

Service manual

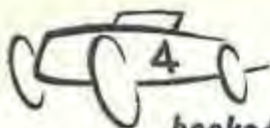
Repairs and maintenance

Section 2(23)

**CI Fuel System
B27, B28E/F**

260 1975–1983

VOLVO



books4cars.com

4850 37th Avenue South
Seattle, WA 98118 U.S.A.



109 423

B27 E 1975



136 659

B 27 1976

Note: new inlet manifold introduced in 1979 –
same type as fitted to B 27 F models.

The information included in this manual concerns the CI fuel system fitted
to the following engines:

Engine Type Model year

B 27 E	1975–1980
B 28 E	1981–1983
B 27 F	1976–1979
B 28 F	1980–1982

Volvos are sold in versions adapted for different markets.
These adaptations depend on many factors including legal,
taxation and market requirements.

This manual may therefore show illustrations and text
which do not apply to cars in your country.

Order number: TP 30592/1
Supersedes TP 11122/3 (USA, Canada)
TP 11543/1 (Other markets)

We reserve the right to make alterations.

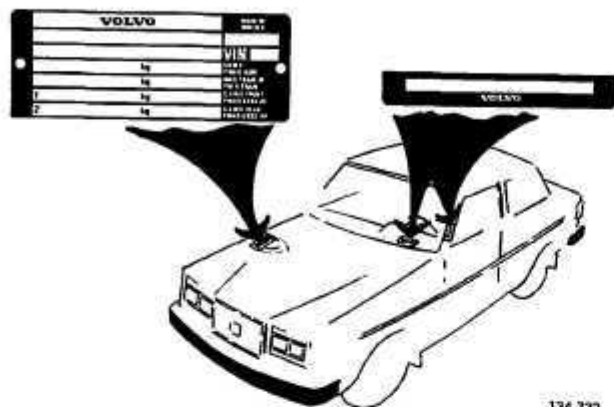
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Specifications

PLATES AND DECALS

Only those plates which contain information concerning the CI-system are included in this section.



134 732

USA/Canada

-1980: VC 264 65 L 1 000000

1981-: YV1 BX 69 4X B 1 000000

Övriga

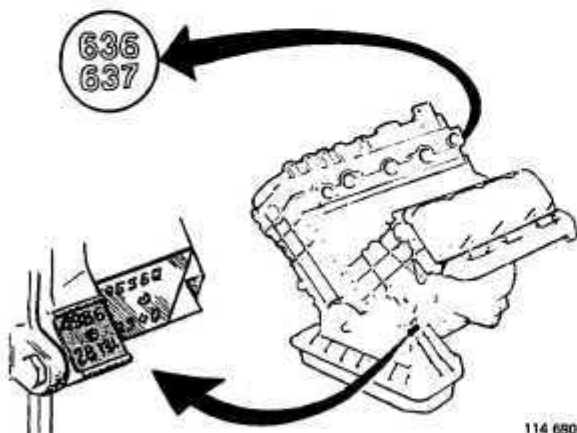
-1980: 265 61 L 1 000000

1981-: YV1 264 68 1 B 1 000000

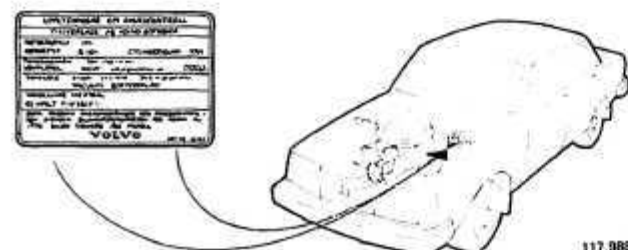
136 604

Engine type

Chassis number

Model year
designation

114 690



117 988

Model plate

Located on front right inner wing/fender.

Also includes type designation.

Note! Type of plate depends on model year. 1981 plate shown adjacent.

Vehicle identification number

USA and Canadian vehicles only. Visible from outside of vehicle.

- 1979: left windscreen/windshield pillar

1980-: top of dashboard.

Vehicle identification (type designation)

Note! Number coding varies with model year and market. Numbers shown adjacent are only intended as examples.

Engine type

61 = B 27 A
62 = B 28 A
64 = B 27 E
65 = B 27 F
68 = B 28 E
69 = B 28 F

Model year designation

B = 1975 A = 1980
E = 1976 B = 1981
H = 1977 C = 1982
L = 1978 D = 1983
M = 1979

Engine serial number and part number

Located on a plate in front of oil filter. B 28 E/F 1981-: a decal on rear right end of cylinder head shows last three digits of part number.

Exhaust emissions plate

Fitted only to vehicles for Sweden, Australia, USA and Canada.

Located on front left inner wing/fender.

Contains information on idle speed, valve clearance, timing, CO-content etc.

Note!

- idle speed not stated on vehicles equipped with constant idle speed system (CIS)
- CO-content not stated on vehicles which have a sealed CO-adjustment screw.

CO-CONTENT & IDLE SPEED

General

- When checking/adjusting CO-content and idle speed on vehicles with automatic transmission always engage neutral "N" and apply the parking brake
- CO-content should be checked/adjusted when engine is warm and idling
- If CO-content is not according to specifications ie. check values, it must be adjusted to setting value
- If CO is according to specifications it is not necessary to adjust the engine providing that it runs satisfactorily.

E-engines

Engine type	Model year	Market	CO-content setting value (check value)	Idle Speed r/s (r/min)
B 27 E	1975–1977	Sweden + Australia	1.5 (1.0–4.0)	15.0 (900)
	1978	Other markets	2.0 (1.0–4.0)	15.0 (900)
	1979–1980		2.0 (1.0–3.0)	15.0 (900)
			2.0 (1.0–3.0)	15.0 (900) ¹⁾
B 28 E	1981	Sweden + Australia Other markets	2.0 (1.0–3.0) ²⁾	15.0 (900) ¹⁾
	1982		2.0 (1.0–3.0) ²⁾	15.0 (900) ¹⁾
	1982–1983		2.0 (1.0–3.0)	15.0 (900)

Remarks

¹⁾ Automatic transmission 16.7 r/s (1000 r/min)

²⁾ Pulsair-system disconnected and plugged

F-engines

Engine type	Model year	Market	CO-content setting value (check value)	Idle Speed r/s (r/min)
B 27 F	1976	USA California USA Federal Canada + Japan USA Federal + Canada USA Calif. + Japan	1.7 (1.4–2.0) ¹⁾	15.0 (900)
	1977		0.7 (0.4–1.0) ¹⁾	15.8 (950)
			1.0 (0.7–1.3)	15.0 (900)
			1.7 (1.4–2.0) ¹⁾	15.0 (900)
	1978		1.0 (0.7–1.3)	15.0 (900)
			1.0 (0.7–1.3) ²⁾	15.0 (900)
	1979		1.0 (0.7–1.3) ²⁾	15.0 (900)
B 28 F	1980		1.0 (0.7–1.3) ²⁾	15.8 (950)
	1981–1982		1.0 (0.7–1.3) ^{2) 3)}	15.0 (900) ⁴⁾

Remarks

¹⁾ Air pump must be disconnected and plugged

²⁾ Lambda-sond disconnected. When Lambda-sond is connected the CO-content must drop to less than 1.0%

³⁾ Sealed CO-adjustment screw, excluding Japan + Canada 1981

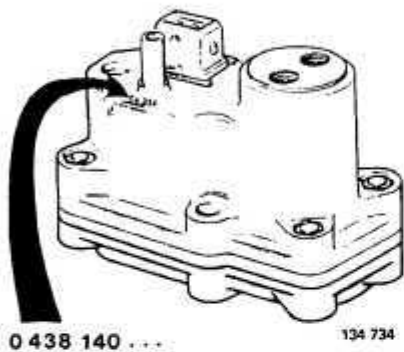
⁴⁾ CIS-system not fitted to USA Federal + Canada 1981

CI-system

PRESSURES

Line pressure	450–530 kPa (64–75 psi)
Rest pressure, min.	150–240 kPa (21–34 psi)
Control pressure, see below	

CONTROL PRESSURE REGULATOR



Type of control pressure regulator fitted to vehicle depends on engine type and model year. Identification number is stamped in top of regulator (last three numbers).

E-engines

Control pressure regulator		Bosch number Volvo number	... 005 269291-1	... 018 269531-0	... 038 269837-0
Engine type	Model year				
B 27 E	Early type Late type Sweden + Australia Other markets	X		X	X
B 28 E					X

F-engines

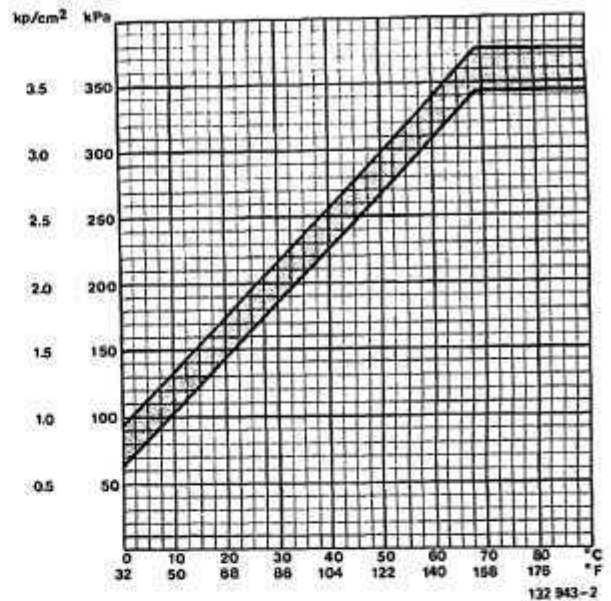
Control pressure regulator		Bosch number Volvo number	... 004 463971-2	... 018 269531-0	... 021 1219952-7	... 029 269777-9	... 066 1269315-6
Engine type	Model year						
B 27 F	1976 1977 USA Other markets 1976–1977 special version USA 1978 USA California + Japan Other markets 1979	X X		X X	X	X X X	
B 28 F	1980–82						X

Control pressure regulator . . . 004

Control pressure, warm engine 345–375 kPa
(49–53 psi)

cold engine, see diagram

Resistance 20–30 ohms

**Control pressure regulator . . . 005**

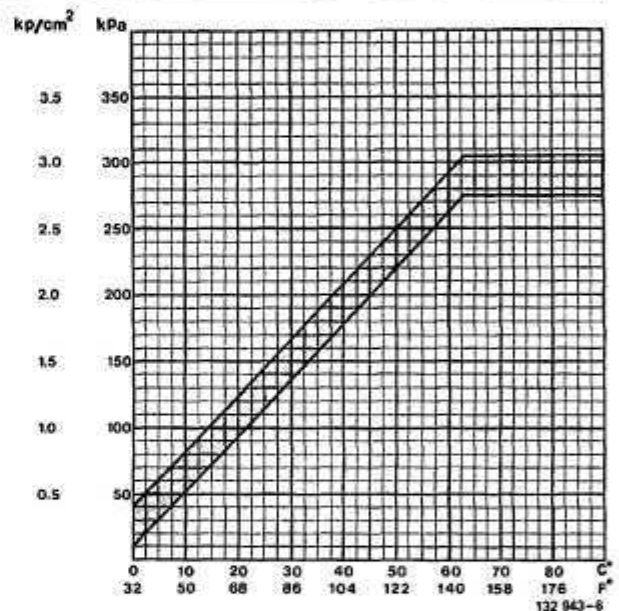
(regulator with full load enrichment)

Control pressure, warm engine
engine off 275–305 kPa
(39–43 psi)
engine on 345–375 kPa
(49–53 psi)

Control pressure, cold engine, see diagram

Note! Diagram shows control pressure with engine turned.

Resistance 20–24 ohms

**Control pressure regulator . . . 018**

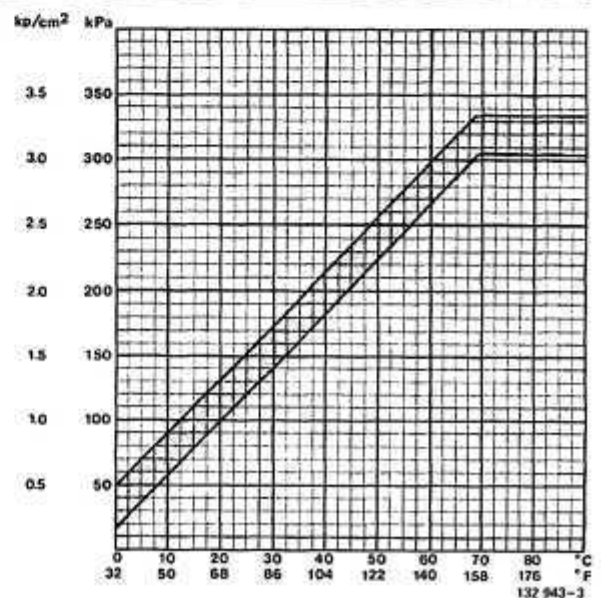
(regulator with full load enrichment)

Control pressure, warm engine
engine off 305–335 kPa
(43–48 psi)
engine on 345–375 kPa
(49–53 psi)

Control pressure, cold engine, see diagram

Note! Diagram shows control pressure with engine turned off.

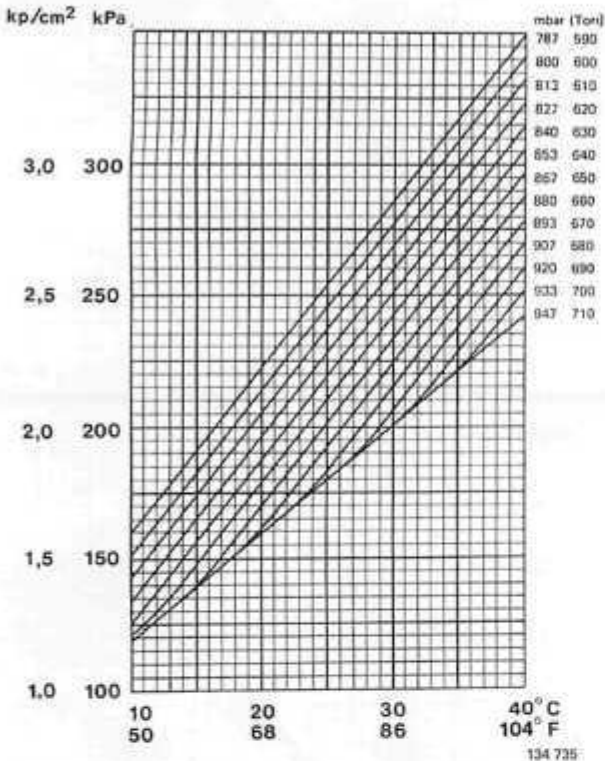
Resistance 20–24 ohms



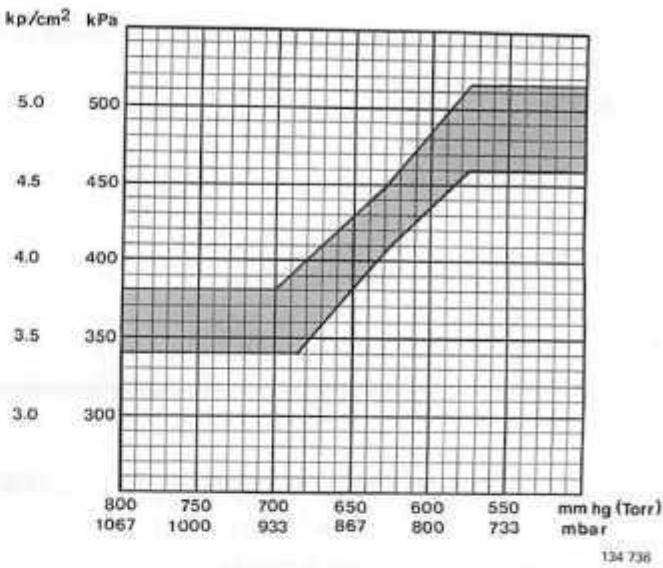
Control pressure regulator . . . 021

Altitude compensating device incorporated in regulator. Special versions for some B 27 F USA Federal 1976 and 1977.

Resistance 20–30 ohms



Control pressure, hot engine at different altitudes
Tolerance: ±25 kPa (0.25 kp/cm² = 3.6 psi).



Control pressure, hot engine at different altitudes

The above graphs apply to air pressure at sea level and up to altitudes of approx 600 m = 2 000 ft (947 mbar or higher). For higher altitudes it is necessary to know the prevailing air pressure to be able to calculate the correct control pressure.

Control pressure regulator . . . 029

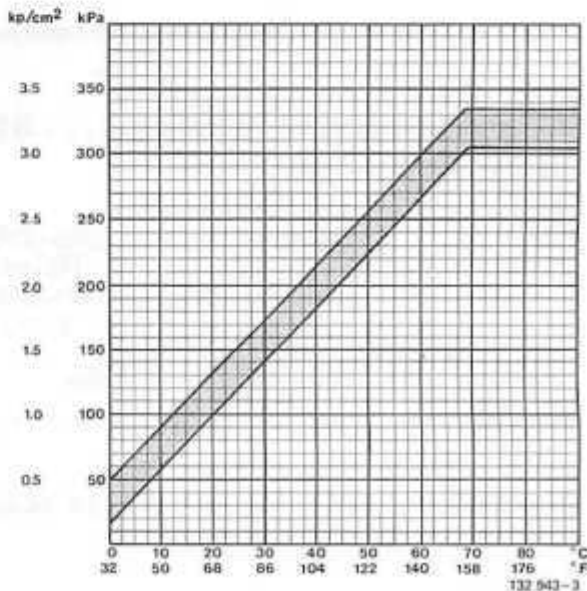
(regulator with full load enrichment)

Note! B 27 F 1977 California: the full load enrichment system is disconnected. Therefore specifications for control pressure apply both with engine off and engine running.

Control pressure warm engine
engine off 305–335 kPa (43–48 psi)
engine on 345–375 kPa (49–53 psi)

Control pressure cold engine, see dia.
Note! Diagram shows control pressure with engine turned off.

Resistance 20–24 ohms



Control pressure regulator . . . 038

(regulator with full load enrichment)

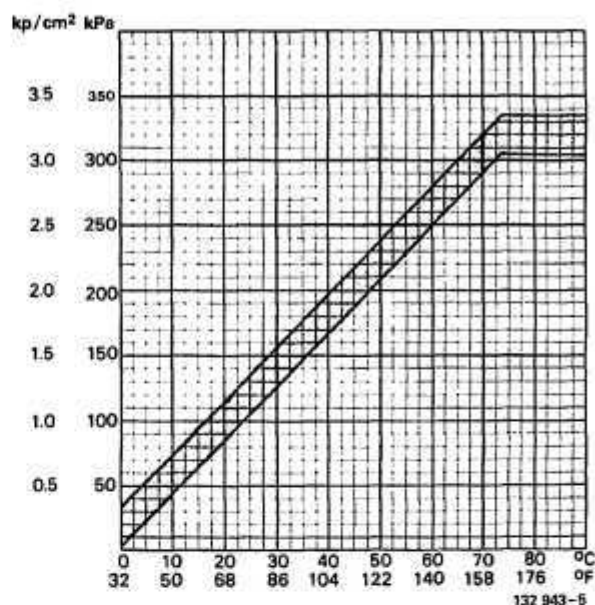
Control pressure, warm engine

engine off 305–335 kPa
(43–48 psi)engine on 345–375 kPa
(49–53 psi)

Control pressure cold engine see diagram.

Note! Diagram shows control pressure with engine turned off.

Resistance 20–24 ohms

**Control pressure regulator . . . 066**

(regulator with cold engine acceleration enrichment)

Note! B 28 F USA & Canada with pressure differential switch: acceleration enrichment system is disconnected via control pressure regulator.

Thermostat closes at approx. 53°C (125°F)

Delay valve

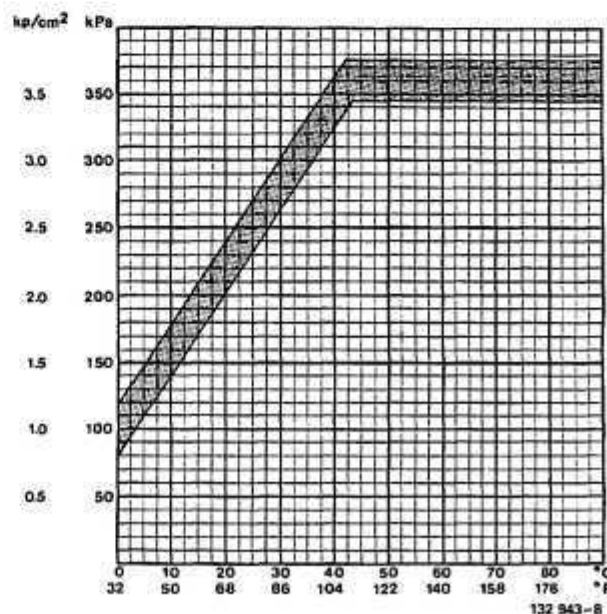
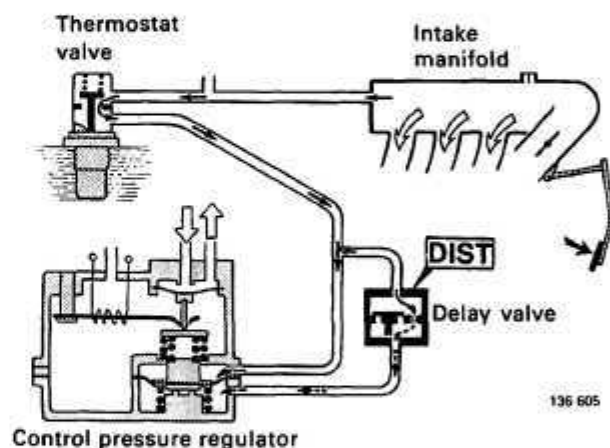
delay time approx. 1 sec.

colour Grey

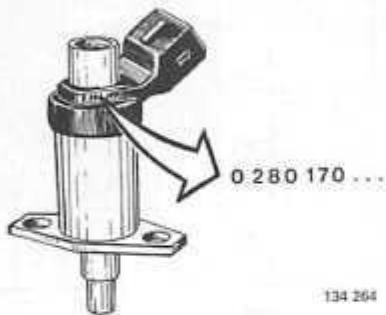
Control pressure

hot engine 345–375 kPa
(49–53 psi)

during acceleration (cold engine

but regulator warmed-up) 145–175 kPa
(21–25 psi)Resistance below 12°C (54°F) 32–38 ohms
above 18°C (64°F) . . . 16.5–19.5 ohms

START INJECTOR



Type of start injector fitted to vehicle depends on model year and engine type. Identification number (last 3 digits) is stamped on side of injector.

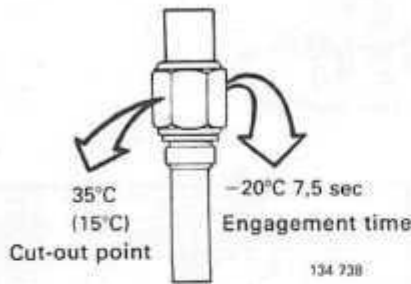
Injection time is controlled by the thermal time switch (see graph below).

1981–1983: start injector is also controlled by an impulse relay so that engine receives additional fuel during warm starts. Impulse relay engages start injector after approx. 1.5 secs. which is then followed by injection for 0.1 secs., pause for 0.3 secs., injection 0.1 secs., pause 0.3 secs. . .

* Impulse relay can also be fitted to B 27 E 1979–1980, B 27 F 1978–1979 and B 28 F 1980. See page 78.

Engine type	Model year	Start injector		
		Bosch number Volvo number Injected quantity	... 400 269292-2 165 cm ³ /min	... 404 462865-7 115 cm ³ /min
B 27 E	1975–1978		X	
	1979–1980			X
B 28 E	1981–1983			X
B 27 F	1976–1979		X	
B 28 F	1980–1982			X

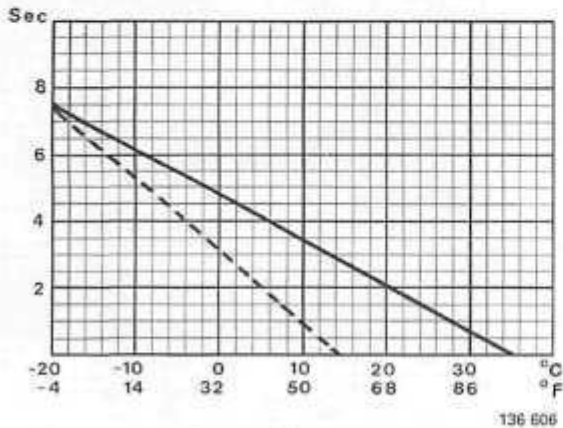
THERMAL TIME SWITCH



Type of thermal time switch fitted to vehicle depends on engine type.

Temperature at which start injector is disengaged
B 27/28 E 35°C (95°F)
B 27 F 15°C (59°F)*
B 28 F 35°C (95°F)

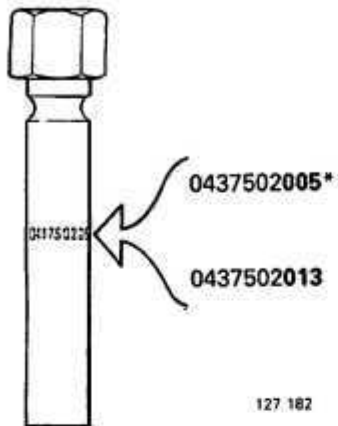
* Replacement part 35°C (95°F)



Cut-out point and engagement time at -20°C (-4°F) are stamped on side of switch.
Tolerances: engagement time ± 2 secs. Cut-out point ± 4°C.

Engagement time at different temperatures

INJECTORS



Type of injector fitted to vehicle depends on engine type. Identification number is stamped on side of injector (three last numbers).

* Spare part . . . 013 (1269274-5)

	1975-1978	1979-1983
Injector, Bosch number	. . . 005*	. . . 013
Volvo number	269184-8	1269274-5
Opening pressure	300-360 kPa	320-380 kPa
	43-51 psi	46-54 psi
no leakage permitted below	240 kPa	260 kPa
	34 psi	37 psi

FUEL PUMP

	1975-1979	1980-1983
Capacity at 500 kPa (71 psi), 12V and 20°C (68°F)	100 l/h (0.8 l/30 sec.)	120 l/h (1.0 l/30 sec.)
Current consumption max.	9.5 A	9.5 A

TANK PUMP

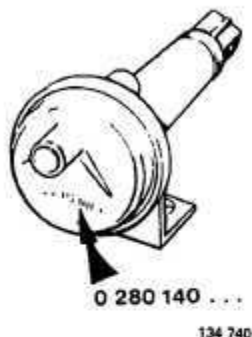
Introduced in 1977 but may have been fitted to earlier vehicles.

Current consumption

1-2 A

AUXILIARY AIR VALVE

Not fitted to vehicles with CIS-system



Type of auxiliary air valve fitted to vehicle depends on model year and engine type. Identification number is stamped on end of valve.

Valve fully open at $-30^{\circ}\text{C} = -22^{\circ}\text{F}$
fully closed at $+17^{\circ}\text{C} = +158^{\circ}\text{F}$

Valve is electrically controlled and should be fully closed after 5 minutes engagement at an ambient temperature of $+20^{\circ}\text{C} = 68^{\circ}\text{F}$.

Engine type	Model year	Auxiliary air valve						
		Bosch number Volvo number Resistance	... 200* 269309-1 15-21 Ω	... 202 269532-8 15-21 Ω	... 213 1269193-7 15-21 Ω	... 110 1269319-8 40-60 Ω	... 114 1266910-7 40-60 Ω	... 100 460833-7 40-60 Ω
B 27 E	1975	Man/Auto		Man/Auto	Man/Auto	Man	Auto	
	1976-1978							
	1979							
	1980							
B 28 E	1981-1983					Man	Auto	
B 27 F	1976-1979			Man/Auto				
B 28 F	1980-1981						Man**	Auto**

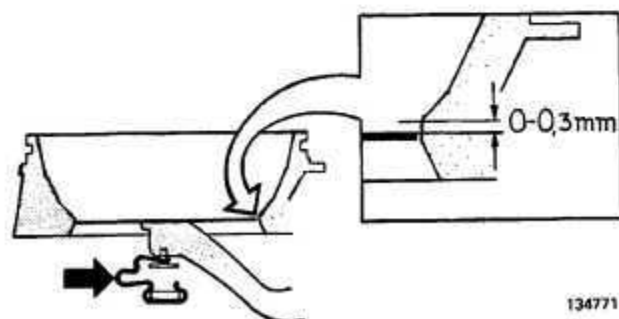
* Spare part replacement ... 202 (269532-8)

** Auxiliary air valve not fitted to vehicles with CIS-system.

AIR FLOW SENSOR

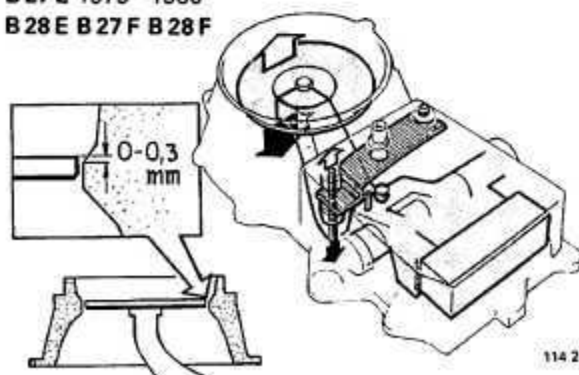
Sensor plate height should be checked at max control pressure = warm engine and fuel pump operating.

B 27 E 1975-1978



134771

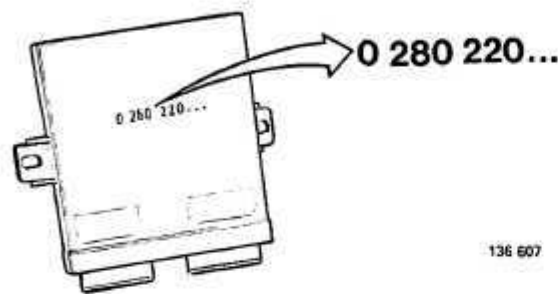
B 27 E 1979-1980
B 28 E B 27 F B 28 F



114 214

Constant idle speed system (CIS)

CONTROL UNIT

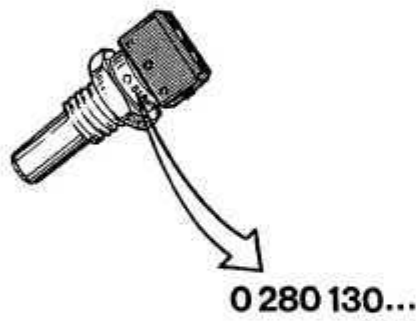


136 607

Type of control unit fitted to vehicle depends on model year. Identification number stamped on side of unit.

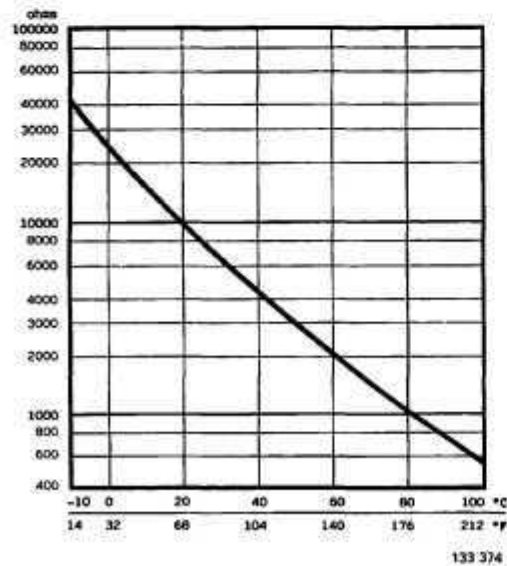
	1981	1982
Bosch No.	... 001	... 008
Volvo No.	1274293-8	1274452-8

THERMAL TIME SWITCH



136 608

Bosch No.	... 028
Volvo No.	1306024-9



Resistance at different temperatures see graph.

Suitable test temperatures

-10°C	32000-53000 Ω
+20°C	8500-11500 Ω
+80°C	770- 1320 Ω

Special tools

999	Description – use
0976-4	Flow differential gauge (USA and Canada): flow measurements used with 0977
0977-2	Gauge (USA and Canada): setting the air-flow sensor plate. Used with 0976
2901-0	Clamping pliers
5011-5	Pressure gauge : used with 5032 + 5116
5012-3	Pliers : fitting hose nipples. Ø 5 & 8 mm
5013-1	Pliers : fitting hose nipples. Ø 10 mm
5014-9	Flow metering unit : checking fuel flow and distribution
5032-1	Nipple : connecting pressure gauge 5011
5102-2	Wrench : Adjusting CO content
5116-2	Hose : connecting pressure gauge 5011
5151-9	Adapter : CO meter (F engines)
5169-1	Spanner : removing/fitting fuel tank pump/gauge unit
5170-9	Test relay : connecting fuel pump 1978-
5232-7	Sealing tool : applying seal (steel ball) to the air-fuel control unit after CO adjustment
9934-4	Injector tester

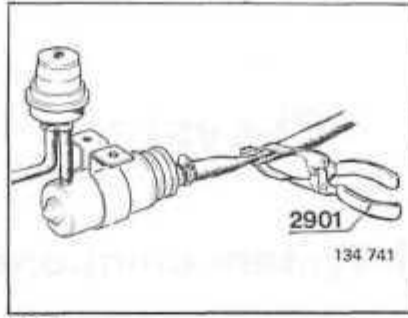
Note: The Ø sign symbolizes diameter.



0976, 0977

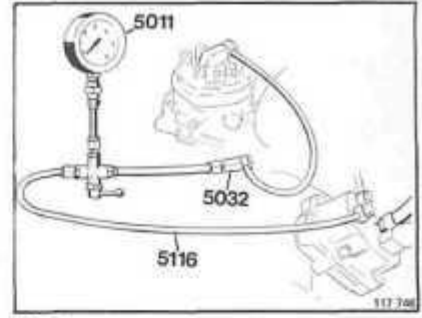


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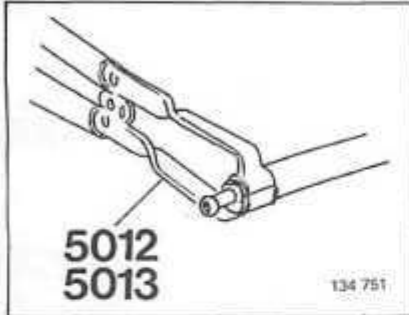
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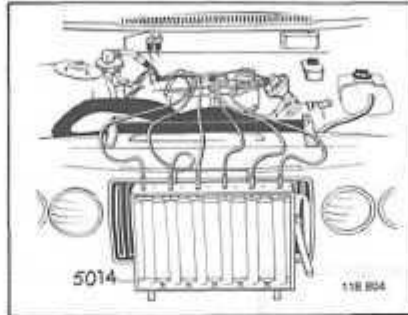
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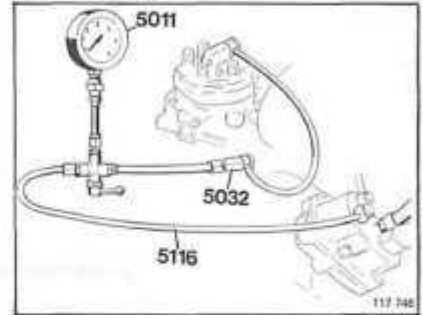
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5013

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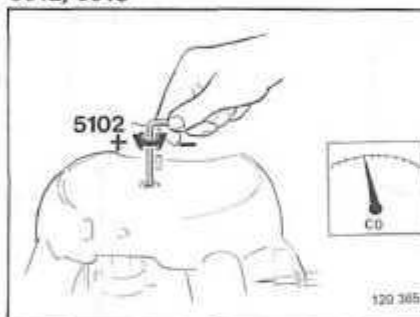
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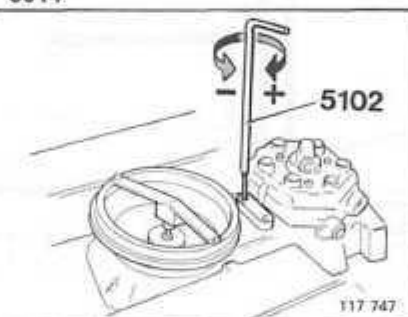
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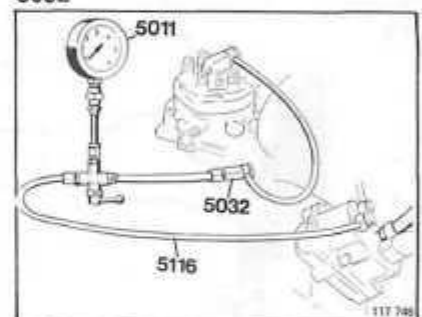
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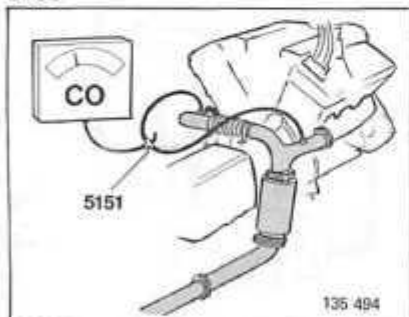
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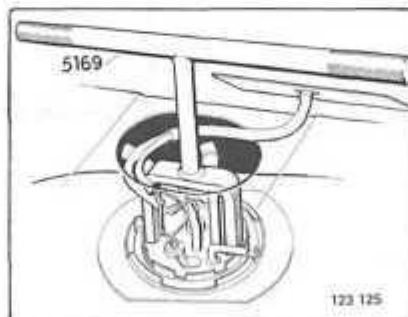
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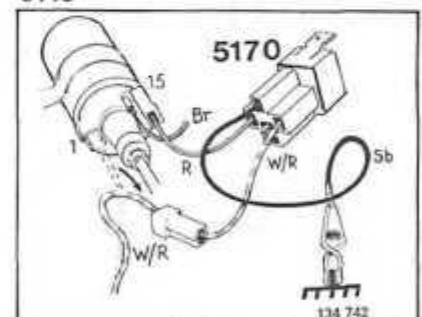
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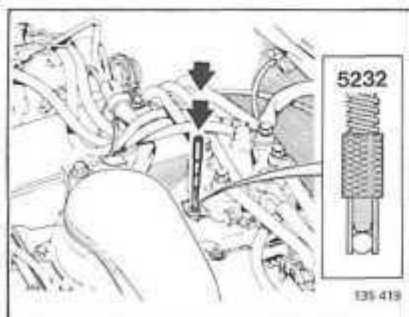
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123 125



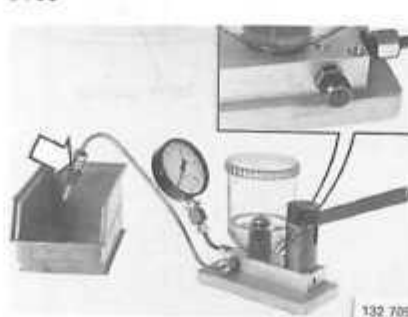
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5232

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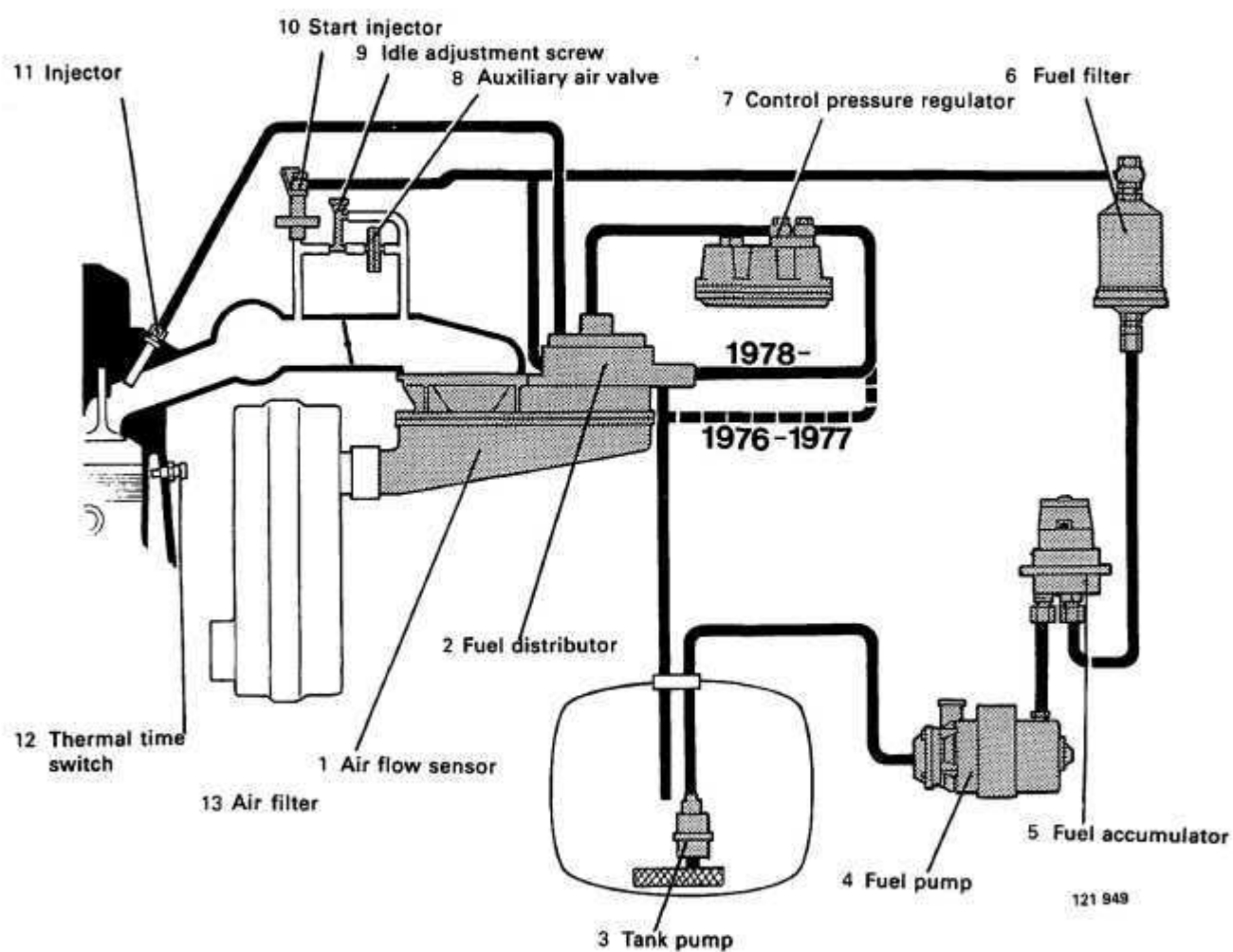
9934

132 705

CI-system

CI System components

For more detailed information refer to the design (construction) and function service manual



The CI system is a mechanically operating fuel injection system with one injector per cylinder. CI is short for "Continuous injection". The name is derived from the fact that the injectors continuously spray fuel i.e. are open all the time the engine is operating. The amount of fuel injected is therefore not controlled by variations of the injection time but instead by regulating the supply of fuel to the injectors.

In principle the system operates by measuring continuously the amount of air flowing into the engine, and adjusting accordingly the amount of fuel to be supplied. The air flow sensor (1) measures the amount of incoming air, and the fuel is regulated by the fuel distributor (2).

1. Air-flow-sensor

Continuously measures the amount of incoming air – is an integral part of the fuel distributor.

2. Fuel distributor

It controls and distributes fuel to injectors. A pressure regulator regulates both line and rest pressures.

NOTE: A new type of pressure regulator was introduced in 1978. This new regulator blocks the fuel return line when the engine is switched off.

3. Tank pump

A tank pump was introduced in 1977 to improve fuel delivery – also installed on some earlier models.

It supplies fuel to the main fuel pump under constant pressure and incorporates a non-return check valve which minimizes the risk of vapour-lock.

4. Fuel pump

Main fuel supply to the system, incorporates a fuel check valve to retain (rest) pressure into the system when engine is shut down.

5. Fuel accumulator

Dampens fuel pump pulsations and maintains (rest) pressure in the system after engine shuts down.

6. Fuel filter

7. Control pressure regulator

Regulates control pressure.

Decreases control pressure during cold start and warm-up resulting in a richer mixture.

There are different versions of regulators (which, for example, give a richer mixture during acceleration-cold engine), see specifications, page 4.

8. Auxiliary air valve

Increases the quantity of air-fuel supplied to the engine during cold start and warm-up (fast idle).

Note! Auxiliary air valve and idle adjustment screw not fitted to engines with CIS-system. These engines have instead an air control valve.

9. Idle adjustment screw

10. Start injector (previously called cold start injector)

Supplies extra fuel during cold engine starting. It is controlled by a thermal time switch (12).

NOTE: On 1981–1983* models the start injector is controlled by an impulse relay.

* Impulse relay may have been fitted to vehicles manufactured before 1981, see page 78.

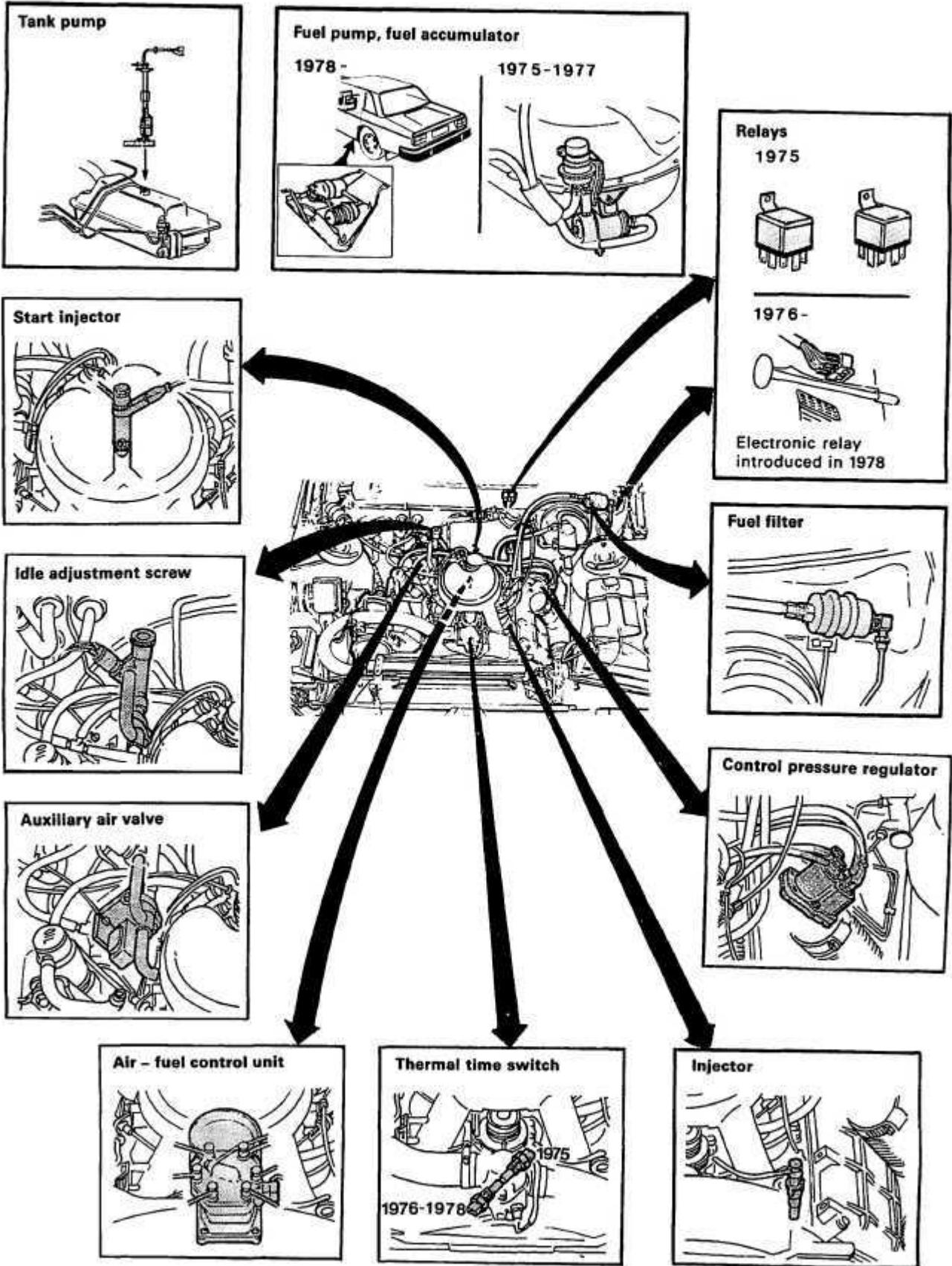
11. Injectors

Atomizes injected fuel.

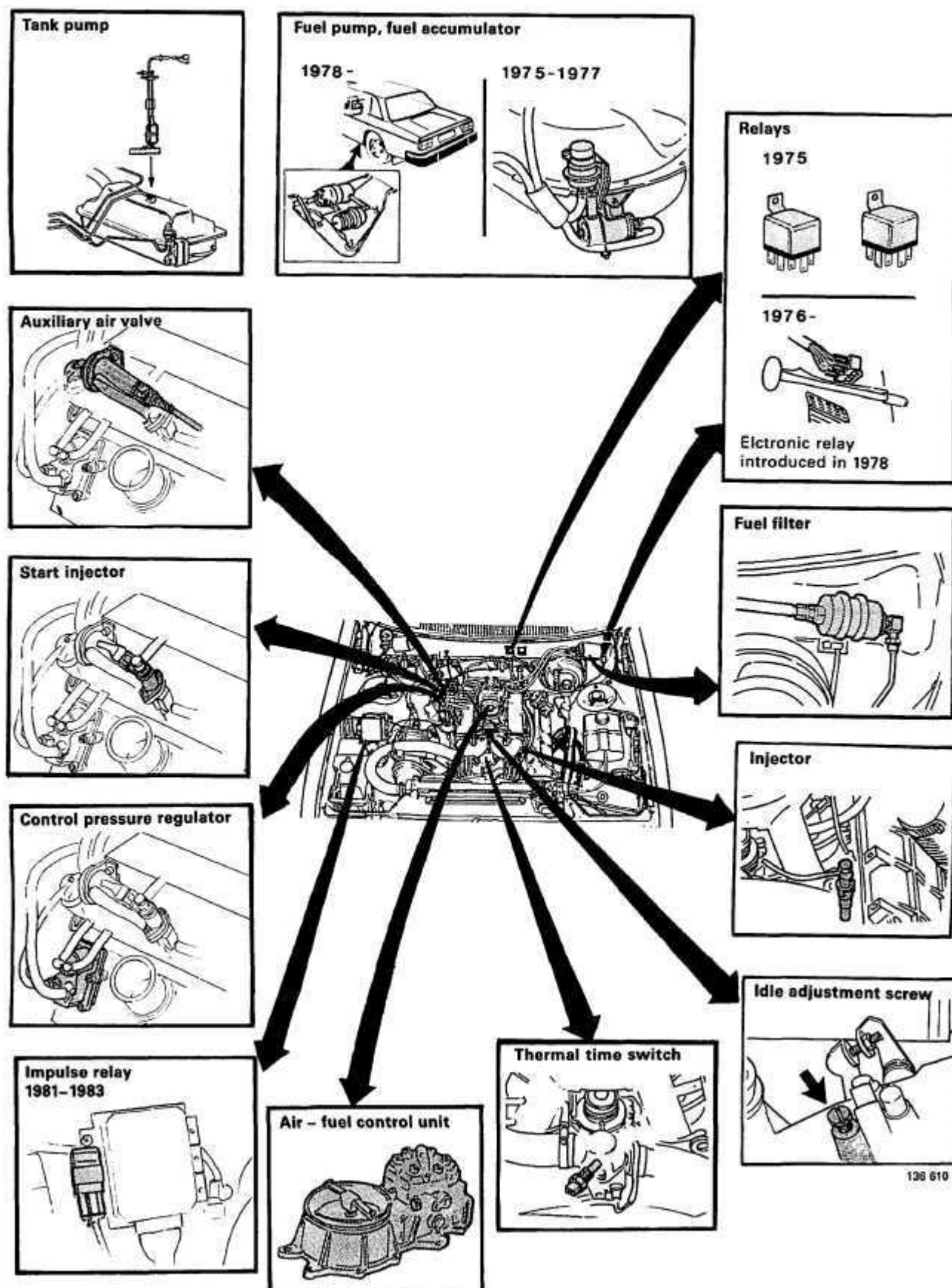
12. Thermal time switch

Senses coolant temperature and controls injection time of start injector during cold starts.

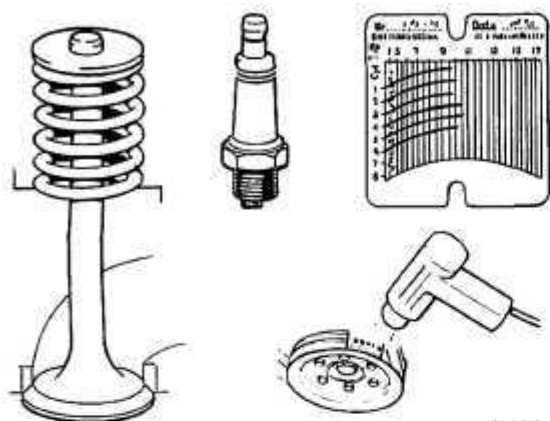
Location of components
B 27 E 1975-1978



B 27 E 1979-1980; B 28 E; B 27 F; B 28 F



Important information



123 264

Mechanical

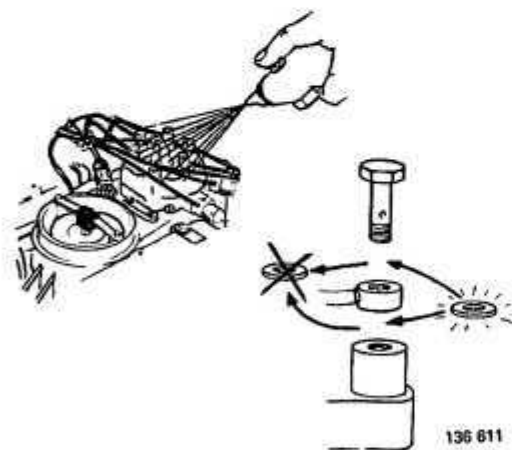
- compression
- valve clearance
- vacuum hoses and connections
- throttle control and kickdown cable (auto)
- air filter
- intake manifold (air leakage)
- exhaust gas system (leakage)

Electrical

- spark plugs
- HT leads
- distributor cap
- ignition coil
- ignition setting, incl. advance
- all electrical connections
- constant idle speed system (CIS)

Exhaust gas purification

- crankcase ventilation
- exhaust gas recirculation (EGR)
- air pump/Pulsair system
- evaporative system
- Lambda-sond system
- catalytic converter



136 611

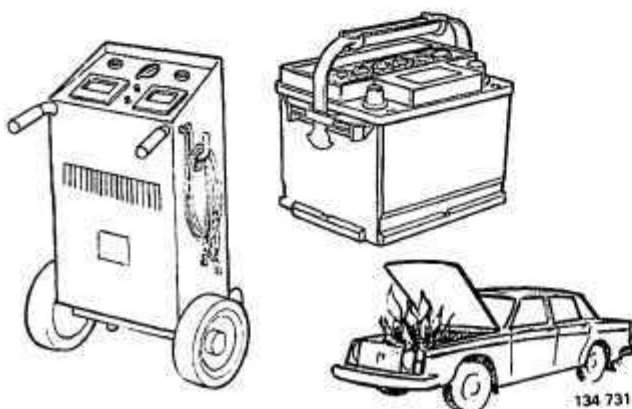
Cleanliness

Utmost cleanliness should be observed when working on the CI system.

