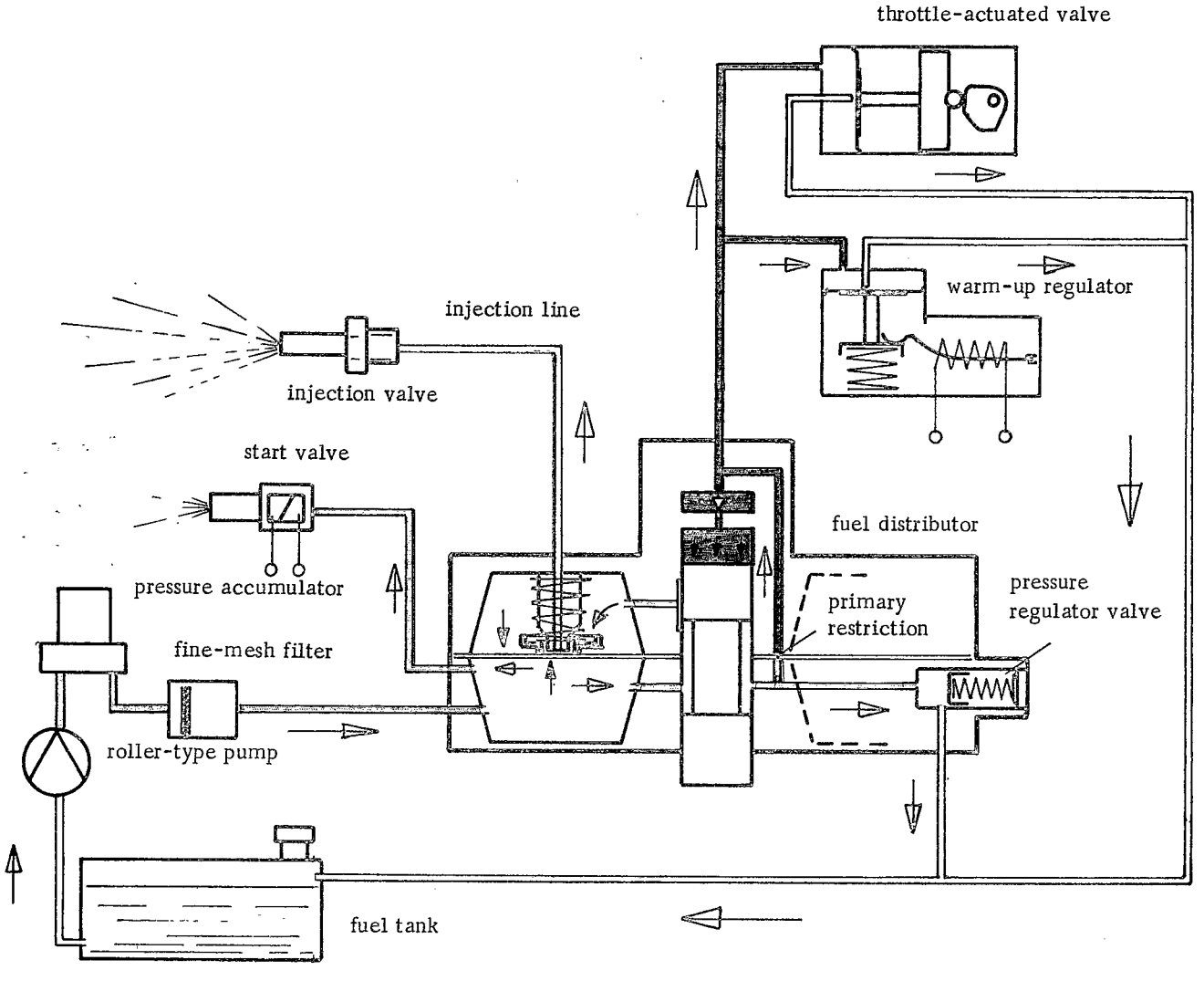
Fuel Flow

The fuel flows from the electric fuel pump through an accumulator and filter to the mixture control unit.

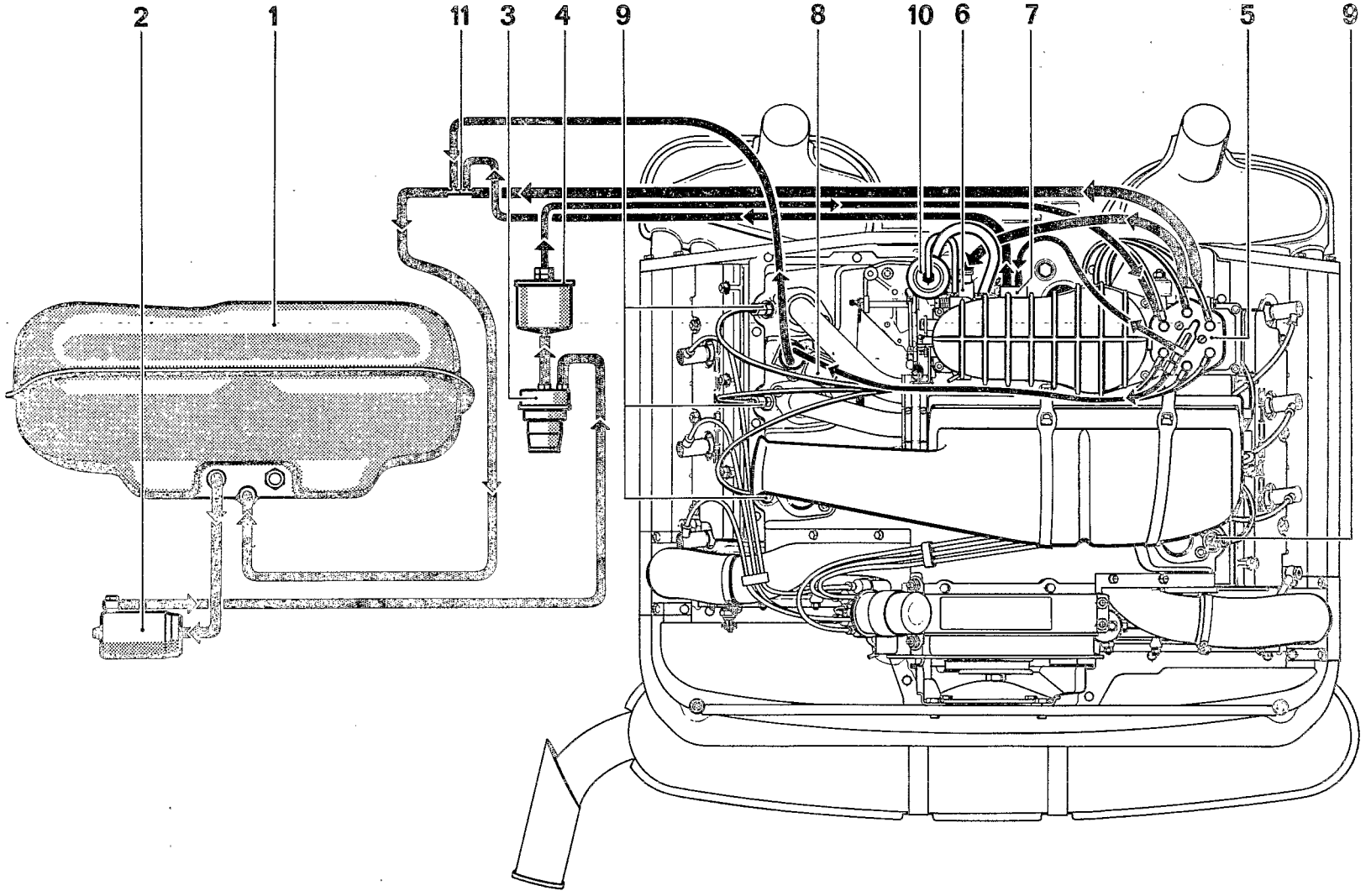
A pressure regulator in the primary system maintains constant pressure in the system.

From the mixture control unit, injection lines carry the fuel to the injection valves. In addition, a separate line carries fuel to the start (enrichment) valve.

Control pressure can be varied by two (control) pressure regulators, one according to engine and outside temperatures, the other according to accelerator pedal movement.



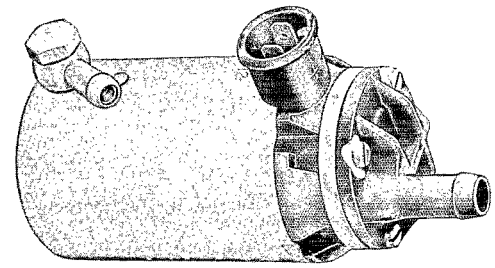
FUEL FLOW SCHEMATIC



1 Fuel tank
2 Fuel pump
3 Fuel pressure accumulator
4 Fuel filter
5 Fuel distributor
6 Start (enrichment) valve
7 Control pressure regulator (throttle valve position)
8 Control pressure regulator (warm running compensation)
9 Injection valves
10 Auxiliary air device
11 Fuel return connection

Electric Fuel Pump

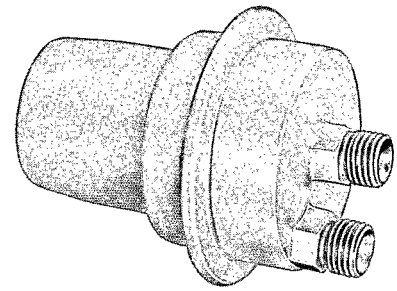
A roller-type fuel pump is utilized.



Fuel Pressure Accumulator

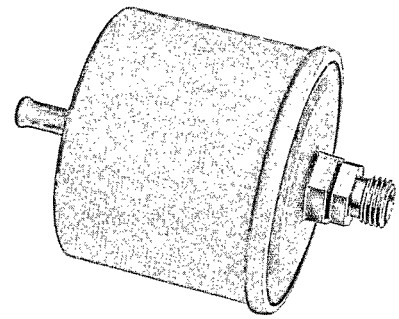
The fuel pressure accumulator is located in the primary circuit directly after the fuel pump. Its function is to delay the initial pressure surge when the pump starts. This delay is necessary to prevent the control plunger from being forced up before sufficient control pressure has been allowed to build up.

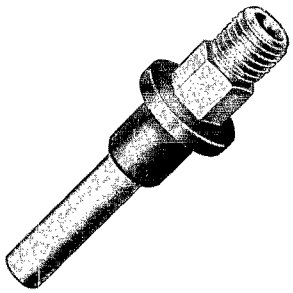
It also serves as a reservoir to keep the system under sufficient pressure for a short period of time when the engine is turned off.



Fuel Filter

An in-line filter with a paper cartridge is utilized.

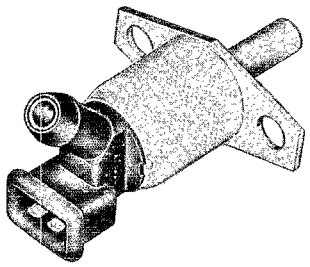




Injection Valves

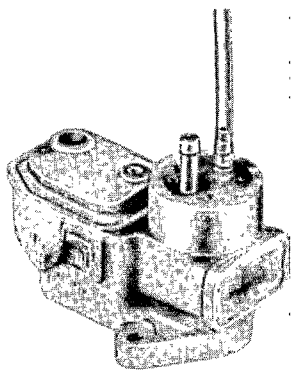
Since the injection, process is longer in a continuous injection system, the injection valves had to be designed for a smaller fuel transfer rate.

The injection valve permits fine atomization of fuel when small amounts are transfered. Opening pressure for the injection valves is approx. 3 bar.



Start (Enrichment) Valve

The solenoid-operated start (enrichment) valve discharges supplemental fuel into the intake manifold when the engine is being started.



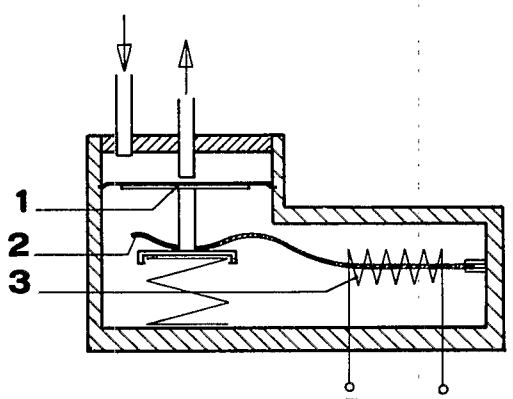
Control Pressure Regulator
(Warm Running Compensation)

The control pressure regulator for warm running compensation contains a bimetallic spring acting on a spring-loaded diaphragm.

During engine warm-up, the bimetal spring presses against the valve spring causing the control pressure to drop. This results in a lower hydraulic pressure F2, greater travel of the air flow sensor plate with unchanged amount of intake air, and increased metering port cross-section, making a richer fuel/air mixture.

As the bimetal spring is heated, it gradually relaxes its pressure against the valve spring. Thus the control pressure normalizes again.

Idle speed can be increased during warm-up by opening the throttle manually (hand throttle).



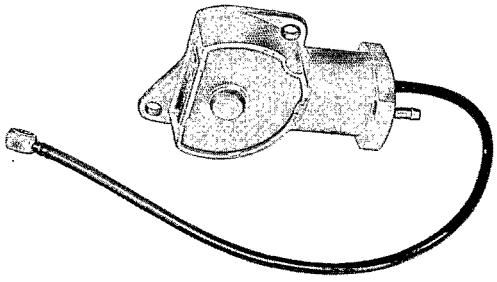
1 Pressure regulating valve
2 Bimetal spring
3 Heater coil

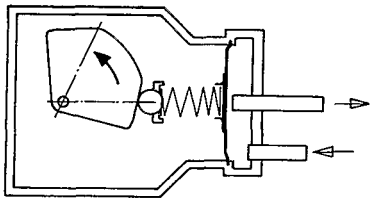
Control Pressure Regulator
(Throttle Valve Position)

The control pressure regulator for throttle valve position is basically similar to the regulator for warm running compensation. It is attached to the throttle valve housing.

A cam plate is attached to the throttle valve shaft and rides along with it, compressing the regulator spring to a greater or lesser degree.

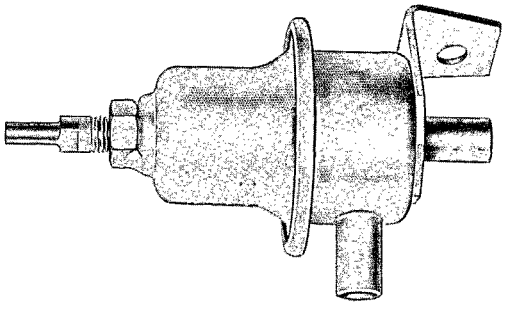
This changes the control pressure along with changed throttle valve position, adjusting the fuel/air mixture as required.





Auxiliary Air Device

When decelerating from high rpm with throttle closed, considerable vacuum builds up in the intake manifold. The vacuum is channeled to an auxiliary air device. As the device opens, additional air bypasses the throttle creating a combustible mixture.

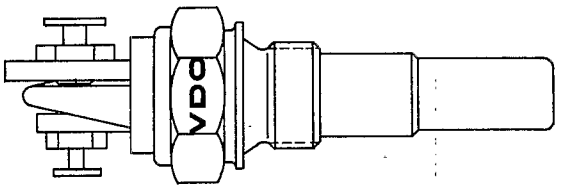


Idle Adjustment

The adjusting method is same as that for carburetors. The idle air mass passes through the air flow sensor where it is measured. The closed throttle is bypassed through a bypass bore.

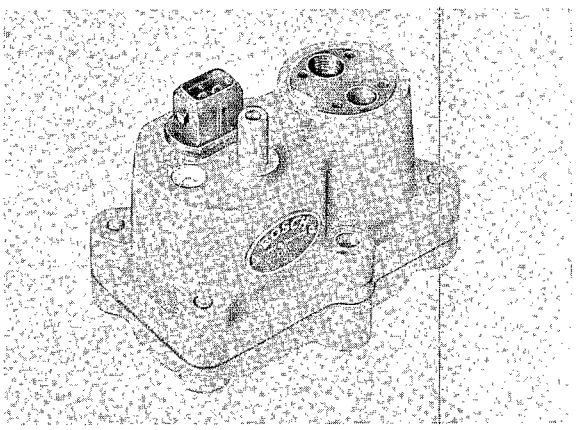
The cross-section of this bore can be changed with the aid of an adjustment screw. A change in cross-section changes the engine speed without affecting the composition of the fuel/air mixture.

The fuel/air mixture can be adjusted within certain limits by means of a mixture adjusting screw to attain the required effect.



Thermoswitch

Beginning with 1974 models, engines equipped with the continuous injection system (K-Jetronic) are furnished with a thermoswitch which is connected to the cold start enrichment valve. The thermoswitch is located in the left chain housing cover. A microswitch is connected in series with it. The microswitch is activated by the hand throttle lever when the latter is moved to at least 5^{o} of the throttle valve position. The thermoswitch is active up to engine temperature of approx. + 45^{o} C (113^{o} F) and prevents the injection of supplemental fuel by the cold start enrichment valve when starting a hot engine.

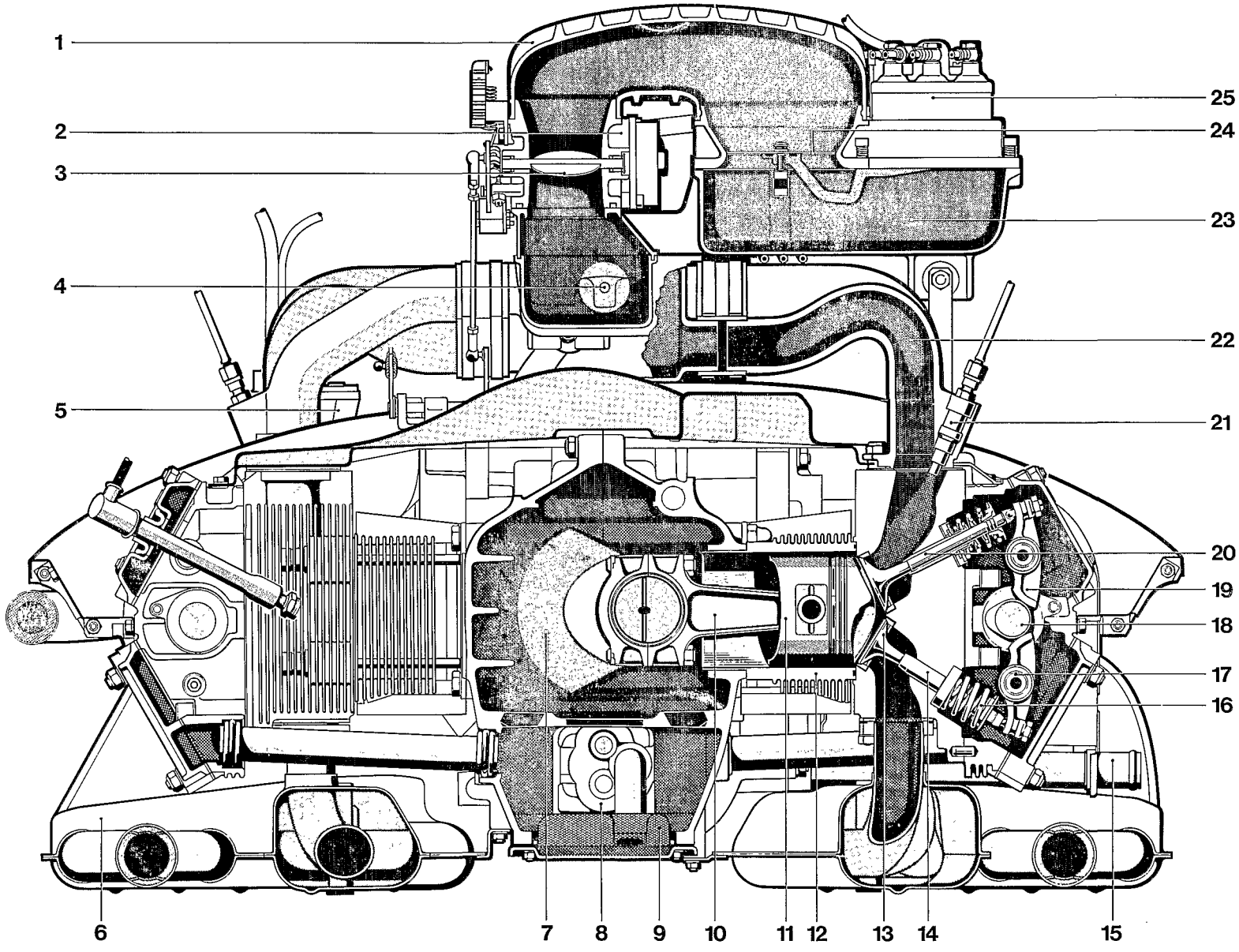


Vacuum controlled warm-up regulator

Controll pressure changes of this warm-up regulator are made via intake manifold vacuum.

ENGINE CROSS SECTION

BEGINNING WITH 1974 MODELS



1 Air duct
2 Control pressure regulator (throttle valve position)
3 Throttle valve
4 Cold start enrichment valve
5 Control pressure regulator (warm running compensation)
6 Heat exchanger
7 Crankshaft
8 Oil pump
9 Oil screen
10 Connecting rod
11 Piston
12 Cylinder
13 Exhaust valve
14 Valve guide
15 Oil hose connection (oil tank - oil pump)
16 Valve spring
17 Rocker arm shaft
18 Camshaft
19 Rocker arm
20 Intake valve
21 Injection valve
22 Intake pipe
23 Intake housing
24 Air sensor plate
25 Mixture control unit

CONTINUOUS INJECTION SYSTEM (CIS)

Beginning with 1974 models, Type 911 and 911 S vehicles are equipped with the continuous injection system.

Changes Effective with 1974 Models

1. Cast intake pipes with mounting hole for injection valves.

2. Repositioning of the injection valves resulted in their being lengthened and injection lines shortened.

3. The diameter of intake pipes at the intake housing has been changed:

   Intake pipe for Type 911 = 31 mm dia.
   911 S = 34.5 mm dia.

4. Mixture control unit has been calibrated for 2.7 liter engines.

5. The pneumatic valve has been repositioned and also modified to the vacuum characteristics prevailing in the 2.7 liter CIS engines.

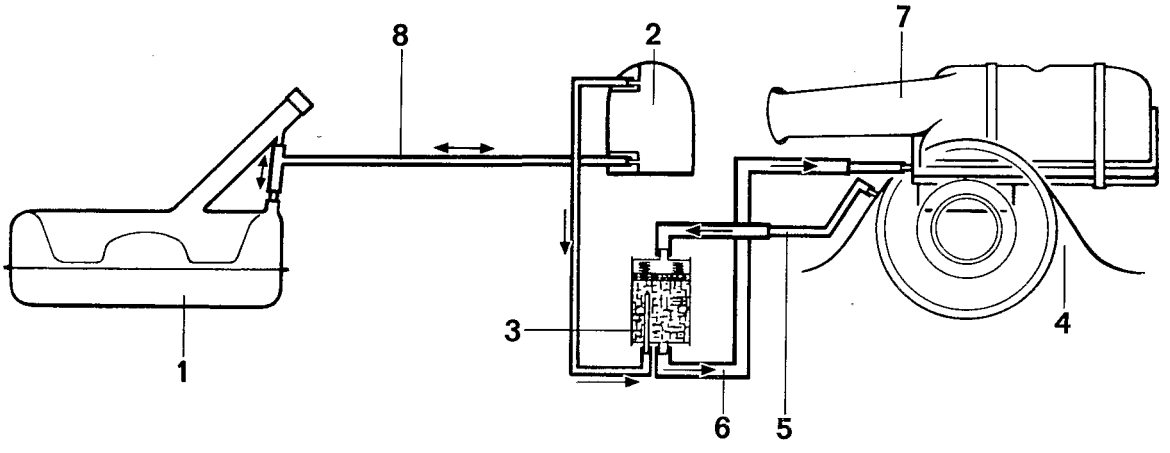
6. The cold start enrichment valve has been moved to the center of the intake housing to effect a better distribution of the fuel to the individual cylinders.

7. A thermoswitch has been mounted on the left chain housing cover to supplement the cold start enrichment valve.

FUEL EVAPORATIVE CONTROL SYSTEM

General

All vehicles are equipped with a sealed fuel tank venting system incorporating an activated charcoal filter. The closed system prevents fuel fumes from entering the atmosphere. The fumes are ducted into the activated charcoal filter with the aid of fresh air supplied by the engine cooling fan, and then to the engine air filter where they mix with the induction air and are burned with it.



1 Fuel tank

2 Expansion chamber

3 Activated charcoal filter

4 Cooling fan upper shroud with hose connector

5 Hose from cooling fan to activated charcoal filter

6 Hose from activated charcoal filter to engine air filter

7 Engine air filter

8 Return hose connecting fuel tank with the expansion chamber

CONTINUOUS INJECTION SYSTEM (CIS)

GENERAL CHECKOUT PROCEDURE

Prerequisite for the CIS checkout is a properly functioning ignition system and proper mechanical condition of the engine.

A complete CIS checkout should be carried out in the below given sequence.

However, specific problems can be analyzed by performing individual tests.

In addition, the following should be noted: Certain tests require that the engine is cold (check control pressure "cold"). For this test, the engine should be out of operation for several hours, or overnight. The checkout should be performed at the same location where the car was parked for several hours. Erroneous test results will be obtained if, for instance, the vehicle should be brought into a heated garage from a cold outside environment.

The remaining tests, with the exception of the idle adjustment, can be performed with the engine warm or cold.

The engine must be at warm operating temperature when idling is adjusted.

All tests, idle adjustment excepted, are accomplished with the engine turned off.

NOTE

Always install new gaskets whenever fuel lines are loosened or detached.

It is important to maintain the highest degree of cleanliness when servicing the CIS.

The outside of the fuel lines must be thoroughly cleaned before they are loosened.

VISUAL INSPECTION

The CIS should be visually inspected prior to the initiation of work.

Visual inspection for leaks:

1. Check all fuel line connections for leaks.

2. Check induction system (vacuum system) for leaks between the mixture control unit and engine (air duct between mixture control unit and throttle housing).

3. Check for leaks between intake manifold and start (enrichment) valve (O-ring).

4. Check for leaks between intake manifold and pipes.
   Replace porous rubber boots.

5. Check hose connections for leaks at the intake manifold, vacuum hoses at the throttle housing, as well as the auxiliary air device.

6. Check proper seating of rubber covers at the injection valves.

7. Check attachment of intake pipes at cylinder heads.

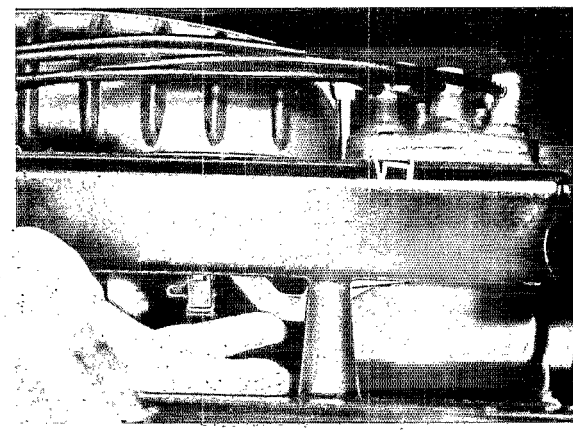
Checking free movement of lever in air flow sensor

1. Unhook rubber straps, remove air filter horn and withdraw cartridge.

2. Raise lever of air flow sensor by hand.

   An even amount of resistance should be felt throughout the length of movement.

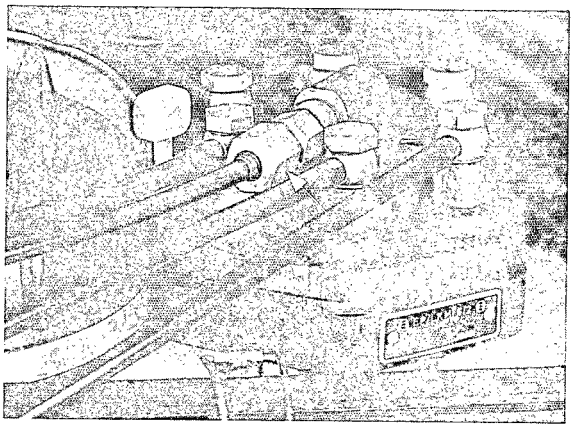
   A quick downward movement of the lever will detach it from the sluggish control plunger at which time no resistance should be felt at the lever.



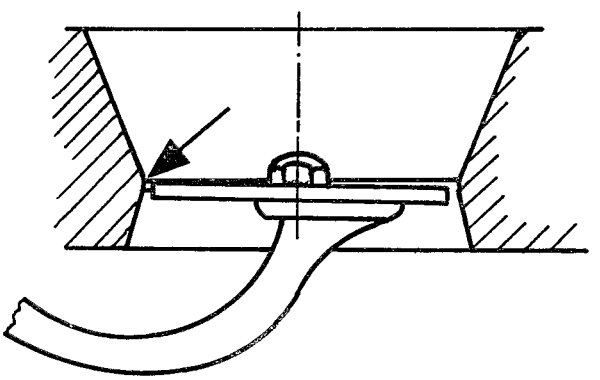
Inspection of the flexible sensor plate stop in the air flow (sensor plate in position of rest)

The fuel system must be depressurized when performing this check.

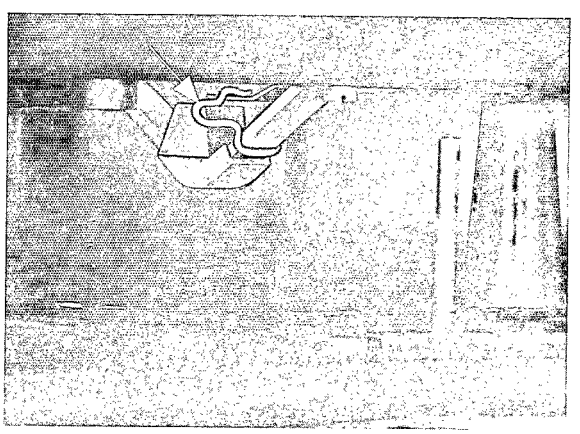
To relieve the remaining pressure, slightly loosen the pressure line connection at the control pressure regulator for warm running compensation. When loosening the line, wrap the connection with a rag to keep fuel from spilling.



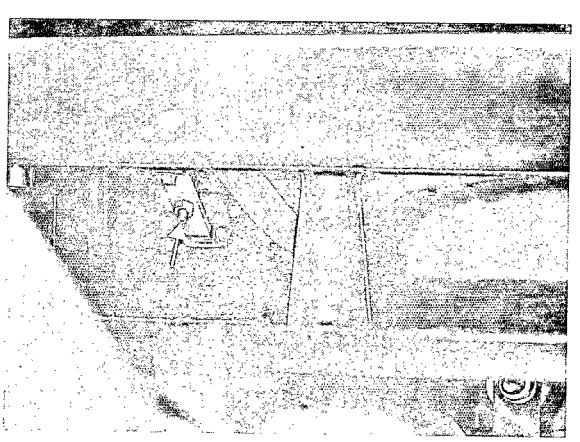
The upper edge of the sensor plate must now be flush with the root of the taper at a point shown in the illustration. A lower positioning of up to 0,5 mm is permissible.



If required, adjustment of the flexible stop can be corrected by bending the wire bow.

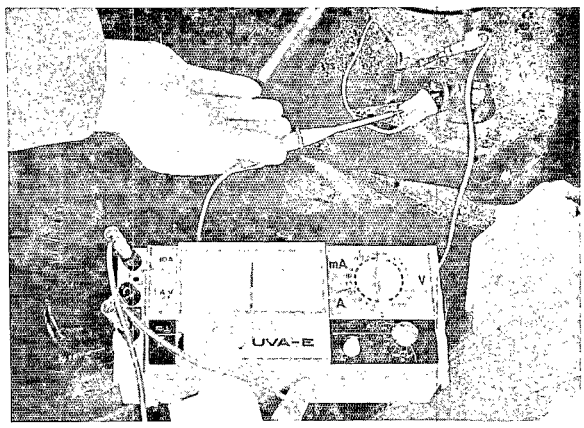


Since April of 1976 the spring-loaded stop of the sensor plate can be corrected with an adjusting screw.



INITIAL CHECKS

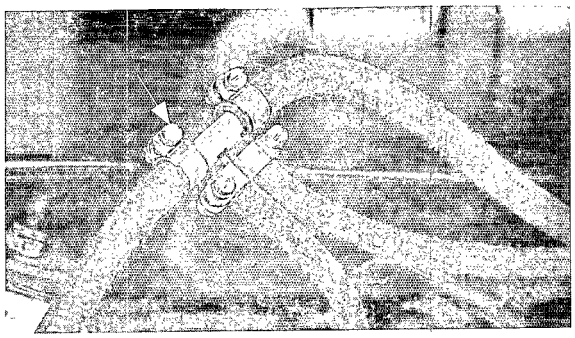
The following tests are component tests. Final evaluation of individual parts is possible only upon completion of pressure checks.
When performing the tests outlined below, remove the middle fuse from the rear fuse box to keep the heater coil in the control pressure regulator for warm running compensation from heating up.



Checking electric fuel pump

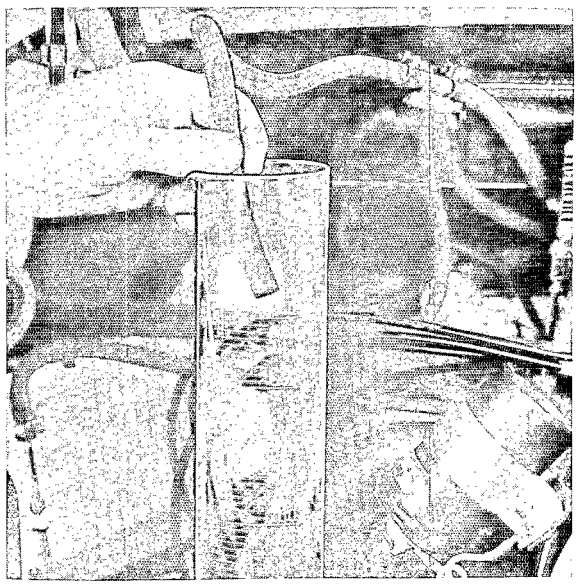
1. Minimum voltage at the connecting terminal is 11.5 volts.

2. Current draw when running is 8.5 amps maximum.



3. Check pump delivery rate:

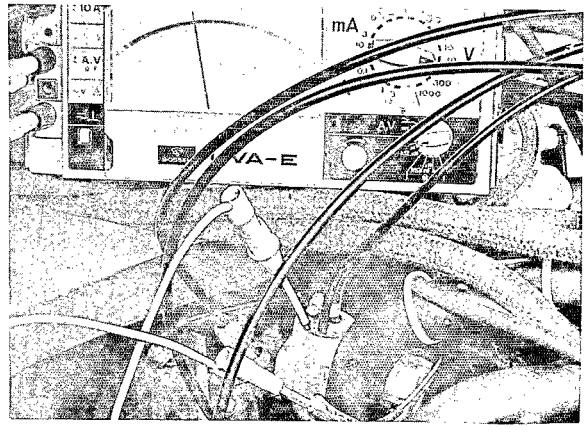
   Disconnect fuel return line at the connector. Push a section (about 50 cm long) of normal fuel hose onto the connector and hold in a measuring glass. Switch the ignition on for the duration of the measuring period.
   See page 1.1 - 1/13 for specifications.



Modifications - 1976 Model

Terminals 30 and 87a of the relay (rear of luggage compartment) must be bridged to check the fuel pump delivery rate, due to a safety switch on the mixture control unit (also refer to page 1.1 - 1/17).

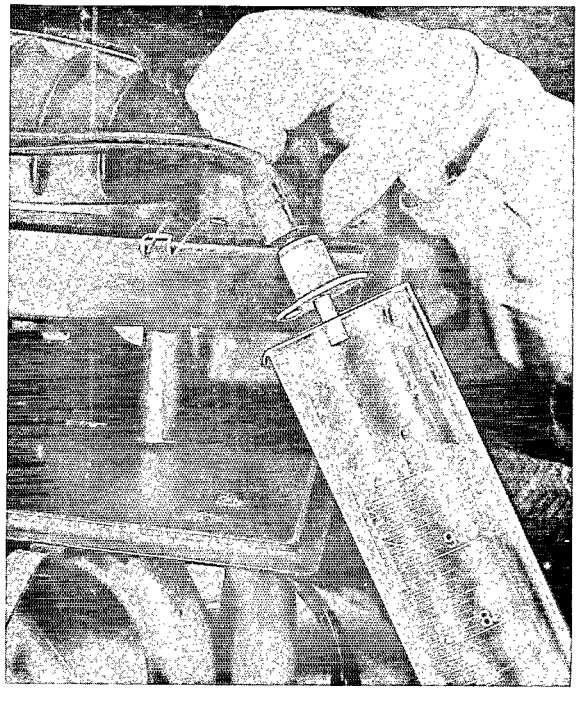
Checking Control Pressure Regulator (Warm Running Compensation)



1. Minimum voltage at the connecting terminal is 11.5 volts.

2. Check heater coil continuity with the aid of a test buzzer or ohmmeter. (Check between wire terminal at the control pressure regulator and the ground.) The connecting wire must be detached from the control pressure regulator. If the circuit is open, the control pressure regulator will have to be replaced.

Checking Start (Enrichment) Valve



1. Remove start (enrichment) valve (see page 2.2 - 1/10); the fuel line remains connected.

2. Hold the start (enrichment) valve in a receptacle and connect to battery B+ (upper fuse in rear fuse box in engine compartment, left side) and to ground with a piece of jumper wire. Briefly switch the ignition on. The start (enrichment) valve must spray fuel in an even conical pattern.

3. Remove jumper wire and switch the ignition on. After waiting about 10 seconds, wipe nozzle of start (enrichment) valve dry; no fuel should come out.

PRESSURE TESTS

TOOLS



No.	Deseription	Special Tool	Remarks
1	Pressure tester	P 378	

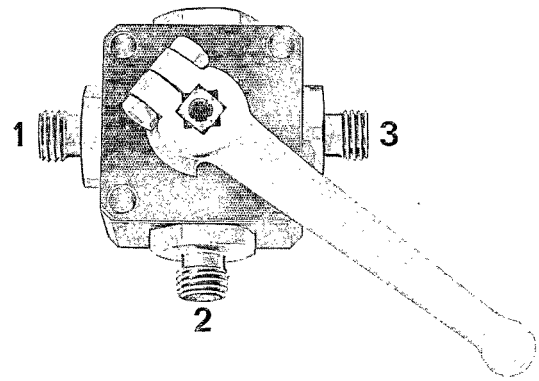
General

The tester should be connected into the control pressure line at the mixture control unit.

The control pressure now is transmitted from the mixture control unit, through the three-way selector valve, to the control pressure regulators for warm running compensation or throttle valve position, respectively.

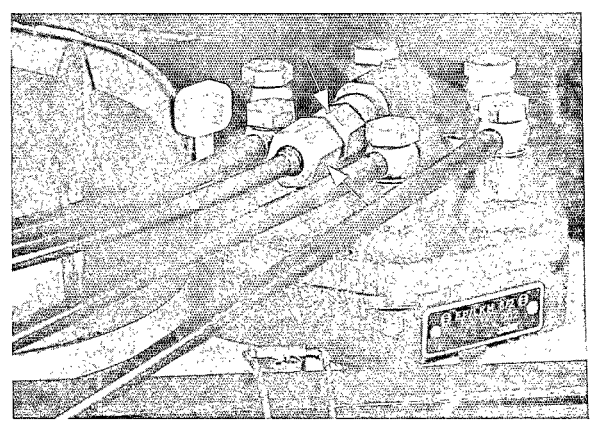
Thus, all pressure tests can be performed without reconnecting the lines.

For better clarity, connecting points and lever positions are referenced in the instructions given below according to numbers shown in the adjacent illustration.

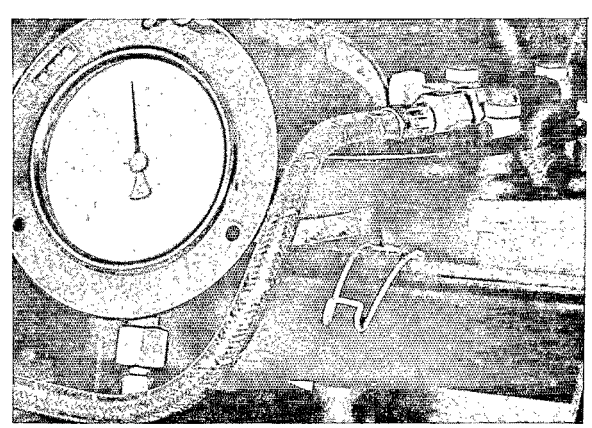


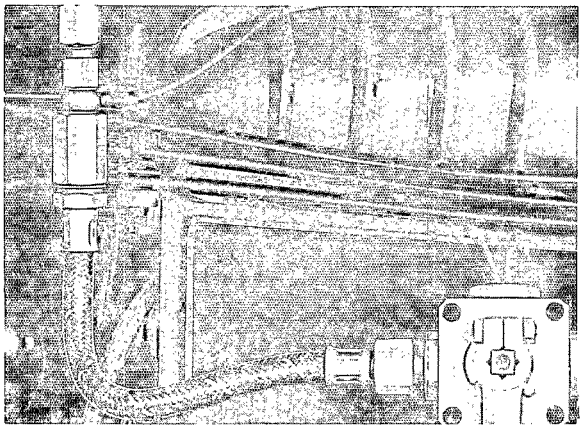
Connecting and Bleeding Pressure Tester

1. Detach pressure lines for control pressure regulators for warm running compensation and throttle valve position.

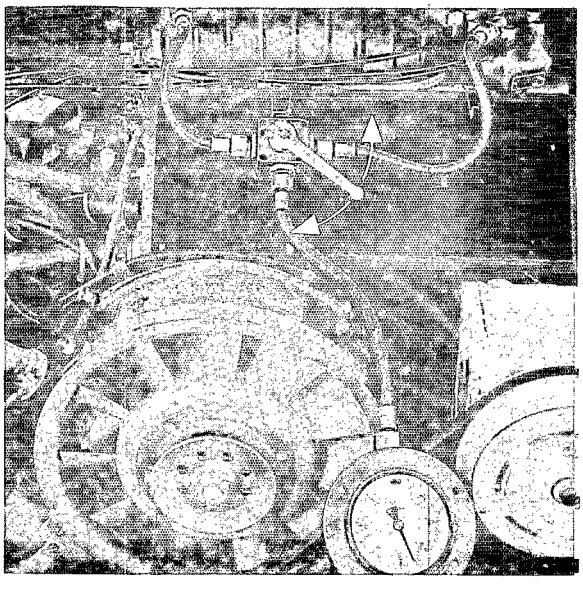


2. Insert a gasket in the special tool connector and screw into the control pressure connection of the mixture control unit in place of the banjo bolt.





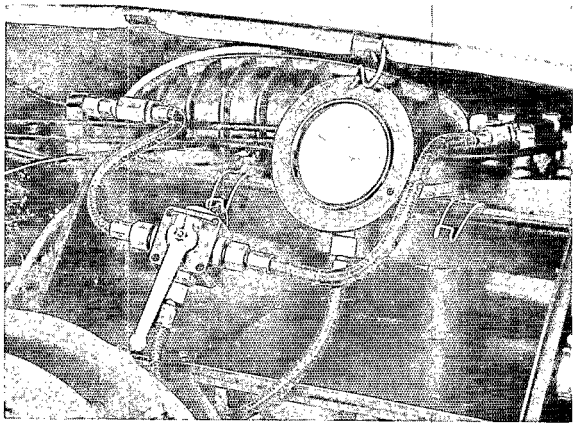
3. Connect pressure lines of control pressure regulators for warm running compensation and throttle valve position to second connector using original banjo bolt and gaskets.



4. Turn selector valve to position ⁝⁝ 2. Allow pressure gauge to hang down (hose stretched) and switch the ignition on. Turn lever of three-way selector valve to position ⁝⁝ 3 about 5 times at 10-seconds intervals.

Checking "Cold" Control Pressure

This test can be performed on a cold engine only. It must definitely be performed when encountering starting or warm-up problems.



1. Turn selector valve to position ⁝⁝ 2. Switch the ignition on.

2. Pressure specifications for the given ambient air temperature are shown in the diagram on page 1.1 - 1/13, Testing and Adjustment Specifications.

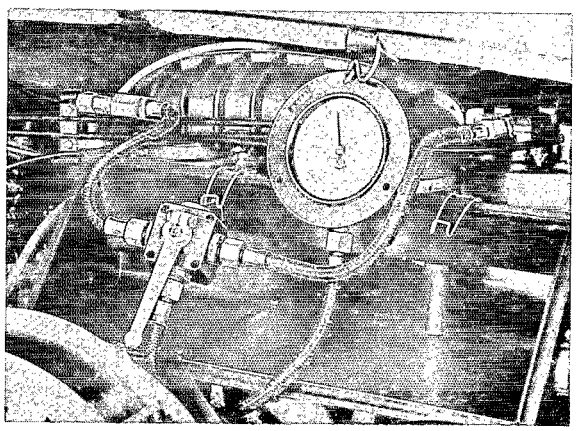
3. Excessive deviations from the specified values are caused by a faulty control pressure regulator for warm running compensation which should be replaced in such cases.

Checking "Warm" Control Pressure

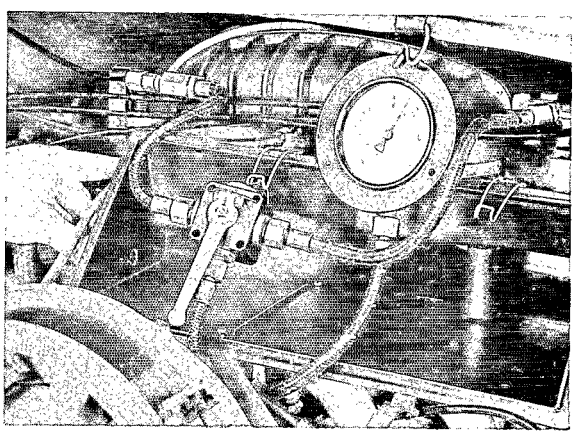
Refer to page 1.1 - 1/15 for engines with vacuum controlled control pressure regulator for warm running compensation.

This test can be performed on a warm or cold engine.

1. Detach connecting wire from control pressure regulator for warm running compensation. Connect the regulator to B+ by means of a jumper wire (fuse box in left side of engine compartment). Switch the ignition on. Make sure that the throttle plate is fully at the idle stop (hand throttle must be fully in).



2. The control pressure will rise slowly and must reach the idle value shown under testing and adjustment specifications, page 1.1 - 1/13.



3. Open throttle about halfway by hand. The control pressure should now rise to the specified part-load value.

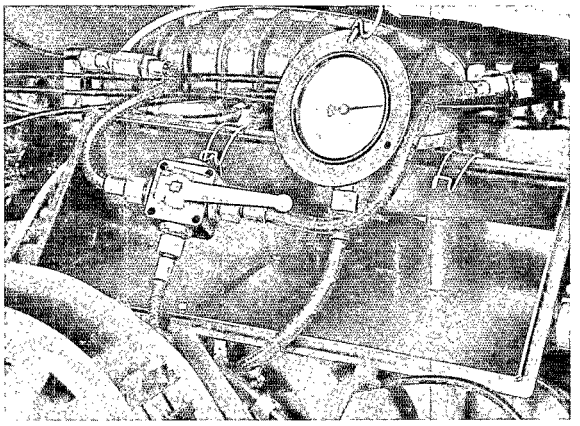
4. Open throttle fully (full power stop). The control pressure should now drop to the full-power value.

If excessive deviation is encountered, proceed as follows:

a. Idle value: Idle value can be corrected within certain limits. Refer to instructions for checking or adjusting control pressure regulator for throttle valve position. If the required pressure cannot be obtained, replace control pressure regulator for throttle valve position.

b. Part-load value: Replace control pressure regulator for warm running compensation.

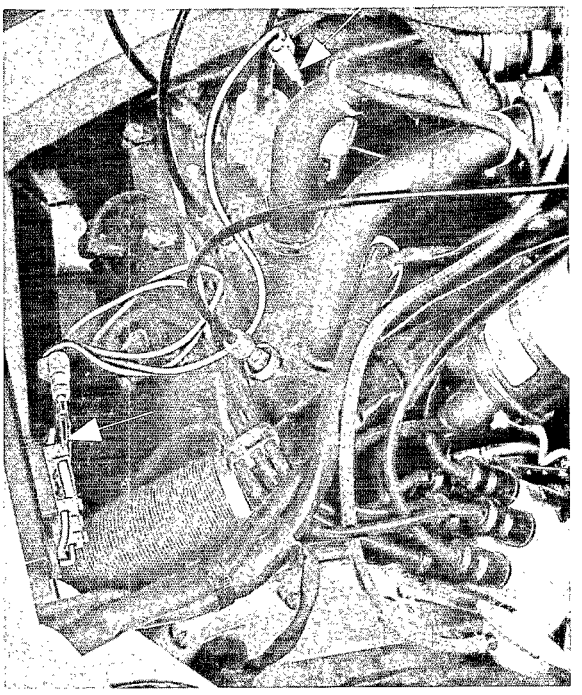
c. Full-power value: Replace control pressure regulator for throttle valve position.



Checking System Pressure

1. Turn selector valve to position ⁝⁝ 3 and switch the ignition on.

2. The system's pressure must agree with specifications on page 1.1-1/13. If it deviates from specifications, correct position of pressure relief valve in fuel distributor with shims.



Checking for Leakage

1. Detach electrical wire from the control pressure regulator for warm running compensation. Using a jumper wire, connect the control pressure regulator for warm running compensation directly to B+ (fuse box on left side of engine compartment).
   Turn selector valve to position ⁝⁝ 2 and switch the ignition on.

   Having attained the "warm" control pressure value (part-load value), switch the ignition off again and observe the pressure drop on pressure gauge (the pressure will drop considerably first). If the pressure continues to drop too rapidly (see testing and adjustment specifications), repeat check in position ⁝⁝ 3 of the selector valve to locate the problem. If the same results are obtained, four components can be responsible:

   electric fuel pump

   Fuel distributor

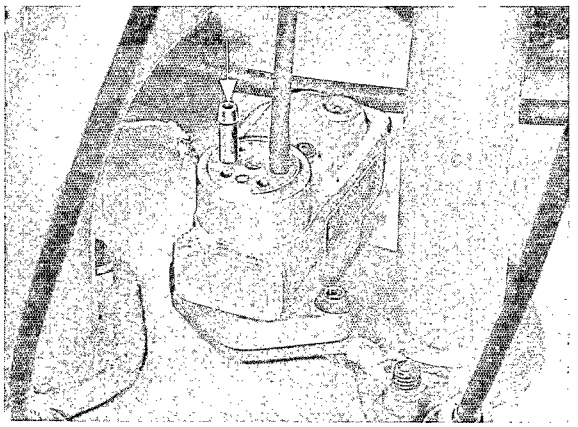
   injection valves

   start (enrichment) valve

   Injection valves and start valve are judged in separate tests. Replace electric fuel pump and seal of pressure relief valve in fuel distributor one after other and repeat each test.

   If leakage does not occur in ⁝⁝ 3 position of the selector valve, the problem can be in the control pressure regulators for warm running compensation or throttle valve position.

To locate the problem, switch the ignition on until control pressure has built up, then switch the ignition off again. Detach return hose from the control pressure regulator for warm running compensation. With the remaining pressure being 1.5 to 2.4 bar , no fuel should come out from the return connector of the control pressure regulator for warm running compensation.



If some fuel should be coming out, it would indicate that the control pressure regulator for warm running compensation is leaking and should be replaced in such case.

If the leak is not in the control pressure regulator for warm running compensation, it will be found in the control pressure regulator for throttle valve position, in which case the control pressure regulator for throttle valve position will have to be replaced.

Checking Injection Valves

Injection valves must be removed for testing (see page 2.2 - 1/13).

Testing is accomplished with a Bosch jet tester EFEP 60 H, pressure gauge 0 to 6 bar, caliber 1.0, 100 mm dia., testing agent Ol 61 v 11.

See testing and adjustment specifications for opening pressure.

Tight: At a pressure of 0.5 bar less than opening pressure there must not be any drops falling within 15 sec..

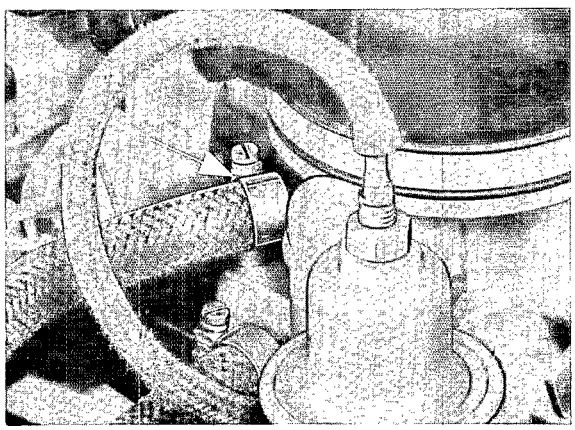
See page 2.1 - 1/5 for testing procedure.

CHECKING AUXILIARY AIR DEVICE

1. Check idle rpm with control pressure regulator for throttle valve position connected (engine warm).

2. Stop engine.

3. Remove filter housing with filter cartridge and duct.



4. Disconnect hose leading to auxiliary air device above throttle valve at throttle valve housing and tightly seal the connector and hose.

5. Install duct.

6. Start engine and check idle rpm.

NOTE
If a change in rpm is noted, the auxiliary air device is leaking. If the valve leaks considerably, it will not be possible to adjust idle speed.

Replace auxiliary air device.

CIS TESTING AND ADJUSTING SPECIFICATIONS (1974/1975 Models)

Test Step	Test Specification	References
Electric fuel pump, fuel delivery	min. 850 cm^3/30 seconds	Page 1.1 - 1/4
Control pressure "cold" (at corresponding ambient air temperature)		Page 1.1 - 1/8 Page 1.1 - 1/16 a

Diagram for Control Pressure Regulator
Part No. 911. 110.927.00
(911.606.103.00)
Bosch No. 0438.140.001

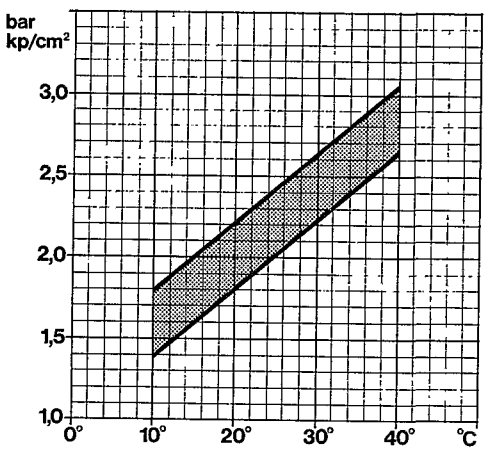


Diagram for Control Pressure Regulator
Part No. 911.606.103.01
Bosch No. 0438.140.008

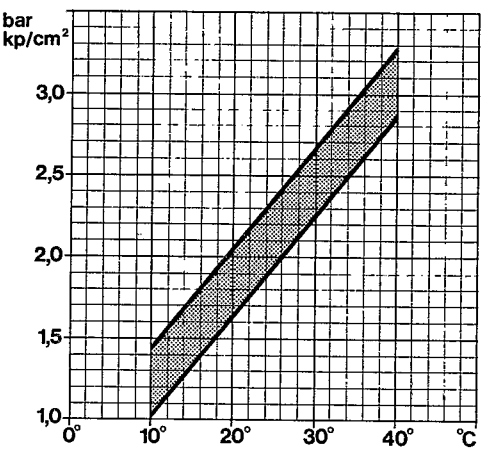
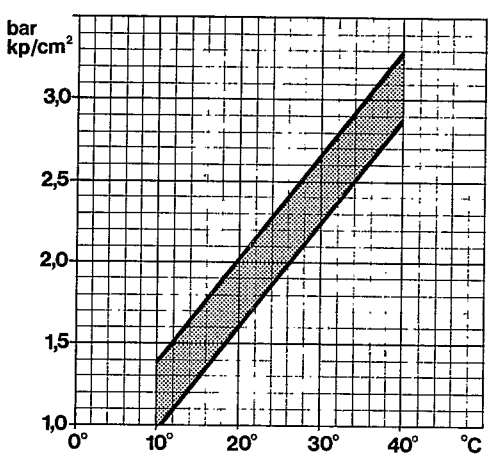


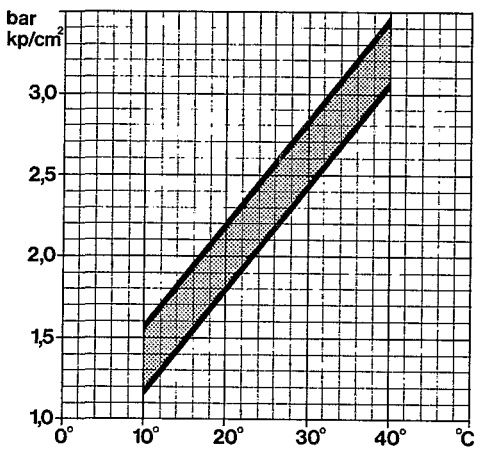
Diagram for Control Pressure Regulator *
Part No. 911.606.105.01
Bosch No. 0438.140.009
Test vacuum: 520 - 546 mbar
(390 - 410 mmHg)



* only applicable for vacuum controlled control pressure regulator

Test Step	Test Specification	References
Control pressure "warm"		Page 1.1 - 1/9
Throttle position version		
Throttle valve position:		
Idle, test specification	2.8 to 3.0 bar	
adjusting specification	2.85 to 2.95 bar	
Partial throttle	3.4 to 3.8 bar	
Full throttle	2.6 to 3.0 bar	
Vacuum controlled version		
Testing at atmospheric pressure (no vacuum)	2.7 to 3.1 bar	
To perform vacuum test, connect vacuum pump to control pressure regulator. Test pressure 520 - 546 mbar (390 - 410 mmHg)	3.4 to 3.8 bar	
System pressure		Page 1.1 - 1/10
Test specification	4.5 to 5.2 bar	
Adjusting specification	4.7 to 4.9 bar	
Leak test (warm engine)		Page 1.1 - 1/10
Min. pressure after		
10 minutes	1.3 bar	
20 minutes	1.1 bar	
Fuel injectors		Page 1.1 - 1/11
opening pressure	2.5 to 3.6 bar	Page 2.1 - 1/5

CIS TESTING AND ADJUSTING SPECIFICATIONS (1976/1977 Models)

Test Step	Test Specification	References
Electric fuel pump, fuel delivery	min. 850 cm^3/30 seconds	Page 1.1 - 1/4
Control pressure "cold" (at corresponding ambient air temperature)	Diagram for Control Pressure Regulator Part No. 911.606.105.03 and 911.606.105.04 Bosch No. 0438.140.017 and 0438.140.033 Test vacuum: 520 - 546 mbar (390 - 410 mmHg)  	Page 1.1 - 1/16 a
Control pressure "warm" 1976 Model Testing atmospheric pressure (no vacuum) To perform vacuum test, connect vacuum pump to control pressure regulator. Test pressure 520 - 546 mbar (390 - 410 mmHg) At high idle speed (approx. 1800 rpm)	 2.7 to 3.1 bar 2.7 to 3.1 bar 3.4 to 3.8 bar	Page 1.1 - 1/9

Test Step	Test Specification	References
1977 Model		
Testing at atmospheric pressure (no vacuum)	2.7 to 3.1 bar	
To perform vacuum test, connect vacuum pump to control pressure regulator. Test pressure 520 - 546 mbar (390 - 410 mmHg)	3.4 to 3.8 bar	
System pressure		Page 1.1 - 1/10
Test specification	4.5 to 5.2 bar	
Adjusting specification	4.7 to 4.9 bar	
Leak test (engine warm)		Page 1.1 - 1/10
Min. pressure after 10 min	1.3 bar	
20 min	1.1 bar	
Fuel injectors		Page 1.1 - 1/11
opening pressure	2.5 to 3.6 bar	Page 2.1 - 1/5

CIS TESTING AND ADJUSTING SPECIFICATIONS (1978/1979 Models)

Test Step	Test Specification	References
Electric fuel pump fuel delivery	min. 1000 cm^3/30 seconds	Page 1.1 - 1/4
Control pressure "cold" (at corresponding ambient air temp.)		Page 1.1 - 1/16 a

Diagram for Control Pressure Regulator

Part No. 911 606 105 05
Bosch No. 0 438 140 045
Test vacuum 460 - 600 mbar
(350 - 450 mmHg)

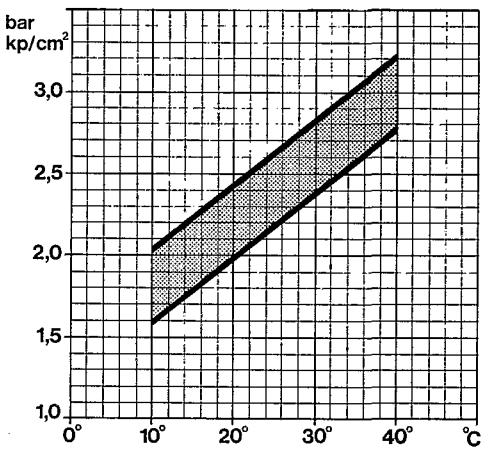
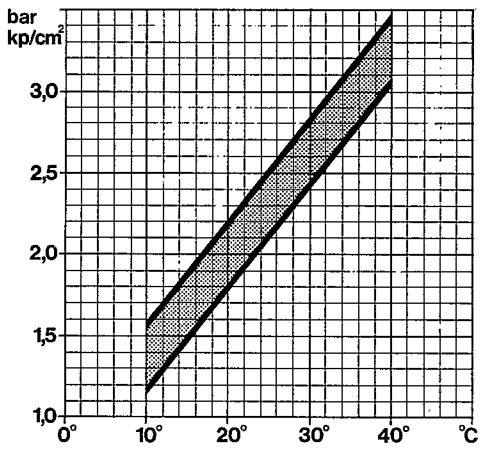
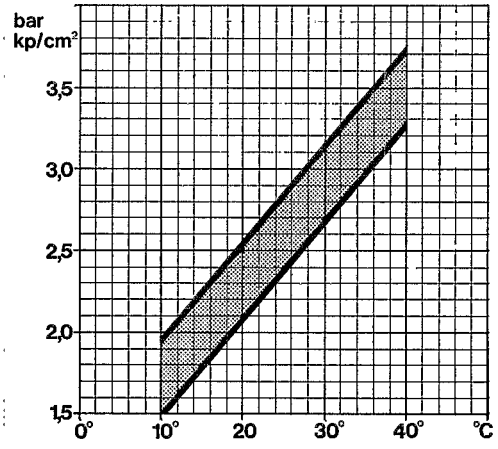


Diagram for Control Pressure Regulator
(from January 1979)
Part No. 911 606 105 06
Bosch No. 0 438 140 069
Test vacuum 450 - 550 mbar
(340 - 420 mmHg)

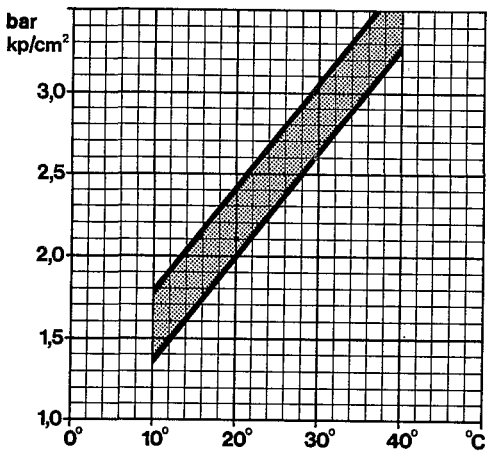


Control pressure "warm"		Page 1.1 - 1/9
Testing at atmospheric pressure (no vacuum)	2.7 to 3.1 bar	
To perform vacuum test, connect vacuum pump to control pressure regulator	3.2 to 3.6 bar	
System pressure		Page 1.1 - 1/10
Test specification	4.5 to 5.2 bar	
Adjusting specification	4.7 to 4.9 bar	
Leak test (warm engine)		Page 1.1 - 1/10
Min. pressure after 10 min.	1.3 bar	
20 min.	1.1 bar	
Fuel injectors		Page 1.1 - 1/11 Page 2.1 - 1/5
opening pressure	2.5 to 3.6 bar	

CIS TESTING AND ADJUSTING SPECIFICATIONS
(1980 Model with Oxygen Sensor)

Test Step	Test Specification	References
Electric fuel pump, fuel delivery	min. 1000 cm^3/30 seconds	Page 1.1 - 1/4
Control pressure "cold" (at corresponding ambient air temperature)	Diagram for Warm-up Regulator Part No. 911.606.105.07 Bosch No. 0438 140 072 	Page 1.1 - 1/8
Control pressure "warm"	3.4 to 3.8 bar	Page 1.1 - 1/9
System pressure Test specification Adjusting specification	 4.5 to 5.2 bar 4.7 to 4.9 bar	Page 1.1 - 1/10
Leak test (warm engine) Min. pressure after 10 min. 20 min.	 1.3 bar 1.1 bar	Page 1.1 - 1/10
Fuel injectors opening pressure	 2.5 to 3.6 bar	Page 1.1 - 1/11 Page 2.1 - 1/5

TESTING AND ADJUSTING VALUES - 911 SC
(1981 Models with Oxygen Sensor Control)

Test Step	Testing/Adjusting Value	Special Instruction
Electric fuel pump Delivery rate	at least 1000 cc/30 sec.	Page 1.1 - 1/4
Control pressure "cold"	Diagram for warm-up control Part No. 911.606.105.08 Bosch No. 0438.140.090 	Page 1.1 - 1/8
Control pressure "warm"	3.4 ... 3.8 bar	Page 1.1 - 1/9
System pressure Test value Adjusting value	 4.5 ... 5.2 bar 4.7 ... 4.9 bar	Page 1.1 - 1/10
Leak test (engine warm) Min. Pressure after 10 min. after 20 min.	 1.3 bar 1.1 bar	Page 1.1 - 1/10
Fuel injectors Opening pressure	 2.5 ... 3.6 bar	Page 1.1 - 1/11 Page 2.1 - 1/5

Test Step	Testing and Adjusting Values		
Idle setting		USA and Canada	California and High Altitude States
	Manual transm. to 1977 models	900 ± 50	900 ± 50
	Sportomatic to 1977 models	950 ± 50	950 ± 50
Idle speed (rpm)	1977 models	950 ± 50	1000 ± 50
	1978/79 models	950 ± 50	950 ± 50
	1980 models	900 ± 50	900 ± 50
	1981 models	900 ± 50	900 ± 50
	1973 models (2.4 ltr.)	1.5 to 2.0	1.5 to 2.0
	1974 models (2.7 ltr.)	1.5 to 2.5	1.5 to 2.5
CO content (%)	1975 models	1.7 to 2.0	1.5 to 2.0
	1976 models	2.0 to 4.0 *	2.0 to 4.0 *
	1977 models	1.5 to 3.0 *	1.5 to 3.0 *
	1978/79 models	1.5 to 3.5 *	1.5 to 3.5 *
	1980 models	0.4 to 0.8 * *	0.4 to 0.8 * *
	1981 models	0.4 to 0.8 * *	0.4 to 0.8 * *

* Air pump disconnected.

* * Measured in front of catalytic converter and with oxygen sensor plug disconnected.

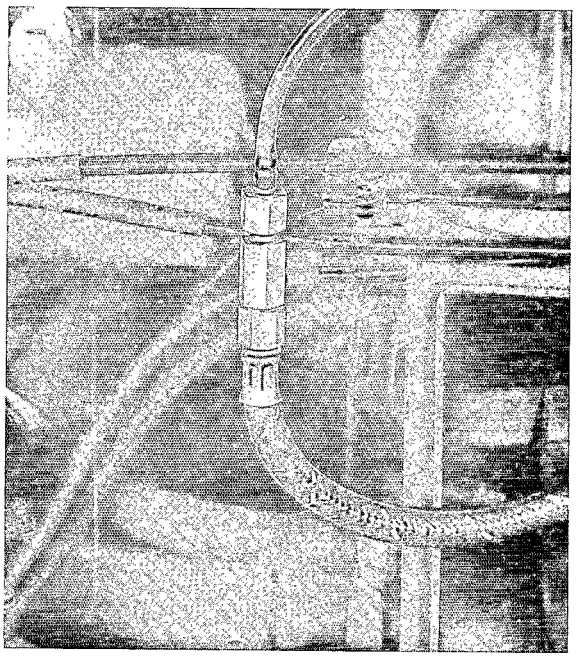
CHECKING CONTROL PRESSURE OF VACUUM-CONTROLLED CONTROL PRESSURE REGULATOR

Connect and bleed pressure gauge.

Refer to page 1.1 - 1/7.

Note

Connect pressure line (of control pressure regulator only) to second connector of pressure tester since the throttle valve control pressure regulator has been eliminated.



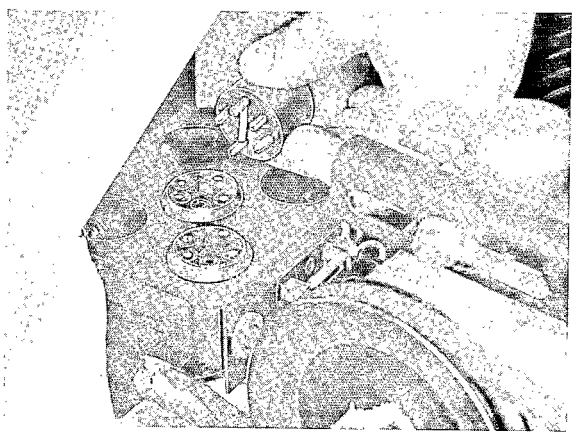
CHECKING "COLD" CONTROL PRESSURE

Refer to page 1.1 - 1/16 a.

CHECKING "WARM" CONTROL PRESSURE

This test can be done on a cold or warm engine.

1. Remove mounting plate cover in engine compartment.
2. Remove standard relay at center of relay plate.

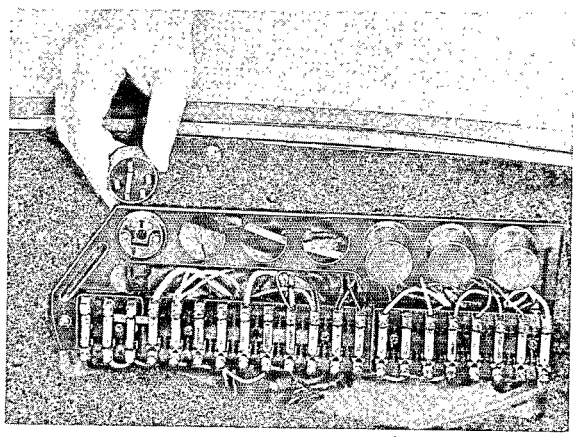


Note

The standard relay for the control pressure regulator of some vehicles is located to the rear, right side of the relay plate - and not as illustrated. Also refer to Group 9, Page 0.1 - 4/3.

CAUTION

With the 1976 Model the relay is in luggage compartment (rear relay as seen in driving direction).



3. Bridge terminals 87 a and 30 of a spare relay.
4. Place this modified relay in relay plate instead of the original relay.

5. Turn on ignition (fuel pump runs).

6. The control pressure rises slowly and must stabilize at 2.9 ± 0.20 bar. The regulating time span varies with the ambient temperature. Replace control pressure regulator (for warm running compensation) if necessary.

CAUTION

Reinstall original relay after testing!

CHECKING "IDLE" CONTROL PRESSURE

Start engine.

Control pressure must be 3.6 ± 0.20 bar at idle speed of 900 ± 50 rpm.

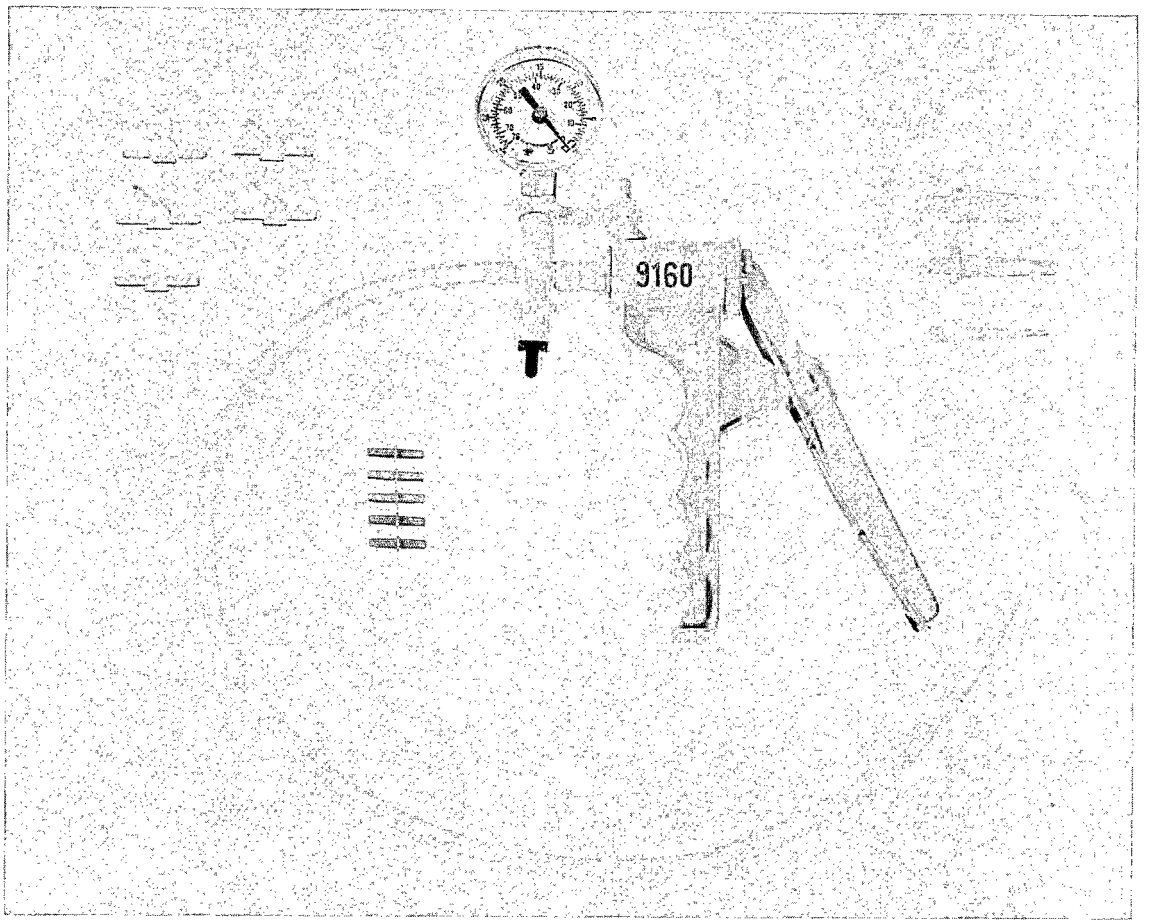
1978 and later models: 3.4 ± 0.20 bar at idle speed of 900 ± 50 rpm.

CAUTION

Position selector valve at 2 for this control pressure test.

CHECKING "COLD" CONTROL PRESSURE
(vacuum controlled (warm-up) control pressure regulator)

TOOLS



No.	Description	Special Tool	Remarks
1	Hand vacuum pump	US 8026	

CHECKING "COLD" CONTROL PRESSURE
(vacuum controlled (warm-up) control pressure regulator)

Note

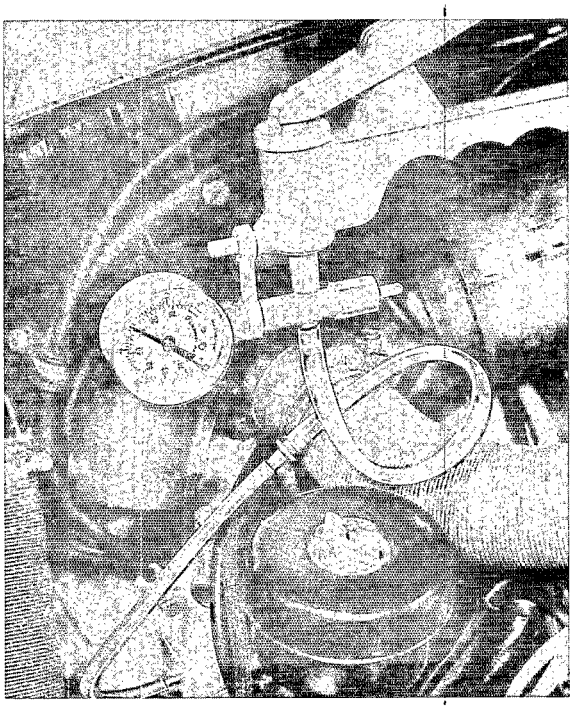
Engine must be absolutely cold.

From 1975 models diagram values are only for the vacuum controlled testing method in the case of vacuum controlled (warm-up) control pressure regulator.

1. Connect and bleed pressure tester. Set valve to position 2.

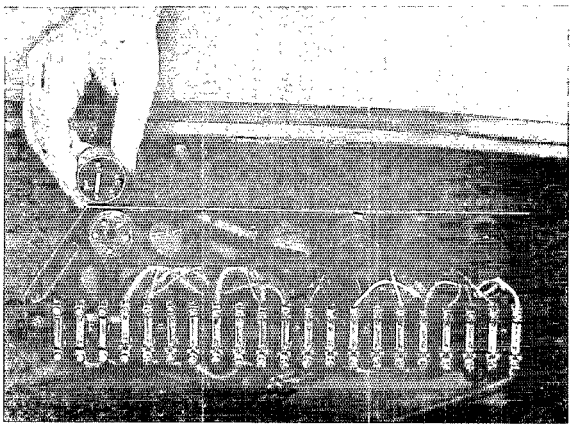
2. Remove hose between heater blower and warm air neck.

3. Pull off vacuum hose from (warm-up) control pressure regulator and connect hose/manual vacuum pump (US 8026) to connection of (warm-up) control pressure regulator.



4. Pull off wire plug from (warm-up) control pressure regulator.

5. Bridge electric safety circuit, by pulling off standard relay in trunk (rear relay looking forward) and replacing with a relay of which terminals 87 a and 30 are bridged or by pulling off wire plugs on air flow sensor.



6. Turn on ignition (fuel pump should run).

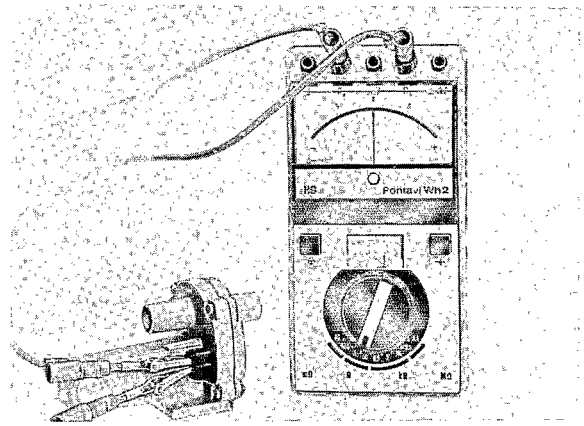
7. Adjust vacuum to specified value with the manual vacuum pump (9160) - see page 1.1 - 1/13.

8. Refer to diagram below "Testing and Adjusting Specifications" on page 1.1 - 1/13 for specified pressure corresponding with actual outside temperature.

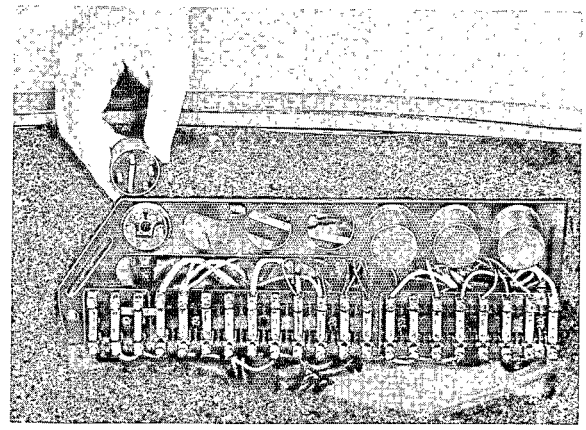
CHECKING AUXILIARY AIR REGULATOR

1. Remove auxiliary air regulator.

2. Connect ohmmeter to both terminals of auxiliary air regulator and check.
   Specifications: approx 33 ohm



3. Check power supply of auxiliary air regulator.
   a) Pull off standard relay in luggage compartment (rear relay as seen in driving direction).
   b) Bridge terminals 30 and 87a, turn on ignition.
   c) Connect test lamp to both auxiliary air regulator terminals from which the plugs have been pulled off.



4. Refer to "Troubleshooting Automatic Choke" for other checks.

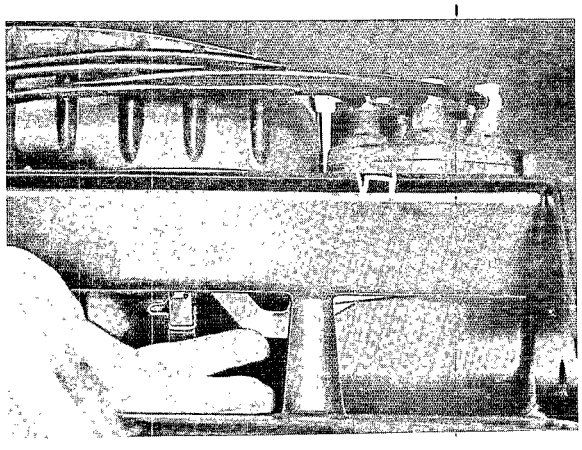
CHECKING AUXILIARY AIR VALVE

Refer to "Troubleshooting Automatic Choke".

CHECKING OPERATION OF SAFETY SWITCH

1. Disconnect rubber straps and remove air cleaner cover as well as the air cleaner cartridge.

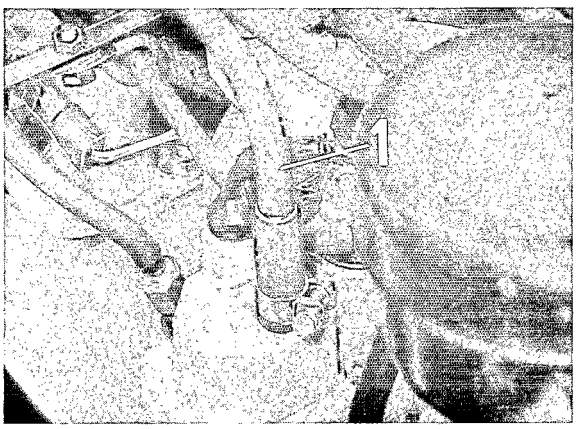
2. Turn on ignition; fuel pump should not run.



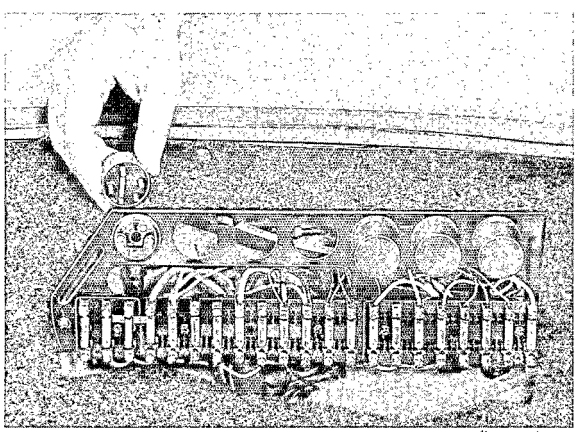
3. Lift sensor plate lever; slightest movement should start fuel pump.

CHECKING THERMOVALVE

1. Detach vacuum hose (1) at warm-up regulator.



2. Bridge terminals 30 and 87a of fuel pump relay in luggage compartment (rear relay as seen in driving direction .



3. Turn on ignition and stop time until switched in.

4. Blow into detached vacuum hose (from warm-up regulator) by mouth.

   Valve must open after 10 to 30 seconds, if thermovalve's ambient temperature is 20 to 30° C/68 to 86° F.

   Replace thermovalve, if necessary.

CIS PROBLEMS AND REMEDIES

A properly working ignition system and good mechanical condition of the engine are prerequisites for a successful CIS problem diagnosis.

Problem / Cause / Remedy	Improper operation	Control pressure "cold" not within tolerances — Pressure test	Control pressure "warm" too high (beyond adjustment) — Pressure test	Control pressure "warm" too low (beyond adjustment) — Pressure test	System pressure not within tolerances — Pressure test	Vacuum system leaking — Visual inspection	
Engine does not start or is difficult to start when cold	●	●			●	●	
Engine does not start or is difficult to start when warm	●						
Engine misses when car is driven					●		●
Unsatisfactory engine performance							
Excessive fuel consumption				●			●
Engine backfires into intake pipe							
Engine dieseling							
Rough idle during warmup		●		●		●	●
Rough idle when warm			●	●		●	●
Idle speed cannot be adjusted						●	
CO emissions too low at idle			●			●	
CO emissions too high at idle				●			

			●	●			●		●			Entire system leaking	Pressure test
	●	●	●	●								Pneumatic valve leaking	Function check
										●	●	Cold start enrichment valve does not open	Visual inspection
●		●	●	●	●		●	●				Cold start enrichment valve leaking	Visual inspection
●			●	●				●	●	●	●	Defective injection valve	Visual inspection
					●		●	●		●	●	Air flow sensor plate or control plunger binding	Function check
		●								●	●	Air flow sensor plate not resting properly at stop	Visual inspection
								●				Throttle valve does not open fully	Visual check (adjust)
●			●				●	●				Basic adjustment (idle) too rich	CO test (adjust)
	●		●			●		●				Basic adjustment (idle) too lean	CO test (adjust)
			●	●				●				Dirty fuel system	Clean
											●	Electric fuel pump not running	Check
										●	●	Defective reversal valve in fuel pump	Replace fuel pump
										●	●	Microswitch inoperative or hand throttle out of adjustment	Adjust

TROUBLESHOOTING AUTOMATIC CHOKE - 1976 MODEL

Problem: Speed remains too high at high engine temperatures or no speed increase on cold engine.

Possible Cause: Auxiliary air regulator or auxiliary air valve defective.

Remedy:

1. Disconnect top control line at auxiliary air valve and plug.

   Problem corrected: Replace auxiliary air valve.

   Problem unchanged: Auxiliary air valve good.

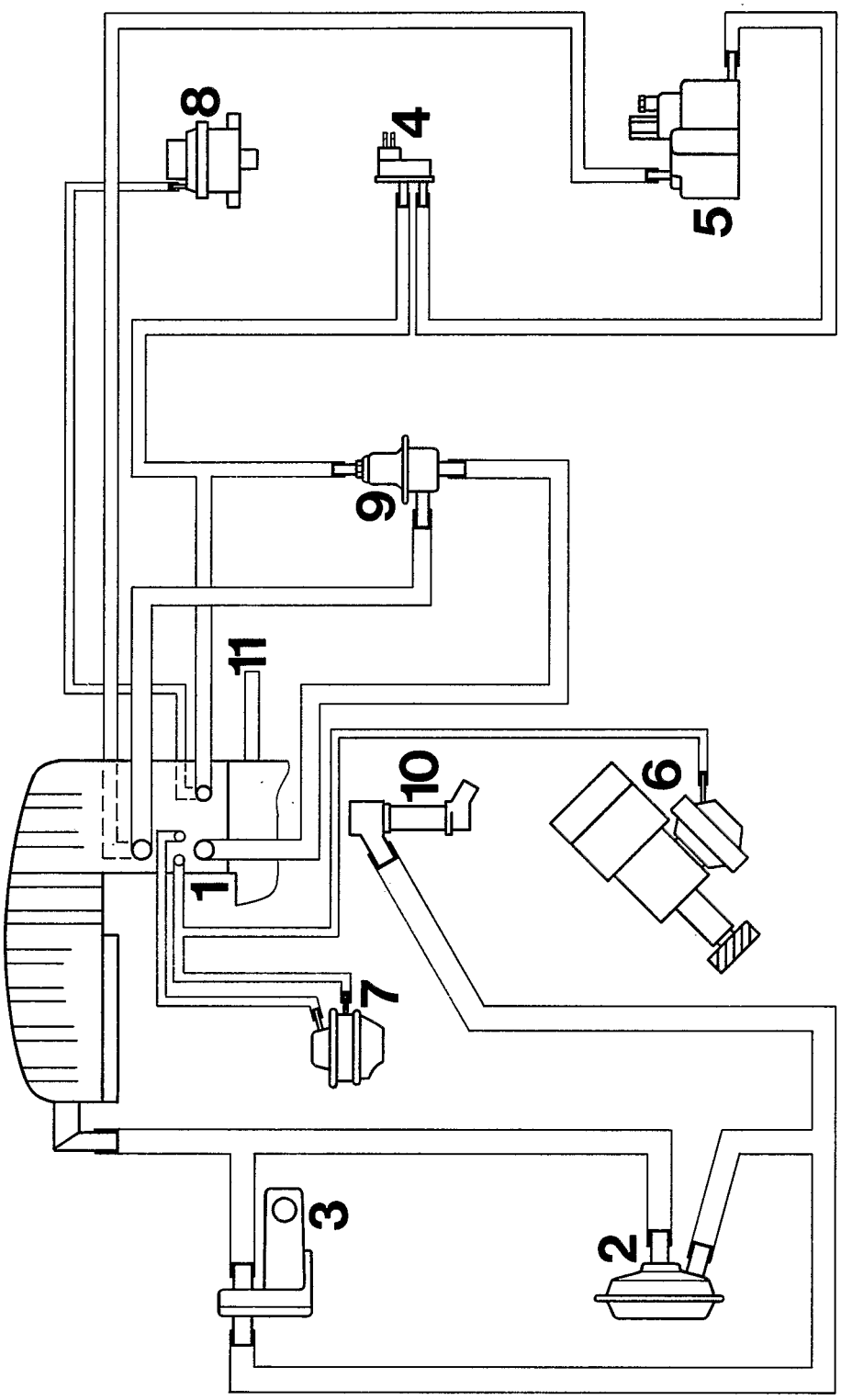
2. Cold engine: If there is no increase in speed, auxiliary air regulator is defective.

   Warm engine: Disconnect one hose at auxiliary air regulator and plug both openings.

   Speed too high: auxiliary air valve defective

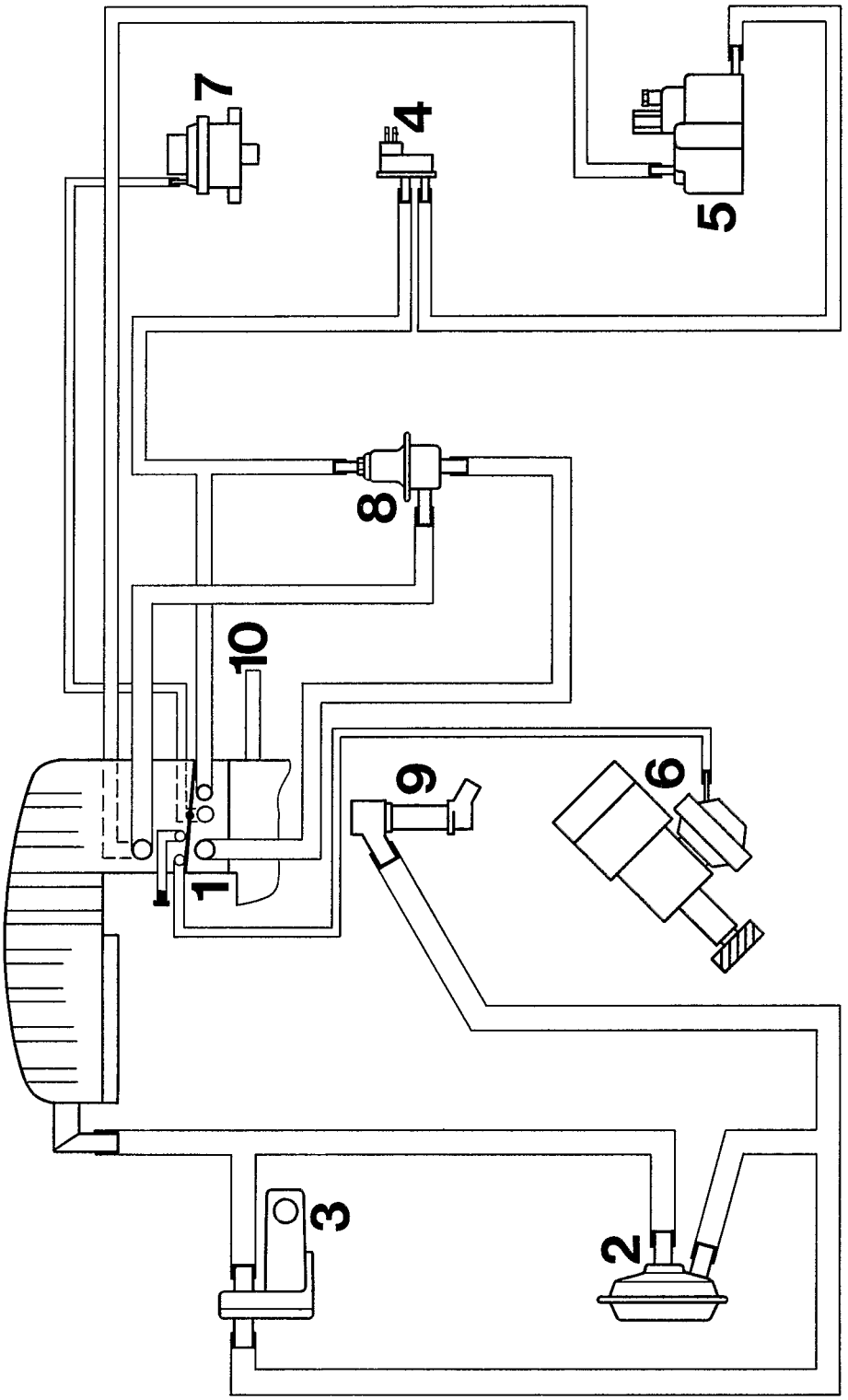
   Speed drops: auxiliary air regulator defective

VACUUM SYSTEM LAYOUT (1978 Models)



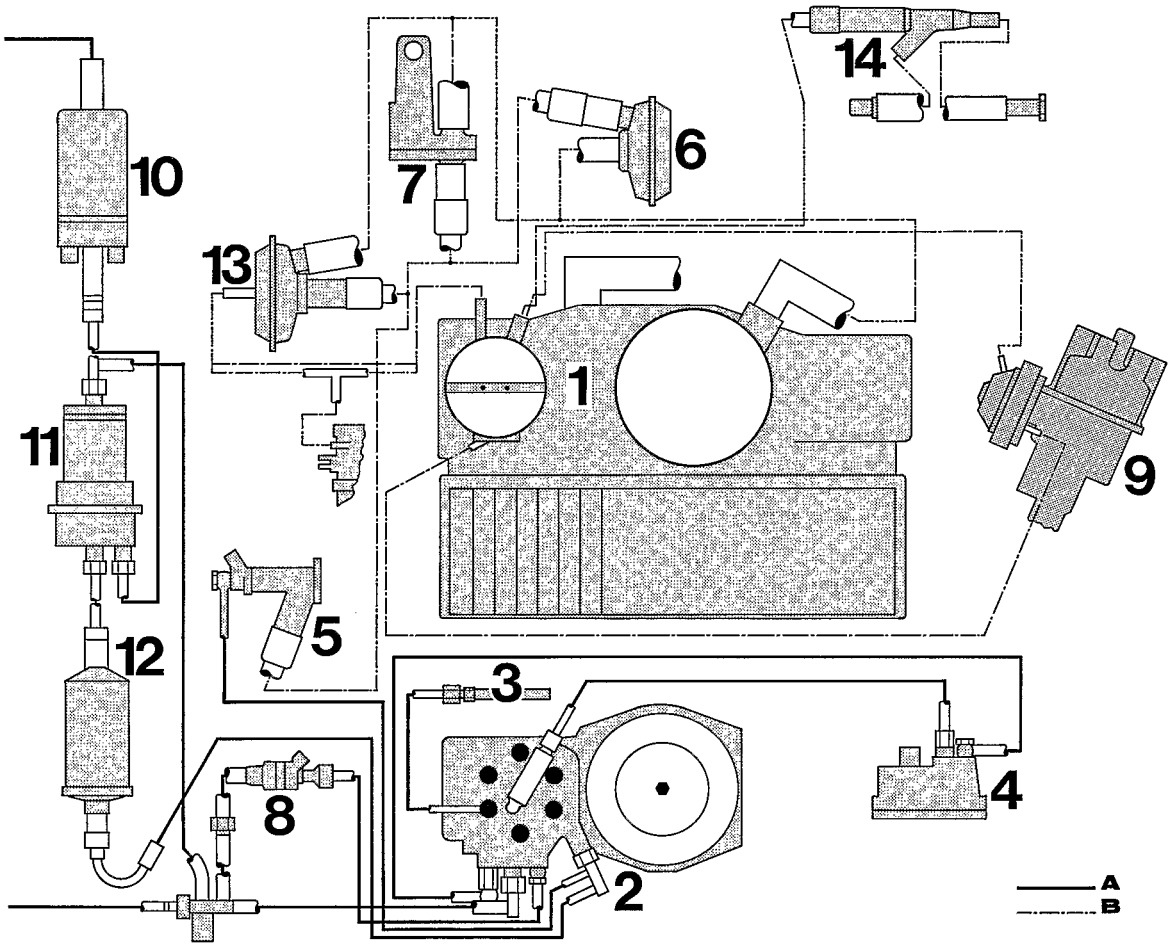
1 - Throttle housing
2 - Auxiliary air valve
3 - Auxiliary air regulator
4 - Thermo valve
5 - Control pressure regulator
6 - Distributor
7 - EGR valve (only California)
8 - Diverter valve
9 - Vacuum control
10 - Vacuum source for auxiliary air valve and auxiliary air regulator
11 - Vacuum source for power brakes

VACUUM SYSTEM LAYOUT (from 1979 Model)



1 - Throttle housing
2 - Auxiliary air valve
3 - Auxiliary air regulator
4 - Thermo valve
5 - (Warm-up) control pressure regulator
6 - Ignition distributor
7 - Diverter valve
8 - Deceleration valve
9 - Vacuum source for auxiliary air valve and auxiliary air regulator
10 - Vacuum source for power brake

LAYOUT OF FUEL AND VACUUM LINES - 911 SC (from 1980 Model)



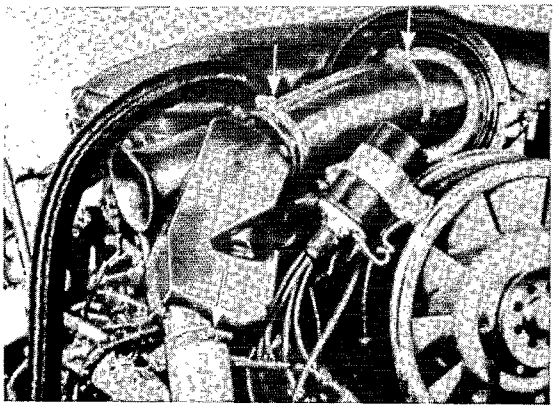
A - Fuel lines
B - Vacuum lines

1 - Throttle housing
2 - Mixture control unit
3 - Fuel injector
4 - (Warm-up) control pressure regulator
5 - Cold start valve
6 - Auxiliary air valve
7 - Auxiliary air regulator
8 - Frequency valve
9 - Ignition distributor
10 - Fuel pump
11 - Fuel reservoir
12 - Fuel filter
13 - Deceleration valve
14 - Vacuum booster

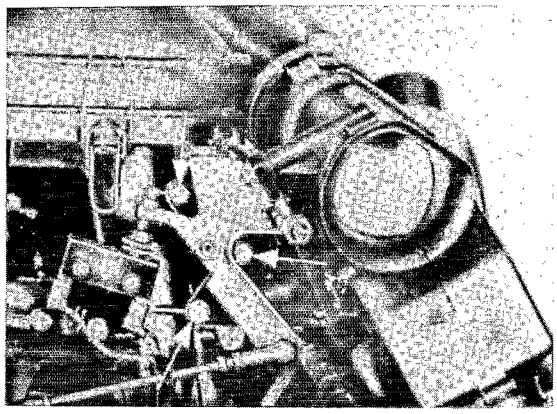
REMOVING AND INSTALLING REGULATOR HOUSING

Removing

1. Detach hot air hose between left heat exchanger and regulator housing, then remove hose between regulator housing and air cleaner intake.



2. Remove 3 retaining bolts from left velocity stack and remove regulator housing.

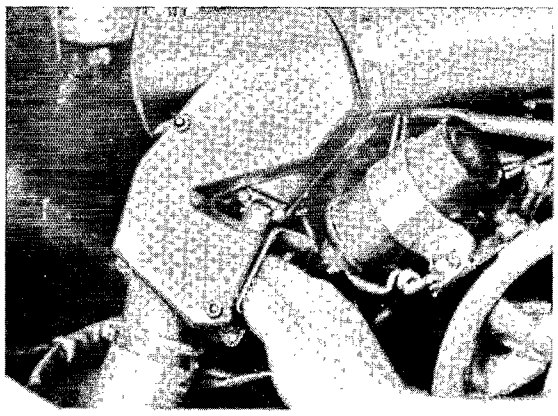


Installing

Adjust fresh air flap (see page 2.1-1/2).

CHECKING OPERATION OF INDUCTION AIR PREHEATING SYSTEM

1. Hot air flap must be open when engine is cold. This can be checked through the bypass hole in the regulator housing. The hot air flap closes the bypass duct and stays in place under spring tension.



2. Warm up engine at about 2500 rpm. The hot air flap must close after about 3-4 minutes. Check flap position through bypass hole.

3. If the hot air flap, which is controlled by a thermostat, does not work, replace the regulator housing.

Note: The thermostat in the regulator housing can not be replaced. Replace the entire control box.

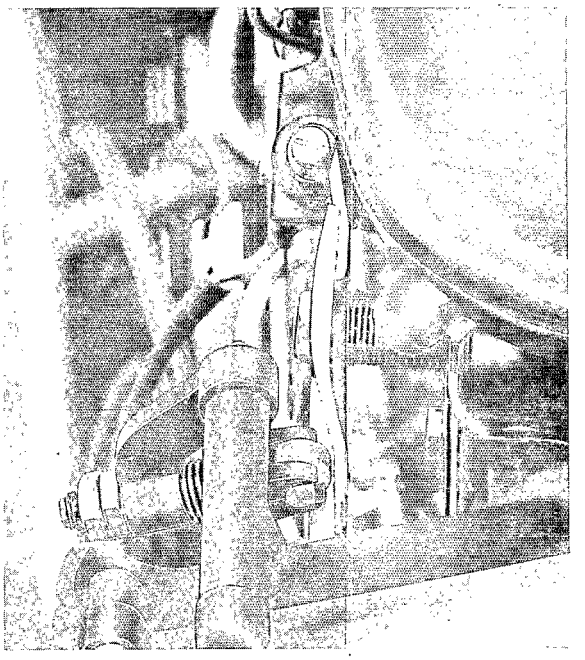
ADJUSTING FRESH AIR FLAP

1. Adjust fresh air flap with throttle valve linkage set in idle position.

2. Adjust roller for fresh air flap lever with both nuts so that the roller touches the control lever without play. Lock the nut.

Note:

After adjusting, check that the fresh air flap begins to open with throttle valves set at 20^{o}.

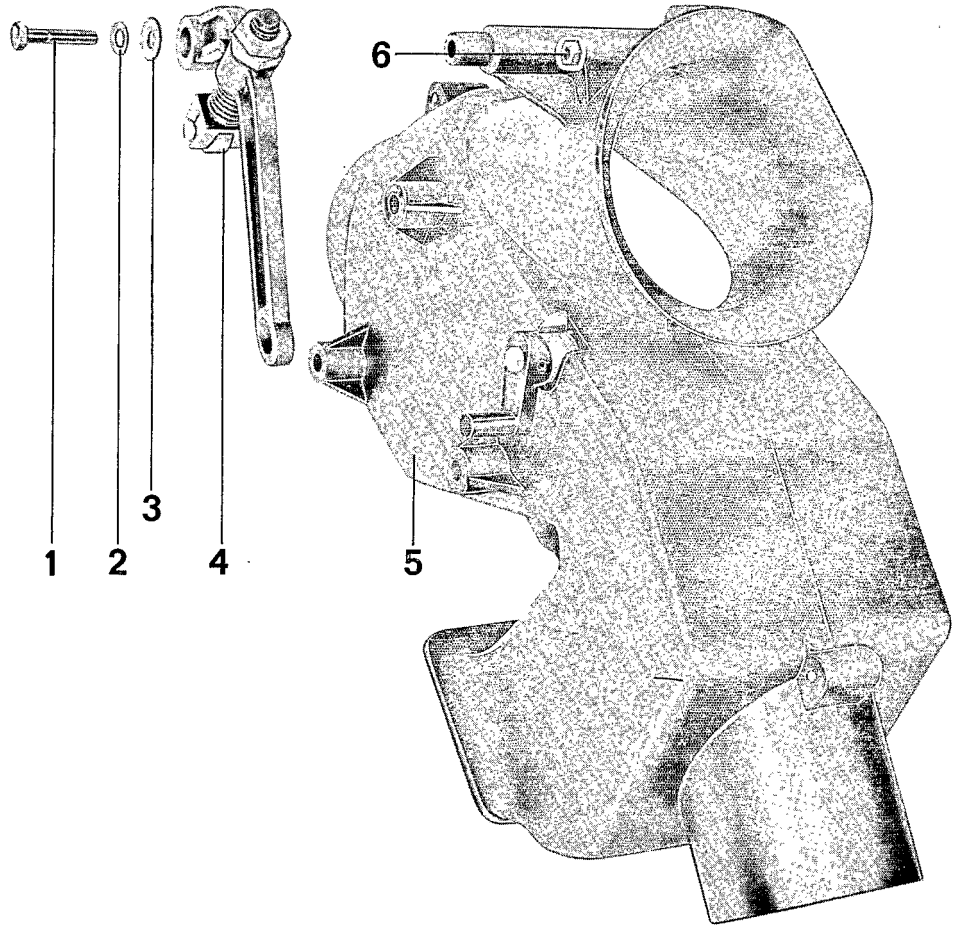


REPLACING FRESH AIR FLAP LEVER

Caution
Prevent nut from falling into regulator housing by holding nut of retaining bolt during removal.

1. Remove bolt and lever.

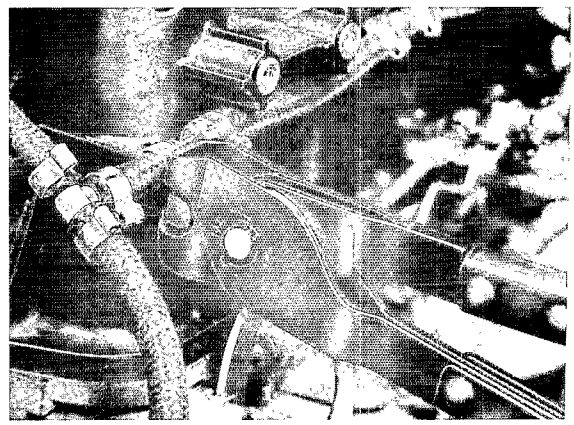
   Note:
   Hold lock nut with punch or scriber. The nut can fall into the control box.



1 Nut
2 Spring washer
3 Washer
4 Lever
5 Control box
6 Nut

INSTALLING HOSE CLAMPS FOR COLD START ENRICHMENT

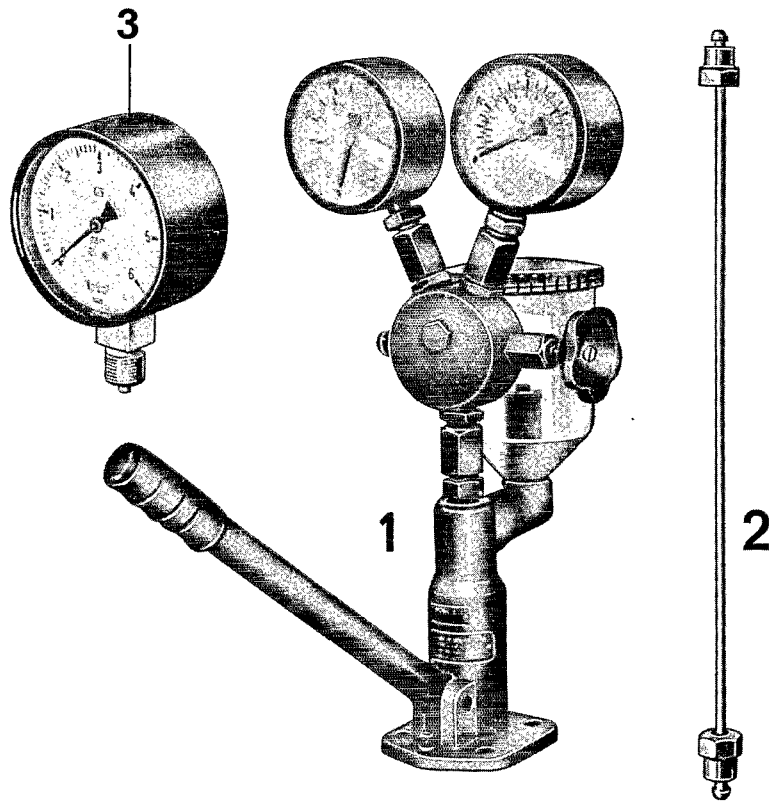
Tighten hose clamps with VW special tool Nr. ASE 000 049.



Note:
The hose clamps can be used only once.

FUEL INJECTION

TOOLS



No.	Description	Special Tool	Remarks
1	Injection nozzle tester with two pressure gauges		Use Bosch or similar injection nozzle tester. Pressure gauge range: 0-25 kg/cm^2 (0-355 psi)
2	Line with fittings		Use Bosch EF 8040/30 or similar
3	Pressure gauge 0-6 kp/cm^2 Kl. 1.0 100 mm dia.		For CIS

CHECKING FUEL INJECTORS

General

Instructions for checking the injectors apply to vehicles equipped with either the mechanical or CIS fuel injection.

The injector tester is used for checking opening pressure, spray pattern, and leakage of injectors.

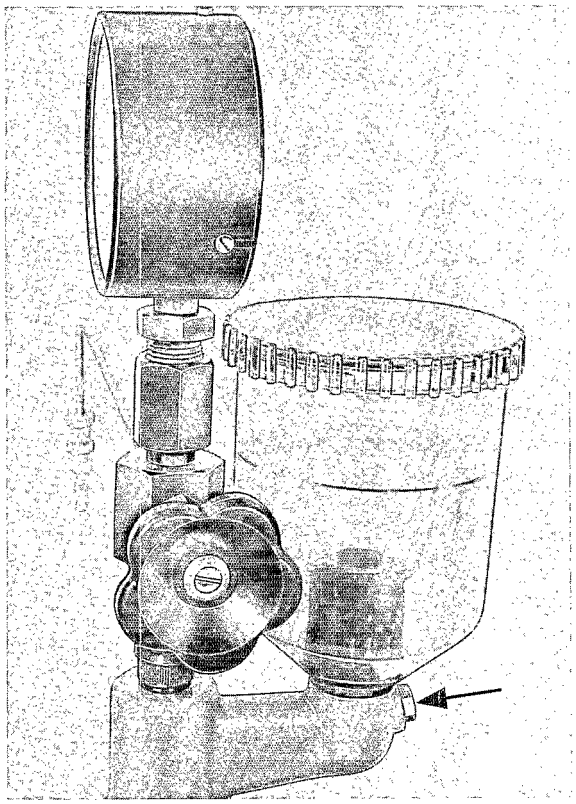
Fill container of the tester with testing oil and bleed tester prior to testing the injectors. Use only testing oil 01 61 v 11.

Under no circumstances should gasoline be used.

When testing injectors for the mechanical injection system, use pressure gauge EF 1687 231 000 0 - 25 bar. When testing CIS injectors use pressure gauge with calibrations 0 - 6 bar.

Bleeding the Tester

1. Open bleeder screw.



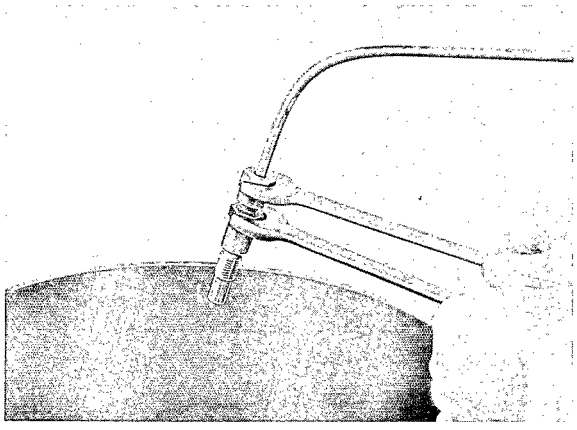
2. Open pressure gauge valve.

3. Actuate hand lever until testing oil comes out of the bleeder without air bubbles.

4. Tighten bleeder screw.

5. Connect injector to pressure line but do not tighten connection. Actuate hand lever until air bubbles cease to come out at the coupling nut.

6. Tighten injector to pressure line.



Checking Injectors

Note

The injectors of one engine can be replaced separately.
Defective injectors cannot be repaired, but must be replaced.

Checking

Operate hand lever slowly (about 2 sec./stroke) with the pressure gauge shut-off valve open. In this manner a valve leaking because of a large particle of dirt can be recognized (tight spray on valve, pressure built up to max. 1.5 bar).

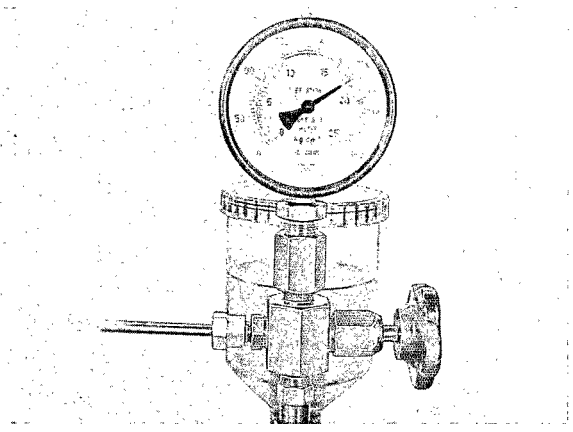
Checking Opening Pressure

1. Flush injector with the pressure gauge shut-off valve closed by moving lever back and forth several times quickly.

2. Open pressure gauge shut-off valve and read opening pressure on pressure gauge while moving lever slowly (about 2 sec./stroke).

The opening pressure is:
15 to 18 bar (mechanical injection system)
2, 5 to 3, 6 bar (continuous fuel injection)

Replace injector, if opening pressure is outside of these tolerances.



Caution

When pressure gauge shut-off valve is open increase pressure slowly to avoid damaging the pressure gauge.

Checking for Leaks

Mechanical Fuel Injection

1. Open shut-off valve on pressure gauge until the pressure on the pressure gauge has dropped below 15 bar.

2. Operate hand lever slowly until a pressure of 2.0 bar less than the measured opening pressure is reached.

No drops should form on the valve within 15 seconds when the pressure is 2 bar less than the opening pressure.

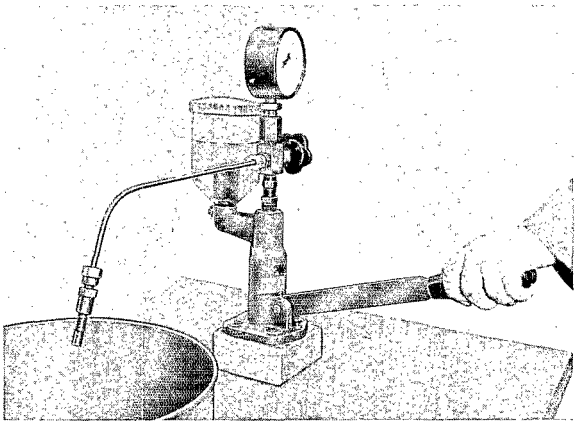
Continuous Fuel Injection

1. Close pressure gauge shut-off valve and flush injector by operating lever many times.

2. Open shut-off valve and increase pressure slowly to 0.5 bar less than the previously measured opening pressure (but not below 2, 3 bar), and hold.
   No drops should form on injector within 15 seconds.

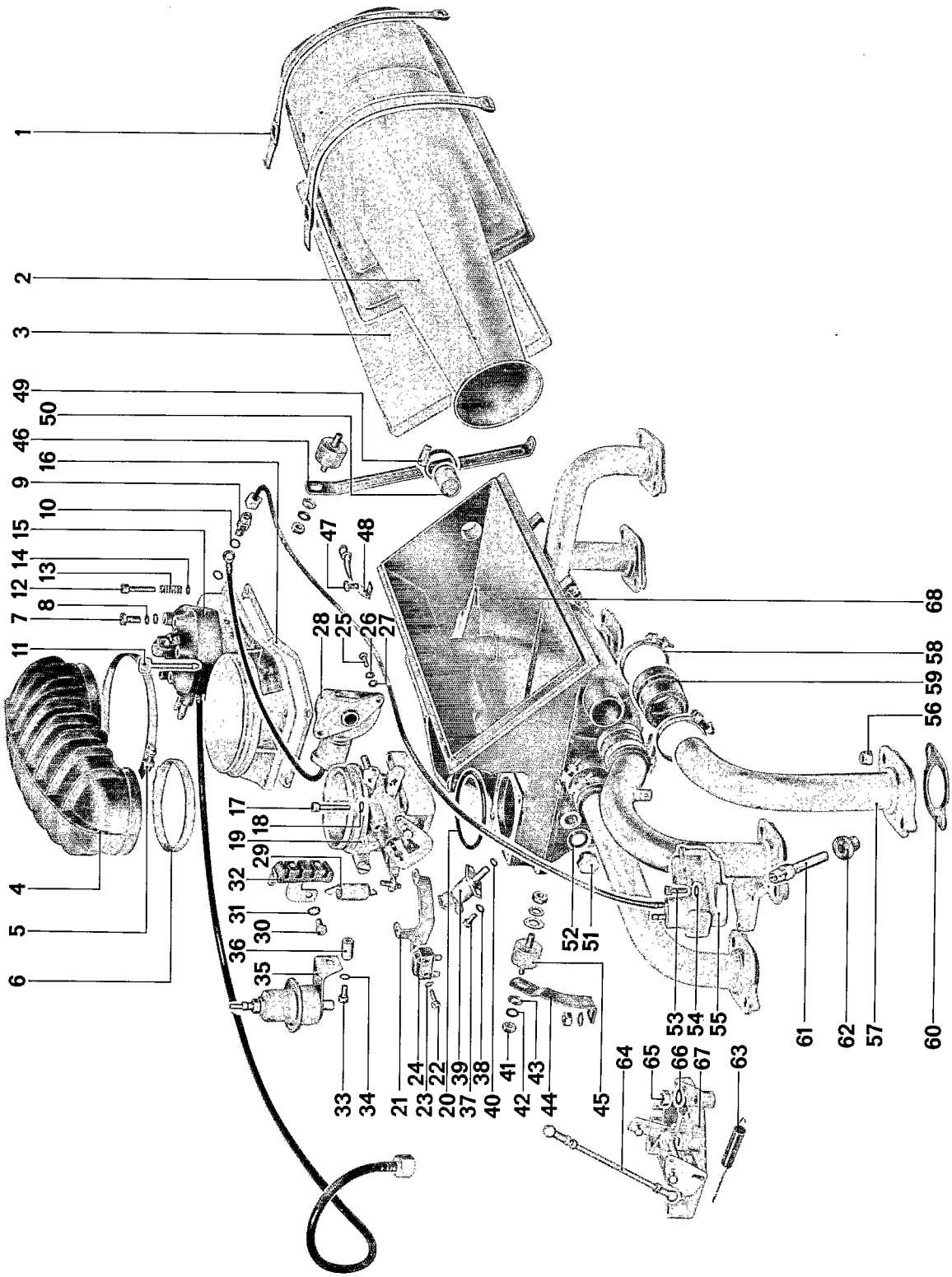
Humming Test/Checking Spray Pattern

1. Close pressure gauge shut-off valve and flush injector by operating lever many times (0.5 sec./stroke).



2. Then reduce lever movement to about 1 sec./stroke. This must cause injector to hum. No drops should form on injector. A tight spray pattern is not allowable. An atomized, one-sided spray pattern of about 35^{o} is permissible.

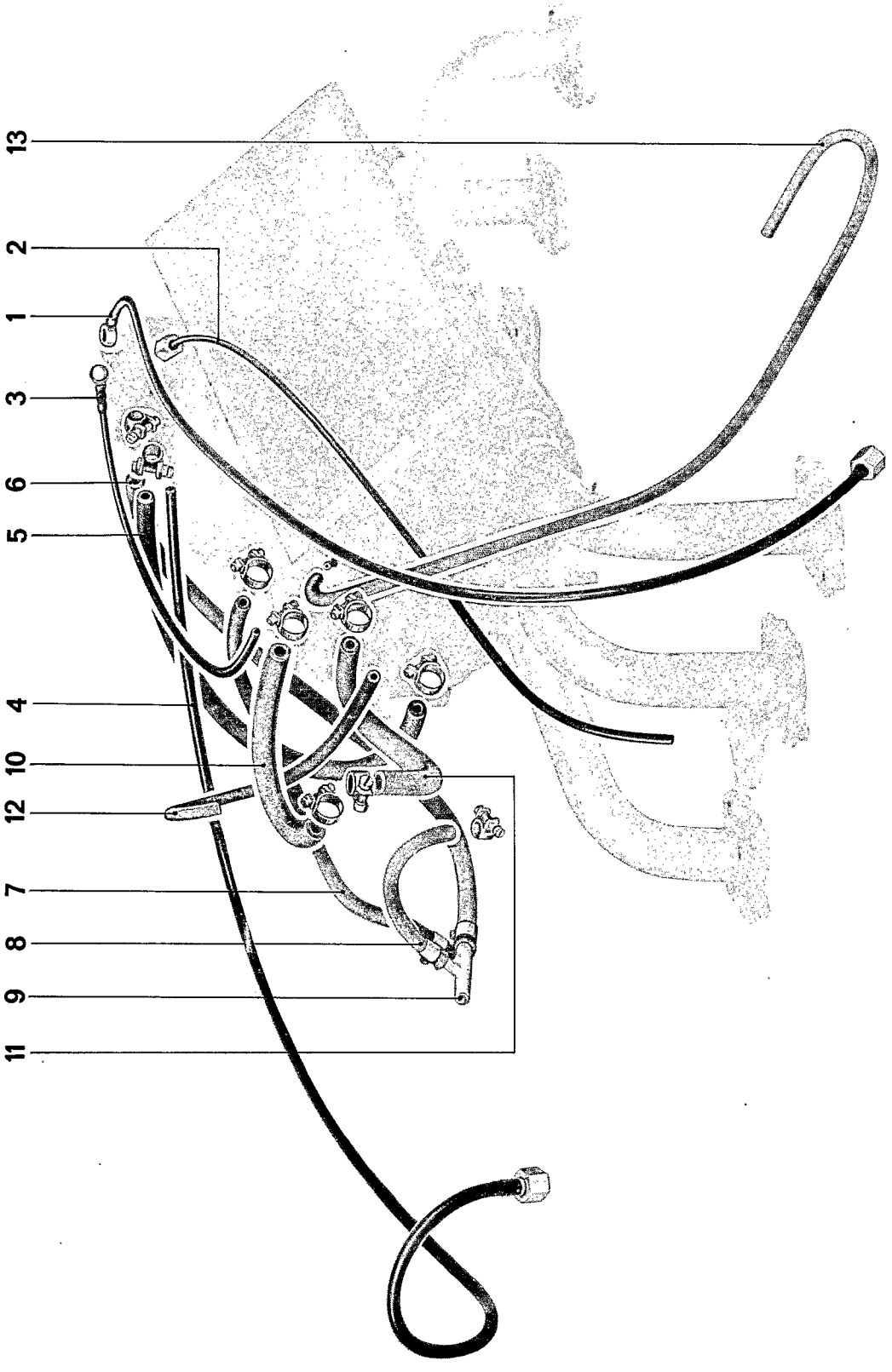
DISASSEMBLING AND REASSEMBLING



No.	Description	Qty	Note when removing	Note when installing	References
1	Rubber strap	2			
2	Intake horn	1			
3	Filter cartridge	1		Replace if necessary	
4	Duct	1			
5	Hose clamp	1			
6	Hose clamp	1			
7	Banjo bolt	6			
8	Gasket	12		Replace	
9	Stud	1			
10	Gasket	2		Replace	
11	Plug	1			
12	Allen bolt	6		Tighten lightly, then loosen by 1 turn	Page 2.2 - 1/7
13	Spring	6			
14	Washer	6			
15	Mixture control unit.	1			Page 2.2 - 1/7
16	Gasket	1		Replace	
17	Allen bolt	4			
18	Spring washer	4			
19	Throttle valve housing	1			Page 2.2 - 1/8
20	O-ring	1		Replace	
21	Holder	1			
22	Allen bolt	2			
23	Spring washer	2			
24	Microswitch	1			Page 3.2 - 1/4

No	Description	Qty	Note when removing	Note when installing	Reference
25	Allen bolt	2			
26	Lock washer	2		Replace	
27	Washer	2			
28	Control pressure regulator for throttle valve position	1			Page 2.2 - 1/8
29	Spring	1			
30	Bolt	1			
31	Lock washer	1			
32	Terminal block	1			
33	Allen bolt	1			
34	Washer	1			
35	Auxiliary air device	1			
36	Spacer sleeve	1			
37	Allen bolt	2			
38	Spring washer	2			
39	Start (enrichment) valve	1			Page 2.2 - 1/10
40	O-ring	1		Replace	
41	Bolt	4			
42	Spring washer	4			
43	Washer	3			
44	Support	1			
45	Rubber/metal cushion	2			

No	Description	Qty	Note when removing	Note when installing	Reference
46	Support	1			
47	Sheet metal screw	2			
48	Holder	2			
49	Hose clamp	1			
50	Flame trap cartridge	1			
51	Plug	1			
52	Gasket	1		Replace	
53	Allen bolt	2			
54	Spring washer	2			
55	Control pressure regulator for warm running compensation	1			Page 2.2 - 1/9
56	Nut	12			
57	Intake pipe	6			
58	Hose clamp	12			
59	Rubber muff	6		Replace if necessary	
60	Gasket	6			
61	Injection valve	6			Page 2.2 - 1/13
62	Rubber bushing	6			
63	Spring	1			
64	Pull rod	1			
65	Nut	3			
66	Spring washer	3			
67	Bracket	1			
68	Intake manifold	1			

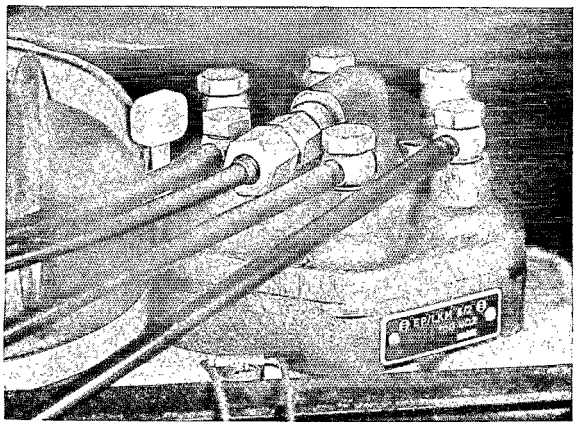

13
2
1
3
6
5
4
10
12
7
8
9
11

No	Designation	Qty	Note when removing	Note when installing	References
1	Injection line	6			
2	Supply line to control pressure regulator for warm running compensation	1			Page 2.2 - 1/15
3	Supply line to control pressure regulator for throttle valve position	1			Page 2.2 - 1/15
4	Supply line from fuel filter to mixture control unit	1		Install in proper position	Page 2.2 - 1/15
5	Supply line to start (enrichment) valve	1			
6	Return line from mixture control unit to fuel tank	1			
7	Return line from control pressure regulator for throttle valve position to fuel tank	1			
8	Return line from control pressure regulator for warm running compensation to fuel tank	1			
9	Connector for return flow hoses	1			
10	Vacuum hose	1			
11	Vacuum hose	1			
12	Vacuum hose	1			
13	Vacuum hose	1			

REMOVING AND INSTALLING MIXTURE CONTROL UNIT

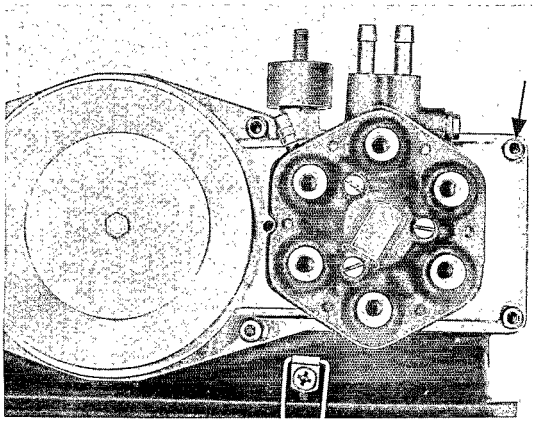
Removal

1. Disconnect all fuel lines and hoses from the mixture control unit. Detach fuel supply line from fuel filter.
   NOTE
   Use rag to prevent fuel spillage.



2. Unscrew 6 Allen bolts and remove with spring and plate.

3. Remove mixture control unit together with gasket.



Installation

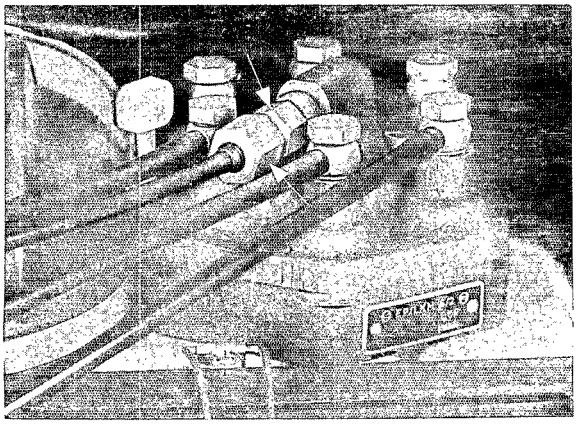
1. Watch proper location of gasket.

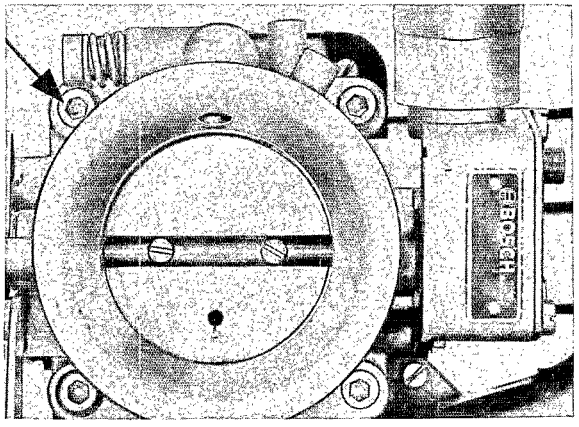
2. Tighten Allen bolts to bottom, then back off 1 complete turn.

3. Use new gaskets in fuel line connections.

4. Bleed fuel line system (see page 2.2 - 1/17).

REMOVING AND INSTALLING THROTTLE VALVE HOUSING AND CONTROL PRESSURE REGULATOR (THROTTLE VALVE POSITION)





Removal

1. Disconnect fuel line, which connects mixture control unit with the control pressure regulator for throttle valve position, from the mixture control unit.

2. Disconnect fuel hose from regulator.

3. Remove 4 Allen bolts and withdraw throttle valve housing with control pressure regulator for throttle valve position.

4. Remove 2 Allen bolts and remove regulator from throttle valve housing.

Installation

1. Check proper positioning of the O-ring for the throttle valve housing.

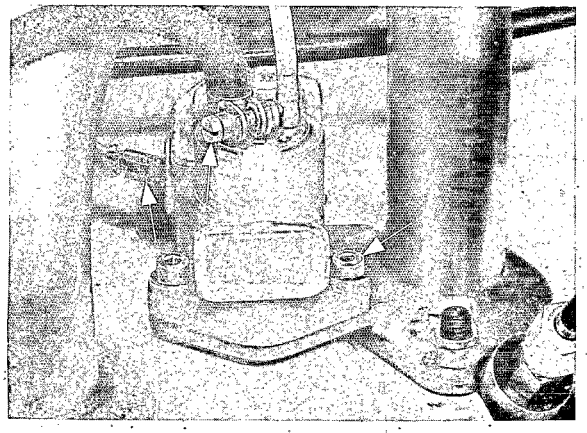
2. Adjust control pressure regulator for throttle valve position (see page 3.2 - 1/5).

3. Bleed fuel line system (see page 2.2 - 1/17).

REMOVING AND INSTALLING CONTROL PRESSURE REGULATOR (WARM RUNNING COMPENSATION)

1. Disconnect ground strap from both batteries.

2. Detach electrical connections.

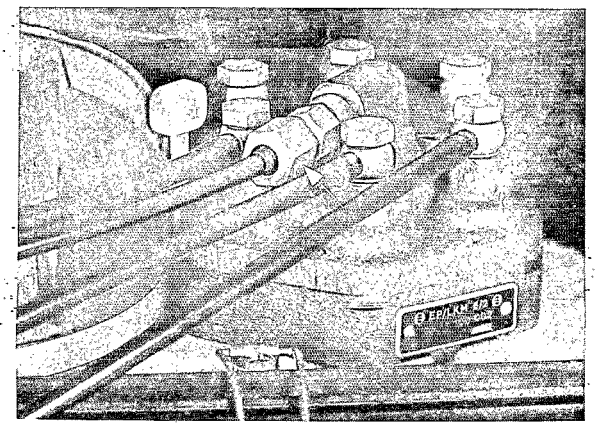


3. Disconnect fuel hose.

4. Remove Allen bolts.

5. Remove fuel line which connects mixture control unit with the control pressure regulator for warm running compensation from the mixture control unit.

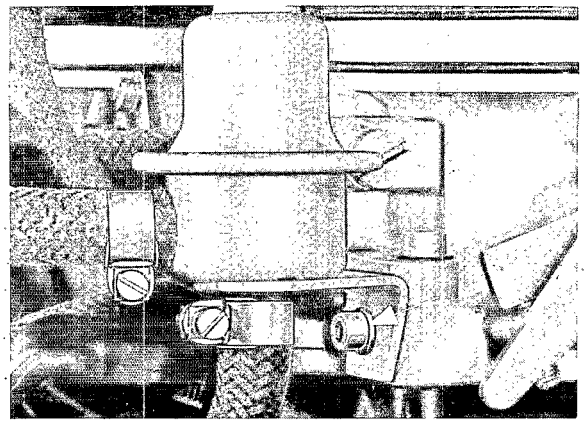
NOTE
Use rag to prevent fuel spillage.



6. Bleed fuel line system (see page 2.2 - 1/17).

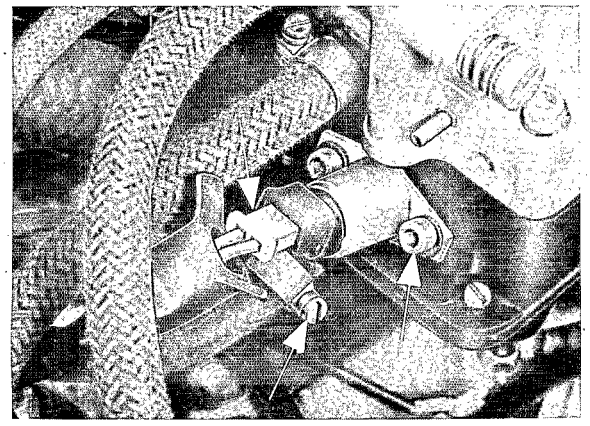
REMOVING AND INSTALLING START (ENRICHMENT) VALVE

Removal



1. Disconnect ground strap from both batteries.

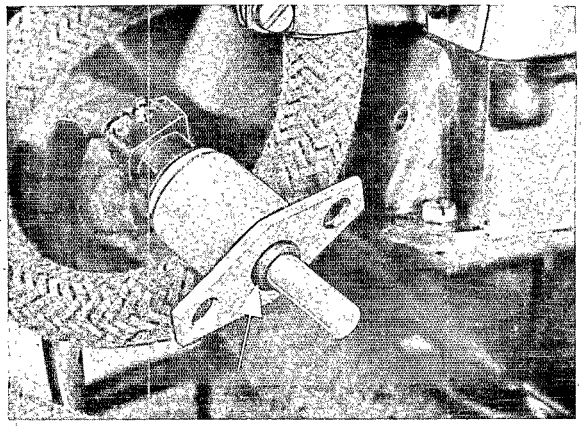
2. Remove auxiliary air device from throttle valve housing.



3. Detach twin electrical connector from the start (enrichment) valve.

4. Remove Allen bolts.

5. Loosen hose clamp and detach fuel line.



Installation

Be sure O-ring is positioned properly.

NOTE
Electrical connector must point upward.

Bleed fuel line system (see page 2.2 - 1/17).

REMOVING AND INSTALLING FUEL FILTER

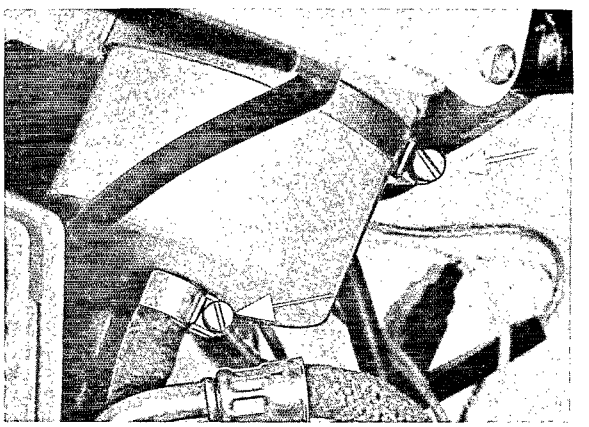
1. Disconnect ground strap from both batteries.

2. Remove fuel line coupling nut.

   NOTE
   Use rag to prevent fuel spillage.

3. Remove retaining clamp and hose clamp and remove filter.

   NOTE
   Use an appropriate vessel to collect fuel which may be running out.

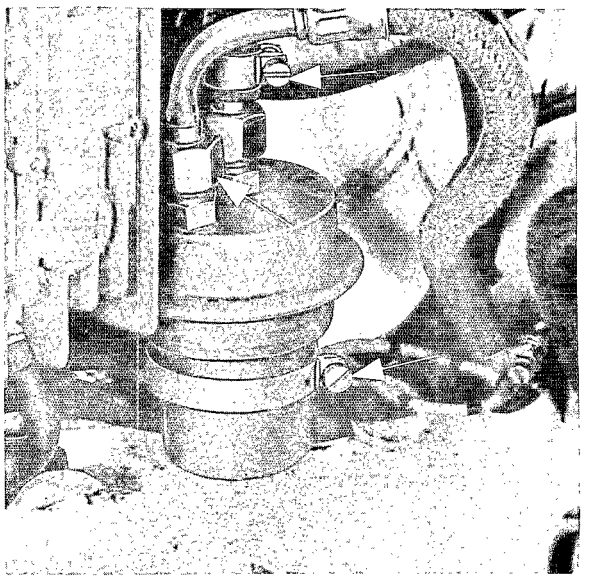


4. Do not overtighten the retaining strap since this could deform the filter assembly.

5. Check all connections for leaks.

6. Bleed fuel line system (see page 2.2 - 1/17).

REMOVING AND INSTALLING FUEL PRESSURE ACCUMULATOR



1. Unscrew coupling nut from fuel supply line at the fuel pressure accumulator.

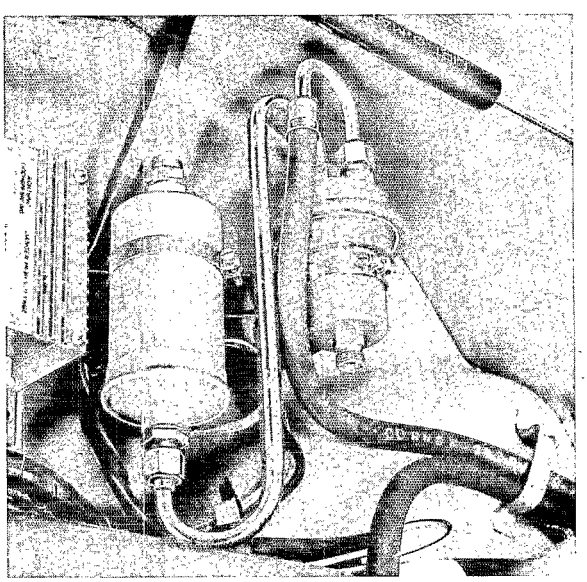
   NOTE
   Use rags to prevent fuel spillage.

2. Remove attaching clamp.

3. Loosen hose clamp, withdraw fuel pressure accumulator and plug fuel hose with an appropriate plug.

4. Check all connections for leaks.

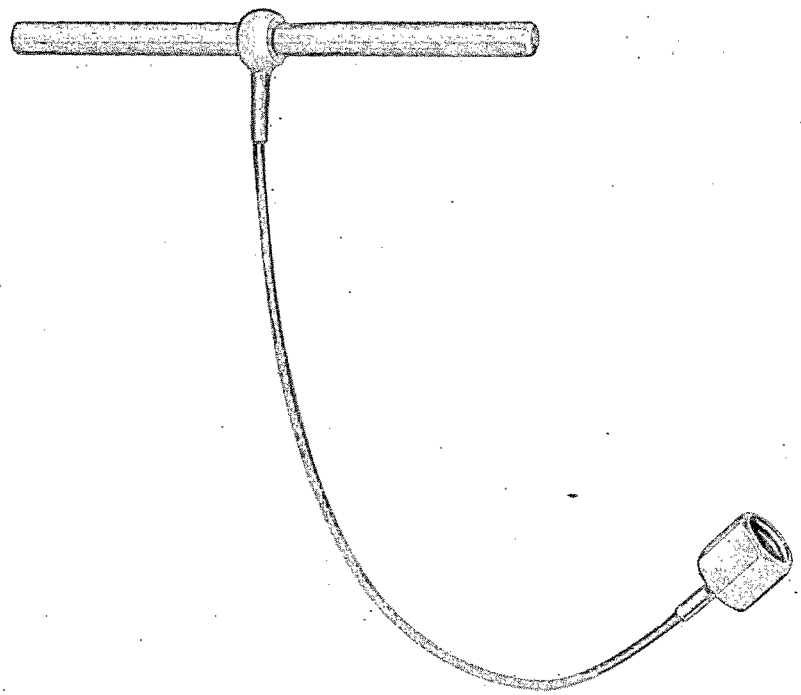
Arrangement from 1977 Models



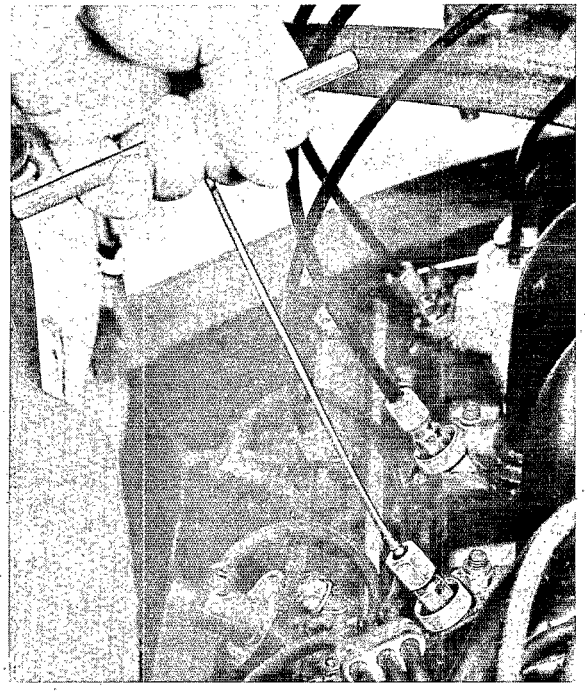
5. Bleed fuel line system (see page 2.2 - 1/17).

REMOVING AND INSTALLING INJECTION VALVES

TOOLS



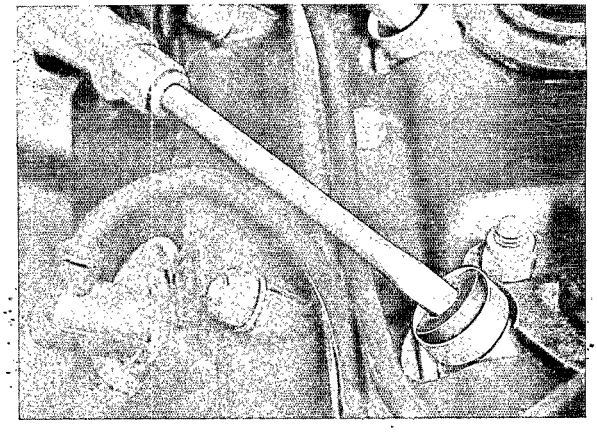
No	Description	Special Tool	Remarks
1	Remover	P 384	



Removal

1. Unscrew coupling nut from the injection line at the injection valve.

2. Install special tool P 384 and pull injection valve out.



3. If rubber bushing remains in the support sleeve, take the bushing out with a screwdriver.

   NOTE
   Avoid damaging the supporting sleeve.

Installation

1. Inspect rubber bushing, replace if necessary.

2. Use a drop of engine oil when installing the bushing.

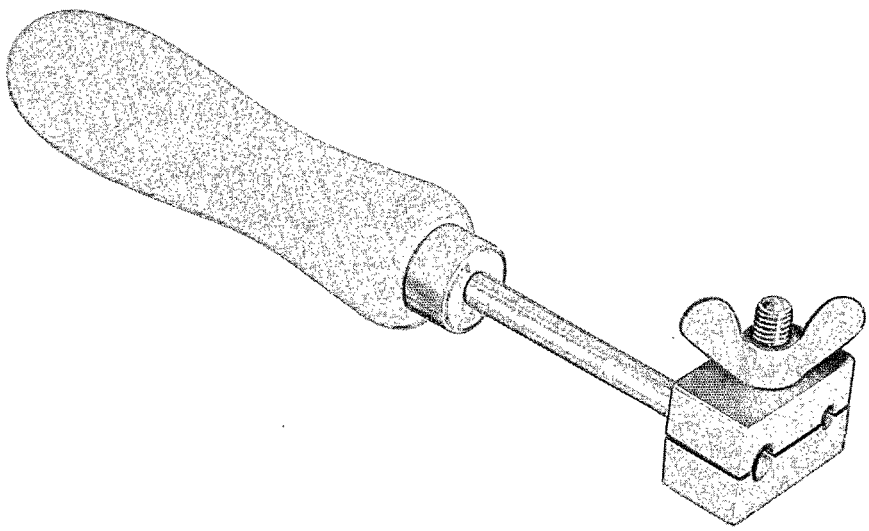
3. Press injection valve firmly into the supporting sleeve to stop.
   The rubber bushing must be seated below the bulge in the supporting sleeve.

4. Check fuel lines for leaks.

5. Bleed fuel line system (see page 2.2 - 1/17).

REPLACING PLASTIC FUEL LINES

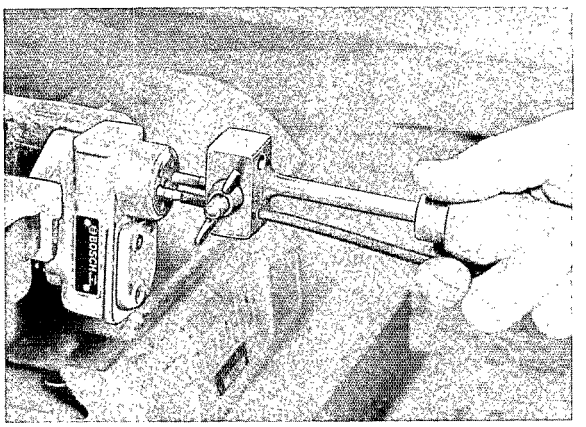
TOOLS



No	Description	Special Tools	Remarks
1	Installer	P 385	

The mixture control unit, control pressure regulator for throttle valve position and control pressure regulator for warm running compensation replacements are furnished with plastic fuel lines attached. Defective plastic fuel lines can be replaced individually.

1. Using a soldering iron, heat defective fuel line in the connector area and pull the line off.



2. Mount replacement part in a vise with soft jaw protectors.

3. Mount fuel line in special tool P 385, allowing push-on section to protrude from the tool.

4. Push dry fuel line onto the connector.

NOTE
Make sure that line is properly positioned.

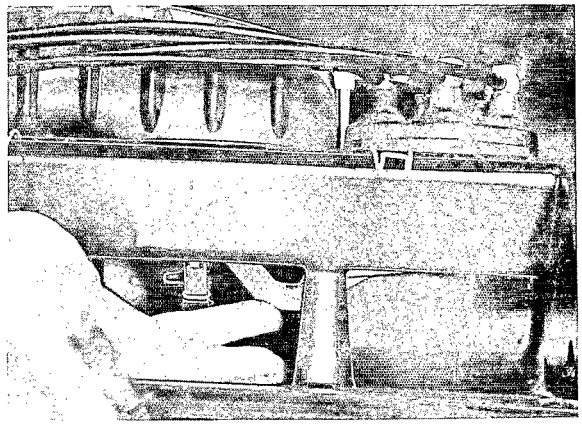
BLEEDING FUEL LINE SYSTEM

The fuel injection system must be bled (prior to starting) whenever a fuel line system component has been replaced.

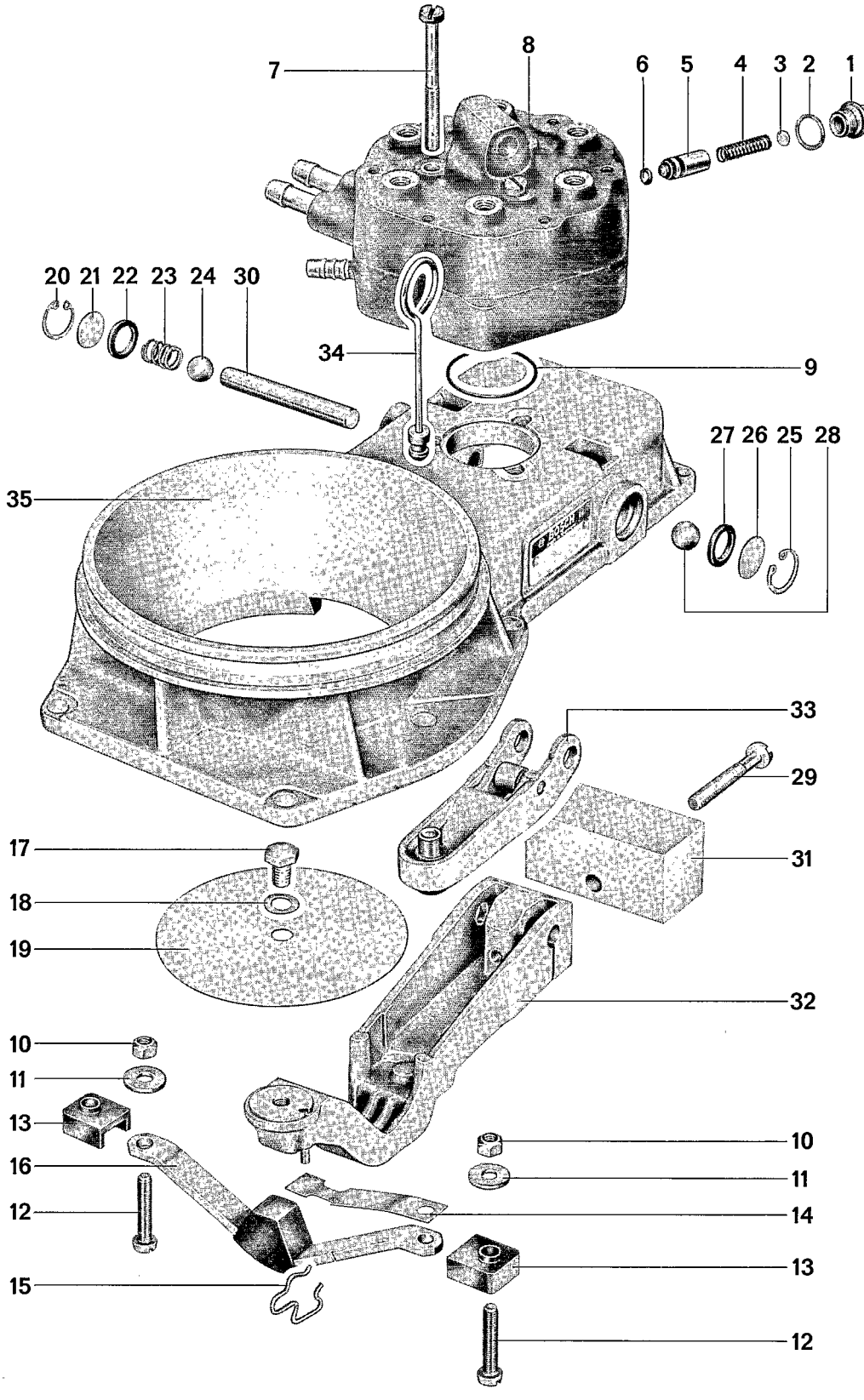
1. Remove intake horn with filter cartridge.

2. Switch the ignition on.

3. Press diaphragm up by hand to stop (for 1 second to a maximum of 5 seconds) until the fuel lines are filled and the injection valves spray fuel audibly.



DISMANTLING AND ASSEMBLING MIXTURE CONTROL UNIT

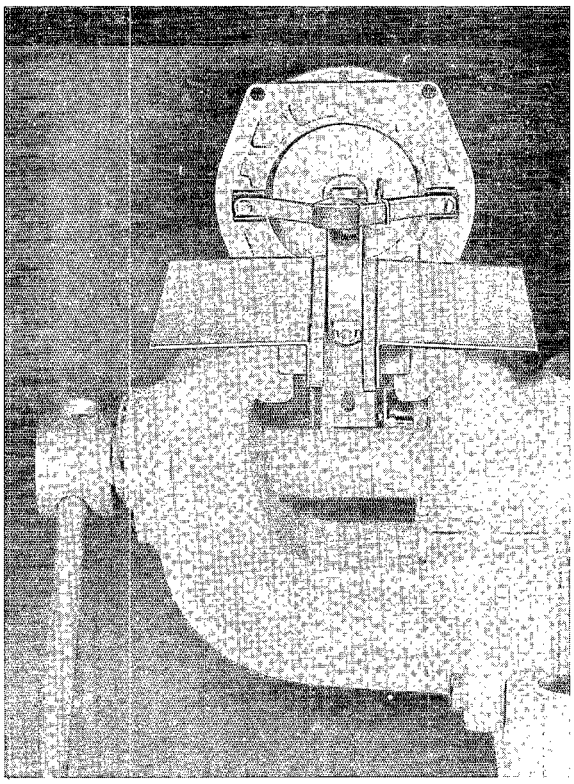


No.	Description	Qty.	Note during: removal	installation	remarks
1	Plug	1		Torque to 1.3 to 1.5 mkp	
2	Seal A 10 x 13.51	1		Replace	
3	Shim	1			2.2 - 2/8
4	Spring	1			
5	Piston	1	Use conical wood peg to drive out	Replace fuel distributor if damaged	
6	Seal	1			
7	Capscrew M 5 x 50	3		Torque to 32 - 38 cmkp	
8	Fuel distributor	1	Don't let control plunger fall out		do not dismantle
9	Seal	1		Replace	
10	Nut	2			
11	Washer	2			
12	Capscrew	2		Torque to 47 - 53 cmkp	
13	Insulator	2			
14	Spring	1		Replace if necessary; install correctly	
15	Clip	1		Replace if necessary; install correctly	
16	Stop	1		Install correctly	
17	Hex head screw	1		Torque to 50 - 55 cmkp and apply liquid thread locking compound	
18	Washer	1			
19	Sensor plate	1		Check, replace if necessary	2.2 - 2/4

No.	Description	Qty.	Note during: removal	installation	remarks
20	Circlip	1	First remove this circlip	Install with sharp edge facing outward	
21	Cover	1			
22	Seal	1		Replace	
23	Spring	1			
24	Ball	1		Coat with silicone grease	
25	Circlip	1		First install this circlip with sharp edge facing outward	
26	Cover	1			
27	Seal	1		Replace	
28	Ball	1		Coat with silicone grease	
29	Capscrew	1		Torque to 47 - 53 cmkp an apply liquid thread locking compound	
30	Pin	1		Check, replace if necessary	
31	Counterweight	1			
32	Operating lever	1		Check	2.2 - 2/6
33	Follower	1		Check if bearing play is too large, needle bearing is damaged, mixture control screw is damaged or rusted, replace parts if necessary	2.2 - 2/7
34	Plug	1			
35	Air flow sensor hsg.	1		Coat bearing bores with silicone grease	

INSTRUCTIONS FOR DISMANTLING AND ASSEMBLING MIXTURE CONTROL UNIT

REMOVING AND INSTALLING SENSOR PLATE

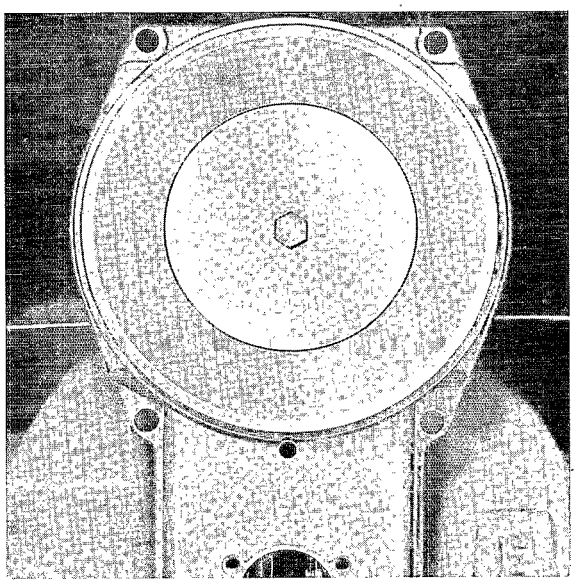


Removing

1. Remove fuel distributor.

2. Clamp mixture control unit vertically in vise with plastic guards on jaws. Clamp mixture control unit at bend in narrow section of operating lever.

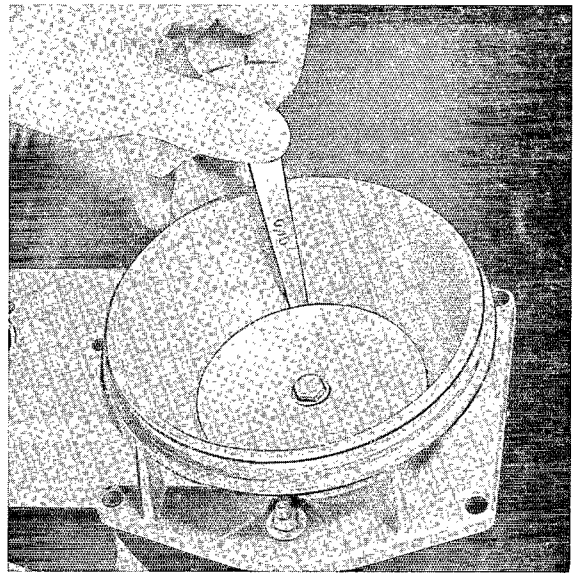
3. Loosen sensor plate mounting screw and remove sensor plate.



Installing

1. Clamp mixture control unit horizontally. Coat sensor plate mounting screw with "Loctite" or "Omnifit". Place new or old sensor plate in center of operating lever and slightly tighten screw by hand.

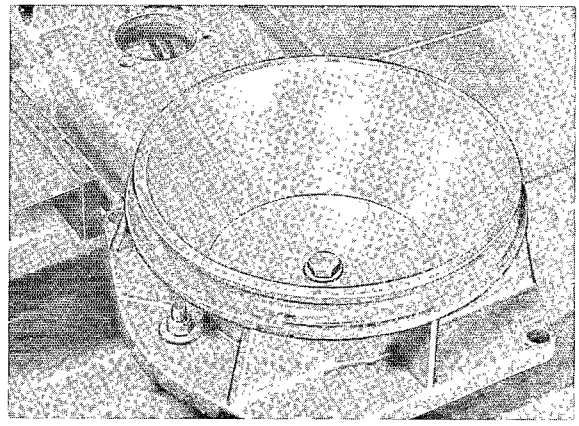
2. Measure gap between sensor plate and air venturi. A visible gap of about 0.10 mm should be seen all around the sensor plate.



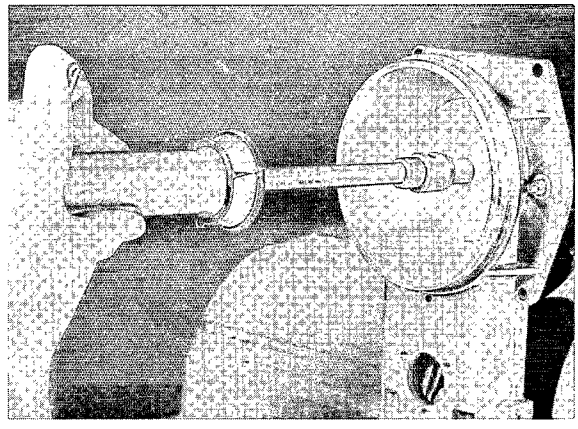
CAUTION

This test requires that the sensor plate be set at the correct height (rest position).
The upper edge of the sensor plate must be flush with the lower edge of venturi.

The height position can be corrected by bending the wire clip (refer to page 1.1 - 1/3).



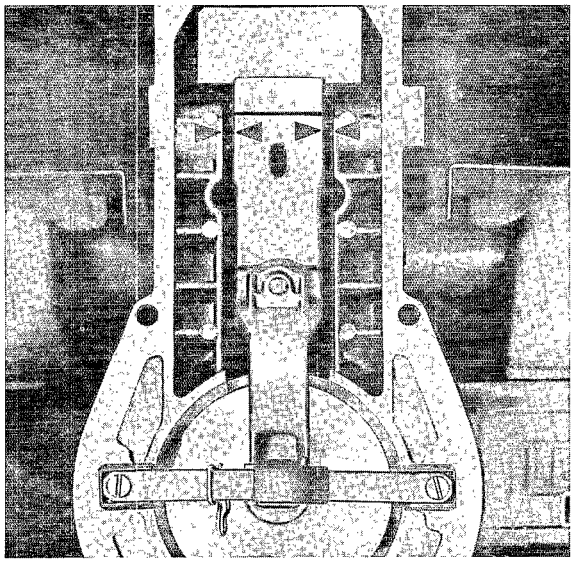
3. Clamp mixture control unit vertically in vise with plastic guards an jaws. Clamp mixture unit at bend in narrow section of operating lever (housing must be able to be moved toward vise).
   Torque hex head screw to 50 - 55 cmkp.



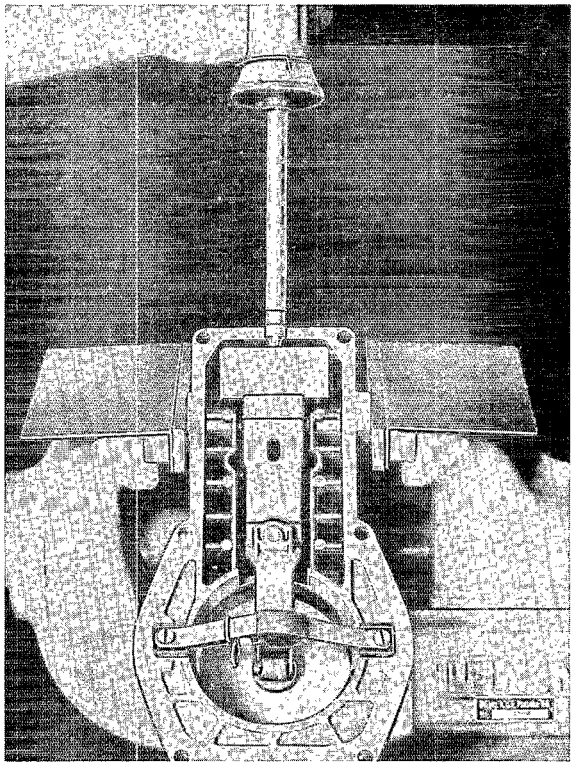
4. Recheck sensor plate adjustment.

LOCATING OPERATING LEVER WITH FOLLOWER IN AIR FLOW SENSOR HOUSING

1. Apply "Loctite" or "Omnifit" to counterweight mounting screw and tighten screw slightly.



2. Adjust operating lever in air flow sensor housing.



3. Tighten mounting screw to 47 - 53 cmkp.

BASIC ADJUSTMENT OF MIXTURE CONTROL SCREW AFTER REPLACEMENT OF OPERATING LEVER

Caution

This test requires that the sensor plate be positioned correctly (rest position).

1. Install mixture control unit.

2. Bleed fuel lines. (Disconnect injectors and hold in a container. Move sensor plate by hand many times).

3. Use adjusting wrench P 377 to initially turn the mixture control screw counterclockwise about 1 - 2 turns.

4. Turn on ignition, pull plugs off safety switch on air flow sensor or fuel pump relay.

5. Turn mixture control screw clockwise until the injectors just barely eject. From this point turn the mixture control screw back, i.e. counterclockwise, by one half turn.

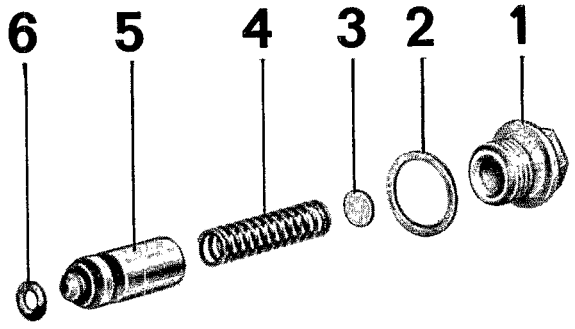
   Install injectors.

Caution

Never apply downward pressure to adjusting wrench during adjustments, since this could change the injection timing.

6. Run engine to operating temperature (oil temperature 80° to 90° C) and adjust idle speed and CO level to their final specified values.

REPLACING PISTON SEAL OF FUEL DISTRIBUTOR PRESSURE RELIEF VALVE



1. Plug
2. Seal
3. Shim
4. Spring
5. Piston
6. Seal

1. Clean fuel thoroughly.

2. Remove plug, being careful of shim in plug.

3. Remove spring and piston (if necessary, use conical wood peg).

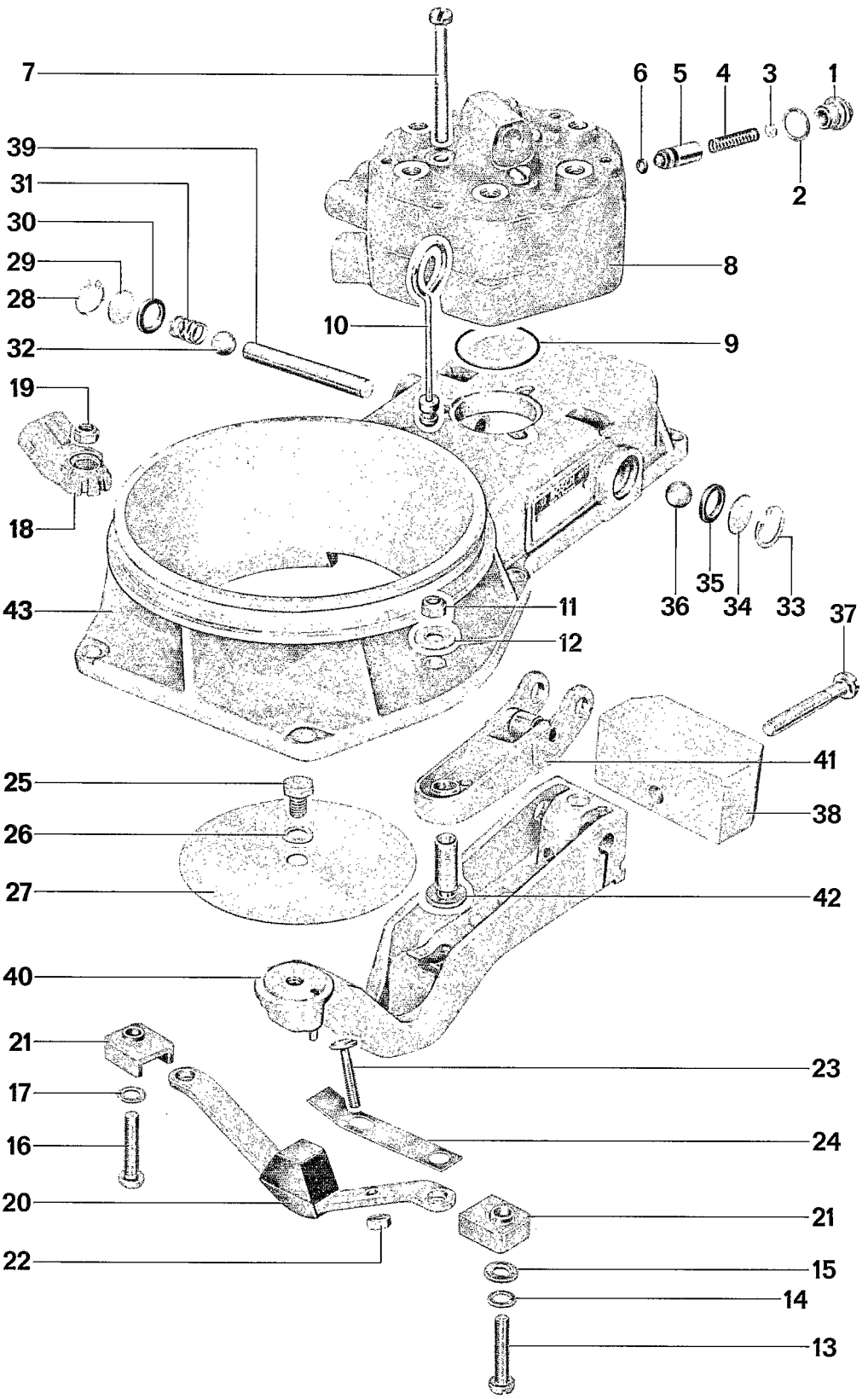
4. Replace seal on conical section of piston, being careful not do damage new seal and piston.

5. Install plug with shim (as found while removing) and new seal. Torque screw to 1.3 - 1.5 mkp.

6. Check pressure of system (refer to page 1.1 - 1/10), correcting with shims if necessary.

DISASSEMBLING AND ASSEMBLING MIXTURE CONTROL UNIT

- MODIFICATIONS from April, 1976 -



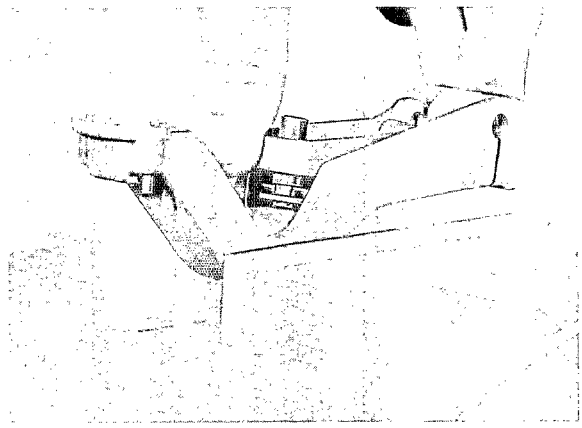
No.	Description	Qty.	Note when removing	Note when installing	Remarks
1	Plug	1		Torque to 13-15 Nm (1.3-1.5 kpm)	
2	Seal	1		Replace	
3	Shim 0.1 mm thick 0.5 mm thick	X			Quantity as required
4	Spring	1			
5	Piston	1	Pull out with tapered wood dowel	Check, replace entire distributor if damaged (fitted part)	
6	O-ring	1	Be careful not to damage piston	Replace	
7	Fillister head cap screw	3		Torque to 3.5 Nm (0.35 kpm)	
8	Fuel distributor	1	Be careful not to let control piston fall out	Check control piston, clean with gasoline, install with chamfer facing down.	Never disassemble
9	Seal	1		Replace	
10	Plug	1			
11	Nut	1			
12	Washer	1			
13	Fillister head cap screw	1		Torque to 4.7-5.3 Nm (0.47-0.53 kpm)	
14	Washer	1			
15	Insulator	1			
16	Fillister head cap screw	1		Torque to 4.7-5.3 Nm (0.47-0.53 kpm)	
17	Washer	1			
18	Plug connector	1		Install in correct position	

No.	Description	Qty.	Note when removing	Note when installing	Remarks
19	Nut	1			
20	Stop bracket	1			
21	Plastic insulator	2			
22	Nut	1			
23	Adjusting screw	1			
24	Leaf spring	1			
25	Bolt	1		Torque to 5.0-5.5 Nm (0.50-0.55 kpm) and apply liquid locking agent	
26	Spring washer	1			
27	Sensor plate	1		Check, replace if necessary	
28	Circlip	1		Sharp side faces out	
29	End plate	1			
30	Seal	1			
31	Spring	1			
32	Ball	1		Lubricate with (Bosch Ft 2 v 2) silicone grease	
33	Circlip	1			
34	End plate	1			
35	Seal	1			
36	Ball	1			
37	Fillister head cap screw	1		Torque to 4.7-5.3 Nm (0.47-0.53 kpm and apply liquid locking agent	
38	Counterweight	1			

No.	Description	Qty.	Note when removing	Note when installing	Remarks
39	Pivot pin	1			
40	Operating lever	1			
41	Adjusting lever	1		Check whether bearing play is excessive or needle bearing is damaged, replace if necessary	
42	Mixture control screw	1			
43	Air flow sensor housing	1		Lubricate bearing bores with (Bosch Ft 2 v 2) silicone grease	

DISASSEMBLING AND ASSEMBLING INSTRUCTIONS

Engage adjusting lever in spring holder by applying sufficient pressure.

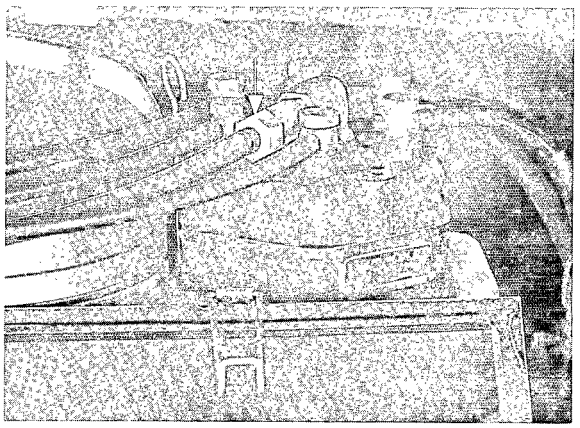


REMOVING AND INSTALLING VACUUM CONTROLLED WARM-UP REGULATOR

Removing

1. Disconnect battery.

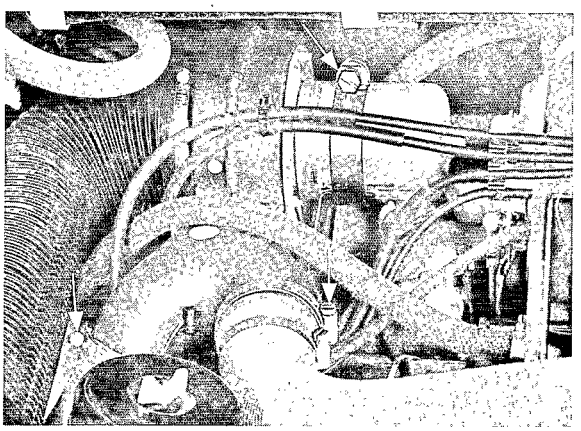
2. Disconnect warm intake air connection.

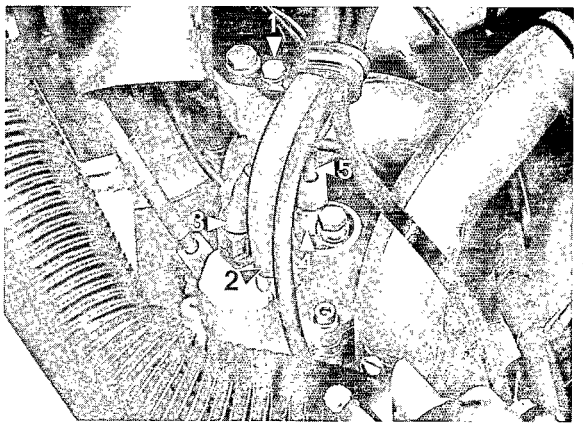


3. Release fuel system pressure by loosening the warm-up regulator pressure line connection at the mixture control unit. Wrap a rag around this connection when loosening to catch escaping fuel. Retighten lines afterwards.

4. Remove air pump air filter.

5. Remove left and right heater hoses, loosen clamp at heater blower and swing heater blower upward.



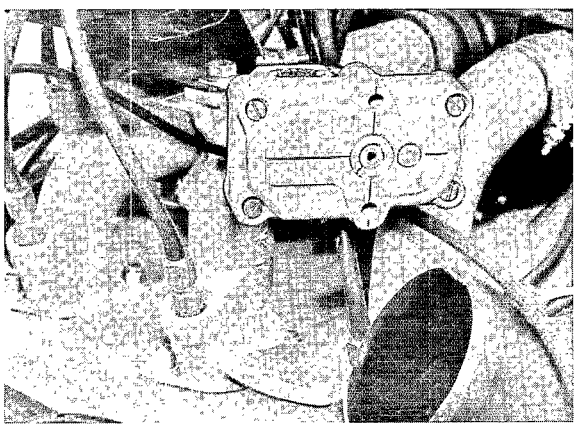


6. Loosen and remove clamp holding hoses and lines (1), vacuum hose clamp (2), plug connector (3), fuel return line (4) and fuel feed line (5).

7. Loosen two socket head capscrews and remove warm-up regulator.

Installing

Torque fuel return line hollow bolt to 1.1 mkp.



Note

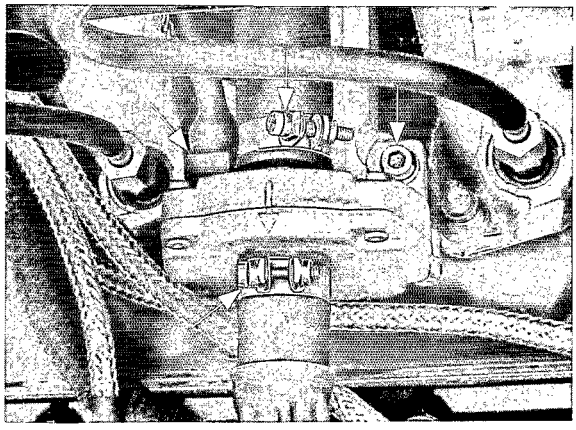
The bottom of the warm-up regulator and the holding plate must be clean to assure proper ventilation for the warm-up regulator.

REMOVING AND INSTALLING AUXILIARY AIR REGULATOR

1. Pull wire plugs off of auxiliary air regulator.

2. Loosen hose clamps.

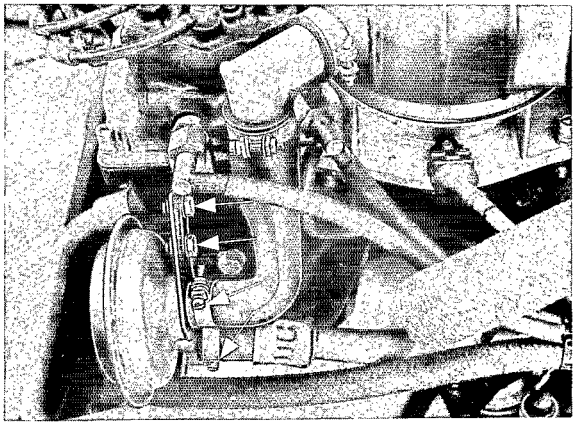
3. Loosen socket head cap screws and remove auxiliary air regulator.



REMOVING AND INSTALLING AUXILIARY AIR VALVE

1. Loosen hose clamps and pull hoses off of auxiliary air valve.

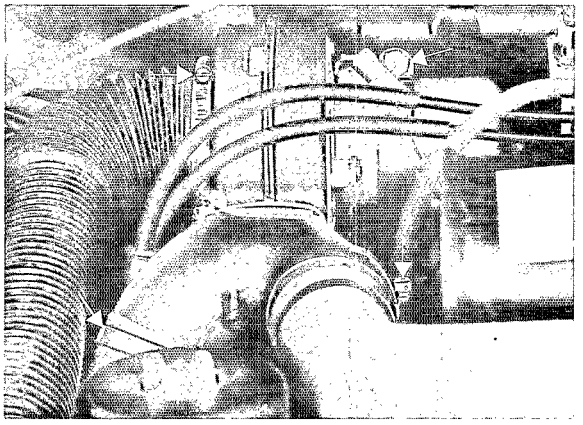
2. Loosen mounting screws and remove valve.



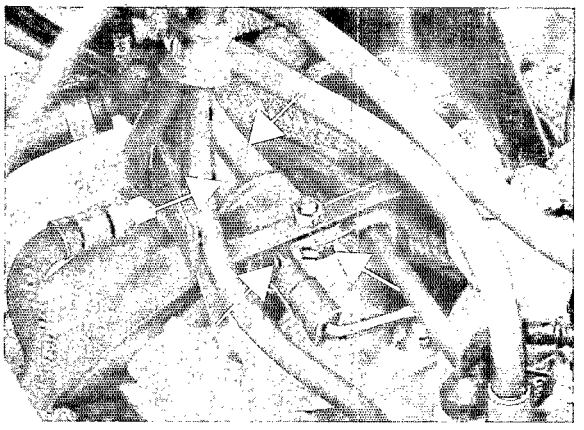
REMOVING AND INSTALLING THERMOVALVE

Removing

1. Remove formed hose, left heater hose and right heater hose. Disconnect electric wires, loosen clamp and remove heater blower.

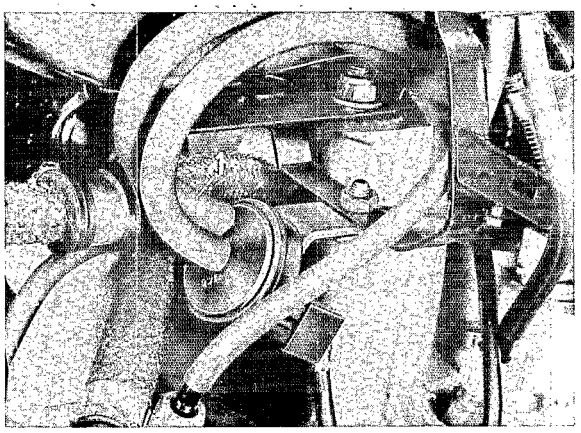


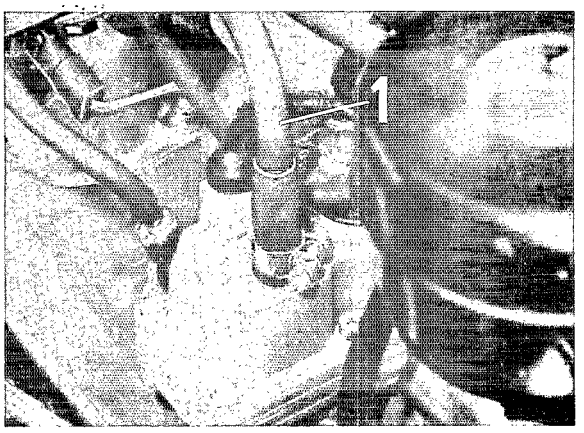
2. Disconnect electric plug at thermovalve. Detach hoses, unscrew bolt and remove thermovalve.



Installing

Connect vacuum hoses properly. Outer connection on thermovalve (1) to control pressure regulator connection (1), see photos below.

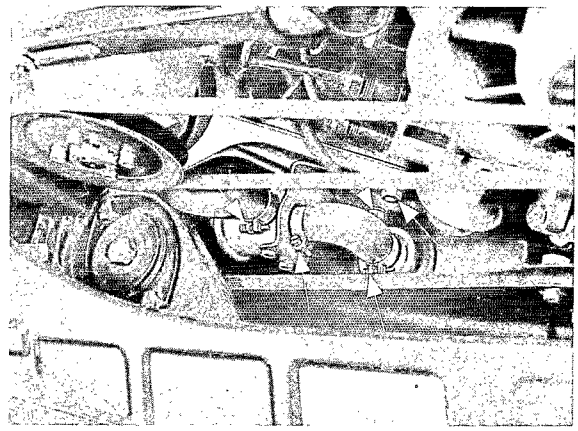




REMOVING AND INSTALLING DIVERTER VALVE

1. Loosen hose clamps and detach hose between diverter valve and check valve as well as hose between diverter valve and air pump.

2. Loosen nuts on air pump carrier and remove diverter valve with holder, pulling off vacuum hose at same time.

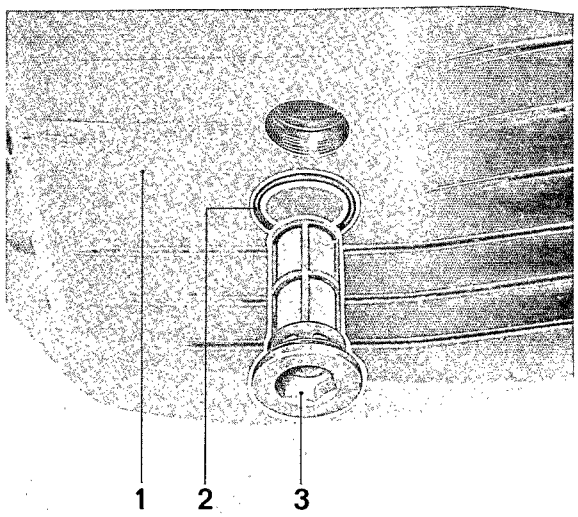


CLEANING FUEL TANK PLUG WITH BUILT-IN CIS FILTER

Fuel supply problems can be traced, among other things, to a dirty filter in the fuel tank plug.

Use new rubber gasket during reassembly.

Tank plug tightening torque is 0.8 - 0.9 mkp.



1. Fuel tank
2. Rubber gasket
3. Tank plug with filter

REMOVING AND INSTALLING FUEL TANK (80 Liter Steel Tank from 1974 Models)

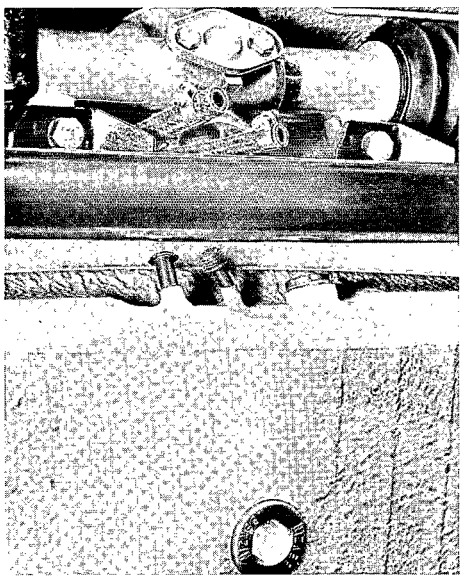
Removing

1. Take off bottom guard.

2. Open plug and drain fuel. Then detach fuel lines at tank

Note

Observe safety regulations when draining fuel.

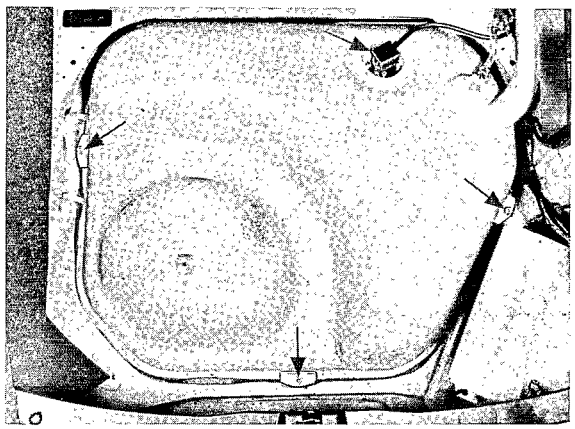


3. Pull off tank vent hose and fuel gauge wire plug (first unscrew cover on top of plug).

4. Remove holders for fuel tank. If necessary, loosen battery and push battery away.

5. Loosen hose clamp on connecting hose between filler neck and tank.

6. Pull off connecting hose and remove fuel tank from above.



Installing

From 1980 models the tank vent neck as a 14 mm diameter (1974 to 1979 models: 9 mm diameter). After depletion of tanks with 9 mm neck, only new tanks with 14 mm neck will be available from parts. An adapter will be required between the connector (Y-piece) and tank when installing this tank in cars prior to 1980 model.

1. Paste new tank seal on tank. Install tank.

2. Clean filter screen on fuel drain plug. Use a new round cord seal and tighten drain plug to specified torque (see page 2.3 - 1/2).

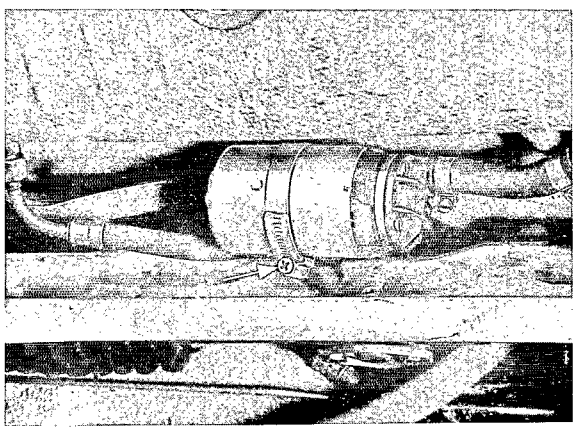
Make sure hoses are connected correctly and tight.

REMOVING AND INSTALLING FUEL PUMP - 1976 MODEL

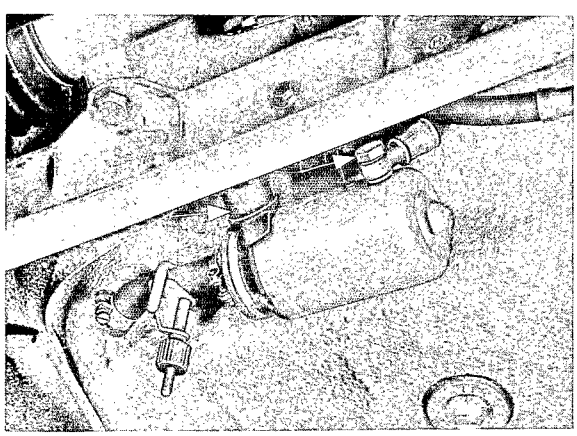
Removing

1. Remove guard.

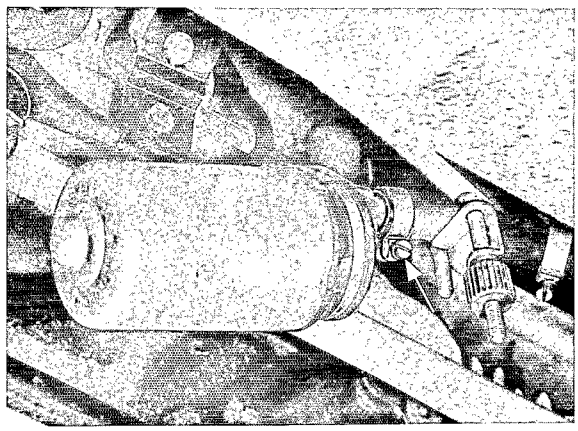
2. Loosen strap and pull fuel pump down a little.



3. Clamp intake fuel hose shut with a pinch clamp. Pull off wire connectors, remove pressure fuel hose and catch escaping fuel.



4. Loosen intake fuel hose clamp and remove fuel pump.



Installing

1. Install pressure fuel hose hollow bolt with new seals. Torque to 16 - 23 Nm/1.6 - 2.3 mkp.

Note
Hollow bolt seals have different thicknesses and must be installed correctly. Place thicker seal between coupling and pump body; thinner seal between coupling and head of hollow bolt.

2. Install wire connectors on to appropriate terminals.

3. Pull cover over wire connectors and position rubber ring for installation.

Note
To prevent corrosion, make sure that cover fits properly.

4. Slide intake fuel hose on pump nipple and secure with hose clamp.

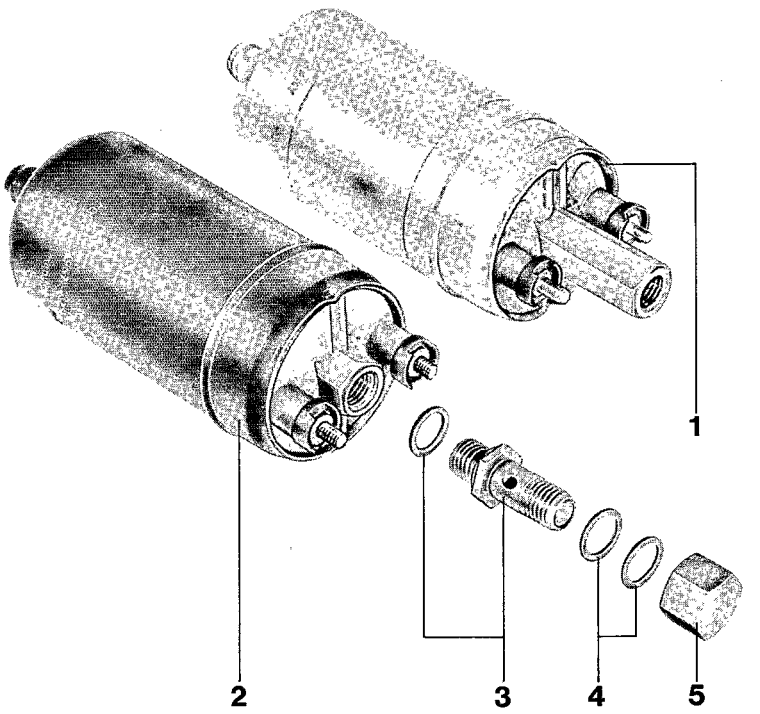
5. Remove pinch clamp from intake fuel hose.

6. Position fuel pump for installation (top electrical terminal inclined back about 35°)and secure with strap.

7. Check hose connections for leaks.

8. Install guard.

LAYOUT DRAWING OF CHECK VALVES ON FUEL PUMPS



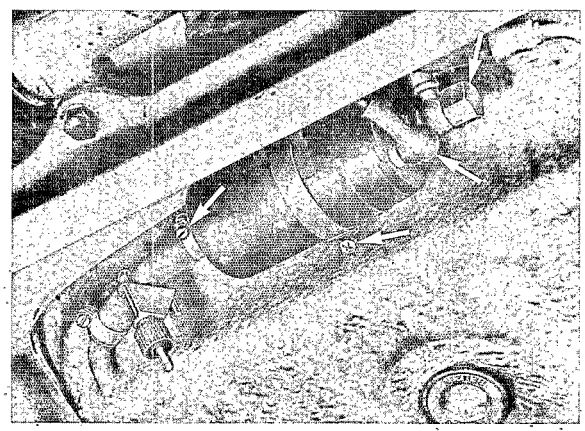
No.	Description	Qty.	Note When: Removing	Installing	Special Instructions
1	Fuel pump (long neck version with integrated check valve)	1			
2	Fuel pump	1			
3	Check valve with seal	1		Always replace seal; tightening torque: 20 Nm	
4	Seal	2		Always replace	
5	Cap nut	1		Tightening torque: 20 Nm	

REPLACING CHECK VALVE

Important: Observe safety pre-cautions for work on fuel systems!

1. Remove bottom guard.

2. Pinch fuel feed hose with a shut-off device and remove pressure hose end by unscrewing cap nut on fuel pump. Catch escaping fuel.



3. Screw in new check valve with a new seal. For long neck version fuel pumps this new check valve is installed in addition to the check valve integrated in the pump.

4. Install fuel line and new seals, and secure with cap nut.

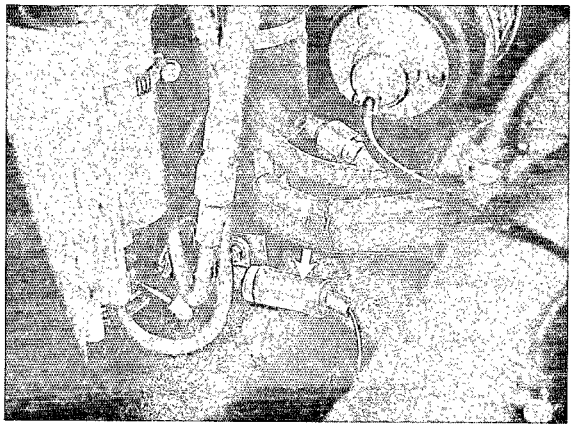
Important: Make sure fuel hose is routed correctly and cannot rub before tightening cap nut.

5. Remove shut-off device and check for leaks. Install bottom guard again.

REMOVING AND INSTALLING OXYGEN SENSOR

Removing

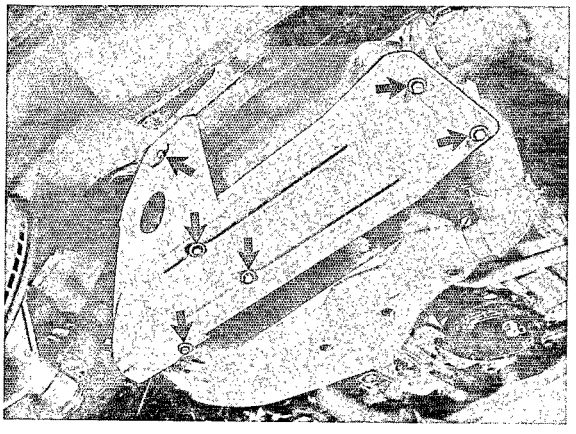
1. Disconnect plug for oxygen sensor on left side of engine compartment. Push wire grommet and plug through engine panel downward.



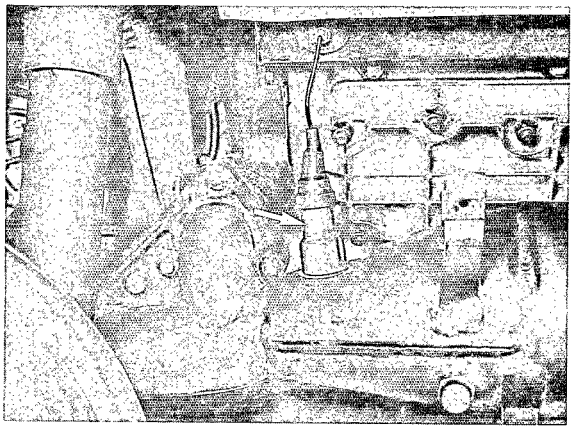
2. Lift car.

3. Take off left rear wheel.

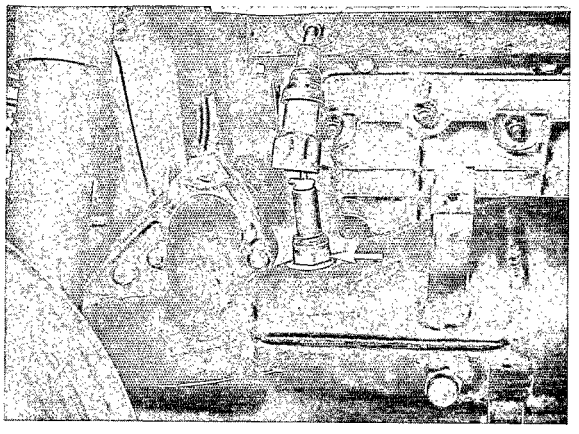
4. Remove shield.



5. Pull off safety plug on oxygen sensor.



6. Remove oxygen sensor.



Installing

1. Coat threads of oxygen sensor with Bosch paste VW 140 16 Ft.

Note

Never allow assembly paste to get into slot of sensor.

2. Tighten sensor to specified torque
   Reference value: 50 - 60 Nm (36 - 43 ft lb).

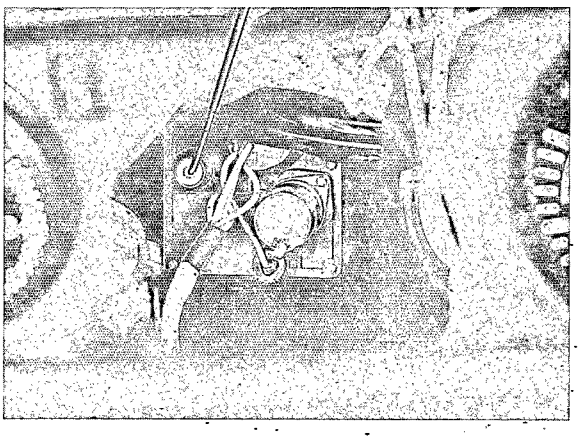
RESETTING COUNTER

A counter is installed behind the fresh air blower to monitor the operation time. It will turn on the oxygen sensor indicator lamp after car has been driven 30,000 miles. The counter must be reset to zero each time the oxygen sensor is replaced.

1. Disconnect battery ground.

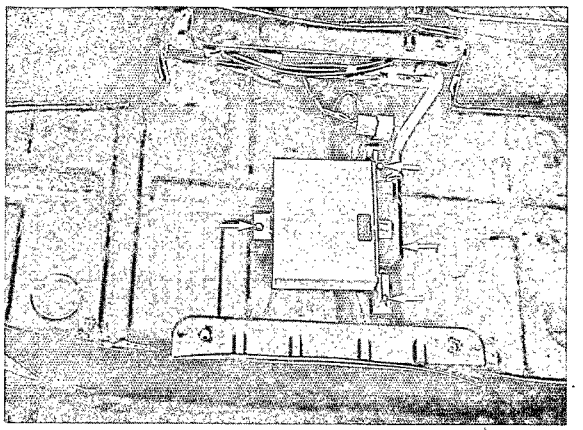
2. Remove speedometer.

3. Press in reset button on counter against stop with an approx. 3 mm thick piece of wire. Counter will return to zero position and oxygen sensor indicator light resumes its normal function.



REMOVING AND INSTALLING OXYGEN SENSOR CONTROL UNIT

1. Remove right seat after loosening front and rear screws on seat rails.

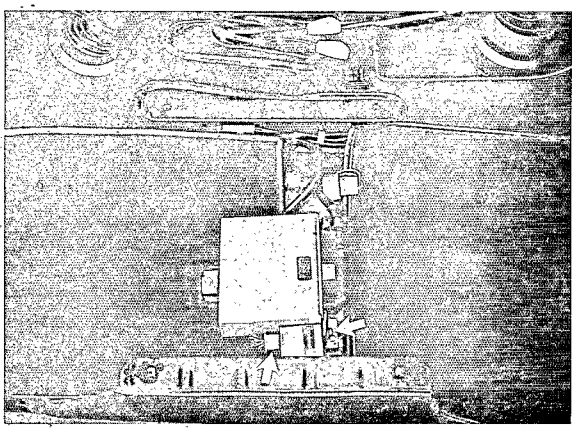


2. Loosen screws on control unit. Pull off plug and remove control unit.

REMOVING AND INSTALLING CONTROL UNIT FOR ACCELERATION ENRICHMENT OF OXYGEN SENSOR CONTROL

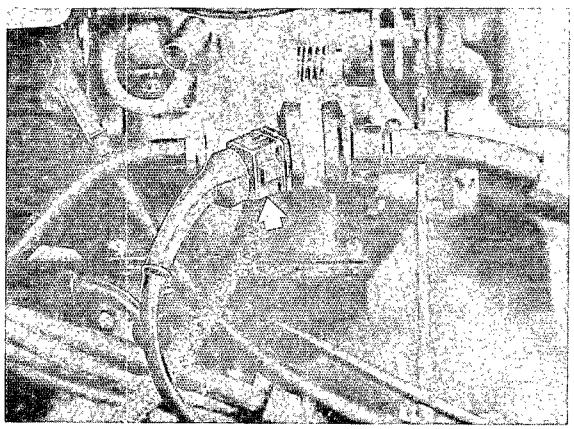
1. Remove right seat.

2. Pull off plugs, unscrew bolt and remove control unit.



CHECKING FREQUENCY VALVE FOR OXYGEN SENSOR

1. Pull off wire plug.



2. Connect ohmmeter on frequency valve.
   Coil resistance: 2 to 3 ohms.

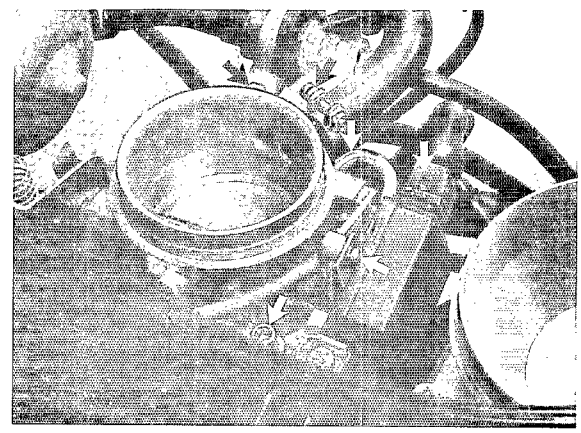
3. If necessary, replace frequency valve.

REMOVING AND INSTALLING THROTTLE VALVE SWITCH

Removing

1. Remove air cleaner and cowl.

2. Disconnect holder for frequency valve, vacuum hoses for distributor, hose to vacuum booster and wire plug on throttle valve switch.
   Remove 4 socket head screws and remove throttle housing.



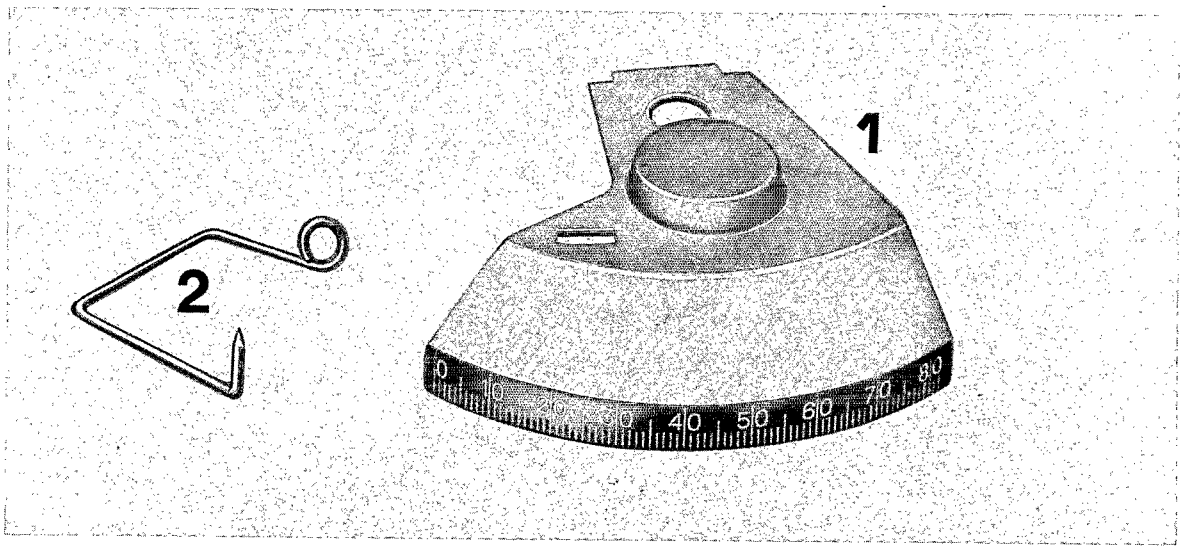
3. Remove mounting screws and remove switch.

Installing

Make sure O-ring is positioned properly on throttle housing.

CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

TOOLS

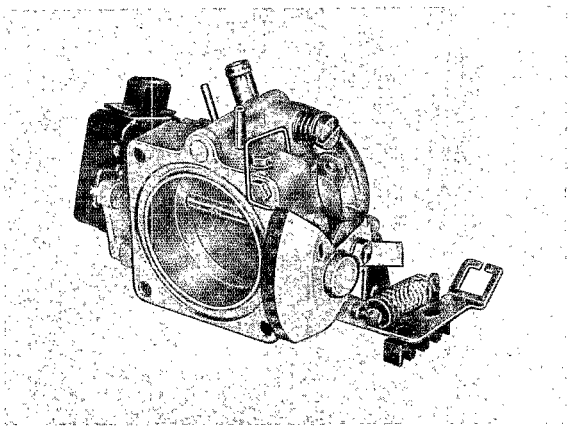


No.	Description	Special Tool	Remarks
1	Dial scale	from P 228 b	
2	Pointer	from P 228 b	

CHECKING AND ADJUSTING THROTTLE VALVE SWITCH

1. Remove throttle housing.

2. Mount dial scale from Special Tool P 228 b on throttle valve shaft.



3. Set pointer (from Special Tool P 228 b) to 0^{o}.

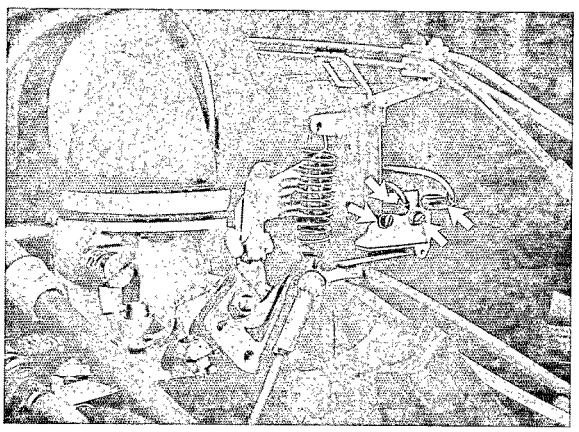
4. Connect standard buzzer or continuity tester to terminals 18 and 2 (idle contact) of throttle valve switch.

5. Operate throttle valve. Switching point should be between 2 and 3^{o}. Adjust if necessary.

6. Check full throttle contact. Connect tester on terminals 18 and 3 of throttle valve switch. The contact must be made between 30 and 35^{o}. The full throttle contact is mounted with the idle contact an a base plate and therefore it cannot be adjusted separately.

REMOVING AND INSTALLING MICROSWITCH FOR ACCELERATION ENRICHMENT OF OXYGEN SENSOR CONTROL (from 1981 Models)

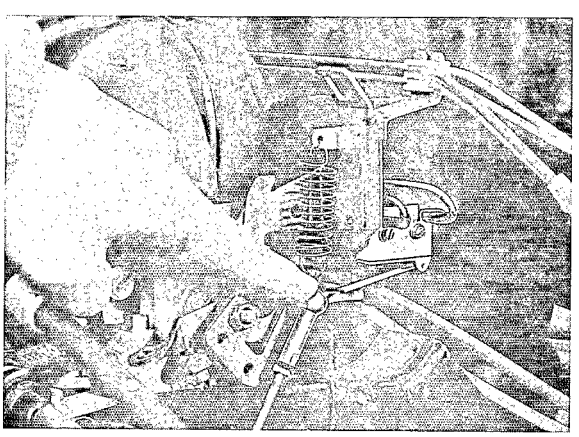
Pull off plugs and unscrew bolts.



CHECKING AND ADJUSTING MICROSWITCH FOR ACCELERATION ENRICHMENT (from 1981 Models)

1. Connect standard buzzer on both contacts of microswitch (buzzer buzzes).

2. Operate throttle lever by hand. Microswitch should function before the throttle opens (buzzer not buzzing). Adjust if necessary.



CORRECTING CO LEVEL SETTING ON MIXTURE CONTROL UNIT - (from 1981 Models) WITH SHEAR-OFF SCREW

1. Remove entire mixture control unit.

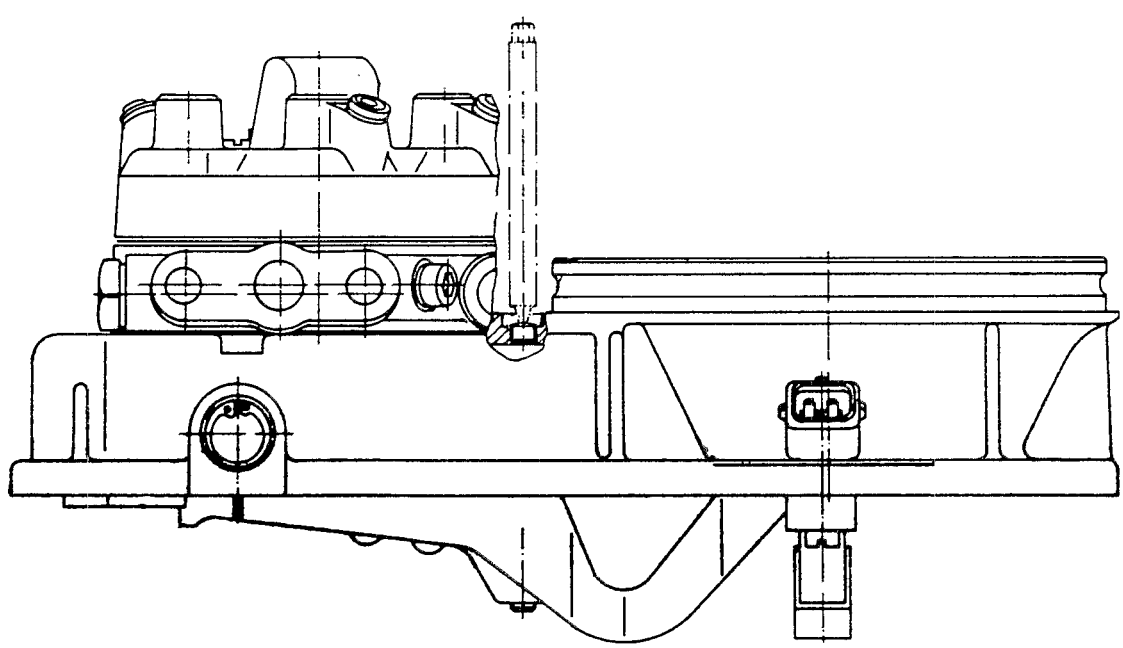
2. Unscrew fuel discributor on air flow sensor.

3. Drill threaded part of shear-off screw with a 2 mm/5,'64 in. dia. drill bit (approx. 3.5 mm/ 9/64 in. deep).

4. Unscrew rest of shear-off screw with a suitable screw extractor.

5. Install mixture control unit.

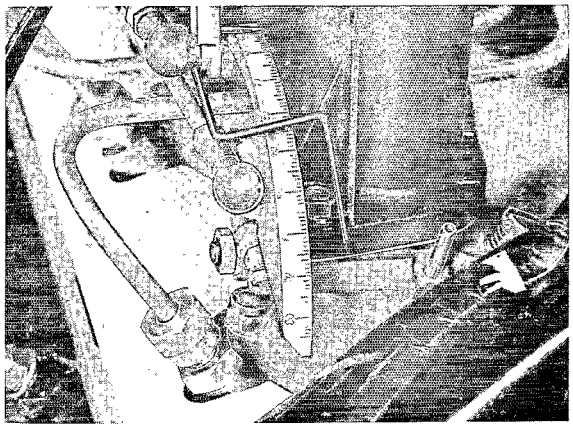
6. After correction of CO level setting install a new shear-off screw in access bore and tighten until screw shears off.



ADJUSTING FUEL INJECTION PUMP WITH EMISSION TESTER

Special Tools

P 228 c Prptractors



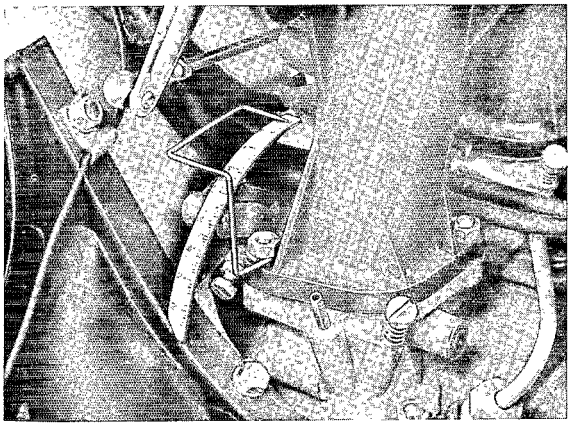
1. Bring engine to operating temperature (about 80°C/175°F).

2. Connect emission tester according to the manufacturer' s instructions.

3. Attach protractor, special tool P 228 c, to the right throttle valve hosuing (if equipped with air conditioner, attach to left throttle valve housing). Adjust pointer to 0°.

Note

Hand throttle lever must be all the way off.



4. Using hand throttle or locally manufactured tool, open throttle 9°;actuate gas pedal a few times to take strain off linkage.

5. Determine axhaust emission by road test or dynamometer test. Under partial load the 2400 rpm with a 9° throttle opening the exhaust emissions (CO%) should be:

911 T	1.5 - 2.0 % CO
911 E and S	2.0 - 2.5 % CO (Europe 2.0-3.0)
Carrera 2.7	2.5 - 3.0 % CO

For typical road test see page SF 35.

Adjustment instructions for injection pump are shown on page SF 36.

Note

The intake air preheating system eliminates the necessity for monitoring intake air temperature.

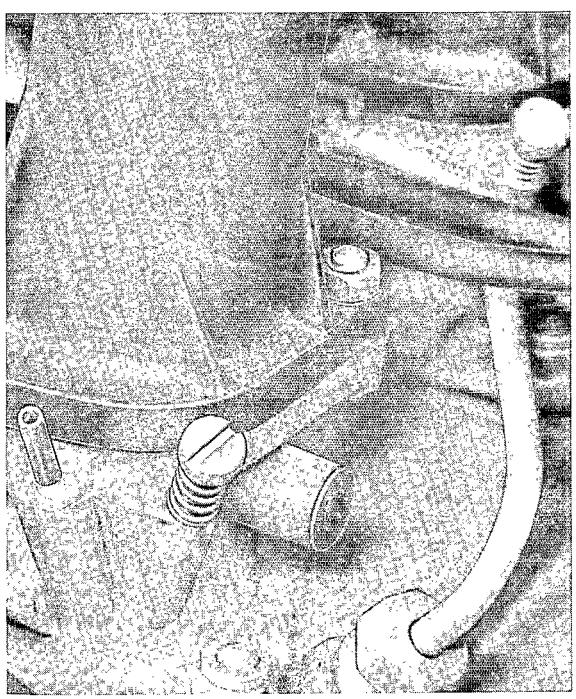
ADJUSTING ENGINE IDLE

Special Tools

P 230 c Socket (9 mm)

1. Bring engine to operating temperature.

2. Check idle speed. If idle speed is too high or low, readjust air correction screws on throttle valve housings as needed. Turning screws in, lowers idle. Turning out, increases idle. Check air flow of individual cylinders at 1600-2000 rpm synchrometer, special tool P 235. See page SF 40 for adjusting instructions.



Note

If resetting the air correction screws shows no reaction on the synchrometer, then the idle passages in the throttle valve housings are carboned up and must be cleaned.

3. Connect emission tester and check CO emissions. If CO value is not within the prescribed limit, shut off engine and readjust idle speed injection quantity on pump.

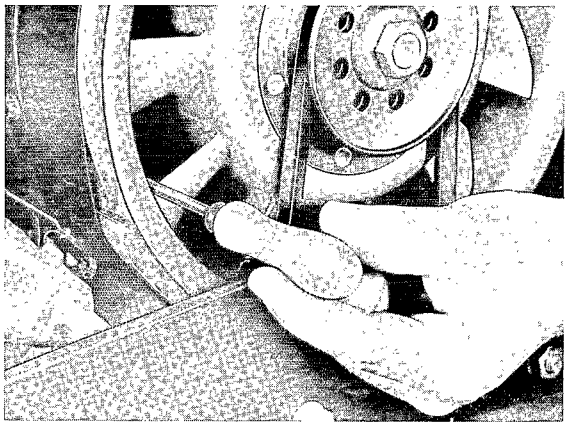
Caution

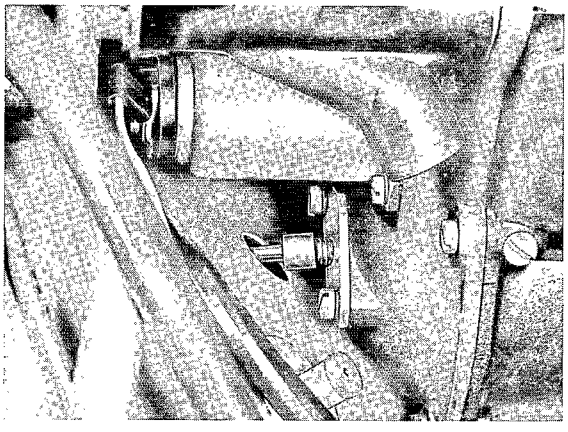
Do not start engine while adjusting idle speed injection quantity.

4. The idle adjusting screw can be reached with special tool P 230 c through a hole which is covered by a plastic cap in the cooling air upper shroud.

5. Remove cap.

6. Depress the spring-loaded idle adjusting screw with special tool P 230 c until you can feel it engage with the slot of the centrifugal governor.





7. Turn adjusting screw counter-clockwise for a leaner mixture and clockwise for a richer mixture.
Do not adjust by more than 1 notch at a time. A maximum of three notches is allowed to either the right or left of the basic adjustment.

CO emissions

USA	=	2 - 3 %
Europa	=	2,5 - 3,5 %
Carrera 2.7	=	2 - 3 %



lean



rich

8. Idle speed can change after CO emissions have been adjusted at idle speed (900 $\pm$ 50 rpm).

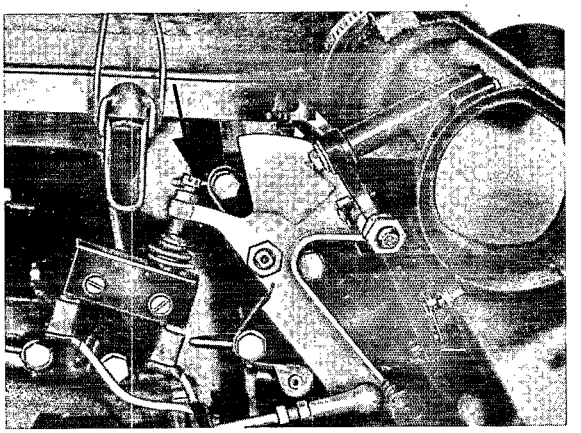
9. Adjust idle speed by turning the air correction screws. Recheck with synchrometer.

Note

Adjustments at idle speed and under partial load should be made as quick as possible so that the velocity stack area does not heat up. Drive the car a short distance or run engine slightly faster (about 3000 rpm) before making another CO test on road or dynamometer. This will cool off the velocity stack area.

ADJUSTING MICRO SWITCH - BEGINNING WITH 1972 MODELS -

1. Loosen lock nut and back off adjusting screw until the micro switch is not closed in idle position.



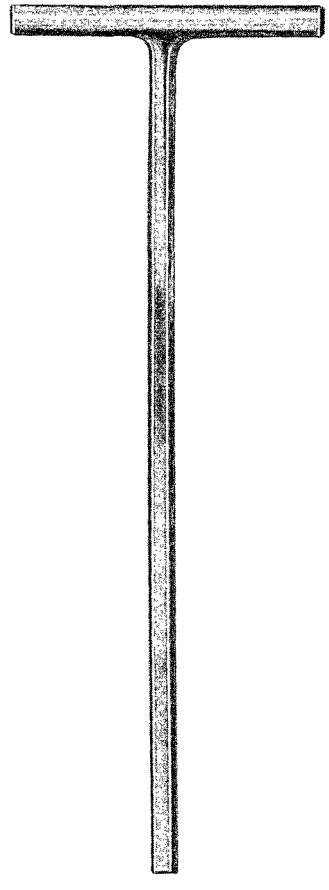
2. Turn the adjusting screw from this position until the micro switch closes (listen for clich sound).

3. Turn adjusting screw 1/4 turn farther in. Tighten lock nut.

Note
The micro switch must be readjusted whenever the throttle valve linkage or injection pump linkage has been reset.

IDLE ADJUSTMENT

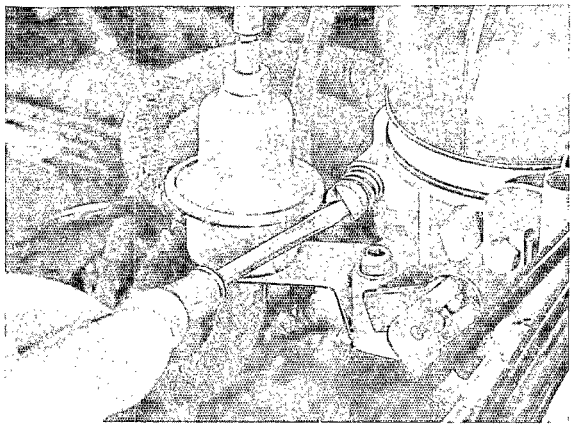
TOOLS



No.	Description	Special Tool	Remarks
1	Adjusting wrench	P 377	

1. Run engine to operating temperature (approx. 80° C).

2. Make sure that hand throttle lever is pushed down to stop.

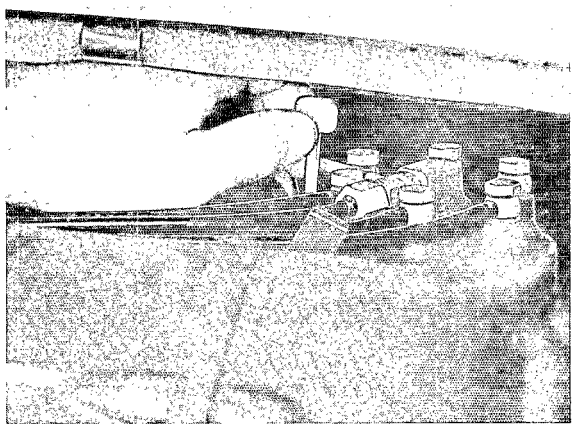


3. Connect CO-tester according to the manufacturer's instructions.

4. Turn adjusting screw, or bypass screw, resp. at the throttle housing until the specified engine speed has been attained. See page 1.1 - 1/14 e. for specifications.

Note

Use an independent tachometer, such as that from the tester or similar.



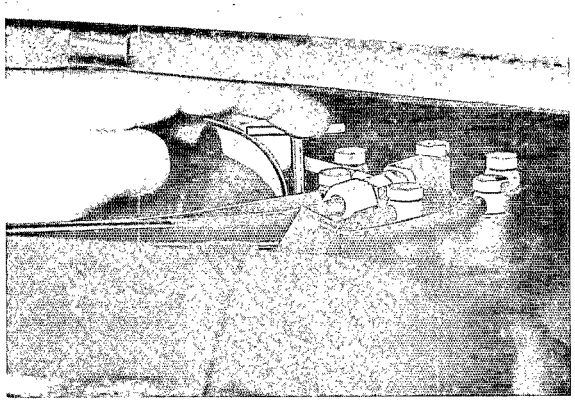
5. Remove plug from mixture control unit between fuel distributor and venturi.

