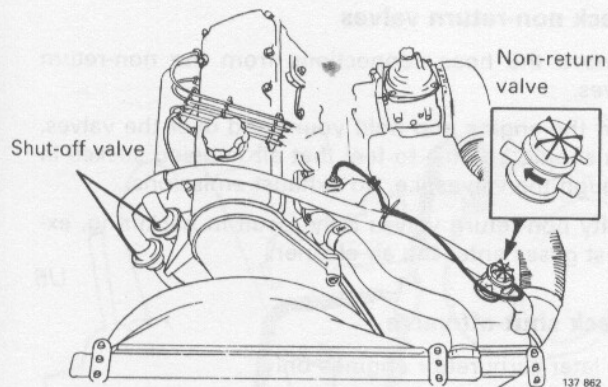


U. Pulsair system



General

U1

Only carburettor engines of later models have shut-off valves.

The valve disconnects the Pulsair system at a high negative pressure in the inlet pipe. It therefore prevents exhaust "puffs" from occurring when shifting gears and braking with the engine.

If necessary the valve can be installed on older carburettor engines, see below.

Installing shut-off valve on previous models

U2

Cut the hose from the air cleaner to the Pulsair system and shorten it approximately 30 mm (1.2 in). Do this some distance away from the bend on the hose.

Push the valve into position. **Note!** The arrow must point towards the engine. Install the control hose on the valve. The length of the hose should be approximately 550 mm (22 in).

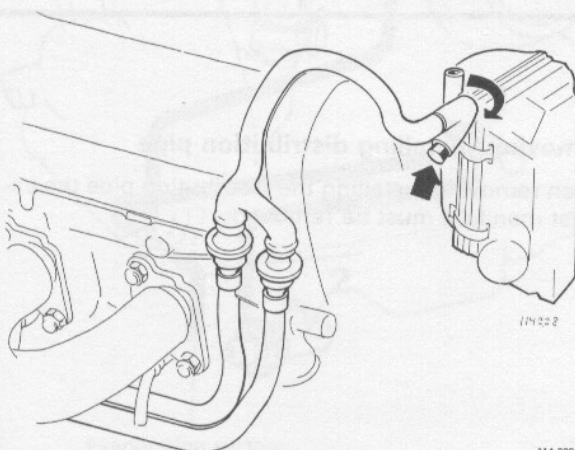
Cars with **manual transmission:**

Remove the plug from the inlet pipe and screw the nipple into position.

Cars with **automatic transmission:**

Cut existing hose to the inlet pipe. Install a T-nipple on the hose.

Connect the control hose and clamp this with tie clamps.



Checking/adjustment CO contact

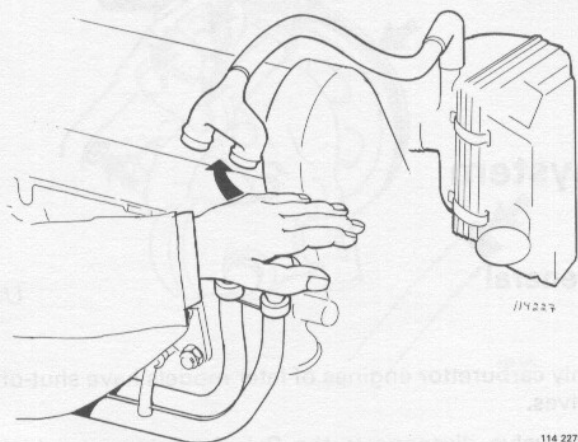
U3

The Pulsair system must be disconnected and plugged when checking/adjusting the CO content, since the values would otherwise be incorrect.

When the system is connected the CO content should drop.

IMPORTANT

Under no circumstances must the CO content be adjusted with the Pulsair system connected.



Checking system

U4

Check that:

- all connections are tightened and not leaking
- hoses are intact

U5

Check non-return valves

Remove the hose connections from the non-return valves.

Start the engine and hold your hand over the valves. You should be able to feel that air is being sucked in through the valves, i.e. no exhaust emissions.

Faulty non-return valves may result in backfiring, exhaust gases enter the air cleaner.

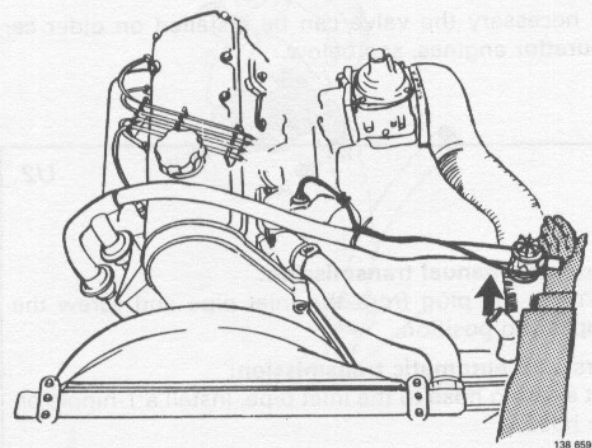
U6

Check shut-off valve

(on later carburettor engines only)

Check that the shut-off valve is open when the engine is idling.

- remove the hose from the air filter
- cover (block) the hose with your hand. The CO content should increase
- reconnect the hose



If the valve does not open when the engine is idling the reason may be:

- faulty valve
- high negative pressure in the inlet pipe (may be caused by too large a valve clearance or too-early ignition)

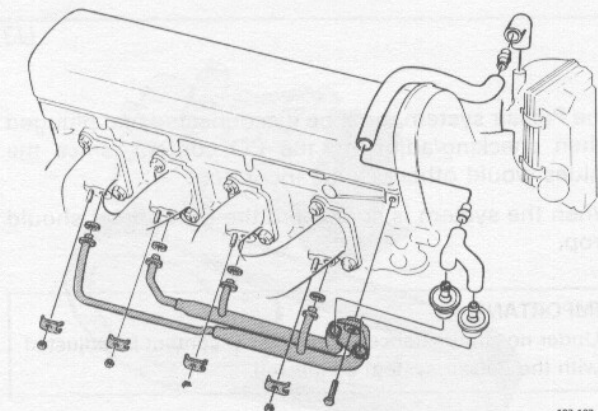
When decelerating (high negative pressure in the inlet pipe) the shut-off valve should close.

If the valve does not close this may result in exhaust "puffs" when decelerating and when shifting gears.

U7

Removing/installing distribution pipe

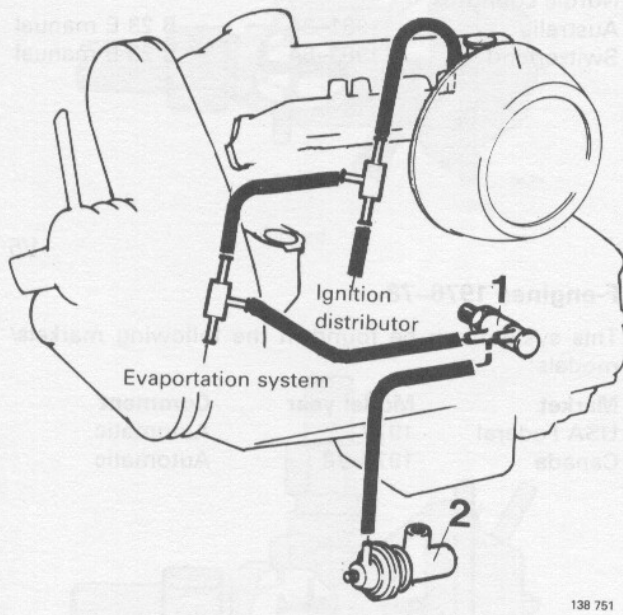
When removing/installing the distribution pipe the exhaust manifold must be removed.



V. Exhaust recirculation (EGR)

ON/OFF system

A-engines

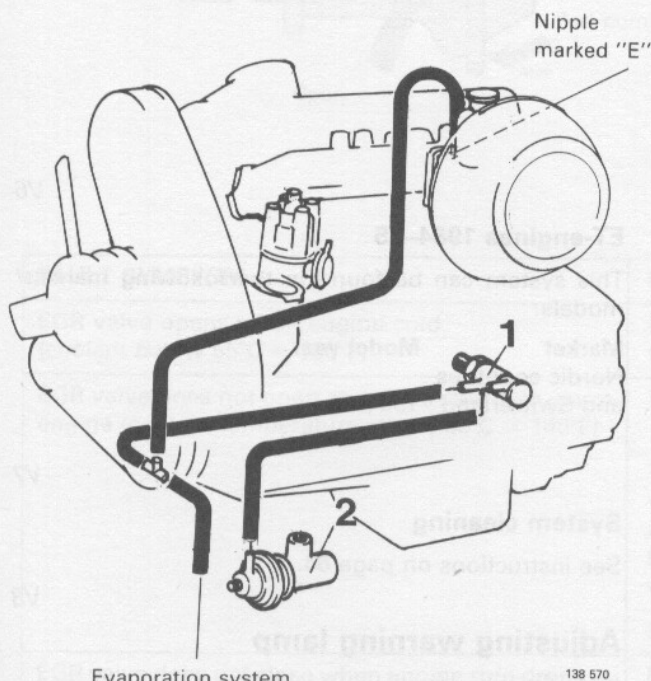


V1

1978-81

This system can be found in the following markets/models.

Market	Model year	Comments
Canada	1978-80	Automatic
Canada	1981	Manual
Australia	1979-80	Automatic
Australia	1981	Manual
Nordic countries	1981	Manual



V2

1982-84

This system can be found in the following markets/models:

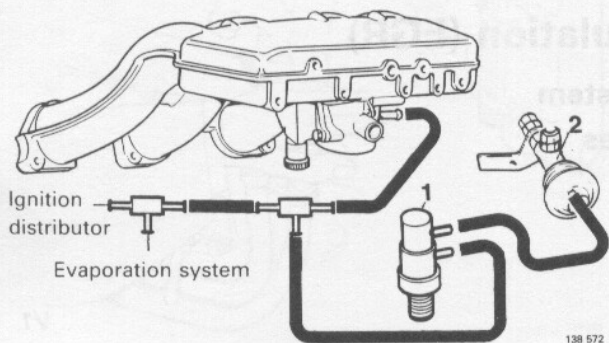
Market	Model year	Comments
Canada	1982-84	Manual
Australia	1982-84	Manual
Nordic countries	1982-84	Manual
Switzerland	1983-84	Manual

V3

Cleaning system

See instructions on page 64.

**ON/OFF system
E/F and ET-engines**

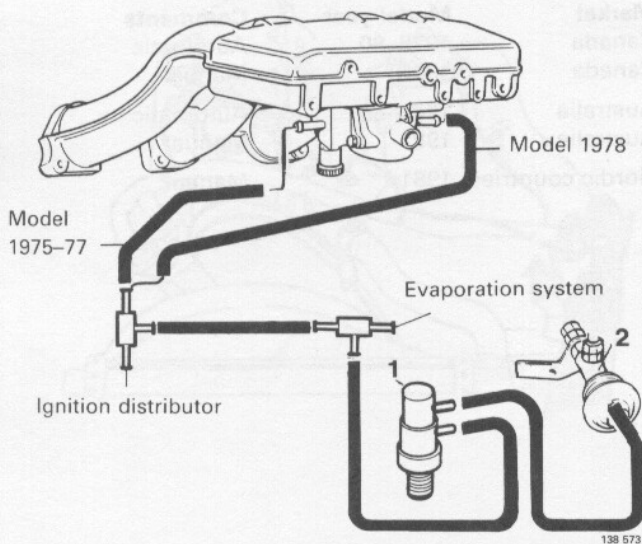


V4

E-engines 1981-84

This system can be found in the following markets/models:

Market	Model year	Comment
Canada	1981-83	B 23 E manual
Nordic countries, Australia	1981-84	B 23 E manual
Switzerland	1983-84	B 23 E manual

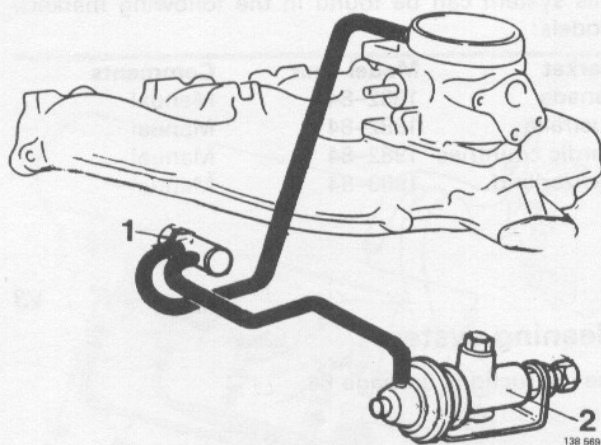


V5

F-engines 1976-78

This system can be found in the following markets/models:

Market	Model year	Comment
USA Federal	1976	Automatic
Canada	1976-78	Automatic



V6

ET-engines 1984-85

This system can be found in the following markets/models:

Market	Model year
Nordic countries and Switzerland	1984-85

V7

System cleaning

See instructions on page 64.

V8

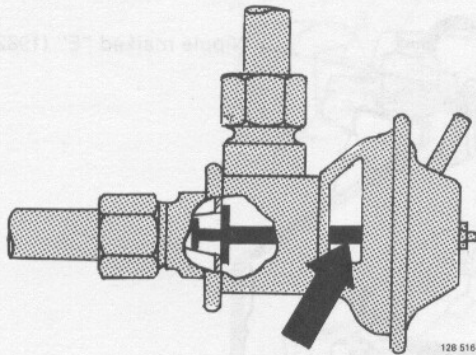
Adjusting warning lamp

(only F-engines)

See instructions on page 65.

Function test

V9



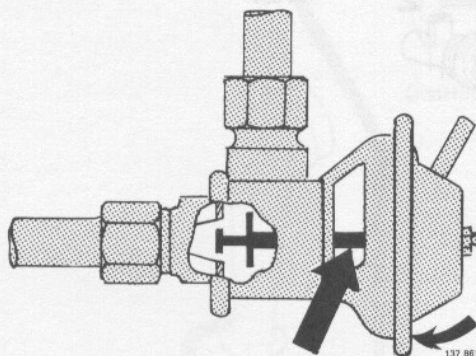
Closed

EGR valve should only open at part throttle with warm engine. To check function of valve, observe movement of link rod at different engine rpm and temperatures.

Note! It may be difficult at times to determine whether the valve closes completely. The only way to check this is to remove the pipe between the valve and the inlet manifold and to feel if the valve is leaking.

A valve which is open when the engine is idling results in uneven idling, and the engine may also stall.

V10



Open

Part number

Check that EGR valve:

- is closed at all engine rpm with cold engine, i.e., coolant temperature **below 55°C (130°F)**
- opens at part throttle with warm engine, i.e., coolant temperatures **above 60°C (140°F)**
Vehicles with delay valve: EGR valve opens approx. 2 seconds after engine is accelerated
- closes when engine speed drops to idle

IMPORTANT

EGR valves exist in various designs (different opening pressures, flow).

Ensure that correct valve is used.

The valves are marked with Part Number.

V11

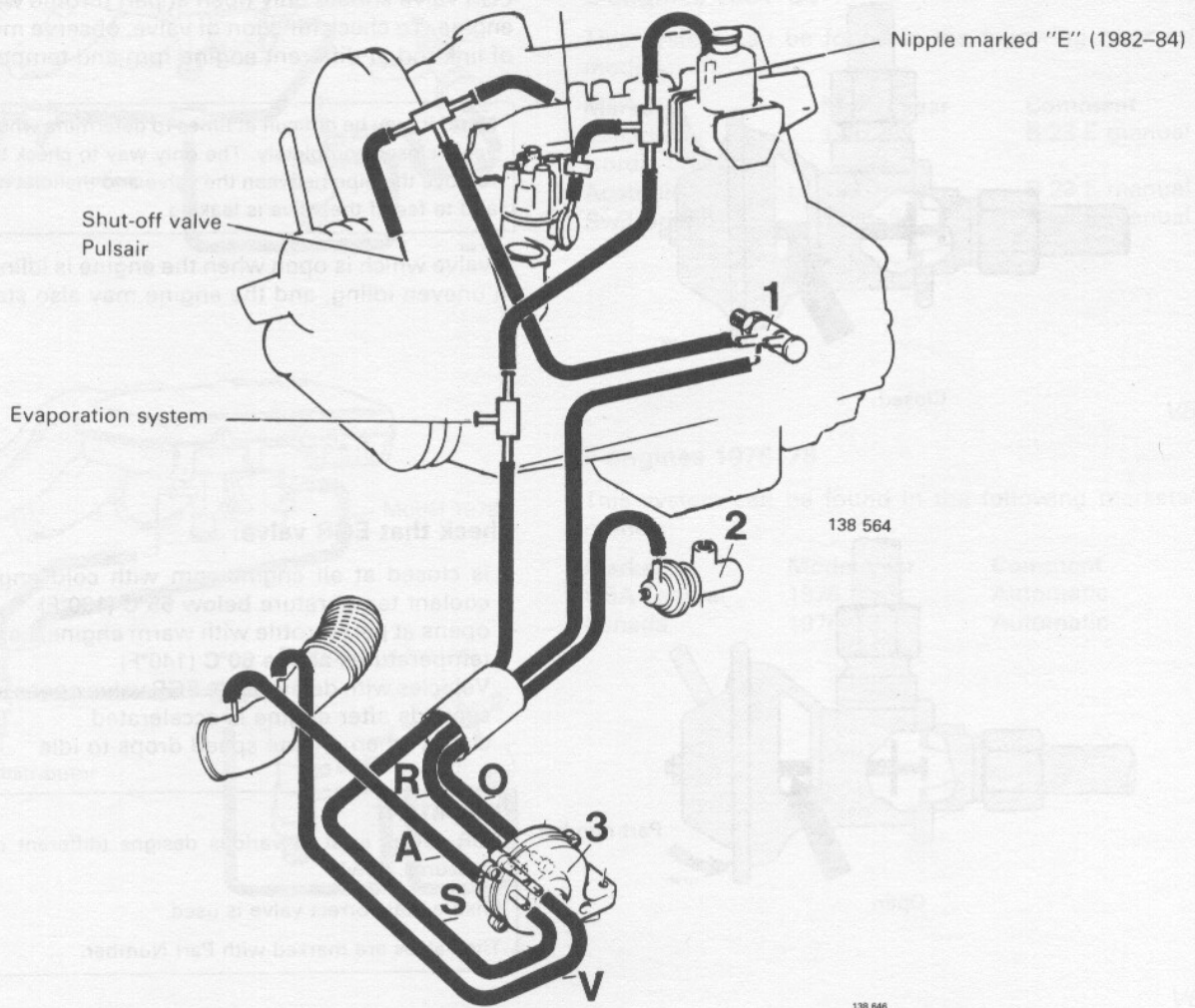
FAULT SYMPTOM	PROBABLE CAUSE/REMEDY
EGR valve opens when engine cold (coolant below 55°C = 130°F)	Defective thermostat valve. Replace. Thermostat valve must open at 55–60°C (130–140°F).
EGR valve does not open at part throttle with warm engine (coolant temperature above 60°C = 140°F)	Vacuum hoses defective, kinked or incorrectly connected.
	Thermostat valve does not open. Test by removing vacuum hose from EGR valve and blowing through hose into valve. Note! On vehicles with delay valve, disconnect hose after valve and check as above.
	EGR valve seized. Clean/replace valve.
EGR valve does not close when engine rpm drops to idle	EGR valve seized. Clean/replace valve.

X. Exhaust recirculation (EGR)

STEPLESS System A-engines

Delay valve (only certain variations).

X1



1981-84

This system is to be found in the following markets:

Market	Model year	Comments
Canada	1981-84	Automatic
Nordic countries	1981-84	Automatic
Australia	1981-84	Automatic
Switzerland	1983-84	Automatic

X2

Checking/trouble-shooting system

See instructions, page 12.

