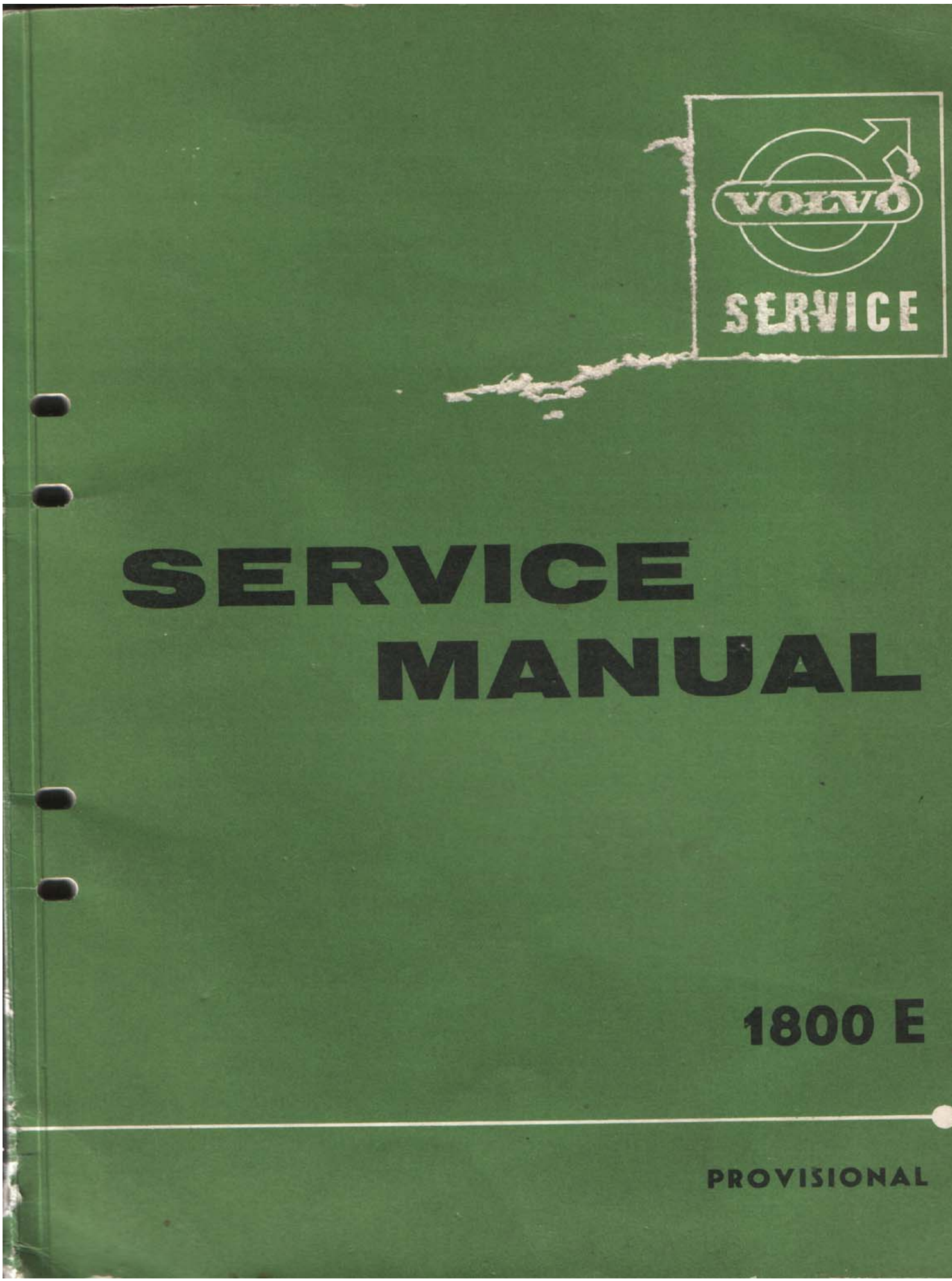


# SERVICE MANUAL

## 1800 E

PROVISIONAL

# CONTENTS

# FOREWORD

This manual contains preliminary servicing instructions for the Volvo 1800 E model. Only those parts which, from a workshop point of view, differentiate the 1800 E from the 1800 S (1969 model), are dealt with in this manual. The groups concerned are as follows:

Group 24 Fuel System

Group 38 Instruments

Group 43 Gearbox

Group 45 Propeller Shaft

Group 46 Rear Axle

Group 51 Wheel Brake Units

Group 55 Handbrake

Group 84 Windscreen

Group 85 Heating System (elec. heated rear window)

For more complete specifications, however, see Part 0.

Otherwise previous instructions apply.

**PART 0**
**GROUP 03**

# SPECIFICATIONS

## MEASUREMENTS AND WEIGHTS

| | |
|---|---|
| Length | 4350 mm (171.25") |
| Width | 1700 mm (67.0") |
| Height | 1280 mm (50.4") |
| Wheelbase | 2450 mm (96.5") |
| Track, front | 1310 mm (51.6") |
| rear | 1310 mm (51.6") |
| Clearance | 155 mm (6") |
| Turning circle | 9 m (30 ft.) |
| Curb weight | 1170 kg (2580 lb.) |

## LUBRICATION

### ENGINE

| | |
|---|---|
| Lubricant, type | Engine oil |
| grade | Service MS |
| viscosity, all year round | Multigrade oil SAE 10 W-30 |
| at continuous temp. below —20° C (—4° F) | Multigrade oil SAE 5 W-20 |
| or | |
| viscosity below —10° C (14° F) | SAE 10 W |
| between —10 and +30° C (14 and 86° F) | SAE 20/20 W |
| above +30° C (86° F) | SAE 30 |
| Oil change quantity, without oil filter | 3.25 litres (5.72 Imp. pints = 6.86 US pints) |
| with oil filter | 3.75 litres (6.60 Imp. pints = 7.91 US pints) |

### GEARBOX WITH OVERDRIVE

| | |
|---|---|
| Lubricant, type | Engine oil |
| grade | Service MS |
| viscosity, all year round | SAE 30 |
| alternative | Multigrade oil SAE 20 W-40 |
| Oil change quantity, gearbox and overdrive | 1.4 litres (2.46 Imp. pints = 2.95 US pints) |

### FINAL DRIVE

| | |
|---|---|
| Lubricant, type, without differential brake | Hypoid oil |
| with differential brake | Oil acc. to MIL-L-2105 B, provided with additive for differential brake |
| viscosity, above —10° C (14° F) | SAE 90 |
| below —10° C (14° F) | SAE 80 |
| Oil change quantity | 1.3 litres (2.28 Imp. pints = 2.75 US pints) |

### STEERING BOX

| | |
|---|---|
| Lubricant, type | Hypoid oil |
| viscosity, all year round | SAE 80 |
| oil capacity | 0.25 litre (0.44 Imp. pint = 0.53 US pint) |

# ENGINE

## GENERAL

| | |
|---|---|
| Type designation | B 20 E |
| Output, h.p. at r.p.m. (SAE) | 130/6000 |
| (DIN) | 120/6000 |
| Max. torque, kpm (lb.ft.) at r.p.m. (SAE) | 18.0 (130)/3500 |
| (DIN) | 17.0 (123)/3500 |
| Compression pressure (hot engine) with starter motor at 250—300 r.p.m. | 11—13 kp/cm² (155—185 p.s.i.) |
| Compression ratio | 10.5: 1 |
| Number of cylinders | 4 |
| Bore | 89.90 mm (3.539″) |
| Stroke | 80 mm (3.15″) |
| Displacement | 1.99 litres |
| Weight incl. electrical equipment | approx. 155 kg (341 lb.) |

## CYLINDER BLOCK

| | |
|---|---|
| Material | Special alloy cast iron |
| Bore, standard | 88.90 mm (3.499″) |
| oversize 0.030″ | 89.66 mm (3.523″) |

## PISTONS

| | |
|---|---|
| Material | Light alloy |
| Weight | 507 ± 5 grammes (18 ± 0.18 oz.) |
| Permissible weight deviation between pistons in same engine | 10 grammes (0.35 oz.) |
| Height, total | 71 mm (2.79″) |
| Height from piston pin centre to piston crown | 46 mm (1.81″) |
| Piston clearance | 0.02—0.04 mm (0.0008—0.0016″) |

## PISTON RINGS

| | |
|---|---|
| Piston ring gap, measured in ring opening | 0.40—0.55 mm (0.016—0.022″) |
| Oversize on piston rings | 0.030″ |

### Compression rings

Marked "TOP". Upper ring chromed.

| | |
|---|---|
| Number on each piston | 2 |
| Height | 1.98 mm (0.078″) |
| Piston ring clearance in groove | 0.045—0.072 mm (0.0017—0.0028″) |

### Oil scraper rings

| | |
|---|---|
| Number on each piston | 1 |
| Height | 4.74 mm (0.186″) |
| Scraper ring clearance in groove | 0.045—0.072 mm (0.0017—0.0028″) |

## GUDGEON PINS

Floating fit. Circlips at both ends in piston.

| | |
|---|---|
| Fit: | |
| In connecting rod | Close running fit |
| In piston | Push fit |
| Diameter, standard | 22.00 mm (0.866″) |
| oversize 0.05″ | 22.05 mm (0.868″) |

## CYLINDER HEAD

| | |
|---|---|
| Height, measured from cylinder head contact face to bolt head face | 84.8 mm (3.34″) |
| Distance from cylinder head top face to upper end of relief pipe (located under the thermostat) | 35 mm (1.38″) |
| Cylinder head gasket, thickness (off-load) | 0.8 mm = 0.032″ (loaded 0.7 mm = 0.028″) |

## CRANKSHAFT

| | |
|---|---|
| Crankshaft, end float | 0.047—0.138 mm (0.0019—0.0054″) |
| Big-end bearings, radial clearance | 0.029—0.071 mm (0.0012—0.0028″) |
| Main bearings, radial clearance | 0.028—0.079 mm (0.0011—0.0031″) |

## MAIN BEARINGS

### Main bearing journals

| | |
|---|---|
| Diameter, standard | 63.451—63.464 mm (2.4977—2.4982″) |
| undersize 0.010″ | 63.197—63.210 mm (2.4880—2.4886″) |
| 0.020″ | 62.943—62.956 mm (2.4781—2.4786″) |
| Width on crankshaft for pilot bearing shell | |
| Standard | 38.930—38.970 mm (1.5327—1.5342″) |
| Oversize 1 (undersize shell 0.010″) | 39.031—39.072 mm (1.5366—1.5383″) |
| 2 ( „ „ 0.020″) | 39.133—39.173 mm (1.5407—1.5422″) |

### Main bearing shells

| | |
|---|---|
| Thickness, standard | 1.985—1.991 mm (0.0782—0.0784″) |
| undersize 0.010″ | 2.112—2.118 mm (0.0832—0.0834″) |
| 0.020″ | 2.239—2.245 mm (0.0882—0.0884″) |

## BIG-END BEARINGS

### Big-end bearing journals

| | |
|---|---|
| Width of bearing recess | 31.950—32.050 mm (1.2579—1.2618″) |
| Diameter, standard | 54.099—54.112 mm (2.1299—2.9281″) |
| undersize 0.010″ | 53.845—53.858 mm (2.1199—2.1204″) |
| 0.020″ | 53.591—53.604 mm (2.1099—2.1104″) |

### Big-end bearing shells

| | |
|---|---|
| Thickness, standard | 1.833—1.841 mm (0.0722—0.0725″) |
| undersize 0.010″ | 1.960—1.968 mm (0.0772—0.0774″) |
| 0.020″ | 2.087—2.095 mm (0.0822—0.0823″) |

## CONNECTING RODS

| | |
|---|---|
| End float on crankshaft | 0.15—0.35 mm (0.006—0.014″) |
| Length, centre—centre | 145 ± 0.1 mm (5.71 ± 0.004″) |
| Max. permissible weight deviation between connecting rods in same engine | 6 grammes (0.21 oz.) |

## FLYWHEEL

| | |
|---|---|
| Permissible axial throw, max. | 0.05 mm (0.002″)/150 mm (5.9″) diam. |
| Ring gear (chamfer forwards) | 142 teeth |

## FLYWHEEL CASING

| | |
|---|---|
| Max. axial throw for rear face | 0.05 mm (0.002″)/100 mm (3.9″) diam. |
| Max. radial throw for rear guide | 0.15 mm (0.006″) |

## CAMSHAFT

| | |
|---|---|
| Marking | D |
| Number of bearings | 3 |
| Front bearing journal, diameter | 46.975—47.000 mm (1.8494—1.8504″) |
| Intermediate bearing journal, diameter | 42.975—43.000 mm (1.6920—1.6930″) |
| Rear bearing journal, diameter | 36.975—37.000 mm (1.4560—1.4567″) |
| Radial clearance | 0.020—0.075 mm (0.0008—0.0030″) |
| End float | 0.020—0.060 mm (0.0008—0.0024″) |
| Valve clearance for control of camshaft setting (cold engine) | 1.40 mm (0.056″) |
| Inlet valve should then open at | 5.5° B.T.D.C. |

### Camshaft bearings

| | |
|---|---|
| Front bearing, diameter | 47.020—47.050 mm (1.8512—1.8524″) |
| Intermediate bearing, diameter | 43.025—43.050 mm (1.6939—1.6949″) |
| Rear bearing, diameter | 37.020—37.045 mm (1.4575—1.4585″) |

## TIMING GEARS

| | |
|---|---|
| Crankshaft drive, number of teeth | 21 |
| Camshaft gear (fibre), number of teeth | 42 |
| Backlash | 0.04—0.08 mm ((0.0016—0.0032″) |
| End float, camshaft | 0.02—0.06 mm (0.008—0.0024″) |

## VALVE SYSTEM

### Valves

#### Inlet

| | |
|---|---|
| Disc diameter | 44 mm (1.73″) |
| Stem diameter | 7.955—7.970 mm (0.3132—0.3138″) |
| Valve face angle | 44.5° |
| Valve seat angle | 45° |
| Seat width in cylinder head | 2 mm (0.080″) |
| Clearance, both warm and cold engine | 0.40 mm (0.016″) |

#### Exhaust

| | |
|---|---|
| Disc diameter | 35 mm (1.378″) |
| Stem diameter | 7.925—7.940 mm (0.3120—0.3126″) |
| Valve face angle | 44.5° |
| Valve seat angle | 45° |
| Seat width in cylinder head | 2 mm (0.080″) |
| Clearance, both warm and cold engine | 0.40 mm (0.016″) |

### Pressure regulator

| | |
|---|---|
| Setting value | 2.0 kp/cm² (28 p.s.i.) |

### Injectors

| | |
|---|---|
| Resistance in magnetic winding | 2.4 ohms at +20° C (68° F) |

### Cold-start valve

| | |
|---|---|
| Resistance in magnetic winding | 4.2 ohms at +20° C (68° F) |

### Auxiliary air regulator

| | |
|---|---|
| Fully open at | —25° C (—13° F) |
| Fully closed at | +60° C (140° F) |

### Temperature sensor I (intake air)

| | |
|---|---|
| Resistance | approx. 300 ohms at +20° C (68° F) |

### Temperature sensor II (coolant)

| | |
|---|---|
| Resistance | approx. 2500 ohms at +20° C (68° F) |

### Pressure sensor

| | |
|---|---|
| Resistance in primary winding (stops 7 and 15) | approx. 90 ohms |
| Resistance in secondary winding (stops 8 and 10) | approx. 350 ohms |

### Air cleaner

| | |
|---|---|
| Type | Paper insert |
| Changing intervals | 40 000 km (25 000 miles) |

### CO-Test

| | |
|---|---|
| Hot engine, idling speed | max. 3 % |

## COOLING SYSTEM

| | |
|---|---|
| Type | Sealed system |
| Radiator cap valve opens at | 0.7 kp/cm² (10 p.s.i.) |
| Capacity | approx. 8.5 litres (1.87 Imp. galls = 2.24 US galls) |
| Fan belt, designation | HC—38×888 |
| right-steered vehicle | HC—38×988 |
| Fan-belt tensioning: For a force of 5.6—7.6 kp (12.3—16.7 lb.) on the belts between the pulleys, there will be a bending of | 10 mm (0.39") |

### Thermostat

| | |
|---|---|
| Type | Wax |
| Marking | 82° C (179° F) |
| Starts opening at | 81—83° C (176—182° F) |
| Fully open at | 90° C (194° F) |

### Pressure regulator

| | |
|---|---|
| Setting value | 2.0 kp/cm² (28 p.s.i.) |

### Injectors

| | |
|---|---|
| Resistance in magnetic winding | 2.4 ohms at +20° C (68° F) |

### Cold-start valve

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| Resistance in magnetic winding | 4.2 ohms at +20° C (68° F) |

### Auxiliary air regulator

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|---|---|
| Fully open at | —25° C (—13° F) |
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| Resistance | approx. 300 ohms at +20° C (68° F) |

### Temperature sensor II (coolant)

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| Resistance | approx. 2500 ohms at +20° C (68° F) |

### Pressure sensor

| | |
|---|---|
| Resistance in primary winding (stops 7 and 15) | approx. 90 ohms |
| Resistance in secondary winding (stops 8 and 10) | approx. 350 ohms |

### Air cleaner

| | |
|---|---|
| Type | Paper insert |
| Changing intervals | 40 000 km (25 000 miles) |

### CO-Test

| | |
|---|---|
| Hot engine, idling speed | max. 3 % |

## COOLING SYSTEM

| | |
|---|---|
| Type | Sealed system |
| Radiator cap valve opens at | 0.7 kp/cm² (10 p.s.i.) |
| Capacity | approx. 8.5 litres (1.87 Imp. galls = 2.24 US galls) |
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### Thermostat

| | |
|---|---|
| Type | Wax |
| Marking | 82° C (179° F) |
| Starts opening at | 81—83° C (176—182° F) |
| Fully open at | 90° C (194° F) |

## TIGHTENING TORQUES

| | Kpm | Lb.ft. |
|---|---|---|
| Cylinder head | 8.5—9.5 | 61—69 |
| Main bearings | 12—13 | 87—94 |
| Big-end bearings | 5.2—5.8 | 38—42 |
| Flywheel | 5.0—5.5 | 36—40 |
| Spark plugs | 3.5—4.0 | 25—29 |
| Camshaft nut | 13—15 | 94—108 |
| Bolt for crankshaft belt pulley | 7—8 | 50—58 |
| Bolt for alternator (1/2") | 7.1—8.6 | 50—60 |
| Nipple for oil filter | 4.5—5.5 | 32—40 |
| Bolt for oil sump | 0.8—1.1 | 6—8 |

## WEAR TOLERANCES

**Cylinder:**

| | |
|---|---|
| To be rebored when wear amounts to (if engine has abnormal oil consumption) | 0.25 mm (0.010") |

**Crankshaft:**

| | |
|---|---|
| Permissible out-of-round on main bearing journals, max. | 0.05 mm (0.002") |
| Permissible out-of-round on big-end bearing journals, max. | 0.07 mm (0.0028") |
| Crankshaft end float, max. | 0.15 mm (0.006") |

**Valves:**

| | |
|---|---|
| Permissible clearance between valve stems and valve guides, max. | 0.15 mm (0.006") |
| Valve spindle, permissible wear, max. | 0.02 mm (0.0008") |

**Camshaft:**

| | |
|---|---|
| Permissible out-of-round (with new bearings), max. | 0.07 mm (0.0028") |
| Bearings, permissible wear, max. | 0.02 mm (0.0008") |

**Timing gears:**

| | |
|---|---|
| Permissible backlash, max. | 0.12 mm (0.0048") |

# ELECTRICAL SYSTEM

## BATTERY

| | |
|---|---|
| Type | Tudor 6 EX 4 E |
| Voltage | 12 volts |
| Grounded | Negative pole |
| Battery, capacity, standard | 60 Ah |
| Specific gravity of electrolyte: | |
| Fully charged battery | 1.28 |
| When recharging is necessary | 1.21 |
| Recommended charging current | 5.5 amps |

## ALTERNATOR

| | |
|---|---|
| Type | Bosch K 1 (R) — 14 V 35 A 20 |
| Wattage | 490 watts |
| Max. continuous current | 35 amps |
| Max. speed | 12 000 r.p.m. |
| Direction of rotation | Clockwise |
| Ratio, engine — alternator | 1: 2 |
| Minimum diameter of slip rings | 31.5 mm (1.24") |
| Max. permissible radial-throw on slip rings | 0.03 mm (0.0012") |
| Max. permissible radial-throw on rotor frame | 0.05 mm (0.0020") |
| Minimum length of brushes | 8 mm (0.32") |
| Brush force | 0.3—0.4 kp (0.66—0.88 lb.) |
| Tightening torque for pulley | 3.5—4.0 kpm (7.7—8.8 lb.ft.) |

**Test values**

| | |
|---|---|
| Stator resistance | 0.26 + 0.03 ohm |
| Rotor resistance | 4.0 + 0.4 ohms |
| Rated test | 35 A (min. at 6000 r.p.m. and approx. 14 V) |

## VOLTAGE REGULATOR

| | |
|---|---|
| Type | Bosch AD — 14 V |
| Control voltage at 4000 alternator r.p.m., cold, read off within 30 seconds (lower contact pair) | 14.0—15.0 volts |
| Circuit current, lower contact pair | 28—30 amps |
| Control area (between upper and lower contact pair) | 0 to —0.3 volt |
| Circuit current, upper contact pair | 3—8 amps |

## STARTER MOTOR

| | |
|---|---|
| Type | Bosch GF 12 V 1 PS |
| Voltage | 12 V |
| Grounded | Negative pole |
| Direction of rotation | Clockwise |
| Output | approx. 1 h.p. |
| Number of teeth on pinion | 9 |
| Brushes, number | 4 |

### Test values

**Mechanical:**

| | |
|---|---|
| Rotor end float | 0.05—0.3 mm (0.002—0.012″) |
| Brush spring tension | 1.2—4.4 mm (0.047—0.173″) |
| Distance from pinion to ring gear | 1.15—1.30 kp (2.53—2.86 lb.) |
| Frictional torque of rotor brake | 2.5—4.0 kpcm (2.17—3.81 lb.in.) |
| Pinion idling torque | 1.3—1.8 kpcm (1.13—1.56 lb.in.) |
| Backlash | 0.35—0.60 mm (0.014—0.018″) |
| Pinion modules | 2.11 |
| Minimum diameter of commutator | 33 mm (1.3″) |
| Minimum length of elec. brushes | 14 mm (0.6″) |

**Electrical:**

| | |
|---|---|
| Unloaded starter motor: 12.0 V and 40—50 A | 6900—8100 r.p.m. |
| Loaded starter motor: 9 V and 185—220 A | 1050—1350 r.p.m. |
| Locked starter motor: 6 V and 300—350 A | 0 r.p.m. |

**Control solenoid**

| | |
|---|---|
| Cut-in voltage | Min. 8 V |

## IGNITION SYSTEM

| | |
|---|---|
| Voltage | 12 V |
| Firing order | 1-3-4-2 |
| Ignition timing at 700—800 engine r.p.m. (vacuum governor disconnected) | 10° before T.D.C. |
| Spark plug | Bosch W 225 T 35 or corresponding |
| Spark plug gap | 0.7—0.8 mm (0.028—0.032″) |
| tightening torque | 3.5—4.0 kpm (25.3—29.0 lb.ft.) |

## Distributor

| | |
|---|---|
| Type | Bosch JFURX 4 |
| Direction of rotation | Anti-clockwise |
| Breaker, points, gap | 0.4—0.5 mm (0.016—0.020″) |
| dwell angle | 59°—65° |
| contact pressure | 0.50—0.63 kp (1.1—1.4 lb.) |
| Capacitor | 0.25 $\mu$F ± 25 % |
| Centrifugal governor: | |
| Advance range, total | 12.5 ± 1° distributor graduation |
| Advance begins at | 375—550 r.p.m. (distr.) |
| Values 5° | 800—950 r.p.m. (distr.) |
| 10° | 1200—1375 r.p.m. (distr.) |
| Advance finishes at | 1500 r.p.m. (distr.) |
| Vacuum governor: (negative control) | |
| Drop, total | 5 ± 1° distributor graduation |
| Drop begins at | 175—205 mm (6.9—8.1″) Hg |
| Values 2° | 205—240 mm (8.1—9.5″) Hg |
| Drop finishes at | 280—290 mm (11.0—11.4″) Hg |

## LAMP BULBS

| | Watts | Socket | Number |
|---|---|---|---|
| Headlights | 45/40 W | P 34 t | 2 |
| Parking lights, front*) | 4 cp | Ba 9 s | 2 |
| Brake and rear lights | 32/4 cp | BAY 15 d | 2 |
| Turn indicators*) | 32 cp | Ba 15 s | 4 |
| Reversing lights | 32 cp | Ba 15 s | 1 |
| Number plate light | 4 cp | Ba 9 s | 2 |
| Interior lighting | 5 W | SW 8.5 | 2 |
| Glove locker light | 2 W | Ba 9 s | 1 |
| Instrument panel lighting, without clock | 3 W | W 2.1 d | 8 |
| clock | 2 W | Ba 7 s | 1 |
| Lighting, heater controls | 3 W | W 2.1 d | 1 |
| Control, lamps, full beam | 3 W | W 2.1 d | 1 |
| charging | 3 W | W 2.1 d | 1 |
| turn indicators | 3 W | W 2.1 d | 1 |
| oil pressure | 2 W | Ba 7 s | 1 |
| overdrive | 2 W | Ba 9 s | 1 |
| brakes | 2 W | Ba 9 s | 1 |
| elec. heated rear window | 1.2 W | W 1.8 d | 1 |
| safety hazard flashers | 1.2 W | W 1.8 d | 1 |
| Side-marking lights (only USA) | 5 W | Ba 15 s | 4 |
| *) For USA: Turn indicators and parking lights, front | 32/4 cp | BAY 15 d | 2 |

## FUSES

| | |
|---|---|
| Number ( 5 A) | 5 |
| ( 8 A) | 6 |
| (16 A) | 1 |

## ELECTRICALLY HEATED REAR WINDOW

| | |
|---|---|
| Output, at first position of switch | approx. 40 W |
| at second position of switch | approx. 150 W |

# POWER TRANSMISSION, REAR AXLE

## CLUTCH

| | |
|---|---|
| Clutch, type | Single, dry-plate |
| Size | 8 1/2″ (215.9 mm) |
| Clutch friction area, total | 440 cm² (68.2 sq.in.) |
| Clutch fork free travel | 3—4 mm (0.12—0.16″) |
| Clutch pedal travel | 140 mm (5.5″) |
| Clutch spring, type | Diaphragm-plate |

The clutch levers are not adjusted

## GEARBOX

| | |
|---|---|
| Type designation | M 410 |
| Reduction ratios: | |
| 1st speed | 3.14: 1 |
| 2nd speed | 1.97: 1 |
| 3rd speed | 1.34: 1 |
| 4th speed | 1: 1 |
| Overdrive | 0.797: 1 |
| Reverse | 3.54: 1 |
| Oil pressure, direct drive | approx. 1.5 kp/cm² (21 p.s.i.) |
| overdrive | 32—35 kp/cm² (455—498 p.s.i.) |
| Tightening torque, nut for flange | 11.0—14.0 kpm (80—101 lb.ft.) |
| Lubricant | Engine oil |
| viscosity | SAE 30 or SAE 20 W-40 |
| grade | Service MS |
| Oil capacity, gearbox and overdrive | approx. 1.4 litres (2.46 Imp. pints = 2.95 US pints) |

## PROPELLER SHAFT

| | |
|---|---|
| Type | Tubular, divided, three universal joints, support bearings |
| Universal joints | Fitted with needle bearings |
| Lubricant, sliding joint (when assembling) | Molybdenum disulphide chassis grease |
| universal joints | Chassis grease. Further addition not required |

## REAR AXLE

| | |
|---|---|
| Rear axle, type | Semi-floating |
| Track | 1350 mm (53.15″) |

## Final drive

| | |
|---|---|
| Type | Spiral bevel (hypoid) |
| Reduction ratio | 4.30: 1 (10: 43) |
| Backlash | 0.13—0.20 mm (0.005—0.008″) |
| Pre-loading on pinion bearings, new bearings | 11—23 kpcm (9.55—20.0 lb.in.) |
| run-in bearings | 6—11 kpcm (5.21—9.55 lb.in.) |
| Pre-loading on differential bearings | 0.13—0.20 mm (0.005—0.008″) |
| Lubricant | Hypoid oil |
| viscosity | SAE 90 |
| Oil capacity | approx. 1.3 litres (2.29 Imp. pints = 2.74 US pints) |

## Tightening torques

| | Kpm | Lb.ft. |
|---|---|---|
| Flange | 28—30 | 200—220 |
| Caps | 5.0—7.0 | 35—50 |
| Crown wheel | 6.5—9.0 | 45—65 |