6. Insert adjusting wrench P 377.

7. Turning the wrench clockwise makes the mixture richer, and turning it counter-clockwise makes the mixture leaner.

Note

The following points must be definitely noted:



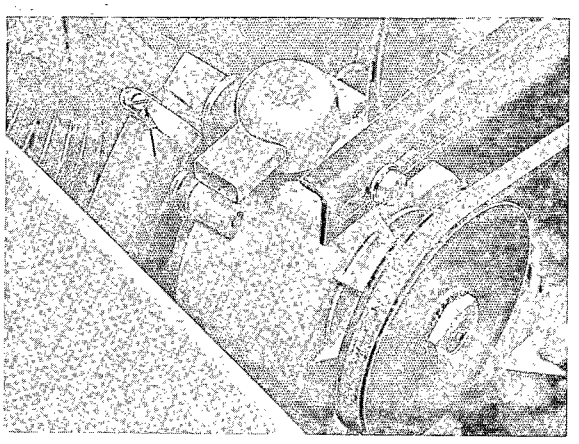
a) Always adjust CO from lean to rich.
Example: It mixture is too rich, first turn idle control screw counterclockwise further than necessary and then clockwise to specified position.

b) Turn the adjusting screw very little because small adjustments result in considerable CO emission changes.

c) The maximum permissible change at the mixture adjusting screw is one-half turn.

d) The air pump of engines with air injection must be disconnected to adjust CO.

Disconnect pressure hose at pump and plug hose.



8. Take the wrench out.

9. Accelerate engine briefly.

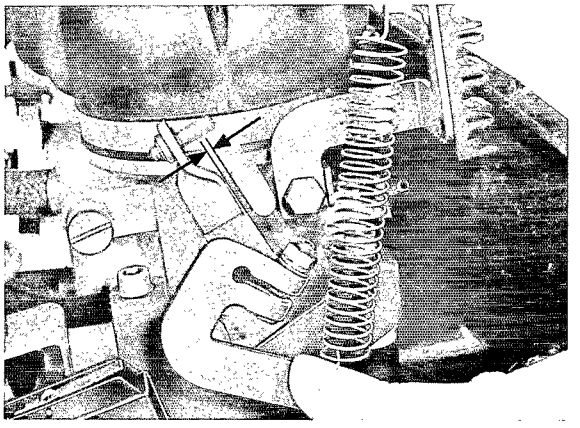
10. Wait until the CO-tester has stabilized for idle speed reading.
Se page 1.1 - 1/14 e for specifications.
If necessary, repeat the procedure.

11. Recheck idle speed and correct, if necessary.

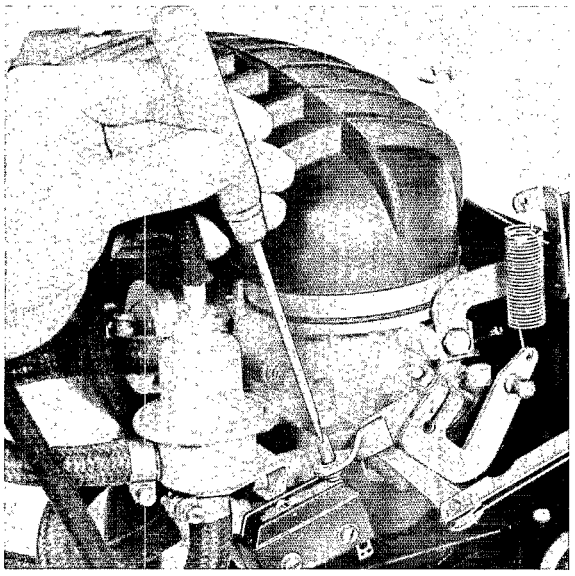
12. Replace plug upon completion of the adjusting procedure.

ADJUSTING FULL POWER POSITION OF THROTTLE

Throttle linkage must be so adjusted that there is at least 1 mm clearance at the throttle valve lever when the accelerator pedal is in the fully depressed position.



ADJUSTING MICROSWITCH



1. Disconnect electrical connections from microswitch.

2. Connect a standard buzzer to both contacts of the microswitch.

3. Prop up throttle. Place a 2 mm feeler gauge between idle stop screw and throttle valve lever.

Note

This distance must be measured exactly, sliding the feeler gauge in horizontally.

4. Turn adjusting screw at the throttle valve lever to a point beyond the switch-off position of the microswitch (buzzer is off).

5. Turn adjusting screw back to the switch-on position (buzzer is on).

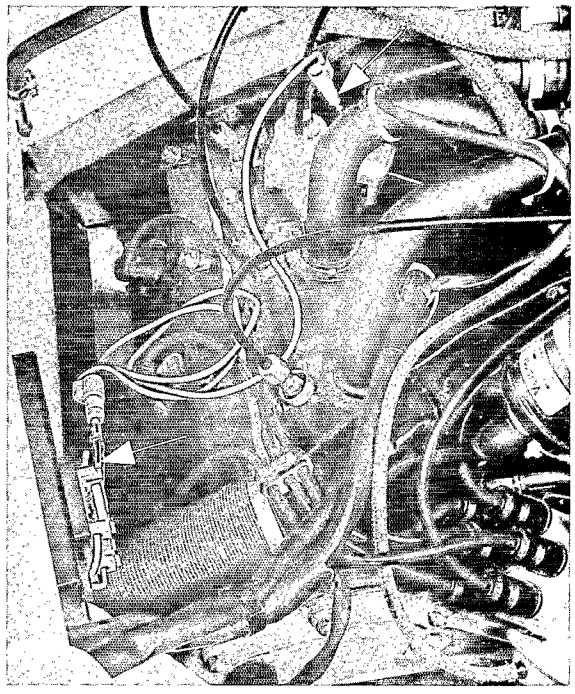
6. Close throttle valve and check if the microswitch arm still has enough travel clearance in this position (at least 0.5 mm).

Note

Once the engine is installed in the car and hand throttle is adjusted, check if the microswitch is in the "on" position (buzzer on) with hand throttle fully on.
If necessary, check hand throttle adjustment.

CHECKING AND ADJUSTING CONTROL PRESSURE REGULATOR FOR THROTTLE VALVE POSITION

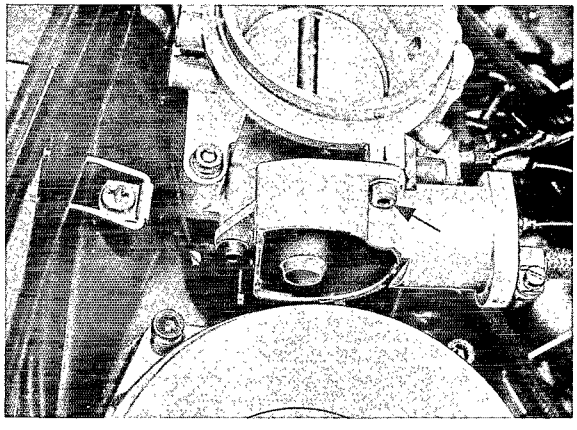
1. Connect and bleed P 378 pressure tester and switch valve to position ⁝⁝ 2.



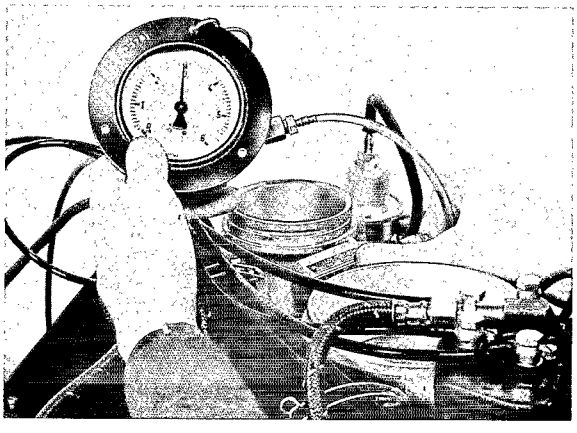
2. Detach electrical wire from control pressure regulator for warm running compensation. Using a jumper wire, connect control pressure regulator for warm running compensation directly to B+ (fuse box on left side of engine compartment). Switch ignition on. Make sure that throttle is fully closed (hand throttle must be pushed back all the way).

3. The control pressure will rise slowly and must reach the idle value shown under testing and adjustment specifications, page 1.1 - 1/13.

4. If the indicated value deviates, turn control pressure regulator for throttle valve position in the oval slots until the specified value is reached.
   Control pressure regulator for throttle valve position in direction of vehicle travel = higher pressure.
   Control pressure regulator for throttle valve position against the direction of vehicle travel = lower pressure.



5. If the specified pressure cannot be attained in this way, replace the control pressure regulator for throttle valve position.

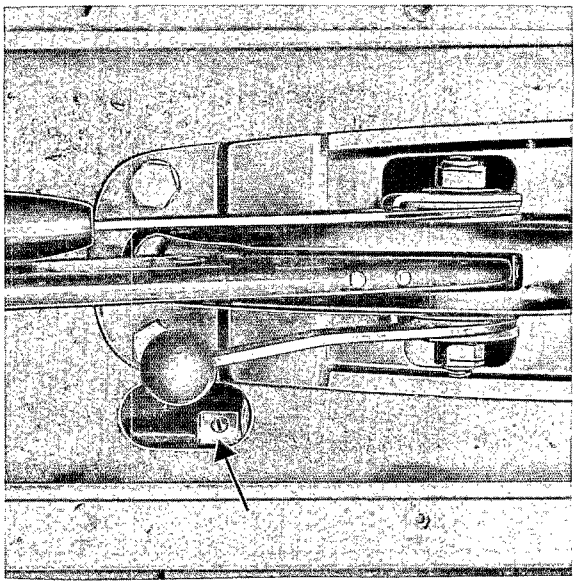


ADJUSTING HAND THROTTLE

1. Fold center tunnel cover forward at parking brake support.

2. When the engine is warm (80°C) and hand throttle completely pulled up, engine should be running at about 3500 - 3800 rpm.

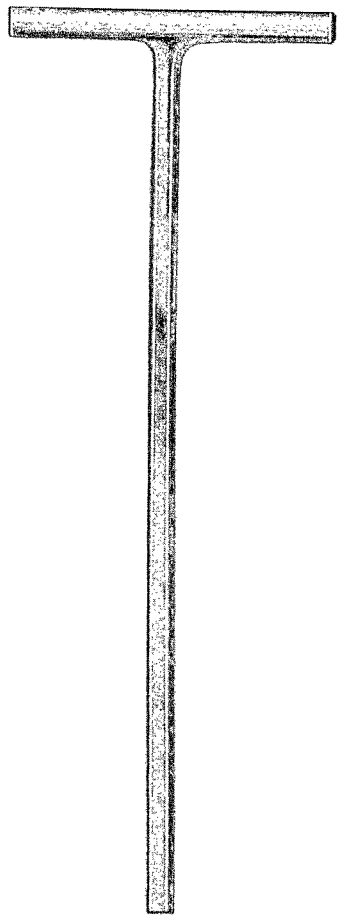
NOTE
Take care not to overspeed the engine.



3. The hand throttle can be adjusted by repositioning the clamping piece on the throttle control rod in the center tunnel.

ADJUSTING IDLE, 911 SC - 1978 MODELS

TOOLS



No.	Description	Special Tool	Note
1	Adjusting wrench	P 377	

Adjusting

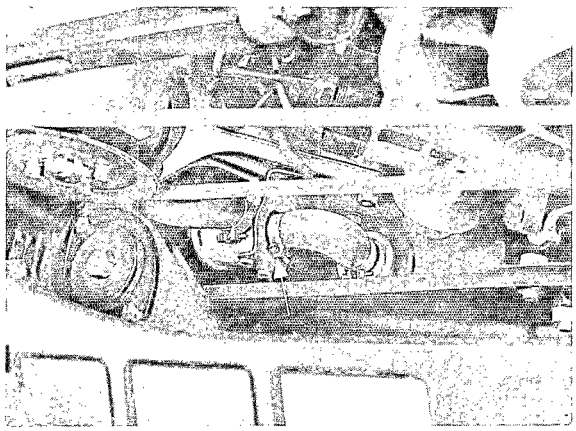
Note

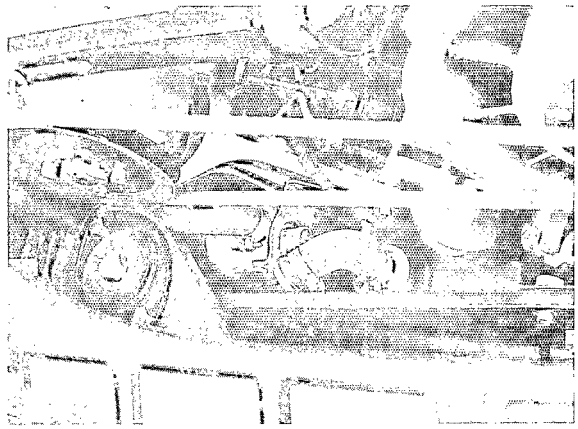
Before starting with the idle adjustments, make sure that oil tank cap fits properly and its seal is in good condition. Leaks at oil tank cap would result in incorrect readings.

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

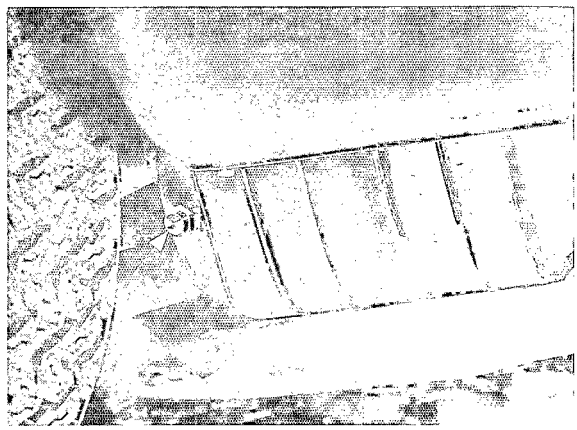
2. Connect CO tester according to instructions of the manufacturer.

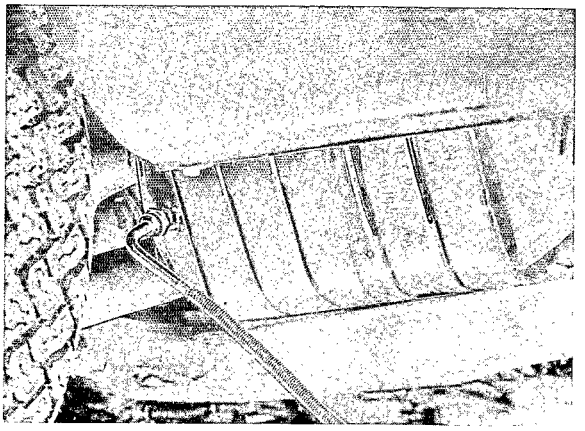
3. Detach air hose at diverter valve (arrow) and insert an appropriate plug into hose.

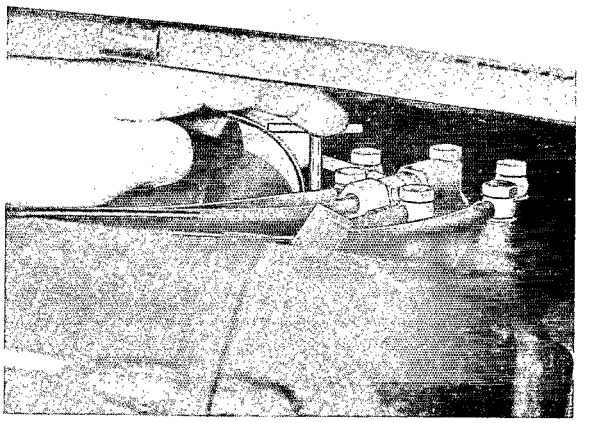




4. Connect exhaust gas source line to test connection of catalytic converter.

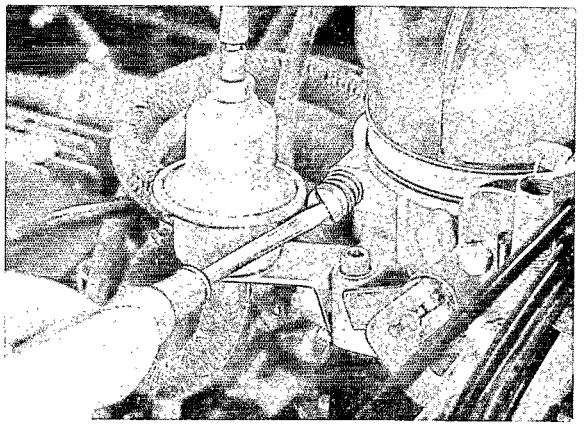






5. Turn idle speed screw or bypass screw on throttle housing, until specified speed is reached.
Test specifications, see page 1.1 - 1/14 e.

Note
Use separate tachometer of tester or similar instrument.



6. Remove plug in mixture control unit, between fuel distributor and air venturi.

7. Guide in adjusting wrench P 377.

8. Turning clockwise = rich mixture
Turning counterclockwise = lean mixture

Note

a) Always adjust CO level from lean to rich. Example: When adjustment is too rich, first turn idle speed screw counterclockwise further than necessary and then clockwise to basic setting.

b) Do not apply pressure on adjusting wrench during adjustments (engine would die).

c) Turn idle speed screw very little because even small adjustments result in considerable CO emission changes.

9. Remove wrench.

10. Race engine briefly.

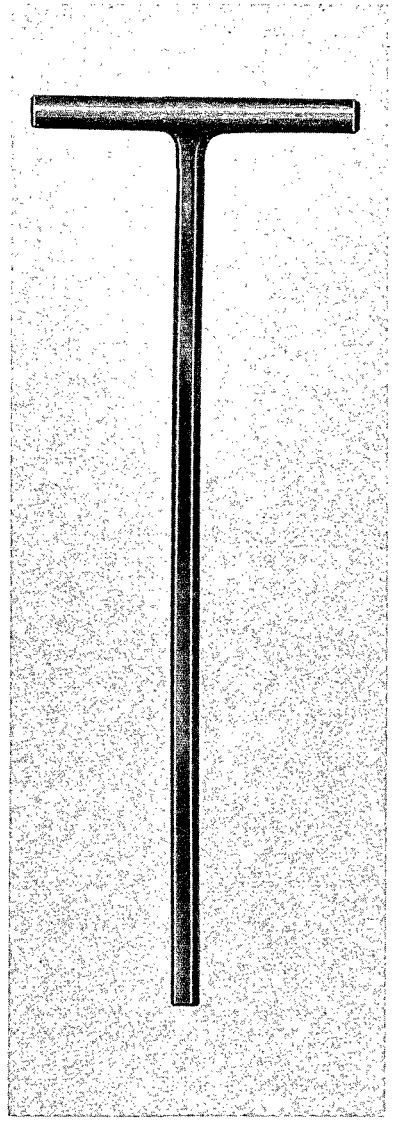
11. Wait until CO tester shows exhaust concentration at idle speed.
Test specifications, see page 1.1 - 1/14 e.
If necessary, repeat adjusting procedure.

12. Recheck idle speed and correct, if necessary.

13. After completion of adjustments, insert plug in mixture control unit and attach air injection hose.

ADJUSTING IDLE SPEED 911 SC - 1980 model

TOOLS



No.	Description	Special Tool	Remarks
1	Adjusting wrench	P 377	

Adjusting

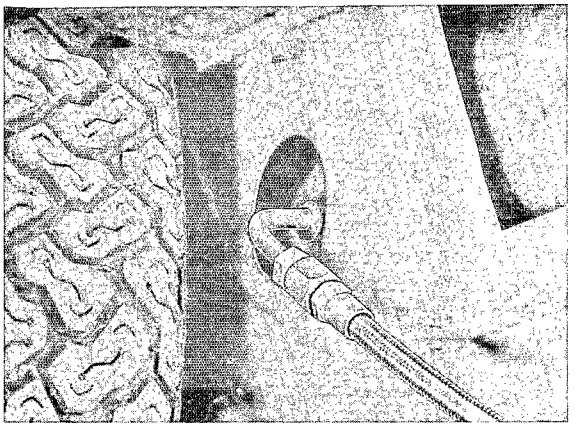
Note

Make sure that oil tank cap and seal fit properly prior to adjustment of the idle speed. Leaks at oil tank cap would cause incorrect measurement.

Requirements:

Engine in perfect mechanical condition and ignition timing adjusted correctly.

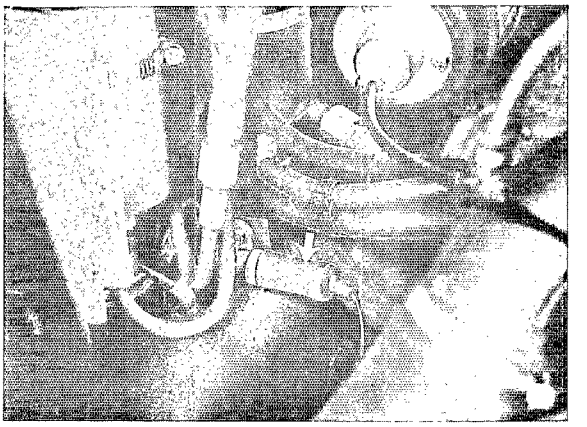
1. Connect exhaust pickup line on test connection of catalytic converter.



2. Run engine to operating temperature (oil temperature about 90° C. oil temperature gauge on upper end of range surrounded in white).

3. Connect CO tester according to instructions supplied with equipment.

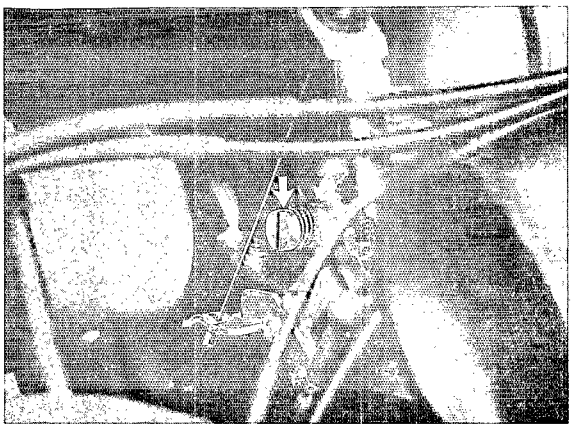
4. Disconnect plug for oxygen sensor in engine compartment on left side.



5. Turn control screw or bypass screw on throttle housing until specified speed is reached. Adjusting values on page 1.1 - 1/13.

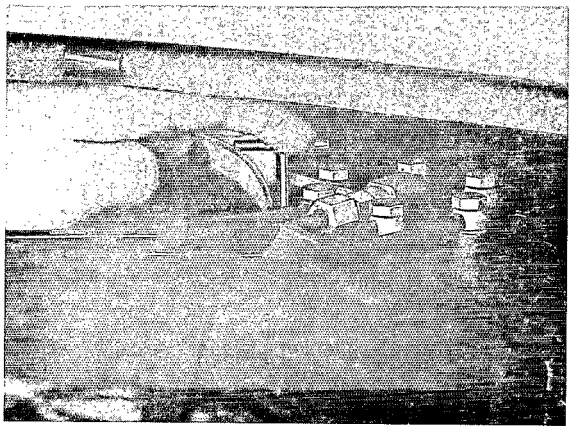
Note

Use separate tachometer from tester or similar.



6. Remove plug in mixture control unit, between fuel distributor and venturi.

7. Insert adjusting tool P 377.



8. Turn clockwise = richer mixture.
Turn counterclockwise = leaner mixture.

Note

Always conform with the following points.

a) Always adjust CO level from lean to rich.
Example: If mixture is too rich first turn idle control screw counterclockwise further than necessary and then clockwise to specification.

b) No force should be exerted on adjusting tool during adjustments (engine would die).

c) Turn control screw only minimal amount, since even a slight turn will change the CO level considerably.

9. Remove adjusting tool.

10. Accelerate engine briefly.

11. Wait until CO tester shows CO concentration at idle speed. See page 1. 1 - 1/14 f for adjusting values. If necessary, repeat adjusting procedures.

12. Recheck idle speed and correct, if necessary.

13. After completion of adjustments insert plug in mixture control unit and connect electric plug for oxygen sensor.

14. Coat threads of cap nut for testing connection on catalytic converter with Bosch assembly paste VS 140 16 Ft.

ADJUSTING IDLE 911 SC - (from 1981 Models)

Adjusting

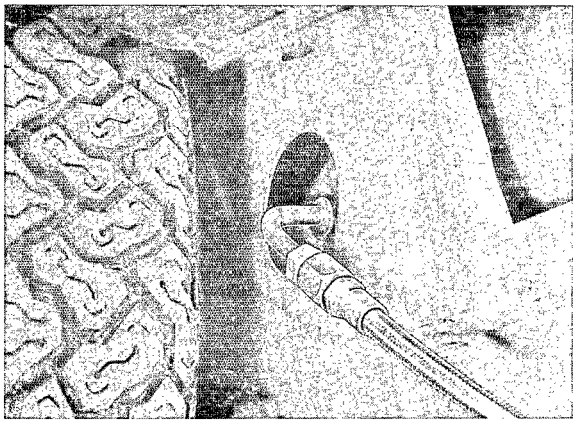
Note

Make sure oil tank cap and seal fit properly before adjusting idle. Leaks through oil tank cap would cause incorrect readings.

Adjusting requirement:

Engine in perfect working condition and ignition timing set correctly.

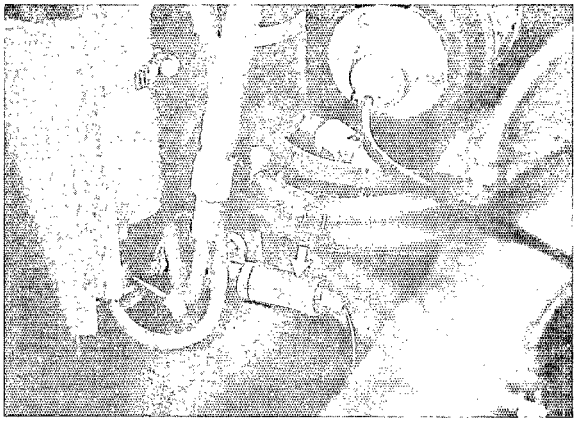
1. Connect exhaust gas tap on test connection of catalytic converter.



2. Run engine to operating temperature (oil temperature about 90° C/194° F; oil temperature gauge needle at upper end of field outlined in white).

3. Connect CO tester according to instructions supplied with equipment.

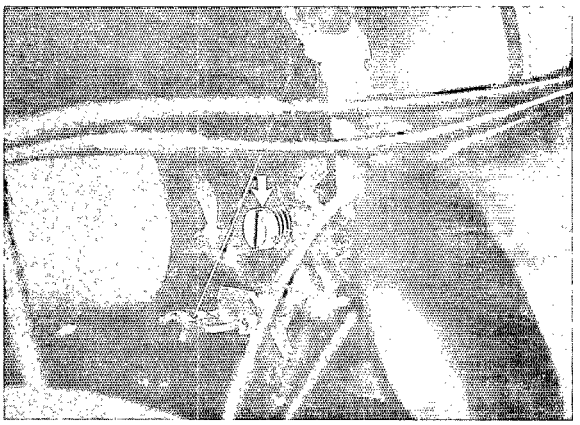
4. Disconnect oxygen sensor plug in engine compartment on left side.



5. Turn control screw or bypass screw on throttle housing until specified engine speed is reached. See page 1.1 - 1/14 f for adjusting value.

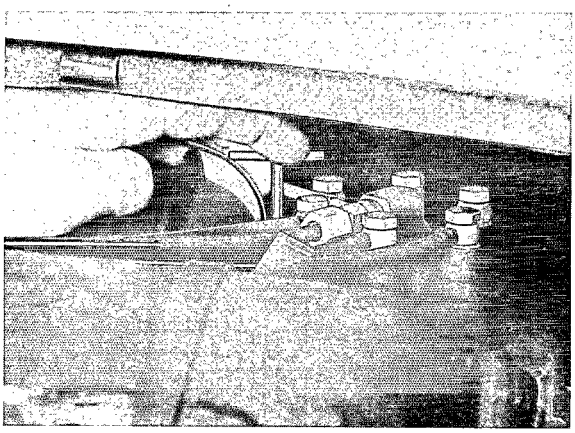
Note

Use separate tachometer of tester or similar.



6. Check CO level. If CO level does not correspond with specified value, remove mixture control unit and remove threaded part of shear-off screw in access bore for mixture control screw (see page 2.5 - 1/8).

7. Guide in Special Tool P 377.



8. Turning tool clockwise = richer mixture.
   Turning tool counterclockwise =leaner mixture.

Note

The following points are important.

a) Always adjust CO level from lean to rich.
   Example: If mixture is too rich, first turn idle control screw counterclockwise further than necessary and then clockwise to specified value.

b) Never exert force on special tool during adjustments (engine dies).

c) Turn control screw only very slightly, since even a slight turn will change CO content in exhaust gas considerably.

9. Remove special tool.

10. Accelerate engine briefly.

11. Wait until CO tester shows exhaust gas concentration at idle speed.
    See page 1.1 - 1/14 f for adjusting value.
    Repeat adjusting procedure, if necessary.

12. Recheck idle speed and, if necessary, correct.

13. After finishing adjustments screw a new shear-off screw in access bore and tighten until screw shears off. Reconnect oxygen sensor plug.

14. Coat threads of cap nut for test connection on catalytic converter with Bosch VS 140 16 Ft or Optimoly HT grease.

Getriebe
Transmission
Boîte de Vitesses
Cambio

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.0 Information

Transmission, 4 and 5 Speeds

Sportomatic

0.1 Description

Transmission, 5 Speeds, Operation 0.1 - 1/1

Transmission, 5 Speeds, Power Transfer 0.1 - 1/6

Transmission with Oil Pump, Description 0.1 - 1/7

Transmission with Oil Pump, General Instruction 0.1 - 1/9

Typ 915, Transmission (1974 model) 0.1 - 1/13

Typ 915, Transmission (1975 model) 0.1 - 1/14

Typ 915, Transmission (1976 model) 0.1 - 1/15

Sportomatic, General 0.1 - 2/1

Sportomatic, Power Transfer 0.1 - 2/7

Typ 925, Sportomatic Transmission (1974 model) 0.1 - 2/9

Typ 925, Sportomatic Transmission (1975 model) 0.1 - 2/11

Typ 925, Sportomatic Transmission (1976 model) 0.1 - 2/15

Sportomatic 1977 Models - General Information 0.1 - 2/16

0.2 Technical Data

Transmission Diagrams, Manual Transmission 0.2 - 1/1

Tightening Torques, Manual Transmission 0.2 - 1/3

Tightening Torque Values, Transmission 0.2 - 1/4

General Specifications, Transmission 0.2 - 1/5

Tolerances and Wear Limits 0.2 - 1/7

Transmission Diagrams, Manual Transmissions (1974 model) 0.2 - 1/9

General Specifications, Transmission (1974 model) 0.2 - 1/11

Transmission Diagrams, Manual Transmissions (1975 model) 0.2 - 1/13

General Specifications, Transmission (1975 model) 0.2 - 1/15

General Specifications, Transmission (1976 model) 0.2 - 1/17

Transmission Diagram 915/44 0.2 - 1/18

Transmission Diagram 915/49 0.2 - 1/19

Transmission Diagram, 925/01 Sportomatic Transmission 0.2 - 2/1

General Data - Sportomatic Transmission 0.2 - 2/2

Tightening Torques, Sportomatic Transmission 0.2 - 2/3

Transmission Diagram, 925/02 Sportomatic Transmission 0.2 - 2/5

General Specifications, Sportomatic (1974 model)	0.2 - 2/6
Transmission Diagram, 3 Speed Sportomatic 925/10 (1975 model)	0.2 - 2/7
General Specifications, 3 Speed Sportomatic 925/10 (1975 model)	0.2 - 2/8
General Specifications, 3 Speed Sportomatic 925/09, 012, 013	0.2 - 2/9
Transmission Diagram, 3 Speed Sportomatic (1976 model)	0.2 - 2/10

0.3 Special Tools

Special Tools, Sportomatic Transmission	0.3 - 1/1

3 - TRANSMISSION, 5-SPEED MANUAL

3.1 Transmission, disassembling and assembling

Transmission, removing and installing	3.1 - 1/1
Seal Ring for drive Shaft: dismantel and reinstall	3.1 - 1/15
Selector Forks, adjust	3.1 - 2/1
Transmission Front Cover, disassembling and assembling	3.1 - 3/1
Oil Pump in Front Cover, disassembling and assembling	3.1 - 3/5
Gear Housing, disassembling and assembling	3.1 - 4/1
Transmission Housing, disassembling and assembling	3.1 - 5/1
Oil Lines for Supplemental Lubrication System, remove and install	3.1 - 5/9
Transmission Housing with Guide Tube for Throwout Bearing	3.1 - 5/11
Transmission Case with Bolted Guide Tube for Release Bearing	3.1 - 5/19
Disassembling and assembling Transmission Case with Servo Clutch (1977 model)	3.1 - 5/25
Input Shaft, disassembling and assembling	3.1 - 6/1
Pinion Shaft, disassembling and assembling	3.1 - 7/1
Synchronization, disassembling and assembling	3.1 - 8/1
Disassembling and Assembling Synchronization (1977 Models)	3.1 - 8/5

4 - TRANSMISSION, SPORTOMATIC

4.1 Transmission, disassembling and assembling

Torque Converter Housing, disassembling and assembling	4.1 - 1/1
Transmission, removing and installing	4.1 - 2/1
Transmission Front Cover, disassembling and assembling	4.1 - 3/1
Intermediate Plate, disassembling and assembling	4.1 - 4/1
Input Shaft (3 Speed Sportomatic) disassembling and assembling	4.1 - 5/1
Pinion Shaft (3 Speed Sportomatic) disassembling and assembling	4.1 - 6/1
Checking Clutch Play (1976 model)	4.2 - 1/1
Checking Control Valve Adjustment (1976 model)	4.2 - 2/1

5 - DIFFERENTIAL

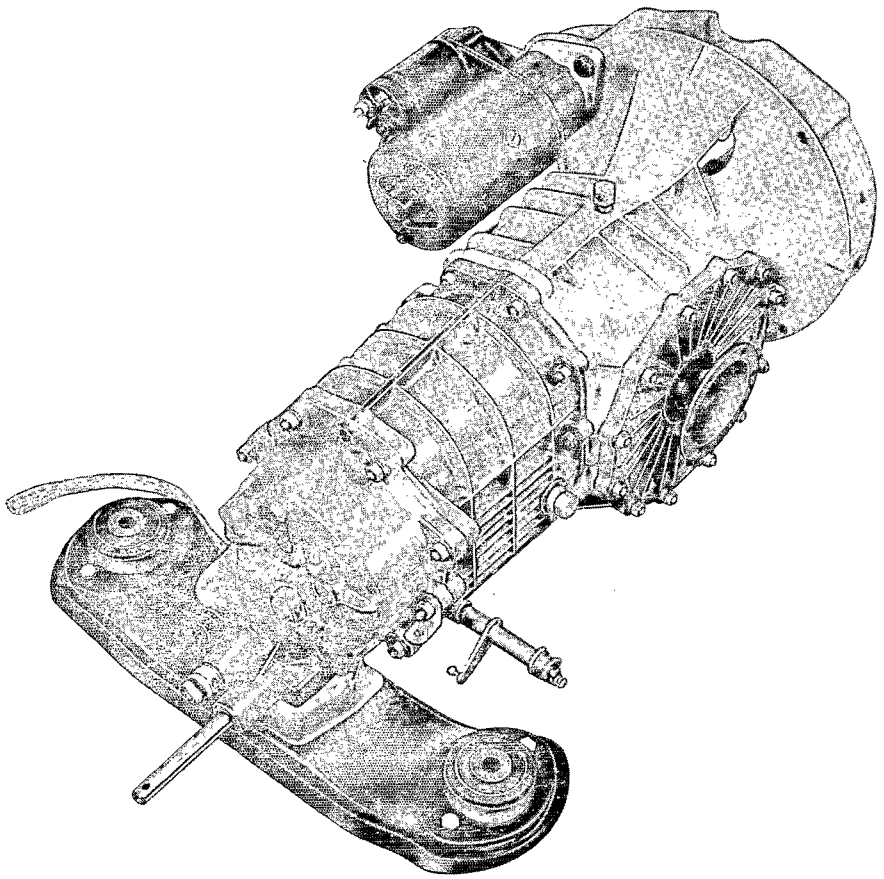
5.1 Differential, with manual transmission

Differential, removing and installing	5.1 - 1/1
Differential, disassembling and assembling	5.1 - 2/1
Differential with electronical speedometer	5.1 - 2/6
Tools	5.1 - 2/7
Disassembling and Assembling Instructions	5.1 - 2/10
Ring and Pinion Gear, adjusting - General Information	5.1 - 4/1
Ring and Pinion Gear, adjusting	5.1 - 5/1
Pinion Shaft, adjust with universal Setting Gage VW 385	5.1 - 5/11

5.2 Differential, with Sportomatic Transmission

Ring and Pinion Gear, adjusting - General Information	5.2 - 1/1
Ring and Pinion Gear, adjusting	5.2 - 2/1

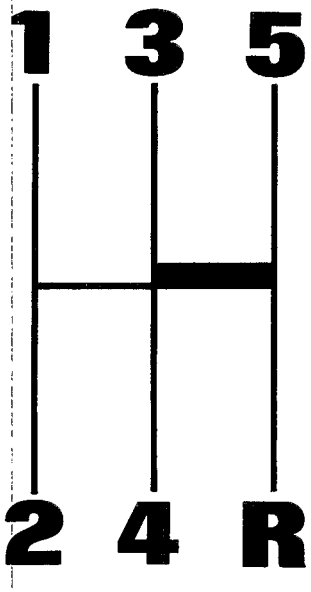
FOUR AND FIVE SPEED TRANSMISSION (TYPE 915)



Beginning with 1972 models, all Type 911 vehicles are equipped with the new, reinforced 4-speed transmission. The 5-speed transmission is optional.

DESIGN AND FUNCTION

The five forward speeds and reverse are arranged in a double "H" shift pattern.



1st speed: left forward

2nd speed: left back

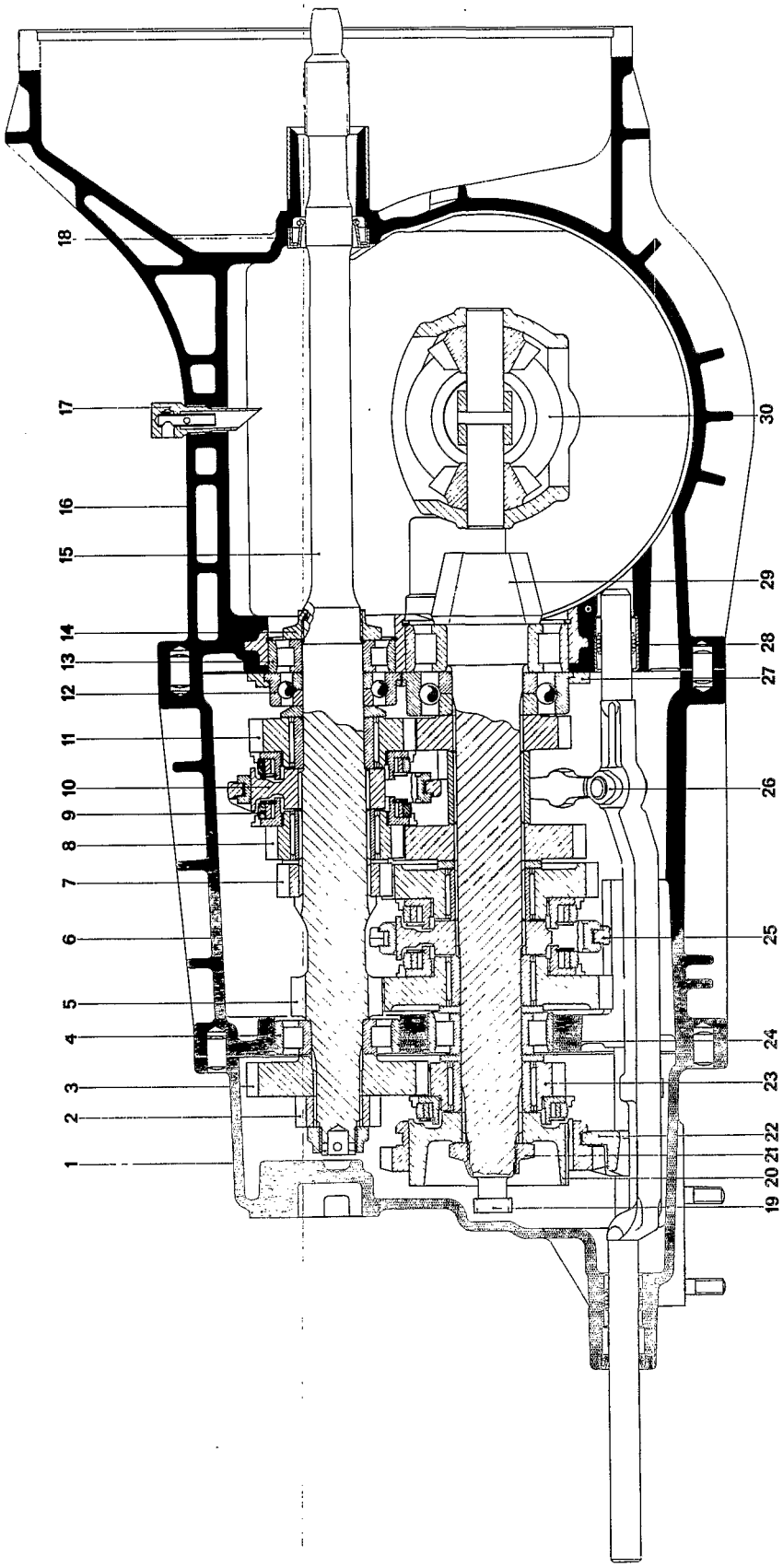
3rd speed: straight forward

4th speed: straight back

5th speed: press right overcoming spring detent, then straight forward

Reserve: press right overcoming spring detent, then straight back

Clutch pedal must be fully depressed and selected gear fully engaged.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 - Transmission front cover

2 - Reverse, Gear I

3 - 5th speed, Gear I, fixed

4 - Roller bearing

5 - 1st speed, Gear I, fixed

6 - Gear housing

7 - 2nd speed, Gear I, fixed

8 - 3rd speed, Gear I, free

9 - Synchronizing ring

10 - Spider (Synchro hub)

11 - 4th speed, Gear I, free

12 - Pinion shaft ball bearing

13 - Roller bearing

14 - Flange nut

15 - Input shaft

16 - Transmission housing

17 - Breather

18 - Seal

19 - Speedometer drive, Gear I

20 - Spider, 5th and reverse speeds

21 - Flange nut

22 - Shift fork, 5th and reverse speeds

23 - 5th speed, Gear II, free

24 - Roller bearing

25 - Shift fork, 1st and 2nd speeds

26 - Selector shaft

27 - Bearing retaining plate

28 - Ball sleeve

29 - Pinion shaft

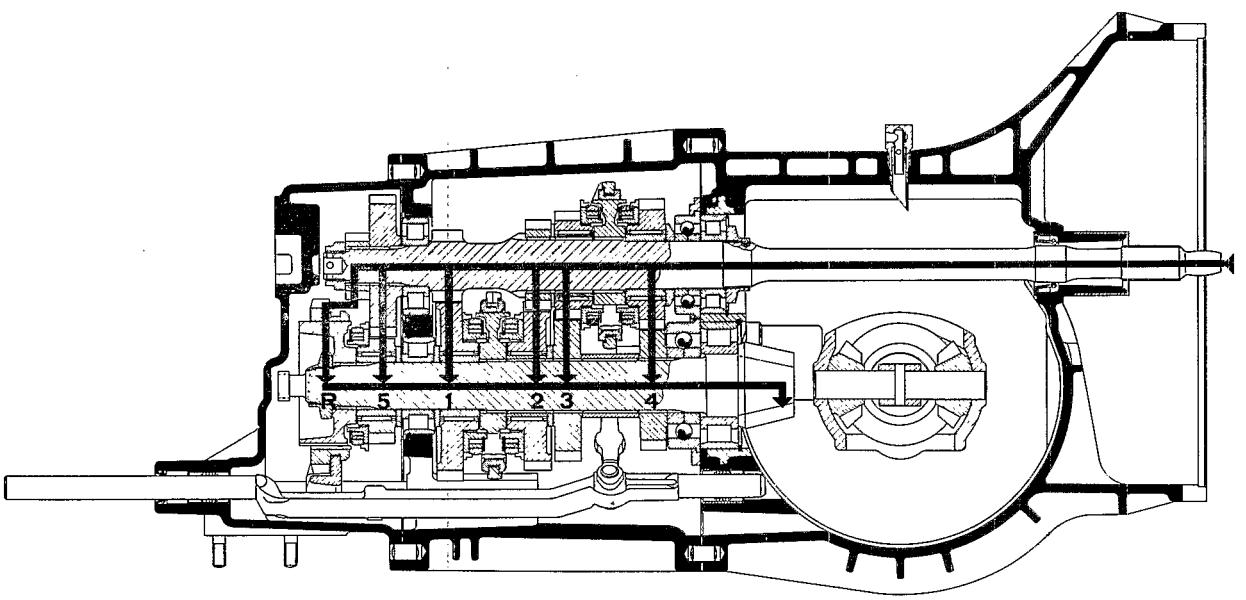
30 - Differential

POWER FLOW

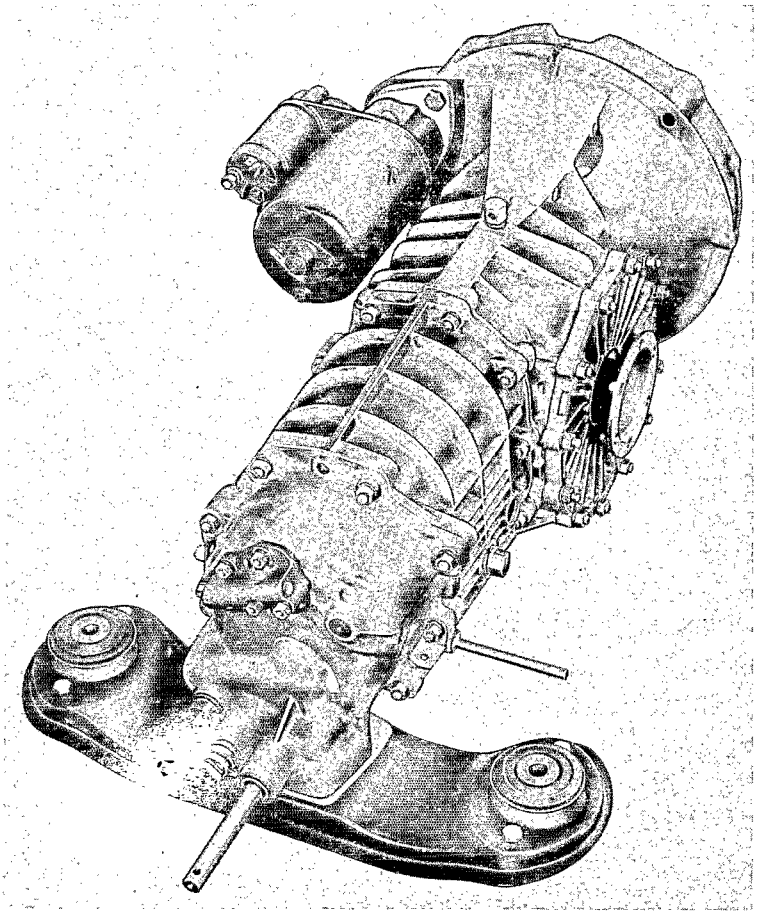
In all gears, power flow is from the input shaft to the pinion shaft through the respectively engaged gear pair. The engaging and synchronizing parts for 1st, 2nd, and 5th gears are on the pinion shaft, and those for the 3rd and 4th gear are on the input shaft.

Torque transfer occurs only through the respective gear pair. Engagement of the 1st, 2nd, and 5th gears is made by repositioning the shifting sleeve or sliding gear located on the pinion shaft, and that of 3rd and 4th gears by one located on the input shaft.

Power flow in reverse gear is from the input shaft through the reverse idler gear, the sliding gear, to the pinion shaft.



TYPE 915 TRANSMISSION WITH OIL PUMP



Carrera 2.7 vehicles are equipped with Type 915/08 and 915/18 transmissions.

These transmissions are identical in design and servicing to transmissions used in 1972 models. However, due to the increased power and torque of the 2.7 liter engines, they are equipped with an oil pump lubrication system.

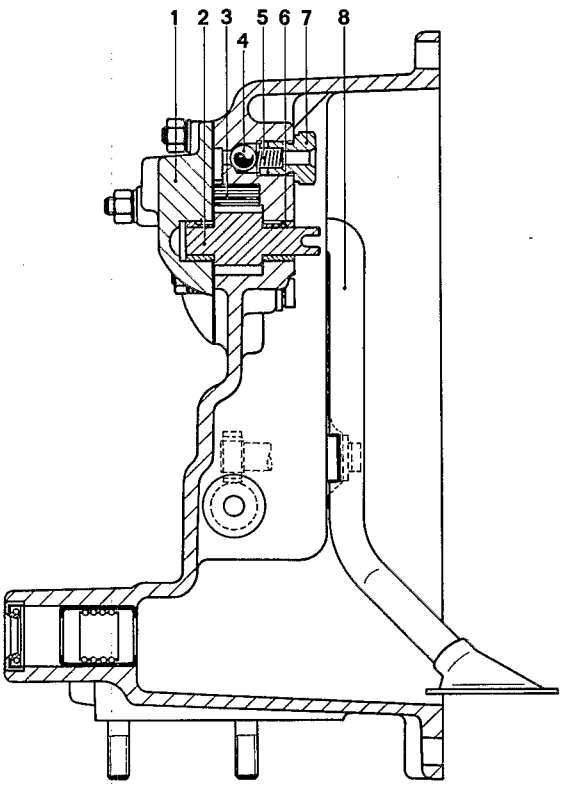
DESCRIPTION OF THE OIL PUMP LUBRICATION SYSTEM

When the car is started, the input shaft sets the oil pump in motion. The pump draws oil from the transmission oil sump through a pickup tube and forces it through the passages in the pump cover and into the pressure lines.

Pressure created by the oil pump forces the transmission oil to pass through discharge nozzles which direct the oil spray to the lubrication points. Oil not used for lubrication cools the working parts and drains back into the transmission oil sump.

A pressure relief valve opens at a pressure of about 3, 4 atmospheres if a malfunction should occur in the oil supply system, such as a plugged pressure line. The oil then drains into the transmission oil sump.

The constant circulation of the transmission oil and spraying of the bearings and gears results in improved cooling and lubrication.



1 - Oil pump cover
2 - Oil pump gear I
3 - Oil pump II
4 - Ball for pressure relief valve
5 - Spring for pressure relief valve
6 - Bushing
7 - Plug for pressure relief valve
8 - Pickup tube

GENERAL INSTRUCTIONS FOR DISASSEMBLING AND REASSEMBLING OF TRANSMISSION WITH OIL PUMP

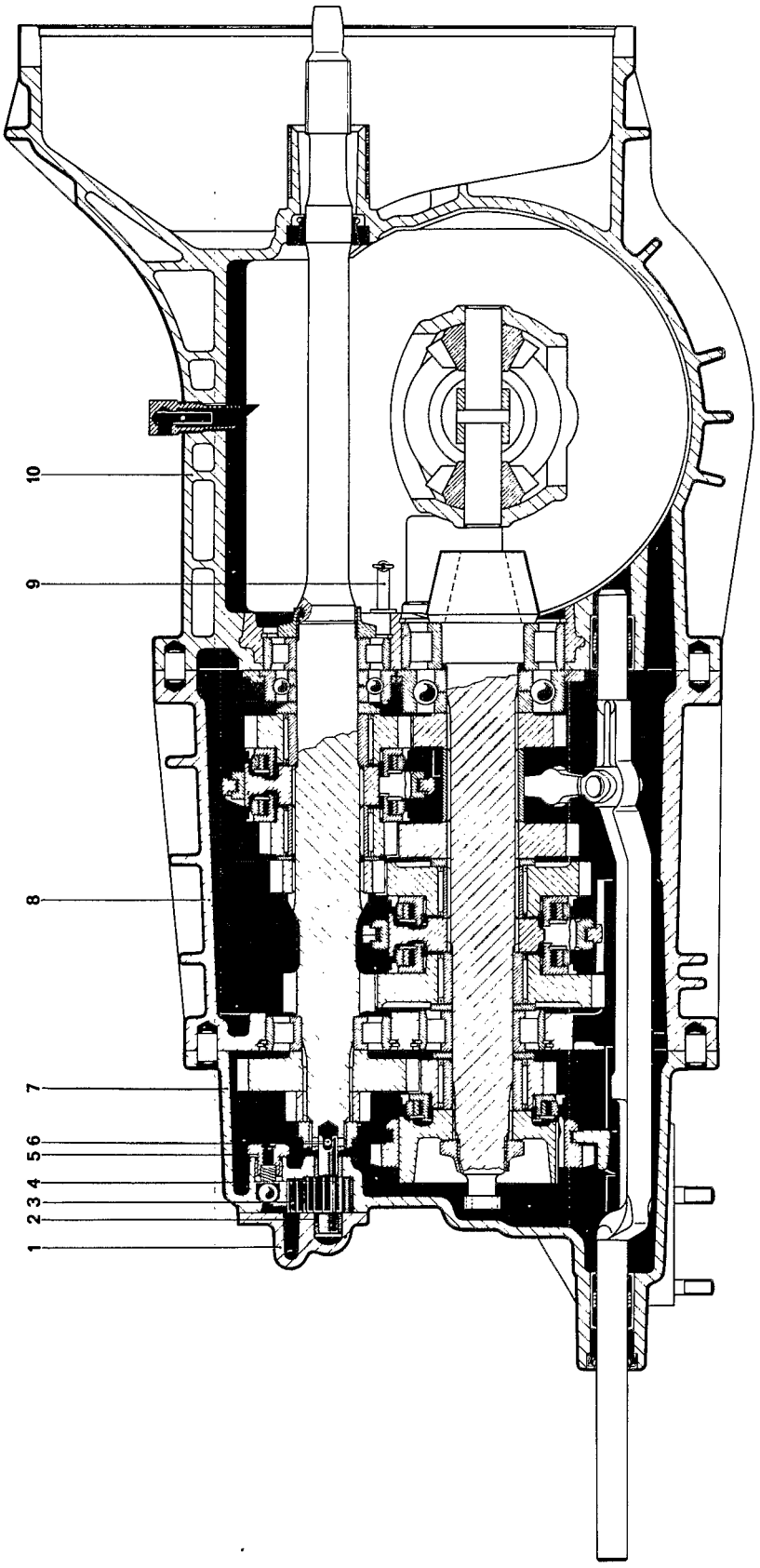
1. Disassembly and reassembly of a transmission with oil pump is the same as that of a unit without the pump because the pressure line connections are of the slip-on type.

2. Oil the O-rings lightly when installing the pickup tube and pressure lines since otherwise damage may occur.

3. The gear housing should be assembled with the pressure line bolted in place. The pressure line must pass through the hole in shift fork for 3rd and 4th speed.

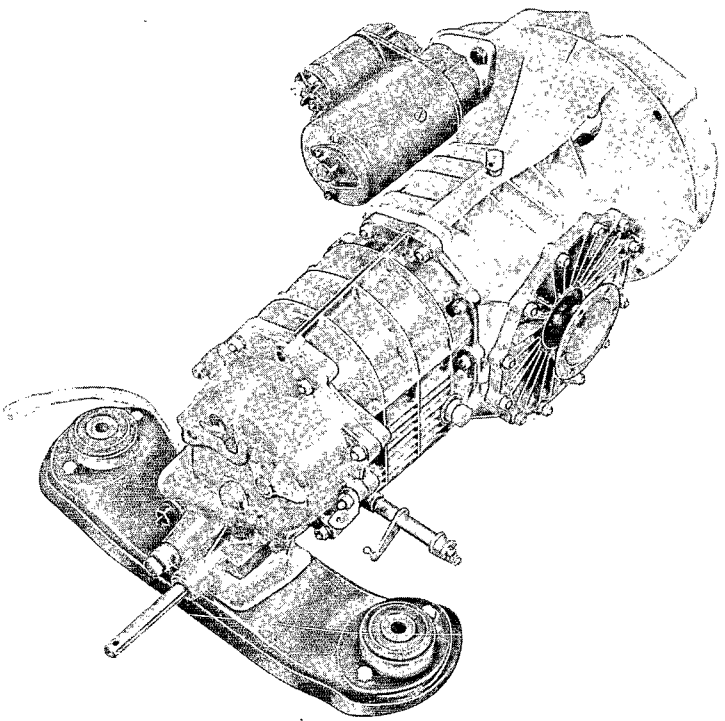
4. When installing the transmission front cover make sure that the coupling pin in the input shaft engages the coupling slot in oil pump gear I. If necessary, turn the input shaft slightly and push cover into place.

5. Work procedures differing from those applicable to transmissions in 1972 models, such as disassembly and reassembly of the oil pump, are described on pages that follow.


10
9
8
7
6
5
4
3
2
1

1 - Oil pump cover
2 - Bushing
3 - Oil pump gear II
4 - Oil pump gear I
5 - Plug for pressure relief valve
6 - Oil pump coupling pin
7 - Transmission front cover
8 - Gear housing
9 - Pressure line
10 - Differential housing

TYPE 915 TRANSMISSION (1974 MODEL)



The following transmission versions are installed from 1974 models on:

4-speed transmission, 915/16 = S
5-speed transmission, 915/06 = SW

S = standard equipment SW = special order

These transmission versions differ from those used in 1973 models only in the aspect of gear ratios (see Technical Data, page 0.2 - 1/11).

Manual transmission 915 (1975 Models)

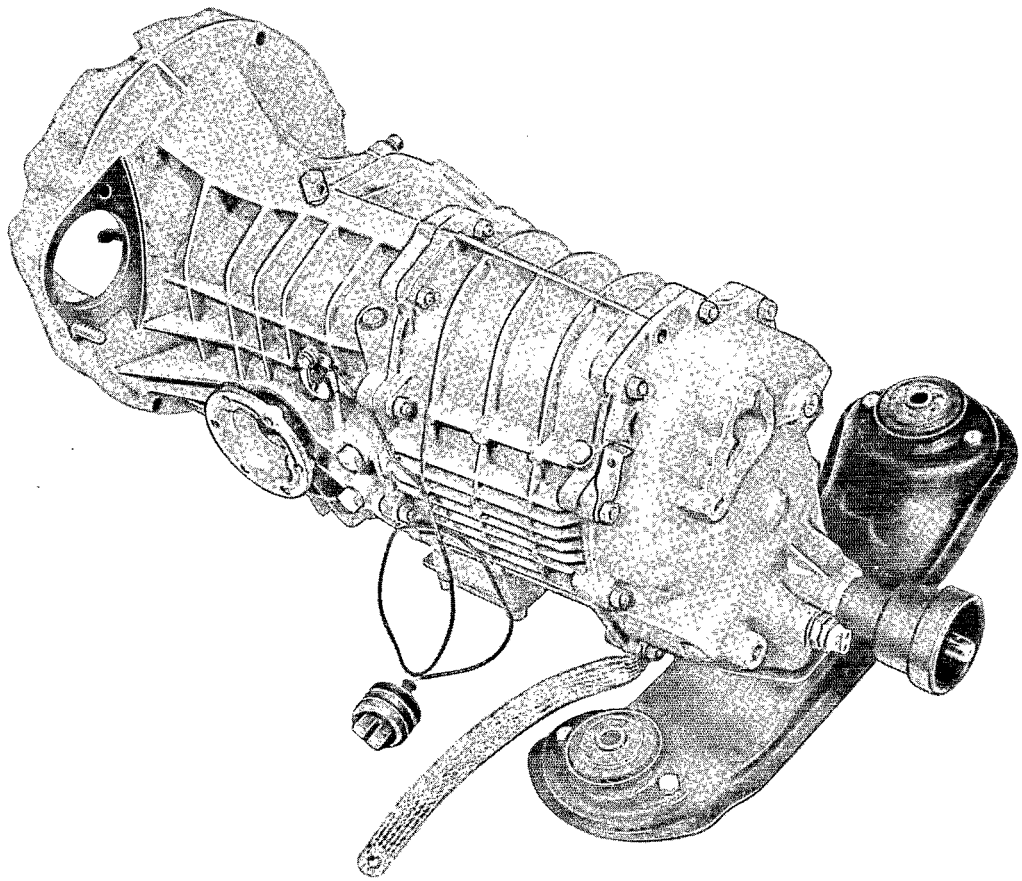
The following transmissions are installed.

Transmission Type	No. of Gears	Application
915/40	5	911 S, Carrera
915/45	4	911 S, Carrera

All transmission types are based on those of 1974 models and only differ slightly from each other.

The 3rd and 4th or 4th and 5th gears as well as the rear axle ratios have been changed on the types 915/45 and 915/40 (refer to technical data on page 0.2 - 1/15). The shift and guide sleeves have also been reinforced, and the clutch release lever modified.

MANUAL TRANSMISSION 915 (1976 MODEL)



The following transmission is available for the 1976 Model.

5-speed transmission 915/44

This transmission model differs from the 1975 model by a new guide tube for the clutch release bearing, an easy to remove drive shaft seal and an electronic speedometer transmitter.

MANUAL TRANSMISSION 915 (1976 MODEL)

The following transmission is available for the 1976 Model.

Transmission	No. of Speeds	For Model
915/44	5	911 S

MANUAL TRANSMISSION 915 (1977 Model)

For 1977 Models the following transmission type is installed.

5-speed transmission 915/61 with auxiliary clutch spring

This transmission differs from the 1976 Model with modified synchronizers for 1st and 2nd gears, an asymmetric tooth profile of the clutch body for 1st gear and a modified operating and guide sleeve for 1st/2nd gear.

MANUAL TRANSMISSION 915 (1978/79 Models)

For the 1978/79 models the

5-speed transmission 915/61

has a silumin case and a modified clutch release lever.

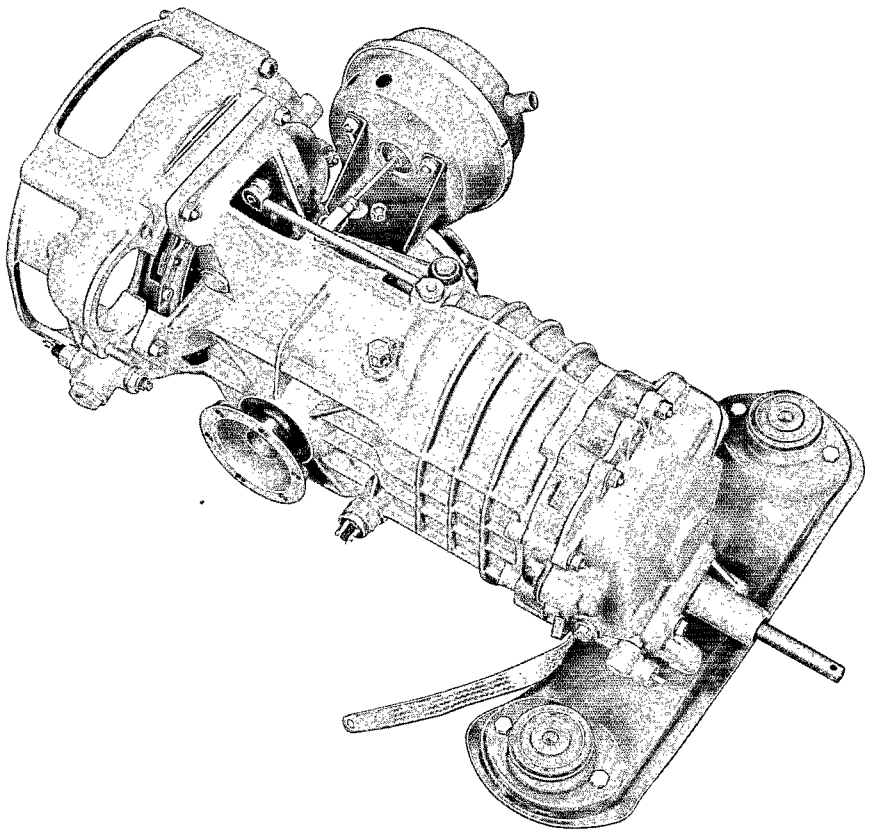
MANUAL TRANSMISSION 915 (1980/81 Models)

The following transmission type is installed in the 1980/81 models:

5-speed transmission 915/63

This transmission differs from those in 1978/1979 models only in the modified 2nd gear ratio.

SPORTOMATIC 925

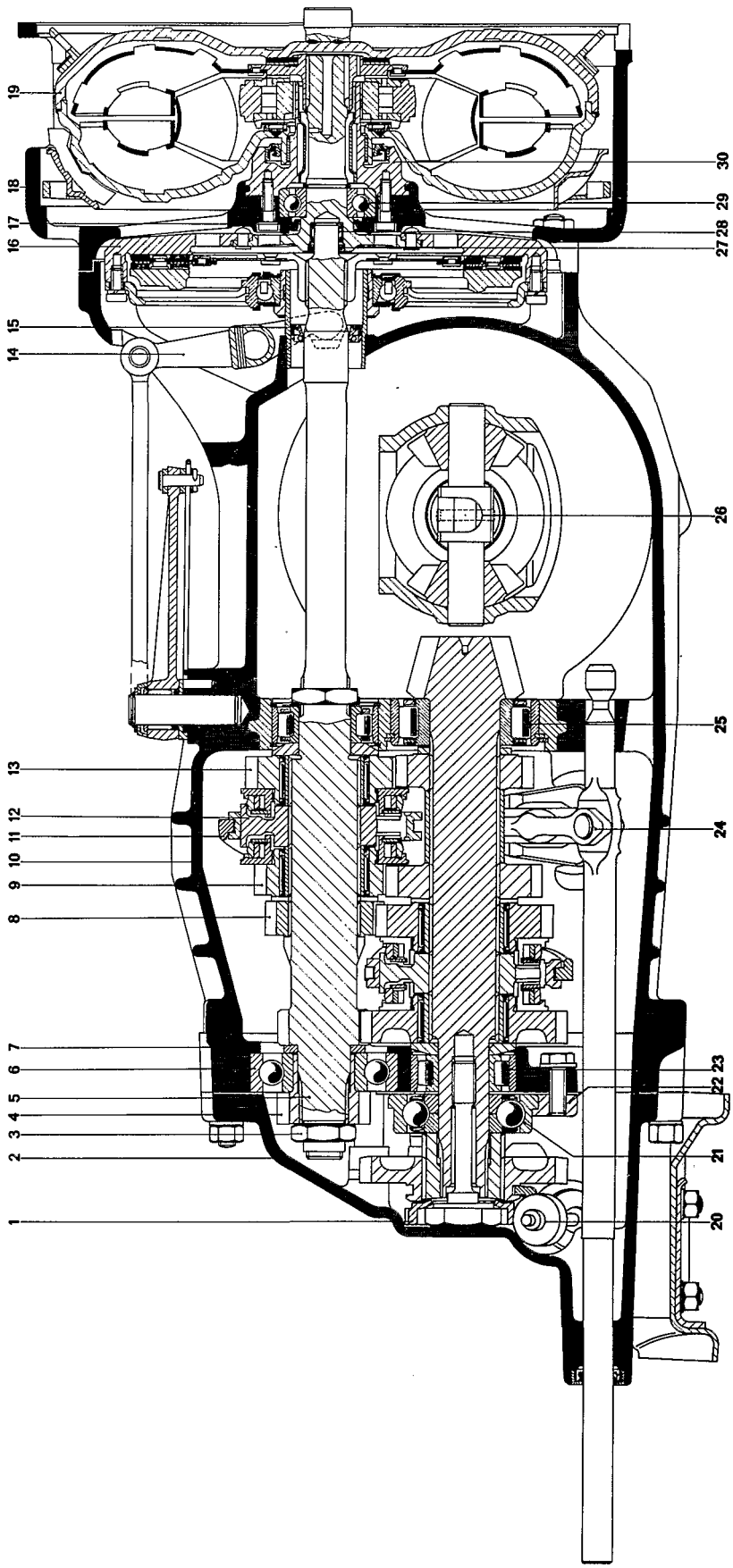


Beginning with Sept. 24, 1971 production, the Sportomatic transmission for 911 vehicles have been modified. The modified transmission have the following designations:

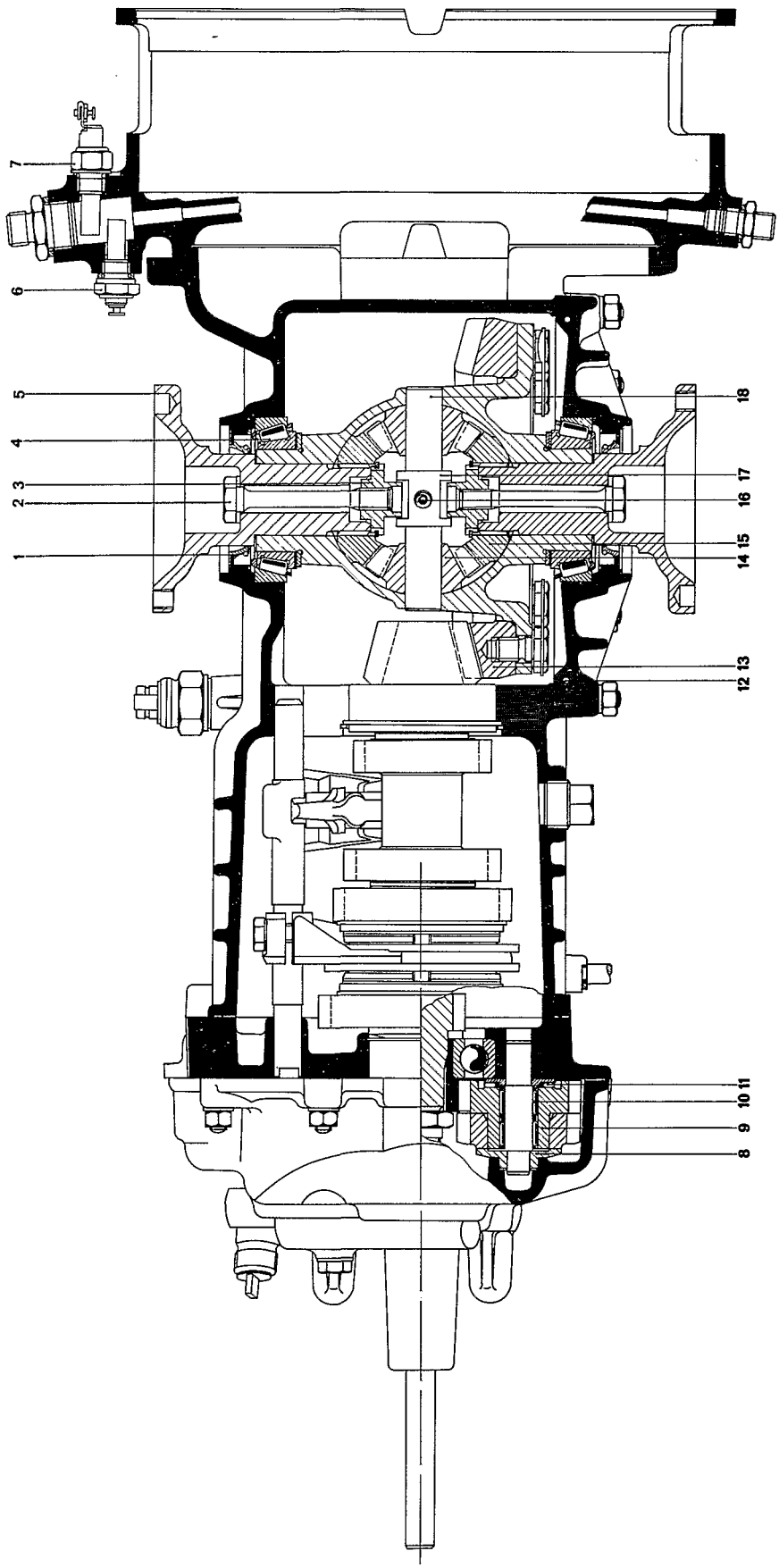
911 T and E	925/ 00
911 S	925/ 01.

Repair procedures for these transmission differ only slightly for those contained in the 911 Workshop Manual, Volume I which applied to models thru 1971.

Only those repair procedures and service information which differ are included in this volume of the workshop manual.


19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
30
29
28
27
26
25
24
23
22
21
20

1 - Speedometer drive
2 - Front cover
3 - Flange nut
4 - Gear I, reverse gear
5 - Input shaft
6 - Ball bearing race
7 - Intermediate plate
8 - Gear I, 2nd gear
9 - Gear I, 3rd gear
10 - Transmission housing
11 - Shift fork, 3rd and 4th gear
12 - Shift sleeve, 3rd and 4th gear
13 - Gear I, 4th gear
14 - Throwout fork
15 - Oil seal
16 - Clutch plate / turbine shaft
17 - Oil seal
18 - Torque converter housing
19 - Torque converter
20 - Speedometer gear shaft
21 - Four point ball bearing
22 - Clamping plate
23 - Roller bearing
24 - Selector shaft
25 - Roller bearing
26 - Anchor block
27 - Oil seal
28 - Needle bearing sleeve
29 - Ball bearing
30 - Stator support


7
6
5
4
3
2
1
18
17
16
15
14
13
12
11
10
9
8

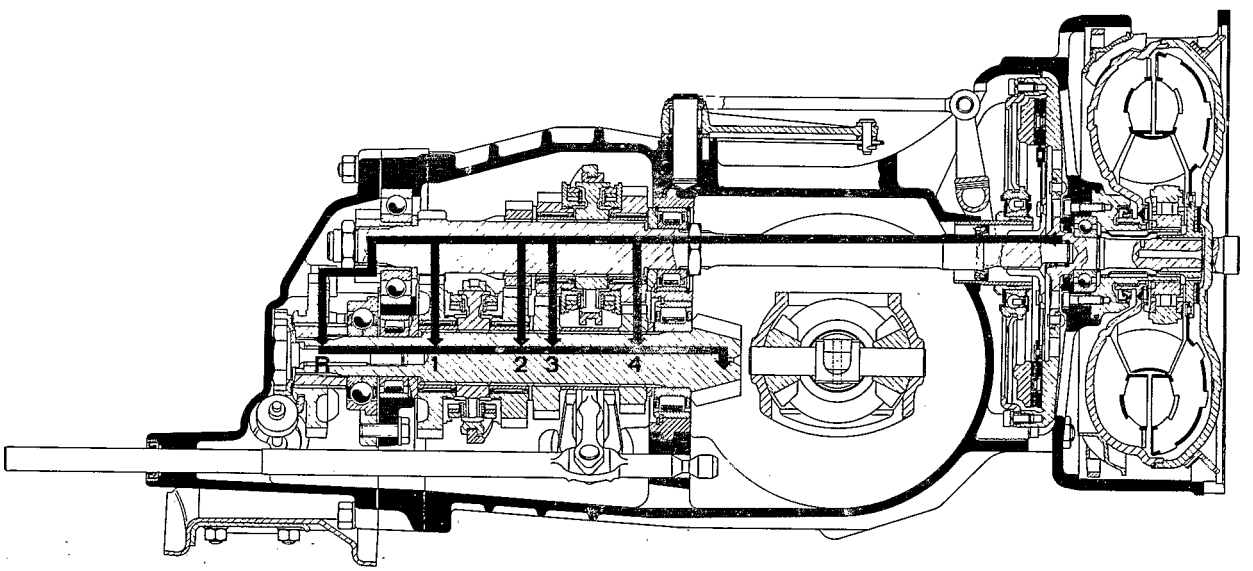
1 - Oil seal
2 - Expansion bolt
3 - Threaded stud
4 - Tapered roller bearing
5 - Axle flange
6 - Temperature sending unit
7 - Temperature switch
8 - Thrust washer
9 - Reverse idler gear
10 - Needle bearing cage
11 - Axial needle bearing cage
12 - 0-ring
13 - Ring gear
14 - Differential spider gear
15 - Differential side gear
16 - Roll pin
17 - Anchor piece
18 - Shaft

Power Transfer

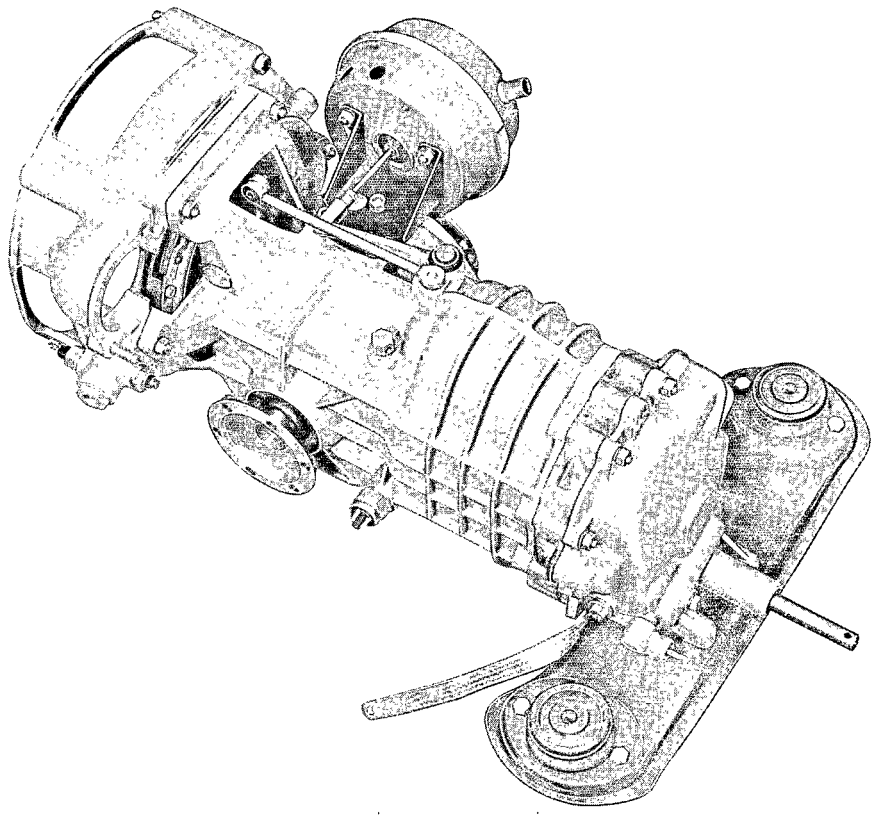
Power transfer from the engine through the torque converter and mechanical clutch is same in all driving ranges.

In ranges L and D, the power is transfered from the fixed gears on the input shaft, through the synchronization components and free-wheeling gears on the pinion shaft, to the pinion shaft. In ranges D3 and D4, the power transfers from the input shaft, through the synchronization components and free-wheeling gears, to the fixed gears on the pinion shaft. Reduction is accomplished by gears engaged in given driving range.

Reverse gear reduction is over two stages. The power flows from the input shaft, through the intermediate shaft, to the pinion.



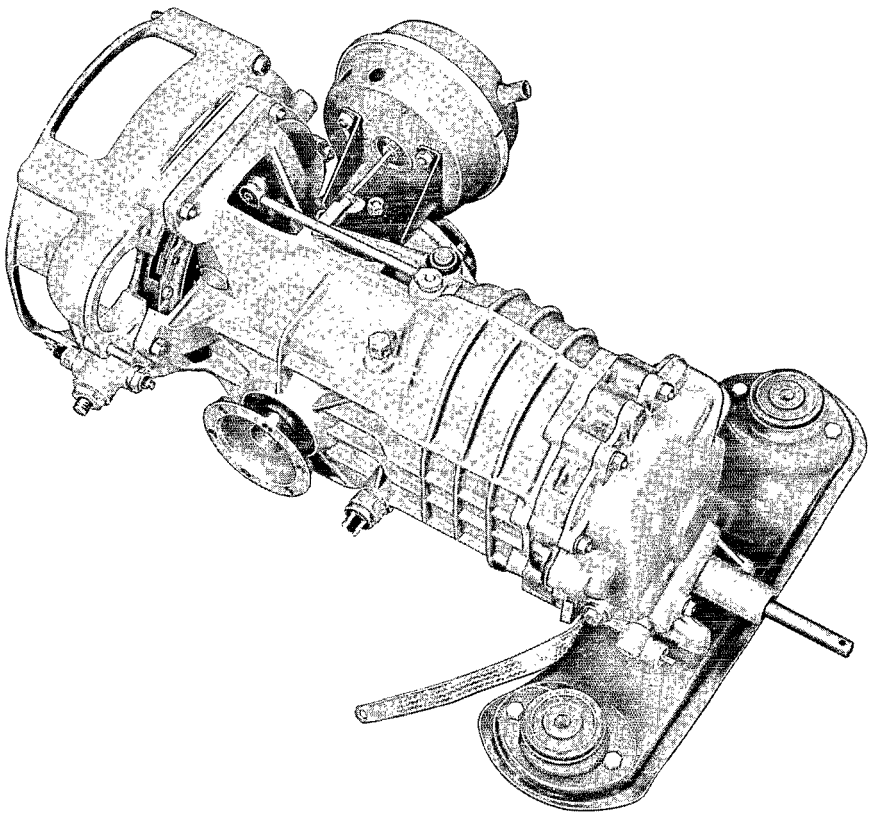
TYPE 925 SPORTOMATIC TRANSMISSION (1974 MODEL)



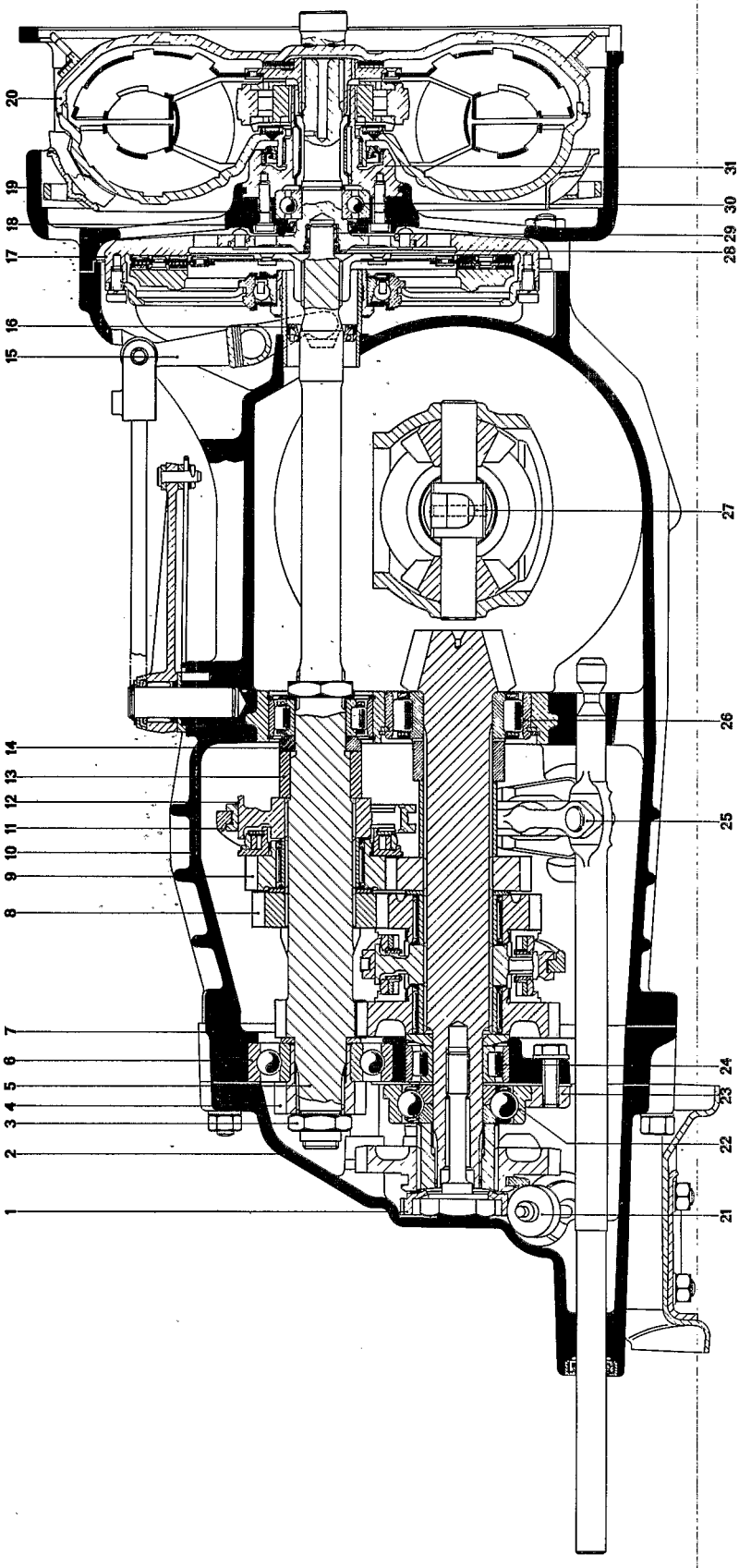
Beginning with 1974 models, Type 911 and 911 S vehicles can optionally be equipped with the Type 925/02 transmission.

This transmission version differs from that used in 1973 models only in the aspect of changed torque converter ratio (see Technical Data, page 0.2 - 2/6).

SPORTOMATIC 925 (1975 Models)

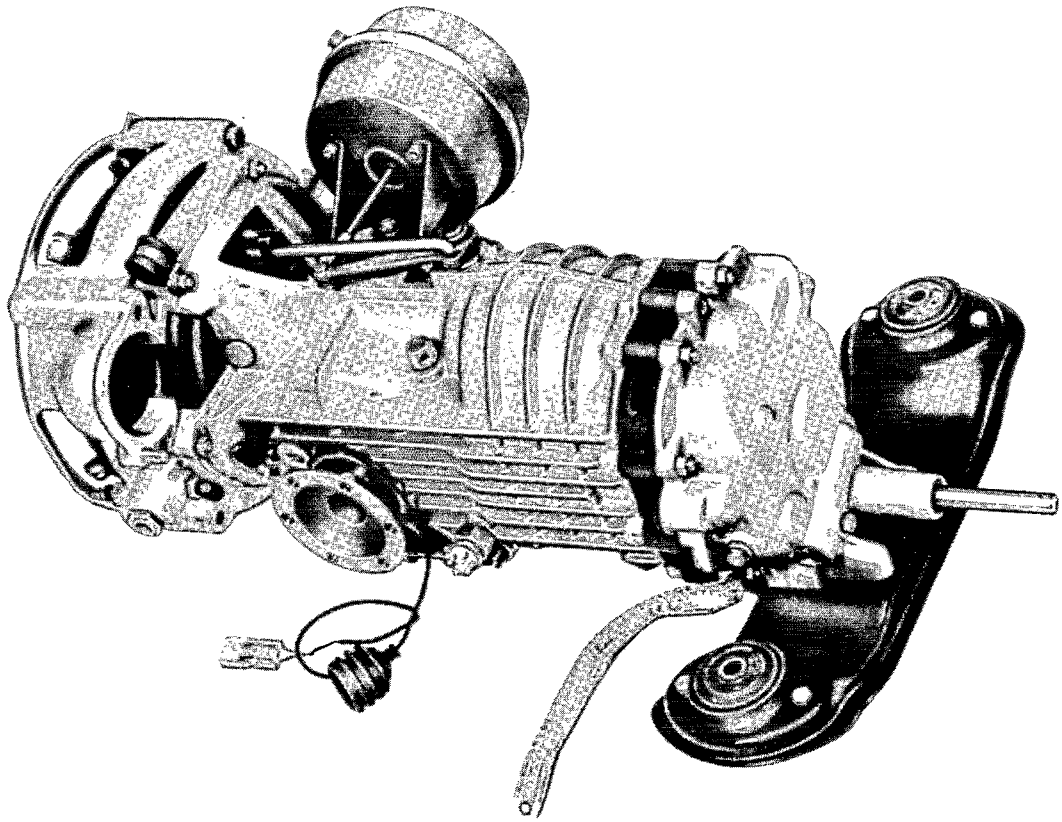


All 1975 models are available with a 3-speed sportomatic transmission (type 925/10) as optional extra equipment.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

1 - Speedometer drive gear
2 - Front transmission cover
3 - Flanged nut
4 - Reverse gear
5 - Main shaft
6 - Ball bearing
7 - Intermediate plate
8 - 2nd gear (22:29 M)
9 - 3rd gear (27:25 V)
10 - Transmission case
11 - 3rd gear shift fork
12 - 3rd gear shift sleeve guide
13 - Spacer
14 - Washer
15 - Release lever
16 - Oil seal
17 - Turbine shaft
18 - Oil seal
19 - Torque converter housing
20 - Torque converter
21 - Speedometer drive shaft
22 - Four-point ball bearing
23 - Clamping plate
24 - Roller bearing
25 - Inner shift lever
26 - Roller bearing
27 - Anchor block
28 - O-ring
29 - Needle bearing
30 - Ball bearing
31 - Stator support

SPORTOMATIC 925 (1976 MODEL)



From 1976 models all cars can be delivered with a 3-speed sportomatic transmission as optional extra equipment. For engines with a swept volume of 2.7 liters transmission 925/09 (mechanical speedometer drive) and 925/12 (electronic speedometer transmitter) are installed.

The 3 liter Carrera engine requires a more powerful servo motor with a modified clutch linkage (Type 925/13). The torque converter has 4 additional drive shells.

SPORTOMATIC TRANSMISSION 925 (1976 MODEL)

The following transmissions are available from 1976 Models.

Transmission	No. of Speeds	For Model
925/09 (mech. speedometer)	3	911
925/12 (electronic speedometer)	3	911 and 911 S USA
925/13 (stronger converter drive)	3	Carrera 3.0

SPORTOMATIC TRANSMISSION 925 (1977 Models)

From 1977 Models the following transmission types are installed.

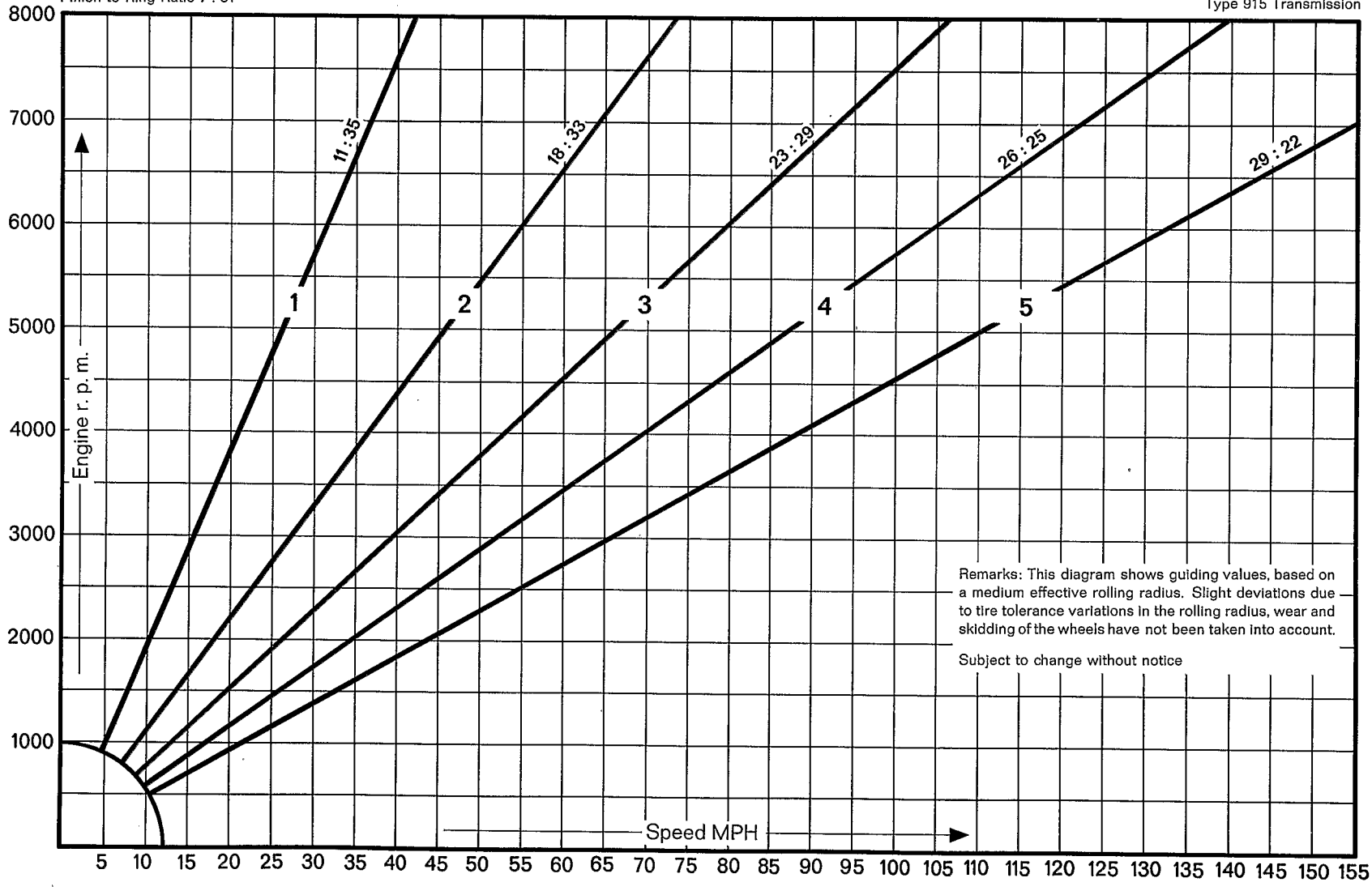
Transmission Type	No. of Gears	Installed in
925/15	3	911
925/16	3	Carrera 3.0
925/17	3	911 S USA and 911 S Japan

Transmission Diagram

5-speed-transmission

Pinion to Ring Ratio 7 : 31

Type 915 Transmission

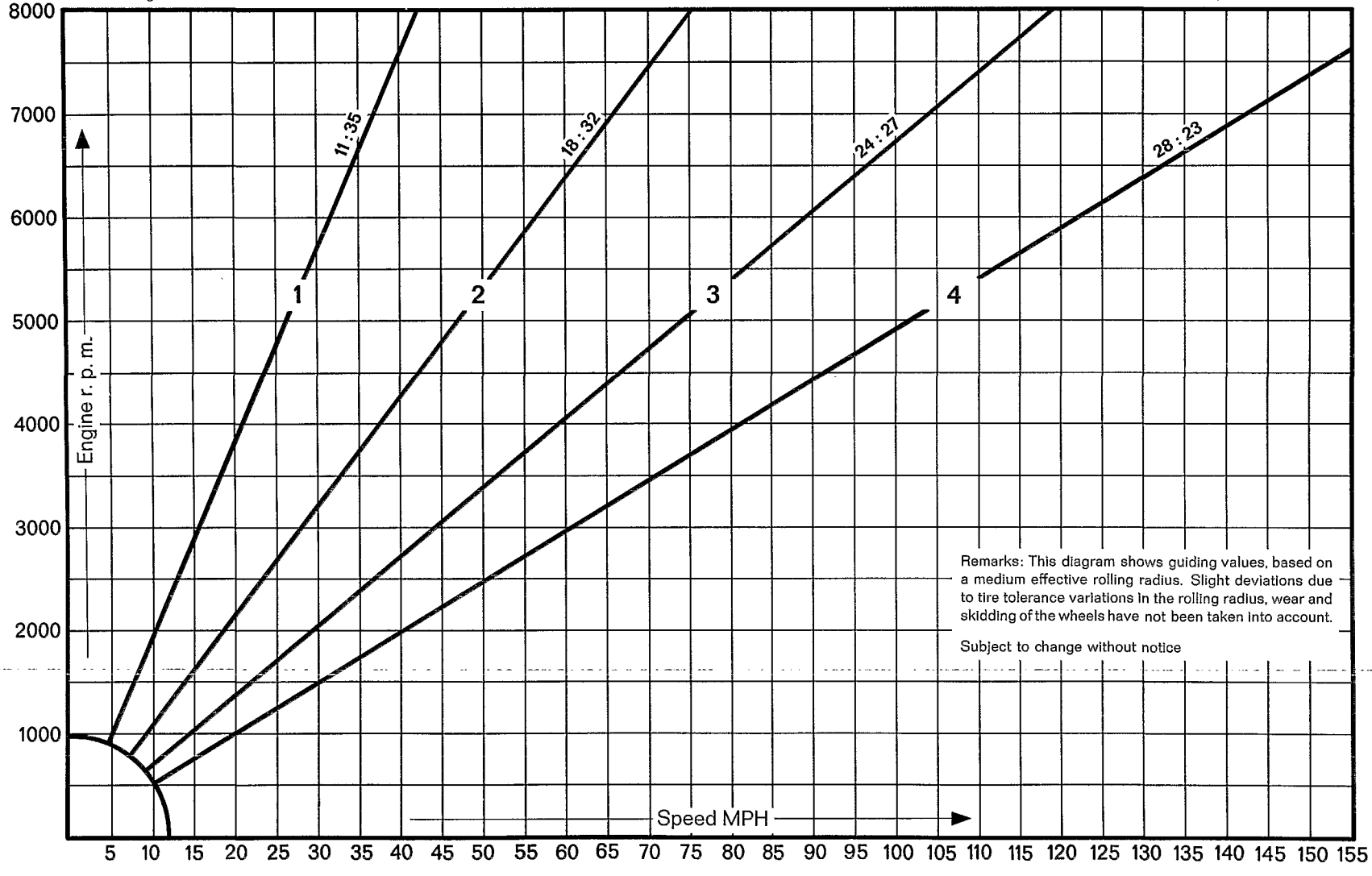


Transmission Diagram

4-speed-transmission

Pinion to Ring Ratio 7 : 31

Type 915 Transmission

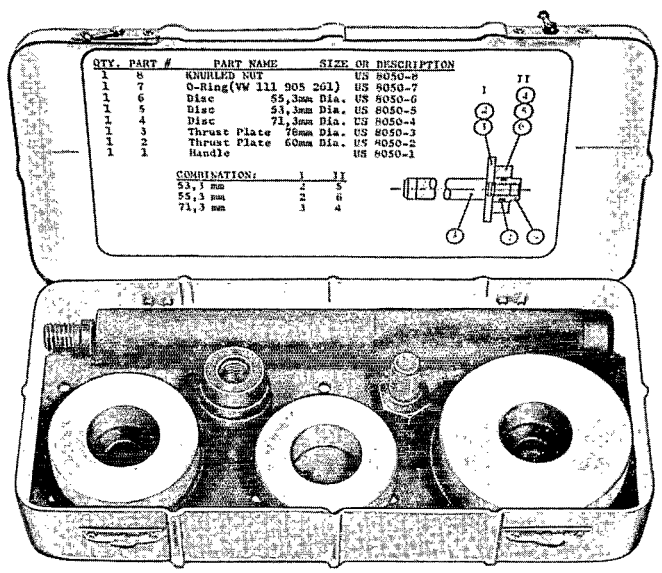


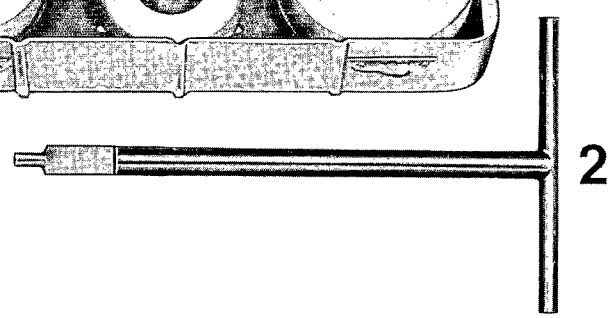
Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

Subject to change without notice

DISASSEMBLING AND ASSEMBLING TRANSMISSION HOUSING

TOOLS





1

2

Nr.	Description	Special Tool	Remarks
1	Driver Set	US 8050	
2	T-handle	P 366	

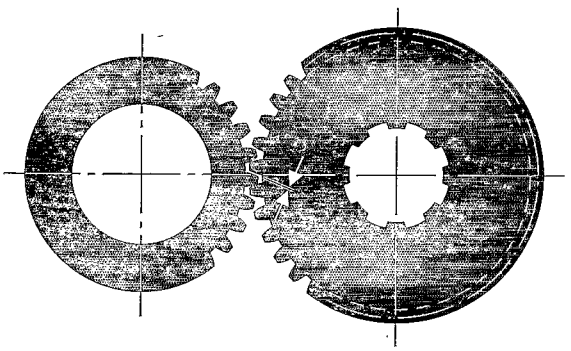
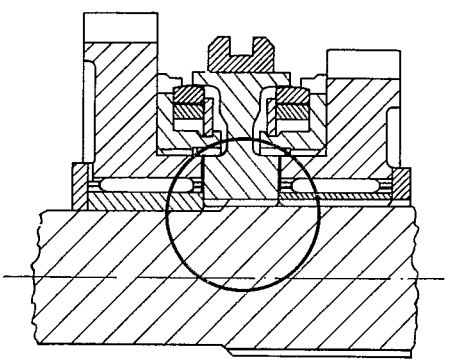
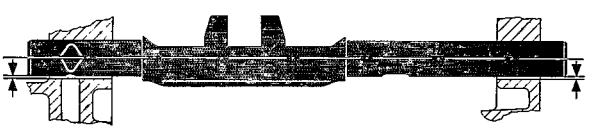
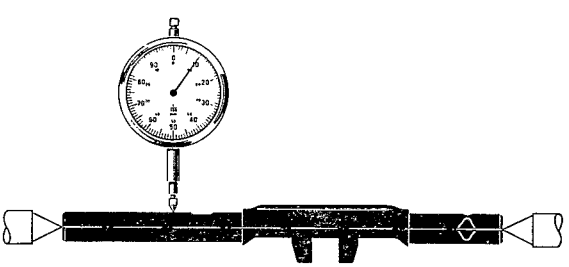
TIGHTENING TORQUES

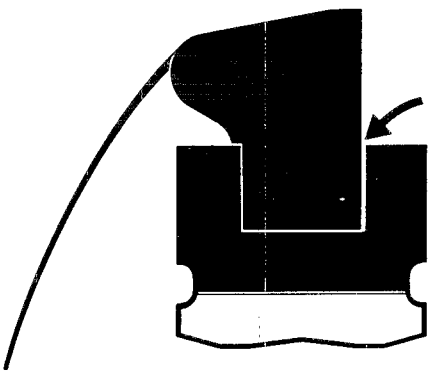
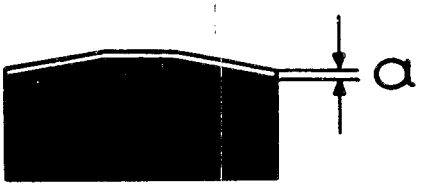
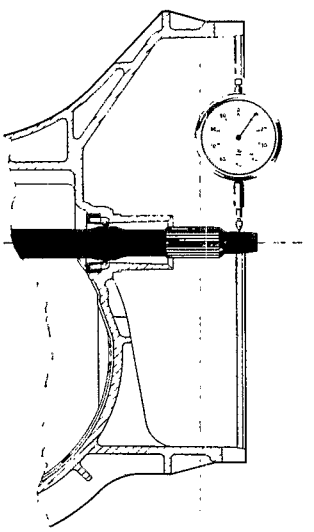
Location	Description	Thread	Grade	Nm	ft lbs
Transmission housing (Oil drain)	Magnetic plug	M24 Tapered	St 37	20 - 25	14.5 - 18.1
Transmission housing (oil filler)	Oil filler plug	M 24 Tapered	St 37	20 - 25	14.5 - 18.1
Transmission housing - side and front cover, guide fork cover	Nut, center lock type	M 8 x 1.25	x 12 CrNi 18-8	22 - 25	15.9 - 18.1
Front cover	Backup light switch	M 18 x 1.5	Ms	25 - 35	18.1 - 25.3
Input shaft	Flange nut	M 30 x 1.5	8.8	160 - 180	115.7 - 130.2
Input shaft	Castellated nut	M 18 x 1.5	6.8	120 - 140	86.8 - 101.3
Retaining plate and transmission support attachment	Nut	M 8 x 1.25	8	21 - 23	15.2 - 16.6
Pinion shaft	Flange nut	M 24 x 1.5	8	240 - 260	173,6-188,1
Guide fork, shifting	Nut	M 6 x 1.0	8	8 - 9	5.8 - 6.5
Shift detent, transmission housing	Nut	M 10 x 1.5	8.8	15 - 18	10.8 - 13.0
Transmission housing	Breather	M 16 x 1.5	9 S 20 K	20 - 30	14.5 - 21.7
Shift forks	Nut	M 8 x 1.25	8.8	24 - 26	17.4 - 18.8
Ring gear (differential)	Bolt	M 12 x 1.25	11.9	115 - 120	83.2 - 86.8
Ring gear (self-locking differential)			11.9 12.9	140 - 150 150 - 160	101.3-108.5 108.5-115.7
Axle flange	Expansion bolt/ Bolt	M 10 x 1.5	8.8	26 - 30/ 39 - 46	18.8 - 21.7/ 28.2 - 33.3
Starter	Nut	M 10 x 1.5	8	46 - 48	33.3 - 34.7
Pressure line (input shaft)	Bolt, M 6x35	M 6 x 1.0	8.8	8 - 9	5.8 - 6.5
Front cover	Plug for pressure relief valve	M 12 x 1.5	9 S 20 K	22 - 25	15.9 - 18.1
Oil pump cover	Self-locking nut	M 6 x 1.0	x 12 CrNi 18.8	9 - 10	6.5 - 7.2
Pickup tube	Allen bolt M 6 x 15	M 6 x 1.0	8.8	8 - 9	5.8 - 6.5
Pressure line	Bolt, M 6 x 12	M 6 x 1.0	8.8	8 - 9	5.8 - 6.5
Guide tube release bearing	Phillips head ctsk. screw	M6x1.0	8.8	8 - 9	5.8 - 6.5

General Specifications	Type 915 Transmission			
	911 T	911 E	911 S	Carrera 2.7
Gear Ratios				
1st gear		11/35 = 3.182		11/35 = 3.182
2nd gear		18/32 = 1.778		20/32 = 1.600
3rd gear		24/27 = 1.125		25/26 = 1.040
4th gear		28/23 = 0.821		29/22 = 0.759
Reverse		12/21 / 20/38 = 3.325		12/21 / 20/38 = 3.325
1st gear		11/35 = 3.182		11/35 = 3.182
2nd gear		18/33 = 1.834		18/33 = 1.834
3rd gear		23/29 = 1.261		23/29 = 1.261
4th gear		26/25 = 0.962		27/25 = 0.925
5th gear		29/22 = 0.759		29/21 = 0.724
Reverse		12/21 / 20/38 = 3.325		12/21 / 20/38 = 3.325
Climbing Ability (calculated) Vehicle Weight: empty according to DIN + 1/2 load				
1st gear	84 %	92 %	100 %	> 100 %
2nd gear	37 %	39 %	41 %	43.5%
3rd gear	20 %	20.5 %	21.5 %	23 %
4th gear	12 %	12 %	12 %	12.5 %
1st gear	84 %	92 %	100 %	> 100 %
2nd gear	38.5%	41 %	43 %	52.5%
3rd gear	23.5%	24.5%	26 %	30.5%
4th gear	16 %	16 %	17 %	20 %
5th gear	10.5%	10.5%	10.5%	12.5%

General Specifications	Type 915 Transmission			
	911 T	911 E	911 S	Carrera 2.7
Rear Axle Drive	Spiral bevel gears, differential			
Final drive ratio	7/31 = 4.429			
Power transfer	double-joint drive shafts, to rear wheels			
Transaxle Weight				
4-speed transmission	54 kg, ready with oil and starter			
5-speed transmission	56 kg, ready with oil and starter			
Filling Capacities				
Transmission and differential	approx. 3 ltr. (6.3 US pints) SAE 90 transmission oil, MIL-L 2105 B or MIL-L 2105 specification			

Table of Tolerances for Type 915 Transmission

Measuring point	Installed tolerances (new) mm	Wear Limit mm	
1. Backlash between Gear I and II 1st gear 2nd gear 3rd gear 4th gear 5th gear	0.06-0.12	0.22	
2. Free gears on pinion and input shafts 1st gear 2nd gear 3rd gear 4th gear 5th gear	 0.3-0.4 0.2-0.3 0.2-0.3 0.2-0.3 0.2-0.3	 0.5 0.4 0.4 0.4 0.4	
3. Shift rods a. Side play in bushings	0.195 - 0.236	0.4	
b. Runout	--	0.10	

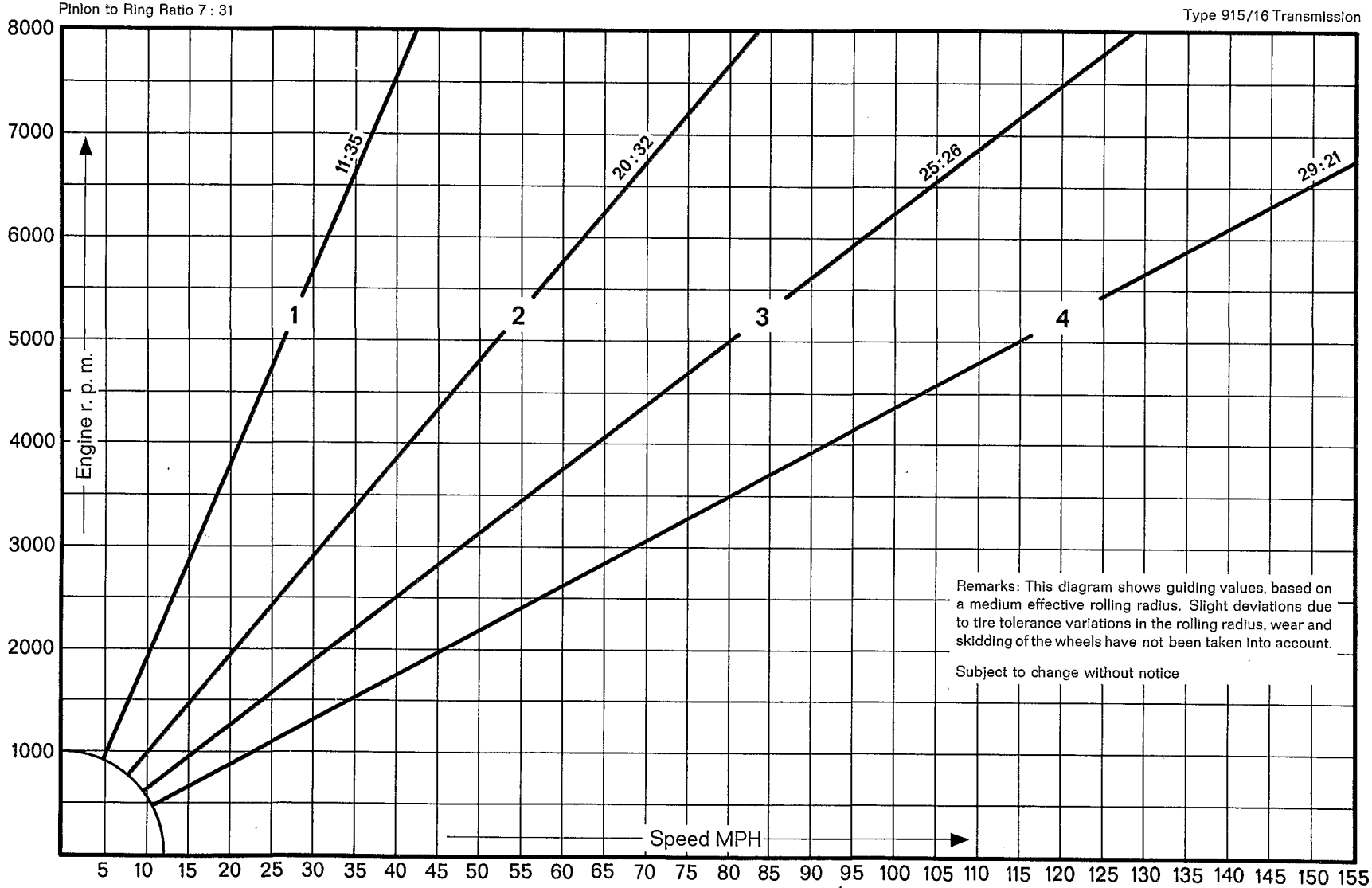
Measuring point	Installed tolerances (new) mm	Wear Limit mm	
4. Side-play between shift fork and shift sleeve:			
5th and reverse gear	0.1-0.3	0.5	
1st and 2nd gear	0.1-0.3	0.5	
3rd and 4th gear	0.1-0.3	0.5	
5. Outside diameter of synchronizing rings: (installed)			
1st gear	86.37 ± 0.17	When molyb-	
2nd gear	86.37 ± 0.17	denum coat	
3rd gear	76.3 ± 0.18	(a) is worn	
4th gear	76.3 ± 0.18	off at any	
5th gear	76.3 ± 0.18	point	
6. Input shaft			
a. Runout at the pilot journal	0.1 max.	0.1 max. (straighten)	

Transmission Diagram

4-speed-transmission

Pinion to Ring Ratio 7 : 31

Type 915/16 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

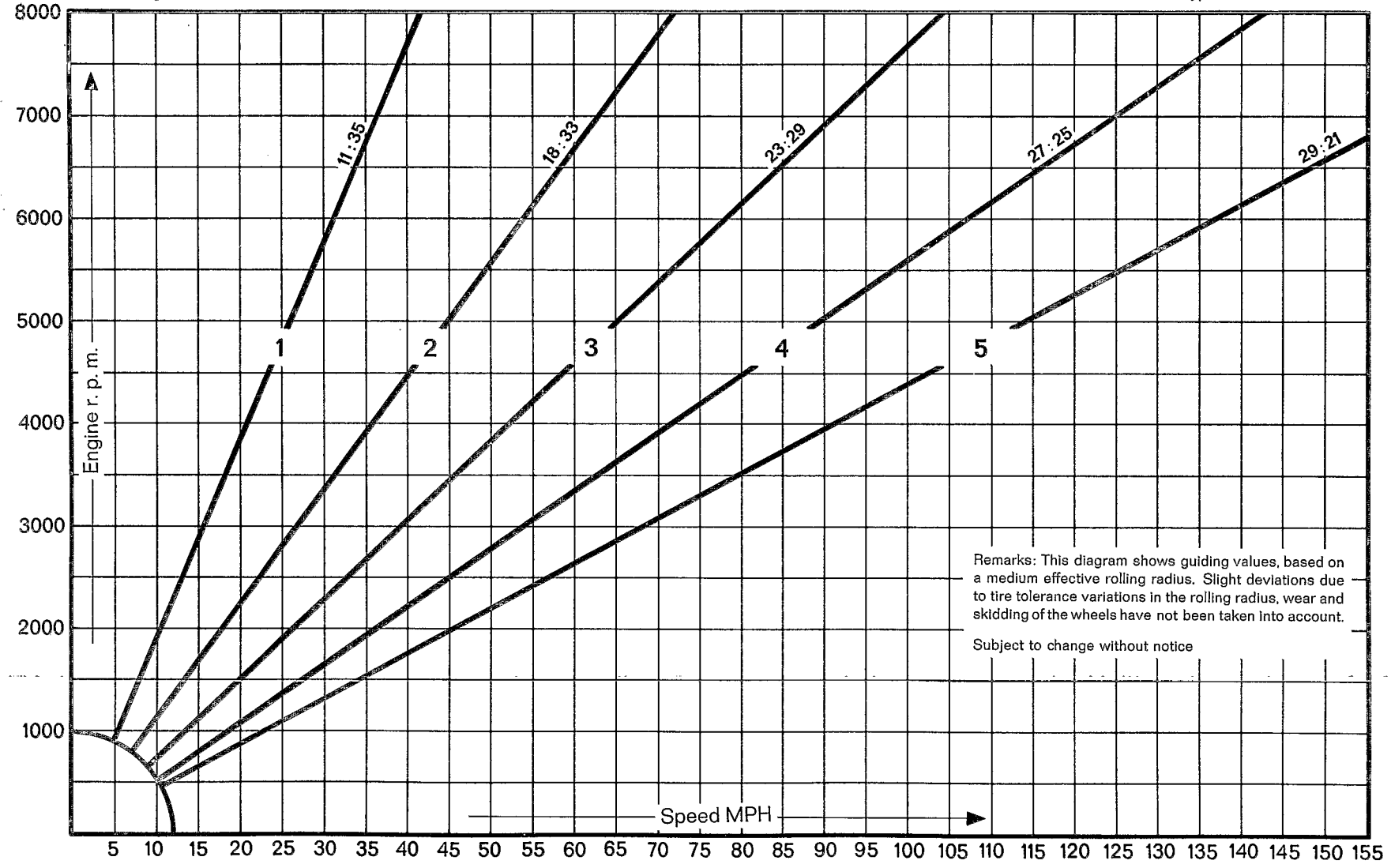
Subject to change without notice

Transmission Diagram

5-speed-transmission

Pinion to Ring Ratio 7 : 31

Type 915/06 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

Subject to change without notice

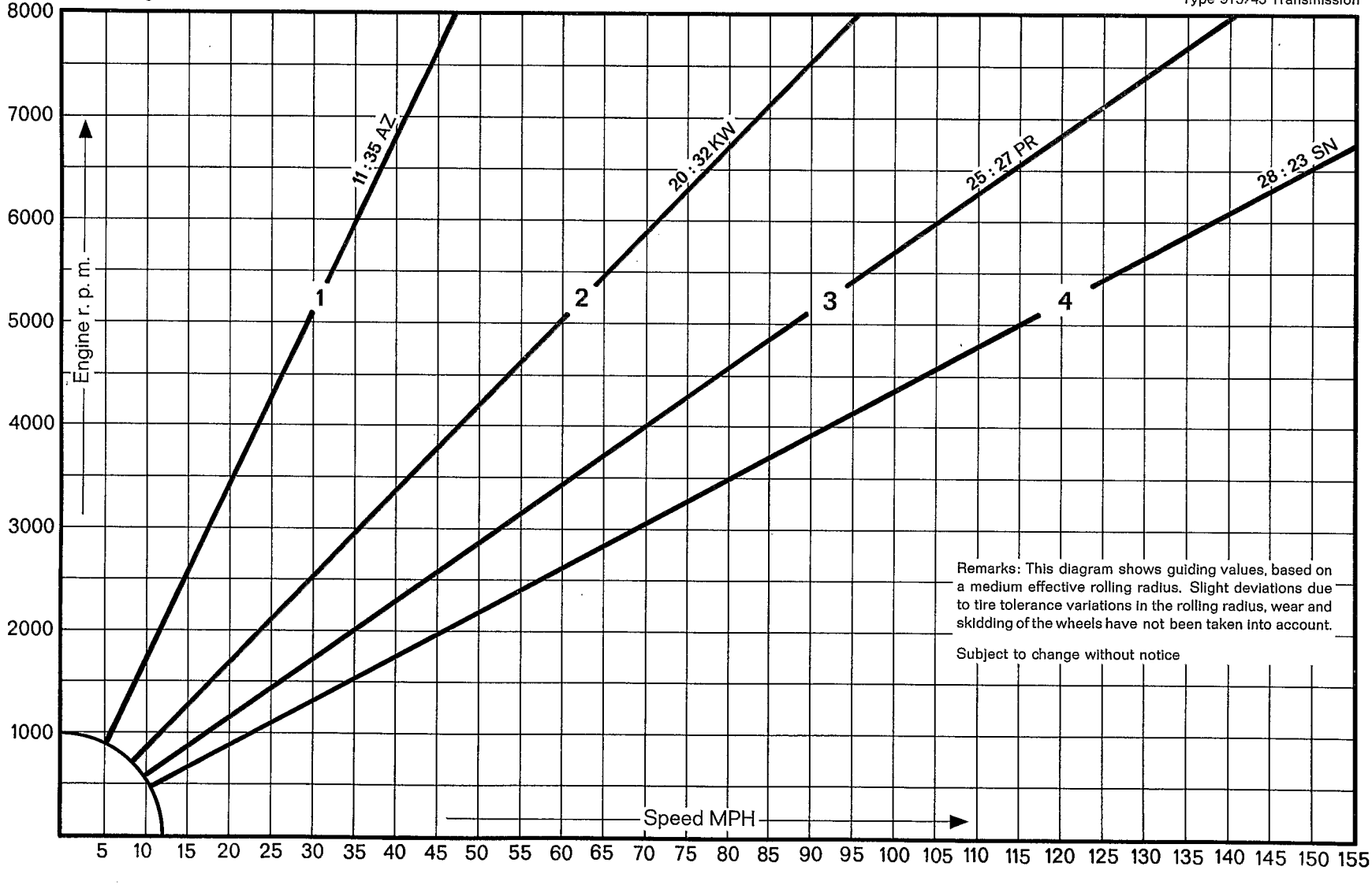
General Data	Type 915 Transmission (1974 model)		
	911	911 S	Carrera
Gear Ratios			
Type 915/16 transmission:			
1st gear	AZ 11/35 = 3.182		
2nd gear	KW 20/32 = 1.600		
3rd gear	PQ 25/26 = 1.040		
4th gear	TL 29/21 = 0.724		
Reverse gear	12/21 × 20/38 = 3.325		
Type 915/06 transmission:			
1st gear	AZ 11/35 = 3.182		
2nd gear	HX 18/33 = 1.834		
3rd gear	RP 23/29 = 1.261		
4th gear	TL 27/25 = 0.926		
5th gear	29/21 = 0.724		
Reverse gear	12/21 × 20/38 = 3.325		
Climbing Ability			
(calculated) Vehicle Weight: empty according to DIN + 1/2 load			
1st gear	>100 %	>100 %	>100 %
2nd gear	40 %	39 %	43 %
3rd gear	22 %	22 %	23 %
4th gear	12 %	11 %	11 %
1st gear	>100 %	>100 %	>100 %
2nd gear	48 %	47 %	52 %
3rd gear	29 %	29 %	30 %
4th gear	19 %	18 %	19 %
5th gear	12 %	11 %	11 %

General Data	Type 915 Transmission (1974 model)		
	911	911 S	Carrera
Rear axle drive	spiral bevel gears, differential		
Final drive ratio	7/31 = 4.429		
Power transfer	double-joint half-axles, to rear wheels		
Transaxle Weight			
4-speed transmission	54 kg (119 lb), ready with oil and starter		
5-speed transmission	55 kg (121 lb), ready with oil and starter		
Filling Capacities			
Transmission and differential	approx. 3 ltr. (3.17 US gts.) SAE 90 transmission oil, MIL-L 2105 or MIL-L 2105 B specification		
Transmission and differential, limited slip	approx. 3 ltr. (3.17 US gts.) SAE 90 transmission oil, M 2 C 119 A		

Transmission Diagram 911 S — 4-speed-transmission

Pinion to Ring Ratio 8:31

Type 915/45 Transmission



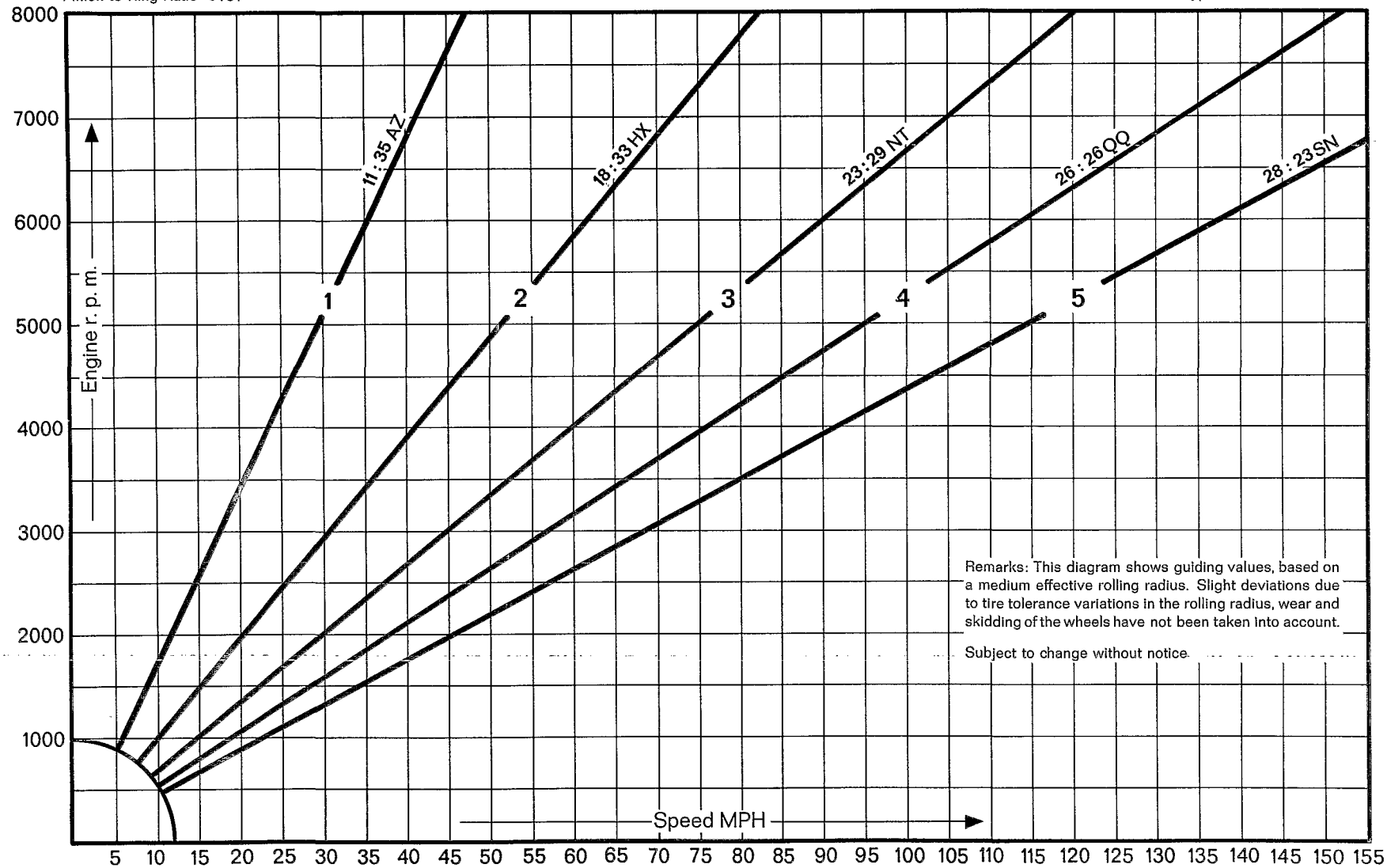
Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

Subject to change without notice

Transmission Diagram 911 S 5-speed-transmission

Pinion to Ring Ratio 8 : 31

Type 915/40 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

Subject to change without notice.

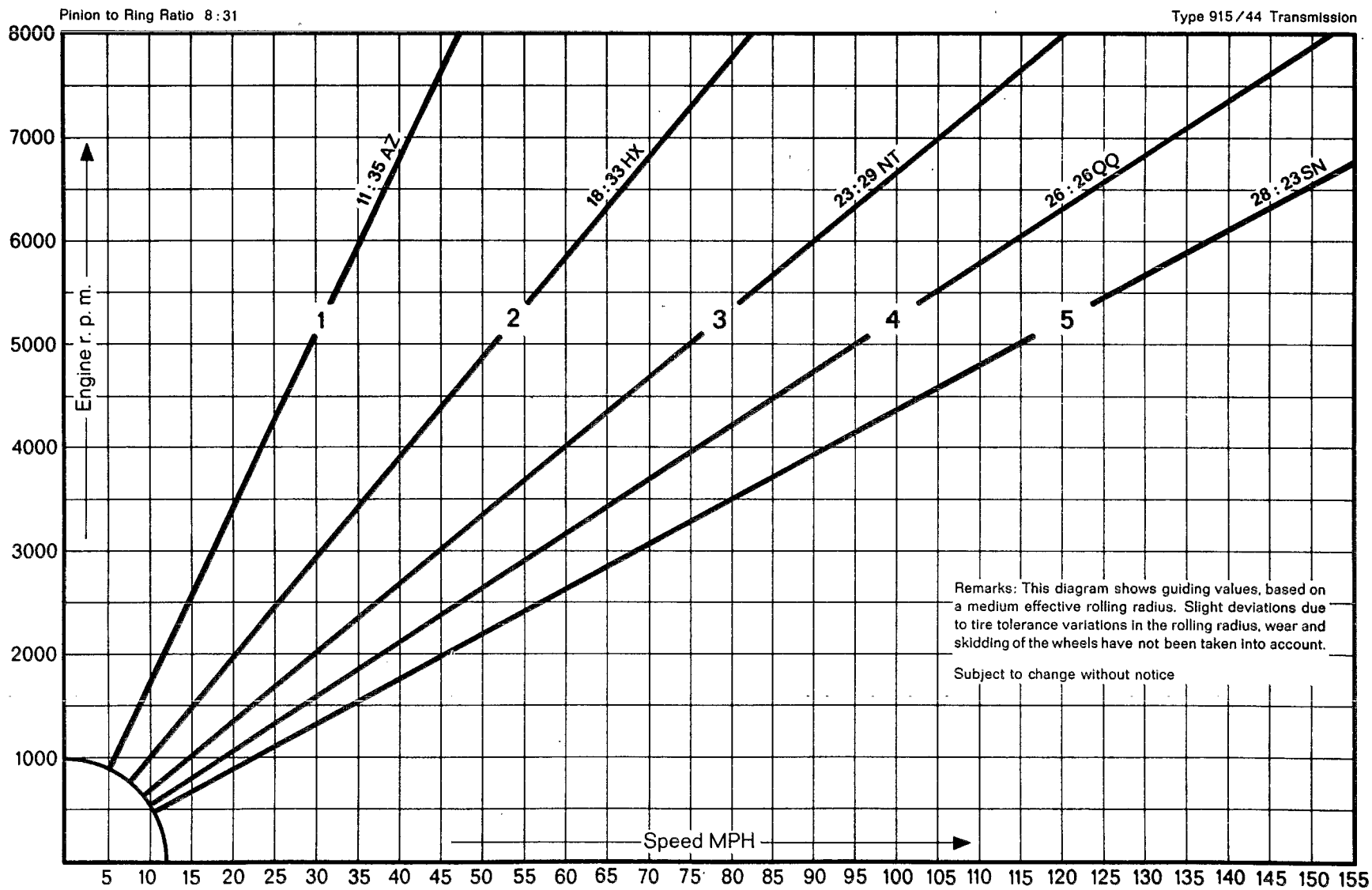
General Data	Manual Transmission 915 (1975 Models)
	911 S, Carrera
Ratios	
1st gear	AZ 11/35 = 3.181
2nd gear	KW 20/32 = 1.600
3rd gear	PR 25/27 = 1.080
4th gear	SN 28/23 = 0.821
Reverse	$\frac{12/21}{20/38}$ = 3.325
1st gear	AZ 11/35 = 3.181
2nd gear	HX 18/33 = 1.833
3rd gear	NT 23/29 = 1.261
4th gear	QQ 26/26 = 1.000
5th gear	SN 28/23 = 0.821
Reverse	$\frac{12/21}{20/38}$ = 3.325
Final drive	8/31 = 3.875
Capacities	
Transmission and differential	Approx. 3 liters (3.17 US gt.) of SAE 90 transmission oil meeting Specifications MIL-L-2105 or MIL-L-2105 B

General data	Manual transmission 915 - 1976, 1977, 1978 and 1979 models
Ratios	915/44 915/61
1st gear	AZ 11 : 35 = 3.181
2nd gear	HX 18 : 33 = 1.833
3rd gear	NT 23 : 29 = 1.261
4th gear	QQ 26 : 26 = 1.000
5th gear	SN 28 : 23 = 0.821
Reverse	12 : 21 x 20 : 38 = 3.325
Final drive ratio	8 : 31 = 3.875
Capacity	approx. 3 ltr./3.15 US qt of SAE 90 transmission oil meeting API Classification GL 5 (or MIL-L 2105 B)
Transmission weight	56 kg/123 lb ready for installation with oil and starter

General data	Manual transmission 915 - 1980 model and 1981 models
Ratios	915/63
1st gear	11 : 35 = 3.181
2nd gear	18 : 32 = 1.778
3rd gear	23 : 29 = 1.261
4th gear	26 : 26 = 1.000
5th gear	28 : 23 = 0.821
Reverse	12 : 21 x 20 : 38 = 3.325
Final drive ratio	8 : 31 = 3.875
Capacity	approx. 3 ltr./3.15 US qt of SAE 90 transmission oil meeting API Classification GL 5 (or MIL-L 2105 B)
Transmission weight	56 kg/123 lb ready for installation with oil and starter

Transmission Diagram

5-speed-transmission

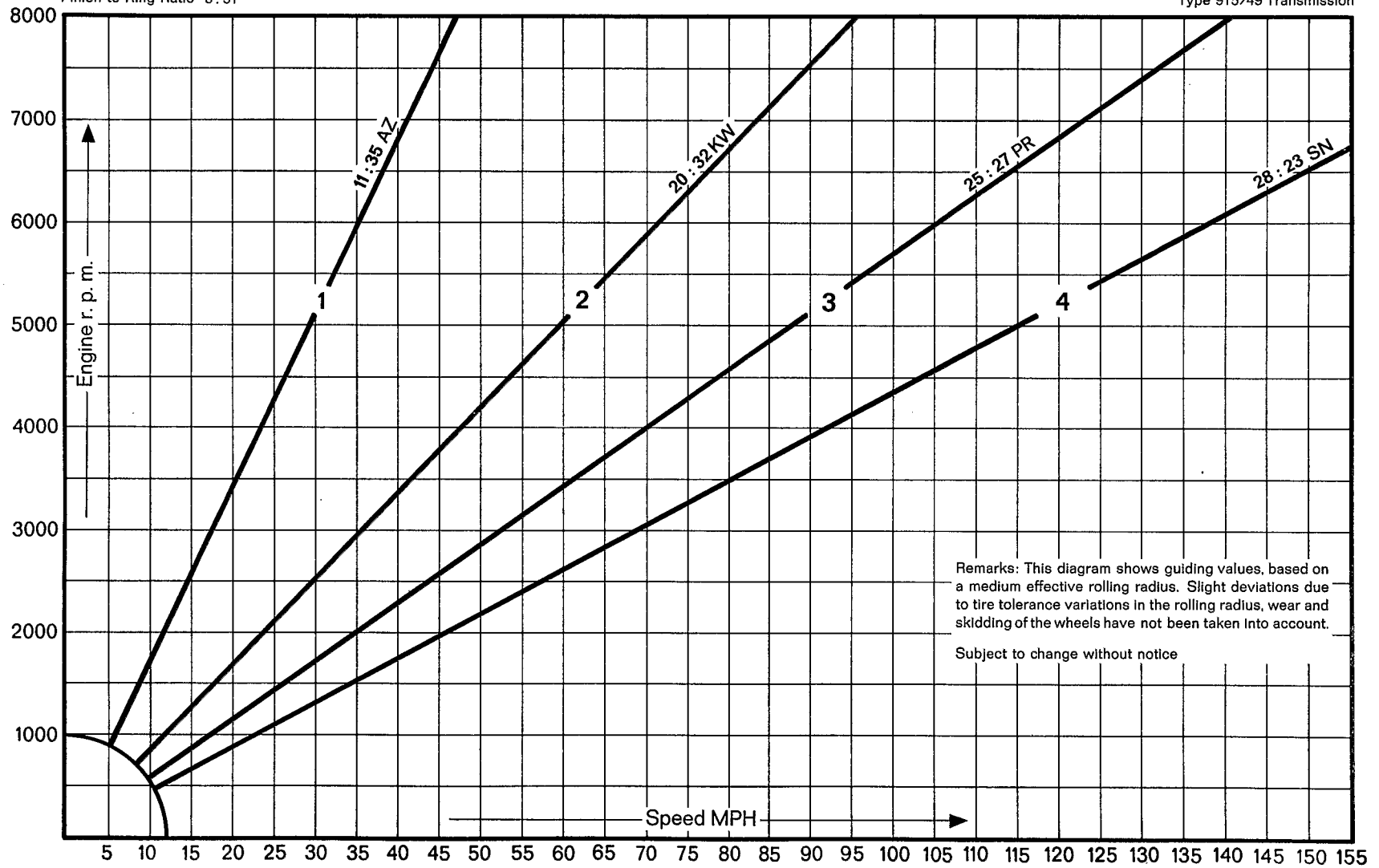


Transmission Diagram

4-speed-transmission

Pinion to Ring Ratio 8 : 31

Type 915/49 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

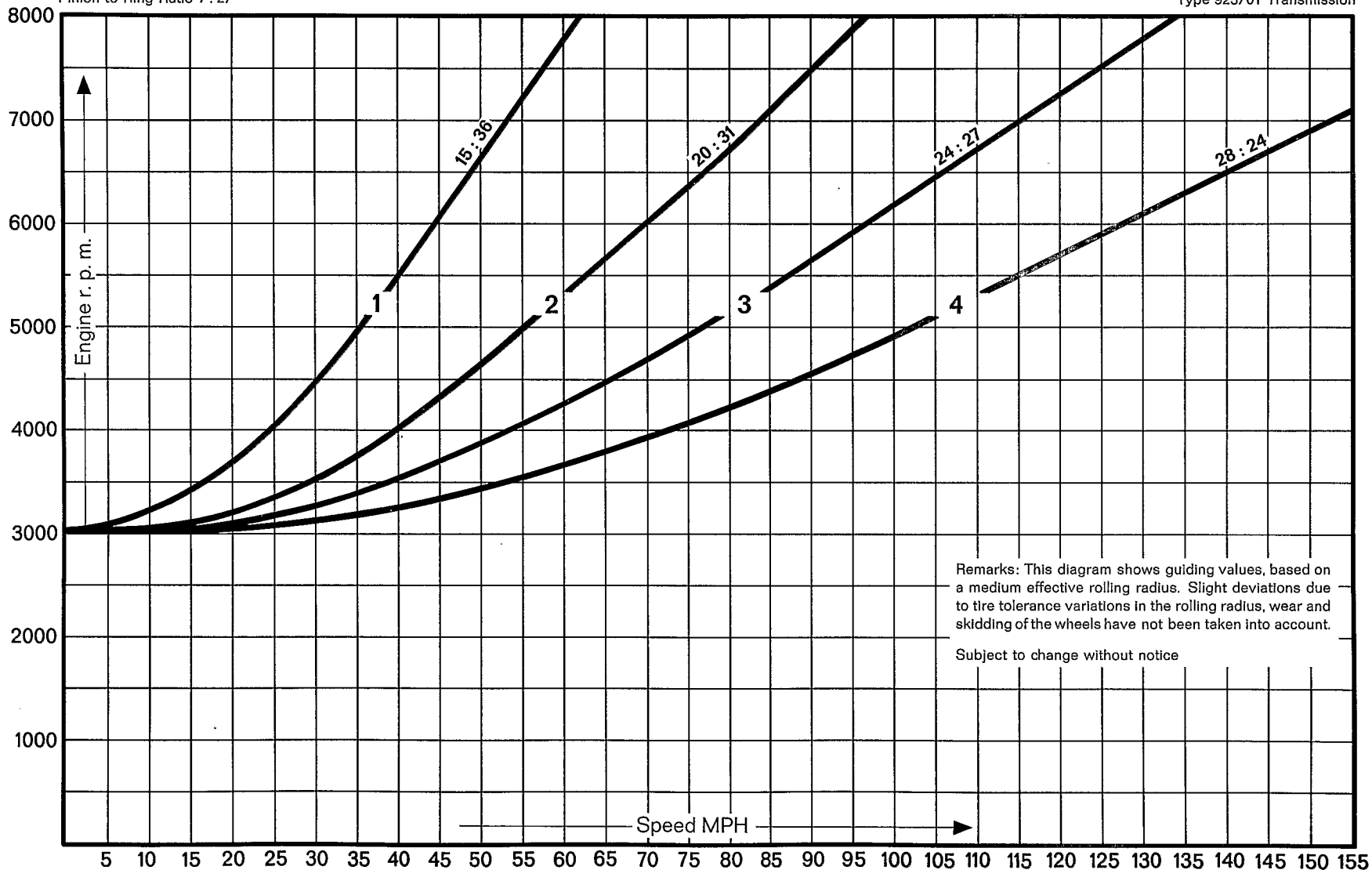
Subject to change without notice

Transmission Diagram

Sportomatic

Pinion to Ring Ratio 7 : 27

Type 925/01 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

Subject to change without notice

General Data	925/00 911 T	925/00 911 E	925/01 911 S
Gear rations *			
1st gear	(15/36) = 2.400 : 1		
2nd gear	(20/31) = 1.550 : 1		
3rd gear	(24/27) = 1.125 : 1		
4th gear	(28/24) = 0.858 : 1		
Reverse gear	(15/21 - 21/38) = 2.533 : 1		
Torque converter ratio	2.19 : 1		2.1 : 1
Final drive ratio *	(7/27 = 3.857 : 1		
Filling Capacities Transmission and differential	Approx. 3.0 ltr (3.17 US qts) SAE 90 transmission oil, specification Mil-L 2105 or Mil-L 2105B		
Engine	approx. 10 ltr. (10.5 US qts)		approx. 11 ltr (11.6 US qts) w/oil cooler
Two-start speed in L-range	approx. 35 kmh (22 mph)		
Stallspeed	2500 - 2700 rpm		2900 - 3100 rpm

* In parenthesis; number of teeth

TIGHTENING TORQUES - SPORTOMATIC 925

Location	Description	Thread	Grade	mkp	ft.lbs.
Transmission housing (at stud for side and front cover, and fork piece)	Nut	M8 x 1.25	6.8	2.1-2.3	15.2-16.6
	Mid grip nut	M8 x 1.25	x12 CrNi 18.8	2.2-2.5	15.9-18.1
Transmission housing (oil filler plug)	Plug	M24 x 1.5 (1:16 taper)	St 37	2.0-2.5	14.5-18.1
Transmission housing (oil drain plug)	Plug with magnet	M24 x 1.5 (1:16 taper)	St 37	2.0-2.5	14.5-18.1
Transmission housing (breather)	Breather	M14x1.5 (1:16 taper)	9S 20K	2.0-3.0	14.5-21.7
Transmission housing	Backup light switch	M18x1.5	Ms	3.5-4.0	25.3-28.9
Transmission housing	Bypass switch	M18x1.5	Ms	3.5-4.0	25.3-28.9
Transmission housing (starter attachment)	Nut	M10x1.5	8.8	4.6-4.8	33.3-34.7
Transmission housing (vacuum servo unit carrier and attachment)	Nut	M8x1.25	6.8	2.1-2.3	15.2-16.6
Torque converter housing (attachment to transmission housing)	Nut	M8x1.25	6.8	2.1-2.3	15.2-16.6
	Nut	M10x1.5	8.8 (SW15)	4.6-4.8	33.3-34.7
Torque converter housing (attachment of freewheeling support)	Allen-head bolt	M6x1.0	10.9	1.2-1.4	8.7-10.1
Torque converter housing	Threaded coupling	M24x1.5	6 S	3.0-3.5	21.7-25.3
Torque converter housing	Temperature sensor	M14x1.5	Ms	2.5-3.0	18.1-21.7
Torque converter housing	Temperature switch	M14x1.5	Ms	2.5-3.0	18.1-21.7
Torque converter housing (clutch pressure plate)	Allen-head bolt	M6x1.0	10.9	1.2-1.4	8.7-10.1
Torque converter coupling plate	2-point bolt	M8x1.25	8.8	2.4-2.6	17.4-18.8

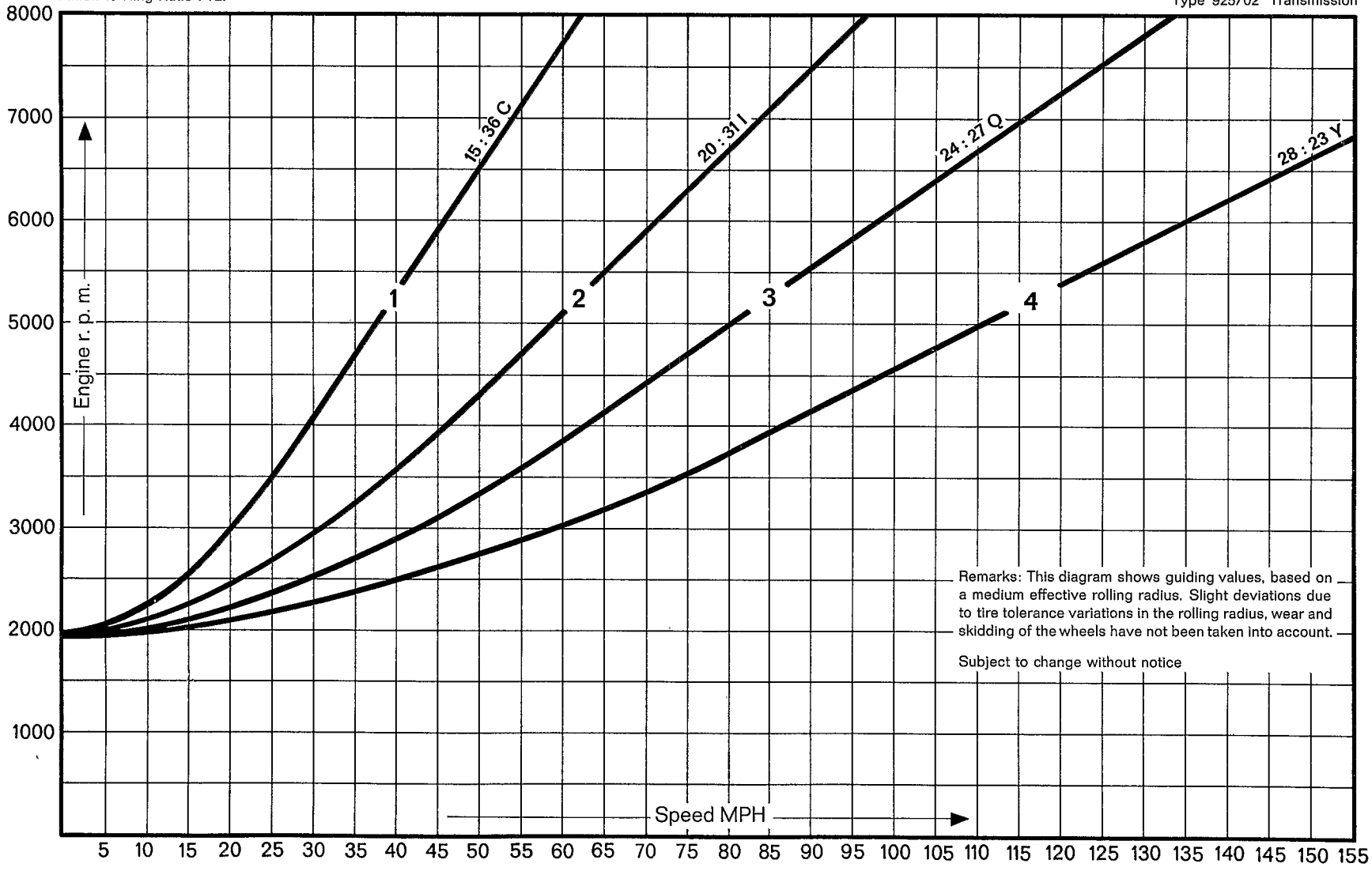
Location	Description	Thread	Grade	mkp	ft. lbs.
Intermediate plate (clamping plate)	Bolt	M8x1.25	8.8	2.1-2.3	15.2-16.6
Intermediate plate	Bellcrank shaft	M8x1.25	9 S 20 K	2.1-2.3	15.2-16.6
Intermediate plate (shift detent)	Cover plug	M14x1.5	4.6	2.2-2.5	15.9-18.1
Transmission front cover (speedometer drive retainer)	Bolt	M8x1.25	8.8	1.6-1.8	11.6-13.0
Transmission front cover (9 mm dia ball - parking lock)	Cover plug	M12x1.5	5.8	3.0-3.5	21.7-25.3
Angular drive in retaining bushing	Hollow bolt	M24x1.5	6.8	2.2-2.4	15.9-17.4
Input shaft	Nut	M24x1.5	6.9	10-12	72.3-86.8
Input shaft	Flanged nut	M18x1.5	5.8	11-13	79.6-94.0
Pinion shaft	Stretch bolt	M12x1.5	10.9	11-12	79.6-86.8
Selector forks	Bolts	M8x1.25	8.8	2.2-2.6	15.9-18.8
Differential (ring gear attachment)	Bolt	M12x1.25	11.9	11.5-12	83.2-86.8
U-joint flange (in differential)	Stretch bolt	M10x1.5	8.8	3.5-4.0	25.3-28.9
Transmission front cover (transmission carrier attachment)	Nut	M8x1.25	6.8	2.1-2.3	15.2-16.6

Transmission Diagram

Sportomatic

Pinion to Ring Ratio 7 : 27

Type 925/02 Transmission



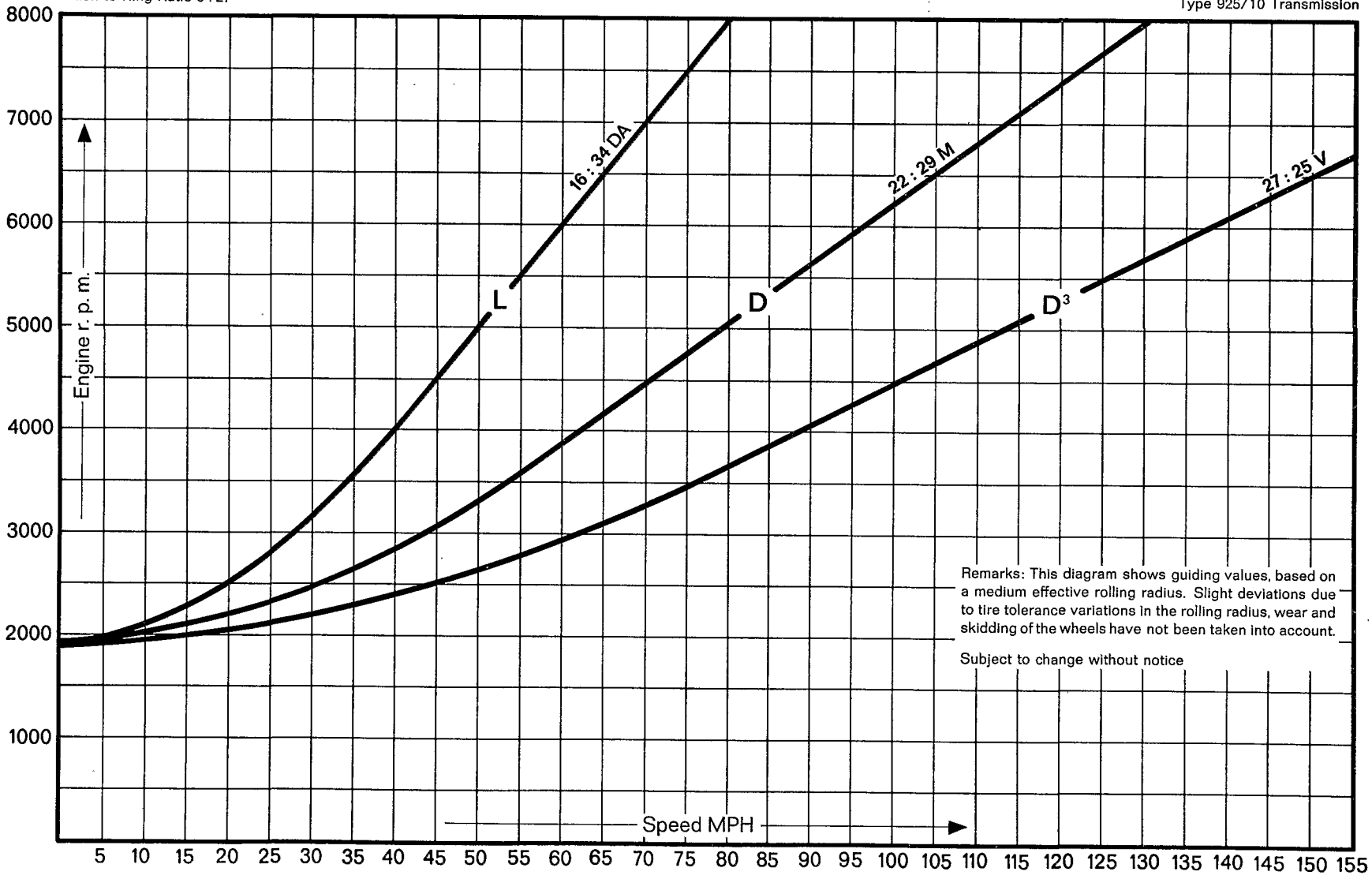
General Data	Sportomatic (1974 model)	
Climbing ability - percent	925/02	
	911	911 S
1st gear	57 (73)	56 (67)
2nd gear	32 (40)	32 (39)
3rd gear	21 (28)	20 (27)
4th gear	12 (19)	11 (19)
	( ) in parentheses: brief climbing ability	
Gear Ratios		
1st gear	15/36 = 2.400	
2nd gear	20/31 = 1.550	
3rd gear	24/27 = 1.125	
4th gear	12/21 = 0.821	
Reverse gear	12/21 / 21/38 = 2.534	
Torque converter ratio	1.7 - 1.9	
Final drive ratio	7/27 = 3.857	
Filling Capacities:		
Transaxle	approx. 2.5 ltr. (2.6 US gts.) SAE 90 transmission oil MIL-L 2105 or MIL-L 2105 B	
Engine	approx. 13 ltr. (13.7 US gts.)	
Tow-start speed in "L" (Low)	approx. 35 kmh (22 mph)	
Stall speed	1850 - 2250	1750 - 2150
Clutch speed (at full power)	3250 $\pm$ 200	3080 $\pm$ 200

Transmission Diagram

Sportomatic

Pinion to Ring Ratio 8 : 27

Type 925/10 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

Subject to change without notice

General Data	Sportomatic 925 (1975 Models)	
Ratios	925/10	
1st gear 2nd gear 3rd gear	DA 16/34 = 2.125 M 22/29 = 1.318 V 27/25 = 0.926	
Reverse	$\frac{15/21}{21/38} = 2.534$	
Converter	1.7 - 1.9	
Final drive	8/27 = 3.375	
Capacities Transmission with final drive	Approx. 2.5 liters (2.65 US gt.) of SAE 90 transmission oil meeting Specifications of MIL-L-2105 or 2105 B	
Towing speed in range "L" to start	Approx. 22 mph	
Stall speed (rpm)	1900 ± 200	California 1850 ± 200
Clutch speed (rpm)	3100 ± 200	3000 ± 200

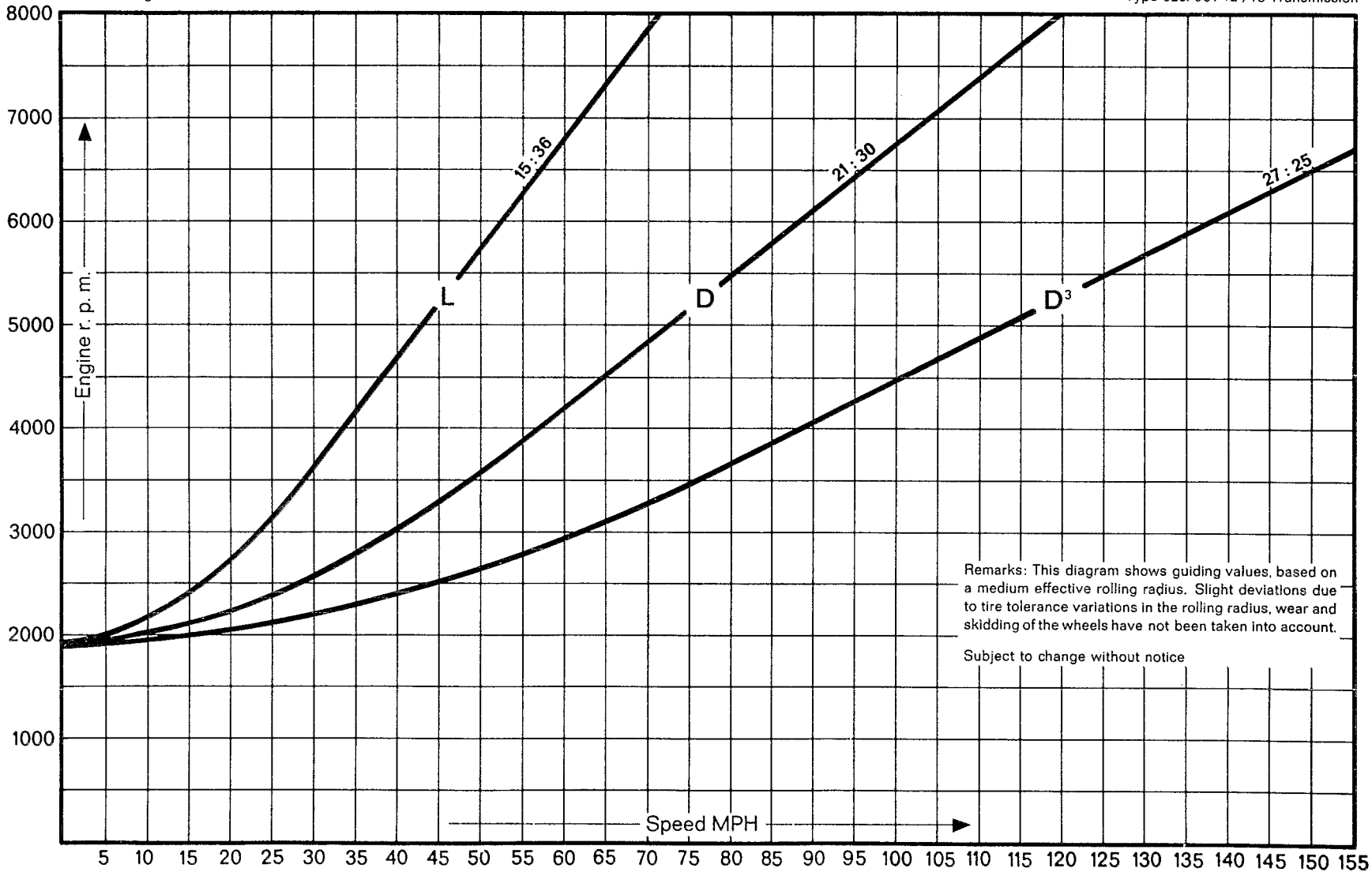
General Data	Sportomatic 925 1976 and 1977 Models	
Ratios	925/12 1976 Mod.	925/17 1977 Mod.
1st speed 2nd speed 3rd speed Reverse	C 15 : 36 = 2.400 K 21 : 30 = 1.429 V 27 : 25 = 0.926 15 : 21 x 21 : 38 = 2.534	
Final Drive Ratio	8 : 27 = 3.375	
Gearbox and Final Drive Capacity	about 2, 5 ltr. / 2, 6 U.S. qt of SAE 90 Gear Lube meeting Specifications MIL-L 2105 or MIL-L 2105 B	
Speedometer	Electronic	
Converter Ratio	1, 9	
Tow-Start Speed in Range "L"	about 25 mph	
Stall Speed (rpm)	1900 $\pm$ 200	
Transmission Weight (ready for installation with converter, starter and oil)	about 71 kg/156 lb	
Contact Pressure of Pressure Plate	7845 - 8630 N (800 - 880 kp)	6400 - 7100 N (652 - 724 kp)

Transmission Diagram

Sportomatic

Pinion to Ring Ratio 8 : 27

Type 925/09-/12 /13 Transmission



Remarks: This diagram shows guiding values, based on a medium effective rolling radius. Slight deviations due to tire tolerance variations in the rolling radius, wear and skidding of the wheels have not been taken into account.

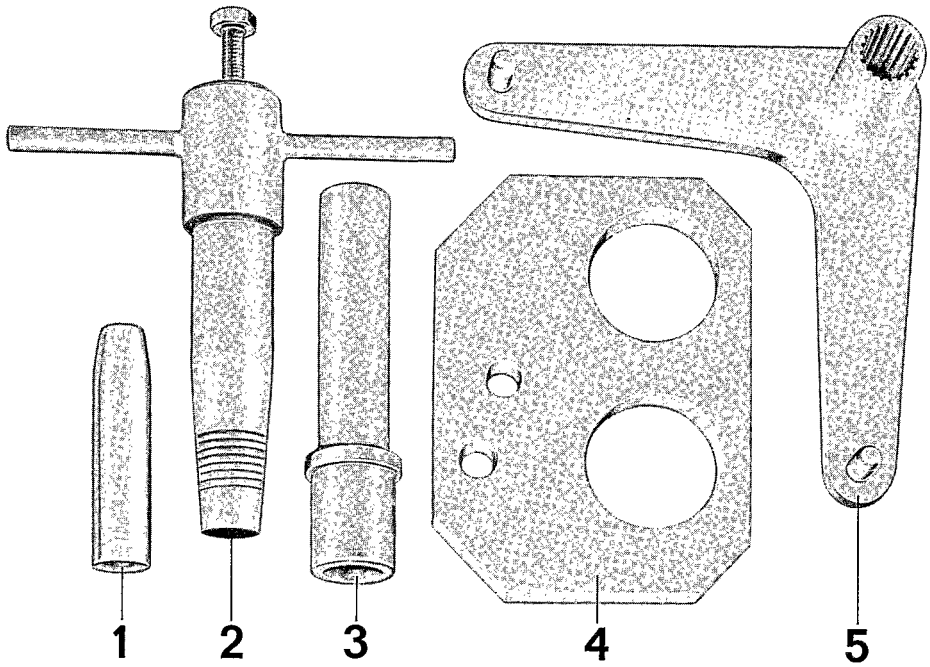
Subject to change without notice

SPECIAL TOOLS - SPORTOMATIC

P 361	Mandrel
P 362	Mandrel
P 358 a	Installer
P 370	Centering mandrel
P 359	Installer
P 351	Assembly plate
P 37	Input shaft holder
P 353 a	Remover
P 260	Support plate
P 218	Mandrel
P 262	Pilot mandrel
P 371	Thrust piece
P 372	Centering mandrel
P 360	Installer
P 364	Assembly sleeve
P 254	Puller and installer
P 256 a	Input shaft lock
P 252	Socket, 32 mm
P 255	Guide sleeve
P 265 b	Thrust piece
P 263	Thrust piece
P 264 b	Installer
P 258	Mandrel
P 258 b	Bushing
P 258 c	Gauge block
P 357 a	Holder
P 357	Dial gauge holder, spacer, feeler tip (w/o clamping adapter)
VW 401	Press plate
VW 402	Press plate
VW 412	Thrust piece
VW 426	Thrust sleeve
VW 405	V-block
VW 407	Thrust piece
=	New special tools

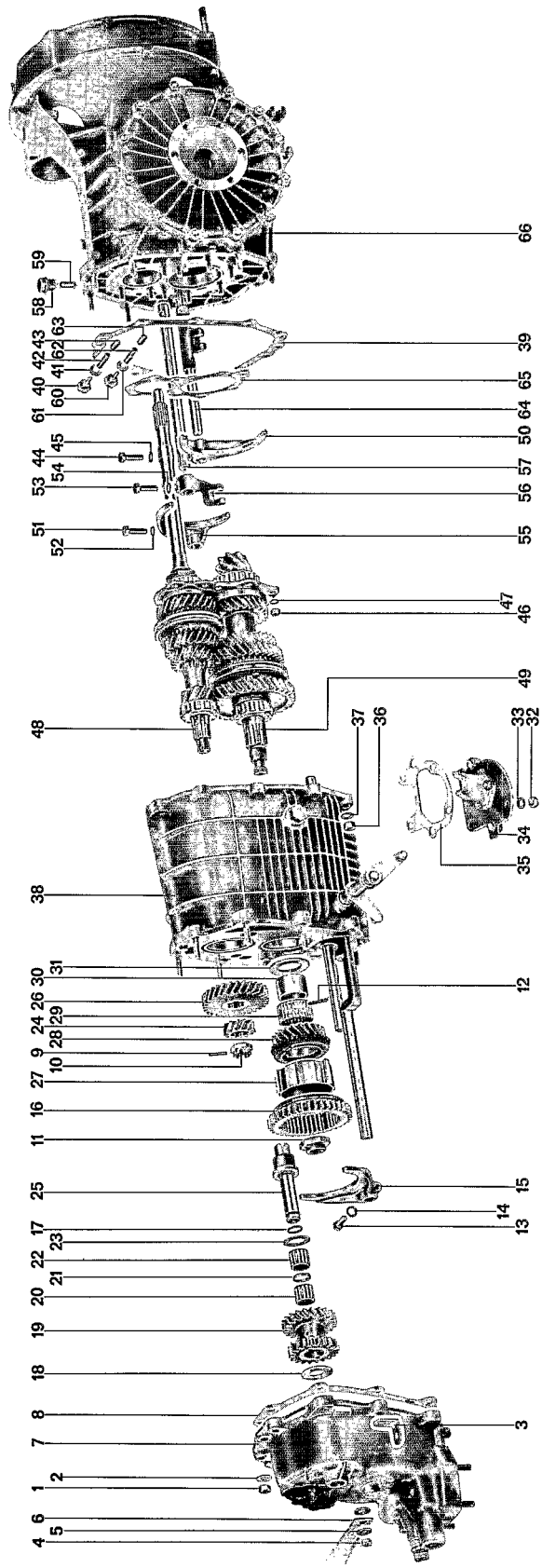
TRANSMISSION

TOOLS



No.	Description	Special Tool	Remarks
1	Sleeve	P 382	
2	Puller	P 386	
3	Driver	P 381	
4	Shift rod holder	P 260 a	
5	Input shaft holder	P 37 a	

Disassembling and Assembling Manual Transmission



Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
1	Self-locking nut	8		Replace if necessary, torque to specification.	
2	Washer	7			
3	Clutch cable bracket	1			
4	Self-locking nut	1		Replace if necessary, torque to specification.	
5	Washer	2		Place one on each side of ground strap.	
6	Ground strap	1			
7	Front transmission cover	1			
8	Gear housing gasket	1		Replace.	
9	Roll pin	1	Drive out.	Replace if necessary.	
10	Castellated nut	1		Torque to specification.	3.1-1/13
11	Flange nut	1		Replace, torque to specification.	3.1-1/13
12	Roll pin	1	Drive out.	Replace if necessary.	
13	Bolt	1		Torque to specification.	
14	Spring washer	1		Replace if necessary.	
15	Shift fork, 5th and reverse gear	1		Readjust.	3.1-2/2

Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
16	Sliding gear, 5th and reverse gear	1		Check for wear.	
17	O-ring	1		Replace, oil lightly.	
18	Thrust washer	1			
19	5th and Reverse idler gear	1		Check for wear.	
20	Needle bearing cage	1		Check for wear.	
21	Intermediate ring	1			
22	Needle bearing cage	1		Check for wear.	
23	Thrust needle bearing cage	1		Check for wear.	
24	Reverse speed, Gear I	1		Replace in pairs only.	
25	Shaft for 5th and Reverse idler gear	1	Remove together with fixed Gear I of 5th speed.	Install together with fixed Gear I of 5th speed.	
26	Gear I, fixed, 5th speed	1		Small flange faces gear housing. Replace in pairs only.	
27	Guide sleeve	1		Check for wear.	
28	Gear II, free, 5th speed	1		Check synchronization. Replace in pairs only.	3.1-8/4
29	Needle bearing cage	1	Mark position for installation.	Install with same gear.	
30	Bushing	1	Mark position for installation.	Install with same gear.	

Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
31	Thrust washer	1			
32	Self-locking nut	4		Replace if necessary, torque to specification.	
33	Washer	4			
34	Cover with guide fork	1			
35	Gasket	1		Replace.	
36	Self-locking nut	10		Replace if necessary, torque to specification.	
37	Washer	10			
38	Gear housing	1	Move selector fork rod for 5th speed and reverse into neutral and remove.		
39	Gasket	1		Replace.	
40	Nut	1		Torque to specification.	
41	Seal	1		Replace.	
42	Spring	1			
43	Short detent	1		Check for free movement.	
44	Nut	1		Torque to specification.	
45	Spring washer	1		Replace if necessary.	
46	Nut	10		Torque to specification.	
47	Lock washer	10		Replace.	

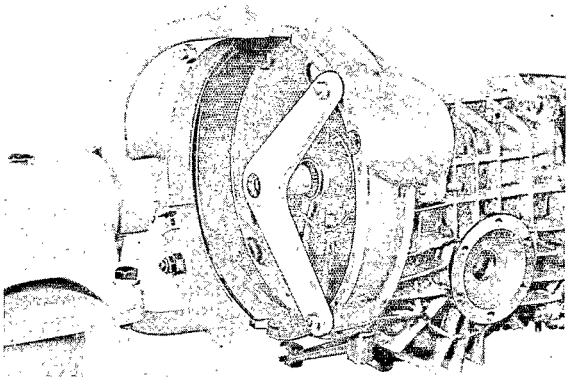
Nr.	Description	Qty	Note when Removing	Note when Installing	Special instructions see
48	Input shaft	1	Remove together with pinion shaft, 1st and 2nd speed selector fork, and complete 3rd and 4th speed shift rod.		3.1-1/10
49	Pinion shaft	1			
50	1st and 2nd speed selector fork	1		Check for wear, readjust.	3.1-2/1
51	Bolt	1		Torque to specification.	
52	Spring washer	1		Replace if necessary.	
53	Bolt	1		Torque to specification.	
54	Spring washer	1		Replace if necessary.	
55	3rd and 4th speed selector fork	1		Check for wear, readjust.	
56	Shift guide	1		Check for wear, readjust.	
57	3rd and 4th speed shift rod	1			
58	Plug	1		Torque to specification.	
59	Short detent	1		Check for free movement.	
60	Bolt	1		Torque to specification.	

Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
61	Seal	1		Replace.	
62	Spring	1			
63	Short detent	1		Check for free movement.	
64	1st and 2nd speed selector fork rod	1			
65	Shim	X	Note thickness and quantity.	Recompute if necessary.	
66	Transmission housing	1			

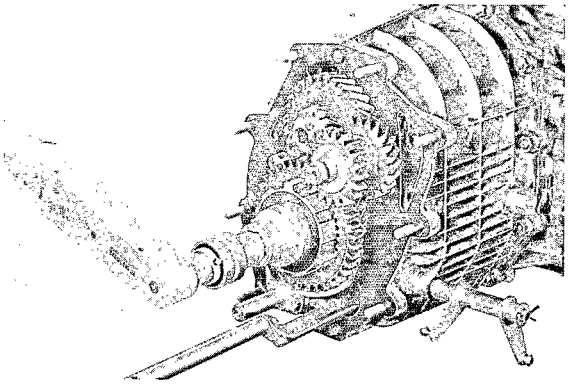
DISASSEMBLING AND ASSEMBLING MANUAL TRANSMISSION

Disassembling

1. Block input shaft with special tool P 37a, engage 5th gear.

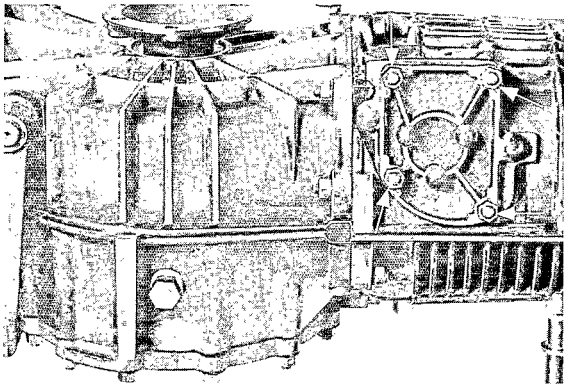


2. Remove castellated nut from input shaft, and flange nut from pinion shaft.



3. Mark needle bearing of 5th speed free gear; it must be reassembled with same gear.

4. Remove guide fork cover with gasket.



5. Remove nuts from gear housing. Pull housing and selector fork rod (5th and reverse speed), and selector fork rod with selector shaft off the studs (tap lightly with a plastic mallet, if necessary).

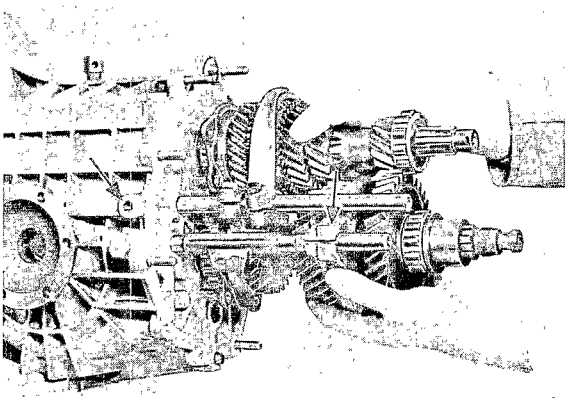
Note
Selector fork rod for 5th and reverse speed must be in neutral. Otherwise the gear housing will bind against the rod and cannot be removed.

6. Remove shift detent plug (3rd and 4th gear). Take out spring and detent.

7. Remove bolt from selector fork of 1st and 2nd gear, gently spread clamping piece with screwdriver.

8. Remove retaining plates for input and pinion shafts.

9. Take input and pinion shafts with complete selector fork rod (3rd and 4th speed) and selector fork (1st and 2nd gear) out of their seats.



10. Remove detent.

11. Remove plug from shift detent (1st and 2nd gear) and take out spring and detent.

12. Take out selector fork rod 1st and 2nd gear.

13. Note the number and thickness of shims between transmission housing and retaining plates for reinstallation.

Assembling

1. Place the same number and thickness of shims on the transmission housing studs as noted during disassembly or as determined while adjusting the pinion.

2. Insert 1st and 2nd speed selector fork rod.

3. Insert 1st and 2nd speed shift detent and spring.

4. Torque bolt to specification.

5. Insert pinion shaft with 1st and 2nd speed selector fork so that the pinion comes barely to rest in the bearing race of the transmission housing.

Note
To keep the selector fork from binding on the selector fork rod, slightly open the selector fork clamping piece with a screwdriver.

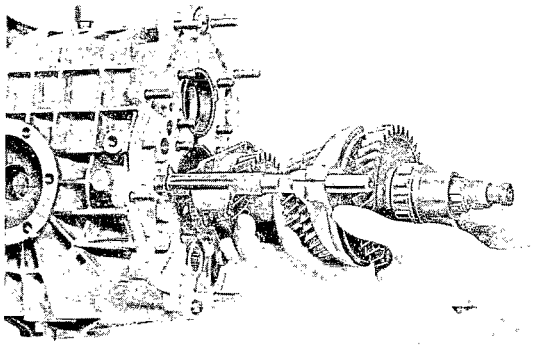
6. Insert input shaft and push into place together with the pinion shaft.

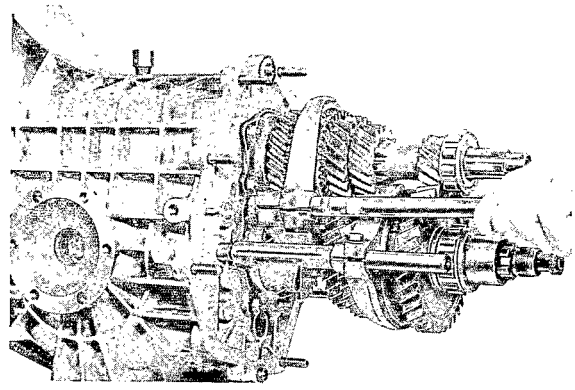
7. Torque clamping plate nuts to specification.

8. Lightly tighten selector fork bolt (1st and 2nd speed).

9. Insert detent from the top.

10. Unscrew bolts for 3rd and 4th speed selector fork and fork clamping piece. Push fork and clamping plate back so that the selector fork and rod can be installed.





11. Lightly tighten selector fork and fork piece bolts.

12. Insert shift detent and spring, torque plug to specification.

13. Adjust selector forks (see 3.1-2/1).

14. Place transmission housing gasket on the studs.

15. Install gear housing together with selector fork rod (5th speed and reverse) and selector shaft. Tighten to correct torque.

16. Push selector fork rod in the ball sleeve, and selector shaft into the shift pawl guides.

17. Install guide fork cover and gasket. Tighten to correct torque.

18. Install idler gear shaft turning the shaft until the pin in the gear housing prevents it from turning.

19. Install reverse speed Gear I and start castellated nut on threads.

20. Install thrust washer for 5th speed free gear.

21. Install needle bearing with 5th speed free gear.

22. Install guide sleeve for 5th and reverse speed, start flange nut on threads.

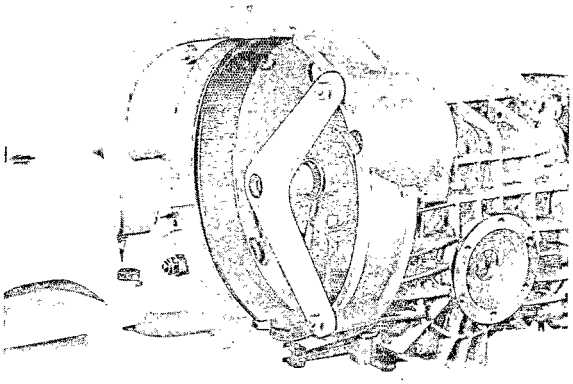
23. Install thrust needle bearing cage, idler gear with needle bearing cages and intermediate piece and thrust washer on the idler shaft.

24. Slide 5th speed and reverse sliding gear with selector fork on guide sleeve and selector fork rod. Slightly open the selector fork clamping piece for easier assembly.

25. Lightly tighten selector fork bolt.

26. Apply light coat of oil to the O-ring and install.

27. Block input shaft with special tool P 37a, and engage 5th gear. Tighten input shaft castellated nut and pinion shaft flange nut to correct torque.



28. Adjust 5th and reverse speed selector fork (see page 3.1-2/2).

29. Secure castellated nut with roll pin; and flange nut by notching.

30. Insert actuating pin for backup light switch with recessed end toward switch.

31. Place gear housing gasket on studs. Install front transmission cover, and tighten nuts to correct torque.

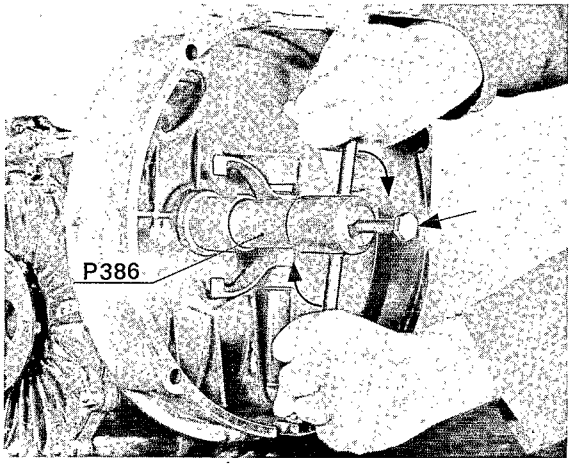
Effective with the listed transmission numbers, the input shaft oil seal can be replaced without the need for disassembling the transmission.

Transmission Type	from transmission No.
915/02	733 7375
915/12	723 0507
915/08	783 0838
Special transmissions	793 1031

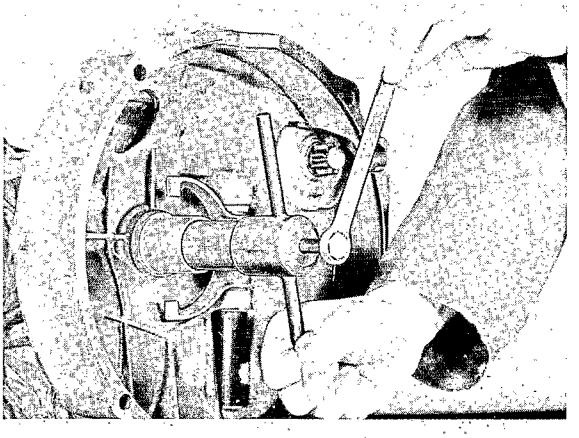
Removal

1. Remove transaxle and detach transmission from engine.

2. Screw puller P 386 firmly into the oil seal.



3. Pull oil seal out by turning the hex. bolt in the puller.

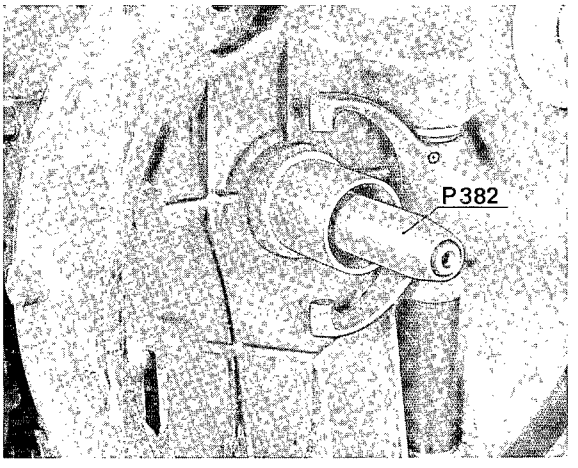


NOTE:

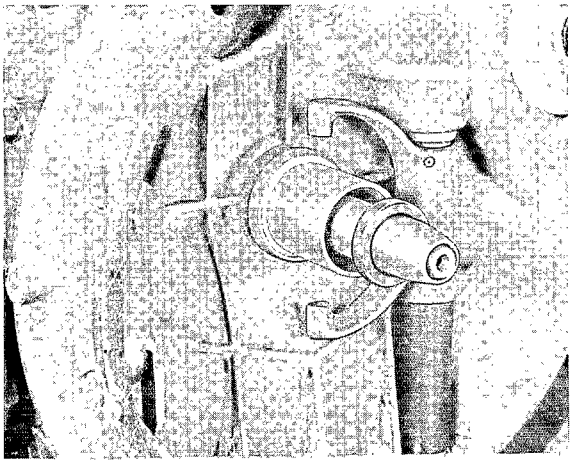
If the (garter) spring should slide off during removal of the seal, pull it off the input shaft with the aid of a wire hook.

Installation

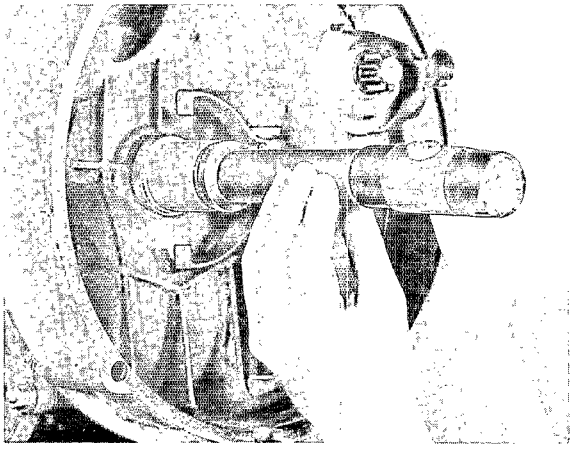
1. Push installation sleeve P 382 onto the input shaft splines.



2. Lightly oil the sealing lip of the oil seal and push the seal onto the installation sleeve.



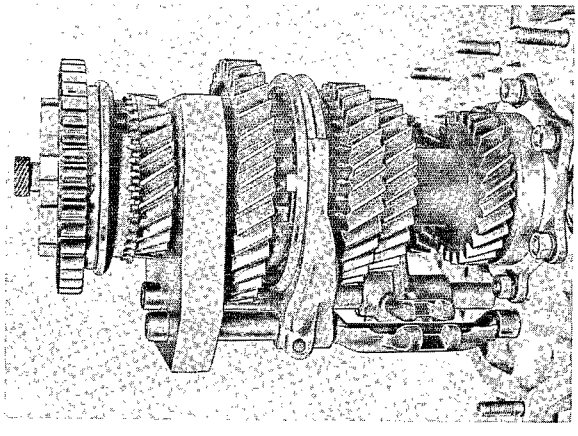
3. Drive oil seal into its seat with the aid of driver P 381.



ADJUSTING SELECTOR FORKS

Note
Tighten input shaft flange nut to correct torque before adjusting selector forks.

1. Install mounting plate P 260a. Install 5th speed synchro hub and 5th and reverse speed sliding gear.



2. Block input shaft with P 37a and engage 5th speed. Tighten input shaft flange nut to correct torque.

3. Turn selector fork rod of 1st and 2nd speed left (in driving direction) to stop, then turn slightly back until the unmachined flat inner surface is almost vertical.

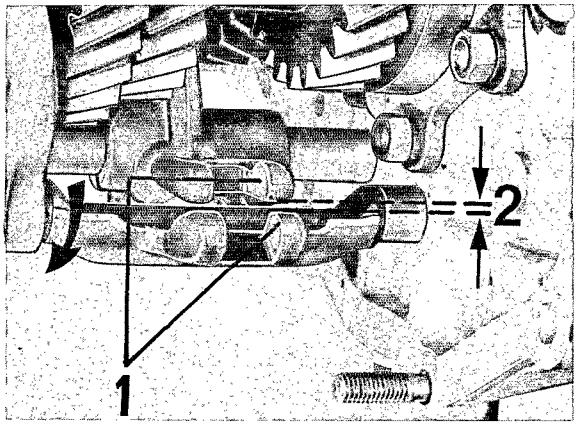
Note

Do not turn it back beyond the middle point or all the way to the right stop.

4. Position the 1st and 2nd speed selector fork so that the shift sleeve is exactly in the middle between the synchronizing rings. Tighten bolt to correct torque.

5. Adjust 3rd and 4th speed selector fork in the same way as 1st and 2nd speed. Tighten bolt to correct torque.

6. Position 3rd and 4th speed shift guide flush with the selector fork. Make sure there is 2-3 mm (0.8-0.12 in.) clearance between the 3rd and 4th speed shift guide and the 1st and 2nd speed shift guide. They must not touch. (see illustration).



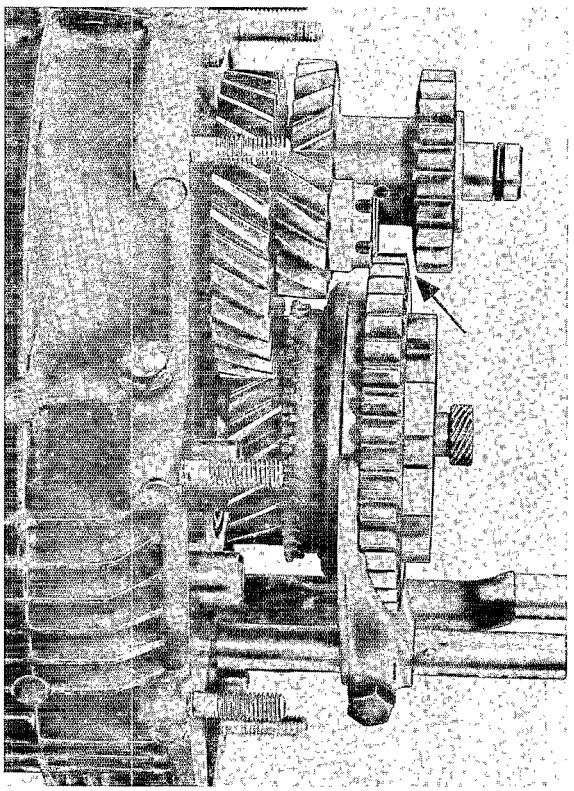
1 - Install aligned

2 - 2 to 3 mm play

7. To ensure proper synchronization, check ease of shifting. Readjust if necessary.

Adjusting 5th and Reverse Speed Selector Fork

1. Push the idler gear on shaft against fixed gear I of 5th speed. Adjust clearance between idler gear and sliding gear in neutral position. Clearance should be 1 mm (0.04 in.).

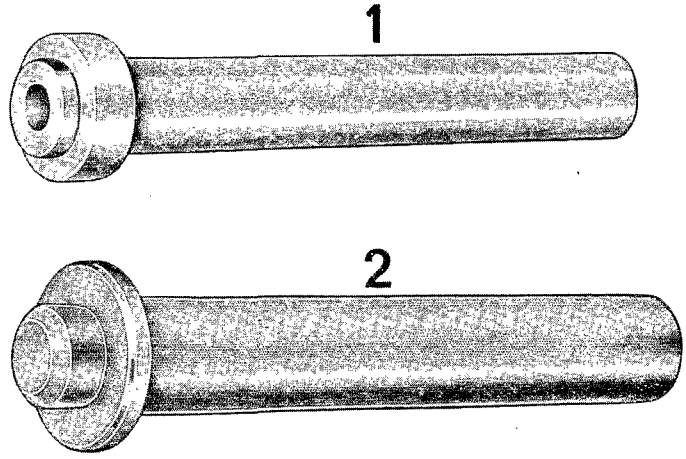


Caution
Push the idler gear gently in direction of travel; there should be no play between the shift fork and the sliding gear groove. This eliminates the possibility of the sliding gear hitting the idler gear in cases of tolerance build-up.

2. Tighten selector fork bolt to correct torque.

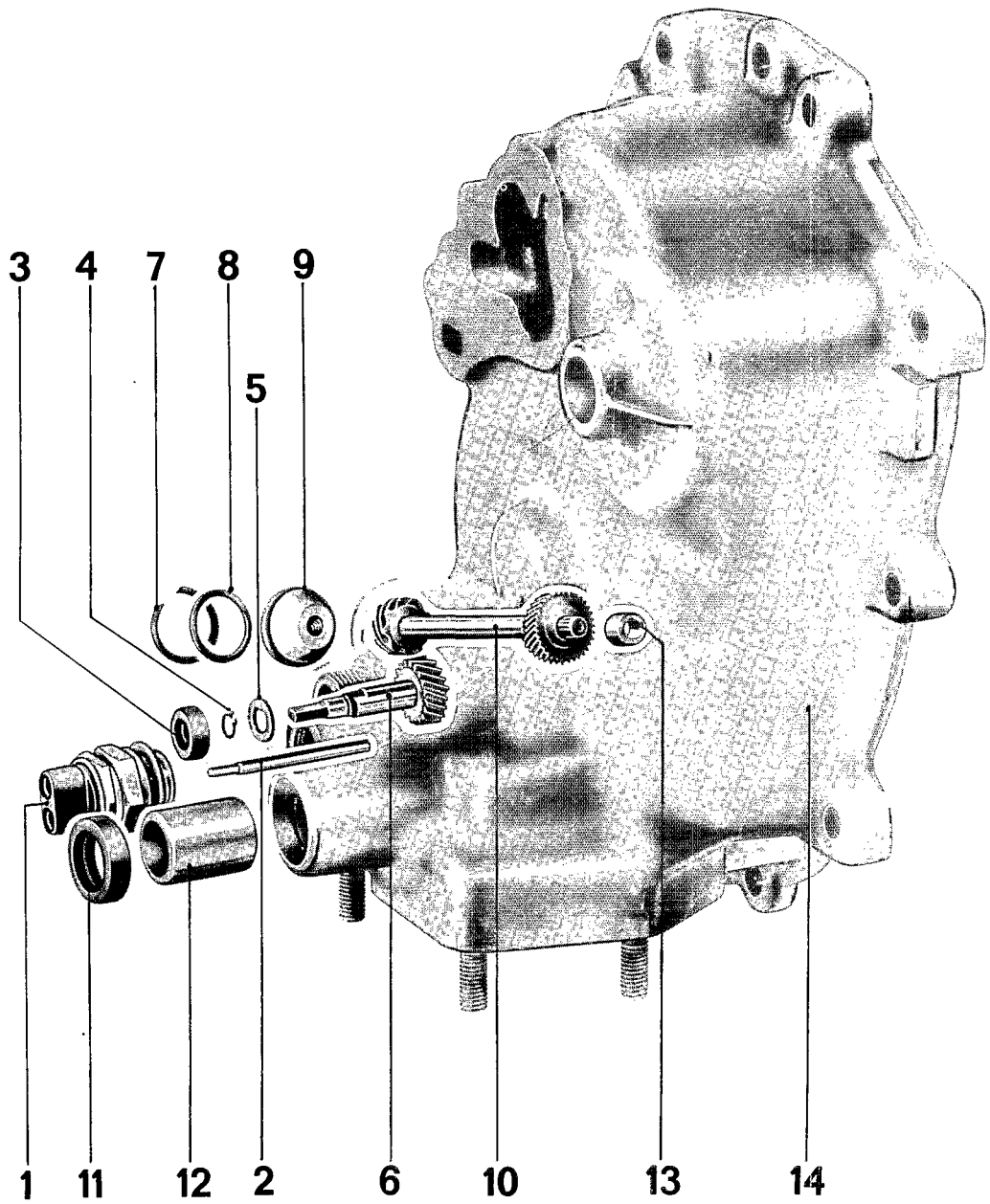
DISASSEMBLING AND ASSEMBLING FRONT COVER

TOOLS



Nr.	Description	Special Tool	Remarks
1	Mandrel	P 374	
2	Mandrel	P 369	

Disassembling and Assembling Front Cover



Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
1	Backup light switch	1		Torque to specification.	
2	Actuating pin	1		Position properly.	3.1-1/13
3	Seal	1	Press out with small screwdriver.	Drive fully into seat with P 374.	3.1-3/4
4	Retainer	1		Replace if necessary.	
5	Thrust washer	1			
6	Speedometer drive	1			
7	Retainer	1		Seat properly.	
8	O-ring	1		Oil lightly.	
9	Positioning piece	1			
10	Worm shaft	1			
11	Seal	1	Pry out with screwdriver.	Drive in with P 369 until fully seated.	3.1-3/4
12	Shift rod bushing	1		Replace.	
13	Bushing	1	Heat the cover to approx. 120°C (250°F) on hot plate then pull out; drill out if necessary.	Heat the cover to approx. 120°C (250°F) on hot plate. Drive on with suitable mandrel.	
14	Transmission front cover	1			

DISASSEMBLING AND ASSEMBLING

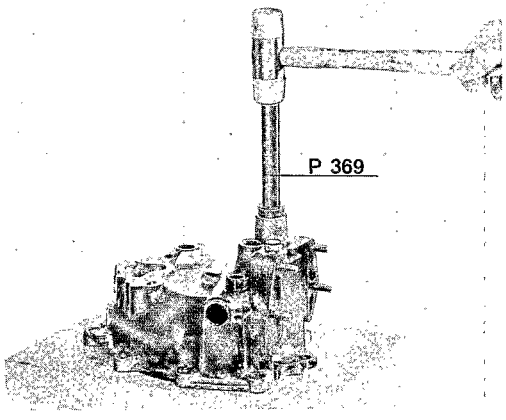
Disassembling

1. Heat transmission cover to approximately 120°C (250°F) and pull speedometer gear shaft bushing out; drill out, if necessary.

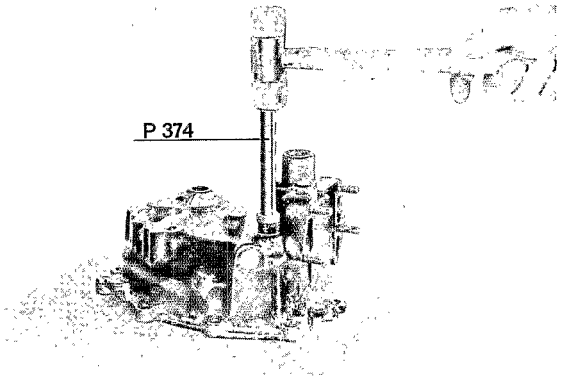
Assembling

1. Heat transmission cover to approximately 120°C (250°F) and drive gear shaft bushing in with a suitable mandrel.

2. Drive on seal for shift rod with special tool P 369.

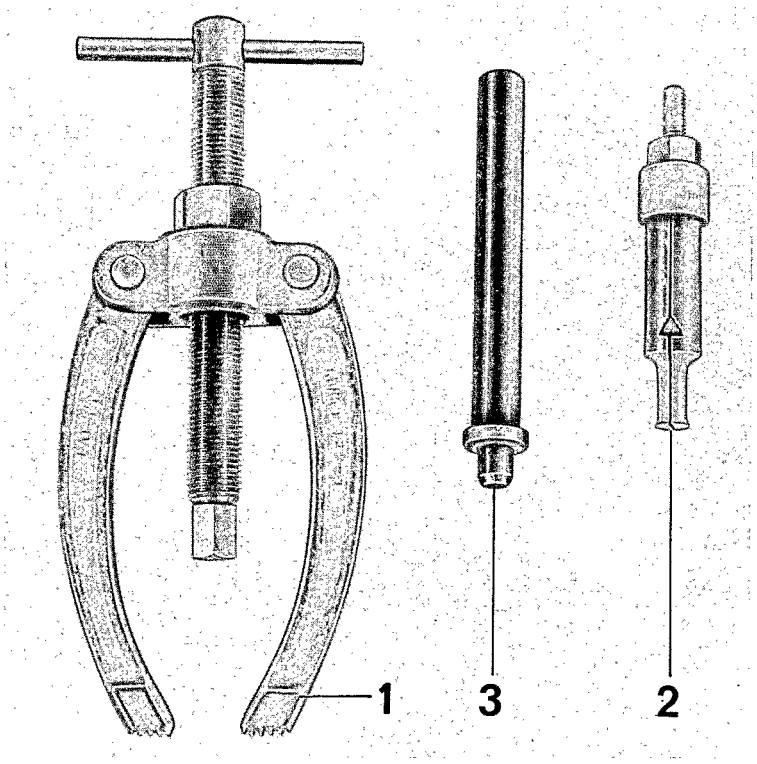


3. Drive on seal for speedometer drive with special tool P 374.



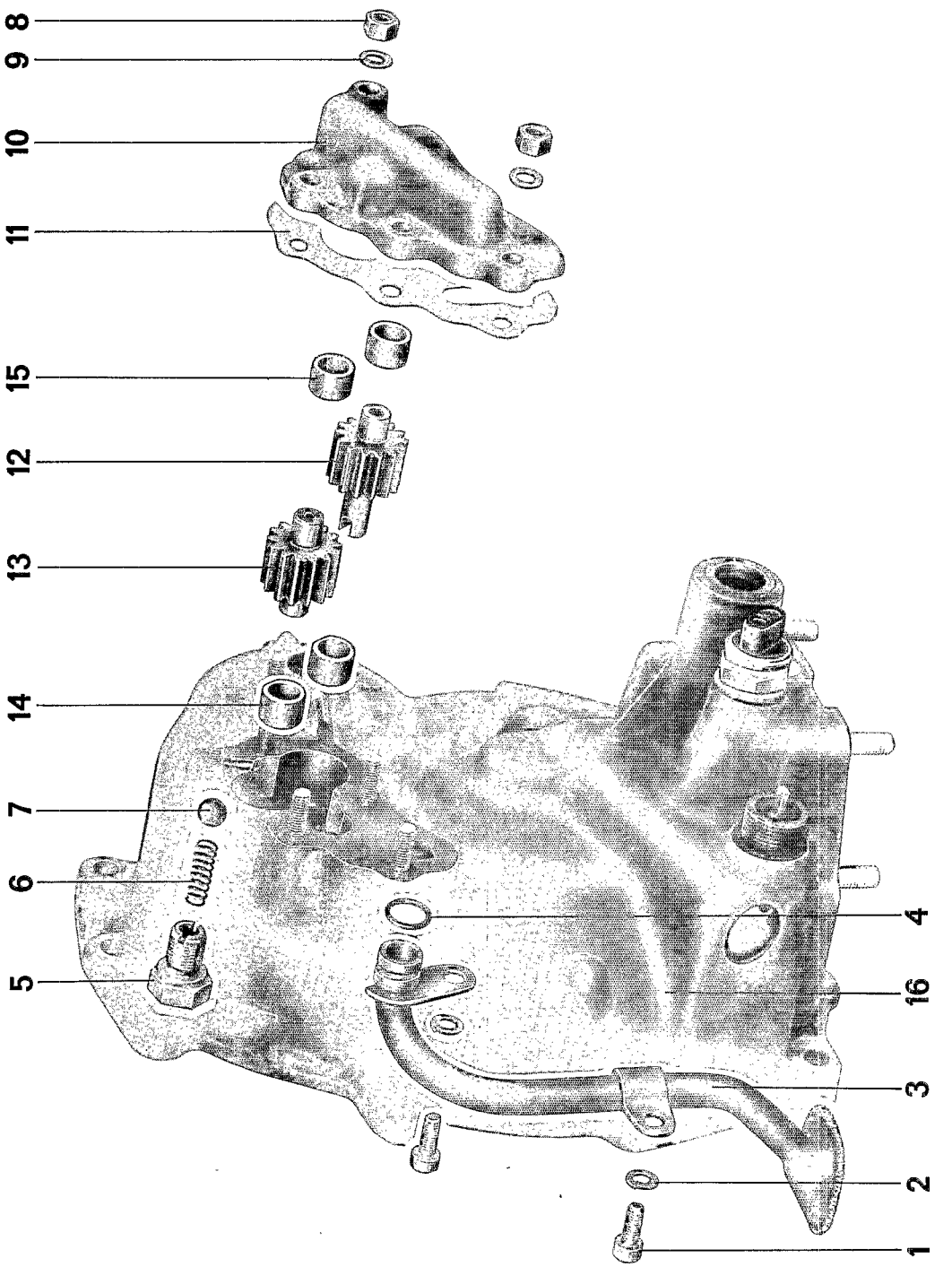
DISASSEMBLING AND REASSEMBLING OIL PUMP

TOOLS



No.	Description	Special Tool	Remarks
1	Support	-	Commercial, KUKKO Nr. 22-1
2	Inside puller	-	Commercial, KUKKO Nr. 21-02
3	Drift	P 368	

Disassembly and Reassembly



No.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Allen bolt	2		Torque to specification.	
2	Lock washer	2		Replace.	
3	Pickup tube	1			
4	O-ring	1		Replace. Oil lightly.	
5	Plug for pressure relief valve	1	Ball and spring can fall out.	Torque to specification.	
6	Spring	1			
7	Ball	1			
8	Self-locking nut	5		Tighten cross-wise to specified torque. Check oil pump gears for free movement.	3.1 - 3/9
9	Washer	5			
10	Oil pump cover	1			
11	Gasket	X	Note number and thickness for reassembly.	Recalculate thickness, if necessary.	3.1 - 3/9
12	Oil pump gear I	1		Check freedom of movement. End play approx. 0.05 mm.	
13	Oil pump gear II	1		Check freedom of movement. End play approx. 0.05 mm.	
14	Bushing	2	Drive out with proper punch.	Drive in, properly oriented, with P 368.	3.1 - 3/9
15	Bushing	2	Pull out with KUKKO inside puller.	Drive in, properly oriented, with P 368.	3.1 - 3/8
16	Transmission front cover	1			

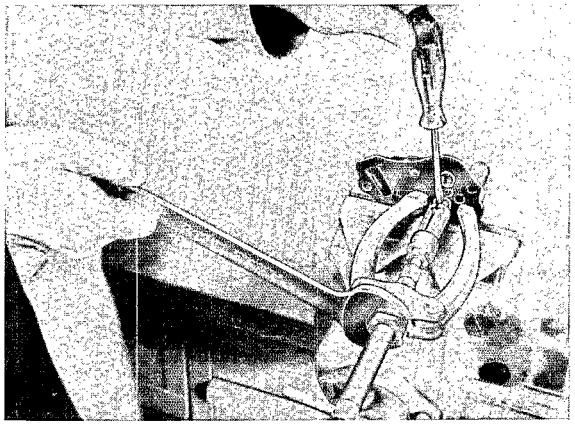
INSTRUCTIONS FOR DISASSEMBLY AND REASSEMBLY

Disassembly

1. Note the thickness and number of gaskets when removing the oil pump cover to simplify reassembly.

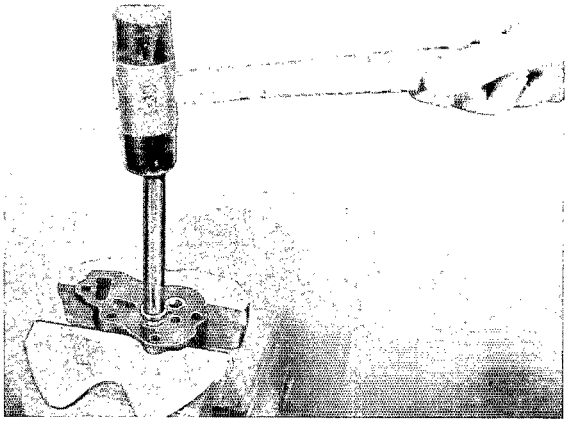
2. Note proper orientation of the bushings. Mark lubricating hole.

3. Use a KUKKO inside puller to remove bushings of oil pump gears from oil pump cover. Place a protector between the puller and the cover to avoid damage to the sealing surface.

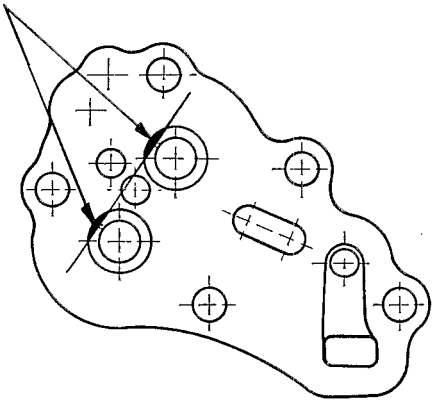


Reassembly

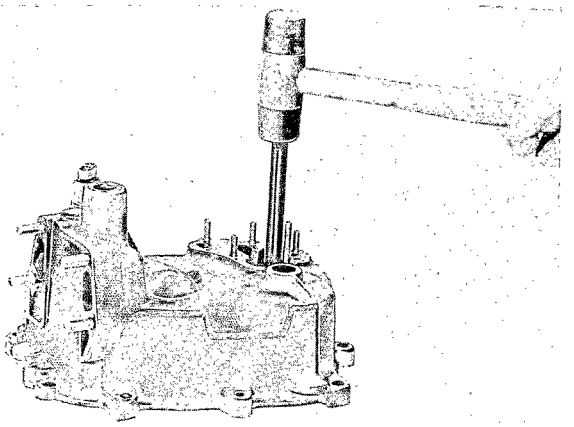
1. Drive bushings into oil pump cover with special tool P 368, making sure that they are properly positioned and fully in. The milled ends of the oil pockets must point towards the pressure chamber or oil pump gears, respectively.



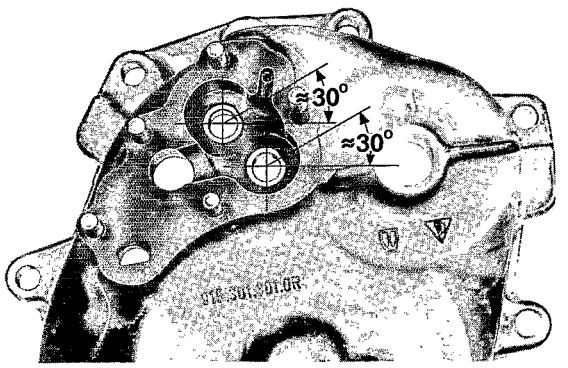
See sketch for exact location.



2. Drive bushings into transmission front cover with special tool P 368, making sure that they are properly positioned and fully in. The milled ends of the oil pockets must point towards the pressure chamber or oil pump gears, respectively.



See illustration for exact location.



3. Install gaskets in same thickness as noted during disassembly.

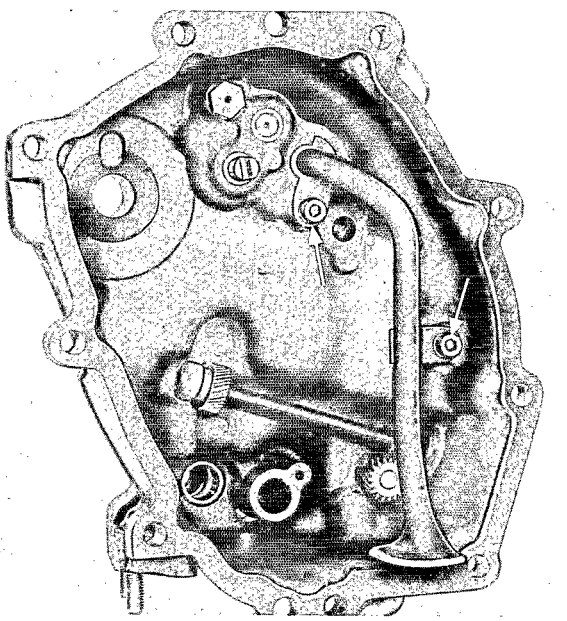
4. Install oil pump cover and tighten self-locking nuts cross-wise to specified torque. Keep checking if the pump gears remain free. If necessary, remove cover again and insert gaskets as appropriate.

NOTE
End play of oil pump gears should be 0.05 mm.

5. Tighten plug of pressure relief valve to specified torque.

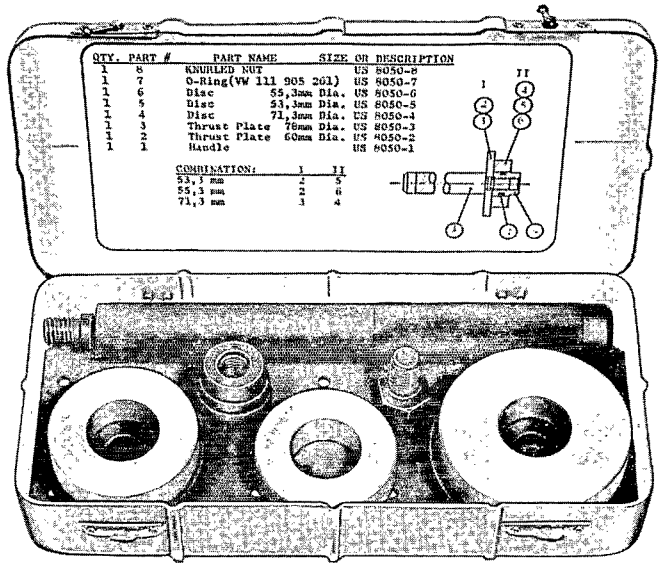
6. Lightly oil the O-ring for pickup tube.

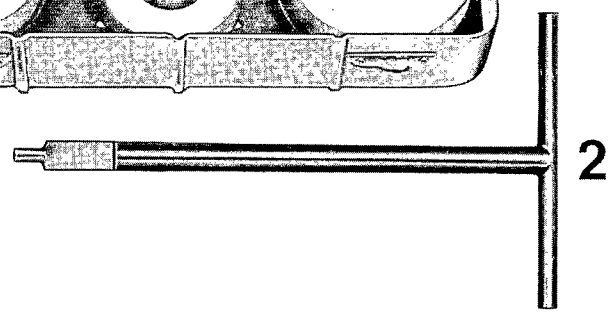
7. Install Allen bolts for pickup tube, using new lock washers, and tighten to specified torque.



DISASSEMBLING AND ASSEMBLING TRANSMISSION HOUSING

TOOLS



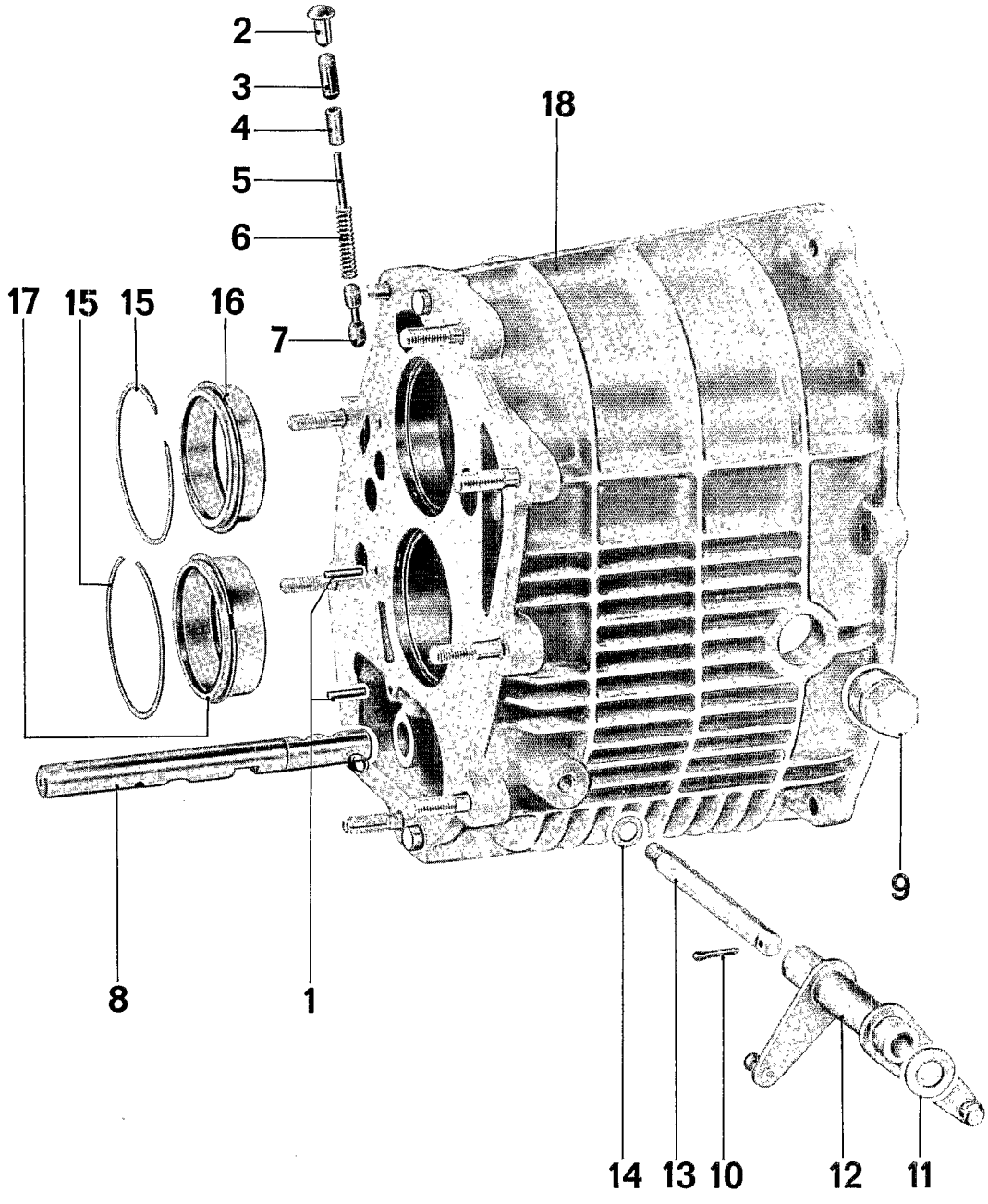


1

2

Nr.	Description	Special Tool	Remarks
1	Driver Set	US 8050	
2	T-handle	P 366	

Disassembling and Assembling Transmission Housing



Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
1	Roll pin	2	Drive out.	Tension spring with P 366 and drive in.	3.1-4/5
2	Plug	1	Drive out with flat chisel.	Replace if necessary.	
3	Short detent	1			3.1-4/5
4	Sleeve	1			
5	Pin	1			
6	Spring	1			
7	Long detent	1			
8	5th and reverse speed selector (shift) rod	1			
9	Plug	1		Torque to specification.	
10	Cotter pin	1		Replace.	
11	Washer	1			
12	Bellcrank for accelerator linkage	1			
13	Shaft	1			
14	Washer	1			
15	Retainer ring	2	Take out with small screwdriver.		
16	Bearing outer race	1	Heat gear housing to approx. 120°C (250°F) and drive out with special tool US 8050.	Heat gear housing to approx. 120°C (250°F) and drive in with special tool US 8050.	
17	Bearing outer race	1	Heat gear housing to approx. 120°C (250°F) and drive out with special tool US 8050	Heat gear housing to approx. 120°C (250°F) and drive in with special tool US 8050	
18	Gear housing	1			

DISASSEMBLING AND ASSEMBLING

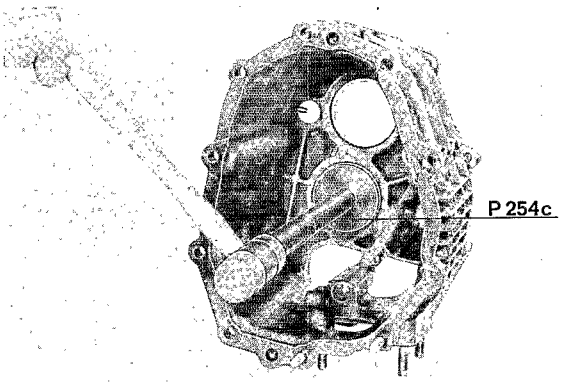
Disassembling

1. Drive shift detent securing roll pins out.

2. Drive half-round dowel pin out.

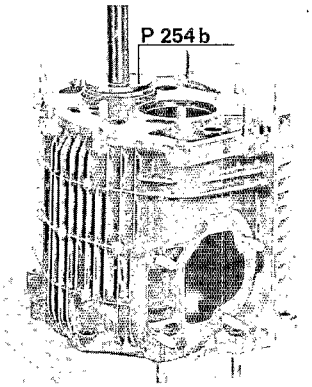
   Note
   Detent components are under spring tension. Therefore, always remove the roll pin first, then the half-round dowel pin.

3. Heat gear housing to approximately 120°C (250°F) and drive bearing outer races out using special tool US 8050.


P 254c

Assembling

1. Heat housing to approximately 120°C (250°F) and drive bearing outer races in with special tool US 8050.

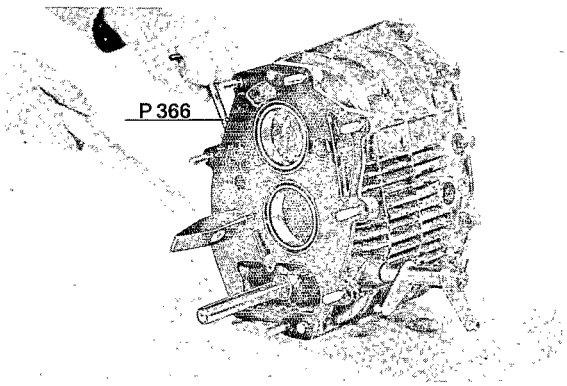

P 254b

Caution
The bearing outer races differ in inside diameter. The race with the larger inside diameter belongs to the pinion shaft (lower shaft).

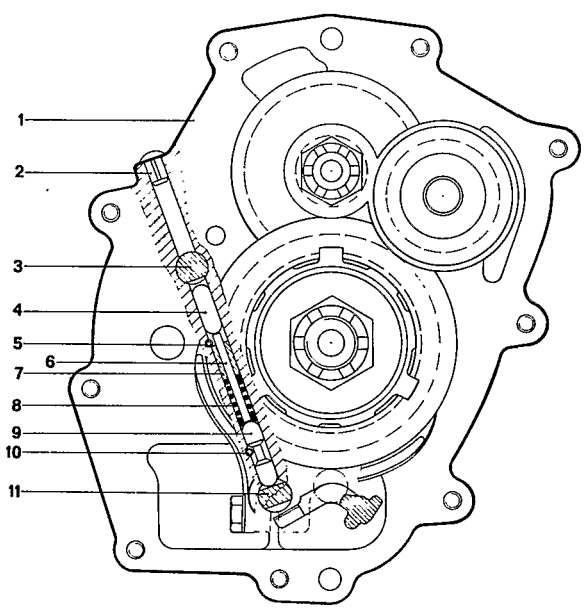
2. Install 5th and reverse speed shift rod.

3. Insert long detent and drive roll pin in.

4. Install spring and sleeve, tension both with special tool P 366, and drive roll pin in.



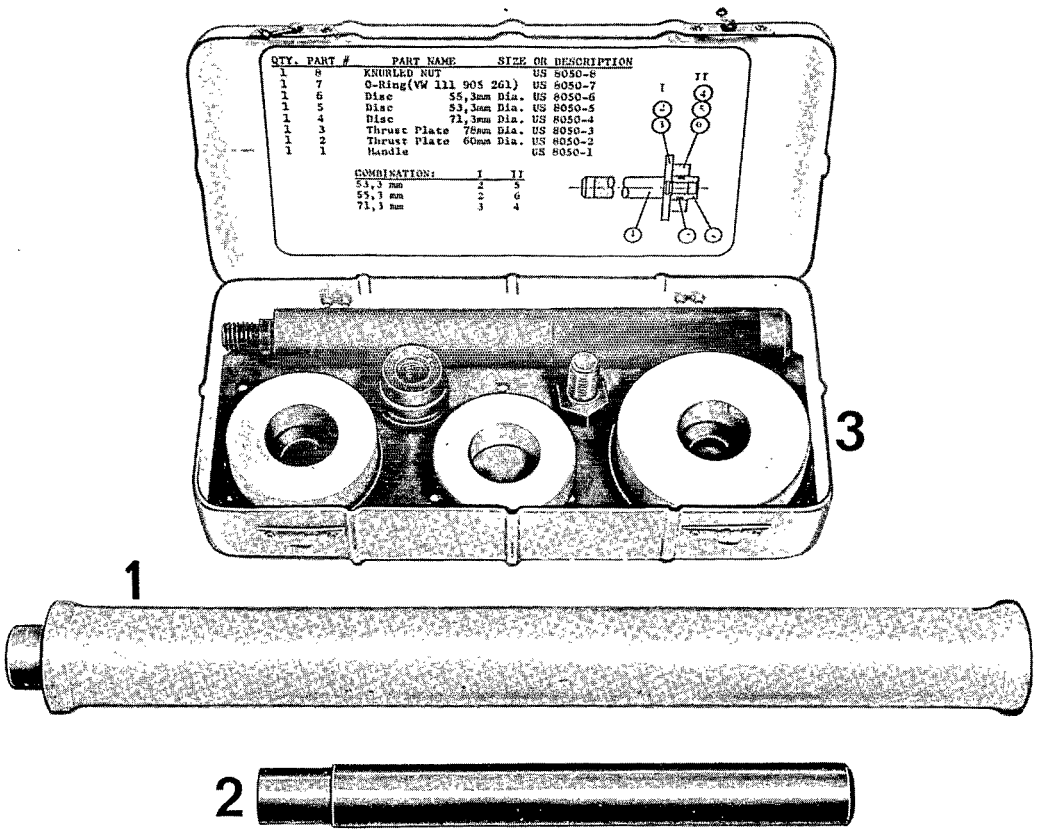
5. Insert pin and detent (short), then drive the plug in.



1 - Gear housing
2 - Half-round dowel pin
3 - 3rd and 4th speed selector fork(shift) rod
4 - Short detent
5 - Roll pin
6 - Pin
7 - Sleeve
8 - Spring
9 - Long detent
10 - Roll pin
11 - 5th and reverse speed selector fork (shift) rod

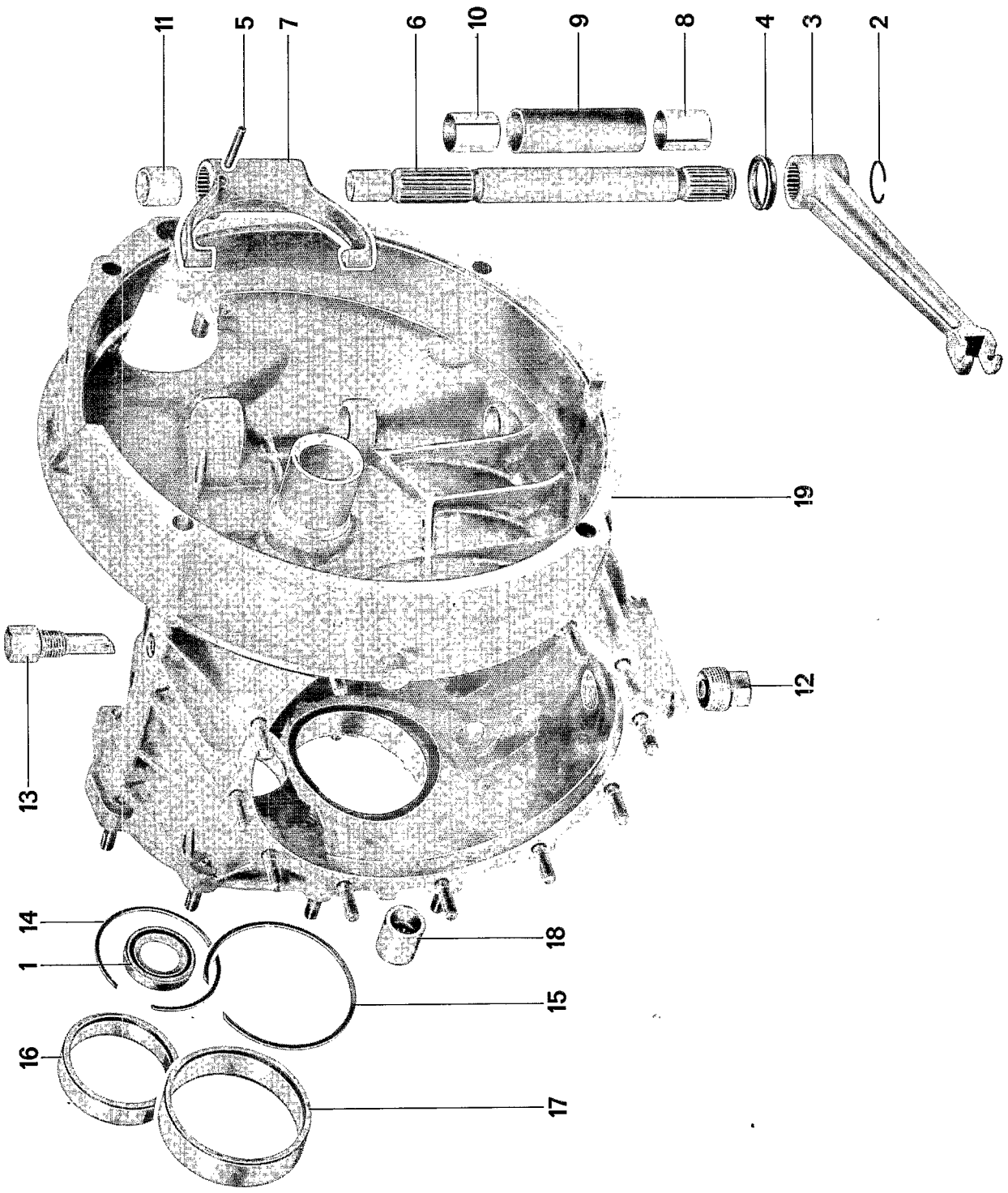
FINAL DRIVE HOUSING

TOOLS



Nr.	Description	Special Tool	Remarks
1	Mandrel	P 360a	
2	Mandrel	P 375	
3	Driver Set	US 8050	

Disassembling and Assembling Final Drive Housing



Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
1	Input shaft oil seal	1	Drive out in direction of bell housing with an appropriate punch.	Install with P 360a. Sealing lip faces bell housing.	3.1-5/7
2	Snap ring	1		Replace.	
3	Throwout lever	1	Mark lever position on shaft to ensure proper reinstallation.	Readjust if necessary.	3.1-5/7
4	Seal	1		Replace if necessary.	
5	Roll pin	1	Drive out.	Replace if necessary.	
6	Lever shaft	1			
7	Throwout fork	1		Readjust.	
8	Bushing	1	Drive out with P 375.	Drive in with P 375.	3.1-5/7
9	Cover tube	1			
10	Bushing	1	Drive out with P 375.	Drive in with P 375.	
11	Bushing	1			
12	Plug	1		Clean and torque to specification.	
13	Breather	1		Position properly, torque to specification.	3.1-5/6
14	Snap ring	1		Make sure it is properly seated.	

