

Service.

Engine code
letters

DJ	MV	SR	SS												

Workshop Manual Volkswagen Transporter 1980 ▶

Digijet, Digifant Fuel Injection and Ignition
System (2.1 ltr. Engine)

Edition December 1992.



Service Department.

List of Workshop Manual Repair Groups

Volkswagen Transporter 1980 ►

Engine code letters	DJ	MV	SR	SS						
<i>Booklet</i>	Booklet Digijet, Digifant Injection and Ignition System (2.1 ltr. Engine) Edition December 1992									

When filing a Technical Bulletin enter the Bulletin No. in the adjacent column. When using the Workshop Manual you can then see at a glance whether Technical Bulletins have been published in respect of the particular Repair Group in which you are looking.

Repair Group	Technical Bulletins				
01 Self diagnosis Electrical Testing					
24 Fuel mixture preparation, fuel injection					
28 Ignition system					

Technical information should always be available to all foremen and mechanics, because their compliance with the instructions given is essential to ensure vehicle roadworthiness and safety. In addition, the normal safety precautions to be observed when working on motor vehicles are also applicable.

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Electrical testing

Wiring and component checks with test box V.A.G 1598

Notes:

- Use hand multimeter V.A.G 1526 or multimeter V.A.G 1715 as well as the diode test lamp V.A.G 1527.
- The specified values apply to ambient temperatures from 0 to + 40°.
- If the measured values deviate from the specified values, determine fault according to circuit diagram and rectify.
- If the measured values deviate only slightly from the specified values, clean plugs and sockets of the testers and measuring cables and repeat test. Before renewing components, check cables and connections and, especially with specified values under 10 Ω , repeat resistance measurements on component.
- To connect test box V.A.G 1598 with adapter cable V.A.G 1598/2 use auxiliary cables from auxiliary measuring set V.A.G 1594.
- Check that the contact numbers of the connecting plug and socket numbers of test box V.A.G 1598 agree.

01-1

Attention!

So as to avoid destroying electronic components, switch over to the relevant measuring range before connecting the measuring cables.

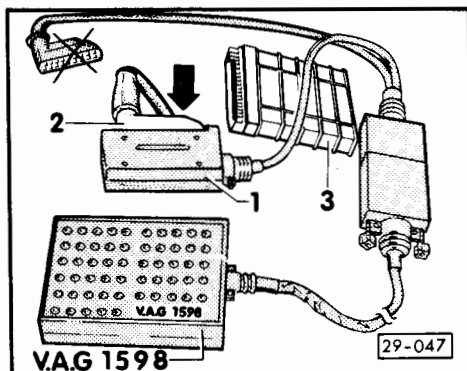
Test requirements

- Battery voltage in order.
- Fuse in order.
- Earthing connections on engine and gearbox in order.
- Fuel pump relay in order.
- Fuel pump in order; Checking
⇒ Repair Group 20.
- Control unit for idling speed stabilization in order; Checking ⇒ page 24-23, Idling speed stabilisation.

01-2

Checks at connector of wiring loom

- With ignition switched off, disconnect the connector plug from the Digijet control unit (J147) or digifant control unit (J169). The control unit is installed in front of the left-hand tail light, on the luggage compartment floor under the rear bench seat or in load compartment, with platform vehicles in equipment space under loading platform.



- ◀ - Connect tester V.A.G 1598 together with adapter cable V.A.G 1598/2-1 - only to the connector plug of cable loom -2- (control unit -3- remains free).

- Carry out the tests in accordance with tables.

- Engine code letters DJ:
Test table A (Digijet fuel injection system)
⇒ page 01-4.
- Engine code letters MV, SR, SS:
Test table B (Digifant fuel injection and ignition system) ⇒ page 01-7.