# BRAKES

## FRONT WHEEL BRAKES

| | |
|---|---|
| Type | Disc brakes |
| Brake disc: | |
| Outside diameter | 268.5 mm (10.6″) |
| Thickness, new, nominal measurement | 14.34 mm (0.6″) |
| reconditioned, min. | 13.14 mm (0.52″) |
| Warp | Max. 0.10 mm (0.004″) |

| | |
|---|---|
| Brake linings: | |
| Number per wheel | 2 |
| Thickness, new | 10 mm (0.394″) |
| Effective area | 172 cm² (27 sq.in.) |
| Code designation | DB 812 GG |
| Wheel unit cylinders: | |
| Number per wheel | 4 |
| Diameter | 36.12 mm (1.422″) |

## REAR WHEEL BRAKES

| | |
|---|---|
| Type | Disc brakes |
| Brake disc: | |
| Outside diameter | 294.6 mm (11.6″) |
| Thickness, new, nominal measurement | 9.6 mm (0.378″) |
| reconditioned, min. | Min. 8.4 mm (0.33″) |
| Warp | Max. 0.15 mm (0.006″) |
| Brake linings: | |
| Number per wheel | 2 |
| Thickness, new | 10 mm (0.394″) |
| Effective area | 100 cm² (15.5 sq.in.) |
| Code designation | DB 812 GG |
| Wheel unit cylinders: | |
| Number per wheel | 2 |
| Diameter | 36.12 mm (1.422″) |

## MASTER CYLINDER

| | |
|---|---|
| Type | Tandem cylinder |
| Nominal diameter | 22.2 mm (0.87″) |
| Bore | Max. 22.40 mm (0.88″) |
| Piston diameter | Min. 22.05 mm (0.86″) |

## BRAKE LINE

| | |
|---|---|
| Outer diameter | 3/16″ |

## BRAKE VALVE

| | |
|---|---|
| Make | A t e |
| Operating pressure | 29 ± 2 kp/cm² (412 ± 28 p.s.i.) |
| Outgoing pressure at an input pressure of: | |
| 25 kp/cm² (356 p.s.i.) | 25 kp/cm² (356 p.s.i.) |
| 45 kp/cm² (640 p.s.i.) | 31.5—36.5 kp/cm² (448—519 p.s.i.) |
| 100 kp/cm² (1422 p.s.i.) | 47.5—54.5 kp/cm² (675—775 p.s.i.) |

## SERVO CYLINDER

| | |
|---|---|
| Type | Direct operating |
| Make | A t e |
| Designation | Bromsgerät T 51 |
| Ratio | 1: 2.7 |

## HANDBRAKE

| | |
|---|---|
| Brake drum: | |
| Diameter | Max. 178.33 mm (7.0") |
| Radial throw | Max. 0.15 mm (0.006") |
| Out-of-round | Max. 0.2 mm (0.008") |
| Brake linings, effective area | 175 cm² (27 sq.in.) |

## TIGHTENING TORQUES

| | Kpm | Lb.ft. |
|---|---|---|
| Attaching bolts, front brake caliper | 9—20 | 65—70 |
| Attaching bolts, rear brake caliper | 6—7 | 45—50 |
| Attaching nuts, rear guard plate | 3.7—4.4 | 27—32 |
| Wheel nuts | 10—14 | 70—100 |
| Stop bolt, master cylinder | 1.3 | 9.5 |
| Attaching nuts, master cylinder | 2.4 | 17 |
| Bleed nipples | 0.4—0.6 | 3—4.5 |
| Brake pipes | 1.1—1.5 | 8—11 |
| Brake hoses | 1.6—2.0 | 12—15 |
| Plug, brake valve | 10—12 | 70—85 |
| Locknut, brake valve | 2.5—3.5 | 18—25 |
| Warning valve, switch | 1.4—2.0 | 10—15 |

# FRONT END AND STEERING GEAR

## WHEEL ALIGNMENT (unloaded vehicle)

| | |
|---|---|
| Caster | 0 to +1° |
| Camber | 0 to +1/2° |
| King pin inclination at camber of 0° | 8° |
| Toe-in | 0 to 4 mm (0 to 0.16") |
| Toe-out | |
| At a 20° turn of the outer wheel the inner wheel should be turned | 21.5 to 23.5° |

## STEERING GEAR

| | |
|---|---|
| Steering wheel diameter | 406.4 mm (16") |
| Number of turns from stop to stop | 3 1/4 turns |
| Steering box, make and type | Gemmer, "cam and ball' |
| reduction ratio | 15.5: 1 |
| Lubricant for steering box | Hypoid oil SAE 80 |
| Capacity | 0.25 litre (0.44 Imp. pint = 0.53 US pint) |

## Tightening torques

| | Kpm | Lb.ft. |
|---|---|---|
| Nut for pitman arm shaft | 8.5 | 60 |
| Steering wheel nut | 3—4 | 20—30 |
| Pitman arm nut | 13.5—16.5 | 100—120 |
| Crown nut for steering and tie rods | 3.2—3.7 | 23—27 |
| Nut for wishbone clamp | 2.0—2.5 | 14—18 |
| Bolt for upper wishbone shaft | 5.5—7.0 | 40—50 |

# SUSPENSIONS, WHEELS

## SPRINGS

### Front springs

| | |
|---|---|
| Type | Helical spring |
| Wire thickness | 14.1—14.3 (0.55—0.56″) |
| External diameter | 121.0—122.5 mm (4.77—4.82″) |
| Number of turns, total | 8.7 |
| Test values: | |
| Loading for a compression of 1 cm (25/64″) (measured within a spring length of 175—215 mm = 6.89—8.46″) | 47.8—51.8 kg (105—114 lb.) |
| Length, turn for turn | max. 120 mm (4.72″) |
| Loading for a spring length of 195 mm (7.68″) | 481—511 kg (1058—1124 lb.) |

### Rear springs

| | |
|---|---|
| Type | Helical spring |
| Wire thickness | 11.2—11.4 mm (0.44—0.45″) |
| External diameter | 114.5—116.0 mm (4.5—4.6″) |
| Number of turns, total | 10.7 |
| Test values: | |
| Loading for a compression of 1 cm (25/64″) (measured within a spring length of 225—265 mm = 8.85—10.43″) | 16.1—17.7 kg (35—39 lb.) |
| Length turn for turn | max. 118 mm (4.65″) |
| Loading for a spring length of 245 mm (9.65″) | 229—234 kg (504—515 lb.) |

## SHOCK ABSORBERS

| | |
|---|---|
| Type | Telescopic |
| Total length: | |
| Front shock absorbers, compressed | approx. 323 mm (12.72″) |
| unloaded | approx. 444 mm (17.48″) |
| Rear shock absorbers, compressed | approx. 368 mm (14.49″) |
| unloaded | approx. 546 mm (21.50″) |

## WHEELS

### Wheel rims

| | |
|---|---|
| Designation | 5″ J × 15″ |
| Number of wheel nuts | 5 |
| Radial throw | max. 1.8 mm (0.071″) |
| Warp | max. 2.5 mm (0.098″) |
| Tightening torque for wheel nuts | 10—14 kpm (72—101 lb.ft.) |

### Tyres

| | |
|---|---|
| Type | Radial with hose |
| Size | 165 HR 15 |
| Pressure (cold tyres), front | 1.8 kp/cm² (26 p.s.i.) |
| rear | 2.0 kp/cm² (28 p.s.i.) |

## Part 2

# ENGINE

## GROUP 20

## GENERAL

Part 2 of this service manual deals only with the special fuel system (electronically controlled fuel injection) with which the 1800 E engine is equipped. For other instructions, which apply also to the B 20-series engines, you are referred to the service manual for the B 20 engine

Other components which differentiate the B 20 E engine from previous models are the camshaft and cylinder head (to mention as an example the 44 mm = 1.73″ intake valves).

## GROUP 24

## TOOLS

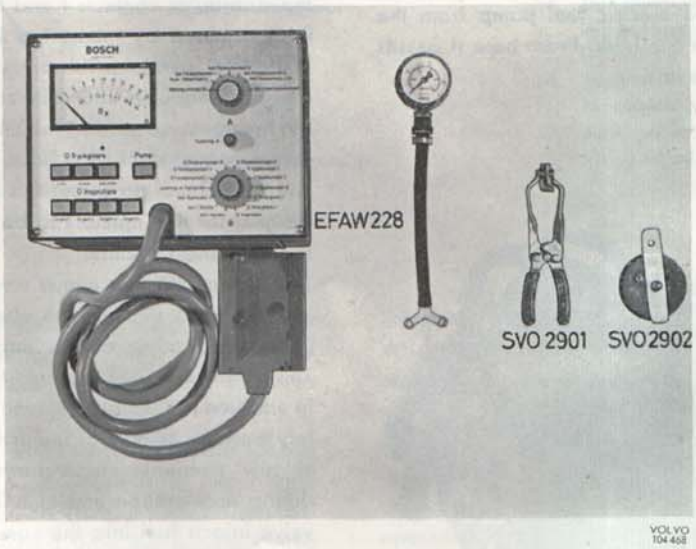


Fig. 2—1. Special tools

| | |
|---|---|
| EFAW 228 | Bosch tester with pressure gauge |
| SVO 2901 | Pinchers, 4 (to close off the fuel hoses) |
| SVO 2902 | Cover (for ignition setting) |

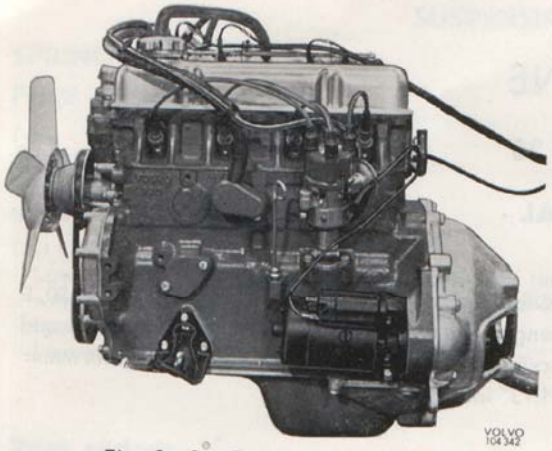


Fig. 2—2. Engine, viewed from left

## DESCRIPTION

The fuel system on the B 20 E engine is an electronically controlled fuel injection system.

The system is made up of the following units: Fuel filter, electric fuel pump, pressure regulator, fuel injectors, cold start valve, inlet duct, throttle valve switch, auxiliary air regulator, temperature sensors (induction air and coolant), pressure sensor (for pressure in inlet duct), triggering contacts in ignition distributor and the electronic control unit, see Fig. 2—5.

## FUNCTION

Fuel is drawn by the electric fuel pump from the tank via and through the filter. From here it passes into the fuel pressure line.

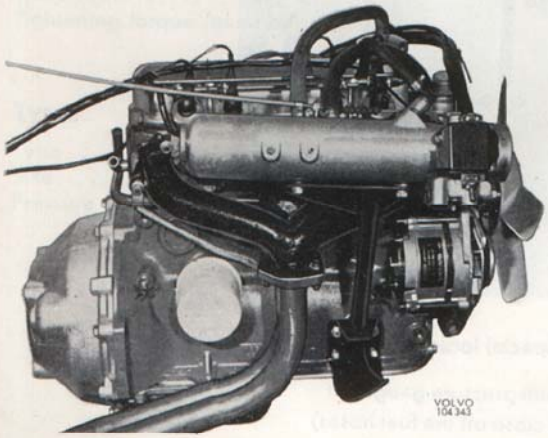


Fig. 2—3. Engine, viewed from right

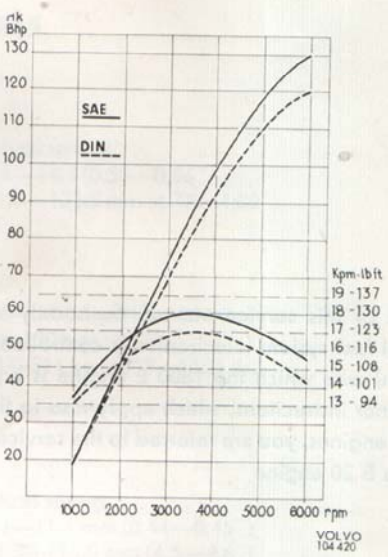


Fig. 2—4. Output and torque curves

The pressure regulator connected to the end of the pressure line limits the fuel pressure to 2 kp/cm² (28 p.s.i.). From the pressure reguator excess fuel flows back to the tank through the return line. The electro-magnetic fuel injectors are connected to the pressure line by means of the fuel distributor pipes.

The duration of injection (fuel quantity) is governed basically by two factors: by the engine speed and the load condition of the engine.

The engine speed is relayed to the control unit by the distributor contacts I and II. The load condition is determined by measuring the absolute pressure in the inlet manifold. This pressure is converted to an electrical impulse and relayed to the control unit by the pressure sensor, which is connected to the common inlet duct by a hose.

The control unit processes this information and gives a signal for the injectors to be open for a longer or shorter period of time.

The control unit thus allows a varying amount of fuel to be passed through the electrically operated injectors depending on the engine load and speed. This is how the "basic quantity" of fuel is governed.

In addition to the "basic quantity" of fuel, an accurately metered amount of fuel is injected when starting at low ambient temperatures, when warming up, during acceleration and at full load. The cold start valve injects fuel into the common inlet duct for as long as the starter is operated.

During warming-up the control unit receives information from the temperature sensor in the cooling water circuit and in consequence permits the injectors to remain open for a little longer time. But, if the

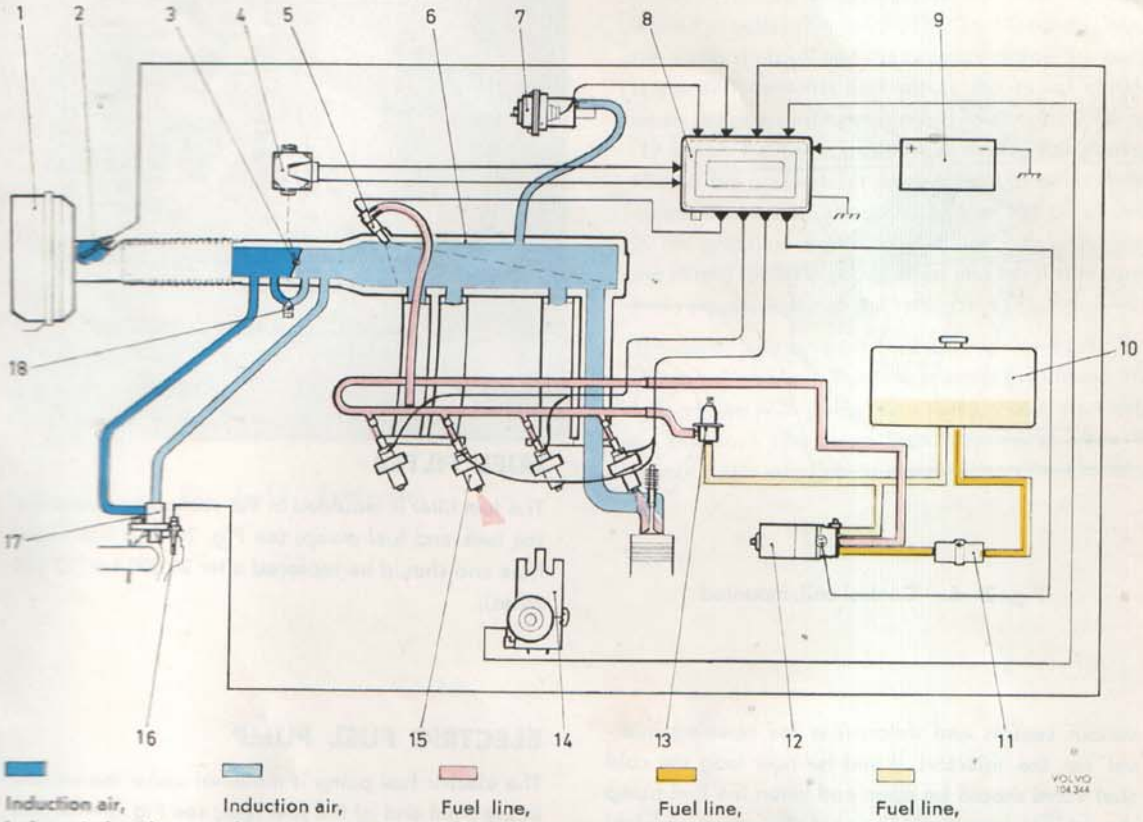


Fig. 2—5. Fuel injection system, principle of operation

1. Air cleaner
2. Temperature sensor for induction air
3. Throttle valve
4. Throttle switch
5. Cold start valve
6. Inlet duct
7. Pressure sensor
8. Control unit
9. Battery
10. Fuel tank
11. Fuel filter
12. Fuel pump
13. Pressure regulator
14. Distributor with triggering contacts
15. Injectors
16. Temperature sensor for coolant
17. Auxiliary air regulator
18. Idling adjustment screw

engine is to operate properly with the increased flow of fuel, more air is required. This is obtained through the auxiliary air regulator which gradually closes as the engine temperature rises.

The electronic control unit receives impulses for additional fuel during acceleration from the throttle valve switch. When the accelerator pedal is depressed, impulses are released from the throttle switch to the control unit which gives orders to the injectors to inject a number of times between the ordinary injections. If the accelerator pedal is depressed quickly, the duration of injection will also be longer than the ordinary injection time.

The throttle valve switch has also another function. When the accelerator pedal is eased up and the engine brakes, a contact in the throttle valve switch is actuated and emits an impulse to the control unit which closes off the fuel injections. If the speed drops to approx. 1000 r.p.m., the fuel supply is switched on again so that a smooth changeover to idling operation is guaranteed. The throttle valve switches off the fuel supply when the speed is over 1700 r.p.m.

## CONTROL UNIT

The control unit is located under the dashboard, see Fig. 2—6. It processes the information from the

Fig. 2—6. Control unit, mounted

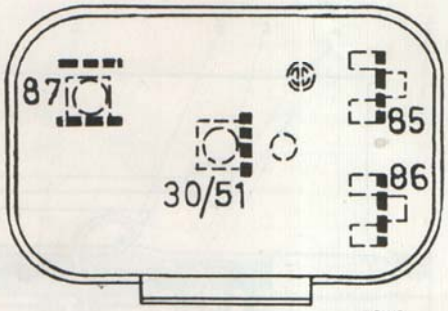


Fig. 2—8. Control relay connections

## FUEL FILTER

The fuel filter is mounted in the suction line between the tank and fuel pump, see Fig. 2—9. It is a paper type and should be replaced after 20 000 km (12 500 miles).

various sensors and determines the opening interval for the injectors, if and for how long the cold start valve should be open and when the fuel pump should start operating. The cold start valve and fuel pump are operated via control relays located on the right wheel arch, see Fig. 2—7. Here the main relay which feeds the control unit is also placed.

The main relay is provided with a diode in the control circuit to prevent the injection system from being engaged and damaged, if the battery is connected with wrong polarity.

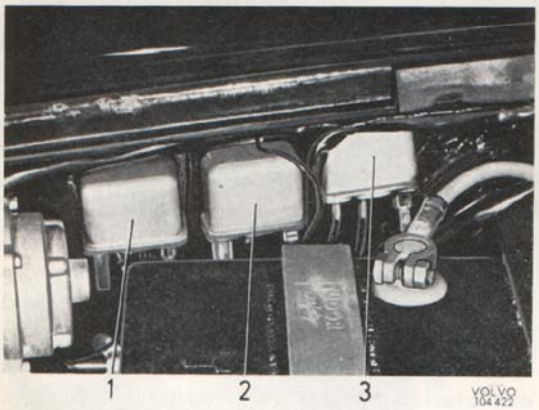


Fig. 2—7. Control relays

1. Coldstart relay
2. Pump relay
3. Main relay

## ELECTRIC FUEL PUMP

The electric fuel pump is mounted under the vehicle at the front end of the fuel tank, see Fig. 2—10. The pump and motor are enclosed and cannot be repaired. The fuel circulates inside the motor so that the rotor and brushes operate in the fuel.

The pump is provided with a combined relief and non-return valve, which also serves for venting if the pump has idled and drawn in air, see Figs. 2—11 and 2—12.

When the pump starts operating and there is air in it, the air is pressed out into the overflow line via the column in the piston (1, Fig. 2—11). The column is not large enough to allow all the fuel the pump can produce to pass, but, when the air is pressed out, the

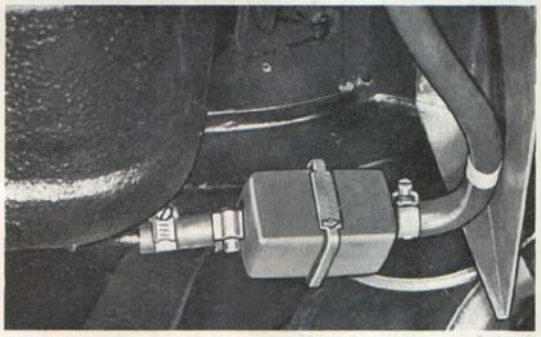

Fig. 2—9. Fuel filter

VOLVO 104 423

Fig. 2—10. Fuel pump

piston is forced back towards the seat and seals, while the outlet channel (II, Fig. 2—11) opens. When the pump shuts off and the pressure drops, the piston is pressed forwards and closes the outlet channel when the pressure has dropped to about 1.2 kp/cm² (17 p.s.i.), the same position as during the venting. Should the pressure for some reason or other during operation exceed about 4.5 kp/cm² (64 p.s.i.) (fault in the pressure regulator, fuel line blockage, etc.), the strong spring is compressed and the piston opens and releases fuel into the return line (III, Fig. 2—11).

The pump runs only for 1—2 seconds when the ignition is switched on. This is to prevent the engine from being filled with petrol by a leaking cold start valve or injector. The pump then only works when the starter motor engages or when the engine is running.

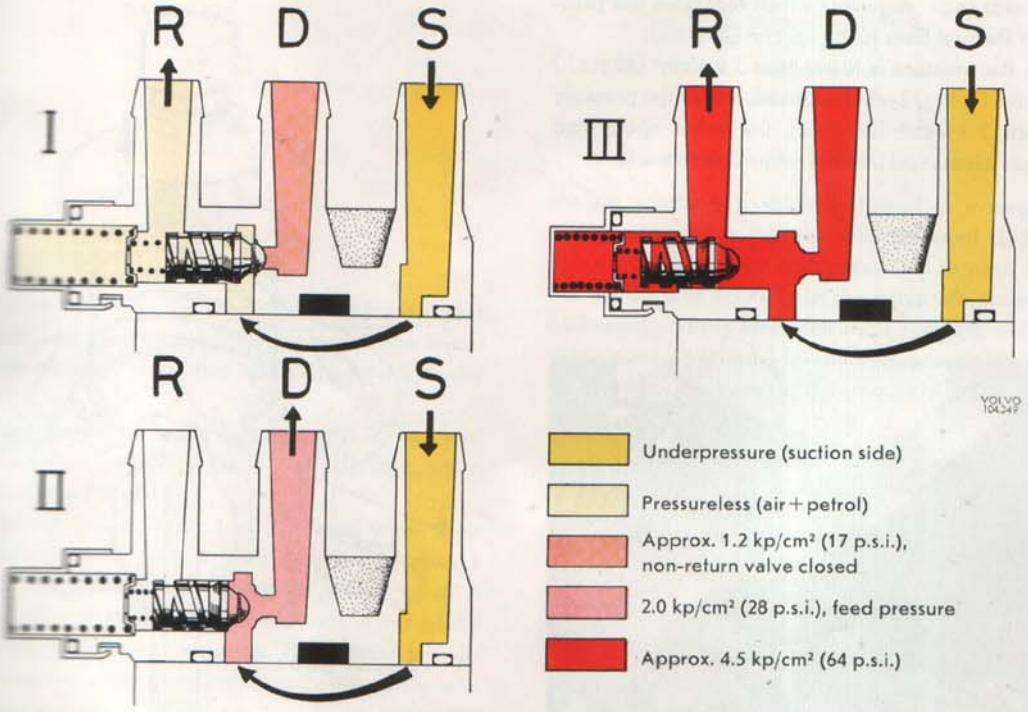


Fig. 2—11. Relief and non-return valve

I Venting
II Normal operation
III Relief valve opens

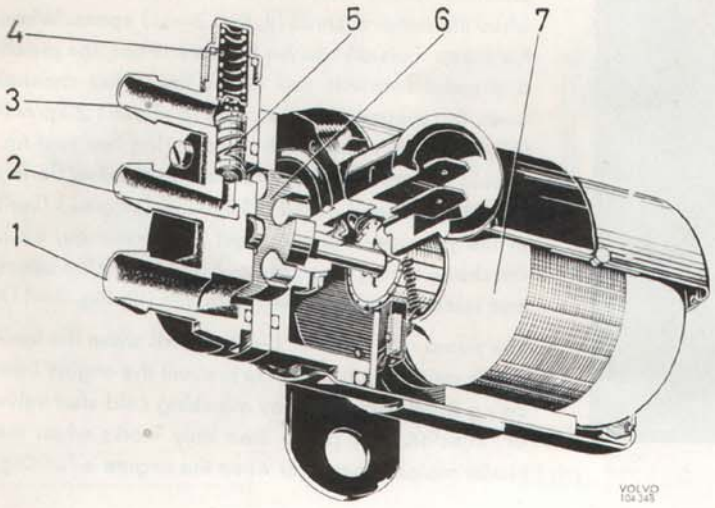


Fig. 2—12. Fuel pump

1. Inlet
2. Outlet
3. Overflow channel
4. Spring
5. Combined relief and non-return valve
6. Pump rotor
7. Rotor for elec. motor

## PRESSURE REGULATOR

The pressure regulator is placed on a bracket mounted on the car heater, see Fig. 2—13, and is connected to the distributing pipe. The pressure regulator is a fully mechanical regulator which regulates the pressure in the fuel lines to 2.0 kp/cm² (28 p.s.i.).
When the pressure is lower than 2 kp/cm² (28 p.s.i.) the valve (1, Fig. 2—14) is closed. When the pressure exceeds 2 kp/cm² (28 p.s.i.), the valve opens and releases excess fuel into the return line to the tank.


Fig. 2—13. Pressure regulator

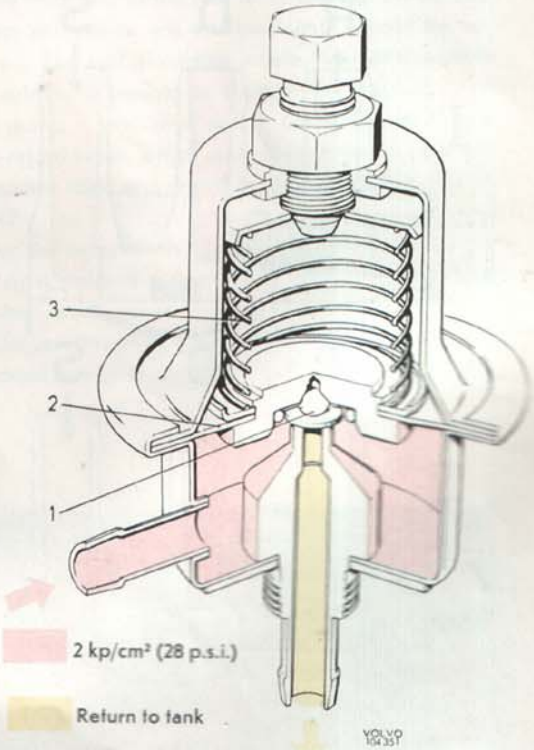


Fig. 2—14. Pressure regulator

1. Valve
2. Diaphragm
3. Spring

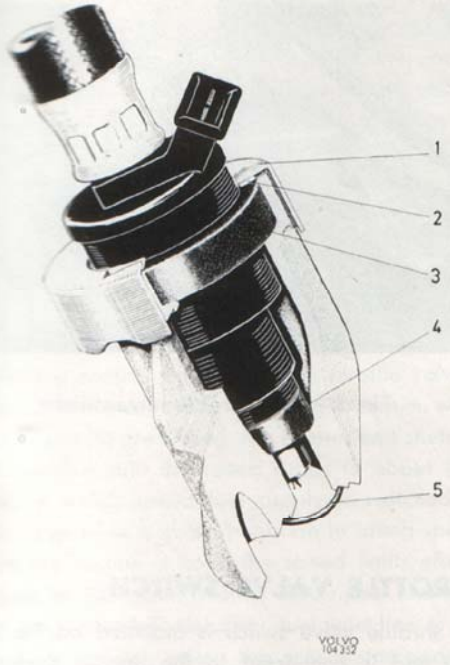


Fig. 2—15. Injector with holder

1. Lock ring
2. Steel washer
3. Rubber seal
4. Rubber seal
5. O-ring

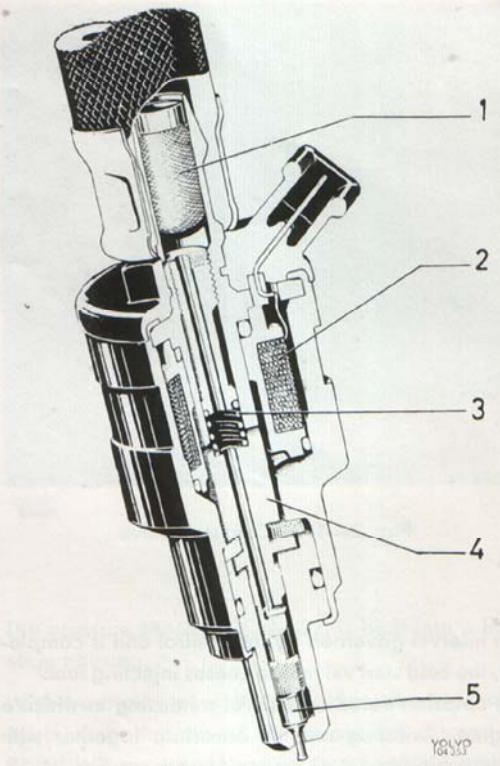


Fig. 2—16. Injector

1. Filter
2. Magnetic winding
3. Return spring
4. Magnetic armature
5. Sealing needle

## INJECTORS

Fuel is injected into the intake ports in the cylinder head by four injectors, one for each port. The injectors are mounted in holders which sit on the cylinder head.