X3

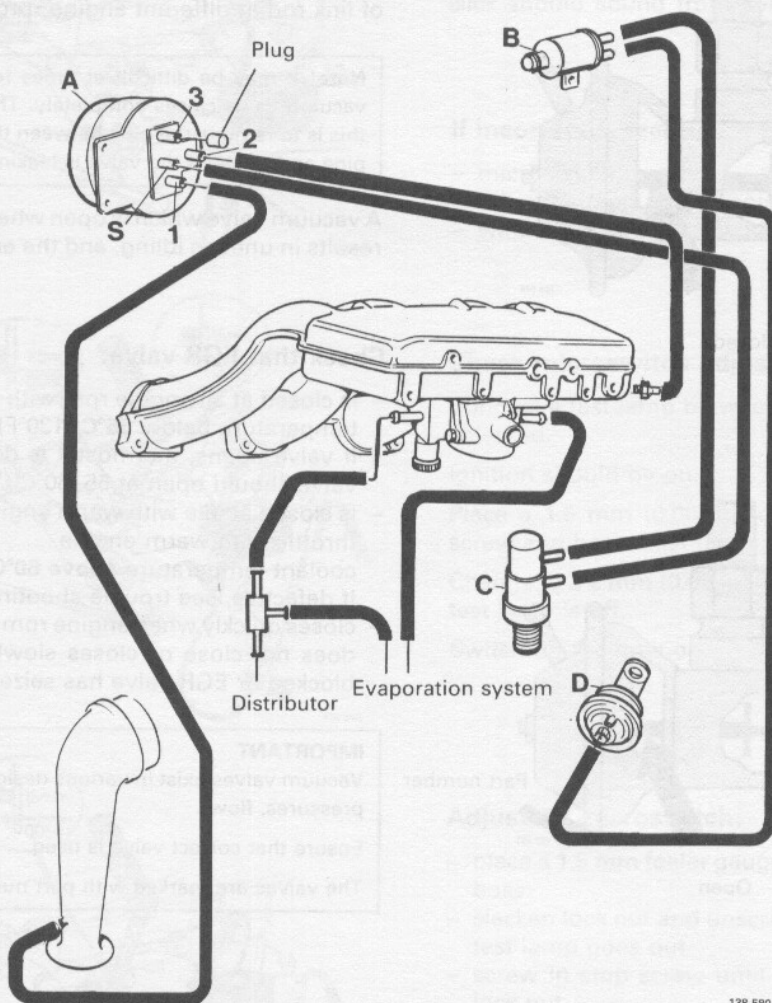
Cleaning the system

See instructions, page 64.

Y. Exhaust recirculation (EGR)

STEPLESS System type 1

F-engines



138 580

Y1

1976-77

This system is to be found in the following markets:

Market	Model year	Comments
Japan	1976-77	
USA, California	1976	Early models

Y2

Cleaning the system

See instructions, page 64.

Y3

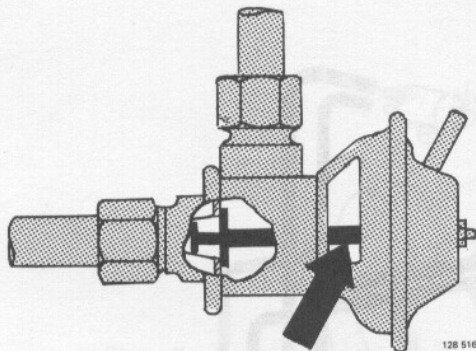
Adjusting warning lamp

See instructions, page 65.

Function check

Y4

EGR valve should only open at part throttle with warm engine. To check function of valve, observe movement of link rod at different engine rpm and temperatures.



Closed

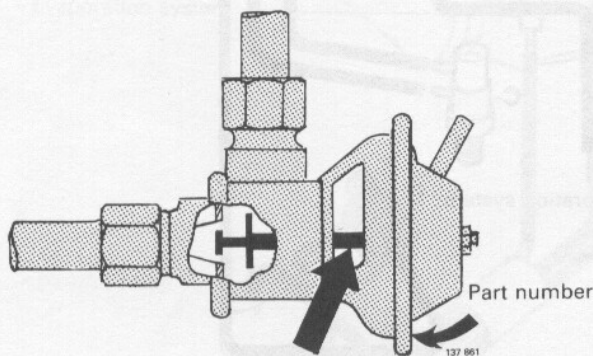
Note! It may be difficult at times to determine whether vacuum valve closes completely. The only way to check this is to remove the pipe between the valve and the inlet pipe and to feel if the valve is leaking.

A vacuum valve which is open when the engine is idling results in uneven idling, and the engine may also stall.

Y5

Check that EGR valve:

- is closed at all engine rpm with cold engine, coolant temperature **below 55°C (130°F)**
If valve opens, thermostat is defective. Thermostat valve should open at 55–60°C (130–140°F)
- is closed at idle with warm engine and opens at part throttle with warm engine
coolant temperature **above 60°C (140°F)**.
If defective, see trouble shooting section
- closes quickly when engine rpm drops to idle. If valve does not close or closes slowly, solenoid valve is blocked or EGR valve has seized.



Open

IMPORTANT

Vacuum valves exist in various designs (different opening pressures, flow).

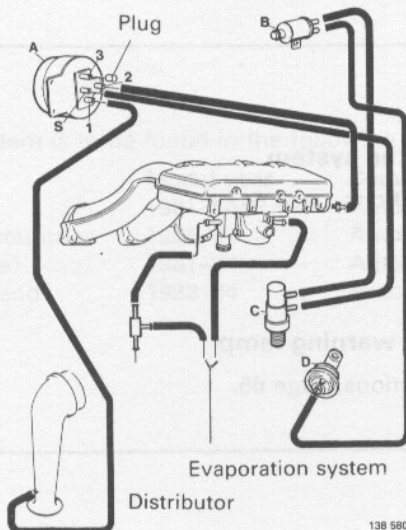
Ensure that correct valve is used.

The valves are marked with part number.

Trouble-shooting Defective EGR system with warm engine

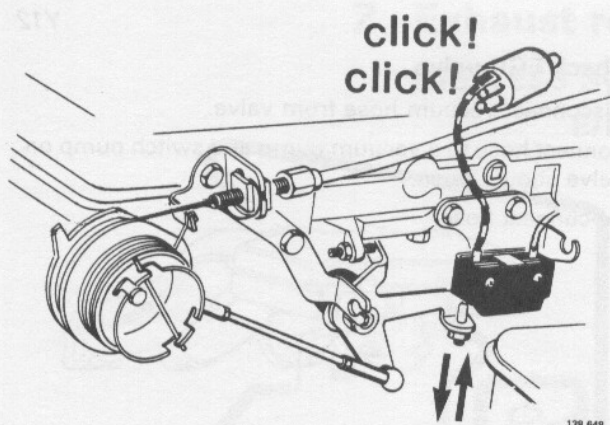
Operations Y6–14

Y6



Check hoses and connections

Check that the vacuum hoses are intact, correctly connected and that they are not pinched.



Check microswitch and solenoid valve

Turn on ignition.

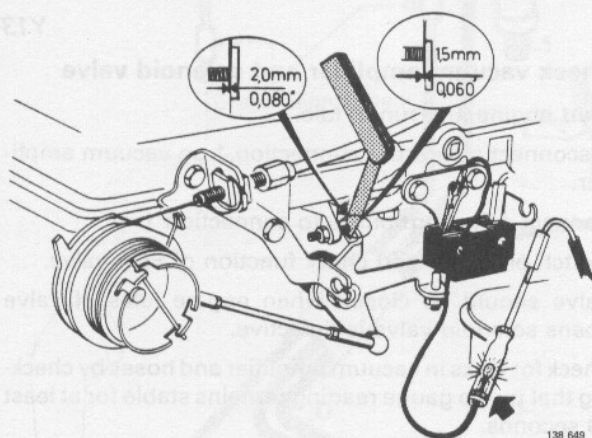
Press microswitch to make/break circuit to solenoid. A click should sound from solenoid.

Y7

Y8

If incorrect, check:

- microswitch ground
- current supply to solenoid
- wire between microswitch and solenoid



Check microswitch adjustment

Connect a test lamp between microswitch and wire to solenoid.

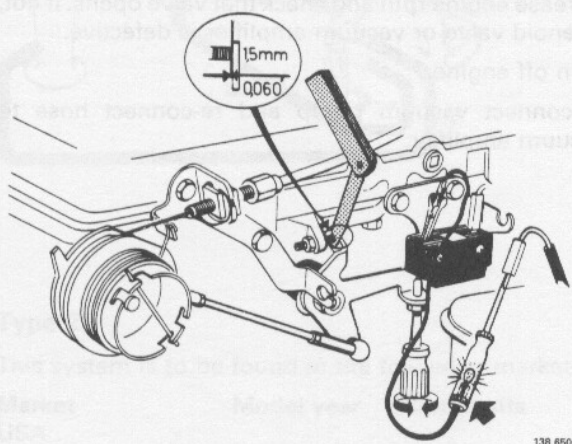
Ignition should be on.

Place a **1.5 mm** (0.06 in) feeler gauge between stop screw and boss. Test lamp should **light up**.

Change to a **2 mm** (0.08 in) feeler gauge and check that test lamp is **off**.

Switch off the ignition.

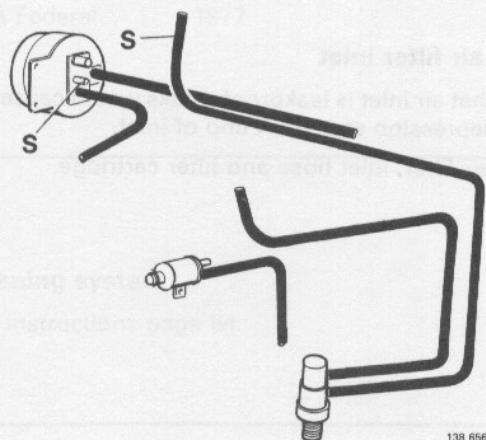
Y9



Adjusting microswitch:

- place a **1.5 mm** feeler gauge between stop screw and boss.
- slacken lock nut and unscrew **upper** stop screw until test lamp goes out
- screw in stop screw until lamp just lights. Tighten lock nut
- check adjustment according to Y9

Y10



Check thermostat valve

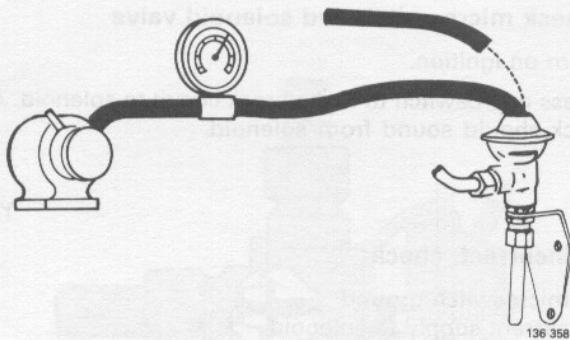
Disconnect thermostat valve hoses from 'S' on vacuum amplifier and from solenoid valve.

Blow through valve to check that it is open. **Note!** Engine must be warm, i.e., above 60°C (140°F).

Re-connect hose to solenoid valve.

Y11

Y12



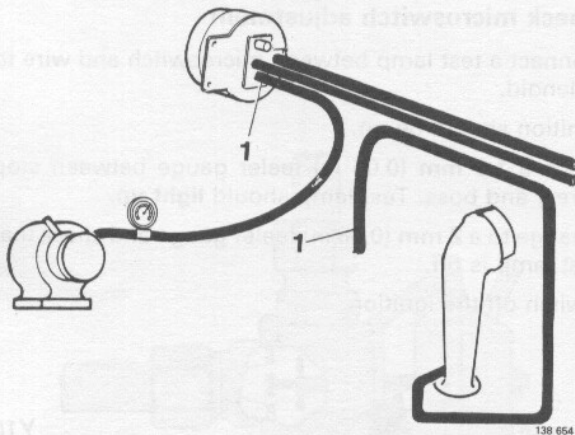
Check EGR valve

Disconnect vacuum hose from valve.

Connect hose to a vacuum pump and switch pump on. Valve should open.

Re-connect hose.

Y13



Check vacuum amplifier and solenoid valve

Start engine and run at idle.

Disconnect hose from connection 1 on vacuum amplifier.

Connect a vacuum pump to connection 1.

Switch on pump and check function of EGR valve.

Valve should be closed when engine idles. If valve opens solenoid valve is defective.

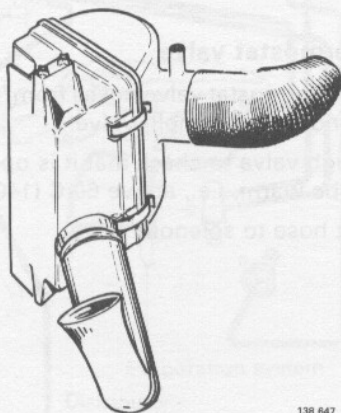
Check for leaks in vacuum amplifier and hoses by checking that pump gauge reading remains stable for at least 10 seconds.

Increase engine rpm and check that valve opens. If not, solenoid valve or vacuum amplifier is defective.

Turn off engine.

Disconnect vacuum pump and re-connect hose to vacuum amplifier.

Y14



Check air filter inlet

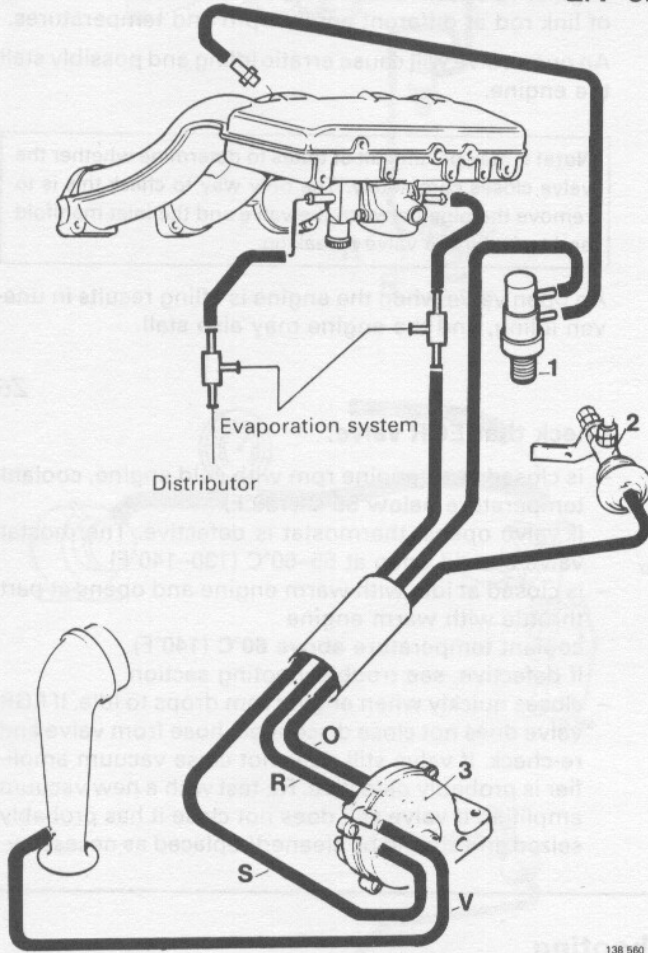
Check that air inlet is leakproof. Leaks would cause too low a depression at venturi end of inlet.

Check air filter, inlet hose and filter cartridge.

Z. Exhaust recirculation (EGR)

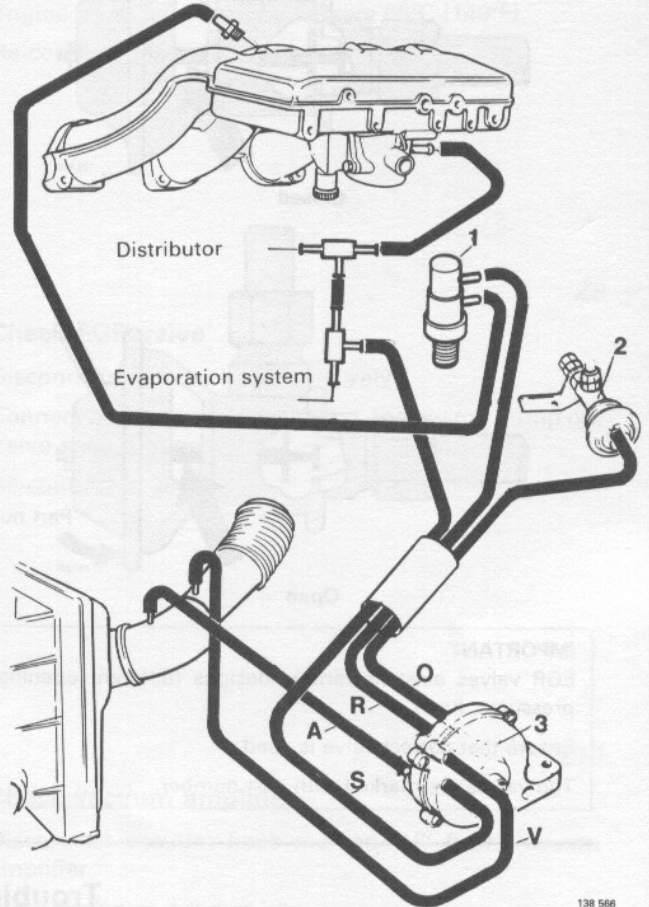
STEPLESS System types 2 and 3

E/F-engines



138 560

Z1



138 566

Z2

Type 2

This system is to be found in the following markets:

Market	Model year	Comments
USA		
California	1976	Late model
USA Federal	1977	

Type 3

This system is to be found in the following markets:

Market	Model year	Comments
USA Federal	1978-79	B 21 F
Canada	1981-83	B 23 E automatic
Australia	1981-84	B 23 E automatic
Nordic countries		
Switzerland	1983-84	B 23 E automatic

Z3

Cleaning system

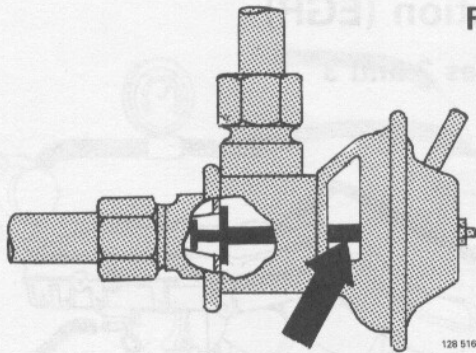
See instructions page 64.

Resetting warning lamp

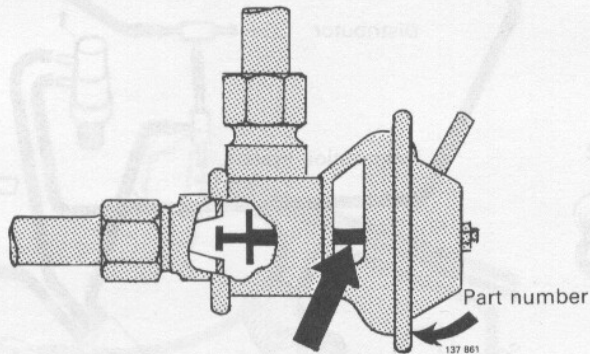
(Only F-engines)

See instructions page 65.

Z4



Closed



Open

Function check

Z5

EGR valve should only open at part throttle with warm engine. To check function of valve, observe movement of link rod at different engine rpm and temperatures.

An open valve will cause erratic idling and possibly stall the engine.

Note! It may be difficult at times to determine whether the valve closes completely. The only way to check this is to remove the pipe between the valve and the inlet manifold and to feel if the valve is leaking.

An open valve when the engine is idling results in uneven idling, and the engine may also stall.

Z6

Check that EGR valve:

- is closed at all engine rpm with cold engine, coolant temperature **below 55°C (130°F)**
If valve opens, thermostat is defective. Thermostat valve should open at 55–60°C (130–140°F)
- is closed at idle with warm engine and opens at part throttle with warm engine
coolant temperature **above 60°C (140°F)**.
If defective, see troubleshooting section
- closes quickly when engine rpm drops to idle. If EGR valve does not close disconnect hose from valve and re-check. If valve still does not close vacuum amplifier is probably defective. Re-test with a new vacuum amplifier. If valve still does not close it has probably seized and should be cleaned/replaced as necessary.

IMPORTANT

EGR valves exist in various designs (different opening pressures, flow).

