

Service Manual

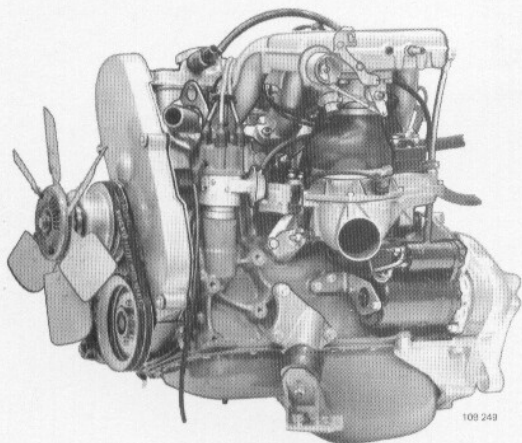
Repairs and maintenance

Section 2 (23)

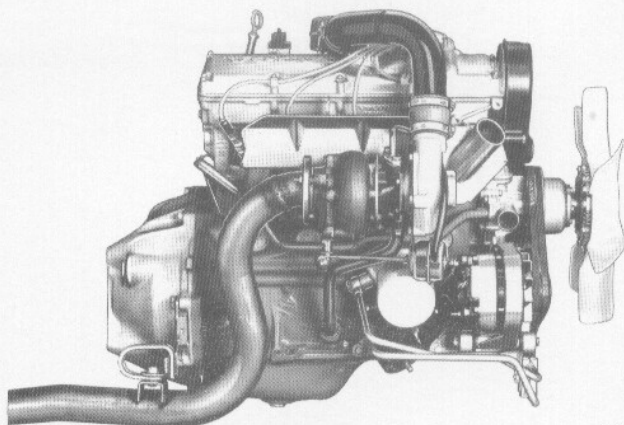
CI System

B19, B21, B23
240 1975-

VOLVO



B 21 F
1976 model



B 21 E-Turbo 1981 model

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.

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

Engine Type	Model year
B 19 E	1977-
B 19 E-Turbo	1982-
B 21 E	1975-
B 21 E-Turbo	1981-
B 21 F-5 ¹	1976- ³
B 21 F-9 ²	1981-
B 23 E	1979-
B 21 F-Turbo	1981-

Remarks:

¹ B 21 F-5 = CI system and Bosch ignition system

² B 21 F-9 = CI system and Chrysler ignition system. Sometimes called B 21 F-MPG

³ Discontinued 1982 for USA. Replaced by B 21 F with LH jetronic fuel injection system.

Order number: TP 30454/1 US
Supersedes TP 11121/3 (USA, Canada)
TP 11590/1 (Other markets)

TP 30454/1

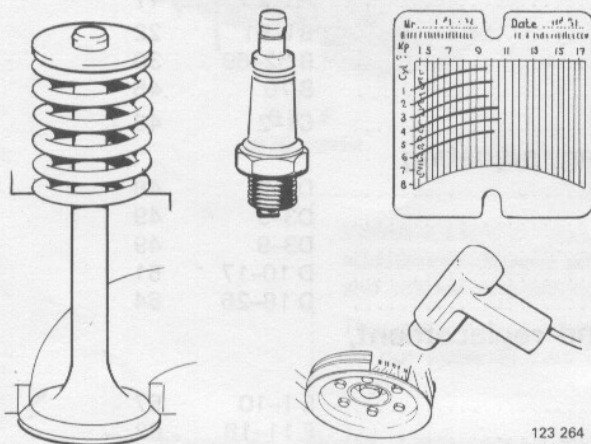
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Printed in U.S.A.

We reserve the right to make alterations
without prior notification.

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Important information



123 264

Before starting

Ensure that the vehicle is mechanically and electrically sound before checking the CI system. Correct octane fuel supplied by well known companies must be used.

The following points should be checked:

Mechanical

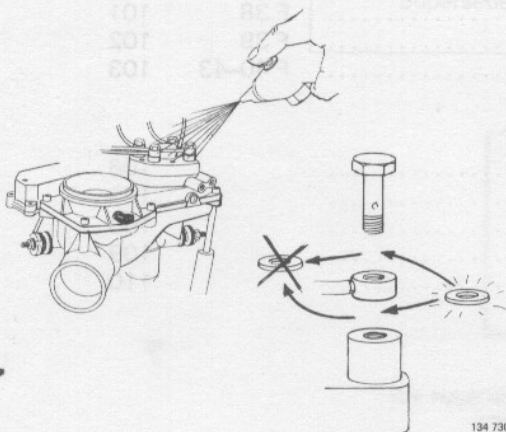
- compression
- valve clearance
- vacuum hoses and connections
- throttle control and kickdown cable (auto)
- air filter
- intake manifold (air leakage)
- charge pressure (Turbo)
- exhaust gas system (leakage)

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



134 730

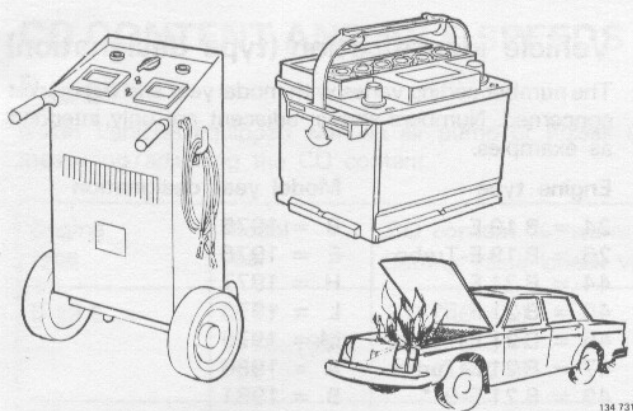
Cleanliness

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.

**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**.

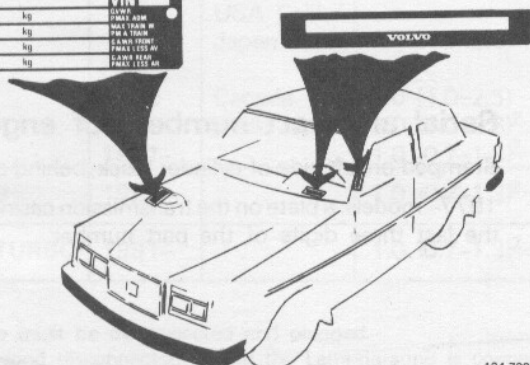
Fire risk

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

Specifications**PLATES AND DECALS**

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

VOLVO		MADE IN SWEDEN
VIN		
kg	kg	kg
kg	kg	kg
1	kg	kg
2	kg	kg

**Model plate**

Located on right inner wheelarch.

Sometimes contains the type designation plate.

The 1981 plate is shown on the left, variations in form do however occur.

Vehicle identification number (VIN)

Concerns USA and Canadian vehicles. Visible from outside the car.

Location:

-1979: on left of windscreen/windshield

1980-: on top of dashboard.

Specifications

USA/Canada

-1980: **VC 244 45 L 1 000000**

1981-: **YV1 AX 45 4X B 1 000000**

Other markets

-1980: **245 45 L 1 000000**

1981-: **YV1 244 46 1 B 1 000000**

Engine type

Chassis number

Model year designation

Vehicle identification (type designation)

The number coding varies with model year and the market concerned. Numbers shown adjacent are only intended as examples.

Engine type

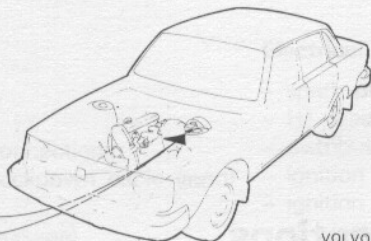
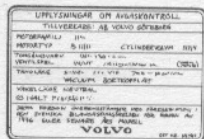
24 = B 19 E
26 = B 19 E-Turbo
44 = B 21 E
45 = B 21 F-5*
46 = B 21 E-Turbo
47 = B 21 F-Turbo
49 = B 21 F-9**
84 = B 23 E

Model year designation

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

* With Bosch ignition system

** With Chrysler ignition system. Engine type sometimes called B 21 F MPG.



VOLVO
117 987

Exhaust emissions plate

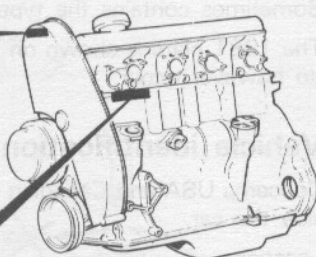
To be found only on vehicles for Sweden, Australia, USA and Canada.

Located on left wheelarch.

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

Note!

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



114 651

Serial and part numbers of engine

Stamped on left side of cylinder block, behind distributor.

1977- models: a plate on the transmission casing contains the last three digits of the part number.

CO CONTENT AND IDLE SPEEDS

E-engines

Note! Vehicles equipped with an air pump or Pulsair system must have these disconnected and plugged before measuring/adjusting the CO content.

Engine type	Model year	CO content %, warm engine at idle speed Setting value (check value)	Idle speed ⁶ r/s (r/min)
B 19 E	1977	2.0 (1.0–4.0)	15.0 (900)
	1978–1980	2.0 (1.0–3.0)	15.0 (900)
	1981–	1.0 (0.5–2.0)	15.0 (900)
B 19 E-TURBO	1982–	2.0 (1.0–3.0)	15.0 (900)
B 21 E	1975–1977	2.0 (1.0–4.0)	15.0 (900)
	1978–1980	2.0 (1.0–3.0)	15.0 (900)
	1981–	1.0 (0.5–2.0)	15.0 (900)
B 21 E-TURBO	1981–	2.0 (1.0–3.0)	15.0 (900)
B 23 E	1979–1980	2.0 (1.5–2.5)	15.8 (950)
	1981–	1.0 (0.5–2.0)	15.0 (900)

F-engines

Engine type	Model year	Market	CO content %, warm engine at idle speed Setting value (check value)	Idle speed ⁶ r/s (r/min)	
				Manual	Automatic
B 21 F-5	1976 1977	Canada/ Japan USA Fed. USA Calif.	2.0 (1.7–2.3) ¹	15.0 (900)	13.3 (800)
			2.0 (1.7–2.3) ¹	15.0 (900)	14.2 (850)
			1.0 (0.7–1.3)	15.0 (900)	13.3 (800)
			1.5 (1.2–1.8) ^{2, 3}	15.0 (900)	
	1978	Canada USA Fed. USA Calif./ Japan	2.0 (1.0–2.5)	15.0 (900)	
			1.0 (0.7–1.3)	15.0 (900)	13.3 (800)
			2.0 (1.0–2.5) ²	15.0 (900)	
	1979	Canada USA Fed. USA Calif./ Japan	2.0 (1.0–2.5)	15.0 (900)	
			1.0 (0.7–1.3)	15.0 (900)	13.3 (800)
	1980 1981–	Canada USA/Japan	2.0 (1.0–2.5)	15.0 (900)	
			2.0 (1.0–2.5) ²	15.8 (950)	
B 21 F-9	1981–		1.0 (0.7–1.3) ^{2, 4}	15.0 (900) ⁵	
B 21 F-TURBO	1981–		1.0 (0.7–1.3) ^{2, 4}	15.0 (900) ⁵	

Remarks

¹ Air pump must be disconnected and plugged.

² Lambda-sond disconnected. When the Lambda-sond is connected the CO content must drop to less than 1 %.

³ Automatic transmission vehicles, check/adjust CO at 13.3 r/s (800 rpm).

⁴ Sealed CO adjustment screw, excl. Japan.

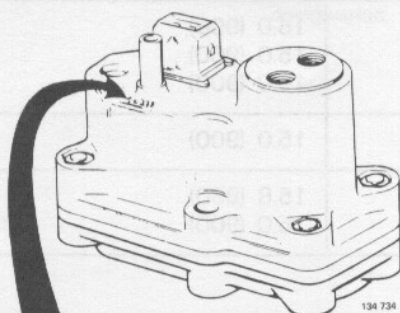
⁵ CIS, not fitted to B 21 F-5 USA Fed. or Japan.

⁶ Vehicles with automatic transmission, engage 'N' and apply parking brake.

PRESSURES

Line pressure	Turbo 1981 520–580 kPa (75–84 psi)	Turbo 1982– 520–580 kPa (75–84 psi)	Others 450–530 kPa (65–77 psi)
Rest pressure, min.	150–240 kPa (22–35 psi)	240–320 kPa (35–46 psi)	150–240 kPa (22–35 psi)
Control pressure, see control pressure regulator.			

CONTROL PRESSURE REGULATOR



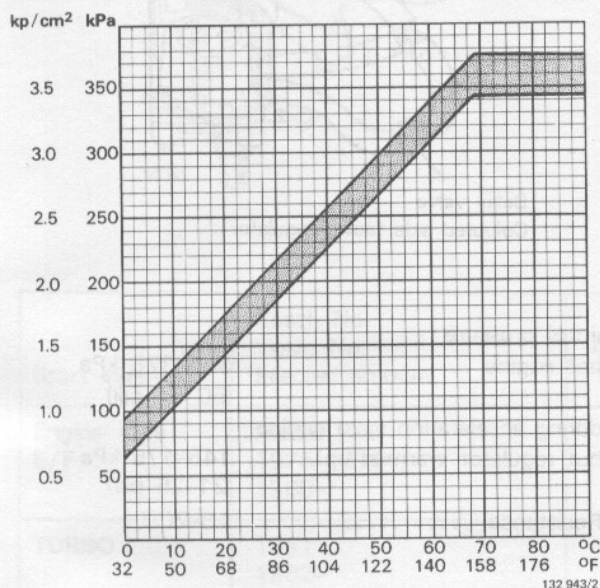
0 438 140 ...

The type of control pressure regulator fitted depends on the model type and model year. Regulators can be identified by the number (last three digits) stamped on the top.

Control pressure regulator	Bosch no. Volvo no.	...004 463971-2	...014 1219159-0	...021 1219952-7 Altitude compensated	...079 1276878-4 Acceleration enrichment, cold engine	...082 1276946-9 Full load enrichment
Engine type	Model year					
B 19 E	1977–	X				
B 19 E-TURBO	1982–					X
B 21 E	1975 1976–	X	X			
B 21 E-TURBO	1981–					X
B 21 F	1976 1977 not USA USA 1978–1980 1981–USA Japan	X X X	X X	X X		X
B 21 F-9	1981–				X	
B 21 F-TURBO	1981–				X	
B 23 E	1979–	X				

Control pressure regulator ...004

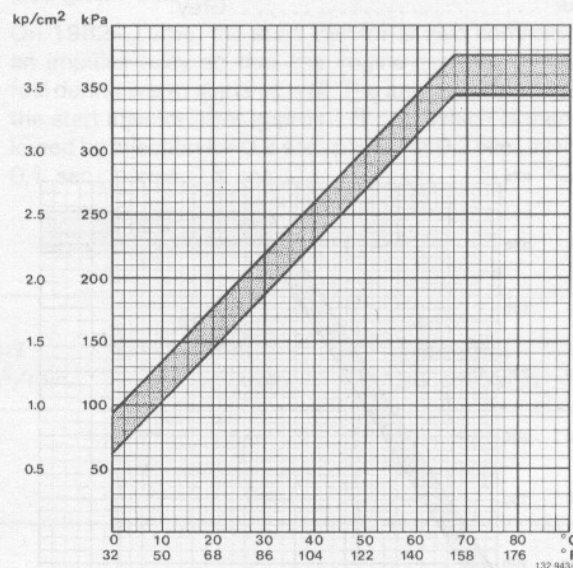
Control pressure, hot engine ... 345–375 kPa
(50–54 psi)
Resistance 20–30 Ω



Control pressure at different ambient temps

Control pressure regulator ...014

Control pressure, hot engine ... 345–375 kPa
(50–54 psi)
Resistance 20–30 Ω

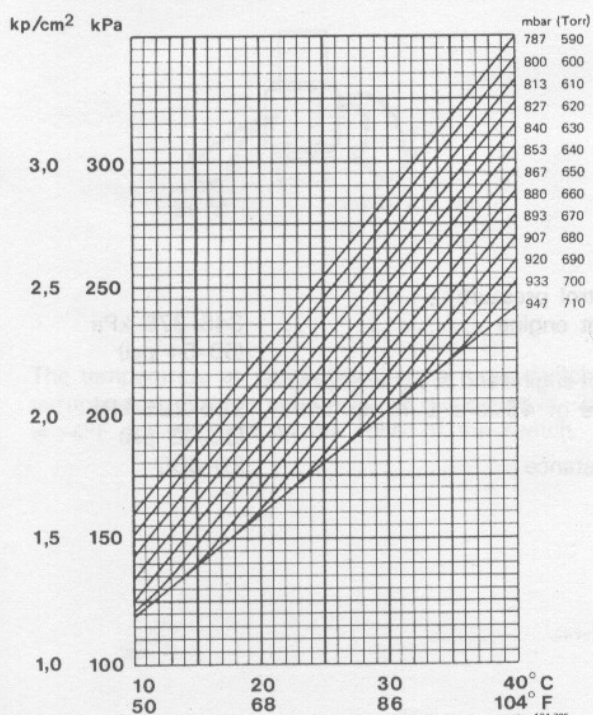


Control pressure at different ambient temps

Control pressure regulator ...021

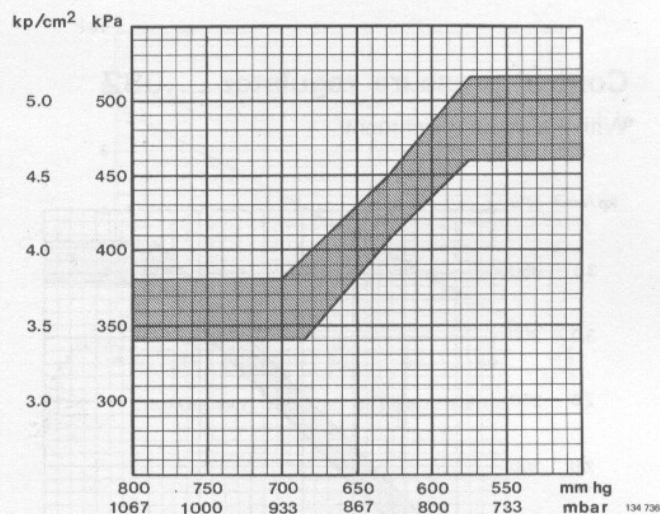
Altitude compensating device incorporated in regulator. Special versions for some B 21 F USA Federal 1976 and 1977.

Resistance 20–30 Ω



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.

Specifications

Control pressure regulator ...079

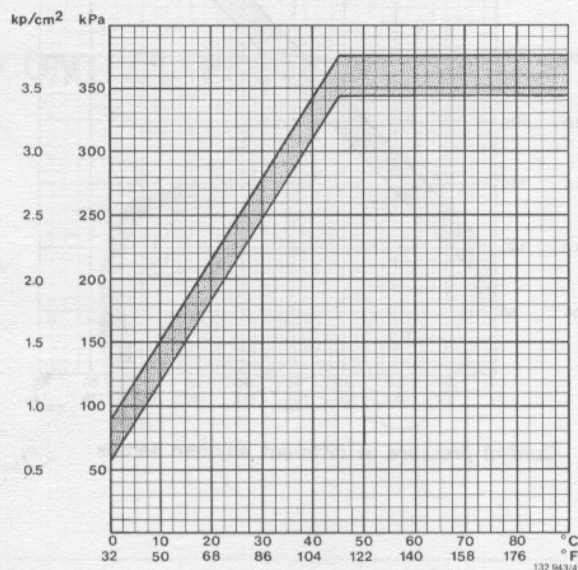
With cold engine acceleration enrichment

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

Delay valve

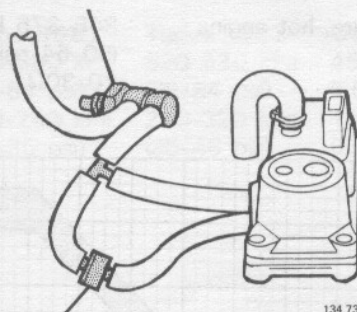
delay time approx. 1 sec

colour Grey



Control pressure at different ambient temps

Thermostat valve



Delay valve
Coloured side facing regulator

Control pressure

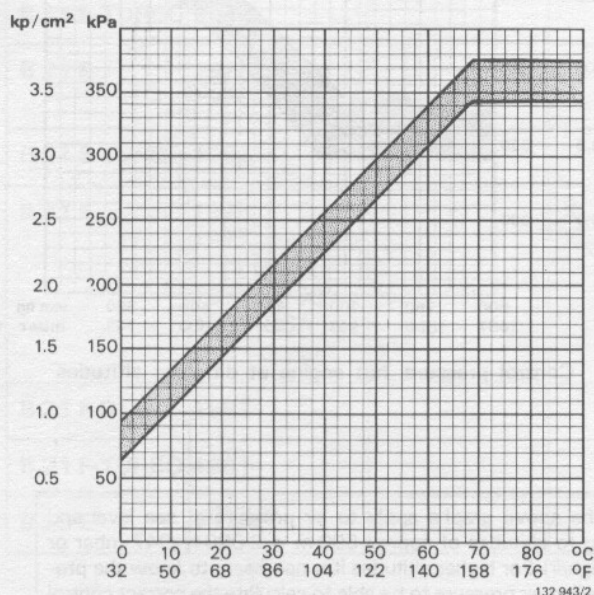
hot engine 345–375 kPa
(50–54 psi)

during acceleration (cold engine
but regulator warmed-up) 145–175 kPa
(21–25 psi)

Resistance 10–20Ω

Control pressure regulator ...082

With full load enrichment



Control pressure at different ambient temps

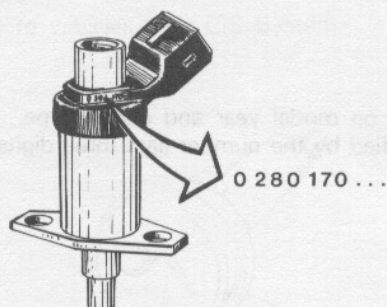
Control pressure

hot engine 345–375 kPa
(50–54 psi)

hot engine and at a charge pressure of 45 kPa (0.45 kp/cm²) 265–295 kPa
(38–43 psi)

Resistance 20–30Ω

START INJECTOR



134 264

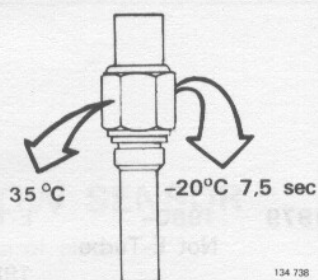
Start injector type depends on model year and engine type. They can be identified by the number (last three digits) stamped on the injector.