The injectors inject in two groups, that is, two and two. Injectors 1 and 3 inject at the same time, while 2 and 4 inject together.

This means that injectors 1 and 4 inject when their respective intake valve is open but that injectors 2 and 3 inject when their respective intake valve is closed. Fuel in the latter case is stored in the intake port until the intake valve opens. The injector consists of a housing containing a sealing needle, magnetic winding and return spring, see Fig. 2—16. When the magnetic winding (2) is not in circuit, the return spring (3) presses the sealing needle (5) against a seat and this closes off the supply of fuel.

When the magnetic winding receives current from the control unit, it attracts the rear section of the sealing needle (4), which is shaped as a magnetic armature, and this lifts the needle about 0.15 mm (0.006″) from the seat and allows fuel to pass. Since the needle and opening in the valve are accurately calibrated and the fuel pressure is constant, only the valve opening interval (2—10 milliseconds = 0.002—0.01 seconds) determines the amount of fuel injected.

## COLD START VALVE

The cold start valve, which is mounted in the inlet duct after the air throttle, provides the engine with extra fuel during cold starting. The injection time is governed by the control unit which in its turn receives information from the coolant temperature sensor.

At —20° C (—4° F) and colder, the cold start valve provides extra fuel for 10 seconds, and at +55° C (130° F) the cold start valve stops giving the engine extra fuel at starting.

The cold start valve only injects when the starter motor is running. When the engine is running and the starter motor has been shut off before the injec-

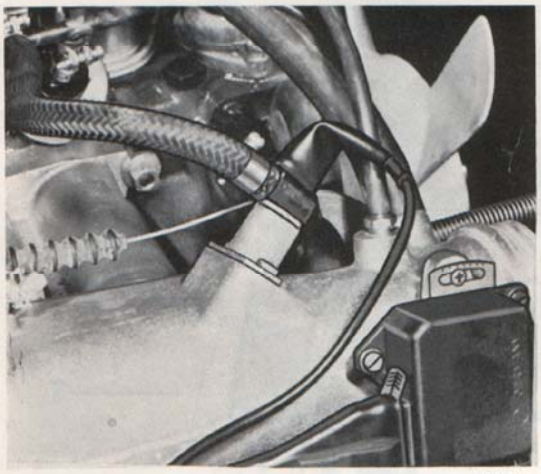


Fig. 2—17. Cold start valve

tion interval governed by the control unit is completed, the cold start valve also ceases injecting fuel.

The coldstart valve consists of a housing in which a magnetic winding and an armarture together with return spring and packing are placed, see Fig. 2—18. When the magnetic winding (1) is not in circuit, the packing (4) is pressed against the inlet of the armature (3), which in its turns is actuated by the return spring (2). This keeps the cold start valve closed. When the magnetic winding is fed from the control unit via a control relay, the armature is drawn down and fuel is pressed passed the packing, through the cold start valve and into the inlet duct.

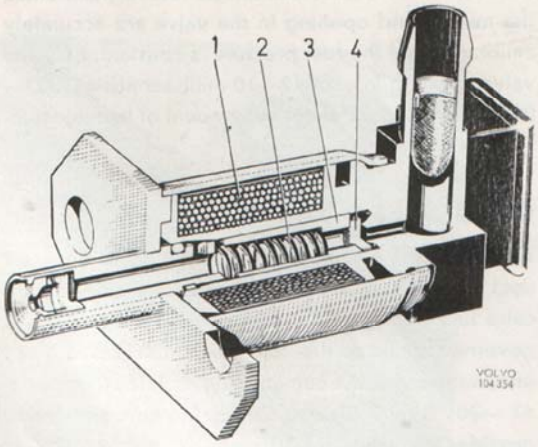


Fig. 18. Cold start valve

1. Magnetic winding
2. Return spring
3. Magnetic armature
4. Packing

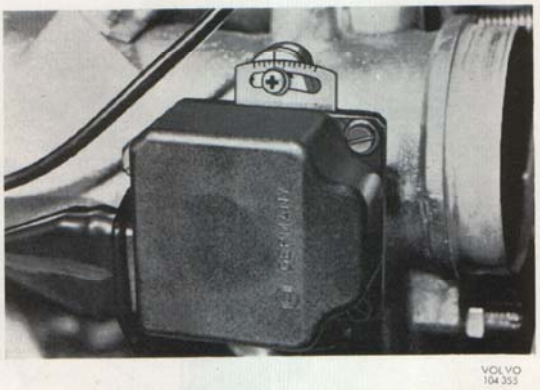


Fig. 2—19. Throttle valve switch

## THROTTLE VALVE SWITCH

The throttle valve switch is mounted on the inlet duct and is connected to the throttle shaft. The throttle valve switch has two functions, one, it sends impulses to the control unit to increase the fuel supply during acceleration; two, it sends impulses to the control unit to shut off the fuel supply during engine braking.

During accleration, the switches (2, Fig. 2—20) are pressed together. This cuts in the circuits so that current can flow from one switch to the other.

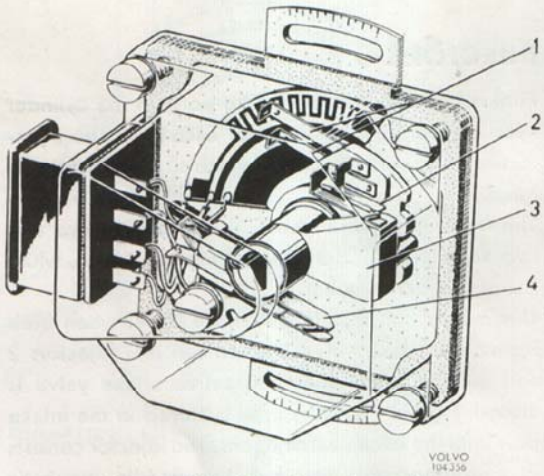


Fig. 2—20. Throttle valve switch

1. Slip contacts
2. Switch pair for acceleration function
3. Connection with throttle spindle
4. Switch pair for fuel shut-off function

When the slip contacts move over the zig-zag, the control unit receives impulses. Depending upon the number of impulses and their rapidity, the control unit determines how much additional fuel will be injected (that is, how many additional injections will take place and how much the injection interval will be extended). Throttle reduction opens the contacts (2) to prevent the control unit from receiving impulses for "extra fuel" when the air throttle valve is closed.

Easing up on the accelerator pedal causes the contacts (4) to come together and this supplies information to the control unit that the air throttle valve is closed. If the speed is higher than 1700 r.p.m. when the contacts (4) are closed, the control unit shuts off fuel injection until the speed drops to about 1000 r.p.m., at which speed fuel supply is switched on again to provide a smoth transition to idling speed. When the engine is cold, the speed limits are increased by 300 r.p.m. (that is, 2000 r.p.m. and 1300 r.p.m. respectively). Naturally fuel injection is engaged immediately when the accelerator pedal is depressed and the contacts (4) open before the speed drops to 1000 r.p.m.

## PRESSURE SENSOR

The pressure sensor senses the pressure in the inlet duct and by permitting pressure variations to influence the armature in a transformer, this altering the transformer inductance, the pressure sensor informs the control unit about the load on the engine.

The pressure sensor is located on the right wheel housing and is connected to the inlet duct by means of a hose, see Fig. 2—21.

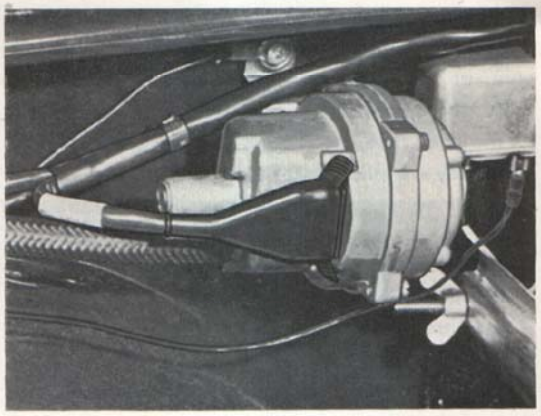


Fig. 2—21. Pressure sensor

The pressure sensor, Fig. 2—22, is built into a light-alloy housing.

With the engine is switched off, atmospheric pressure exists on both sides of the diaphragm (8) and the movable armature (11), which is suspended friction-free in both leaf springs (3 and 6), is pressed against the full-load stop (9) by the spring (2). Moreover, both the deflated diaphragm bellows (7) are pressed together, since they are influenced by atmospheric pressure and in this way permit the armature (11) to move itself further to the right. With the armature at the extreme right, the pressure sensor informs the control unit that maximum possible fuel can now be injected.

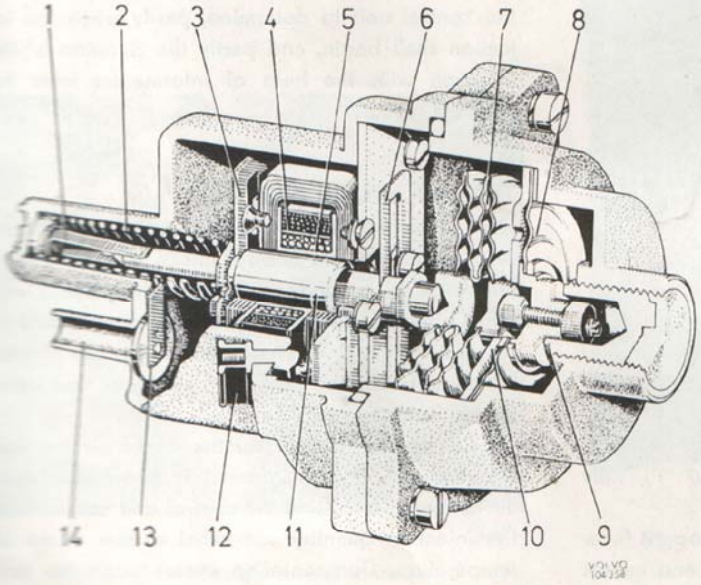


Fig. 2—22. Pressure sensor

1. Damping spring
2. Coil spring
3. Leaf spring (suspension)
4. Secondary winding
5. Primary winding
6. Leaf spring (suspension)
7. Diaphragm bellows
8. Diaphragm
9. Full-load stop
10. Part-load stop
11. Armature
12. Electric connection
13. Valve
14. Hose connection

When the engine starts and the underpressure from the engine intake manifold influences the left-hand side of the diaphragm (8), atmospheric pressure forces the diaphragm over to the part-load stop (10). At the same time, the diaphragm bellows (7) expand since they are influenced by the underpressure inside the pressure sensor and they move the armature a bit to the left. Depending upon the pressure in the inlet duct (engine load), the armature adjusts itself to different positions during driving.

At full-throttle driving, the pressure in the inlet duct will be almost equal to the atmospheric pressure, at which point the armature takes up the same position as when the engine starts.

The function of the valve (13) is to prevent pressure impulses in the inlet duct (from the piston movement) from being conveyed into the pressure sensor. This valve has a small hole which constricts the impulses. During sudden acceleration, when air will rush into the pressure sensor, the hole in the valve is insufficient to cope with this so that the entire valve is moved by spring pressure away from the opening and air is allowed to enter.

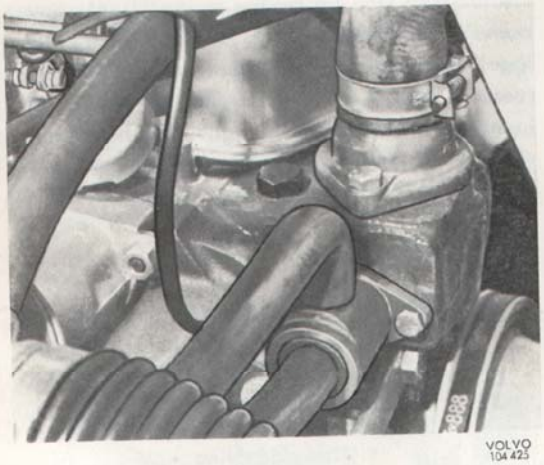


Fig. 2—23. Auxiliary air regulator

## AUXILIARY AIR REGULATOR

The auxiliary air regulator is located at the front end of the cylinder head and has its expanding element projecting into the coolant system, see Fig. 2—23.

The regulator operating range is from —25° C (—13° F), fully open, to +60° C (140° F), fully closed.

At cold start, the auxiliary air regulator opens (how much will depend on the temperature) and admits additional air into the inlet duct. Gradually as the engine heats up, the regulator element (1, Fig. 2—24) expands and presses back the regulator (2) which, at 60° C (140° F), completely closes off the cross-sectional area of the auxiliary air pipe.

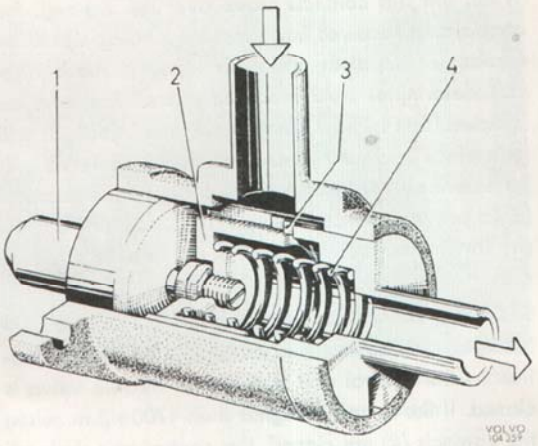


Fig. 2—24. Auxiliary air regulator

1. Expanding element
2. Regulator
3. Auxiliary air pipe
4. Return spring

## TRIGGERING CONTACTS

Below the centrifugal governor in the distributor there is a contact device with two triggering contacts, see Fig. 2—25.

The contacts are actuated by a cam on the distributor shaft.

The function of the contacts is to supply information to the control unit about the engine speed to enable the control unit to determine, partly when the injection shall begin, and partly the duration of the injection with the help of information from the pressure sensor.

## TEMPERATURE SENSOR

The system is fitted with two temperature sensors, one for coolant and one for intake air. The coolant temperature sensor provides the control unit with information concerning the coolant temperature so that the control unit can adapt the injection interval and also determine how long the cold start valve should be open at cold start.

The temperature sensor for the intake air provides the control unit with information about the intake air temperature so that the control unit can increase the injection quantity somewhat at low intake air temperature. Compensation ceases when the tem-

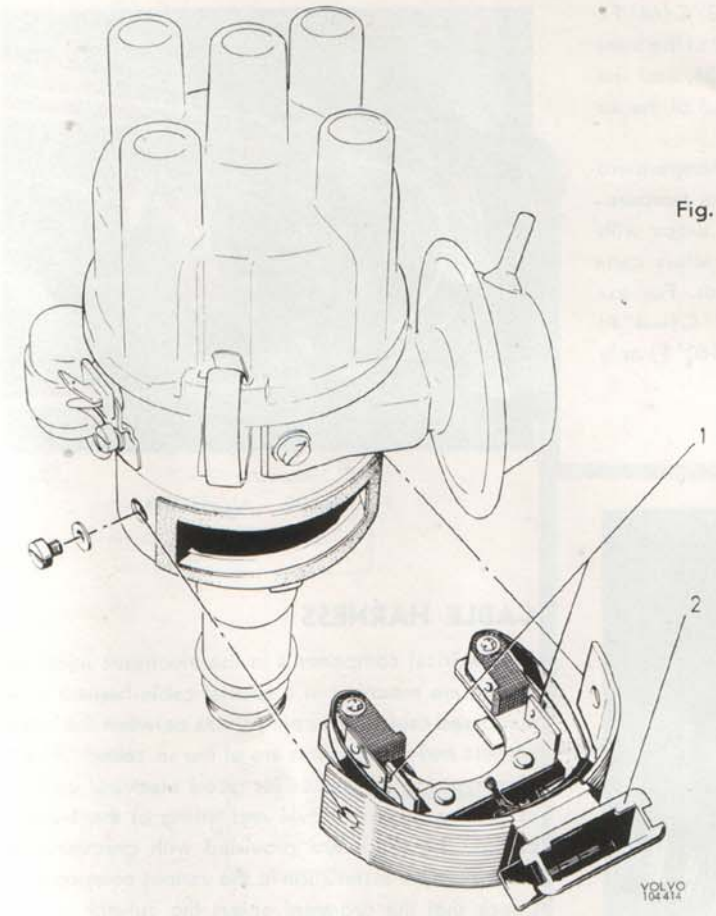


Fig. 2—25. Distributor with contact device

1. Triggering contacts
2. Electrical connection

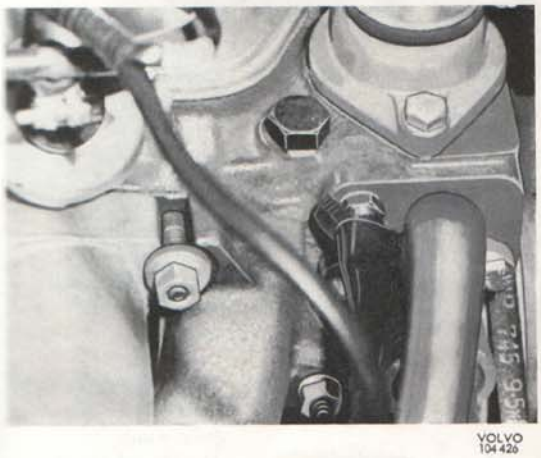


Fig. 2—26. Coolant temperature sensor


Fig. 2—27. Intake air temperature sensor (connection removed)

perature of the intake air is greater than 20° C (68° F). The coolant temperature sensor is located at the front end of the cylinder head, see Fig. 2—26, and the intake temperature sensor at the rear end of the air cleaner, see Fig. 2—27.

The temperature-sensitive part of the temperature sensor is a semi-conductor with negative temperature coefficient, that is, the resistance drops with increasing temperature. The resistance alters considerably between different temperatures. For example, the temperature sensor has at —20° C (—4° F) a resistance of 15 000 ohms but at 60° C (140° F) only 600 ohms.

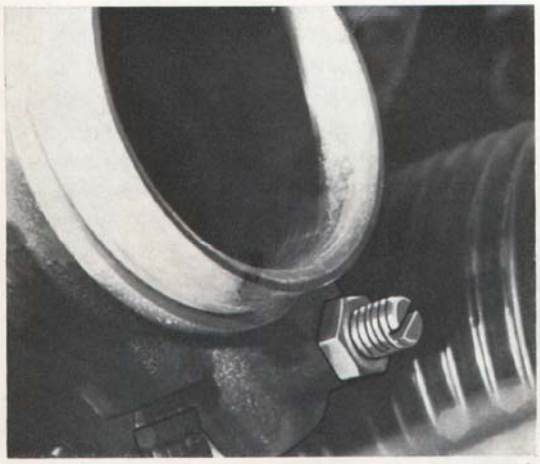

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Fig. 2—28. Screw for idle adjustment

## INLET DUCT

The inlet duct is of aluminium, cast in one piece.

It consists of a common inlet duct from which individual induction pipes lead to each induction port in the cylinder head.

A throttle valve is mounted at the mouth of the common inlet duct. During idling, the throttle valve is completely closed. Air then flows in through a "bypass" pipe under the throttle valve. Idling speed is adjusted by altering the cross-sectional area of the auxiliary air pipe by means of the idle adjustment screw, see Fig. 2—28.

## AIR CLEANER

The air cleaner is located behind the radiator grille, see Fig. 2—29. The paper insert in the cleaner should be replaced after every 40 000 km (25 000 miles).

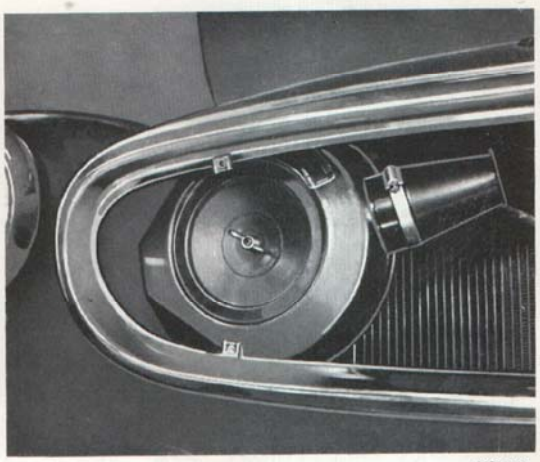

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Fig. 2—29. Air cleaner

## CABLE HARNESS

All electrical components in the electronic injection system are mounted in a special cable harness with numbered cables. The connections between the cable harness and components are of the so-called "Amp" plug type, which makes for good electrical contact as well as rapid removal and fitting of the various cables. The plugs are provided with grommets to ensure proper installation in the various components. Check that the grommet enters the cut-out on the control unit before pushing in the harness plug securely. The connections are covered by rubber protectors which also serve for locking purposes. These protectors are removed by pulling the "tongues".

### CABLE HARNESS NUMBERING

| Cable No. | From | To |
|---|---|---|
| 1 | Control unit | Temperature sensor I (intake air) |
| 2 | Control unit | Cold starter relay, terminal 85 |
| 3 | Control unit | Injector, cyl. 1 |
| 4 | Control unit | Injector, cyl. 3 |
| 5 | Control unit | Injector, cyl. 4 |
| 6 | Control unit | Injector, cyl. 2 |
| 7 | Control unit | Pressure sensor |
| 8 | Control unit | Pressure sensor |
| 9 | Control unit | Throttle valve switch |
| 10 | Control unit | Pressure sensor |
| 11 | Control unit | Ground |
| 12 | Control unit | Distributor (triggering contacts) |
| 13 | Control unit | Temperature sensor I (intake air) |
| 14 | Control unit | Throttle valve switch |
| 15 | Control unit | Pressure sensor |

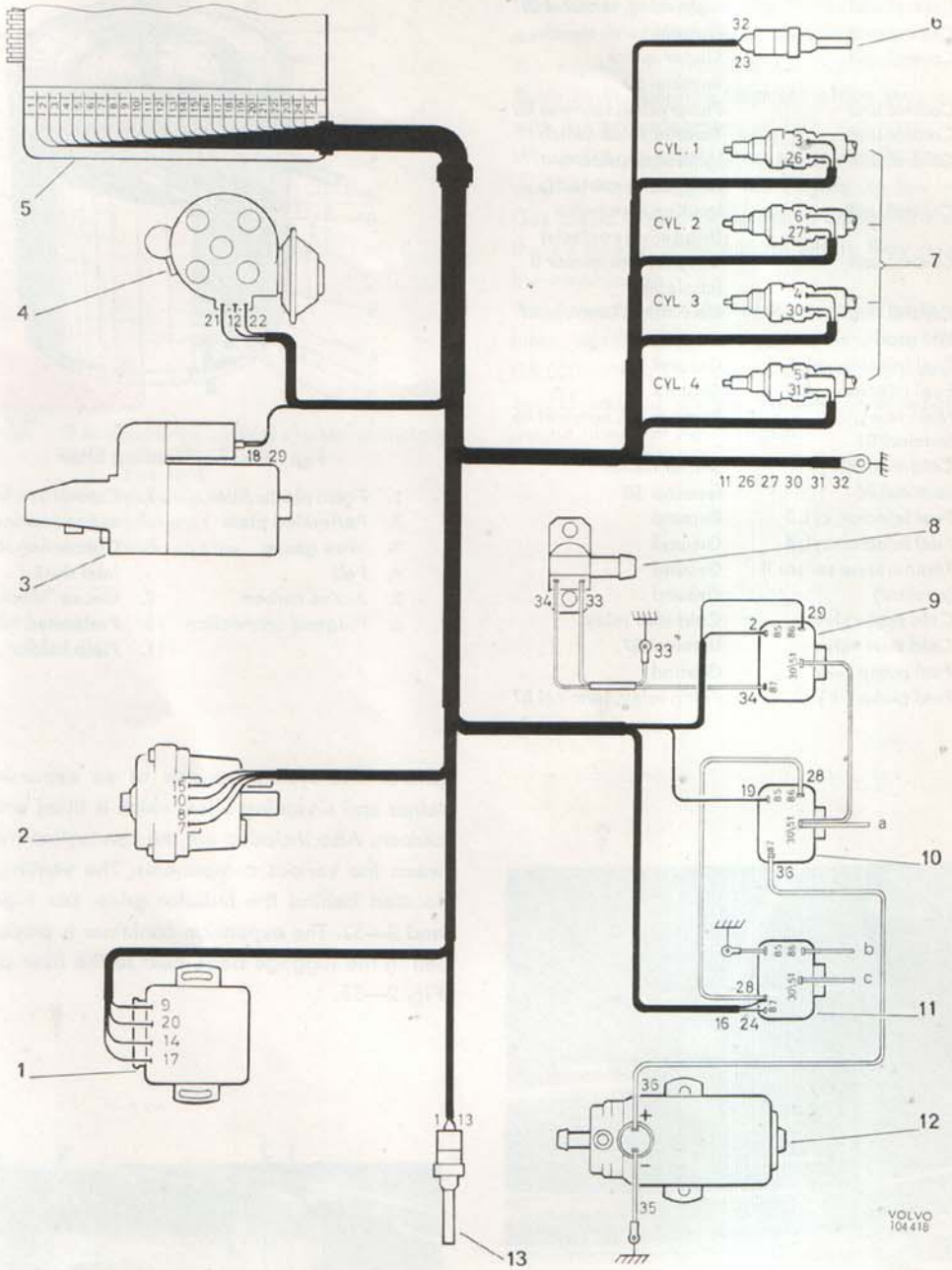



Fig. 2—30. Cable harness

1. Throttle valve switch
2. Pressure sensor
3. Starter motor (term. 50)
4. Distributor (triggering contacts)
5. Control unit
6. Coolant temperature sensor
7. Injectors
8. Cold start valve
9. Cold start relay
10. Pump relay
11. Main relay
12. Fuel pump
13. Intake air pressure sensor

a To fuse 5
b To ignition coil, term. 15
c To battery, B+

| | | |
|---|---|---|
| 16 | Control unit | Main relay, terminal 87 |
| 17 | Control unit | Throttle valve switch |
| 18 | Control unit | Starter motor terminal 50 |
| 19 | Control unit | Pump relay, terminal 85 |
| 20 | Control unit | Throttle valve switch |
| 21 | Control unit | Ignition distributor (triggering contacts) |
| 22 | Control unit | Ignition distributor (triggering contacts) |
| 23 | Control unit | Temperature sensor II (coolant) |
| 24 | Control unit | Main relay, terminal 87 |
| 25 | Not used | |
| 26 | Fuel injector, cyl. 1 | Ground |
| 27 | Fuel injector, cyl. 2 | Ground |
| 28 | Main relay, terminal 87 | Pump relay, terminal 86 |
| 29 | Cold start relay, terminal 86 | Starter motor, terminal 50 |
| 30 | Fuel injector, cyl. 3 | Ground |
| 31 | Fuel injector, cyl. 4 | Ground |
| 32 | Temperature sensor II (coolant) | Ground |
| | | Ground |
| 33 | Cold start valve | Cold start relay, |
| 34 | Cold start valve | terminal 87 |
| 35 | Fuel pump (—) | Ground |
| 36 | Fuel pump (+) | Pump relay, terminal 87 |

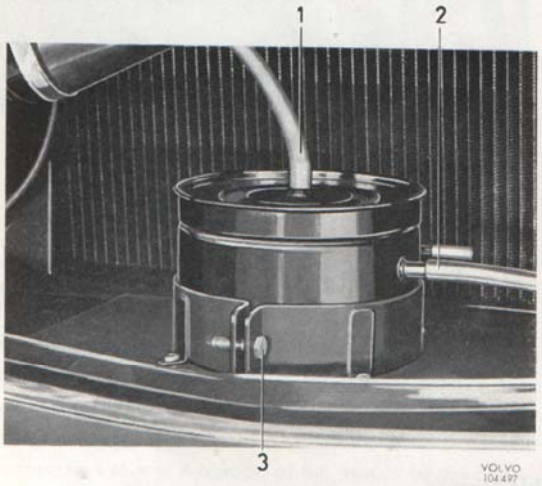



Fig. 2—31. Venting filter

1. Connection to inlet duct
2. Connection from expansion container
3. Attaching screw

## GAS EVAPORITE CONTROL SYSTEM

Vehicles intended for the U.S.A. market are fitted with a gas evaporite control system, which prevents gas fumes from being released into the atmosphere. The system consists of an expansion container and a venting filter, which is filled with active carbon. Also included are the connection hoses between the various components. The venting filter is located behind the radiator grille, see Figs. 2—31 and 2—32. The expansion container is placed to the left in the luggage boot, next to the filler pipe, see Fig. 2—33.

