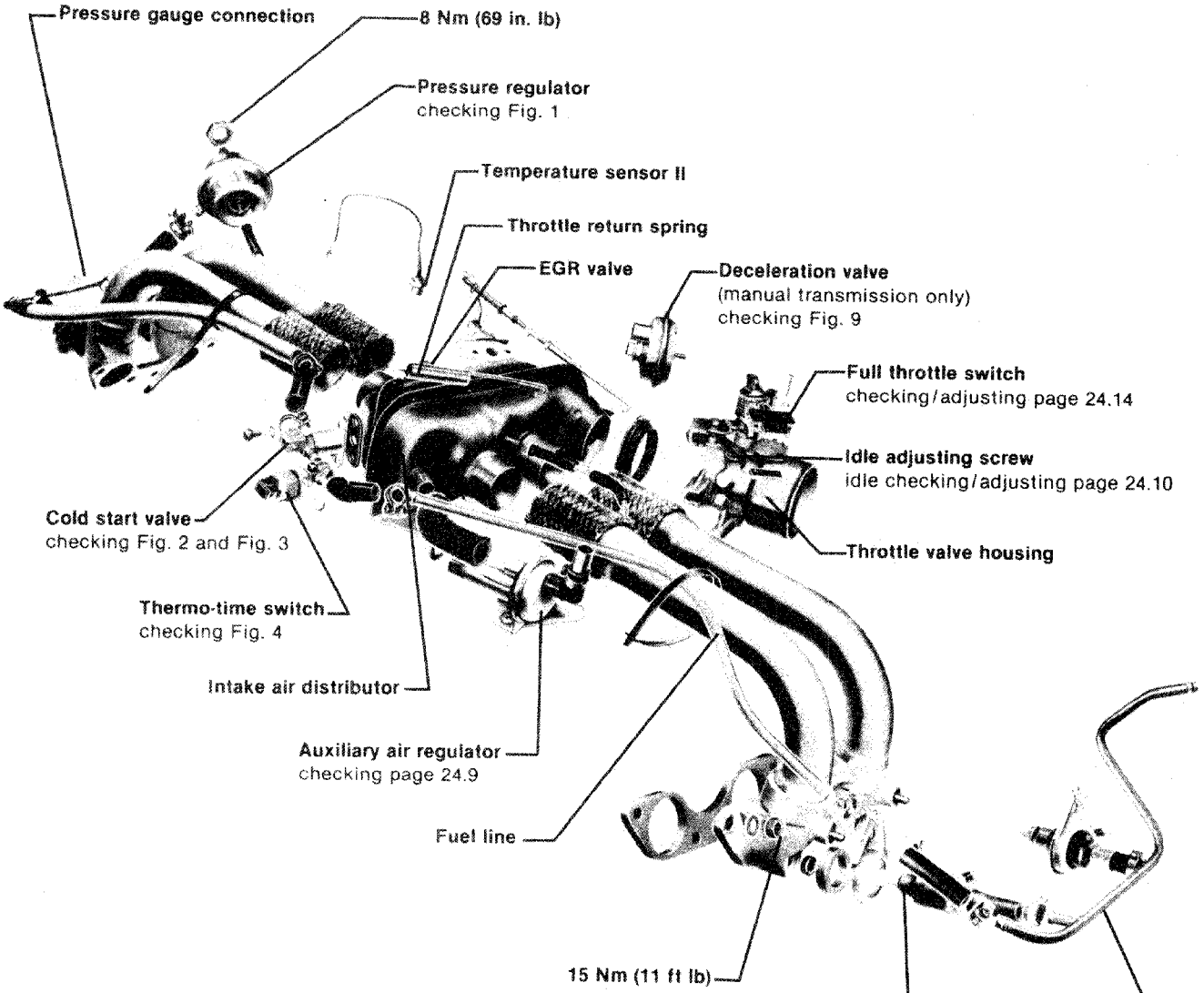
Fuel Injection, AFC System

Index

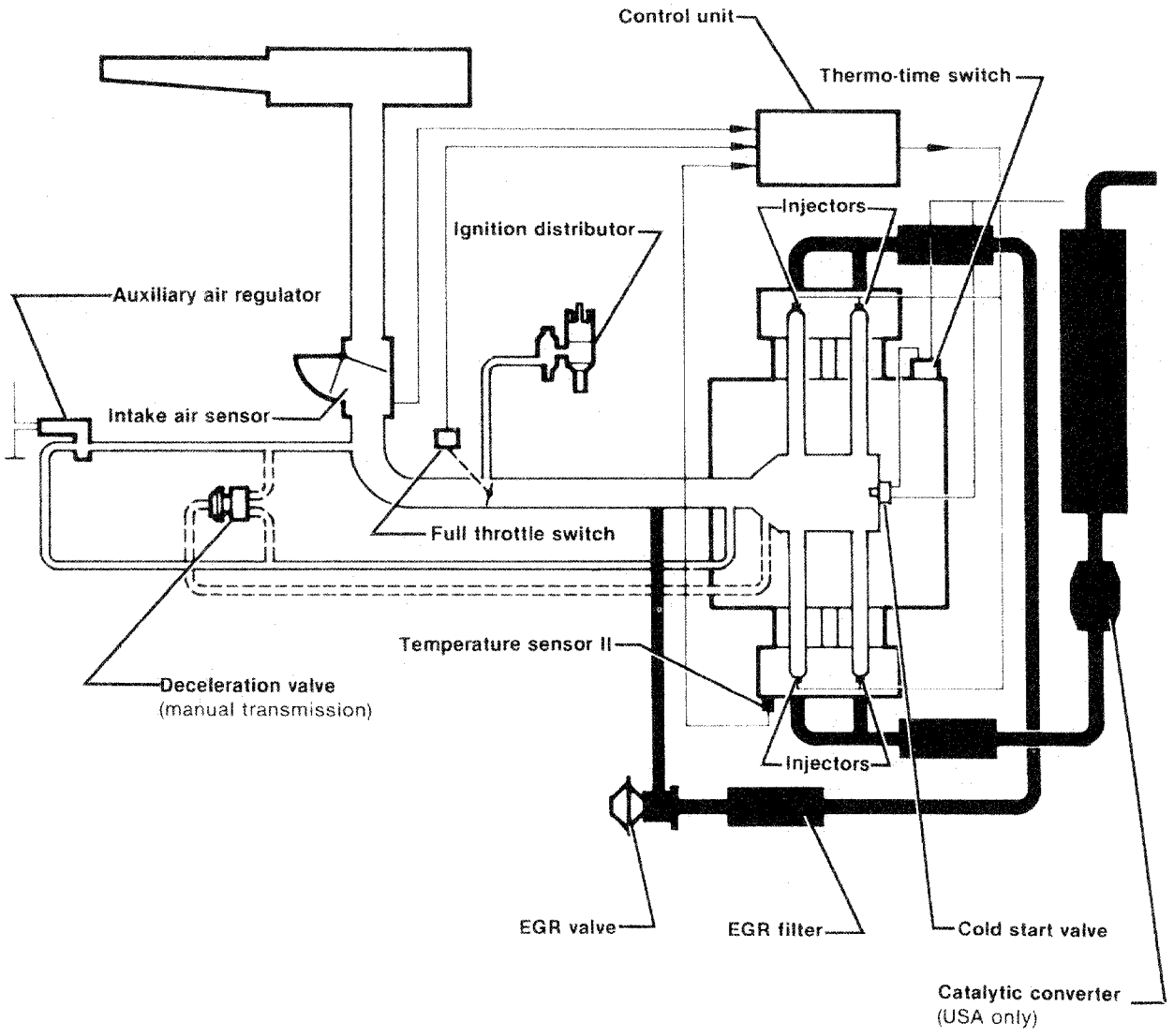
CAUTION

During repairs always replace gaskets, seals and clamps

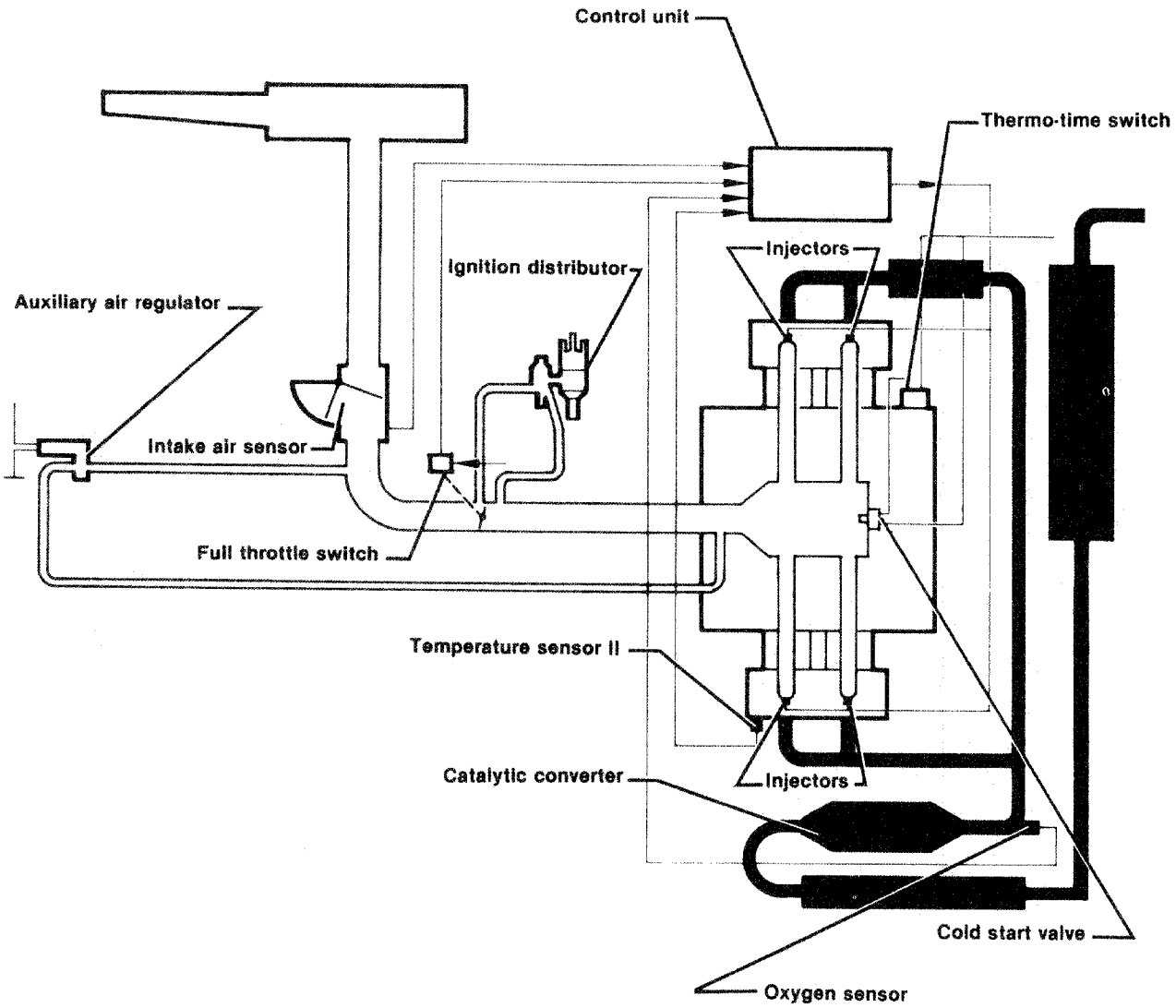


24.2 System component layout

Air-cooled | AFC


Control unit
Thermo-time switch
Injectors
Ignition distributor
Auxiliary air regulator
Intake air sensor
Full throttle switch
Temperature sensor II
Deceleration valve
(manual transmission)
Injectors
EGR valve
EGR filter
Cold start valve
Catalytic converter
(USA only)

24-104



24-105

24.4 System component layout

Air-cooled | AFC
California

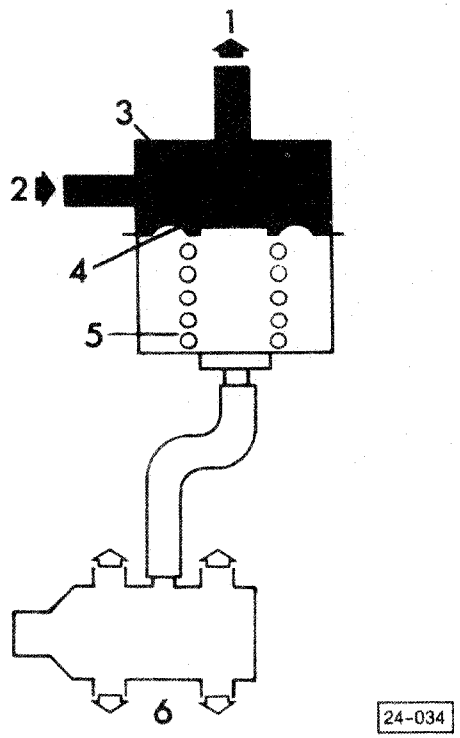


Fig. 1 Pressure regulator, checking

1 = return line
2 = from fuel pump
3 = fuel pressure chamber
4 = diaphragm
5 = spring
6 = intake air distributor

Note

Pressure regulator controls fuel pressure depending on intake air distributor vacuum

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel

— connect gauge US 1076 to fuel ring main
— disconnect hose between intake air distributor and pressure regulator
— start engine and run at idle
• pressure should be: 2.5 bar (36 psi)

— re-connect hose
• pressure (at idle) must drop to approx. 2.0 bar (29 psi)

if pressure too low, check fuel pump delivery rate
if pressure too high, check return line
if readings still incorrect, replace pressure regulator

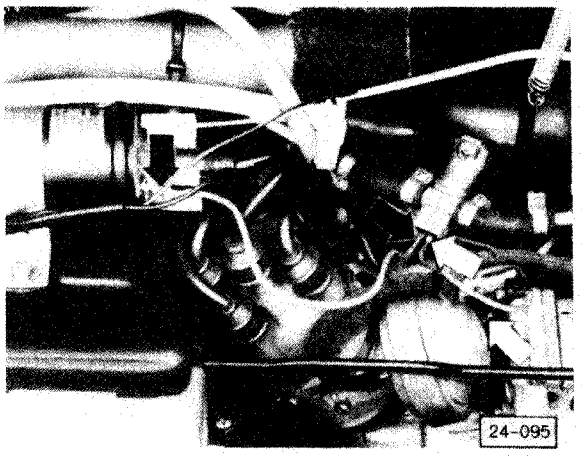


Fig. 2 Cold start valve, checking

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel

— connect gauge US 1076 to fuel ring main
— operate starter briefly until fuel pressure is present
— pull electrical connector off cold-start valve
— operate valve with two jumper wires (arrows)
• fuel pressure should drop slowly

if **NO**, replace cold start valve

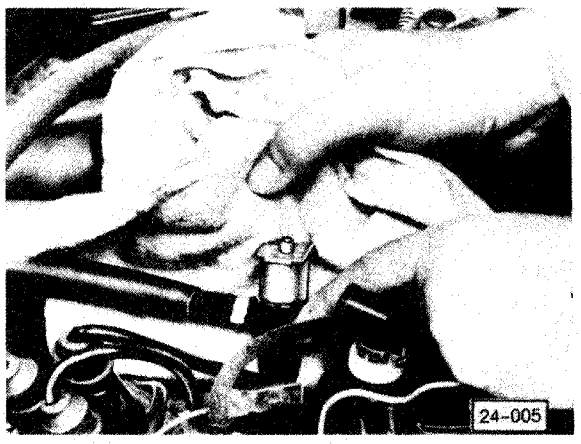


Fig. 3 Cold start valve, checking for leaks

— pull electrical connector off cold start valve
— remove cold start valve from intake air distributor but leave valve connected to ring main
— pull wire off ignition coil terminal 1
— operate starter
• cold-start valve should not leak. Replace if necessary

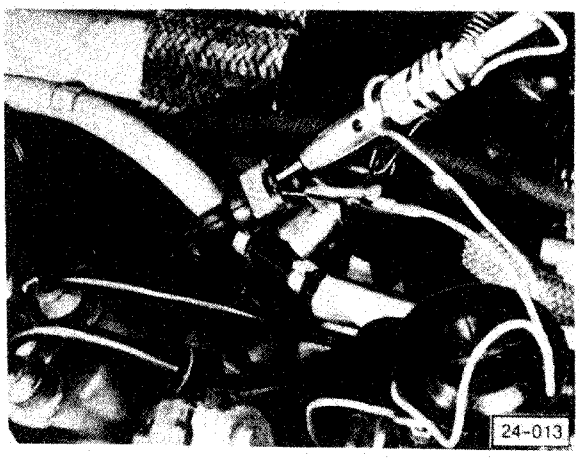


Fig. 4 Thermo-time switch, checking

- engine cold, air temperature below 20 °C (68 °F)

— pull electrical connector off cold-start valve
— connect test light
— pull wire off ignition coil terminal 1
— operate starter
- test light must light up brightly
- after 11 seconds (maximum) test light must dim or go off

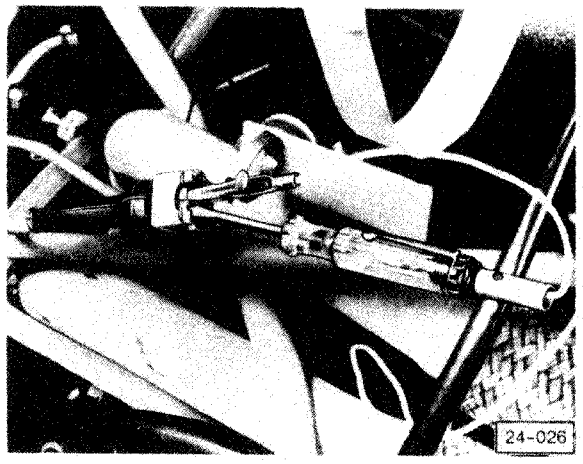


Fig. 5 Voltage supply at injectors, checking

— remove connector from injector
— connect test light to wire connector
— operate starter, test light must flicker

if **NO**, refer to page 24.38

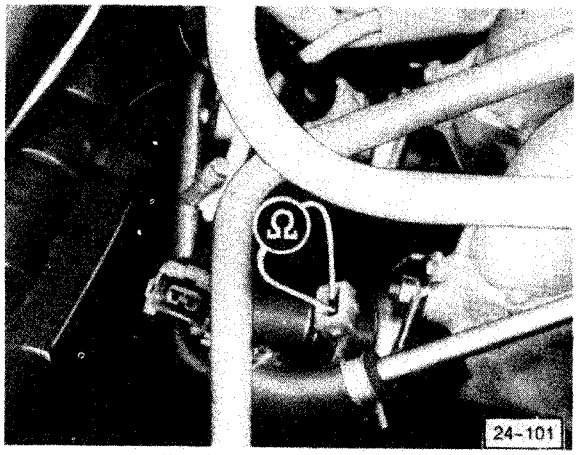


Fig. 6 Injector resistance, checking

— pull connector off injector and connect ohmmeter to injector
- resistance should be 2-3 ohms

if **NO**, replace injector

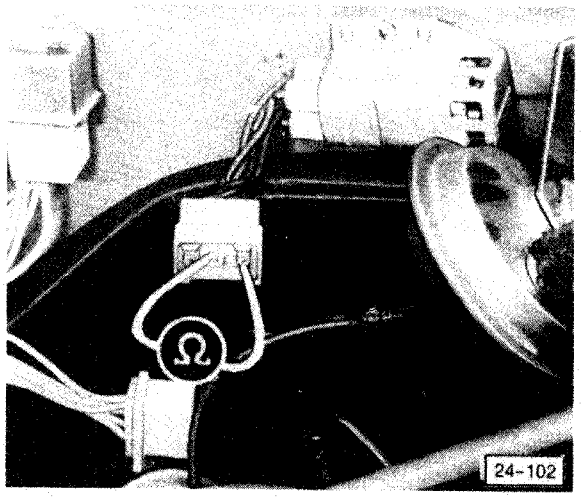


Fig. 7 Series resistance, checking
(USA and Canada except Calif.)