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

On 1982- Turbo, the start injector is also controlled by an impulse relay so that the engine receives additional fuel during warm starts as well. The impulse relay engages the start injector after approx 1.5 sec., which is then followed by injection for 0.2 sec., pause for 0.3 sec., injection 0.1 sec., pause 0.3 sec. . .

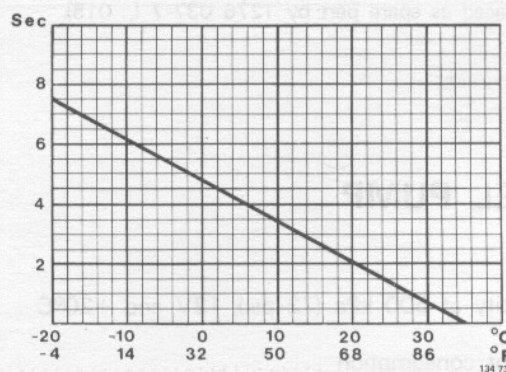
Start injector	Bosch No. Volvo No. Injected amount	...404 462865-7 115 cm ³ /min.	...413 1276498-1 85 cm ³ /min.	...415 1269585-4 135 cm ³ /min.
Engine type E/F	Model year 1975-1979 1980-	X	X	
TURBO	1981 1982-	X		X

THERMAL TIME SWITCH



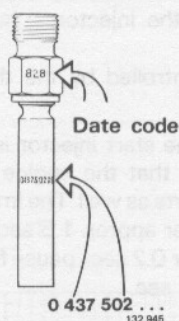
134 738

The temperature at which the thermal time switch interrupts start injection, and the time it is engaged at -20°C = -4°F are stamped on the collar of the switch.



Engagement time at different temps

INJECTORS



Injector type depends on model year and engine type.
Injectors can be identified by the number (last three digits) stamped on the side.

Injectors	Bosch No. Date code Volvo No	...007*	...015 -828 829- 1276037-7	...020 1306499-3
Opening pressure	kPa (psi)	300-360 (43-52)	320-380 (46-55)	350-410 (51-60)
No leakage permitted below	kPa (psi)	240 (35)	260 (38)	290 (42)
Engine type B 19 E, B 21 E, B 21 F-5	-1978 1979-	X	X	
B 21 F-9, B 21 F-Turbo, B 23 E			X	
B 19/21 E-Turbo				X

* Replaced as spare part by 1276 037-7 (...015).

FUEL PUMP

	1975-1979	1980- Not E-Turbo	E-Turbo 1981
Capacity at 500 kPa (72 psi), 12V and +20°C	100 l/h (0.8 l/30 sec.)	120 l/h (1.0 l/30 sec.)	150 l/h (1.25 l/30 sec.)
Current consumption	9.5 A		

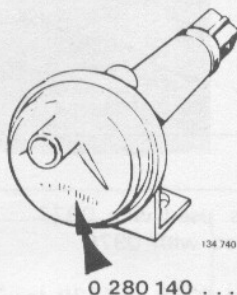
TANK PUMP

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



Auxiliary air valve type depends on model year and engine type. They can be identified by the number (last three digits) stamped on the end of the valve.

Resistance 40–60Ω

Fully open at –30°C = –22°F

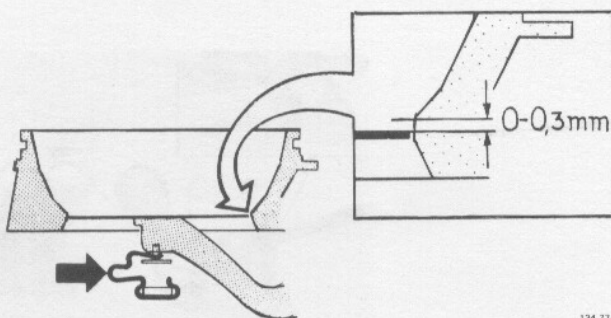
Fully closed at +70°C = +158°F

The valve is electrically controlled and should be fully closed after five minutes engagement at an ambient temp. of +20°C = +68°F.

Auxiliary air valve	Bosch No. Volvo No.	...100 460833-7	...106 1219160-7	...114 1266910-7
Engine type	Model year			
B 19/21 E [®]	1975–1978 1979–		Man./Auto Man.	Auto
B 19/21 E-TURBO	1981–		Man.	
B 21 F	1976–1978 1979–	Man./Auto	Man.	Auto
B 23 E	1979–1980 1981–		Man.	Man. Auto

AIR FLOW SENSOR

Rest position of plate



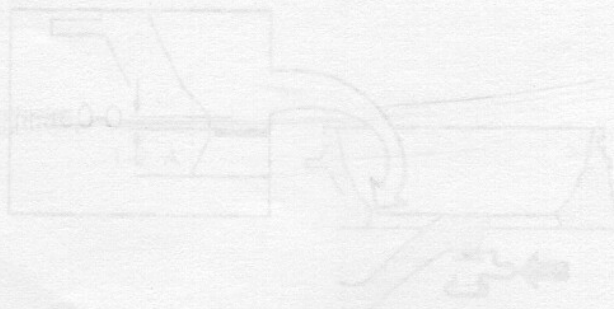
Check the position at max. control pressure i.e. hot engine and fuel pump in operation.

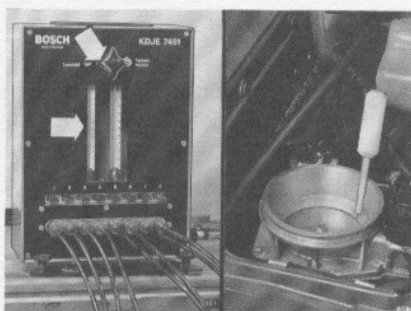
0–0.3 mm = 0–0.012"

Special tools

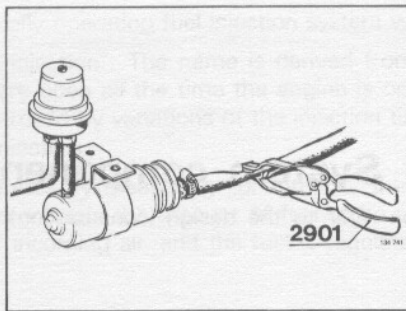
999	Description – use
0976-4	Flow differential gauge (USA and Canada): flow measurements, used with 0977
0977-2	Gauge (USA and Canada): setting the air-flow sensor plate. Used with 0976
2901-0	Clamping pliers
5011-5	Pressure gauge : used with 5032 + 5116 for E/F engines and 5228 + 5229 for Turbo engines
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
5015-6	Key : adjusting CO content
5032-1	Nipple : connecting pressure gauge 5011 for E/F engines
5016-2	Hose : connecting pressure gauge 5011 for E/F engines
5169-1	Spanner : removing/fitting fuel tank pump/gauge unit
5170-9	Test relay : connecting fuel pump 1978-
5228-5	Nipple : connecting pressure gauge 5011 for Turbo engines
5229-3	Nipple : connecting pressure gauge 5011 for Turbo engines
5230-1	Pressure gauge : checking fuel enrichment and pressure sensor on Turbo engines
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.

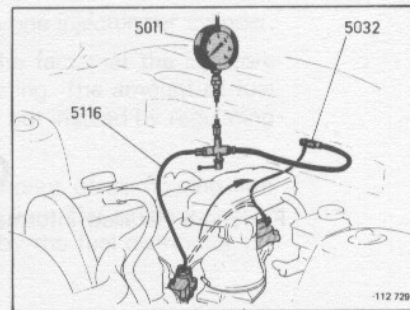




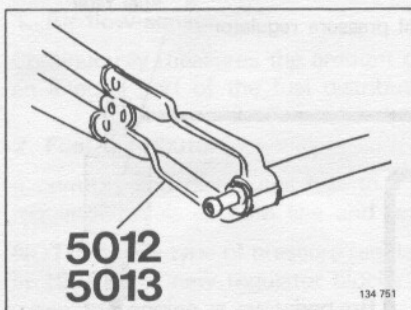
0976, 0977



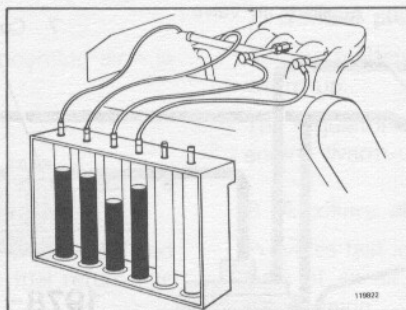
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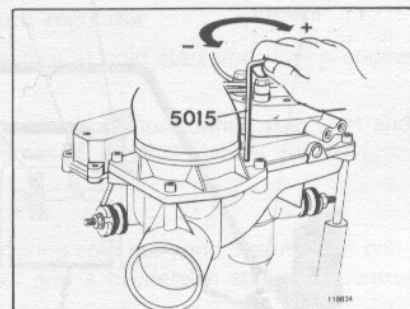
5011



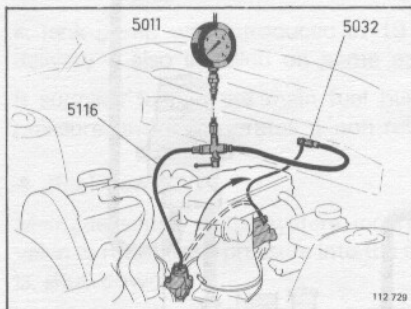
5012, 5013



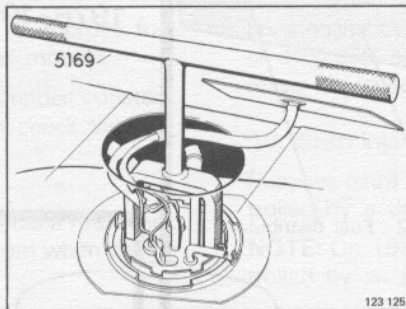
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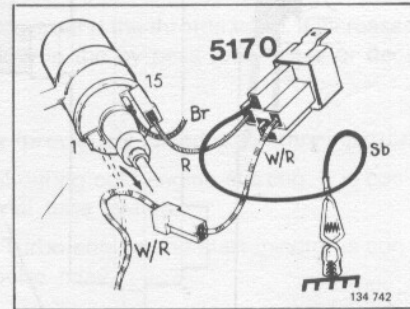
5015



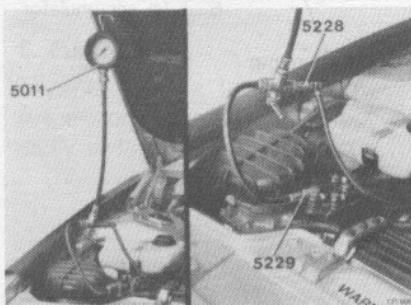
5032, 5116



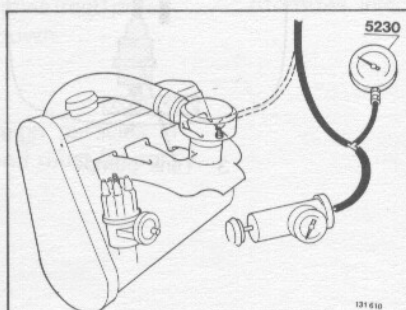
5169



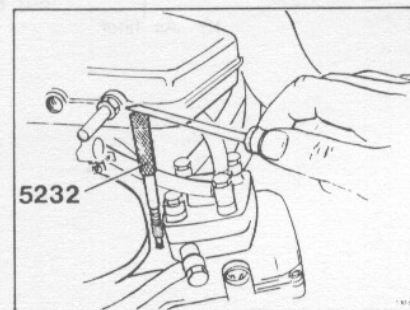
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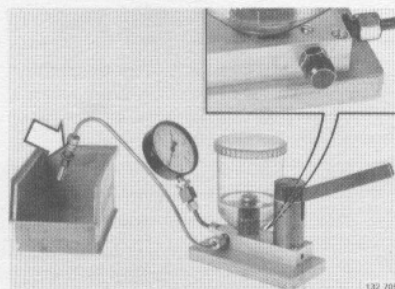
5228, 5229



5230



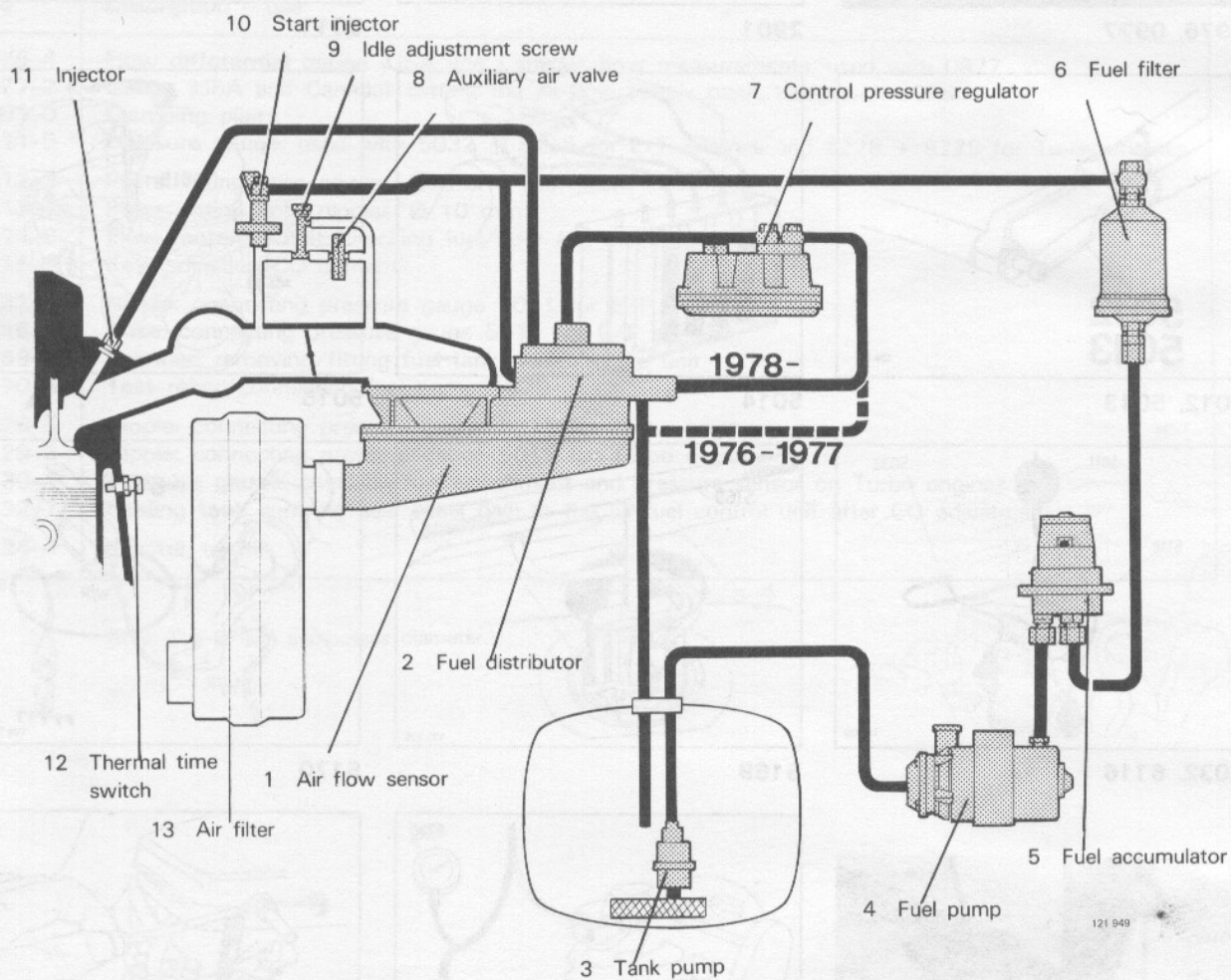
5232



9934

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.

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

A paper element filter traps most foreign particles in suspension in the fuel. It is directional and must be correctly installed.

7. Control pressure regulator

Adjusts fuel-air mixture at cold start and during engine warm-up.

The regulator lowers fuel pressure during cold start and engine warm-up creating a richer fuel-air mixture.

8. Auxiliary air valve

Provides fast idle during cold start and warm-up. It consists of an air duct and a bi-metallic spring to control it's opening.

9. Idle adjustment screw

Located in a by-pass around the throttle valve. It increases or decreases air flow in the by-pass to increase or decrease idle speed.

10. Start injector (previously called cold start injector)

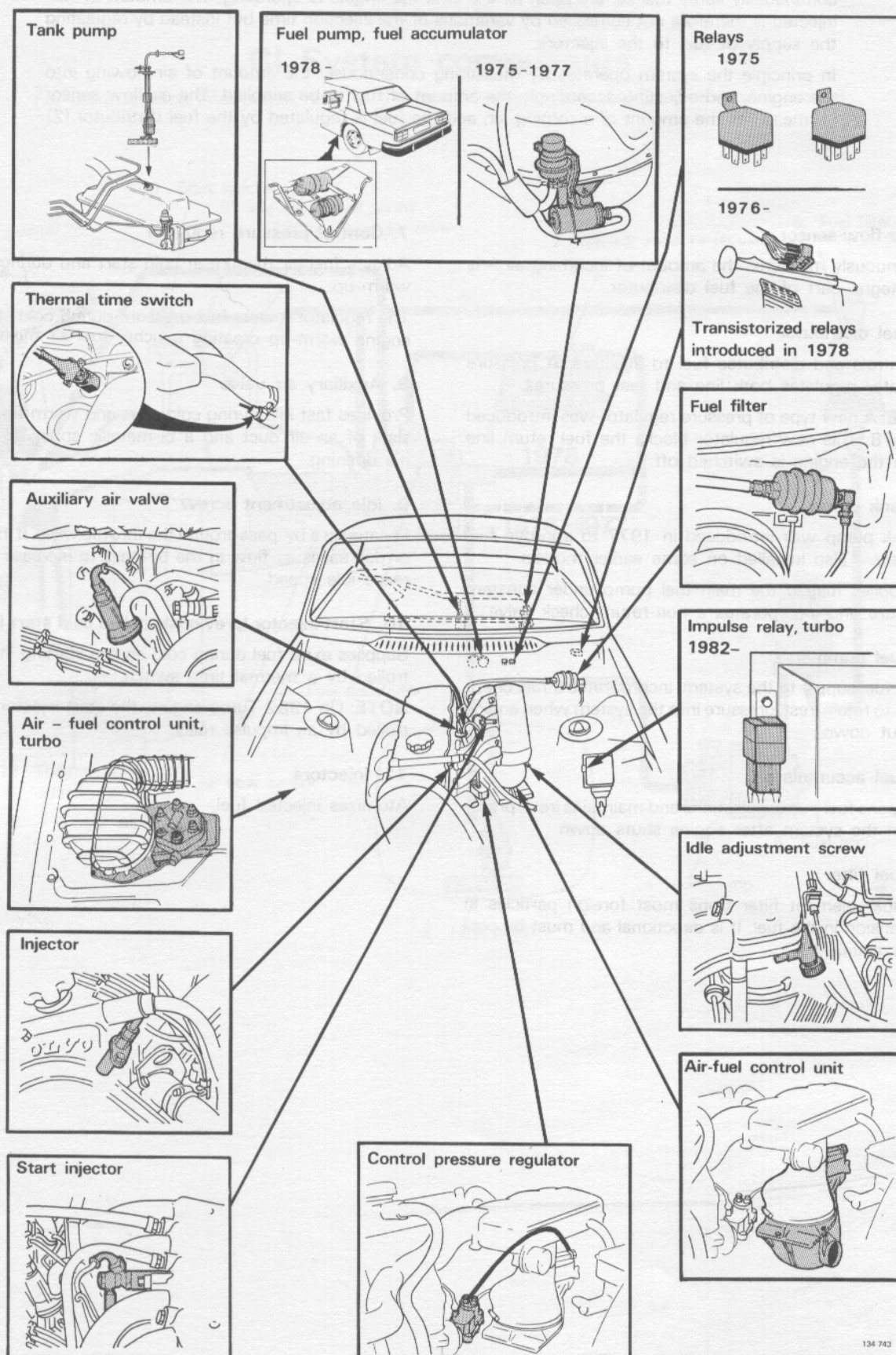
Supplies extra fuel during cold engine starting. It is controlled by a thermal time switch.