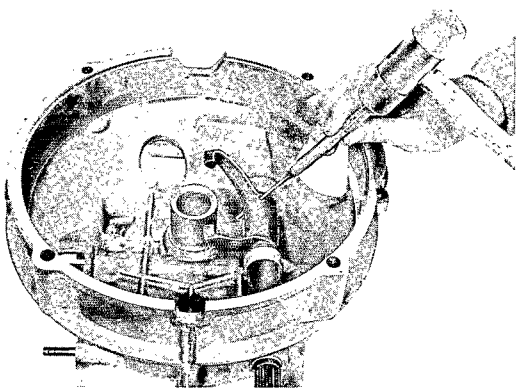
Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
15	Snap ring	1		Note proper seating.	3.1-5/6
16	Bearing outer race	1	Heat transmission housing to 120°C (250°F) on a hot-plate and drive out with US 8050.	Heat transmission housing to 120°C (250°F) on hotplate and drive in with US 8050.	
17	Bearing outer race	1	Heat transmission housing to 120°C (250°F) on hotplate and drive out with US 8050.	Heat transmission housing to 120°C (250°F) on hotplate and drive in with US 8050.	
18	Needle bearing/ bushing	1	Drive out with appropriate mandrel.	Drive in with appropriate mandrel.	
19	Transmission housing	1			

DISASSEMBLING AND ASSEMBLING FINAL DRIVE HOUSING

Disassembling

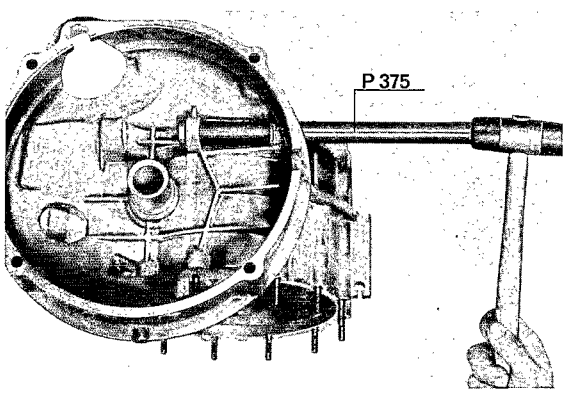
1. Drive out input shaft seal in direction of bell housing with an appropriate mandrel.

2. Drive roll pin out.



Caution
Mark throwout lever and shaft to ensure proper position when installing.

3. Drive out lever shaft bushings with special tool P 375.

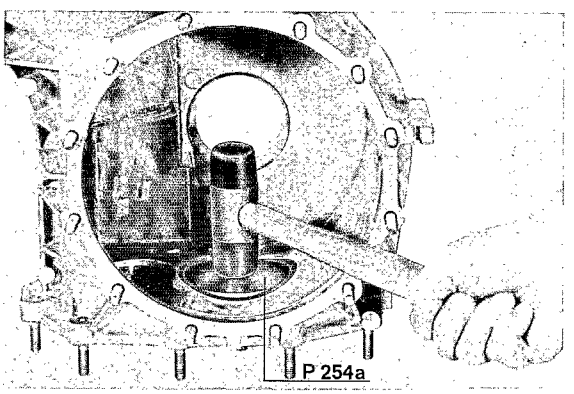


4. Remove bushing.

5. Using a small screwdriver, remove both snap rings from the housing for input shaft and pinion shaft bearings.

Note
The retaining rings are pressed against the housing by the bearing outer races. For this reason, first loosen the bearing racer from the snap rings with a punch.

6. Heat housing to approximately 120°C (250°F) on a hotplate and drive out both bearing outer races with special tool US 8050.



7. Drive out shift rod needle bearing/bushing from inside of housing using an appropriate mandrel.

Assembling

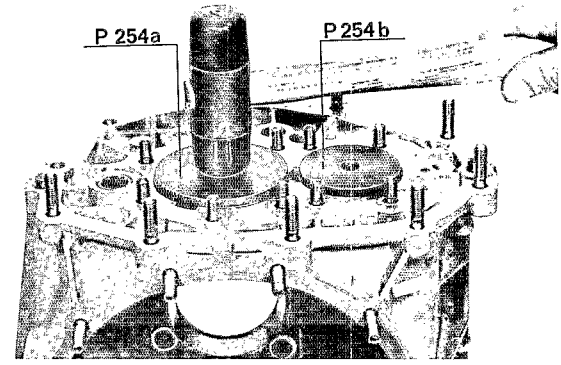
Caution
When cleaning the final drive housing, do not use corrosive cleaning materials as they will damage the magnesium alloy.

1. Clean housing and check for wear, external damage, and cracks. If repair is due to broken pinion shaft of ring gear, check for damage in center web bearing bores. Replace the housing if necessary.

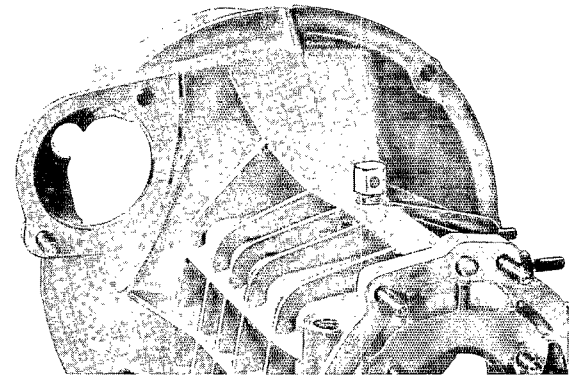
2. Install bearing outer race snap rings in housing grooves.

Note
Position the large snap ring so that its gap will rest in the groove in the housing. In no case should the snap ring gap appear at the sides where the groove is interrupted by a machined cut.

3. Heat housing to approximately 120°C (250°F) on a hotplate and drive both bearing outer races in with special tool US 8050.

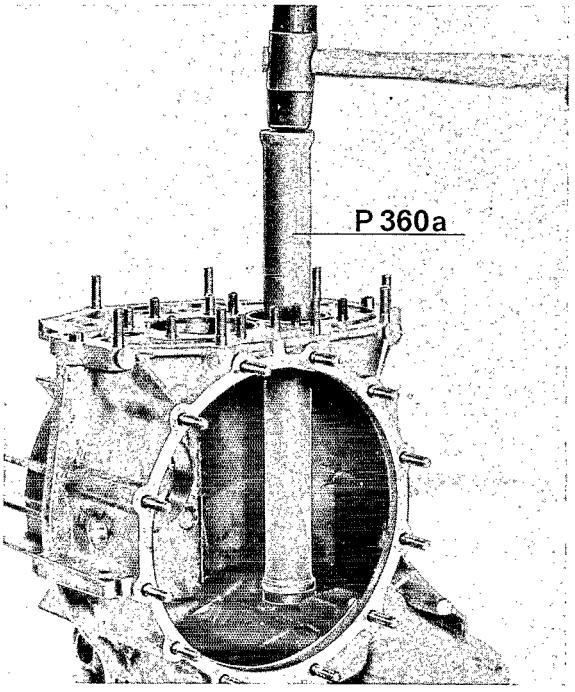


4. Install breather and torque to specification.

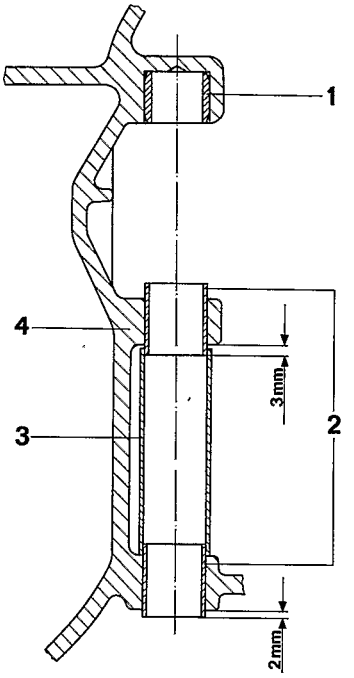


Note
The opening in the hex part of the breather must face forward in direction of travel (toward transmission front cover).

5. Install input shaft seal with P 360a. Sealing lip faces bell housing.



6. Drive in bushings for lever shaft with Special Tool P 375 (see drawing) and coat with grease having a lithium or silicone base.



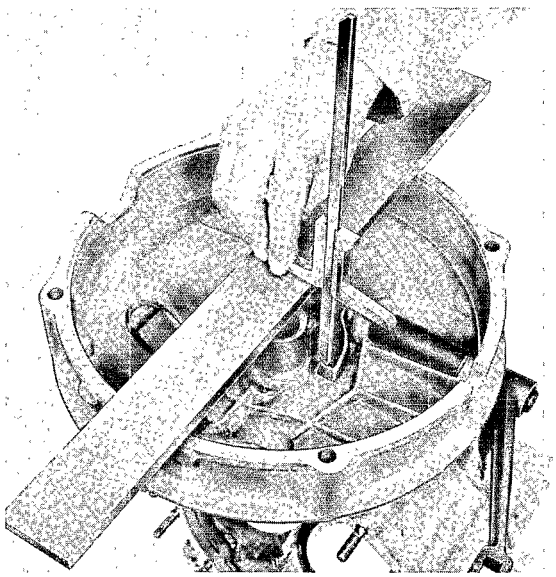
1 - Bushing
2 - Lever shaft bushing
3 - Cover tube
4 - Transmission housing

7. Assemble clutch controls.

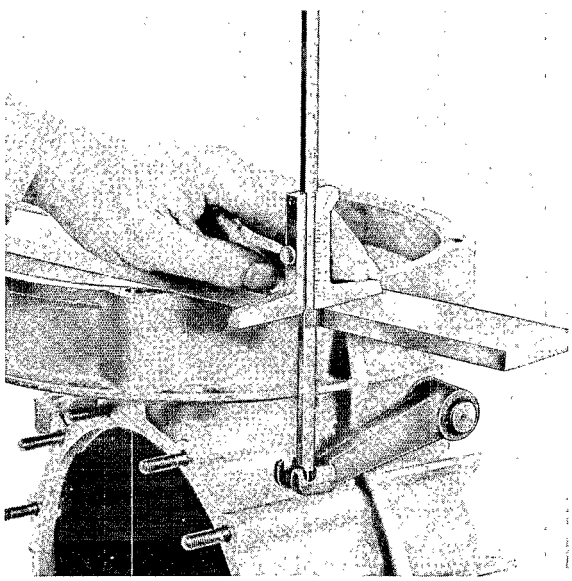
Note
Throwout fork and throwout lever must be adjusted on the lever shaft splines in order to attain proper lever travel.

Important
8. After making repairs to transmission, apply new protective undercoating to the entire outside of the housing.

The adjustment dimensions are:
From top edge of the bell housing to the tip of the throwout fork = 70 mm



From top edge of bell housing to the bottom throwout lever cut-out = 79 mm



Modified Clutch Release Lever - 1975 Models

The shape of the clutch release lever for transmission types 915/40/45 has been modified due to the location of the pipes of the new exhaust system. This makes it impossible to detach or attach the transmission without first removing the release lever.

After attaching the engine and transmission together, the new release lever must be installed so that it runs parallel to the clutch cable sleeve flange.

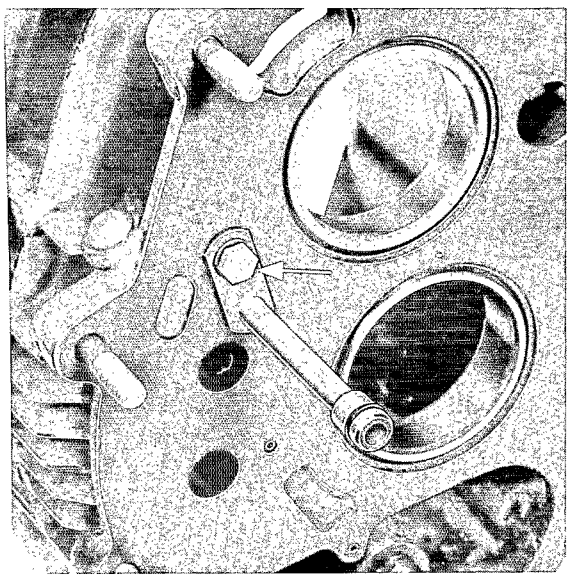
Adjustment of the release fork and release lever as in the past is omitted.

NOTE

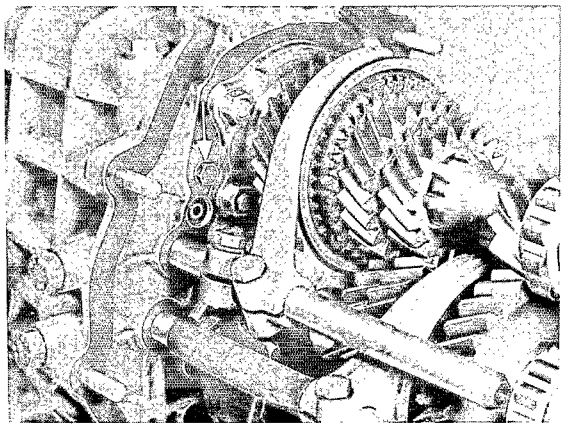
Due to the simple attachment of the pressure lines, they can be replaced without removal of the gears.

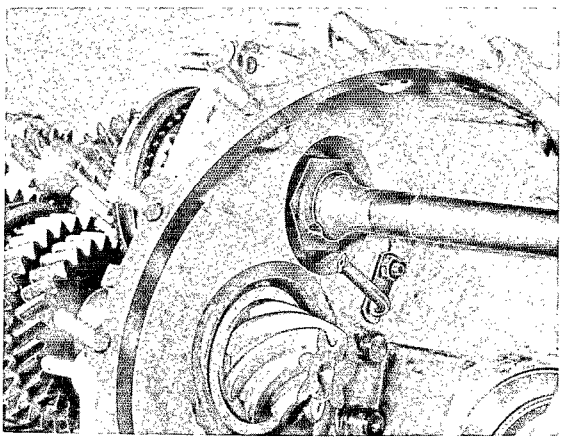
Removal

1. Remove pressure line retaining bolt from gear housing and pull pressure line out.



2. Remove retaining bolt of pressure line (spray nozzle for ring and pinion gears) from differential housing and pull the pressure line out.





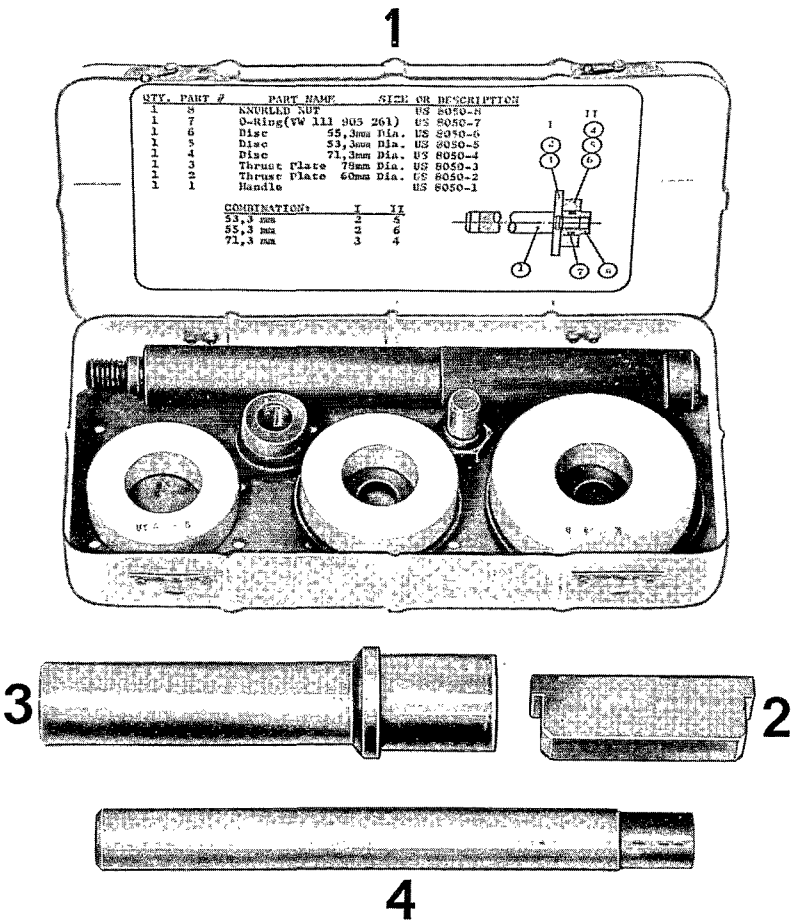
Installation

1. Install new O-rings and oil lightly.

2. Tighten retaining bolts to specified torque.

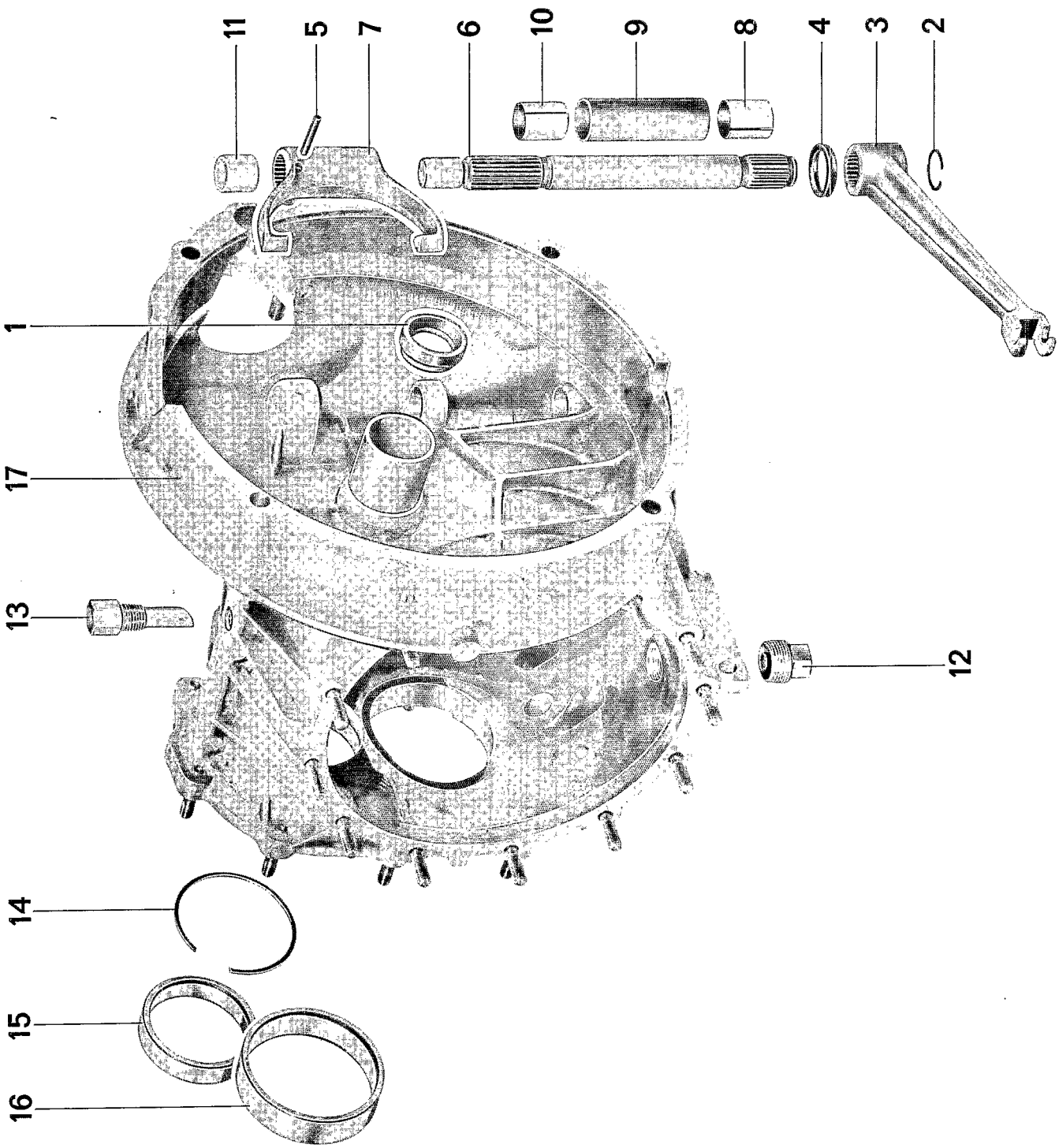
TRANSMISSION HOUSING WITH GUIDE TUBE FOR THROWOUT BEARING

TOOLS



No.	Description	Special Tool	Remarks
1	Driver Set	US 8050	
2	Thrust piece	P 254 d	
3	Sleeve	P 381	
4	Mandrel	P 375	

Disassembling and Reassembling Differential Housing



No.	Description	Qty	Note when: removing	installing	Remarks
1	Input shaft oil seal	1	Drive out inward with fitting pipe piece	Drive into seat with P 381	
2	Snap ring	1		Replace if necessary	
3	Throwout lever	1	Mark lever position on shaft for reassembly	Readjust if necessary	3.1 - 5/18
4	Seal	1		Replace if necessary	
5	Roll pin	1	Drive out with proper punch	Replace if necessary	
6	Lever shaft	1			
7	Throwout fork	1	Mark fork position on shaft for reassembly	Readjust if necessary	3.1 - 5/17
8	Bushing	1	Drive out with P 375	Drive in with P 375 in proper position	3.1 - 5/17
9	Cover tube	1			
10	Bushing	1	Drive out with P 375	Drive in with P 375 in proper position	3.1 - 5/17
11	Bushing (DELRIN)	1	Pry out with angular screwdriver by pressing around sides	Replace if necessary	
12	Drain plug	1		Clean, torque to specification	

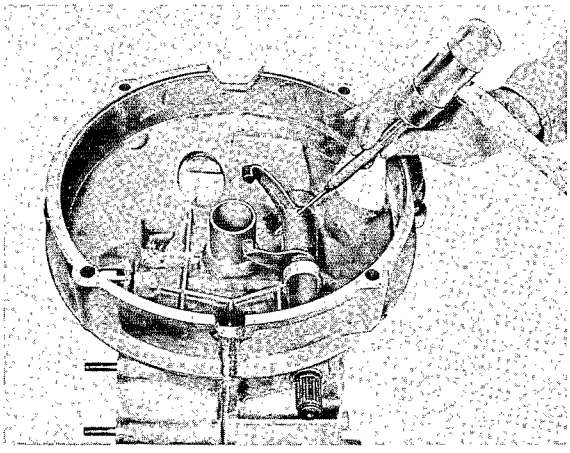
No.	Description	Qty	Note when: removing	Note when: installing	Remarks
13	Breather	1		Position properly and torque to specification	3.1 - 5/16
14	Snap ring	1	Remove with small screwdriver	Make sure it is properly seated	
15	Bearing outer race	1	Heat differential housing to approx. 120° C (248° F) and drive race out with US 8050	Heat differential housing to approx. 120° C (248° F) and drive race in with US 8050	3.1 - 5/16
16	Bearing outer race	1	Heat differential housing to approx. 120° C (248° F) and drive race out with US 8050	Heat differential housing to approx. 120° C (248° F) and drive race in with US 8050	3.1 - 5/15 3.1 - 5/16
17	Differential housing	1			

DISASSEMBLING AND REASSEMBLING DIFFERENTIAL HOUSING

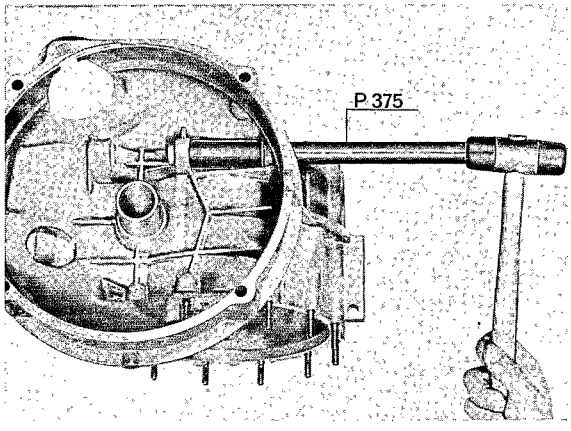
Disassembly

1. Drive input shaft oil seal inward with the aid of a fitting pipe section.

2. Drive roll pin out with an appropriate punch.



3. Drive out lever shaft bushings with P 375.

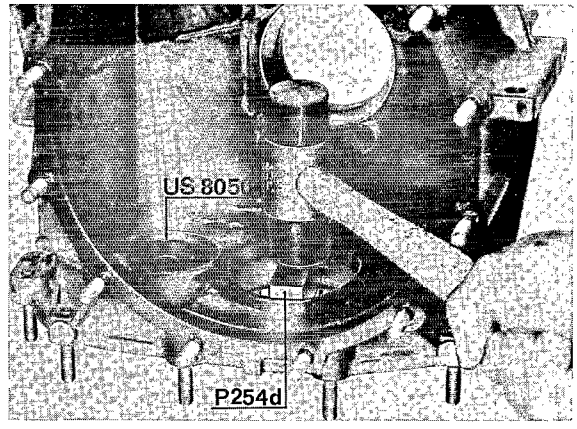


4. Using a small screwdriver, remove snap ring of input shaft bearing race.

NOTE:

The snap ring is pressed against the housing by the bearing race. It is necessary to first drive the bearing race away from the snap ring with the aid of a punch.

5. Heat differential housing to approx. 120° C (248° F) and drive both bearing races out with thrust pieces US 8050 and P 254 d.



Reassembly

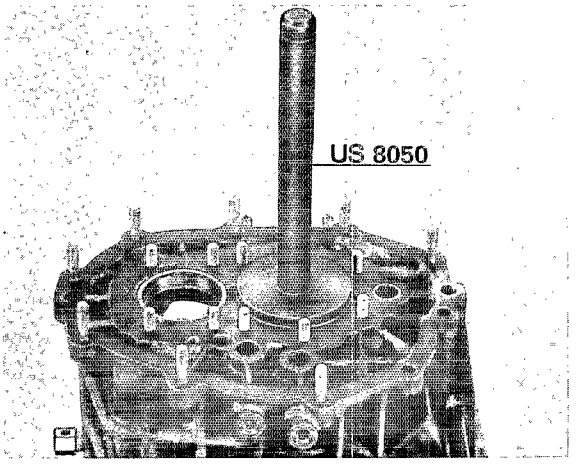
1. Clean differential housing and check for wear, external damage, and cracks. If the repair is due to a damaged pinion shaft or ring gear (such as metal fracturing), check for possible damage to center web bearing bores. Replace the housing if necessary.

NOTE

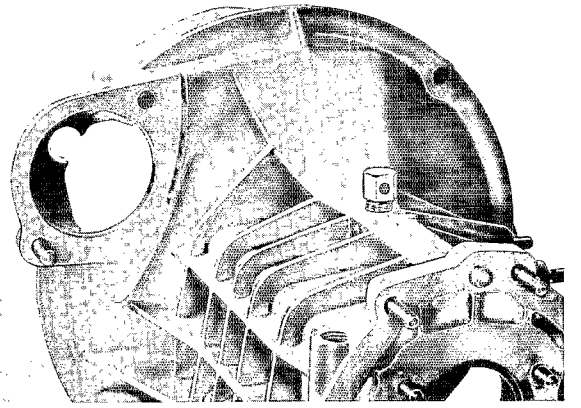
Pressure-cast housings must not be cleaned with corrosive liquids since these damage magnesium alloys. In addition, cleaned pressure castings must be treated with seasonal corrosion preservatives of bitumen or wax base, such as TECTYL, following transmission repairs to restore the corrosion proofing.

2. Install snap ring securing the input shaft bearing race in the groove in housing.

3. Heat differential housing to approx. 120° C (248° F) and drive both bearing outer races into place with the aid of US 8050.



4. Install breather in proper position and torque to specification.

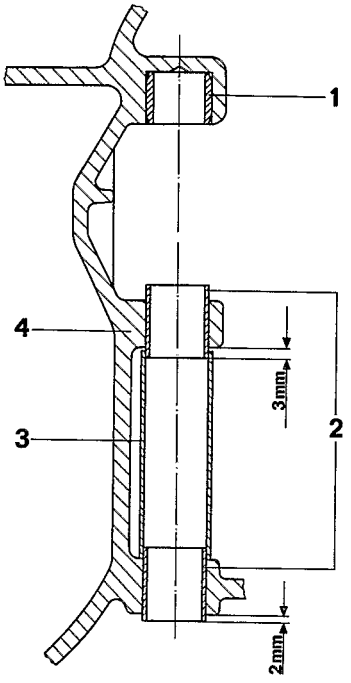


NOTE

The hole in the hex. head of the breather must face forward in direction of travel (toward transmission front cover).

5. Drive input shaft oil seal into place with P 381.

6. Drive in bushings for lever shaft with Special Tool P 375 (see drawing) and coat with grease having a lithium or silicone base.



1 - Bushing
2 - Lever shaft bushing
3 - Cover tube
4 - Differential housing

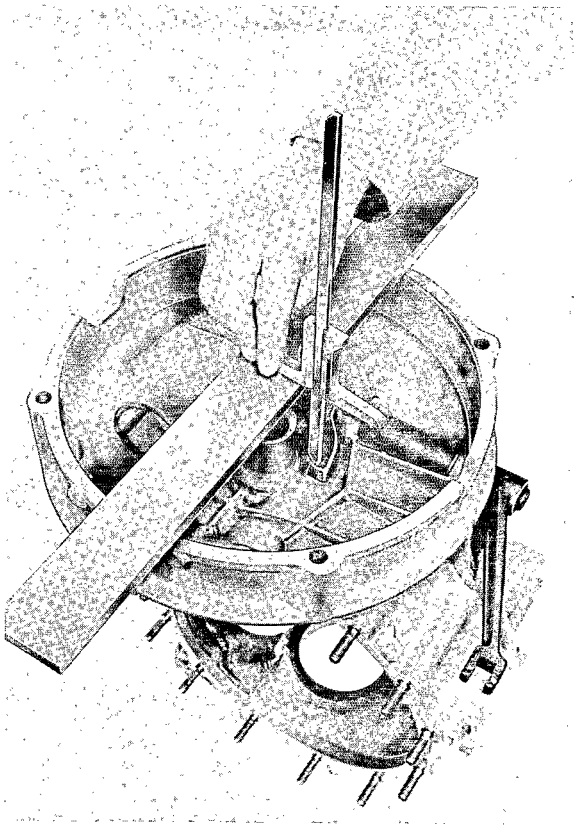
7. Install clutch controls.

NOTE

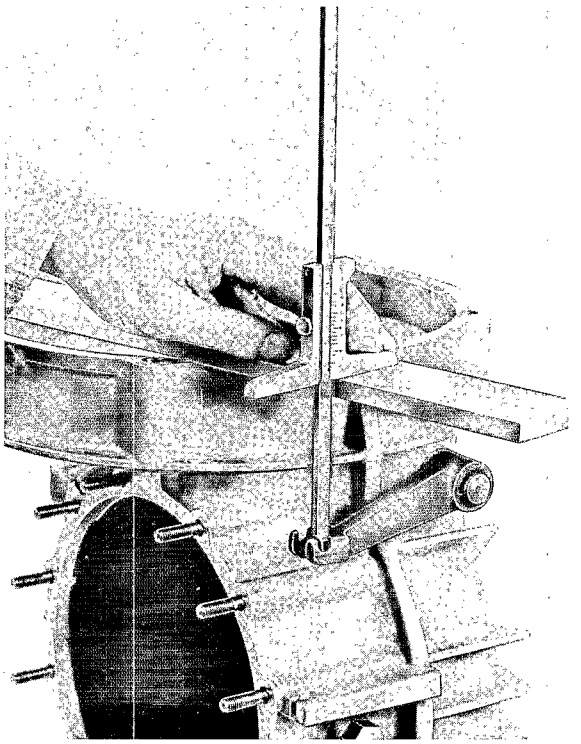
Throwout fork and throwout lever must be adjusted on the lever shaft splines to attain proper clutch lever travel.

The dimensions are:

From top edge of bell housing to the tip of the throwout fork = 70 mm.



From top edge of the bell housing to the root of the claw in the throwout lever = 79 mm.



8. Coat guide tube for throwout bearing with MoS_2 multipurpose grease.

Modified Clutch Release Lever - 1975 Models

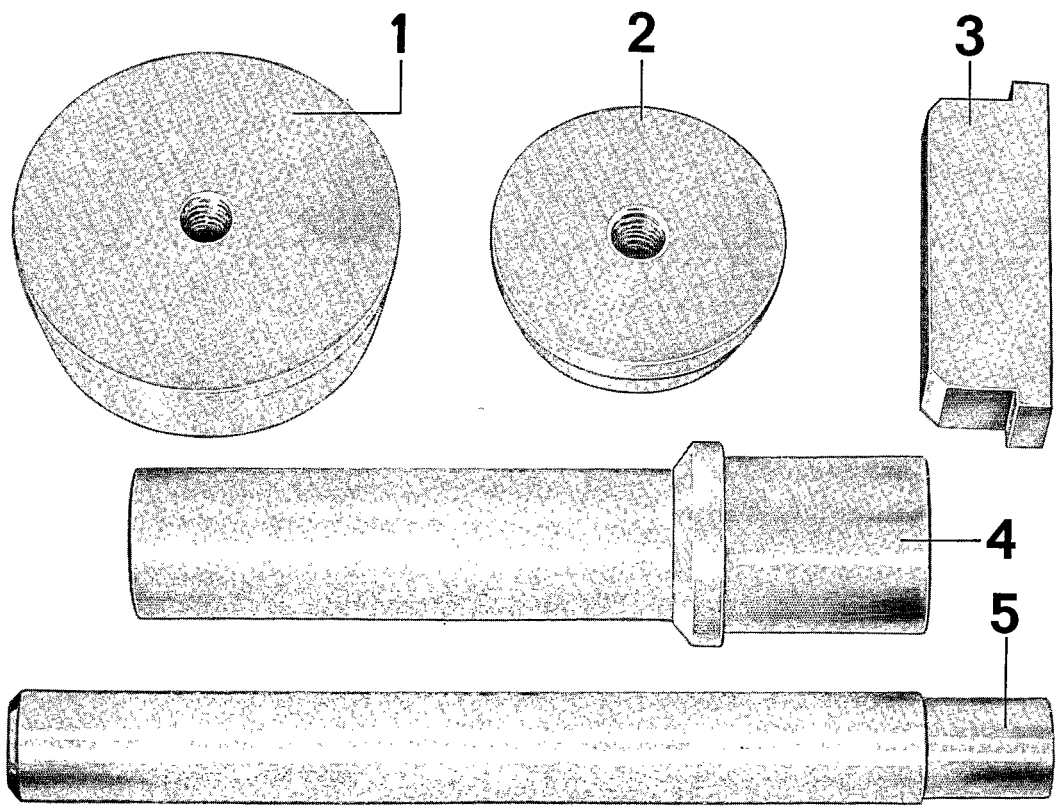
The shape of the clutch release lever for transmission types 915/40/45 has been modified due to the location of the pipes of the new exhaust system. This makes it impossible to detach or attach the transmission without first removing the release lever.

After attaching the engine and transmission together, the new release lever must be installed so that it runs parallel to the clutch cable sleeve flange.

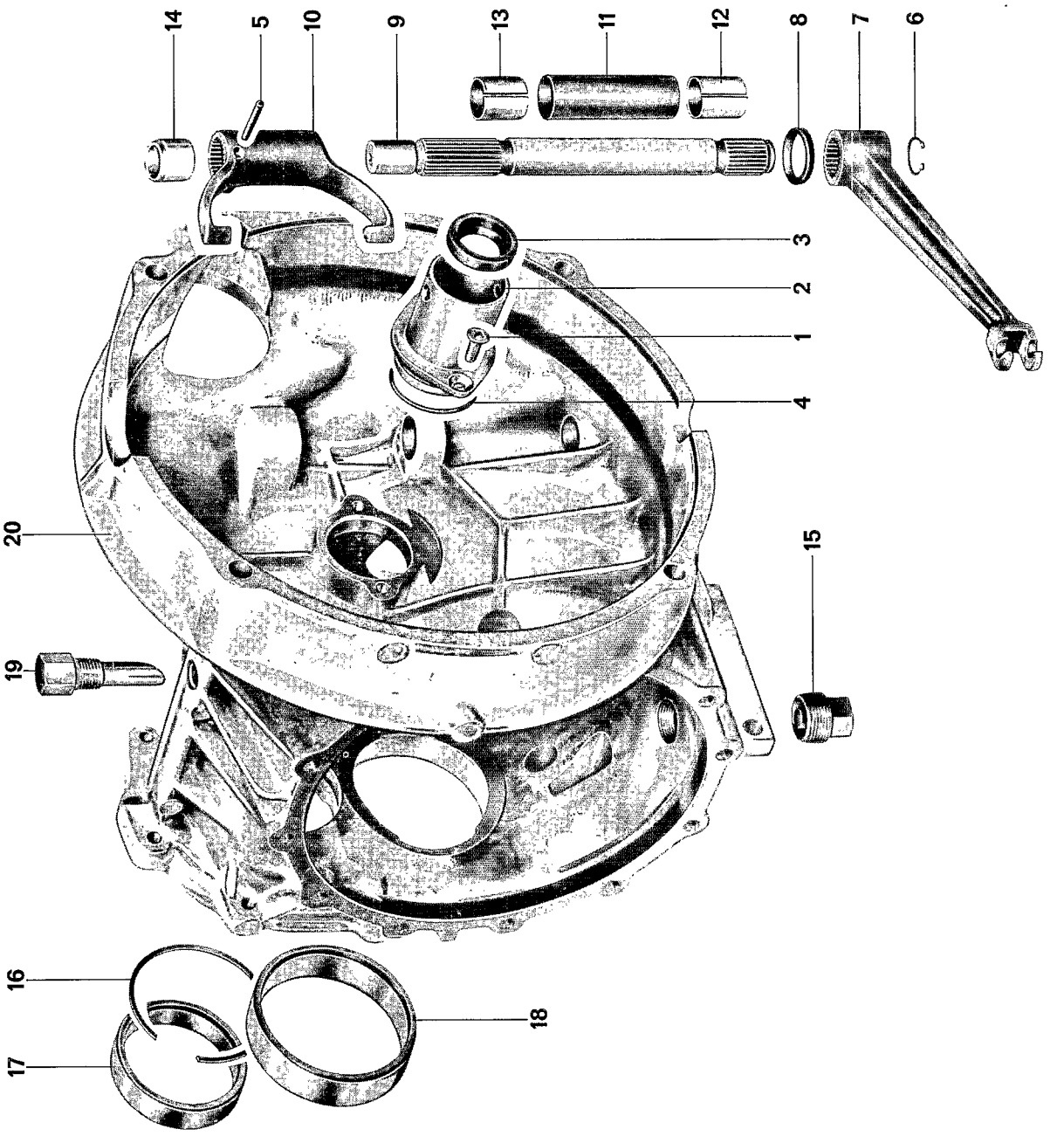
Adjustment of the release fork and release lever as in the past is omitted.

TRANSMISSION CASE WITH BOLTED GUIDE TUBE FOR RELEASE BEARING

TOOLS



No.	Description	Special Tool	Remarks
1	Thrust plate	US 8050	
2	Thrust plate	US 8050	
3	Thrust plate	US 8050	
4	Mandrel	P 381	
5	Mandrel	P 375	


14
5
10
9
13
11
12
8
7
6
3
2
1
4
20
15
19
16
18
17

No.	Description	Qty.	Note when Removing	Note when Installing	Special instructions see
1	Phillips ctsk. screw	2		Torque to specifications	
2	Guide tube	1	Use hook to remove	Install with MoS2 additive lubricant	
3	Seal, drive shaft	1	Drive out with P 381	Press in with P 381	
4	O-ring	1		Replace, lubricate	
5	Pin	1	Drive out with appropriate drift	Replace if necessary	
6	Circlip	1		Replace if necessary	
7	Release lever	1	Mark for reinstalling with lever shaft	Adjust, if necessary	
8	Seal	1		Replace if necessary	
9	Lever shaft	1			
10	Release fork	1	Mark for reinstalling with lever shaft	Replace if necessary	
11	Cover tube	1			
12	Bushing	1	Drive out with P 375	Drive in with P 375	
13	Bushing	1	Drive out with P 375	Drive in with P 375	
14	Bushing (Delrin)	1	Use angled screwdriver on both sides to pry out	Replace, if necessary	
15	Plug	1		Clean and torque to specifications	
16	Snap ring	1	Remove with small screwdriver	Install correctly	

No.	Description	Qty.	Note when Removing	Note when Installing	Special instructions see
17	Bearing outer race	1	Heat case to approx 120°C / 248°F and drive out with US 8050	Heat case to approx 120°C / 248°F and drive in with US 8050	
18	Bearing outer race	1	Heat case to approx 120°C / 248°F and drive out with US 8050	Heat case to approx 120°C / 248°F and drive in with US 8050	
19	Breather	1		Position correctly and torque to specifications	
20	Transmission case	1		Check for damage	

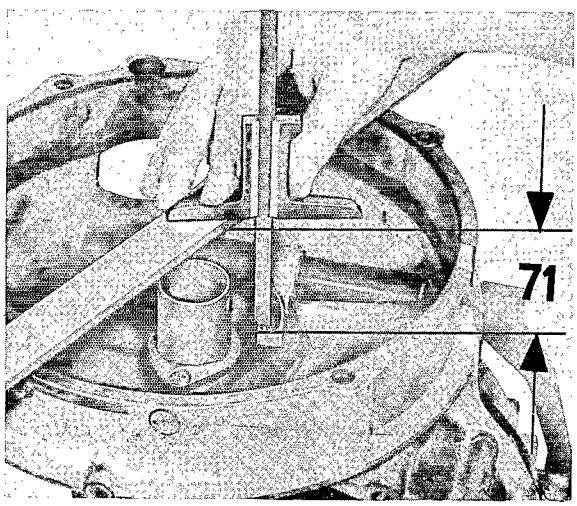
DISASSEMBLING AND ASSEMBLING INSTRUCTIONS

On the 1976 model manual transmission 915 the clutch release lever can be preassembled and adjusted.

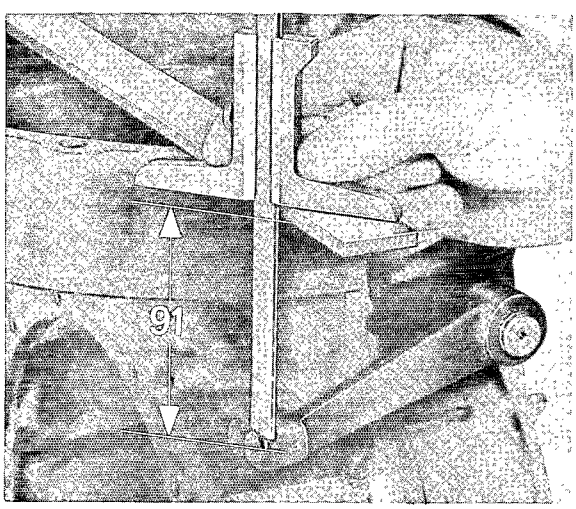
Assembling Clutch Release Components

To assure perfect clutch operation, release fork and release lever must be matched with each other on the lever shaft splines.

Specifications are:
Approx. 71 mm from clutch bell housing flange surface to upper edge of release bearing surface on fork.



Approx. 91 mm from clutch bell housing flange surface to depression in lever.



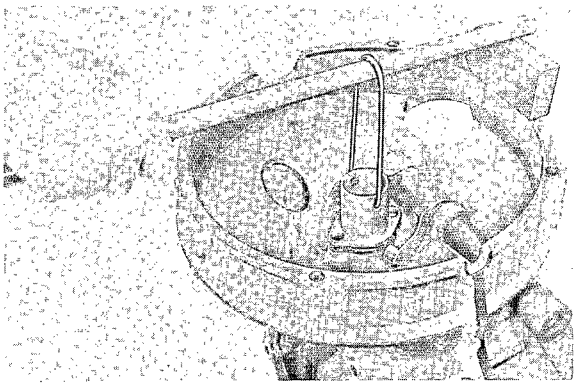
REMOVING AND INSTALLING DRIVE SHAFT SEAL - 1976 MODEL

The drive shaft seal of 1976 model manual transmission 915 can be replaced without having to disassemble the transmission.

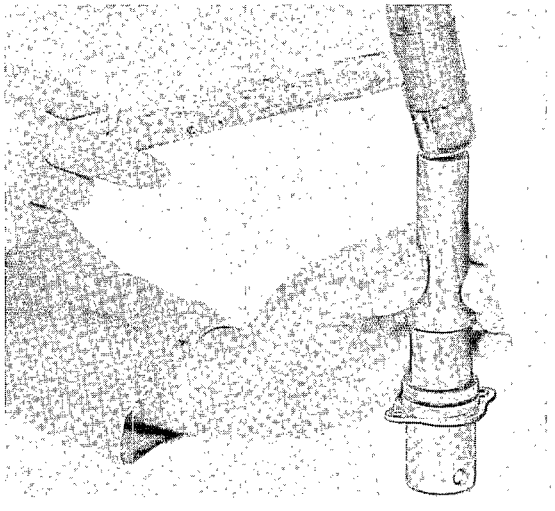
Removing

1. Remove engine/transmission assembly and separate transmission from engine.

2. Remove both Phillips countersunk bolts on guide tube. Pull out guide tube for drive shaft seal with a locally manufactured hook.



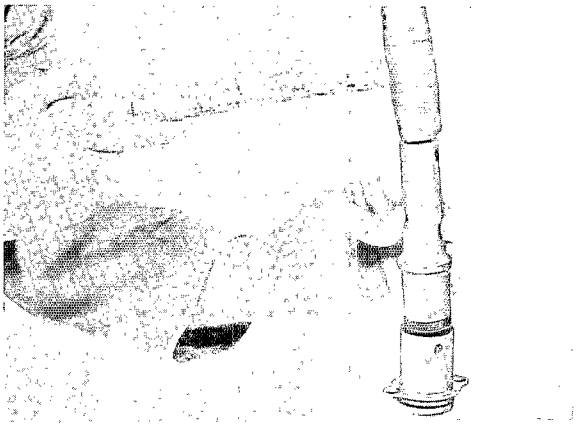
3. Remove seal with an appropriate mandrel or screwdriver. Special tool P 381 can be applied.



Installing

1. Drive new seal in guide tube with special tool P 381.

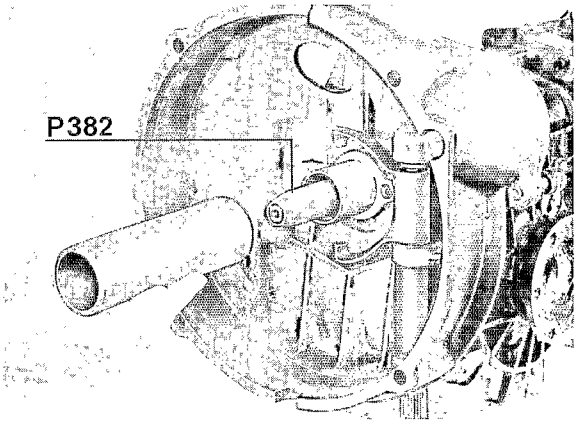
2. Place new rubber O-ring on neck of guide tube.



3. Slide special tool P 382 over splines of drive shaft.

4. Apply a light coat of lubricant to sealing lip of seal in guide tube and rubber O-ring on guide tube neck.

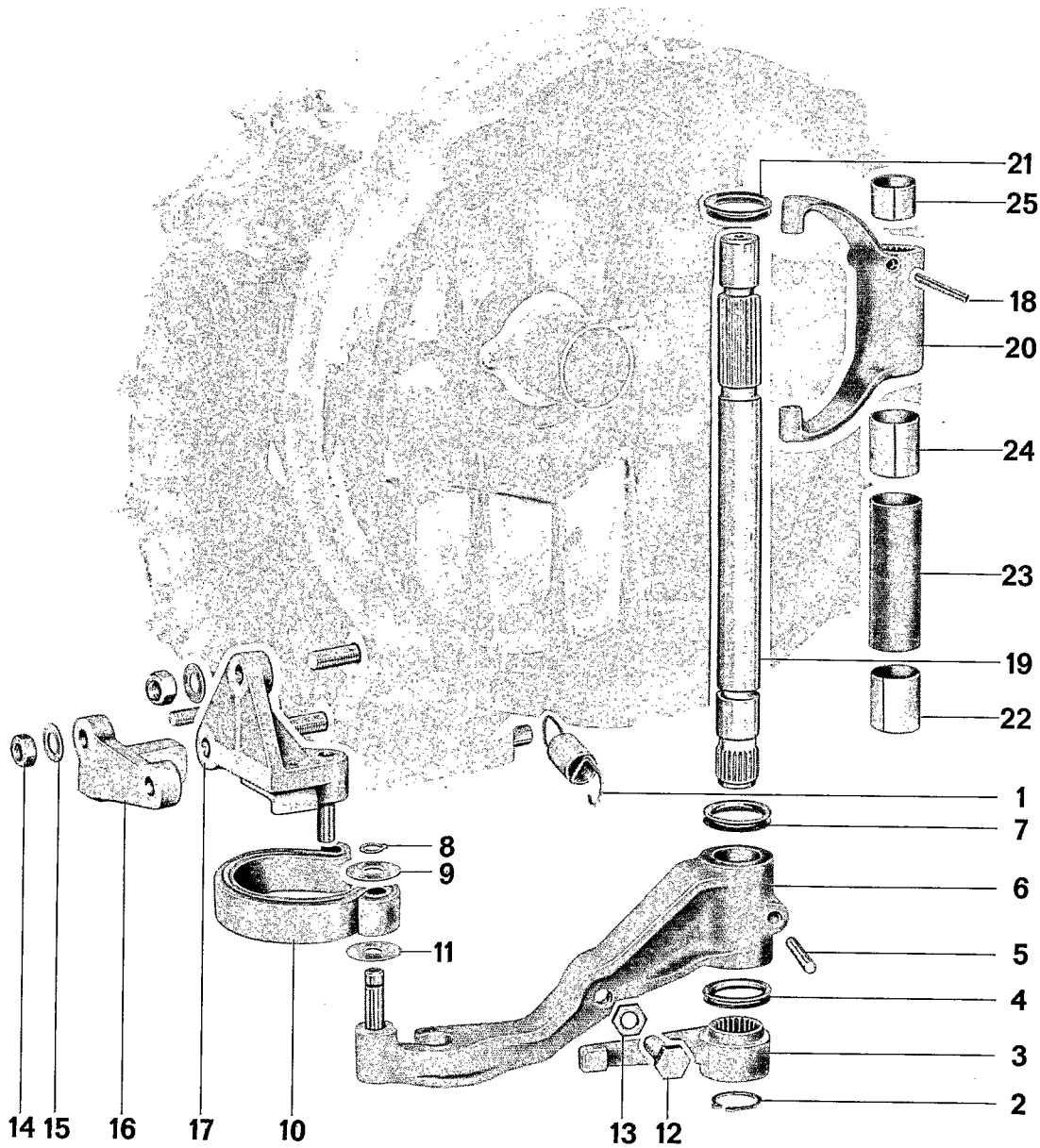
5. Drive in guide tube until positioned correctly.



6. Install mounting bolts and torque to specifications.

7. Coat release bearing guide tube with MoS2 paste.

TRANSMISSION CASE WITH AUXILIARY CLUTCH SPRING (1977 MODELS)



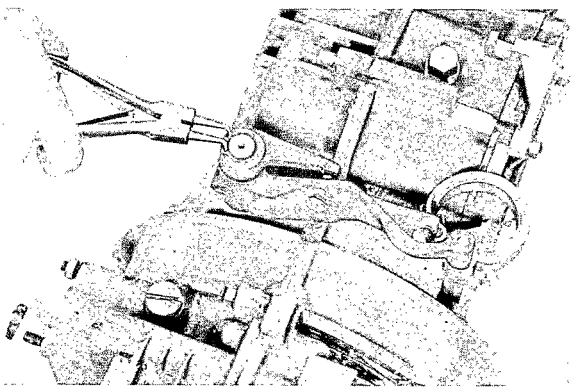
No.	Description	Qty.	Note when removing	Note when installing	Remarks
1	Spring	1			
2	Circlip	1		Replace, if necessary	
3	Adjusting lever	1		Adjust	
4	Seal	1		Replace, if necessary	
5	Round pin	1			omitted from March, 1979
6	Clutch release lever	1		Coat pin for spring with all-purpose lube containing MoS_2	
7	Seal	1		Replace, if necessary	
8	Circlip	1		Replace, if necessary	
9	Washer	1			
10	Auxiliary spring	1			
11	Washer	1			
12	Adjusting bolt	1			
13	Nut	1		Torque to specifications	
14	Nut	4		Torque to specifications	
15	Washer	4		Replace, if necessary	
16	Holder	1			
17	Base	1		Coat pin for spring with all-purpose lube containing MoS_2	
18	Spring pin	1		Replace, if necessary	
19	Lever shaft	1			

No.	Description	Qty.	Note when removing	Note when installing	Remarks
20	Release fork	1			
21	Seal	1		Replace, if necessary	
22	Bushing	1	Drive out with P 375	Drive in with P 375 until positioned correctly	3.1 - 5/28
23	Cover tube	1			
24	Bushing	1	Drive out with P 375	Drive in with P 375 until positioned correctly	3.1 - 5/28
25	Bushing	1		Replace, drive in	

DISASSEMBLING AND ASSEMBLING INSTRUCTIONS

Disassembling

1. Disengage spring for adjusting lever and remove circlip.



2. Pull adjusting lever off of lever shaft.

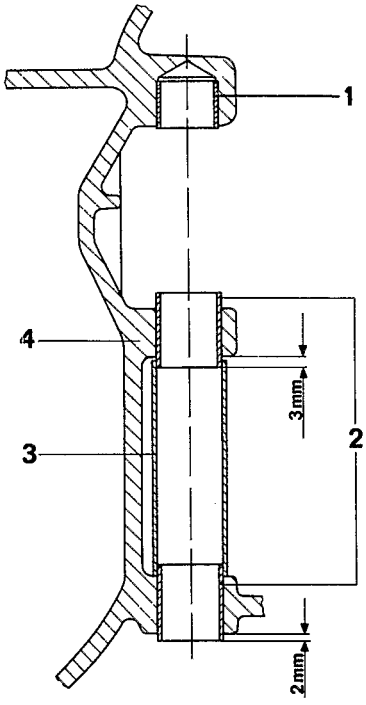
3. Release auxiliary spring. This requires pressing clutch release lever toward front transmission cover with an appropriate tool.

Note

When reaching the "dead point" the auxiliary spring will snap forward on its own.

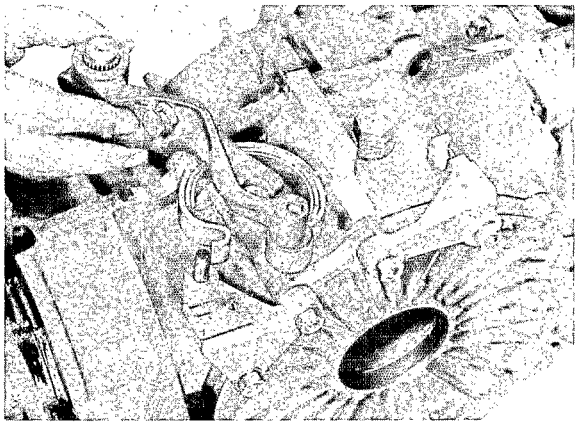
Assembling

1. Drive in bushings for lever shaft with Special Tool P 375 (see drawing) and coat with grease having a lithium or silicone base.

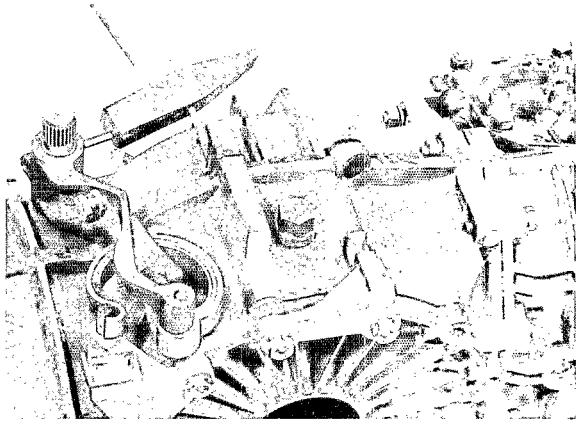


1 - Bushing
2 - Bushing, lever shaft
3 - Cover tube
4 - Transmission case

2. Install clutch release lever with spring and adjusting screw on splines of lever shaft.



3. Locate clutch release lever with a round pin.



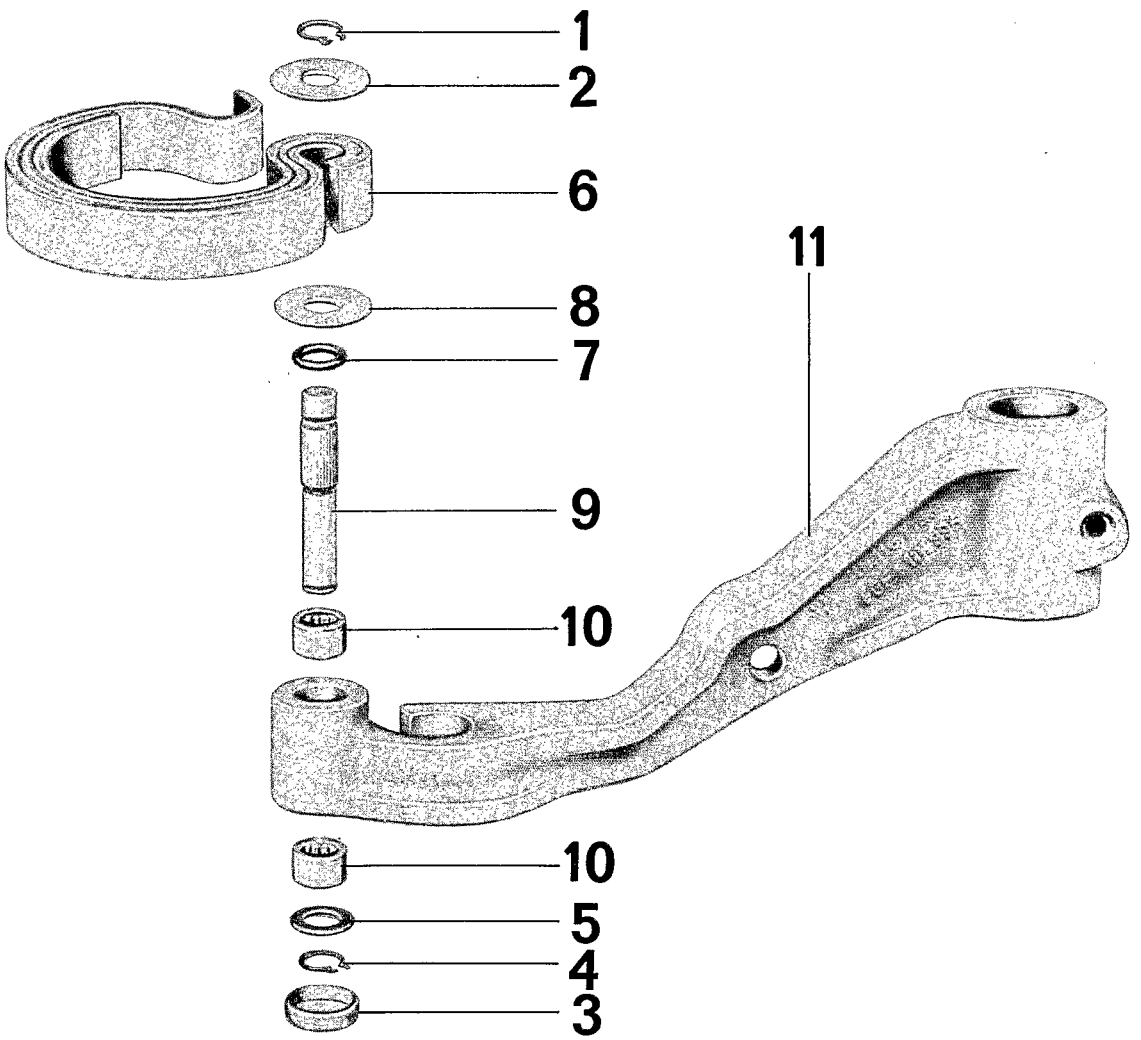
4. Tension auxiliary spring (must snap past the dead point to stop pin).



Note

Only install adjusting lever after engine/transmission lever is installed in car.

RELEASE LEVER - 1978 MODELS



No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Circlip	1		Replace, if necessary	
2	Washer	1			
3	Cover	1		Replace	
4	Circlip	1		Replace, if necessary	
5	Washer	1			
6	Auxiliary spring	1			
7	O-ring	1		Replace	
8	Washer	1		Replace	
9	Pin	1			
10	Needle bushing	2	Drive out with Tool No. 9153	Drive in to correct position with Tool No. 9153	3.1 - 5/31
11	Release lever	1			

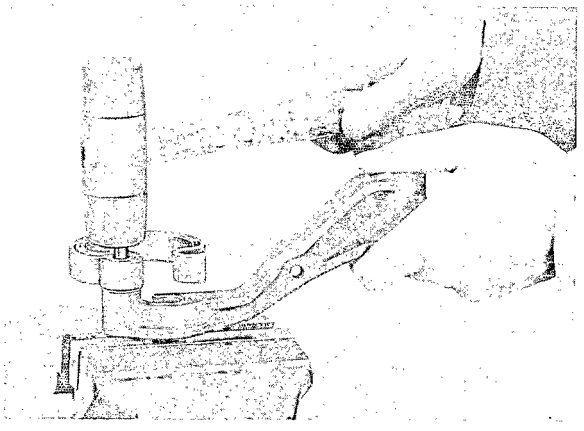
DISASSEMBLING AND ASSEMBLING INSTRUCTIONS

Disassembling

1. Remove upper circlip and drive pin down until cover falls out.

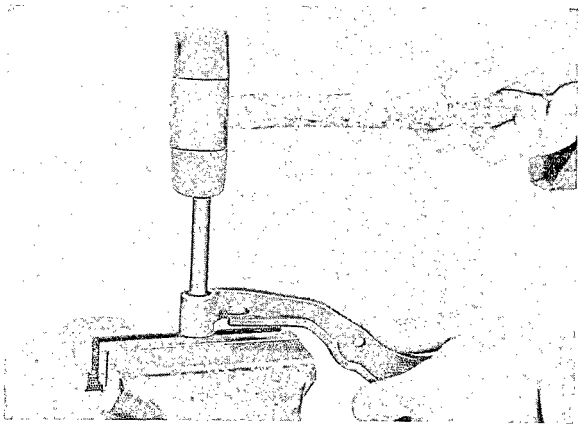
Note

This will deform the washer (item 8).



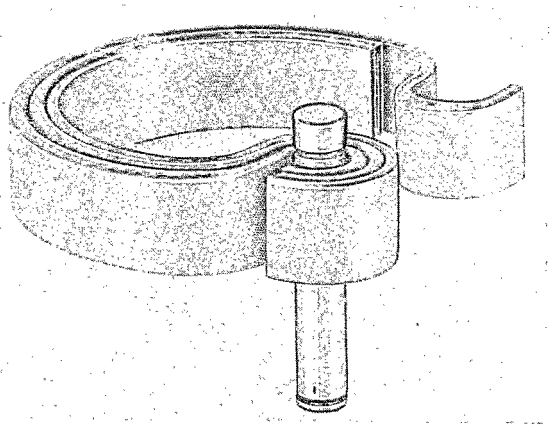
2. Remove lower circlip and pull out pin with spring.

3. Drive out needle bearings with Special Tool No. 9153.



Assembling

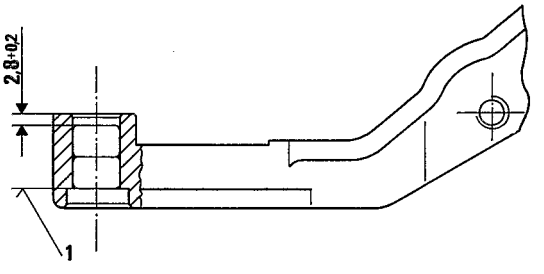
1. Drive pin into spring so that washer and circlip can just be installed.



2. Drive in needle bearings to correct position with Special Tool No. 9153.

Note

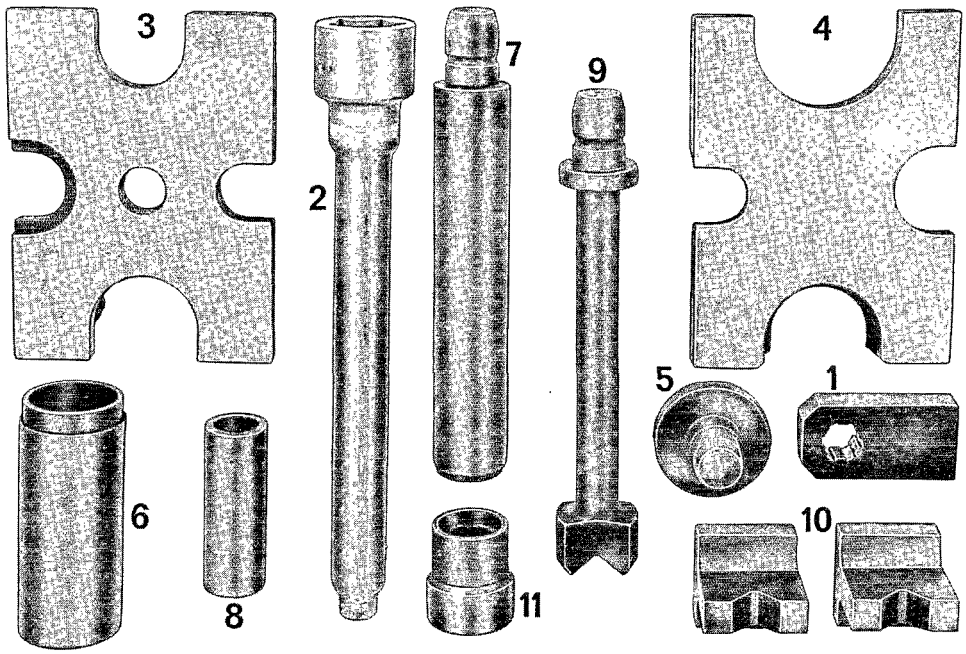
Lubricate needle bearings and bore of release lever with a waterproof lubricant (silicone or lithium-based) before installation.



1 - Flush

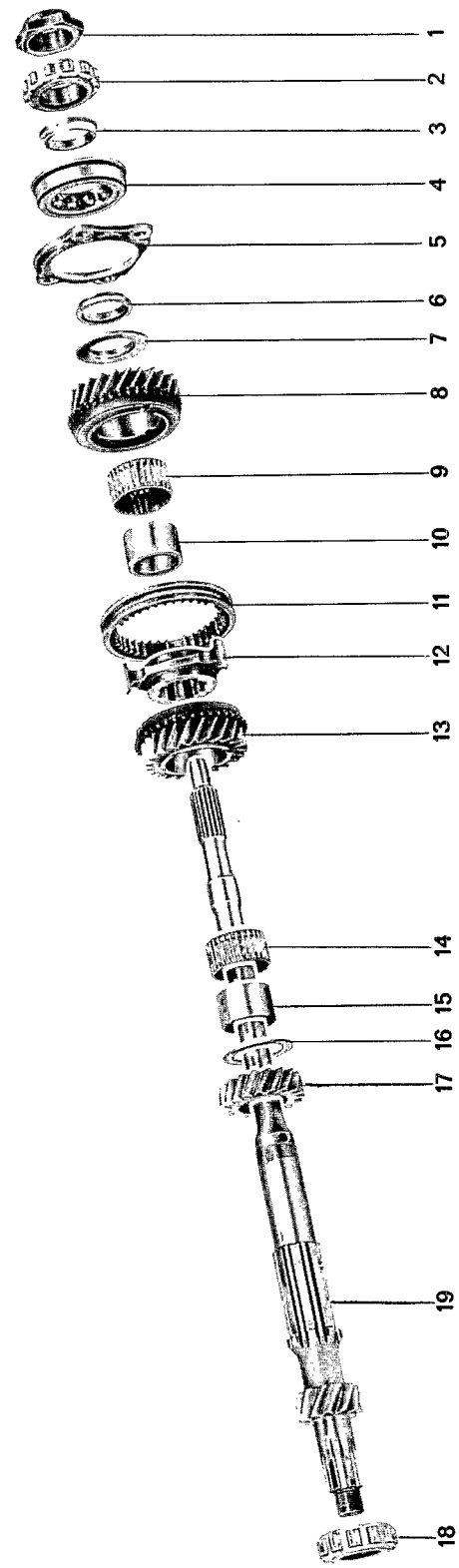
DISASSEMBLING AND ASSEMBLING INPUT SHAFT

TOOLS



Nr.	Description	Special Tool	Remarks
1	Support plate	P 355a	
2	Socket	P 252a	
3	Thrust plate	VW 401	
4	Thrust plate	VW 402	
5	Thrust disc	VW 412	
6	Thrust tube	VW 415a	
7	Press punch	VW 407	
8	Thrust tube	VW 416b	
9	Press punch	VW 405	
10	V-blocks	VW 406	Two each
11	Thrust tube	VW 454	

Disassembling and Assembling Input Shaft



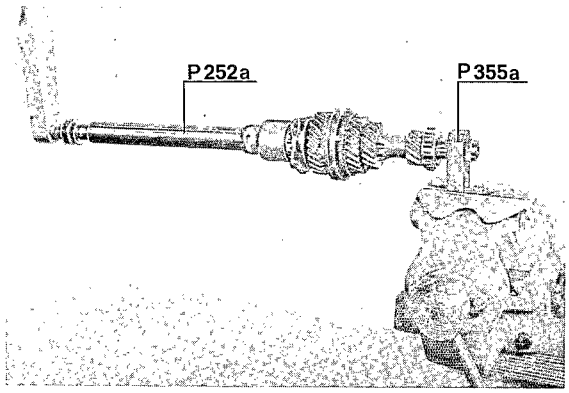
Nr.	Description	Qty.	Note when		Special instructions see
			Removing	Installing	
1	Flange nut	1	Remove with P 252a	Torque to specification, secure with center punch.	3.1-6/6
2	Roller bearing	1	Press off with VW 401, VW 402, and VW 412.	Press in with VW 401, VW 454, and VW 407.	
3	Bearing inner race	1	Keep together with bearing to ensure correct installation position.	Install as a matched set only. Heat to approx. 120°C (250°F) and drive on.	
4	Four-point bearing	1			
5	Bearing clamping plate	1			
6	Bearing inner race	1		Install as a matched set only. Heat to approx. 120°C (250°F) and drive on.	
7	Thrust washer	1			
8	4th speed	1		Check synchronization. Replace in pairs only.	3.1-8/4
9	Needle bearing	1	Fasten to respective gear and race with mechanic's wire.	Make sure bearings have not been interchanged.	
10	Needle bearing race	1	Fasten to respective gear and bearing with mechanic's wire.	Make sure races have not be interchanged.	
11	Shifting sleeve	1		Check for wear.	
12	Spider	1		Check for wear.	
13	3rd speed	1		Check synchronization. Replace in pairs only.	3.1-8/4

Nr.	Description	Qty.	Note when		Special instructions see
			Removing	Installing	
14	Needle bearing	1	Fasten to respective gear and race with mechanic's wire.	Make sure bearings have not been interchanged.	
15	Needle bearing race	1	Fasten to respective gear and bearing with mechanic's wire.	Make sure races have not been interchanged.	
16	Thrust washer	1			
17	2nd speed	1		Check for wear. Replace in pairs only.	
18	Roller bearing	1	Press off with VW 415a and VW 407	Press on with VW 416b and VW 412	
19	Input shaft	1		Check for runout.	3.1-6/7

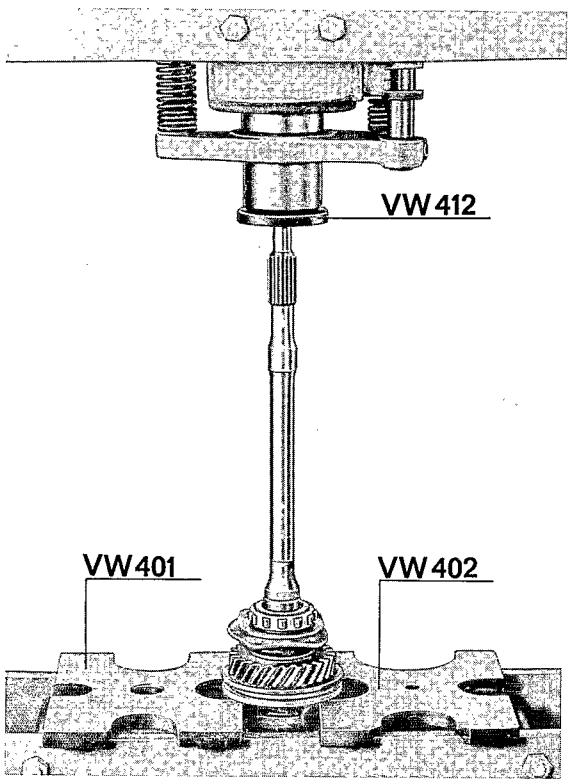
DISASSEMBLING AND ASSEMBLING INPUT SHAFT

Disassembling

1. Mount support plate P 355a in a vise. Insert input shaft and remove flange nut with special tool P 252a.

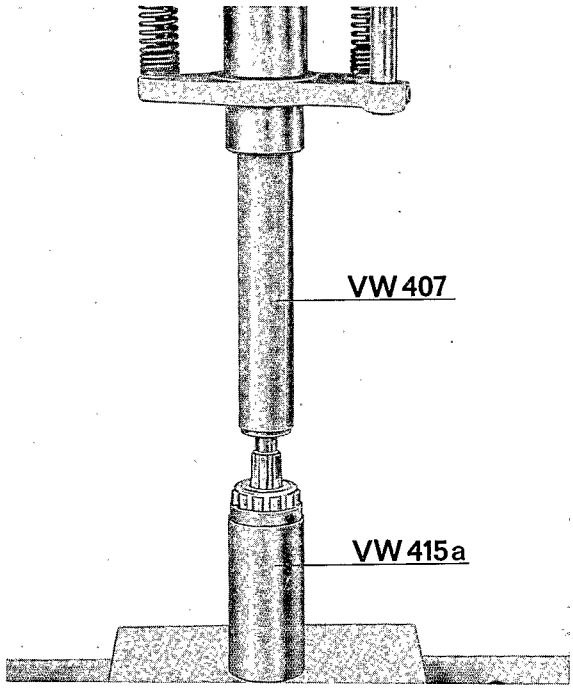


2. Press roller bearing off input shaft with thrust plates VW 401 and VW 402, and thrust disc VW 412.



3. When removing other parts, wire needle bearings races, and respective gears together for correct reinstallation.

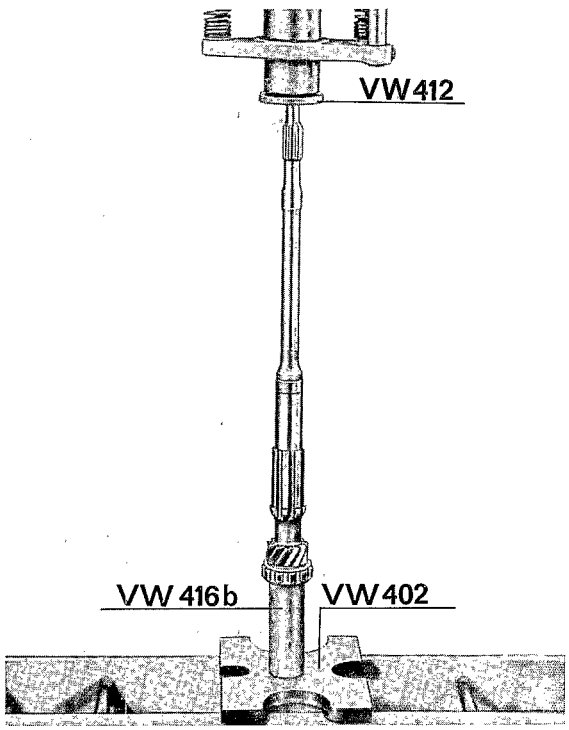
4. Press roller bearing off input shaft with thrust tube VW 415a and press punch VW 407.



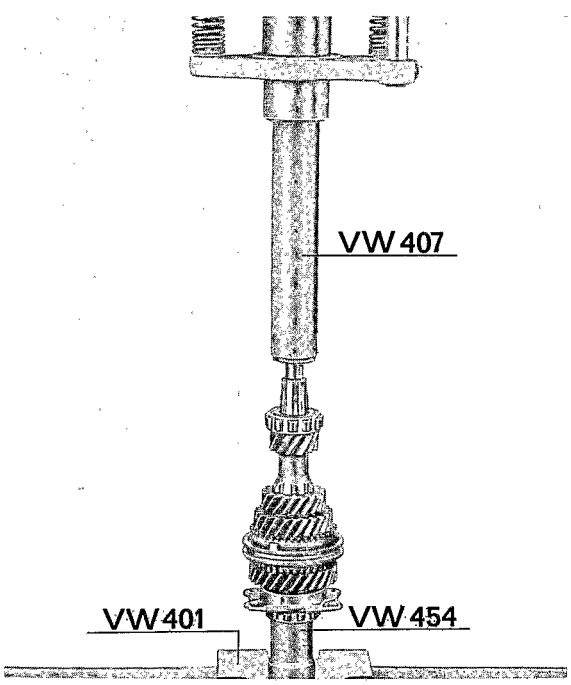
Assembling

Caution
Assemble all input shaft parts dry. Make sure oil does not enter between the contact surfaces.

1. Press roller bearing on with thrust disc VW 412 and press thrust tube VW 416b.



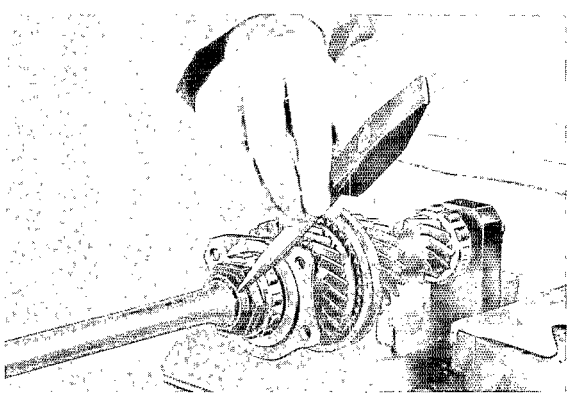
2. Press roller bearing on with thrust plate VW 401 and thrust tube VW 454 and press punch VW 407.



Caution
When reinstalling needle bearings and races, make sure they are not interchanged with those of another gear.

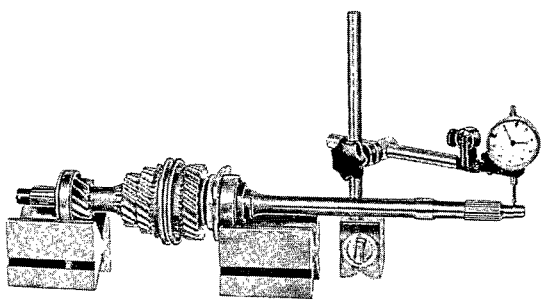
3. Torque flange nut to specification with special tool P 355a and P 252a.

4. Rock flange nut in place with center punch.



Always check input shaft for runout when it is fully assembled and the flange nut torqued to proper specification.

1. Remove the input shaft outer bearing races from the transmission and final drive housings and place them on the pinion shaft (substitute bearings can be used).

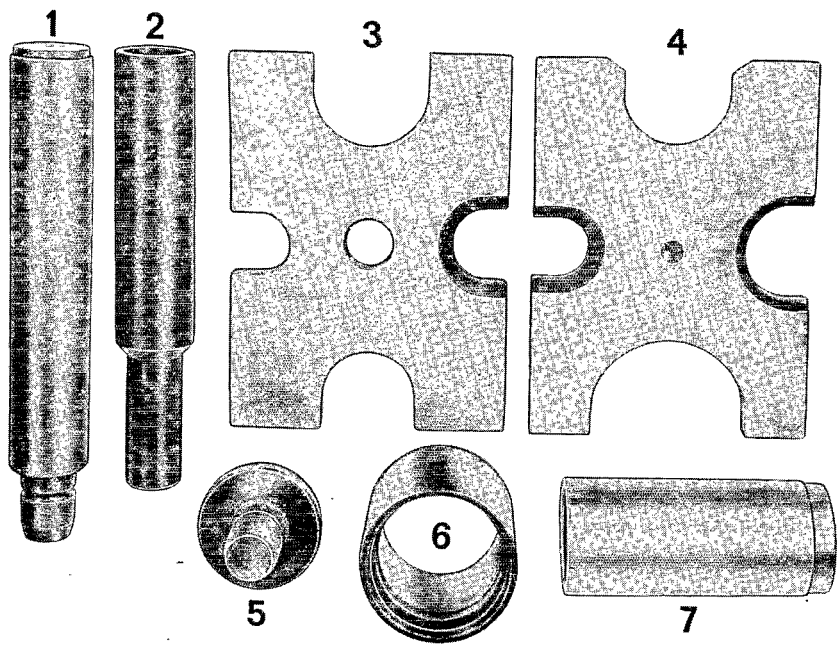


2. Place assembled pinion shaft with bearing outer races on V-blocks VW 406. Check for runout as shown in illustration. Maximum runout = 0.1 mm (0.004 in.).

3. The input shaft can be straightened while cold if the runout does not exceed 0.3 mm (0.012 in.). Use press with V-blocks VW 406 and press punch VW 405.

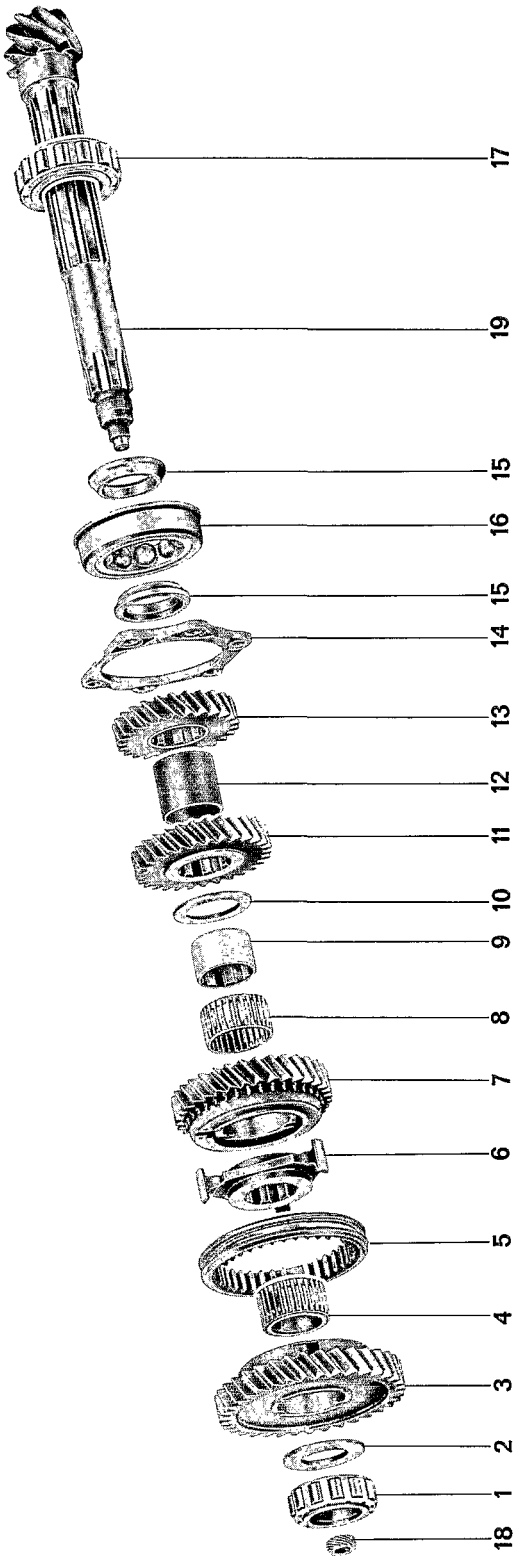
DISASSEMBLING AND ASSEMBLING PINION SHAFT

TOOLS



Nr.	Description	Special Tool	Remarks
1	Press punch	VW 407	
2	Thrust sleeve	VW 244b	
3	Thrust plate	VW 401	
4	Thrust plate	VW 402	
5	Thrust disc	VW 412	
6	Thrust tube	P 255a	
7	Thrust tube	VW 415a	

Disassembling and Assembling Pinion Shaft



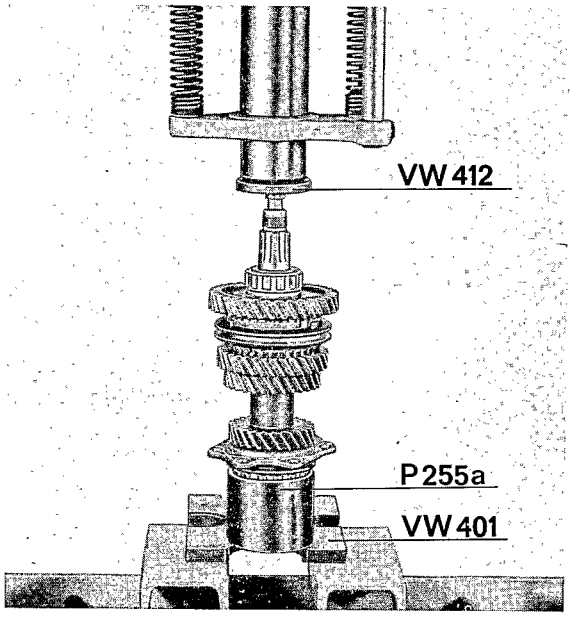
Nr.	Description	Qty.	Note when Removing	Note when Installing	Special instructions see
1	Roller bearing	1	Press off pinion shaft with VW 401, VW 412, and P 255 a.	Press on with VW 407 and VW 415 a.	
2	Thrust washer	1			
3	1st speed	1		Check synchronization. Replace only in pairs.	From 1977 Models with asymmetric tooth point of clutch body
4	Needle bearing	1	Fasten to respective gear with mechanic's wire.	Make sure bearings have not been interchanged.	
5	Shift sleeve	1		Check for wear..	From 1977 Models with asymmetric tooth point of 1st gear. Note direction of installation (see Page 3.1-7/6)
6	Synchro hub	1		Check for wear.	From 1977 Models reinforced
7	2nd speed	1		Check synchronization. Replace only in pairs.	3.1 - 8/4
8	Needle bearing	1	Fasten to respective gear and race with mechanic's wire.	Make sure bearings have not been interchanged.	
9	Needle bearing race	1	Fasten to respective gear and bearing with mechanic's wire.	Make sure races have not been interchanged.	
10	Thrust washer	1			
11	3rd speed	1		Large, smooth surface must face thrust washer. Replace only in pairs.	
12	Spacer bushing	1			

Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
13	4th speed	1		Large, smoothly ground surface faces four-point bearing. Replace only in pairs.	
14	Clamping plate	1			
15	Bearing inner race	2	Press off with VW 401, VW 412, and P 255a.	Heat to approx. 120°C (250°F) and drive on.	
16	Four-point bearing	1		Check for wear.	
17	Roller bearing	1	Press off with VW 401, VW 412, and P 255a.	Press on with VW 407 and VW 415a.	3.1-7/5
18	Speedometer drive, Gear I	1	Remove with puller.	Heat to approx. 120°C (250°F) and drive on.	3.1-7/5
19	Pinion shaft	1		Readjust if necessary.	5.1-4/1

DISASSEMBLING AND ASSEMBLING PINION SHAFT

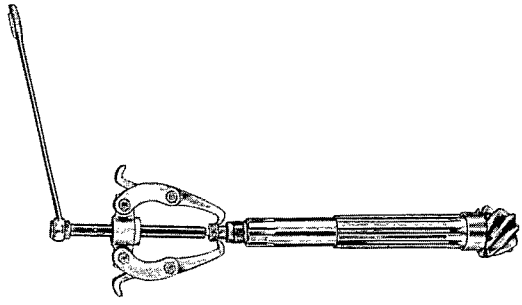
Disassembling

1. Press roller bearing off pinion shaft with thrust plate VW 401, disc VW 412, and tube P 255a.



2. Remove components from pinion shaft. Wire needle bearings and races to respective gears to prevent interchanging of parts during re-assembly.

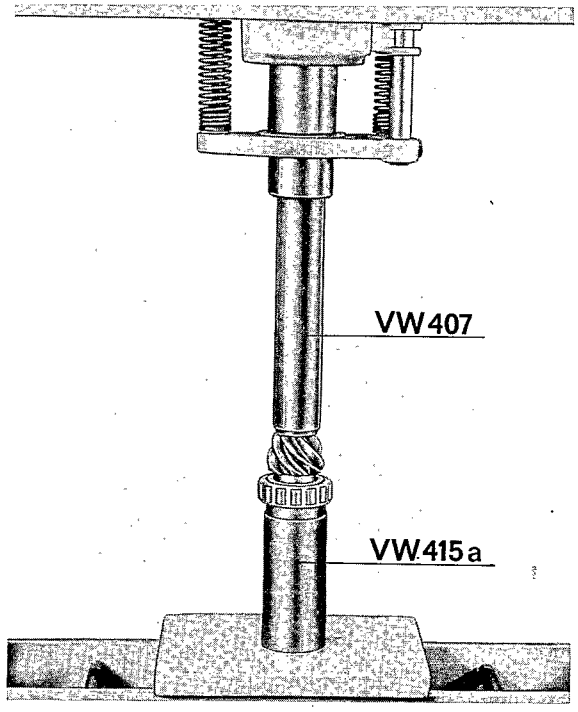
3. Remove speedometer drive Gear I.



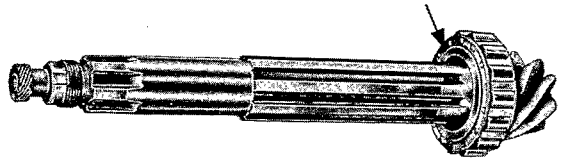
Assembling

Assemble all pinion shaft parts dry. Make sure that no oil enters between the contact surfaces. Pinion shaft and ring gear are marked with paired numbers. Check that these numbers match before assembling.

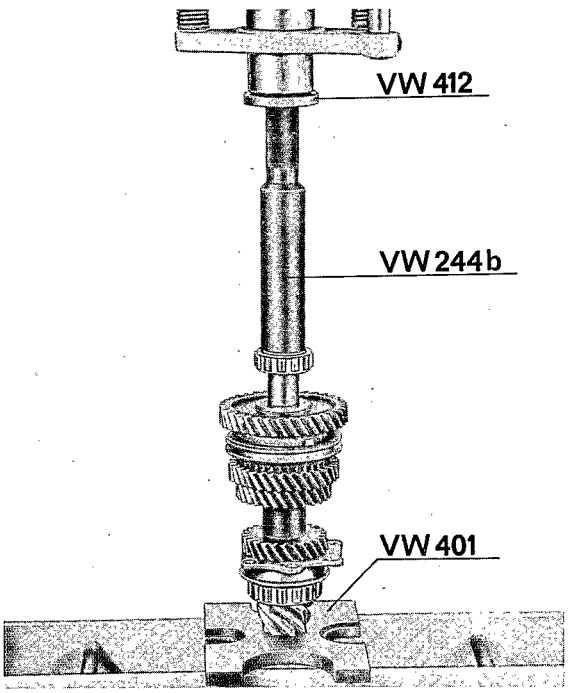
1. Press roller bearing on with press punch VW 407 and tube 415a.



Note
Install bearing so that the ring of the two part roller cage faces the gears.



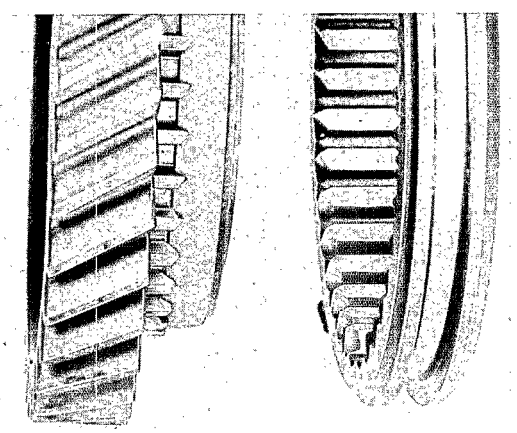
2. Press small roller bearing on pinion shaft using thrust disc VW 412 and thrust sleeve VW 244b.



3. Heat speedometer drive gear I to 120°C (250°F) and drive on.

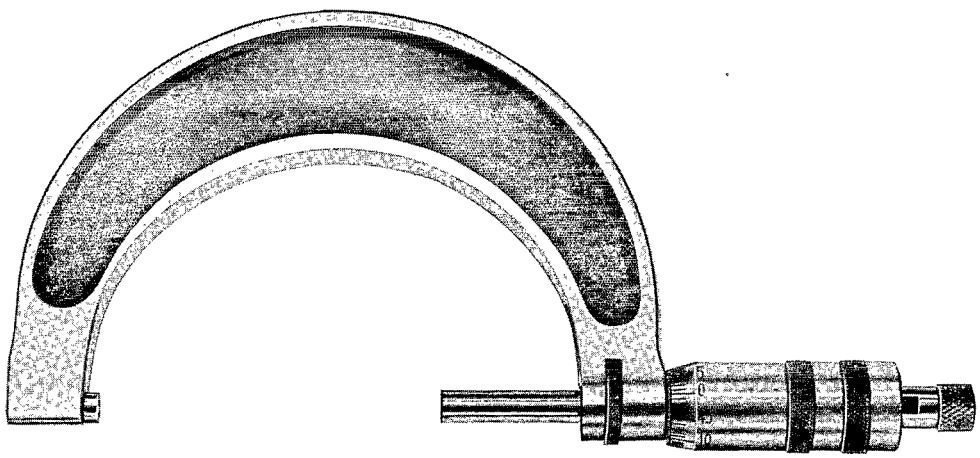
Modifications from 1977 Models

The asymmetrical pointed teeth of 1st/2nd gear operating sleeve must face toward 1st gear wheel.



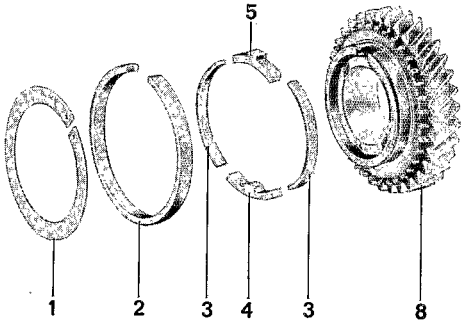
DISASSEMBLING AND ASSEMBLING SYNCHRONIZERS

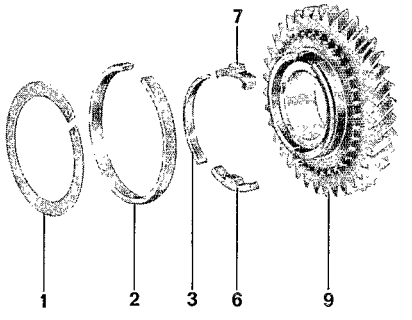
TOOLS



Nr.	Description	Special Tool	Remarks
	Micrometer	-	Size: 75-100 mm

Disassembling and Assembling Synchronizers



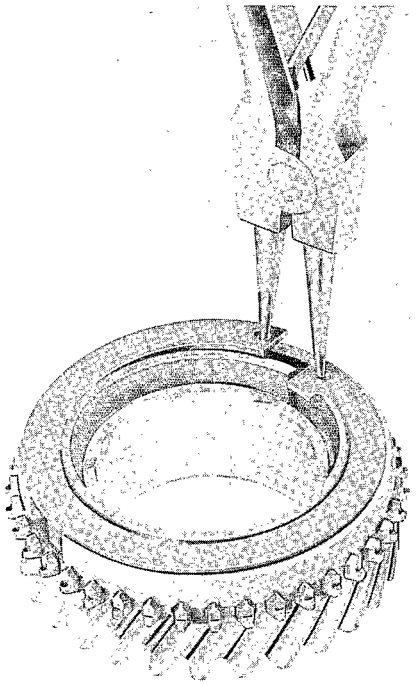


Nr.	Description	Qty	Note when		Special instructions see
			Removing	Installing	
1	Circlip	1	Remove with pliers.	Install with pliers.	
2	Synchronizing ring	1		Check for wear.	
3	Brake band, only 1 for 1st speed	2		Place on proper side in 1st speed.	3.1-8/3
4	Brake band anchor block, 2nd speed	1			
5	Thrust block, 2nd speed	1			
6	Brake band anchor block, 1st speed	1		Position properly.	3.1-8/3
7	Thrust block, 1 st speed	1		Position properly.	3.1-8/3
8	Gear, 2nd speed	1			
9	Gear, 1st speed	1			

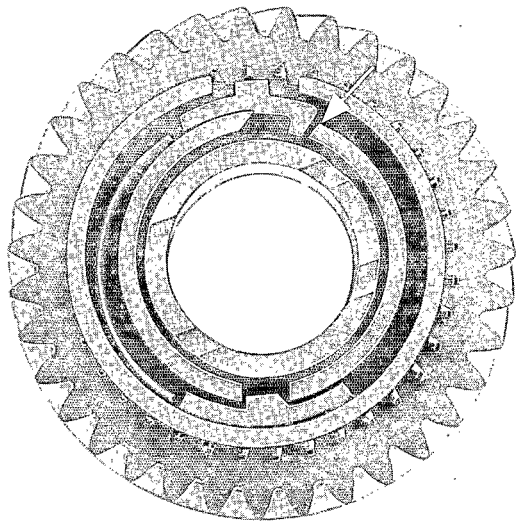
DISASSEMBLING AND ASSEMBLING SYNCHRONIZERS

Disassembling

1. Remove the circlip from the gear. Check all parts for wear and damage and replace as necessary.

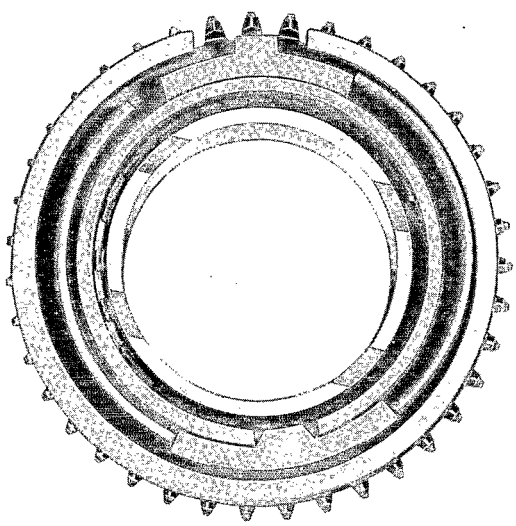


2. When assembling the 1st gear synchronizer, make sure to install only one brake band (see illustration).



Assembling

1. Place synchronizing ring on clutch carrier. Make sure rough ring surface faces the shift sleeve. Insert thrust block, anchor block, and brake band(s).

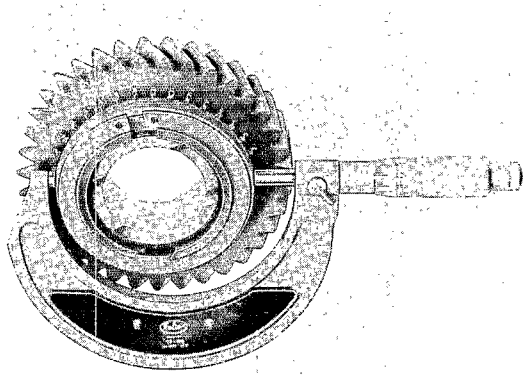


Note
Clutch carrier and brake band energizer have matching contour and must be installed in such positions (see arrow).

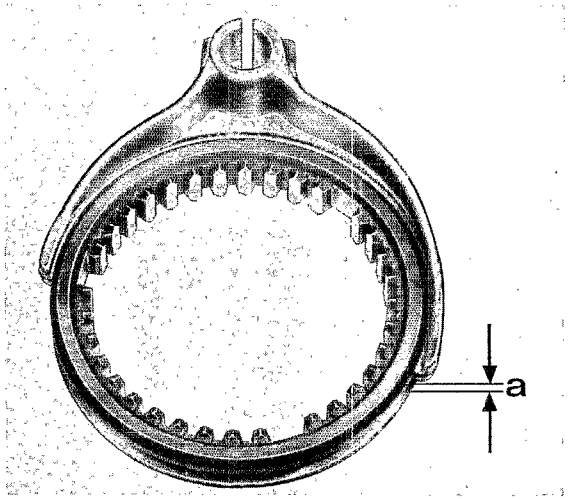
3. Install retaining ring with retaining ring plier.

Checking

1. Using a micrometer, check diameter of installed synchronizing ring. Place micrometer at the highest point of the synchronizing ring.



2. Maximum clearance between selector fork and shifting sleeve of 1st through 5th speed: Dimension a = 0.5 mm (0.02 in.).



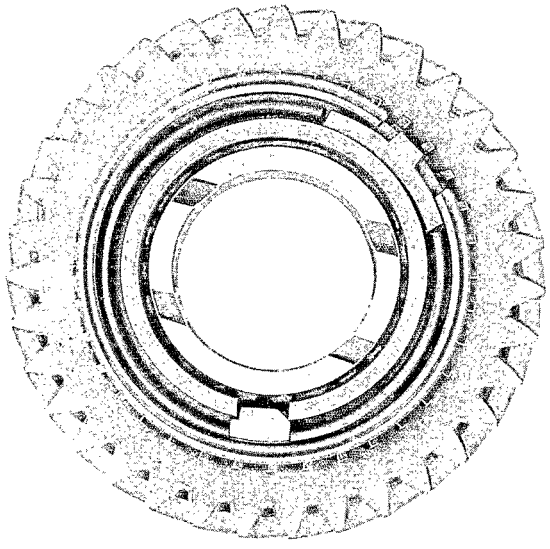
Diameter:

3rd, 4th, and 5th speed = 76.3 ± 0.18 mm
1st and 2nd speed = 86.37 ± 0.17 mm

MODIFICATIONS - 1977 MODELS

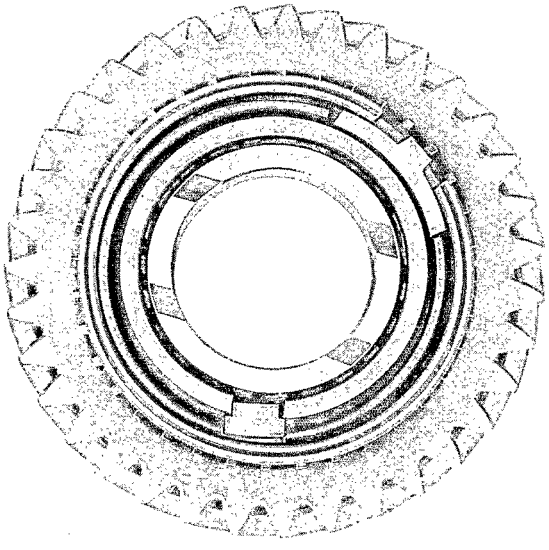
The synchronization for 1st and 2nd gears has been modified on the 1977 Models.

1. 1st gear synchronizing parts.

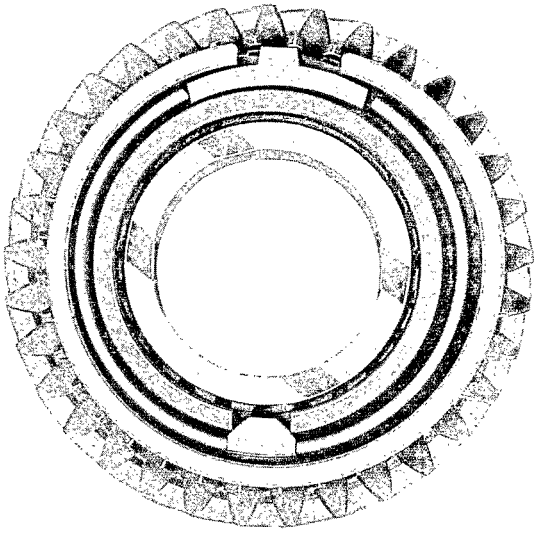


Note

An altered anchor block (see photo) will be introduced later for 1st gear.



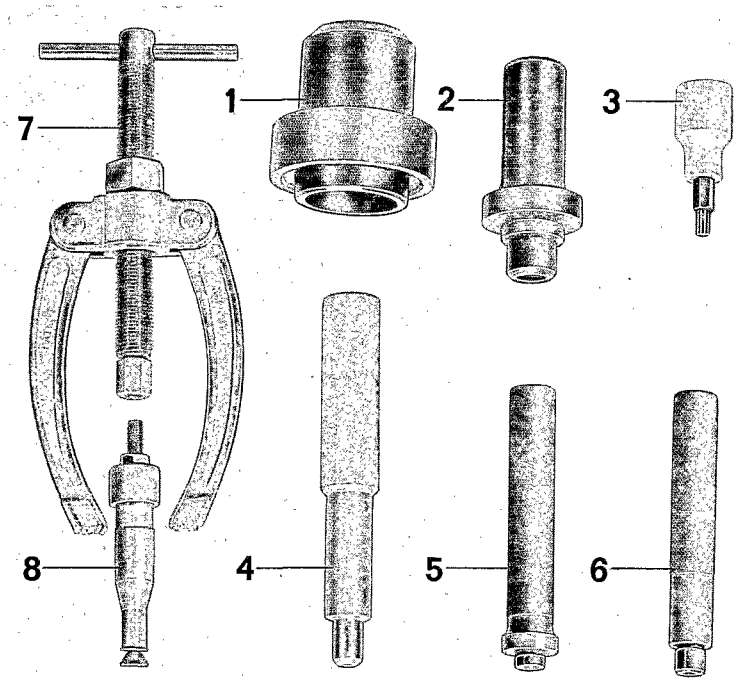
2. 2nd gear synchronizing parts.



3. The installation diameter of the synchronizing rings has not been changed (see Page 3.1 - 8/4).

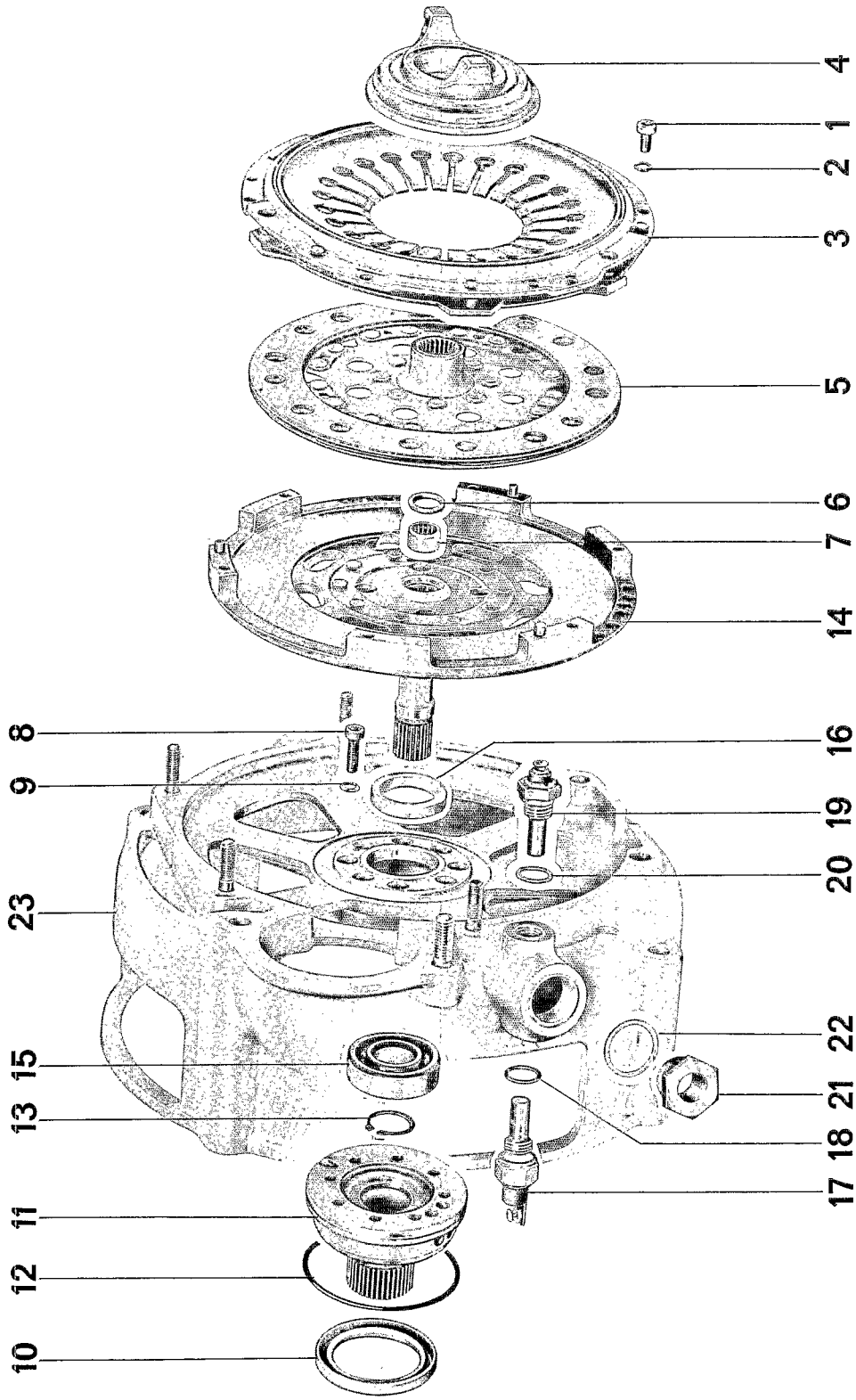
DISASSEMBLING AND ASSEMBLING TORQUE CONVERTER HOUSING

TOOLS



Nr.	Description	Special Tool	Remarks
1	Installer	P 358 a	
2	Installer	P 359	
3	Socket, 6 mm, 12-point	US 103 C	
4	Centering mandrel	P 370	
5	Mandrel	P 362	
6	Mandrel	P 361	
7	Support	---	Local purchase item
8	Internal puller	---	Local purchase item

Disassembling and Assembling Torque Converter Housing

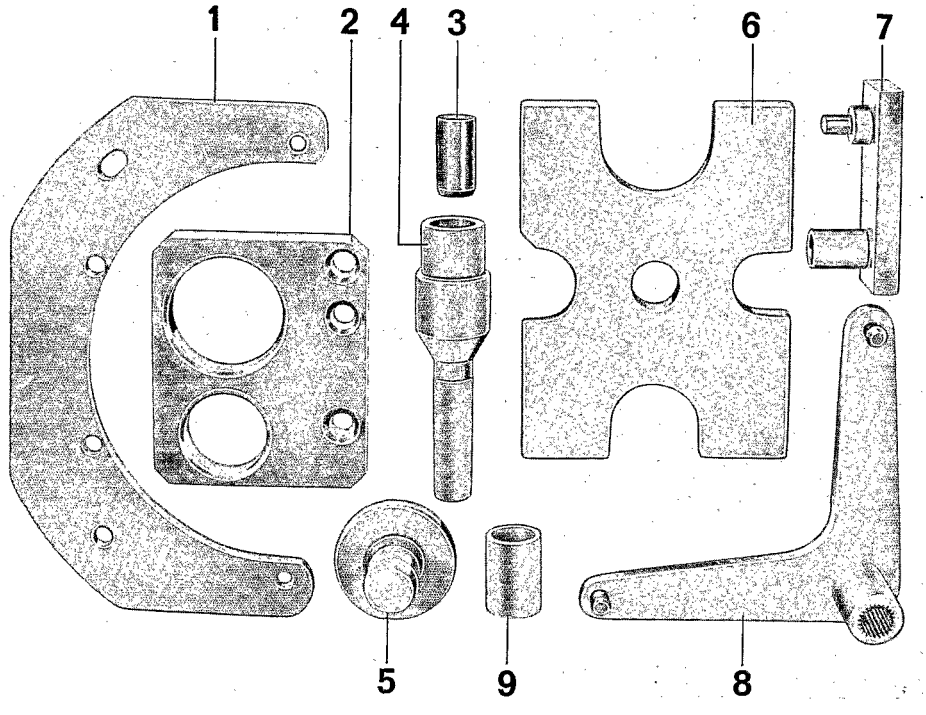


Nr.	Description	Qty.	Note when removing	Note when installing	Special instructions see
1	Socket-head bolt	6	loosen evenly in criss-cross pattern	Tighten evenly in criss-cross pattern to specified torque.	
2	Lock washer	6		Replace if necessary.	
3	Pressure plate	1		Check wear.	
4	Throwout bearing	1		Do not wash in solvents, only dry wipe.	
5	Clutch disc	1		Check wear, check free movement on splines between clutch plate and input shaft.	
6	Oil seal	1	Remove with puller	Install with P 362.	
7	Needle bearing	1	Remove with puller	Install with P 362, lubricate with a mixture of multi-purpose grease and Molykote type lubricant.	
8	Socket-head bolt	8		Tighten evenly to specified torque.	
9	Oil seal	8		Replace.	
10	Oil seal	1	Remove together with freewheeling support	Oil torque converter seating surface, drive in with P 358a.	
11	Stator support	1		Using two (6x60) bolts, drive out with alternating forces applied from turbine shaft side.	
12	0-ring	1		Oil lightly	
13	Snap ring	1		Replace. Check seating.	
14	Turbine shaft	1	Drive out. Assure firm support under torque converter housing.	Check wear.	
15	Ball bearing	1	Drive out with punch.	Heat torque converter housing to 120°C, drive in with P 359.	

Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
16	Oil seal	1	Push out with screwdriver.	Oil torque converter seating surface, drive in with P 359.	
17	Temperature switch	1		Tighten to correct torque.	
18	Oil seal	1		Replace	
19	Temperature sender	1		Tighten to correct torque.	
20	Oil seal	1		Replace	
21	Threaded coupling	1		Tighten to correct torque.	
22	Oil seal	1		Replace	
23	Torque converter housing	1			

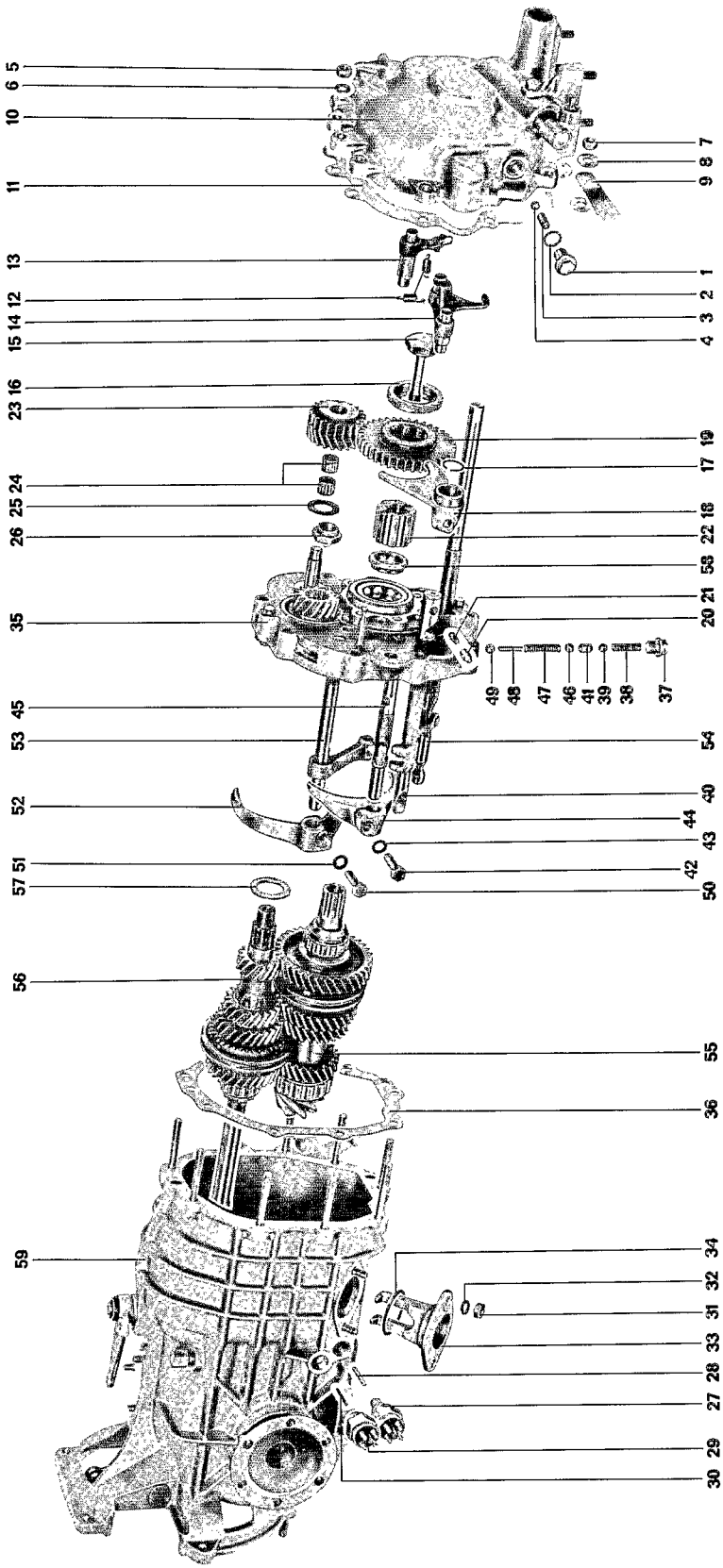
DISASSEMBLING AND ASSEMBLING TRANSMISSION

TOOLS



Nr.	Description	Special Tool	Remarks
1	Assembly plate	P 351	
2	Holding plate	P 260	
3	Sleeve	P 364	
4	Installer	P 360	
5	Thrust piece	VW 412	
6	Press plate	VW 401	
7	Remover	P 353a	
8	Input shaft holder	P 37	
9	Thrust sleeve	VW 426	

Disassembling and Assembling Transmission



Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Cap screw	1		Tighten to correct torque.	
2	Oil seal	1		Replace	
3	Spring	1			
4	Ball, 9 mm	1			
5	Lock nut	9		Replace if necessary. Tighten to correct torque.	
6	Washer	9			
7	Lock nut	2		Replace if necessary. Tighten to correct torque.	
8	Washer	2		Place on ahead and one behind the ground strap.	
9	Ground strap	1			
10	Transmission front cover	1			
11	Gasket	1		Replace	
12	Spring	2			
13	Parking lock lever	1			
14	Parking lock pawl	1			
15	Expansion bolt	1	Engage 4th gear, block input shaft with P 37.	Oil contact surface. Tighten to correct torque. Ensure correct seating of speedometer drive gear.	4.1 - 2/9
16	Speedometer drive gear	1		Must still have clearance after expansion bolt has been tightened.	
17	Lock ring	1		Replace	

Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
18	Shift fork for reverse gear	1	Push detent pin in. Remove with selector gear.	Check wear.	4.1 - 2/9
19	Reverse selector	1		Check wear.	
20	Detent pin	1		Small end faces out.	
21	Spring	1			
22	Splined bushing	1		Speedometer drive groove faces expansion bolt head.	
23	Reverse idler gear assembly	1		Check wear.	
24	Needle bearing cage	2		Check wear.	
25	Thrust needle bearing	1		Check wear.	
26	Flange nut	1		Tighten to correct torque, secure with center punch.	
27	Bypass bridging	1		Tighten to correct torque.	
28	Plunger	1			
29	Backup light switch	1		Tighten to correct torque.	
30	Plunger	1			
31	Nut	2		Tighten to correct torque.	
32	Spring washer	2		Replace.	
33	Fork piece	1		Insert only when no gear is engaged.	
34	0-ring	1		Oil lightly.	
35	Immediate plate	1	Pull off studs with components in items 37-58.		

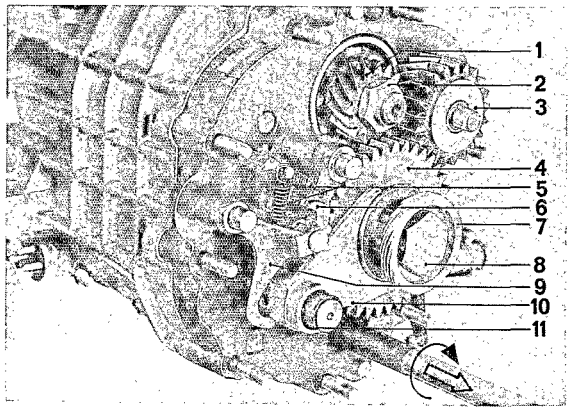
Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
36	Gasket	X	Note quantity and thickness.	Recalculate if necessary.	
37	Plug	1		Tighten to correct torque.	
38	Spring	1			
39	Ball, 9 mm	3			
40	Reverse gear shift rod	1			
41	Detent	1			
42	Bolt	2		Tighten to correct torque	
43	Spring washer	2		Replace.	
44	Shift fork, 1st and 2nd gear	1	Mark for reassembly	Check wear.	
45	Shift rod, 1st and 2nd gear	1		Adjust.	
46	Ball, 9 mm	3			
47	Spring	1		Insert large detent with some grease, install spring and pin together with spring.	
48	Detent (large)	1			
49	Ball, 9 mm	3			
50	Bolt	2		Tighten to correct torque.	
51	Spring washer	1		Replace.	
52	Shift fork, 3rd and 4th gear	1	Mark for reassembly.	Check wear, readjust.	
53	Shift rod, 3rd and 4th gear	1		Adjust.	
54	Shift fork rod and selector lever	1		Insert before installing intermediate plate.	

Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
55	Pinion shaft	1	Press out of intermediate plate with P 353a.		
56	Input shaft	1			
57	Spacer	1			
58	Bearing inner race half	1		Press in with VW 401, 412 and 426.	4.1 - 2/8
59	Transmission housing	1			

DISASSEMBLING AND ASSEMBLING TRANSMISSION

Disassembling

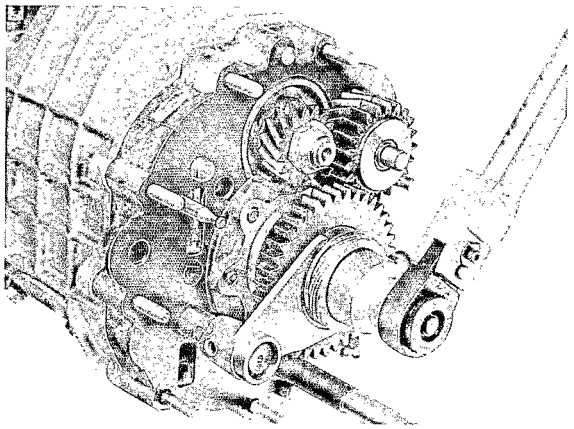
1. Engage 4th gear (turn shift rod to the right and pull outward).



1. Gear I, reverse gear
2. Flanged nut
3. Reverse idler gear assembly
4. Reverse selector gear
5. Parking lock springs
6. Speedometer drive gear
7. Speedometer drive gear
8. Expansion bolt
9. Parking lock lever
10. Shift fork, reverse gear
11. Snap ring

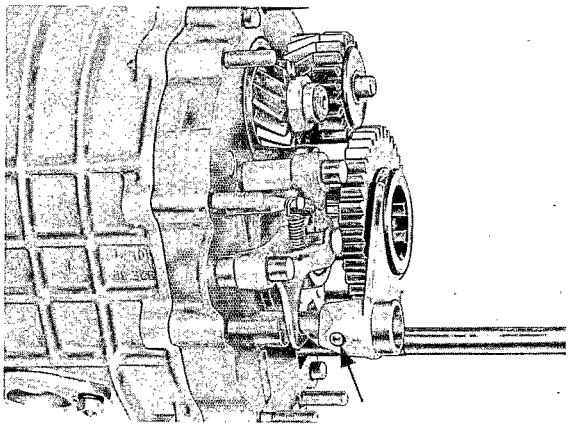
2. Detach parking lock springs, remove pawl and lever.

3. Lock input shaft with P 37 holder. Loosen pinion shaft expansion bolt and remove together with speedometer drive gear.



4. Remove snap ring from reserve gear shift rod and parking lock.

5. Remove selector gear and shift rod for reverse gear; this requires pushing the detent pin in.



5. Slide intermediate plate and gear assembly into transmission housing. Then using four spacer bushings on four of the studs, tighten intermediate plate in a criss-cross pattern.

6. Block input shaft with P 37 holder, slide splined bushing into place, and tighten expansion bolt (without speedometer drive gear) to correct torque.

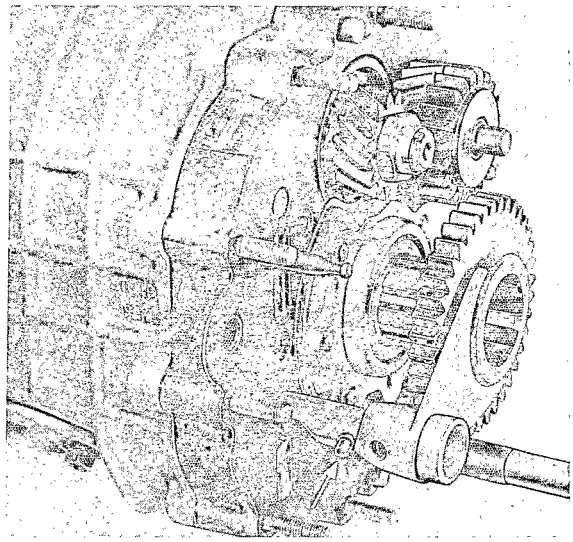
Note

The expansion bolt is later removed when installing selector gear and shift forks.

7. Remove intermediate plate with the assembled gears in order to install and adjust shift forks.

8. Assemble selector lever. Tapered hole in the shift rod must point in same direction as the selector lever.

9. Install reverse selector gear and shift fork. Detent pin in shaft rod for reverse gear and parking lock must be pushed in.



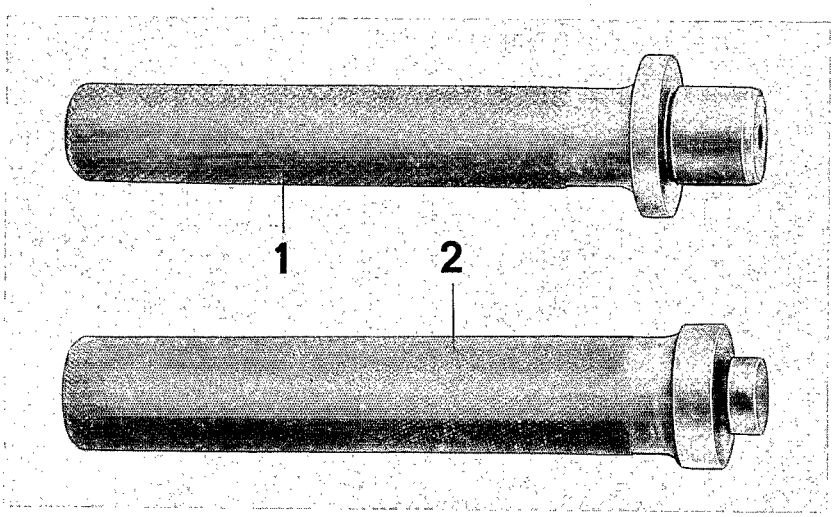
10. Remove pinion shaft expansion bolt and oil bolt head contact surface. Install bolt together with the speedometer drive gear. Make sure that the speedometer drive gear is properly seated on the end of the splined bushing.

11. Lightly coat the 0-ring for the selector lever guide fork with oil.

12. Place special tool P 364 on the input shaft. Position the oil seal so the sealing lip is toward the transmission. Then drive the seal in place with special tool P 360 until the tool bottoms.

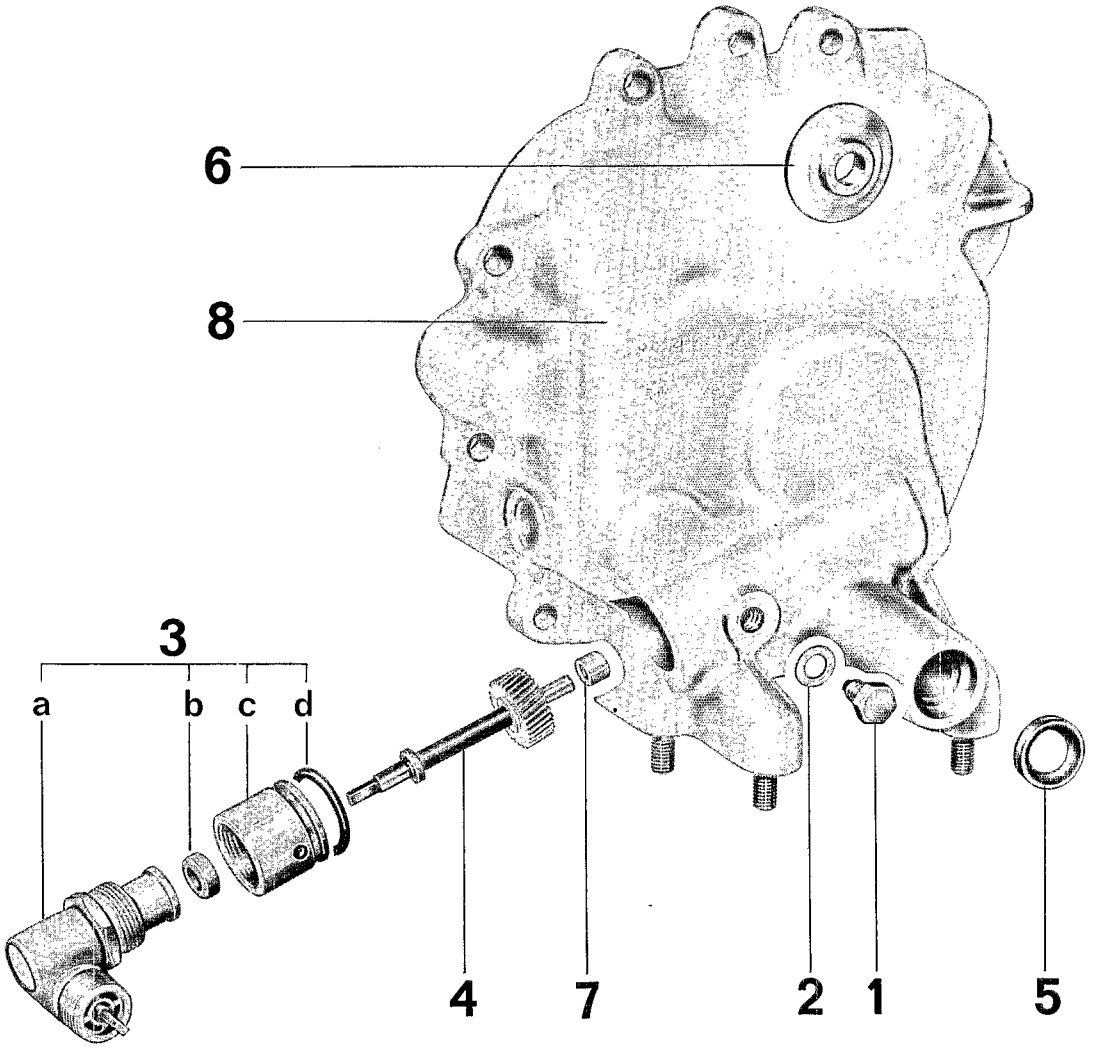
DISASSEMBLING AND ASSEMBLING TRANSMISSION FRONT COVER

TOOLS



Nr.	Description	Special Tool	Remarks
1	Mandrel	P 218	
2	Mandrel	P 362	

Disassembling and Assembling Transmission Front Cover

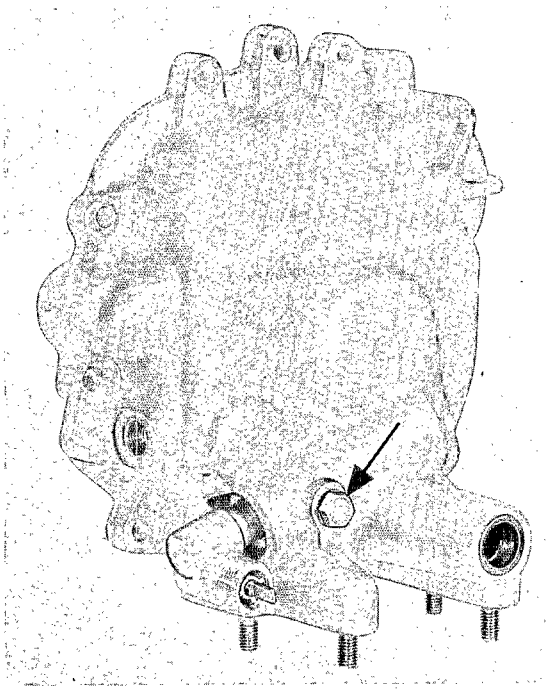


Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Speedometer drive retaining bolt	1		Tighten to specified torque.	
2	Washer	1			
3	Speedometer drive (complete)	1		Blind hole in guide bushing lines up with hole in cover.	
3a	Elbow adapter	1			
3b	Seal	1		Replace if necessary.	
3c	Guide bushing	1			
3d	0-ring	1		Oil lightly.	
4	Gear shaft	1			
5	Seal	1		Drive in with P 218.	4.1 - 3/5
6	Thrust washer	1	Heat cover to approx. 120° C (250° F) on a hot plate and pry out.	Drive in to bottom with P 362.	
7	Bushing	1	Heat cover to approx. 120° C (250° F) on a hot plate and pull out. Drill out if necessary.	Heat cover to approx. 120° C (250° F) and drive in with an appropriate mandrel.	
8	Transmission front cover	1			

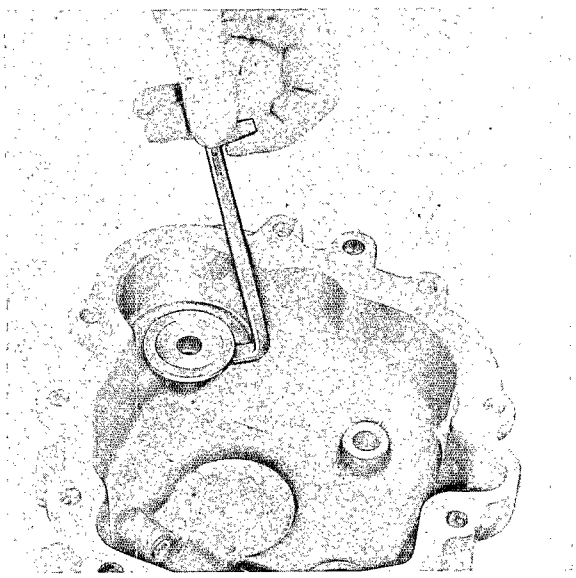
DISASSEMBLING AND ASSEMBLING

Disassembling

1. Remove speedometer drive retaining bolt, pull out elbow adapter and gear shaft.



2. Pry out thrust washer for reverse idler gear assembly by prying on both sides.

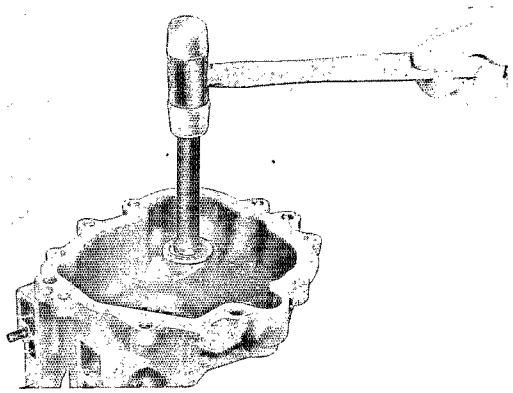


3. Heat transmission cover to approx. 120° C (250° F) on a hot plate. Pull out or drill out the gear shaft bushing.

Assembling

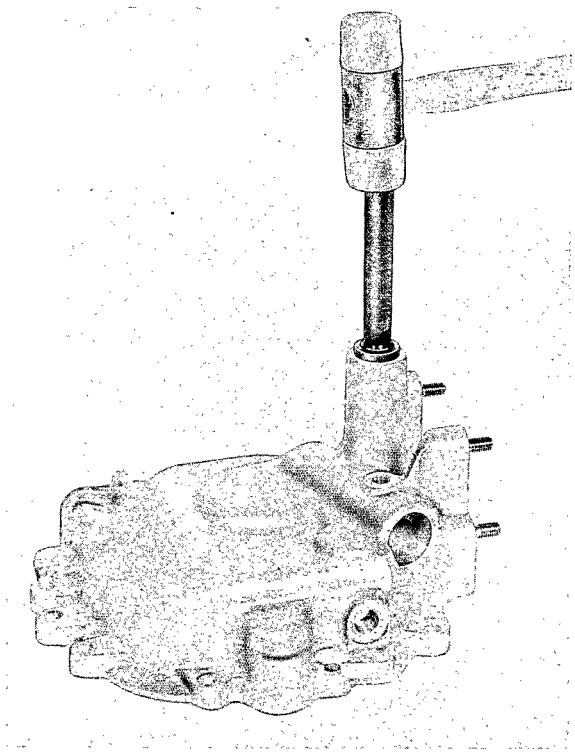
1. Heat transmission cover to approx. 120° C (250° F) on a hot plate, drive gear shaft bushing in.

2. Drive the thrust washer for reverse idler gear in to bottom with special tool P 362.



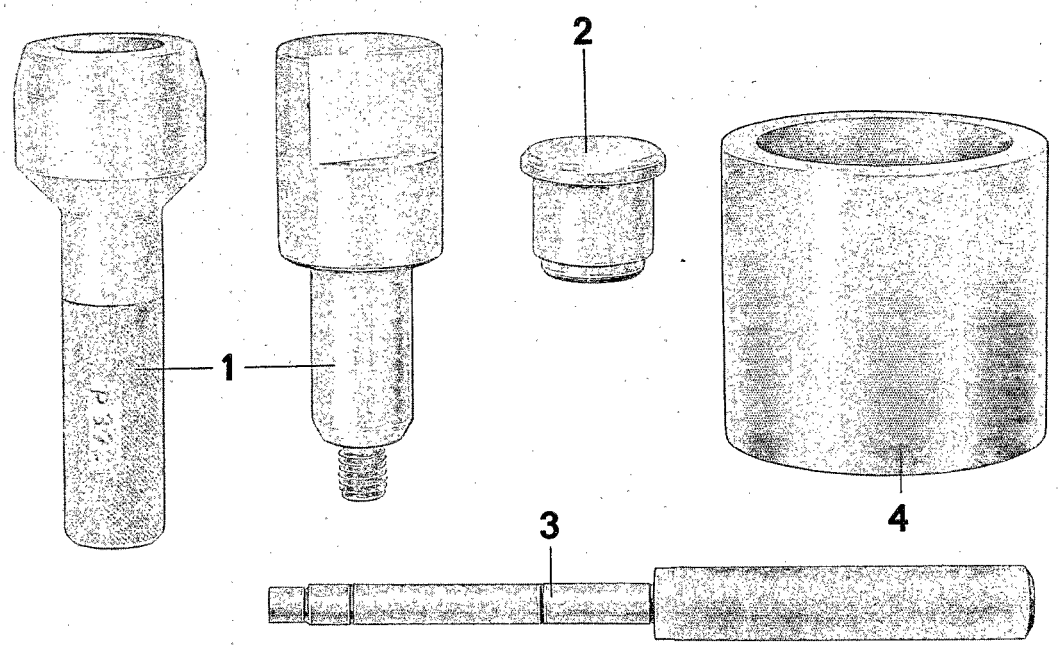
3. Insert elbow adapter. Blind hole in guide bushing must line up with hole in cover.

4. Install shift rod seal with special tool P 218.



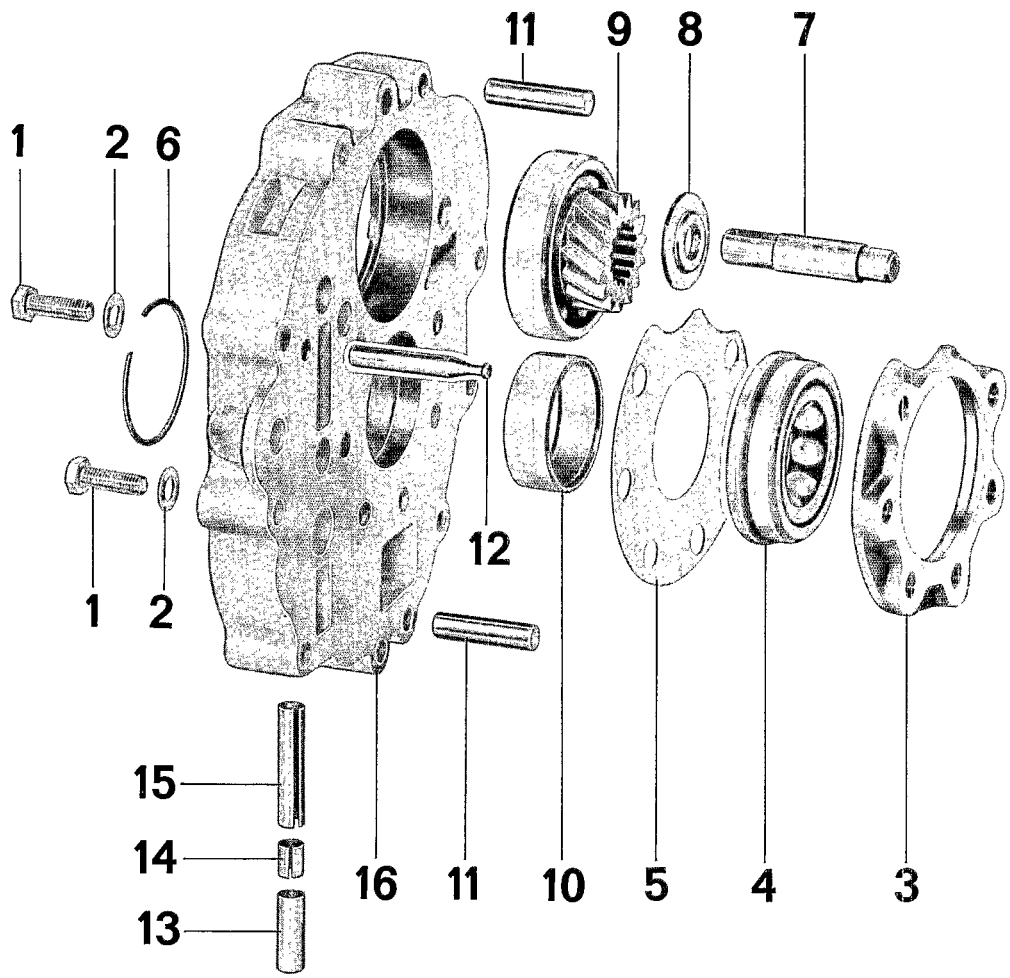
DISASSEMBLING AND ASSEMBLING INTERMEDIATE PLATE

TOOLS



Nr.	Description	Special Tool	Remarks
1	Centering mandrel	P 372	In 2 parts.
2	Thrust piece	P 371	
3	Installation arbor	P 262	
4	Guide sleeve	P 255	

Disassembling and Assembling Intermediate Plate



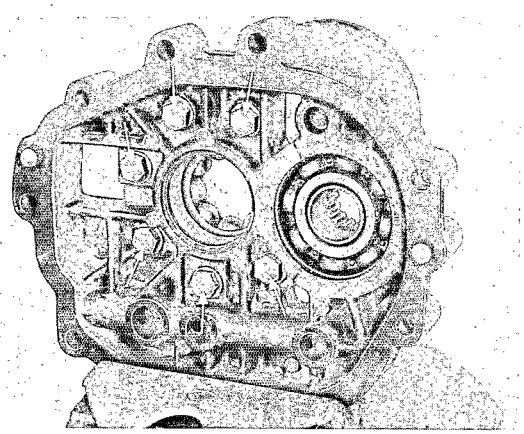
Nr.	Description	Qty.	Note when removing	Note when installing	Special instructions see
1	Bolt	6		Tighten to specified torque.	
2	Washer	6			
3	Clamping plate	1		Check helicoil inserts.	
4	Four-point ball bearing	1		Check wear. Align center with P 372.	4.1 - 4/6 4.1 - 4/7
5	Support plate	1		Position properly when installing.	
6	Snap ring	1	Remove with small screwdriver.		4.1 - 4/5
7	Shaft for reverse idler gear assembly	1	Heat intermediate plate to approx. 120° C (250° F) and press out.	Heat intermediate plate to approx. 120° C (250° F) and press in shaft. Make sure it is properly seated.	
8	Thrust washer	1		Stepdown side faces front cover.	
9	Grooved ball bearing with Gear I for reverse gear	1	Heat intermediate plate to approx. 120° C (250° F) and drive out with appropriate pipe section.	Heat intermediate plate to approx. 120° C (250° F) and drive in with appropriate pipe section.	
10	Roller bearing outer race	1	Heat intermediate plate to approx. 120° C (250° F) and drive out with appropriate pipe section.	Heat intermediate plate to approx. 120° C (250° F) and drive in with appropriate pipe section.	
11	Dowel	2	Heat intermediate plate to approx. 120° C (250° F) and press out.	Heat intermediate plate to approx. 120° C (250° F) and press in.	4,1 - 4/6
12	Spring anchor stud	1			

Nr.	Description	Qty.	Note when removing	Note when installing	Special instructions see
13	Bushing	1		Drive in with P 262.	4.1 - 4/6
14	Bushing	1		Drive in with P 262.	4.1 - 4/6
15	Bushing	1		Drive in with P 262.	4.1 - 4/6
16	Intermediate plate	1			

DISASSEMBLING AND ASSEMBLING INTERMEDIATE PLATE

Disassembling

1. Remove clamping plate retaining bolts (arrows).



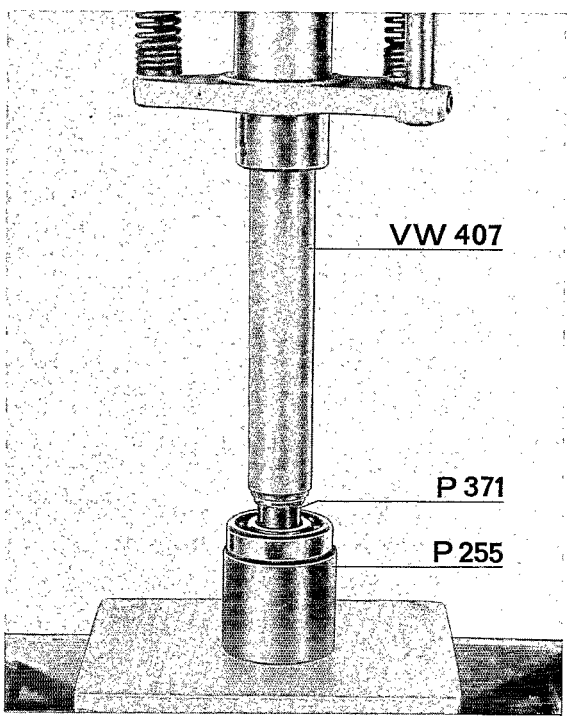
2. Using a small screwdriver, remove snap ring which retains roller bearing outer race.

Note

The snap ring may bind in the groove. Therefore, relieve binding pressure by tapping the bearing outer race away from the snap ring.

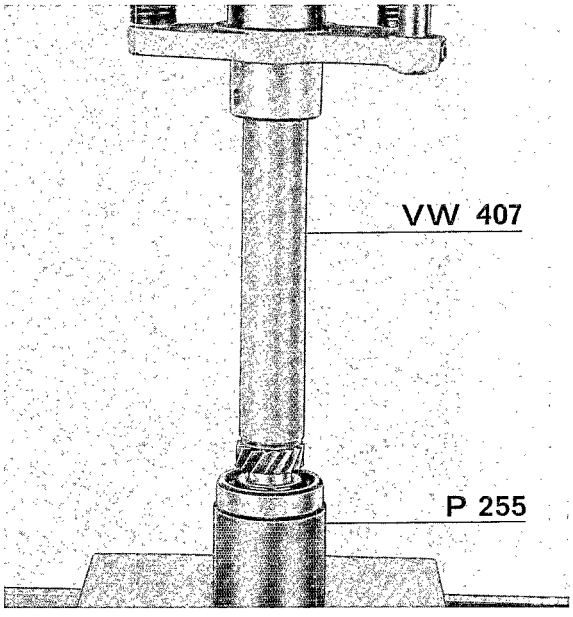
3. Heat intermediate plate to approx. 120° C (250° F) and press or drive the parts out.

4. Using special tools P 371 and P 255, press Gear I for reverse gear off grooved ball bearing.



Assembling

1. Using special tools VW 407 and P 255, press Gear I for reverse gear into grooved ball bearing.



Note

When installing the bushings, make sure, the bushings do not protrude into the guide bores of shift rods.

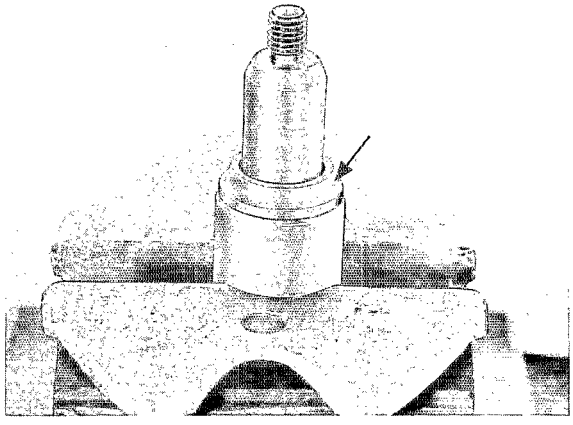
2. Using special tool P 262, drive bushings for shift detents in.
   a) Drive long bushing in until mandrel bottoms.
   b) Drive short bushing in to the second mark on the mandrel.
   c) Drive the medium size bushing in to the first mark on the mandrel.

3. Heat intermediate plate to approx. 120° C (250° F) and press or drive the parts in.

4. Press dowel pins in. They must protrude approx. 5.5 mm (0.22 in.) on each side of the intermediate plate.

5. Install clamping plate together with four-point bearing and support plate.

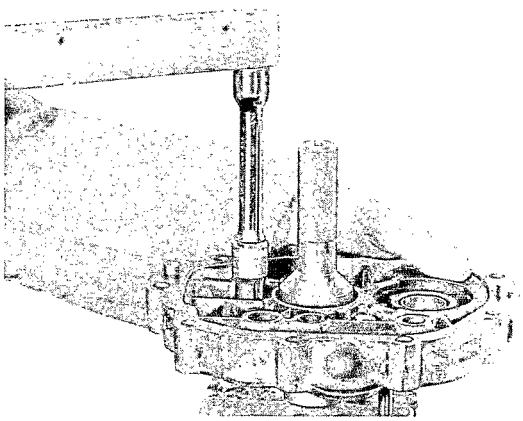
6. Mount receptacle from special tool P 372 in vise and place bearing inner race of four-point bearing on it.



Note

To center the bearing, use bearing inner race of the four-point bearing which should be pressed off the pinion shaft. A spare bearing inner race can be used for this purpose.

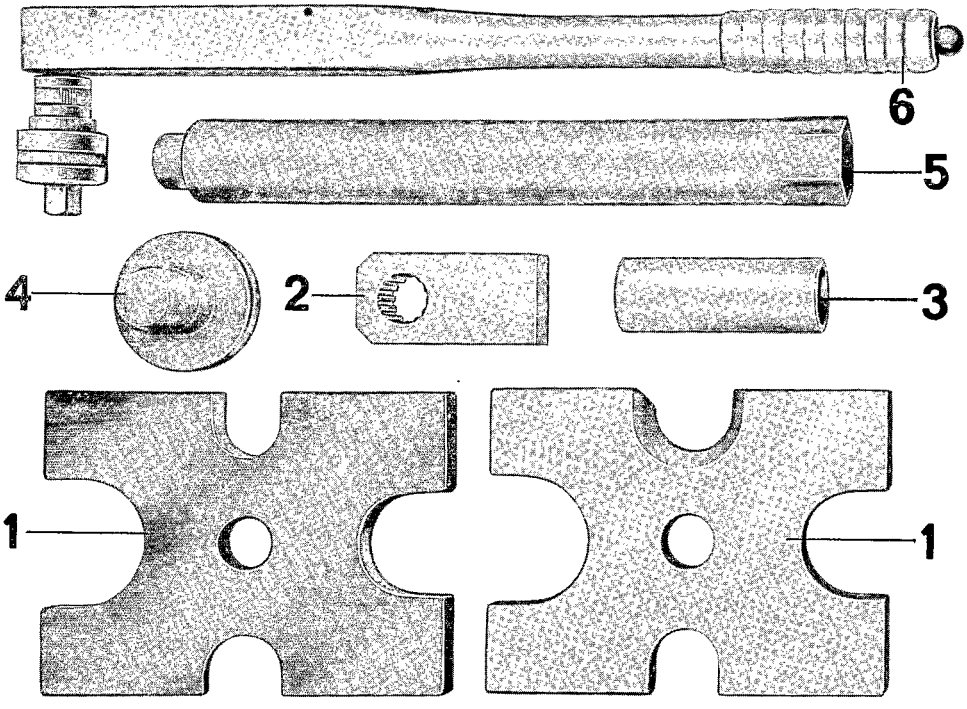
7. Place intermediate plate on top, insert second bearing inner race, and center four-point bearing with P 372.



8. Tighten bolts to correct torque.

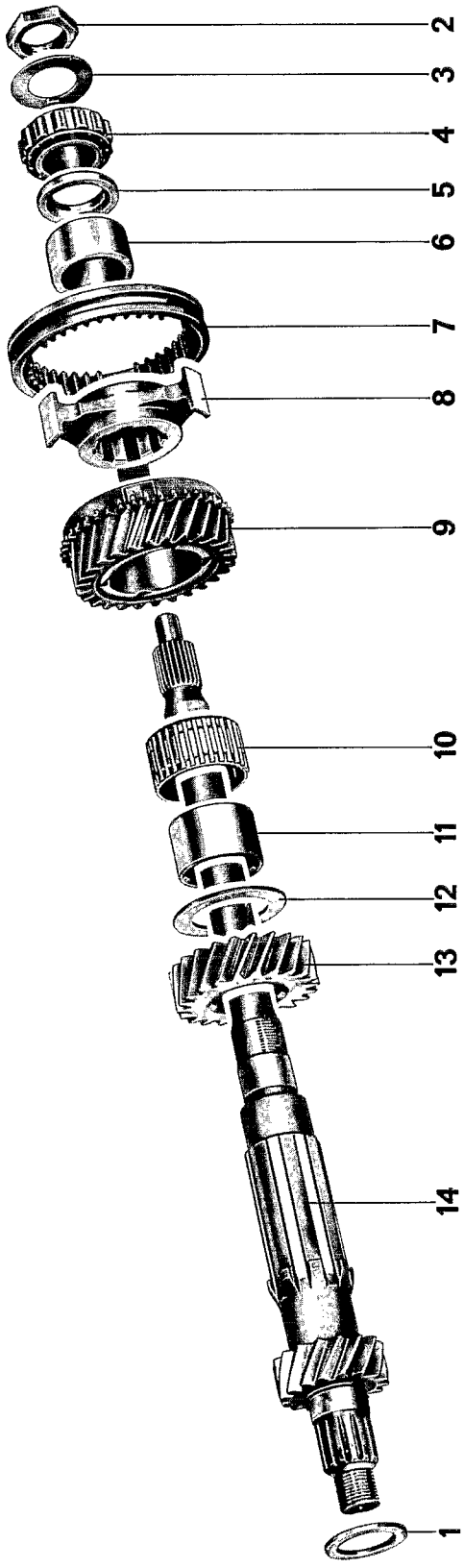
MAIN SHAFT

TOOLS



No.	Description	Special Tool	Remarks
1	Plate	VW 401	
2	Holder	P 376	
3	Thrust tube	VW 416 b	
4	Thrust disc	VW 412	
5	Socket wrench	P 252	
6	Torque wrench	-	Local purchase

DISMANTLING AND ASSEMBLING

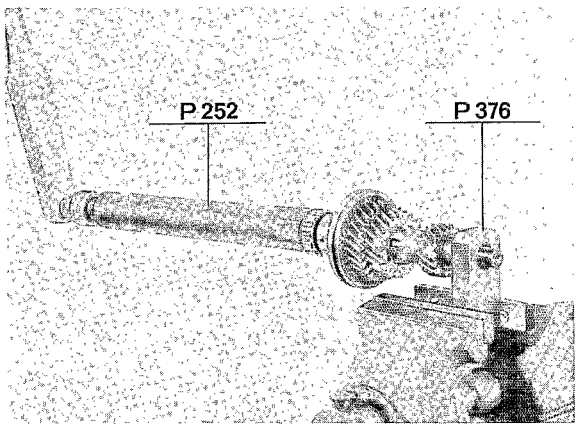


No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
1	Spacer (2.6 mm thick)	1			
2	Nut	1	Unlock and loosen with P 252	Torque to specifications	
3	Lockplate	1		Replace	
4	Roller bearing	1	Press off VW 401 and VW 412	Install with VW 412, VW 416 b and VW 401	
5	Washer	1		Install correctly, bevel faces roller bearing	
6	Spacer	1			
7	Shift sleeve	1		Check for wear	
8	Shift sleeve guide	1		Check for wear	
9	3rd gear 27:25 V	1		Check synchronization; replace in pairs only	
10	Needle bearing	1	Mark for installation	Install with same gear	
11	Race, needle bearing	1	Mark for installation	Install with same gear	
12	Thrust washer (2 mm thick)	1			
13	2nd gear 22:29 M	1		Check for wear; replace in pairs only	
14	Main shaft with 1st gear 16:34 DA	1		Check runout, replace if necessary	

DISMANTLING AND ASSEMBLING INSTRUCTIONS

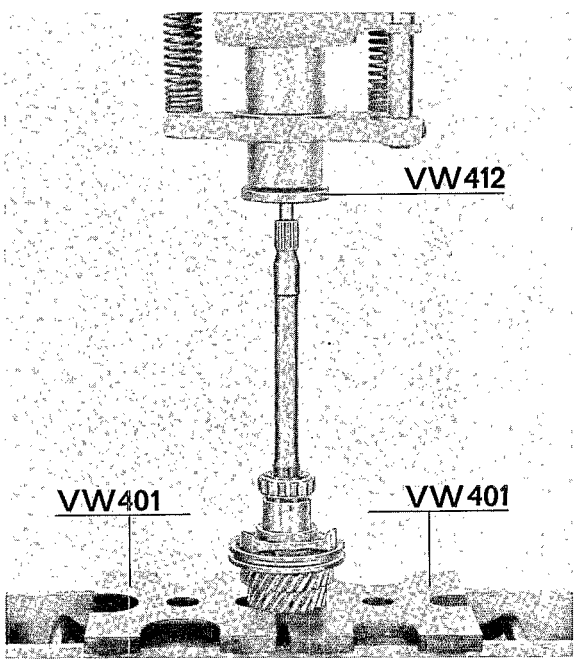
Dismantling

1. Clamp holder P 376 in a vise, install shaft and unlock nut.



2. Loosen nut with special tool P 252.

3. Remove roller bearing from shaft with special tools VW 401 and VW 412.

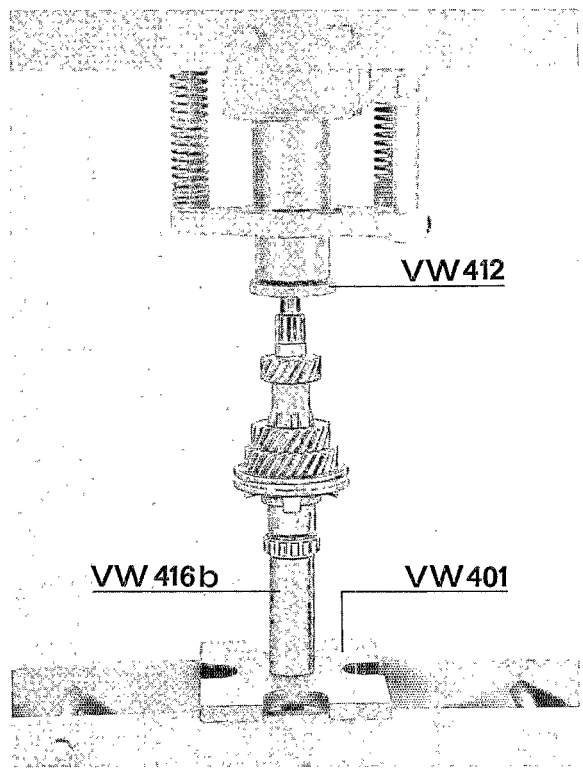


Assembling

Note

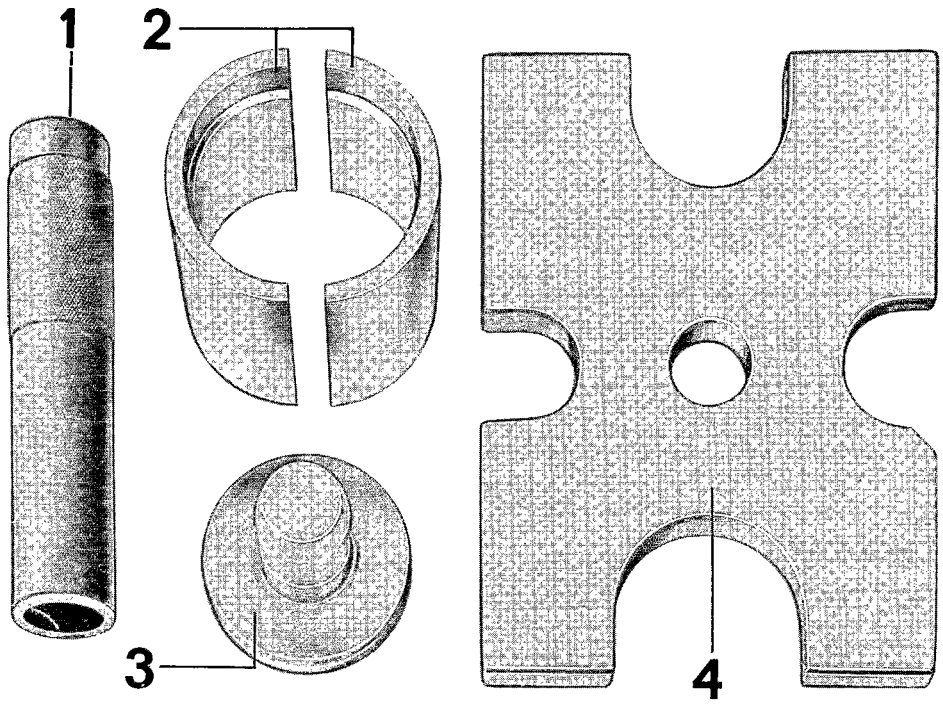
Before assembling, clean all shaft parts and dry.

1. Install roller bearing with special tools VW 412, VW 416 b and VW 401.



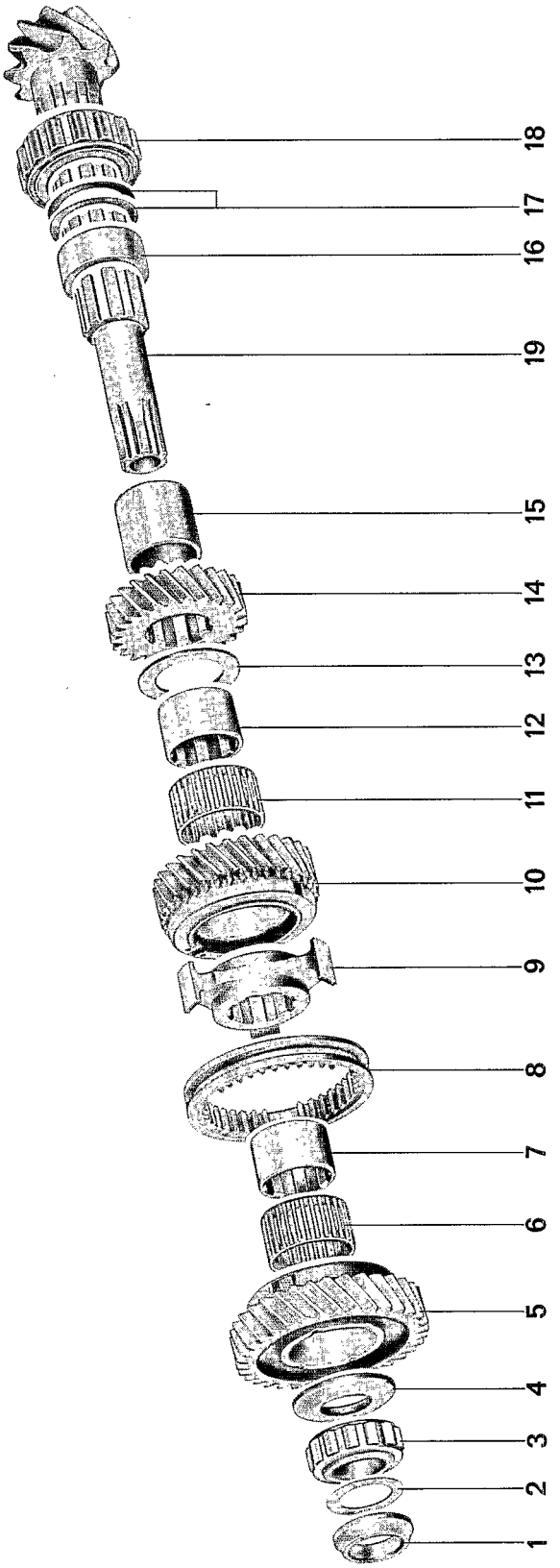
PINION SHAFT

TOOLS



No.	Description	Special Tool	Remarks
1	Drive sleeve	VW 244	
2	Guide	No. 9100	Consists of 2 pieces
3	Thrust disc	VW 412	
4	Plate	VW 401	

DISMANTLING AND ASSEMBLING



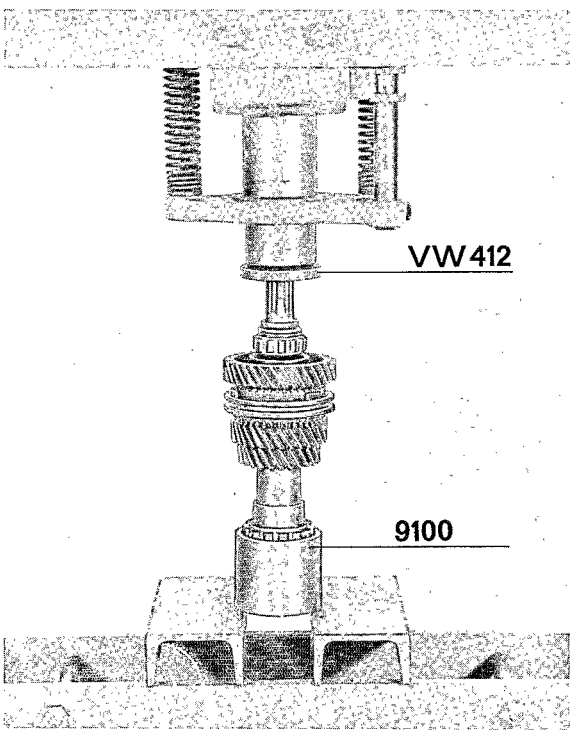
No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
1	Bearing inner race	1		Install with correct adapter	
2	Spacer (1 mm thick)	1			
3	Roller bearing	1	Remove from pinion shaft with VW 412 and 9100	Install with VW 412, VW 244 and VW 401	
4	Thrust washer	1		Flat side faces needle bearing	
5	1st gear 16:34 DA	1		Check synchronization; replace in pairs only	From 1977 Models with asymmetrical pointed teeth of clutch body
6	Needle	2	Mark for installation	Install with same gear	
7	Race, needle bearing	2	Mark for installation	Install with same gear	
8	Shift sleeve	1		Check for wear	From 1977 Models with asymmetrical pointed teeth for 1st gear. Note direction of installation (see Page 3.1-7/6)
9	Shift sleeve guide	1		Check for wear	
10	2nd gear 22:29 M	1		Check synchronization; replace in pairs only	
11	Needle bearing	2	Mark for installation	Install with same gear	
12	Race, needle bearing	2	Mark for installation	Install with same gear	
13	Thrust washer (2 mm thick)	1			
14	3rd gear 27:25 V	1		Check for wear; replace in pairs only	
15	Spacer	1			

No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
16	Spacer	1			
17	Shim	X	Note number and thickness for installation	Recalculate if necessary	
18	Roller bearing	1	Remove from pinion shaft with VW 412 and 9100	Install with correct adapter	
19	Pinion shaft	1		Check for wear; measure thickness of shims again if necessary	

DISMANTLING AND ASSEMBLING INSTRUCTIONS

Dismantling

1. Remove roller bearing from pinion shaft with special tools VW 412 and 9100.



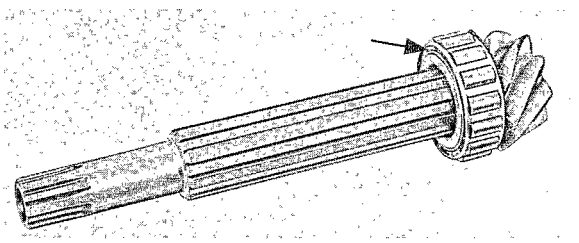
Assembling

Pinions and ring gears are matched. Pair numbers must agree with each other when installing.

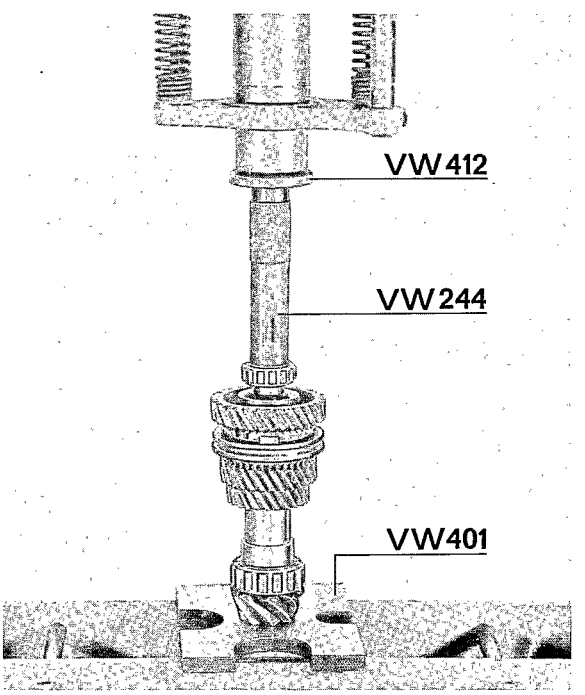
Note

Before installing, clean all pinion shaft parts and dry.

1. Install roller bearing on pinion shaft with appropriate adapter. The two-part roller cage with ring faces the gears.



2. Install small roller bearing with special tools VW 412, VW 244 and VW 401.



CHECKING CLUTCH PLAY

Engine/transmission assembly installed

1. Raise car.

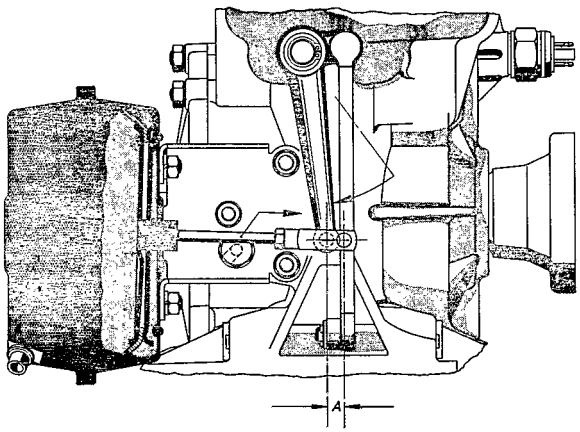
2. Press accelerator linkage operating lever on transmission toward full throttle (bleeds servo). Use left hand to press clutch intermediate lever toward right rear wheel. Travel of about 5 to 7 mm must be felt on the clutch intermediate lever. If there is not enough travel, remove engine/transmission assembly and adjust clutch (basic adjustment 12 to 15 mm).

Engine/transmission assembly removed

1. Remove engine/transmission assembly.

2. Remove cotter pin from clevis pin for actuating rod and intermediate lever and pull out clevis pin.

3. Pull out actuating rod mounted on servo up to stop and at the same time press intermediate lever toward servo to stop.
In this position the actuating rod clevis must be located so that its bore is 12 to 15 mm above the intermediate lever bore.



CHECKING CONTROL VALVE ADJUSTMENT

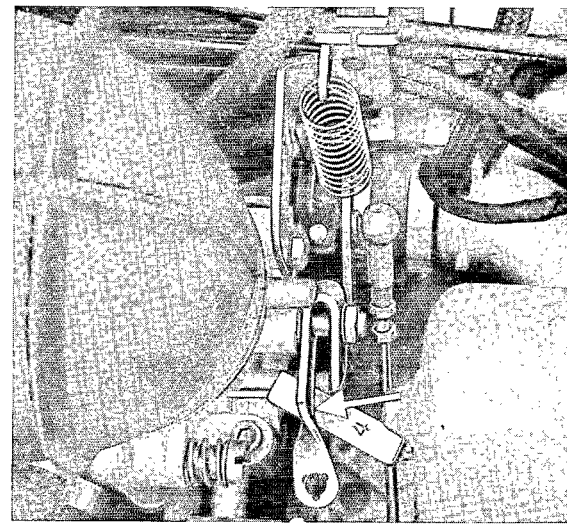
This requires that the throttle operating linkage and engine idle speed are adjusted correctly.

Full throttle position
(upshifting on acceleration)

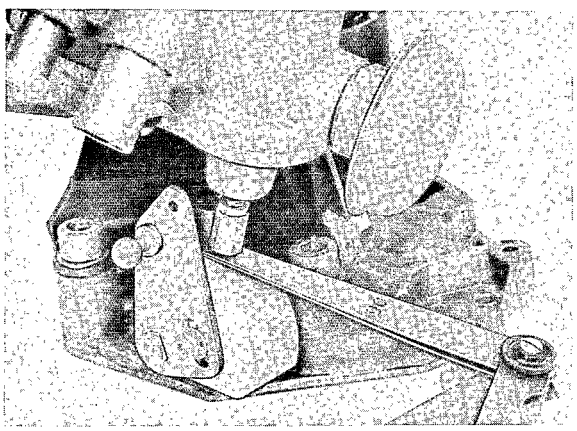
To check the control valve adjustment and make changes if necessary, it will be necessary to remove various parts of the CIS (continuous fuel injection) equipment.

a) Disconnect battery.
b) Remove air cleaner cover.
c) Remove heater blower.
d) Remove holder.
e) Detach No. 3 cylinder injection line at injector.
f) Remove No. 3 cylinder intake pipe.

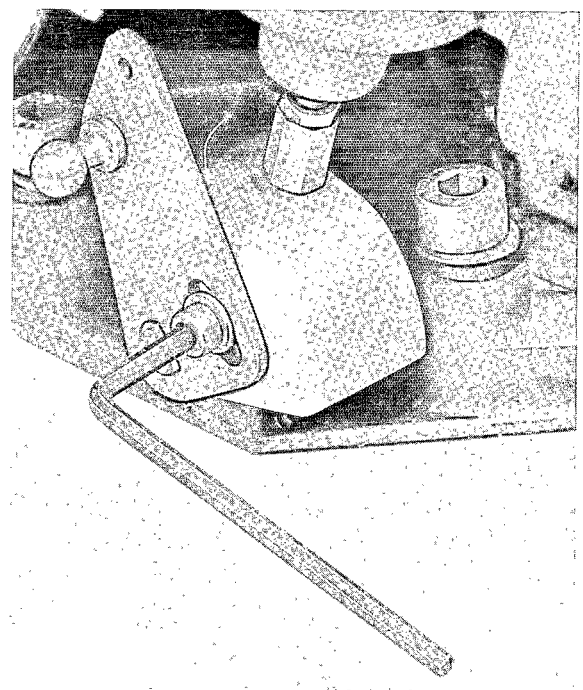
2. Place a strip of 4 mm thick metal between the stop and idle limit screw (this opens throttle partially).



1. There must be a play of 1.5 mm between the control valve plunger and the throttle linkage cam in idle position. Use feeler gauge, lock plunger with lock nut. Make sure that the cam on the operating lever for the linkage is set back all the way.



Using a 3 mm socket wrench loosen the cam clamping screw and turn the cam until the control valve plunger just barely touches the cam surface. Tighten cam clamping screw.



Remove strip of metal at idle limit screw. The idle play set at 1.5 mm at the beginning could change because of cam movement, but there must be at least 1 mm of play.

Closed throttle position (downshifting on deceleration)

The closed throttle position can be adjusted at the self-locking control screw with a screwdriver, without removing engine parts.

Basic adjustment

The closed throttle position can only be checked for correct adjustment by downshifting a car on the road or possibly on a roller test stand. The following information can be used as a reference point for adjustments on a stationary car.

a) Start engine and allow to idle.
b) Apply parking brakes.
c) Move lever to driving range.

There should be 0.3 to 0.5 seconds from the moment the shift lever is released to the time the clutch engages.

Road test

Drive in range "D" at 4500 rpm and shift back to range "L". Clutching should take place without delay, yet the rear wheels should not lock. The adjustment can be altered to suit the customer.

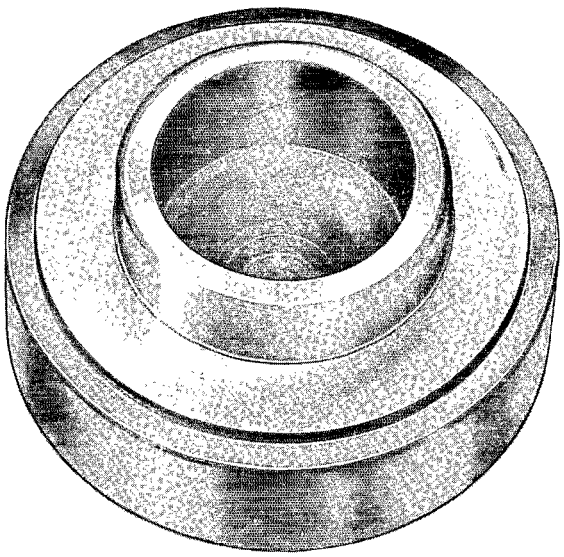
a) Tighten control screw (turn clockwise) to provide a softer, delayed clutch engagement.
b) Loosen control screw (turn counterclockwise) to provide a firmer, quicker clutch engagement.

Caution

Only turn control screw 1/4 to 1/2 turn at a time in either direction, because this will be sufficient to alter the engagement considerably.

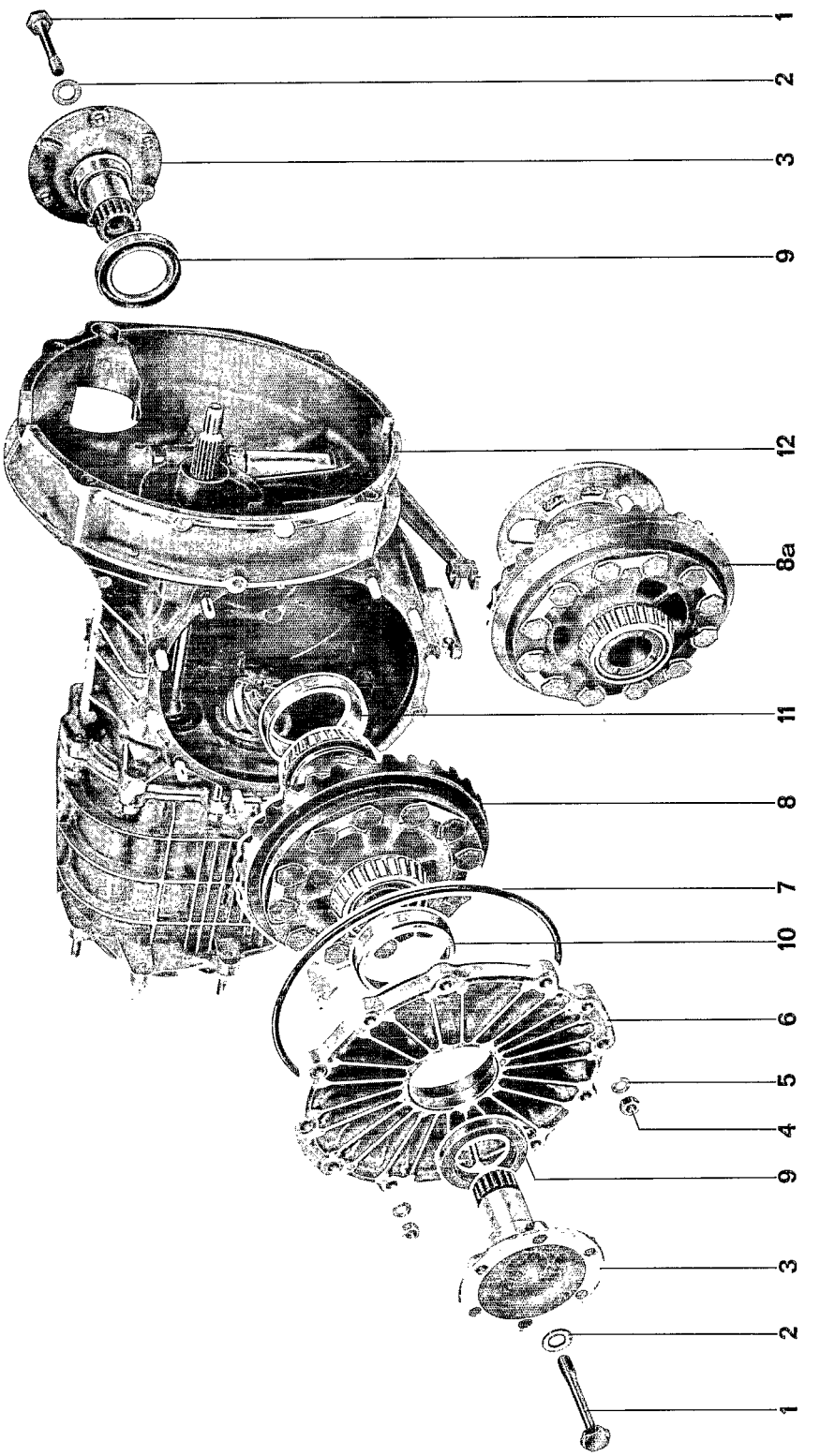
REMOVING AND INSTALLING FINAL DRIVE

TOOLS



Nr.	Description	Special Tool	Remarks
	Thrust piece	P 265c	

Removing and Installing Final Drive

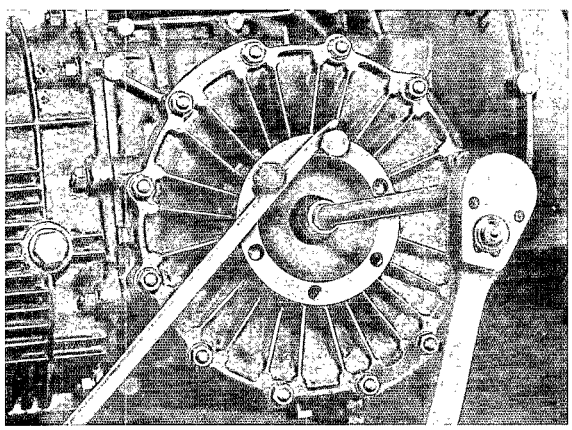


Nr.	Description	Qty	Note when		Special Instructions see
			Removing	Installing	
1	Expansion bolt	2		Tighten to correct torque.	5.1-1/4
2	Washer	2			5.1-1/4
3	Flange shaft	2			
4	Self-locking nut	12		Tighten to correct torque.	
5	Washer	12			
6	Final drive side cover	1			
7	O-ring	1		Replace if necessary. Oil lightly.	
8	Differential	1		Readjust if necessary.	5.1-5/5
8a	Differential with magnetic carrier disc	1		Adjust, if necessary. No adjusting necessary when replacing magnetic carrier disc	
9	Seal	2	Knock out with drift.	Install with P 265c	
10	Bearing outer race	1	Knock out with drift.	Heat transmission cover to approx. 120°C (250°F) and install with appropriate tubing.	
11	Bearing outer race	1	Knock out with drift.	Heat transmission cover to approx. 120°C (250°F) and install with appropriate tubing.	
12	Final drive housing	1			

REMOVING AND INSTALLING

Removing

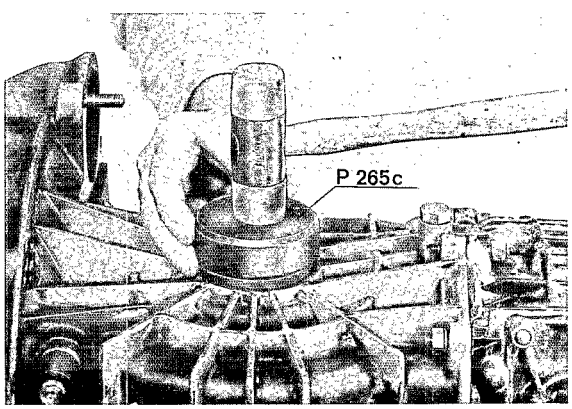
1. Unscrew joint flange mounting bolt and remove joint flange.



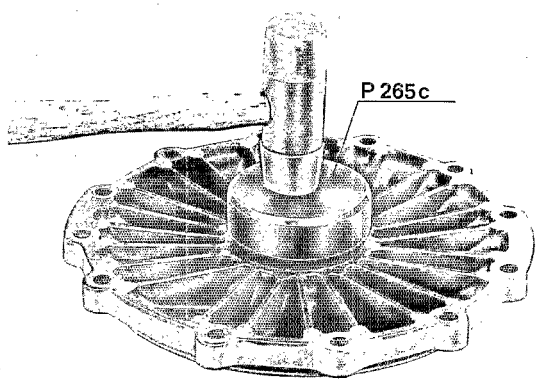
2. Drive seals and bearing outer races out of final drive housing and side cover with an appropriate drift.

Installing

1. Install seal in final drive housing with special tool P 256c.



2. Apply light coat of oil to side cover seal.



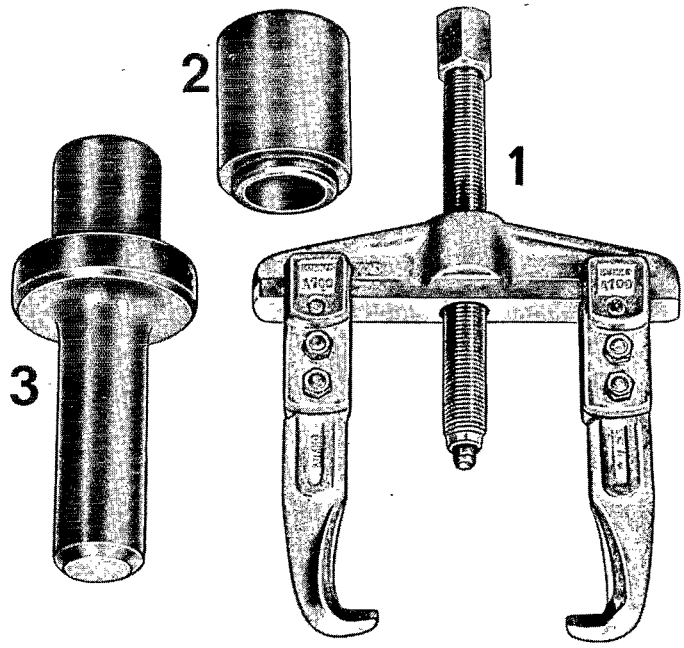
3. Install seal in side cover with special tool P 265c.

MODIFICATION ON DIFFERENTIAL

The joint flanges and mounting bolts were also changed with introduction on the new differential (similar to 928). A M 10 x 80 hexagon head bolt without washer is used on these transmissions to mount the joint flanges instead of the expansion bolt with washer.
Tightening torque value is different (see page 0.2-1/4).

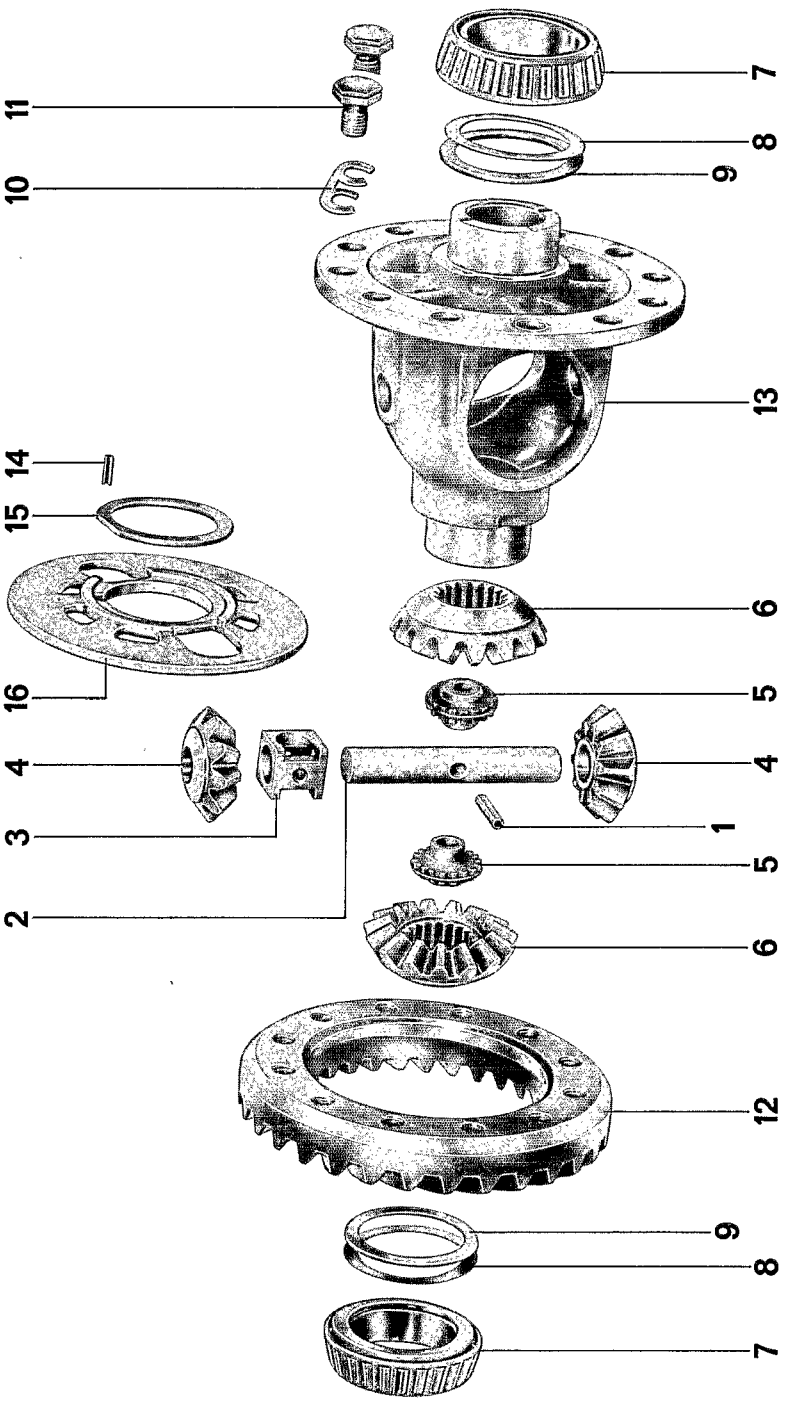
DISASSEMBLING AND ASSEMBLING DIFFERENTIAL

TOOLS



Nr.	Description	Special Tool	Remarks
1	Puller	40 - 19 (AUDI)	or similar
2	Thrust piece	P 263	
3	Thrust piece	P 264b	

Disassembling and Assembling Differential



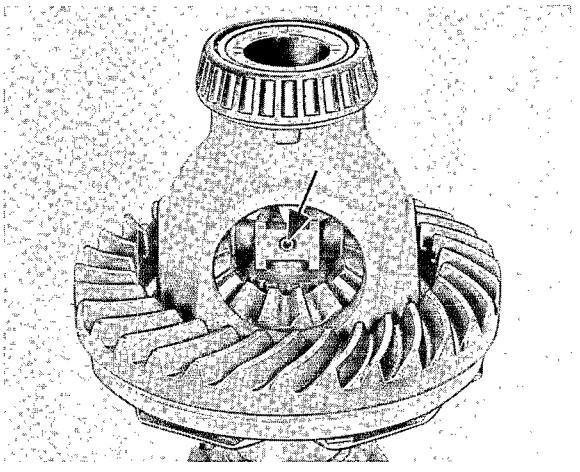
Nr.	Description	Qty	Note when		Special instruc. see
			Removing	Installing	
1	Roll pin	1	Drive out.	Replace if necessary	
2	Shaft	1	Drive out.	Note location of roll pin bore.	
3	Anchor piece	1			
4	Small differential pinion (spider gear)	1		Coat thrust areas with Molykote or similar lubricant.	3.1-2/4
5	Threaded retainer	2		Position properly.	3.1-2/5
6	Large differential pinion (side gear)	2		Coat thrust areas with Molykote or similar lubricant.	
7	Tapered roller bearing	2	Remove with puller No. 40-19 and P 263	Drive on with P 264b	3.1-2/4
8	Shim	2	Keep together with mechanic's wire for reassembly.	If necessary, re-calculate thickness	5.1-5/5
9	Spacer washer	2	Keep together with mechanic's wire for reassembly.	If necessary, re-calculate thickness	5.1-5/5
10	Lock plate	6		Replace	
11	Bolt	12		Torque to specify	
12	Ring gear	1	Check for wear	Make sure ring gear and pinion have matching pair numbers.	5.1-4/1
13	Differential housing	1			
14	Pin	1			*
15	Spacer	1	Mark for re-installation	Determine thickness again if necessary	5.1 - 5/5 *
16	Magnetic carrier disc	1		Determine thickness again if necessary	5.1 - 5/5 *

* Parts only in conjunction with electronic speedometer

DISASSEMBLING AND ASSEMBLING DIFFERENTIAL

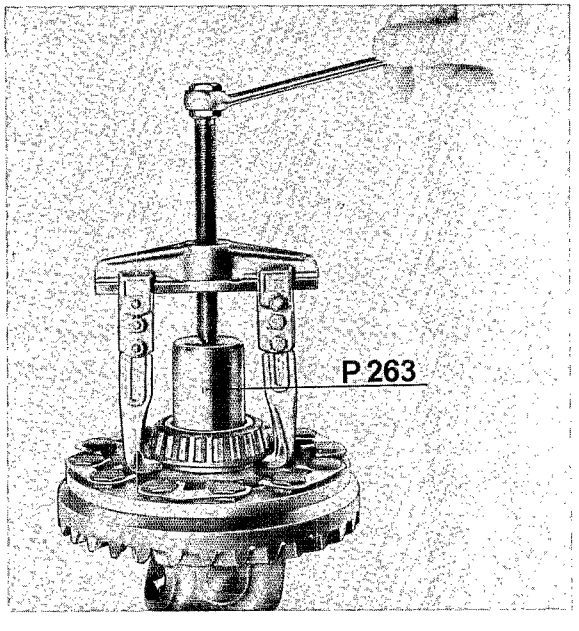
Disassembling

1. Drive out differential pinion shaft roll pin.



2. Drive out differential pinion shaft with a mandrel and remove anchor piece.

3. Remove tapered roller bearing with a puller and thrust piece P 263.



Caution
Do not interchange spacer washers and shims. Attach tags to prevent mixing up right side with left and vice versa.

4. Remove lock plates from ring gear retaining bolts. Remove bolts and take off ring gear.

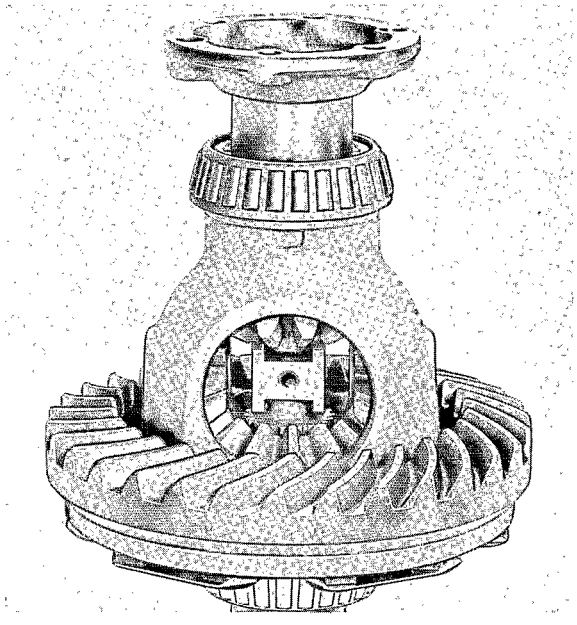
Assembling

1. Slide lock plates into grooves in bolt heads. Close open ends with pliers to firmly attach the plates to bolt heads. Secure bolts by bending the plates down on one side of the hex surface.

2. Coat thrust surfaces of the differential pinions in the differential housing with Molykote or similar lubricant. Insert large differential pinion (side gears) through oval opening in the housing. Center the pinions by inserting the flange shafts.

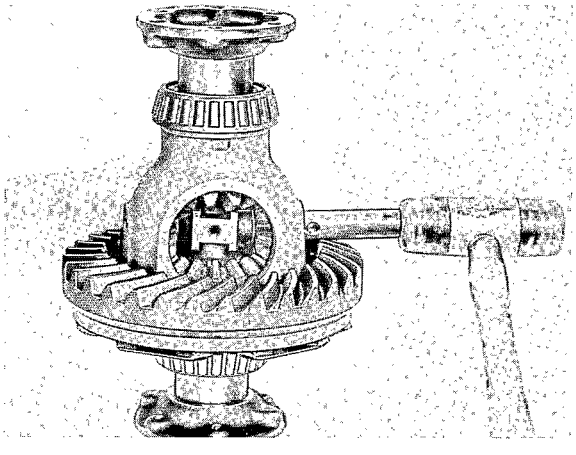
3. Insert small differential pinions through the opening in the housing and position them opposite each other so that bores align with the bores in the housing.

4. Insert threaded retainers with lock rings into the large differential pinions (side gears) and slide the anchor piece between the threaded retainers (see illustration).



Caution
Position the locating hole of the differential pinion shaft so it aligns with the hole of the anchor piece.

5. Hold the anchor piece in place (so prevent binding) and drive in the differential pinion shaft.



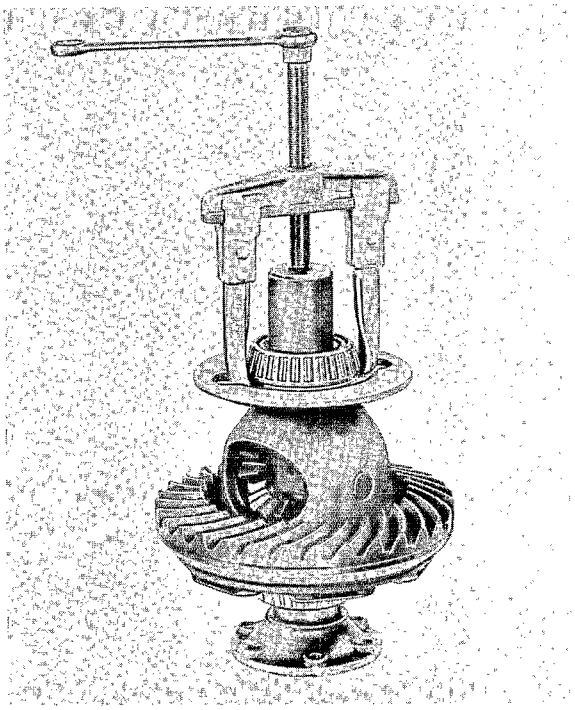
6. Place marked or measured bearing shims and spacer washers on the differential housing. Install tapered roller bearing using thrust piece P 264.

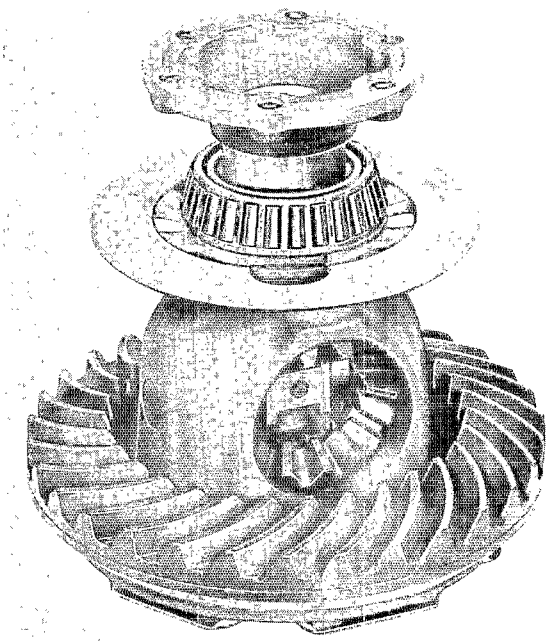
7. Re-adjust ring and pinion gears if necessary. See "Adjusting Ring Gear and Pinion".

Note

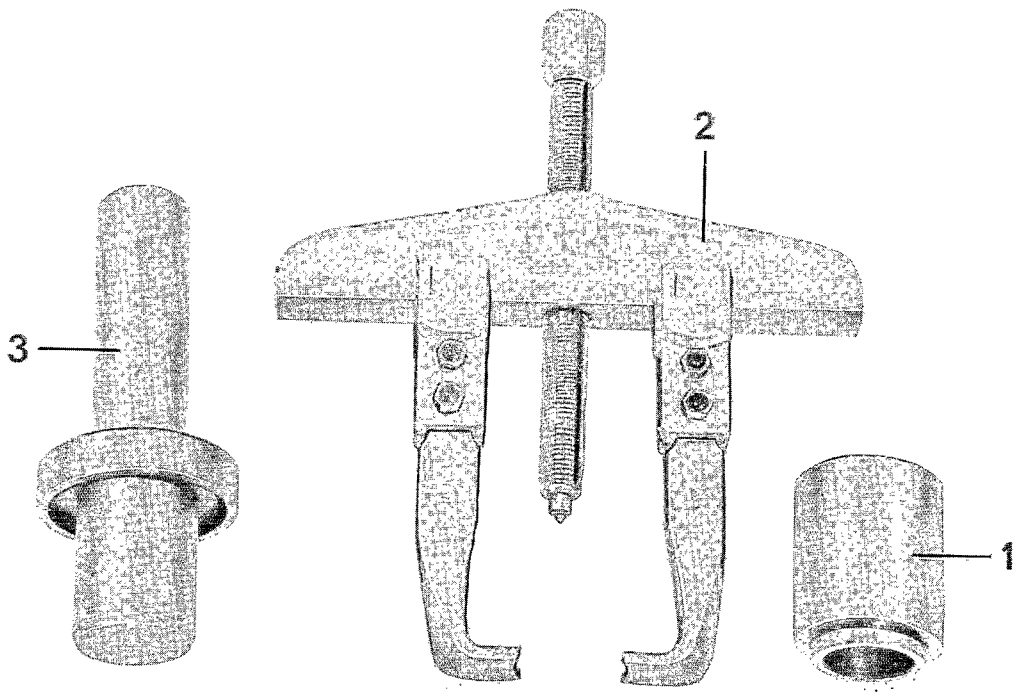
With the 1976 Model the tapered roller bearing is pulled off through openings in the magnetic carrier disc with an extractor and special tool P 263.

When replacing the magnetic carrier disc the tapered roller bearing preload does not have to be checked if the same shims are used again.

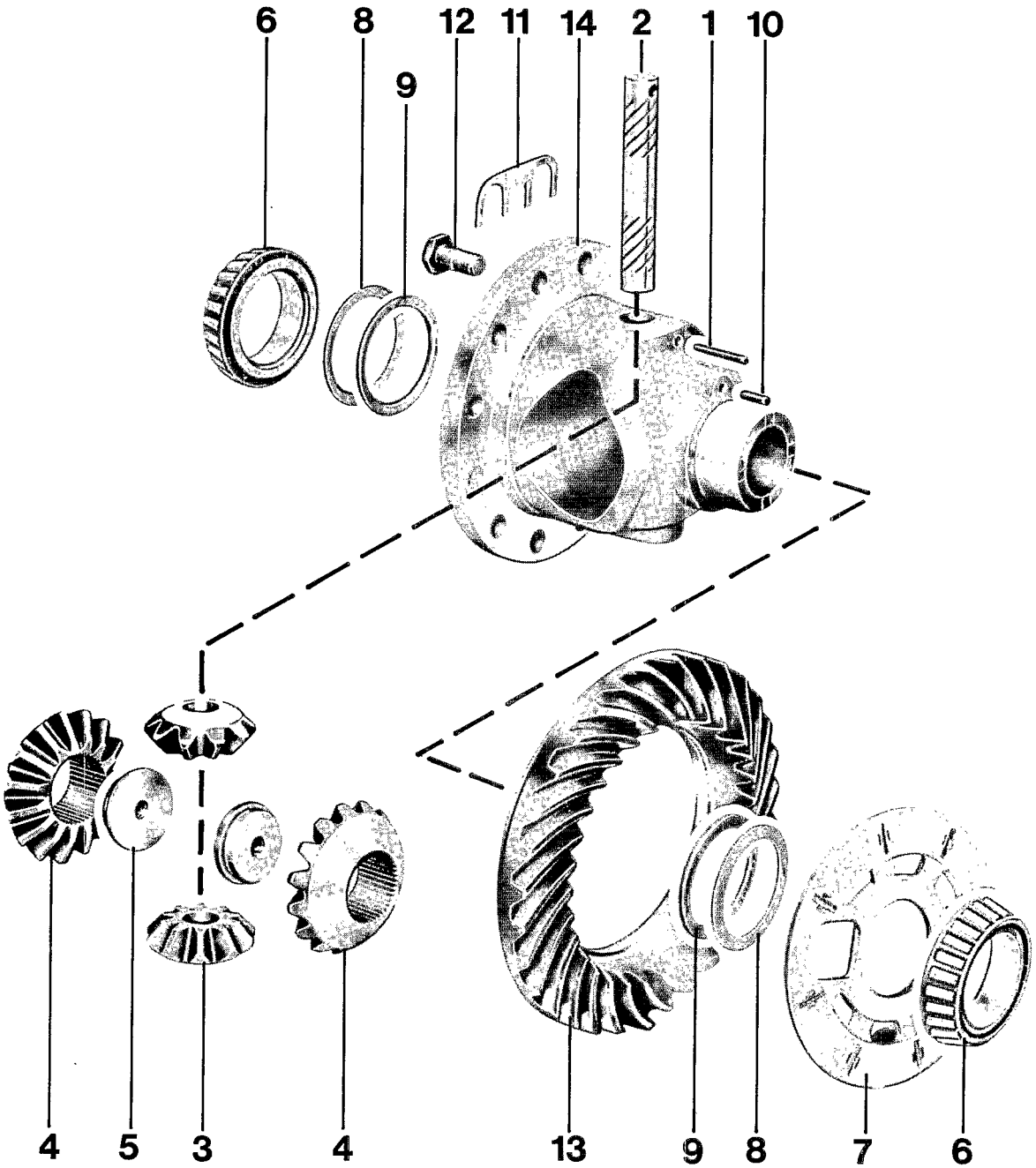




TOOLS



No.	Description	Special Tool	Remarks
1	Pressure pad	P 263	
2	Puller	US 1078	or 40 - 19
3	Pressure pad	P 264 b	

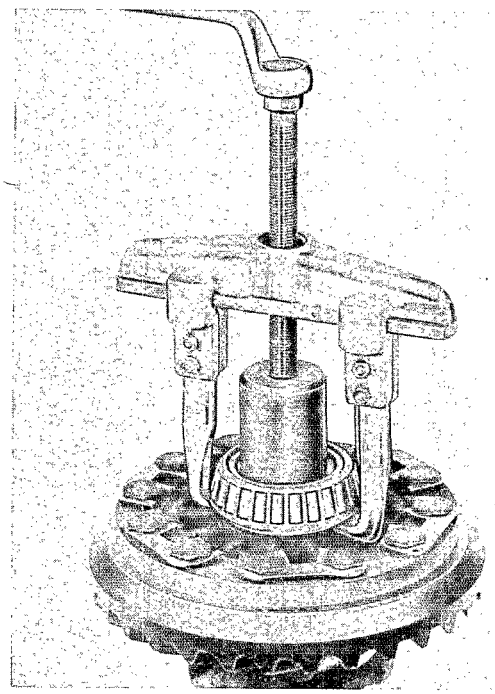

6
8
12
11
14
2
1
10
9
4
5
3
4
13
9
8
7
6

No.	Description	Qty.	Note When: Removing	Installing	Special Instructions
1	Roll pin	1			
2	Shaft	1			
3	Small differential gear	2		Coat with MoS_2 paste. Replace only in sets (with large differential gears).	
4	Large differential gear	2		Coat with MoS_2 paste. Replace only in sets (with small differential gears)	
5	Threaded retainer	2			
6	Taper roller bearing inner race	2	Pull off with US 1078 and P 263.	Drive on with P 264 b.	
7	Magnetic carrier disc	1			
8	Washer	X	Mark for reinstallation.	Determine new thickness, if necessary.	
9	Shim	X	Mark for reinstallation	Determine new thickness, if necessary.	
10	Key	1			
11	Lockplate	6		Replace	
12	Bolt	12		Threads dry and without grease. Tighten to 115... 120 Nm (83...86 ft lb).	
13	Ring gear	1		Heat to about 120° C/248° F. Tapped bores for ring gear bolts must be dry and without grease. Watch pair code number. Adjust, if necessary.	
14	Differential case	1			

DISASSEMBLING AND ASSEMBLING INSTRUCTIONS

Disassembling

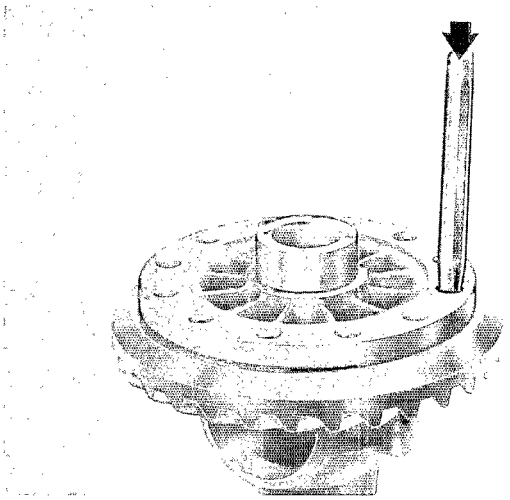
1. Pull off taper roller bearing inner races with a puller (e. g. US 1078) and Special Tool P 263.



Note

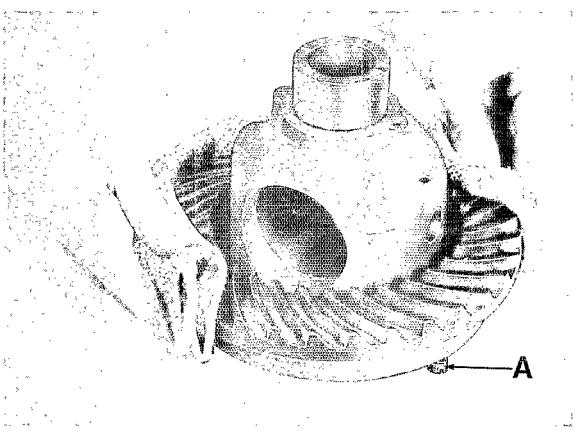
Claws of both arms must be machined, if necessary.

2. Knock ring gear off of case with a suitable mandrel.



Assembling

1. Heat ring gear to about 120° C/248° F and install. Use locally made centering pins as guides.

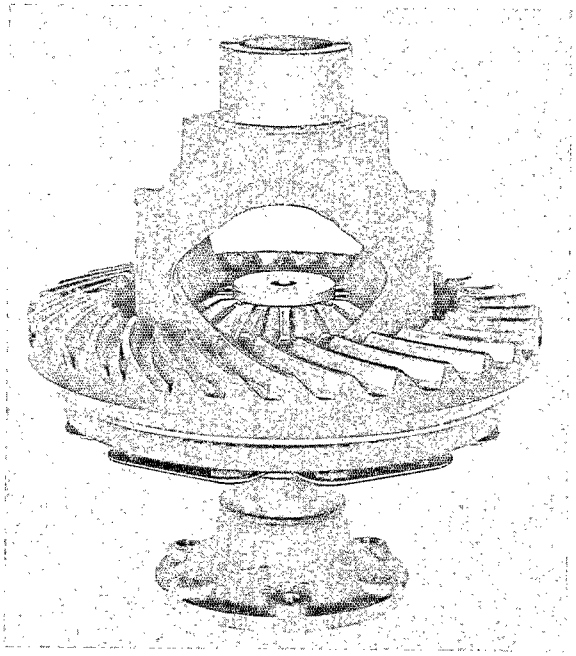


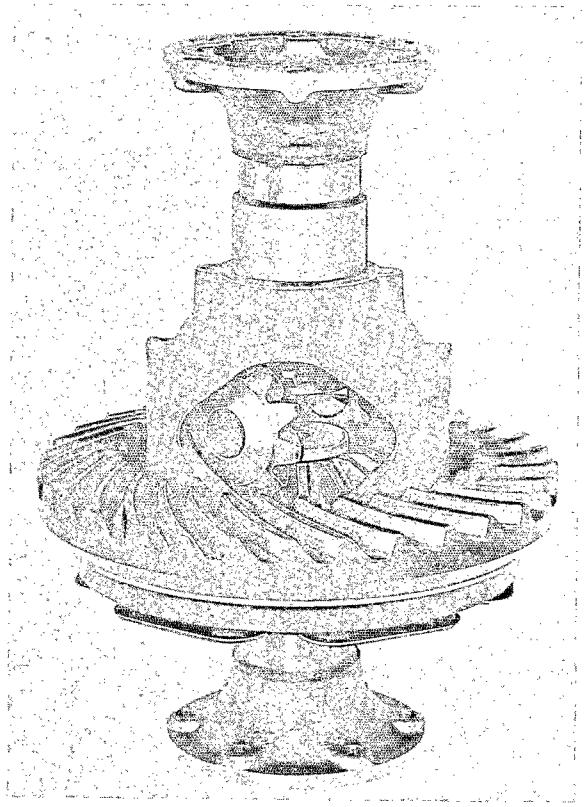
A - Centering pins (made locally)

2. Tighten ring gear bolts to specified torque value. Push lockplate in groove of bolts, squeeze front with pliers (so that lockplate is connected tightly on bolts) and bend down over a hexagon surface to lock.

3. Coat differential gears with MoS_2 paste.

4. Insert large differential gears with press-fit threaded retainers through large opening in differential case and locate with joint flanges.





5. Insert small differential gears between large differential gears and turn until bores of gears are aligned with bores in case.

6. Drive in differential shaft in correct position and lock with roll pin.

7. Drive on taper roller bearing inner races with Special Tool P 264.

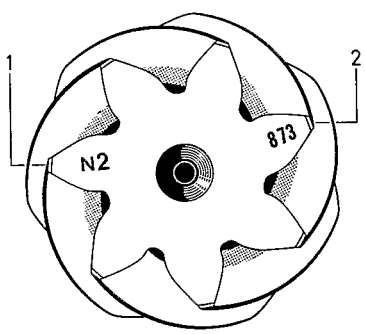
ADJUSTING RING GEAR AND PINION

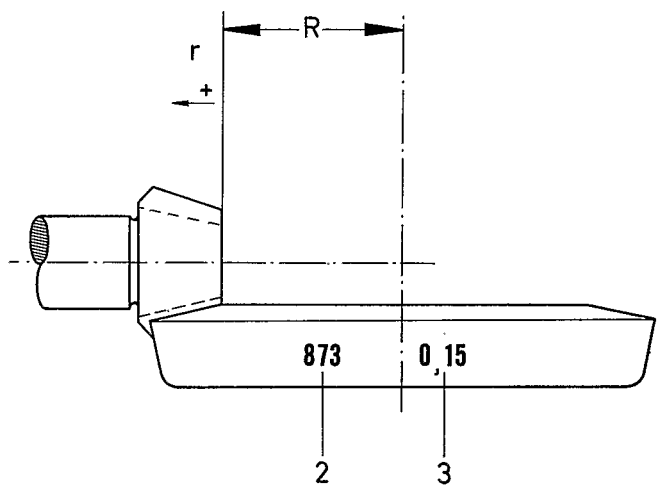
General

Adjustment of the ring gear and pinion is important for quiet operation of the rear axle assembly. For this reason the pinion shaft and ring gear is already matched as a pair during production. They are checked on testing machines for correct contact pattern and low noise level in both directions of rotation. When the ring gear and pinion is tested, it is set according to the design dimension "R". Dimension "R" is the distance from the face of the pinion to the ring gear center line. The pinion is then moved in or out of mesh until the quietest operation is determined. The deviation from the design dimension (the in or out movement of the pinion) is called "r" and is etched on the face of the pinion. While making this test, the ring gear backlash is kept within a tolerance of 0.12 - 0.18 mm. The ring gear and pinion shaft is designed in such a way that the deviation "r" must always be added to the design dimension "R".

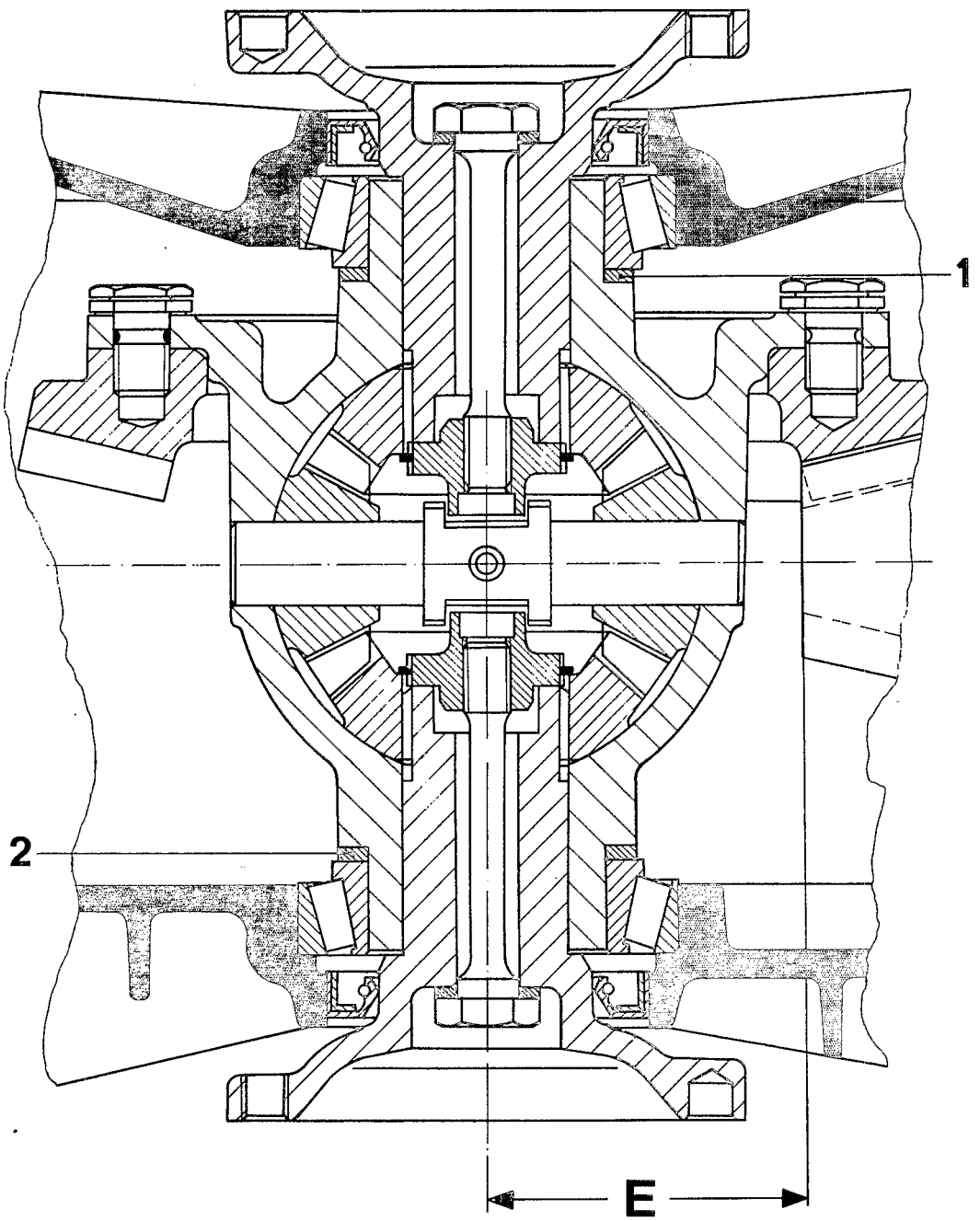
Earlier pinion assemblies had either a plus (+) or a minus (-) etched in front of the deviation "r" whereas on the newer pinion assemblies, the letter "N" precedes the deviation "r" on the pinion shaft.

Ring gear and pinion shaft sets are also stamped with a matching set number and should always be replaced as a complete set.





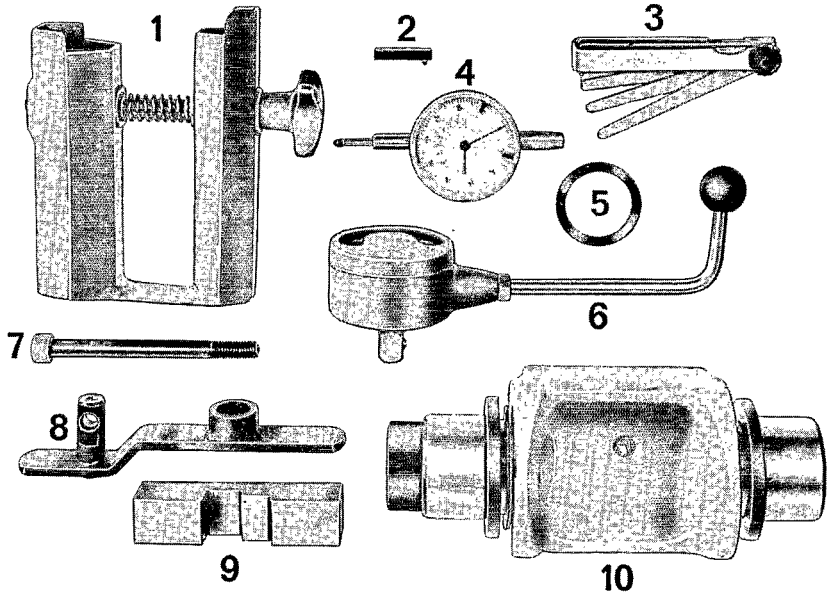
R - Design Dimension (66.30 mm)
r - Deviation from design dimension, shown in 1/100 mm
1 - Deviation r
2 - Matching set number
3 - Backlash



1 - Spacer S1
2 - Spacer S2
E - Adjusting value

ADJUSTING RING GEAR AND PINION

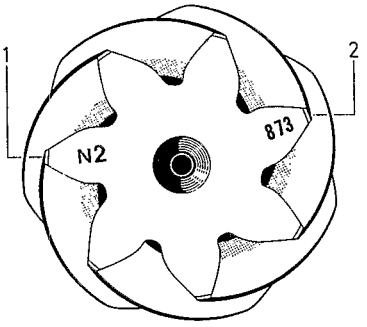
TOOLS



Nr.	Description	Special Tool	Remarks
1	Holder	P 259a	
2	Sensor	P 259b	
3	Feeler gauge	-	0.05 to 1.0 mm
4	Dial indicator	-	0 to 10 mm scale
5	Washer	-	From P 357
6	Torque wrench	US 8020 or similar	0 to 60 cmkp
7	Bolt	-	M 10 x 110
8	Dial indicator holder	-	From P 259
9	Gauge block	P 258c	
10	Mandrel	P 258	With bushings

ADJUSTING PINION SHAFT

By adding the design dimension "R" and the deviation "r" you get the adjusting dimension "E". Dimension "E" is the distance from the ring gear center line to the face of the pinion at which the ring and pinion set has been found to operate best.



1 - Deviation r in 1/100 mm
2 - Mating number

Example
The pinion shaft face end shows the deviation "r" to be 0.02 mm.

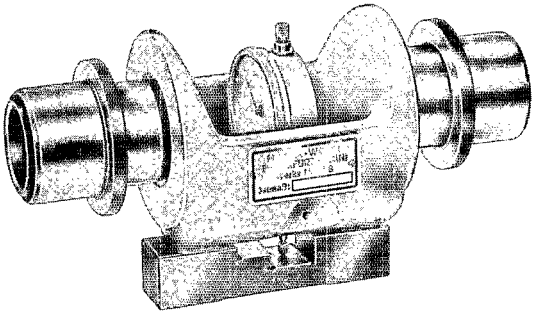
R (design dimension)		66.30 mm
+ r (deviation)	+	0.02 mm
E (adjusting dimension)		66.32 mm

1. After finding the "Adjusting dimension E", attach input and pinion shafts, without shims, to final drive housing with clamping plates.

Caution
Tighten flange nut on input shaft to correct torque before making any measurements.

Install plate P 260a. Assemble 5th speed gears with synchro hub and shifting sleeve. Engage 5th gear. Block input shaft with holder P 37a and torque flange nut to specification.

2. Place mandrel P 258 on gauge block P 258a. Attach dial gauge to mandrel with a 1 mm preload.



3. Install mandrel P 258, with tapered roller bearings, in the differential housing so that there is an axial preload of approx. 0.1 mm when the side cover is installed. The mandrel should not have axial play during the measurement. Play can be eliminated by using differential shims.

Caution
Make sure the dial indicator sensor does not point into the center bore of the pinion shaft.

4. Rotate the mandrel carefully until the sensor forms a right angle with the face of the pinion. At this point the dial indicator will show the highest reading. A notch on the end of the mandrel shows the position of the dial indicator sensor. Record the reading.

Note the following when reading the dial indicator:

The distance from the center line of the mandrel to its resting base is shown on the side of the mandrel.

The distance from the measuring surface of the gauge block to its support surface is indicated on the side of the gauge block.

By adding the mandrel and gauge block dimensions the "actual adjusting dimension" is obtained.

Example:

	Mandrel dimension	54.015 mm
+	Gauge block dimension	+ 12.595 mm
	Actual adjusting dimension	66.610 mm

If the pointer reads to the right (clockwise), the distance is smaller than the "actual adjusting dimension" (66.61 mm). Therefore subtract the dial indicator reading from the "actual adjusting dimension" to determine the distance from ring gear center to face of pinion.

Example:

	Actual adjusting dimension	66.61 mm
-	Dial indicator reading	- 0.39 mm
	Distance from ring gear center to face of pinion	66.22 mm

	Adjusting dimension "E" (as in example on P 5.1-5/2)	66.32 mm
-	Distance from ring gear center to face of pinion	- 66.22 mm
	Shim thickness	0.10 mm

The pinion shaft must therefore be moved away from the ring gear center by 0.10 mm. This can be achieved by inserting a 0.10 mm thick shim. (End numbers from 3 or more should be rounded off to 5, and from 7 or more to 10).

Should the dial indicator read clockwise, the deviation when added to the "actual adjusting dimension" (mandrel dim. + gauge block dim.) should not exceed 0.03 mm.

Shims are available in the following thicknesses: 0.10, 0.15 and 0.20 mm. Total thickness of shims must not exceed 0.50 mm.

Adjusting dimension E should be rechecked after shims have been installed. A deviation of ± 0.03 mm is permissible. It is not necessary to check the gear tooth contact pattern.

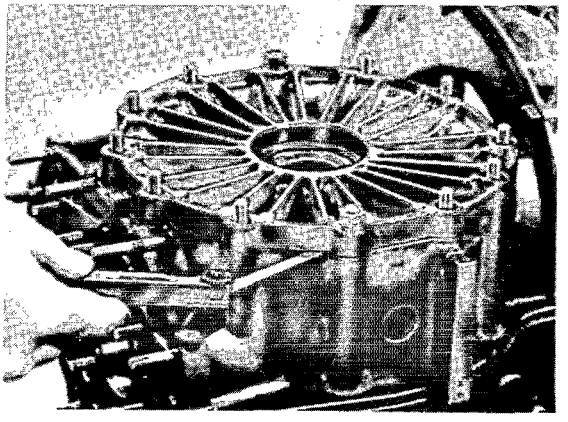
DETERMINING TOTAL SPACER THICKNESS FOR RING GEAR ADJUSTMENT

1. Make sure that side bearing outer races are fully seated in the housing and side cover.

2. Install a 3.5 mm spacer (S_1) on the ring gear side beneath the side bearing. Install a 3.0 mm spacer (S_2) on the opposite side beneath the other bearing.

