Service Manual

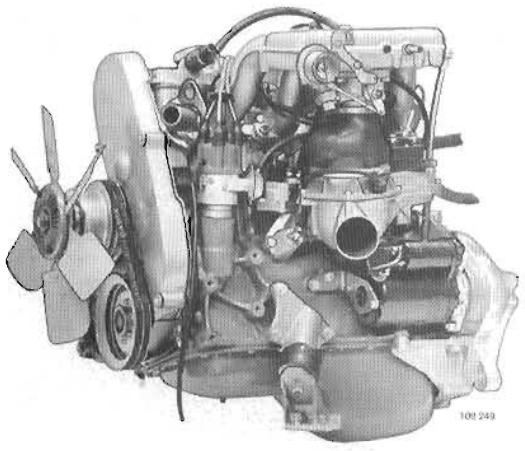
Repairs and maintenance

Section 2 (23)

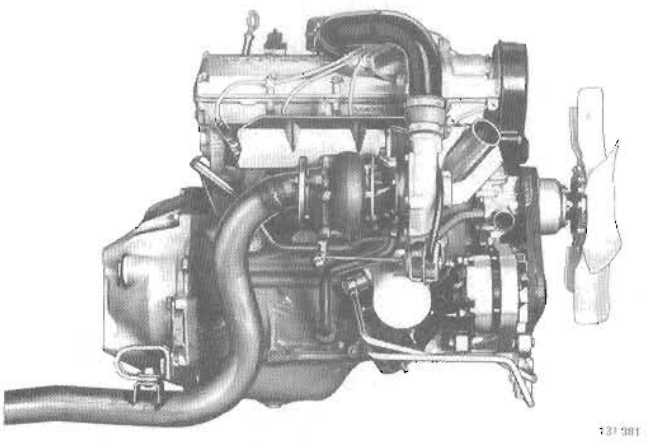
CI System

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
1500.10.85
Printed in U.S.A.

We reserve the right to make alterations without prior notification.

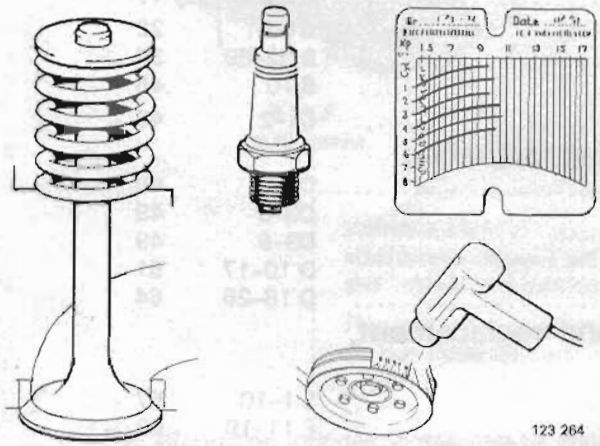
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A Division of Volvo North America Corporation

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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

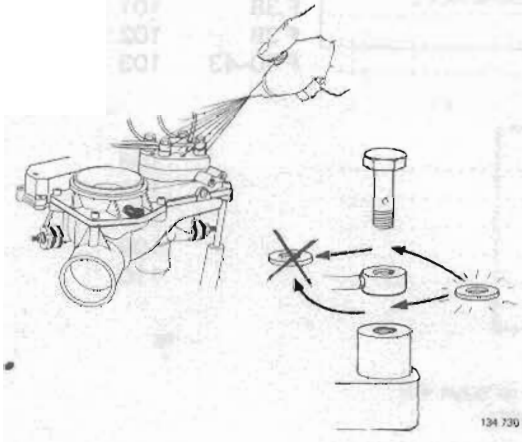
- compression
- valve clearance
- vacuum hoses and connections
- throttle control and kickdown cable (auto)
- air filter
- intake manifold (air leakage)
- charge pressure (Turbo)
- exhaust gas system (leakage)

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



134 739

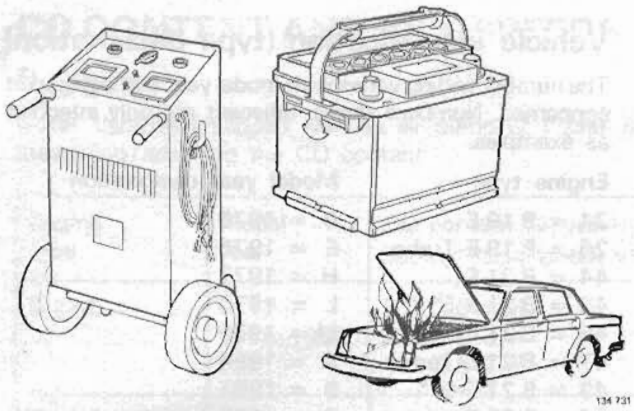
Cleanliness

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

All fuel connections should be carefully cleaned before removal.

Gaskets, seals

Always use new gaskets/seals.



134 731

Warning!

Battery

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

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

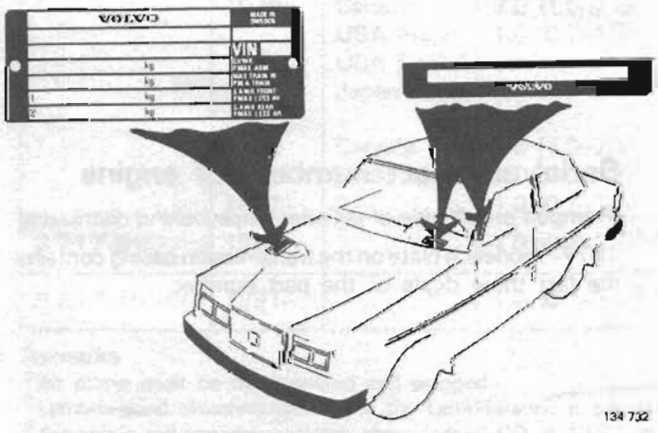
Fire risk

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

Specifications

PLATES AND DECALS

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



134 732

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.

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

Model year designation

Chassis number

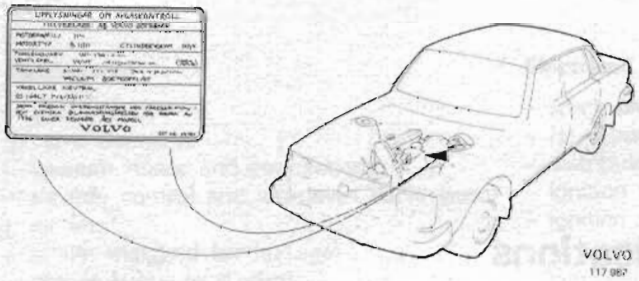
Vehicle identification (type designation)

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

Engine type	Model year designation
24 = B 19 E	B = 1975
26 = B 19 E-Turbo	E = 1976
44 = B 21 E	H = 1977
45 = B 21 F-5*	L = 1978
46 = B 21 E-Turbo	M = 1979
47 = B 21 F-Turbo	A = 1980
49 = B 21 F-9**	B = 1981
84 = B 23 E	C = 1982

* With Bosch ignition system

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



Exhaust emissions plate

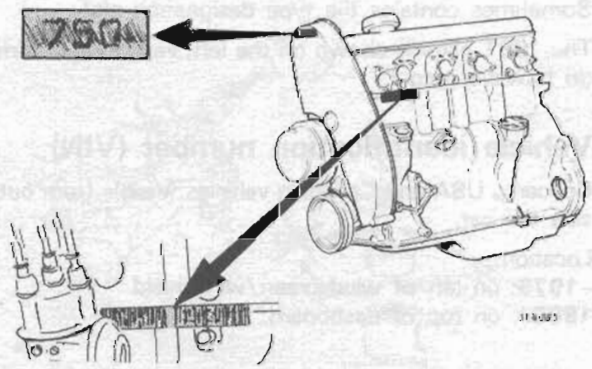
To be found only on vehicles for Sweden, Australia, USA and Canada.

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.



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 1978–1980 1981–	2.0 (1.0–4.0) 2.0 (1.0–3.0) 1.0 (0.5–2.0)	15.0 (900) 15.0 (900) 15.0 (900)
B 19 E-TURBO	1982–	2.0 (1.0–3.0)	15.0 (900)
B 21 E	1975–1977 1978–1980 1981–	2.0 (1.0–4.0) 2.0 (1.0–3.0) 1.0 (0.5–2.0)	15.0 (900) 15.0 (900) 15.0 (900)
B 21 E-TURBO	1981–	2.0 (1.0–3.0)	15.0 (900)
B 23 E	1979–1980 1981–	2.0 (1.5–2.5) 1.0 (0.5–2.0)	15.8 (950) 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		2.0 (1.7–2.3)[1]	15.0 (900)	13.3 (800)
	1977	Canada/ Japan	2.0 (1.7–2.3)[1]	15.0 (900)	14.2 (850)
		USA Fed.	1.0 (0.7–1.3)	15.0 (900)	13.3 (800)
		USA Calif.	1.5 (1.2–1.8)[2, 3]		15.0 (900)
	1978	Canada	2.0 (1.0–2.5)		15.0 (900)
		USA Fed.	1.0 (0.7–1.3)	15.0 (900)	13.3 (800)
		USA Calif./ Japan	2.0 (1.0–2.5)[2]		15.0 (900)
	1979	Canada	2.0 (1.0–2.5)		15.0 (900)
		USA Fed.	1.0 (0.7–1.3)	15.0 (900)	13.3 (800)
		USA Calif./ Japan	2.0 (1.0–2.5)		15.0 (900)
	1980	Canada	2.0 (1.0–2.5)		15.0 (900)
		USA/Japan	2.0 (1.0–2.5)[2]		15.8 (950)
	1981–		1.0 (0.7–1.3)[2, 4]		15.0 (900)[5]
B 21 F-9	1981–		1.0 (0.7–1.3)[2, 4]	12.5 (750)[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.

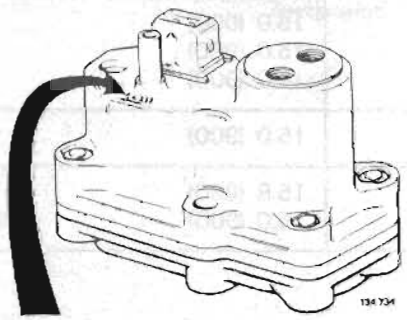
[6] Vehicles with automatic transmission, engage 'N' and apply parking brake.

PRESSURES

	Turbo 1981	Turbo 1982–	Others
Line pressure	520–580 kPa (75–84 psi)	520–580 kPa (75–84 psi)	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 . . .

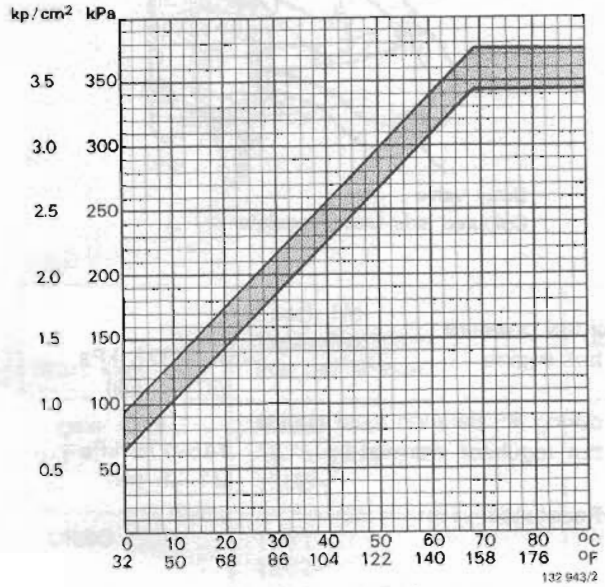
The type of control pressure regulator fitted depends on the model type and model year. Regulators can be identified by the number (last three digits) stamped on the top.

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 20–30Ω

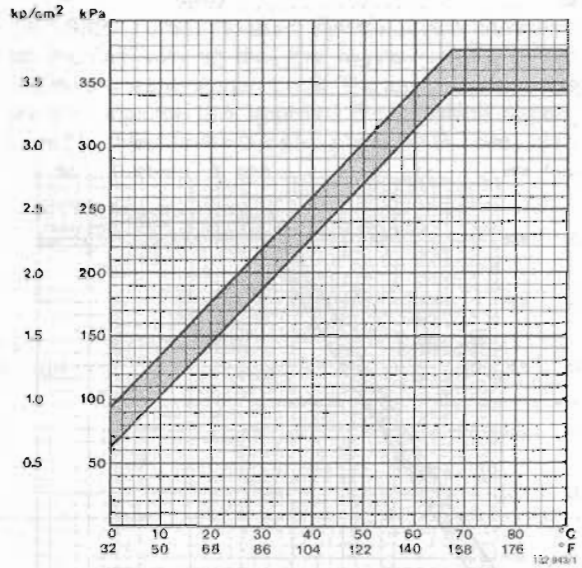


Control pressure at different ambient temps

Control pressure regulator ...014

Control pressure, hot engine ... 345–375 kPa (50–54 psi)

Resistance ..... 20–30 Ω

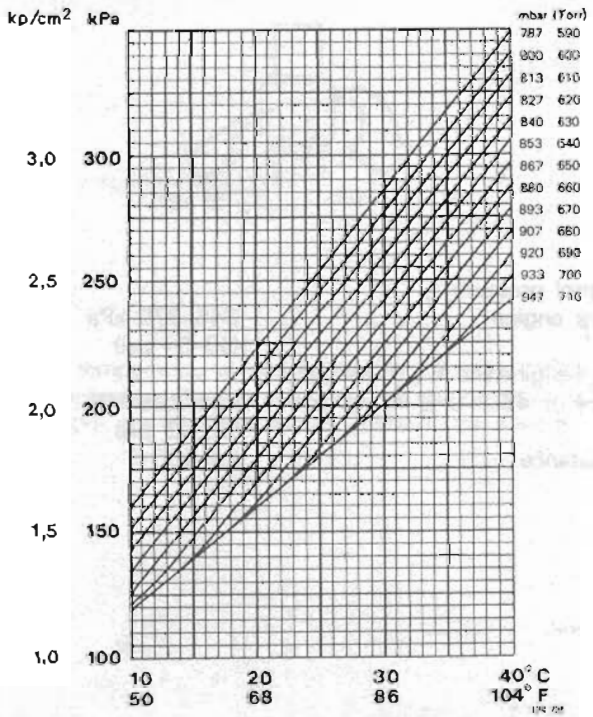


Control pressure at different ambient temps

Control pressure regulator ...021

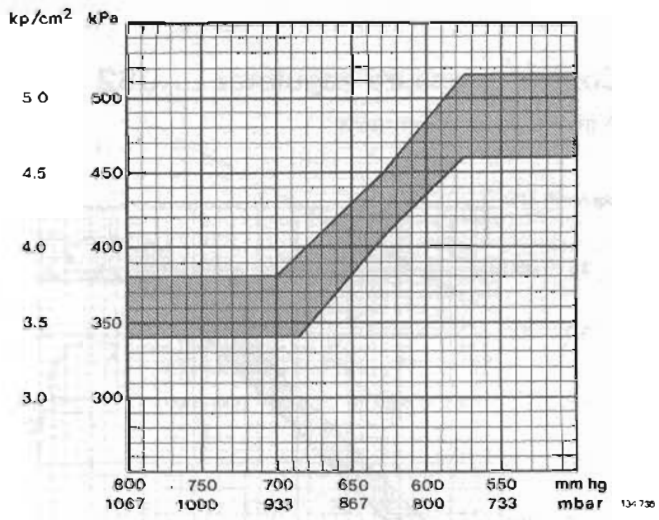
Altitude compensating device incorporated in regulator. Special versions for some B 21 F USA Federal 1976 and 1977.

Resistance 20–30Ω



Control pressure, hot engine at different altitudes

Tolerance + 25 kPa (0.25 kp/cm² = 3.6 psi).



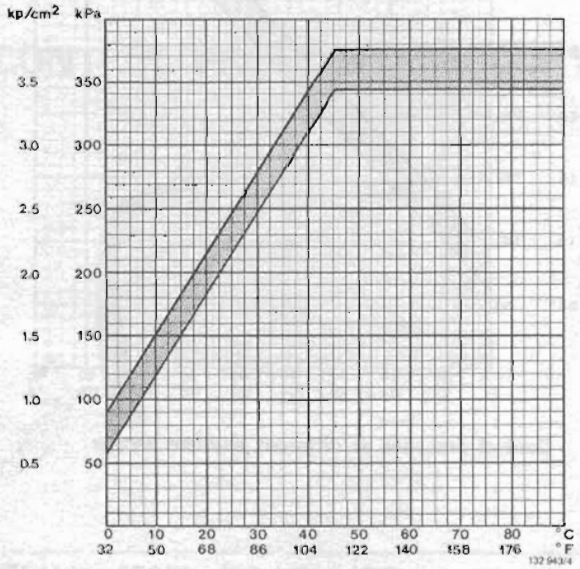
Control pressure, hot engine at different altitudes

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

Control pressure regulator ...079

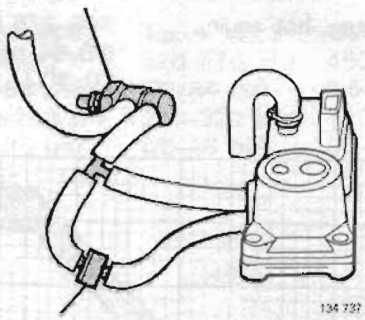
With cold engine acceleration enrichment
Thermostat closes at ..... approx. +53°C (125°F)

Delay valve
delay time ..... approx. 1 sec
colour ..... Grey



Control pressure at different ambient temps

Thermostat valve

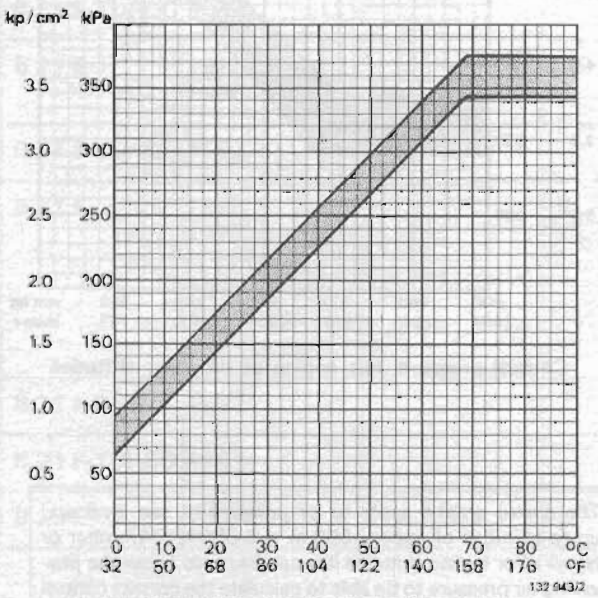


Delay valve
Coloured side facing regulator

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

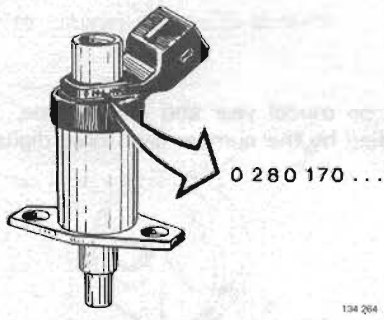
With full load enrichment



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



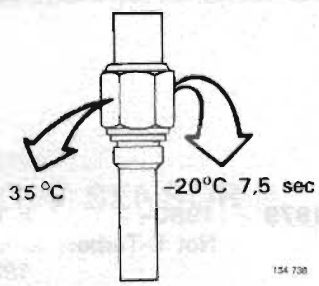
Start injector type depends on model year and engine type. They can be identified by the number (last three digits) stamped on the injector.

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

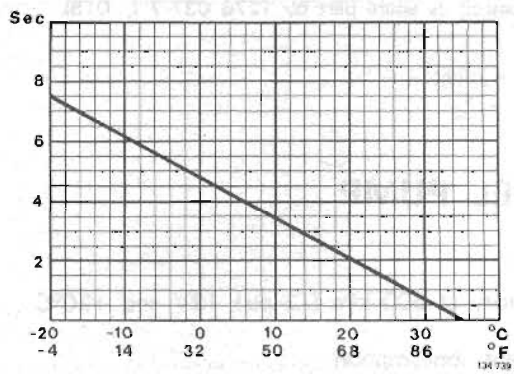
On 1982– Turbo, the start injector is also controlled by an impulse relay so that the engine receives additional fuel during warm starts as well. The impulse relay engages the start injector after approx 1.5 sec., which is then followed by injection for 0.2 sec., pause for 0.3 sec., injection 0.1 sec.,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

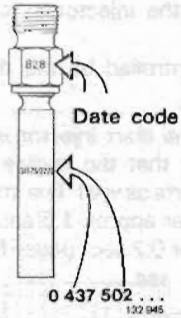


The temperature at which the thermal time switch interrupts start injection, and the time it is engaged at –20°C = –4°F are stamped on the collar of the switch.



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* 463972-0	...015 -828 829- 1276037-7	...020 1306499-3
Opening pressure	kPa (psi)	300–360 (43–52)	320–380 350–410 (46–55) (51–60)	350–410 (51–60)
No leakage permitted below	kPa (psi)	240 (35)	260 290 (38) (42)	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 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		

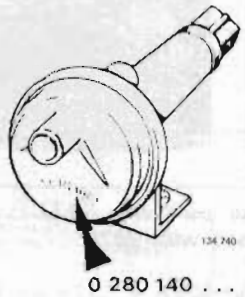
TANK PUMP

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



0 280 140 . . .

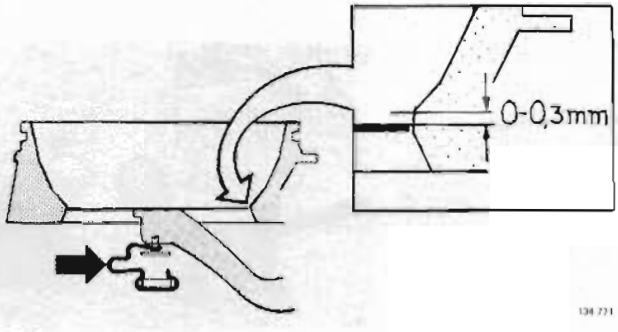
Auxiliary air valve type depends on model year and engine type. They can be identified by the number (last three digits) stamped on the end of the valve.

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



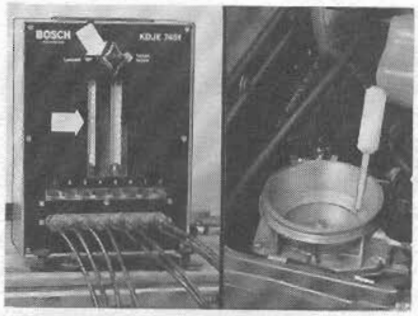
Check the position at max. control pressure i.e. hot engine and fuel pump in operation.

0–0.3 mm = 0–0.012"

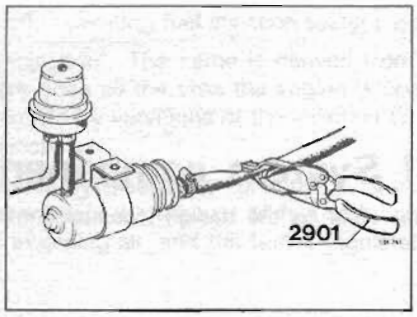
Special tools

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**

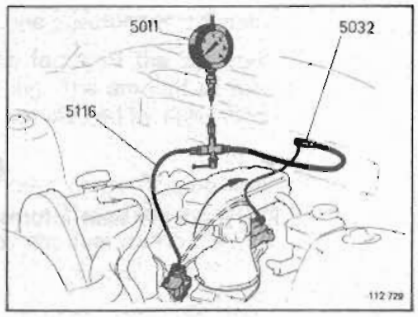
Note: The Ø sign symbolizes diameter.



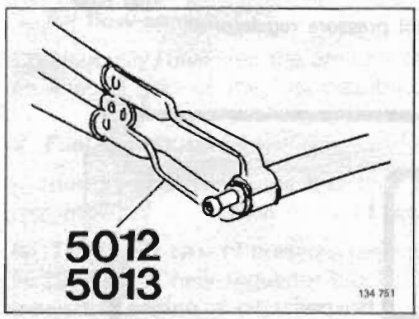
0976, 0977



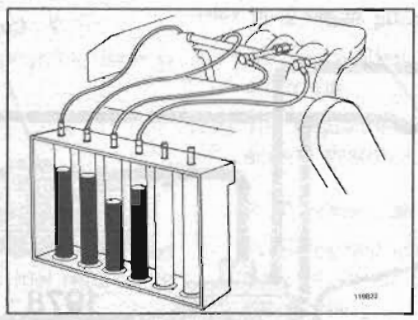
2901



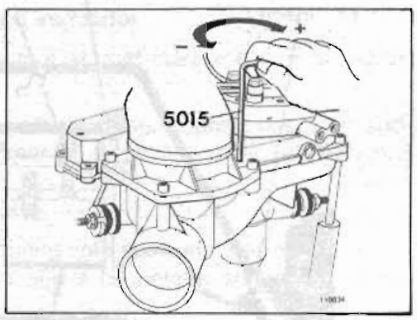
5011



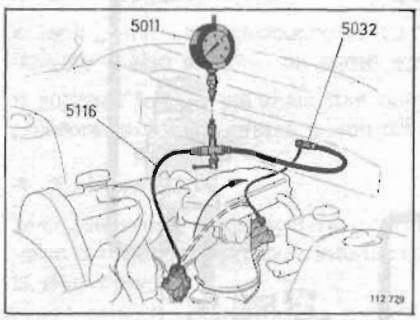
5012, 5013



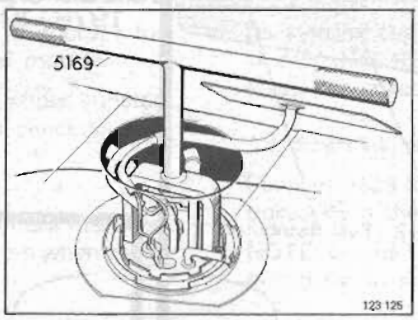
5014



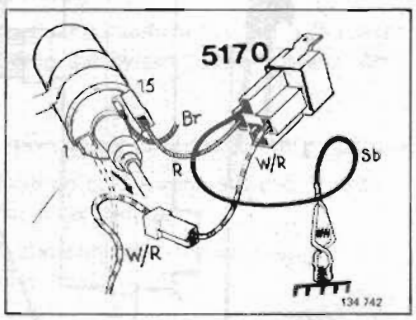
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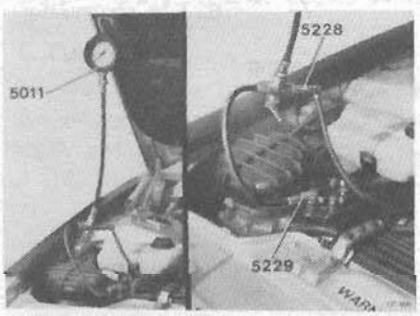
5032, 5116



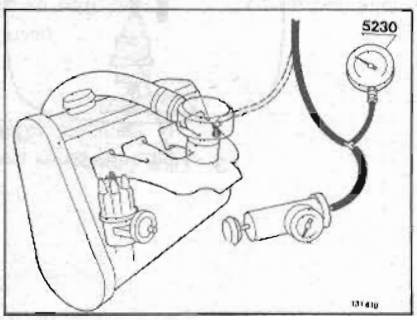
5169



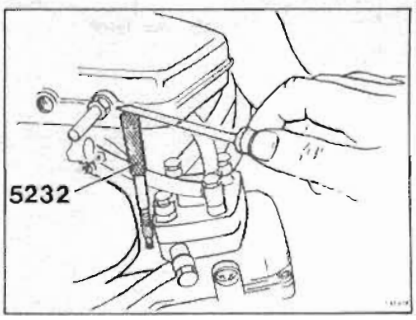
5170



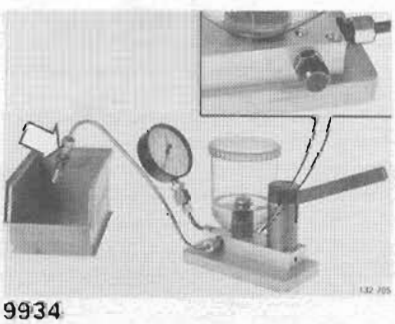
5228, 5229



5230



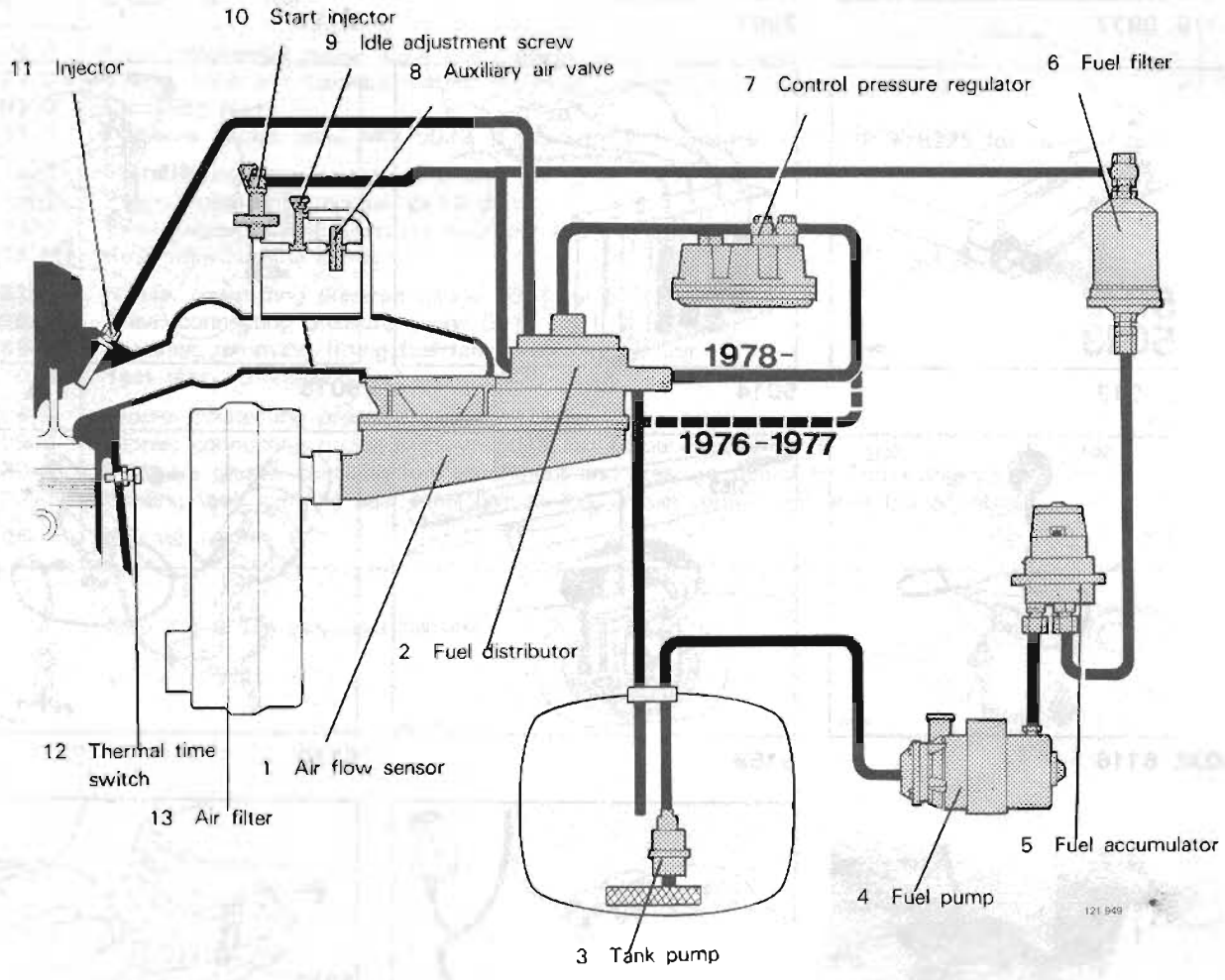
5232



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)

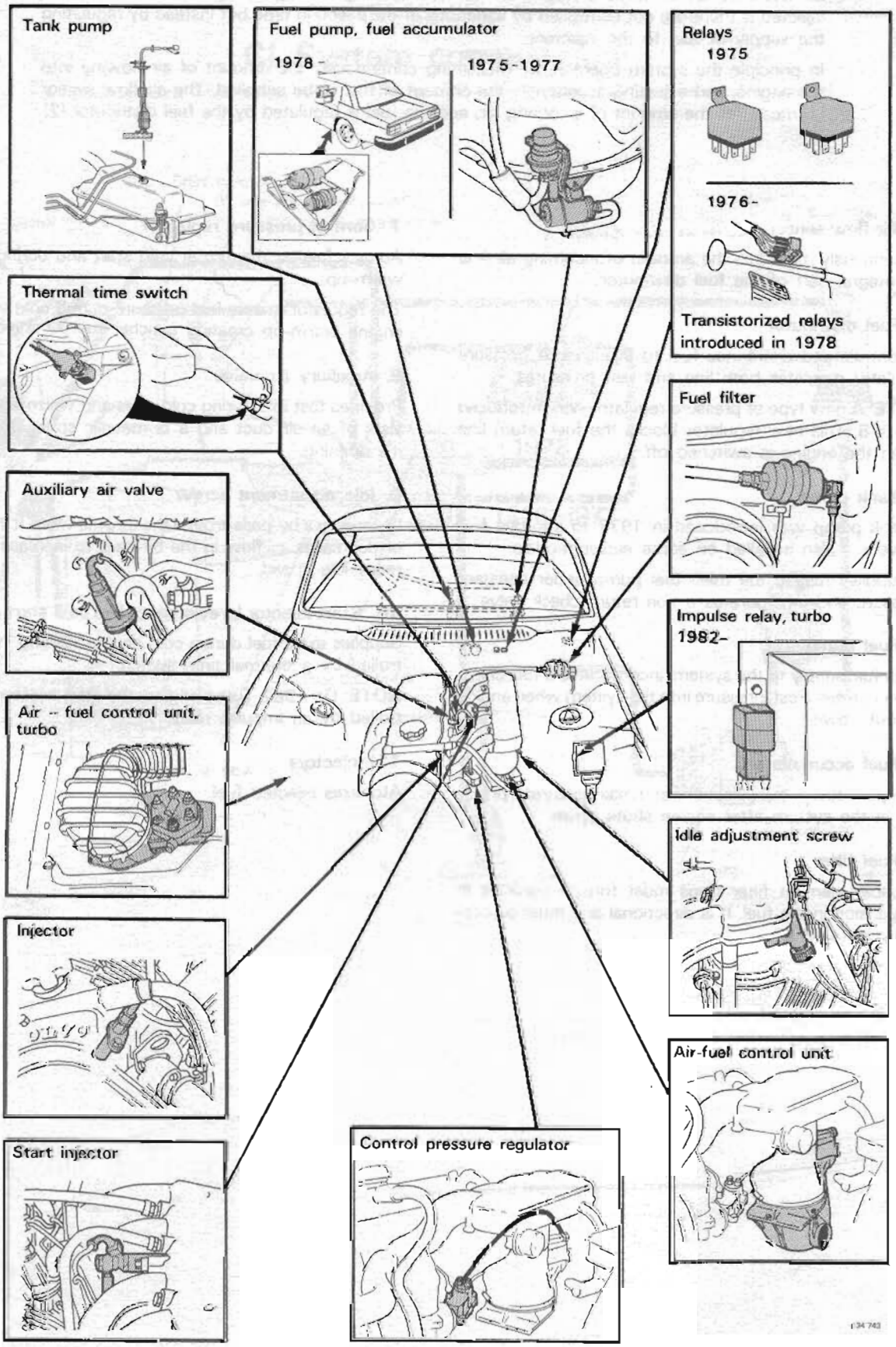
Supplies extra fuel during cold engine starting. It is controlled by a thermal time switch.

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

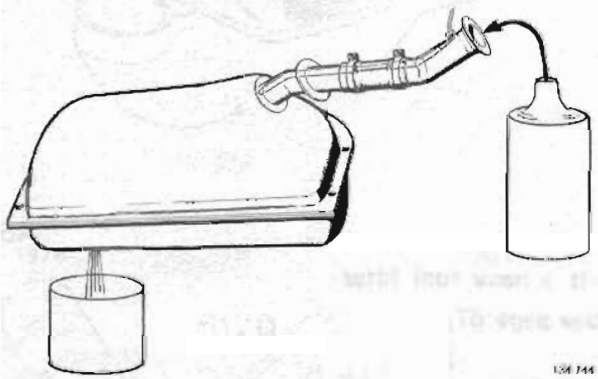
The fuel tank should be flushed if water has (or is believed to have) condensed in the system.

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–).



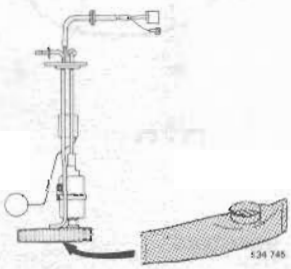
A1

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.

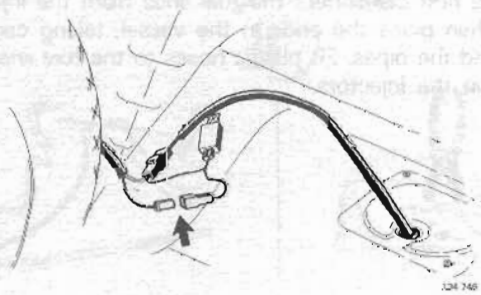
Drain the tank and refill with clean petrol (gasoline).



A2

Fit a new tank pump filter

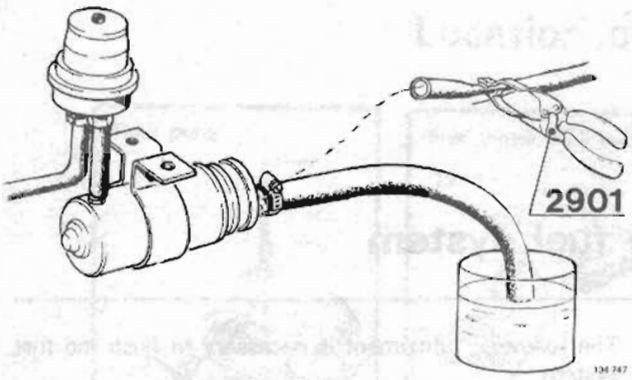
See page 57.



A3

Disconnect the tank pump

Disconnect the plug in the boot (trunk).



A4

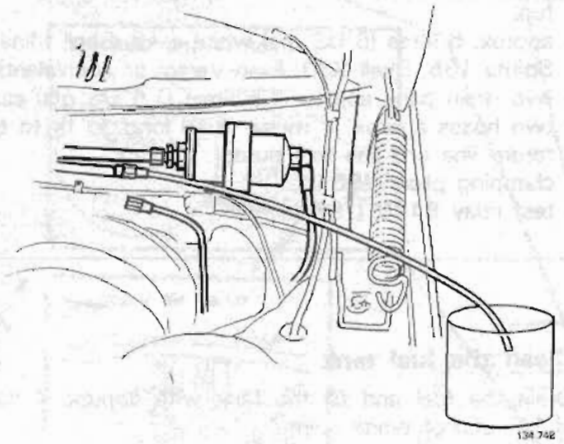
Connect the fuel pump to a vessel containing white spirit (at least 2 litres = 2 US qts)

Block the fuel line between the pump and tank.

Use clamping pliers **2901**.

Disconnect the line from the pump inlet.

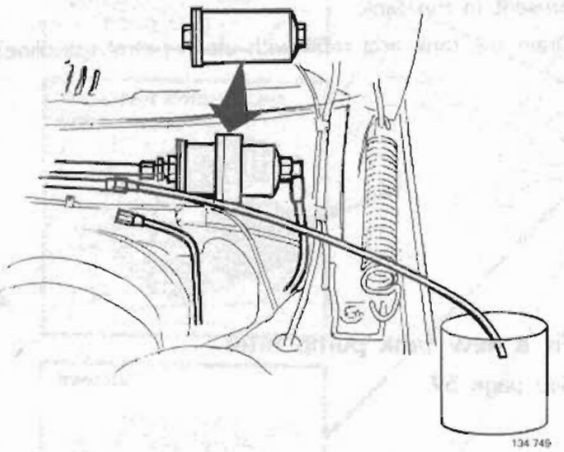
Connect one end of the hose (approx. 1 metre = 3 ft) to the pump and submerge the other end in a jar containing white spirit.



A5

Connect the return line to an empty vessel

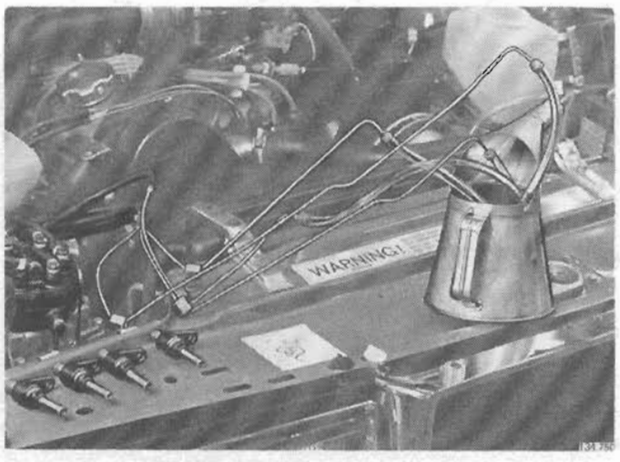
Separate the return line on the firewall (bulkhead). Connect one end of a hose (approx. 1 metre = 3 ft) to the return line and submerge the other end in an empty vessel (capacity approx. 1.5 litres = 1.5 US qts).



A6

Fit a new fuel filter

See page 67.



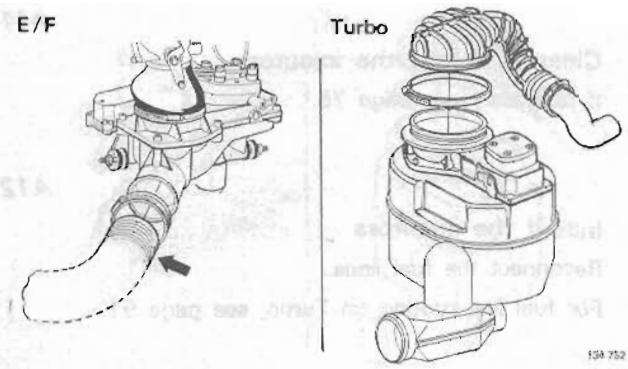
A7

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.