All fuel connections should be carefully cleaned before removal.

Gaskets, seals

Always use new gaskets/seals.



134 731

Warning! Battery

It is important when testing the different components to ensure that the battery voltage is not too low.

A battery charger can be connected if necessary. Max. charging current 15 A.

Fire risk

Extreme care should be taken to avoid causing sparks especially when testing the start injector and injectors.

A. Flushing fuel system

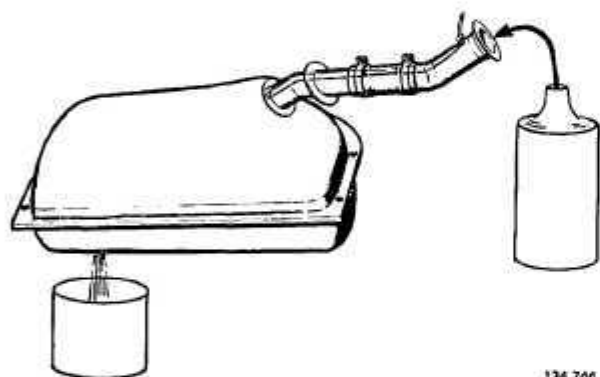
Fuel tank should be flushed if water has (or is believed to have) condensed in fuel system.

Presence of water in fuel system is indicated by

- engine stoppage
- difficult cold starting
- erratic idling
- low output (poor performance).

The following equipment is necessary to flush fuel system:

- fuel tank drainer or a large container for collecting fuel
- approx. 6 litres (6 US qts) white spirit (Shell Mineral Spirits 135, Shell K30, Esso-Versol or equivalent)
- two drain pans approx. 1.5 litres (1.5 US qts) each
- two hoses approx. 1 metre (3 ft) long, to fit to the return line and the fuel pump
- clamping pliers **2901**
- test relay **5170** (1978-).



134 744

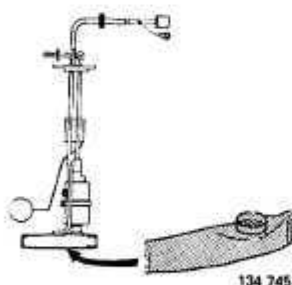
Clean fuel tank

Drain fuel and fill tank with approx. 4 litres (4 US qts) of white spirit.

Rock car so that white spirit mixes with any water present in tank.

Drain tank and refill with clean petrol (gasoline).

A1

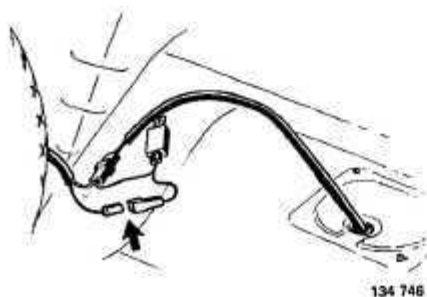


134 745

Fit a new tank pump filter

If necessary see page 50.

A2

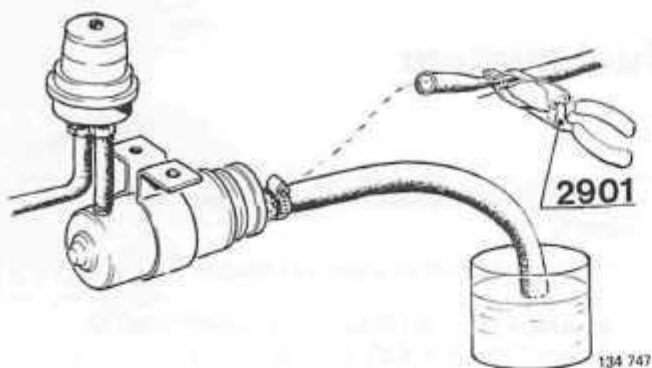


134 746

Disconnect tank pump

Disconnect plug in boot (trunk).

A3



A4

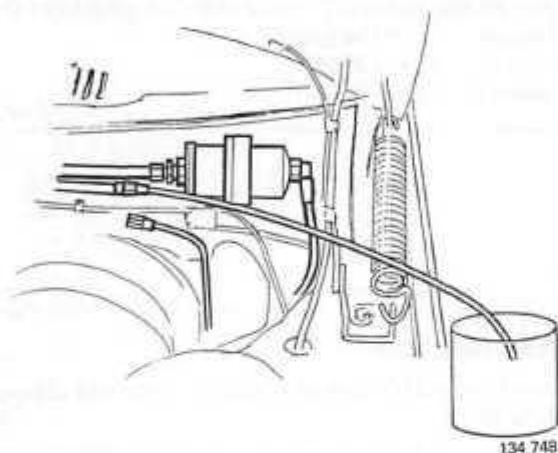
Connect fuel pump to a vessel containing white spirit

(at least 2 litres = 2 US qts)

Block fuel line between pump and tank. Use clamping pliers 2901.

Disconnect line from pump inlet.

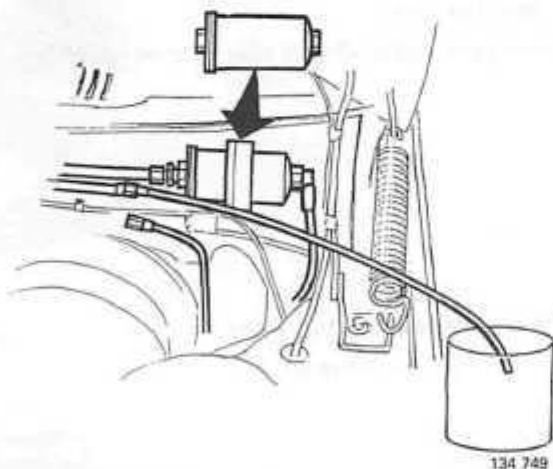
Connect one end of hose (approx. 1 m = 3 ft) to pump and submerge other end in a jar containing white spirit.



A5

Connect return line to an empty vessel

Separate return line on firewall. Connect one end of a hose (approx. 1 m = 3 ft) to return line and submerge other end in an empty vessel (capacity approx. 1.5 litres = 1.5 qts).



A6

Install new fuel filter

If necessary see page 60.



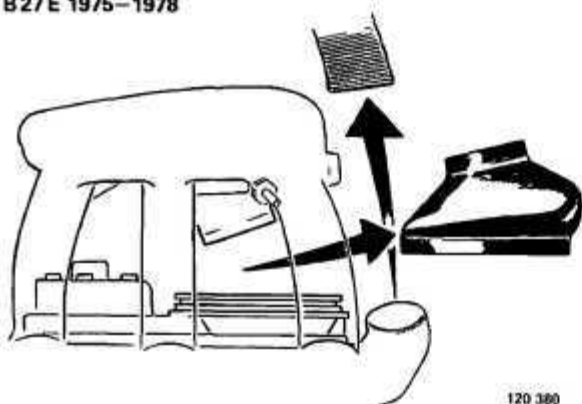
A7

Remove injectors

Place ends of fuel lines in empty vessel (capacity approx. 1.5 litres = 1.5 US qts).

B 27 E 1975–1978

A8



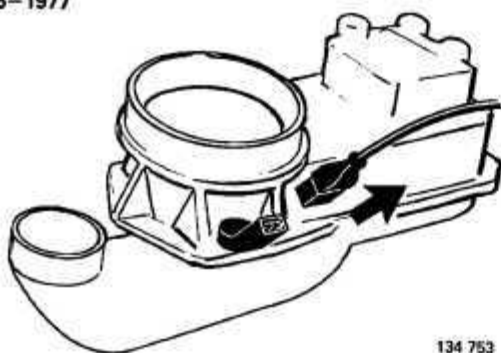
120 380

Remove air filter

B 27 E 1975–1978: Also detach hose from air filter and rubber bellows.

1975–1977

A9

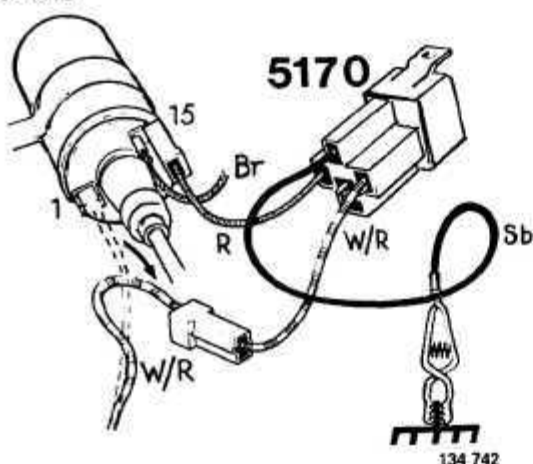


134 753

Prepare start of fuel pump 1975–1977

Withdraw plug from air flow sensor.

1978–1980

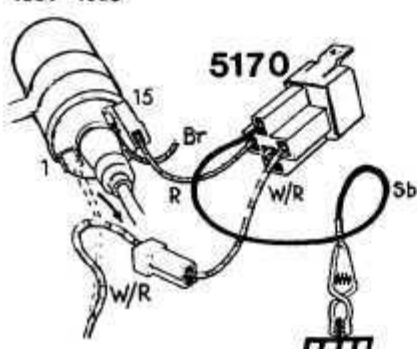


134 742

1978–1980

Connect test relay 5170.

1981–1983

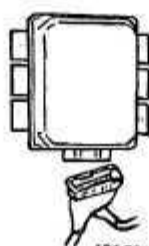


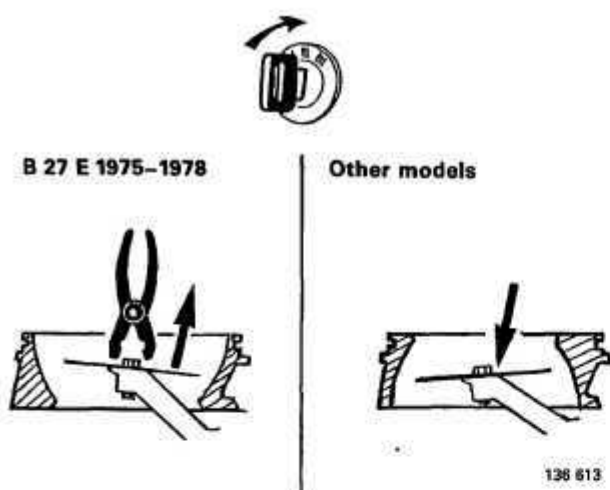
134 754

1981–1983

Connect test relay 5170.

Withdraw plug from ignition system control unit.
Take care not to lose rubber seal in connector.





A10

Flush system

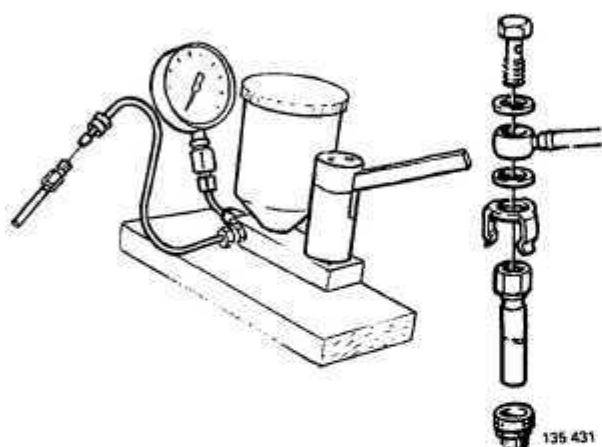
Turn on ignition to start fuel pump.

B 27 E 1975-1978: Lift air-flow sensor plate to topmost position.

Other models: Push down the plate until it bottoms.

Release plate after 1.5 litres (1.5 US qts) white spirits have flushed through system.

Turn off ignition.



A11

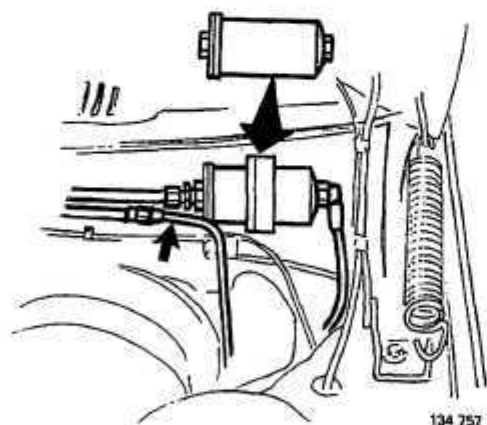
Clean and test injectors

If necessary see page 74.

A12

Install injectors

Reconnect fuel lines.



A13

Install new fuel filter. Reconnect return line

It is necessary to fit a second new filter because some of the water which has condensed in fuel system is absorbed by the filter when system is flushed.



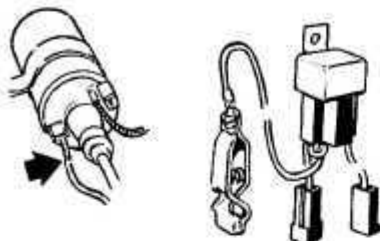
A14

Reconnect wiring to air-flow sensor

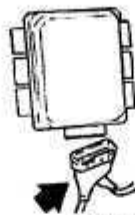
1975-1977 models

Reconnect plug to air flow sensor.

1978—



1981—



134 759

1978–1980

Disconnect test relay 5170 and reconnect lead to terminal 1 on ignition coil.

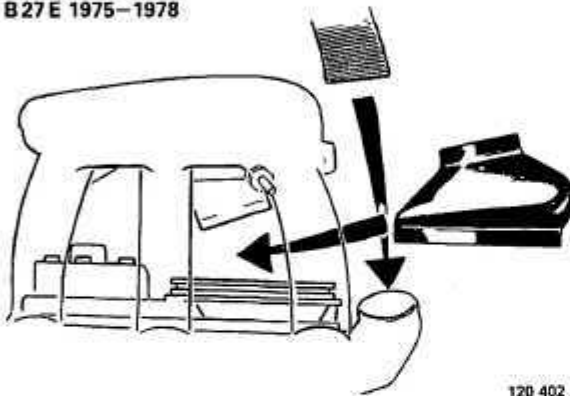
1981–1983

Disconnect test relay 5170 and reconnect lead to terminal 1 on ignition coil.

Reconnect ignition system control unit.

IMPORTANT! Ensure rubber seal is fitted correctly. Water entering system will cause corrosion, poor contacts etc.

B 27 E 1975–1978

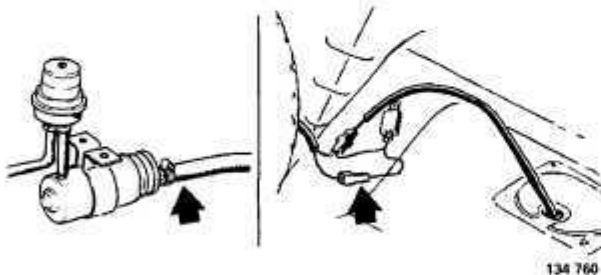


120 402

A15

Install air filter

B 27 E 1975–1978: also attach rubber belows and hose to air filter.



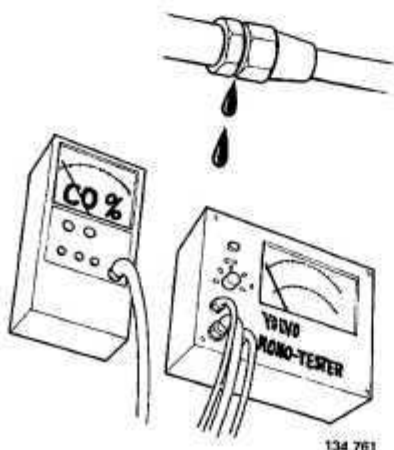
134 760

A16

Reconnect fuel line to fuel pump
Reconnect tank pump lead

A17

Fill tank with new fuel
Start engine. Check for leakage



134 761

A18

Check/adjust idle speed and CO-content

	Page
B 27 E 1975–1978	97
1979–1980	98
B 28 E	98
B 27 F	100
B 28 F	100

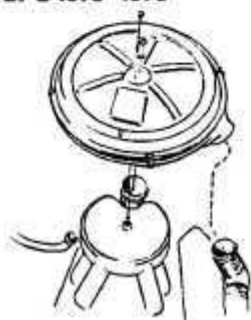
B. Inspection of CI-system

Special tools: 2901, 5011, 5014, (alt. 0976+0977 for USA & Canada), 5032, 5116, 5170 (1978-)

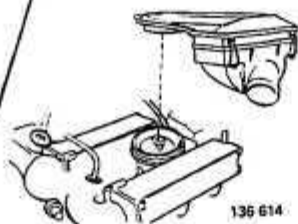
Engine must be cold (below $+30^{\circ}\text{C} = 86^{\circ}\text{F}$) at start of inspection as it is necessary to check control pressure, auxiliary air valve and start injector in a cold state.

Note! B 27 F: temperature must be (below $15^{\circ}\text{C} = 60^{\circ}\text{F}$) to be able to check thermal time switch in car.

B 27 E 1975-1978



Other models



Preparatory work

Operations B1-3

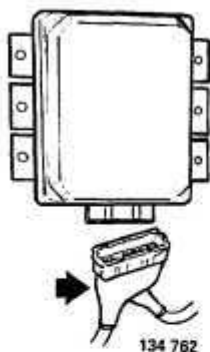
B1

Remove air filter

B2

Disconnect plug from ignition system control unit

Safety precaution: This is also necessary on some models to enable fuel pump to be started.

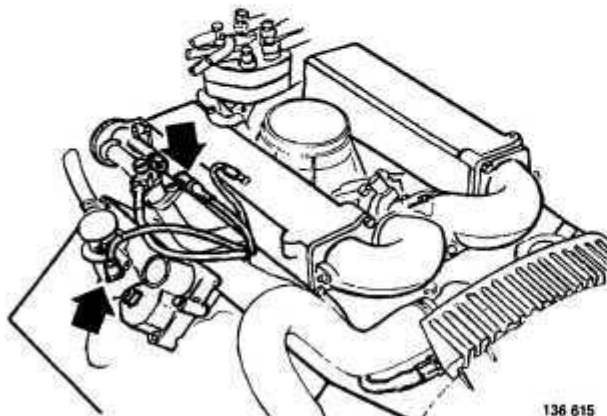


B3

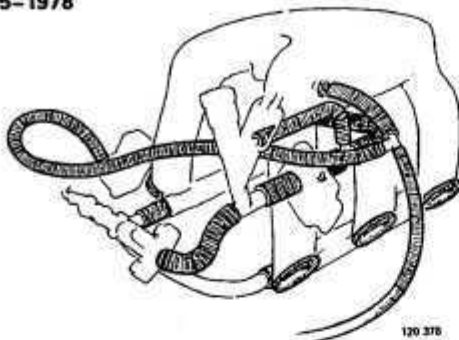
Disconnect connectors from:

- control pressure regulator
- auxiliary air valve (not fitted on vehicles with CIS)

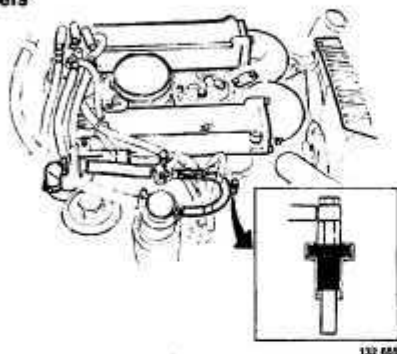
These components must be disconnected or they will heat up during inspection and results will be invalid.
(It can take as long as an hour for a component to cool down again.)



B 27 E 1975–1978



Other models



Inlet system

Operation B4

B4

Check that inlet system does not leak

Air must not leak between air-flow sensor and engine.

Repair as required.

Check:

- B 27 E 1975–1978: rubber bellows between air-flow sensor and intake manifold.
- hose connections at auxiliary air valve (air control valve) and start injector
- all vacuum hoses
- O-rings
- if all screw joints are tight
- that injectors are fitted correctly and that rubber seals are intact.

Start injector

Operations B5–10

B5

Remove injector

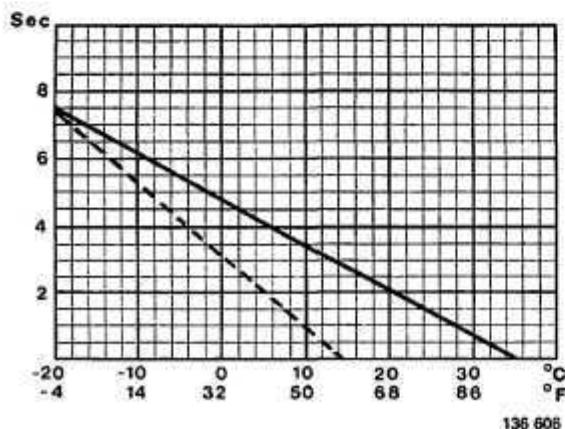
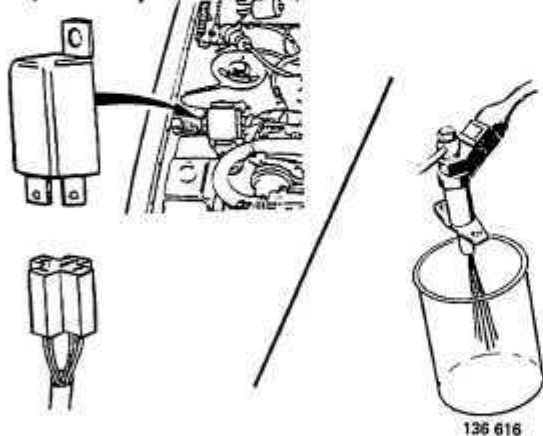
Allen key 5 mm.

B6

Check start injector and thermal time switch

IMPORTANT! Withdraw connector from impulse relay during following check.

Impulse relay



Injection time at different temperatures

Tolerances: Injection time ± 2 secs. Cut-out temperature $\pm 4^\circ\text{C}$ (8°F)

Hold injector above a suitable container.

Run starter motor and observe injector.

Fuel should be injected continuously when starter motor is cranked. Engagement time does however depend on engine temperature, see graph adjacent.

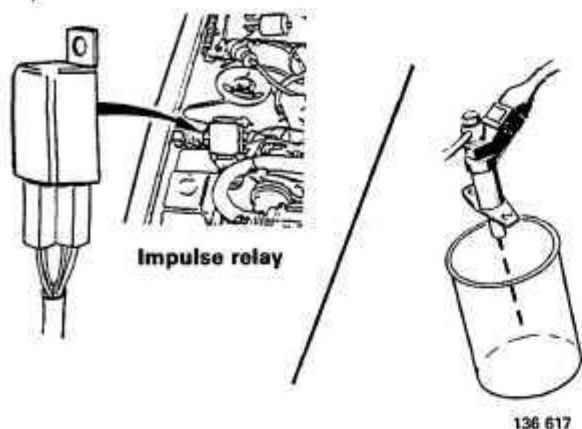
Note! Some B 27 F engines may have been fitted with a thermal time switch with a 15°C (59°F) cut-out point.

Incorrect injection time: remove connector from start injector. If injection is interrupted then thermal time switch is defective. If injection is still not interrupted, start injector is defective.

Incorrect injection time: test with a new thermal time switch.

No injection





Engines with impulse relay

B7

Check impulse relay

Connect plug to relay.

Hold start injector above a suitable container.

Run starter motor and observe injectors.

Fuel should be injected after approx. 1.5 secs. with subsequent injection for 0.1 secs. – pause 0.3 secs. – injection 0.1 secs. – pause 0.3 secs. . .

Incorrect timing: test with a new impulse relay.

No injection: defective relay or wiring.



B8

Start fuel pump

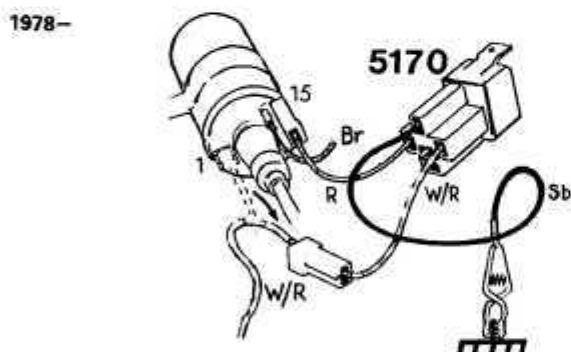
Place hand on fuel filter to check that pump is operating (filter vibrates slightly).

1975-1977: Withdraw connector from air-flow sensor.

1978-: Connect test relay 5170.

Turn on ignition to start fuel pump.

Fuel pump does not start: Check fuses, wires and relay. See Wiring diagrams on pages 83-85.



134 768



123 304

B9

Make sure that start injector does not leak

Max. rate = 1 drop per minute.

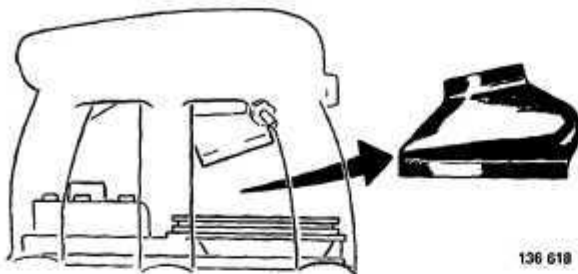
If greater, replace injector.

B10

**Turn off ignition
Install injector**

Air-fuel control unit

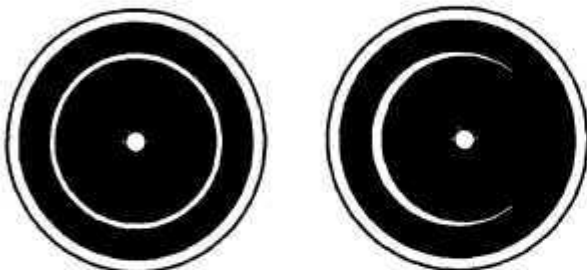
Operations B11–13



B 27 E 1975–1978

B11

Remove rubber bellows from air-flow sensor



Correct

Incorrect 108 604

B12

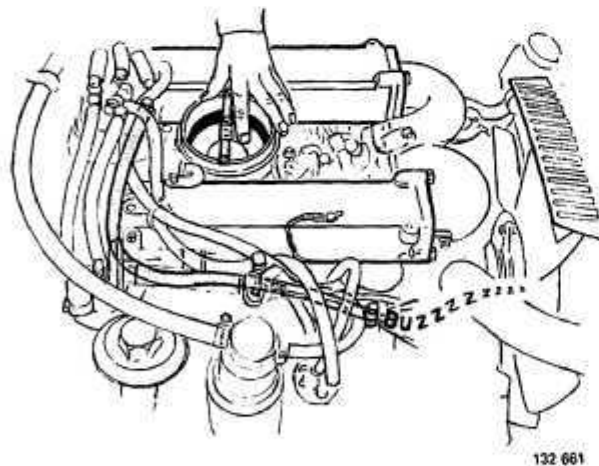
Check plate position

No part of plate may touch air venturi. Make sure that plate does not have any side play.

Side play: recondition air-flow sensor.

Incorrect position: loosen centre screw and adjust. Retighten screw.

Height of sensor plate is checked later at max control pressure.



B13

Ensure that air-flow sensor plate does not jam

Turn on ignition.

Depress plate for a short while and listen to injectors.

IMPORTANT! B 27 E 1975–1978: sensor plate must be lifted.

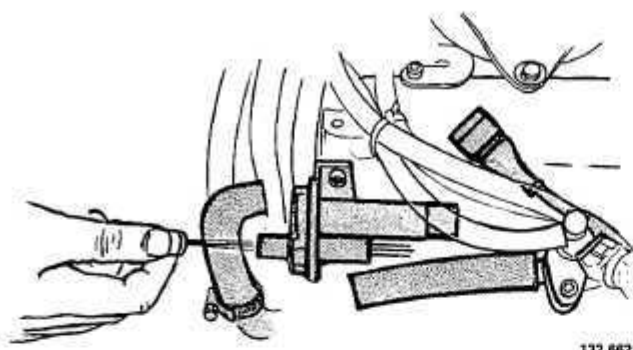
Note! Control pressure offers some resistance when depressing plate, do not mistake this for jamming.

Injectors should only buzz when plate is depressed. On release, plate should return to rest position and buzzing should stop.

Turn off ignition.

Plate jams: recondition air-flow sensor.

Injectors buzz with plate in rest position: control plunger in fuel distributor has jammed, clean/replace as required. **Injectors do not buzz with plate depressed:** incorrect line pressure.



132 662

Auxiliary air valve

Operation B14

B14

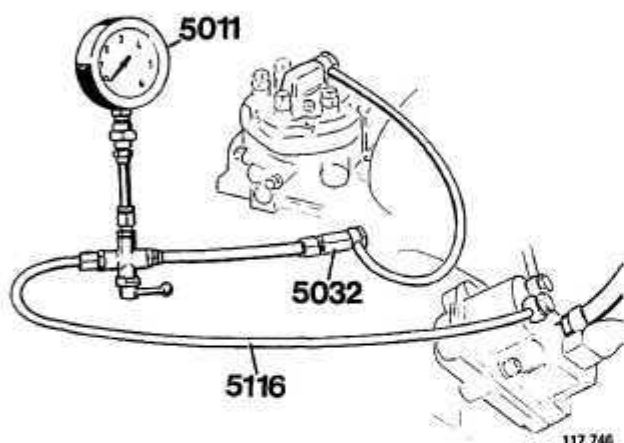
Check that auxiliary air valve opens

Valve should be partly open at room temperature and:
Fully open at -30°C (-22°F) fully closed at $+70^{\circ}\text{C}$ (158°F).

Use a penlight to illuminate valve when checking operation. Replace valve if defective.

Connect plug to valve.

Closing operation of auxiliary air valve is checked at a later stage.



117 746

Checking all pressures

Operations B15–24

B15

Connect pressure gauge 5011

Turn off ignition.

Connect gauge between control pressure regulator and fuel distributor.

Use hose 5116 and nipple 5032.

B16

Turn on ignition to start fuel pump

B17

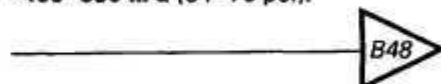
Check line pressure

Turn gauge cock on 5011 to position 1 (ie. towards fuel distributor).

Record pressure when it is stable.

Line pressure = $450\text{--}530\text{ kPa}$ ($64\text{--}75\text{ psi}$).

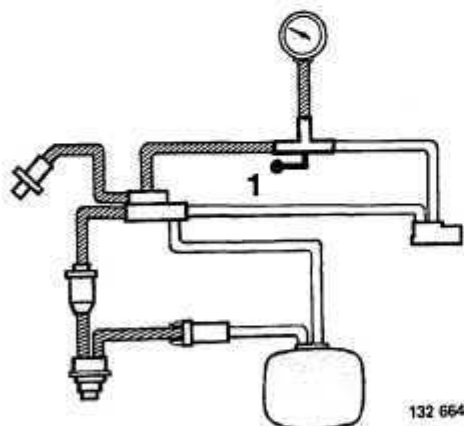
Too low



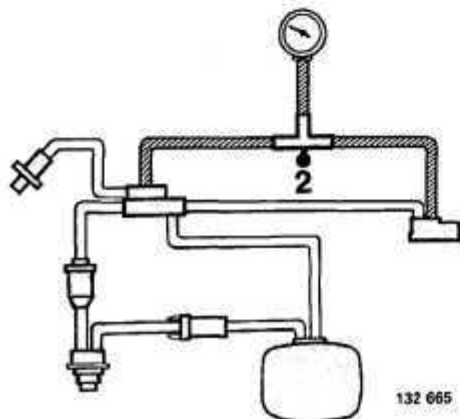
Too high



B18



132 664



132 665

Check control pressure (cold control pressure regulator)

Turn off engine.

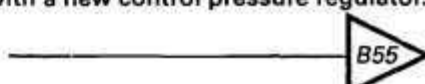
Turn gauge cock on 5011 to position 2 (at right angles to hoses).

Control pressure regulator should be at room temperature.

Correct control pressures at different temperatures are shown in graphs on pages 29 and 30.

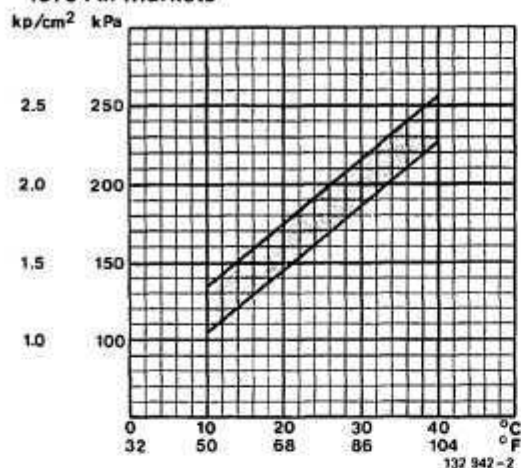
Too low: test with a new control pressure regulator.

Too high

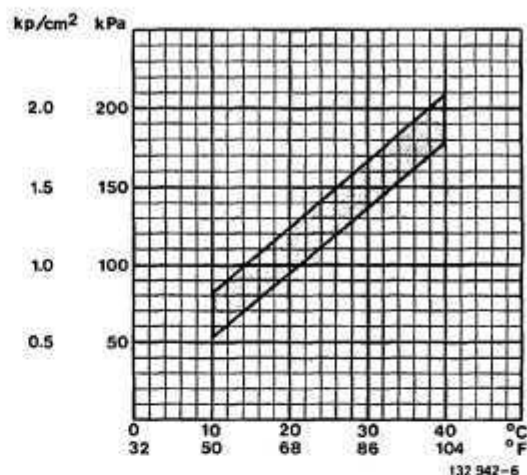


Control pressure regulator . . . 004

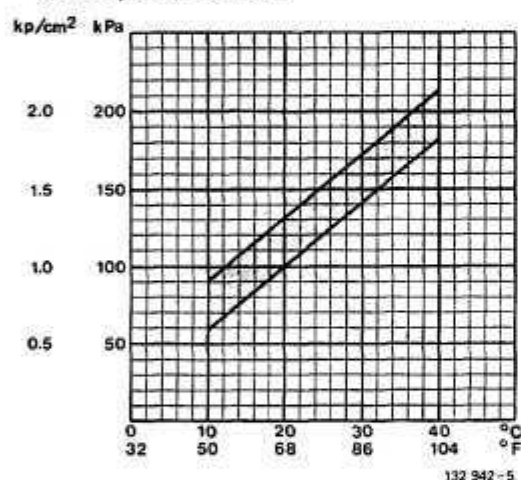
B 27 F 1978 USA California + Japan
1979 All markets

**Control pressure regulator . . . 005**

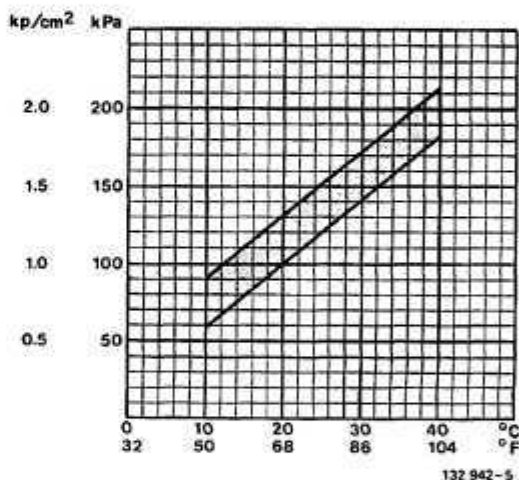
B 27 E Early type

**Control pressure regulator . . . 018**

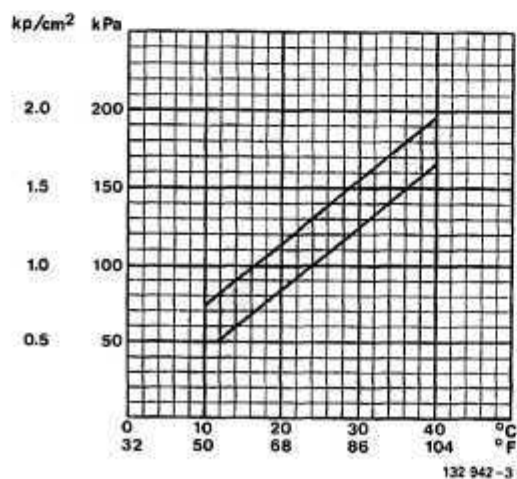
B 27 E Late type Sweden + Australia
B 27 F 1976 All markets
1977 Japan + Canada

**Control pressure regulator . . . 029**

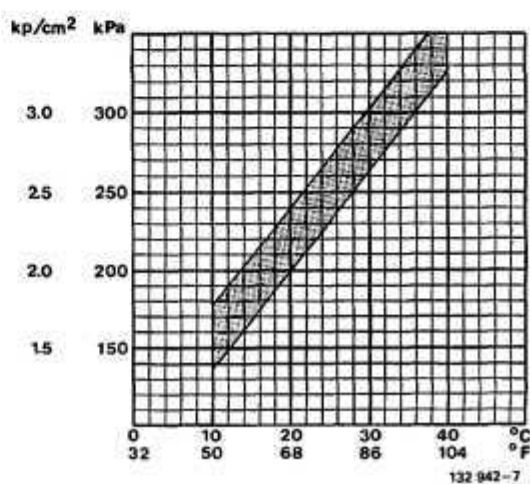
B 27 F 1977 USA
1978 USA Federal + Canada

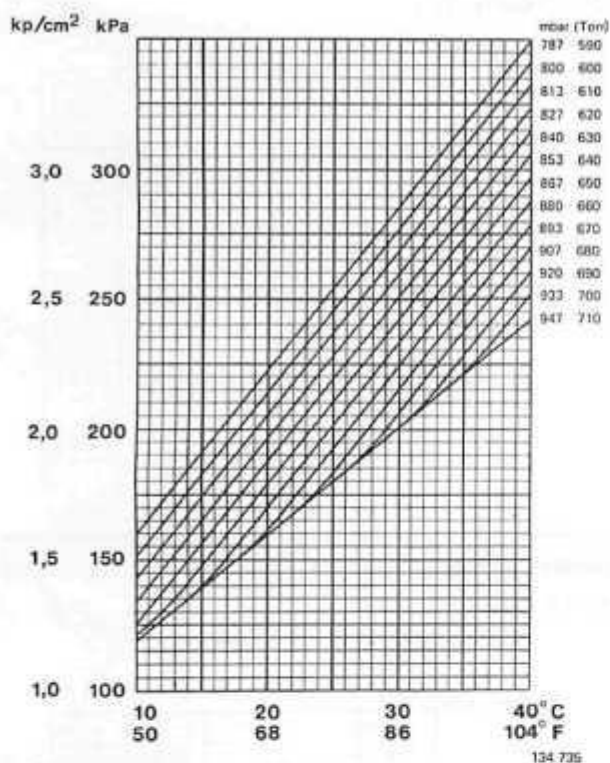
**Control pressure regulator . . . 038**

B 27 E Late types excl Sweden + Australia
B 28 E

**Control pressure regulator . . . 066**

B 28 F





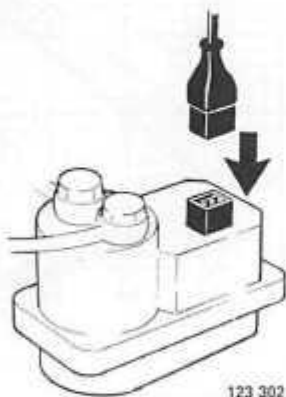
Control pressure regulator . . . 021

Altitude compensated.

B 27 F Federal 1976 and 1977 some special versions.

Tolerances for control pressure are ± 25 kPa (± 3.6 psi).

Diagram on left is based on air pressure at sea level and up to altitudes of approx. 600 meters (2000 ft) i.e. 947 mbar or higher. For altitudes in excess of this it is necessary to know air pressure at time of test.



B19

Check control pressure (warm control pressure regulator)

Turn off engine.

Connect plug to control pressure regulator. Regulator will now receive heating current and control pressure increases.

After max. 5 minutes control pressure should increase to:

Control valve pressure

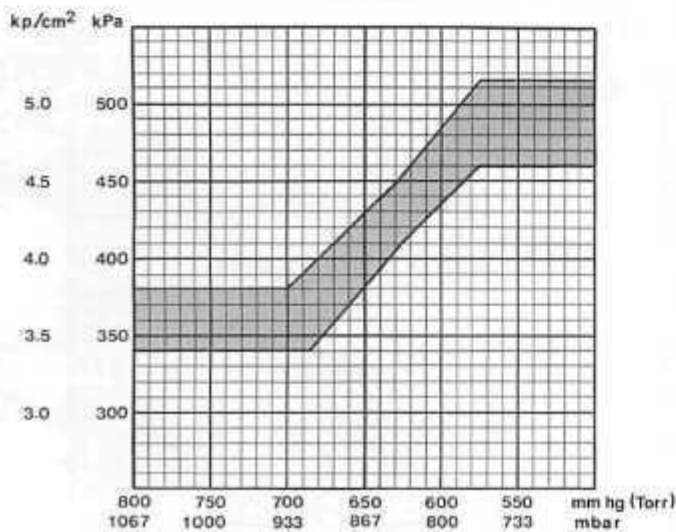
. . . 004 + . . . 066 345–375 kPa (49–53 psi)

. . . 005 275–305 kPa (39–43 psi)

. . . 018 + . . . 029 + . . . 38 . . . 305–335 kPa (43–48 psi)

Note! B 27 F USA Federal 1976 and 1977 with altitude compensated regulators: control pressure may vary depending on prevailing air pressure, see graph on left.

Graph applies at sea level and up to 600 meters (2000 ft) i.e. 947 mbar or greater.



Control pressure, altitude compensated regulator

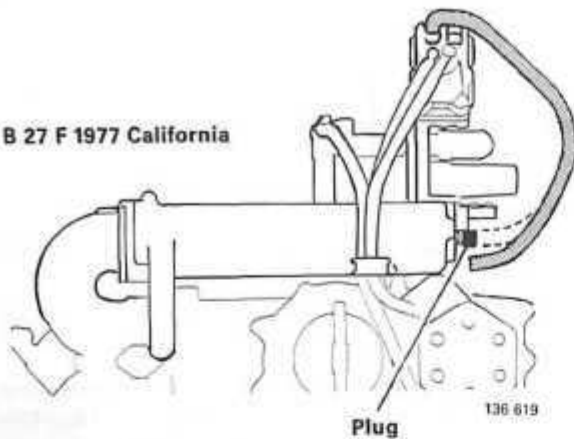
Too low



Too high



B 27 F 1977 California



B 27 E, B 28 E
B 27 F 1976 all types
1977 not California
1978 USA Federal + Canada

IMPORTANT! B 27 F 1977 California: full load enrichment system is not connected.

B20

Check enrichment at full load

Check vacuum hose for leaks and make sure that it is correctly connected.

Evacuate hose connected to control pressure regulator. Control pressure should increase.

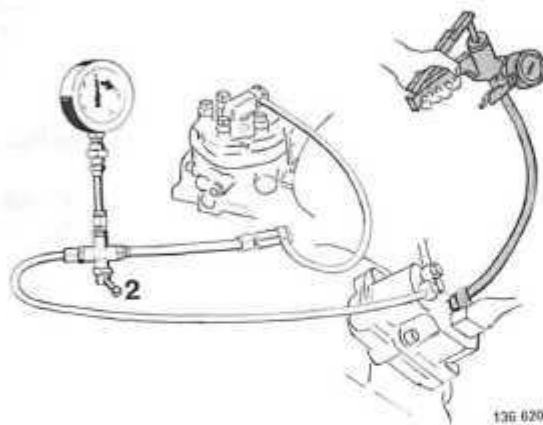
IMPORTANT! System must be evacuated carefully or regulator may be damaged.

At a depression (vacuum) of 50 kPa (7 psi) control pressure should be 345–375 kPa (49–53 psi).

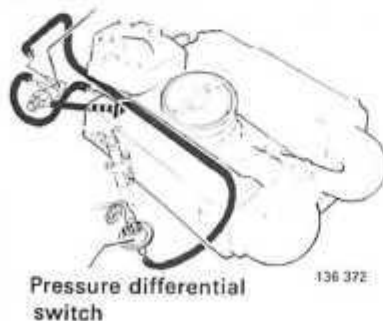
Control pressure should return to the initial value when pump is removed.

Reconnect vacuum hose.

Note! This test can also be performed with engine running by comparing the gauge values with the vacuum hose connected and then disconnected.

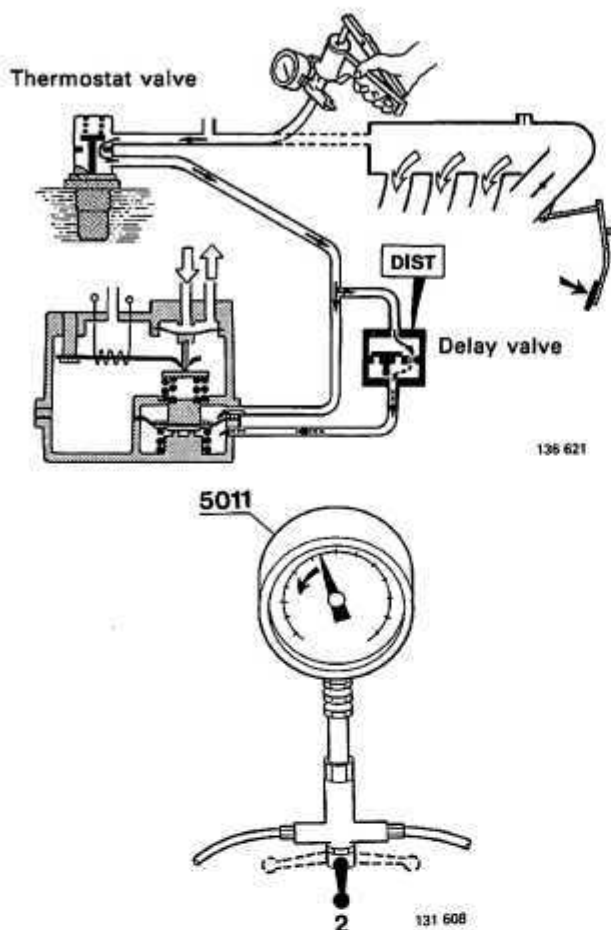


Thermostat valve



B 28 F

Operation B 21 on next page applies only for engines **without** a pressure differential switch. On engines with a pressure differential switch the acceleration enrichment system via the control pressure regulator must always be disconnected.



B21

Check acceleration enrichment

B 28 F without pressure differential switch.

Check vacuum hoses for leaks and correct connection. Disconnect hose from intake manifold and connect it to a vacuum pump.

Evacuate system until pressure drops to approx. 50 kPa (7 psi).

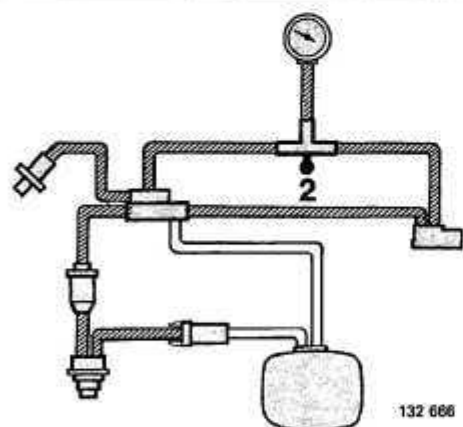
Disconnect pump quickly and record control pressure on gauge 5011. Control pressure should drop to 145–175 kPa (21–25 psi) for one second and then return to the initial value.

Reconnect hose to intake manifold.

If incorrect:

Check that delay valve is connected correctly, see fig., and that thermostat valve is open.

Thermostat valve should be open at temperatures below 55°C (131°F). (Closing operation of valve is checked at a later stage.)



B22

Check rest pressure

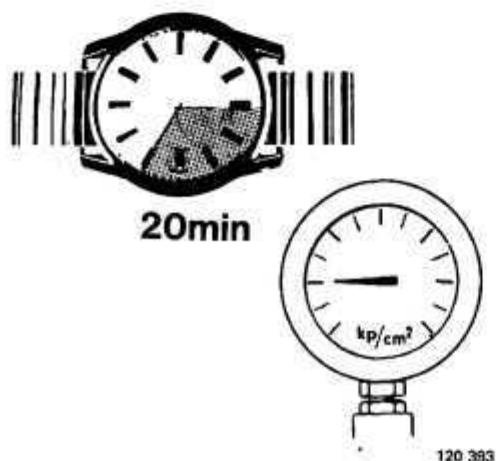
Turn gauge cock on 5011 to position 2 (at right angles to hoses).

Turn off ignition.

Record pressure when it is stable and for a further minute.

Rest pressure = 150–240 kPa (21–34 psi).

Pressure does not drop but is incorrect: adjust line and rest pressures, see page 47.



Pressure drops



B23

Check pressure drop for 20 minutes

Especially important if hot starting problems are encountered.

Pressure after 20 minutes should be at 150 kPa (21 psi).

Too low

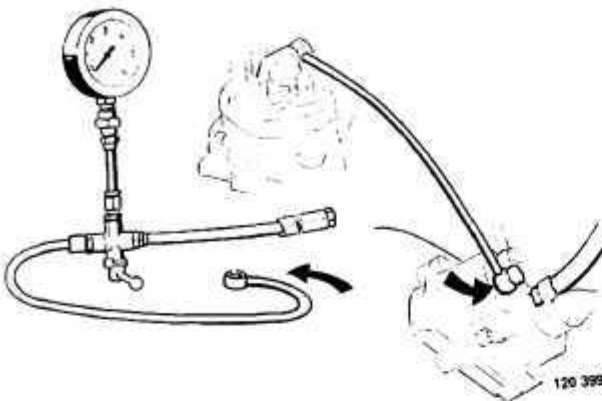


B24

Disconnect pressure gauge 5011 and nipples (hose)

Turn off engine.

Reconnect hose from control pressure regulator to fuel distributor.



Air-flow sensor

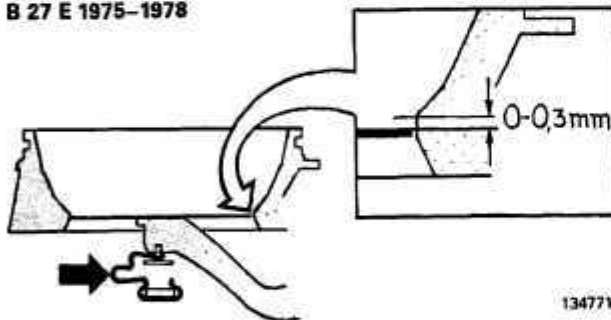
Operation B25

B25

Check air-flow sensor plate rest position

Fuel pump must be operating for this test and control pressure at max. value.

B 27 E 1975–1978



B 27 E 1975–1978

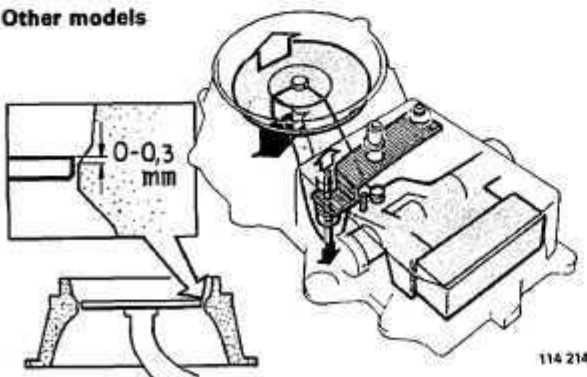
Turn on ignition.

Upper edge of plate should lie flush or at most 0.3 mm (0.012 in) below cylindrical part of air venturi, see fig.

Turn off ignition.

Incorrect position: adjust by bending/straightening spring beneath plate.

Other models



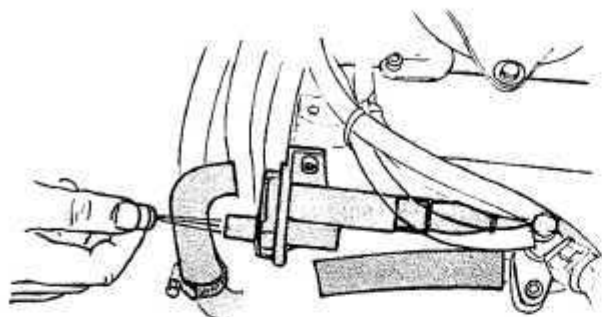
Other models

Turn on ignition.

Upper edge of plate should lie **flush or at most 0.3 mm (0.012 in) above** cylindrical part of air venturi, see fig.

Turn off ignition.

Incorrect position: adjust by tapping pin upwards/ downwards. It is necessary to remove upper part of air-flow sensor to obtain access to pin.



132 669

Auxiliary air valve

Operation B26

B26

Check that auxiliary air-valve closes

Turn on ignition.

Valve should be completely closed after approx. 5 minutes at 20°C (68°F).

Turn off ignition.

Does not close: tap lightly on valve. If it closes now it is not defective (engine vibrations usually cause valve to close).

If valve still does not close

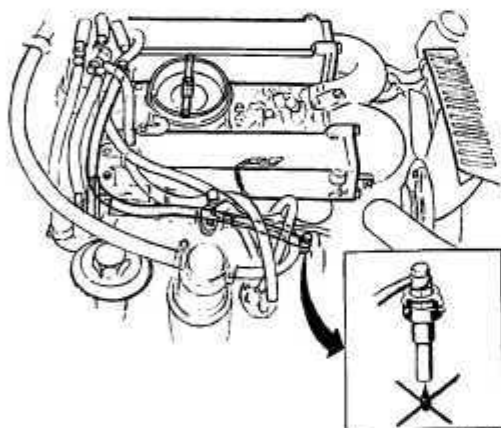
B62

Injectors Fuel distributor

Operations B27-40

B27

Remove injectors from cylinder heads



132 670

B28

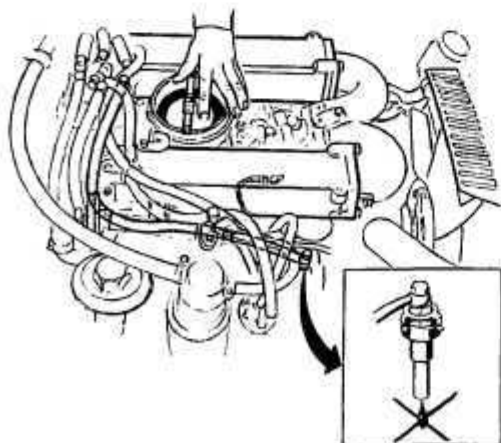
Make sure that fuel distributor does not leak internally

Turn on ignition to start fuel pump.