3. Install differential with side bearings in housing and install side cover without O-ring and without oil seal. Do not tighten.

4. Lightly tighten the side cover using two nuts opposite each other. This preloads the side bearings. Check the gap between the cover and housing with a feeler gauge. The nominal value for the side bearing preload is 0.30 to 0.40 mm.



5. If the nominal value of 0.30 to 0.40 mm is not reached, replace the (S_1) spacer (ring gear side) with an appropriate spacer.

Example:

Feeler gauge measurement	0.65 mm
- Nominal value for side bearing preload	0.40 mm
	0.25 mm

The installed spacer S_1 (3.5 mm) must therefore be replaced with one 0.25 mm thinner, that is, it should be 3.25 mm thick.

6. Tighten side cover to correct torque.

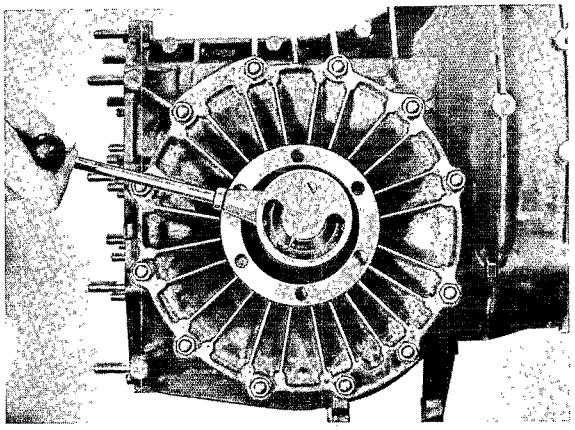
7. Place washer from special tool P 357 on the U-axle flange. Install the axle flange. Slightly tighten the expansion bolt.

CAUTION

When measuring differential drag, the pinion shaft must be disengaged and the axle flange oil seal must be removed from the side cover to prevent additional drag.

8. Measure drag of the assembled differential with a torque wrench. The following values must be obtained to ensure proper side bearing preload.

SKF bearings	= 300 to 420 Ncm (26 - 37 in. lb)
FAG bearings	= 350 to 650 Ncm (30 - 56 in. lb)



If the differential drag is not within tolerance, replace the spacer washer.

9. Remove differential. Then pull off both side bearings.

CAUTION

Do not interchange spacer washers after removal.

10. Measure the thickness of both spacers with a micrometer. Add these measurements to obtain the total thickness of the spacers for ring gear adjustment.

Note

In order to check backlash correctly (a subsequent procedure), the spacer S_1 should be 0.1 mm (0.004 in.) thinner than one half of the sum of spacers S_1 and S_2. The spacer S_2 should be 0.1 mm (0.004 in.) thicker than one half of the sum of spacers S_1 and S_2.

Example:

Total thickness of spacers ($S_1 + S_2$) ... 6.25 mm

$$\frac{6.25 \text{ mm}}{2} = 3.125 \text{ mm}$$

$$3.125 \text{ mm} - 0.10 \text{ mm} = 3.025 \text{ mm}$$

Thickness of spacer S_1 = 3.025 mm

$$\frac{6.25 \text{ mm}}{2} = 3.125 \text{ mm}$$

$$3.125 \text{ mm} + 0.10 \text{ mm} = 3.225 \text{ mm}$$

Thickness of spacer S_2 = 3.225 mm

Spacers are available in increments of 0.10 mm from 2.4 to 3.7 mm.

A shim, 0.25 mm thick, permits adjustments to the nearest 0.05 mm. The rounded off spacer thickness should not differ from the calculated spacer thickness.

Example:
Calculated spacer thickness
S1 + S2 = 3.025 + 3.225 = 6.25 mm

Rounded off spacer thickness
S1 + S2 = 3.0 + 3.25 = 6.25 mm

Before measuring, remove any burr that may be on the edges of the spacer. Measure the thickness of the two spacers with a micrometer at four different points; the thickness tolerance is 0.02 mm (0.008 in.).

ADJUSTING RING GEAR BACKLASH

1. Install gear cluster with shims determined at time of pinion shaft adjustment.

Caution
Make sure pinion shaft flange nut is tightened to correct torque before making any adjustments.

2. Install differential with side bearings and correct shims (S1 and S2).

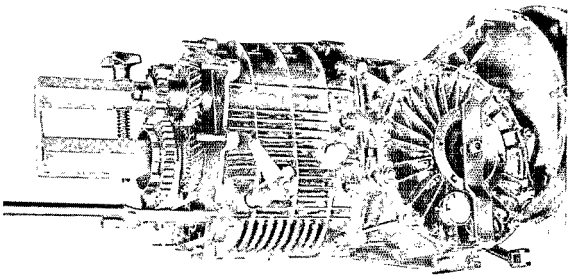
3. Install side cover with oil seal. Apply light coat of oil to seal.

Caution
When tightening the nuts, take care that a certain amount of side clearance exists. Make sure the pinion shaft does not jam.

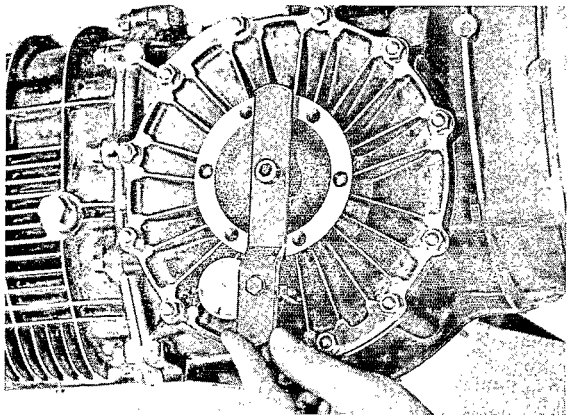
Tighten side cover bolts to correct torque.

4. Block pinion shaft with holder P 259a.

5. Place washer from special tool P 357 onto the axle flange. Attach dial indicator with sensor P 259b. Bolt dial indicator holder over the axle flange with the 10 x 110 mm bolt. The dial indicator should have a slight preload.



6. Move dial indicator holder back and forth. Read backlash on dial indicator.

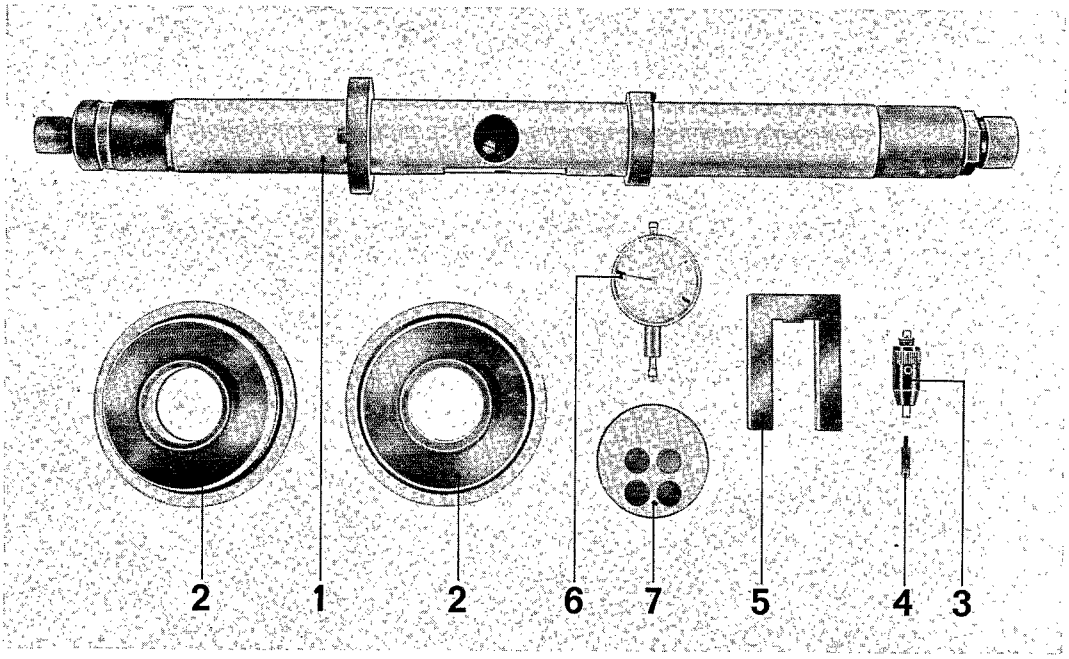


7. Turn ring gear about 90° and measure backlash again. The readings must not vary by more than 0.05 mm.

Caution
The accurate backlash is marked on the ring gear.
Backlash tolerance: 0.12 to 0.18 mm.

8. Spacers S1 and S2 can be replaced with special tools P 263 and P 264b until proper backlash is attained. Be sure that the total spacer thickness is not changed.

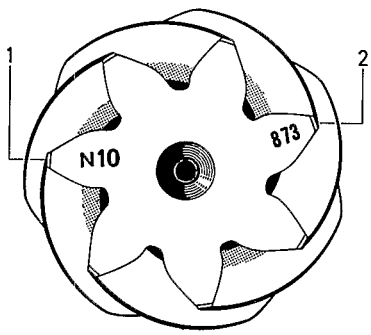
TOOLS



Nr.	Designation	Special Tool Nr.	Remarks
1	Setting gage shaft	VW 385/1	
2	Gage block	VW 385/4	
3	Gage contact plunger	VW 385/14	
4	Gage contact extension	VW 385/53	14 mm
5	Master plate	VW 385/52	R = 66.30 mm
6	Dial indicator	---	3 mm range
7	Setting pad	VW 385/17	50 mm ø

ADJUSTING PINION SHAFT WITH UNIVERSAL SETTING GAGE VW-385

Determine adjustment value E from known design value R = 66.30 mm by adding deviation "r" which is shown on pinion face.



1 - Deviation "r" in 1/100 mm
2 - Mating number

Example:

The pinion face shows deviation "r" to be N 10

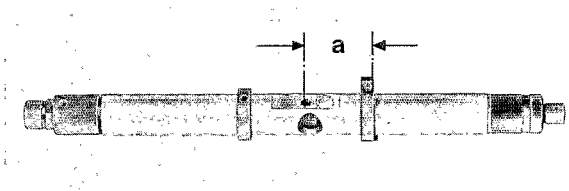
R =	Design value		66.30 mm
r =	Deviation	+	0.10 mm
E =	Adjustment value	=	66.40 mm

1. Assemble gear cluster without selector forks or adjustment shims.
   Tighten preload plate nuts to specified torque.

NOTE:
The collar nut on the pinion shaft must definitely be tightened to specified torque prior to measuring.
Fasten gear housing with 2 nuts. Install free gear of 5th speed together with spider. Block pinion shaft with clamp P 37a. Engage 4th speed and tighten collar nut to specified torque.

2. Make sure that outer races of bevel roller bearings are firmly seated in gear housing and housing side cover.

3. Move adjustable collar on setting gage VW 385/1 to dimension "a".

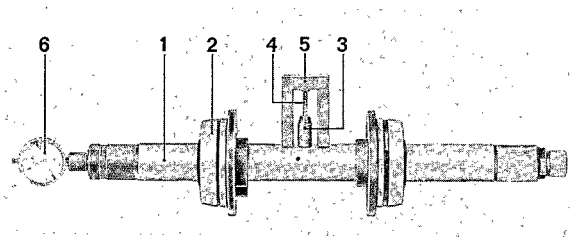


a = ca. 52 mm

4. Slide gage blocks VW 385/4 onto the setting gage shaft and screw contact plunger VW 385/14, together with the contact extension VW 385/53 (14 mm), into place.

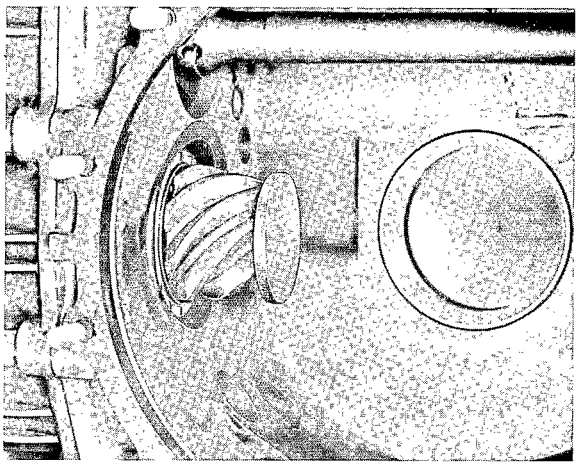
NOTE: Turn adjustable collar back to stop.

5. Place master plate VW 385/52 (R = 66.30 mm) in position and adjust dial indicator (3 mm range) to 0 under a 1 mm preload (small pointer on 1, long pointer on 0).

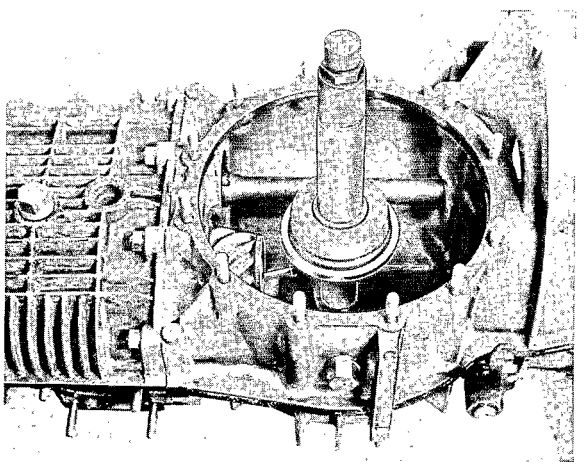


1 = VW 385/1 Setting gage shaft
2 = VW 385/4 Gage block
3 = VW 385/14 Gage contact plunger
4 = VW 385/53 Gage contact extension
5 = VW 385/52 Master plate
6 = --- Dial indicator

6. Place setting pad VW 385/17 on the pinion face.



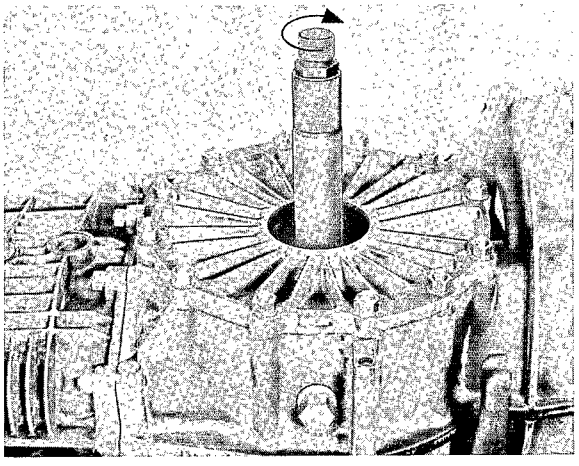
7. Remove master plate and place setting gage in gear housing, making sure that the dial indicator extension is oriented towards the setting pad.



8. Insert housing side cover (without O-ring) and tighten nuts to specified torque.

Caution:
Never use a hammer when installing the housing side cover. This may cause the magnetically attached setting pad to fall off the pinion.
Bring side cover into proper place only by evenly tightening the retaining nuts.

9. Using the spindle, pull the second gage block so far outwards that the setting gage shaft can still be barely turned.



10. Carefully turn setting gage until the gage contact extension is positioned perpendicular to the pinion shaft face. In this instance, the indicator shows the highest reading which is to be noted.

Note the following points when reading the dial indicator:

The design value R = 66.30 mm was set by means of the master plate VW 385/52.

If the value indicated on the gage deviates clockwise from the set design value (R = 66.30 mm), then the dimension is smaller than 66.30 mm, that is, the amount of deviation from 0 must be subtracted from the value of 66.30 mm.

Example:
The small pointer on the indicator is between 1 and 2, and the long pointer shows 0.29 mm.

Adjusted design value (master plate VW 385/52)		66.30 mm
minus measured value	-	0.29 mm
Distance to pinion shaft face	=	66.01 mm

Adjustment value (as example)		66.40 mm
Distance to pinion shaft face		66.01 mm
Shim thickness	=	0.39 mm

This means that the pinion shaft must be moved away from the ring gear center by 0.39 mm. This is accomplished by installing two 0.20 mm thick shims (end values of 3 or more should be rounded off to 5, and from 7 on to 10).

Recheck adjustment value E (shown as 66.40 mm in the example) upon installation of shims; a deviation of ± 0.03 mm is permissible. A tooth contact pattern test need not be performed.

NOTE:
If the shims were selected in proper thickness, the dial indicator must show the value of deviation "r" (shown in the example as 0.10 mm) within a tolerance of ± 0.03 mm during the recheck.

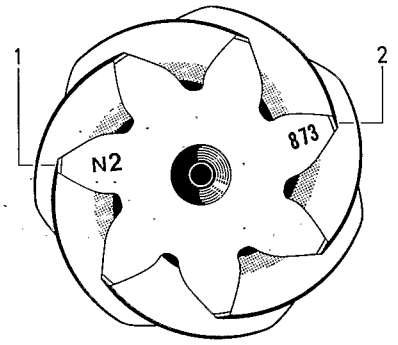
ADJUSTING RING GEAR AND PINION

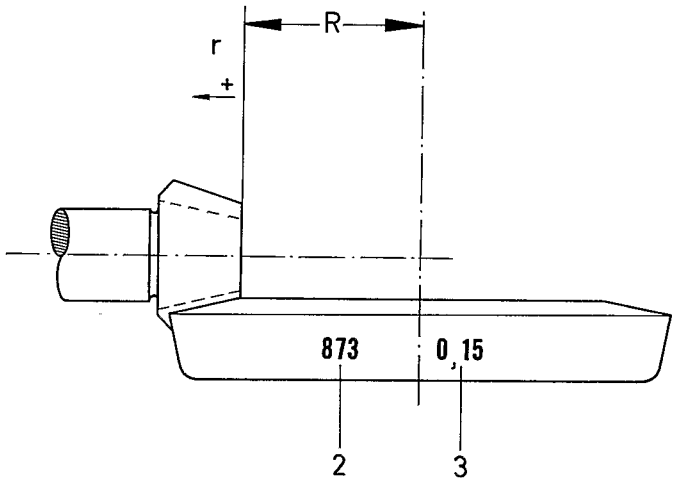
General

Adjustment of the ring gear and pinion is important for quiet operation of the rear axle assembly. For this reason the pinion shaft and ring is already matched as a pair during production. They are checked on testing machines for correct contact pattern and low noise level in both directions of rotation. When the ring gear and pinion is tested it is set according to the design dimension "R". Dimension "R" is the distance from the face of the pinion to the ring gear center line. The pinion is then moved in or out of mesh until the quitetest operation is determined. The deviation from the design dimension (the in or out movement of the pinion) is called "r" and is etched on the face of the pinion. While making this test, the ring gear backlash is kept within a tolerance of 0.12 - 0.18 mm. The ring gear and pinion shaft is designed in such a way that the deviation "r" must always be added to the design dimension "R".

Earlier pinion assemblies had either a plus (+) or a minus (-) etched in front of the deviation "r" where as on the newer pinion assemblies , the letter "N" precedes the deviation "r" on the pinion shaft.

Ring gear and pinion sets are also stamped with a matching number and should always be replaced as a complete set.





R Design dimension (59.70 mm for Sportomatic transmissions 925/00 and 925/01).

r Deviation from R indicated in 1/100 mm.

1 Deviation r

2 Matching set number

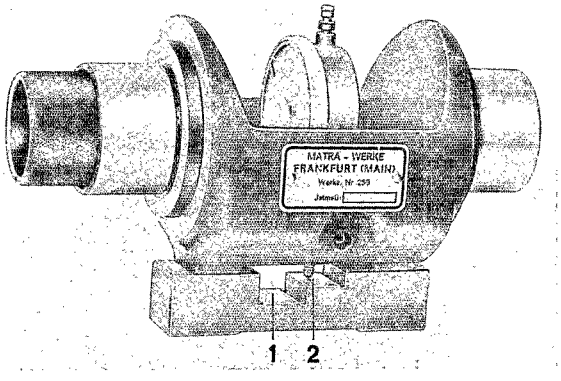
3 Backlash

ADJUSTING RING GEAR AND PINION

1. The design dimension "R" and the basic approximation value have been changed in the 925/00 and 925/01 transmission versions.

Design dimension "R" (formerly 54.20 mm)	59.70 mm
Basic distance (approximation value) (formerly 55.70 mm)	60.70 mm

2. When determining the "Actual Adjusting Dimension", the gauge block P 258c must be used.
Adjustment is made in the same way as for manual units. See Type 911 workshop manual, volume I, 11 RA, page 46.

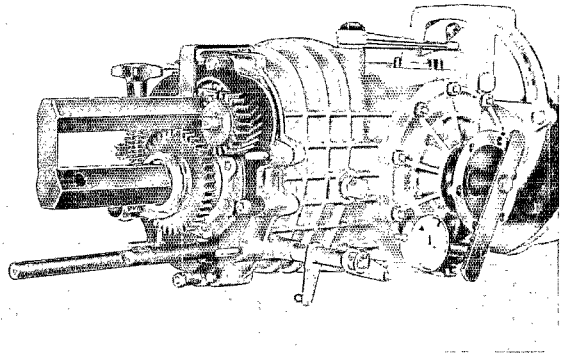


1 - Calibration surface for Type 915 transmission
2 - Calibration surface for Type 925 transmission

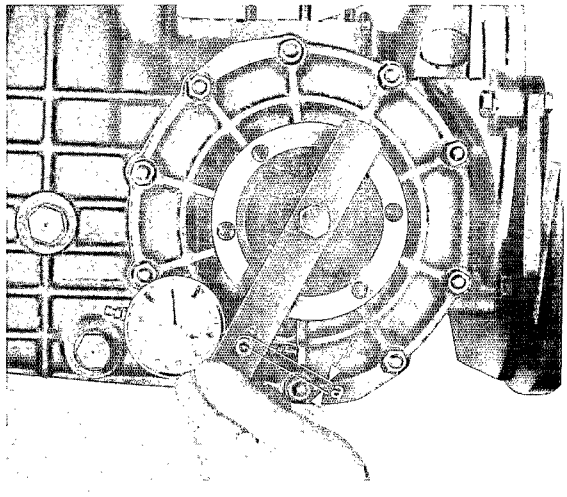
Note

When using gauge block P 258c, make sure to use the appropriate calibration surface.

3. The holder P 357a is needed for blocking the pinion shaft when measuring gear backlash.



4. When measuring backlash, be sure to use the modified dial indicator holder (must have a second 6.5 mm hole - see illustration).



a = 10 mm

Vorderachse
Front Axle
Essieu AV
Assale anteriore

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.0 Information

0.1 Description

Front Axle Changes, from 1972 Model 0.1 - 1/1
Self-Leveling Hydropneumatic Suspension Strut, Operation - General Outline 0.1 - 2/1
Operation of the Self-Leveling Hydropneumatic KONI Suspension Struts 0.1 - 2/2
Cross-Section of Self-Leveling Hydropneumatic KONI Suspension Struts 0.1 - 2/5

0.2 Technical Data

Technical Data 0.2 - 1/1
Technical Data, 1974 models 0.2 - 1/3
Technical Data, 1975 models 0.2 - 1/5
Tightening Torque Values 0.2 - 2/1

1 - FRONT WHEEL ALIGNMENT

1.1 Alignment

General 1.1 - 1/1
Sample Wheel Alignment Card 1.1 - 1/1

2 - FRONT AXLE

2.1 Front Axle with Shockabsorbers or Suspension Struts

Disassembling and reassembling 2.1 - 1/1
Self-Leveling Hydropneumatic Suspension Struts, check 2.1 - 2/1
Aluminium Auxiliary Support, Carrera 2.7 2.1 - 3/1
Disassembly and Reassembly of Stabilizer 1974 Models 2.1 - 4/1
Instructions for Removal and Installation 2.1 - 4/4
Shock Absorber/Spring Struts, USA Models Installation Instructions 2.1 - 5/1

4 - STEERING WHEEL AND STEERING COLUMN

4.1 Steering Wheel

4.2 Steering Shaft

Steering Shaft, disassemble and reassemble, beginning with 1974-models 4.2 - 1/1
Instructions for Disassembly and Reassembly 4.2 - 1/6

FRONT AXLE CHANGES - BEGINNING WITH 1972 MODELS

1. BOGE shockabsorber struts are installed in front axles of all vehicles.
   Available on special order are BILSTEIN or KONI shockabsorber struts, and BOGE or KONI suspension struts.

2. The basic adjustment of suspension struts has been changed.
   To attain the highest degree of driving comfort, damping forces have been reduced. This softer adjustment can also be used in earlier models. In such cases make sure that struts of same setting are used on both left and right side:

   Two complete shockabsorber struts, or one complete shockabsorber strut and one strut insert, or two strut inserts.

3. The ball joint mount in shockabsorber strut has been changed.
   The ball joint assembly is now attached by a double-wedge arrangement. The former clamp-mount in the shockabsorber strut is no longer in use.

4. Type 911 S vehicles have 15 mm dia. stabilizers in front and rear as standard equipment.

DESCRIPTION OF THE SELF - LEVELING HYDROPNEUMATIC SUSPENSION SYSTEM

General

Beginning with 1972 models, self-leveling hydropneumatic front suspension struts are optional equipment for all Type 911 vehicles.

Operation - General Outline

As soon as the car begins to move, wheel oscillations caused by road bumps result in a pumping action in the strut, raising the car's height to a predetermined level.

The struts will bring the car to a normal level after covering a distance of anywhere between 300 and 1500 yards, depending on the road irregularities encountered. When the car is driven on particularly rough roads, the struts will pump the car, up to 10 mm more than the predetermined height. The height remain constant overnight providing that the load is not increased after the car has been parked. Upon removal of any load from the car, the suspension will first rebound, as in conventional systems, but will quickly proceed to adjust itself to the predetermined height where it then will remain.

Should the suspension be loaded beyond the permissible maximum, the pumping effect will automatically be relieved and height compensation stopped to prevent any overstressing of the system. Consequently, an overload condition can be readily noticed by the reduced ground clearance, similar to cars with conventional suspensions.

The suspension strut is filled with oil with the exception of two gas cushions. One of the gas cushions is located in the high-pressure part, between the damping cylinder and outer cover. The gas (nitrogen) is separated from the oil by a diaphragm. The second gas cushion is located in the low-pressure part above the damping cylinder, within the oil reservoir, and is not separated from the oil.

The pressure of the gas cushions is such that the force it exerts on the piston is equal to 90 percent of the empty weight of the vehicle.

A piston divides the damping cylinder. The space below the piston is in contact with the high-pressure part, and the space above the piston with the oil reservoir. A pressure valve is located on the piston.

The hollow piston rod accomodated the pump cylinder whose upper section is limited by a suction valve with a return flow orifice.
The pump rod is in the damper housing which is supported by the housing base. It also contains a needle valve which is suspended in the pump rod with the aid of a spring.

Pump Action Under Load

Irregularities in the road surface cause the piston rod to move in relation to the pump rod. Through this motion, the pump rod displaces a certain amount of oil from the pump cylinder, through the pressure valve, into the space below the piston.

During the suction stroke, a certain amount of oil is sucked from the space above the piston through the suction valve.

Due to the reduced oil supply above the piston, gas expands in the oil reservoir thus causing a pressure drop. At the same time, gas is compressed in the high-pressure chamber. The force under the piston is increased and the vehicle rises. This cycle repeats until the pump rod guide clears several orifices in the pump rod. On the subsequent suction stroke, oil also flows from the high-pressure chamber through the orifices into the oil reservoir. The pump also is neutralized, and the vehicle is no longer raised.

A balance is thus achieved since at higher vehicle level a return flow orifice is cleared by the needle valve permitting a small amount of oil to flow back to the oil reservoir.

In the balanced condition, the amount of oil pumped up equals the amount flowing back through the return flow orifice. The vehicle is at its predetermined level.

Action on Rebound

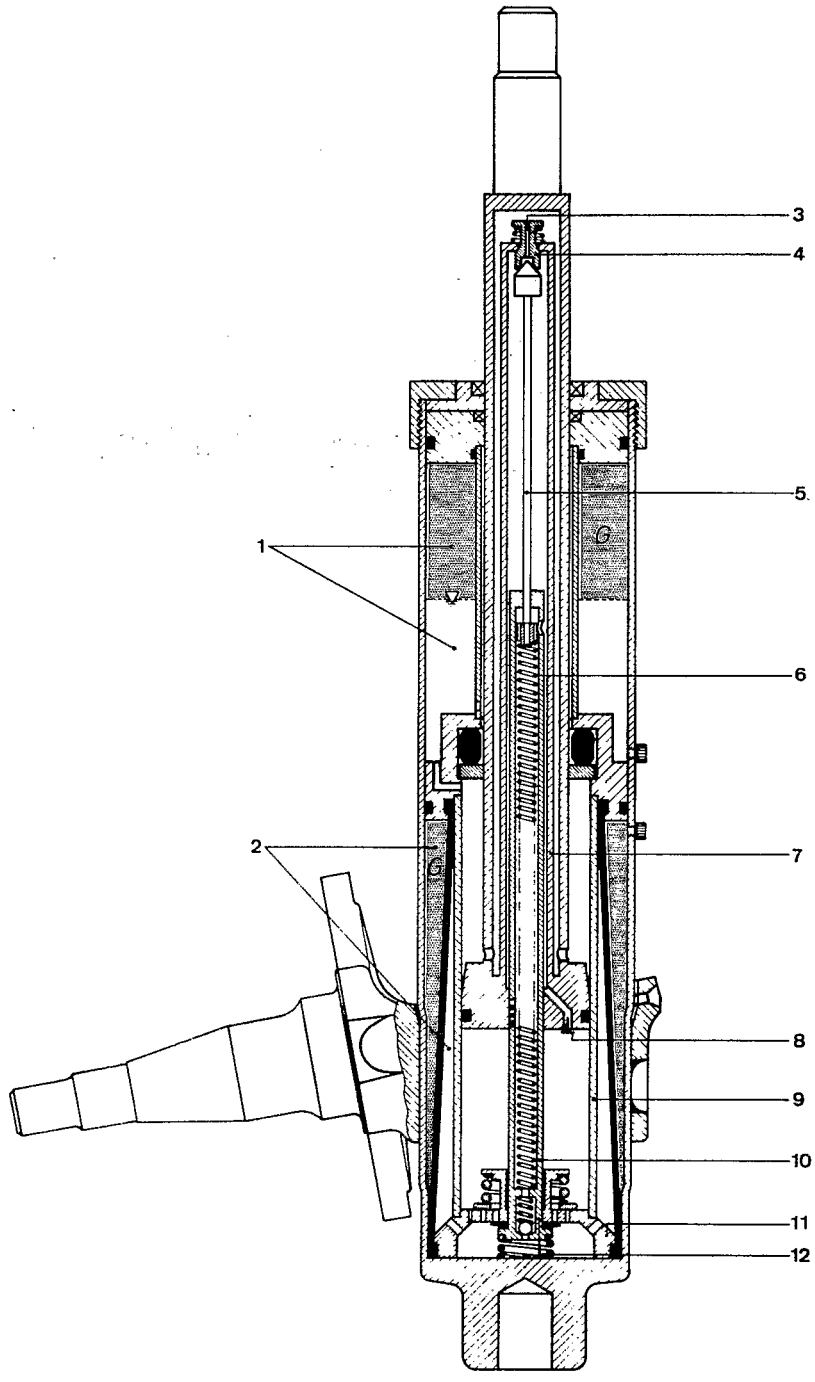
When the load is decreased, the car will rise briefly. As a result, the needle valve will open the return flow orifices until enough oil has returned to reestablish the normal oil level.

When the piston moves, the oil below the piston flows through the damper housing, creating a damping action. The oil velocity is kept within specified limits, thus limiting piston speed.

The required damping and springing characteristics are achieved through exact calibration of passages and valves, same as in conventional hydraulic shock absorbers.

In addition, the pumping action results in supplemental damping which increases in proportion to the load. In other words, the damping effect is load-sensitive.

Cross-Section of Self-Leveling Hydropneumatic KONI Suspension Strut



1. Low pressure chamber
2. High pressure chamber
3. Return flow orifice
4. Suction valve
5. Needle valve
6. Spring
7. Pump cylinder
8. Pressure valve
9. Main cylinder
10. Pump rod
11. Damper housing
12. Overload valve

G - Gas cushions

GENERAL SPECIFICATIONS

TYPE 911 VEHICLES - BEGINNING WITH 1972 MODELS

Wheel suspension	independent, with shockabsorber struts and transverse control arms
Springing	1 round longitudinal torsion bar per wheel (hydropneumatic suspension struts optional)
Shockabsorbers	double-action hydraulic shockabsorber struts
Stabilizer	15 mm dia, standard in Type 911 S only (optional in Type 911 T and 911 E)
Wheelbase	2271 mm (89.4 in.)
Track, front (wheel center 108 mm above torsion bar center)	911 T = 1360 mm / 53.54 in. (5 1/2 J x 15 rim) 911 E & 911 S = 1372 mm / 54.02 in. (6 Jx15 rim)
Max. axle load, front	600 kp (1320 lbs.)
Mean steering ratio	17.78 : 1
Steering wheel turns, lock-to-lock	approx. 3.1
Smallest turning circle	approx. 10.7 m (35.1 ft.)

Nominal Adjustment Values and Wear Tolerance (at DIN curb weight)

Toe angle, overall (pressed 15 kp)	$\pm$ 0'
Camber, front	0° $\pm$ 10'
Max. camber difference, left to right	10'
Caster	6° 5' $\pm$ 15'
Steering difference angle, front wheels turned 20°	0° to 30'
Front axle height adjustment (wheel center above torsion bar center)	108 mm $\pm$ 5 mm (4.25 $\pm$ 0.20 in.)
Height difference, left to right	max. 5 mm (0.20 in.)
Steering drag (measured at steering assembly flange without tie rods or damper connected)	8 - 14 cmkp (6 - 12 in.lbs.)

TECHNICAL DATA - 1974 Models

Vehicle Type	911	911 S	Carrera
Wheel suspension	independent, with shock absorber struts and transverse control arms		
Springing	1 round longitudinal torsion bar per wheel (hydropneumatic suspension struts optional)		
Shock absorbers	double-action hydraulic shock absorbers struts		
Stabilizer, diameter front/rear	16 mm/---	16 mm/---	20 mm/18 mm
Torsion bar dia.	18.8 mm	same as 911	same as 911
Wheelbase	2271 mm	2271 mm	2271 mm
Track, front (wheel center 108 mm above torsion bar center)	1360 mm (5 1/2 Jx15 rim)	1372 mm (6 Jx15 rim)	1372 mm (6 Jx15 rim)
Max. axle load, front	600 kg	same as 911	same as 911
Mean steering ratio (steering wheel angle to road wheel angle)	17.78 : 1	same as 911	same as 911
Steering wheel turns, lock-to-lock	approx. 3.1	same as 911	same as 911
Nominal Adjustment Values and Wear Tolerances (at DIN curb weight)			
Overall toe-in, front (pressed 15 kg)	$\pm$ 0'	same as 911	same as 911
front wheel camber	$0^{\circ} \pm$ 10'	same as 911	same as 911
Max. camber difference, left to right	10'	same as 911	same as 911
Caster	$6^{\circ}5' \pm$ 15'	same as 911	same as 911
Steering difference angle, front wheels turned 20°	0° to 30'	same as 911	same as 911
Front axle height adjustment (wheel center above torsion bar center)	108 mm $\pm$ 5 mm	same as 911	113 mm $\pm$ 5 mm
Height difference, left to right	max. 5 mm	same as 911	same as 911
Steering drag (measured at the steering assembly flange with tie rods disconnected)	8 - 14 cmkp	same as 911	same as 911

TECHNICAL DATA - 1975 Models

Model	911 S	Carrera
Wheel suspension	Independent with transverse control arms and shock absorber struts	
Springing	One round longitudinal torsion bar per wheel	
Shock absorbers	Double action hydraulic shock absorber struts	
Stabilizer dia. front/rear	20 mm/18 mm	same as 911 S
Torsion bar dia.	18.8 mm	same as 911 S
Wheelbase	2271 mm	same as 911 S
Track width, front	1372 mm with 6 J x 15 wheel	same as 911 S
Front axle height adjustment: center of wheel above center of torsion bar (at curb weight according to DIN)	93 $\pm$ 5 mm	same as 911 S
Max. axle load, front	600 kg (1323 lb)	same as 911 S
Steering ratio (overall)	17.78 : 1	same as 911 S
No. of steering wheel turns from lock to lock	approx. 3.1	same as 911 S
Adjusting, reference and wear specifications (at curb weight according to DIN)		
Total toe, front (wheels pressed together with 15 kg)	$\pm$ 0'	same as 911 S
Camber, front	+ 30' $\pm$ 10'	same as 911 S
Max. camber difference between left and right	10'	same as 911 S
Caster	$6^{\circ}5' \pm 15'$	same as 911 S
Toe difference angle at 20° lock	0° to 30'	same as 911 S
Height difference between left and right	max. 5 mm	same as 911 S
Steering drag (measured at steering gear flange with tie rods disconnected)	8 to 14 cmkp	same as 911 S

TECHNICAL DATA - from 1976 Model

	1976/77 Models 911 S	From 1978 911 SC
Wheel suspension	Independent wheel suspension on control arms and spring/absorber struts	
Springing	One round torsion bar per wheel in forward direction	
Shock absorbers	Double-action hydraulic shock absorbers	
Stabilizer dia. front/rear	16 mm/---	20/18 mm
Torsion bar dia.	18.8 mm	18.8 mm
Track width, front	1361 mm with rim 6 J x 15	1361 mm with rim 6 J x 15
Wheelbase	2272 mm	2272 mm
Front axle height (wheel center over torsion bar center) (at DIN curb weight)	99 ± 5 mm	99 ± 5 mm
Height difference, left to right	max. 5 mm	max. 5 mm
Max. axle load, front	600 kg	model 1978/79: 600 kg/1323 lb model 1980/81: 650 kg/1433 lb
Steering ratio at center (steering wheel lock to lock)	17.78 : 1	17.78 : 1
No. of steering wheel turns from lock to lock	approx. 3.1	approx. 3.0
Adjusting, reference and wear limit values (at DIN curb weight)		
Total toe, front (wheels pressed together with 15 kg/150 N)	0°	0°
Toe difference angle at 20° steering lock	0° to + 30'	0° to + 30'
Camber of front wheels	+ 30' ± 10'	+ 30' ± 10'
Max. camber difference, left to right	10'	10'
Caster	6°5' ± 15'	6°5' ± 15'
Steering drag (measured on flange of steering gear with tie rod disconnected)	0.8 to 1.4 Nm (8 to 14 cmkg)	0.8 to 1.4 Nm (8 to 14 cmkg)

TIGHTENING TORQUES FOR FRONT AXLE AND STEERING

Location	Description	Thread	Grade	mkp	ft. lbs.
Shockabsorber strut to upper mounting plate	Nut	M 14 x 1.5	8	8	57.9
Tie rod clamping sleeve	Nut	M 8	8.8	1.5	10.8
Strut upper mounting plate to body	Allen bolt	M 10	8.8	4.7	34.0
Auxiliary support to body	Bolt	M 12 x 1.5	8.8	9	65.1
Undershield fastener	Bolt	M 10	8.8	4.7	34.0
Undershield fastener	Bolt	M 8	8.8	2.5	18.1
Flanbloc attachment	Bolt	M 10	8.8	4.7	34.0
Auxiliary support attachment	Bolt	M 10	8.8	4.7	34.0
Steering unit attachment	Bolt	M 10	8.8	4.7	34.0
Tie rod to steering unit	Bolt	M 10	8.8	4.7	34.0
Stabilizer mount to body	Bolt	M 8	8.8	2.5	18.1
Stabilizer lever to stabilizer	Bolt	M 8	8.8	2.5	18.1
Wheelbearing clamping nut to axle	Allen bolt	M 7	10 K	1.5	10.0
Ball joint to shockabsorber strut	Nut	M 8	8	2.2	15.9
Ball joint to shockabsorber strut	Bolt	M10x30	10.9	4.5	32.5
Ball joint to transverse arm	Notched nut	M 45 x 1.5	8.8	25	180.0
Plug for BOGE shockabsorber strut	Plug			12 + 2	86.8 + 14.5
Plug for KONI shockabsorber strut	Plug			20	144.7
Wheel to hub	Lug nut	M 14 x 1.5	10 K	13	94.0
Brake disc to wheel hub	Nut	M 8	8.8	2.3	16.6
Cover shroud to steering knuckle	Bolt	M 8	8.8	2.5	18.1
Brake caliper to steering knuckle	Bolt	M 12 x 1.5	8.8	7.0	50.6

Location	Description	Thread	Grade	mkp	ft. lbs.
Hollow bolt to brake caliper	Hollow bolt	M 10 x 1		2.0	14.5
Steering coupling to steering shaft	Bolt	M 8	8.8	2.5	18.1
Steering shaft to steering unit	Bolt	M 8	8.8	2.5	18.1
Steering support attachment	Allen bolt	M 8	8.8	2.5	18.1
U-joint to steering shaft	Bolt	M 8	8.8	2.5	18.1
Steering wheel attachment	Nut	M 18 x 1.5	8	7.5	54.2
Dust boot support to steering rack	Notched nut	M 16 x 1.5	8	7.0	50.6
Ball joint to steering arm	Castellated nut	M 10 x 1	8	4.5	32.5
Coupling flange to steering pinion (self-locking)	Nut	M 10	8	4.7	34.0
Housing cover to steering housing	Bolt	M 8 x 1	8.8	1.5	10.8
Centering screw to steering lock	Stud	M 8	10.9	0.2-0.3	1.4-2.2
Lock nut for centering screw	Nut	M 8	8	1.8	13

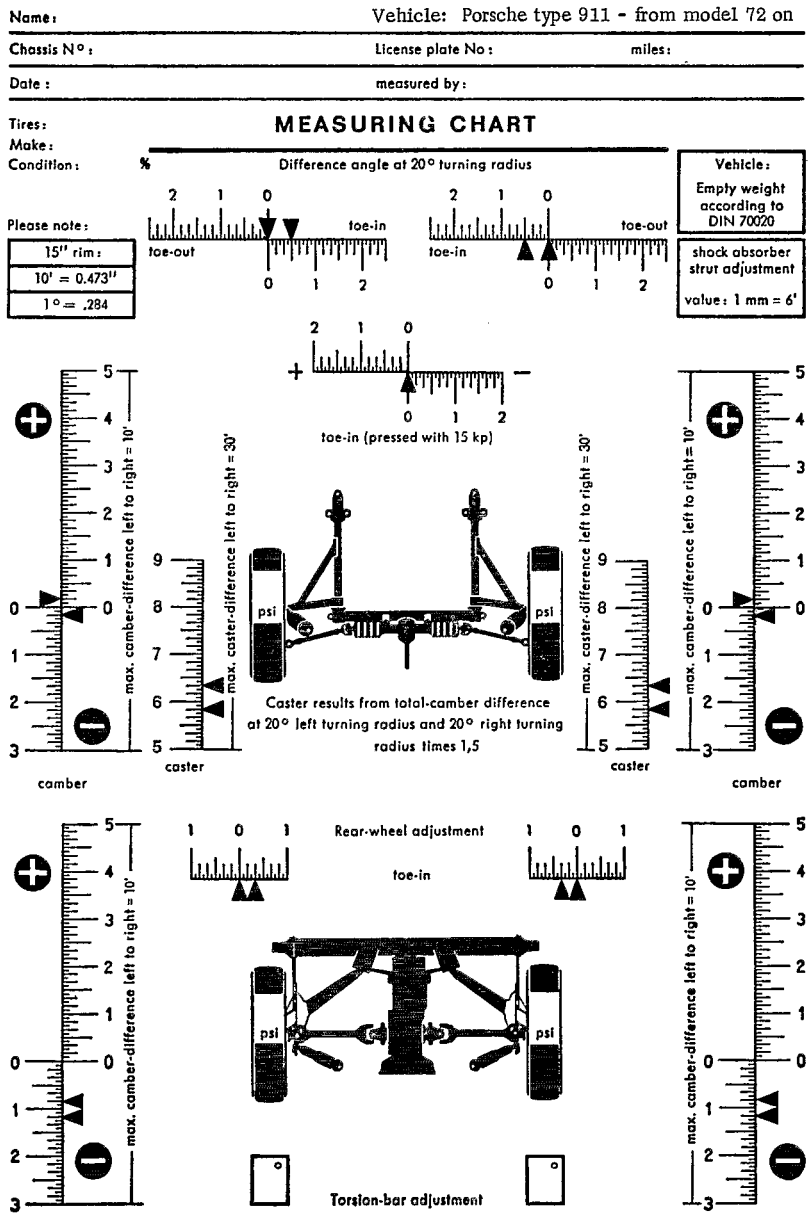
MEASURING FRONT AXLE

General Information

Beginning with 1972 models, caster and camber specifications for the front axle have been changed. The new adjustment values have been indicated on the new wheel alignment chart by small triangles. This acts as a quick reference for evaluating the alignment data.

SAMPLE

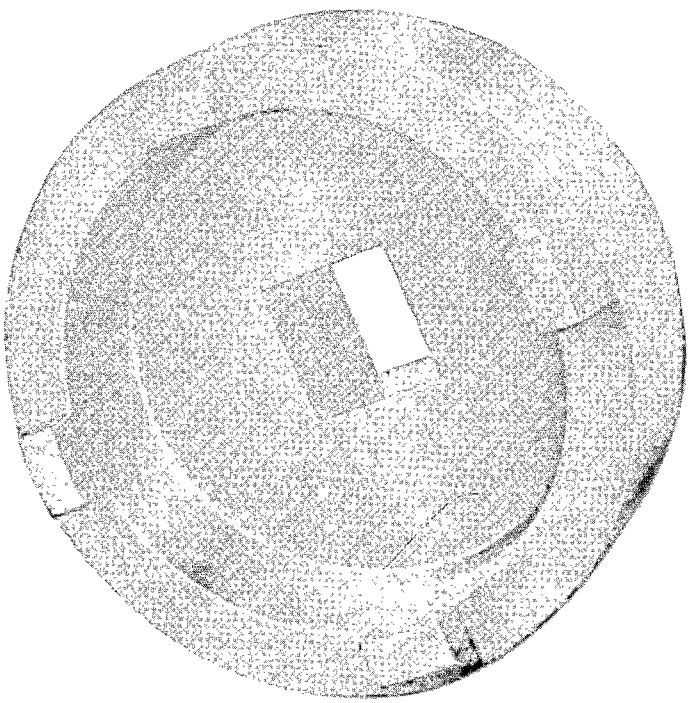
WHEEL ALIGNMENT DATA CHART



Copyright by Dr. Ing. h. c. F. Porsche KG

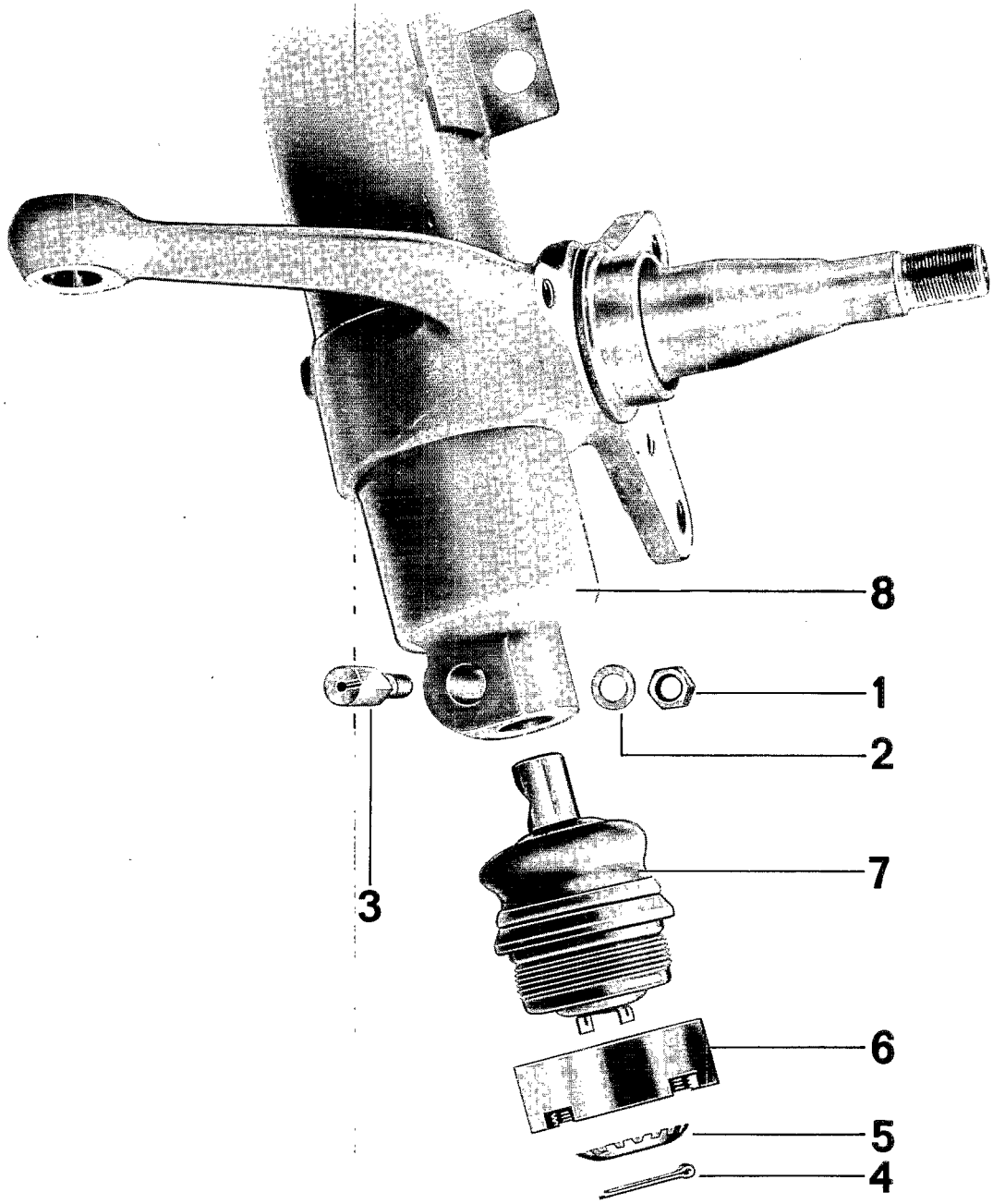
REMOVING AND INSTALLING FRONT AXLE BALL JOINT

TOOLS



Nr.	Description	Special Tool	Remarks
1	Wrench	P 280b	

REMOVING AND INSTALLING FRONT AXLE BALL JOINT



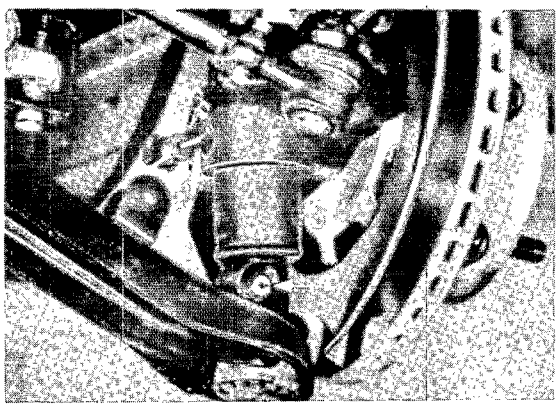
Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Nut M 8	1		Torque to specification.	
2	Washer	1			
3	Double-wedge bolt	1	Drive out.	Install with multipurpose grease, noting proper seating. Replace.	
4	Cotter pin	1		Replace.	
5	Lock plate	1		Replace if necessary.	
6	Nut	1	Remove with special tool P 280b.	Torque to specification.	
7	Ball joint	1		Check, replace if worn.	
8	Shockabsorber strut (suspension strut)			Check, replace if necessary.	

INSTRUCTIONS FOR DISASSEMBLY AND REASSEMBLY

Assembling

1. Coat double-wedge bolt with multipurpose grease before assembling.

2. Installed position of the double-wedge is so that the retaining nut points for ward in the direction of travel.
   The notch on the face of the double-wedge piece and the wedge contour must point toward the wheel stub axle.



3. Make sure the double-wedge bolt is properly seated by tapping with a hammer before tightening the nut.

4. Torque Stop-nut to 2.2 mkp.

CHECKING SELF-LEVELING HYDROPNEUMATIC SUSPENSION STRUTS

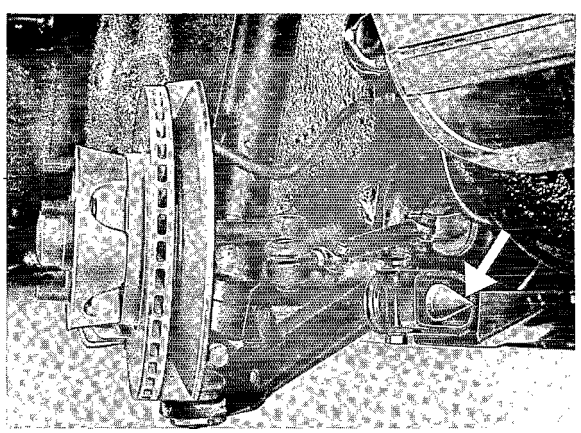
Special Tools:

P 301b Measuring Mandrel

1. Load the front axle with a ballast of 100 kp (220 lbs) in such way that both wheels are evenly weighted (distribute the load evenly in the luggage compartment).

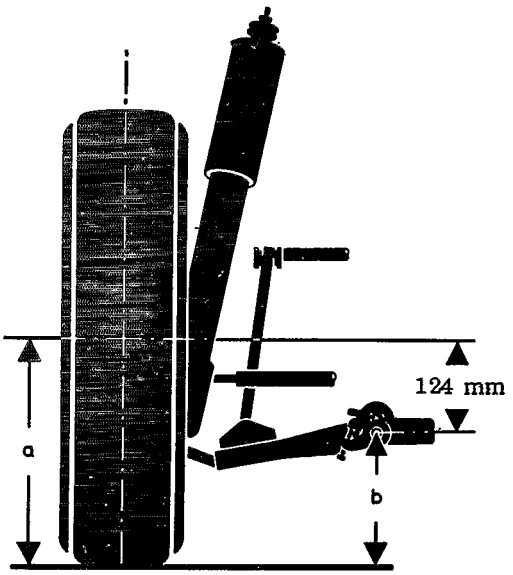
2. The best way to test the pumping action is by driving the car.

Drive the car into level surface and push plug gauges (special tool P 301b), from within the compartment of the reinforcing support member, to the stop in left and right transverse support arm (grease the mandrels slightly to provide some adhesion).



Measure distance "a" - from the ground vertically to the front wheel center.

Distance "b" eguals distance "a" less 124 mm (5.0 in). Raise the car by the front center with a jack until distance "b" is attained at the measuring mandrels.



Measure and note the distance from the ground to the bottom edge of the fender across the front wheel center on left and right side. Remove measuring mandrels (special tool P 301b).

Note: Before lowering the jack, measure the distance from the wheel flange to the ground, then measure again after lowering the jack to determine the static deflection of the tires on both sides of the car. The difference must be deducted from measurements obtained between the ground and lower edge of fender.

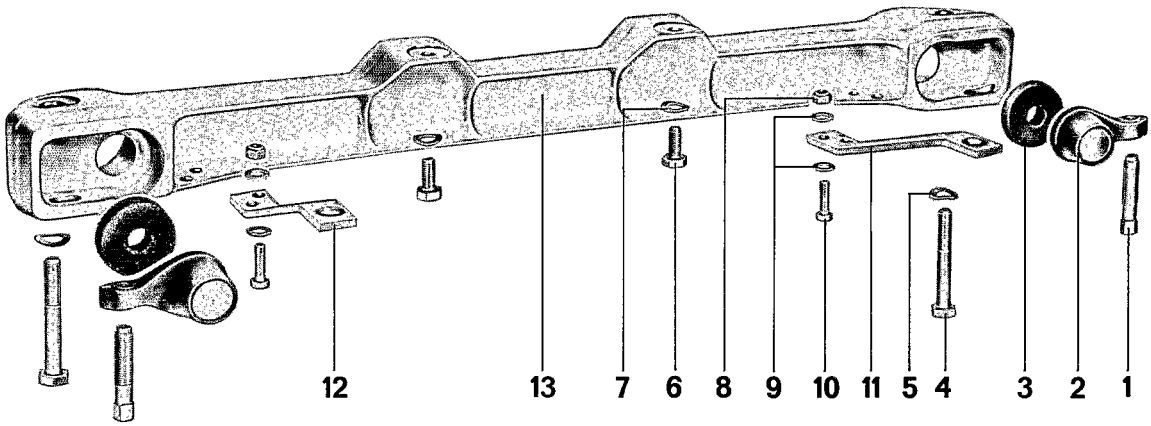
Drive the car on al relatively straight but rough road over a distance of approc. 2 km (1 1/4 miles), without hard braking, and stop car on a level surface. Keeping car occupants in the car, have another person make comparison measurements at both front fenders. The values should not differ from the determinal nominal values by more than ± 10 mm (13/32 in).

LIGHT-ALLOY AUXILIARY CROSS MEMBER FOR CARRERA 2.7

General

Carrera 2.7 vehicles are equipped with a new, forged light-alloy auxiliary cross member. Tightening torques for the front axle remain unchanged.

DISASSEMBLY AND REASSEMBLY



No.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Adjusting screw	2		Coat with multi-purpose MOS_2 grease.	
2	Adjusting lever	2			
3	OWA-gasket	2			
4	Bolt, M 12 x 1.5	2		Tighten to specified torque.	
5	Spring washer	2		Replace.	
6	Bolt, M 10 x 20	2		Tighten to specified torque.	
7	Spring washer	2		Replace.	
8	Self-locking nut M 8	4		Replace if necessary.	
9	Washer	8			
10	Allen bolt M 8	4			
11	Right brace	1			
12	Left brace	1			
13	Auxiliary cross member	1			

STABILIZER 1974 MODELS

General

Beginning with the 1974 models, all vehicles are equipped with a new, one-piece front axle stabilizer.

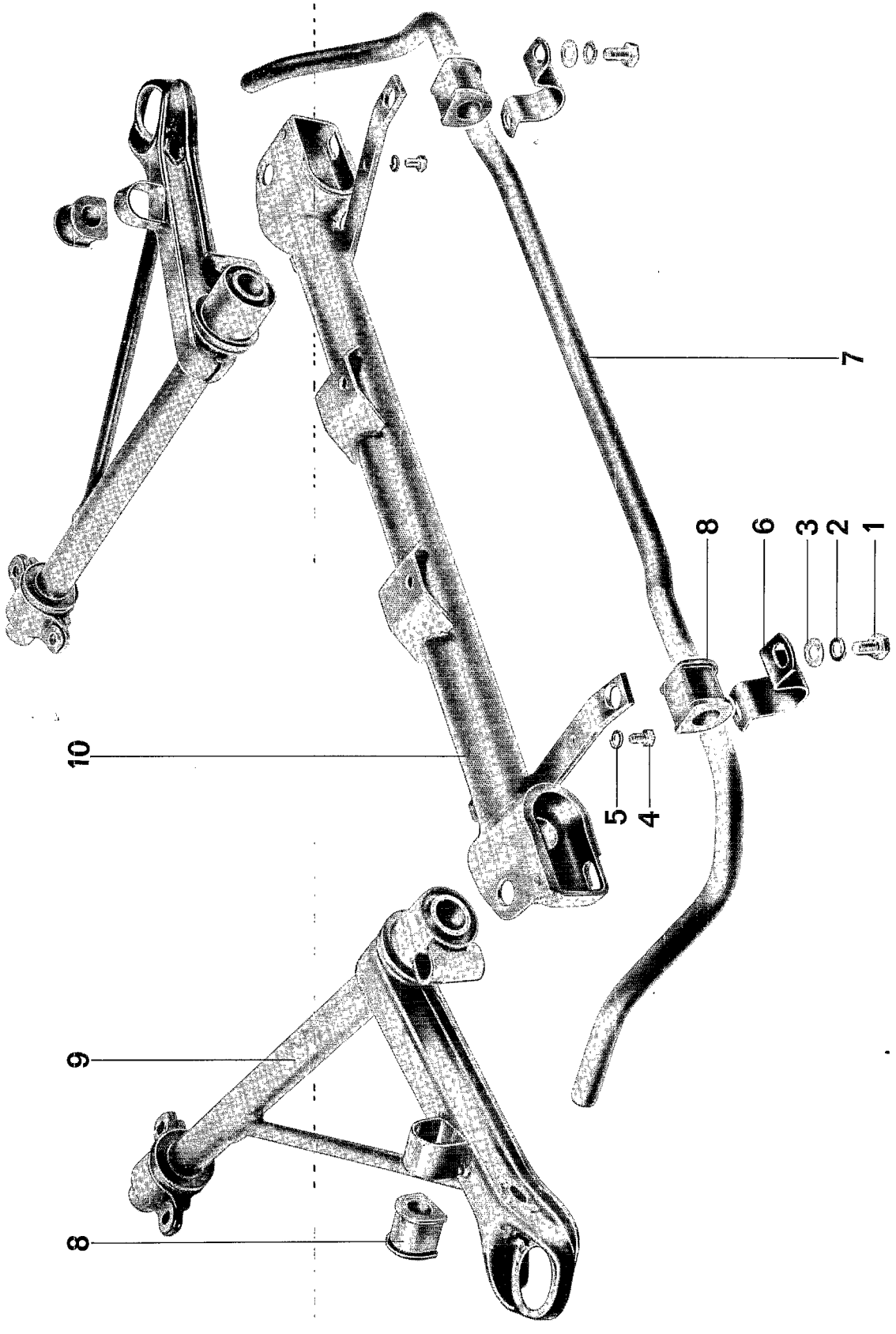
The stabilizer bar diameter is

16 mm in 911 and 911 S vehicles

20 mm in Carrera vehicles

The stabilizer is mounted in rubber bushings located in the transverse control arms and the auxiliary support. It is attached by means of two clamps which are bolted to the modified support struts of the auxiliary support.

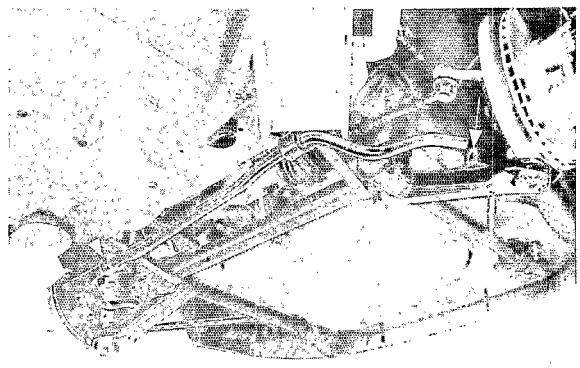
DISASSEMBLY AND REASSEMBLY



No.	Description	Qty	Note during removal	Note during installation	References
1	Bolt M 8	2		Tighten to specified torque	
2	Lock washer	2		Replace	
3	Washer	2			
4	Bolt M 8	2		Tighten to specified torque	
5	Lock washer	2		Replace	
6	Clamp	2			
7	Stabilizer	1			
8	Rubber bushing	4	Check for wear	Use rubber lubricant	
9	Transverse control arm	2			
10	Auxiliary support	1			

INSTRUCTIONS FOR REMOVAL AND INSTALLATION

Removal



1. Remove stone guard.

2. Remove both support clamps from auxiliary support.

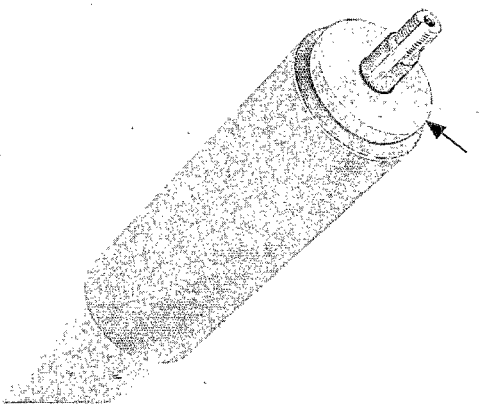
3. Remove stabilizer rearward by first pulling it out of one mounting point in the transverse control arm, and then out of the other.

Installation

1. First push the stabilizer end into one mounting point, then into the other. Use rubber lubricant.

INSTALLATION NOTES FOR SHOCK ABSORBER/SPRING STRUTS

With the 1975 Models a different height adjustment was introduced. When installing the shock absorber/spring struts, make sure that spacer, Part No. 911.341.615.00, is installed between the guard tube and support bracket.



STEERING COLUMN ARRANGEMENT BEGINNING WITH 1974 MODELS

General

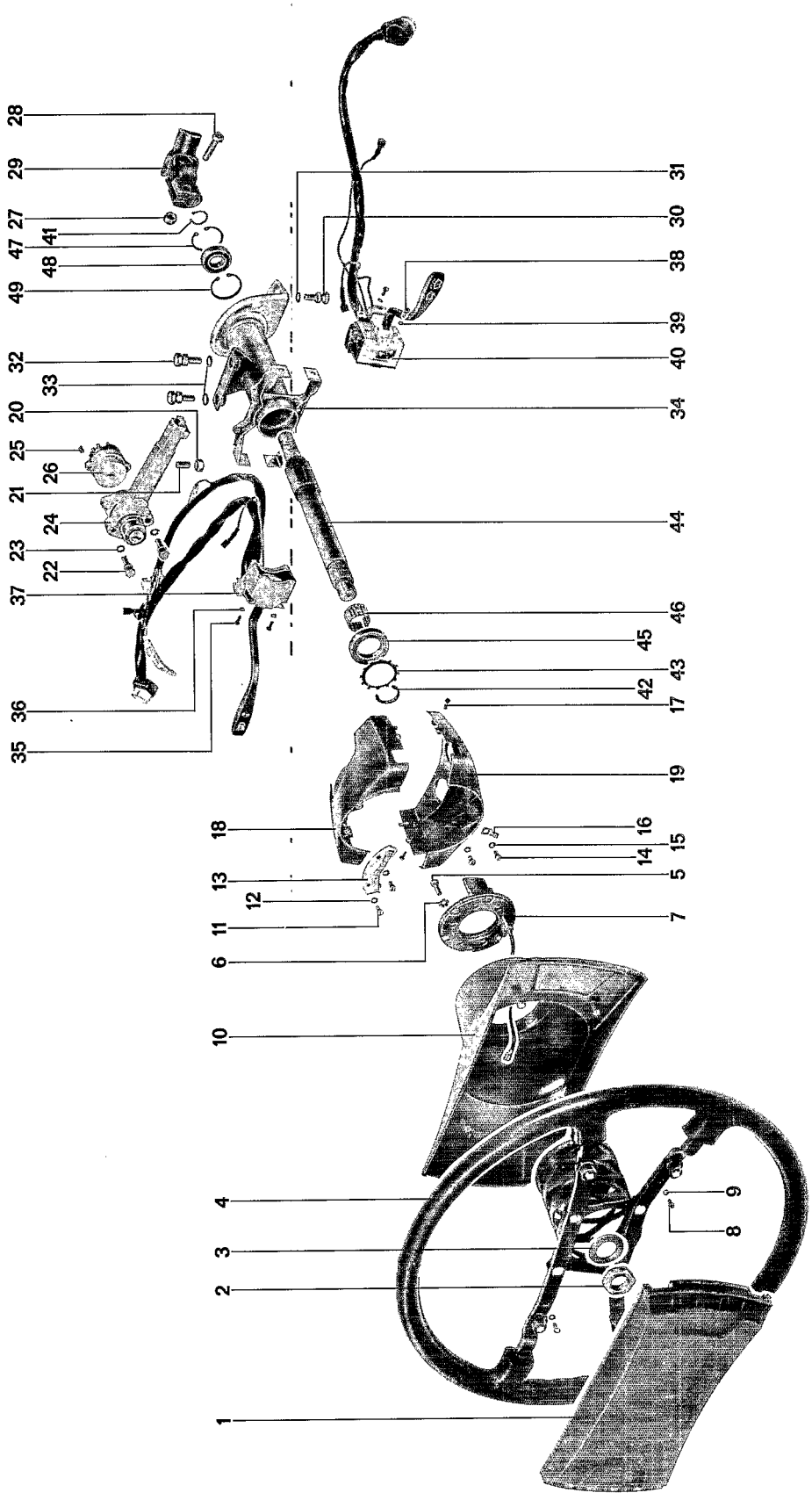
Beginning with 1974 models, the steering column attachment to the instrument panel has been changed.

A safety steering wheel has been introduced at the same time.

This modification necessitated changes in the following parts: steering shaft, steering shaft tube, and the switch assembly mounted on the steering column.

This steering column version with safety steering wheel can be subsequently installed in 1968 and later vehicles.

DISASSEMBLY AND REASSEMBLY



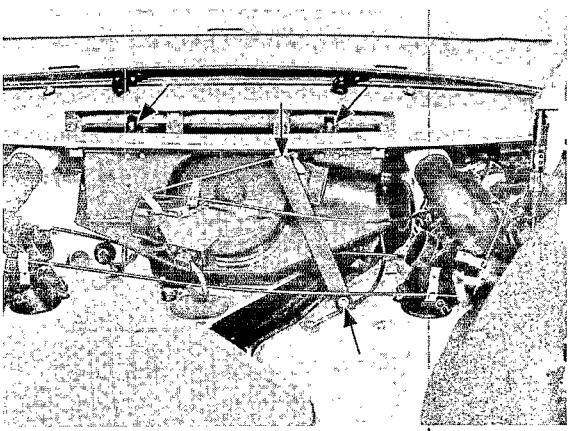
No.	Description	Qty	Note when: removing	installing	Remarks
1	Pad	1	Pull off steering wheel	Press into place	
2	Nut, SW 27	1		Torque to specification	0.2 - 2/2
3	Spring washer	1		Replace if necessary	
4	Safety steering wheel hub and energy absorbing support	1		Install with road wheels in straight ahead position, release ring on left side	
5	Oval head screw M 3.5 x 10	3			
6	External tooth lock washer	3		Replace if necessary	
7	Contact ring	1		Lightly grease contact surface (such as KONDOR T 250 contact grease)	
8	Fillister head screw	4			
9	Lock washer	4		Replace if necessary	
10	Hub cover	1			
11	Fillister head screw, M 4 x 10	2		Replace if necessary	
12	Lock washer	2		Replace if necessary	
13	Contact plate	1		Lightly grease contact surface (such as KONDOR T 250 contact grease)	
14	Fillister head screw, M 3 x 8	4			
15	Lock washer	4		Replace if necessary	
16	Contact tab	1			
17	Fillister head screw, M 3 x 10	2			

No.	Description	Qty.	Note when: removing	Note when: installing	Remarks
18	Switch housing top	1			
19	Switch housing bottom	1			
20	Nut, M 8	1			
21	Stud	1			
22	Shear bolt, M 8	2	drill bolt head off.	Tighten until bolt head shears off	4.2 - 1/6
23	Lock washer	2		Replace if necessary	
24	Ignition steering lock	1			
25	Fillister screw M 3	2			
26	Ignition/starter switch	1			
27	Self-locking nut M 8	1		Replace. Torque to specification	0.2 - 2/2
28	Bolt M 8	1			
29	Universal joint	1		Check, replace if necessary	
30	Shear bolt M 8	1	Drill bolt head off	Tighten until bolt head shears off	
31	Lock washer	1		Replace if necessary	
32	Shear bolt M 8	2	Drill bolt head off, or grind it off if necessary. (Remove tachometer.)	Tighten until bolt head shears off	4.2 - 1/7
33	Lock washer	2		Replace if necessary	

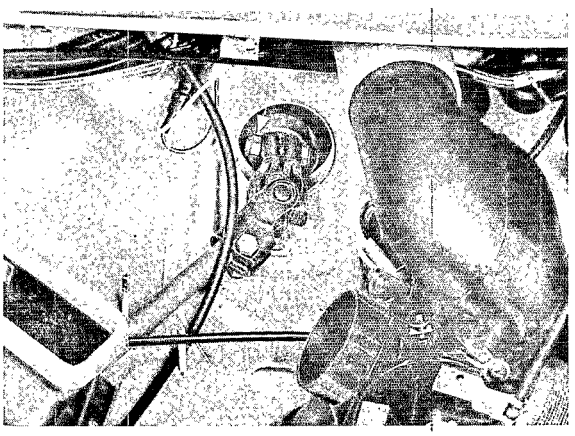
No.	Description	Qty	Note when: removing	Note when: installing	Remarks
34	Steering shaft tube	1	Remove from instrument panel together with steering shaft and switches		
35	Fillister head screw, M 3 x 8	2			
36	Lock washer	2		Replace if necessary	
37	Directional signal and dimmer switch	1			
38	Fillister head screw, M 8 x 3	2			
39	Lock washer	2		Replace if necessary	
40	Wiper/washer switch	1			
41	Lock washer	1		Replace if necessary	
42	Lock washer	1		Replace if necessary	
43	SEEGER retaining ring	1	Press out with a screwdriver	Press into seat	
44	Steering shaft	1	Drive out of steering shaft tube		
45	Ball bearing	1		Check, replacing if necessary. Grooved ball bearings with plastic inner races from 1975 models.	4.2 - 1/7
46	Contact ring	1		Replace if necessary. Deleted from 1975 models.	4.2 - 1/7
47	Circlip	1		Must be seated in groove in steering shaft groove	
48	Ball bearing	1		Check, replace if necessary	
49	Circlip	1		Must be seated in groove in steering shaft groove	

Disassembly

1. Remove blower.



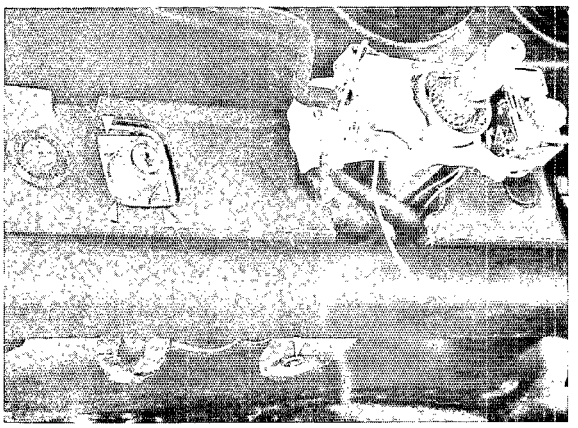
2. Remove steering shaft cover and take off universal joint retaining bolt.



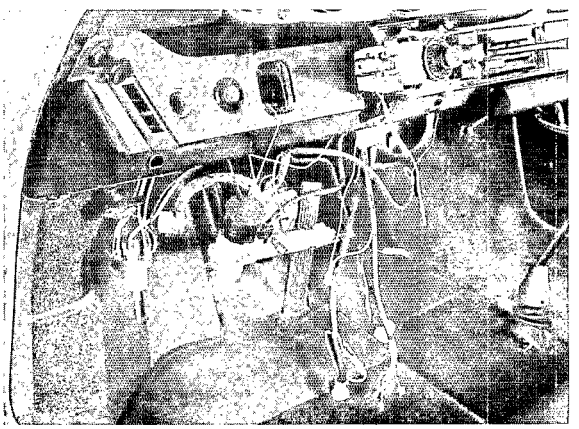
3. Remove knee strip.

4. Remove light switch and tachometer.

5. Drill off or grind off shear bolts in steering switch attachment and ignition/starter switch.



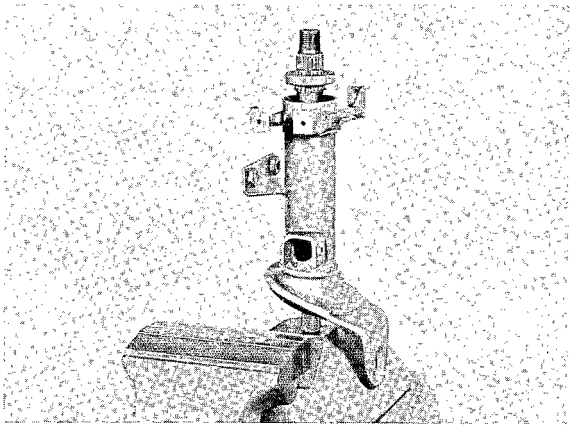
6. Detach wire connectors and multiple plugs.



7. Remove complete steering switch from instrument panel.

Reassembly

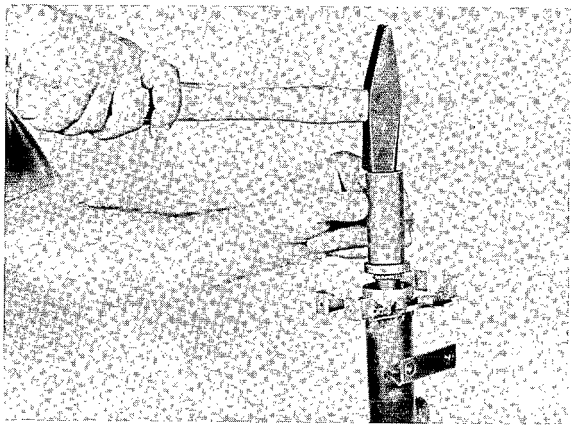
1. Place contact ring and bearing together on the steering shaft.



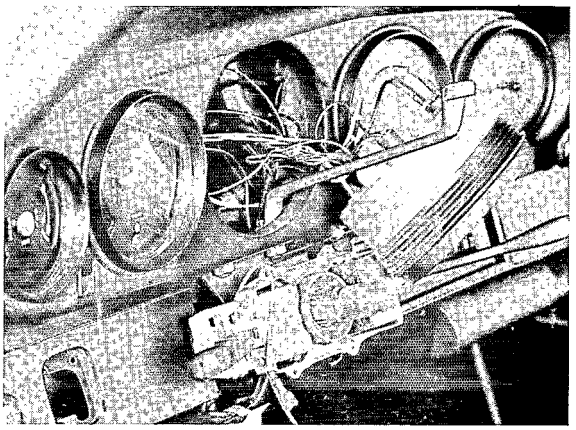
2. Drive bearing into place with a pipe section (inside dia. 24 mm, outside dia. 28 mm).

NOTE

The pipe section should contact the bearing inner race only.



3. Tighten shear bolts for steering tube attachment until the heads break off.



Hinterachse
Rear Axle
Essieu AR
Assale posteriore

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.0 General Information

0.1 Description

Rear Axle Changes - Beginning with 1972 Models 0.1 - 1/1

0.2 Technical Data

General Specifications 0.2 - 1/1
Technical Data from 1974 model 0.2 - 1/3
Technical Data from 1975 model 0.2 - 1/5
Tightening Torques 0.2 - 2/1

1 - REAR WHEEL ALIGNMENT

1.1 Measuring Rear Axle

General Information 1.1 - 1/1
Wheel Alignment Data Chart 1.1 - 1/1

2 - REAR AXLE

2.1 Rear Axle Control Arms

Dismantle and reinstall Rear Axle Control Arms from 1974 Model 2.1 - 1/1
Instructions for Disassembly and Reassembly 2.1 - 1/6
Checking Parts 2.1 - 1/7

3 - AXLE DRIVESHAFTS

3.1 Axle Driveshafts

Axle Driveshafts - Lighter Version 3.1 - 1/1

REAR AXLE CHANGES - BEGINNING WITH 1972 MODELS

1. Beginning with 1972 models, rear axle shockabsorbers have been modified. The outside diameter and overall length of the shockabsorbers has been increased:

Outer diameter

new:	62 mm (2.44 in.)
old:	58 mm (2.28 in.)

Extended length

new:	599 ± 2.0 mm (23.59 ± 0.08 in.)
old:	574 ± 2.5 mm (22.61 ± 0.10 in.)

Closed length

new:	407.5 ± 2.0 mm (16.04 ± 0.08 in.)
old:	390 ± 2.5 mm (15.37 ± 0.10 in.)

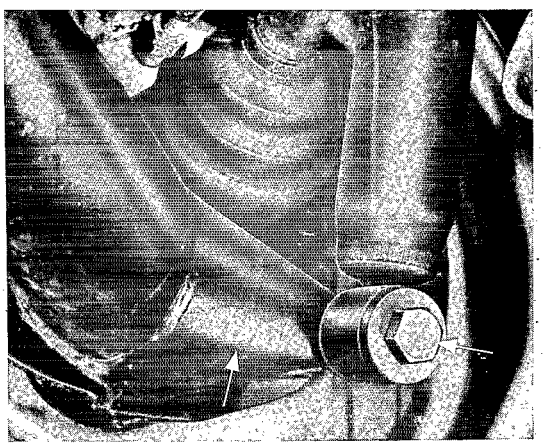
2. The BOGE shockabsorbers are standard on the rear axle. BILSTEIN or KONI shockabsorbers are optional.

The various shockabsorber types can be distinguished by their color:

BOGE	black
KONI	red
BILSTEIN	green

To allow for the larger shocks, the lower mount has been moved rearward 10 mm. The upper mounting has also been moved slightly forward and in towards the vehicle longitudinal axis. This change was also necessary due to the new transmission which has its axle flanges approximately 10 mm further to the rear.

The shockabsorber mounting bolt has been changed from the former 12 mm diameter to 14 mm diameter.



GENERAL SPECIFICATIONS

TYPE 911 VEHICLES - BEGINNING WITH 1972 MODELS

Wheel suspension	independent, with longitudinal trailing arms (radius arms)	
Springing	1 round transverse torsion bar per wheel	
Shockabsorbers	double-action, hydraulic shockabsorbers	
Stabilizer	transverse, 15 mm (0.59 in.) dia, in Type 911 S only	
Wheelbase	2271 mm (89.4 in.)	
Rear trailing arm adjustment (trailing arm inclination)	36° 30' to 37°	
Track, rear	911 T	1342 mm/52.8 in. (5 1/2 J x 15 rim)
	911 E and 911 S	1354 mm/53.3 in. (6 J x 15 rim)
Max. axle load, rear	840 kp (1852 lbs.)	
Nominal Adjustment Values and Wear Tolerances (at empty weight DIN)		
Toe-in	0° to + 20 ' per wheel	
Camber, rear	$-1^{\circ} \pm 10'$	

GENERAL SPECIFICATIONS BEGINNING WITH 1974 MODELS

Vehicle Type	911	911 S	Carrera
Wheel suspension	independent, with triangulated control arms		
Springing	1 round transverse torsion bar per wheel,23 mm dia.		
Shock absorbers	double-action, hydraulic shock absorbers		
Stabilizer, transverse	optional	optional	18 mm dia.
Wheelbase	2271 mm	same as 911	same as 911
Trailing arm adjustment (trailing arm inclination)	36° 30' to 37°	same as 911	same as 911
Track, rear (wheel center 12 mm below center of transverse tube)	1342 mm (5 1/2 J x 15 rim)	1354 mm (6 J x 15 rim)	1380 mm (7 J x 15 rim)
Max. axle load, rear	840 kg	same as 911	same as 911
Nominal Adjustment Values and Wear Tolerances (at empty weight DIN)			
Toe-in	+ 20' - 20' per wheel	same as 911	same as 911
Camber, rear	- 1° ± 10'	same as 911	same as 911

TECHNICAL DATA (1975 MODELS)

Model	911 S	Carrera
Wheel suspension	Independent with triangulated control arms	
Springing	One round transverse torsion bar per wheel	
Torsion bar dia.	23 mm	same as 911 S
Shock absorbers	Double action hydraulic shock absorbers	
Transverse stabilizer	18 mm dia.	same as 911 S
Wheelbase	2271 mm	same as 911 S
Trailing arm inclination		
Coupe	42°	same as 911 S
Targa	+ 0.5°	same as 911 S
Air conditioner	+ 0.5°	same as 911 S
Sportomatic	+ 0.5°	same as 911 S
Models with Bilstein shock absorbers	41°	same as 911 S
Track width, rear	1342 mm with 6J x 15 wheel	1368 mm with 7J x 15 wheel
Rear axle height adjustment: center of wheel below center of cross tube	37 ± 5 mm	same as 911 S
Max. axle load, rear	840 kg (1852 lb)	same as 911 S
Adjusting, reference and wear specifications (at curb weight according to DIN)		
Toe	+ 20' - 20'	same as 911 S
Camber, rear wheel	0° ± 10'	same as 911 S

TECHNICAL DATA - from 1976 Model

	1976/77 Models	from 1978
	911 S	911 SC
Wheel suspension	Independent on trailing arms	
Springs	One round transverse torsion bar per wheel	
Torsion bar dia.	23 mm	24.1 mm
Shock absorbers	Double-action hydraulic absorbers	
Transverse stabilizer dia.	18 mm (optional)	18 mm
Wheelbase	2272 mm	2272 mm
Trailing arm inclination		
Coupe	42^{o}	40^{o}
Targa	$+ 0.5^{o}$	$+ 0.5^{o}$
Air conditioner	$+ 0.5^{o}$	$+ 0.5^{o}$
Sportomatic	$+ 0.5^{o}$	$+ 0.5^{o}$
With Bilstein shock absorbers	41^{o}	39^{o}
Rear track width	1342 mm with 6 J x 15 wheels	1367 mm with 7 J x 15 wheels
Rear axle height Wheel center below cross tube center	37 ± 5 mm	37 ± 5 mm
Max. rear axle load	840 kg/1852 lb	78/79 model: 840 kg/1852 lb 1980 model: 880 kg/1940 lb 1981 model:950 kg/2094 lb
Adjusting, reference and wear limit specifications (at DIN curbweight)		
Toe per wheel	$+ 10' \pm 10'$	$+ 10' \pm 10'$
Camber of rear wheels	$0^{o} \pm 10'$	$0^{o} \pm 10'$

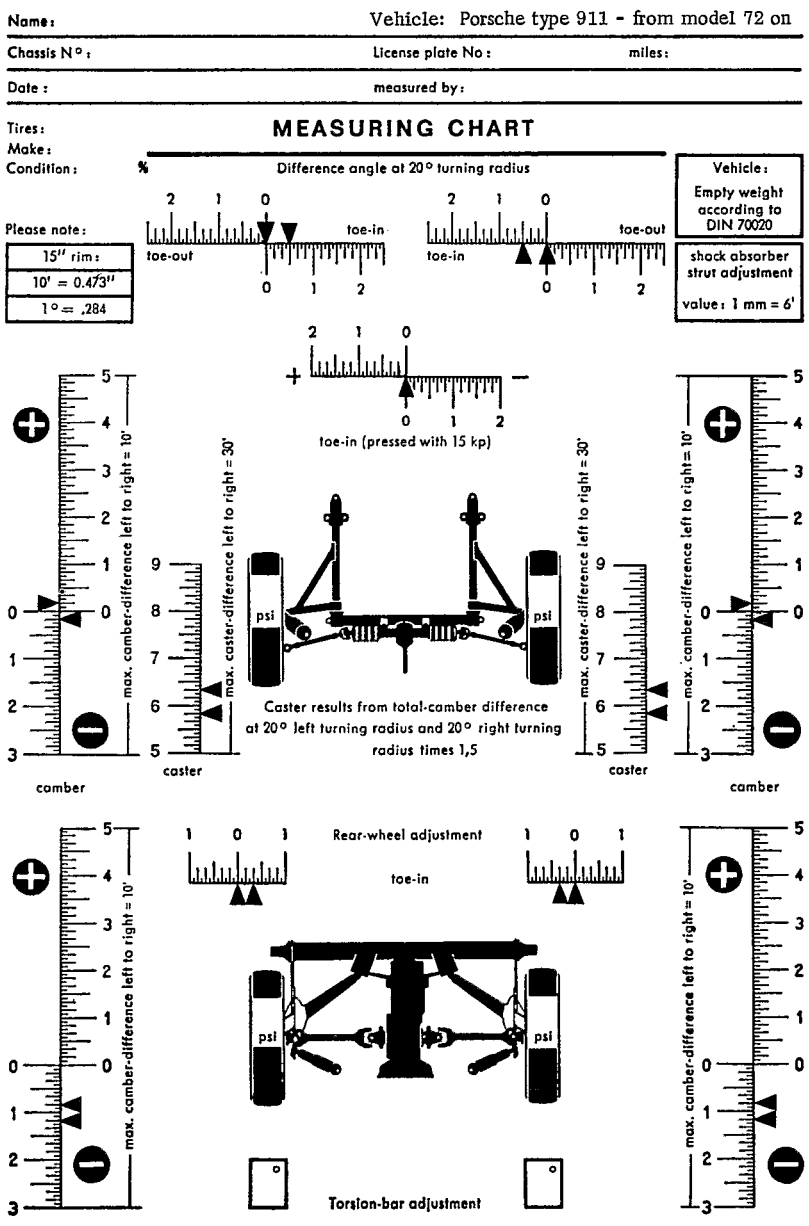
TIGHTENING TORQUES

Location	Description	Thread	Grade	mkp	ft.lbs.
Bearing cap to body	Bolt	M 10	8.8	4.7	33.9
Rear radius arm to axle cross	Bolt	M 14x1,5	10 K	9.0	65.1
Radius arm to spring plate	Eccenter	M 12x1,5	8.8	6.0	43.4
Radius arm to spring plate	Bolt	M 12x1,5	10 K	9.5	68.7
Brake caliper to arm	Bolt	M 12x1,5	8.8	7.0	50.6
Shockabsorber to arm	Bolt	M 14x1,5	8.8	12.5	90.4
Shockabsorber to body	Nut	M 10x1	8	2.5	18.1
Brake hose to brake lines	Brake hose	M 10x1		1.5	10.9
Stabilizer to body	Bolt	M 8	8.8	2.5	18.1
CV flange attachment	Allen bolt	M 10 M 8	12 K 12.9/10	8.3 4.2	60.0 30.4
Parking brake assembly to arm	Bolt	M 8	8.8	2.5	18.1
Wheel to hub	Wheel lug	M 14x1,5		13	94.0
Wheel hub to axle	Castellated nut	M 20x1,5	10 K	30-35	217-243
Brake disc to wheel hub	Countersunk screw	M 6	8.8	0.5	3.6 (43 in.lbs.)
Parking brake cable housing to arm	Bolt	M 6	8.8	0.5	3.6 (43 in.lbs.)
Adjusting lever to spring strut	Hex.hd.bolt	M 16x1,5	10.9	24.5	177
Adjusting lever to spring strut	Eccentric bolt	M 16x1,5	10.9	24.5	177

MEASURING REAR AXLE

General Information

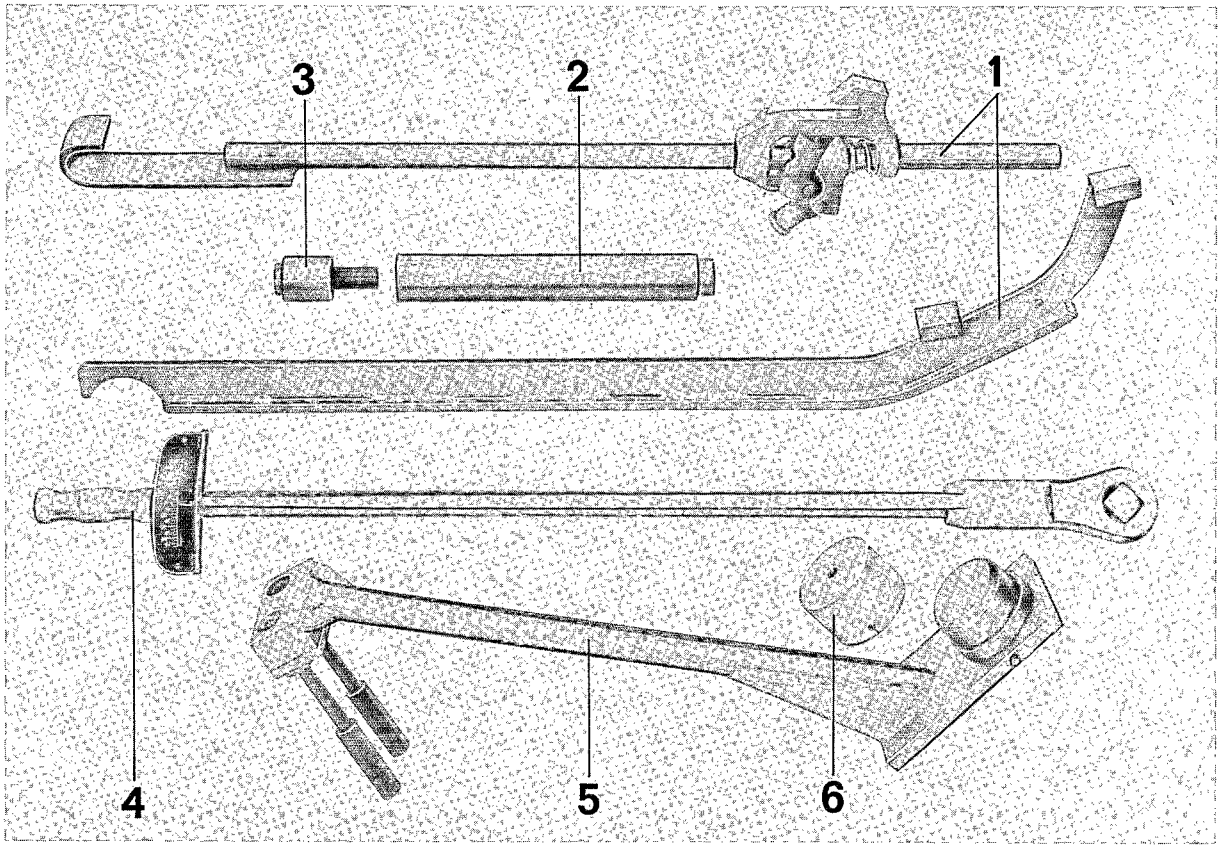
Beginning with 1972 models, rear axle camber specifications have been changed.
The specifications are listed on the new wheel alignment data chart by small triangles. This provides a quick reference for evaluating the alignment data.



Copyright by Dr. Ing. h. c. F. Porsche KG

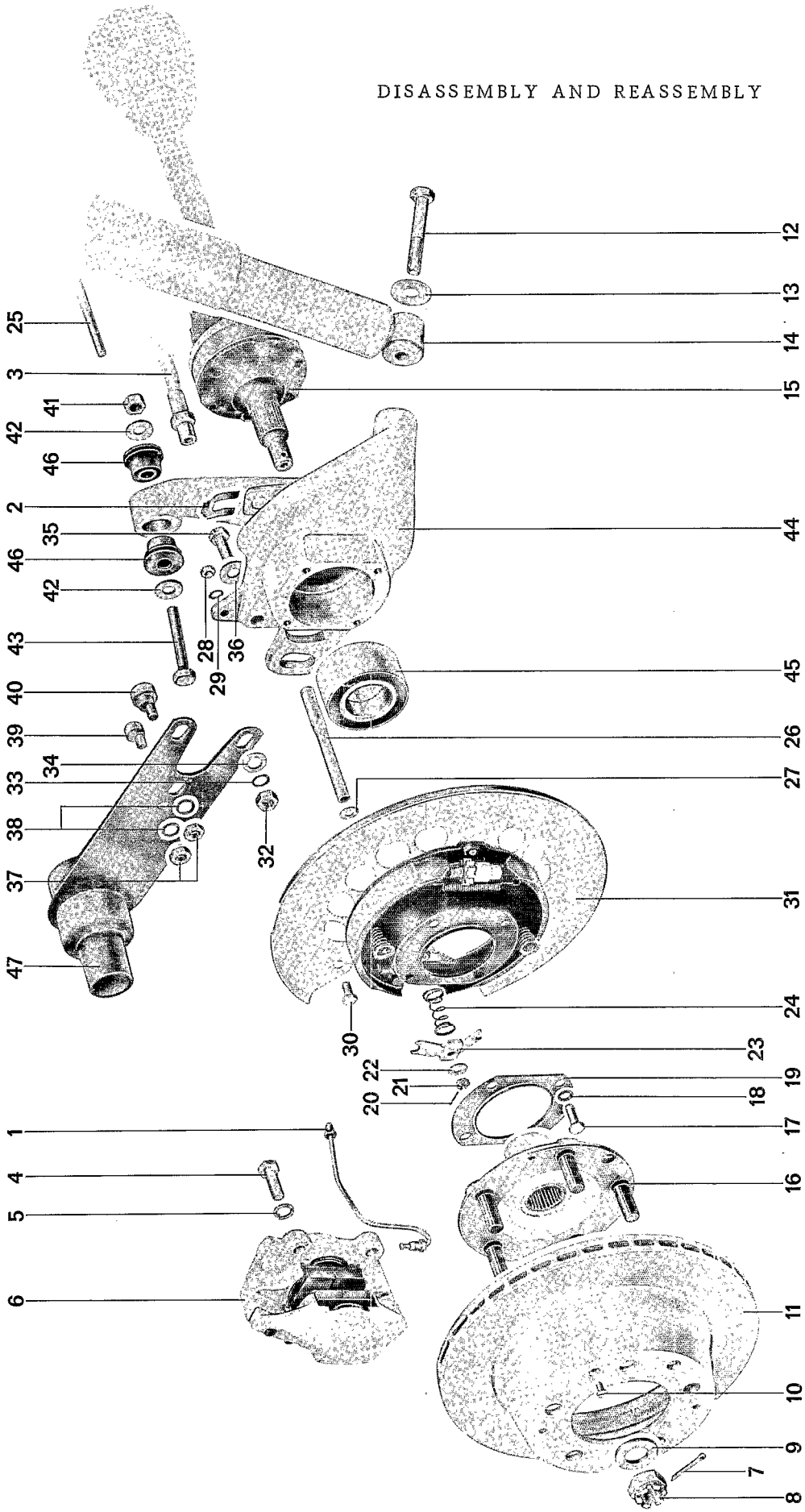
REAR AXLE CONTROL ARMS

TOOLS



No.	Description	Special Tool	Remarks
1	Trailing arm positioner	P 289	
2	Driver for removing rear wheel hub	P 297 a	
3	Installer, rear wheel hub into control arm	P 298 b	
4	Torque wrench, 75 mkp	US 118/40	
5	Rear axle control arm alignment gauge	P 295 b	
6	Adapter for control arms beginning with 1974 models	P 295 c	Used with P 295 b

DISASSEMBLY AND REASSEMBLY



No.	Description	Qty	Note when: removing	Note when: installing	Remarks
1	Brake line	1		Torque to specification	0.2 - 2/1
2	Brake line retaining clip	1			
3	Brake hose	1	Pull out towards center of vehicle		
4	Bolt, M 12 x 1.5	2		Torque to specification	0.2 - 2/1
5	Lock washer	2		Replace if necessary	
6	Brake caliper	1			
7	Cotter pin	1		Replace	
8	Castellated nut	1		Torque to specification	0.2 - 2/1 2.1 - 1/6
9	Washer	1			
10	Countersunk screw, M 6 x 12	2		Torque to specification	
11	Brake disk	1			
12	Bolt, M 14 x 1.5	1		Torque to specification	
13	Washer	1			
14	Shock absorber	1			
15	Wheel shaft	1	Drive out towards center of vehicle		
16	Wheel hub	1	Drive out with P 297 a		2.1 - 1/7

No.	Description	Qty	Note when: removing	installing	Remarks
17	Bolt, M 8	4		Torque to specification	
18	Lock washer	4		Replace if necessary	
19	Reinforcing cover	1			
20	Cotter pin	1		Replace	
21	Castellated nut M 6	1			
22	Washer	1			
23	Expander	1		Seat properly	
24	Spring	1			
25	Parking brake cable	1	Pull out towards vehicle center		
26	Spacer tube	1		Seat properly. Large cross-section faces towards vehicle center	
27	Washer	1			
28	Nut, M 8	2		Torque to specification	
29	Spring wahser	2		Replace if necessary	
30	Bolt, M 8	2			
31	Backing plate with brake shoes	1		Remove whole assembly	
32	Nut, M 12	2		Torque to specification	
33	Toothed washer	2		Replace if necessary	

No.	Description	Qty	Note when: removing	Note when: installing	Remarks
34	Washer	2			
35	Bolt, M 12	2			
36	Washer	2			
37	Nut (thin), M 12	2		Torque to specification	
38	Toothed washer	2			
39	Eccentric bolt for toe-in adjustment	1			
40	Eccentric bolt for camber adjustment	1			
41	Self-locking nut, M 14	1		Replace, torque to specification	
42	Washer	2			
43	Bolt, M 14	1			
44	Axle control arm (aluminum)	1		Check for deformation, replace if necessary	
45	Double-row ball bearing	1	Press out with fitting thrust piece.	Replace. Press in with appropriate thrust piece	2.1 - 1/7
46	Rubber mount	2		If rubber mounts are removed, install new ones	2.1 - 1/7
47	Torsion plate (trailing arm)	1			

INSTRUCTIONS FOR DISASSEMBLY AND REASSEMBLY

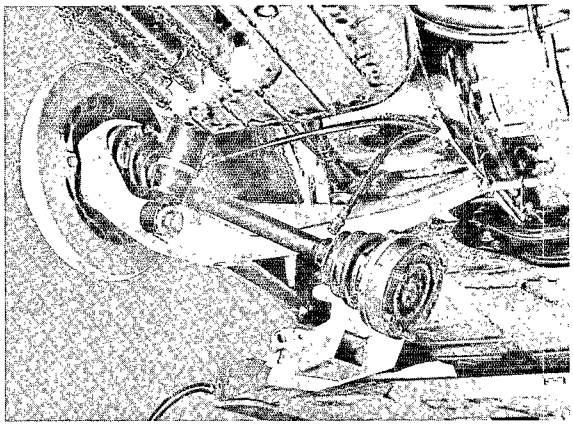
Disassembly

1. Detach drive shaft from transmission flange. Use flat chisel in the area of the flange gasket to separate shaft assembly from flange.

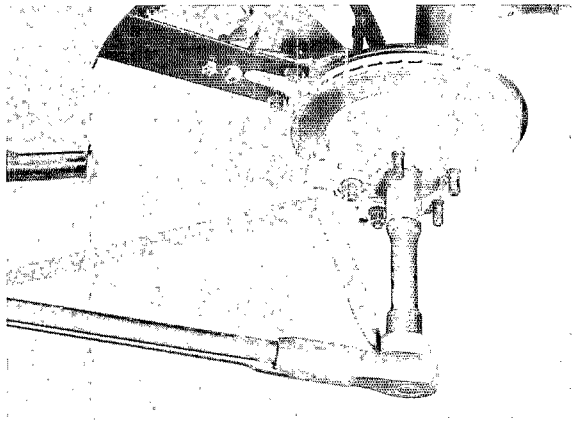
CAUTION

Do not damage the flange surfaces.

2. Detach brake line from brake caliper and control arm assembly (first depress brake pedal with pedal holder to keep brake fluid from draining out of the brake fluid reservoir).

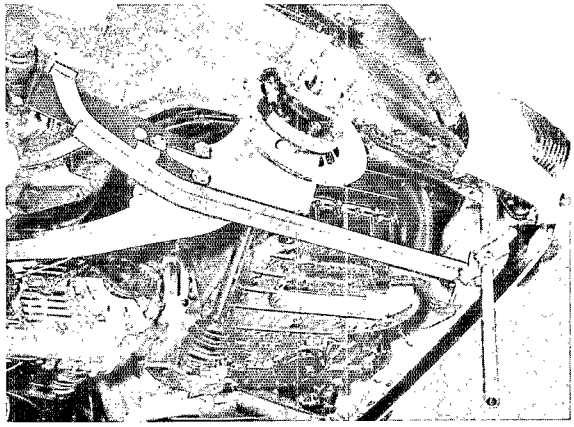


3. Remove cotter pin from the castellated nut in the wheel shaft and remove nut with the aid of P 42 a, P 36 b, P 44 a, and P 296.



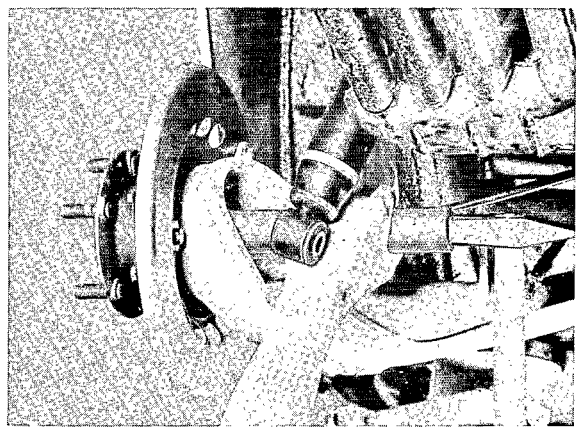
4. Remove brake disk.

5. Raise torsion plate (trailing arm) with the aid of P 289. Remove shock absorber retaining bolt.



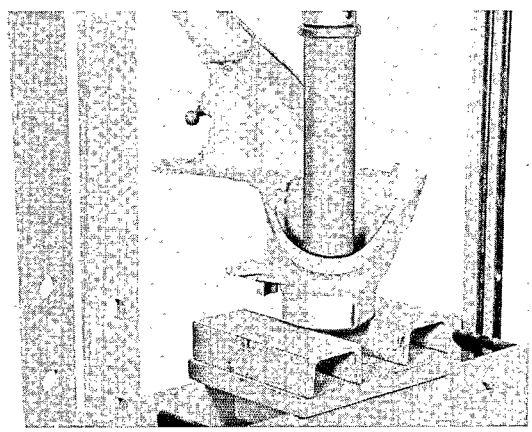
6. Drive wheel shaft out towards vehicle center.

7. Drive rear wheel hub out with the aid of P 297a.



8. Remove cotter pin and castellated nut from brake cable stub. Pull brake cable out towards vehicle center.

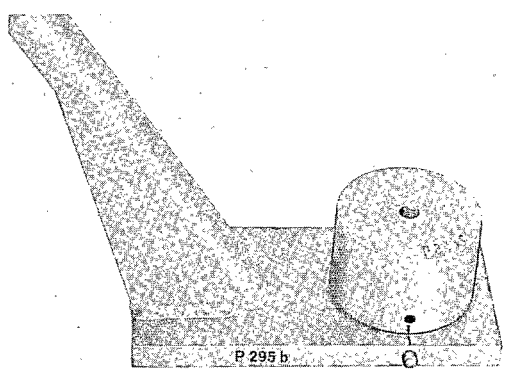
9. Press ball bearing out with an appropriate thrust piece (approx. 65 mm dia.).

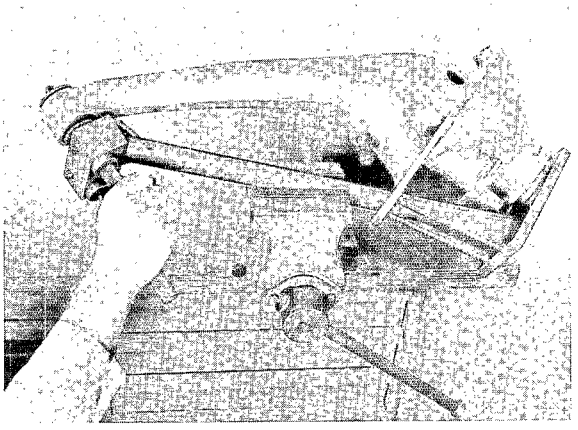


Checking Parts

1. Check rubber mounts in rear axle control arms for wear or damage, replace if necessary.

2. Install special tool P 295c (adapter for mounting aluminum axle control arm) in special tool P 295b. Marker in the P 295c adapter must point towards the marker in P 295b.

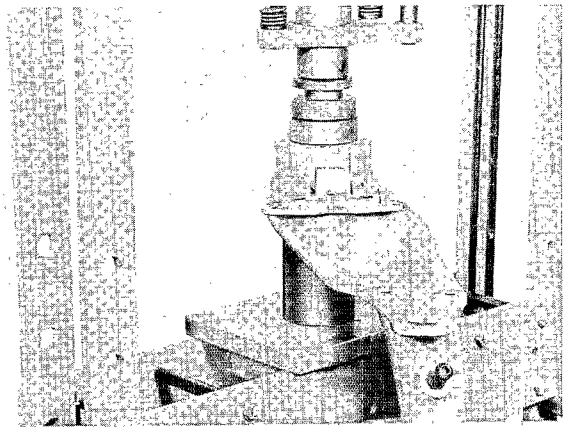




3. Using P 295b and P 295c, check axle control arm for deformation.

   If the control arm is in alignment, it will be possible to push the test mandrel in with the rubber mounts installed. Deformed axle control arms must be replaced.

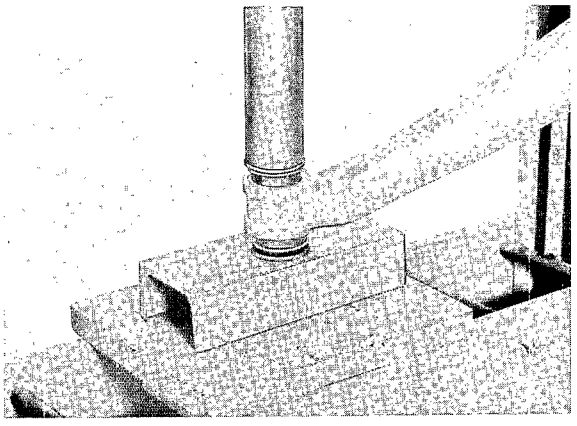
Reassembly



1. Using an appropriate press adapter (approx. 79 mm dia.), press the double-row ball bearing fully in (apply pressure to bearing outer race).

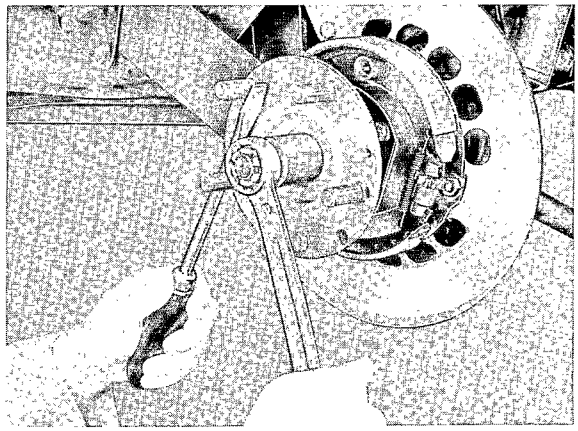
NOTE:

The double-row ball bearing must always be replaced because it is damaged during removal from the axle control arm.



2. If the rubber mounts were removed, install new ones by pressing them fully in.

3. Using P 298b and the wheel shaft, press the wheel hub into the double-row ball bearing.



NOTE:

Do not drive the wheel hub into the bearing with a hammer since this will damage the bearing.

AXLE DRIVESHAFTS - LIGHTER VERSION

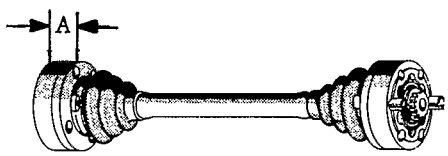
General

Beginning with October 6, 1971 production, all 911 models have new and lighter axle driveshafts (approx. 0.9 kp. (2 lbs.) lighter).
The CV (constant velocity) joints are 8 mm (0.31 in.) narrower (dimension A). As a result, the axle shafts are 8 mm longer.

Installation Note:

From 1969 models on, old-type drive shafts can be replaced with the new version on individual basis from 1969 models on.

When installing the newer axle drive shafts, it is necessary to use the new socket head bolts, M 10 x 48, as well as new supporting plates.



Dimension A - new driveshaft version = 32 mm
Dimension A - old driveshaft version = 40 mm

Bremsen, Räder, Reifen
Brakes, Wheels, Tires
Freins, Roues, Pneus
Freni, Ruote, Gomme

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.0 Information

0.1 Description

0.2 Technical Data

General Data 0.2 - 1/1
Tightening Torques, front and rear brakes 0.2 - 2/1

1 - BRAKE BOOSTER, MASTER BRAKE CYLINDER

1.1 Brake Booster

Removing and Installing Brake Booster 1.1 - 1/1
Disassembling Brake Booster and Brake Master Cylinder Partially 1.1 - 2/1
Checking Brake Booster 1.1 - 3/1

4 - WHEELS AND TIRES

4.1 Wheels and Tires

Summary 4.1 - 1/1
Checking Steel-Disc Wheels 4.1 - 1/1
Mounting Instructions 4.1 - 1/2
Instructions for Installation of Adhesive Weights in Light-Alloy Wheels 4.1 - 1/2
Balancing Wheels 4.1 - 1/2
Collapsible Spare Tire (Spare tire in vehicles with 85-liter fuel tank) 4.1 - 1/3
Standard Wheels and Tires, overview, from 1973 model 4.1 - 1/5
Standard Wheels and Tires, overview, from 1975 model 4.1 - 1/7

GENERAL DATA - through 1977 model

Item	Dimensions and Adjustment Values	Wear Tolerances
Tandem Brake Master Cylinder		
Bore	19.05 mm Ø	
Stroke	18/13 mm	
Reduction ratio at brake pedal	5.4 : 1	
Clearance, actuating rod to piston	1 mm	
Front Wheel Brakes		
Brake disc outer diameter	282.5 mm, vented	
Thickness, new	20.0 mm resp. 20,5 mm	
Minimum thickness when reconditioned*	18.6 mm	18.0 mm
Thickness tolerance	max. 0.03 mm	
Brake disc lateral runout	max. 0.05 mm	
Lateral runout when installed	0.2 mm	
Caliper piston Ø	48 mm	
Brake lining thickness	10 mm	2.0 mm
Lining to rotor clearance when released	0.2 mm	
Lining area per wheel: Type 911 T and E Type 911 S	52.5 cm^2 76.0 cm^2	
Rear Wheel Brakes		
Brake disc outer diameter	290 mm, vented	
Thickness, new	20.0 mm	
Minimum thickness when reconditioned *	18.6 mm	18.0 mm
Thickness tolerance	max. 0.03 mm	
Brake disc lateral runout	max. 0.05 mm	
Lateral runout when installed	max. 0.2 mm	
Disc surface finish when reconditioned	max. 0.006 mm	
Caliper piston Ø	38 mm	
Lining thickness	10 mm	2.0 mm
Lining to rotor clearance when released	0.2 mm	
Lining area per wheel	52.5 cm^2	

*The disc must always be machined on both sides by the same amount.

Item	Dimensions and Adjustment Values	Wear Tolerances
Parking Brake		
Parking brake drum Ø, new	180 mm	181 mm
Parking brake lining thickness		2.0 mm

General Information for Brakes with Brake Booster

Brake Booster

Type	T 52, 7 inch
Mean multiplication factor	2.2

Tandem Brake Master Cylinder

Bore	20.64 mm dia.
Stroke	20/12 mm
Play at brake pedal with brakes bled and engine stopped	10 mm

GENERAL DATA - from 1978 Model

Description	Specifications	Wear Limits
Service brakes (foot-operated)	Hydraulic dual circuit brake system, separate circuit for each axle, brake booster, inboard vented brake discs on front and rear axles	
Brake booster dia.	7 inches	
Brake master cylinder dia.	20.64 mm	
Brake disc dia., front	282.5 mm	
rear	290 mm	
Eff. brake disc dia., front	228 mm	
rear	244 mm	
Brake caliper piston dia., front	48 mm	
rear	38 mm	
Brake pad area/each front wheel	76.0 cm^2	
Brake pad area/each rear wheel	52.5 cm^2	
Total pad area	257 cm^2	
Pad thickness, front	10 mm	2 mm
rear	10 mm	2 mm
Brake disc thickness when new		
Front	20.5 mm	
Rear	20.0 mm	
Min. brake disc thickness after machining *		
Front	19.1 mm	18.5 mm
Rear	18.6 mm	18.0 mm
Max. brake disc thickness tolerance	0.02 mm	
Max. brake disc lateral runout	0.05 mm	
Max. brake disc lateral runout when installed	0.1 mm	
Max. peak-to-valley surface finish after machining	0.006 mm	
Play at brake pedal with brakes bled and engine stopped	10 mm	

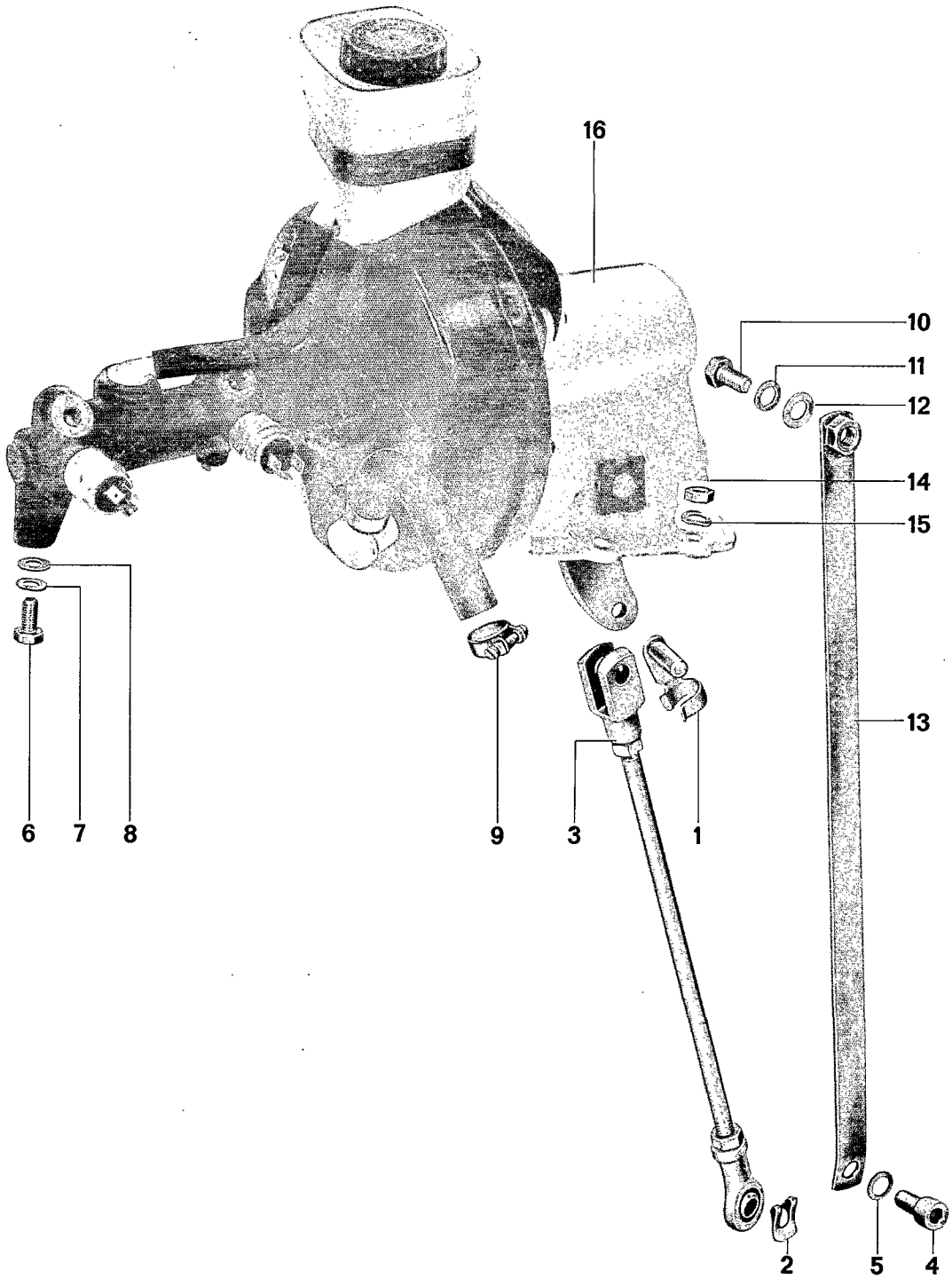
* Brake discs must always be machined on both sides by the same amount.

Description	Specifications	Wear Limits
Parking brake (hand-operated)	Drum brake mechanical action on both rear wheels	
Brake drum dia.	180 mm	181 mm
Brake shoe width	25 mm	
Brake lining area per wheel	85 cm^2	
Brake lining thickness	4. 5 mm	2 mm

TIGHTENING TORQUES FOR FRONT AND REAR BRAKES

Location	Designation	Thread	Grade	ft. lbs.	mkp
Tandem brake master cylinder to transverse wall	Nut	M 8	8.8	18	2.5
Attachment of piston rod to eyebolt end	Nut (flat)	M 10	C 45/6	7.3	1.0
Brake line connection	Hollow bolt	M 10x1	5.8	11	1.5
Hollow bolt in caliper	Hollow bolt	M 10x1		14,5	2.0
Caliper to steering knuckle	Bolt	M 12x1.5	8.8	51	7.0
Lock nut to steering knuckle	Allen bolt	M 7	10 K	11	1.5
Brake disc to wheel hub	Nut	M 8	8.8	17	2.3
Disc shroud	Bolt	M 8	8.8	7,3	1.0
Caliper housing bolt (front)	Allen bolt	M 8	10 K	25	3.4
Caliper housing bolt (rear)	Allen bolt	M 6	12 K	16	2.2
Caliper to rear control arm	Bolt	M 12x1.5	8.8	51	7.0
Brake disc to rear wheel hub	Countersunk bolt	M 6	8.8	3.6	0.5
Brake carrier plate to rear control arm	Bolt	M 10		34	4.7
Shroud to brake carrier plate	Bolt	M 8	8.8	18	2.5
Parking brake cable to control arm	Bolt	M 6	8.8	3.6	0.5
Wheel to wheel hub	Spherical flange nut	M 14x1.5		94	13.0
Bleeder valve in caliper SW 7 wrench size	--	--	--	2.2	0.3

REMOVING AND INSTALLING BRAKE BOOSTER

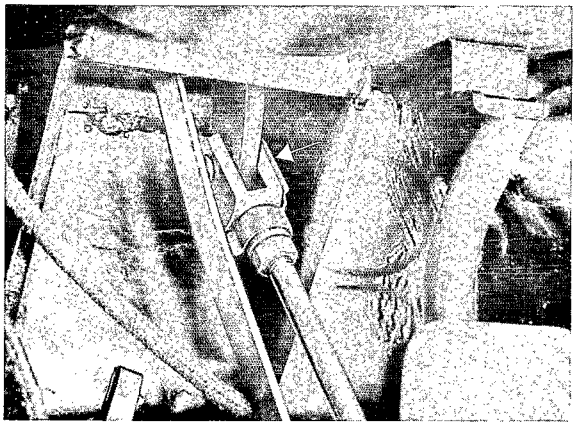


No.	Description	Qty.	Note when removing	Note when installing	Remarks
1	Lock pin	1		Install in correct position Pull back brake pedal to stop. Lock pin must now be installed without tension, adjust operating rod if necessary	1.1 - 1/3
2	Lock clip	1		Check for proper fit	
3	Operating rod	1		Adjust, if necessary	
4	Socket head bolt	1	Can only be removed after removing pedal assembly	Torque to specifications	
5	Lock washer	1		Replace, if necessary	
6	Bolt	1		Torque to specifications	
7	Lock washer	1		Replace, if necessary	
8	Washer	1			
9	Hose clamp	1			
10	Bolt	1		Torque to specifications	
11	Lock washer	1		Replace, if necessary	
12	Washer	1			
13	Brace	1			
14	Nut	4		Torque to specifications	
15	Spring washer	4		Replace, if necessary	
16	Brake booster with tandem master cylinder	1			

REMOVING AND INSTALLING INSTRUCTIONS

Removing

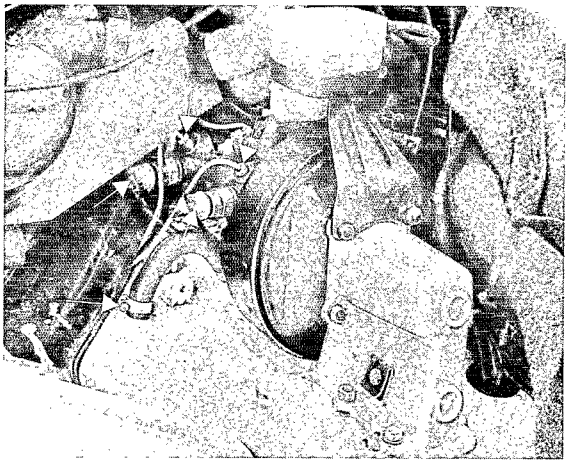
1. Remove lock pin for operating rod.



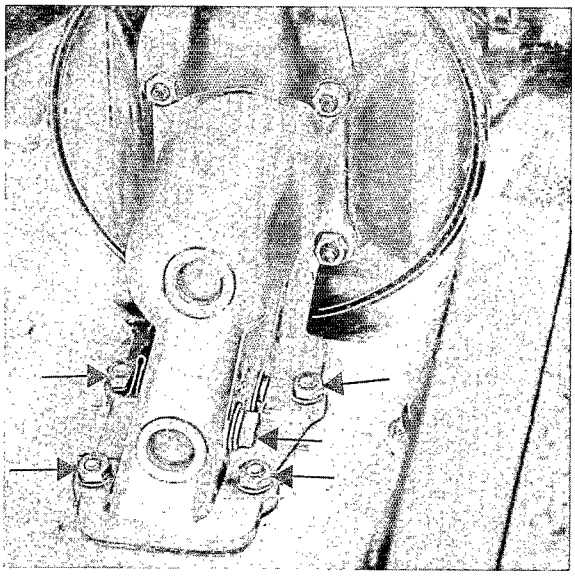
2. Remove mounting bolt for brake master cylinder (located inside on luggage compartment floor plate).

3. Drain brake fluid reservoir with siphoning device.

4. Disconnect stop light switch plugs. Loosen vacuum hose clamp and remove brake line.

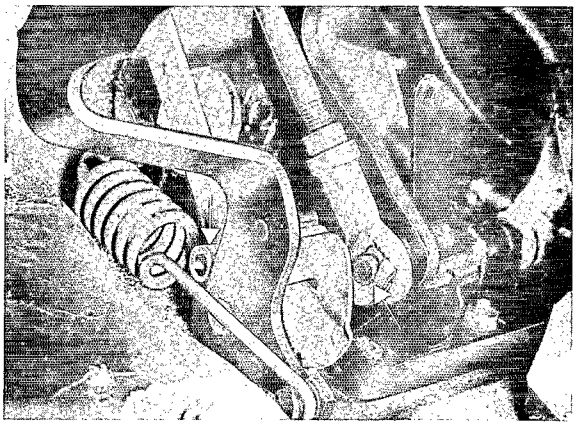


5. Remove upper bolt for brace and nuts for booster base.



Note

Brace and operating rod do not have to be detached at pedal assembly to remove brake booster.



Installing

1. Install brake booster with brake master cylinder in reverse sequence.

2. Lock pin (item 1) for operating rod must be installed so that the spring can be inserted from above (see arrow, upper left picture).

ADJUSTING BRAKE OPERATING ROD

Note

The operating rod must be attached when the brake pedal is at its rest position without any force applied to the operating lever. The play set at the factory must not be changed.

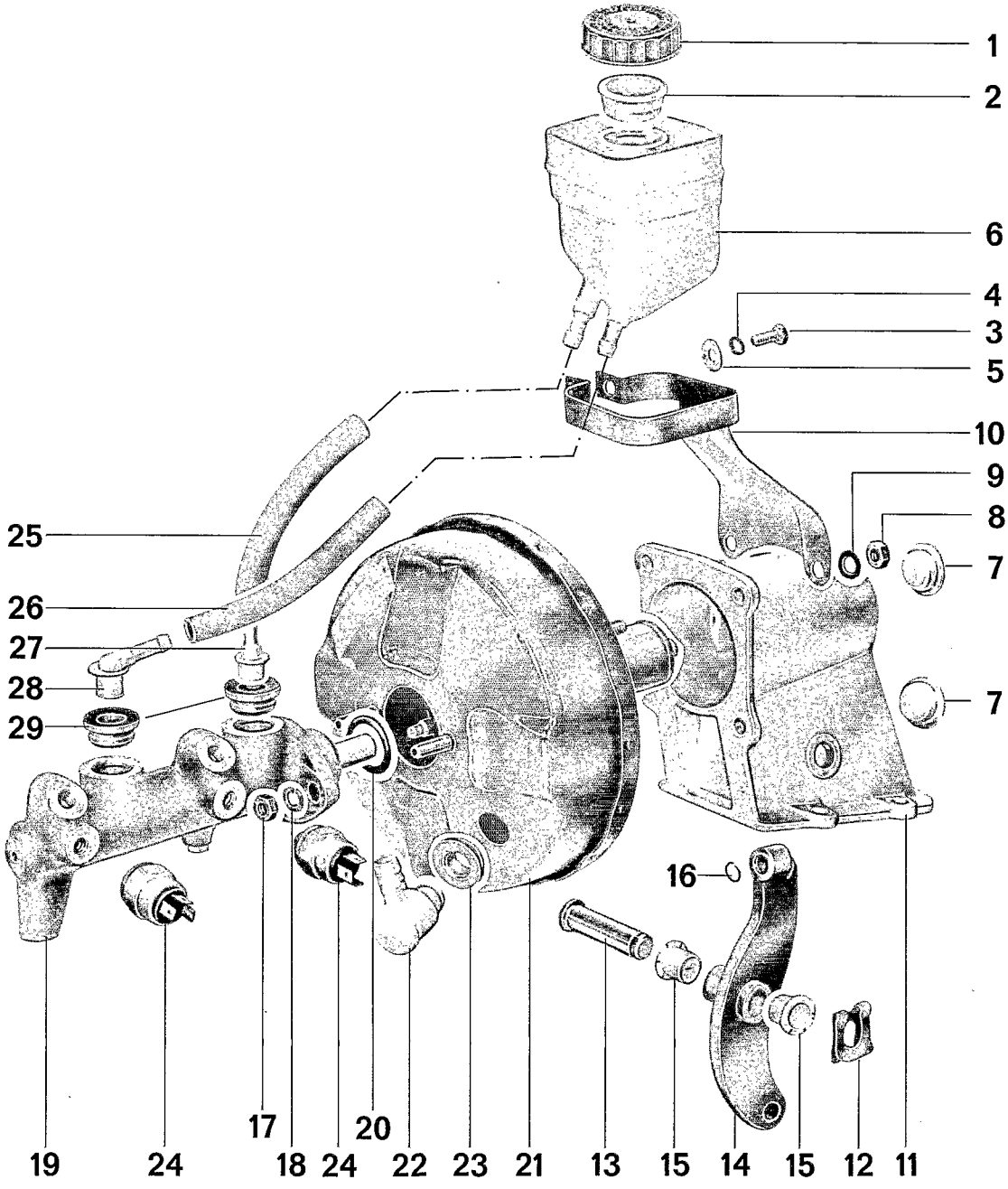
1. Pull brake pedal back to stop.

2. Loosen nuts on operating rod. Adjust operating rod until the lock pin for the operating lever can be installed without tension.

3. Tighten nuts on operating rod.

4. To verify the clearances required in the brake booster, check the operating rod play at the brake pedal by manual operation after the brakes have been bled and the engine is stopped. This play must be at least 10 mm.

DISASSEMBLING BRAKE BOOSTER AND BRAKE MASTER CYLINDER (PARTIALLY)



No.	Designation	Qty.	Notes		Remarks
			Removal	Installation	
1	Bolt cap	1			
2	Filter screen	1			
3	Hex. head screw	1		Torque to specifications	
4	Lockwasher	1		Replace, if necessary	
5	Washer	1			
6	Tank	1			
7	Plug	2			
8	Hexagon nut	4		Torque to specifications. Not too tight! If staybolt is stretched or broken, replace brake booster.	
9	Spring washer	4		Replace, if necessary	
10	Holder	1			
11	Base	1			
12	Lock	1		Check for proper fit	
13	Bearing pin	1		Coat with all-purpose lube containing MOS_2	
14	Operating lever	1		Coat ball socket with all-purpose lube containing MOS_2. Make sure that piston rod fits properly.	
15	Bearing bushing	2			
16	Snap ring	1			

No.	Designation	Qty.	Notes		Remarks
			Removal	Installation	
17	Hexagon nut	2		Torque to specifications. Not too tight! If staybolts are stretched or broken, replace brake booster.	
18	Lockwasher	2		Replace, if necessary	
19	Tandem master cylinder	1		Check, if necessary repair or replace	
20	Seal	1		Replace	
21	Brake booster	1		Check, replace if necessary	
22	Check valve	1		Check, replace if necessary	
23	Plug	1			
24	Stop light switch	2		Torque to specifications	
25	Hose	1			
26	Hose	1			
27	Supply neck	1			
28	Supply neck 75°	1			
29	Plug	2			

Checking Brake Booster

Depress and release brake pedal several times with the engine stopped to remove any vacuum out of the booster.

Now depress brake pedal to braking position with medium effort and start engine.

If the brake booster functions properly, it will be felt as the pedal gives slightly underneath the foot (booster takes effect).

Troubleshooting Chart

Condition	Cause	Correction
1 - Pedal pressure unusually high, no support from booster	a - Vacuum line connections loose	Tighten clamps
	b - Roller diaphragm loose	Replace booster
	c - Master cylinder seal leaking	Replace large seal, replace master cylinder
	d - Vacuum check valve malfunctions (closed always)	Check function of vacuum check valve, by blowing into valve in direction of arrow. Valve must lift off of seat. Valve must be tight against direction of arrow
2 - Pedal pressure increases very much at certain pedal position	Pressure rod piston scored at one point. Once secondary cup passes this point, outside air comes into booster through vent bore	Repair or replace master cylinder
3 - Pedal can be pressed to stop without braking effect Brake fluid runs out at vent bore	Cups leak	Repair or replace master cylinder

Note

When a brake circuit fails or after repairs on the brake system, a brake warning light installed in the dashboard comes on.

After brake repairs, the brake warning light can be turned off by disconnecting the battery ground strap.

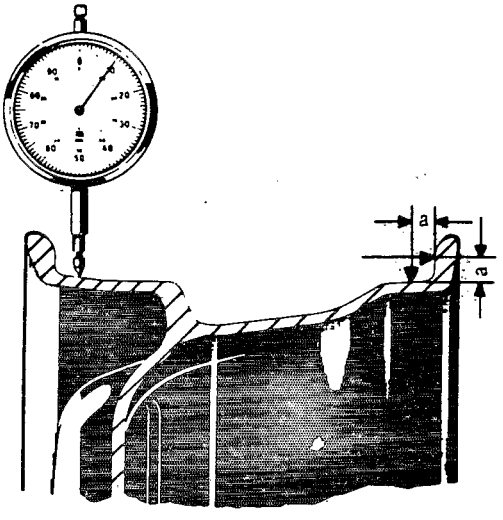
CHECKING WHEEL RIMS

Points for measuring radial and lateral runout on inside and outside shoulders of rim.

Distance "a" = 8 mm.

Max. permissible radial runout for steel rims	1.25 mm
Max. permissible radial runout for aluminum rims	1.0 mm
Max. permissible lateral runout for steel rims	1.25 mm
Max. permissible lateral runout for aluminum rims	0.8 mm

Max. permissible radial and lateral runout for rim + tire (also refer to pages 4.1 - 1/3 and 4.1 - 1/4) 1.5 mm



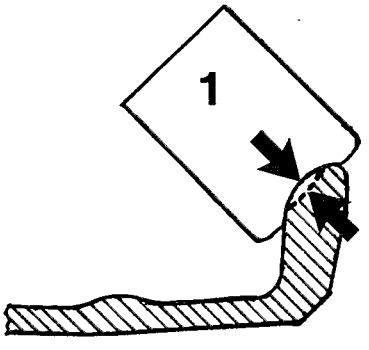
Note

Straightening of deformed rims is not permitted.

Check flanges of aluminum wheel rims for wear. The inside rim flange is more subject to wear.
Check with a standard 8 mm radius gauge. If applicable, first remove sharp edges and burrs.
Wear limit = 1 mm.
Replace wheel rim, if necessary.

Checking Rim Flange Shape

——— New condition
- - - - - - - - After wear
➡➡ Max. wear 1 mm
1 Radius gauge 8 mm



GENERAL ASSEMBLY INFORMATION ON TIRES AND TUBES

Always also use new tubes or rubber valve stems each time tires are replaced!

Tubes should only be used in "tubeless" tires in an emergency situation. It cannot be recommended to combine tires and tubes of different make. Tubes are not available for series 50 and 55 tires!

When mounting tubes with steel valve stems remember that valve core is screwed in only after inflation of the tire.
Be careful not to turn the tire valve when tightening the nut.

"Tubeless" tires may only be mounted without tubes on rims with a double hump. If this type rim is not available, this tire must also be mounted with a pertinent tube. When necessary tubeless tires can be used on an axle with tube tire as long as the make, size and type are identical.

Double hump rims (H2) were used on a general basis in the 1975 model year.

Original Porsche rims are identified by the Porsche part number in the wheel rim. Meaning of number: 901.361.xxx.xx (rim without hump) or 911.361.xxx.xx (rim with double hump), whereby x = digit for internal designation of version and paint.

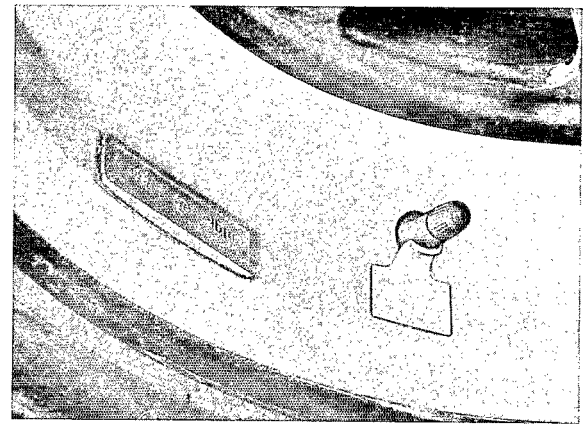
Diecast rims are not always sufficiently leak-proof because of the coarser grain structure and consequently can only be used for tubeless tires when tested accordingly. From1976 models on Porsche diecast rims are checked for leaks with a special fixture and therefore suitable for use with "tubeless" tires.

Part numbers of these rims:

Rim Size	Untested Diecast Tires (tires with tubes)	Leak-proof Diecast Tires ("tubeless" tires)
6 J x 15 (silver)	911.361.023.10	911.361.023.40
6 J x 15 (unpainted)	911.361.023.14	911.361.023.44
7 J x 15 (silver)	911.361.023.20	911.361.023.54

For cars, which have center pin wheel centering, we recommend always using rims with centering pins. Wheel nuts made of steel should be used on steel rims.

To prevent excessive loads on rubber tire valve stems (tube or tubeless version) caused by position of valve stem bore, 7" and 8" Porsche rims must be fitted with a valve stem support, Part No. 911. 361. 561.00 or 01.



7 J x 15 diecast rims (ATS) sometimes have a special cast boss in area of the valve stem bore, so that safe support can be guaranteed without a holding plate. On rims, which have this cast boss, the wall thickness is so great at the valve stem hole that the 3 mm wide bead ring on the valve stem should not be pulled in when installing tubeless tire valves (as common on steel rims). Pulling in the valve stem bead would stretch the valve stem excessively.

Check sealing surfaces of tire and wheel rim for dirt and damage when mounting a tubeless tire. In conjunction with this point remember that the bead base of a tubeless tire provides the seal. If the bead flank is used for sealing, air could escape when driving aggressively.

Check flanges of aluminum wheel rims for wear (see page 4.1 - 1/1).

Always coat tire beads with rubber lubricant when mounting.

Apply talcum powder inside of tire in tube type.

Inflate tubeless tires to about 4 bar/58 psi after mounting without valve core to guarantee proper fit on rim. With 3.3 bar/48 psi pressure the tire bead should jump over the rim hump. Screw in valve core and inflate tire to specified pressure.

Max. permissible radial and lateral runout of wheel (tire + rim) is 1.5 mm/0.59 in. If necessary, turn tire on rim 180° (uncontrolled matching) to reach an acceptable value.
Controlled matching: align highest point of rim (not marked on 911, determine) with green dot on side wall of tire.

New tires should be used on the front axle, since
1. the rear axle is more critical over stability and
2. the front wheels must first make a track on wet roads, in which the rear wheels can follow.

(Not possible on cars with different size tires front and rear.)

When replacing a defective tire, make sure difference in tread depth on one axle is not greater than 30 %.

BALANCING WHEELS

Max. permissible dynamic and static unbalance 5 grams.

Check radial and lateral runout of wheels when there is vibration and steering wheel shake in spite of perfect wheel suspension parts, perfect wheel centering, correctly adjusted wheel bearing play and properly balanced wheels.
Check on tires run warm (to exclude flat spots from standing) with a standard tester.
Max. permissible radial and lateral runout of wheel (tire +rim) = 1.5 mm.
Max. permissible radial and lateral runout of wheel rim =see page 4.1 - 1/1.
If testing is not performed on a stationary balancing machine, but direct on the car, a very slight lateral runout of wheel hub from manufacturing, wheel bearing play and also any error in wheel centering will be reflected in the measured value. If these factors are eliminated or compensated and the value is still greater than 1.5 mm, check whether an acceptable value can be reached by turning tire on rim 180° (uncontrolled matching).

INFORMATION ON CEMENTED WEIGHTS FOR ALUMINUM WHEEL RIMS

General

Aluminum wheel rims may only be balanced with balance weights which are cemented. The cemented type balance weights supplied by Porsche are available in steps of 10 g from 10 to 80 g.

Installation

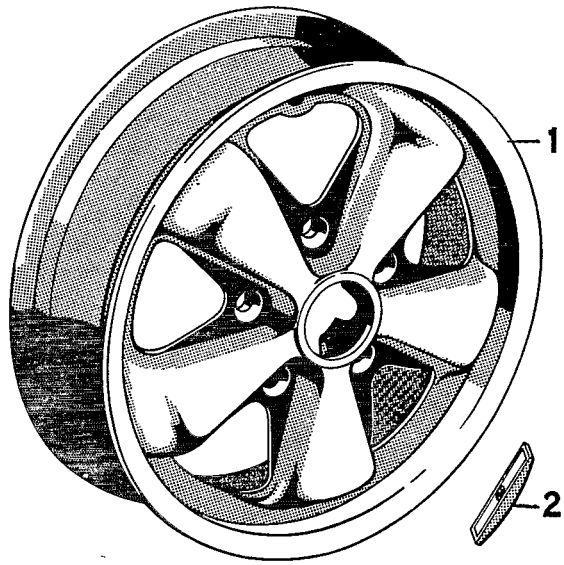
1. Determine exact position of balance weights (if applicable first hold balance weights with pieces of tape until correct position has been determined).

2. Prepare adhesive surface on rim. Adhesive surfaces must be absolutely clean and free of grease.

3. Pull off paper backing from adhesive surface of weight and press weight on firmly.

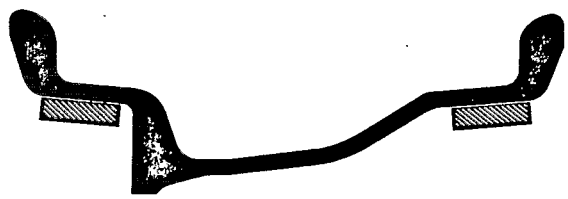
Note

Pull off paper backing only immediately before pressing on weight, since the effect of air over a long time will impair the adhesion and there is also danger of dirt getting on the adhesive surface.



1 Aluminum rim
2 Adhesive balance weight

The adhesive balance weight must be located accurately on the flat surface of the rim. It must rest uniformly on the entire bearing surface.
For rims of size 5 1/2 J x 14 the adhesive weights must be contoured to the rim with a plastic hammer to match the smaller radius (prior to pulling off the green paper backing).



4. Check tight fit of balance weight after trial run on a balancing machine.
   The newly installed balance weight must not become loose from the rim when load is applied transversely to it.

Note

Adhesive weights may only be installed on the outside of 5 1/2 J x 14 aluminum hole-type wheel rims. Weights with spring clips must be used on the inside of these rims (as for steel hole-type rims).

From 1973 models on 5 1/2 J x 15 steel rims have tire valve holding sleeves instead of spring clips. The sleeve is fitted from inside of the rim and held in position by the tube or valve stem. This sleeve can also be used subsequently on older models.

COLLAPSIBLE SPARE TIRE

A spare wheel with a collapsible tire is used in cars with a 85 liter fuel tank to save space.

From 1974 models on a 80 liter steel tank and a collapsible tire/wheel are standard in all models.

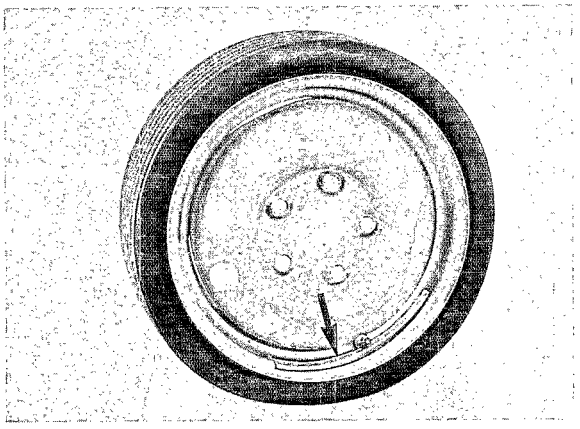
Rim size 5 1/2 J x 14, tire size 7.35/185 - 14 SST or from 1973 models on.
Rim size 5 1/2 J x 15, tire size 165 - 15/4, 75/10.00 - 15 SST

When required the tubeless tire may be inflated to only 2.2 bar/32 psi. The tire will return to its original shape when discharging the air from the collapsible tire.
A collapsible tire cannot be repaired or mounted with conventional workshop equipment. Only the manufacturer should perform work on the collapsible tire/wheel.

This collapsible tire/wheel is only for an emergency situation and should not be used for long driving. The max. permissible speed with this wheel is 80 km/h (50 mph).

Replacing:

Only new version collapsible tires/wheels will be available after depletion of old stocks. Label on rim has been changed. Part number of collapsible tire/wheel remains unchanged.



SURVEY OF WHEEL RIMS AND TIRES - from 1972 Models

Type	Standard Rim	Tire	Optional Equipment Rim	Optional Equipment Tire
911 T	St. 5 1/2 J x 15	165 HR 15	5 1/2 J x 15 LMg 6 J x 15 St	185 HR 15 185/70 VR 15
911 E	Mod. 72 St. 6 J x 15 Mod. 73 LMg 6 J x 15	185/70 VR 15	6 J x 15 LMgs	185/70 VR 15
911 S	LMgs 6 J x 15	185/70 VR 15		

SURVEY OF WHEEL RIMS AND TIRES - from 1974 Models

Type	Standard Rim	Tire	Optional Equipment Rim	Optional Equipment Tire
911	St. 5 1/2 x 15	165 HR 15	6 J x 15 LMgs	185/70 VR 15
911 S	LMg 6 J x 15	185/70 VR 15	6 J x 15 LMgs	185/70 VR 15
Carrera	Front LMgs 6 J x 15	185/70 VR 15		
	Rear LMgs 7 J x 15	215/60 VR 15		

LMg	Cast aluminum rim
LMgs	Forged aluminum rim
St	Painted steel rim

Winter tires and tire inflation values same as for 1975 models, see page 4.1 - 1/8.

SURVEY OF WHEEL RIMS AND TIRES - from 1975 Models

Type	Standard Rim	Tire	Optional Equipment Rim	Optional Equipment Tire
911 S	LMg 6 J x 15	185/70 VR 15	LMgs 6 J x 15	185/70 VR 15
Carrera	Front LMgs 7 J x 15 Rear LMgs 8 J x 15	185/70 VR 15 215/60 VR 15		

Winter Tires *

Tire	Rim
165 R 15 M+S	5 1/2 J x 15
185/70 R 15 M+S	5 1/2 J x 15 6 J x 15

Inflation Pressure for Cold Tires:

Front	2.0 bar/29 psi
Rear	2.4 bar/35 psi
Spare	2.2 bar/32 psi

LMg	Cast aluminum rim
LMgs	Forged aluminum rim
St	Painted steel rim

* SR or HR version

WHEELS AND TIRES - from 1976 Model

Type	Standard Wheel	Tire	Optional Wheels (check fender clearance and position of wheels in wheel housings)	Optional Tires (check fender clearance and position of wheels in wheel housings)
911 S	LMg 6 J x 15	185/70 VR 15	LMgs 6 J x 15	185/70 VR 15
			front 6 J x 15 rear 7 J x 15	185/70 VR 15
			front 7 J x 15 rear 7 J x 15	185/70 VR 15
			front 6 J x 15 rear 7 J x 15	185/70 VR 15 215/60 VR 15
			front 7 J x 15 rear 8 J x 15	185/70 VR 15 215/60 VR 15

LMg = cast light alloy

Winter Tires *

Tires	Wheels Type 911 S
165 R 15 M+S	5 1/2 J x 15
185 R 14 M+S	5 1/2 J x 14
185/70 R 15 M+S	5 1/2 J x 15 6 J x 15

Cold Tire Pressure

front	2.0 bar/28 psi
rear	2.4 bar/34 psi
spare wheel	2.2 bar/31 psi

* = SR or HR version

WHEELS AND TIRES - from 1978 Model

Type	Standard Wheels	Tires	Optional Wheels	Optional Tires
911 SC	front 6 J x 15 rear 7 J x 15	185/70 VR 15 215/60 VR 15	front 6 J x 16 rear 7 J x 16	205/55 VR 16 225/50 VR 16

Winter Tires *

Tires	Wheels
185 R 14 M+S	5 1/2 J x 14
185/70 R 15 M+S	6 J x 15 7 J x 15 6 J x 15 front/ 7 J x 15 rear
205/55 R 16 M+S	6 J x 16 6 J x 16 front/ 7 J x 16 rear

Cold Tire Pressure:

front	2.0 bar/28 psi
rear	2.4 bar/34 psi
spare wheel	2.2 bar/31 psi

* = SR or HR version

Hebelwerk
Pedal System and Levers
Pédalier et Leviers
Pedaleria e Leve

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.0 Information

0.1 Description

0.2 Technical Data

Tightening Torques 0.2 - 2/1

1 - MANUAL CONTROLS

1.1 Gear Shift Linkage in Manual Transmission

Gear Shift Linkage, disassemble and reassemble 1.1 - 1/1

Gear Shift Linkage, adjust 1.1 - 2/1

Notes for Disassembly and Reassembly 1.1 - 1/5

Gear Shift Linkage, disassemble and reassemble, from 1973-model 1.1 - 1/7

Instructions for Disassembly and Reassembly 1.1 - 1/11

1.2 Heater and hand throttle controls from 1975 models

Dismantling and assembling heater and hand throttle controls 1.2 - 1/1

Removing and installing heater and hand throttle controls 1.2 - 1/3

Adjusting heater controls 1.2 - 1/6

Adjusting hand throttle control 1.2 - 1/7

Heater Blower Switch, remove and install 1.2 - 1/8

2 - PEDAL CONTROLS

2.1 Pedal Controls

Pedal Controls, disassemble and reassemble 2.1 - 1/1

Notes for Disassembly and Reassembly 2.1 - 1/6

Disassembly and Reassembly of Pedal Controls 1974 Models 2.1 - 1/7

Instructions for Disassembly and Reassembly 2.1 - 1/12

Adjusting Clutch 2.1 - 2/1

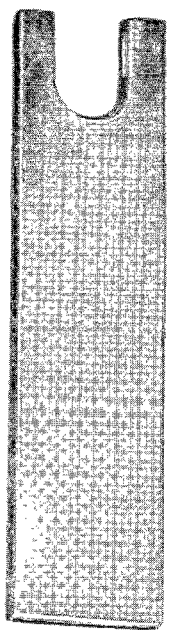
Adjusting Clutch from 1977 Models (with Servo Clutch on Transmission) 2.1 - 2/3

TIGHTENING TORQUES FOR MANUAL AND PEDAL CONTROLS

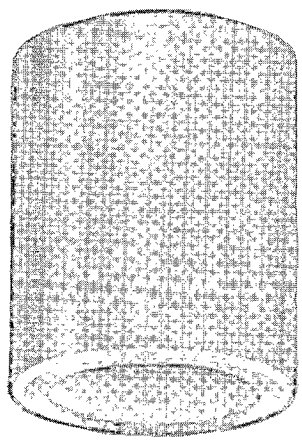
Location	Designation	Thread	Grade	mkp
Support bracket to shift lever housing	Bolt	M 6	8.8	0.6
Shift lever housing to center tunnel	Allen bolt	M 8	8.8	2.1
Set screw in shift rod head	Taper screw	M 8	8.8	1.5
Set screw in shift rod coupling	Taper screw	M 8	8.8	1.5
Clamp bolt	Bolt	M 8	8.8	2.5
Parking brake, heater, and throttle support bracket to body	Bolt	M 8	8.8	2.1
Set screw in throttle control rod	Pointed set screw	M 5	8.8	0.2
Parking brake switch to support bracket	Countersunk screw	M 4	5.8	0.1
Throttle pedal to body	Bolt	M 6	8.8	0.6
Pedal assembly support bracket to body	Nut	M 8	8.8	2.5
Throttle shaft attachment	Nut	M 6	6.6	0.5
Ball socket lock nut	Nut	M 5	St 34-2K/8	0.3

DISASSEMBLING AND ASSEMBLING SHIFT LEVER ASSEMBLY

TOOLS



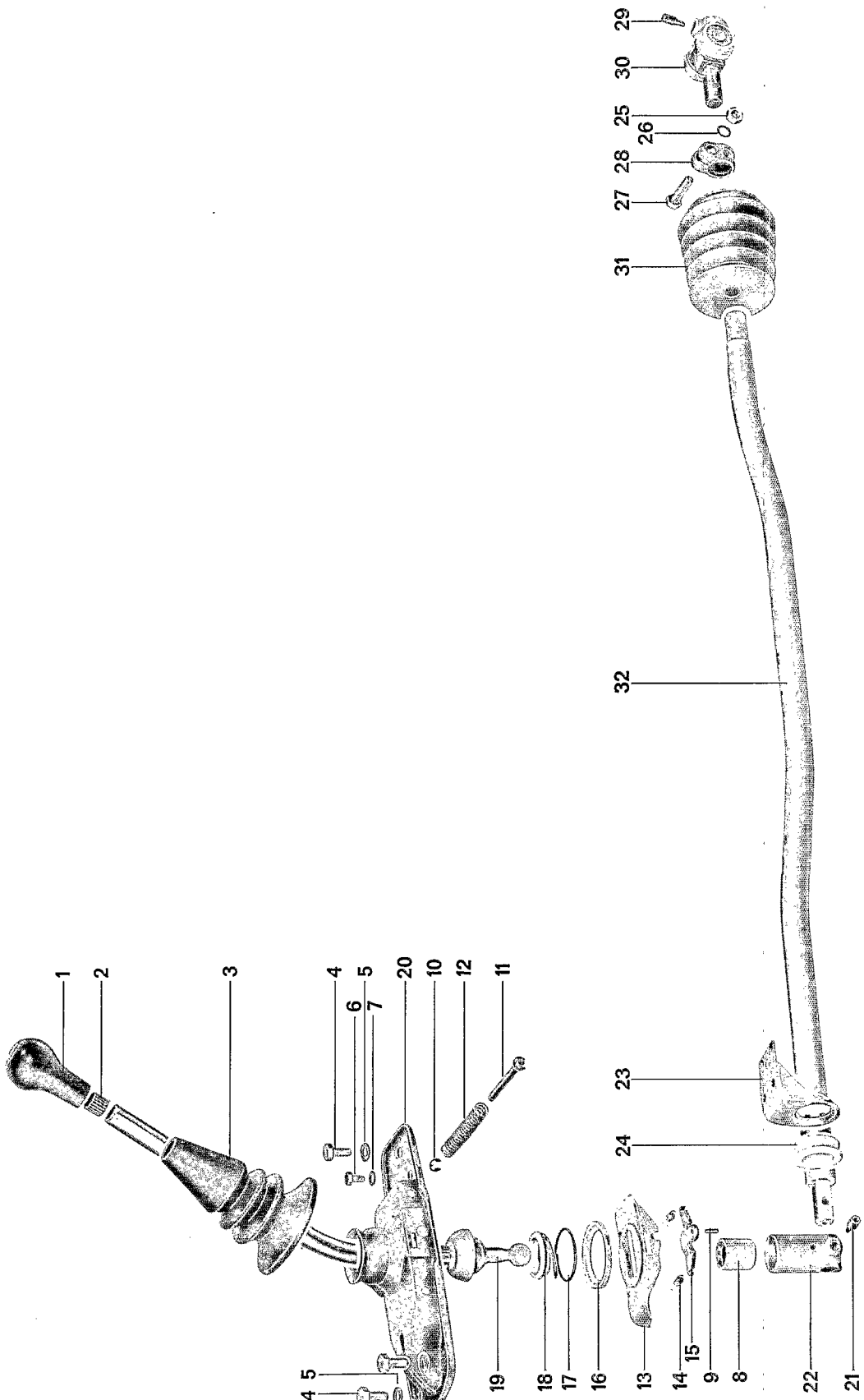
1



2

Nr.	Description	Special Tools	Remarks
1	Assembly lever		Locally manufactured
2	Installer	P 299	

DISASSEMBLING AND ASSEMBLING SHIFT LEVER ASSEMBLY



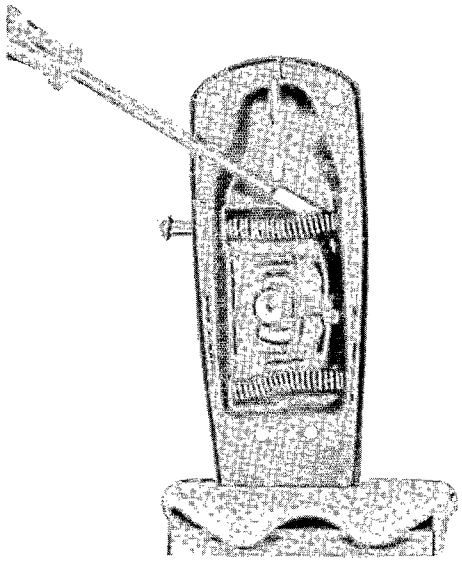
Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Shift knob	1			
2	Shift knob retaining ring	1		Replace.	
3	Dust boot	1			
4	Bolt, M8	3			
5	Lock washer	3		Replace.	
6	Bolt, M6	2			
7	Spring washer	2			
8	Ball socket	1		Use multipurpose grease with molybdenum additive.	
9	Pin, 30 x 10	1	Drive out with punch.	Replace if necessary.	
10	Snap ring	4		Replace.	
11	Guide pin	2			
12	Spring	2			
13	Stop plate	1		Use multipurpose grease with molybdenum additive.	
14	Lock pawl return spring	2			
15	Lock pawl	1		Use multipurpose grease with molybdenum additive.	
16	Spring seat, lower	1		Use multipurpose grease with molybdenum additive.	
17	Spring				
18	Spring seat, upper	1		Use multipurpose grease with molybdenum additive.	
19	Gearshift lever				
20	Support plate	1			
21	Tapered bolt	1			
22	Shift rod joint	1		Coat inner side with multipurpose grease.	
23	Guide bracket	1			
24	Bushing	1			
25	Nut, M8	1			

Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
26	Serrated washer	1		Replace.	
27	Bolt, M8 x 32	1			
28	Clamping bolt	1			
29	Tapered bolt	1			
30	Shift rod coupling	1			
31	Dust boot	1			
32	Shift rod	1		Lubricate pivot point.	

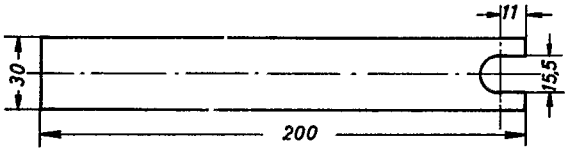
DISASSEMBLING AND ASSEMBLING SHIFT LEVER ASSEMBLY

Disassembling

1. Clamp the shift lever into a vice equipped with soft jaws. Drive off shift knob using the self-made tool. See illustrations.



Drawing for self-made tool



1/4 inch flat stock, all edges rounded off.

2. Pull retaining ring out of shift knob with a hook.

3. Remove shift boot. Pry plastic ball socket off shift lever with a screwdriver.

4. Clamp shift lever mounting bracket into vice.

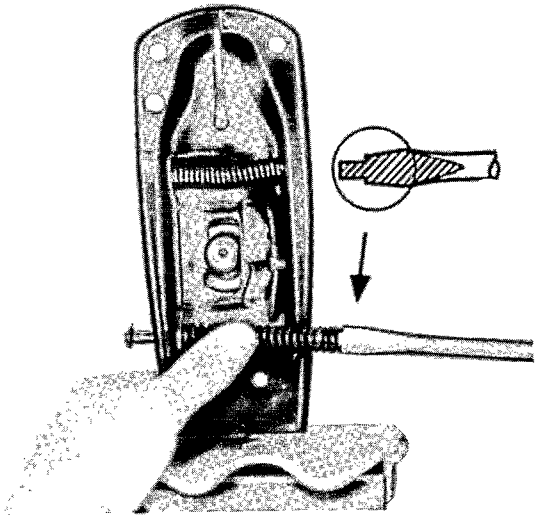
Caution
Use car when removing the guide pin springs. They are under tension and may fly out. Cover the springs with a rag.
Remove the guide pin snap springs. Remove the guide pin springs one at a time.

5. Remove remaining parts.

Assembling

1. Push lower spring seat on the shift lever compression spring until the spring is seated.

2. Coat the lower part of the shift lever well with Molykote or similar lubricant. Insert lever into shift bracket.



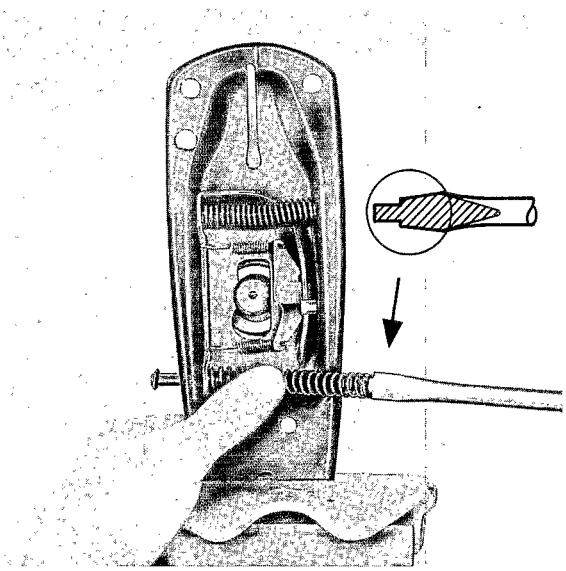
3. To install the guide pin springs:

   a. Position the stop plate to the shift bracket of the guide pins.

   b. Insert the second guide pin with snap ring at an angle.
   Slip the spring over the pin.

   c. Carefully push one end of the spring into the cutout. Align the spring and push the pin in completely.

   d. Install the spring on the other guide pin in the same way.



4. Slide on the shift boot.

5. Insert new retaining ring into shift knob (as far as the stop).

6. Place shift knob on lever so that the shift pin is in the correct position. Install using special tool P 299.

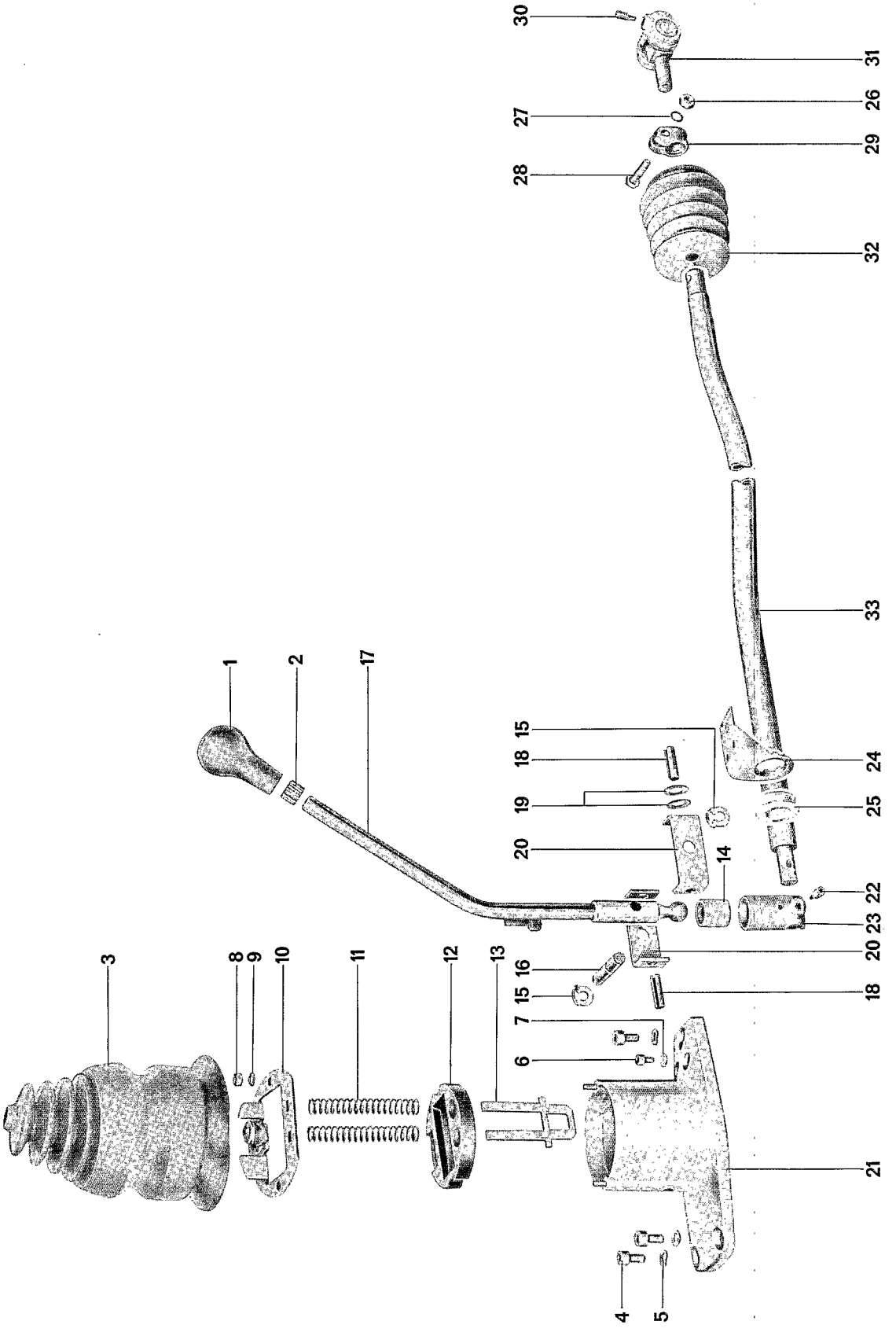
GEAR SHIFT ASSEMBLY EFFECTIVE WITH 1973 MODELS

General

Beginning with the 1973 models, a new pressure-cast shift lever housing is installed in all Type 911 vehicles equipped with a 5-speed transmission.

This shift lever housing can also be installed in older vehicles from 1972 model year on.

DISASSEMBLY AND REASSEMBLY



Nr.	Description	Qty	Note when: removing	installing	Remarks
1	Shift knob	1			
2	Interference sleeve	1		Replace	
3	Dust boot	1			
4	Allen bolt, M8x20	3			
5	Spring washer	3		Replace	
6	Allen bolt, M6x20	2			
7	Spring washer	2		Replace	
8	Nut, M 6				
9	Lock washer	2			
10	Lock pawl carrier plate with lock pawl	1		Apply MoS_2 multi-purpose grease	
11	Spring	2			
12	Buffer plate	1			
13	Guide plate	1		Apply MoS_2 multi-purpose grease	
14	Ball socket	1		Apply MoS_2 multi-purpose grease	
15	Lock ring	2		Replace if necessary	
16	Pivot pin	1	Check for wear	Apply MoS_2 multi-purpose grease	
17	Gear shift lever	1		Apply MoS_2 multi-purpose grease in the pivot area	
18	Roll pin	2	Drive out with punch	Replace if necessary. Install flush with shift lever housing	
19	Spacer	X	Note number of shims and their thickness	If necessary, redetermine required number and thickness	1.1 - 1/11

Nr.	Description	Qty	Note when: removing	Note when: installing	Remarks
20	Fork	2		Apply MoS_2 multi-purpose grease to friction points	
21	Shift lever housing	1			
22	Set screw	1			
23	Shift rod head	1		Apply MoS_2 multi-purpose grease to the inner surfaces	
24	Support bracket	1			
25	Bearing bush	1			
26	Nut, M 8	1			
27	Schnorr lock washer	1		Replace	
28	Bolt, M 8 x 32	1			
29	Clamp	1		Torque to specification	
30	Set screw	1			
31	Shift rod coupling	1			
32	Dust boot	1			
33	Shift rod	1		Apply MoS_2 multi-purpose grease to friction points	

INSTRUCTIONS FOR DISASSEMBLY AND REASSEMBLY

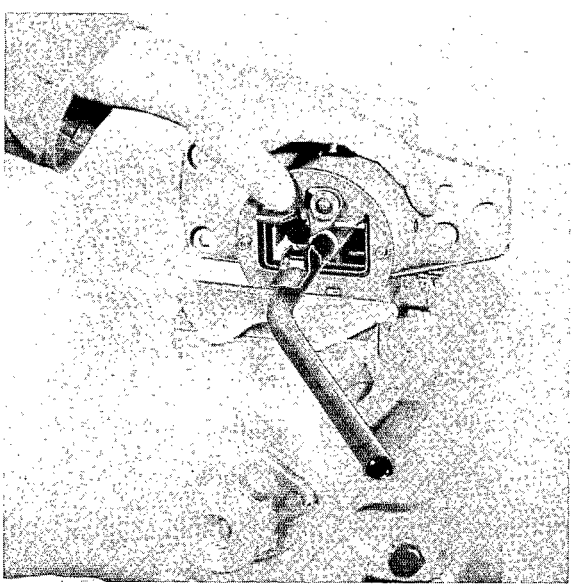
Disassembly

1. Remove shift knob (see 1.1 - 1/5).

2. Mount shift lever housing in a vise.

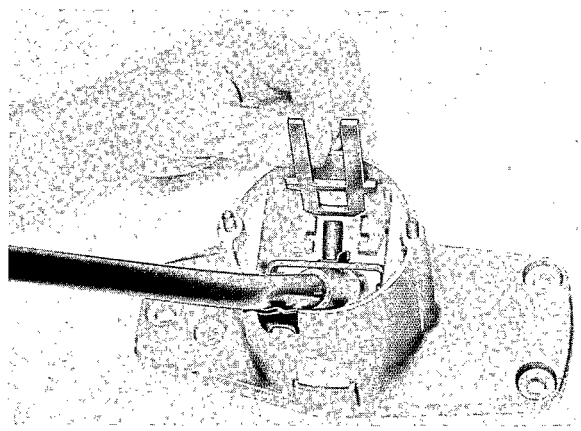
3. Remove both lock pawl carrier plate retaining nuts (M 6).

4. Open the vise slowly, holding the lock pawl carrier plate with one hand.

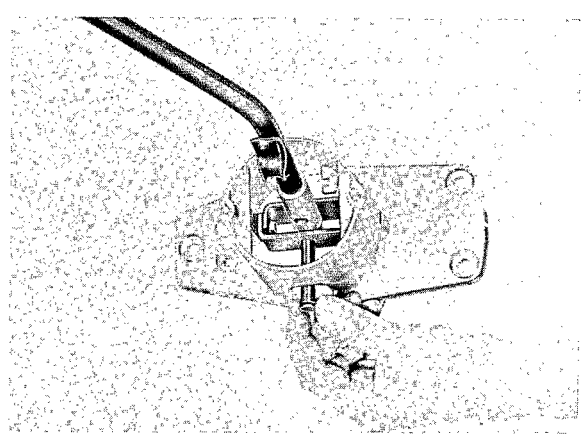


Caution:
The springs are under strong pressure and can cause the lock pawl carrier plate to snap out.

5. Take guide plate out of the shift lever housing through the top.



6. Remove lock rings from pivot pin with a screwdriver and pull pivot pin out of the shift lever housing.

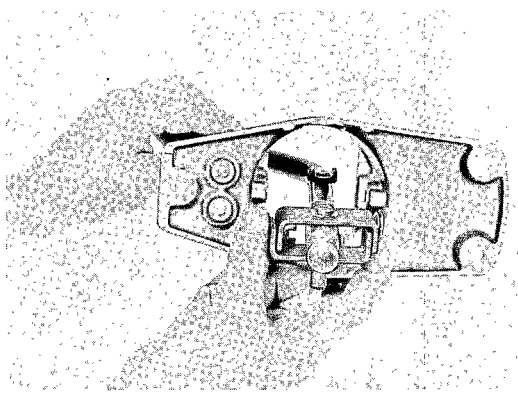


7. Take gear shift lever out of the housing.

Reassembly

1. Install gear shift lever, with forks and pin in place, into the shift lever housing.

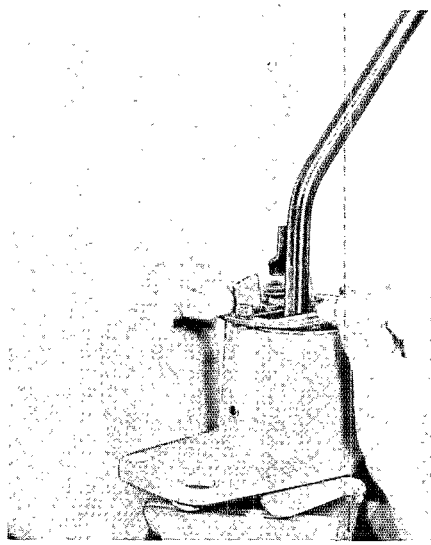
2. Insert spacers. Select the spacers to achieve a clearance of 0 to 0.1 mm between the forks and housing.



3. When installing the lock pawl carrier plate, place the lower part of the shift lever in the vise.
Use vise jaw covers.

4. Firmly press the lock pawl carrier plate down onto the shift lever base and tighten the M 6 retaining nuts.

Caution:
The springs are under heavy pressure and can cause the lock pawl carrier plate to snap out.

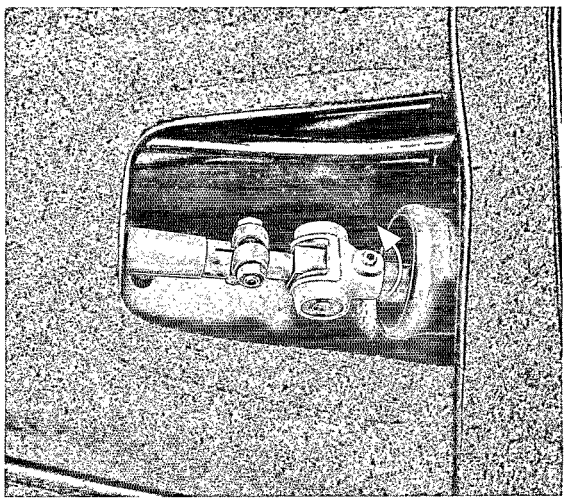


5. Place gear shift knob onto the shift lever and drive it into place with special tool P 299.

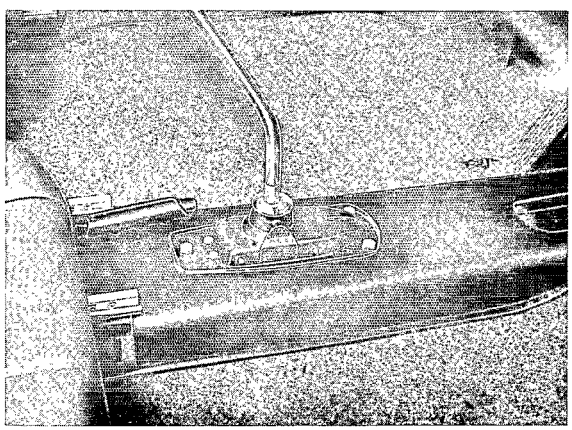
6. Install gear shift lever assembly in vehicle and adjust (see 1.1 - 2/1).

ADJUSTING GEARSHIFT LINKAGE

1. Loosen shift rod clamp. Turn shift rod for selector shaft to the right in neutral position (seen in direction of driving).



2. Move gearshift lever in neutral to the point where the lower part of the shift lever is positioned vertically and touching the left stop.



3. Lightly tighten the shift rod clamp.

4. Check if equally long travel is evident in gears 1 thru 4, and 5th and reverse gears can be easily engaged. Correct the adjustment if necessary.

5. Torque clamp nut to specification.

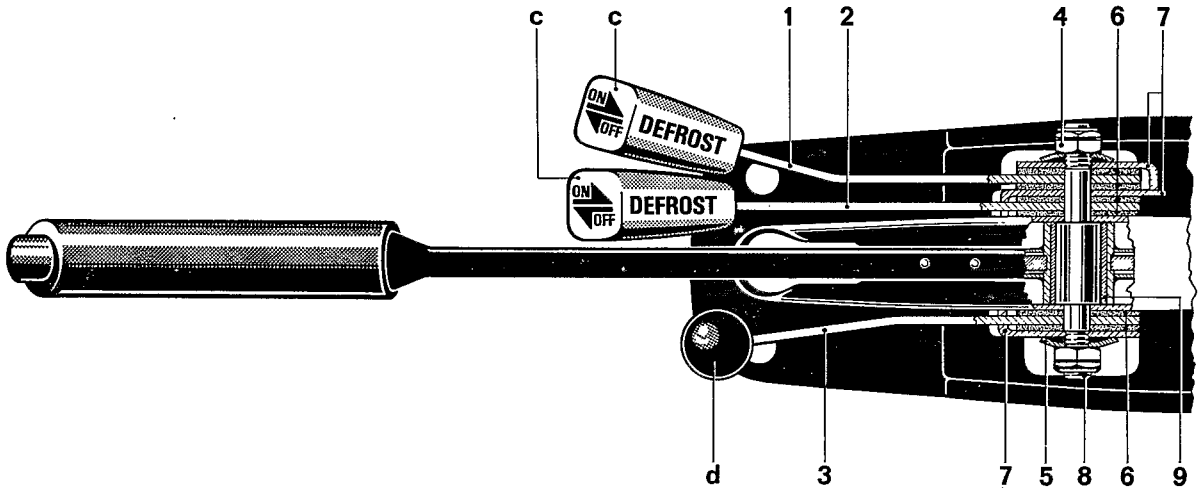
6. Shift into 5th gear. With the dust boot at the shift rod coupling pushed back, check selector shaft for rotational play. A definite amount of play must be in evidence.

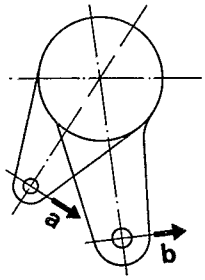
DISMANTLING AND ASSEMBLING HEATER AND HAND THROTTLE CONTROLS (from 1975 Models)

General Notes

The hand throttle and heater controls are located on the parking brake holder. The heater is regulated by two control levers infinitely, on the left and right sides of the vehicle.

DISMANTLING AND ASSEMBLING





1 Heater control lever, right
2 Heater control lever, left
3 Hand throttle control lever
4 Nut, self-locking
5 Spring disc
6 Friction disc
7 Disc
8 Shaft
9 Spacer

a Release pressure for heater control friction clutch: 10 kp
b Release pressure for hand throttle control friction clutch: 6 kp
c Heater control knob (press fit)
d Hand throttle control knob (press fit)

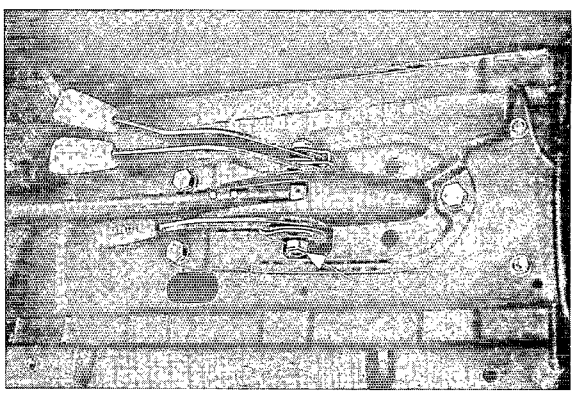
REMOVING AND INSTALLING HEATER AND HAND THROTTLE CONTROLS

Removing

1. Disconnect heater cables at rotary valves of heater body (underneath vehicle).

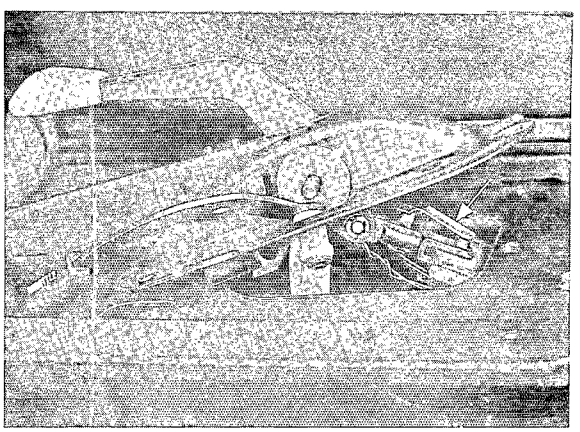
2. Remove tunnel cover and parking brake boot.

3. Remove parking brake base screws.



4. Remove hand throttle lever self-locking nut. Remove friction disc and discs. Disconnect hand throttle lever.

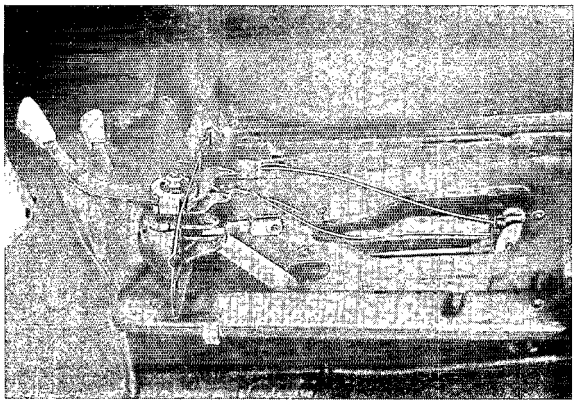
5. Lift parking brake base to unlock and pull out cable pin.



6. Disconnect wire connector at operating segment of parking brake indicator lamp. Remove parking brake base with heater cables.

Caution

If the parking brake base cannot be lifted high enough to disconnect cable, disconnect the parking brake compensator.



Installing

1. Pull heater cables into heater control lever. The longer heater cable is connected to left heater control lever.

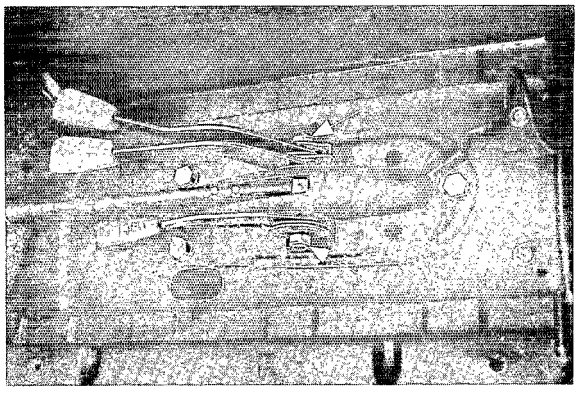
2. Slide heater flap cables into guide tubes. Lubricate cables at the same time with a multi-purpose grease. Make sure that heater flap cables do not tangle.

3. Install and lock parking brake compensator (apply multi-purpose grease).

Caution

Make sure that parking brake cables are located properly.

4. Connect wire connector to operating segment of parking brake indicator lamp.



5. Connect hand throttle lever at parking brake base and throttle linkage. Install parking brake base on center tunnel.

6. Secure hand throttle lever. Tighten self-locking nut until hand throttle lever will not return on its own when throttle is fully pulled out.

7. Check hand throttle position (refer to page 1.2 - 1/7).

8. Connect heater cables to rotary valves at heater body. Install grommets on guide tubes.

9. Check heater flap settings (refer to page 1.2 - 1/6).

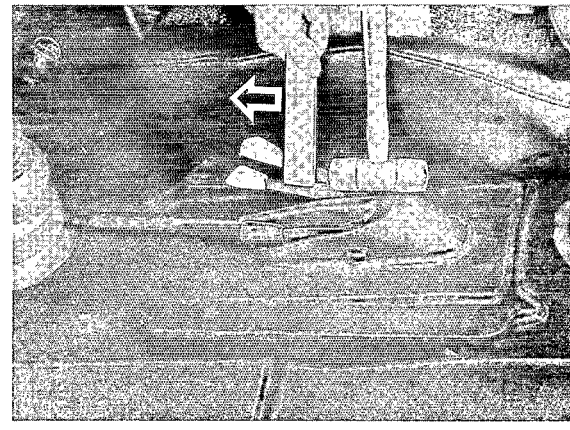
Replacing heater and hand throttle control knobs

Drive knobs off heater and hand throttle control levers with a piece of wood, or similar.

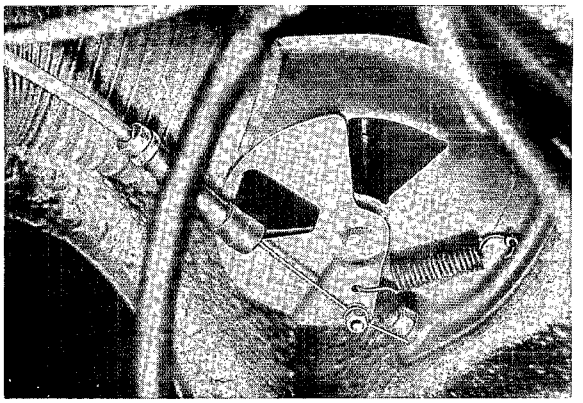
Drive knobs on with a plastic hammer.

Caution

Do not damage knobs.



ADJUSTING HEATER CONTROLS



1. Move both heater control levers to front stop, slide to "off" position and tighten left and right heater cables to rotary valves underneath vehicle.

2. Heater flap valves must be fully open.

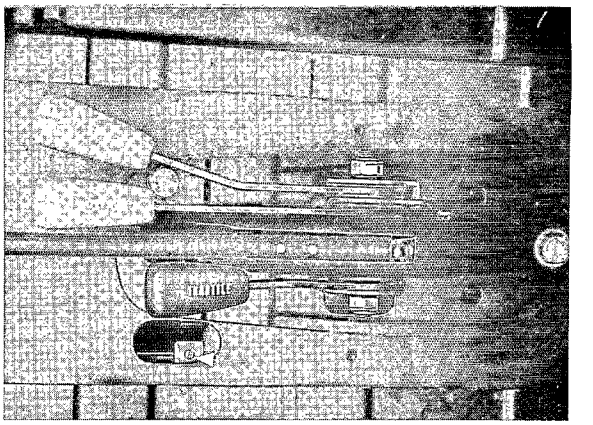
3. Check function of heater flaps. Heater flaps and rotary valves must open and close completely when operated.

4. Tighten self-locking nut of heater controls so that lever does not return on its own when heater is on. On the other hand, the levers should not be too hard to move.

ADJUSTING HAND THROTTLE CONTROL

1. Remove tunnel cover and parking brake base cuff.

2. With a warm engine (approx. 80° C) and the hand throttle control lever pulled out completely, the engine speed must be between 3500 and 3800 rpm.



Caution

Do not race engine.

3. The hand throttle control adjustment can be corrected on the accelerator linkage nipple in the vehicle's tunnel.

PEDAL CONTROLS

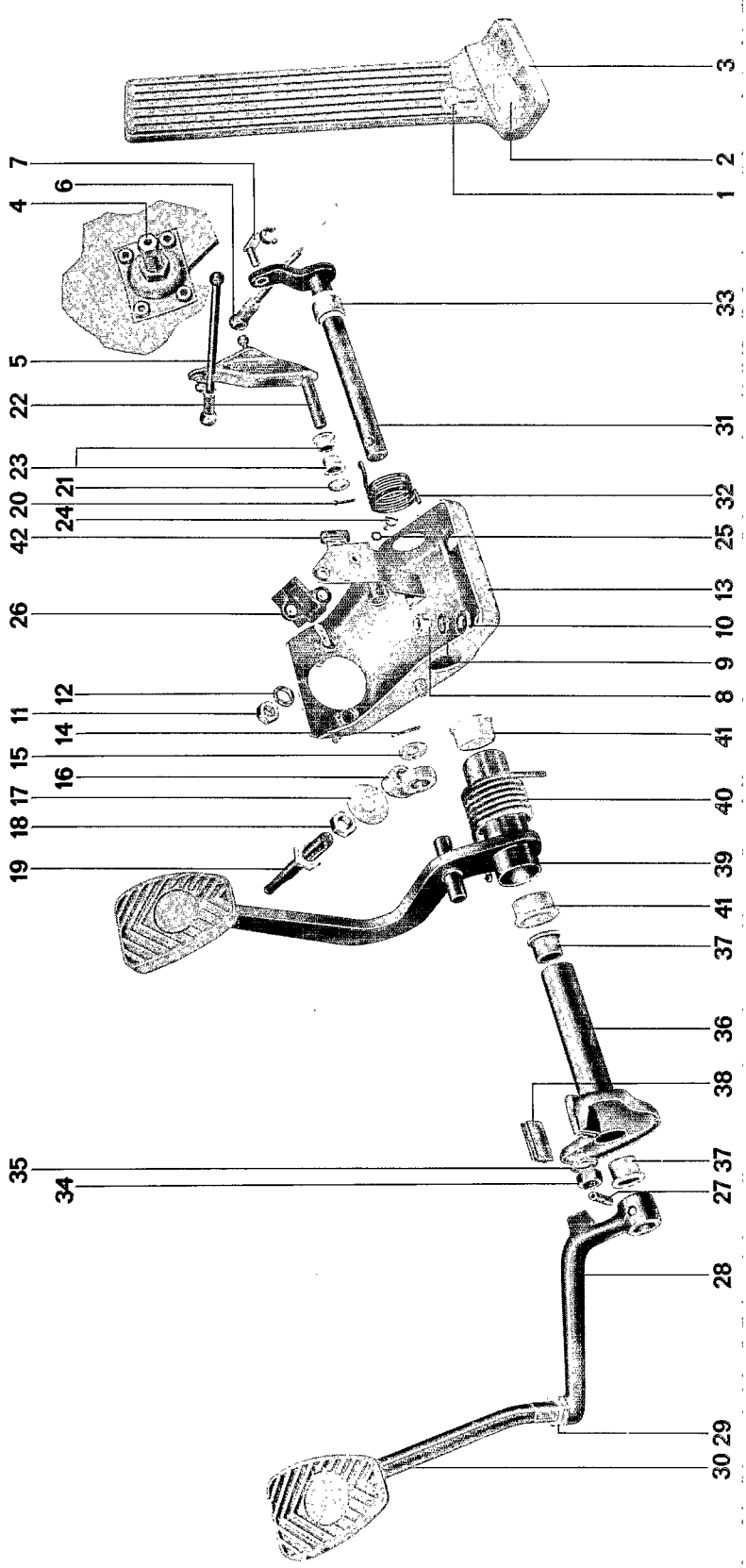
General

The clutch and brake pedals are mounted on a common clutch pedal shaft which is attached to the support fixture.

The support fixture is bolted to the floor and brake master cylinder attachment to the brake master cylinder is by two studs which extend through the transverse panel.

The throttle pedal cross-shaft rides in bushings mounted in the support fixture. The throttle pedal is fastened to the floor by two M 6 bolts.

DISASSEMBLING AND REASSEMBLING



Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Bolt, M 6 x 25	2			
2	Washer	2			
3	Throttle pedal	1	Pull back to remove.		
4	Throttle pedal stop	1		Adjust.	
5	Throttle pedal pressure rod	1	Detach.	Lubricate ball socket with multipurpose grease.	
6	Throttle rod		Detach.	Install with some multi-purpose grease, adjust if necessary.	
7	Clevis pin	1			
8	Nut, M 8	2			
9	Spring washer	2		Use new spring washers.	
10	Washer	2			
11	Nut, M 8	2	Remove frontshroud of steering and dual master cylinder.	Torque to 2.5 mkp.	
12	Spring washer	2		Use new spring washers.	
13	Support fixture		Remove together with pedals.	Install in assembled condition.	
14	Cotter pin for actuating rod	1		Use new cotter pin.	
15	Washer	1			
16	Intermediate piece	1			
17	Stop light actuating washer	1			
18	Nut, M 10	1			

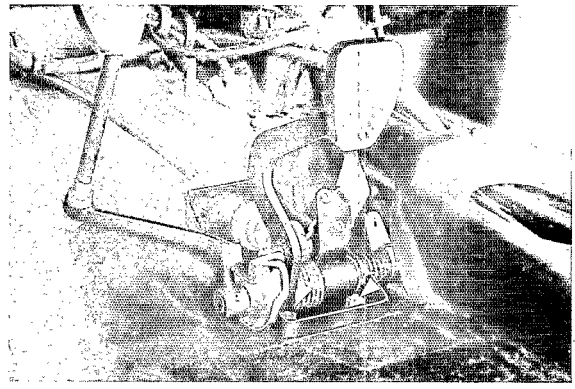
Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
19	Master cylinder rod	1		Assemble and install rod prior to the installation of the pedal assembly. Adjust free play between rod and piston in the brake master cylinder.	
20	Cross-shaft cotter pin	1		Use new cotter pin.	
21	Washer	1			
22	Cross-shaft	1	Check for wear.	Install with multipurpose grease.	
23	Bushing	2	Check for wear.	Press in.	
24	Fillister head screw M 4 x 10	2			
25	Lock washer	2			
26	Stop light switch	1	Detach flat connector.	Adjust switch, if necessary.	
27	Roll pin	1	Drive out.	Use new roll pin.	
28	Clutch pedal lower part	1			
29	Nut, M 14 x 1.5	1			
30	Clutch pedal upper part	1		Adjust length, if necessary.	
31	Clutch pedal shaft	1	Check for wear.	Install with multipurpose grease.	
32	Spring for clutch pedal shaft	1			
33	Bushing	1	Check for wear.	Lubricate with multipurpose grease.	
34	Nut, M 8	1			

Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
35	Spring washer	1		Use new spring washer.	
36	Support tube	1		Install with multipurpose grease.	
37	Bushing	2	Check for wear.	Press in.	
38	Rubber cushion	1	Check for wear or damage.	Replace if necessary.	
39	Brake pedal	1			
40	Return spring	1			
41	Bushing	2	Check for wear.	Press in.	
42	Rubber cushion	1	Check for wear or damage.	Replace if necessary.	

INSTRUCTIONS FOR REMOVAL AND INSTALLATION

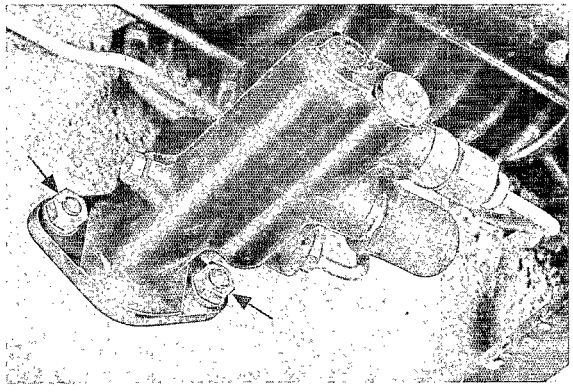
Removing

1. Remove shroud covering steering and brake master cylinder under the car.



2. Remove both M 8 retaining nuts from brake master cylinder.

   Note:
   Do not detach brake lines or remove the brake master cylinder. Remember to install the master cylinder rod prior to installing the pedal assembly.



3. Remove M 8 retaining nuts from support fixture and remove pedal assembly (first remove clevis pin from clutch pedal shaft, and detach throttle rod).

Installing

1. Clean the parts, check for wear or damage, and replace if necessary.

2. Press bushing in, lubricate bearing surface and pedal shaft.

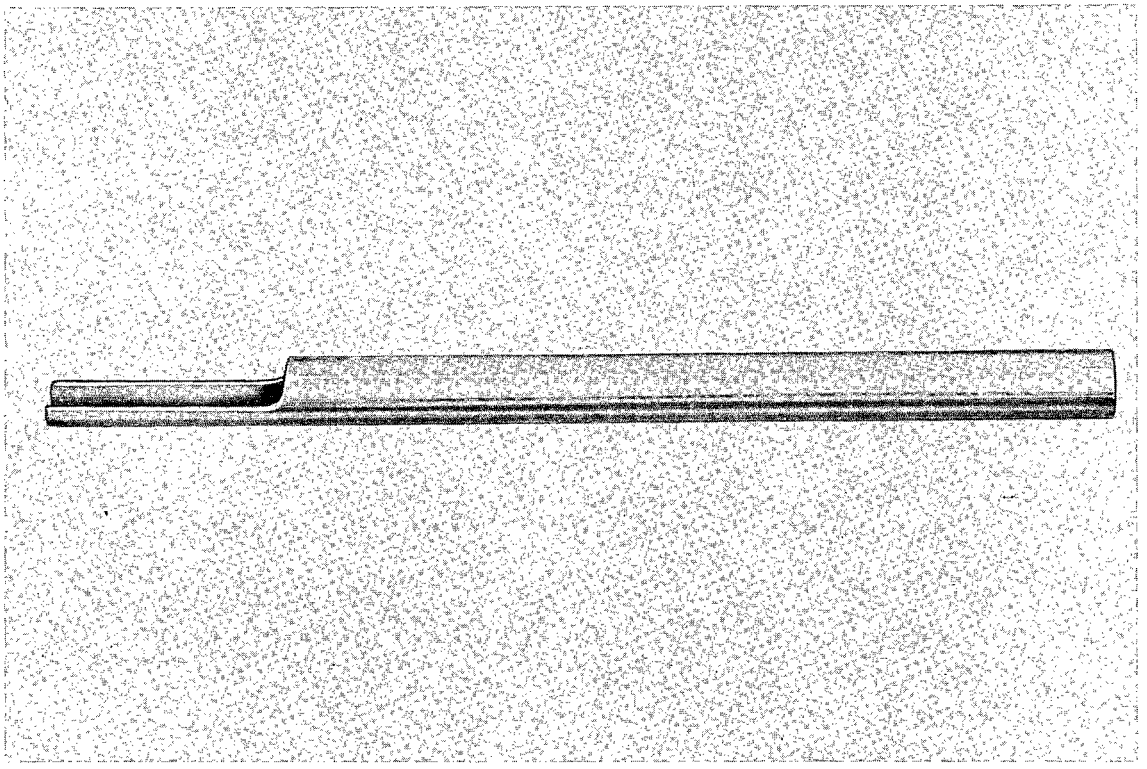
PEDAL CONTROLS

General

Beginning with the 1974 models, all Type 911 vehicles are furnished with a supplemental clutch pedal spring to reduce the necessary pedal force. The pedal force decreases progressively as the clutch pedal is pushed in.

In addition, the cars are equipped with a longer brake pedal. The pedal lever length is 250 mm, the ratio 5.8:1.

TOOLS



No.	Description	Special Tool	References
1	Installer	---	Local manufacture

No.	Description	Qty	Note during removal	Note during installation	References
1	Bolt M 6 x 25	2		Tighten to specified torque	
2	Washer	2			
3	Throttle pedal	1	Pull off rearward		
4	Throttle pedal stop	1		Adjust	
5	Throttle control link	1	Detach	Grease ball socket with multi-purpose grease	
6	Throttle control rod		Detach	Install with multipurpose grease, adjust if necessary	
7	Clevis pin	1			
8	Nut M 8	2		Tighten to specified torque	
9	Lock washer	2		Replace	
10	Washer	2			
11	Nut M 8	2	Remove steering and brake master cylinder stone guard first	Tighten to specified torque	
12	Lock washer	2		Replace	
13	Support	1	Remove together with pedals	Install assembled	
14	Dust boot	1			
15	Cotter pin for actuating rod	1		Use new cotter pin	
16	Washer	1			
17	Intermediate piece	1			
18	Nut M 10	1			

No.	Description	Qty	Note during removal	Note during installation	References
19	Actuating rod	1		Assemble and insert the actuating rod prior to the installation of the pedal assembly. Adjust clearance between the actuating rod and piston in brake master cylinder	
20	Stoplight switch actuating washer	1			
21	Spring	1	Detach with the aid of a screwdriver	Use locally-manufactured tool	2.1-1/2
22	Cotter pin for bell crank	1		Use new cotter pin	
23	Washer	1			
24	Bell crank	1	Check for wear	Grease with multipurpose grease prior to installation	
25	Bushing	2	Check for wear	Press in	
26	Rubber stop	1		Replace if necessary	
27	Slotted screw M 4 x 10	2			
28	External tooth lock washer	2			
29	Stoplight switch	1	Detach tab connector	Adjust if necessary	
30	Rollpin	1	Drive it out	Use new rollpin	
31	Clutch pedal	1			
32	Clutch pedal shaft	1	Check for wear	Use multipurpose grease	
33	Bushing	1		Use multipurpose grease	
34	Nut M 8	1			
35	Lock washer	1		Replace	

No.	Description	Qty	Note during removal	Note during installation	References
36	Support tube	1		Use multipurpose grease	
37	Bushing	2	Check for wear	Press in	
38	Rubber stop	1	Check for wear and damage	Replace if necessary	
39	Brake pedal	1			
40	Return spring	1			
41	Bushing	2	Check for wear	Press in	

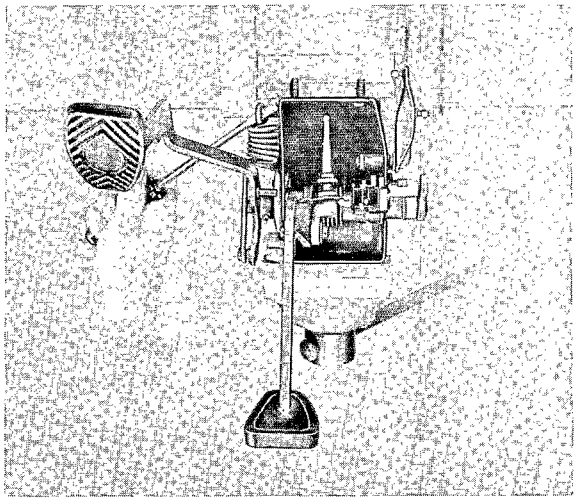
INSTRUCTIONS FOR DISASSEMBLY AND REASSEMBLY

Disassembly

1. Mount pedal support in a vise.

2. Unhook the clutch pedal supplemental spring from pedal support with the aid of a screwdriver while depressing the clutch pedal.

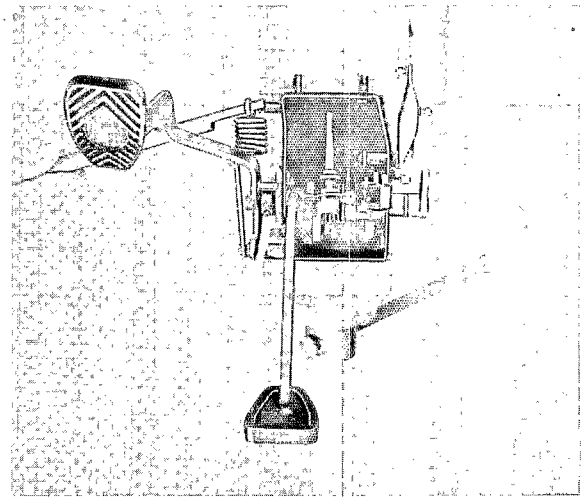
Caution
The spring is under tension and can jump out.



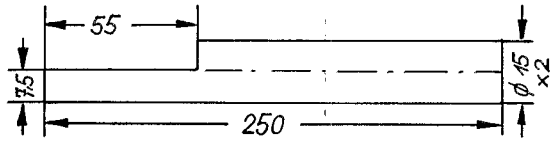
Reassembly

1. Grease both spring attachment studs (in the pedal and pedal support) with MoS_2 multipurpose grease.

2. Attach spring to pedal support with the aid of the installer (see sketch for local manufacture of tool).



Sketch for local Manufacture of Tool



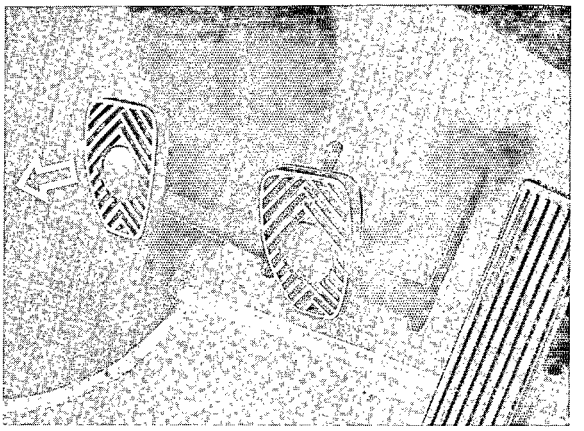
Material:

Steel pipe , 15 mm dia., wall thickness 2 mm

ADJUSTING CLUTCH

Checking Clutch Free Play

The clutch pedal free play is 15 - 20 mm. It is determined by pulling the clutch pedal out in the direction of the arrow.

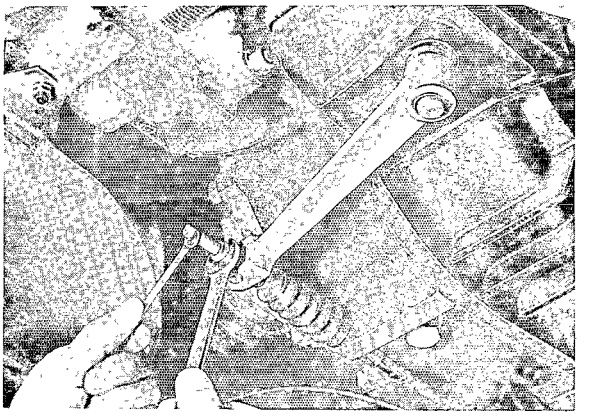


NOTE:

The clutch free play of 20 mm must not be exceeded since otherwise the clutch pedal supplemental spring will become active without actuation of the clutch pedal.

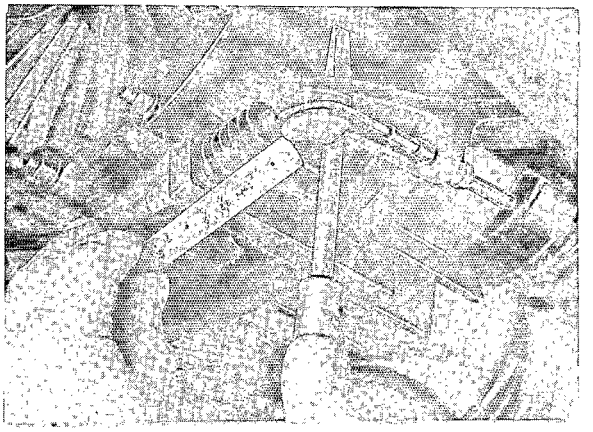
Adjusting Play

Use screwdriver to press release lever in direction of engine against stop. Measure distance between lever and transmission case. Release lever again. Turn adjusting nut on end of cable (underneath car) until lever travel is 4 mm (5/32 in.). Now check clutch play at pedal and correct again, if necessary.



Note

A new clutch lever is installed on all 1975 models.



Checking Clutch Pedal Travel

The test should be accomplished when the transmission is warm. Depress clutch pedal fully to the stop. With clutch pedal in this position, the reverse gear should still engage clash-free.

Adjusting Clutch Pedal Travel

1. Detach floor mat and remove.

2. Loosen both travel stop retaining screws.

3. Push the travel stop plate up or down, as required, until the adjustment is such that the reverse gear can still be engaged clash-free.

4. Tighten the retaining screws, recheck clutch pedal travel, and install floor mat.

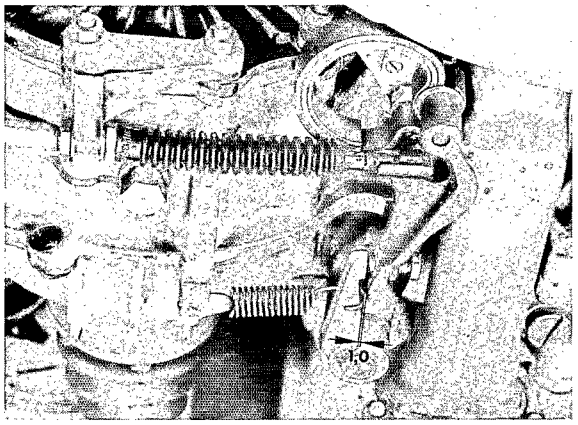
ADJUSTING CLUTCH ON MODELS WITH AUXILIARY CLUTCH SPRING

Checking Clutch Play

Because of the auxiliary clutch spring the clutch play cannot be measured exactly at the clutch pedal. This is why the clutch play of models with a auxiliary clutch spring is checked at the transmission adjusting lever.

1. Check whether clutch cable is tight.

2. If cable has sufficient tightness, check clutch play with a feeler gauge and, if applicable, adjust it to 1.0 + 0.1 mm with the adjusting screw.



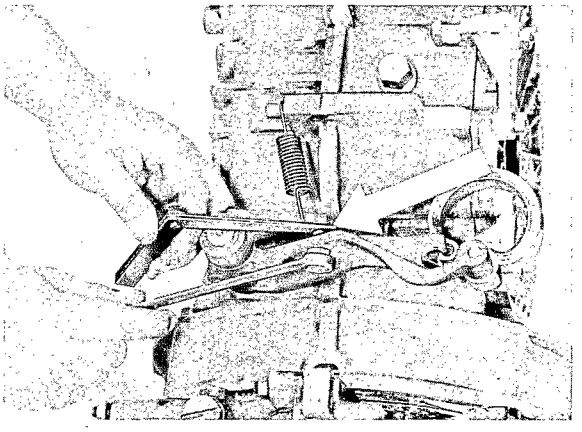
Note

Make basic adjustment if cable is loose (stretching process).

Basic Adjustment

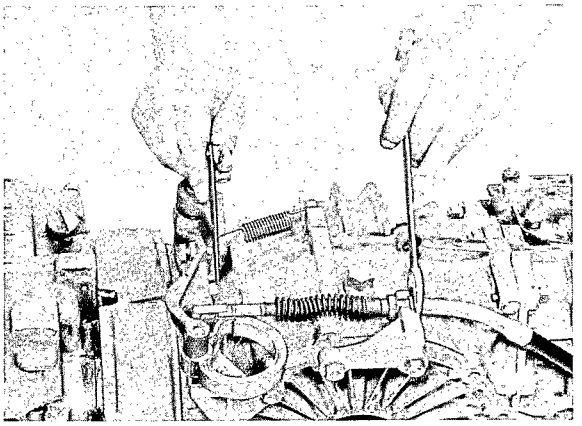
1. Detach clutch cable or loosen completely at holder.

2. Adjust clutch play to 1.2 mm with a feeler gauge and lock adjusting screw.



3. Detach clutch cable.

4. Tighten clutch cable until clutch play is 1.0 mm.



Note

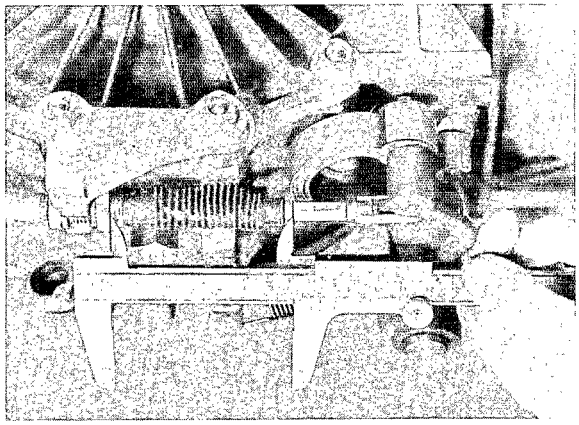
If there is not enough room for adjustment at the clutch cable holder, adjustments must also be made up front at the pedal assembly. Adjust stop on floor plate until the release travel at the release lever is 25 $\pm$ 0.5 mm (Turbo 27 $\pm$ 0.5 mm).

5. Measure release travel distance.

a) Insert calipers as shown in the photo and read distance I (e.g. 95.3 mm).

b) Depress clutch pedal and measure distance II with calipers as shown in the photo (e.g. 69.9 mm).

c) Distance I minus distance II (e.g. 95.3 minus 69.9 = 25.4 mm) equals release travel distance.



Aufbau
Body
Carrosserie
Carrozzeria

CONTENTS

0 - INFORMATION, DESCRIPTIONS, SPECIFICATIONS

0.1 Descriptions

Body modifications - 1972 model 0.1 - 1/1

Body modifications - 1973 model 0.1 - 2/1

Body modifications - 1974 model 0.1 - 3/1

1 - BUMPERS

1.1 Bumpers

Front spoiler - 911 S 1.1 - 1/1

Bumper, removing and installing - 1973 model 1.1 - 2/1

Front bumper - 1974 model 1.1 - 3/1

Rear bumper - 1974 model 1.1 - 4/1

Front spoiler, installing 1.3 - 1/1

3 - HOODS AND LIDS

Front hood lock, removing and installing 3.1 - 1/1

Hood, opening with broken cable 3.1 - 1/2

Rear lid with spoiler 3.2 - 1/1

4 - DOORS

Inner door fittings, removing and installing - 1974 model 4.1 - 1/1

Door stop, removing and installing 4.2 - 1/1

Ridge filler, installing 4.2 - 1/2

Door sheel preparation for remote control outside mirror 4.3 - 1/1

New door lock controls, service installing 4.4 - 1/1

Door window lift channel, installing 4.5 - 1/1

Electric window regulators, removing and installing 4.6 - 1/1

Electric cross arm window controls - 1980 model 4.6 - 2/1

Electric cross arm window controls, service installing 4.6 - 3/1

Adjusting door window - Targa 4.6 - 4/1

7 - ROOF

Folding roof modifications - 1974 model 7.1 - 1/1
Folding roof lock pin, service installing 7.2 - 1/1
Hardtop roof 7.3 - 1/1
Folding top to hardtop, switching 7.4 - 1/1

9 - INTERIOR FITTINGS

9.1 Interior fittings

Interior mirror, installing 9.1 - 1/1
Targa roof adjustments - 1970 model 9.2 - 1/1
Top wind deflector strip modifications 9.2 - 1/3
Three point belt with automatic retractor and warning system, removing and installing 9.3 - 1/1
Electric window regulator, removing and installing 9.3 - 2/1
Seat, installing - 1973 model 9.4 - 1/1

10 - EXTERIOR FITTINGS

10.1 Exterior fittings

Oil tank filler lid and control, removing and installing 10.1 - 1/1
Rocker panel cover, removing and installing 10.1 - 2/1
End plate, removing and installing 10.1 - 3/1
Carrera emblems 10.2 - 1/1
Outside mirror with defogger and remote control, removing and installing 10.3 - 1/1
Exterior mirror on passenger's door, service installing 10.3 - 1/4

18 - REFERENCE DIMENSIONS FOR REPAIRS

18.1 Reference dimensions

Repair dimensions - 1972 model 18.1 - 1/1

20 - REPAIRS

20.1 Repairs

Rear axle cross tube rust prevention 20.1 - 1/1
Galvanized sheet metal instructions - 1976 model 20.2 - 1/1
Rear axle cross tube, checking alignment 20.1 - 2/1

22 - PAINTING

22.1 Paints

Paints - 1972 model 22.1 - 1/1

Paints - 1974 model 22.1 - 1/3

Paints - 1976 model 22.1 - 1/4

Paints - 1978 model 22.1 - 1/5

Range of body paint colors - 1981 models 22.1 - 1/7

22.2 Metallic paints

Metallic paint - wet on wet method 22.2 - 1/1

Targa roll bar cover, painting 22.2 - 1/2

30 - BODY REPAIRS

30.1 Front body 30.1 - 1/1

30.2 Extra attachment for economical repair of front end damage 30.2 - 1/7

Universal anchor ENS 937.900 30.2 - 3/1

Cobra 3 straightener with accessories 30.2 - 3/3

30.3 Rear body 30.3 - 1/1

BODY CHANGES - FROM 1972 MODEL

Beginning with 1972 models, the following body and trim changes were made.

Body

1. The shape of the rear seat sheetmetal and upper rear wall has been changed. They are the same shape for both Coupe and Targa models.
2. Rear crossmember moved forward; has modified shockabsorber cavities.
3. The rear seats were reshaped. The seat backs are positioned further to the rear.
4. Rocker panel and fender well provided with connecting points for oil tank and oil lines (911 S).
5. Rear torsion bar tubes provided with water drain holes.
6. Right rear fender with oil filler lid.
7. Muffling portion of heater pipe shortened 50 mm as of October, 1971.
   As a result, the forward heating duct has been extended.
8. Inside area of door still galvanized.

Changes in Type 911 S

Rocker panels provided with supports for externally located oil lines, right fender well does not have oil line openings.
Engine compartment lid and bumper center section made of steel sheetmetal.
Front spoiler for Type 911 S (optional for other models).

Trim

1. Lettering, type identification, air inlet grille, and seat recliners in dull black finish.
2. Same basic trim for 911 T and 911 E.
3. Leatherette used on the instrument panel and seats (new leather-grained material).
4. Self-sealing clips in the door panel.
5. Door locks with vertically-positioned key slots.
6. Improved inside mirror attachment.
7. Seat belt mounting points in door lock posts dropped 90 mm lower in Coupe models beginning with November 1971.
8. Targa moulding strip, depressed in the area of roof lock pawls.
9. Tubular crossmember under instrument panel discontinued (Targa).
10. New color numbering code in paint nomenclature plate; paints are tested according to VW standards.

BODY CHANGES EFFECTIVE WITH 1973 MODELS

Doors

Modified door lock and striker plate can be replaced.

New type door hinges which are attached to the hinge post with interference pins instead of previously used rivets. The hinges can be installed in doors of older version by filing the bolt holes slightly.

Seats

1973-models are equipped with sport seats that are provided with double rail locks as of Sep-72.

Body Shell

Oil tank under right rear fender repositioned rearward.

Fender without filler neck lid.

Exterior

Black front horn grill.

Front bumpers in Type 911 E and 911 S vehicles equipped with spoiler.

Reinforced front and rear bumpers.

Front and rear bumper horns of energy absorbing material effective with Sep-1-72 production.

BODY CHANGES EFFECTIVE WITH 1974 MODELS

The following body changes were effective with the 1974 models.

Body:

1. New transverse lock panel in front with lid lock cover, as well as brackets for car jack and roof top.
2. Tank support modified for 80-liter tank (standard).
3. Battery support on left side for 66 or 88 Ah battery.
4. Front wheelhouse panels without battery compartments. Strong support plates for deformation tubes or hydraulic dampers along the front and rear wheelhouse panels.
5. New seat rails (with forward inclination).
6. Instrument panel with changed switch receptacles, as well as side-vent outlets.
7. Shorter front lid with new lid lock.
8. New front fenders with changed headlamp compartments. Large windshield washer reservoir under the left front fender, with filler neck within the fuel filler compartment.
9. Rocker panel covers with protective strip.
10. Aluminum bumpers with side boots and separate skirts, with rubber bumper guards in rear.
11. New towing hooks in front and rear.
12. Seat belt anchorages along side members and center tunnel.

Appointments:

1. Foam-padded instrument panel with adjustable side vents and changed glove compartment door.
2. New door trim, door weatherstrip, and door handles.
3. Seats with integrated head restraints.
4. Targa with solid roof top (fiberglass). Folding roof (optional) with central anchorage in rear.
5. Rear panel with reflectors and PORSCHE lettering.
6. Seat belts with automatic action.
7. Rear side window not operable in Type 911.
8. Front directional signals mounted in the bumper.
9. Black ornamentation for Carrera (instead of chrome).
10. New paint finish colors.

FRONT SPOILER - TYPE 911 S

Beginning with 1972 models, Type 911 S vehicles are furnished with a front spoiler-type bumper as standard equipment. This modification results in increased stability at high speed.

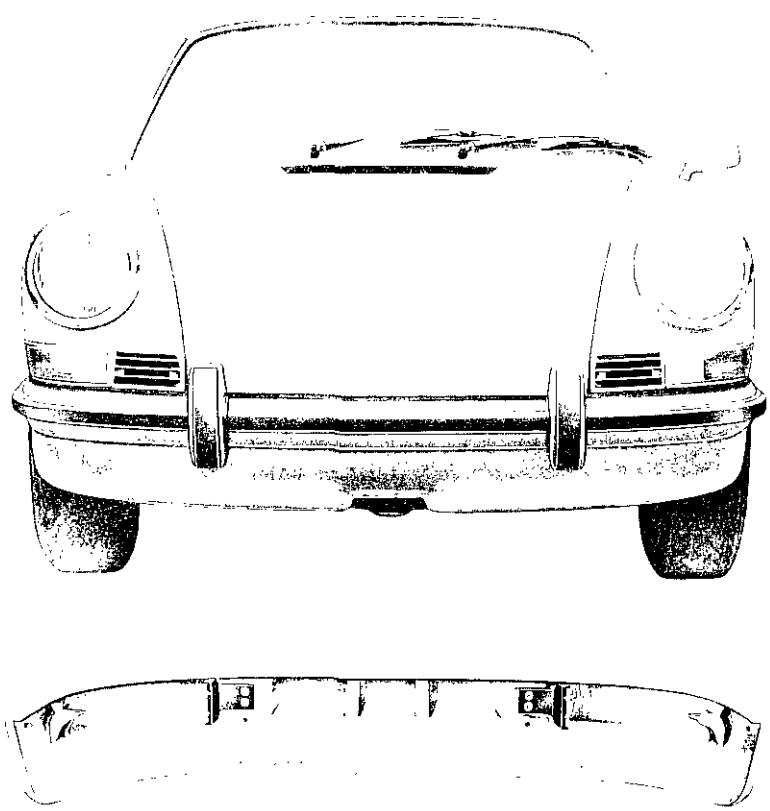
Initially made of fiberglass, these spoiler-type bumpers are made of steel sheetmetal from

chassis #	911 230 0385	-	Coupe
	911 231 0231	-	Targa

The steel spoiler-type bumper can be optionally equipped with overrider horns.

NOTE

The spoiler-type bumper can be installed in all vehicles from 1969 models on without further modifications.



Steel spoiler-type bumper with bumper supports

REMOVING AND INSTALLING USA - TYPE BUMPERS

General

Beginning with the 1973 models, all vehicles exported to the USA are equipped with bumpers with energy-absorbing rubber bumper horns in front and rear, and reinforced bumper brackets. The bumper horns deform under heavy impact. Additional rubber supports are mounted on the rear bumper horn brackets to further support the bumper center section and upper part of bumper horns against the rear transverse member.



Removing Front Bumper

1. Detach bumper from fender sides; detach electrical wires if additional lamps are installed.

2. Detach bumper brackets from body (ahead of the battery compartments). Remove bumper.

   NOTE:
   In vehicles equipped with air conditioning, it will be necessary to detach impact protection bars from the suspension control arm attaching points.

Disassembling Bumper

1. Unscrew bumper brackets (M 8 nuts nd Allen bolts).

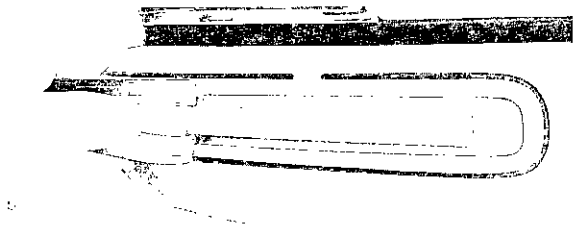
2. Detach bumper horns.

3. Remove bumper trim strip.

4. Pull weather seal off bottom edge of fender and the lock transverse panel.

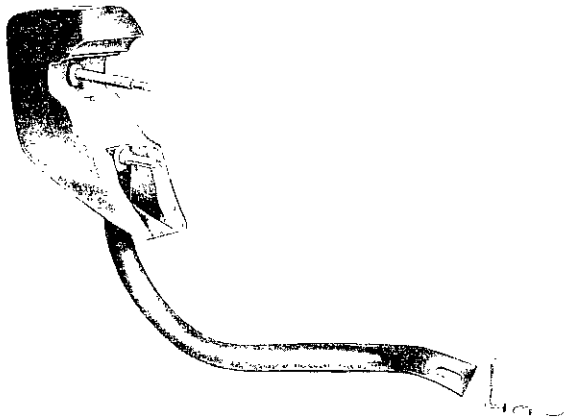
Reassembling Bumper

1. Insert weather seal into front lock transverse panel, glue it in at the fenders.



2. Install bumper trim strip (911 T).

NOTE:
Trim strip containing a rubber liner should be installed by first securing the supporting strip to the bumper, then pressing and attaching one end of the rubber strip, and finally bending the rubber strip sides over and sliding it onto the supporting strip.



3. Install bumper horns.

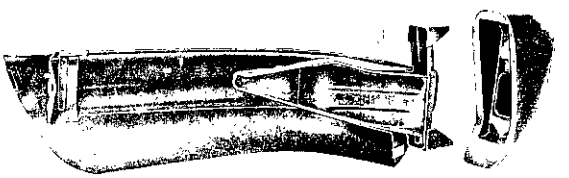
NOTE:
If impact protection bars for the air conditioning system are to be installed, it will be necessary to first make an opening in the horn bottom through which the bar will pass for attachment to the horn, as shown in the illustration. The other end of the bars is later secured to the outer control arm mounting points.

Removing Rear Bumper

1. Detach bumper outer sections from support pipe and bumper bracket sides.

2. Detach bumper brackets from the longitudinal members and remove complete bumper assembly.

3. Remove rubber spacers from the brackets.



Outer section of bumper with reinforced bracket, rubber spacer, and rubber bumper horn.

Disassembling Bumper

1. Pull weather seal off center panel and bottom edge of fender.

2. Remove cover plugs from the bumper horns, unscrew Allen bolts, and take bumper horns off.

3. Remove sheetmetal screws connecting outer and center sections.

4. Remove trim strip, reflectors, and end plates from bumper outer sections.

Reassembling Bumper

NOTE:
When installing bumpers which were disassembled for painting, it is best to reassemble the parts off the vehicle and then mounting the entire bumper assembly in its place. If the disassembly involved repairs, it will be necessary to first fit the bumper outer sections on the car, making sure that they fit flush with the fenders and tail lamp assemblies, as well as being parallel to the fender bottom edge.

1. Glue weather seals to the bottom of the fenders.

2. Install reflectors, trim strips, and end plates in outer sections.

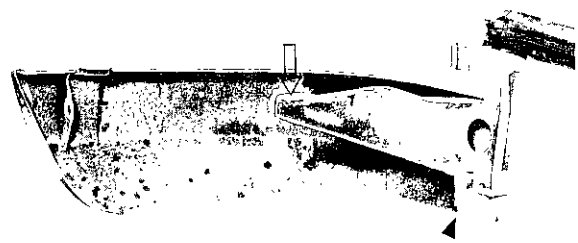
3. Slide sealing strip into center section and glue weather seal in place.