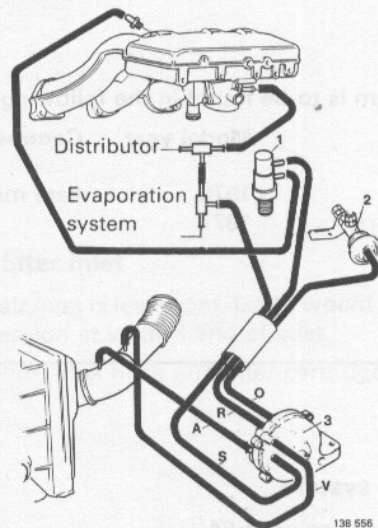
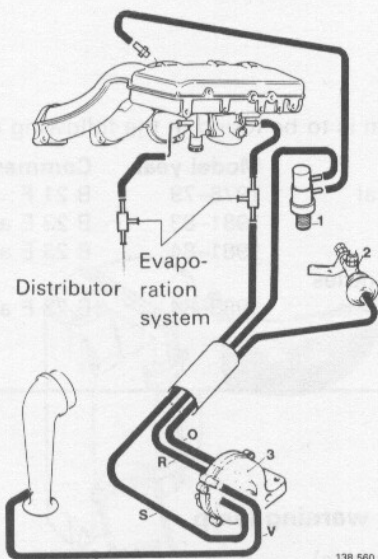
Ensure that correct valve is used.

The valves are marked with part number.

Trouble shooting

Defective EGR system with warm engine

Operations Z7–11

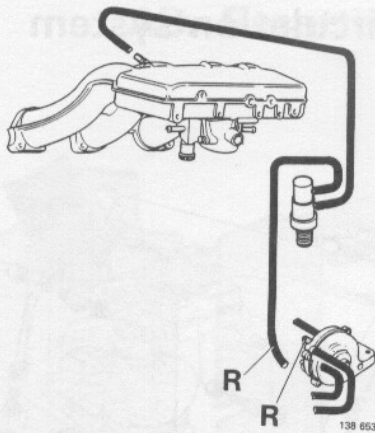


Check hoses and connections

Check that the vacuum hoses are intact, correctly connected and that they are not pinched. Check also the

vacuum hoses indirectly connected to the system, such as the hose to the distributor.

Z8



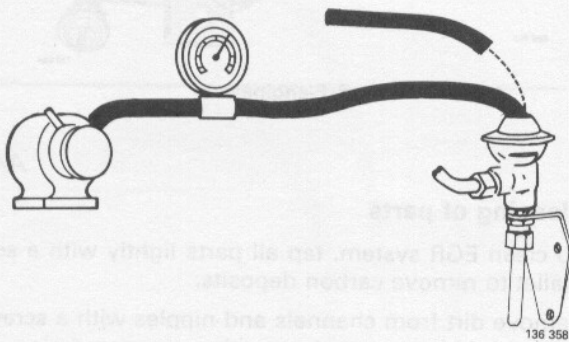
Check thermostat valve

Disconnect thermostat valve hoses from intake manifold and connection 'R' on vacuum amplifier.

Blow through valve to check that it is open. **Note!** Engine must be warm, i.e., above 60°C (140°F).

Re-connect hoses.

Z9



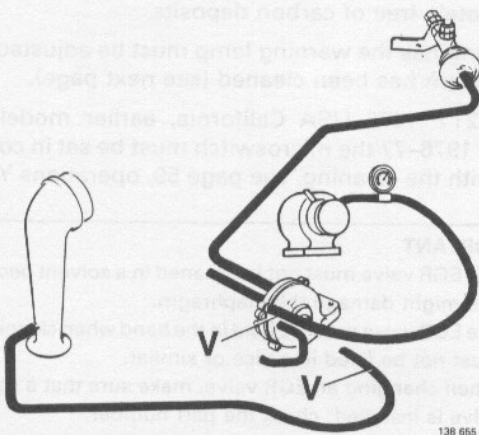
Check EGR valve

Disconnect vacuum hose from valve.

Connect hose to a vacuum pump and switch pump on. Valve should open.

Re-connect hose.

Z10



Check vacuum amplifier

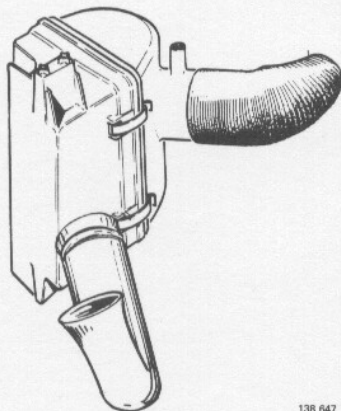
Disconnect vacuum hose marked "V" from vacuum amplifier.

Start engine and run at idle.

Connect a vacuum pump to vacuum amplifier connection 'V' and start pump. EGR valve should open if vacuum amplifier is functioning correctly.

Turn off engine and re-connect hose 'V'.

Z11



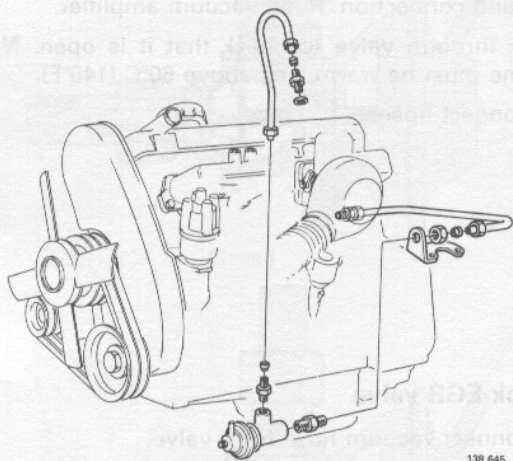
Check air filter inlet

Check that air inlet is leakproof. Leaks would cause too low a depression at venturi end of inlet.

Check air filter, inlet hose and filter cartridge.

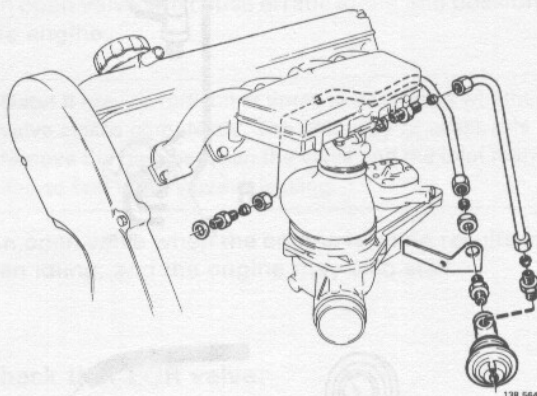
AA. Cleaning of exhaust gas recirculation system

Applies to all systems



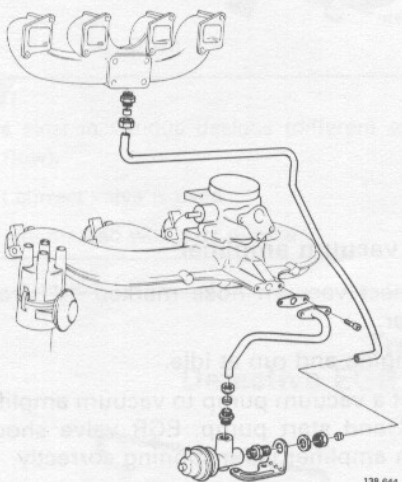
A-engines

138 645



E/F-engines

138 564



ET-engines

139 644

AA1

Cleaning of parts

To clean EGR system, tap all parts lightly with a soft mallet to remove carbon deposits.

Remove dirt from channels and nipples with a screwdriver and blow parts clean with compressed air.

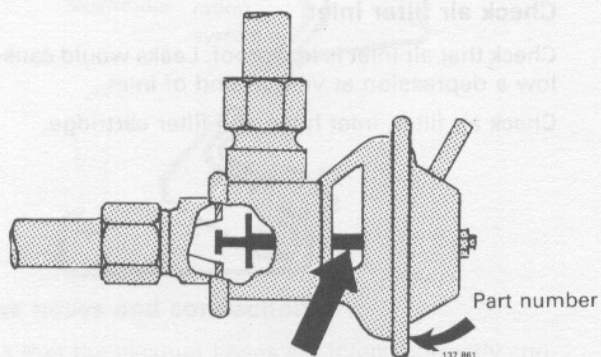
Check in particular that the valve seat in the EGR valve is completely free of carbon deposits.

On F-engines the warning lamp must be adjusted after the system has been cleaned (see next page).

On B 21 F 1976 USA California, earlier model, and Japan 1976-77 the microswitch must be set in connection with the cleaning, see page 59, operations Y7-10.

IMPORTANT

- The EGR valve must not be cleaned in a solvent because this might damage the diaphragm.
- The EGR valve must be held in the hand when cleaning. It must not be fixed in a vice or similar.
- When changing an EGR valve, make sure that a correct valve is installed; check the part number.

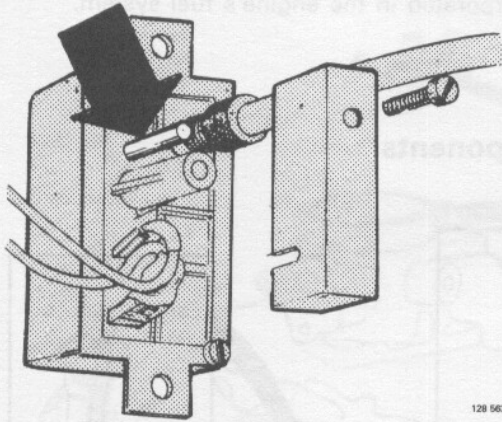


137 861

AB. Resetting dashboard indicator lamp

F engines only

AB1



Indicator lamp will light each time the exhaust gas recirculation system is due for service

Lamp is actuated by a switch connected to car odometer and mounted on back of speedometer.

To reset switch, remove cover (shown adjacent) and depress white push button (arrowed).

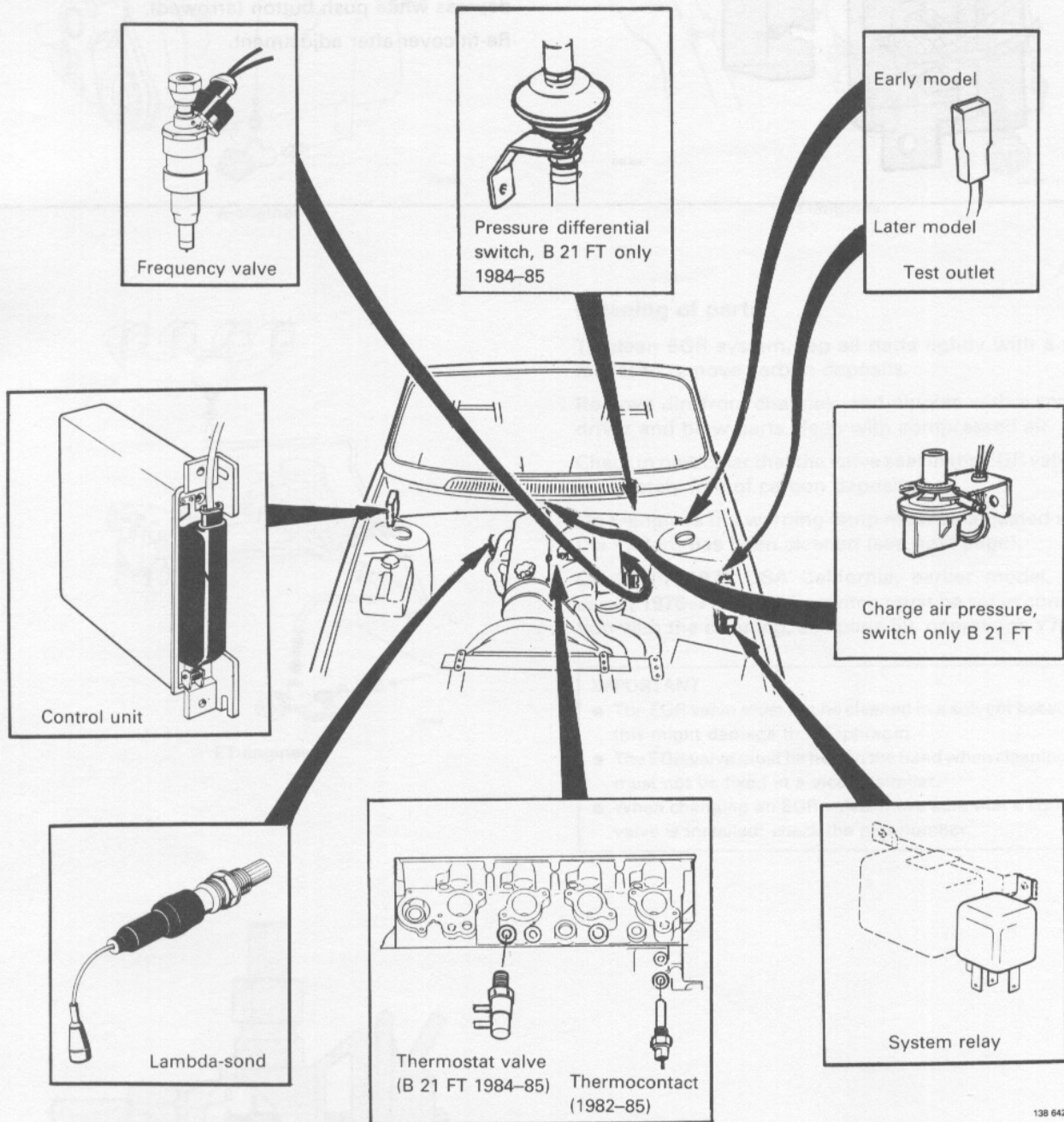
Re-fit cover after adjustment.

AC. Lambda-sond system

Applies to B 21 F/FT-engines with CI fuel injection system. Engines with LH-jetronic fuel injection system do not have separate Lambda-sond system, as it is incorporated in the engine's fuel system.

AC1

Positioning of components

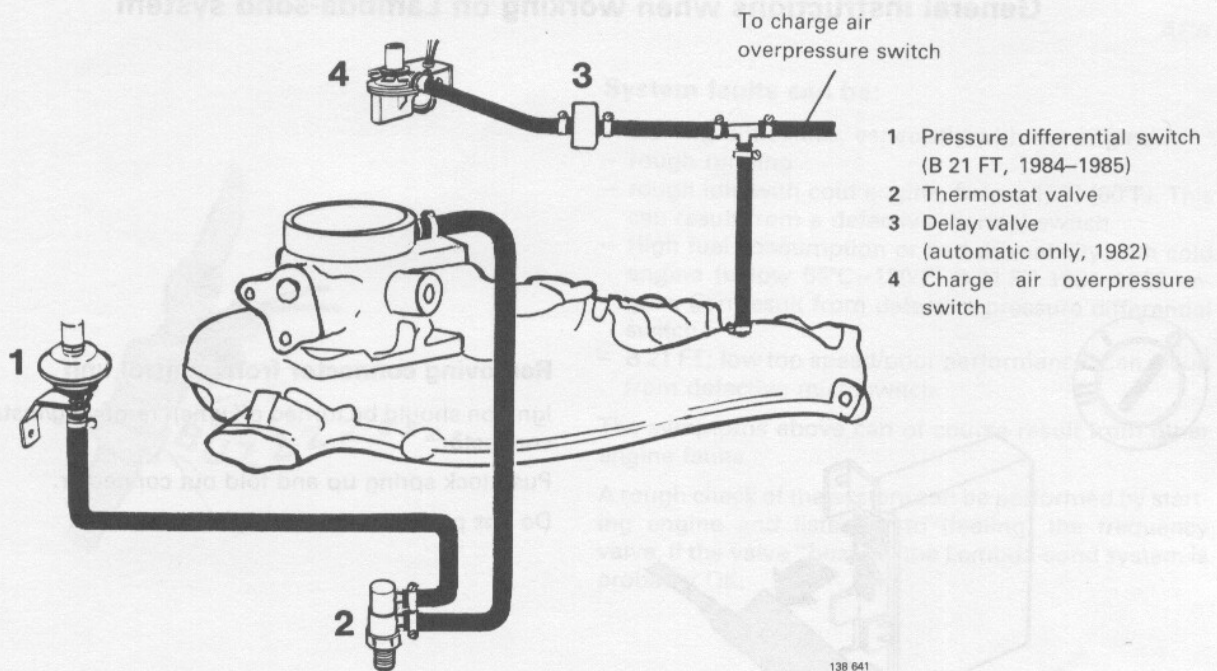


138 642

Connection of vacuum hoses

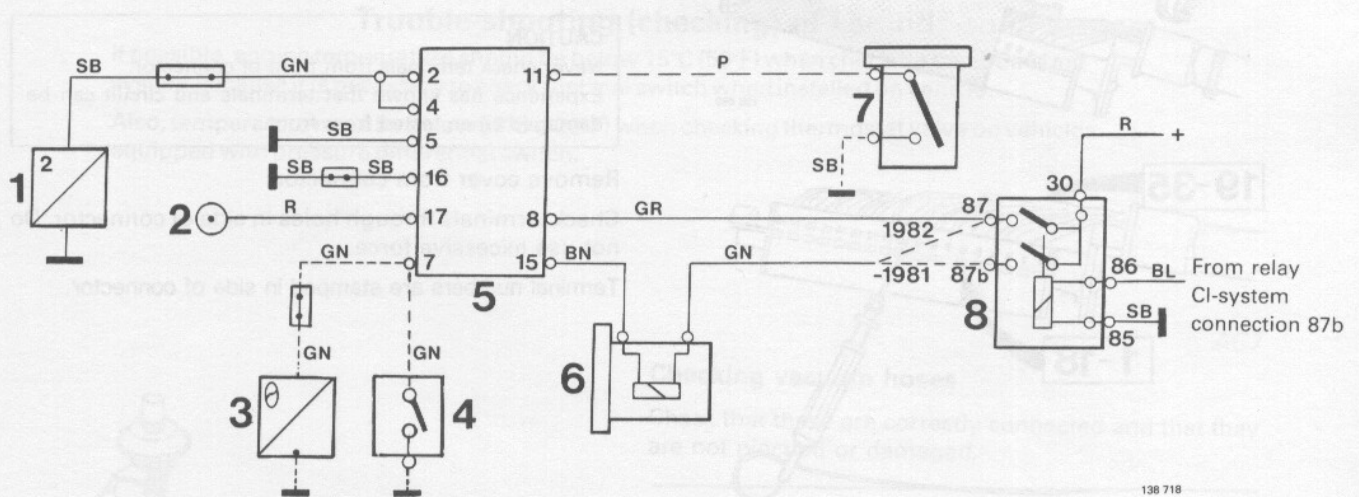
For pressure differential switch and charge air pressure switch

AC2



Wiring diagram

AC3



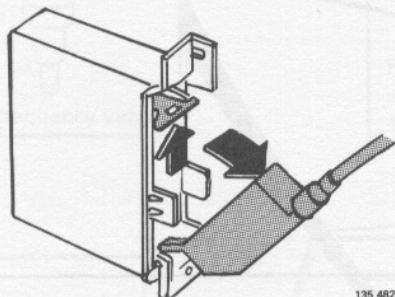
Colour coding

- | | |
|------------|------------|
| SB = black | R = red |
| GR = grey | BN = brown |
| W = white | BL = blue |
| GN = green | P = pink |

List of components

- 1 Lambda-sond
- 2 Test outlet
- 3 Thermal switch (1982)
- 4 Charge air pressure switch (only B 21 FT)
- 5 Control unit
- 6 Frequency valve
- 7 Pressure differential switch (B 21 FT only, 1984-1985)
- 8 System relay

General instructions when working on Lambda-sond system



135 482

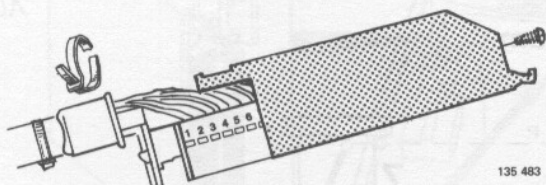
AC4

Removing connector from control unit

Ignition should be turned off when removing/installing connector.

Push lock spring up and fold out connector.

Do **not** pull connector straight out.



135 483

AC5

Checking terminals

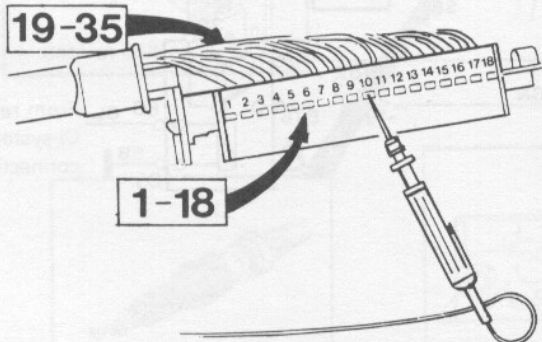
CAUTION

Never check terminals from front of connector. Experience has shown that terminals and circuit can be damaged when tested from front.