NOTE: On 1982 Turbo engine, the start injector is controlled by an impulse relay.

11. Injectors

Atomizes injected fuel.

Location of components



A. Flushing the fuel system

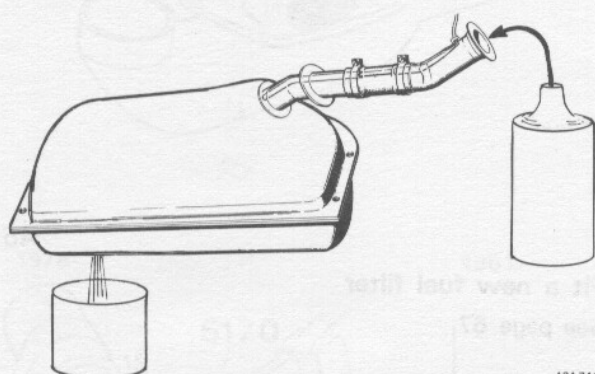
The fuel tank should be flushed if water has (or is believed to have) condensed in the system.

The presence of water in the fuel system is indicated by:

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

The following equipment is necessary to flush the fuel system:

- fuel tank drainer or a large container for collecting the 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

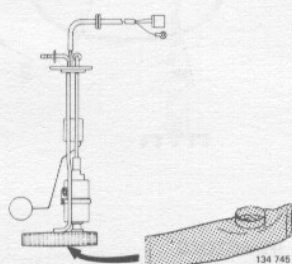
A1

Clean the fuel tank

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

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

Drain the tank and refill with clean petrol (gasoline).

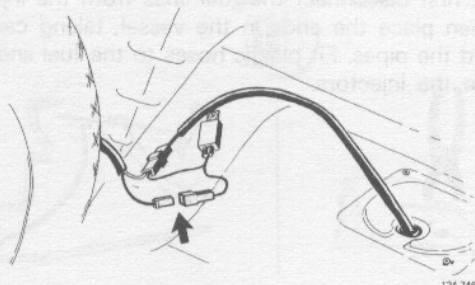


134 745

A2

Fit a new tank pump filter

See page 57.

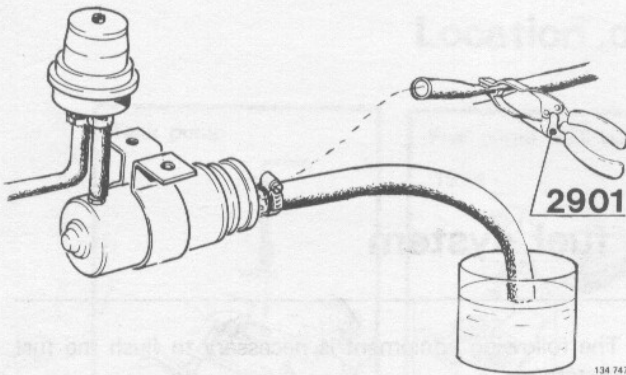


134 746

A3

Disconnect the tank pump

Disconnect the plug in the boot (trunk).



A4

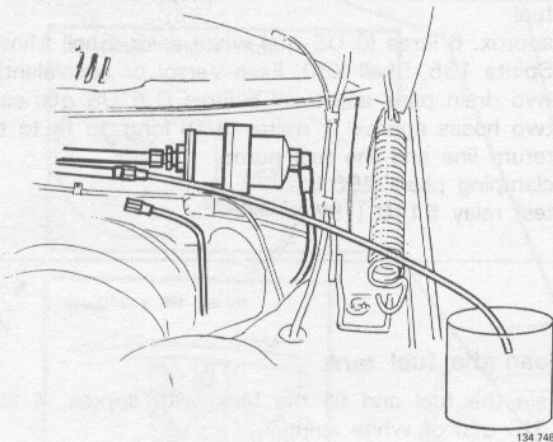
Connect the fuel pump to a vessel containing white spirit (at least 2 litres = 2 US qts)

Block the fuel line between the pump and tank.

Use clamping pliers 2901.

Disconnect the line from the pump inlet.

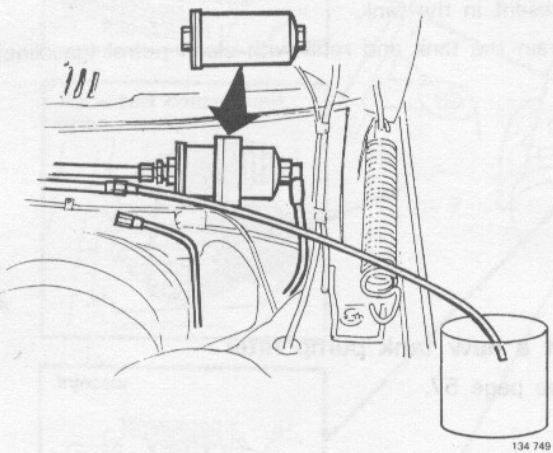
Connect one end of the hose (approx. 1 metre = 3 ft) to the pump and submerge the other end in a jar containing white spirit.



A5

Connect the return line to an empty vessel

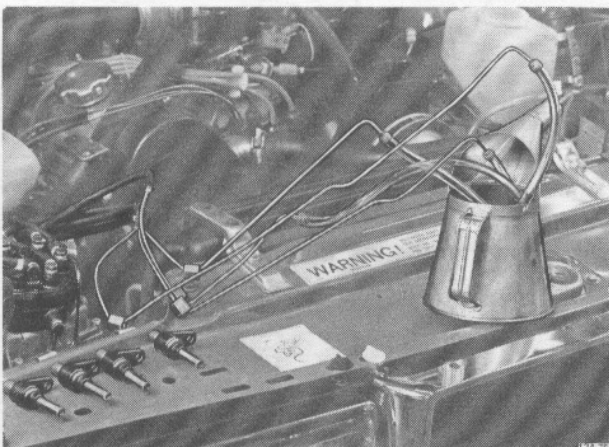
Separate the return line on the firewall (bulkhead). Connect one end of a hose (approx. 1 metre = 3 ft) to the return line and submerge the other end in an empty vessel (capacity approx. 1.5 litres = 1.5 US qts).



A6

Fit a new fuel filter

See page 67.



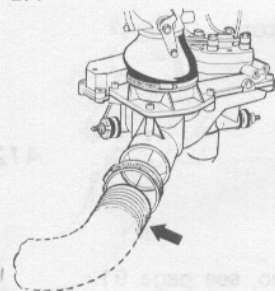
A7

Remove the injectors

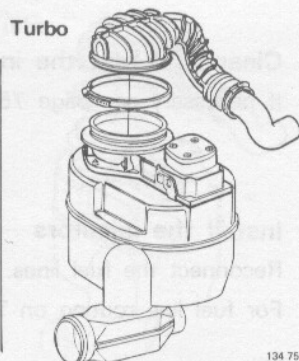
Place the ends of the fuel lines in an empty vessel (capacity approx. 1.5 litres = 1.5 US qts).

Turbo: first disconnect the fuel lines from the injectors and then place the ends in the vessel, taking care not to bend the pipes. Fit plastic hoses to the fuel lines and remove the injectors.

E/F



Turbo



134 752

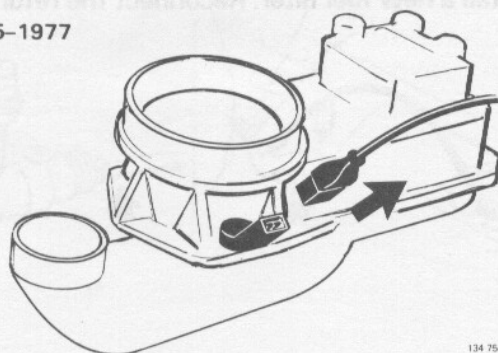
A8

Remove:

E/F-engines: inlet hose from the air flow sensor.

Turbo engines: rubber bellow from the air-flow sensor.

1975-1977



134 753

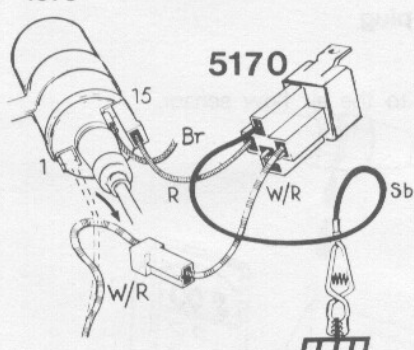
A9

Prepare to start the fuel pump

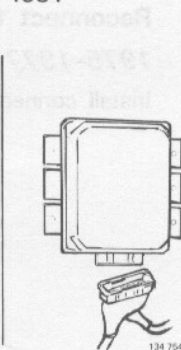
1975-1977

Withdraw the connector from the air flow sensor.

1978-



1981-



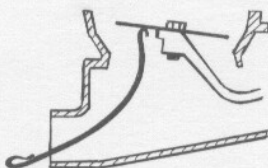
134 754

1978-

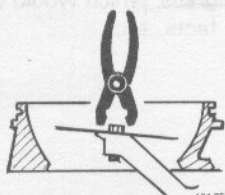
Connect test relay 5170.

Note! On 1981- (not Turbo): withdraw the plug from the ignition system control unit as well. Take care not to lose the rubber seal in the connector.

E/F



Turbo



134 755

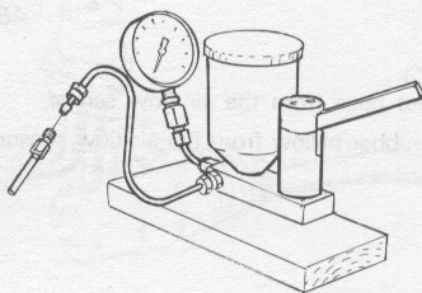
A10

Flush the system

Turn on the ignition to start the fuel pump.

Lift up the air flow sensor plate to its uppermost position. Release the plate after 1.5 litres (1.5 US qts) white spirit has flushed through the system.

Turn off the ignition.



Clean and test the injectors

If necessary see page 75.

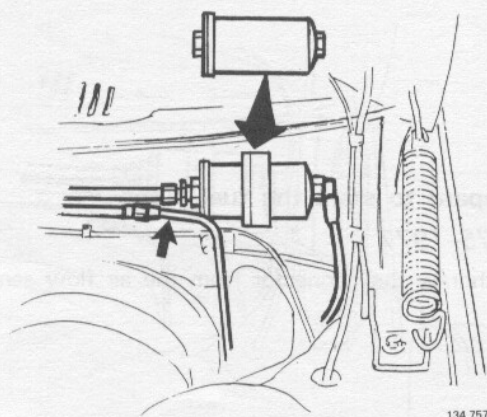
A11

A12

Install the injectors

Reconnect the fuel lines.

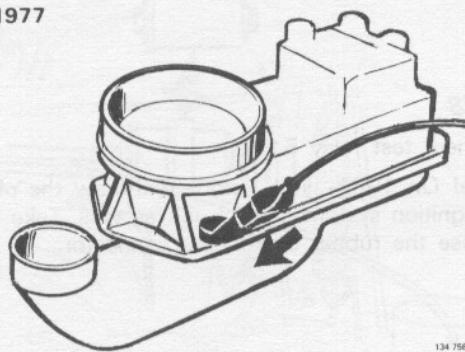
For fuel line routing on Turbo, see page 91.



Install a new fuel filter. Reconnect the return line

A13

1975-1977

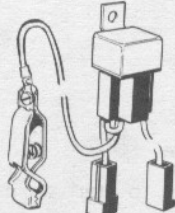
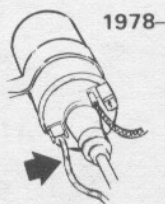


Reconnect the plug

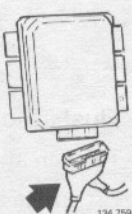
1975-1977

Install connection to the air flow sensor.

A14



1981-

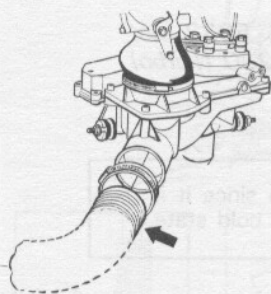


1978-

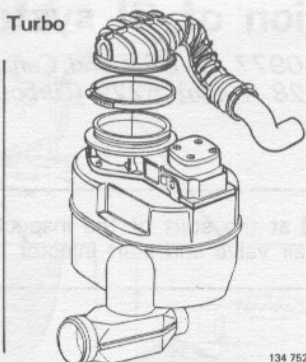
Disconnect test relay 5170. Reconnect the lead to terminal 1 on the ignition coil.

Caution! On 1981- (not Turbo): reconnect the ignition system control unit. Make sure that the rubber seal is fitted correctly to protect against water and moisture ingress, which would otherwise cause corrosion, poor contacts, etc.

E/F



Turbo

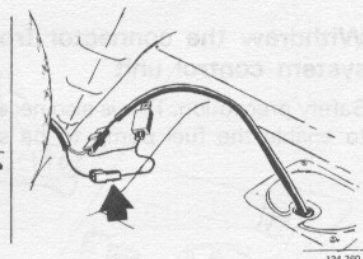
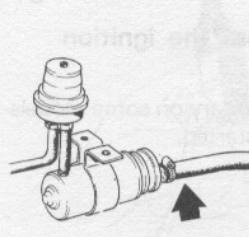


134 762

Fit:

- inlet hose (E/F) and rubber bellow (Turbo).

A15



134 700

Reconnect the fuel line to the fuel pump

A16

Reconnect the tank pump plug

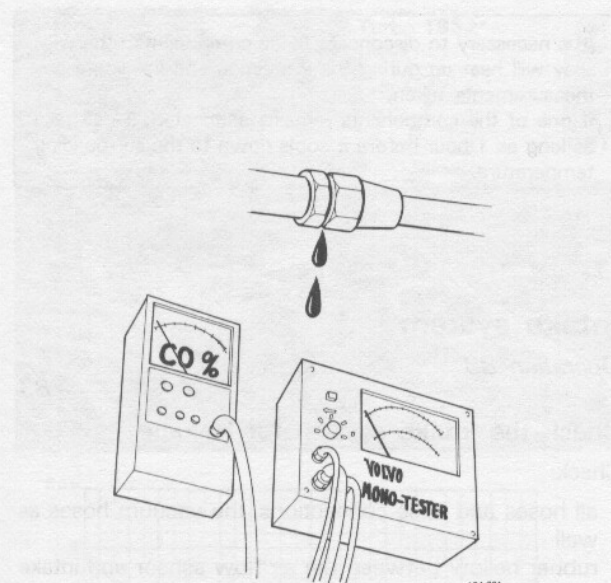
A17

Fill the tank with new fuel

A18

Start the engine. Check for leakage

A19



134 761

Check/adjust idle speed and CO content

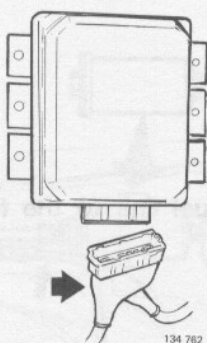
A20

	Page
E-engines	49
F-engines, without catalytic converter	49
with catalytic converter	51
with Lambda-sond	54

B. Complete inspection of CI system

Special tools: 2901, 5011, 5014 (or 0976+0977 for USA and Canada), 5032 (not Turbo), 5116 (not Turbo), 5170 (1978-), 5228 (Turbo), 5229 (Turbo), 5230 (Turbo)

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



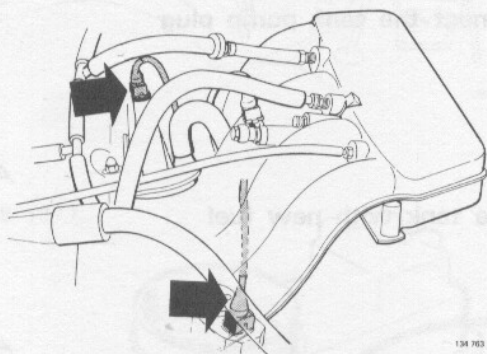
Preparatory work

Operations B1-2

B1

Withdraw the connector from the ignition system control unit

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



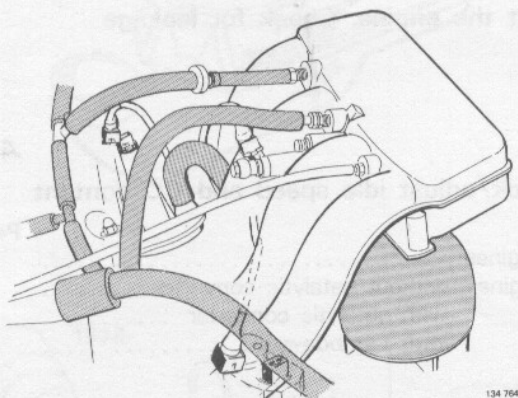
B2

Withdraw the connectors from:

- control pressure regulator
- auxiliary air valve (not fitted on vehicles with constant idle system).

It is necessary to disconnect these components otherwise they will heat up during the inspection and invalidate any measurements taken.

If one of the components remains connected, it can take as long as 1 hour before it cools down to the surrounding temperature.



Intake system

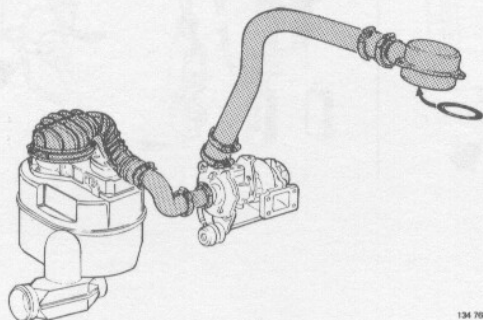
Operation B3

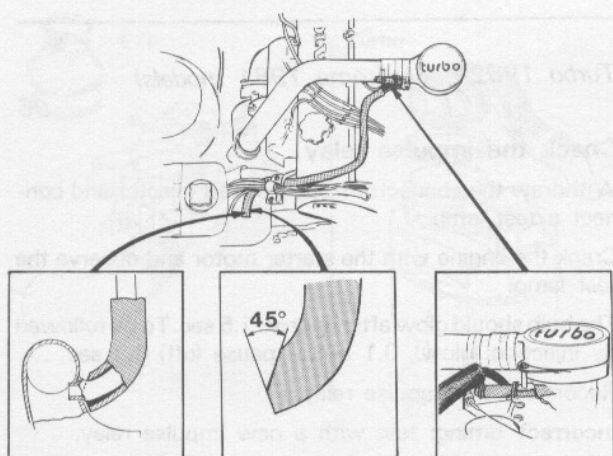
B3

Check the intake system for leakage

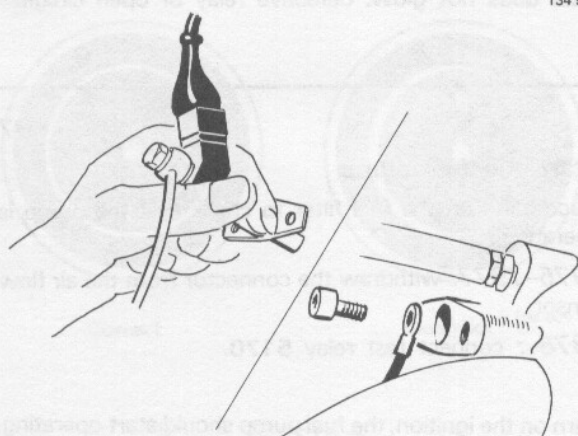
Check:

- all hoses and hose connections, the vacuum hoses as well
- rubber bellow between the air flow sensor and intake manifold
- O-rings
- screw joints: intake manifold, start injector, injectors etc.

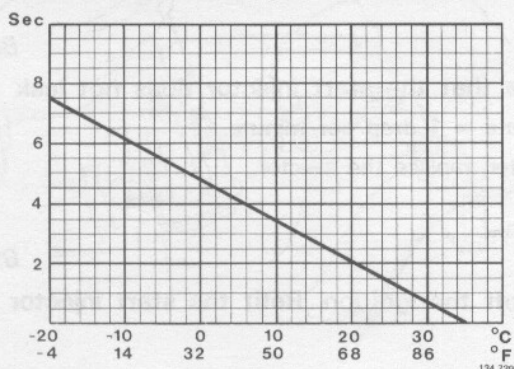
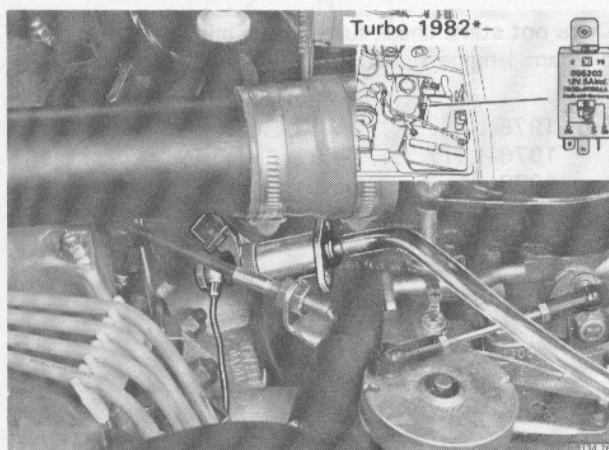




134 958



123 272



Injection time at different temperatures

Tolerances: time = ± 2 seconds; temperature $\pm 4^{\circ}\text{C}$
= approx. $\pm 8^{\circ}\text{F}$.