— disconnect connector to series resistance
— connect ohmmeter with one lead to center pin of connector and touch other lead to each side pin
- resistance for each must be 5.5-6.5 ohms

if **NO**, replace series resistance as complete unit

Note

On California vehicles, series resistance is built into fuel injection control unit and can not be checked

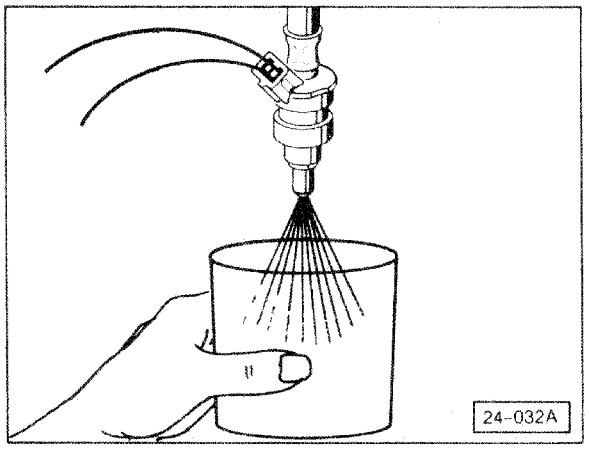


Fig. 8 Injector spray pattern, checking

— remove injector but leave connected to ring main

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel

— operate starter briefly
  • spray pattern must be an even, cone-shaped spray

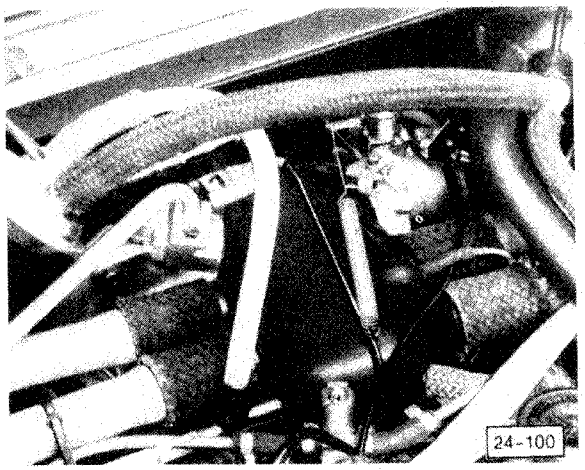


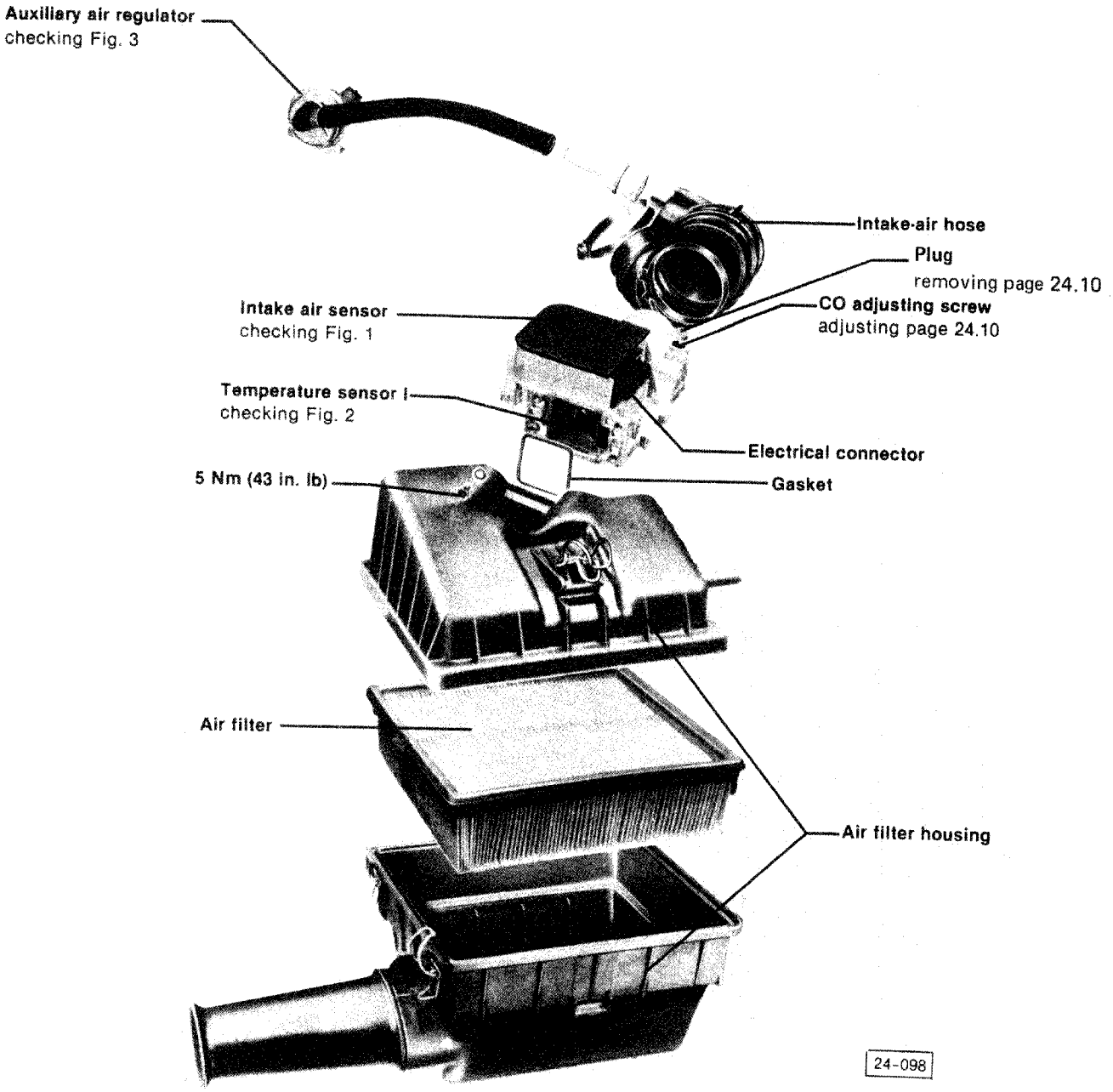
Fig. 9 Deceleration valve, checking (manual transmission only)

— pull off hose from deceleration valve to air filter at filter
— start engine and run briefly at approx. 3000 rpm
— let throttle valve snap closed
— at same moment check for suction at disconnected hose

if **NO**, replace deceleration valve

Injectors, checking for leaks

— remove electrical connector from injector
— remove injector but leave connected to ring main line
— pull off wire from terminal 1 of ignition coil
— operate starter briefly
— check that no more than 2 drops leak from each injector in one minute



24.8 Intake air sensor housing
Air filter housing
Auxiliary air regulator

Air-cooled | AFC

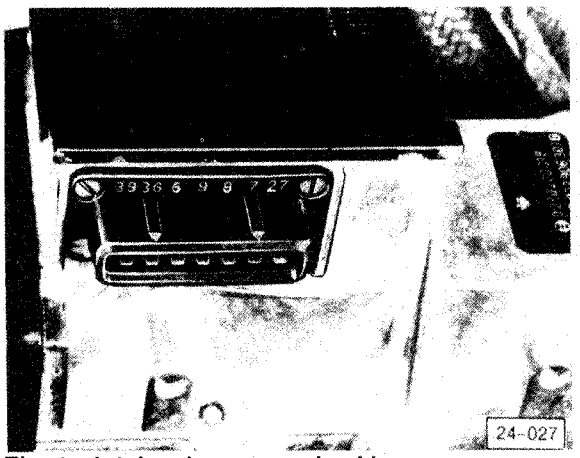


Fig. 1 Intake air sensor, checking

— pull off electrical connector from intake air sensor
— check fuel pump contacts in intake air sensor by connecting ohmmeter to terminals 36 and 39
— push air sensor flap open fully
  • meter should read 0 ohms
— release air sensor flap
  • meter should read ∞ ohms

Note

If resistance specifications are correct but fuel pump does not work, check for break in wiring between control unit and intake air sensor

— touch probes to following pairs of air sensor connections (flap closed, room temperature)
  • 6 & 9 = 200-400 ohms
  • 6 & 8 = 130-260 ohms
  • 8 & 9 = 70-140 ohms
  • 6 & 7* = 40-300 ohms
  • 7 & 8* = 100-500 ohms
  • 6 & 27 if applicable = max. 2,800 ohms at 20 °C (68 °F)

*To check that resistance strip in intake air sensor is not burnt, proceed as follows:

— check intake air sensor plate is in closed position
— connect ohmmeter to terminals 7 & 8 and open air sensor plate slowly.
  • resistance should not be lower than 40 ohm and not above 500 ohms of values
— repeat on terminals 6 & 7

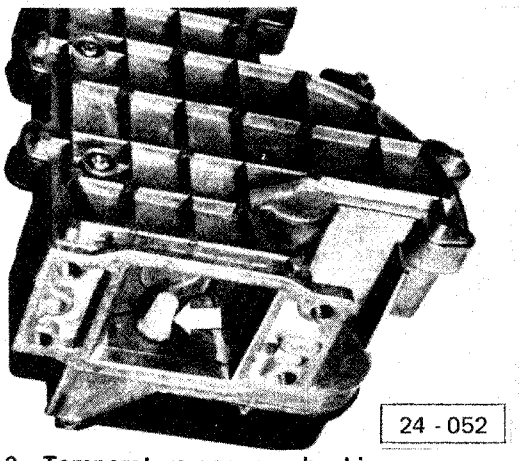


Fig. 2 Temperature sensor, checking

— check that intake air sensor (arrow) has reached room temperature of 20 °C (68 °F) before checking
— connect ohmmeter to terminals 6 and 27
  • meter should read 2300-2700 ohms

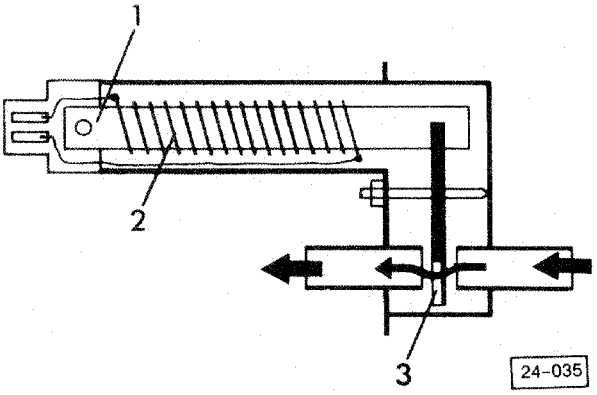


Fig. 3 Auxiliary air regulator, checking

Note

When engine is cold, regulator is open fully, allowing additional air to engine

1 = bimetal spring
2 = heating coil
3 = rotary gate valve

— check regulator electrically by pulling connector off and attaching ohmmeter to both terminals
  • meter should read approx. 30 ohms
— check mechanically by pulling off both hoses and blowing into regulator
  • with engine cold, regulator must be open
  • with engine warm, regulator must be closed
— turn ignition **ON**
  • after 5 minutes, regulator must close

Idle speed/CO, checking/adjusting
(USA and Canada except Calif.)

Work sequence

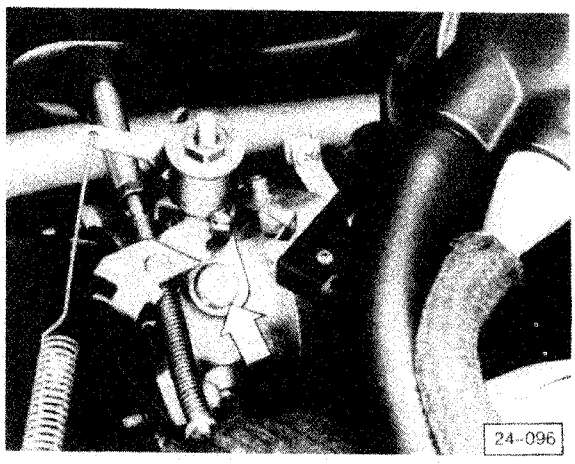
Preliminary conditions:

- engine oil temperature min. 60 °C (140 °F)
- intake air sensor must be 20 °C (68 °F)
- all electrical equipment must be **OFF**
- hose for charcoal filter must be disconnected and blocked at air filter
- dwell and timing OK (see Repair Group 28)

Note

When vehicle has been parked outside at temperatures below 10 °C (50 °F), adjustment must wait until intake air sensor has reached room temperature 20 °C (68 °F)

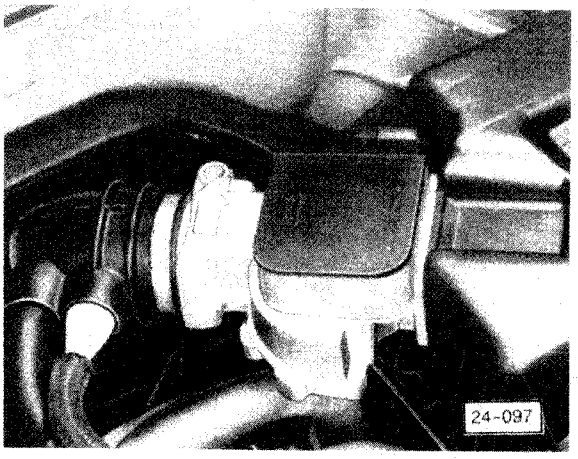
— connect tach/dwell meter according to manufacturer's instructions



— check idle speed and adjust if necessary, with adjusting screw (arrow)
  - manual transmission: 800–950 rpm
  - automatic transmission: 850–1000 rpm

— connect CO meter according to manufacturer's instructions

— connect CO probe ahead of catalytic converter at probe receptacle



— check CO and if necesssary adjust at adjusting screw (arrow)
  - 1.0 ± 0.5%

— secure CO adjusting screw with blue cap

Note

If CO cannot be adjusted following components may be defective:
- injectors
- spark plugs
- vacuum leak between cylinder head and intake manifold

Idle speed/CO, checking/adjusting
(Calif. only)

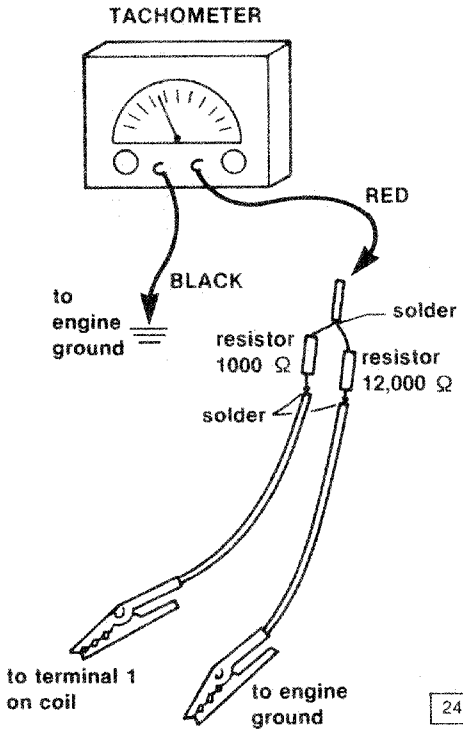
Work sequence

Preliminary conditions:

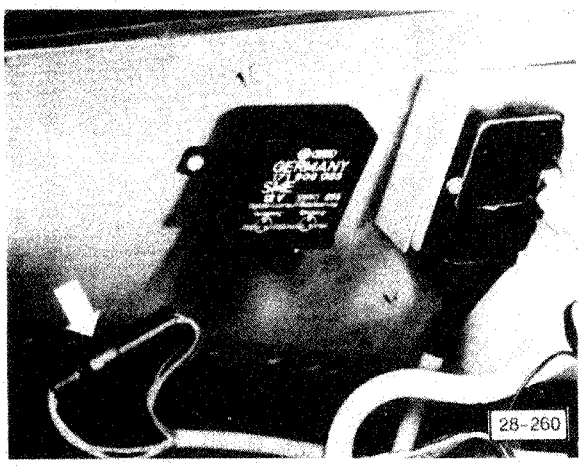
- engine oil temperature min. 60 °C (140 °F)
- intake air sensor must be 20 °C (68 °F)
- all electrical equipment must be **OFF**
- hose for charcoal filter must be disconnected and blocked at air filter

Note

To check engine rpm on vehicles with oxygen sensor and electronic ignition (Calif. vehicles), resistor adaptor must be used in conjunction with commercial tach/dwell meter



— assemble and connect adapter according to illustration
— check idle speed (with idle stabilizer connected)
  • 850–950 rpm



— disconnect plugs on idle stabilizer and connect together (arrow)
— check ignition timing and if necessary adjust (see Repair Group 28)
— check idle speed and if necessary, adjust
  • 850–950 rpm (at adjusting screw)

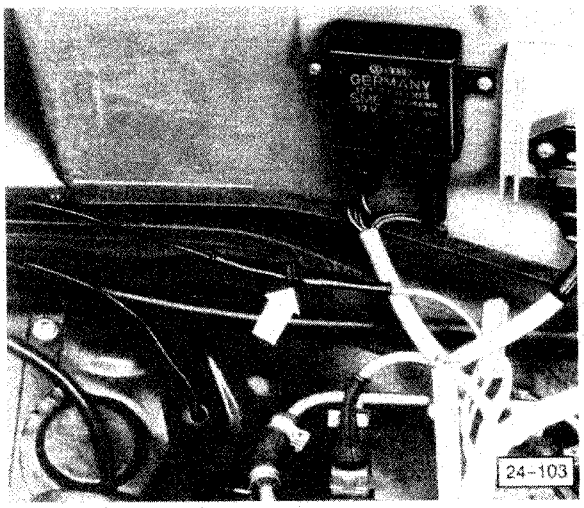
— reconnect idle stabilizer
— start engine and slowly increase engine speed to at least 900 rpm
— release throttle
  • idle must now be: 850–950 rpm

— if timing setting does not change with changes in rpm, replace idle stabilizer

Note

Before checking or adjusting CO, idle speed and ignition timing must be within specifications

— connect CO meter according to manufacturer's instructions
— connect CO probe ahead of catalytic converter at probe receptacle

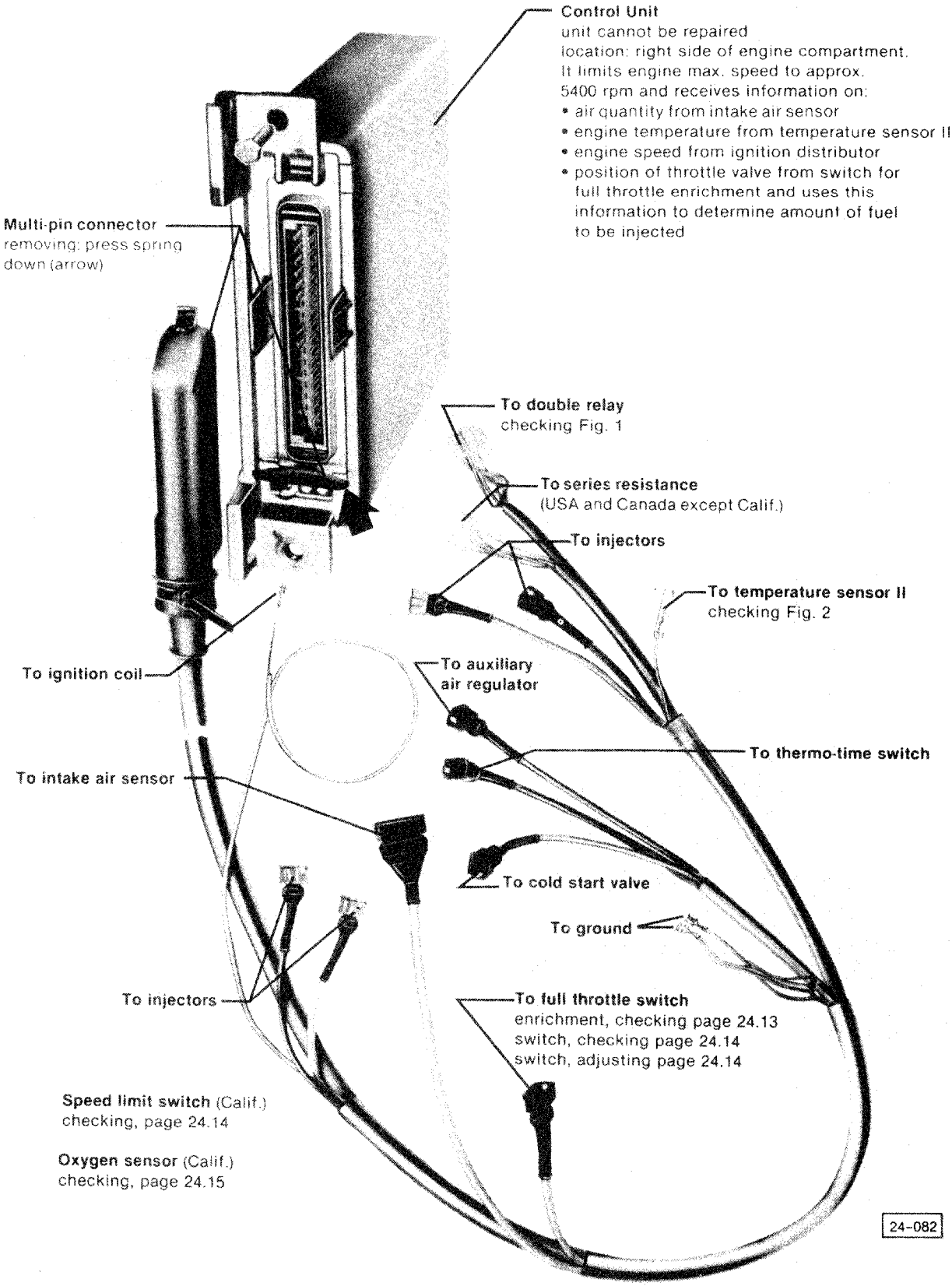


— disconnect oxygen sensor (arrow)
— check CO; if necessary adjust at CO adjusting screw (see photo 24-097, page 24.10)
  • 0.7 ± 0.4%

Note

If CO cannot be adjusted following components may be defective:
• injectors
• spark plugs
• vacuum leak between cylinder head and intake air sensor

— reconnect oxygen sensor
  • CO must be within specifications
— secure CO adjusting screw with blue cap


Control Unit
unit cannot be repaired
location: right side of engine compartment.
It limits engine max. speed to approx. 5400 rpm and receives information on:
• air quantity from intake air sensor
• engine temperature from temperature sensor II
• engine speed from ignition distributor
• position of throttle valve from switch for full throttle enrichment and uses this information to determine amount of fuel to be injected
Multi-pin connector
removing: press spring down (arrow)
To double relay
checking Fig. 1
To series resistance
(USA and Canada except Calif.)
To injectors
To temperature sensor II
checking Fig. 2
To ignition coil
To auxiliary air regulator
To thermo-time switch
To intake air sensor
To cold start valve
To ground
To injectors
To full throttle switch
enrichment, checking page 24.13
switch, checking page 24.14
switch, adjusting page 24.14
Speed limit switch (Calif.)
checking, page 24.14
Oxygen sensor (Calif.)
checking, page 24.15
24-082

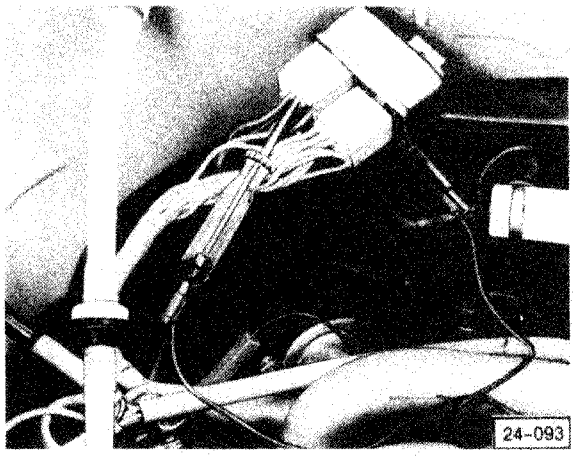


Fig. 1 Double relay, checking

— detach relay from firewall (do not unplug connectors)
— check for voltage at terminals at relay by attaching one lead of test light to terminal 85 and touching other lead to following:
  • 86a
  • 88y
  • 88d
— operate starter
  • test light must light up

if **NO**, check wire to battery or inline fuse
if wire or inline fuse OK, double relay defective and must be replaced

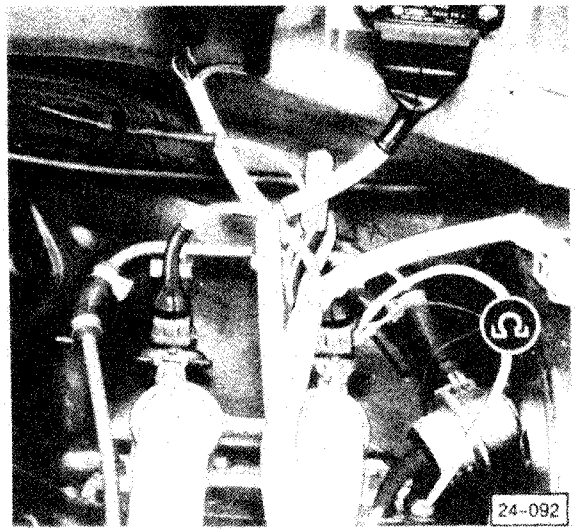


Fig. 2 Temperature sensor II, checking

Note

Temperature sensor in cylinder head supplies control unit with information for starting and warm-up enrichment

— disconnect temperature sensor wire from sensor
— "zero" ohmmeter and connect one probe to temperature sensor and other to ground
— check resistance at oil temperatures below

Oil temperature	Meter reading
– 10 °C (14 °F)	7,000–11,600 Ω
20 °C (68 °F)	2,100–3,100 Ω
80 °C (176 °F)	270–390 Ω

  • if resistance reading too high, touch ground probe to steel housing of sensor
  • if resistance now OK, problem is corrosion between sensor and cylinder head
  • if resistance is still incorrect, replace temperature sensor II

Full throttle enrichment, checking

Work sequence

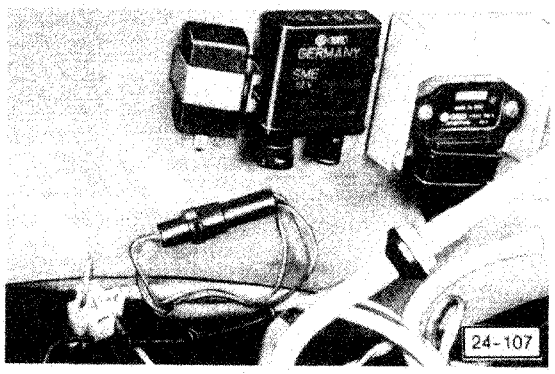
Note

This check shows possible defects in control unit or break in wiring between control unit and full throttle switch. At full throttle, this switch signals control unit to increase amount of fuel injected