4. Place center piece onto the outer section brackets and lightly fasten at the bottom with sheetmetal screws and nuts.

5. Insert bumper horns and secure with Allen bolts.
   Place rubber spacers onto brackets.

6. Attach bumper to longitudinal members, securing it by the brackets.

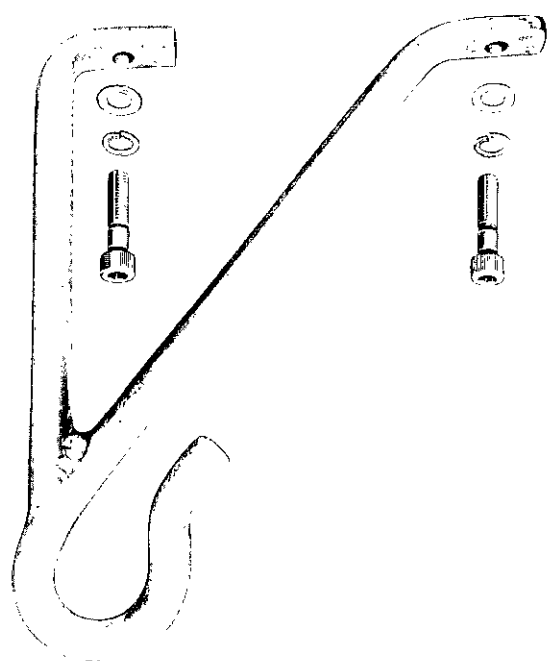
NOTE:
If the rear part of the bumper does not press against the weather seal in the fender, that distance must be reduced by inserting spacers between the bracket and longitudinal members, at the front bolt.



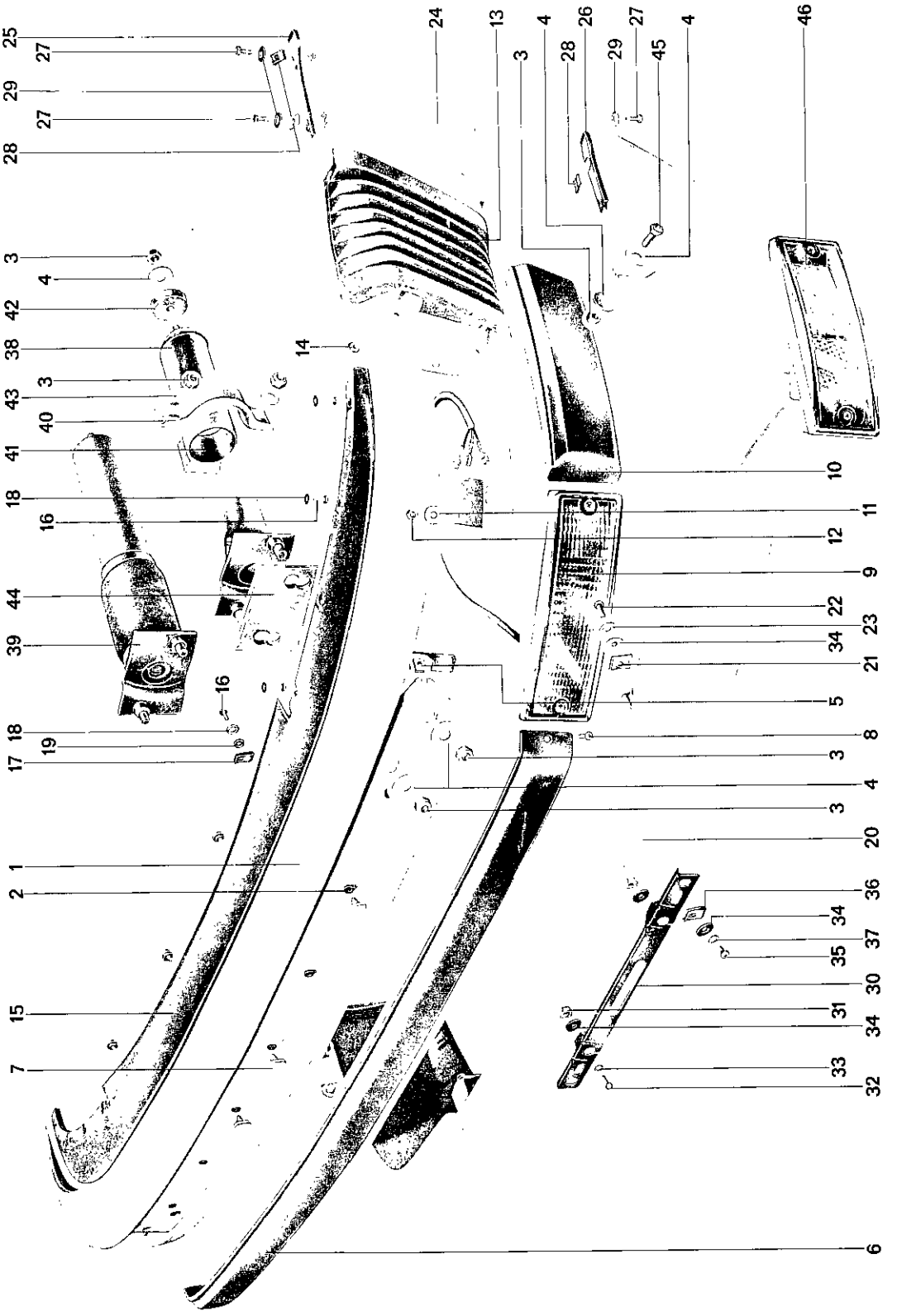
7. Attach bumper outer sections to support tubes and fender brackets.

8. Adjust distance between outer sections and center part by means of washers and tighten sheetmetal screws.

NOTE:
A tow hook can be installed on the right side only, in the direction of travel, by fastening it to the longitudinal member together with the bumper bracket. Allen bolts 8 x 35 mm, washers, and spring washers should be used for this purpose.



FRONT BUMPERS EFFECTIVE WITH 1974 MODELS

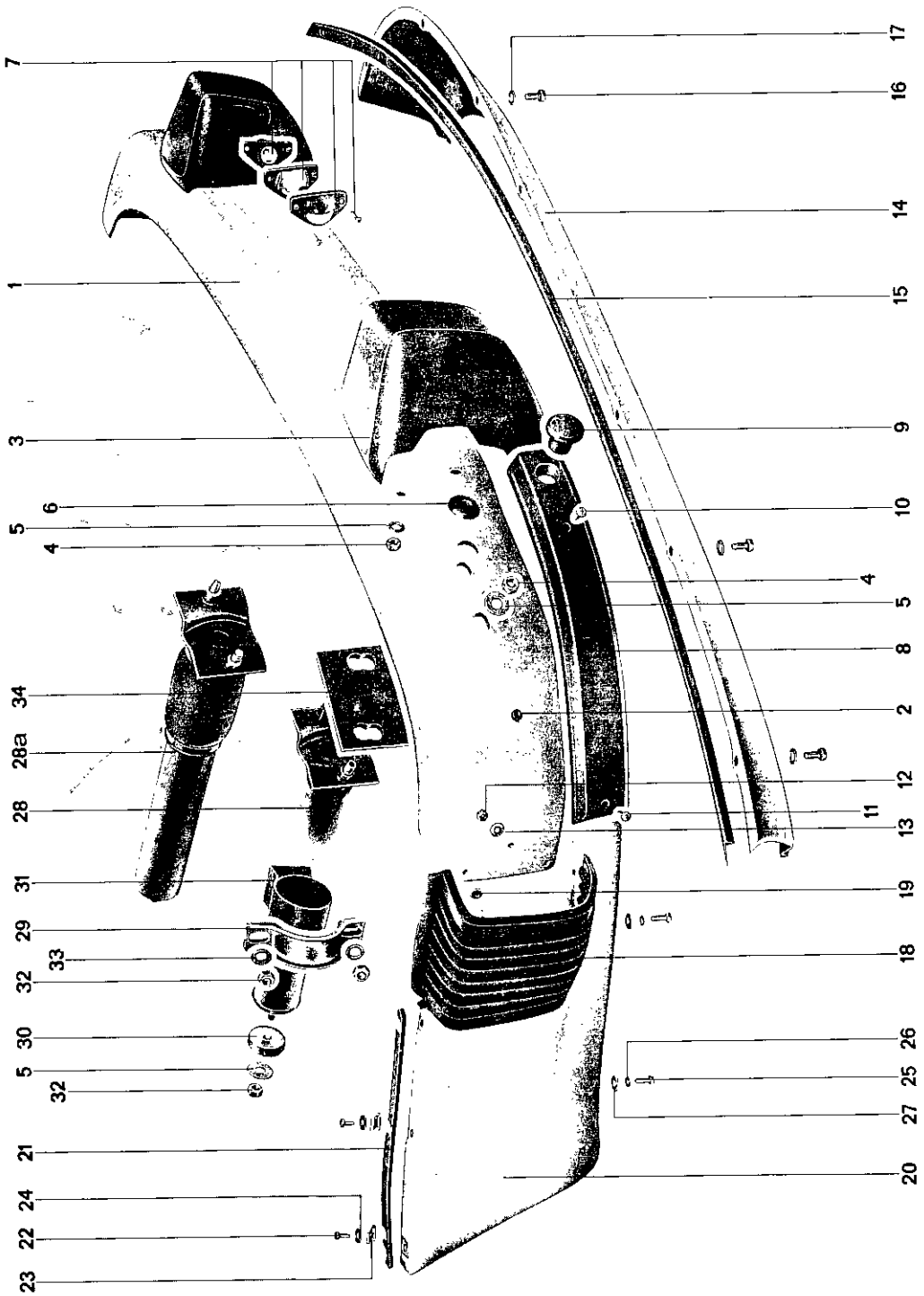


No.	Description	Qty	Note when: removing	installing	Remarks
1	Front bumper	1		Flanged studs of deformation tube must fit into cutouts. Sealing strip must fit alround.	
2	Grommet	7			
3	Nut, M 8	12		Use self-locking nuts.	
4	Washer	4			
5	Sheetmetal nuts, 4.2 mm	2			
6	Bumper strip	1	Detach side and pull off.	Press into grommets, bolt sides on.	
7	Bumper strip plugs	7		Replace if necessary	
8	Sheetmetal screws, 4.2	2		Replace if necessary	
9	Directional signal lamp	2	Remove bumper, take out through back	Check for equal spacing.	
10	Side cover	2		Check for equal spacing	
11	Washer	8			
12	Nut, M 5	8		Use self-locking nuts	
13	Boot	2	Remove self-tapping nuts from skirt	Attach to bumper	
14	Self-tapping nuts	8			
15	Sealing strip	1		Fit well along the fender	
16	Sheetmetal screw	12			
17	Sheetmetal nut, 4.8 mm	12	Replace if necessary		
18	Washer	12			
19	Rubber washer	4		Use in the area of the lock transverse panel	

No.	Description	Qty	Note when: removing	Note when: installing	Remarks
20	Front skirt	1		Preassemble side skirts.	
21	Sheetmetal nut, 6.3	2			
22	Sheetmetal screw, 6.3 x 19	2			
23	Gasket	2		Place against lock transverse panel	
24	Side skirt	2			
25	Insert, top	2		Install neatly	
26	Insert, bottom	2		Install neatly	
27	Sheetmetal screw 4.8 x 13	8			
28	Clip nut	8		Replace if necessary	
29	Washer	8			
30	License plate bracket	1			
31	Sheetmetal nut	2			
32	Sheetmetal screw, 5.5 x 16	2			
33	Washer	2			
34	Rubber washer	4		Place between skirt and bracket	
35	Bolt, 5 x 10	2			
36	Cage nut	2		Replace if necessary. Space according to holes in license plate	
37	Washer	2			
38	Deformation tube	2		Check, replace if necessary. Align bumper, then attach. Remove water reservoir	

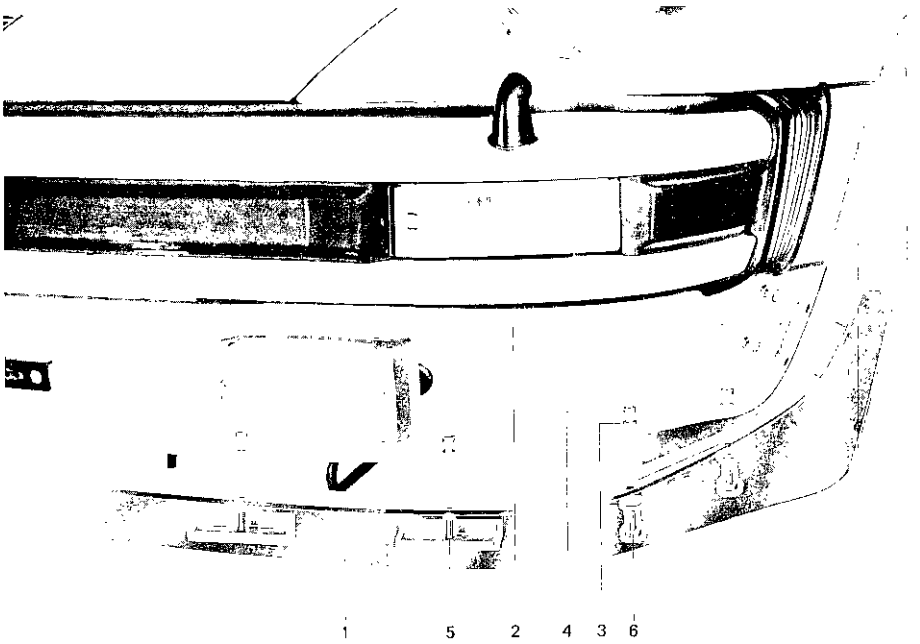
No.	Description	Qty	Note when: removing	Note when: installing	Remarks
39	Hydraulic damper (optional)	2		Check, replace if necessary. Align bumper, then attach. Remove water reservoir	
40	Clamp	2			
41	Rubber buffer	2		Check, replace if necessary	
42	Insert with sleeve	2		Check, replace if necessary	
43	Washer	6			
44	Insert	2		Glue to deformation tube	
45	Bolt, M 8 x 16	2			
46	Side marker lamp	2			

REAR BUMPER EFFECTIVE WITH 1974 MODELS



No.	Description	Qty	Note when: removing	installing	Remarks
18	Boot	2	Detach from bumper on right, and from lower fender on left, press out	Attach boot to both lower fender parts	
19	Self-tapping nut	8			
20	Fender lower section	2		Fit against fender contour	
21	Insert	2		Replace damaged parts. Install neatly	
22	Sheetmetal screw 4.8 x 16	6			
23	Sheetmetal nut 4.8	6		Slip onto lower parts	
24	Washer	6			
25	Bolt, M 6 x 12	4		Attach fender lower parts to supporting tubes	
26	Lock washer	4			
27	Washer	4			
28	Deformation tube	2	Remove oil tank attachment at support tube, right side. Loosen 2 bolts in engine compartment	Check, replace if necessary. Align bumper and fasten accordingly	
28a	Hydraulic damper	2			
29	Clamp	2			
30	Rubbert insert	2		Replace if necessary. Install between deformation tube and console	
31	Rubber buffer	2		Replace if necessary	

No.	Description	Qty	Note when: removing	Note when: installing	Remarks
32	Nut, M 8	10		Use self-locking nuts	
33	Washer	10			
34	Insert for mounting plate	2		Glue to deformation tube	



No.	Description	Qty.	Notes Removal	Notes Installation	Remarks
1	Nose spoiler	1	Replace if necessary	Bolt flush on sides with apron	
2	Spacer	2		Match chamfer	
3	Washer	19			
4	Nut	15			
5	Insulator	7		Use at front	
6	Bolt 6 x 20	4	Replace if necessary	Use at outer holes	

REMOVING AND INSTALLING FRONT LID LOCK

Removal

1. Remove plastic cover from lock transverse panel (pull out metal clips from lower part).



2. Loosen screw in clamp piece, pull control wire out.

3. Remove lock attaching bolts and take lower part of lock off.

4. Remove upper part of lock.

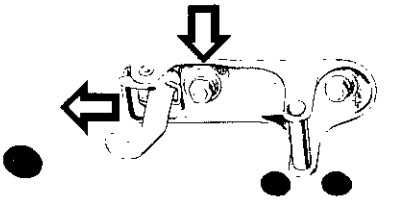


Installation



1. Lightly tighten upper part of lock to lid.

2. Lightly tighten lower part of lock. Insert control wire.



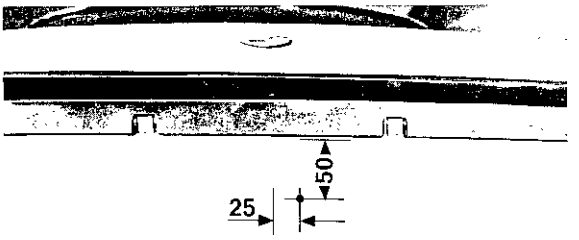
3. Adjust both lock parts to center position cross- and lengthwise, then tighten bolts. Tighten clamp piece securing screw and bend wire all the way back.

4. Close lid. Adjust height of lower part of lock. Adjust side stopper screws accordingly.

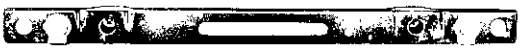
5. Install plastic cover.



Opening Lid Lock when Control Cable breaks



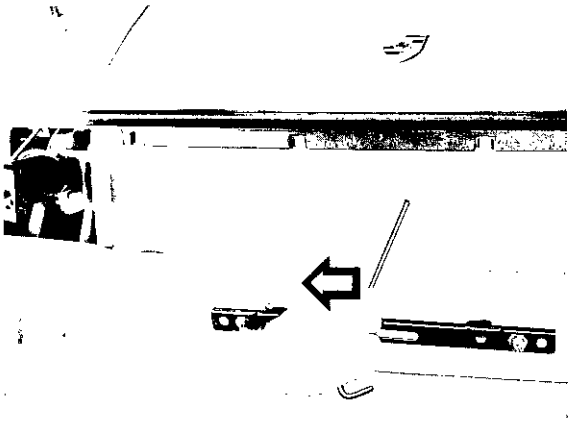
1. Remove front bumper (remove bumper strip, remove fasteners from rear part of boots and press the boots out; remove bumper fasteners from collision tubes).



2. Drill an 8 mm hole into the lock transverse panel (see illustration).



3. Make a tool from steel wire of 5 - 6 mm dia. and approx. 40 cm length.

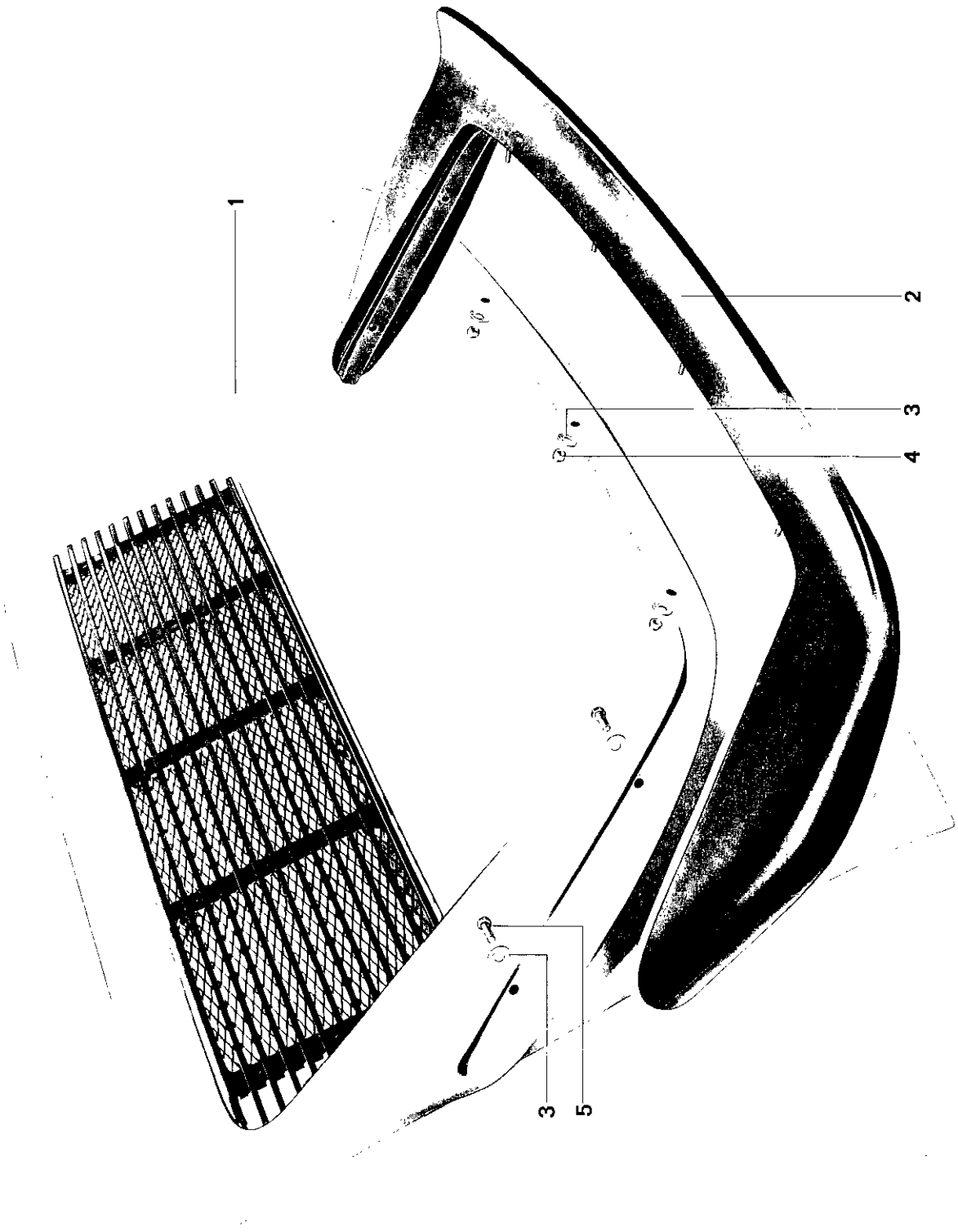


4. Insert the self-made tool upward through the hole and press the wire clamping piece to the right. Open the lid.

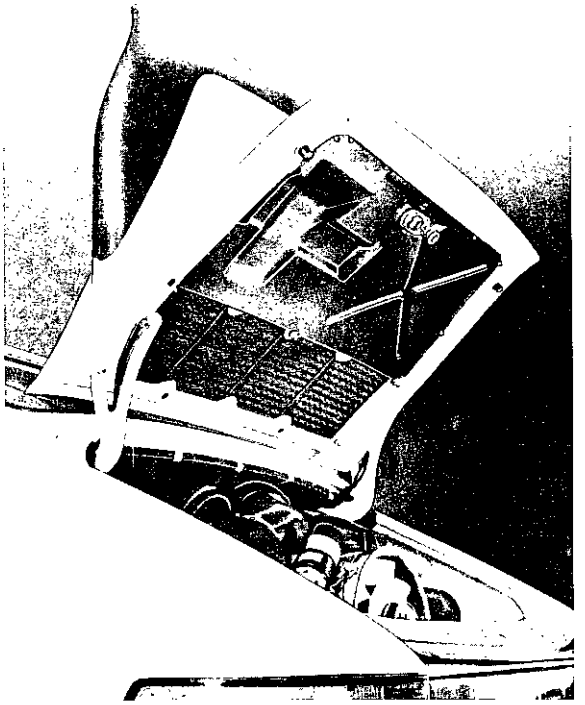
5. Install new control wire and check lock for proper operation.

6. Close hole with plug (999 703 044 50).

7. Install bumper.


1
2
3
4
3
5

No.	Description	Qty.	Notes Removal	Installation	Remarks
1	Rear lid	1		Even gaps all around. Adjust height with washers at hinges	
2	Spoiler	1	Loosen guard	Align. Secure with studs and lock nuts	
3	Washer 5.3 mm diameter	8			
4	Lock nut	4		Install with washer	
5	Hex. head metal screw 4.8 x 16	4		Install with washer	
	Guard	1	Remove metal screws, loosen at air inlet grill		
	Oval head metal screw 2.9 x 9.5	9			
	Gas lift cylinder Lift-O-Mat Part No. 911 512 331 07	1		Gas lift cylinder must hold lid open, replace if necessary	



Removing

1. Detach lid at hinges.
2. Loosen lower air inlet grill screws.
3. Loosen all metal screws of guard. Bend open guard, or loosen upper lid lock section and remove guard.
4. Remove outer spoiler metal screws as well as the 4 lock nuts and remove spoiler

Installing

After assembling, bolt lid and ground wires to hinges. Align lid.

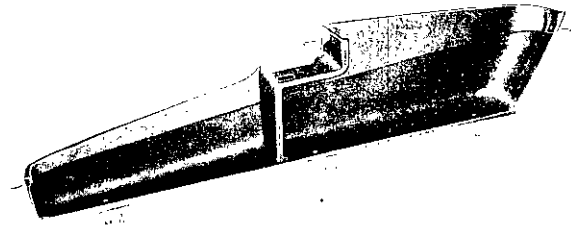
REMOVING AND INSTALLING DOOR PANEL EFFECTIVE WITH 1974 MODELS

General

Beginning with 1974 models, the doors have new type of door panel, door storage compartment, hand grip, and inside door release.

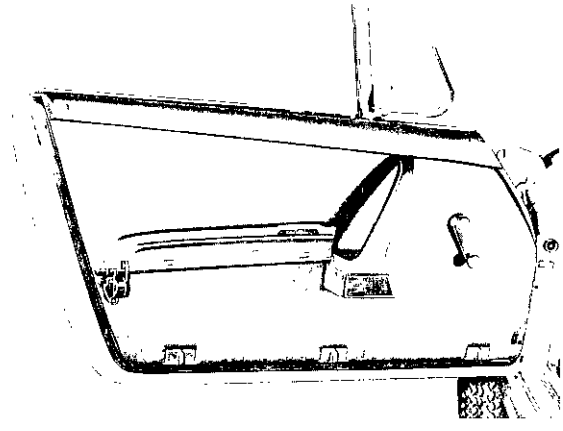
Removal

1. Remove sheetmetal screws from below the storage compartment, both end flanks, and in front below the cover. Remove the storage compartment.



2. Remove door ledge cover (unscrew door lock button and sheetmetal screws at both ends).

3. Detach rear of storage compartment cover and remove.



4. Detach connecting rod at the handle, unscrew fasteners from handgrip top and bottom.

5. Remove window crank.

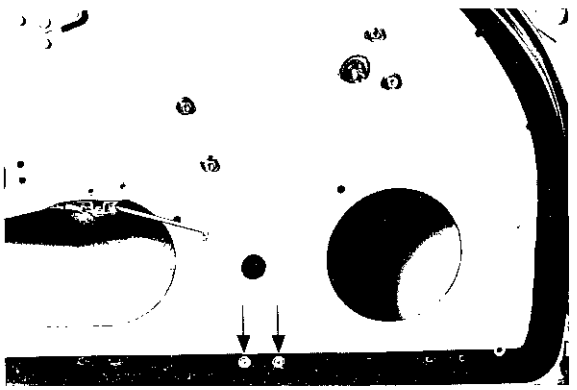
6. Remove supporting brackets.

7. Unhook door panel.

8. Remove control lever from door inner panel and disconnect spring.

NOTE

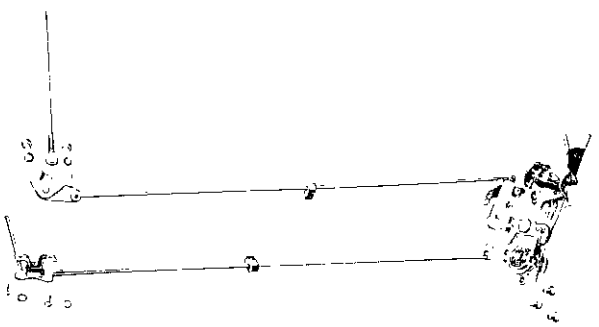
Removal and installation of the remaining door parts is described in volume II of the workshop manual.



Installation

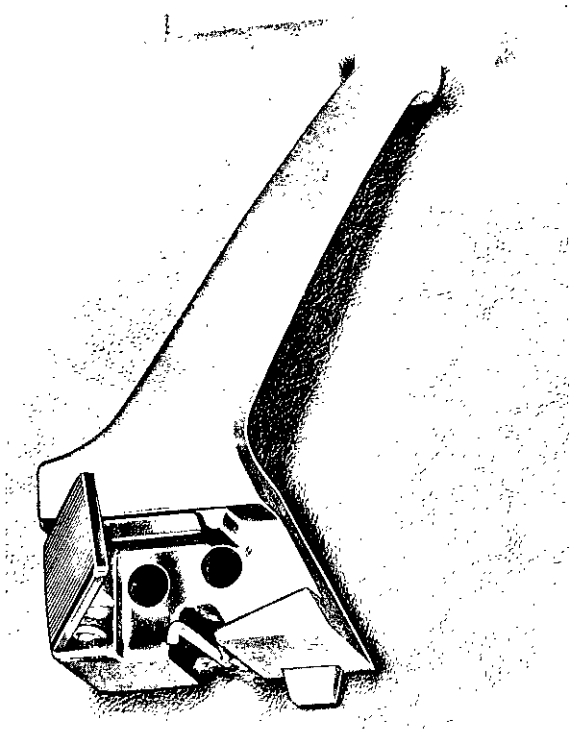
1. Attach threaded plate (see arrow) with countersunk screw.

2. Install control lever with connecting rod, hook spring to door inner panel.



3. Tightly glue weatherfoil to door inner panel.

4. Hang door panel on door.



5. Install supporting brackets according to the location of holes in the storage compartment.

6. Install hand grip and connect connecting rod.

7. Install folding cover and storage compartment.

8. Install window crank and door ledge cover.

REMOVING AND INSTALLING DOOR STOP

Beginning with 1974 models, all Type 911 vehicles are equipped with a modified door stop. The door stop link is attached to the door hinge post with a rollpin.

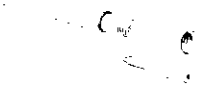
The new door stops can be installed in all vehicles, from 1970 model on, which have the hinge post attachment as shown in the illustration.

Special tools: P 290 and P 290a



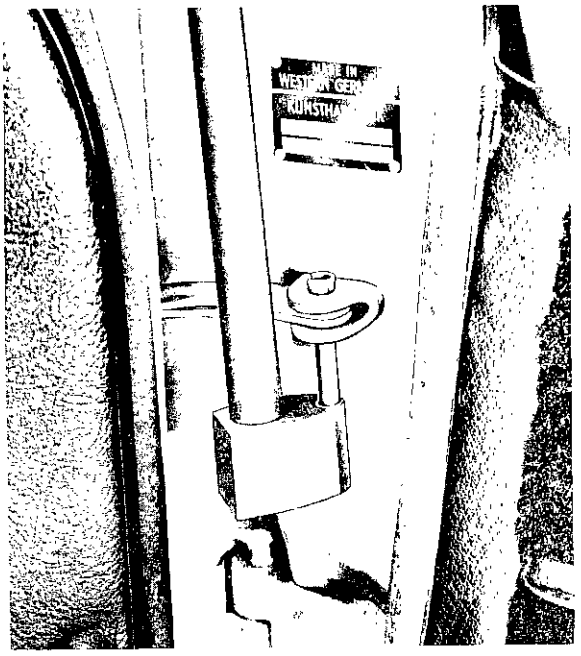
Removal

1. Detach window ledge rail, door pocket, door inner panel, and sealing foil as far as necessary.



2. Drive rollpin out with P 290 and P 290a.

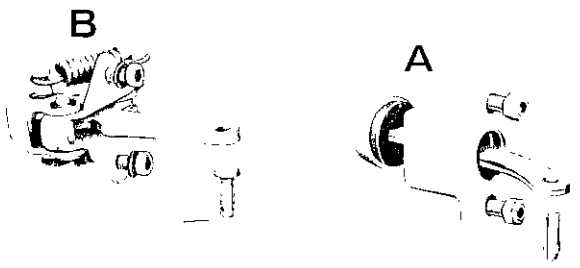
3. Unscrew door stop from door frame and take out.



Installation

1. Insert door stop and secure with self-locking nuts.

2. The rollpin must be so installed, that the slit faces outside when the door is open. Drive the pin fully in to the upper ridge.

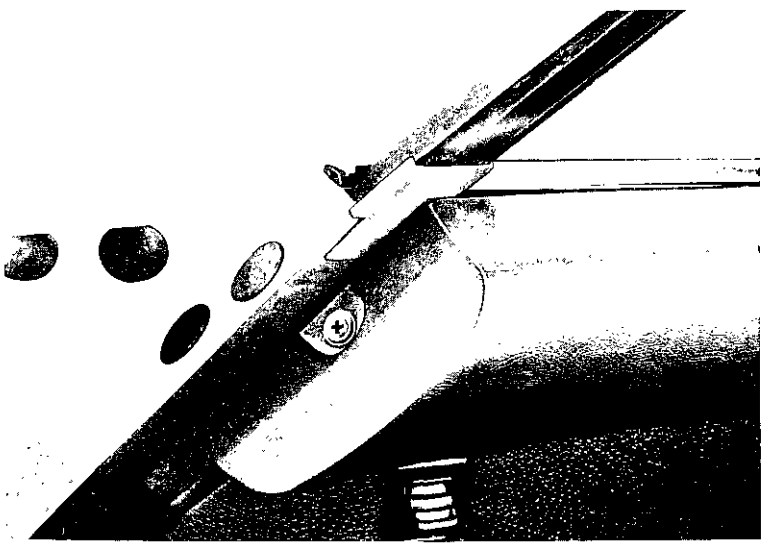


a = new version
b = old version

INSTALLING RIDGE FILLERS

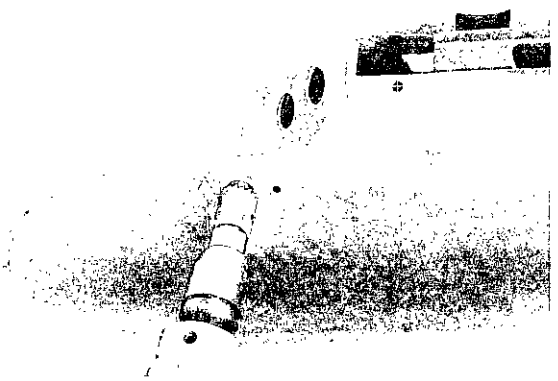
Beginning with 1974 models, all Coupe vehicles are furnished with rubber ridge fillers which are glued to the front and rear part of the window frame to reduce wind noise.

Make sure that the ridge fillers are glued into place with waterproof glue, such as the BOSTIK-CYANDIT 202.

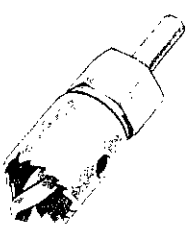


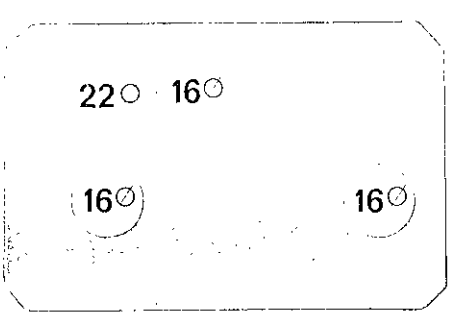
PREPARING DOOR SHELLS FOR REMOTE CONTROL OUTSIDE MIRROR

1. From the center of the hole for the first moulding clip, draw a vertical line 85 mm (3 1/2 in.) long down the door panel.



2. Hold reinforcement plate in position and mark holes as illustrated in picture. Then drill holes according to specifications.
CAUTION: The distance between the top edge of the large hole and the door mating edge must be at least 13 mm. The hole for the cables can be opened up with a standard hole saw, e.g. Black + Decker Type 21748 (see illustration).

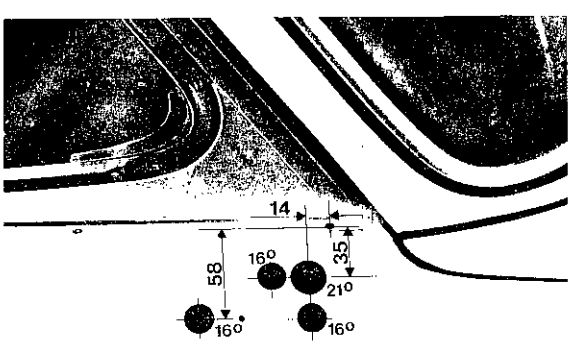




3. Drill another 5 mm dia. hole through the door panel and reinforcement plate (in front of the rear bottom hole). Secure the reinforcement plate with an appropriate pop rivet.

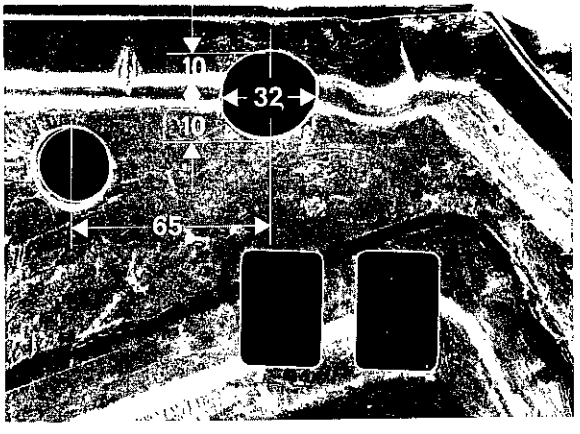


4. Install a cable clamp on the inside of the reinforcement plate (behind the top door hinge) so that the wires will not be damaged by the window regulator teeth.
Note: If the new mirror is installed on doors with old type mirrors, the front mounting hole must be plugged (welded).

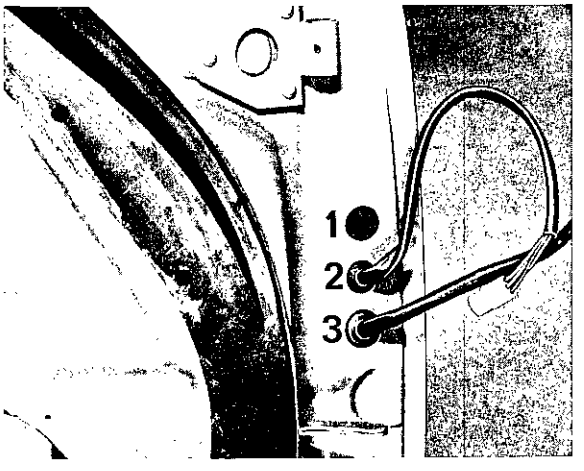


Hole pattern for passenger door mirror (installation instructions, see 10.3 - 1/4).

5. Cut opening (according to specifications) for operating switch in inner door panel, top.



6. If necessary for the harness opening, drill another 20 mm dia. hole below the present hole in the front inner door panel.



1 - For electric window winder.
2 - For outside mirror.
3 - For loudspeaker.

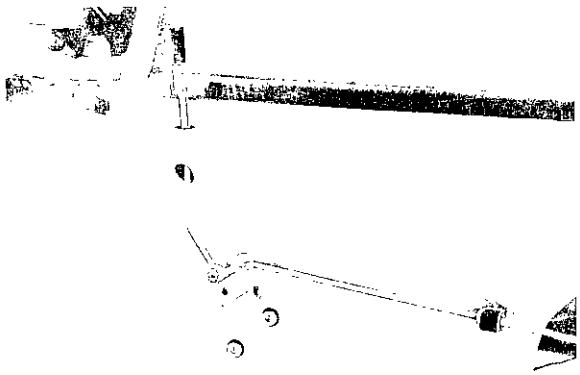
SERVICE INSTALLING NEW DOOR LOCK CONTROLS

All 1977 models will have doors with an improved, anti-theft lock control. The lock button lowers into the trim strip completely when the door is locked. Unlocking from the inside is by turning the new rotary knob.

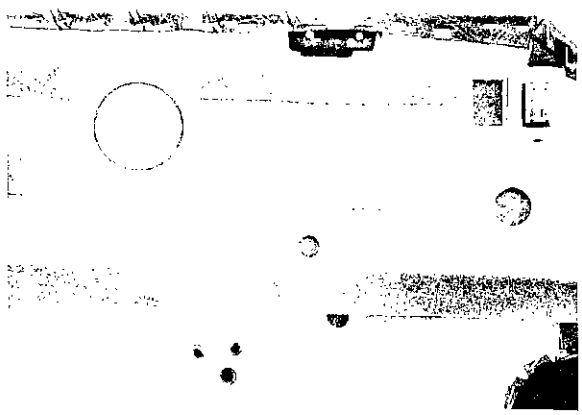
Installing

1. Remove trim strip and inside door panel.

2. Exchange lock button holder for new part with a square pin and insert the new lock button rod.



3. Transfer center point of square pin to door panel. Cut an opening of 65 mm diameter in pressboard panel with a sharp compass. Cut out door panel trim around the square pin.

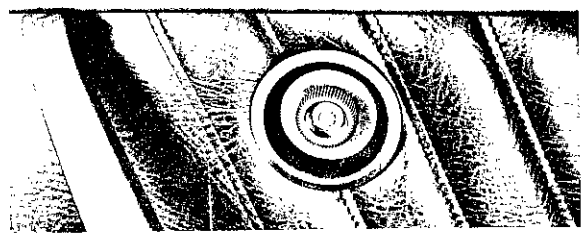


4. Open up hole in trim strip to 14.5 mm diameter for lock button and insert new guide sleeve.

5. Install inside door panel, lock button and trim strip.

6. Insert cover, mount rotary knob with fillister head cap screw M 5 x 12 mm and spring washer, and press on cap.





7. Check operation of door lock controls.

INSTALLING DOOR WINDOW LIFT CHANNEL

Assembling

1. Place door window on soft material and remove grease from lower edge.

2. Use new rubber insert, Part No. 901 542 491 21, and fit it on window glass to match lift channel.

Note

Clean rubber insert with acetone before installing. If wax coating is not cleaned off, window glass could disengage from lift channel.

3. Press in window lift channel.

Note

The window lift channel of a coupe must be installed so that the channel begins 88 mm behind edge of glass.



Coupe - window glass

The window lift channel of a Targa must be installed so that the glass fits fully in the plastic guide.

Window lift channels must be pressed in all the way over their entire length. Light taps applied to the channels while pressing the glass in will facilitate installation.

4. Place window in door and coat sliding surfaces of window regulator with a multi-purpose grease.



Targa - window glass

REMOVING AND INSTALLING ELECTRIC WINDOW REGULATORS

General

Beginning with the April 26, 1972 production, new electric motors with an integral transmission, as well as modified toggle switches with mounting frames are used. Electrical connections are made according to a new wiring diagram. Electric window regulators can be installed in Coupe models only.

The new regulators were first installed in the following vehicles:

911 T	911 210 2072
911 E	911 220 0809
911 S	911 230 1391

Removing

1. Remove window ledge rail and lock button.

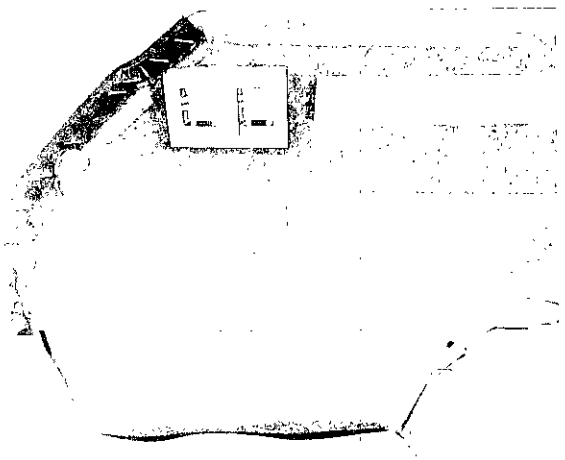
2. Remove toggle switches. If possible, first position window glass about 10 cm (4") above its lowest position.

3. Remove entire door panel and sealing foil.

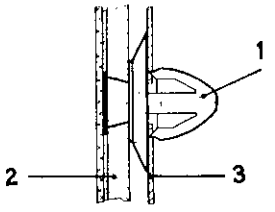
4. Remove outer chrome strip at window base.

5. Remove all window frame fasteners. Pull the frame out.

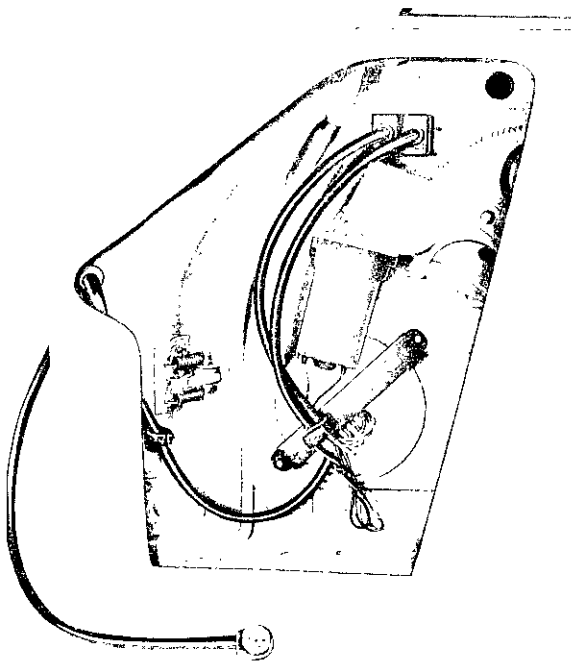
6. Push window glass forward and detach from the regulator. Remove upper door well weather seal and take the glass out.



Rear side of door panel with weather seals and self-sealing mounting clips.



1 Clip
2 Door panel
3 Door inner sheetmetal panel



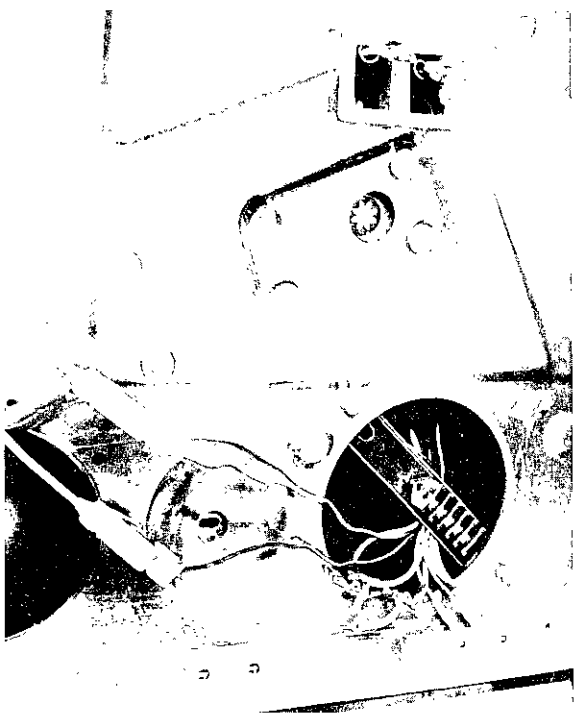
New motor and transmission with cable layout.

7. Take wires out of retainers, disconnect them from junction bar, and pull wire looms out together with caps. If the wire loom leading from the door into the car' s interior is to be removed, it will be necessary to take the door off.

8. Unscrew window regulator and remove.

9. Remove stop wedge from door base.

Installing



1. Insert wire grommet in forward part of inner sheetmetal panel of door. Lead the connecting wires into the car' s interior. Install door.

2. Insert window regulator and fasten. Install stop wedge.

3. Run the regulator with a battery or battery charger to bring window to about 10 cm (4") above its lowest position by connecting the positive wire to green and negative wire to black wires in motor. If the regulator moves up, switch the wires to make if move down.

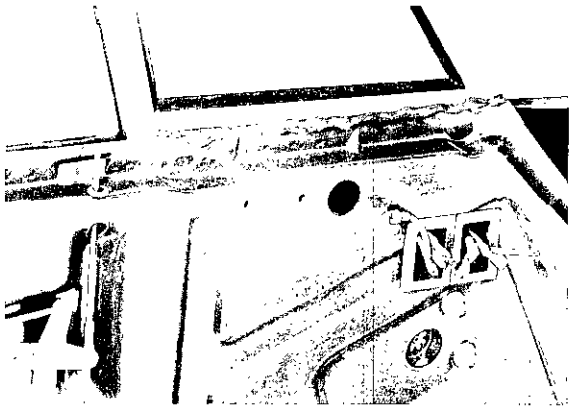
4. Install carrier plate with junction bar.

5. Insert toggle switches, cover caps, and wire looms. Connect all wires according to the new supplemental wiring diagram in Group 9, page 0.1 - 2/11. Fasten the wire looms to carrier plate and inner sheetmetal panel.



6. Install door well weather seal. Place window glass in door well and attach to the regulator.

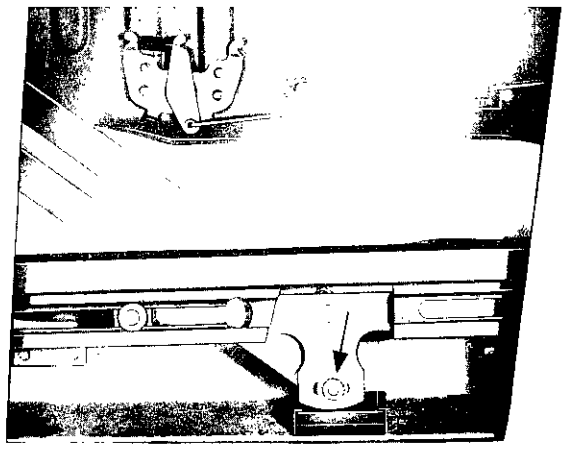
7. Insert door window frame in door and seal along the outside and inside flanks of top door edge with black, non-hardening putty. Fasten the frame in such position that sufficient pressure will be exerted against the door weatherstrip.

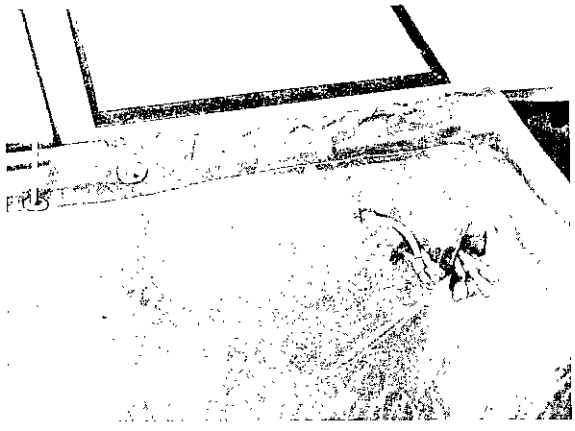


Note

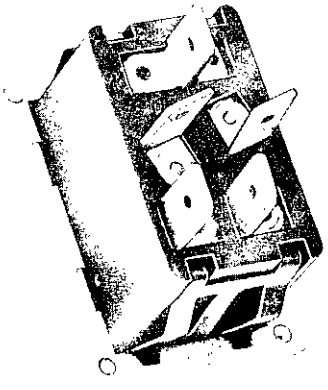
Do not bend the window frame to fit.

8. Check window regulator for proper operation and free movement. If necessary, readjust regulator with adjusting screws so that the top edge of the window is parallel with the top part of the window frame.

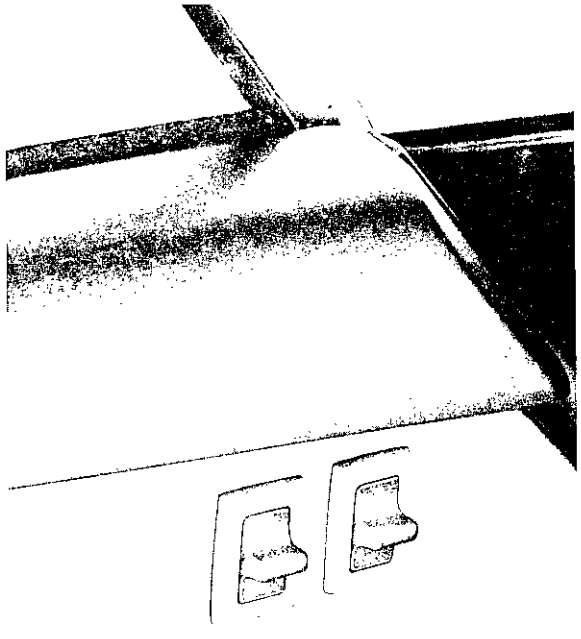




9. Glue the sealing foil in leak-free. Cut out a section in the toggle switch area.



10. Install door inner panel, armrest with inner door release, door pocket, folding compartment, door ledge rail, and outside window base chrome strip.



11. Connect toggle switches and install.

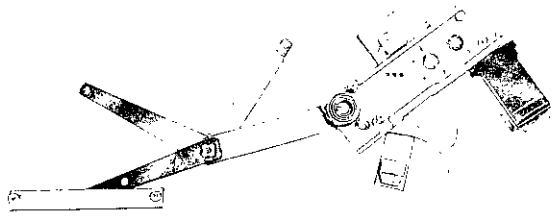
Note

When properly installed, all toggle switches are positioned with the single connector facing up.

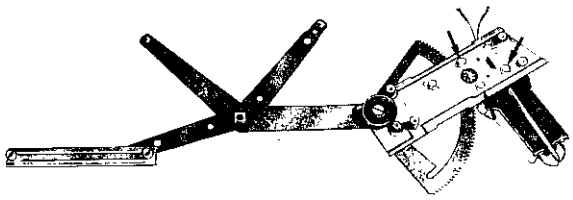
The rear toggle switch in driver' s door actuates the passenger side window.

ELECTRIC CROSS ARM WINDOW CONTROLS - from 1980 Model

Electric cross arm window controls are installed in all cars as of the 1980 model year. These new window controls have a different design for coupe and targa models. Targa window controls run slower and have tow adjustable height limit stop brackets at top. Coupe has one adjustable stop bracket.

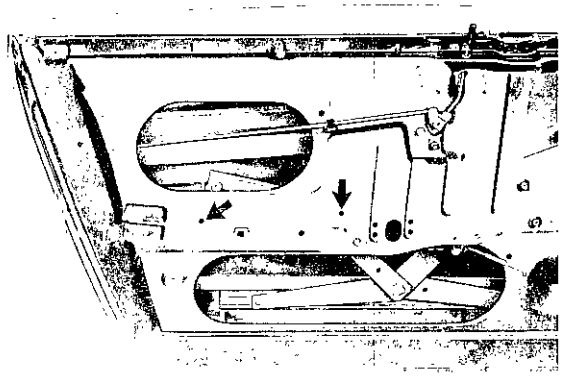


Targa Version



Coupe Version

These new window controls have an additional guide rail, which is bolted on the door inside panel (arrows).

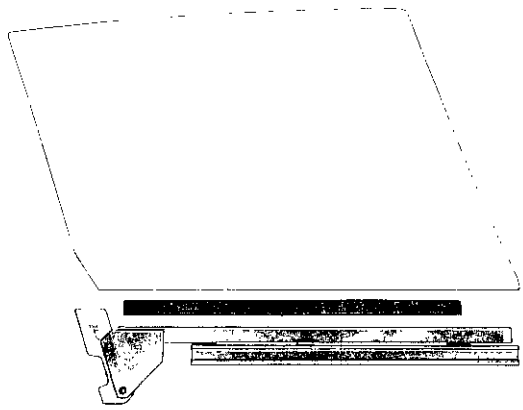


Coupe and Targa window controls use electric motors, of different power outputs and therefore cannot be interchanged. As of November 20, 1979 new light weight motors are used, whose power corresponds with the former versions.

Coupe motor, Part No. 911.624.014/015 01
formerly 00
Targa motor, Part No. 911.624.014/015 41
formerly 40

These motors are interchangeable with the former versions.

In conjunction with the new window controls, the door window glass has new one-piece window lift channels.



Targa window with new lift channel.

SERVICE INSTALLATION ELECTRIC CROSS ARM WINDOW CONTROLS

General Information

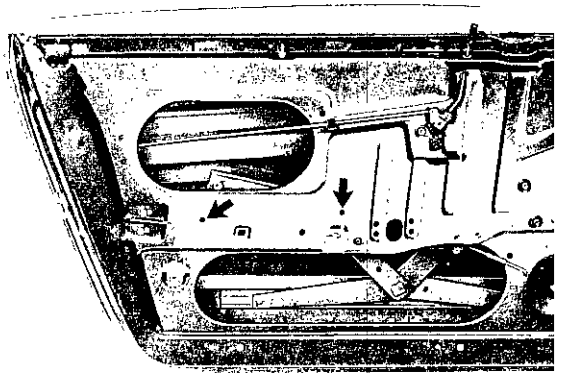
Electric cross arm window controls are installed in all cars as of the 1980 model year. These new window controls guarantee smoother door window operation and in future will replace all parallel arm window controls for Types 911 and 911 Turbo.

Later the Parts Catalog will be changed to include the mechanical cross arm window controls, which replace the mechanical parallel arm window controls after depletion of stocks and can be installed in all doors.

Service installation of these new cross arm window controls will require exchange of the lift channels on the door windows or use of new door windows.

Removing

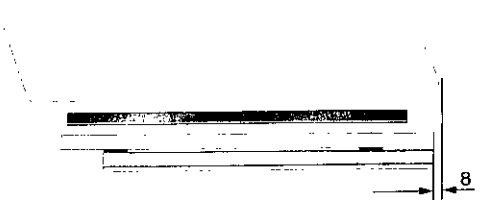
1. Remove inside door trim panel. Disconnect window control and mirror switch.
2. Pull off door window water shields.
3. Loosen and remove door window frame.
4. Disconnect parallel arm window control, detach door window at guide and remove.
5. Remove window control and electric motor.
6. Remove height adjusting screw on Targa doors.



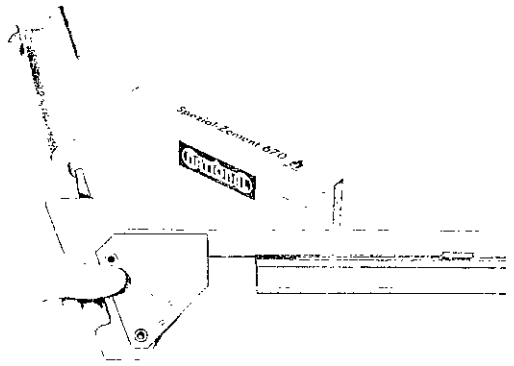
7. Loosen old lift channels from window by lightly tapping and then remove.

Installing

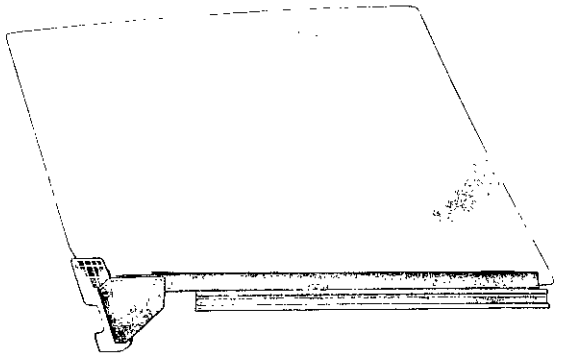
1. Position new lift channel with cleaned (wax-free) rubber insert on window glass and press on tight.
   The lift channel for Coupe door windows must be positioned 8 mm behind the front edge of the glass.



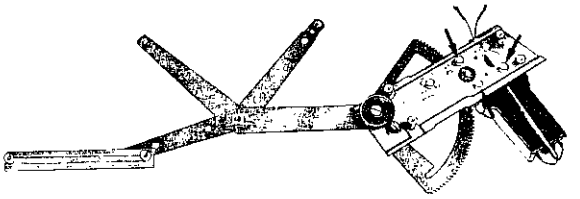
The plastic part of Targa window lift channels will have to be coated with rain molding cement, e.g. National Special Cement 670, at the groove.



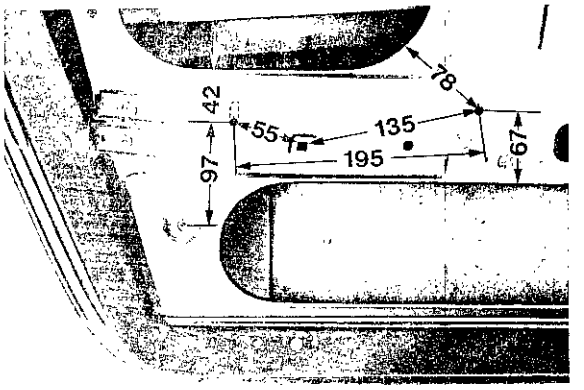
Then install window glass so that it rests firmly in guide groove and channel.



2. Mount electric motor on new cross arm window control (arrows). Guide wire harness between bolts so they will not interfere with moving parts.
   Set window control at center position for installation in door.



3. Find location for holes on inside door panel with a compass according to given dimensions and drill two 7.0 mm (9/32 in.) dia. holes.

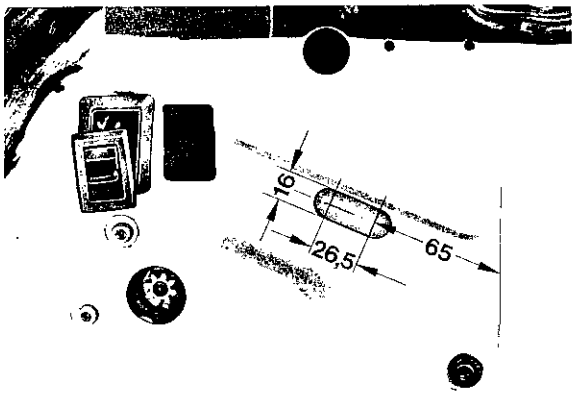


Note

If door window sags at rear when operated, the rear mounting hole (see broken line) must be extended upward.

Note

A slot must be made according to given dimensions in door inside panel of Targa models. The stop bracket for height control will be accessible through this opening.



4. Check window guides for wear and replace if velvet is partially worn. Glue at top when inserting in door window frame.

5. Insert window control and bolt base plate. Connect wire harness with switch.

6. Insert window glass and guide plastic rollers of window control into window lift channel. Mount short guide rail on inside door panel with M 6 x 10 bolts and washers. Lubricate moving parts with a multi-purpose grease.

7. Install and secure door window frame.

8. Check door window for easy movement. Close door and check entire periphery of glass and/or window frame for neat fit at door weatherstrip, correcting window frame adjustment if necessary.

9. Install door window water shields and inside door trim panel. Check operation of window control and mirror switch.

ADJUSTING DOOR WINDOW - TARGA

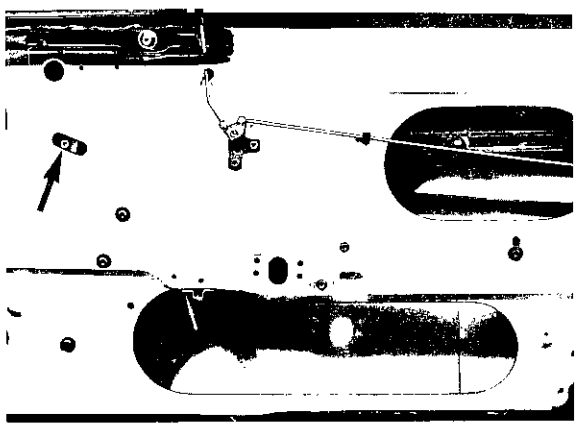
The methods of adjustment have been improved since introduction of electric cross-arm window regulators from 1980 models on. The Targa window regulators now have two adjustable stop brackets for height control. The adjusting screw has been omitted.

Before beginning with adjustments the door gap to the rear fender and installed position of the Targa top must be checked.

Adjusting procedures require that the hinge strip, door pocket with cover, grab handle, door inside trim panel and plastic sheet be removed.

Adjusting Door Window

- Height Adjustment (arrow)



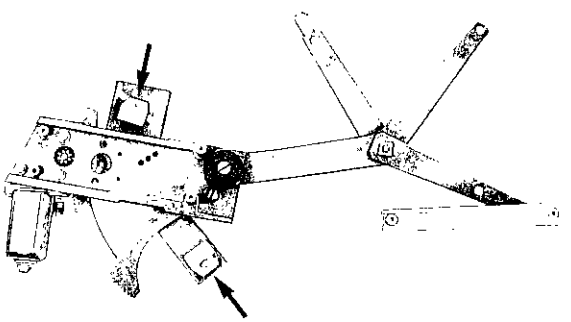
Note

Lower window until stop bracket is accessible through opening in door inside panel.

Adjust height so that window glass is aligned with roof seal and fits tight in profile seal along entire length.

- Inclination

Inclination of the door window glass can be regulated with the guide rail. If the door window glass sags excessively at the rear during movement, the rear bolt hole must be extended up.

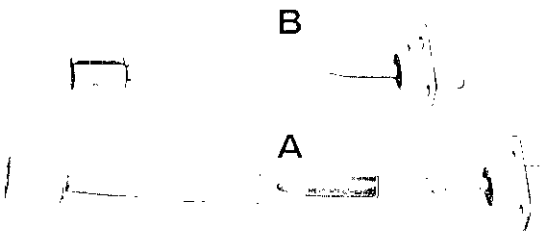


Targa version with stop bracket

MODIFICATIONS IN TARGA FOLDING ROOF 1974 MODELS

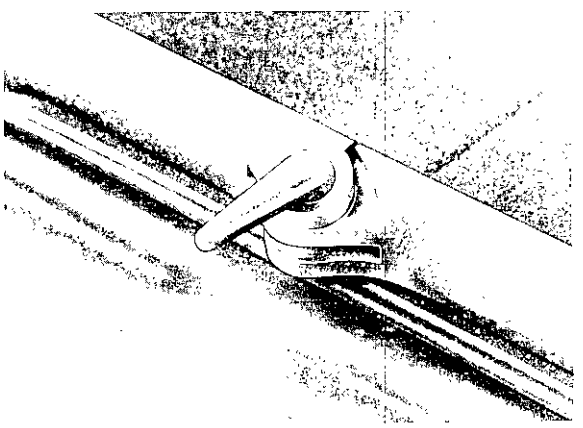
1. Beginning with 1974 models, new METALLASTIK supports are used in the rear part of the folding roof; the locating pins are covered with replaceable plastic sleeves.

A = new version
B = old version



2. Modified METALLASTIK mounts, with bigger and longer receptacles, are used in the rollbar to accomodate the larger locating pins.

3. An additional support pin is provided in the center joint of the rear roof frame. The pin rests in rubber and provides additional rigidity for the roof.



4. Modified weatherstripping is used along the windshield frame and the front part of the roll bar to improve sealing and tightness of the roof.

NOTE:

The new folding roof can be used only in vehicles which have the larger METALLASTIK sleeves in the roll bar.

SUBSEQUENT INSTALLATION OF LOCATING PIN FOR FOLDING ROOF

NOTE: Installation of the additional locating pin may be accomplished only in folding roofs which have the pressure-cast aluminum frame. The rear frame section is of the triangular configuration.

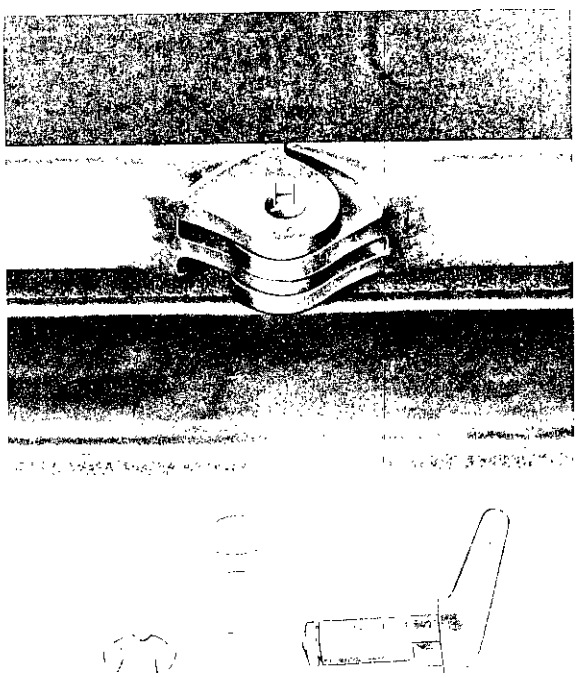
Removal

1. Remove and slacken roof.

2. Drive hinge pin out of the rear roof frame and take the frame out.

3. Remove window ledge rails from right and left side of rear compartment, detach and remove roll bar inner panel.

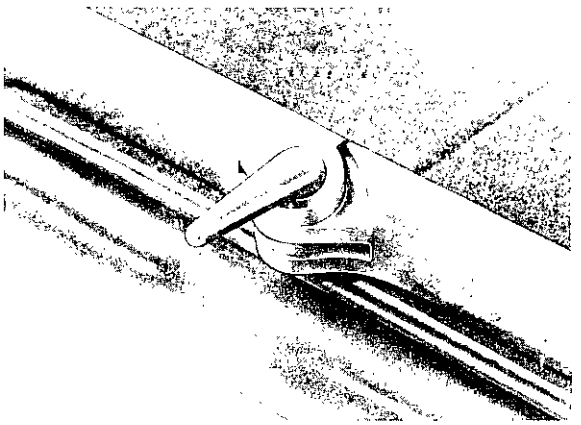
4. Pull off approx. 30 cm of weatherstrip from roll bar center. Loosen leatherette and upholstery padding.



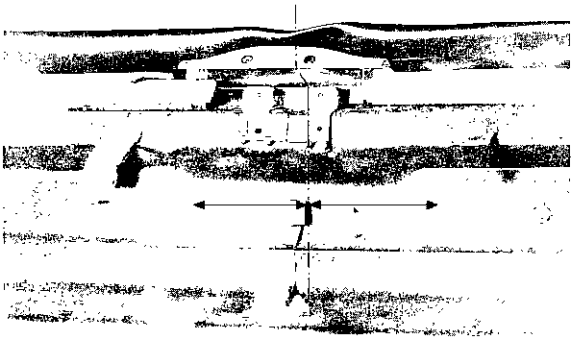
Installation

1. Replace right rear section of roof frame with one containing a slot (Part # 911 565 212 45).

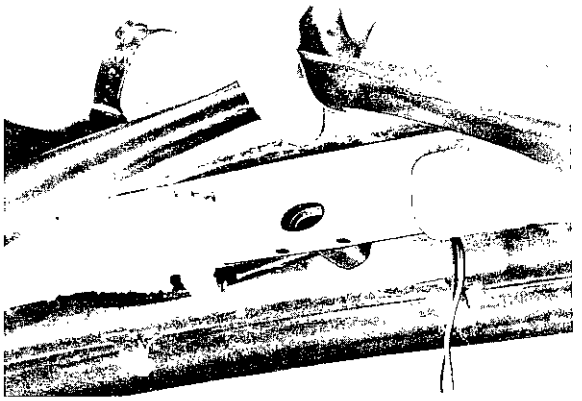
   NOTE:
   The right roof frame section need not be replaced providing that a slot is filed into the hinge pin hole so that the locating pin points exactly to the rear when the roof is locked tight.



2. Install locating pin, Part # 911 565 145 10.



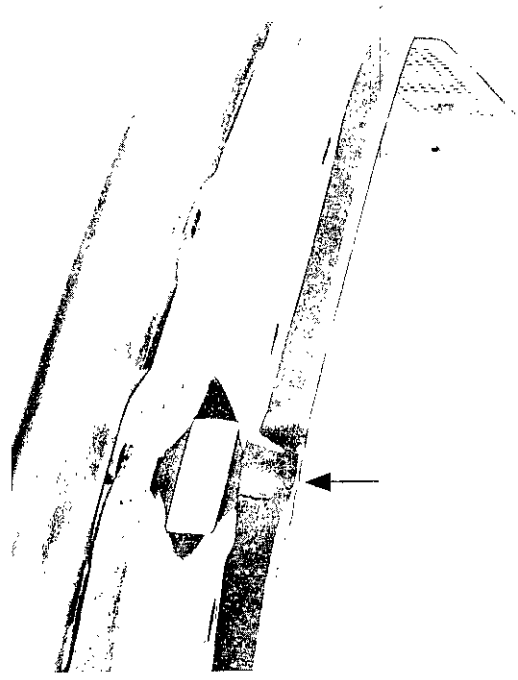
3. Measure and mark the center of the roll bar. Center the supporting plate and weld it in.



4. Align cover plate, Part # 911 565 133 40, with sheetmetal top edge and weld, or spot-weld. Shorten upholstery padding to fit the cover plate.

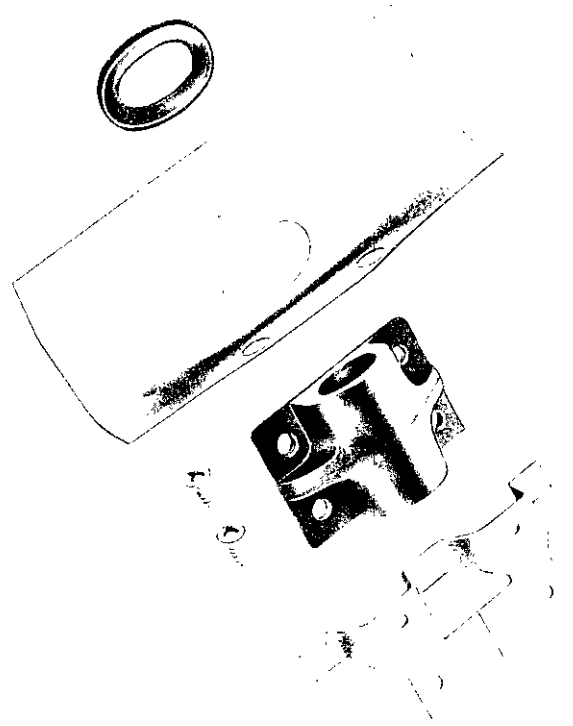
5. Prime sheetmetal parts with primer. Attach rubber mount, with large opening facing forward, to the supporting plate using sheet-metal screws.

6. Bend the inner panel front part to match the rubber mount.
   Glue the leatherette covering to the roll bar and cut the access hole out. Insert rubber grommet.



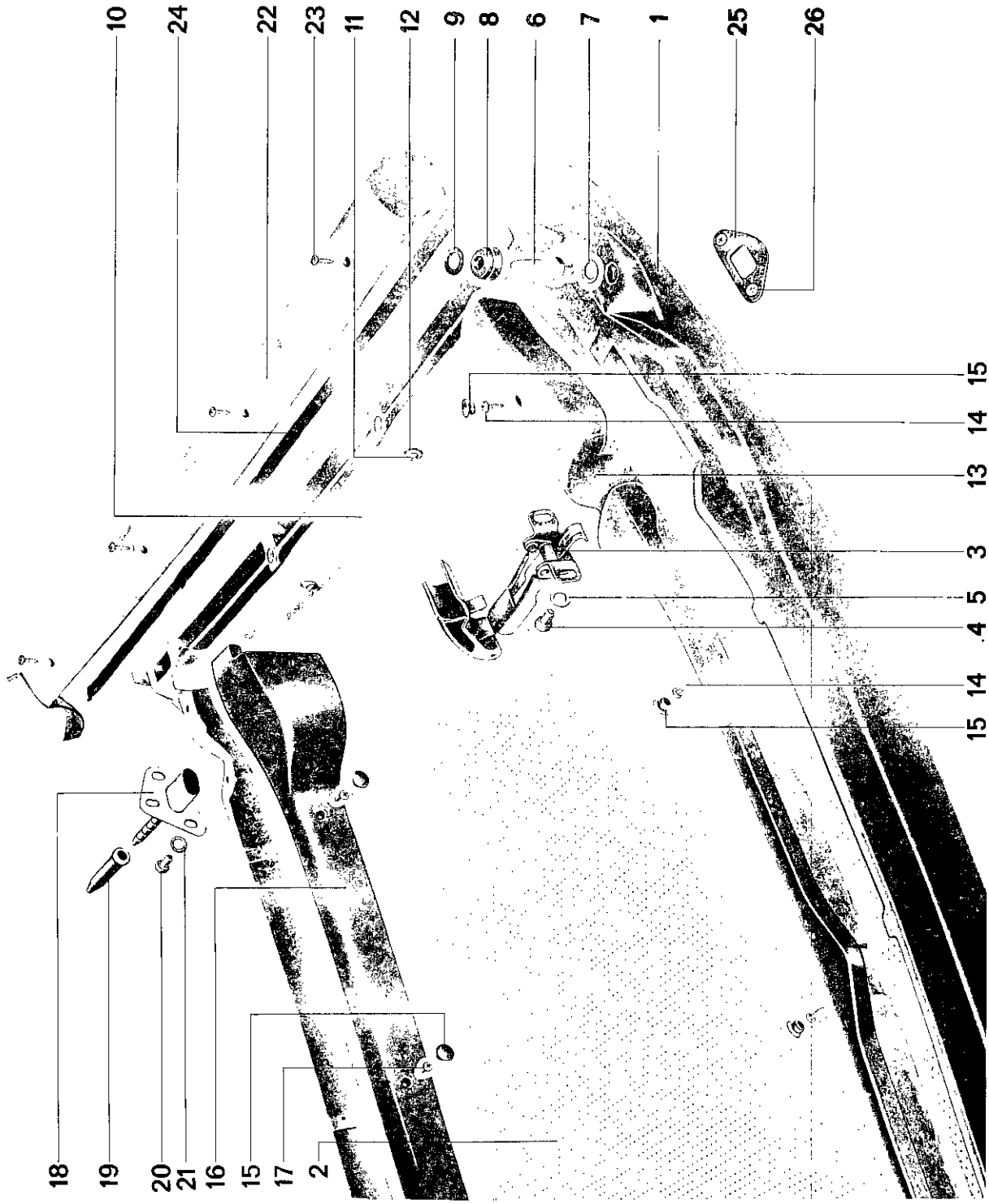
7. Install and fasten the roll bar inner panel.
   Glue the weatherstrip in.

8. Place roof in position and check alignment of locating pin.



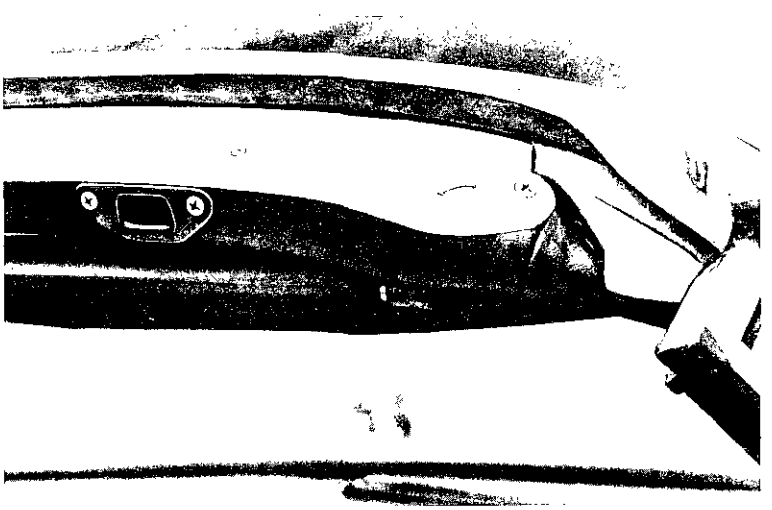
Required parts:

1 Supporting plate	911 565 133 40
1 Cover plate	911 565 135 40
1 Rubber mount	911 565 009 40
1 Rubber grommet	911 565 189 40
1 Locating pin	911 565 145 10
1 Roof rail section	911 565 212 45


10
24
22
23
11
12
9
8
6
7
1
25
26
15
14
13
3
5
4
14
15
18
19
20
21
16
15
17
2

No.	Description	Qty.	Notes		Remarks
			Removal	Installation	
1	Removable hardtop	1			
2	Headliner	1		Install with heat-resistant adhesive	
3	Lock	2	Check, replace if necessary	Adjust to tension of windshield	
4	Fillister head screw M 6 x 10	4			
5	Washer	4			
6	Locating pin	2	Check, replace if necessary		
7	Washer	2			
8	Stop pad	2	Check, replace if necessary		
9	Spacer	X		If required, install on stop pad to adjust height	
10	Roof edge guard	1	Loosen glued edge, remove metal screws	Glue properly to roof frame	
11	Oval head metal screw 3.5 x 13	4			
12	Washer	4			
13	Roof edge guard front	1	Replace if damaged		
14	Oval head metal screw 3.5 x 9.5	5			
15	Cap plug	9		Replace if necessary, plug openings in rear and front roof edge guards	
16	Roof edge guard rear	1			
17	Oval head metal screw 3.5 x 9.5	4			
18	Metal/plastic bearing, left + right	1	Check, replace if necessary	Adjust so that roof and roll bar upper edges match	
19	Cover	2	Check, replace if necessary		
20	Fillister head screw M 6 x 10	6			

No.	Description	Qty.	Notes Removal	Installation	Remarks
21	Washer	6			
22	Roof frame seal side, left and right	1	Loosen glued front and rear ends, remove metal screws	Glue end pieces properly, using foam rubber underneath if required. Adjust door window seal, then tighten. Treat rubber seal with, for example, glycerine etc.	
23	Oval head metal screw 3.5 x 9.5	8			
24	Sealing tape	1	Pull off	Glue on roof frame along complete length of seal	
25	Escutcheon, lock	2		Installed for hardtop roof only	
26	Oval head metal screw 3.5 x 9.5	4			



Removable hardtop escutcheon on windshield frame

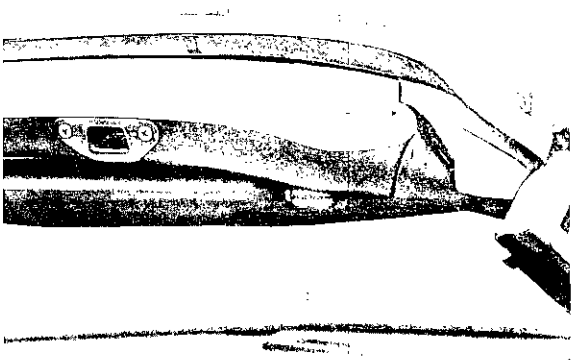
REPLACING FOLDING OR SOLID ROOF

Note

Targa models (from 1974) can be equipped with either a folding or solid roof. Two escutcheons have to be installed on the windshield frame for the roof locks on models delivered with folding roofs. Adjustments are the same for both folding and solid roofs.

Converting

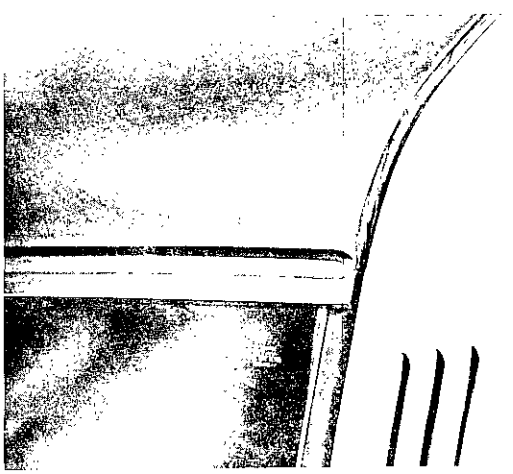
1. Remove folding or solid roof.



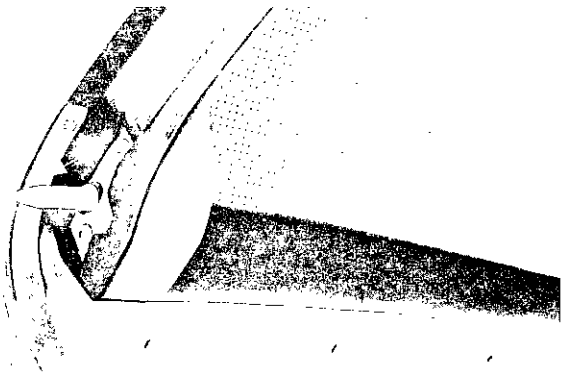
2. Cut out and paste leatherette on windshield frame for escutcheons.

3. Install escutcheons, Part No. 911 565 221 40, with rust-proof metal screws 3.5 x 13 mm.

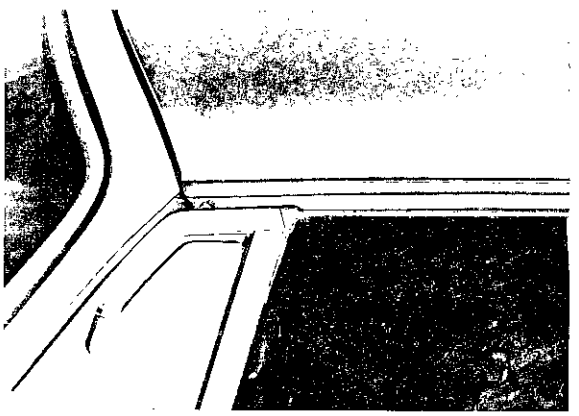
4. Install and lock roof. Place rubber washers on the locating pins to adjust height.



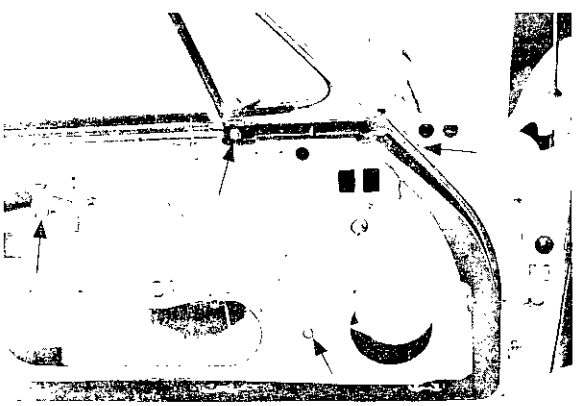
5. Check visually if all windshield and roll bar seals fit roof properly. If the seal lips are pressed together, the particular windshield or roll bar seal must be replaced.



Small leaks can be repaired by gluing pieces of rubber on the roof - especially at the curved sections.



6. Close doors and remove inner door trim if the window frames and door windows protrude or do not align with the side roof frames correctly. Loosen door window frame screws and adjust the door windows to align with roof.

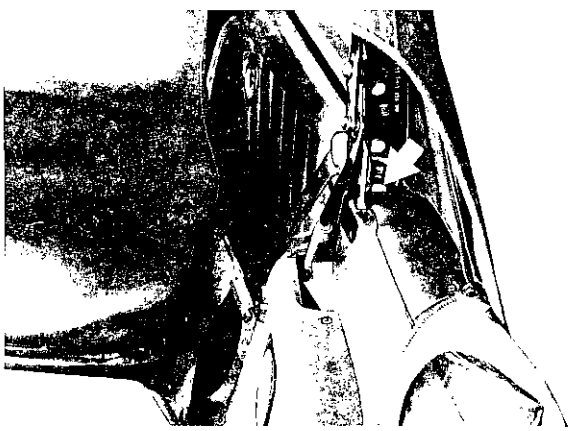


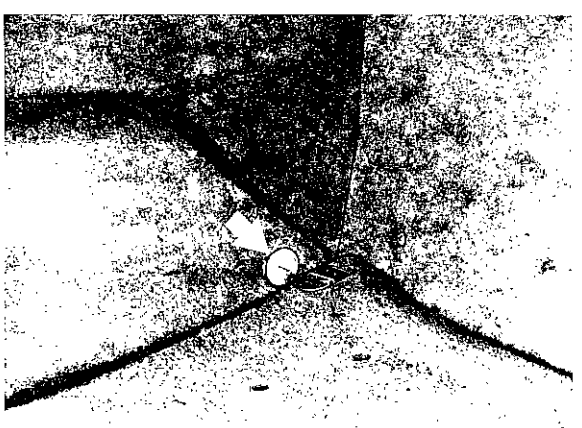
7. Check for leaks with a water test. If necessary, repair leaks with rubber or a non-hardening caulking compound.

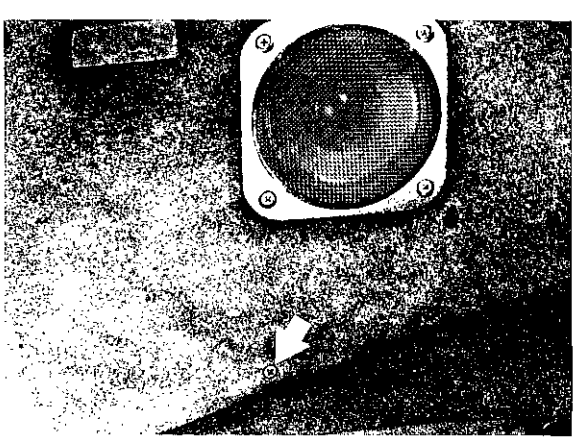
REMOVING AND INSTALLING CABRIOLET TOP (since 1983 models)

Removing

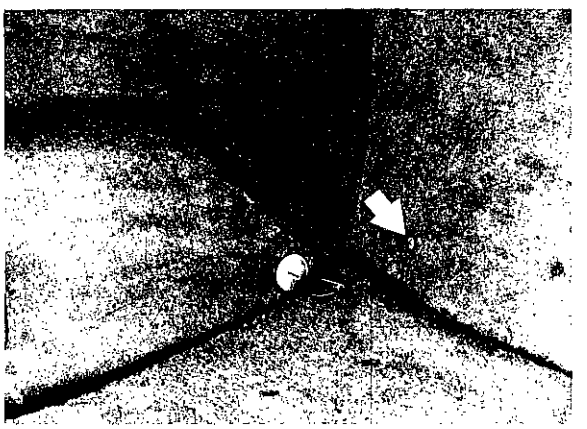
1. Remove mounting screws and push buttons on key boards and side trim panels.
   Pull off plugs on radio speakers and remove all parts.



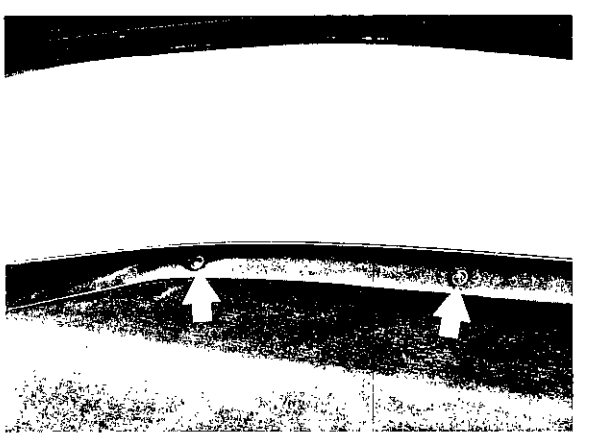




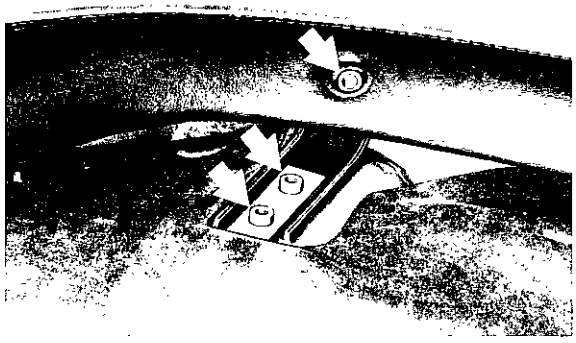
2. Remove screws on rear wall trim panel at bottom on left and right sides. Push up and pull out rear wall trim panel forward.



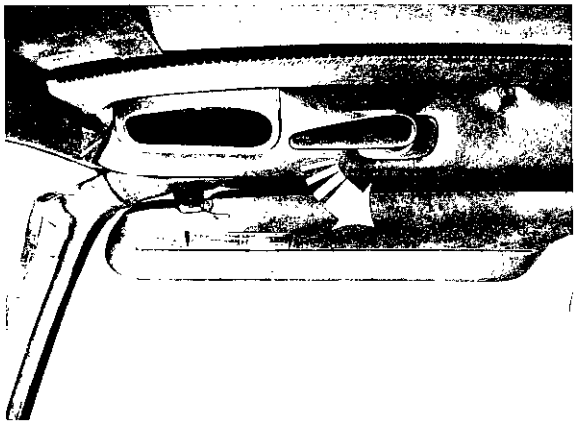
3. Remove caps on tensioning bar with a suitable tool.

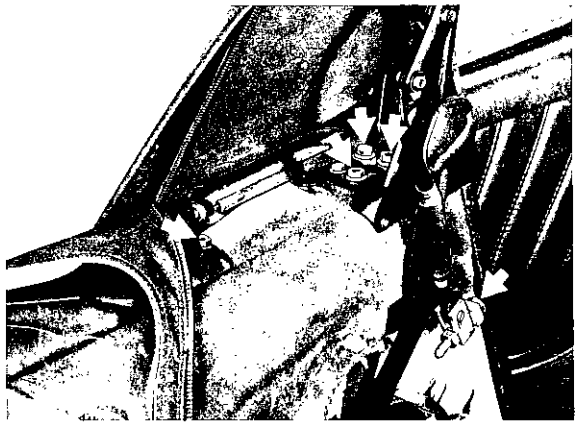


4. Remove mounting screws on tensioning bar and bracket.



5. Open top locks. Remove mounting nuts and screws on top mounts, guide arms tensioning bar. Lift top off of car.





Installing

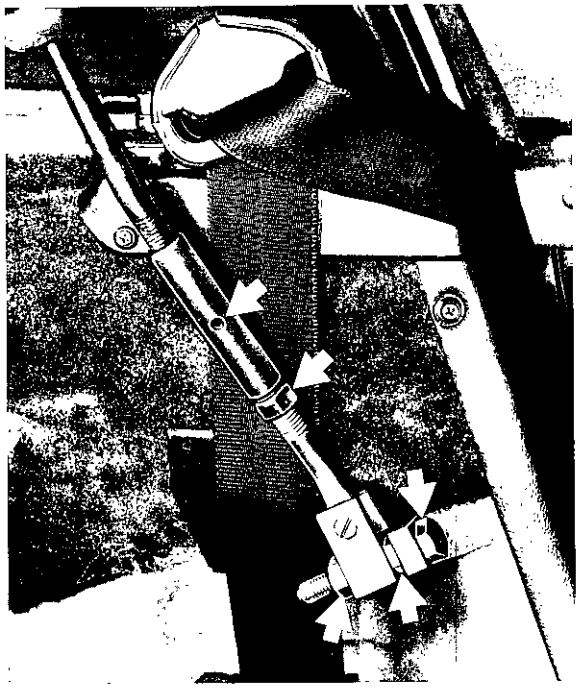
Installation is in reverse sequence.

Adjusting

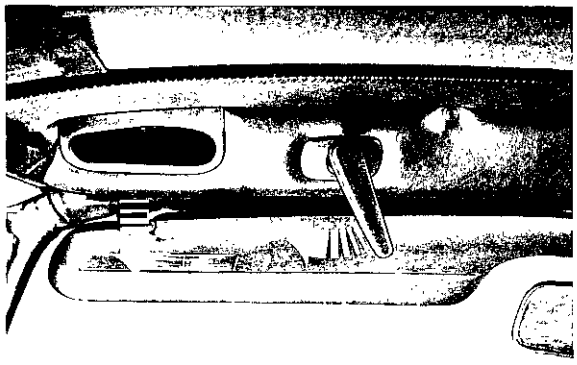
1. 1 and 2 mm thick shims (max. 4 mm) can be used underneath the top hinges for correction of height.

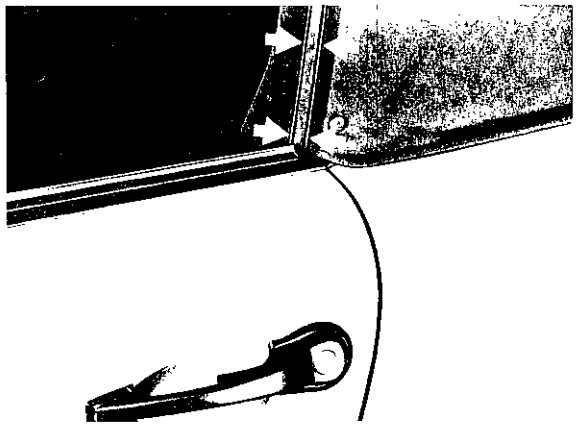


2. The forward motion can be corrected slightly on the supports of the operating levers, so that the guide pins and locking hooks on the windshield frame engage exactly.

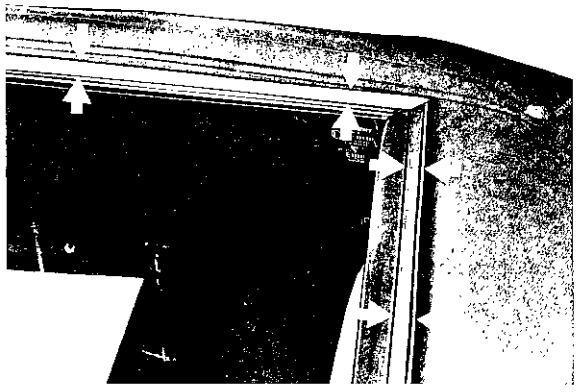


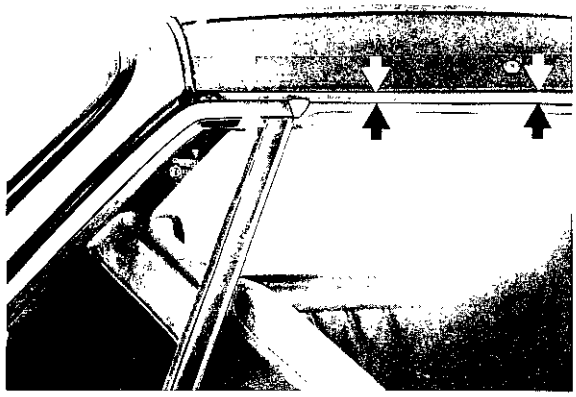
3. Close top, pull down on grip plate with one hand and lock lock simultaneously.
   Repeat this step on the other side.



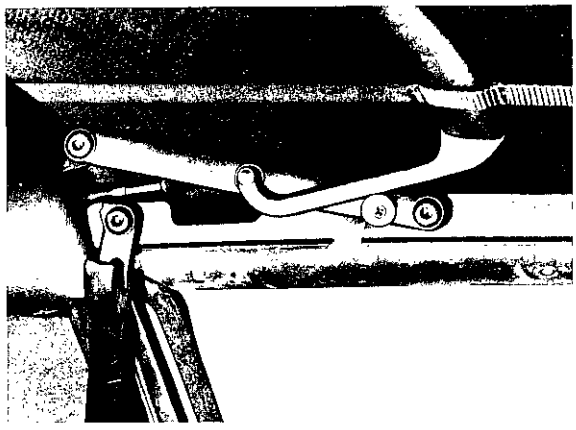


4. If the top is closed, make sure that there is equal distance from the top frame to the windows. If not, center door frames and windows to the top frame.

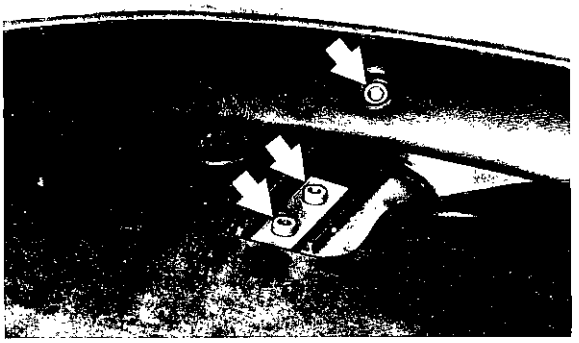


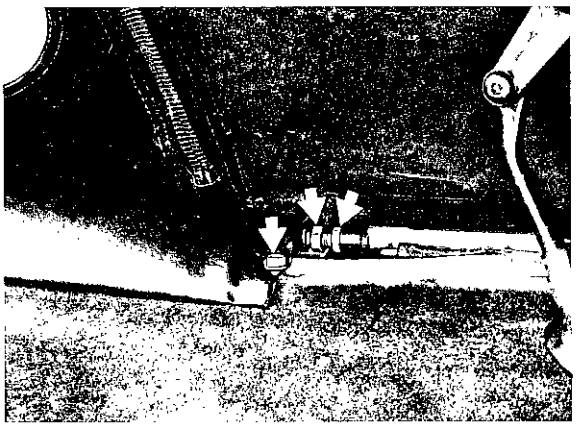


5. In order to have a smooth contour on the front top canvas cover between the front and rear hoops, the eccentric has to be adjusted accordingly.



6. To adjust the tension of the rear window, loosen the mounting screws and then adjust the rear window tension with the tensioning screws on left and right sides.

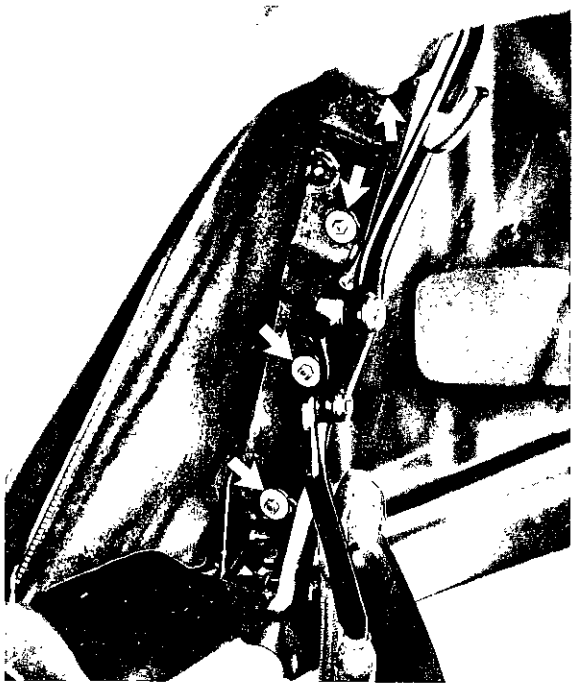


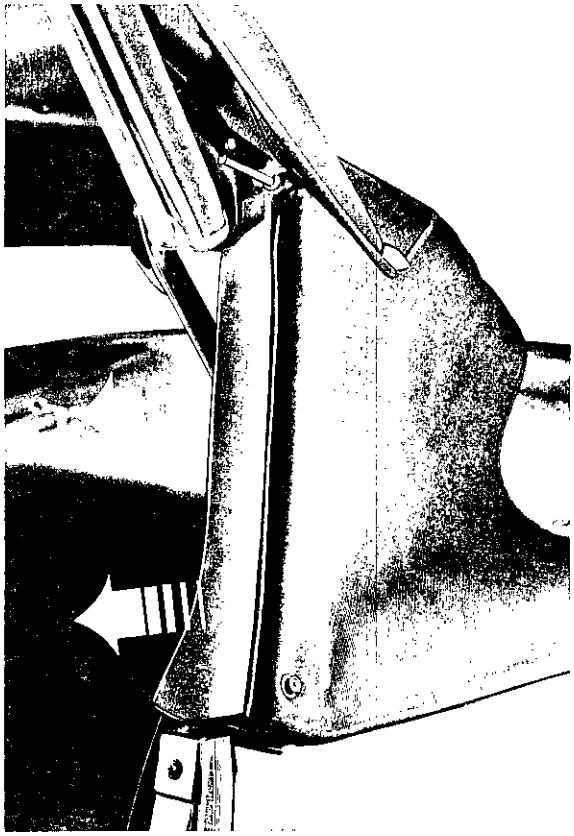


REMOVING AND INSTALLING TOP SEALS

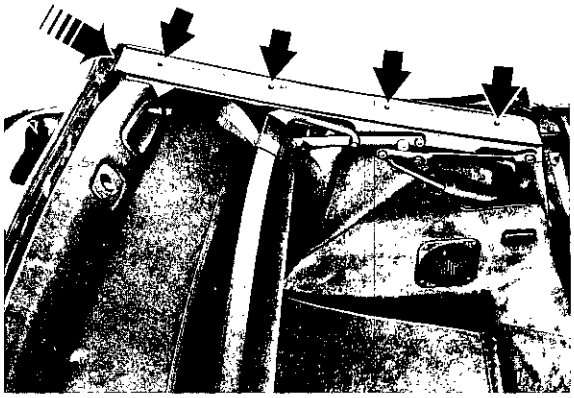
Removing

1. Open top locks and unzip the zipper. Remove nuts and washers on the B pillars and lift off seals with profile section rails and trim forward.

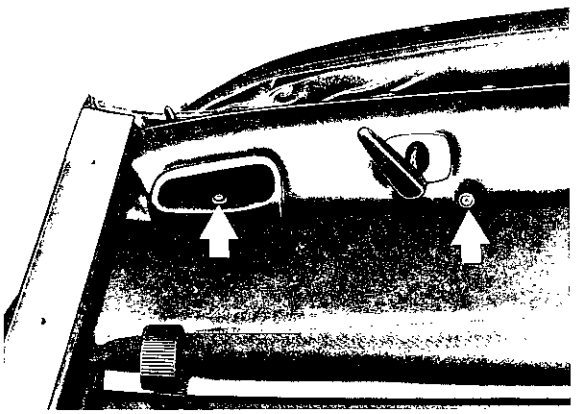




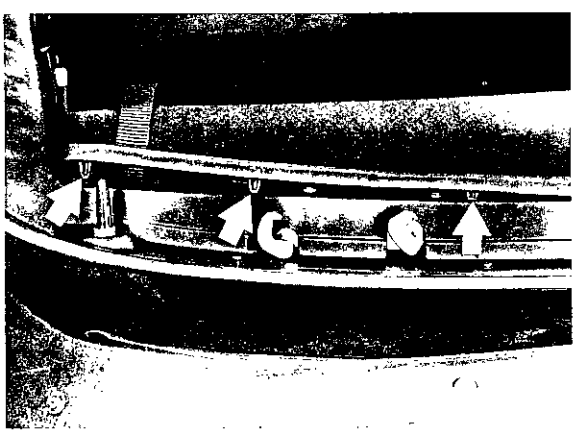
2. Lay back top, loosen screws of top frame seals, disconnect gluing on front hoop tips and take off seals.

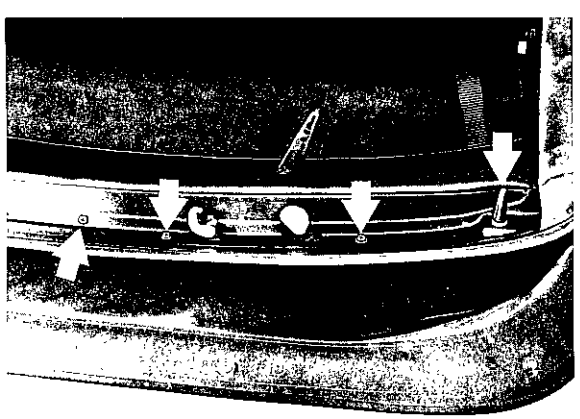


3. Remove rivets of grip plates and mounting screws of hoop trim.

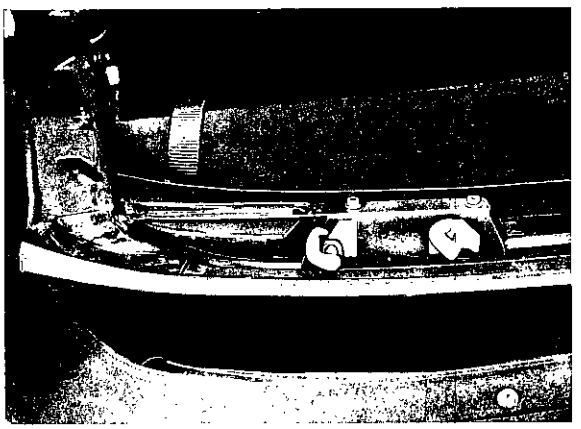


4. Remove grip plates, unclip hoop trim and unscrew locating pins and screws.



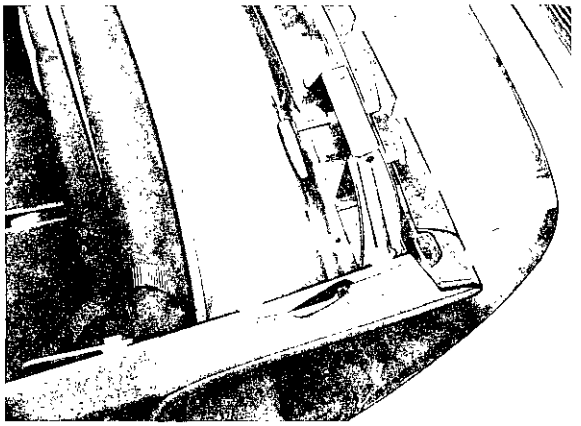


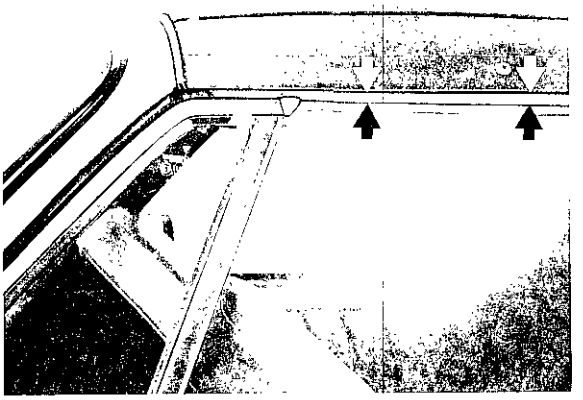
5. Loosen seal on hoop carefully.

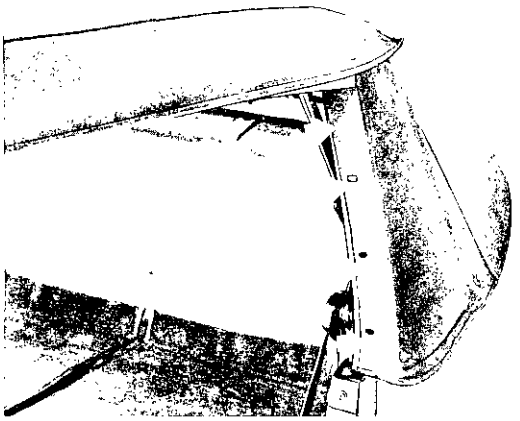


Installing

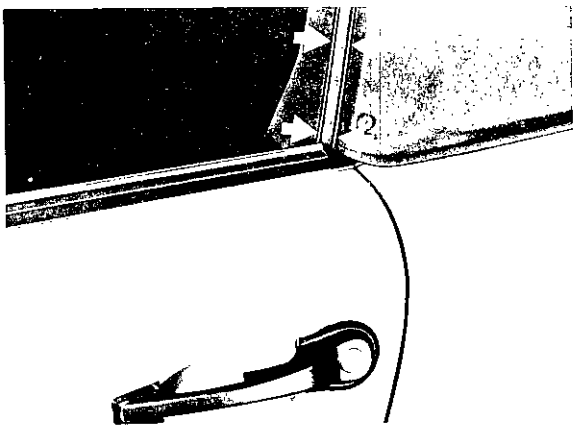
Installation is in reverse sequence.
All bearing surfaces for seals must be cleaned to remove sealing and adhesive compound.











Adjusting

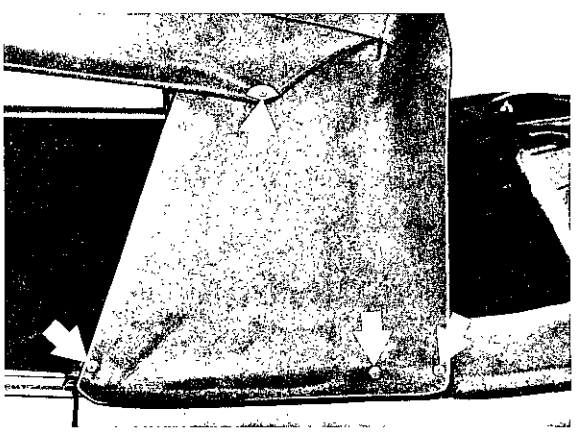
Seals have to be adjusted after closing the top.
Adjust top frame seals so that door windows run up into the provided sealing lips accurately.
Adjust B pillar seals so that door windows have tight contact.

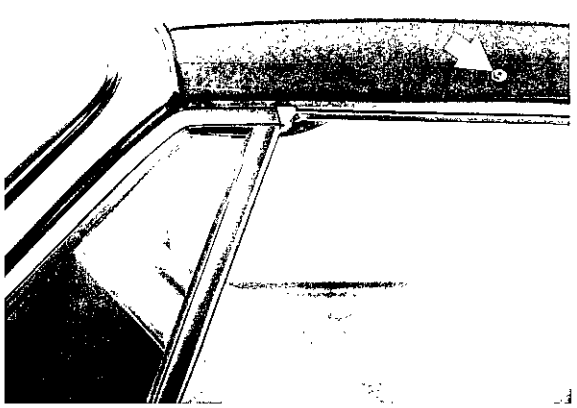
REMOVING AND INSTALLING FRONT TOP CANVAS COVER

Removing

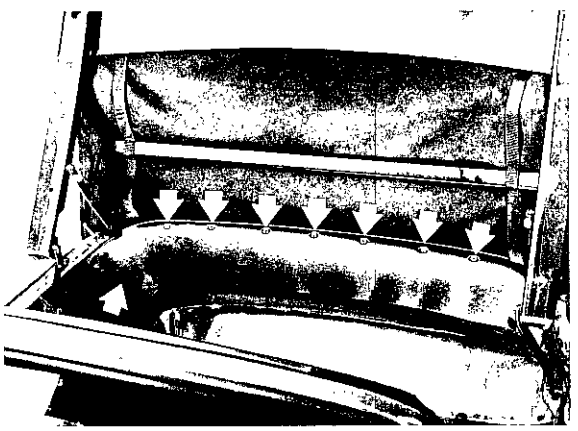
1. Remove key boards, B pillar seals, top frame seals and seal on hoop.
   See "Removing Top and Top Seals".

2. Remove snaps or Tenax bases, mounting screws, corners for tensioning cables and screws for tensioning cable guides.

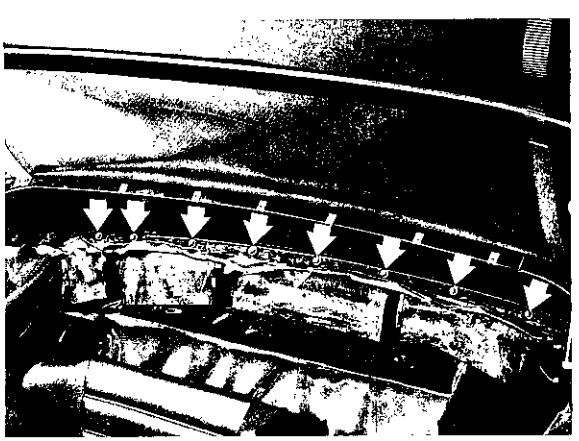




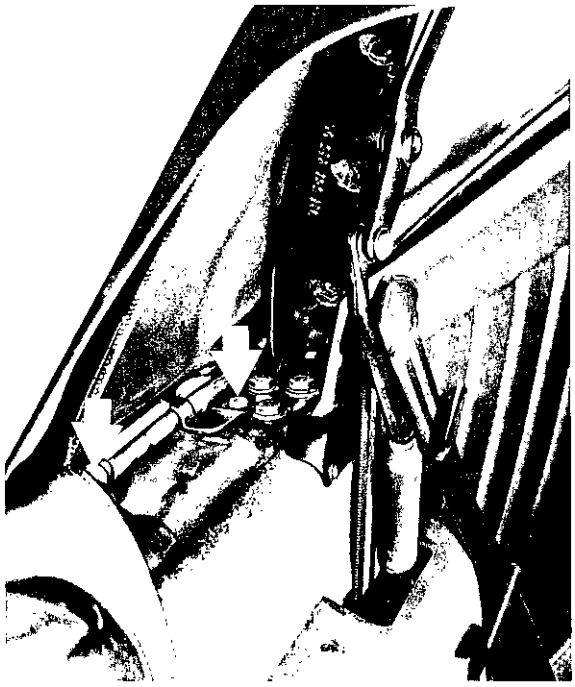
3. Unscrew mounting screws on rear top trim.



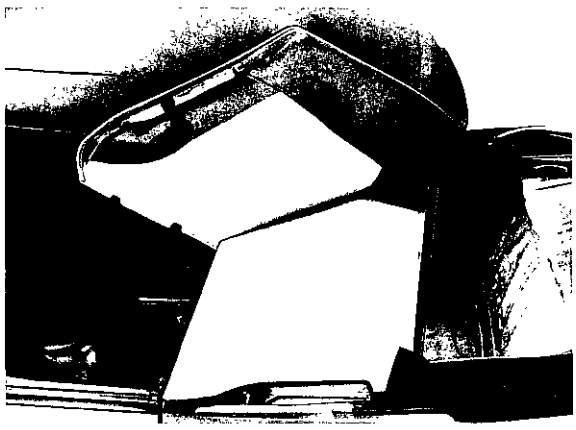
4. Disconnect front and rear cemented top canvas cover and remove screws of mounting rails.



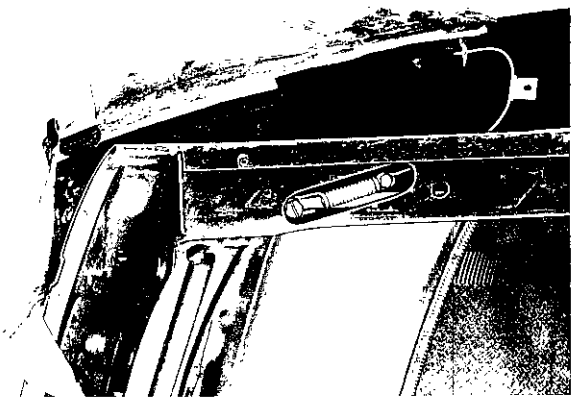
5. Loosen tensioning screws of tooth rails and remove screws.



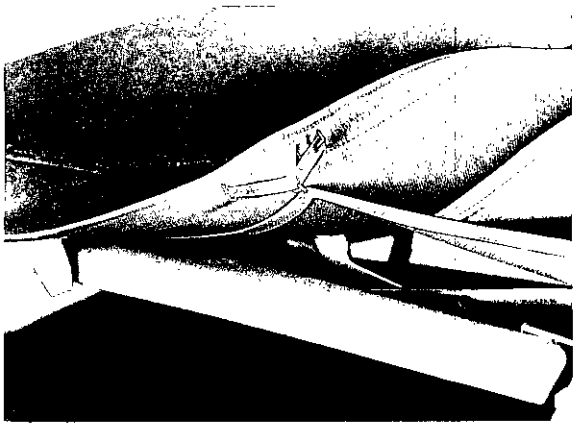
6. Disconnect cemented top canvas cover on B pillars and main hoop.



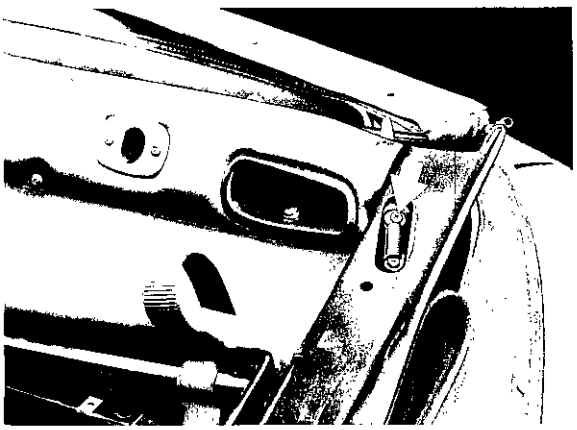
7. Disconnect cemented canvas cover on front hoop.



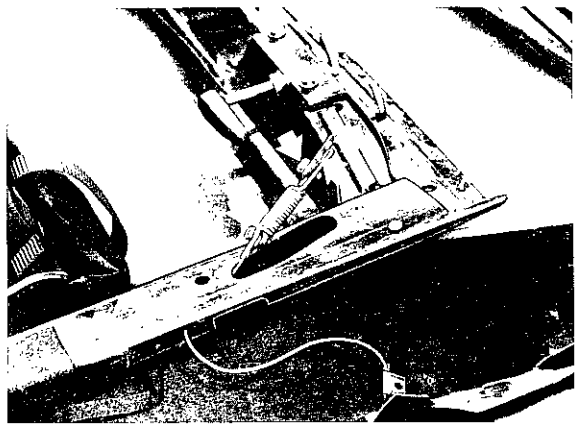
8. Disconnect rubber strap on roof liner.



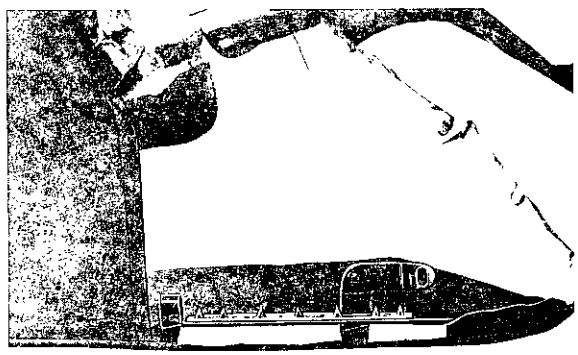
9. Unscrew screws of tensioning springs on top frame.



10. Unscrew tensioning springs on tensioning cables. Pull tensioning cables out of top frame and take off top canvas cover.

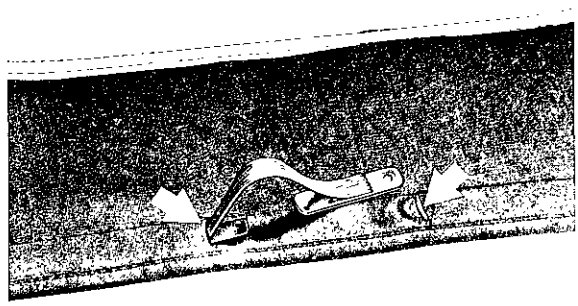


11. Disconnect tooth rails on top canvas cover and remove tooth rails.

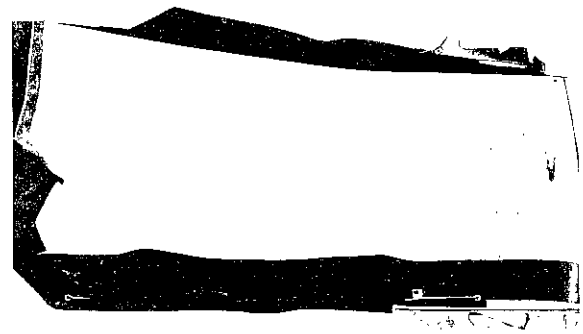


Installing

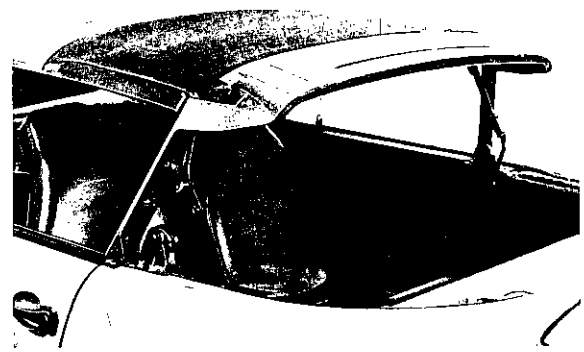
1. Guide rubber strap into top canvas cover.



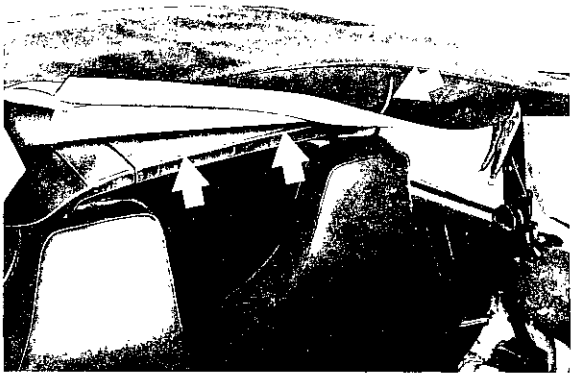
2. Guide tensioning cables into openings in top canvas cover from front end.

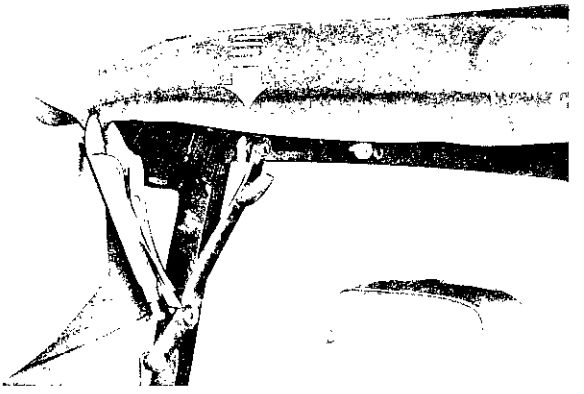


3. Mark center on rear hoop.



4. Mark center on rear end of top canvas cover. Install and align top canvas cover that marks are aligned. Canvas cover seam must run in groove of hoop edge. Only cement top canvas cover on threaded flange.

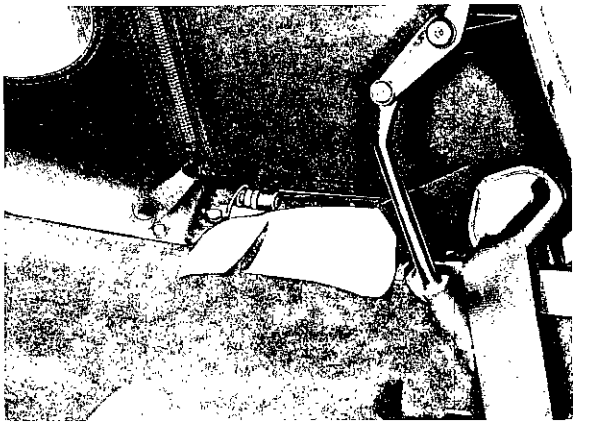


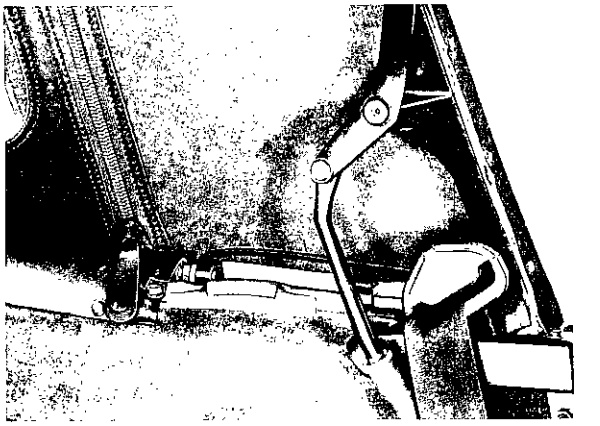


5. Cement top canvas cover on front hoop after stretching it.

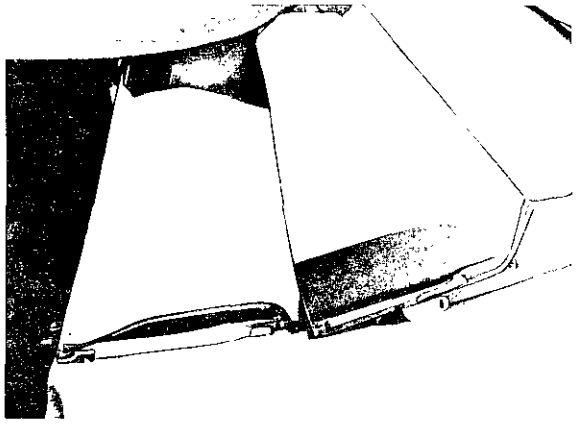


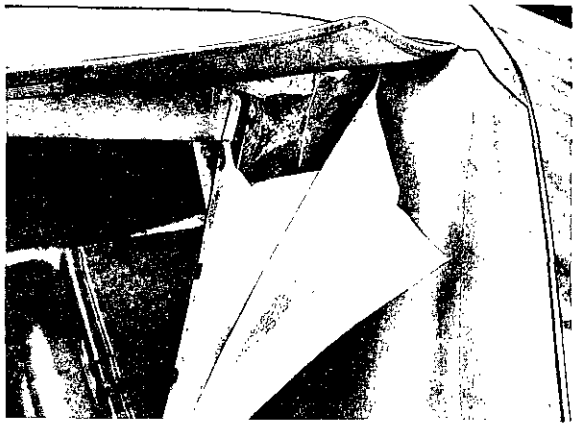
6. Mount tooth rails. Guide mounting strips of top canvas cover underneath tooth rails, cut to size, apply coat of cement, stretch, connect doubled in teeth and bend down teeth.



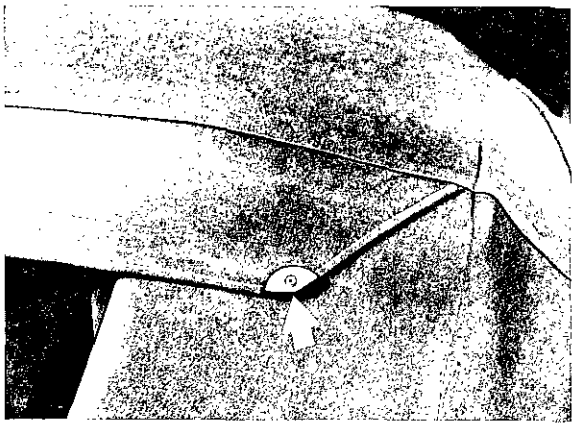


7. Loosen tooth rails and fold back top canvas cover. Insert seals and coat canvas cover with cement.
   Mount tooth rails and cement canvas cover on the B pillars.

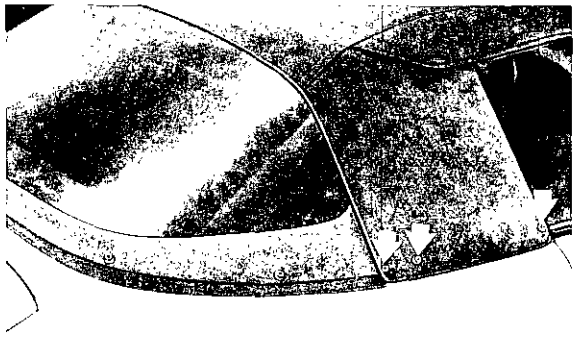


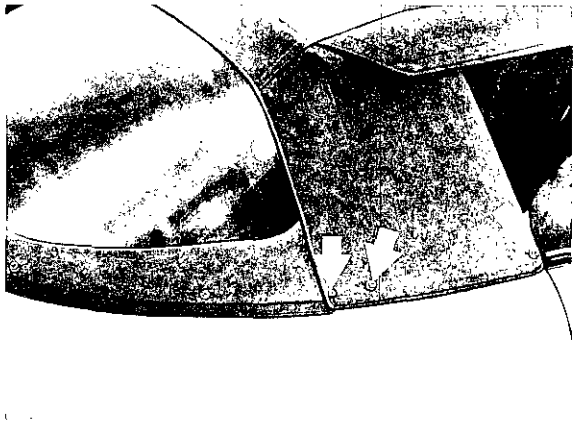


8. Stretch side canvas cover. Make a hole in the cover with a pointed punch and mount corners and tensioning cables with screws.



9. Install snaps or Tenax bases and screws with cloth protection washers.

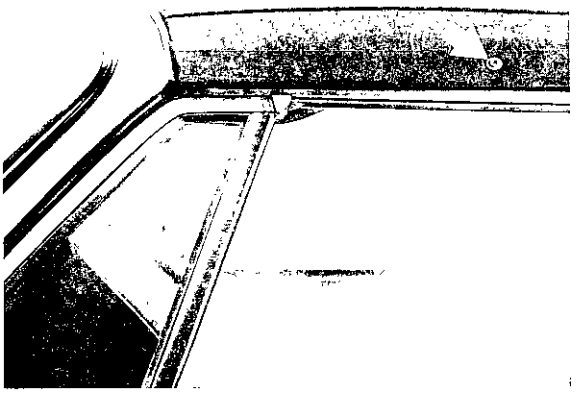




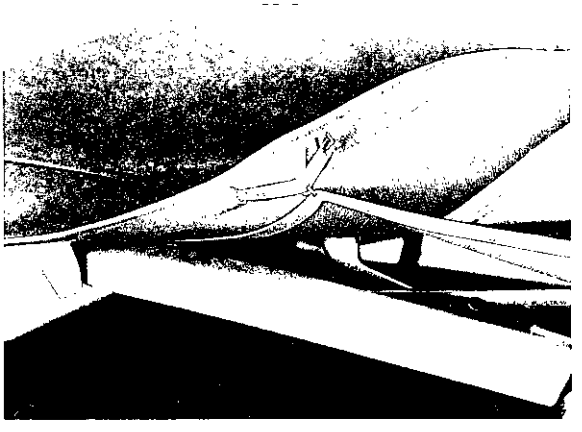
10. Cut front end of top canvas cover to size and cement on top frame.



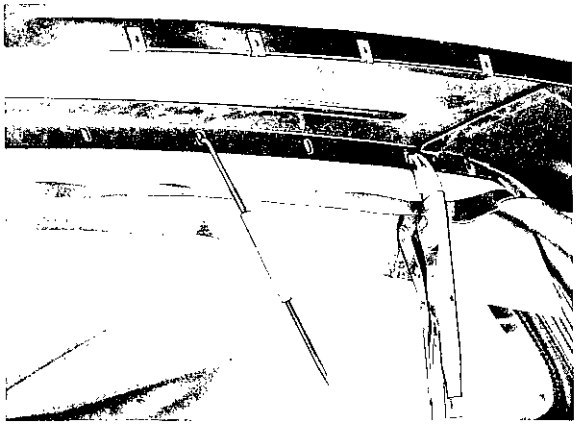
11. Guide tensioning cables into top frame. Mount tensioning cable guides and canvas cover with screws and cloth protection washers.



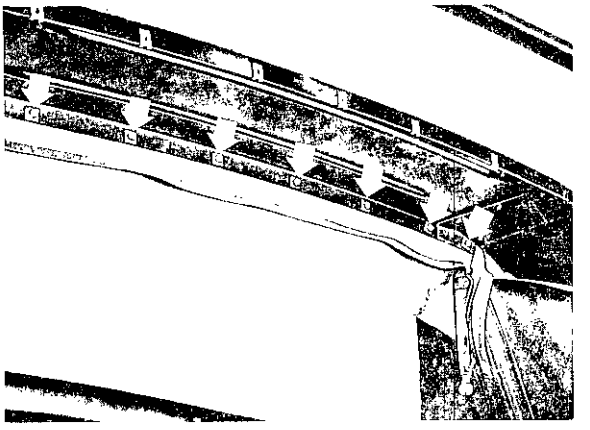
12. Sew rubber strap on roof liner.



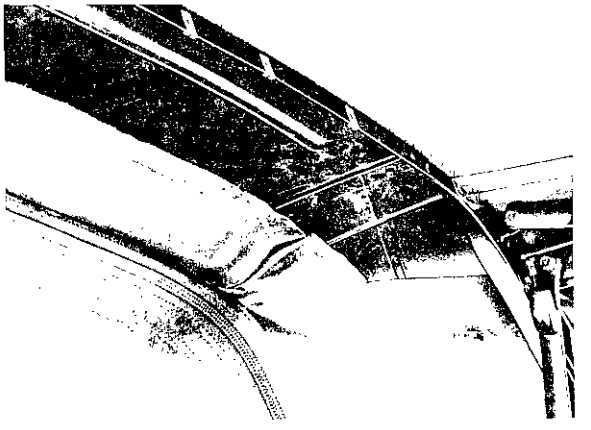
13. Clamp rear canvas cover on rear hoop with mounting rail and make hole in canvas cover with a suitable tool.



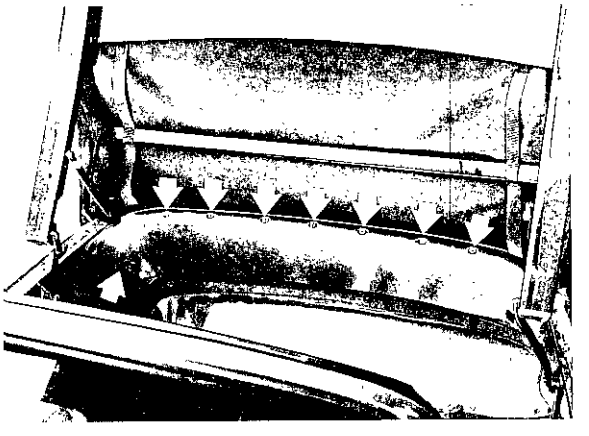
14. Mount shim wedges with screws.



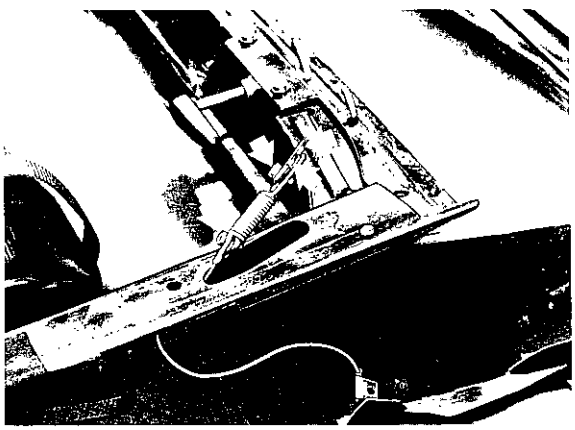
15. Cement rear and front canvas cover on rear hoop.



16. Install rear top trim.



17. Screw on tensioning springs with tensioning cables. The bracket has two raised bosses, with which the tensioning force of the tensioning cables can be adjusted. Mount tensioning springs with bracket on the top frame.

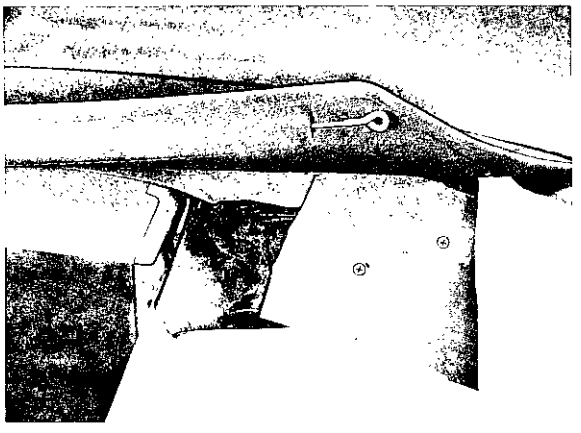


18. See "Installing Top and Top Seals" for rest of installing procedures.

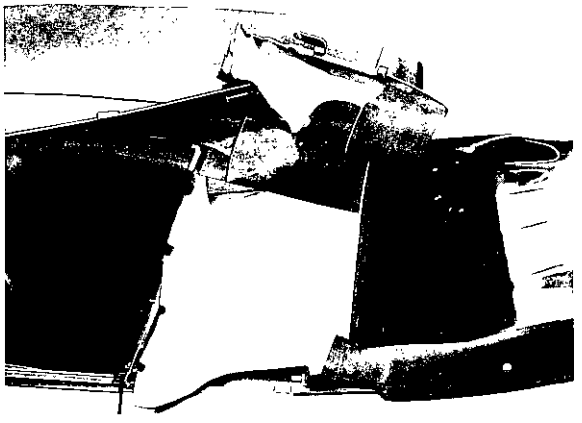
REMOVING AND INSTALLING REAR TOP CANVAS COVER WITH TENSIONING BAR AND MOUNTING RAIL

Removing

1. Remove the key boards, side wall trim panels, rear wall trim panel, B pillar seals and front top canvas cover on B pillars. See "Removing Top Canvas Cover Seals and Front Top Canvas Cover". Remove screws on main hoop and disconnect cemented points.



2. Disconnect canvas cover on B pillars and take off canvas cover.



Installing

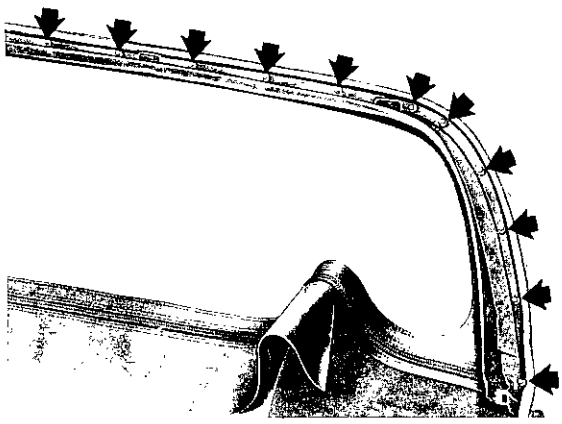
Installation is in reverse sequence.

REMOVING AND INSTALLING REAR TOP CANVAS COVER WITHOUT TENSIONING BAR AND MOUNTING RAIL

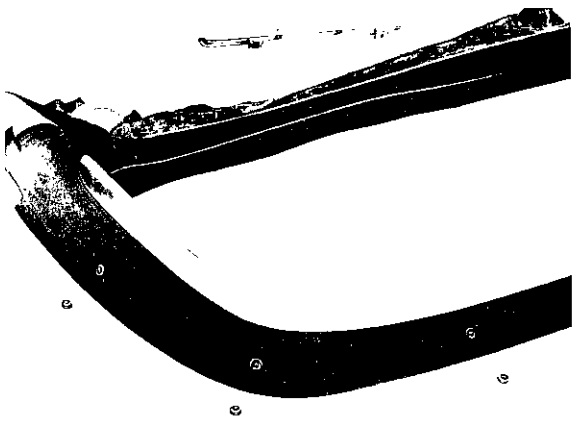
Removing

1. Remove key boards, side wall trim panels, rear wall trim panel, B pillar seals, front canvas cover and rear canvas cover on B pillars. See "Removing Top Canvas Cover Seals, Front and Rear Canvas Covers with Tensioning Bar and Mounting Rail".

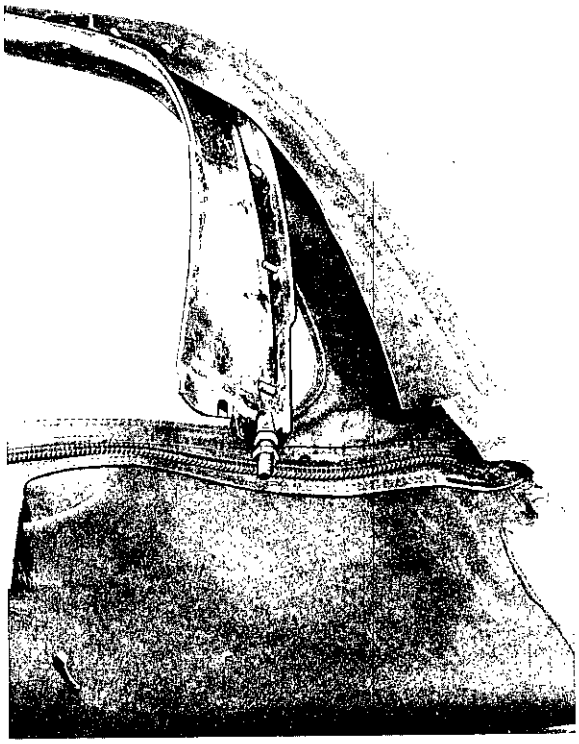
2. Remove nuts on tensioning bar. Lift off shims, clamping rails and seal.



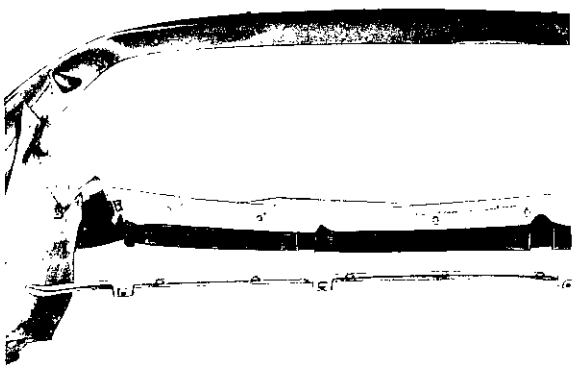
3. Unscrew snap heads and Tenax bases on tensioning bar.



4. Disconnect cemented canvas cover on tensioning bar.

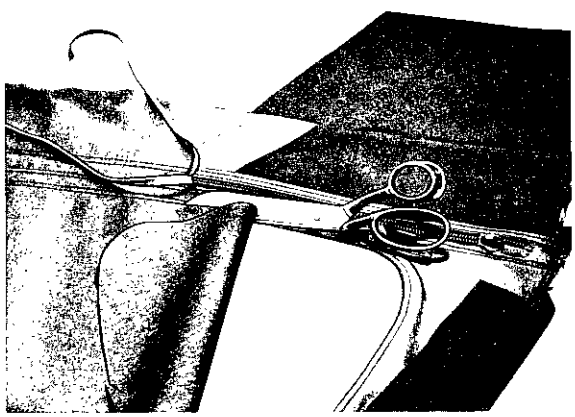


5. Disconnect and remove cemented mounting rail.

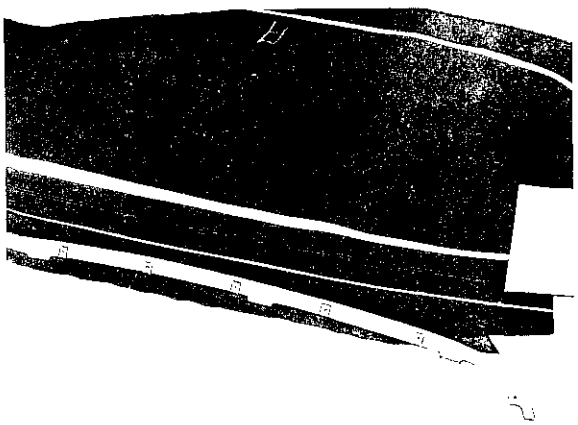


Installing

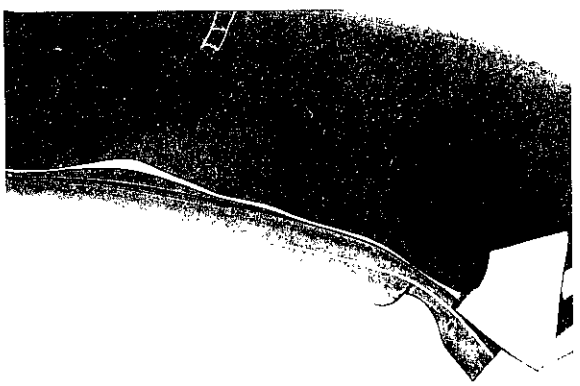
1. Cut out protective coat on inside of top canvas cover and zipper with a scissors.

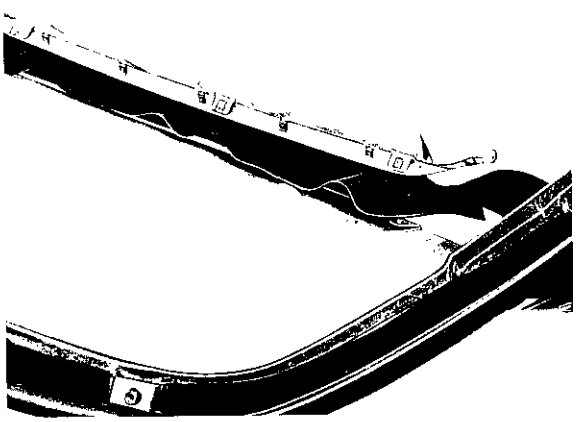


2. Mark distance from rear window to cementing edge of mounting rail on top canvas cover; approx. 80 mm.

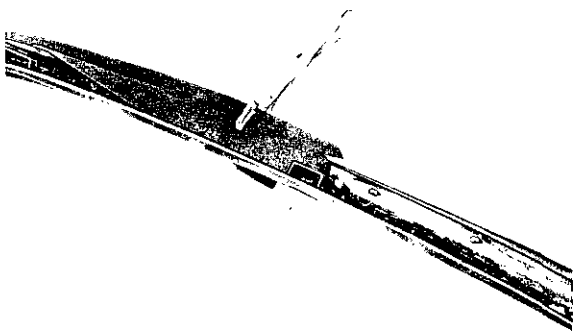


3. Cement mounting rail on top canvas cover according to marks.

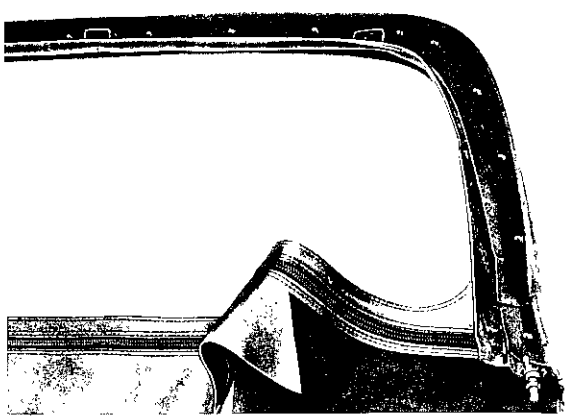




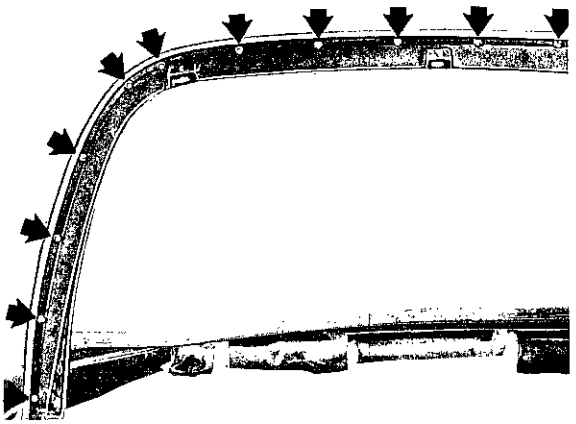
4. Fit canvas cover on tensioning bar and cut to size. Cement canvas cover on outside of tensioning bar from the center to left and right sides. Seam of canvas cover must run slightly higher than lower edge of the tensioning bar.



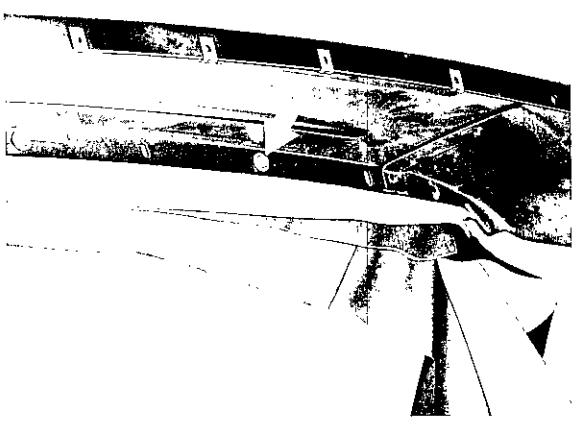
5. Cut holes in canvas cover for the staybolts and cement canvas cover on inside of tensioning bar.



6. Fit in seal and clamping rails, and mount with washers and nuts.



7. Place rear end of canvas cover on car. Place mounting rail with canvas cover on main hoop and install screws. Press down on rear of tensioning bar. If polyglass window does not have sufficient tension, disconnect canvas cover on the main hoop again. Disconnect cemented mounting rail and stretch the canvas cover.

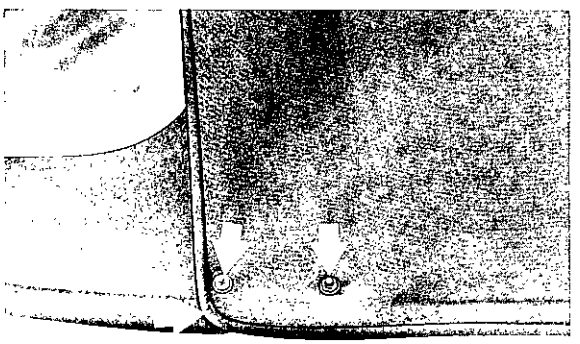


8. For remaining installation procedures refer to "Installing Rear Canvas Cover with Tensioning Bar and Mounting Rail".
Install top canvas cover seals.

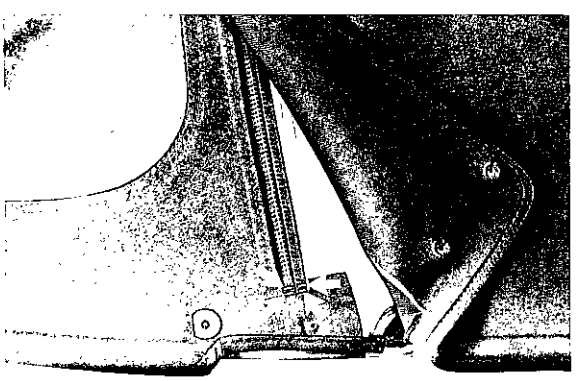
REPLACING ZIPPER SLIDE

Removing

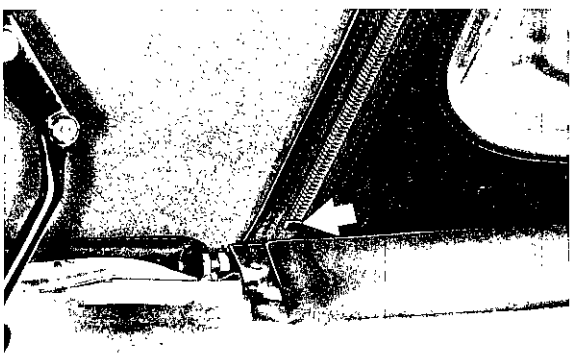
1. Remove Tenax base and self-tapping screw with cloth protection washer on the side, where the end hook is located (on rear end of front canvas cover) and open up sewn seam.



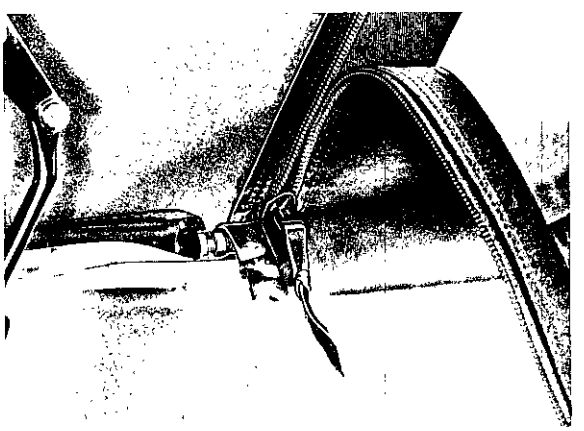
2. Fold open canvas cover and bend open claws of end hook.

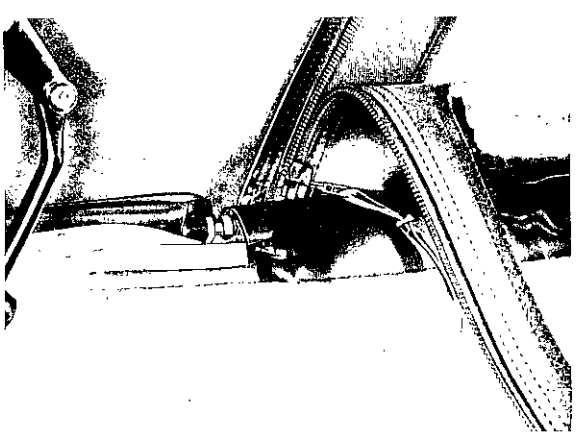


3. Lift off end hook towards inside.



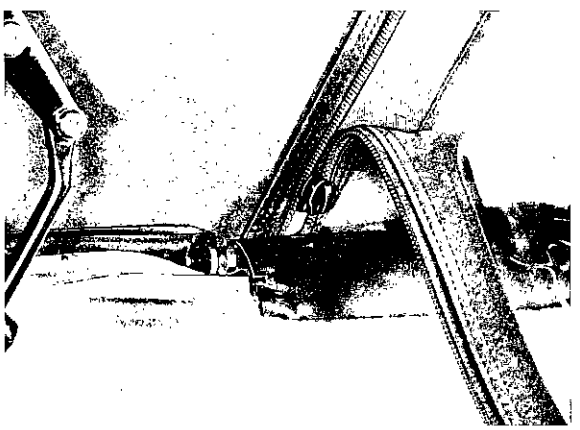
4. Remove key board. Slide zipper slide down and remove.



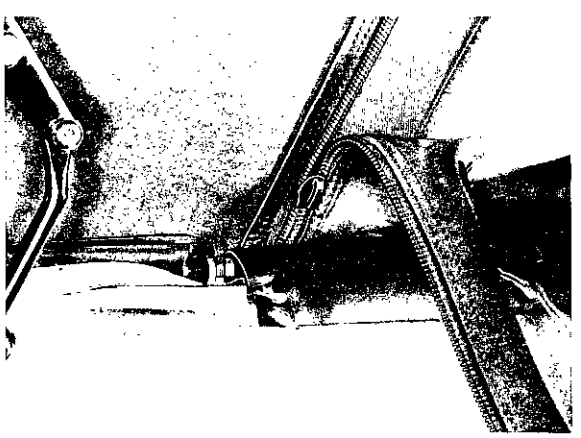


Installing

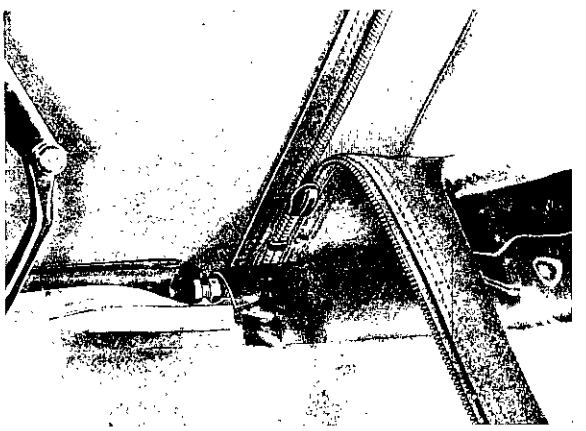
1. Press new zipper slide into rear zipper section.



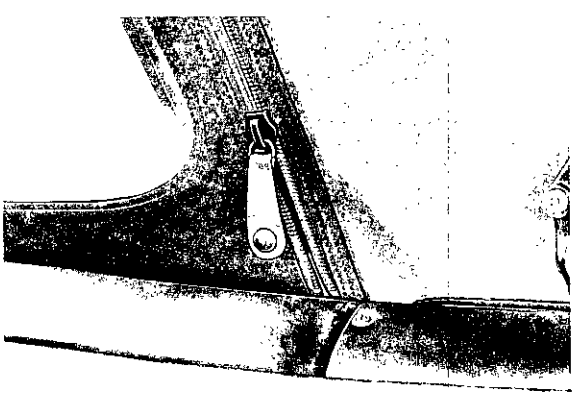
2. Insert zipper slide in front zipper section.



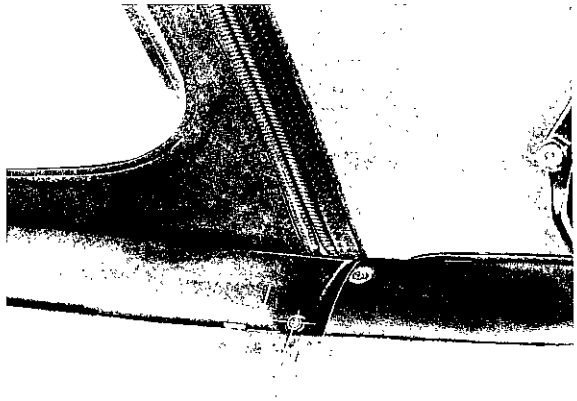
3. Insert end hook and bend down claws from the outside.



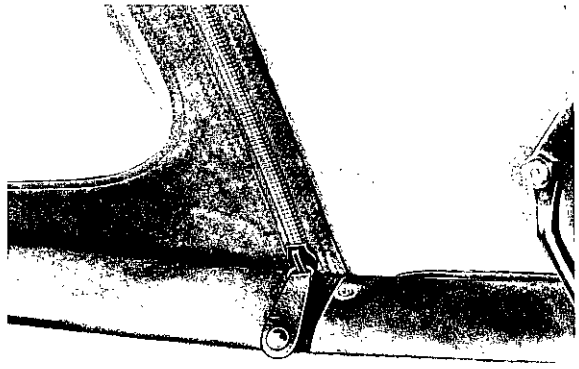
4. Mount pulling strap and snap head with eye on zipper slide.



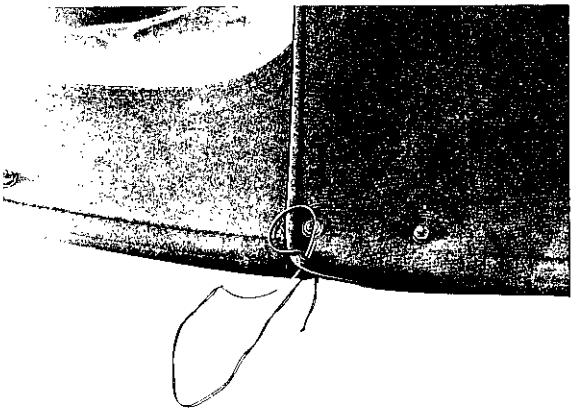
5. If applicable, drill a hole in the front of the key board, where the snap base is mounted with a self-tapping screw (see figure).



6. Press snap head into snap base.



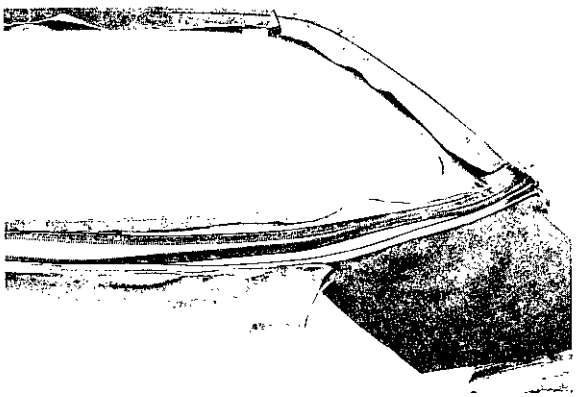
7. Install key board, Tenax base and self-tapping screw with cloth protection washer as well as front and rear canvas covers with two seam stitches.



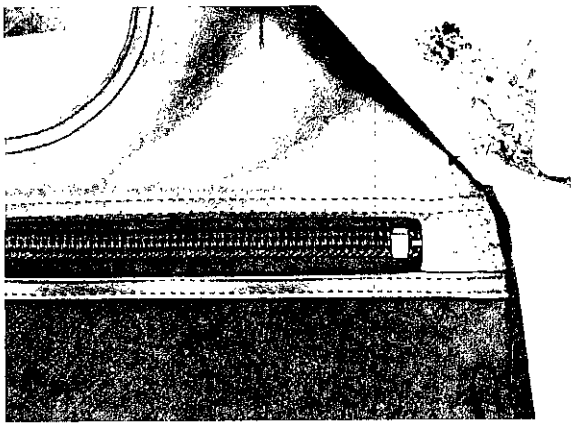
REMOVING AND INSTALLING ZIPPER

Removing

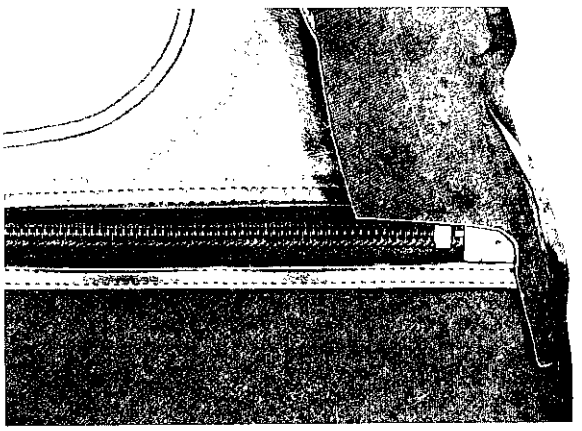
1. After removal of the rear top canvas cover without tensioning bar and without mounting rail, cut out zipper from rear canvas cover.



2. Cement canvas cover on zipper from above.

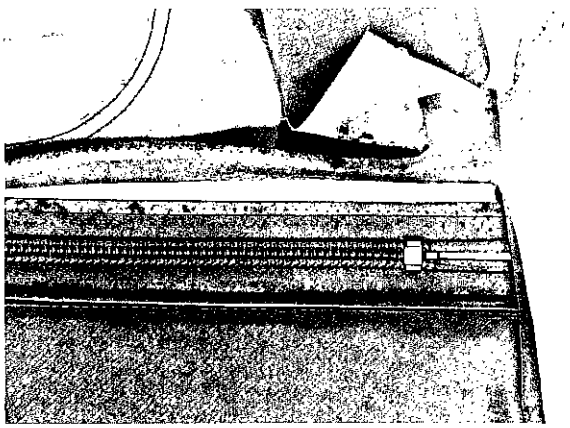


3. Cement tensioning section.



Installing

1. Canvas cover must be free of sewing yarn at cut surfaces. Apply coat of cement on zipper and canvas cover. Cement bottom of zipper on canvas cover on one side.



4. Wait until cement is dry and then sew zipper and border. Cement tensioning bar and mounting rail on canvas cover and install complete part in car.

RECOMMENDED CEMENTS OR ADHESIVES

Cements/Adhesives:

Terocal 2444 for cementing seals

Manufacturer: Teroson Werke GmbH
6900 Heidelberg 1

Dekalin 3649 for installation of canvas on metal or plastic

Manufacturer: Deutsche Klebestoffwerke GmbH
Rödiger & Sohn
6450 Hanau/Main

INSTALLING INSIDE MIRROR

1. Remove screw from mirror arm and take off mirror base.

2. Remove adhesive plate and clean burr, if any, from the mirror base collar.

3. Carefully clean and degrease windshield and mirror base (use alcohol, acetone, etc.)

4. Mark mounting surface for mirror base. Upper edge of mirror base must be in windshield center, 80 mm below windshield seal. Mark location on outside of windshield.

5. Heat mirror base on hot plate to approximately 200° F.

6. Remove backing (white or beige) from adhesive plate and place on mirror mounting base.

NOTE

Do not use adhesive plates on which the backing was already partially removed or plates from which the backing cannot be fully removed. These conditions will cause faulty bonding.

7. Seal all sides of adhesive plate with a bead of weatherstrip adhesive (3 M # 8011 or similar adhesive).

8. Place mounting base on windshield.

9. Attach extension US 8015 to the wheel tensioner (Bosch part # 2 688 190 000) and install mirror mounting base. Apply a pressure of 12 kp (26.5 lbs) for 15 minutes.

CAUTION

To prevent damage to windshield, compress the wheel tensioner against the floor tunnel. Do not compress against windshield.

NOTE

The adhesive area should be a shiny black and without dull black spots.

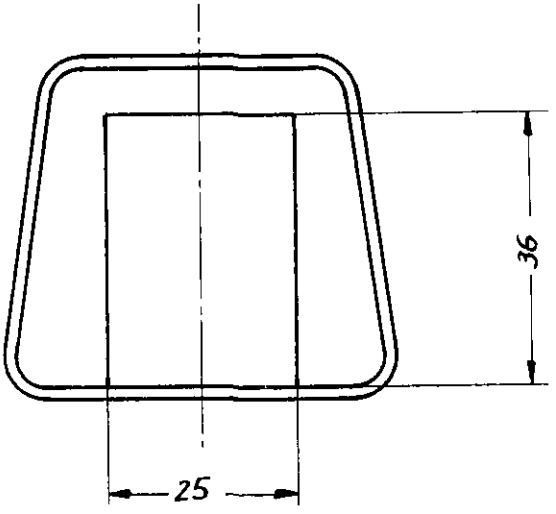
10. Remove tool and attach mirror to base.

INSTALLING INTERIOR REAR VIEW MIRROR

Note: Repair kit, Part No. 914 731 025 10, is required for the following operations.

1. Clean and degrease mirror base and windshield with acetone.

2. Cut strip of tape and paste on mirror base as illustrated.



3. Fill in open surface on mirror base with an adhesive to height of tape.

4. Pull paper backing off tape.

5. Position mirror and press firmly so that tape surface rests completely flat on winshield.

6. Remove excess adhesive with cloth soaked in aceton.

7. Adjust mirror carefully, because the adhesive requires 24 hours to dry completely.

8. If possible, the car should not be used for several hours to let the adhesive settle and dry.

TARGA ROOF ADJUSTMENTS - FROM 1970 MODELS

General

If wind noise or creaking should occur in a Targa roof due to changed position, the following adjustments may become necessary to rectify the condition:

Creaking Noises

1. Remove folding top. Check front and rear tensioning rails for proper alignment, adjust if necessary.
2. Check roof locks, tighten retaining screws.
3. Check hinges, removing pins if loose; worn pins should be replaced. Grease hinges lightly.
4. Check front locating pins for wear, replacing if necessary.
5. Check weatherstrip at windshield and roll bar ends, replacing if damaged or flattened.

   NOTE

   Lightly coat weatherstrip with glycerine during the winter season.

6. If moulding strips in windshield frame show pressure marks, meaning improper tolerances at the convertible top, straighten the strip with a piece of hardwood, or remove strip and rework top surface across windshield frame.

Wind Noises

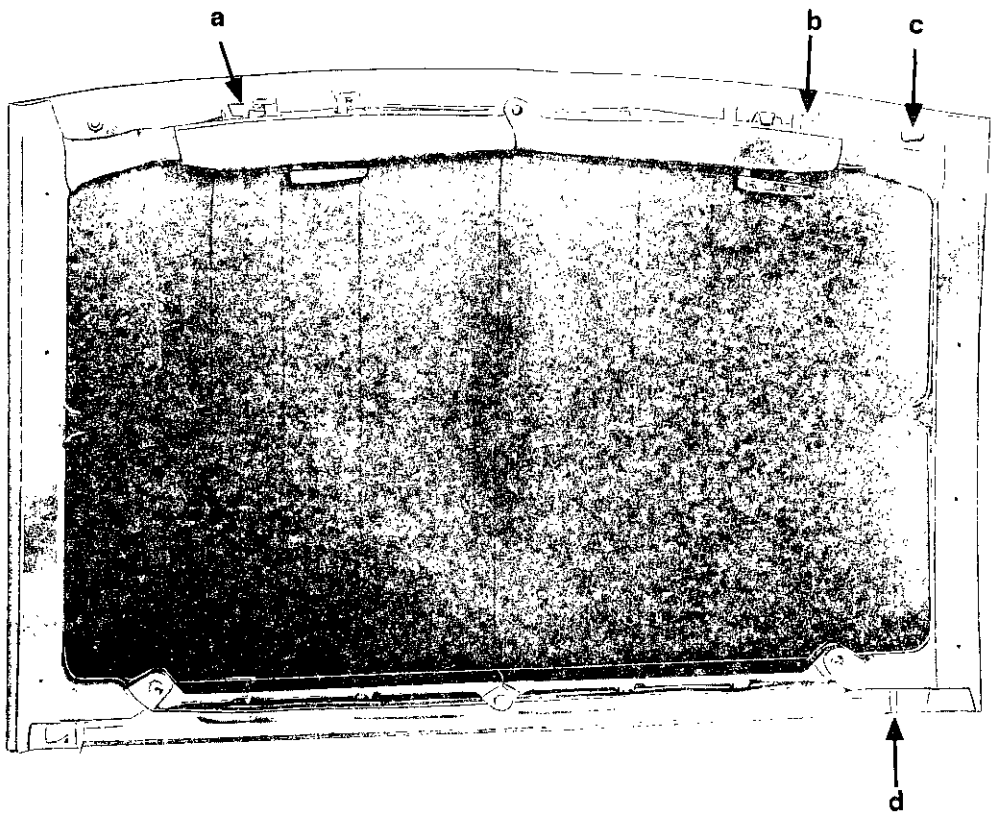
1. Check convertible top for proper seating. Readjust if it protrudes above the windshield frame or roll bar, or if it is uneven.
2. Check windows for proper sealing, readjust if necessary.
3. Readjust proof side seal if necessary.
4. Using wide-grip flat pliers, lightly bend rear seating surface of the folding top downward. (Do not bend the rounded sides).
5. Install convertible top and check positioning, readjusting door window frames if necessary.

Top Billows Out

The convertible top may billow out a high speeds with the fan on and windows closed (pressure in passenger compartment).

Remedy:

1. Move rear support pin upward on convertible top.
2. Check rear hinges, removing hinge pins if loose; worn hinge pins should be replaced. Grease hinges lightly.
3. If high pressure is exerted on the gasket at the LASTIK supports (roll bar), take gasket out of the supports and cut the base down as required. Glue it in place and secure with plastic rivets.

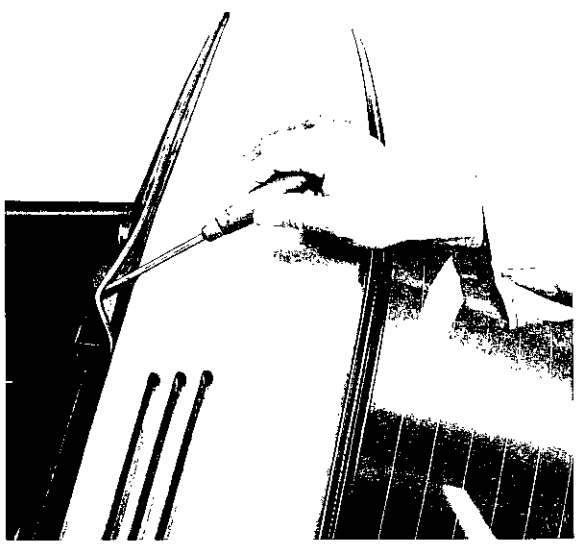


a Tensioning rail

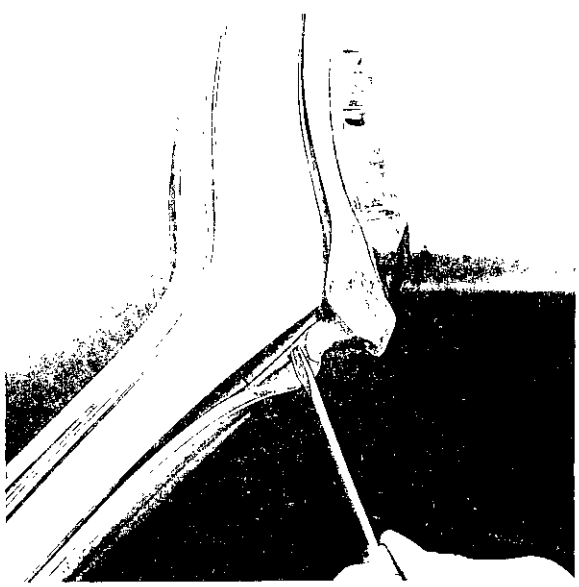
b = Roof lock pawl

c = Locating stud

d = Rear support pin



Rollbar weatherstrip, new version



Windshield frame weatherstrip, new version

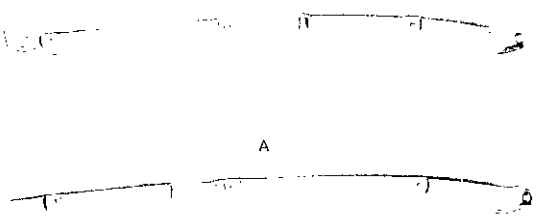
MOULDING CHANGES IN WINDSHIELD TOP

Beginning with chassis numbers	911 251 0143	911 T
	911 221 0091	911 E
	911 231 0059	911 S

moulding strips with a 2.3 mm depression in the area of the roof lock pawls are being installed on windshield frame top in all Targa vehicles. These strips can also be used on earlier vehicles, providing that the channel going across the windshield frame is reworked accordingly.

NOTE

If the moulding strips show pressure marks causing noise, do the following:

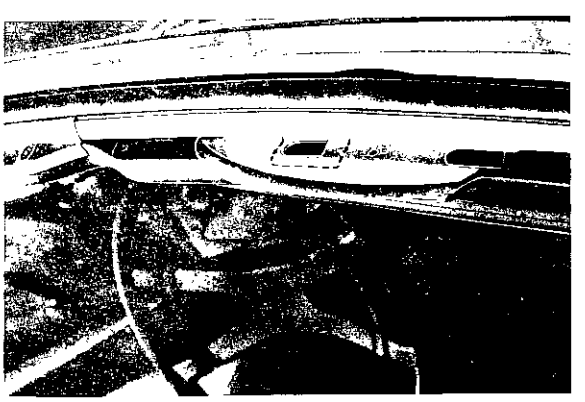


A = New version

1. Reshape moulding strip with a piece of hardwood, as necessary.

2. Replace windshield frame weatherstrip if damaged or flattened. (The convertible top should rest only against the weatherstrip).

3. Further possible retification:
   - a - Remove old moulding strips.
   - b - Partly loosen leatherette covering.
   - c - Reshape top surface of windshield frame to accomodate new-type moulding strips.

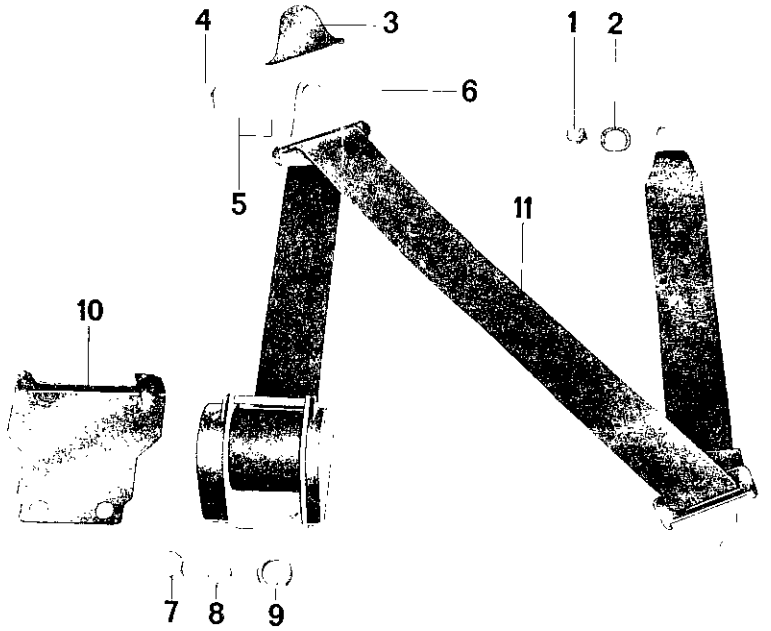


CAUTION

Support other side of windshield frame to prevent damaging windshield when reshaping surface.

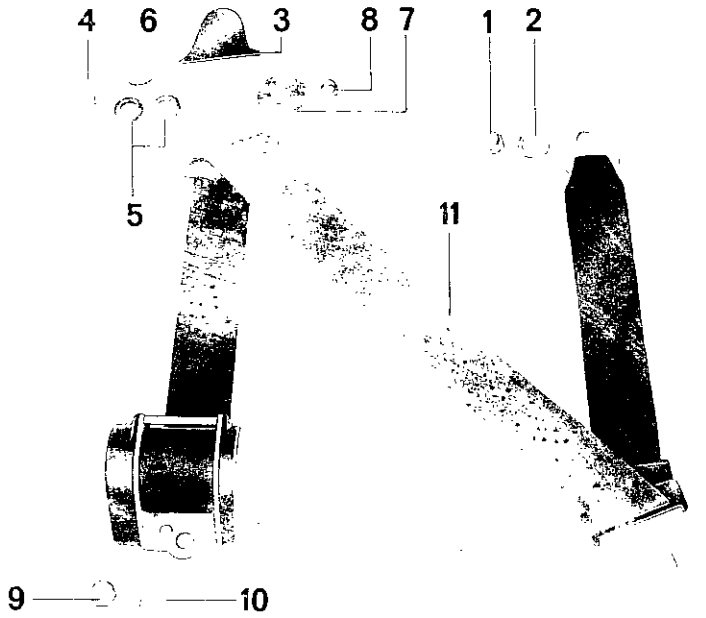
- d - Reglue leatherette covering and install new moulding strip.

INERTIA REEL SAFETY BELT WITH AUTOMATIC LOCKING RETRACTOR (COUPE)



Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Retaining bolt	1		Use original self-locking bolt.	9.3 - 1/5
2	Spring washer	1		Replace if necessary.	
3	Loop cover	1			
4	Retaining bolt	1		Use original self-locking bolt.	9.3 - 1/5
5	Flanged washer	2		Position properly.	9.3 - 1/5
6	Washer	1			9.3 - 1/5
7	Retaining bolt	1			
8	Serrated washer	1		Replace if necessary.	
9	Spacer	1			
10	Support plate	1		Install together with belt retractor.	9.3 - 1/4
11	Inertia reel belt with automatic retractor	1		Check installation side. Belts are different for right and left side.	9.3 - 1/4

INERTIA REEL SAFETY BELT WITH AUTOMATIC LOCKING RETRACTOR (TARGA)



Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Retaining bolt	1		Use original self-locking bolt.	
2	Spring washer	1		Replace if necessary.	
3	Loop cover	1			
4	Loop retaining bolt	1		Use original self-locking bolt.	9.3 - 1/7
5	Flanged washers	2		Position properly.	9.3 - 1/7
6	Washer	1			9.3 - 1/7
7	Protective washer	1			9.3 - 1/7
8	Spacer	1			9.3 - 1/7
9	Retaining bolt	1			
10	Serrated washer	1		Replace if necessary.	
11	Inertia reel belt with automatic retractor	1		Check installation side. Belts are different for right and left side.	9.3 - 1/7

REMOVING AND INSTALLING INERTIA REEL SAFETY BELT WITH AUTOMATIC LOCKING RETRACTOR AND ELECTRIC WARNING DEVISE

Removal (Coupe and Targa)

1. Detach belt from side of seat.

2. Remove loop cover from B-pillar or roll bar.

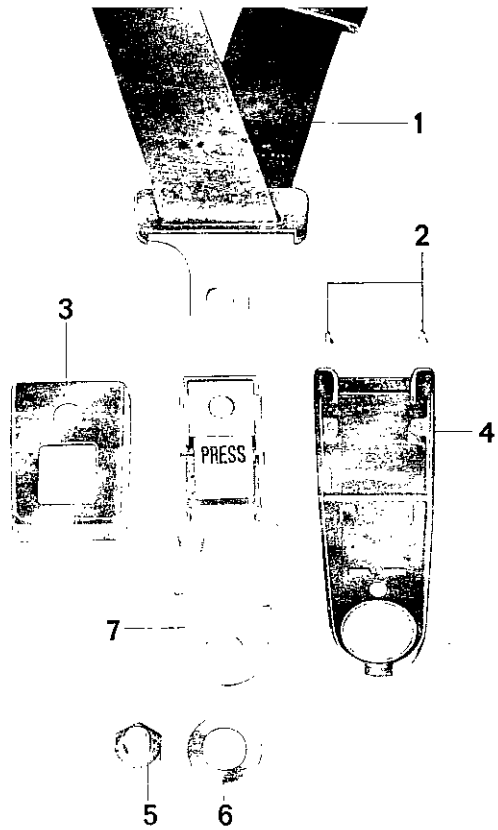
3. Remove loop retaining bolt. Remove flanged washers, in Targa additionally the spaser located under the perforated cover.

4. Remove cover from side section; this requires removal of sheetmetal screws from the rosette plate and rocker panel. In the Targa vehicle, remove covering strip from side cover as well as sheetmetal screws from the rosette plate in the side cover and take both parts off.

NOTE: The belt can be pulled out through the opening once the plastic cover is removed from the buckle assembly.

5. Remove belt retractor retaining screws.

6. Remove and reinstall buckle.

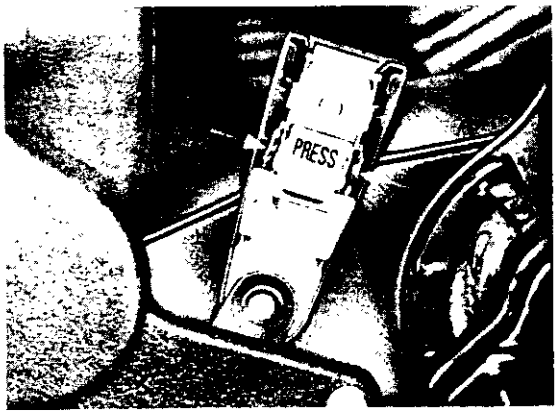


1 - Inertia reel belt with automatic retractor
2 - Countersunk screws
3 - Cover
4 - Cover
5 - Retaining bolt
6 - Spring washer
7 - Buckle assembly

NOTE: The buckle assembly should not be disassembled unless it does not function properly.

a) Remove both countersunk screws from the cover and separate both halves.

b) Carefully detach buckle contact wires from connecting tabs.



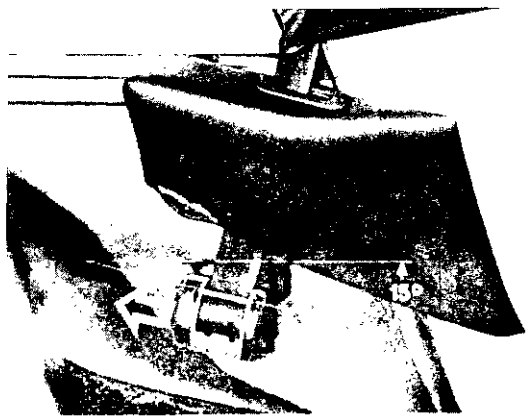
NOTE: To prevent damage to the contact plates, hold the tabs with needle nose pliers when disconnecting the wires.

c) Press plastic cover off. Remove buckle retaining bolt and take buckle out.

Installation (Coupe)

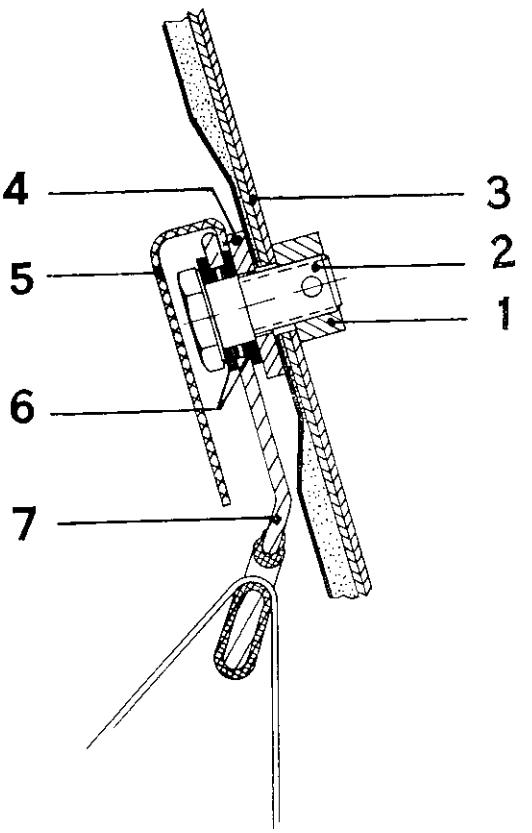
1. Mount belt retractor on side panel together with support plate, spacer, and serrated washer.

NOTE: The larger retractor plastic cover should face to the rear, and the cover holder upwards.
In addition, the retractor should be tilted forward about 15° in line with the direction of pull.



2. Pull the belt through the upholstery cover.

3. Install yoke on door lock post; see sketch for location of washer.

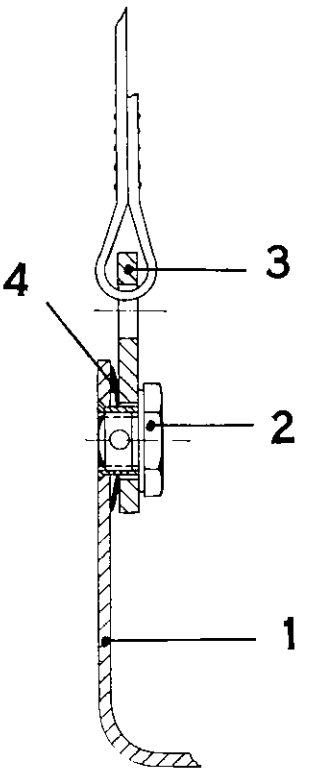


1 - Weld-nut
2 - Retaining bolt
3 - Door lock post with reinforcement
4 - Spacer
5 - Cover
6 - Flanged washers
7 - Yoke

4. Pull the belt out horizontally and check unreeling and retrieval of belt. The belt should be traveling in center of retractor reel. If necessary, correct the 15° installation position of the retractor.

5. Install upholstery cover and rosette plate.

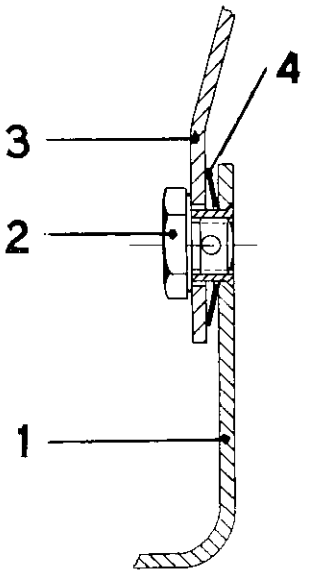
6. Fasten belt to mounting bracket in seat. See sketch for installed position of the spring washer.



1 - Mounting bracket on seat outside
2 - Retaining bolt
3 - Yoke
4 - Spring washer

NOTE: The belt should not be twisted. Sewn end should face the seat.

7. Install belt buckle assembly. See sketch for location of spring washer.



1 - Mounting bracket on seat inside
2 - Retaining bolt
3 - Latch
4 - Spring washer

8. Guide buckle contact cable through the plastic cover and connect to contact tabs.

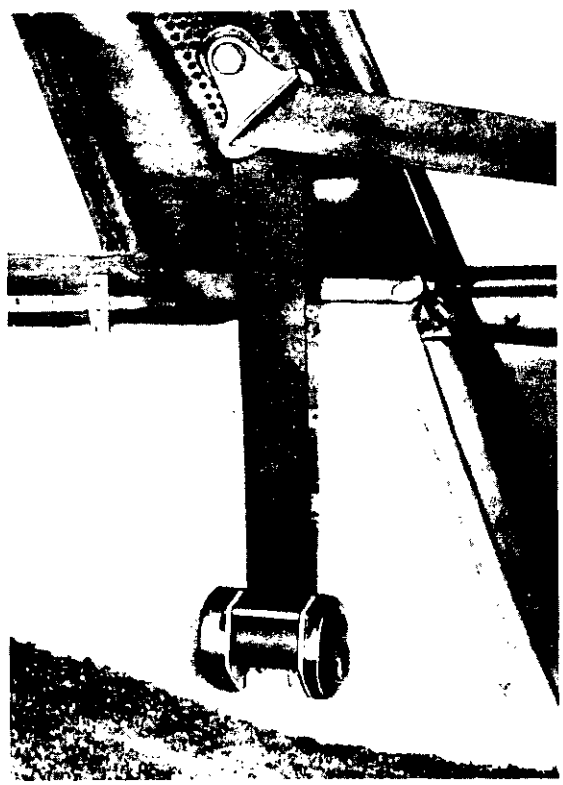
NOTE: To prevent damage to the contact plates, hold tabs with needle nose pliers when connecting the wires. Also see Group 9, page 6.2 - 1/1.

9. Join belt buckle covers and secure with countersunk screws.

10. Put the belt on, adjust, and check operation. When the belt is moved rapidly, the locking retractor must lock, and must unreel easily when moved slowly.

Installation Instructions for Targa Vehicles

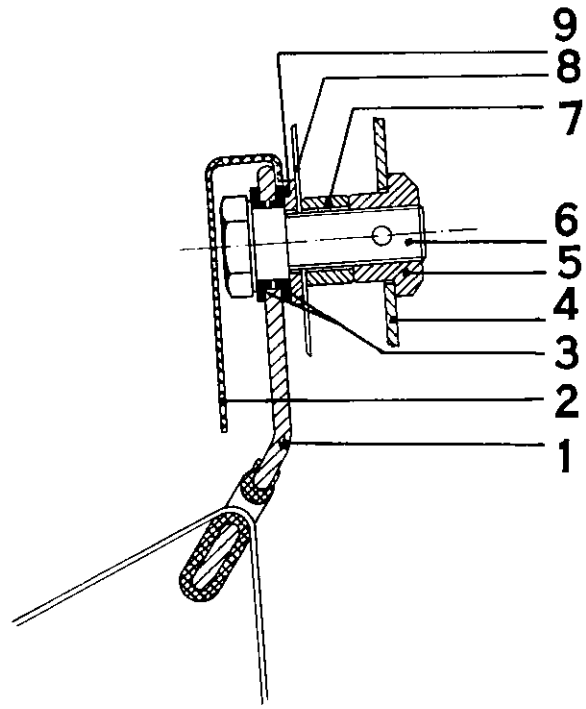
1. Install retractor with retaining bolt and serrated washer. For clarity, the illustration does not show side covering.



NOTE: The larger plastic cover on retractor should face back, and the retractor should tilt forward by 12° along the direction of pull.

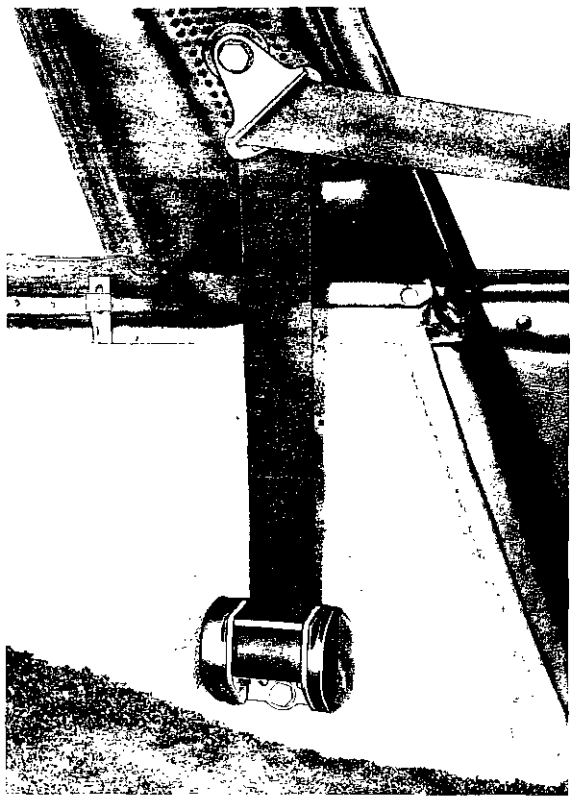
2. Pull belt end through the side covering and rosette plate.

3. Attach yoke to roll bar. See sketch for location of washers.



1 - Yoke
2 - Cover
3 - Flanged washers
4 - Roll bar reinforcement pan
5 - Weld-nut
6 - Retaining bolt
7 - Spacer
8 - Protective washer
9 - Spacer

4. Pull the belt out horizontally and check unreeling and retraction. The belt should reel in center of retractor- if not, correct the 12° alignment of the retractor. For clarity, the illustration does not show the side covering.



5. Install side covering, rosette plate, and cover moulding.

NOTE: The electrical operation and outline dealing with the automatic retractor is described in Group 9.

REMOVING AND INSTALLING ELECTRIC WINDOW REGULATORS

General

Beginning with the Apr-26-72 production, new electric motors with an integral transmission, as well as modified toggle switches with mounting frames are used. Electrical connections are made according to a new wiring diagram. Electric window regulators can be installed in Coupe models only.

The new regulators were first installed in the following vehicles:

911 T USA	911 210 2072
911 E	911 220 0809
911 S	911 230 1391

Removal

1. Remove window ledge rail and lock button.

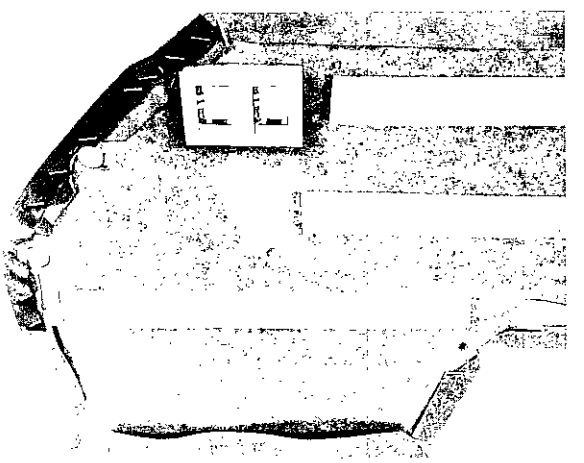
2. Remove toggle switches. If possible, first position window glass about 10 cm (4") above its lowest position.

3. Remove entire door panel and sealing foil.

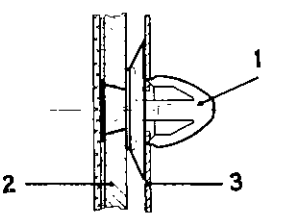
4. Remove outer chrome strip at window base.

5. Remove all window frame fasteners. Pull the frame out.

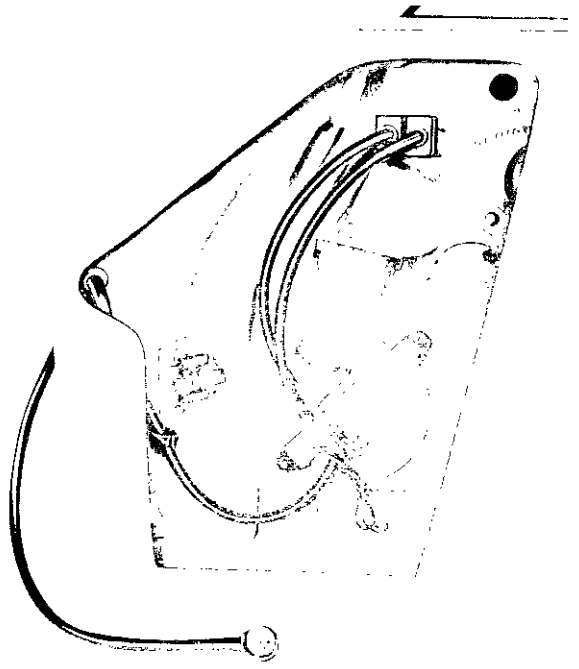
6. Push window glass forward and detach from the regulator. Remove upper door well weather seal and take the glass out.



Rear side of door panel with weather seals and self-sealing mounting clips.



1 Clip
2 Door panel
3 Door inner sheetmetal panel



New motor and transmission with cable layout

7. Take wires out of retainers, disconnect them from junction bar, and pull wire looms out together with caps. If the wire loom leading from the door into the car's interior is to be removed, it will be necessary to take the door off.

8. Unscrew window regulator and remove.

9. Remove stop wedge from door base.

Installation



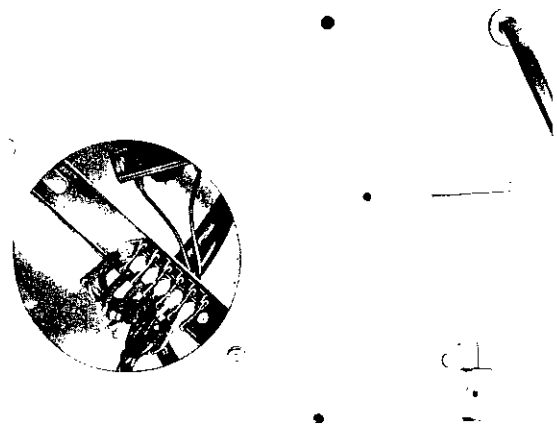
1. Insert wire grommet in forward part of inner sheetmetal panel of door. Lead the connecting wires into the car's interior. Install door.

2. Insert window regulator and fasten. Install stop wedge.

3. Run the regulator with a battery or battery charger to bring window to about 10 cm (4") above its lowest position by connecting the positive wire to green and negative wire to black wires in motor. If the regulator moves up, switch the wires to make it move down.

4. Install carrier plate with junction bar.

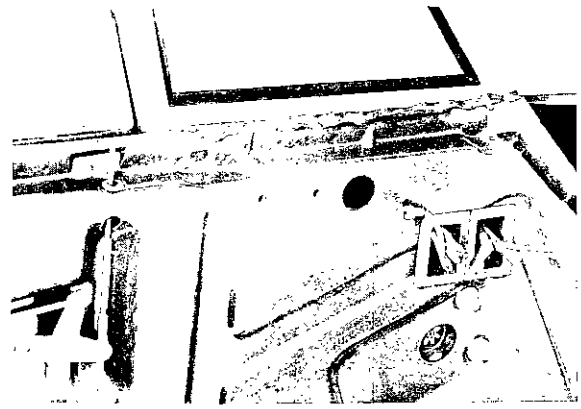
5. Insert toggle switches, cover caps, and wire looms. Connect all wires according to the new supplemental wiring diagram in Group 9. Fasten the wire looms to carrier plate and inner sheetmetal panel.



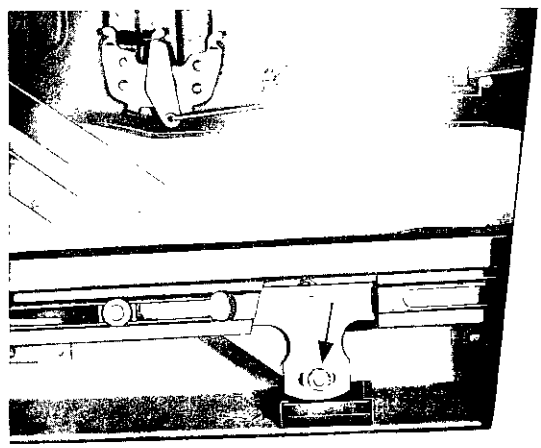
6. Install door well weather seal. Place window glass in door well and attach to the regulator.

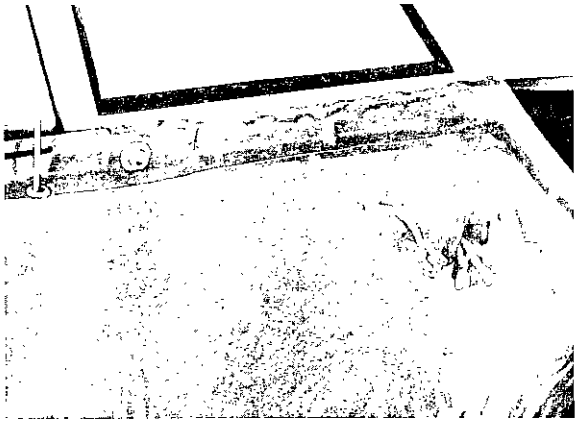
7. Insert door window frame in door and seal along the outside and inside flanks of top door edge with black, non-hardening putty. Fasten the frame in such position that sufficient pressure will be exerted against the door weatherstrip.

   NOTE:
   Do not bend the window frame to fit.

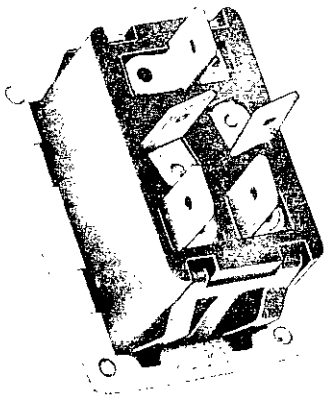


8. Check window regulator for proper operation and free movement. If necessary, readjust regulator with adjusting screws so that the top edge of the window is parallel with the top part of the window frame.

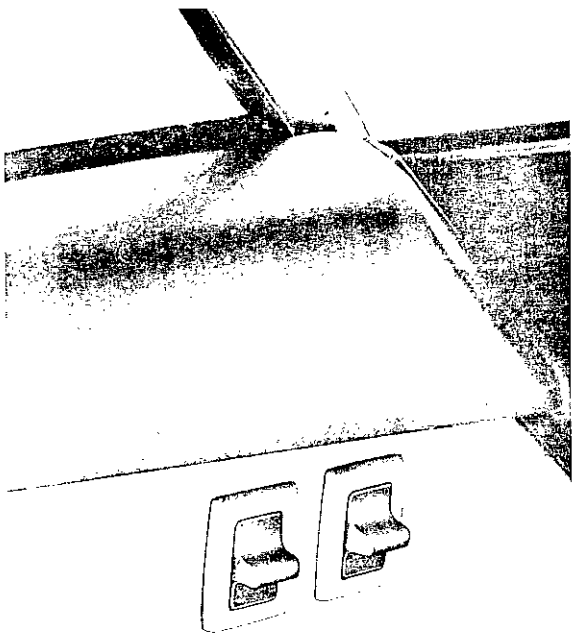




9. Glue the sealing foil in leak-free. Cut out a section in the toggle switch area.



10. Install door inner panel, armrest with inner door release, door pocket, folding compartment, door ledge rail, and outside window base chrome strip.



11. Connect toggle switches and install.

NOTE:
When properly installed, all toggle switches are positioned with the single connector facing up.
The rear toggle switch in driver's door actuates the passenger side window.

SEATS

General

Beginning with 1973 models, all standard and sport type seats have new longitudinal seat adjuster locks on both sides of the seat. The upholstery materials were also changed.

The seat adjuster controls remain unchanged. In the new standard seats, the seat pan has a control cable interconnecting lock pawls on both sides of the seat so that movement of the lock pawl on the center tunnel side of the seat is simultaneously transmitted to the lock pawl on the outer side of the seat.

This modification includes new seat rails with adjuster locking slots, Part # 911 521 051 01, for installation along the longitudinal side members.

In the new sport seats, the twin adjuster locks are locked by two pawls mounted on a bar so that the pawls engage the rail locking slots on both sides simultaneously.

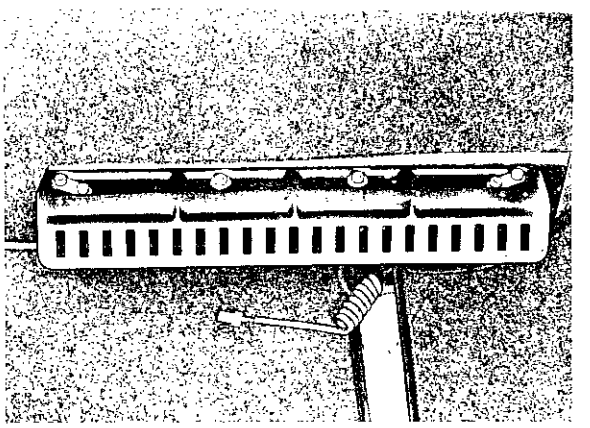
Installation date for the new standard seats:

July 24, 1972

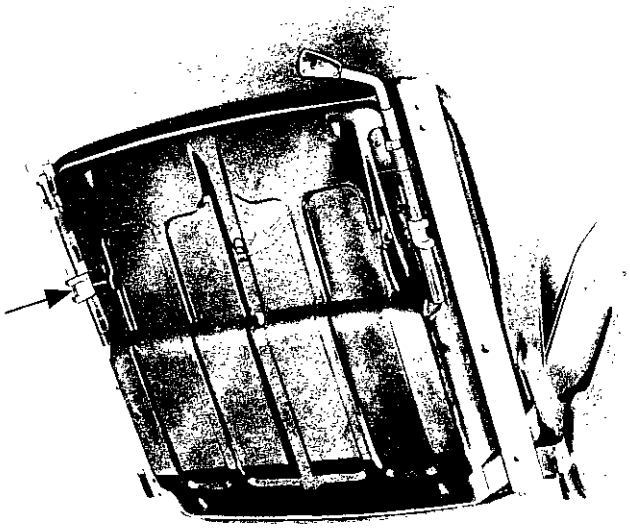
Installation date for the new sport seats:

October 16, 1972

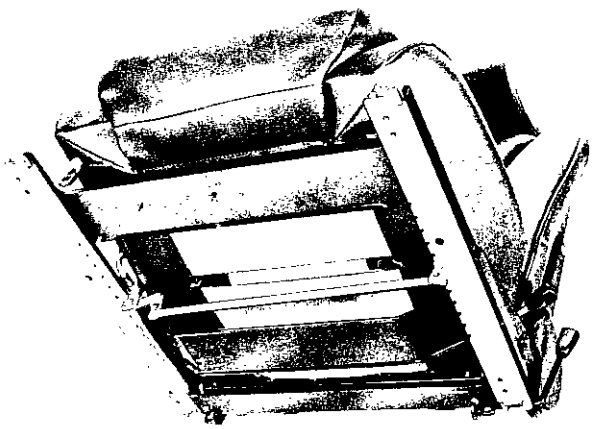
Seats with changed upholstery materials are installed from August 1972.



Seat rail support with seat contact cable



Standard seat - right side



Sport seat - right side

Installing Seats

1. At first, tighten seat rails only lightly. Check seat adjustment positions throughout the entire position range to ensure that the lock pawls engage and the seat moves easily on the rails. The seat adjusting lever must return into its normal position by itself. If this is not the case, reposition the seat rails.

2. Torque all seat retaining bolts in seat rails and seat rail supports to 1.2 - 1.4 mkp.

3. Recheck seat repositioning.

REMOVING AND INSTALLING OIL FILLER LID AND CONTROL

General

Beginning with 1972 models, oil tanks in all Type 911 vehicles are located under the right rear fender, adjacent to side member and wheel housing. The tank is fastened with retaining straps. The lid lock support was being welded to the oil filler pan until September 24, 1971.

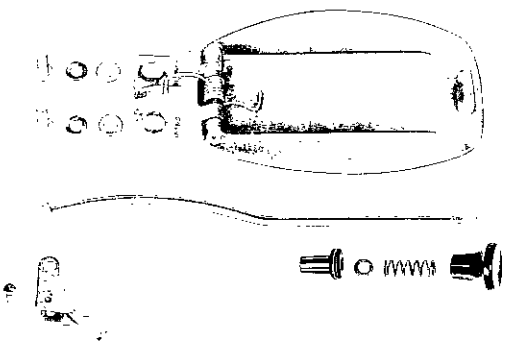
Removing

1. Open lid, remove screws, and take lid off.
2. Detach remote control rod from connecting clip in lock lever and remove. Take grommet out.
3. Remove cotter key and clevis pin from the lock lever.
4. The bolt-on lock support can be detached only when the oil tank is removed (2 x M5 nuts).



Installing

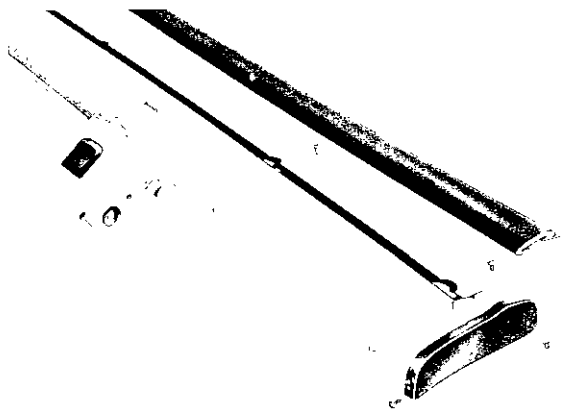
1. Position oil filler lid, together with M6 x 15 screws and spring washers, lightly tightening screws. Align lid and tighten retaining screws.
2. Insert rubber grommet in door lock post.
3. Replace connecting clip if damaged. Install lock lever.
4. Connect remote control rod. Install washer, spring and control knob from the door lock post side.
5. Close oil filler lid. Bend lock lever as required.



REMOVING AND INSTALLING ROCKER PANEL COVER

Removal

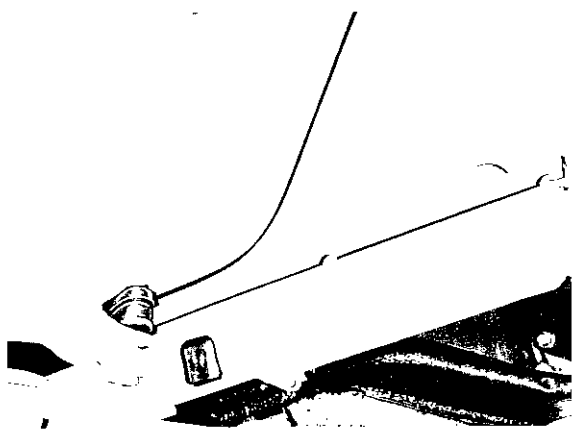
1. Remove end pieces from both ends.



2. Take rubber strip off. Remove cover from jacking point.

3. Remove sheetmetal screws from top and bottom parts, take rocker panel cover off.

Installation is accomplished in reversed order.



NOTE

Insert one end of rubber strip onto the supporting rail, bend the strip tightly back, and slide it onto the supporting rail. The upper lip must rest closely to the body. If necessary, straighten supporting rail.

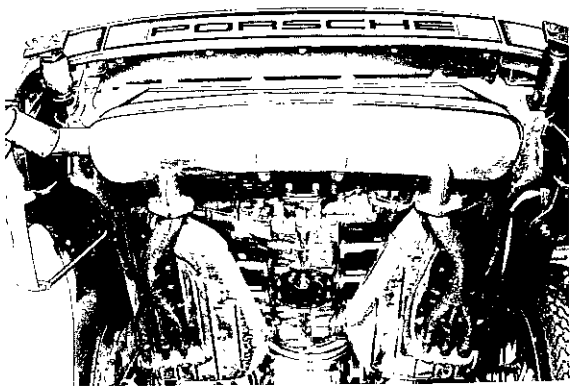
REMOVING AND INSTALLING END PANEL

General

Beginning with 1974 models, an end panel with reflectors and PORSCHE lettering is mounted at the rear cross panel. A sheetmetal shroud, serving as a heat shield, is located below the panel; it is inserted above the muffler and secured with bolts.

Removal

1. Remove rear bumper.



2. Unscrew heat shield and remove.

3. Remove self-locking nuts, washers, and rubber spacers.

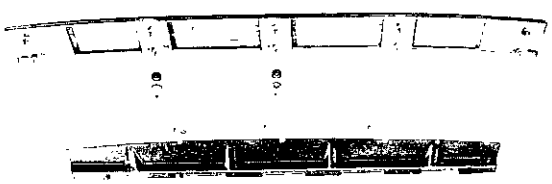
4. Remove end panel.

Installation

1. Lightly glue contoured rubber strip underneath.

2. Insert end panel, watching for equal side and height alignment with the tail lights.

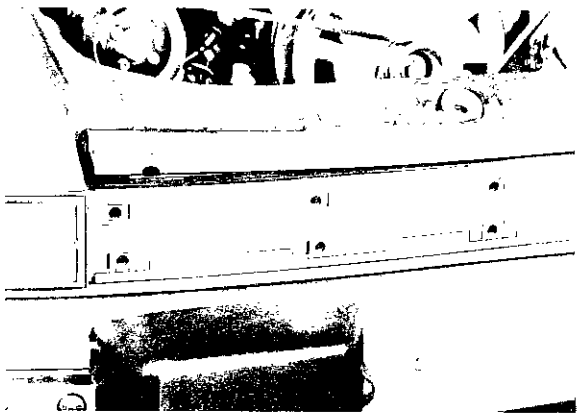
3. Insert plastic washers, rubber spacers, and washers on the mounting studs and secure with self-locking M 4 nuts. Check installed location and correct if necessary. Moderately tighten nuts cross-wise without creating stresses.



4. Insert heat shield and secure with bolts.

5. Install bumper.

REMOVING AND INSTALLING TAIL PLATE AS FROM 1978 MODELS





As from 1978 models the tail plate is attached to the tail panel with 10 clips, Part No. 999 591 447 02.

This facilitates installation, in that the bumper and heat guard do not have to be removed.

Square holes (previously slots) are punched in the tail panel to take the clips.

Removing

1. Cover tail panel above plate with adhesive tape to prevent damage on the paintwork.

2. Use pertinent tools (screwdriver, putty knife, etc.) to pry tail plate out of clips, first top and then bottom.

Note

Only apply pressure at reinforcements of plate to prevent damage on plate. Be careful not to injure coat on back of reflector area by scratching, since otherwise the reflecting effect will be impaired.

3. Take clips out of tail panel, replace damaged clips, straighten tail panel if necessary and eliminate paint damage.

Installing

1. Insert clips into tail panel.

2. Hold tail plate in position, align clips with reinforcement pins and press on tail plate up to stop.

LETTERING FOR CARRERA VEHICLES

Notes

The following points must be observed to ensure that the lettering adheres firmly to the paint:

1. Wash paint surface, removing wax, etc, with clean cleaning solvent. Dry the paint surface.
2. Do not affix the lettering in cold or damp weather. The temperature of the vehicle and surrounding air should be about +20°C.
3. Side lettering should be attached by two persons.

Affixing "Carrera" Side Lettering

1. Mark front and rear location of lettering above door lower edge.



2. Peel off backing foil from the adhesive side.



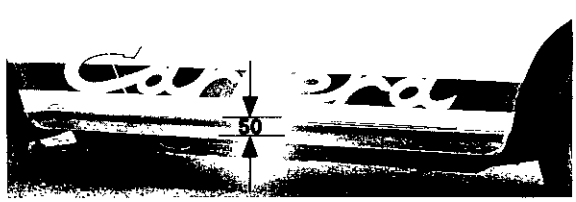
3. Left door: Align starting letter "C" 1 cm behind the forward door edge and glue on. Stretch the foil forward and back, and press into place.

   Right door: Align point of letter "a" at the forward door edge and glue on. Stretch the foil and press into place.

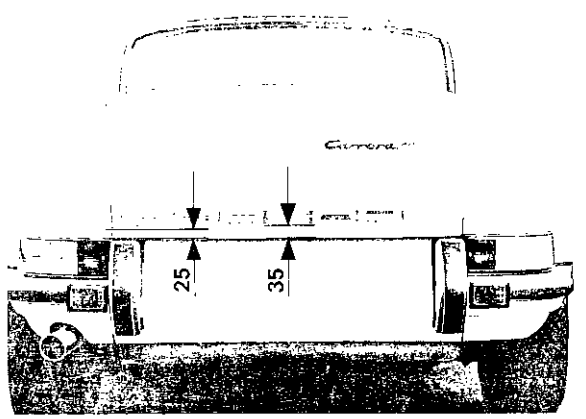


4. Press lettering areas smooth in all directions, then remove top foil.

5. Trim the lettering with a sharp knife, along the fender contour in front, along the door edge in rear, and along the wheel cutouts. Press end sections into place.



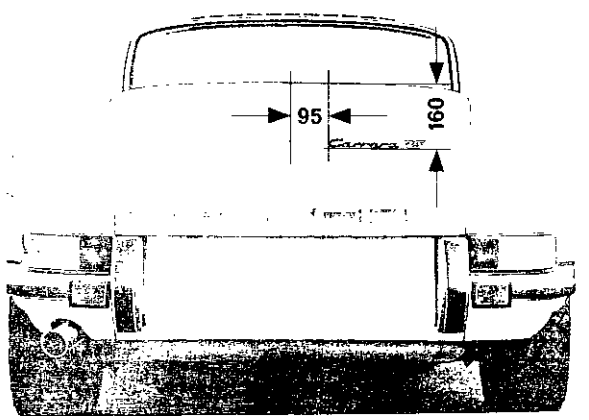
6. Puncture air bubbles in lettering with a needle and press smooth.



Affixing "Porsche" Lettering on Engine Compartment Lid

1. Mark location of the lettering 25 mm from bottom edge of lid on both sides, and 35 mm from bottom of lid in the center.

2. Peel off backing foil and affix the lettering as marked. Press it smooth and peel off top foil.



Affixing "Carrera RS" Lettering on Lid Spoiler

1. Mark location of the beginning of the lettering 160 mm below the spoiler inner edge, and 95 mm to the right of the lid center.

2. Peel off backing foil and glue the lettering optically horizontal to the right.

Colored Lettering

Carrera vehicles painted Grand Prix white are furnished with lettering in colors matching the respective wheel color (red - blue - green). All other vehicles are furnished with black lettering.

Removing Damaged Lettering

Heat the lettering with air heaters, infra-red lamps, etc, to the point where it can be peeled off without pulling the paint off in the process. Wash remnants of adhesive off the paint surface with cleaning solvent.

Removing

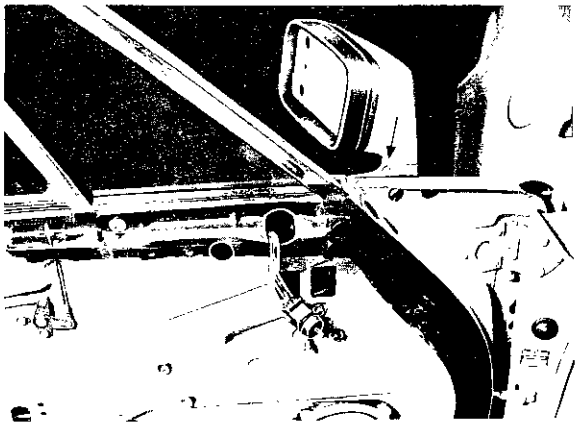
1. Use putty knife to mirror glass clips out of carrier plate. Carefully detach the wire terminals from the glass.

2. Remove the 3 Phillips head screws through the openings in carrier plate. Take out carrier plate and disconnect socket/plug.

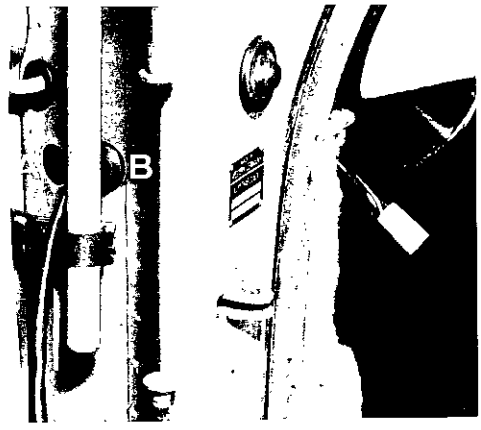
3. Unscrew mirror housing at mirror arm.

4. Note color of wires in socket. Use a pointed tool (scriber) to press in the tongues of each wire terminal and pull out the wires.

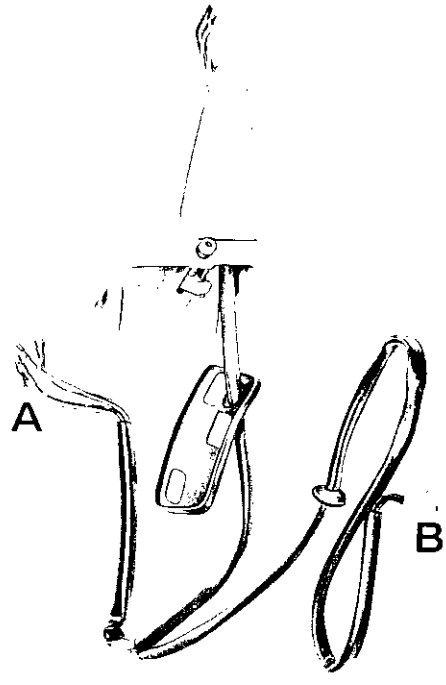
5. Unscrew Allen head screw on mirror base until the mirror base and gasket can be removed.



Note: If it is necessary to take the harness out of the door, remove the inner door trim and bend open the cable clamp behind the top door hinge.
The door must also be removed. First separate the connector in the side panel storage pocket.



A - Mirror cable B - Loudspeaker wire



A - To operating switch B - To inside of car

INSTALLING

The following points are important.

1. Use the cable clamp (inside door behind the top hinge) to hold the harness away from the teeth of the window regulator.

2. Tighten the clamping jaw with the Allen head screw until the mirror base is held tight.

3. Observe wire colors when assembling socket.

4. Wrap foam tape around socket/plug and insert it through oval opening in mirror housing so that the mirror movement is not restricted.

   Note: Check operation before attaching mirror because the clips and terminals on the mirror glass are easily damaged.

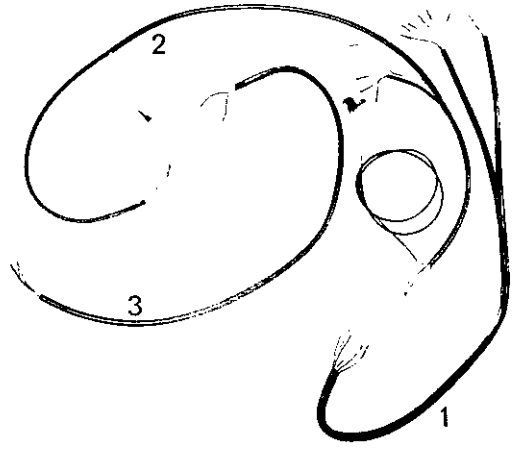
5. Install operating switch on trim strip so that the switch pin engages in bore of trim strip.

SERVICE INSTALLING EXTERIOR MIRROR ON PASSENGER'S DOOR

Note

These instructions apply to all models equipped with an exterior mirror, which is adjusted on the inside.

Three new harnesses are required.
1 - Driver's door harness
2 - Luggage compartment floor harness
3 - Passenger's door harness



Installing

1. Paint mirror set to match car body color.

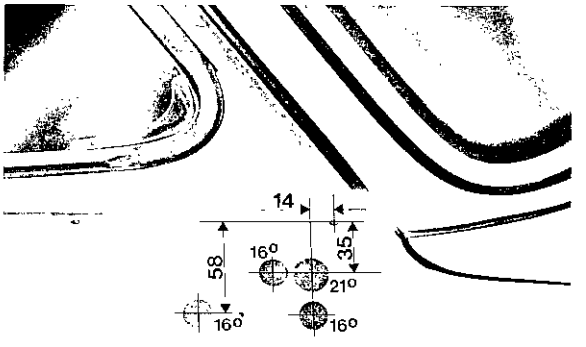
2. Install guide tube with spring and centering disc, and tighten to torque of 15 + 3 Nm (1.5 + 0.3 kpm). (Installed mirror can then still be turned via the cams.)

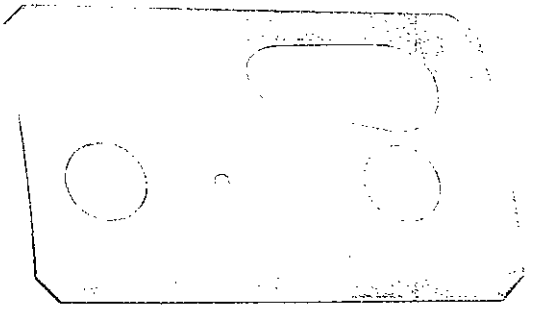


3. Pull harness into mirror.

4. Pull off door waistline strip. Remove inside trim on doors (also loudspeaker if applicable).

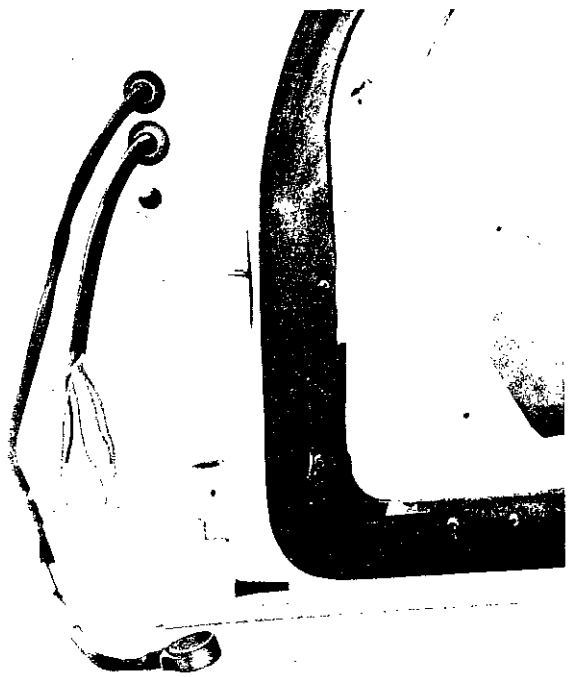
5. Drill holes in outside door panel according to dimensions and with reinforcement plate - for right door.



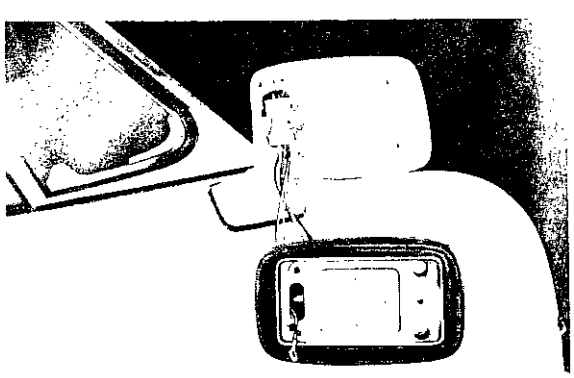


6. Install reinforcement plate and secure with pop rivets.

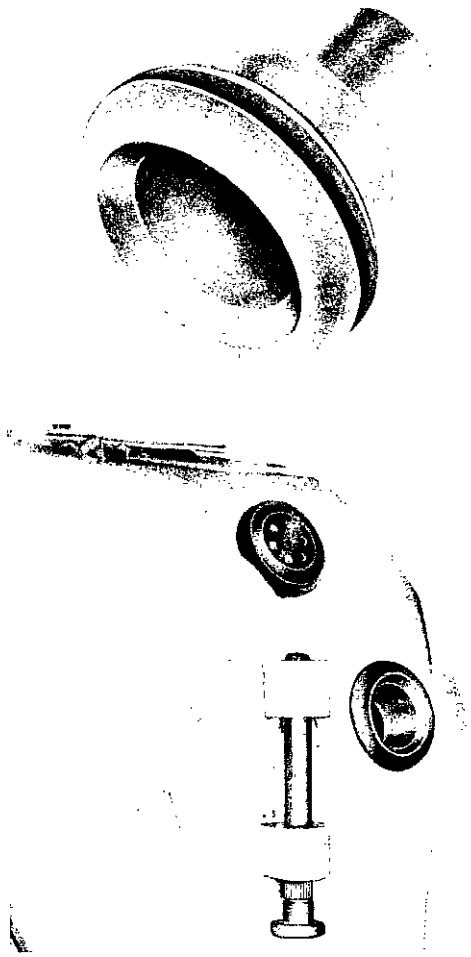
7. Lift out door and mount mirror base with gasket on door. Glue cap on mounting screw head. Guide set of wires through inside door panel and insert rubber grommet.