A8

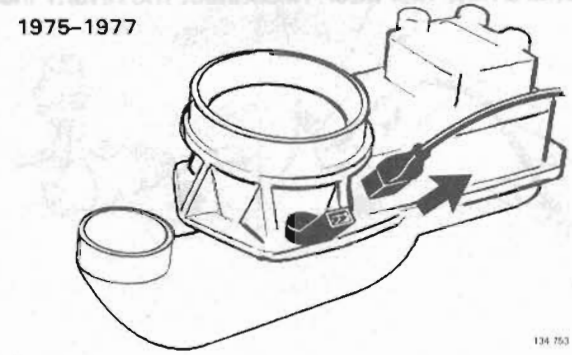


Remove:

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

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

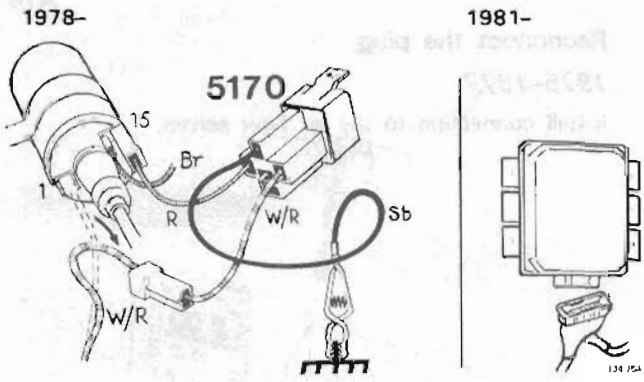
A9



Prepare to start the fuel pump

1975–1977

Withdraw the connector from the air flow sensor.

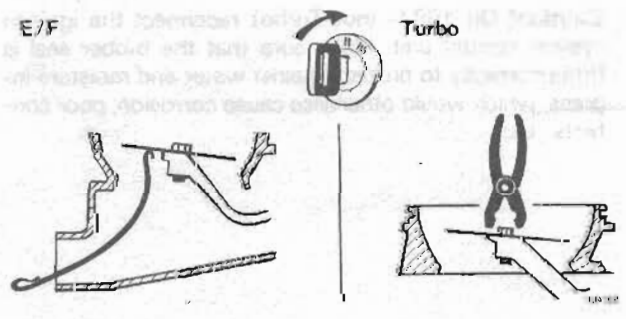


1978–

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.

A10

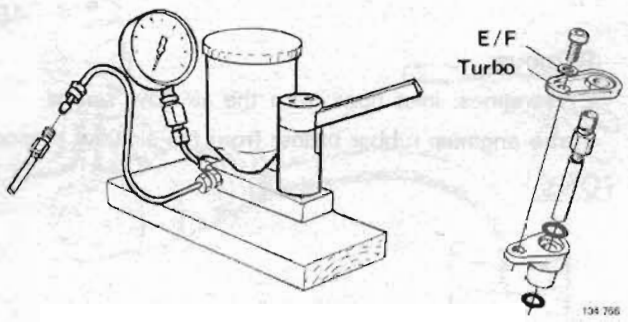


Flush the system

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.



A11

Clean and test the injectors

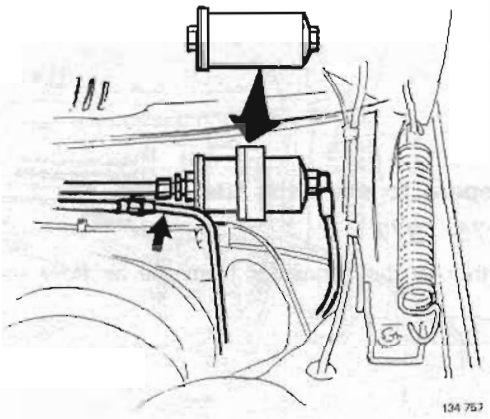
If necessary see page 75.

A12

Install the injectors

Reconnect the fuel lines.

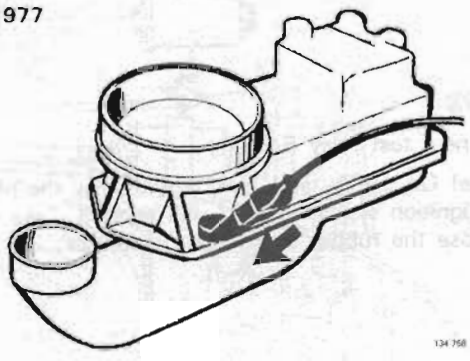
For fuel line routing on Turbo, see page 91.



A13

Install a new fuel filter. Reconnect the return line

1975–1977



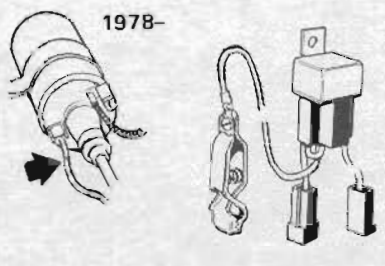
A14

Reconnect the plug

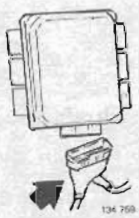
1975–1977

Install connection to the air flow sensor.

1978–



1981–

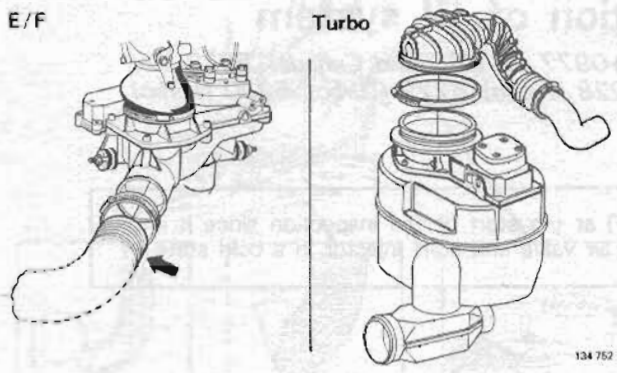


1978–

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

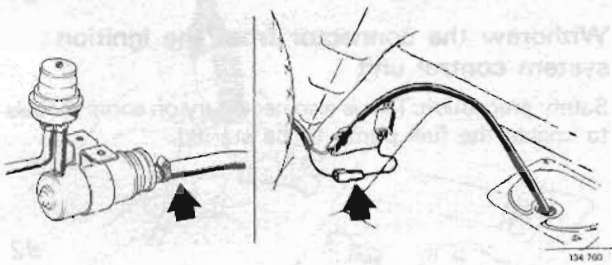


134 752

A15

Fit:

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



134 760

A16

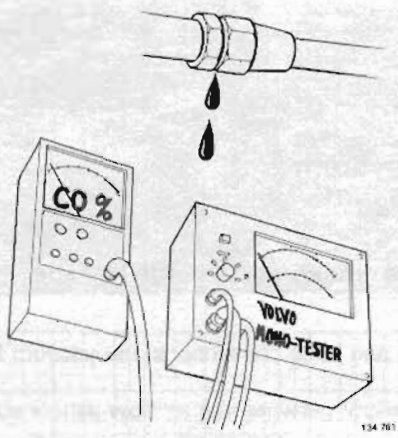
Reconnect the fuel line to the fuel pump

A17

Reconnect the tank pump plug

A18

Fill the tank with new fuel



134 761

A19

Start the engine. Check for leakage

A20

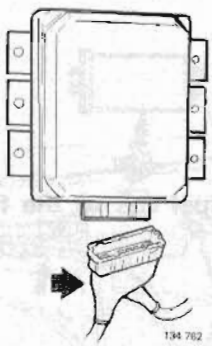
Check/adjust idle speed and CO content

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

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°C = 86°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.



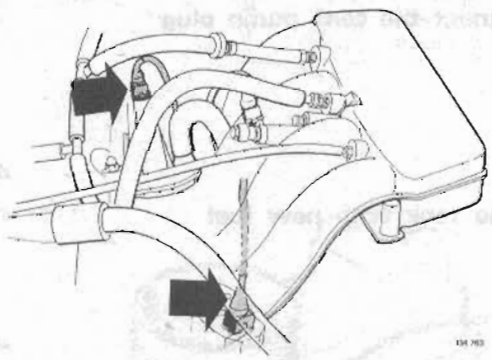
Preparatory work

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.

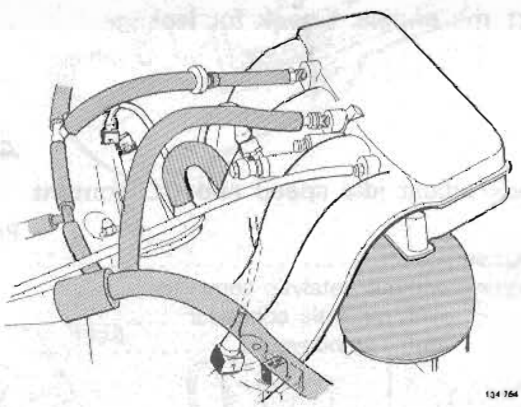


B2

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

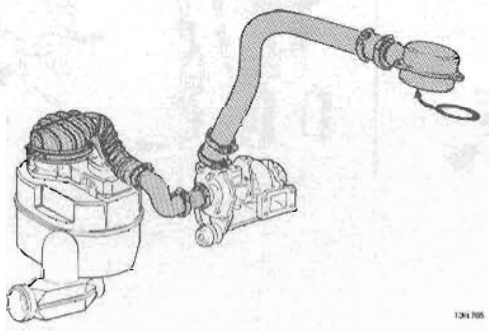
Operation B3

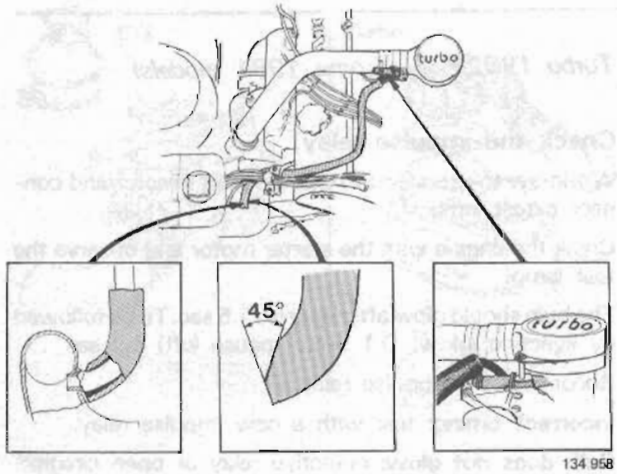
B3

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.





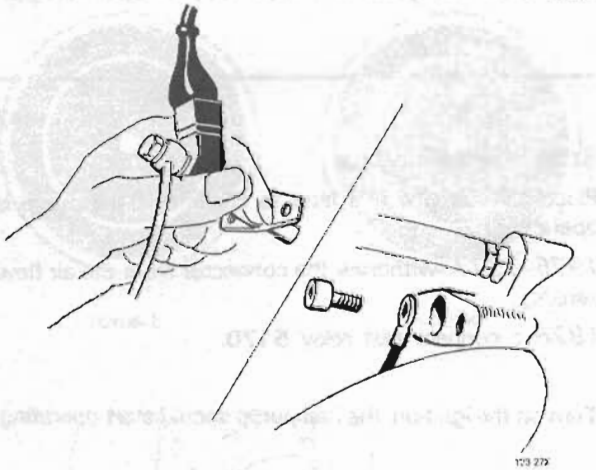
Turbo: check the crankcase ventilation hose (if incorrectly connected or kinked, difficulties in starting the engine may be encountered).

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

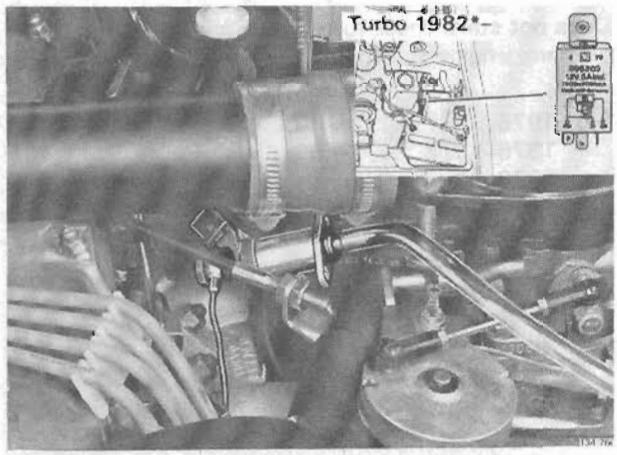


B4

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.

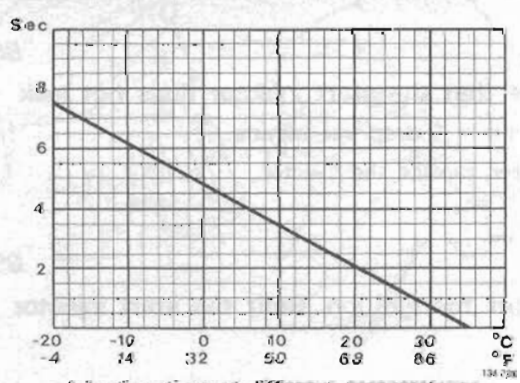
Connect the injector to a piece of transparent plastic hose. Hold the end of the hose upwards. (Hose inner diameter 7–8 mm = 0.28–0.32 in, length 0.5 m = 16 in.

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.



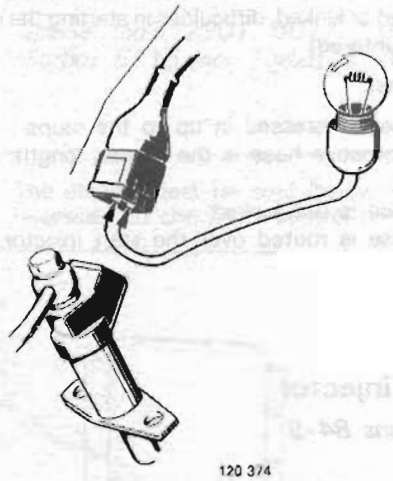
Injection time at different temperatures

Tolerances: time = ±2 seconds; temperature ±4°C = approx. ±8°F.

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.

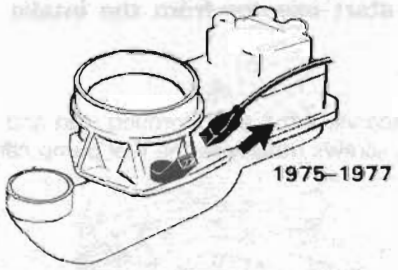
Crank the engine with the starter motor and observe the test lamp.

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.



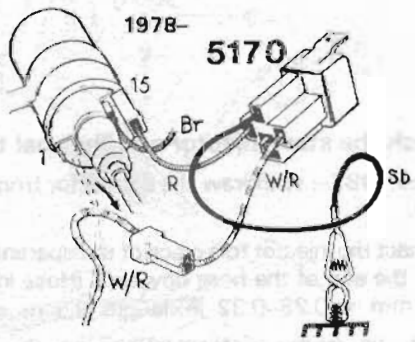
B7

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.**



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



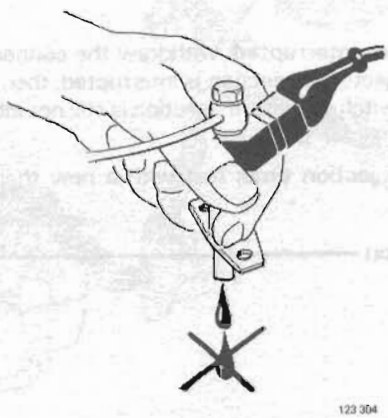
134 768

B8

Ensure that the start injector does not leak

Max. rate = **1 drop per minute.**

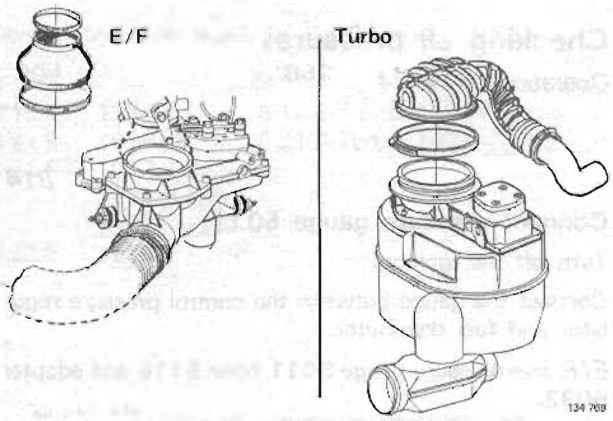
If greater, replace the injector.

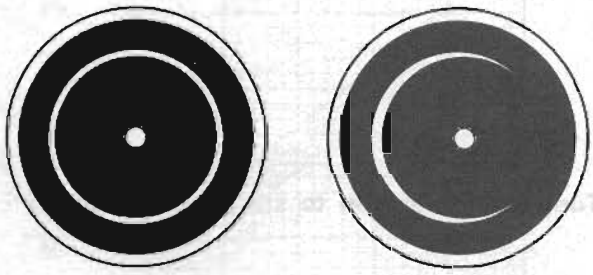


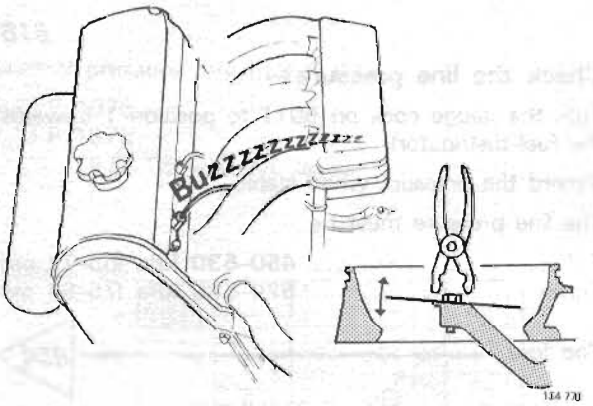
123 304

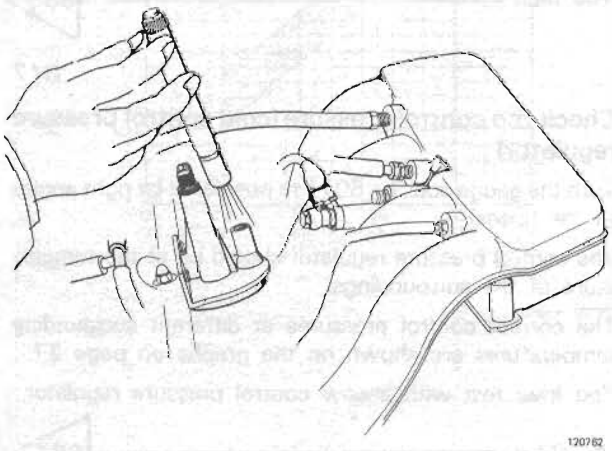
B9

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

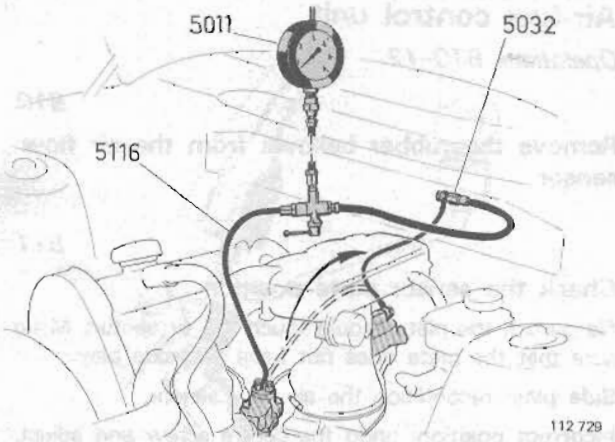
The valve should be partly open at room temperature.

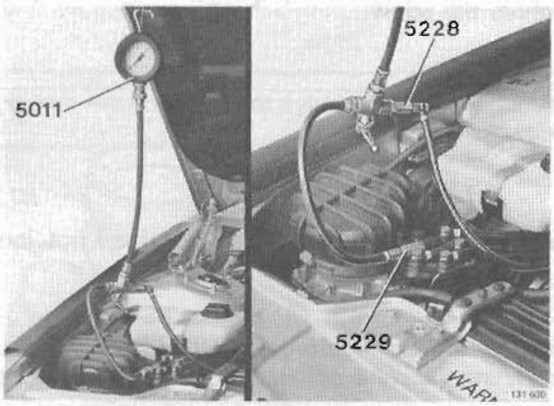
Completely open at –30°C (–22°F), and completely closed at +70°C (158°F)

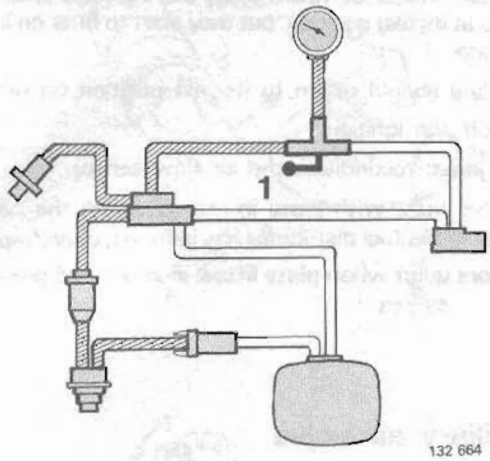
Use a pen light to check the valve. Replace if defective.

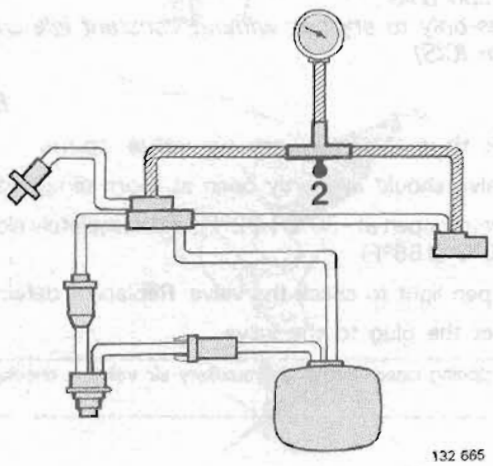
Connect the plug to the valve.

> 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.

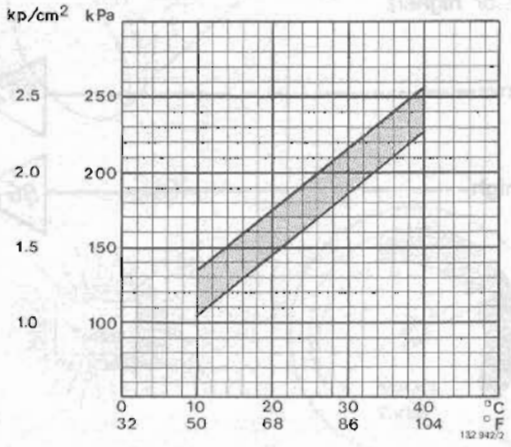
The correct control pressures at different surrounding temperatures are shown on the graphs on page 27.

Too low: test with a new control pressure regulator.

Too high → *B61*

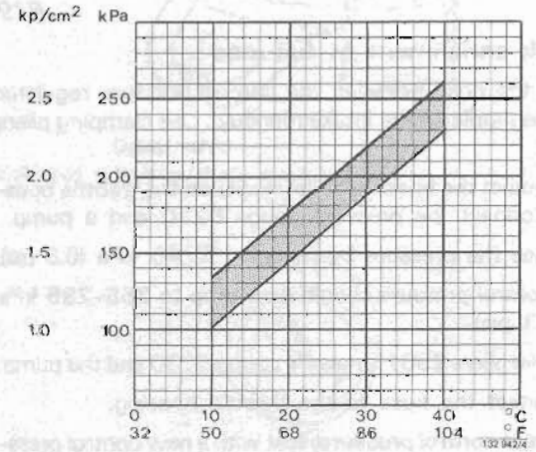
Control pressure regulator ...004 and ...082

...004		...082
B 19 E	1977–	B 19 E-Turbo 1982–
B 21 E	1976–	B 21 E-Turbo 1981
B 21 F-5	1977 USA	
	1978–1980	
	1981–Japan	
B 23 E	1979–	



Control pressure regulator ...014

B 21 E 1975
B 21 F 1976
1977 Canada and Japan



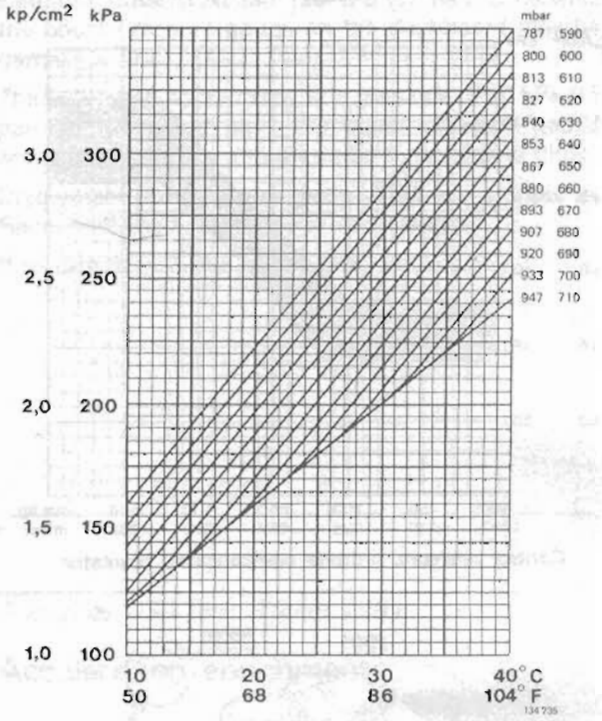
Control pressure regulator ...021

Altitude compensated.

B 21 F Federal 1976 and 1977 certain special versions.

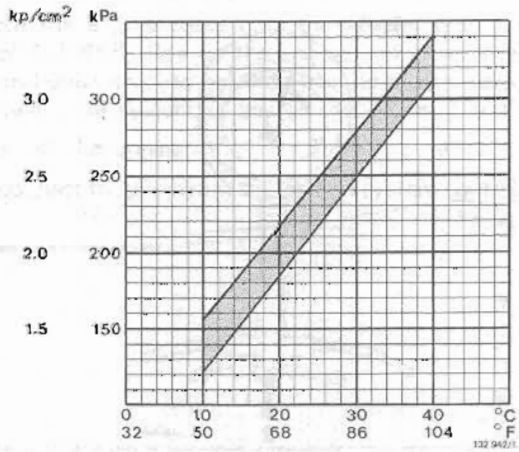
The tolerances for the control pressure are ±25 kPa (±3.6 psi)

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.

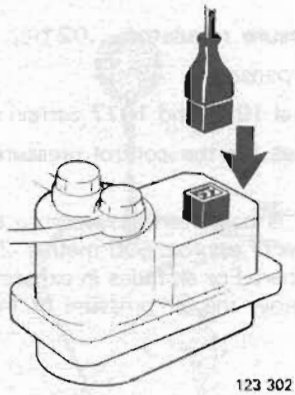


Control pressure regulator ...079

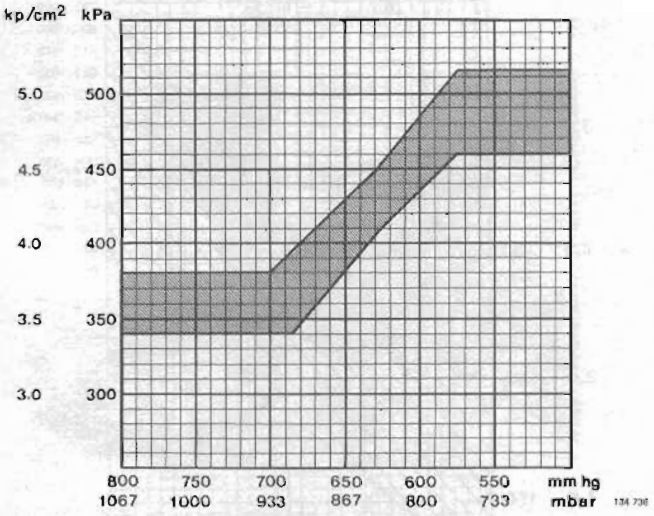
B 21 E-5	B 21 F-5	1981 USA
B 21 F-9	B 21 F-9	1981–
B 21 F-Turbo	B 21 F-Turbo	1981–



B18



123 302



Control pressure, altitude compensated regulator

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.

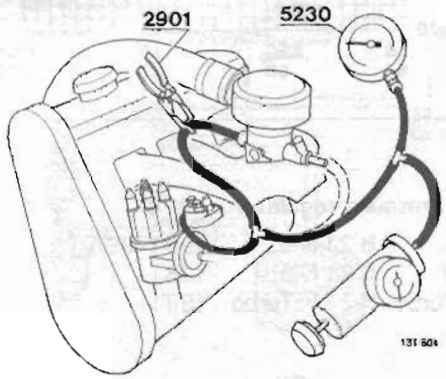
After max. 5 minutes the control pressure should have increased to **345–375 kPa** (50–54 psi).

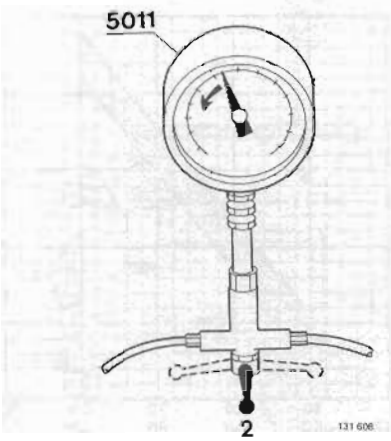
Note! On B 21 F USA Federal 1976 and 1977 models with altitude compensated control pressure regulators the control pressure varies to an extent dependent on the prevailing air pressure, see diagram.

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).

Too low → *B62*

Too high → *B61*





E-Turbo engines only

Full load enrichment

Operations B19–20

B19

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).

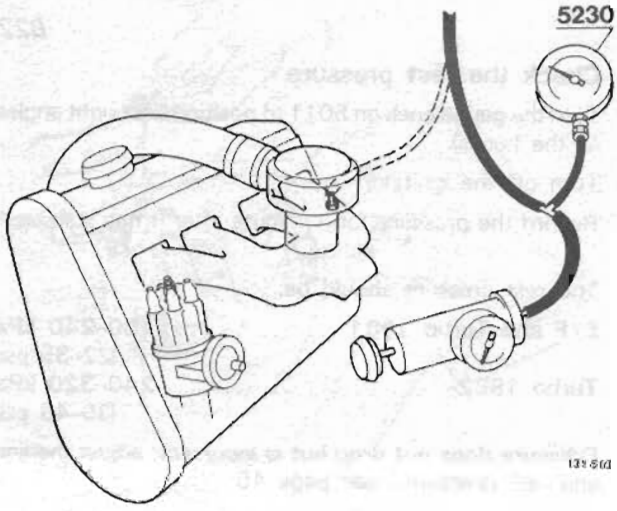
The control pressure should now drop to **265–295 kPa** (38–43 psi).

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

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.)

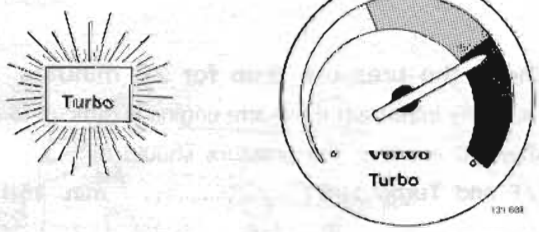
Increase the pressure until the fuel pump stops working. This can be checked by placing the hand on the fuel filter (the pressure sensor interrupts the pump relay earth/ground connection).

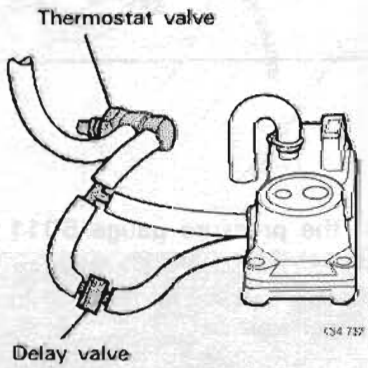
Caution! Do not exceed **120 kPa** (17 psi). Otherwise the boost pressure gauge on the dashboard may be damaged.

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.

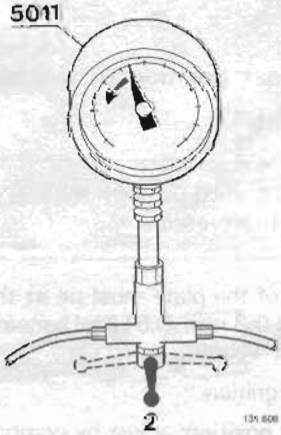
Disconnect the pressure gauge 5230 and the pump. Reconnect the hose to the intake manifold.

If incorrect: test with a new pressure sensor.





(Coloured side away from regulator)



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

Acceleration enrichment

B21

Check the enrichment during acceleration

The engine must be cold (below +50°C = 118°F).

Connect the plug to the ignition system control unit.

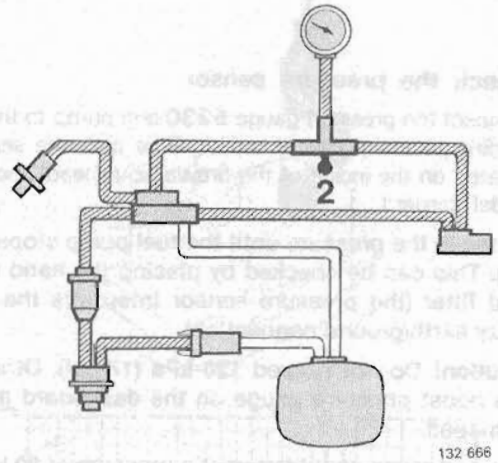
Start the engine.

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.

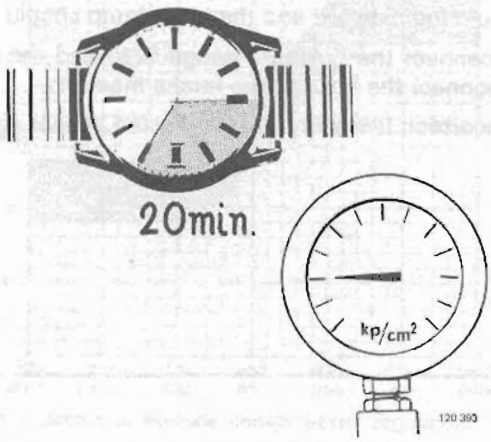
Leave the engine idling until the temperature reaches +55°C (130°F). Rev up the engine and check that the control pressure does not drop (the thermostat valve disconnects the system at approx. +53°C = 127°F).

Turn off the engine.

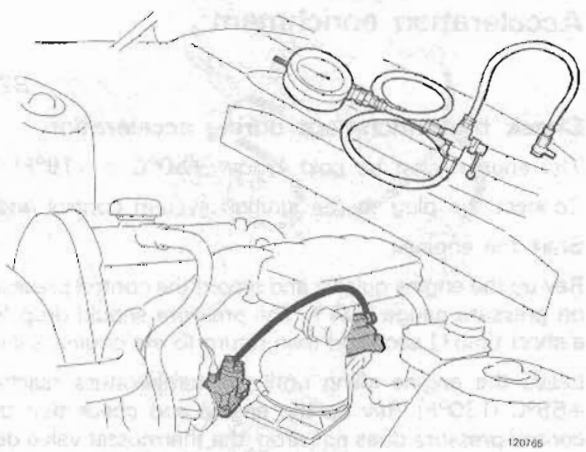
Disconnect the plug from the ignition system control unit.



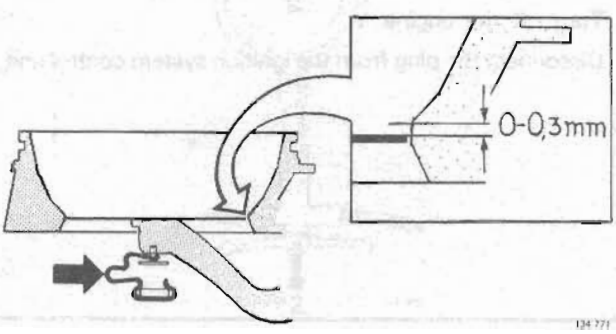
132 666



120 390



120765



124 771

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 → *B64*

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 → *B64*

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

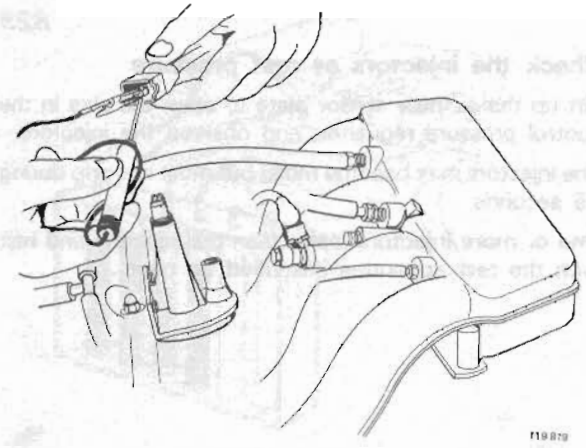
Turn on the ignition.

> 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.



Auxiliary air valve

Operation B26

Only cars without constant idle speed system (CIS)

B26

Check that the auxiliary air valve closes

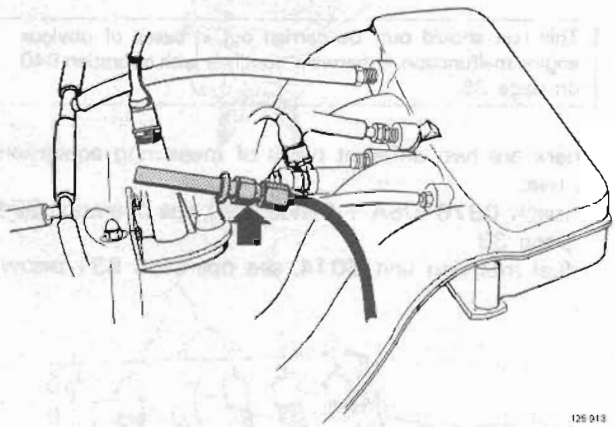
Turn on the ignition.

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*

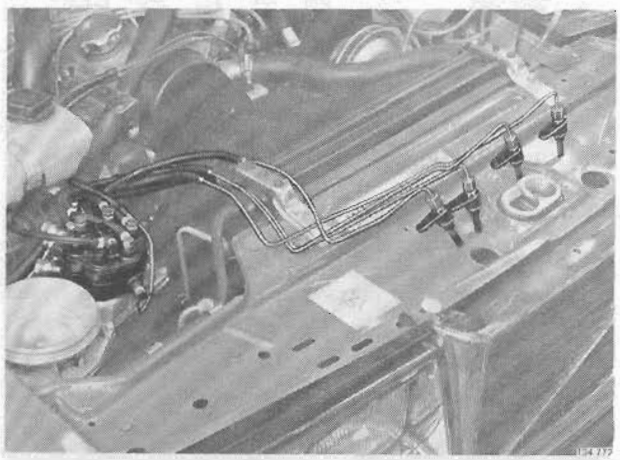


Injectors, fuel distributor

Operations B27–40

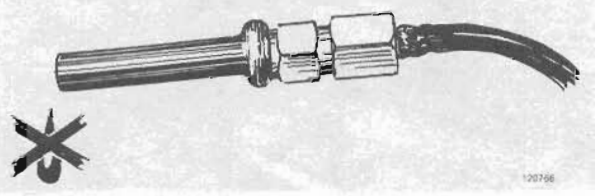
B27

Remove the injectors from the cylinder head



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

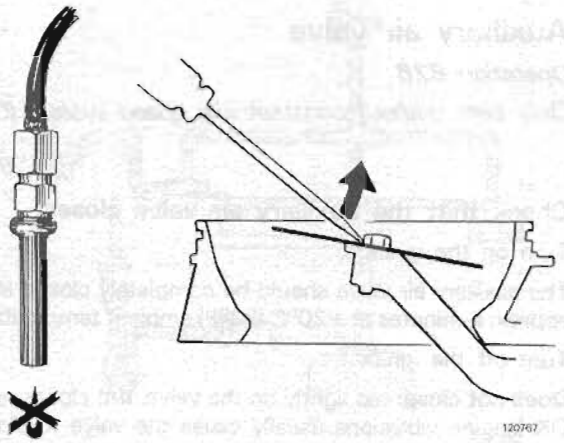
Make sure that the fuel distributor does not leak

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.



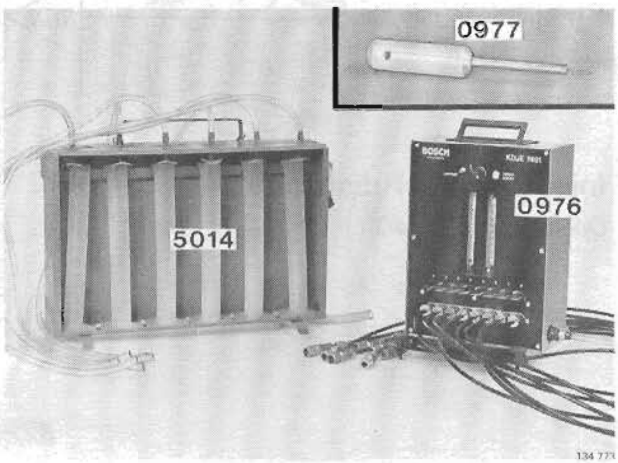
B29

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.



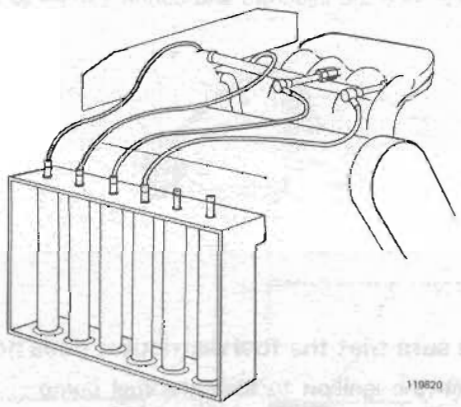
B30

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 + Canda only), see operation B34, page 33
- fuel metering unit **5014**, see operation B31 below.



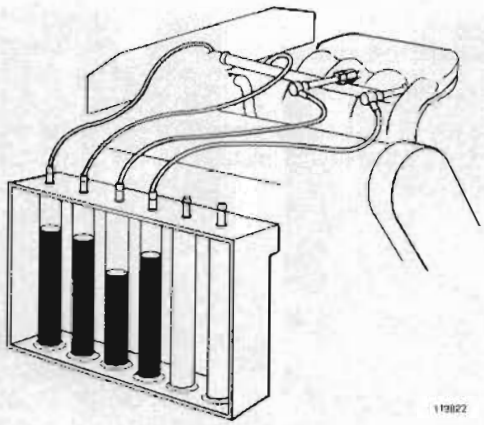
Fuel metering unit 5014

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 cm³** 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 %**.

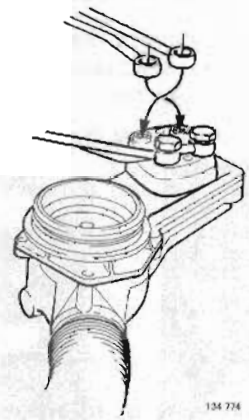
Turn off the ignition.