Remove cover from connector.

Check terminals through holes in side of connector. Do not use excessive force.

Terminal numbers are stamped in side of connector.



135 484

Fault symptoms

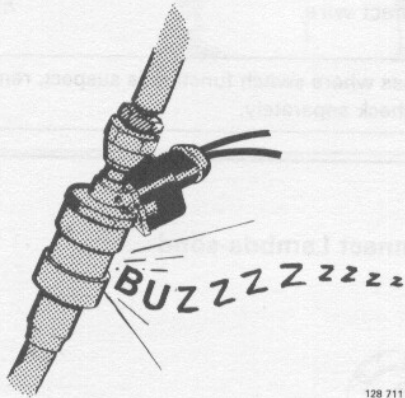
AC6

System faults can be:

- starting difficulties, especially with hot engine
- rough running
- rough idle with cold engine, below 15°C (60°F). This can result from a defective thermal switch
- High fuel consumption or bad driveability with cold engine (below 55°C=130°F) B 21 FT 1984-1985 engine. Can result from defective pressure differential switch
- B 21 FT: low top speed/poor performance. Can result from defective microswitch.

The symptoms above can of course result from other engine faults.

A rough check of the system can be performed by starting engine and listening to (feeling) the frequency valve. If the valve "buzzes" the Lambda-sond system is probably OK.



Trouble-shooting (checking) of Lambda-sond system

If possible, engine temperature should be below 15°C (50°F) when checking Lambda-sond system because it is necessary to check thermal switch when installed on vehicle.

Also, temperature must be below 50°C (120°F) when checking thermostat valve on vehicles equipped with pressure differential switch.

AC7

Checking vacuum hoses

Check that these are correctly connected and that they are not pinched or damaged.

Only B 21 FT 1984-1985

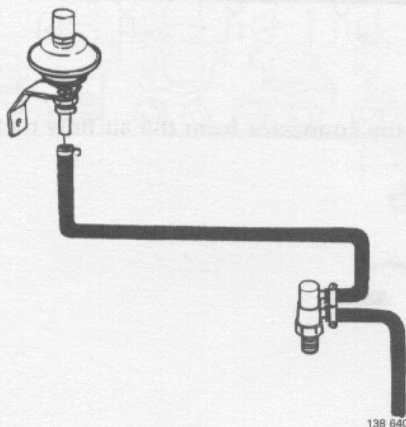
AC8

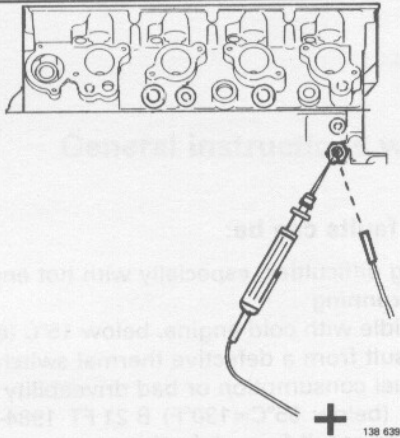
Checking thermostat valve

Coolant temperature below 50°C (120°F).

Disconnect hose from pressure differential switch and blow in hose.

Valve should be open at temperatures below 55°C (130°F).





1982-

AC9

Check thermal switch

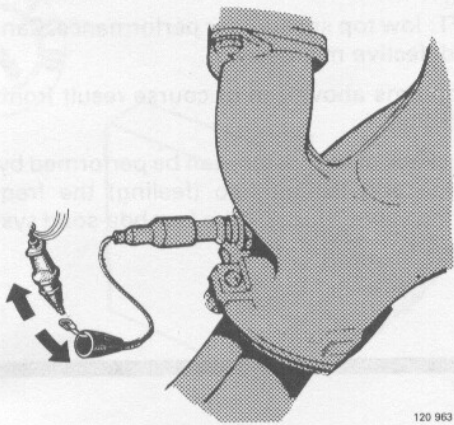
Disconnect wire from thermal switch.

Connect a test lamp between wire and a 12 V current supply.

Test lamp should **light** (switch closed) at coolant temperatures **below 15°C (60°F)** and be **off** at temperatures **above 15°C (60°F)**.

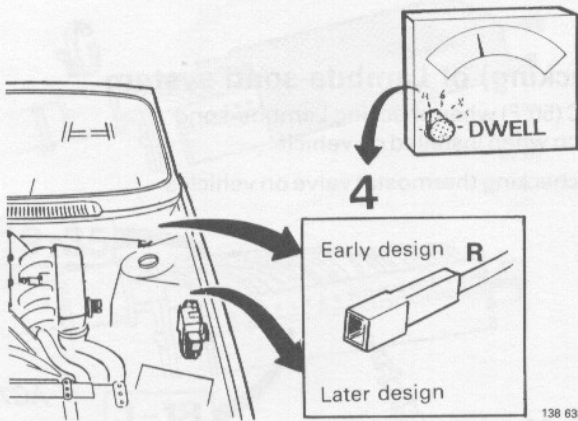
Reconnect wire.

In cases where switch function is suspect, remove switch and check separately.



AC10

Disconnect Lambda-sond



AC11

Connect a dwell meter

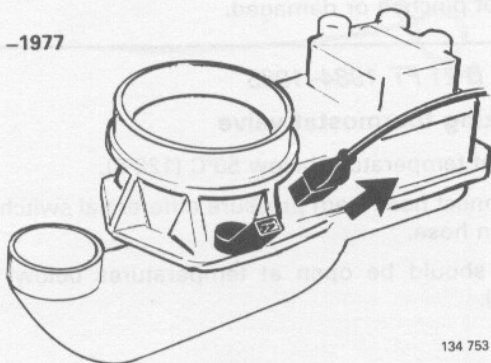
Connect red wire to test point.

Set meter to position for **4 cylinder** engine.

The dwell meter must have a measuring range of at least 70°.

Example of suitable instruments: Volvo Mono-Tester and SUN instrument of later design.

-1977



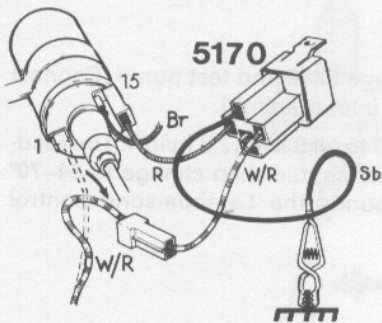
-1977

AC12

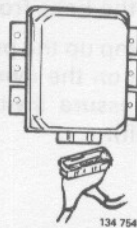
B 21 F

Remove the connector from the air flow meter.

1978-



1981-



1978-

AC13

B 21 F/FT

Connect test relay 5170.

Note! On 1981 models – (except turbo) the connector should also be removed from the ignition system control unit. Be careful; do not loosen rubber seal in the connector.

AC14

Switch on the ignition

AC15

Check meter reading and listen to frequency valve

A buzzing sound should be heard from valve and meter should show:

B 21 F	51–57°
B 21 FT	42–48°

Valve does not buzz and meter shows 0



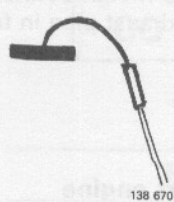
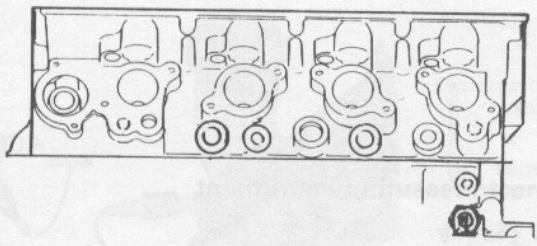
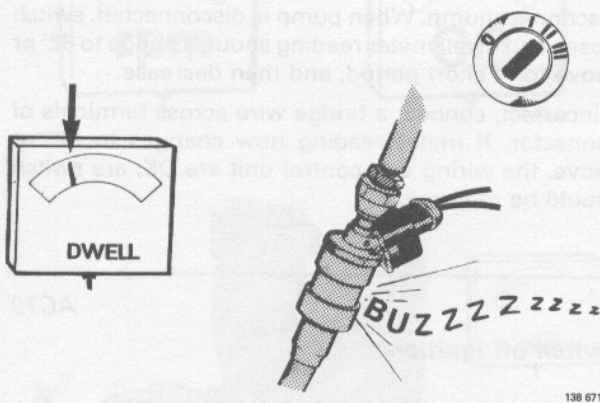
Valve does not buzz but meter deflects



Valve buzzes but meter shows 0

probably a break in the wire to the test point

Valve buzzes but meter reading too high



1982 models –

AC16

Check enrichment (cold engine)

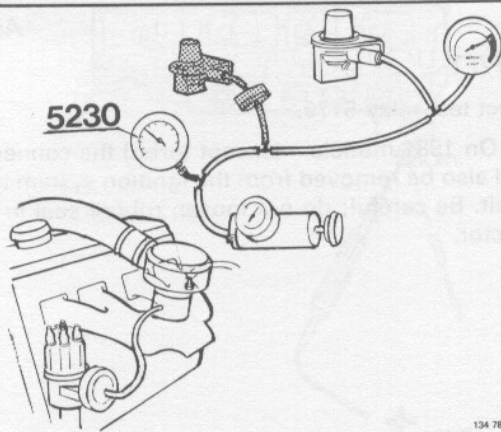
Disconnect and earth wire from thermal switch.

Dwell meter reading should change to:

B 21 F	54°
B 21 FT	64–70°

Re-connect wire.

If readings are not according to above, check wiring before testing with a new control unit.



134 785

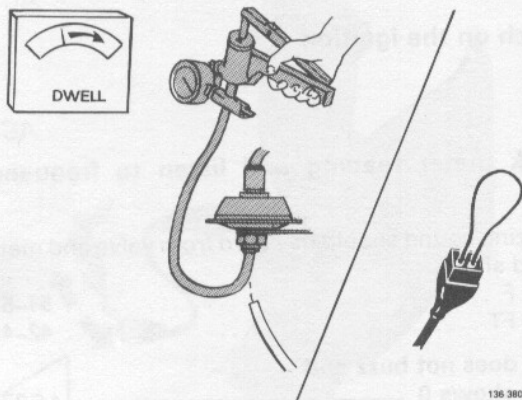
Only B 21 FT

AC17

Check enrichment

Connect pressure gauge **5230** and test pump. Connect to the hose from the inlet manifold.

Pump up the pressure to **20.3 kPa** (2.8 lb/in²). The reading on the dwell meter should then change to **64–70°** (pressure switch grounds the Lambda-sond control unit).



136 380

Only B 21 FT 1984–1985

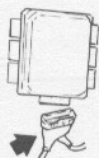
AC18

Check acceleration enrichment

Connect a vacuum pump to pressure differential switch and start pump.

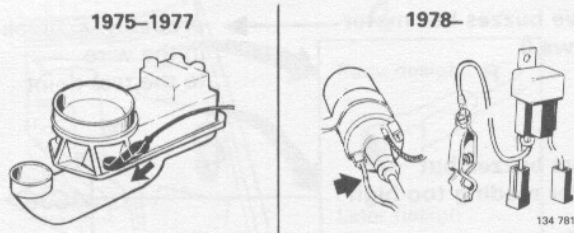
Disconnect pump. When pump is disconnected, switch closes and dwell meter reading should change to **82° or above** for a short period, and then decrease.

If incorrect, connect a bridge wire across terminals of connector. If meter reading now changes to **82° or above**, the wiring and control unit are OK, are switch should be replaced.



AC19

Switch off ignition



1975–1977

1978–

134 781

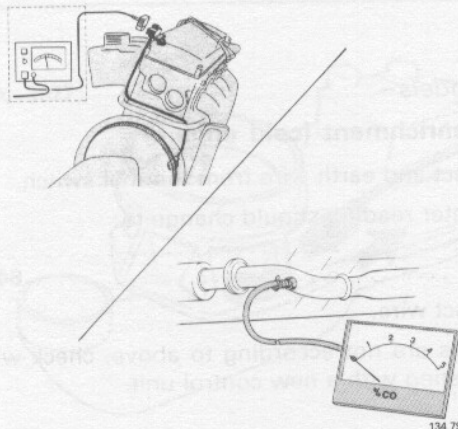
AC20

Connect wires and connector

Connect the connector to the ignition system control unit. Check that rubber seal is in place. Without the seal, water can leak in and cause oxidation etc.

1975–1977: connect connector to air flow meter.

1978–: remove test relay 5170. Connect the wire to ignition coil.



134 792

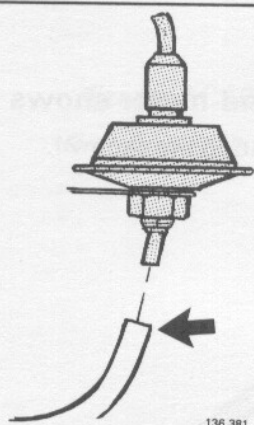
AC21

Connect measuring instrument

- rev counter
- CO meter. Connect the meter to the probe port in the exhaust pipe in front of the catalytic converter

AC22

Start engine



136 381

B 21 FT 1984-1985

AC23

Check thermostat valve

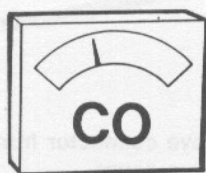
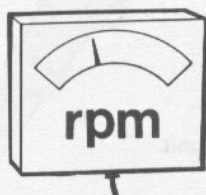
Warm-up engine and disconnect hose from pressure differential switch. Place finger over end of hose.

Thermal vacuum switch should close (i.e. no suction) at approx. 55°C (130°F).

AC24

Warm-up engine

Wait at least 5 min after coolant thermostat has opened before carrying out next step.

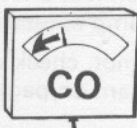
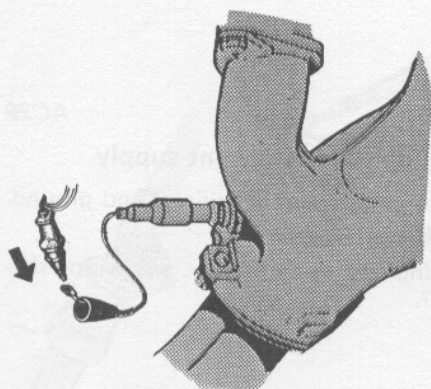


136 496

AC25

Check idle speed and CO content

Adjust if necessary.



138 669

AC26

Check Lambda-sond function

Connect Lambda-sond to dwell meter and CO meter. Check reading.

Dwell meter reading should change slightly, usually drop when sond is connected. CO level should drop to less than 1.0 %.

If neither CO content nor dwell meter reading changes:

Disconnect Lambda-sond and ground the wire. CO content and dwell angle should increase.

Wiring and control unit are OK if meter reading increases.

Re-test with a new Lambda-sond.

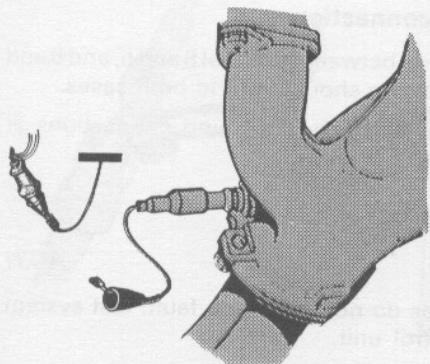
If meter reading does not change, either control unit or wiring to control unit is defective.

CO content does not change, dwell meter reading drops significantly:

This indicates a defective frequency valve. Re-test with a new valve.

CO content and dwell meter reading increase:

This indicates a defective Lambda-sond (internal short-circuit). Re-test with a new Lambda-sond.

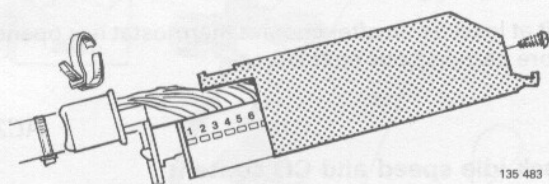


138 672

End of test

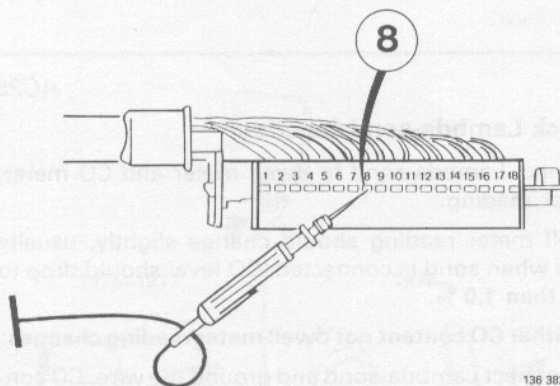
From AC15: Frequency valve does not buzz and meter shows 0

On completion of repair proceed with operation AC16 on page 71.



Switch off ignition

AC27



Remove connector from control unit.
Remove cover

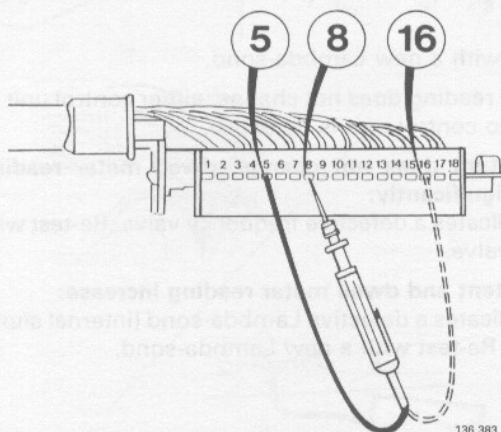
AC28

Switch on ignition. Check current supply

AC29

Connect a test lamp between terminal 8 and ground. Lamp should light.

If not, check wiring and system relay, see wiring diagram on page 67.



Check ground connections

AC30

Connect a test lamp between terminal 8 and 5, and 8 and 16 respectively. Lamp should light in both cases.

If lamp does not light, check ground connections at intake manifold.

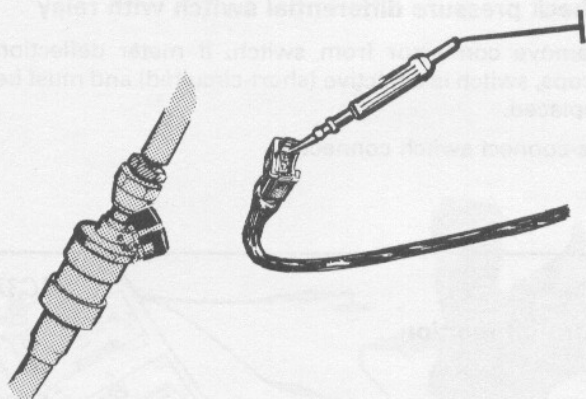
AC31

If the above steps do not indicate a fault, test system with a new control unit.

End

From AC16: Valve does not buzz but meter deflects

On completion of repair continue with operation AC16 on page 71.



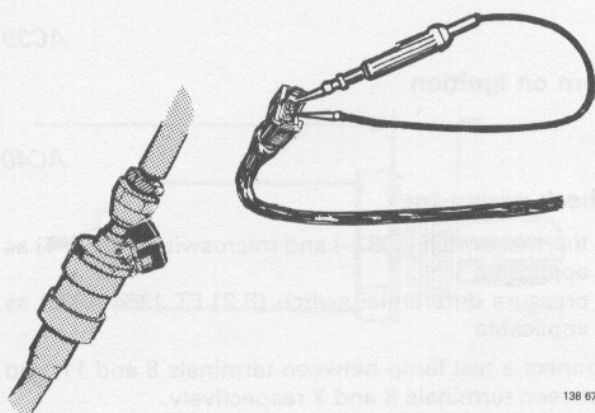
138 674

AC32

Check current supply to frequency valve

Connect a test lamp between the connector pin (green wire) and ground. Lamp should light.

If lamp does not light, check function of system relay and wiring.



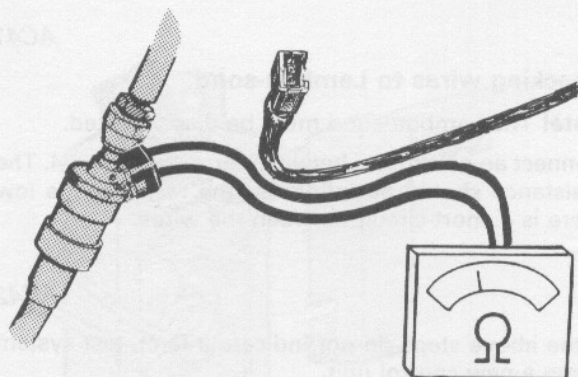
138 673

AC33

Check wire from frequency valve to control unit

Connect a test lamp between both connector pins. Lamp should light (dimly).