Observe injectors, they may become moist but must not start to drip.

Turn off ignition.

Injectors drip: internal leakage in fuel distributor. Replace.



132 671

B29

Check injectors for leakage at rest pressure

Depress* sensor plate until slits in control plunger are open and observe injectors.

* B 27 E 1975-1978: sensor plate must be lifted.

Injectors may become moist but must not drip in a 15 second period.

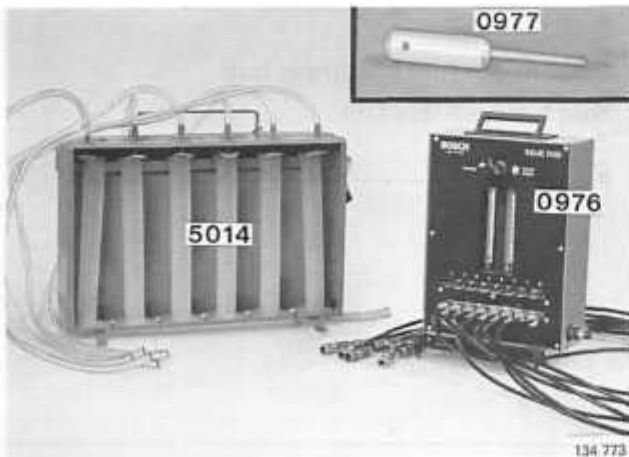
One or more injectors leak: clean injectors and test with test apparatus described on page 74.

B30

Check difference between fuel delivered from each injector

This test should only be carried out in cases of obvious engine malfunction. Otherwise continue with operation B40 on page 38.

There are two types of measuring equipment in use:
 – meter **0976** (USA + Canada), see operation B34 on page 36.
 – fuel metering unit **5014**, see operation B31 below.

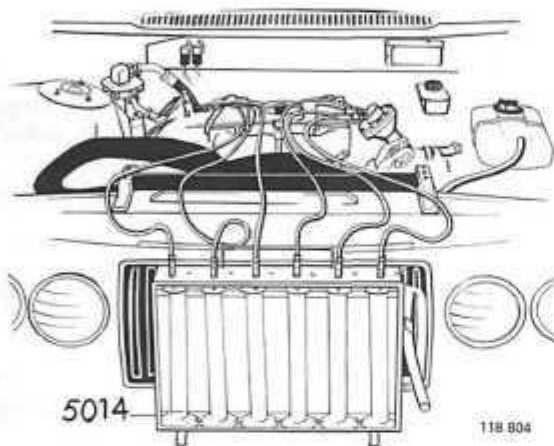


Fuel metering unit 5014 Operations B31–33

B31

Connect fuel metering unit 5014

To obtain correct readings all hoses should be either empty or full at start of test.



B32

Check fuel deviation

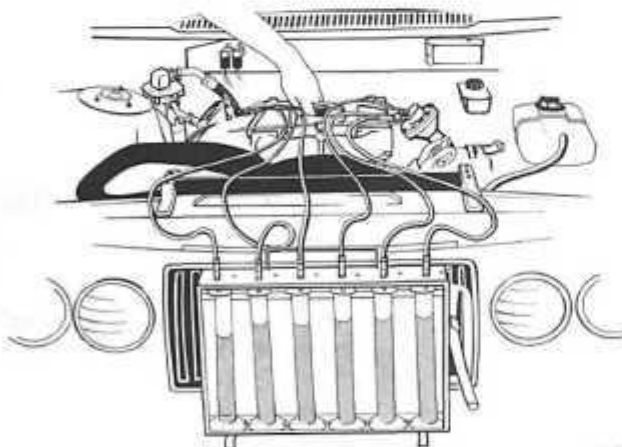
Turn on ignition to start fuel pump.

Depress* sensor plate halfway. Keep it depressed in this position until **100 cm³** of fuel is collected in one of measuring cylinders. Then release plate.

* B 27 E 1975–1978 sensor plate must be lifted.

Injectors should start delivering fuel at same time. Max fuel deviation must not exceed **20%**.

Turn off ignition.

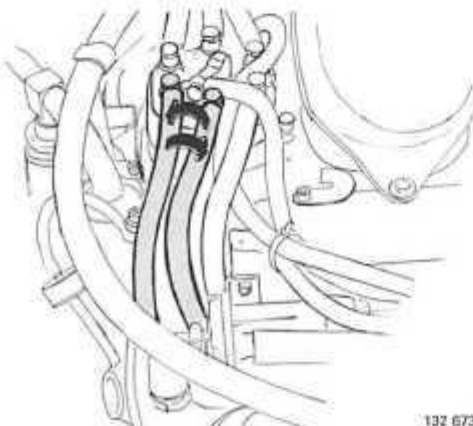


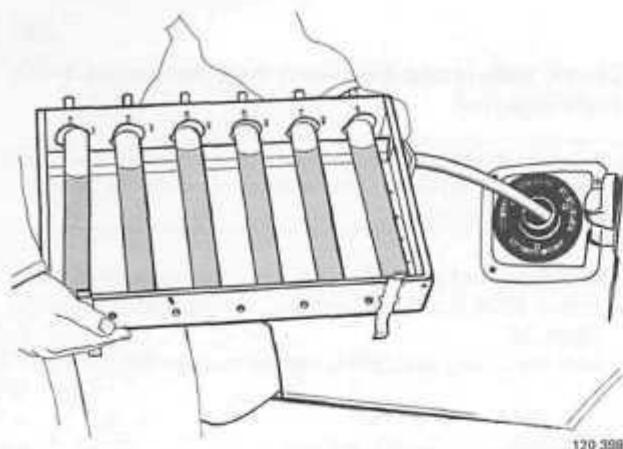
Greater than 20%: repeat test to be exactly sure.

If deviation is still greater than 20%, swap hoses between two injectors (one correct and one faulty) and repeat test.

If results are still same, injector or hose is defective. Clean injector and test in test equipment described on page 74.

If other injector malfunctions, fuel distributor is defective and will have to be replaced.





B33

Disconnect fuel metering unit

Pour fuel back into tank.

Proceed to

B40



Test meter 0976
Operations B34-40

USA and Canada only

Note! Fuel pump must be running during test. A battery charger (max. charge **15A**) can be connected to prevent battery from discharging.

Low battery voltage will decrease fuel pump capacity and test results will be invalid.

B34

Connect meter 0976

Support meter on a flat surface, next to car, and make sure that it is horizontal by checking built-in spirit (bubble) level.

Connect injectors to hoses from meter, injector No. 1 to hose No. 1 etc.

Insert meter return line in fuel tank.



B35

Evacuate meter and lines

Turn on ignition.

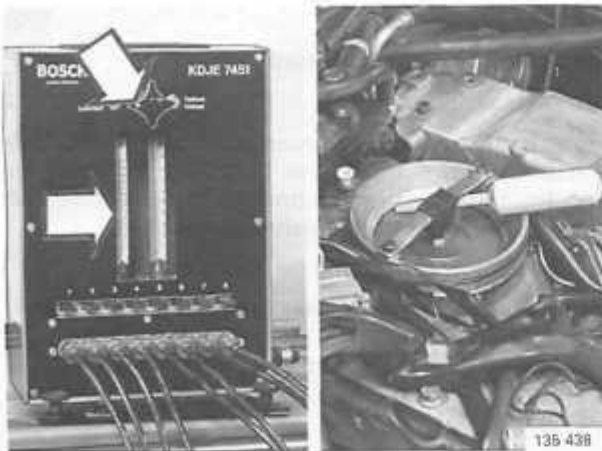
Depress air-flow sensor plate to its max. position. Insert tool 0977 so that plate does not move.

Depress meter switches one at a time, and open meter knob. Continue until both tubes in meter are evacuated and free from air bubbles.

Remove 0977 and release air-flow sensor plate.



B36



Check fuel flow at idle position

Turn meter knob to left (white spot).

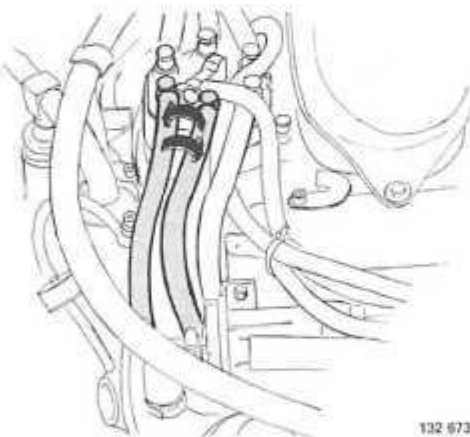
Depress switch for injector No. 1. Depress air-flow sensor plate until a flow of approx. 6 cm³/min is obtained. Keep plate in this position with tool 0977.

Depress switches for remaining injectors one at a time in order to find out which injector has lowest fuel flow.

Depress switch for injector with lowest flow. Position tool 0977 so that flow becomes 6.0, 6.6 or 7.2 cm³/min.

Check fuel flow for remaining injectors. Flow values for remaining injectors can only lie above set value.

Set value	Max permissible fuel flow
6.0 cm ³ /min	7.2 cm ³ /min
6.6 "	7.9 "
7.2 "	8.6 "



Incorrect fuel flow:

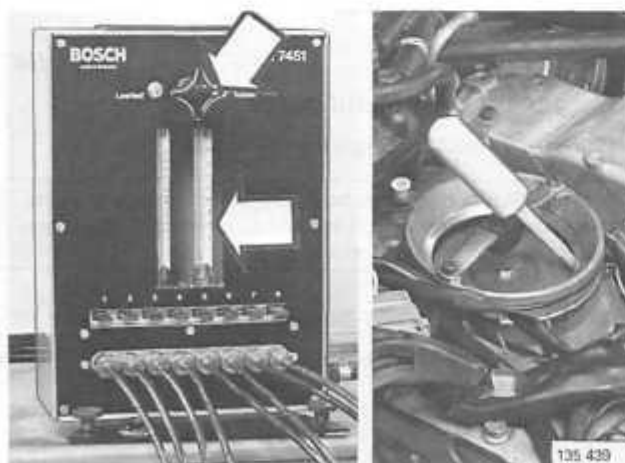
Turn off ignition.

At fuel distributor, swap a fuel line (with incorrect flow) with a fuel line having a correct flow.

Repeat flow test.

If fault still remains on same injector, either the injector or fuel line is defective. Clean injector and test in test apparatus described on page 74.

If fault moves to other injector, fuel distributor is defective and will have to be replaced.



B37

Check fuel flow at part load

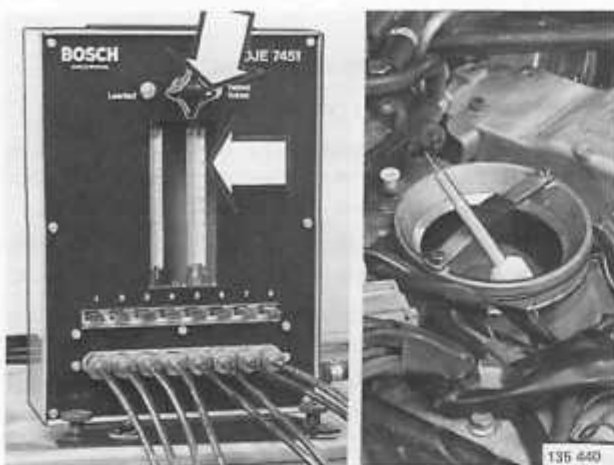
Turn meter knob to right (white spot).

Position tool 0977 so that fuel flow for injector with lowest flow becomes 40, 50 or 60 cm³/min.

Check fuel flow for remaining injectors.

Set fuel flow	Max permissible
40 cm ³ /min	46 cm ³ /min
50 "	57 "
60 "	68 "

Incorrect fuel flow: Turn off ignition. Swap fuel lines at fuel distributor. Repeat test as previously described.



B38

Check fuel flow at full load

Turn meter knob to right.

Depress sensor plate to its max position. Check which injector has lowest fuel flow. Place tool 0977 so that flow for this injector becomes 120 or 140 or 160 cm³/min. Select as high a value as possible.

Check fuel flow for remaining injectors.

Set fuel flow	Max. permissible fuel flow
120 cm ³ /min	131 cm ³ /min
140 "	153 "
160 "	175 "

Incorrect fuel flow: Turn off ignition. Swap fuel lines at fuel distributor. Repeat test as previously described.

B39

Turn off ignition and disconnect test apparatus

B40

Install injectors

Check rubber seals. Replace if hard/worn.

B41

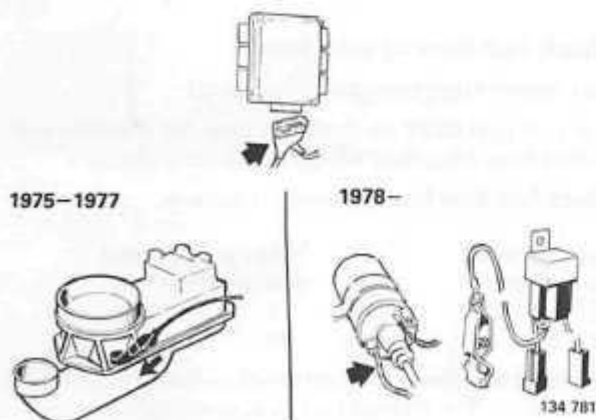
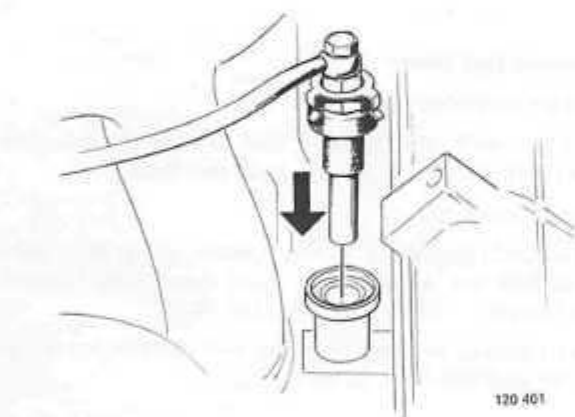
Reconnect wiring and plugs

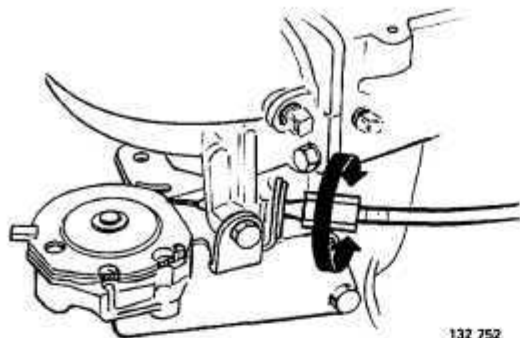
Plug in connector to ignition system control unit.

IMPORTANT! Ensure rubber seal in connector is installed correctly. Without it water can enter and cause corrosion, poor contacts etc.

1975–1977: plug in air-flow sensor connector.

1978–: disconnect test relay 5170. Reconnect wire to ignition coil.

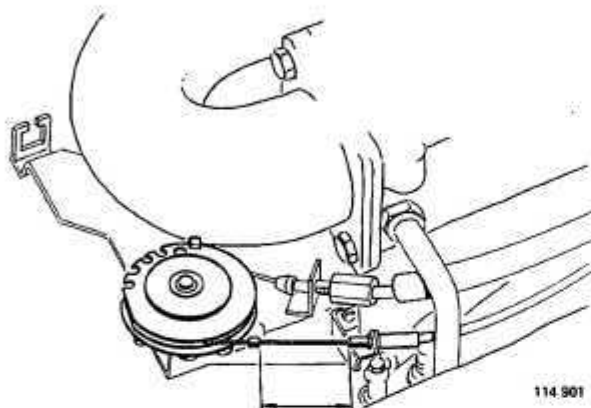




B42 Check/adjust throttle cable

Throttle pulley should strike stop at idle position. Cable should be taut but should not move pulley. Adjust using cable sleeve.

At full throttle, pulley should strike other stop.



B43 Check/adjust kick-down cable (auto)

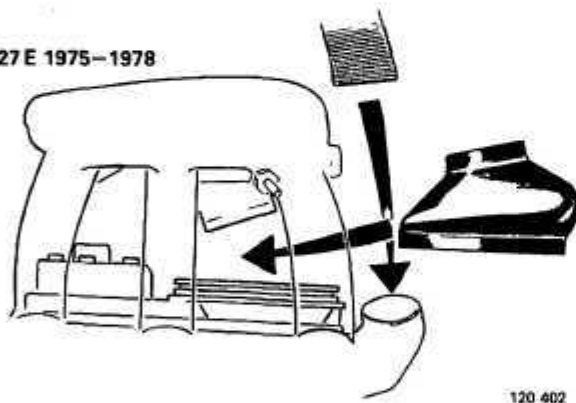
Depress accelerator to floor.

IMPORTANT! Do not adjust throttle by hand otherwise setting will be incorrect.

At full throttle distance from cable sleeve to clip should be 50.4–52.6 mm (1.98–2.07 in).

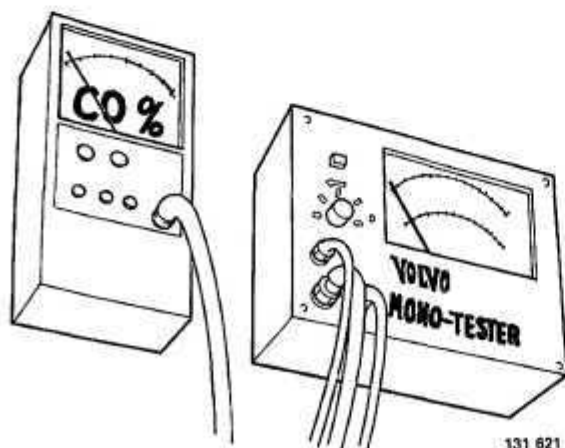
Adjust using cable sleeve.

B 27 E 1975–1978



B44 Install air filter

B 27 E 1975–1978: also attach rubber bellows and hose to air filter.



B45 Check/adjust idle and CO-content

	Page
B 27 E 1975–1978	97
1979–1980	98
B 28 E	98
B 27 F	100
B 28 F	100

End of inspection

Different faults discovered during inspection

Operations B46–63



From B6: No fuel injected from start injector

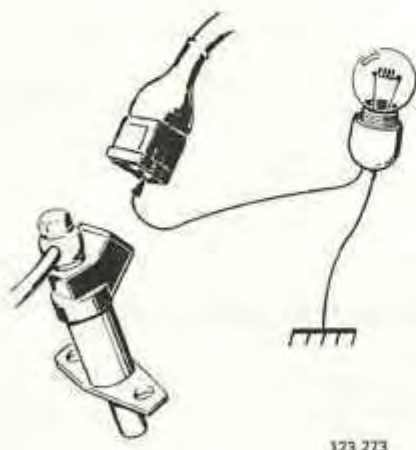
When fault has been rectified proceed from B7

B46

Check for voltage at start injector when starter motor is operating

Measure voltage across both pins.

Voltage: test using a new start injector.



B47

Check for voltage between plug and ground when starter motor is operating

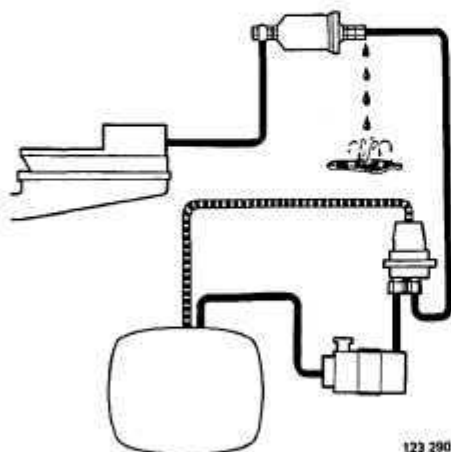
Voltage: indicates a defective thermal time switch or an open circuit in the lead between it and the start injector.

No voltage: open circuit in lead between starter motor and start injector.

End

From B17: Line pressure too low

When the fault has been rectified proceed from B18

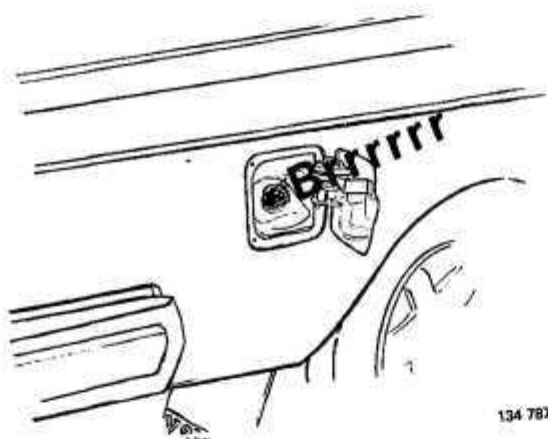


B48

Fuel leakage?

Check for fuel leakage between fuel pump and fuel distributor.

Cars equipped with a fuel leakage return line between fuel accumulator and fuel tank: remove tank cap to release overpressure from fuel system and disconnect hose from fuel accumulator. Check that fuel accumulator does not leak. Reconnect hose.



B49

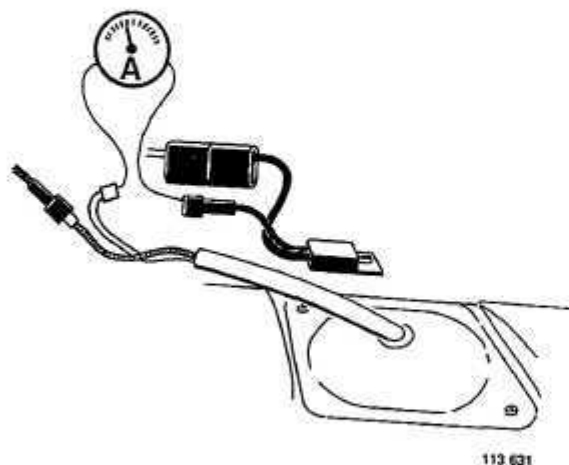
Check tank pump

Tank pump was introduced in 1977 but may have been fitted to some models before this.

Unscrew fuel tank cap and listen for sound of pump.

A defective tank pump often causes a noisy main fuel pump.

Tank pump does not work: check fuse in boot/trunk (1975–1978) or fuse No. 5 in fusebox (1979–).



B50

Check tank pump current consumption

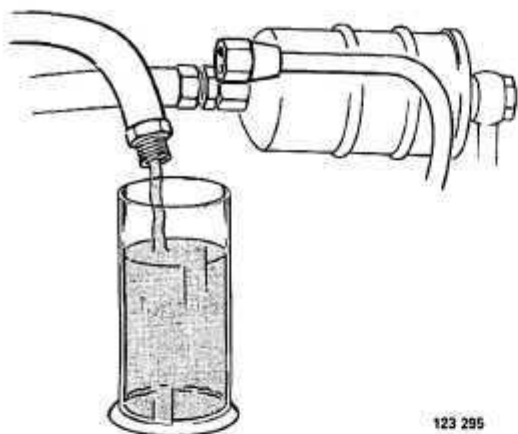
Connect an ammeter as illustrated.

Current should be 1–2A.

Incorrect: Check tank pump and filter for blockages. If correct, retest with a new tank pump.

No current: Check for voltage at pump. If correct test with a new pump.

B51



123 295

Check fuel pump capacity

Turn off ignition.

Unscrew fuel tank cap to release overpressure from fuel system.

Disconnect return line at connection in engine compartment and hold end above a measuring cylinder.

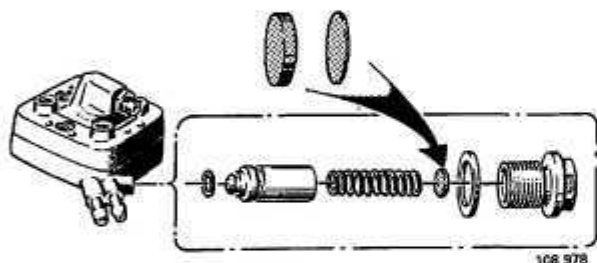
Turn on ignition for **30 seconds**.

Min. volume of fuel should be:

1975–1979	0.8 litres (0.75 US qts)
1980–	1.0 litres (1.0 US qts)

Reconnect return line.

Incorrect pump capacity: Retest with a new fuel pump. If this does not help, fault may be due to a blocked fuel filter, fuel line or fuel distributor.



106 978

B52

Adjust line and rest pressures

See page 47. Clean line pressure regulator and check/replace O-rings.

End

From B17: Line pressure too high

When the fault has been rectified proceed with B18

B53

Check that return line is not blocked

Turn off ignition.

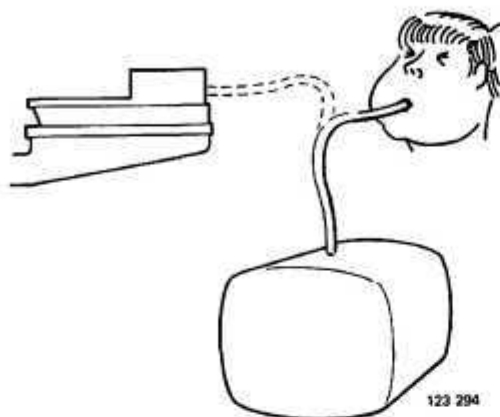
Unscrew fuel tank cap to release overpressure.

Disconnect return line from fuel distributor and blow through line.

Blocked line: clean/replace.

OK: check that fuel fitting screw holes are not blocked.

Reconnect return line.



B54

Adjust line and rest pressures

See page 47. Check line pressure regulator and check/replace O-rings.

End

From B18 and B19: Control pressure too high (cold/warm control pressure regulator)

When the fault has been rectified proceed with B19 (B20)

B55

Check that return line is not blocked

Turn off ignition.

Unscrew fuel tank cap to release overpressure.

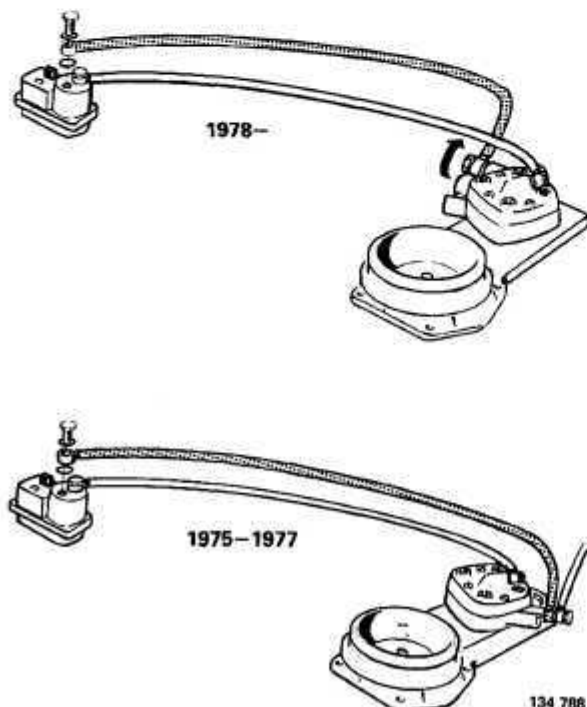
Disconnect return line from control pressure regulator. 1978-: also disconnect line from fuel distributor.

Blow through line.

Blocked line: clean/replace.

OK: check that fuel fitting screw holes are not blocked. Retest with a new control pressure regulator.

Note! 1978-: fault may be due to a blocked line pressure regulator.



End

**From B19: Control pressure too low
(warm control pressure regulator)**

*When the fault has been rectified proceed with
B20*

B56

Check for voltage at control pressure regulator

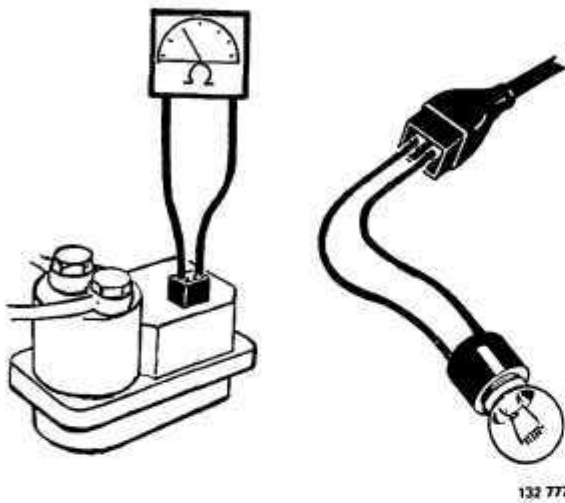
Connect a test lamp across plug pins. Lamp should
light.

Lamp lights: measure regulator resistance. Resis-
tance varies with type of regulator.

Control pressure regulator (last 3 digits of identifica- tion number)	Resistance
005+018+029+038	20-24 Ω
004+021	20-30 Ω
066 at temperatures below 12°C 54°F	32-38 Ω
above 18°C (64°F) .	16.5-19.5 Ω

If resistance is correct, fault is due to a poor contact
between plug and regulator.

Lamp does not light: proceed to B57.



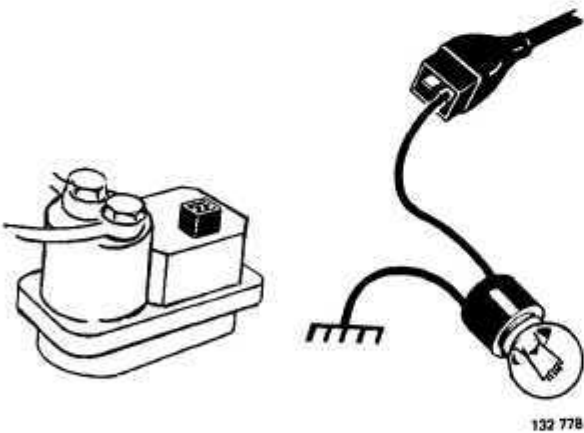
132 777

B57

Check for voltage between plug and ground

Voltage: open circuit in lead to ground.

No voltage: open circuit in lead between pump relay
and control pressure regulator.



132 778

End

From B22 and B23: Rest pressure drops

When the fault has been rectified proceed with B23 (B24)

B58

Check rest pressure. Gauge cock in position 1

Turn on ignition to build up pressure in fuel system.

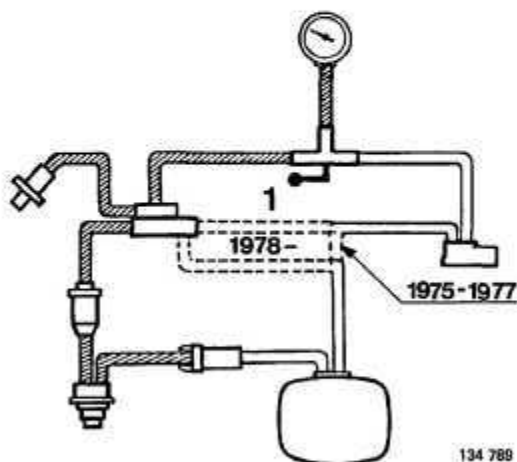
Turn off ignition.

Turn gauge cock on 5011 to position 1 (towards fuel distributor).

Wait and record pressure after 5 minutes, (this is necessary because fuel accumulator compensates for any leakage as long as it contains fuel under pressure).

Pressure does not drop in position 1: fault is due to one or more of the following:

- fuel line leak
- 1975-1977: fuel flow through control pressure regulator too great. Test with a new regulator.
- 1978-: needle valve in line pressure regulator does not close. Clean/replace needle valve and fitting.



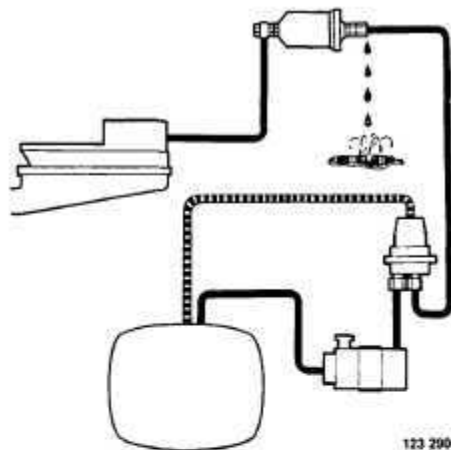
134 789

B59

Fuel leakage? Check for fuel leakage between fuel pump and fuel distributor

Cars equipped with a fuel leakage return line between fuel accumulator and fuel tank: remove tank cap to release overpressure from fuel system and disconnect hose from fuel accumulator. Check that fuel accumulator does not leak.

Reconnect hose.



123 290

B60

Make sure that line pressure regulator does not leak

Unscrew fuel tank cap to release overpressure.

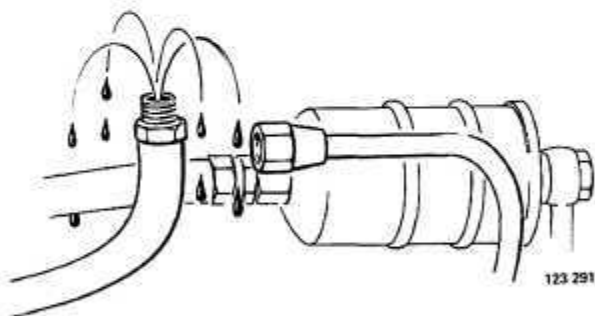
Switch on ignition to build up pressure in fuel system.

Switch off ignition.

Disconnect return line (junction next to filter) and hold end of hose up. If fuel flows out of hose, line pressure regulator is leaking.

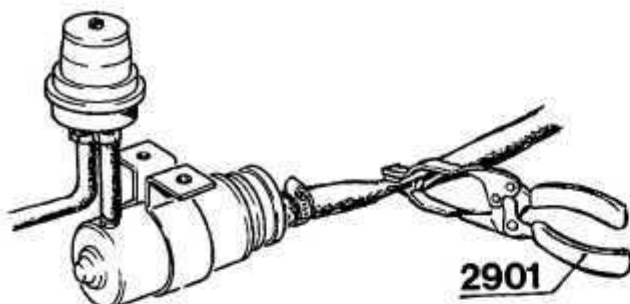
Reconnect return line.

Line pressure regulator leaking: Replace O-ring. If this does not help, replace fuel distributor.



123 291

B61



134 741

Check fuel pump non-return valve

Switch on ignition to build up pressure in fuel system.

Switch off ignition.

Block line between tank pump and fuel pump using pliers 2901.

Record rest pressure for 5 minutes.

Rest pressure drops: start injector or line to it, leaking.

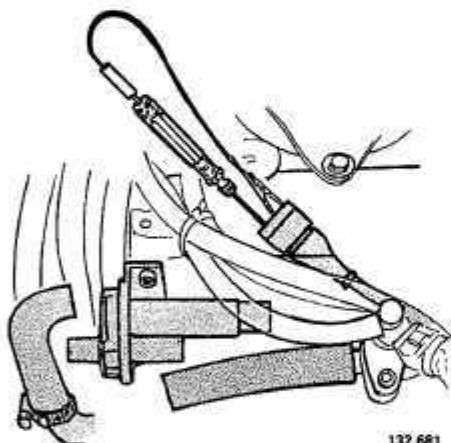
Rest pressure does not drop: non-return valve is leaking, replace.

End

From B26: Auxiliary air valve does not close

When the fault has been rectified proceed with B27

B62



132 681

Check for voltage at auxiliary air valve

Connect a test lamp across pins. Lamp should light.

Lamp does not light: check ground connections. Connect lamp across yellow wire (1975) or blue wire (1976-) and ground.

B63

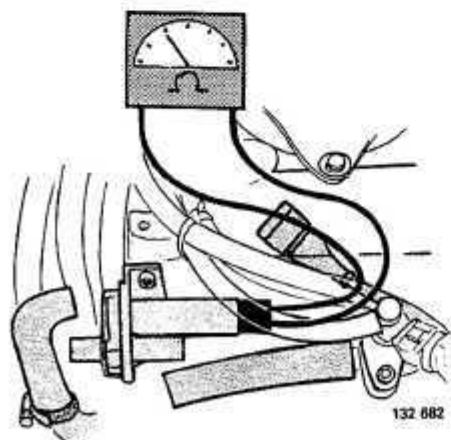
Check auxiliary air valve resistance

Connect an ohmmeter across auxiliary air valve plug.

Model year	Resistance
1975-1979	15-21 Ω
1980-1983	40-60 Ω

Correct: indicates poor plug contact.

Incorrect: replace auxiliary air valve.



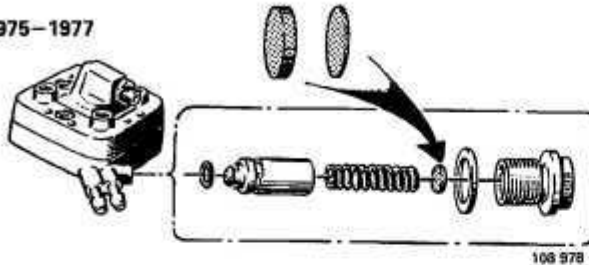
132 682

End

Adjusting line and rest pressures

B64

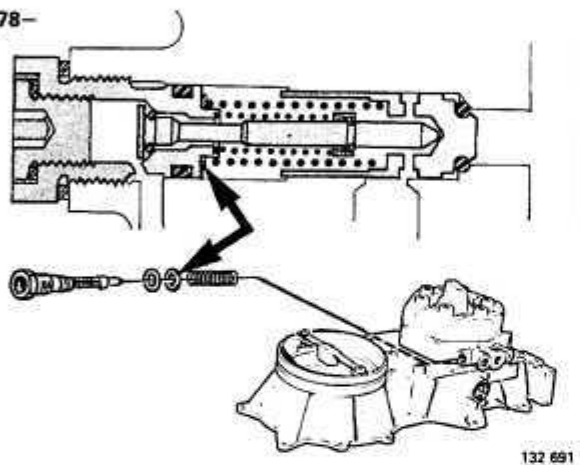
1975–1977



Add or remove shims from line pressure regulator as required.

Line and rest pressures are effected to a similar extent by shims. Both increase by addition of shims and vice-versa.

1978–



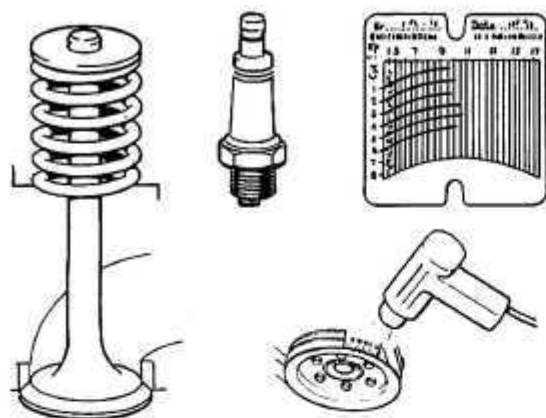
Shims are available in following thicknesses:

	Thickness	Pressure change
1975–1977	0.1 mm	6 kPa (0.85 psi)
	0.5 mm	30 kPa (4.3 psi)
1978–	0.1 mm	15 kPa (2.13 psi)
	0.15 mm	22 kPa (3.2 psi)
	0.6 mm	90 kPa (13 psi)

Line pressure	450–530 kPa (64–75 psi)
Rest pressure	150–240 kPa (21–34 psi)

C. Fault tracing, CI system

C1



123 264

General

The instructions in this section apply only if the engine is free from any mechanical or electrical faults. Correct octane fuel supplied by well known companies must be used.

The following points should always be checked before following the fault tracing procedures.

Mechanical

- compression
- valve clearances
- vacuum hoses and connections
- throttle control, kick-down control (auto gearbox)
- air cleaner
- intake manifold (leakage).
- exhaust system (leakage).

Electrical

- spark plugs and HT leads.
- distributor cap
- ignition coil
- timing (incl. ignition advance)
- all electrical connections.
- constant idle speed system (CIS)

Emission controls

- crankcase ventilation
- exhaust gas recirculation (EGR)
- evaporate control system
- airpump/Pulsair system
- Lambda-sond system
- catalytic converter

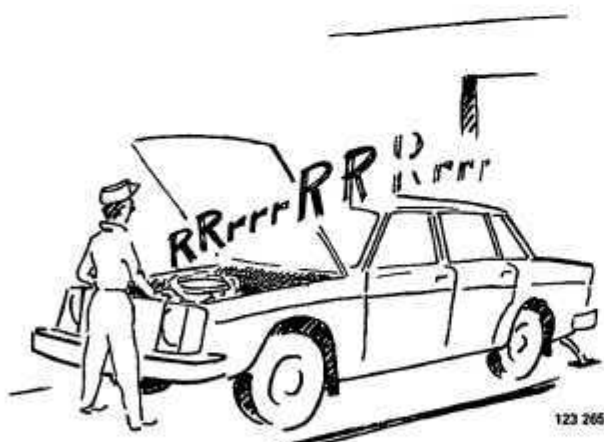
C2

Description:

Only the most common and easily detected fault symptoms are included in this section.

Perform a complete inspection of the CI system (see page 24):

- if no faults are found when fault tracing
- if no easily detected symptoms are found
- if several components malfunction.



123 265



132 692

The fold-out section overleaf contains a list of the most common symptoms and related checks.

The letter and number (e.g. B2) after each check refer to operations in the "Inspection of the CI system".

Refer also to the wiring diagram on pages 83-85.

Fault symptoms and causes

Symptoms, probable faults/remedies

Fold out this section while performing the fault tracing procedures.

FAULT SYMPTOM										CAUSE
Engine does not start										
Cold engine difficult to start										
Hot engine difficult to start										
Erratic running, cold + during warming-up										
Erratic running, hot										
Erratic idle										
Occasional stalling										
Low top speed, poor performance										
Excessive fuel consumption										
x	x	x	x	x	x	x	x	x	x	Leakage, fuel/air Inlet system, air leakage Fuel system, external leakage Fuel distributor, leakage Air leakage, injector holder
x		x	x							Pressure (line, control and rest) One or more of the pressures incorrect Line pressure incorrect Control pressure, cold, too high Control pressure, cold, too low Control pressure, warm, too high Control pressure, warm, too low Control pressure, B 28 F: acceleration enrichment, cold engine defective Control pressure, B 27 E, B 28 E, B 27 F 1976-78 full load enrichment defective Rest pressure, too low (vapour locks) Rest pressure, too high (injectors leaking)
x		x	x	x	x	x	x	x	x	Fuel pump, tank pump Fuel pump does not start (relay, fuses) Fuel pump, low capacity, poor connections Tank pump faulty
x	x	x	x	x	x	x	x	x	x	Air-fuel control unit Air flow sensor plate, incorrect position Sensor plate-lever-control plunger jamming Fuel distributor blocked
x	x									Start injector Does not open Thermal timer switch shorted Impulse relay defect Does not close
x	x	x	x	x	x	x	x	x	x	Lines, filters Fuel lines/filters for tank pump, blocked
	x				x					Auxiliary air valve, injectors Auxiliary air valve, does not open Auxiliary air valve does not close (fast idle) Injectors blocked (fuel not atomized) Injectors leaking
		x	x	x	x	x	x	x	x	CO, throttle valve, controls CO content, incorrect Throttle valve, loose Throttle valve incorrectly set

Engine does not start

Probable cause	Operation
Air inlet system, leakage	B1, 4
Fuel pump, defective	B2, 8
Air-fuel control unit (control plunger) seizes	B11-13
Incorrect pressure	B15-24
Sensor plate height, incorrect	B25

Cold engine difficult to start

Probable cause	Operation
Start injector, defective	B3, 5-6
Auxiliary air valve, defective	B14

Hot engine difficult to start

Probable cause	Operation
Impulse relay, defective	B5-7
Start injector leaking	B2, 8-10
Rest pressure too low	B15-16, 22-23

Engine difficult to start cold + hot

Probable cause	Operation
Air inlet system, leakage	B1, 4
Start injector, impulse, relay defective	B2, 5-7
Sensor plate position, incorrect	B11-12
Line pressure, incorrect	B8, 15-17
Sensor plate height, incorrect	B24-25

Erratic running, cold + during warming-up

Probable cause	Operation
Control pressure, cold, incorrect	B2-3, 8 B 15-16, 18
Acceleration enrichment, cold engine, defective B 28 F	B19, 21

Erratic running, hot engine

Probable cause	Operation
Control pressure warm, incorrect	B2, 8, 15-16, 19-20

Erratic running, cold + hot engine

Probable cause	Operation
Air inlet system, leakage	B1, 4
Control pressure, incorrect	B2, 8, 15-16, 18-20
CO content, incorrect	-
Throttle valve, loose	-

Erratic running + excessive fuel consumption

Probable cause	Operation
Start injector leakage	B2-3, 5, 8-10
Control pressure, incorrect	B15-16, B18-20
CO content, incorrect	-

Low top speed + poor performance

Probable cause	Operation
Throttle control setting, incorrect, throttle valve does not open fully	-
Incorrect control pressure when engine warm	B2, 8, 15-16, 18-21
Tank pump, defective	B49-50
Fuel pump capacity, too low	B51
CO content, incorrect	-

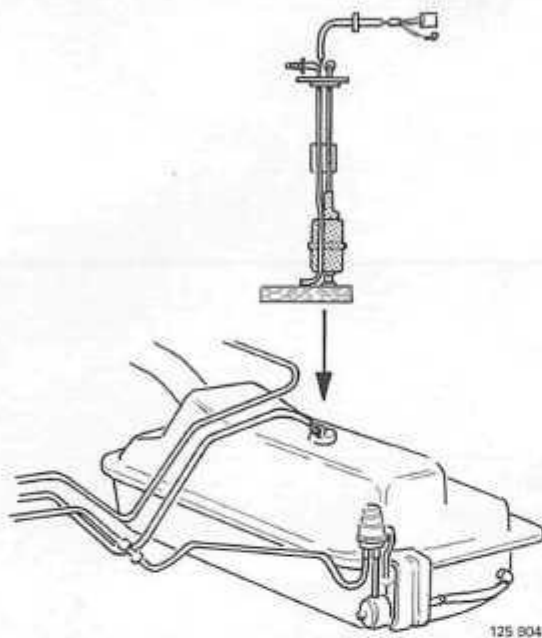
Erratic idle

Probable cause	Operation
Engine does not run on all cylinders	-
Air inlet system, leakage	B1, 4
Air-fuel control unit seizes	B2, 8, 11-13
Throttle valve, loose	-
Injectors leaking, poor spray pattern	B27-40

D. CI-system, components, checking, replacement etc

TANK PUMP

Operations D1-D10



D1

General

Tank pump was introduced into production in 1977, but may have been fitted to vehicles manufactured before this.

D2

Fault symptoms

A defective tank pump may cause low line pressure.

The following symptoms can arise:

- noisy main fuel pump
- low top speed, poor performance
- juddering, engine cut-out (fuel vapour locks).

D3

Check tank pump

Carry out operations B2, B8, B49-50.

D4

Tank gauge unit, removing/installing

(necessary if tank pump or filter is to be replaced).

Unscrew fuel tank cap to release overpressure from fuel system.

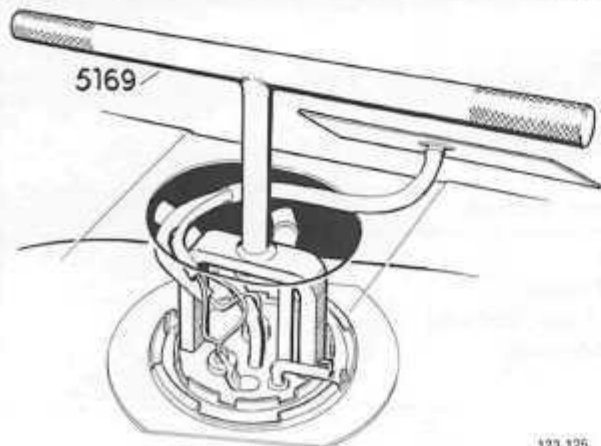
Remove/install tank gauge unit through aperture in rear floor section.

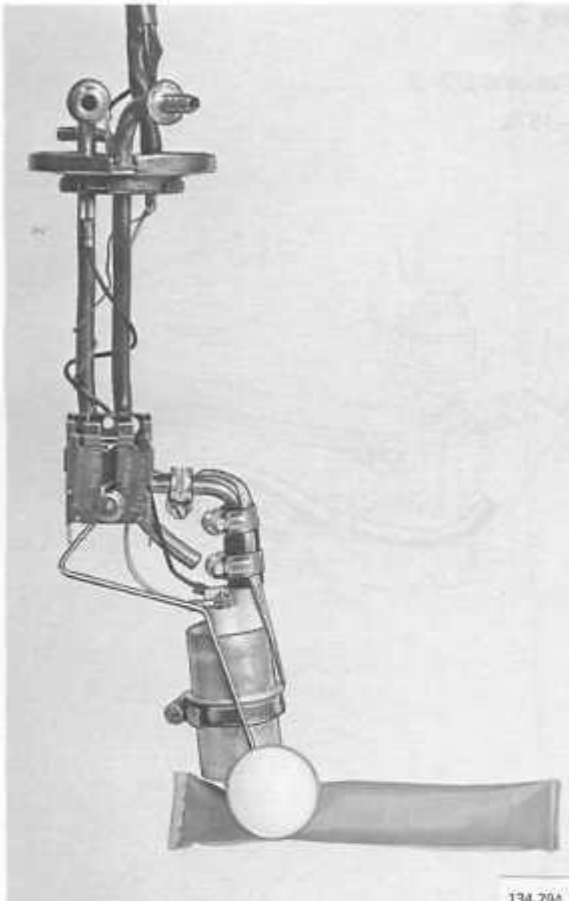
Use tool 5169.

Install new O-ring smeared with glycerine or similar.

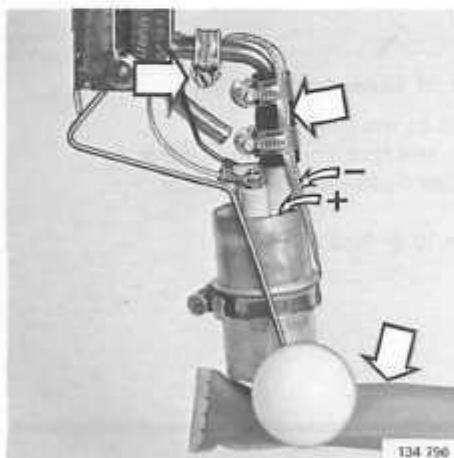
There are three different types of tank gauge units in use, see pages 51-53.

Note! Type 2 or 3 units may have been fitted to early production vehicles if fuel tank has been replaced.





134 794

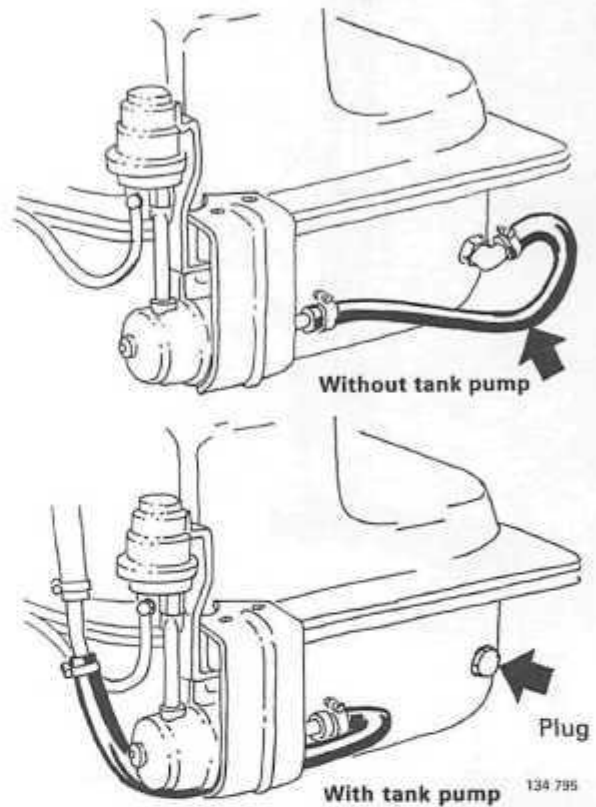


134 796

Type 1

Operations D5-6

Applies to models from 1975-1976 and early part of 1977.