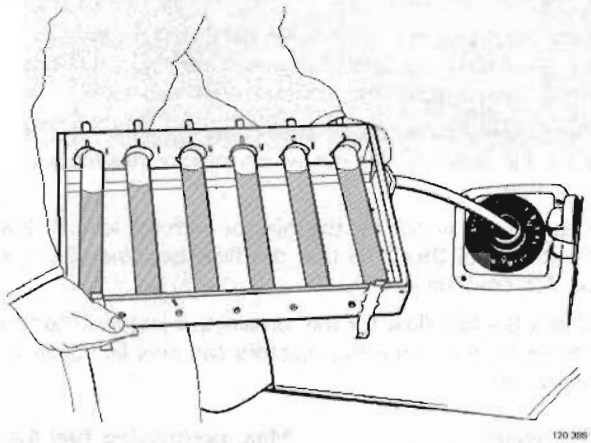
Greater than 20 %: repeat the test to be exactly sure.

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.





B33

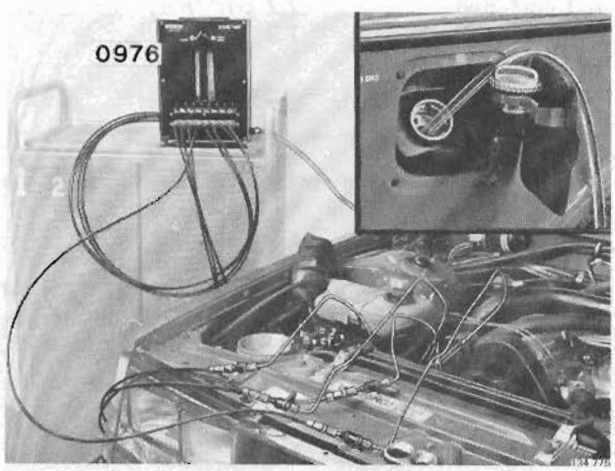
Disconnect the measuring equipment

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.

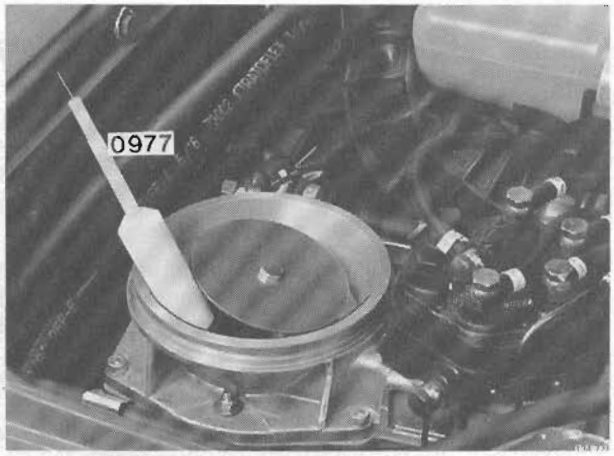
B34

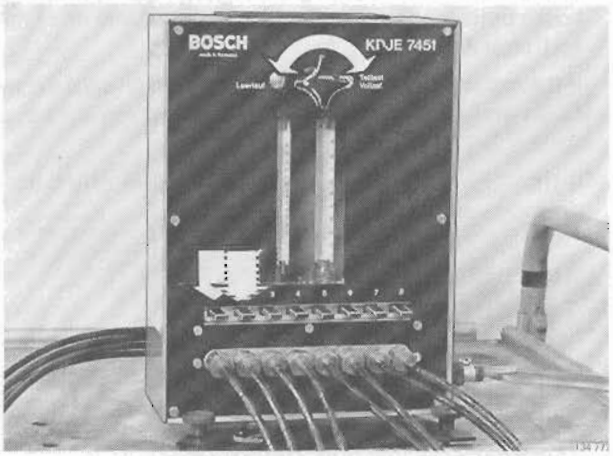
Connect meter 0976

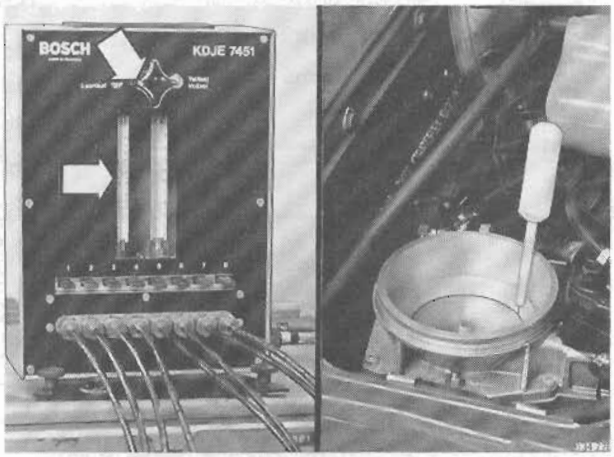
Support the meter on a flat surface, next to the car, and make sure that it is horizontal by checking the built-in spirit (bubble) level.

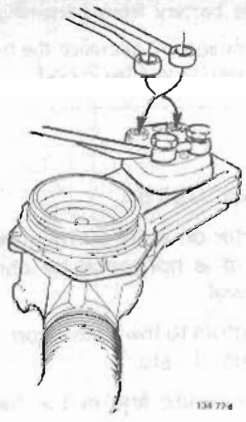
Connect the injectors to the hoses from the meter, injector no. 1 to hose no. 1, etc.

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 cm^3/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 cm^3/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 cm^3/min.	7.2 cm^3/min.
6.6 "	7.9 "
7.2 "	8.6 "

Incorrect fuel flow:

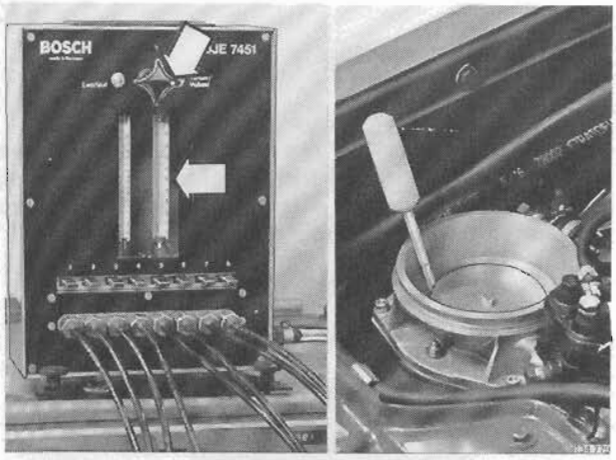
Turn off the ignition.

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

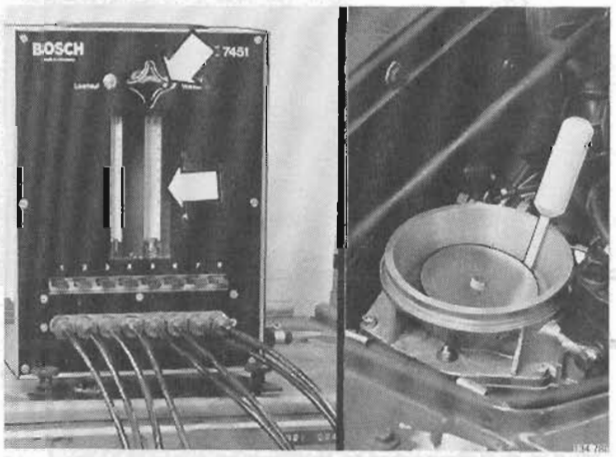
Turn the meter knob to the right (white spot).

Position tool **0977** so that the fuel flow for the injector with the lowest flow becomes 40, 50 or 60 cm^3/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 cm^3/min. Select as high a value as possible.

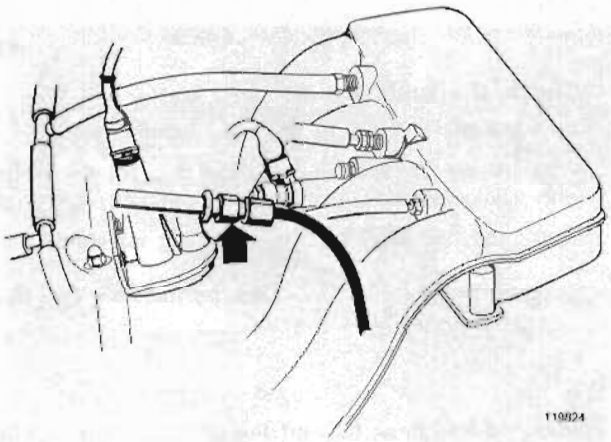
Check the fuel flow for the remaining injectors.

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

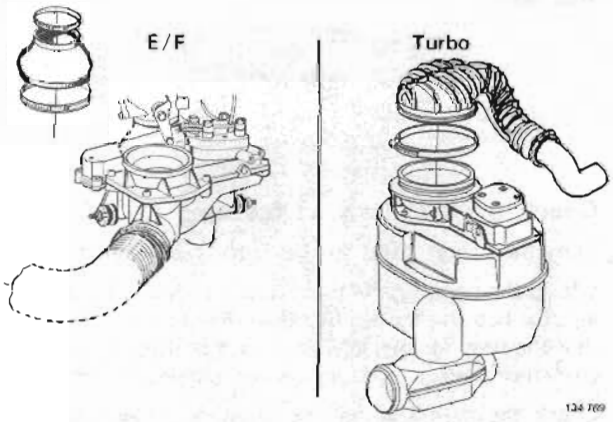
Turn off the ignition and disconnect the test apparatus



B40

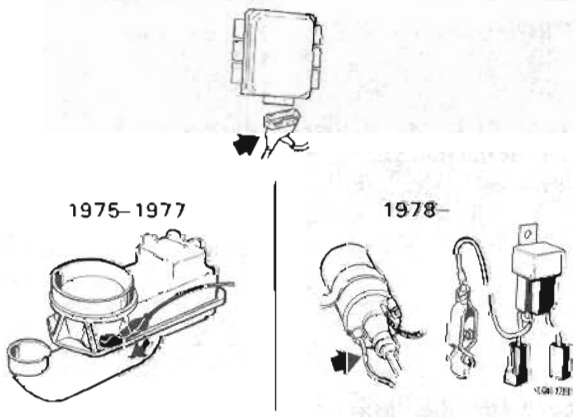
Reinstall the injectors

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



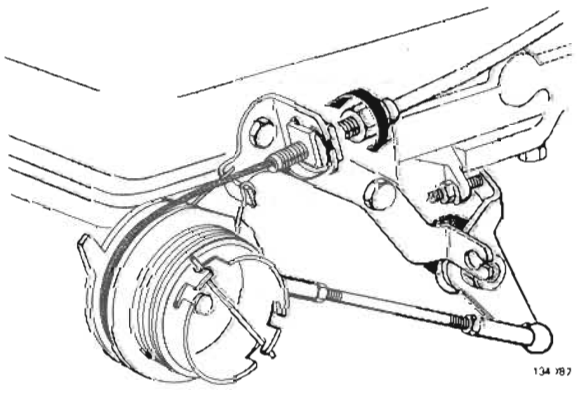
B42

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.



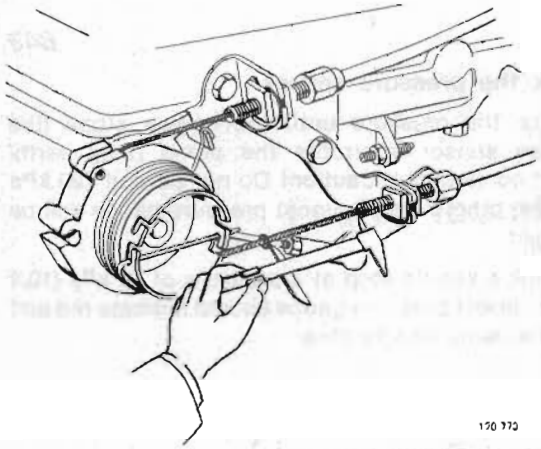
B43

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.



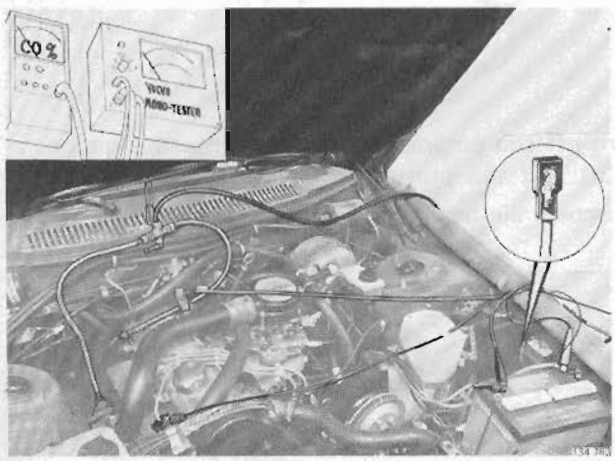
B44

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 shoud 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.



F-Turbo engines only

Pressure switch
Pressure sensor

Operations B45–50

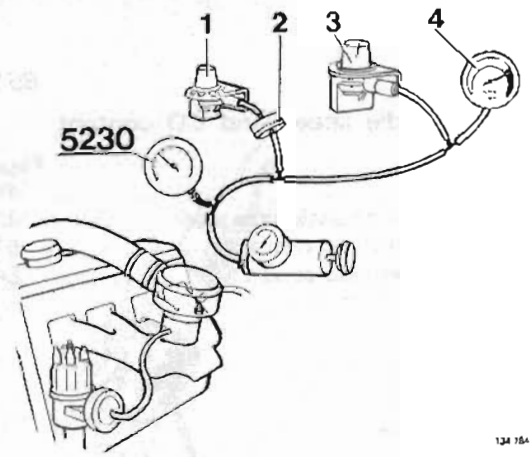
B45

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

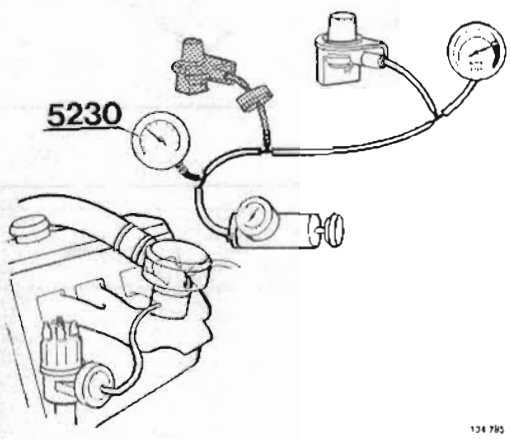


B47

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



B48

Check full load enrichment

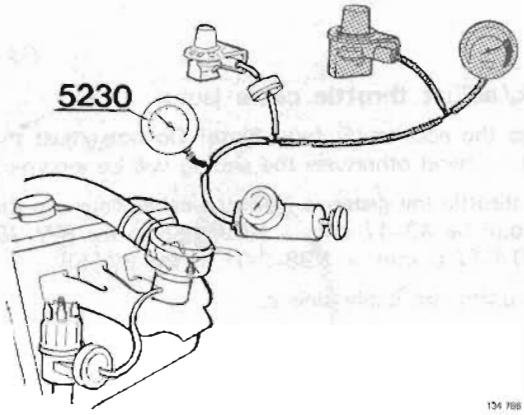
The engine must be running.

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.

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.

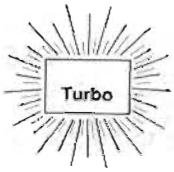


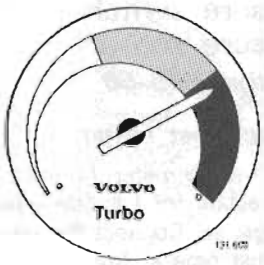
B49

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.

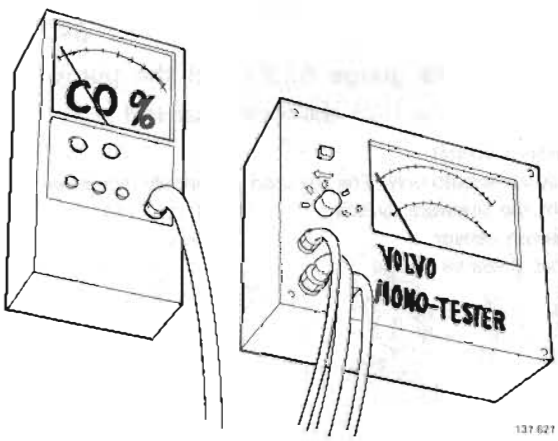




B50

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

Reconnect the hose to the intake manifold.



B51

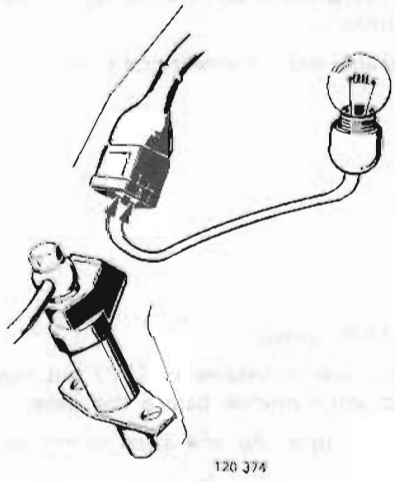
Check/adjust idle speed and CO content

	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

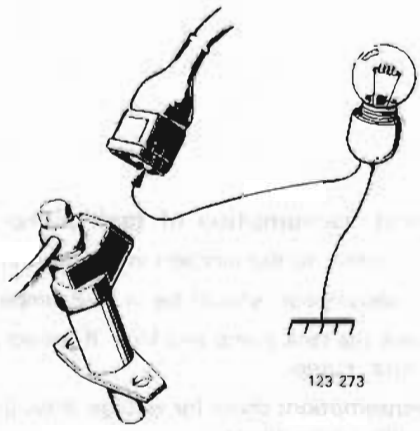
When the fault has been rectified proceed from B6

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

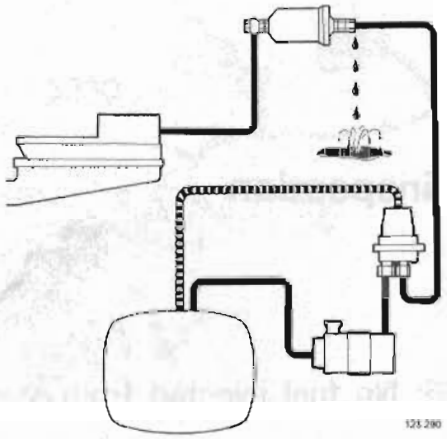
B53

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

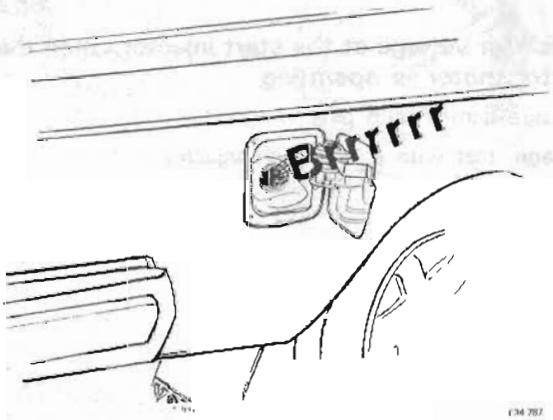
B54

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

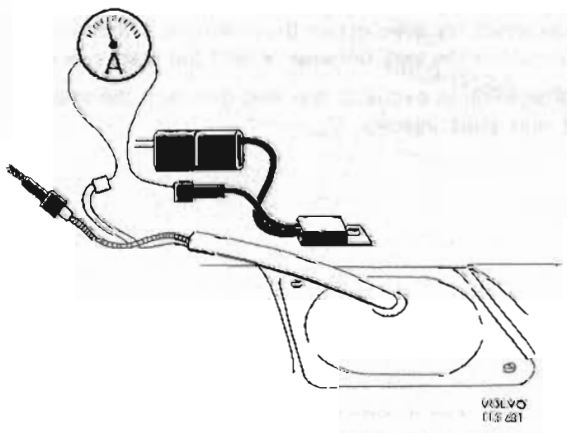
Check the tank pump

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

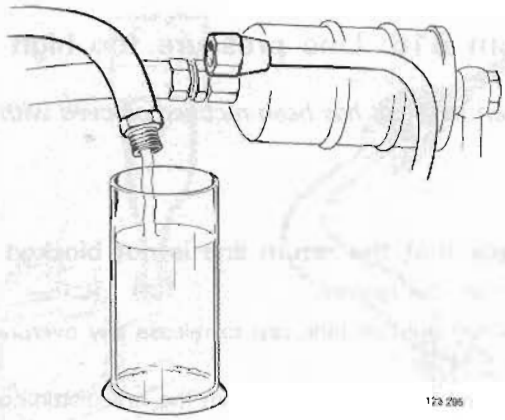
Check current consumption of tank pump

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.

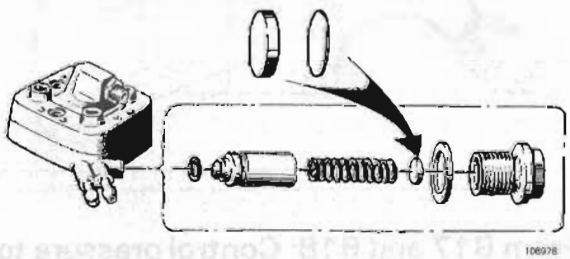
Turn on the ignition for **30 seconds.**

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.

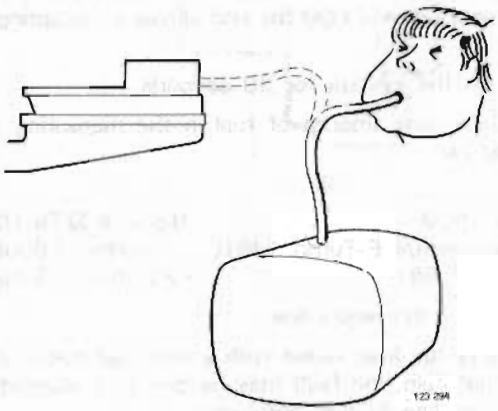


B58

Adjust the line and rest pressures

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

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.

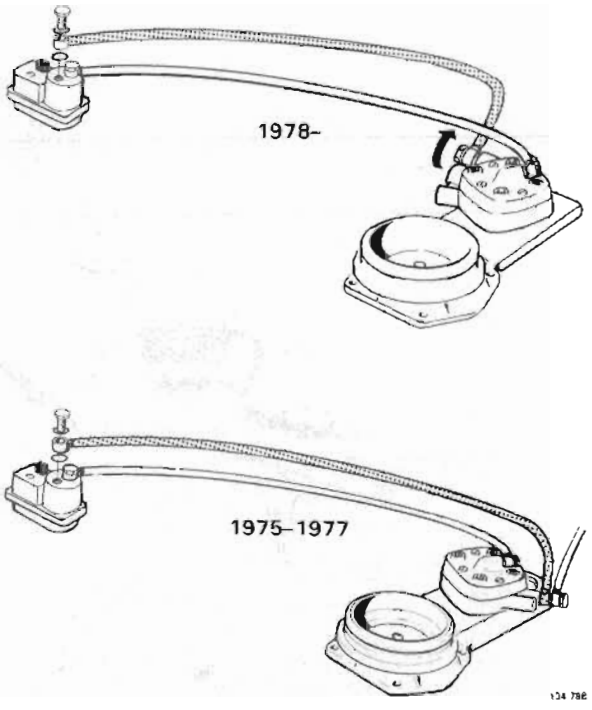
Reconnect the return line.

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.

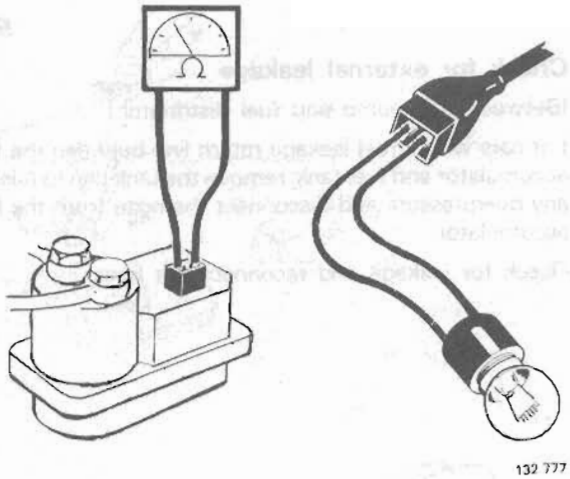
Blow through the line.

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

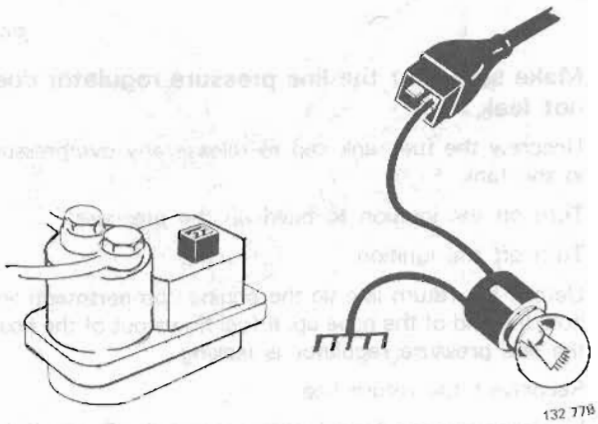
B62

Check for voltage at the control pressure regulator

Measure across both the plug pins.

Voltage: measure the regulator resistance
10–20Ω regulator ...079 (USA 1981–)
20–30Ω others.

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



132 778

B63

Check for voltage between the plug and earth/ground

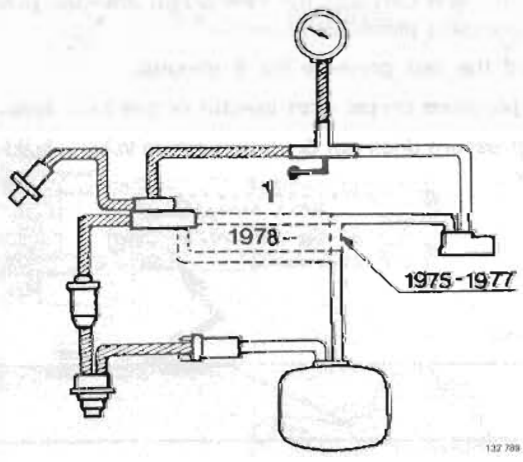
Voltage: open circuit in lead to earth.

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 recified proceed with B23 and B24



132 789

B64

Check the rest pressure with gauge cock in position 1

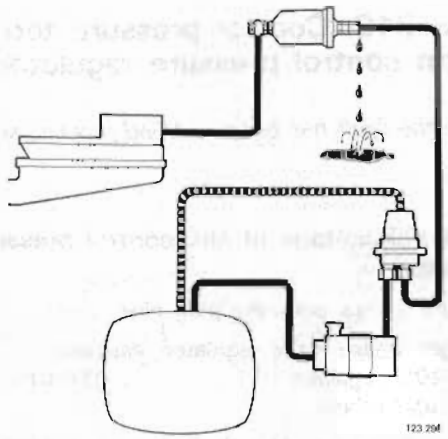
Turn on the ignition to build up the pressure in the system.

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.



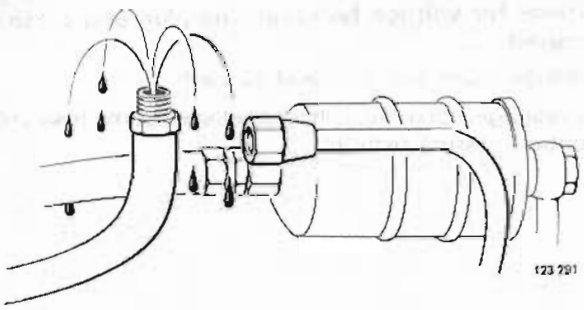
B65

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.

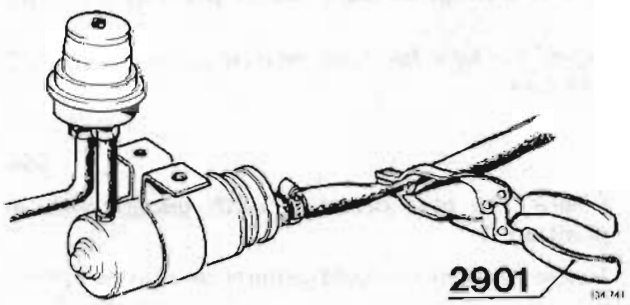
Turn on the ignition to build up the pressure.

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.

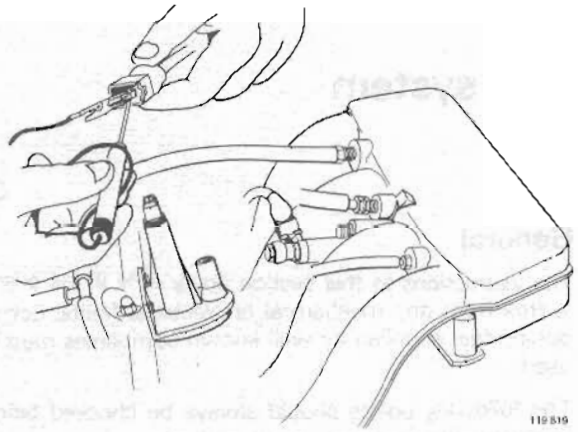
Block the line between the tank pump and fuel pump. Use clamping pliers **2901**.

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



From B26: Auxiliary air valve does not close

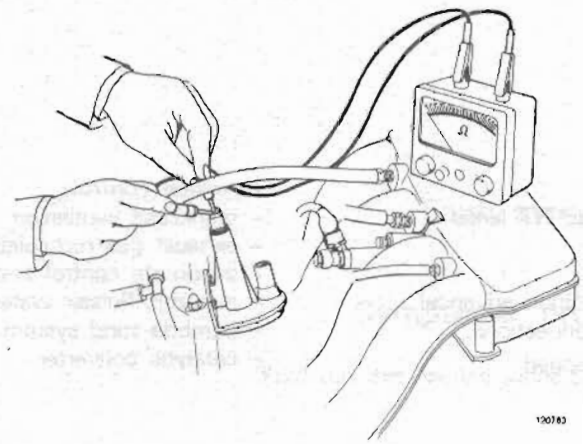
When the fault has been rectified proceed with B27

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.

Resitance should be **40–60Ω**.

Correct: indicates poor plug contact.

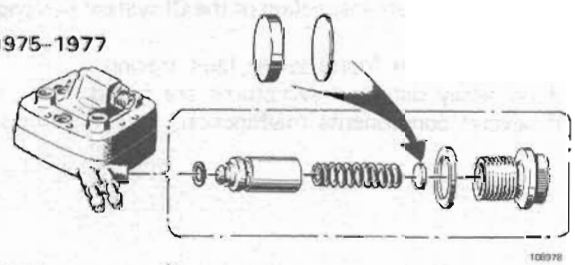
Incorrect: replace the auxiliary air valve.

End

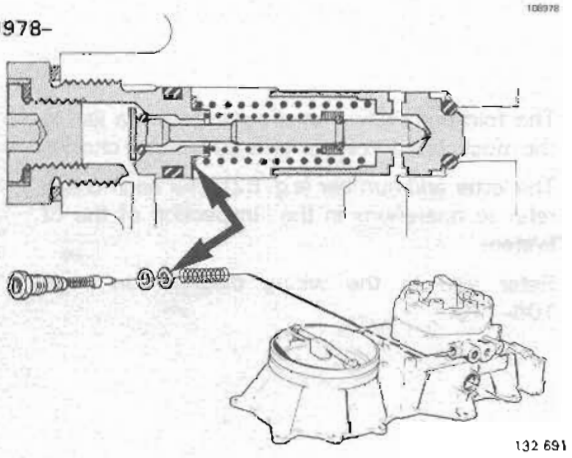
Adjusting the line and rest pressures

B70

1975–1977



1978–



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

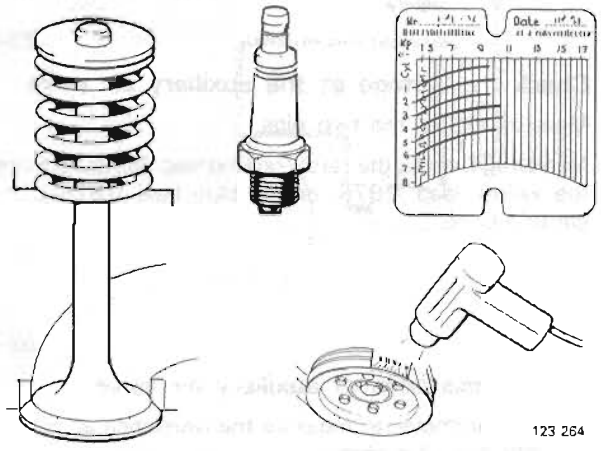
The line and rest pressures are affected equally by the adjustment. Both pressures are increased by adding shims and reduced by removing shims.

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

C1

General

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

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

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

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



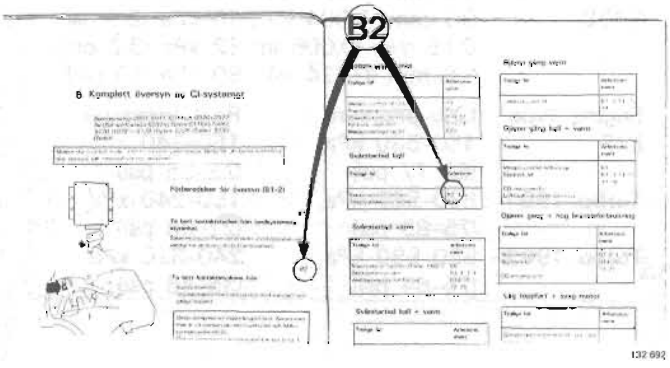
123 265

C2

Description:

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

Perform a complete inspection of the CI system (see page 22):
- if no faults are found when fault tracing
- if no easily detected symptoms are found
- if several components malfunction.



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.

(EGR)

Fault symptoms and causes

Symptoms, probable faults/remedies

Fold out this section while performing the fault tracing procedures.

FAULT SYMPTOM: Engine does not start	Cold engine difficult to start	Hot engine difficult to start	Erratic running, cold + during warming-up	Erratic running, hot	Occasional stalling	Low top speed, poor performance	Erratic idle	Excessive fuel consumption	CAUSE
									Leakage, fuel/air
X	X	X	X	X	X	X	X		Inlet system, air leakage
		X						X	Fuel system, external leakage
		X			X			X	Fuel distributor, leakage
					X				Air leakage, injector holder
									Pressure (line, control and rest)
X									*One or more of the pressures incorrect*
	X	X							Line pressure incorrect
	X		X			X			Control pressure, cold, too high
				X				X	cold, too low
		X		X	X				warm, too high
		X		X	X			X	warm, too low
			X				X	X	USA 1981–: acceleration enrichment, cold engine defective
							X		E Turbo: full load enrichment defective
		X							Rest pressure, too low (vapour locks)
		X							too high (injectors leaking)
									Fuel pump, tank pump
X									Fuel pump does not start (relay, fuses)
	X	X	X	X	X	X	X		low capacity, poor connections
					X		X		Tank pump faulty
									Air-fuel control unit
X	X	X							Air flow sensor plate, incorrect position
X	X	X	X	X	X	X	X	X	Sensor plate/lever/control/plunger jamming
					X		X		Fuel distributor blocked
									Start injector
X	X	X							Does not open
	X								Thermal timer switch shorted
		X							Turbo 1982–: Impulse relay defective
X	X	X	X	X	X		X	X	Does not close
									Lines, filters
X	X	X	X	X	X	X	X		Fuel lines/filters for tank pump, blocked
									Auxiliary air valve, injectors
	X				X				Auxiliary air valve, does not open
					X				does not close (fast idle)
					X		X		Injectors blocked (fuel not atomized)
		X							Injectors leaking
									CO, throttle valve, controls
		X	X	X	X	X	X	X	CO content, incorrect
					X	X			Throttle valve, loose
					X		X		Throttle valve incorrectly set

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	–

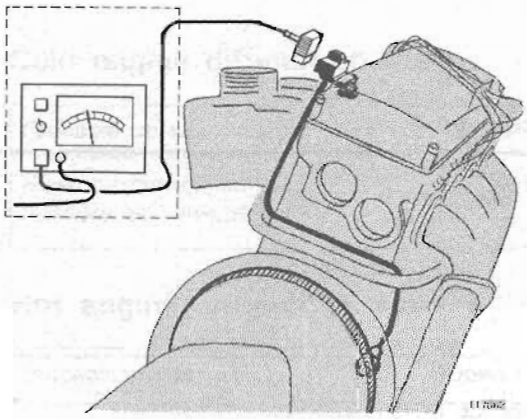
Low top speed + poor performance

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

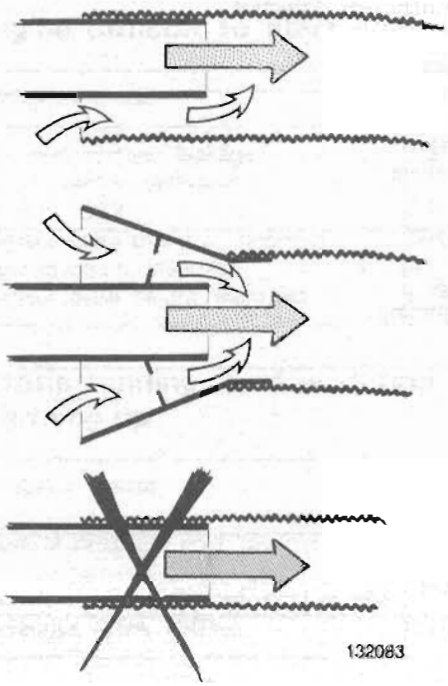
General

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

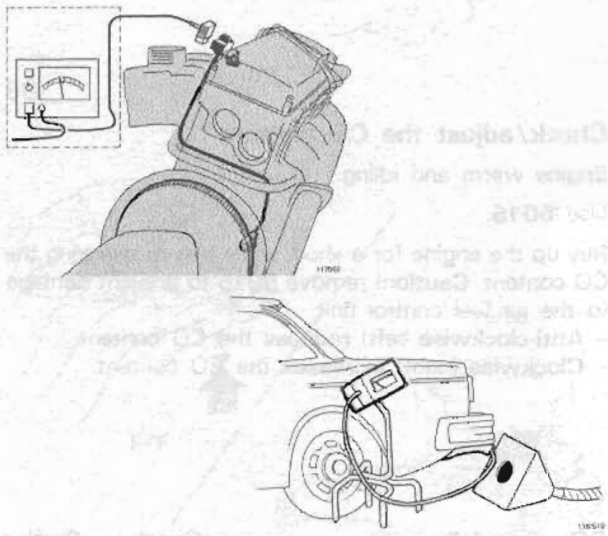
Use an exhaust gas extractor that fits loosely over the exhaust pipe.

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

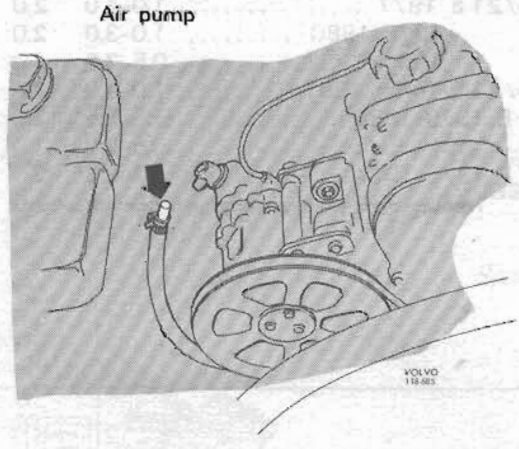
Special tools: (2901), 5015



D3

Connect test equipment

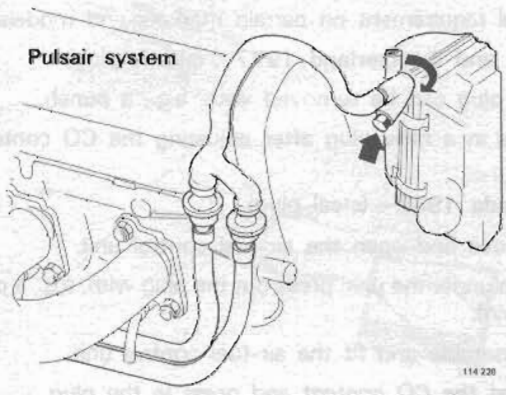
- Rev counter. **Note!** 1975 models are not equipped with a connection for a rev counter or Monotester.
- CO gauge. The probe should be placed in the exhaust pipe approx. 480 mm = 19" from the end, otherwise fresh air may mix with the exhaust gases causing invalid results.

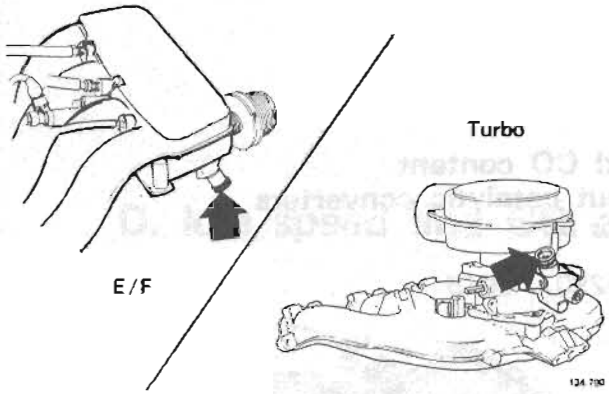


D4

Disconnect the air pump / Pulsair system, where fitted

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



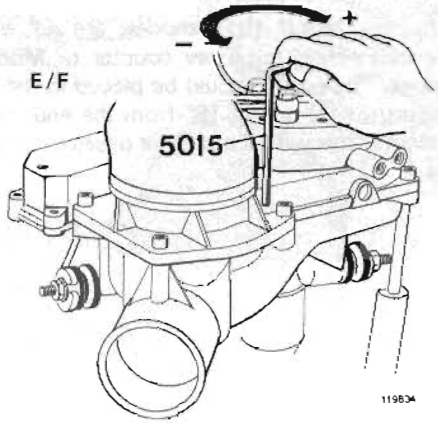


D5

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

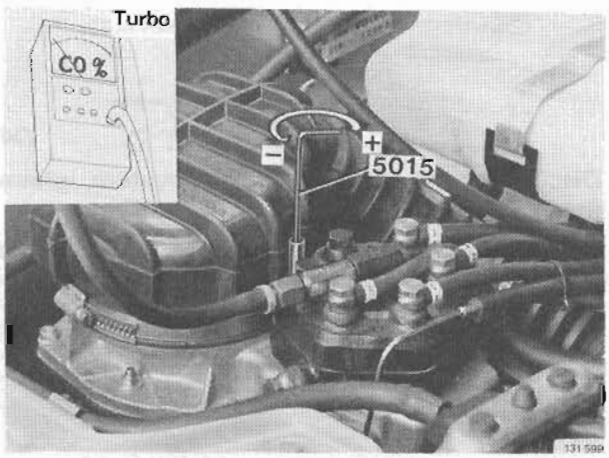
Check/adjust the CO content

Engine warm and idling.

Use **5015**.