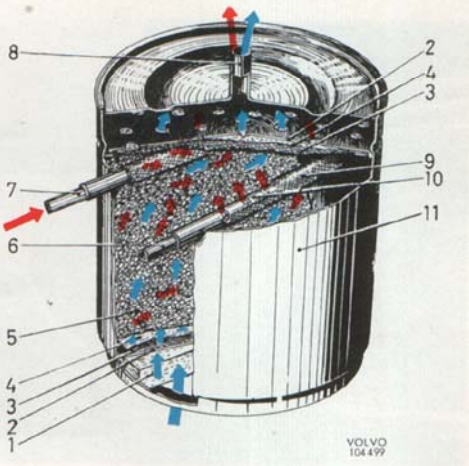



Fig. 2—32. Venting filter

1. Foam plastic filter
2. Perforated plate
3. Wire gauze
4. Felt
5. Active carbon
6. Plugged connection
7. Connection from expansion container
8. Connection to inlet duct
9. Gauze "stocking"
10. Perforated tubes
11. Plate holder

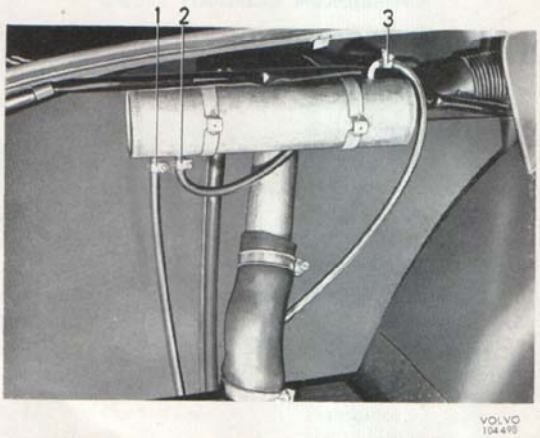



Fig. 2—33. Expansion container

1. Connection from tank
2. Connection from filler tube
3. Connection to venting filter

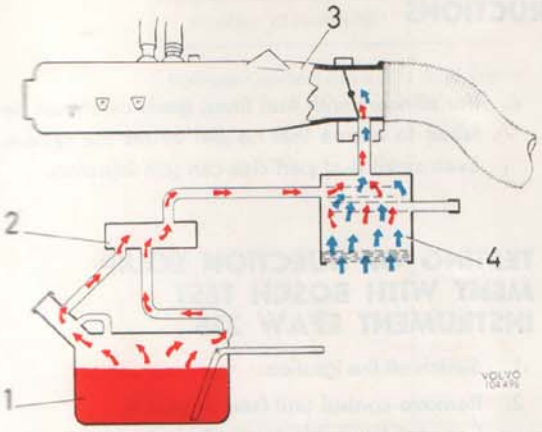



Fig. 2—34. Gas evaporite control system, principle

1. Fuel tank
2. Expansion container
3. Inlet duct
4. Venting filter

Gas fumes forming in the hermetically sealed tank, particularly during warm weather, are conveyed to the expansion container (2, Fig. 2—34) and from there to the venting filter (4) where they are mixed with the active carbon.

When the engine starts, air is drawn through the venting filter and into the engine via the inlet duct. Gas fumes stored in the active carbon are drawn by the air flow into the engine where they take part in the combustion.

The foam plastic filter at the bottom of the venting filter should be replaced after every 40 000 km (25 000 miles). To replace, slacken the screw (3, Fig. 2—31) and lift up the venting filter whereby the plastic filter can be changed.

## SPECIAL INSTRUCTIONS FOR WORKING ON VEHICLES WITH ELECTRONIC FUEL INJECTION

1. **Never** let the engine run without the battery connected.
2. **Never** use a high speed battery charger as a starting aid.
3. When using a high speed charger to charge the battery in the vehicle, the battery should be disconnected from the rest of the electrical system.
4. The control unit **may not** overheat above 85° C (185° F). The control unit must not be connected up (the engine started) when the ambient temperature exceeds 70° C (158° F). (With paint work, etc., when the vehicle is being stove-heated, it may not driven out of the oven, it must be conveyed out. If there is risk of temperatures exceeding 85° C [185° F], the control unit must first be removed.)
5. The ignition should be switched off before connecting up or disconnecting the control unit.
6. For all work with fuel lines, **great** care must be taken to ensure that no dirt enters the system. Even small dust particles can jam injectors.

## TESTING OF INJECTION EQUIPMENT WITH BOSCH TEST INSTRUMENT EFAW 228

1. Switch off the ignition.
2. Remove control unit (see page 39).
   Connect the cable from the test instrument to the cable harness in the vehicle, see Fig. 2—35.
3. Turn switch "A" on the instrument to position "Measuring circuit B".
4. Test as follows:
   (N.B. When testing with the test instrument, the entire program should be carried out. Any faulty component should be replaced or adjusted before continuing the test. Extra starting button for operating the starter motor may not be connected until the test "Voltage III starter motor" has been carried out.)


Fig. 2—35. Test instrument connected to the cable harness

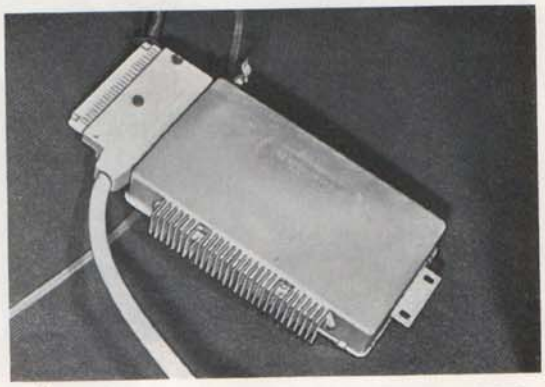
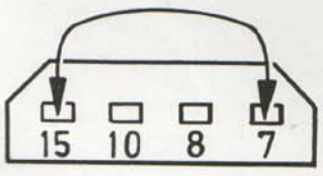
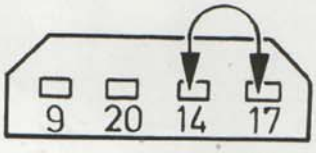



Fig. 2—36. Test instrument connected to cable harness and control unit

| Position of switch "B" | Operate | To measure | Indication (nominal value) | Devia |
|---|---|---|---|---|
| Voltage I control device | Switch on ignition | Voltage supply for the control unit | 11.0—12.5 (11.0—12.5 volt) | **No read**<br>1. Ope cont<br>2. Mai none igni cabl nals<br>**Voltage**<br>1. Fla<br>2. Volt |
| Voltage II control device | | | 11.0—12.5 (11.0—12.5 volt) | As for "V |
| Voltage III starter motor | Operate starter for a short time | Voltage at terminal 50 of starter solenoid | 9.0—12.0 (9.0—12.0 volt) | **No volta**<br>Open ci control u<br>**No volta**<br>1. Igni<br>2. Ope start<br>**Voltage**<br>1. Batt<br>2. Volt 50 or<br>3. Volt |
| Adjustment "Ω", pressure sensor | Set test instrument to "∞" by turning knob | | | When ful of the ve (See also |
| | Push "Ground" button | Resistance between pressure sensor windings and ground (short-circuit ground) | ∞ (∞ Ω) | **Resistanc**<br>Short circ of pressu remains a<br>**Resistanc**<br>Damage |
| | Push "Primary" button | Resistance of primary windings of pressure sensor | 0.5—1.0 on the Ω scale (approx. 90 Ω) | **Resistanc**<br>Damage instrume 7 and 15.<br>**Resistanc**<br>Voltage c (Check ca<br>**Resistanc**<br>Short circ plug out replace p<br>**Resistanc**<br>Open ci cables. (P sor. Brid in Illustra ment sh pressure cated, che |

| Operate | To measure | Indication (nominal value) | Deviation from nominal value. Possible faults and elimination |
|---|---|---|---|
| Switch on ignition | Voltage supply for the control unit | 11.0—12.5 (11.0—12.5 volt) | **No reading:**<br>1. Open circuit in cable 16, from terminal 87 on main relay to control unit.<br>2. Main relay inoperative. (Check for voltage at terminal 86. If none there, check the cable between terminals 86 and 15 on ignition coil. Check grounding from relay terminal 85 and cable 11 from control unit to ground. Check voltage at terminals 30/51. If there is no fault, change relay.)<br>**Voltage below 11 volt:**<br>1. Flat battery. (Check the battery voltage.)<br>2. Voltage drop in cables 16 or 11. Voltage drop in relay contacts. |
| | | 11.0—12.5 (11.0—12.5 volt) | As for "Voltage I control device". Also check cable 24. |
| Operate starter for a short time | Voltage at terminal 50 of starter solenoid | 9.0—12.0 (9.0—12.0 volt) | **No voltage, starter operates:**<br>Open circuit in cable 18 from terminal 50 on starter motor to control unit.<br>**No voltage as above, starter does not operate:**<br>1. Ignition/starter switch defective.<br>2. Open circuit in cable between ignition and terminal 50 on starter.<br>**Voltage below 9.0 volt:**<br>1. Battery flat.<br>2. Voltage drop in cable from ignition/starter switch to terminal 50 on the starter solenoid too high.<br>3. Voltage drop in cable 18. |
| Set test instrument to "∞" by turning knob | | | When full deflection on the instrument is not obtained the voltage of the vehicle battery is too low.<br>(See also test stage "Voltage I control device".) |
| Push "Ground" button | Resistance between pressure sensor windings and ground (short-circuit ground) | ∞ (∞ Ω) | **Resistance "0":**<br>Short circuit to ground in cable or at pressure sensor. (Pull plug out of pressure sensor, alter reading ∞, replace sensor. If the reading remains an unchanged 0, there is fault in cables 7, 8, or 15.)<br>**Resistance between "0" and "∞":**<br>Damage to insulation. (Proceed as described above.) |
| Push "Primary" button | Resistance of primary windings of pressure sensor | 0.5—1.0 on the Ω scale (approx. 90 Ω) | **Resistance considerably smaller than nominal value:**<br>Damage to insulation. (Pull plug out of pressure sensor and if test instrument shows "∞", replace pressure sensor, otherwise cables 7 and 15.)<br>**Resistance considerably larger than nominal value:**<br>Voltage drop in cables or contacts.<br>(Check cables and contacts.)<br>**Resistance "0":**<br>Short circuit to ground, short circuit in secondary windings. (Pull plug out of pressure sensor and if test instruments shows "∞", replace pressure sensor, otherwise check cables 7 and 15.)<br>**Resistance "∞":**<br>Open circuit in sensor or cables. (Pull plug out of sensor. Bridge plug as shown in illustration. If test instrument shows "0", replace pressure sensor. If "∞" indicated, check cables 7 and 15.)<br>  |

| Position of switch "B" | Operate | To measure | Indication (nominal value) |
|---|---|---|---|
| | Press in "Secondary" button | Resistance in pressure sensor secondary winding | 3—4 on Ω scale (approx. 350 Ω) |
| Ω distributor contact I<br>Ω distributor contact II | Read off test instrument with switch in position I. Switch to position II. If the test instrument swings to 0 in the first position, it should now indicate ∞ and if the instrument shows ∞ in the first position, it should now indicate 0.<br>Switch to position I. Run the engine with short strokes on the starter motor until the instrument shows a reading opposite to the first reading. Switch to position II again and check to make sure that the reading changes. | Functioning of the triggering contacts in the distributor | 0 and ∞<br>(0 and ∞ Ω) |
| Ω throttle valve switch I | Open and close throttle valve slowly | Impulses for extra fuel during acceleration | Instrument needle swings approx. 10 times between "0" and "∞" when the throttle valve opens. |
| Ω throttle valve switch II | | | (0 and ∞ Ω)<br>The instrument needle should indicate the ∞ when the throttle closes. |
| Ω throttle valve switch III | Check that throttle valve is closed | Functioning of the contacts in the throttle valve switch | 0<br>(0 Ω) |
| | Open throttle valve approx. 1°, (Place a 0.50 mm = 0.02" feeler gauge between stop screw and stop on throttle spindle.) | | ∞<br>(∞ Ω) |
| Ω temperature sensor I | | Resistance in temperature sensor for intake air | 2—5<br>(300 Ω at +20° C = 68° F considerably dependent on temperature. Small reading at higher temperature.) |
| Ω temperature sensor II | | Resistance in temperature sensor for coolant | 0.5—3.5<br>(approx. 2.5 K Ω at +20° C = 68° F. Considerably dependent on temperature. Lower reading at higher temperature.) |

| Operate | To measure | Indication (nominal value) | Deviation from nominal value. Possible faults and elimination |
|---|---|---|---|
| Press in "Secondary" button | Resistance in pressure sensor secondary winding | 3—4 on Ω scale (approx. 350 Ω) | See under "Primary". If needle of the test instrument shows ∞, connect terminals 8 and 10 in the plug instead of 7 and 15.) |
| Read off test instrument with switch in position I. Switch to position II. If the test instrument swings to 0 in the first position, it should now indicate ∞ and if the instrument shows ∞ in the first position, it should now indicate 0. Switch to position I. Run the engine with short strokes on the starter motor until the instrument shows a reading opposite to the first reading. Switch to position II again and check to make sure that the reading changes. | Functioning of the triggering contacts in the distributor | 0 and ∞ (0 and ∞ Ω) | **Resistance between 0 and ∞:** Check terminal on distributor. Check cables 12, 21 and 22. (If there is no fault in the terminal or cables change the contact insert in distributor.) |
| Open and close throttle valve slowly | Impulses for extra fuel during acceleration | Instrument needle swings approx. 10 times between "0" and "∞" when the throttle valve opens. (0 and ∞ Ω) The instrument needle should indicate the ∞ when the throttle closes. | **Instrument needle shows "0" or swings when throttle valve closes:** Faulty throttle valve switch, replace. |
| Check that throttle valve is closed | Functioning of the contacts in the throttle valve switch | 0 (0 Ω) | **Resistance "∞":** Throttle valve switch incorrectly adjusted or damaged. Open circuit in cables to switch. (Pull out plug and bridge as shown in Illustration. If the pointer swings to "0", there is no damage in the cables. Re-connect the switch. Check setting of throttle valve switch acc. to page 39: Change switch if unable to be adjusted.)   VOLVO 104 416 |
| Open throttle valve approx. 1°, (Place a 0.50 mm = 0.02" feeler gauge between stop screw and stop on throttle spindle.) | | ∞ (∞ Ω) | **Reading "0":** Throttle valve switch incorrectly adjusted or damaged. Open circuit in cables. (Pull out plug. If reading swings to "∞", the cables are not damaged. Re-connect switch and check setting acc. to page 41. Replace throttle valve switch if unable to be adjusted.) |
| | Resistance in temperature sensor for intake air | 2—5 (300 Ω at +20° C = 68° F considerably dependent on temperature. Small reading at higher temperature.) | **Resistance "∞":** Open circuit. (Pull out plug and connect terminals. If reading swings to "0", change sensor, otherwise check cables 1 and 13.) **Reading "0":** Short circuit. (Pull out plug. If reading is the same, check cables 1 and 13. If reading swings to "∞", change sensor.) |
| | Resistance in temperature sensor for coolant | 0.5—3.5 (approx. 2.5 K Ω at +20° C = 68° F. Considerably dependent on temperature. Lower reading at higher temperature.) | Se under "Temperature sensor I". (Check cables 23 and 32.) |

| Position of switch "B" | Operate | To measure | Indication (nominal value) |
|---|---|---|---|
| Ω Injectors | Adjust instrument to ∞ again (with switch "B" in position "Ω Injectors"). Press in the buttons 1, 2, 3 and 4, one after the other.<br><br>Push buttons:<br><br>1 = injector for cyl. 1<br>2 = injector for cyl. 4<br>3 = injector for cyl. 2<br>4 = injector for cyl. 3 | Resistance of the windings in the injector with cable | 2—3<br>(2.4 Ω at 20° C = 68° F) |

Turn switch "A" to "Pressure-leakage injectors". (Switch "B" position is of no importance here.)

| Position of switch "A" | Operate | To measure | Indication (nominal value) |
|---|---|---|---|
| Pressure-leakage injectors | Connect pressure gauge to pressure regulator, see page 40<br><br>Press "Pump" button on the instrument | Pressure in fuel system | Nominal value<br>2 kp/cm² (28 p.s.i.) |
| | Press "Pump" button briefly | Leaks in the fuel system (pressure side) | Pressure may drop back to 1.2 kp/cm² (17 p.s.i.) when "Pump" button released. After this, any pressure drop should be very slow. |
| | N.B. The following control should only be made when it is ascertained that there is a fault in one of the injectors.<br>Remove the injectors, see page 43<br>Press in "Pump" button on the instrument and check the injectors for leakage.<br>Then press in buttons 1, 2, 3 and 4, one after the other with the "Pump" button and check that the injectors open. Take care not to damage the injector needles.<br>Collect the injected fuel to prevent it from making contact with a possibly warm exhaust manifold. | Function and leakage of the injectors | |

| Operate | To measure | Indication (nominal value) | Deviation from nominal value. Possible faults and elimination |
|---|---|---|---|
| Adjust instrument to ∞ again (with switch "B" in position "Ω Injectors"). Press in the buttons 1, 2, 3 and 4, one after the other.<br><br>Push buttons:<br><br>1 = injector for cyl. 1<br>2 = injector for cyl. 4<br>3 = injector for cyl. 2<br>4 = injector for cyl. 3 | Resistance of the windings in the injector with cable | 2—3<br>(2.4 Ω at 20° C = 68° F) | **Resistance "0":**<br>Short circuit in cables or injectors.<br>(Pull plug out of injector concerned and if test instrument shows "∞", exchange injector, otherwise replace cable harness.)<br><br>**Resistance "∞":**<br>Open circuit in cable or injector windings. (Remove plug from injector concerned, connect terminals in plug. If test instrument shows "0", the injector is defective; otherwise check the cables for the injector.)<br><br>**Resistance over "3":**<br>Ground cable from the injectors has a bad connection on the engine.<br>(Check ground cables for respective valves, 26, 27, 30 and 31.) |

ssure-leakage injectors". (Switch "B" position is of no importance here.)

| Operate | To measure | Indication (nominal value) | Deviation from nominal value. Possible faults and elimination |
|---|---|---|---|
| Connect pressure gauge to pressure regulator, see page 40<br><br>Press "Pump" button on the instrument | Pressure in fuel system | Nominal value<br>2 kp/cm² (28 p.s.i.) | **No pressure build-up (pump does not start):**<br>Check if pump relay cuts in when "Pump" button is depressed.<br>Relay does not cut-in: Open circuit in cable 28, from main relay terminal 87 to pump relay terminal 86, resp. cable 19 from pump relay terminal 85 to control unit. (If the cables are not damaged, change the relay.)<br>Relay cuts-in: Open circuit in cable 36, from terminal 87 on pump relay to contact on pump or in cable 35, from contact to ground. Faulty pump. (Check cables, measure voltage at plug contact for pump. If voltage is 12 volts, change pump.)<br><br>**Pressure above or below 2 kp/cm² (28 p.s.i.):**<br>Pressure regulator incorrectly adjusted or damaged.<br>(Adjust or change regulator.) |
| Press "Pump" button briefly | Leaks in the fuel system (pressure side) | Pressure may drop back to 1.2 kp/cm² (17 p.s.i.) when "Pump" button released. After this, any pressure drop should be very slow. | **Pressure drops quickly below 1.2 kp/cm² (17 p.s.i.) when "Pump" button is released:**<br>(Build up the pressure again. With pinchers (SVO 2901) pinch off the fuel line between the header pipe and the fuel pipe from the pump. If the pressure does not drop, then the leak is in the pump or fuel line.<br>If the pressure continues to drop, remove the pinchers from the hose, build up the pressure again and re-fit the pinchers on the hose between the pressure gauge and pressure regulator. (After having released the "Pump" button.)<br>If the pressure does not drop more, then the pressure regulator is faulty.<br>If the pressure continues to drop, remove the pinchers from the hose. Run up the pressure again and re-fit the pinchers between the header pipe and the cold start valve.<br>If the pressure does not drop any more, the fault is in the cold start valve. If the pressure drops, the fault must be in one of the injectors, see below. |
| N.B. The following control should only be made when it is ascertained that there is a fault in one of the injectors. Remove the injectors, see page 43<br>Press in "Pump" button on the instrument and check the injectors for leakage.<br>Then press in buttons 1, 2, 3 and 4, one after the other with the "Pump" button and check that the injectors open. Take care not to damage the injector needles.<br>Collect the injected fuel to prevent it from making contact with a possibly warm exhaust manifold. | Function and leakage of the injectors | | The valve opening may be wet, but the injector must not leak more than 2 drops per minute at 2 kp/cm² (28 p.s.i.). |

Switch off ignition. Connect control unit to other side of connection from instrument acc. to Fig. 2—32. Switch on ig

| Position of switch "A" | Operate | To measure | Indication (nominal value) | De |
|---|---|---|---|---|
| Volt-distr. contact I | Remove plug contact from distributor | Function of cold start valve and control unit operation of cold start valve via cold start relay | | |
| a) Coolant temperature below 40—50° C (104—122° F) | Press "Pump" button on instrument briefly<br>Disconnect cable 36 to pump from terminal 87 on pump relay<br>Run starter motor briefly | | Pressure in fuel line should drop slowly (cold start valve should inject) | **Press**<br>(Che<br>relay<br>starte<br>relay<br>termi<br>own<br>If th<br>repla |
| b) Coolant temperature above 40—50° C (104—122° F) | 1. See under "a" | | The pressure must not drop noticeably (The cold start valve must not inject) | **Press**<br>Cool |
| (If coolant temperature is below 40—50° C (104—122° F) at the beginning of test, check both according to "a" and "b" (run engine warm) at warm engine only according to "b".) | 2. Pull out the plug contact from the temperature sensor for coolant<br>Otherwise, see under "a" | | The pressure should drop (The cold start valve should inject) | See |

Switch off ignition. Remove the pressure gauge. Fit the plug contacts on the distributor and coolant temperature s

| | | | | |
|---|---|---|---|---|
| Volt-distr. contact I<br>Volt-distr. contact II | Start engine and let it run about 2000 r.p.m.<br>Switch over instrument to between Z-V contacts I and II | Functioning of the triggering contacts | Instrument pointer should swing to full reading and then to average value. On switching between ZV-contacts I and II, pointer may not move more than 2 fraction marks on voltage scale | **Feed**<br>(Rep |

Remove instrument and fit control unit.

ect control unit to other side of connection from instrument acc. to Fig. 2—32. Switch on ignition.

| Operate | To measure | Indication (nominal value) | Deviation from nominal value. Possible faults and elimination |
|---|---|---|---|
| Remove plug contact from distributor<br>Press "Pump" button on instrument briefly<br>Disconnect cable 36 to pump from terminal 87 on pump relay<br>Run starter motor briefly | Function of cold start valve and control unit operation of cold start valve via cold start relay | Pressure in fuel line should drop slowly (cold start valve should inject) | **Pressure does not drop when starter is operated:**<br>(Check cable 34, from cold start valve to terminal 87 on cold start relay, cable 33, from cold start valve to ground, and cable 29, from starter motor terminal 50 to terminal 86 on cold start relay. Check relay. If cables and relay are not damaged, remove cable 2 from terminal 85 on relay and connect terminal 85 to ground. (Make own bridge.)<br>If the pressure drops, the control unit is faulty and should be replaced. Otherwise, check the valve, 4.2 Ω at 20° C (68° F). |
| 1. See under "a" | | The pressure must not drop noticeably (The cold start valve must not inject) | **Pressure drops when starter motor is operated:**<br>Coolant temperature sensor or control unit faulty. |
| 2. Pull out the plug contact from the temperature sensor for coolant<br>Otherwise, see under "a" | | The pressure should drop (The cold start valve should inject) | See under "a". |

ove the pressure gauge. Fit the plug contacts on the distributor and coolant temperature sensor.

| | | | |
|---|---|---|---|
| Start engine and let it run about 2000 r.p.m.<br>Switch over instrument to between Z-V contacts I and II | Functioning of the triggering contacts | Instrument pointer should swing to full reading and then to average value. On switching between ZV-contacts I and II, pointer may not move more than 2 fraction marks on voltage scale | **Feed reading deviates more than 2 fraction marks:**<br>(Replace contact kit in distributor.) |

control unit.

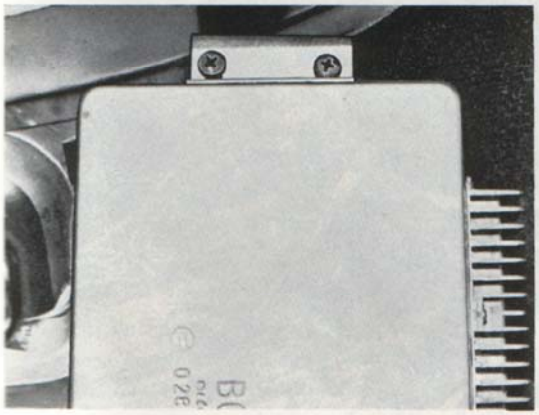


Fig. 2—37. Screws for control unit

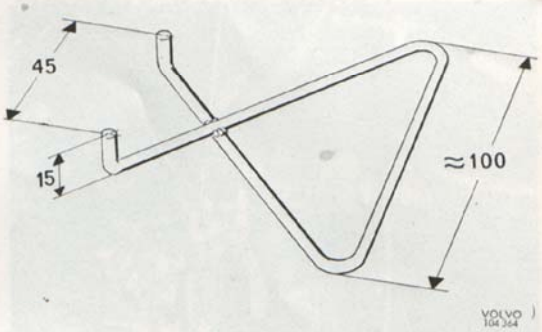



Fig. 2—39. Puller for plug contact
Material: 2 mm (5/64") welding wire

## CONTROL UNIT

### REMOVING

1. Disconnect the defroster hose.
2. Remove the two screws, see Fig. 2—37, securing the control unit. Take down the control unit.
3. Remove the screw (1, Fig. 2—38) for the cap holding the cable harness to the control unit.
4. Pull out the plastic cover strip (2, Fig. 2—38).
5. Make a puller as shown in Fig. 2—39. Hook in the puller, see Fig. 2—40, and pull out the plug contact carefully.

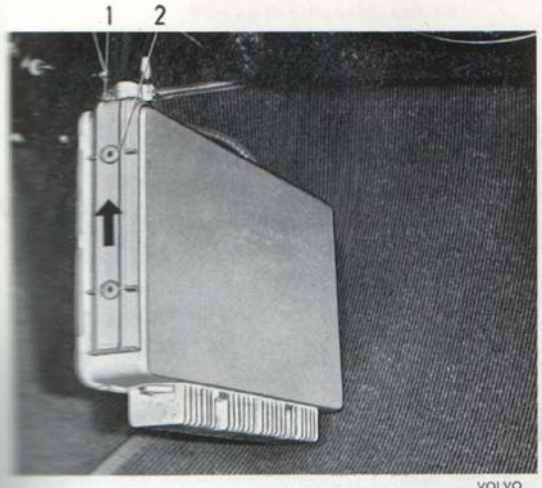



Fig. 2—38. Removing the control unit

1. Screw for cap
2. Plastic protection

### FITTING

1. Press the plug contact firmly into the control unit.
   Fit the plastic cover strip and cap.
   Check that the cable is mounted correctly.
2. Mount the control unit and fit the screws. Make sure that the control cable for the fresh-air intake is not clamped.
3. Fit the defroster hose.