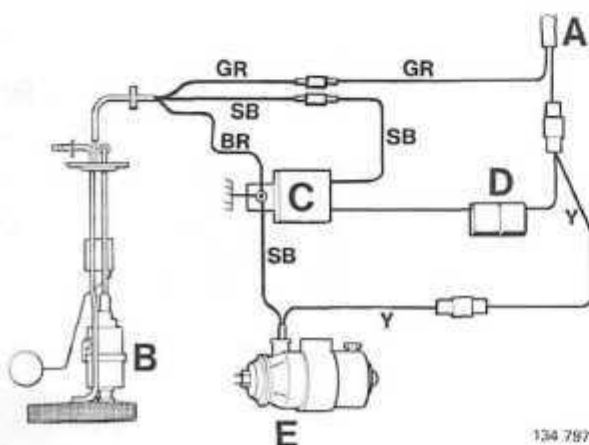
134 795

D5

Replacement of tank pump/filter:

- locate upper clip as shown, otherwise it will be difficult to fit unit in tank
- route earth/ground lead under hose clips. If this is not done movement of float will be inhibited. Do not stretch earth/ground lead
- return hose must be fitted on vehicles equipped with parking heaters
- check that filter does not interfere with movement of float

D6



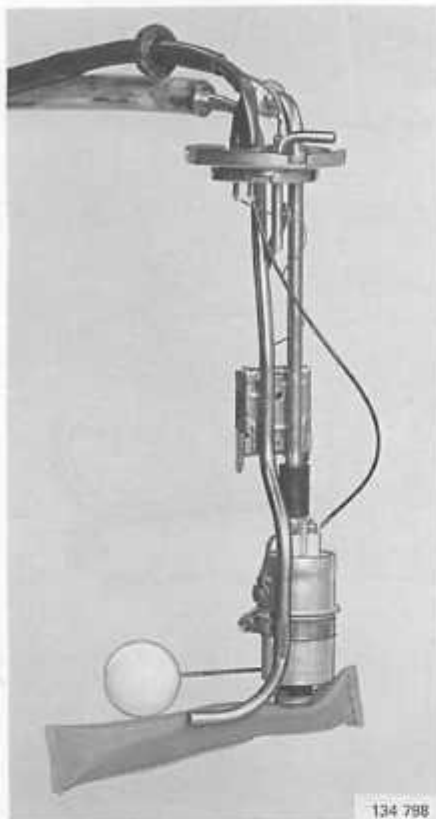
134 797

Wiring diagram

- A = wiring harness
- B = tank pump
- C = suppressor
- D = fuse
- E = fuel pump

Colour codes

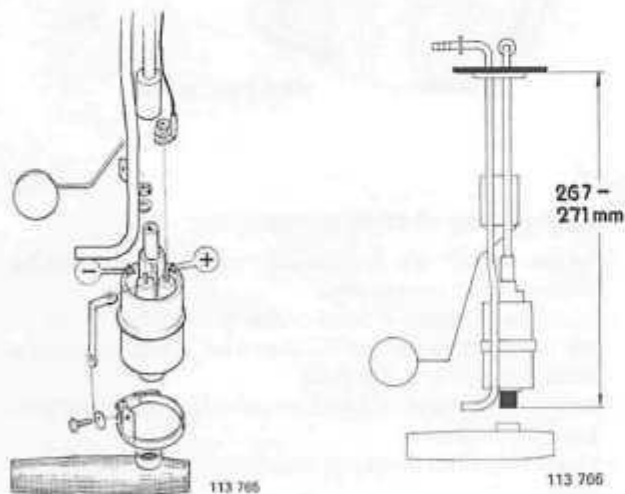
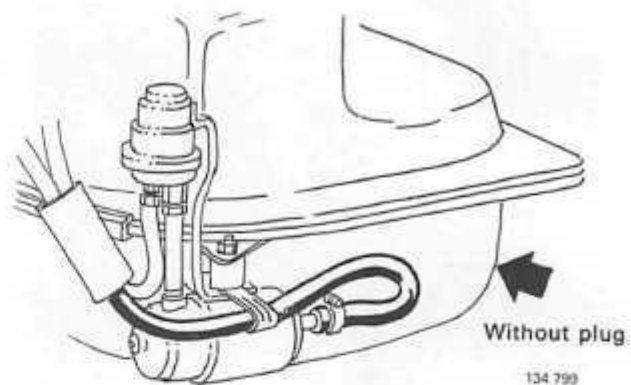
- GR = grey
- Y = yellow
- SB = black
- BR = brown



Type 2

Operations D7-8

1977-1978

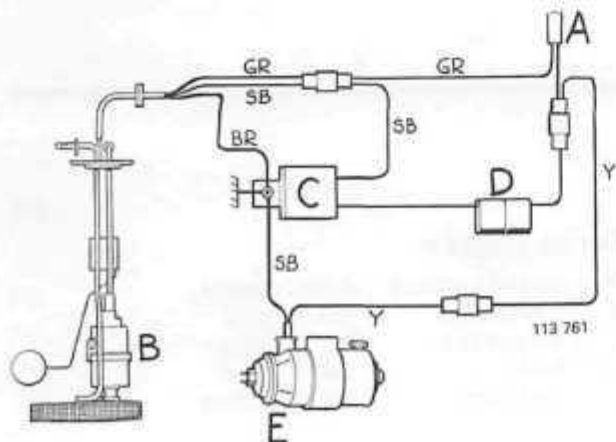


D7

Replacement of tank pump/filter:

- connect leads to the pump
- check height, see left, adjust if necessary
- check that filter does not contact float.

267-271 mm = 10.5-10.6 in.



D8

Wiring diagram

- A = wiring harness
- B = tank pump
- C = suppressor
- D = fuse
- E = fuel pump

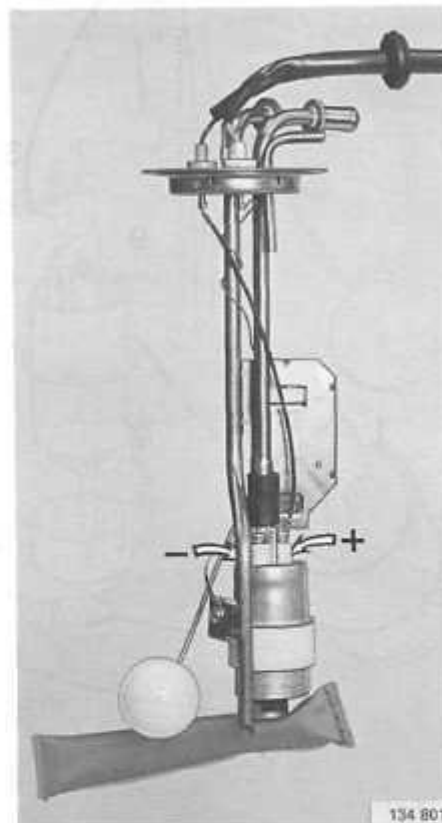
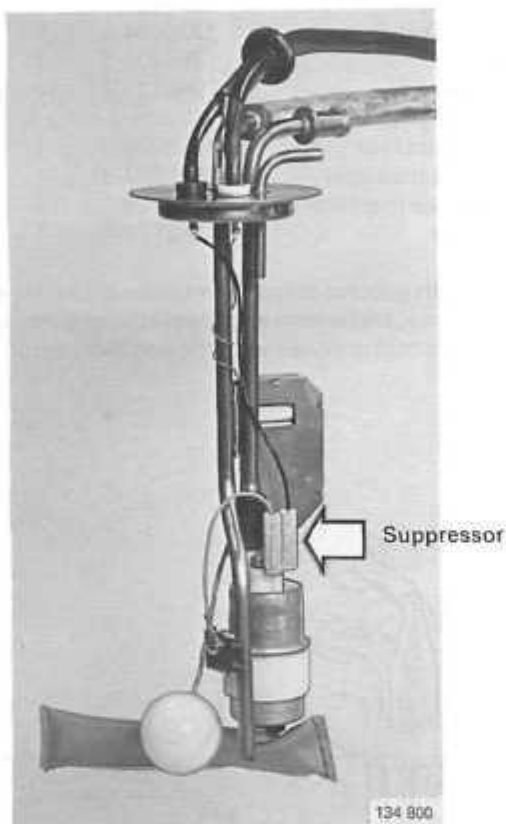
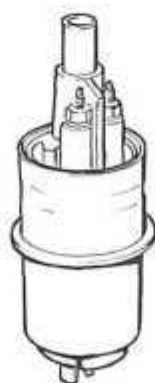
Colour codes

- GR = grey
- Y = yellow
- SB = black
- BR = brown

Type 3

Operations D9-10

1978-1983

**VDO****AC**

132 022

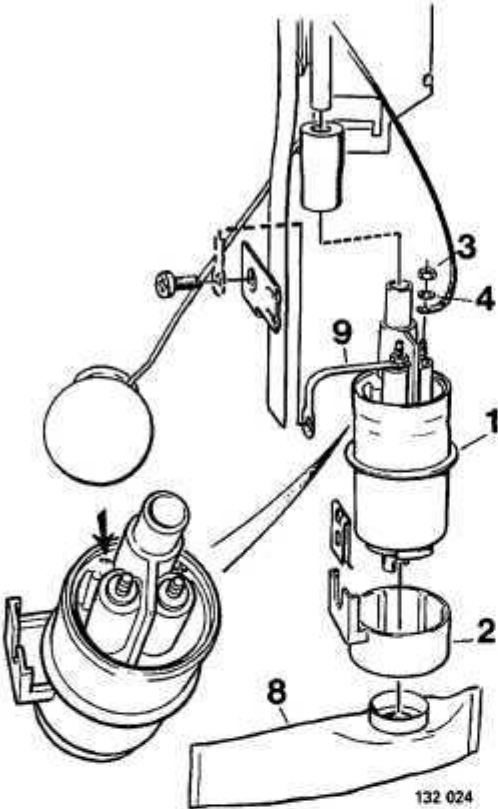
D9

Replacement of tank pump/filter:

- connect leads (earth/ground junction) to pump
- check that filter does not contact float.

Note! 1978-1981 models may be fitted with pumps from two different manufacturers. AC and VDO. Only the AC pump is stocked, the two pumps are however interchangeable.

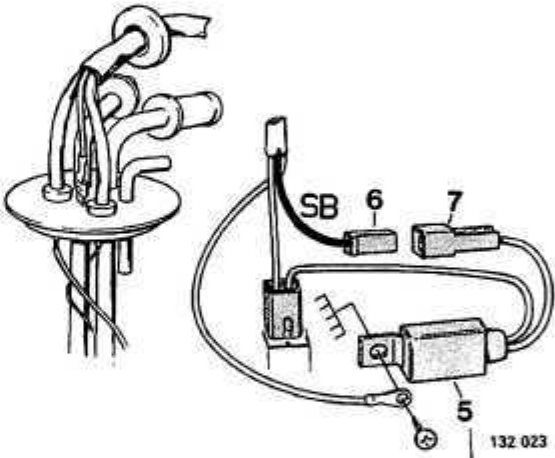
If a suppressor has not been fitted to the fuel level sensor unit a separate suppressor must be fitted when changing from VDO to AC pumps. See next page.



Parts required when changing from VDO to AC tank pump

Part	P/N	Qty
1 – pump	1276330-6	1
2 – bracket	1235444-5	1
3 – nut	1266390-2	2
4 – washer	940121-7	2
If necessary		
5 – suppressor	1235204-3	1
6 – plug insulator	958207-3	1
7 – sleeve insulator	958208-1	1
8 – filter	1266822-4	1

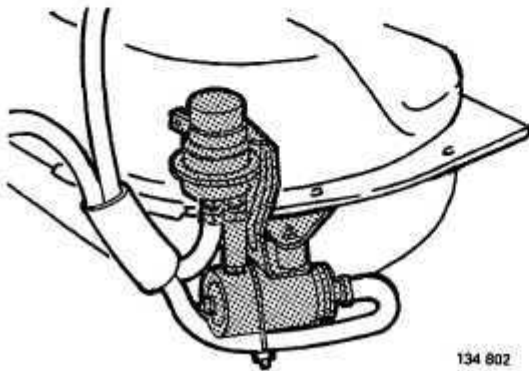
The earth/ground strap (9) must be transferred to the new pump, and where applicable the suppressor must be connected in series with the positive terminal of the pump.



FUEL PUMP WITH NON-RETURN (CHECK) VALVE FUEL ACCUMULATOR

Operations D11–18

1975–1977



134 802

Location of fuel pump and
fuel accumulator, 1975–1977

D11

Fault symptoms

Fuel pump: a faulty fuel pump will cause low line pressure. The following symptoms may arise:

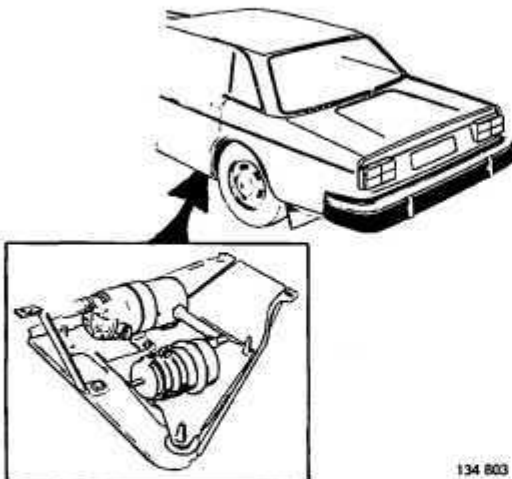
- engine difficult to start or does not start
- engine misfires during driving, under heavy load
- poor acceleration
- engine starts but stops immediately
- poor engine performance
- pump noise. **Note!** May also be due to a defective tank pump or vapour locks in the fuel system.

Fuel pump non-return valve, fuel accumulator: if these components are defective, the rest pressure will be below the specified value.

Symptoms:

- difficult to start warm engine.

1978–1983



134 803

Location of fuel pump and
fuel accumulator, 1978–1983

D12

Inspection

Fuel pump

Record the pressure. Carry out the following operations B2, 8, 15–17.

Fuel pump non-return valve/fuel accumulator

Measure the rest pressure. Carry out the following operations B2, 8, 15–17, 22–23.

D13

Replacement

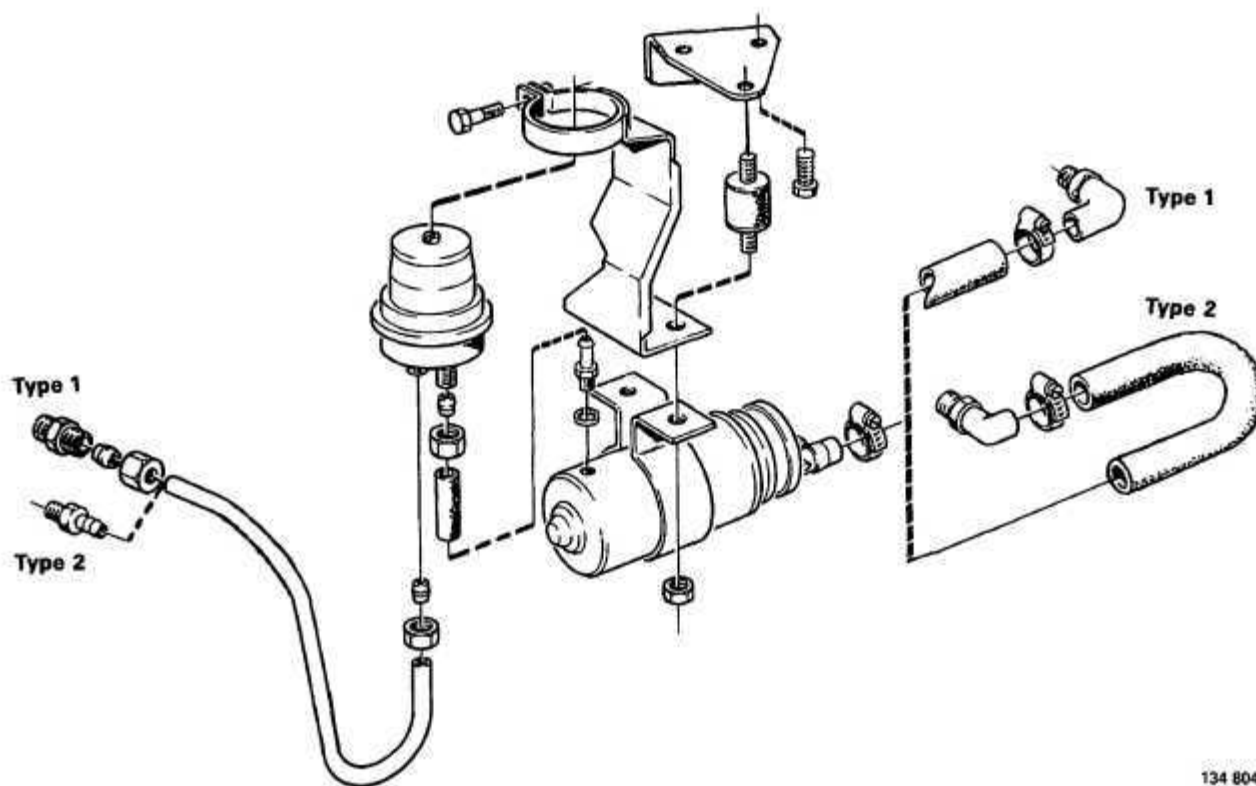
Fuel pump: never fit an old non-return valve to a new pump (a new non-return valve and seal is supplied with the new pump).

On replacing the pump, check that all pressures are correct, check also the idle speed and CO content.

Fuel pump non-return valve or fuel accumulator: check the rest pressure after replacement.

Fuel pump, fuel accumulator 1975–1977 without tank pump

Operations D14–15



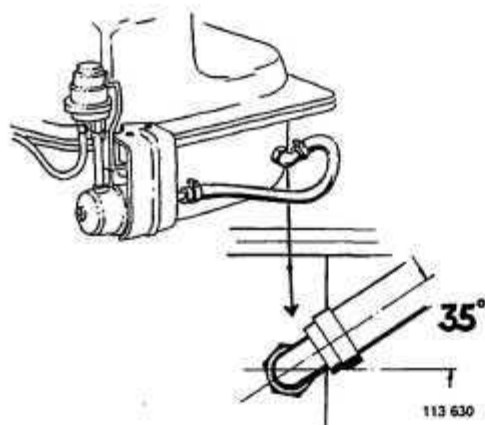
134 804

D14

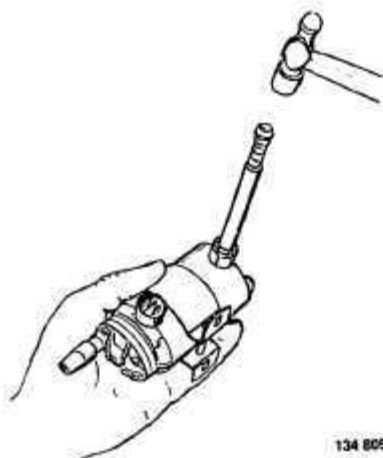
Fuel hose, tank-pump

Only type 2 hoses are stocked.

When fitting hose, tighten nipple to 70 Nm (52 ft.lb). Then turn until nipple points 35° backwards and upwards.



113 630



134 805

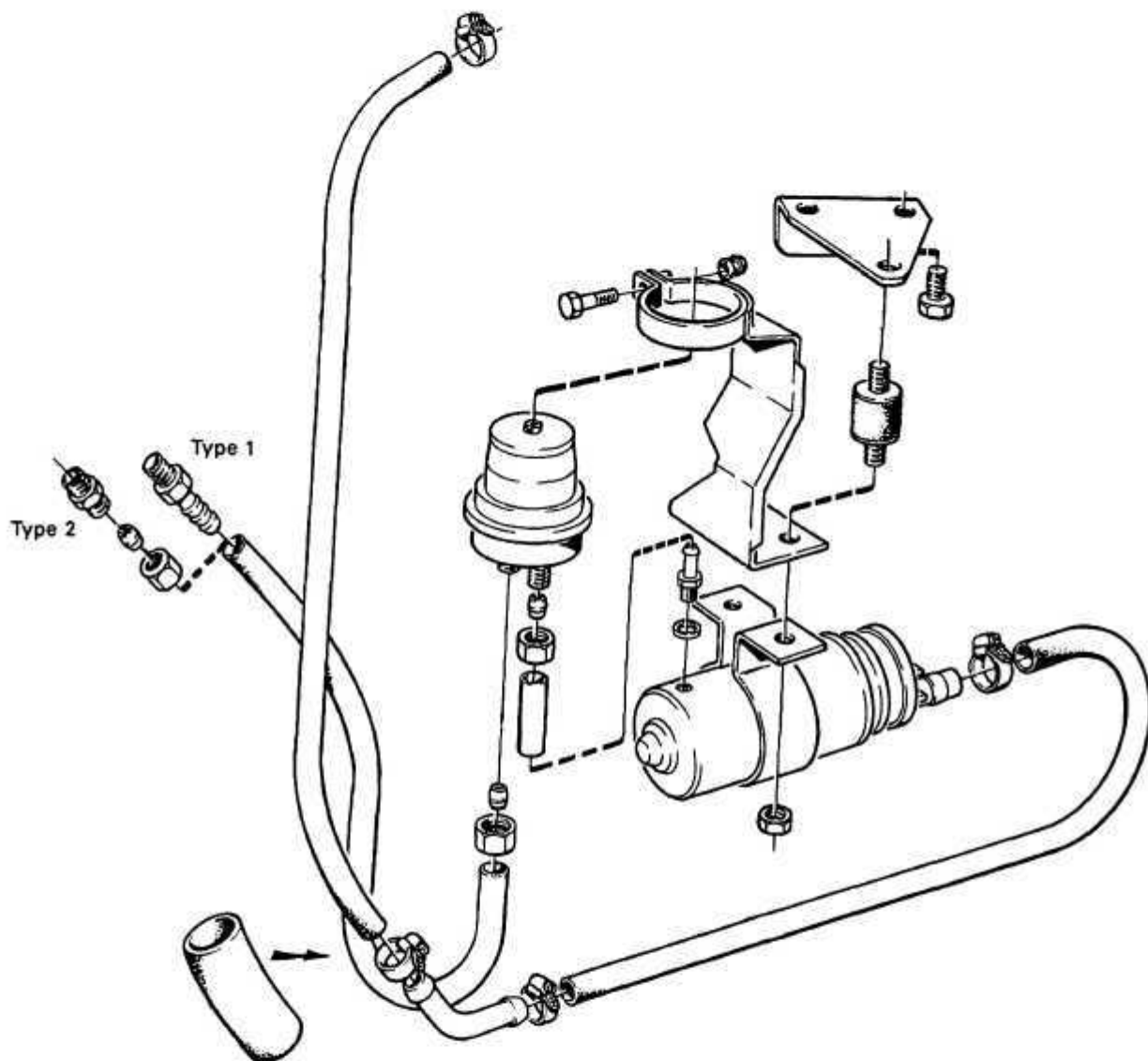
D15

Connecting fuel line to pump (non return valve)

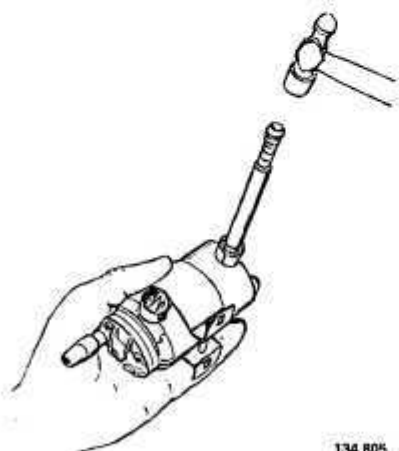
- connect hose by hand (length of hose 45 mm = 1.75 in)
- fit nut and sleeve by hand
- hold pump (pump must not be supported on a bench otherwise it may be damaged)
- carefully tap in hose and sleeve. Use a clean hammer.

Fuel pump, fuel accumulator 1975–1977 with tank pump

Operation D16



134 806



134 805

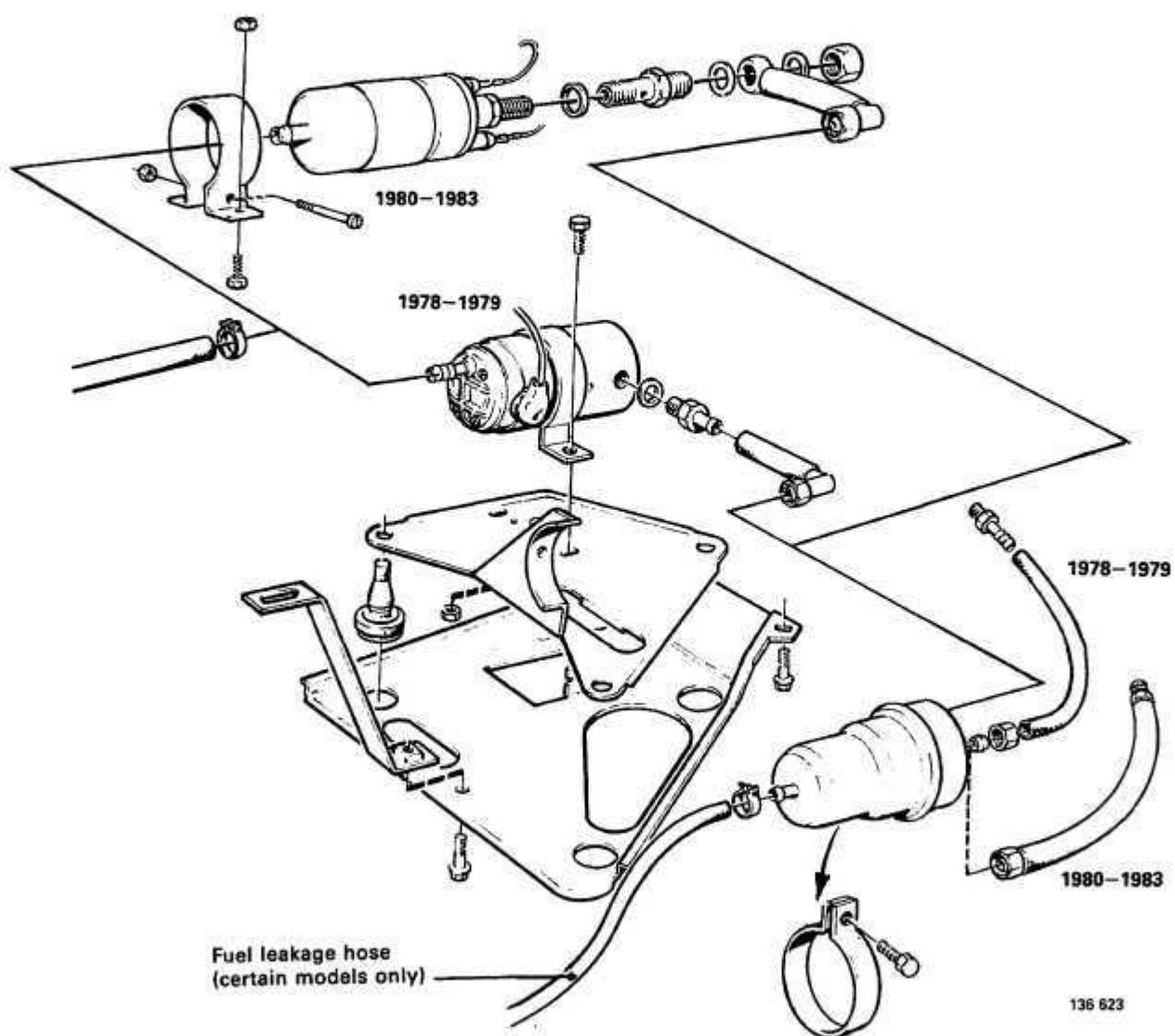
D16

Connecting fuel line to pump (non-return valve)

- connect hose by hand (length of hose 45 mm = 1.75 in)
- fit nut and sleeve by hand
- hold pump (pump must not be supported on a bench otherwise it may be damaged)
- carefully tap in hose and sleeve. Use a clean hammer.

Fuel pump, fuel accumulator 1978-

Operations D17-18



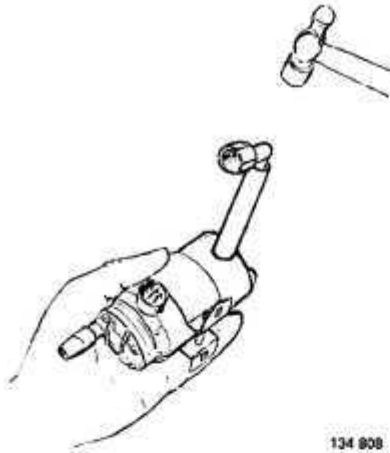
For hose installation/replacement of non-return valve, see over leaf.

D17

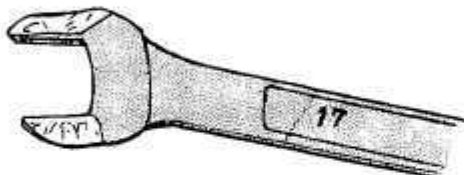
Connecting fuel line to pump (non-return valve)

1978–1979:

- connect hose by hand
- hold the pump (pump must not be supported on a bench otherwise it may be damaged)
- carefully tap in hose. Use a clean hammer.



134 808



132 090

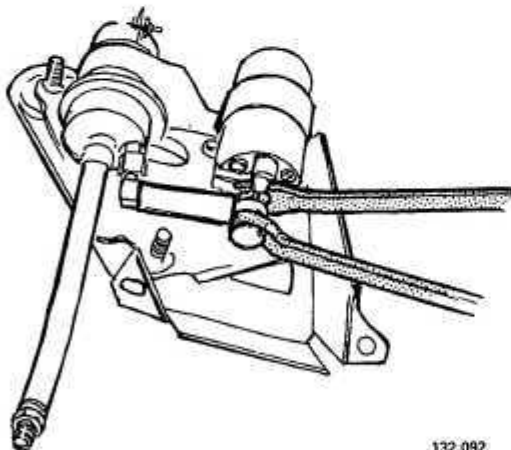
D18

Replacement of fuel pump/non-return valve 1980–1983

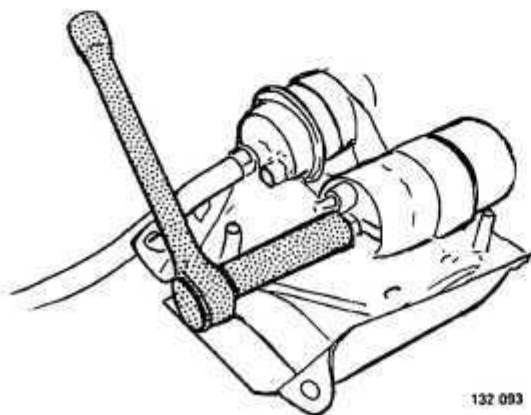
A ground, bevelled, 17 mm open-ended spanner (wrench) is needed for this operation.

Remove pump, fuel accumulator and bracket in one unit.

Use open-ended spanner described above to counterhold pump when disconnecting fuel line. Take care not to damage electrical connections on pump.



132 092

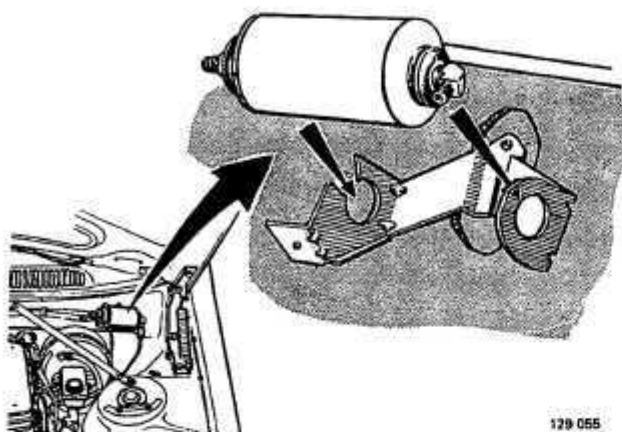


132 093

Use a long 17 mm socket spanner (wrench) to remove/install non-return valve.

FUEL FILTER

Operations D19–21



129 055

Fuel filter USA 1980–, other markets 1981–

D19

Fault symptoms

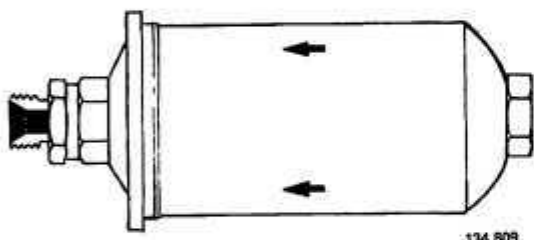
A blocked fuel filter causes line pressure to drop (reduced fuel supply). This can cause:

- difficult to start engine
- misfiring while driving under heavy loads
- erratic acceleration
- poor performance

D20

Checking fuel filter

Measure line pressure. Perform following operations B2, 8, 15–17.



134 809

USA – 1979, other markets – 1980

For economical reasons, only one type of fuel filter (P/N 1276050-0) is stocked by the Parts Department.

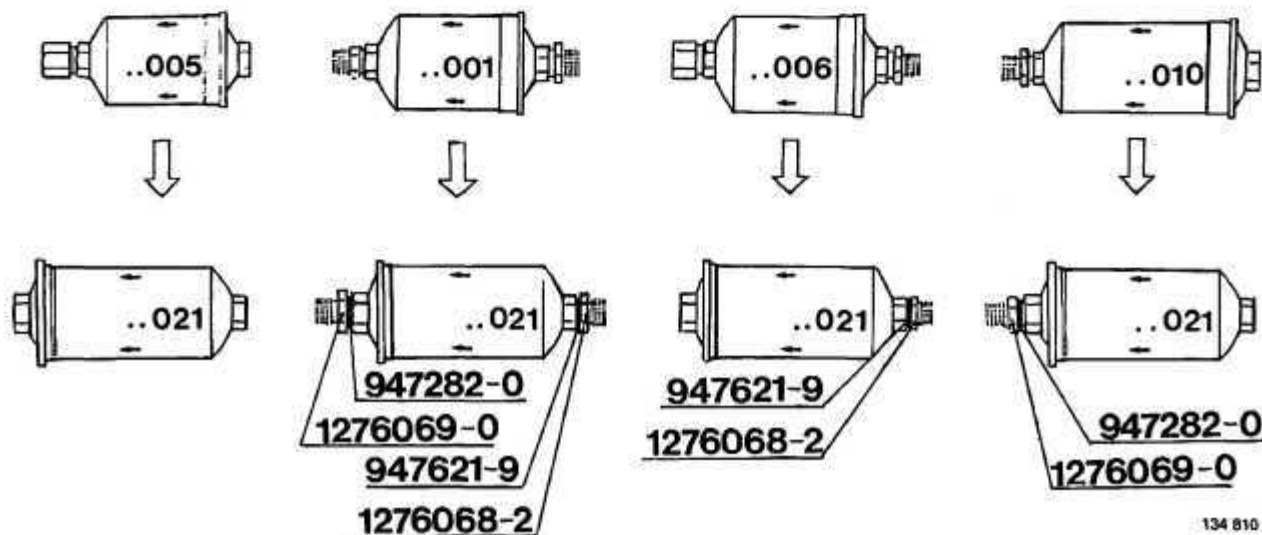
When replacing a fuel filter with the above filter, additional nipples and seals are required.

D21

Replacement of fuel filter:

- turn nipples so that tapered side faces outwards, away from filter
- note flow indicating arrows on filter.

Example: When replacing a fuel filter marked . . . 006, an additional nipple (P/N 1276068-2) and a seal (P/N 947621-9) are required.



134 810

AIR-FUEL CONTROL UNIT

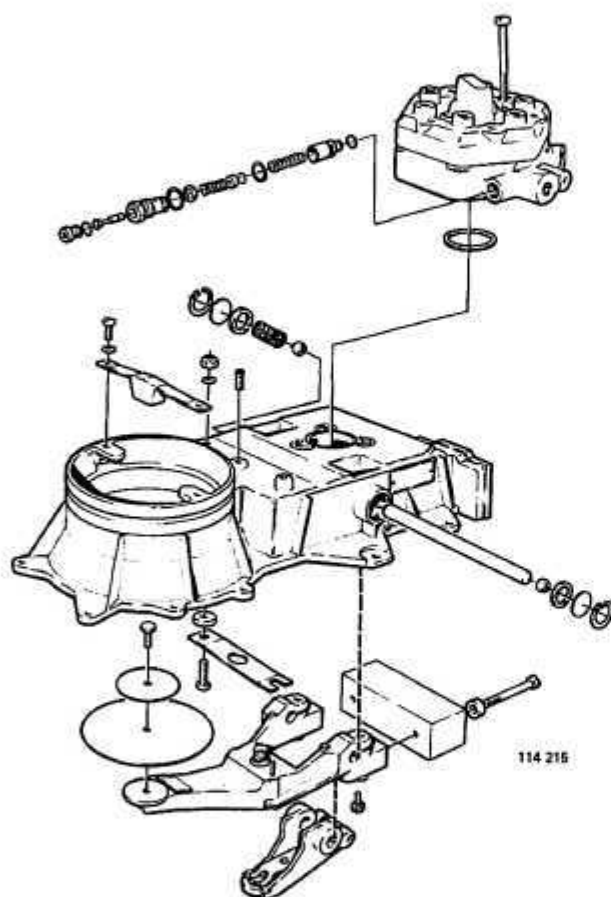
Operations D22–65

D22

Fault symptoms

A defective air-fuel control unit can cause:

- difficult to start engine
- erratic operation
- erratic acceleration
- excessive fuel consumption
- variable CO-content
- dieselling (running-on).



B 27 E 1979–1980, B 28 E, B 27/28 F

D23

Checking air-fuel control unit

A thorough inspection of CI-system should be carried out before replacing/reconditioning the air-fuel control unit (air-flow sensor of fuel distributor). See page 24.

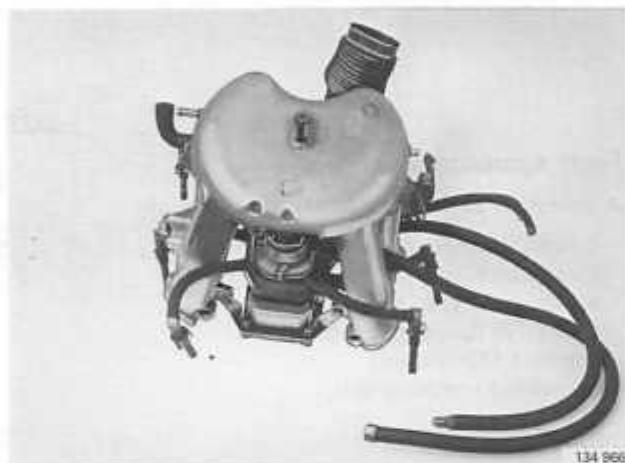
D24

Type of air-fuel control unit

Two main types of air-fuel control unit are in use:

	Page
B 27 E 1975–1978 removing	62
installing	62
reconditioning	64
Other models, removing	68
installing	68
reconditioning	70

B 27 E 1975-1978



134 966

Removing air-fuel control unit

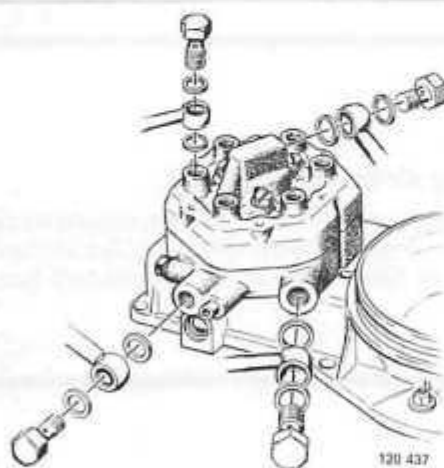
Operations D25-27

D25

Remove air-fuel control unit with intake manifold

First unscrew fuel tank cap to release overpressure from fuel system (reduces spillages).

Clean all connections carefully before disconnecting fuel lines.



120 437

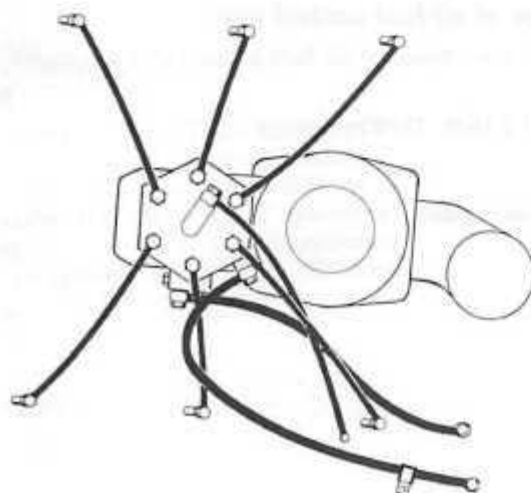
D26

Detach air-fuel control unit from intake manifold

D27

Disconnect fuel lines

Clean all connections thoroughly before disconnecting fuel lines.



120 445

Installing air-fuel control unit

Operations D28-33

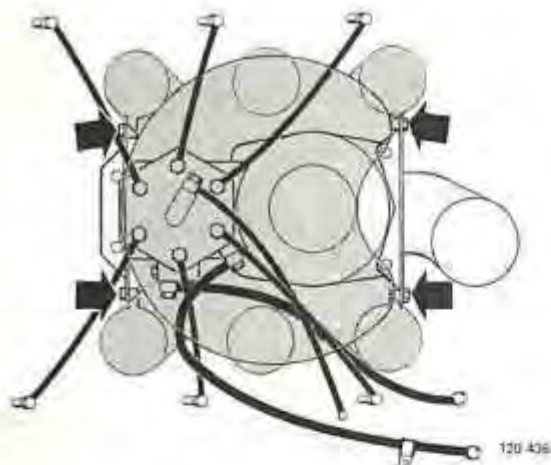
Special tools: 5102, 5170 (1978)

D28

Connect fuel lines

Install new seals.

It is important that fuel lines are routed as shown adjacent. Fuel lines for injectors 2, 3, 5 and 6 are of same length.

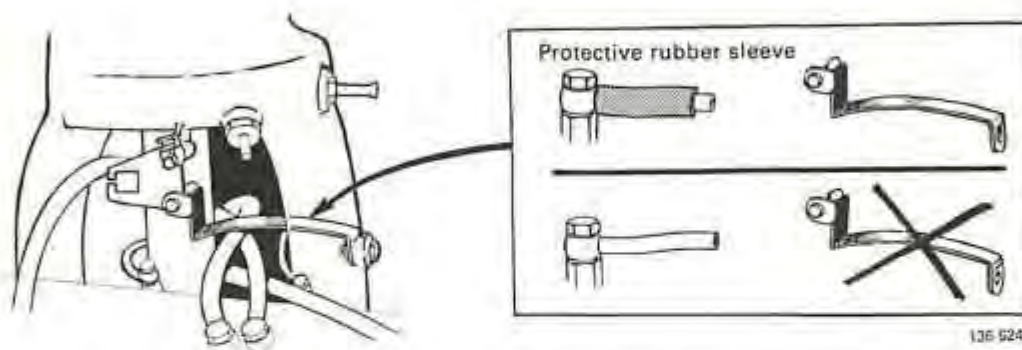
**Attach air-fuel control unit to intake manifold**

IMPORTANT! There are two types of fuel lines, one with a rubber sleeve and one without.

Fuel lines with rubber sleeves: check to see that a bracket (P/N 1269051/7) (see below) has been fitted to prevent fuel lines from interfering with throttle control. This bracket must not be used for other type fuel lines.

Install intake manifold with air-fuel control unit

Connect all fuel lines.

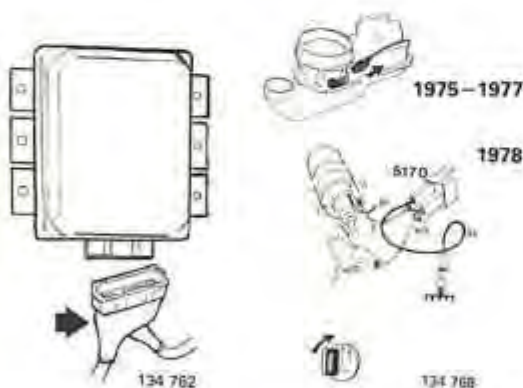
**Start fuel pump**

Disconnect plug from ignition system control unit.

1975-1977: withdraw plug from air-flow sensor.

1978-: connect test relay 5170.

Turn on ignition.

**Basic-set air-fuel control unit (CO adjustment screw)**

Disconnect fuel line from fuel distributor.

Turn CO screw clockwise until fuel is supplied from outlet. Then tighten screw by half a turn, using wrench 5102.

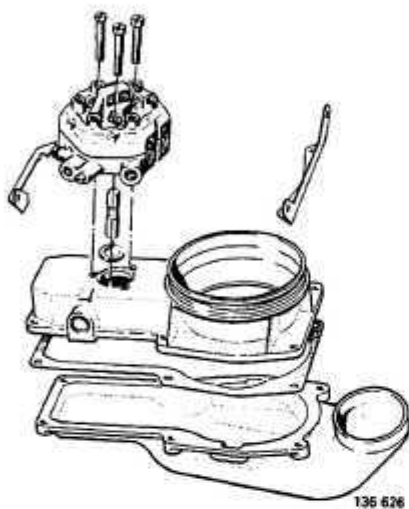
Turn off ignition and reconnect fuel lines.

**Check/adjust:**

	Operation
- all pressures	B3, 15-24
- rest position of air-flow sensor plate	B25
- idle speed and CO-content	J3-7

Reconditioning air fuel control unit

Operations D34-46



D34

Remove fuel distributor

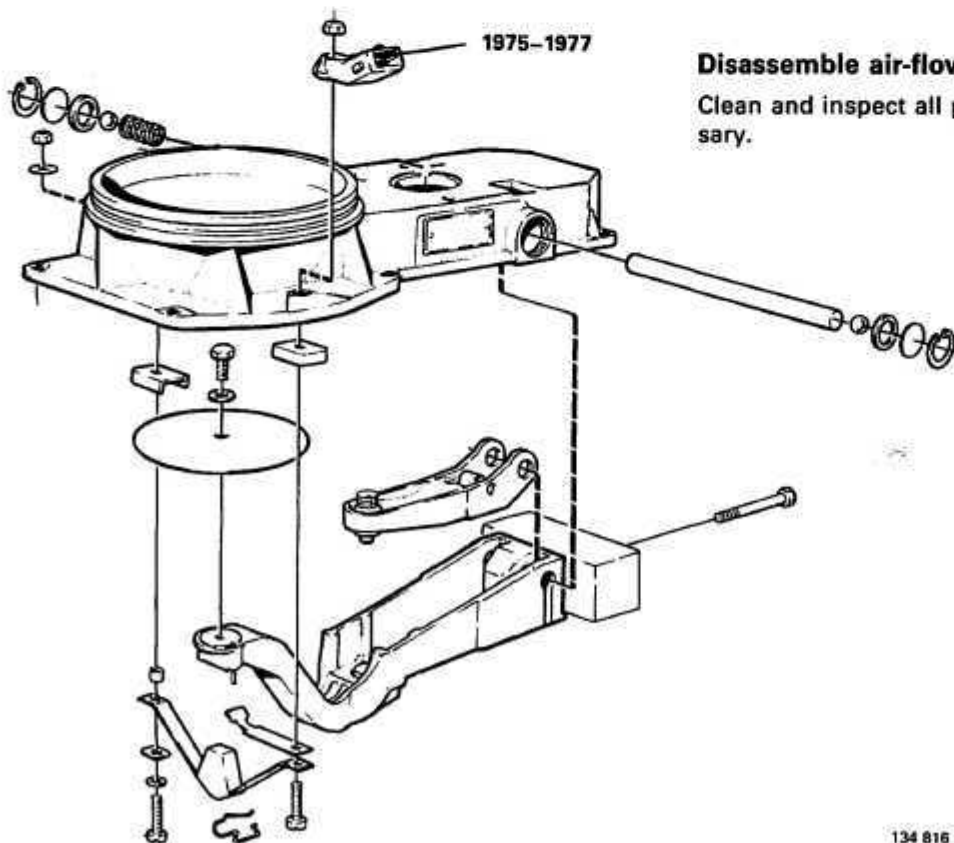
Take care that control plunger does not fall out as it is easily damaged.

If control plunger is removed, it must be cleaned in clean petrol/gasoline before being refitted.

D35

Remove lower part of air-flow sensor

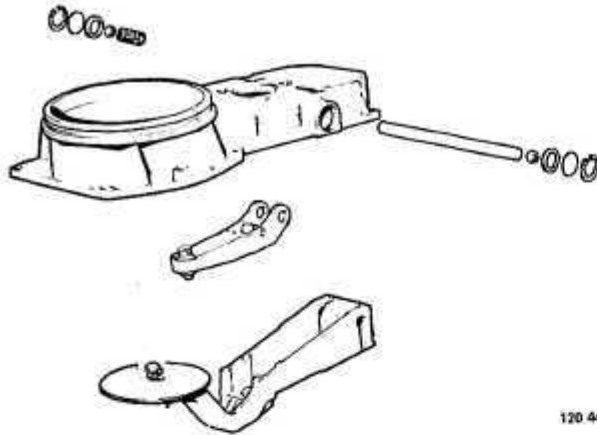
Allen key 5 mm.



D36

Disassemble air-flow sensor

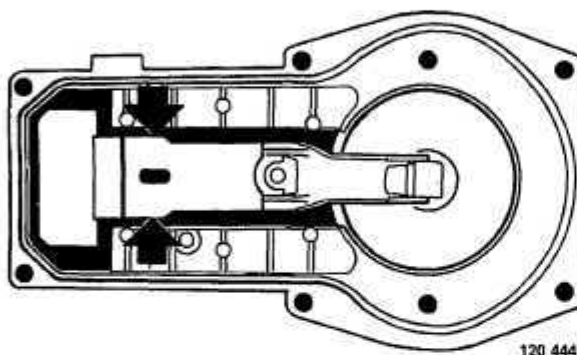
Clean and inspect all parts. Replace if and as necessary.



120 443

D37

Reinstall lever + plate and adjustment arm
Grease bearing surfaces, shaft, balls and spring.



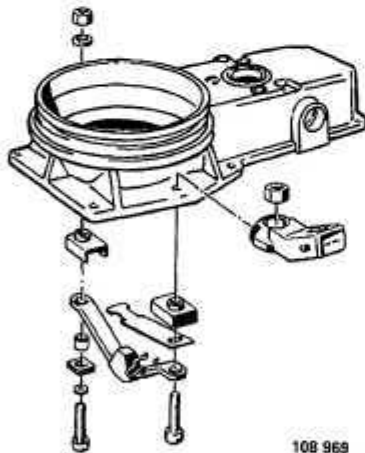
120 444

D38

Reinstall counterbalance

Centre lever before tightening retaining screws for counterbalance.

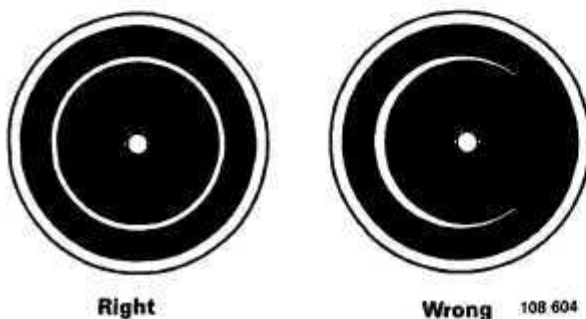
CO adjustment screw should be opposite drilled hole in housing. Key/wrench 5015 can be used to check this.



108 969

D39

Install stopper for plate



Right

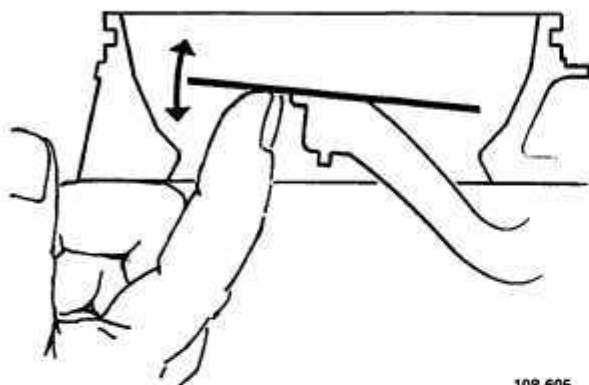
Wrong

108 604

D40

Centre plate

Adjust to obtain an equal space all the way round. Unscrew centre bolt to adjust plate.

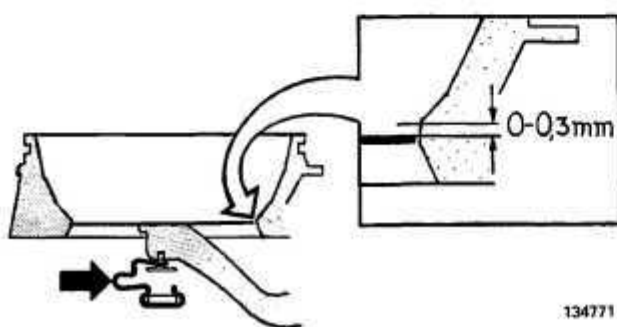


108 605

D41

Check operation of sensor plate/lever

Check throughout complete travel that plate does not stick, and is easy to move.



134771

D42

Adjust plate rest position

Upper edge of plate should be **flush**, or at the most **0.3 mm (0.012 in)** below cylindrical part of air venturi.

Position can be adjusted by bending/straightening spring clamp beneath plate.

Note! The rest position of the sensor plate should be checked before fitting the air-fuel control unit. It is advisable to set the plate as near flush as possible. This is because the plate takes up a low rest position when the unit is installed and is affected by the control pressure.

Fuel distributor

The fuel distributor must not be disassembled. If any part is defective, the complete unit must be replaced. It is however possible to clean the control plunger. The line pressure regulator can also be cleaned. O-rings seals should be replaced.

D43

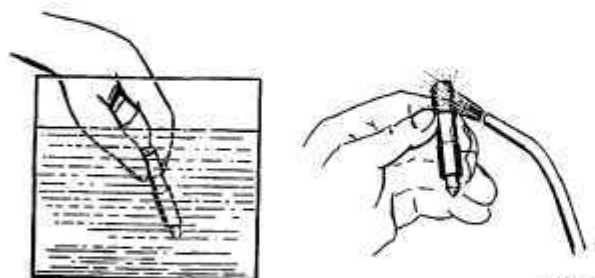
Clean and check control plunger

Always use clean petrol/gasoline and observe utmost cleanliness.

Wash control plunger and blow clean with compressed air. Also clean metering slits.

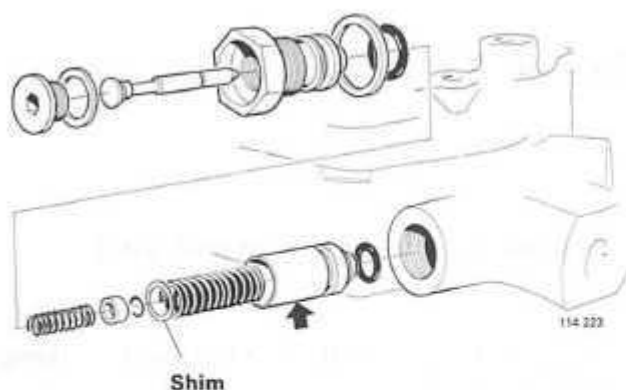
Make sure that plunger is not damaged or coated with carbon deposits. Use finger nails to remove dirt particles, **on no account may tools be used.**

Refit plunger in fuel distributor and check in-out operation, turning at same time. Plunger should move freely, if not replace complete fuel distributor.



108 987

D44

**Clean and inspect line pressure regulator**

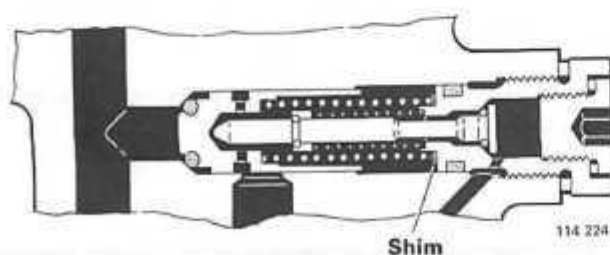
Use clean gasoline/petrol and observe the utmost cleanliness.

Disassemble and clean regulator.