Turbo: check the crankcase ventilation hose (if incorrectly connected or kinked, difficulties in starting the engine may be encountered).

Check that:

- the hose is pressed in up to the stops
- the protective hose is the correct length, and cut as shown
- the hose is not kinked
- the hose is routed over the start injector.

Start injector

Operations B4-9

B4

Remove the start injector from the intake manifold

Inhex 5 mm.

E/F engines: reconnect the earth/ground lead and one of the retaining screws otherwise the fuel pump cannot be operated.

B5

Check the start injector and thermal time switch

Turbo 1982-: withdraw the connector from the impulse relay.

Connect the injector to a piece of transparent plastic hose. Hold the end of the hose upwards. (Hose inner diameter 7-8 mm = 0.28-0.32 in, length 0.5 m = 16 in.

Crank the starter motor and observe the injector.

The injector should spray fuel when the starter motor is cranked. The injection time, depends on the engine temperature (see diagram).

Turbo 1982-: connect the plug to the impulse relay.

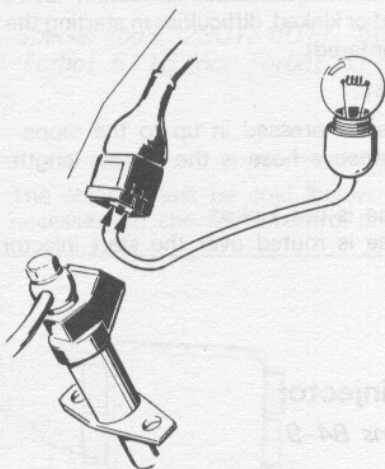
* The impulse relay may have been fitted to some 1981 Turbos.

Injection not interrupted: withdraw the connector from the start injector. If injection is interrupted, then the thermal time switch is faulty. If injection is still not interrupted, the start injector is faulty.

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

No injection

B52



120 374

Turbo 1982- only (some 1981 models)

B6

Check the impulse relay

Withdraw the connector from the start injector and connect a test lamp.

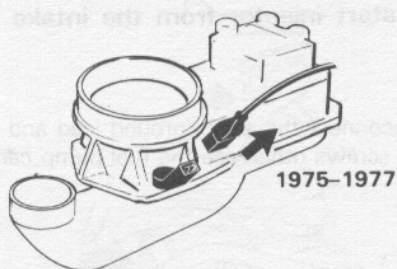
Crank the engine with the starter motor and observe the test lamp.

The bulb should glow after approx. 1.5 sec. To be followed by injection (glow), 0.1 sec. - pause (off) 0.3 sec. ...

Reconnect the impulse relay.

Incorrect timing: test with a new impulse relay.

Bulb does not glow: defective relay or open circuit.



1975-1977

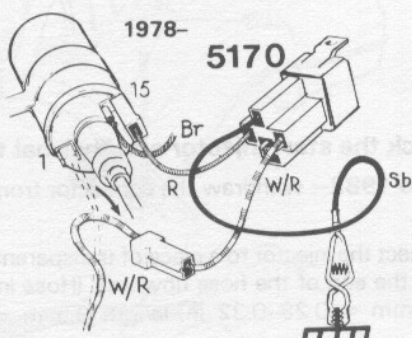
B7

Start the fuel pump

Place hand on the fuel filter to check that the pump is operating.

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

1978-: connect test relay 5170.



1978-

5170

Turn on the ignition, the fuel pump should start operating.

Does not start: check fuses, leads and relay. See wiring diagram (engine running):

	Page
E/F 1975	106
1976-1977	107
1978	108
1979-	109
Turbo 1981	109
1982-	110



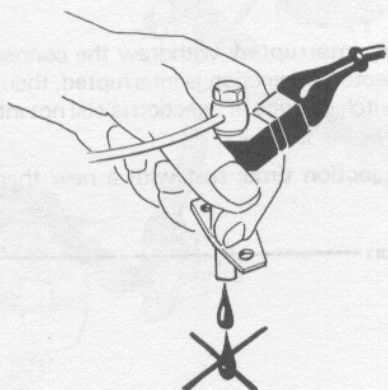
134 768

B8

Ensure that the start injector does not leak

Max. rate = 1 drop per minute.

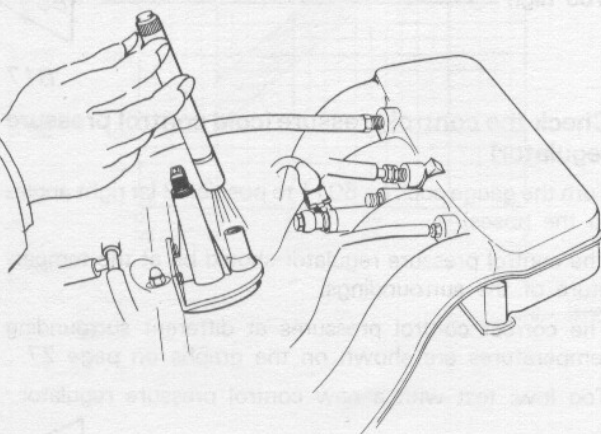
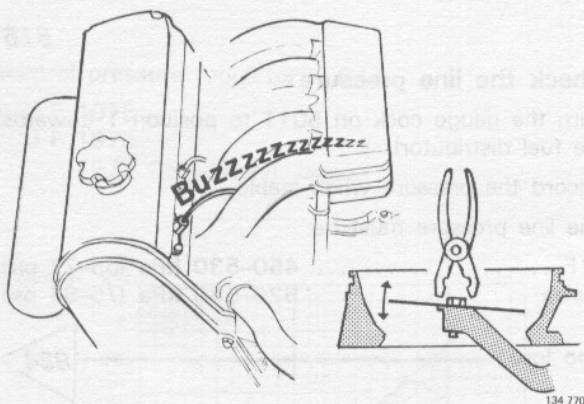
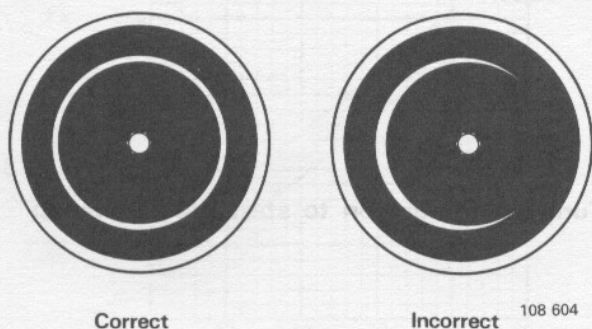
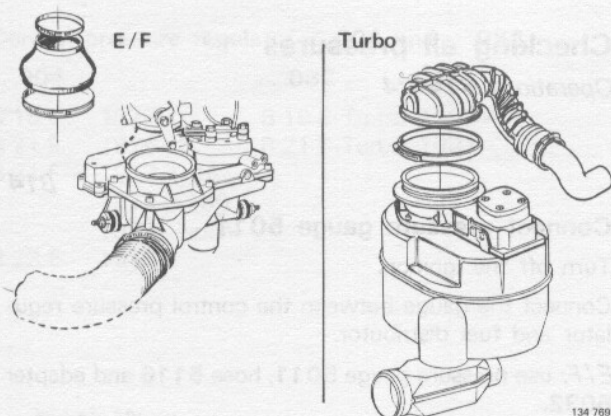
If greater, replace the injector.



123 304

B9

Turn off the ignition. Refit the start injector



Air-fuel control unit

Operations B10-12

B10

Remove the rubber bellows from the air flow sensor

B11

Check the sensor plate position

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

Side play: recondition the air flow sensor.

Incorrect position: undo the centre screw and adjust. Retighten the screw.

The height of the sensor plate is checked later at max. control pressure.

B12

Make sure that the sensor plate does not jam

Turn on the ignition.

Lift up the plate for a **short while** and listen to the injectors. **Note!** The control pressure offers some resistance when lifting the plate, do not mistake this for jamming.

No noise should be heard from the injectors when the plate is at its rest position, but they start to buzz on lifting the plate.

The plate should return to its rest position on release.

Turn off the ignition.

Plate jams: recondition the air flow sensor.

Injectors buzz with plate in rest position: the control plunger in the fuel distributor has jammed, clean/replace.

Injectors quiet when plate lifted: incorrect line pressure.

Auxiliary air valve

Operation B13

Applies only to engines without constant idle speed system (CIS)

B13

Check that the auxiliary air valve opens

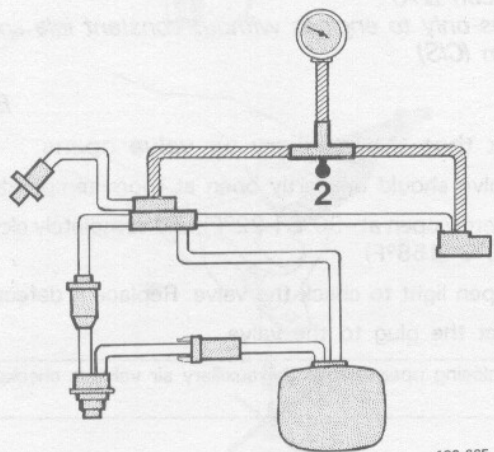
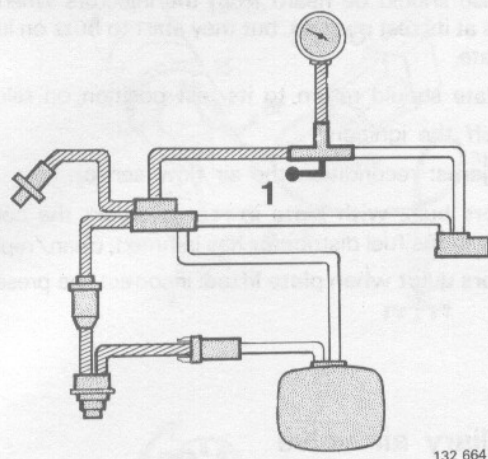
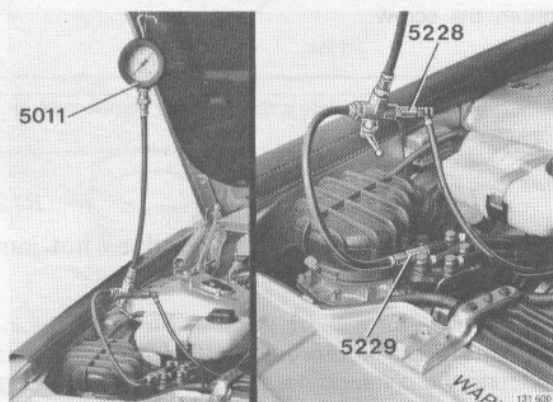
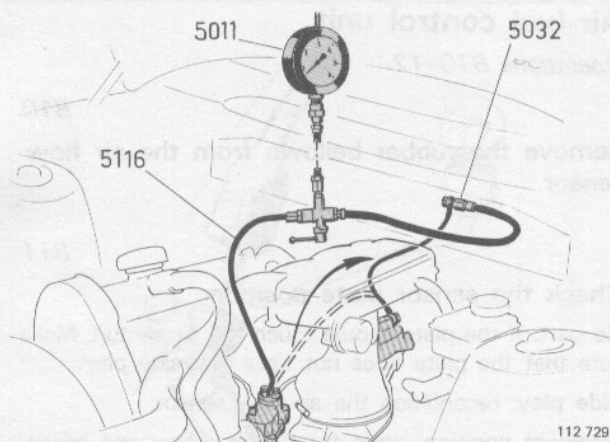
The valve should be partly open at room temperature.

Completely open at -30°C (-22°F), and completely closed at $+70^{\circ}\text{C}$ (158°F)

Use a pen light to check the valve. Replace if defective.

Connect the plug to the valve.

The closing operation of the auxiliary air valve is checked later.



Checking all pressures

Operations B14–24

B14

Connect pressure gauge 5011

Turn off the ignition.

Connect the gauge between the control pressure regulator and fuel distributor.

E/F: use pressure gauge 5011, hose 5116 and adapter 5032.

Turbo: use pressure gauge 5011 and adapters 5228 and 5229.

B15

Turn on the ignition to start the fuel pump

B16

Check the line pressure

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

Record the pressure when stable.

The line pressure must be:

E/F 450–530 kPa (65–77 psi)
Turbo 520–580 kPa (75–84 psi)

Too low —————→ B54

Too high —————→ B59

B17

Check the control pressure (cold control pressure regulator)

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

The control pressure regulator should be at the temperature of the surroundings.

The correct control pressures at different surrounding temperatures are shown on the graphs on page 27.

Too low: test with a new control pressure regulator.

Too high —————→ B61

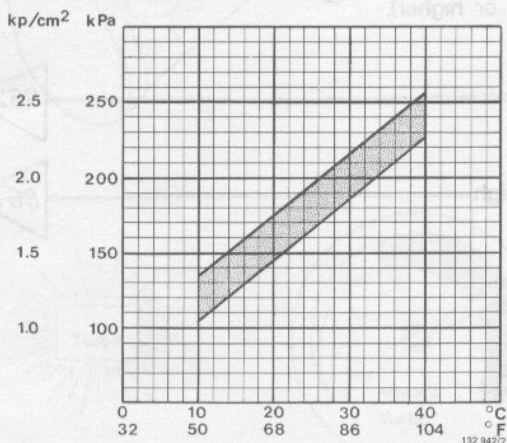
Control pressure regulator ...004 and ...082

...004

B 19 E 1977-
B 21 E 1976-
B 21 F-5 1977 USA
1978-1980
1981-Japan
B 23 E 1979-

...082

B 19 E-Turbo 1982-
B 21 E-Turbo 1981

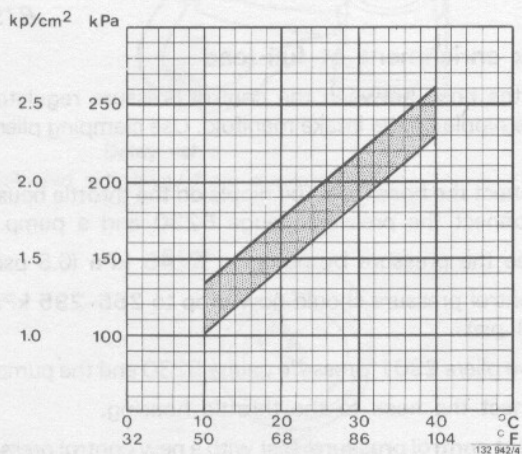


Control pressure regulator ...014

B 21 E 1975

B 21 F 1976

1977 Canada and Japan



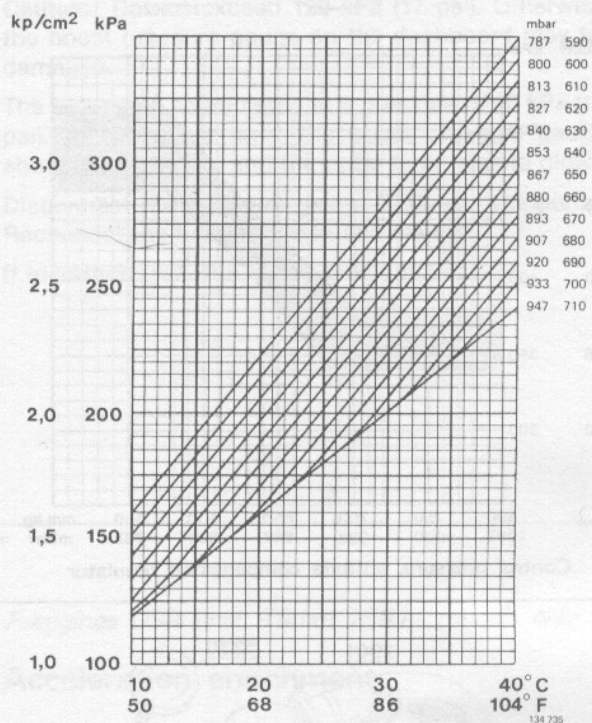
Control pressure regulator ...021

Altitude compensated.

B 21 F Federal 1976 and 1977 certain special versions.

The tolerances for the control pressure are ± 25 kPa (± 3.6 psi)

The diagram is based on air pressure at sea level and up to altitudes of approx. 600 metres (2000 ft) (i.e. 947 mbars or higher). For altitudes in excess of this, it is necessary to know the air pressure at the time of test.

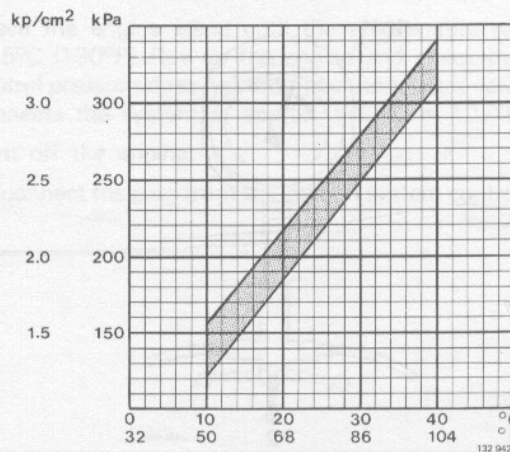


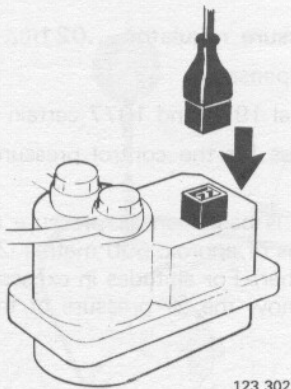
Control pressure regulator ...079

B 21 E-5 B 21 F-5 1981 USA

B 21 F-9 B 21 F-9 1981-

B 21 F-Turbo B 21 F-Turbo 1981-





123 302

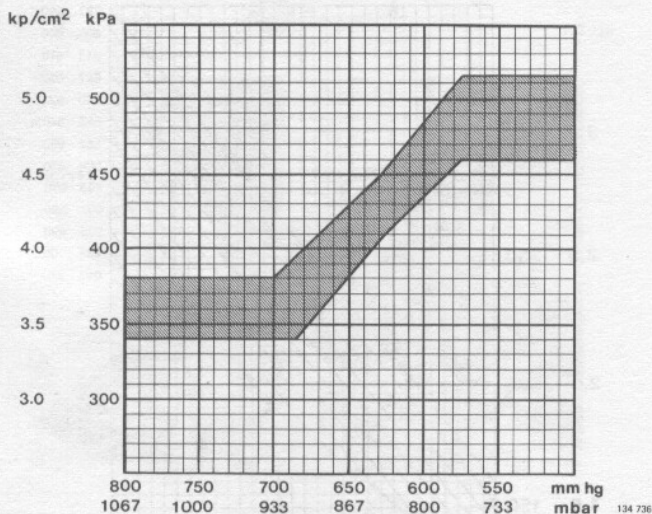
Check the control pressure (warm control pressure regulator)

Connect the plug to the control pressure regulator. The regulator now receives current and will heat up.

After max. 5 minutes the control pressure should have increased to **345–375 kPa** (50–54 psi).

Note! On B 21 F USA Federal 1976 and 1977 models with altitude compensated control pressure regulators the control pressure varies to an extent dependent on the prevailing air pressure, see diagram.

The diagram is based on air pressure at sea level, and up to altitudes of approx. 600 metres (2.000 ft) (i.e. 947 mbars or higher).



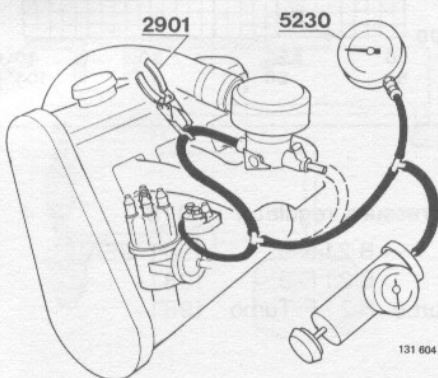
Control pressure, altitude compensated regulator

Too low

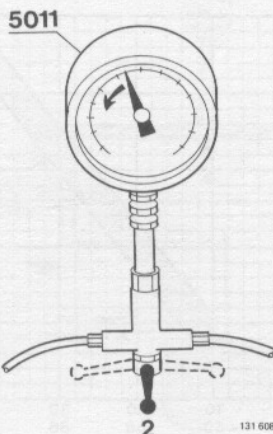
B62

Too high

B61



131 604



2

131 608

E-Turbo engines only

Full load enrichment

Operations B19–20

Check enrichment at full load

Block the hose between the control pressure regulator and the nipple on the intake manifold. Use clamping pliers **2901**.

Disconnect the hose from the nipple on the throttle housing. Connect the pressure gauge **5230** and a pump.

Increase the pressure by pumping to **45 kPa** (6.5 psi).

The control pressure should now drop to **265–295 kPa** (38–43 psi).

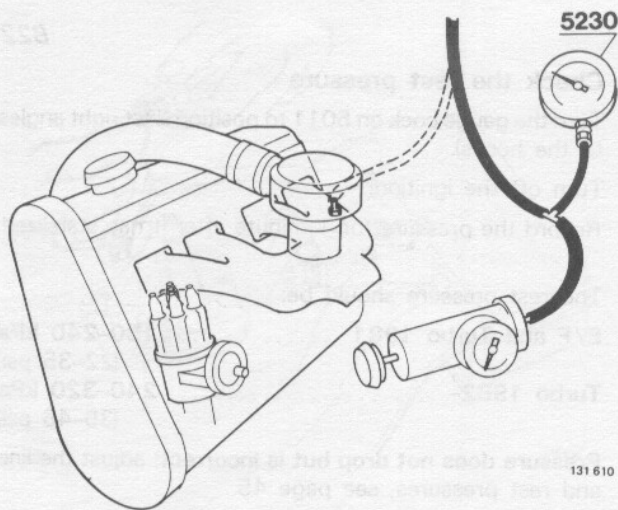
Remove pliers **2901**, pressure gauge **5230** and the pump.