01-3

Test table A
(Digijet fuel injection system)

- Measuring range: Select voltage measurement -V-.				
Test step	Item under test	• Test conditions - additional operations	Tester sockets	Specified values ¹⁾
1	Voltage supply for Digijet control unit (J147)	- Witch on ignition.	7 + 13	Approx. battery voltage
			13 + 25	
2	RPM impulse from TCI-H control unit (N41): Telefunken, Fairchild "35"	• Ignition switched on. - Touch centre cable of plug connector of distributor to earth (-).	1 + 7	Approx. battery voltage lower than 3 V
	RPM impulse from TCI-H control unit (N41): Siemens, Bosch, Fairchild "33"	• Ignition switched on. - Connect centre cable of plug connector on distributor for at least 3 secs. to earth (-).	1 + ignition Terminal 15	Approx. battery voltage lower than 3 V

¹⁾ Observe notes ⇒ page 01-1

01-4

<ul style="list-style-type: none"> Ignition switched on. Measuring range: Voltage measurement –V– switched on. 				
Test step	Item under test	• Test conditions – additional operations	Tester sockets	Specified values ¹⁾
3	Cable from starter motor terminal 50 and from adapter for idling speed stabilization control unit (J142) terminal 50	<ul style="list-style-type: none"> Disconnect plug from fuel injectors. Operate starter motor (Gear selector lever to autom gearbox selection in P and N position). 	7 + 21	At least 8 V
4	Cable to fuel pump relay (J17)	<ul style="list-style-type: none"> Ignition switched on. 	Bridge 7 + 20	Fuel pump must run audibly
<ul style="list-style-type: none"> Switch off ignition. Measuring range: Select resistance measurement –Ω–. 				
5	Fuel injectors Cylinder 1 (N30) and 2 (N31)	<ul style="list-style-type: none"> Connecting plug connected to all fuel injectors. 	11 + 12	30 ... 40 Ω for 2 valves
6	Fuel injectors cylinder 3 (N32) and 4 (N33)	–	23 + 24	30 ... 40 Ω for 2 valves

¹⁾ Observe notes ⇒ page 01–1

01–5

<ul style="list-style-type: none"> Ignition switched off. Measuring range: Resistance measurement –Ω– switched on. 				
Test step	Item under test	• Test conditions – additional operations	Tester sockets	Specified values ¹⁾
7	Coolant temperature sensor (G18)	–	2 + 7	⇒ Fig. 1, page 01–10
8	Throttle valve switch (F25 or F60/F81)	Throttle valve	4 + 7	Max. 1.5 Ω
		<ul style="list-style-type: none"> Closed Slightly open until just before full throttle selection 		∞ Ω
		<ul style="list-style-type: none"> Fully open 		Max. 1.5 Ω
9	Air flow potentiometer (G19)	–	6 + 19	0.5 ... 1.0 kΩ
		– Move throttle valve.	15 + 19	Change in resistance
10	Sender for intake air temperature (G42) in air flow meter	–	6 + 14	⇒ Fig. 1, page 01–10

¹⁾ Observe notes ⇒ page 01–1

01–6

Test table B

(Digifant fuel injection and ignition system)

– Measuring range: Select voltage measurement –V–.				
Test step	Item under test	• Test conditions – additional operations	Tester sockets	Specified values ¹⁾
1	Voltage supply for Digifant control unit (J169)	– Switch on ignition.	13 + 14	Approx. battery voltage
			14 + 19	
2	Cable to ignition coil Terminal 1 (–)	• Ignition switched on.	13 + 25	Approx. battery voltage
3	Cable from starter motor terminal 50 and from adapter for idling speed stabilization control unit (J176) terminal 50	– Disconnect plug from fuel injectors. – Operate starter motor (Gear selector lever to autom gearbox selection in P and N position).	1 + 13	At least 8 V
4	Cable to fuel pump relay (J17)	• Ignition switched on.	Bridge 3 + 13	Fuel pump must run audibly