8. Press plug together and hold with self-adhesive foam tape. Note colors of wires and wiring diagram. Mount cover frame to mirror glass carrier. Connect and insert mirror glass.



9. Insert wire grommet into door recess.

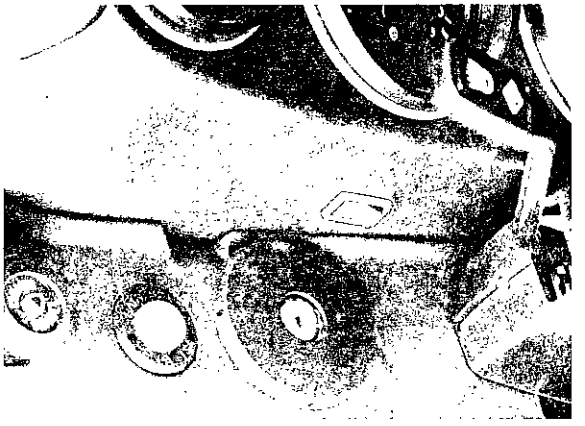


10. Install door and guide wires to luggage compartment floor plate. Install coupling plug according to wiring diagram.

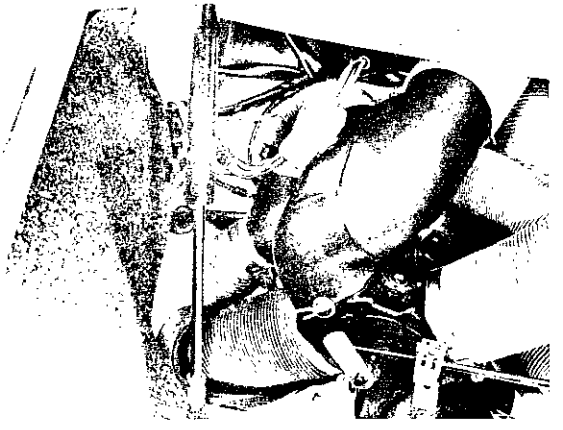
11. Disconnect wire harness on luggage compartment floor plate at rear window defogger switch and combination instrument, and pull out. Pull in and connect new wire harness; remove instruments for this purpose.

12. Remove driver's door, and insert and connect new exterior mirror wire harness.

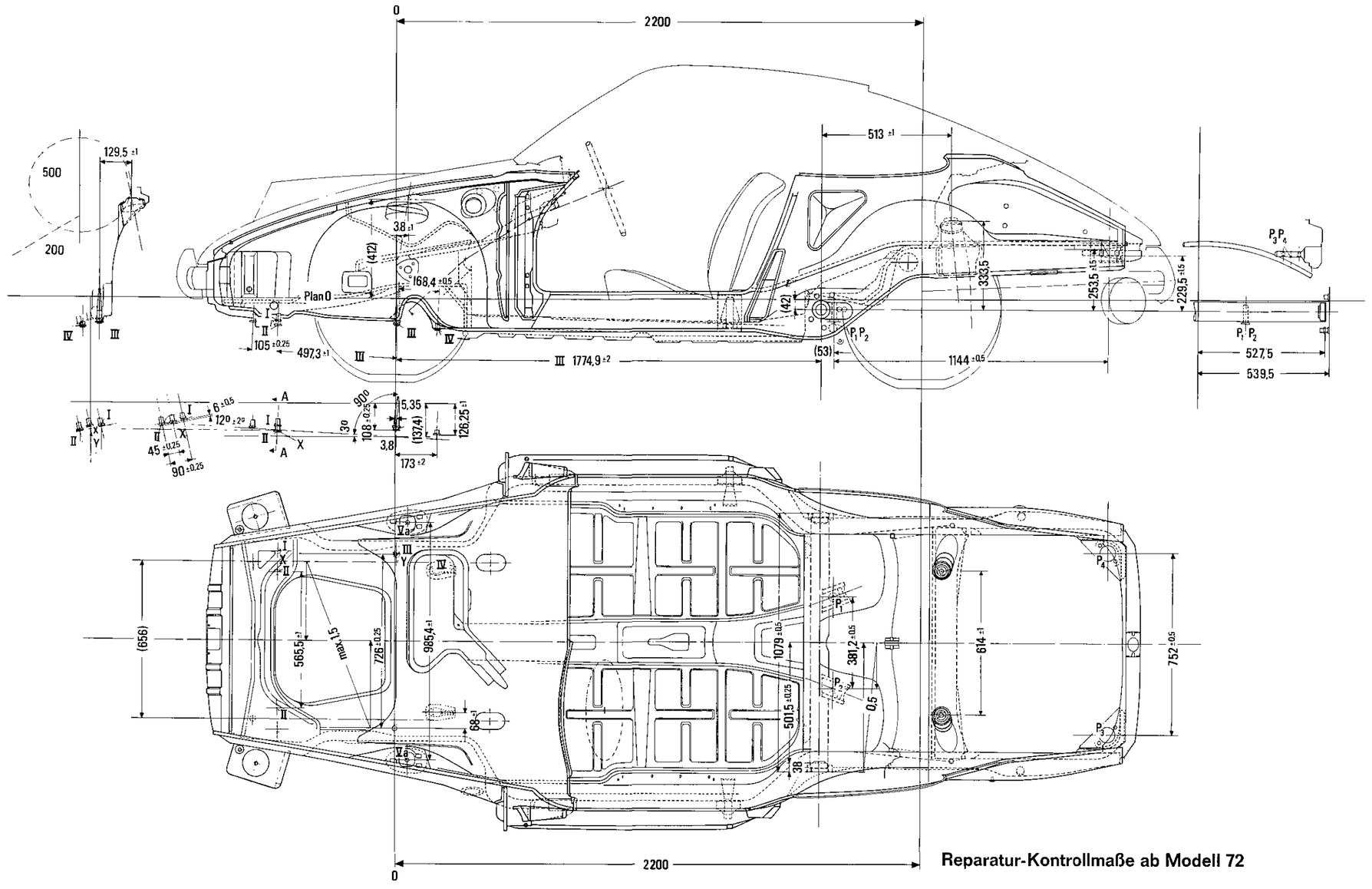
13. Cut a hole in trim of instrument panel, connect and install switch.



14. Connect couplings of wire harnesses in luggage compartment floor plate on left and right sides.



15. Attach door trim and check operation of mirror controls.



Reparatur-Kontrollmaße ab Modell 72

Check dimensions for bottom groups from model 72 on

Cotes de contrôle pour le groupe de fonde à partir du modèle 72

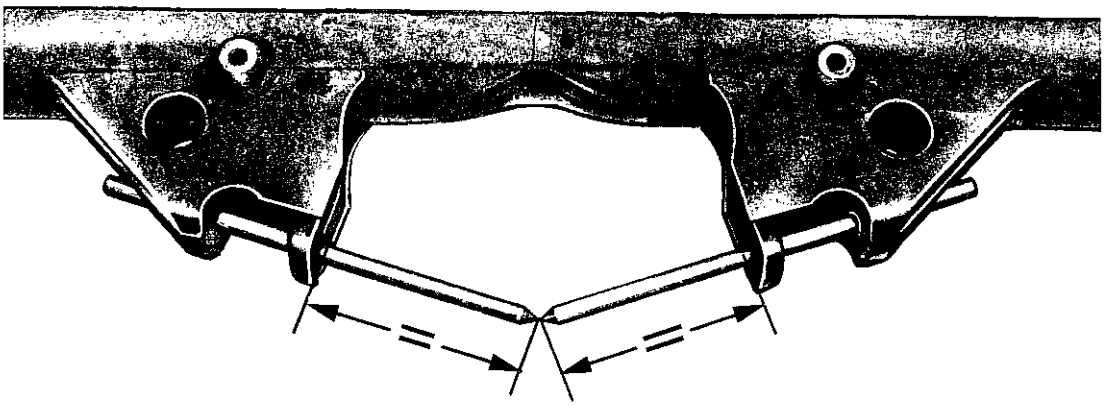
CHECKING REAR AXLE CROSS TUBE

The rear axle tube for Types 911 and 911 Turbo can be inspected for deformation with a locally made tool and a torsion bar.

Two pieces of round steel bar, 13 mm (1/2 in.) dia. x 300 mm (12 in.) long, are required for the locally made tool.

Machine one end of each bar to a point of about 60^{o}.

The rear axle cross tube can be inspected after removal of the engine and rear axle.



1. Insert both round bars through the trailing arm mounts. If both steel bar tips meet each other with the same distance from the mount to the tip, the mounts are okay. Deviations up to max. 3 mm (1/8 in.) are permissible.

2. Guide torsion bar into splines of cross tube on one side. Bar must be centered in tube with distance between bar and tube equal around entire circumference. Repeat procedure on other side. Slight deviations of about 3 mm (1/8 in.) are permissible.

INSTRUCTIONS FOR WELDING GALVANIZED SHEET METAL - 1976 MODEL

For the 1976 model the entire body is made of steel sheet galvanized on both sides. The zinc thickness varies between 7.5 and 20 micromillimeters depending on the corrosion possibility (except the Coupe's roof). Together with other protective measures, such as cavity spraying, undercoating and modern painting techniques, the body has adequate protection against corrosion.

This means seversal changes for repairs on sheet metal parts.

- The zinc coat should be ground down as little as possible or damaged in any other manner.
- Never use acids for cleaning.
- Use welding techniques which cause the least possible damage to the zinc coat. If at all possible replace welding with other welding techniques - resistance welding (spot) - gas-arc welding/brazing. Painting can be performed with the same materials as for steel sheet.
  Below are several explanations about recommended welding techniques.

RESISTANCE WELDING

Several points must be observed when employing resistance welding (spot welding).

- Due to the improved electrical conductivity of galvanized sheet in comparison to blank steel sheet, the current intensity will have to be increased to attain the required welding temperature of 1300° C/ 2372° F.
- The welding time should be as brief as possible to keep the melting zone around the welding spot small. This will also mean that less zinc will stick to the electrodes and thus longer operating times are assured before maintenance becomes necessary.
- Hard copper (copper-chrome-zirconium alloys) is the best material for electrodes. It has high heat physical properties (above 400° C/752° F); maximum service life up to 15,000 spots.
- The electrode welding surface shape can be Shape 1 or Shape 2 (see sketch).



Fig. 1

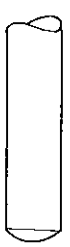


Fig. 2

- Depending on the thickness of the material, the max. welding spot diameter should be 4 to 5 mm (5/32 to 3/16 in.) depending on pressure applied to the electrode holder.
- Butt weld spots are not acceptable because these welding spots do not have sufficient strength.
- Cool-off periods must be scheduled if welding equipment without water cooling is employed, so that the electrodes are not deformed.

- Never make spot welds on edges of sheet metal (spatter formation).

- Clean and dress electrodes on their flanks and tip surface only if there is a heavy coat of deposits. The tip surface of the electrodes becomes harder from spot welding; the layer underneath however becomes softer.

- The distance between spots should be about 20 mm (3/4 in.). If the spots are too close together, the welding current will reduce the strength of the welding spots.

- Electrode arms should be as short as possible to increase the pressure at the weld point.

GAS-ARC WELDING

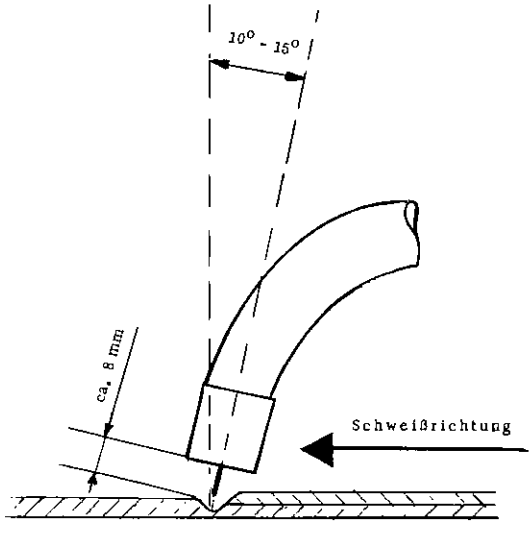
For body repairs the only type of gas-arc welding acceptable is the MIG method (Metal Inert Gas) with carbon dioxide (CO_2) or mixed gases, e.g. corgon (argon, CO_2, O_2). Good welding is possible with these types of gases. Mixed gases increase the welding speed and the seams remain ductile.

Additional information for MIG welding galvanized steel sheet.

- Clean as much of the area to be welded as possible.
  Optimum welding results require that the equipment be adjusted correctly.

- Check adjustment by listening if the arc has a steady crackling or hissing sound.

- Hold the torch at an angle of 75-80° and approximately 3/8 inch away from the metal (dependent on equipment being used).



If adjusted properly the gas shielding will surround the melting zone and blow away the zinc oxide vapors produced.
To keep welding distortion to a minimum, the work should be allowed to cool down after welding a long seam.

- The most suitable welding wire is of soft quality, 0.8 mm (0.031 in.) in diameter and has 0.8 % silicon and manganese additives.
- The gas shielding flow rate should be set at about 17 cu. ft. per hour.
- For large scale welding adequate ventilation must be provided.
- Welding seams, if accessible, must be protected with zinc paint, cavity or undercoating materials.

COLOR SELECTION - FROM 1972 MODEL

General

Beginning with 1972 models, a new numbering code is used in identifying paints on the paint nomenclature plate. The change was necessary to ensure right shipment of paint when ordered for given vehicle.

The new color code on the vehicle paint data plate is identical with the order numbers in the color catalogue.

Identification of the new 5-digit code numbers on the paint nomenclature plate:

Example: 131 9 2

1.	Three-digit paint number	131 9 2	light ivory
2.	Place of application	131 9 2	Porsche company
3.	Paint manufacturer	131 9 2	Glasurit company

Standard colors from 1972 model:

131	light ivory
117	light yellow
114	signal yellow
018	tangerine
022	bahia red
025	aubergine
225	viper green
325	albert blue
415	sepia brown

Optional colors from 1972 model:

	019	gulf orange
	024	fraise
	116	signal orange
	132	ivory
	213	irish green
	218	bush green
	226	lind green
	227	light green
	326	icing blue
	328	gulf blue
	329	sea blue
	341	lilac
	414	olive
	622	beige grey
	700	black

Metallic colors:

to Sep-1st	133	metallic gold
from Sep-2nd	140	VW-metallic gold
	224	metallic green
	324	metallic blue
	330	metallic gemini
to Sep-2nd	925	metallic silver
from Sep-3rd	936	VW-metallic silver
	999	optional colors to sample

COLOR SELECTION EFFECTIVE WITH 1974 MODELS

Standard colors beginning with 1974 models:

027	India red
042	Peru red
117	Light yellow
137	Yellow green
156	Orange
336	Mexico blue
408	Cockney brown
516	Sahara beige
908	Grand-Prix white

Optional colors beginning with 1974 models:

009	Carmine red
024	Fraise
025	Aubergine
116	Signal orange
139	Blossom yellow
213	Irish green
227	Light green
253	Space green
328	Gulf blue
341	Lilac
351	Dark blue
354	Acid blue
414	Olive
700	Black

Metallic colors:

036	Salmon dust
250	Silver-green diamond
335	Gemini metallic
406	Comet shower
432	Copper diamond
936	Silver metallic
249	viper green diamond
334	metallic blue

PAINTS - 1976 MODEL

Standard Colors:	027	indian red
	106	talbot yellow
	107	continental orange
	117	light yellow
	258	speedway green
	305	arrow blue
	408	cockney brown
	700	black
	908	grand prix white
Optional Colors:		
	009	carmine red
	042	peru red
	137	yellow green
	213	irish green
	260	daphne green
	360	cappa florio
	516	sahara beige
Metallic Colors:		
	264	viper green diamond
	265	oak green
	266	silver green diamond
	304	minerva blue
	436	diamond sarah
	443	brown copper diamond
	936	silver
	944	platinum diamond

Note: Some of the metallic colors have new color codes because of a finer bronze powder. E.g. silver green diamond before 250, now 266.

An extra "A" after the color code indicates an acrylic paint.

All of the listed colors are standard for the Turbo Carrera.

Caution: Most paints and their additives are combustible or explosive. Take every precaution when using them.

PAINTS - 1978 MODELS

Standard	027	india red
	106	talbot yellow
	107	continental orange
	260	sebring green
	273	fern green
	274	olive green
	305	royal blue
	408	chocolate brown
	451	mocca brown
	502	cashmere beige
	700	black
	908	grand prix white
Metallic	265	oak green
	275	light green
	304	caribe blue
	376	petrol blue
	443	copper brown
	936	silver

BODY PAINT COLORS FOR 1979 + 1980 MODELS

Standard Colors from 1979 Models:	027	india red
	106	talbot yellow
	273	olive green
	305	arrow blue
	408	cockney brown
	451	mocca brown
	502	cashmire beige
	601	lilac
	700	black
	908	grand prix white
Metallic Colors from 1979 Models:	265	oak green
	275	lind green
	30 T	light blue
	304	minerva blue
	376	petrol blue
	443	copper brown
	463	opal green
	464	tabacco
	708	black
	936	silver
Colors by Sample:	099	

RANGE OF BODY PAINT COLORS - 1981 MODELS

Standard Colors:		Special Colors:	
guards red	027	metallic moss green	20C
alpine white	182	metallic light blue	30T
mint green	20A	metallic minerva blue	304
royal blue	305	metallic pacific blue	31G
mocca black	451	metallic rosewood	474
bamboo beige	523	metallic platinum	655
black	700	metallic black	708
grand prix white	908	metallic wine red	895
caramel brown	524	metallic pewter	956

Metallic Paint

Wet-on-Wet Process

Until now, two different types of clear enamel with synthetic resin base were used in the course of repairs:

1.	80° C clear enamel	77 - 84 0503
2.	Two-component acryllic clear enamel with catalyst	51 - 09168 40 - 22004

To simplifi painting process, only the two-component acryllic clear enamel with catalyst will be offered in the future.

The two-component clear enamel # 51 - 09168 will be available in 1 liter cans, and the catalyst # 40 - 22004 in 0.125 liter cans. This provides for an easy preparation of the two-component enamel in the right proportions.

This enamel can be air-dried or baked at 80° C.

Preparation: The spraying consistency is attained upon mixing.

Allow to age 15 - 20 minutes before applying.

Spraying pressure	5 atm
Nozzle size	1.2 mm
Application	1 1/2 - 2 cross-coats

Do not mix more enamel than can be used within a max. of 8 hours

The enamels should not be stored in excess of 1 year.

PAINTING TARGA ROLL BAR COVER

General Information

The Targa roll bar cover (rustproof steel) has a coat of flat black polyurethane textured paint. In addition to metal parts, polyurethane paint can be used on parts made of fiber glass (Targa removable roof) and rigid expanded polyurethane.
Polyurethane paint is extremely scratch and wear resistant, color fast and can be air dried.

Required for touch-up painting:

Polyurethane textured paint	Part No. 911 096 160 02
Polyurethane hardener	Part No. 911 096 220 04
Polyurethane thinner	Part No. 911 096 330 03

Procedure:

Clean and degrease new part.
Grind off all textured paint from damaged part, grind out and clean damage spot (s) as required.

Priming	Use Dupont 1005 (or equivalent) primer	
Initial coat	Mix polyurethane textured paint with hardener	
	Mixing ratio	5 : 1 or 7 : 2 parts by weight
	Spray viscosity	20 to 25 seconds
	Spray nozzle	1.5 mm dia (30 De Vilbiss or equivalent)
	Spray pressure	3 to 4 bar (45 - 60 psig)
	Application	1 cross pattern
	Flash off time	15 to 20 minutes in open air
Final coat	Spray viscosity	45 to 50 seconds (using pressure gun)
	Spray nozzle	1.5 mm dia. (30 De Vilbiss or equivalent)
	Spray pressure	0.8 to 1.0 bar (12 - 15 psig)
	Application	1 cross pattern

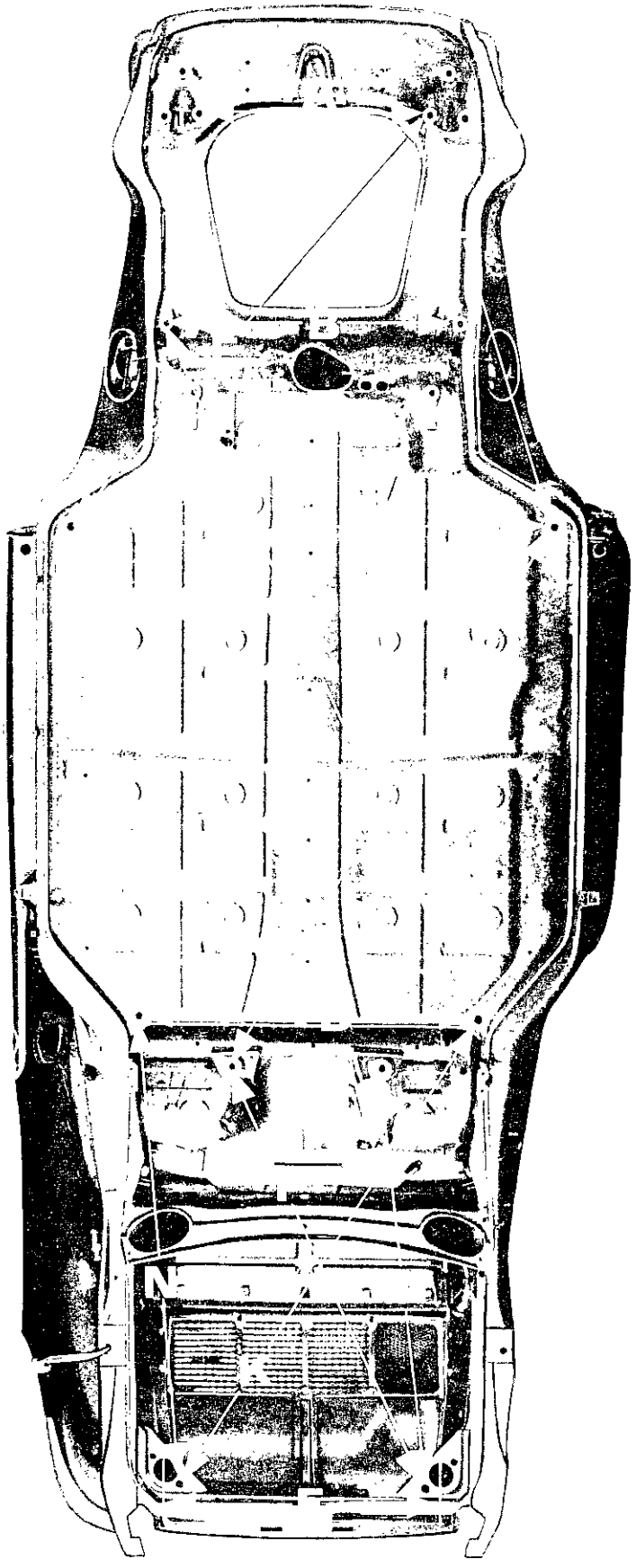
Note: Check texture pattern by spraying a test panel.

Drying	Air drying	approx. 12 hrs. at 20° C/68° F
	Force drying	30 to 40 min. at 80° C/176° F

Complete hardness is reached in 5 to 7 days.

SHOP MATERIALS FOR BODY REPAIRS

Hydraulic 10 ton straightener with accessories	
Celette straightening bench	
Set of attachments	ENS 77.360
Universal anchor	ENS 937.900
Front end gauge	P 863 + P 863 a
Inert gas welder	
Resistance spot welder	
Gas welder	
Hand grinder with inserts (grinding wheels and stones, steel brushes, cutters)	
Disc grinder	
Angle grinder with accessories (180 mm dia. cutting wheels and grinding paper)	
Pneumatic hammer with inserts	
Beam compass	
Bubble level	
Shoulder pliers	
Air gun	
Equipment and materials	for permanent undercoating
	for cavity sealing
	for sealing



Dimension	Location	mm	inch
A	Control arm mounts	565.5 ± 1	22 1/4 ± 1/32
B	Auxiliary support	726 ± 1	28 1/2 ± 1/32
C	Front floor plate	1200 ± 2	47 1/4 ± 1/16
D	Rear floor plate	850 ± 2	33 1/2 ± 1/16
E	Engine brackets	752 ± 1	29 19/32 ± 1/32
F	Front floor plate - control arm mount	1327 ± 3	52 1/4 ± 1/8
G	Rear floor plate - auxiliary support	1868 ± 3	73 1/2 ± 1/8
H	Axle tube/transmission mount - front floor plate	1550 ± 3	61 1/32 ± 1/8
I	Axle tube/transmission mount - engine bracket	1323 ± 5	52 3/32 ± 3/16
K	Rear floor plate - engine bracket	1557 ± 5	61 5/16 ± 3/16
L	Front floor plate - control arm mount	1041 ± 3	41 ± 1/8
M	Front floor plate - rear floor plate	1215 ± 2	47 27/32 ± 1/16
N	Rear floor plate - engine bracket	1355 ± 3	53 11/32 ± 1/8
O	Axle tube/transmission mount - engine bracket	1220 ± 3	48 1/32 ± 1/8

All dimensions are measured from center of holes.

Note

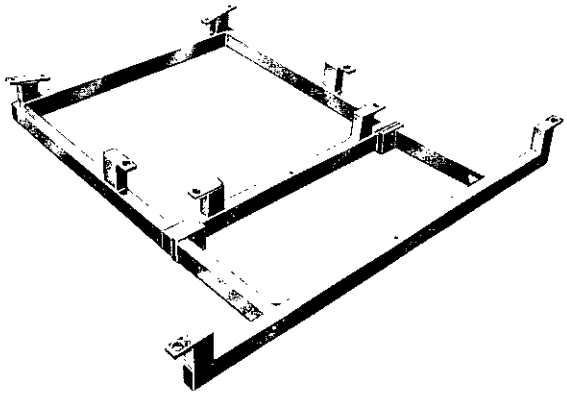
Dimensions to engine suspension points are measured diagonally.

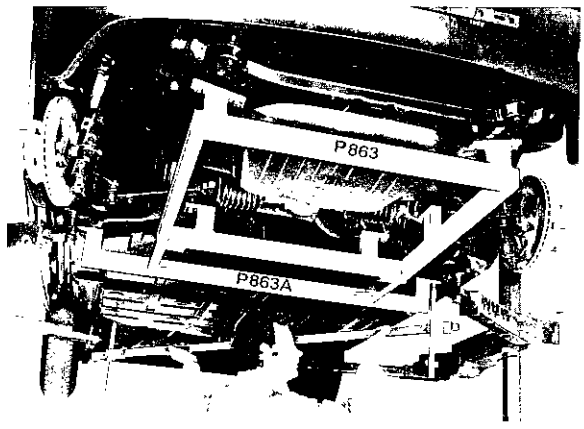
CAUTION

The difference between left and right longitudinal dimensions may not exceed the specified tolerances.

Floor Assembly Checkpoints and Front Body Gauges P 863 and 863a

As already announced in the 1975 Model Information, checkpoints are welded to the frame/floor assembly of 1975 models. These checkpoints and front body gauge P 863a (consisting of former gauge P 863 and an additional adaptor) make it possible to diagnose the damage quickly.





The gauge can also be applied to repair slight front end damage (Dents up to 10mm). It is no longer necessary to place a car with damage of this type on an alignment bench.

Installation of this gauge requires removal of the wheels, guards, carrier and control arms. As illustrated, the gauge is then bolted to the front axle holder points and front floor plate checkpoints.

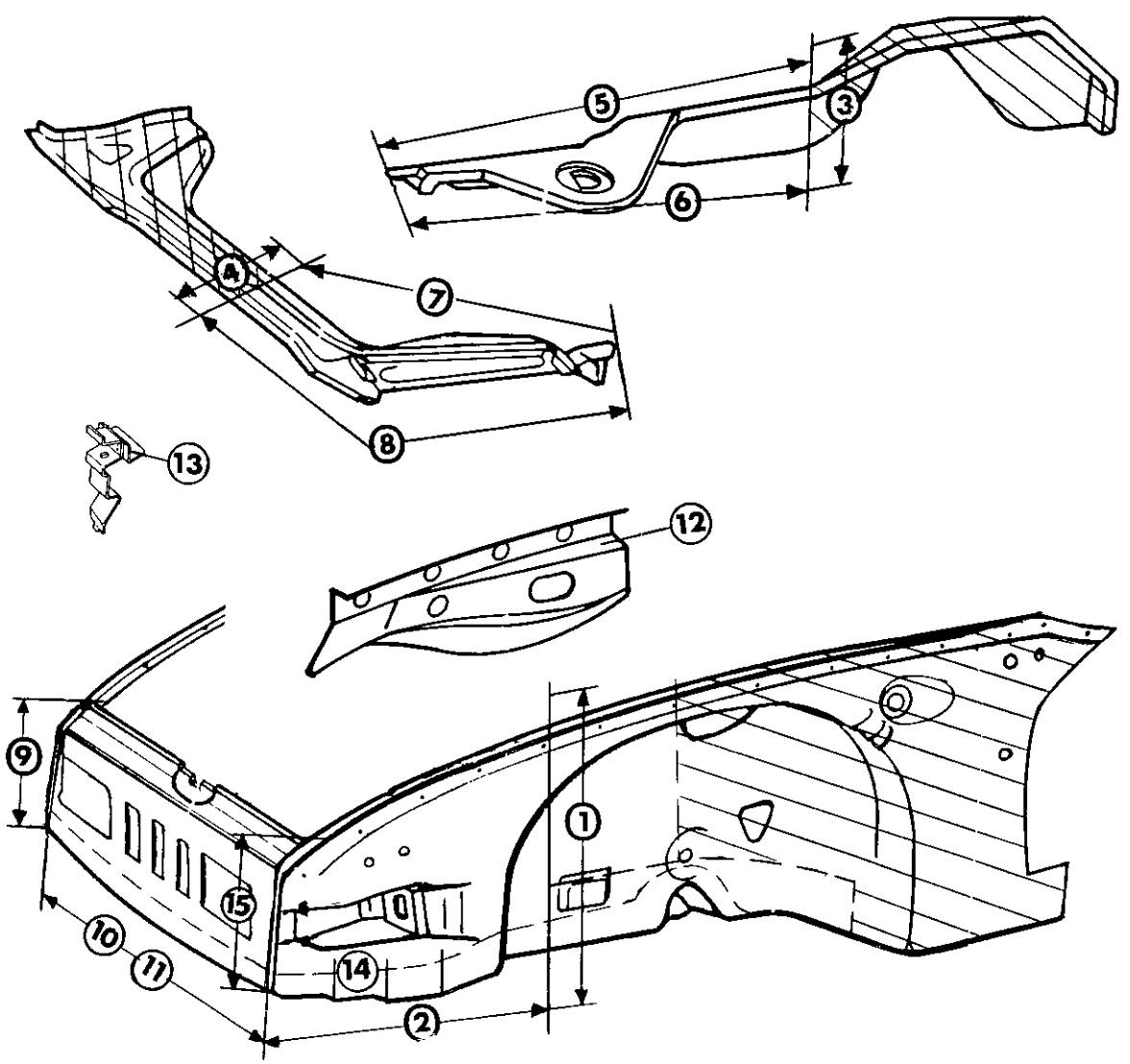
A surveyor's rod is used to measure the distances back to the floor plate checkpoints and rear axle tube holder points for the transmission, from the engine suspension.

Note! The gauge is for gauging only. It must be removed for aligning and welding operations to prevent distortion through body stresses.

The auxiliary carrier pin for Type 911 Turbo is installed 21 mm higher. When measuring with front end gauge P 863 the distance between upper edge of gauge and collar on auxiliary carrier pin must be 21 mm or, with adapter mounted on auxiliary carrier pin, 13 mm.

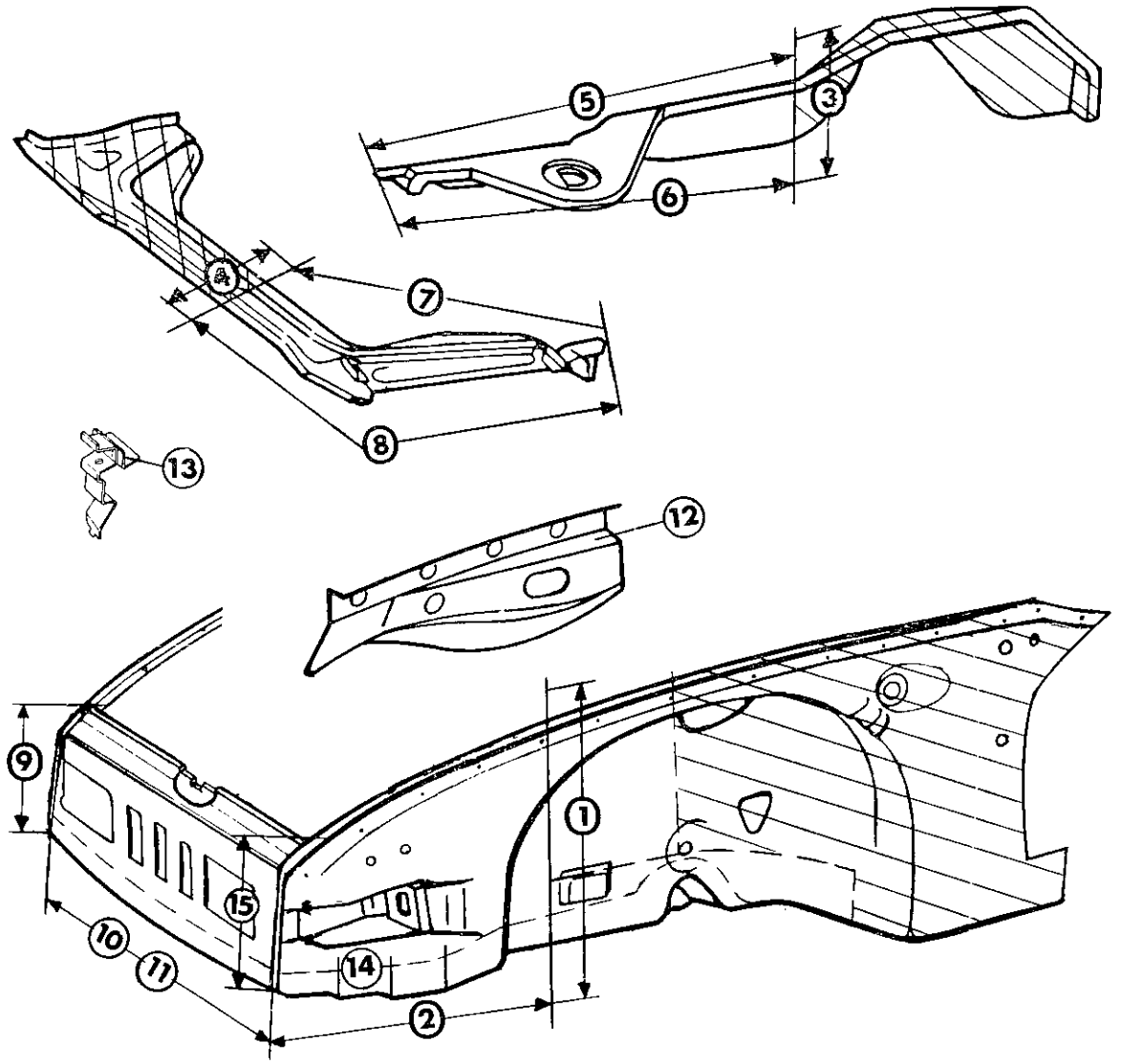
Replacing Part of Front Wheelhousing

Includes: Lock panel, front tank support and left or right tank support.



Replacing Part of Front Wheelhousing

Includes: Lock panel, front tank support and left or right tank support.



Replacing Part of Front Wheelhousing

Operation	Areas	Material
1. Separating	1, 3, 4, 9, 10, 12	Cutting disc
Chiseling	2, 5, 6, 7, 8, 10, 11	Pneumatic chisel or hand chisel
Remove metal scraps undercoating and paint	2, 5, 7, 8, 9, 10, 11, 12, 14	Welding torch, hand grinder and pliers
2. Preparing (new parts) Cutting and grinding	1, 3, 4	Cutting disc, hand grinder and metal cutters
Apply rust preventative	1-15	Paint
3. Welding		
Spot weld	2, 5, 7, 10, 12	Spot welder
Butt weld	3, 6, 8, 12	Spot welder
Weld	1, 3, 4, 9, 11, 13, 14, 15	MIG welder
Weld	hood and fender connection welded flush	Gas welder
4. Finishing Grinding	1, 4, 5, 7	Hand grinder
Welding seams	1-15 spots burnt through	Gas or MIG welder
Sealing	Inner and outer	Undercoating (asphalt - PVC basis)
Preserving	Cavities	Tectyl etc. (wax basis)

Replacing Part of Front Wheelhousing

1 - Damage Diagnosis
When the extent of damage cannot be defined exactly.
- Check floor plate assembly.
  Includes: Removing and installing front wheels, control arms, auxiliary support and protection plate.

2 - Alignment
Before the damaged parts are cut out, the dented portion is as close as possible aligned with hydraulic alignment equipment.

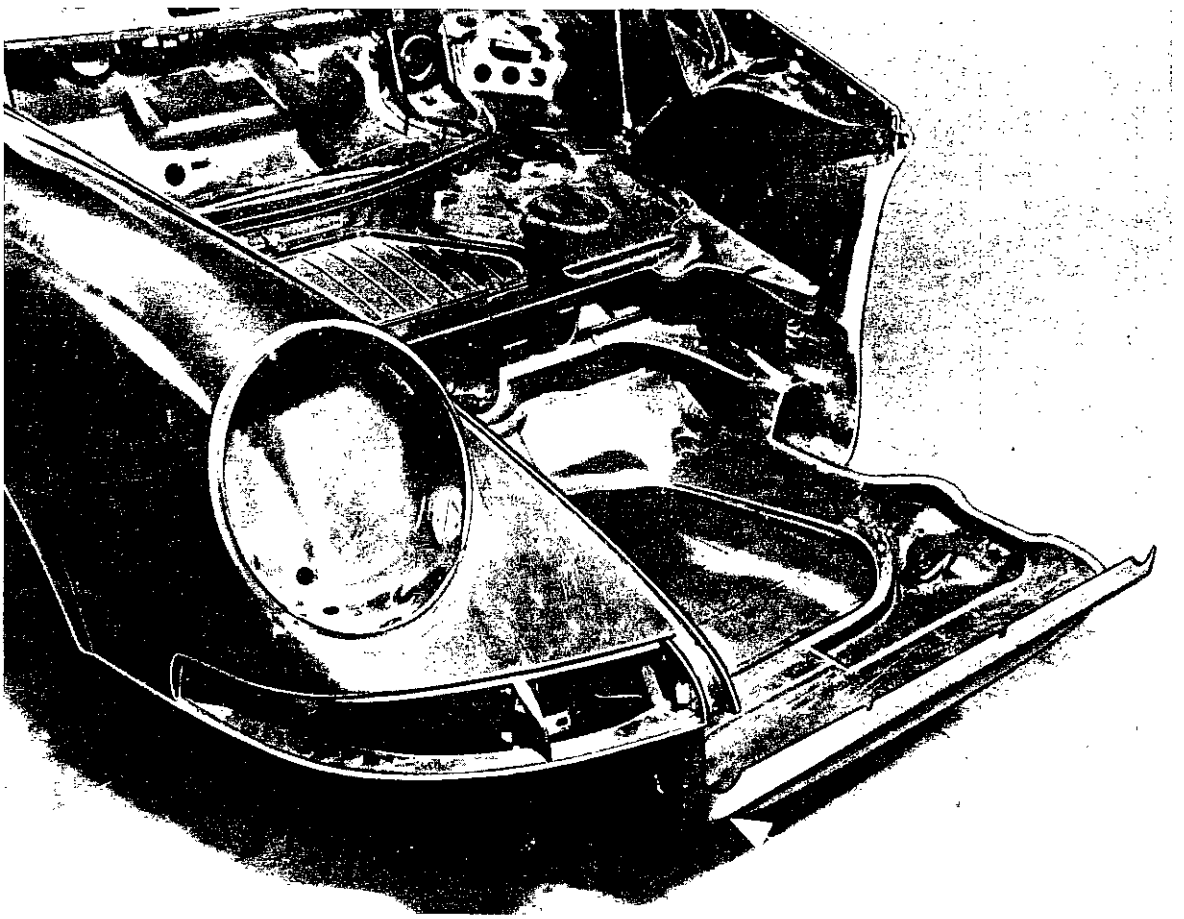
3 - Preparations
Dismantle front bumper
left front fender
right front fender (loosen partially)
front hood
lower hood lock and cable
front apron
electrical items as required

4 - Separation of damaged parts

Note: Cut out badly damaged parts instead of unbolting.

Replacing Part of Front Wheelhousing

4 a - Damaged parts can be separated in any sequence in accordance with the operations illustrated below.



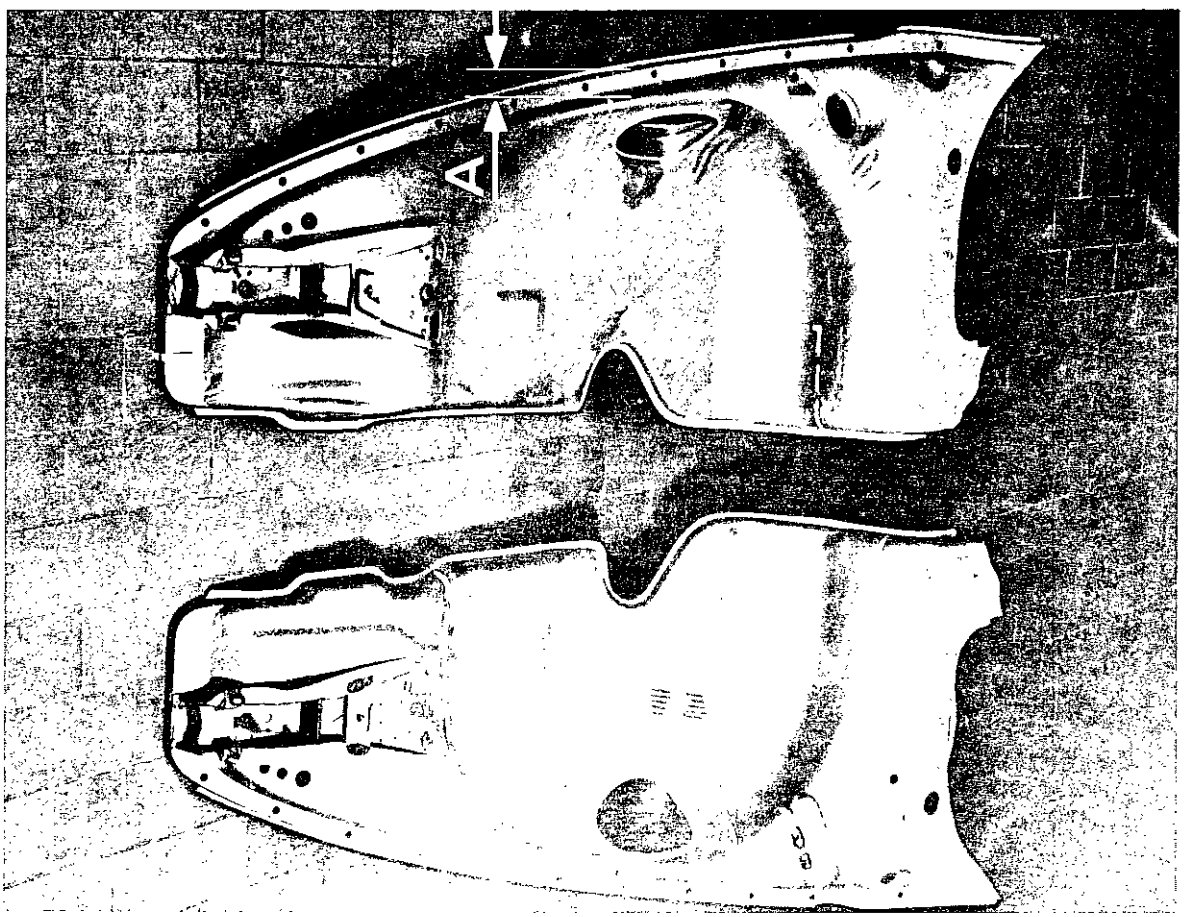
4 b - Remove remaining scraps of metal. Align and grind down mating surfaces and flange.

5 - Cut floor plate at remaining portion of wheelhousing far enough so that the lock panel can be stuck through (see arrow).

Replacing Part of Front Wheelhousing

6 - Check axle take-up points, aligning if necessary.

7 - Align and cut new parts.
(various cutting lines marked)

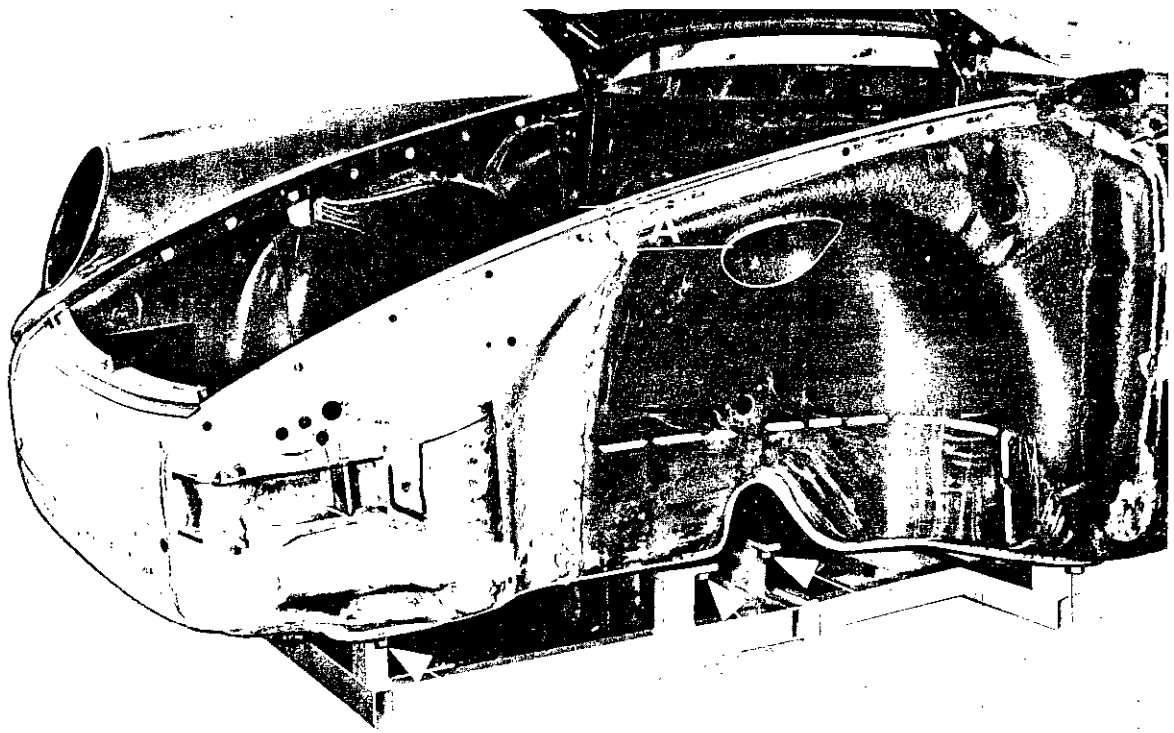


8 - Bolt front hood.

9 - Install lock panel cutting bottom left and right if necessary.

10 - Install wheelhousing panel so that it overlaps connector plate. Saw cuts in hood crease and fender mating surface and butt weld (Area A).

Replacing Part of Front Wheelhousing



10 a - If the wheelhousing was dented at the rear control arm bolting points and above, extend and weld the new part overlapping the dented section. See broken line.

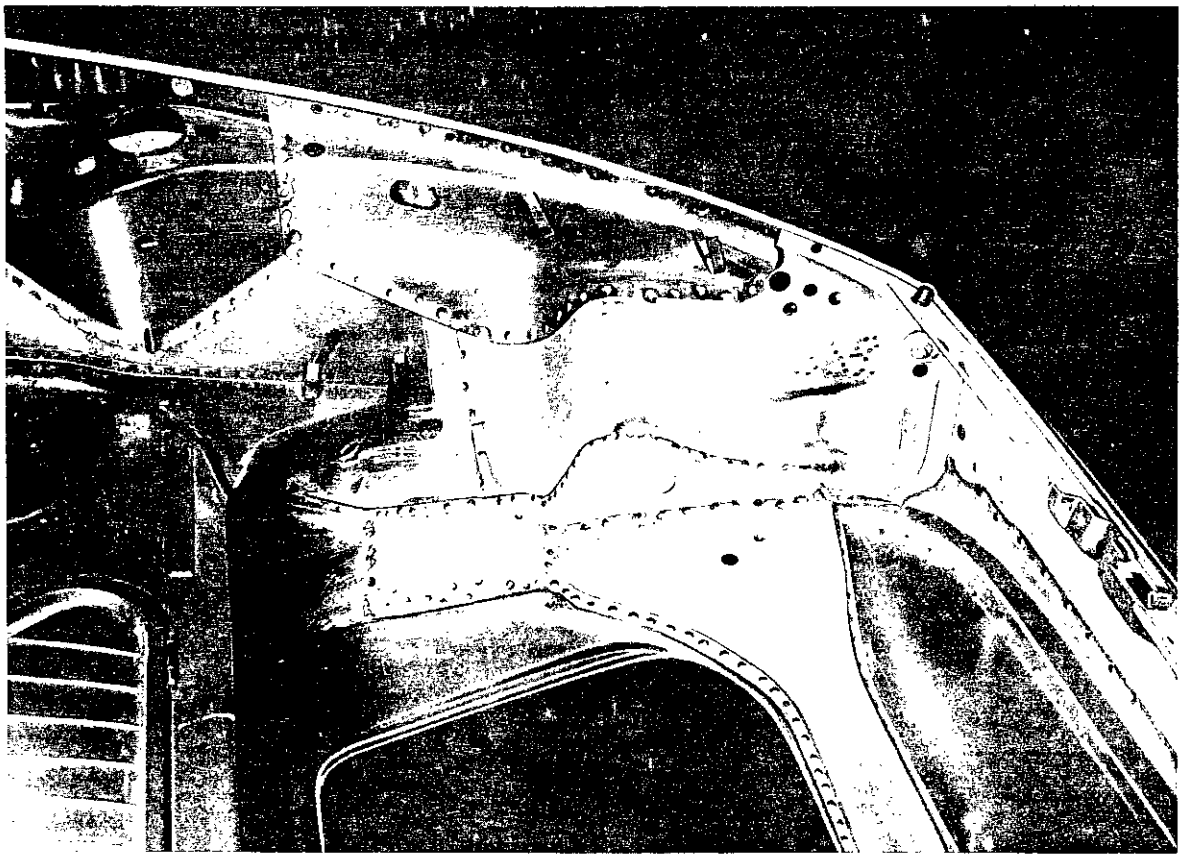
11 - Check take-up points.

Replacing Part of Front Wheelhousing

12 - Align and spot weld front tank support.

13 - Align and spot weld left tank support.

- Secure tube for hood release cable.
- Insert and spot weld reinforcement plate.
- Weld jack and hardtop roof brackets.



14 - Finishing

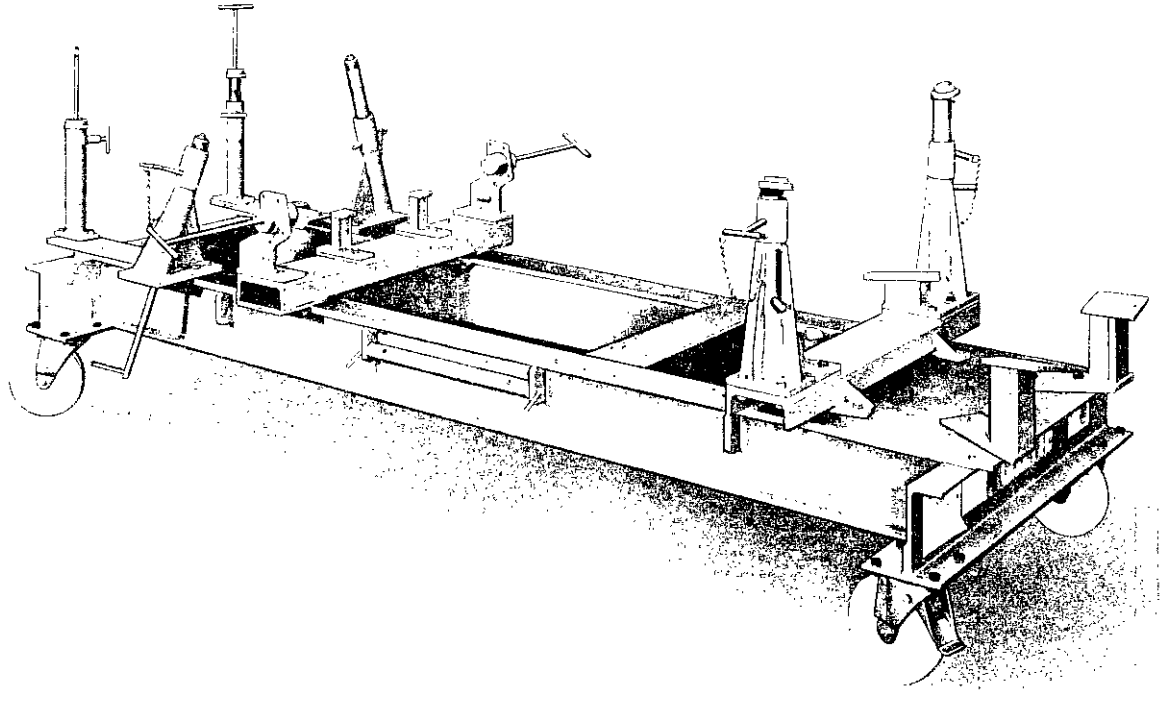
Grind down welding seams in Area A. Clean and prime coat all other welding seams. Weld burnt through welding spots. Apply undercoating. Seal seams and joints.

ECONOMICAL REPAIRS WITH CELETTE STRAIGHTENING BENCH FOR TYPE 911, 912 AND 930 TURBO

The attachment set ENS 77.360 was developed for body straightening work. The attachment set consists of basic equipment, with which all important take-up points can be checked. This attachment set also has attachments for simple repairs. With these parts it is no longer necessary to remove the engine and transmission for front end body damage or the front axle for rear end body damage.
All mounting points must fit flat on the Celette straightening bench and bolting must be possible without stress.

Take-up Points and Bolt Size

1. Control arm front	M 10 x 30
2. Auxiliary carrier front	M 12 x 1.5 x 70
3. Auxiliary carrier rear	M 10 x 30
4. Shock absorber top	
5. Rear axle cross tube outer	M 10 x 30
6. Transmission suspension	M 12 x 1.5 x 70
7. Cross member upper	
8. Engine mount	



Attachment set ENS 77.360 basic equipment

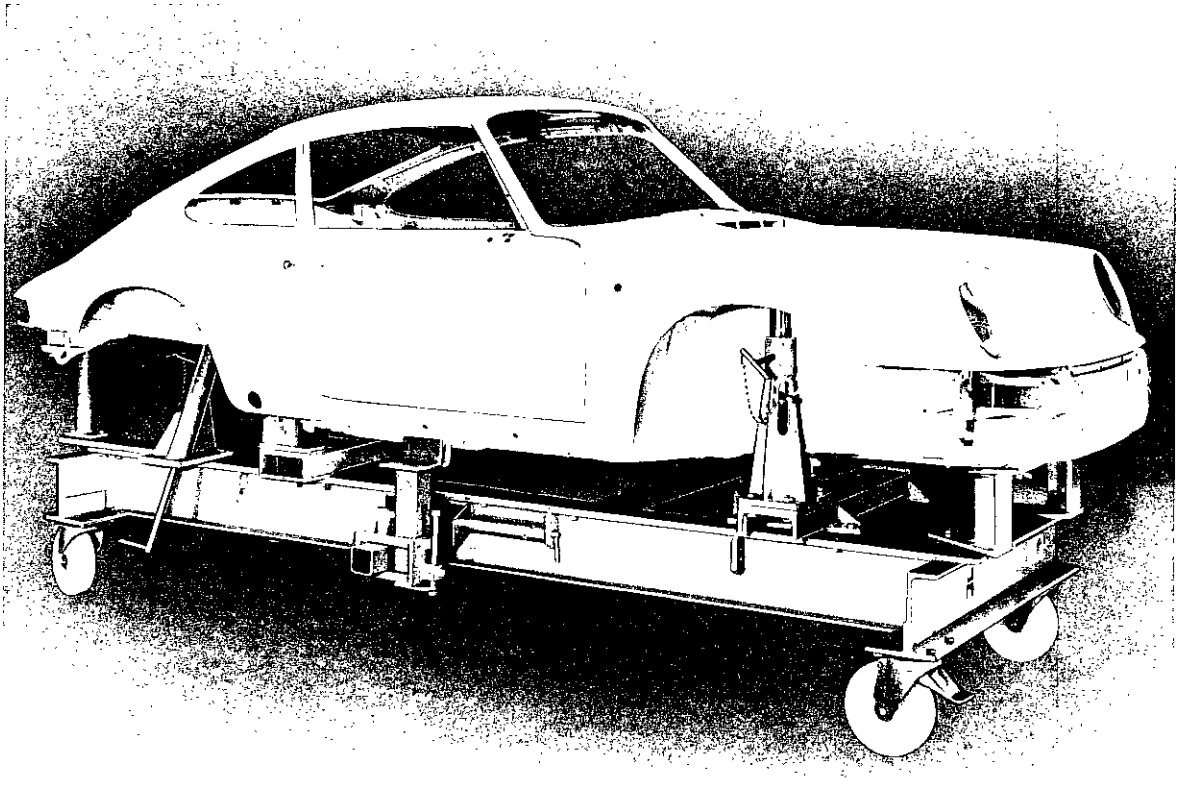
PREPARING BODY FOR USE OF ATTACHMENT SET
ENS 77.360

Remove:

- Bottom guard
- Wheels
- Front axle and steering gear assembly
- Fuel tank
- Rear axle arms and shock absorbers
- Torsion bars
- Engine
- Transmission
- Damaged body parts and equipment, as necessary for straightening.

Preparing Celette straightening bench:

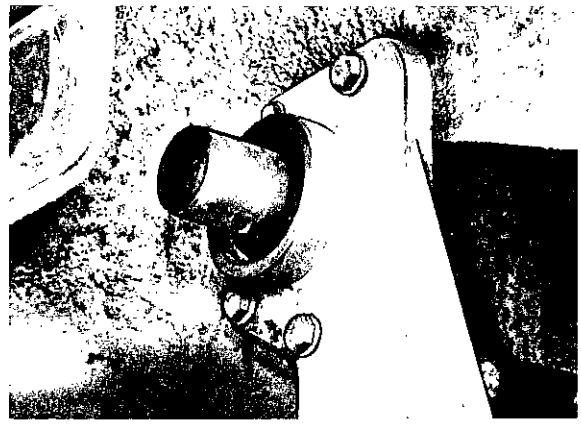
Bolting all attachments of set, except for spring strut dome. Setting scale on auxiliary carrier take-up to 0.



Note:

Horizontal position of a movable Celette straightening bench must be checked with a bubble level.

From 1977 models on (adjustable spring strut setting) the shoulder bolts of side member/rear axle cross tube are 4 mm longer on both sides.

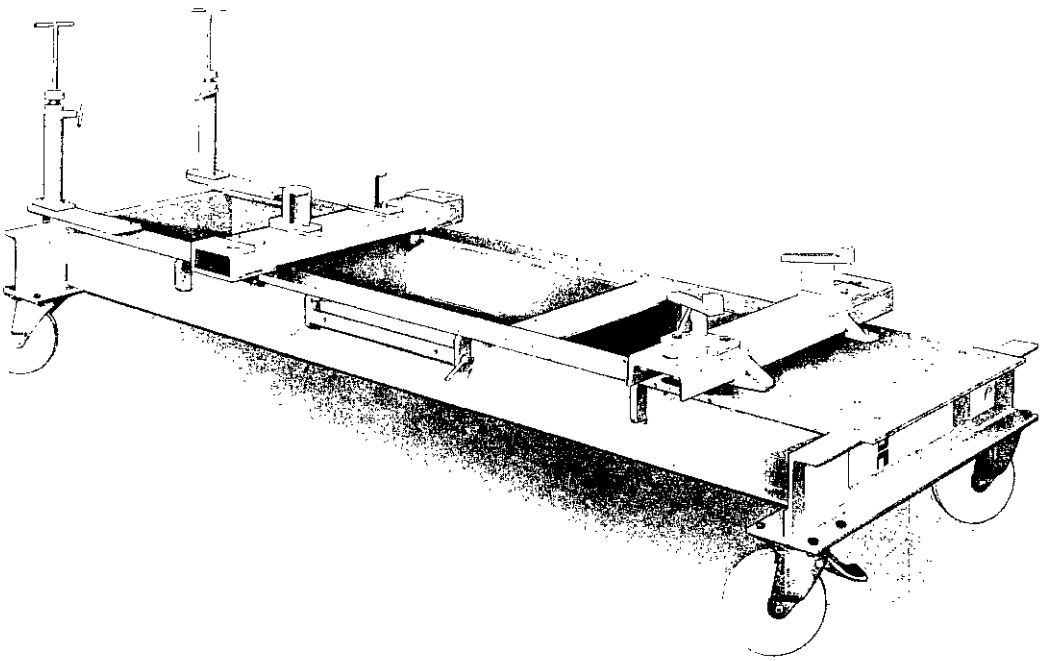


For these cars the bores in the take-ups of the attachment set must be enlarged by this amount. For the previous models these enlarged holes must be adapted by using suitable washers.

Note

Attachment set ENS 77.360 corresponds with version from 1977 models on. For cars up to 1976 models the supplied washers must be used.

ATTACHMENT SET FOR TYPE 930 TURBO ENS 77.303



The illustrated take-up points differ from Type 911 attachment set and are used for Turbo models.

The auxiliary carrier pin is installed 21 mm higher.

The brackets on the rear axle cross tube are inclined upward.

The take-up point for transmission suspension is located further forward by 25 mm.

The engine mount for Type 3.0 Turbo up to 1977 models corresponds with Type 911.

The engine mount for Type 3.3 Turbo from 1978 models on is located further toward rear by 30 mm.

EXTRA ATTACHMENT FOR ECONOMICAL REPAIR OF FRONT END DAMAGE

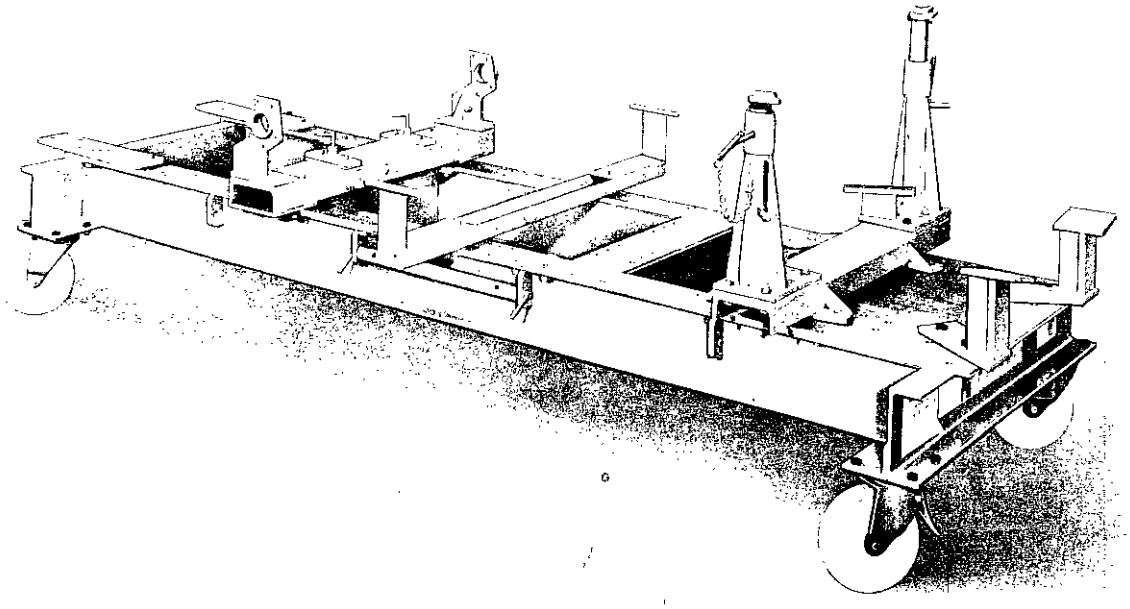
With this set of straightening bench attachments it is not necessary to remove the engine, transmission and rear running gear parts.
Its application requires that the rear end of the body is not damaged.

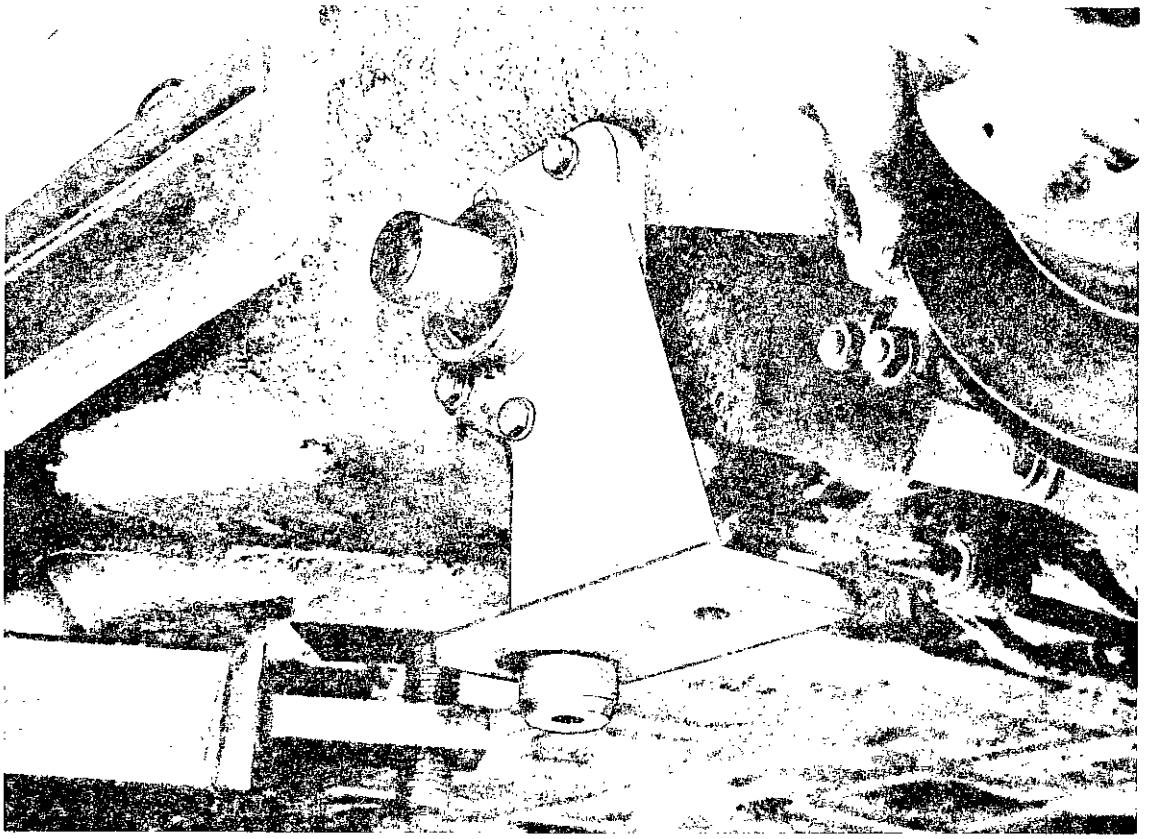
Remove:

Bottom guard
Wheels
Front axle with steering gear
Fuel tank
Bearing (torsion bar) covers
Damaged body parts and equipment for required for straightening

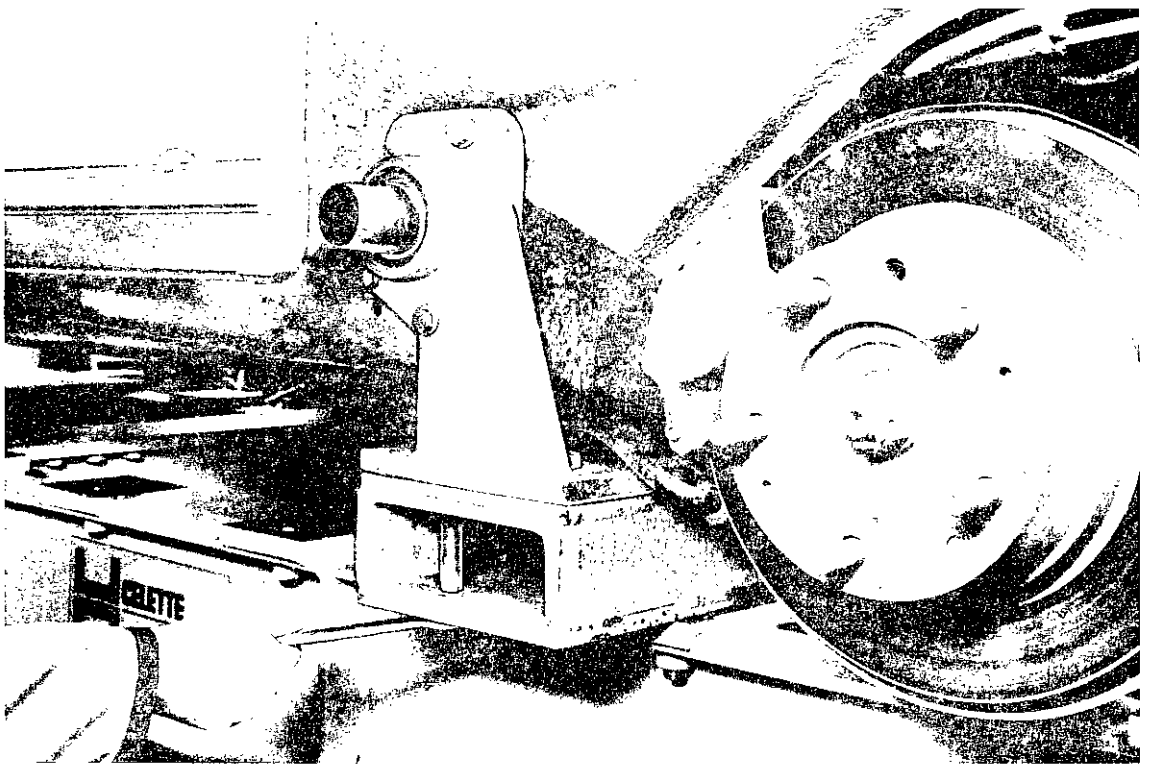
Preparation of Celette straightening bench:

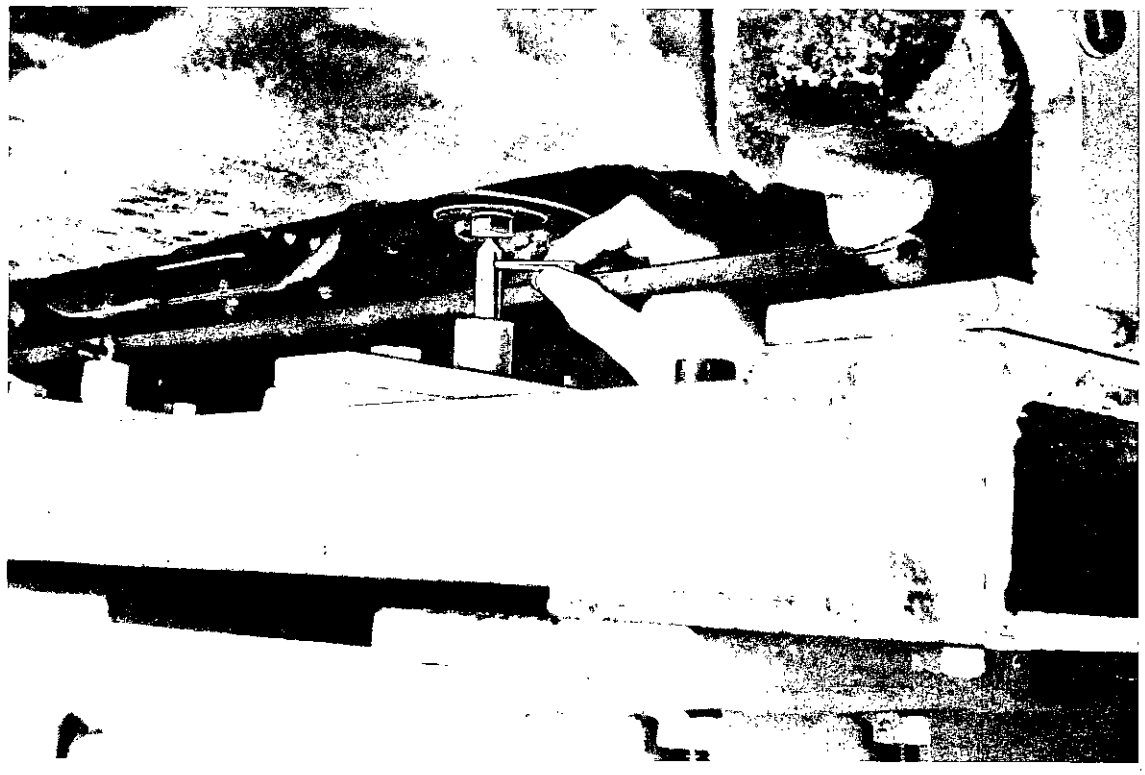
Bolt attachments for front control arms and auxiliary carrier. Install and bolt cross member with control pins.





Note: Before lowering the body on the straightening bench the attachments must be secured on the shoulder bolts.





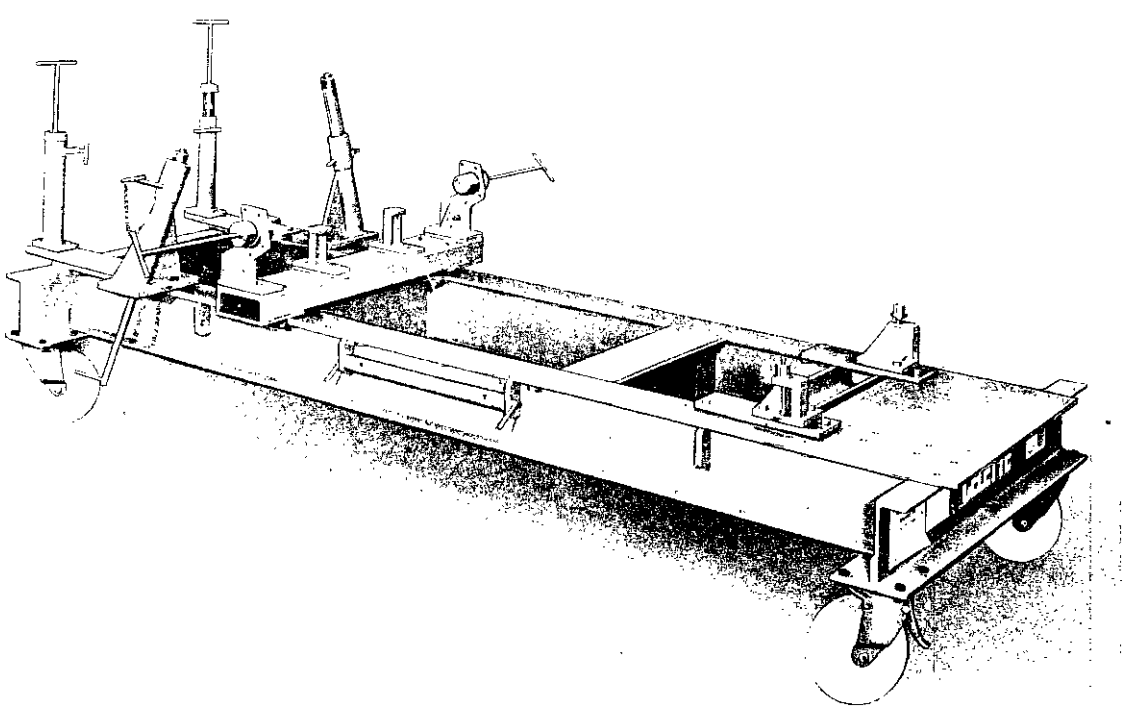
After bolting down the set of attachments, check the central position of the transmission bolts with the control pins.

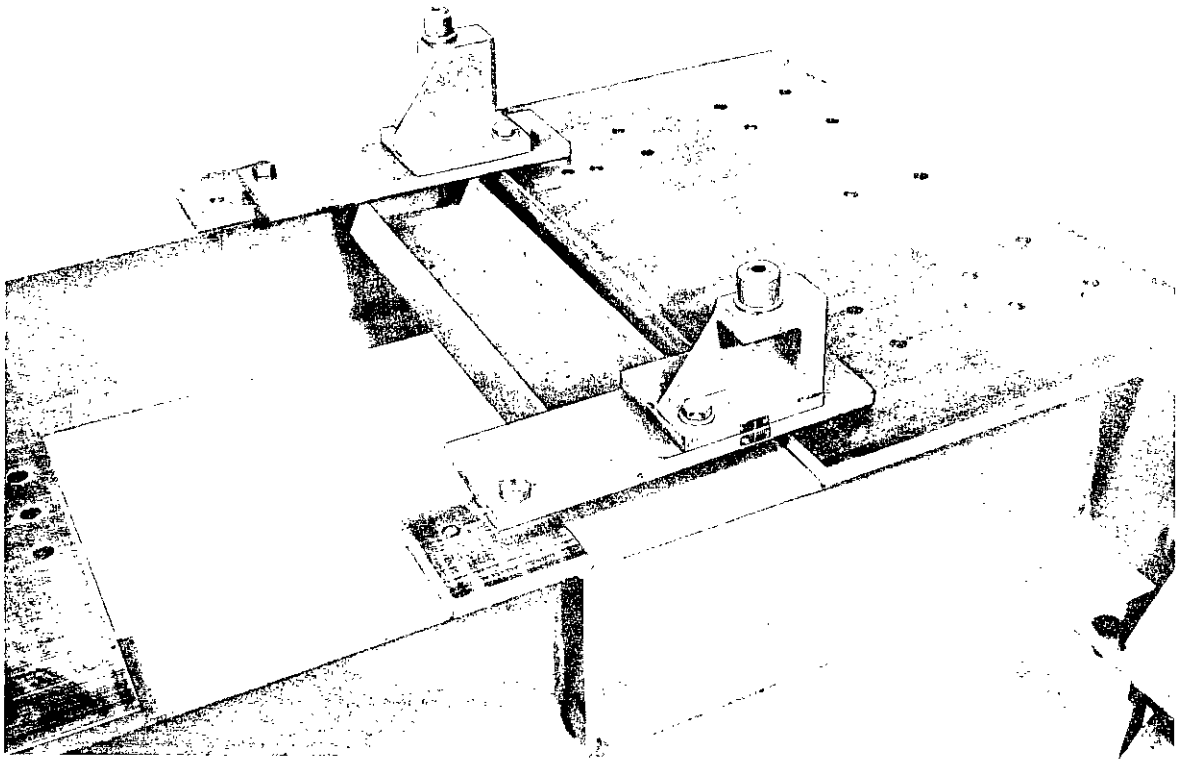
Note: The horizontal position of a moving Celette straightening bench must be checked with a (bubble) level.

EXTRA ATTACHMENT FOR ECONOMICAL REPAIRS OF BODY REAR SECTION DAMAGE

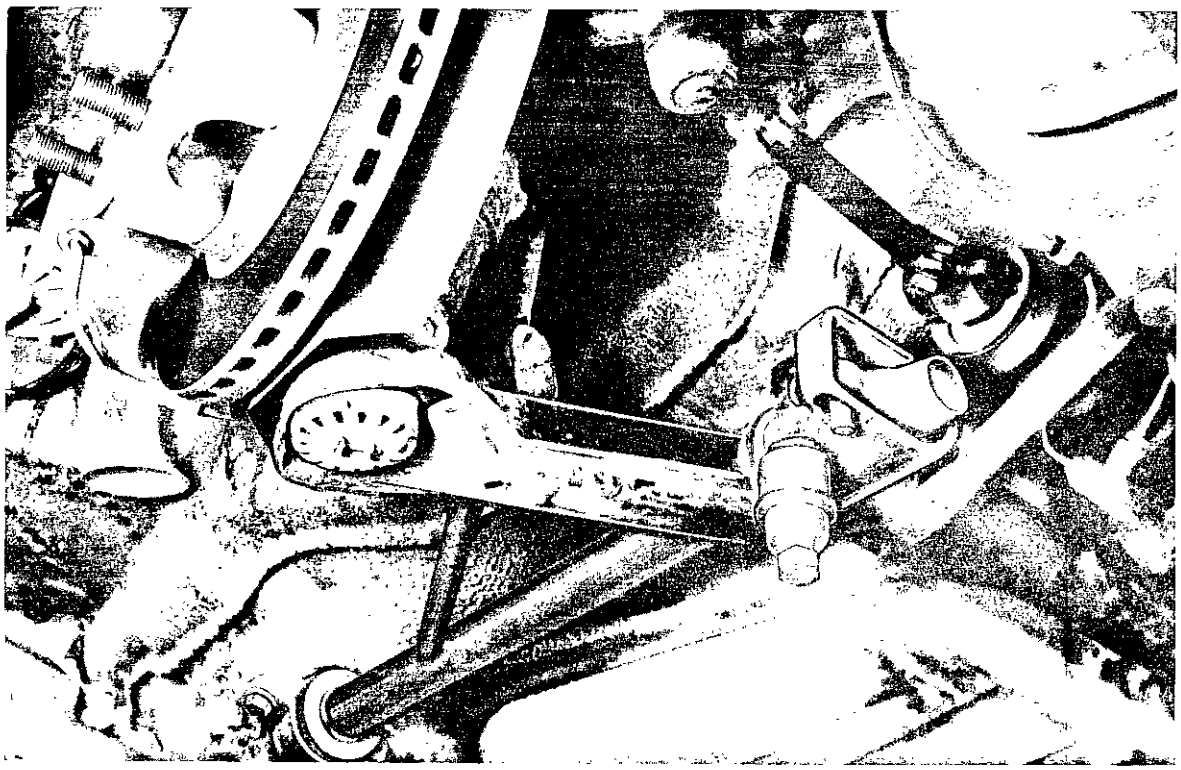
With this attachment set it is not necessary to remove the bottom guard and front axle. Its application requires that the body front section is not damaged.
For serious body rear section damage, e.g. when the rear axle cross tube has to be replaced, it is not recommended to use the economical extra attachment without removal of the front axle.

Remove:	Engine Transmission Rear axle arms and shock absorbers Bearing caps and torsion bars Damaged body and equipment parts, insofar as required for straightening.
Preparing Celette straightening bench:	Bolting economical extra attachment. Removing all other attachments in front area. Bolting cross member, shock absorber attachments and engine mount attachment at rear.

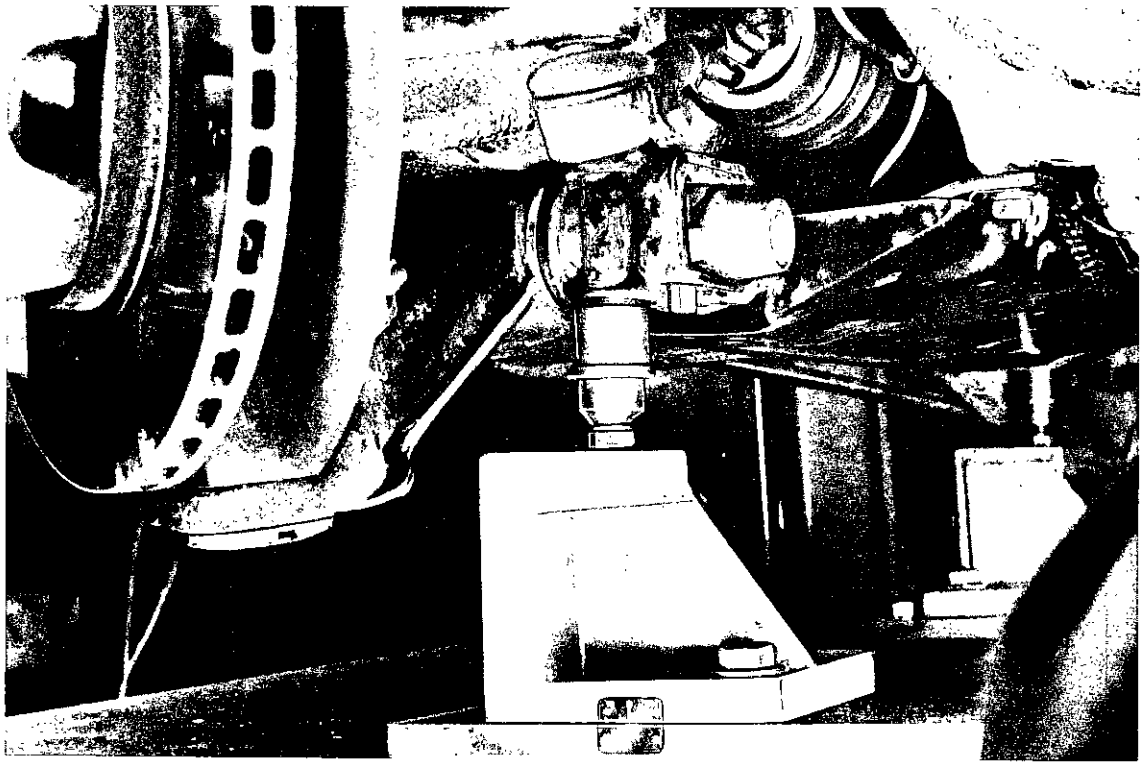




Economical extra attachment is bolted on auxiliary carrier pin.



Remove auxiliary carrier bolts and mount adapter with longer bolts supplied.

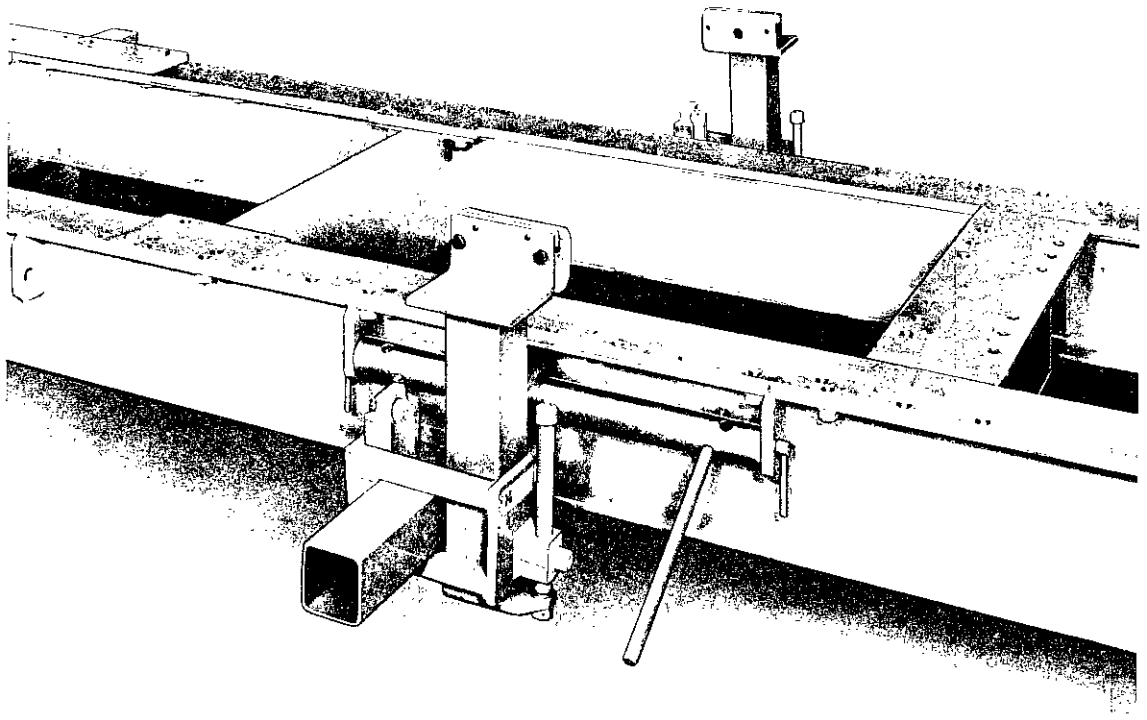


Lower body in horizontal position. Set attachment set to 0 on scale and tighten.

Note

The auxiliary carrier pin is installed 21 mm higher on Turbo cars. This deviation must be compensated for when installing the adapter.

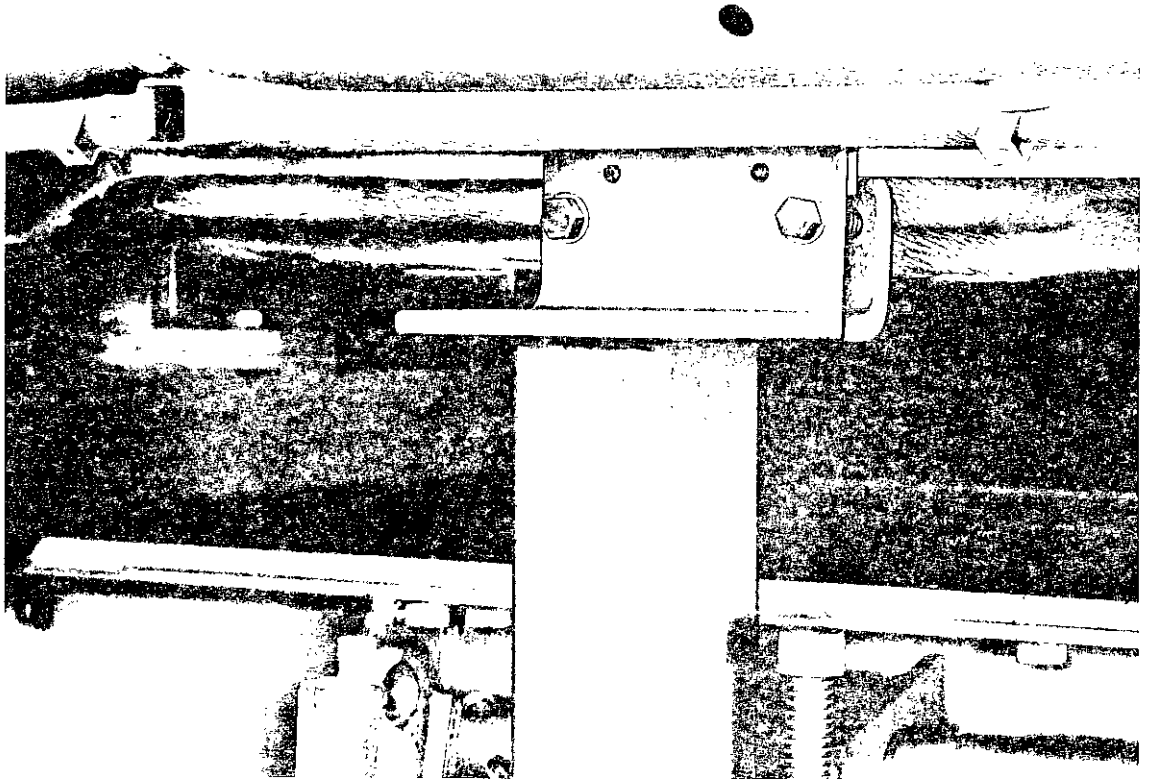
UNIVERSAL ANCHOR ENS 937.900



The universal anchor ENS 937.900 illustrated above can be used for additional anchorage of a body on the Celette straightening bench.

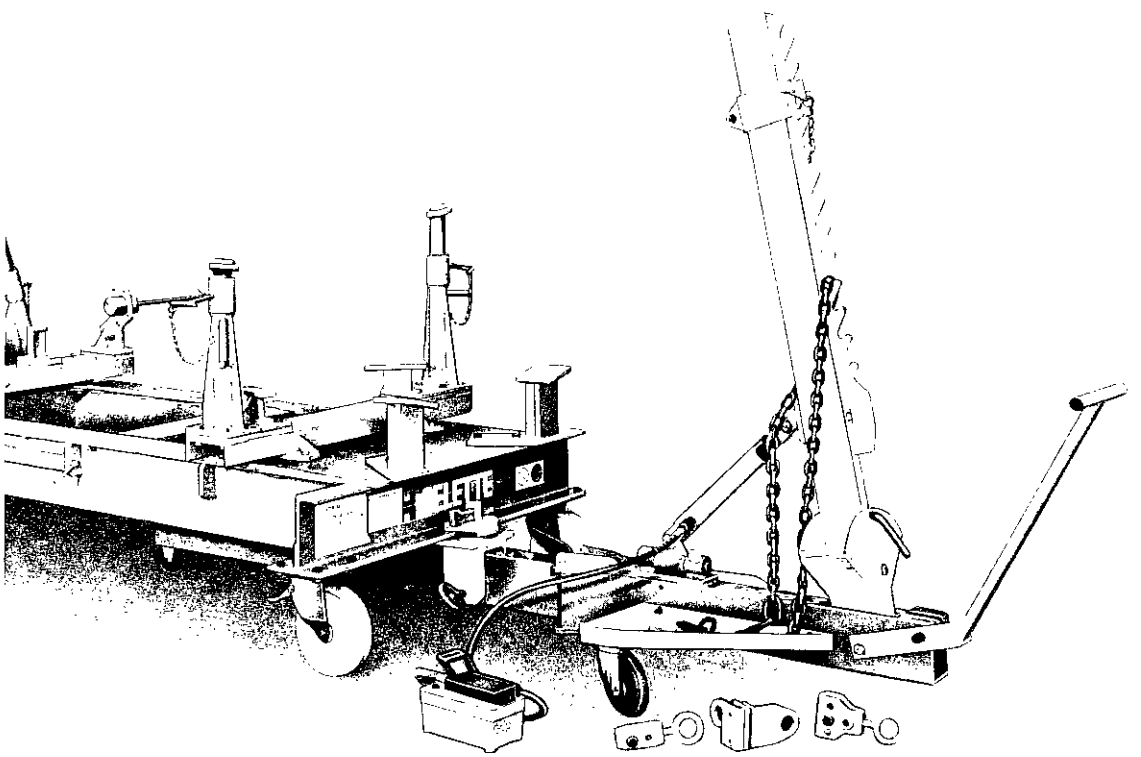
Application of the universal anchor is recommended in conjunction with the extra attachments for economical repair of front and rear end damage.

The universal anchor can be mounted on the straightening bench at three different points. It can be adjusted in axial direction as well as in height and width. Even older straightening benches can be fitted with universal anchors.



Universal anchor mounted on floor flange. Undercoating should be removed in this area to provide greater holding forces.

COBRA 3 STRAIGHTENER WITH ACCESSORIES

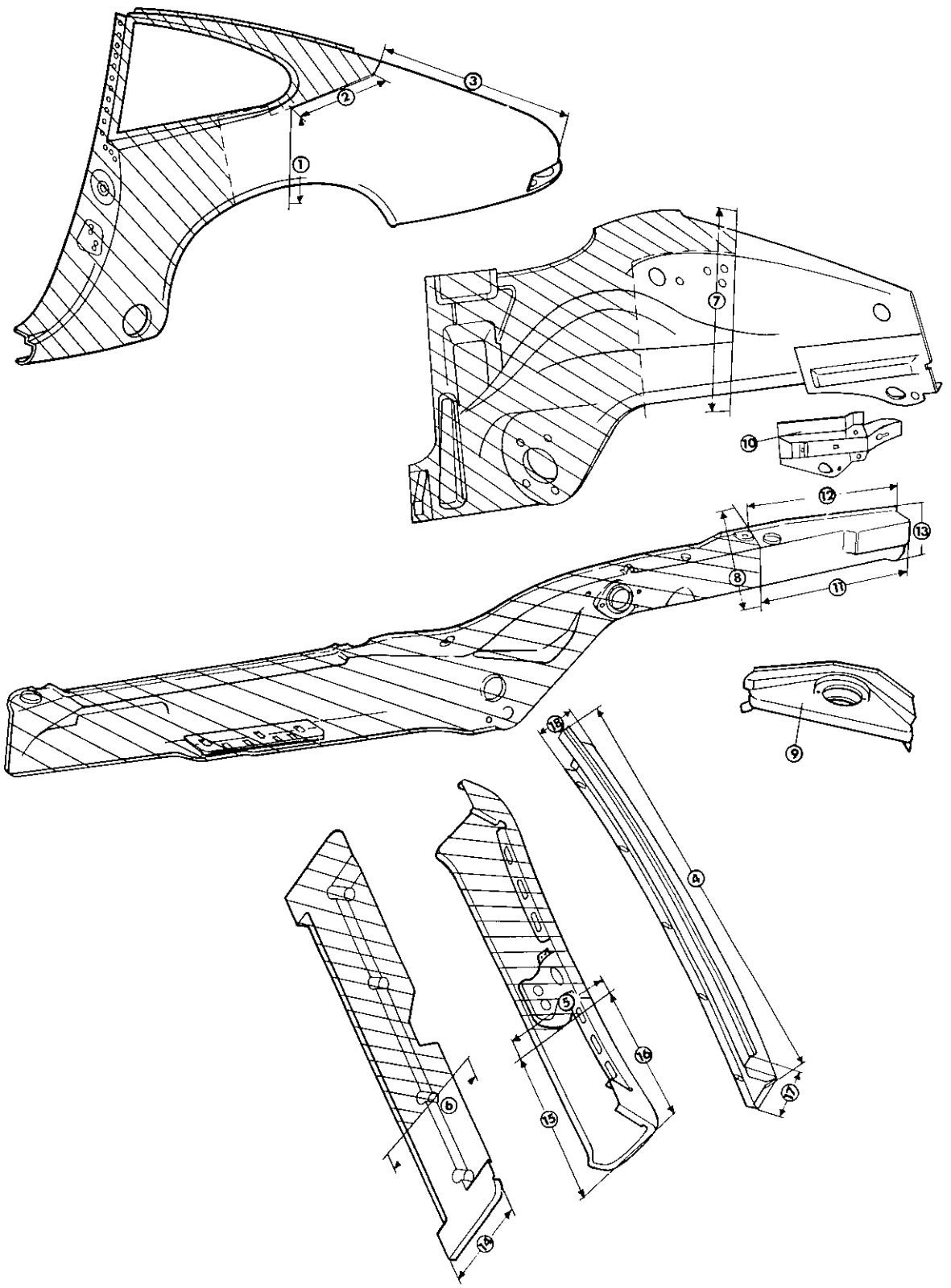


This straightener can be permanently anchored on the bench. The pulling direction can be adjusted by swinging the beam even when anchored.

BODY REPAIRS - REAR

Replacing Part of Inner Side Member

Includes: Wheelhousing inner and outer rear cross members, left or right engine brackets end plate and rear fender.



Replacing Part of Inner Side Member

Operation	Areas	Material
1. Separating	1-8	Cutting disc
Re move metal scraps	2, 4, 7, 8	Welding torch, hand grinder and öliers
Undercoating and paint	Clean and grind down mating surfaces	
2. Preparing (new parts)		
Aligning, cutting and grinding	1, 2, 5, 6, 7, 8	Cutting disc, metal cutters and hand grinder
Apply rust preventative	1-10	Paint
3. Welding		
Spot weld	3, 11, 12, 15, 16	Spot welder
Butt weld	4, 9, 10	Spot welder
Weld	1, 2, 5, 6, 7, 8, 13, 14, 17	MIG welder
Weld	Area 3, top of lid and wheel-housing joint welded flush	Gas welder
4. Finishing		
Grinding	1, 2, 3, 4, 5, 6, 7, 8	Hand grinder
Welding seams	1-18 welding spots burnt through	Gas or MIG welder
Sealing	All surfaces inner and outer	Undercoating (asphalt - PVC basis)
Preserving	Cavities	Tectyl etc. (wax basis)

Replacing Part of Inner Side Member

1 - Damage Diagnosis

2 - Alignment

Before the damaged parts can be removed by cutting, align the ented section with hydraulic alignment equipment as well as possible.

3 - Preparation

Dismantle

Engine with transmission
Rear bumper
Left and right bottom fender sections
Left and right vent windows
Lower lid lock
Electrical items as required

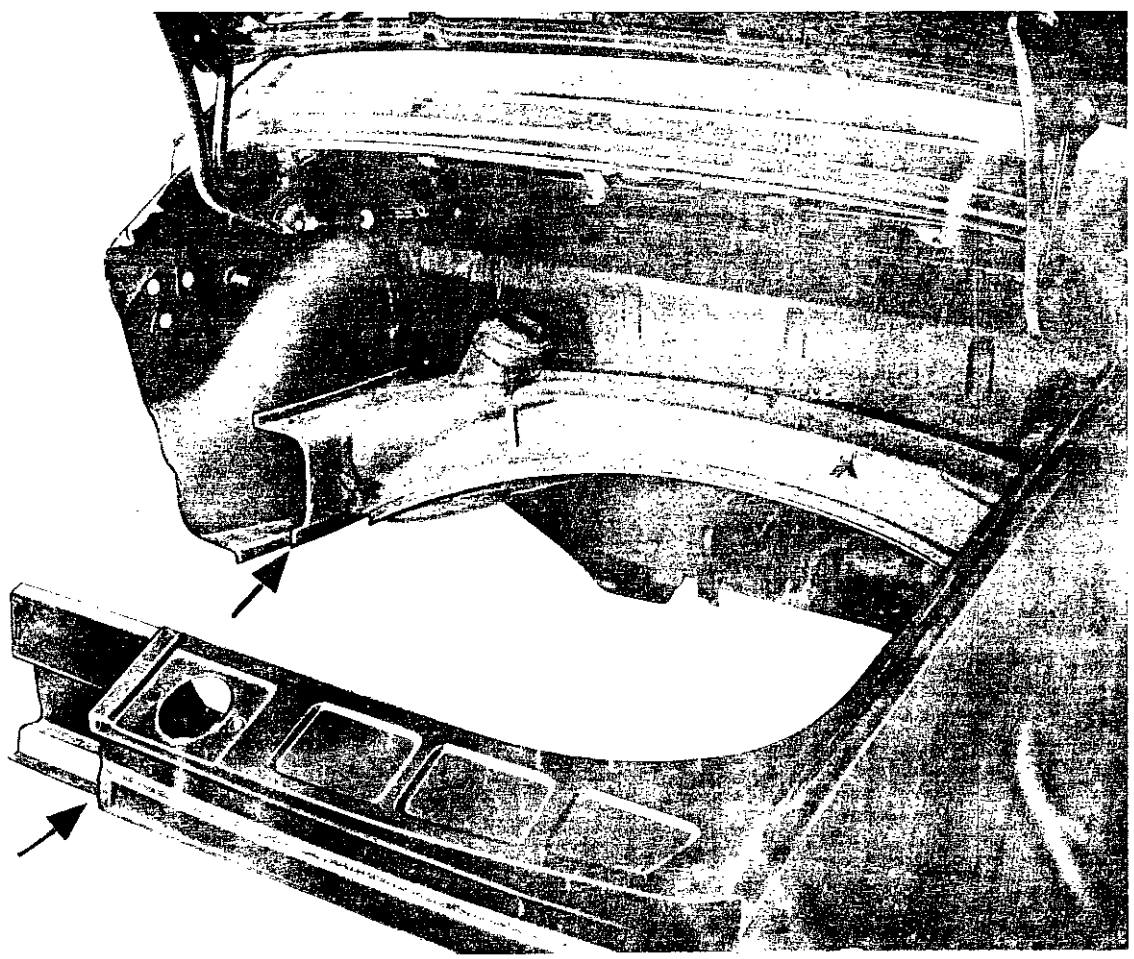
4 - Separation of damaged parts

Note Cut out badly damaged parts instead of unbolting.

Replacing Part of Inner Side Member

4 a - Damaged parts can be separated in any sequence in accordance with the operations illustrated.

Note Mating surfaces of supporting parts are offset to each other see arrows.



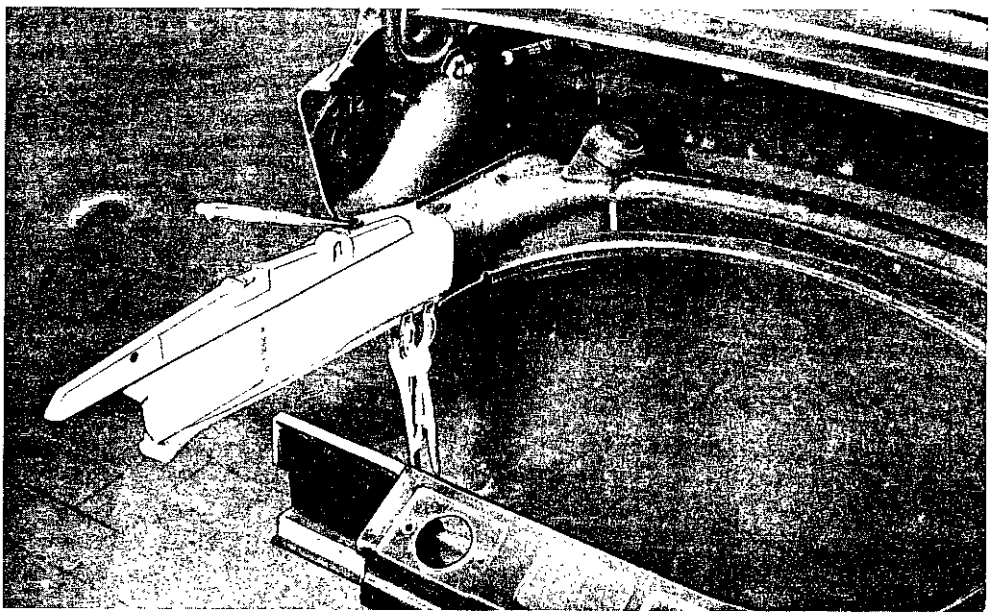
5 - Remove remaining scraps of metal. Align and grind down mating surfaces and flange.

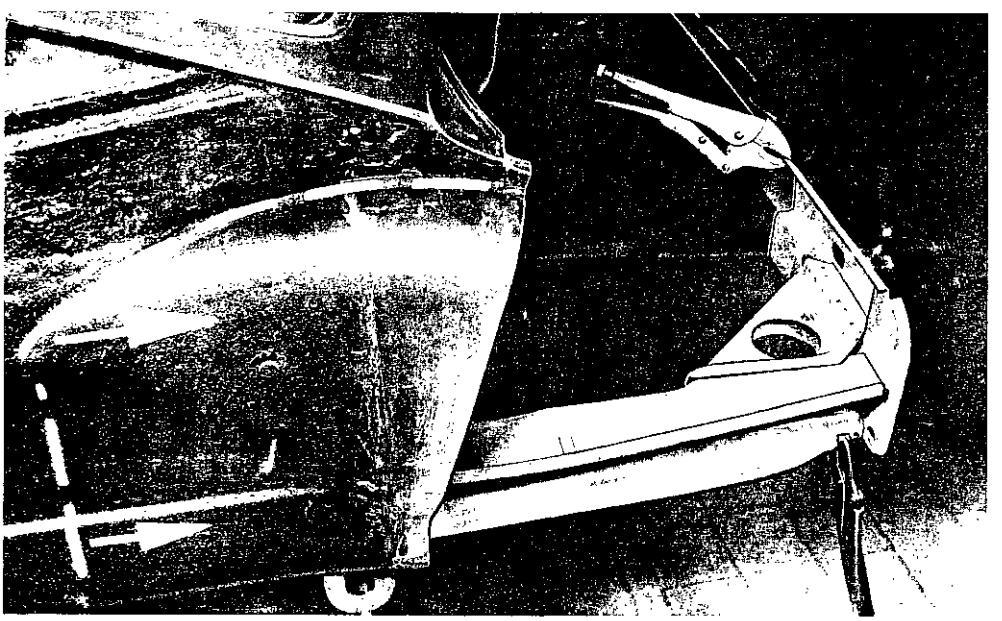
6 - Align car in both directions with side members.

Replacing Part of Inner Side Member

7 - Align and weld new parts.

7 a - Install side member with about 2 cm (4 inches) overlap. Align, Check engine compartment in longitudinal and diagonal direction. Weld side member.

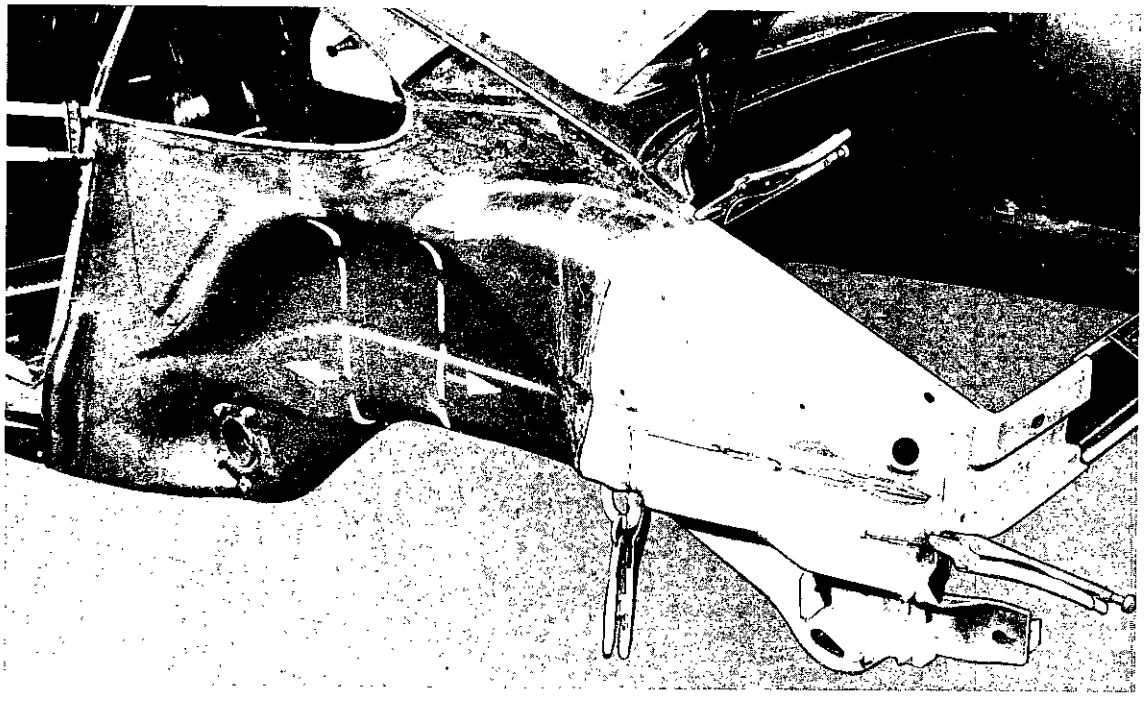




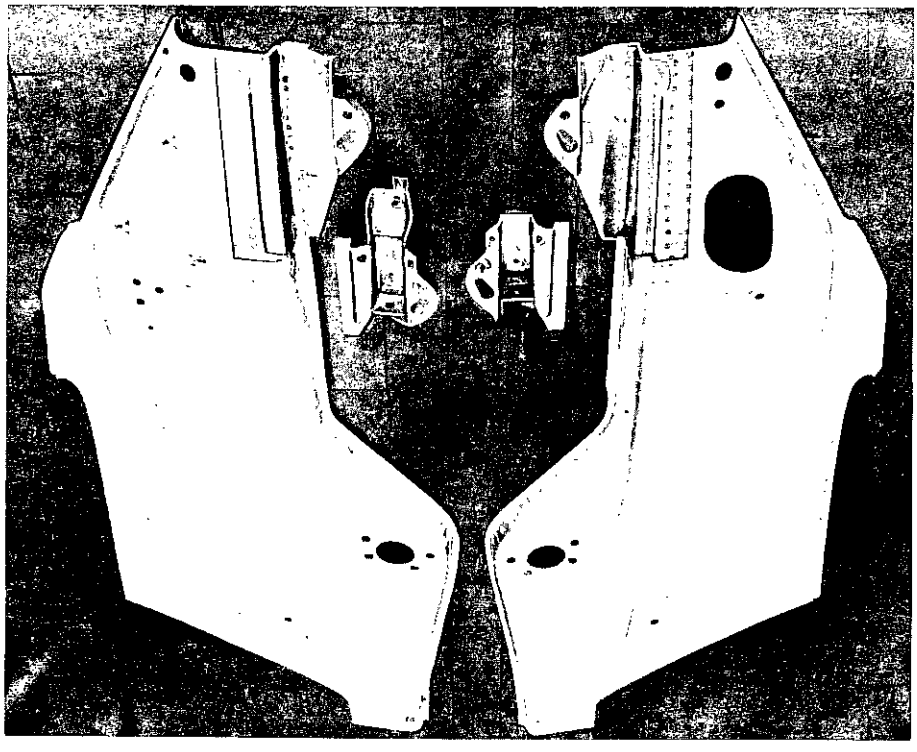
7 b - Align and weld inner cross member. Install engine bracket suspension. Align and spot weld.

Replacing Part of Inner Side Member

7 c - Align wheelhousing panel, cut and weld with about 2cm (4inches) overlap. Butt weld in area of lid recess. Align wheelhousing panel with contour of lid.

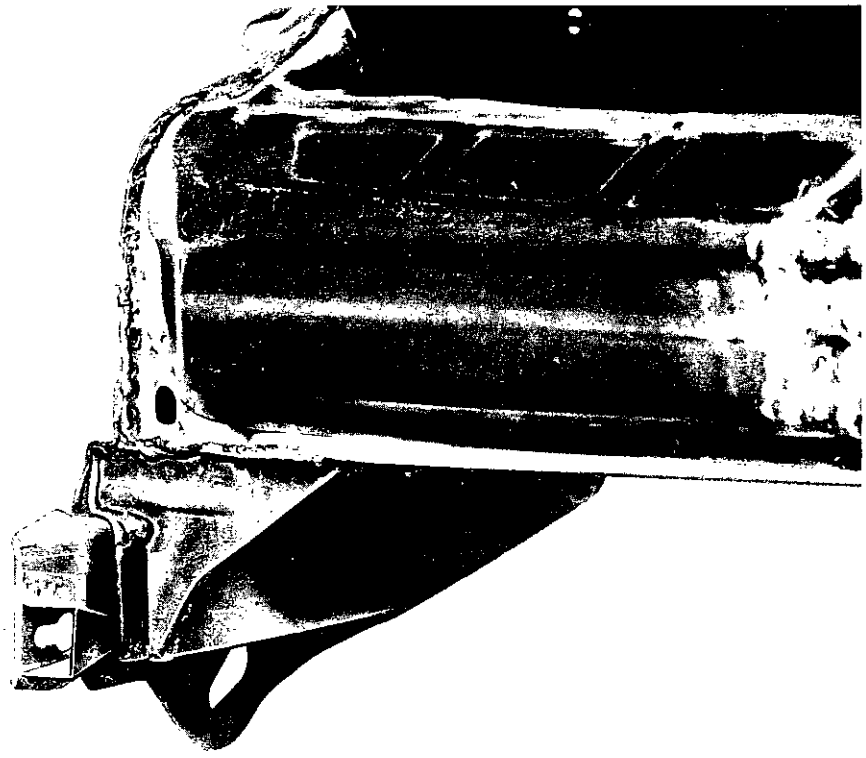


Various marked cutting lines (broken lines).



Replacing Part of Inner Side Member

8 - Align and butt weld outer section of cross member at center cutting point. Spot weld top and bottom of inner cross member section.



9 - Install and weld impact absorber holder.

- Weld impact absorber holder reinforcement to cross member.
- Braze tube for lid release cable.
- Spot weld engine seal rails.

10 - Install and spot weld rear panel.

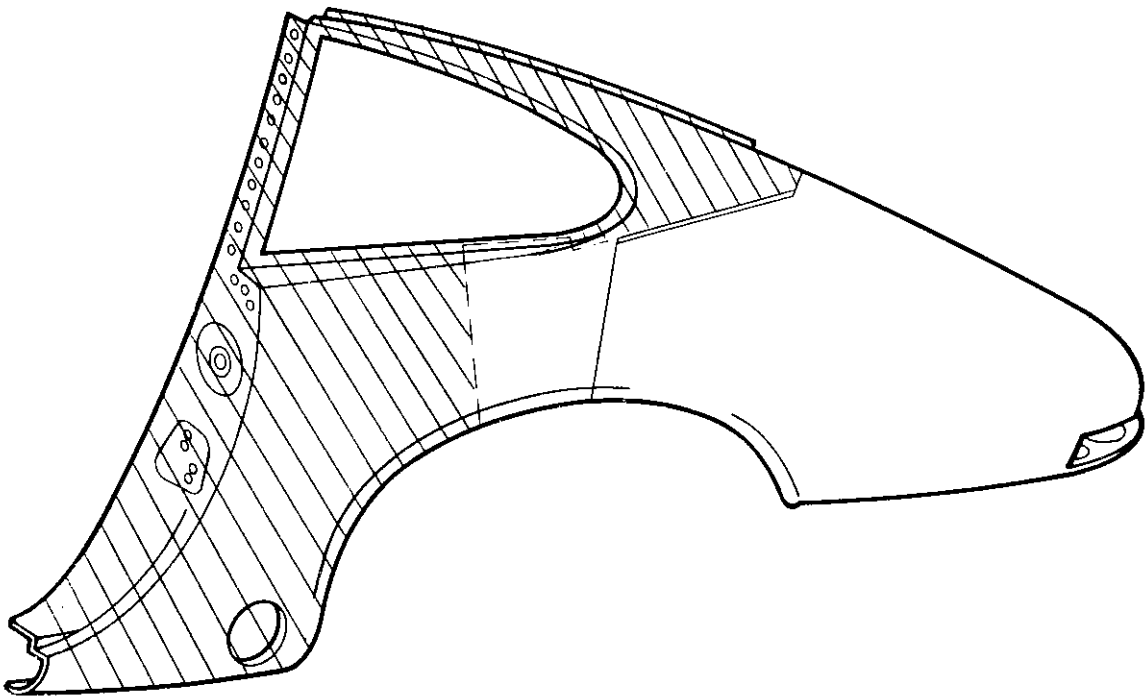
Replacing Part of Inner Side Member

11 - Align and cut rear fender.

- Cut along cutting line to wheel opening.
- Cut along cutting line from lid opening to vent window so that it overlaps. Crimp new part using crimping pliers.
- Shorten crimped sufaces to an overlap of about 3mm (1/8 inch).

11 a - Clamp and tack weld fender. Watch lid joint.

11 b - Spot weld rain molding in lid opening. Gas weld seam to wheel opening. MIG weld overlap and align fender.



12 - Finishing: Weld burnt through welding spots. Clean welding seams and prime, apply body solder if necessary. Seal seams and joints. Apply undercoating.

Elektrische Anlage
Electrical System
Installation électrique
Impianto elettrico

CONTENTS

0 - INFORMATION, DESCRIPTION, TECHNICAL DATA

0.0 Information

0.1 Description

Ignition distributor, current flow diagram 0.1 - 1/1

Wiring diagram 0.1 - 2/1

Current flow diagram 0.1 - 3/1

Relays and fuses 0.1 - 4/1

Lighting 0.1 - 5/1

Alternator - 1975 model 0.1 - 6/1

Ignition system modifications - 1978 model 0.1 - 7/1

0.2 Technical data

Starter 0.2 - 1/1

1 - GENERATOR, VOLTAGE REGULATOR

2 - STARTER

2.1 Description

2.2 Disassembling and assembling

Spiral-drive starter BOSCH GB 12 V 1.5 HP 2.2 - 1/1

2.3 Removing and installing 2.3 - 1/1

3 - LIGHTING EQUIPMENT

3.1 Description

3.2 Headlights

Headlights (sealed beam), replacing 3.2 - 1/1

Headlights, adjusting 3.2 - 2/1

3.3 Fog lamps and fog/tail lamp

Subsequent installation - 1974 model 3.3 - 1/1

4 - WINDSHIELD WIPER AND WASHER SYSTEM

4.1 Description

4.2 Disassembling and assembling

Adjustment instruction 4.2 - 1/1

Removing and installing 4.3 - 1/1

4.4 Water reservoir for windshield wiper switch

Removing and installing 4.4 - 1/1

4.5 Intermittent windshield washer system

Removing and installing 4.5 - 1/1

5 - INSTRUMENTS AND CONTROL SYSTEM

5.2 Emission controls

Exhaust gas recirculation control 5.2 - 1/1

5.3 Speedometer

Speedometer cable, removing and installing 5.3 - 1/1

Electronic speedometer 5.3 - 2/1

6 - ELECTRICAL ACCESSORIES

6.1 Description

Safety belt warning system 6.1 - 1/1

Control illumination 6.1 - 2/1

Headlight washer 6.1 - 3/1

6.2 Safety belt warning system

Removing and installing 6.2 - 1/1

Troubleshooting 6.2 - 2/1

6.3 Control illumination

Bulbs, replacing 6.3 - 1/1

6.4 Headlight washers

Removing and installing 6.4 - 1/1

Adjusting specifications 6.4 - 2/1

Service installation 6.4 - 3/1

6.5 Automatic heating control

Removing and installing 6.5 - 1/1

Troubleshooting 6.5 - 2/1

Disassembling and assembling 6.5 - 1/4

6.6 Automatic speed control

Removing and installing 6.6 - 1/1

Troubleshooting 6.6 - 1/5

Removing and installing automatic antenna 6.7 - 1/1

911 Alarm system 6.8 - 1/1

7 - WIRING HARNESS

8 - BATTERY

8.2 Battery - 1974 model

Removing and installing 8.2 - 1/1

9 - IGNITION

9.1 Description

9.2 Spark plugs, ignition leads, connectors

Spark plug chart 9.2 - 1/1

Equipment tables - 1980 model 9.2 - 1/5

Ignition leads 9.2 - 2/1

9.3 Ignition distributor

Adjusting 9.3 - 1/1

Testing instructions 9.3 - 2/1

Ignition timing, adjusting - 1977 model 9.3 - 2/9

Ignition timing curves - 1978 model 9.3 - 2/11

Ignition timing, adjusting - 1980 model 9.3 - 2/13

Ignition retard/advance, checking - 1980 model 9.3 - 2/14

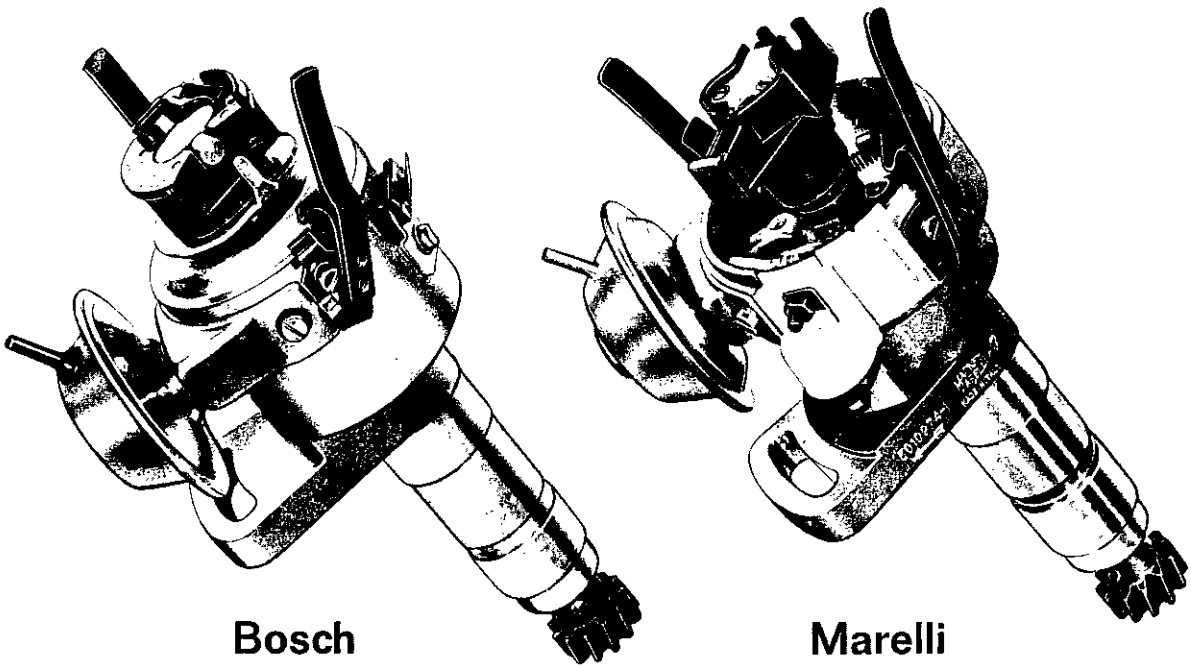
Adjusting ignition timing from 1981 models 9.3 - 2/17

Checking ignition timing control from 1981 models 9.3 - 1/18

IGNITION DISTRIBUTOR FOR 2.4 LITER ENGINES - BEGINNING WITH 1972 MODELS

General Information

Beginning with the 1972-model year, all Type 911 vehicles are equipped with either BOSCH or MARELLI distributors described below.



In the new distributors, engine timing is changed by:

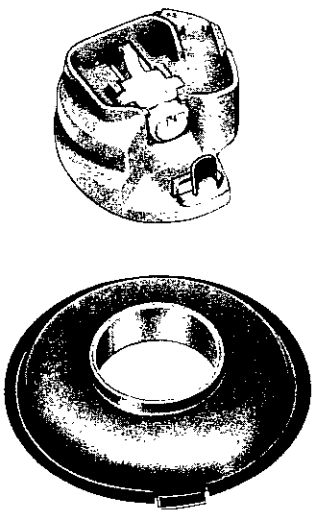
1 - Centrifugal weights (responding to engine speed)
2 - Vacuum control (responding to throttle valve position)

Speed limiters (engine governors) continue to be used in the distributors. A centrifugal weight built into the rotor of each distributor short-circuits the secondary side of the ignition system at a predetermined cut-off speed. This prevents exceeding maximum engine speed. The distributors for the Type 911 T, E, and S 2.4 liter engines are identical with the exception of the rotors which have different cut-off speeds.

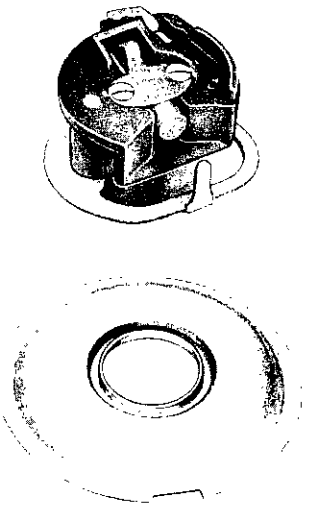
The vacuum control unit retards the ignition timing during idle and low speed ranges. The ignition then fires 5° ATDC. This results in cleaner combustion, reducing the emission of harmful exhaust pollutants. When the throttle opens, vacuum is reduced and the ignition timing is advanced by 10°.

Vehicle Type	BOSCH Distributor	MARELLI Distributor
911 T	0 231 169 003	5 010 974 - 1
911 E	0 231 169 004	5 010 974 - 2
911 S	0 231 169 005	5 010 974 - 3

Beginning with 1973 models, all BOSCH distributors used in Type 911 T, E and S vehicles are equipped with a modified rotor. The new rotor can be installed in distributors used in 1972 model vehicles providing that the old dust cover is replaced with one of the new version.



NEW



OLD

With this modification, BOSCH distributors are assigned a new part number.

IGNITION DISTRIBUTOR FOR 2.7 LITER ENGINES

Beginning with 1974 models, Type 911 (2.7 liter) and 911 S (2.7 liter) engines are equipped with the BOSCH or MARELLI distributors formerly used in the Type 911 T (2.4 liter) engines. Ignition timing spark advance characteristics, and test spécifications applicable to the 2.4 liter engine are also continued.
The cutoff speed in both engine types is 6500 ± 200 rpm.

The BOSCH or MARELLI distributors used in the 2.7 liter CARRERA engines differ from the above described distributors due to a different spark advance characteristic.

Ignition timing at idle is on TDC. Upon opening of the throttle valve, the drop in manifold negative pressure (vacuum) results in the ignition point advancing by 10^{o} crankshaft rotation.

The CARRERA cutoff speed is 7300 rpm.

The distributor used in the 1973 model 2.7 CARRERA engines remains in use in 1974 model engines as well.

DISTRIBUTOR - 1976 MODEL

The distributor advance curves on pages 9.3 - 2/1, 9.3 - 2/3 and 9.3 - 2/4 also apply to the 1976 model 911 S.

The cutoff speeds of the speed limiter are for

911 S	6500 ± 200 rpm

How to read current flow diagrams

In previous wiring diagrams electrical components were shown in the approximate position as you would find them on the car. However, to show the electrical connections between each component in the diagram became more and more difficult as the number of components increased. The result was that it was hard to trace electrical circuits.

To make reading wiring diagrams easier, we revised them completely. The result of intensive studies is a new diagram called "current flow diagram".

Current flow diagrams are laid out by placing circuits of related components one next to the other. The base of each circuit always starts with ground. The location of components on this diagram is no longer related to where the components would be in the car. The layout of the circuits, however, is such that each can be followed much easier to help in troubleshooting of electrical faults.

Looking at a current flow diagram you will find a yellow base line. The numbers in the yellow base line characterize the current tracks in the diagram and are to locate each component that is listed in the legend.

The colored lines in the diagram represent wires in the car, the colors correspond with the actual colors of the wires. The small numbers in the wiring runs indicate the wiring gauge in mm^2. The thin black lines are not actual wires but internal connections, such as the ground connection of a lamp housing. The base line for ground is the thin black line directly on top of the yellow base line.

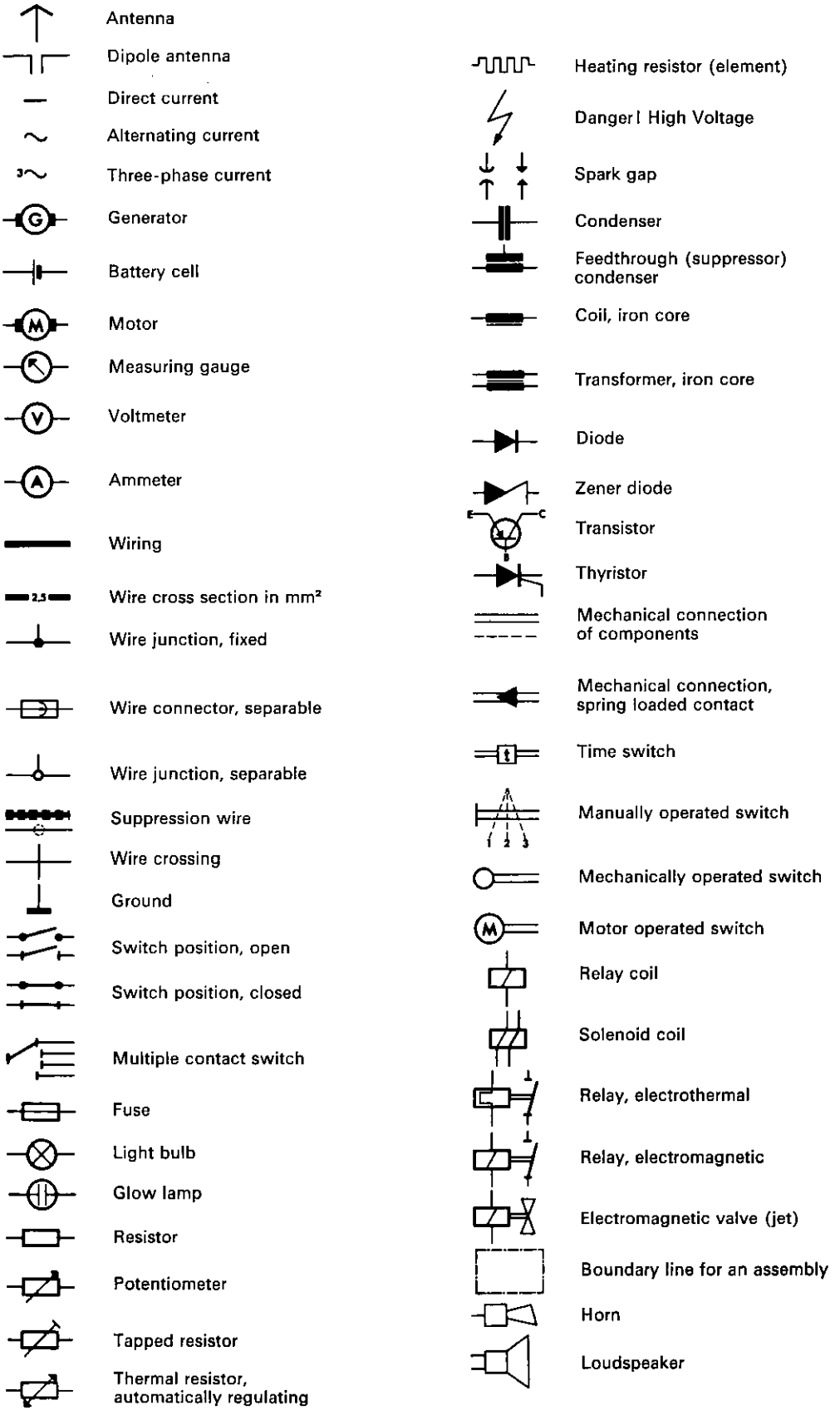
Interrupted wires or connections end in a yellow square. Continuation of this interrupted circuit can be found in the current track using the number in the square.

Each component in the diagram is identified with a letter, sometimes with a letter and a number. Component definition can be found in the legend.

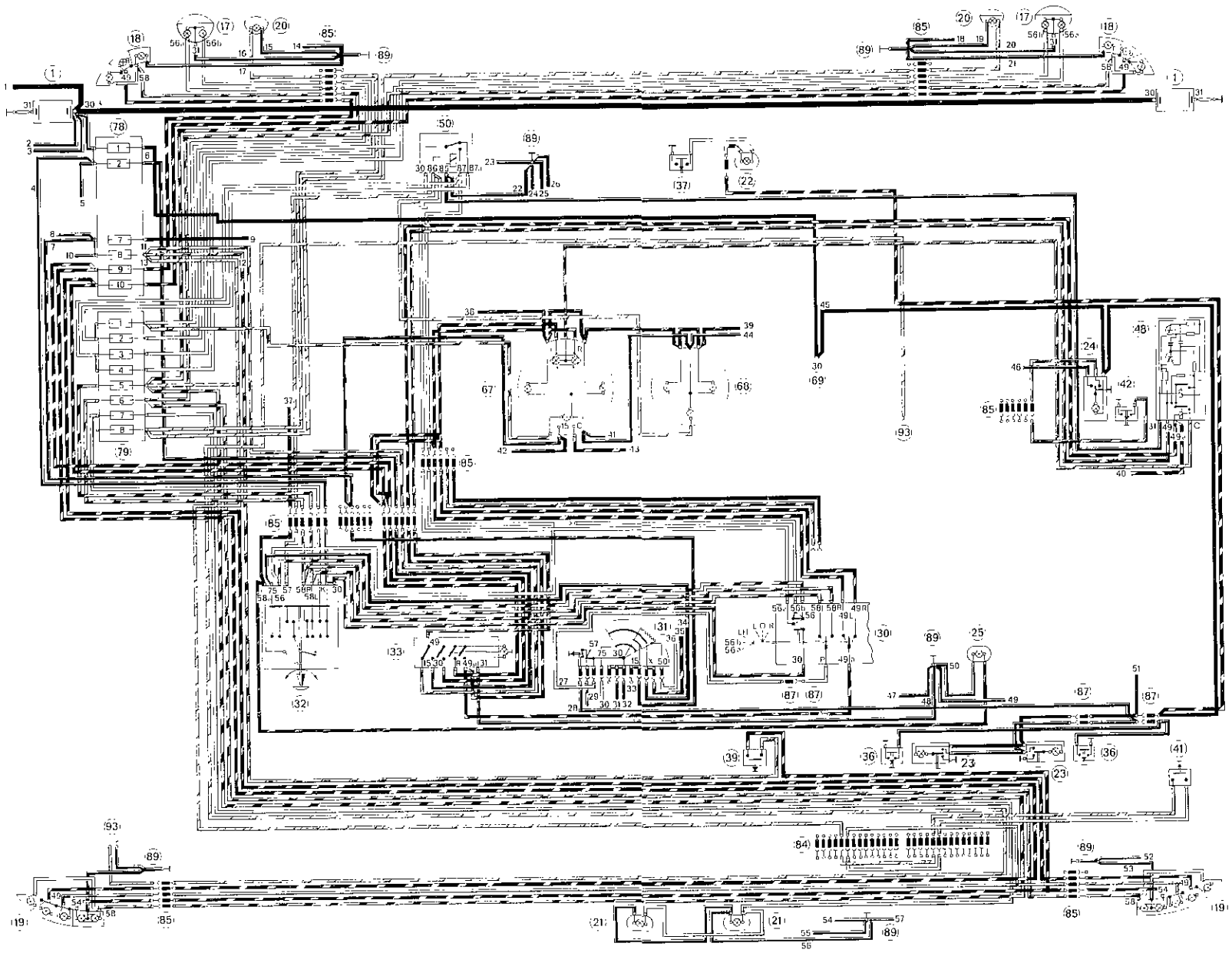
Most connectors or terminals are numbered. These numbers correspond with the numbers that are right next to most connectors on electrical components, such as switches and relays. This numbering system is used on most European cars. Listed below are the most commonly used terminals and their location.

Terminal No.		Location
B+	-	on coil, input from ignition switch
D+	-	on relay and generator
DF	-	on relay and generator
1	-	on coil, output to primary distributor lead
4	-	on coil, high tension output and on distributor high tension lead
15	-	on coil, input from ignition switch
30	-	on starter solenoid, input from battery, ignition starter switch, light switch, dimmer relay, and twin horn relay
31	-	ground
31 b	-	windshield wiper switch and motor
49	-	on turn signal bulbs
50	-	on both terminals of starter solenoid - ignition starter switch
54	-	on stoplight bulbs, steering ignition switch and windshield wiper switch
54 d	-	windshield wiper switch and motor
56	-	light switch and dimmer relay
56 a	-	dimmer relay, headlight low beam
56 b	-	headlight high beam
58	-	on taillight bulbs, light switch and front parking lights
58 b	-	light switch
85, 86, 87	-	relay

Electrical Symbols



Electric wiring diagram (Part I) Type 911 T, 911 E, 911 S, Model 72



1 Battery
17 Headlights
18 Turn signal, parking and side marker lights
(side marker lights USA only)
19 Tail, stop, turn, back-up and side marker lights
(side marker lights USA only)
20 Fog lights (optional)
21 License plate light
22 Luggage compartment light
23 Interior light
24 Glove compartment light
25 Ashtray light
30 Flasher, dimmer, wiper/washer switch with horn ring on steering column
31 Ignition starter switch and steering lock
32 Light switch
33 Emergency flasher switch
(not applicable in Italy and France)
36 Door contact switch
37 Switch for luggage compartment light
39 Stop light switch
41 Back-up light switch
42 Switch for glove compartment light
48 Turn signal/emergency flasher unit
50 Headlight relay
67 Tachometer
68 Speedometer
69 Electric clock
78 Fuse box I (10 terminal)
79 Fuse box II (8 terminal)
84 Multi-connector (14 terminal)
85 Multi-connector (6 terminal)
87 Connector (single contact)
89 Ground connection-body
93 Rear fog light (optional)

FUSES:

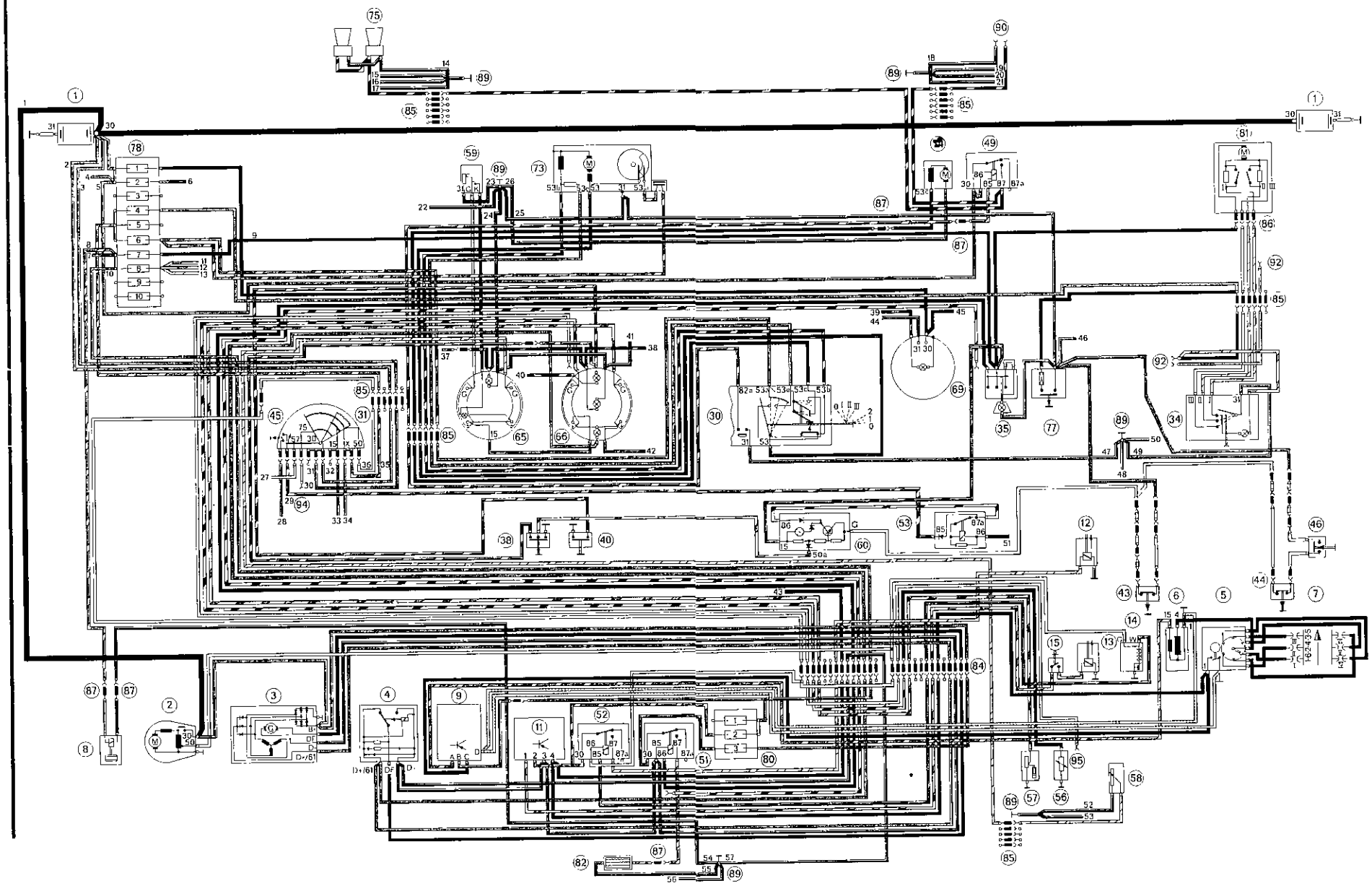
Fuse box I:
1 Interior light, clock, luggage compartment light
2 Emergency flasher
7 Fresh air fan
8 Stop, turn and back-up lights
9 Left front turn signal light
10 Right front turn signal light

Fuse box II:
1 High beam, left
2 High beam, right
3 Low beam, left
4 Low beam, right
5 Side marker, left
6 Side marker, right
7 License plate light
8 (Fog lights)

CAUTION!
Do not disconnect battery while the engine is running as this will damage the alternator.

Printed in Germany – I, 1971

Electric wiring diagram (Part II) Type 911 T, 911 E, 911 S, Model 72



1 Battery
2 Starter
3 Alternator
4 Governor
5 Distributor
6 Ignition transformer
7 Spark plugs
8 Fuel pump
9 High tension ignition unit
11 Speed switch
12 Cold start solenoid (except 911 TV)
13 Shut-off solenoid (911 TV: solenoid valve)
14 Thermo-time switch (except 911 TV)
15 Micro switch
30 Flasher, dimmer, wiper/washer switch with horn ring on steering column
31 Ignition starter switch and steering lock
34 Switch for fan and auxiliary heater
35 Rear window defogger switch
38 Parking brake contact
40 Brake warning light switch (USA only)
43 Safety belt contact, driver side (USA only)
44 Safety belt contact, passenger side (USA only)
45 Buzzer contact (USA only)
46 Seat contact, passenger side (USA only)
49 Horn relay
51 Rear window defogger relay
52 Auxiliary starting relay (except 911 TV)
53 Buzzer (USA only)
56 Oil temperature indicator
57 Oil pressure indicator
58 Oil level indicator
59 Indicator for fuel gauge
60 Safety belt warning light (USA only)
65 Fuel gauge dial
66 Oil temperature gauge dial
69 Electric clock
73 Wiper motor
74 Washer pump
75 Horns
77 Cigarette lighter
78 Fuse box I (10 terminal)
80 Fuse box III (3 terminal)
81 Fan motor
82 Rear window defogger element
84 Multi-connector (14 terminal)
85 Multi-connector (6 terminal)
86 Multi-connector (4 terminal)
87 Connector (single contact)
89 Ground connection-body
90 Optional horn
92 Auxiliary combustion heater (optional)
94 Radio (optional)
95 Oil temperature switch sportomatic (optional)

FUSES:

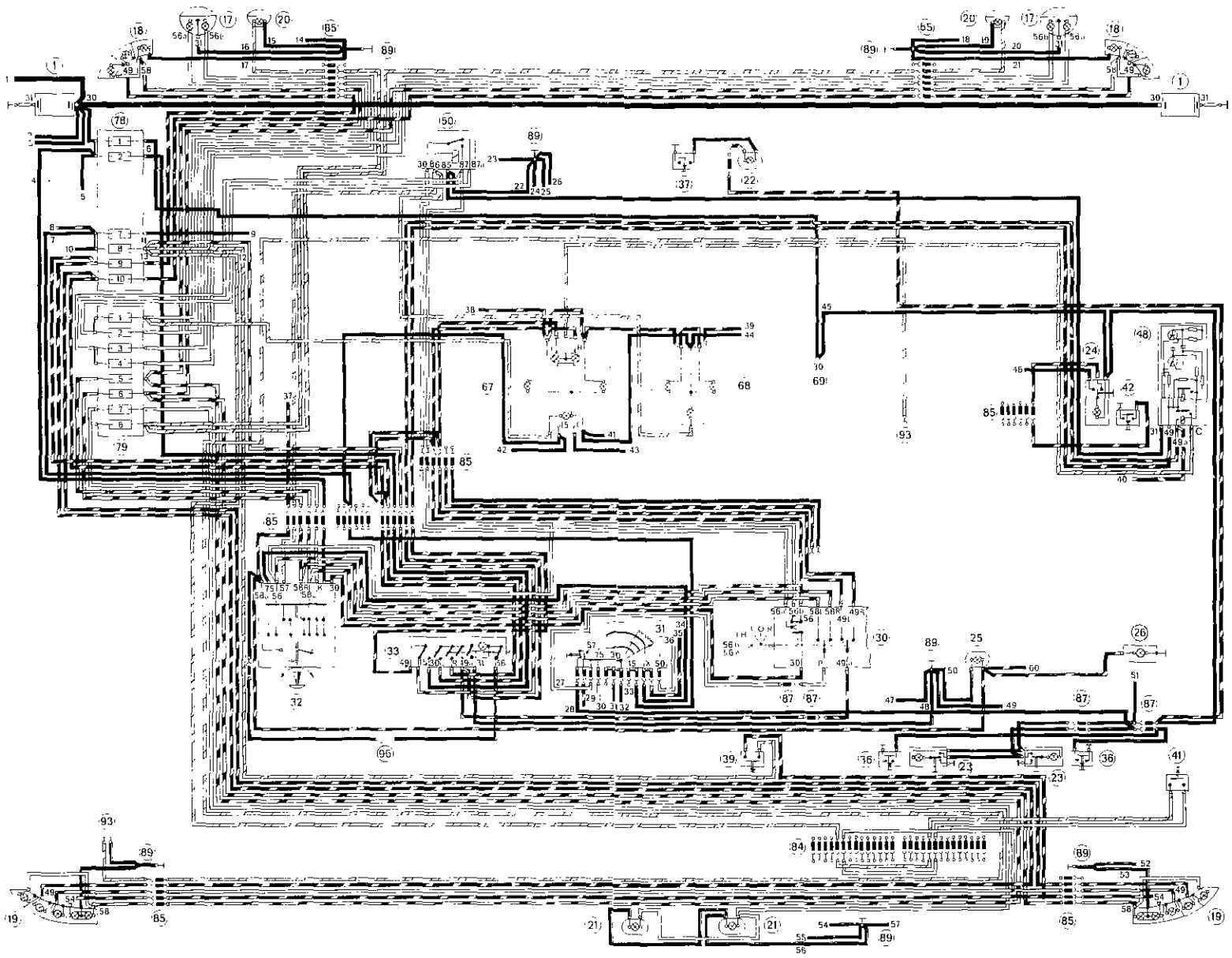
Fuse box I:
1 Interior light, clock, luggage compartment light
2 Emergency flasher
3 (Electric windows)
4 Cigarette lighter
5 (Sliding roof)
6 Windshield wiper, washer pump
7 Fresh air fan
8 Stop, turn and back-up lights
9 Left front turn signal light
10 Right front turn signal light

Fuse box III:
1 (Sportomatic)
2 Shut-off solenoid, solenoid valve, solenoid for cold starting unit
3 Rear window defogger

CAUTION!
Do not disconnect battery while the engine is running as this will damage the alternator.

Printed in Germany – I, 1971

Electric wiring diagram (Part I) Type 911 T, 911 E, 911 S, Carrera 2.7, Model 73



1 Battery
17 Headlights
18 Turn signal, parking and side marker lights
(side marker lights USA only)
19 Tail, stop, turn, back-up and side marker lights
(side marker lights USA only)
20 Fog lights (optional)
21 License plate light
22 Luggage compartment light
23 Interior light
24 Glove compartment light
25 Ashtray light
26 Illumination for heating lever (USA only)
30 Flasher, dimmer, wiper/washer switch with horn ring on steering column
31 Ignition starter switch and steering lock
32 Light switch
33 Emergency flasher switch
(not applicable in Italy and France)
36 Door contact switch
37 Switch for luggage compartment light
39 Stop light switch
41 Back-up light switch
42 Switch for glove compartment light
48 Turn signal/emergency flasher unit
50 Headlight relay
67 Tachometer
68 Speedometer
69 Electric clock
78 Fuse box I (10 terminal)
79 Fuse box II (8 terminal)
84 Multi-connector (14 terminal)
85 Multi-connector (6 terminal)
87 Connector (single contact)
89 Ground connection-body
93 Rear fog light (optional)
96 Resistor (USA only)

FUSES:

Fuse box I:

1 Interior light, clock, luggage compartment light
2 Emergency flasher
7 Fresh air fan
8 Stop, turn and back-up lights
9 Left front turn signal light
10 Right front turn signal light

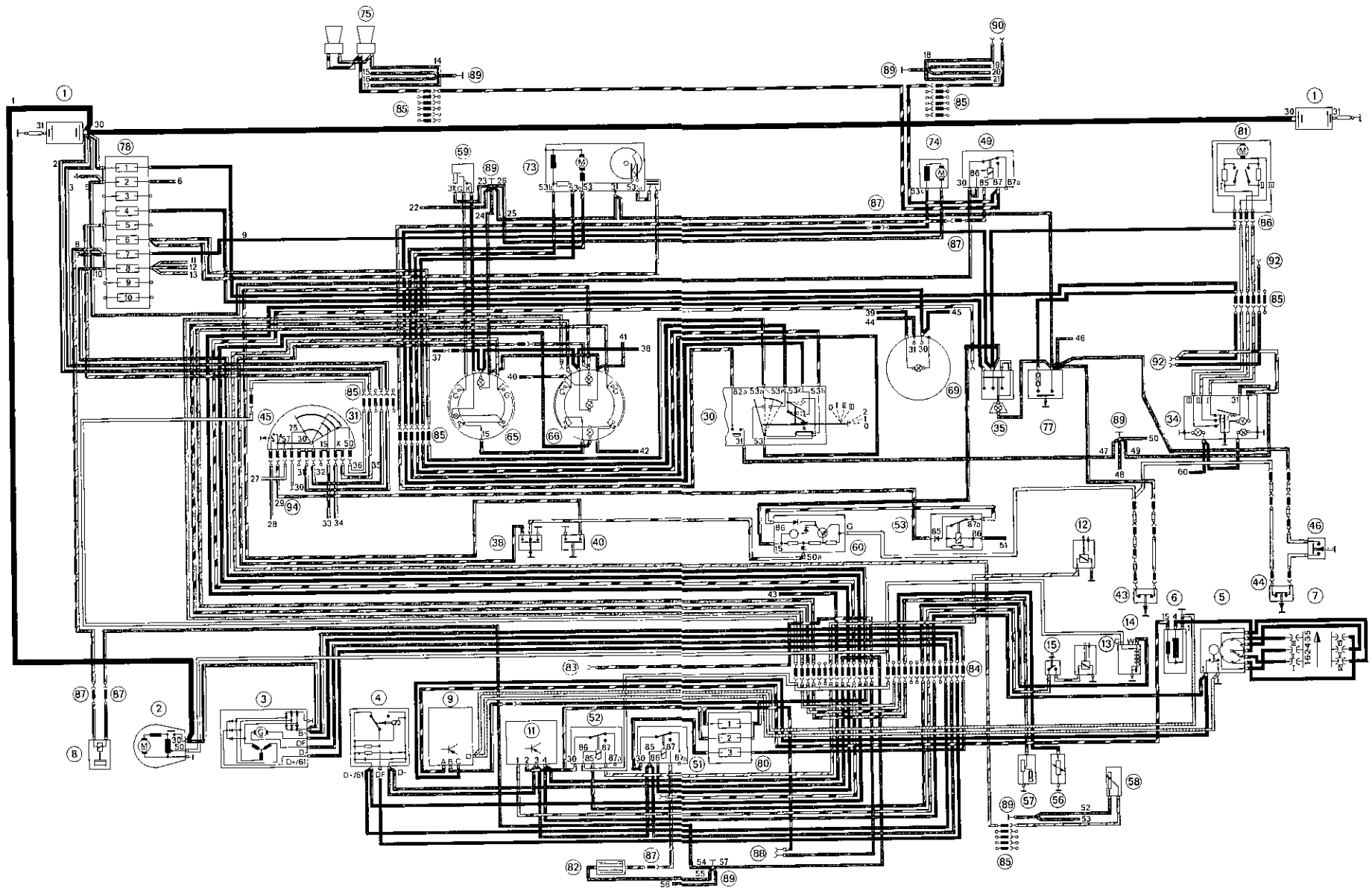
Fuse box II:

1 High beam, left
2 High beam, right
3 Low beam, left
4 Low beam, right
5 Side marker, left
6 Side marker, right
7 License plate light
8 (Fog lights)

CAUTION!

Do not disconnect battery while the engine is running as this will damage the alternator

Electric wiring diagram (Part II) Type 911 T, 911 E, 911 S, Carrera 2.7, Model 73



1 Battery
2 Starter
3 Alternator
4 Governor
5 Distributor
6 Ignition transformer
7 Spark plugs
8 Fuel pump
9 High tension ignition unit
11 Speed switch
12 Cold start solenoid (except 911 TV)
13 Shut-off solenoid (911 TV: solenoid valve)
14 Thermo-time switch (except 911 TV)
15 Micro switch
30 Flasher, dimmer, wiper/washer switch with horn ring on steering column
31 Ignition starter switch and steering lock
34 Switch for fan and auxiliary heater
35 Rear window defogger switch
38 Parking brake contact
40 Brake warning light switch (USA only)
43 Safety belt contact, driver side (USA only)
44 Safety belt contact, passenger side (USA only)
45 Buzzer contact (USA only)
46 Seat contact, passenger side (USA only)
49 Horn relay
51 Rear window defogger relay
52 Auxiliary starting relay (except 911 TV)
53 Buzzer (USA only)
56 Oil temperature indicator
57 Oil pressure indicator
58 Oil level indicator
59 Indicator for fuel gauge
60 Safety belt warning light (USA only)
65 Fuel gauge dial
66 Oil temperature gauge dial
69 Electric clock
73 Wiper motor
74 Washer pump
75 Horns
77 Cigarette lighter
78 Fuse box I (10 terminal)
80 Fuse box III (3 terminal)
81 Fan motor
82 Rear window defogger element
83 Sportomatic (optional)
84 Multi-connector (14 terminal)
85 Multi-connector (6 terminal)
86 Multi-connector (4 terminal)
87 Connector (single contact)
89 Ground connection-body
90 Optional horn
92 Auxiliary combustion heater (optional)
94 Radio (optional)

FUSES:

Fuse box I:

1 Interior light, clock, luggage compartment light
2 Emergency flasher
3 (Electric windows)
4 Cigarette lighter
5 (Sliding roof)
6 Windshield wiper, washer pump
7 Fresh air fan
8 Stop, turn and back-up lights
9 Left front turn signal light
10 Right front turn signal light

Fuse box III:

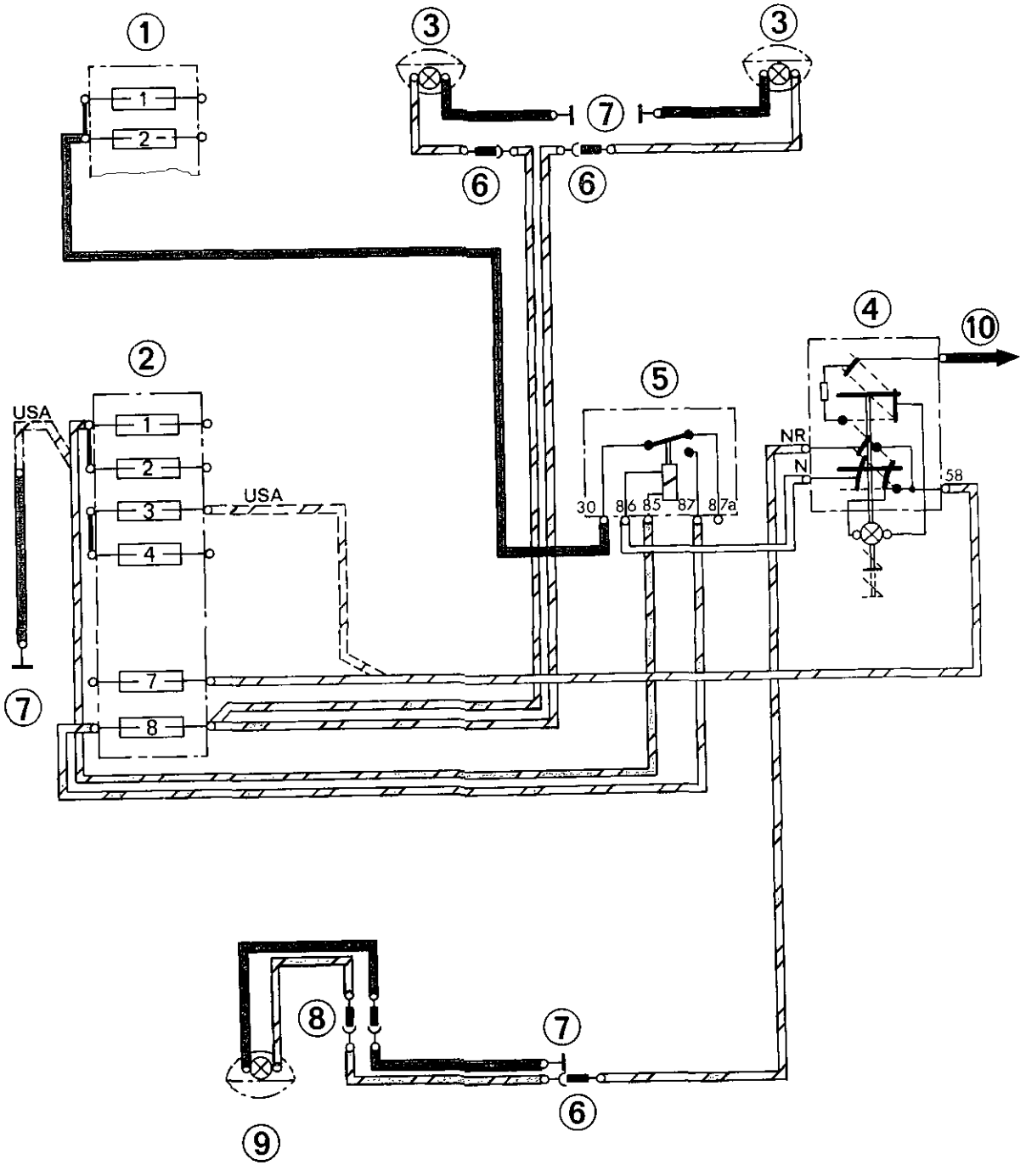
1 (Sportomatic)
2 Shut-off solenoid, solenoid valve, solenoid for cold starting unit
3 Rear window defogger

CAUTION!

Do not disconnect battery while the engine is running as this will damage the alternator.

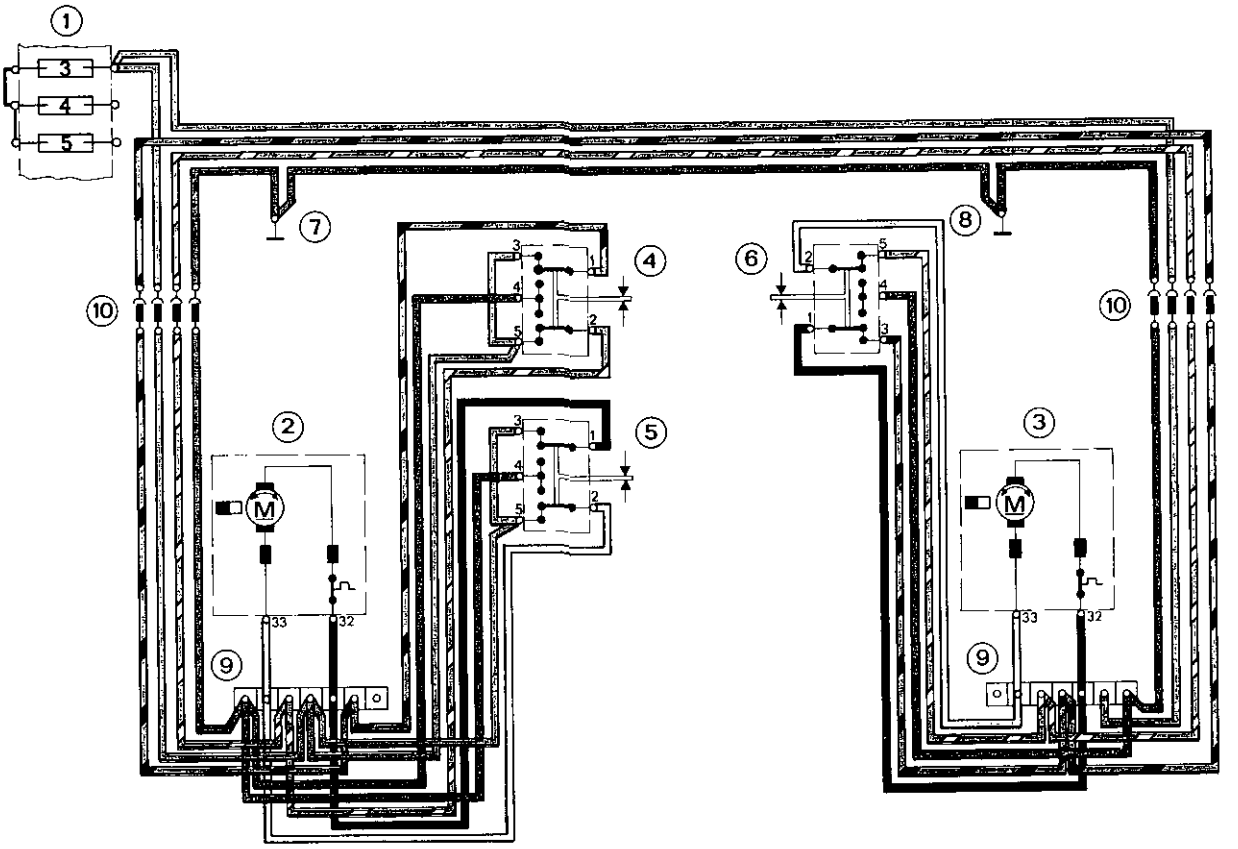
Printed in Germany – I, 1972

Additional wiring diagram front and rear fog lights, Type 911



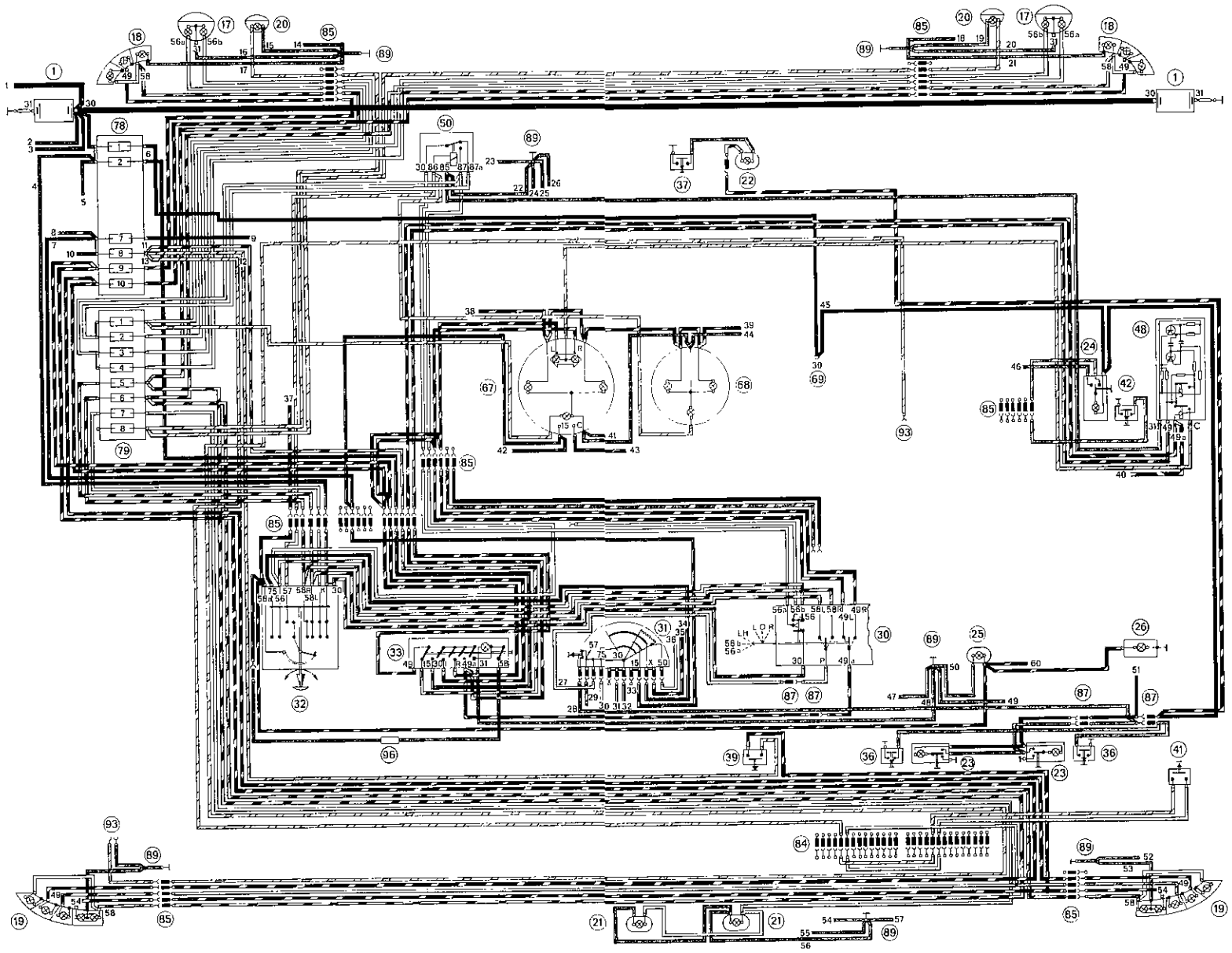
1 Fuse box I
2 Fuse box II
3 Fog lights
4 Fog lights switch
5 Relay
6 Multi-connector (6 terminal)
7 Ground connection-body
8 Connector (double contact)
9 Rear fog light
10 Ground connection (cigarette lighter)

Additional wiring diagram electric window opener, Type 911



1 Fuse box I
2 Motor, driver side
3 Motor, passenger side
4 Switch for passenger side, left
5 Switch for driver side
6 Switch for passenger side, right
7 Ground connection, left
8 Ground connection, right
9 Terminal strip
10 Connector

Electric wiring diagram (Part I) Type 911 T with CIS, Model 73



1 Battery
17 Headlights
18 Turn signal, parking and side marker lights
(side marker lights USA only)
19 Tail, stop, turn, back-up and side marker lights
(side marker lights USA only)
20 Fog lights (optional)
21 License plate light
22 Luggage compartment light
23 Interior light
24 Glove compartment light
25 Ashtray light
26 Illumination for heating lever (USA only)
30 Flasher, dimmer, wiper/washer switch with horn ring on steering column
31 Ignition starter switch and steering lock
32 Light switch
33 Emergency flasher switch
(not applicable in Italy and France)
36 Door contact switch
37 Switch for luggage compartment light
39 Stop light switch
41 Back-up light switch
42 Switch for glove compartment light
48 Turn signal/emergency flasher unit
50 Headlight relay
67 Tachometer
68 Speedometer
69 Electric clock
78 Fuse box I (10 terminal)
79 Fuse box II (8 terminal)
84 Multi-connector (14 terminal)
85 Multi-connector (6 terminal)
87 Connector (single contact)
89 Ground connection-body
93 Rear fog light (optional)
96 Resistor (USA only)

FUSES:

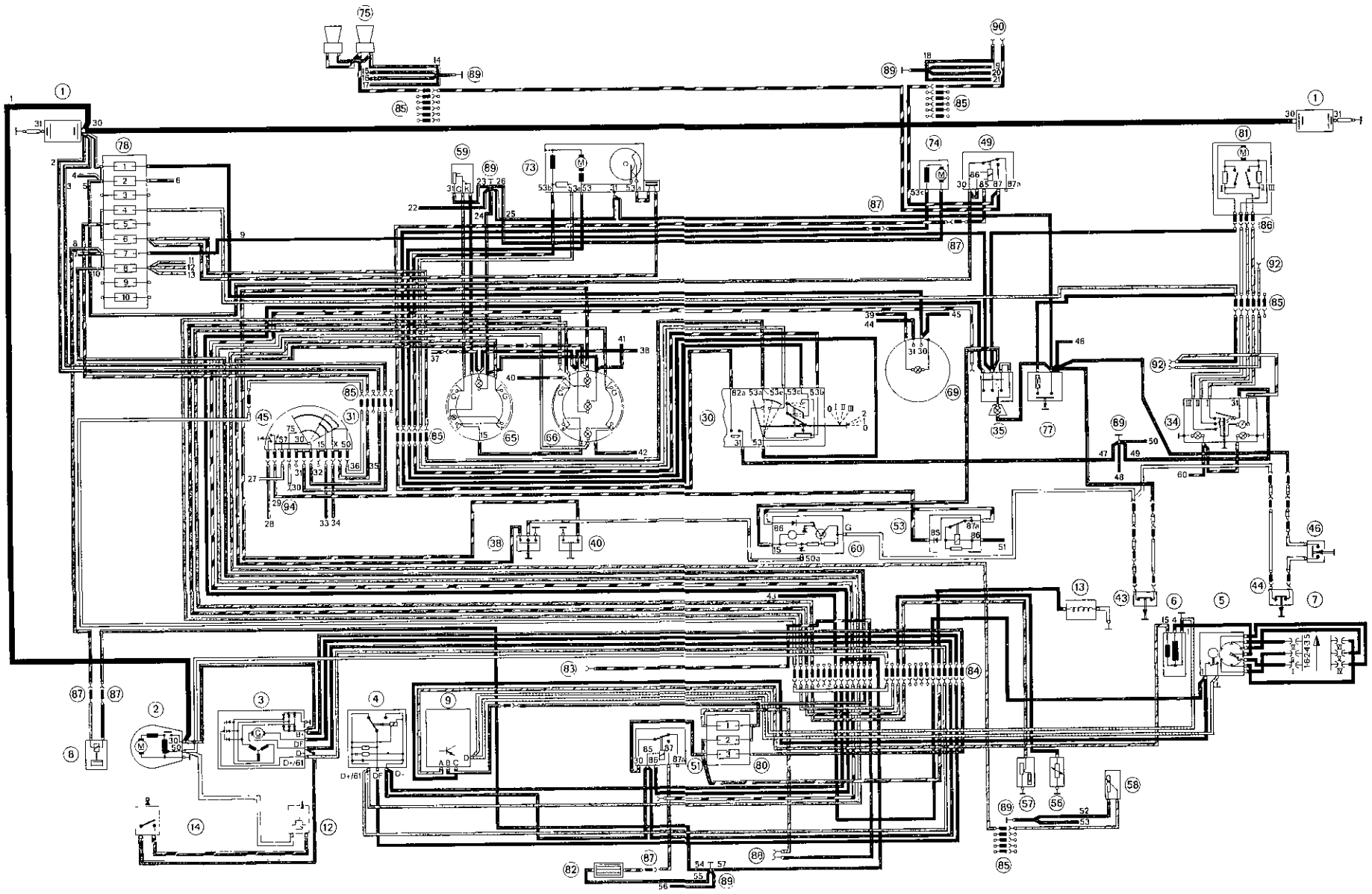
Fuse box I:
1 Interior light, clock, luggage compartment light
2 Emergency flasher
7 Fresh air fan
8 Stop, turn and back-up lights
9 Left front turn signal light
10 Right front turn signal light

Fuse box II:
1 High beam, left
2 High beam, right
3 Low beam, left
4 Low beam, right
5 Side marker, left
6 Side marker, right
7 License plate light
8 (Fog lights)

CAUTION!

Do not disconnect battery while the engine is running as this will damage the alternator.

Electric wiring diagram (Part II) Type 911 T with CIS, Model 73



1 Battery
2 Starter
3 Alternator
4 Governor
5 Distributor
6 Ignition transformer
7 Spark plugs
8 Fuel pump
9 High tension ignition unit
12 Cold start solenoid
13 Control pressure regulating valve with warm-up compensation
14 Micro switch
30 Flasher, dimmer, wiper/washer switch with horn ring on steering column
31 Ignition starter switch and steering lock
34 Switch for fan and auxiliary heater
35 Rear window defogger switch
38 Parking brake contact
40 Brake warning light switch (USA only)
43 Safety belt contact, driver side (USA only)
44 Safety belt contact, passenger side (USA only)
45 Buzzer contact (USA only)
46 Seat contact, passenger side (USA only)
49 Horn relay
51 Rear window defogger relay
53 Buzzer (USA only)
56 Oil temperature indicator
57 Oil pressure indicator (optional)
58 Oil level indicator (optional)
59 Indicator for fuel gauge
60 Safety belt warning light (USA only)
65 Fuel gauge dial
66 Oil temperature gauge dial
69 Electric clock
73 Wiper motor
74 Washer pump
75 Horns
77 Cigarette lighter
78 Fuse box I (10 terminal)
80 Fuse box III (3 terminal)
81 Fan motor
82 Rear window defogger element
83 Sportomatic (optional)
84 Multi-connector (14 terminal)
85 Multi-connector (6 terminal)
86 Multi-connector (4 terminal)
87 Connector (single contact)
88 Gear lever contact SPM (optional)
89 Ground connection-body
90 Optional horn
92 Auxiliary combustion heater (optional)
94 Radio (optional)

FUSES:

Fuse box I:

1 Interior light, clock, luggage compartment light
2 Emergency flasher
3 (Electric windows)
4 Cigarette lighter
5 (Sliding roof)
6 Windshield wiper, washer pump
7 Fresh air fan
8 Stop, turn and back-up lights
9 Left front turn signal light
10 Right front turn signal light

Fuse box III:

1 (Sportomatic)
2
3 Rear window defogger

CAUTION!

Do not disconnect battery while the engine is running as this will damage the alternator.

Printed in Germany - XXVII, 1973

SUPPLEMENT TO ELECTRIC WIRING DIAGRAM

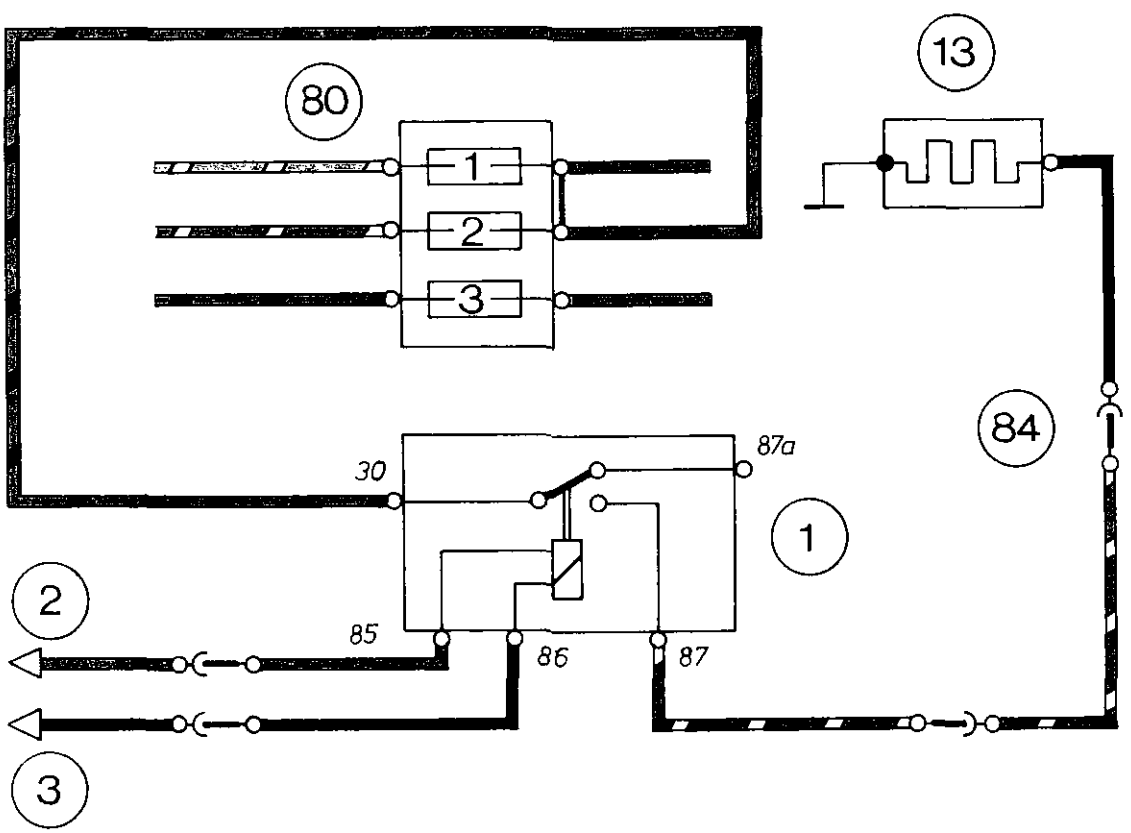
TYPE 911 T WITH CONTINUOUS INJECTION SYSTEM (CIS), 1973 MODEL

Wiring in the area of fuse box III shown on page 0.1 - 2/15 differs in Type 911 T vehicles equipped with the Continuous Injection System (CIS) due to the utilization of differing components. The resulting changes in the wiring diagram can be seen in the circuit schematic shown below.

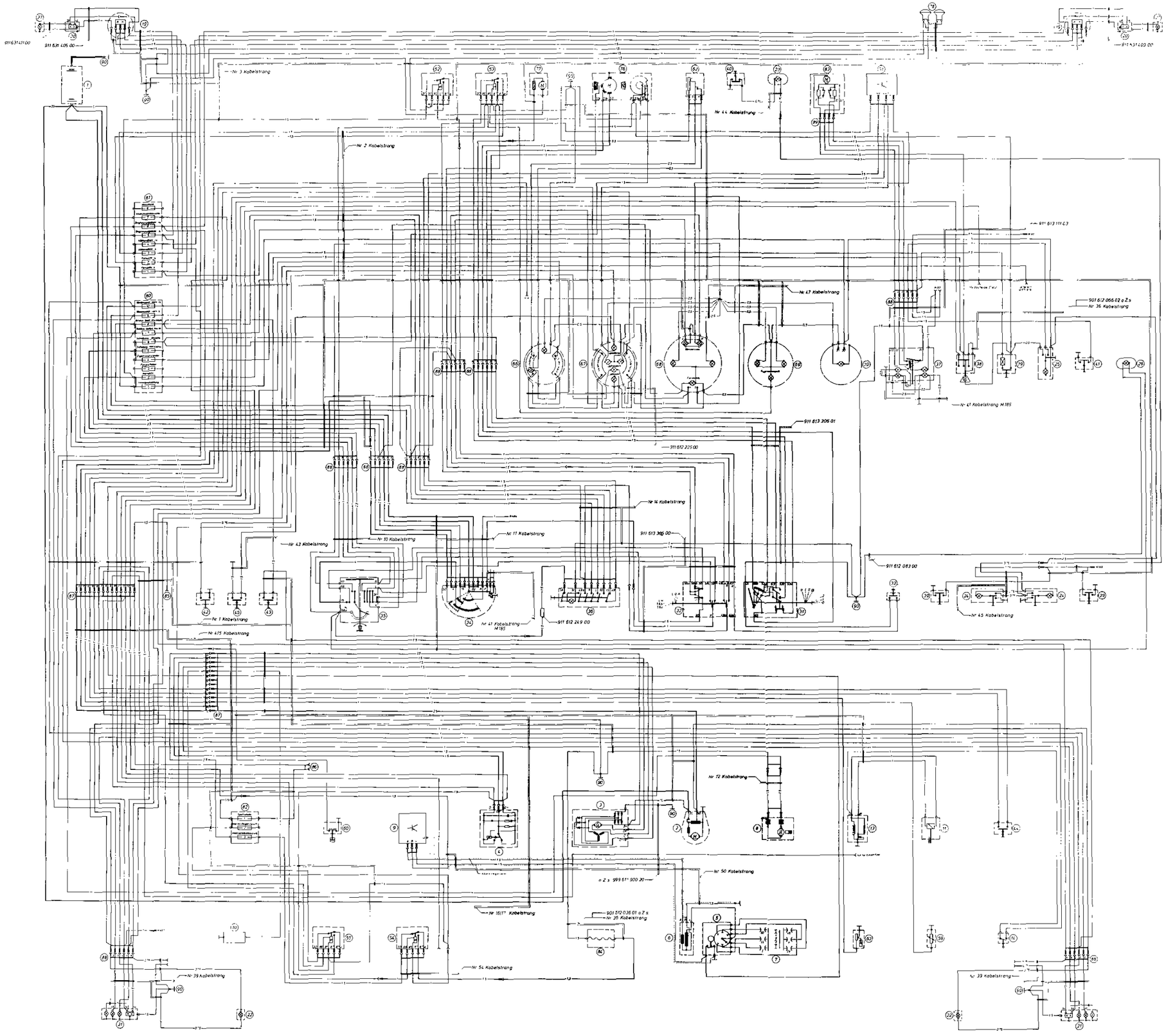
The red/white wire originally connected to fuse No. 2 now is connected to terminal No. 87 of the newly added solenoid switch. The red/white wire currently attached to fuse No. 2 has no function in CIS-equipped vehicles even though it continues to be installed for production reasons.

The added solenoid switch is installed in the same place where the cold start enrichment solenoid normally is located in vehicles equipped with the mechanical fuel injection system.

This wiring circuit ensures that the warm-up regulator does not come into action until electric current is produced by the alternator, that is, only when the engine actually is running. This system prevents preparation of an overly lean starting fuel/air mixture if a longer time lag should occur between the time the ignition is switched on and the engine started.

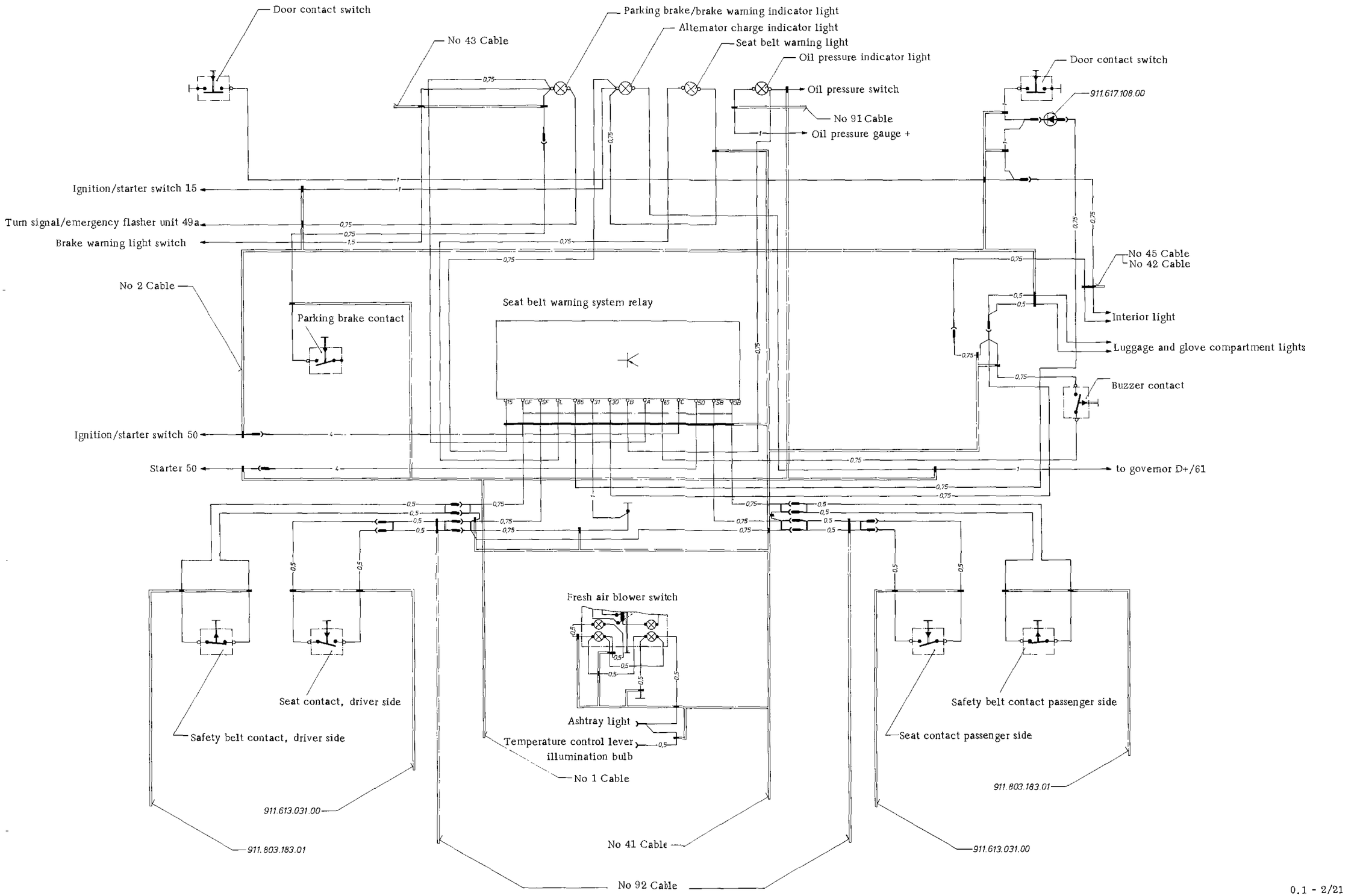


1 Solenoid switch
2 To voltage regulator, terminal D- (ground)
3 To voltage regulator, terminal D+/61
13 Warm-up regulator
80 Fuse box III
84 14-pole connector, connector No. 10



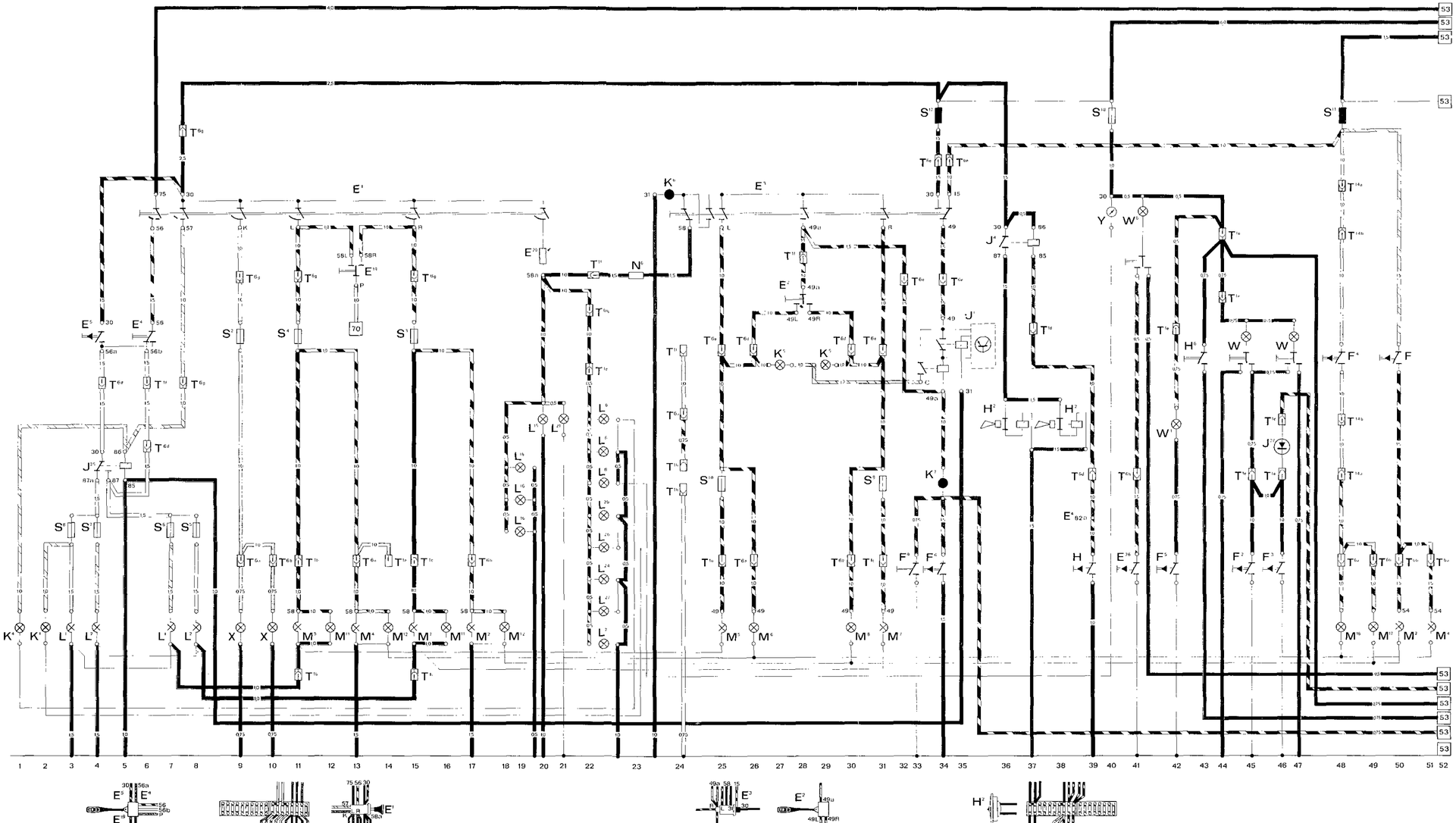
Electric wiring diagram 911, 911S - Model 74 - USA

1 Battery
2 Starter
3 Alternator
4 Governor
5 Distributor
6 Ignition transformer
7 Spark plugs
8 Fuel pump
9 High tension ignition unit
10 Control pressure regulating valve with warm-up compensation
11 Cold start solenoid
13 Thermo-time switch
14 Micro switch
19 Head lights
20 Turn signal and parking lights
21 Tail, stop, turn, back-up and side marker lights
22 License plate light
23 Luggage compartment light
24 Interior light
25 Glove compartment
26 Ashtray light
27 Side marker light
31 Windshield wiper/washer switch
32 Flasher/dimmer switch
33 Horn button
34 Ignition starter switch and steering lock
35 Light switch
36 Emergency flasher switch
37 Switch for fan and auxiliary heater
38 Rear window defogger switch
39 Door contact switch
40 Switch for luggage compartment light
41 Switch for glove compartment light
42 Parking brake contact
43 Stop light switch
44 Back-up light switch
45 Brake warning light switch
51 Turn signal/emergency flasher unit
52 Horn relay
53 Headlight relay
54 Rear window defogger relay
55 Relay for control pressure regulating valve
59 Oil temperature indicator
60 Oil pressure switch
61 Oil level indicator
62 Indicator for fuel gauge
63 Oil pressure indicator
66 Fuel gauge dial
67 Oil temperature gauge dial
68 Tachometer
69 Speedometer
70 Electric clock
76 Wiper motor
77 Washer pump
78 Horns
79 Cigarette lighter
80 Fuse box I (10 terminal)
81 Fuse box II (8 terminal)
82 Fuse box III (3 terminal)
83 Fan motor
84 Rear window defogger element
85 Gear lever contact SPM (optional)
86 Connector SPM (double)
87 Multi-connector (14 terminal)
88 Multi-connector (6 terminal)
89 Multi-connector (4 terminal)
90 Ground connection - body


Door contact switch
No 43 Cable
Parking brake/brake warning indicator light
Alternator charge indicator light
Seat belt warning light
Oil pressure indicator light
Oil pressure switch
No 91 Cable
Oil pressure gauge +
Door contact switch
911.617.108.00
Ignition/starter switch 15
Turn signal/emergency flasher unit 49a
Brake warning light switch
No 2 Cable
Parking brake contact
Seat belt warning system relay
No 45 Cable
No 42 Cable
Interior light
Luggage and glove compartment lights
Buzzer contact
Ignition/starter switch 50
Starter 50
to governor D+/61
Fresh air blower switch
Ashtray light
Temperature control lever illumination bulb
No 1 Cable
Seat contact, driver side
Safety belt contact, driver side
911.613.031.00
911.803.183.01
No 41 Cable
No 92 Cable
Safety belt contact passenger side
Seat contact passenger side
911.803.183.01
911.613.031.00

9 Current flow diagram, Type 911 USA, Model 74

Description	Current track
E^1 — Headlight switch	6, 8, 9, 11, 15, 20
E^2 — Turn signal switch	28
E^3 — Emergency flasher switch	24, 25, 28, 31, 34
E^4 — Dimmer switch	6, 39
E^5 — Headlight flasher switch	4
E^{19} — Parking light switch	13
E^{20} — Instrument panel illumination potentiometer	20
E^{26} — Switch for glove compartment light	41
F — Stop light switch	50
F^2 — Left door switch	45
F^3 — Right door switch	46
F^4 — Back-up light switch	48
F^5 — Switch for luggage compartment light	42
F^6 — Brake warning switch	34
F^9 — Parking brake switch	33
H — Horn switch	39
H^2 — Horns	38, 38
H^6 — Key warning buzzer contact	43
J^1 — Hazard / turn signal flasher	33, 34, 35
J^4 — Horn relay	36, 37
J^{25} — Headlight relay	4, 5
J^{27} — Diode for seat belt warning system	46
K^1 — High beam indicator light	2
K^2 — Parking lights indicator light	1
K^3 — Turn signal indicator light	27, 29
K^4 — Hazard flasher indicator light	24
K^7 — Parking brake / brake warning indicator light	34
L^1 — Sealed beam unit, left headlight	3, 7
L^2 — Sealed beam unit, right headlight	4, 8
L^4 — Speedometer illumination light	22
L^7 — Fuel gauge illumination light	22
L^8 — Clock illumination light	22
L^{15} — Ashtray illumination light	20
L^{16} — Heater control assembly illumination light	19
L^{21} — Temperature control lever illumination light	21
L^{24} — Oil temperature indicator illumination light	22
L^{26} — Tachometer illumination light	22
L^{27} — Oil pressure indicator illumination light	22
M^2 — Right stop / rear light	17, 50
M^4 — Left stop / rear light	13, 51
M^5 — Left front turn signal / parking light	11, 25
M^6 — Left rear turn signal	26
M^7 — Right front turn signal / parking light	15, 31
M^8 — Right rear turn signal	30
M^{11} — Front side marker light	12, 16
M^{12} — Rear side marker light	14, 18
M^{16} — Left back-up light	48
M^{17} — Right back-up light	49
N^6 — Resistor	23
S^3	9, 15, 11
to — Fuses	8, 7, 4
S^{11} on the	3, 31, 25, 48
S^{17}	34
S^{18} fuse box	40
T^1 — Cable connector, single	
a — near regulator panel	14
b — behind sealed beam unit, left	11, 25
c — behind sealed beam unit, right	15, 31
d — behind fuse box	37
e — on luggage compartment floor	22, 42, 44, 45, 46
f — behind instrument panel	6, 22, 24, 28
g — near left rear lights	24
T^6 — Cable connector, sixfold	
a — in the engine compartment, rear left	9, 13, 24, 26, 48, 51
b — in the engine compartment, rear right	10, 17, 30, 49, 50
d — below instrument panel	4, 6, 26, 30, 39
e — below instrument panel	25, 31, 32, 34
g — below instrument panel	8, 9, 11, 15, 22
h — below instrument panel	41
T^{14} — Cable connector, fourteenfold	
a — on regulator panel, front	48
b — on regulator panel, rear	48
W — Interior light	45, 46
W^3 — Luggage compartment light	42
W^6 — Glove compartment light	41
X — License plate light	9, 10
Y — Clock	40

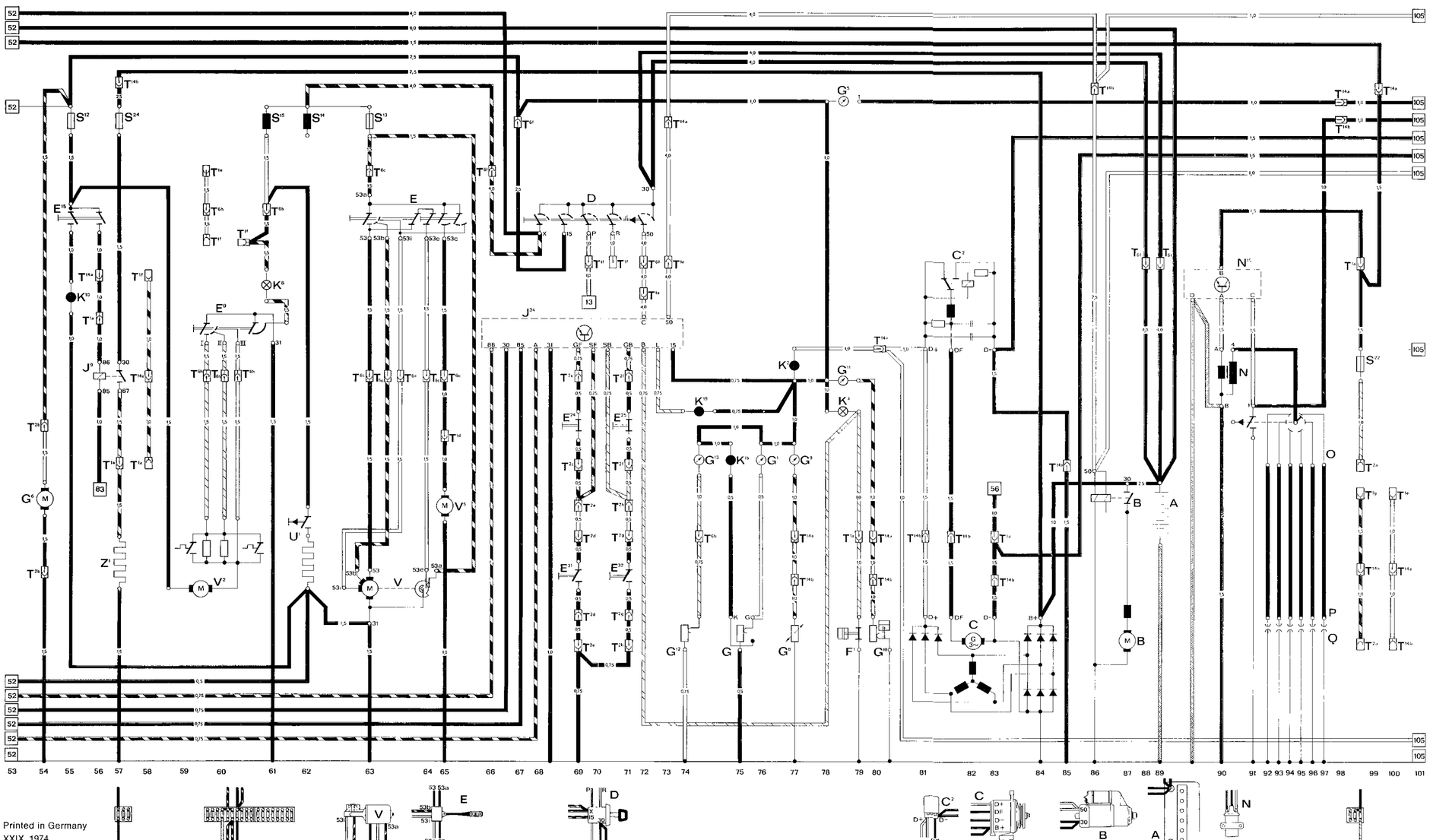


Printed in Germany XXIX, 1974

Current flow diagram, Type 911 USA, Model 74

9

Current flow diagram, Type 911 USA, Model 74

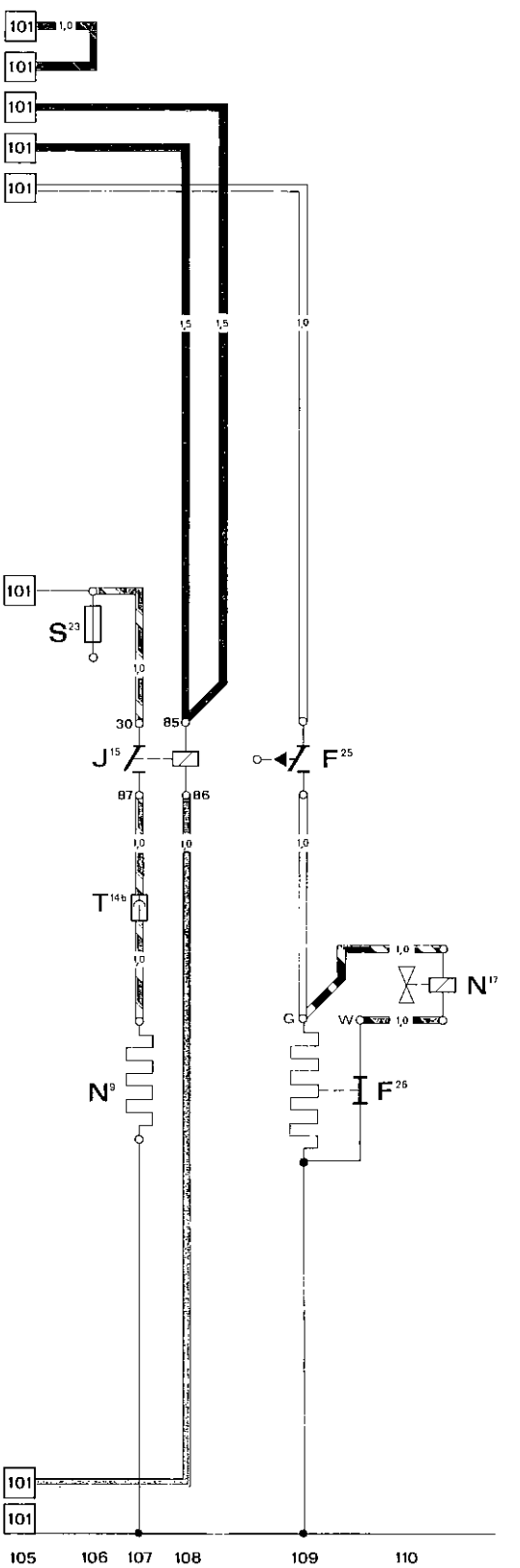


Description	Current track
A — Battery	89
B — Starter	86, 87
C — Generator	81, 82, 83, 84
C^2 — Voltage regulator	81, 82, 83
D — Ignition / starter switch	68, 69, 70, 71, 72
E — Windshield wiper switch	63, 64, 65
E^9 — Fresh air blower switch	60
E^{15} — Rear window defogger switch	55, 56
E^{24} — Left seat belt switch	69
E^{25} — Right seat belt switch	71
E^{31} — Left seat sensor switch	69
E^{32} — Right seat sensor switch	71
F^1 — Oil pressure switch	79
G — Fuel sender unit	75
G^1 — Fuel gauge	76
G^5 — Tachometer	78
G^6 — Fuel pump	54
G^8 — Oil temperature sender unit	77
G^9 — Oil temperature indicator	77
G^{10} — Oil pressure sender unit	80
G^{11} — Oil pressure indicator	78
G^{12} — Oil level sender unit	74
G^{13} — Oil level gauge	74
J^9 — Rear window defogger relay	56, 57
J^{34} — Seat belt warning system relay with integrated buzzer	66, 67, 68, 69, 70, 71, 72, 73
K^2 — Generator charge indicator light	77
K^3 — Oil pressure indicator light	78
K^8 — Blower indicator light	61
K^{10} — Rear window defogger indicator light	55
K^{16} — Low fuel warning light	75
K^{19} — Seat belt warning light	74
N — Ignition transformer	90
N^{15} — High tension ignition unit	90
O — Distributor	91, 92, 93, 94, 95, 96, 97
P — Spark plug connector	92, 93, 94, 95, 96, 97
Q — Spark plug	92, 93, 94, 95, 96, 97
S^{12} Fuses	55, 63
to — on the	62
S^{15} fuse box	61
S^{22} — Fuses on the	99
S^{24} — rear fuse box (regulator panel)	57
T^1 — Cable connector, single	
a — near regulator panel	56, 57, 58, 79, 83, 99
d — behind fuse box	65
e — on luggage compartment floor	60, 72, 73, 100
f — behind instrument panel	58, 60, 61, 69, 70
g — below shift lever housing	99
T^2 — Cable connector, douple	
a — below regulator panel	99
b — in engine compartment, left	54
c — near left seat	69
d — below left seat	69
e — near left seat	69
f — near right seat	71
g — below right seat	71
h — near right seat	71
T^6 — Cable connector, sixfold	
b — in engine compartment, right	74
c — below instrument panel	63, 64, 65
f — below instrument panel	66, 67, 72, 88, 89
h — below instrument panel	60, 61
T^{14} — Cable connector, fourteenfold	
a — on regulator panel, front	56, 58, 73, 77, 80, 85, 98, 99, 100
b — on regulator panel, rear	57, 77, 80, 81, 83, 86, 98, 100
U^1 — Cigar lighter	62
V — Windshield wiper motor	63, 64
V^2 — Blower motor	60
V^5 — Washer pump	65
Z^1 — Rear window defogger	57

Printed in Germany
XXIX, 1974

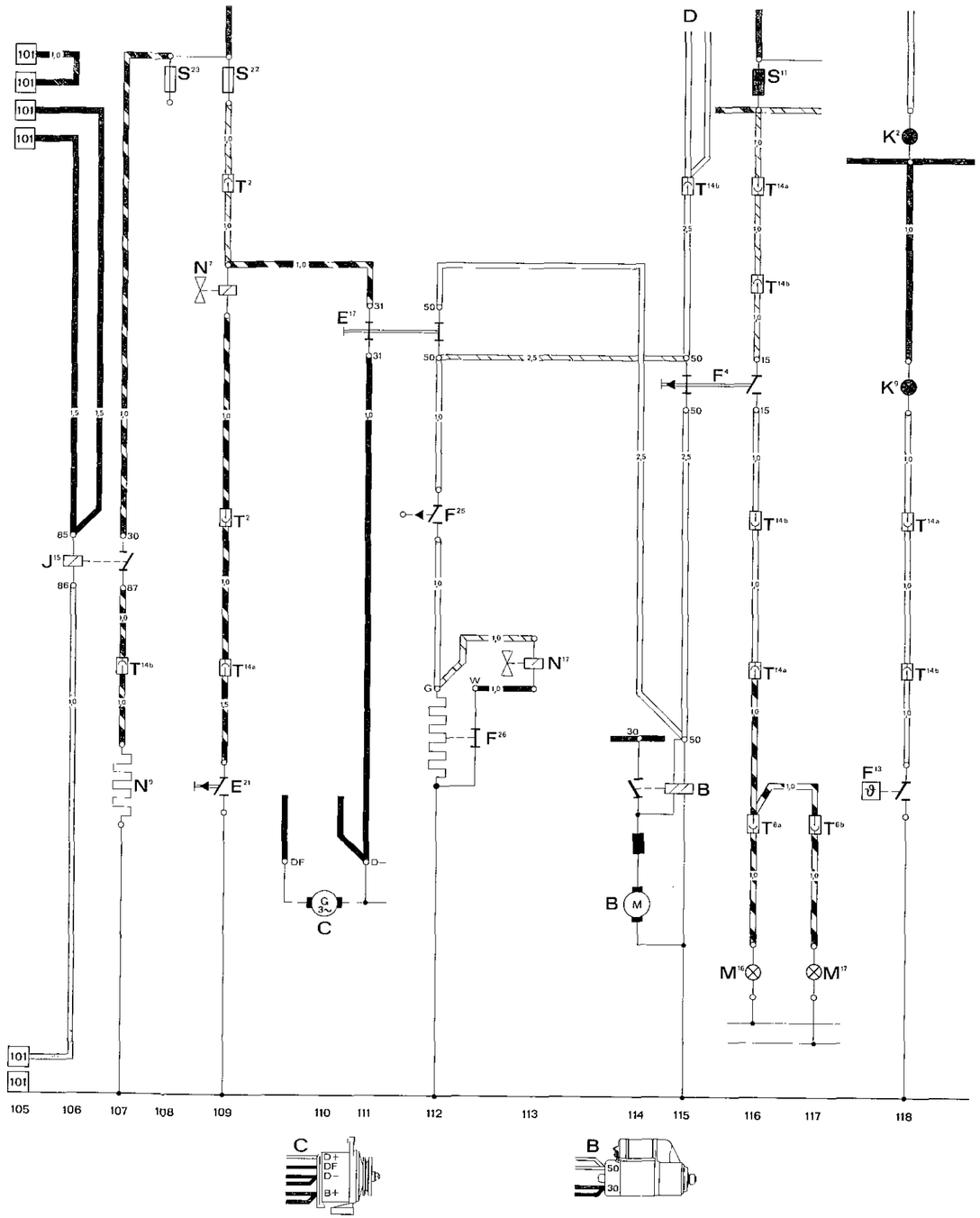
Additional current flow diagram CIS-injection engine, Type 911, Model 74

Description	Current track
F^{25} – Throttle valve switch	109
F^{26} – Thermo-switch for cold start valve	109
J^{15} – Relay for warm-up regulator	107, 108
N^{9} – Warm-up regulator	107
N^{17} – Cold start valve	110
S^{23} – Fuse on the rear fuse box	106
T^{14b} – Cable connector, fourteenfold on regulator panel, rear	107



Additional current flow diagram CIS-injection and Sportomatic, Type 911, Model 74

Description		Current track
B	– Starter	114, 115
C	– Generator	110, 111
D	– to ignition / starter switch	115
E^{17}	– Starter cutout switch (bypass switch)	111, 112
E^{21}	– Selector lever contact	109
F^{4}	– Back-up light switch	115, 116
F^{13}	– Oil temperature switch	118
F^{25}	– Throttle valve switch (micro switch)	112
F^{26}	– Thermo-switch for cold start valve	112
J^{15}	– Relay for warm-up regulator	106, 107
K^{2}	– Generator charge indicator light	118
K^{9}	– Oil temperature indicator light	118
M^{16}	– Left back-up light	116
M^{17}	– Right back-up light	117
N^{7}	– Control valve	109
N^{9}	– Warm-up regulator	107
N^{17}	– Cold start valve	113
S^{11}	– Fuse on the fuse box	116
S^{22}	– Fuse on the rear fuse box (regulator panel)	109
S^{23}	– Fuse on the rear fuse box (regulator panel)	108
T^{2}	– Cable connector, double, below regulator panel	109
T^{6}	– Cable connector, sixfold	
	a – in engine compartment, rear left	116
	b – in engine compartment, rear right	117
T^{14}	– Cable connector, fourteenfold	
	a – on regulator panel, front	109, 116, 118
	b – on regulator panel, rear	107, 115, 116, 118



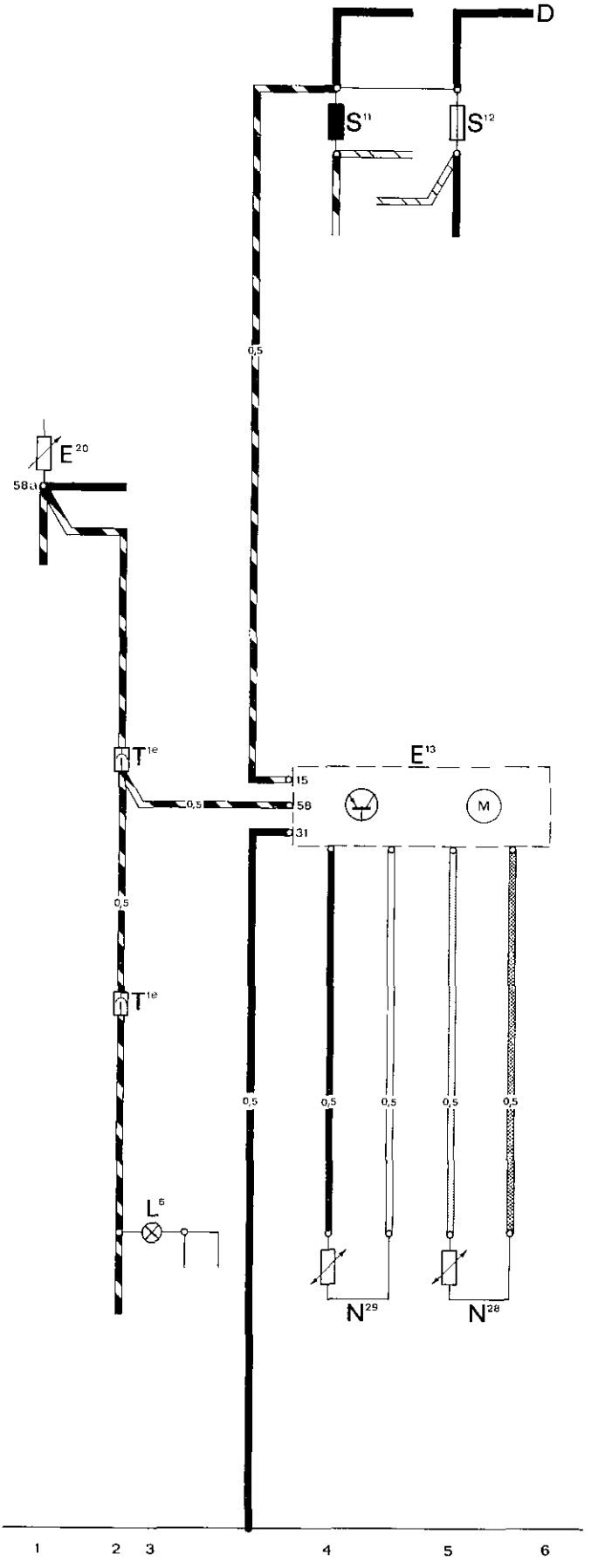
Printed in Germany — XXXI, 1974

Additional current flow diagram CIS-injection and Sportomatic, Type 911, Model 74

9

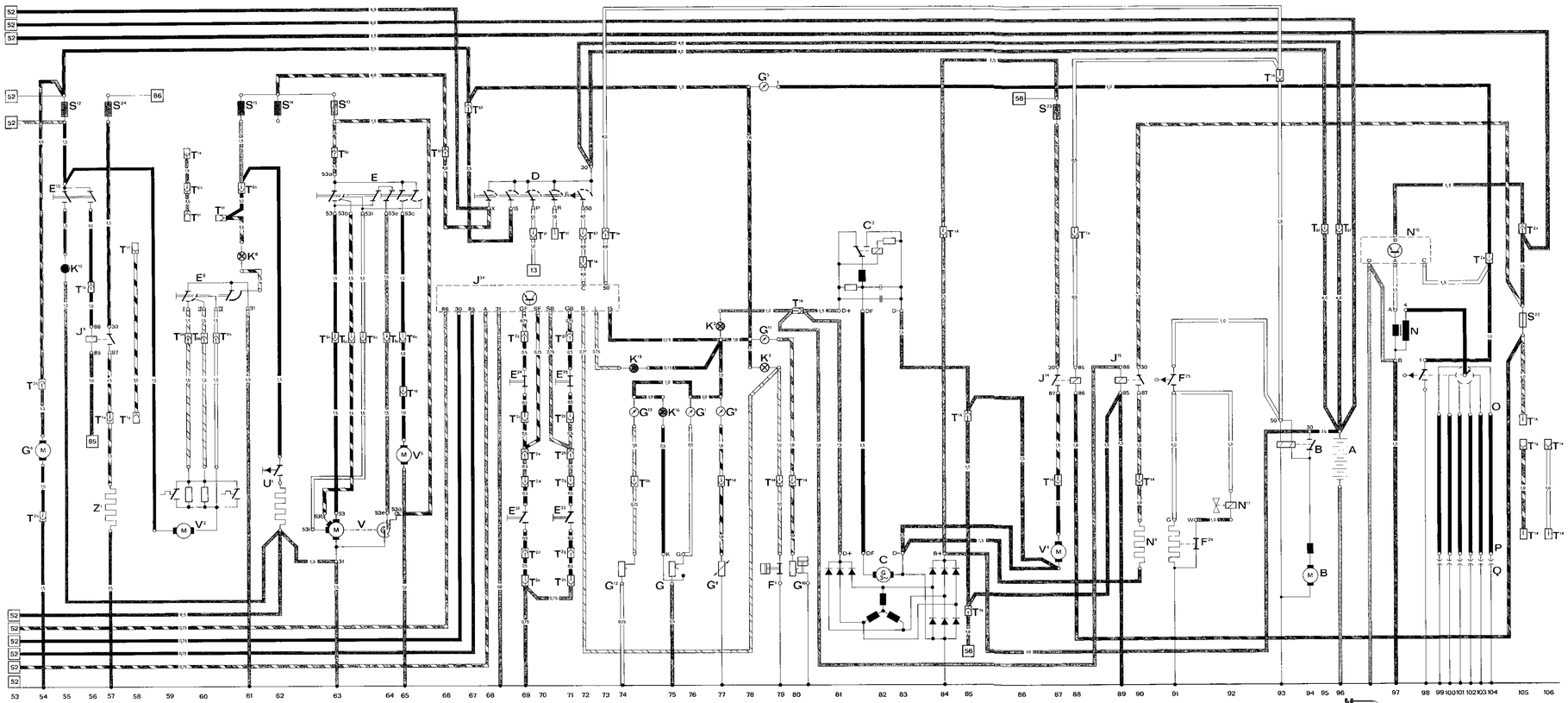
Additional current flow diagram automatic heating system, Type 911

Description		Current track
D	– to ignition/starter switch	6
E^{13}	– Control unit for automatic heating system	4, 5
E^{20}	– Instrument panel illumination potentiometer	1
L^{6}	– Speedometer illumination light	3
N^{28}	– Interior temperature sensor	5
N^{29}	– Exterior temperature sensor	4
S^{11}	– Fuses in the	4
S^{12}	– fuse box	5
T^{1e}	– Cable connector, single, on luggage compartment floor	2



Current flow diagram, Type 911 USA, Model 75 9

Current flow diagram, Type 911 USA, Model 75



Description	Current track
A — Battery	96
B — Starter	93, 94
C — Generator	81, 82, 83, 84
C^2 — Voltage regulator	81, 82, 83
D — Ignition / starter switch	68, 69, 70, 71, 72
E — Windshield wiper switch	63, 64, 65
E^9 — Fresh air blower switch	60
E^{15} — Rear window defogger switch	55, 56
E^{24} — Left seat belt switch	69
E^{25} — Right seat belt switch	71
E^{31} — Left seat sensor switch	69
E^{32} — Right seat sensor switch	71
F^1 — Oil pressure switch	79
F^{29} — Throttle valve switch	91
F^{28} — Thermo-switch for cold start valve	91
G — Fuel sender unit	75
G^1 — Fuel gauge	76
G^2 — Tachometer	78
G^4 — Fuel pump	54
G^8 — Oil temperature sender unit	77
G^9 — Oil temperature indicator	77
G^{10} — Oil pressure sender unit	80
G^{11} — Oil pressure indicator	78
G^{12} — Oil level sender unit	74
G^{13} — Oil level gauge	74
J^7 — Rear window defogger relay	56, 57
J^{14} — Relay for heater blower	87, 88
J^{15} — Relay for warm-up regulator	89, 90
J^{24} — Seat belt warning system relay with integrated buzzer	66, 67, 68, 69 70, 71, 72, 73
K^2 — Generator charge indicator light	77
K^3 — Oil pressure indicator light	78
K^6 — Blower indicator light	61
K^{10} — Rear window defogger indicator light	55
K^{16} — Low fuel warning light	75
K^{19} — Seat belt warning light	74
N — Ignition transformer	97
N^3 — Warm-up regulator	90
N^{15} — High tension ignition unit	97
N^{17} — Cold start valve	92
O — Distributor	98—104
P — Spark plug connector	99—104
Q — Spark plug	99—104
S^{12} Fuses to S^{22} — on the fuse box	55, 63 62 61
S^{22} bis S^{24} — Fuses on the rear fuse box (regulator panel)	105 87 57
T^1 — Cable connector, single	
a — near regulator panel	56, 57, 58, 85, 88
d — behind fuse box	65
e — on luggage compartment floor	60, 72, 73
f — behind instrument panel	58, 60, 61, 69, 70
g — below shift lever housing	105
T^2 — Cable connector, double	
a — below regulator panel	104, 105
b — in engine compartment, left	54
c — near left seat	69
d — below left seat	69
e — near left seat	69
f — near right seat	71
g — below right seat	71
h — near right seat	71
T^6 — Cable connector, sixfold	
b — in engine compartment, right	74
c — below instrument panel	63, 64, 65
f — below instrument panel	66, 67, 72, 95, 96
h — below instrument panel	60, 61
T^{14} — Cable connector, fourteenfold on regulator panel	77, 79, 80, 84, 85, 87, 90, 93, 105, 106
U^1 — Cigar lighter	62
V — Windshield wiper motor	63, 64
V^2 — Blower motor	60
V^4 — Heater blower	87
V^5 — Washer pump	65
Z^1 — Rear window defogger	57

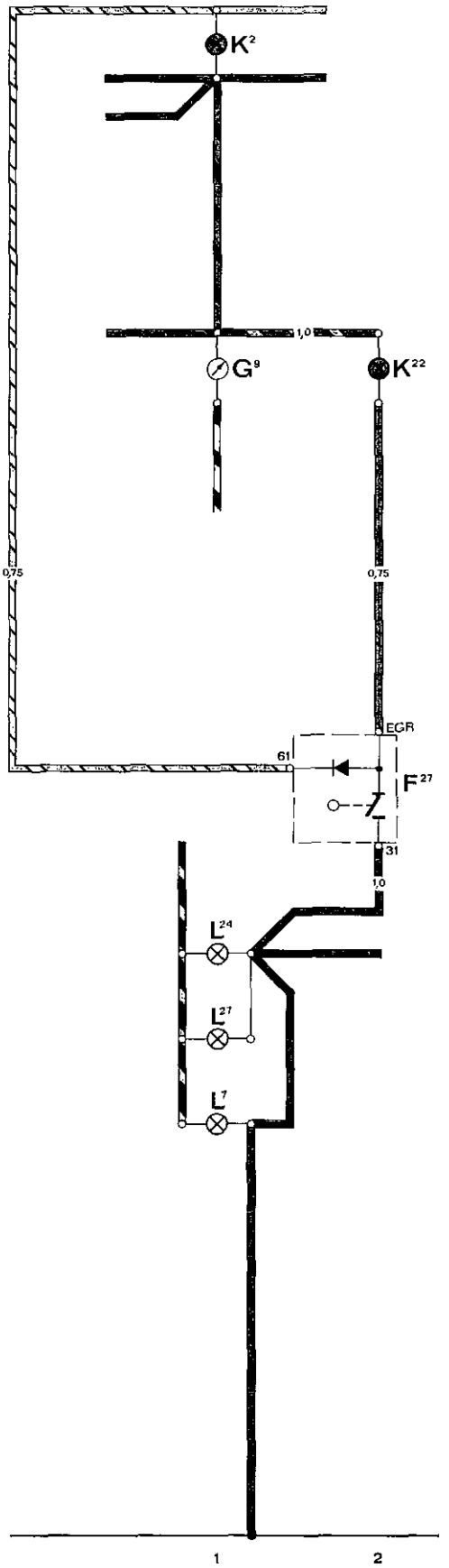
Printed in Germany
XXXII, 1974

9

Current flow diagram, Type 911 USA, Model 75

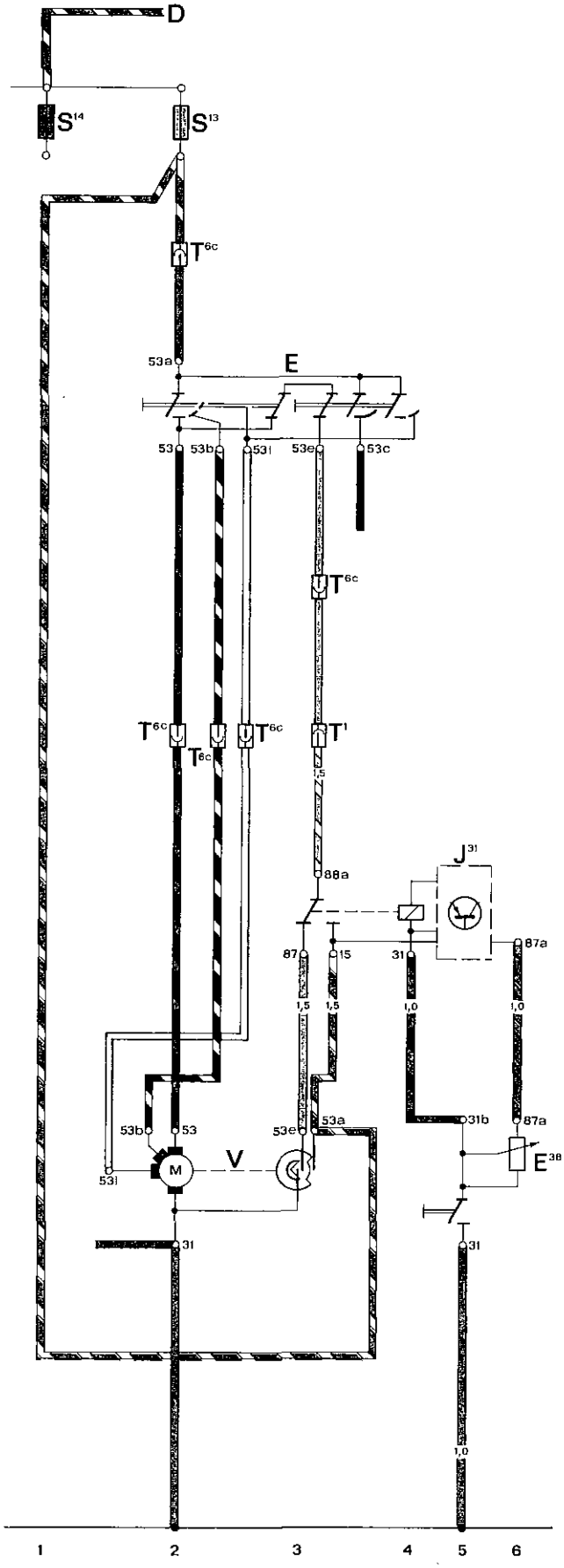
Additional current flow diagram California, Type 911, Model 75

Description	Current track
F^{27} – Mileage counter switch (EGR)	2
G^{9} – Oil temperature indicator	1
K^{2} – Generator charge indicator light	1
K^{22} – EGR warning light	2
L^{7} – Fuel gauge illumination light	1
L^{24} – Oil temperature indicator illumination light	1
L^{27} – Oil pressure indicator illumination light	1



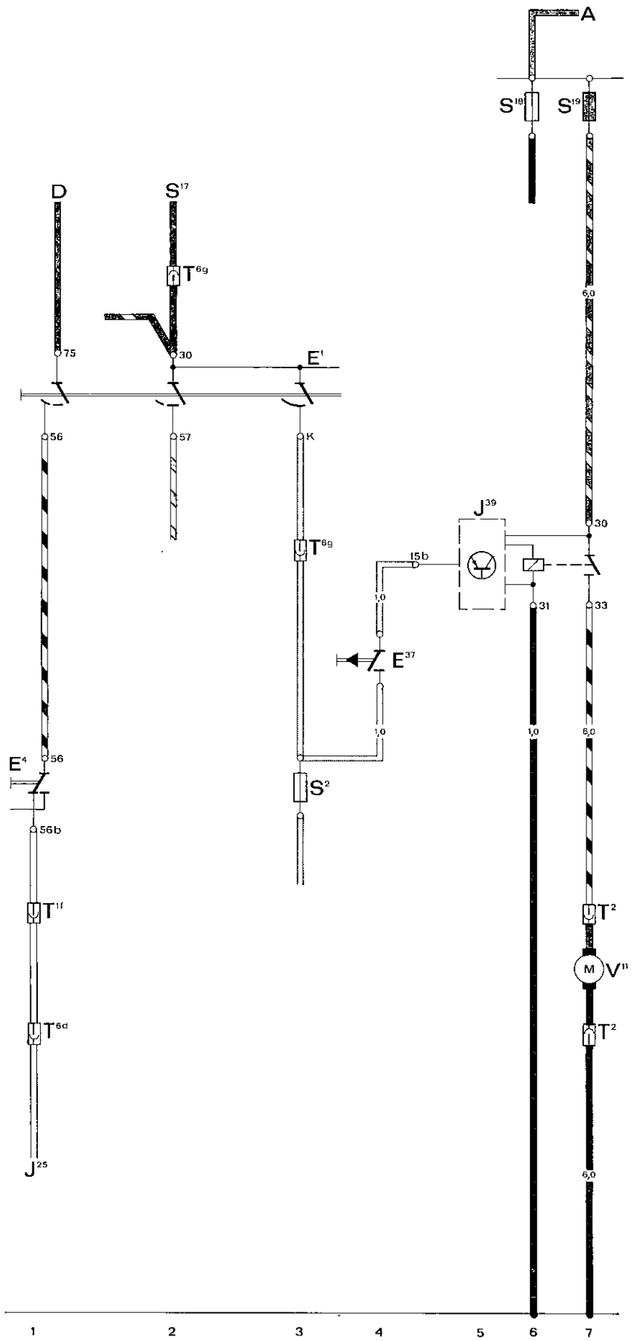
Additional current flow diagram intermittent wiper operation, Type 911

Description		Current track
D	– to ignition/starter switch	2
E	– Windshield wiper switch	2, 3, 4
E^{38}	– Potentiometer for intermittent wiper operation	5, 6
J^{31}	– Relay for intermittent wiper operation	3, 4, 5
S^{13}	– Fuses in the	2
S^{14}	– fuse box	1
T^{1}	– Cable connector, single, on luggage compartment floor	3
T^{6c}	– Cable connector, sixfold, below instrument panel	2
V	– Windshield wiper motor	2, 3



Additional current flow diagram headlight washers, Type 911

Description	Current track
A – to battery	7
D – to ignition/starter switch	1
E^{1} – Headlight switch	1, 2, 3
E^{4} – Dimmer switch	1
E^{37} – Headlight washer switch	4
J^{25} – to headlight relay (from model 76 to fuse S^{6})	1
J^{39} – Headlight washer relay	5, 6, 7
S^{17} – to fuse S^{17}	2
S^{2} – Fuses	3
S^{18} – in the	6
S^{19} – fuse box	7
T^{1f} – Cable connector, single, behind instrument panel	1
T^{2} – Cable connector, double, near battery	7
T^{6} – Cable connector, sixfold	
d – below instrument panel	1
g – below instrument panel	3
V^{11} – Headlight washer pump	7

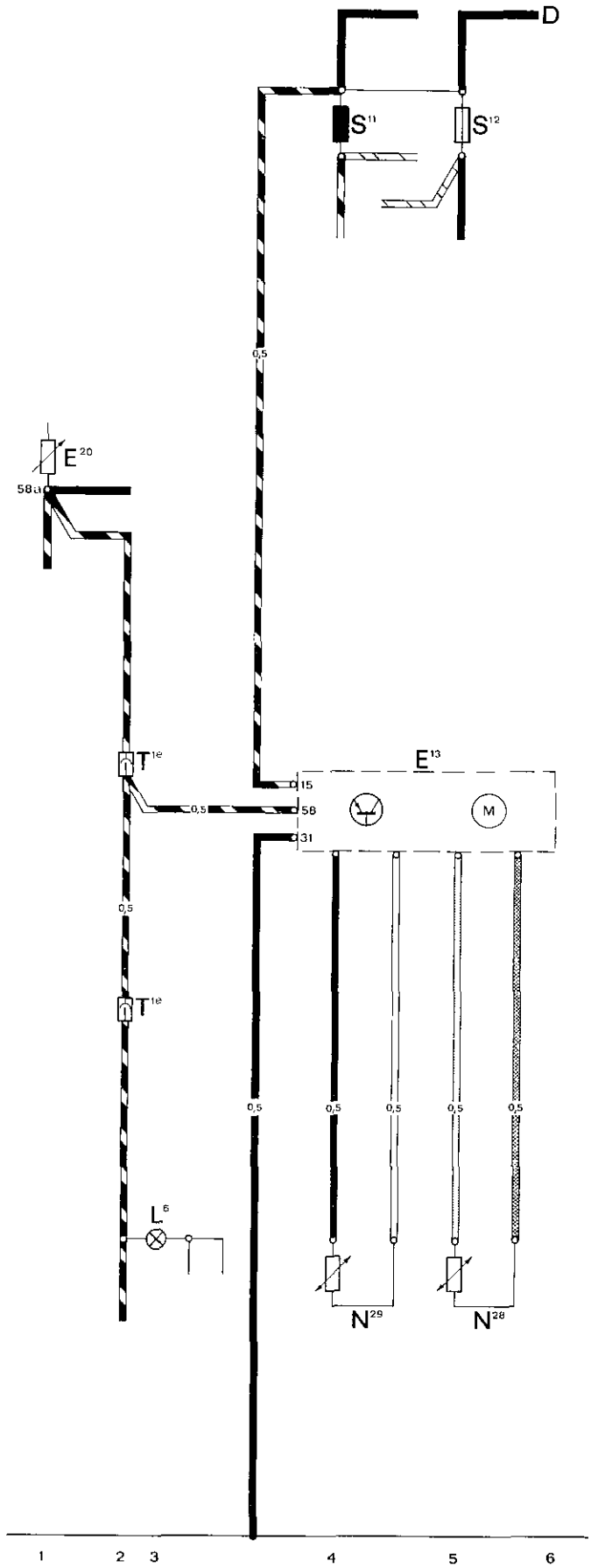


Additional current flow diagram headlight washers, Type 911

9

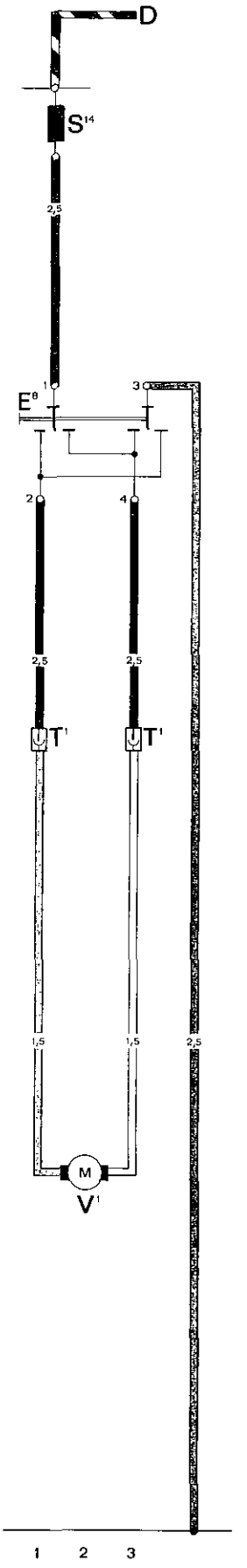
Additional current flow diagram automatic heating system, Type 911

Description		Current track
D	– to ignition/starter switch	6
E^{13}	– Control unit for automatic heating system	4, 5
E^{20}	– Instrument panel illumination potentiometer	1
L^{6}	– Speedometer illumination light	3
N^{28}	– Interior temperature sensor	5
N^{29}	– Exterior temperature sensor	4
S^{11}	– Fuses in the	4
S^{12}	– fuse box	5
T^{1e}	– Cable connector, single, on luggage compartment floor	2



Additional current flow diagram electric sliding roof, Type 911

Description		Current track
D	– to ignition/starter switch	3
E^{8}	– Switch for sliding roof	1, 3
S^{14}	– Fuse in the fuse box	1
T^{1}	– Cable connector, single, near sliding roof motor	1, 3
V^{1}	– Sliding roof motor	2



ADDITIONAL CURRENT FLOW DIAGRAM

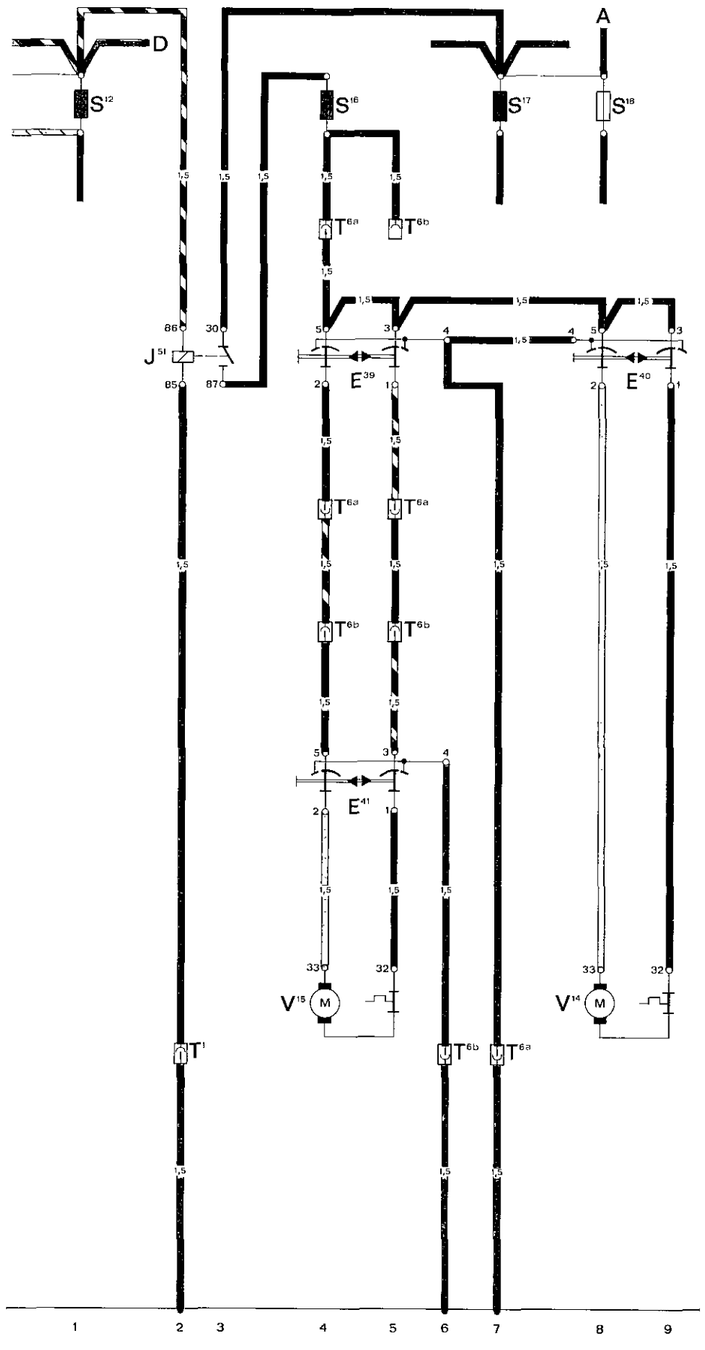
ELECTRIC WINDOW CONTROLS

Modification - 1977 Models

The electric connection for the window regulating motor is no longer made at fuse S 16, but S 21 instead.