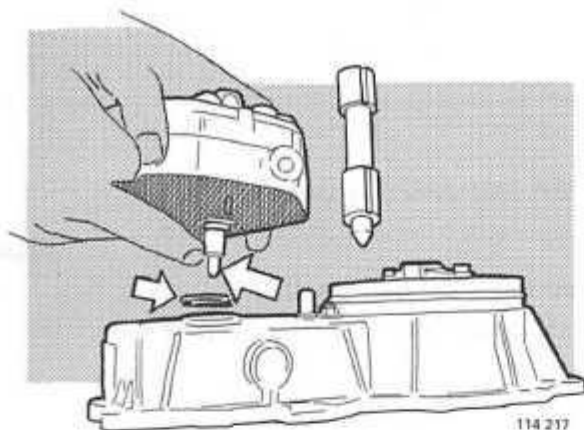
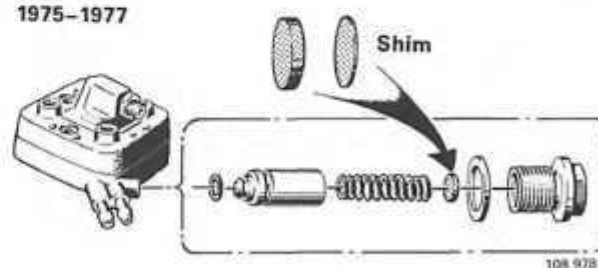
Replace worn and damaged parts.

IMPORTANT! Piston must not be replaced separately. If piston is defective the complete fuel distributor must be replaced.

Reassemble and install regulator, using new O-rings and seals.



1975-1977



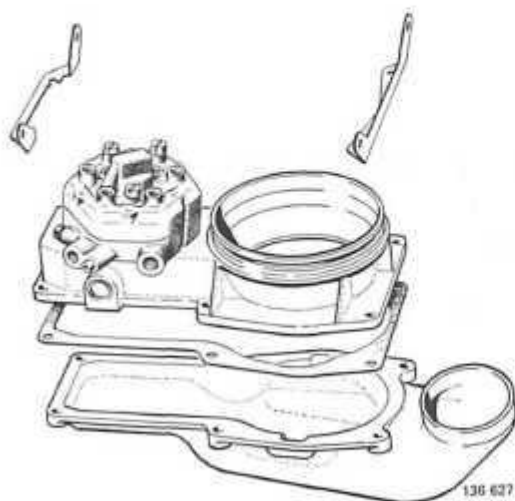
D45

Install fuel distributor on air-fuel sensor

Install new O-ring and make sure that it sits correctly.

Take care that control plunger does not fall out. If damaged it must be replaced.

Tighten screws evenly. Tightening torque 3.6 Nm (2.6 ft lbs).



D46

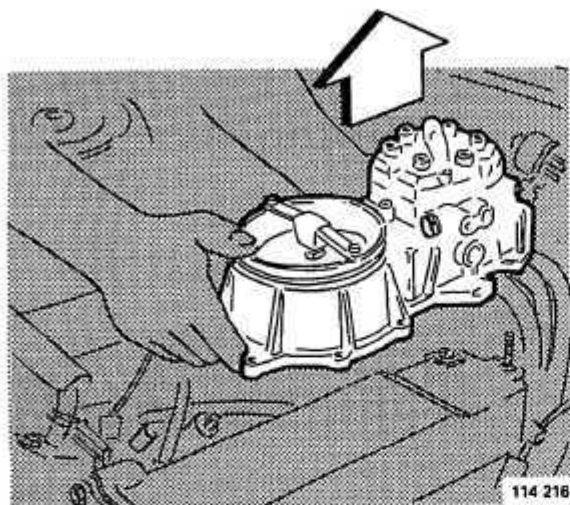
Assemble upper and lower parts of air-flow sensor

Install new seal.

Allen key 5 mm.

Check after tightening that lever moves freely.

B 27 E 1979–1980: B 28 E: B 27 F: B 28 F



Removing air-fuel control unit

D47

Remove upper section of air-flow sensor along with fuel distributor

Note! If necessary, fuel distributor can be removed and checked separately.

Unscrew fuel tank cap to release overpressure from fuel system (reduces spillages).

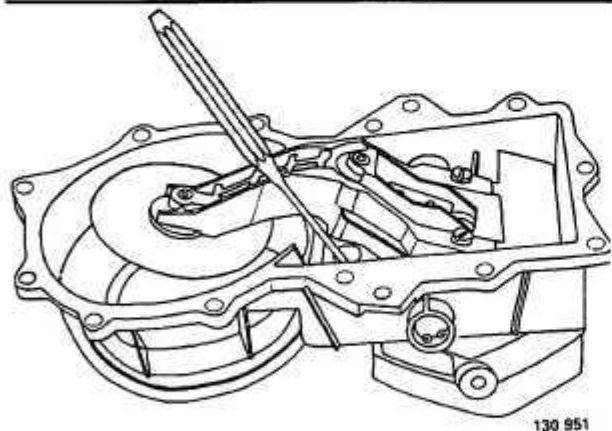
Clean all connections thoroughly before disconnecting fuel lines.

Allen key 5 mm.

Installing air-fuel control unit

Operations D48–52

Special tools: 5102, 5170 (1978–)

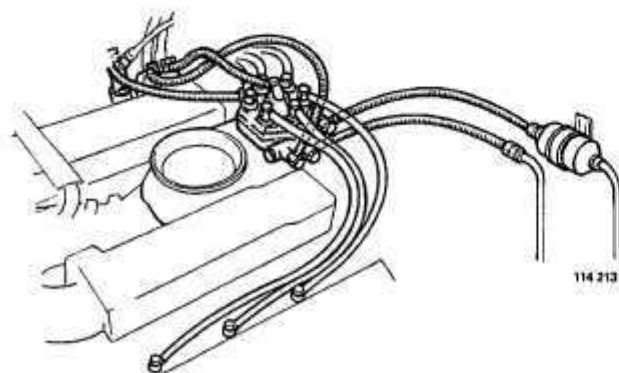


USA 1981–1982: Canada 1982

D48

Tap out steel ball (seal)

Use a 3 mm (0.125 in) punch (slightly bent).



D49

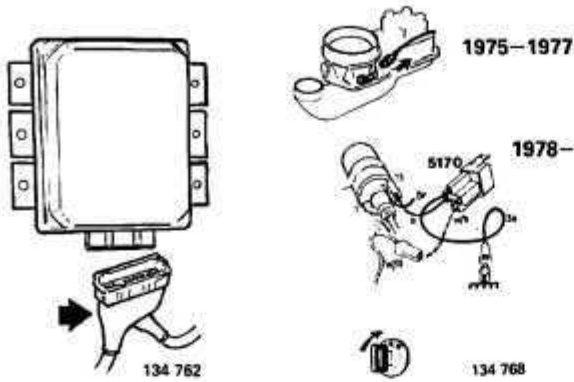
Install air-fuel control unit

Install new seal. Allen key 5 mm.

Check after tightening that air-flow sensor plate moves freely.

Connect all fuel lines apart from one. Use new seals.

D50



Start fuel pump

Disconnect plug from ignition system control unit.

1975-1977: withdraw connector from air-flow sensor.

1978-: connect test relay 5170.

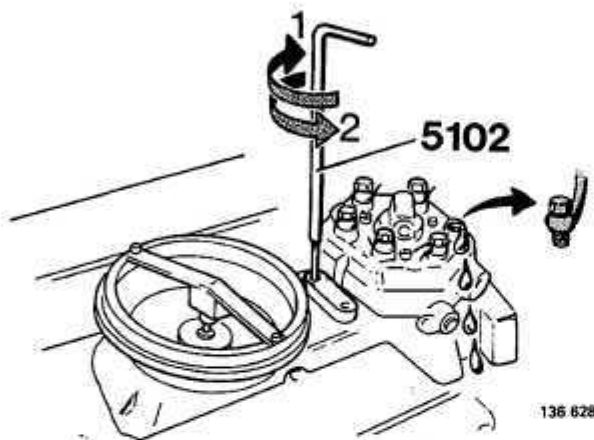
Turn on ignition.

D51

Basic-set air-fuel control unit CO-adjustment screw

Disconnect fuel line from fuel distributor. Turn CO screw clockwise until fuel is supplied from outlet. Then tighten screw by half a turn, using wrench 5102.

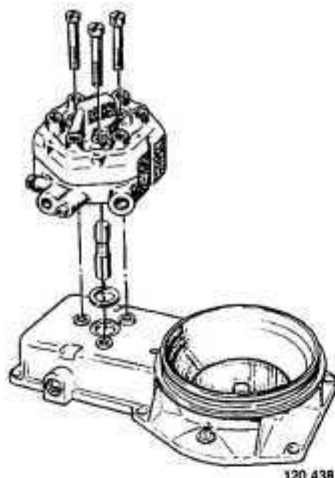
Turn off ignition and reconnect fuel line.



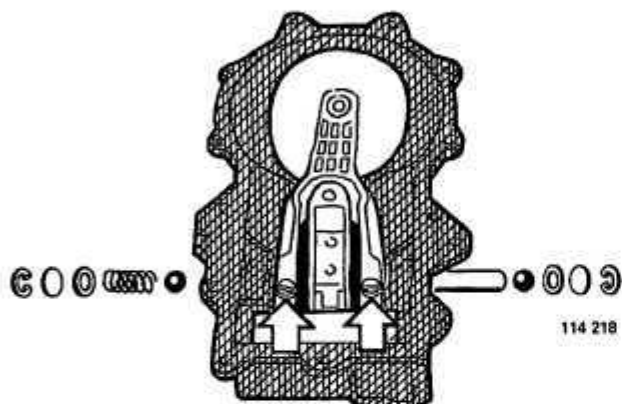
D52

Check/adjust:

	Operation
- all pressures	B3, 15-24
- air-flow sensor plate rest position ...	B25
- idle speed and CO-content	
B 27 E 1979-1980	J8-15
B 28 E	J8-15
B 27 F	J16-30
B 28 F	J16-30

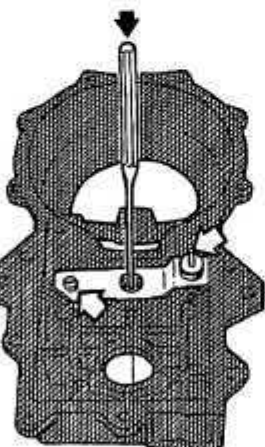
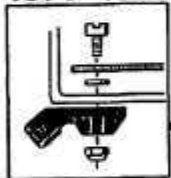


120 438

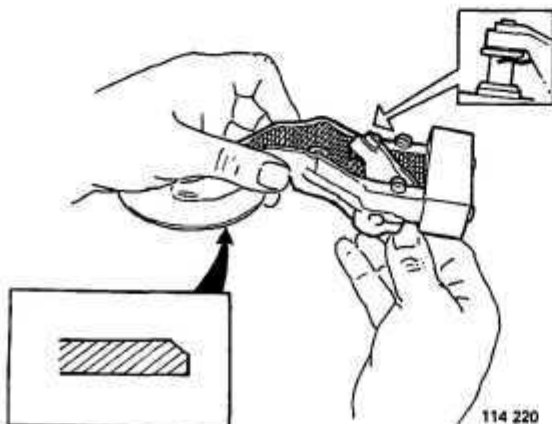


114 218

1976-1977



136 629



114 220

Reconditioning air-fuel control unit

Operations D53-65

D53

Remove fuel distributor

This should be done carefully to prevent control plunger from falling out and becoming damaged.

A control plunger which has been removed must always be cleaned in clean gasoline before reinstalling.

D54

Remove lever and adjustment arm

Slacken clamping screws, lever-shaft.

Remove snap-rings, cover washers, O-rings, spring (one side) and balls. It may be necessary to tap lightly on side to free balls.

Press out shaft and lift out lever and adjustment arm.

D55

Clean and inspect all parts

Replace worn or damaged parts.

Make sure that spring and pin (for adjusting height of sensor plate) are not loose.

1976-1977: Check connector on air flow sensor.

USA 1981-1982: Canada 1982

D56

Remove seal (steel ball) from air flow sensor

3 mm drift (0.125 in).

D57

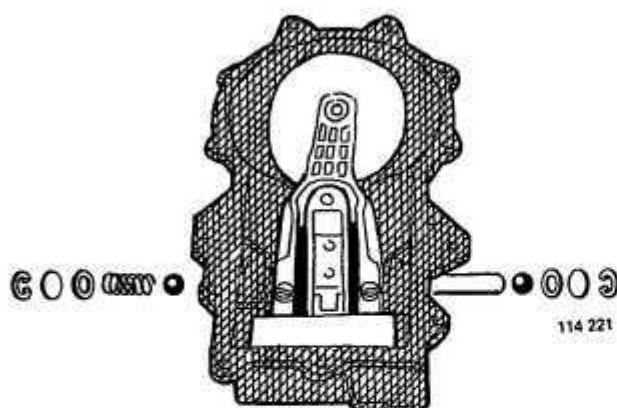
Assemble lever and adjustment arm

Install counterbalance (if removed).

Place adjustment arm in lever.

If sensor plate has been removed: plate should be positioned so that bevelled edge faces lever.

D58

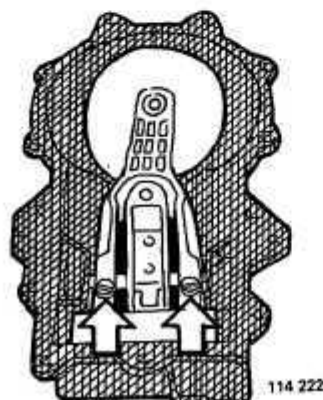
**Assemble air flow sensor**

Grease bearing seats, shaft, balls and spring.

Place lever and adjustment arm in air flow sensor and press in shaft. **Note!** Hold adjustment arm straight when shaft is pressed into position, otherwise shaft will not be free to turn.

Install balls, spring, O-rings, cover washers and circlips. Spring should be installed in side where bearing seat is deepest.

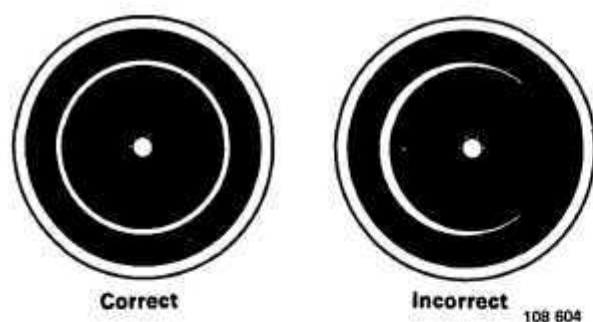
D59

**Align lever**

CO adjustment screw should lie directly in front of hole in housing. Use key 5102 to check.

Tighten clamping screws, lever – shaft.

D60

**Center sensor plate**

Adjust to obtain equal clearance all around. Unscrew center bolt when adjusting plate.

D61

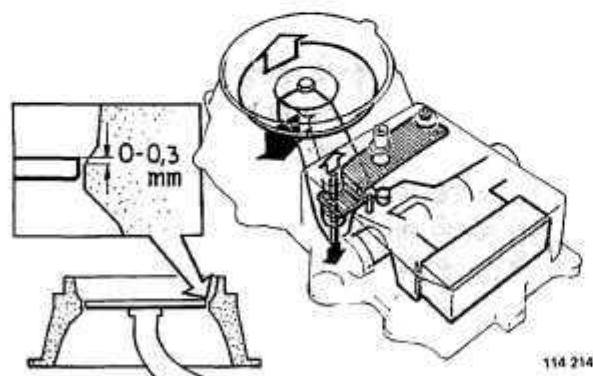
Check operation of sensor plate/lever

Parts should move easily and without binding.

D62

Adjust sensor plate rest position

Note! It is advisable to set sensor plate slightly above flush position. This is because when unit is installed it is only possible to tap pin downwards i.e. lower position of plate.



Upper edge of plate should lie flush, or at the most 0.3 mm (0.012 in) above cylindrical part of air venturi.

If necessary adjust position by tapping pin (indicated) either upwards or downwards.

Recheck position of sensor plate after refitting air-fuel control unit in vehicle.

Fuel distributor

Fuel distributor must not be disassembled. If any part is defective, complete unit must be replaced. It is however possible to clean control plunger.

Line pressure regulator can also be cleaned, O-rings and seals should be replaced.

D63

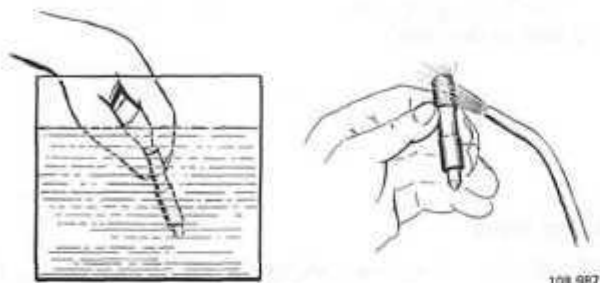
Clean and check control plunger

Always use clean gasoline and observe utmost cleanliness.

Wash control plunger and blow clean with compressed air. Also clean metering slits.

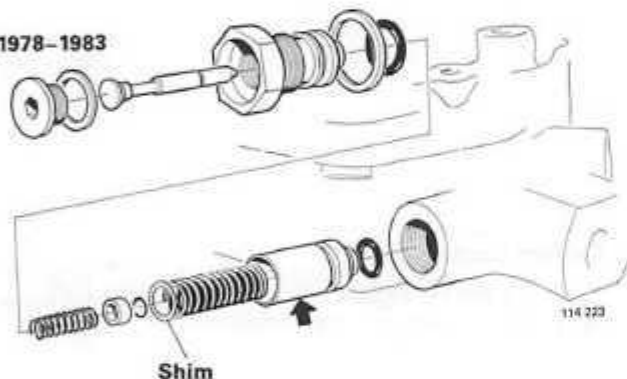
Make sure that plunger is not damaged, use non-metallic brush to remove dirt particles (**on no account use metal tools**).

Install plunger in fuel distributor and check that it moves freely. If it binds, replace complete fuel distributor.



108 987

1978-1983



114 223

Shim

Clean and check line pressure regulator

Use clean gasoline and observe utmost cleanliness.

Disassemble and clean regulator.

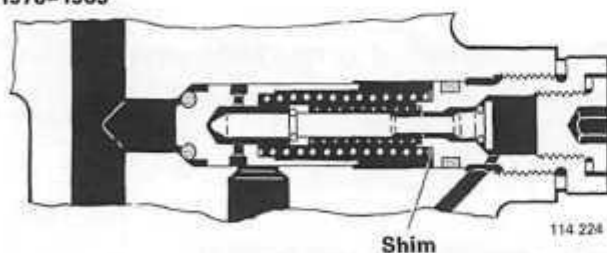
Replace worn or damaged parts.

Caution! Pistons must not be replaced separately. If defective complete fuel distributor must be replaced.

Assemble regulator and install, using new O-rings and seals.

D64

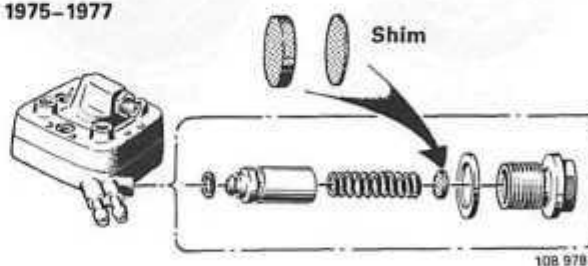
1978-1983



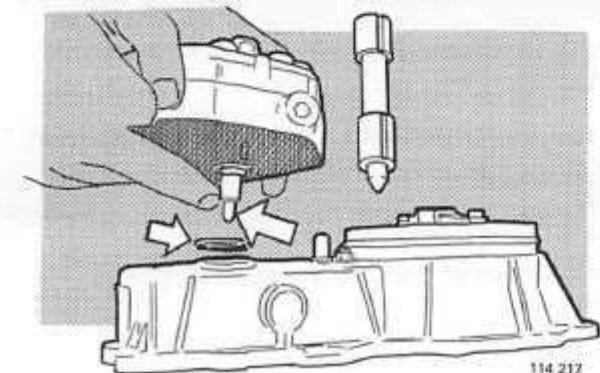
114 224

Shim

1975-1977



108 978



114 217

D65

Install fuel distributor on air-fuel sensor

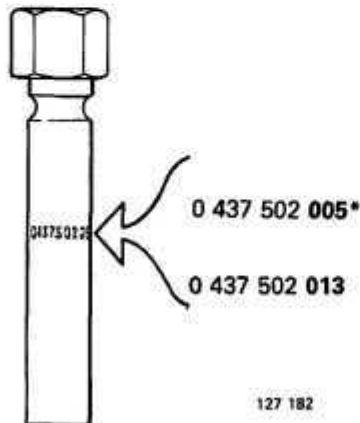
Use a new O-ring and make sure that it sits correctly.

Take care that control plunger does not fall out and become damaged.

Tighten screws evenly. Tightening torque 3.6 Nm (2.6 ft. lb.).

INJECTORS

Operations D66–75



*Injector . . . 005 is not available as a spare part. Use . . . 013 instead.

D66

General

Type of injector fitted to vehicle depends on engine type. Identification number is stamped on side of injectors. See table on page 75.

D67

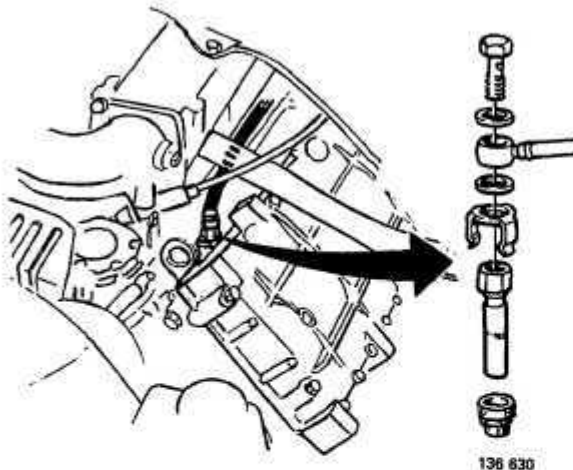
Fault symptoms:

- erratic idling (fuel not atomised)
- low top speed/poor engine performance (fuel not atomised)
- misfiring while driving under heavy load
- difficult to start hot engine (injectors do not seal which causes too low a rest pressure)
- dieselling (injector opening pressure too low).

D68

Checking injectors

Carry out the following operations B2, B8, B27–40.



D69

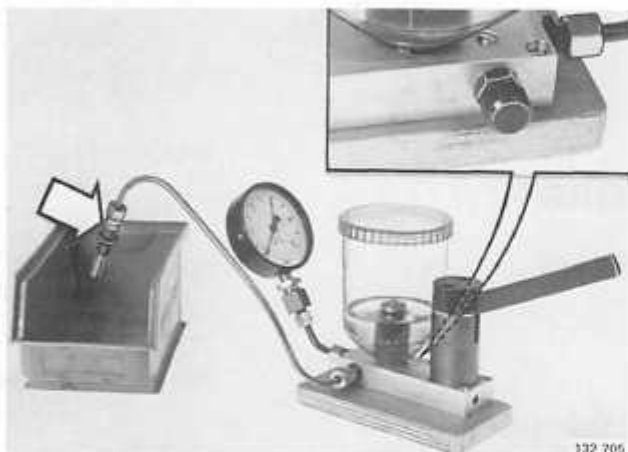
Replacing injectors

New injectors are filled with a rustproofing compound. On storing, the compound hardens which is why injectors should always be cleaned and tested before installing (see method on next page).

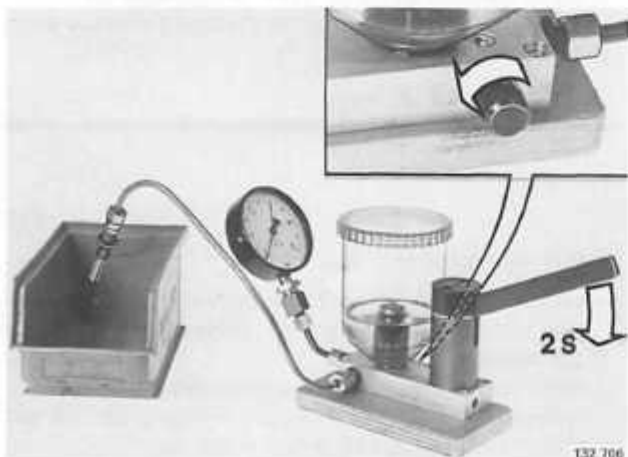
Check rubber seals and replace wherever necessary.

Check idle speed and CO-content after replacing injectors.

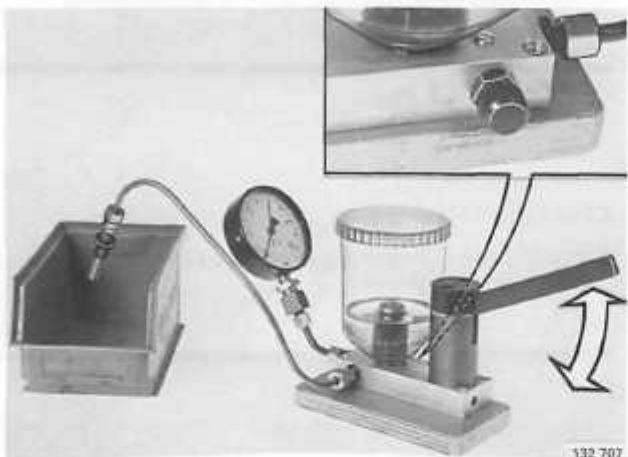
Note! Engine must be run at above idle speed to vent fuel lines.



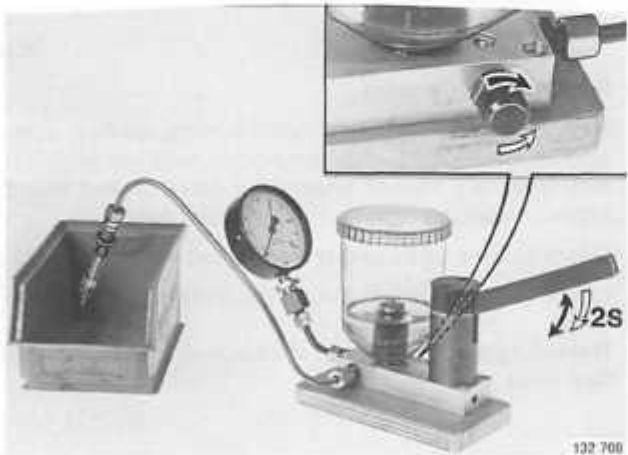
132 705



132 706



132 707



132 708

Testing and cleaning injectors

Operations D70–75

Special tool: 9934

Apparatus should be filled with solvents intended for cleaning purposes such as Shell K30, Esso-Versol, Shell Mineral spirits 135 or similar products.

WARNING! Never exceed a pressure of 600 kPa (85 psi) during the test.

D70

Connect injector to tester 9934

Use adapter P/N 243895-0. Do not tighten.

Bleed pressure line by pumping until fuel free from air bubbles is supplied from fuel line.

Then tighten connection.

D71

Check to see if injector is leaking

Open pressure gauge cock.

Pump slowly, about 2 seconds per sweep. Check that pressure rises to at least 100–150 kPa (14–21 psi).

If not, injector is leaking and must be cleaned. See D72.

D72

Clean injector (whenever necessary)

Pump strongly 15–20 times. Then repeat D71.

If pressure is still too low, injector should be replaced.

D73

Check opening pressure

Close pressure gauge cock.

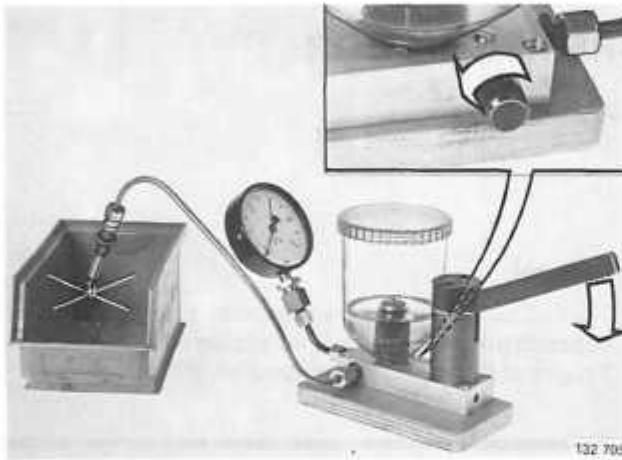
Quickly pump a few times to vent injector.

Open pressure gauge cock.

Pump slowly, about 2 seconds per sweep. Record pressure when injector opens.

See table at bottom of next page for opening pressures.

If pressure is incorrect, replace injector.

**Check injector**

Open pressure gauge cock.

Increase pressure slowly to value indicated in table below.

Keep pressure constant at this value.

In a 15 second period injector must not drip.

If injector drips, clean injector according to D72.

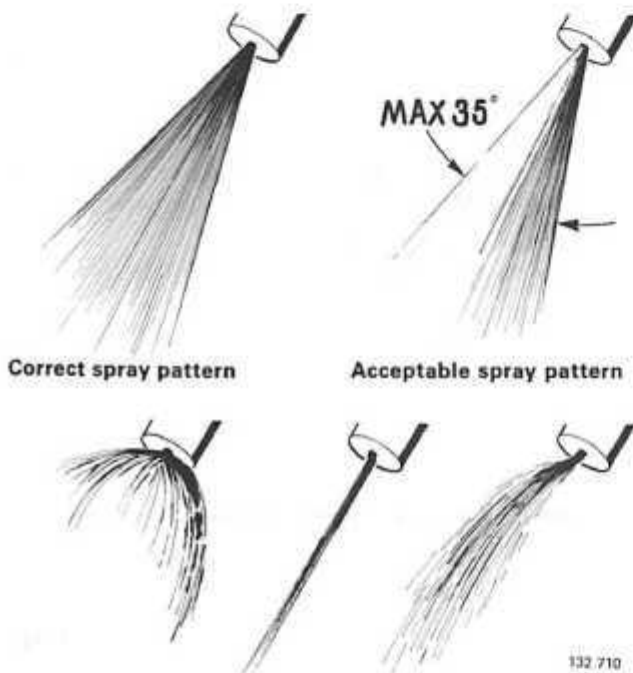
Check injector function, spray pattern etc.

Close pressure gauge cock.

Pump at approx. 1 sweep per second for at least 10 seconds and observe injectors.

Correct injectors buzz and no drops form at the tip. The correct spray pattern is shown adjacent.

If incorrect, clean injector according to D72.



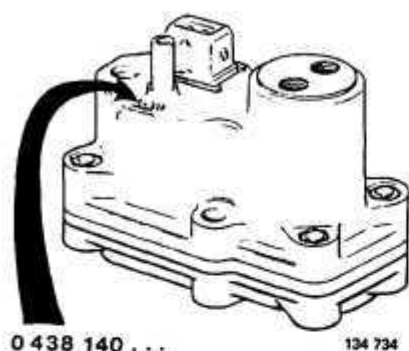
Examples of poor spray patterns (injector should be replaced)

	1975-1978	1979-1983
Injector, Bosch number	... 005*	... 013
Volvo number	269184-8	1269274-5
opening pressure	300-360 kPa (42-50 psi)	320-380 kPa (45-53 psi)
no leakage permitted below	240 kPa (34 psi)	260 kPa (36 psi)

*replacement part ... 013

CONTROL PRESSURE REGULATOR

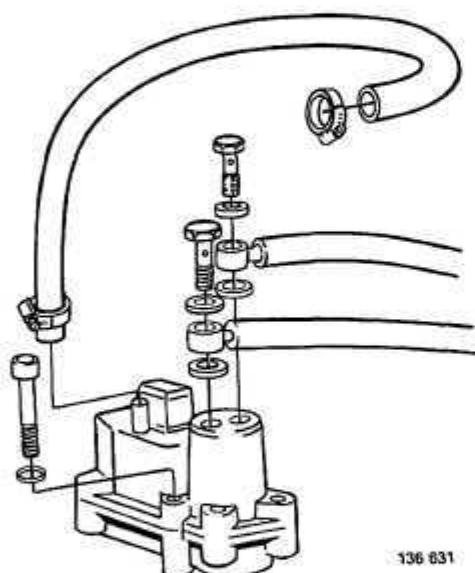
Operations D76–79



D76

General

Type of control pressure regulator fitted to vehicles depends on engine type. They are identified by the last 3 digits of the number stamped on top of regulator.



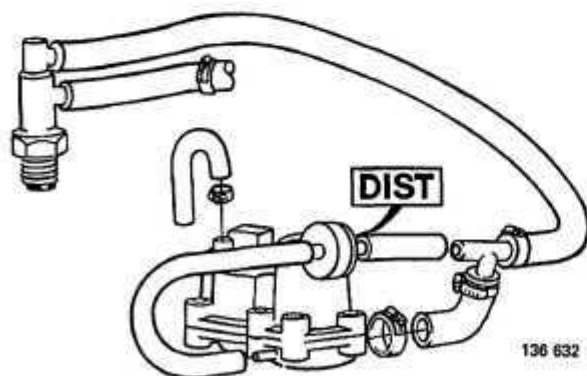
D77

Fault symptoms

A defective control pressure regulator causes incorrect control pressure which in turn causes an incorrect fuel-air mixture.

The following symptoms can arise:

- difficult to start engine
- erratic running, possibly stalling
- excessive fuel consumption (low control pressure)
- poor engine performance/low top speed
- rough acceleration, backfiring
- misfiring while driving under heavy load.



D78

Checking control pressure regulator

Control pressure should be measured when engine is cold ie. below 30°C (86°F).

Follow operations B1–3, B8, B15–21.

D79

Replacing control pressure regulator

Allen key 5 mm.

After replacing regulator, check control pressure, idle speed and CO-content.

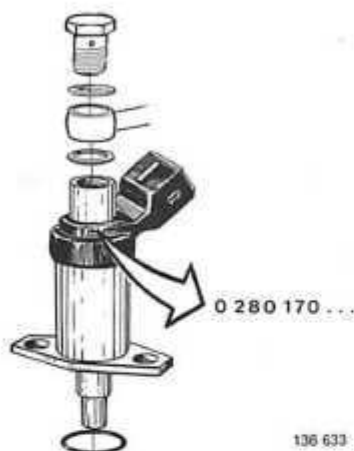
Illustration shows a control pressure regulator incorporating acceleration enrichment system for cold engine (B 28 F).

Note! B 28 F USA and Canada with pressure differential switch: acceleration enrichment system via control pressure regulator is disconnected.

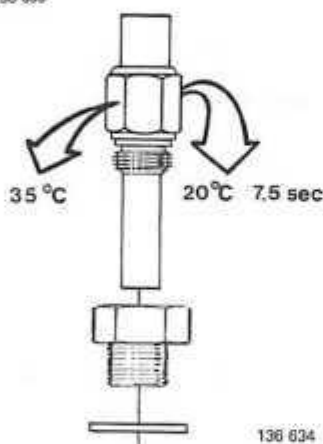
START INJECTOR, THERMAL TIME SWITCH, IMPULSE RELAY

Operations D80-92

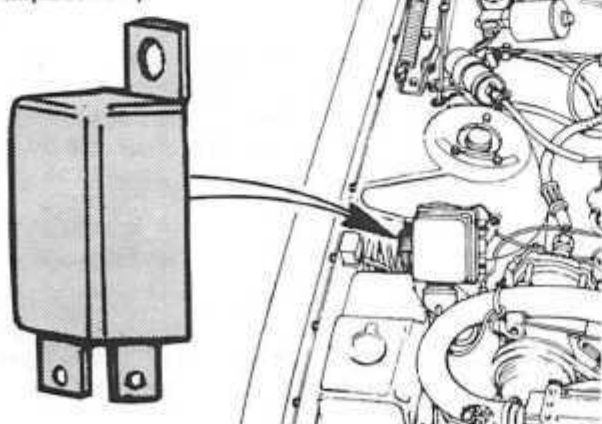
D80



136 633



Impulse relay



130 557

General

Type of start injector fitted to vehicle depends upon model year and engine type. Identification number is stamped on side of injector.

Thermal time switch controls start injector when starting with a cold engine. Engagement time of start injector at -20°C (-4°F) is stamped on collar of injector.

B 27 F engines are equipped with a switch with a 15°C (59°F) cut-out temperature. Replacement part for this switch has a cut-out temperature of 35°C (95°F).

Impulse relay is fitted to 1981-1982 *models. It controls start injector during warm starts.

*Impulse relay may have been fitted to some B27 E 1979-1980, B 27 F 1978-1979 and B 28 F 1980 models. See page 78.

D81

Fault symptoms:

- difficult to start engine/does not start when cold
- difficult to start when warm.

A leaking start injector can cause excessively high fuel consumption, rough running and dieselling.

Cold start problems B 27 F 1978-1979

Replace thermal time switch with one with a cut-out temperature of 35°C (95°F). This improves cold starting in temperature range 15°C - 35°C .

Warm start problems B 27 E 1979-1980, B 27 F 1978-1979 and B 28 F 1980

Installation of an impulse relay improves warm starting, see page 78.

D82

Checking parts

Start injector function should be checked when the engine is cold (below 30°C = 86°F).

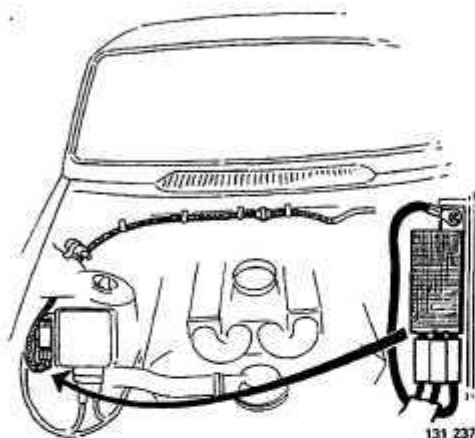
Carry out operations B2, B5-10.

Installing impulse relay

Operations D83-92

Applies to: B 27 E 1979-1980, B 27 F 1978-1979, B 28 F 1980

D83



General

Injection time of start injector is controlled by a thermal time switch.

1981-1983 models also have an impulse relay to operate start injector.

Impulse relay engages start injector after approx. 1.5 seconds with subsequent injection for 0.1 secs - pause 0.3 secs - injection 0.1 secs etc.

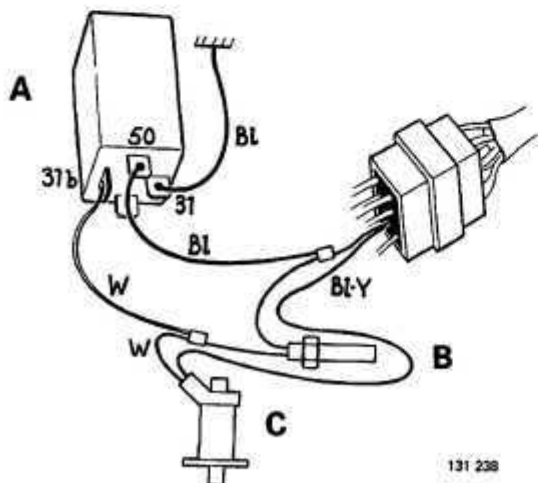
Additional fuel is therefore supplied during warm starts.

Impulse relay can, if required, be fitted to vehicles manufactured before 1981.

IMPORTANT! B 27 E 1979 Australia and B 27 F 1978-1979: evaporative system must be modified slightly before installing impulse relay.

D84

Wiring diagram



Component

- A Impulse relay
- B Thermal time switch
- C Start injector

Colour

- BL = blue
- W = white
- Y = yellow

D85

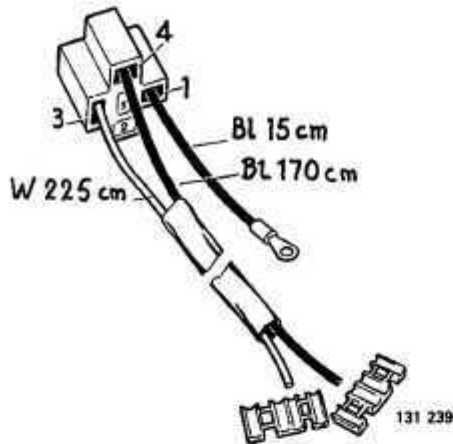
Required parts

Description	Qty	P/N
Wire 1.5 mm ²		
white	2250 mm	954450-3
blue	1700+150 mm	954448-7
PVC sheath	1600 mm	192598-1
Cable terminal	3	949489-9
Cable terminal	1	956925-2
Clamp	2	944306-0
Plug	1	1234066-7
Impulse relay	1	1274396-9

Note! B 27 E Australia and B 27 F 1978-1979: a delay valve (P/N 1276311-6) is also required.

- 150 mm = 6 in
- 1600 mm = 63 in
- 1700 mm = 67 in
- 2250 mm = 89 in

D86



Assemble wiring harness

Do not attach clamps at this stage.

15 cm = 6 in

170 cm = 63 in

225 cm = 89 in

D87

Disconnect/remove

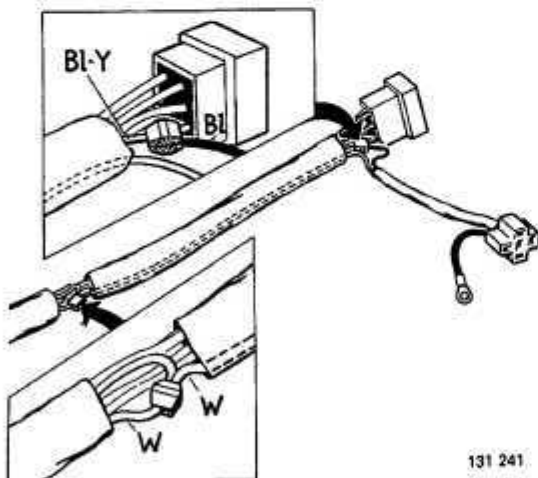
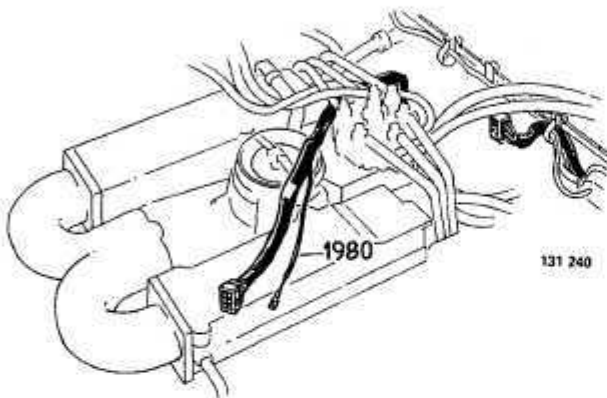
- ground lead from battery
- air filter.

D88

Detach wiring harness from intake manifold.

Disconnect plug next to bulkhead.

1980- models; also disconnect wire from thermal time switch.



D89

Connect wiring harness for impulse relay

Pull apart plastic covering on existing wiring harness.

Connect new wiring harness.

Slide cover back into position.

D90

Connect wiring harness Install impulse relay

Reconnect plugs on existing wiring harness.

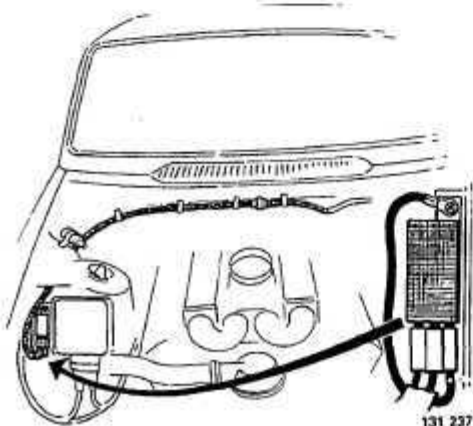
Route wiring harness for impulse relay along existing wiring harness, to ignition system control unit.

Secure wiring harness with clamps.

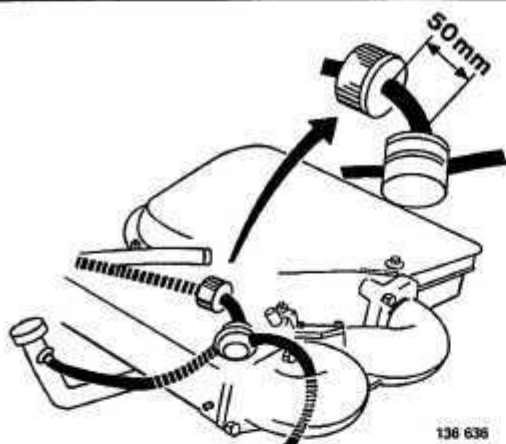
Install impulse relay and connect wires.

Do not forget the ground wire.

IMPORTANT! Impulse relay must not be mounted on bulkhead/firewall because heat radiation from exhaust system can interfere with relay function.



Group 23 Fuel system
Installing impulse relay



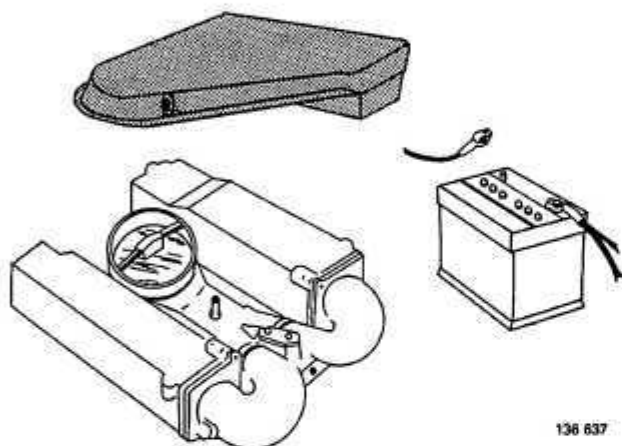
B 27 E 1979 Australia
B 27 F 1978-1979

D91

Connect delay valve

Cut vacuum hose approx. 50 mm (2in) from vacuum unit.

Connect delay valve with yellow side (DIST) facing vacuum unit.



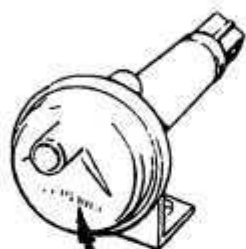
Install:

- air filter
- battery lead.

D92

AUXILIARY AIR VALVE

Operations D93–95



0 280 140 ...

134 740

D93

General

Type of auxiliary air valve fitted to vehicle depends on model year and engine type. Identification number is stamped on end of valve.

Vehicles equipped with Constant Idle Speed system are not fitted with an auxiliary air valve.

D94

Fault symptoms:

- difficult to start engine/does not start when cold
- idle speed too high (valve does not close)

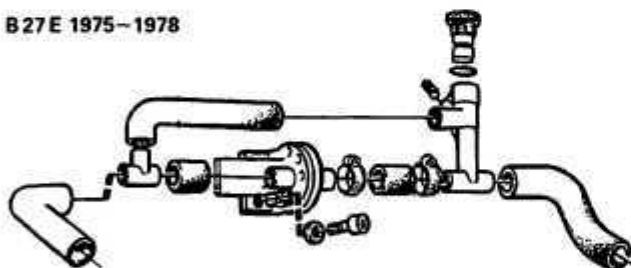
D95

Inspection of auxiliary air valve

Engine must be cold (below 30°C = 86°F) when inspecting valve.

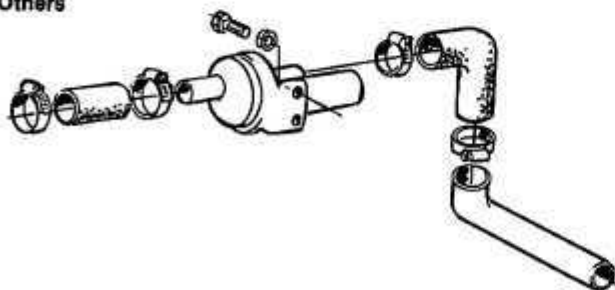
Carry out following operations:
B2–3, B14, B26.

B 27 E 1975–1978



138 635

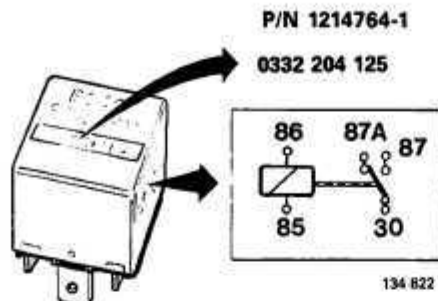
Others



136 638

RELAYS

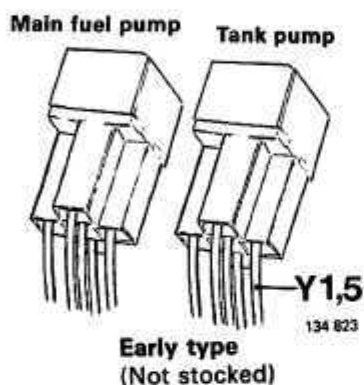
Operations D96-98



D96

1975

Main pump relay and tank pump relay are interchangeable.

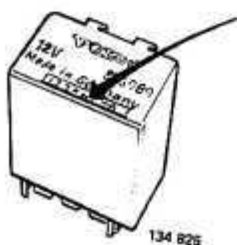
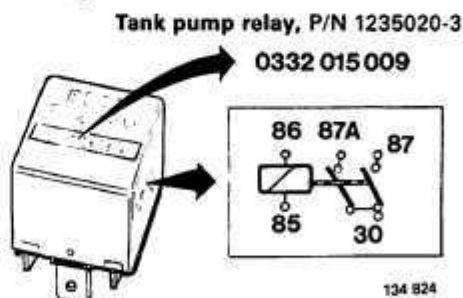
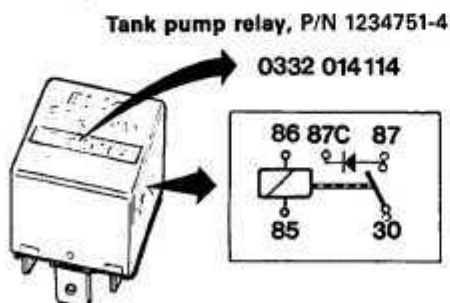
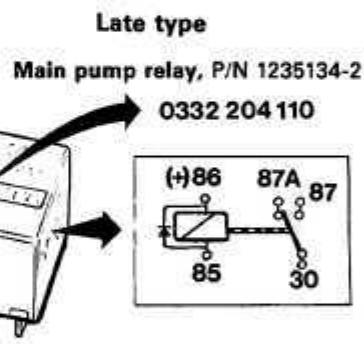
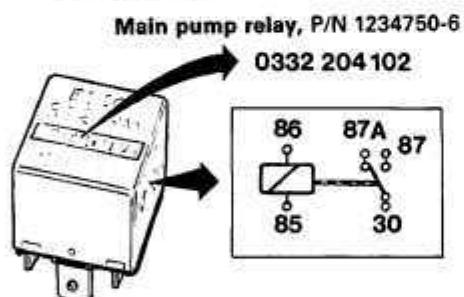


D97

1976-1977

Caution! Main pump relay and tank pump relay are different and **must not be interchanged**.

A yellow ($\varnothing 1.5 \text{ mm} = 0.006 \text{ in}$) is connected to tank pump relay connector.



D98

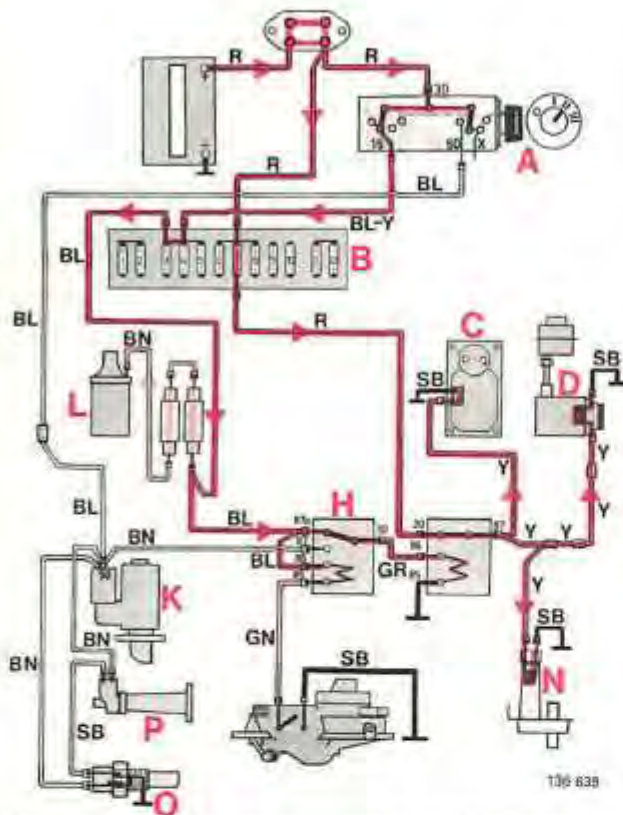
1978-1983

One relay (electronic).

E. CI-system wiring diagram

Note! All diagrams show current flow when engine is operating

E1



1975

Fuse No. 4
Glove compartment
Heated driver seat
Air conditioning
Reversing/back-up light

Fuse No. 7
Clock

Note! If vehicle is equipped with tank pump, fuse no. 7 should be 16A.