¹⁾ Observe notes ⇒ page 01–1

01–7

– Switch off ignition. – Switch on resistance measurement –Ω–.				
Test step	Item under test	• Test conditions – additional operations	Tester sockets	Specified values ¹⁾
5	Fuel injectors (N30 ... N33)	– Always connect only one fuel injector alternatively.	► 07.87 12 + 14	15 ... 20 Ω
	Fuel injectors (N30 ... N33) and Lambda probe heating		08.87 ► 12 + 13	20 ... 25 Ω ²⁾
6	Coolant temperature sensor (G18)	–	6 + 10	⇒ Fig. 1, page 01–10
7	Throttle valve switch (F25 or F60/F81)	Throttle valve	6 + 11	Max. 1.5 Ω
		• Closed		∞ Ω
		• Slightly open until just before full throttle selection		Max. 1.5 Ω
8	Air flow potentiometer (G19)	–	6 + 17	0.5 ... 1.0 kΩ
		– Move throttle valve.	17 + 21	Change in resistance

¹⁾ Observe notes ⇒ page 01–1²⁾ Resistance at fuel injector 15 ... 20 Ω

01–8

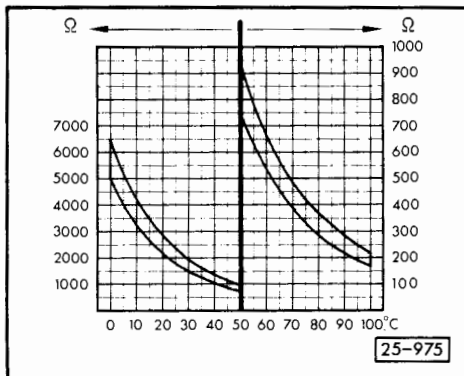
- Ignition switched off.
- Resistance measurement –Ω– switched on.

Test step	Item under test	• Test conditions – additional operations	Tester sockets	Specified values ¹⁾
9	Sender for intake air temperature (G42) in air flow meter	–	6 + 9	⇒ Fig. 2 page 01–10
10	Cables to Hall sender (G40)	– Disconnect plug from Hall sender and bridge all 3 connections.	6 + 8	Max. 1.5 Ω
			6 + 18	
11	Cable to Lambda probe (G39)	– Disconnect plug connection to Lambda probe and position on green cable (earth) (-). – Connect Lambda probe cable.	2 + 13	Max. 1.5 Ω
				∞ Ω

¹⁾ Observe notes ⇒ page 01–1

Note:

Additional tests of the ignition part of the Digifant fuel injection and ignition system as well as Hall sender test ⇒ page 28–43 to page 28–45.



◀ Fig. 1 Resistance values for temperature sender / sensor

- Sender for intake air temperature (G42).
- Coolant temperature sensor (G18).

Servicing fuel injection system

(Digijet or Digifant)

Notes:

- *Hose connections are secured with screw or clip type hose clamps.*
- *Always renew clip type clamps with screw clamps.*
- *Do not use silicon containing sealants on vehicles with controlled catalytic converter. Silicon particles sucked in to the intake by the engine will not be burned and damage the Lambda probe.*
- *A voltage of at least 10.5 V is required for problem-free operation of the electrical components.*