California only

Vehicles for California are equipped with speed limit switch located between full throttle enrichment switch and control unit. Full throttle enrichment will take place when engine runs above 3000 rpm (at same time oxygen sensor switches off)

— warm engine until oil temperature is at least 60 °C (140 °F)
— check that idle speed, CO, and ignition timing are OK
— go to next page



California only

— use jumper wire and make contact between terminal 4 and 8 (arrow **A**) of connector for speed limit switch
— pull off connectors for idle stabilizer and connect together (arrow **B**)

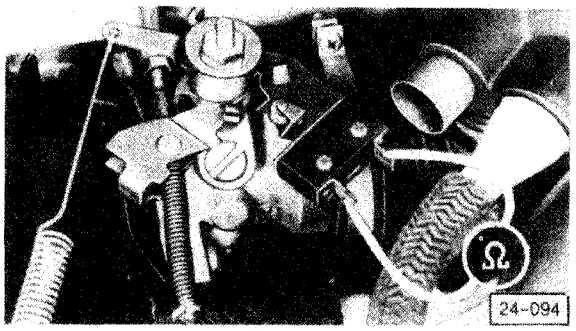
— run engine at idle and adjust to specifications in table

	USA/Canada	Calif.
Manual	800–950 rpm	850–950 rpm
Automatic	850–1000 rpm	850–950 rpm

— operate full throttle switch by hand
• idle speed must increase approx. 100 rpm
if **NO**, check full throttle switch and adjustment position
if OK, replace control unit or wiring between control unit and switch
— on Calif. vehicles readjust idle speed to specifications on sticker and reconnect idle stabilizer

Full throttle enrichment switch, checking

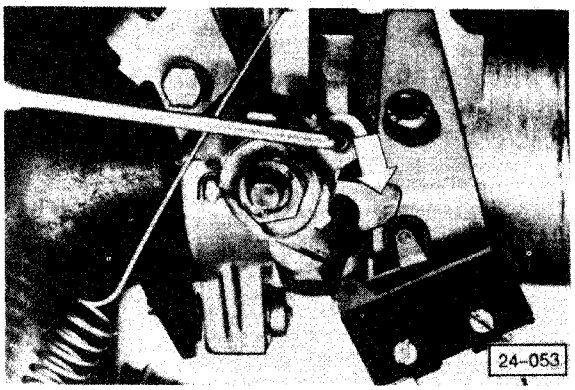
Work sequence



— "zero" ohmmeter and connect to contacts on switch
• with throttle valve closed, ohmmeter must read ∞ ohms
— open throttle valve slowly
• just before reaching stop, ohmmeter must read 0 ohms
if **NO**, switch must be adjusted or replaced

Full throttle enrichment switch, adjusting

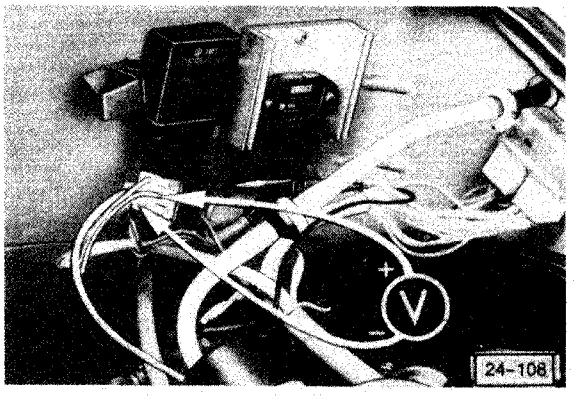
Work sequence



— depress accelerator pedal fully and hold in position
— loosen switch and move it until ohmmeter changes from ∞ ohms to 0 ohms
• roller should be in center of curved lever (arrow)
— tighten switch

Speed limit switch, checking

Work sequence



— connect positive lead (+) of voltmeter to switch terminal 8 and negative lead (–) to switch terminal 6
— start engine and accelerate to approx. 3000 rpm
• voltmeter must indicate battery voltage
if **NO**, replace speed limit switch

Note

Entire AFC System can be checked electrically at control unit plug using an ohmmeter or volt meter according to following chart.

Ohmmeter to terminal:	Specs	Checks
#1 and Ground	Disconnect white injection wire at coil ∞ ohms; hook wire to ground 0 ohms	Wire to #1 terminal on coil
#3 and #18	Press accelerator pedal down fully. 0 ohms	Full throttle enrichment circuit thru throttle switch
#5 and Ground	0 ohms	Ground Circuit
#6 and #9	200-400 ohms	Air Sensor Circuit
#6 and #8	130-260 ohms	Air Sensor Circuit
#8 and #9	70-140 ohms	Air Sensor Circuit
#6 and #7	40-300 ohms	Air Sensor Circuit
#7 and #8	100-500 ohms	Air Sensor Circuit
#6 and #27	Max 2,800 ohms at 68° F	Air Sensor Circuit
#13 and Ground	2,100-2,900 ohms at 68° F 270-390 at 176° F	Head Sensor
#14 and #10	Approximately 7 ohms	Injector wire and resistor
#15 and #10	Approximately 7 ohms	Injector wire and resistor
#32 and #10	Approximately 7 ohms	Injector wire and resistor
#33 and #10	Approximately 7 ohms	Injector wire and resistor
#16 and Ground	0 ohms	Ground Circuit
#17 and Ground	0 ohms	Ground Circuit
#34 at control unit and #37 on the double relay	Approximately 30 ohms	Auxiliary air regulator and wires

Voltmeter to terminal	Specs	Checks
#4 and Ground	12 volts during cranking 0 volts at all other times	Signal from starter
#10 and Ground	12 volts with key on 0 volts with key off	Voltage supply to computer
#20 and Ground	12 volts with key on and sensor flap open	Pump Circuit

Oxygen sensor, checking
(Calif. only)

Work sequence

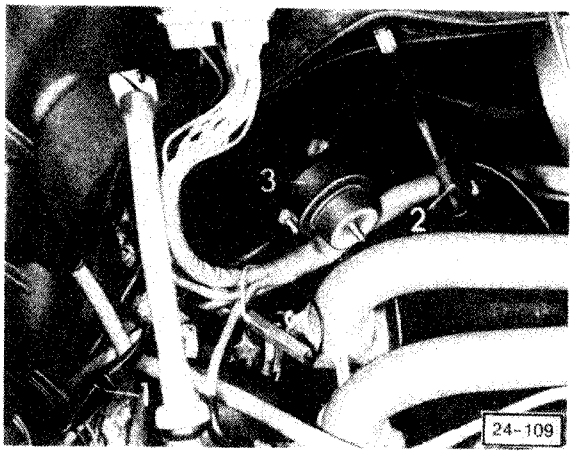
Note

Oxygen sensor is located in exhaust system (in front of catalytic converter). It produces varying voltages (up to 1 volt) dependent on oxygen content of exhaust gases. These voltages are sent to electronic control unit which alter injection time accordingly. Oxygen sensor operates at all engine speeds, except warm-up and full throttle

Preliminary conditions:

- engine oil temperature at least 60 °C (140 °F)
- air temperature 20 °C (68 °F). Before starting following test procedures, wait until intake air sensor housing has assumed room temperature

— connect tachometer according to manufacturer's instructions
— connect CO meter to test receptacle in front of converter (do not connect at tailpipe)
— check idle speed and adjust if necessary
- 850–950 rpm



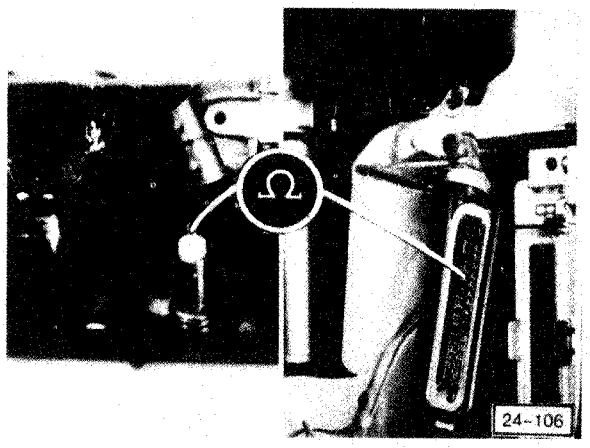
— disconnect oxygen sensor wire **1** to control unit
— check CO
- 0.7 ± .4%

— let engine idle, disconnect vacuum hose **2** at pressure regulator **3** and plug hose
- CO must increase to approx. 2.5%

— reconnect oxygen sensor wire **1**
- CO must drop to 0.7 ± 0.4% if oxygen sensor is OK

if **NO,** following components may be defective:
- oxygen sensor
- wire between oxygen sensor and control unit
- leak in exhaust system between catalytic converter and cylinder head

Wire between oxygen sensor and control unit, checking

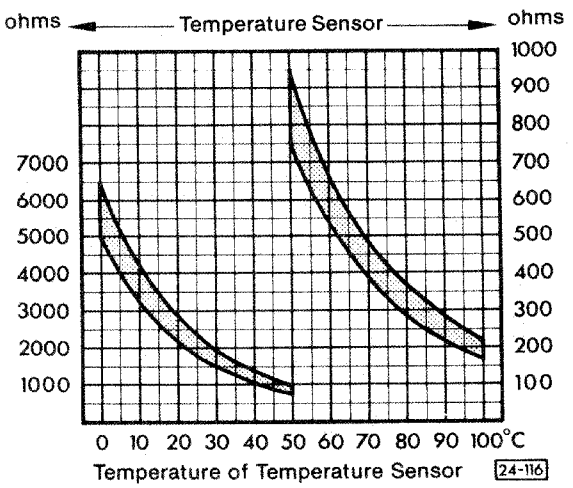


— connect ohmmeter between oxygen sensor and terminal 24 on control unit
- 0 ohm, sensor wiring OK
- ∞ ohm, sensor wiring defective

Technical data and specifications

Components—checking/adjusting	Specifications	Notes
Idle speed see chart page 24.19		• oxygen sensor connected
CO-value checking spec. adjusting spec.	0.3–1.1% 0.7 ± 0.4% *	• oxygen sensor and idle stabilizer connected • oxygen sensor disconnected *
Ignition timing	5° ± 1° ATDC	• idle stabilizer disconnected
Idle stabilizer control unit	below 940 rpm under load, ignition timing advances	• engage 4th gear at idle speed and engage clutch slowly; timing should advance
Fuel pump delivery rate	min. 500 cm³/30 sec.	• disconnect relay connection, turn ignition **ON**, let fuel pump run by using bridging adaptor US 4480/3
Pressure regulator/fuel pressure vacuum hose connected vacuum hose disconnected	 approx. 2.0 bar (29 psi) approx. 2.5 bar (36 psi)	 • idle speed • idle speed
Oxygen sensor wiring disconnected wiring connected	 CO above 2% CO 0.3–1.1%	 • vacuum hose at pressure regulator disconnected and plugged
Injectors fuel spray pattern voltage supply resistance	 even, coneshaped spray test light flickering approx. 16–16.4 ohms	 • operate starter • operate starter
Auxiliary air regulator cold warm	 open closed	 • pinch hose, rpm must drop • after idling about 5 min. pinch hose, rpm does **not** drop
Intake air sensor terminals: 6 and 9 or 3 and 4 7 and 9 or 2 and 3 6 and 22 or 1 and 4	 approx. 560 ohms ohms—changing 2300–2700 ohms	 — • move sensor plate • intake air sensor about 20 °C (68 °F)
Throttle valve switches for deceleration/idle speed for full throttle enrichment	 closed only during idle speed closed at full throttle	 — —

* note altitude; see adjustment procedure, page 24.29

Components—checking/adjusting	Specifications	Notes
Temperature sensor I and II for intake air temperature and coolant temperature		

Idle speed, specifications

Application/ Model year	Idle stab. control unit, identification/ Test conditions	Idle speed rpm
CAL and CAN	green, 251 906 083	
1983-85	control unit by-passed	850 ± 50
49 States	control unit connected	900 ± 50
1983-84		
49 States	black, 321 906 083	
1985	control unit by-passed	750 ± 80
	control unit connected	800 ± 50

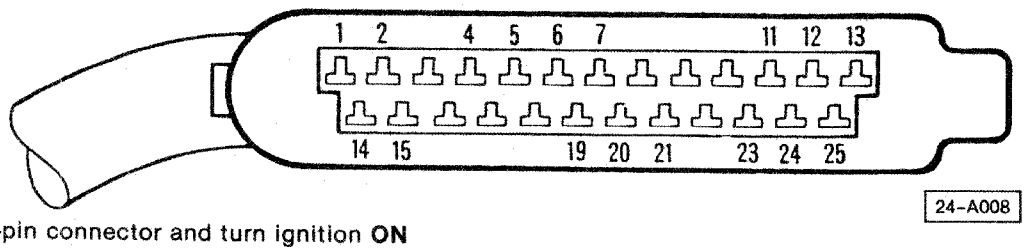
Note

Replacing digital idle stabilization control unit can lower idle speed rpm. When replacing control unit, always recheck idle speed and adjust as necessary.

AFC System check with volt/ohmmeter

Note

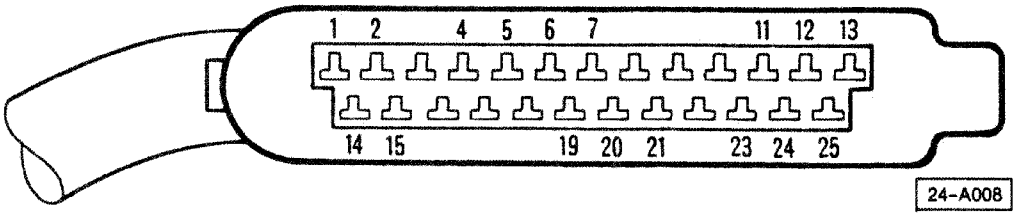
Entire AFC system can be checked electrically at disconnected multi-pin connector of control unit



— remove multi-pin connector and turn ignition **ON**

Tester to terminal:	Components	Checks	Specs
1 and 7	Hall control unit type: AEG	• voltage with ignition **ON**	battery voltage or slightly less
1 and ignition coil terminal 15	HALL control unit type: FAIRCHILD	• touch center wire of connector at ignition distributor to ground	1.5 volts or slightly less
2 and 7	Temperature sensor II (coolant temperature)	• resistance at 20°C (68°F) see diagram page 24.19	2300–2700 ohm
4*) and 7	Deceleration/idle switch Full throttle enrichment switch	• idle speed position • full throttle position	0 ohms 0 ohms
5 and 7	Oxygen sensor	• connector disconnected and grounded • connector connected	0 ohms ∞ ohms
6 and 19	Intake air sensor	• resistance/potentiometer	approx. 560 ohms
7 and 25	Ground connection/control unit	• wiring	0 ohms
11 and 7	Fuel injector, cyl. 4	• injector and wiring	approx. 16–16.4 ohms
12 and 7	Fuel injector, cyl. 3	• injector and wiring	approx. 16–16.4 ohms
13 and 7	Relay, left; terminal 87	• ignition **ON**; function of relay, left	battery voltage
14 and 6	Temperature sensor I (intake air temperature)	• resistance at 20 °C (68 °F)	2300–2700 ohms
15 and 19	Intake air sensor	• resistance/potentiometer; if sensor plate is moved	ohms—changing

*) **do not** connect test light on this terminal if control unit is connected to multi-pin connector

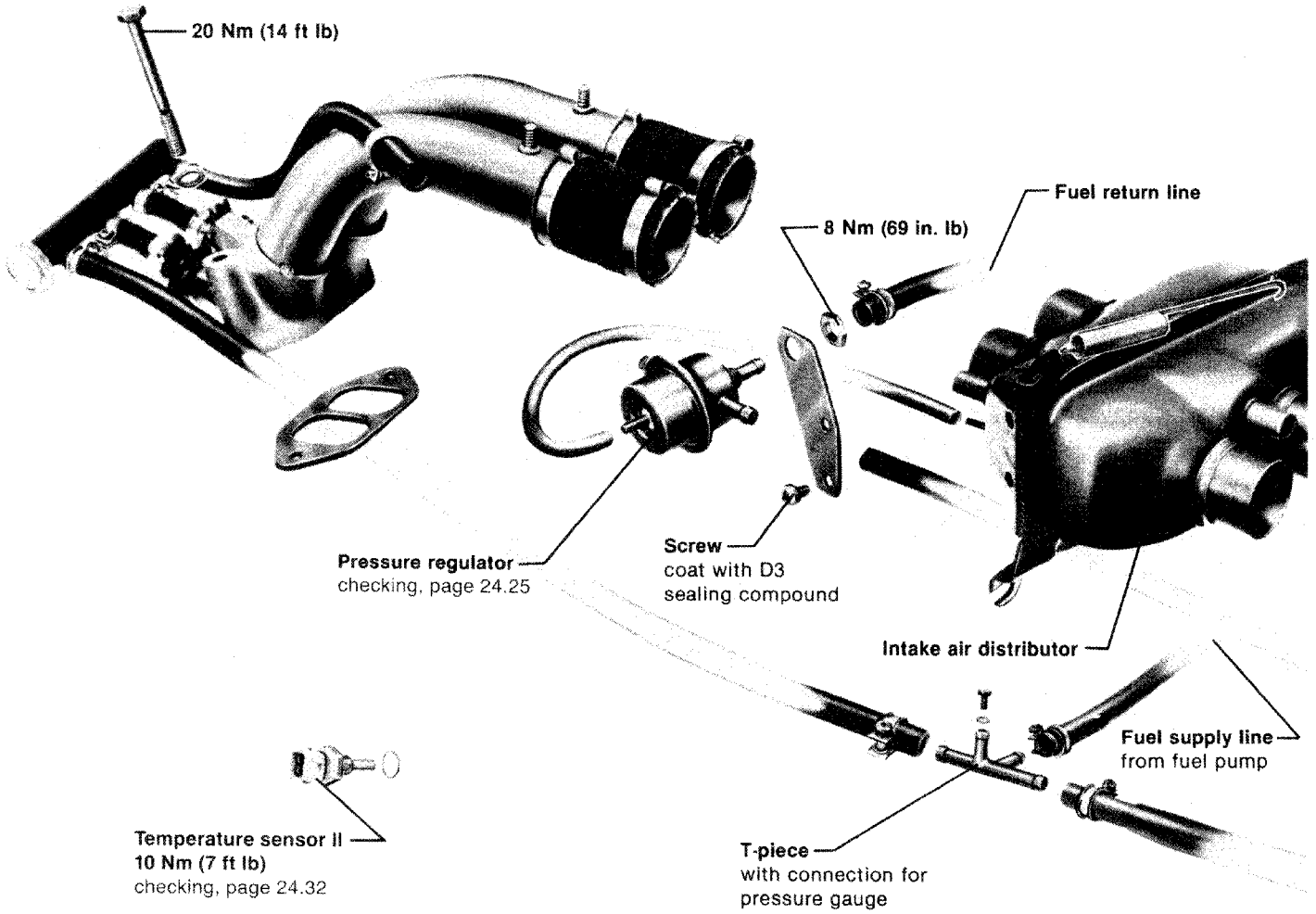


Tester to terminal:	Components	Checks	Specs
20*) and 25 bridged	Relay, right; terminal 86*)	• ignition **ON**; function of relay, right	fuel pump must run
	Auxiliary air regulator	• ignition **ON**; function of auxiliary air regulator	power must be supplied to auxiliary air regulator
21 and 7	Wiring from starter; starting enrichment	• voltage at terminal 50 during starting — crank engine (with injector plugs **OFF**)	cranking voltage
23 and 7	Fuel injector, cyl. 1	• injector and wiring	approx. 16–16.4 ohms
24 and 7	Fuel injector, cyl. 2	• injector and wiring	approx. 16–16.4 ohms
25 and 7	Ground connection/control unit	• wiring	0 ohms

*) **do not** connect test light on this terminal if control is connected to multi-pin connector