Reconnect the hose to the throttle housing.

Incorrect control pressure: test with a new control pressure regulator.

The fuel enrichment at full load is necessary to ensure the internal cooling of the engine. If the fuel-air mixture is too lean, then the combustion temperature will rise and the engine may overheat.

B20



131 610

Check the pressure sensor

Connect the pressure gauge **5230** and pump to the hose leading to the pressure sensor. (The pressure sensor is located on the inside of the firewall (bulkhead) above the pedal carrier.)

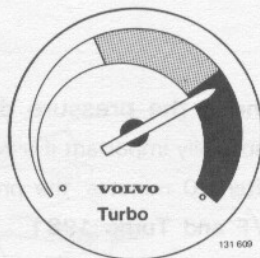
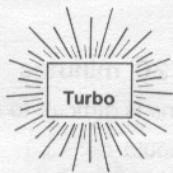
Increase the pressure until the fuel pump stops working. This can be checked by placing the hand on the fuel filter (the pressure sensor interrupts the pump relay earth/ground connection).

Caution! Do not exceed **120 kPa (17 psi)**. Otherwise the boost pressure gauge on the dashboard may be damaged.

The fuel pump should stop at a pressure of **90 kPa (13 psi)**. At the same time, the boost pressure gauge should indicate red and the turbo lamp should glow.

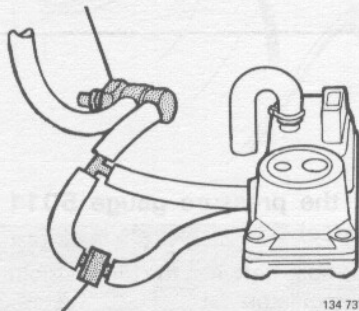
Disconnect the pressure gauge **5230** and the pump. Reconnect the hose to the intake manifold.

If incorrect: test with a new pressure sensor.



131 609

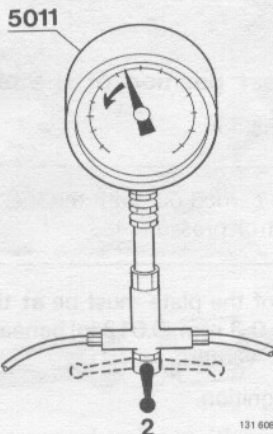
Thermostat valve



134 737

Delay valve

(Coloured side away from regulator)



131 608

F-engines USA (incl. Turbo) 1981- models only

Acceleration enrichment

B21

Check the enrichment during acceleration

The engine must be cold (below $+50^{\circ}\text{C} = 118^{\circ}\text{F}$).

Connect the plug to the ignition system control unit.

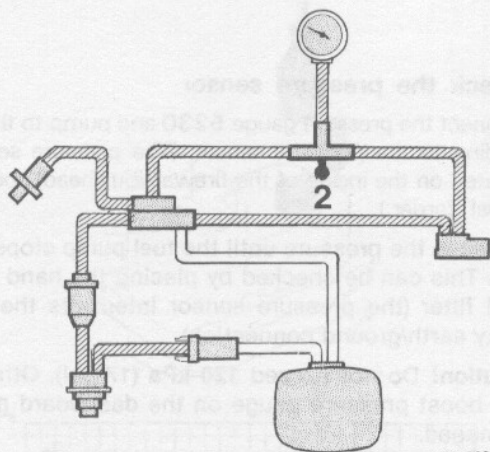
Start the engine.

Rev up the engine quickly and record the control pressure on pressure gauge **5011**. The pressure should drop for a short time (1 sec.) and then return to the original value.

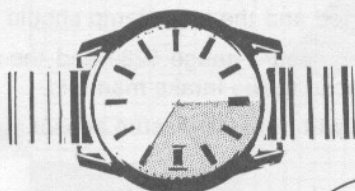
Leave the engine idling until the temperature reaches $+55^{\circ}\text{C} (130^{\circ}\text{F})$. Rev up the engine and check that the control pressure does not drop (the thermostat valve disconnects the system at approx. $+53^{\circ}\text{C} = 127^{\circ}\text{F}$).

Turn off the engine.

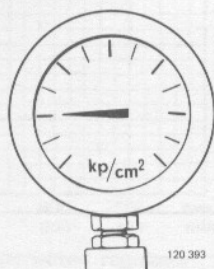
Disconnect the plug from the ignition system control unit.



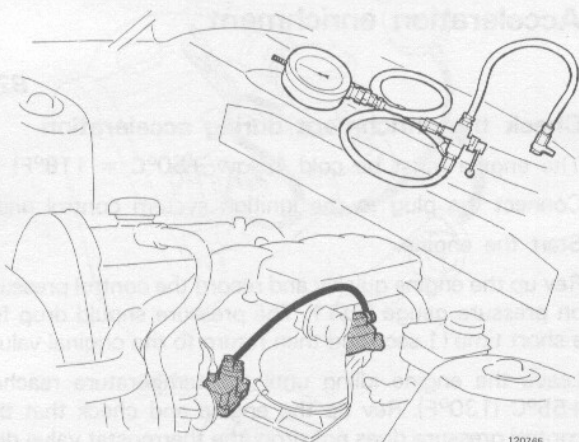
132 666



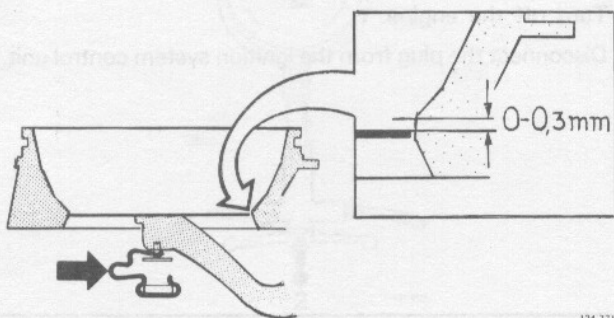
20min.



120 393



120765



134 771

B22

Check the rest pressure

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

Turn off the ignition.

Record the pressure for 1 minute after it has stabilized.

The rest pressure should be:

E/F and Turbo 1981	150–240 kPa (22–35 psi)
Turbo 1982–	240–320 kPa (35–46 psi)

Pressure does not drop but is incorrect: adjust the line and rest pressures, see page 45.

Pressure drops



B23

Check the pressure drop for 20 minutes

Especially important if a warm engine is difficult to start

After 20 minutes, the pressure should be:

E/F and Turbo 1981	min. 150 kPa (22 psi)
Turbo 1982–	min. 240 kPa (35 psi).

Too low



B24

Disconnect the pressure gauge 5011 and adapters (hose)

Reconnect the hose between the fuel distributor and control pressure regulator.

Air flow sensor

B25

Check the rest position of the plate

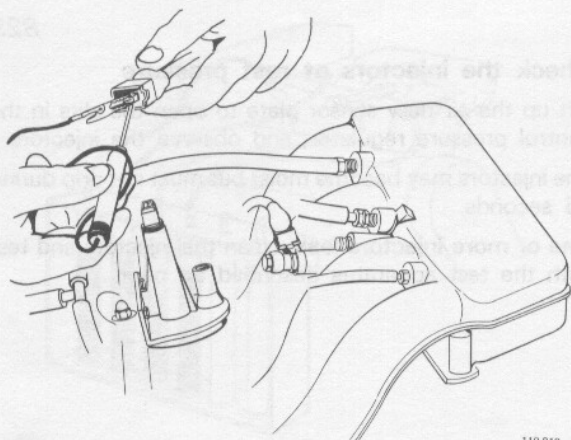
Turn on the ignition.

This must be carried out with the fuel pump running at max. control pressure.

The top edge of the plate must be **at the same height, or at the most 0.3 mm (0.012 in) beneath** the cylindrical part of the air venturi.

Turn off the ignition.

Incorrect rest position: adjust by compressing/expanding the spring beneath the plate.



119 819

Auxiliary air valve

Operation B26

Only cars without constant idle speed system (CIS)

B26

Check that the auxiliary air valve closes

Turn on the ignition.

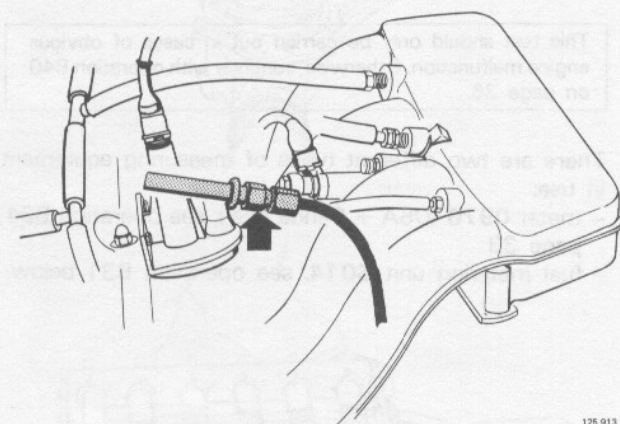
The auxiliary air valve should be completely closed after approx. 5 minutes at +20°C (68°F) ambient temperature.

Turn off the ignition.

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

If it still does not close

B68



126 913

Injectors, fuel distributor

Operations B27-40

B27

Remove the injectors from the cylinder head



1134 772

Turbo: first disconnect the fuel lines from the injectors. Take care not to bend the pipes.

Then remove the injectors and connect them to the fuel lines.

B28

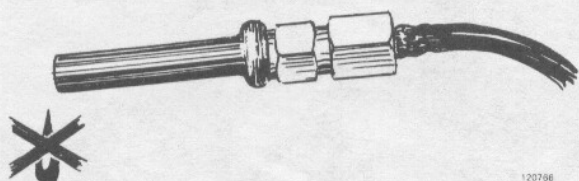
Make sure that the fuel distributor does not leak

Turn on the ignition to start the fuel pump.

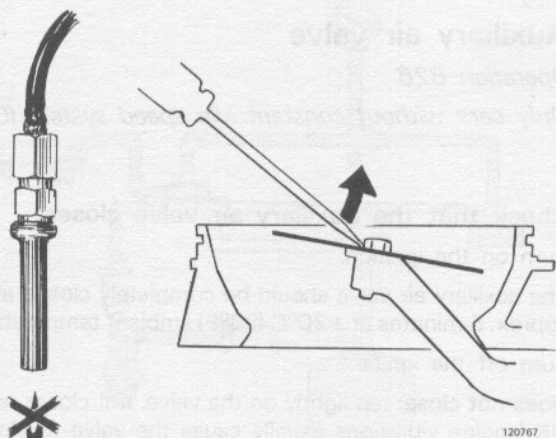
Observe the injectors, they can become moist but must not start to drip.

Turn off the ignition.

Injectors drip: internal leakage in fuel distributor, replace the complete fuel distributor.



120786



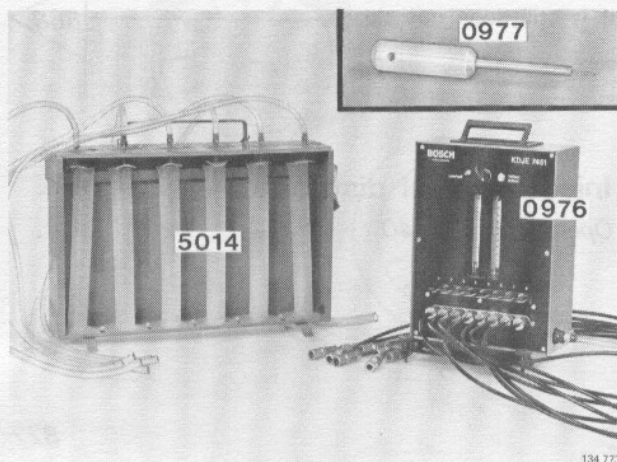
B29

Check the injectors at rest pressure

Lift up the air flow sensor plate to open the slits in the control pressure regulator, and observe the injectors.

The injectors may become moist but must not drip during 15 seconds.

One or more injectors leak: clean the injectors and test with the test apparatus described on page 75.



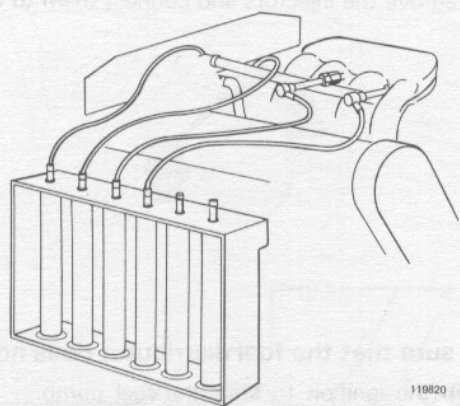
B30

Check the difference between the 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 36.

There are two different types of measuring equipment in use:

- meter **0976** (USA + Canada only), see operation B34, page 33
- fuel metering unit **5014**, see operation B31 below.



Fuel metering unit 5014

Operations B31-33

B31

Connect fuel metering unit 5014

In order to obtain comparable results, all of the hoses should either be empty or full at the start of the test.

B32

Check injector deviation

Turn on the ignition to start the fuel pump.

Lift up the sensor plate to half its travel. Keep it in this position until 100 cm^3 of fuel has been delivered in one of the measuring cylinders. Then release the plate.

The injectors should start delivering fuel at the same time. The max. fuel deviation, i.e., the difference between the largest and smallest amounts of fuel delivered, must not exceed 20 %.

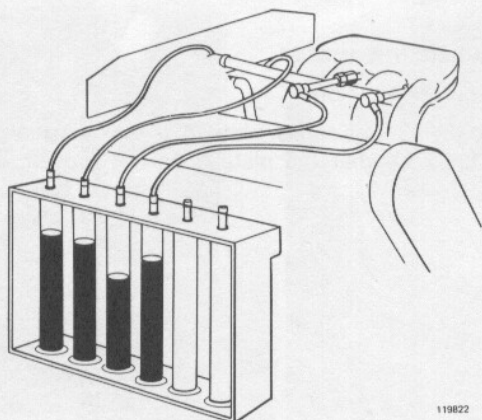
Turn off the ignition.

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

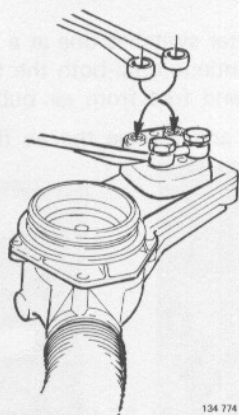
If the deviation is still greater than 20 %: swap the hoses between two injectors (one correct and one faulty) and repeat the test.

If the result is still the same, the injector or line is defective. Clean and test the injector using the test apparatus, see page 75.

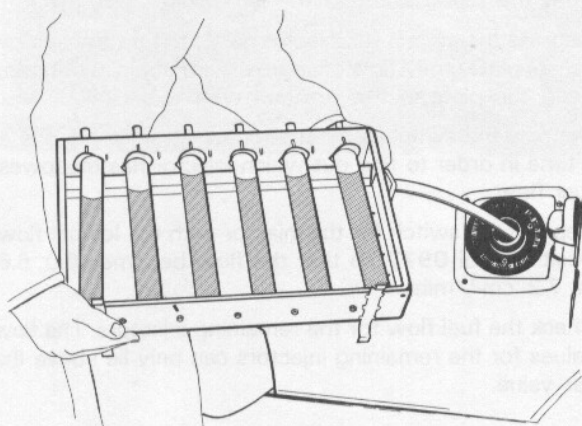
If the other injector malfunctions, the fuel distributor is defective and will have to be replaced.



119822



134 774



120 398

B33

Disconnect the measuring equipment

Pour the fuel back into the tank.

Continue with

B40

Meter 0975 Operations B34-39

USA and Canada only.

Note! The fuel pump must be running during the test. A battery charger (max. charge 15A) can be connected to prevent the battery from becoming discharged.

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

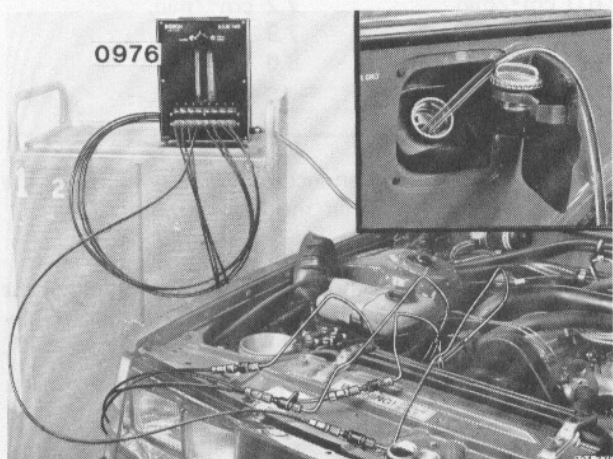
B34

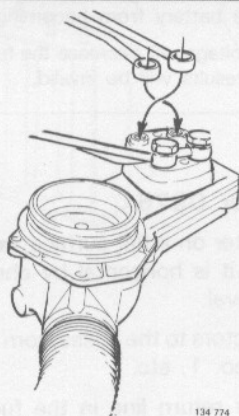
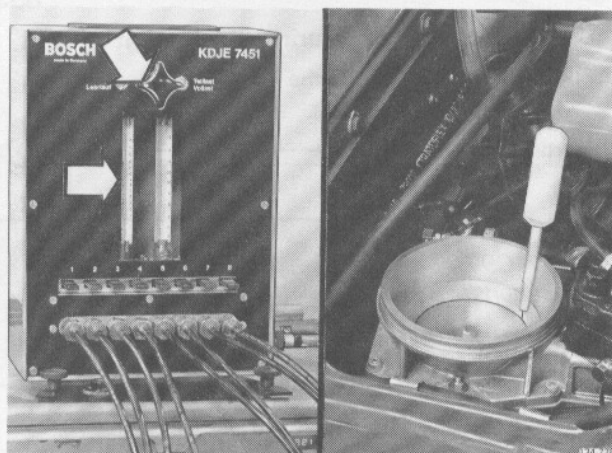
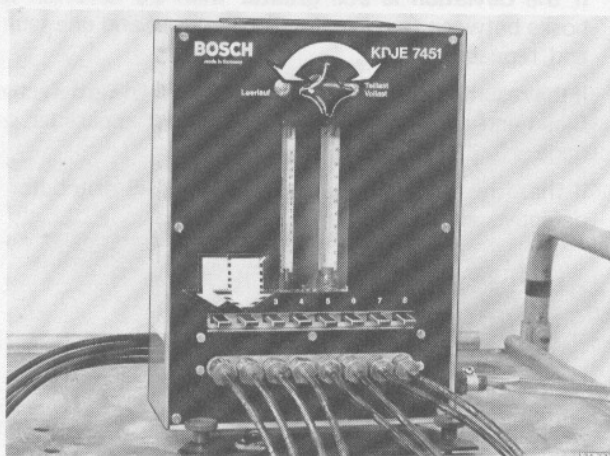
Connect meter 0976

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

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

Insert the meter return line in the fuel tank.





B35

Evacuate the meter

Turn on the ignition.

Lift up the air flow sensor plate to its max. position. Insert tool **0977** so that the plate does not move.

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

Remove **0977** and release the air flow sensor plate.

B36

Check the fuel flow at idle position

Turn the meter knob to the left (white spot).

Depress the switch for injector no. 1. Lift up the air flow sensor plate until a flow of approx. $6 \text{ cm}^3/\text{min.}$ is obtained. Keep the plate in this position with tool **0977**.

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

Depress the switch for the injector with the lowest flow. Position tool **0977** so that the flow becomes 6.0 , 6.6 , or $7.2 \text{ cm}^3/\text{min.}$

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

Set value	Max. permissible fuel flow
$6.0 \text{ cm}^3/\text{min.}$	$7.2 \text{ cm}^3/\text{min.}$
6.6 "	7.9 "
7.2 "	8.6 "

Incorrect fuel flow:

Turn off the ignition.

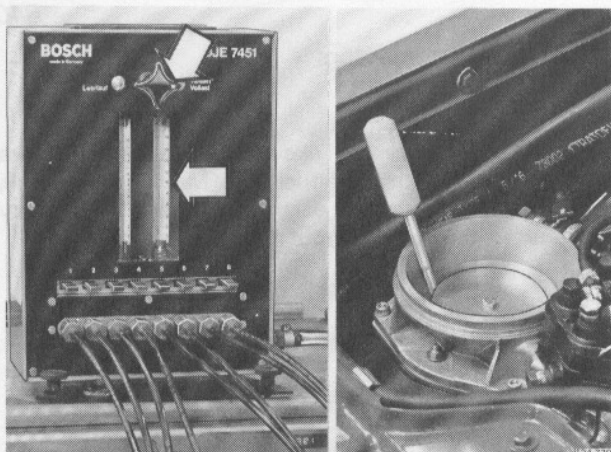
Swap a fuel line with an incorrect flow, with a fuel line having a correct flow (at the fuel distributor).

Repeat the flow test.

If the fault still remains on the same injector, either the injector or the fuel line is defective. Clean the injector and test it in the test apparatus described on page 75.