If lamp does not light, control unit or wiring to control unit is defective.



138 675

AC34

Measure frequency valve resistance

Use an ohmmeter.

Resistance should be 2-3 ohms.

Replace frequency valve if incorrect.

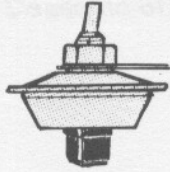
AC35

If the above steps do not indicate a fault, test system with a new control unit.

End

From AC15: Valve buzzes but meter reading is too high

On completion of repair proceed with operation AC16 on page 71.



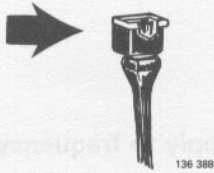
B 21 FT 1984-1985

AC36

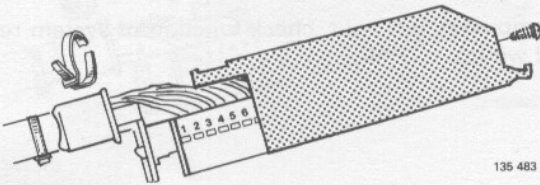
Check pressure differential switch with relay

Remove connector from switch. If meter deflection drops, switch is defective (short-circuited) and must be replaced.

Re-connect switch connector.



136 388



135 483

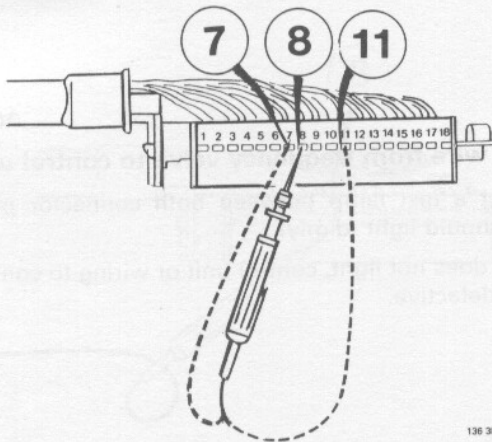
AC37

Turn off ignition

AC38

**Remove connector from control unit
 Remove cover**

AC39



136 389

Turn on ignition

AC40

Check wiring to:

- thermal switch (1982-) and microswitch (B 21 FT) as applicable
- pressure differential switch (B 21 FT 1984-1985) as applicable

Connect a test lamp between terminals 8 and 11, and between terminals 8 and 7 respectively.

Lamp should **not** light in either case. If lamp lights, wire is short-circuited.

AC41

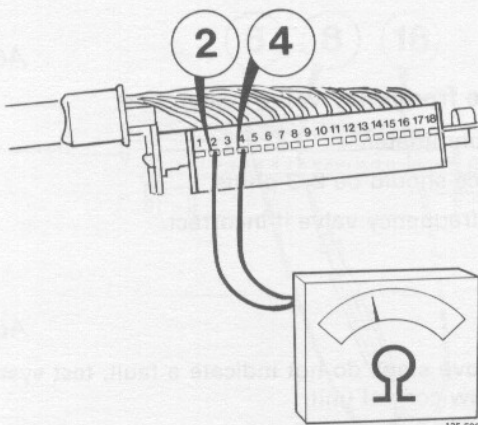
Checking wires to Lambda-sond

Note! The Lambda-sond must be disconnected.

Connect an ohmmeter between terminals 2 and 4. The resistance should be infinite. If the resistance is low there is a short-circuit between the wires.

AC42

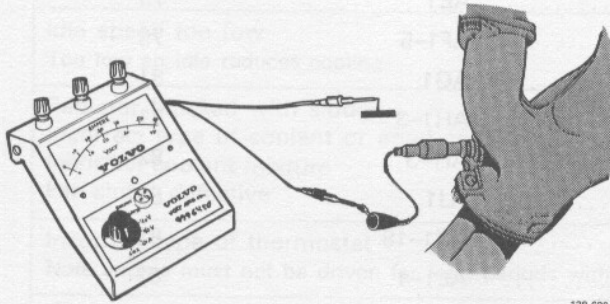
If the above steps do not indicate a fault, test system using a new control unit.



135 508

End

AD. Lambda-sond



138 690

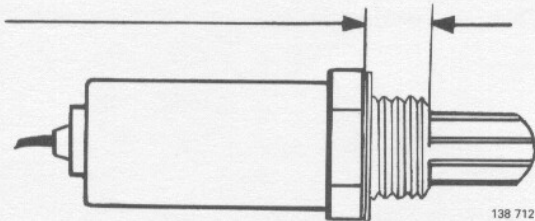
AD1

Checking Lambda-sond

As an alternative checking method, the Lambda-sond can be checked by using a voltmeter.

Run the engine warm for at least 5 minutes after the coolant thermostat has opened.

With the engine running, connect a voltmeter to the sond. The meter must give a reading (normally 0.5–0.7 V) if the sond is in order.



138 712

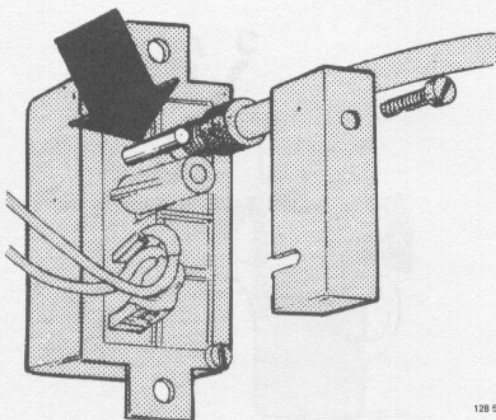
AD2

Replacing Lambda-sond

Smear bolt joint paste "Never-Seez" (P/N 1161035-9) on Lambda-sond threads. Make sure that no paste enters slot as this will inhibit function of Lambda-sond.

Torque to **55 Nm** (40 ft.lbs).

When removing/installing a sond in B 21 FT engines, use tool 5250.



128 563

AD3

Resetting dashboard indicator lamp

Indicator lamp will light each time the exhaust gas recirculation system is due for service.

Lamp is actuated by a switch connected to car odometer and mounted on back of speedometer.

To reset switch, remove cover (shown adjacent) and depress white push button (arrowed).

Re-fit cover after adjustment.

Group 26 Cooling system

	Operation	Page
Fault symptoms – poor cooling	AE1	79
Coolant	AF1-5	79
Testing cooling system	AG1	81
Radiator	AH1-3	81
Thermostat	AI1-3	82
Temperature sensor	AJ1	82
Coolant (water) pump, replacement	AK1-18	83
Drive belts	AL1-4	87
Cooling fan	AM1	89
Electric cooling fan	AN1-4	90

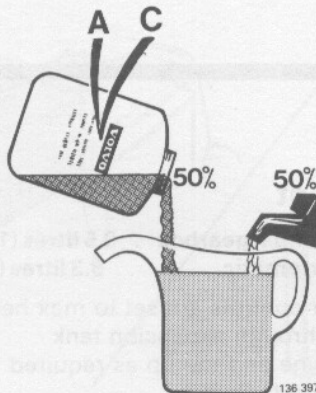
AE. Fault symptoms – poor cooling

Engine overheats and/or poor operation of air conditioning

POSSIBLE CAUSE	REMEDY	OPERATION
Coolant leakage, opening pressure of expansion tank cap too low	Pressure-test system	AG1
Radiator blocked by e.g. insects	Clean	AH1
Air bypasses radiator	Check/adjust position	AH3
Ignition setting too low Retarded ignition increases engine combustion temperature	Check/adjust	–
CO content too low Poor mixture (low CO) increases engine combustion temperature	Check/adjust	–
Idle speed too low Too low an idle reduces cooling	Check/adjust	–
Radiator blocked with sludge Incorrect type of coolant or aged coolant Incorrect coolant mixture Fan clutch defective	Check radiator Check/drain coolant Check/adjust mixture Replace fan clutch	AH2 AF3 AF1
Incorrect type of thermostat Note engine must not be driven for long periods without thermostat	Check/replace	AI 1–3
Vehicles with AC: Idle speed compensation defective	Check/adjust	–
Electric cooling fan defective	Check/adjust	AN1–4

AF. Coolant

AF1



General

Since aluminum is used in the engines, active corrosion protection is necessary in the coolant to help prevent corrosion damage.

* Use genuine Volvo coolant diluted with **clean** water in proportions of **50/50**. This mixture helps to prevent corrosion and frost damage.

Vehicles manufactured before 1981 were filled with **type A** (red) coolant whereas vehicles manufactured after 1981 are filled with the improved **type C** (blue-green) coolant.

* See overleaf

AF2

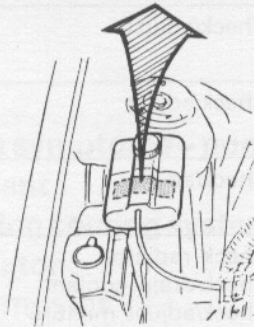
Topping-up cooling system

Never add only water to the cooling system. Use genuine Volvo coolant diluted to a 50/50 mixture with clean water.

Two different types of coolants are in use, type A and type C. When topping up a cooling system filled with type A coolant – either use type A or add type C coolant. Note, however, that no more than 25 % of the coolant can be substituted with type C coolant. If more coolant is required the cooling system must be drained and filled afresh with type C coolant.

E.g. If cooling system capacity = 9.5 litres (10 US qts) no more than 2.4 litres (2.50 US qts) of type C coolant can be used to top up system. (2.4 l refers to diluted coolant i.e. 50 % water + 50 % concentrated coolant).

VOLVO ORIGINAL KYLVÄTSKA TYP C ÄR PÅFYLLO. KYLSYSTEMET ÄR FRODET SKYDDAT TILL -30°C. EFTERFYLLO ÅRETT RUMT MED EN DEL VATTEN OCH EN DEL VOLVO KYLVÄTSKA TYP C. OBS! FÄR EJ BLANDAS MED ANDRA KYLVÄTSKOR.
FILLED WITH GENUINE VOLVO COOLANT TYPE C. COOLING SYSTEM IS PROTECTED TO -22°F. TOP UP YEAR ROUND WITH HALF WATER AND HALF VOLVO COOLANT TYPE C. NOTE! DO NOT MIX WITH OTHER COOLANTS.
REPLIRI DE LIQUIDE ANTIGEL "VOLVO" TYPE C VALABLE JUSQU'À -30°C. REMPLIR EN TOUTE SAISON AVEC MOITIÉ EAU ET MOITIÉ ANTIGEL TYPE C. ATTENTION! NE MÉLANGEZ PAS AVEC D'AUTRE ANTIGEL.



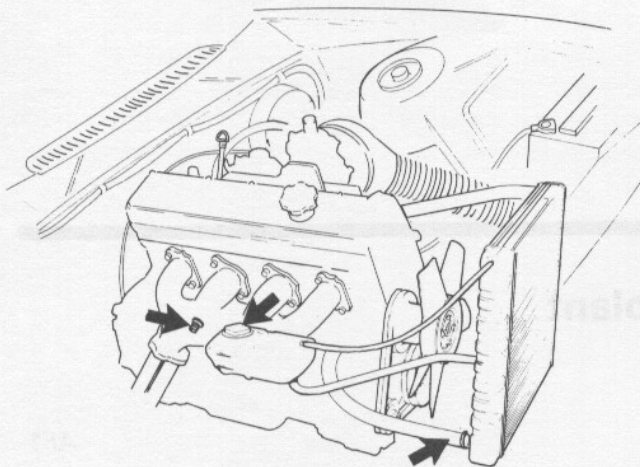
138 686

AF3

Changing coolant

The coolant must be replaced regularly since the corrosion protection in the coolant loses effect with time.

Always fill cooling system with **type C** coolant. Remember to change the decal (P/N 1 331 473-7) on the expansion tank when changing to type C coolant.



AF4

Draining

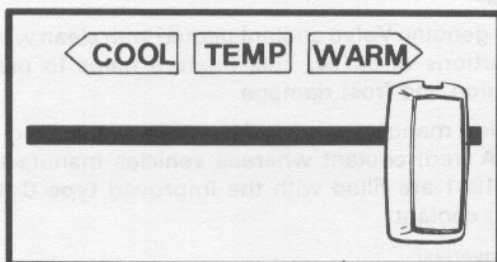
- set dashboard heater control to max. heat
- disconnect battery
- unscrew cap from expansion tank
- open drain cock on right side of cylinder block. Attach hose to cock to prevent spillages
- disconnect lower radiator hose from radiator
- close cock, re-connect lower radiator hose and battery

AF5

Filling coolant

Capacity with **manual gearbox** 9.5 litres (10.0 US qts)
automatic 9.3 litres (9.8 US qts)

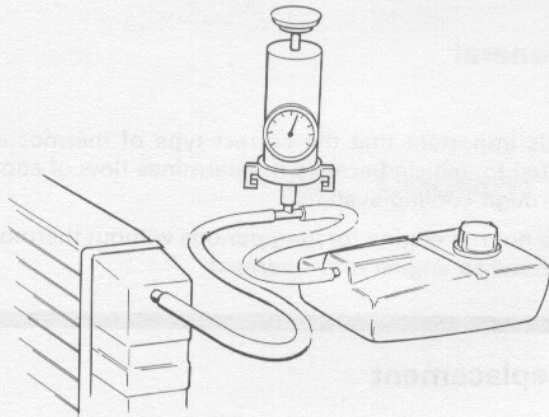
- ensure heater controls are set to max heat
- add coolant through expansion tank
- warm-up engine and top up as required
- re-fit expansion tank cap.



138 713

AG. Pressure testing cooling system

AG1



128 186

Check breather hose between radiator and expansion tank. Replace hose if worn or cracked.

Connect pressure tester between radiator and expansion tank.

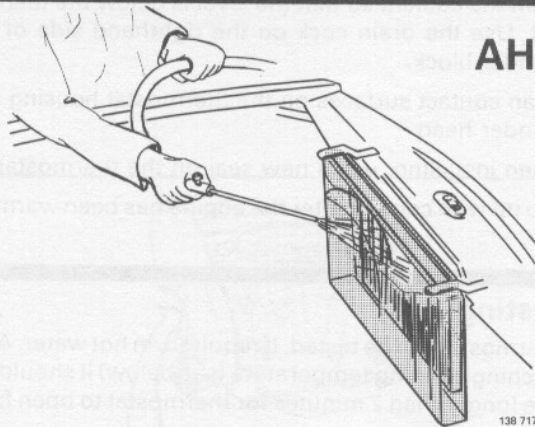
Increase pressure and check opening pressure of expansion tank cap and for leaks:

- opening pressure = **65–85 kPa** (9.2–12.0 psi)
- check that pressure does not drop noticeably during **30 seconds**.

AH. Radiator

Cleaning radiator

AH1



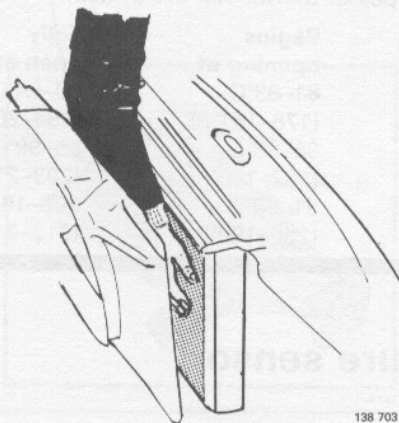
138 717

Remove flies, etc. from radiator grille by hosing radiator from inside as illustrated. Blow clean with compressed air.

Note! Do not spray water or blow air at too high a pressure at radiator as damage may result.

Checking radiator

AH2



138 703

Heat up engine until thermostat opens and then for a few more minutes.

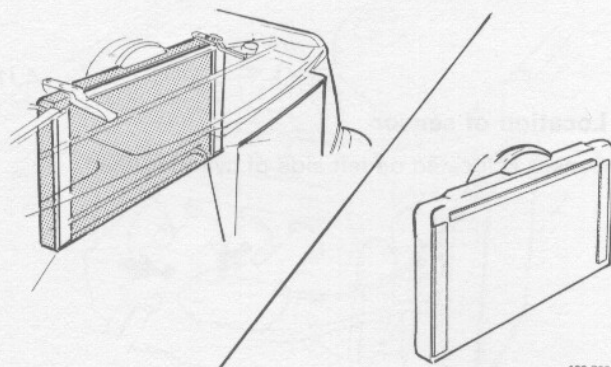
Turn off engine.

Detach fan shroud from radiator.

Check radiator with hand, warm and cold sections indicate that radiator is partly blocked.

Checking/adjusting position of radiator

AH3



138 702

Radiator must lie flush with front panel otherwise some air will bypass radiator.

Adjust position of front panel as required.

Plastic foam can also be used to seal gap between radiator and front panel.

- 2 strips 20x50x410 mm
- 1 strip 10x25x660 mm

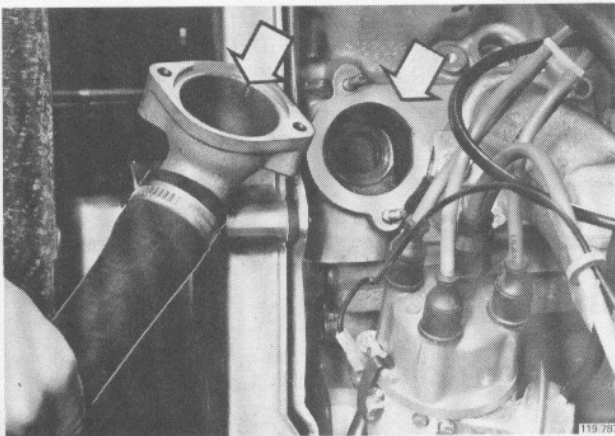
AI. Coolant thermostat

General

A11

It is important that the correct type of thermostat is fitted to vehicle because it determines flow of coolant through cooling system.

Do not run engine for long periods without thermostat otherwise engine may overheat.



Replacement

A12

Drain the coolant so that the level is below the thermostat. Use the drain cock on the righthand side of the cylinder block.

Clean contact surfaces on the thermostat housing and cylinder head.

When installing, use a new seal on the thermostat.

Top up with coolant after the engine has been warmed-up.

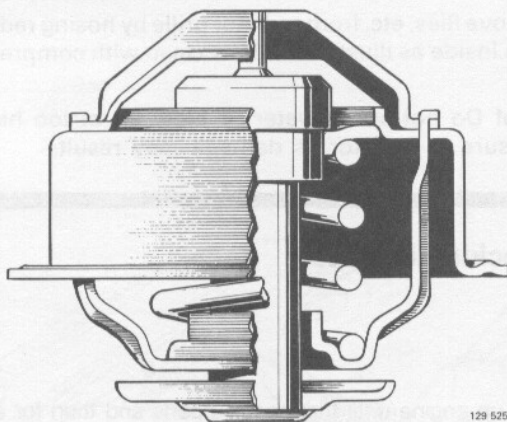
Testing

A13

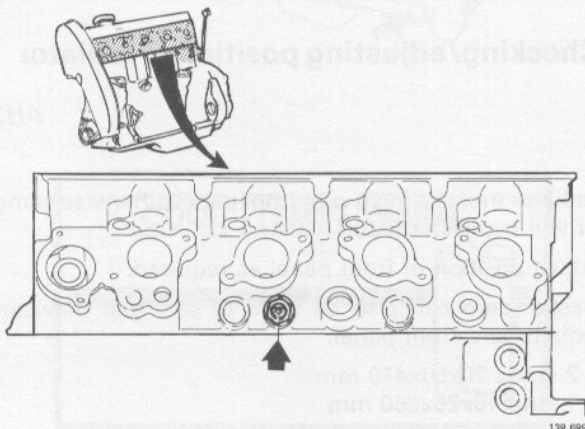
Thermostat can be tested, if required, in hot water. After reaching opening temperature (see below) it should not take longer than 2 minutes for thermostat to open fully.

Three types of thermostat are in use:

Marking	Begins opening at	Fully open at
82	81–83°C (178–181°F)	90–94°C (194–201°F)
87	86–88°C (187–190°F)	95–99°C (203–210°F)
92	91–93°C (196–199°F)	100–104°C (212–219°F)



AJ. Coolant temperature sensor



AJ1

Location of sensor

Sensor is located on left side of cylinder head.