CAUTION

During repairs always replace gaskets, seals and clamps

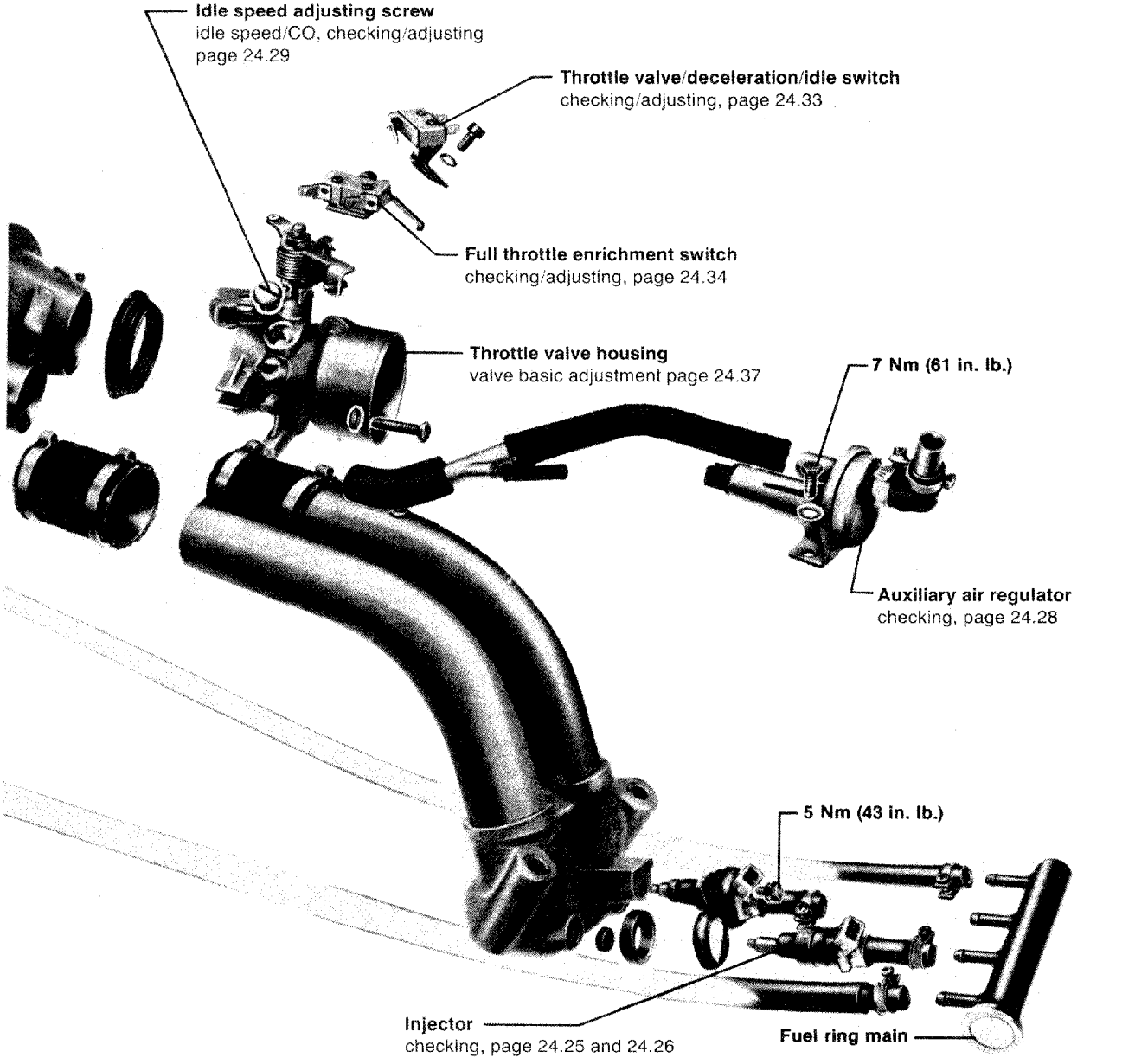


24.22 System components layout

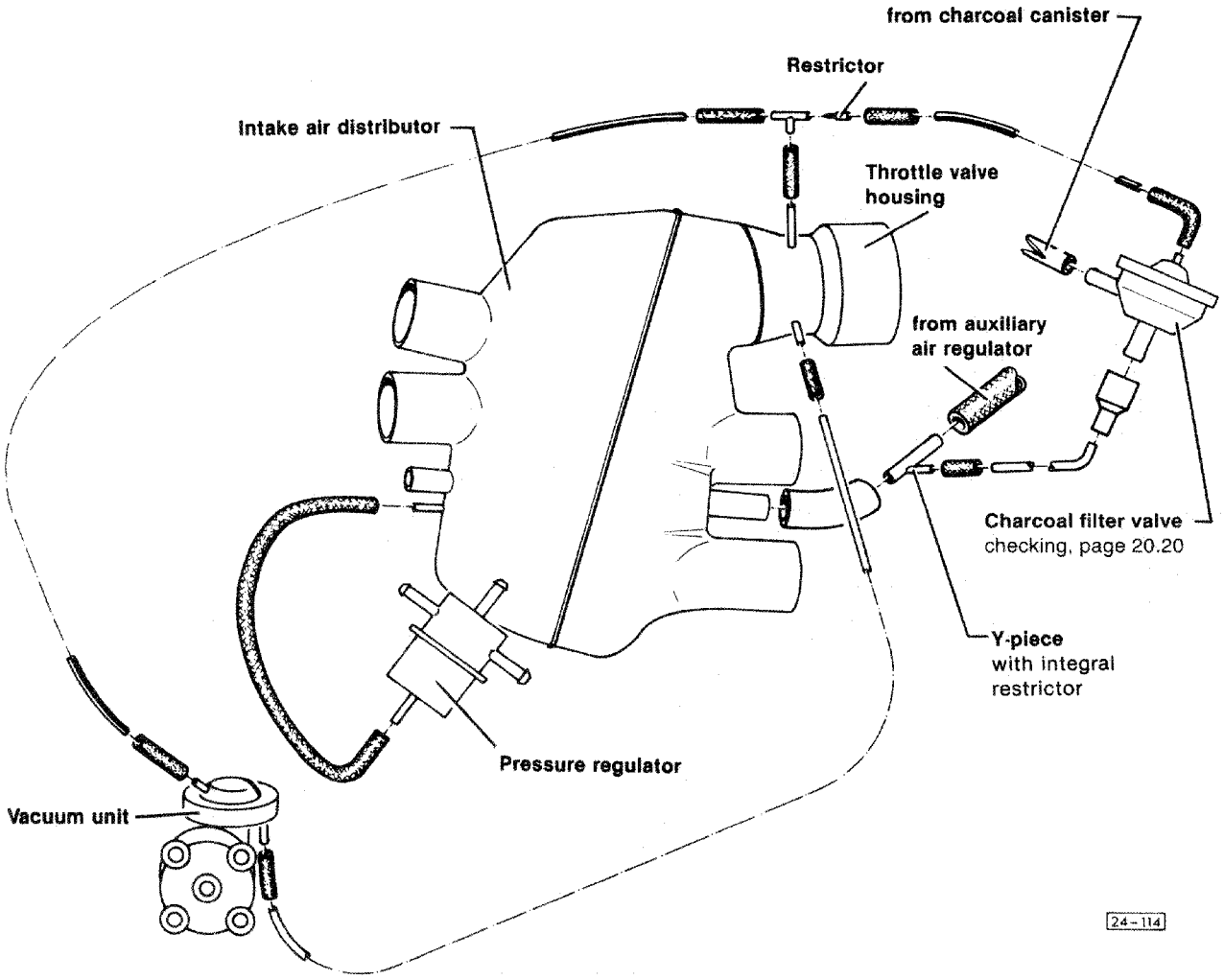
Water-cooled | **Digijet**

Note

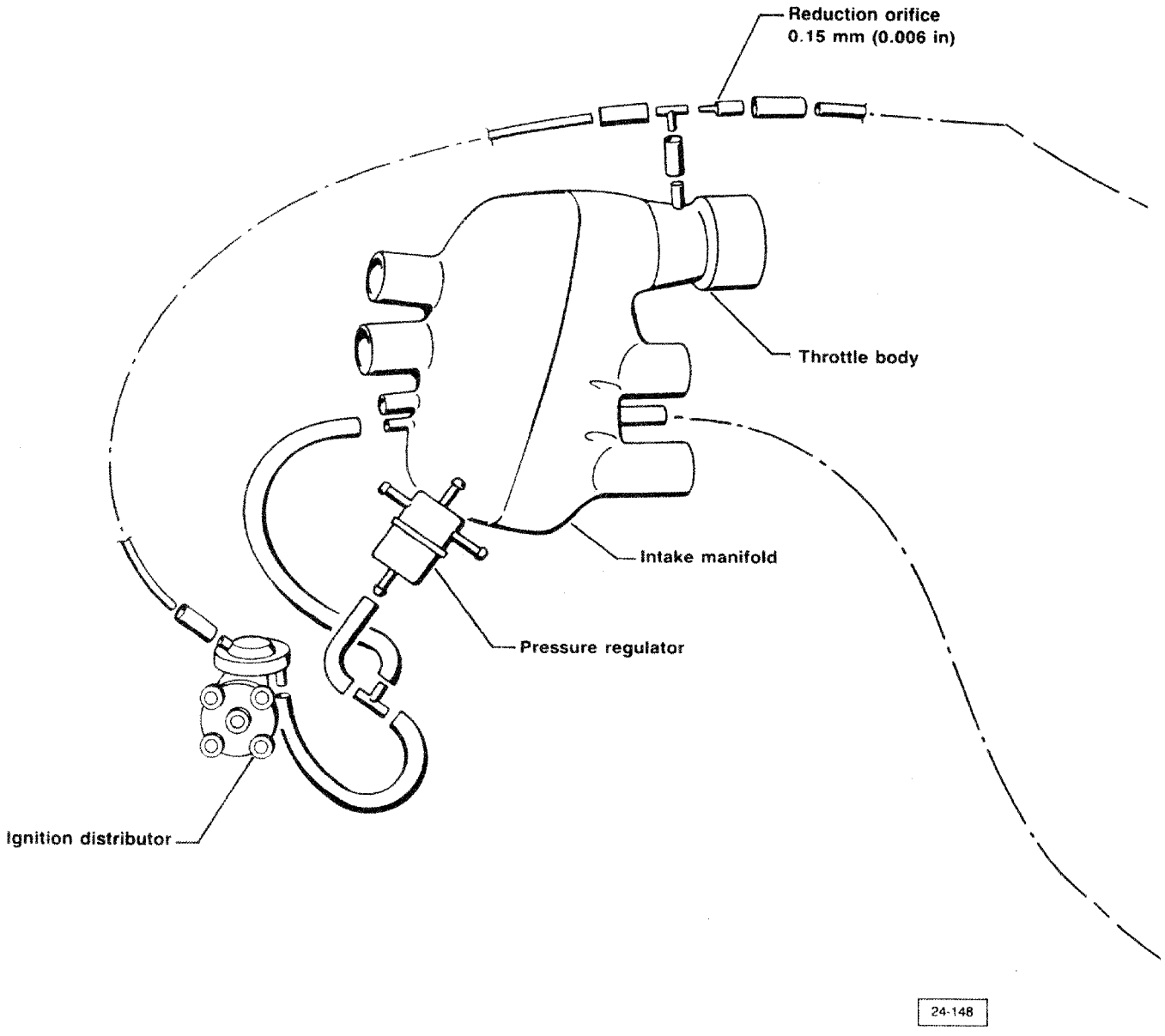
Later versions have throttle body with 1 switch for idle speed, deceleration fuel shut off, and full throttle enrichment
checking/adjusting page 24.35
removing/installing page 24.36



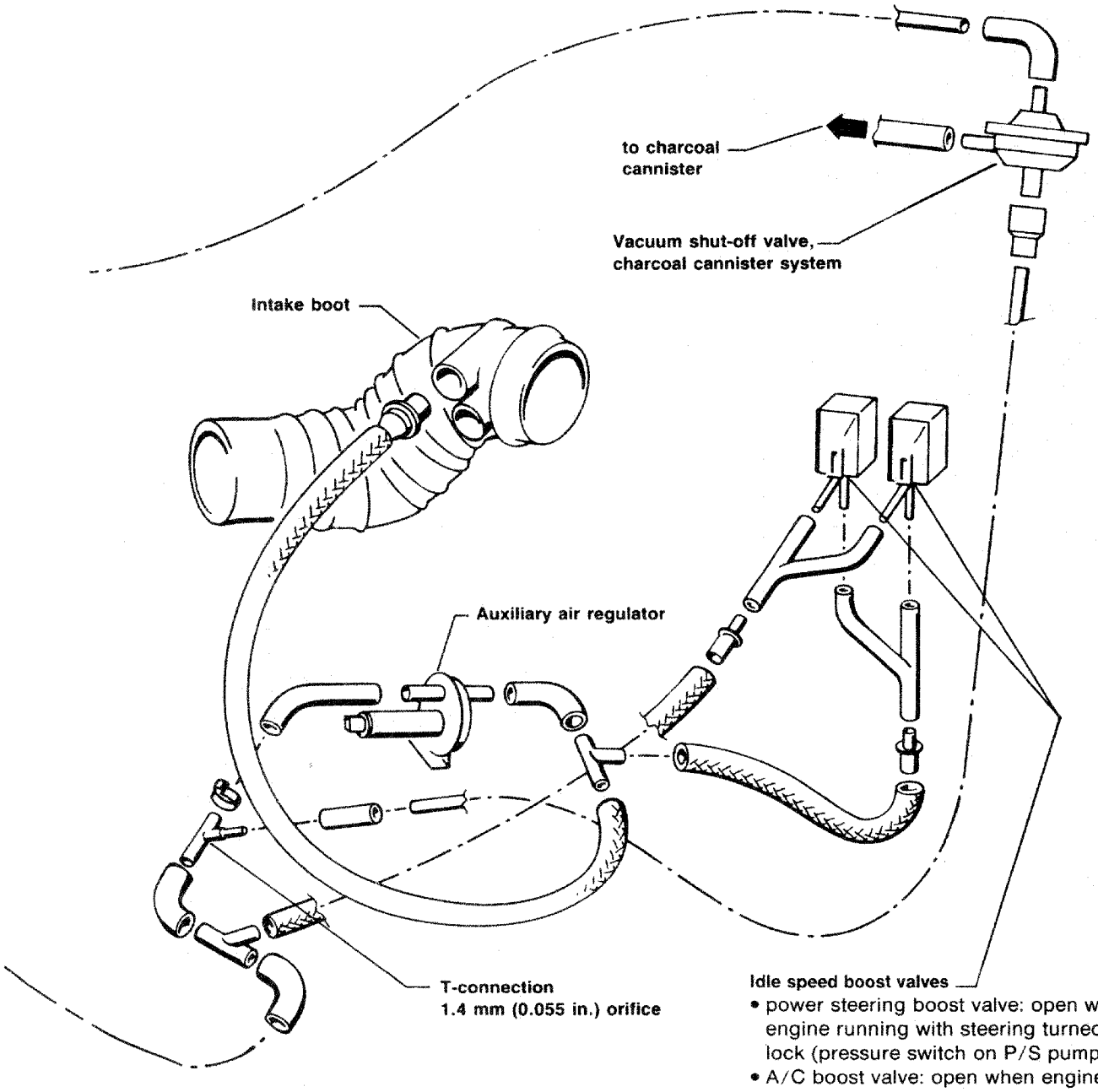
Vacuum hose layout
(early version)



Vacuum hose layout
(late version)



24.24a System components layout (late version) | Water-cooled | Digijet

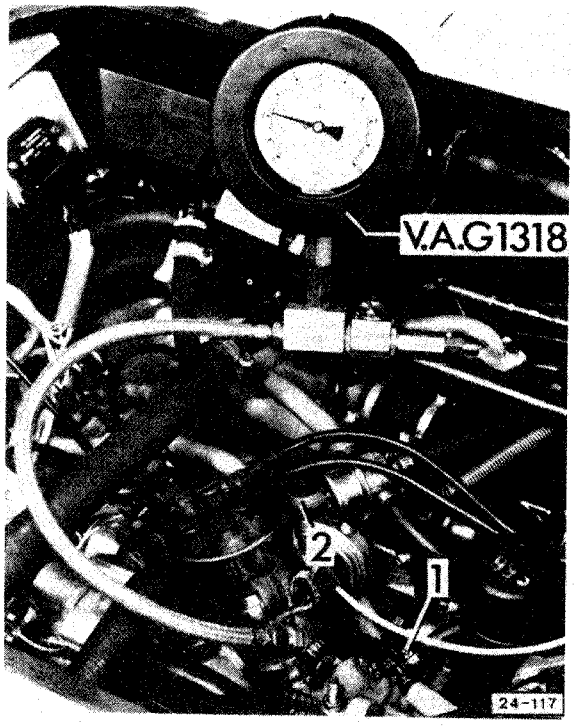


Idle speed boost valves

- power steering boost valve: open when engine running with steering turned to lock (pressure switch on P/S pump closed)
- A/C boost valve: open when engine running with A/C on, and compressor clutch engaged

24-148

Pressure regulator, checking



— connect pressure gauge V.A.G. 1318 or equivalent with adaptor to T-piece **1** of fuel line

CAUTION

Pressure gauge lever must be in closed position during measurement procedure

— run engine at idle speed and check pressure

Specifications:

bar (psi)	vacuum hose **2** (shown in above illustration)
approx. 2.0 (29)	connected
approx. 2.5 (36)	disconnected

Fuel injectors, checking

Work sequence

CAUTION

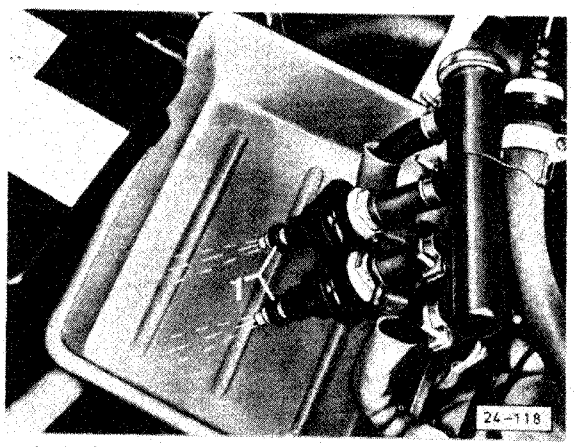
Do **not** disconnect terminal **1** at ignition coil when operating starter

Spray pattern

— pull out fuel injectors in pairs but leave electrical plugs and fuel lines connected
— disconnect electrical plugs at fuel injectors which are still installed (second pair)

WARNING

Fire hazard. Do not smoke or have anything in area that can ignite fuel



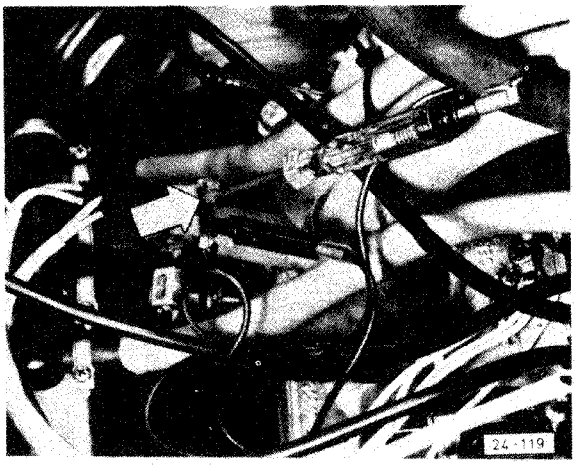
— hold injectors in jar or pan
— operate starter briefly
  • spray pattern must be an even, coneshaped spray
— reinstall fuel injectors with new sealing rings **1**

Leak checking

— pull off electrical plugs at fuel injectors
— pull out injectors in pairs but leave connected to fuel ring line
— turn ignition **ON** for about 5 seconds (fuel pump operates briefly)
— check that no more than 2 drops leak from each injector in one minute

Voltage supply

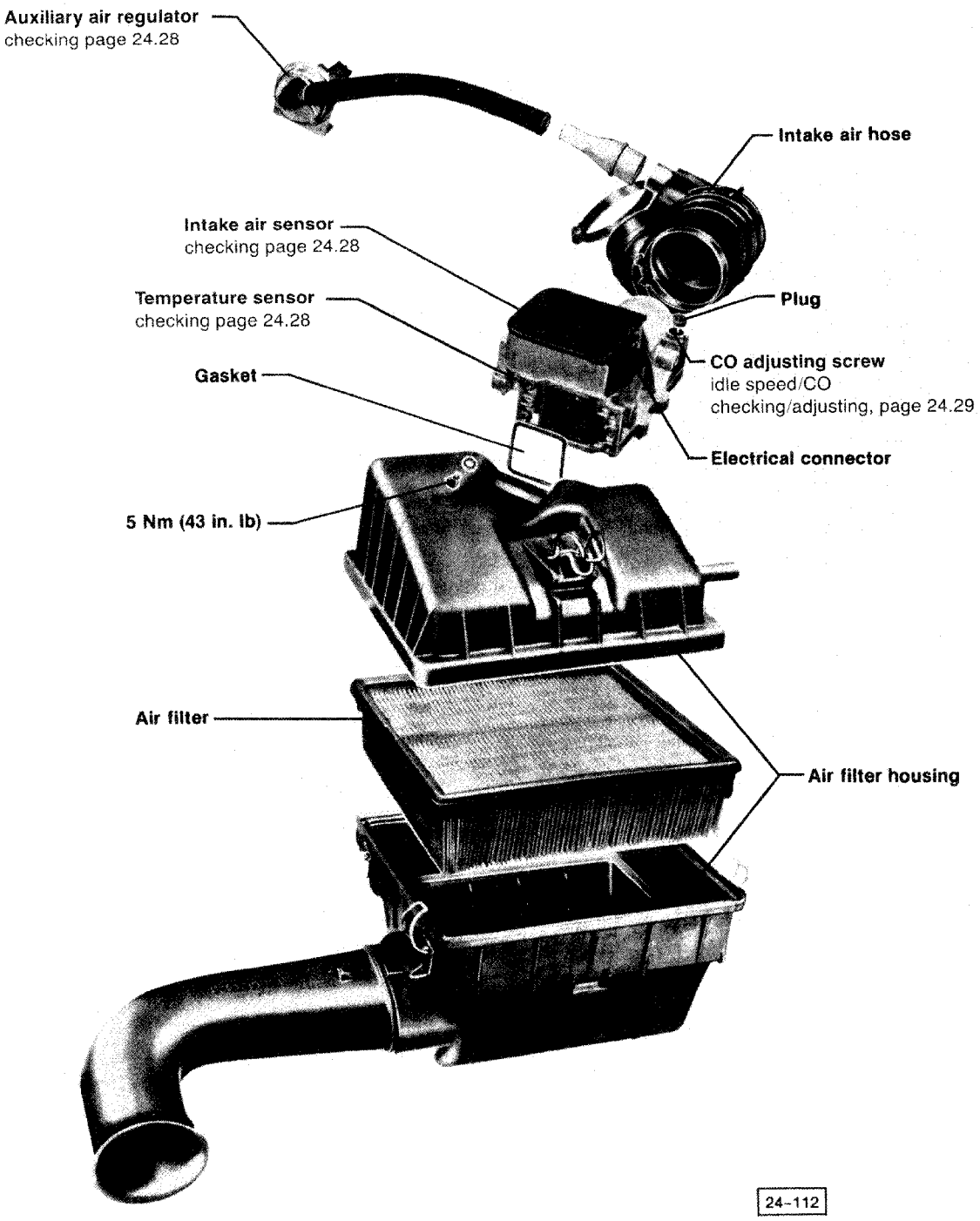
> **CAUTION**
>
> To prevent damage to control unit, **do not** short-circuit connector contacts



— pull off all electrical plugs from fuel injectors
— connect test light to one plug contact (arrow)
— operate starter
  • test light must flicker

if **NO**

—check relays, see page 24.32
— check impulse output of Hall control unit terminal **7**
— check all ground connections at cylinder head

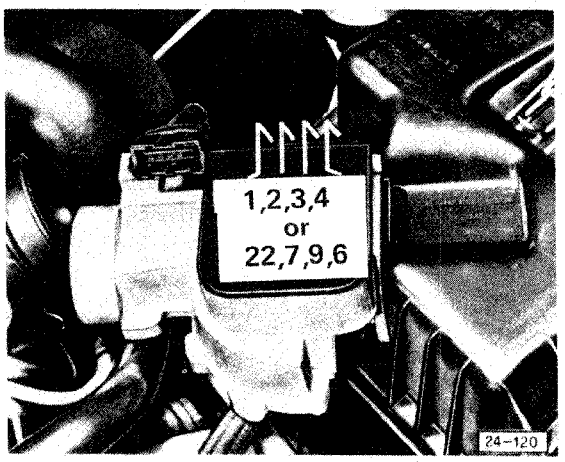


24.27

Intake air sensor housing
Air filter housing
Auxiliary air regulator

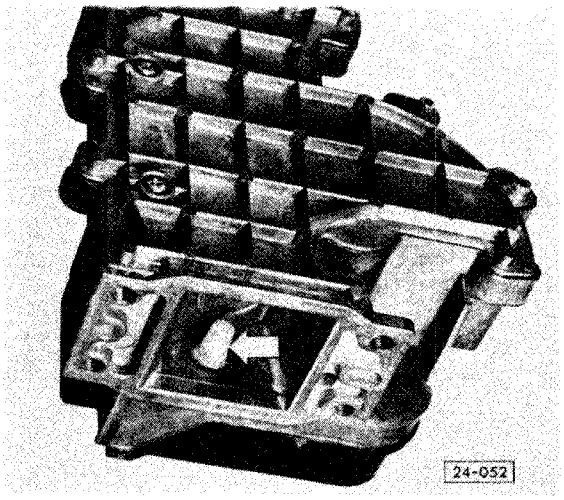
Water-cooled **Digijet**

Intake air sensor, checking

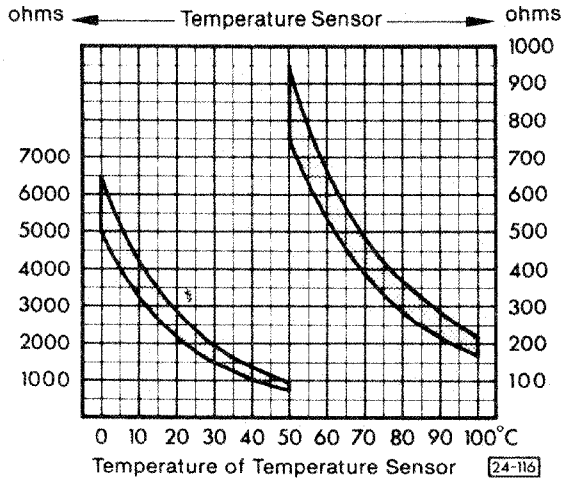


— pull off hose and electrical connector from intake air sensor
— connect ohmmeter to following terminals of potentiometer (arrows)
- 3 and 4 or 6 and 9 = approx. 560 ohms
- 2 and 3 or 7 and 9 when moving sensor plate = changing ohms

Temperature sensor I, checking



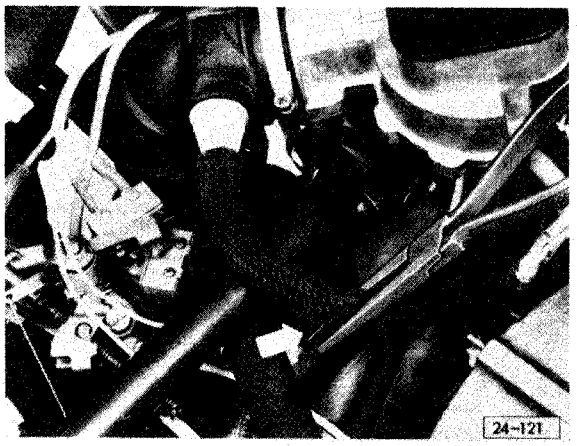
— connect ohmmeter to terminals 6 and 22
- ohmmeter reading should correspond to graph



Note

If specifications are not reached, replace intake air sensor and readjust idle speed/CO value (see page 68)

Auxiliary air regulator, checking



Note

When engine is cold, regulator is open fully, allowing additional air to engine

- engine cold
— run engine at idle speed
— pinch hose (arrow)
- rpm must drop
— run engine at idle speed for about 5 minutes more
— repeat above test
- rpm must not change

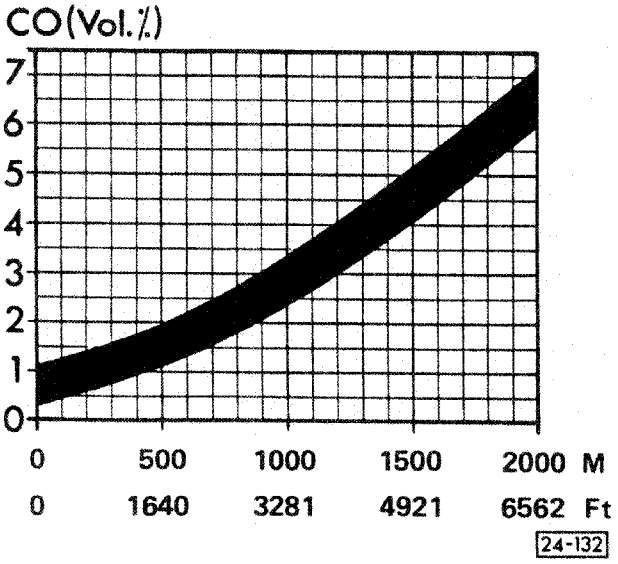
if **NO**
— disconnect electrical plug from auxiliary air regulator
— check voltage supply with engine running
if **OK**
— replace auxiliary air regulator

Idle speed/CO, checking/adjusting

CAUTION

It is important to follow work sequence when checking and adjusting idle speed and CO value

1. Check ignition timing; if necessary adjust
   - idle stabilizer bypassed
   - oxygen sensor connected
2. Check idle speed; if necessary adjust
   - idle stabilizer bypassed
   - oxygen sensor connected
3. Check CO value; if necessary adjust
   - idle stabilizer connected
   - disconnect oxygen sensor wiring connection with ignition **OFF**
   - adjust CO value corresponding to local altitude. See shaded area of graph. shown below.
   - reconnect oxygen sensor at electrical connection.