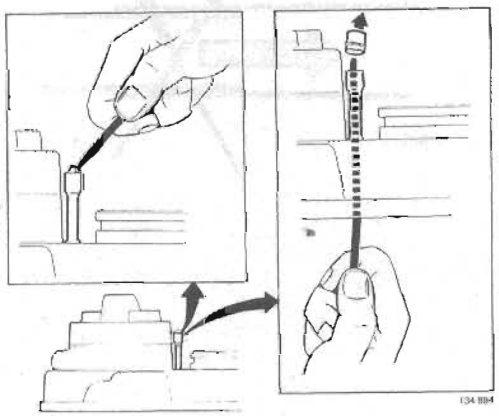
Rev up the engine for a short while before checking the CO content. **Caution!** remove 5015 to prevent damage to the air-fuel control unit.

- **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.

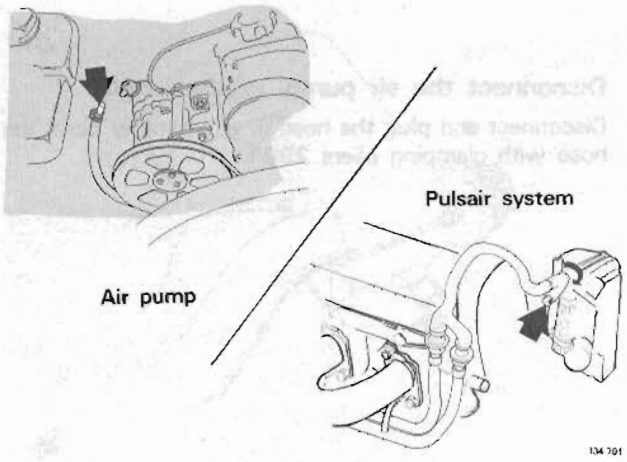
Canada 1982–: (steel plug)

Remove and open the air-fuel control unit.

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

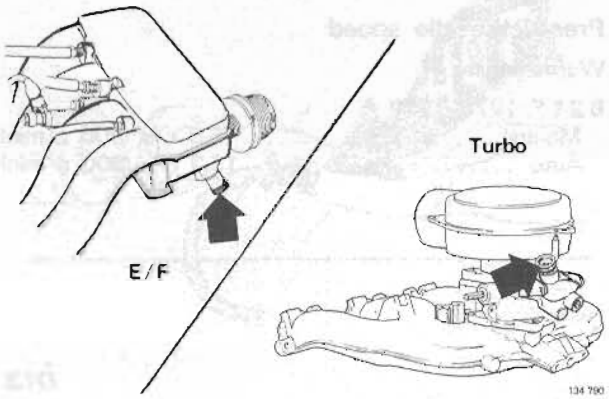
Reassemble and fit the air-fuel control unit.

Adjust the CO content and press in the plug.



D7

Reconnect the hose to the air pump / Pulsair system



D8

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

D9

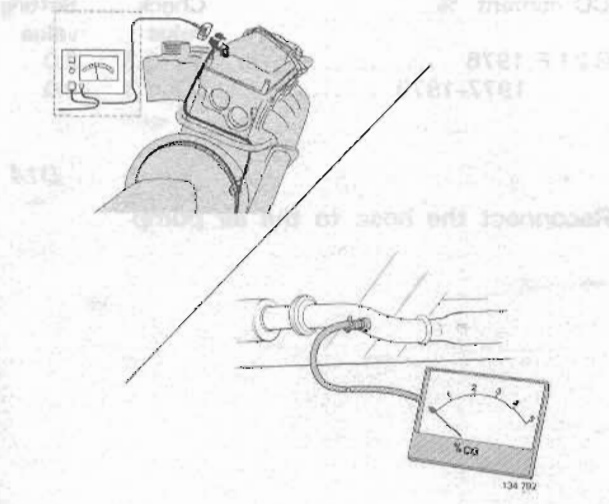
Remove the test equipment

Turn off the ignition

Idle speed and CO content
F engines with catalytic converter

Operations D10–17

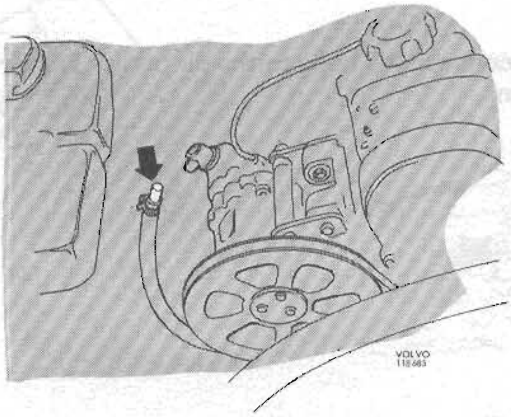
Special tools: (2901), 5015



D10

Connect the test equipment

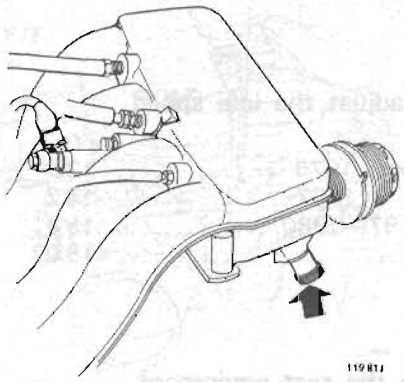
- Rev. counter
- CO gauge. Connect the gauge to the nipple on the exhaust pipe in front of the catalytic converter.



D11

Disconnect the air pump, where fitted

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



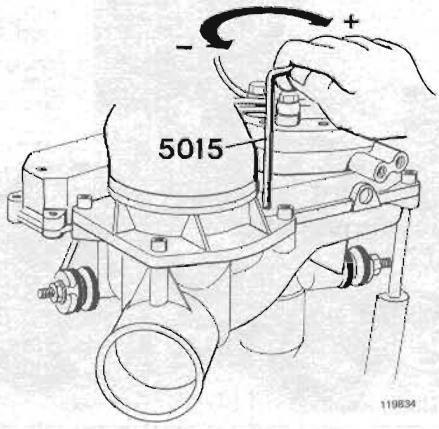
D12

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

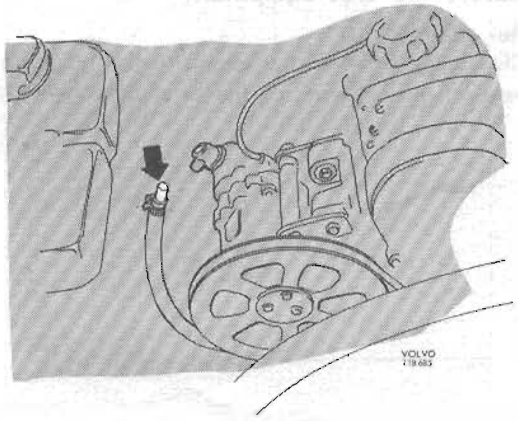
Engine warm and idling.

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.

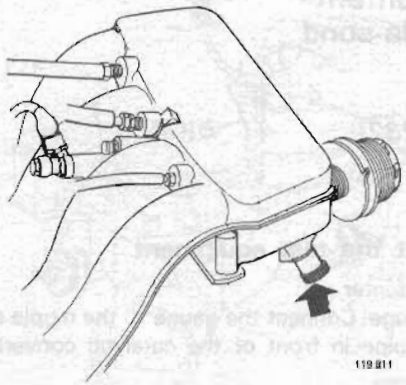
CO content %	Check value	Setting value
B 21 F 1976	1.7–2.3	2.0
1977–1979	0.7–1.3	1.0



D14

Reconnect the hose to the air pump

D15

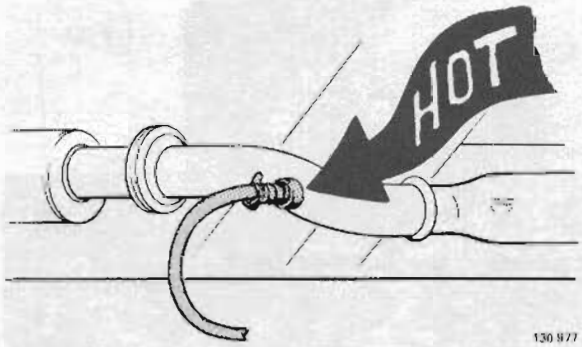


Check/adjust the idle speed

B 21 F 1976–1979

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

D16



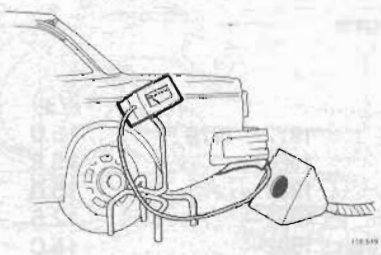
Remove the test equipment

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

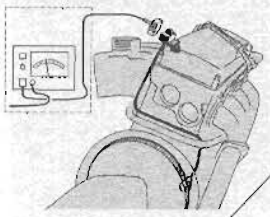
The probe should be placed in the exhaust pipe approx. 480 mm (19 in) from the end, otherwise fresh air will mix with the exhaust gases causing invalid results.

The CO content should be **0–0.5 %**.

Idle speed and CO content
F engines with Lambda-sond

Operations D18–26

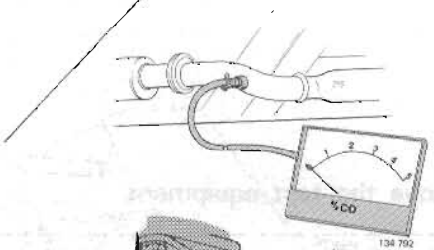
Special tools: 5015, (5232)

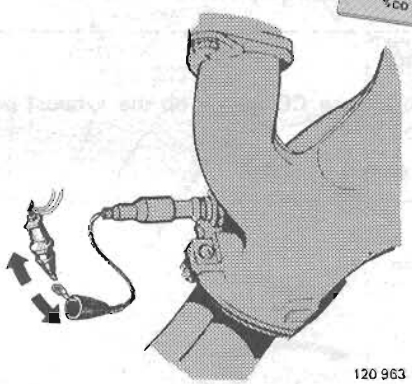


D18

Connect the test equipment

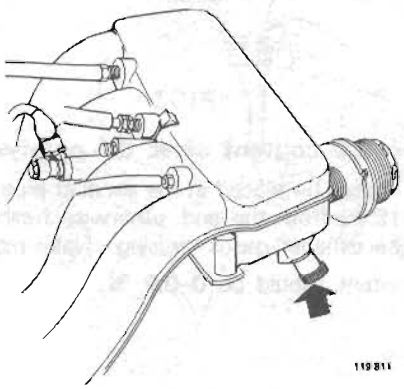
- Rev counter
- CO gauge. Connect the gauge to the nipple on the exhaust pipe in front of the catalytic converter.





D19

Disconnect the Lambda-sond



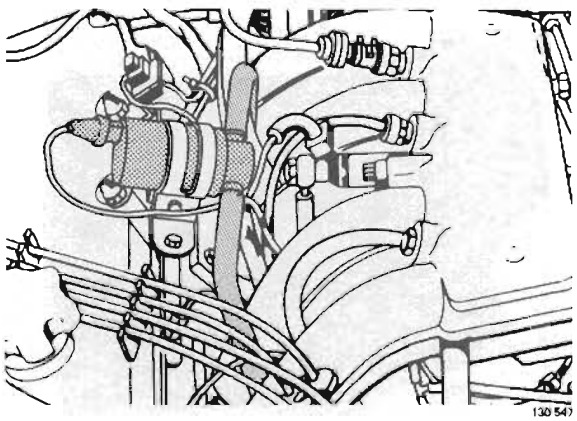
D20

Check/adjust the idle speed

Warm engine.

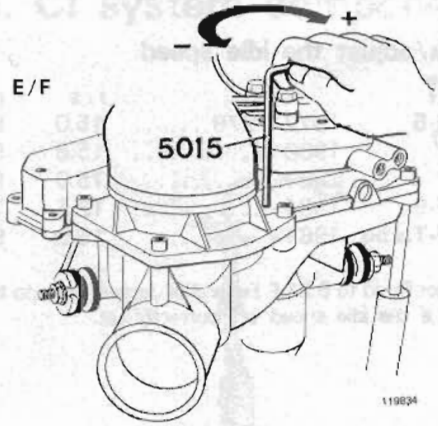
		r/s	r/min
B 21 F-5	1977—1979	15.0	900
	1980—	15.8	950
	1981—	15.0	900*
B 21 F-9	1981—	12.5	750*
B 21 F-Turbo	1982—	15.0	900*

* 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

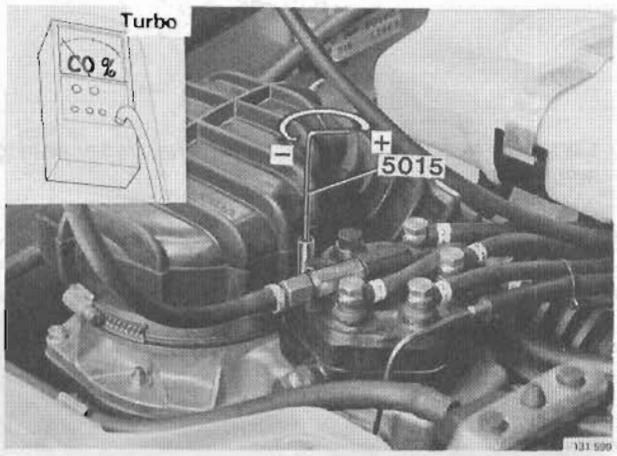
Check/adjust the CO content

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.

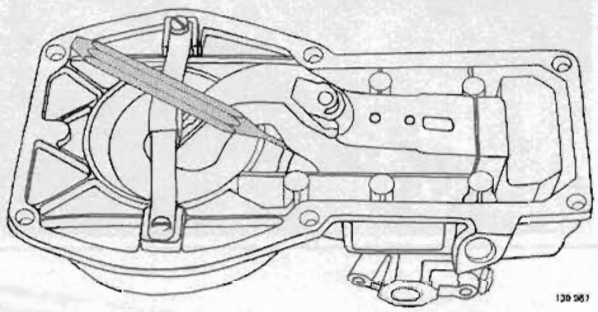
- **Anti-clockwise** (left) **reduces** the CO content.
- **Clockwise** (right) **increases** the CO content.



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.

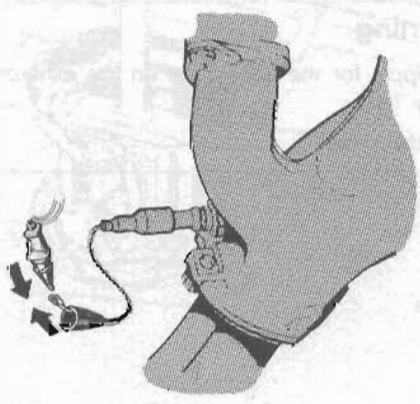


Cars with sealed CO adjustment screw

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.

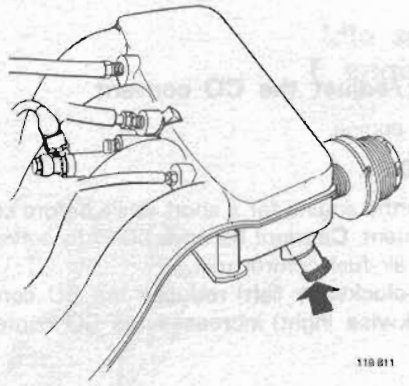


D22

Reconnect/check the Lambda-sond

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

Idle speed, CO content



D23

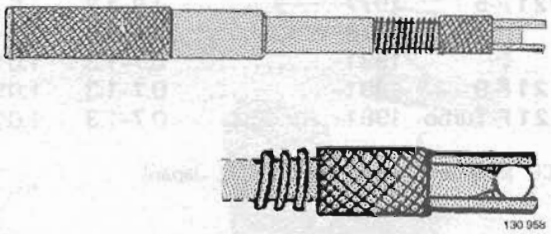
Check/adjust the idle speed

		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*

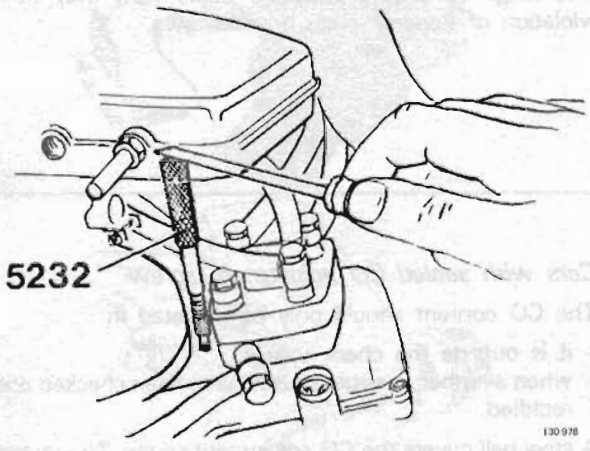
* CIS (not fitted to B 21 F Federal of Japan). Refer to the service manual if the idle speed is incorrectly set.

D24

Turn off the engine



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



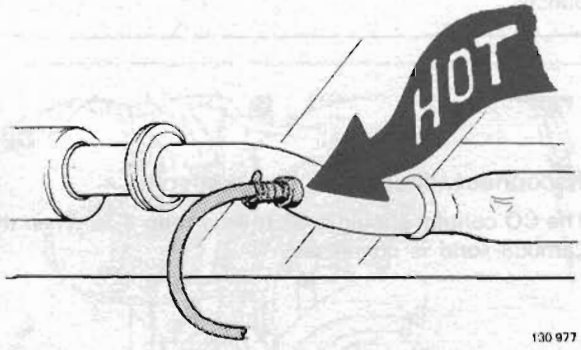
D25

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

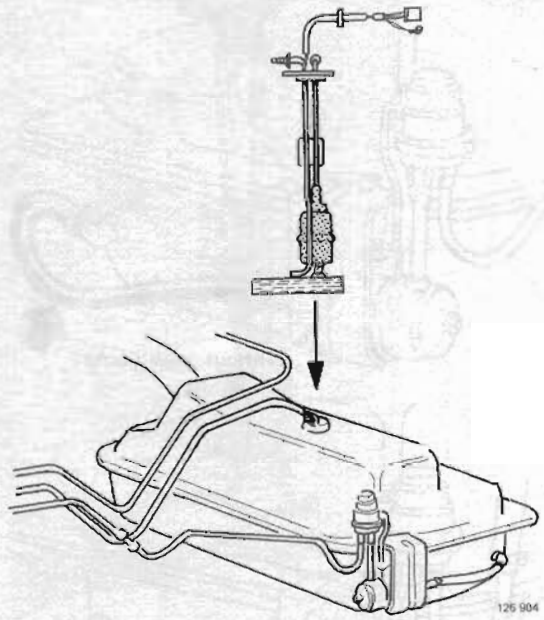
The nipple for the CO gauge on the exhaust pipe is very hot.

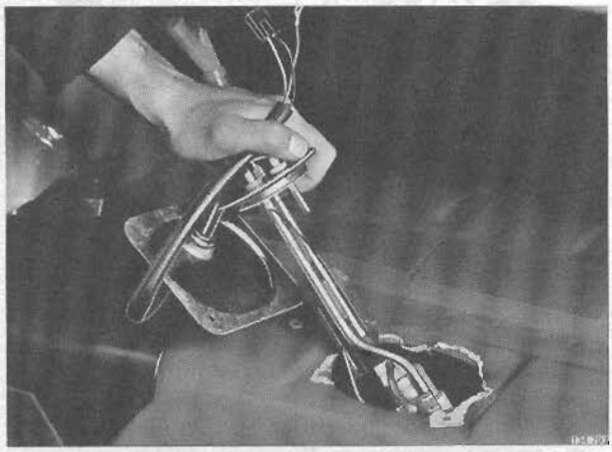
Refit the plug.

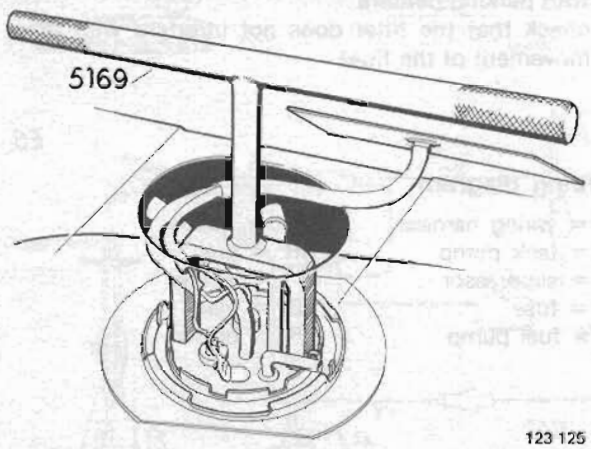
E. CI system components, checking, replacement, etc.

TANK PUMP

Operations E1–10







E1

General

The tank pump was introduced in production in 1977. The pump may have, however, been fitted to earlier vehicles.

E2

Fault symptoms

A defective tank pump may cause low line pressure.

The following symptoms can arise:
- increased noise level at the main fuel pump
- low top speed, poor engine performance
- juddering, engine cut-out (fuel-vapour locks).

E3

Check the tank pump

Carry out the repair operations B1, 7, 55–56.

E4

Tank sender unit, removing/fitting

Necessary if the tank pump or filter is to be replaced.

The unit is removed/fitted through the aperture in the rear floor section.

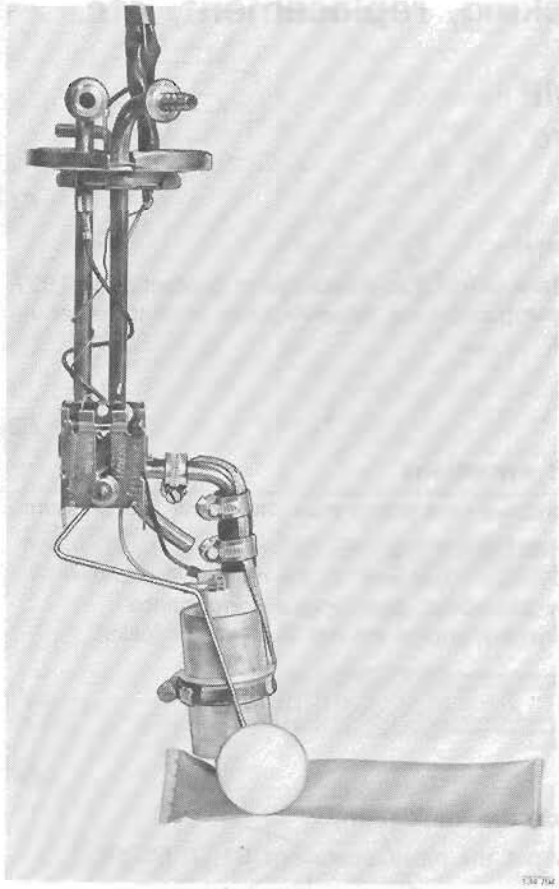
First unscrew the fuel tank cap to release any overpressure in the fuel system.

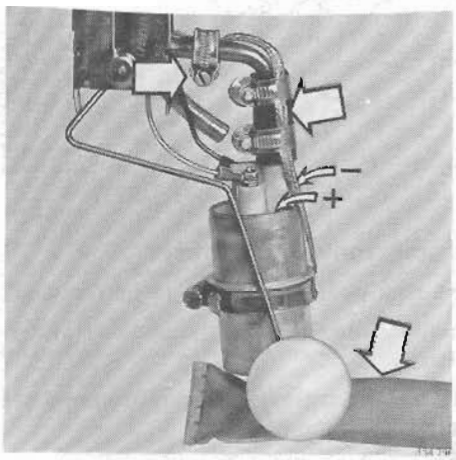
Use tool **5169** to remove the unit.

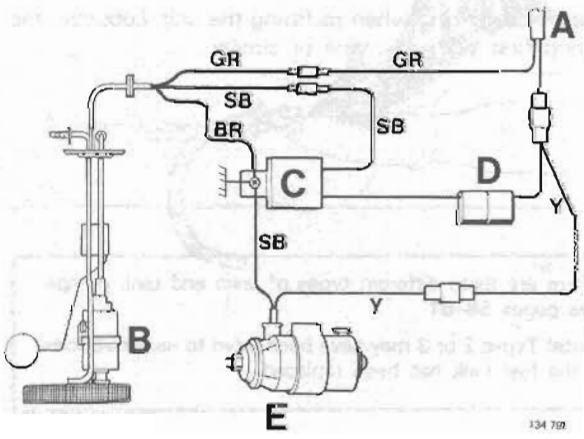
Use a **new** O-ring when re-fitting the unit. Lubricate the O-ring first with glycerine or similar.

There are three different types of units and tank pumps, see pages 58–61.

Note! Types 2 or 3 may have been fitted to earlier vehicles if the fuel tank has been replaced.



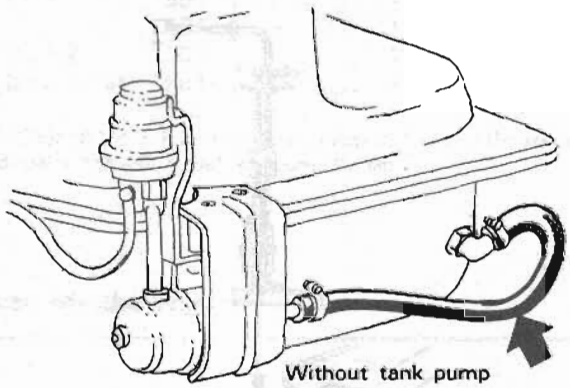


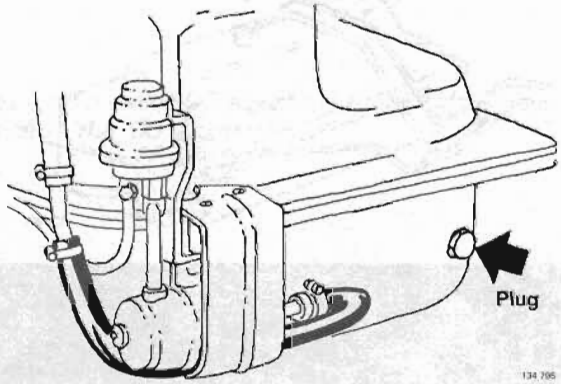


Type 1

Operations E5–6

Applies to models from 1975–1976 and early part of 1977





With tank pump

E5

Replacement of tank pump / filter:

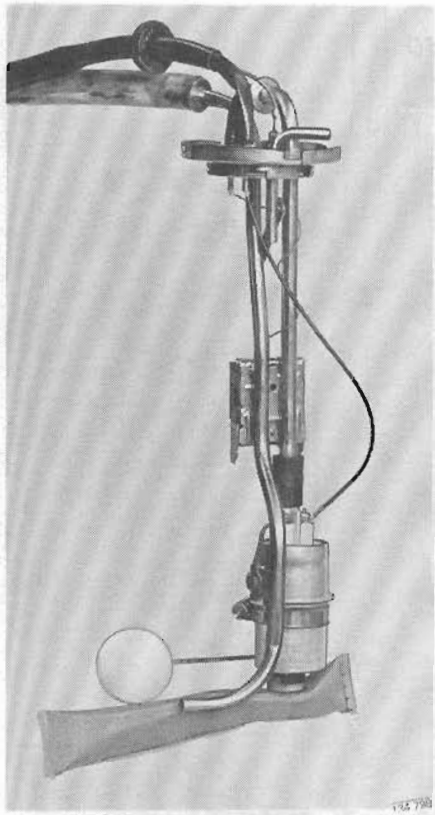
- locate the upper clip as shown, otherwise it will be difficult to fit the unit in the tank
- route the earth/ground lead under the hose clips. If this is not done the movement of the float will be inhibited. Do not stretch the earth/ground lead
- the return hose must be fitted on vehicles equipped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

E6

Wiring diagram

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

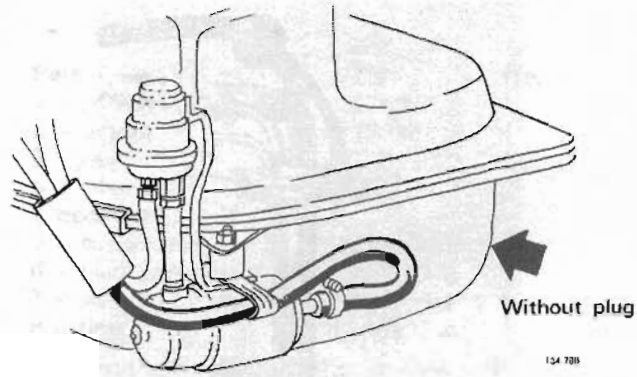
Colour codes
GR = grey
Y = yellow
SB = black
BR = brown



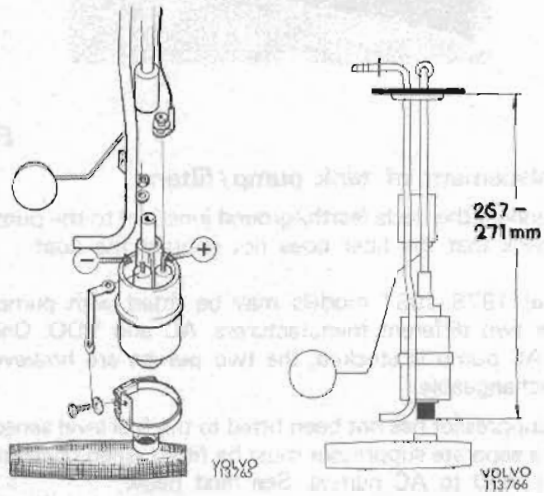
Type 2

Operations E7–8

1977–1978



E7

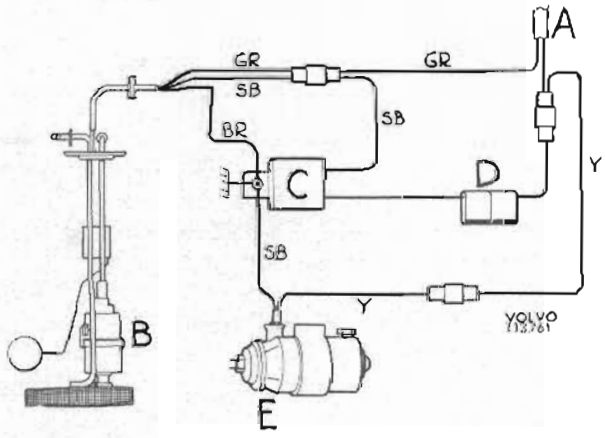


Replacement of tank pump/filter:

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

267–271 mm = 10.5–10.6 in.

E8



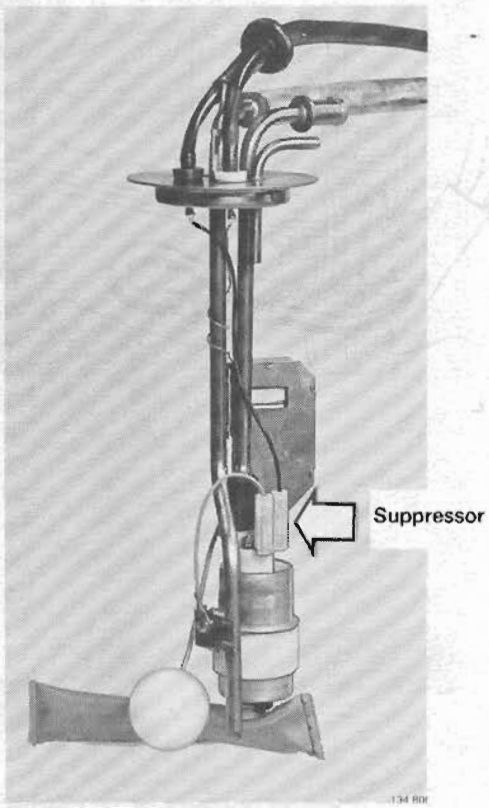
Wiring diagram

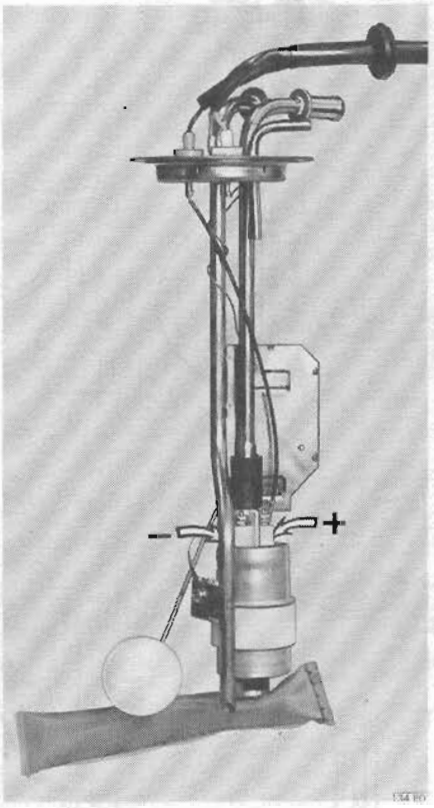
A = wiring harness	Colour codes
B = tank pump	GR = grey
C = suppressor	Y = yellow
D = fuse	SB = black
E = fuel pump	BR = brown

Type 3

Operations E9–10

1978–





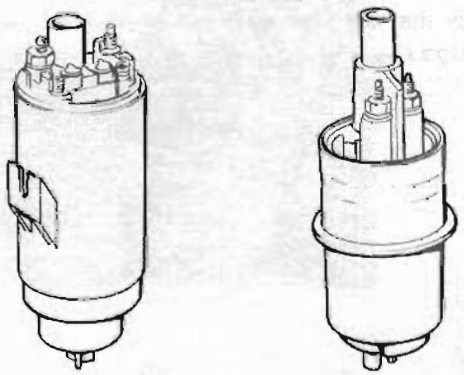
E9

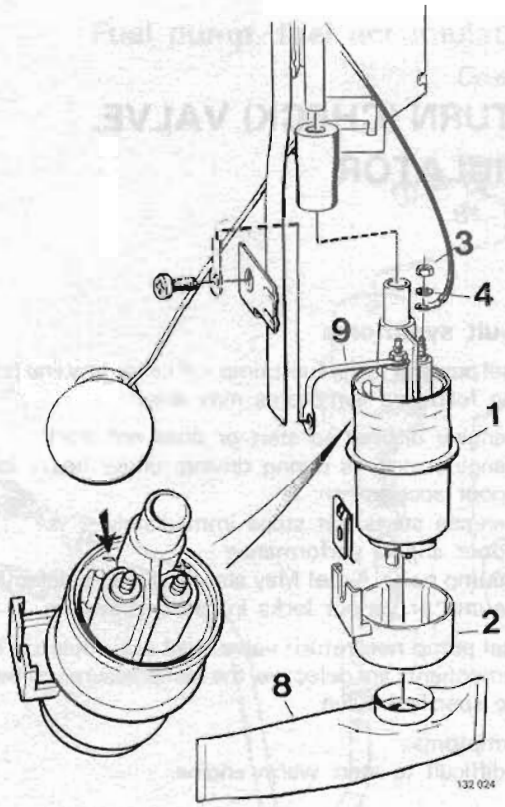
Replacement of tank pump/filter:

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

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

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



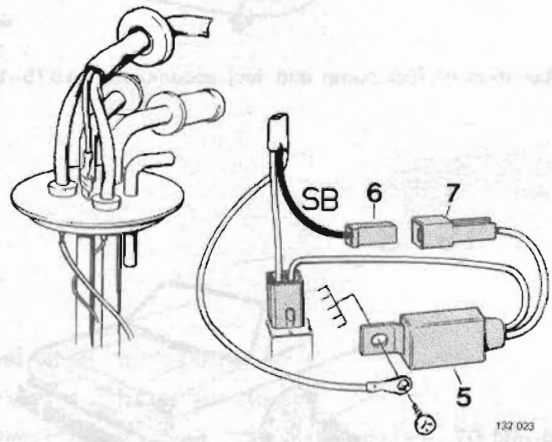


E10

Parts required when changing from VDO to AC tank pump

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

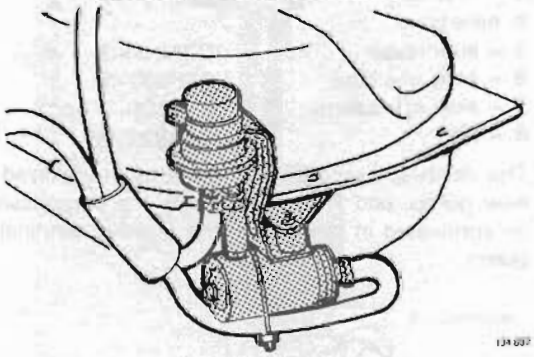
The earth/ground strap (9) must be transferred to the new pump, and where applicable the suppressor must be connected in series with the positive terminal of the pump.



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

Operations E11–18

1975-1977



Location of fuel pump and fuel accumulator, 1975–1977

E11

Fault symptoms

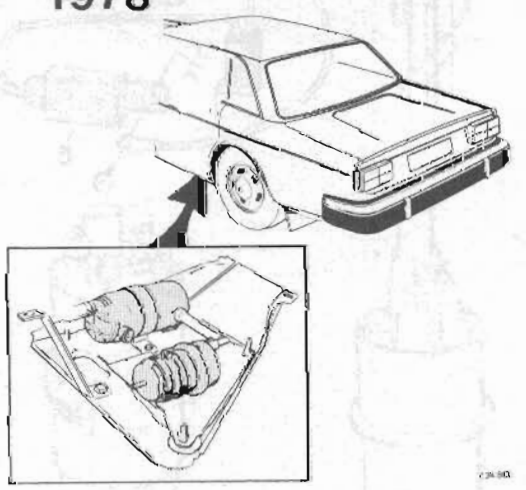
Fuel pump: a faulty fuel pump will cause low line pressure. The following symptoms may arise:

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

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

Symptoms:
- difficult to start warm engine.

1978 -



Location of fuel pump and fuel accumulator, 1978–

E12

Inspection

Fuel pump

Record the pressure. Carry out the following operations B1, 7, 14–16.

Fuel pump non-return valve / fuel accumulator

Measure the rest pressure. Carry out the following operations B1, 7, 14–16, 22–23.

E13

Replacement

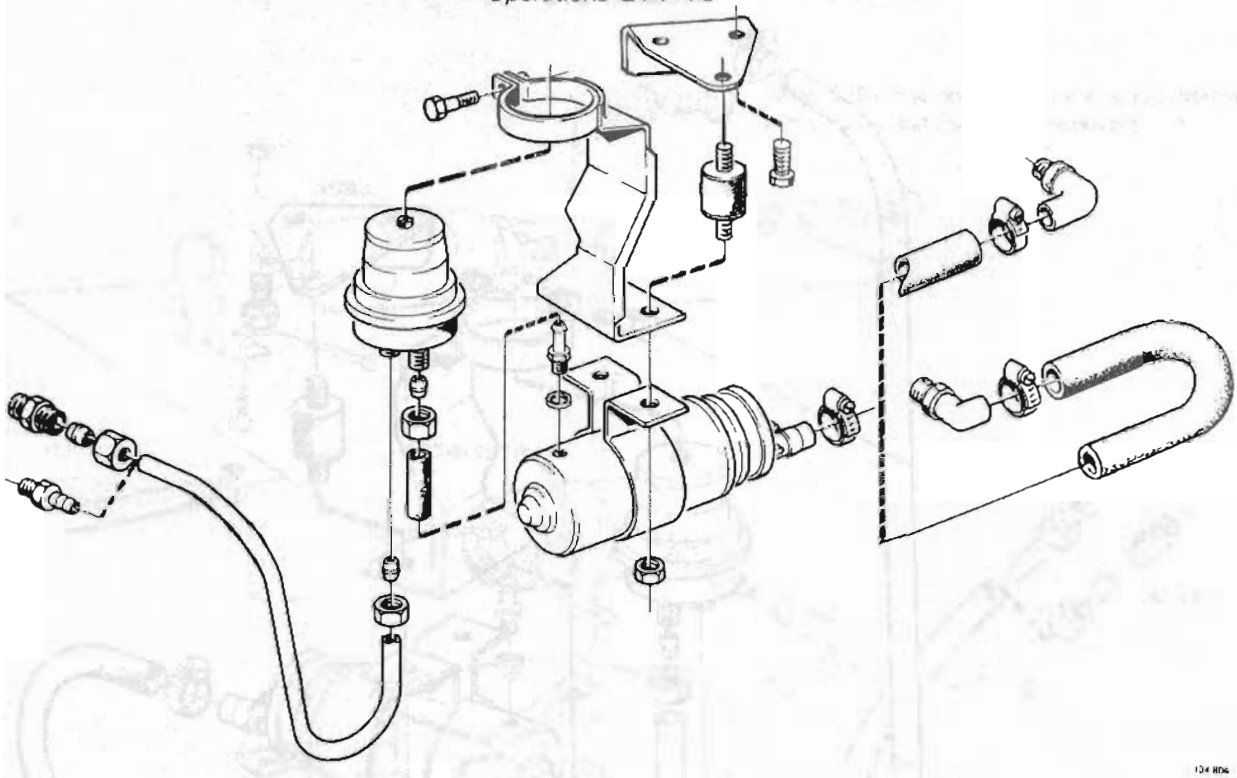
Fuel pump: never fit an old non-return valve to a new pump (a new non-return valve and seal is included with the new pump).

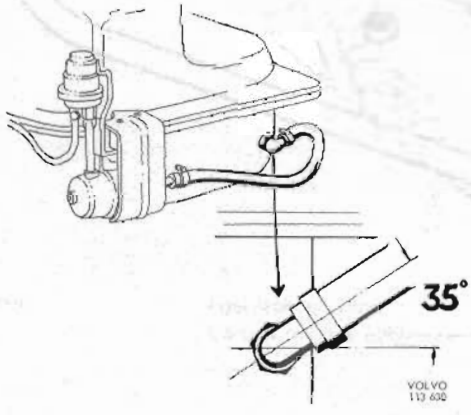
On replacing the pump, check that all pressures are correct, check also the idle speed and CO content.

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

Fuel pump, fuel accumulator 1975–1977 without tank pump

Operations E14–15



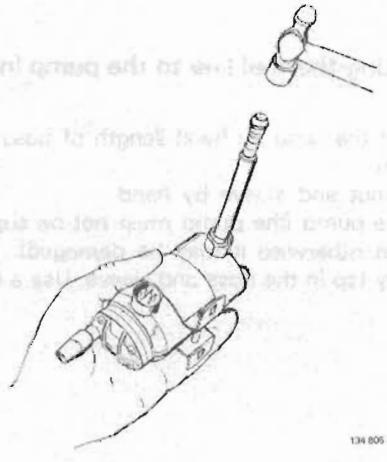


E14

Fuel hose, tank-pump

Only type 2 hoses are stocked.