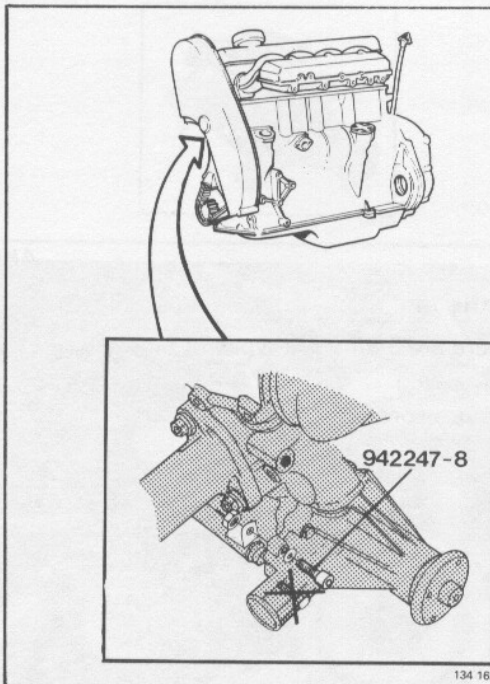
AK. Coolant pump, replacement

AK1

General

Replacement of coolant pump, rubber seals or gasket must always be preceded by pressure testing the cooling system.

Coolant pumps are often changed unnecessarily, for example when only a gasket is leaking. In the case of a leakage, the system should therefore be pressure tested (see AG1) in order to establish whether there is a leakage, and to avoid unnecessary pump replacement.



AK2

Changed mounting bolt for return pipe

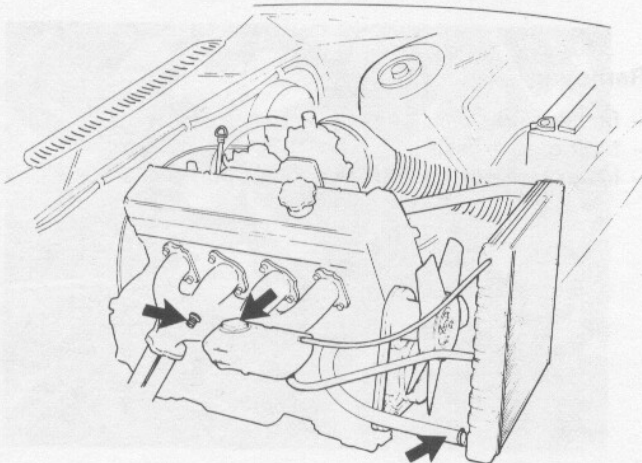
The hexagonal bolt has been replaced by a different bolt, P/N. 942247-8. This has been done to make it easier to remove/install the bolt on engines with Pulsair system.

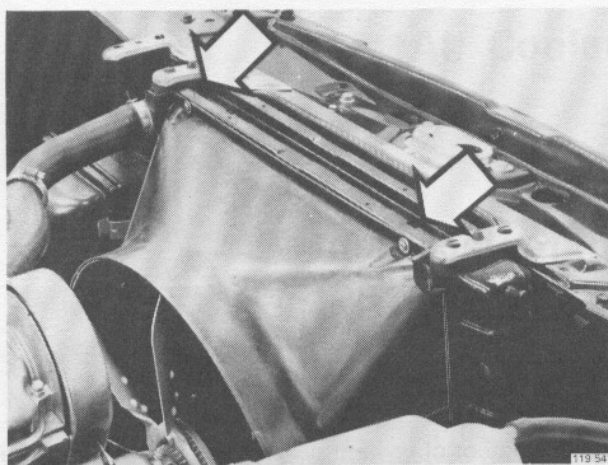
See page 85 regarding removal of hexagonal bolt on engines with Pulsair system.

AK3

Drain the cooling system

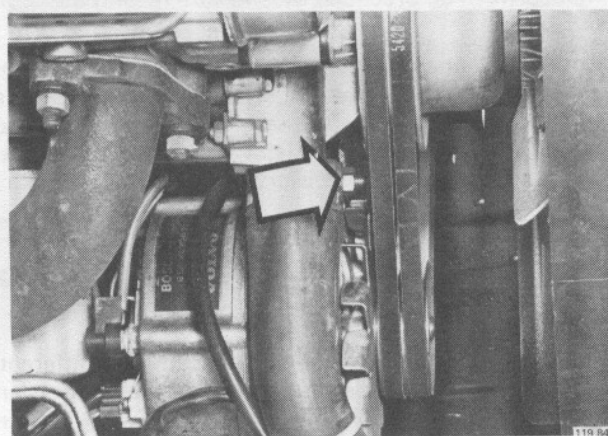
Move the heater control to maximum heat.
Remove the cap from the expansion tank.
Open the drain cock on the righthand side of the engine block.
Disconnect the lower hose from the radiator.





AK4

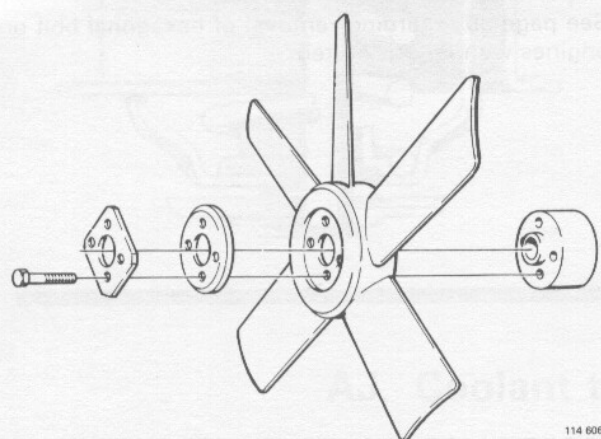
Disconnect the fan shroud and move it out of the way



AK5

Loosen alternator belts

Loosen the alternator mounting bolt and the clamp bolt.

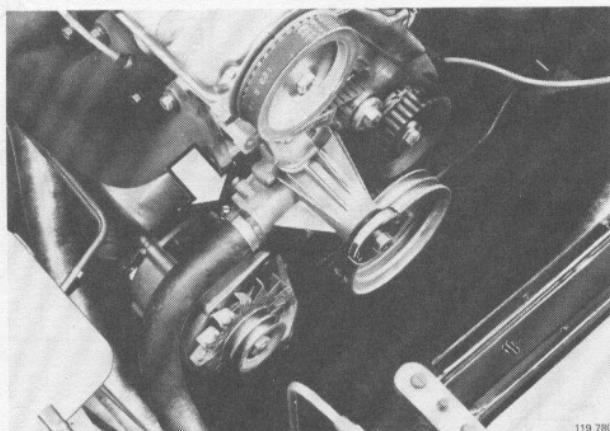


AK6

Remove the fan

NOTE! There are 3 different types of fans:

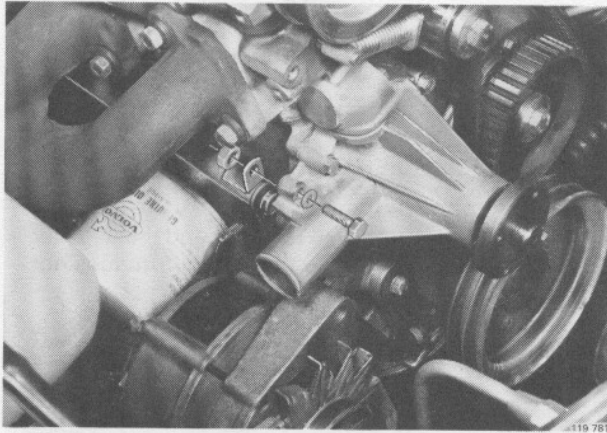
- fixed fan
- temperature-controlled clutch-type fan
- clutch-type fan



AK7

Remove:

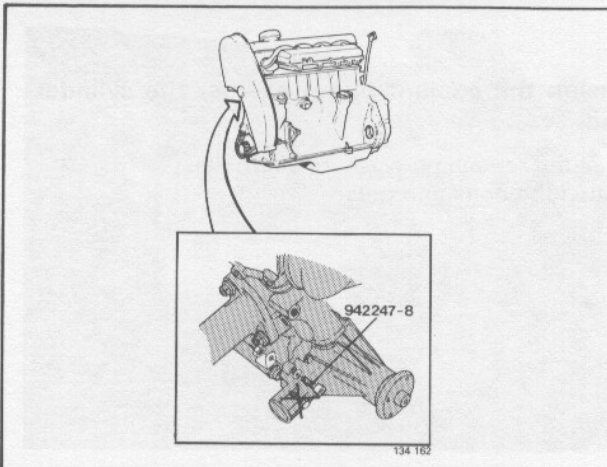
- fan shroud
- timing gear casing
- lower radiator hose from coolant pump



AK8

Loosen return pipe at the coolant pump

Remove the bolt, washer and nut.



AK9

Removing hexagonal bolt on engines with Pulsair system

There are two different methods for removing the old hexagonal bolt:

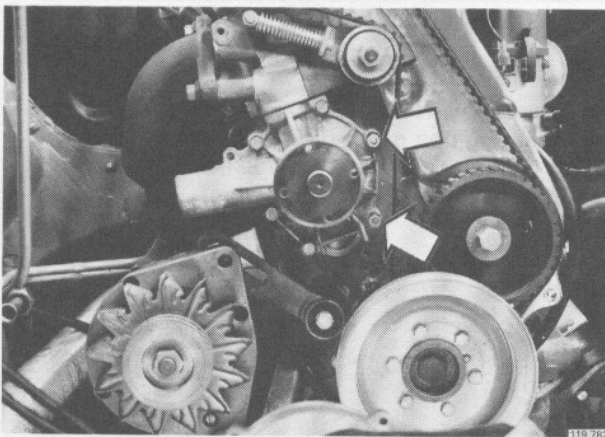
Cars without block heaters

Remove the rear mounting bolt of the return pipe (rear edge of cylinder block).

Loosen and pull the coolant pump out slightly. Remove the bolt.

Cars with block heaters

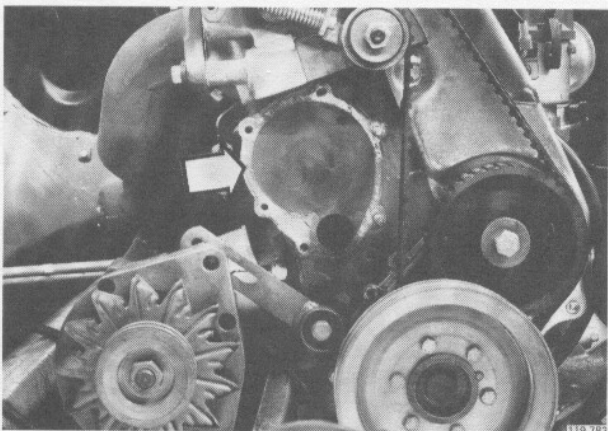
Drill away the head of the bolt (drill \varnothing 8 mm).



AK10

Remove the coolant pump

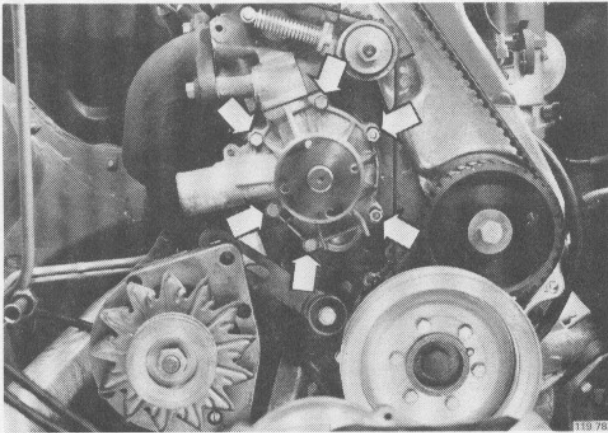
Remove all bolts, washers and nuts.



AK11

Clean gasket surface and contact surfaces

Scrape off any traces of gasket material from the block and coolant pump. Clean the rubber ring contact area on the cylinder head.



AK12

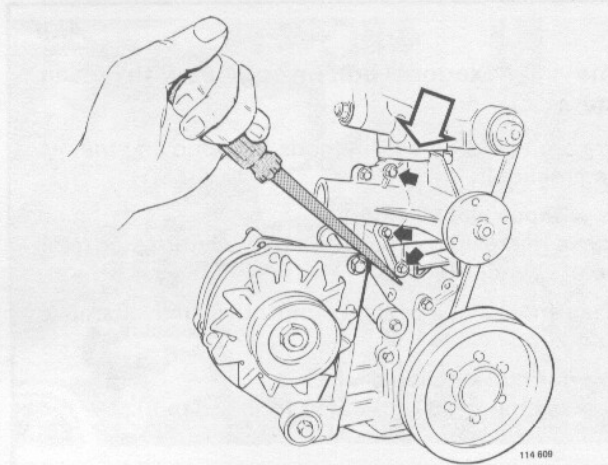
Install coolant pump

Use a new gasket between the pump and the cylinder block.

Install a new O-ring on the coolant pump.

Secure the pump with the two nuts.

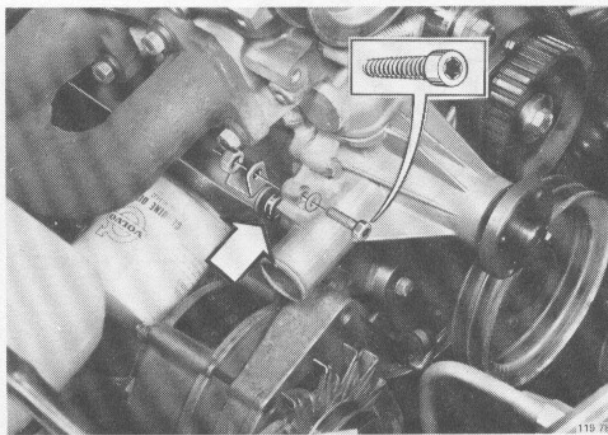
Make sure that the O-ring is in position and that it is not damaged. Tighten the nuts so that the pump does not slip, but can be slid upwards.



AK13

Tension the coolant pump against the cylinder head

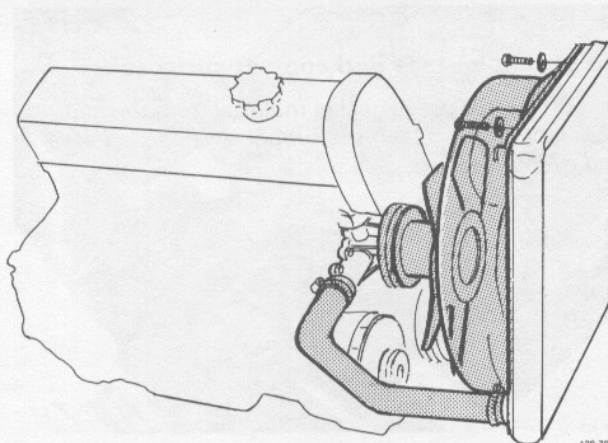
Install the remaining washers and bolts. Tighten the bolts and nuts.



AK14

Install:

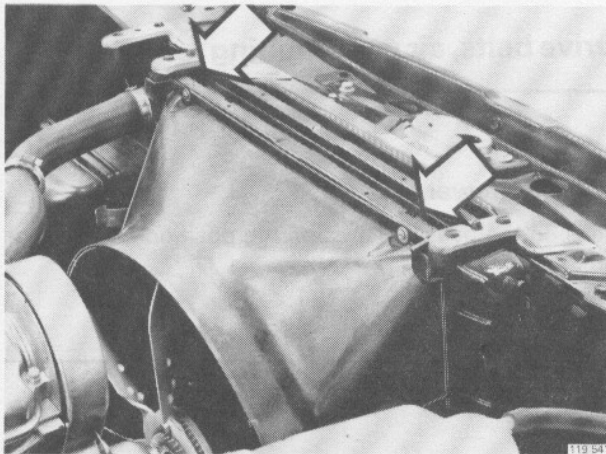
- the return pipe. **NOTE!** On cars with Pulsair system the mounting bolt of the pipe must be replaced by a bolt of the new type (see page 83),
- timing gear casing



AK15

Install:

- lower radiator hose
- fan shroud. **NOTE!** Do not tighten the pulley and the fan at this stage



AK16

Install fan shroud

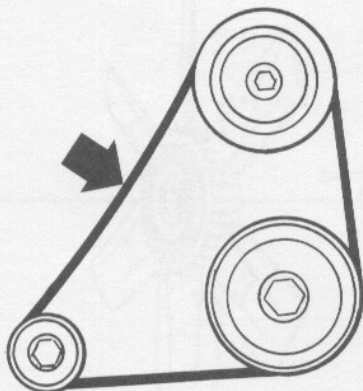


AK18

Fill with coolant

Close the drain cock.
Fill the expansion tank to "maximum" level.
Run the engine warm with the heater control set in hot, check that there is no leakage, and top up with coolant if required.

AL. Drive belts



136 413

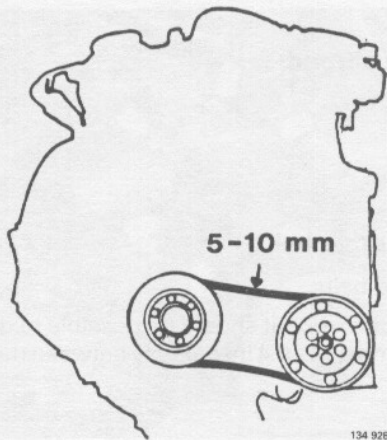
AL1

General

With correct tension it should be possible to deflect the belts 5–10 mm (0.2–0.4 in) halfway between the pulleys.

Note! When changing the alternator-fan belt, both belts must be replaced.

When adjusting the drive belt for the cooling system on cars with power steering and one drive belt, use tool 5197. See next page.

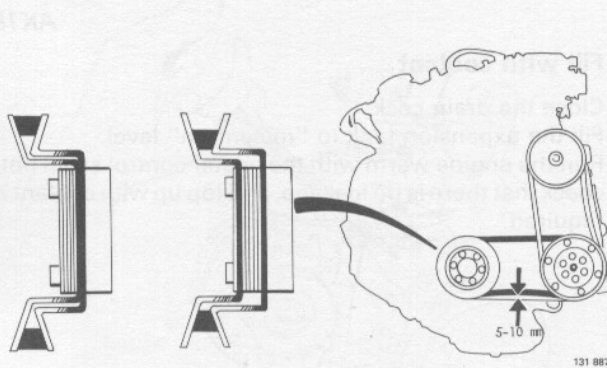


Drive belts, air conditioning

AL2

Without power steering

Tension the belt by adjusting the position of the compressor.

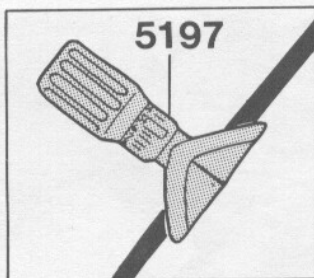


AL3

With power steering and two drive belts

Tension the belt by placing an appropriate number of shims between the two halves of the crankshaft pulleys.

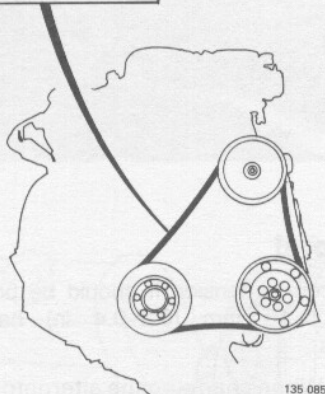
One shim changes the belt tension by approximately 5 mm (0.2 in).



AL4

With power steering and one belt

Tension the belt by moving the power pump. Check the belt tension by positioning tool 5197 against the belt between the crankshaft pulley and the pump. The belt tension should be 17-18 units.



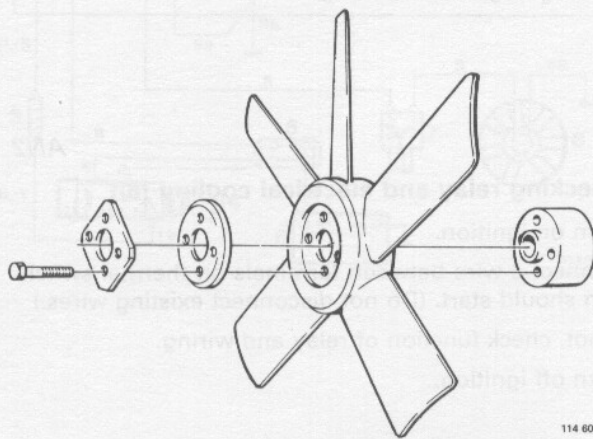
AM. Fan

Type of cooling fan fitted to vehicle depends on model year, market and engine type.