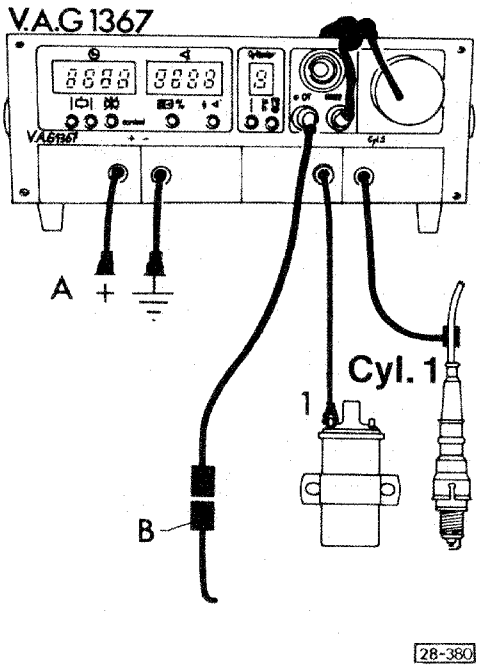
Work sequence

Preliminary conditions:

- engine oil temperature min. 60 °C (140 °F)
- all electrical equipment must be turned **OFF** (radiator fan must not run)
- throttle valve switch must be ON at idle

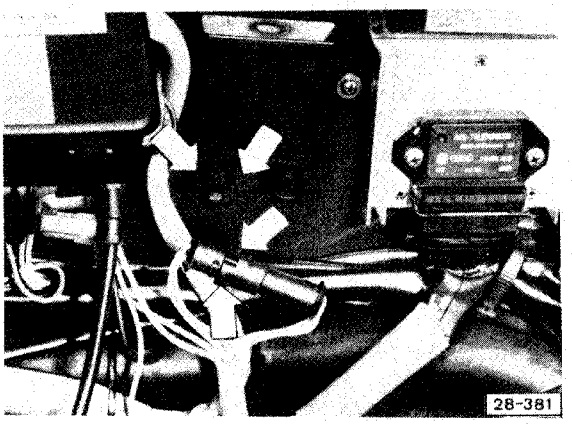
CAUTION

Ignition must be switched **OFF** before connecting tester



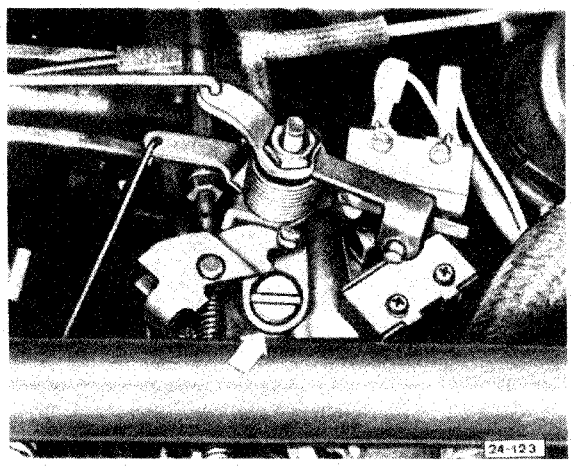
— connect tester V.A.G. 1367 as follows
- **A** to alternator or terminal box
- **B** to TDC sender

— connect CO meter to receptacle in left exhaust pipe

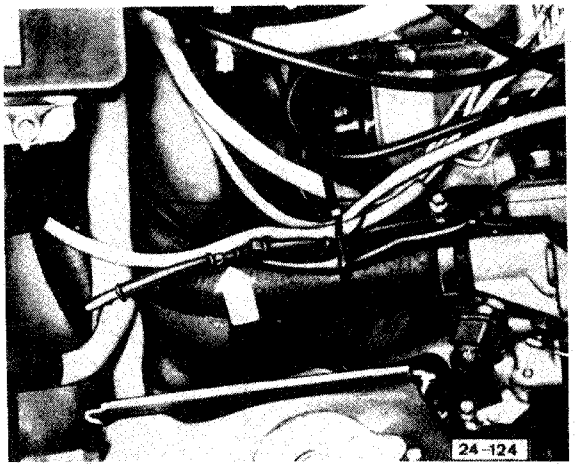


— check ignition timing and adjust if necessary
— disconnect electrical plugs at idle stabilizer control unit (squeeze to release—arrows)
— connect plugs together
— start engine and check ignition timing and adjust if necessary
- spec. = 5 ± 1 ° ATDC
- rpm = below 1000

— adjust ignition timing, see Repair Group 28



— run engine at idle speed
— check RPM after 2 minutes, if necessary adjust with screw (arrow)
— stop engine

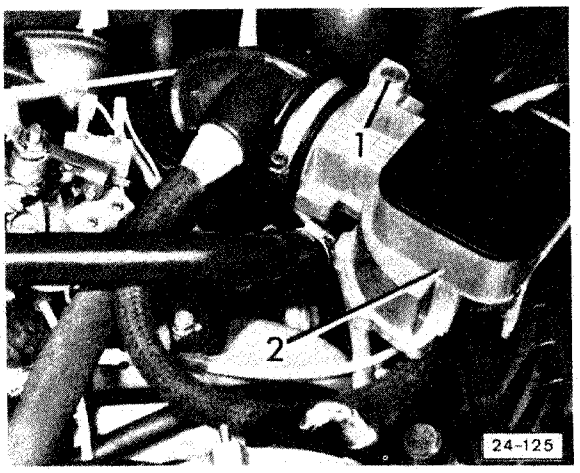


— check CO and adjust if necessary
  • idle stabilizer connected
— with engine **OFF** disconnect electrical connection at oxygen sensor (arrow)
— start engine and check CO value
  • checking spec. = 0.3-1.1%

Note

If CO value is above 1.1% pinch crankcase hose.
• CO should drop below 1.1%
if **YES**, CO adjustment is not necessary (engine oil dilution—change engine oil)
if **NO**, adjust CO (continue with procedure)

— stop engine



— adjust CO as follows:
— remove intake air sensor **2**
— center-punch plug in CO adjusting hole
— drill 2.5 mm (3/32 in.) hole in center of plug 3.5-4.0 mm (9/64-5/32 in.) deep

CAUTION

Clean up any metal shavings

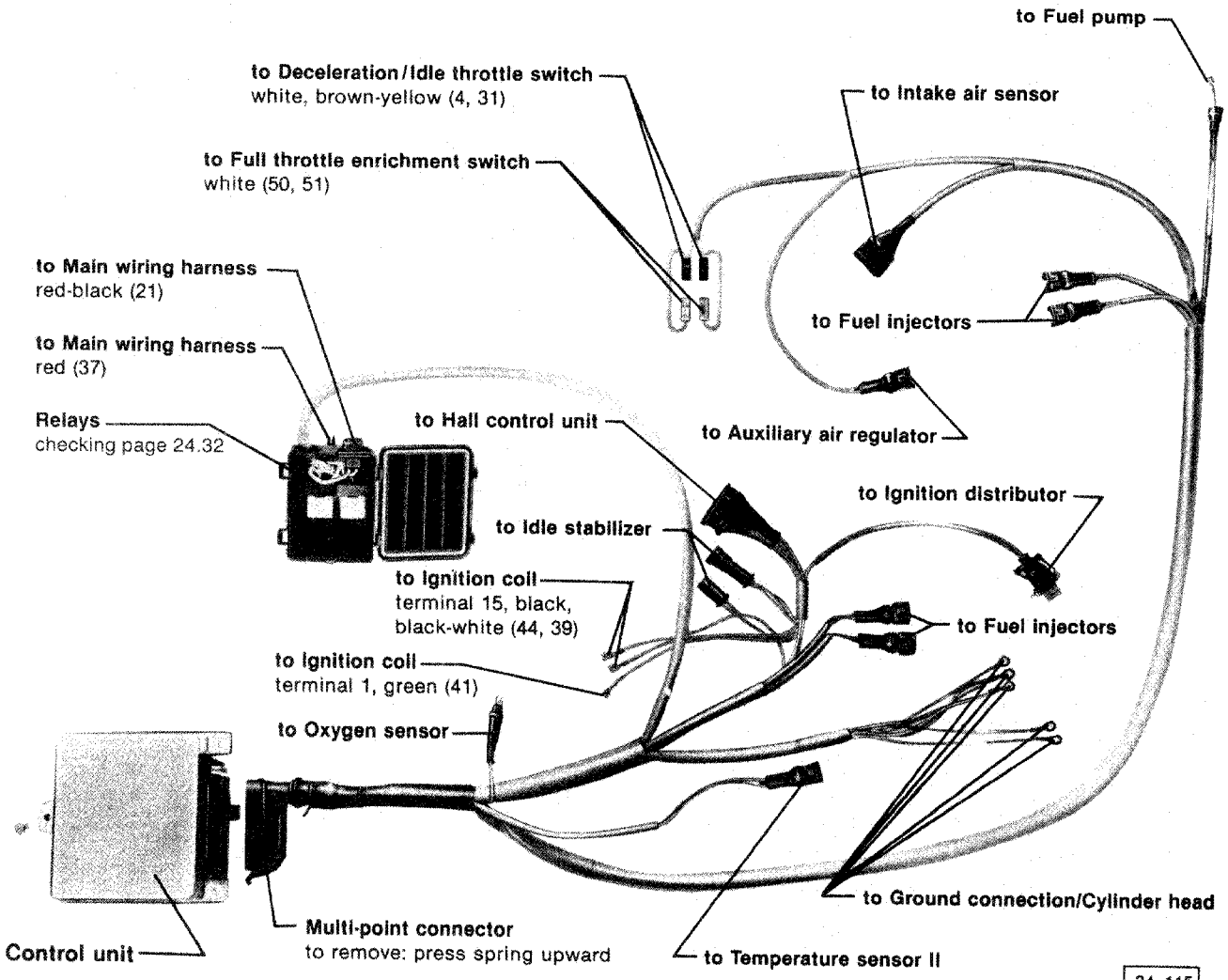
— screw in 3 mm (1/8 in.) sheet-metal screw
— remove plug with screw, using pliers
— reinstall intake air sensor **2**
— start engine (oxygen sensor disconnected)
— adjust CO to 0.7 ± 0.4%
— stop engine
— drive in new plug flush with intake air sensor
— reconnect electrical connection of oxygen sensor

Note

With oxygen sensor and idle stabilizer connected
  • CO must be: 0.3-1.1%
  • Idle speed: 850-950 rpm

Idle stabilizer control unit checking, see Repair Group 28

Oxygen sensor checking, see Repair Group 26



It receives information on:
- air quantity from intake air sensor
- intake air temperature from temperature sensor I in intake air sensor
- engine temperature from temperature sensor II
- engine speed from ignition distributor
- oxygen in exhaust gas from oxygen sensor
- position of throttle valve from full throttle enrichment/deceleration switch and uses this information to determine amount of fuel to be injected

Note

Always replace control unit if defective, can not be repaired in workshop

Note

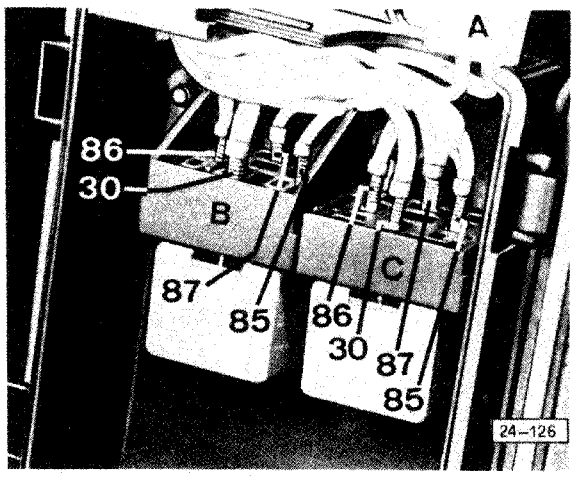
Wiring has white color, note stamped number on it

Relays, checking (with relays installed)

CAUTION

Do not connect any test light to terminal 86 of adaptor **C** (shown in illustration) if control unit is connected

— remove all electrical plugs at fuel injectors



— turn ignition **ON**
— connect test light to ground and check following terminals for voltage:

- connection **A** = red wire terminal **30**
- adaptor **B** = terminals **30, 85, 87**
- adaptor **C** = terminals **30 and 85**
- test light should light

— operate starter and check with test light

- adaptor **C** = terminal **87**
- test light should light
- if test light does not light, check wiring by using current flow diagram (see page 59)
- if wiring is OK and no voltage at terminal 87, check relay
- if relay is OK, replace control unit

Relay on adaptor B, checking

— turn ignition **ON**
— connect test light to terminals **30 and 86**

- test light must light up

if **NO**, check wiring with current flow diagram, see page 59
— connect test light to terminals **86 and 87**

- test light must light up

if **NO**, replace relay on adaptor **B**

Relay on adaptor C, checking

— connect test light between terminals **30 and 86**
— crank engine

- test light must light

if **NO**, check wire to terminal 20 of control unit
if **OK**, replace control unit
— connect test light to terminal **87**
— crank engine

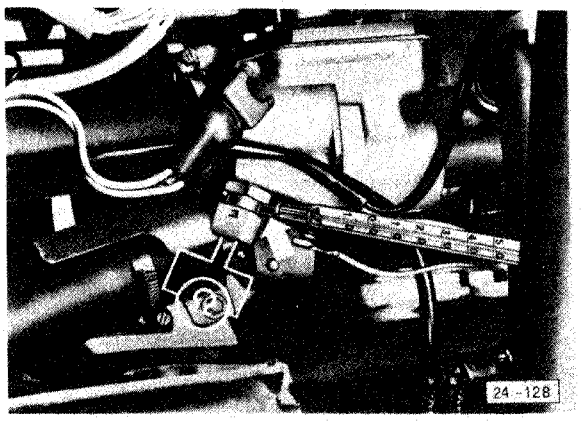
- test light must light

if **NO**, replace relay on adapter **C**

Temperature sensor II, checking

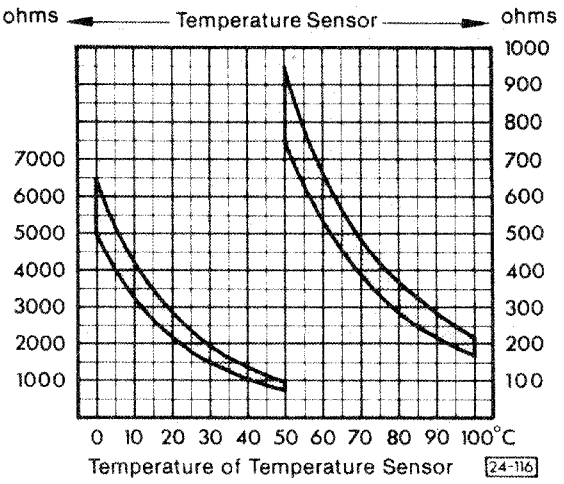
Note

Temperature sensor II in coolant thermostat housing supplies control unit with information for starting and warm-up enrichment



— check temperature and resistance of temperature sensor II

- check specifications, see diagram below:



Throttle valve/deceleration/idle switch, checking

Note

This switch supplies control unit with information that throttle valve is **closed.**

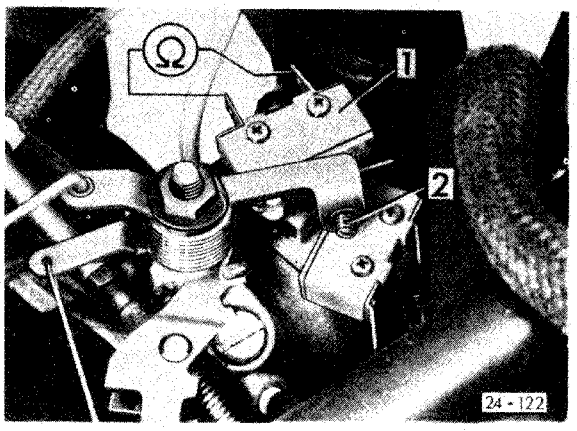
If engine is above 1500 rpm with the throttle closed, fuel will be shut off to the injectors.

At idle speed, this switch signals control unit to regulate amount of fuel injected

> **CAUTION**
>
> Do **not** connect test light to throttle valve switch connectors if control unit is connected

First check (Throttle valve switch)

- throttle valve switch connectors disconnected



— attach ohmmeter to switch **1**
- throttle valve closed
  switch turned **ON** = 0 ohm
- throttle valve open
  switch turned **OFF** = ∞ ohm

Second check (Wiring and control unit)

— run engine at idle speed for a short time
— stop engine and turn ignition **ON**
— pull off connectors from both throttle valve switches
— check voltage between connectors of throttle valve idle switch
- voltage should be approx. 5 volt

if **NO**, control unit is defective or break in wiring

Third check (Deceleration)

Test condition

- result of first and second check must be OK
- throttle valve switch connectors connected
- temperature at temperature sensor II must be minimum 60 °C (140 °F) and resistance below 550 ohms

— operate throttle valve switch by hand and accelerate slowly
- engine speed must fluctuate (surges)

If NO, replace control unit

Throttle valve/deceleration/idle switch, adjusting

- throttle valve closed

— adjust screw **2** so that switch just closes
— from this position turn adjusting screw exactly one turn farther in
— secure adjusting screw with sealant

Note

Correct adjustment is very important
If switch is mis-adjusted engine may surge or cut-out during acceleration

Full throttle enrichment switch, checking

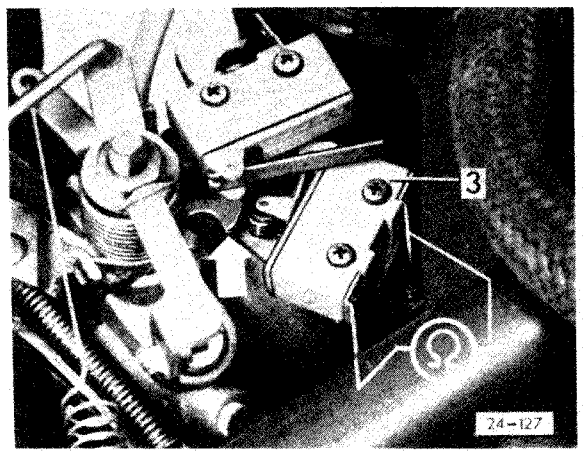
Note

Full throttle enrichment switch supplies the control unit with information to increase amount of fuel injected at full throttle

> **CAUTION**
>
> Do **not** test light to throttle valve switch connectors if control unit is connected

First check (Throttle valve switch)

- throttle valve switch connectors disconnected



— attach ohmmeter to switch **3**
- throttle valve closed
  switch turned **OFF** = ∞ ohms
- throttle valve full open
  switch turned **ON** = 0 ohms

Second check (Wiring and control unit)

— run engine at idle for a short time
— stop engine and turn ignition **ON**
— pull off connectors from both throttle valve switches
— check voltage between connectors of full throttle enrichment switch
- voltage should be approx. 5 volts

if **NO**, control unit is defective or break in wiring

Third check (Full throttle enrichment)

Test conditions:

- result of first and second check must be OK
- throttle valve switch connectors connected
- temperature at temperature sensor II must be minimum 60 °C (140 °F) and resistance below 550 ohms
- CO tester and tachometer connected

— run engine for about 2 minutes at idle speed
— increase idle speed slowly until tachometer reads about 4000 rpm
- CO should be between 0.3 to 1.1%

— with engine at about 4000 rpm, operate full throttle enrichment switch **3** by hand for about 15 seconds
- CO must increase above 1.5%

if **NO**, control unit is defective

Full throttle enrichment switch, adjusting

— loosen retaining screw for switch
— open throttle valve fully and move switch until cut-in position is reached
- position of roller should be nearly in center of cam disk (arrow, photo, 24-127)

— retighten retaining screw for switch

Throttle valve switch
(design with 1 switch)

Function

With throttle valve **closed**, switch signals control unit about the following

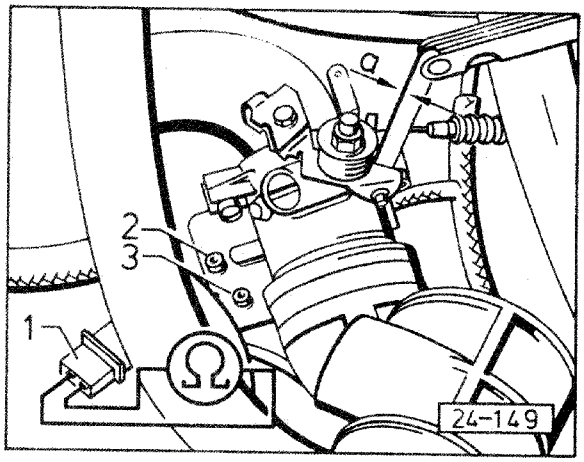
- idle injection quantity
- switching off injection during deceleration

With throttle valve **open**, switch signals control unit about the following

- full throttle injection quantity

> **CAUTION**
>
> **DO NOT** connect test light to terminals of throttle switch unless control unit is disconnected.