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

B37

**Check the fuel flow at part load**

Turn the meter knob to the right (white spot).

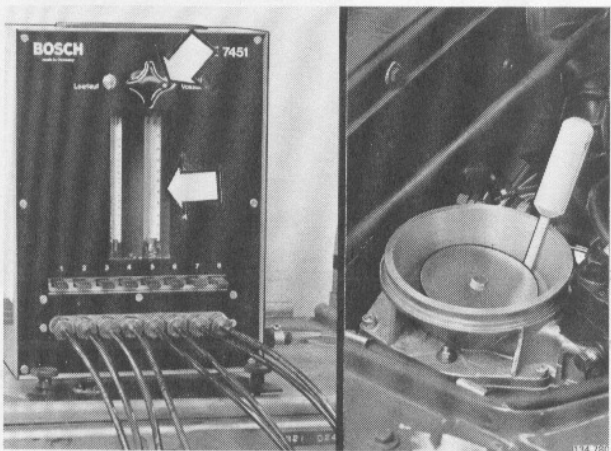
Position tool **0977** so that the fuel flow for the injector with the lowest flow becomes 40, 50 or 60 cm³/min.

Check the fuel flow for the remaining injectors.

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

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

B38

**Check the fuel flow at full load**

Turn the meter knob to the right (white spot).

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

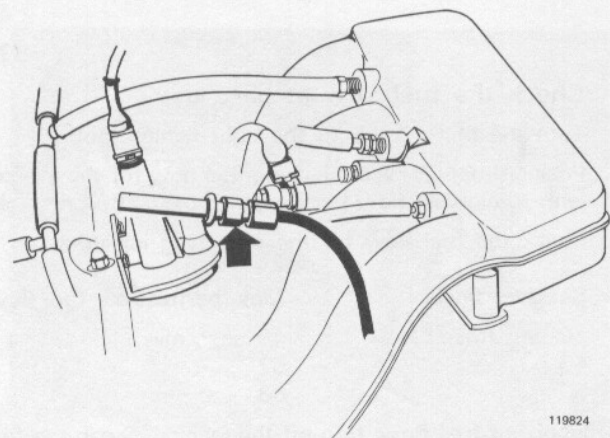
Check the fuel flow for the remaining injectors.

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

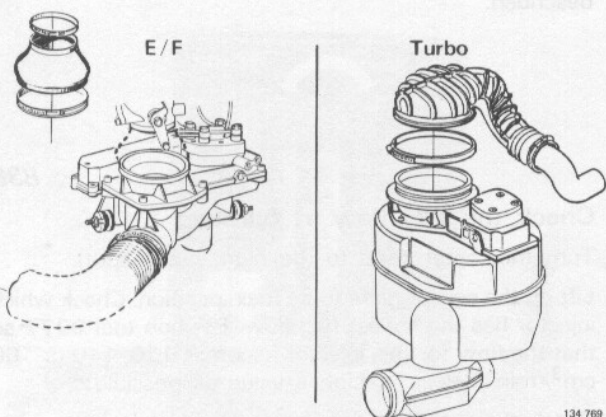
Incorrect fuel flow: turn off the ignition. Swap the fuel lines at the fuel distributor. Repeat the test, as previously described.

B39

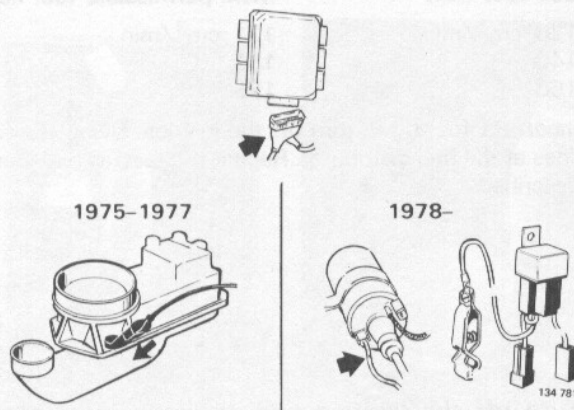
Turn off the ignition and disconnect the test apparatus



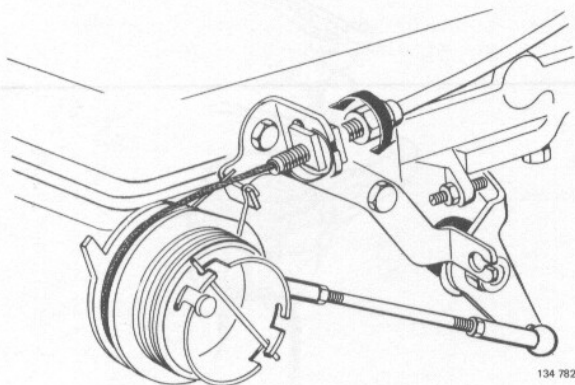
119824



134 769



134 781



134 782

B40

Reinstall the injectors

Turbo:

- refit the injectors.
- position the fuel lines. Take care not to bend the pipes.
- connect and clamp the fuel lines. Make sure that they do not rub against any part of the engine. If necessary, refer to the fuel line routing diagram on page 91.

B41

Reinstall the rubber bellows

B42

Reconnect the wiring and plugs

Plug in the connector to the ignition system control unit. **Caution!** Ensure that the rubber seal in the connector is installed correctly. Without it water can enter and cause corrosion, poor contact, etc.

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

1978-: disconnect test relay 5170. Reconnect the ignition coil.

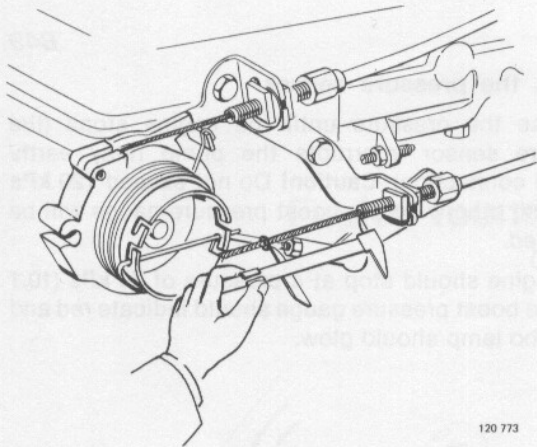
B43

Check/adjust the throttle cable

The bobbin must strike the stop at idle. The cable should be taut but should not affect the position of the throttle.

Adjust if necessary with the cable sleeve.

At full throttle, the bobbin should strike the other stop.



120 773

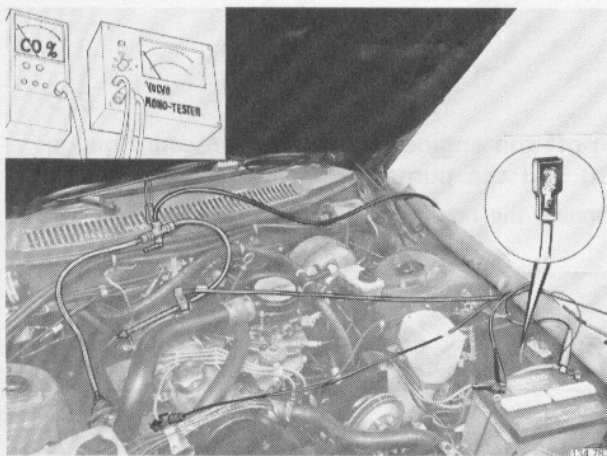
B44

Check/adjust throttle cable (auto)

Depress the accelerator fully. **Note!** Do not adjust the control by hand otherwise the setting will be incorrect.

At full throttle the distance from the cable sleeve to the clip should be 43–47 mm = 1.69–1.85 in for BW 35, and 50.4–52.6 mm = 1.98–2.07 in for BW 55.

Adjust using the cable sleeve.



134 783

F-Turbo engines only

**Pressure switch
Pressure sensor**

Operations B45–50

B45

Connect test meter

- Dwell-angle meter. Connect the meter to the service connection for Lambda-sond.
- CO gauge. Connect the gauge to the socket on the exhaust pipe in front of the catalytic converter.

B46

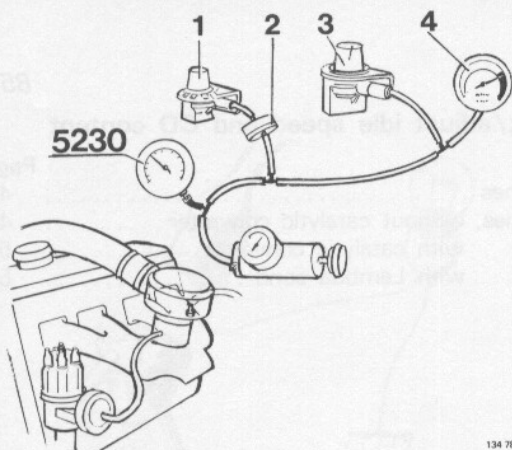
Warm-up the engine

B47

Connect pressure gauge 5230 and the pump

Connect to the hose from the intake manifold.

- 1 = pressure switch
- 2 = delay valve (auto only). The coloured side should face away from the pressure switch
- 3 = pressure sensor
- 4 = boost pressure gauge



134 784

B48

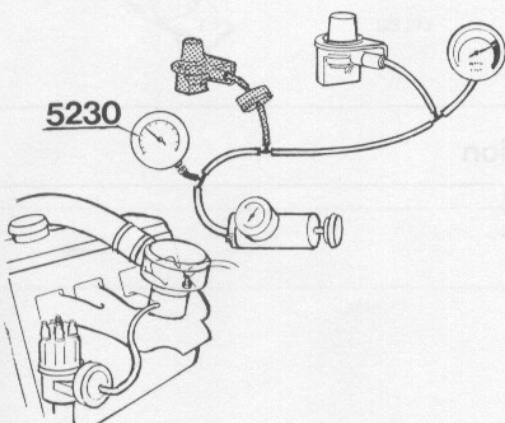
Check full load enrichment

The engine must be running.

Increase the pressure to **20.3 kPa** (2.9 psi). The dwell angle gauge should drop to **64–70°** (the pressure switch earths/grounds the lambda sond control unit).

If pressure incorrect: test with a new pressure switch.

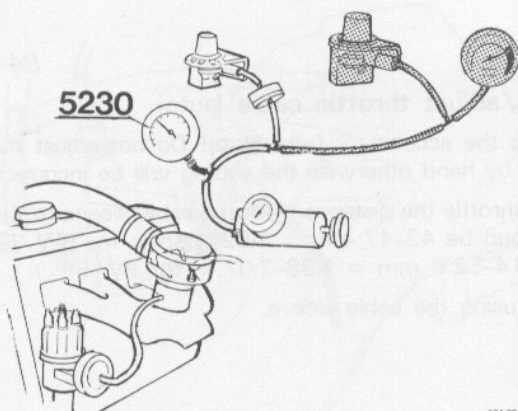
If dwell angle reading is incorrect: check the lambda sond system for faults, see respective service manual.



134 785

Fuel enrichment at full load is necessary to ensure the internal cooling of the engine. If the fuel-air mixture is too lean, the combustion temperature will rise and the engine may overheat.

B49

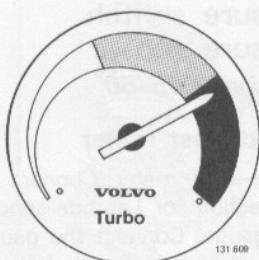
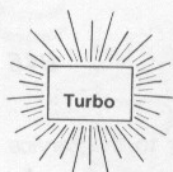


134 706

Check the pressure sensor

Increase the pressure until the engine stops (the pressure sensor interrupts the pump relay earth/ground connection). **Caution!** Do not exceed **120 kPa** (17.4 psi) otherwise the boost pressure gauge will be damaged.

The engine should stop at a pressure of **70 kPa** (10.1 psi), the boost pressure gauge should indicate red and the turbo lamp should glow.

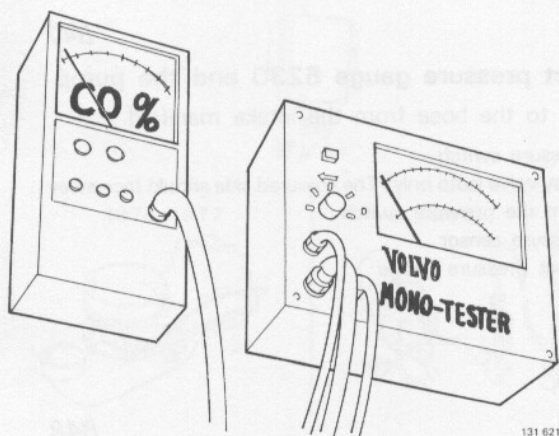


131 608

B50

Turn off the engine. Disconnect pressure gauge 5230 and the pump

Reconnect the hose to the intake manifold.



131 621

B51

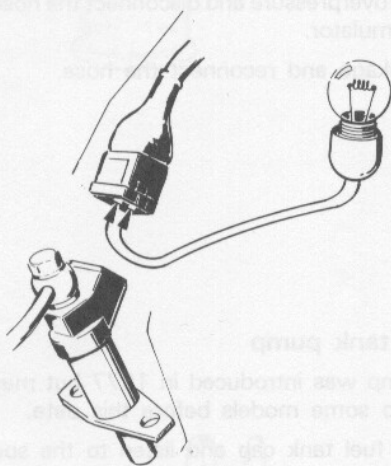
Check/adjust idle speed and CO content

	Page
E-engines	49
F-engines, without catalytic converter	49
with catalytic converter	51
with Lambda sond	54

End of inspection

Faults found during the inspection

Operations B52–69



120 374

From B5: No fuel injected from start injector

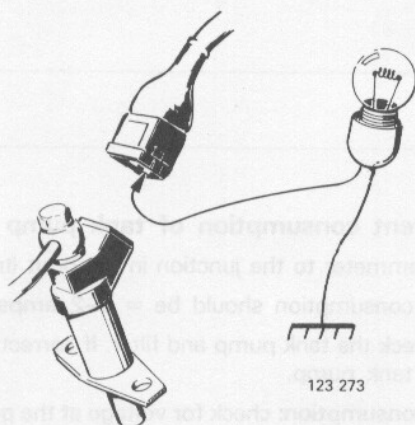
When the fault has been rectified proceed from B6

B52

Check for voltage at the start injector when the starter motor is operating

Measure across both pins.

Voltage: test with a new start injector.



123 273

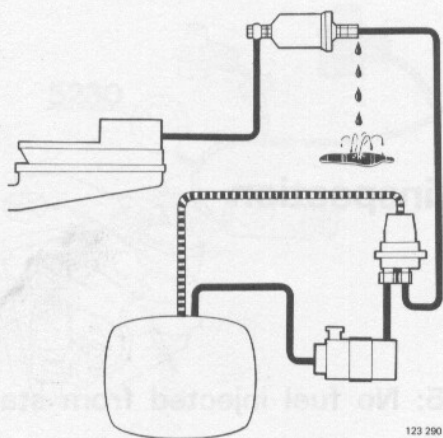
B53

Check for voltage between the plug and earth/ground when the 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 the lead between the starter motor and start injector.

End



From B16: Line pressure too low

When the fault has been rectified proceed with B17

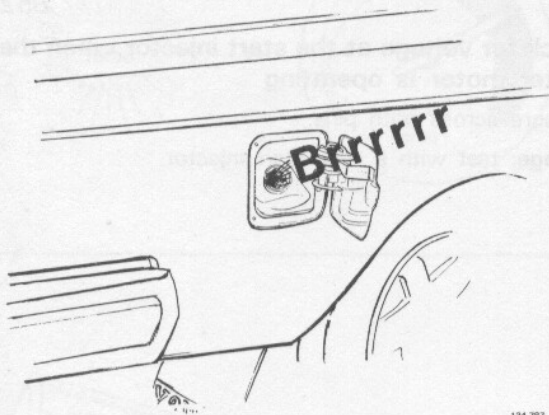
B54

Check for external leakage

(Between the fuel pump and fuel distributor.)

For cars equipped with a fuel leakage return line between the fuel accumulator and fuel tank: remove the tank cap to release any overpressure and disconnect the hose from the fuel accumulator.

Check for leakage and reconnect the hose.



B55

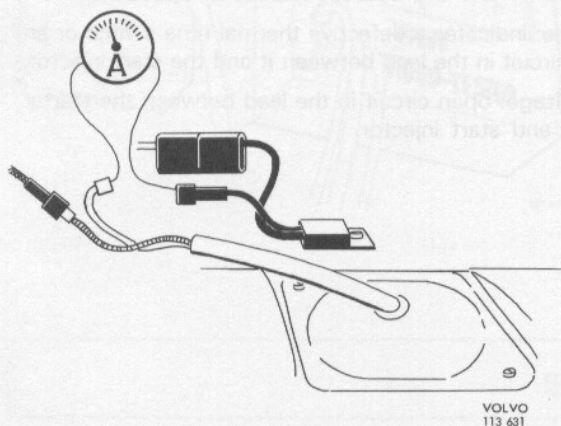
Check the tank pump

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

Unscrew the fuel tank cap and listen to the sound of the pump.

A defective tank pump often causes an increase in the noise level at the main fuel pump.

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



B56

Check current consumption of tank pump

Connect an ammeter to the junction in the boot (trunk).

The current consumption should be = 1–2 amps.

Incorrect: check the tank pump and filter. If correct, test with a new tank pump.

No current consumption: check for voltage at the pump. If OK, test with a new pump.

B57

Check capacity of fuel pump

Turn off the ignition.

Unscrew the fuel tank cap to release any overpressure in the fuel tank.

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

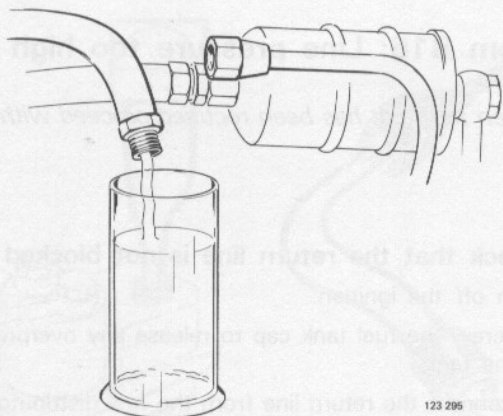
Turn on the ignition for **30 seconds**.

The minimum amount of fuel in the measuring glass should be:

1975-1979	0.8 litre (0.75 US qt)
1980- (except E-Turbo 1981) .	1.0 litre (1.0 US qt)
E-Turbo 1981	1.25 litres (1.2 US qt)

Reconnect the return line.

Capacity too low: retest with a new fuel pump. If this does not help, the fault may be due to a blocked fuel filter, fuel line or fuel distributor.

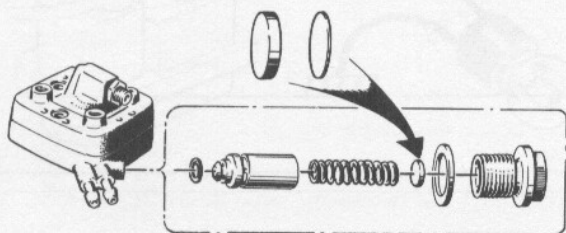


123 295

B58

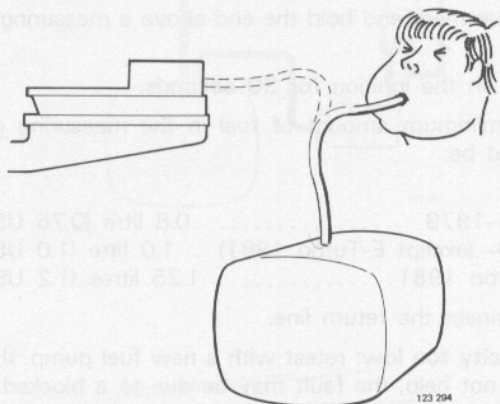
Adjust the line and rest pressures

See page 45. Clean the line pressure regulator and fit new O-rings wherever necessary.



106978

End



From B16: Line pressure too high

When the fault has been rectified proceed with B17

B59

Check that the return line is not blocked

Turn off the ignition.

Unscrew the fuel tank cap to release any overpressure in the tank.

Disconnect the return line from the fuel distributor and blow through the line.

Blocked line: clean, if necessary replace.

OK: check that the screw holes are not blocked.

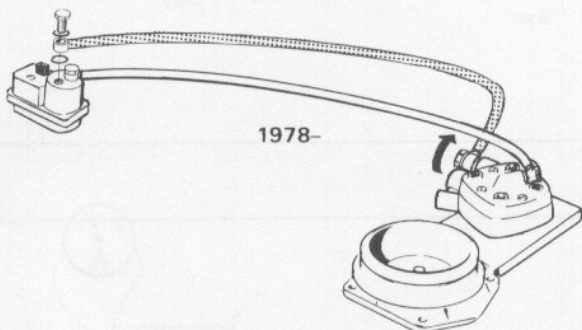
Reconnect the return line.

B60

Adjust the line and rest pressures

See page 45. Clean the line pressure regulator and fit new O-rings wherever necessary.

End



From B17 and B18: Control pressure too high (cold/warm control pressure regulator)

When the fault has been rectified proceed with B18 and B19

B61

Check that the return line is not blocked

Turn off the ignition.

Unscrew the fuel tank cap to release any overpressure in the tank.