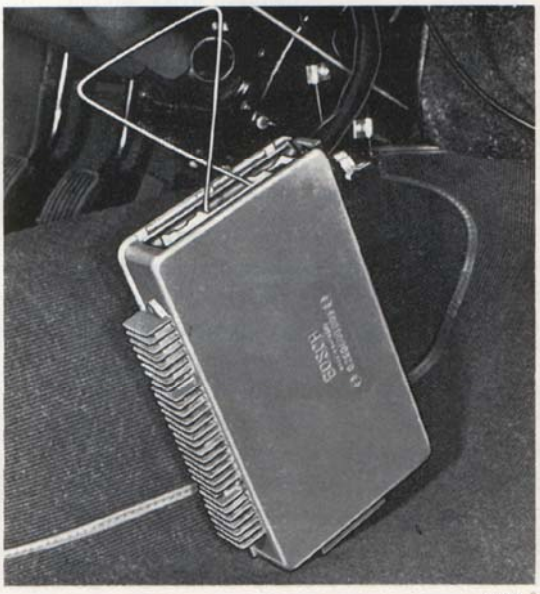


Fig. 2—40. Removing the plug contact

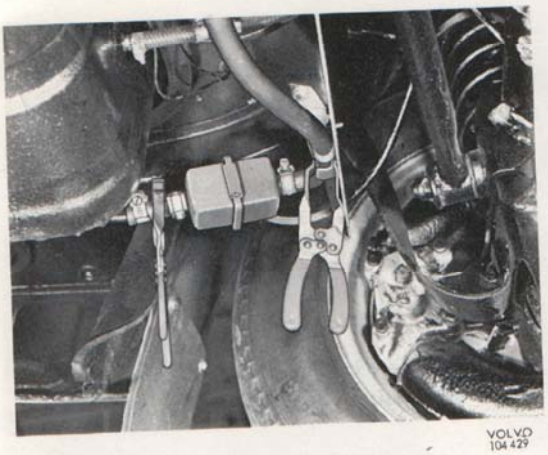



Fig. 2—41. Changing the fuel filter

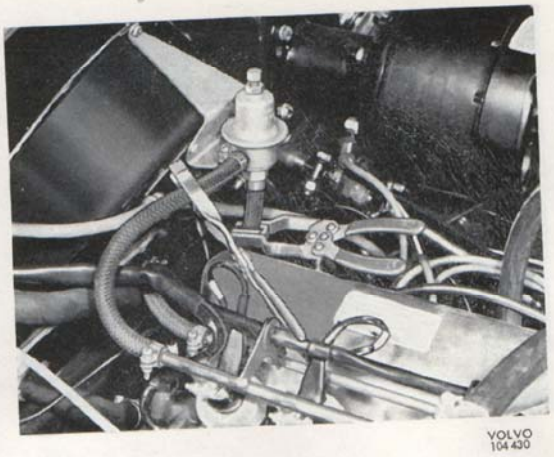



Fig. 2—42. Changing the pressure regulator

## FUEL FILTER

### REPLACING

1. Clean well round the filter.
2. Fit the pinchers (SVO 2901) on the hoses next to the filter, see Fig. 2—41. Slacken the hose clips and remove the filter.
3. Fit the new filter. Tighten the hose clips and remove the pinchers from the hoses.

N.B. Make sure that the new filter is fitted with the arrow pointing in the direction of the flow. Make sure that no dirt enters the connections for the new filter.

## FUEL PUMP

### REPLACING

1. Clean round the connections on the pump.
2. Fit pinchers (SVO 2901) on the suction and delivery lines and on both sides of the T-pipe in the return line to the tank. Slacken the hose clips and remove the hoses. Remove the plug contacts.
3. Remove the screws holding the pump.
4. Fit the new pump. Connect up hoses and plug contacts. Remove the pinchers. Check to make sure that the pump is functioning and that the connections do not leak.

### CHECKING

The pump should deliver 50 litres/h (11 Imp. galls—13.2 US galls/h at a pressure of 2 kp/cm² (28 p.s.i.). At this load, current consumption should be 2.5 amps.

N.B. The pump is pole-sensitive. Observe care when testing a disconnected pump.

## PRESSURE REGULATOR

### REPLACING

1. Place pinchers (SVO 2901) on the hoses next to the pressure regulator, see Fig. 2—42.
2. Slacken the hose clips and remove the hoses. Remove the nut holding the regulator.
3. Fit the new regulator and secure with the nut. Fit the hoses and tighten up the hose clips.
4. Remove the pinchers and check for leakage.

### ADJUSTING

1. Place pinchers (SVO 2901) at the fuel hose between the header pipe and pressure regulator.

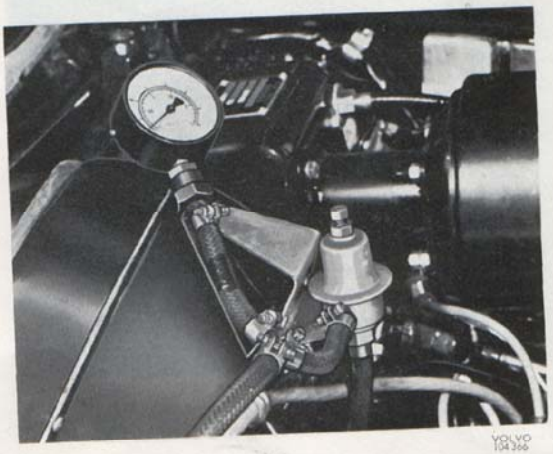



Fig. 2—43. Connecting the pressure gauge

2. Slacken the hose clips and disconnect the hose. Connect the pressure gauge as shown in Fig. 2—43. Remove the pinchers.
3. Run the fuel pump, either by starting the engine or by connecting up test instrument Bosch EFAW 228 and operating the pump with this instrument.
4. Slacken the locknut and adjust the pressure to 2.0 kp/cm² (28 p.s.i.). (Replace regulator if pressure is not correct.)
5. Fit pinchers on the hose between the header pipe and pressure gauge.
   Remove the pressure gauge. Fit the hose on the pressure regulator and tighten the hose clips. Remove the pinchers on the hose. Check for leakage.

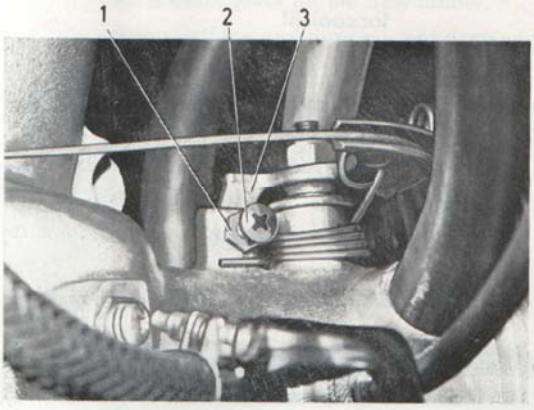



Fig. 2—44. Stop screw for throttle valve

1. Locknut
2. Stop screw
3. Stop on throttle valve spindle

## THROTTLE VALVE

### ADJUSTING

1. Slacken the locknut for the stop screw on the throttle valve, (see 1, Fig. 2—44) and screw out the screw a couple of turns so that it does not lie against the stop on the throttle valve spindle. Check to make sure that the valve is completely closed.
2. Screw in the stop screw until it touches the stop on the throttle valve spindle. Then screw in 1/4—1/2 turn more and secure the locknut. Check to make sure that the throttle valve does not jam or stick in the closed position.
3. Adjust the throttle valves switch shown on page 41. N.B. Idling must **not** be adjusted with the stop screw.

## THROTTLE VALVE SWITCH

### REPLACING

1. Pull out the plug contact from the throttle valve switch. Remove the two screws holding the throttle valve switch to the intake duct. Pull the throttle valve switch straight out.
2. Press on the new throttle valve switch carefully. Fit the screws loosely. Connect the plug contact. Adjust the throttle valve switch according to below.

### ADJUSTING

1. Connect Bosch test instrument EFAW 228.
2. Set switch "A" to position "Measuring" and switch "B" to position "Throttle valve switch III'.
3. Slacken the screw in order to turn the throttle valve switch. Make a mark on the intake duct at the upper screw if there is not one there already.
4. Turn the throttle valve switch clockwise as far as possible. Then turn it slowly anti-clockwise until the pointer on the instrument goes over from the "∞" to "0".
   Then turn a further 1° (1/2 graduation mark on scale at upper attaching screw) and secure the throttle valve switch.
5. Check to make sure that instrument pointer goes over to "∞" when the throttle valve opens about 1°. (Place a 0.50 mm = 0.02" feeler gauge between the stop screw and stop on the throttle valve spindle.)

### CHECKING

For the following checks, several components are connected up, so that it is not possible to establish with certainty whether the fault is in the throttle switch if the checks are unsatisfactory.

1. Switch on the ignition. Open and close the throttle valve slowly. Clicking sounds should come from a group of injectors to indicate that extra fuel for acceleration has been injected.
2. Start the engine and run it warm. Pull off the hose between the intake duct and auxiliary air regulator. The engine should now "roll', that is, change speed between approx. 900 and approx. 1700 r.p.m. This indicates that the contacts in the throttle valve switch are closed and that the section of the control unit which regulates closing of the fuel supply during enginge braking is functioning.

## TEMPERATURE SENSOR I (INTAKE AIR)

### REPLACING

1. Pull out the four-way plug from the sensor.
2. Replace the sensor. Do not tighten the new sensor too hard.
3. Re-fit the four-way plug.

### CHECKING

Measure the resistance between the terminal pins and compare with the table below, see Fig. 2—45.

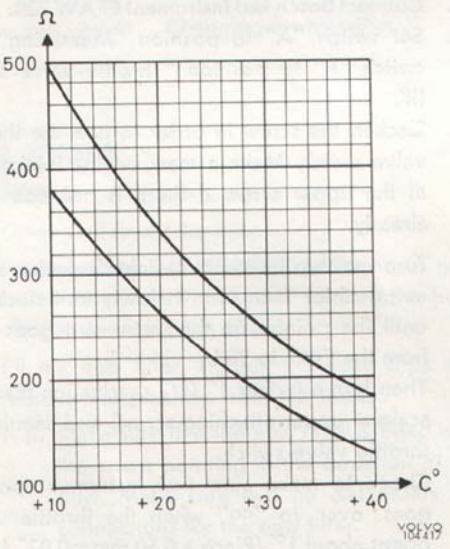



Fig. 2—45. Resistance in temperature sensor for intake air

## TEMPERATURE SENSOR II (COOLANT)

### REPLACING

1. Drain off coolant.
2. Disconnect plug contact from the sensor. Screw out and replace the sensor. Do not forget the sealing ring.
3. Re-fit the plug contact and fill with coolant.

### CHECKING

1. Measure the resistance between the terminal pins and compare with the table below, see Fig. 2—46.

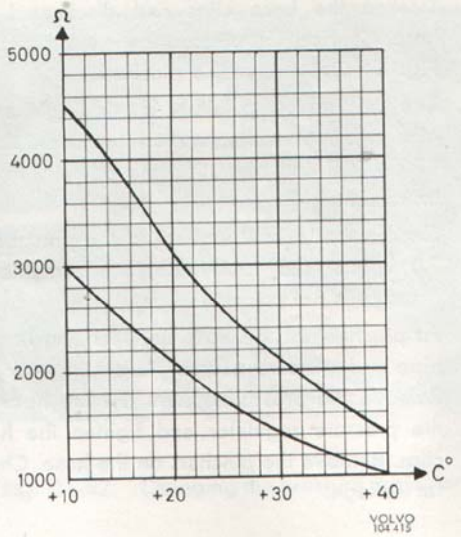



Fig. 2—46. Resistance in temperature sensor for coolant

## AUXILIARY AIR REGULATOR

### REPLACING

1. Drain off the coolant.
2. Remove the two air hoses from the auxiliary air regulator.
   Undo the fixing screws and draw out the regulator.
3. Fit the sealing ring and screw on the new regulator.
4. Re-fit the air hoses and fill with coolant.

### CHECKING

1. Run the engine warm (approx. 80° C=176° F). Read off the idling speed. Then pull off the hose between the intake duct and the auxiliary air regulator. Cover the hose opening with the hand.
2. Check that the speed does not drop noticeably in relation to the first reading.
   If the speed drops noticeably, there must be a leak in the auxiliary air regulator, which should be replaced.

## PRESSURE SENSOR

### REPLACING

1. Pull out the four-way plug.
   Pull off the hose from the sensor, having removed the clips.
2. Undo the three fixing screws holding the pressure sensor to the wheel housing.
3. Fit the new sensor on the wheel housing. Connect up the hose and re-fit the four-way plug.
   N.B. Do not remove the protection over the hose connection until the hose has been re-fitted.

### CHECKING

Measure the resistance between the terminal points.
The resistance should be approx. 90 ohms between 7 and 15 (primary winding).

Approx. 350 ohms between 8 and 10 (secondary winding).

All other combinations should give "∞" resistance.

## IGNITION DISTRIBUTOR TRIGGERING CONTACTS

### REPLACING

1. Remove the ignition distributor.
2. Undo the two screws securing the holder and pull out the holder.
3. Apply a little grease (Bosch Ft 1 v 4 or corresponding) to the fibre deflecting pieces of the contact breaker lever on the new holder.
4. Check to see if the rubber ring is not damaged, replace if necessary.
5. Fit the new holder in the distributor and secure it.
   (It is not possible to adjust the contacts.)
6. Fit the distributor and adjust the ignition according to page 43.

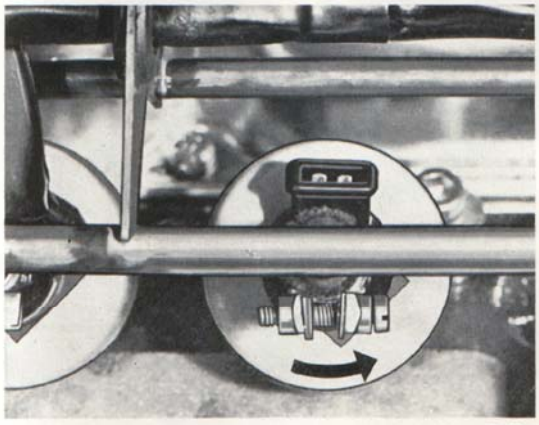



Fig. 2—47. Removing an injector

## INJECTORS

### REPLACING

1. Disconnect the hose clips for all injectors. Remove the header pipe.
2. Turn the lock ring, Fig. 2—47, anti-clockwise so that it loosens from the bayonet fitting. Pull out the injector.
3. Fit the new injector and lock it securely with the lock ring.
   Fit the header pipe.

When removing all the injectors, for example, for checking purposes, the hose clips do not need to be removed since all the injectors and header pipe can be lifted up at the same time, see Fig. 2—48.

N.B. The small rubber ring on the injector should be replaced each time the injector is removed.

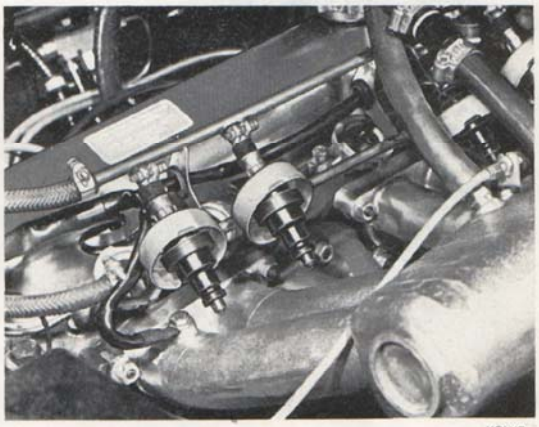



Fig. 2—48. Injector removed for checking

### CHECKING

Measure the resistance between the terminal pins. The resistance should be 2.40 ohms at +20° C (68°F).

N.B. Never test an injector by connecting up 12 volts to the terminal. The injector will be ruined immediately since it caters for a max. operating voltage of 3 volts.

Maximum leakage for the injectors is two drops/minute at 2 kp/cm² (28 p.s.i.).

## ADJUSTING THE IGNITION

1. Connect rev. counter and stroboscope.
2. Remove the hose for the air cleaner at the intake duct. Disconnect the hose for the distributor vacuum control from the intake duct. Fit pinchers (SVO 2901) on the hose between the intake duct and oil trap.
3. Start the engine. Fit the plastic cover, SVO 2902, as shown in Fig. 2—49 and adjust down the speed to 700—800 r.p.m. by moving the plate across the hole in the plastic cover.

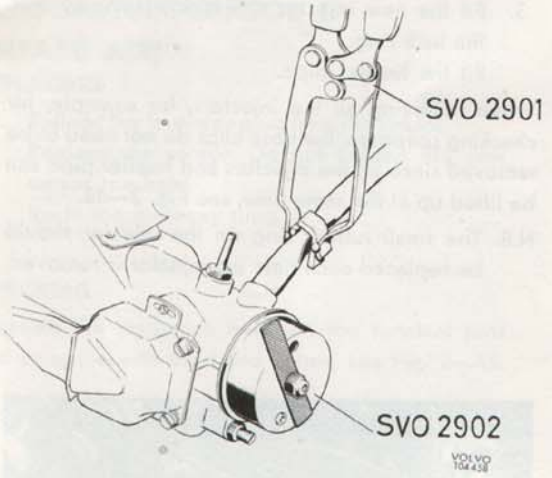



Fig. 2—49. Cover for ignition adjustment

4. Adjust the ignition to 10° B.T.D.C. (For the adjustment, slacken the distributor housing and turn in the desired direction.)
5. Remove the plastic cover and pinchers. Re-fit the hose on to the vacuum governor. Re-fit the air cleaner hose.

## ADJUSTING THE IDLING

1. Run the engine until it is warm (approx. 80° C = 176° F). Connect a rev. counter.
2. Remove the hose from the air cleaner at the intake duct.
3. Check to make sure that the auxiliary air regulator is completely closed by pulling off the hose between the intake duct and the regulator and by covering the opening with the hand. The speed must not differ much from the previous speed. (Engine insufficiently warm or auxiliary air regulator faulty.) Re-fit the hose.
4. Adjust the idling speed to 900 r.p.m. by means of the throttle stop screw. (If the speed cannot be lowered sufficiently, check the basic setting of the throttle valve, see page 41.)
5. Re-fit the air cleaner hose.

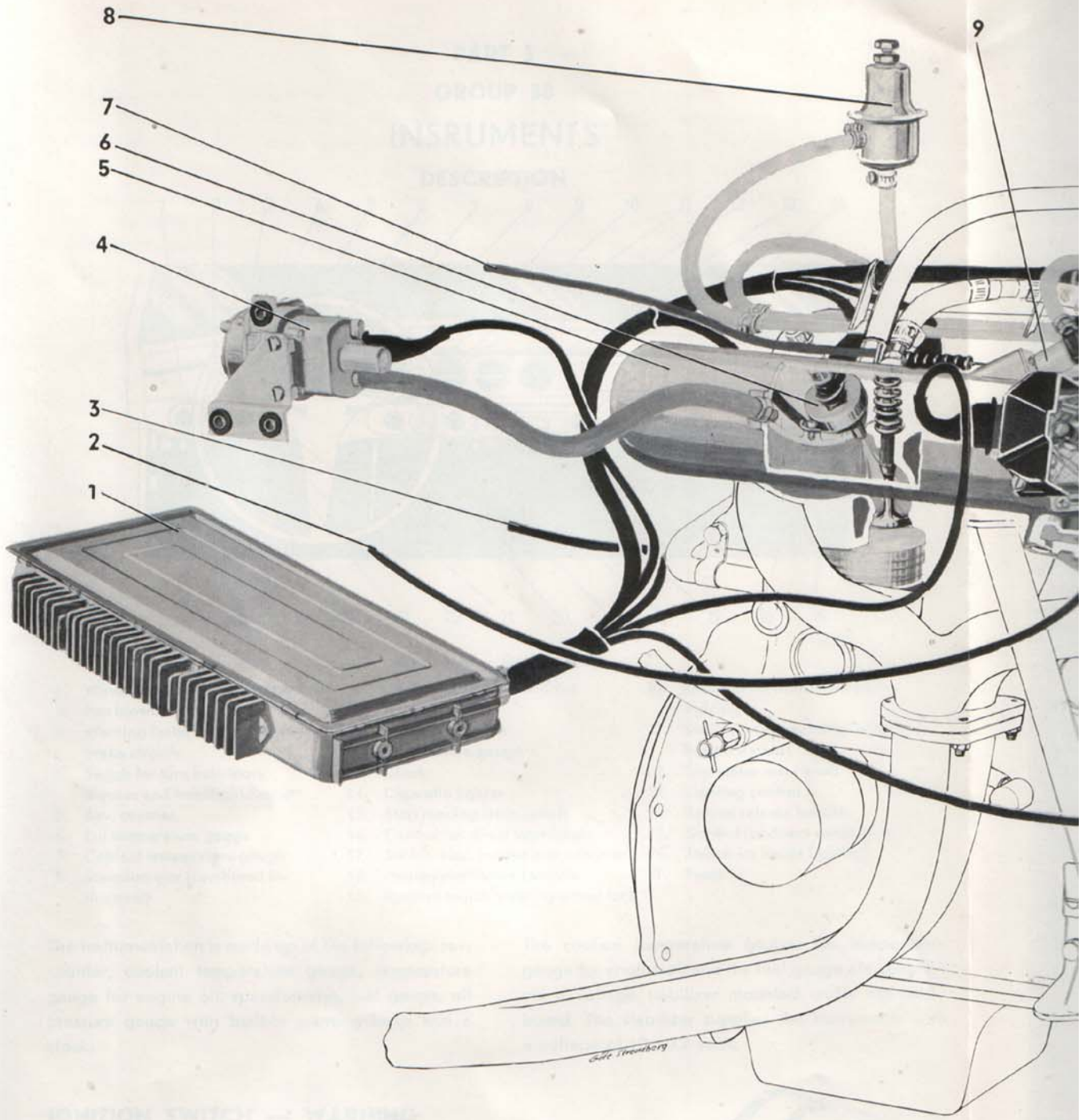



Illustration 2—A. B 20 E engine

1. Control unit
2. To cold start relay
3. To main relay
4. Pressure sensor
5. Intake duct
6. Injectors
7. To throttle control
8. Pressure regulator
9. Cold start valve
10. Throttle valve switch
11. Throttle valve
12. Temperature sensor, coolant

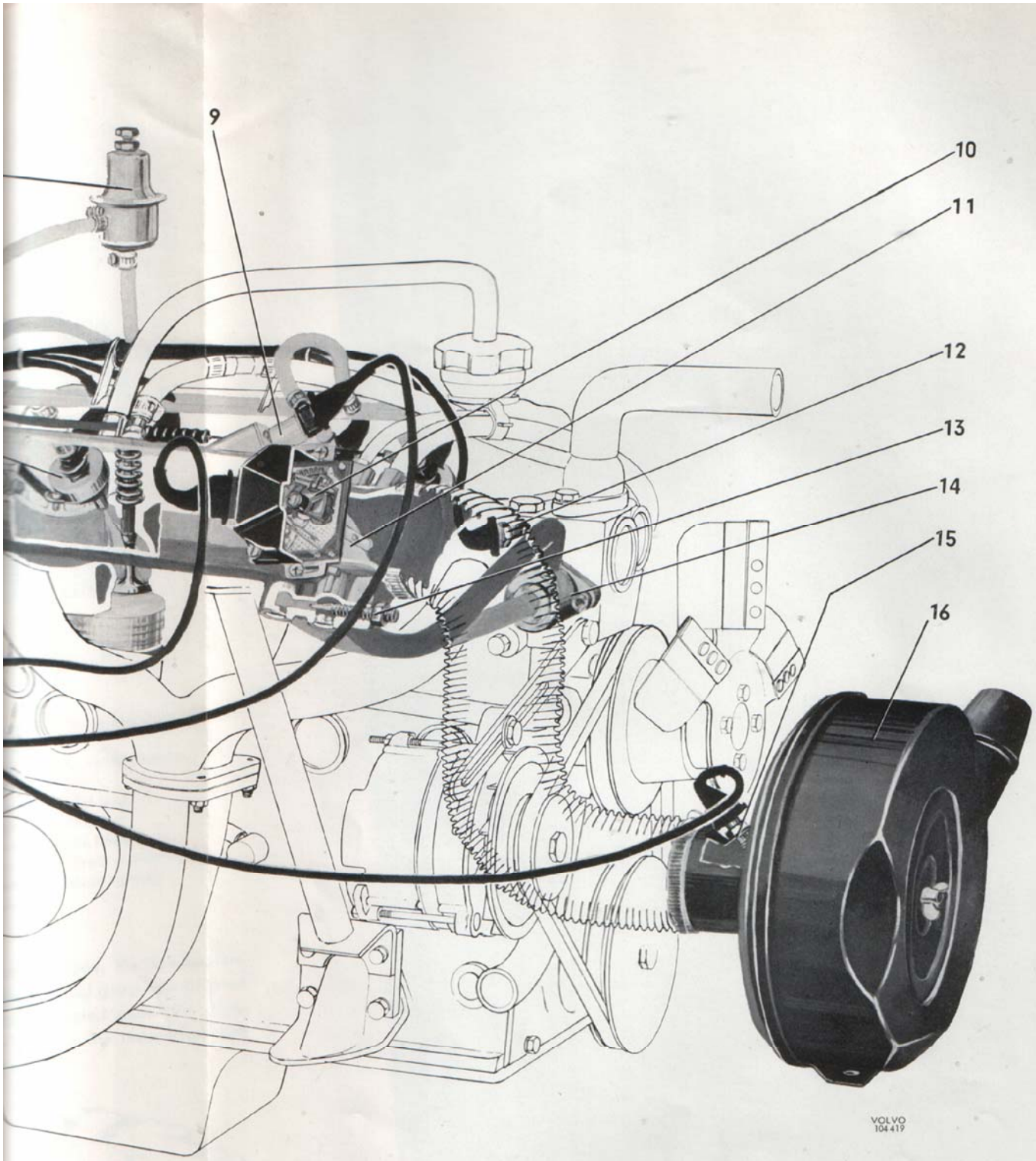



Illustration 2—A. B 20 E engine

To throttle control
Pressure regulator
Cold start valve
Throttle valve switch
Throttle valve
Temperature sensor, coolant

13. Throttle stop screw
14. Auxiliary air regulator
15. Temperature sensor, intake air
16. Air cleaner

# PART 3

## GROUP 38

# INSRUMENTS

## DESCRIPTION

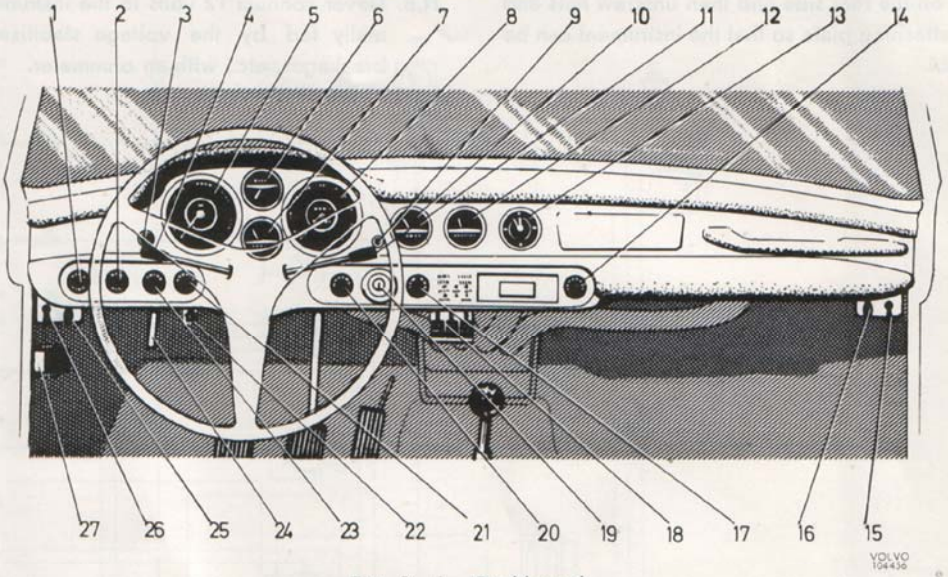



Fig. 3—1. Dashboard

1. Windscreen wiper washer control
2. Fan blower
3. Warning lamp, handbrake and brake circuits
4. Switch for turn indicators, dimmer and headlight flasher
5. Rev. counter
6. Oil temperature gauge
7. Coolant temperature gauge
8. Speedometer (combined instrument)
9. Control lamp for overdrive
10. Fuel gauge
11. Overdrive switch
12. Oil pressure gauge
13. Clock
14. Cigarette lighter
15. Map reading lamp switch
16. Control for direct ventilation
17. Switch, elec. heated rear window
18. Heater/ventilation controls
19. Ignition switch/steering wheel lock
20. Rheostat for instrument panel lighting
21. Switch, 4-way warning safety hazard flashers
22. Trip meter reset knob
23. Lighting control
24. Bonnet release handle
25. Control for direct ventilation
26. Switch for inside lighting
27. Fuses

The instrumentation is made up of the following: rev. counter, coolant temperature gauge, temperature gauge for engine oil, speedometer, fuel gauge, oil pressure gauge with built-in warning lamp and a clock.

The coolant temperature gauge, the temperature gauge for engine oil and the fuel gauge are actuated via a voltage stabilizer mounted under the dashboard. The stabilizer supplies the instruments with a voltage of $10 \pm 0.2$ volts.

## IGNITION SWITCH — WARNING DEVICE

Vehicles for the U.S.A. market are fitted with a special ignition switch with a warning device. This warning device consists of an extra contact on the ignition switch (1, Fig. 3—2), and a buzzer which is mounted above the fusebox on the left-hand side of the firewall.

The warning device starts buzzing if the ignition key is left in the switch and the driver's door is opened.