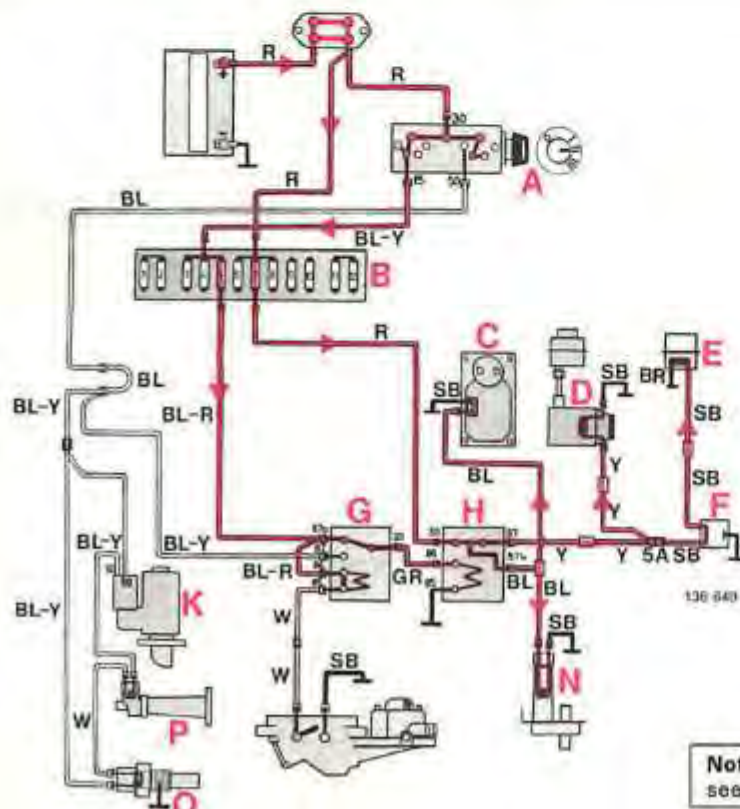
Component

- A Ignition switch
- B Fusebox
- C Control pressure regulator
- D Fuel pump
- E Tank pump
- F Capacitor (integrated with tank gauge unit on some models)
- G Main relay (1975-1977)
- H Pump relay (1975-1977)
- J Transistorized pump relay (1978-1983)
- K Starter motor
- L Ignition coil
- N Auxiliary air valve
- O Thermal time switch
- P Start injector
- Q Impulse relay (1981-1983)
- R Control unit for ignition system
- S Distributor

Colour code

SB = black BN = brown OR = orange
GR = grey Y = yellow VO = violet
W = white BL = blue P = pink
R = red GN = green

E2



1976-1977

Fuse No. 5
Direction indicator
Combined instrument
Indicator and warning lamps
Seat belt reminder
Power door mirror

Fuse No. 7
Clock

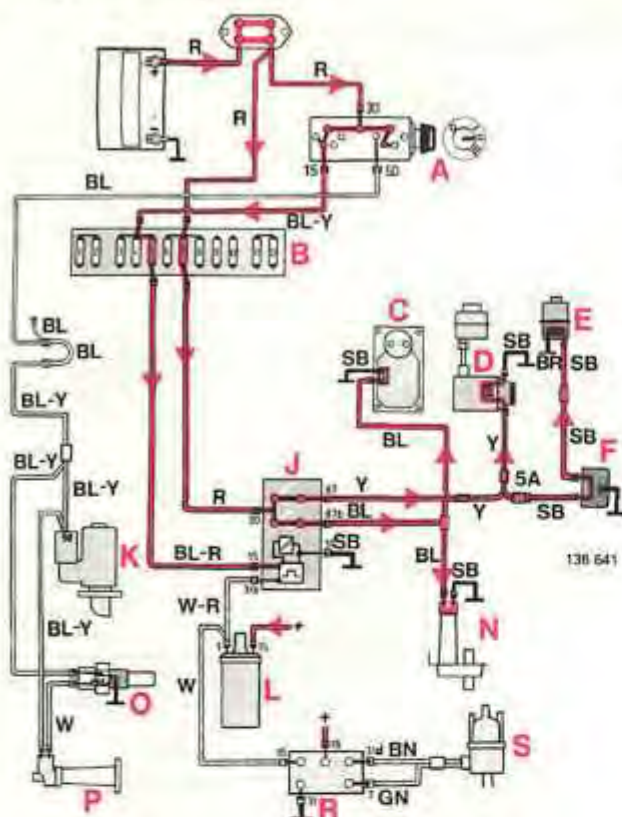
Note! Main relay G and pump relay H are not same type, see page 82.

E3

1978

Fuse No. 5
Direction indicator
Combined instrument
Indicator and warning lamps
Seat belt reminder

Fuse No. 7
Clock



Component

- A Ignition switch
- B Fusebox
- C Control pressure regulator
- D Fuel pump
- E Tank pump
- F Capacitor (integrated with tank gauge unit on some models)
- G Main relay (1975-1977)
- H Pump relay (1975-1977)
- J Transistorized pump relay (1978-1983)
- K Starter motor
- L Ignition coil
- N Auxiliary air valve
- O Thermal time switch
- P Start injector
- Q Impulse relay (1981-1983)
- R Control unit for ignition system
- S Distributor

Colour code

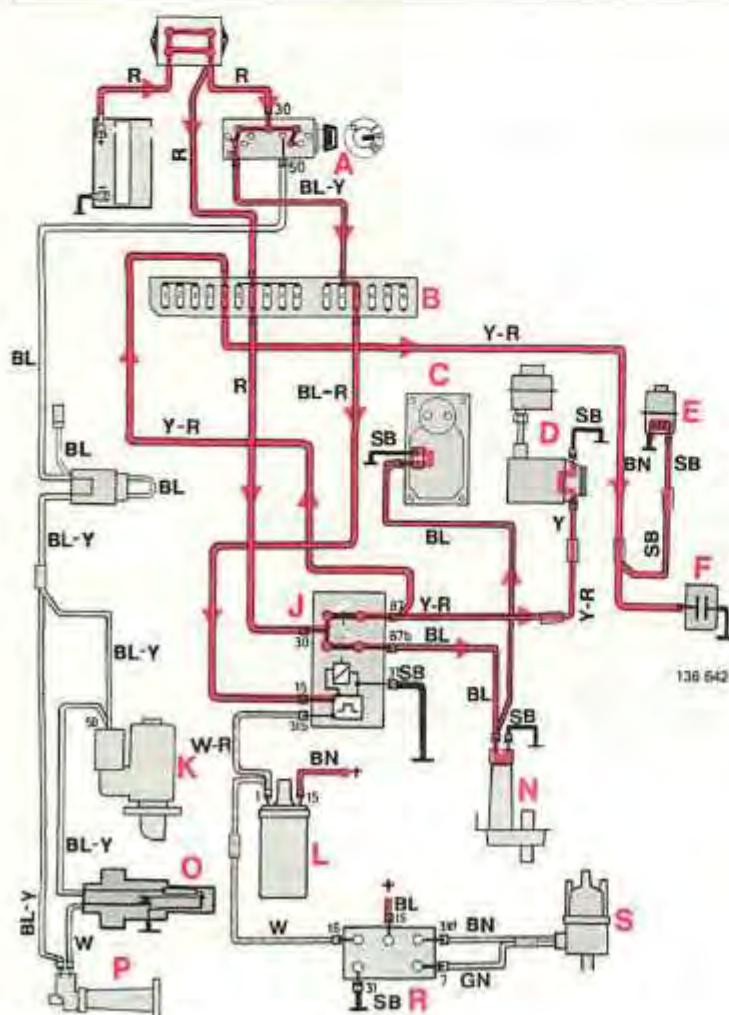
SB = black BN = brown OR = orange
GR = grey Y = yellow VO = violet
W = white BL = blue P = pink
R = red GN = green

E4

1979-1980

Fuse No. 5 and No. 7
No other functions

Fuse No. 13
Direction indicator
Seat belt reminder
Combined instrument

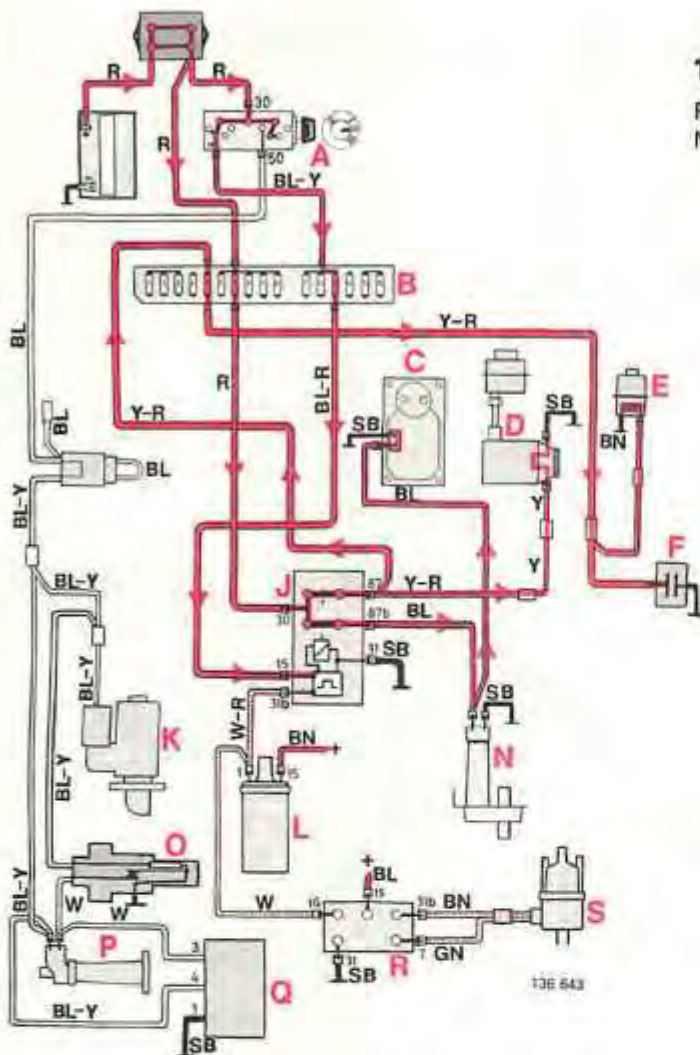


E5

1981-1983

Fuses No. 5 & 7
No other functions

Fuse No. 13
Direction indicator
Seat belt reminder
Combined instrument



Component

- A Ignition switch
- B Fusebox
- C Control pressure regulator
- D Fuel pump
- E Tank pump
- F Capacitor (integrated with tank gauge unit on some models)
- G Main relay (1975-1977)
- H Pump relay (1975-1977)
- J Transistorized pump relay (1978-1983)
- K Starter motor
- L Ignition coil
- N Auxiliary air valve
- O Thermal time switch
- P Start injector
- Q Impulse relay (1981-1983)
- R Control unit for ignition system
- S Distributor

Colour code

- SB = black BN = brown OR = orange
- GR = grey Y = yellow VO = violet
- W = white BL = blue P = pink
- R = red GN = green

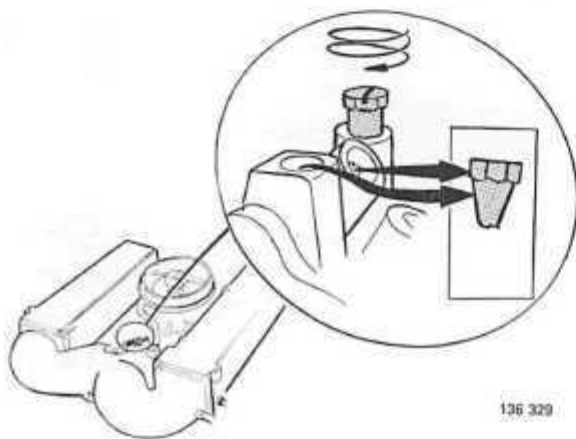
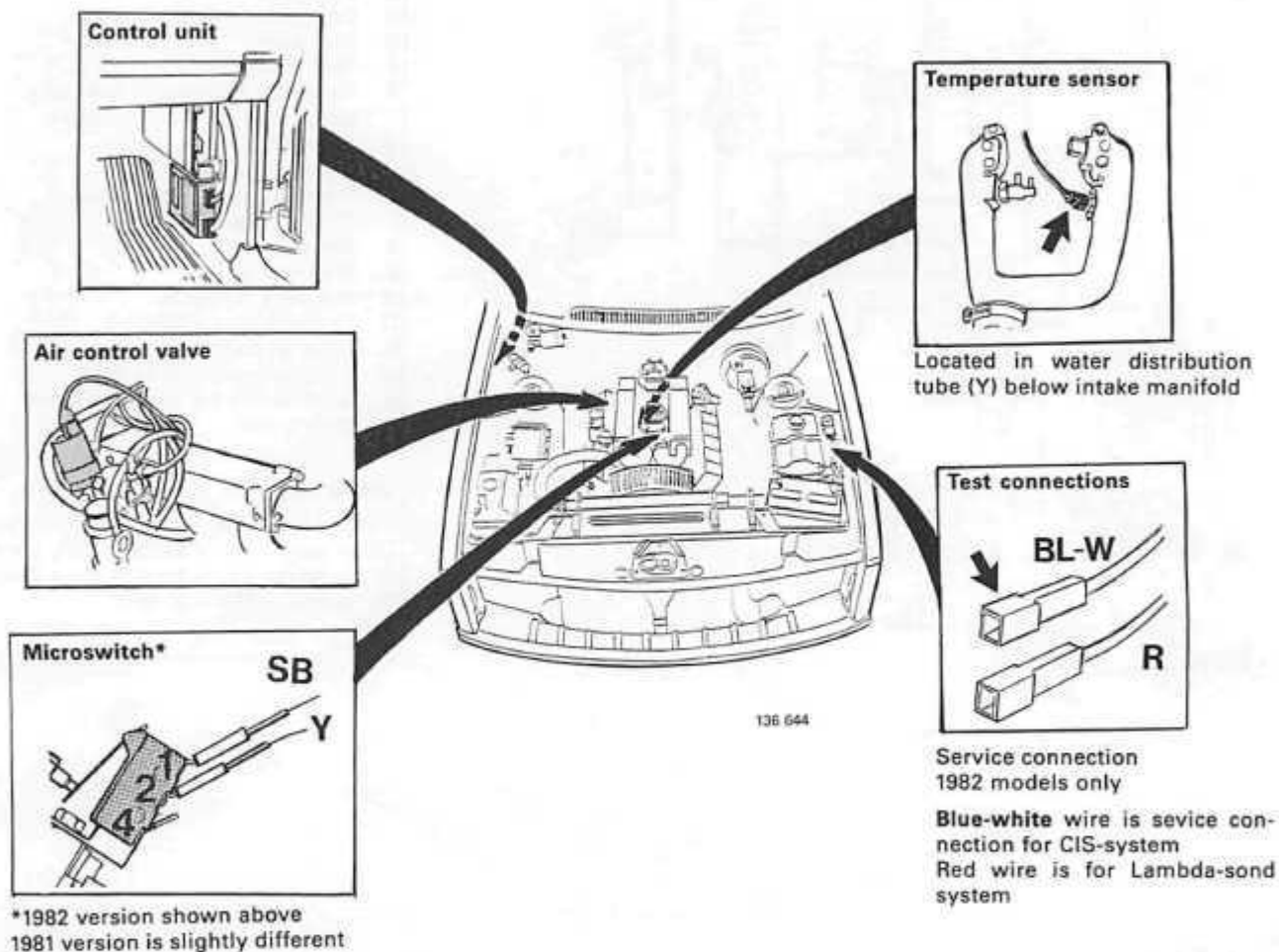
Constant Idle Speed system

(CIS-system)

CIS system is fitted to following engine types:

- B 28 F 1981 USA California and Japan
- B 28 F 1982 All models

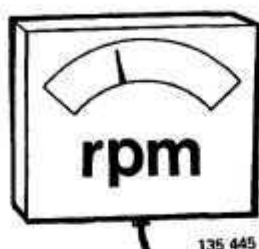
Location of components



IMPORTANT! "Idle adjustment" screw and balance screws must always be screwed in fully on engines with constant idle speed system.

Balance screws are of shearhead type and must be tightened until heads break off.

Idle speed



Cold engine ($-20^{\circ}\text{C} = 4^{\circ}\text{F}$) approx. **18 r/s** (1100 r/min)
Idle speed reduces as engine heats up and stabilizes at approx. 15°C (59°F)

Warm engine **15 r/s** (900 r/min)

Tolerances:

1981 14.2–15.8 r/s (850–950 r/min)

1982 14.7–15.3 r/s (880–920 r/min)

Fault symptoms

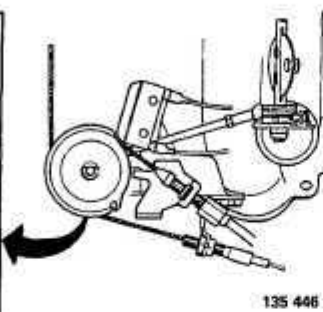
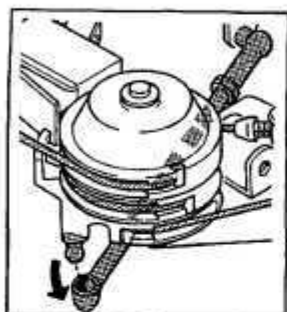
Fault symptoms in system may be caused by external faults, see list below.

Note! All symptoms can be caused by poor electrical contacts (e.g. oxide formation).

FAULT SYMPTOM	POSSIBLE CAUSE
Idle speed fluctuates	– ignition setting – CO-content – air leakage
Idle speed too high	– incorrectly adjusted microswitch – temperature sensor defective or not connected – throttle valve incorrectly set
Idle speed too low	– blocked air hoses – blocked crankcase ventilation
No control	– throttle valve incorrectly set – microswitch incorrectly set
Engine stalls when braking to stop	– ignition setting – CO-content – air leakage
No fast idle, cold engine	– temperature sensor defective or damaged cable.

F. Basic setting and inspection of CIS system

Engine should be warmed-up to normal operating temperature.



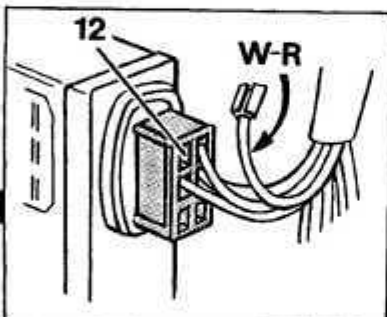
135 446

F1

Disconnect link rod from throttle pulley

Ensure that pulley moves smoothly and does not bind.

1981



136 428

B28 F 1981

F2

Disconnect control unit

Air control valve now takes up basic position.

Ignition should be off.

Withdraw white-red wire (terminal 12) from blue connector on control unit.

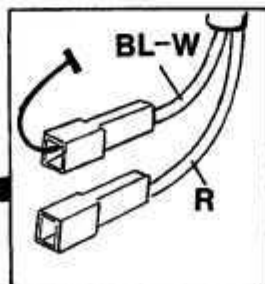
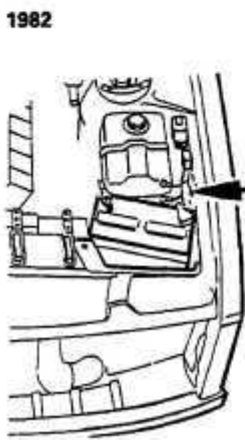
F3

Connect a rev counter and start engine

Note AC must be disengaged.

Engage "N" (auto).

1982



136 429

B 28 F 1982

F4

Ground service connection

Air control valve closes

IMPORTANT! Ground the blue-white wire.

Red wire is service connection for Lambda-sond system.

F5

Connect a test lamp to microswitch

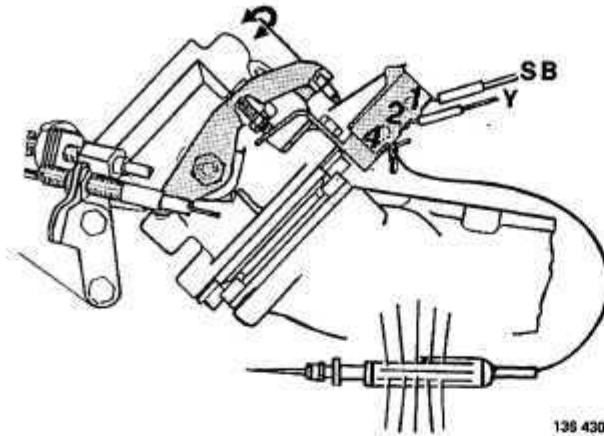
1982 version shown adjacent.

Connect test lamp between 12V power source and:

1981 yellow wire on microswitch

1982 terminal 4 on microswitch

Lamp should light and remain on throughout adjustment, otherwise setting will be incorrect. Adjust if necessary with the **upper** adjustment screws.



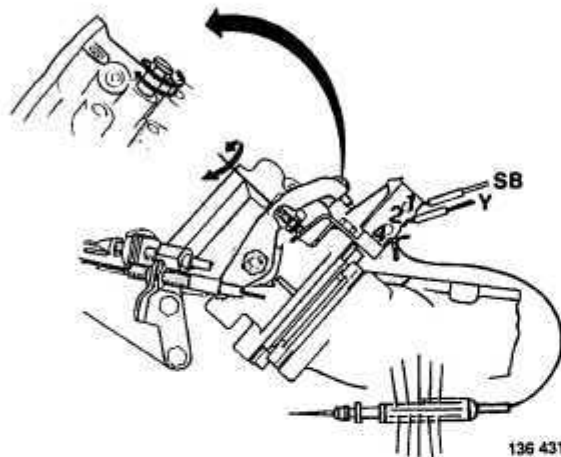
F6

Basic-set throttle valves

Make sure that idle adjustment screw is screwed in fully ie. bottoms.

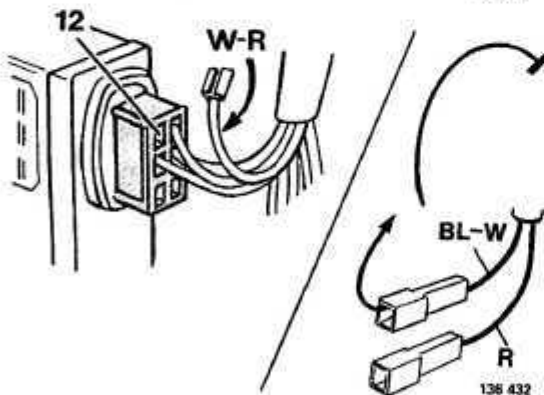
Adjust idle speed with **lower** adjustment screw to 14.2 r/s (850 r/min).

IMPORTANT! Test lamp must remain on.



1981

1982



F7

Connect control unit

1981

Turn off ignition.

Connect white-red wire (terminal 12) to control unit.
Start engine.

1982

Disconnect ground wire from service connection.



F8

Check idle speed

When control unit is engaged idle speed should increase briefly and then stabilize at 15.0 r/s (900 r/min).

Tolerances:

1981 14.2–15.8 r/s (850–950 r/min)

1982 14.7–15.3 r/s (880–920 r/min)



F9

Check fast idle

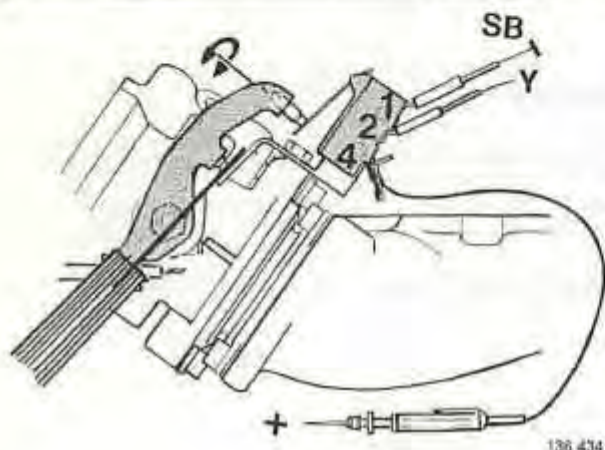
Turn off engine.

Withdraw blue wire from connector on bulkhead. (This disengages temperature sensor and simulates cold start).

Start engine. Engine speed should now be **26.6–40.0 r/s** (1600–2400 r/min).

Reconnect blue wire. Engine speed should return to normal again.

Turn off engine and disconnect rev counter.



F10

Adjust microswitch

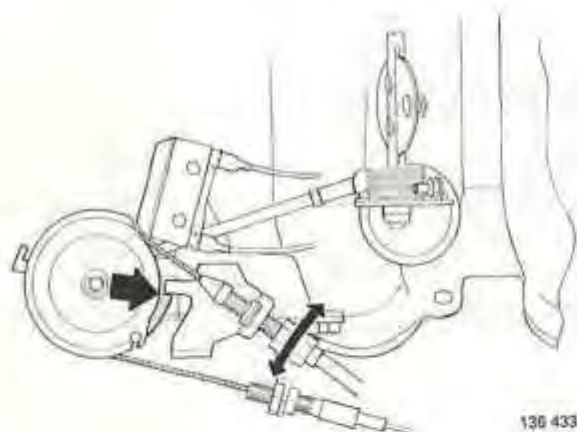
Insert a **0.3 mm** (0.012 in) feeler gauge at **lower** adjustment screw.

Unscrew **upper** adjustment screw until test lamp goes out. Then screw in until lamp just lights.

Check setting with a **0.2 mm** (0.008 in) and a **0.6 mm** (0.024 in) feeler gauge.

0.2 mm = lamp on

0.6 mm = lamp off

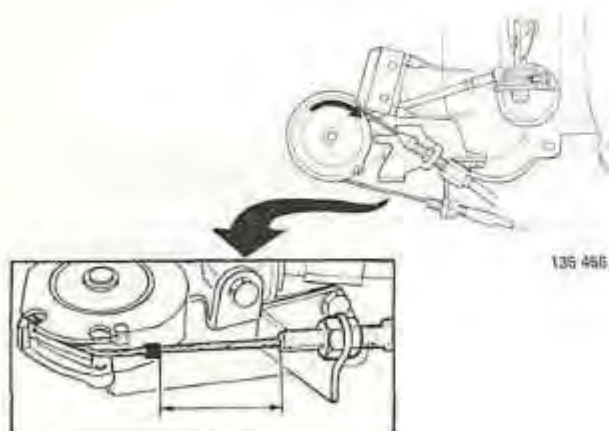


F11

Adjust throttle cable

Throttle pulley should strike stop in idle position. Cable should be taut but must not move throttle pulley.

At full throttle, pulley should contact other stop.



F12

Adjust kick-down cable

Depress accelerator to floor.

Note! Do not adjust cable by hand otherwise setting will be incorrect.

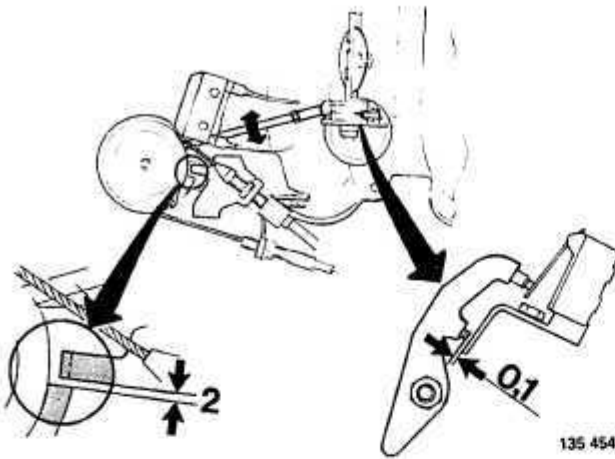
At full throttle, distance between cable sleeve and clip equals **50.4–52.6 mm** (1.98–2.10 in).

F13

Connect and adjust link rod

Insert a 2 mm (0.08 in) feeler gauge at throttle pulley stop.

Adjust link rod to obtain a 0.1 mm (0.004 in) clearance between adjustment screw and stop.



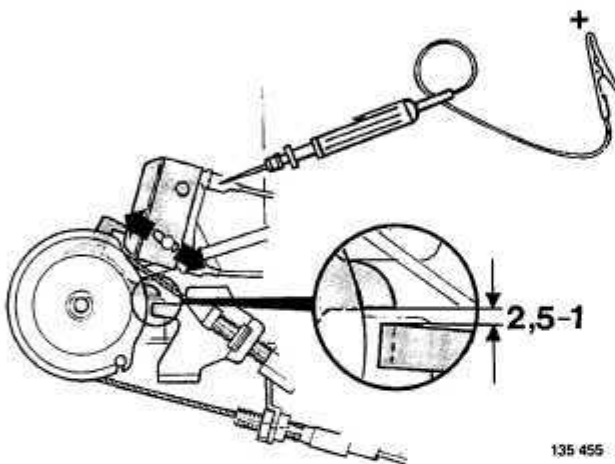
F14

Adjust microswitch at throttle pulley

Connect test lamp between 12V power source and green wire on microswitch.

Adjust microswitch to engage (lamp on) 2.5–1.0 mm (0.1–0.04 in) before throttle pulley contacts full throttle stop.

IMPORTANT! B 28 F USA vehicles for high altitude use: microswitch should be disconnected.



G. Fault tracing of CIS system

It is assumed in the instructions below that the engine is in a good condition and that the ignition is correctly set.

See also wiring diagram on page 95.

IMPORTANT! Ignition must be off when connecting/disconnecting electrical connections.



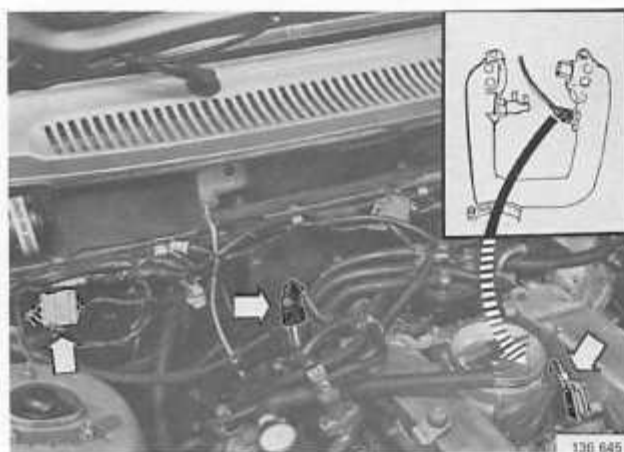
G1

Check air hoses

Make sure that hoses are not kinked or damaged.

If engine speed is far too low:

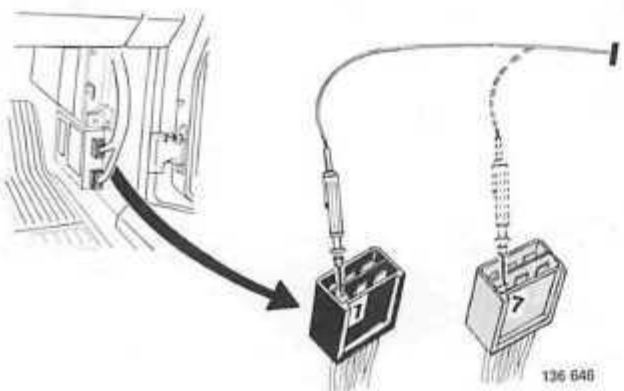
Check hoses, nipples and air valve for blockages. Blockages can be caused by carbon deposits from engine crankcase. Check that oil has been changed according to specifications. Correct if necessary.



G2

Check electrical connections

Note! Poor connections can cause many symptoms.



G3

Disconnect plugs from control unit

Turn on ignition.

G4

Check current supply

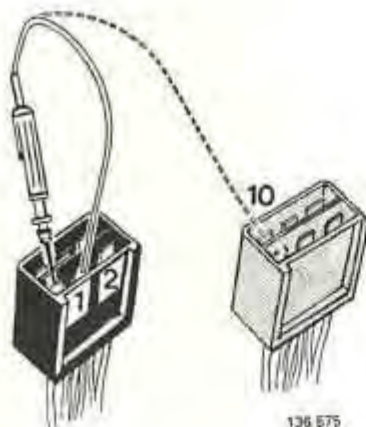
Connect a test lamp between terminal 1 and ground. 1982 models: also connect test lamp between terminal 7 and ground.

Lamp should light. If not, first check fuse No. 13.

G5

Check ground connection

Connect test lamp between terminals 1 and 2.
Lamp should light.

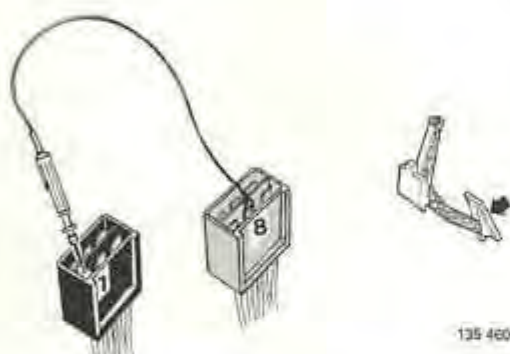


B 28 F 1982

G6

Check that service connection is not grounded

Connect test lamp between terminals 1 and 10.
Lamp should not light.



G7

Check microswitch

Connect test lamp between terminals 1 and 8.
Depress accelerator to floor and observe test lamp.

Note! Microswitch function is different on 1981 and 1982 models.

Test lamp	1981	1982
- accelerator UP (idle)	ON	off
- accelerator depressed	off	ON

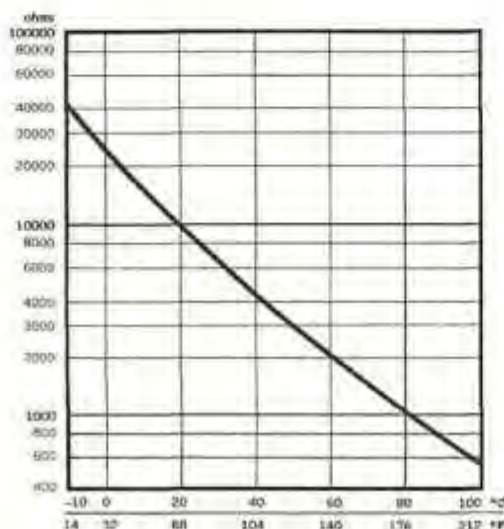
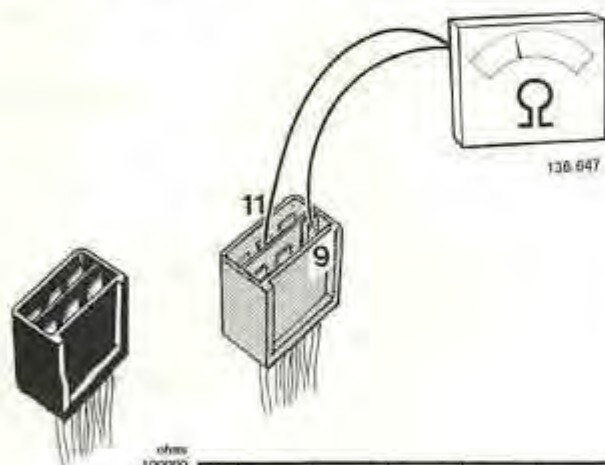
G8

Check temperature sensor

Connect an ohmmeter between terminals 9 and 11.

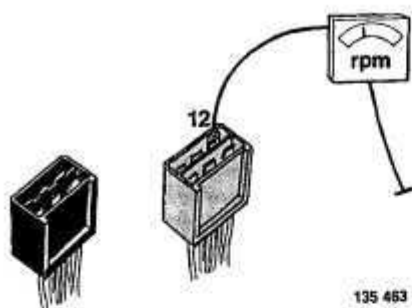
Correct resistance at different temperatures is shown in diagram below.

If incorrect, repeat measurement at temperature sensor. If in doubt, remove sensor and test at different temperatures.



Suitable test temperatures:

-10°C (14°F)	32000-53000Ω
+20°C (68°F)	8500-11500Ω
+80°C (176°F)	770-1320Ω



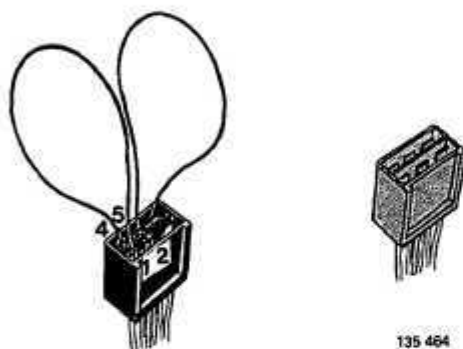
G9

Check signal from ignition coil

Connect a rev counter to terminal 12.

Start engine. Rev counter should indicate engine speed.

Leave rev counter connected and engine running.



G10

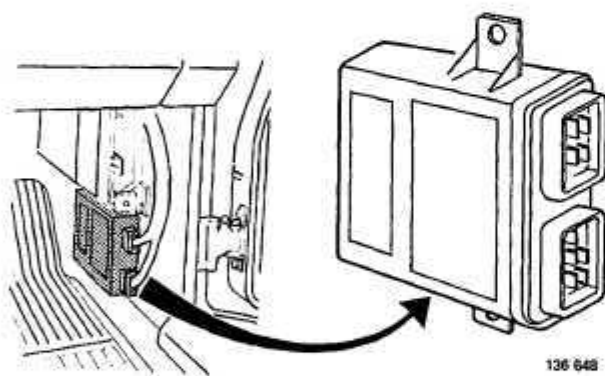
Check air control valve

Two short cables are needed for this test.

Connect one between terminals 5 and 2 and the other between terminals 4 and 1.

Engine speed must remain constant at 26.6–40.0 r/s (1600–2400 r/min).

A defective air control valve is indicated by low engine speed.



G11

Test with a new control unit

If no fault is found in above tests, connect new control unit and retest.

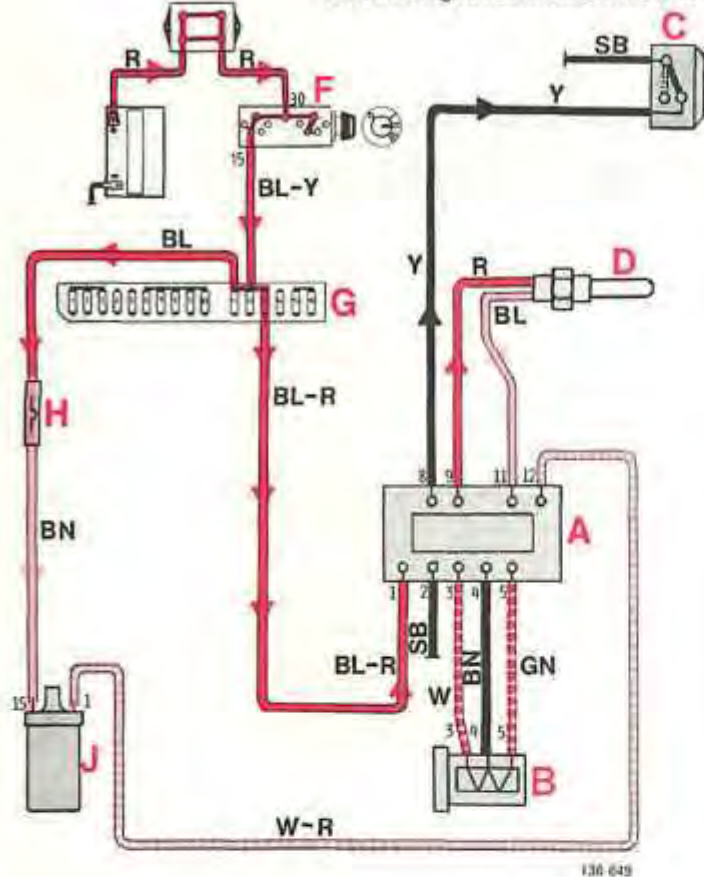
IMPORTANT! Turn off ignition when disconnecting/connecting electrical connections.

Bear in mind that different control units are used for 1981 and 1982 models.

H. Wiring diagram, CIS system

Note! Diagram shows current flow with engine idling.

H1

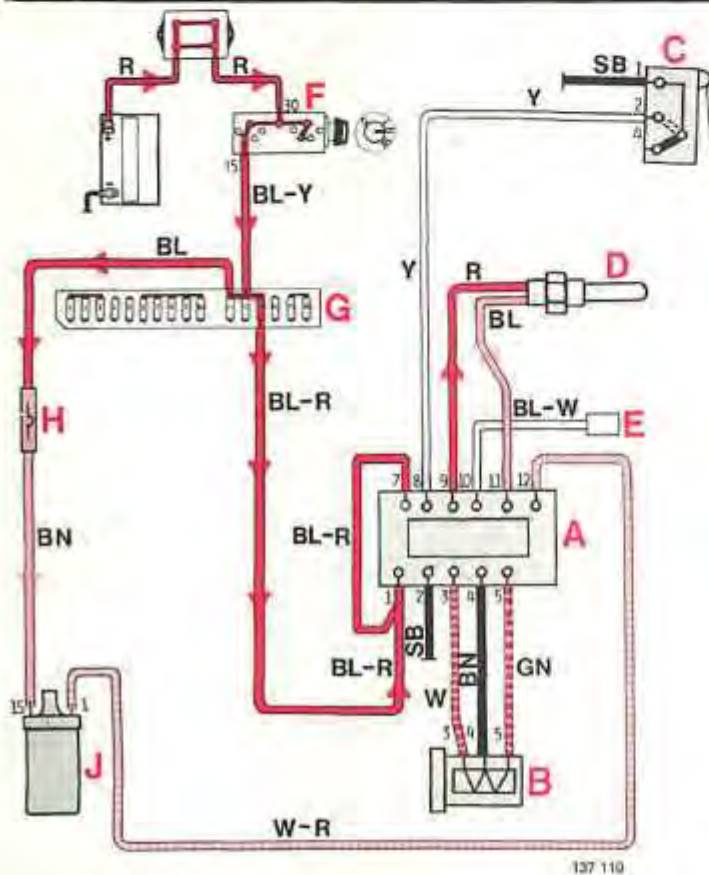


1981

Fuse No. 13
Combined instrument
Direction indicator
Seat belt reminder
CI-system (pump relay)

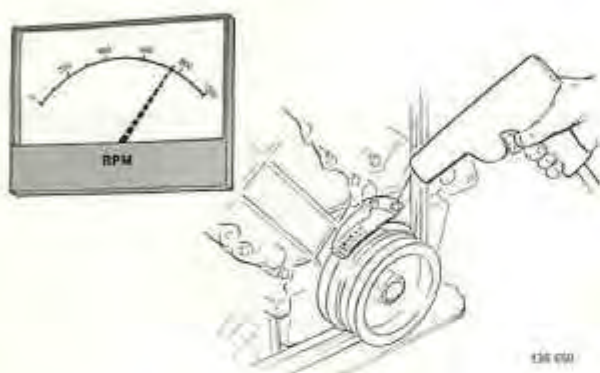
Component
A Control unit, CIS system
B Air control valve
C Microswitch
D Temperature sensor
E Service connection, 1982 only
F Ignition switch
G Fusebox
H Ballast resistor
J Ignition coil

Colour code
SB = black Y = yellow
W = white BL = blue
R = red GN = green
BN = brown



1982

J. Idle speed and CO-content Checking/adjusting



J1

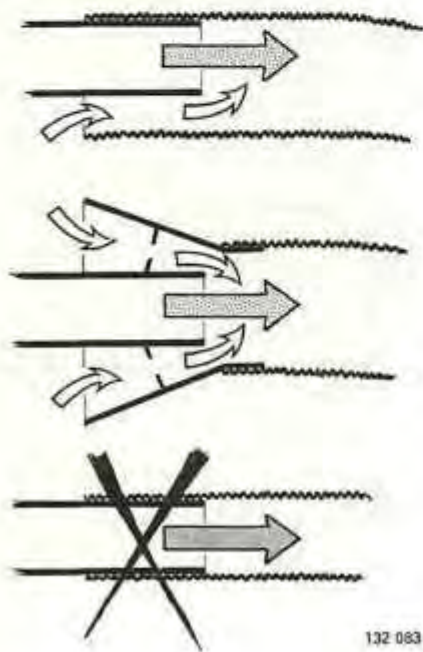
General

It is important that the engine settings are correctly adjusted (e.g., timing) if valid results are to be obtained.

The engine should be warm and idling.

Warm-up the engine at 25 r/s (1500 r/min).

Check/adjust the CO content 5 minutes (no earlier), after the radiator thermostat has opened.



J2

Exhaust gas extraction

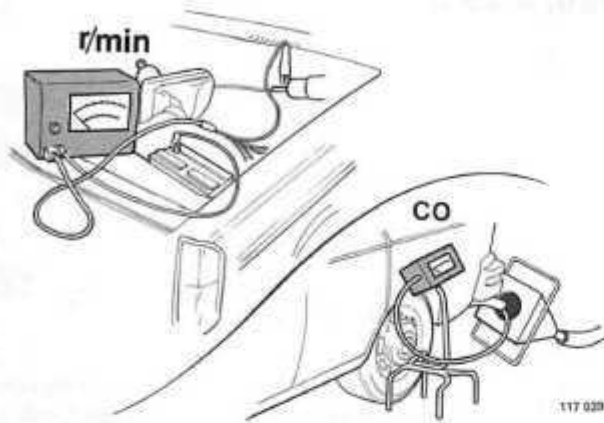
Use an exhaust gas extractor that fits loosely over the exhaust pipe, otherwise CO may be set incorrectly.

Idle speed and CO-content

B 27 E 1975-1978

Operations J3-7

Special tool: 5102



J3

Connect test equipment

- Tachometer (there is no service connection for Volvo Mono-Tester on 1975-1976 or early manufactured 1977 models).
- CO-meter. Probe should be inserted at least 480 mm (19 in) from end of exhaust pipe otherwise fresh air may mix with exhaust gases and cause false results.

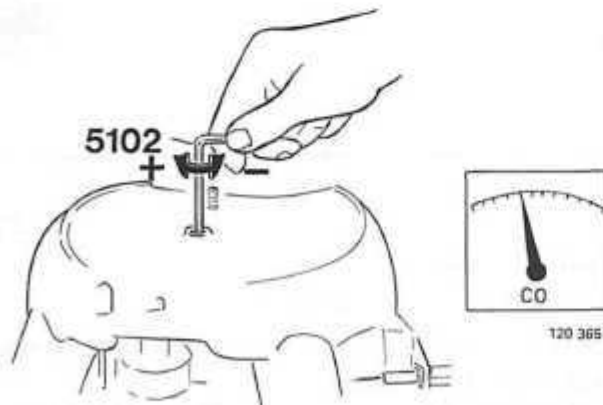


J4

Set idle speed

Engine must be warmed-up to operating temperature.

Idle speed = 15.0 r/s (900 r/min).



J5

Check/adjust CO-content

Engine warm and idling.

Use tool 5102 to adjust CO-content.

After each adjustment rev-up engine for a short while before checking CO-content.

CAUTION! Remove 5102 otherwise air-fuel control unit may be damaged.

- Anti-clockwise (left) reduces CO-content

- Clockwise (right) increases CO-content

Refit plug after adjusting CO.

CO-content	Check value	Setting value
1975-1977		
Sweden + Australia ..	1.0-4.0	1.5
Other markets	1.0-4.0	2.0
1978	1.0-3.0	2.0

J6

Check/adjust idle speed

15.0 r/s (900 r/min).

J7

Remove measuring equipment

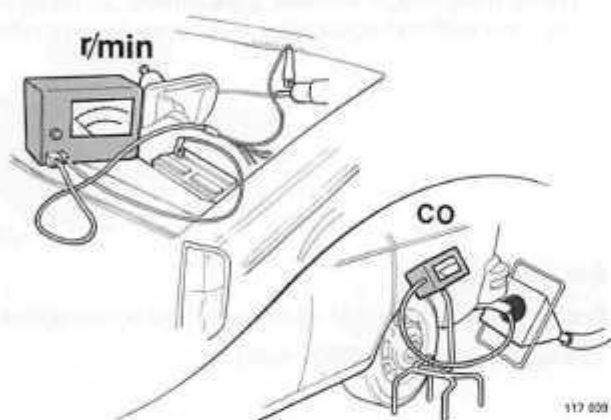
Turn off engine.

Idle and CO content

B 27 E 1979–1980, B 28 E

Operations J8–15

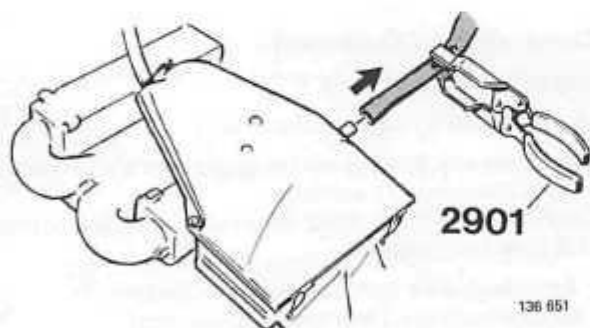
Special tool: (2901) 5102



J8

Connect test equipment

- Rev counter
- CO-meter. Probe should be inserted at least 480 mm (19 in) from end of exhaust pipe otherwise fresh air may mix with exhaust gases and cause false results.



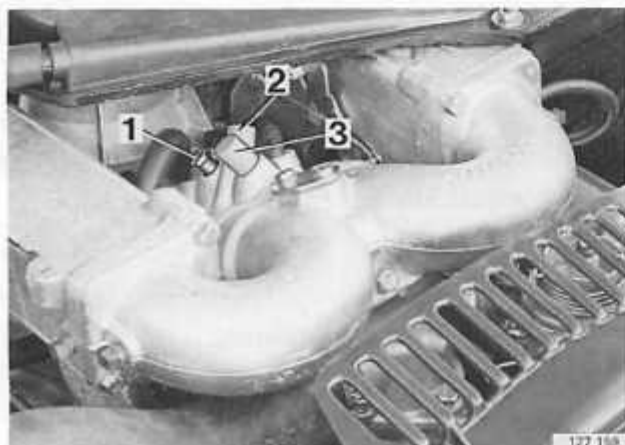
J9

Vehicles with Pulsair system

Disconnect Pulsair system.

This is necessary otherwise false readings will be obtained.

Disconnect and plug hose or block hose with pliers 2901.



J10

Set idle speed

Warm engine. Adjust with screw 1.

Manual gearbox 15.0 r/s (900 r/min)

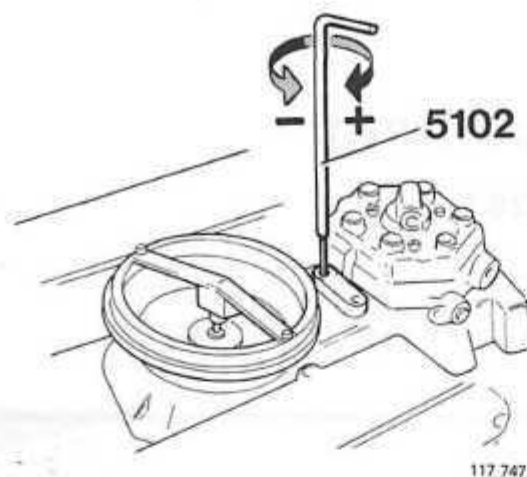
Automatic transmission:

1979–1981 All 16.7 r/s (1 000 r/min)

1982 Sweden + Australia ... 16.7 r/s (1 000 r/min)

1982 Other markets 15.0 r/s (900 r/min)

J11

**Check/adjust CO-content**

CO-content, checking	1.0–3.0%
setting	2.0%

Use wrench **5102** to adjust CO-content.

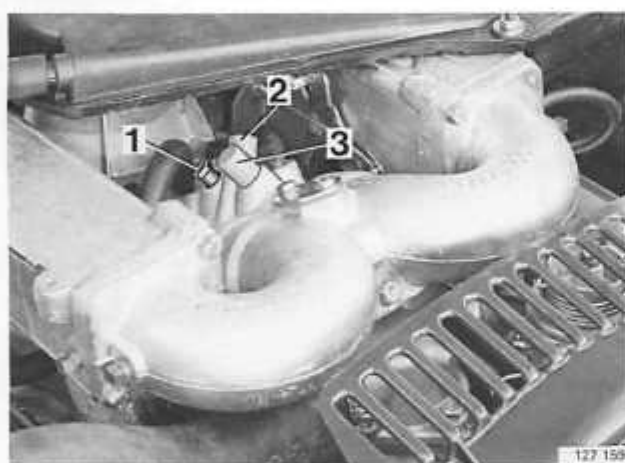
- anti-clockwise (**left**) reduces CO-content.
- clockwise (**right**) increases CO-content.

After each adjustment rev-up engine for a short while before checking CO-content.

CAUTION! Remove 5102 otherwise air-fuel control unit may be damaged.

Refit plug after adjusting CO.

J12

**Basic-setting of balance screws**

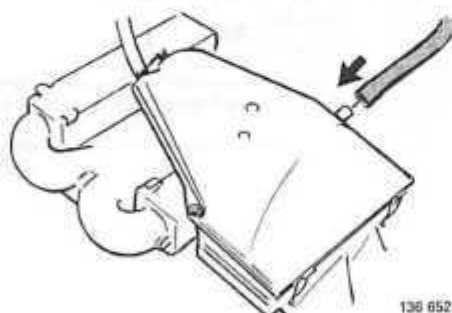
Balance screws need only be reset if idle is rough on condition that all other engine controls are correctly set.

Screw in both balance screws (2 and 3) fully to bottom position. Then unscrew:

- screw 2 (left bank = cylinders 1, 2, 3) **1.5 turns**
- screw 3 (right bank = cylinders 4, 5, 6) **5.0 turns**

Adjust idle speed and CO-content according to J10–11.

J13

**Reconnect hose to pulsair system**

J14

Check/adjust idle speed

See J10.

J15

Disconnect test equipment

Turn off engine.

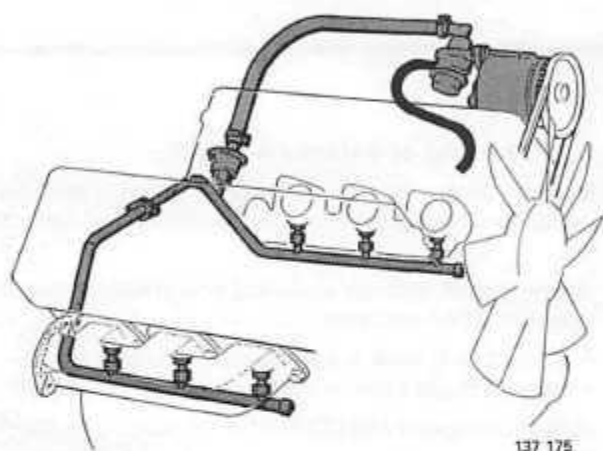
Idle and CO-content

B 27 F and B 28 F

Operations J16-30

Special tools 5102, 5151

5232 USA 1981-1982, Canada 1982)

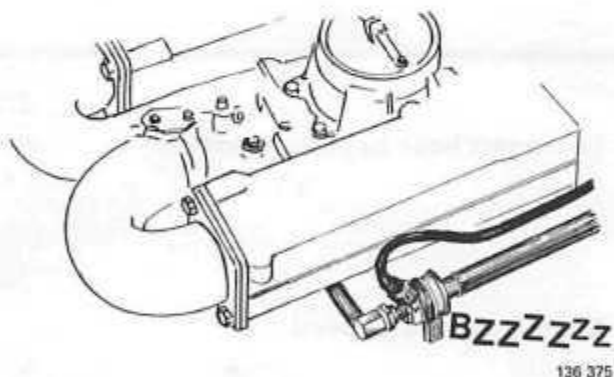


Special care must be taken when adjusting/checking CO and idle on engines with systems shown below.

• Air pump

B 27 F 1976 All models

1977 All apart from USA Federal models



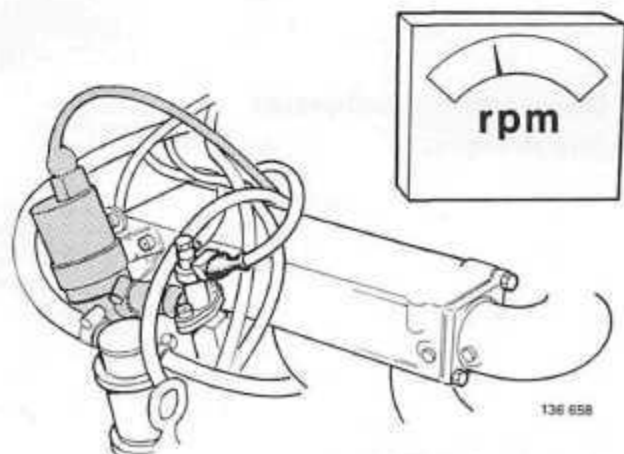
• Lambda-sond system

B 27 F 1978 USA California + Japan

1979 All models

B 28 F 1980-1982 All models

Illustration on left shows frequency valve in Lambda-sond system.