Additional current flow diagram power windows, Type 911

Description		Current track
A	– to battery	9
D	– to ignition/starter switch	2
E^{39}	– Power window switch, driver side, for passenger side	4, 5
E^{40}	– Power window switch, driver side	8, 9
E^{41}	– Power window switch, passenger side	4, 5
J^{51}	– Power window relay	2, 3
S^{12}	– Fuses	1
S^{16}	– in	4
S^{17}	– the	7
S^{18}	– fuse box	8
T^{1}	– Cable connector, single, behind fuse box	2
T^{6}	– Cable connector, sixfold	
	a – in door well, left	4, 5, 7
	b – in door well, right	4, 5, 6
V^{14}	– Power window motor, left	8, 9
V^{15}	– Power window motor, right	4, 5

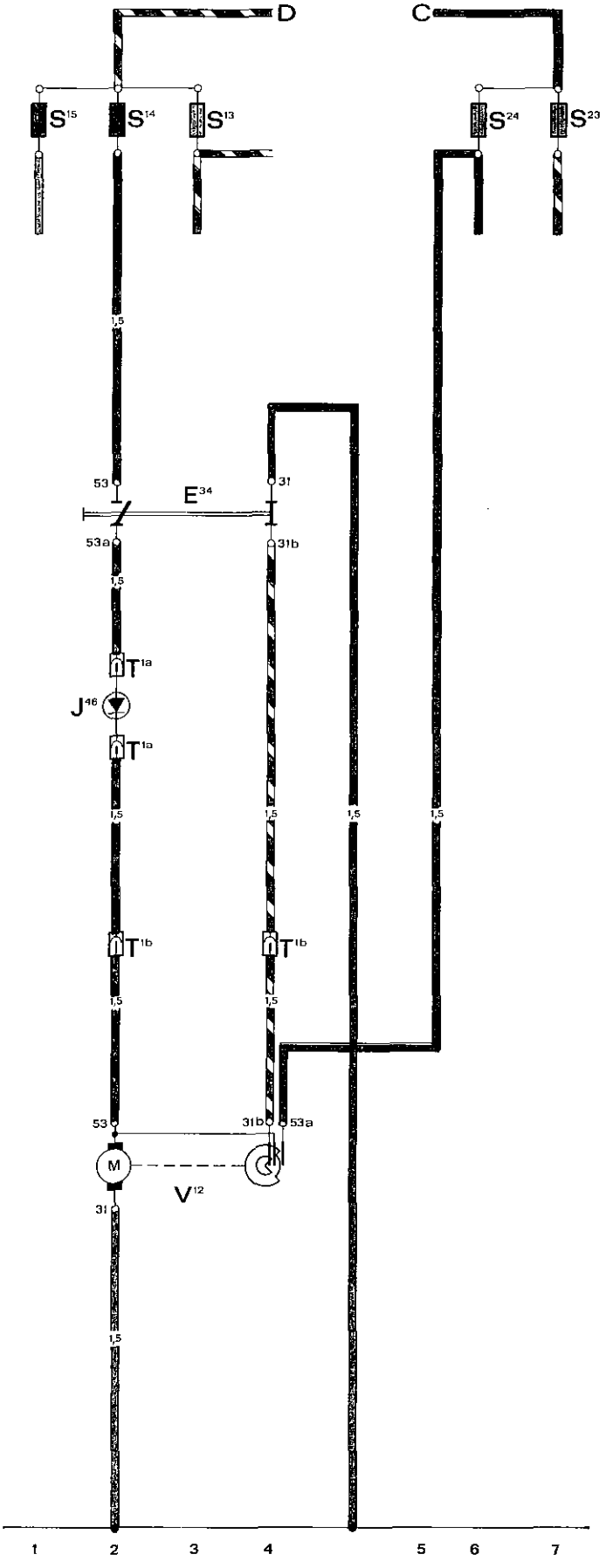


Additional current flow diagram power windows, Type 911

9

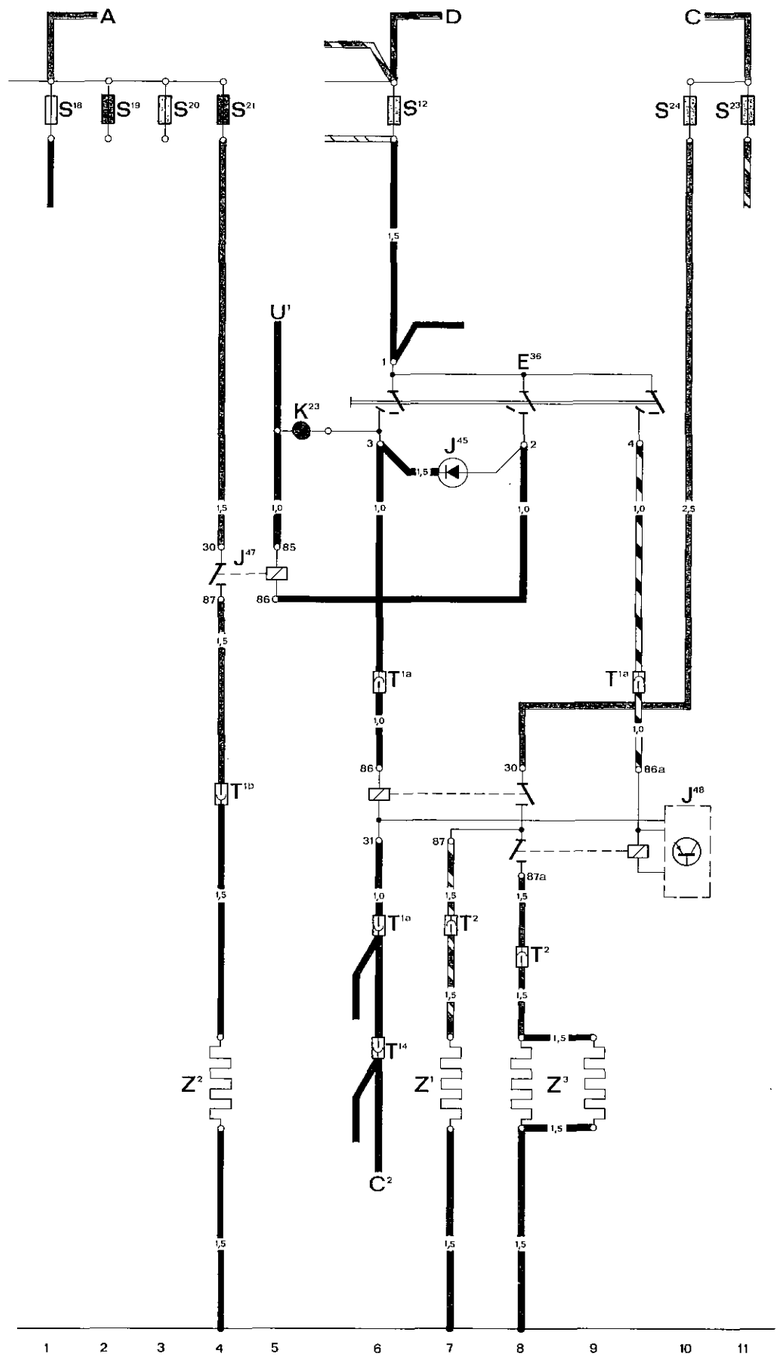
Additional current flow diagram rear window wiper, Type 911

Description		Current track
C	– to generator	5
D	– to ignition/starter switch	4
E^{34}	– Rear wiper switch	2, 4
J^{46}	– Diode for rear wiper	2
S^{13}	– Fuses	3
S^{14}	– in the	2
S^{15}	– fuse box	1
S^{23}	– Fuses in the	7
S^{24}	– rear fuse box	6
T^{1}	– Cable connector, single	
	a – behind instrument panel	2
	b – in engine compartment, left	2, 4
V^{12}	– Rear wiper motor	2, 4



Additional current flow diagram windshield and rear window defoggers Type 911

Description	Current track
A – to battery	2
C – to generator	10
C^2 – to voltage regulator	6
D – to ignition/starter switch	7
E^{36} – Windshield and rear window defogger switch	6, 8, 9
J^{45} – Diode for windshield defogger	7
J^{47} – Windshield defogger relay	4, 5
J^{48} – Relay for two-stage rear window defogger	6, 7, 8, 10
K^{23} – Windshield and rear window defogger indicator light	5
S^{12} – Fuses	6
S^{18} – in	1
to – the	2, 3
S^{21} – fuse box	4
S^{23} – Fuses in the	11
S^{24} – rear fuse box	10
T^1 – Cable connector, single	
a – below regulator panel	6, 10
b – behind fuse box	4
T^2 – Cable connector, double, below regulator panel	7, 8
T^{14} – Cable connector, fourteenfold	6
U^1 – to cigar lighter	5
Z^1 – Rear window defogger, stage 1	7
Z^2 – Windshield defogger	4
Z^3 – Rear window defogger, stage 2	8, 9

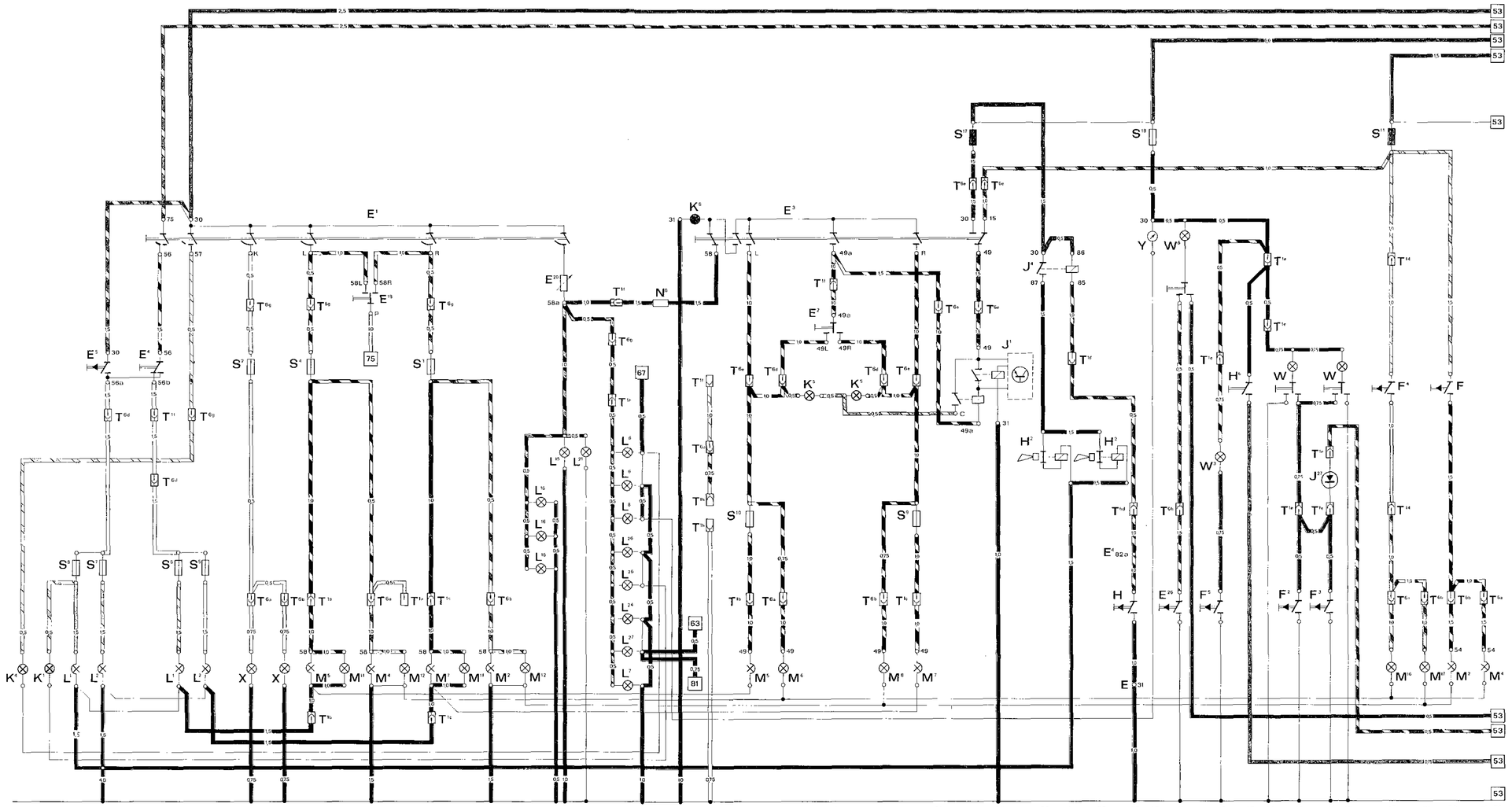


Additional current flow diagram windshield and rear window defoggers Type 911

9

9 Current flow diagram, Type 911 S, USA, Model 76

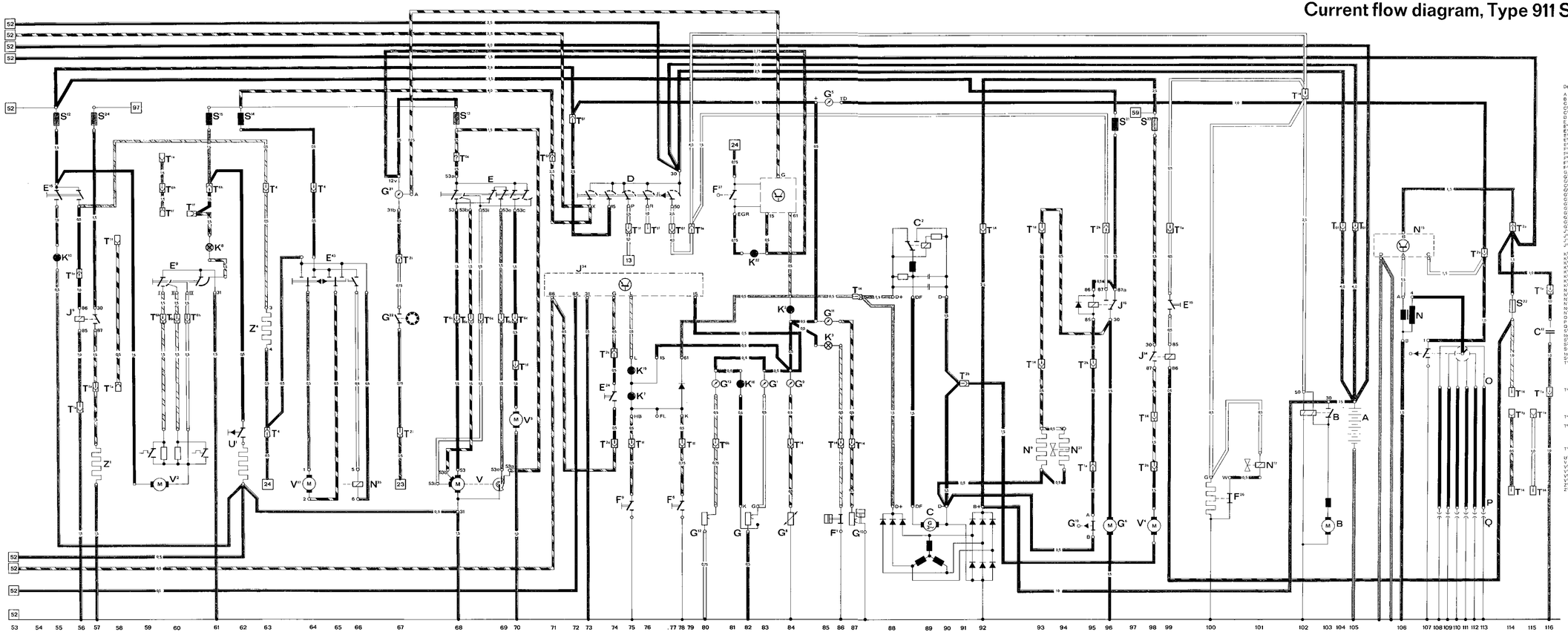
Description	Current track
E — Windshield wiper switch	39
E^{1} — Headlight switch	6, 8, 9, 11, 15, 20
E^{2} — Turn signal switch	28
E^{3} — Emergency flasher switch	24, 25, 28, 31, 34
E^{4} — Dimmer switch	6, 39
E^{5} — Headlight flasher switch	4
E^{19} — Parking light switch	13
E^{20} — Instrument panel illumination potentiometer	20
E^{26} — Switch for glove compartment light	41
F — Stop light switch	50
F^{2} — Left door switch	45
F^{3} — Right door switch	46
F^{4} — Back-up light switch	48
F^{5} — Switch for luggage compartment light	42
H — Horn switch	39
H^{2} — Horns	36, 38
H^{6} — Key warning buzzer contact	43
J^{1} — Hazard / turn signal flasher	33, 34, 35
J^{4} — Horn relay	36, 37
J^{25} — Headlight relay	4, 5
J^{27} — Diode for seat belt warning system	46
K^{1} — High beam indicator light	2
K^{4} — Parking lights indicator light	1
K^{5} — Turn signal indicator light	27, 29
K^{6} — Hazard flasher indicator light	24
L^{1} — Sealed beam unit, left headlight	3, 7
L^{2} — Sealed beam unit, right headlight	4, 8
L^{6} — Speedometer illumination light	22
L^{7} — Fuel gauge illumination light	22
L^{8} — Clock illumination light	22
L^{15} — Ashtray illumination light	20
L^{16} — Heater control assembly illumination light	19
L^{23} — Temperature control lever illumination light	21
L^{24} — Oil temperature indicator illumination light	22
L^{26} — Tachometer illumination light	22
L^{27} — Oil pressure indicator illumination light	22
M^{2} — Right stop / rear light	17, 50
M^{4} — Left stop / rear light	13, 51
M^{5} — Left front turn signal / parking light	11, 25
M^{6} — Left rear turn signal	26
M^{7} — Right front turn signal / parking light	15, 31
M^{8} — Right rear turn signal	30
M^{11} — Front side marker light	12, 16
M^{12} — Rear side marker light	14, 18
M^{16} — Left back-up light	48
M^{17} — Right back-up light	49
N^{6} — Resistor	23
S^{2}	9, 15, 11
to — Fuses	8, 7, 4
S^{11} on the	3, 31, 25, 48
S^{17} fuse box	34
S^{18}	40
T^{1} — Cable connector, single	
a — near regulator panel	14
b — behind sealed beam unit, left	11, 25
c — behind sealed beam unit, right	15, 31
d — behind fuse box	37
e — on luggage compartment floor	22, 42, 44, 45, 46
f — behind instrument panel	6, 22, 24, 28
h — near left rear lights	24
T^{6} — Cable connector, sixfold	
a — in the engine compartment, rear left	9, 13, 24, 26, 48, 51
b — in the engine compartment, rear right	10, 17, 30, 49, 50
d — below instrument panel	4, 6, 26, 30, 39
e — below instrument panel	25, 31, 32, 34
g — below instrument panel	8, 9, 11, 15, 22
h — below instrument panel	41
T^{14} — Cable connector, fourteenfold on regulator panel	48
W — Interior light	45, 46
W^{3} — Luggage compartment light	42
W^{6} — Glove compartment light	41
X — License plate light	9, 10
Y — Clock	40



Printed in Germany XXXIV, 1975

Current flow diagram, Type 911 S, USA, Model 76 9

Current flow diagram, Type 911 S, USA, Model 76



Description	Current track
A — Battery	108
B — Starter	102, 103
C — Generator	88, 89, 90, 91, 92
C' — Voltage regulator	88, 89, 90
C'' — Capacitor for ignition unit	116
D — Ignition - starter switch	73, 74, 75, 76, 77
E — Headlight switch	68, 69, 70
E' — Fresh air blower switch	60
E'' — Rear window defogger switch	55, 56
E'' — Heater blower switch	59
E'' — Left seat belt switch	74
E'' — Outside mirror control switch	64, 65
F' — Oil pres. unit switch	86
F' — Brake warning switch	78
F' — Parking brake switch	73
F'' — Thermo time switch for cold start valve	100
F'' — Mixture equivient switch (EGR)	81, 93, 84
G — Fuel sender unit	62
G' — Fuel gauge	63
G' — Tachometer	85
G' — Fuel pump	95
G' — Oil temperature sender unit	84
G' — Oil temperature indicator	83
G'' — Oil pressure sender unit	81
G'' — Oil pressure indicator	80
G'' — Oil level sender unit	89
G'' — Oil level gauge	90
G'' — Air meter contact	82
G'' — Speedometer	67
G'' — Speedometer sensor	67
J' — Rear window defogger relay	56, 57
J'' — Heater blower relay	59, 58
J'' — Relay for fuel pump	95, 96
J'' — Seat belt warning system relay with integrated buzzer	71, 72, 73, 74, 75, 79
K' — Generator charge indicator light	84
K' — Oil pressure indicator light	85
K' — Parking brake - brake warning light	72
K' — Rear window defogger light	55
K'' — Main beam headlight indicator light	69
K'' — Low fuel warning light	91
K'' — Seat belt warning light	75
K'' — EGR warning light	82
N — Ignition transformer	108
N' — Warm-up regulator	93
N' — High tension ignition unit	109
N'' — Cold start valve	101
N'' — Thermo time switch for cold start valve	100
N'' — Magnetic clutch for evntor control	66
O — Distributor	107—113
P — Spark plug connector	108—113
Q — Spark plug	108—113
S' — Fuses, on the fuse box	85, 86
S' — on the fuse box	62
S' —	96
S'' — Fuses on the rear fuse box (regulator panel)	114
S'' —	98
T' — Cable connector, single a — near regulator panel b — behind fuse box c — on luggage compartment floor d — near left seat e — below shift lever housing	56, 57, 58, 59, 99, 116 73, 83 63, 65, 115 63, 64, 65, 75, 76 114
T'' — Cable connector, double a — below regulator panel b — in engine compartment, left c — near left seat d — in tunnel, rear e — below instrument panel	113, 114 91, 98 74 67 55, 96
T'' — Cable connector, quadruple, in outside mirror housing	63, 64
T'' — Cable connector, sixfold b — in engine compartment right c — below instrument panel f — below instrument panel h — below instrument panel	92 58, 69, 70 71, 72, 77, 104, 105 65, 81
T'' — Cable connector, fourteenfold a — below instrument panel	94, 86, 87, 92, 93 102, 114, 112
U' — Cigar lighter	69
V — Windshield wiper motor	58, 69
V' — Blower motor	60
V' — Heater blower	98
V' — Washer pump	70
V'' — Outside mirror control motor	64
V'' — Rear window defogger	57
Z' — Out-ide mirror defogger	63

Printed in Germany
XXXIV, 1975

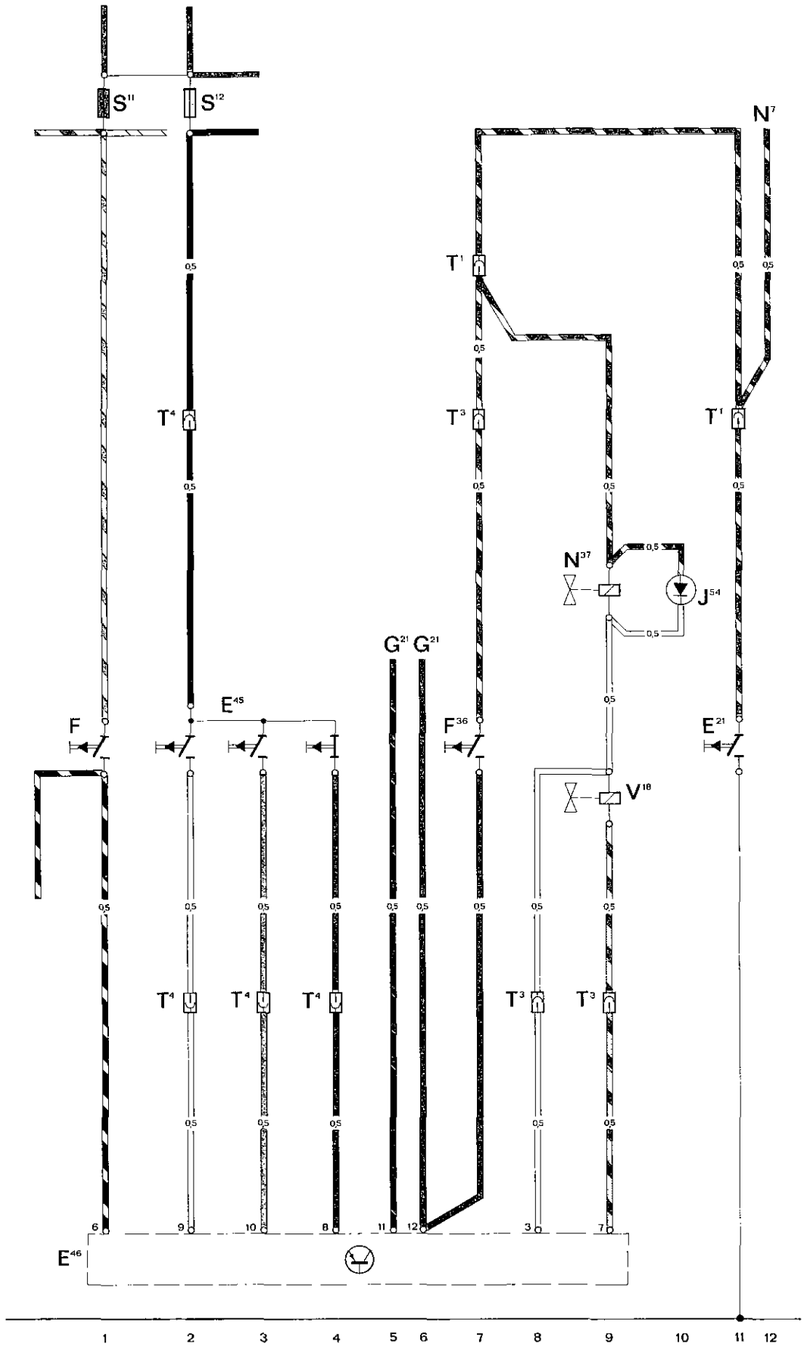
Current flow diagram, Type 911 S, USA, Model 76

Additional current flow diagram automatic speed control, Type 911

9

Additional current flow diagram automatic speed control, Type 911

Description	Current track
E^{21} – Selector lever contact (Sportomatic)	11
E^{45} – Speed control switch	2, 3, 4
E^{46} – Control unit for speed control	1–9
F – Stop light switch	1
F^{36} – Clutch pedal switch	7
G^{21} – to speedometer (terminal 31 b)	5
G^{21} – to speedometer (ground)	6
J^{54} – Diode for speed control	10
N^{7} – to control valve	12
N^{37} – Solenoid valve for speed control	9
S^{11} – Fuses in the	1
S^{12} – fuse box	2
T^{1} – Cable connector, single, in tunnel	7, 11
T^{3} – Cable connector, triple, in footwell, left	7, 8, 9
T^{4} – Cable connector, quadruple, below instrument panel	2, 3, 4
V^{18} – Control element	9

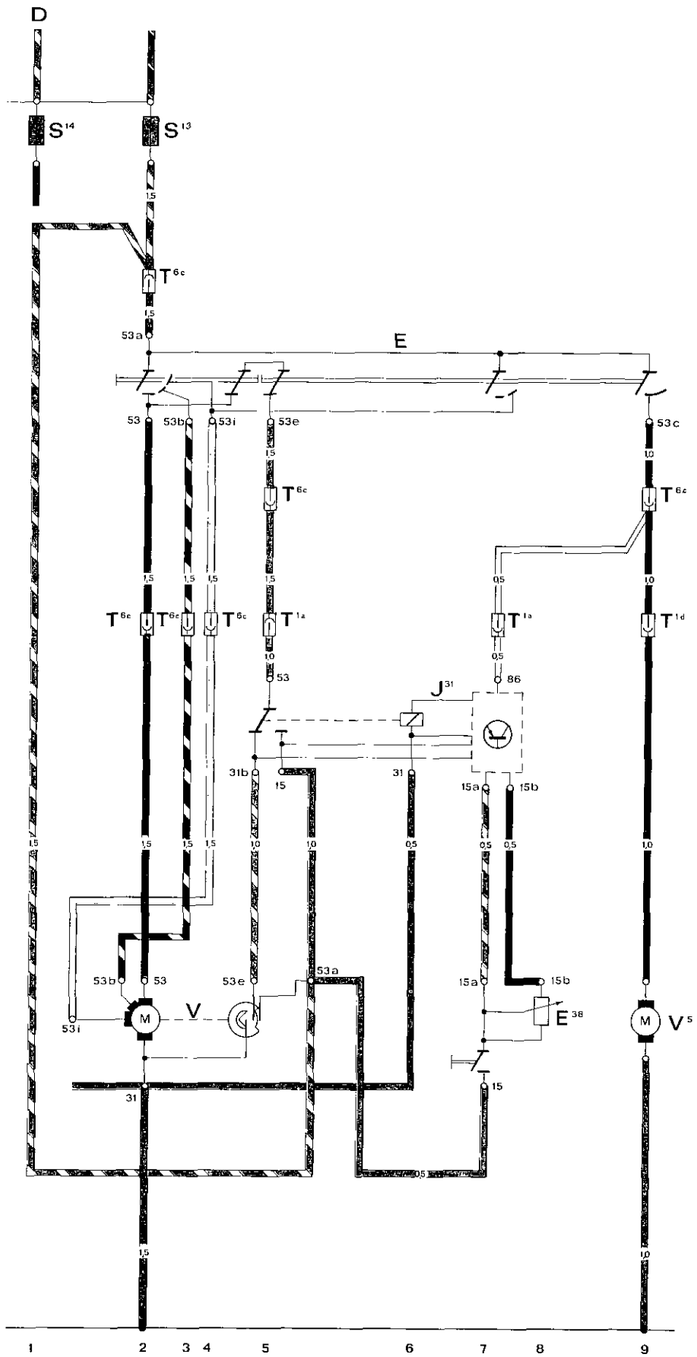


Additional current flow diagram intermittent wiper operation, Model 76

9

Additional current flow diagram intermittent wiper operation, Model 76

Description	Current track
D – to ignition/starter switch	1
E – Windshield wiper switch	2, 5, 7, 9
E^{38} – Potentiometer for intermittent wiper operation	7, 8
J^{31} – Relay for intermittent wiper operation	5, 6, 7, 8
S^{13} – Fuses in the	2
S^{14} – fuse box	1
T^{1} – Cable connector, single	
a – on luggage compartment floor	5, 7
d – behind fuse box	9
T^{4c} – Cable connector, sixfold, below instrument panel	2, 3, 4, 5, 9
V – Windshield wiper motor	2, 5
V^{5} – Washer pump	9

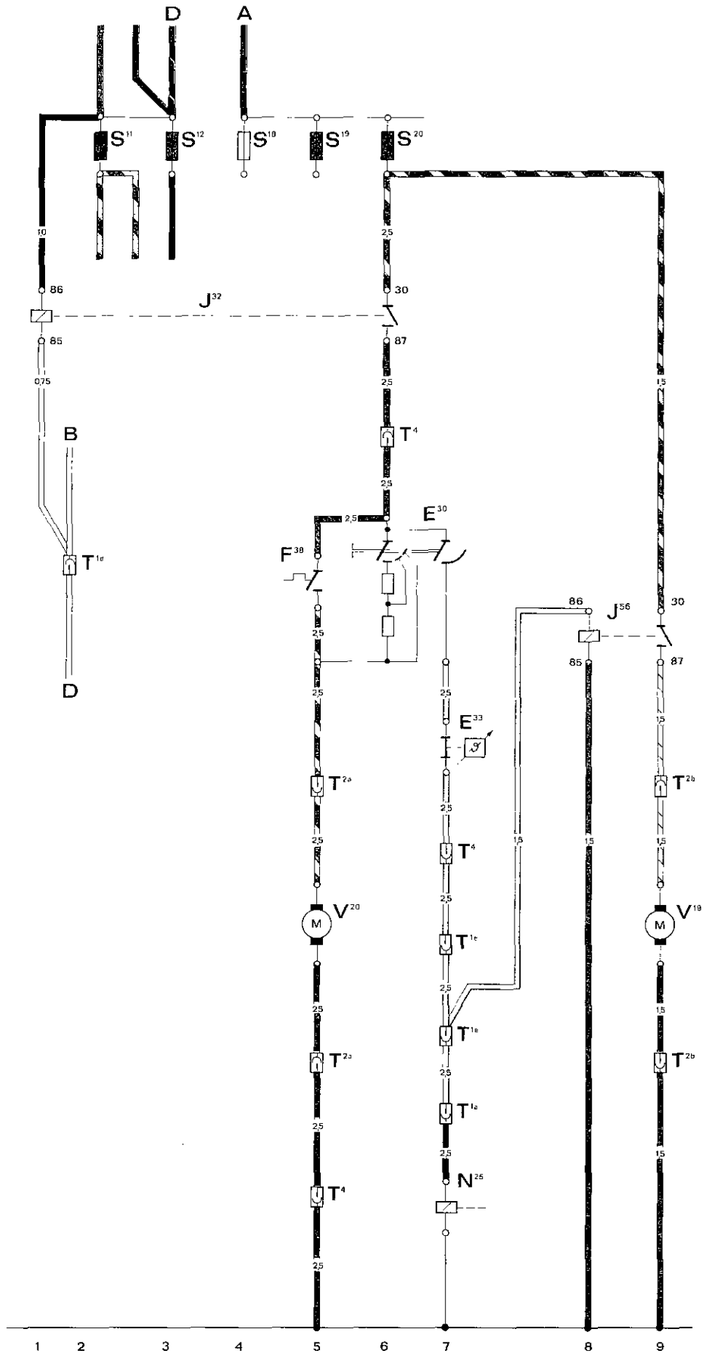


Additional current flow diagram air conditioner with front condenser

9

Additional current flow diagram air conditioner with front condenser

Description		Current track
A	– to battery	4
B	– to starter	2
D	– to ignition/starter switch, terminal 50	2
D	– to ignition/starter switch, terminal 15	3
E^{30}	– Blower switch	6, 7
E^{33}	– Temperature switch	7
F^{38}	– Thermostat	5
J^{32}	– Power supply relay	1, 6
J^{56}	– Relay for condenser fan	8, 9
N^{25}	– Electromagnetic clutch	7
S^{11}	– Fuses	2
S^{12}	– in	3
S^{18}	– the	4
S^{19}	– fuse	5
S^{20}	– box	6
T^{1}	– Cable connector, single	
	a – near regulator panel	7
	e – on luggage compartment floor	2, 7
T^{2}	– Cable connector, double	
	a – near evaporator blower	5
	b – near battery	9
T^{4}	– Cable connector, fourfold, below instrument panel	5, 6, 7
V^{19}	– Condenser fan	9
V^{20}	– Evaporator blower	5

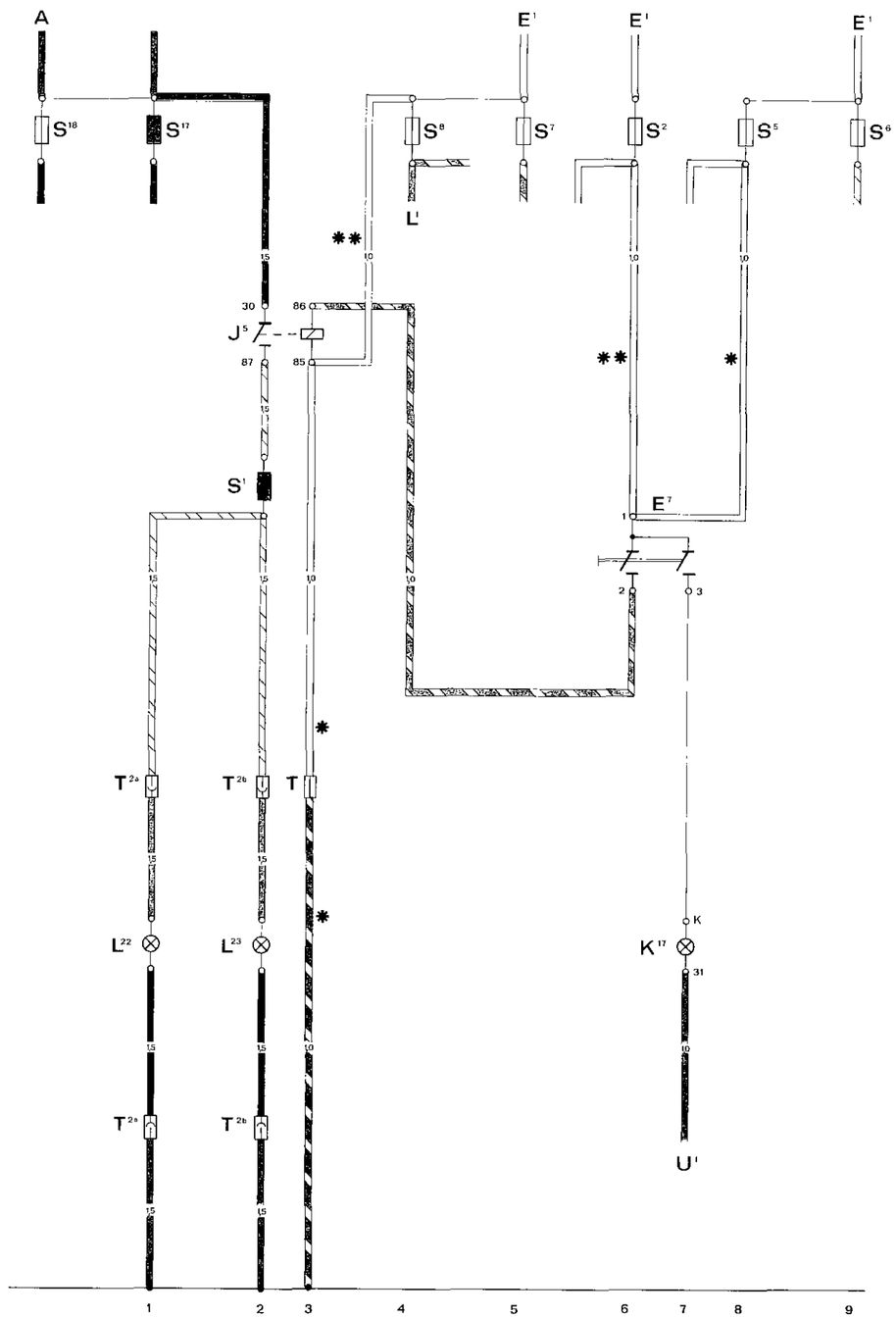


Additional current flow diagram fog lights

9

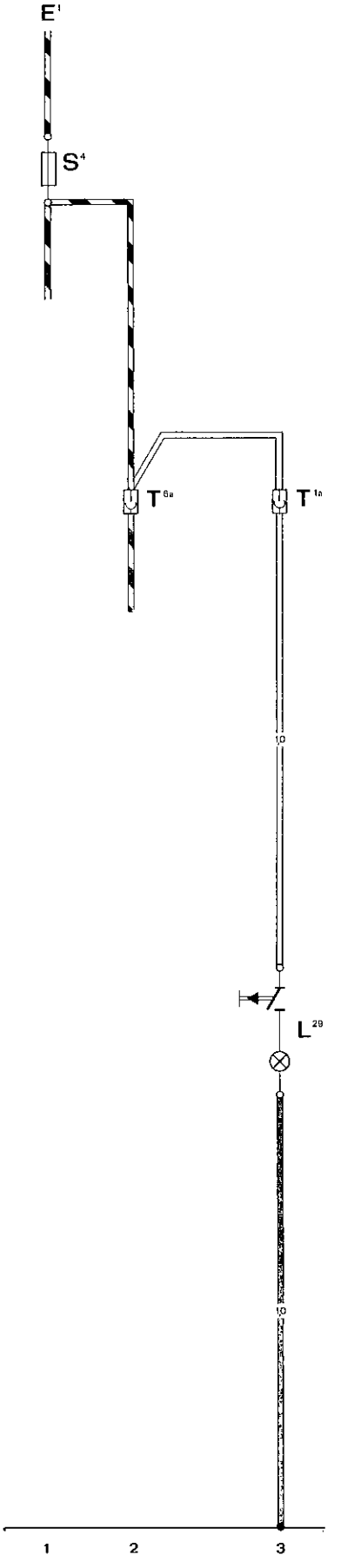
Additional current flow diagram fog lights

Description		Current track
A	– to battery	1
E¹	– to headlight switch	5, 6, 9
E⁷	– Fog light switch	6, 7
J⁵	– Fog light relay	2, 3
K¹⁷	– Fog light indicator light	7
L¹	– to left headlight	4
L²²	– Left fog light	1
L²³	– Right fog light	2
S¹	–	2
S²	– Fuses	6
S⁵	– in	8
à	– the	9
S⁸	– fuse	5, 4
S¹⁷	– box	1
S¹⁸	–	1
T	– Cable connector	3
T²	– Cable connector, double	
	a – in luggage compartment, left	1
	b – in luggage compartment, right	2



Additional current flow diagram engine compartment light

Description			Current track
E^{1}	–	to headlight switch	1
L^{29}	–	Engine compartment light	3
S^{4}	–	Fuse in fuse box	1
T^{1a}	–	Cable connector, single, near regulator panel	3
T^{6a}	–	Cable connector, sixfold, in engine compartment, rear left	2

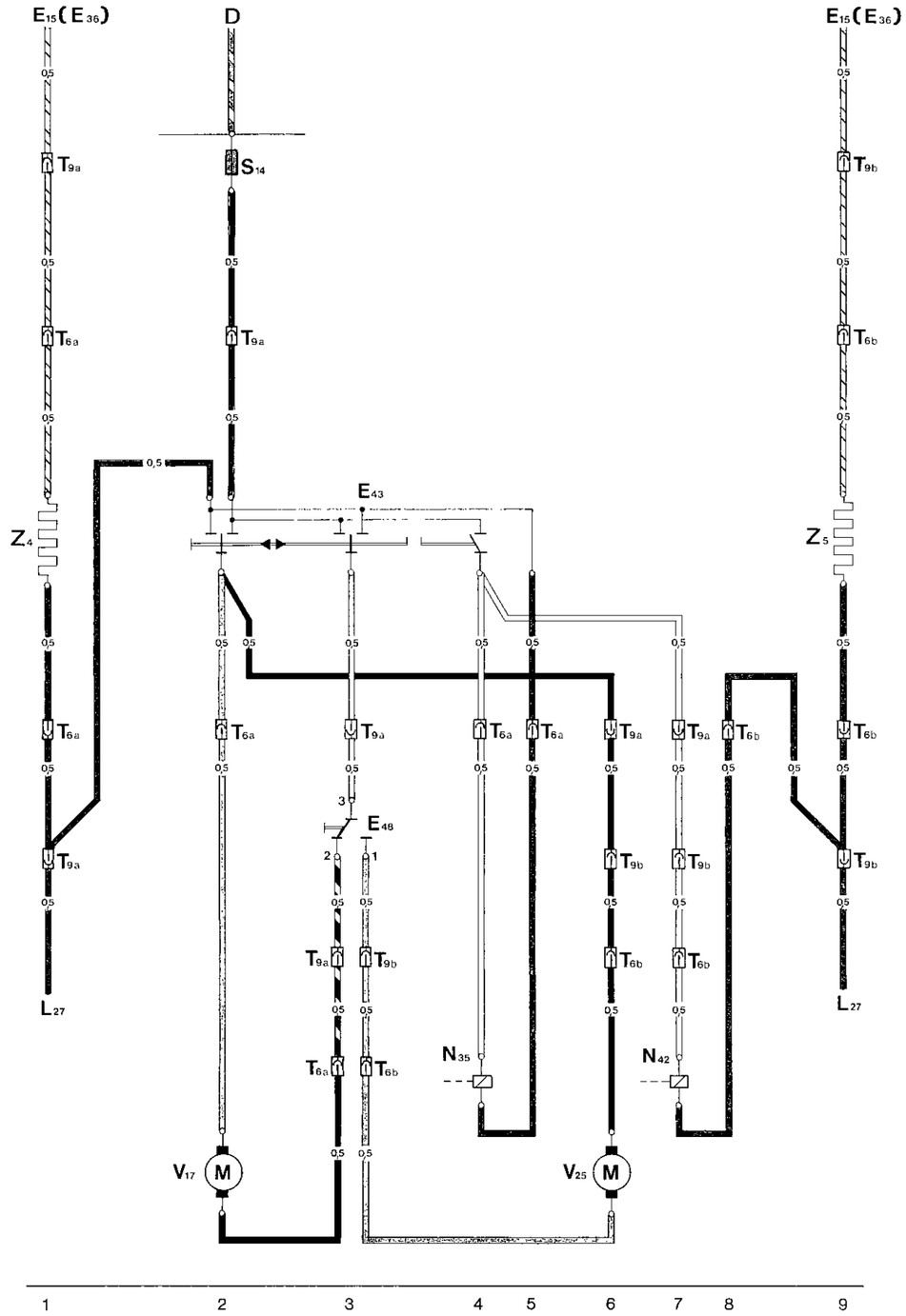


Additional current flow diagram remotely controlled outside mirrors, Type 911

9

Additional current flow diagram remotely controlled outside mirrors, Type 911

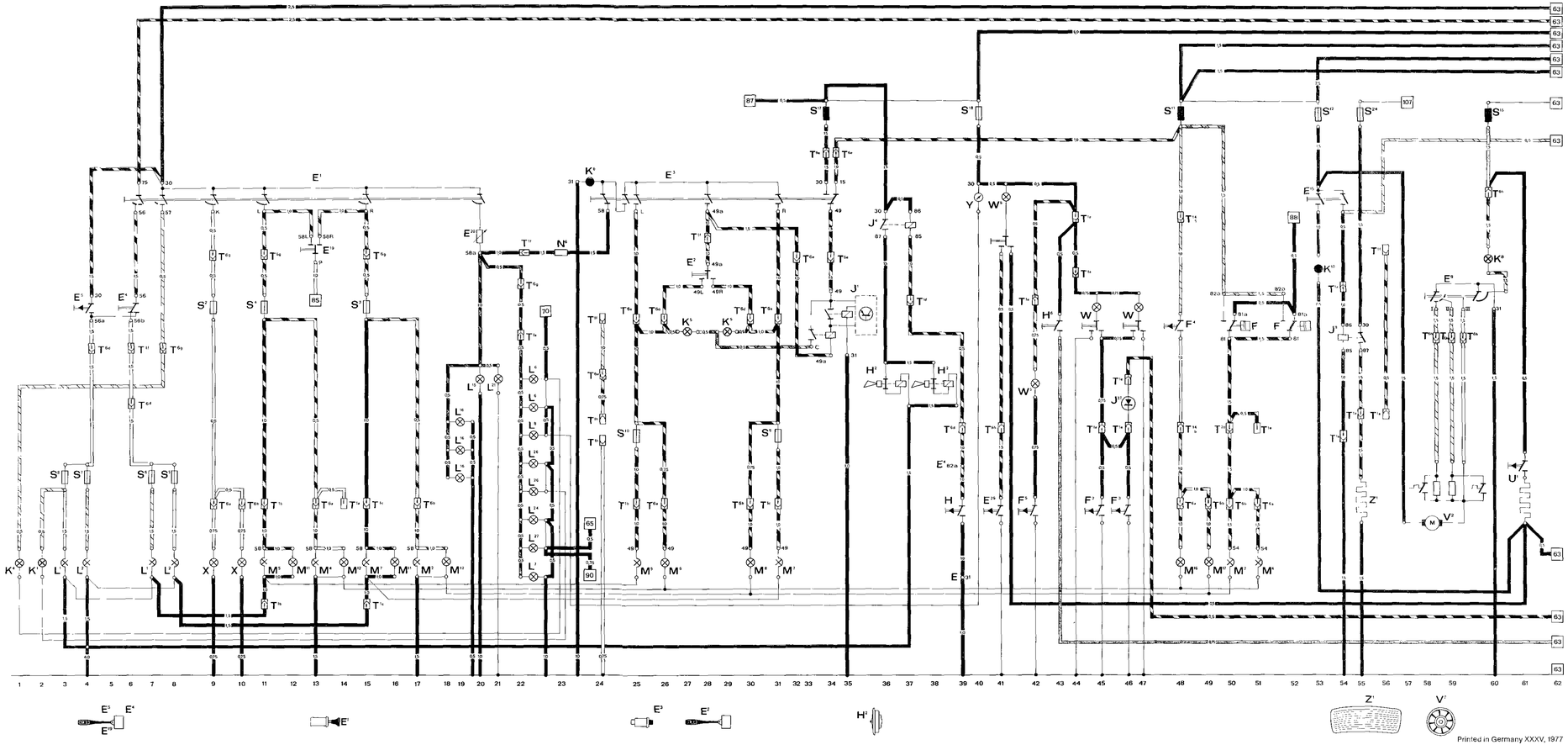
Description	Current track
D – to ignition/starter switch	2
E^{15} – to rear window defogger switch	1, 9
E^{43} – Mirror control switch	2, 3, 4, 5
E^{48} – Change-over switch for mirror control	3
L^{27} – to oil pressure indicator light	1, 9
N^{35} – Magnetic clutch for mirror control, driver side	4
N^{42} – Magnetic clutch for mirror control, passenger side	7
S^{14} – Fuse on fuse box	2
T^{6} – Cable connector, sixfold	
a – in mirror housing, driver side	1, 2, 3, 4, 5
b – in mirror housing, passenger side	3, 6, 7, 8, 9
T^{9} – Cable connector, ninefold	
a – on luggage compartment floor, left	1, 2, 3, 6, 7
b – on luggage compartment floor, right	3, 6, 7, 9
V^{17} – Mirror control motor, driver side	2
V^{25} – Mirror control motor, passenger side	6
Z^{4} – Outside mirror defogger, driver side	1
Z^{5} – Outside mirror defogger, passenger side	9



Current flow diagram, Type 911 S, USA, Model 77 9

9 Current flow diagram, Type 911 S, USA, Model 77

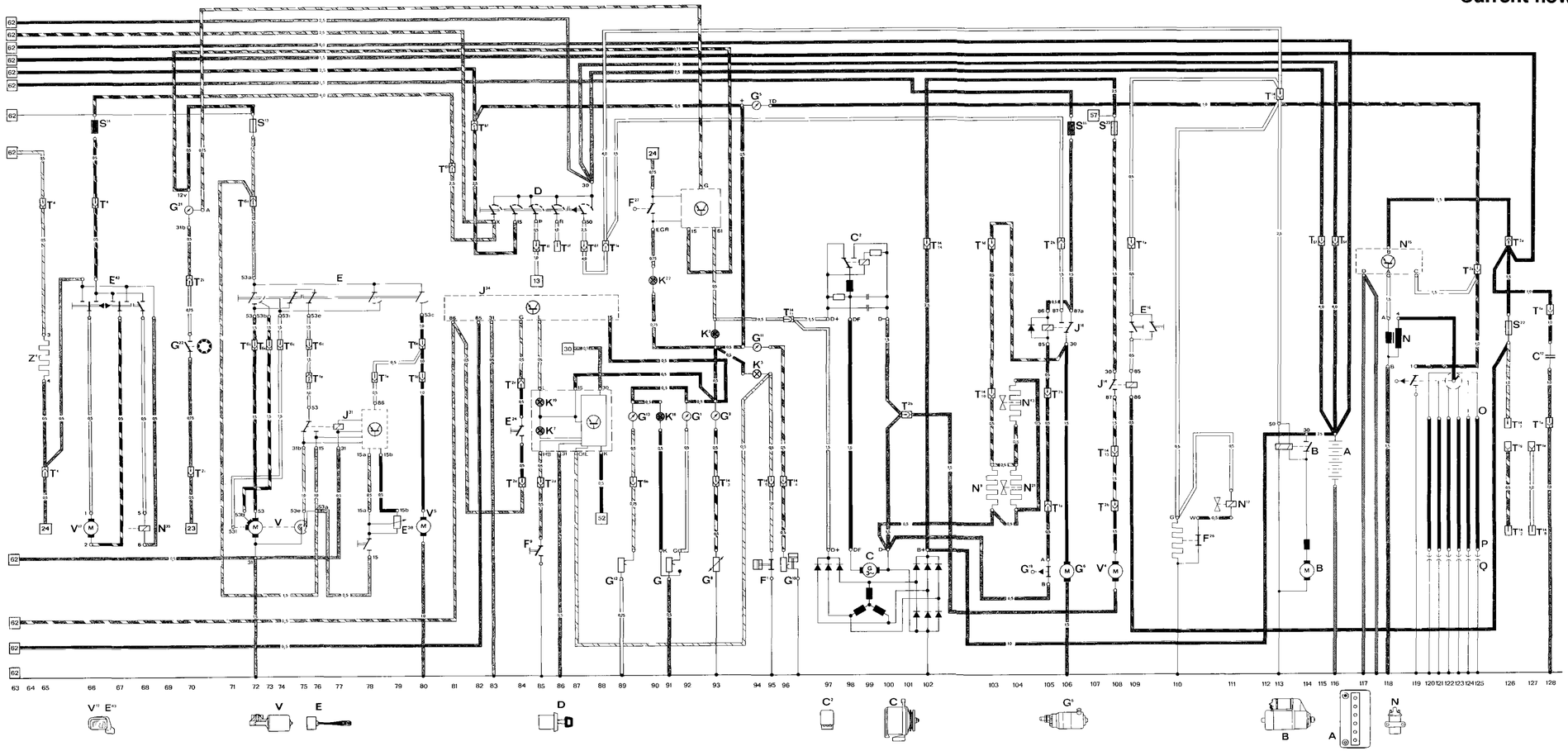
Description			Current track
E	–	Windshield wiper switch	39
E 1	–	Headlight switch	6, 8, 9, 11, 15, 20
E 2	–	Turn signal switch	28
E 3	–	Emergency flasher switch	24, 25, 28, 31, 34
E 4	–	Dimmer switch	6, 39
E 5	–	Headlight flasher switch	4
E 9	–	Fresh air blower switch	58, 59, 60
E 15	–	Rear window defogger switch	53, 54
E 19	–	Parking light switch	13
E 20	–	Instrument panel illumination potentiometer	20
E 26	–	Switch for glove compartment light	41
F	–	Stop light switch	50, 52
F 2	–	Left door switch	45
F 3	–	Right door switch	46
F 4	–	Back-up light switch	48
F 5	–	Switch for luggage compartment light	42
H	–	Horn switch	39
H 2	–	Horns	36, 38
H 6	–	Key warning buzzer contact	43
J 1	–	Hazard / turn signal flasher	33, 34, 35
J 4	–	Horn relay	36, 37
J 9	–	Rear window defogger relay	54, 55
J 27	–	Diode for seat belt warning system	46
K 1	–	High beam indicator light	2
K 4	–	Parking lights indicator light	1
K 5	–	Turn signal indicator light	27, 29
K 6	–	Hazard flasher indicator light	24
K 8	–	Blower indicator light	60
K 10	–	Rear window defogger indicator light	53
L 1	–	Sealed beam unit, left headlight	3, 7
L 2	–	Sealed beam unit, right headlight	4, 8
L 6	–	Speedometer illumination light	22
L 7	–	Fuel gauge illumination light	22
L 8	–	Clock illumination light	22
L 15	–	Ashtray illumination light	20
L 16	–	Heater control assembly illumination light	19
L 24	–	Temperature control lever illumination light	21
L 24	–	Oil temperature indicator illumination light	22
L 26	–	Tachometer illumination light	22
L 27	–	Oil pressure indicator illumination light	22
M 2	–	Right stop / rear light	17, 50
M 4	–	Left stop / rear light	13, 51
M 5	–	Left front turn signal / parking light	11, 25
M 6	–	Left rear turn signal	26
M 7	–	Right front turn signal / parking light	15, 31
M 8	–	Right rear turn signal	30
M 11	–	Front side marker light	12, 16
M 12	–	Rear side marker light	14, 18
M 16	–	Left back-up light	48
M 17	–	Right back-up light	49
N 6	–	Resistor	23
S 2			9, 15, 11
to	–	Fuses	8, 7, 4
S 17		on the	3, 31, 25, 48, 53
S 15			60
S 17			34
S 18		fuse box	40
S 24	–	Fuse on the rear fuse box	55
T 1	–	Cable connector, single	
		a – near regulator panel	14, 54, 55, 56
		b – behind sealed beam unit, left	11, 25
		c – behind sealed beam unit, right	15, 31
		d – behind fuse box	37
		e – on luggage compartment floor	22, 42, 44, 45, 46, 51
		f – behind instrument panel	6, 22, 24, 28, 56
		h – near left rear lights	24
T 2d	–	Cable connector, double, on luggage compartment floor	60
T 6	–	Cable connector, sixfold	
		a – in the engine compartment, rear left	9, 13, 24, 26, 48, 51
		b – in the engine compartment, rear right	10, 17, 30, 49, 50
		d – below instrument panel	4, 6, 26, 30, 39
		e – below instrument panel	25, 31, 32, 34
		g – below instrument panel	8, 9, 11, 15, 22
		h – below instrument panel	41, 58, 59, 60
T 14	–	Cable connector, fourteenfold on regulator panel	48
U 1	–	Cigar lighter	61
V 2	–	Blower motor	58, 59
W	–	Interior light	45, 46
W 3	–	Luggage compartment light	42
W 6	–	Glove compartment light	41
X	–	License plate light	9, 10
Y	–	Clock	40
Z 1	–	Rear window defogger	55



Printed in Germany XXXV, 1977

Current flow diagram, Type 911 S, USA, Model 77

Current flow diagram, Type 911 S, USA, Model 77 9

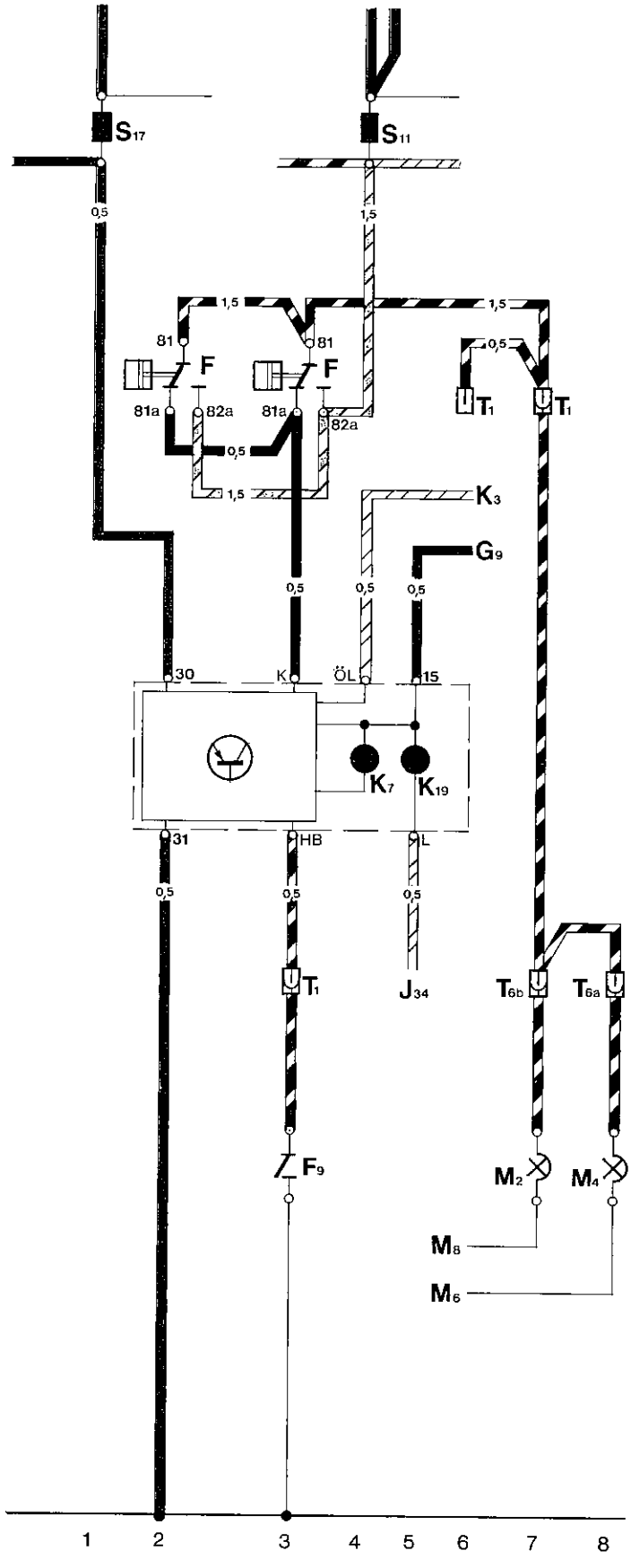


Description		Current track
A	— Battery	116
B	— Starter	113, 114
C	— Generator	97 – 102
C 2	— Voltage regulator	98, 99
C 12	— Capacitor for ignition unit	128
D	— Ignition / starter switch	83 – 88
E	— Windshield wiper switch	72 – 80
E 16	— Heater blower switch	109
E 24	— Left seat belt switch	84
E 38	— Potentiometer for intermittent wiper operation	76, 79
E 43	— Outside mirror control switch	66, 67, 68
F 1	— Oil pressure switch	95
F 9	— Parking brake switch	85
F 26	— Thermo-switch for cold start valve	110
F 27	— Mileage counter switch (EGR)	90 – 93
G	— Fuel sender unit	91
G 1	— Fuel gauge	92
G 5	— Tachometer	94
G 6	— Fuel pump	106
G 8	— Oil temperature sender unit	93
G 9	— Oil temperature indicator	93
G 10	— Oil pressure sender unit	96
G 11	— Oil pressure indicator	94
G 15	— Oil level sender unit	89
G 17	— Oil level gauge	89
G 19	— Air meter contact	105
G 21	— Speedometer	70
G 22	— Speedometer sensor	70
J 14	— Relay for heater blower	108, 109
J 15	— Relay for fuel pump	105, 106
J 34	— Relay for intermittent wiper operation	75 – 78
J 34	— Seat belt warning system relay with integrated buzzer	81 – 88
K 2	— Generator charge indicator light	93
K 3	— Oil pressure indicator light	94
K 7	— Parking brake / brake warning light	85
K 15	— Low fuel warning light	90
K 19	— Seat belt warning light	85
K 29	— EGR warning light	90
N	— Ignition transformer	118
N 9	— Warm-up regulator	103
N 15	— High tension ignition unit	118
N 17	— Cold start valve	111
N 21	— Supplementary air valve	104
N 35	— Magnetic clutch for mirror control	68
N 49	— Thermovalve	104
O	— Distributor	119 – 125
P	— Spark plug connector	120 – 125
Q	— Spark plug	120 – 125
S 13	— Fuses	72
S 14	— on the	66
S 16	fuse box	106
S 22	— Fuses on the	126
S 23	rear fuse box (regulator planel)	108
T 1	— Cable connector, single	
	a — near regulator panel	105, 109, 128
	d — behind fuse box	80, 103
	e — on luggage compartment floor	76, 78, 88, 127
	f — behind instrument panel	85, 86
	g — below shift lever housing	126
T 2	— Cable connector, double	
	a — below regulator panel	125, 126
	b — in engine compartment, left	101, 108
	c — near left seat	84
	d — on luggage compartment floor	85
	i — in tunnel, rear	70
	k — below regulator panel	105, 106
T 4	— Cable connector, quadruple, on luggage compartment floor	65, 66
T 6	— Cable connector, sixfold	
	b — in engine compartment, right	89
	c — below instrument panel	72, 73, 74, 76, 80
	f — below instrument panel	81, 82, 87, 115, 116
T 14	— Cable connector, fourteenfold on regulator panel	93, 95, 96, 102, 103, 108, 113, 126, 127
V	— Windshield wiper motor	72, 75
V 4	— Heater blower	108
V 5	— Washer pump	80
V 17	— Outside mirror control motor	66
Z 4	— Outside mirror defogger	65

Printed in Germany XXXV, 1977

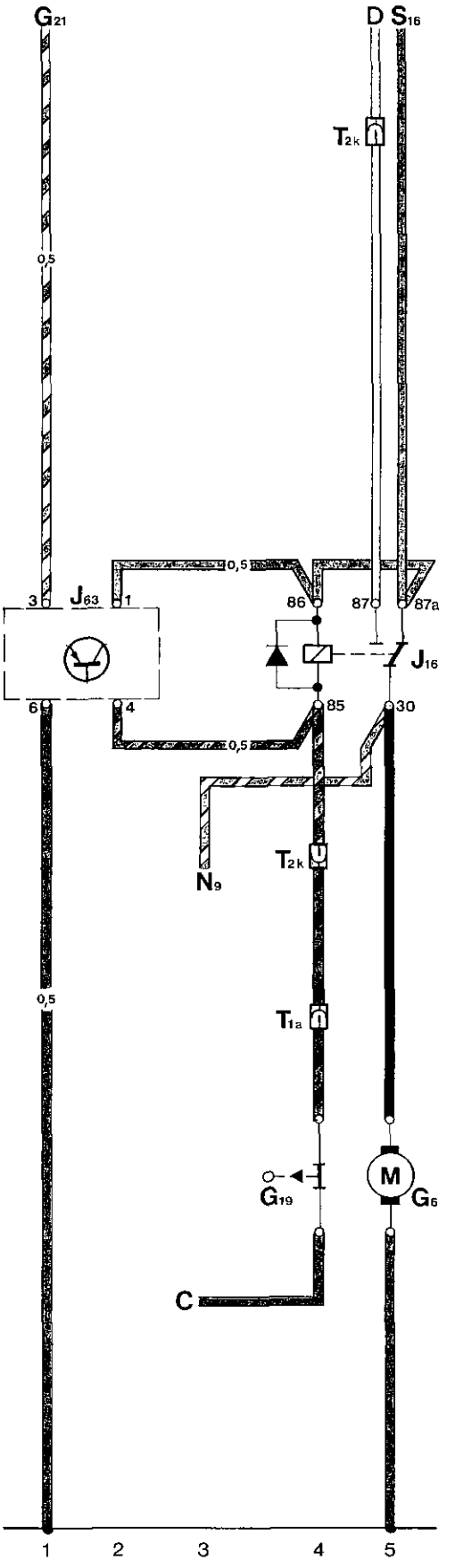
Additional current flow diagram brake booster, Type 911

Description		Current track
F	– Stop light switch	2, 3
F^{9}	– Parking brake switch	3
G^{9}	– to oil temperature indicator (terminal 15)	6
J^{34}	– to seat belt warning system relay	5
K^{3}	– to oil pressure indicator light	6
K^{7}	– Parking brake/brake warning light	4
K^{19}	– Seat belt warning light	5
M^{2}	– Right stop light	7
M^{4}	– Left stop light	8
M^{6}	– to left rear turn signal (ground)	6
M^{8}	– to right rear turn signal (ground)	6
S^{11}	– Fuses on the	4
S^{17}	– fuse box	1
T^{1}	– Cable connector, single, behind instrument panel	3, 6, 7
T^{6}	– Cable connector, sixfold	
	a – in engine compartment, left	8
	b – in engine compartment, right	7



Additional current flow diagram speed limiter, Type 911

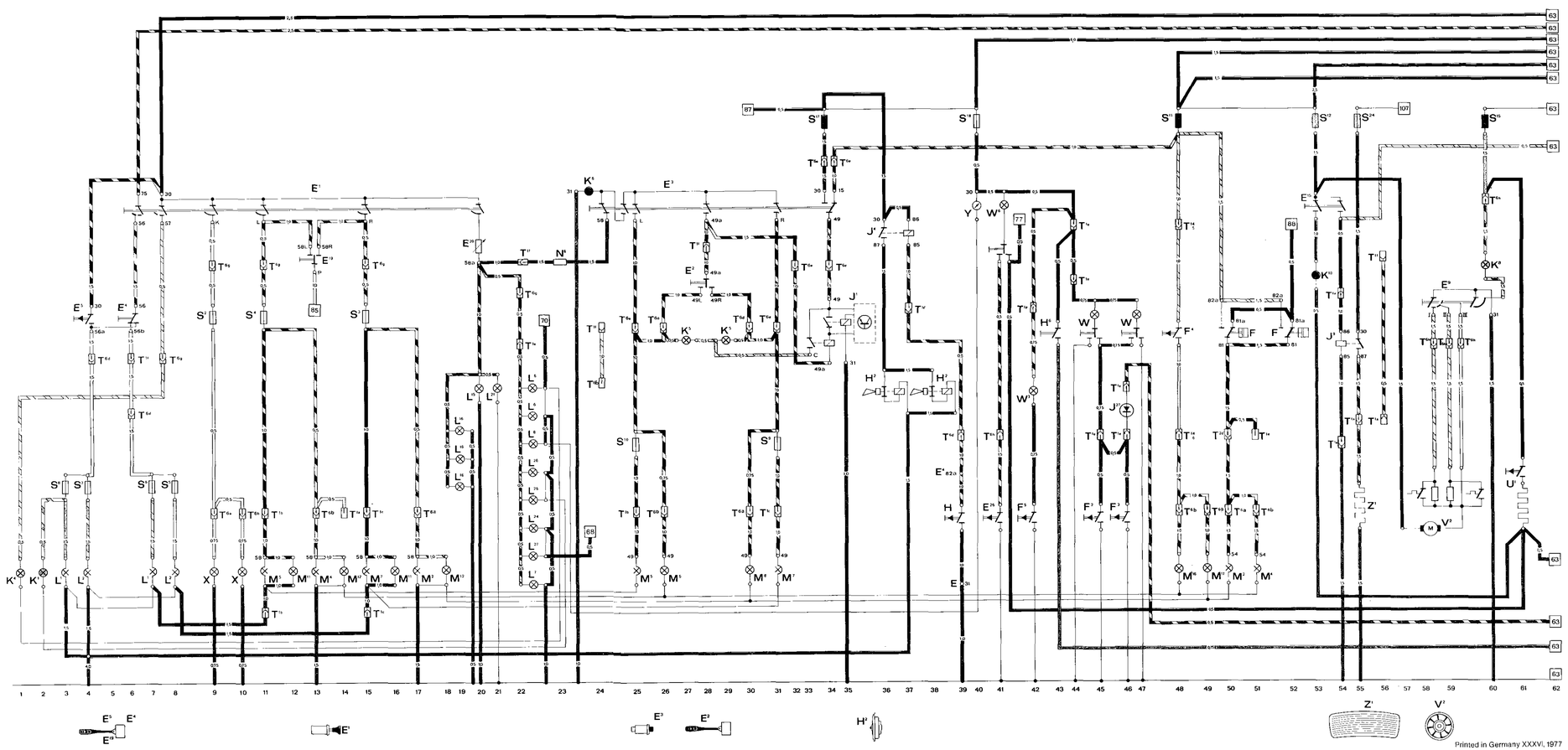
Description			Current track
C	–	to generator	3
D	–	to ignition/starter switch	5
G^{6}	–	Fuel pump	5
G^{19}	–	Air meter contact	4
G^{21}	–	to speedometer (terminal A)	1
J^{16}	–	Relay for fuel pump	4, 5
J^{63}	–	Speed limiter relay	1, 2
N^{9}	–	to warm-up regulator	3
S^{16}	–	to fuse 16	5
T^{1a}	–	Cable connector, single, near regulator panel	4
T^{2k}	–	Cable connector, double, below regulator panel	4, 5



Current flow diagram, Type 911 SC, USA, Model 78 9

9 Current flow diagram, Type 911 SC, USA, Model 78

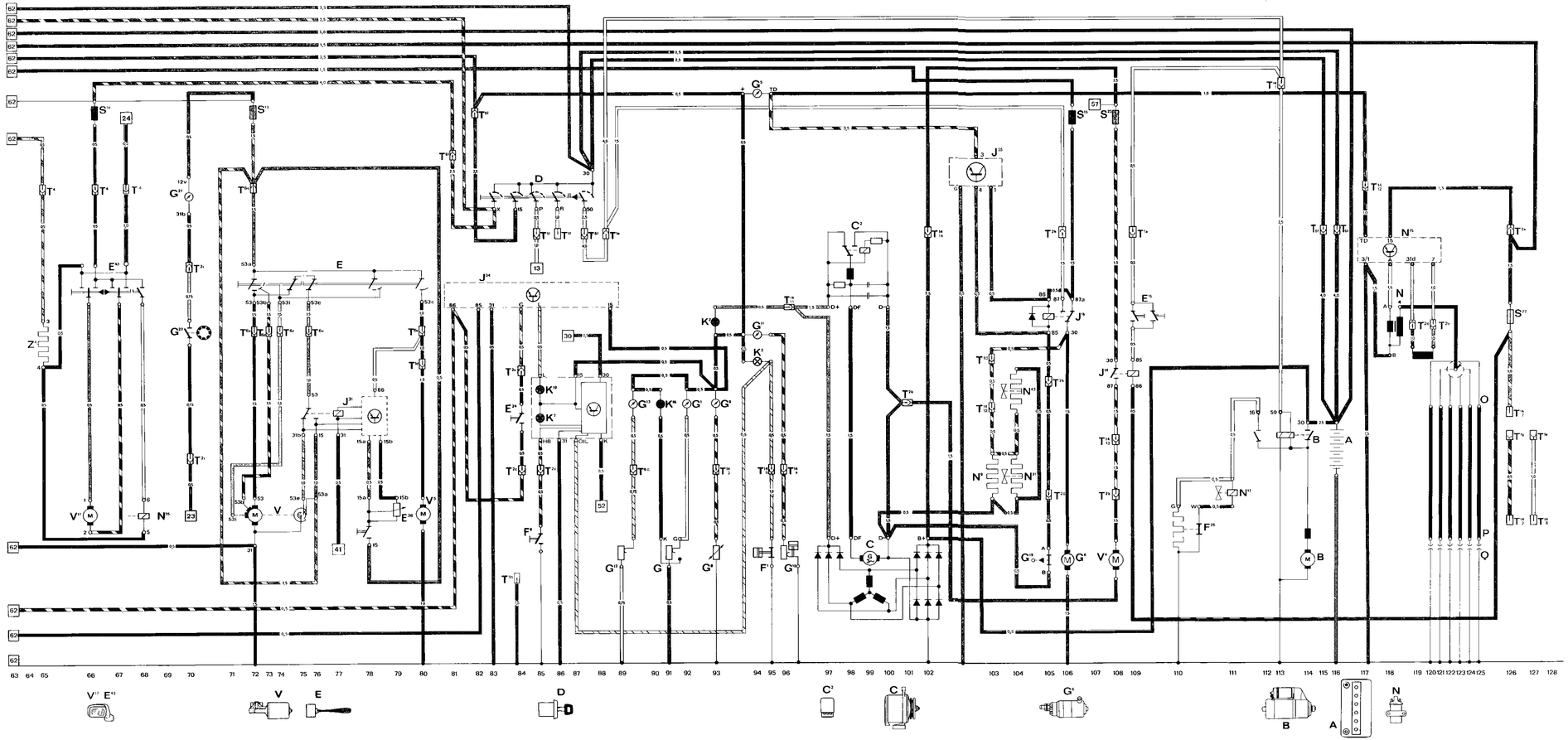
Description		Current track
E	– Windshield wiper switch	39
E 1	– Headlight switch	6, 8, 9, 11, 15, 20
E 2	– Turn signal switch	28
E 3	– Emergency flasher switch	24, 25, 28, 31, 34
E 4	– Dimmer switch	6, 39
E 5	– Headlight flasher switch	4
E 9	– Fresh air blower switch	58, 59, 60
E 15	– Rear window defogger switch	53, 54
E 19	– Parking light switch	13
E 20	– Instrument panel illumination potentiometer	20
E 26	– Switch for glove compartment light	41
F	– Stop light switch	50, 52
F 2	– Left door switch	45
F 3	– Right door switch	46
F 4	– Back-up light switch	48
F 5	– Switch for luggage compartment light	42
H	– Horn switch	39
H 2	– Horns	36, 38
H 6	– Key warning buzzer contact	43
J 1	– Hazard / turn signal flasher	33, 34, 35
J 4	– Horn relay	36, 37
J 9	– Rear window defogger relay	54, 55
J 27	– Diode for seat belt warning system	46
K 1	– High beam indicator light	2
K 4	– Parking lights indicator light	1
K 5	– Turn signal indicator light	27, 29
K 6	– Hazard flasher indicator light	24
K 8	– Blower indicator light	60
K 10	– Rear window defogger indicator light	53
L 1	– Sealed beam unit, left headlight	3, 7
L 2	– Sealed beam unit, right headlight	4, 8
L 6	– Speedometer illumination light	22
L 7	– Fuel gauge illumination light	22
L 9	– Clock illumination light	22
L 15	– Ashtray illumination light	20
L 16	– Heater control assembly illumination light	19
L 21	– Temperature control lever illumination light	21
L 24	– Oil temperature indicator illumination light	22
L 26	– Tachometer illumination light	22
L 27	– Oil pressure indicator illumination light	22
M 2	– Right stop / rear light	17, 50
M 4	– Left stop / rear light	13, 51
M 5	– Left front turn signal / parking light	11, 25
M 6	– Left rear turn signal	26
M 7	– Right front turn signal / parking light	15, 31
M 8	– Right rear turn signal	30
M 11	– Front side marker light	12, 16
M 12	– Rear side marker light	14, 18
M 15	– Left back-up light	48
M 17	– Right back-up light	45
N 6	– Resistor	23
S 2		9, 15, 11
to	– Fuses	8, 7, 4
S 12	on the	3, 31, 25, 48, 53
S 15		60
S 17		34
S 18	fuse box	40
S 24	– Fuse on the rear fuse box	55
T 1	– Cable connector, single	
	a – near regulator panel	14, 54, 55, 56
	b – behind sealed beam unit, left	11, 25
	c – behind sealed beam unit, right	15, 31
	d – behind fuse box	37
	e – on luggage compartment floor	22, 42, 44, 45, 46, 51
	f – behind instrument panel	6, 22, 24, 28, 56
T 2d	– Cable connector, double, on luggage compartment floor	50
T 6	– Cable connector, sixfold	
	a – in the engine compartment, rear left	9, 17, 30, 49, 50
	b – in the engine compartment, rear right	10, 24, 26, 48, 51
	d – below instrument panel	4, 6, 26, 30, 39
	e – below instrument panel	25, 31, 32, 34
	g – below instrument panel	8, 9, 11, 15, 22
	h – below instrument panel	41, 58, 59, 60
T 14	– Cable connector, fourteenfold on regulator panel	48
U 1	– Cigar lighter	61
V 2	– Blower motor	58, 59
W	– interior light	45, 46
W 2	– Luggage compartment light	42
W 5	– Glove compartment light	41
X	– License plate light	9, 10
Y	– Clock	40
Z 1	– Rear window defogger	55



Printed in Germany XXXVI. 1977

Current flow diagram, **9**

Type 911 SC, USA, Model 78



Description		Current track
A	— Battery	116
B	— Starter	113, 114
C	— Generator	97 – 102
C 2	— Voltage regulator	98, 99
D	— Ignition / starter switch	83 – 88
E	— Windshield wiper switch	72 – 80
E 16	— Heater blower switch	109
E 24	— Left seat belt switch	84
E 35	— Potentiometer for intermittent wiper operation	78, 79
E 42	— Outside mirror control switch	66, 67, 68
F 1	— Oil pressure switch	95
F 9	— Parking brake switch	85
F 26	— Thermo-switch for cold start valve	110
G	— Fuel sender unit	91
G 1	— Fuel gauge	92
G 5	— Tachometer	94
G 6	— Fuel pump	106
G 8	— Oil temperature sender unit	93
G 9	— Oil temperature indicator	93
G 10	— Oil pressure sender unit	96
G 11	— Oil pressure indicator	94
G 12	— Oil level sender unit	89
G 18	— Oil level gauge	89
G 19	— Air meter contact	105
G 21	— Speedometer	70
G 22	— Speedometer sensor	70
J 14	— Relay for heater blower	108, 109
J 16	— Relay for fuel pump	105, 106
J 31	— Relay for intermittent wiper operation	75 – 78
J 34	— Seat belt warning system relay with integrated buzzer	81 – 88
J 36	— Speed switch	103
K 2	— Generator charge indicator light	93
K 3	— Oil pressure indicator light	94
K 7	— Parking brake / brake warning light	85
K 15	— Low fuel warning light	90
K 19	— Seat belt warning light	85
N	— Ignition transformer	118
N 9	— Warm-up regulator	103
N 15	— High tension ignition unit	118
N 17	— Cold start valve	111
N 21	— Supplementary air valve	104
N 35	— Magnetic clutch for mirror control	68
N 43	— Thermovalve	104
O	— Distributor	119 – 125
P	— Spark plug connector	120 – 125
Q	— Spark plug	120 – 125
S 13	— Fuses	72
S 14	— on the	66
S 15	fuse box	106
S 22	— Fuses on the	126
S 23	rear fuse box (regulator planel)	108
T 1	— Cable connector, single	
	a — near regulator panel	105, 109,
	d — behind fuse box	80, 103
	e — on luggage compartment floor	88, 127
	f — behind instrument panel	85, 86
	g — below shift lever housing	126
	h — near battery	84
T 2	— Cable connector, double	
	a — below regulator panel	105, 126
	b — in engine compartment, left	101, 108
	c — near left seat	84
	d — on luggage compartment floor	85
	e — near distributor	119, 120
	i — in tunnel, rear	70
	k — below regulator panel	105, 106
T 4	— Cable connector, quadruple, on luggage compartment floor	65, 66, 67
T 6	— Cable connector, sixfold	
	a — in engine compartment, right	89
	c — below instrument panel	72, 73, 74, 76, 80
	f — below instrument panel	81, 82, 87, 115, 116
T 14	— Cable connector, fourteenfold on regulator panel	93, 95, 96, 102, 103, 108, 113, 117, 126, 127
V	— Windshield wiper motor	72, 75
V 4	— Heater blower	108
V 5	— Washer pump	80
V 17	— Outside mirror control motor	66
Z 4	— Outside mirror defogger	65

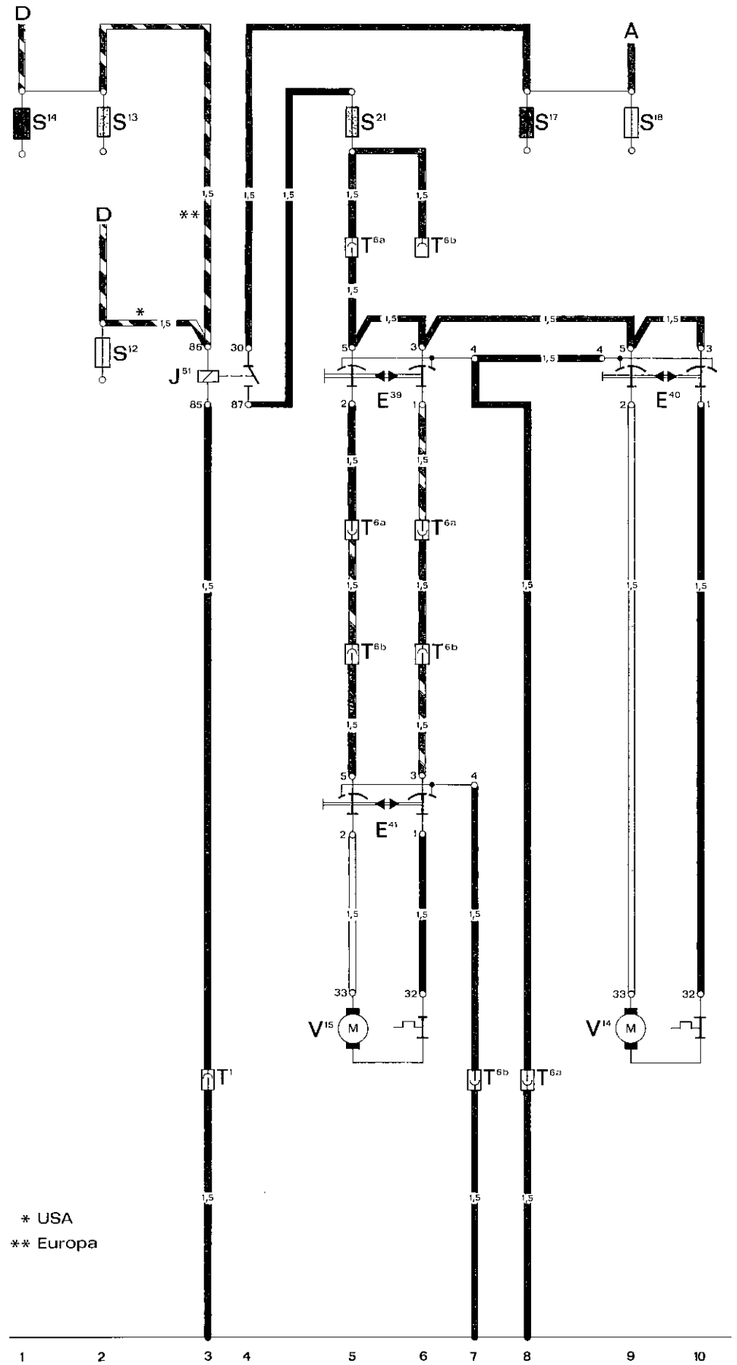
Printed in Germany XXXVI, 1977

Additional current flow diagram power windows Type 911 from model 77

9

Additional current flow diagram power windows Type 911 from model 77

Description	Current track
A – to battery	9
D – to ignition/starter switch (terminal X)	1
D – to ignition/starter switch (terminal 15)	2
E^{39} – Power window switch, driver side, for passenger side	5, 6
E^{40} – Power window switch, driver side	9, 10
E^{41} – Power window switch, passenger side	5, 6
J^{51} – Power window relay	3, 4
S^{12} – Fuse	2
S^{13} – Fuse	2
S^{14} – Fuse	1
S^{17} – Fuse	8
S^{18} – Fuse	9
S^{21} – Fuse	5
T^{1} – Cable connector, single, behind fuse box	3
T^{6} – Cable connector, sixfold	
a – in door well, left	5, 6, 8
b – in door well, right	5, 6, 7
V^{14} – Power window motor, left	9, 10
V^{15} – Power window motor, right	5, 6



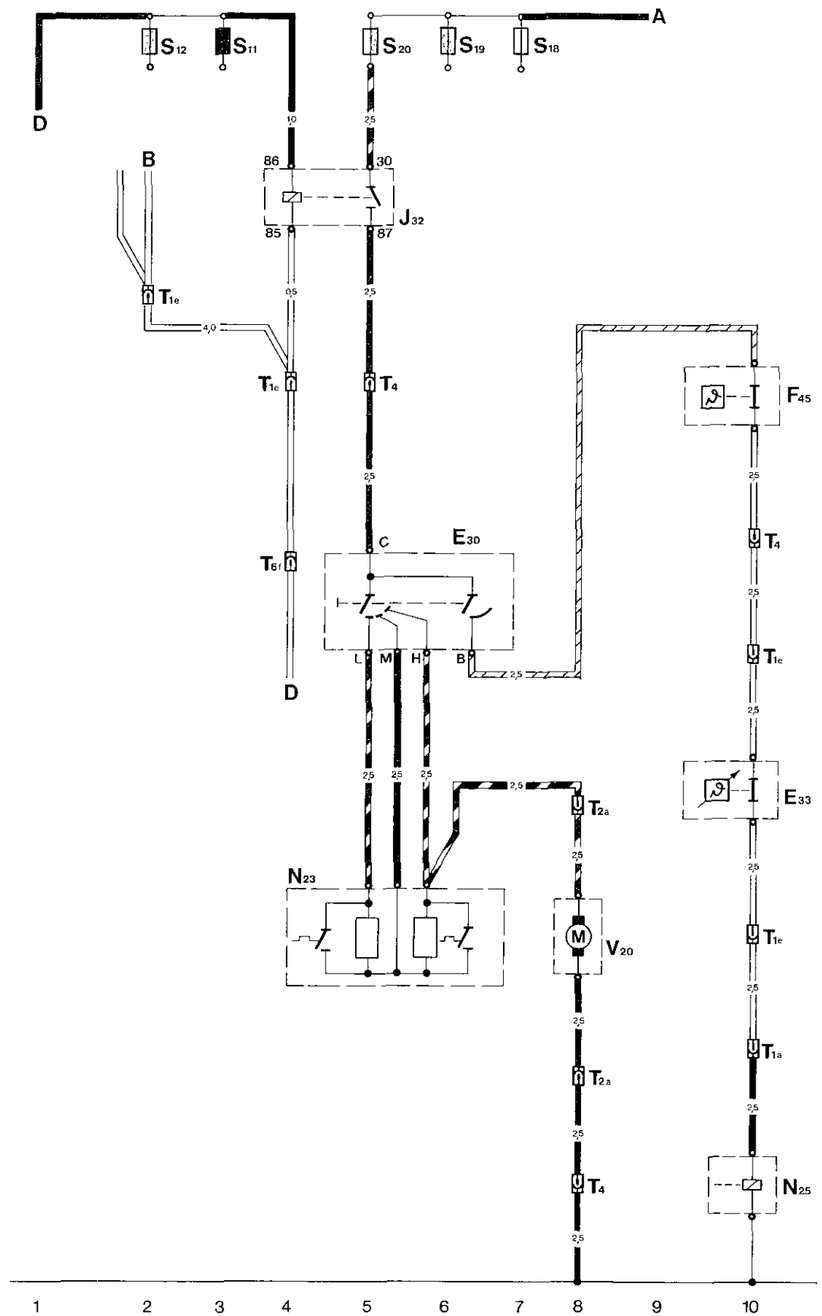
* USA
** Europa

Additional Current Flow Diagram
Air Conditioner (M 399)
Type 911 from model 77

9

Additional Current Flow Diagram
Air Conditioner (M 399)
Type 911 from model 77

Description	Current track
A – to battery	9
B – to starter (terminal 50)	2
D – to ignition/starter switch (terminal 15)	1
D – to ignition/starter switch (terminal 50)	4
E^{30} – Switch for AC	5, 6
E^{33} – Temperature switch for AC	10
F^{45} – Thermo-switch for AC (excess temperature)	10
J^{32} – Relay for AC	4, 5
N^{23} – Resistor for evaporator blower	5, 6
N^{25} – Electromagnetic clutch	10
S^{11} – Fuse	3
S^{12} – Fuse	2
S^{18} – Fuse	7
S^{19} – Fuse	6
S^{20} – Fuse	5
T^{1} – Wire connector, single	
a – near compressor	10
e – on luggage compartment floor	2, 4, 10
T^{2} – Wire connector, two-pole	
a – near evaporator blower	8
T^{4} – Wire connector, four-pole, below instrument panel	5, 8, 10
T^{6f} – Wire connector, six-pole, below instrument panel	4
V^{20} – Evaporator blower	8

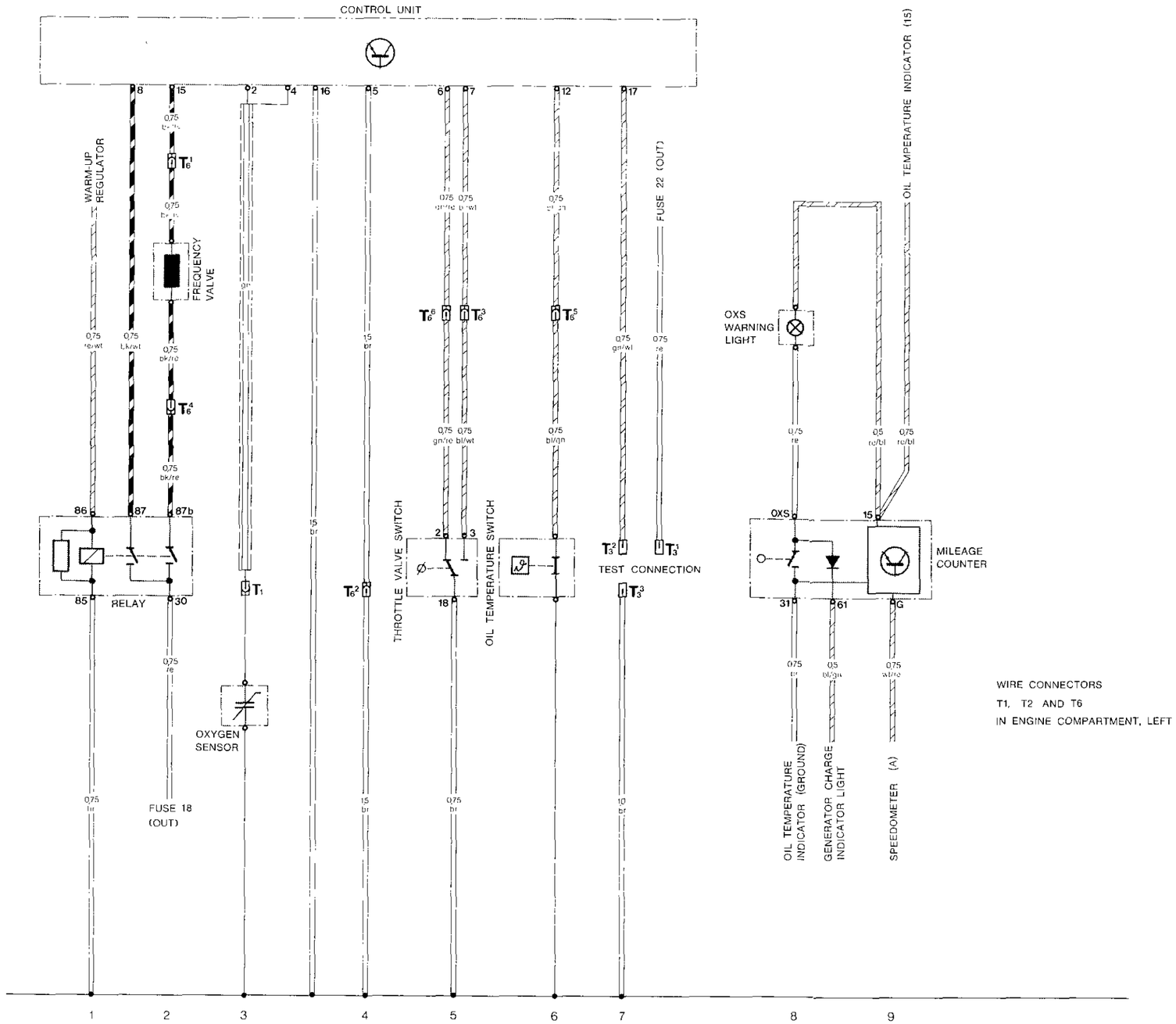


Additional Current Flow Diagram
Type 911 SC USA, Model 80

Oxygen Sensor System

Additional Current Flow Diagram, Type 911 SC USA, Model 80

Oxygen Sensor System



Current Flow Diagram
Type 911 SC USA Model 81

PART I POWER SUPPLY, STARTER
FUEL PUMP
HEATER VENTILATOR
IGNITION

PART II HEADLIGHT, FRONT TURN SIGNAL, HAZARD FLASHER

PART III REAR LIGHT, BRAKE LIGHT
HORNS
INTERIOR LIGHT
IGNITION/STARTER SWITCH

REAR WINDOW DEFOGGER

PART IV OUTSIDE MIRROR
FRESH AIR BLOWER
CIGARETTE LIGHTER
WINDSHIELD WIPER
POWER WINDOWS

PART V OXYGEN SENSOR SYSTEM
INSTRUMENT, SENDER UNITS

PART VI OXYGEN SENSOR SYSTEM

Current Flow Diagram
Type 911 SC USA Model 81

WIRE CONNECTORS

T1 – ONE POLE

A – NEAR REGULATOR PANEL
B – BEHIND HEADLIGHT LEFT
C – BEHIND HEADLIGHT RIGHT
D – BEHIND FUSE BOX
E – ON LUGGAGE COMPARTMENT FLOOR
F – BEHIND INSTRUMENT PANEL

T2 – TWO POLE

A – BELOW REGULATOR PANEL
B – IN ENGINE COMPARTMENT LEFT
C – NEAR DISTRIBUTOR
D – IN TUNNEL REAR
E – BELOW REGULATOR PANEL
F – ON LUGGAGE COMPARTMENT FLOOR
G – NEAR LEFT SEAT

T3 – THREE-POLE

A – ON LUGGAGE COMPARTMENT FLOOR
B – IN ENGINE COMPARTMENT

T6 – SIX POLE

A – IN ENGINE COMPARTMENT LEFT
B – IN ENGINE COMPARTMENT RIGHT
C – BELOW INSTRUMENT PANEL
D – BELOW INSTRUMENT PANEL
E – BELOW INSTRUMENT PANEL
F – BELOW INSTRUMENT PANEL
G – BELOW INSTRUMENT PANEL
H – BELOW INSTRUMENT PANEL
I – IN DOOR WELL LEFT
K – IN DOOR WELL RIGHT

T12 – TWELVE-POLE
IN ENGINE COMPARTMENT

T14 – FOURTEEN POLE
ON REGULATOR PANEL

GROUND TERMINALS

① ON ENGINE

② IN LUGGAGE COMPARTMENT

③ BATTERY

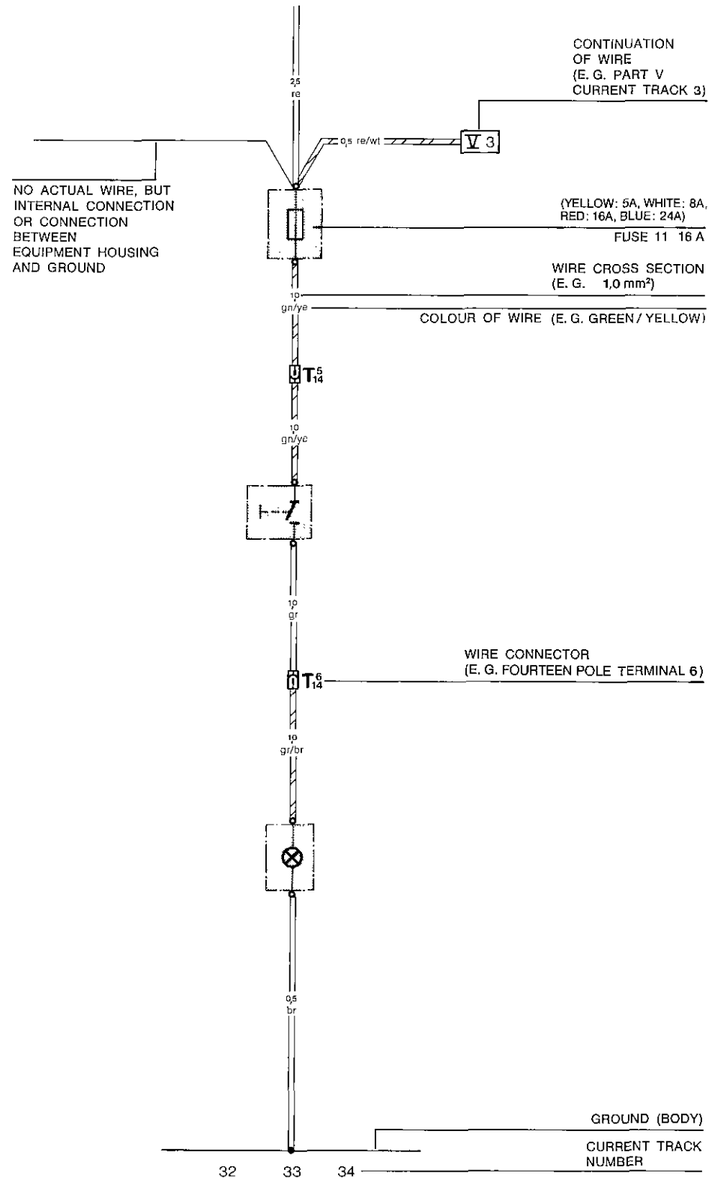
④ IN ENGINE COMPARTMENT

⑤ ON LUGGAGE COMPARTMENT FLOOR

⑥ NEAR FUSE BOX

WIRE COLOURS

BK - BLACK	GN - GREEN	BR - BROWN
WT - WHITE	YE - YELLOW	BL - BLUE
RE - RED	GR - GREY	VI - VIOLET



Current Flow Diagram Type 911 SC USA Model 81, Part I

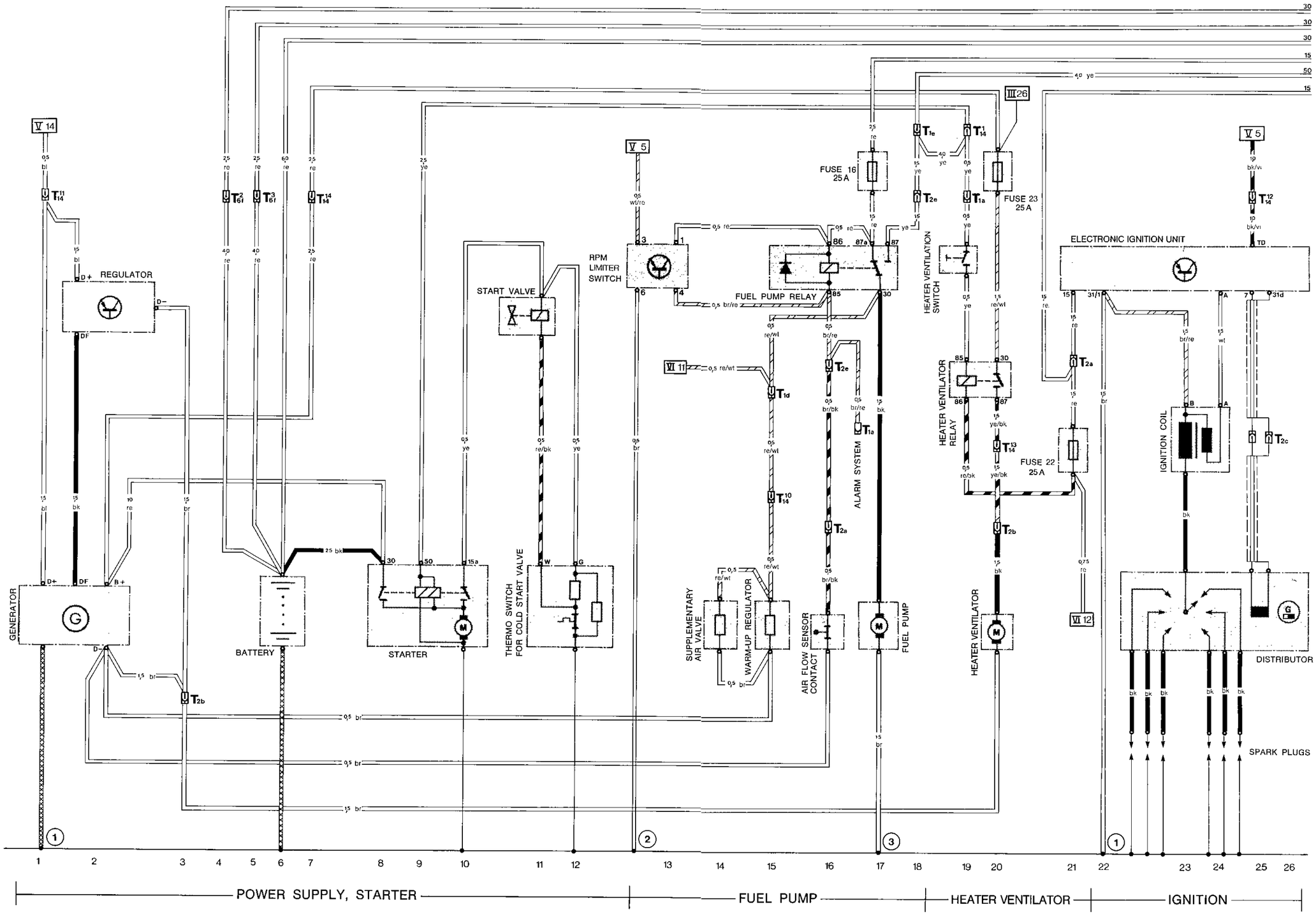
POWER SUPPLY, STARTER

FUEL PUMP

HEATER VENTILATOR

IGNITION

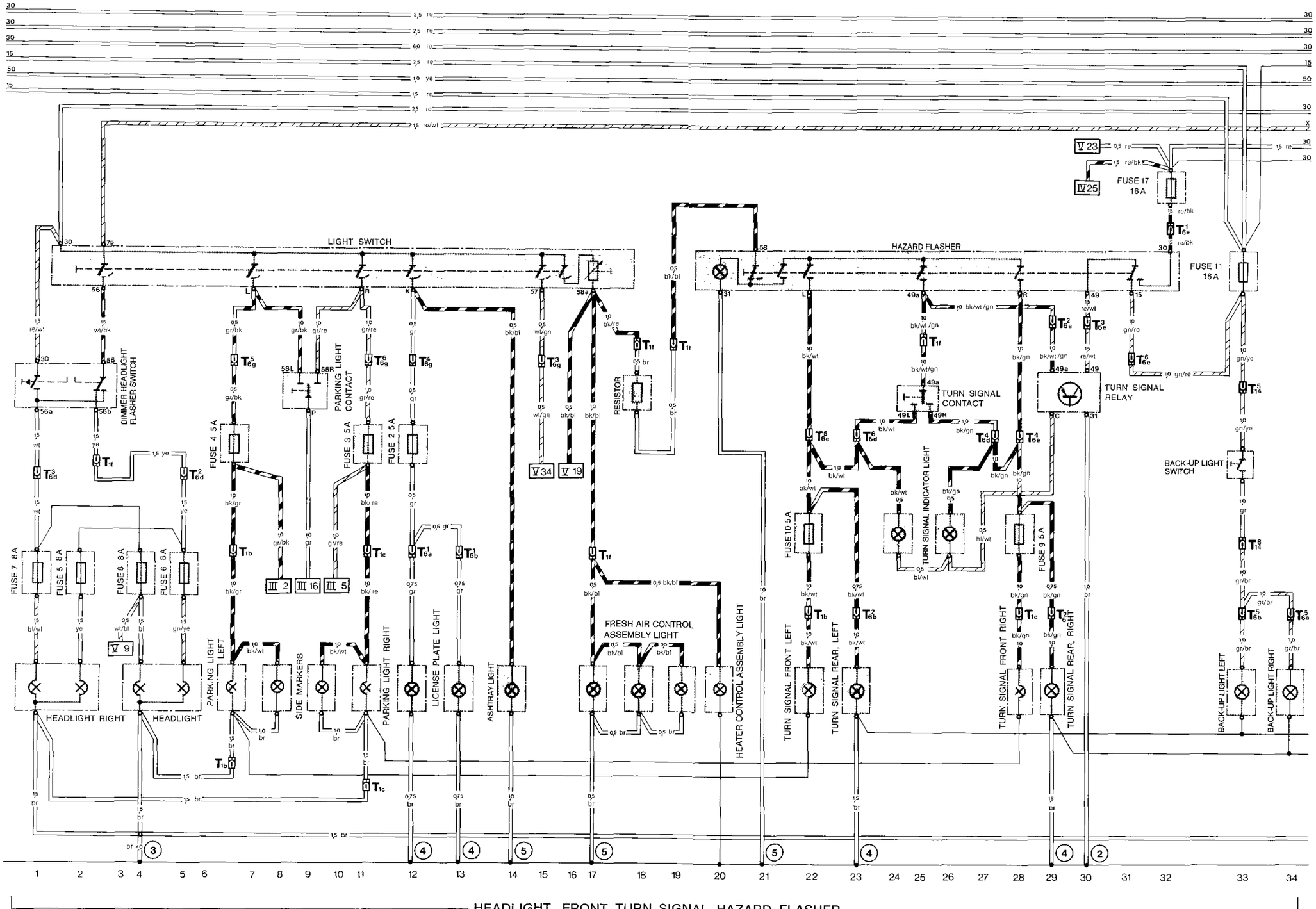
Current Flow Diagram Type 911 SC USA, Model 81, Part I



Current Flow Diagram Type 911 SC USA Model 81, Part II

HEADLIGHT, FRONT TURN SIGNAL,
HAZARD FLASHER

Current Flow Diagram Type 911 SC USA, Model 81, Part II



Current Flow Diagram Type 911 SC USA Model 81, Part III

REAR LIGHTS, BRAKE LIGHTS

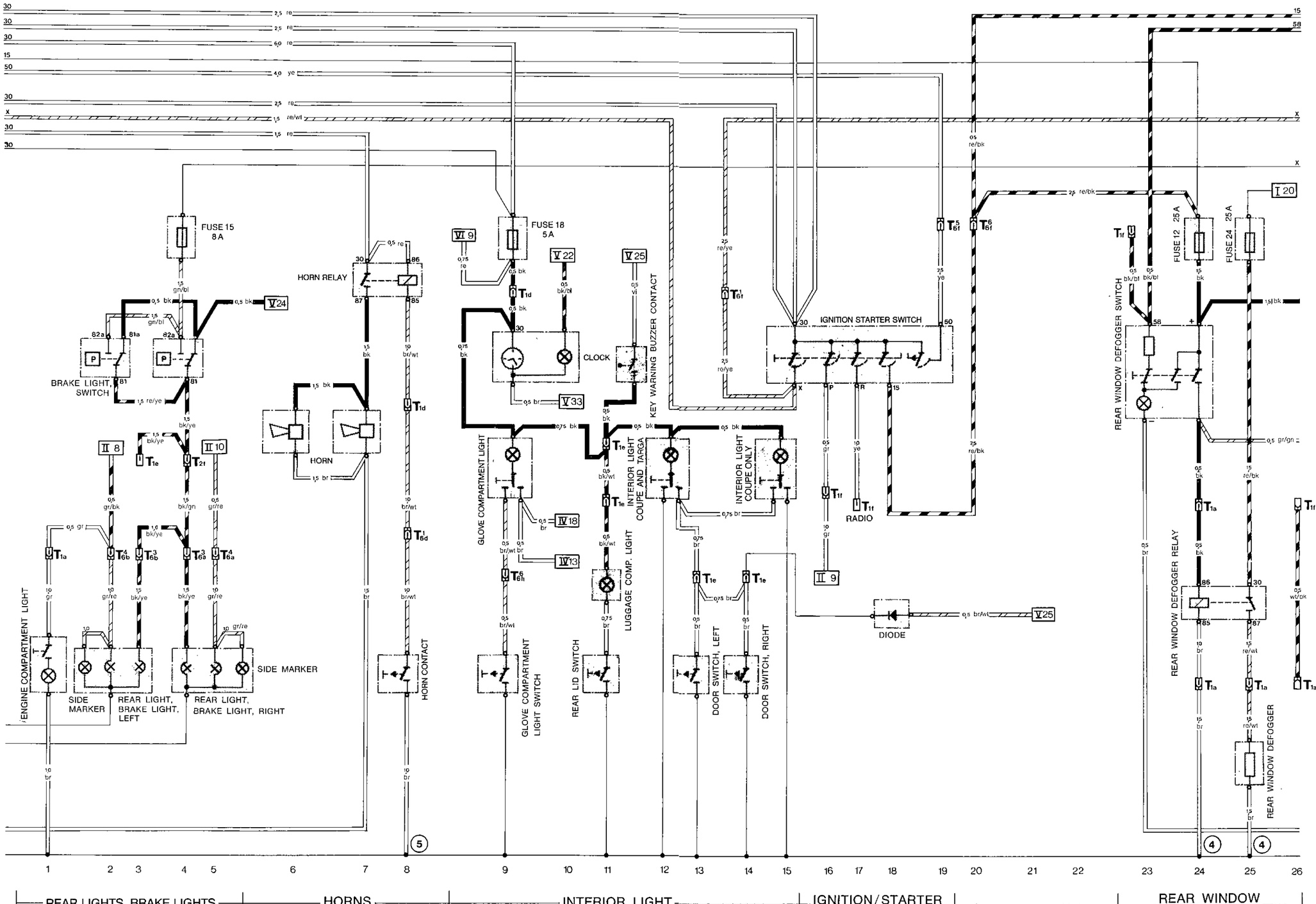
HORNS

INTERIOR LIGHT

IGNITION/STARTER SWITCH

REAR WINDOW DEFOGGER

Current Flow Diagram Type 911 SC USA, Model 81, Part III



Current Flow Diagram Type 911 SC USA Model 81, Part IV

OUTSIDE MIRROR

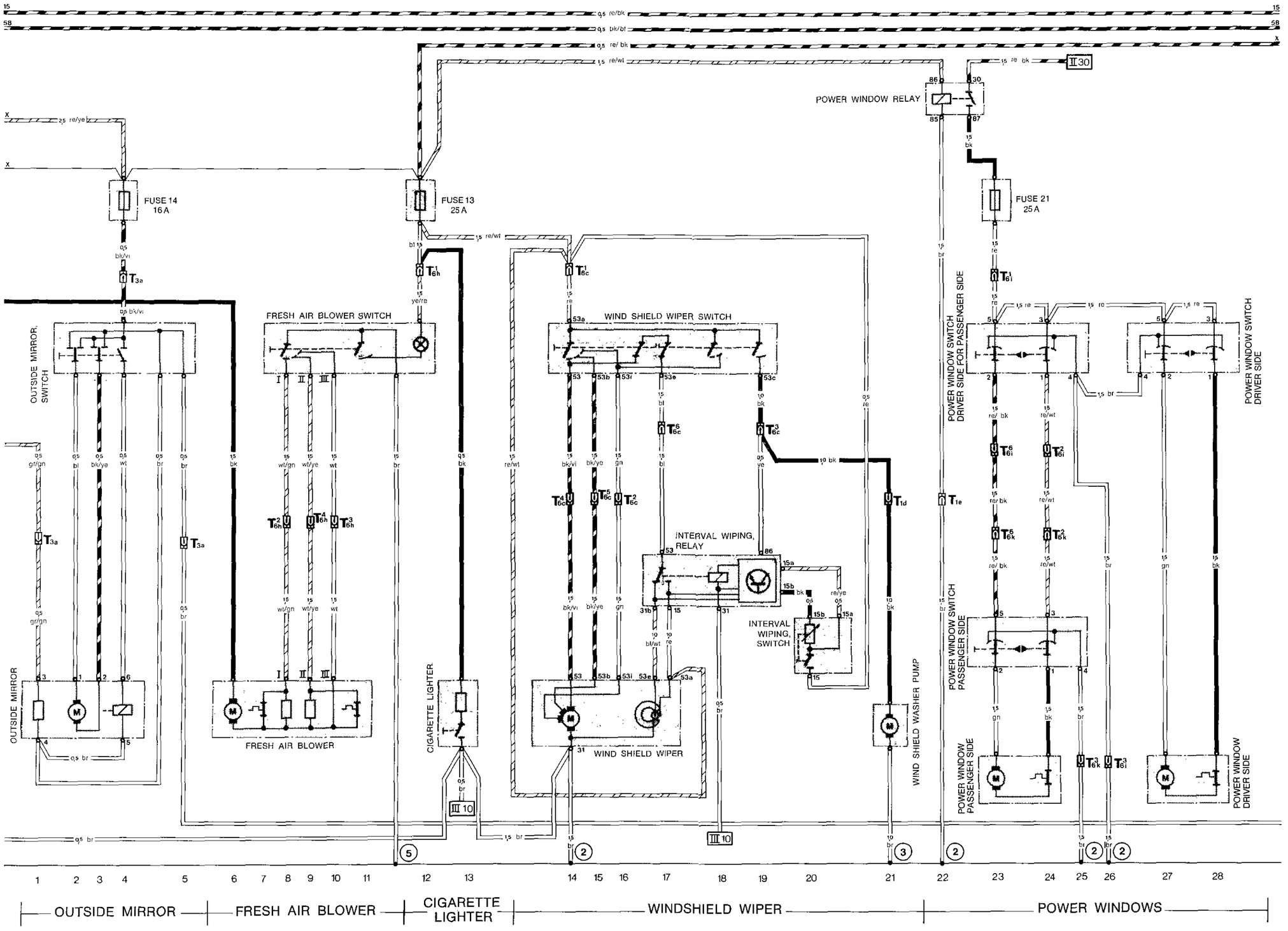
FRESH AIR BLOWER

CIGARETTE LIGHTER

WINDSHIELD WIPER

POWER WINDOWS

Current Flow Diagram Type 911 SC USA, Model 81, Part IV

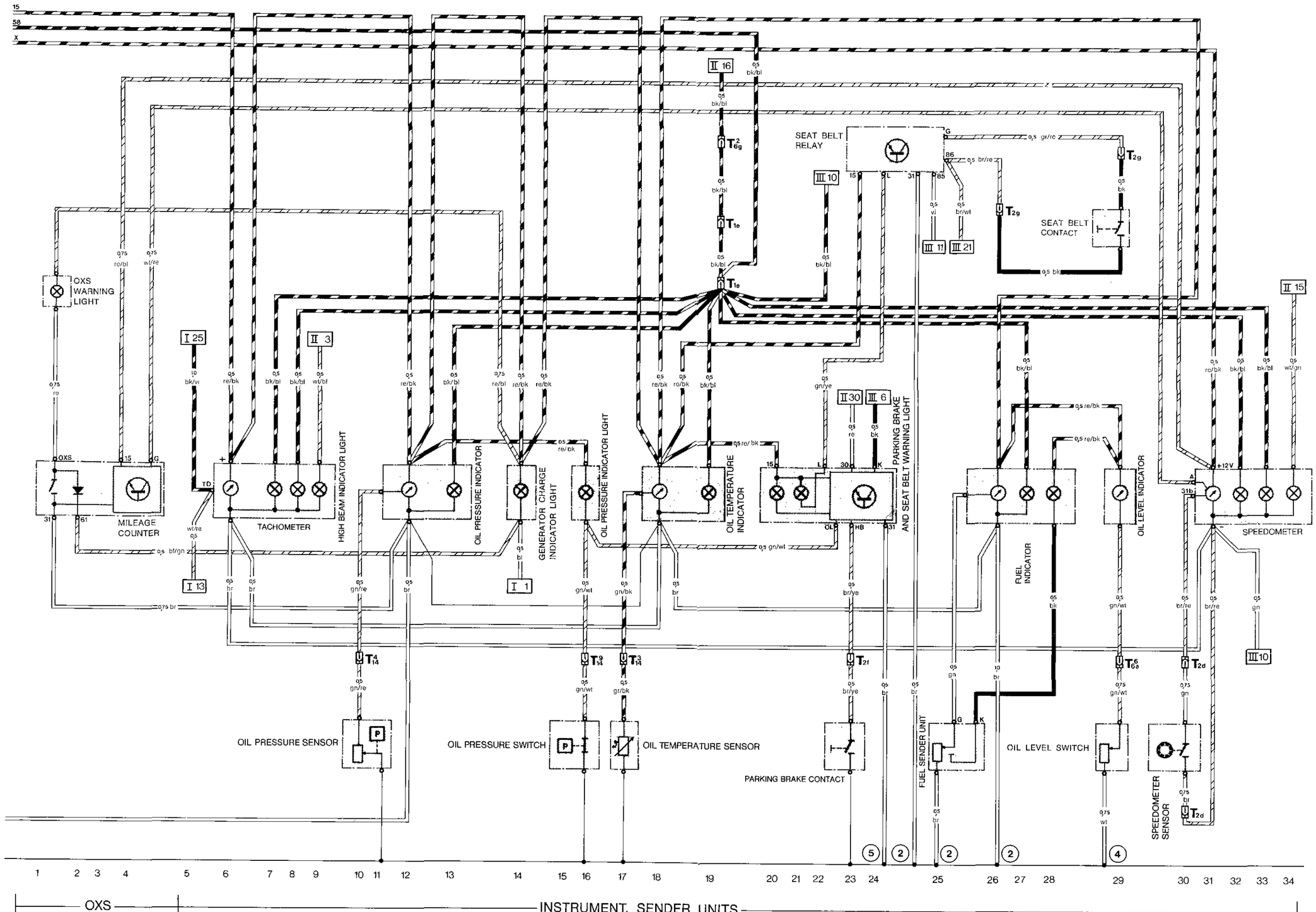


Current Flow Diagram Type 911 SC USA Model 81, Part V

OXYGEN SENSOR SYSTEM

INSTRUMENT, SENDER UNITS

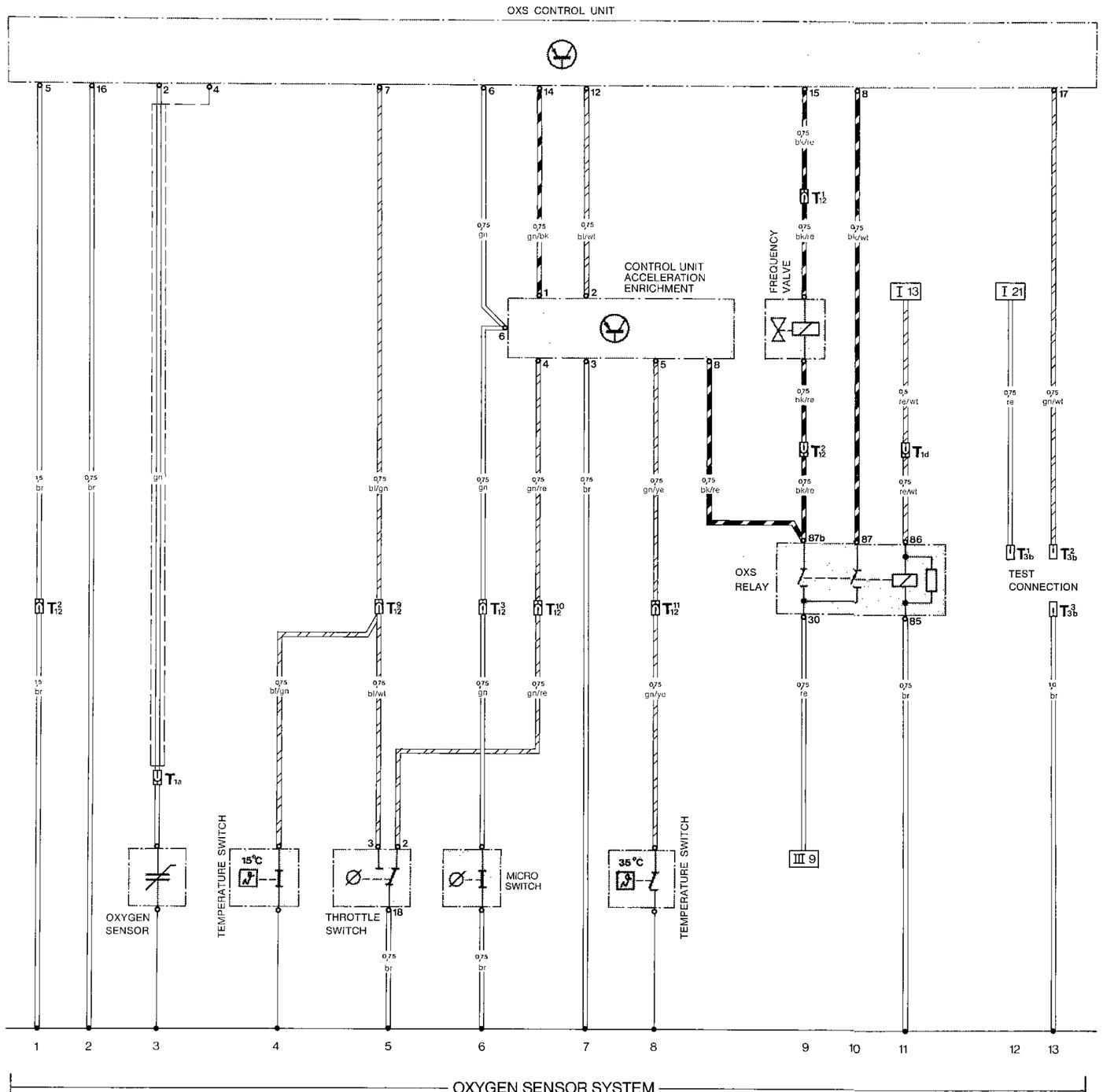
Current Flow Diagram Type 911 SC USA, Model 81, Part V



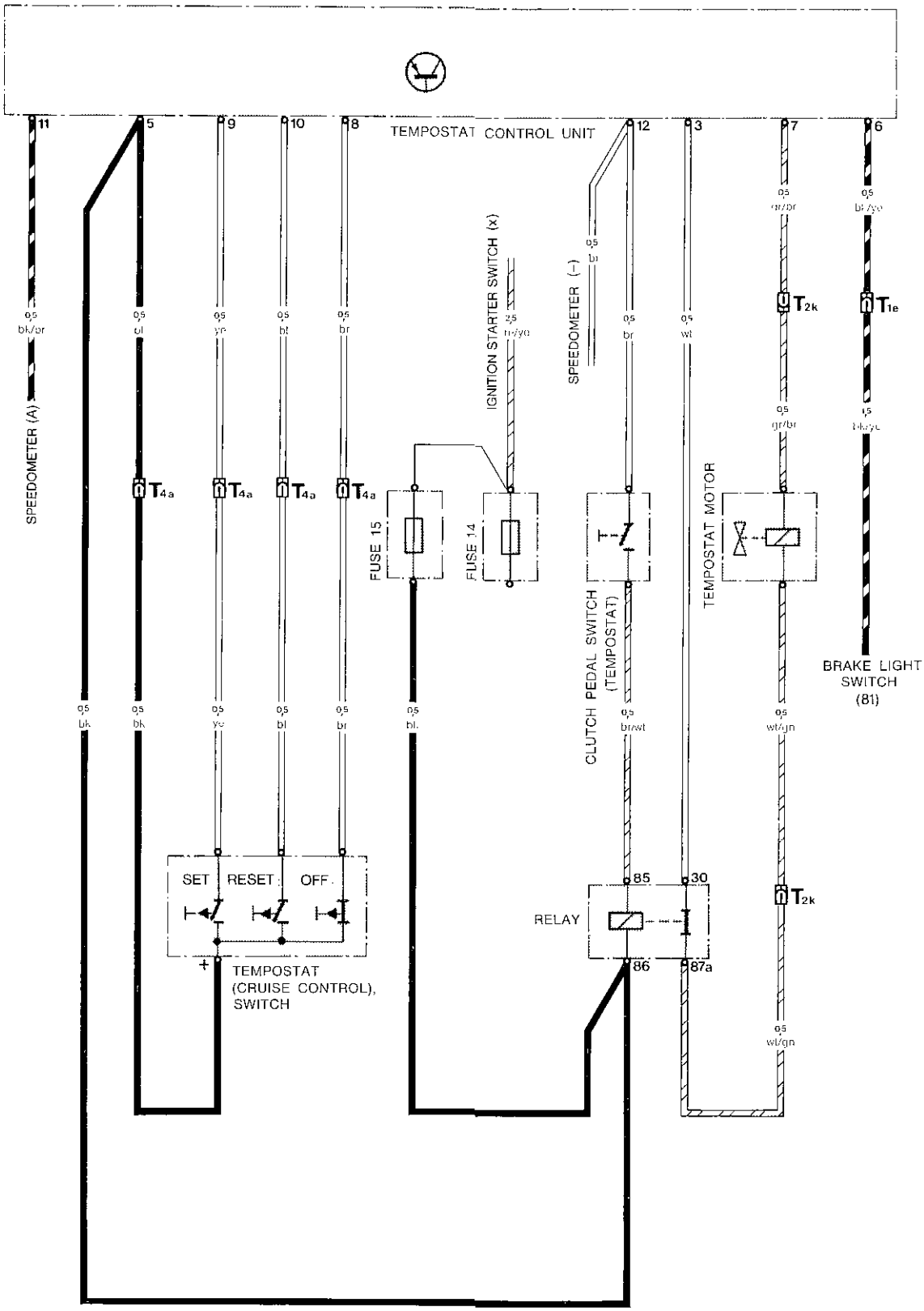
Current Flow Diagram Type 911 SC USA Model 81, Part VI

OXYGEN SENSOR SYSTEM

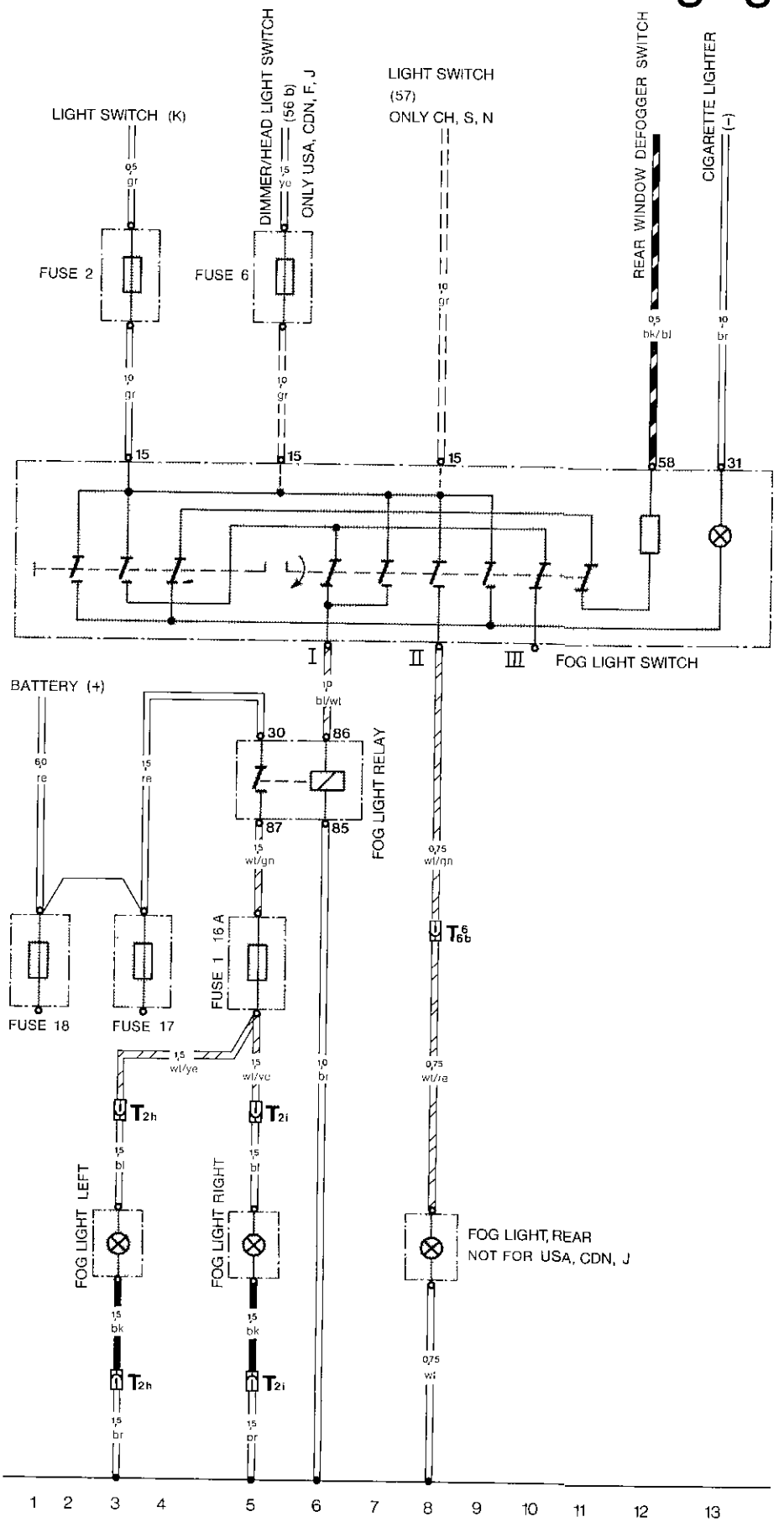
Current Flow Diagram Type 911 SC USA, Model 81, Part VI



Additional Current Flow Diagram
Type 911 SC Cruise control (Tempostat)



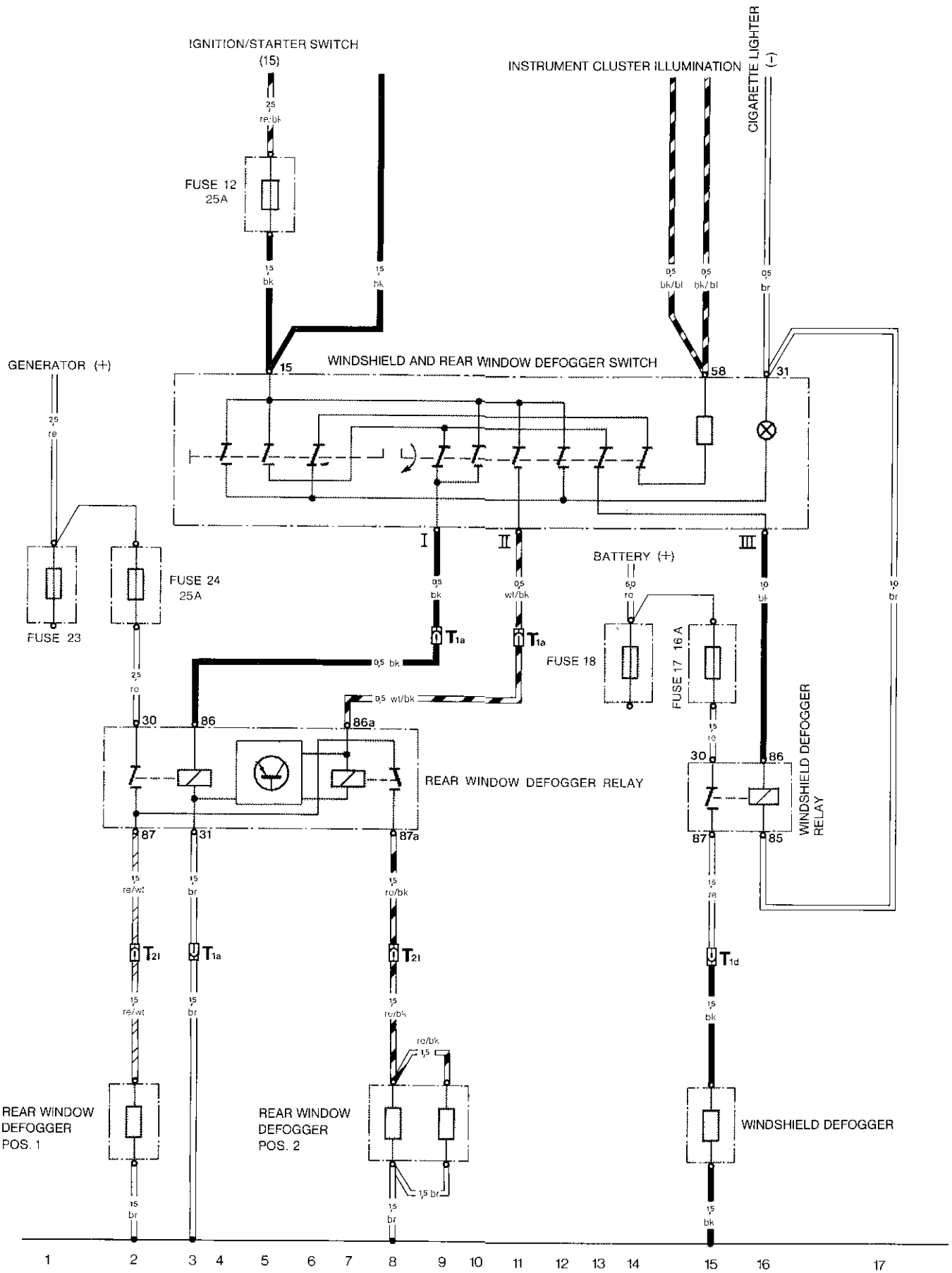
Additional Current Flow Diagram
Type 911 SC FROM MODEL 81 Fog light



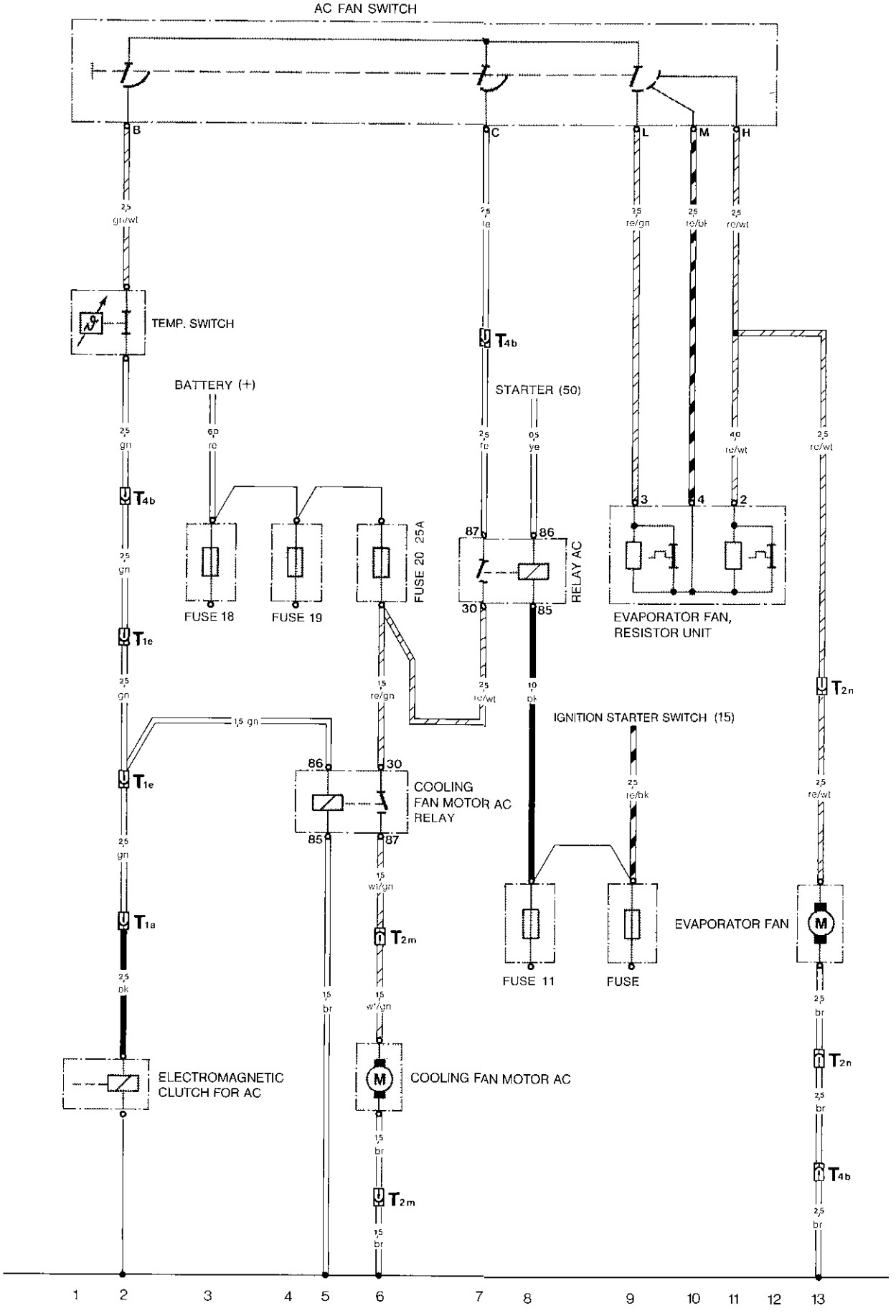
Additional Current Flow Diagram
Type 911 SC FROM MODEL 81

9

WINDSHIELD AND REAR WINDOW DEFOGGER



Additional Current Flow Diagram
Type 911 SC Air Condition



Current Flow Diagram
Type 911 SC USA Model 82

PART I POWER SUPPLY, STARTER
FUEL PUMP
HEATER VENTILATOR
IGNITION

PART II HEADLIGHT, FRONT TURN SIGNAL, HAZARD FLASHER

PART III REAR LIGHT, BRAKE LIGHT
HORNS
INTERIOR LIGHT
IGNITION/STARTER SWITCH

REAR WINDOW DEFOGGER

PART IV OUTSIDE MIRROR
FRESH AIR BLOWER
CIGARETTE LIGHTER
WINDSHIELD WIPER
POWER WINDOWS

PART V OXYGEN SENSOR SYSTEM
INSTRUMENT, SENDER UNITS

PART VI OXYGEN SENSOR SYSTEM
HEADLIGHT WASHER

Current Flow Diagram
Type 911 SC USA Model 82

WIRE CONNECTORS

T1 – ONE POLE

A – NEAR REGULATOR PANEL
B – BEHIND HEADLIGHT LEFT
C – BEHIND HEADLIGHT RIGHT
D – BEHIND FUSE BOX
E – ON LUGGAGE COMPARTMENT FLOOR
F – BEHIND INSTRUMENT PANEL

T2 – TWO POLE

A – BELOW REGULATOR PANEL
B – IN ENGINE COMPARTMENT LEFT
C – NEAR DISTRIBUTOR
D – IN TUNNEL REAR
E – BELOW REGULATOR PANEL
F - ON LUGGAGE COMPARTMENT FLOOR
G - NEAR LEFT SEAT
P - NEAR BATTERY

T3 - THREE-POLE

A - ON LUGGAGE COMPARTMENT FLOOR
B - IN ENGINE COMPARTMENT

T6 – SIX POLE

A – IN ENGINE COMPARTMENT LEFT
B – IN ENGINE COMPARTMENT RIGHT
C – BELOW INSTRUMENT PANEL
D – BELOW INSTRUMENT PANEL
E – BELOW INSTRUMENT PANEL
F – BELOW INSTRUMENT PANEL
G – BELOW INSTRUMENT PANEL
H – BELOW INSTRUMENT PANEL
I – IN DOOR WELL LEFT
K – IN DOOR WELL RIGHT

T12 - TWELVE-POLE
IN ENGINE COMPARTMENT

T14 –FOURTEEN POLE
ON REGULATOR PANEL

GROUND TERMINALS

① ON ENGINE

② IN LUGGAGE COMPARTMENT

③ BATTERY

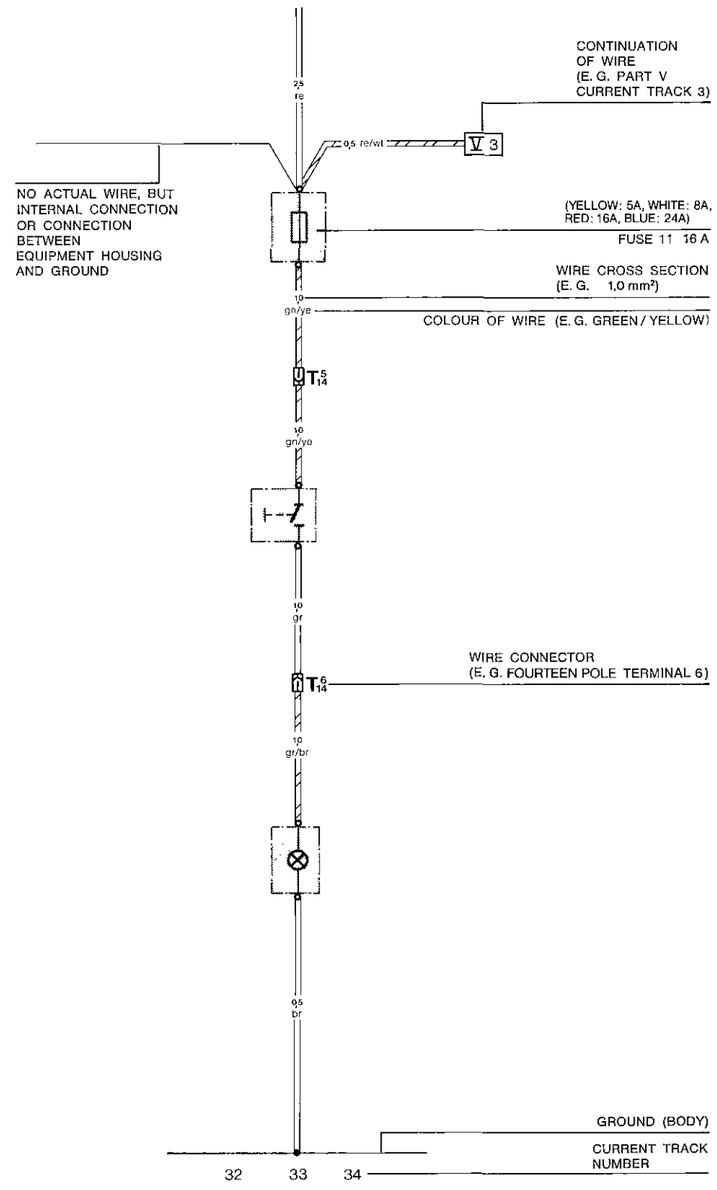
④ IN ENGINE COMPARTMENT

⑤ ON LUGGAGE COMPARTMENT FLOOR

⑥ NEAR FUSE BOX

WIRE COLOURS

BK - BLACK	GN - GREEN	BR - BROWN
WT - WHITE	YE - YELLOW	BL - BLUE
RE - RED	GR - GREY	VI - VIOLET



Current Flow Diagram Type 911 SC USA Model 82, Part I

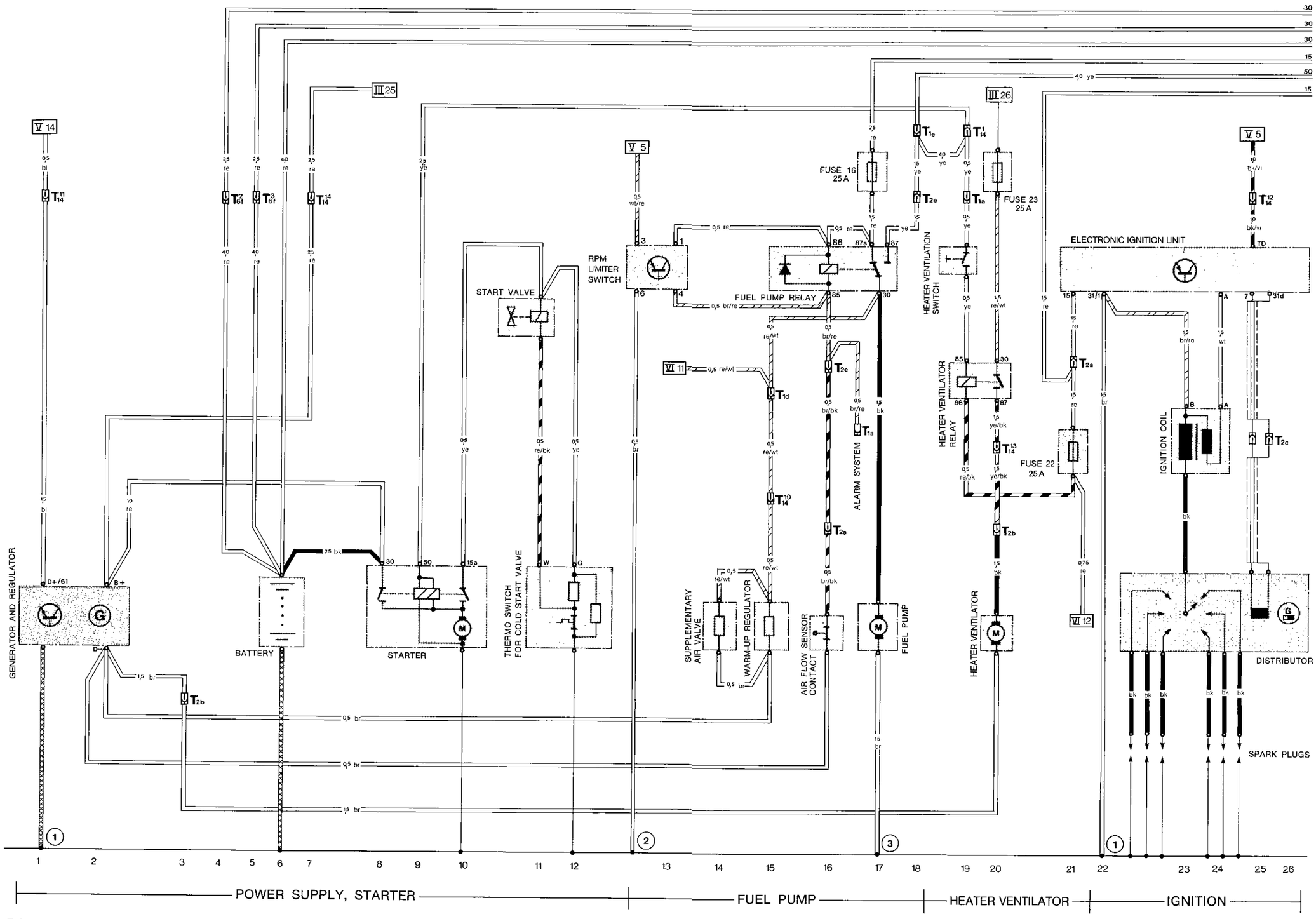
POWER SUPPLY, STARTER

FUEL PUMP

HEATER VENTILATOR

IGNITION

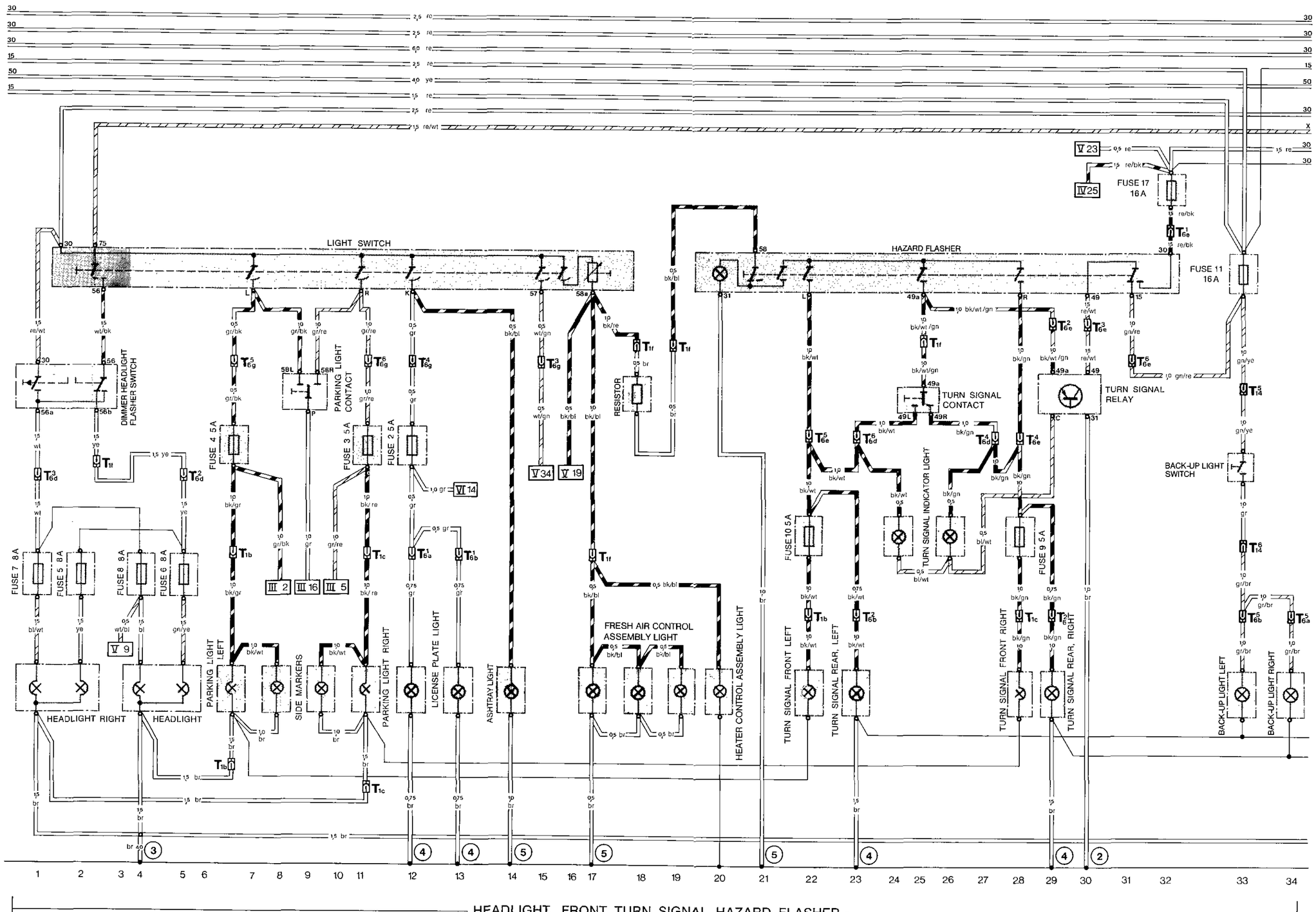
Current Flow Diagram Type 911 SC USA, Model 82, Part I



Current Flow Diagram Type 911 SC USA Model 82, Part II

HEADLIGHT, FRONT TURN SIGNAL,
HAZARD FLASHER

Current Flow Diagram Type 911 SC USA, Model 82, Part II



Current Flow Diagram Type 911 SC USA Model 82, Part III

REAR LIGHTS, BRAKE LIGHTS

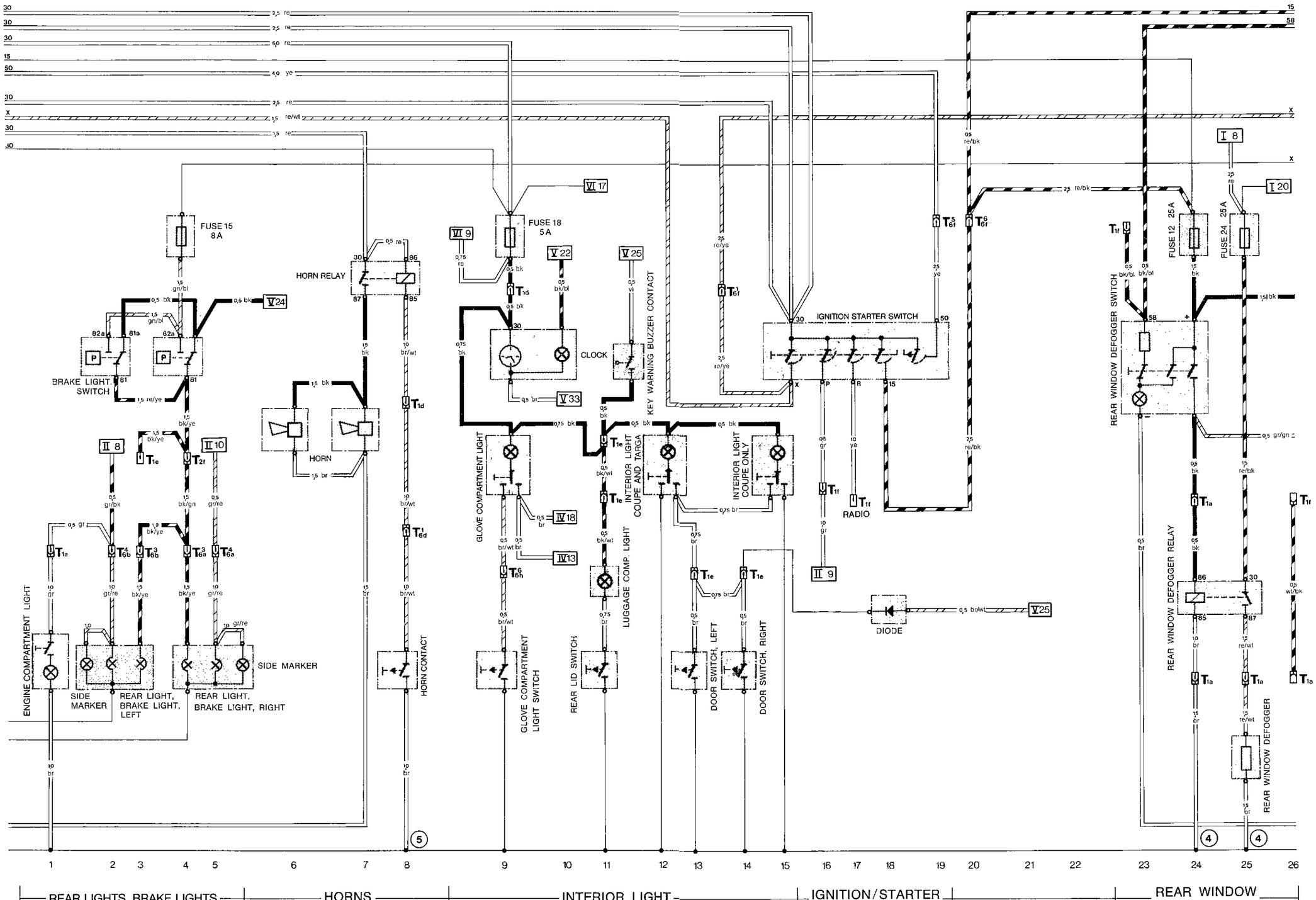
HORNS

INTERIOR LIGHT

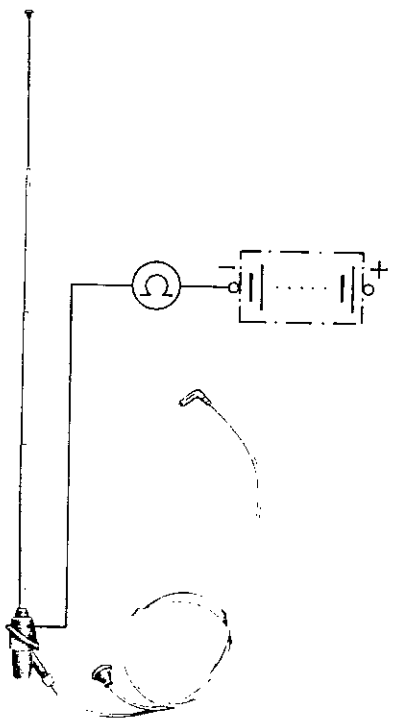
IGNITION/STARTER SWITCH

REAR WINDOW DEFOGGER

Current Flow Diagram Type 911 SC USA, Model 82, Part III

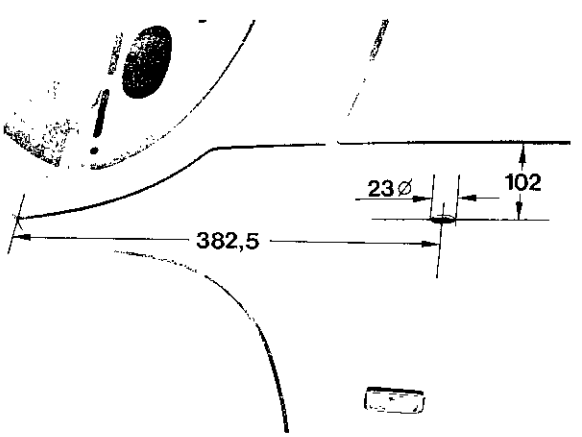


When installing antenna make sure there is perfect ground contact between base of antenna and fender.

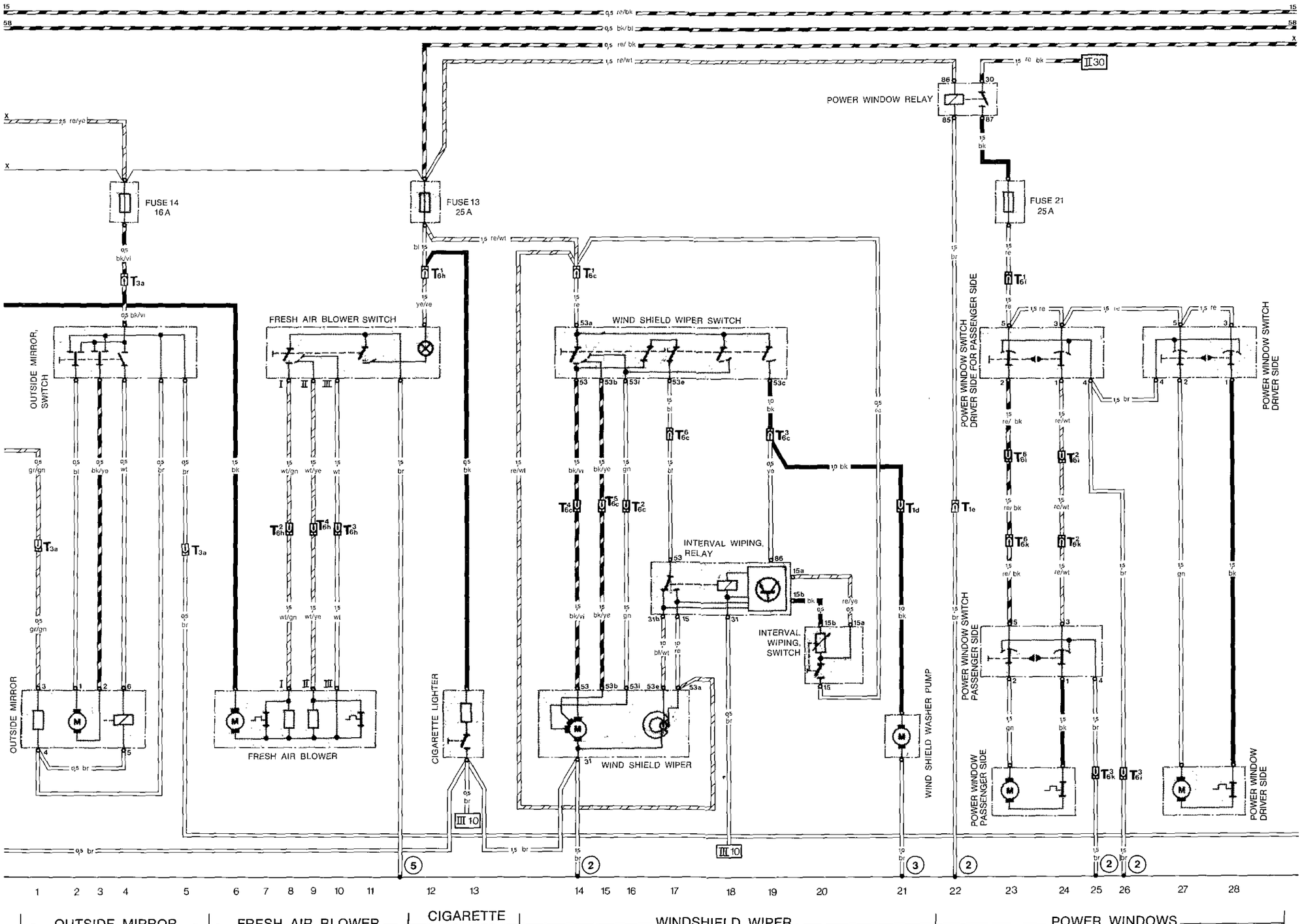


Base ground to battery negative pole = 0 ohm.

Installed distance for automatic antenna.



Current Flow Diagram Type 911 SC USA, Model 82, Part IV

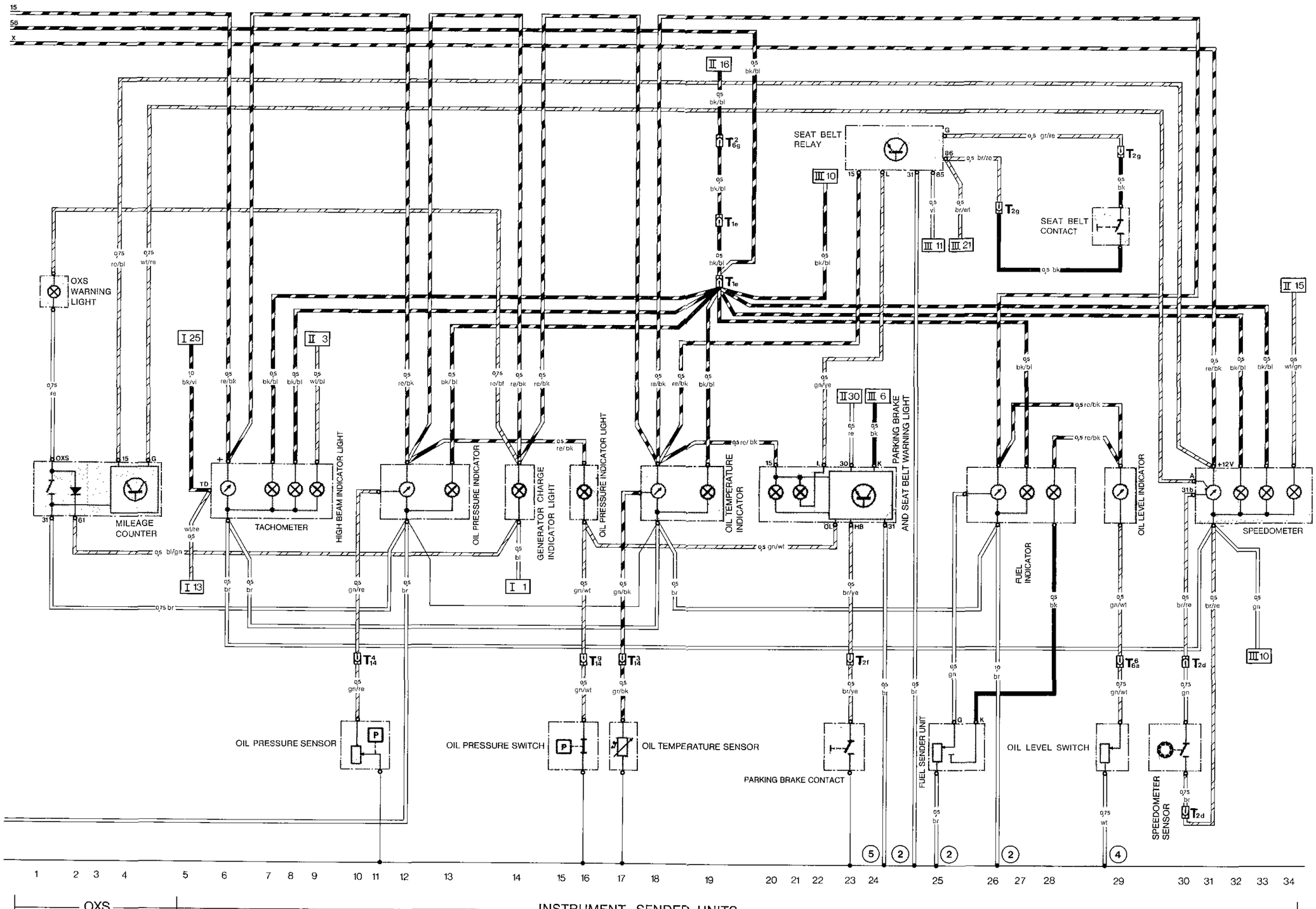


Current Flow Diagram Type 911 SC USA Model 82, Part V

OXYGEN SENSOR SYSTEM

INSTRUMENT, SENDER UNITS

Current Flow Diagram Type 911 SC USA, Model 82, Part V

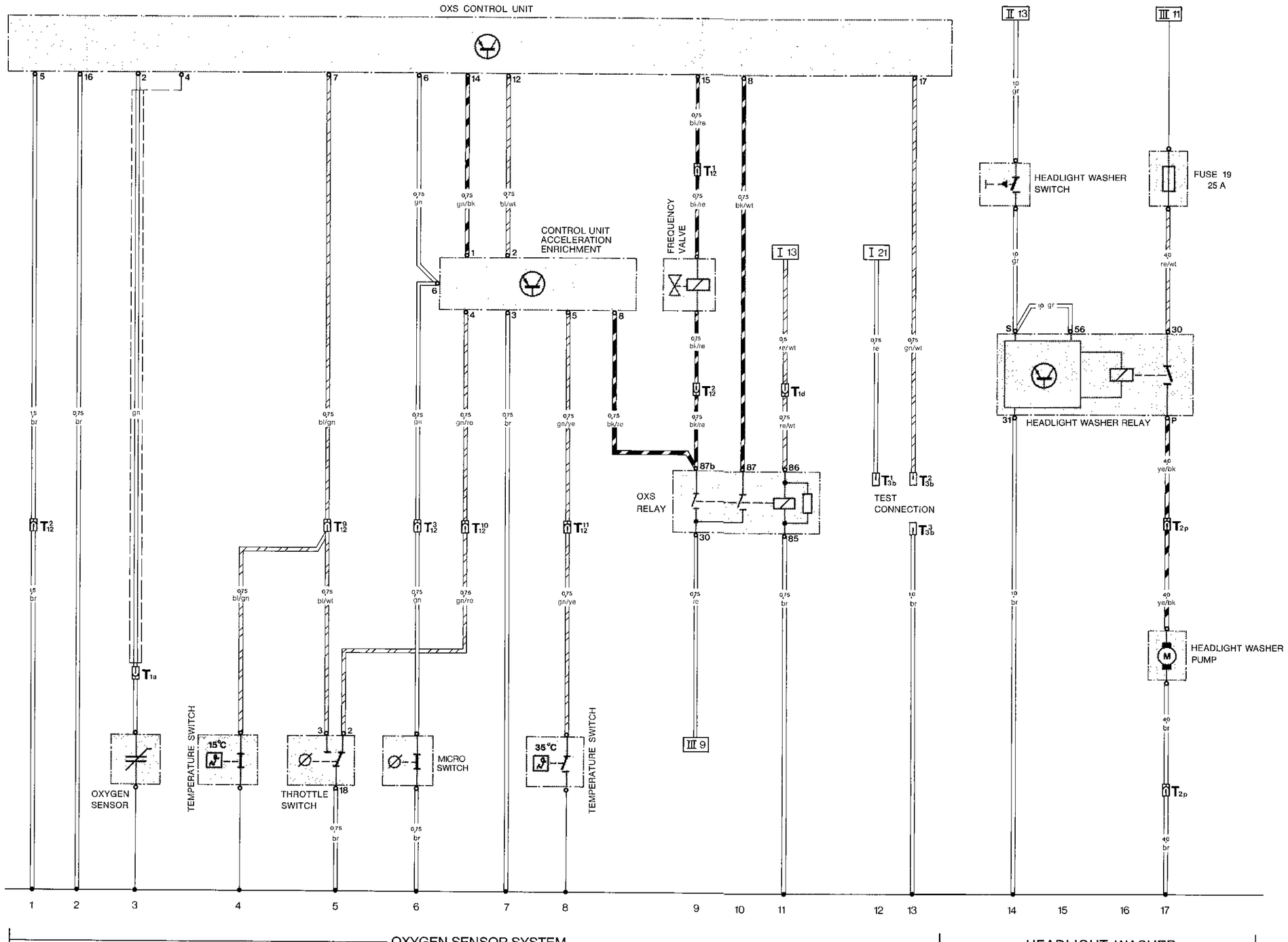


Current Flow Diagram Type 911 SC USA Model 82, Part VI

OXYGEN SENSOR SYSTEM

HEADLIGHT WASHER

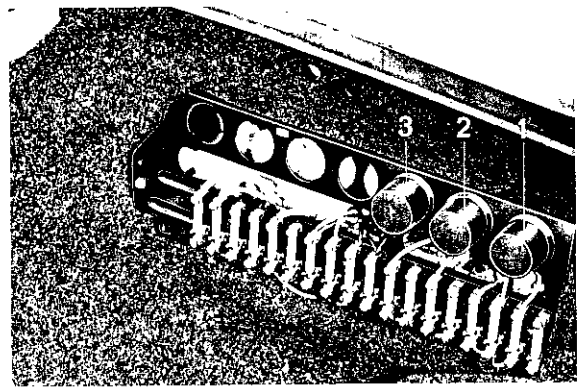
Current Flow Diagram Type 911 SC USA, Model 82, Part VI



LOCATION OF RELAYS AND FUSES IN THE VEHICLE EFFECTIVE WITH 1974 MODELS

Beginning with 1974 models, the fuse box is located on the left side panel of the luggage compartment near the brake fluid reservoir. The plastic cover can be removed from the fuse box by lightly pressing its top downward.

The fuse box contains 18 fuses and, depending on options, 1 to 3 standard relays.



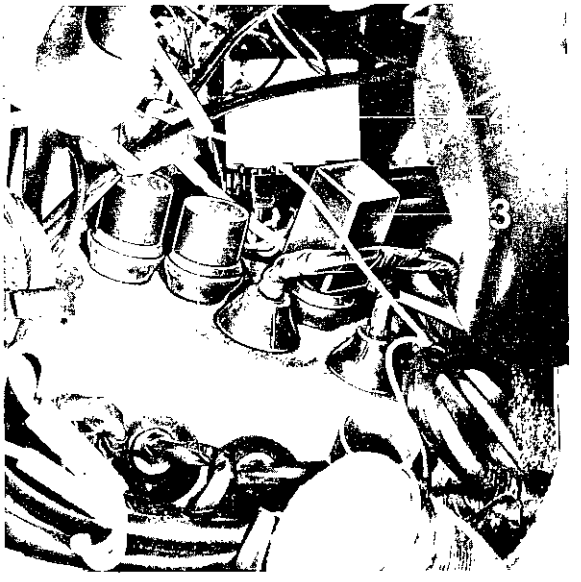
1 - Relay for air conditioning

2 - Relay for fog lamps

3 - Relay for signal horn

Mounting space for 4 additional relays has been provided for possible expansion of the electrical system.

A fuse listing is contained in the wiring diagrams. The fuses are identified in the diagrams in an ascending numerical order whereby the forward-most fuse in the vehicle bears the designation S 1.



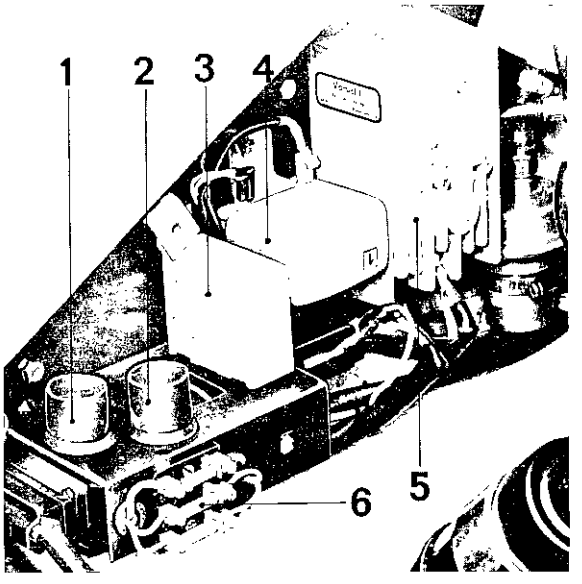
Additional fuses and relays are located on the luggage compartment floor (left, as seen in direction of driving), as well as on the mounting plate in the engine compartment.

1 - Vacant

2 - Relay for heated windshield

3 - Relay for emergency flasher

4 - Logic-relay for safety belt warning system



1 - Relay for single stage heated rear window (not installed with two-stage version)

2 - Cold start relay

3 - Control relay for two-stage heated rear window (not installed with single stage version)

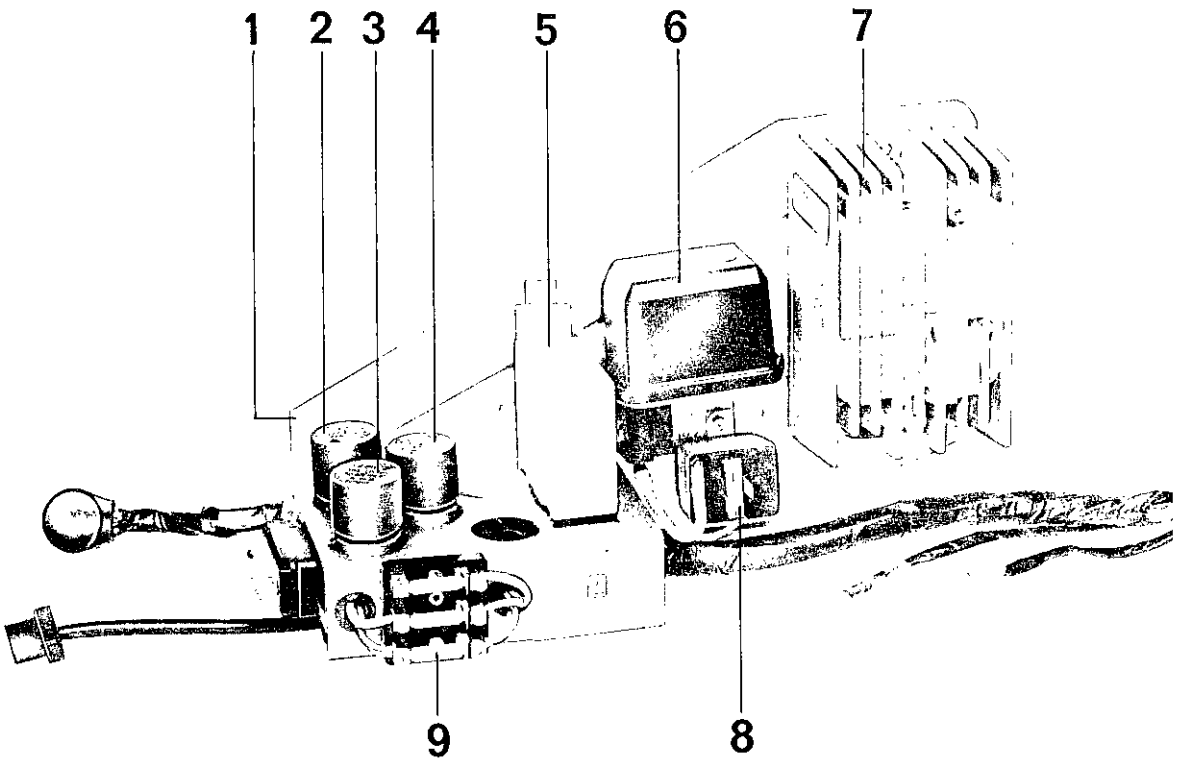
4 - Voltage regulator

5 - CDS trigger unit

6 - Rear fuse box

Vehicles not equipped with CIS (fuel injection) have the RPM-transducer installed adjacent to the two-stage heated rear window relay.

The 1975 911 S and Carrera models have a modified relay plate.



1 - Relay plate

2 - Standard relay for 1-stage rear window defogger (deleted for 2-stage heater)

3 - Standard relay for heater blower

4 - Standard relay for warm-up regulator

5 - Control relay for 2-stage rear window defogger (deleted for 1-stage heater)

6 - Voltage regulator

7 - Capacitor discharge ignition control unit

8 - Radio (interference) suppressor

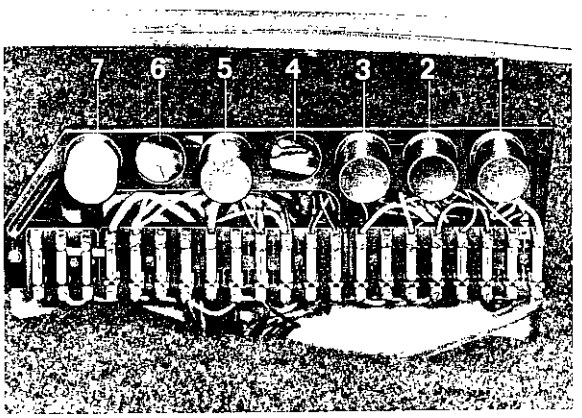
9 - Rear fuse box (fuses S 22 thru S 24 of wiring diagram)

Note

The relay positions for the heater blower and warm-up regulator were interchanged in some vehicles.

LOCATION OF RELAYS AND FUSES - 1976 MODEL

Depending on the car's equipment, the relay carrier in the fuse box is fitted with up to 5 relays.



1 - Air conditioner relay

2 - Foglight relay

3 - Horn relay

4 - Vacant

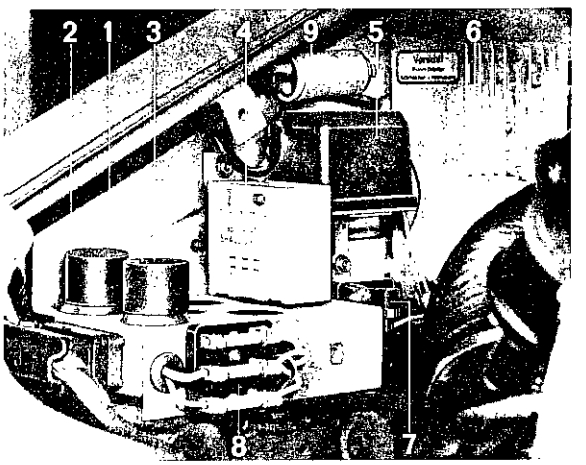
5 - Electric window winder relay

6 - Vacant

7 - Fuel pump relay

The fuel pump relay also controls the warm-up regulator and auxiliary air regulator. It has a red cover to distinguish it from the standard relays.

The fuse box has 21 fuses. The last fuse (S 21) as seen in the driving direction is for the fuel pump for 1976 models.



The warm-up regulator relay is omitted.

1 - Relay plate

2 - Relay for single stage rear window defogger (omitted for 2-stage defogger)

3 - Relay for heater blower

4 - Relay for 2-stage rear window defogger (omitted for single stage defogger).

5 - Voltage regulator

6 - CDI control unit

7 - Radio (interference) suppressor

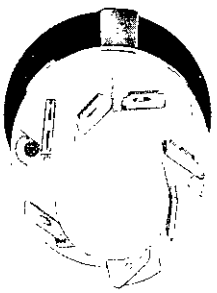
8 - Rear fuse box (fuses S 22 thru S 24 of current flow diagram)

9 - Capacitor (only for Bosch CDI control unit) - omitted as from 1978 models -

HAZARD WARNING FLASHER

Beginning with 1973 models, all Type 911 vehicles are equipped with a new hazard warning flasher.

The new flasher can be identified by its white plastic base; the old flasher was all black. The new flasher is additionally equipped with Terminal 58 which is needed.

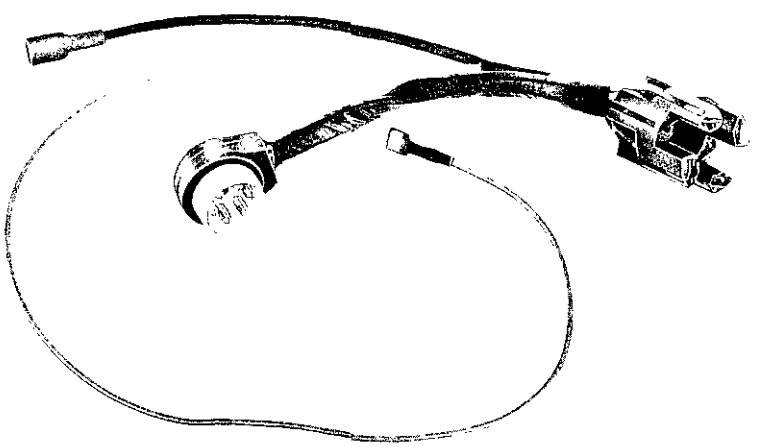


NEW



OLD

Since this modification required repositioning of the terminal tabs, it is not possible to install the new hazard warning flasher into vehicles of pre-1973 vintage unless the new wire loom (with white coupling) is used or the terminals are changed in the coupling of the old loom to match those in the new flasher. This would require removal of the brown wire, together with the flat terminal socket, from the plug-in connector (watch retention hook) and inserting it into the adjacent, formerly unused, receptacle.



ALTERNATOR - 1975 MODELS

An 840 W alternator (same size as the 770 W alternator used previously) is installed as of the 1975 model year. The 840 W alternator will be replaced by one of 980 W later in the 1975 model year. This alternator will be 9.3 mm longer. The blower housing, already designed for this size, has a ring installed with the 840 W alternator to compensate for the 9.3 mm deeper hole in the blower housing. This ring is to be omitted when a 980 W alternator is service installed in such a vehicle.

A new voltage regulator is also introduced for the 1975 models. It is applicable to both new alternators (840 and 980 watts).

A modified hub extension is installed with the introduction of the 980 W Alternator. This part must also be installed if a 980 W alternator is service installed in a vehicle. If the former hub extension is left in the vehicle, there will be a large gap between it and the blower housing.

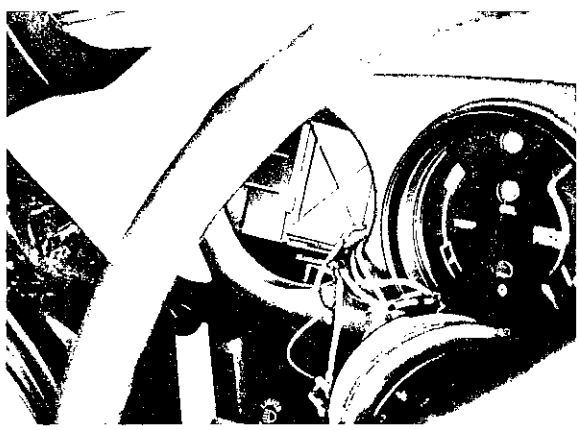
IGNITION SYSTEM MODIFICATIONS - 1978 MODELS

1. All 911 models are equipped with a breakerless capacitor discharge ignition system (similar to that of 930 Turbo).

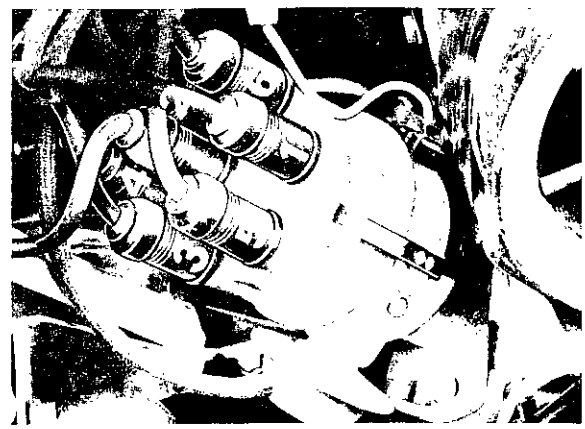
2. CDI unit and distributor have been changed.

3. Ignition control: centrifugal advance and vacuum retard.

4. Speed control:
   Electronic speed relay, cut-out of fuel pump at 6850 ± 150 1/min.

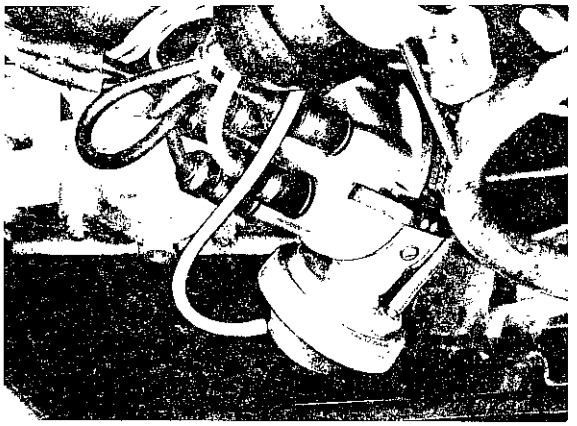


5. Distributor turns counterclockwise. Consequently the breakerless CDI system cannot be serviced installed in earlier vehicles.



Changes to Ignition System - 1980 Model

The 911 SC is equipped with a distributor having a double vacuum unit for retard and advance ignition control.



STARTER

General Information

Beginning with 1972 models, starter power output is increased from 0.8 HP to 1.5 HP. Both starter types are basically of the same design.

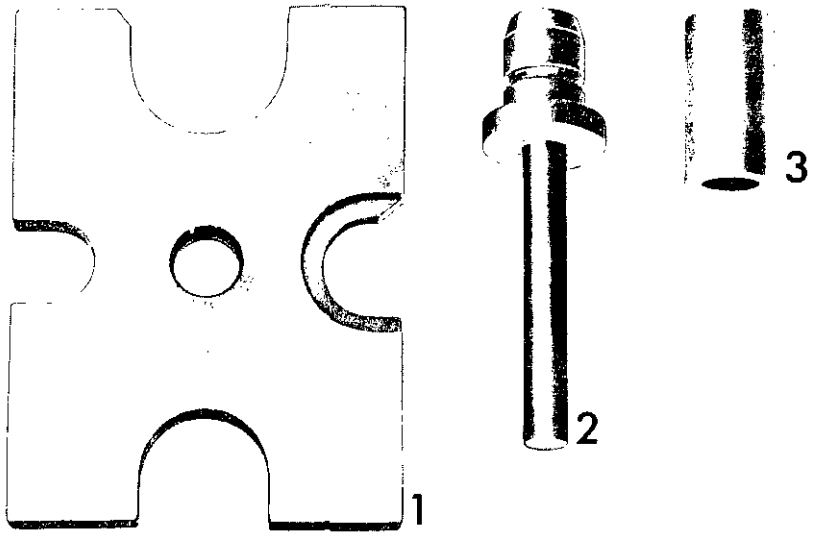
Specifications for GB 12 V 1.5 HP (BOSCH #: 0 001 312 100)

Voltage	12 V
Power rating	1.5 HP
No-load current draw @ 11.5 volts	50 - 80 amps
No-load speed	7300 - 9300 rpm
Stall torque current draw @ 6 volts	690 - 780 amps
Minimum voltage for solenoid draw-in	7.5 volts
Brush pressure	800 - 900 grams
Armature end-play	0.1 - 0.3 mm

Beginning with the end of April 1972, only vehicles equipped for countries in the northern hemisphere and Canada continue to be equipped with the 1,5 HP starter. All other Type 911 T, E and S vehicles will again be equipped with the 0.8 HP starter.

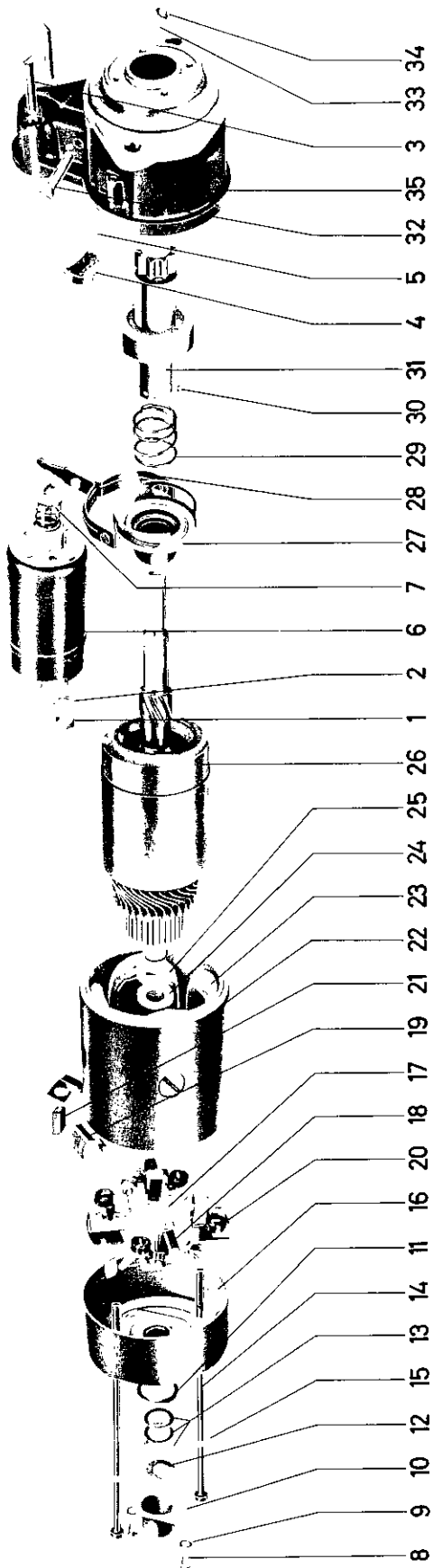
DISASSEMBLING AND ASSEMBLING STARTER

TOOLS



Nr.	Description	Special Tool	Remarks
1	Press plate	VW 401	
2	Press block	VW 411	
3	Press pipe	VW 418a	31.5 mm dia.

Disassembling and Assembling
Starter



Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
1	Nut	1			
2	Lock washer	1			
3	Retaining screw	2			
4	Rubber block	1		Position rubber block tip in field frame recess.	
5	Disc	1			
6	Solenoid	1	Pull pinion engagement assembly forward.	Check solenoid current draw and free movement of core. Seal, lubricate lightly.	
7	Disengagement spring	1			
8	Fillister screw	2			
9	Washer	2			
10	Dust cap	1		Seal.	
11	O-ring	1	Replace if damaged.		
12	Retainer	1			
13	Shim		Note number of shims.	Adjust armature endplay to 0.1 - 0.3 mm (0.004 - 0.012 in.)	
14	Bolt	2		Seal with paste.	
15	Washer	2			
16	Brush-end cover	1	Check bearing bushing, replace if necessary (remove with VW 401, VW 411, and VW 418a).	Ground-connecting surface to field frame must be free of paint or grease. Upon assembling, seal and lubricate lightly.	
17	Brush carrier plate	1		Check position of rotation detent for proper ground to field frame.	

Nr.	Description	Qty	Note when removing	Note when installing	Special instructions see
18	Negative brush	2	Check for cracks, dirt, and tight connection.	Brushes must move freely in holder. Replace in sets only.	
19	Positive brush				
20	Brush spring	4	Lift with wire hook.	Brush pressure ca. 800 - 900 grams (28-32 oz.).	
21	Rubber grommet	1		Check for proper sealing.	
22	Field frame	1		Check for proper ground between brush end cover and drive housing.	
23	Field coil			Check continuity. Replace coil if burned.	
24	Insulating washer	1		Locate against brush carrier plate.	
25	Thrust washer	1		Locate against commutator.	
26	Armature	1	Vertical runout 0.03 mm; minimum diameter 33.3 mm; if necessary, undercut segment insulation 0.8 mm deep.	Check for grounding. Check soldered points between segments and soldered tabs. Install armature together with actuating lever.	
27	Actuating sleeve	1			
28	Actuating lever	1		Replace if bent.	
29	Engagement spring	1		Coat heavily with Ft 2-v-3 grease or similar.	
30	Detent balls	10		Install packed in lithium grease.	
31	Overrun clutch	1			
32	Pivot bolt	1		Grease lightly.	
33	Lock washer	1			
34	Nut	1			
35	Drive housing	1		Seal joining surfaces between solenoid and drive housing, and field frame and drive housing. Coat lightly with oil.	

Instructions for Removal and Installation

Beginning with 1974 models, Type 911 and 911 S vehicles are equipped with the 0.8 HP starter motor. The 1.5 HP starter, standard in the 2.7 liter Carrera vehicles, can be installed on special order.

A battery-starter lead with a cross-section of 25 mm^2 is used in conjunction with the 0.8 HP starter motor; this lead has a cross-section of 35 mm^2 in vehicles equipped with the 1.5 HP starter motor. For easier identification, both battery leads are color-coded about 800 mm from the starter connector:

white band - 25 mm^2

yellow band - 35 mm^2

It is necessary to replace the battery-starter cable when replacing the 0.8 HP starter motor with the 1.5 HP unit in 1974 model and later vehicles.

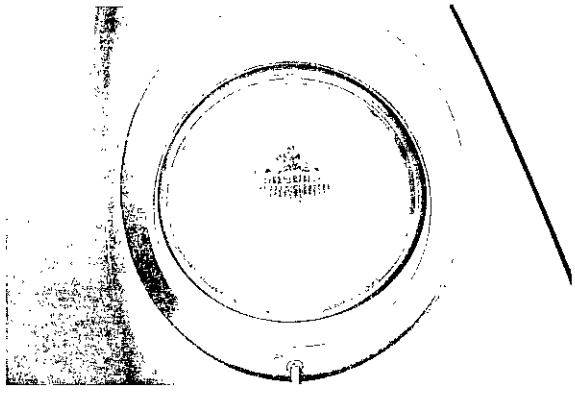
The type of cable installed in pre-1974 vehicles must be determined in such cases, although no color coding will be found.

Standard Equipment	To end of 1971 models	From 1972 model to May 1972	From May 1972
Starter Power Rating	0.8 HP	1.5 HP	0.8 HP
Cross-Section of Battery-Starter Cable	25 mm^2	35 mm^2	35 mm^2

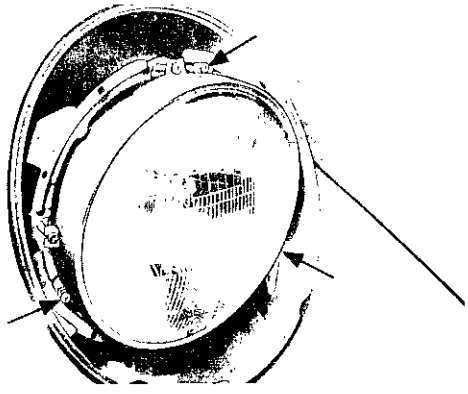
Excepted from the above are all vehicles equipped with the Sportomatic transmission, which were equipped exclusively with the 0.8 HP starters and 25 mm^2 cables; and Carrera 2.7 vehicles which were furnished only with the 1.5 HP starter and 35 mm^2 cable.

SEALED BEAM HEADLIGHTS

Replacing Sealed Beam



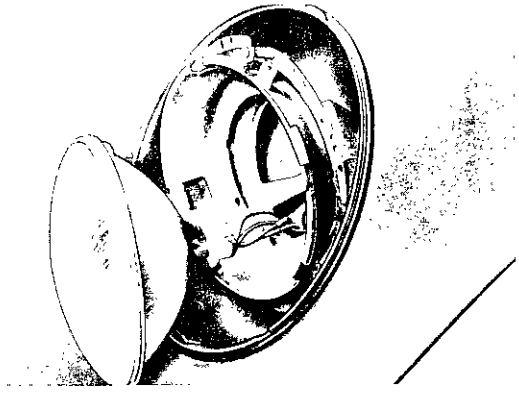
1. Unscrew retaining screw and remove lamp rim.



2. Remove only the 3 screws (arrows) which secure the lamp unit retaining ring, remove retaining ring and withdraw sealed beam unit.

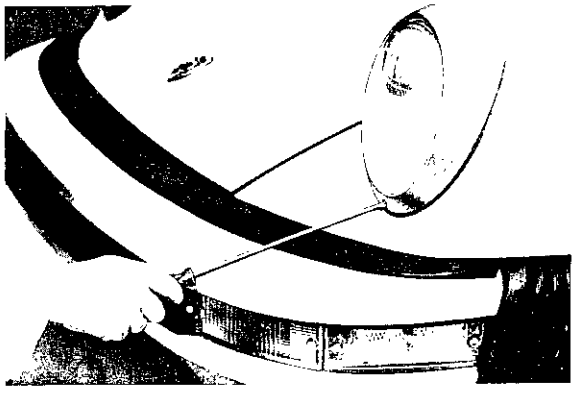
3. Disconnent plug from rear of unit.

4. Attach plug to rear of new unit.



5. Insert sealed beam unit and reatining ring tighten hold-down-screws.

6. Install lamp rim and tighten retaining screw. It is best to first screw the Philips-headscrew in by a few turns and then to seat the lamp unit in its upper retainer. Afterwards tighten the Philips-headscrew.



Beginning with the 1974 models, it is necessary to use the extra-long Philips screwdriver when loosening or tightening the headlamp retaining screw (Special Tool P 388).

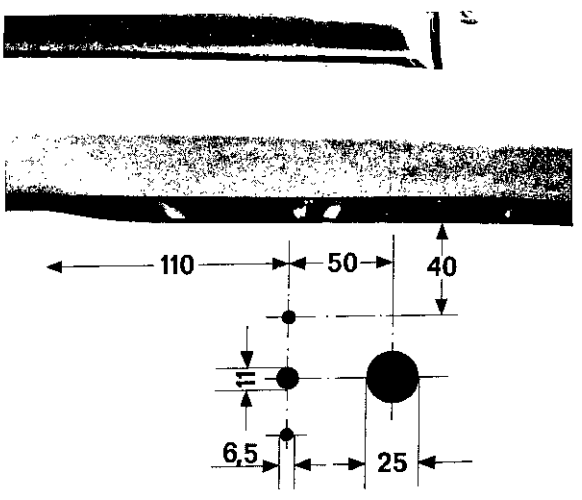
FOG LAMPS AND FOG TAIL LAMP

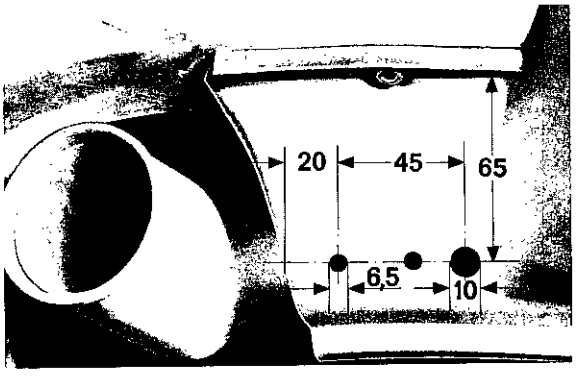
Subsequent Installation

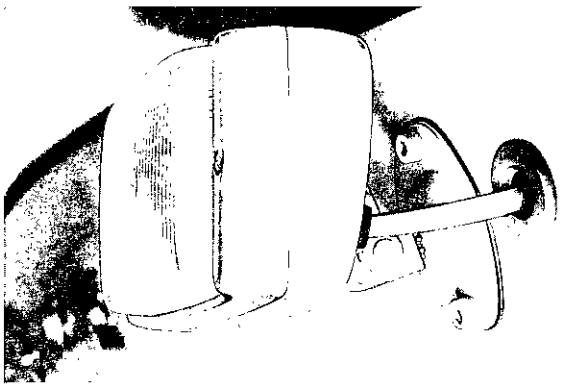
1. Disconnect battery ground strap.

2. Drill holes for lamp mounting and rubber grommets in front and rear bumper skirts. Make sure that the hole arrangement is made exactly as in the illustration for each of the two fog lamps.

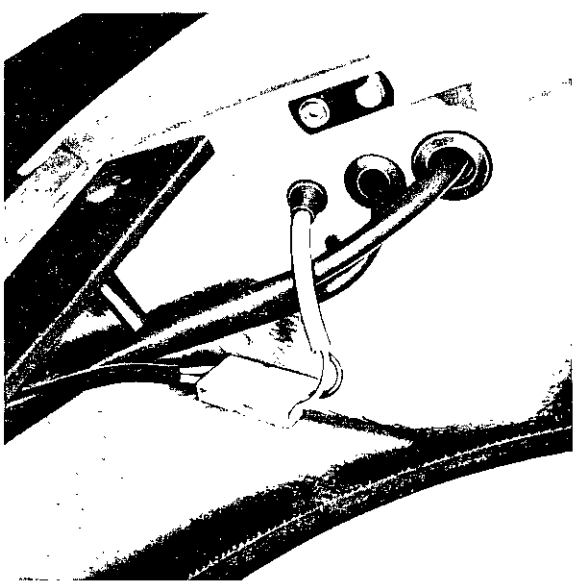
   (Dimensions are in mm)







3. Install the outer and inner fog lamp mounting plates. The plate with the larger bulge is mounted outside, together with the rubber gasket. Use two Allen-head, M 6 x 15 bolts with washers and lock washers on each lamp unit. Place a toothed washer between the lamp bracket and lamp mounting plate. Fasten the lamp to the mounting plates with a lock ring and M 10 nut.

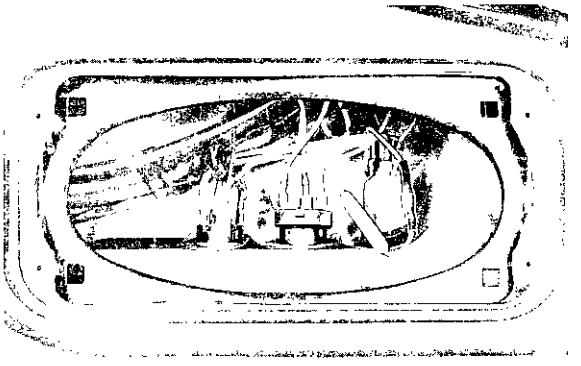


4. Thread the electrical wire through the bumper skirt and the already present holes in the wheelhouse into the luggage compartment, then press the grommets into place. The windshield washer reservoir must be removed for this operation (see 4.4-1/1).

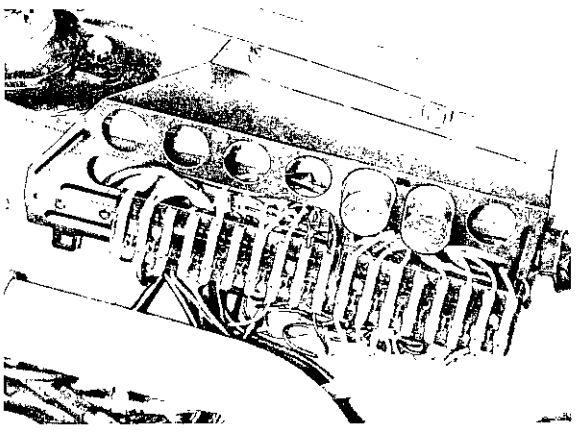
5. Remove loudspeaker cover and loudspeaker. This fog lamp switch should be installed between the rear window defroster switch and the cigarette lighter. A hole of 20 mm dia. has to be cut in the instrument panel cover; the holes are already made in the instrument panel and luggage compartment pan. Mark center of the hole by pushing a pin through the back of the instrument panel cover. Cut the hole by using a compass for marking and then carefully cutting the cover with a knife, or by using an appropriate rotary cutter and cutting the cover to the sheetmetal base.

Vehicles manufactured to U.S. specifications are furnished with the hole already made; it is covered with a plug.

Remove plug from luggage compartment pan and install a grommet in its place, or else cut a hole in the plug. Insert switch assembly from the rear, fasten with ring nut, and screw the knob in.



6. Remove luggage compartment lining and detach fuse box. Install the wires in such way that the two two-pole connectors will be located adjacent to the fog lamp wires. Fasten the wires along the front cross panel with the metal tabs already there. The relay switch socket should be pushed in from the front and the relay switch then plugged into it. The wires are then pushed along the luggage compartment floor to the fog lamp switch. The speedometer should be removed during this installation. Make sure that the wire does not touch the windshield wiper drive components.



7. Wires leading from the fog lamps should connect brown with black, and white/yellow with blue. The brown ground wire should be connected to the ground bolt in the cross panel near the battery.

Connect wires to fuse box as follows:

red wire to	Fuse # 17 top
grey wire to	Fuse # 2 bottom
white wire to	Fuse # 8 top
white/green wire to	Fuse # 1 top
both white/yellow wires to	Fuse # 1 bottom

Refasten fuse box and replace luggage compartment lining.

NOTE:

In vehicles manufactured to U.S. specifications, the connections differ as follows:

grey wire to	Fuse # 6 bottom
white wire to	Ground (lengthen the wire)

To preclude mistakes, note that the fuses are numbered 1 thru 18 (in vehicles equipped with air conditioning the numbers go thru 23), starting in front in the direction of travel. The fuse number code is also used in the wiring diagram.

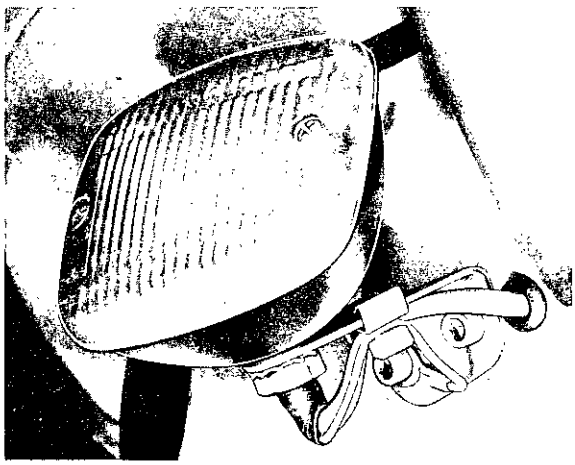
The wires are connected to the switch as follows:

blue/white wire to Terminal N
grey wire to Terminal 58

A white/green wire is already installed in the vehicle; it is accessible through the loudspeaker cutout and can be found taped to the wire loom located there. Remove the tape and connect the wire to Terminal NR. The negative (-) terminal at the switch should be connected to the ground at the cigarette lighter through a resistor of 100 ohms.

NOTE:

If only the fog lamps, or one fog tail lamp is installed, a simple push-pull switch is used instead of the pull-turn switch. In addition, the resistor in the ground wire connecting the switch and the cigarette lighter is not used.



8. Unfasten wire attached to the rear part of the left tail lamp assembly. Push rubber grommet into the 10 mm hole in the bumper skirt and lead the wire from inside out. Attach fog tail lamp bracket to the bumper skirt with 2 Allen-head bolts M 6 x 15, lock washers and washers.

   Attach a connector to the white cable and fasten it to the skirt with one of the two bolts. Lead the white/green wire through the grommet into the lamp unit and connect. Install wedge-base bulb (18 watts) and close lamp unit. The lamp retaining nut should be tightened firmly for proper ground connection.

   Attach wire to lamp bracket with a wire clip.

9. Reconnect battery and check lamp operation. When the switch knob is pulled out, the fog lamps are switched on and the yellow control light glows with reduced brightness. When the knob is turned, the fog tail lamp is switched on and the yellow control light glows with full intensity.

10. Adjusting Lamps

An optical lamp adjuster should be used for adjusting the fog lamps. When the driver's seat is occupied, the upper bright/dark intensity line must be on the marker line, extending horizontally over the entire screen.

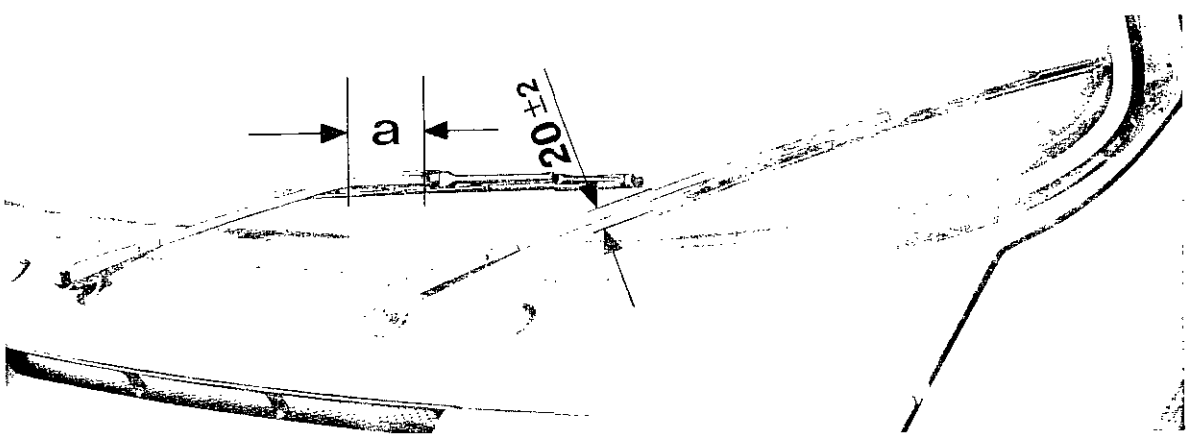
The lens of the fog tail lamp must be positioned vertically to the road and at a right angle to the longitudinal vehicle axis.

ADJUSTMENT INSTRUCTIONS

Beginning with February 1972 and the below given chassis serial numbers, all type 911 vehicles are equipped with modified windshield wiper arms:

Type	VIN
911 T Coupe	911 250 1075
911 T Targa	911 251 0905
911 E Coupe	911 220 0529
911 E Targa	911 221 0419
911 S Coupe	911 230 0818
911 S Targa	911 231 0482

When adjusting the new windshield wiper arms make sure that the outer (left) arm does not rest against the decorative strip, and the distance of 20 mm (25/32 in) is maintained between both arms.
Check that blades are positioned properly by operating the wipers for a few strokes.
NOTE: When operating the windshield wipers, make sure the windshield is wet.

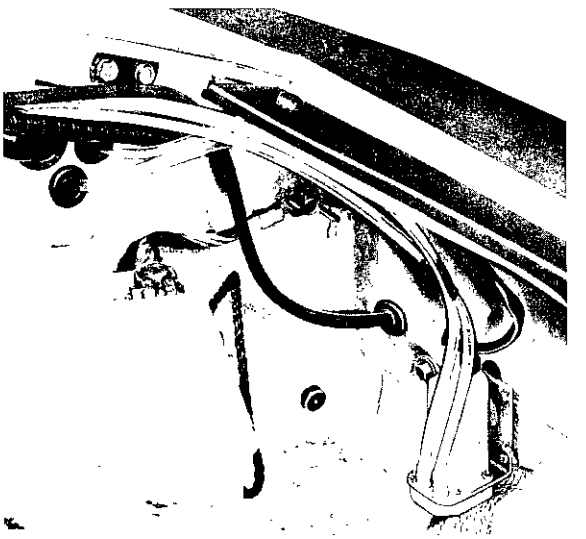


The difference for dimension a between the old and new wiper arms is:

a - approx. 35 mm (1 3/8 in) (old)
a - approx. 60 mm (2 3/8 in) (new)

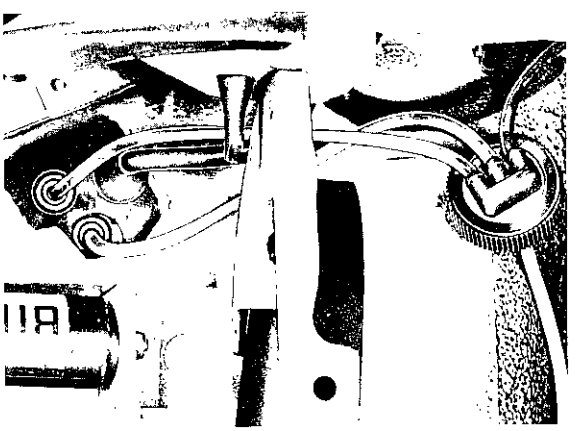
WINDSHIELD WASHER PUMP

Removal and Installation



The windshield washer pump in 1974 model vehicles is located at the lock transverse panel near the battery.