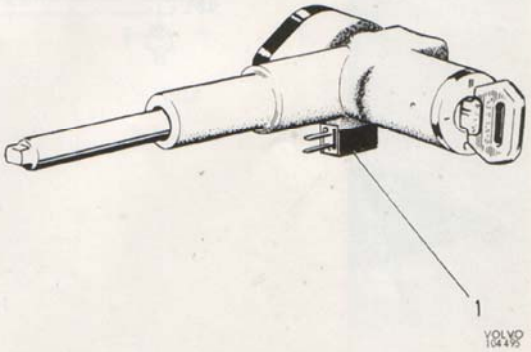



Fig. 3—2. Ignition switch for U.S.A. vehicle
1. Contact for buzzer

## REPAIR INSTRUCTIONS

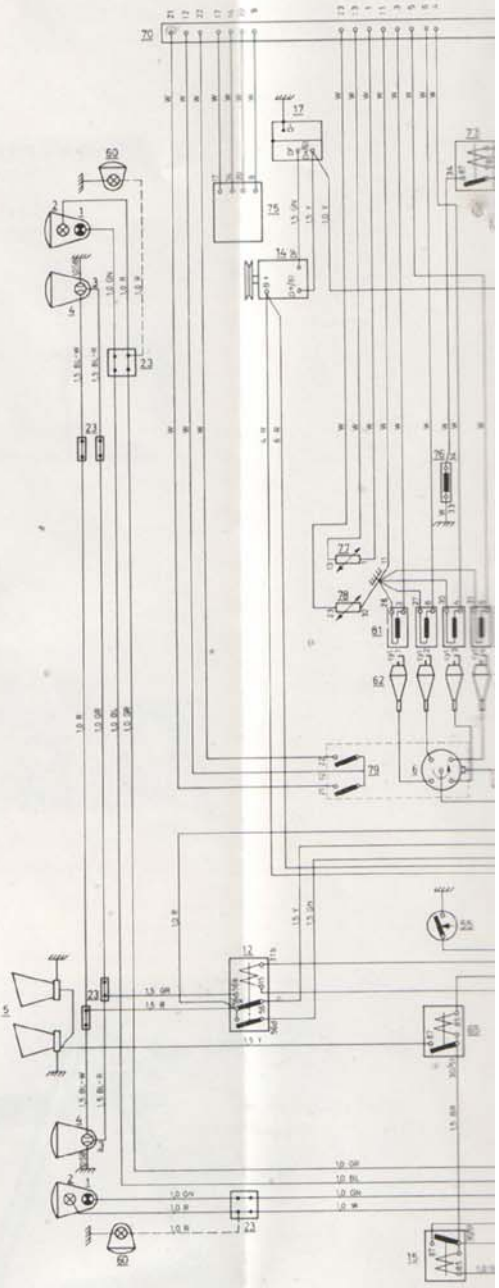
Before carrying out any work behind the dashboard, disconnect the negative battery lead to avoid possible short-circuiting.

When changing an instrument first remove the connections on the rear side and then unscrew nuts and remove attaching plate so that the instrument can be pulled out.

When replacing the voltage stabilizer, make sure that the new one takes up the same position as the old one, otherwise the voltage from the stabilizer will be altered.

N.B. Never connect 12 volts to the instruments normally fed by the voltage stabilizer. Check breakages, etc., with an ohmmeter.

1. Turn indicators, 32 CP
2. Parking lights, 4 CP
3. Dipped lights, 40 W
4. Main beam, 45 W
5. Horns
6. Distributor (firing order 1-3-4-2
7. Ignition coil
8. Battery, 12 V 60 Ah
9. Starter motor, 1.0 h.p.
10. Switch for reversing lights
11. Control lamp for main beam, 3 W
12. Step relay for main beam, dipped and flasher signal
13. Horn ring
14. Alternator, 35 A
15. Relay for reversing lights
16. Fusebox
17. Voltage regulator
18. Brake switch
19. Warning blinkers
20. Warning lamp for brakes, 2 W
21. Warning lamp for oil pressure, 2 W
22. Warning lamp for charging, 3 W
23. Connector
24. Connector (only r-h steered)
25. Control lamp for overdrive, 2 W
26. Switch for turn indicators and flasher
27. Fuel gauge
28. Voltage stabilizer
29. Temperature gauge
30. Oil pressure sensor
31. Switch for overdrive, on gearbox
32. Control lamp for turn indicators
33. Instrument lighting
34. Temperature sender
35. Heater control lighting
36. Heater
37. Windscreen wipers
38. Windscreen washers
39. Control solenoid for overdrive, on gearbox
40. Interior lighting, 2×5 W
41. Switch for heater
42. Switch for windscreen wipers/ washers
43. Rheostat for instrument lighting
44. Lighting switch
45. Ignition switch
46. Cigarette lighter
47. Door switch
48. Switch for handbrake control
49. Fuel level sensor
50. Reversing lights
51. Brake lights, 32 CP
52. Rear lights, 4 CP
53. Number plate lighting, 2×4 CP
54. Switch for overdrive
55. Brake warning switch
56. Map reading lamp
57. Switch for map reading lamp
58. Elec. heated rear window, 150/40 W
59. Switch for elec. heated rear window
60. Side marking lights (only USA), 5 W
61. Relay for elec. heated rear window
62. Spark plug
63. Warning buzzer (only USA)
64. Door switch on driver side
65. Horn relay
66. Oil pressure gauge
67. Oil temperature sensor
68. Oil pressure gauge
69. Clock
70. Control unit for fuel injection
71. Main relay for fuel injection
72. Relay for fuel pump
73. Relay for cold start valve
74. Pressure sensor
75. Throttle valve switch
76. Cold start valve
77. Temperature sensor I (intake air)
78. Temperature sensor II (coolant)
79. Triggering contacts
80. Fuel pump
81. Injectors



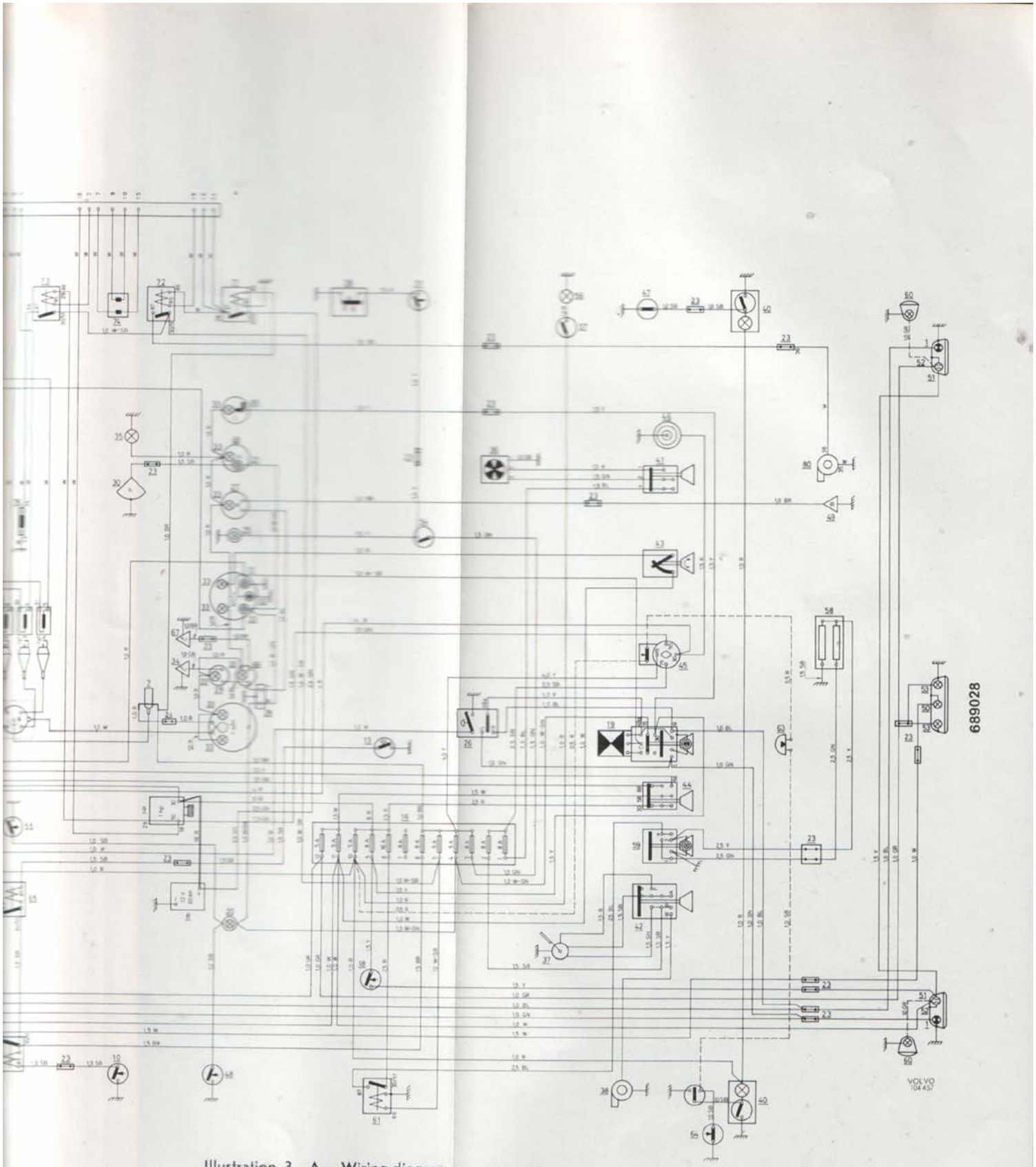



Illustration 3—A. Wiring diagram

# PART 4
# POWER TRANSMISSION, REAR AXLE
## GROUP 43
# GEARBOX
## TOOLS

The following special tools are used for repairs on the gearbox

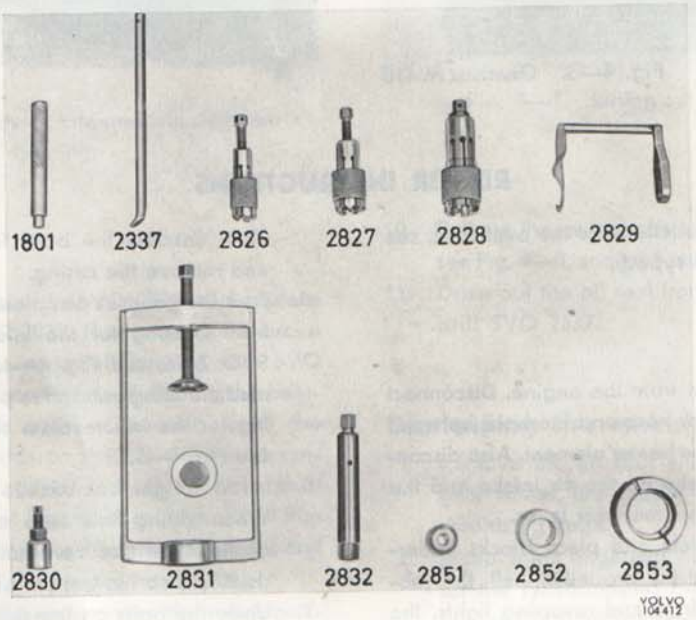



Fig. 4—1. Special tools

| | |
|---|---|
| SVO 1801 | Standard handle 18×20 mm |
| SVO 2337 | Drift for removing oil seal in cover for input shaft |
| SVO 2520 | Stand, see Fig. 4—2. Used together with fixture SVO 2825. |
| SVO 2825 | Fixture for mounting the gearbox. Used together with stand SVO 2520 |
| SVO 2826 | Puller for front bearing on intermediate shaft |
| SVO 2827 | Puller for rear bearing on intermediate shaft |
| SVO 2828 | Puller for rear bearing on mainshaft |
| SVO 2829 | Device for lifting out and installing mainshaft in gearbox |
| SVO 2830 | Extractor for removing reverse shaft |
| SVO 2831 | Press tool for fitting bearing on intermediate shaft and rear bearing on mainshaft |
| SVO 2832 | Puller for rear bearing on mainshaft. Used together with SVO 2828. |
| SVO 2833 | Fixture for gearbox. Used on garage jack for removing and fitting gearbox |
| SVO 2851 | Drift for fitting oil sealing cover for input shaft |
| SVO 2852 | Cushioning ring for fitting bearing on input shaft and synchronizers on mainshaft |
| SVO 2853 | Ring for dismantling mainshaft |


Fig. 4—2. Stand SVO 2520 and fixture SVO 2825

## DESCRIPTION

The gearbox is four-speed and fully synchronized. The design and construction can be seen from Fig. 4—3 and Illustration 4—A. All gears except reverse are in constant mesh with one another. For this reason, the mainshaft gears are journalled with needle bearings on the shaft. When a gear is engaged, the corresponding gear wheel is connected to the mainshaft by means of an engaging sleeve.

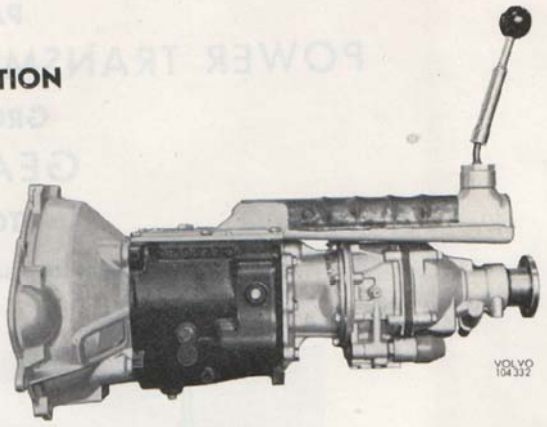



Fig. 4—3. Gearbox M 410

## REPAIR INSTRUCTIONS

Concerning repair instructions for the overdrive, see Part 4 (43 b, Overdrive Type J).

### REMOVING

1. Drain the coolant from the engine. Disconnect the upper radiator hose and the hose between the engine and the heater element. Also disconnect the hose between the air intake and the inlet duct. Remove the gear lever.
2. Jack up the vehicle and place blocks underneath. Disconnect the propeller shaft, the cables for the overdrive and reversing lights, the bracket for the exhaust pipe and the clutch cable.
3. Replace the lifting plate on a garage jack with fixture SVO 2833. The pin in the fixture should be placed in its rear position. Support under the gearbox with the fixture and then disconnect the support member under the gearbox.
4. Place a wooden chock between the engine and cowl and lower the jack until the engine is against the chock.
5. Unscrew the bolts on the clutch casing. Pull the gearbox backwards and then lower it.

### DISMANTLING

1. Mount fixture SVO 2825 on stand SVO 2520, see Fig. 4—2. Secure the gearbox to the fixture.
2. Unscrew the bolts and lift off the gearbox cover. Remove the springs and interlock balls for the selector rails.
3. Unscrew the nuts securing the overdrive to the intermediate flange. Remove the overdrive.
4. Remove the throw-out bearing. Undo the bolts and remove the cover over the input shaft. Then unscrew the bolts for the clutch casing and remove the casing.
5. Turn the gearbox completely over. Pull out the front bearing for the intermediate shaft with SVO 2826, see Fig. 4—4. Remove the intermediate flange and then pull off the rear bearing for the intermediate shaft with SVO 2827, see Fig. 4—5.
6. Invert the gearbox back to its original position. When doing this take care that the intermediate shaft teeth are not damaged when the shaft falls so the bottom of the gearbox.
7. Undo the bolts on the selector forks. Push the selector rails back and drive out the tensioning pin in the flange of the selector rails. Push out the rails. Hold against the selector forks to prevent them from coming askew and so jam on the rails. Remove the selector forks.

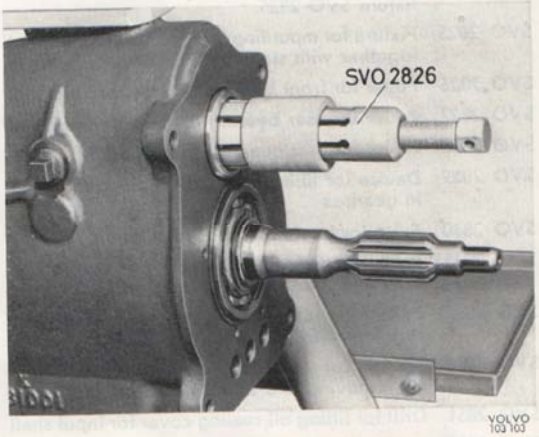



Fig. 4—4. Removing the intermediate shaft front bearing

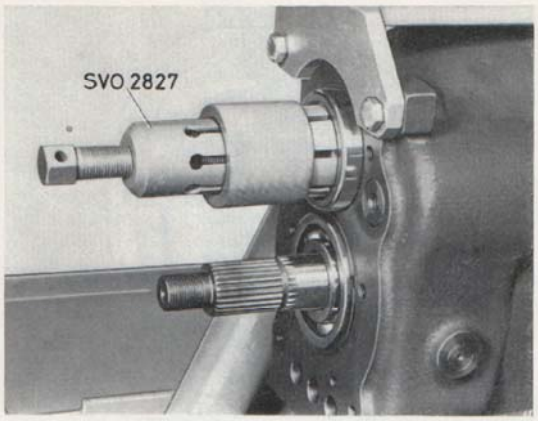



Fig. 4—5. Removing intermediate shaft rear bearing


Fig. 4—7. Lifting out the mainshaft

8. Remove the screw in SVO 2828 and replace it with tools SVO 2832. Then remove the circlip and pull off the mainshaft bearing with SVO 2828 and 2832, see Fig. 4—6. Should the bearing stick in the gearbox housing, push the mainshaft forwards so that its drive and synchronizers go against the intermediate shaft drive. To prevent this, however, a piece of iron or similar can be placed between the front end of the mainshaft and the gearbox housing.
9. Pull out the input and remove the synchronizing ring. Remove the thrust washer from the rear end of the mainshaft. Fit lift tool SVO 2829 onto the mainshaft. Push the engaging sleeve for 1st—2nd speed backwards. Lift up the mainshaft as shown in Fig. 4—7.
10. Pull out the reverse shaft with puller SVO 2830, see Fig. 4—8, and take out the reverse gear.
11. Drive out the oil seal from the front cover with drift SVO 2337.

## Dismantling the mainshaft

1. Remove the lift tool and then the 1st speed gear wheel, the needle bearing and the synchronizing cone.
2. Remove the engaging sleeves and the flanges for the synchronizing rings. Take off the circlips for the synchronizing hub.
3. Fit tool SVO 2853 on the mainshaft. Place the shaft in a press and place a support under the tool as shown in Fig. 4—9. Press off the 2nd


Fig. 4—6. Removing the mainshaft rear bearing

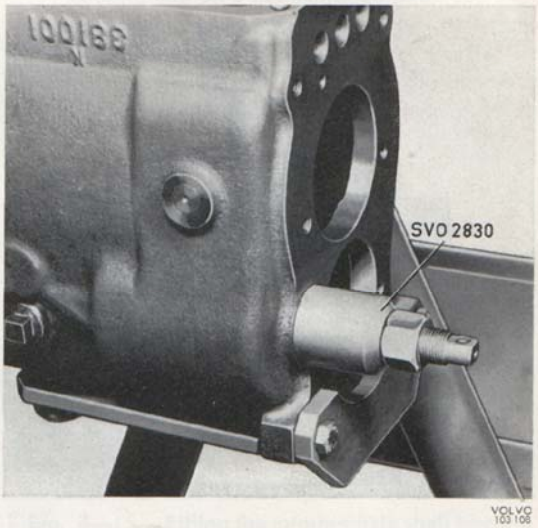



Fig. 4—8. Removing the reverse shaft

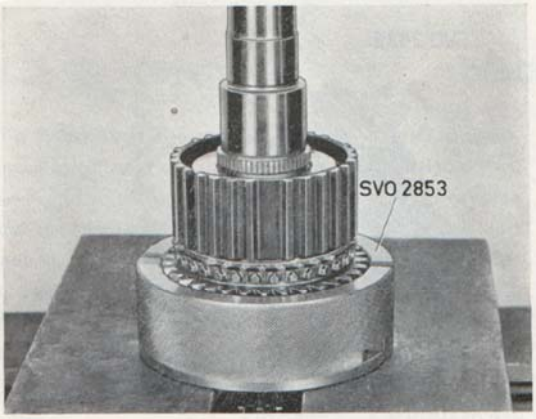



Fig. 4—9. Dismantling the mainshaft, I

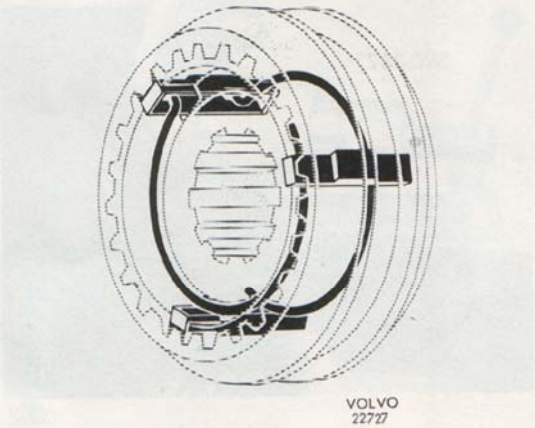



Fig. 4—11. Assembling the synchronizing

speed gear wheel and the 1st—2nd speed synchronizing hub.

4. Invert the shaft and place it in the press as shown in Fig. 4—10. Press off the 3rd speed gear wheel and the 3rd—4th speed synchronizing hub.

## INSPECTING

After dismantling, clean all the parts in white spirit and check for wear or other damage.

Check the gear wheels, especially for scoring or cracks in the surfaces. Damaged or worn gears should be replaced.

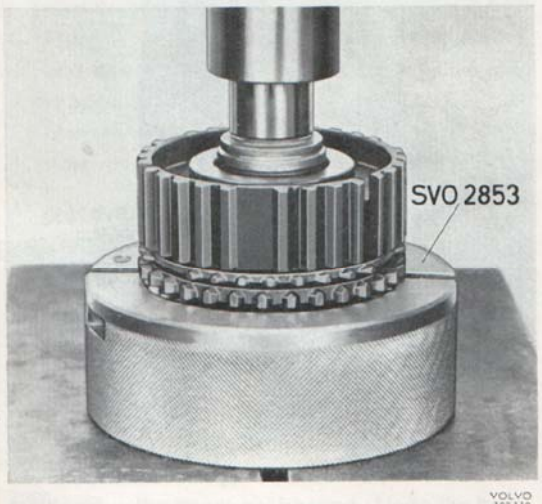



Fig. 4—10. Dismantling the mainshaft, II

Check the synchronizing cones, also the other components in the synchronizing devices. Damaged or worn parts should be replaced.

Check the ball bearings for scoring or cracks in the races or on the balls.

## ASSEMBLING

### Assembling the mainshaft

1. Put together 1st—2nd and 3rd—4th speed synchronizers. Fit the snap rings properly, see Fig. 4—11.
2. Place ring SVO 2852 in a press. Fit on 3rd—4th speed synchronizer, synchronizing cone, 3rd speed gear wheel and needle bearing. Make sure that the flange for the synchronizer fits properly in the grooves in the synchronizing cone. Press the mainshaft into the synchronizing hub, see Fig. 4—12. Then rotate the 3rd speed gear wheel to check that both it and the needle bearing are properly fitted. Try on a circlip which fills out the groove well and fit it.
3. Place 1st—2nd speed synchronizer, synchronizing cone, 2nd speed gear wheel and needle bearing on ring SVO 2852. Make sure that the gear ring on the engaging sleeve is forwards and that the flange fits properly in the synchronizing cone groove. Press in the mainshaft as shown in Fig. 4—12. When doing this, rotate the 2nd speed gear wheel to make sure that it does not stick. Try out a circlip which fills the groove well and fit it.
4. Fit the 1st speed gear wheel together with needle bearing and synchronizing cone on the mainshaft. Fit on the lift tool SVO 2829.

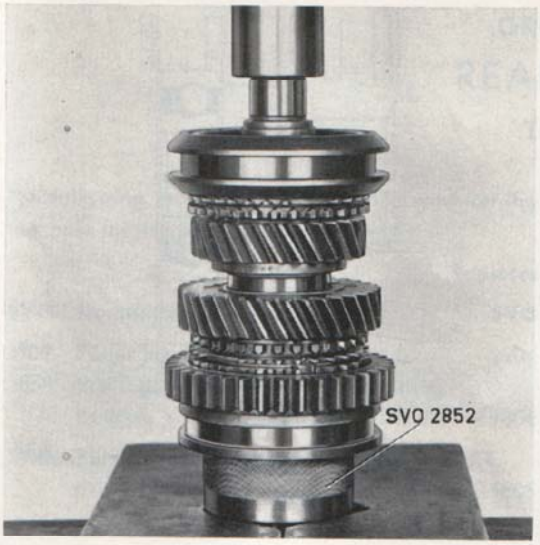



Fig. 4—12. Fitting the synchronizing

## Assembling the gearbox

1. Press the oil seal into the front cover with drift SVO 2851 + 1801. Press the ball bearing on the input shaft with the help of the cushioning ring SVO 2852 and drift SVO 2851, see Fig. 4—13. Try out a circlip which fits the groove well and fit it.
2. Place the shift levers for the reverse gear on the bearing pin in the gearbox housing. Fit the reverse gear and the reverse gear shaft. The reverse gear shaft should lie at a level with the rear wall of the housing or max. 0.2 mm (0.008") below.

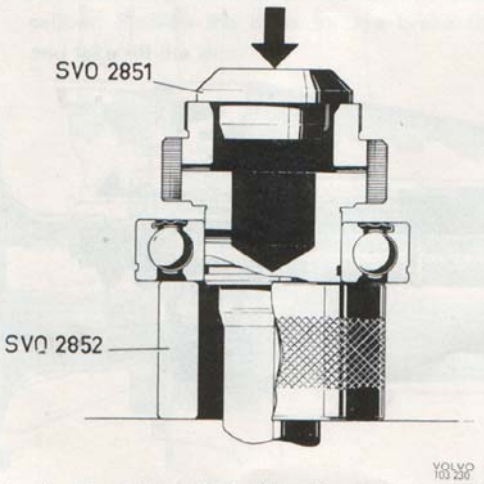



Fig. 4—13. Fitting the ball bearing on input shaft

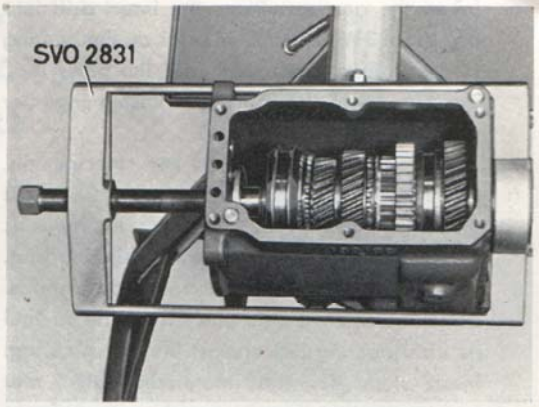



Fig. 4—14. Fitting the mainshaft rear bearing

3. Place the intermediate shaft on the bottom of the gearbox housing. Fit the mainshaft in the housing. Remove the lift tool and place the thrust washer on the mainshaft.
4. Place the rear ball bearing on the mainshaft. Fit press tool SVO 2831 over the bearing and mainshaft as shown in Fig. 4—14. Press the bearing on the shaft. If the bearing does not take up its correct position in the housing, the spindle on tool SVO 2831 can be screwed out and a piece of flat iron placed between it and the front wall of the housing. The bearing can then be pressed into position with the tool. Fit the circlip.
5. Place the needle bearing in the input shaft. Place the loose synchronizing cone into the 3rd—4th speed synchronizer. Make sure that it is fitted properly so that the flanges come in its groove. Push the input shaft into the housing and onto the mainshaft pin.

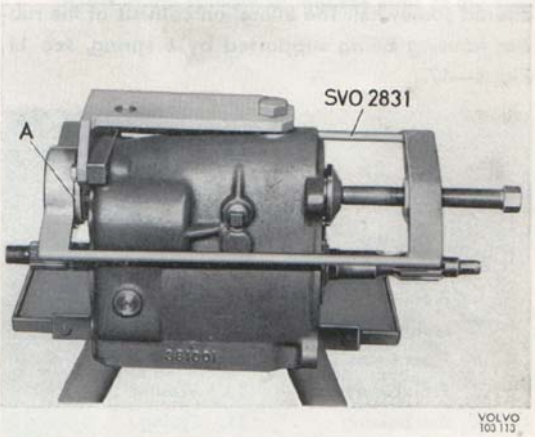



Fig. 4—15. Fitting the intermediate shaft bearing
A. Insert drift

6. Invert the gearbox. Place the insert drift into press tool SVO 2831. Then press on the bearing for the intermediate shaft with the press tool, see Fig. 4—15. Fit the clutch casing together with the new gasket.
7. Fit the selector forks, flange and selector rails. Make sure that the reverse gear flange is properly fitted into the gear lever. Fit the bolts and tensioning pins. Use new tensioning pins.
8. Upend the gearbox with the rear face upwards. Drive the intermediate shaft forwards so that its front bearing lies against the clutch casing. Insert shims for the intermediate shaft rear bearing so that they lie evenly with or up to 0.05 mm (0.002″) under the rear face, see A, Fig. 4—16.
9. Fit the intermediate flange with a new gasket. When fitting, compress the gasket and ensure that the intermediate shaft has the correct clearance, 0.20—0.25 mm (0.08—0.10″).
10. Fit the overdrive.
11. Place the interlock balls and springs in position. Fit the gearbox cover together with the gasket. Fit the throw-out bearing.