AM1

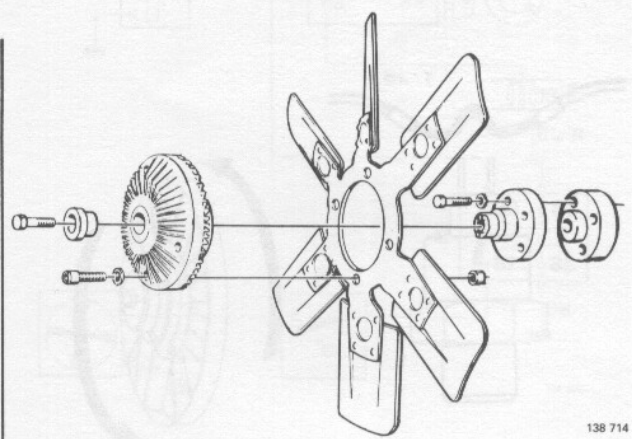
General

In order to gain access to the fan, the two upper securing bolts on the fan shroud must be removed and the shroud moved rearwards.



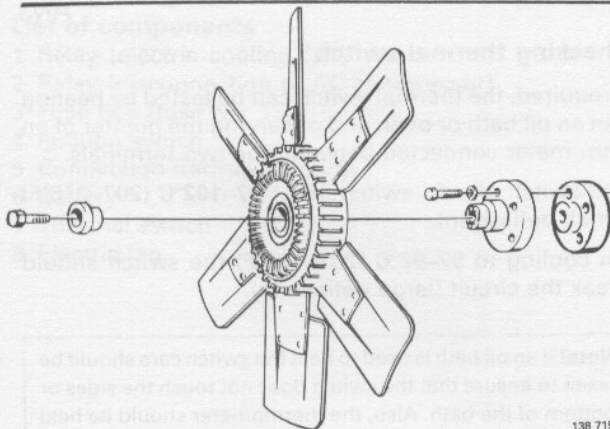
Type 1 Fixed fan

114 606



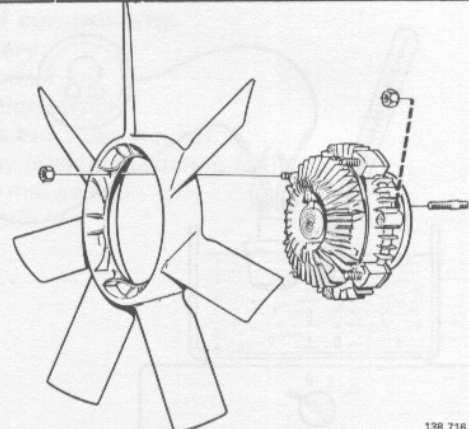
Type 2 Fan of clutch type, type 1

138 714



Type 3 Fan of clutch type, type 2

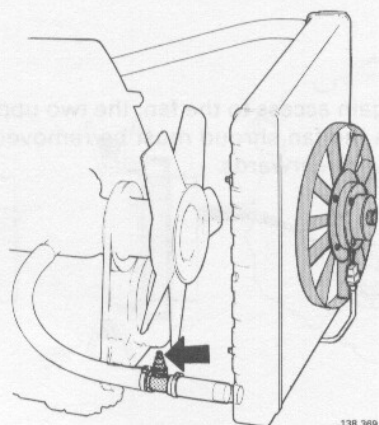
138 715



Type 4 Thermo-clutch type

138 716

AN. Electric cooling fan



138 369

AN1

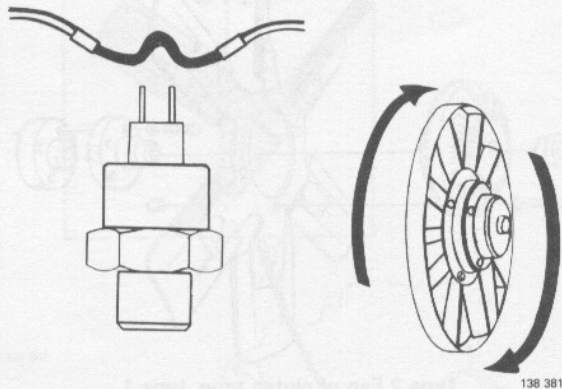
General

This fan is installed on most B 21 FT 1984–1985 with inter-cooler and certain cars with air conditioning (AC) intended for "hot" markets.

A thermal switch in the lower radiator hose controls the connection of the fan.

The fan is switched on when the coolant temperature is approximately +100°C (212°F) and is switched off when the temperature has dropped to approximately +95°C (203°F).

Wiring diagram on next page.



138 381

AN2

Checking relay and electrical cooling fan

Turn on ignition.

Connect a wire between terminals on thermal switch. Fan should start. (Do not disconnect existing wires.)

If not, check function of relay and wiring.

Turn off ignition.

AN3

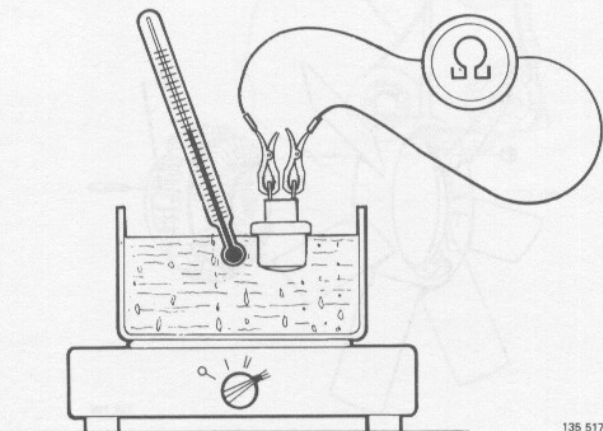
Checking thermal switch

If required, the thermal switch can be tested by heating it in an oil bath or oven and observing the pointer of an ohm meter connected between the two terminals.

The switch should switch on at 97–102°C (207–216°F) (small deflection).

On cooling to 97–92°C (207–198°F) the switch should break the circuit (large deflection).

Note! If an oil bath is used to heat the switch care should be taken to ensure that the switch does not touch the sides or bottom of the bath. Also, the thermometer should be held near to the switch.



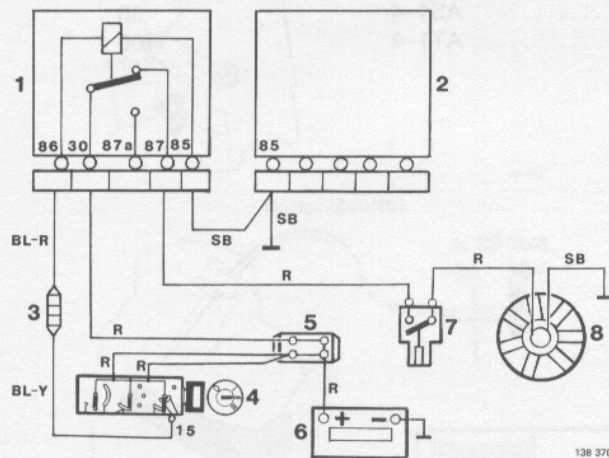
135 517

Wiring diagram

AN4

The diagrams show the position with the ignition on and coolant temperature below +100°C (212°F).

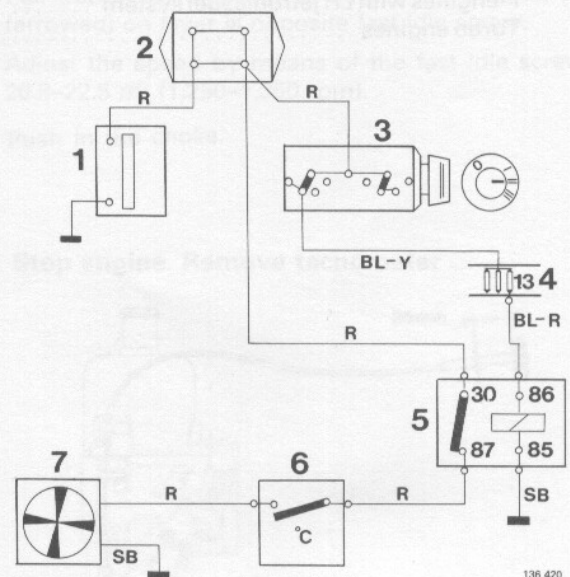
B 21 FT 1984–1985 with intercooler



List of components

- 1 Relay (electric cooling fan)
- 2 Relay (disconnection of AC compressor)
- 3 Fuse box (fuse No. 13)
- 4 Ignition switch
- 5 Connection (terminal board)
- 6 Battery
- 7 Thermal switch
- 8 Electric fan

Others



List of components

- 1 Battery
- 2 Terminal box
- 3 Ignition switch
- 4 Fuse box (fuse No. 13)
- 5 Relay (electrical cooling fan)
- 6 Thermal switch
- 7 Electric fan

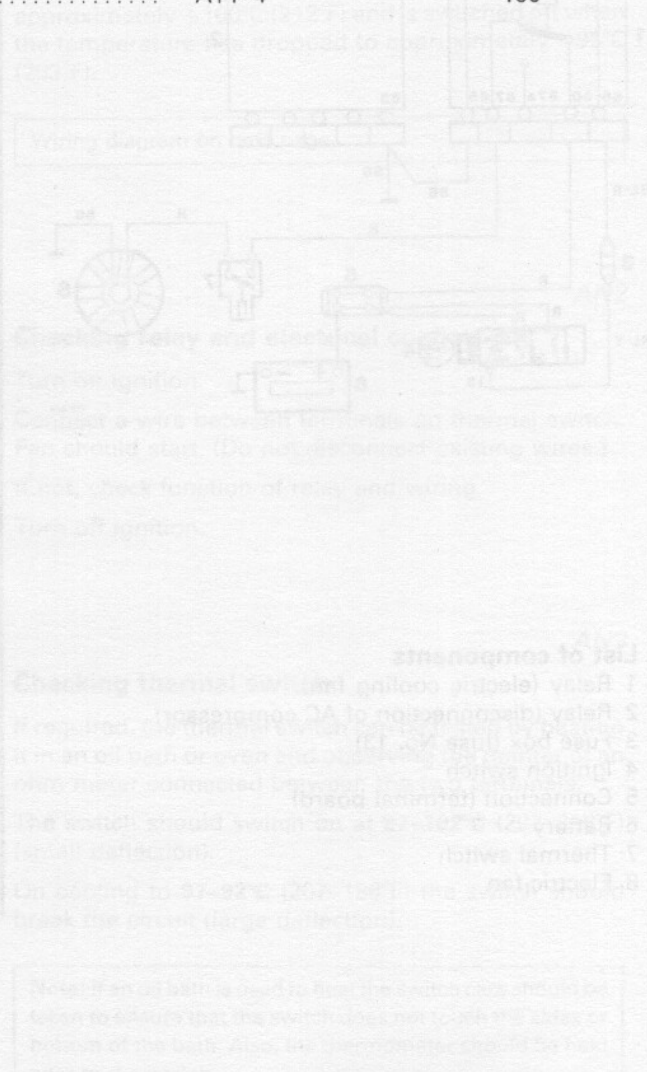
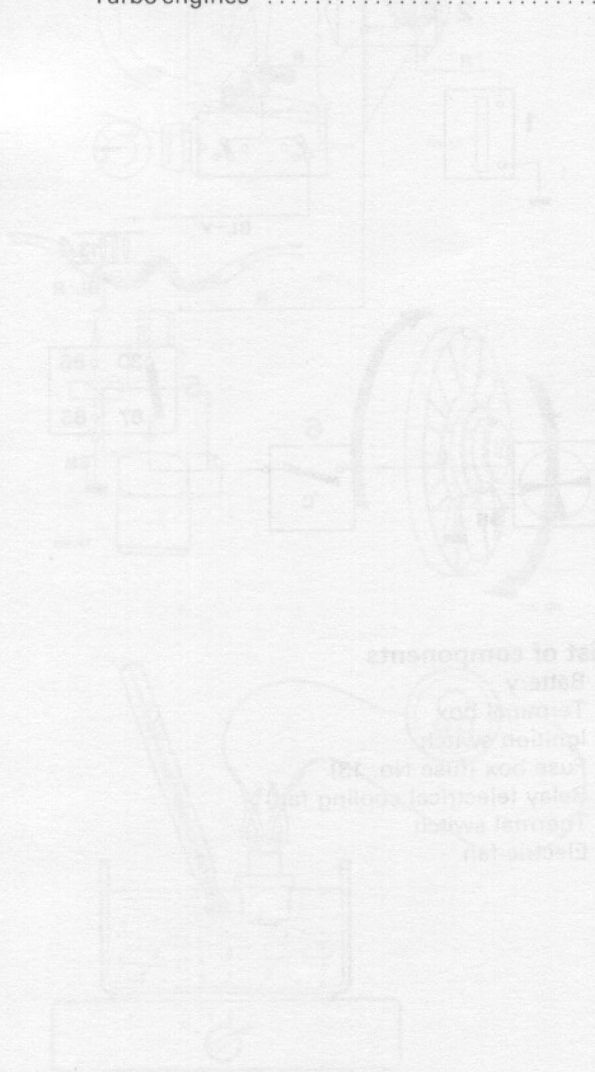
Group 27 Engine controls

Choke control, setting

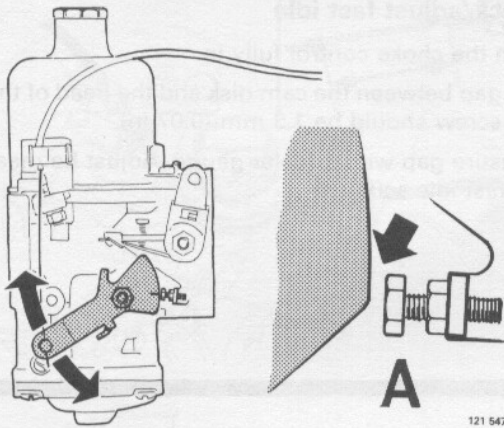
	Operation	Page
A-engines	AO1-4	93
K-engines	AO5-6	93

Throttle control, adjusting

A-engines	AP1-4	94
K-engines	AQ1-2	96
E/F-engines	AR1-5	97
F-engines with LH jetronic fuel system	AS1-4	98
Turbo engines	AT1-4	100



AO. Choke control, adjusting



121 547

A-engines

A01

Check choke control

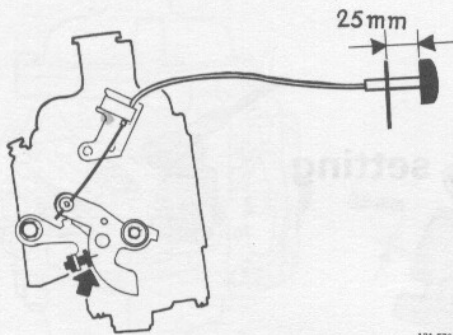
Ensure lever makes full sweep when choke is pulled out.

Push choke in and check that lever is in lower stop position and fast idle adjustment screw A does not contact lever. Adjust if necessary.

A02

Connect tachometer – warm-up engine

A03



121 576

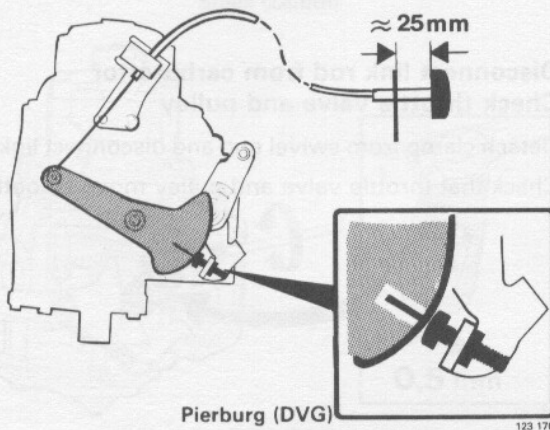
Adjust fast idle

Pull out choke (approx. 25 mm = 1.0 in) until mark (arrowed) on lever is opposite fast idle screw.

Adjust the speed by means of the fast idle screw to 20.8–22.5 r/S (1,250–1,350 rpm).

Push in the choke.

Solex (Zenith)

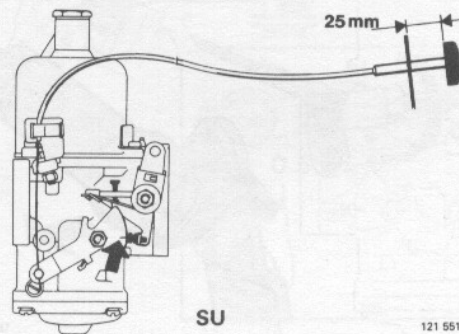


123 170

Pierburg (DVG)

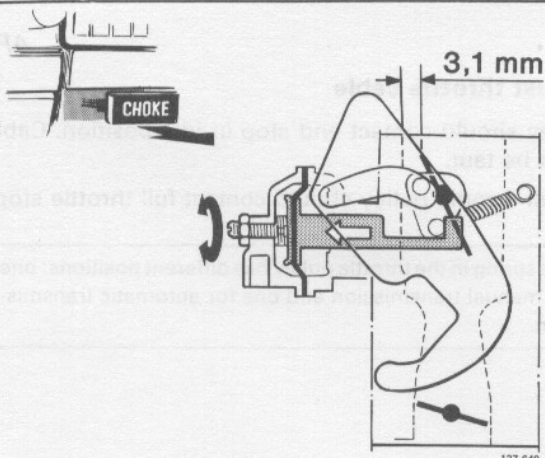
A04

Stop engine. Remove tachometer



SU

121 551



137 649

K-engines

A05

Checking/adjusting vacuum servo for choke damper

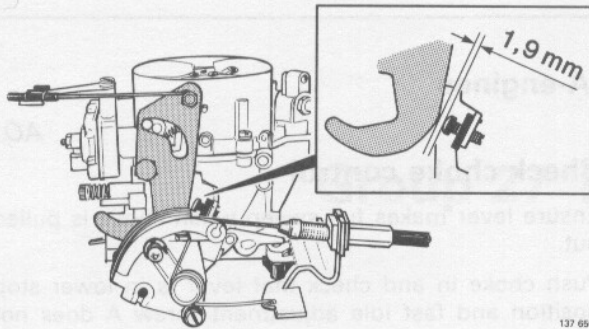
Pull out the choke control completely so that the choke damper closes.

Push the rod of the vacuum servo straight into bottom position. If the rod is pushed at an angle the values will be incorrect.

The gap between the carburetor throat and the damper must be 3.1 mm (0.122 in). Try with a 3.0 mm (0.118 in) drill and a 3.5 mm (0.137 in) drill.

Adjust the screw on the vacuum servo.

A06



Check/adjust fast idle

Push the choke control fully in.

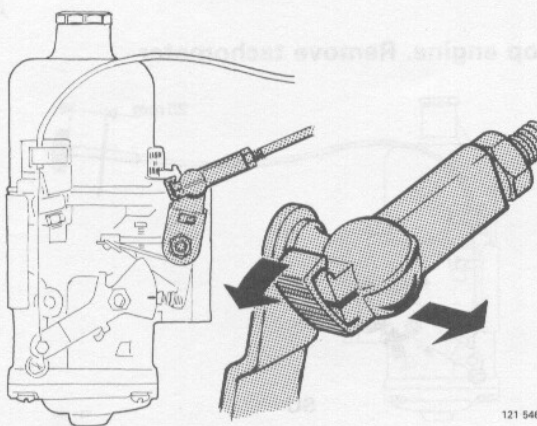
The gap between the cam disk and the head of the fast idle screw should be 1.9 mm (0.07 in).

Measure gap with a feeler gauge. Adjust by means of the fast idle screw.

AP. Throttle control, setting

A-engines

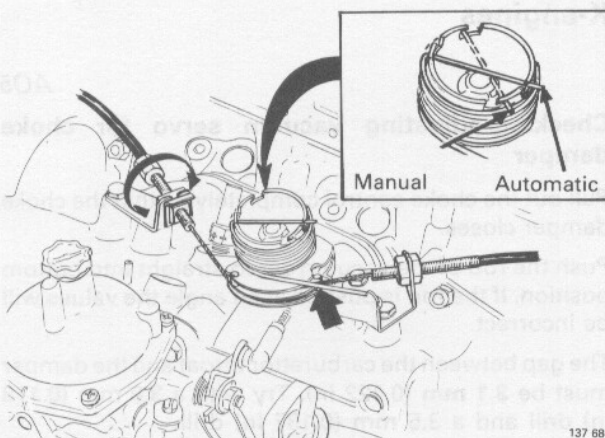
AP1



Disconnect link rod from carburettor Check throttle valve and pulley

Detach clamp from swivel end and disconnect link rod. Check that throttle valve and pulley move smoothly.