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



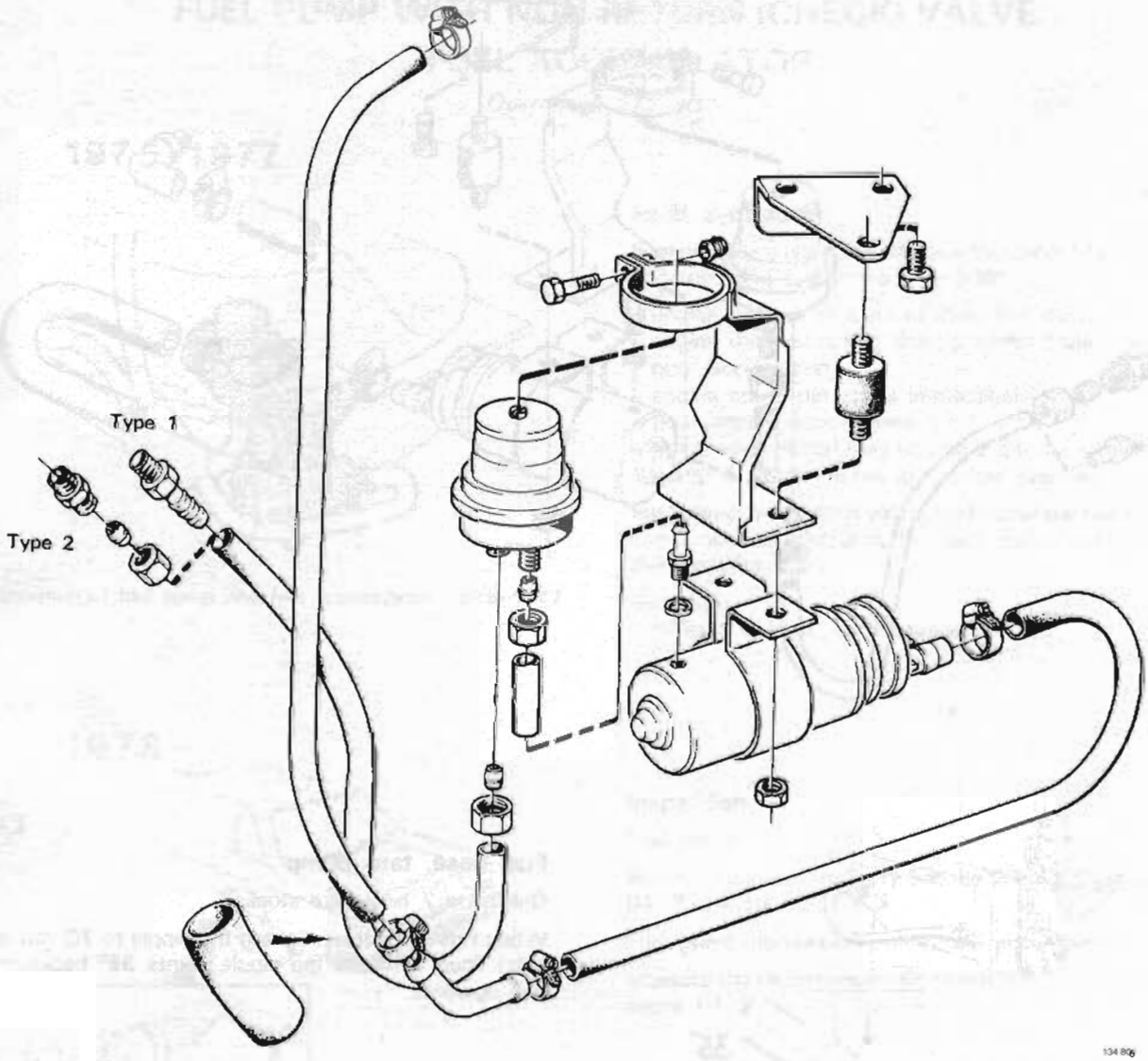
E15

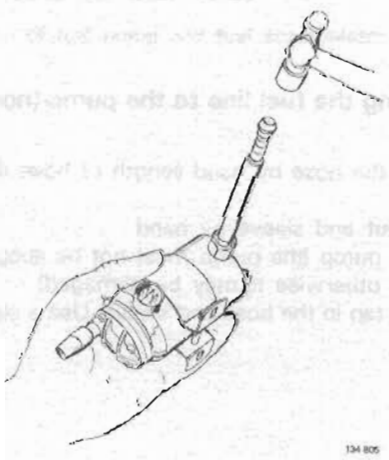
Connecting the fuel line to the pump (non return valve)

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

Fuel pump, fuel accumulator 1975–1977 with tank pump

Operation E16





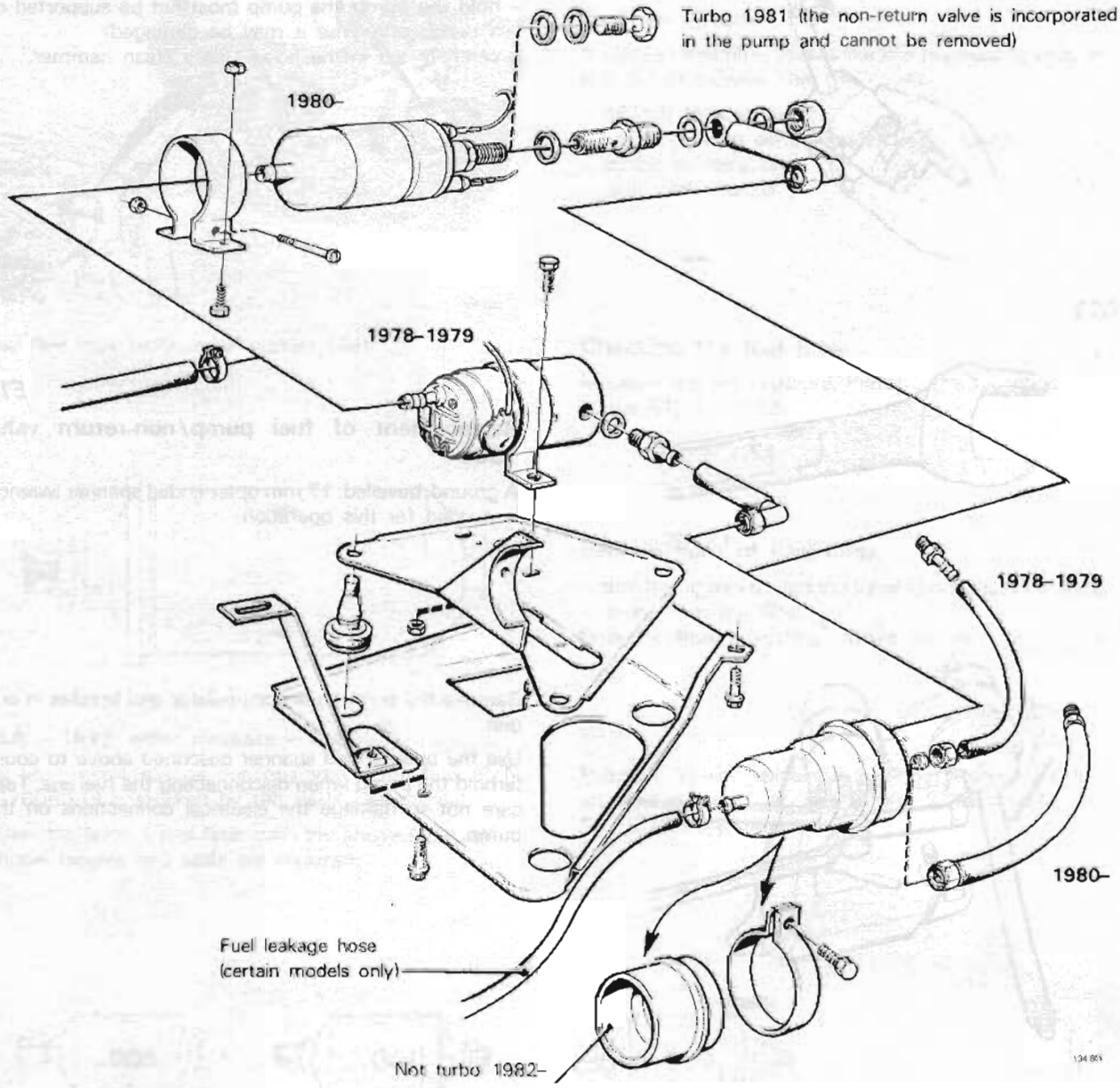
E16

Connecting the fuel line to the pump (non-return valve)

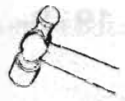
- connect the hose by hand (length of hose 45 mm = 1.75 in)
- fit the nut and sleeve by hand
- hold the pump (the pump must not be supported on a bench otherwise it may be damaged)
- carefully tap in the hose and sleeve. Use a clean hammer.

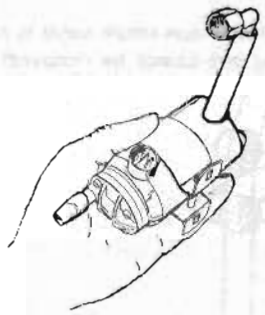
Fuel pump, fuel accumulator 1978–

Operations E17–18



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



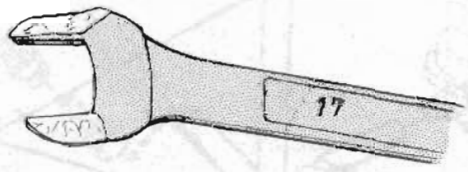


134.808

E17

Connecting the fuel line to the pump (non-return valve) 1978–1979:

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

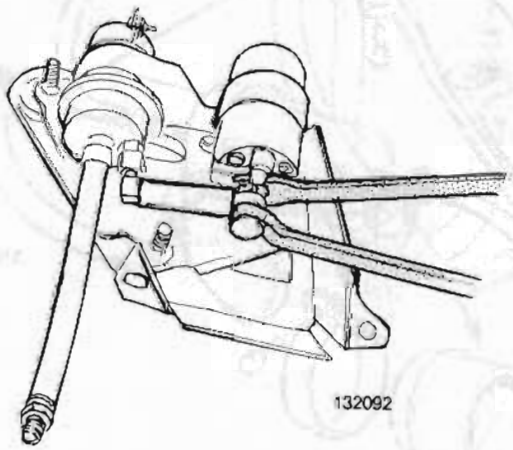


132090

E18

Replacement of fuel pump/non-return valve 1980–

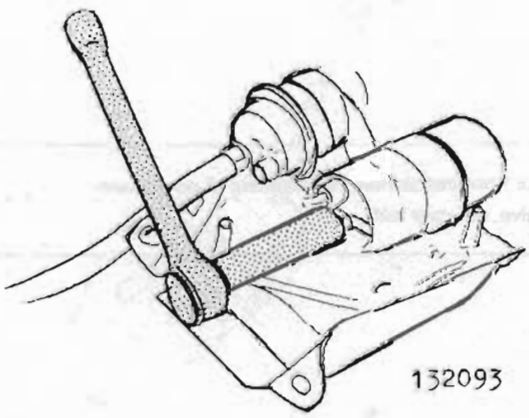
A ground, bevelled, 17 mm open-ended spanner (wrench) is needed for this operation.



132092

Remove the pump, fuel accumulator and bracket in one unit.

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

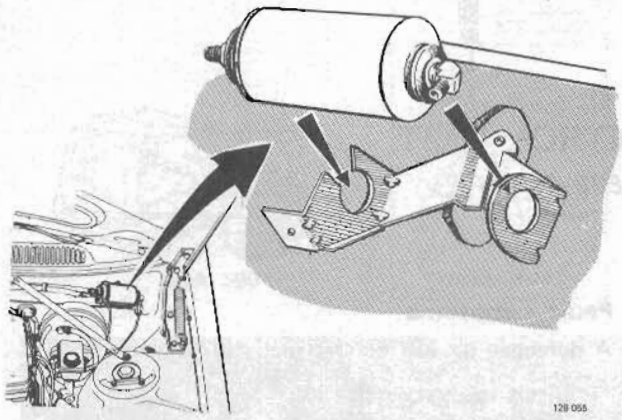


132093

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

FUEL FILTER

Operations E19–21



Fuel filter USA 1980–, other markets 1981–

E19

Fault symptoms

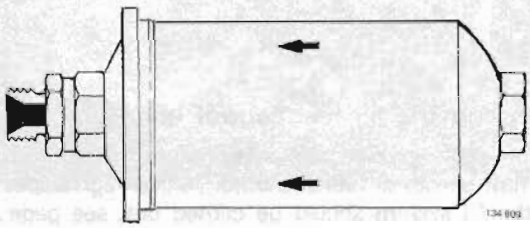
A blocked fuel filter causes the line pressure to drop (reduced fuel supply). This can cause:

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

E20

Checking the fuel filter

Measure the line pressure. Perform the following operations B1, 7, 14–16.



E21

Replacement of fuel filter:

- turn the nipples so that the tapered side faces outwards, away from the filter

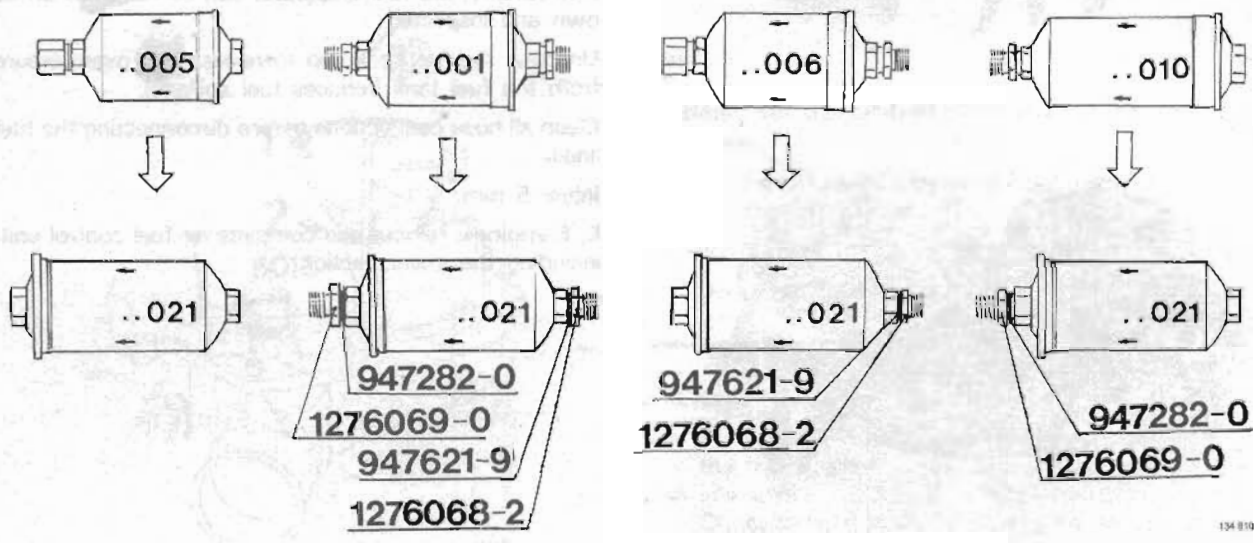
Note the **flow** indicating arrows on the filter.

USA – 1979, other markets – 1980

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

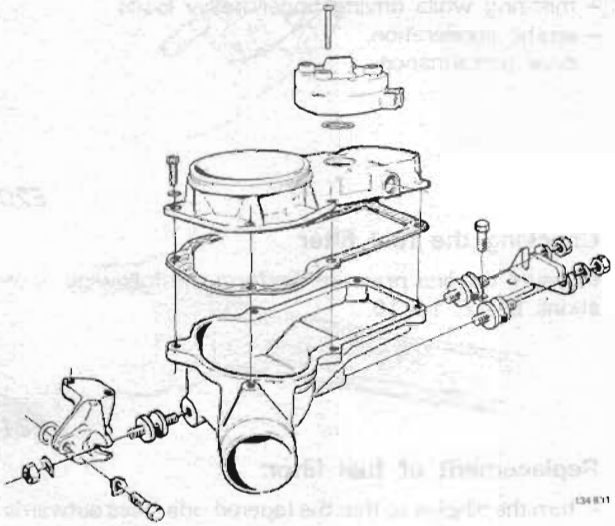
When replacing a fuel filter with the above filter, additional nipples and seals are required.

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



AIR-FUEL CONTROL UNIT

Operations E22–39



E22

Fault symptoms

A defective air-fuel control unit can cause:

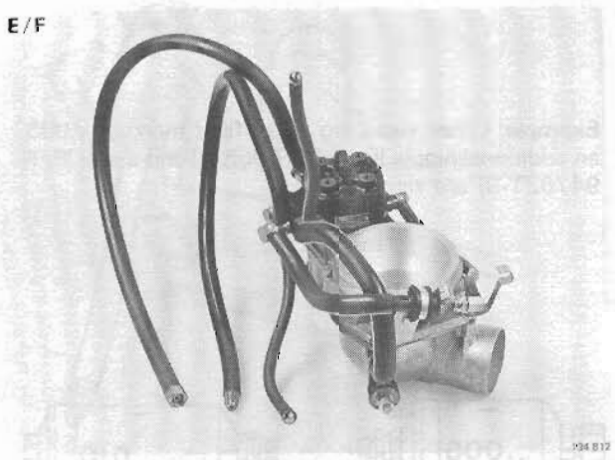
- difficult to start engine
- engine does not start
- erratic operation
- erratic acceleration
- excessive fuel consumption
- variable CO content
- dieselling (running-on).

E23

Checking the air-fuel control unit

Before replacing/reconditioning the air-fuel control unit (air flow sensor or fuel distributor), a thorough inspection of the CI system should be carried out, see page 22.

E/F



E24

Removing the air-fuel control unit

If necessary, the fuel distributor can be removed on its own and inspected.

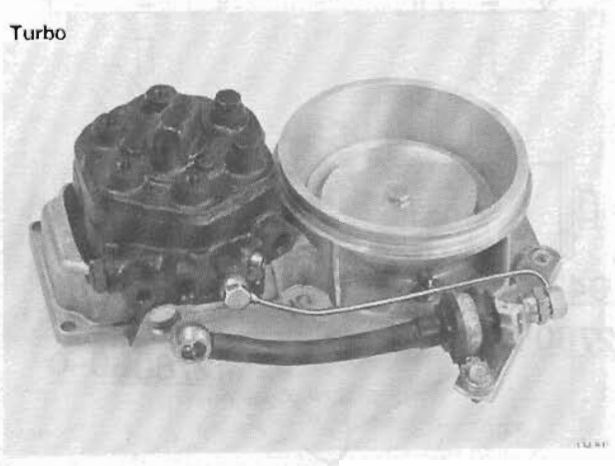
Unscrew the fuel tank cap to release any overpressure from the fuel tank (reduces fuel spillage).

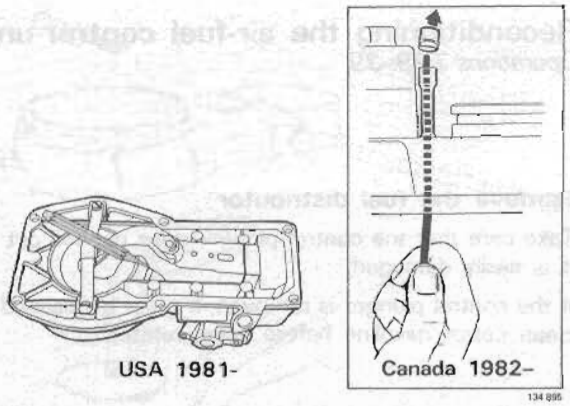
Clean all hose connections before disconnecting the fuel lines.

Inhex 5 mm.

E/F engines: remove the complete air-fuel control unit, including the lower section.

Turbo





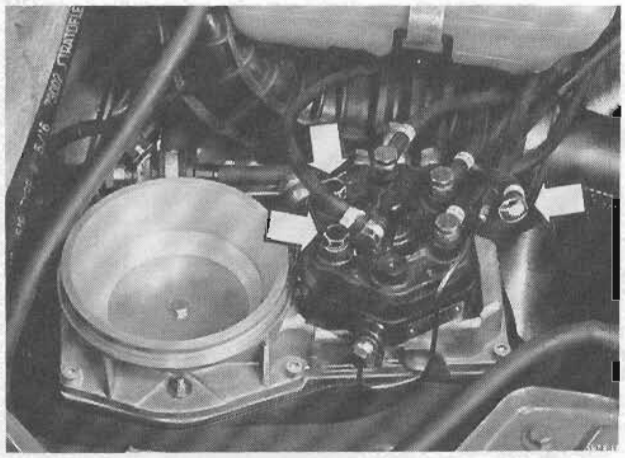
Fitting the air-fuel control unit

Operations E25–28

Special tools: 5015, 5170 (1978–)

USA 1981– and Canada 1982–

Remove the steel ball or plug from the air-fuel control unit before installation.



E25

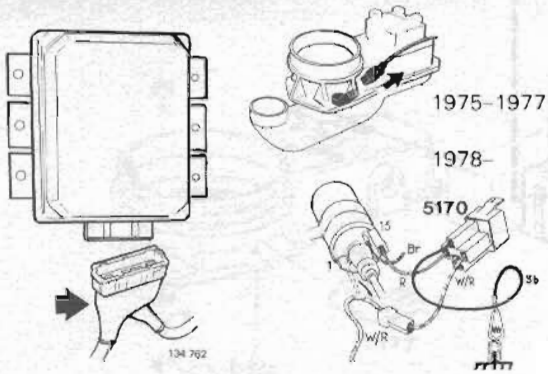
Install the air-fuel control unit

Use new seals, inhex 5 mm.

After fitting the unit, check that the air flow sensor plate moves freely.

Reconnect all fuel lines with the exception of one injector line. Use new seals.

Caution! The fuel distributor fitted to turbo engined vehicles is the same as the one used for 6 cylinder engines but two of the outlet ports are plugged. Under no circumstances should the fuel lines be connected to these ports.



E26

Start the fuel pump

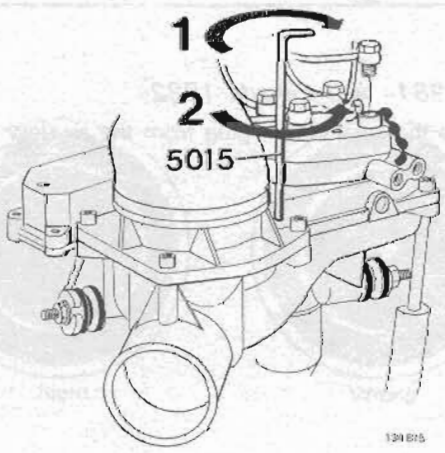
Disconnect the ignition system control unit.

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

1978–: connect test relay **5170**.

Turn on the ignition.





E27

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

Turn the CO screw clockwise (right) until fuel is supplied from the open outlet.

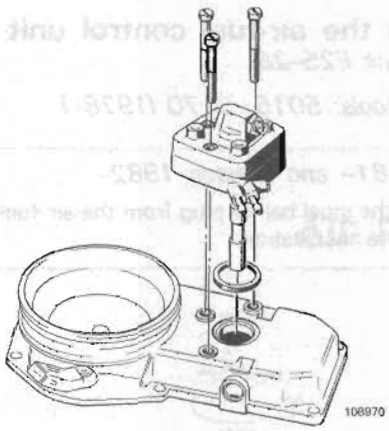
Then tighten the screw by 1/2 a turn. Use **5015**.

Turn off the ignition and reconnect the fuel line.

E28

Check / adjust:

- all pressures
- the rest position of the sensor plate
- idle speed
- CO content.



108970

Reconditioning the air-fuel control unit

Operations E29–39

E29

Remove the fuel distributor

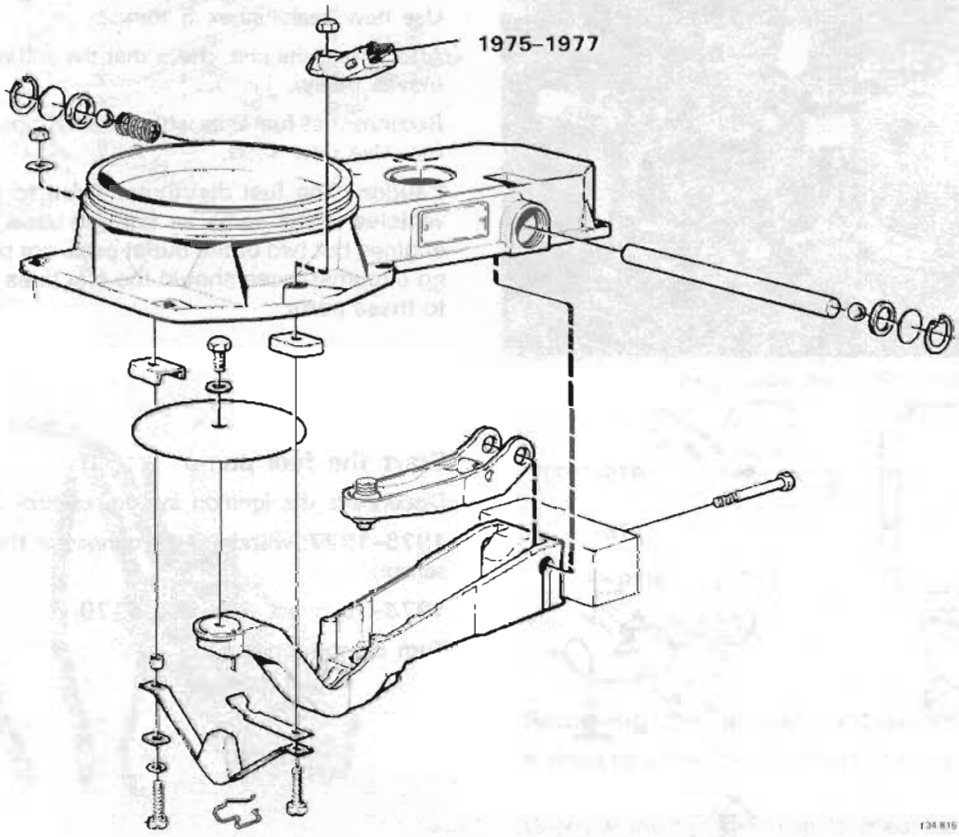
Take care that the control plunger does not fall out as it is easily damaged.

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

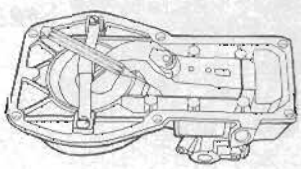
E30

Disassemble the air-flow sensor

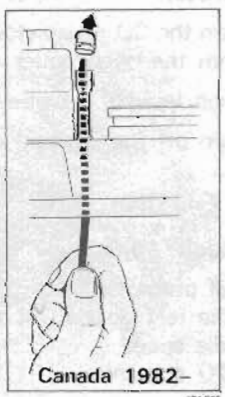
Clean and inspect all parts. Replace if and as necessary.



134 815



USA 1981–

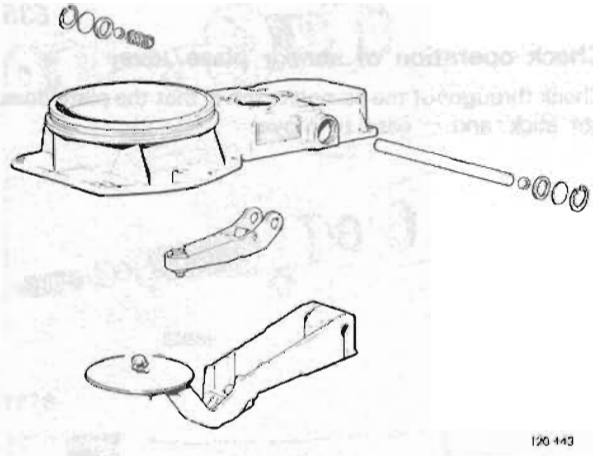


Canada 1982–

134 895

USA 1981– and Canada 1982–

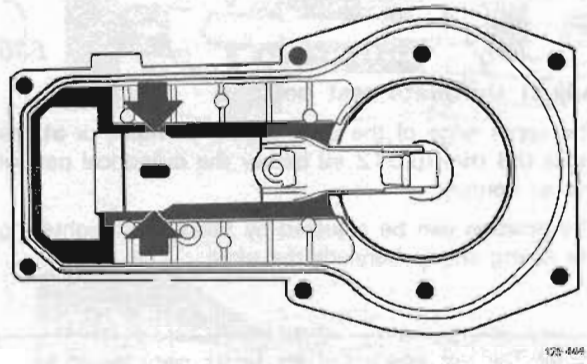
Remove the steel ball or plug from the air flow sensor.



E31

Reinstall the lever + plate and adjustment arm

Grease the bearing seats, shaft, balls and spring.

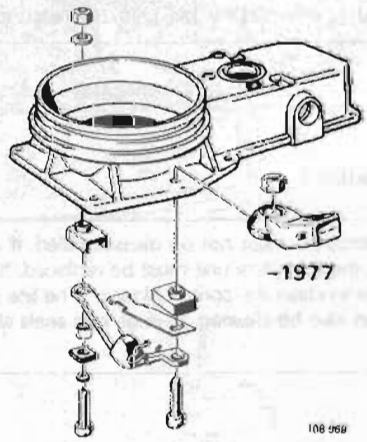


E32

Reinstall the counterbalance

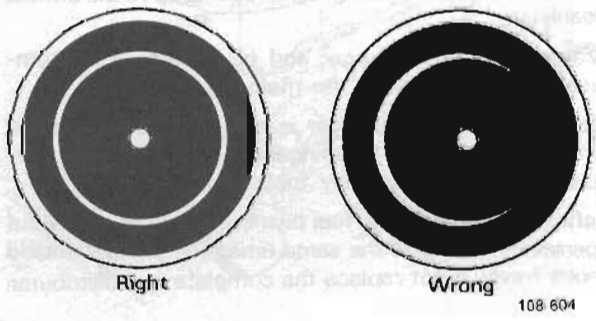
Centre the lever before tightening the retaining screws for the counterbalance.

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



E33

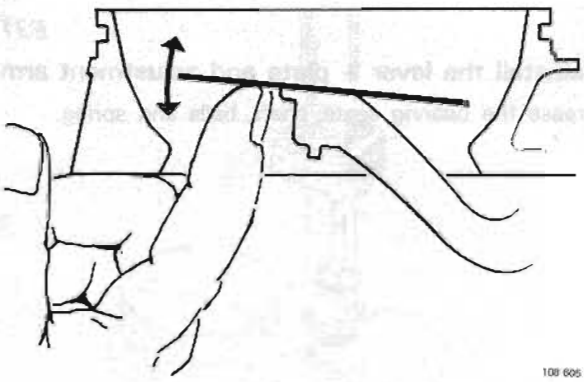
Install the stopper for the plate



E34

Centre the plate

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

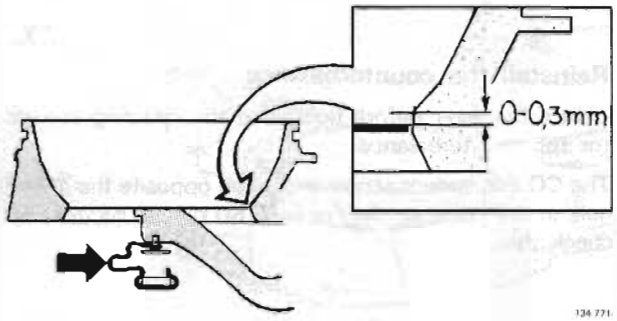


108 605

E35

Check operation of sensor plate/lever

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



134 771

E36

Adjust the plate rest position

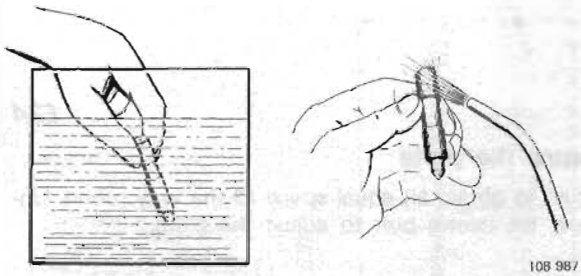
The upper edge of the plate should be **flush, or at the most 0.3 mm (0.012 in) below** the cylindrical part of the air venturi.

The position can be adjusted by bending/straightening the spring clamp beneath the plate.

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

Fuel distributor

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



108 987

E37

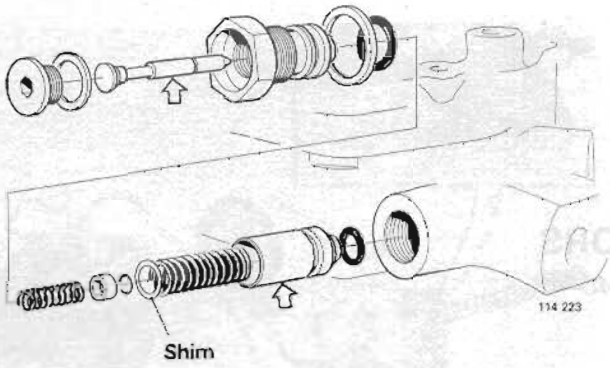
Clean and check the control plunger

Always use clean petrol/gasoline and observe the utmost cleanliness.

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

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

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



E38

Clean and inspect the line pressure regulator

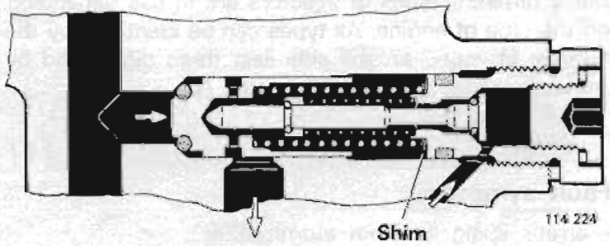
Use clean petrol/gasoline and observe the utmost cleanliness.

Disassemble and clean the regulator.

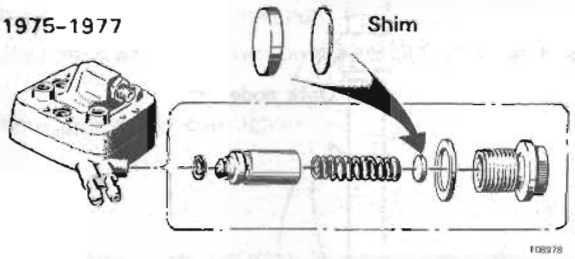
Replace worn and damaged parts. **Caution!** The piston must not be replaced separately. If the piston is defective, the complete fuel distributor should be replaced.

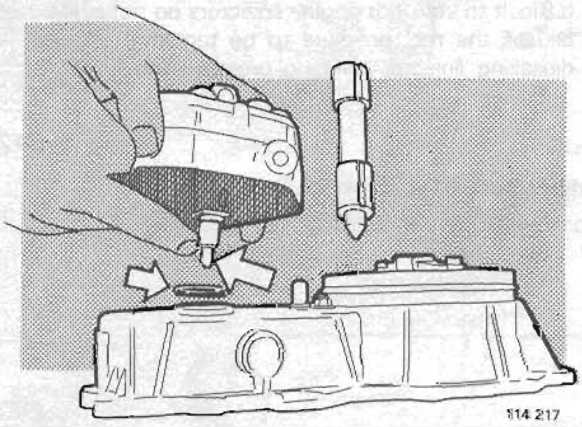
Reassemble and fit the regulator, using new O-rings and seals.

1978–



1975–1977





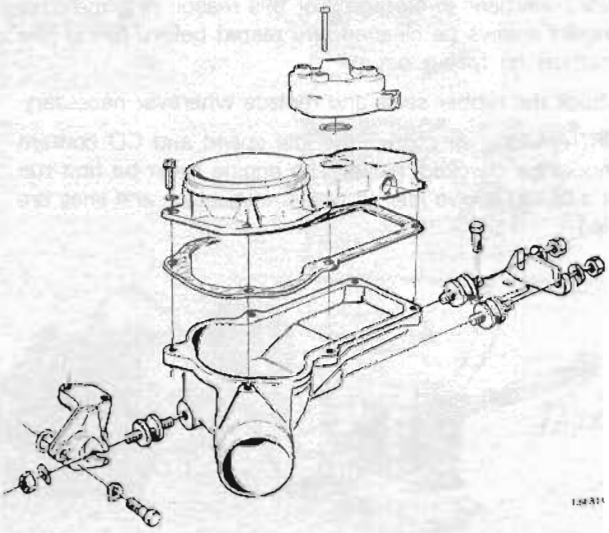
E39

Fit the fuel distributor to the air flow sensor

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

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

Torque the screws evenly. Tightening torque 3.6 Nm (2.5 ft lb).



E/F engines

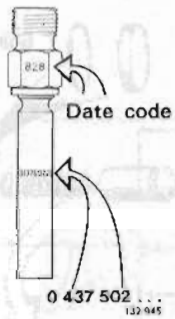
Assemble the upper and lower parts of the air fuel control unit. Use a new seal. Inhex 5 mm.

Check that the lever moves freely after tightening.

INJECTORS

Operations E40–49

E40



General

Many different types of injectors are in use depending on the type of engine. All types can be identified by the number stamped on the side (last three digits) and by the date code. See table on page 76.

E41

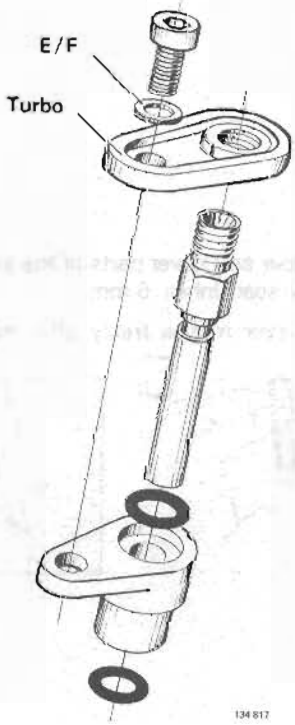
Fault symptoms:

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

E42

Inspection of injectors

Carry out operations B1, 7, 27–39.



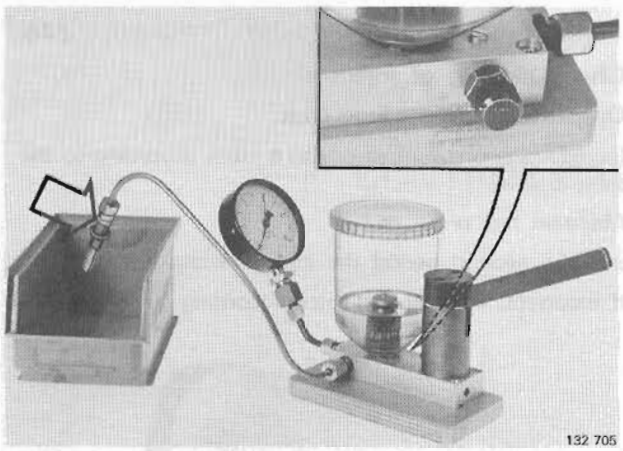
E43

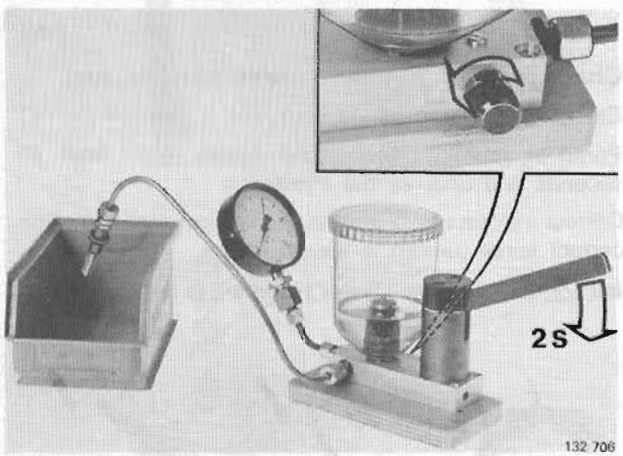
Replacing injectors

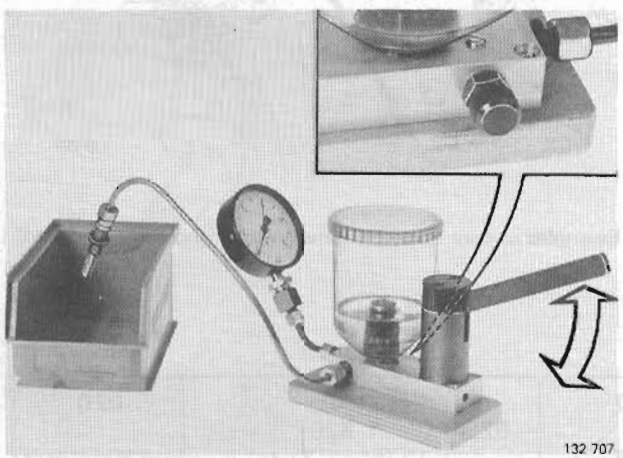
New injectors are filled with a rustproofing compound which hardens in storage. For this reason new injectors should always be cleaned and tested before fitting (see method on facing page).

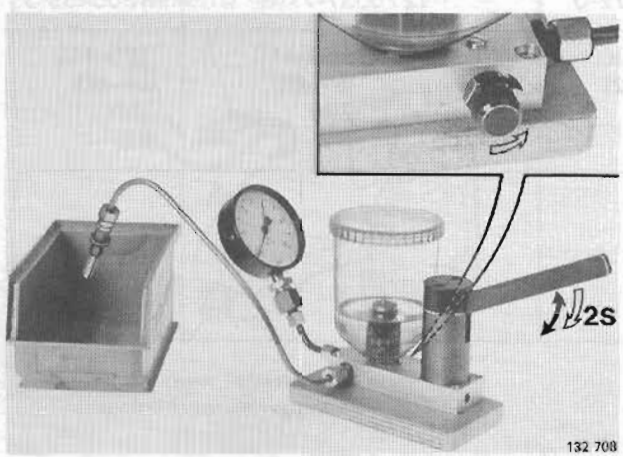
Check the rubber seals and replace wherever necessary.

On replacing injector(s), the idle speed and CO content should be checked. **Note!** The engine must be first run at a speed above idle so that the injectors and lines are bled.









Cleaning and testing injectors

Operations E44–49

Special tool: 9934

Use liquids intended for cleaning purposes such as Shell K30, Esso-Versol, Shell Mineral spirits 135 or similar products.

Warning! Never exceed a pressure of **600 kPa** (87 psi) during the test.

E44

Connect the injector to tester 9934

Do not tighten the connection.

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

Then tighten the connection.

E45

Ensure that the injector is free from dirt

Open the pressure gauge cock.

Pump slowly, about 2 seconds per sweep. Check that the pressure rises to at least **100–150 kPa** (15–22 psi).

If not, the injector is blocked and must be cleaned.

E46

Clean the injector (whenever necessary)

Pump strongly 15–20 times. Then repeat E45.

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

E47

Check the opening pressure

Close the pressure gauge cock.

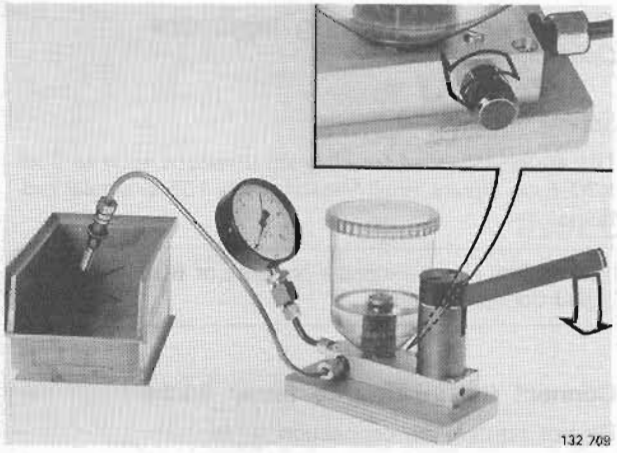
Quickly pump a few times to remove all air from the injector.