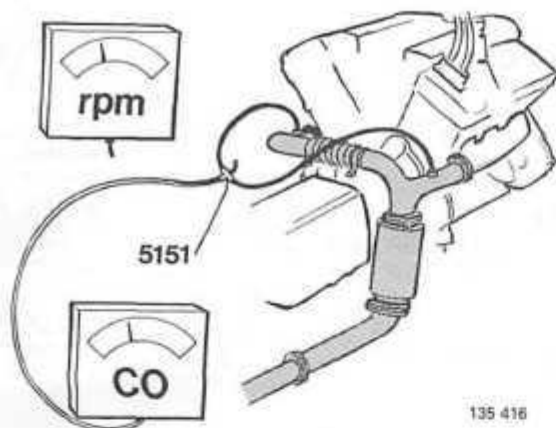
• Constant idle speed system

B 28 F 1981 USA California + Japan

1982 All models

Illustration shows air control valve in CIS-system.

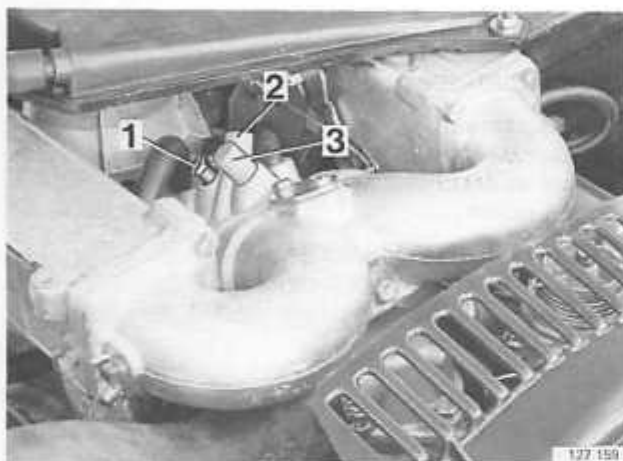
J16



135 416

Connect test equipment

- rev counter
- CO-meter. Connect to adapter **5151**, lever should be in centre position.



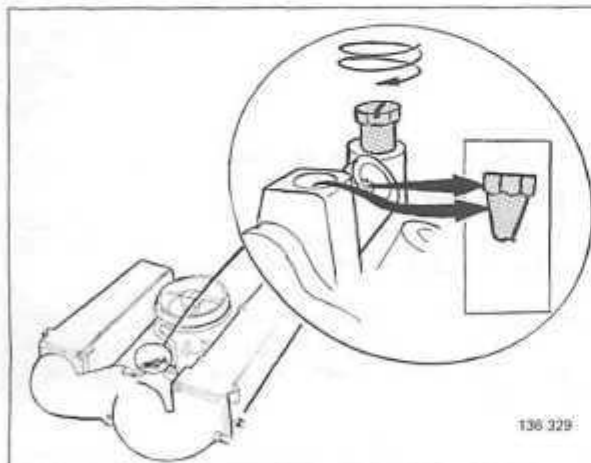
127 159

J17

Check/adjust idle speed

Warm engine. Adjust with screw 1.

B 27 F 1977 California	15.8 r/s (950 r/min)
B 28 F 1980	15.8 r/s (950 r/min)
Other markets	15.0 r/s (900 r/min)

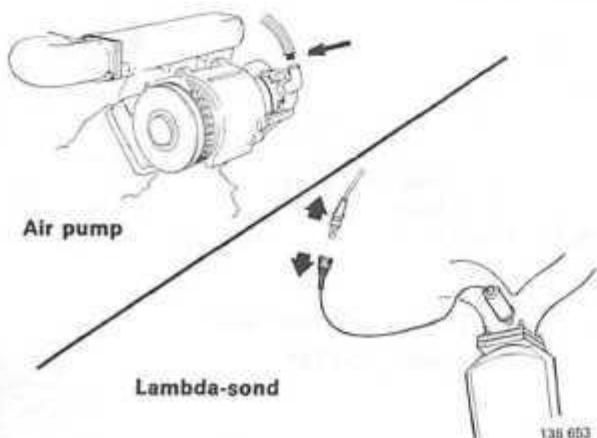


136 329

IMPORTANT!

The following applies for engines equipped with CIS-system

- idle adjustment screw (1) must be screwed in fully
- balance screws (2 & 3) are of shear-head type and must be screwed in until heads break off.
- if idle speed is incorrect, CIS-system must be checked and basic-set whenever necessary. See F1-14, page 88.



138 653

Engines with air pump

J18

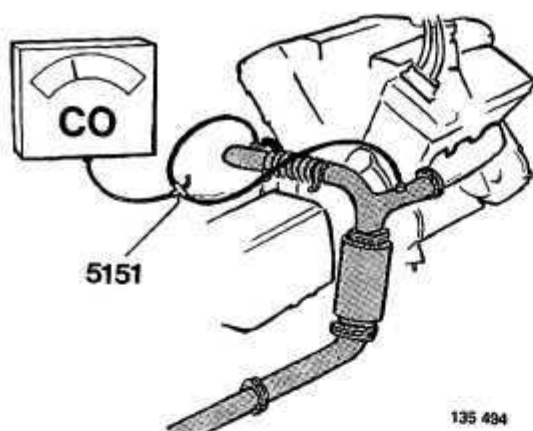
Disconnect air pump:

Disconnect hose from air pump.

Plug hose or block hose with clamps **2901** (safety precaution).**Engines with lambda-sond system**

J19

Disconnect lambda-sond

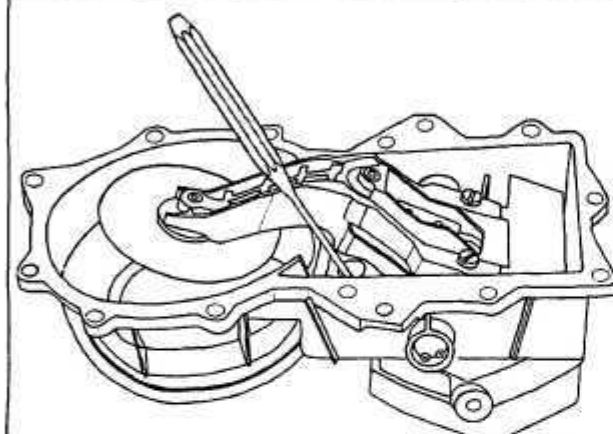


135 494

Check CO-content

Adapter lever (5151) must be in centre position:

		Checking value
B 27 F	1976	1.4–2.0%
	1977 USA Calif.	0.4–1.0%
	1977 USA Fed.	0.7–1.3%
	1977 Canada + Japan	1.4–2.0%
	1978–1979	0.7–1.3%
B 28 F	1980–1982	0.7–1.3%



130 951

B 28 F 1981–1982 USA, 1982 Canada

CO adjustment is sealed with a steel ball. To remove steel ball, lift off upper section of air-flow sensor as described on page 68. Tap out steel ball with a punch.

CO may only be adjusted if:

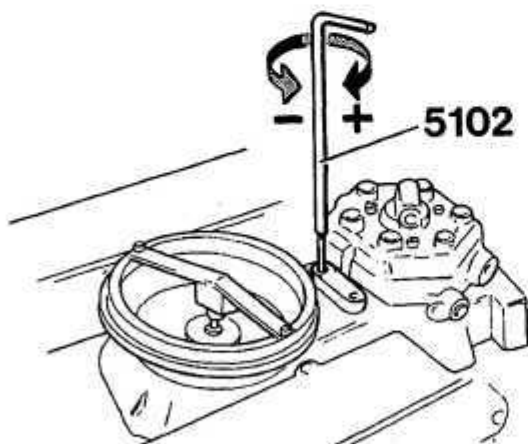
- not according to specifications
- when all other possible causes have been checked/remedied.

Adjust CO-content (as applicable)

Use wrench 5102.

- Anticlockwise (left) reduces CO-content
- Clockwise (right) increases CO-content.

After each adjustment: remove wrench 5102 and cover hole in air-flow sensor for CO-adjustment. Rev-up engine briefly. If this is not done, incorrect results will be obtained.



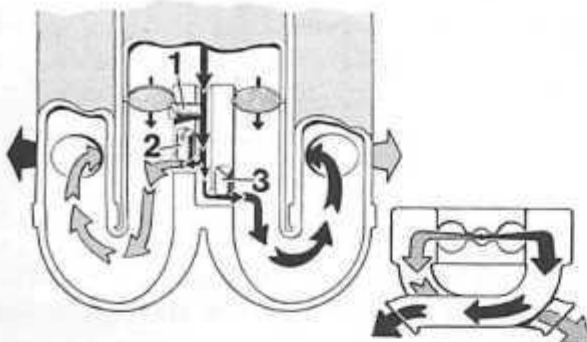
117 747

Idle speed must be correct when checking the CO-content, adjust if necessary.

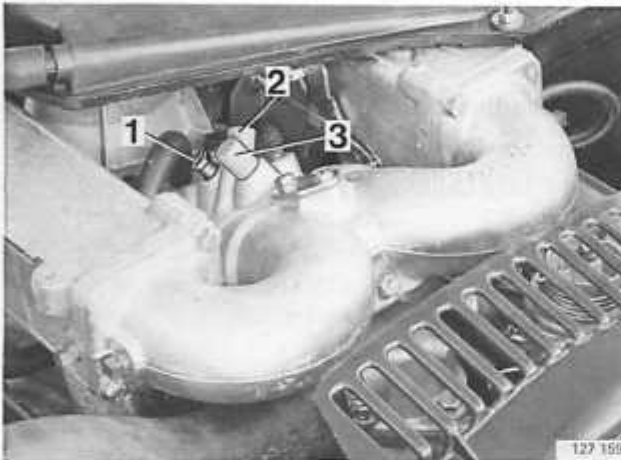
		Setting value
B 27 F	1976	1.7%
	1977 USA California	0.7%
	1977 USA Federal	1.0%
	1977 Canada + Japan	1.7%
	1978–1979	1.0%
B 28 F	1980–1982	1.0%

Cars without CO adjustment seal:

Refit plug after adjusting CO.



136 654



129 159

Checking/adjusting CO balance

IMPORTANT! Not applicable to engines with CIS-system.

Operations J22-24

Balance screws need only be reset if idle is rough, on condition that all other engine controls are correctly set.

Idle adjustment screw 1 allows a certain amount of air to pass by. This air is divided between both cylinder banks, and balanced by screws 2 and 3.

Screw 2 is for left bank = cylinders 1, 2 and 3.

Screw 3 is for right bank = cylinders 4, 5 and 6.

J22

Basic-set balance screws

Only necessary if engine running is very rough.

Screw in screws 2 and 3 fully.

Then unscrew screw 2 – 1.5 turns and 3 – 5 turns.

J23

Check/adjust CO balance

Set lever on adapter 5151 to point towards left cylinder bank.

Record CO-content.

Turn lever to point towards right cylinder bank.

Record CO content.

CO content should be same for both cylinder banks. Adjust by screwing in screw for bank with lowest CO.

Example

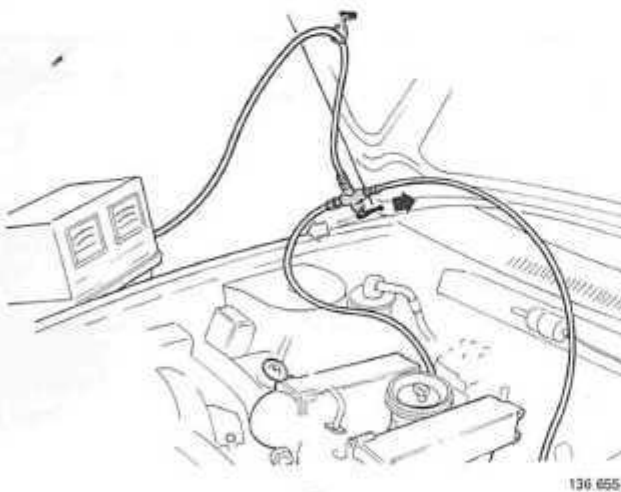
Screwing in screw 2 will reduce air-flow to left cylinder bank and cause CO to increase. Air-flow to right bank will accordingly increase, and CO decrease.

J24

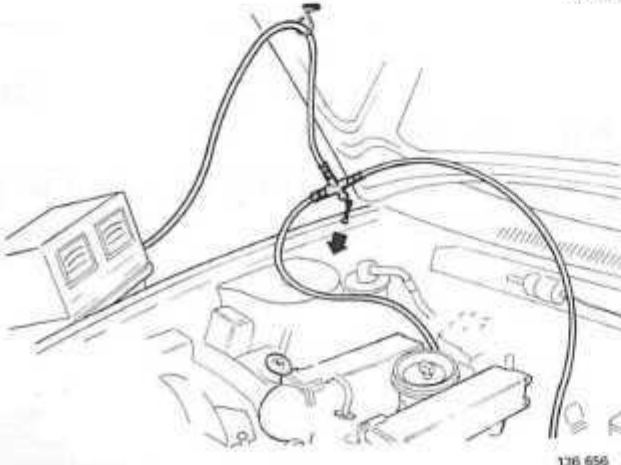
Check/adjust CO-content

Check/adjust CO for both cylinder banks together. If necessary refer to J20-21.

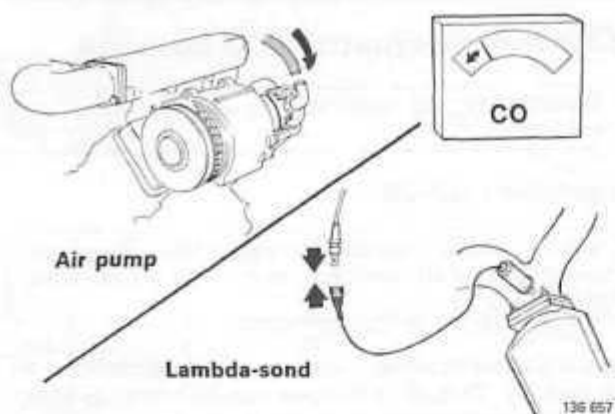
Adapter lever 5151 should be in center position.



136 655



136 656



Engines with air pump

J25

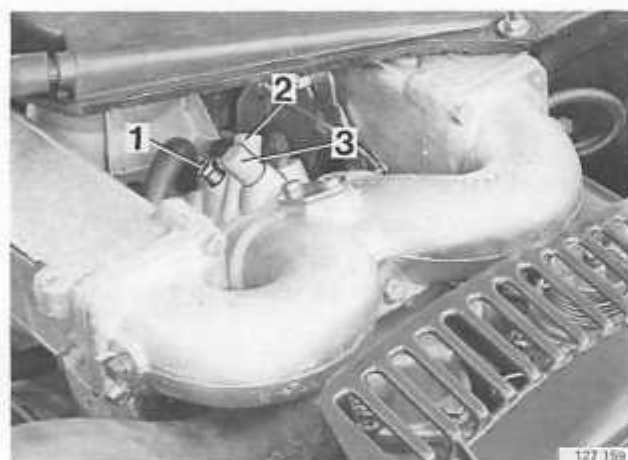
Connect hose to air pump.

When hose is connected CO-content should drop indicating that system is functioning.

J26

Engines with Lambda-sensor system:

When Lambda-sensor is connected the CO should drop to **less than 1.0%**, indicating that system is functioning.



J27

Check/adjust idle speed

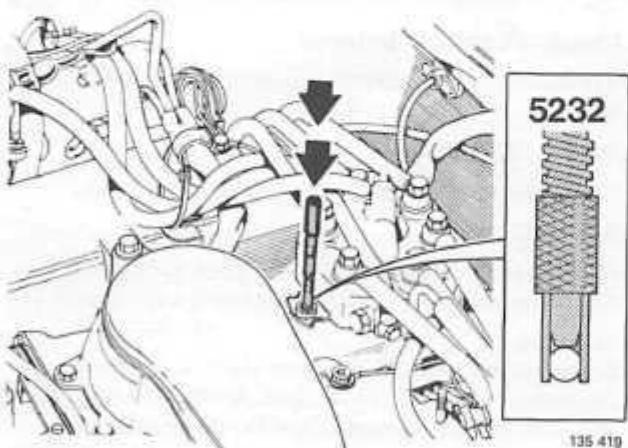
Adjust screw 1

B 27 F 1977 California	15.8 r/s (950 r/min)
B 28 F 1980	15.8 r/s (950 r/min)
Other markets	15.0 r/s (900 r/min)

Note! Engines with CIS-system: idle adjustment screw (1) must be screwed in fully.

J28

Turn off engine



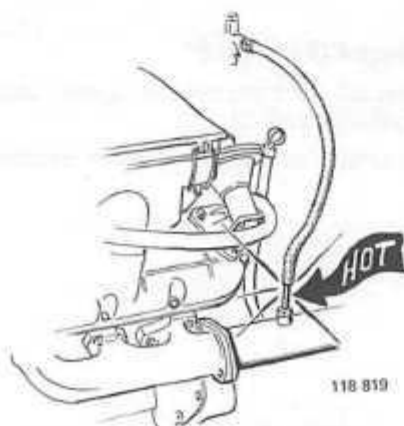
B 28 F 1981–1982 USA, 1982 Canada

If CO is adjusted:

J29

Seal air-flow sensor

Place steel ball in tool 5232 and tap it into position.



J30

Remove test equipment

WARNING! Adapter nipples for CO-gauge may be extremely hot.

Refit plugs in exhaust pipe.

K. Miscellaneous

Air filter, air pre-heating

Operations K1-4

K1

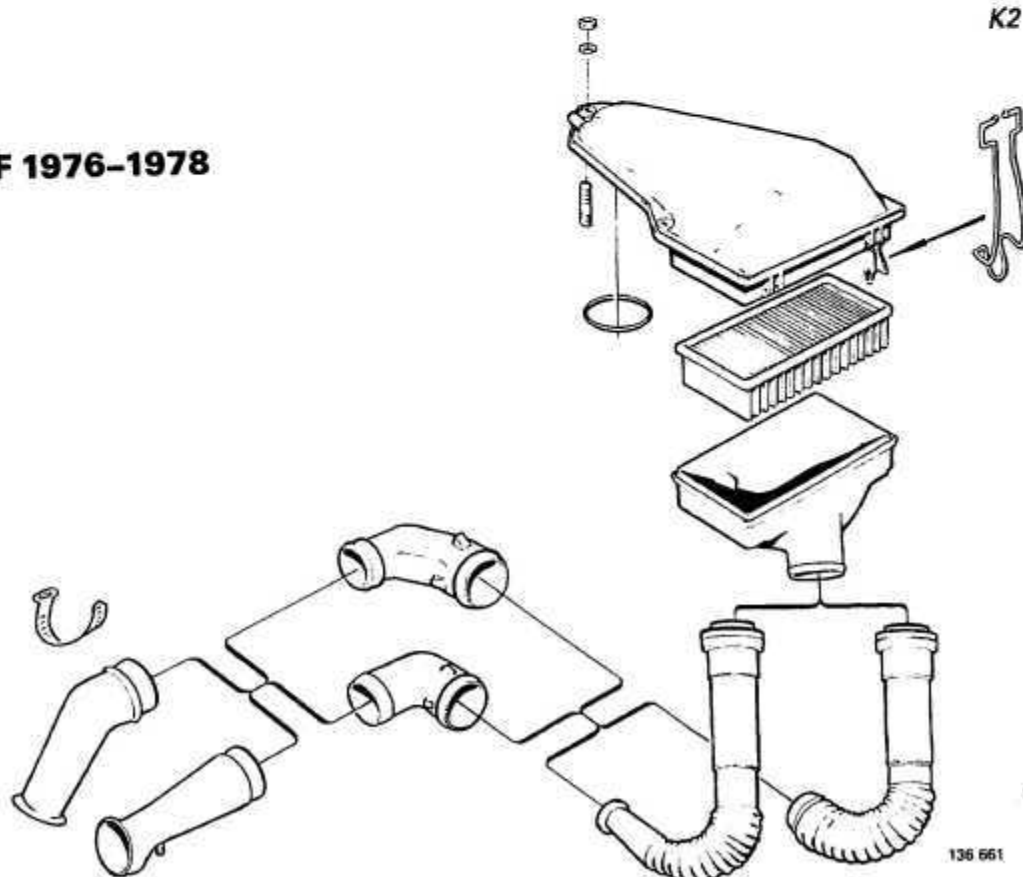


B 27 E 1975-1978

136 660

B 27 F 1976-1978

K2



136 661

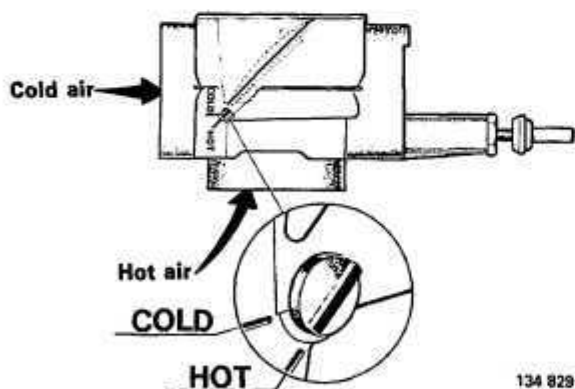
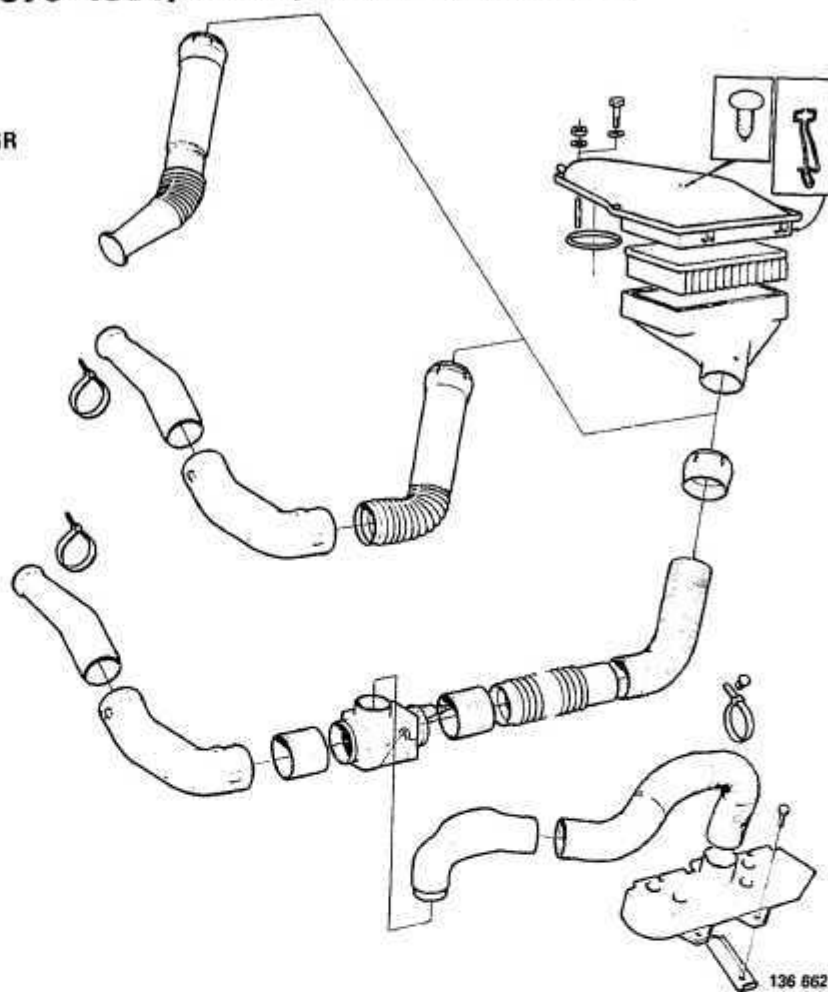
B 27 E 1979-1980, B 28 E, B 27 F 1979, B 28 F

K3

1979 without EGR

1979 with EGR

1980-1983

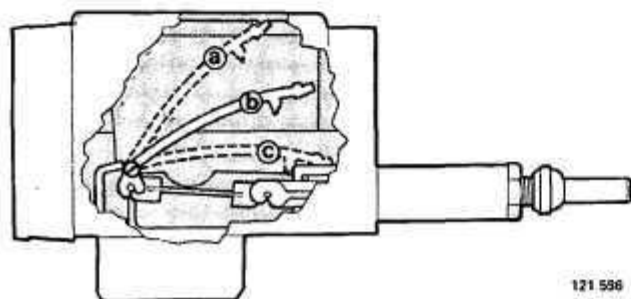


K4

Shutter housing for air pre-heating

Position of shutter at different temperatures can be checked by observing ends of spindle, see fig. For a more exact check, it is necessary to remove the shutter housing and test the thermostat in warm water.

If defective, replace the complete shutter housing and thermostat.



Shutter positions:

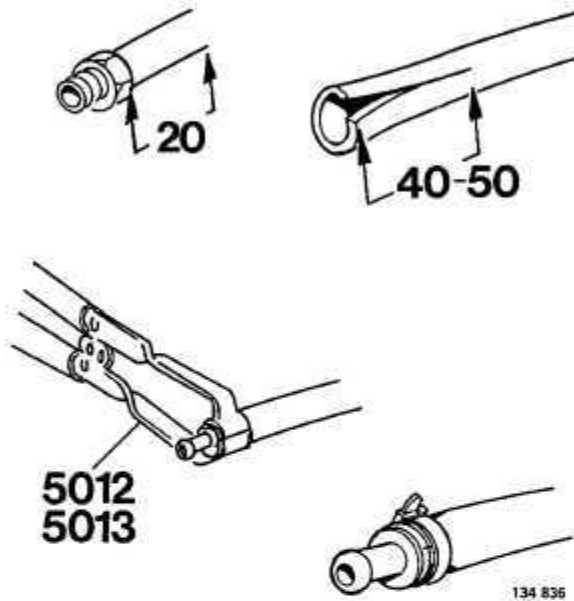
- a hot air only up to 15°C (59°F)
- b intermediate
- c cold air only = from 25°C (77°F)

Fuel lines

Operations K5-19

Replacing nipples in fuel lines (plastic hoses)

Special tools: 5012, 5013



K5

Always use new nipples when reconnecting fuel lines since sealing surfaces of the nipples are easily damaged on removal.

To fit a new nipple, cut fuel line at right angles approx. 20 mm (0.8 in) from adapter.

Cut a slit in the outer shielding hose approx. 40-50 mm (1.6-2.0 in) long.

Remove dirt from fuel line and blow clean.

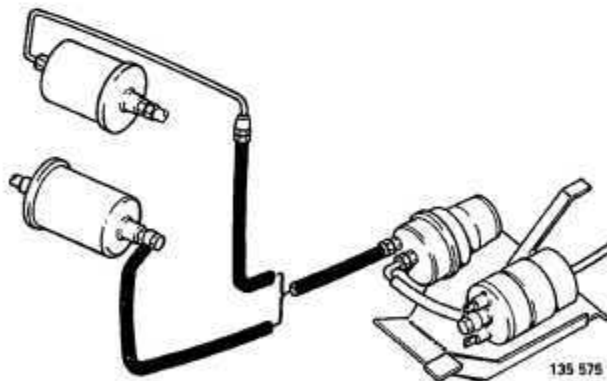
Use pliers 5012 (5013 for larger sizes) as shown. Heat fuel line with hot air, eg. use a hair dryer, and press in the new nipple. White spirit can be used as a lubricant.

Fold back the outer shielding hose and fit a strip clamp.

Replacing fuel line between fuel accumulator and fuel filter

(Right hand drive vehicles: from fuel accumulator to connector on firewall)

1978-1982 models only



K6

In March 1982 one-piece polyamide plastic fuel lines were introduced into production instead of steel fuel lines.

This was done primarily for economical reasons but fuel injection engines have also benefitted by a reduction in noise level from fuel pump.

Only the new type of fuel line will be stocked by the Parts Department for 1978- vehicles.

See next page for replacement method.

Required parts

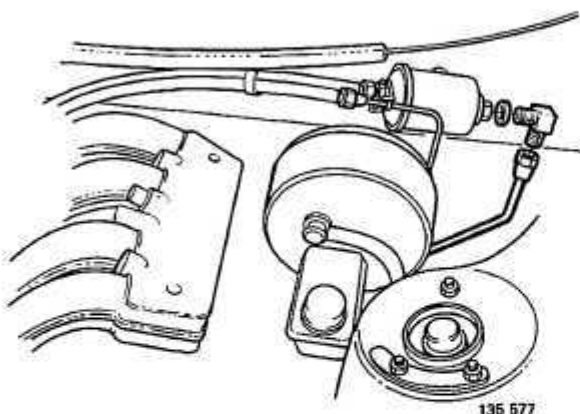
Fuel line	
Clamp	
Strip clamp	
Hollow screw	
Seal (2x)	

Left hand drive

1312287-4
1221990-3
948211-8
25167-8
18671-8

Right hand drive

1312286-4
1221990-3
-
-
-



Left hand drive vehicles

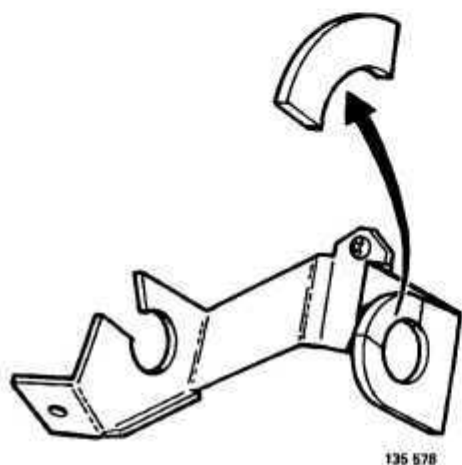
Operations K7-9

K7

Disconnect fuel line and elbow connector from fuel filter

First unscrew fuel tank cap to release pressure from fuel tank (reduces spillages).

Remove dirt from connections before disconnecting fuel line.

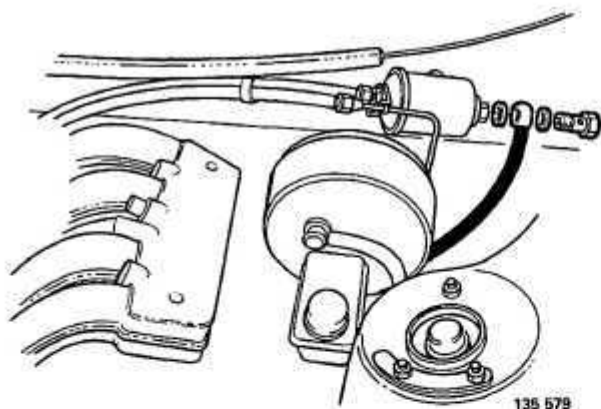


USA 1979-, Other markets 1980-

K8

Cut out a piece of fuel filter bracket

This is necessary to prevent fuel filter from turning when fuel line is connected. File edges on bracket.

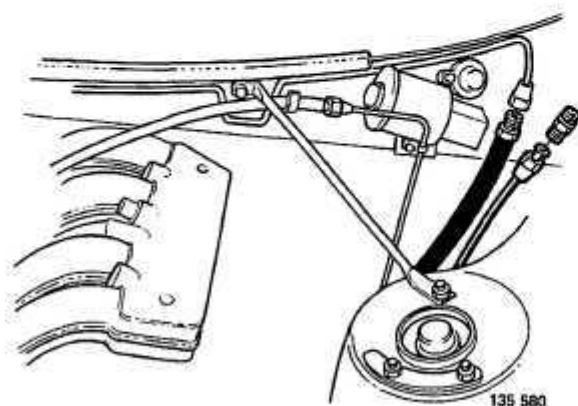


K9

Connect new fuel line to fuel filter

Tape over end of fuel line to prevent dirt from entering. Route fuel line alongside existing one.

Connect it to fuel filter, use new seals.



Right hand drive vehicles

K10

Connect new fuel line to junction on firewall

Unscrew fuel tank cap to release pressure from fuel tank (reduces spillages).

Clean connections before disconnecting fuel line.

Tape over end of fuel line to prevent dirt from entering.

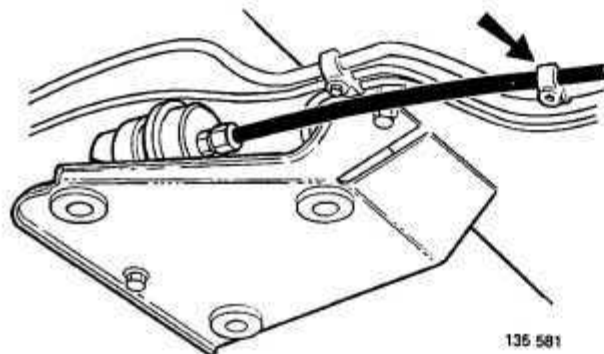
Route fuel line alongside existing one.

Connect fuel line.

Left and Right hand drive vehicles

K11

Remove old fuel line.



K12

Connect new fuel line to fuel accumulator

Fit clamps

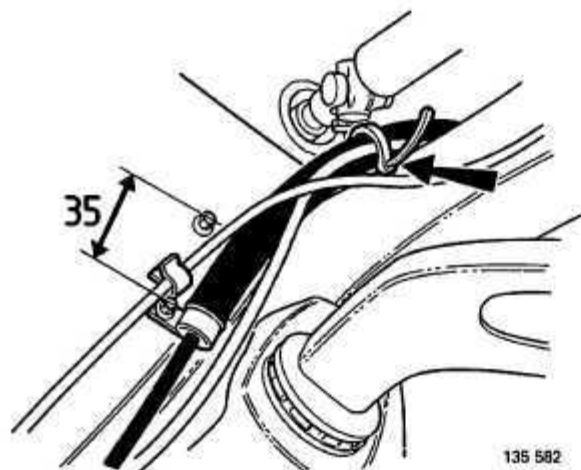
Start at rear and clamp fuel line with old clamps. Do not fit front clamp at this stage.

Fit a new clamp (arrowed).

K13

Fit front clamp

Move clamp approx. 35 mm (1.4 in) downwards in relation to old position. Drill a 3.5 mm (0.14 in) hole for clamp.



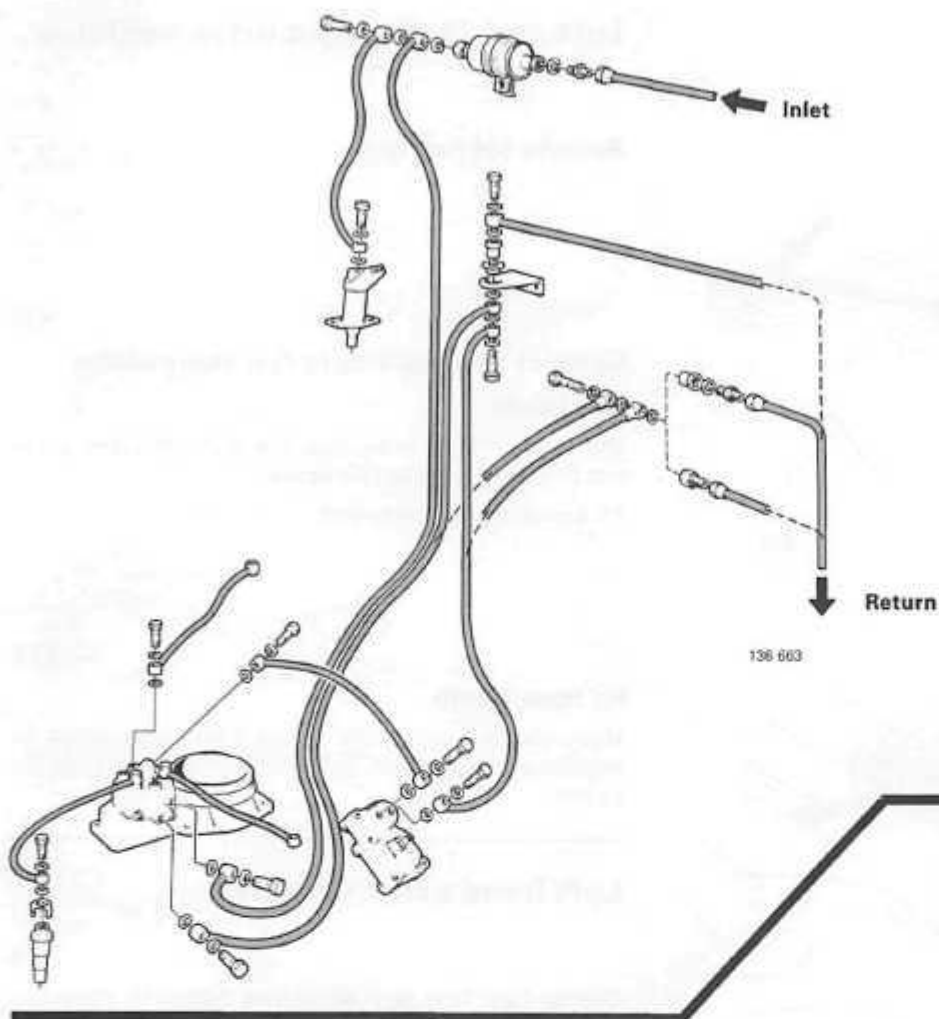
Left hand drive vehicles

K14

Clamp fuel line to return line beneath steering column

Use strip clamps.

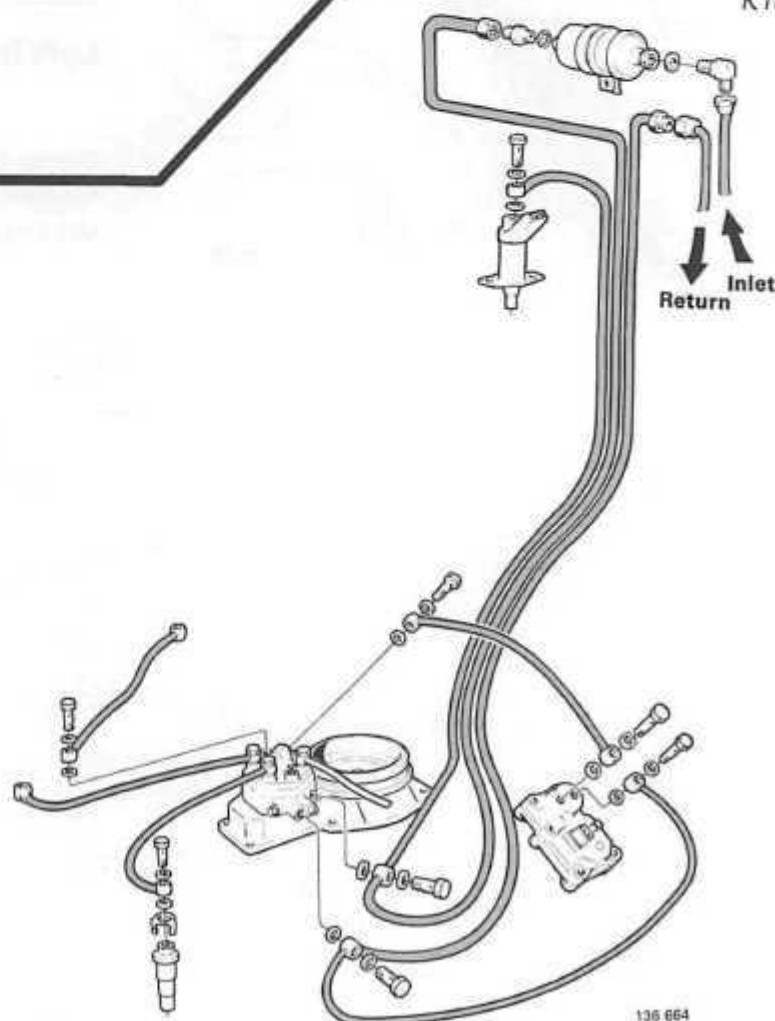
K15



B 27 E 1975

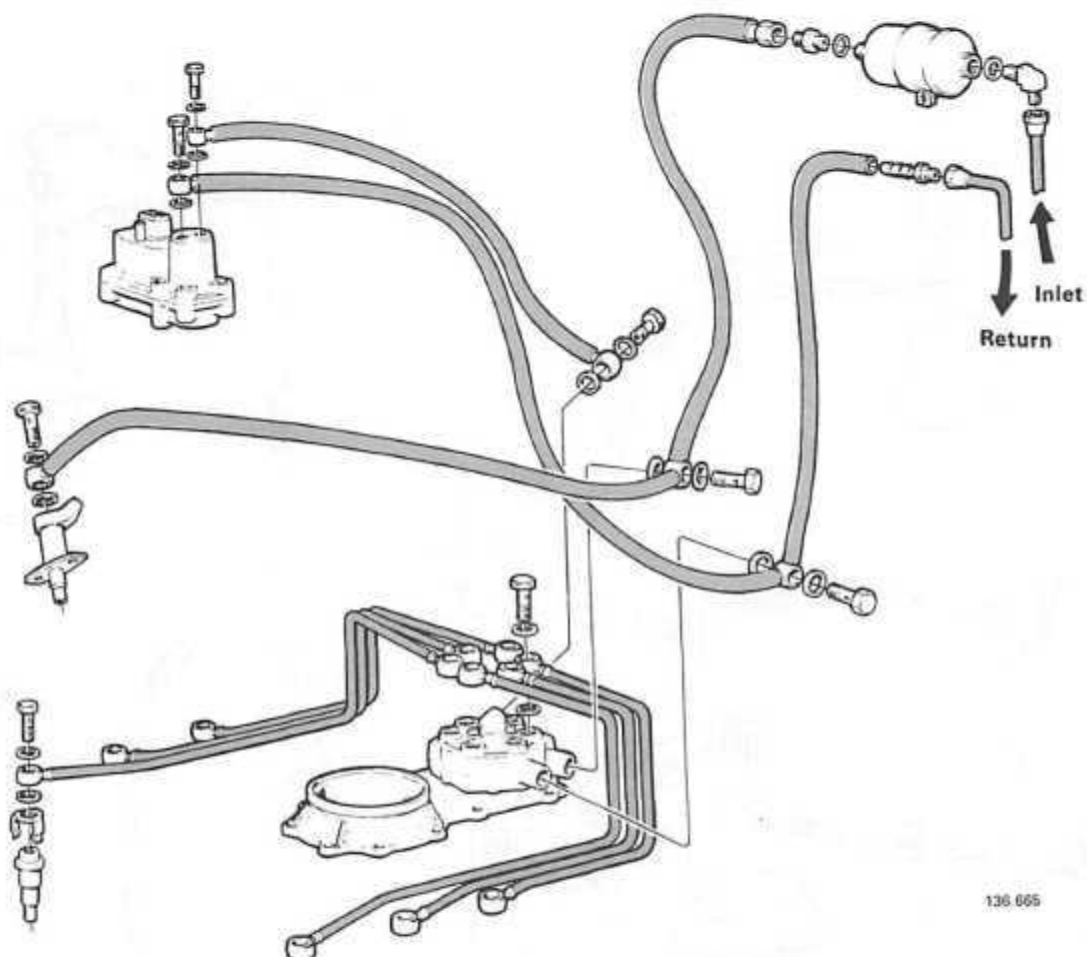
K16

B 27 E 1976-1978



B 27 F 1976-1977

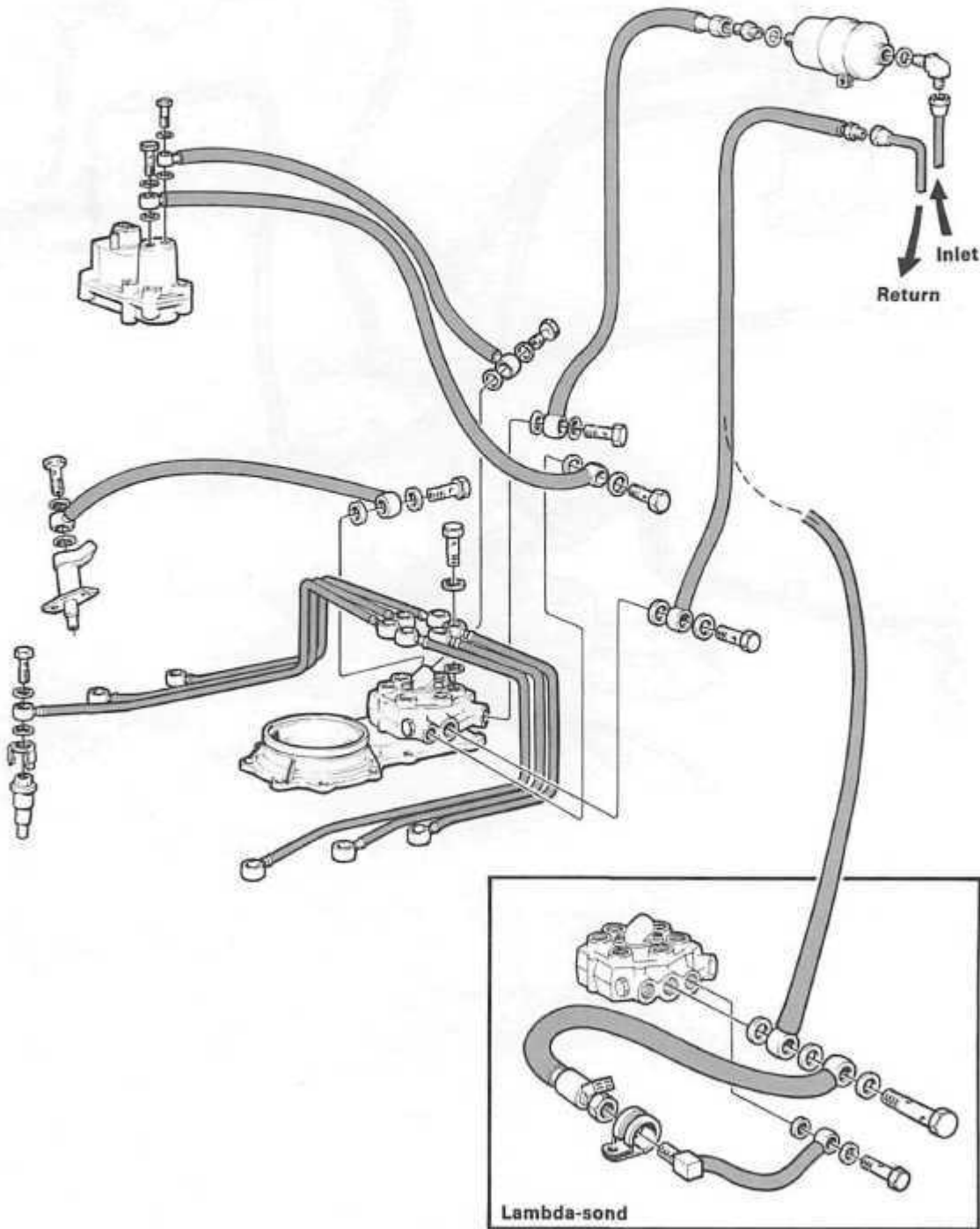
K17



136 665

B 27 F 1978

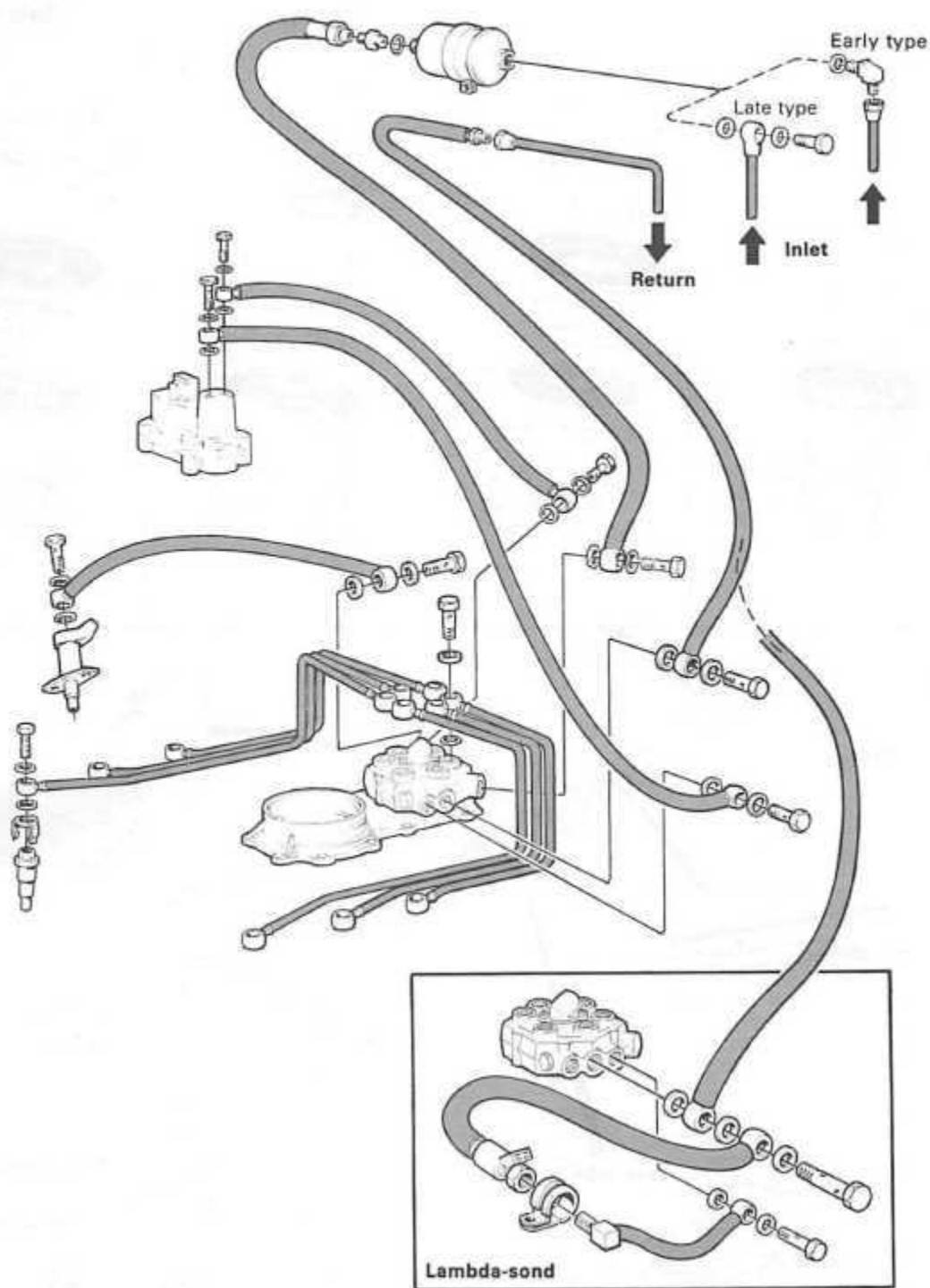
K18



136 666

**B 27 E 1979-1980: B 27 F 1979
B 28 E: B 28 F**

K19

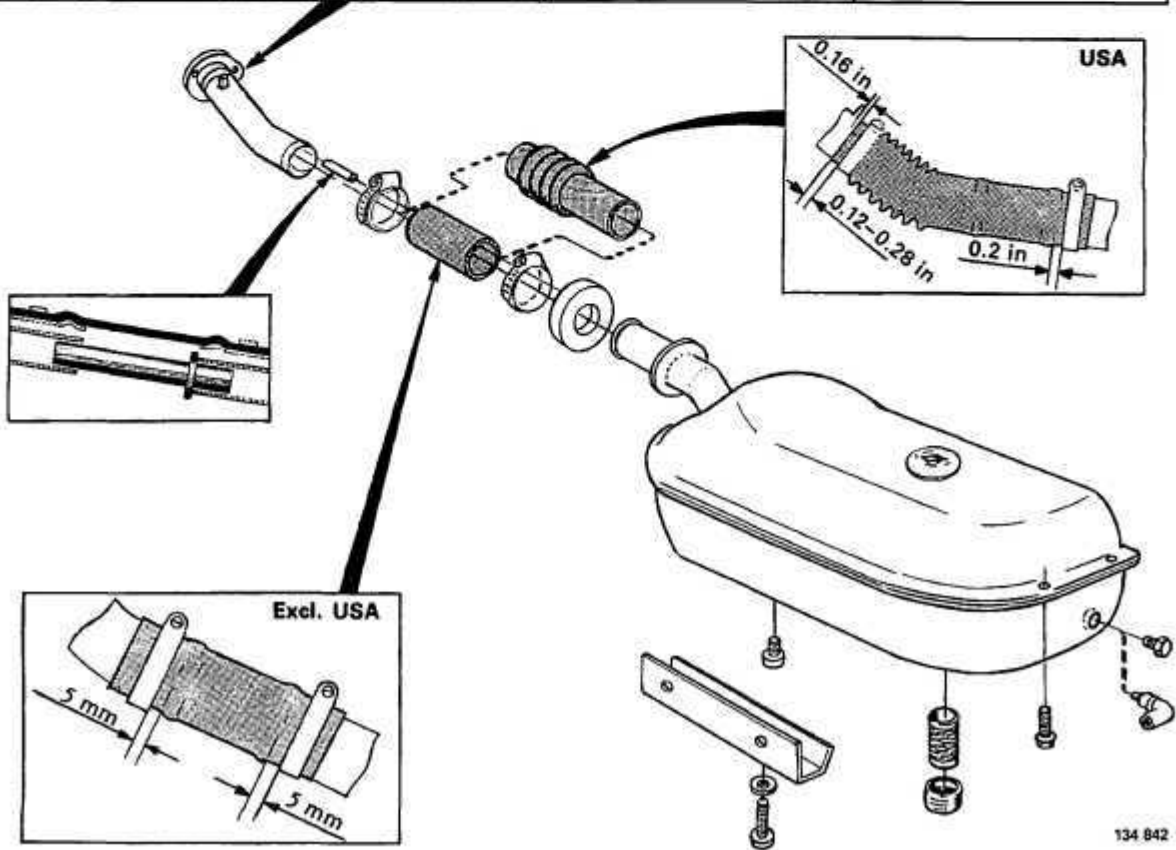
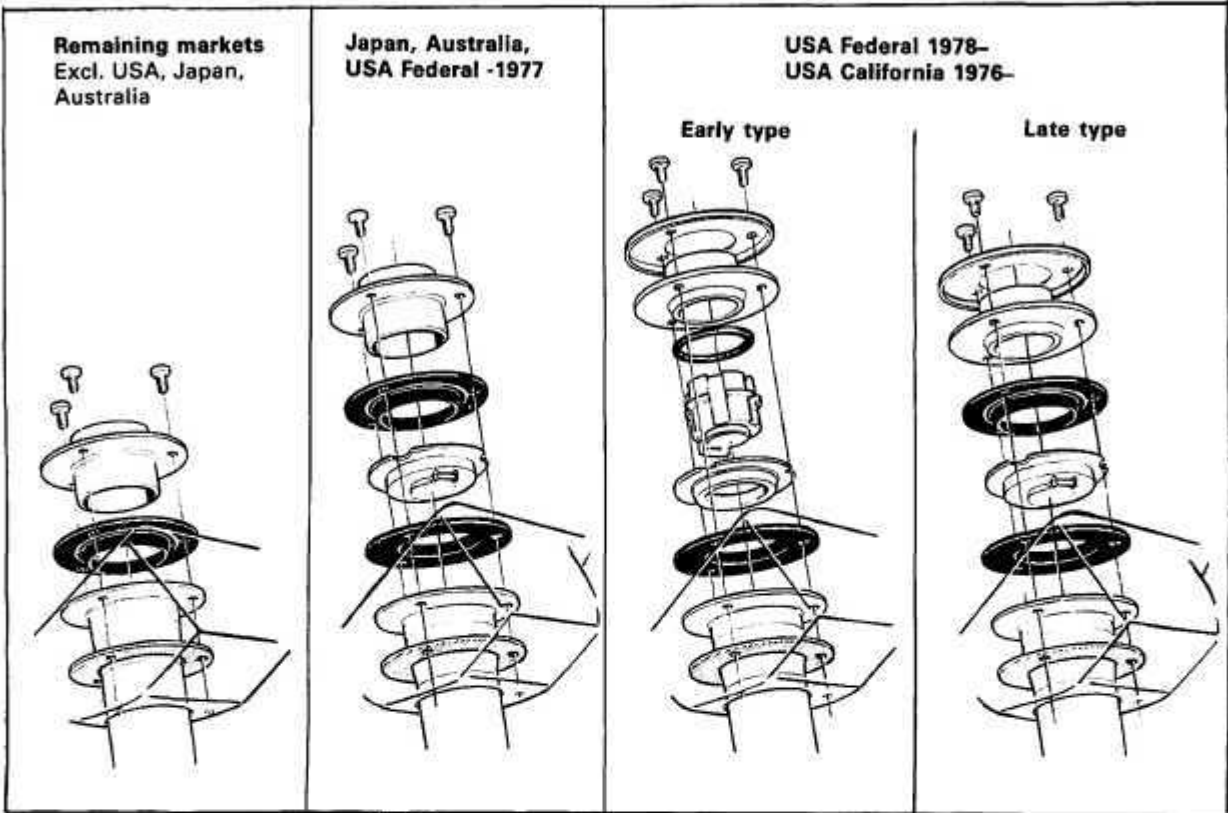


136 667

FUEL TANK 1975- MIDDLE OF 1978

Operations K20-43

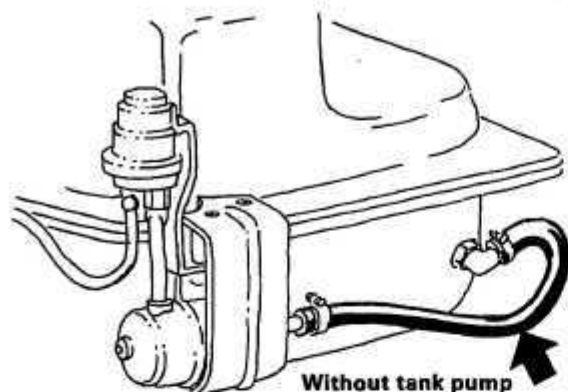
Model	Chassis number
262	→ 3362
264	→ 52131
265	→ 12594



134 842

Fuel tank types

Three different types of fuel tanks have been fitted to vehicles manufactured between 1975 and the middle of 1978. The difference between the types lies in the location of the tank sender unit and splash can in the tank, and also in the attachment of the tank sender unit.