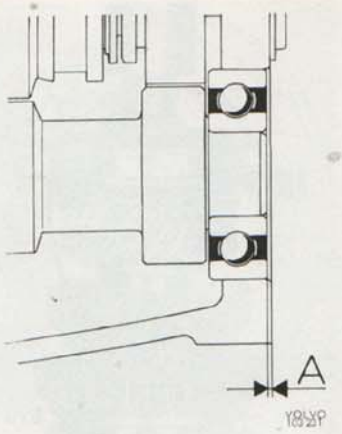



Fig. 4—16. Clearance for intermediate shaft
A = 0.00—0.05 mm (0—0.002″)

## FITTING

Fitting the gearbox is in reverse order to removal. Fill with oil.

# GROUP 45

# PROPELLER SHAFT

The pilot bearing for the propeller shaft has been altered somewhat. The alteration consists of the rubber housing being supported by a spring, see 11, Fig. 4—17.

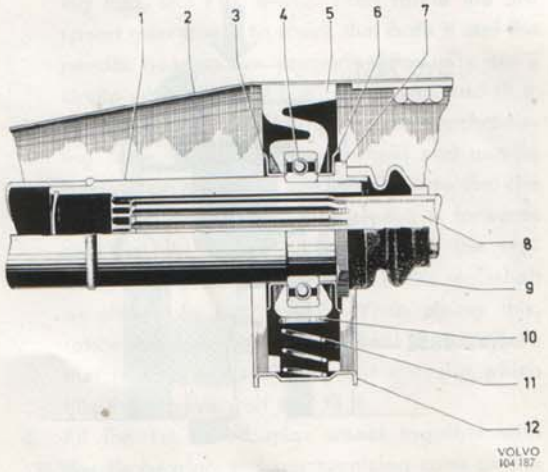


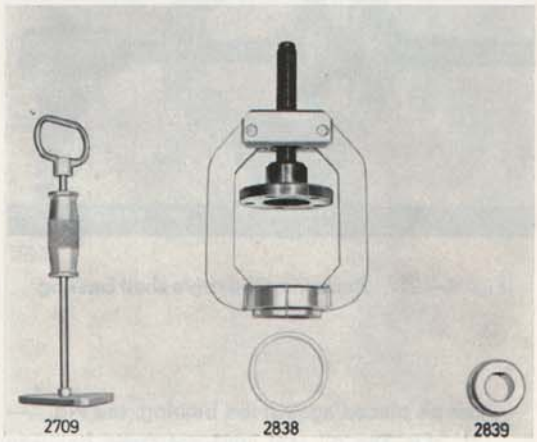

Fig. 4—17. Pilot bearing

1. Front propeller shaft section
2. Floor tunnel
3. Protection plate
4. Ball bearing
5. Rubber housing
6. Protection plate
7. Nut
8. Splined shaft
9. Rubber protection
10. Washer
11. Spring
12. Cap

## GROUP 46
# REAR AXLE
## TOOLS

The following tools are used for repair work on the rear axle for the 1800 E.

| SVO | Description | Replaces SVO |
|---|---|---|
| 2709 | Puller for drive shaft | 2204 |
| 2838 | Press tools for removing and fitting bearing and circlip on drive shaft | 1806 |
| 2839 | Ring for fitting bearing and circlip on drive shaft. Used together with SVO 2838 | 1805 |




## DESCRIPTION

The rear axle on the 1800 E has the same drive shaft journalling as for the 164 model. Bearing clearance is not adjustable but is determined by the construction of the bearing, see 4—19.

## REPAIR INSTRUCTIONS

### REPLACING BEARINGS AND OIL SEALS FOR DRIVE SHAFT

1. Jack up the vehicle and place blocks under the rear axle. Take off the wheels.
2. Disconnect the brake pipe for the brake caliper. Undo the bolts and take off the brake caliper. Slacken the bolts for the brake disc and take off the disc.
3. Undo the screws for the thrust washer. These are taken out through the hole in the drive shaft flange. Pull out the drive shaft with puller SVO 2709, see Fig. 4—20.
4. Secure press tool SVO 2838 in a vice. Screw the drive shaft firmly to the spindle plate. Screw in the spindle so that the arms of the tool

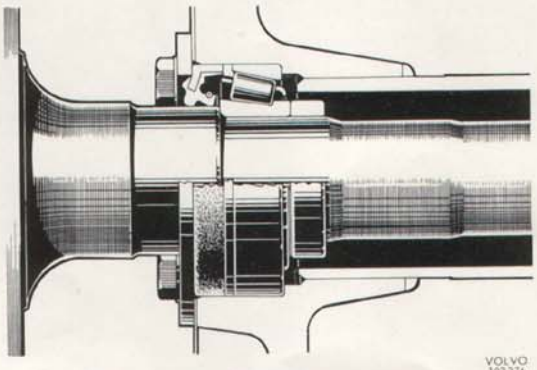



Fig. 4—19. Drive shaft journalling

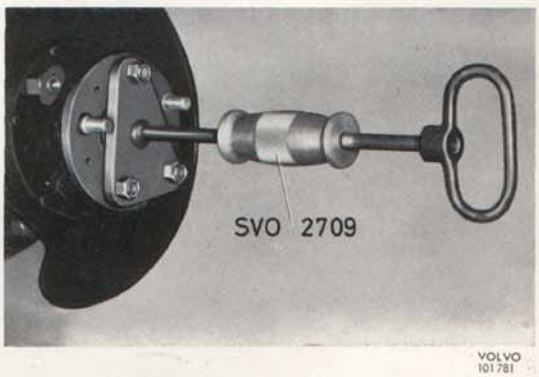



Fig. 4—20. Removing the drive shaft

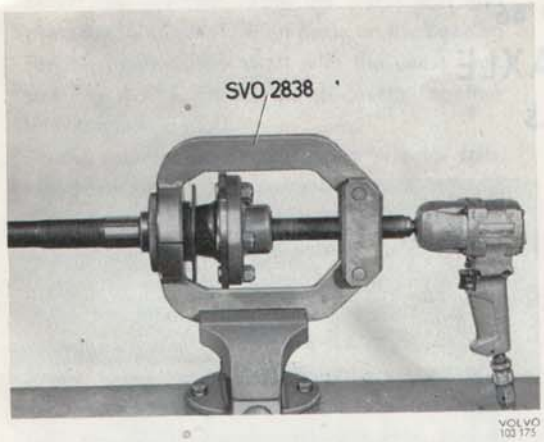



Fig. 4—21. Removing the drive shaft bearing

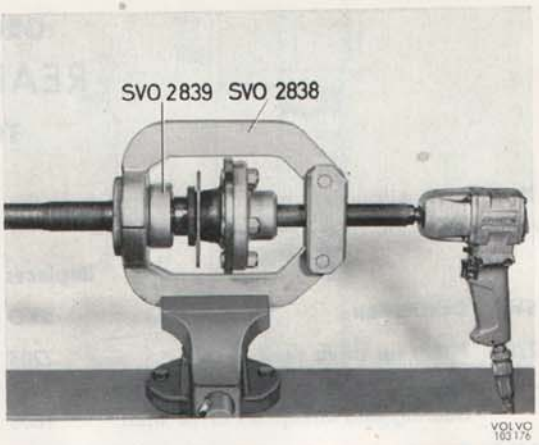
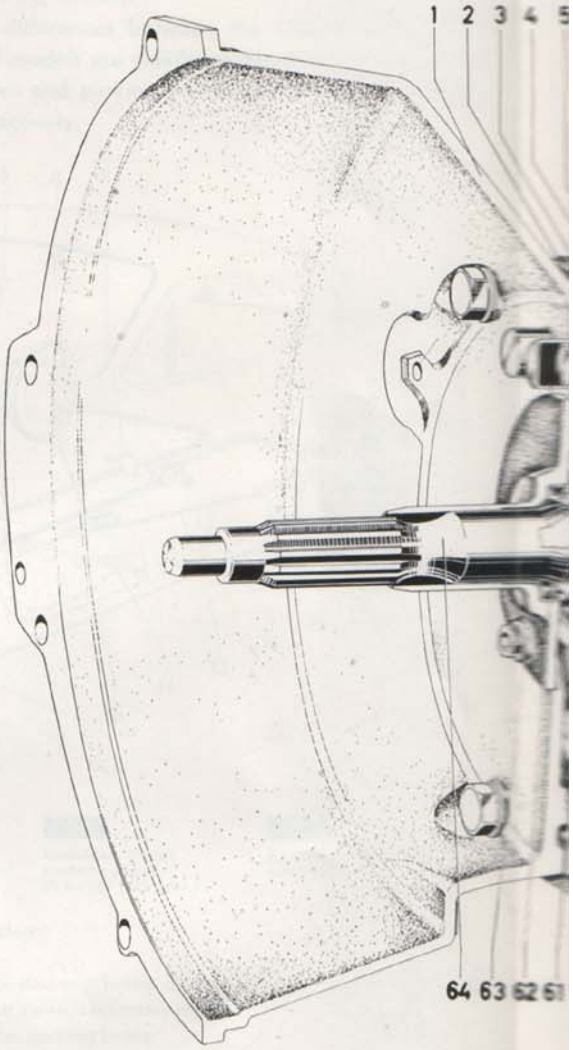



Fig. 4—22. Fitting the drive shaft bearing

can be placed against the bearing, see Fig. 4—21. N.B. The oil seal must not come between the tool and the bearing. Screw out the spindle and press off the bearing and circlip. Remove the oil seal.

5. Fill the space between the sealing lips on the new oil seal with grease. Then fit it on the drive shaft. Fit the bearing and circlip. Turn the bearing so that it is fitted properly, see Fig. 4—19.
   N.B. Always use a new circlip.
   Place the fitting ring SVO 2839 against the bearing and circlip. Fold the tool arms together and lock them round the fitting ring, see Fig. 4—22. Press on the bearing and circlip by screwing in the spindle.
6. Grease the bearing. Then fit the drive shaft. Tighten the screws for the thrust washer to a torque of 5 kpm (70 lb.ft.). Fit the brake disc and brake caliper. Connect up the brake line. Bleed and adjust the brakes, see Part 5.
7. Mount the wheels and fit the wheel nuts. Lower the vehicle. Tighten the wheel nuts.

1. Clutch casing
2. Clutch ring
3. Interlock ball
4. Spring
5. Selector shaft, reverse gear
6. Selector shaft, 1st—2nd speed
7. Selector shaft, 3rd—4th speed
8. Flange
9. Spring
10. Selector fork
11. Gear wheel, 3rd speed
12. Gear wheel, 2nd speed
13. Needle bearings
14. Spring
15. Synchronizing hub, 1st—2nd speed
16. Interlock ball
17. Sliding plate
18. Flange
19. Selector fork, 1st—2nd speed
20. Gearbox cover
21. Synchronizing cone
22. Flange
23. Bush
24. Thrust washer
25. Ball bearing
26. Selector fork, reverse gear
27. Mainshaft
28. Shaft
29. Bush
30. Gear lever knob
31. Gear lever, upper section
32. Rubber bush
33. Rubber bush
34. Gear lever, lower section
35. Washer
36. Casing
37. Spring
38. Protective cover
39. Intermediate flange
40. Gear lever arm
41. Gear wheel, 1st speed
42. Needle bearing
43. Reverse gear
44. Bush
45. Slide nib
46. Engaging sleeve and gear wheel for reverse gear
47. Circlip
48. Reverse shaft
49. Needle bearing
50. Gear wheel
51. Gearbox housing
52. Synchronizing hub
53. Engaging sleeve
54. Circlip
55. Synchronizing cone
56. Needle bearing
57. Drain plug
58. Gear wheel
59. Intermediate shaft
60. Ball bearing
61. Ball bearing
62. Oil seal
63. Cover
64. Input shaft



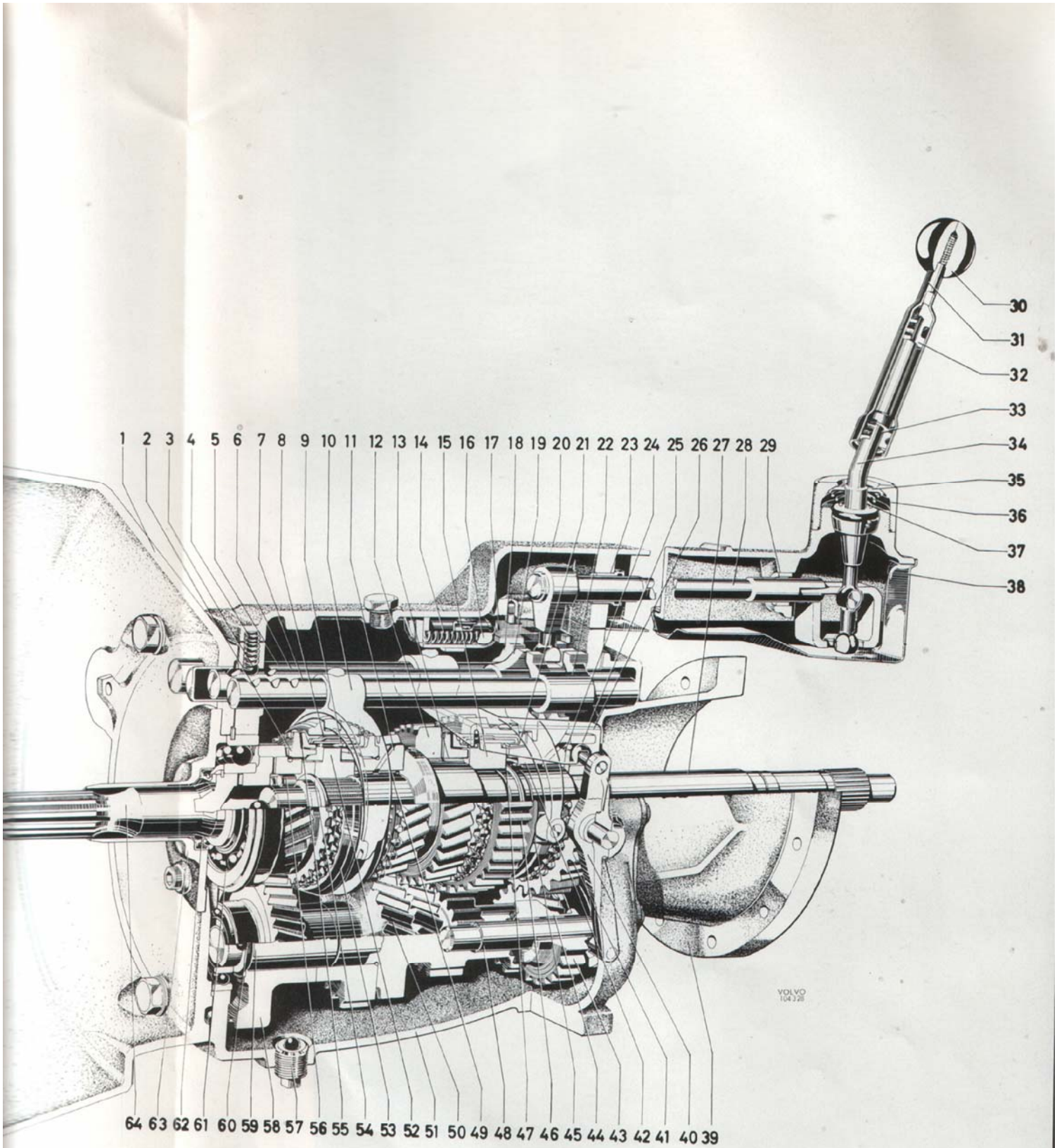



Illustration 4—A. Gearbox

# PART 5
# BRAKES
## GROUP 50
# GENERAL
## DESCRIPTION

The footbrake system has disc brakes on all four wheels. Its arrangement can be seen on Fig. 5—1.

It is a two-circuit system due to the fact that it has a tandem-type master cylinder (3) and the front wheel brake units (16) two pairs of cylinder completely separated from each other. One of the circuits serves the lower cylinders for the front wheel brakes and the left wheel, the other taking care of the upper cylinders of the front wheel brake units and the right rear wheel. With this arrangement, braking effect is ensured, even if there is a breakdown in one of the brake lines.

The servo cylinder (4) is directly influenced by the brake pedal and, with the help of vacuum from the engine inlet duct, it ensures that less pedal pressure is required for braking. The purpose of the brake valves (9 and 12) is to assist in a suitable distribution of braking power between the front and rear wheel brakes.

The warning valve (2) gives warning to the driver that there is an abnormal pressure difference between the circuits.

The differences between the 1800 E and 1800 S 1969 models are chiefly confined to the rear wheel brakes and parking brake, see Groups 51 and 55 respectively.

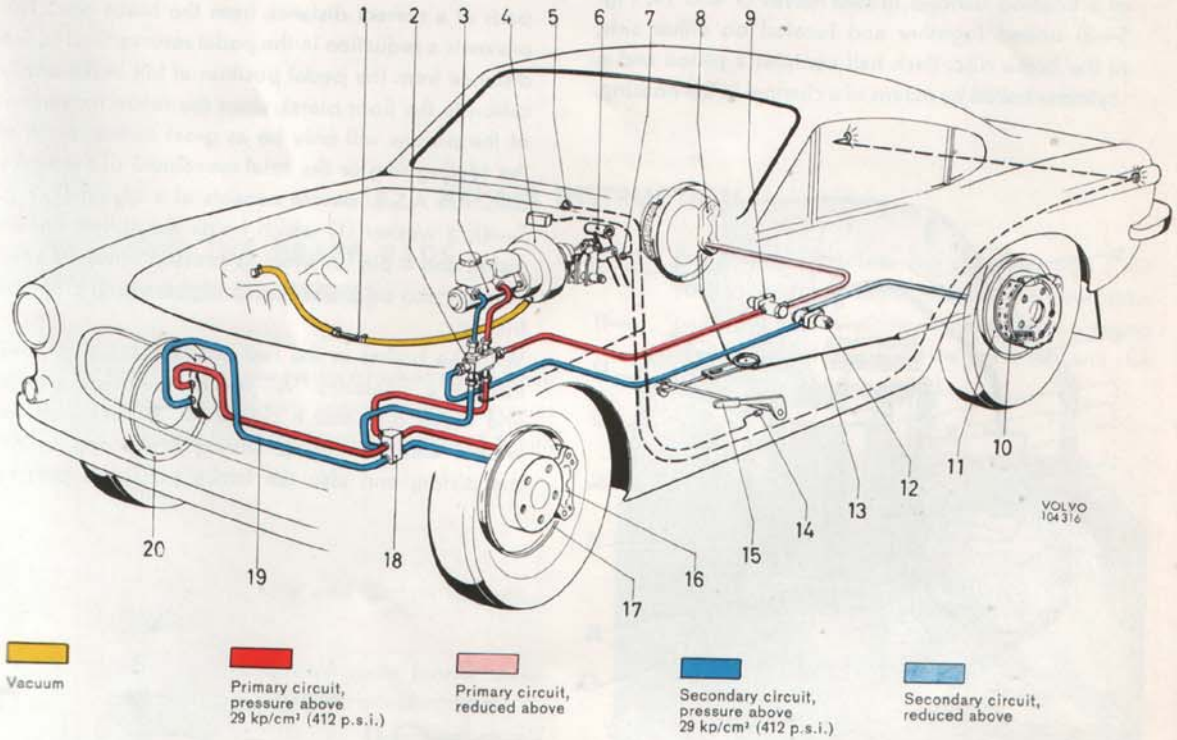



Fig. 5—1. Brake system

1. Check valve
2. Warning valve
3. Master cylinder with brake fluid container
4. Servo cylinder
5. Warning lamp
6. Brake pedal
7. Brake switch
8. Rear brake caliper
9. Brake valve, primary circuit
10. Brake shoes, parking brake
11. Brake disc with brake drum
12. Brake valve, secondary circuit
13. Cable, parking brake
14. Handbrake warning switch
15. Handbrake
16. Front brake caliper
17. Brake disc
18. 6-way union (double 3-way union)
19. Brake line
20. Guard plate

## GROUP 51

# WHEEL BRAKE UNITS

## DESCRIPTION

### CONSTRUCTION OF REAR WHEEL UNITS (FOOTBRAKE COMPONENT)

Fig. 5—1 shows the location of the brake components on the rear wheels. The brake disc (11) is of cast iron and is fixed to the drive shaft with which it rotates. The guard plate prevents dirt from reaching the disc.

The rear wheel brake caliper is mounted to the rear axle casing with the help of the retainer. It houses the wheel unit cylinders and brake pads. It consists of a housing divided in two halves (9 and 14, Fig. 5—2) bolted together and located on either side of the brake disc. Each half contains a piston and a cylinder linked by means of a channel in the housing.

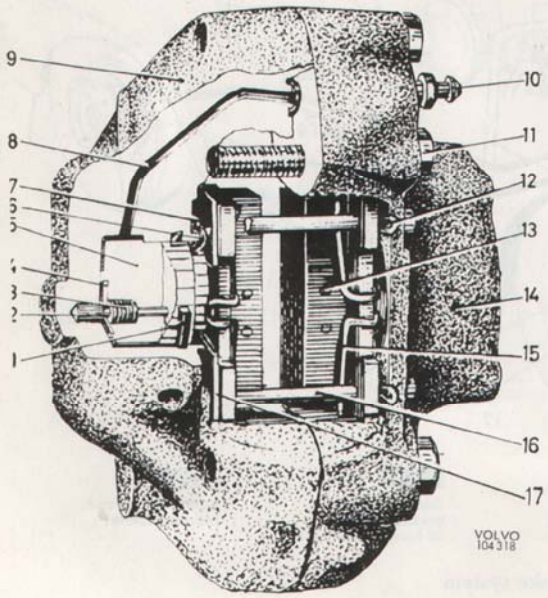


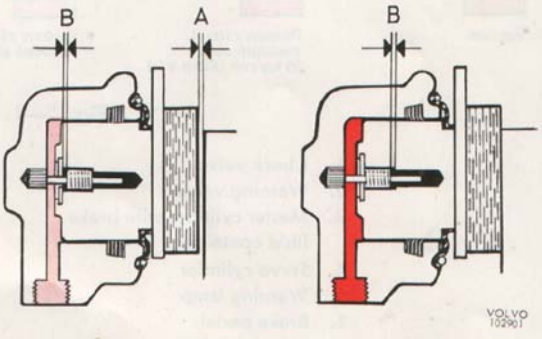

Fig. 5—2. Rear wheel brake caliper

1. Sealing ring
2. Pin
3. Spring
4. Washer
5. Piston
6. Rubber dust cover
7. Circlip
8. Channel
9. Outer half
10. Bleeder nipple
11. Bolt
12. Retaining clip
13. Brake pad
14. Inner half
15. Damping spring
16. Retaining pin
17. Washer

The sealing rings (1) have a square section and press against the piston from the slightly oblique groove in the housing. The purpose of the rings is partly to prevent brake fluid from leaking out and partly to restore the pistons to the rest position after braking. The rubber dust covers (6) prevent dust from entering. The brake pads (13) are provided with bonded facings and are held in position by means of retainning pins (16).

The rear brake calipers are fitted with a so-colled A.S.B. (anti-shake back) device, the function of which is to keep the pistons and consequently the brake pads at a correct distance from the brake disc. This prevents a reduction in the pedal reserve (that is, the distance from the pedal position at full brake application to the floor plate), since the return movement of the pistons will only be as great as the return of the sealing ring or the axial movement of the brake disc. The A.S.B. device consists of a spring (2, Fig. 5—4), a washer (1) which holds the spring on the piston and a pin (3) which is pressed firmly into the housing and on which the spring runs with a certain friction.

With the brakes in the rest position, see Fig. 5—3, there is a clearance "A" between the brake pads and brake disc and a clearance "B" between the washer and the spring. During brake application, the piston, and also the brake pads, are pressed




Rest position Brake application

Fig. 5—3. A.S.B. device, function

against the brake disc so that clearance "A" is reduced. The washer (1, Fig. 5—4) pulls the spring (2) in the direction towards the brake disc.
When the brake pedal is released, the piston is moved back by the sealing ring (4) so that distances "A" and "B" are restored. During this movement, the spring on the pin is not moved. Should the lateral movement of the brake disc, due to, for example, a bumpy road or a curve, be greater than the distance "A", the piston is pressed back into the cylinder. But, because of the friction between the spring and pin, the lateral movement of the piston will not be greater than that caused by the disc.

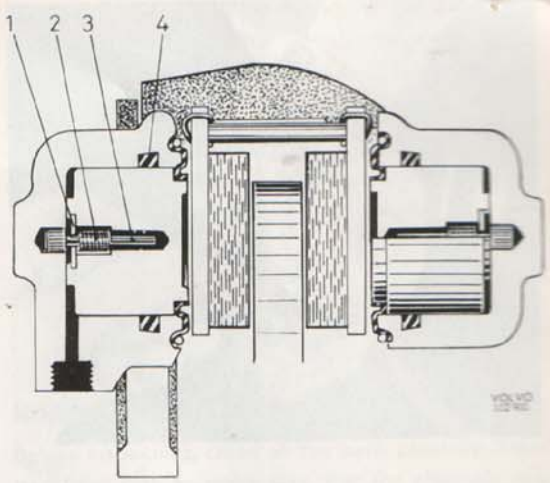



Fig. 5—4. Brake caliper with A.S.B. device
1. Washer
2. Spring
3. Pin
4. Sealing ring

## REPAIR INSTRUCTION

### REPLACING THE BRAKE PADS (REAR BRAKE CALIPERS)

The brake pads should be replaced when about 3 mm (1/8") of the lining thickness remains. On no account must the linings be worn down to below 1.5 mm (1/16").

1. Remove the hub caps and slacken the wheel nuts slightly.
2. Jack up the vehicle and place blocks under the rear axle and front jack attachments. Unscrew the wheel nuts and take off the wheels.
3. Remove the hairpin-shaped locking clips for the guide pins. Pull out one of the lock pins while holding the damper springs in place. Remove the springs and the other lock pin. Draw out the pads, see Fig. 5—6.
4. Carefully clean out the cavity in which the pads fit. If any of the rubber dust covers are damaged, they should be replaced. If dirt has penetrated into the cylinder due to a damaged cover, the brake unit should be reconditioned.
5. Press the pistons into the cylinders with SVO 2809 in order to provide room for the new brake pads, see Fig. 5—5. Remember when pressing in that the fluid level in the container will rise so that fluid may spurt out.


Fig. 5—5. Pressing in the piston

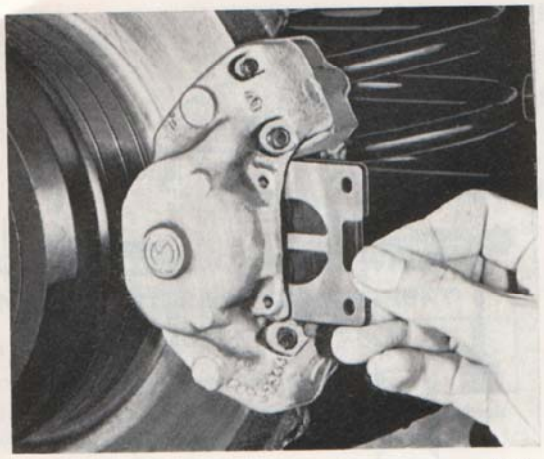



Fig. 5—6. Fitting the brake pads and washer

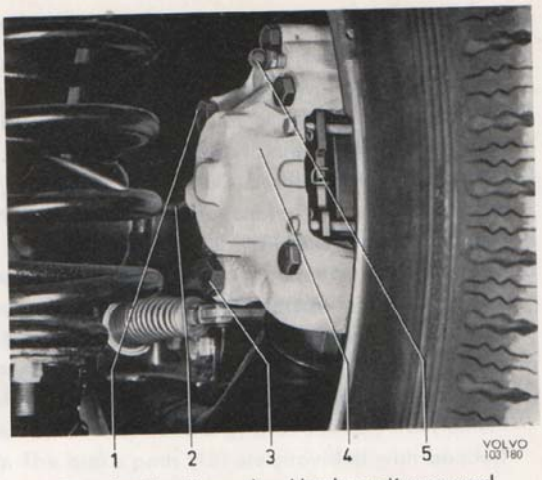



Fig. 5—7. Rear wheel brake unit removed

1. Attaching bolt
2. Brake line
3. Attaching bolt
4. Rear brake caliper
5. Bleeder nipple

6. Fit the new pads and washers, see Fig. 5—6. Place one of the retaining pins in position, then the damping springs and finally the other retaining pin. Fix the pins with the retaining clips. Check that the pads are movable.
7. After the requisite brake pads have been replaced, depress the brake pedal several times to check that the movement is normal. Generally the system. does not require bleeding after replacing the brake pads.
8. Fit the wheels after the contact surfaces between wheel and brake disc have been cleaned of sand, etc. Tighten the nuts so much that the wheel cannot be moved. Lower the vehicle and secure the wheel nuts. Tighten every second nut a little at a time until all are finally tightened to a torque of 10—14 kpm (70—100 lb.ft.). Fit the hub caps.