Open the pressure gauge cock.

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

See chart overleaf for opening pressures.

If incorrect, replace the injector.



E48

Check sealing of injector

Open the pressure gauge cock.

Increase the pressure slowly to a value according to the table below.

Maintain this pressure.

In a 15 second period the injector must not drip.

If incorrect, clean the injector according to E46.

E49

Check injector function, spray pattern, etc.

Close the pressure gauge cock.

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

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

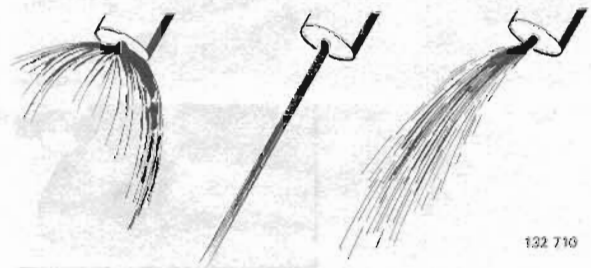
If incorrect, clean the injector according to E46 and retest.



Correct spray pattern



Acceptable spray pattern



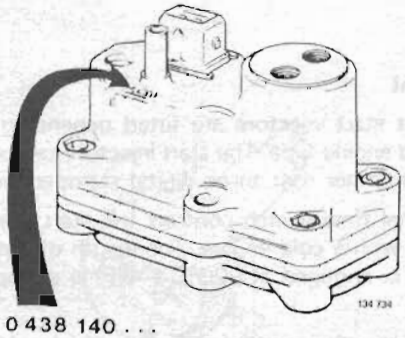
Examples of poor spray patterns (injector should be renewed)

Injectors	Bosch no. Date code Volvo no.	...007 463972-0	...015 -828 829- 1276037-7		...020 1306499-3
Opening pressure	kPa (psi)	300–360 (43–52)	320–380 (46–55)	350–410 (51–60)	350–410 (51–60)
No leakage permitted below	kPa (psi)	240 (35)	260 (38)	290 (42)	290 (42)
Engine type: B 19 E, B 21 E, B 21 F-5 –1978 1979– B 21 F-9, B 21 F-Turbo, B 23 E B 19/21 E-Turbo		X		X X	X

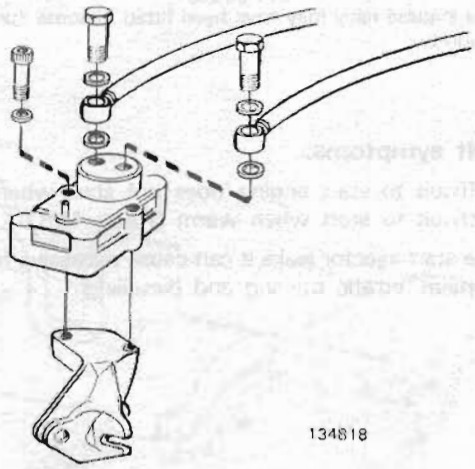
* Replaced as spare part by P/N 1276037-7 (...015)

CONTROL PRESSURE REGULATOR

Operations E50-53

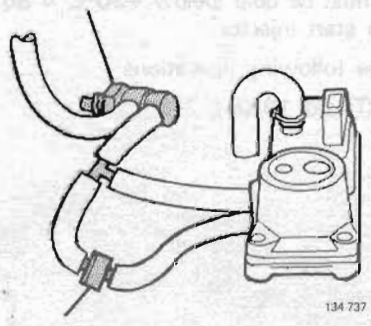


0 438 140 . . .



134818

Thermostat valve



Delay valve. Coloured side away from control pressure regulator.

E50

General

The type of control pressure regulator fitted varies with engine type, and can be identified by the number stamped (last three digits) on the top.

E51

Fault symptoms

A defective control pressure regulator causes an incorrect pressure.

The following symptoms can arise:
- incorrect fuel-air mixture
- difficult to start engine
- erratic running, possibly stalling
- excessive fuel consumption (low control pressure)
- poor engine performance/low top speed
- hesitates when accelerating, backfires
- erratic running on acceleration
- misfiring while driving under heavy load.

E52

Checking the control pressure regulator

Measure the control pressure. The engine must be cold (below +30°C = 86°F).

Perform the following operations:

B1–2, 7, 14–15, 17–18, 19 (E-Turbo), 21 (F-engines 1981– excl. Japan).

E53

Replacing the control pressure regulator

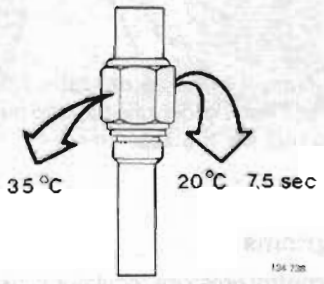
Inhex 5 mm.

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

The illustration shows a control pressure regulator incorporating acceleration fuel enrichment, cold engine (F-engines 1981–, excl. Japan) **Caution!** Hoses on turbo engines must be clamped at all connections.

START INJECTOR, THERMAL TIME SWITCH, IMPULSE RELAY

Operations E54–56



E54

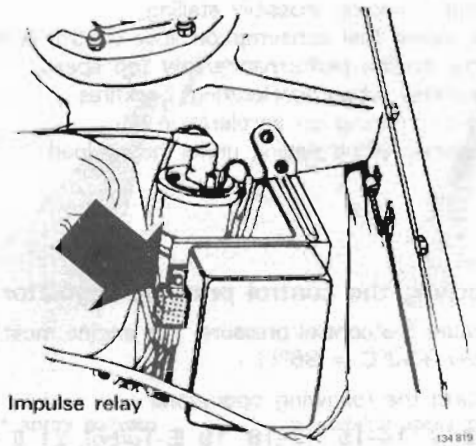
General

Different start injectors are fitted depending on model year and engine type. The start injectors can be identified by the number (last three digits) stamped on the side.

A thermal time switch controls the start injector when starting with a cold engine. The length of time the start injector is engaged at –20°C (–4°F) is stamped on the collar.

An impulse relay is fitted to Turbo vehicles 1982–*, and controls the start injector during warm starts.

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

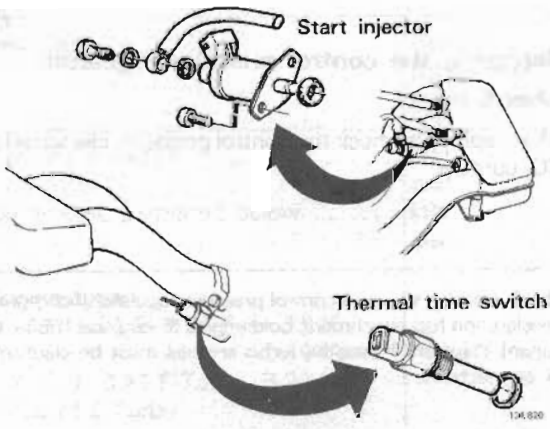


E55

Fault symptoms:

- difficult to start engine/does not start when cold
- difficult to start when warm (Turbo 1982–).

If the start injector leaks it can cause excessive fuel consumption, erratic running and dieselling.



E56

Inspection of parts

The engine must be cold (below +30°C = 86°F) when checking the start injector.

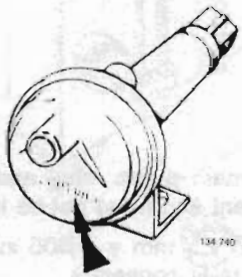
Carry out the following operations:

B1, 4–5, 6 (Turbo 1982–), 7–8.

AUXILIARY AIR VALVE

Operations E57–59

E57



0 280 140 . . .

General

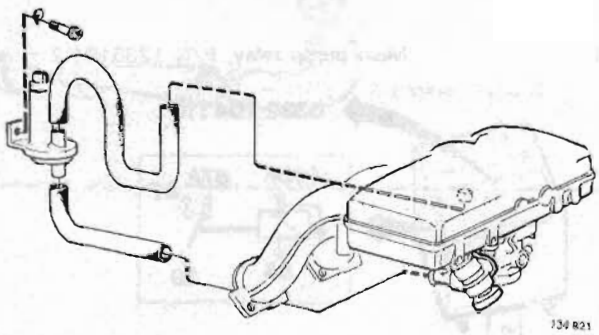
The auxiliary air valve fitted depends on model year and engine. They can be identified by the number stamped on the end of the valve.

Cars equipped with the constant idle speed system (CIS) are not fitted with an auxiliary air valve.

E58

Fault symptoms:

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



Caution! Hose clamps must be fitted to all connections on Turbo engined vehicles.

E59

Inspection of auxiliary air valve

The engine must be cold (below +30°C = 86°F) when inspecting the auxiliary air valve.

Carry out the following operations:

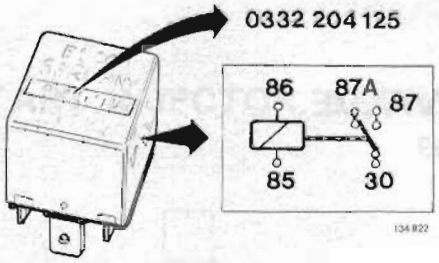
B1–2, 13, 26.

RELAYS

Operations E60-62

E60

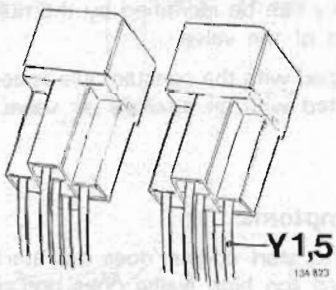
P/N 1214764-1



1975

The main pump relay and the tank pump relay are the same and are interchangeable.

Main fuel pump Tank pump



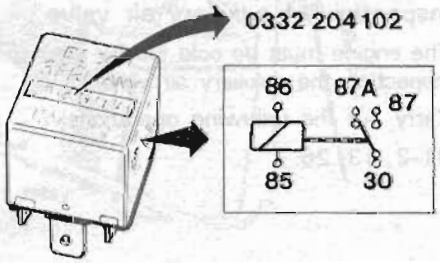
1976—1977

Caution! The main pump relay and the tank pump relay are different and **must not be interchanged.**

A yellow lead (Ø 1.5 mm = 0.006 in) is connected to the tank pump relay connector

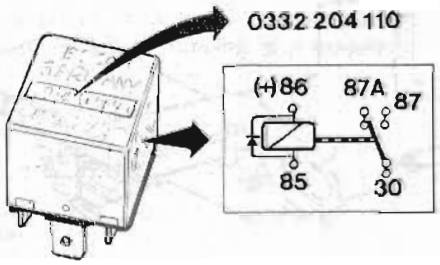
Early type
(Not stocked)

Main pump relay, P/N 1234750-6

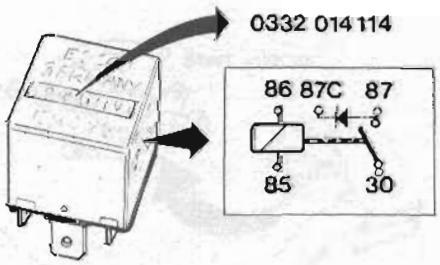


Late type

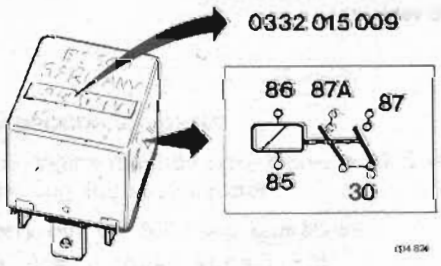
Main pump relay, P/N 1235134-2



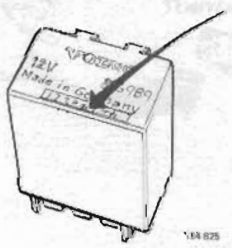
Tank pump relay, P/N 1234751-4



Tank pump relay, P/N 1235020-3



E62



1978–

One relay (transistorized).

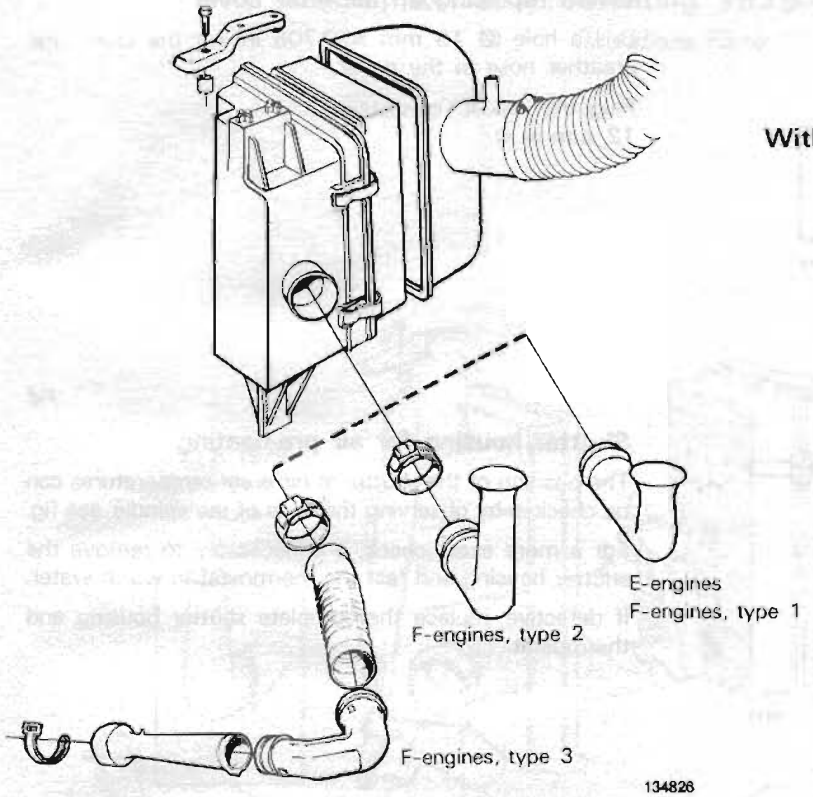
F. Miscellaneous

Air filter, air pre-heating 1975–1978

Operations F1–4

F1

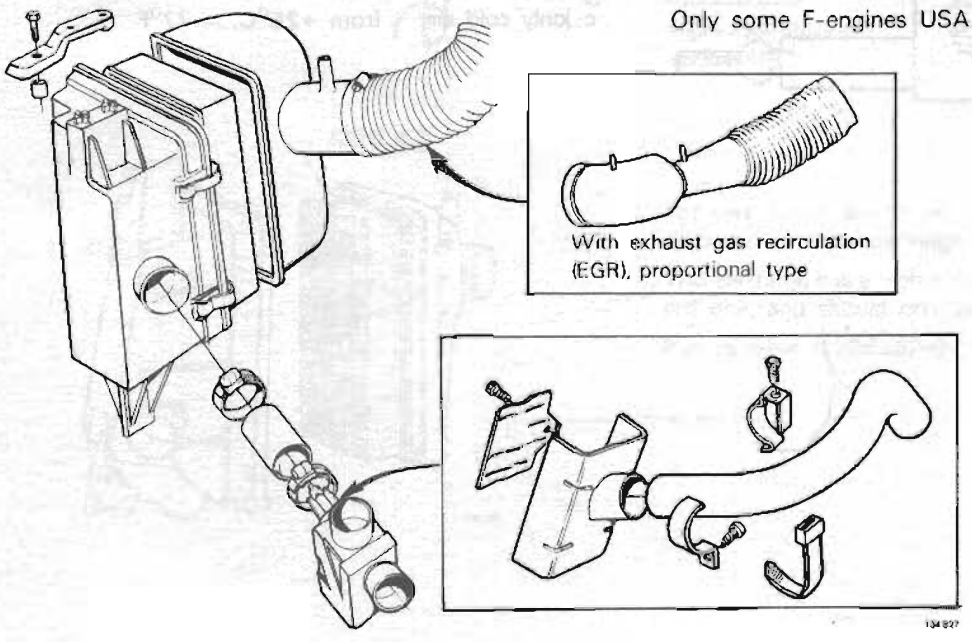
Without air pre-heating

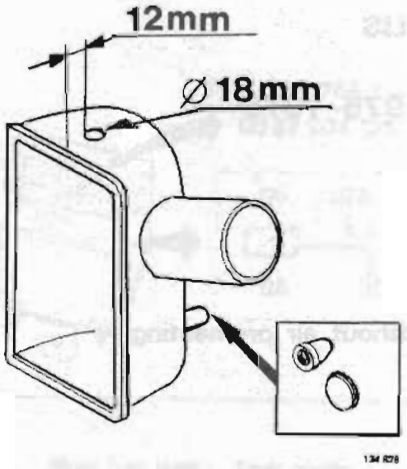


F2

With air pre-heating

Only some F-engines USA and Canada.





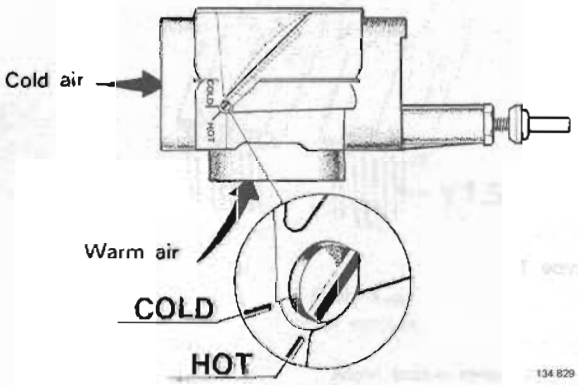
With air pre-heating
F3–4

F3

When replacing an air filter cover

Drill a hole (Ø 18 mm = 0.708 in) for the crankcase breather hose in the cover.

Plug the "usual" connection.
12 mm = 0.5 in.



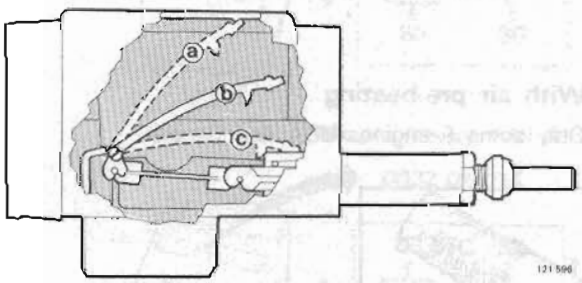
F4

Shutter housing for air pre-heating

The position of the shutter at different temperatures can be checked by observing the ends of the spindle, see fig.

For a more exact check, it is necessary to remove the shutter housing and test the thermostat in warm water.

If defective, replace the complete shutter housing and thermostat.



Shutter positions:

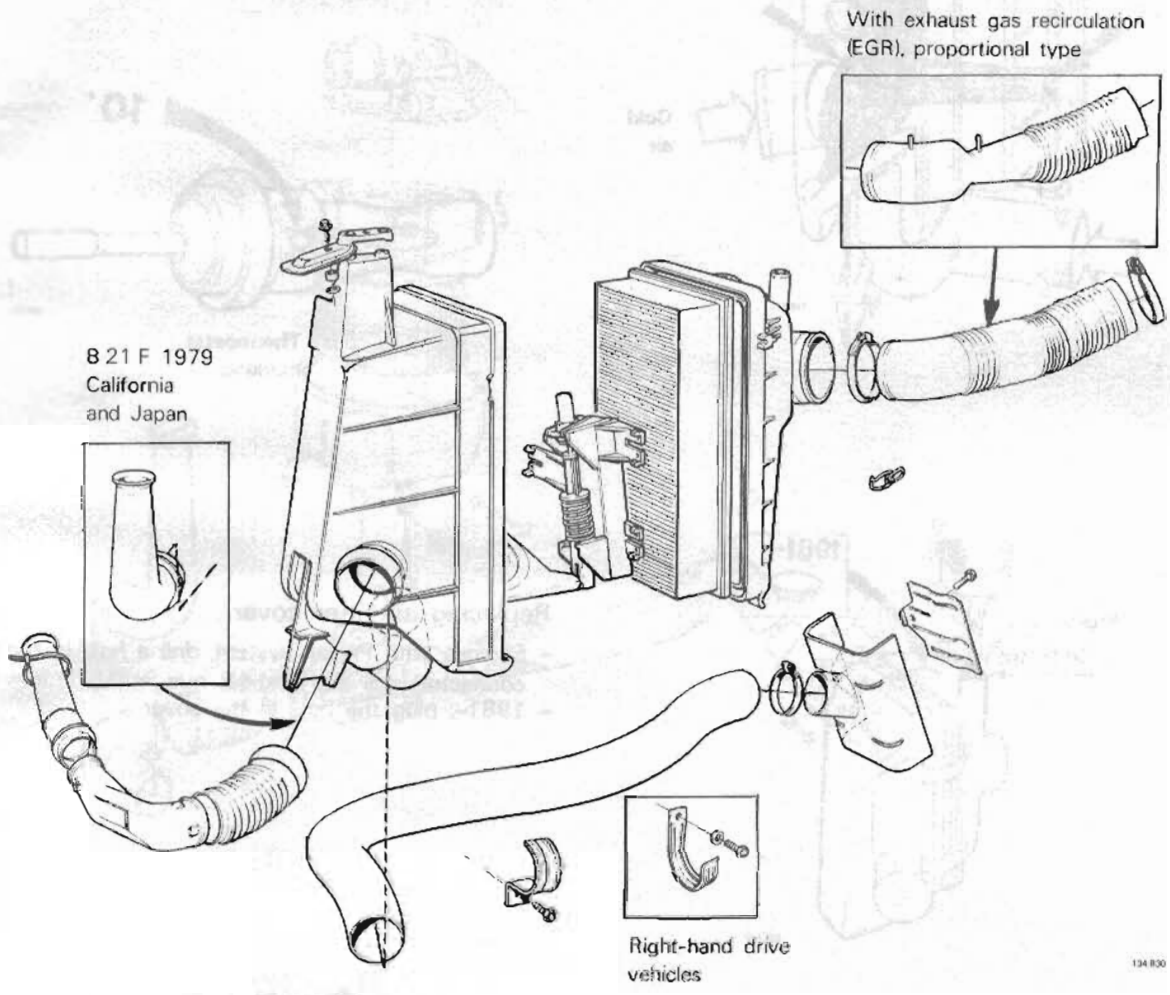
a (hot air only) = up to + **15°C** = 59°F

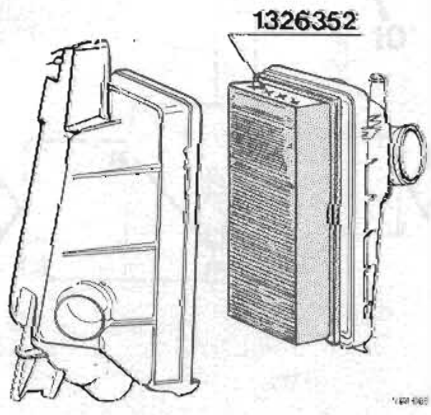
b (intermediate)

c)only cold air) – from +**25°C**. = 77°F

Air filter, air pre-heating 1979– (excl. Turbo)

Operations F5–6

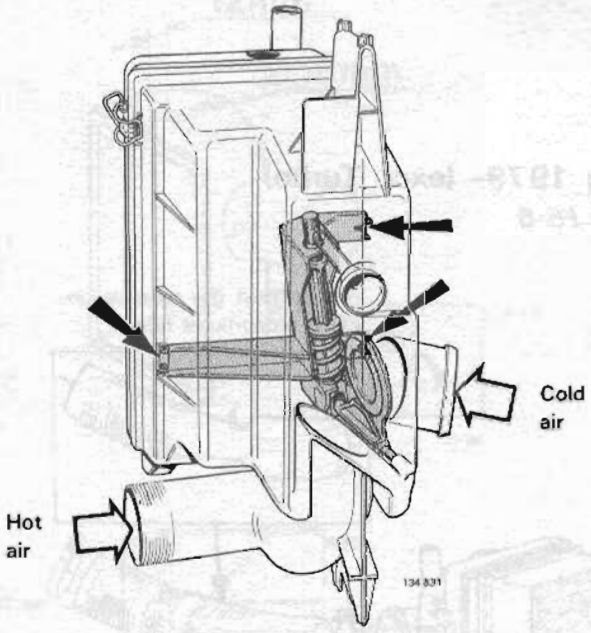




For cars which are driven in dry, dusty, polluted areas a special air filter cartridge is available.

This cartridge has a higher filtering ability than the standard one, and should only be used as specified.

Part number (1326352-0– (stamped on cartridge).



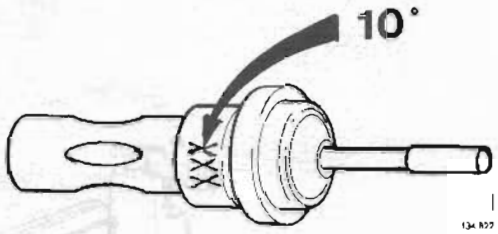
F5

Thermostat and air pre-heating mechanism

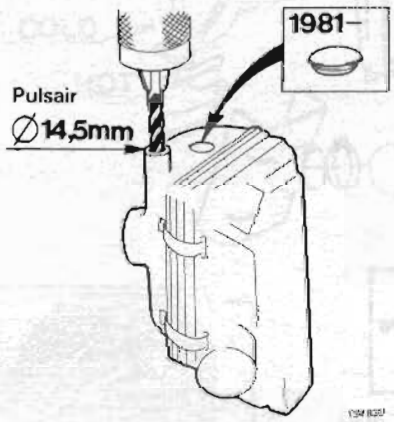
Shutter positions:

- hot air only = up to **+5°C** = 41°F
- cold air only = from **+15°C** = 59°F.

The shutter mechanism and thermostat are held in position by plastic clips, see fig.



Thermostat
marking



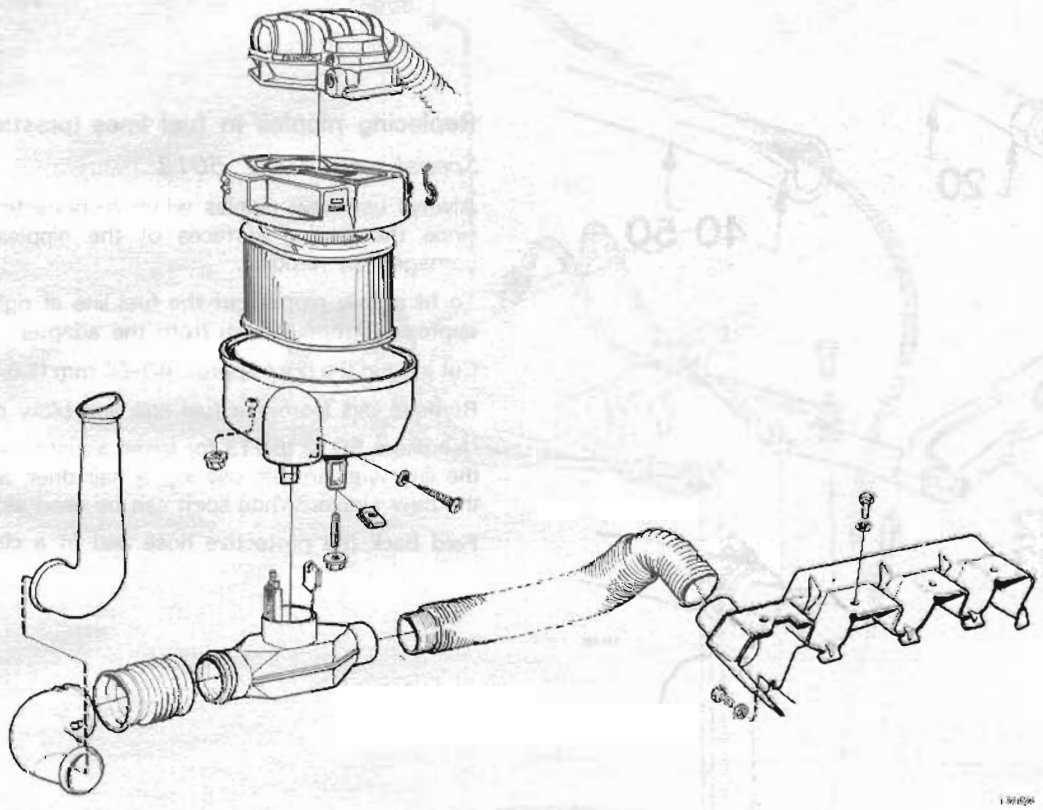
F6

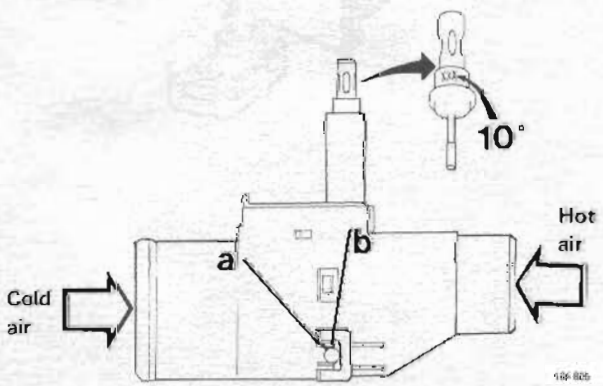
Replacing air filter cover

- Engines with Pulsair system: drill a hole in the hose connector, drill size Ø 14.5 mm = 0.571 in.
- 1981–: plug the hole in the cover.

Air filter, air pre-heating Turbo 1981-

Operation F7





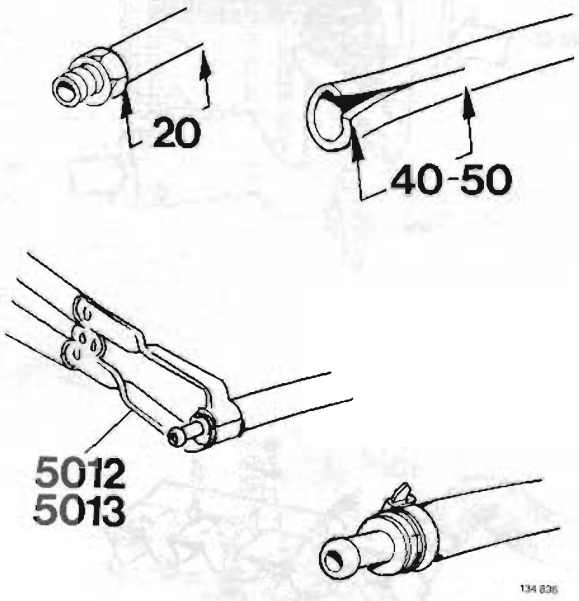
F7

Shutter positions:

a hot air only = up to +5°C = 41°F
b cold air only = from +15°C = 59°F.

FUEL LINES

Operations F8–13



F8

Replacing nipples in fuel lines (plastic hoses)

Special tools: 5012, 5013

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

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

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

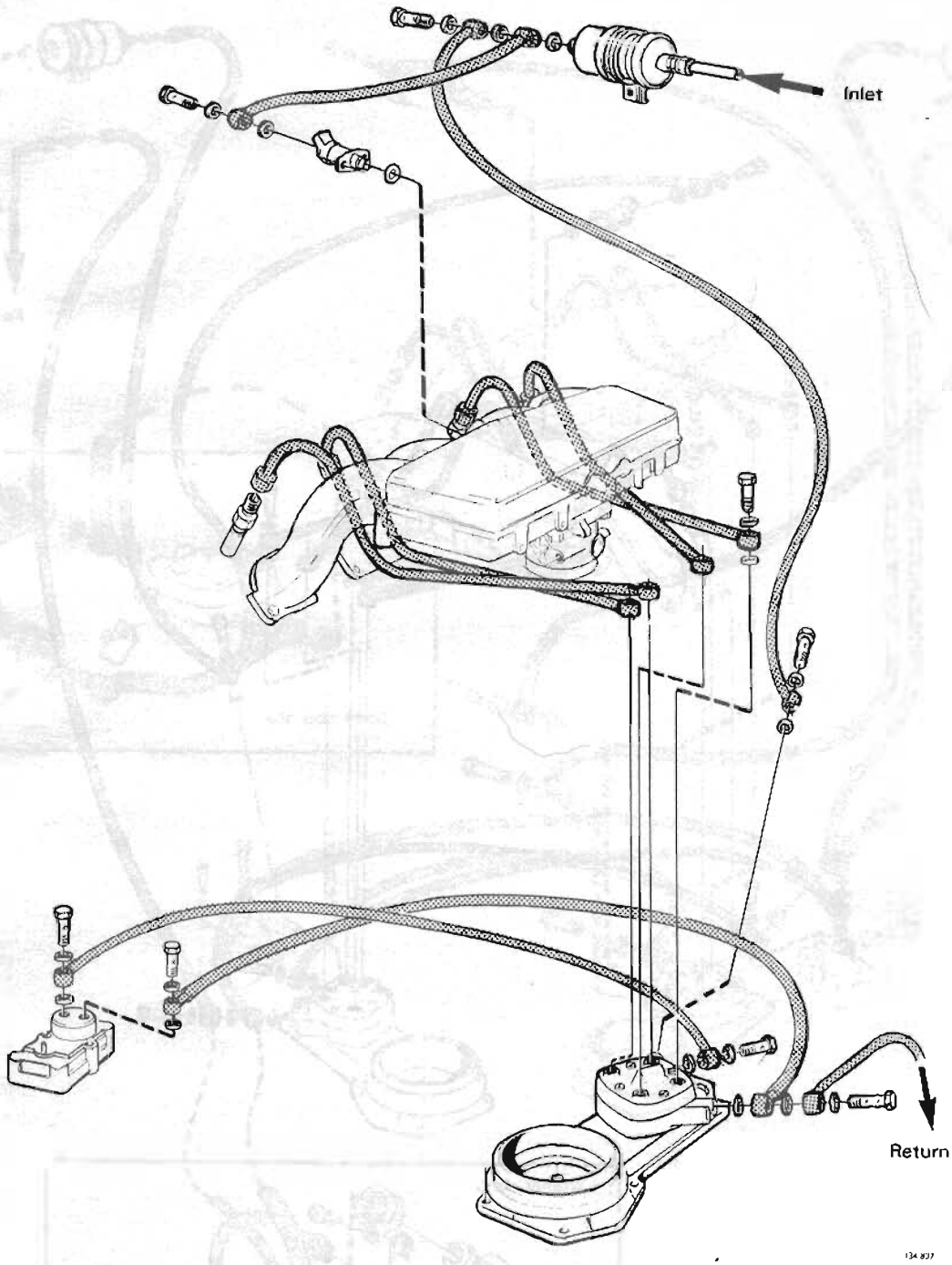
Remove dirt from the fuel line and blow clean.

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

Fold back the protective hose and fit a clamp.

E-engines 1975

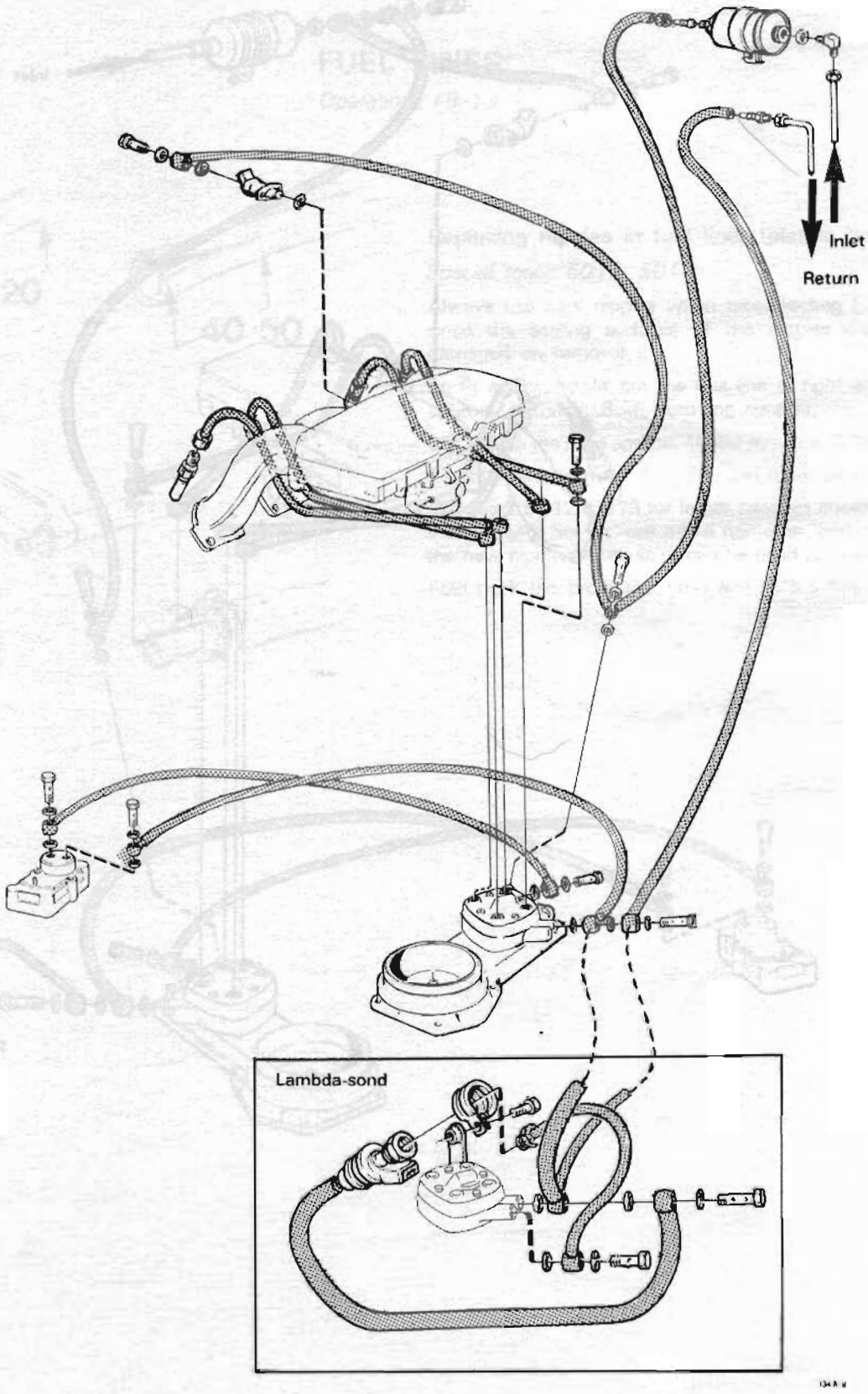
F9



E/F engines 1976–1977

F10

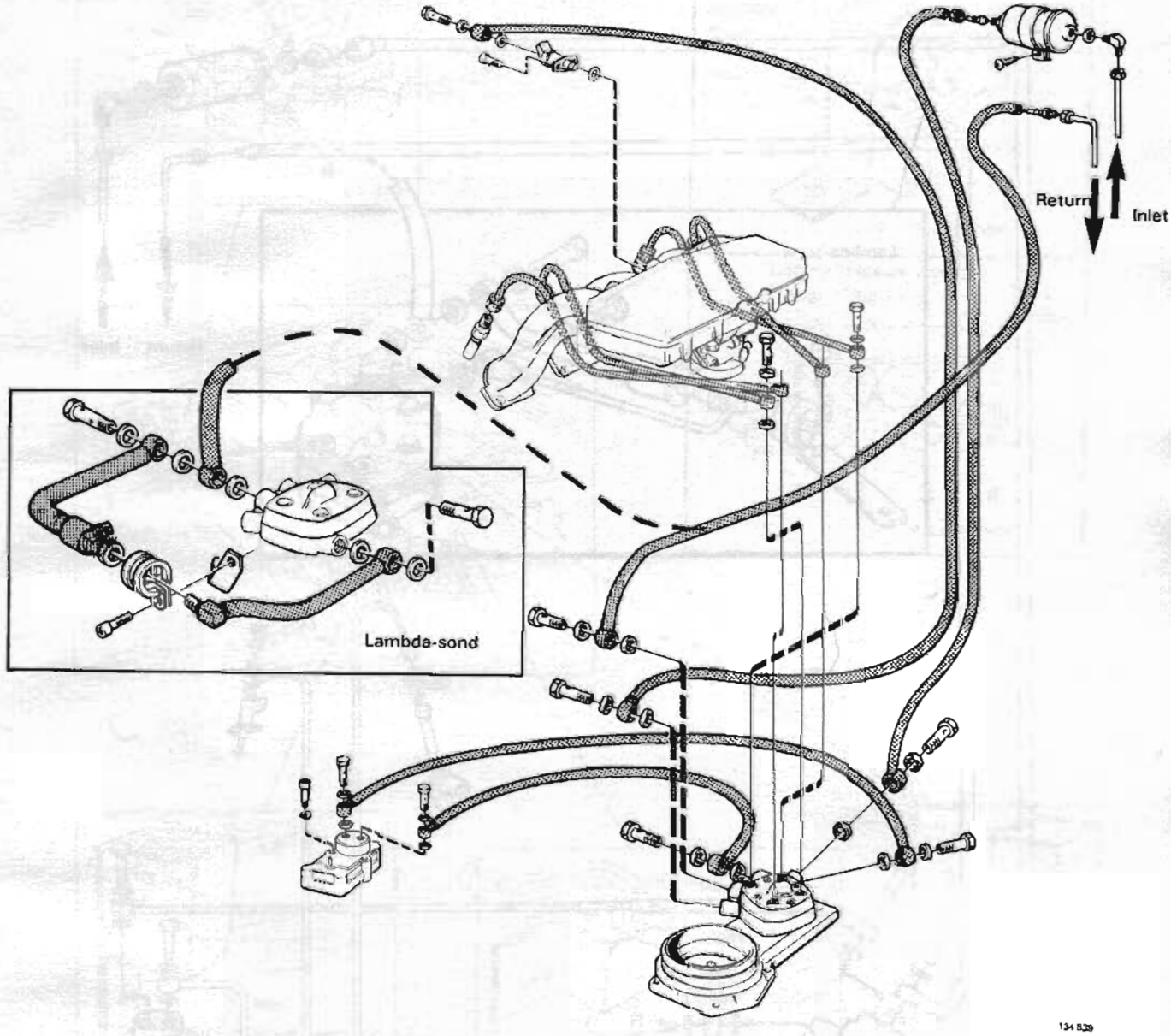
Also B 21 E Sweden + Australia 1978 and early manufactured 1979 models.