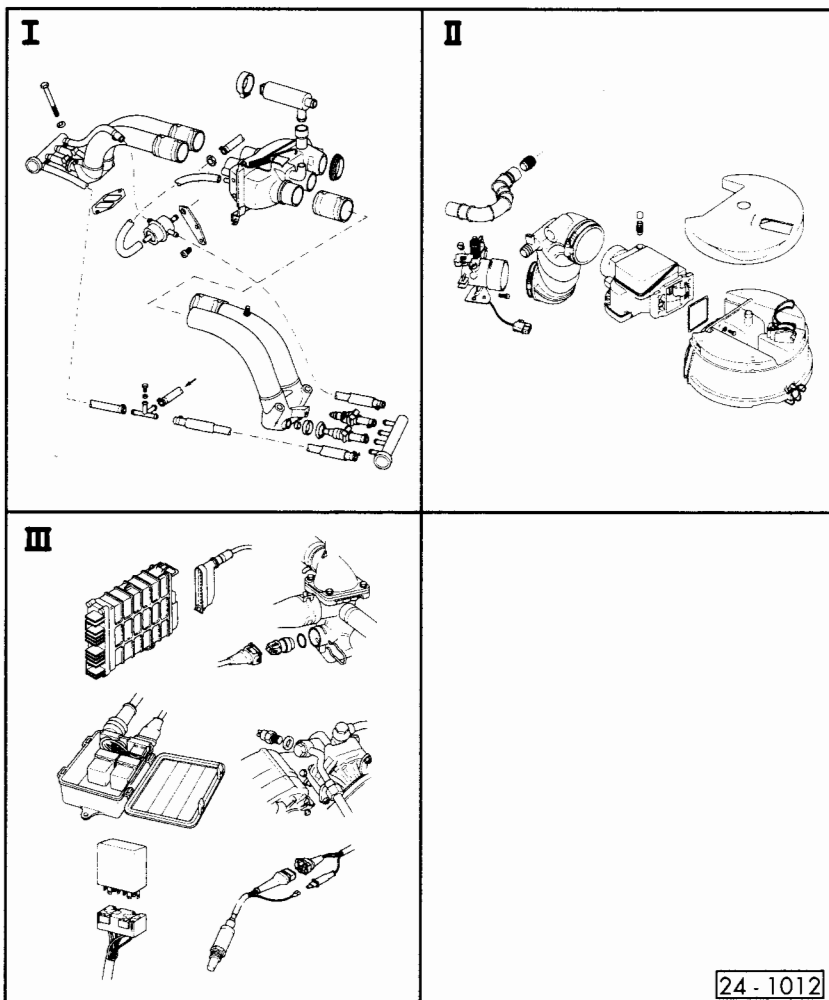
Safety precautions ⇒ page 24–12.

Rules for cleanliness ⇒ page 24–13.

Technical data ⇒ page 24–14.

Electrical testing of Digijet fuel injection system or Digifant fuel injection and ignition system ⇒ page 01–1.

24–1



Part I ⇒ page 24–3.

Part II ⇒ page 24–5.

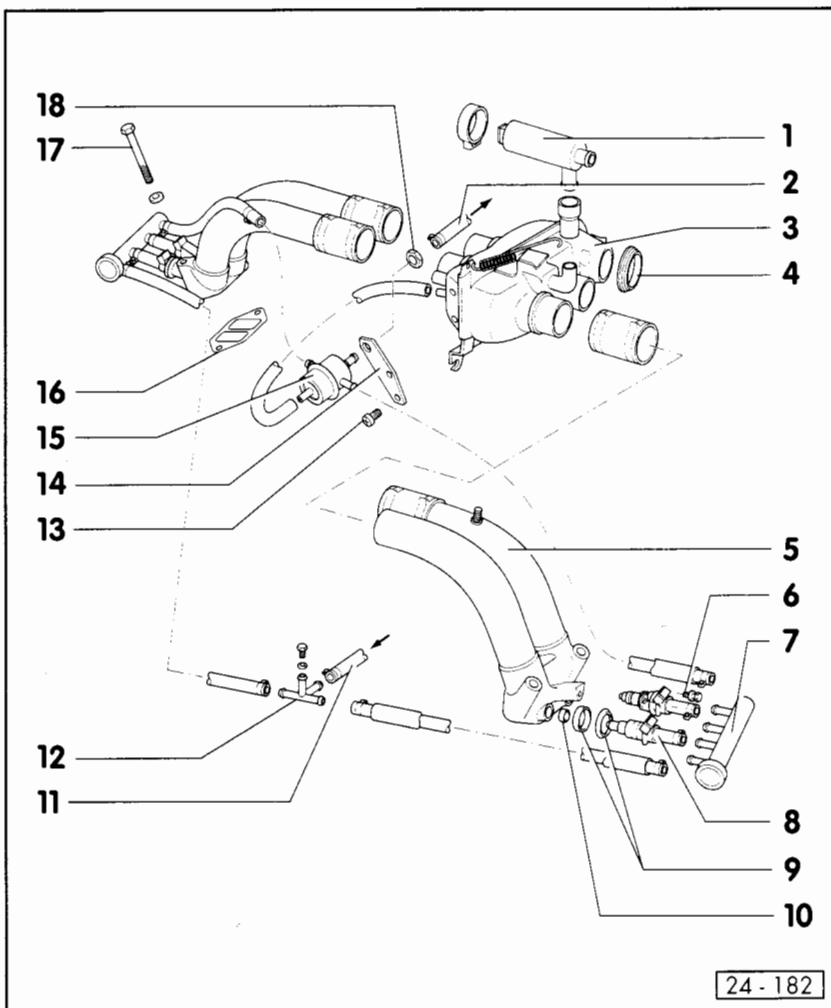
Part III ⇒ page 24–7.