## RECONDITIONING THE REAR BRAKE CALIPERS

### Removing

1. Remove the hub caps and slacken the wheel nuts a little. Plug for the moment the vent-hole in the brake fluid container cover to reduce possible leakage.
2. Jack up the rear end and place blocks under the rear axle. Unscrew the wheel nuts and take down the wheels. Release the handbrake.
3. Disconnect the connection (2, Fig. 5—7) and fit the guard cover. Screw out the attaching bolts (1 and 3). Take off the brake caliper, see Fig. 5—8. Take care of any shims.

### Dismantling

1. Remove the hairpin-shaped retaining clips for the retaining pins. Pull out one of the retaining pins while holding the damping springs in position. Remove the springs and the other retaining pin. Pull out the pads, see Fig. 5—6.

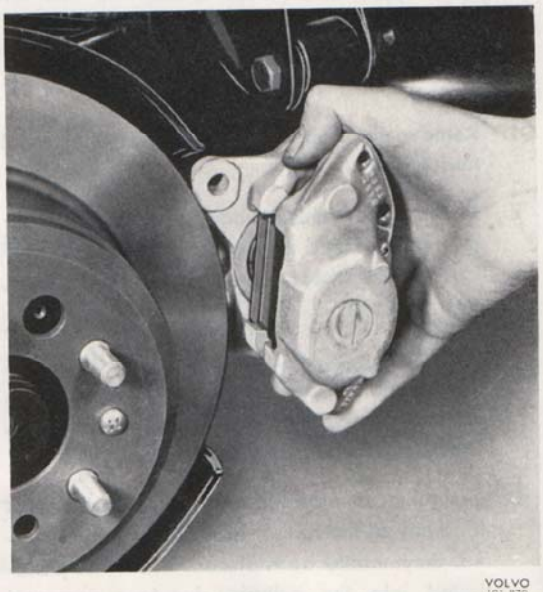



Fig. 5—8. Removing rear brake caliper

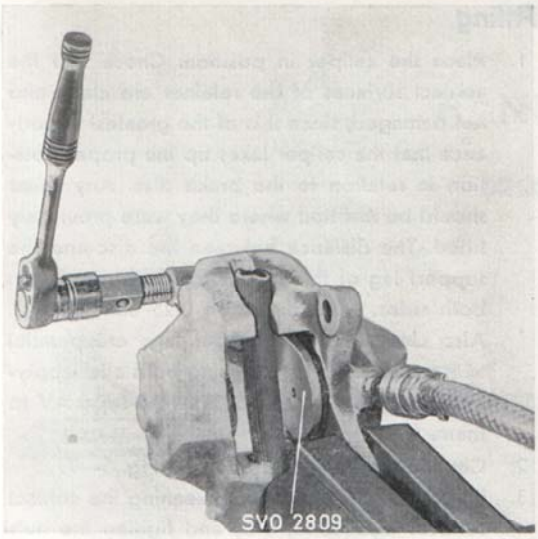



Fig. 5—9. Removing the piston

2. Remove the retaining rings and the rubber dust covers. Place the caliper in a vice, see Fig. 5—9. Fit SVO 2809 and press one of the pistons down to the bottom. Fit a suitable bleeder connection, see Fig. 5—9. to the caliper. Place a piece of hose in the caliper and blow out the other piston. The pressure required should go up to about 7 kp/cm² (100 p.s.i.). Remove the piston.
3. Fit the tool (Fig. 5—10) with a suitable rubber seal "A" for the free cylinder. Press out the piston. Remove the piston and tool.

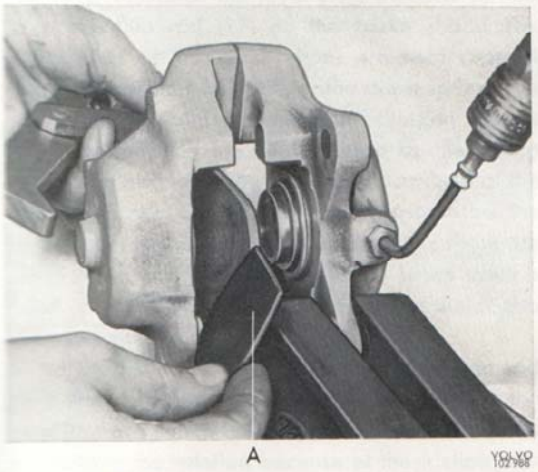



Fig. 5—10. Removing the piston

A = rubber seal

4. Remove the sealing rings with the help of a blunt tool. Take care not to damage the edges of the grooves. Screw out the bleeder nipple.

N.B. The brake caliper halves should not be separated. The reason for this is that reassembling these halves will require pressure testing equipment and special fluid for the bolts.

## Inspecting

Before inspecting, clean all the parts carefully. Take particular care to make sure that the channels are clean.

Check the pistons and pins in the caliper in relation to the A.S.B. device. If the pins in the caliper are worn, the entire caliper must be replaced. Sealing rings and rubber dust covers should be replaced after each reconditioning. If there are scratches, scoring, etc., in any of the cylinders, replace the entire cylinder housing complete. Inspect the other parts and replace any that are damaged or worn.

## Assembling

1. Coat the working parts on the piston and cylinders with brake fluid.
2. Fit the new sealing rings in the cylinders.
3. Fit one of the pistons into the caliper. Make sure that it is fitted properly and that it does not scratch or damage the pin for the A.S.B. device. Press the piston in with SVO 2809. Check the function of the A.S.B. device with a torque wrench, see Fig. 5—5. The force required to press in the piston should be between 20—80 kpcm (111—445 lb.in.). If force other than this is required, change the piston.
4. Fit and test the other piston in the same way as above. Fit the rubber dust covers on the piston and housing. Fit the lock rings.
5. Fit the brake pads and washers. Place one of the retaining pins in position and fit the damper springs and then the other retaining pin. Fit the hairpin-shaped retaining clips. Check to make sure that the pads are movable.
6. Fit the bleeder nipple.

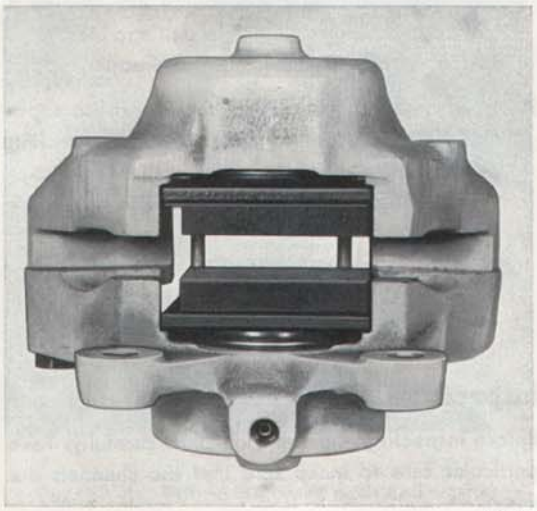


Fig. 5—11. Rear brake caliper assembled

## Fitting

1. Place the caliper in position. Check that the contact surfaces of the retainer are clean and not damaged, since it is of the greatest importance that the caliper takes up the proper position in relation to the brake disc. Any shims should be re-fitted where they were previously fitted. The distance between the disc and the support tag of the caliper should be equal on both sides. Max. deviation 0.25 mm (0.001″). Also check that the caliper tags are parallel with the disc. Fit the attaching bolts after applying a couple of drops of Locktite Type AV to them.
2. Connect up the brake line, see Fig. 5—7.
3. Fit on the wheel after first cleaning the contact surfaces from sand, etc., and tighten the nuts so much that the wheel cannot be moved. Lower the vehicle and final-tighten the wheel nuts. Tighten each nut a little at a time until all are tightened to a torque of 10—14 kpm (70—100 lb.ft.). Fit the hub cap.
4. Clean the vent-hole in the brake fluid container cover and bleed the fitted brake caliper.

## GROUP 55

# HANDBRAKE

### DESCRIPTION

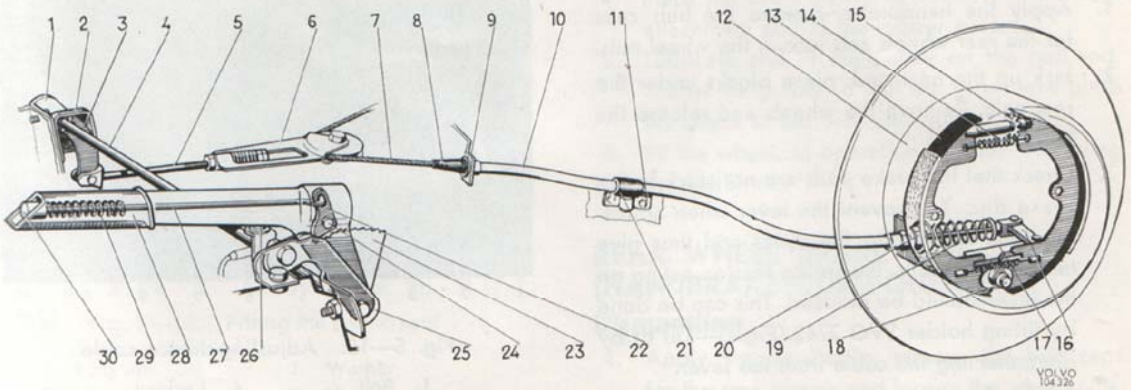



Fig. 5—12. Handbrake system

1. Inside support attachment
2. Rubber cover
3. Lever
4. Shaft
5. Pull rod
6. Pulley
7. Cable
8. Rubber sleeve
9. Front attachment
10. Cable sleeve
11. Attachment
12. Brake drum
13. Brake shoe
14. Return spring
15. Adjusting device
16. Lever
17. Link
18. Anchor bolt
19. Return spring
20. Rear attachment
21. Rubber cable guide
22. Pawl
23. Ratchet segment
24. Rivet
25. Outside support attachment
26. Brake warning switch
27. Push rod
28. Handbrake lever
29. Spring
30. Push button

The construction of the handbrake is shown in Fig. 5—12. The handbrake lever is mounted on the floor on the outside of the driving seat. The movement of the lever is transmitted via the shaft (4), lever and pull rod (5) to the pulley (6). From there the movement is transmitted through the cable (7) to the wheel brake units. At each rear wheel, the movements of the cable influence the lever (16), which is carried in a movable rod (17) on the brake shoes. The lower ends of the brake shoes are held pressed against the anchor bolt (18) by the lower spring. The upper ends are jointed through the adjusting devices (15) to which they are held pressed by the spring (14), which also locks the small serrated wheel of the adjusting screw. Due to this type of suspension, the brake shoes are selfcentering and both the shoes are partly self-applying (Duo-Servo). The brake drum is fitted on the drive shaft and so designed that it also serves as a brake disc for the footbrake.

When the handbrake is applied, the lever and rod press the shoes against the brake drum. When the wheels or drive shaft tend to turn the drum, the shoes accompany the rotation because of the friction between lining and drum. Due to the "floating" suspension of the shoes, the primary shoe is thus pressed downwards and the secondary one upwards until the upper end moves towards the anchor bolt, see Fig. 5—13.

Due to the fact that the turning centre of the secondary shoe lies in the anchor bolt and that of the primary shoe in the adjusting device, the friction between the drum and the linings will assist in brake application. Also contributing to this is the retarding effect on the secondary shoe because of the primary shoe's endeavour to accompany the direction of rotation of the drum.

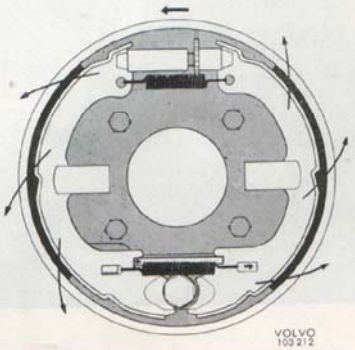



Fig. 5—13. Duo-servo principle

## ADJUSTING THE HANDBRAKE

The handbrake should give full effect at the 3rd—4th notch. If it does not do so, adjustment should be carried out. Here the wheel brake units are first adjusted and, if necessary, the cable.

1. Apply the handbrake, remove the hub caps for the rear wheels and loosen the wheel nuts.
2. Jack up the hear end, place blocks under the rear axle. Remove the wheels and release the handbrake.
3. Check that the brake pads are not stuck to the brake disc. To prevent the lever when adjusting from influencing the shoes and thus give misleading results, the spring tension acting on the lever should be reduced. This can be done by fitting holder SVO 2742 (Fig. 5—16) or by disconnecting the cable from the lever.
4. Set the drum so that its hole coincides with the serrations on the adjusting screw and apply the shoes by moving the screwdriver handle upwards, see Fig. 5—14. When the drum can be rotated easily, discontinue applying the shoes. Then turn the adjusting screw back 4—5 serrations. Check that the shoes do not "drag" by rotating the drum in its normal direction of rotation. Very little dragging may be permitted. If, however, the dragging is more pronounced, the adjusting screw should be released a further 2—3 serrations. Connect the cable to the lever and remove the holder SVO 2742.

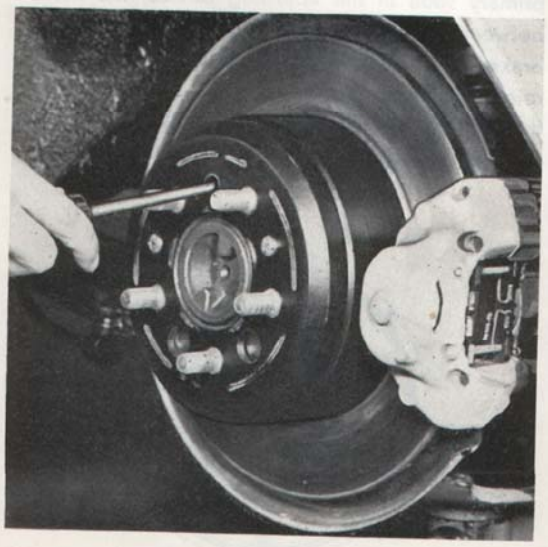


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Fig. 5—14. Adjusting the handbrake, rear wheel

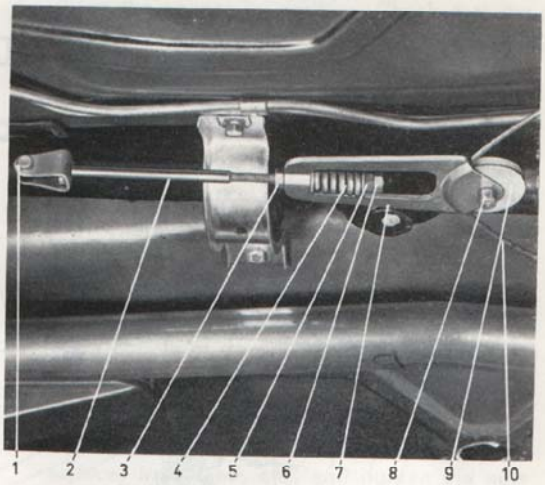


Fig. 5—15. Adjusting device, cable

1. Bolt
2. Pull rod
3. Locknut
4. Spring
5. Nut
6. Locknut
7. Pulley
8. Bolt
9. Wheel
10. Cable

5. Repeat the adjusting procedure with the other rear wheel.
6. Apply the handbrake lever and check that full braking effect, is obtained on the 3rd—4th notch. If the handbrake can applied still further, the cable should be tensioned. This is done by loosening the locknuts and screwing in the pulley on the pull rod, see Fig. 5—15. After adjusting, tighten the locknuts.
7. Mount the wheels after having cleaned any dirt from the contact surfaces, and tighten the wheel nuts sufficiently so that the wheel cannot move. Lower the vehicle and tighten the nuts. Tighten every other nut a little at a time until all are tightened to a torque of 10—14 kpm (70—100 lb.ft.). Fit the hub caps.

## REPLACING THE CABLE

### Removing

1. Apply the handbrake, remove the hub caps of the rear wheels and loosen the wheel nuts.
2. Jack up the rear end, place blocks under the rear axle, remove the nuts and take off the wheels. Release the handbrake.
3. Remove the bolt (8, Fig. 5—15) and then the wheel (9) from the pulley (7).

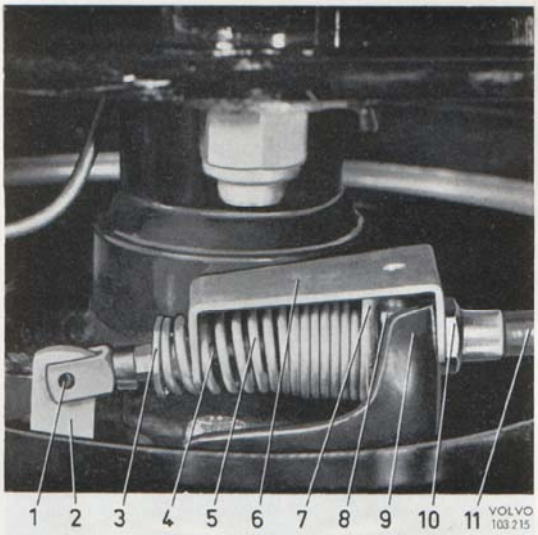


Fig. 5—16. Fitting the spring tool

1. Lock pin
2. Lever
3. Washer
4. Cable
5. Return spring
6. Holder SVO 2742
7. Washer
8. Nut
9. Cable attachment
10. Locknut
11. Cable sleeve

4. Remove the rubber cover (8, Fig. 5—12) from the front attachment of the cable sleeve, also the nut as well as the attachment for the rubber suspension ring on the frame member. Remove the cable from the other side of the attachment in the same way.
5. Place holder SVO 2742 so that the return spring is held in position according to Fig. 5—16. Bend up the lock and remove the lock pin so that the cable releases from the lever.
6. Remove the return spring with washers. Loosen the nut for the rear attachment of the cable sleeve. Lift the cable forwards after having loosened both sides of the attachments.

### Installing

1. Adjust the brake shoes of the rear wheel. Check that the brake pads do not stick to the brake disc and adjust the drum so that its hole coincides with the serrations of the adjusting screw. Place a screwdriver between the serrations of the adjusting screw and apply the shoes by moving the screwdriver handle upwards, see Fig. 5—14. When the drum can be turned easily, discontinue applying the shoes. Then turn the adjusting screw 4—5 serrations back.
2. Fit on new rubber cable guides for the cable suspension. Place the cable in position in the rear attachment and tighten the nut. Fit the washers and return spring. Compress the spring with the help of the holder tool, see Fig. 5—16. Oil the lock pin and fit it together with the cable on the lever. Fit the attachment and rubber and rubber cable guide on the frame member.
3. Fit the cable in the same way as above on the other side of the vehicle.
4. Place the cable sleeve in position in the front attachment and fit the rubber covers.
5. Lubricate and fit the pulley on the pull rod. Adjust the pulley so that the handbrake gives full effect at the 3rd—4th notch.
6. Fit the wheel, se operation 7 under "Adjusting the handbrake".

## REAR WHEEL BRAKE UNIT (HANDBRAKE COMPONENT)

### Dismantling

1. Apply the handbrake, remove the hub caps for the rear wheels and loosen the wheel nuts.
2. Jack up the rear end, place blocks under the rear axle, remove the nuts and take off the wheels. Release the handbrake.
3. Screw loose the brake line (2, Fig. 5—7) from the rear brake caliper and plug the connection. Brake fluid must not spill on to the disc or brake pads. The leakage can be reduced by temporarily plugging the vent-hole in the brake fluid container cover. Remove the attaching bolts (1 and 3). Lift out the caliper, see Fig. 5—8.
4. Remove the attaching bolts for the brake drum and lift off the drum, see Fig. 5—17.
5. Unhook the lower return spring. Lift the shoes forwards, see Fig. 5—18.


Fig. 5—17. Removing the brake drum


Fig. 5—18. Fitting the brake shoes

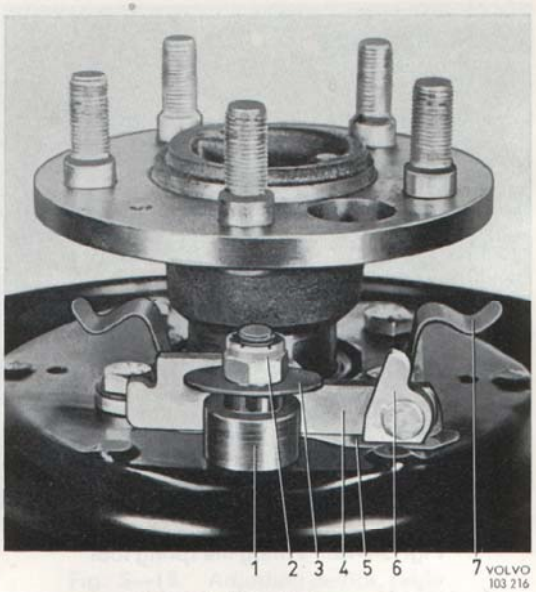


Fig. 5—19. Brake parts

1. Anchor bolt
2. Locknut
3. Washer
4. Link
5. Cover plate
6. Lever
7. Brake shoe retainer

## Inspecting

First check for oil leakage. If there is none, replace the sealing rings, see Group 46. Clean all the parts except the brake linings. Check that the lever joint does not chafe and replace parts which are damaged or worn. If the brake linings are oily or worn down to the rivets, replace the shoes completely. The brake drum should be replaced if its friction surface is concave, or if its out-of-round exceeds 0.2 mm (0.008"). Rust spots can, however, be polished off. Wipe the contact surfaces on the backing plate.

## Assembling

1. If new linings or drums are to be fitted, slacken the pulley (7, Fig. 5—15) to remove tension in the cable.
2. Coat the 6 guide lips on the backing plates as well as the lever joint and adjusting screw with grease. Check that the lever and anchor bolt parts are correctly fitted, see Fig. 5—19.
3. Fit the brake shoes, see Fig. 5—18. The shorter sleeve on the adjusting device should be turned forwards on the right-hand side and backwards on the left-hand side, see Fig. 5—20. Hook on the lower return spring.
5. Fit the brake drum with attaching bolts.
6. Place the brake caliper in position. Fit the attaching bolts (1 and 3, Fig. 5—7) after smearing the bolts with a couple of drops of Loctite, Type AV.
7. Check that the brake pads move freely from the brake disc and adjust the handbrake, see operation 4—6 under "Adjusting the handbrake".
8. Clean the vent-hole in the brake fluid container cover and bleed the fitted brake caliper.
9. Fit the wheel, see operation 7 under "Adjusting the handbrake".

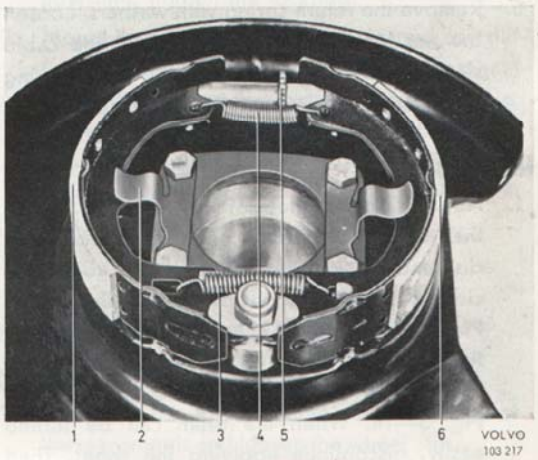


Fig. 5—20. Handbrake unit

1. Front brake shoe (primary shoe)
2. Retainer for brake shoe
3. Lower return spring
4. Upper return spring
5. Adjusting device
6. Rear brake shoe (secondary shoe)

# PART 8

# BODY

## DESCRIPTION

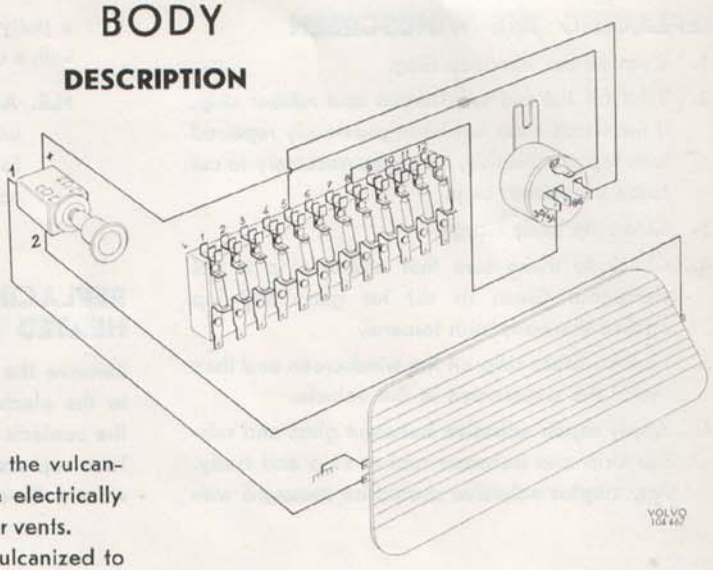


Fig. 8—1. Wiring diagram for electrically heated rear window

Body modification is confined mainly to the vulcanized attachment of the windscreen, the electrically heated rear window and the rear extractor vents.

The rubber strip of the windscreen is vulcanized to the body. This is done in production by means of a special sealing strip which houses a resistance wire. After being fitted, the resistance wire is connected to electric current. This heats up the sealing strip which swells and in doing so fastens to the body and rubber strip. For servicing purposes, there is a special adhesive, see "Repair Instructions".

The heating system is supplemented with an electrically heated rear window. Two power ranges are involved here, a max. output of 150 watts and a lower output of 40 watts. Heating is switched on by means of a switch on the dashboard. The switch is connected across a control relay which cuts out the current when switched off, see Fig. 8—1.

In order to obtain good through ventilation, the vehicle has been fitted with rear extractor vents. Air flows through the grille at the rear, over the side panels and through the non-return valves and channels to the grille in the rear mudguards, where it is released out into the atmosphere. See Fig. 8—2.

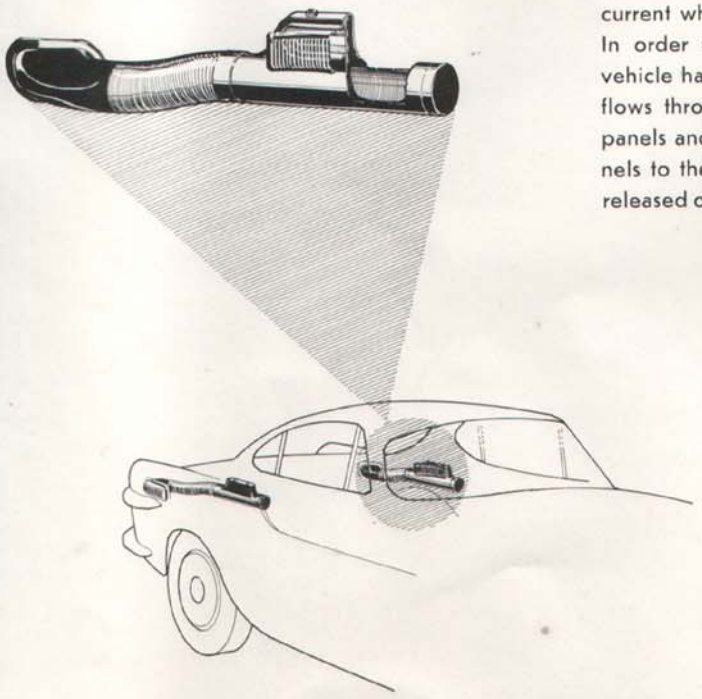


Fig. 8—2. Air outflow

# REPAIR INSTRUCTIONS

## REPLACING THE WINDSCREEN

1. Remove the trim moulding.
2. Take off the old windscreen and rubber strip. If the windscreen has been previously repaired with repair adhesive, it may be necessary to cut loose the rubber strip.
3. Clean the body flange.
4. Check to make sure that rubber strip is not damaged. Clean its slit for glass and lap against the body with toluene.
5. Fit the rubber strip on the windscreen and then install the windscreen in the vehicle.
6. Apply repair adhesive between glass and rubber strip and between rubber strip and body. Any surplus adhesive should be removed with a putty knife and the remainder loosened up with a clean rag moistened in toluene.

N.B. Adhesive joints may not come in contact with water until after 1 hour at the earliest following upon the application of the adhesive.

## REPLACING THE ELECTRICALLY HEATED REAR WINDOW

Remove the upper rear side panels ta gain access to the electric cables. Disconnect the cables from the contacts on the rear window.
Then replace the window in the same way as previously. Re-connect the cables and re-fit the panels.

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