E/F engines 1978–

F11

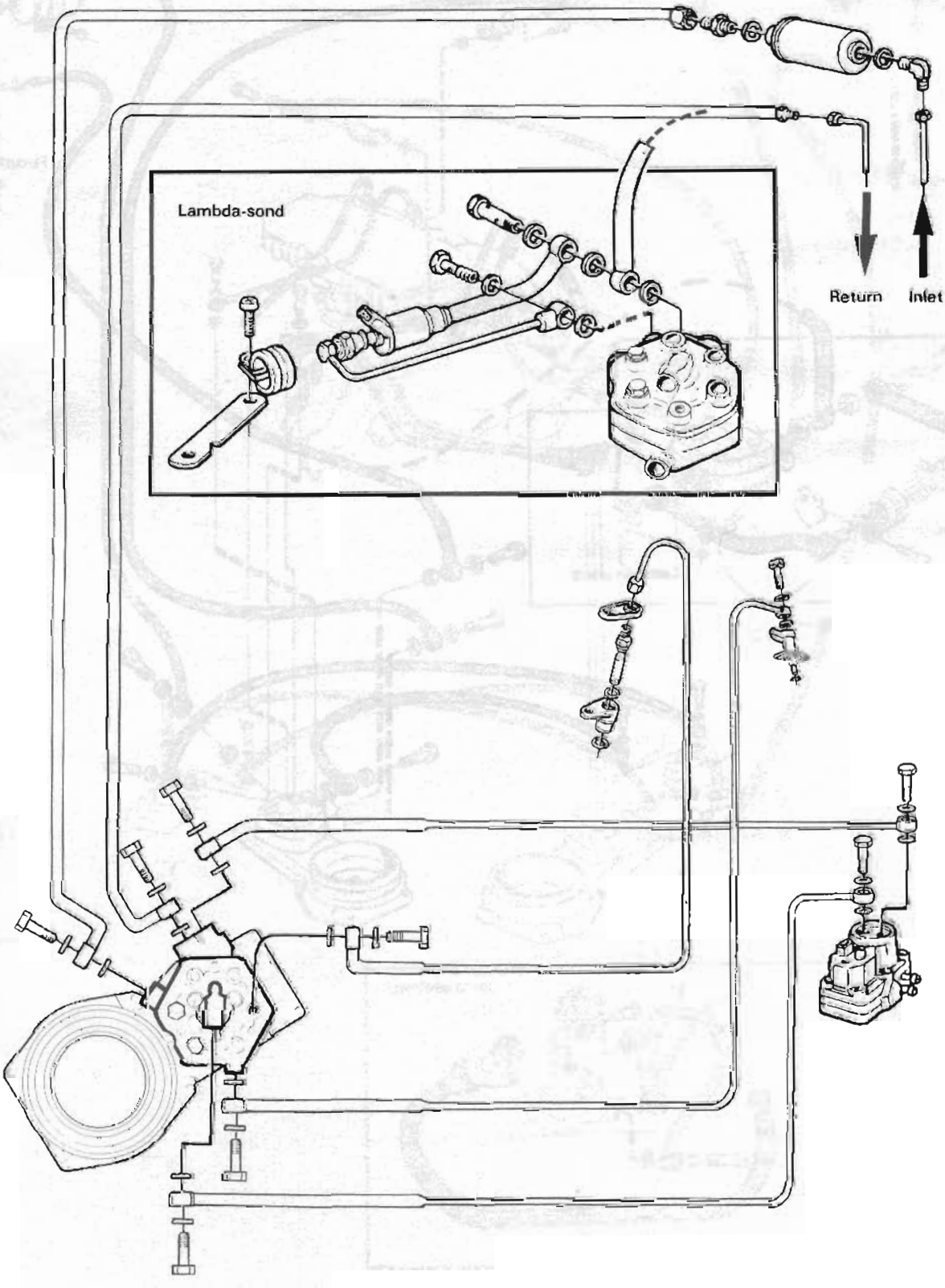
Note! B 21 E Sweden + Australia late manufactured 1979– models.



E/T-Turbo 1981-

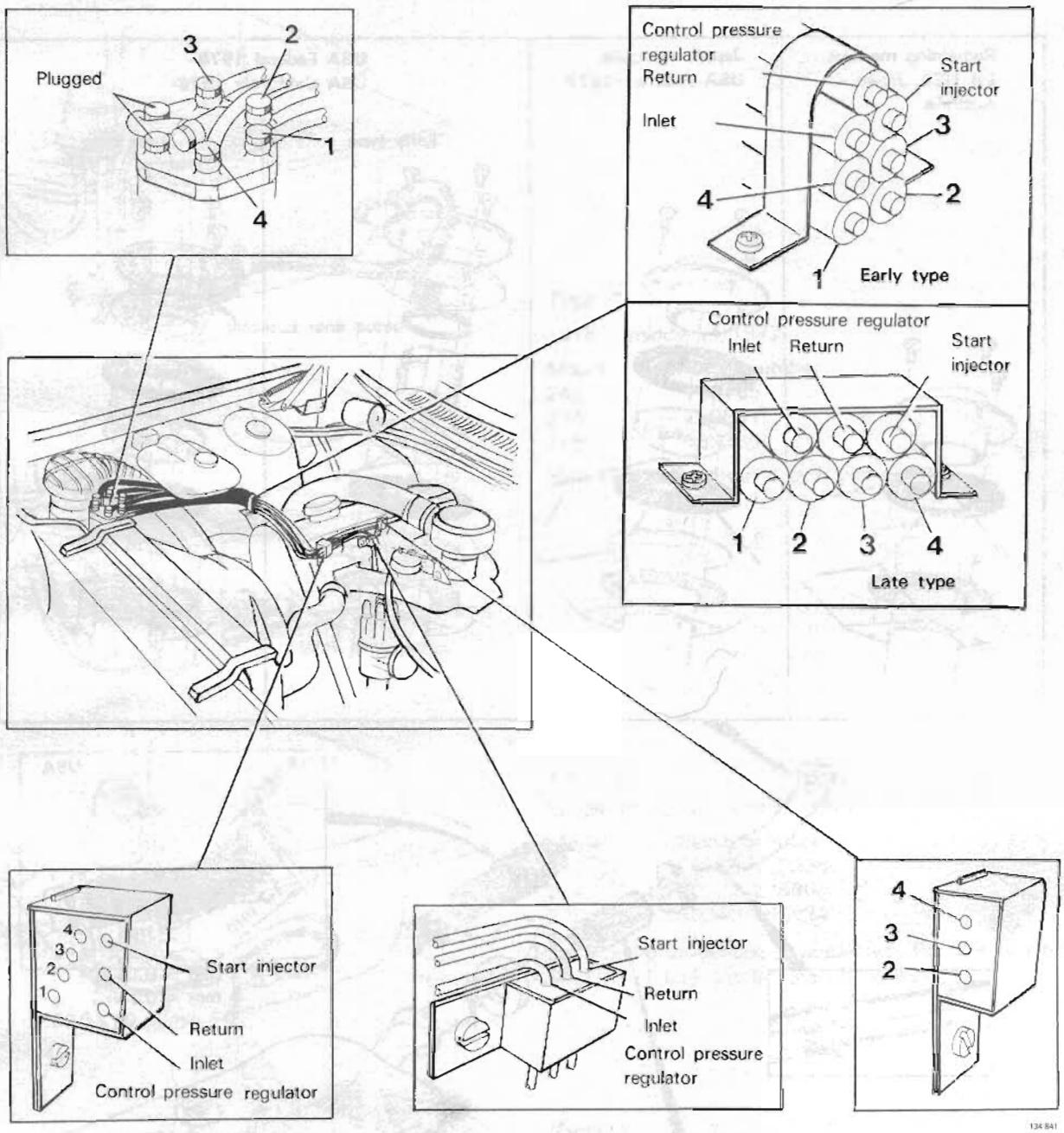
F12

For clamping of fuel lines see next page.



E/F-Turbo 1981–

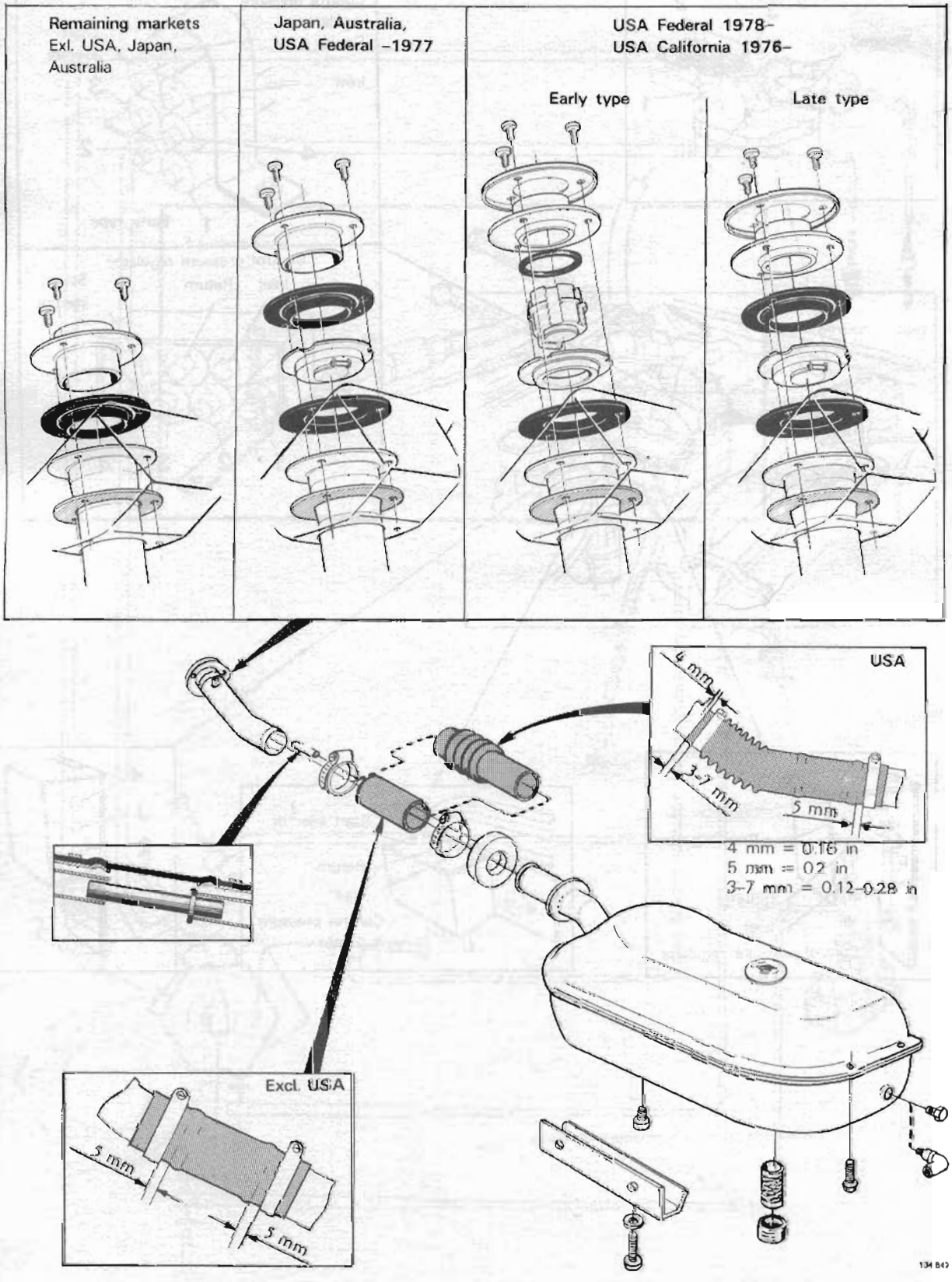
F13



FUEL TANK 1975– MIDDLE OF 1978

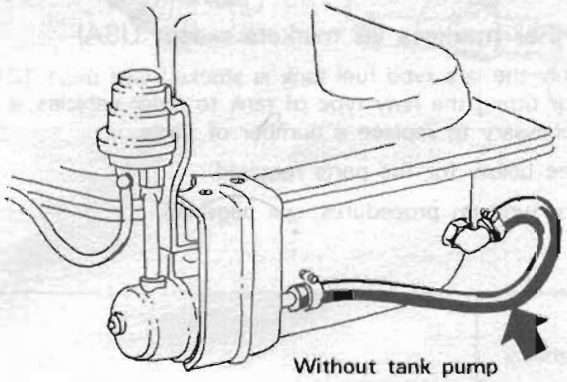
Operations F14–37

Model	Chassis number
242	– 130642
244	– 315493
245	– 181314



Fuel tank types

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



Without tank pump

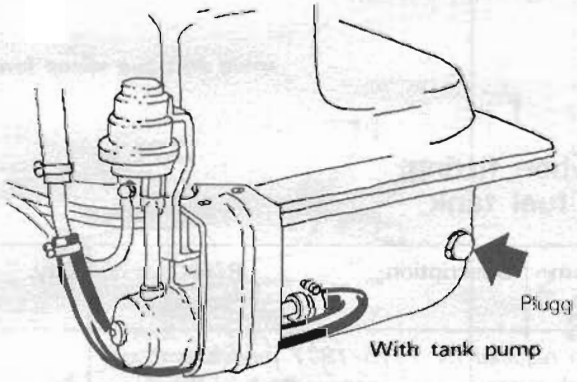
F14

Type 1

1975 – middle of 1977.

Model	Chassis number
242	– 106765
244	– 200331
245	– 130339

Manufactured without a tank pump.



With tank pump

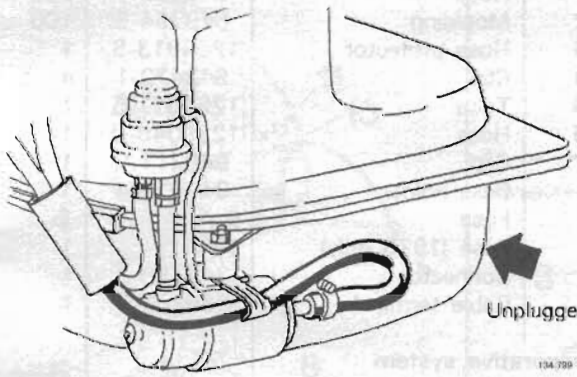
F15

Type 2

Middle of 1977 – end of 1977.

Model	Chassis number
242	106766–122894
244	200332–274964
245	130340–163834

Tank pump introduced in production. Possible to alter. Position of tank sender unit and splash can.



134 739

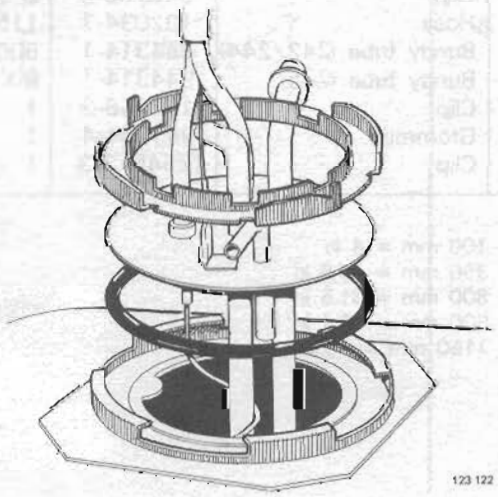
F16

Type 3

Beginning of 1978 – middle of 1978.

Model	Chassis number
242	122895–130642
244	274965–315493
245	163835–181314

Modified attachment of tank sender unit.



123 122

Replacement of fuel tank

Operations F17–37

F17

USA

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

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

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

For working procedures, see page 96.

F18

Other markets (all markets except USA)

Only the late type fuel tank is stocked (see page 101). For fitting the new type of tank to older vehicles, it is necessary to replace a number of parts.

See below for the parts required.

For working procedures, see page 96.

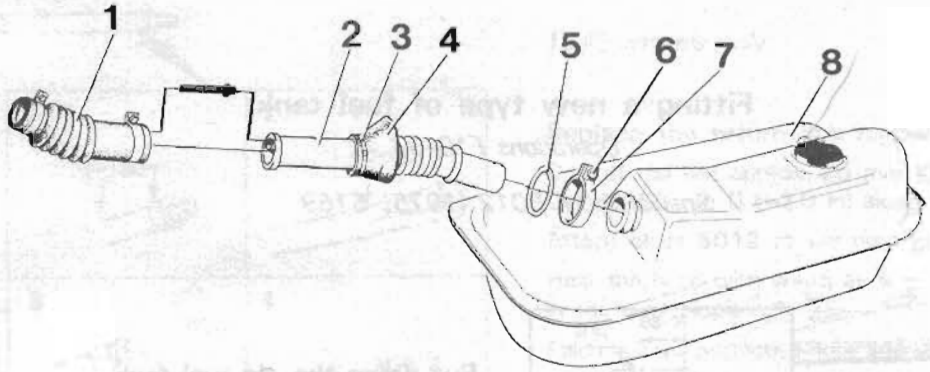
Parts required when fitting a new type of fuel tank

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

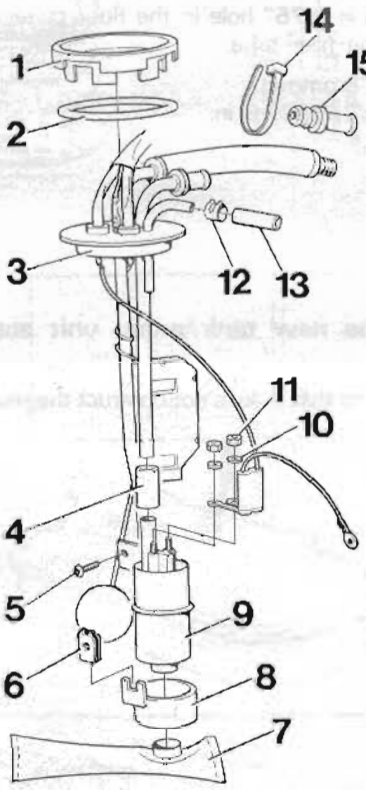
Item No.	Description	P/N	Qty.
Also required for 1975-1977 models without tank pump			
1	Hose	943707-0	350 mm
2	Moulding	679754-5	100 mm
3	Hose protector	1254913-5	1
4	Clip	943472-1	4
5	Tube	1254611-5	1
6	Hose	1229049-0	1
7	Clip	948211-8	1
–	Fuse holder	949611-4	1
–	Fuse	5 A	1
–	Fuse (1976 only)	16 A	1
–	Connector	247780-3	1
–	Cable terminal	958203-2	1
Evaporative system			
1	Clip	946709-3	2
2	Hose	192034-7	1150 mm
3	Bundy tube (242/244)	944314-1	800 mm
3	Bundy tube (245)	944314-1	900 mm
4	Clip	192248-3	1
5	Grommet	941264-4	1
6	Clip	1254513-3	1

100 mm = 4 in
350 mm = 13.8 in
800 mm = 31.5 in
900 mm = 35.4 in
1150 mm = 45.3 in

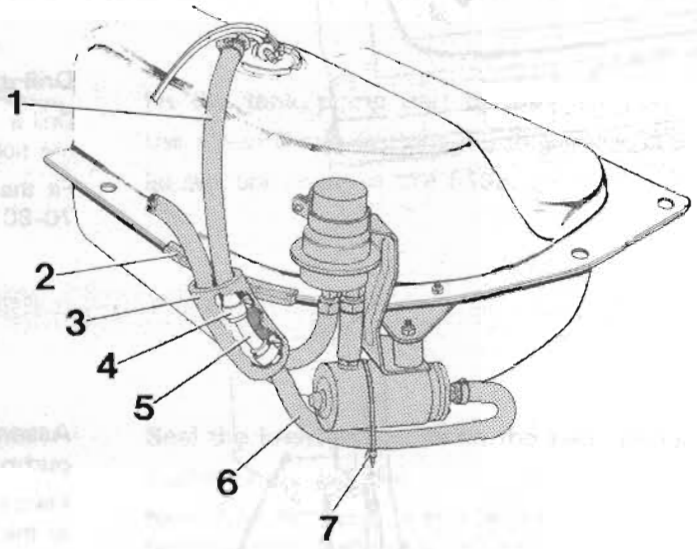
Fuel tank incl. filler tube



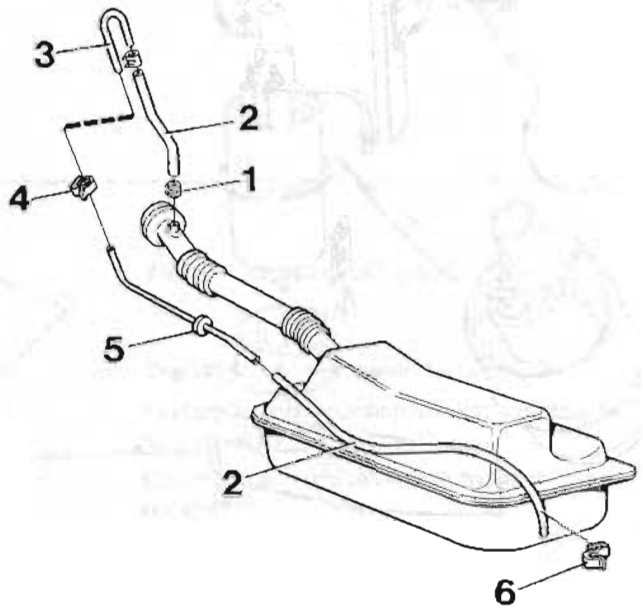
Level sensor and tank pump



Additional parts required for 1975–1977 models without tank pump



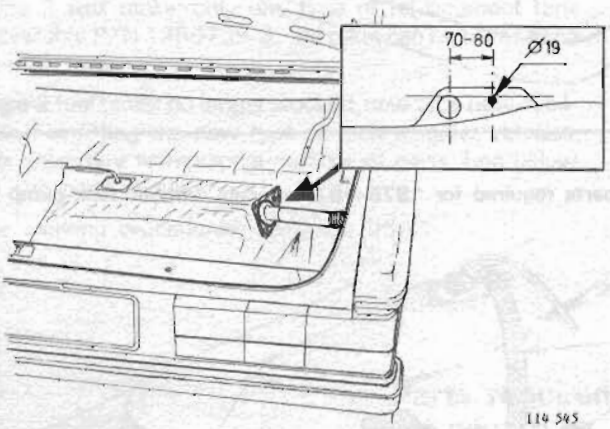
Evaporative system



Fitting a new type of fuel tank

Operations F19–37

Special tools: 5012 (1975), 5169



F19

Pull down the old fuel tank

Disconnect the battery ground lead first.

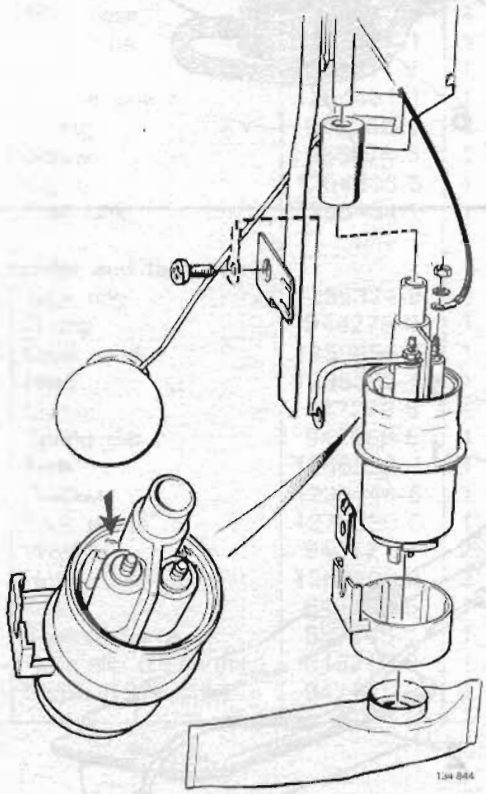
Drain the fuel.

F20

Drill a hole to take the evaporative system tube

Drill a **19 mm = 0.75"** hole in the floor panel next to the hole for the filler tube.

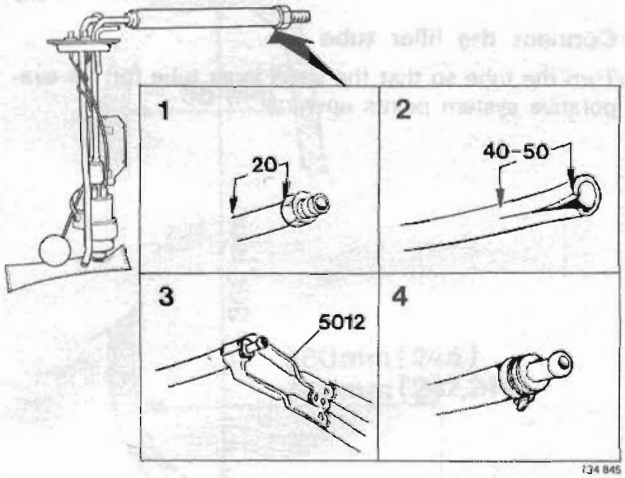
Fit the rubber grommet.
70–80 mm = 2.75–3.15 in.



F21

Assemble the new tank/pump unit and tank pump

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



1975 models only

F22

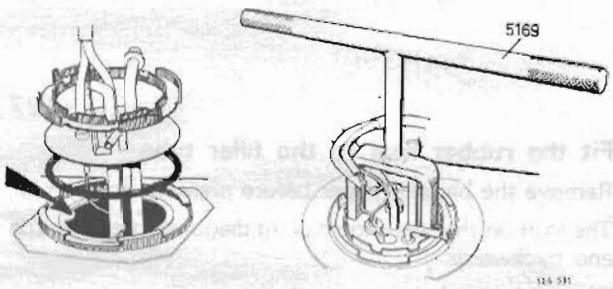
Replace the return line nipple

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

Attach pliers **5012** to the hard plastic hose.

Heat the hose with warm air (e.g. hair drier) and press in the new nipple.

Fold back the protective hose and secure it with a clamp.

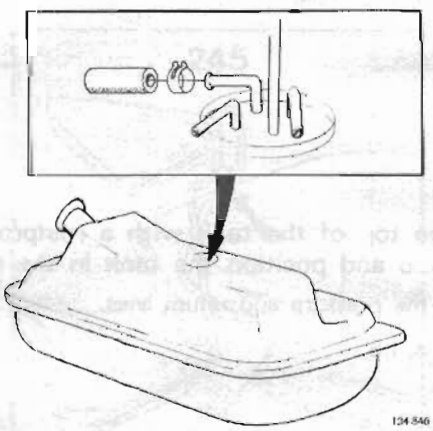


F23

Fit the tank/pump unit to the new fuel tank

Use a new O-ring, lubricate it with glycerine or similar.

Fit the lock ring. Use tool **5169**.

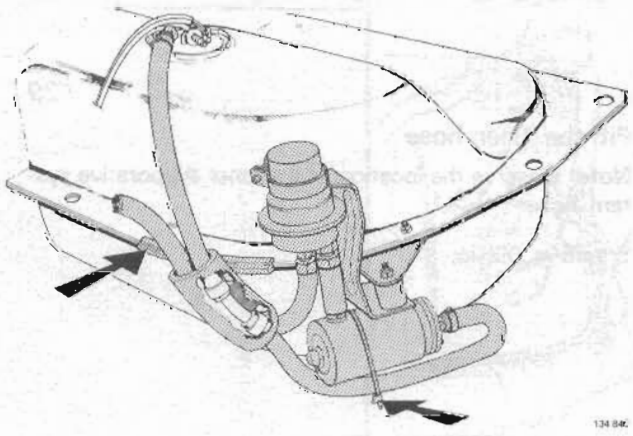


F24

Seal the breather nipple on the tank/pump unit

Sealing sleeve and clip.

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



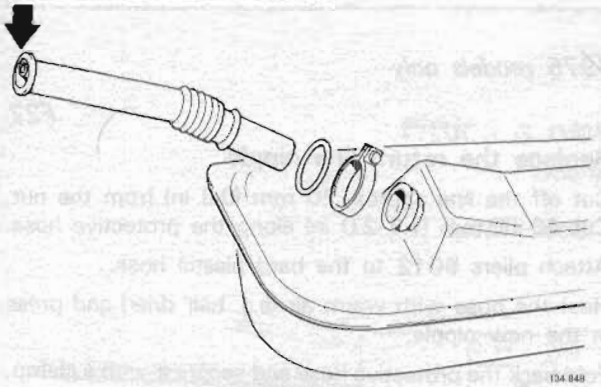
1975–1977 models only

F25

Transfer to the new tank:

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

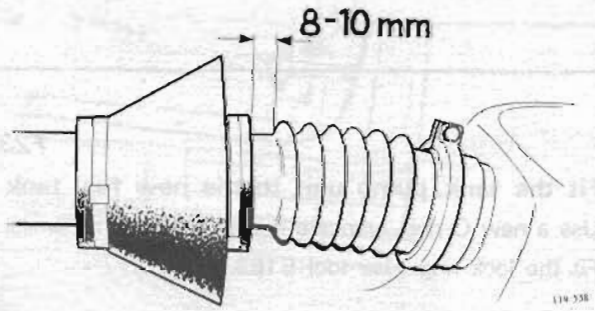
Connect the "suction" line to the tank/pump unit as applicable.



F26

Connect the filler tube

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



F27

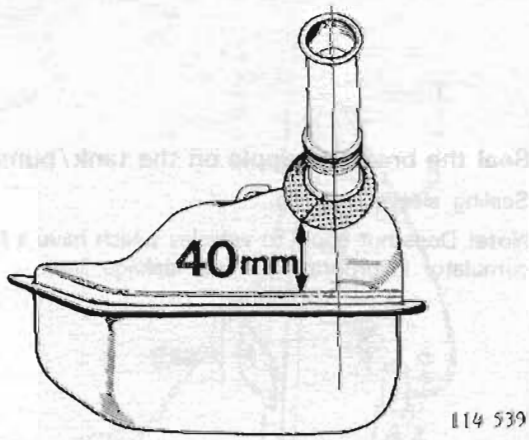
Fit the rubber seal to the filler tube

Remove the backing paper before pressing on the seal.

The joint on the seal should point diagonally downwards and backwards.

Fit two hose clamps, cut off pieces not used.

8-10 mm = 0.3-0.4"

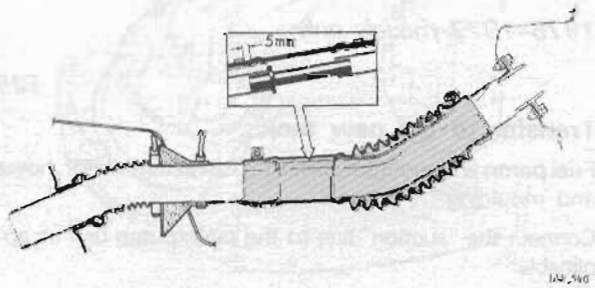


F28

Coat the top of the tank with a rustproofing compound and position the tank in the car

Connect the pressure and return lines.

40 mm = 1.6"

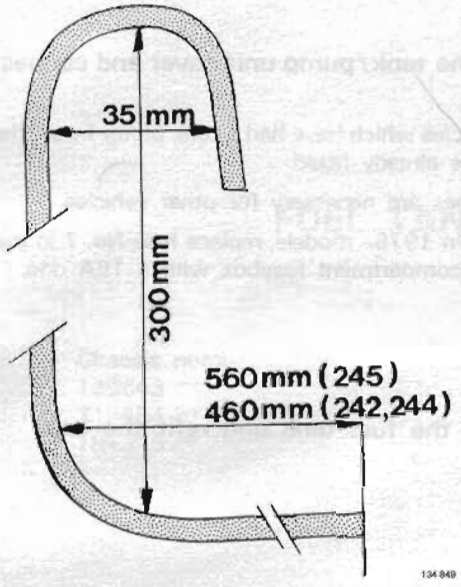


F29

Fit the filler hose

Note! Observe the location of the inner evaporative system hose.

5 mm = 0.2 in.



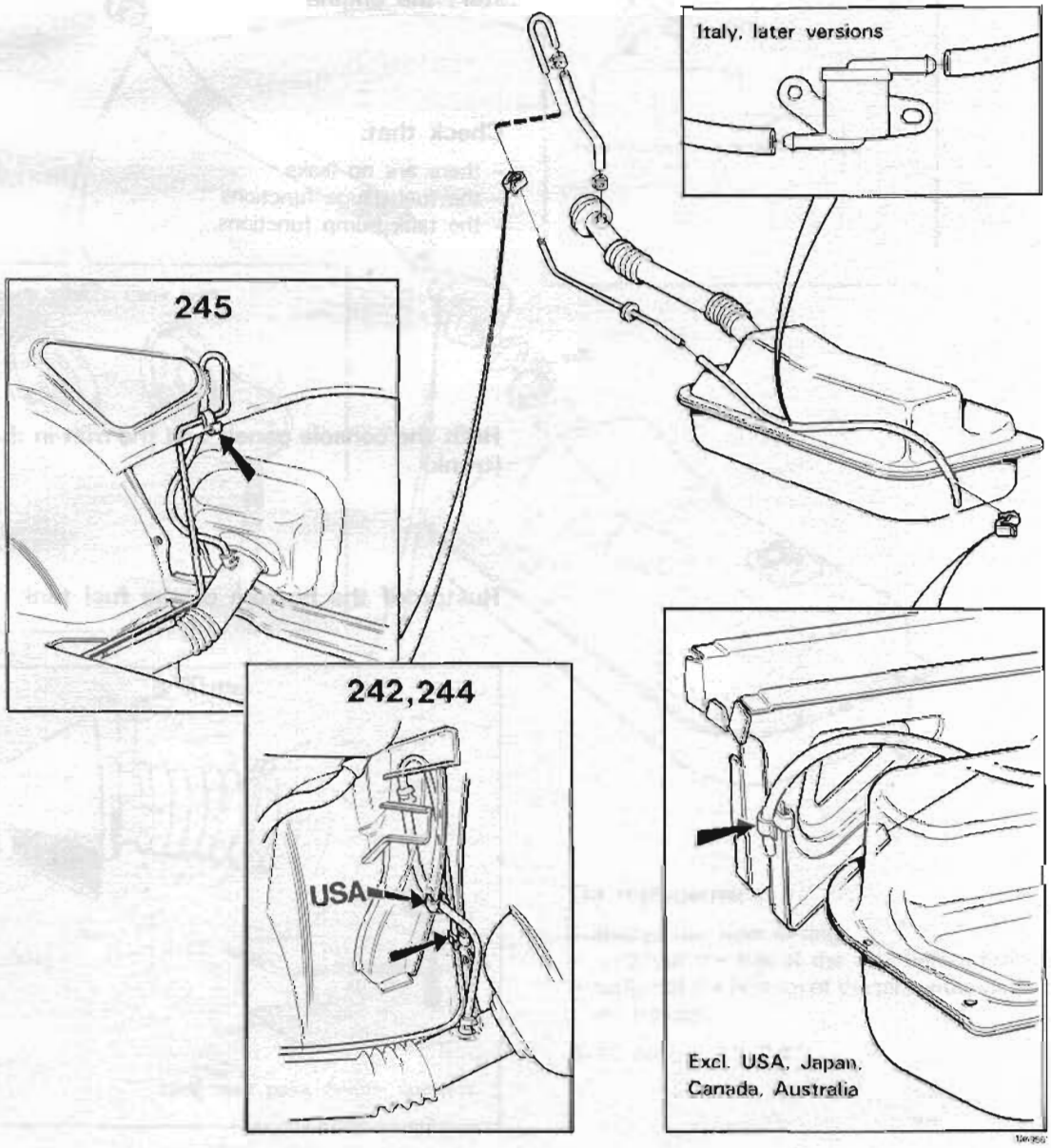
F30

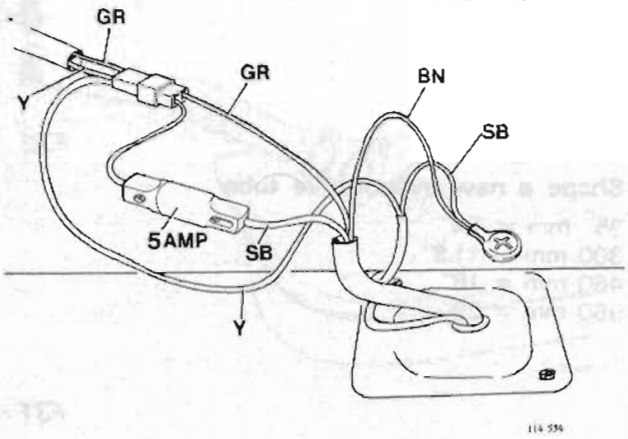
Shape a new evaporative tube

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

F31

Install the evaporative system





F32

Refit the tank/pump unit cover and connect the wiring

On vehicles which have had a tank pump fitted, the fuse holder is already fitted.

New ones are necessary for other vehicles.

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

F33

Fill up the fuel tank and refit the cap

F34

Reconnect the battery earth/ground lead and start the engine

F35

Check that:

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

F36

Refit the console panels and the mat in the boot (trunk)

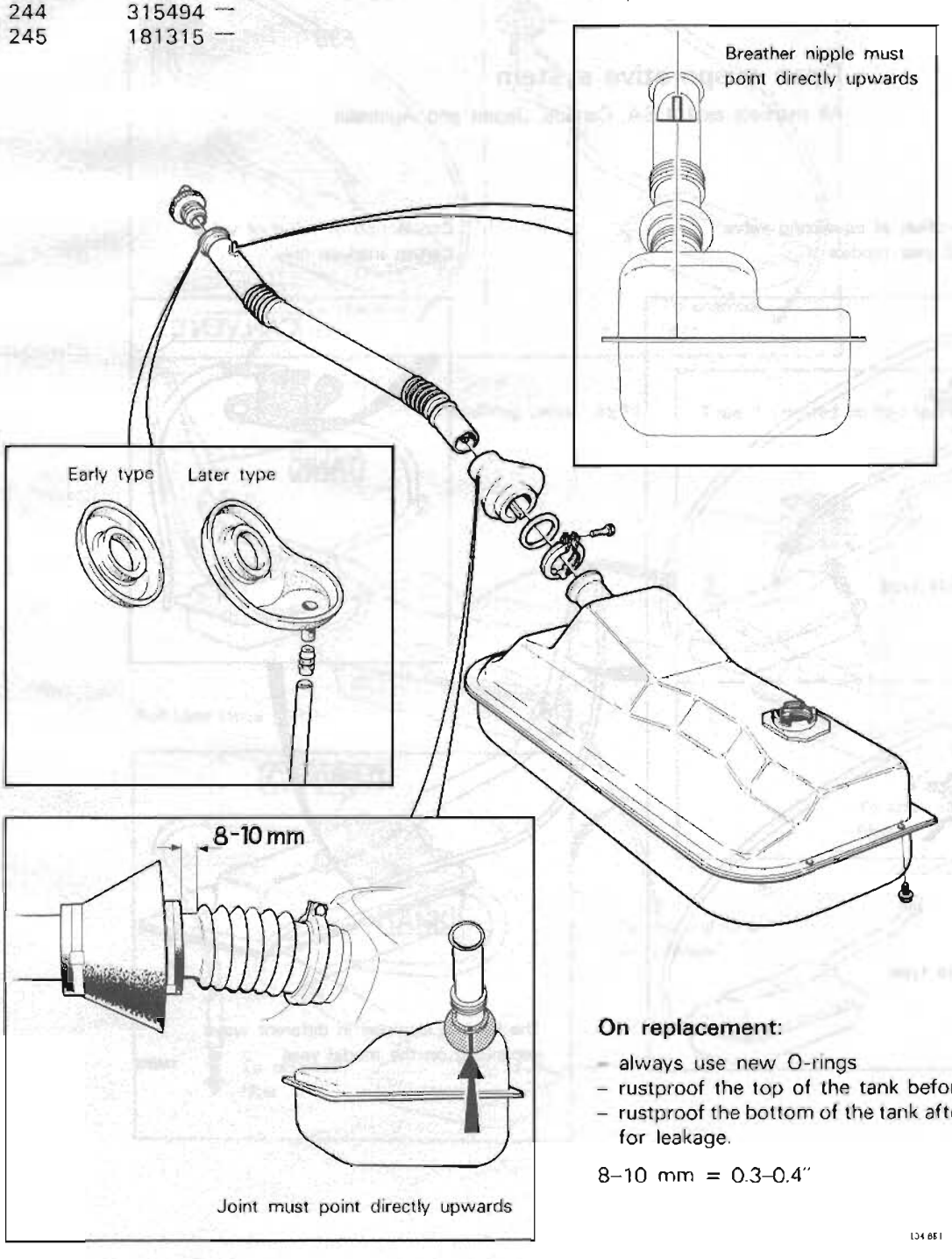
F37

Rustproof the bottom of the fuel tank

FUEL TANK, MIDDLE OF 1978–

Operation F38

Model	Chassis number
242	130643 —
244	315494 —
245	181315 —



F38

On replacement:

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

8–10 mm = 0.3–0.4"

EVAPORATIVE SYSTEM

Operations F39–43

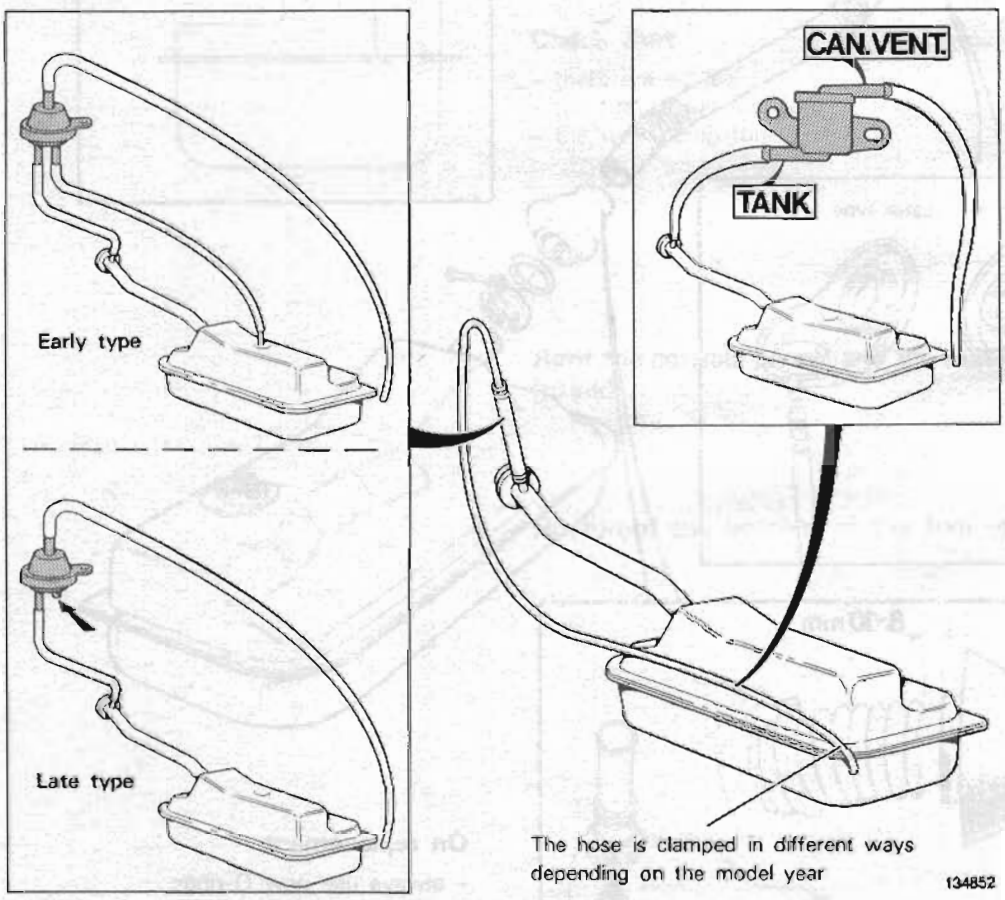
F39

Open evaporative system

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

Connection of equalizing valve
Not all year models

Connection of roll-over valve
Certain markets only



The hose is clamped in different ways depending on the model year

134852

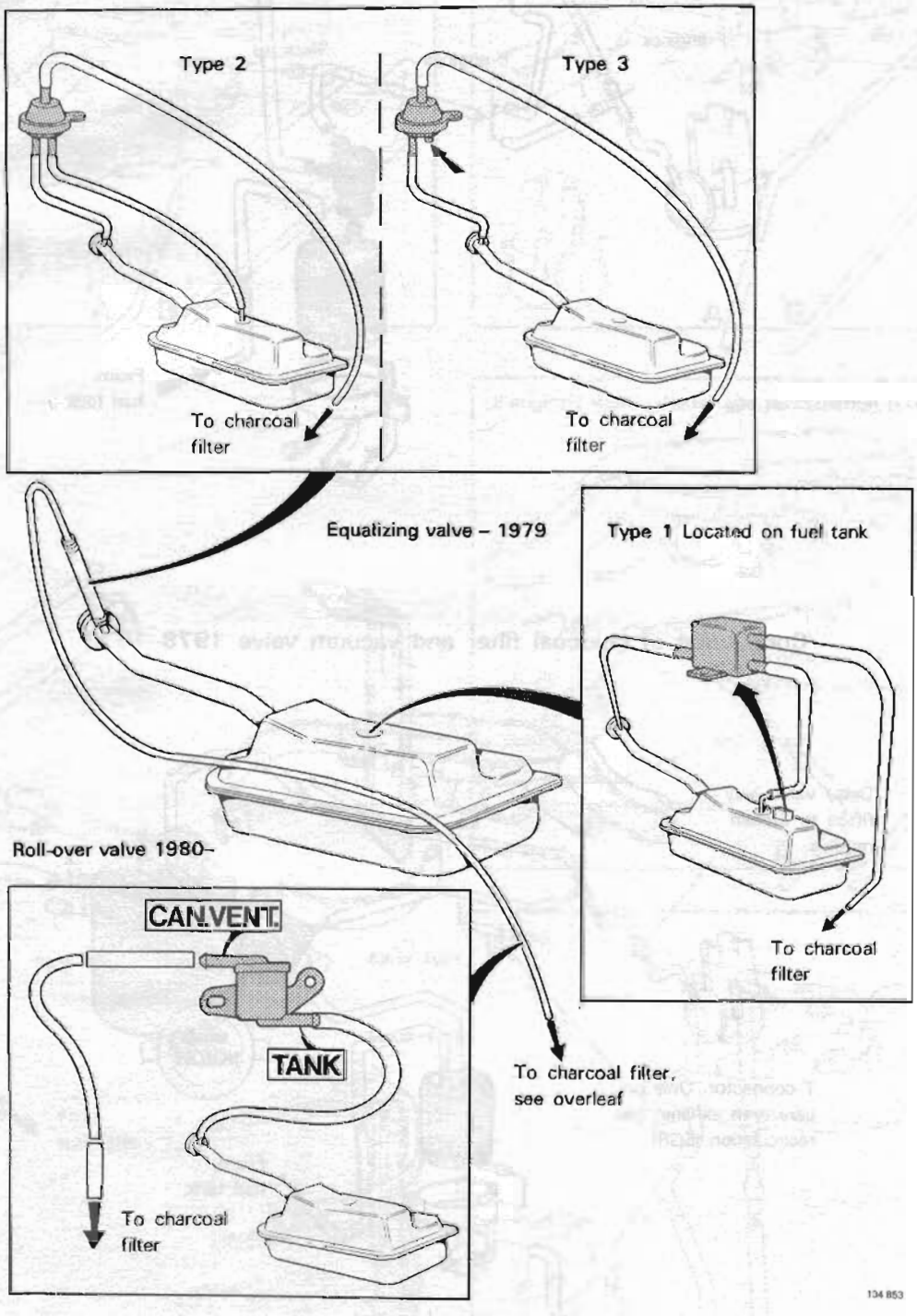
Closed evaporative system
USA, Canada, Japan and Australia

Operations F40–43

F40

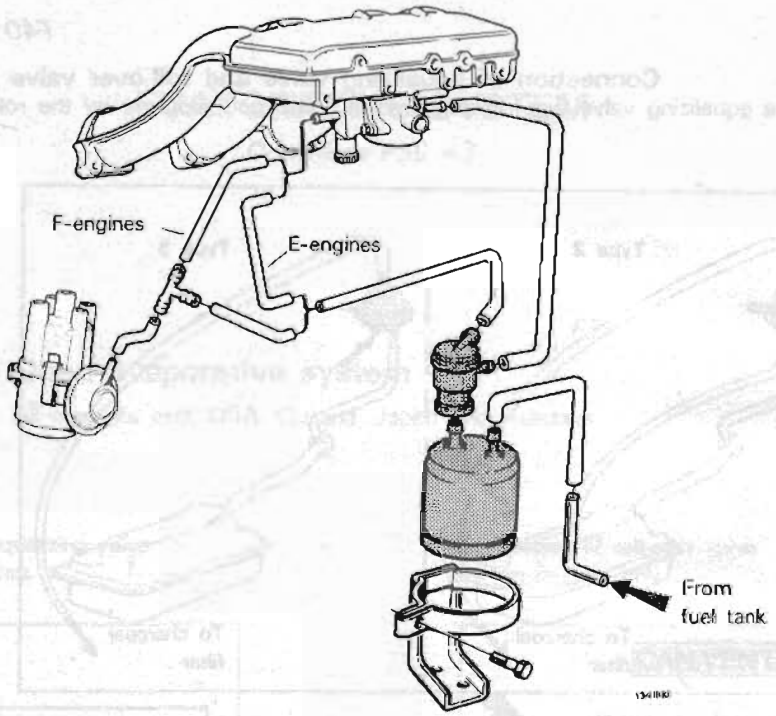
Connection of equalizing valve and roll-over valve

The equalizing valve was discontinued in 1980 and replaced by the roll-over valve.