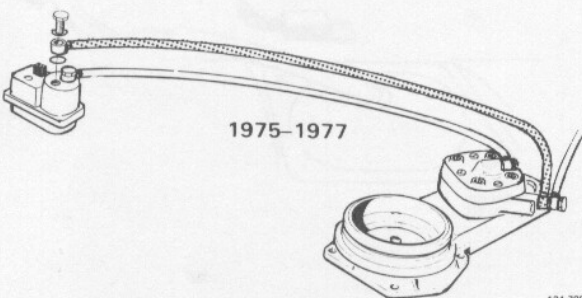
Disconnect the return line from the control pressure regulator. On 1978- models disconnect the line at the fuel distributor as well.

Blow through the line.

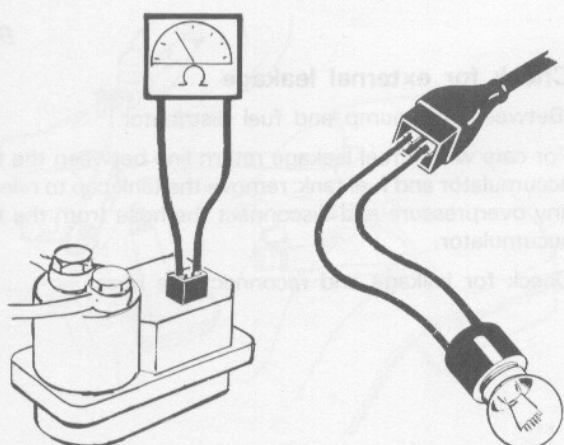
Blocked line: clean, replace if necessary.

Clear line: check that the screw holes are not blocked. If OK, test with a new control pressure regulator.

Note! On 1978- models, the fault may also be due to a blocked line pressure regulator in the fuel distributor.



End



132 777

From B18: Control pressure too low (warm control pressure regulator)

When the fault has been rectified proceed with B19

B62

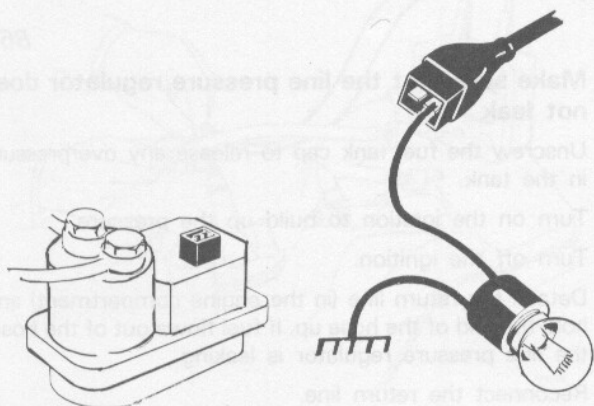
Check for voltage at the control pressure regulator

Measure across both the plug pins.

Voltage: measure the regulator resistance

10–20 Ω regulator ...079 (USA 1981–)
20–30 Ω others.

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



132 778

Check for voltage between the plug and earth/ground

Voltage: open circuit in lead to earth.

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

End

From B22 and B23: Rest pressure drops

When the fault has been rectified proceed with B23 and B24

B64

Check the rest pressure with gauge cock in position 1

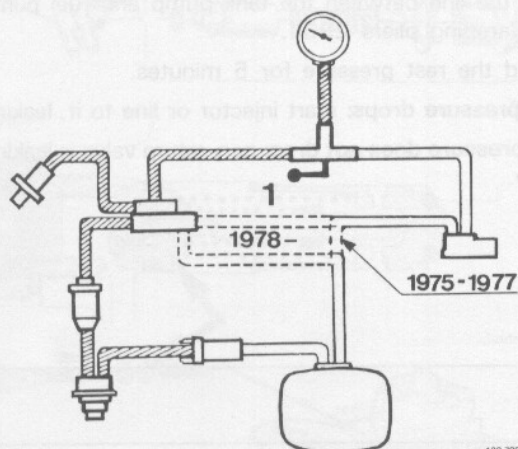
Turn on the ignition to build up the pressure in the system.
Turn off the ignition.

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

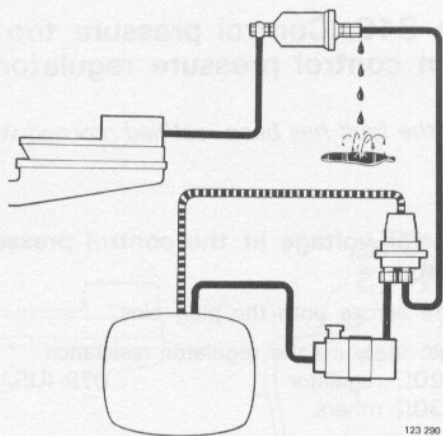
Wait and record the pressure after 5 minutes (this is necessary because the fuel accumulator compensates for any leakage as long as it contains fuel under pressure).

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

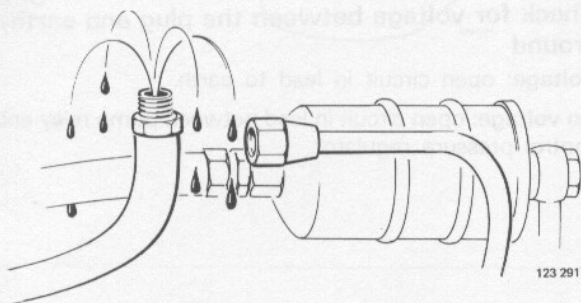
- fuel line leak from the control pressure regulator
- 1975–1977 the control pressure regulator allows too much fuel to flow through. Test with a new regulator
- 1978– the needle valve in the line pressure regulator does not close. Clean/replace the needle valve and fitting.



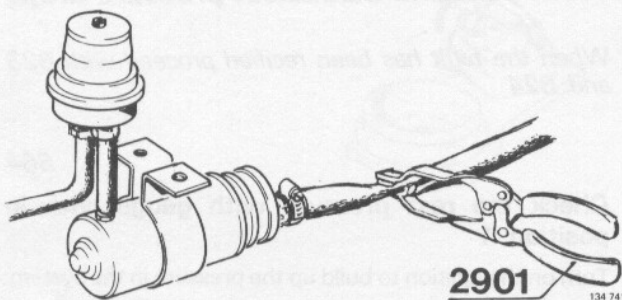
132 789



123 290



123 291



2901

134 741

B65

Check for external leakage

(Between fuel pump and fuel distributor.)

For cars with a fuel leakage return line between the fuel accumulator and fuel tank: remove the tank cap to release any overpressure and disconnect the hose from the fuel accumulator.

Check for leakage and reconnect the hose.

B66

Make sure that the line pressure regulator does not leak

Unscrew the fuel tank cap to release any overpressure in the tank.

Turn on the ignition to build up the pressure.

Turn off the ignition.

Detach the return line (in the engine compartment) and hold the end of the hose up. If fuel flows out of the hose, the line pressure regulator is leaking.

Reconnect the return line.

Line pressure regulator leaking: renew the O-ring. If this does not help, renew the complete fuel distributor.

B67

Check the fuel pump non-return valve

Turn on the ignition to build up the pressure.

Turn off the ignition.

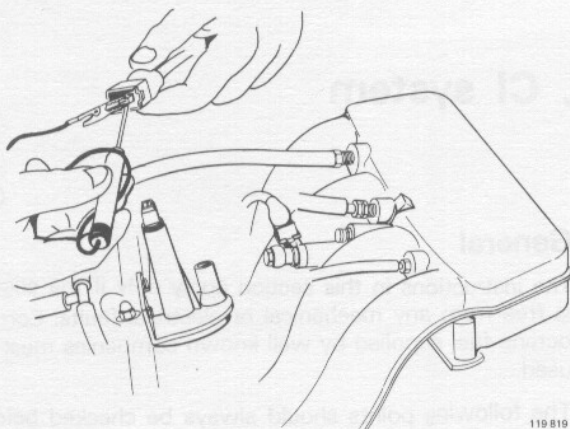
Block the line between the tank pump and fuel pump. Use clamping pliers **2901**.

Record the rest pressure for 5 minutes.

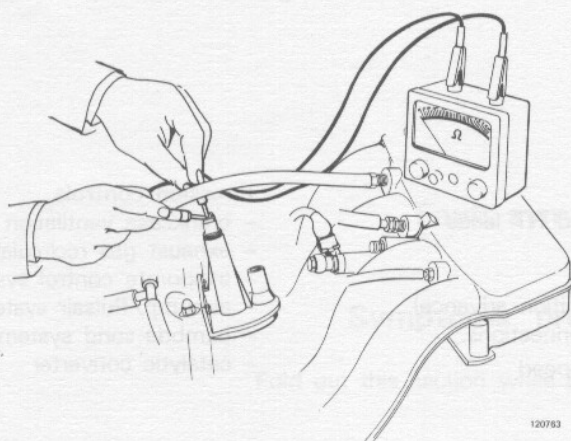
Rest pressure drops: start injector or line to it, leaking.

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

End



119 819



120763

From B26: Auxiliary air valve does not close

When the fault has been rectified proceed with B27

B68

Check for voltage at the auxiliary air valve

Measure across the two pins.

No voltage: check the earth/ground lead. Measure across the yellow lead (1975) or the blue lead (1976-), and earth/ground.

B69

Check resistance of auxiliary air valve

Use an ohmmeter to measure the resistance across the auxiliary air valve plug.

Resistance should be **40-60Ω**.

Correct: indicates poor plug contact.

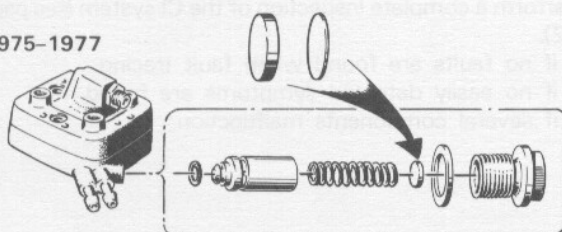
Incorrect: replace the auxiliary air valve.

End

Adjusting the line and rest pressures

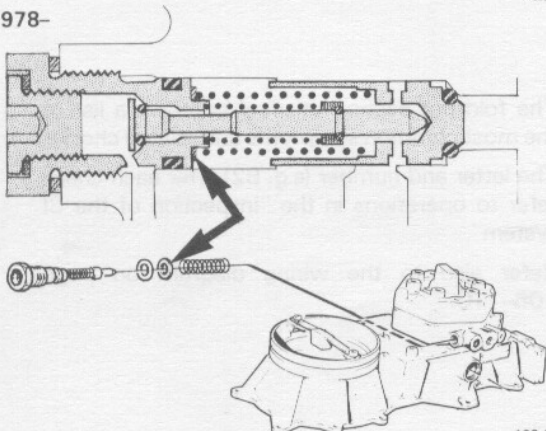
B70

1975-1977



106978

1978-



132 691

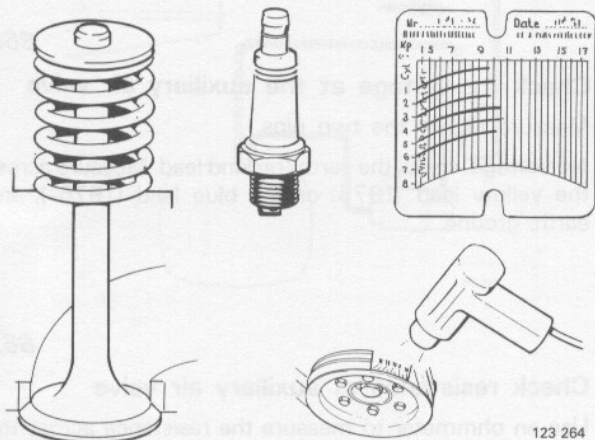
Remove or fit shims in the line pressure regulator if and as necessary.

The line and rest pressures are affected equally by the adjustment. Both pressures are increased by adding shims and reduced by removing shims.

Shims are available in the following thicknesses:

	Thickness	Pressure variation
1975-1977	0.1 mm (0.004 in)	6 kPa (1 psi)
	0.5 mm (0.020 in)	30 kPa (4.3 psi)
1978-	0.1 mm (0.004 in)	15 kPa (2.1 psi)
	0.15 mm (0.006 in)	22 kPa (3.2 psi)
	0.6 mm (0.024 in)	90 kPa (13 psi)
Engine type	Line pressure	Rest pressure
E/F	450-530 kPa (65-77 psi)	150-240 kPa (22-35 psi)
Turbo 1981	520-580 kPa (75-89 psi)	150-240 kPa (22-35 psi)
Turbo 1982-	520-580 kPa (75-84 psi)	240-320 kPa (35-46 psi)

C. Fault tracing, CI system



123 264

Mechanical

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

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.

C1



123 265

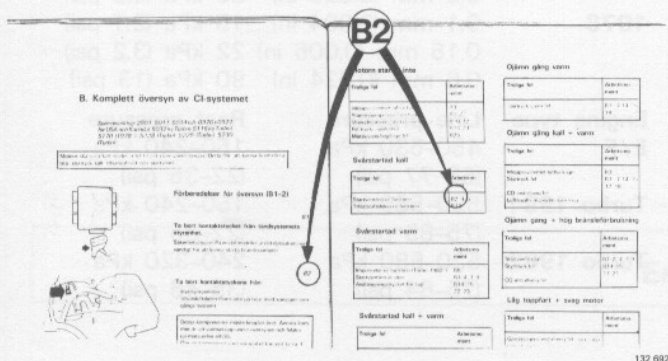
Description:

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

Perform a complete inspection of the CI system (see page 22):

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

C2



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 page 106-110.

Fault symptoms and causes

Symptoms, probable faults/remedies

Fold out this section while performing the fault tracing procedures.

EGR)

Engine does not start

Probable cause	Operation
Air inlet system, leakage	B3
Fuel pump, defective	B1, 7
Air-fuel control unit (control plunger) seizes	B10-12
Incorrect pressure	B14-24
Sensor plate height, incorrect	B25

Cold engine difficult to start

Probable cause	Operation
Start injector, defective	B2, 4-5
Auxiliary air valve, defective	B13

Hot engine difficult to start

Probable cause	Operation
Start injector (Turbo 1982-) impulse relay, defective	B1, 6
Start injector leaking	B1, 6
Rest pressure too low	B4, 7-9
	B14-15, 22-23

Engine difficult to start cold + hot

Probable cause	Operation
Air inlet system, leakage	B3
Start injector, defective (Turbo 1982-)	B1, 4-6
Sensor plate position, incorrect	B10, 11
Line pressure, incorrect	B7, 14-16
Sensor plate height, incorrect	B24-25

Erratic running, cold + during warming-up

Probable cause	Operation
Control pressure, cold, incorrect	B1-2, 7
	14-15, 17
Acceleration enrichment, cold engine, defective (USA 1981-)	B18, 21

Erratic running, hot engine

Probable cause	Operation
Control pressure warm, incorrect	B1, 7, 14-15, 18

Erratic running, cold + hot engine

Probable cause	Operation
Air inlet system, leakage	B3
Control pressure, incorrect	B1, 7, 14-15
	17-18
CO content, incorrect	-
Throttle valve, loose	-

Erratic running + excessive fuel consumption

Probable cause	Operation
Start injector leakage	B1-2, 4, 7-9
Control pressure, incorrect	B14-15
	17-18
CO content, incorrect	-

Low top speed + poor performance

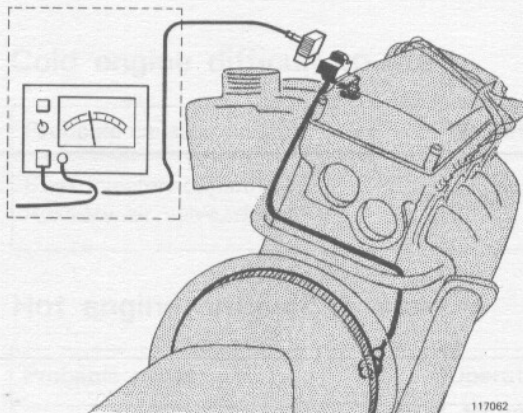
Probable cause	Operation
Throttle control setting, incorrect, throttle valve does not open fully	-
Incorrect control pressure when engine warm	B1, 7, 14-15, 18
Fuel enrichment, defective	B19, 21
Tank pump, defective	B55-56
Fuel pump capacity, too low	B57
CO content, incorrect	-

Erratic idle

Probable cause	Operation
Engine does not run on all cylinders	-
Air inlet system, leakage	B3
Air-fuel control unit seizes	B1, 7, 10-12
Throttle valve, loose	-
Injectors leaking, poor spray pattern	B27-40

D. Idle speed and CO content, checking/adjusting

D1



General

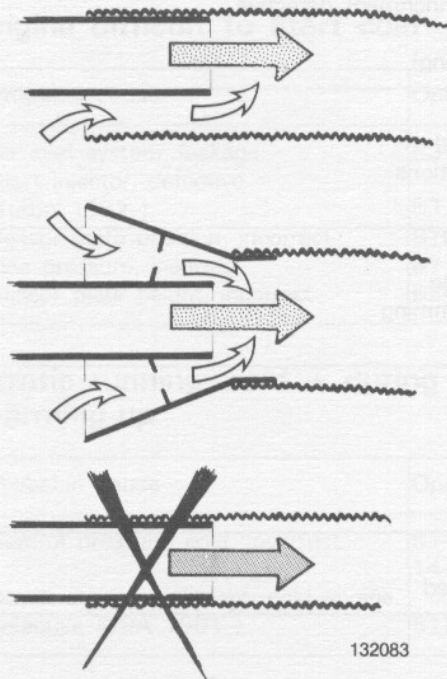
It is important that the engine settings are correctly adjusted (e.g., timing) if valid results are to be obtained.

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.

D2



Exhaust gas extraction

Use an exhaust gas extractor that fits loosely over the exhaust pipe.

If very powerful exhaust gas extraction is used there is risk that oil will be drawn into the exhaust system past the turbocharger gaskets. This would cause the sound damping material in the exhaust system to be soaked in oil, and cause blue exhaust smoke for a long time. Such a condition could be misinterpreted as an inner oil leakage and could be the cause of unnecessary repairs.

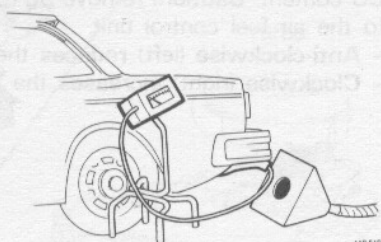
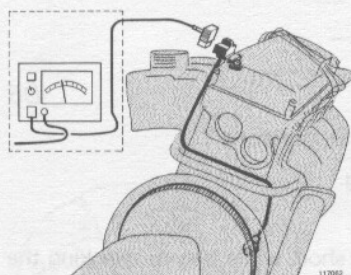
Idle speed and CO content E and F engines without catalytic converters Operations D3-9

Special tools: (2901), 5015

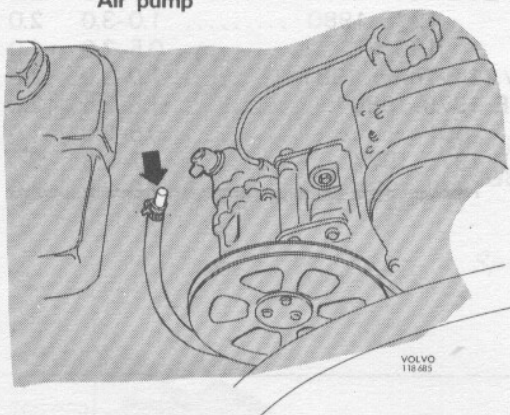
D3

Connect test equipment

- Rev counter. **Note!** 1975 models are not equipped with a connection for a rev counter or Monotester.
- CO gauge. The probe should be placed in the exhaust pipe approx. 480 mm = 19" from the end, otherwise fresh air may mix with the exhaust gases causing invalid results.



Air pump

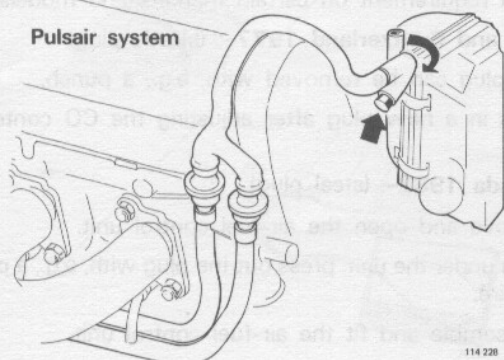


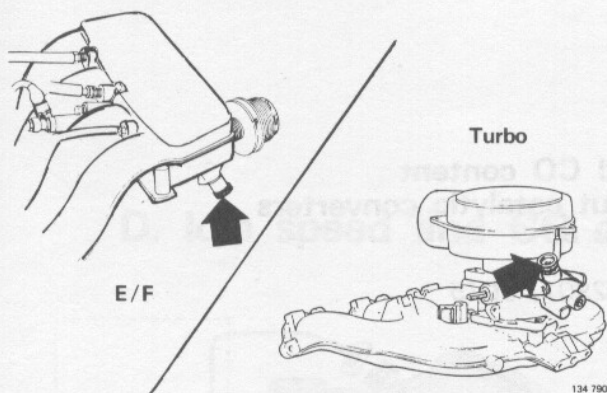
D4

Disconnect the air pump/Pulsair system, where fitted

Disconnect and **plug** the hose, or alternatively block the hose with clamping pliers 2901.