Throttle valve switch, checking/adjusting
(design with 1 switch)



— connect ohmmeter across terminals of unplugged switch connector **1**
- ohmmeter must read 0 Ω only when throttle lever is at idle stop and full throttle stop
- check switch-on point of throttle switch as follows

— open throttle valve and slowly close
— measure switch-on point with feeler gauge between idle stop and idle adjusting screw
- must be 0.05-0.10 mm (0.002-0.004 in) before idle stop (gap **a**)

If measurement **NOT OK**

— correct by adjusting position of switch. Loosen screw **2** and adjust screw **3**

CAUTION

Basic throttle valve adjustment must **NOT** be changed.

Note

Correct adjustment is important. Following are conditions that are created by improper adjustment

- gap **a** too large

Engine surges with lean condition

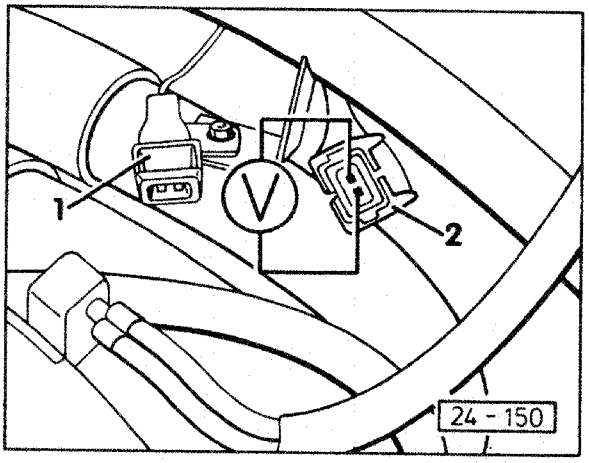
- gap **a** too small

With cold engine, stalling at full throttle acceleration.
With engine warm, no deceleration fuel shut-off

Control unit and wiring, checking

Work sequence

— switch ignition **ON**



— using voltmeter, check voltage present across terminals of connector **2**
- must be approx. 5V

If voltage reading **NOT OK**
— check for open circuit in wiring according to current flow diagram

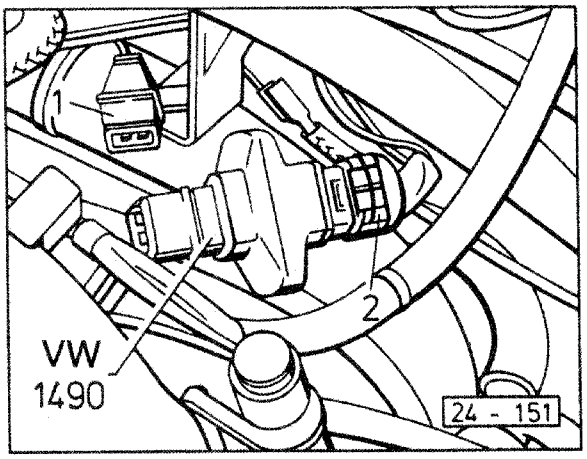
If wiring **OK**
— replace control unit

Deceleration fuel shut-off, checking

Test conditions

- temp. sensor II minimum 60°C (140°F) with resistance reading less than 550 Ω

Work sequence



— using ⌐¬ end of tool VW 1490, bridge terminals of connector **2**
— accelerate engine slightly
  • engine rpm must fluctuate (deceleration fuel shut-off system operates)

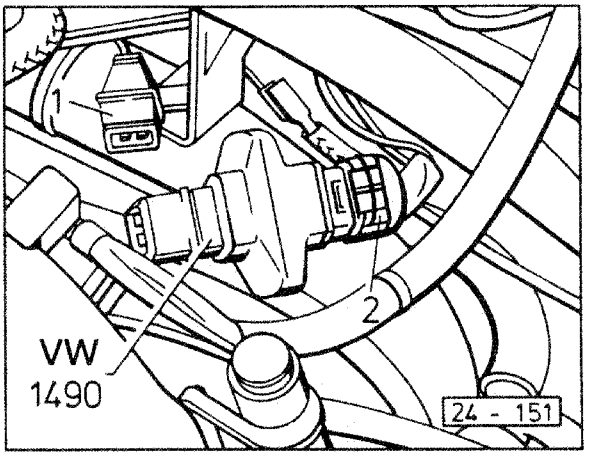
If rpm **DOES NOT** fluctuate
— replace control unit

Full throttle enrichment, checking

Test conditions

- temp. sensor II minimum 60°C (140°F)
- CO testor and tachometer connected

— start engine and let idle approx. two minutes
— slowly accelerate engine until 4000 rpm is reached
  • CO must read 0.3 – 1.1% Vol.



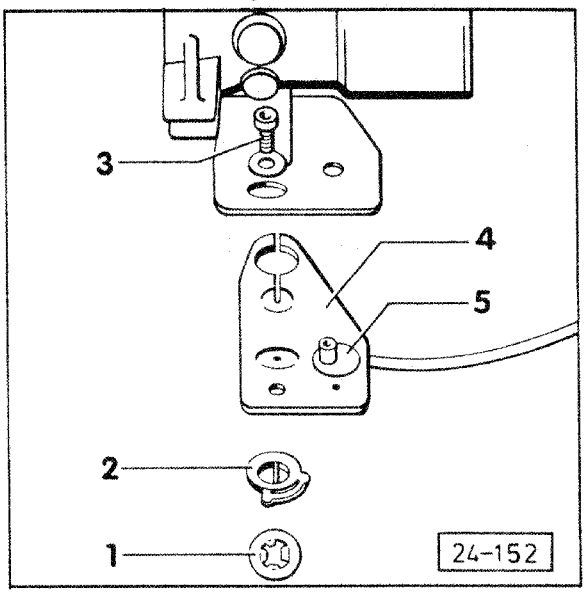
— using ⌐¬ end of tool VW 1490, bridge terminals of connector **2**
  •CO reading must increase above 1.5% Vol.

If CO readings **NOT OK**
— replace control unit

Throttle valve switch, removing/installing

Work sequence

— remove throttle body



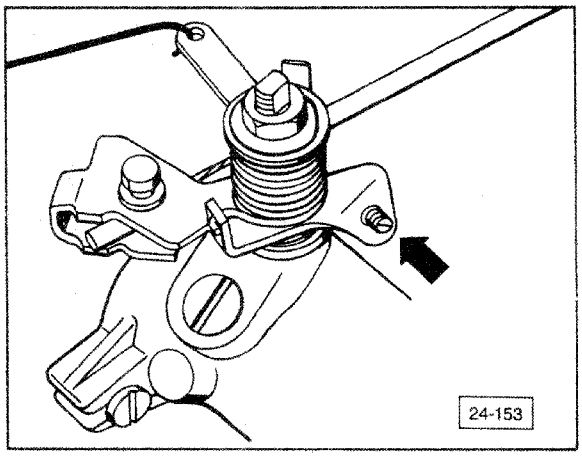
— remove switch **4** following numerical sequence of components **1** through **5**
— install components in reverse order
— perform basic adjustment as follows

Throttle valve, basic adjustment

Note

Stop screw is set at factory and should not be moved. If screw position has been altered, check basic adjustment as follows

Work sequence



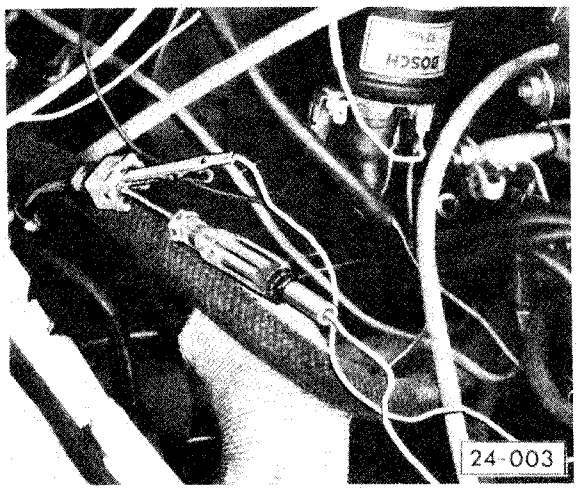
— turn adjusting screw (**arrow**) out until gap exists between stop and screw
— turn screw in until it touches stop

Note

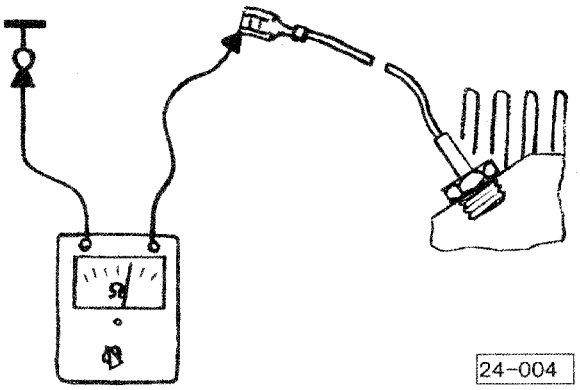
In order to determine exact point of contact with screw stop, place a thin piece of paper between screw and stop. Slide paper and turn screw at same time until screw pinches paper.

— turn screw clockwise additional 1/2 turn
— check idle speed and CO; adjust if necessary

No voltage at injectors, troubleshooting



Voltage at injectors, checking



Temperature sensor, checking

from page 24.6

No voltage at injectors

- pull connector off one injector and connect test light
- operate starter, light should flicker weakly

test light flickers weakly	test light does not light	test light stays on
	go to page 24.40	replace control unit

Temperature sensor on cylinder head has no continuity or is shorted

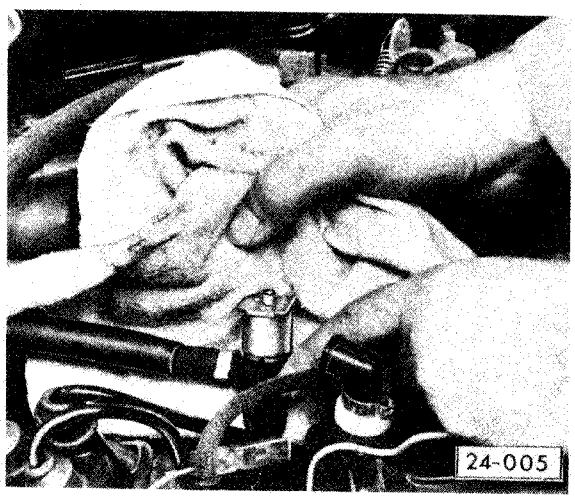
- disconnect wire from temperature sensor
- connect ohmmeter on cylinder No. 4
- check that resistance is about 2.5 kΩ (engine at room temperature)

measured resistance is as specified	ohmmeter shows 0 Ω or ∞ Ω
	replace temperature sensor

Engine floods due to defective cold start valve

- pull connector off cold start valve
- start engine with throttle fully open, because spark plugs may be wet

Engine does not start	Engine starts
go to page 24.39	replace thermo time switch



Cold start valve, checking

Warning
Fire hazard

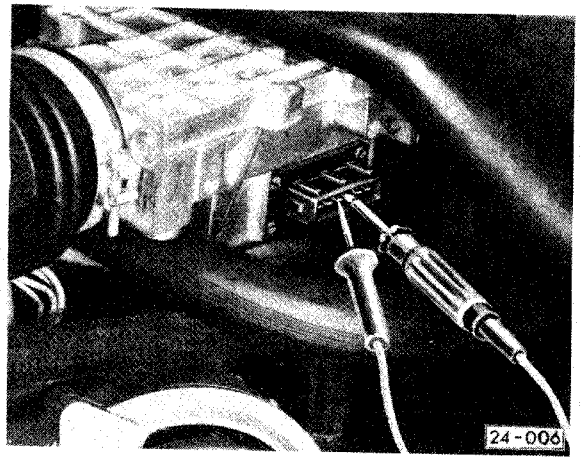
from page 24.38

Engine floods due to leaky cold start valve

- detach cold start valve from intake air distributor but leave it connected to ring main
- pull connector off cold start valve
- pull wire off ignition coil terminal 1
- operate starter

Valve does not leak	Valve leaks

replace
cold start valve



Intake air sensor, checking

Intake air sensor bad

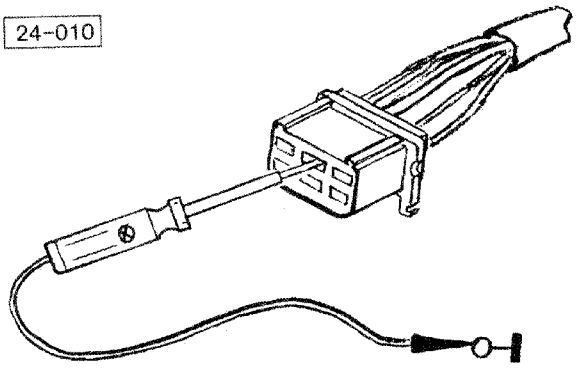
- pull connector off air intake sensor
- connect ohmmeter to terminals 6 and 9 on intake air sensor (reading: 100 to 300 Ω)
- then check at terminals 7 and 8 (reading: 80 to 200 Ω)

Readings outside tolerances	Readings as specified

replace
intake air sensor

Break in wire or connections between control unit and intake air sensor

24-010



Double relay, checking

from page 24.38

Double relay defective	
● connect test light between center slot in molded connector of series resistance and ground ● switch ignition on	
Test light lights	Test light does not light

go to page 24.41

No voltage at double relay	
● switch ignition on ● connect test light between: terminal 86c and 85 (to coil terminal 15) terminal 88z and 85 (to battery) terminal 88b and 85 (to series resistances)	
Test light lights	Test light does not light

replace double relay

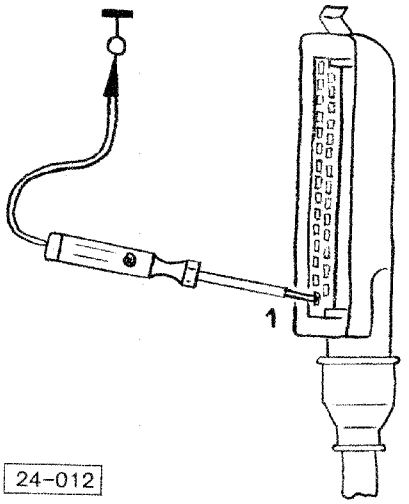
break in wire

from page 24.40

No triggering impulse from coil terminal 1

- pull multi-pin connector off control unit
- connect test light between terminal 1 and ground
- operate starter

Test light flickers	Test light does not flicker



24-012

Triggering impulse, checking

Possible causes:
- break in wire between terminal 1 on distributor and terminal 1 on control unit multi-pin connector
- breaker contacts in distributor bad or incorrectly adjusted
- condenser ground connection
- ignition coil bad

Control unit has no ground connection

- switch on ignition
- test voltage between following terminals on multi-pin connector of control unit:
  terminal 10 and 5
  terminal 10 and 16
  terminal 10 and 17

Test light lights	Test light does not light

replace defective control unit

Possible causes:
- break in ground wire of control unit

CAUTION

Do **NOT** touch or disconnect ignition cables when engine is running or starter is cranked.

Disconnect wires in ignition system only when ignition is switched **OFF**.

Connect and disconnect tester leads to ignition system only when ignition is switched **OFF**.

When high tension cable (terminal **4** from coil) is disconnected from distributor, always connect it directly to ground using jumper cable. Otherwise, engine must **NOT** be cranked with starter (such as with compression test).

Vehicles that have a defect in the ignition system or are suspected of having one, may only be towed with the connector from terminal **1** of the ignition coil (green wire) disconnected.

Fast charging may only be used for emergency starting for up to 15 seconds maximum with no more than 16.5 volts. Wait at least one minute after each starting attempt.

Do **NOT** replace ignition coil with conventional type coil.

Battery must be completely disconnected when using arc, spot, or electrical welding equipment.

If components are heated above 80°C (176°F) such as from paint drier or steam cleaner, wait for components to cool down before starting engine.

Do **NOT** wash engine while it is running or ignition is switched **ON**.

Do **NOT** disconnect battery with engine running.

Do **NOT** apply voltage to control unit to simulate output signals.

CAUTION

When working on fuel system, always follow these precautions on cleanliness

— thoroughly clean all unions and area near connections before disconnecting
— place removed parts on a clean surface and cover over. Use paper or plastic sheet. Use only lint-free cloths
— components which have been opened or disassembled must be covered or sealed carefully if repair cannot be carried out immediately

— only install clean components
— only unpack replacement parts immediately before they are installed
— do not use parts that have been stored loose (for instance, in toolboxes)
— when fuel system is open, do not work with compressed air if this can be avoided or move car unless absolutely necessary

Technical data/specified values

Engine code			MV
Type			2.1 liter 70 kW, 90 SAE net HP
Introduction			October 1985
Part no. Control unit			025 906 022
Ignition timing	checking spec.		3-7° before TDC
	adjusting spec.		5 ± 1° before TDC
• Test and adjustment conditions		no.	1 and 9
Idle adjustment	idle rpm		880 ± 50 rpm
	CO content		0.7 ± 0.4 Vol. %
• Test and adjustment conditions		no.	1 to 6, 7, 8

Conditions and requirements:

1 — engine oil temperature min. 80°C (176°F)

2 — electrical consumers turned off

3 — crankcase breather hose on oil breather removed and closed tightly

4 — throttle valve switch turned on (continuity)

5 — idle stabilizer OK (valve vibrates and hums)

6 — ignition timing setting: OK

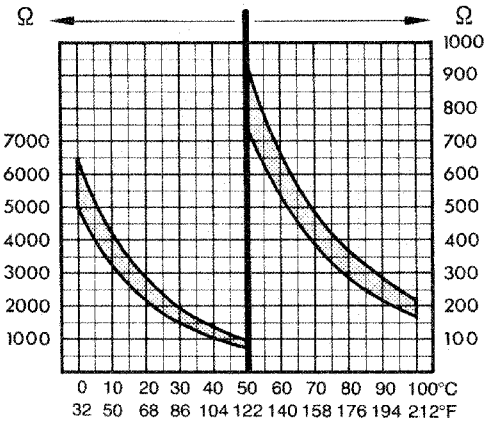
7 — connector (single connector) for idle stabilizer control valve disconnected

8 — with ignition OFF, disconnect connector (single connector) for oxygen sensor

9 — with engine running, double connector for temperature sender disconnected and rpm increased to 2000-2500 rpm by depressing throttle

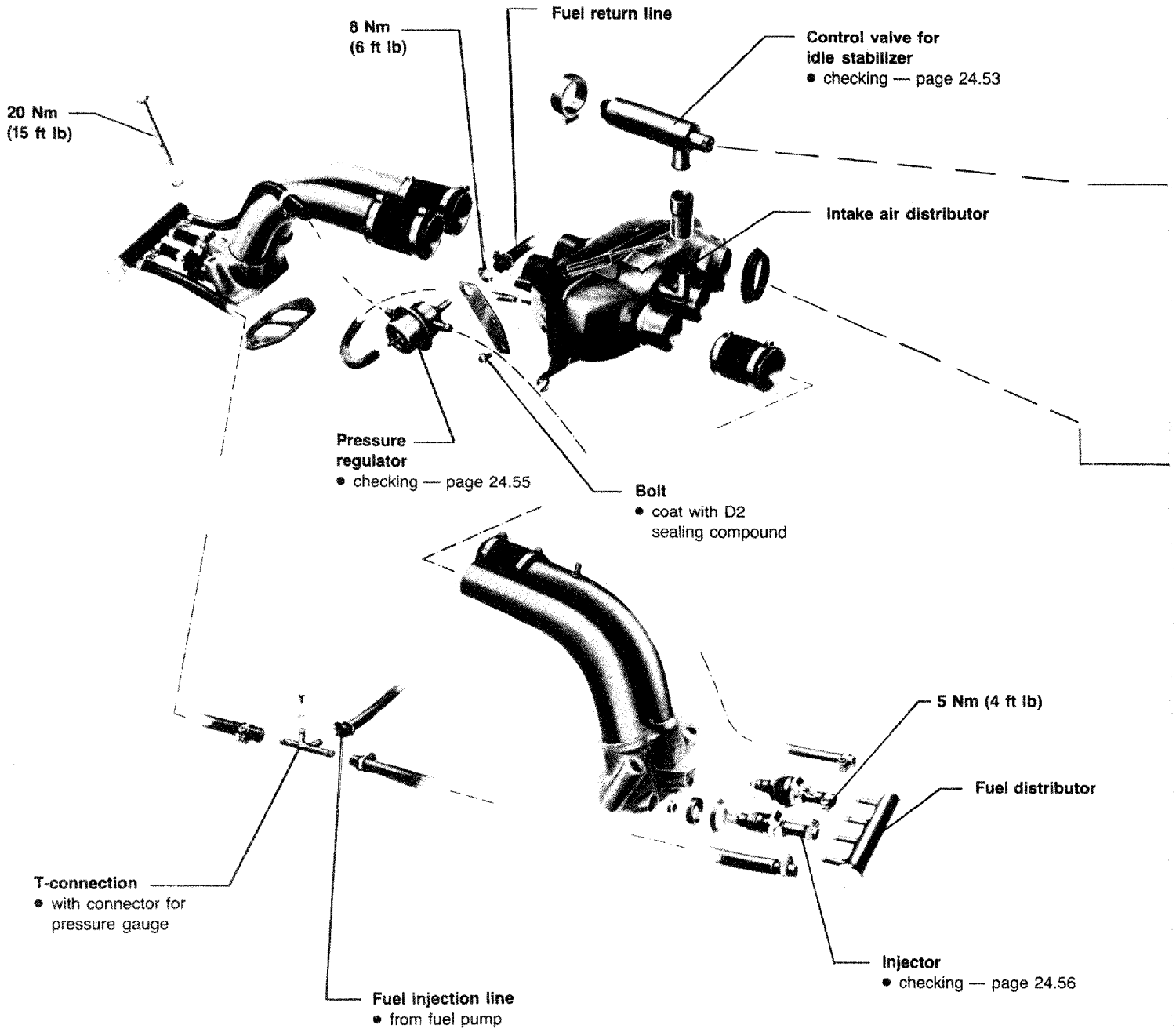
Engine code		MV
RPM limiter (Control unit) switch-off rpm:		5500-5800 rpm
Idle stabilizer: valve (resistance)		continuity
current • connector (single connector) for control valve:	disconnected	approx. 430 mA constant
	connected	approx. 430 ± 20 mA, fluctuating
under load per following conditions: • steering turned all the way • selector switch in drive position • climate control switched on • electrical consumers turned on • engine cold		depending on load 440-1000 mA
Power steering pressure switch • measured at idle speed Steering:	straight ahead	no continuity
Steering:	turned all the way (to either side)	Ω display (continuity)
Fuel pump:	delivery quantity	min. 500 cm^3/30 sec
Pressure regulator • fuel pressure measured at idle rpm vacuum hose:	connected	approx. 2.0 bar (29 psi)
vacuum hose:	disconnected	approx. 2.5 bar (36 psi)