Both electrical wires and water hoses must be detached prior to removal of the pump.



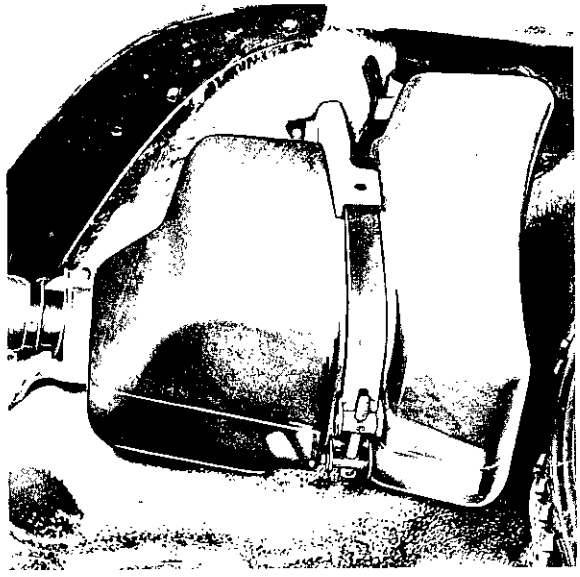
When connecting the wires, it is necessary to note the proper polarity, that is, the brown wire must be connected to the terminal marked (-). The nipple marked D is connected to the hose leading to the spray nozzles through the T-joint. A hose leads from each (the connection B and a connection in the T-joint) to the threaded cap in the windshield washer reservoir which, effective with 1974 models, is located under the left front fender. An additional connection in the reservoir cap is a vent hose which leads to the water filler neck within the tank filler compartment.

WATER RESERVOIR FOR WINDSHIELD WASHER SYSTEM

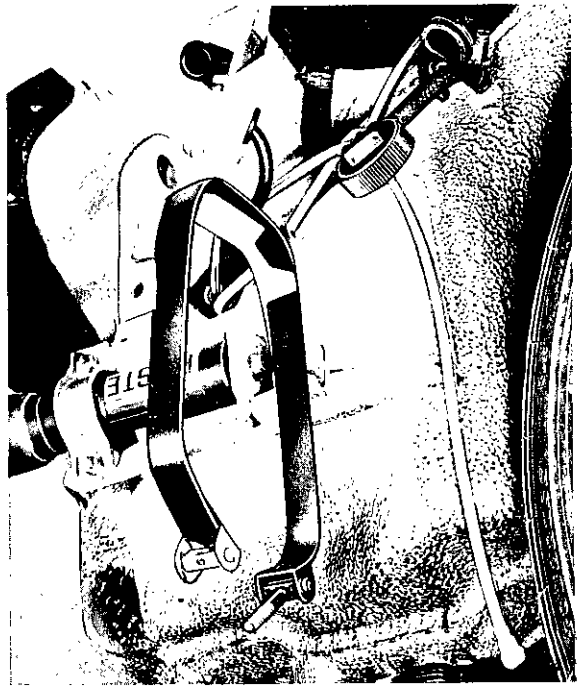
Removal and Installation

The left front wheel must be removed when removing the water reservoir. The bumper does not have to be removed.

The reservoir is attached to the vehicle by means of a strap which is bolted to the headlamp compartment. The reservoir can be taken out rearward after the attachments are unfastened, the filler hose detached, and the threaded cap removed.



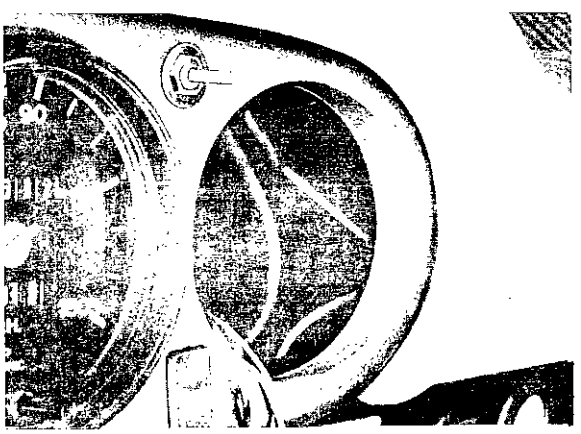
Make sure during installation that the mounting strap is seated properly in the support bracket.



INTERMITTENT WINDSHIELD WIPER SWITCH

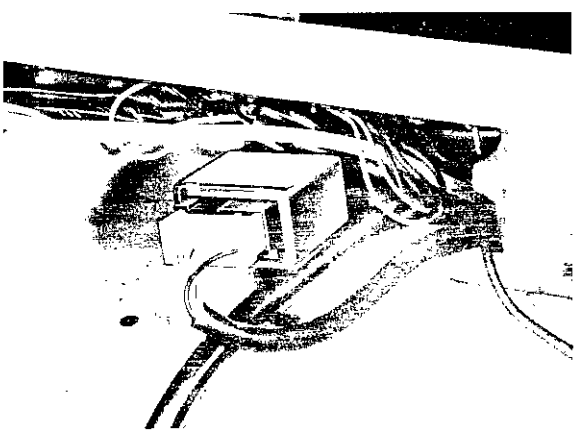
Removing and Installing Potentiometer

1. Disconnect battery ground strap.
2. Remove clock.
3. Pull off potentiometer knob, unscrew nut and take out potentiometer to front.



Removing and Installing Intermittent Relay

1. Remove blower housing.
2. Pull plug off of intermittent relay and unscrew mounting screws.



Note

The potentiometer on cars prior to 1976 model is located next to steering column on right side.

Exhaust gas recirculation control

All 1975 models with California equipment have exhaust gas recirculation (EGR) to reduce the pollution from exhaust gases.

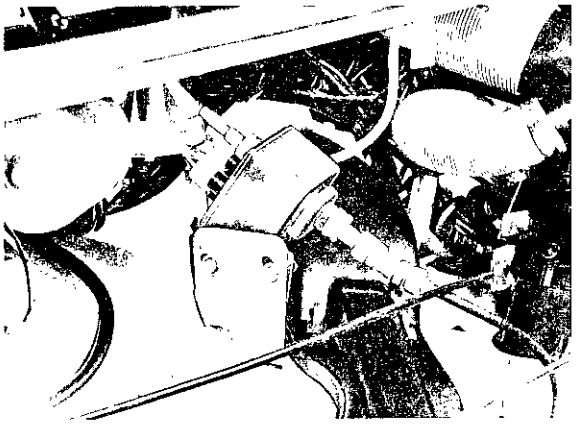
Parts of the EGR system are subject to a certain amount of wear and have to be inspected and/or replaced at certain intervals (see Group 1).

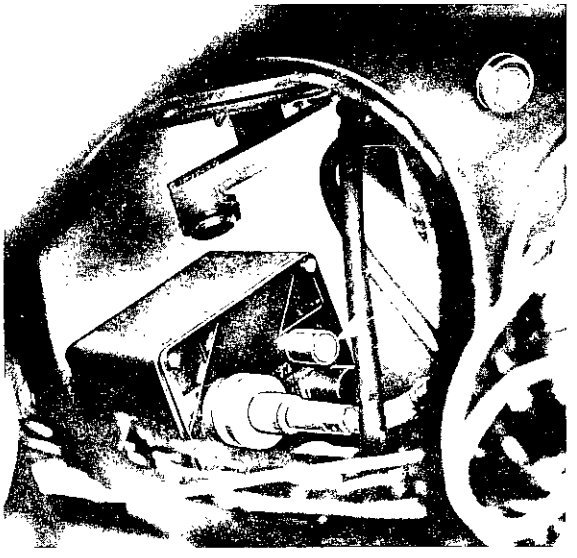
An elapsed mileage odometer is installed beneath the blower housing to control the inspection intervals. The EGR indicator lamp will light up after 30, 000 miles have been driven. After inspection of the EGR system, the elapsed mileage odometer must be reset to zero als follows:

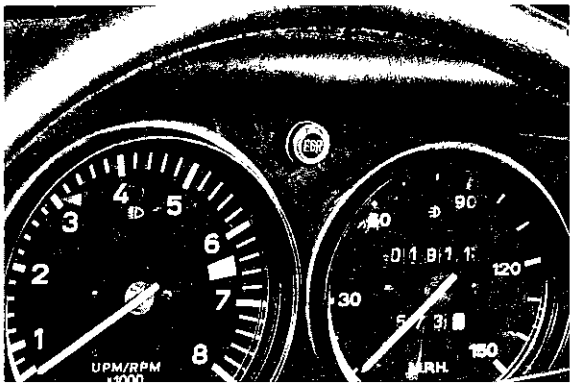
1. Disconnect battery ground strap.

2. Remove tachometer.

3. Using an appropriate tool (small screwdriver, punch or something similar) press the pin on the elapsed mileage odometer housing in to the stop.



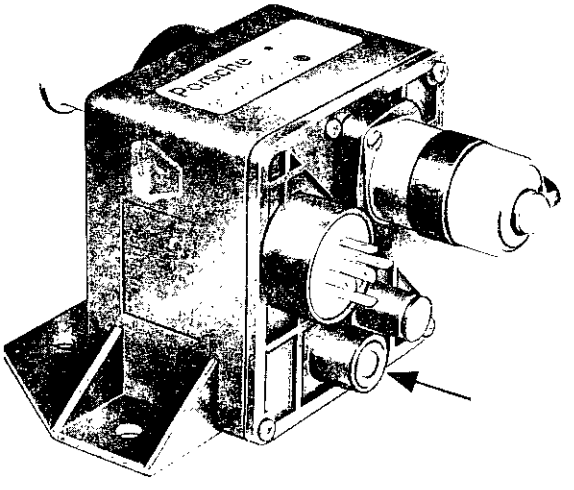


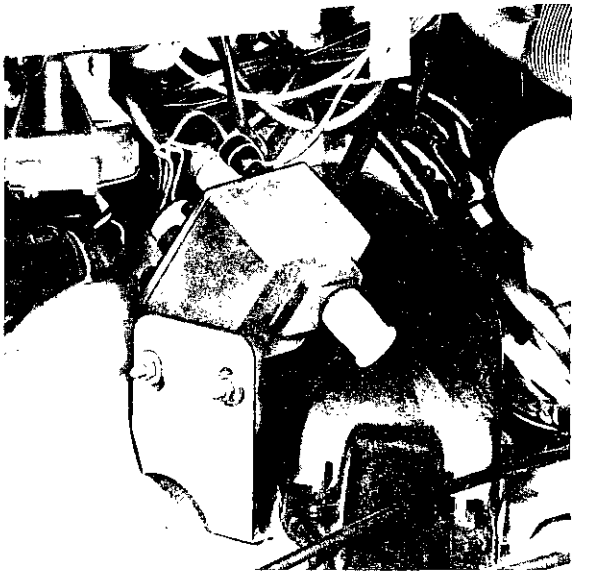


The EGR indicator lamp comes on when the ignition is turned on and goes out when the engine starts. This wiring hookup provides a method of checking the indicator lamp before each start.

An altered elapsed mileage odometer is installed in all models in conjunction with the electronic speedometer, effective with the 1976 model.

Mounting, removal and installation of this switch is identical to that of the former elapsed mileage odometer. This also applies when resetting to zero.





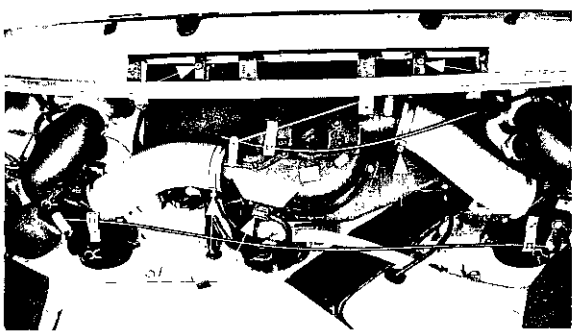
REMOVING AND INSTALLING SPEEDOMETER CABLE

Note

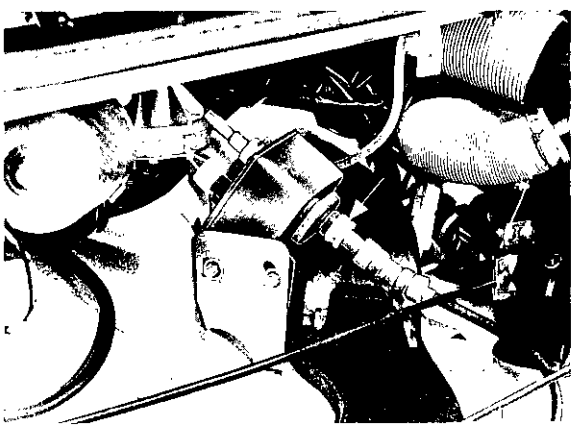
The blower housing of California equipped cars has to be removed to be able to detach the speedometer cable at the EGR elapsed mileage odometer switch. Pull the speedometer out of the dashboard of all other models to detach the speedometer cable.

Removing

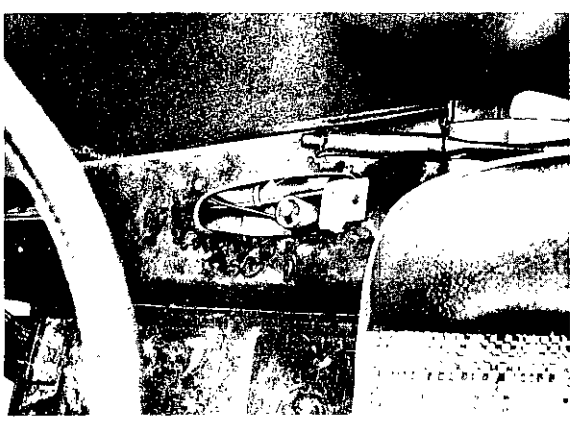
1. Remove blower housing. Do not lock operating cables.

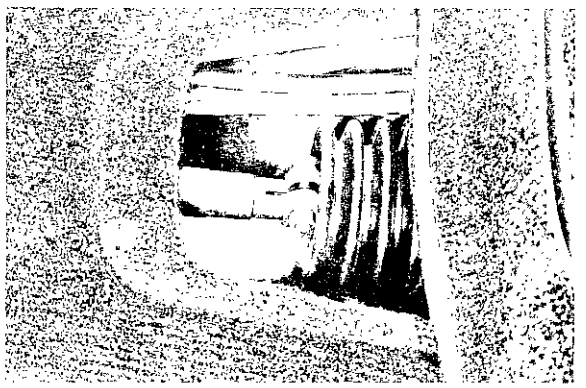


2. Detach speedometer cable atEGR elapsed mileage odometer switch. Tie a string to end of cable.



3. Remove tunnel cover in car.
   Remove gearshift lever housing.
   Take off plastic strap.





4. Remove cover at back of tunnel.
Take off plastic strap.



5. Disconnect speedometer cable beneath car at transmission.

6. Pull speedometer cable toward rear out of car.

Installing

1. Tie string to speedometer cable and pull in cable toward front.

2. Secure speedometer cable to car tunnel with 2 plastic straps.

Caution

Make sure that cable is installed without kinks or bends.
Install seal at transmission.

ELECTRONIC SPEEDOMETER

Checking Electronic Speedometer Sensor

Remove tunnel cover in front of emergency seats. Disconnect the flat male plugs at the connector in the tunnel and connect a test buzzer to the wires leading back. Lift car at rear axle and turn right rear wheel by hand. Lock left rear wheel. The buzzer must sound off 8 times for each two revolutions of the wheel. If not, replace the sensor.

The left rear wheel need not be locked, if a car is equipped with a limited slip differential. In this case the buzzer sounds off 8 times for each one revolution.

Checking Electronic Speedometer

1. Connect and disconnect very quickly the two wires in the tunnel that lead forward. A distributor can be applied to help, if both wires are connected to terminal 1 and the distributor housing, and the distributor shaft is turned by hand as quickly as possible. Remove the speedometer if there is no deflection of the needle. Check all wire connections to the speedometer and replace the speedometer if necessary.

   Turn on the ignition for this test.

2. The operation of the electronic speedometer of Type 911 and Turbo Carrera Models can also be checked as follows:

   Disconnect wire from terminal TD of tachometer and instead connect the wire from terminal 31 b on the speedometer.

   The speedometer must now show a reading according to the engine speed. If there is no needle deflection, the speedometer must be replaced.

   Relation between engine speed and speedometer reading:

$$\text{Speedometer reading (MPH)} = \frac{\text{engine speed (rpm)} \times 180}{\text{calibration number}}$$

   Example:

$$55 \text{ MPH} = \frac{2000 \text{ rpm} \times 180}{6524 \text{ pulses/mile}}$$

   The calibration number is embossed on speedometer housing.

CAUTION

The testing method at point 2 can no longer be used on speedometers after manufacturing date 1/77. There is danger of damaging an electronic component in the speedometer.

Removing and Installing Electronic Speedometer Sensor

1. Remove right rear wheel.



2. Remove hex head screw and take holder off of sensor.

3. Take sensor wires out of holders and pull sensor out of transmission case.

4. Separate connector in tunnel and pull out sensor wire toward rear.

Note

The polarity need not be observed when connecting the sensor wire.

SAFETY BELT WARNING SYSTEM

Beginning with January 1972, all USA export vehicles are equipped with the safety belt warning system required by law. This system consists of 2 inertia reel safety belts with automatic locking retractors, a control lamp with the inscription "Fasten Seat Belt", a seat contact switch built into the passenger seat, a new parking brake switch, and a modified buzzer.

The three-pole buzzer can still be used as replacement for the formerly used two-pole buzzer in vehicles not equipped with the safety belt warning system.

An electric switch is built into each safety belt buckle. The switch is closed when the belts are not worn, providing ground for Terminal G of the control lamp. If Terminal 50a does not have a ground connection through the handbrake switch at the same time, a transistor incorporated in the control lamp becomes conductive. Since the buzzer Terminal 86 is energized at all times, and Terminal 15 of the control lamp is energized when the ignition is on, the control lamp will light up and the buzzer sound off.

When the belt is put on, the contact in the belt buckle opens and Terminal G ceases to have a ground connection.

The passenger seat is equipped with a seat contact which breaks the ground connection from the belt buckle on passenger side to Terminal G in the control lamp when the seat is unoccupied.

The reminder to wear seat belts is given by the control lamp with the inscription "Fasten Seat Belt" and the simultaneously audible sound of the buzzer whenever

the ignition is switched on,
the driver (and passenger) have not put the seat belts on,
the parking brake is fully released.

The former function of the buzzer remains unchanged.

SEAT BELT WARNING SYSTEM 1974 MODELS

The seat belt warning system has been changed effective with the 1974 models.

The new system consists of 2 three-point seat belt assemblies with automatic locking retractors, a control lamp with the inscription FASTEN SEAT BELTS, a seat contact in each seat, and the so-called logic relay switch with an integrated buzzer. The formerly used separate buzzer is discontinued. Also, the control lamp circuit has been changed so that it cannot be used in cars of pre-1974 vintage.

The following steps must be performed to start the engine:

1. The engine can be started at any time when no load is placed on the seats (for instance, starting from the outside).

2. Whenever a load is placed on a seat, the seat belt must be buckled. This applies to both driver's and passenger's seats. It may become necessary to buckle the seat belt when a heavier piece of luggage is placed upon it. Since the action sequence of "Occupy Seat - Fasten Seat Belt" is monitored by the logic relay switch, the engine will not start if either the driver or passenger should fasten the seat belt prior to occupying the seat.
   When the proper action sequence is not followed, the buzzer and the control lamp with the inscription FASTEN SEAT BELT are activated as soon as the ignition switch is turned on.

3. It is possible to restart the engine without fastening the seat belt if the restarting occurs within 2 ± 1 minutes of shutdown.

The accoustic and optical warning system will be activated whenever any of the following conditions occur when the engine is running:

1. When a load is placed on a seat without buckling the seat belt.
2. If the action sequence of "Occupy Seat - Fasten Seat Belt" was not followed in that order.
3. When the load is removed from a seat. in which the belt is buckled for more than 10 seconds and is then placed back on it.

In all of the above cases the warning system can be activated only when the parking brake is in the off position. The warning condition can be cancelled by refastening the seat belts in proper sequence.

The buzzer integrated in the logic relay switch also is part of the ignition key warning system.

An improved interlock relay for the seat belt warning system was introduced around the middle of December 1973.

With the introduction of this relay, the warning system is only activated (engine running) if the seat belts are unfastened while the seats are occupied.

SEAT BELT WARNING SYSTEM FROM FEBRUARY 14, 1975

All models have a modified seat belt warning system as of February 24, 1975.

The belt contact switch on the passenger's side and both seat contact switches are omitted. A timer relay with a built-in buzzer replaces the interlock relay. The connection between the seat belt warning system and starter is omitted, i.e. the starter can be used any time.

"Fasten Seat Belt" warning light always lights up when the ignition is switched on and goes off in 4 to 8 seconds regardless if belts are worn or not. If the driver's belt is not worn a buzzer will also come on with the warning light. The passenger's belt has nothing to do with the warning system.

CONTROL ILLUMINATION

Beginning with the 1973 models the following controls are illuminated:

1. Heater control lever on the center tunnel.

2. Fan control switch on the instrument panel.

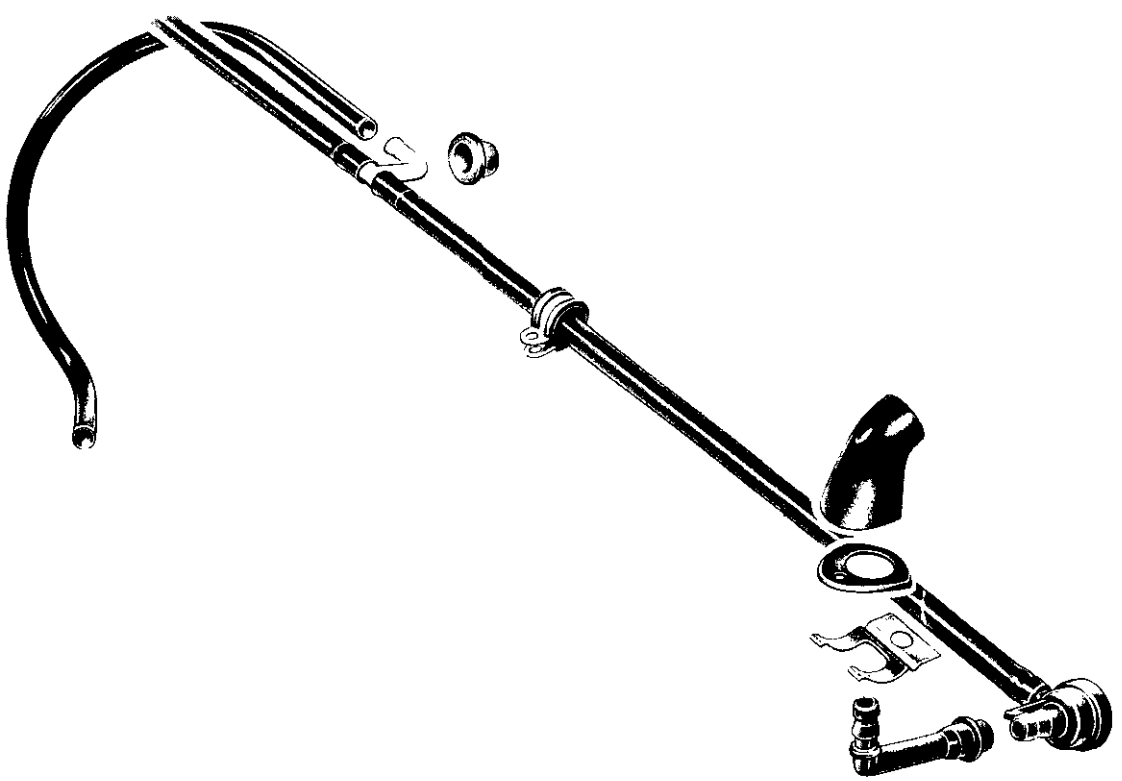
3. Hazard warning flasher control switch.

All lamps are connected to the instrument illumination circuit permitting dimming.

HEADLIGHT WASHERS

Depressing the switch in the instrument panel operates the water pump, which is bolted to the front hood lock panel. It is controlled by a relay located next to it. At a pressure of about 2.8 bar, a valve opens and a stream of high pressure water goes to the spray jets. The relay limits the washing phase to about 0.3 seconds. If this time is not sufficient to clean headlights, depress switch again.

The container (in front of the left front wheel) holds about 9 liters (2.2 US gal.) of fluid. It is also used to provide fluid for the windshield washer.

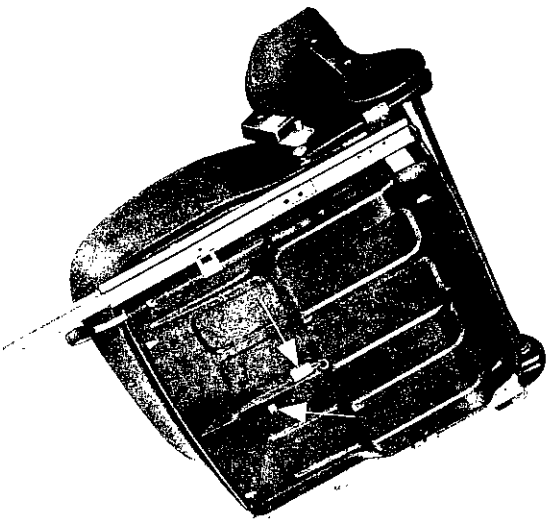


SAFETY BELT WARNING SYSTEM

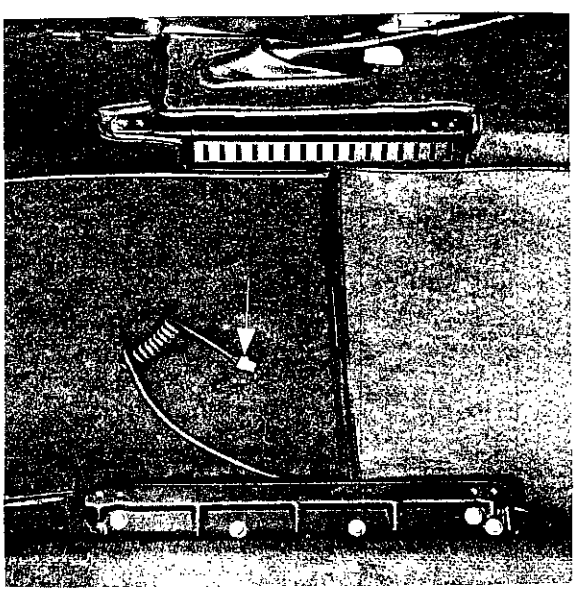
Removing and Installing Seat

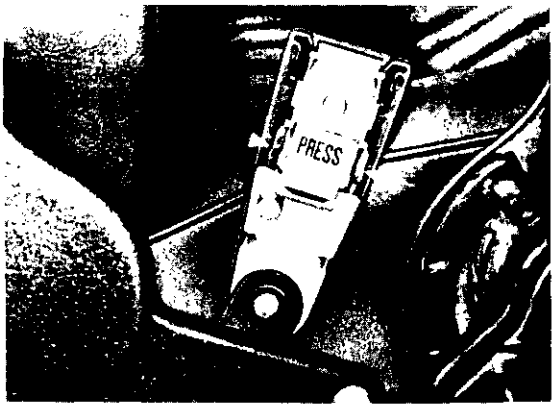
(Also see Group 8)

A two-pole connector is located under the seat. In the driver's seat the connector wire leads into the seat interior and is connected directly to the safety belt buckle. In the passenger's seat an additional seat contact is wired inbetween.



Prior to seat removal, the wire must be disconnected at the connector and also detached from its retainer on seat underside. The wire must be reconnected upon installation of the seat; the polarity makes no difference.





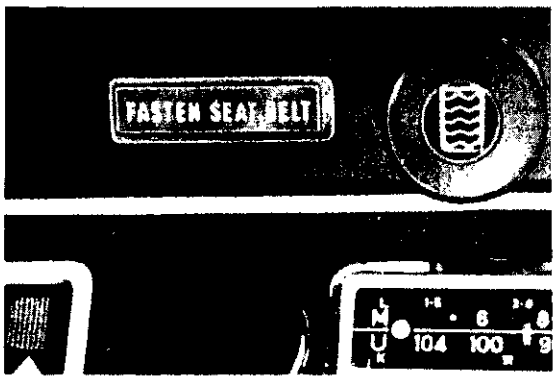
Removing and Installing Safety Belt Buckle

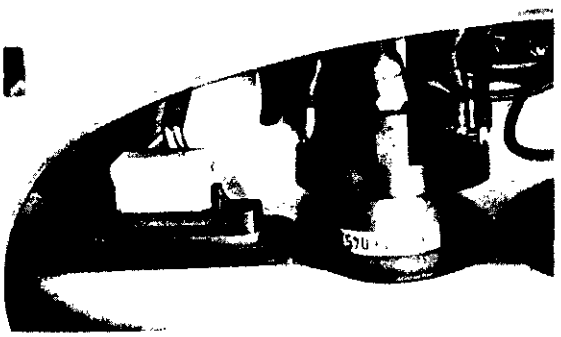
(Also see Group 8)

The front plastic cover of the buckle can be removed upon removal of both countersunk screws. Push rear cover to the side and remove buckle retaining screws.

When detaching both wires, hold terminal tabs with needle pliers since otherwise the tabs can break off when the wires are being pulled off.

The belt buckle should not be disassembled unless it does not function properly.

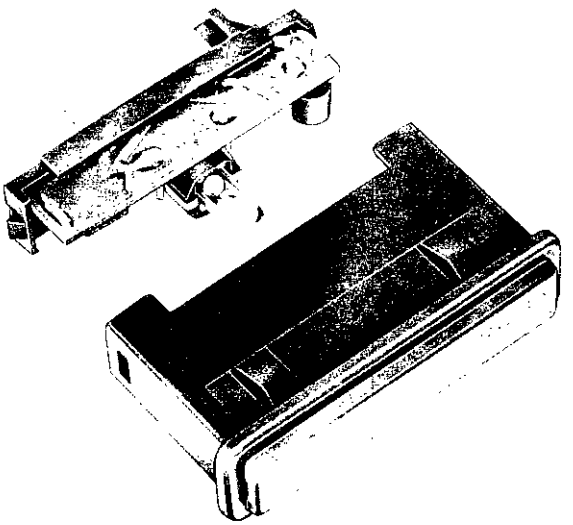




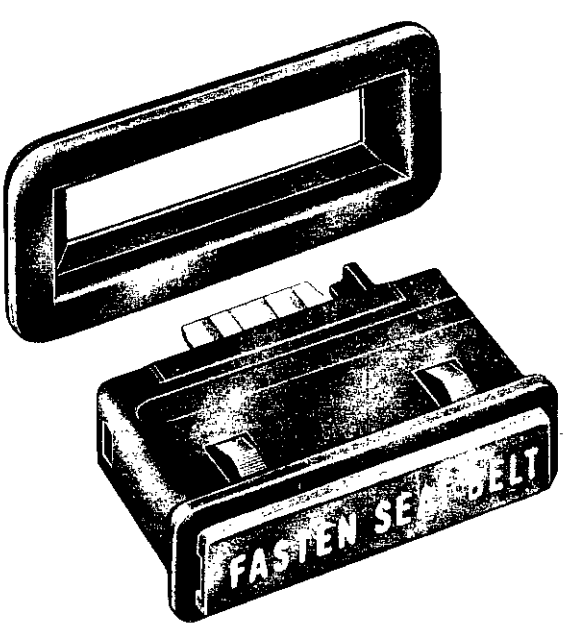
Removing and Installing "Fasten Seat Belt" Control Lamp

Pry loudspeaker cover off and pull off glued in plastic foil or remove loudspeaker, respectively. Detach connector from the back side of the control lamp and press the lamp forward out of the instrument panel.

When replacing the wedge-base bulb (12V, 1.2W), it is necessary to open the control lamp for access.



When installing the lamp, make sure that the rubber gasket is properly seated.



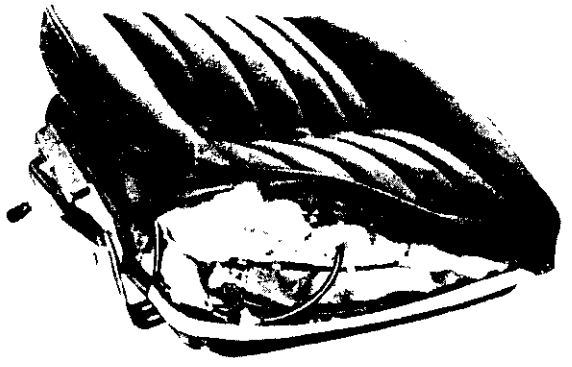


Removing and Installing Seat Contact in Passenger Seat

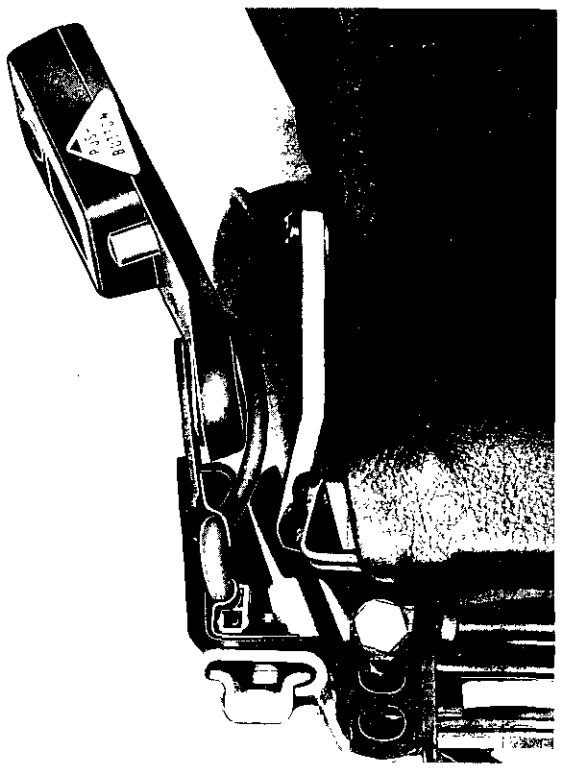
Remove seat (see Group 8, page SB 21 and 22).

Remove seat recliner retaining screws and remove back rest. Remove seat cover to gain access to the seat contact.

Make sure during installation that the seat contact is located in its original position in the seat. Reconnect both wires; polarity makes no difference.



Removing and Installing Safety Belt Lock in the Sport Seat

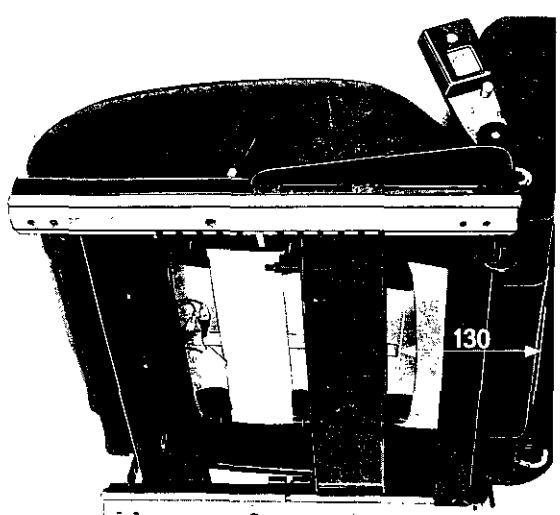


Remove both countersunk screws and take the plastic cover off. The rear cover should be pushed to the side to clear the lock assembly retaining bolt and permit its removal.

Pry both wire retaining clips open to free the wire and detach it at the plug connector.

Removing and Installing Seat Contact Switch in Passenger's Seat (Sport Seat)

Remove seat (see Group 8, page SB 21 and 22).



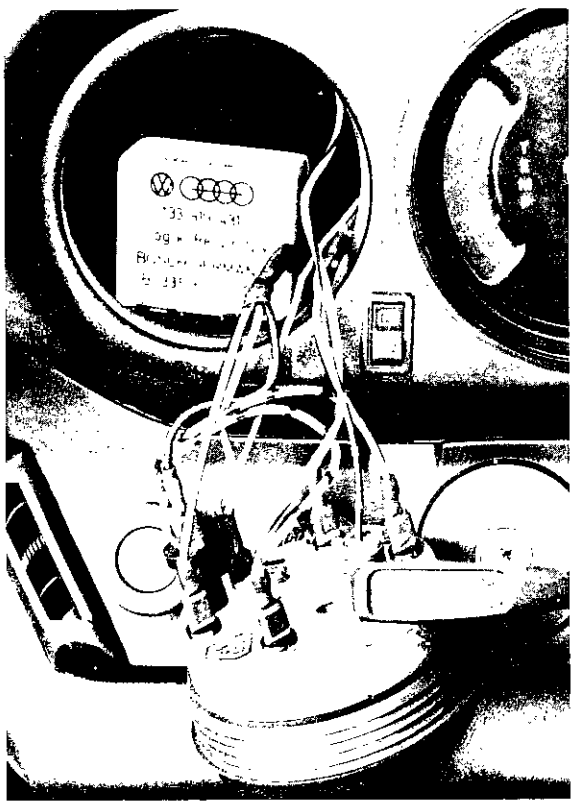
The seat contact switch is freely accessible on the seat underside and can be removed once the wires are disconnected.

Make sure during installation that the seat contact switch is reinstalled in its original position (note dimensions). To prevent the seat contact switch from relocating itself sideways, it should be glued to the seat underside with a commercial adhesive.

Polarity is of no consequence when the electrical connections are made.

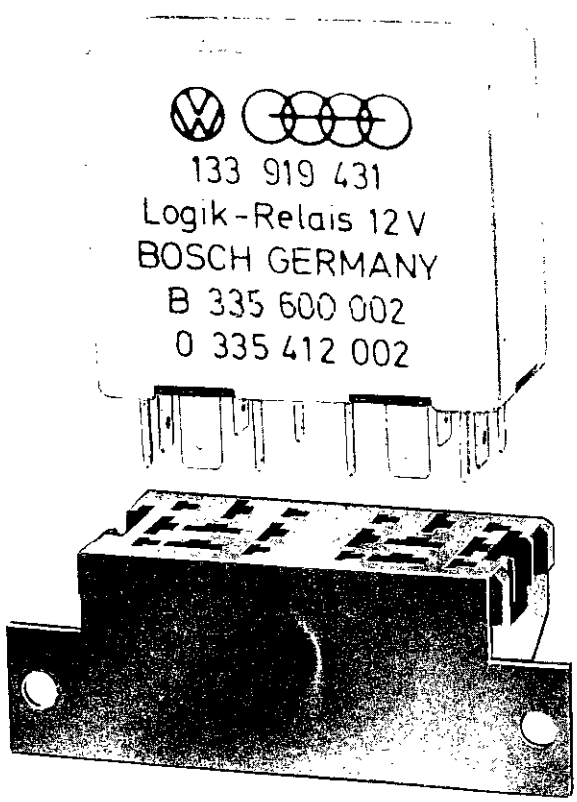
(Dimensions shown are in mm)

SAFETY BELT WARNING SYSTEM 1974 MODELS



Removing and Installing Logic Relay Switch

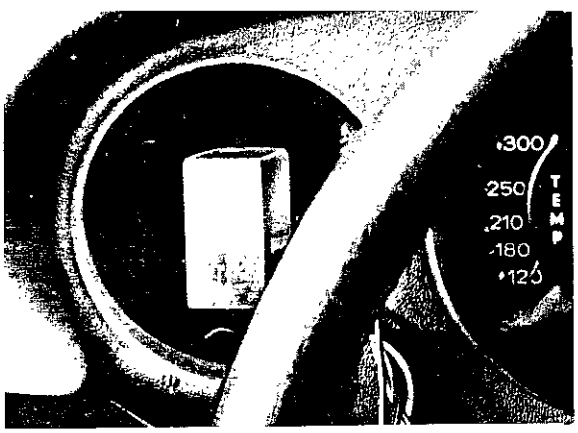
The logic relay switch rests in a socket which is attached to the luggage compartment floor and is accessible upon removal of the small combination instrument. The asymmetrically arranged contact prongs ensure proper installation of the relay, which is with the inscription facing rearward in relation to the direction of travel.

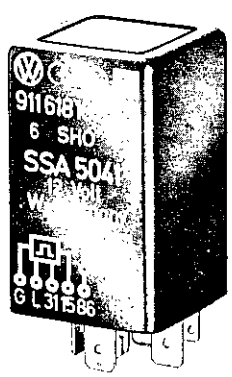


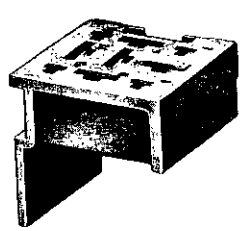
SEAT BELT INTERLOCK SYSTEM - 1976 MODEL

Removing and Installing Time Relay

The time relay, installed since February 1975 is just as accessible as the logic relay after removal of the small combination instrument.

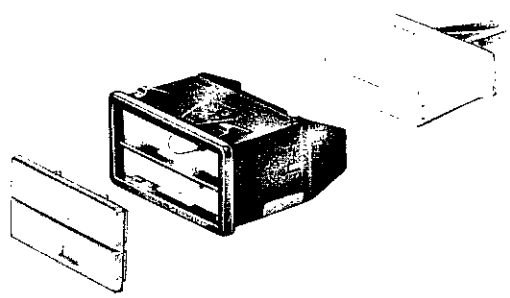






Removing and Installing Seat Belt/Brake Warning System Indicator Housing

A housing containing the indicator lights for both warning systems (seat belts and brakes including parking brakes) is installed in the 1976 model. It replaces the previous FASTEN SEAT BELT indicator light. Consequently, the brake warning light in the combination instrument is no longer installed.



Removal and installation is the same as previously for the single indicator housing.

SAFETY BELT WARNING SYSTEM 1974 MODELS

Troubleshooting Safety Belt Warning System

If the starter does not work despite properly attached safety belts, proceed as follows to eliminate the problem:

1 - Replace logic relay switch.
If this does not correct the problem the malfunction may be in the following component areas:

a - in the starter itself
b - in the ignition/starter switch
c - in the connecting wire between the two
d - in the wires between belt and seat contacts, and logic relay switch.

2 - Remove logic relay and connect jumper wire between terminal C and 50 in the logic relay socket. The jumper wire must be provided with flat contact tabs to ensure good connection.
If starting is now possible, the defect will be found in the wires which connect the belt or seat contacts with the logic relay switch.

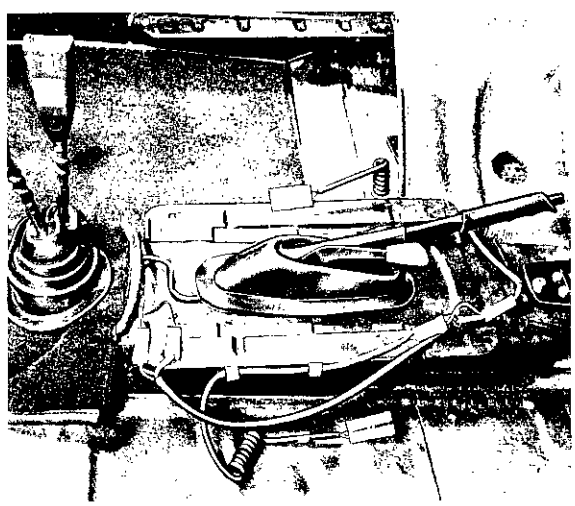
3 - Remove seats and check electrical connections according to the wiring diagram.
If the starter fails to work despite the jumper wire connection, check starter, starter/ignition switch, or wires connecting the two.

Other possible malfunction areas are:

a - Malfunction in the optical and accoustic warning devices when belts are not buckled.

b - Activation of the warning devices despite proper handling of the safety belts.

In either case, first replace the logic relay switch and then, if necessary, check the electrical connections and wires in the safety belt warning system by following the wiring diagram.



NOTE

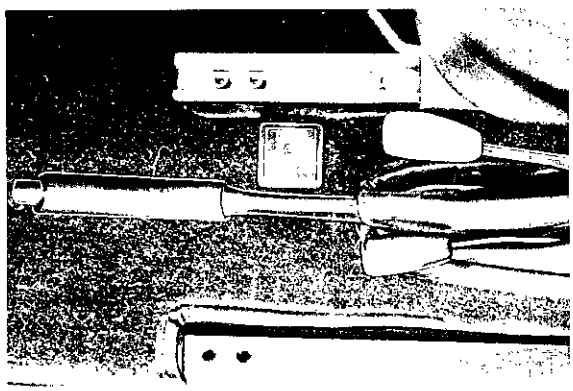
Upon rectification of the problem be sure to remove the jumper wire and replace the logic relay switch, otherwise the entire safety belt warning system will remain inoperative.

CONTROL ILLUMINATION

Illumination of the Heater Control Lever

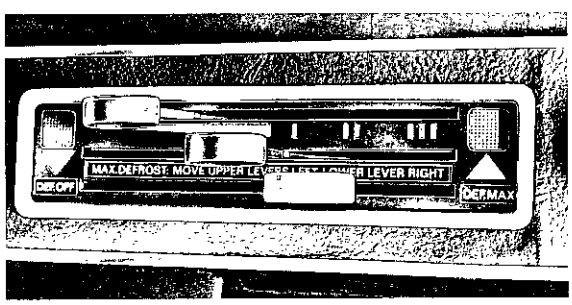
A square, illuminated plaque showing the function of the heater control lever is located on the center tunnel adjacent to the lever.

The plaque can be lifted off to gain access to the wedge-base bulb (12V, 1.2 W).

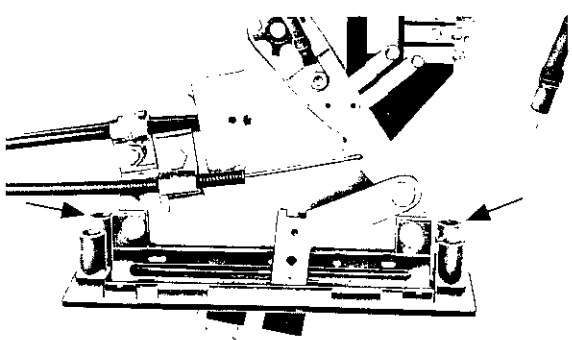


Illumination of the Fan Control Switch

Located behind the inscriptions "DEF. OFF" and "DEF. MAX." in the lower part of the fan control switch are wedge-base bulbs (12V, 1.2 W), one on each side.



The socket-mounted lamps are seated in their receptables on the rear side of the switch. The bulbs are easily accessible from beneath the instrument panel without removing the knee guard.



Beginning with 1974 models, a third bulb is installed. It is located above the DEF.OFF field.



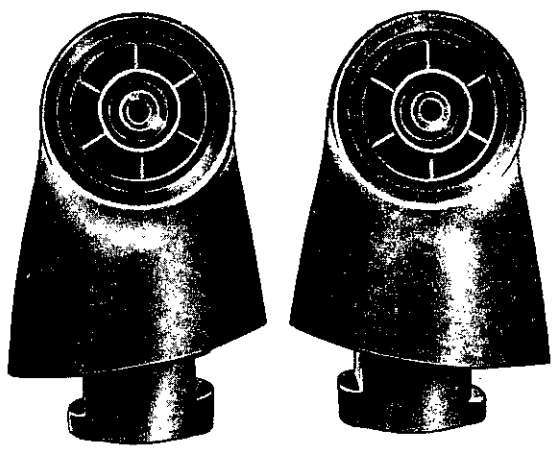
The control lamp located in the hazard warning switch is connected to the light switch through a 150 Ohm resistor. Thus the lamp fulfills the requirement of illuminating the hazard warning switch, although it burns with less intensity.

HEADLIGHT WASHERS

Removing and Installing Spray Jets

1 - Remove turn signal housing from bumper. Remove water container on left side of car (refer to page 4.4 - 1/1).

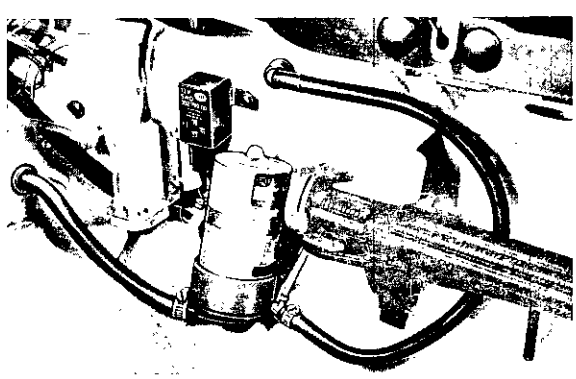
2 - Push spring out toward rear and lift out spray jet. When installing note that both jets are different for the left and right sides.

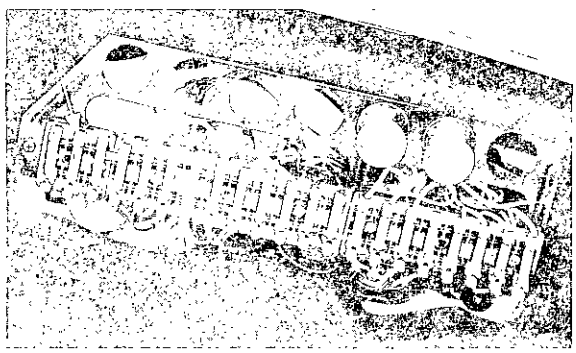


Removing and Installing Water Pump

1 - Disconnect hoses and electric wiring at pump.

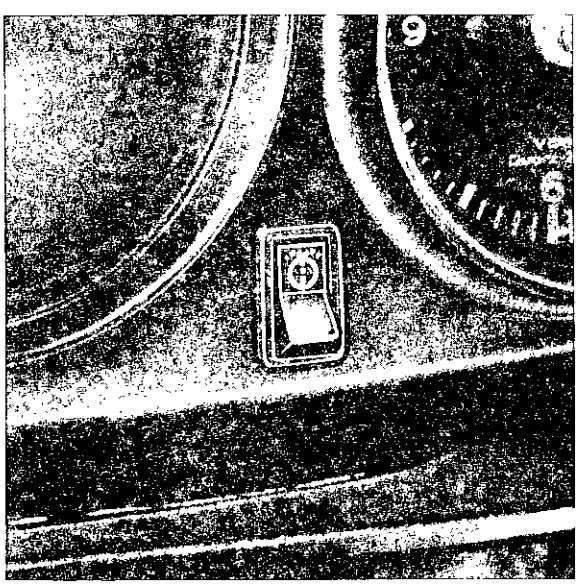
2 - Loosen strap and remove pump. When installing make sure that hoses and wiring are connected correctly.





Note

A 25 ampere fuse is used for the water pump.



Removing and Installing Switch

1 - Disconnect battery.

2 - Pull out switch and disconnect wires.

Adjusting spezifications

Use a locally manufactured tool to aim spray jets. This tool is inserted over the jet and extended by pulling out the mandrel. The jets are aimed correctly when the mandrel touches the center of the lens.



CAUTION

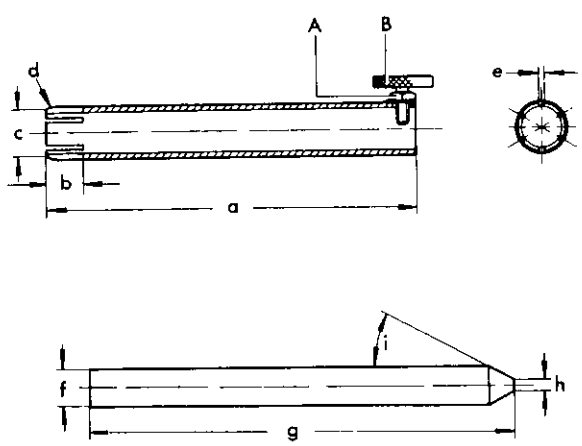
When adjusting the jet insert, hold the spray jet tightly to prevent damage to the jet.

Tool dimensions

a	=	100	mm
b	=	10	mm
c	=	12.5	mm
d	=	5	mm
e	=	1+0.2	mm
f	=	10.5	mm dia.
g	=	115	mm
h	=	3	mm dia.
i	=	30°	

A = M 4 nut, soldered
B = M 4 knurled head screw

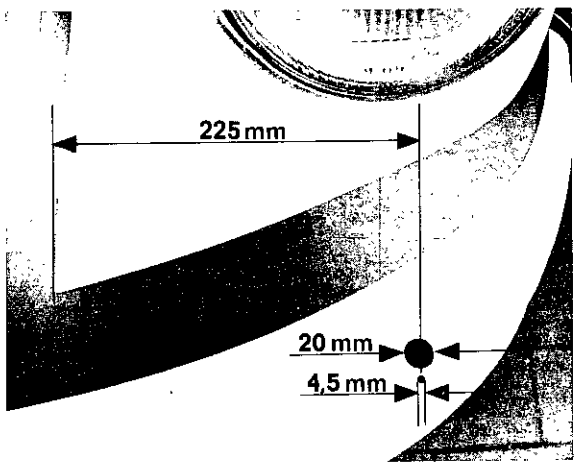
Tube 14 x 1.5 mm



Service Installation of Headlight Washers

beginning with 1974 Models

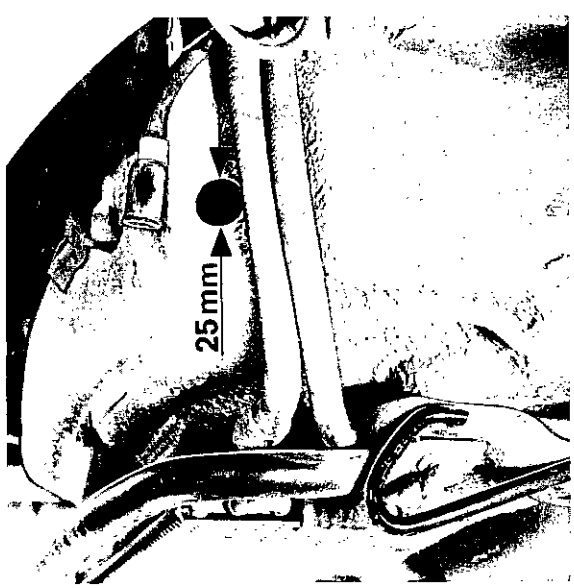
1. Mark and drill nozzle mounting holes in bumper. To locate hole centers place the rubber grommet on the bumper. Note that the nozzles and rubber grommets are different for left and right sides.

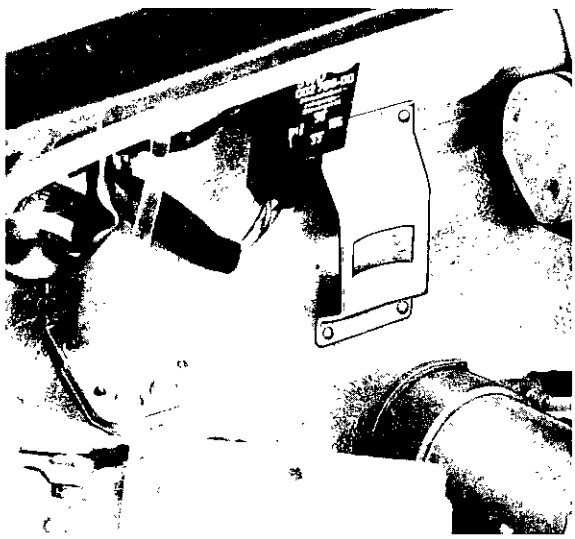


The spray jets are positioned slightly off center (of headlight) the distance between jets is 1250 mm (49 1/4 in.)

2. Remove bumper. If an angle drill motor is not available, the front apron will also have to be removed.

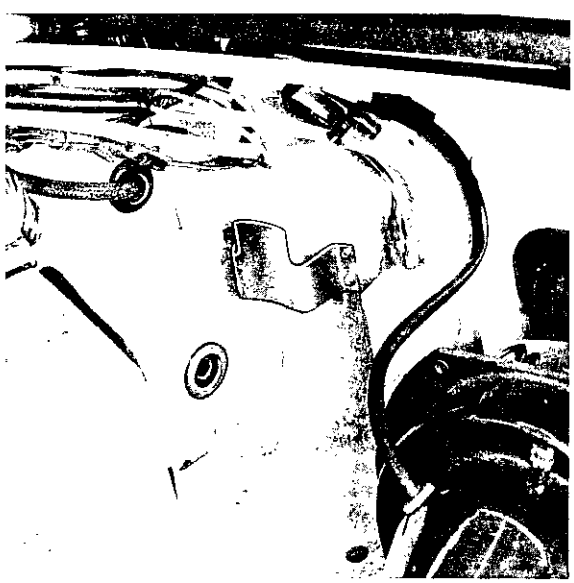
3. Drill 25 mm (1 in.) hole for water feed hose and insert grommet. (Be careful not to damage hoses in this area of cars equipped with an air conditioner.)





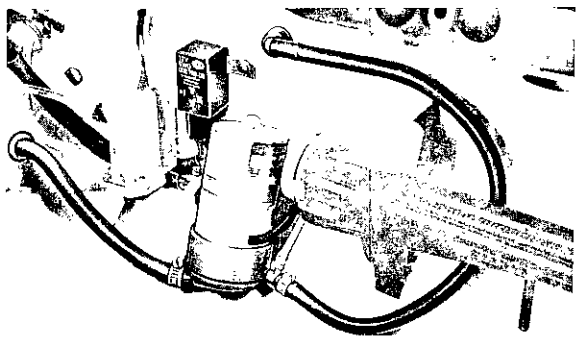
4. Remove present fluid container and install new container.

5. Drill two holes on each side of water pump bracket and bolt or rivet holder to lock panel. Location of bracket itself is different for cars with or with-out an air conditioner. Locate bracket in cars with an air conditioner so that the inlet adaptor of the pump has its opening at the same height as the water feed hose.

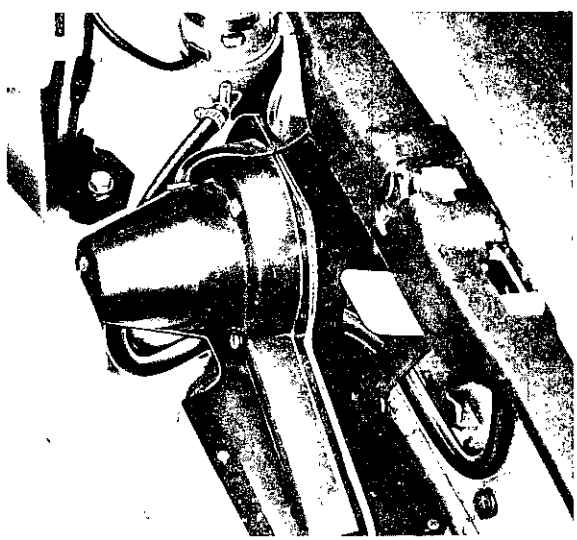


6. Install front apron.

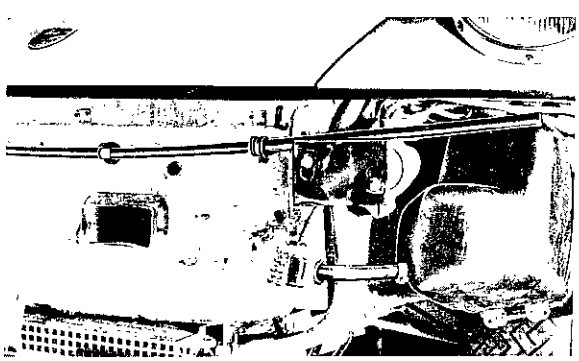
7. Install water feed hose on intake neck and molded hose on pressure adaptor of pump with hose clamps. Use longer molded hose on models with air conditioners and shorten water feed hose to a length of about 100 mm/4in.

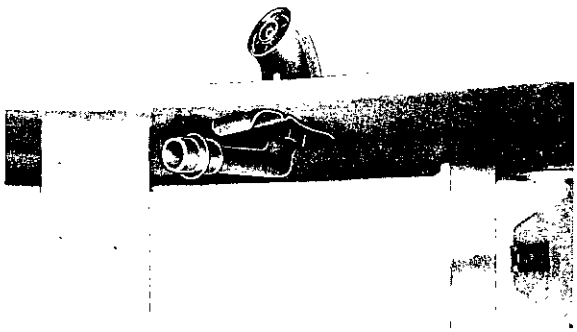


Insert molded hose (detach condenser blower of cars with an air conditioner), slide feed hose through grommet toward outside, clamp hose to water container adaptor with clamp and secure pump to bracket with clamp.

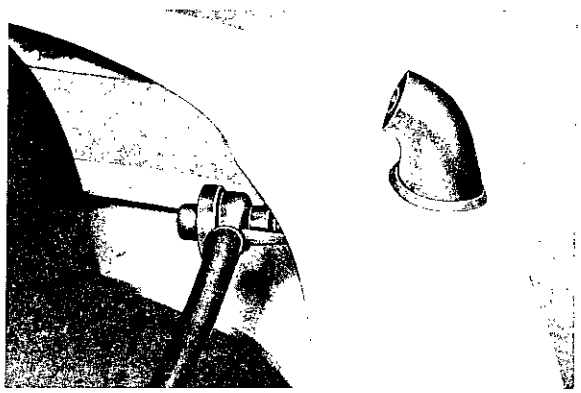


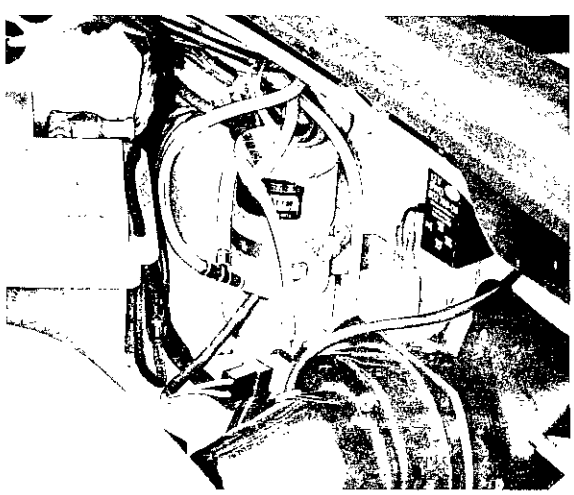
8. Connect both outlet hoses to adaptor (short hose left), locate hole for adaptor by placing in front of lock panel and drill 18 mm (3/4in.) dia. hole. Place adaptor and rubber grommet through hole and connect molded hose. Secure both hoses leading to nozzles with clamps. Insert pressure control valves on ends of hoses.





9. Secure nozzles and rubber grommets to bumper with spring locks, connect them to pressure control valves and install bumper.





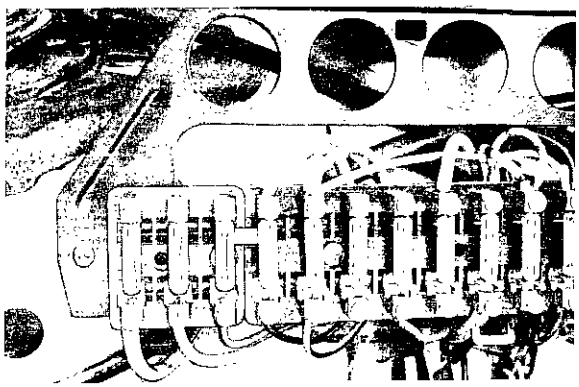
10. Disconnect hose at center connection of adaptor and connect it to center connection of valve adaptor.

Note

Use a longer hose for cars without an air conditioner.

Connect the open center connection of adaptor with S and the outlet adaptor of the water pump with P on valve adaptor.

11. Secure relay to lock panel with sheet metal screw. Disconnect battery ground cable. Connect wires to relay and water pump. Connect brown wire to body ground. Place wires behind fusebox and secure with clamps. Install an extra 3-position fusebox so that the brass rails on the back face upward. Bridge adjacent fuse with a shunt. Connect gray wire to fuse 2 (second fuse from front) at top, red/white wire to fuse 20 (center fuse of 3-position fusebox) at bottom. Use 25 ampere fuses.

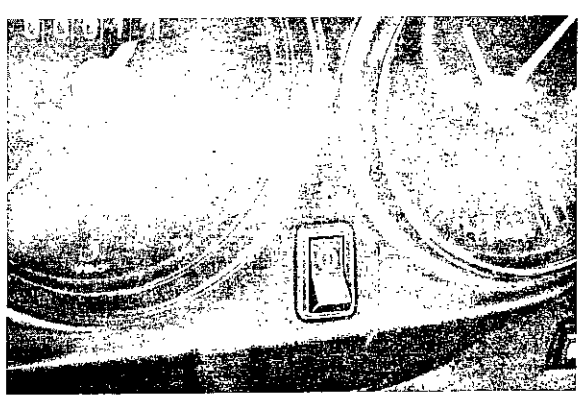


Note

Use open fuse connection of the 3-position fusebox already installed in cars with special equipment (e.g. air conditioner). Install 25 ampere fuse!

12. Locate wires toward instrument panel, remove instrument and clock, take off square cover between tachometer and clock and place wires through opening. Connect switch and press into opening.

13. Connect battery. Fill fluid container and check operation. Aim spray jets.

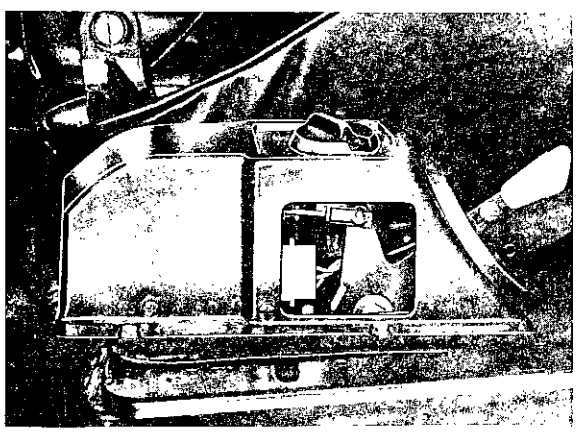


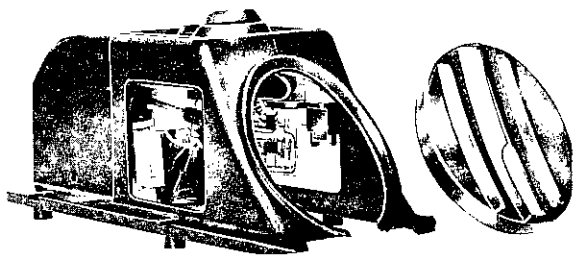
AUTOMATIC HEATING CONTROL

Removing and Installing Control Unit

1. Pry both side covers off of control unit.

2. Detach connecting rod between servo-motor and heater lever.





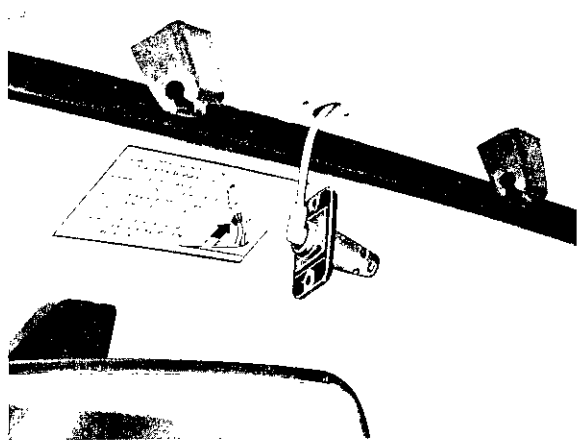
3. Remove the four bolts, lift control unit carefully and disconnect the three plugs at the control unit.

4. Remove rubber seal and slide control unit forward past heater and parking brake levers to remove.

5. After installation of the control unit turn off the heater with the ignition on and let the heater lever move all the way down. Check, whether both heater flaps are closed. If not, adjust the heater cables to remove any play.

Removing and Installing Interior Sensor

1. Remove both Phillips screws and pull down sensor carefully.



2. Pull angled plug off of sensor.

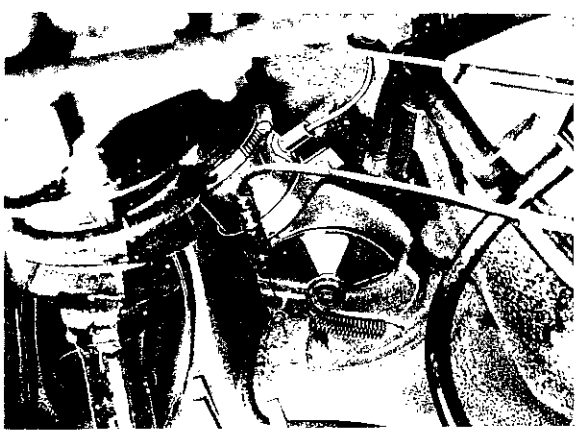
Removing and Installing Heat Sensor in Heater Flap Housing

1. Loosen control unit and pull off the front 2-pole male plug.

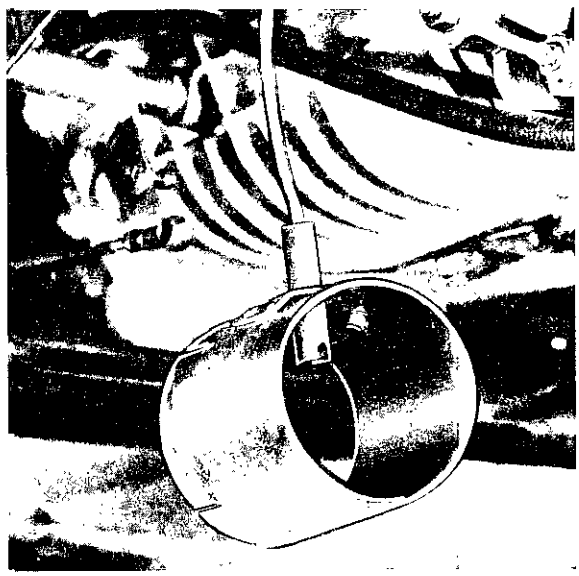
2. Loosen carpet along center tunnel and clear cable up to grommet in kick plate.

3. Pull both wires out of male plug housing (be sure to depress terminal retainer) and push out grommet.

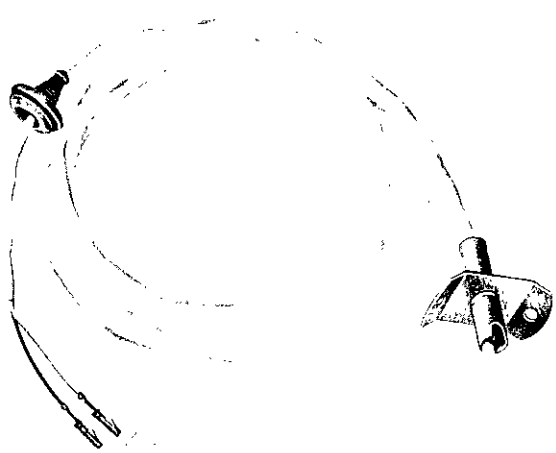
4. Remove adaptor on left heater flap housing.



5. Pull out cable and remove rivets on the adaptor.



6. Rivet new heat sensor to adaptor rout cable and press in grommet.

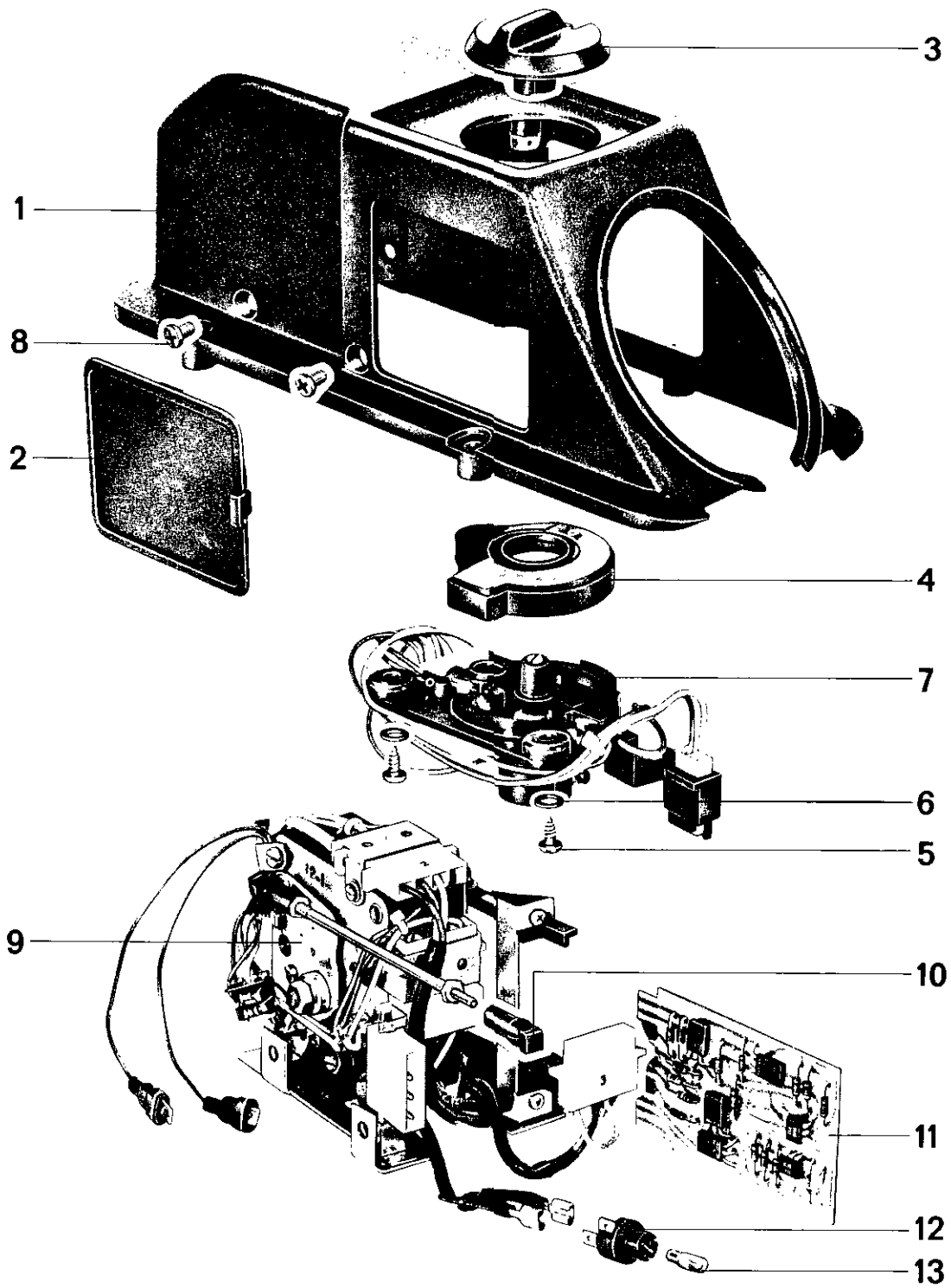


7. Install adapter. Make sure that the heater flaps are adjusted evenly on both sides.

8. Secure plug housing to cable. The black wire must be located on the side of the housing with a tab.

9. Place cable inside of car, glue carpets, connect plug to control unit and secure control unit again.

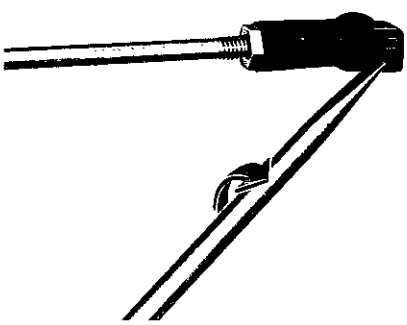
Disassembling and Assembling Control Unit



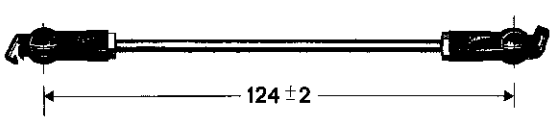
No.	Description	Qty.	Note When Removing	Note When Installing	Special Instructions
1	Housing	1			
2	Cover	2			
3	Knob	1	Pull off		
4	Light mask	1			
5	Screw	3			
6	Washer	3			
7	Switch	1			
8	Phillips screw	4			
9	Control unit	1			
10	Ball socket	2			see page 6.5 - 1/6
11	Card	1		Push in completely	
12	Bulb holder	1			12 V, 1.2 W
13	Bulb	1			

Installation Instructions

Prior to removing the connecting rod, detach clamp at ball socket with a screwdriver.



When replacing ball sockets adjust to 124 $^{+}_{-}$2 mm as shown in figure.

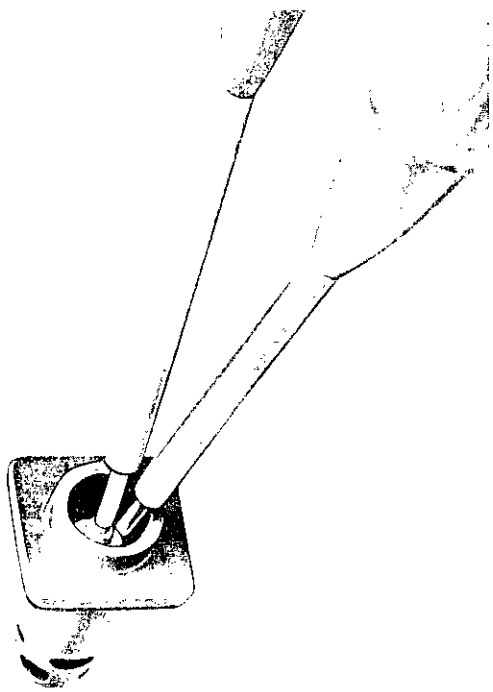


TROUBLESHOOTING AUTOMATIC HEATING CONTROLS

Checking Interior Sensor

1. Remove interior sensor.

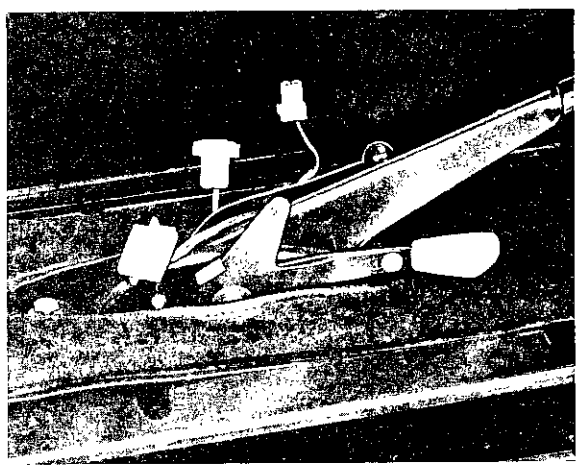
2. Using an ohmmeter with an appropriate testing range, check the resistance between both coaxial connections on the sensor (use test points). The resistance is very dependent on the temperature and should be about 1.5 kOhm at room temperature. Replace the temperature sensor if the resistance is about ∞ ohm (open circuit in sensor) or about O ohm (short circuit in sensor).



Checking Heat Sensor in Heater Flap Housing

1. Remove control unit.

2. Connect ohmmeter to 2-pole plug of heat sensor. The resistance must be 135 ohm with warm engine at 100°C/ 212°F. Replace heat sensor if resistance is way off (see "Checking Interior Sensor").

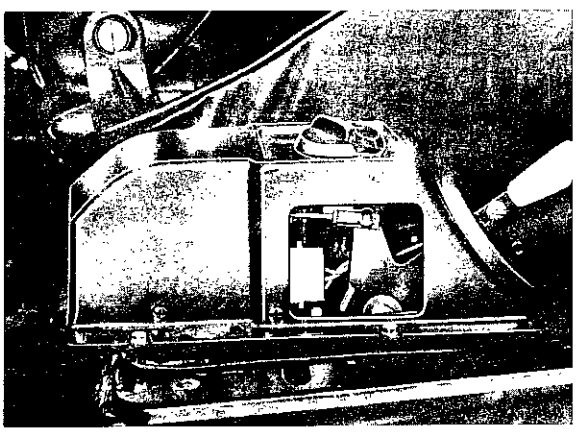


Note

An open circuit in one of the sensors or in the wires to the control unit will show a too low inside temperature or, a short circuit, a too high inside temperature. This will result in an improper movement of the heater lever up or down.

Checking Power Supply to Control Unit

1. Remove right side cover of control unit.



2. Disconnect 3-pole plug.

3. Turn on ignition and parking lights.

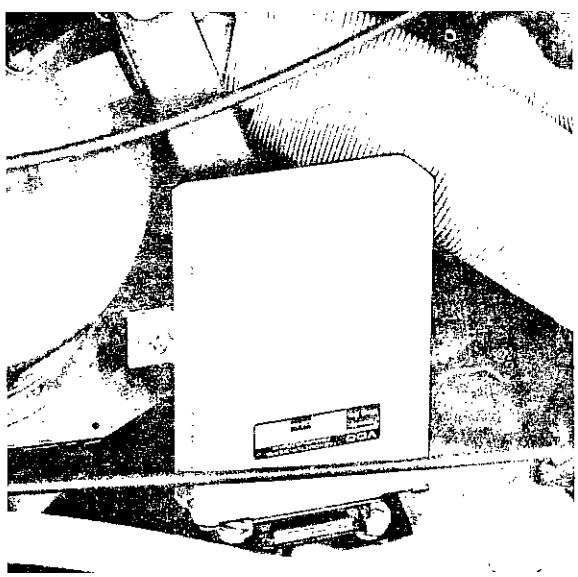
4. Connect test lamp between brown and red/white as well as brown and gray/blue cables. Test lamp must come on in both cases.

If both temperature sensors and the power supply operate correctly, but the heater controls do not operate properly, replace the complete control unit.

AUTOMATIC SPEED CONTROL

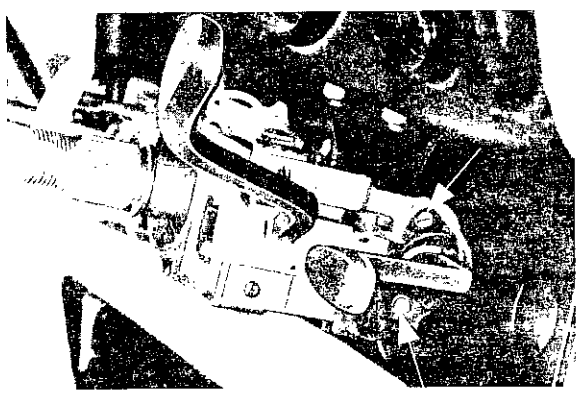
Removing and Installing Regulator

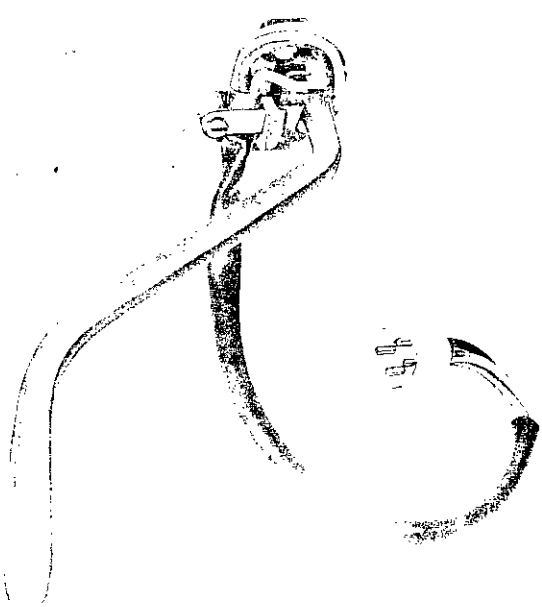
1. Remove cover in luggage compartment.
2. Pull plugs off of regulator.
3. Remove Phillips head screws and take out regulator.



Removing and Installing Engagement Switch

1. Remove steering wheel and switch housing.
2. Remove engagement switch screws and take off switch.
3. Detach plug. If car has an air conditioner, loosen duct on driver's side.





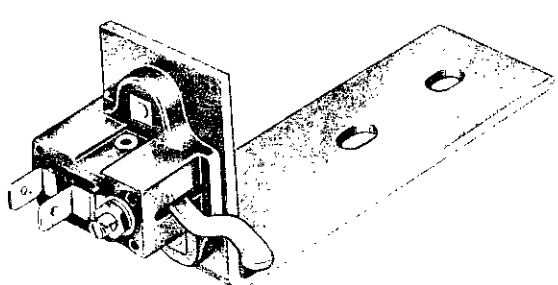
Removing and Installing Clutch Pedal Switch

1. Remove front tunnel cover.

2. Unscrew nuts on bracket, pull off wires and remove bracket with switch.



3. When installing make sure switch is adjusted correctly for clutch pedal. Adjust bracket in slots so that switch is not damaged when pulling back clutch pedal to check clutch play.

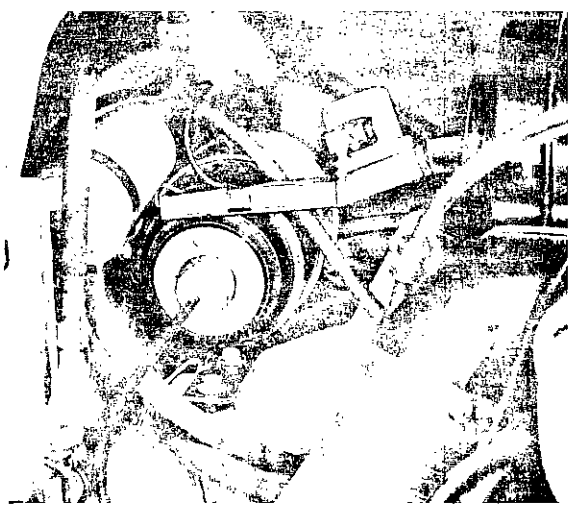


Removing and Installing Servo

1. Take out hose between heater air connection and blower motor.

2. Pull off plugs on servo and solenoid.

3. Unscrew mounting screws, detach vacuum line (small hose) on servo.

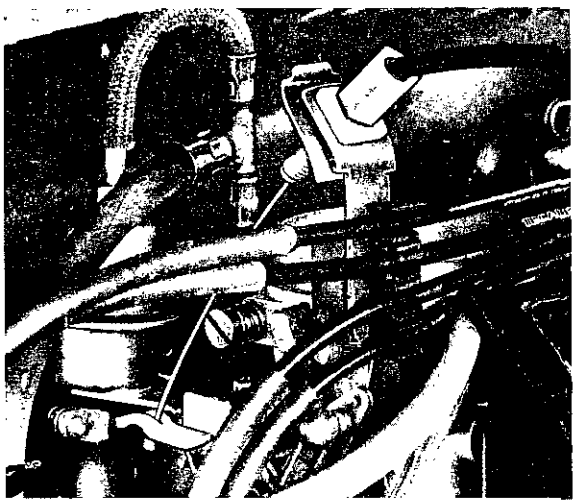


Note

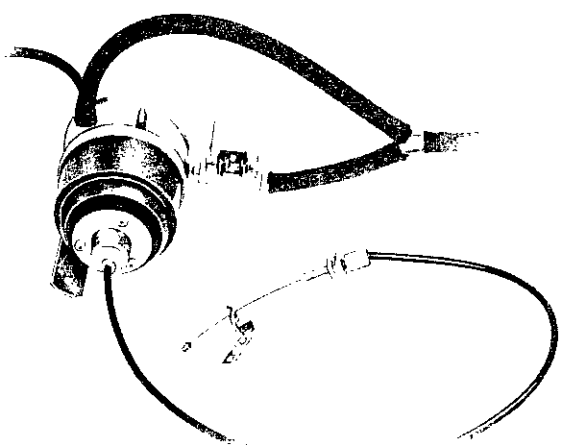
The vacuum hose is connected to an adaptor near the throttle housing.



4. Unscrew holder on throttle lever.



5. Pull off cable clip on holder upward and remove servo with cable.

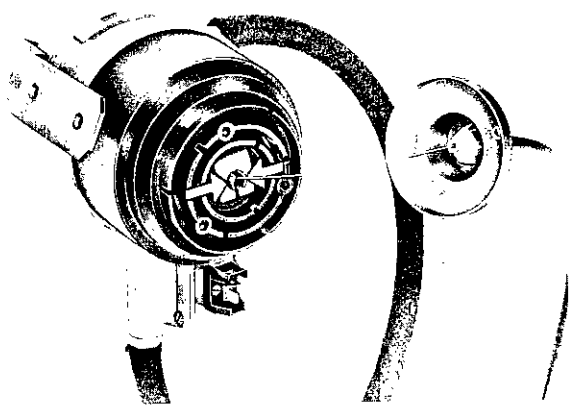


Removing and Installing Cable

1. Detach cable at throttle.

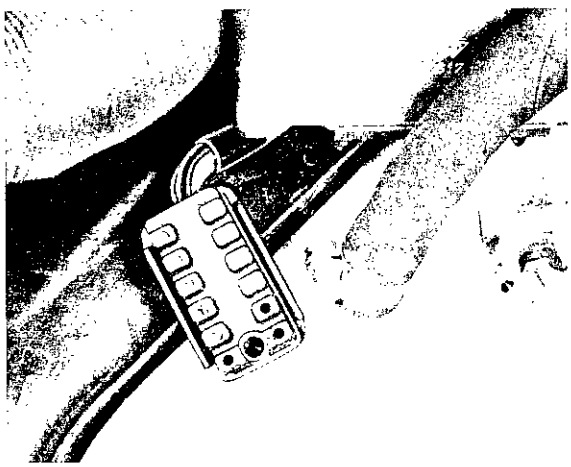
2. Unscrew cap on servo.

3. Press black clip together, slide in and detach cable.



Troubleshooting Automatic Speed Control

1. Disconnect plugs at speed control regulator.



2. Connect ohmmeter between ground and terminal 3 of plug. Ohmmeter must show ∞ Ω .

   Depress clutch. Ohmmeter now shows about 10 ohms. If resistance remains at ∞ Ω , either the clutch pedal switch or the solenoid on the servo is defective or not connected.

Note

On models with a sportomatic transmission operate the selector lever. (If the selector lever is not moved, the ohmmeter will show an additional 20 ohms.)

3. Connect ohmmeter between terminals 3 and 7. Reading must be between 11 and 17 ohms. If not, replace servo.

4. Terminal 12 must go directly to ground.

5. Connect ohmmeter between terminal 11 and ground. Move car; ohmmeter must deflect periodically.

6. Connect ohmmeter between terminal 6 and ground. Ohmmeter must show open circuit, provided that the stop lights operate properly.

7. Turn on ignition. Connect voltmeter between terminal 6 and ground. Depress brake pedal; instrument must show 12 volts.

8. 12 volts must be supplied to terminal 9, if the engagement switch is moved up.

9. Supply 12 volts to terminal 8. Terminal 8 must be dead when moving engagement switch toward steering wheel.

10. Supply 12 volts to terminal 10, if engagement switch is moved down.

The regulator must be replaced if all readings are within specifications and there is still a problem.

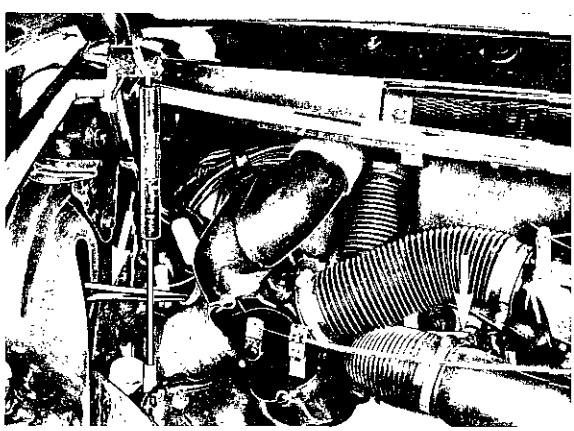
REMOVING AND INSTALLING AUTOMATIC ANTENNA

1. Disconnect battery.

2. Pull off wire (term. 30) on light switch and ground wire underneath instrument panel.

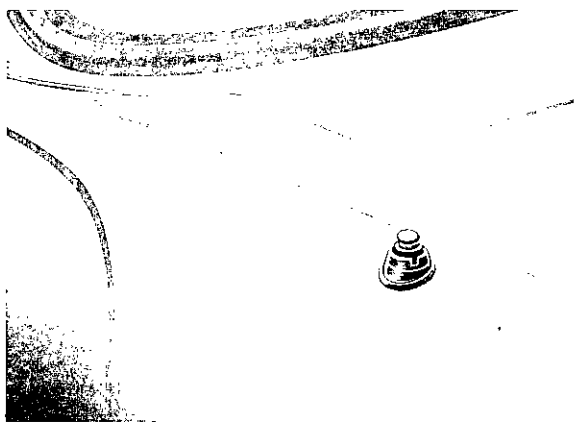
3. Disconnect control wire for antenna on radio and antenna wire on radio.

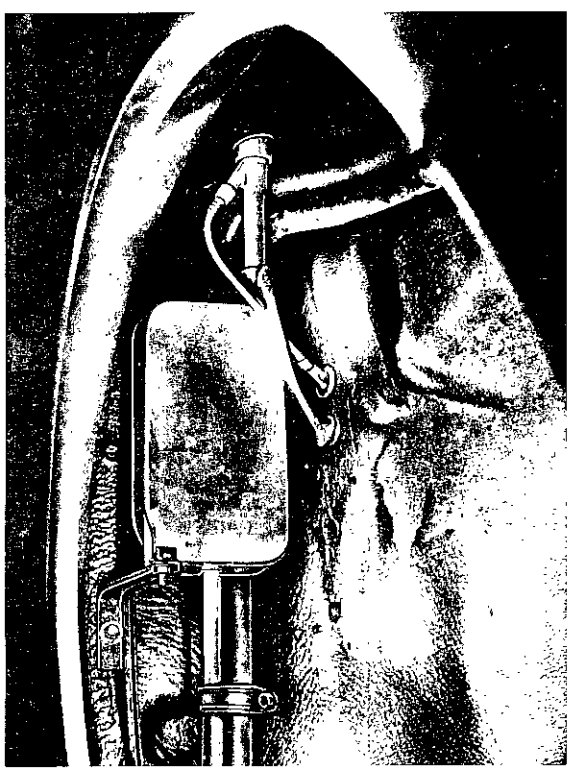
4. Disconnect front area mat and unscrew luggage compartment trim.



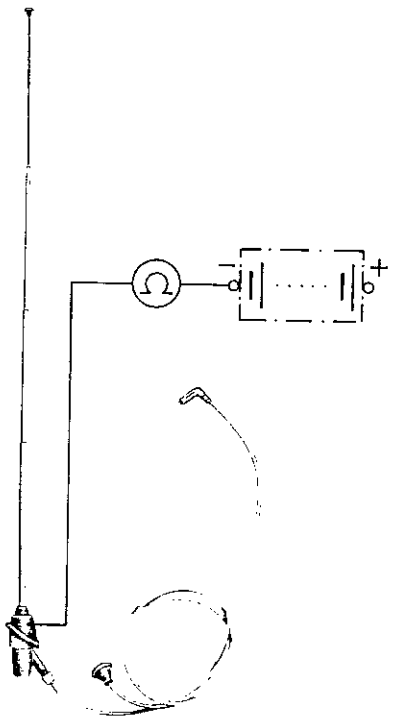
Pull wires into wheel well.

5. Unscrew antenna and remove from below.



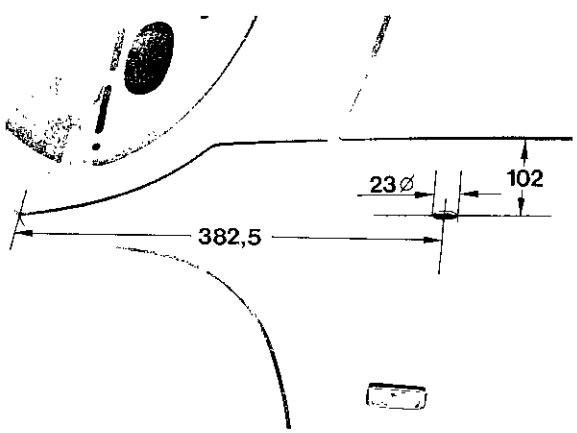


When installing antenna make sure there is perfect ground contact between base of antenna and fender.



Base ground to battery negative pole = 0 ohm.

Installed distance for automatic antenna.

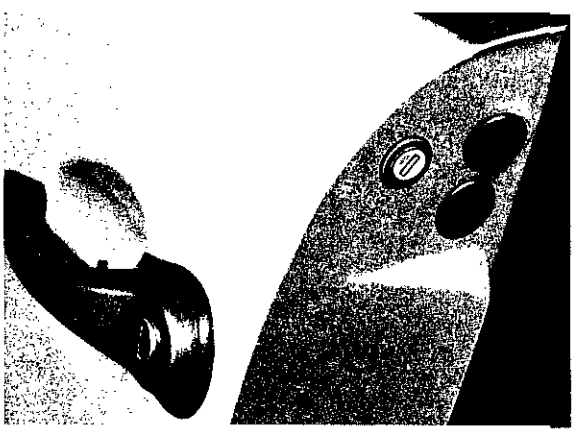


911 ALARM SYSTEM

Function

The alarm system is switched on and off with a separate key. The alarm switch is located on the face of an opened driver' s door.

The alarm will be set off by opening the driver' s and/or passenger' s door, the engine hood and when turning on the ignition.
After setting off the alarm system a separate alarm horn will sound off intermittently for about 30 seconds (or constant tone for Swiss version cars) and could be set off again by the measures described above. At the same time the engine cannot be started.



The key must be turned clockwise 90^{o} to switch on the system.

Setting off the alarm system with the doors is accomplished via the door contact switches which also operate the inside light. Consequently when turning off the alarm system the driver' s door must only be opened far enough to insert the key in the alarm switch lock.

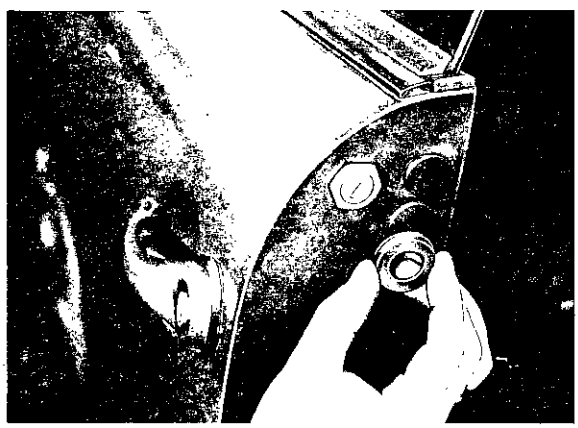
Note

Spare keys are not available for the alarm switch. The alarm switch must be replaced, if the key is lost.

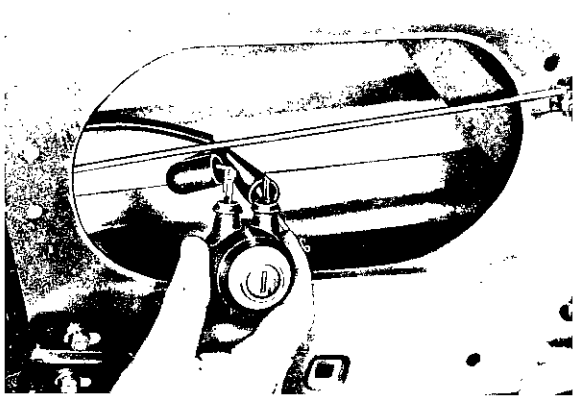
Removing and Installing Alarm Switch

1. Take off left door panel.

2. Pull off rubber escutcheon on alarm switch and unscrew hexagon nut.



3. Remove alarm switch through inside of door and pull off flat plug.

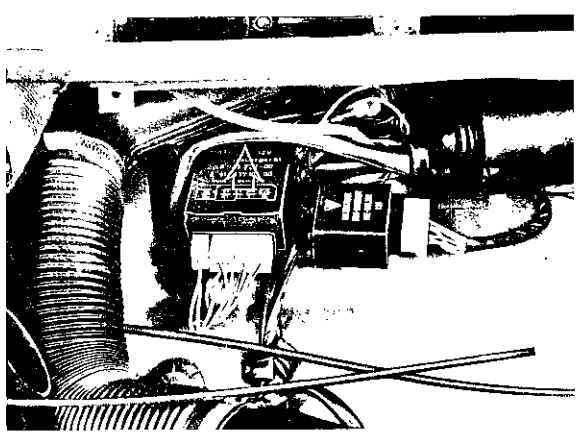


Removing and Installing Alarm Control Unit

1. Disconnect and remove front area mat. Unscrew luggage compartment trim.

2. Remove fresh air blower.

3. The alarm control unit is held by a holding clip and can be pulled off in direction of instrument panel.



Removing and Installing Alarm Horn

1. Unscrew bottom guard on front axle.

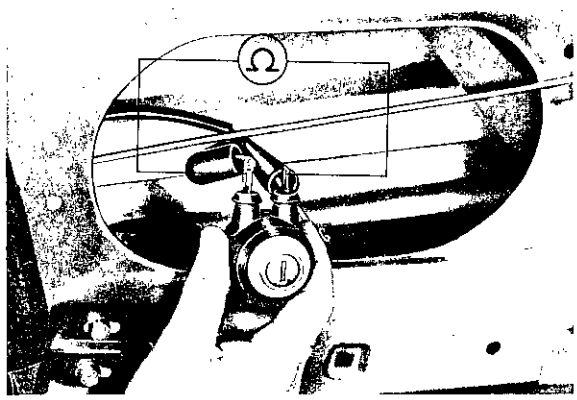
2. Unscrew alarm horn and pull off wire plug.



Troubleshooting Alarm System

Checking Alarm Switch

1. Remove alarm switch and measure ohm values between contacts.



Alarm switch on
(key positioned horizontally)
= 2 to 3 k-ohms)

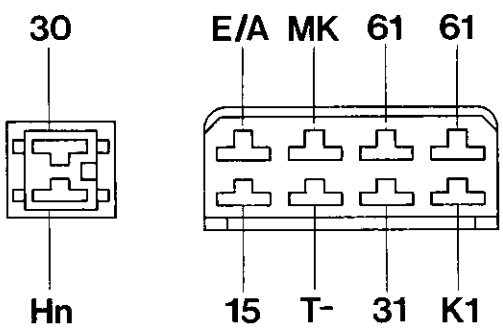
Alarm switch off
(key positioned vertically)
= 4 to 5,5 k-ohms

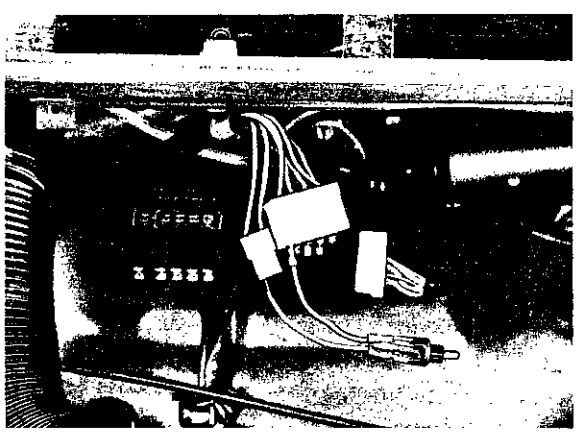
If measured values are higher or lower than specified ohm values, replace alarm switch.

Checking Lines and Connections

1. Remove alarm control unit. Pull off both plugs on alarm control unit.

2. Connect test lamp (max. 3 W) on double contact plug (term. 30 and Hn).
   If lamp comes on, there is battery voltage and wire to alarm horn is okay.





3. Leave test lamp connected on term. 30 and make other lamp connection on term. K 1. Lamp should come on.

4. Connect test lamp on term. 30 and 31. Lamp should come on.

5. Connect test lamp on term. 30 and T-. Open and close both doors separately. Lamp should come on while opening.

6. Connect test lamp on term. 31 and 15. Lamp should come on when turning on ignition.

7. Connect test lamp on term. 30 and 61 (connect on both terminals separately).

   Lamp comes on and goes out when turning on ignition.

   Lamp comes on and goes out after starting and running engine at high speed.

8. Connect test lamp on term. 30 and MK. Operate trunk light contact switch by hand.
Lamp should come on and go out when pushing in switch.

9. Terminal E/A must be checked with an ohmmeter. Connect meter between term. E/A and 31. Alarm switch must be connected.

Test as described in point 1.1 (checking alarm switch). The same ohm values apply.

Checking Function of Control Unit

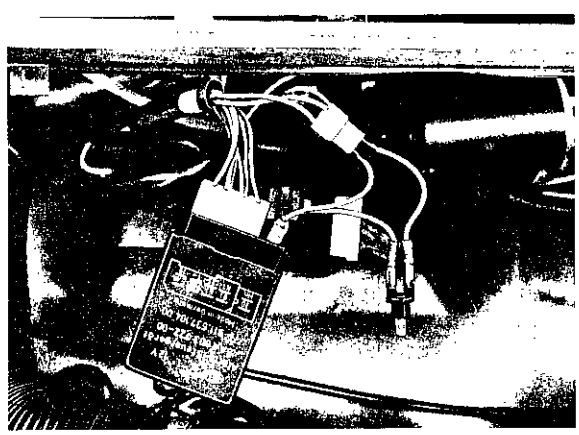
Note

It is recommended to use a test lamp instead of the alarm horn (no noise).

1. Connect eight-pin plug with alarm control unit. Two-pin plug remains disconnected.

Connect red wire on two-pin plug and term. 30 of control unit with a piece of wire.

Connect test lamp between term. HN on control unit and red/white wire of two-pin plug.



2. Turn on alarm system and open door wide. Lamp should flash.
Also check passenger's door and trunk lid.

3. Set off alarm by opening a door. Leave system turned on and close door again. The alarm must last about 30 seconds.
   Don' t turn off alarm system.
   When opening door again, alarm should also be set off again.

4. Turn on ignition after alarm has stopped. Lamp should flash.
   Start engine. Engine should not run.

5. Disconnect test lamp and connect two-pin plug on control unit.
   Install control unit.
   Check function of alarm horn by setting off alarm system once again.

Replace alarm control unit if functions are not fulfilled.

Note

Even with the alarm system turned off a defect in the control unit could cause failure of the fuel pump under certain circumstances.

If a new control unit were not immediately available, help could be provided by the following measure.

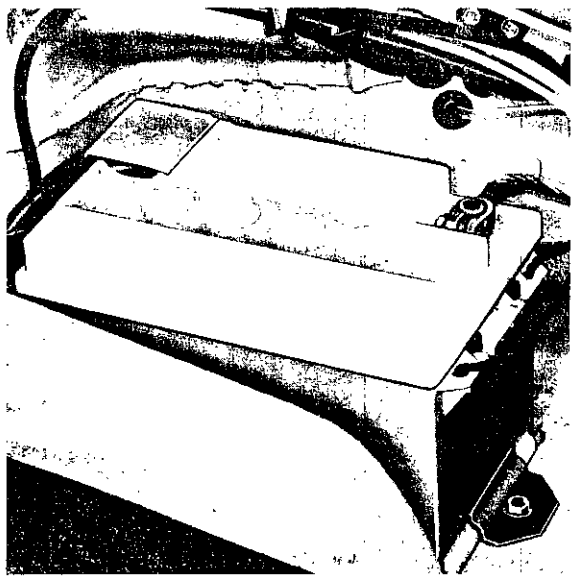
Remove alarm control unit and pull off eight-pin plug. Bridge both terminals 61 on plug with a piece of wire. This will eliminate function of the alarm system.

BATTERY - 1974 MODELS

Removal and Installation

Beginning with 1974 models, all vehicles are furnished with only one battery. The battery has a capacity of 66 Ah. A battery with a capacity of 88 Ah is available on special order.

The battery is located in the left forward part of the luggage compartment and is easily accessible upon removal of the cover mat.

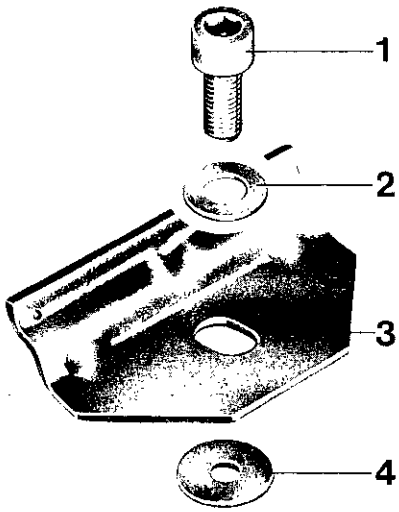


To remove the battery, disconnect battery leads from the battery terminals, disconnecting the ground strap first. Then remove the bracket retaining bolt in the compartment floor and take the bracket off.

A special tool for removal and installation of the 88 Ah battery is supplied with the car from 1981 models on.

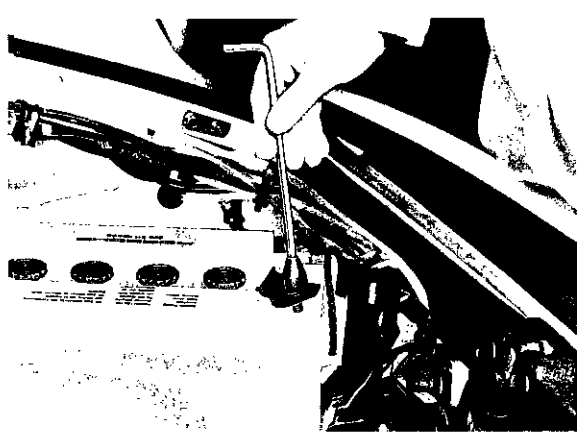


Angled driver for hexagon socket with holder and extension.



No.	Description	Qty.	Note When: Removing / Installing	Special Instructions
1	Socket head bolt M 8 x 20	1		
2	Washer A 8.4	1		
3	Bracket	1		
4	Rubber washer 18 x 5.5 x 1.5	1		

To install battery place bolt head in angled driver and holder.



SPARK PLUGS

Beginning with the 1972 models, the following spark plugs can be used in the 2.4 liter engines:

Vehicle Type	Spark Plug Type	Electrode Gap
911 T USA	BOSCH W 235 P 21 BERU 235/14/3 P or similar	0.55 mm 0.55 mm
911 E and 911 S	BOSCH W 265 P 21 BERU 265/14/3 P or similar	0.55 mm 0.55 mm

Coat spark plug threads with a molybdenum paste (such as MOLYKOTE HTP-White or similar) before installing.

Torque spark plugs to 2.5 - 3 mkp (18.1 - 21.7 ft. lbs.).

SPARK PLUGS

The following spark plugs are approved for use in 1974 model engines:

Vehicle Type	Spark Plug Type	Electrode Gap
911	BOSCH W 215 P 21 BERU 215/14/3 P	0.55 mm 0.55 mm
911 S	BOSCH W 235 P 21 BERU 235/14/3 P	0.55 mm 0.55 mm
Carrera 2.7	BOSCH W 265 P 21 BERU 265/14/3 P	0.55 mm 0.55 mm

Coat spark plug threads with a molybdenum paste (MoS_2), such as MOLYKOTE HTP WHITE, prior to installation.

Torque spark plugs to 2.5 - 3.0 mkp (24.5 - 29.4 Nm).

NOTE

Use only spark plugs approved by PORSCHE.

SPARK PLUGS

Spark plugs - 1976 / 1977 models

Model	Spark Plug	Electrode Gap
911 S	Bosch W 235 P 21 Beru 235/14/3P	0.55 mm/0.022 in. 0.55 mm/0.022 in.

Spark plugs - 1978/1979

Model	Spark Plug	Electrode Gap
911 SC	Bosch W 8 D (W 145 T 30) Beru 14-8 C (145/14/3 A)	0.8 mm/o.031 in. 0.8 mm/0.031 in.

Spark plugs - 1980

Model	Spark Plug	Electrode Gap
911 SC	Bosch W 5 D (W 225 T 30) Beru 14-5 D (225/14/3 A)	0.7 mm/0.028 in. 0.7 mm/0.028 in.

Specifications concerning installation of plugs remain unchanged.

Equipment Tables - 1980 Model

Ignition Transformer

Type/Model	Version	Remarks
911 SC	901 602 502 00 Bosch No. 0 221 121 001	

Distributor

Type/Model	Version	Remarks
911 SC	930 602 021 06 Bosch No. 0 237 304 016	With double vacuum unit (retard and advance) without rev. limiter

Spark Plugs

Type/Model	Version	Remarks
911 SC	Bosch W 5 D (W 225 T 30) Beru 14/5 D (225/14/3A)	0.7 mm (0.028 in.)

Control Unit

Type/Model	Version	Remarks
911 SC	930.602.702.0 Bosch No. 0 227 300 004	Capacitor discharge ignition (CDI), breakerless

IGNITION LEADS

Beginning with 1972 models, ignition lead lengths are as follows:

From distributor to:	Cylinder 1	= 330 mm (13 in.)
	Cylinder 2	= 390 mm (15-11/32 in.)
	Cylinder 3	= 510 mm (20- 5/64 in.)
	Cylinder 4	= 880 mm (34-21/32 in.)
	Cylinder 5	= 900 mm (35- 7/16 in.)
	Cylinder 6	= 990 mm (38-63/64 in.)

These lengths must be maintained for proper radio noise suppression.

ADJUSTING AND CHECKING DISTRIBUTOR

Adjusting Ignition Breaker Points

1. Remove distributor cap, rotor, and dust cover (BOSCH only). In MARELLI distributors, loosen retaining screw in rotor.

2. Turn crankshaft pulley until a distributor cam lifts the breaker arm to its highest point.

3. Adjust gap with feeler gauge (basic setting):

BOSCH	0.35 mm
MARELLI	0.40 mm

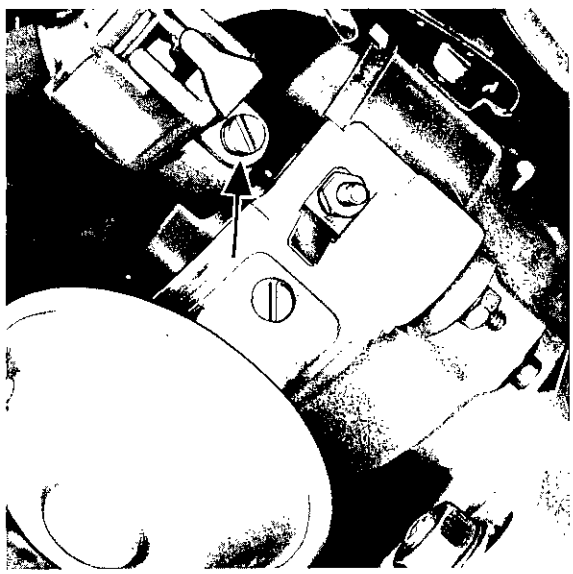
4. Check dwell angle with an appropriate tester and adjust, if necessary, by changing breaker point gap:

BOSCH	$38^{o} \pm 3^{o}$
MARELLI	$40^{o} \pm 3^{o}$

Large breaker point gap	=	small dwell angle
Small breaker point gap	=	large dwell angle

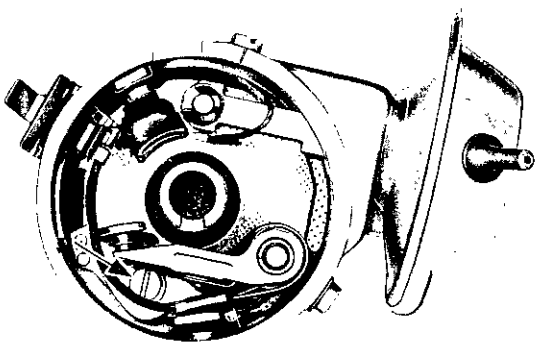
5. Tighten breaker point plate retaining screw.

Note
Always check ignition timing after adjusting dwell angle since dwell angle changes affect timing.



Beginning with 1973 model vehicles, the following specifications apply to MARELLI distributors:

Breaker gap	0.35 mm
Dwell angle	$37^{o} \pm 3^{o}$



Changing Breaker Points

1. Remove distributor cap, rotor, and dust cover.

2. Remove slotted screws and disconnect wire from Terminal 1. (In MARELLI distributor loosen nut at Terminal 1.)

3. Remove breaker points.



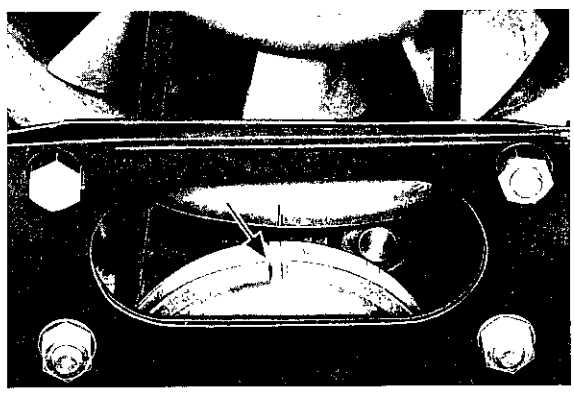
Install in reversed order. Lightly coat the cam with distributor cam lubricant. Keep lubricant off breaker points.

Adjusting Ignition (All 2.4 and 2.7 liter engines, except 2.7 CARRERA)

Check dwell angle before adjusting ignition timing, correct if necessary.

1. Connect engine to engine tester.

2. The adjustment should be made with a stroboscopic timing light when engine oil temperature is 80° C (176° F). The notch located to the left of the Z 1 mark on the crankshaft pulley (5° crankshaft rotation after TDC) must align with the notch in the blower housing at 900 ± 50 rpm. The vacuum hose must remain connected to the ignition distributor. Timing is changed by loosening the distributor clamping nut and turning the distributor body.



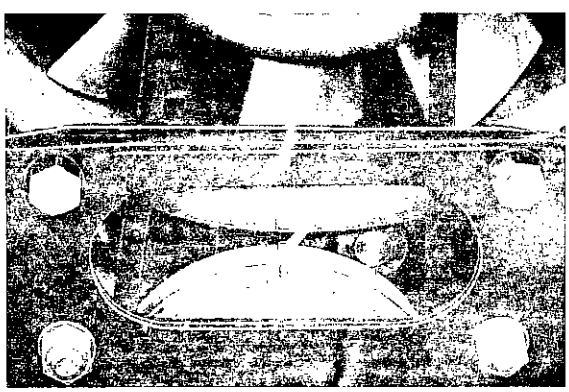
NOTE

The firing point may vary by ± 1° crankshaft rotation at 900 rpm. The variation must be within the tolerance limits of the spark advance curve at 6000 rpm. The timing must not advance past 38° of crankshaft rotation above 6000 rpm.

Adjusting Ignition (2.7 liter engines)

The dwell angle must be checked, and corrected if necessary, prior to adjusting the ignition timing. Apply same values as those applicable to the 2.4 liter engines.

1. Connect engine to the engine tester.



2. The adjustment is to be made with a stroboscopic timing light when engine oil temperature is 80° C (176° F). The Z1 mark on the crankshaft pulley must align with the notch in the blower housing when the engine is running at 850 - 950 rpm. The vacuum hose must remain connected to the ignition distributor. Timing can be changed by loosening the distributor retaining nut and rotating the distributor body.

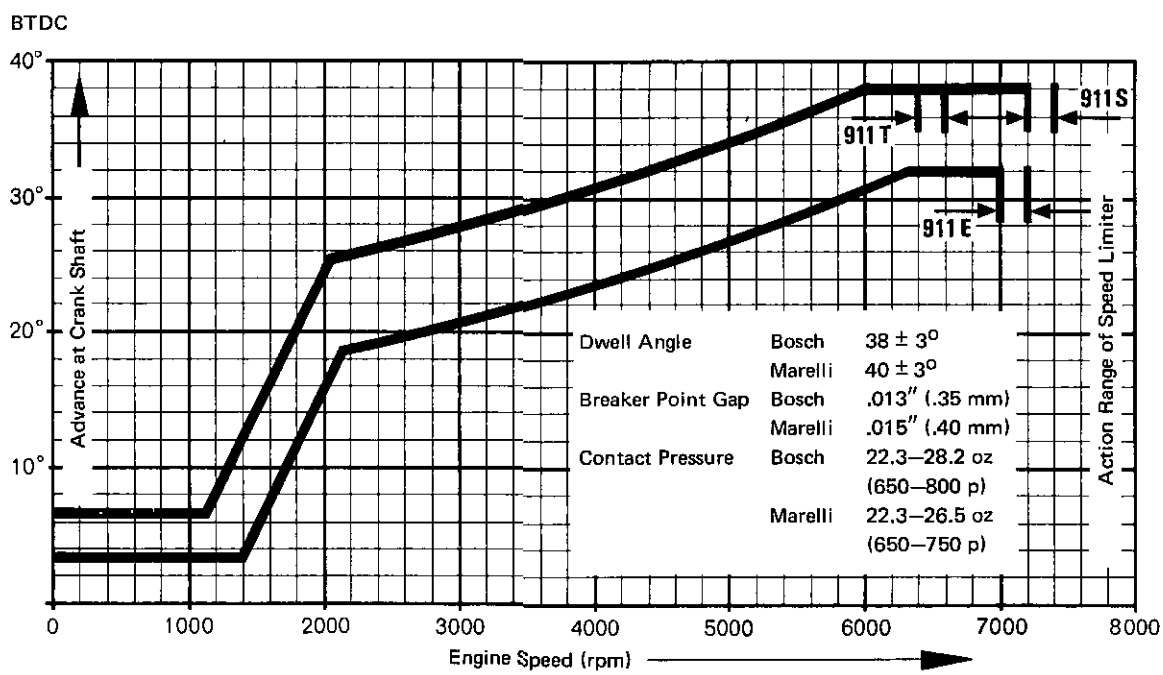
NOTE

The ignition timing may vary by ± 1° crankshaft rotation at 900 rpm. The variation must be within the tolerance limits of the advance curve when the engine is running at 6000 rpm. The timing must not advance past 38° of crankshaft rotation at speeds above 6000 rpm.

Checking Timing Advance Curve

1. Remove vacuum hose and compare advance curve with chart below at 1000 - 1500 - 2000 - 4000 - 6000 rpm. The readings must be within the two lines on the chart.

Ignition Advance Curve for Distributor for 2.4 l- and 2.7 l-Engines Bosch and Marelli except Carrera



Beginning with 1973 model vehicles, the following specifications apply to MARELLI distributors:

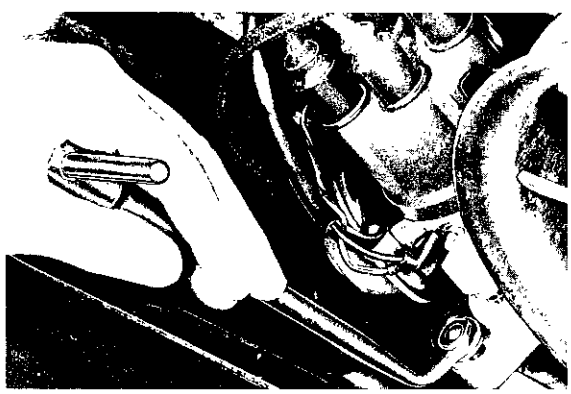
Breaker gap	0,35 mm
Dwell angle	37° ± 3°

Checking Distributor Advance Curve on Test Stand

The advance curves may be checked only on a test stand equipped with CDS hookup.

Centrifugal Advance

1. Remove distributor and mount in test stand.



2. Remove distributor cap and connect according to test stand manufacturer. Terminal 4 of the ignition transformer must be connected to the test stand spark display unit by an ignition wire.

3. Position the test stand selector lever to "auxiliary ignition coil"; the CDS unit will then be switched on.

4. Move distributor and bridge so that one of the light-markers will stop at 0^{o}.

Note
The vacuum hose must be disconnected and speed reduction avoided during this test.

5. Increase speed and compare rpm with the degrees of advance (BTDC) with the chart below.

Degrees Advance	Distributor Shaft RPM
1°	600 - 750 rpm
7°	900 - 1050 rpm
9°	1000 - 1650 rpm
12°	1950 - 2550 rpm
14°	2550 - 3050 rpm

At 3500 rpm, the advance must be between 14.3° and 15.7°.

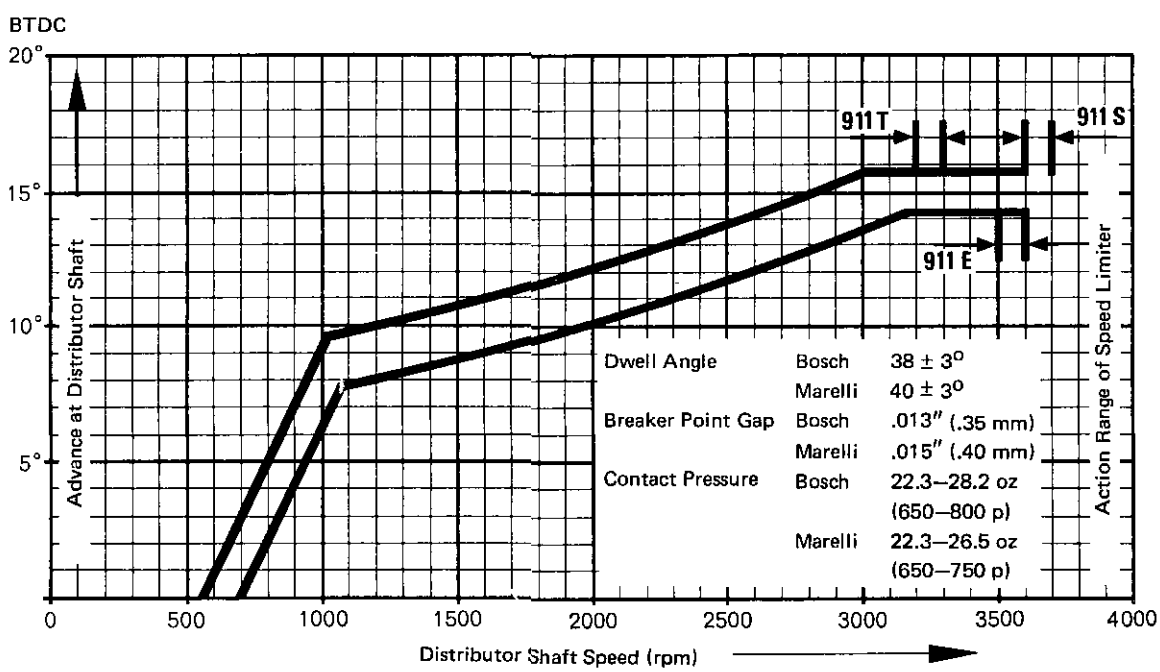
Contact Bounce

The light marker must not deviate by more than 1° at 300 rpm, or 2° at 3500 rpm.

Measurement Errors (cam displacement)

Run distributor at 300 rpm. The 6 visible light markers on the protractor must be spaced at 60° intervals (± 1° deviation per cam).

Centrifugal Advance Curve for Distributor for 2.4 l- and 2.7 l-Engines Bosch and Marelli except Carrera



Beginning with 1973 model vehicles, the following specifications apply to MARELLI distributors:

Breaker point gap: 0.35 mm Dwell angle: 37° ± 3°

Vacuum

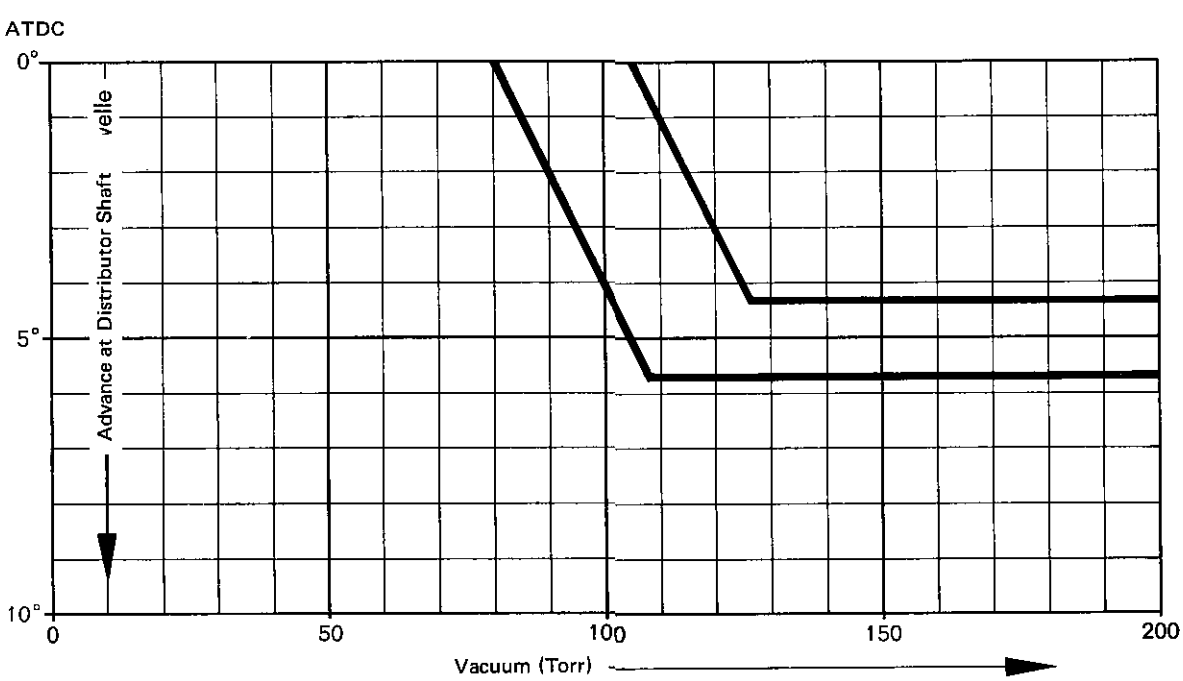
1. Connect vacuum line of test stand to distributor vacuum chamber.

2. Set speed to 300 rpm and do not change during the test.

3. Check vacuum at the indicated degrees advance (ATDC):

Degrees Advance	Vacuum
1^{o}	85 - 110 Torr (3.3 - 4.3 in.)
4^{o}	100 - 125 Torr (3.9 - 4.9 in.)

Vacuum Advance Curve for Distributor for 2.4 l- and 2.7 l-Engines Bosch and Marelli except Carrera



Speed Limiter

1. Mount cap on distributor and connect according ro rest stand manufacturer. The ignition lead must be removed from the spark display unit and connected to the distributor cap so that connection is made between ignition transformer and distributor.

2. Adjust spark display to 5 mm distance.

3. Increase speed until sparks stop. The sparks must stop at the following speeds:

Distributor for Vehicle Type	Cut-off RPM
911 T	3250 ± 50 rpm
911 E	3550 ± 50 rpm
911 S	3650 ± 50 rpm

Beginning with 1973 models, speed limiter tolerances are as follows:

Distributor for Vehicle Type	Cut-off RPM
911 T	3250 ± 100 rpm
911 E	3550 ± 100 rpm
911 S	3650 ± 100 rpm

Beginning with 1974 models, the cutoff speed for Type 911 (2.7 liters) and 911 S (2.7 liters) engines is

3250 ± 100 rpm

Dwell Angle

1. Connect standard ignition condenser between Terminal 1 of the distributor and the ground.

2. Position test stand selector lever to the "Dwell Angle" position.

3. Attach test stand connecting wire to Terminal 1 of the distributor.

4. Adjust speed to 300 rpm and turn bridge so that the end of a light marker lines up with the 0^{o} mark on the protractor. The length of the light marker indicates dwell angle.

Remove the ignition condenser after completing the test. Connect vacuum hose and adjust ignition timing after reinstalling the distributor in the vehicle.

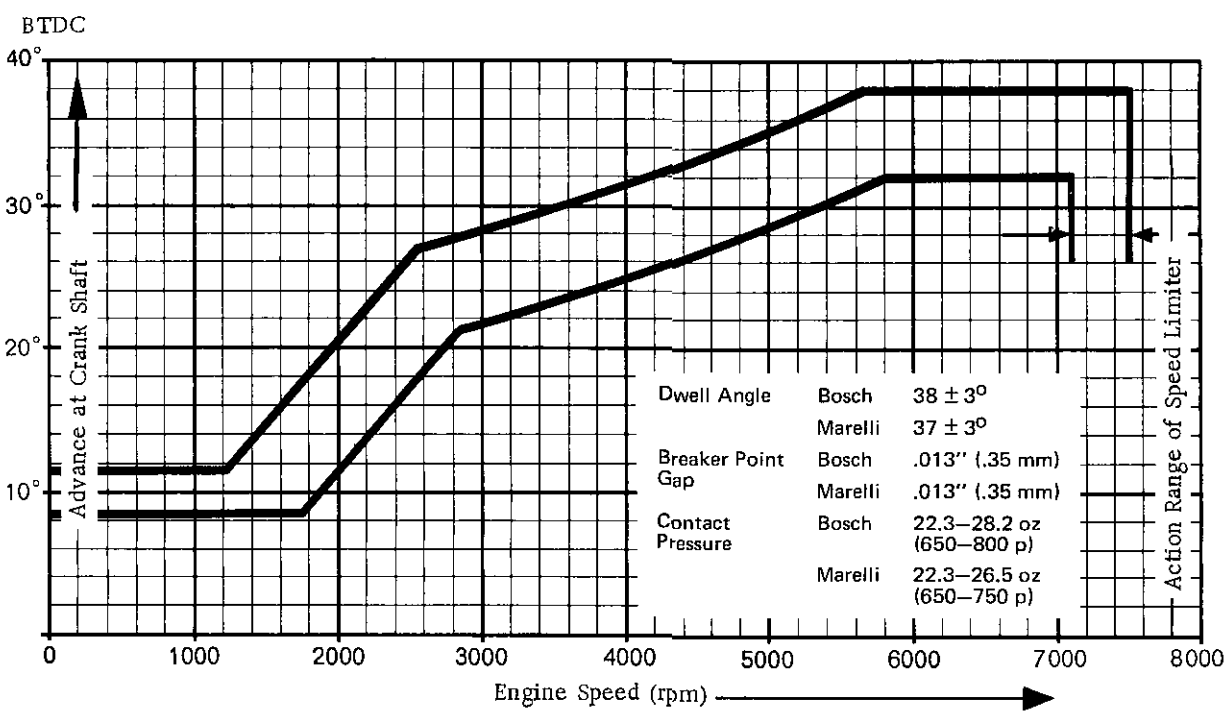
Ignition Advance Curves for

2.7 Liter Carrera Engine

Testing is accomplished in same manner as that for distributors in 2.4 liter engines. The values differing from those applicable to the 2.4 liter engines are shown below.

Values shown in the advance curve graph apply to a distributor installed in the engine with the vacuum hose detached. A prerequisite for the test is proper adjustment of the ignition timing at idle speed.

IGNITION DISTRIBUTOR ADVANCE CURVE FOR 2.7 LITER CARRERA ENGINE - BOSCH AND MARELLI

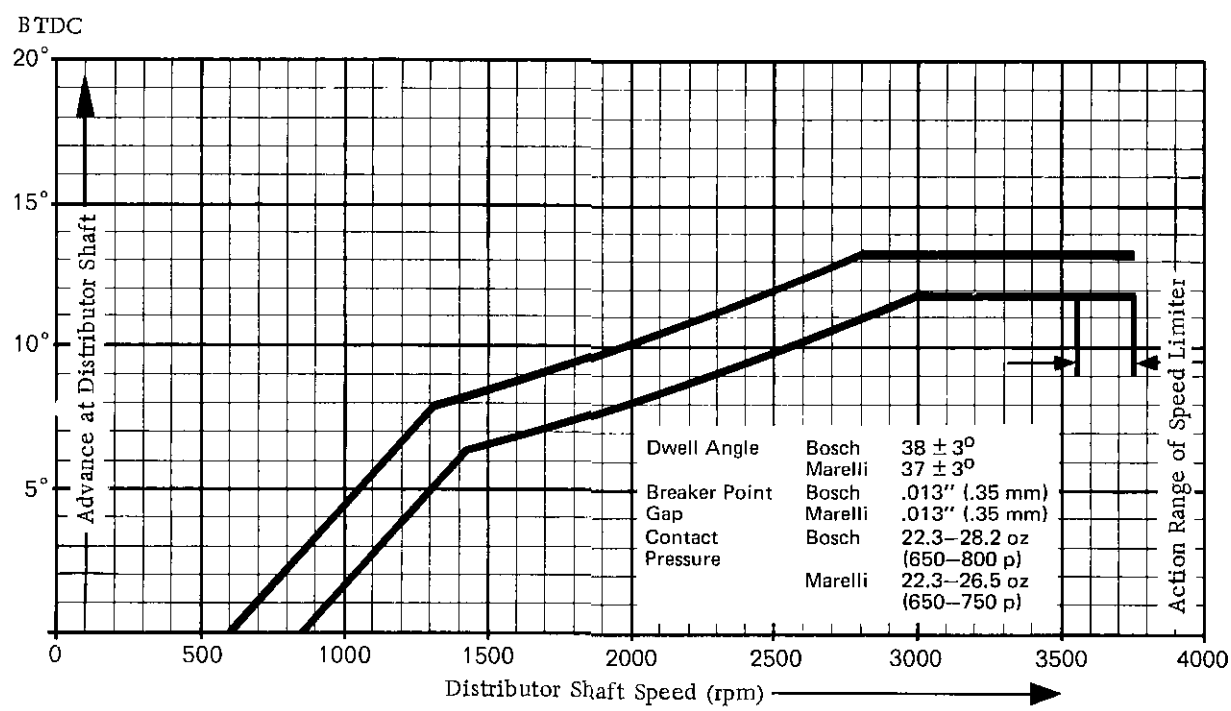


The mechanical advance curve graph applies to a distributor mounted in the test stand.

Degrees Advance (BTC)	Distributor Shaft Speed
1°	700 - 950 rpm
6°	1140 - 1380 rpm
8°	1350 - 1930 rpm
11°	2250 - 2770 rpm

The ignition advance point must be between 11.8° and 13.3° at 3500 rpm.

CENTRIFUGAL ADVANCE CURVE FOR 2.7 LITER CARRERA ENGINE - BOSCH AND MARELLI



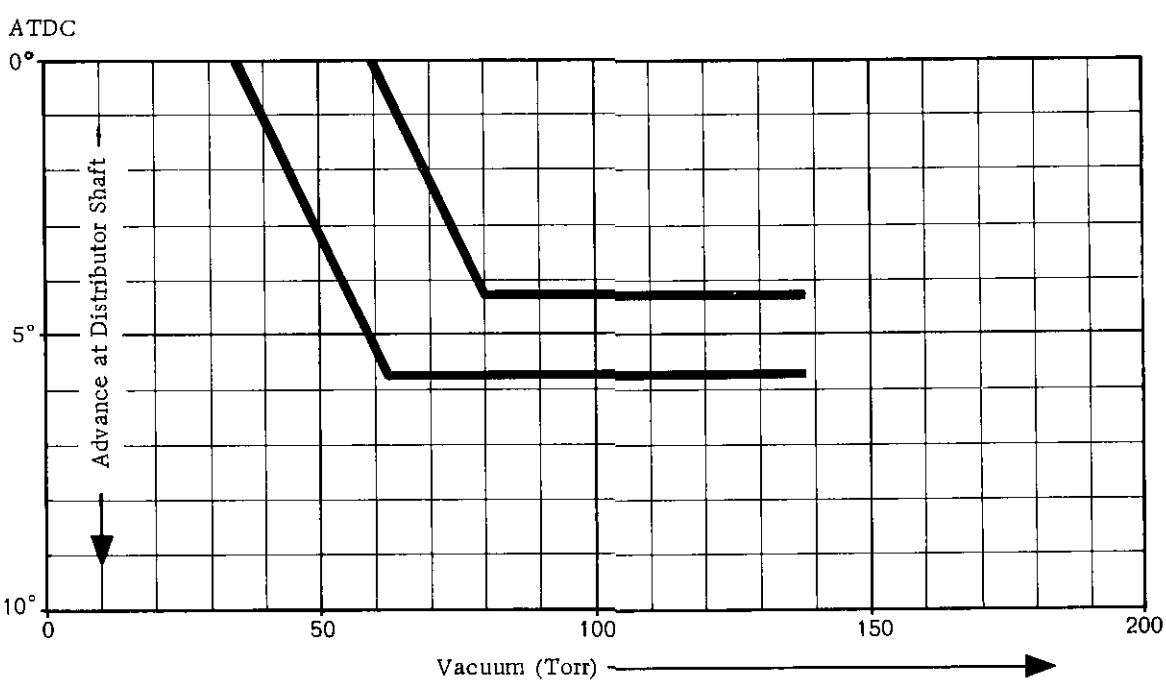
Testing of vacuum advance is accomplished on the distributor test stand.

Vacuum Advance (ATC)	Vacuum
1^{o}	40 - 65 Torr
4^{o}	54 - 78 Torr

The advance point must be between 4.3^{o} and 5.7^{o} when vacuum is at 100 Torr.

The distributor cut-off speed in 2.7 liter Carrera engine is 3550 - 3750 rpm.

VACUUM ADVANCE CURVE FOR DISTRIBUTORS IN 2.7 LITER CARRERA ENGINE - BOSCH AND MARELLI



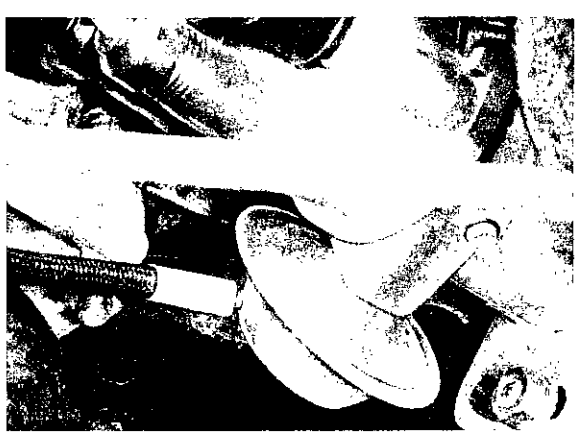
ADJUSTING IGNITION TIMING
(Type 911 S - 1977 Model)

USA Version

Adjust to $0^{\circ} \pm 2^{\circ}$ (Z 1 mark) at an oil temperature of 80° C/176° F and idle speed of 900 to 1000 rpm.



The plug between the vacuum hose and vacuum advance unit must be installed and may not be removed, not even while adjusting.

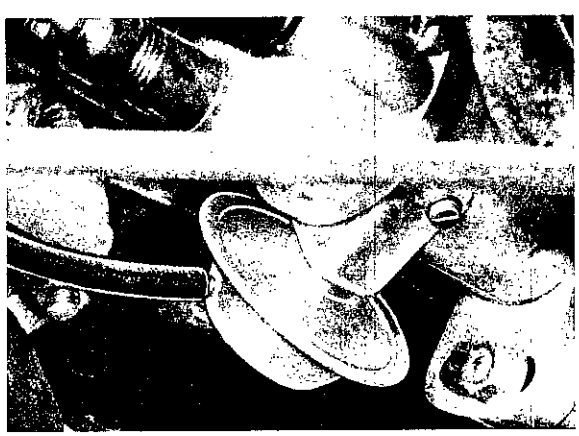


California Version

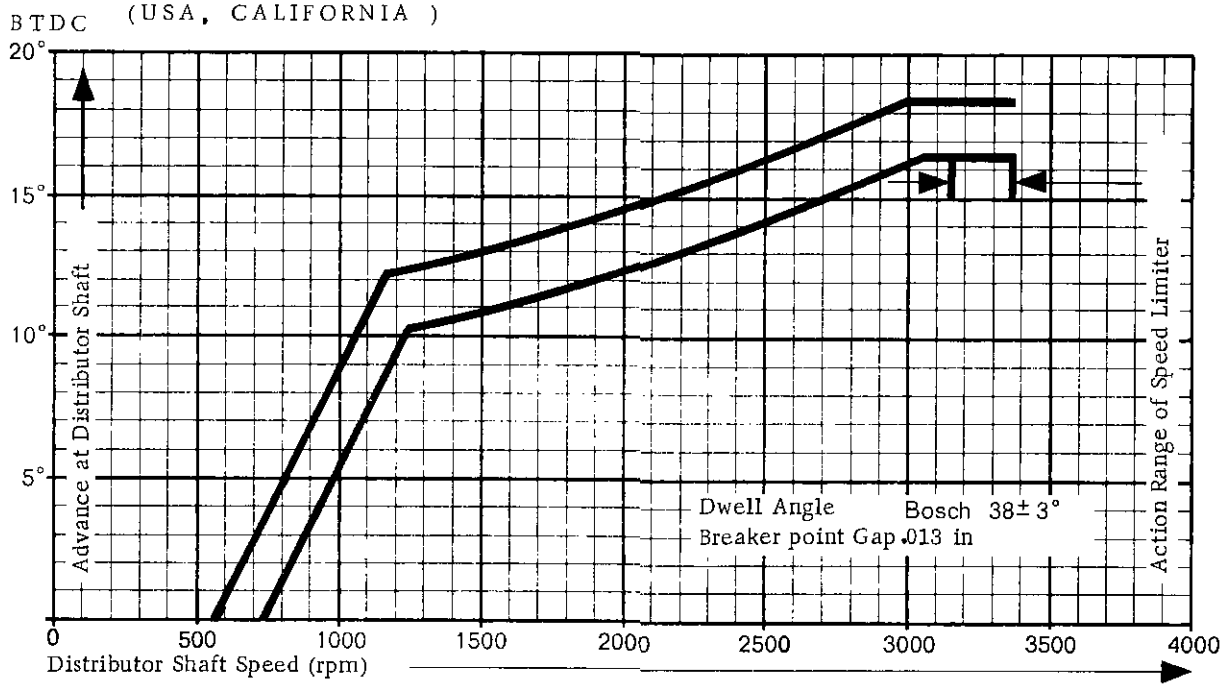
Adjust to $15^{\circ} \pm 2^{\circ}$ ATDC at an oil temperature of 80° C/176° F and idle speed of 950 to 1050 rpm.



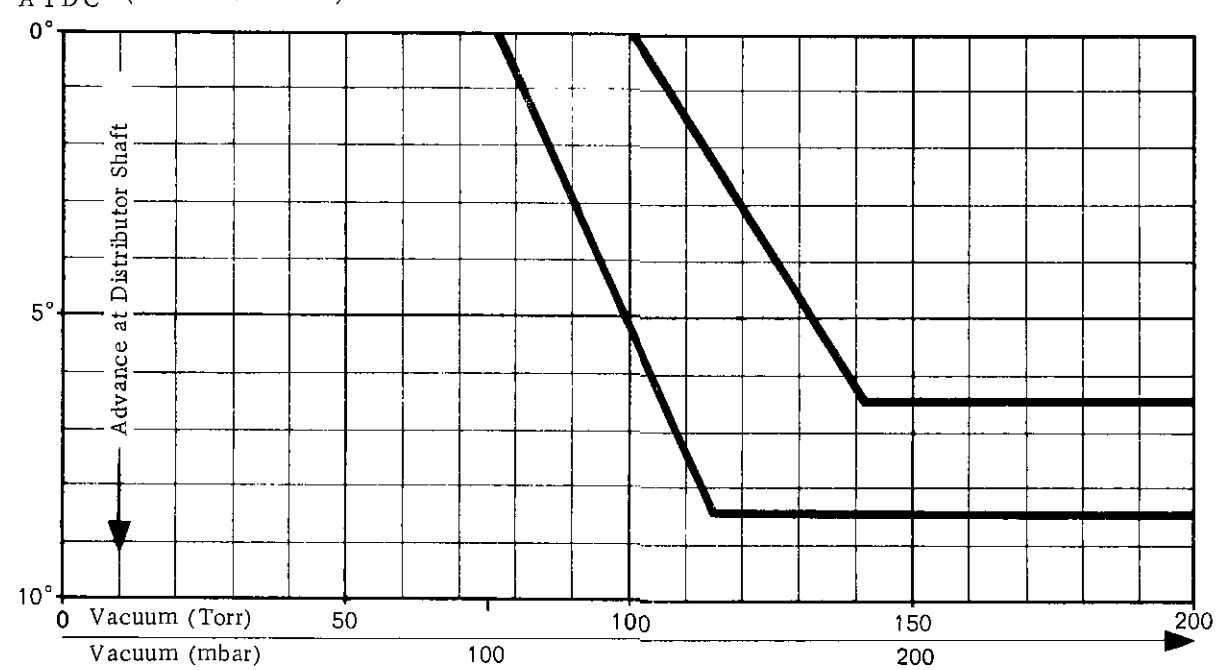
No plug is installed between the vacuum hose and vacuum advance unit. The vacuum hose must remain connected for adjustments.



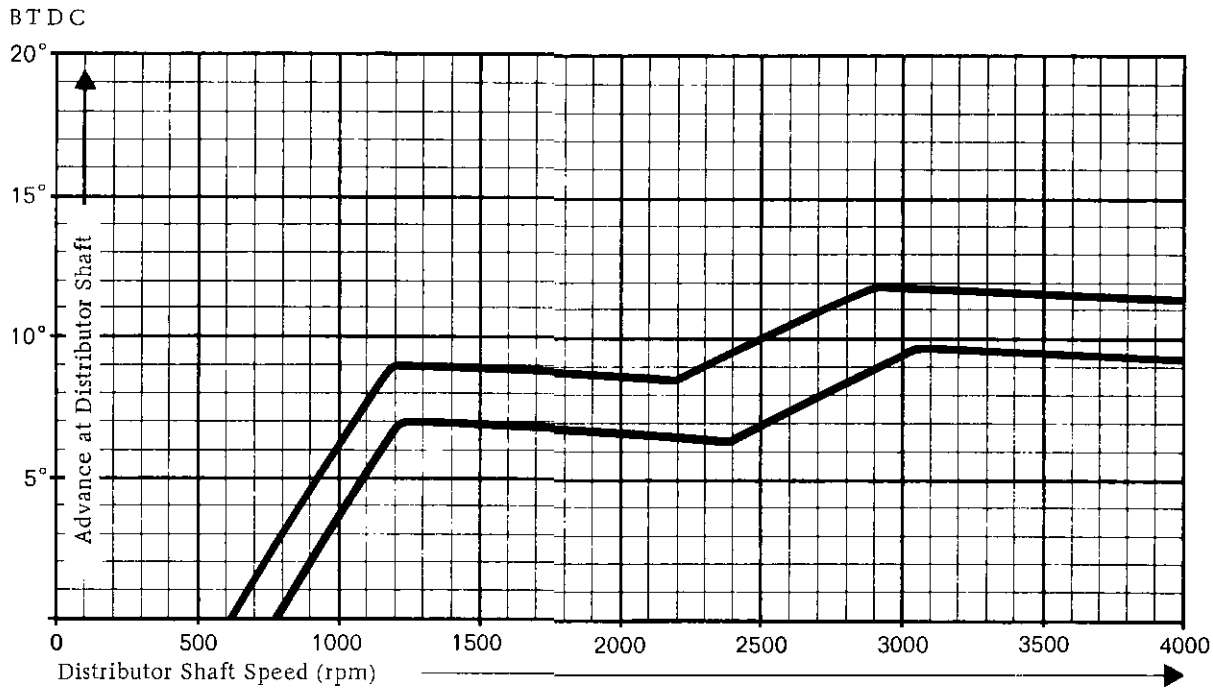
CENTRIFUGAL ADVANCE CURVE TYPE 911 S FROM MODEL 77 (USA, CALIFORNIA)



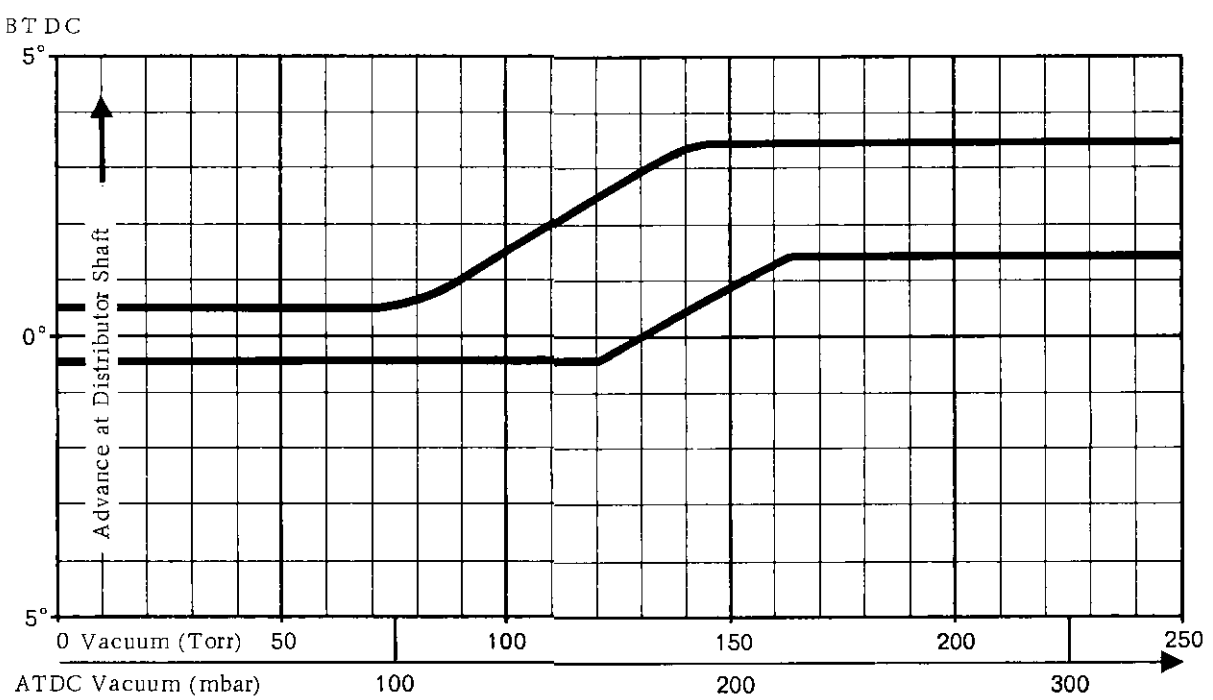
VACUUM ADVANCE CURVE TYPE 911 S FROM MODEL 77 (CALIFORNIA)



CENTRIFUGAL ADVANCE CURVE TYPE 911 SC - MODEL 78



VACUUM ADVANCE CURVE TYPE 911 SC - MODEL 78



Adjusting Ignition Timing as from 1978 Models

Adjusting value:

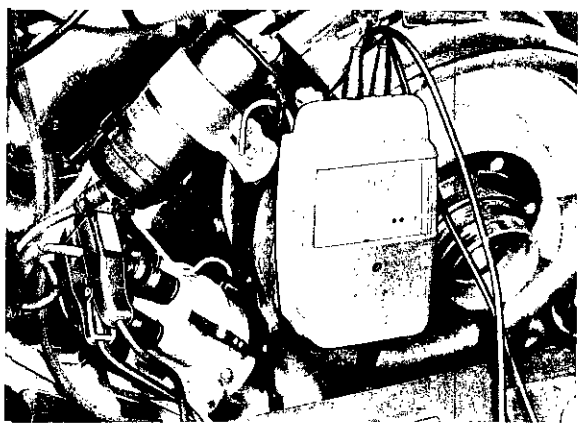
Europe: $5^{o} \pm 2^{o}$ BTDC at 900 $\pm$ 50 1/min
USA: $5^{o} \pm 2^{o}$ BTDC at 950 $\pm$ 50 1/min

1. Adjustment must be made on an engine with oil temperature of approx. 80^{o} C. The 5^{o} mark on pulley must align with notch on fan housing at specified engine speed.



The vacuum hose of USA version models can remain attached.

To measure engine speed, use a tester with an inductive speed recorder (clips).



2. After adjustment of ignition timing, check ignition timing advance.

Europe: $35^{o} \pm 2^{o}$ BTDC at 6000 1/min
USA: $26^{o} \pm 2^{o}$ BTDC at 6000 1/min
(vacuum hose detached)

If these control values are not reached, remove distributor and inspect in a test bench.

Note

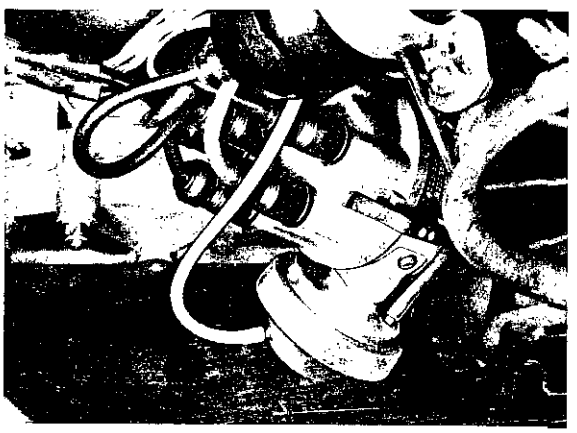
An inspection or adjustment of the dwell angle is not possible and also not necessary on the breakerless ignition system installed as from 1978 models.

Adjusting Ignition Timing - 1980 Models

1. Run engine to operating temperature (oil temperature approx. 90° C/194° F).

2. Connect engine tester.

   Adjusting Values: 5° before TDC at 950 ± 50 rpm



Pull off vacuum hoses.
Adjust speed to 950 ± 50 rpm.

3. Connect timing light.
   At specified engine speed the 5° mark on pulley must be opposite notch on blower housing.



Adjust idle speed after connecting the vacuum hoses.

Checking Ignition Retard/Advance - 1980 Models

Requirements:
Ignition timing adjusted to specifications.

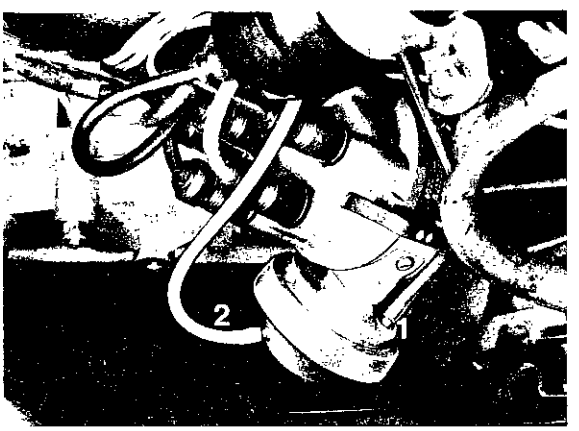
1. Centrifugal Advance
(vacuum hoses detached)

Ignition timing must be between 15 and 20° before TDC at 3000 rpm or 19 and 25° before TDC at 6000 rpm.

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

Checking Vacuum Retard

Connect blue hose at connection 1 of double vacuum box and disconnect red hose at connection 2.



1 = Retard (blue)
2 = Advance (red)

Ignition timing must be between 3 and 7° after TDC.

Checking Vacuum Advance

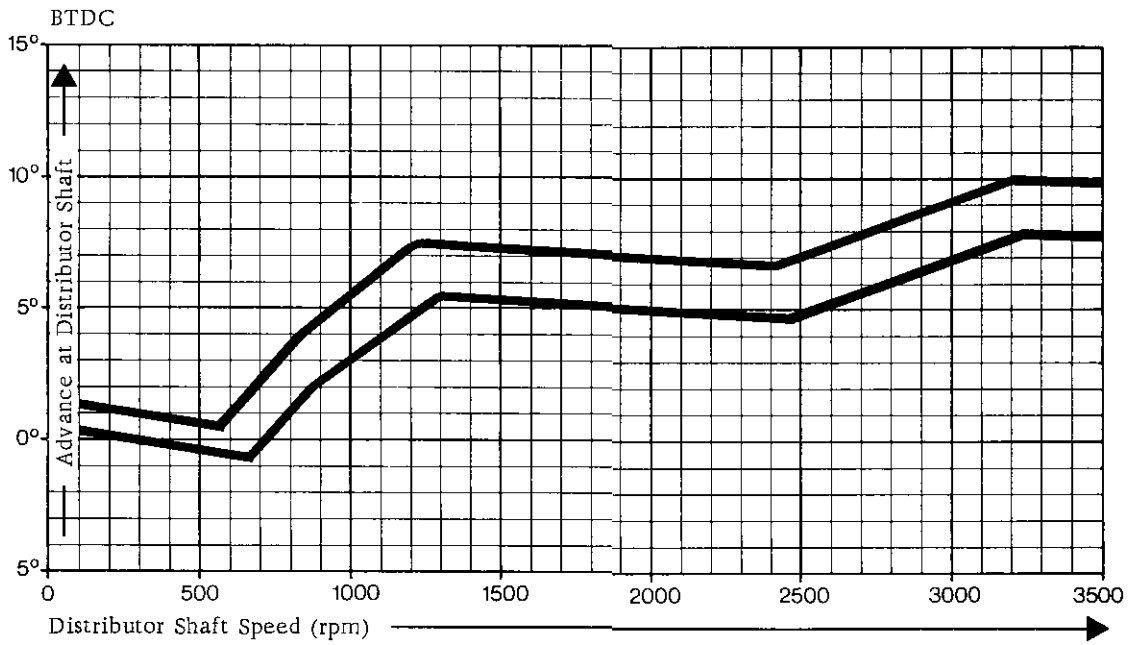
Connect blue hose on connection 2. Adjust speed to 950 ± 50 rpm.

Ignition timing must be between 8 and 12° before TDC.

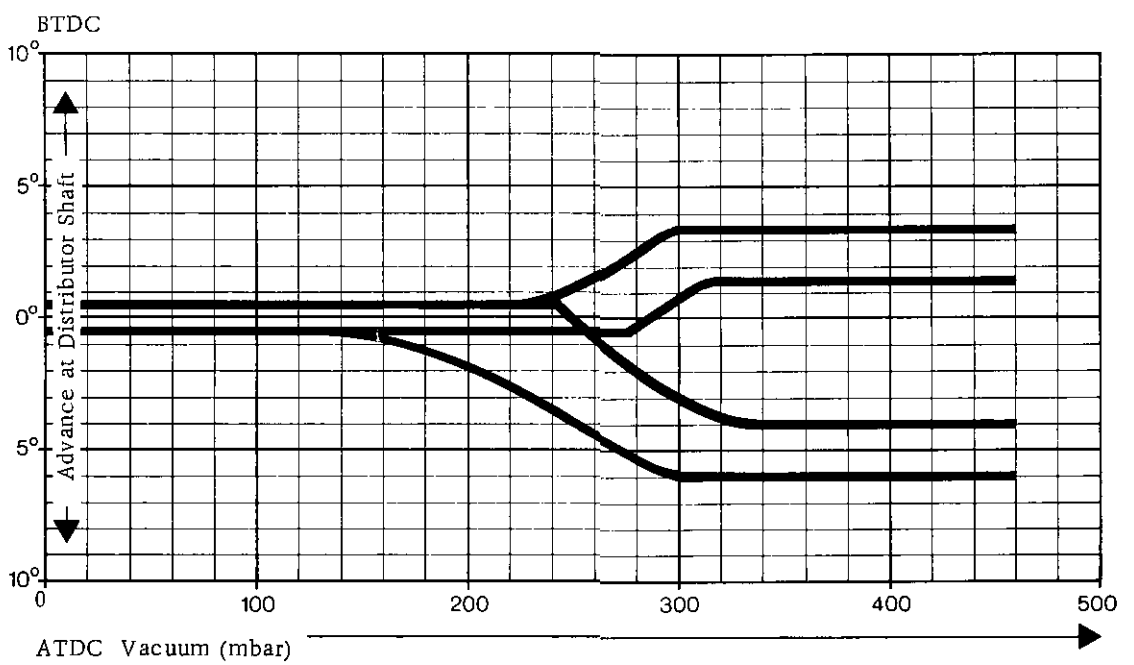
Adjust idle speed after connecting vacuum hoses.

If specified values cannot be reached, remove and check distributor on a test bench.

CENTRIFUGAL ADVANCE CURVE TYPE 911 SC - MODEL 1980



VACUUM ADVANCE CURVE TYPE 911 SC - MODEL 1980

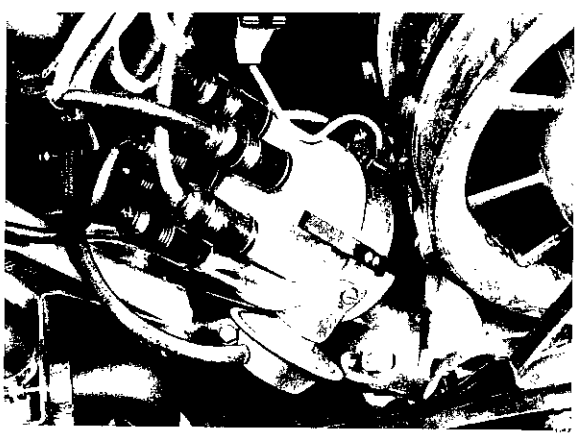


Adjusting Ignition Timing from 1981-Models

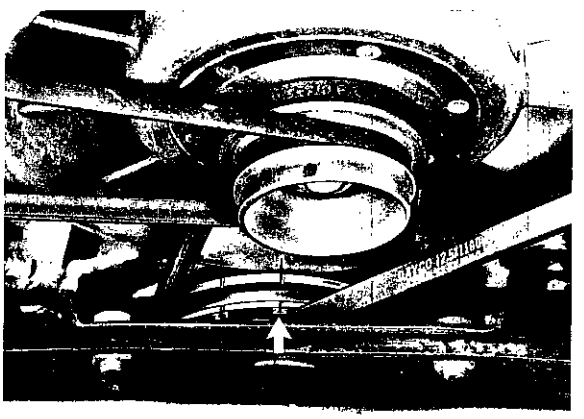
1. Run engine warm (oil temperature about 90°C).

2. Connect engine tester.

3. Pull off vacuum hose.



4. Connect ignition stroboscope lamp.
   25° mark on pulley should be opposite notch on fan housing at 4000 rpm.



Loosen and turn distributor to correct ignition timing.

5. Connect vacuum hose.

Checking Ignition Timing Control from 1981 Models

Requirements:

Ignition timing adjusted to specifications.

1. Centrifugal control (vacuum hose detached).

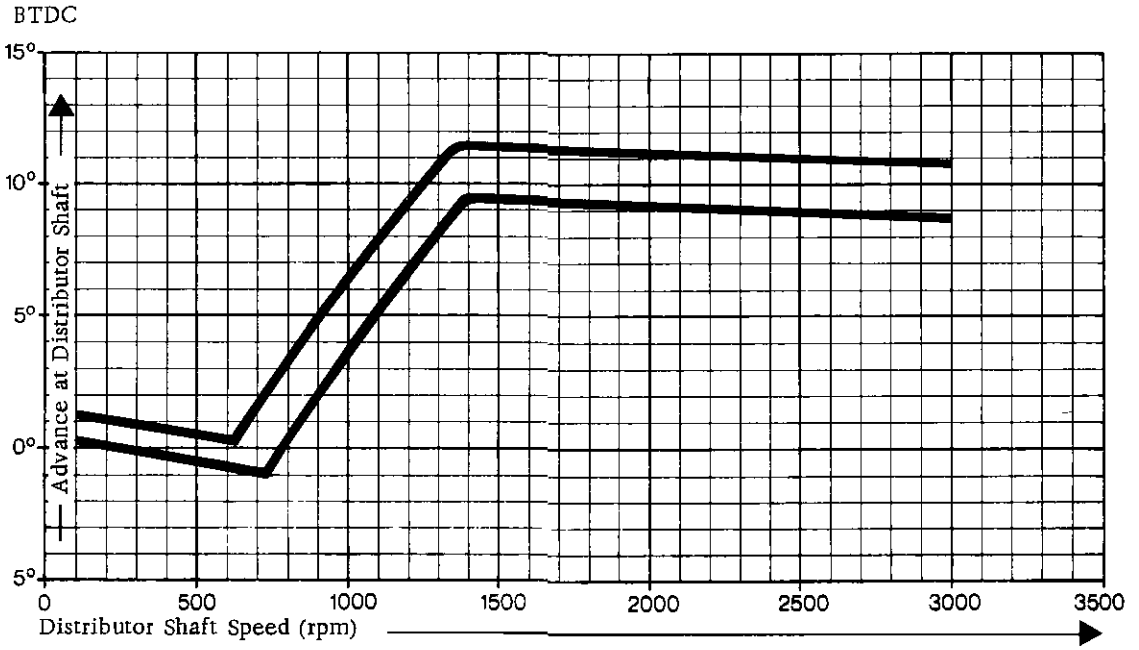
   Ignition timing should be 3 to 5° before TDC at idle speed (900 ± 50 rpm).

   At 6000 rpm ignition timing must not exceed 25° before TDC.

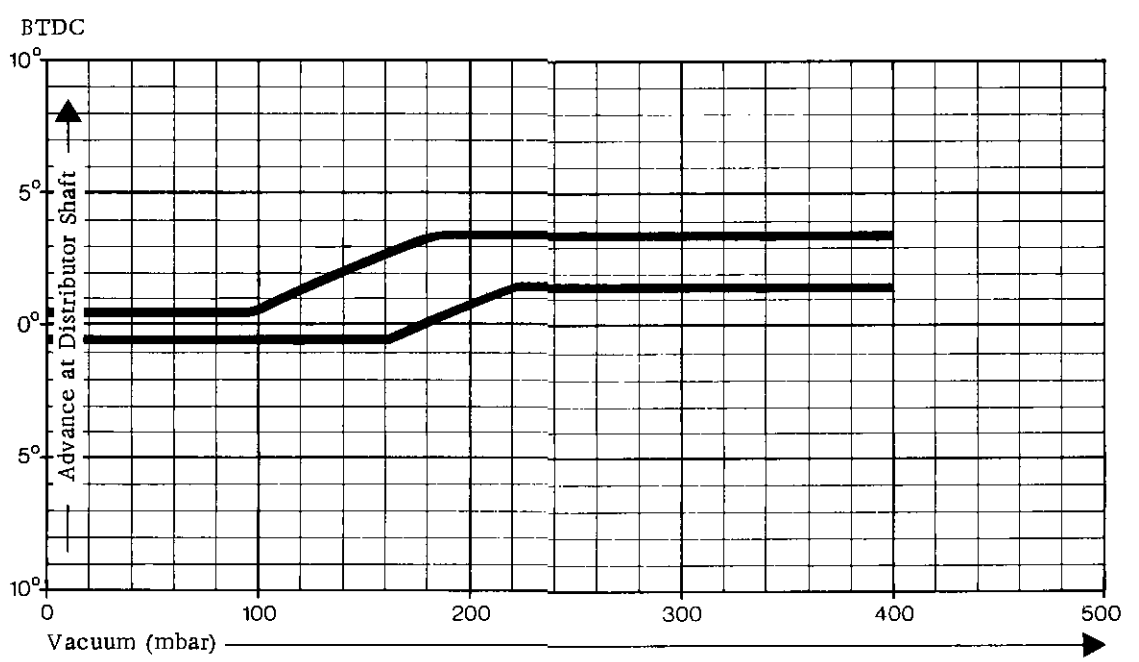
2. Vacuum control (vacuum hose connected).

   At an engine speed of 4000 rpm ignition timing should be between 28 and 32° before TDC.

CENTRIFUGAL ADVANCE CURVE TYPE 911 SC - from 1981 Models



VACUUM ADVANCE CURVE TYPE 911 SC - from 1981 Models



Wartungsarbeiten, Technische Daten
Maintenance, Specifications
Travaux d'entretien, Caractéristiques techniques
Lavori di manutenzione, dati tecnici

CONTENTS

0 - INFORMATION

0.0 Information

1 - TECHNICAL DATA

Specifications	-	Engine	1.1 - 1/1
	-	Fuel System	1.1 - 1/5
	-	Electrical System	1.1 - 1/6
	-	Transmission and Final Drive	1.1 - 1/9
	-	Chassis	1.1 - 1/11
	-	Capacities	1.1 - 1/15
	-	Dimensions	1.1 - 1/15
	-	Weights	1.1 - 1/16
	-	Performance Data	1.1 - 1/17
	-	Specification Changes, from 1973 model	1.1 - 1/19
	-	Carrera 2.7 Specifications	1.1 - 1/21
Specifications for 1974 Models	-		1.1 - 1/25
	-	Filling Capacities	1.1 - 1/25
	-	Dimensions	1.1 - 1/25
	-	Weights	1.1 - 1/26
	-	Performance	1.1 - 1/26
Technical Data - 1981 Models			1.1 - 1/35

2 - MAINTENANCE

2.1 Service Schedule

Service Schedule 2.1 - 1/1

2.2 Lubrication Schedule

Lubrication Schedule 2.2 - 1/1

2.3 Service Schedule

Preventive Maintenance Schedule 2.3 - 1/1

MOTOR	911 T	911 E	911 S
Type	four-stroke gasoline engine with two opposing cylinder banks		
Number of cylinders	6	6	6
Cylinder arrangement	horizontal, three cylinders per bank	horizontal, three cylinders per bank	horizontal, three cylinders per bank
Bore	84 mm (3.31 in.)	84 mm (3.31 in.)	84 mm (3.31 in.)
Stroke	70.4 mm (2.77 in.)	70.4 mm (2.77 in.)	70.4 mm (2.77 in.)
Engine displacement	2341 cc (142.8 cu. in.)	2341 cc (142.8 cu. in.)	2341 cc (142.8 cu. in.)
Compression ratio	7.5 : 1	8.0 : 1	8.5 : 1
Cylinder pressure	maximum difference in compression between cylinders = 1.5 kp/cm^2 (21.3 psi), with engine oil warmed to at least 60°C (140°F).		
Horsepower rating (DIN)	140 HP	165 HP	190 HP
(SAE NET)	133 HP	157 HP	181 HP
at engine speed of	5600 rpm	6200 rpm	6500 rpm
Maximum torque (DIN)	20 mkp	21 mkp	22 mkp
(SAE)	166 ft. lbs.	174 ft. lbs.	181 ft. lbs.
at engine speed of	4000 rpm	4500 rpm	5200 rpm
Specific power output (DIN)	60 HP/ltr	70 HP/ltr	81 HP/ltr
	55 HP/ltr	65 HP/ltr	75 HP/ltr
	.93 HP/cu. in.	1.09 HP/cu. in.	1.26 HP/cu. in.
Maximum engine speed	6500 rpm	7100 rpm	7300 rpm

	911 T	911 E	911 S
Cut off speed of ignition distributor speed limiter	6500 ± 100 rpm	7100 ± 100 rpm	7300 ± 100 rpm
Fuel octane requirement	91	91	91
Engine weight	approx. 183 kp (404 lbs)	approx. 182 kp (402 lbs)	approx. 182 kp (402 lbs)
Nominal fuel comsumption	9.0 ltr/100 km 26.1 mpg	9.5 ltr/100 km 24.7 mpg	10.2 ltr/100 km 23.0 mpg
Cooling system	air cooled by axial fan on alternator shaft	air cooled by axial fan on alternator shaft	air cooled by axial fan on alternator shaft
Air fan drive	by V-belt off crankshaft	by V-belt off crankshaft	by V-belt off crankshaft
Crankshaft to fan ratio	approx. 1 : 1.3	approx. 1 : 1.3	approx. 1 : 1.3
Air flow rate	approx. 1230 ltr/sec @ 5800 rpm	approx. 1380 ltr/sec @ 6500 rpm	approx. 1380 ltr/sec @ 6500 rpm
Lubrication system	dry sump	dry sump	dry sump
Oil cooling system	oil cooler on crankcase in air stream of fan	oil cooler on crankcase in air stream of fan	oil cooler on crankcase in air stream of fan plus auxiliary oil cooler in front of vehicle
Oil pressure indication	by warning light	by warning light	by gauge in kp/cm^2
Oil pressure: engine warm 80°C (175°F) at 5500 rpm	5.5-7 kp/cm^2 (78-99 psi)	5.5-7 kp/cm^2 (78-99 psi)	5.5-7 kp/cm^2 (78-99 psi)
Max. oil temperature	130°C (265°F)	130°C (265°F)	130°C (265°F)
Oil filter type	full flow	full flow	full flow

	911 T	911 E	911 S
Oil consumption	1 1/2 - 2 ltr/100 km 1 1/2 - 2 US qts/600 mi	1 1/2 - 2 ltr/100 km 1 1/2 - 2 US qts/600 mi	1 1/2 - 2 ltr/100 km 1 1/2 - 2 US qts/600 mi
Crankcase	two-piece pressure casting of aluminum/magnesium alloy	two-piece pressure casting of aluminum/magnesium alloy	two-piece pressure casting of aluminum/magnesium alloy
Crankshaft	forged, surface-hardened	forged. surface-hardened	forged, surface-hardened
Crankshaft bearings	eight, plain journal	eight, plain journal	eight, plain journal
Main bearings 1-7	split shell, tri-metal inserts	split shell, tri-metal inserts	split shell, tri-metal inserts
Main bearing 1	thrust bearing	thrust bearing	thrust bearing
Main bearing 8	one-piece bushing, hard-lead lined	one-piece bushing, hard-lead lined	one-piece bushing, hard-lead lined
Connecting rods	forged steel	forged steel	forged steel surface-hardened
Connecting rod bearings	split shell, tri-metal inserts	split shell, tri-metal inserts	split shell, tri-metal inserts
Piston pin bushings	bronze, pressed-in	bronze, pressed-in	bronze, pressed-in
Intermediate shaft bearings	two, plain journal	two, plain journal	two, plain journal
Pistons	light-alloy, die-cast	light-alloy, die-cast	light-alloy, die-cast box-shaped
Piston pins	floating, secured with circlips	floating, secured with circlips	floating, secured with circlips
Piston rings	two compression rings, one oil scraper	two compression rings, one oil scraper	two compression rings, one oil scraper

	911 T	911 E	911 S
Cylinders	individual, grey-cast iron with integral cooling fins	individual, grey-cast iron sleeve with finned light alloy jacket	individual, grey-cast iron sleeve with finned light alloy jacket
Cylinder heads	light alloy, finned individual castings for each cylinder	light alloy, finned individual castings for each cylinder	light alloy (Y-alloy) finned individual castings for each cylinder
Valve seat inserts	shrunk-in, grey-cast iron alloy	shrunk-in, grey-cast iron alloy	shrunk-in, grey-cast iron alloy
Valve guides	shrunk-in, special bronze	shrunk-in, special bronze	shrunk-in, special bronze
Spark plug threads	14 x 1.25, machined into cylinder heads	14 x 1.25, machined into cylinder heads	14 x 1.25, machined into cylinder heads
Valves	1 intake and 1 exhaust valve per cylinder	1 intake and 1 exhaust valve per cylinder	1 intake and 1 exhaust valve per cylinder
Valve arrangement	overhead in "V"	overhead in "V"	overhead in "V"
Exhaust valves	sodium cooled, with reinforced seat	sodium cooled, with reinforced seat	sodium cooled, with reinforced seat
Valve springs	2 coil springs per valve	2 coil springs per valve	2 coil springs per valve
Valve timing	OHC, 1 camshaft per cylinder bank	OHC, 1 camshaft per cylinder bank	OHC, 1 camshaft per cylinder bank
Camshafts	cast steel, in three plain journal bearings in camshaft housing	cast steel, in three plain journal bearings in camshaft housing	cast steel, in three plain journal bearings in camshaft housing
Camshaft drive	by chain	by chain	by chain

	911 T	911 E	911 S
Valve timing with 1 mm (0.039 in.) valve clearance			
inlet opens	15° BTDC	18° BTDC	38° BTDC
inlet closes	29° ATDC	36° ATDC	50° ATDC
exhaust opens	41° BTDC	38° BTDC	40° BTDC
exhaust closes	5° BTDC	8° ATDC	20° ATDC
Intake valve lift at overlap TC with 0.1 mm (0.004 in.) valve clearance	2.3 - 2.7 mm (0.091 - 0.106 in.)	2.7 - 3.1 mm (0.106 - 0.122 in.)	5.0 - 5.4 mm (0.197 - 0.213 in.)
Valve clearance, cold, intake and exhaust	0.10 mm (0.004 in.) measured between valve stem and rocker arm	0.10 mm (0.004 in.) measured between valve stem and rocker arm	0.10 mm (0.004 in.) measured between valve stem and rocker arm
Clutch	single plate, dry, pull-actuated	single plate, dry, pull-actuated	single plate, dry, pull actuated
Pressure plate type	MFZ 225 KL, Fichtel & Sachs	MFZ 225 KL, Fichtel & Sachs	MFZ 225 KL, Fichtel & Sachs
Plate pressure	650 - 720 kp (143 - 159 lbs.)	650 - 720 kp (143 - 159 lbs.)	650 - 720 kp (143 - 159 lbs.)
FUEL SYSTEM	BOSCH intake manifold fuel injection with double row six-plunger, injection pump	BOSCH intake manifold fuel injection with double row six-plunger, injection pump	BOSCH intake manifold fuel injection with double row six-plunger, injection pump
Air cleaner	induction air silencer with cartridge filter and induction air preheating system	induction air silencer with cartridge filter and induction air preheating system	induction air silencer with cartridge filter and induction air preheating system

	911 T	911 E	911 S
Fuel pump	1 electric roll-cell pump	1 electric roll-cell pump	1 electric roll-cell pump
Transfer rate	125 ltr/h (128 qts/h)	125 ltr/h (128 qts/h)	125 ltr/h (128 qts/h)
Operating pressure	1 kp/cm^2 (14.2 psi)	1 kp/cm^2 (14.2 psi)	1 kp/cm^2 (14.2 psi)
Pressure relief valve opens at	approx. 2 kp/cm^2 (28.4 psi)	approx. 2 kp/cm^2 (28.4 psi)	approx. 2 kp/cm^2 (28.4 psi)
Fuel filter	fuel screen ahead of fuel injection pump with built-in restrictor valve	fuel screen ahead of fuel injection pump with built-in restrictor valve	fuel screen ahead of fuel injection pump with built-in restrictor valve
ELECTRICAL SYSTEM			
Operating voltage	12 volts	12 volts	12 volts
Battery capacity	2 x 36 Ah	2 x 36 Ah	2 x 36 Ah
Generator	AC, 770 watts	AC, 770 watts	AC, 770 watts
Voltage regulator	same make as generator	same make as generator	same make as generator
Ignition type	capacitive discharge system (CDS)	capacitive discharge system (CDS)	capacitive discharge system (CDS)
Firing order	1 - 6 - 2 - 4 - 3 - 5	1 - 6 - 2 - 4 - 3 - 5	1 - 6 - 2 - 4 - 3 - 5
Ignition transformer	BOSCH	BOSCH	BOSCH
Distributor (either kind)	MARELLI 50.10.974.1 BOSCH JFUDR6 0231169003	MARELLE 50.10.974.2 BOSCH JFUDR6 0231169004	MARELLI 50.10.974.3 BOSCH JFUDR6 0231169005
Spark advance	centrifugal and vacuum	centrifugal and vacuum	centrifugal and vacuum
Basic ignition timing	5° ATDC @ 900 rpm	5° ATDC @ 900 rpm	5° ATDC @ 900 rpm
Dwell angle	BOSCH 38° ± 3° MARELLI 40° ± 3°	BOSCH 38° ± 3° MARELLI 40° ± 3°	BOSCH 38° ± 3° MARELLI 40° ± 3°

	911 T	911 E	911 S
Spark plugs (either kind)	BOSCH W 235 P 21 or similar	BOSCH W 265 P 21 BERU 265/14/3 P or similar	BOSCH W 265 P 21 BERU 265/14/3 P or similar
Electrode gap	0.5 - 0.6 mm	0.5 - 0.6 mm	0.5 - 0.6 mm
Starter	BOSCH 12 V, 1.5 HP	BOSCH 12 V, 1.5 HP	BOSCH 12 V, 1.5 HP
Bulb List (12 V)			
Headlamps (Halogen) H 1	(see USA table)	55 W, 2 each lamp	55 W, 2 each lamp
Driving lamps (Halogen) H 1 and H 3	(see USA table)	55 W	55 W
Fog lamps	35 W	55 W	55 W
Stop lamp/tail lamp	(see USA table)	21/5 W	21/5 W
Directional signals	(see USA table)	21 W	21 W
Backup lamp	(see USA table)	15 W	15 W
Fog tail lamp	(not for USA)	18 W	18 W
Interior lamp, luggage compartmet lamp, glove compartment lamp	10 W	10 W	10 W
Parking lamp, license plate lamp	(see USA table)	4 W	4 W
Instrument lamps, control lamps, ashtray lamp	2 W	2 W	2 W
Control lamp for ventilator and auxiliary heater	1.2 W	1.2 W	1.2 W

Bulb List	911 T	911 E	911 S
Sealed beam headlamps	50/40 W (6012)	50/40 W (6012)	50/40 W (6012)
Fog lamps	35 W	35 W	35 W
Stop/tail lamp	32/3 cp (1034)	32/3 cp (1034)	32/3 cp (1034)
Front turn signal/parking lamps	32/3 cp (1034)	32.3 cp (1034)	32/3 cp (1034)
Rear turn signal	32 cp (1073)	32 cp (1073)	32 cp (1073)
Backup lamp	15 cp (1003)	15 cp (1003)	15 cp (1003)
Sidemarker lamp	2 cp (1889)	2 cp (1889)	2 cp (1889)
Interior lamp, luggage compartment lamp, glove compartment lamp	10 W	10 W	10 W
License plate lamp	4 W	4 W	4 W
Instrument lamps, control lamps, ashtray lamp	2 W	2 W	2 W
Control lamp for ventilator and auxiliary heater	1.2 W	1.2 W	1.2 W
Fuses			
Fuse Box I			
1 - Interior lamp, luggage compartment lamp, glove compartment lamp, clock	5 A	5 A	5 A
2 - Emergency flasher	16 A	16 A	16 A
3 - Power windows	25 A	25 A	25 A
4 - Cigarette lighter (auxiliary heater)	16 A (25 A)	16 A (25 A)	16 A (25 A)
5 - Sun roof, rear window wiper	16 A	16 A	16 A
6 - Windshield wipers, windshield washer	25 A	25 A	25 A
7 - Fresh air fan, rear window defroster	25 A	25 A	25 A

	911 T	911 E	911 S
8 - Stop, rear turn signal, and backup lamps	16 A	16 A	16 A
9 - Left front turn signal lamp	5 A	5 A	5 A
10 - Right front turn signal lamp	5 A	5 A	5 A
Fuse Box II			
1 - High beam, left	8 A	8 A	8 A
2 - High beam, right	8 A	8 A	8 A
3 - Low beam, left	8 A	8 A	8 A
4 - Low beam, right	8 A	8 A	8 A
5 - Parking lamp, left	5 A	5 A	5 A
6 - Parking lamp, right	5 A	5 A	5 A
7 - License plate lamp	5 A	5 A	5 A
8 - Fog lamp	16 A	16 A	16 A
TRANSMISSION AND FINAL DRIVE			
Type	Transmission and differential unitized in one assembly	Transmission and differential unitized in one assembly	Transmission and differential unitized in one assembly
Transmission	4 forward speeds, one reverse, with Porsche synchronization (5 speeds optional)	4 forward speeds, one reverse, with Porsche synchronization (5 speeds optional)	4 forward speeds, one reverse, with Porsche synchronization (5 speeds optional)

	911 T	911 E	911 S
Gear ratio, reverse speed	3.325 : 1	3.325 : 1	3.325 : 1
Gear shift system	shift linkage with floor mounted gearshift lever	shift linkage with floor mounted gearshift lever	shift linkage with floor mounted gearshift lever
Rear axle drive	spiral bevel gears, differential unit	spiral bevel gears, differential unit	spiral bevel gears, differential unit
Rear axle ratio	7/31, 4.429 : 1	7/31, 4.429 : 1	7/31, 4.429 : 1
Power transfer	to rear wheels by drive shafts with two CV joints per shaft	to rear wheels by drive shafts with two CV joints per shaft	to rear wheels by drive shafts with two CV joints per shaft
Gearbox weight	approx. 49 kp (108 lbs), ready for installation including oil supply but without starter.	approx. 49 kp (108 lbs), ready for installation including oil supply but without starter.	approx. 49 kp (108 lbs), ready for installation including oil supply but without starter.
Limited slip differential	ZF limited slip differential optional with manual transmissions	ZF limited slip differential optional with manual transmissions	ZF limited slip differential optional with manual transmissions
Sportomatic Transmission Type	925/00	925/00	925/01
Clutch (190 mm dia)	hydraulic torque converter and vacuum actuated single plate, dry clutch MFZ 190K	hydraulic torque converter and vacuum actuated single plate, dry clutch MFZ 190K	hydraulic torque converter and vacuum actuated single plate, dry clutch MFZ 190K
Number of gears	4 forward, 1 reverse, and parking lock	4 forward, 1 reverse, and parking lock	4 forward, 1 reverse, and parking lock
Selector lever location	floor mounted on center tunnel	floor mounted on center tunnel	floor mounted on center tunnel
Torque converter ratio	2.19 : 1	2.19 : 1	2.10 : 1
Rear axle ratio	7/27, 3.857 : 1	7/27, 3.857 : 1	7/27, 3.857 : 1

	911 T	911 E	911 S
Tow-start speed in "L"	35 kmh (21 mph)	35 kmh (21 mph)	35 kmh (21 mph)
Stallspeed	approx. 2500 - 2700 rpm	approx. 2500 - 2700 rpm	approx. 2900 - 3100 rpm
Clutch speed	approx. 3000 rpm	approx. 3000 rpm	approx. 3000 rpm
CHASSIS			
Body characteristics	welded assembly, sheet metal box section, unitized with body	welded assembly, sheet metal box section, unitized with body	welded assembly, sheet metal box section, unitized with body
Wheel suspension, front	independent, with shockabsorber struts and transverse control arms	independent, with shockabsorber struts and transverse control arms	independent, with shockabsorber struts and transverse control arms
rear	independent, with triangulated control arms	independent, with triangulated control arms	independent, with triangulated control arms
Springing, front	1 round longitudinal torsion bar per wheel	1 round longitudinal torsion bar per wheel	1 round longitudinal torsion bar per wheel
rear	1 round transverse torsion bar per wheel	1 round transverse torsion bar per wheel	1 round transverse torsion bar per wheel
Rear control arm adjustment (spring plate inclination)	36° 30' to 37°	36° 30' to 37°	36° 30' to 37°

		911 T	911 E	911 S
Shockabsorbers	front	double-action hydraulic shockabsorber strub	double-action hydraulic shockabsorber strub	double-action hydraulic shockabsorber strub
	rear	double-action hydraulic shockabsorber	double-action hydraulic shockabsorber	double-action hydraulic shockabsorber
Stabilizers				transverse, 15 mm (0,59 in.) dia
Steering		rack-steering ZF	rack-steering ZF	rack-steering ZF
Mean steering ratio		17,78 : 1	17,78 : 1	17,78 : 1
Steering wheel turns, lock-to-lock		approx. 3,1	approx. 3,1	approx. 3,1
Smallest turning circle		approx. 10,7 m (35,1 ft.)	approx. 10,7 m (35,1 ft.)	approx. 10,7 m (35,1 ft.)
Toe-in.	front	± 0 '	± 0 '	± 0 '
	rear	0° to + 20 ' per wheel	0° to + 20 ' per wheel	0° to + 20 ' per wheel
Chamber	front	0° ± 10 '	0° ± 10 '	0° ± 10 '
	rear	- 1° ± 10 '	- 1° ± 10 '	- 1° ± 10 '
Caster		6° 5 ' ± 15 '	6° 5 ' ± 15 '	6° 5 ' ± 15 '
Inclination		10° 55 '	10° 55 '	10° 55 '
Difference angle, front wheels turned 20°		0 to 30 '	0 to 30 '	0 to 30 '

	911 T	911 E	911 S
Wheels	steel, 5 1/2J x 15, optional 6J x 15 steel or light alloy	steel, 6J x 15 or optional light alloy	6J x 15 light-alloy
Tires	165 HR 15	185/70 VR 15	185/70 VR 15
Tire pressures (cold)			
front	2.0 atm (29 psi)	2.0 atm (29 psi)	2.0 atm (29 psi)
rear	2.4 atm (35 psi)	2.4 atm (35 psi)	2.4 atm (35 psi)
Service brake	hydraulic, dual-circuit, vented - disc brakes on all four wheels	hydraulic, dual-circuit, vented - disc brakes on all four wheels	hydraulic, dual-circuit, vented - disc brakes on all four wheels
Total effective braking surface (foot brake)	210 cm^2 (32.55 sg.in.)	210 cm^2 (32.55 sg.in.)	257 cm^2 (39.84 sg. in.)
Effective brake disc diameter front	235 mm (9.25 in.)	235 mm (9.25 in.)	228 mm (8.98 in.)
rear	244 mm (9.61 in.)	244 mm (9.61 in.)	244 mm (9.61 in.)
Parking brake	mechanical, to rear wheels	mechanical, to rear wheels	mechanical, to rear wheels
BODY			
Type	all-steel body, unitized with underbody, sloping front, fastback rear in Coupe	all-steel body, unitized with underbody, sloping front, fastback rear in Coupe	all-steel body, unitized with underbody, sloping front, fastback rear in Coupe
Doors	2 doors attached to the body A-pillars	2 doors attached to the body A-pillars	2 doors attached to the body A-pillars

	911 T	911 E	911 S
Door opening angle	approx. 70°	approx. 70°	approx. 70°
Windows			
Windshield	one-piece, constant radius, convex contour, laminated safety glass	one-piece, constant radius, convex contour, laminated safety glass	one-piece, constant radius, convex contour, laminated safety glass
Door windows	crankdown windows	crankdown windows	crankdown windows
Rear side windows	open and lock in position	open and lock in position	open and lock in position
Rear window	one-piece, convex contour, electrically heated	one-piece, convex contour, electrically heated	one-piece, convex contour, electrically heated
Windshield wipers	electric, 2 parallel wiping arms, 3 speeds	electric, 2 parallel wiping arms, 3 speeds	electric, 2 parallel wiping arms, 3 speeds
Front hood	opens from front of vehicle, with hydraulic stays, hood release under instrument panel	opens from front of vehicle, with hydraulic stays, hood release under instrument panel	opens from front of vehicle, with hydraulic stays, hood release under instrument panel
Engine compartment lid	opens from rear of vehicle, with hydraulic stays, lid release in left rear door post	opens from rear of vehicle, with hydraulic stays, lid release in left rear door post	open from rear of vehicle, with hydraulic stays, lid release in left rear door post
Heating	hot air heating with remote control; hot air mixable with outside air; 2 defroster outlets at the windshield, and 2 hot air outlets into passenger compartment leg area	hot air heating with remote control; hot air mixable with outside air; 2 defroster outlets at the windshield, and 2 hot air outlets into passenger compartment leg area	hot air heating with remote control; hot air mixable with outside air; 2 defroster outlets at the windshield, and 2 hot air outlets into passenger compartment leg area

	911 T	911 E	911 S
Ventilation	flap-controlled fresh air chamber, 3-speed fan, air distributor system, centralized control unit	flap-controlled fresh air chamber, 3-speed fan, air distributor system, centralized control unit	flap-controlled fresh air chamber, 3-speed fan, air distributor system, centralized control unit
CAPACITIES			
Engine	approx. 8 ltr (8.5 US qts) premium quality HD oil according to API classification SD or SE; summer SAE 30, winter SAE 20, below -15°C (+5°F) SAE 10 W	approx. 8 ltr (8.5 US qts) premium quality HD oil according to API classification SD or SE; summer SAE 30, winter SAE 20, below -15°C (+5°F) SAE 10 W	approx. 8 ltr (8.5 US qts) premium quality HD oil according to API classification SD or SE; summer SAE 30, winter SAE 20, below -15°C (+5°F) SAE 10 W first filling approx. 9 ltr (9.5 US qts) with oil cooler
Engine together with Sportomatic (torque converter in engine oil circuit)	approx. 10 ltr (10.5 US qts)	approx. 10 ltr (10.5 US qts)	approx. 11 ltr (11.5 US qts) with oil cooler
Transmission and differential	approx. 3.0 ltr (3 US qts) SAE 30 transmission oil, specification MIL-L 2105 or MIL-L 2105 B	approx. 3.0 ltr (3 US qts) SAE 30 transmission oil, specification MIL-L 2105 or MIL-L 2105 B	approx. 3.0 ltr (3 US qts) SAE 30 transmission oil, specification MIL -L 2105 or MIL-L 2105 B
Fuel tank	approx. 62 ltrs (16.4 US gals) including 6 ltrs (1.6 US gals) reserve Fuel requirement: 91 octane (RON)	approx. 62 ltrs (16.4 US gals) including 6 ltrs (1.6 US gals) reserve Fuel requirement: 91 octane (RON)	approx. 62 ltrs (16.4 US gals) including 6 ltrs (1.6 US gals) reserve Fuel requirement: 91 octane (RON)
Brake fluid reservoir	approx. 0.2 ltr (0.42 US pints)	approx. 0.2 ltr (0.42 US pints)	approx. 0.2 ltr (0.42 US pints)
Windshield washer reservoir	approx. 2.0 ltr (2 US qts)	approx. 2.0 ltr (2 US qts)	approx. 2.0 ltr (2 US qts)
DIMENSIONS Vehicle empty according to DIN			
Wheelbase	2271 mm (89.4 in.)	2271 mm (89.4 in.)	2271 mm (89.4 in.)
Track, front (wheel center 108 mm above torsion bar center)	1360 mm (53.54 in.)	1372 mm (54.0 in.)	1372 mm (54.0 in.)
Track, rear (wheel center 12 mm below transverse tube center)	1342 mm (52.82 in.)	1354 mm (53.34 in.)	1354 mm (53.34 in.)

	911 T	911 E	911 S
Length, USA and Canada only	4163 mm (163.9 in.)	4163 mm (163.9 in.)	4163 mm (163.9 in.)
Width	1610 mm (63.39 in.)	1610 mm (63.39 in.)	1610 mm (63.39 in.)
Height (unladen)	1320 mm (51.97 in.)	1320 mm (51.97 in.)	1320 mm (51.93 in.)
Ground clearance	150 mm (5.91 in.)	150 mm (5.91 in.)	150 mm (5.91 in.)
WEIGHTS			
Unloaden weight	1061 kp (2340 lbs)	1061 kp (2340 lbs)	1061 kp (2340 lbs)
Maximum load capacity	280 kp (617 lbs)	280 kp (617 lbs)	280 kp (617 lbs)
Total permissible weight	1400 kp (3086 lbs)	1400 kp (3086 lbs)	1400 kp (3086 lbs)
Maximum axle load, front	600 kp (1320 lbs)	600 kp (1320 lbs)	600 kp (1320 lbs)
rear	840 kp (1852 lbs)	840 kp (1852 lbs)	840 kp (1852 lbs)
Permissible trailer weight,			
without brakes	480 kp (1058 lbs)	480 kp (1058 lbs)	480 kp (1058 lbs)
with brakes	600 kp (1320 lbs)	600 kp (1320 lbs)	600 kp (1320 lbs)

	911 T	911 E	911 S
PERFORMANCE DATA			
Max. speed (with 4 or 5 speed transmission)	208 kmh 129 mph	220 kmh 137 mph	230 kmh 143 mph
	with Sportomatic transmission ca. 5 kmh (3 mph) slower than shown above		
1 km with standing start at DIN empty weight + 1/2 loading capacity	30.0 sec	28.5 sec	27.5 sec
Weight-to-power ration DIN	7.5 kp/HP	6.37 kp/HP	5.52 kp/HP
Nominal fuel consumption	9.0 ltr/100 km 26.1 mpg(US)	9.5 ltr/100 km 24.7 mpg (US)	10.2 ltr/100 km 23.0 mpg (US)
Engine oil consumption	1.5 - 2.0 ltr (1.5 - 2.0 US qts per 600 miles)	1.5 - 2.0 ltr (1.5 - 2.0 US qts per 600 miles)	1.5 - 2.0 ltr (1.5 - 2.0 US qts per 600 miles)

SPECIFICATION CHANGES EFFECTIVE WITH 1973 MODELS

	911 T	911 E	911 S
CAPACITIES			
(Initial filling)			
Engine with transmission	Approx. 2.77 US gals. (10.5 ltr.) quality brand HD oil, API classification SD or SE, summer SAE 30, winter SAE 20, below + 5° F (-15° C). SAE 10 W		Initial filling approx. 3.43 US gals. (13 ltr.) with oil cooler.
Engine together with Sportomatic (torque converter in engine oil circuit)	Approx.3.43 US gals. (13 ltr.)		Approx. 4.09 US gals. (15.5 ltr.) with oil cooler.
Fuel tank	16.4 US gals. (62 ltr.) 1.6 US gals. (6 ltr.) reserve included		
DIMENSIONS			
Vehicle empty = DIN			
Wheelbase	4277 mm (168.39") (Bumpers front and rear)		
WEIGHTS			
Empty weight, DIN	2425 lbs. (1100 kg)		

CARRERA 2.7 SPECIFICATIONS

Shown below are specifications which differ from Type 911 S/2.4

ENGINE		TOURING	SPORT
Bore	mm	90	90
Stroke	mm	70.4	70.4
Displacement	cc	2687	2687
Compression ratio	ϵ	8.5 : 1	8.5 : 1
Compression pressure	kp/cm^2	max. difference between cylinders = 1.5 kp/cm^2, engine oil temp = 60°C (140°F) minimum	
Horsepower rating (DIN)	HP (KW)	210 (154)	210 (154)
Horsepower rating (SAE)	HP (KW)	230 (172)	230 (172)
at engine speed of	rpm	6300	6300
Max. torque	mkp (Nm)	26 (255)	26 (255)
at engine speed of	rpm	5100	5100
Specific power output (DIN)	HP/ltr (KW/ltr)	78 (57)	78 (57)
Mean piston speed at maximum power	m/sec	14.8	14.8
Mean pressure at Md. max.	kp/cm^2	12.19	12.19
Max. permissible engine speed	rpm	7300	7300
Fuel octane requirements	RON	91	91
Pistons		light-alloy, forged	
Cylinders		light-alloy cylinders with Ni coating	
Clutch	Type	MFZ 225 KL	MFZ 225 KL
Clutch pressure	kp	720 - 780	720 - 780
Fuel System			
Injection pump	BOSCH # PORSCHE #	0408126019 911.110.254.00	0408126019 911.110.254.00

		TOURING	SPORT
ELECTRICAL SYSTEM			
Operating voltage	V	12	12
Battery capacity	Ah	2 x 36	1 x 36
Ignition distributor (either brand)	BOSCH MARELLI	0231169011 61015155	0231169011 61015155
Breaker point gap (BOSCH and MARELLI)	mm	0.35	0.35
Dwell angle	BOSCH MARELLI	$38^{\circ} \pm 3^{\circ}$ $37^{\circ} \pm 3^{\circ}$	$38^{\circ} \pm 3^{\circ}$ $37^{\circ} \pm 3^{\circ}$
Basic ignition timing (vacuum hose attached)		TDC at 900 rpm	TDC at 900 rpm
Spark plugs (gap in mm)	BOSCH BOSCH BERU BERU	W 265 P 21 (0.55) W 260 T 2 (0.7) 265/14/3P (0.55) 260/14/3 (0.7)	W 265 P 21 (0.55) W 260 T 2 (0.7) 265/14/3P (0.55) 260/14/3 (0.7)
TRANSMISSION AND DIFFERENTIAL			
Ratios, 5-speed transmission	1st gear 2nd gear 3rd gear 4th gear 5th gear Reverse	11/35 = 3.182 18/33 = 1.834 23/29 = 1.261 27/25 = 0.925 29/21 = 0.724 $\frac{12/21}{20/38}$ = 3.325	11/35 = 3.182 18/33 = 1.834 23/29 = 1.261 27/25 = 0.925 29/21 = 0.724 $\frac{12/21}{20/38}$ = 3.325
Rear axle ratio		7 : 31 = 4.429	7 : 31 = 4.429
Climbing ability (calculated)			
5-speed transmission, vehicle empty per DIN plus 1/2 load	1st gear 2nd gear 3rd gear 4th gear 5th gear	100 % 52.5 % 30.5 % 20 % 12.5 %	100 % 55 % 32 % 21 % 13 %
CHASSIS			
Stabilizer, front/rear	mm dia.	18/19 or 15/15	18/19 or 15/15
Wheels, front, forged light-alloy rear, forged light-alloy		6 J x 15 7 J x 15	6 J x 15 7 J x 15
Tires, front rear		185/70 VR 15 215/60 VR 15	185/70 VR 15 215/60 VR 15
Tire pressure, front/rear	kp/cm^2 (bar)	2.0/2.0 (1.96/1.96)	2.0/2.0 (1.96/1.96)
Spare tire, Collapsible		5 1/2 J x 15 steel	6 J x 15 light-alloy
Torsion bar adjustment		36° 30'	33°

		TOURING	SPORT
DIMENSIONS WHEN EMPTY PER DIN			
Track, front	mm	1372	1372
Track, rear, with 7 mm spacer on each wheel	mm	1394	1394
Wheel center above center of front torsion bar	mm	108	118
Wheel center below center of rear transverse tube	mm	12	2
Overall width	mm	1652	1652
WEIGHTS			
Engine weight	kg (lbs)	182 (402)	182 (402)
Empty, per DIN	kg	1075	960
Total permissible weight	kg	1400	1400
Permissible axle load, front rear	kg kg	600 840	600 840
Power/weight ratio	kg/HP (kg/KW)	5.1 (7.0)	4.55 (6.2)
PERFORMANCE DATA			
Max. speed	kmh (mph)	240 (149)	245 (153)
Acceleration, 0 - 100 km (0-62 mph) empty per DIN + 1/2 load	sec	6.3	5.8
Standing kilometer empty per DIN + 1/2 load	sec	26.5	25.5
Nominal fuel consumption	ltr./100 km	10.8	10.8
FILLING CAPACITIES			
Engine (initial filling)			
Dipstick min/max	ltr. (US guarts)	11/13 (12/13)	11/13 (12/13)
Oil change quantity	ca. ltr. (US guarts)	10 (10)	10 (10)
Transaxle (*)	ca. ltr. (US pints)	3 (6.3)	3 (6.3)
Fuel tank	ltr. (US gal.)	85 less 9 reserve (22 less 2)	85 less 9 reserve (22 less 2)

(*) EP oil Mil-L 2105 or 2105 B
Limited-slip differential:
Kendall 80/90 M 2 C 119 A or eguiralent.

SPECIFICATIONS FOR 1974 MODELS

	911	911 S	Carrera
FILLING CAPACITIES			
Engine (initial filling) (applies to dipstick check according to owner's manual)	approx. 11 ltr. (11.6 US gts) premium brand HD oil, API classification SD or SE; summer SAE 30, winter SAE 20, below -15° C SAE 10 W	same as 911	approx. 13 ltr. (13.7 US gts) with oil cooler
Engine with Sportomatic transmission	approx. 2 ltr. (2.1 US gts) more	same as 911	same as 911
Transmission and differential	approx. 3 ltr. (3.2 US gts) per MIL-L-2105 or MIL-L-2105B, SAE 90	same as 911	same as 911
Sportomatic transmission	approx. 2.5 ltr. (2.6 US gts)	same as 911	same as 911
Fuel tank	80 ltr. (22 US gal.) less 8 ltr. (2 US gal.) reserve	same as 911	same as 911
Brake fluid reservoir	approx. 0.2 ltr. (0.4 US pt)	same as 911	same as 911
Windshield washer reservoir	approx. 8.5 ltr. (9 US gts)	same as 911	same as 911
DIMENSIONS PER DIN EMPTY WEIGHT			
Wheelbase	2271 mm	same as 911	same as 911
Length	4291 mm	same as 911	same as 911
Width	1610 mm	sama as 911	same as 911
Height	1320 mm	same as 911	same as 911
Ground clearance	150 mm	same as 911	same as 911

	911	911 S	Carrera
WEIGHTS			
Empty weight, per DIN	1075 kg	same as 911	same as 911
with Sportomatic transmission	1090 kg	same as 911	same as 911
Max. permissible weight	1400 kg	same as 911	same as 911
Permissible axle load,			
front	600 kg	same as 911	same as 911
rear	840 kg	same as 911	same as 911
Trailer weight,			
w/o brakes	480 kg	same as 911	same as 911
with brakes	800 kg	same as 911	same as 911
PERFORMANCE			
Max. speed kmh (mph) (with 4-speed or 5-speed transmission)	210 (125)	225 (137)	240 (149)
with Sportomatic	approx. 5 kmh (3 mph) less	same as 911	same as 911
Acceleration, 0 - 100 kmh (0 - 62 mph) per DIN empty weight + 1/2 load	8.5 sec.	7.6 sec.	6.3 sec.
Standing kilometer (per DIN empty weight + 1/2 load)	29.0 sec.	28.0 sec.	26.5 sec.
Specific power output (per DIN 70020 empty weight)	7.2 kg/HP 9.8 kg/KW	6.1 kg/HP 8.3 kg/KW	5.2 kg/HP 5.5 kg/KW
Fuel consumption (average consumption in highway traffic, incl. maximum speed travel)	14 ltr/100 km (17 mi. per US gal.)	15 ltr/100 km (16 mi. per US gal.)	18 ltr/100 km (13 mi. per US gal.)
Oil consumption	approx. 1.5 ltr/1000 km (2.5 US gts/1000 mi.)	same as 911	same as 911

TECHNICAL DATA 1975 MODELS

	911 S	Carrera
CAPACITIES		
Engine (initial filling)	Approx. 13 liters (13, 8 US gt) of brand name HD oils of API classification SD or SE; SAE 30 for summer, SAE 20 for winter, SAE 10 W below -15° C (+ 5° F)	same as 911 S
(Measurement with dipstick according to operating instructions applies)		
Engine with sportomatic	Approx. 2 liters (2.1 US gt) more	same as 911 S
Transmission with differential	Approx. 3 liters (3.2 US gt) according to MIL-L-2105 of MIL-L 2105 B SAE 90	same as 911 S
Sportomatic transmission	Approx. 2.5 liters (2.65 US gt)	same as 911 S
Fuel tank	80 liters (21 US gal.) including 8 liters (2.1 US gal.) in reserve	same as 911 S
Brake fluid reservoir	Approx. 0.2 liters (0.21 US gt)	same as 911 S
Windshield washer reservoir	Approx. 8.5 liters (2.2 US gal.)	same as 911 S
DIMENSIONS AT CURB WEIGHT ACCORDING TO DIN		
Wheelbase	2271 mm (89.4 in.)	same as 911 S
Length	4291 mm (168.9 in.)	same as 911 S
Width	1610 mm (63.3 in.)	1652 mm
Height	1320 mm (51.9 in.)	same as 911 S
Ground clearance	180 mm (7.1 in.)	same as 911 S
Ground clearance at full load	140 mm (5.5 in.)	same as 911 S

	911 S	Carrera
WEIGHTS		
Curb weight according to DIN	1160 kg (2552 lb)	same as 911 S
with sportomatic transmission	1160 kg (2552 lb)	same as 911 S
Max. total weight	1400 kg (3086 lb)	same as 911 S
Max. axle load, front	600 kg (1323 lb)	same as 911 S
rear	840 kg (1852 lb)	same as 911 S
Trailer load, without brakes **	480 kg (1058 lb)	same as 911 S
with brakes **	800 kg (1763 lb)	same as 911 S
Max. roof load * (coupe only)	35 kg (77 lb)	same as 911 S
PERFORMANCE		
Top speed (with 4 or 5 speed transmission)	134 mph	same as 911 S
with sportomatic	About 3 mph slower	same as 911 S
Acceleration from 0 to 62 mph at DIN curb weight plus 1/2 payload	8.4 seconds	same as 911 S
Kilometer from standing start (DIN curb weight plus 1/2 payload)	29.0 seconds	same as 911 S
Weight/power ratio (curb weight DIN 70020)	6.7 kg (14.7 lb)/HP	same as 911 S
	9.0 kg (19.8 lb)/KW	same as 911 S
Fuel consumption (average consumption on highways and country roads)	13-15 l/100 km) (13.7-16 US gt/62 mi.)	same as 911 S
Oil consumption	Approx. 1.5 l/1.6 US gt 1000 km/620 mi.	same as 911 S

* Never exceed max. total weight.
** Grades up to 16 %.

Note
Installation of extra equipment (air conditioner etc.) reduces payload.

TECHNICAL DATA - 1976/1977 Models

	911 S
Capacities	
Engine (initial filling)	approx. 13 ltr. (13.75 US qt) of brand name HD oil per API Classifications SD or SE; summer SAE 30, winter SAE 20, below - 15° C/+ 5° F SAE 10 W
(measured with oil dipstick per operating instructions)	
Engine with Sportomatic	approx. 2 ltr. (2.1 US qt) more
Transmission and differential	approx. 3 ltr. (3.2 US qt) per MIL-L 2105 or MIL-L 2105 B, SAE 90; for locking differential gear lube per M2C28B, SAE 90
Sportomatic transmission	approx. 2.5 ltr. (2.6 US qt)
Fuel tank	80 ltr. (21.1 US gal.), of which 8 ltr. (2.1 US gal.) in reserve
Brake fluid reservoir	approx. 0.2 ltr. (6.75 fl oz)
Windshield washer tank	approx. 8.5 ltr. (2.2 US gal.)

Dimensions at DIN Curb Weight		
Wheelbase	mm/inch	2272/89.45
Length	mm/inch	4291/168.94
Width	mm/inch	1610/63.39
Height	mm/inch	1340/52.76
Ground clearance	mm/inch	175/6.89
Ground clearance at max. total weight	mm/inch	143/5.63

		911 S
Weight		
Curb weight per DIN	kg/lb	1160/2552
Max. total weight	kg/lb	1400/3086
Max. axle load, front	kg/lb	600/1323
rear	kg/lb	840/1852
Max. roof load *(only coupe)	kg/lb	35/77
Performance		
Max. speed (with 5 speed transm.)	km/h/mph	above 220/136.7
With Sportomatic	km/h/mph	215/133.6
Acceleration 0 - 100 km/h at DIN curb weight + 1/2 payload	sec.	7.8
Kilometer from standing start (DIN curb weight + 1/2 payload)	sec.	29.0
Weight-to-power (curb weight DIN 70020)	kg/HP kg/kW	6.8 9.24
Fuel consumption (average value, highways and country roads)	ltr/100 km miles/US gal.	13 - 15 15.6 - 18
Oil consumption	ltr/1000 km (US qt/620 mi.)	approx. 1.5

* Max. total weight must not be exceeded.

CAUTION

Installation of extra equipment (air conditioner, etc.) reduces the payload.

TECHNICAL DATA - 1978/1979 Models

	911 SC
Capacities	
Engine (initial filling)	approx. 13 ltr. /13.75 US qt of brand name HD per API Classification
(measured with oil dipstick per operating instructions)	SD or SE; summer SAE 30, winter SAE 20, below - 15° C (+ 5° F) SAE 10 W
Transmission and differential	approx. 3 ltr. /3.2 US qt per MIL-L 2105 or MIL-L 2105 B, SAE 90; with locking differential gear lube per M2C28B, SAE 90
Fuel tank	80 ltr. /21.1 US gal., of which 8 ltr./ 2.1 US gal. in reserve
Brake fluid reservoir	approx. 0.2 ltr. /6.75 US fl oz
Windshield washer tank	approx. 8.5 ltr. /2.2 US gal.

Dimensions at DIN Curb Weight		
Wheelbase	mm/inch	2272/89.45
Length	mm/inch	4291/168.94
Width	mm/inch	1652/65.04
Height	mm/inch	1340/52.76
Ground clearance at max. total weight	mm/inch	143/5.63

		911 SC
Weight		
Curb weight per DIN	kg/lbs	1160/2558
Max. total weight	kg/lbs	1400/3086
Max. axle load, front	kg/lbs	600/1323
rear	kg/lbs	840/1852
Max. roof load *(only coupe)	kg/lbs	35/77
Performance		
Max. speed (with 5 speed transm.)	km/h/mph	225/139
Acceleration 0 - 100 km/h at DIN curb weight + 1/2 payload	sec.	7.0
Kilometer from standing start (DIN curb weight + 1/2 payload)	sec.	27.5
Fuel consumption (average values, highways and country roads)	ltr/100 km miles/US gal.	14 - 16 14.7 - 16.8
Oil consumption	ltr/1000 km US qt/600 mi.	approx. 1.5

* Max. permissible total weight must not be exceeded.

CAUTION

When installing extra equipment (air conditioner, etc.) the payload will be less.

TECHNICAL DATA - 1980 Models

	911 SC
Capacities	
Engine (initial filling)	approx. 13 ltr. of brand name HD oil per API Classification
(measured with oil dipstick per operating instructions)	SD or SE; summer SAE 30, winter SAE 20, below - 15°C/+ 5° F SAE 10 W
Transmission and differential	approx. 3 ltr. per MIL-L 2105 or MIL-L 2105 B, SAE 90, with differential lock gear lube M2C28B SAE 90
Fuel tank	80 ltr./21.1 US gal., of which 8 ltr./ 2.1 US gal. in reserve
Brake fluid reservoir	approx. 0.2 ltr./6.75 fl oz
Windshield washer tank	approx. 8.5 ltr./2.2 US gal.

Dimensions at DIN Curb Weight		
Wheelbase	mm/inch	2272/89.45
Length	mm/inch	4291/168.94
Width	mm/inch	1652/65.04
Height	mm/inch	1320/51.57
Ground clearance (at max. total weight)	mm/inch	120/4.72

		911 SC
Weight		
Curb weight per DIN	kg/lbs	1250/2756
Max. total weight	kg/lbs	1460/3219
Max. axle load, front	kg/lbs	650/1433
rear	kg/lbs	880/1940
Max. roof load* (only coupe)	kg/lbs	35/77
Performance		
Max. speed (with 5 speed transm.)	km/h/mph	225/139
Acceleration 0 - 100 km/h at DIN curb weight + 1/2 payload	sec.	7.0
Kilometer from standing start (DIN curb weight + 1/2 payload)	sec.	27.5
Fuel consumption (acc. DIN 70030, Part 1)		
at 90 km/h	1/100 km	9.2
at 55.9 mph	miles/US gal.	25.5
city driving	1/100 km	17.3
	miles/US gal.	13.8
Oil consumption	1/1000 km	approx. 1.5
	US qt/620 mi.	

* Max. permissible total weight must not be exceeded.

CAUTION

Installation of extra equipment (air conditioner, etc.) will reduce payload.

TECHNICAL DATA - 1981 Models

911 SC

Capacities

Engine (new filling)	approx. 13 liters/13.7 US qt
(measured with oil dipstick according to operating instructions)	Oil grade: see operating instructions
Transmission and differential	approx. 3 liters/3.2 US qt Oil grade: see operating instructions
Fuel tank	approx. 80 liters/21.1 US gal., of which 8 liters/2.1 US gal. in reserve
Brake fluid reservoir	approx. 0.2 liters/6.75 fl oz
Windshield washer	approx. 8.5 liters/2.2 US gal.

Dimensions at DIN Curbweight

Wheelbase	mm/inch	2272/89.45
Length	mm/inch	4291/168.94
Width	mm/inch	1652/65.04
Height	mm/inch	1320/51.57
Ground clearance (at max. total weight)	mm/inch	120/4.72

911 SC

Weight

Curbweight acc. DIN	kp/lbs	1250/2756
Max. total weight	kp/lbs	1550/3417
Max. axle load, front **	kp/lbs	650/1433
rear **	kp/lbs	950/2094
Max. roof load * (only coupe)	kp/lbs	35/77

Performance

Max. speed (with 4 or 5 speed manual transmission)	km/h/mph	225/139
Acceleration from 0 to 100 km/h at DIN curbweight plus 1/2 payload	sec.	7.0
Kilometer from standing start (DIN curbweight plus 1/2 payload)	sec.	27.5
Oil consumption	ltr./1000 km approx. (1 US qt/600 mi.)	1.5

* Max. total weight must not be exceeded.

** Up to 16 % gradient.

Important

Installation of extra equipment (air conditioner, etc.) will reduce the payload.

Service Schedule, Type 911 T, 911 E, and 911 S (beginning with 1972 models)

at 1000 miles	Maintenance required		then at and every 10 000 miles
▬	**A. Before Road or Dynamometer Test**		
	1. Front wheel bearing play:	Check.	
	2. Steering:	Check all connections and rubber boots for thightness and for leaks.	▬
▬	3. V-belt and injection pump spur belt:	Check.	▬
▬	4. Valve adjustment (rocker arm shafts for tightness)*:	Check.	▬
▬	5. Ignition points and timing:	Check (engine at operating temperature.)	▬
	6. Fuel and air filter cartridges:	Replace.	▬
	7. Flame trap cartridge:	Clean.	▬
▬	8. Clutch pedal free play:	Check.	▬
	9. Complete brake system (incl. wear and leaks):	Check.	▬
▬	10. Reflectors and operation of lights:	Check.	▬
▬	11. Horn, wipers and washer:	Check.	▬
▬	12. Battery electrolyte level:	Check.	▬
▬	**B. During Road or Dynamometer Test**		
	1. Test engine performance, foot and parking brakes, clutch operation and gear shifting.		▬
▬	2. All instruments, control and warning lights:	Check.	▬
▬	**C. After Road or Dynamometer Test**		
	1. Engine idle and exhaust emission:	Check.	▬

Note: The recommended service intervals apply under normal driving conditions. The condition of tires, brakes and clutch lining depends greatly on the amount of driving and on driving habits and should possibly be checked at shorter intervals. A complete maintenance service as well as protection against corrosion should be carried out at least once a year, preferably before the winter.

* Necessary at first maintenance only.

Lubrication Schedule for Type 911 T, 911 E, and 911 S (beginning with 1972 models)

at 1000 miles	Service required		then at and every 10 000 miles
▬	**Engine**		
	Engine oil :	Change (oil at operating temperature), at least twice a year, preferably once before summer and once before winter.	▬
▬	Oil strainer and magnetic drain plugs :	Clean.	▬
▬	Oil filter :	Replace.	▬
	Lubricate :	Accelerator linkage.	▬
▬	**Transmission**		
	Transmission oil :	Change (oil at operating temperature.)	▬
▬	Magnetic drain plug :	Clean.	▬
	Miscellaneous		
	Lubricate :	Door and hood hinges and locks.	▬

Note : The recommended service intervals apply under normal driving conditions. The condition of oil, and wear and tear items depends greatly on the amount of driving and on driving habits. Therefore, oil, and wear and tear items should be checked more frequently and possibly changed at shorter intervals. A complete lubrication and maintenance service should be carried out at least once a year, preferably before the winter. The same applies to protective undercoating for the vehicle.

I. Required Maintenance for the Emission Control System

at 1,000 miles	Maintenance service required	then at 10,000 miles	and every 20,000 miles
Check+adjust	Valves (check rocker arm shafts for tightness *)	Check+adjust	
Adjust	V-belt	Check	
Retorque	Manifold mounting bolts		
Change	Engine oil	Change	
Replace	Oil filter	Replace	
Clean	Oil strainer	Clean	
Clean	Magnetic drain plug	Clean	
Check+adjust	Engine idle	Check+adjust	
Check+adjust	Exhaust emission	Check+adjust	
Check+adjust	Hand throttle lever	Check+adjust	
Check	Auxiliary air by-pass valve for overrun	Check	
	Fuel filter		Replace
Check	Fuel cap, tank, lines and connections		Check
	Air filter cartridge	Replace	
Check	Dwell angle	Adjust	
Check	Timing	Adjust	
	Spark plugs	Replace	
	Ignition wiring		Check
	Distributor cap/rotor	Check	
	Crankcase vent hoses		Check
	Filter for crankcase ventilation system	Clean	
	Evaporative emission control system	Check	
	Activated charcoal filter		Replace

Note: The recommended service intervals apply under normal driving conditions. When driving on dusty roads check air filter cartridge more often and replace if necessary. The condition of tires, brakes and clutch lining depends greatly on the amount of driving and on driving habits and should possibly be checked at shorter intervals. A complete lubrication and maintenance service as well as protection against corrosion should be carried out at least once a year, preferably before the winter.

* Necessary at first maintenance only.

II. Required Maintenance Service

at 1,000 miles	Maintenance service required	then at and every 10,000 miles
Change	Transmission oil	Change
	Door and hood hinges and locks	Lubricate
Check + adjust	Front wheel bearing play	
	Steering gear and tie rod-connections and rubber boots	Check for tightness and leaks
Adjust	Clutch pedal free play	Adjust
Check	Brake system complete (includes wear and leaks)	Check
Check	Operation of lights	Check
Check	Reflectors	Check
Check	Horns, wipers and washer	Check
Check	Battery electrolyte level	Check
	During road or dynamometer test:	
Check	Foot and parking brakes Clutch operation and gear shifting	Check
Check	All instruments, control and warning lights	Check

Note: The recommended service intervals apply under normal driving conditions. The condition of oil, and wear and tear items depends greatly on the amount of driving and on driving habits. Therefore, oil, and wear and tear items should be checked more frequently and possibly changed at shorter intervals. A complete lubrication and maintenance service should be carried out at least once a year, preferably before the winter. The same applies to protective undercoating for the vehicle.

I. Required Maintenance for the Emission Control System (from 1975 model)

at 1,000 miles	Maintenance service required	then at and every 15 000 miles	additional at and every 30 000 miles
Change	Engine oil	Change	
Clean	Magnetic drain plugs	Clean	
Replace	Engine oil filter	Replace	
Adjust	V-belts (including V-belt for air pump), check tension and condition	Adjust or replace if necessary	
Check + adjust	Valve clearance (additionally at 1,000 miles: Check rocker arm shafts for tightness)	Check + adjust	
Retighten	Manifold mounting bolts		
	Compression	Check	
	Spark plugs	Replace	
	Ignition distributor: ignition points, dwell angle and timing	Adjust with electronic equipment	
	Ignition wiring, distributor cap and rotor	Check visually, replace if necessary	
	Fuel filter	Replace	
	EGR system		Check visually
	EGR system filter		Replace
Check visually	Evaporative control system (incl. fuel cap, tank and connections)	Check visually	
	Crankcase ventilation hoses		Check visually
	Filter for crankcase ventilation system	Clean	
	Exhaust system (incl. thermal reactor, where applicable)	Check for damage	
Check + adjust	Engine idle, hand throttle lever and exhaust emission (CO and HC)	Check and adjust	
	Air cleaner filter element (at least after two years)	Replace	
	Air pump, control valves, air injection hoses and connections	Check	
	Filter element for air pump	Replace	
	Anti-backfire valve	Check	

Regular maintenance of the emission control system at 15 000-mile intervals is necessary to keep your emission control system warranty valid. Details are in your Emission Control System brochure, which you receive with your Owner's Manual.

II. Required Maintenance and Lubrication Service (from 1975 model)

at 1,000 miles	Maintenance service required	then at and every 15 000 miles
	Door hinges and locks	Lubricate
	Accelerator linkage	Lubricate
	Door and Targa top weatherstrips: Remove rubber residue from contacting areas and coat with talc or other suitable rubber lubricant	Maintain
Change	Transmission oil (clean magnetic drain plugs)	Change
	Windshield washer, operation and fluid level	Check and correct
Check+adjust	Front wheel bearing play	
	Front axle: steering gear, tie-rod connections and rubber boots	Check for tightness and leaks
Check+adjust	Clutch pedal free play	Adjust
	Brake system, all lines and hoses (incl. wear and leaks)	Check
Check	Operation of lights, horns, wipers and washer	Check
Check	Headlight adjustment	Check and correct
	Ignition/steering lock and buzzer alarm	Check
	Safety belt warning light and buzzer alarm	Check
	Battery electrolyte level	Check
Check and correct pressure	Tires	Check and correct pressure

During road or dynamometer test:

Check	Braking, clutch, steering, heating, ventilation systems	Check
Check	All instruments, control and warning lights	Check

The recommended service intervals apply under normal driving conditions. If you drive mainly in dusty areas, check the air cleaner element more often and replace if necessary. The condition of oil,and wear-and-tear items (such as tires, brakes, clutch lining) depend greatly on the amount of driving and on driving habits. Therefore, oil and wear-and-tear items should be checked more frequently, and if necessary replaced at shorter intervals. Also, the battery electrolyte level should be checked more often. A complete maintenance and lubrication service should be performed at least once a year, preferably before the winter. The same applies to protective undercoating for the vehicle.