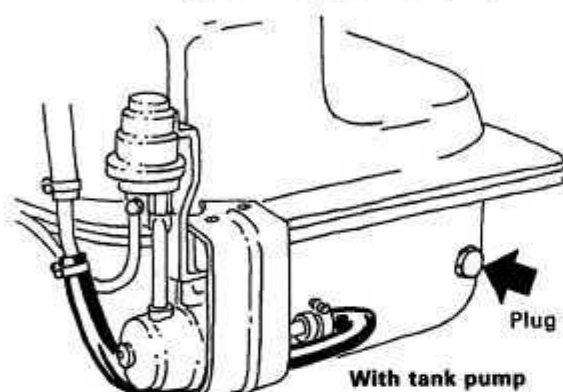
Type 1

1975 – middle of 1977.

Model	Chassis number
262	→ 2429
264	→ 37729
265	→ 9092

Manufactured without a tank pump. May have later been fitted with a tank pump.

K20



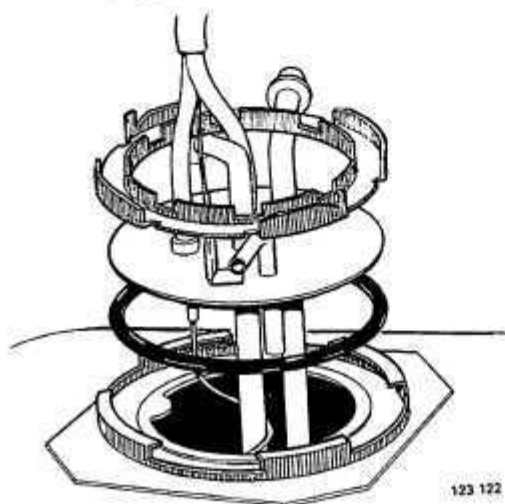
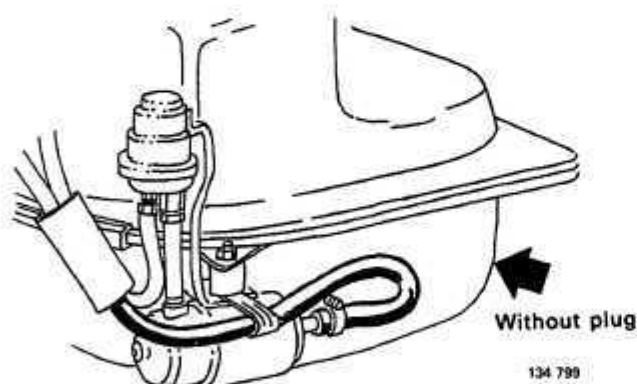
Type 2

Middle of 1977 – end of 1977.

Model	Chassis number
262	2430–2659
264	37730–46514
265	9093–10919

Tank pump introduced in production.
Position of sender unit and splash can changed.

K21



Type 3

Beginning of 1978 – middle of 1978.

Model	Chassis number
262	2660–3362
264	46515–52131
265	10920–12594

Modified attachment of tank sender unit.

K22

Replacement of fuel tank

Operations K23-43

K23

USA

Type 1 fuel tanks: only one type of replacement tank is available P/N 1255740-1. Old parts can be transferred to the new tank.

Type 2 fuel tanks: only one type of replacement tank is available P/N 1255739-3. Old parts can be transferred to new tank.

Type 3 fuel tanks: no longer stocked, new type now available. For fitting the new type of tank to older vehicles, it is necessary to replace a number of parts. See below for the parts required.

For working procedures, see page 118.

K24

Other markets (all markets except USA)

Only the late type fuel tank is stocked (see page 122). For fitting the new type of tank to older vehicles, it is necessary to replace a number of parts.

See below for the parts required.

For working procedures, see page 118.

Parts required when fitting
a new type of fuel tank

Item No.	Description	P/N	Qty.
Fuel tank incl. filter tube			
1	Filler hose	1304240-3	1
2	Filler tube	1255189-1	1
3	Clip	948211-8	2
4	Rubber seal	1254461-1	1
5	O-ring	949282-8	1
6	Screw	955274-6	1
7	Clip	1254606-5	1
8	Fuel tank	1255754-2	1
Level sender and tank pump			
1	Lock ring	1235324-9	1
2	O-ring	949276-0	1
3	Level sender	1258854-7	1
4	Hose	1235388-4	1
5	Screw	947279-8	1
6	Spring clip	942866-5	1
7	Filter	1266822-4	1
8	Bracket	1235444-6	1
9	Tank pump	1276330-6	1
10	Washer	940121-7	2
11	Nut	1266390-2	2
12	Clip	647709-5	1
13	Sealing sleeve	687245-1	1
14	Hose clip (1975 only)	948210-0	1
15	Nipple (1975 only)	947411-2	1

Item No.	Description	P/N	Qty.
Also required for 1975-1977 models without tank pump			
1	Hose	943707-0	350 mm
2	Moulding	679754-5	100 mm
3	Hose protector	1254913-5	1
4	Clip	943472-1	4
5	Tube	1254611-5	1
6	Hose	1229049-0	1
7	Clip	948211-8	1
-	Fuse holder	949611-4	1
-	Fuse	5 A	1
-	Fuse (1975 only)	16 A	1
-	Connector	247780-3	1
-	Cable terminal	958203-2	1
Evaporative system			
1	Clip	946709-3	2
2	Hose	192034-7	1150 mm
3	Bundy tube (262/264)	944314-1	1800 mm
3	Bundy tube (265)	944314-1	900 mm
4	Clip	192248-3	1
5	Grommet	941264-4	1
6	Clip	1254513-3	1

100 mm = 4 in

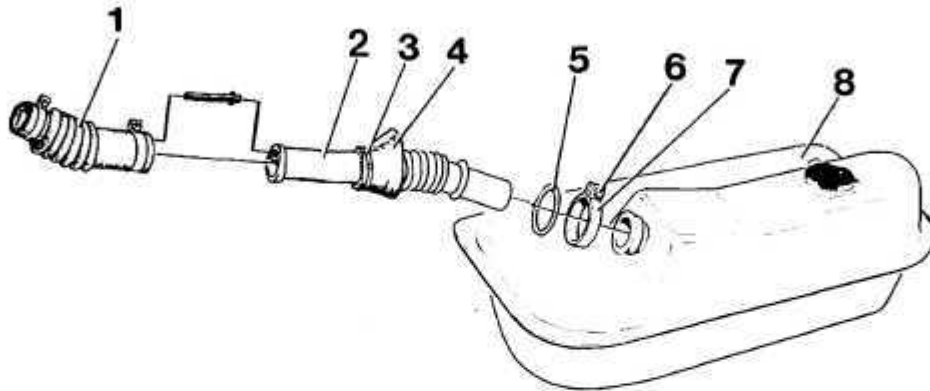
350 mm = 13.8 in

800 mm = 31.5 in

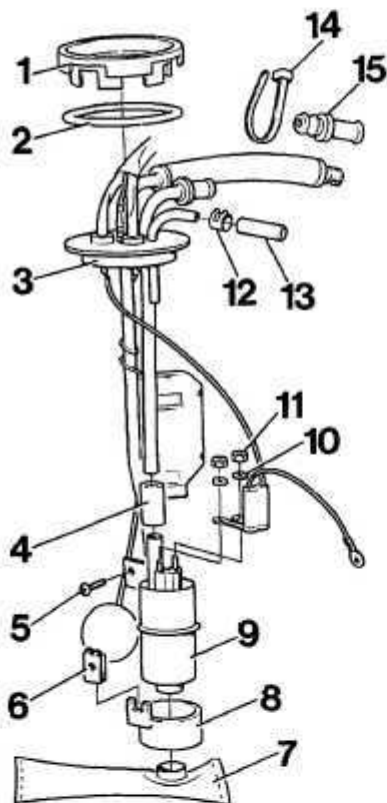
900 mm = 35.4 in

1150 mm = 45.3 in

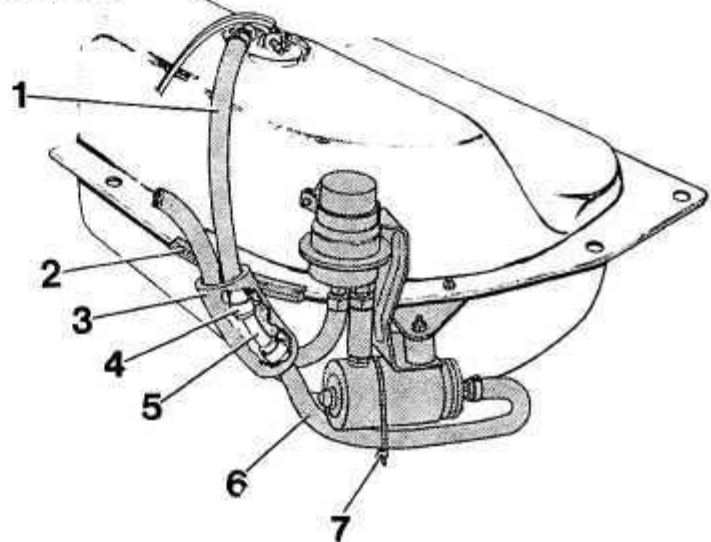
Fuel tank incl. filler tube



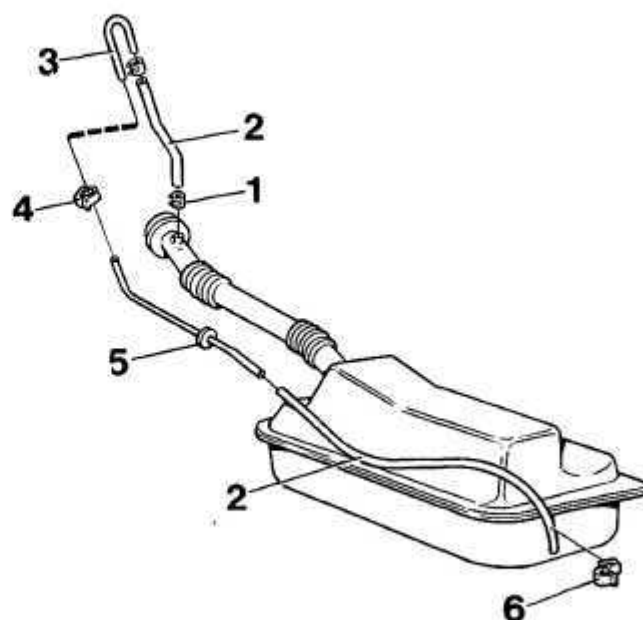
Level sensor and tank pump



Additional parts required for 1975–1977 models without tank pump



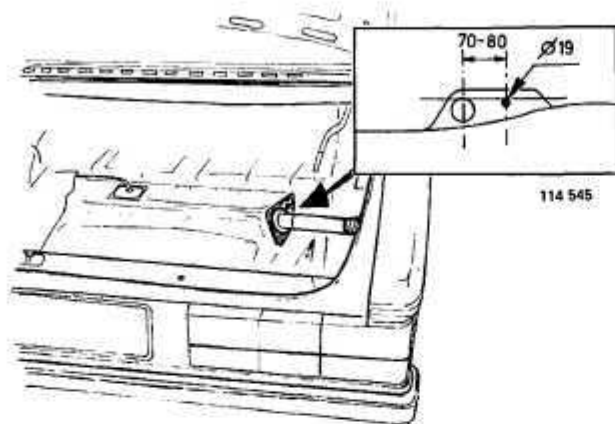
Evaporative system



Installing a new type fuel tank

Operations K25-43

Special tools: 5012 (1975), 5169



K25

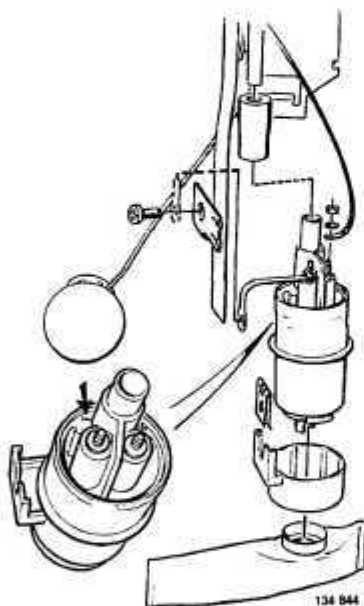
Pull down old fuel tank

As a safety precaution disconnect battery.
Drain fuel.

K26

Drill a hole for evaporative system tube

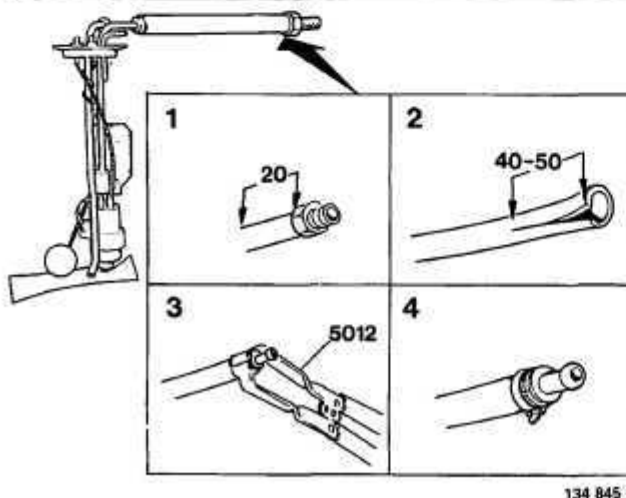
Drill a 19 mm (0.75 in) hole in floor panel 70-80 mm (2.75-3.15 in) from the hole for the filler tube.
Install rubber grommet.



K27

Assemble new tank/pump unit and tank pump

Place filter so that it does not obstruct movement of float.



1975 models only

K28

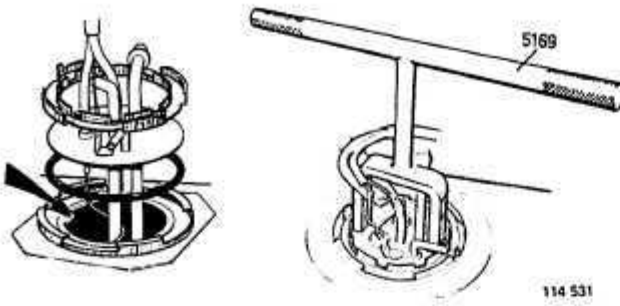
Replace return line nipple

Cut off line approx. 20 mm (0.8 in) from nut. Cut a slit approx. 40-50 mm (1.6-2.0 in) along protective hose.

Attach pliers 5012 to hard plastic hose.

Heat hose with warm air (eg. hair dryer) and press in the new nipple.

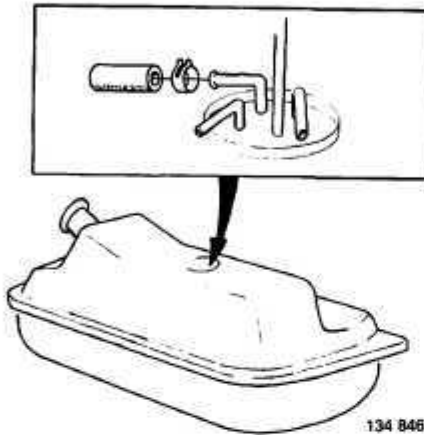
Fold back protective hose and secure with a clamp.



K29

Install tank/pump unit in new fuel tank

Use a new O-ring, lubricate it with glycerine or similar. Install lock-ring with tool 5169.

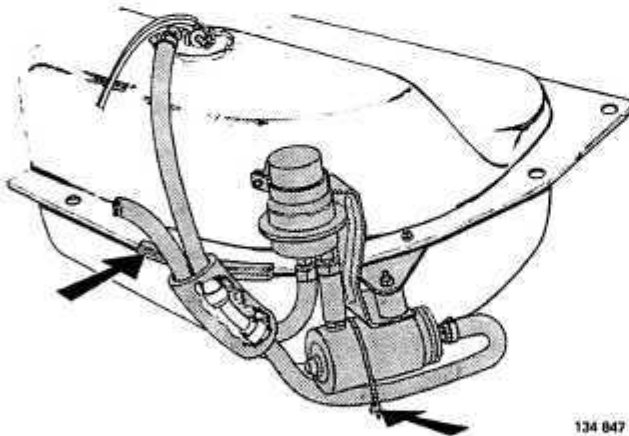


K30

Seal breather nipple on tank/pump unit

Use a sealing sleeve and clip.

Note! Does not apply to vehicles which have a fuel accumulator with a fuel leakage line.



1975-1977 models only

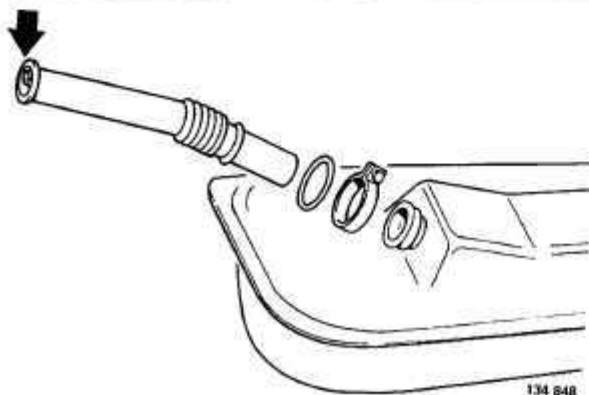
K31

Transfer following parts to new tank:

Fuel pump and mounting bracket, fuel accumulator, hoses and moulding.

Connect "suction" line to tank/pump unit.

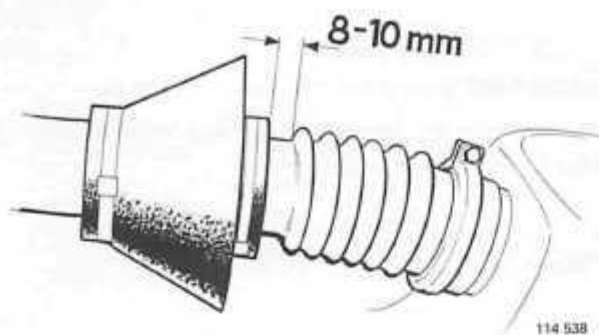
Cars already equipped with tank pump have these parts. Cars without must be so equipped.



K32

Connect filler tube

Turn tube so that small inner tube for evaporative system points upwards.



K33

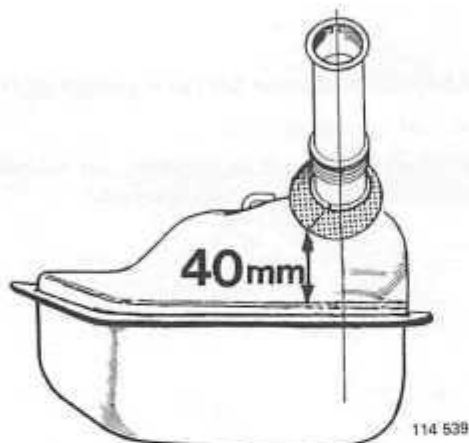
Install rubber seal on filler tube

Remove backing paper before pressing on seal.

Joint on seal should point diagonally downwards and backwards.

Attach two strip clamps. Cut off pieces not used.

8-10 mm = 0.3-0.4 in



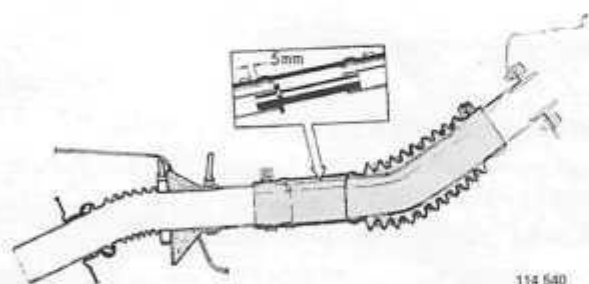
K34

Coat top of tank with a rustproofing compound

Position tank in car.

Connect delivery and return lines.

40 mm = 1.6 in

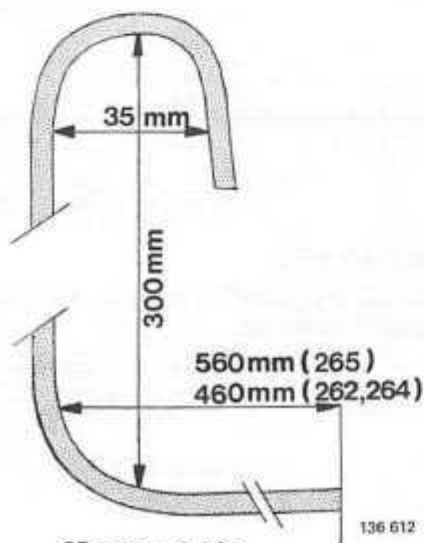


K35

Connect filler hose

Note! Observe location of inner evaporative system hose.

5 mm = 0.2 in.



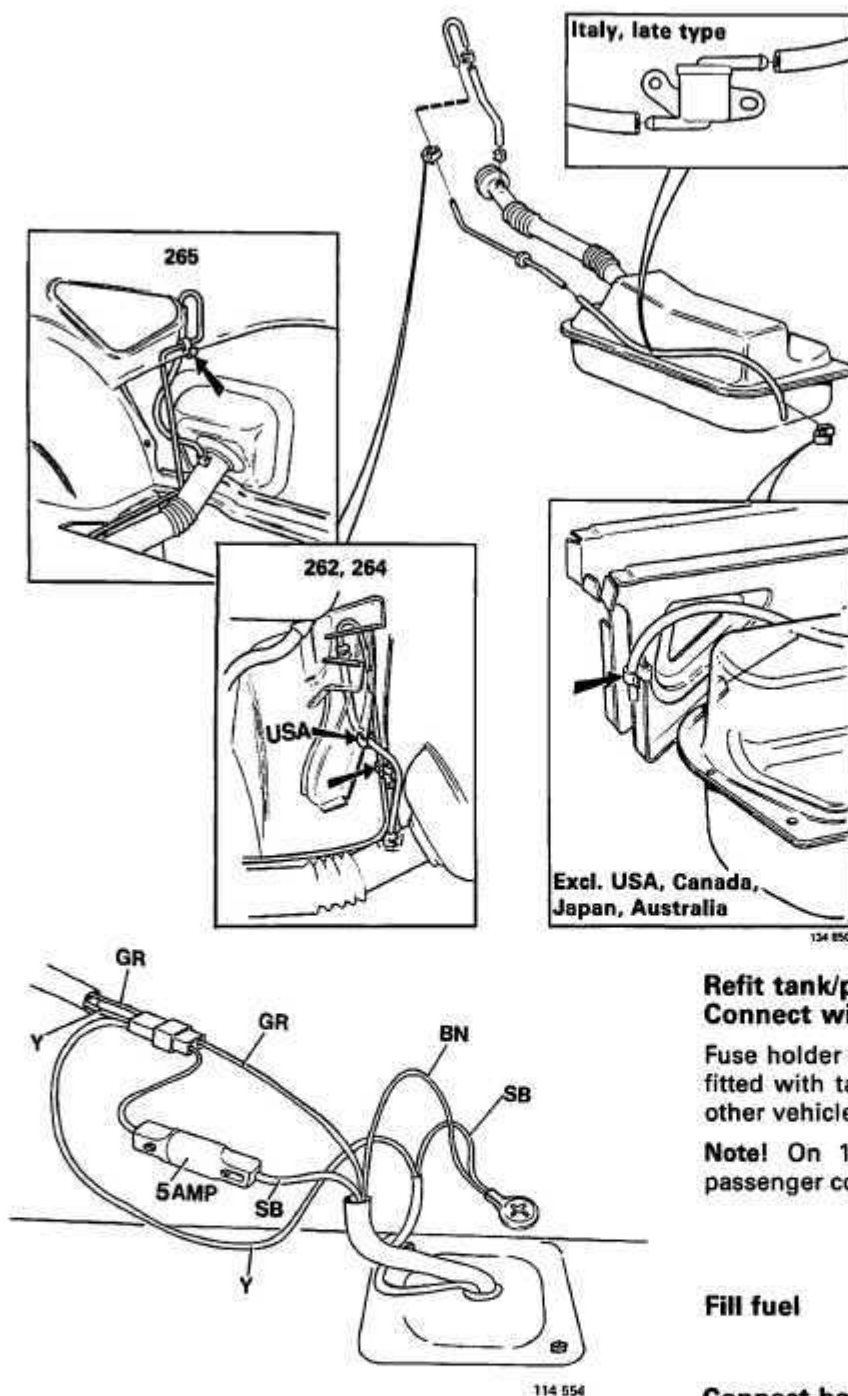
K36

Shape new evaporative tube

K37

Install evaporative system

35 mm = 1.4 in
300 mm = 11.8 in
460 mm = 18 in
560 mm = 22 in



Refit tank/pump unit cover Connect wiring

Fuse holder already installed on vehicles previously fitted with tank pump. New ones are necessary for other vehicles.

Note! On 1975- models, replace fuse No. 7 in passenger compartment fusebox with a 16A fuse.

Fill fuel

Connect battery and start engine

Check that:

- there are no leaks
- fuel gauge functions
- tank pump functions.

Install console panels and mat in boot/trunk

Rustproof bottom of fuel tank

K38

K39

K40

K41

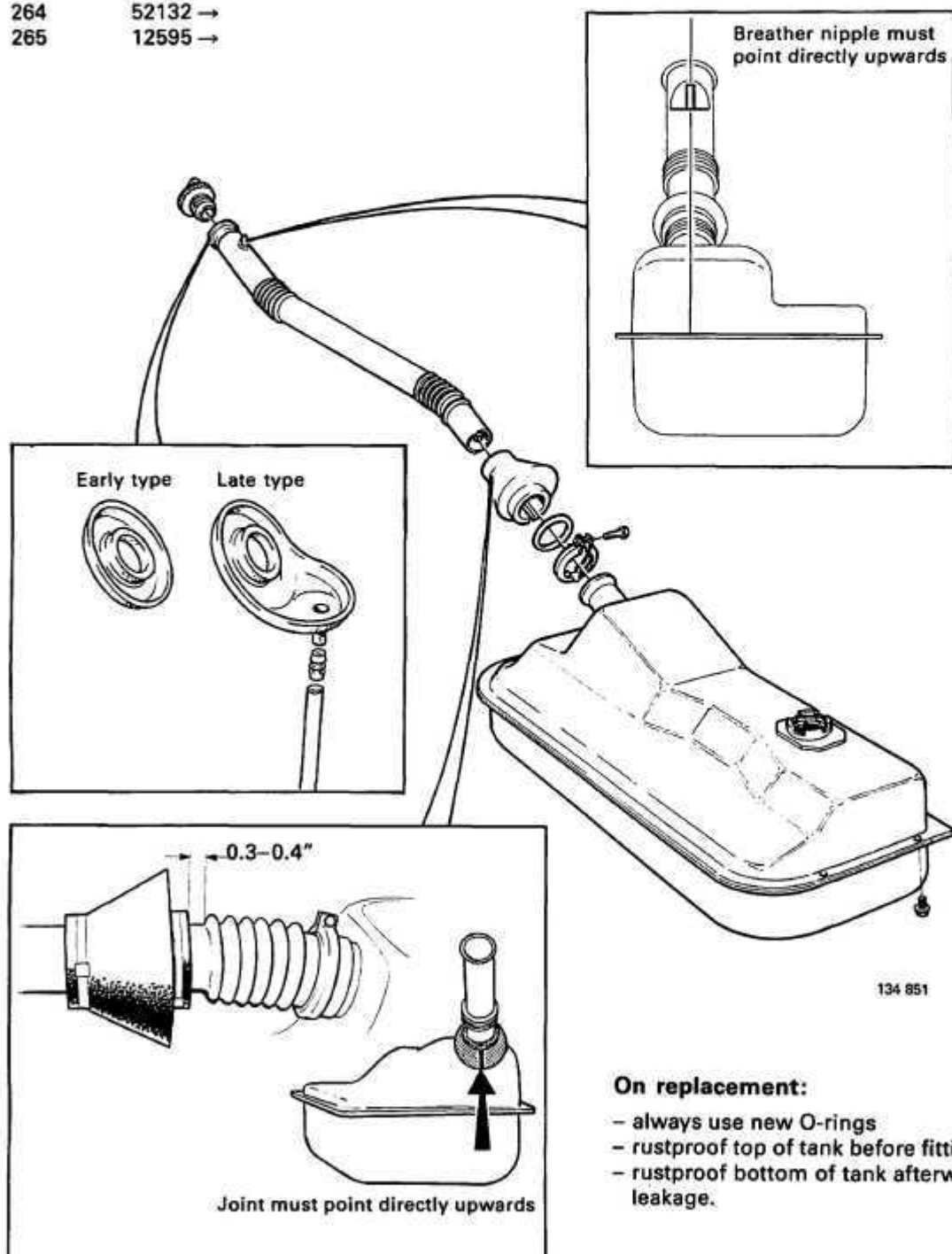
K42

K43

Fuel tank, middle of 1978–1983

Operation K44

Modell	Chassis number
262	3363 →
264	52132 →
265	12595 →



K44

On replacement:

- always use new O-rings
- rustproof top of tank before fitting in vehicle
- rustproof bottom of tank afterwards, and check for leakage.

Evaporative system

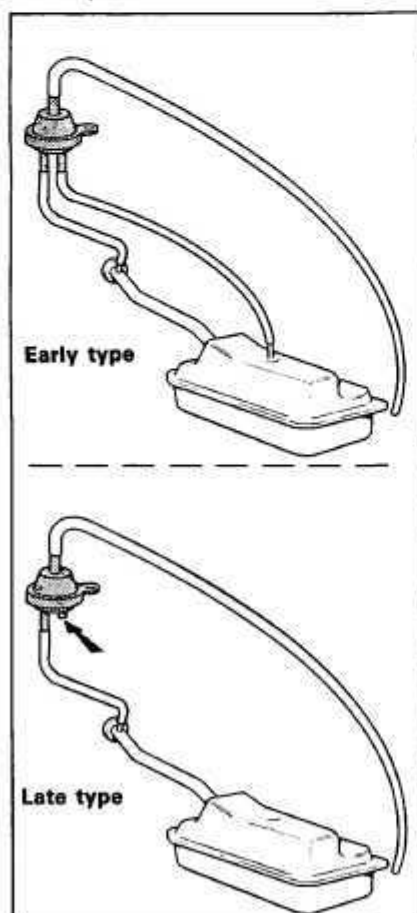
Operations K45-54

K45

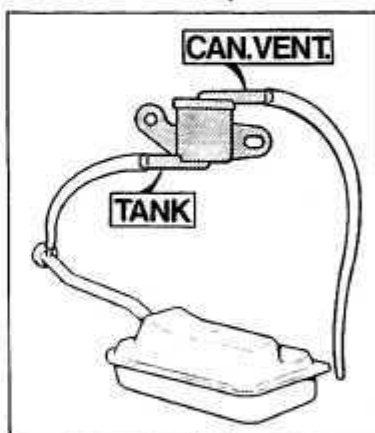
Open evaporate system

All markets excl. USA, Canada, Japan and Auatralia.

Connection of equalizing valve
Not all year models



Connection of roll-over valve
Certain markets only



Hose is clamped in different ways
depending on model year

134 852

Closed evaporative system

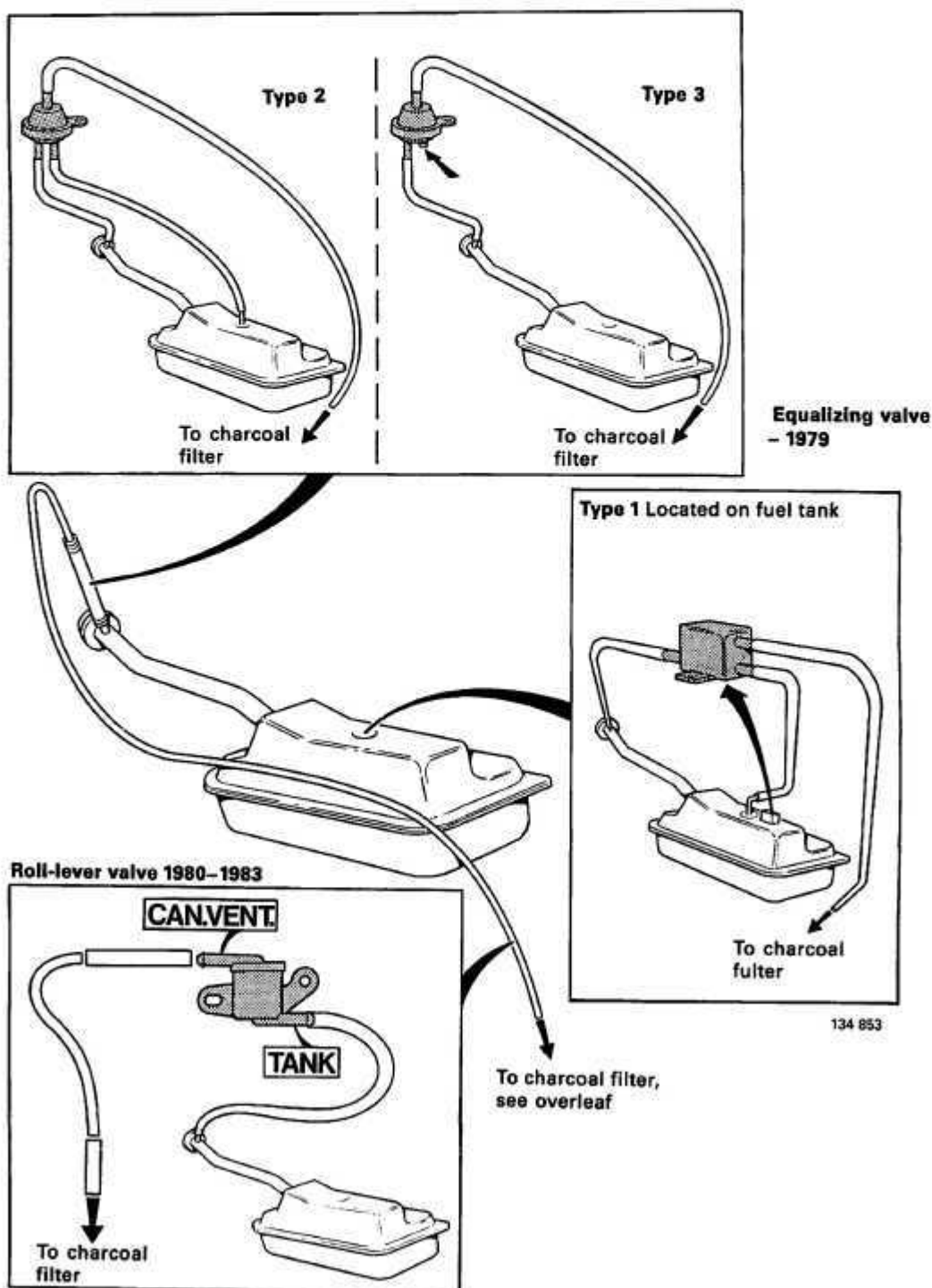
USA, Canada, Japan and Australia

Operations K46-54

K46

Connection of equalizing valve and roll-over valve

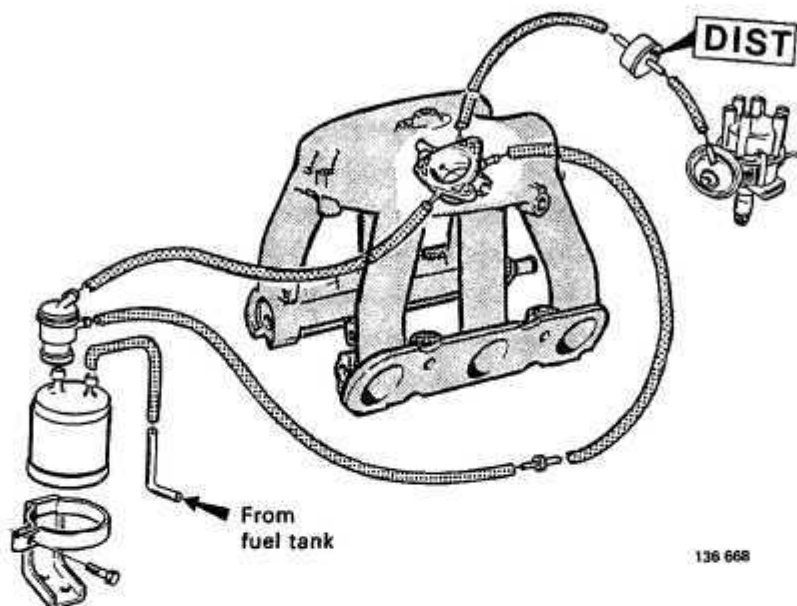
Equalizing valve was discontinued in 1980 and replaced by roll-over valve.



Connection of charcoal filter and vacuum valve

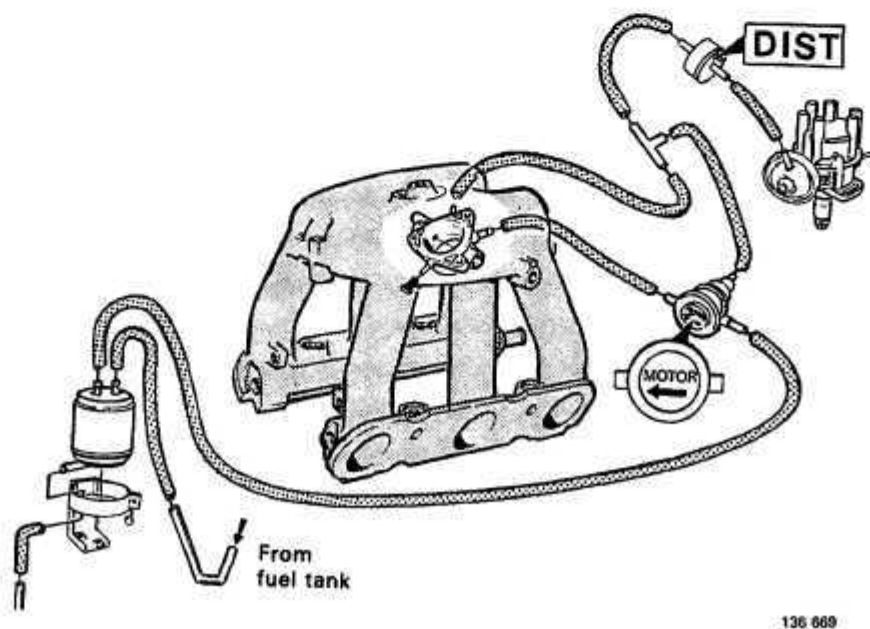
K47

B 27 E 1975-1977 Australia



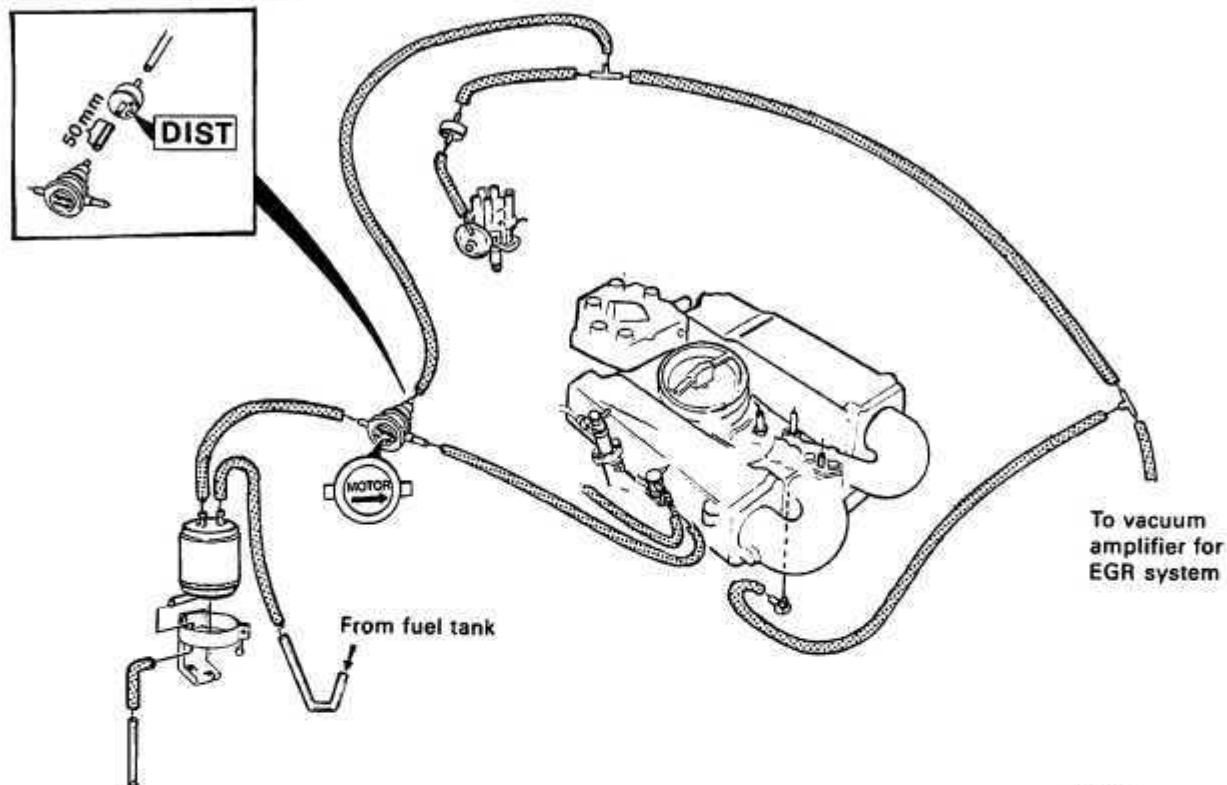
K48

B 27 E 1978 Australia



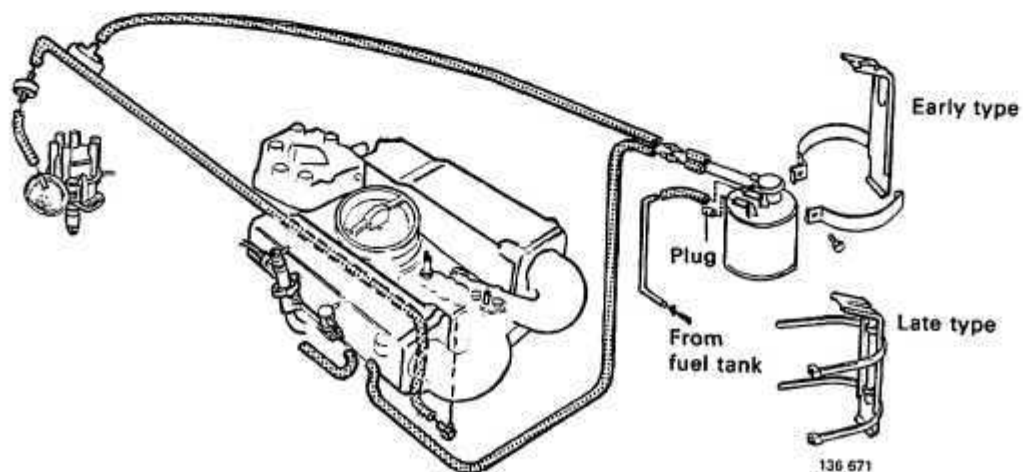
B 27 E 1979 Australia

Vehicles with impulse relay



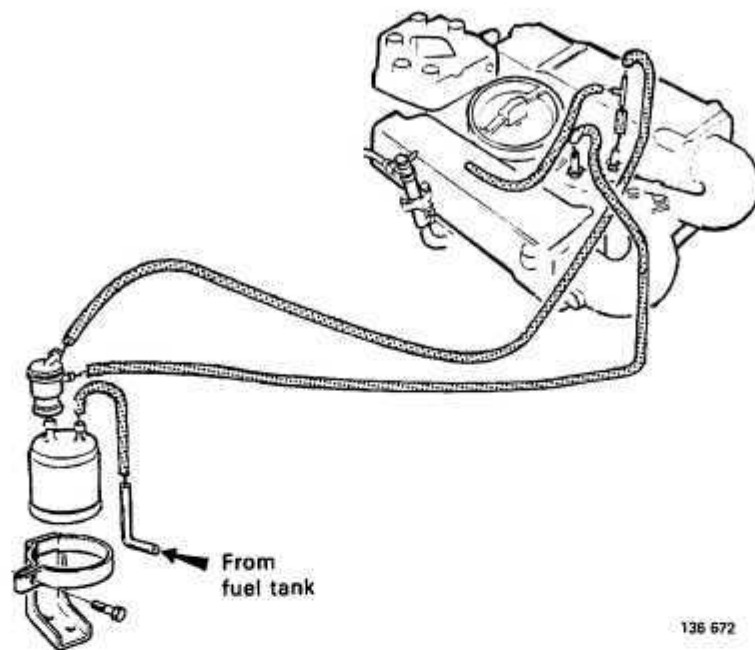
136 670

B 27 E 1980 and B 28 E 1981-1982 Australia



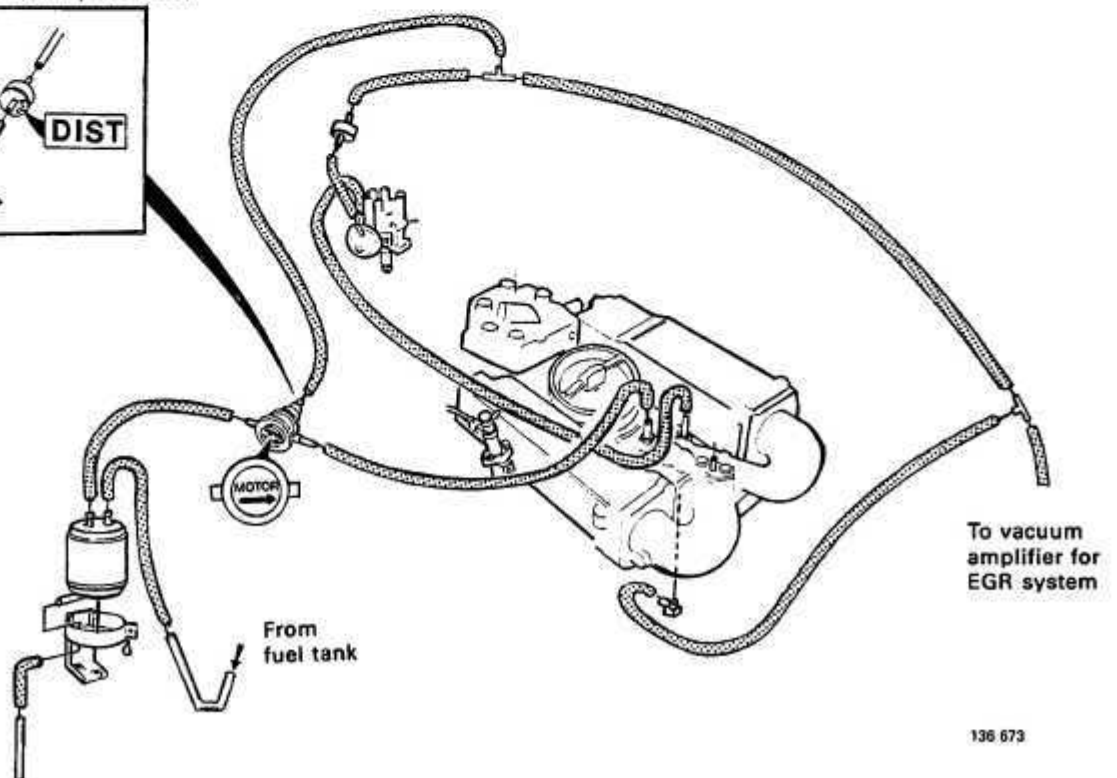
136 671

B 27 F 1976-1977



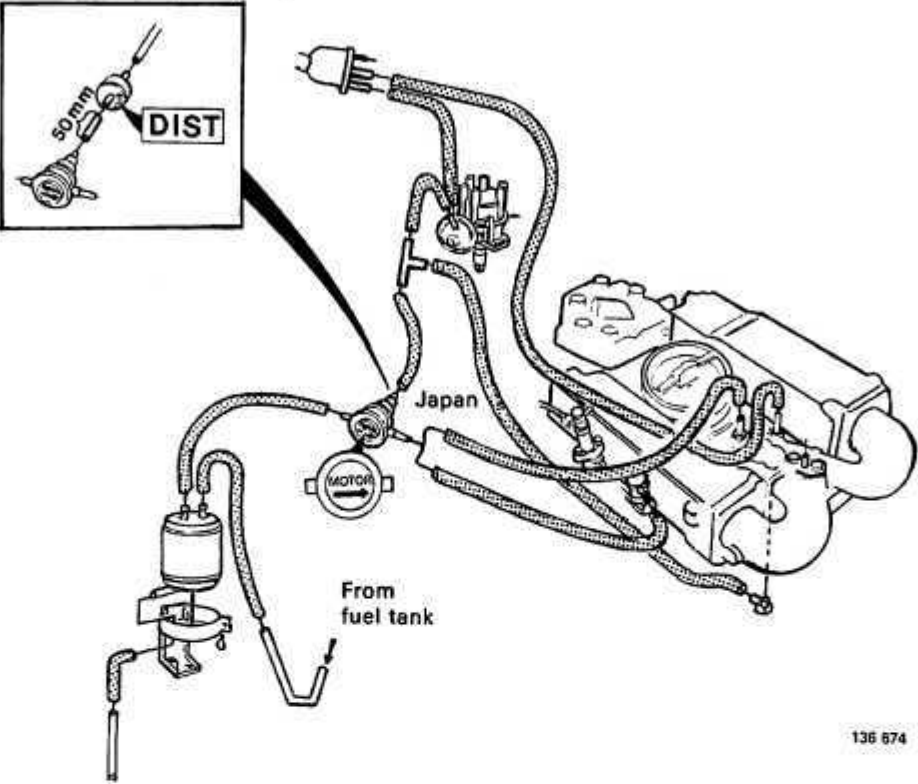
B 27 F 1978

Vehicles with impulse relay

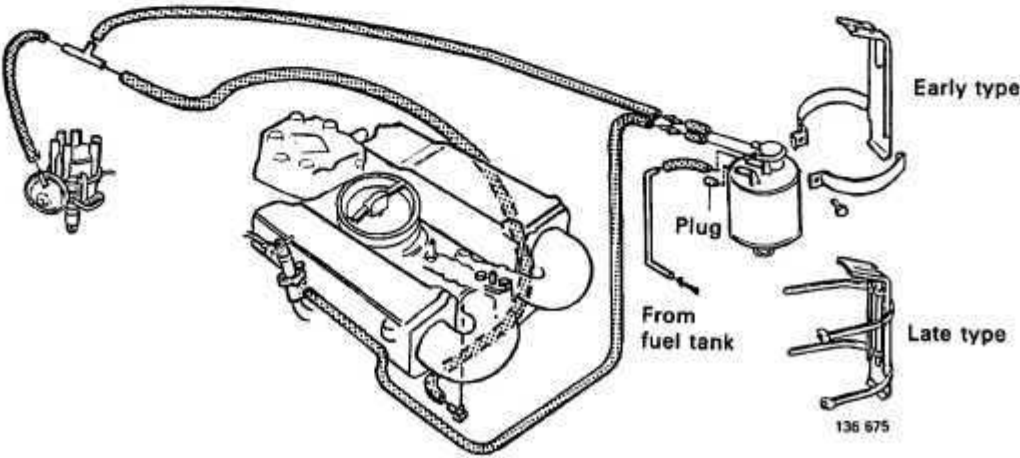


B 27 F 1979

Vehicles with impulse relay



B 28 F 1980-1982



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