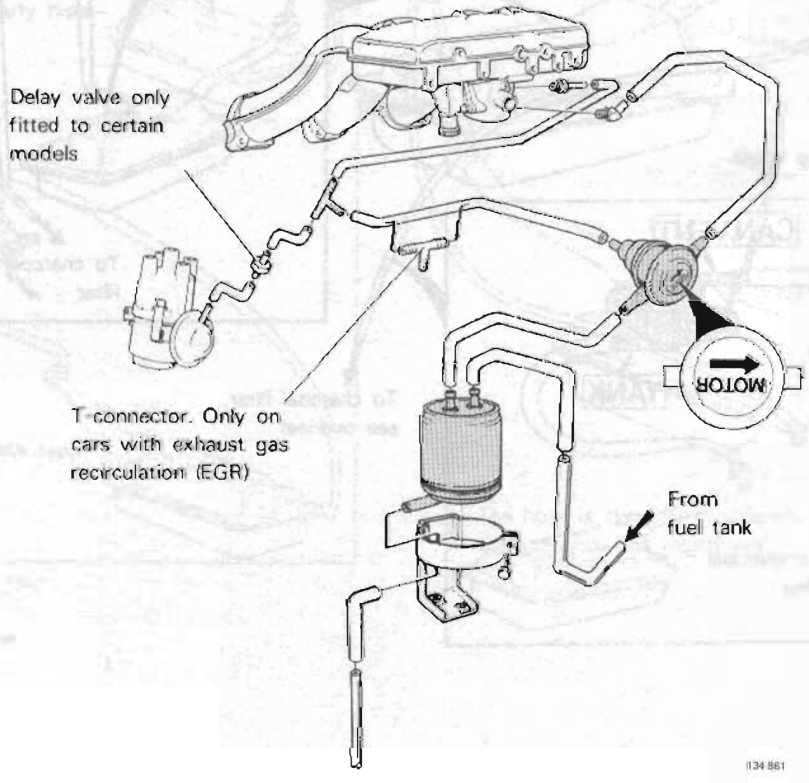
F41

Connection of charcoal filter and vacuum valve 1975–1977



F42

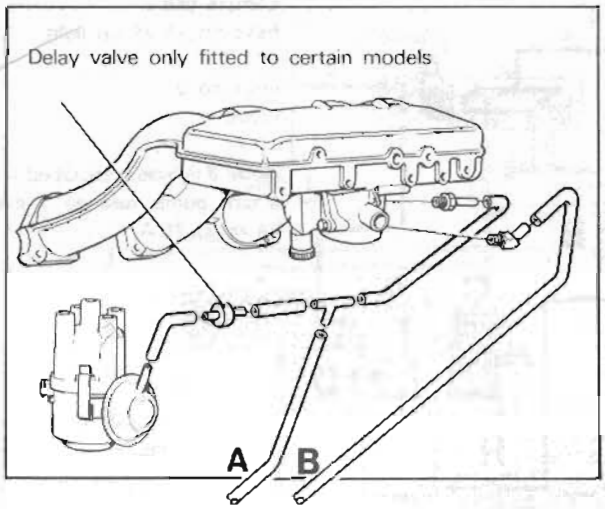
Connection of charcoal filter and vacuum valve 1978–1979

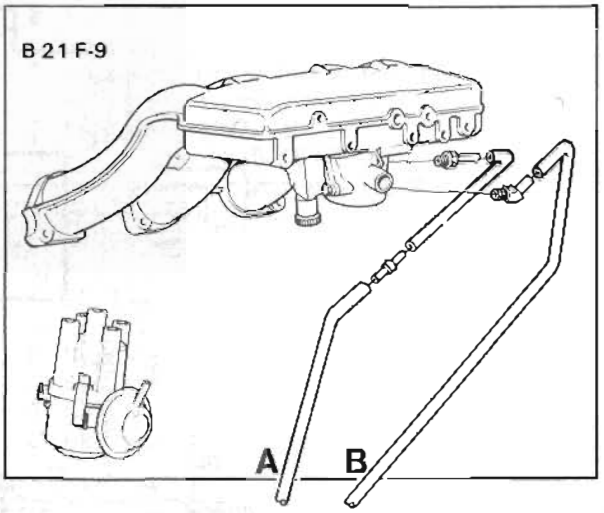


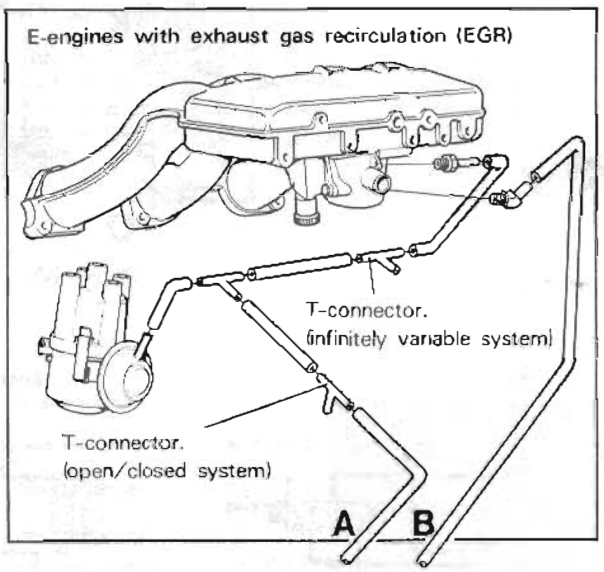
F43

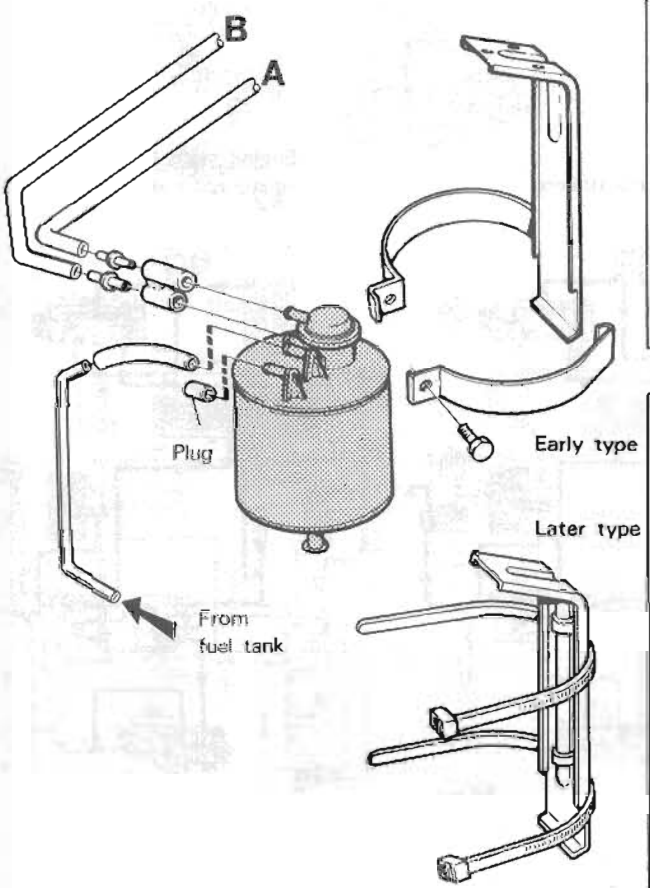
Connection of charcoal filter and vacuum valve 1980–

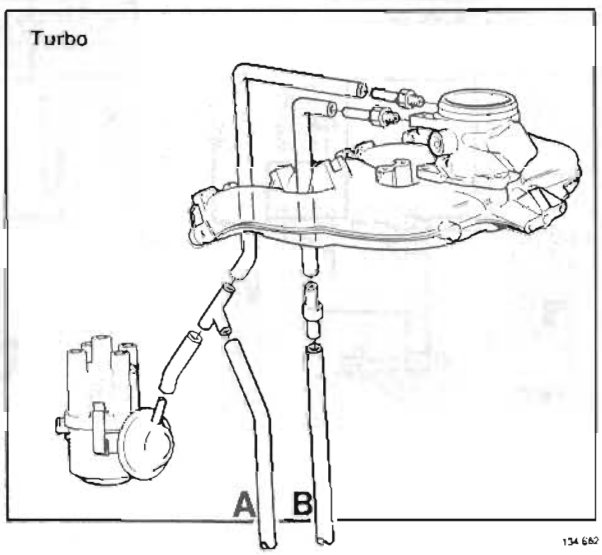
B 21 F-5 and E-engines without exhaust gas recirculation (EGR)











134 682

CI system 19

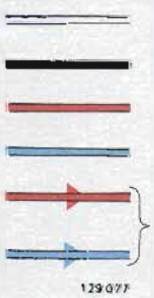
List of components

A Ignition switch
B Fusebox
C Control pressure regulator
D Fuel pump
E Tank pump
F Capacitor (incorporated in tank/pump unit on certain models)
G Main relay (1975–1977)
H Pump relay (1975–1977)
J Transistorized pump relay (1978–)
K Starter motor
L Ignition coil
M Pressure sensor (Turbo)
N Auxiliary air valve
O Thermal time switch
P Start injector
Q Impulse relay (Turbo 1982–)
R Control unit for ignition system
S Distributor

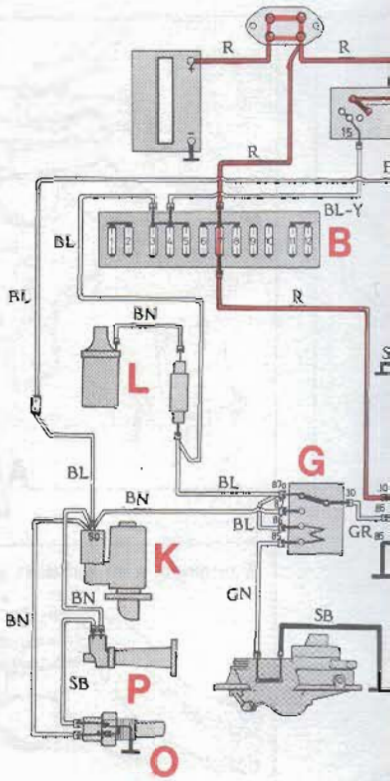
Colour code:

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

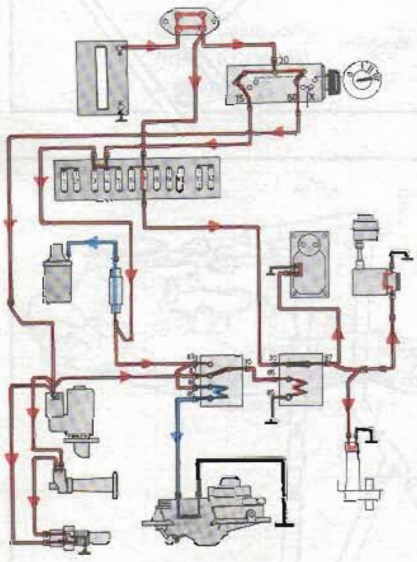
Wiring diagram colours



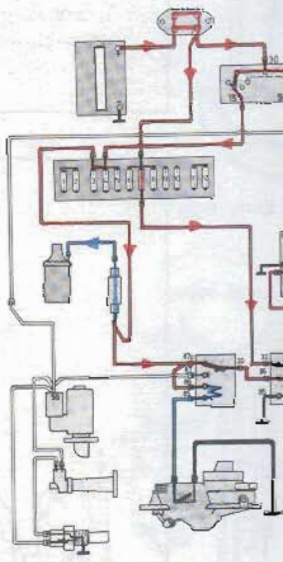
= no voltage
= connected to earth (ground)
= system voltage
= voltage lower than system voltage
= current flow



Starting, cold engine



Engine running

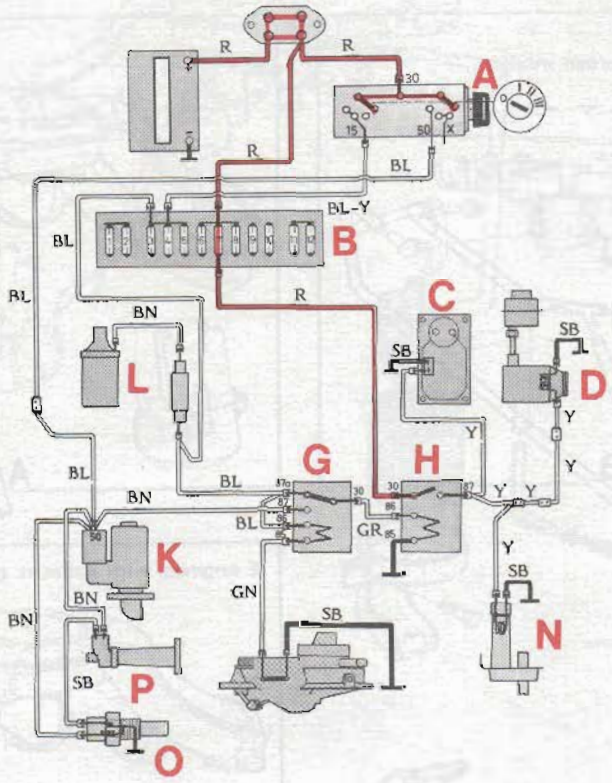


CI system 1975

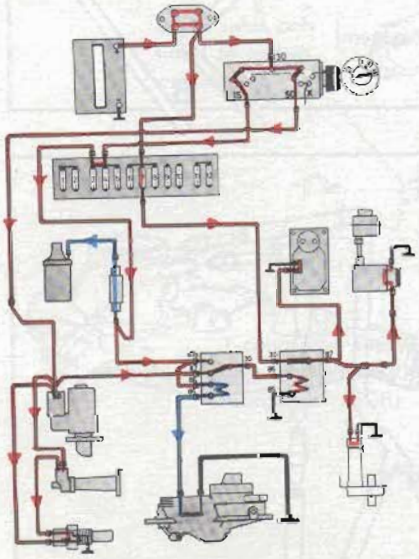
Fuse no 4
Glove compartment light
Heated driver seat
Climate unit
Reversing/back-up light

Fuse no 7
Clock

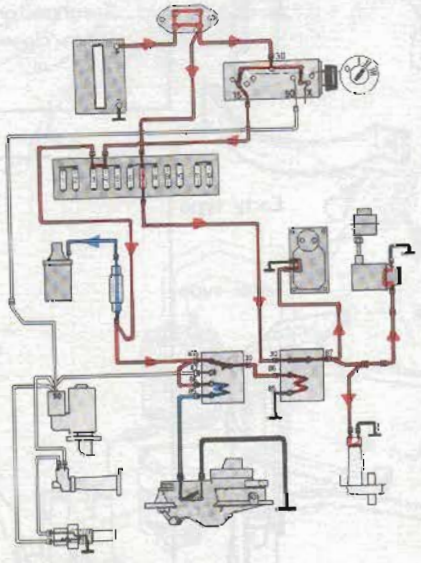
Note! If vehicle is equipped with a tank pump, fuse no. 7 must be rated 16 A.



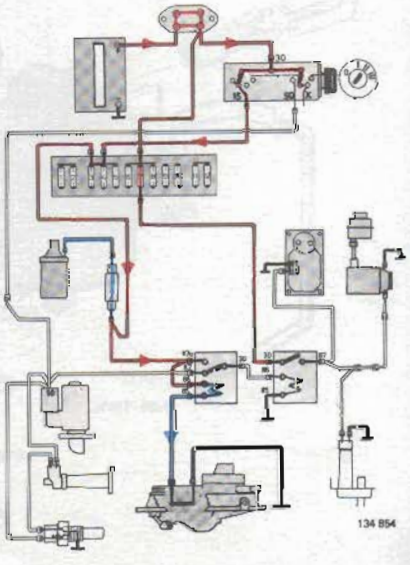
Starting, cold engine



Engine running



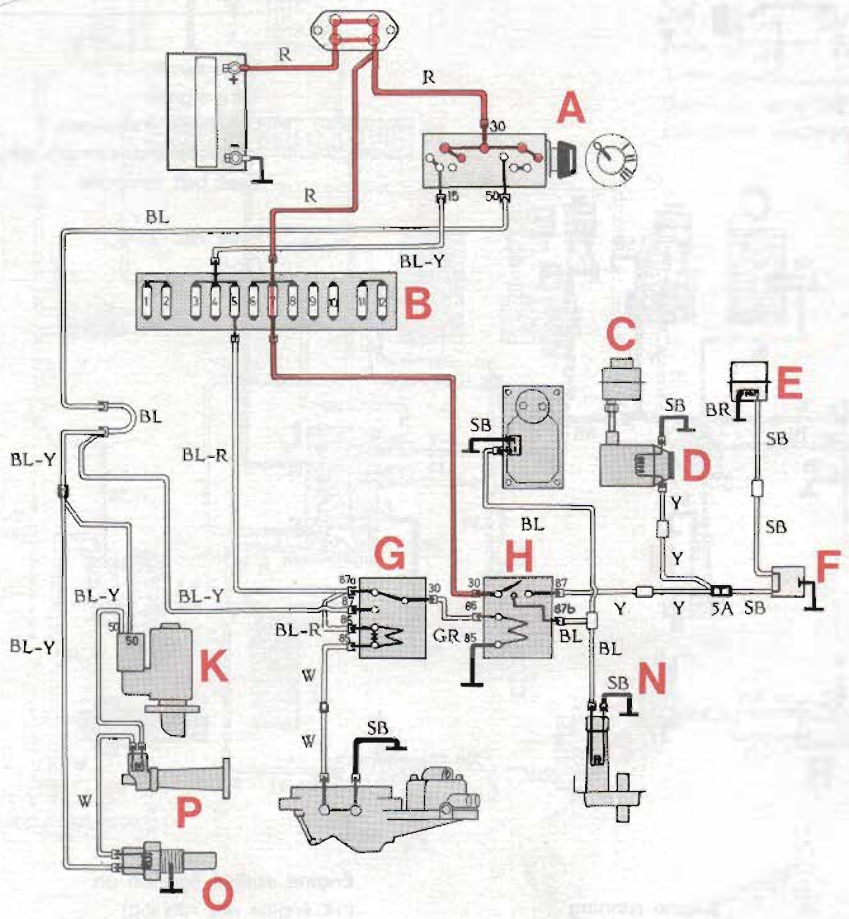
Engine stalls (ignition on but engine not running)



CI system 1976–1977

For identification of components and colour code, see page 106.

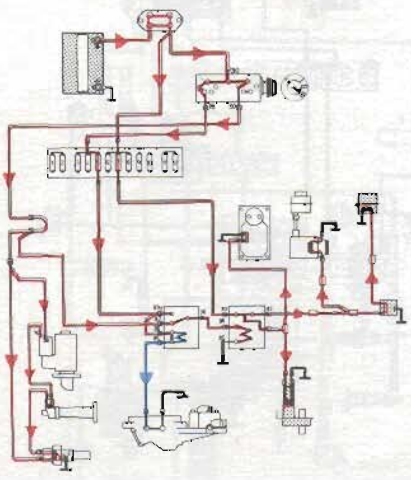
Note! There are different types of relays, see page 80



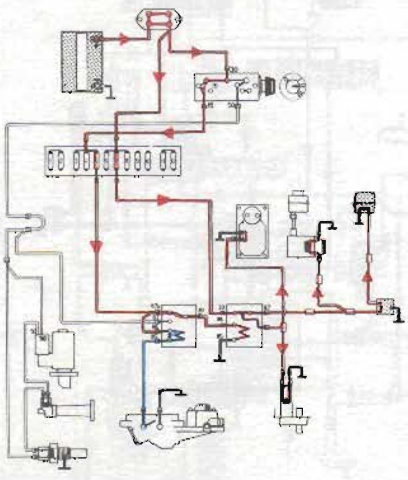
Fuse no 5
Turn signals
Combined instrument
Indicator and warning lamps
Seat belt reminder
Door mirrors

Fuse no 7
Clock

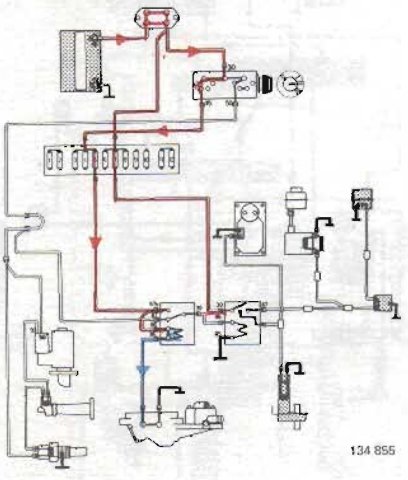
Starting, cold engine



Engine running

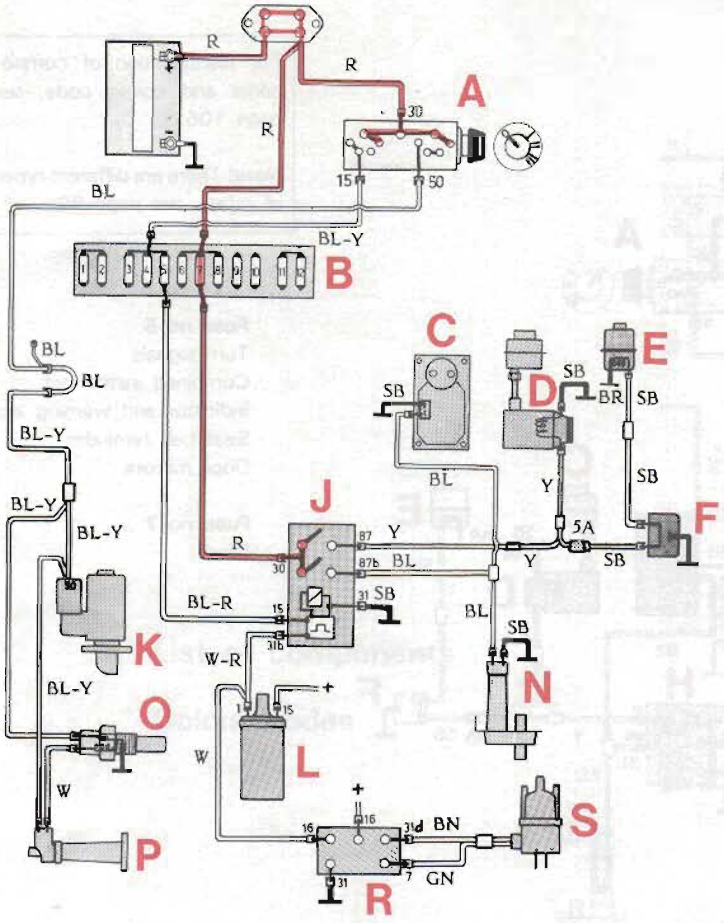


Engine stalled (ignition on but engine not running)



134 855

CI system 1978–

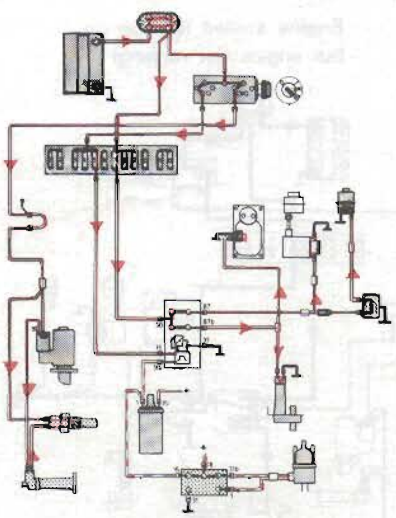


For identification of components and colour code, see page 106.

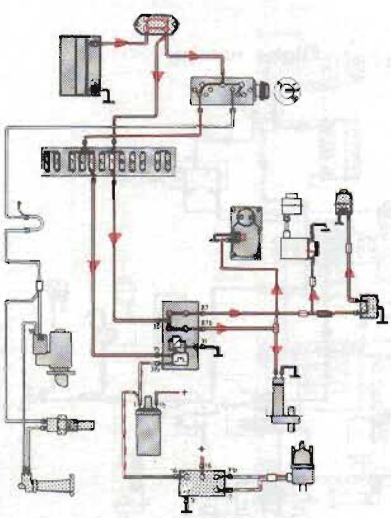
Fuse no 5
Turn signals
Combined instrument
Indicator and warning lamps
Seat belt reminder

Fuse No. 7
Clock

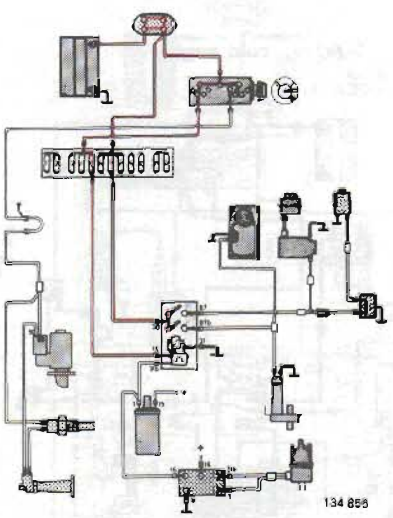
Starting, cold engine



Engine running



Engine stalled (ignition on but engine not running)



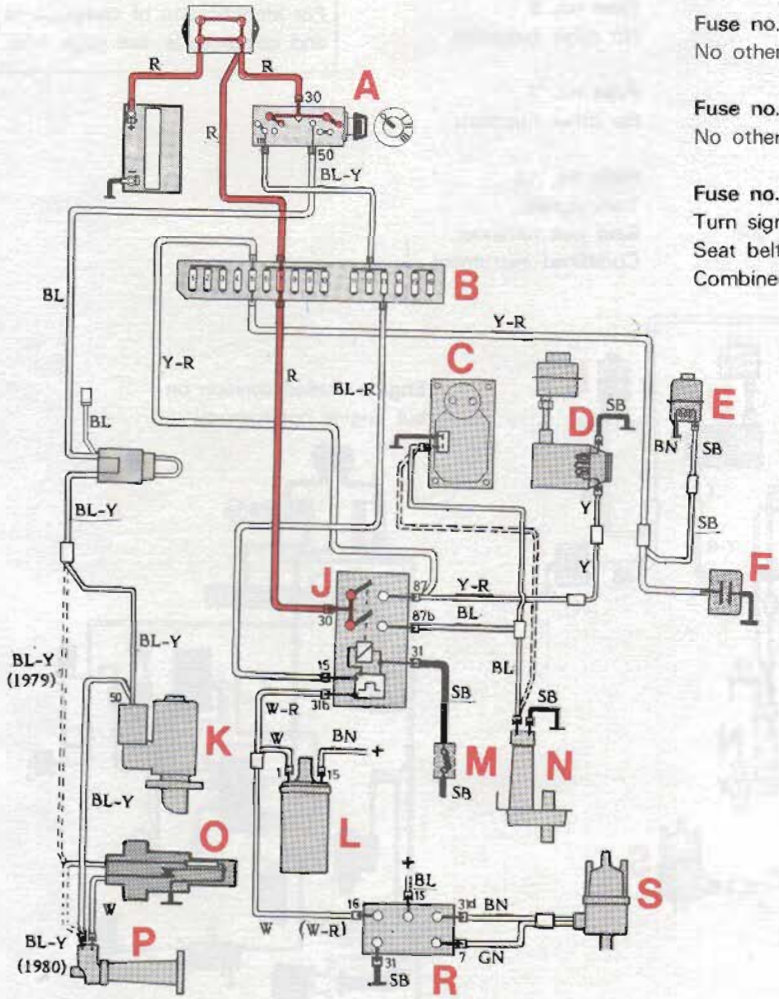
CI system E/F 1979–, Turbo 1981

Fuse no. 5
No other functions

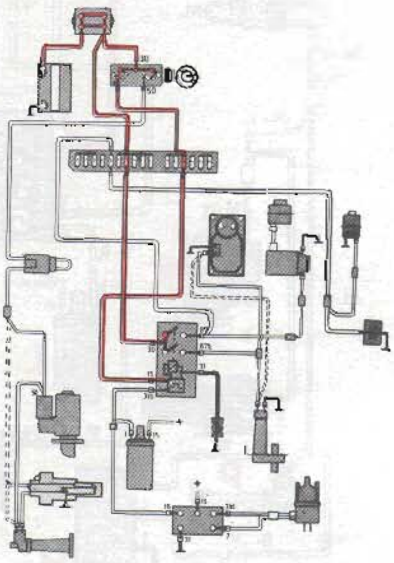
Fuse no. 7
No other functions

Fuse no. 13
Turn signals
Seat belt reminder
Combined instrument

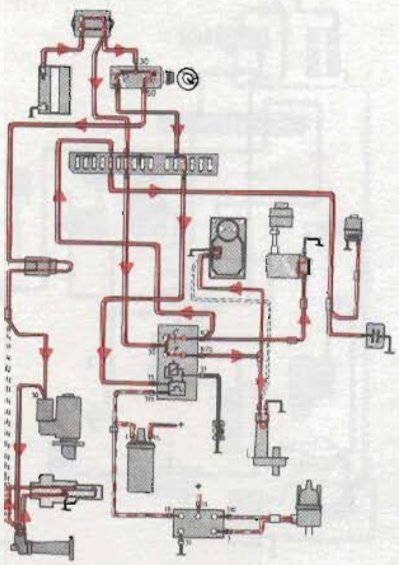
For identification of components and colour code, see page 106.



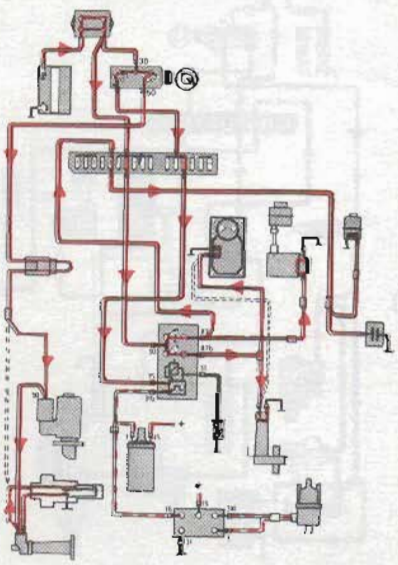
Engine stalled ignition on but engine not running)



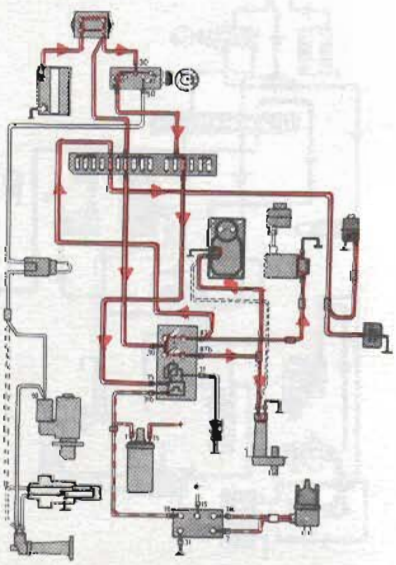
Starting, cold engine



Starting, warm engine



Engine running



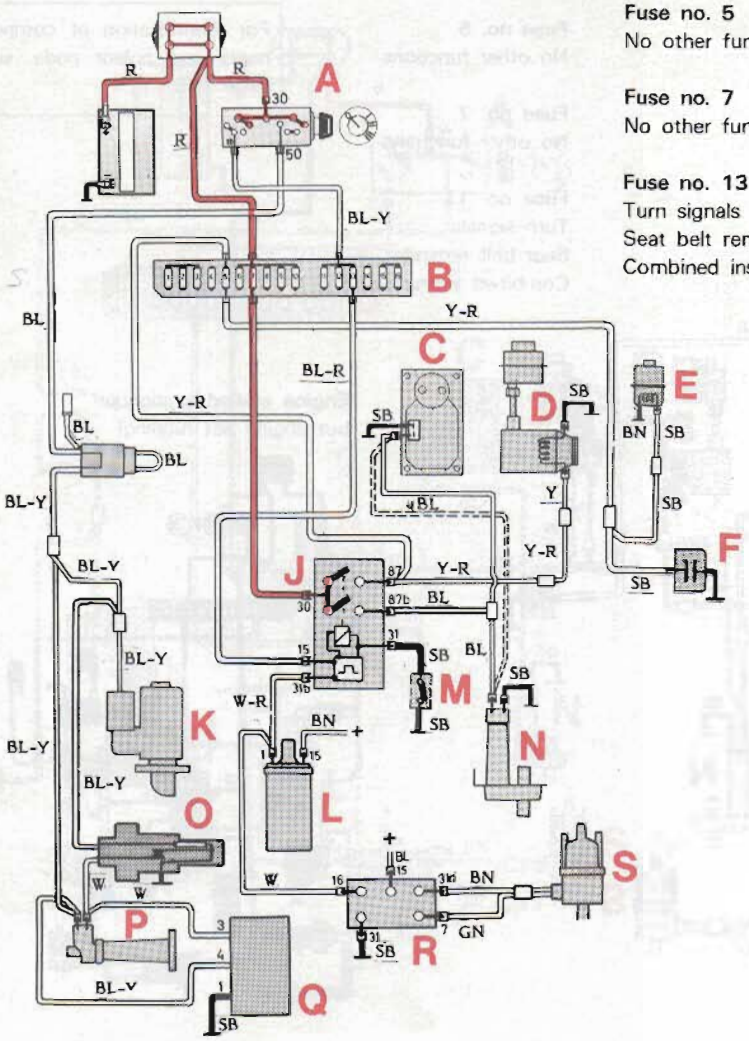
CI system Turbo 1982–

Fuse no. 5
No other functions

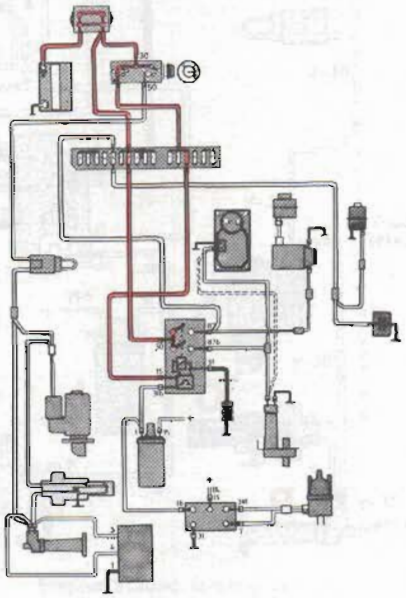
Fuse no. 7
No other functions

Fuse no. 13
Turn signals
Seat belt reminder
Combined instrument

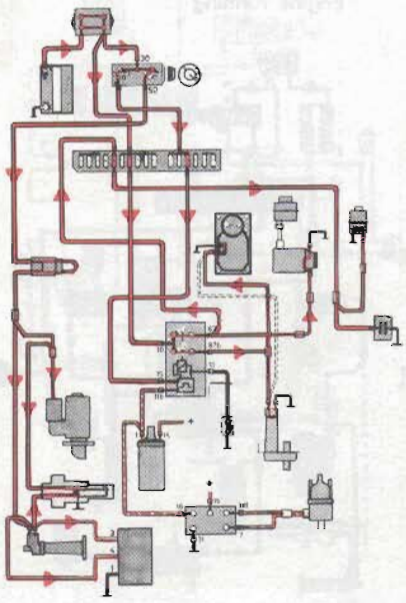
For identification of components and colour code, see page 106.



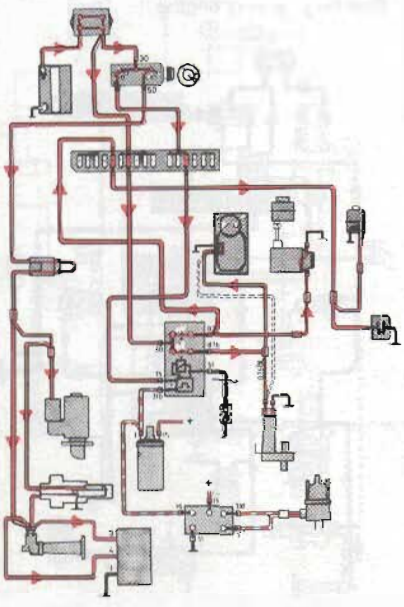
Engine stalled (ignition on but engine not running)



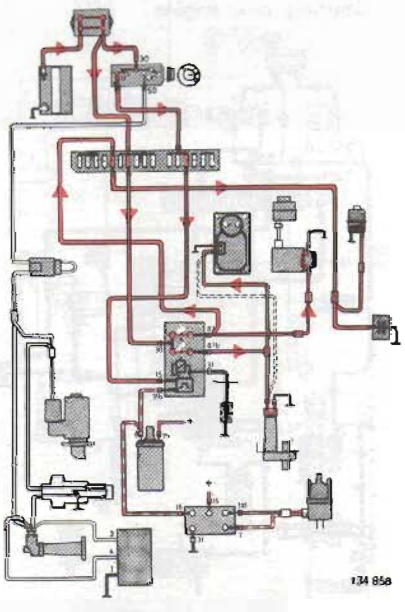
Starting, cold engine



Starting, warm engine



Engine running



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