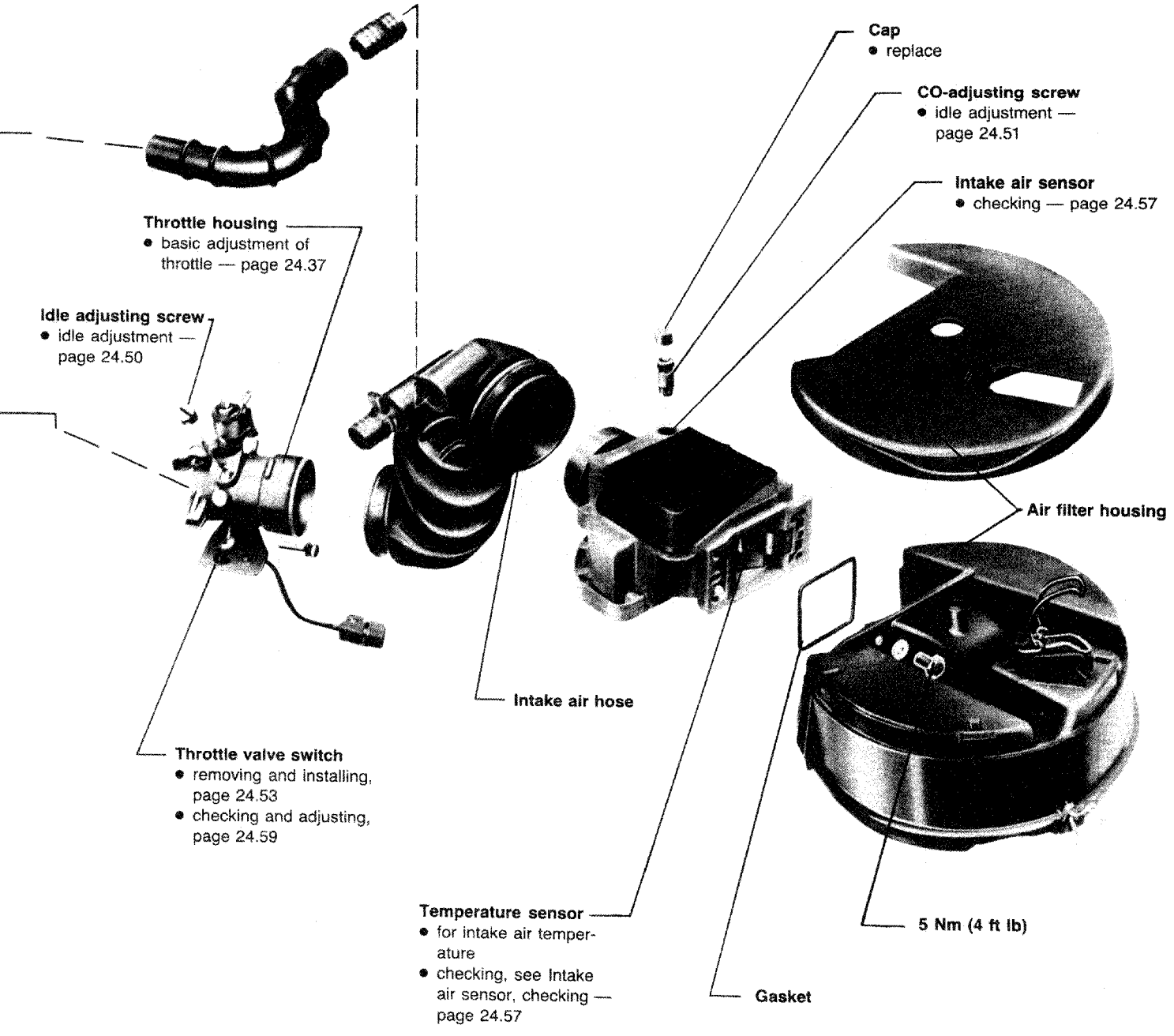
Engine code		MV
Injectors Spray pattern **Note** ONLY connector connected is valve being checked		cone shaped
Voltage supply • ALL connectors disconnected, starter operated		diode test lamp flickers
Resistance • measured on valve		15-20Ω
Air flow sensor Resistance between terminals:	3 and 4	500-1000 Ω
	2 and 4	change in resistance when air sensor plate is moved
	1 and 4	resistance dependent on temperature of air flow sensor — see diagram
Temperature sender • for engine temperature • resistance dependent on coolant temperature — see diagram at right		



Fuel injection system, repairing

Technical data/specified value — pages 24.43-24.45
Note Rules of Cleanliness — page 24.42
Replace gaskets, sealing rings and spring clamps



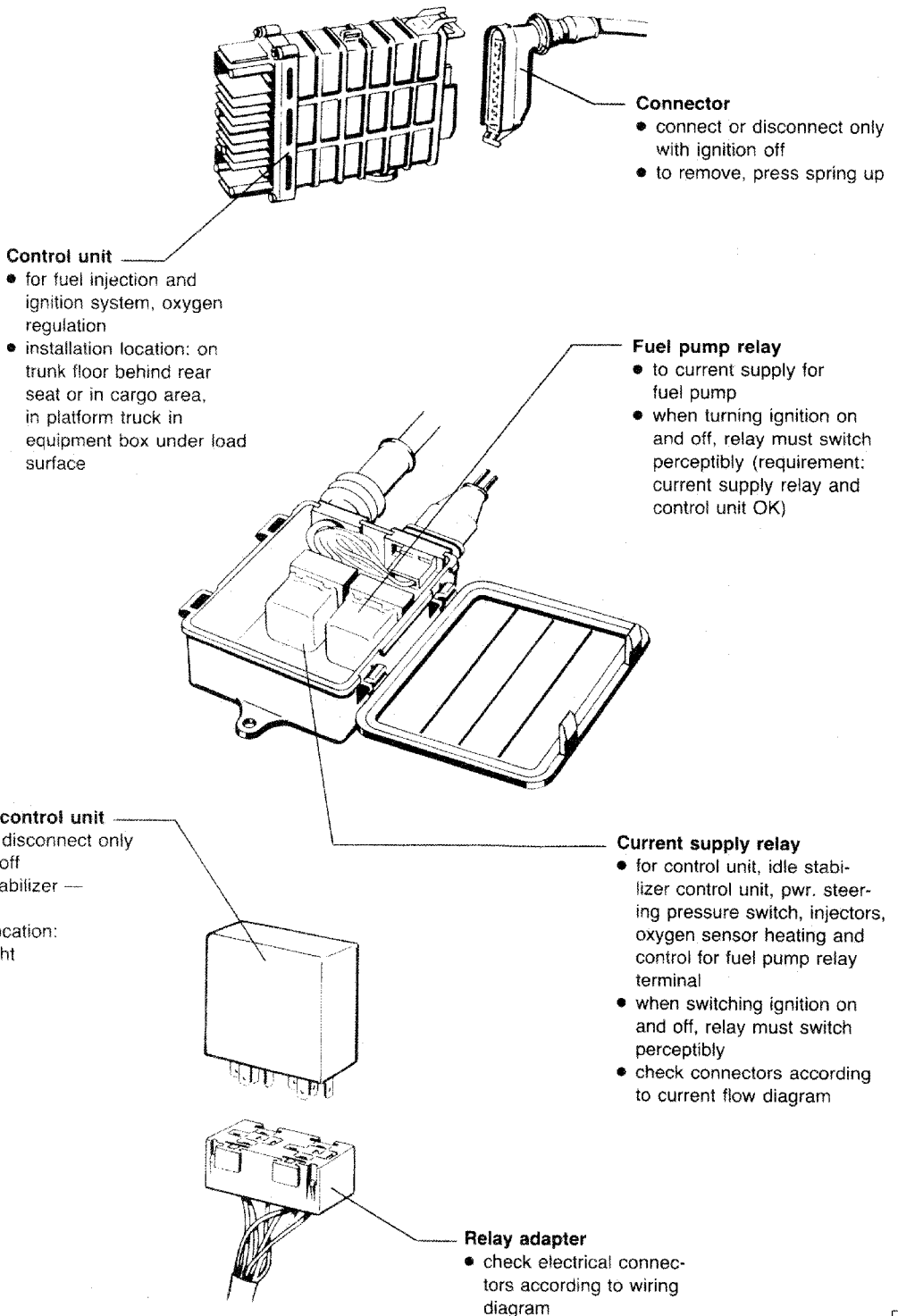

Cap
• replace
CO-adjusting screw
• idle adjustment — page 24.51
Intake air sensor
• checking — page 24.57
Throttle housing
• basic adjustment of throttle — page 24.37
Idle adjusting screw
• idle adjustment — page 24.50
Air filter housing
Intake air hose
Throttle valve switch
• removing and installing, page 24.53
• checking and adjusting, page 24.59
Temperature sensor
• for intake air temperature
• checking, see Intake air sensor, checking — page 24.57
Gasket
5 Nm (4 ft lb)

24-183

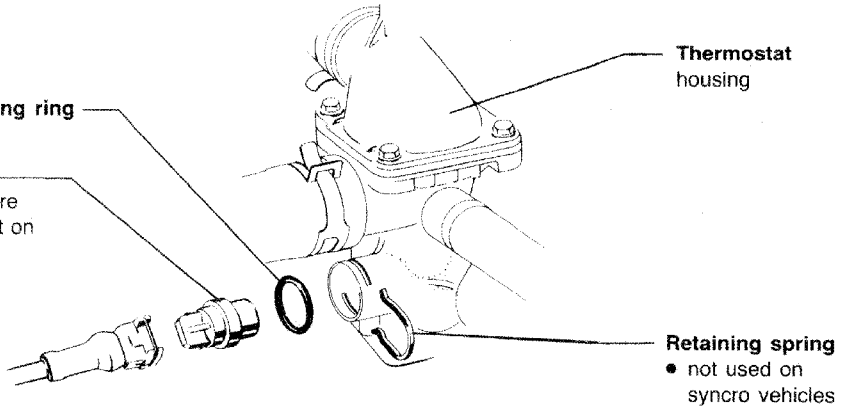
Fuel injection system components

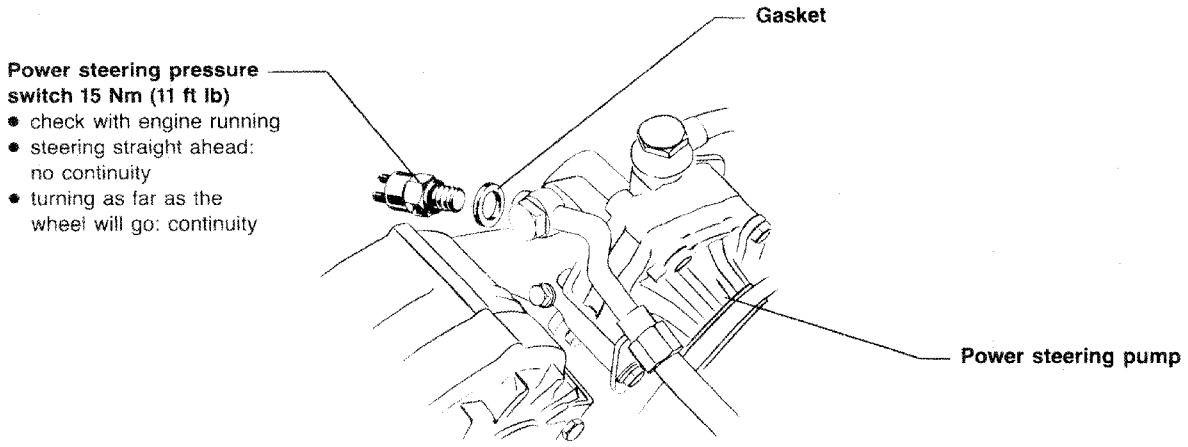
Note

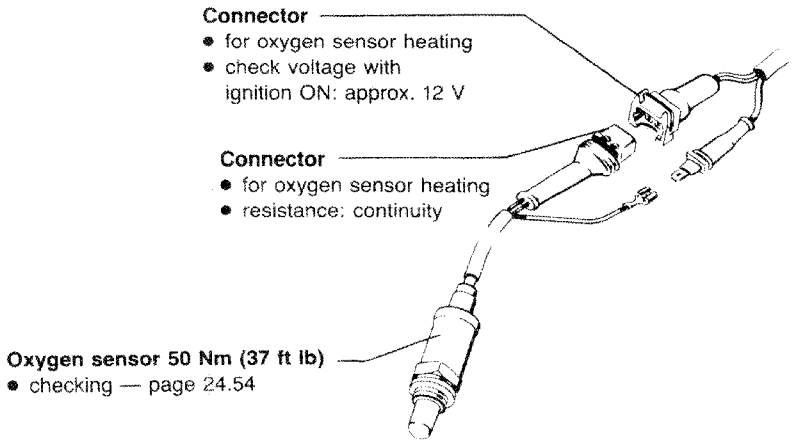
Electrical checking of ignition and fuel injection system — pages 24.61, 24.62
Safety precautions — page 24.42



24-185


Thermostat housing
Sealing ring
Temperature sender
• for engine temperature
• resistance dependent on coolant temperature, specified value: diagram, page 24.45
Retaining spring
• not used on syncro vehicles


Gasket
Power steering pressure switch 15 Nm (11 ft lb)
• check with engine running
• steering straight ahead: no continuity
• turning as far as the wheel will go: continuity
Power steering pump


Connector
• for oxygen sensor heating
• check voltage with ignition ON: approx. 12 V
Connector
• for oxygen sensor heating
• resistance: continuity
Oxygen sensor 50 Nm (37 ft lb)
• checking — page 24.54

24-184

Idle checking

Note

It is important to follow the sequence when performing idle checking/adjusting.

— check timing, adjust if necessary
- temperature sensor II disconnected
- rpm — 2000-2500

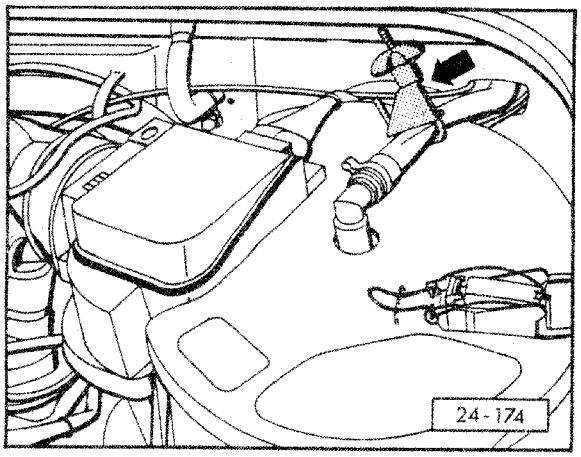
— check idle speed and **CO** content, adjust if necessary
- idle stabilization valve disconnected
- (with ignition off) disconnect oxygen sensor

Note

The oxygen sensor must be disconnected with the ignition off, to cancel the memory in the Electronic Control Unit (ECU).

Test and adjustment conditions

— engine oil temp min. 80°C (176°F)
— all electrical consumers turned off (radiator fan should not be running while performing checks or adjustments)
— crankcase breather hose removed from oil vent and plugged
— throttle valve switch operating properly (closed when in idle position)
— ignition timing within specifications
— idle stabilizer operating properly (with ignition turned on, valve should vibrate and hum)

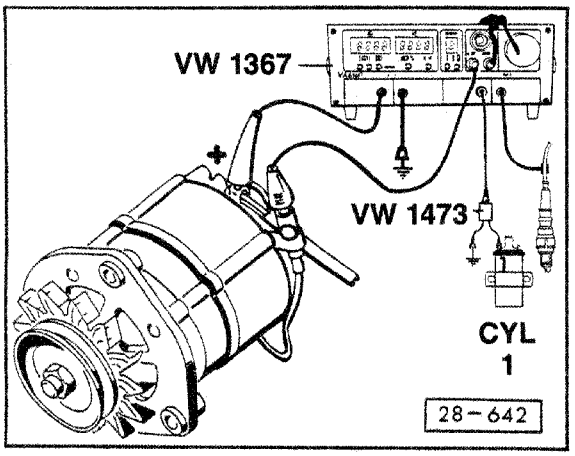


The hose from charcoal cannister to air filter must be pinched closed. See arrow

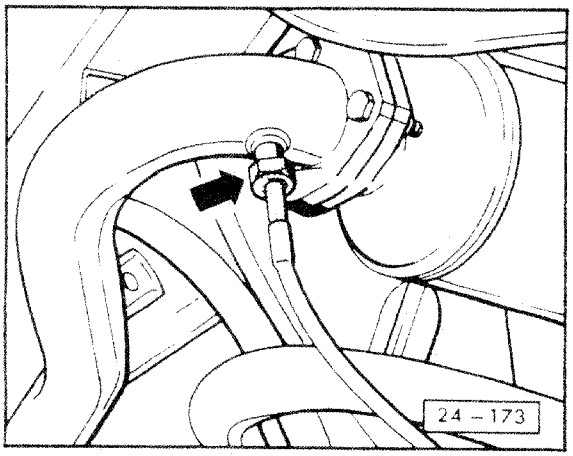
Connecting test equipment

WARNING

Ignition must be turned off when connecting test equipment.

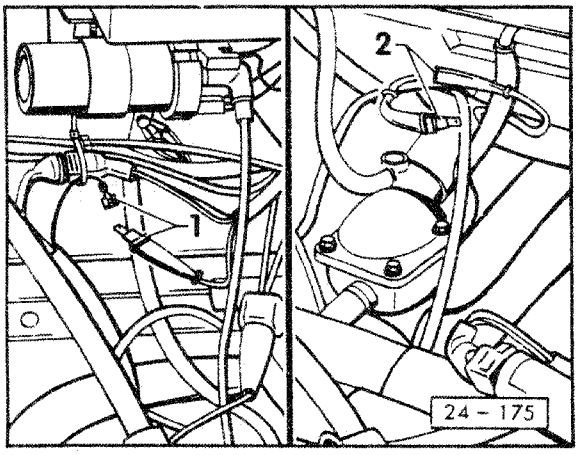


— connect **VW 1367** tester for ignition timing and rpm display functions
— using adapter **VW 1473**, connect tester **VW 1367** to terminal 1 of ignition coil

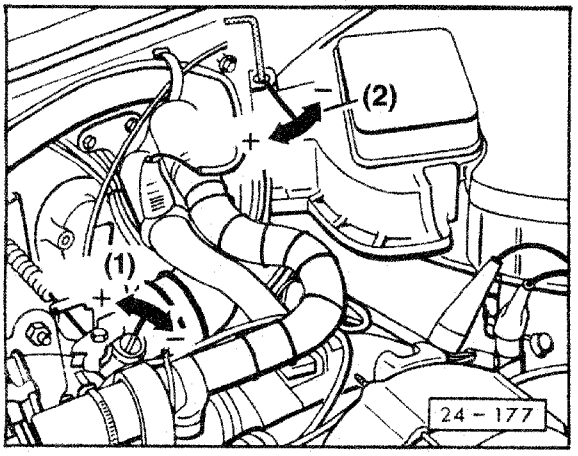


— connect **CO** tester to adapter on left exhaust pipe, using Sun tool **120.239**

Idle speed and CO content, checking and adjusting



— with ignition switched off, disconnect oxygen sensor connector (**1**) and idle stabilizer control valve connector (**2**)



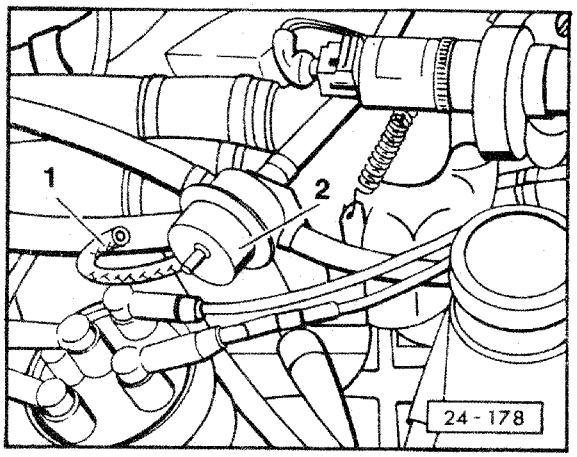
— check idle speed rpm, correct if necessary using adjusting screw (**1**)
- specification: 880 ± 50 rpm

— check **CO** content
- specification: 0.7 ± 0.4% vol.

For **CO** adjusting, remove screw cap as follows:
— drill **CO** adjusting screw cap using 2.5mm (0.098 in.) drill
— thread 3mm (0.137 in.) sheet metal screw into drilled hole
— grasp screw with pliers, pull out cap

Set idle speed and **CO** content by alternately turning adjusting screws (**1** and **2**) to obtain specifications
— reconnect oxygen sensor connector and idle stabilizer control valve connector
— let engine idle approx. 2 minutes
— check **CO** content, correct if necessary by repeating adjusting procedure

Idle speed/CO content, checking and adjusting, continued

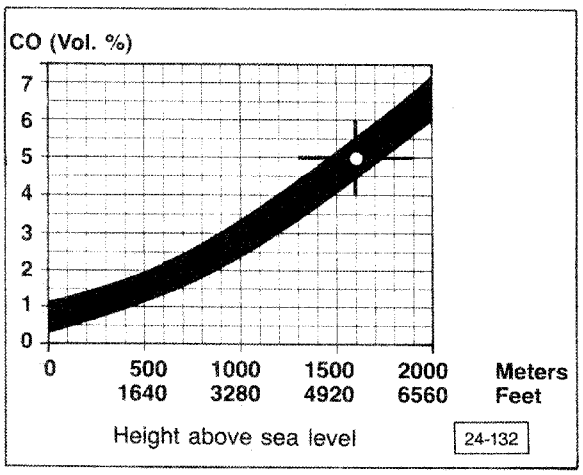


Check oxygen regulation function as follows:
— remove hose (**1**) from pressure regulator (**2**) and plug

CO should increase briefly, then drop in value.
— secure **CO** adjusting screw with new safety cap

Note

CO content is altitude dependent, refer to the following chart to compensate for the altitude of the workshop.



Example: At 1600 meters (approx. 1 mile) **CO** should be **5%** ± **.5%**

— with ignition switched off, disconnect oxygen sensor
- **CO** content should correspond to chart according to elevation of workshop

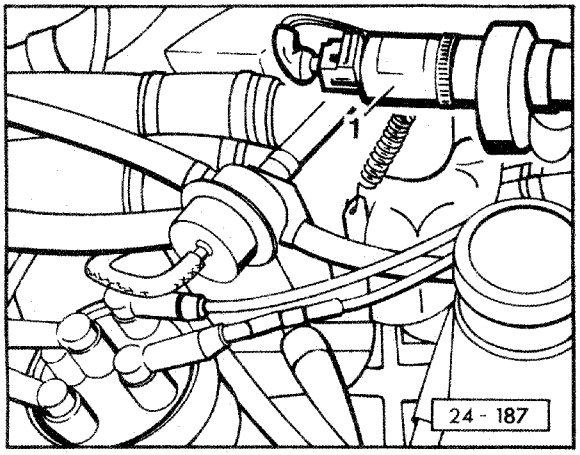
— re-connect oxygen sensor
- **CO** content must read within specifications: **0.3** to **1.1%** (not dependent upon elevation with sensor connected)

Note

After adjusting, the hoses for the crankcase must be reconnected. If the control current and the CO content change, this is not due to an improper adjustment, but rather to oil dilution caused by short distance driving. With long distance drives, the amount of fuel in the oil will be reduced and the CO value will normalize again. A short-term solution would be an oil change.