Pulsair system



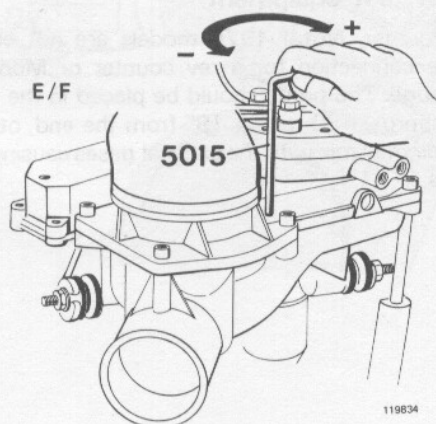


D5

Pre-set the idle speed

Warm engine.

	r/s	r/min
B 21 F auto 1976	13.3	800
1977	14.2	850
B 23 E 1979-1980	15.8	950
Others	15.0	900



D6

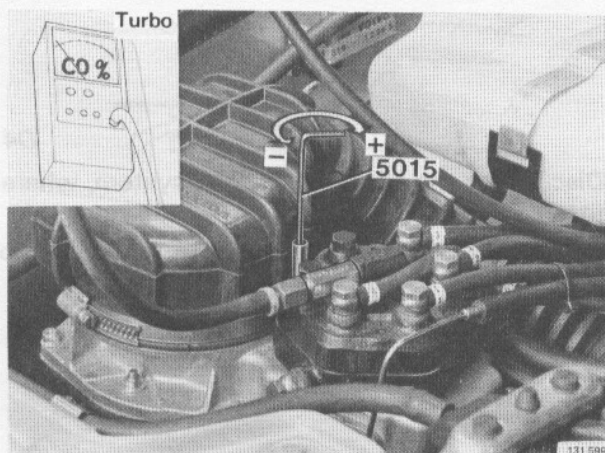
Check/adjust the CO content

Engine warm and idling.

Use 5015.

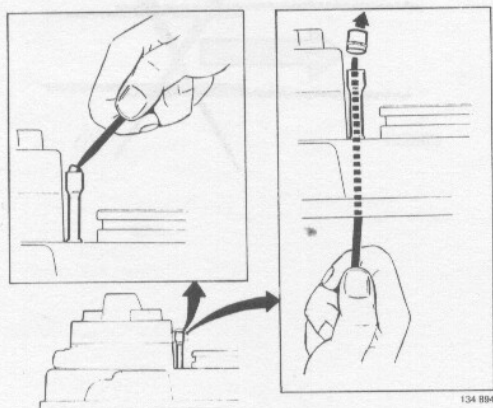
Rev up the engine for a short while before checking the CO content. **Caution!** remove 5015 to prevent damage to the air-fuel control unit.

- **Anti-clockwise** (left) **reduces** the CO content
- **Clockwise** (right) **increases** the CO content.



CO content %	Check value	Setting value
B 19/21 E 1977	1.0-4.0	2.0
1978-1980	1.0-3.0	2.0
1981-	0.5-2.0	1.0
B 19/21 E-Turbo 1981-	1.0-3.0	2.0
B 21 E 1979-1980	1.5-2.5	2.0
1981-	0.5-2.0	1.0
B 21 F 1976-1977	1.7-2.3	2.0
1978-1980	1.0-2.5	2.0

EEC, Switzerland 1977- Canada 1982-



CO adjustment screw seal

Legal requirement on certain markets and models.

EEC and Switzerland 1977-: (plastic plug)

The plug can be removed with, e.g., a punch.

Press in a **new** plug after adjusting the CO content.

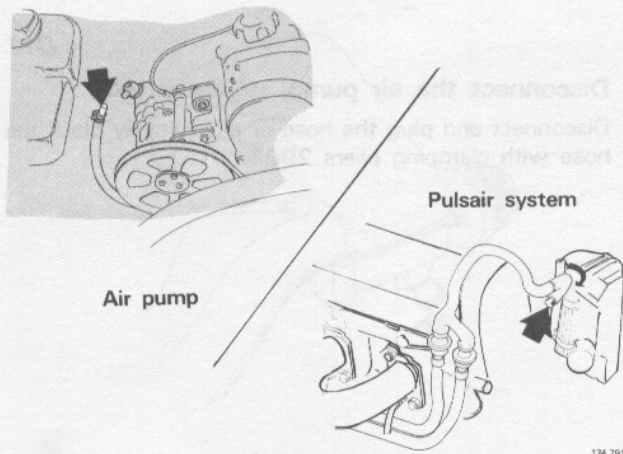
Canada 1982-: (steel plug)

Remove and open the air-fuel control unit.

From under the unit, press out the plug with, e.g., a piece of wire.

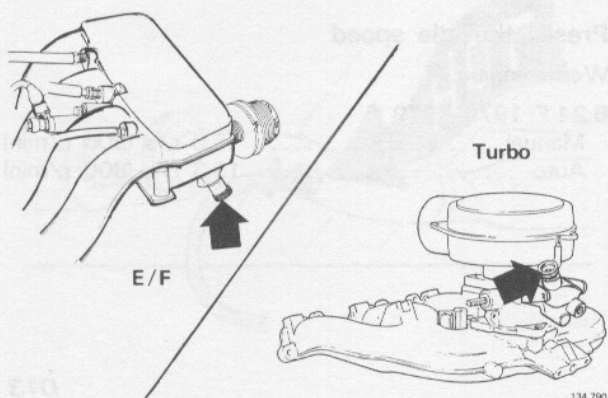
Reassemble and fit the air-fuel control unit.

Adjust the CO content and press in the plug.



Reconnect the hose to the air pump / Pulsair system

D7



Check/adjust the idle speed

	r/s	r/min
B 21 F auto 1976	13.3	800
1977	14.2	850
B 23 E 1979-1980	15.8	950
Others	15.0	900

D8

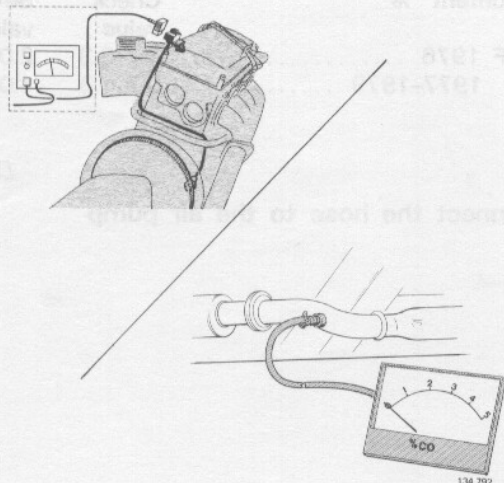
Remove the test equipment

Turn off the ignition

D9

Idle speed and CO content F engines with catalytic converter Operations D10-17

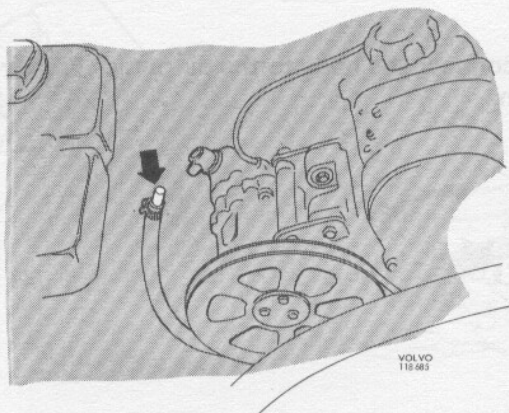
Special tools: (2901), 5015



Connect the test equipment

- Rev. counter
- CO gauge. Connect the gauge to the nipple on the exhaust pipe in front of the catalytic converter.

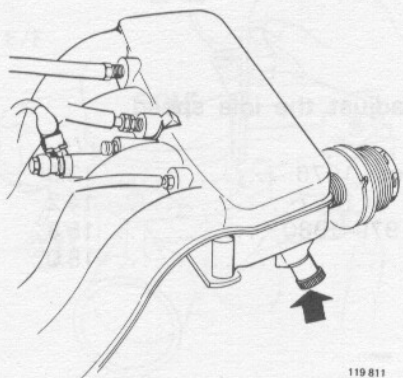
D10



D11

Disconnect the air pump, where fitted

Disconnect and **plug** the hose or alternatively block the hose with clamping pliers **2901**.



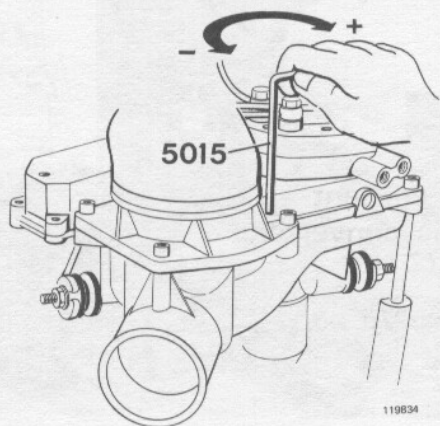
D12

Preset the idle speed

Warm engine.

B 21 F 1976-1979

Manual	15.0 r/s (900 r/min)
Auto	13.3 r/s (800 r/min)



D13

Check/adjust the CO content

Engine warm and idling.

Use **5015**.

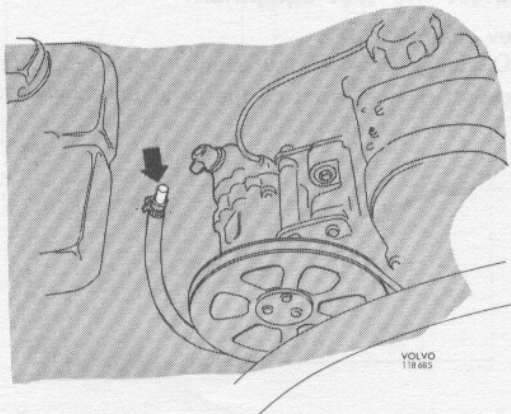
Rev up the engine for a short while before checking the CO content. **Caution!** Remove 5015 to prevent damage to the air-fuel control unit.

- **Anti-clockwise** (left) **reduces** the CO content.
- **Clockwise** (right) **increases** the CO content.

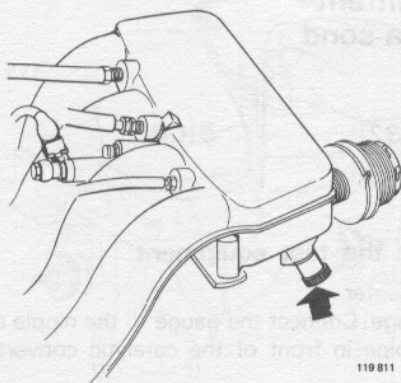
CO content %	Check value	Setting value
B 21 F 1976	1.7-2.3	2.0
1977-1979	0.7-1.3	1.0

D14

Reconnect the hose to the air pump



D15

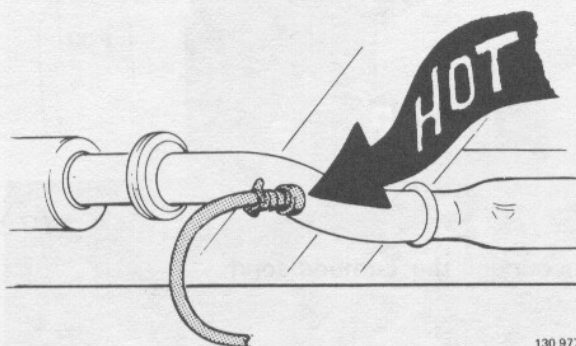


Check/adjust the idle speed

B 21 F 1976-1979

Manual	15.0 r/s (900 r/min)
Auto	13.3 r/s (800 r/min)

D16



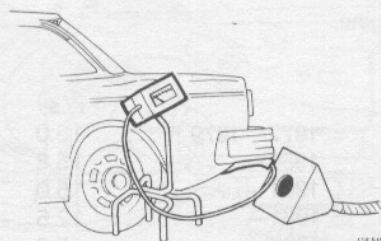
Remove the test equipment

Warning

The nipple for the CO gauge on the exhaust pipe is very hot.

Refit the plug.

D17



Check the CO content after the catalyst

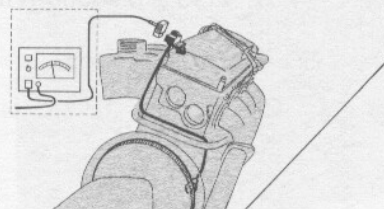
The probe should be placed in the exhaust pipe approx. 480 mm (19 in) from the end, otherwise fresh air will mix with the exhaust gases causing invalid results.

The CO content should be 0-0.5 %.

Idle speed and CO content F engines with Lambda-sond

Operations D18-26

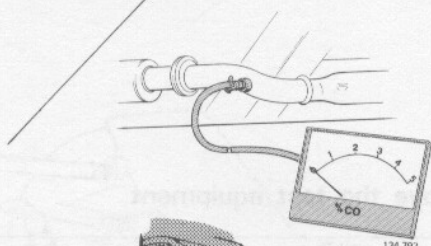
Special tools: 5015, (5232)



D18

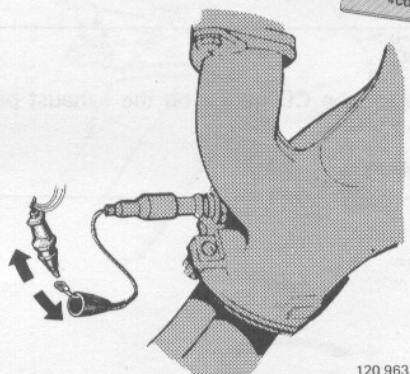
Connect the test equipment

- Rev counter
- CO gauge. Connect the gauge to the nipple on the exhaust pipe in front of the catalytic converter.



D19

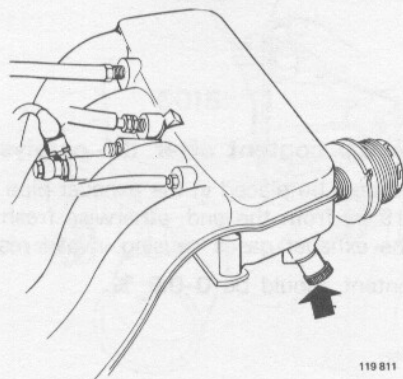
Disconnect the Lambda-sond



D20

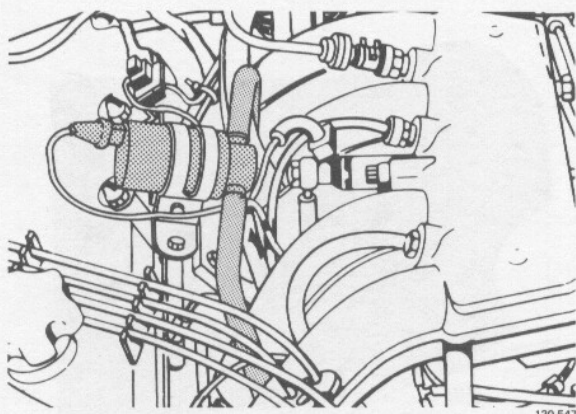
Check/adjust the idle speed

Warm engine.



		r/s	r/min
B 21 F-5	1977—1979	15.0	900
	1980—	15.8	950
	1981—	15.0	900*
B 21 F-9	1981—	12.5	750*
B 21 F-Turbo	1982—	15.0	900*

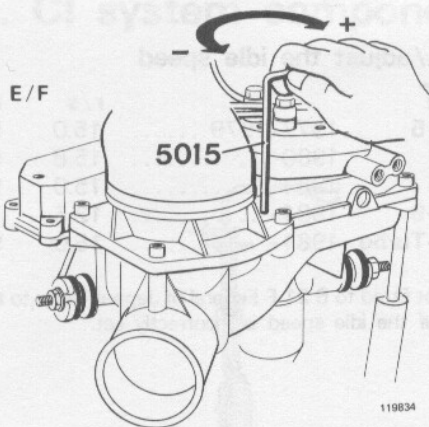
* CIS (not fitted to B 21 F-5 Federal or Japan).



Cars with CIS

Refer to the service manual if the idle speed is incorrectly set.

D21

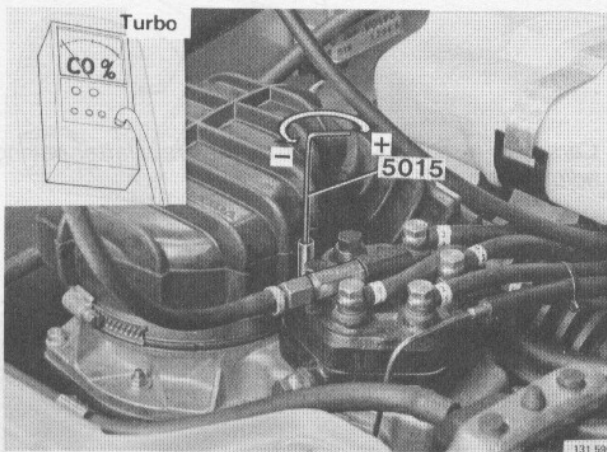
**Check/adjust the CO content**

Warm engine.

Use 5015.

Rev up the engine for a short while before checking the CO content. **Caution!** Remove 5015 to prevent damage to the air-fuel control unit.

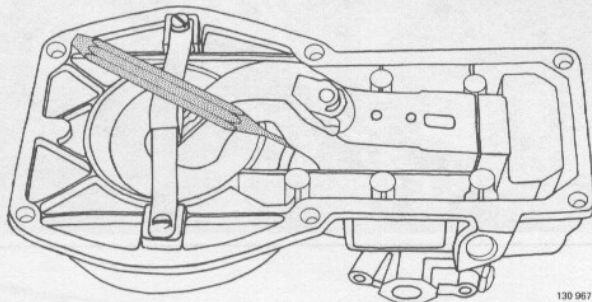
- **Anti-clockwise** (left) **reduces** the CO content.
- **Clockwise** (right) **increases** the CO content.



CO content %		Check value	Setting value
B 21 F-5	1977	1.2-1.8	1.5
	1978-1980	1.0-2.5	2.0
	1981-	0.7-1.3	1.0*
B 21 F-9	1981-	0.7-1.3	1.0*
B 21 F-Turbo	1981-	0.7-1.3	1.0*

* CO adjustment screw sealed (excl. Japan).

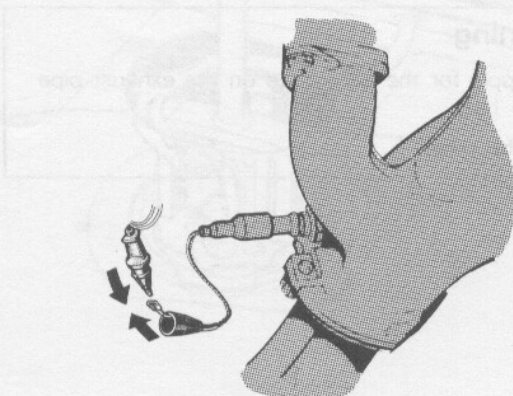
Warning. Tampering with CO adjustment may be a violation of Federal, state or local laws.

**Cars with sealed CO adjustment screw**

The CO content should only be adjusted if:

- it is outside the check values
- when all other possible causes have been checked and rectified.

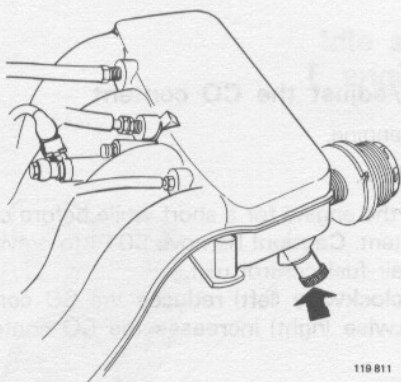
A steel ball covers the CO adjustment screw. To remove the ball, it is necessary to remove the air-flow sensor (see page 68). The ball can then be tapped out with a punch.



D22

Reconnect/check the Lambda-sensor

The CO content should drop to **less than 1 %** when the Lambda-sensor is connected.



D23

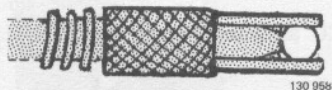
Check/adjust the idle speed

		r/s	r/min
B 21 F-5	1977-1979	15.0	900
	1980	15.8	950
	1981-	15.0	900*
B 21 F-9	1981-	12.5	750*
B 21 F-Turbo	1981-	15.0	900*

* CIS (not fitted to B 21 F Federal of Japan). Refer to the service manual if the idle speed is incorrectly set.

D24

Turn off the engine



Cars with a sealed CO adjustment screw (after having adjusted the CO content)

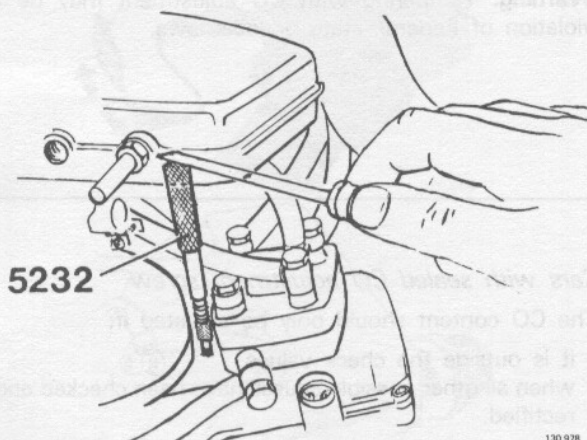
D25

Seal the air-flow sensor

Fit the steel ball with tool 5232.

For B 21 F use a screwdriver.

For Turbo use a hammer.



D26

Remove the test equipment

Warning

The nipple for the CO gauge on the exhaust pipe is very hot.

Refit the plug.