AP2



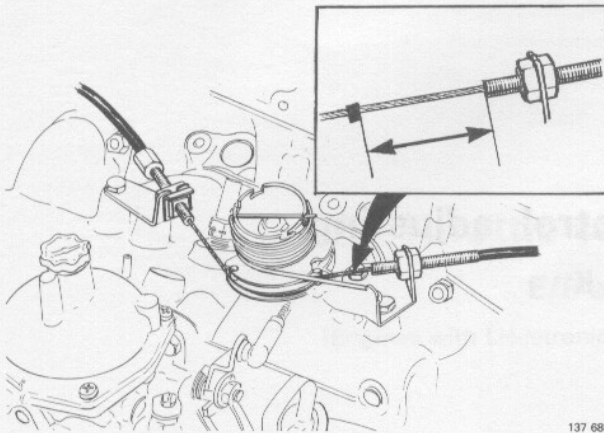
Adjust throttle cable

Pulley should contact end stop in idle position. Cable must be taut.

At full throttle pulley should contact full throttle stop.

The spring in the throttle pulley has different positions: one for manual transmission and one for automatic transmission.

AP3



Adjust kick-down cable (automatic)

Depress accelerator to floor. **Note!** Do not operate control by hand otherwise setting will be incorrect.

At full throttle, distance between clip on cable and cable sleeve:

BW 35	43–47 mm (1.7–1.9 in)
BW/AW 55, AW 71	50.4–52.6 mm (1.98–2.07 in)

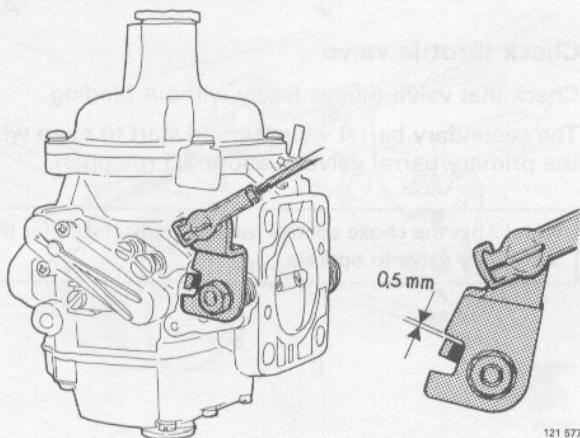
137 686

AP4

Install and adjust link rod

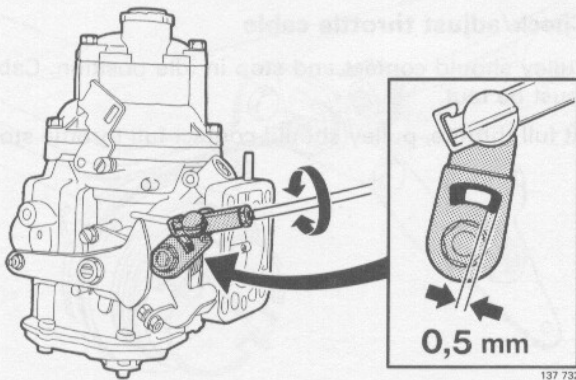
Push link rod in position and bend in the locking tab.

Adjust link rod so that there is a play of 0.5 mm (0.02 in) between the lifting arm and the follower of the throttle valve shaft.



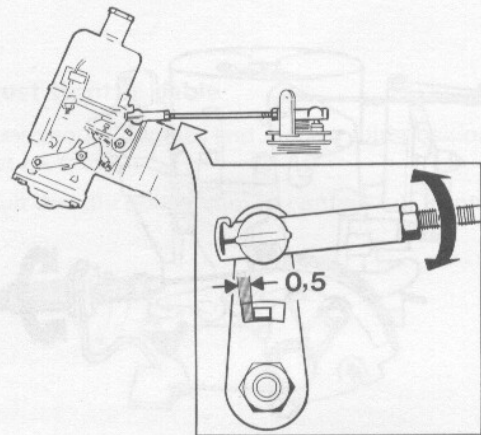
Solex (Zenith)

121 577



Pierburg (DVG)

137 732



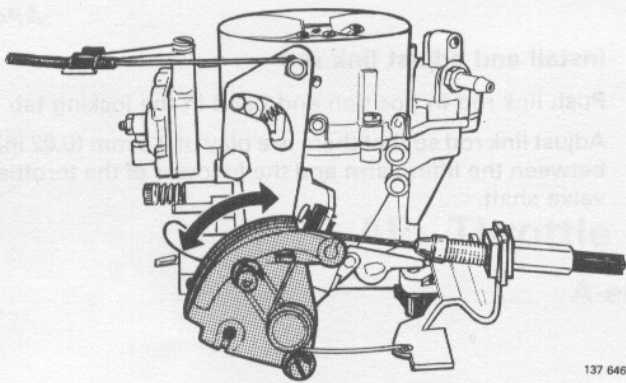
SU

132 646

AQ. Throttle control, adjusting

B 19 K

AQ1



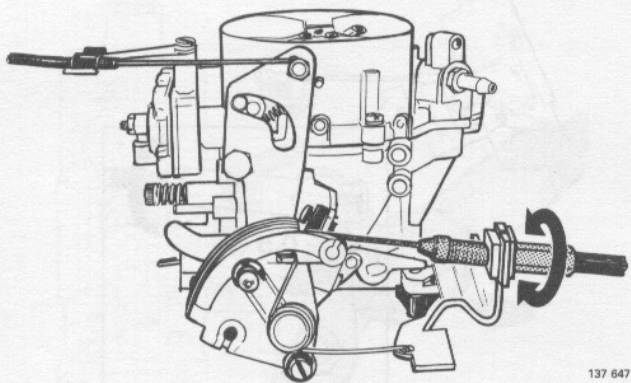
Check throttle valve

Check that valve moves freely without binding.

The secondary barrel valve should start to open when the primary barrel valve is about 2/3 rds open.

Note! That the choke control must be fully closed for the secondary valve to operate.

AQ2



Check/adjust throttle cable

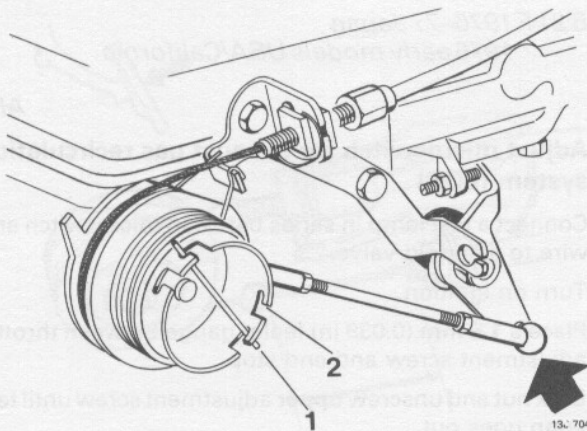
Pulley should contact end stop in idle position. Cable must be taut.

At full throttle, pulley should contact full throttle stop.

AR. Throttle control, adjusting

E/F-engines

(Engines with LH-jetronic fuel system, see page 98).



AR1

Checking throttle pulley

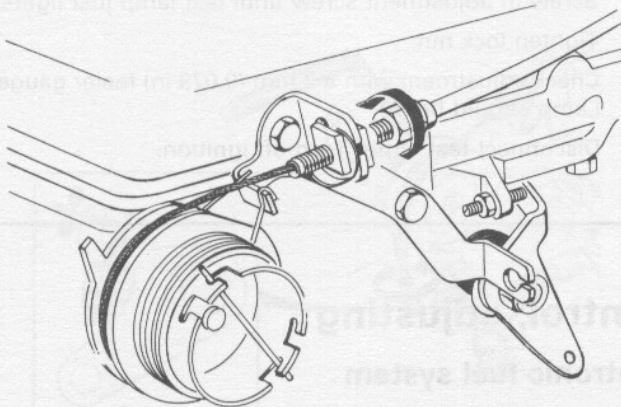
Disconnect the link rod.

Check that the pulley moves freely without binding.

Throttle pulley spring – 1979

Note: two different positions for spring:

- one for vehicles with automatic transmission
- one for vehicles with manual transmission

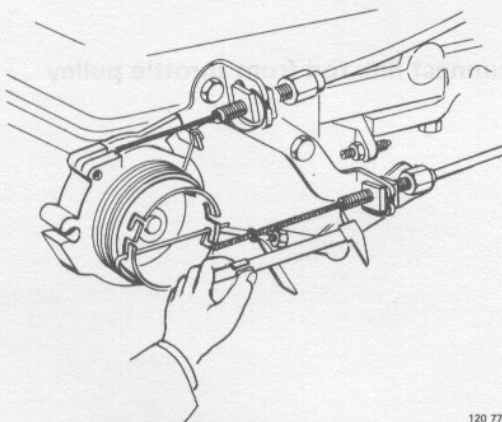


AR2

Adjust throttle cable

Pulley should contact end stop in idle position. Cable must be taut.

At full throttle pulley should contact full throttle stop.



AR3

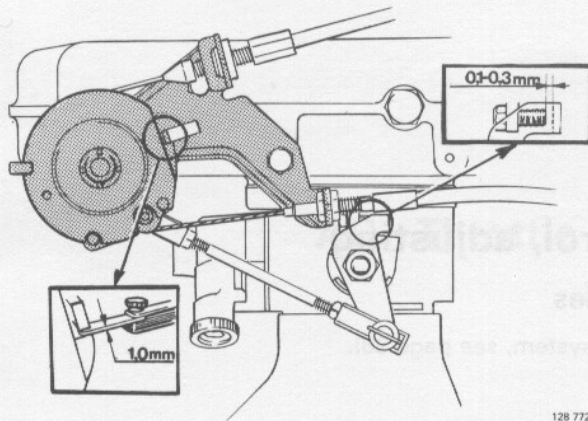
Adjust kick-down cable (automatic)

Depress accelerator to floor. **Note!** Do not operate control by hand otherwise setting will be incorrect.

At full throttle distance between clip on cable and cable sleeve:

- | | | |
|-----------------|-------|-----------------------------|
| BW 35 | | 43–47 mm (1.7–1.9 in) |
| BW/AW 55, AW 71 | | 50.4–52.6 mm (1.98–2.07 in) |

Adjust cable at the cable sleeve if necessary.



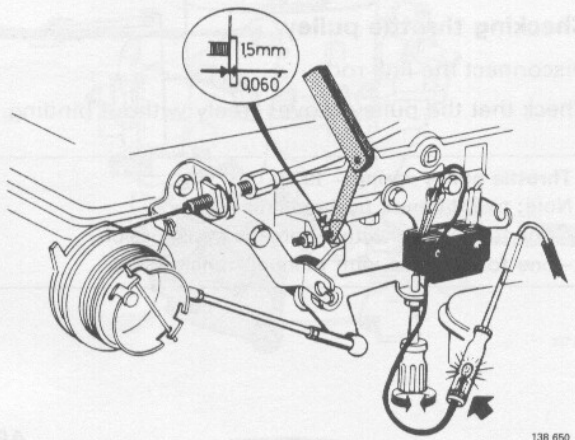
AR4

Install and adjust link rod

Install link rod.

Insert a 1 mm (0.04 in) thick feeler gauge between the throttle pulley and the stop. The play between the adjustment screw and the lifting arm should then be 0.1–0.3 mm (0.004–0.01 in).

B 21 F 1976–77 Japan
1976 early models USA/California



AR5

Adjust microswitch for exhaust gas recirculation system (EGR)

Connect a test lamp in series between microswitch and wire to solenoid valve.

Turn on ignition.

Place a 1.5 mm (0.039 in) feeler gauge between throttle adjustment screw and end stop.

Lock nut and unscrew **upper** adjustment screw until test lamp goes out.

Screw in adjustment screw until test lamp just lights.

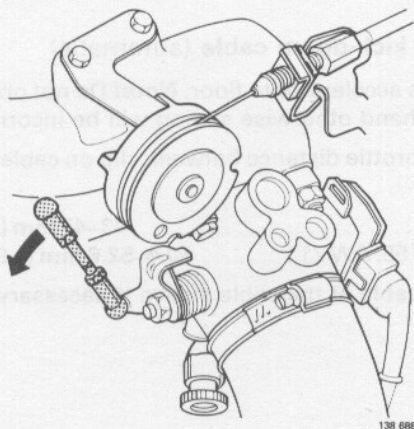
Tighten lock nut.

Check adjustment with a 2 mm (0.079 in) feeler gauge. Lamp should be off.

Disconnect test lamp. Turn off ignition.

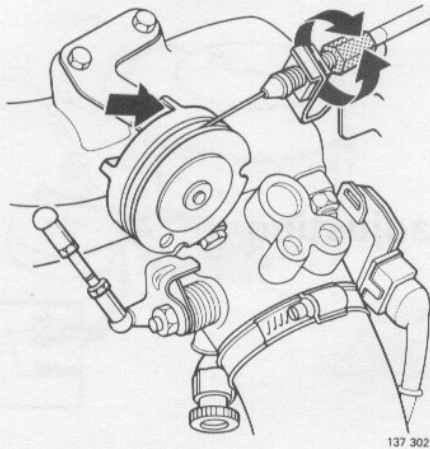
AS. Throttle control, adjusting

Engines with LH-Jetronic fuel system



AS1

Disconnect link rod from throttle pulley

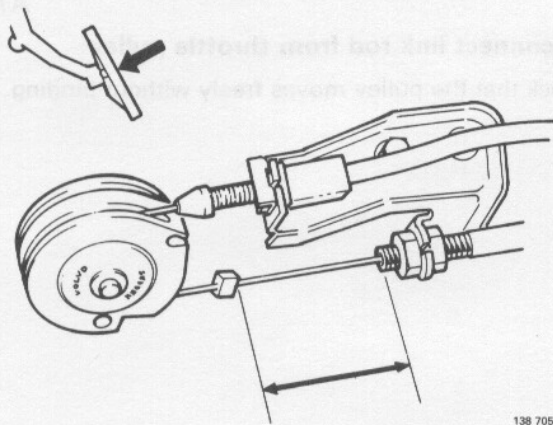


137 302

AS2

Check/adjust throttle pulley and throttle cable

Check that the pulley moves freely without binding. Pulley should contact end stop in idle position. Cable must be taut but must not move throttle pulley. Depress accelerator pedal and check that at full throttle, pulley contacts full throttle stop.

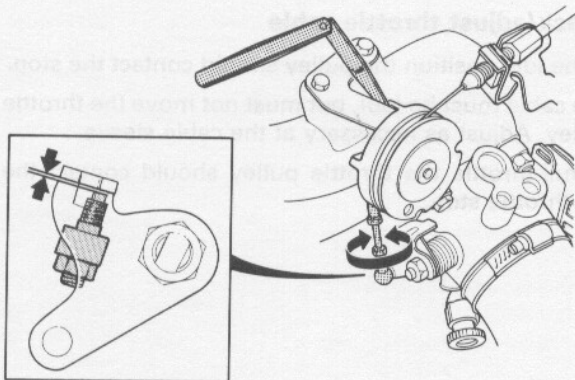


138 705

AS3

Check/adjust kick-down cable (automatic)

Depress accelerator to floor. **Note!** Do not operate control by hand otherwise setting will be incorrect. At full throttle, distance between clip on cable and cable sleeve = **50.4–52.6 mm** (1.98–2.07 in).

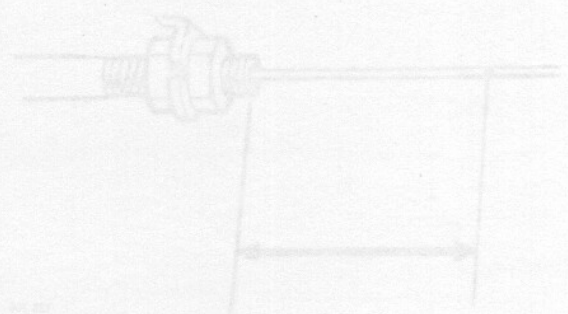


137 303

AS4

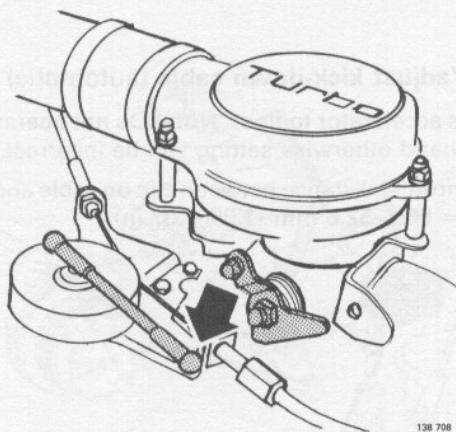
Attach/adjust link rod

Place a **1 mm** (0.040 in) feeler gauge between pulley and idle stop. Adjust link rod to obtain a **0.1 mm** (0.004 in) clearance between lower adjustment screw and end stop. Remove feeler gauge.



AT. Throttle control, adjusting

Turbo engines

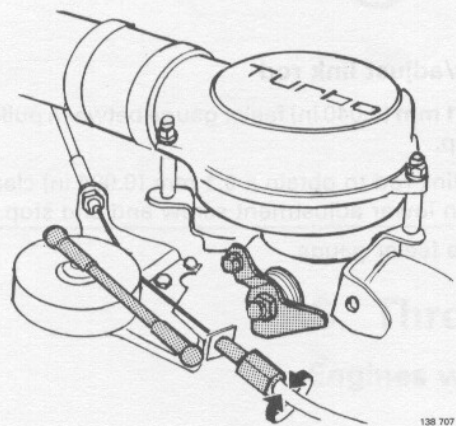


138 708

AT1

Disconnect link rod from throttle pulley

Check that the pulley moves freely without binding.



138 707

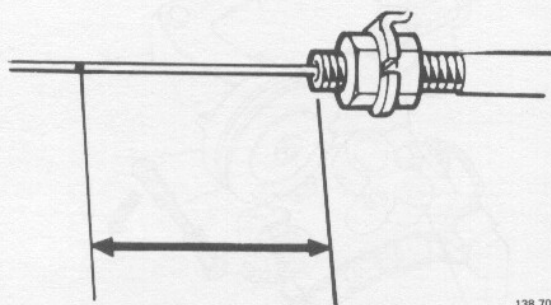
AT2

Check/adjust throttle cable

In the idle position the pulley should contact the stop.

The cable must be taut, but must not move the throttle pulley. Adjust as necessary at the cable sleeve.

At full-throttle the throttle pulley should contact the full-throttle stop.



138 706

AT3

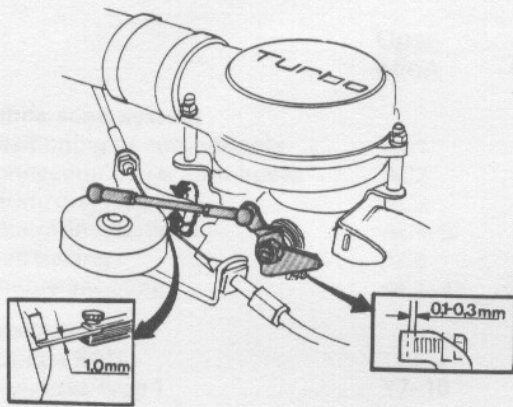
Check/adjust kick-down cable (automatic transmission)

Make a mark on the cable exactly where it enters the cable sleeve.

Press the accelerator pedal down completely. Do not turn the throttle pulley by hand otherwise the setting will be incorrect.

At full throttle the distance from the cable sleeve to the mark should be **50.4-52.6 mm** (1.98-2.07 in).

Adjust as necessary at the cable sleeve.



138 711

Installing and adjusting link rod

Install link rod.

Insert a **1 mm** (0.04 in) thick feeler gauge between the throttle pulley and the stop. The play between the adjustment screw and the lifting arm should be **0.1–0.3 mm** (0.004–0.01 in).

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**VOLVO SUPPORTS VOLUNTARY
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