Idle stabilizer, checking

1st check (function)



— switch ignition ON
- idle stabilizer valve **1** must vibrate and hum.

If OK,
go ahead with 2nd check

If NO,
remove connector from valve **1** and check resistance of valve with VW 1315 A/1
- specified value: display (continuity)

If specified value NOT obtained
— replace valve

If specified value IS obtained
— re-connect connector to valve and check electrical connections on control unit relay adapter (in front of right tail light) according to wiring diagram

If electrical connections OK
— replace idle stabilizer control unit

2nd check (regulator)

Requirements

Engine oil temperature min. 80°C

Electrical consumers turned OFF

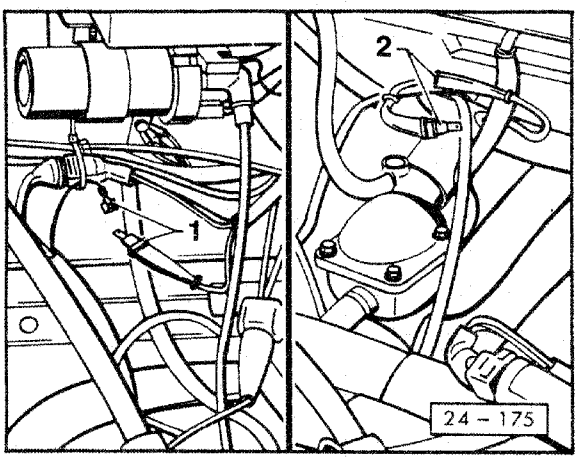
No leaks in intake air system

Ignition timing OK

Idle rpm OK

CO-content OK

— remove crankcase breather hose and close tightly
— connect tester VW 1315 A/1 with adapter VW 1315A/2 to idle stabilizer valve **1**
— let engine idle
- specified value: approx. 430 ± 20 mA (fluctuating)



— Disconnect connector **2**
- specified value: approx. 430 mA constant

If test conditions have been met and specified values are NOT obtained
— replace idle stabilizer control unit

Oxygen sensor and oxygen regulation, checking

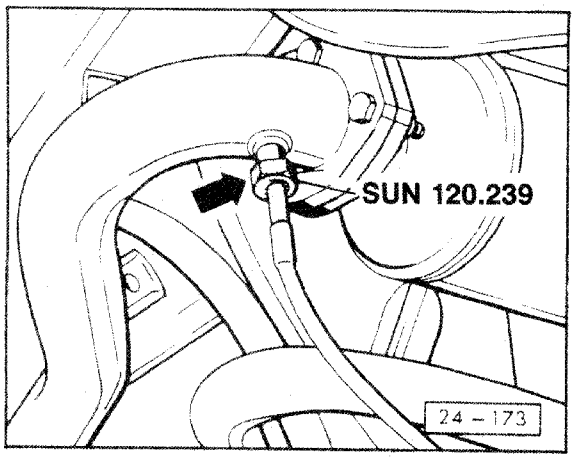
Engine code MV

Requirement

Engine oil temperature min. 80°C (176°F)

Note

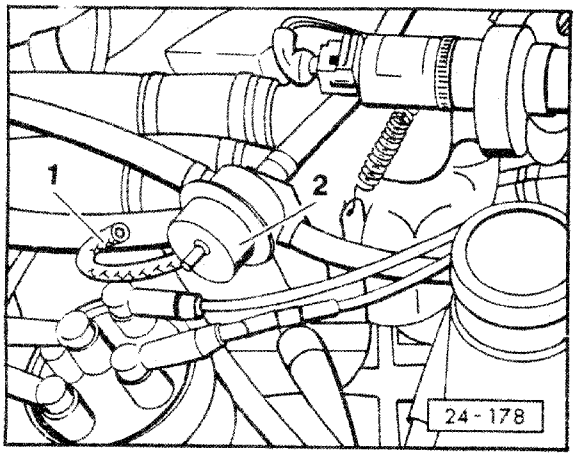
There must be no leaks in the exhaust system between the cylinder heads and the catalytic converter



— connect CO test equipment hose to the sampling point on left exhaust pipe using Sun 120.239 adapter (**arrow**)

Test step I

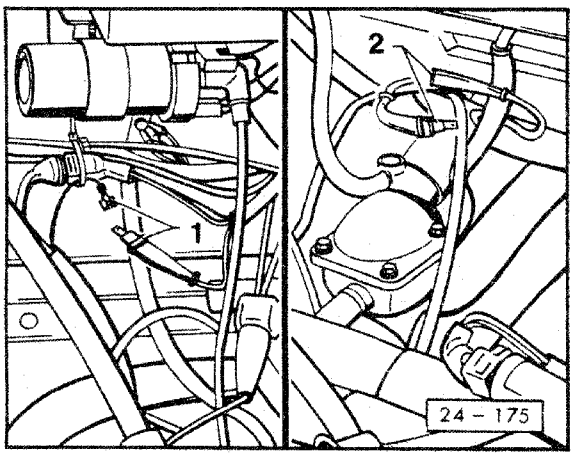
— let engine run approx. 2 minutes at idle and read CO-content



— check function of oxygen regulation
— pull hose **1** off pressure regulator **2** and pinch off
• CO content must rise briefly and **then drop again** (regulation)

If NO
— use Test step II to determine if control unit or oxygen sensor is defective

Test step II



— disconnect connector **1** and hold control unit wire connector to ground,
• CO content must rise

— connect control unit wire connector to + connector of alternator
• CO content must drop

If NO
— check wire connection on control unit, page 24.62 test step II

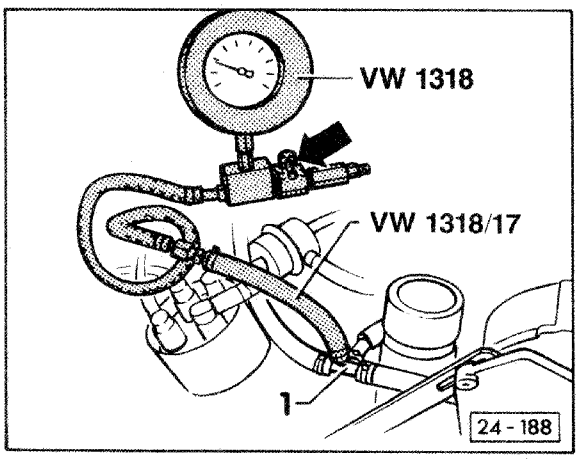
If OK
— replace control unit

Note

If test step I is not OK but test step II is OK, the oxygen sensor is defective.

Pressure regulator, checking

The pressure regulator regulates the fuel pressure in relation to the intake manifold pressure.



— connect pressure measuring equipment VW 1318 with adapter VW 1318/17 and hose to t-connection 1 of fuel line

CAUTION

The switch (**arrow**) on the pressure measuring equipment must remain closed during the measuring process.

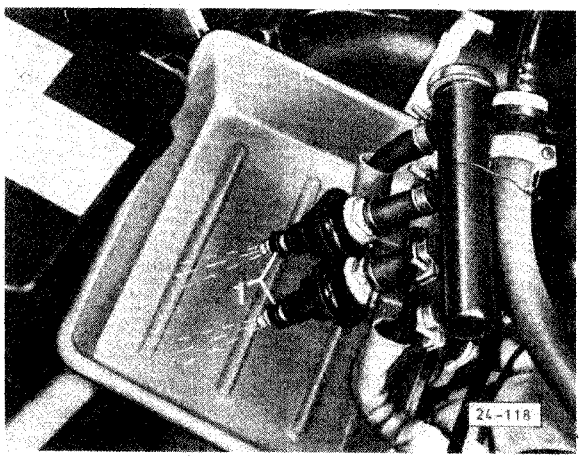
— run engine at idle and measure fuel pressure
- specified values

bar (PSI)	vacuum hose on pressure regulator
approx. 2.0 (29)	connected
approx. 2.5 (36)	disconnected

Fuel injectors, checking

Injector spray pattern, checking

— remove injectors in pairs, (connectors and fuel lines remain connected)
— disconnect connector from second pair of injectors



— operate starter briefly, observe spray pattern:
• spray pattern must be cone shaped

— re-install injectors

Note

When installing, make sure seals **(1)** are present.

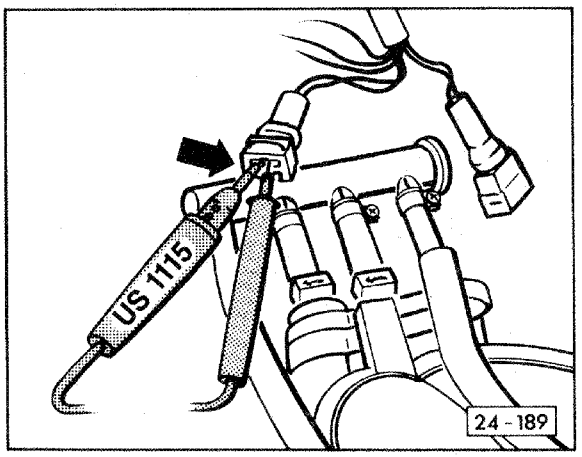
Checking for leaks

— disconnect all connectors from injectors
— remove injectors in pairs (fuel lines remain connected)
— switch ignition on for about 5 seconds
• no more than 2 drops per minute per injector may leak out

Voltage supply, checking

CAUTION

Avoid short circuits at the connector terminals, otherwise the control unit can be damaged.

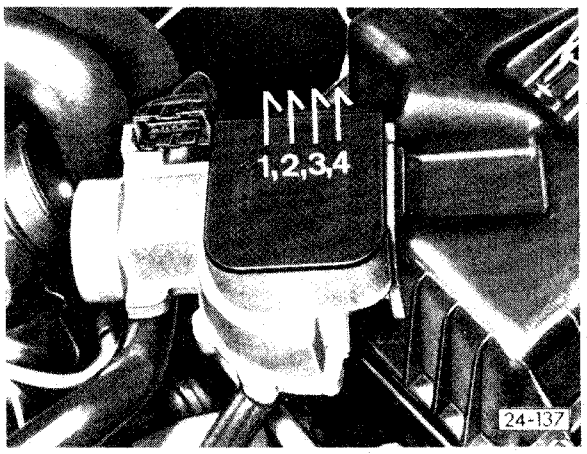


— remove all connectors from injectors and connect voltage tester US1115 on one connector (**arrow**)
— operate starter
• LED must flicker

If NO

— see electrical checks, page 24.61, 24.62, test steps **1** and **5** or control unit defective

Intake air sensor, checking

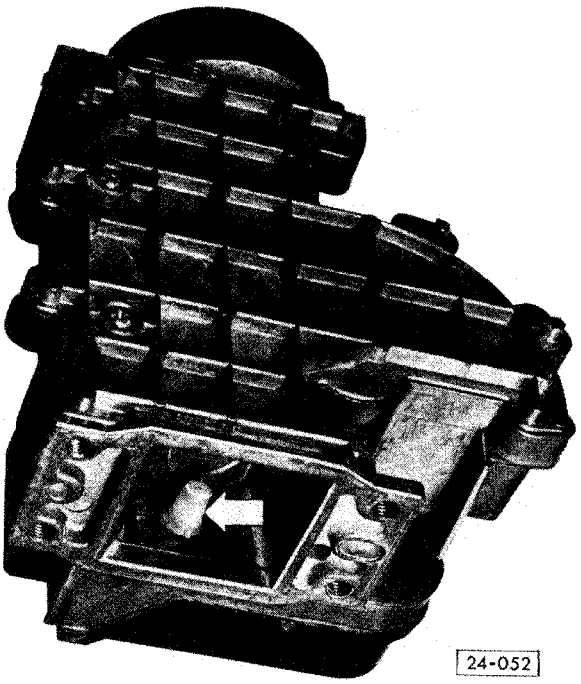


— remove connector and hose from intake air sensor and test with digital multimeter US1119 using adapter VW 1315A/1

Potentiometer, checking

— measure between terminals **3** and **4**
specified value: approx. 0.5-1.0 k
— move air sensor flap and measure resistance between terminals **2** and **3**
• specified value: resistance change

Intake air temperature sensor, checking (arrow)

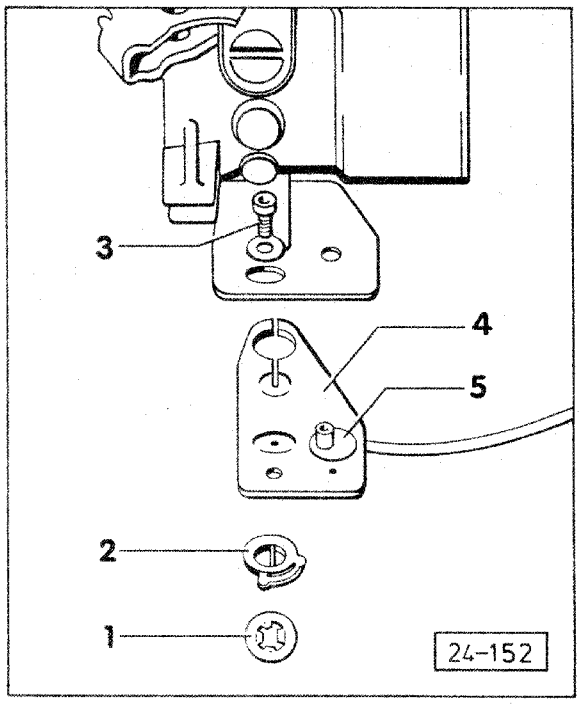


— measure resistance between terminals **1** and **4**
• specified value:

20°C = 2.3 -2.7 k
over 20°C = Ω less
under 20°C = Ω greater
(20°C = 68°F)

Throttle valve switch, removing and installing

— remove throttle valve housing



— remove throttle valve switch **4** in sequence numbered 1 to 5
— installation is reverse of removal

Throttle valve switch, checking and adjusting

Note

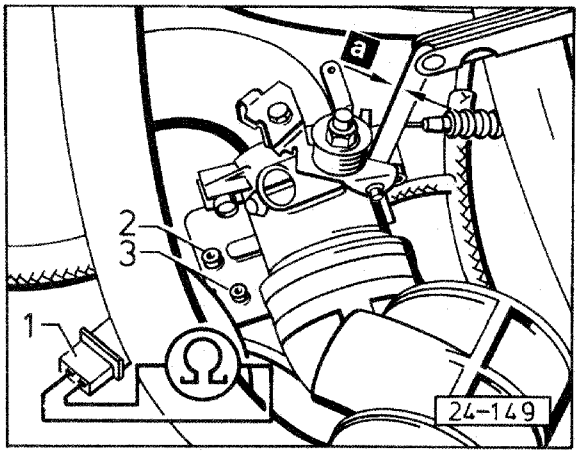
The throttle valve switch supplies the following information to the control unit:

Throttle valve closed

— injection quantity for idle
— switching off the injection quantity during deceleraton fuel shut-off
— ignition point setting in idle (DLS function)

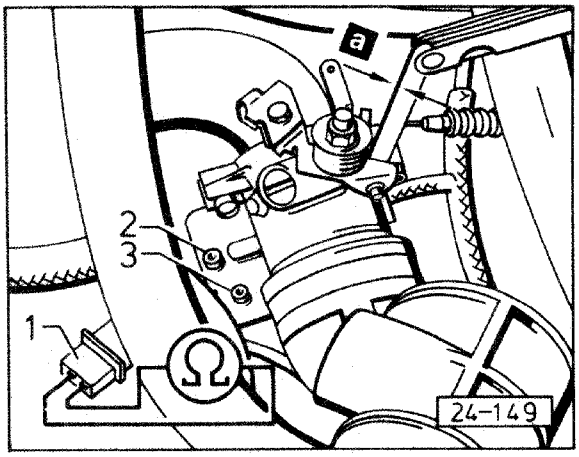
Throttle valve completely open

— injection quantity for full throttle



— check **continuity** of throttle valve switch at connector **1**
  • switch must display continuity only during idle and full throttle position of throttle valve switch

Throttle valve switch checking, continued



— open throttle valve and close slowly. While doing so, check **switching point** (continuity) of switch with feeler gauge at idle stop of throttle valve lever
  • switching point: gap (**a**) — 0.05-0.10 mm (0.002-0.004 in) before idle stop

— If necessary, adjust gap (**a**) with eccentric screw **3** (first loosen screw **2**)

Note

Proper adjustment is important.

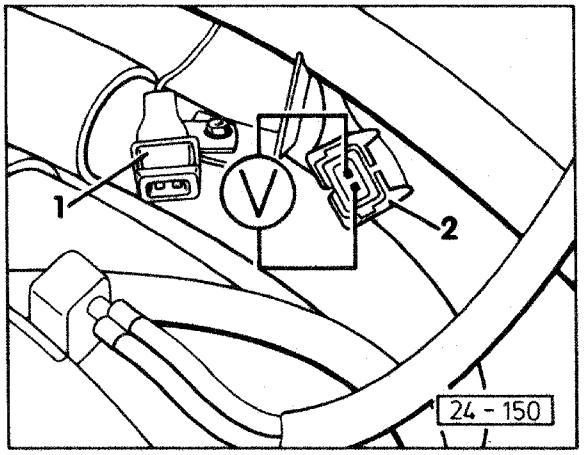
If gap (**a**) too LARGE
— engine will surge when throttled slightly

If gap (**a**) too SMALL
— cold engine will stall out when given gas and warm engine will have NO fuel deceleration shut-off or DLS function at idle

Note

The limiting screw for basic throttle valve adjustment must **not** be changed.
If the screw is turned by mistake, it will be necessary to carry out a basic adjustment of the throttle valve page 24.37.

Throttle valve switch voltage, checking



CAUTION

Do not connect test light to throttle valve switch connectors IF control unit is connected.

— disconnect connector **2** from connector **1** of throttle valve switch
— switch ignition ON
— measure voltage on connector **2**
  • specified value: approx. 5 volts

If NO
— check for break in wiring or control unit is defective

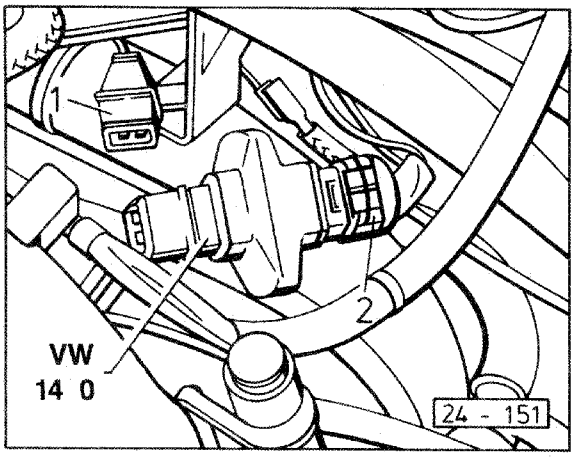
Deceleration fuel shut-off

Requirement

Engine oil temperature min. 80°C

Fuel shut-off will occur only when:

- throttle is closed
- coolant temperature is above 50°C (122°F)
- engine speed is above 1250 rpm
- engine speed was above 2600 rpm



— bridge connections in connector **2** with side of double adapter VW 1490 and give **slight amount** of gas

- engine rpm must vary (surge, then deceleration fuel shut-off begins)
- break in wiring
- temperature sender for engine temperature defective
- control unit defective

Full throttle enrichment, checking

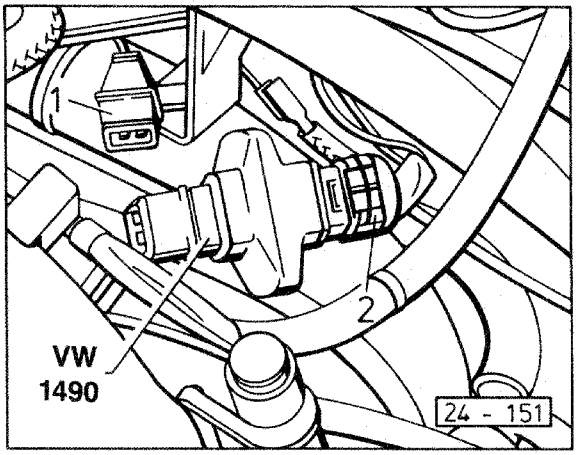
Requirements

Engine oil temperature min. 80°C (176°F)

RPM gauge connected

CO tester connected (if catalytic converter present;) on sampling point using Sun 120.239 adaptor

— let engine idle about 2 minutes



— remove connecter **2** from connector **1** of throttle valve switch

— slowly increase engine speed to about 4500 rpm

- connections in connector **2 not** bridged

— check CO and record

— bridge connections in connector **2** with ⌐¬ side of double adapter VW 1490

- CO must raise at least 1 vol.% over recorded value

If NO, check for

— break in wiring

— temperature sender for engine temperature defective

— control unit defective

Electrical testing — ignition and injection system

Requirements

Battery OK

Fuel pump and fuel pump relay OK

Idle stabilizer control unit OK

Note

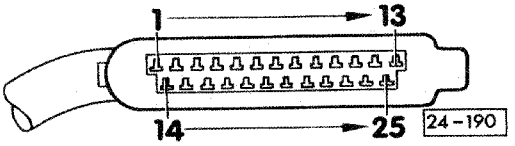
Internal resistance of the test equipment and ambient temperature have a strong influence on test results, digital multimeter US1119 should be used to perform testing.

The specified values given are for ambient temperatures of 0° to +40°C (32°-104°F)

If the measured value deviates from the specified values, determine fault **according to current flow diagram.** Check wiring and connectors before replacing any parts.

CAUTION

To avoid damage to circuitry, switch to the proper measuring range **before** connecting the test leads.



Measuring range: switch to **voltage measurement**				
Test step:	(Connector) terminal:	To test	Test conditions, additional steps:	Specified values:
1	13 + 14 14 + 19	control unit voltage supply	switch ignition ON	approx. battery voltage
2	13 + 25	wire to ignition coil terminal **1**	ignition switched ON	approx. battery voltage
3	1 + 13	wire from starter terminal **50** and from adapter for idle stabilizer control unit terminal **50**	Disconnect connector from injectors. Operate starter (selector switch in P or N)	min. 8 V
4	bridge 3 + 13	wire to fuel pump relay	ignition switched ON	fuel pump must run audibly

Requirements Switch ignition OFF Measuring range: switch to **resistance measurement** Ω				
Test step:	(Connector) terminal:	To test	Test conditions, additional steps:	Specified values:
5	12 + 14	injectors	connect **only one** injector at a time	15-20 Ω
6	6 + 10	temperature sender for engine temp		see diagram, page
7	6 + 11	throttle valve switch	throttle valve: • closed	continuity
			• slightly open to shortly before full throttle	∞ Ω
			• completely open	continuity
8	6 + 17	intake air sensor potentiometer		0.5 - 1.0 k Ω
	17 + 21		move air flow sensor	change in resistance
9	6 + 9	intake air temperature sender in intake air sensor		see diagram, page
10	6 + 8	wiring to Hall sender	remove connector from Hall sender and bridge all three connectors	continuity
	6 + 18			
11	2 + 13	wiring to oxygen sensor	disconnect connector to oxygen sensor and hold green wire to ground (−)	continuity
			re-connect oxygen sensor wiring	∞ Ω

Note

For additional tests of ignition parts of the digifant system as well as Hall sender test see Repair Group 28.