Note:

Servicing mixture charge limiter (engine code letters SS) ⇒ page 24–40.

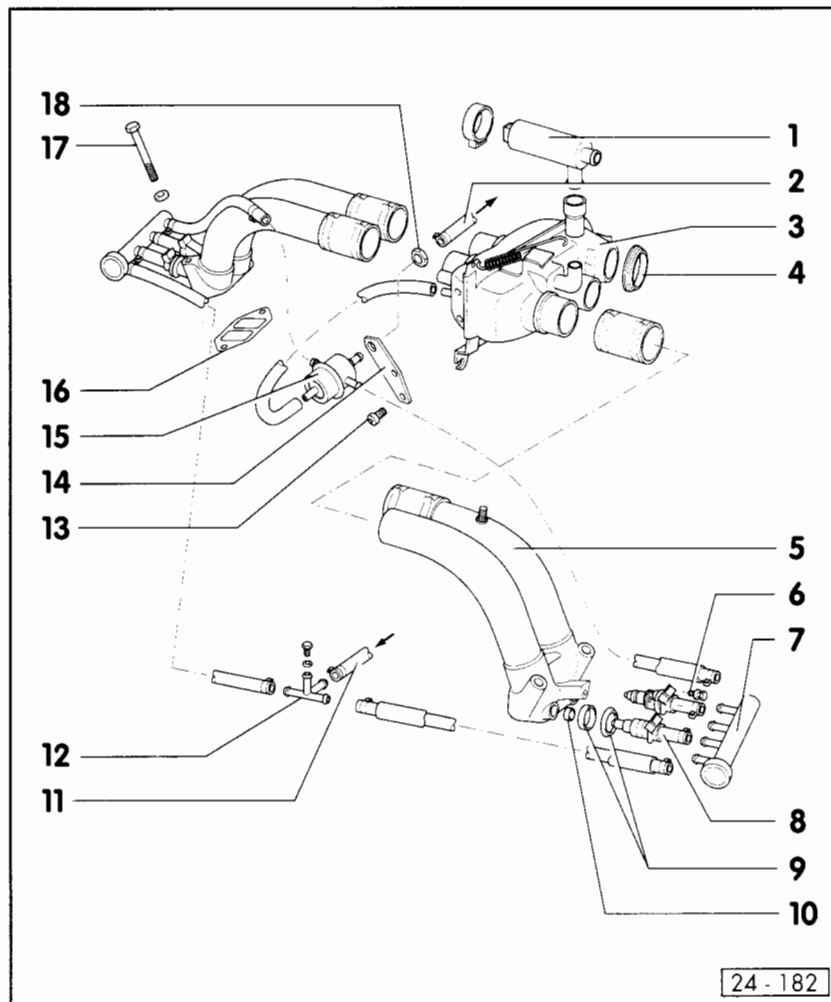
24 - 1012

24–2

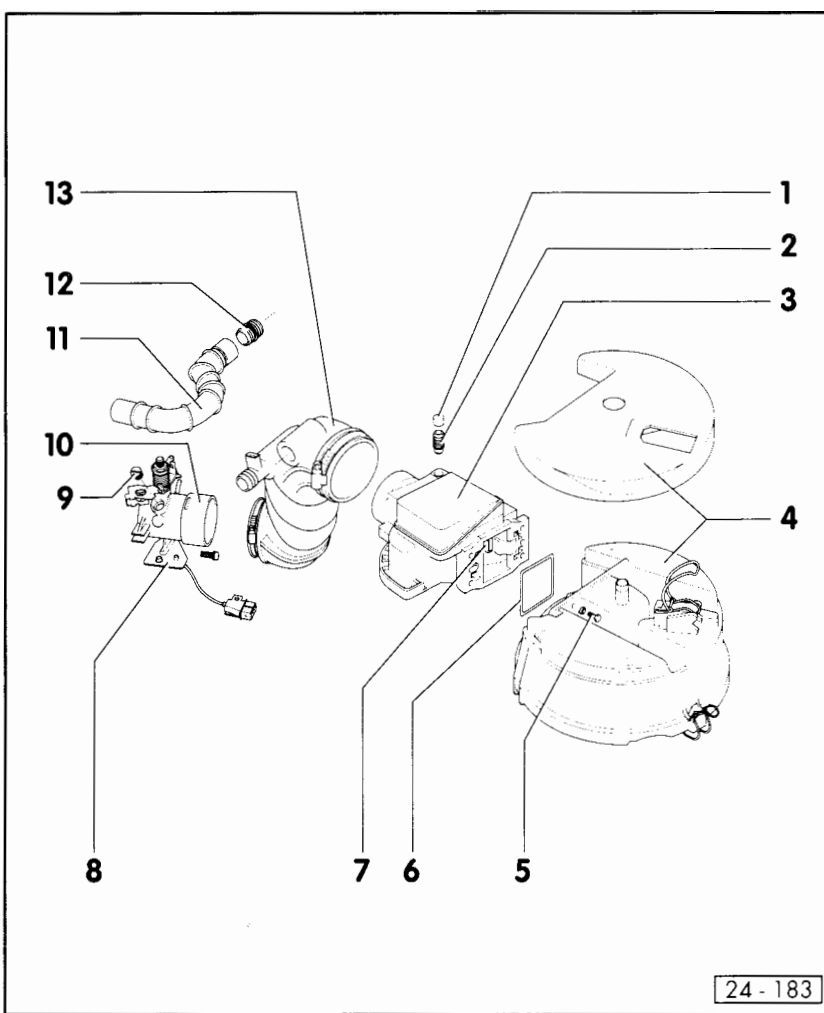


Part I

- 1 – Idling speed stabilization valve (N71)**
 - Checking idling speed stabilization ⇒ page 24–23
- 2 – Fuel return pipe**
 - To fuel tank
- 3 – Intake manifold**
- 4 – Sealing ring**
 - Renew if damaged
- 5 – Intake pipe**
- 6 – 5 Nm**
- 7 – Fuel distributor**
- 8 – Fuel injector (N30 ... N33)**
 - Checking ⇒ page 24–31
- 9 – Injector bearings**



- 10 – Sealing ring**
- 11 – Fuel supply pipe**
 - From fuel pump
- 12 – Branch pipe**
 - With connection for pressure manometer
- 13 – Bolt**
 - Coat with D2
- 14 – Retaining plate**
- 15 – Fuel pressure regulator**
 - Checking ⇒ page 24–28
- 16 – Gasket**
 - Renew
- 17 – 20 Nm**
- 18 – 8 Nm**

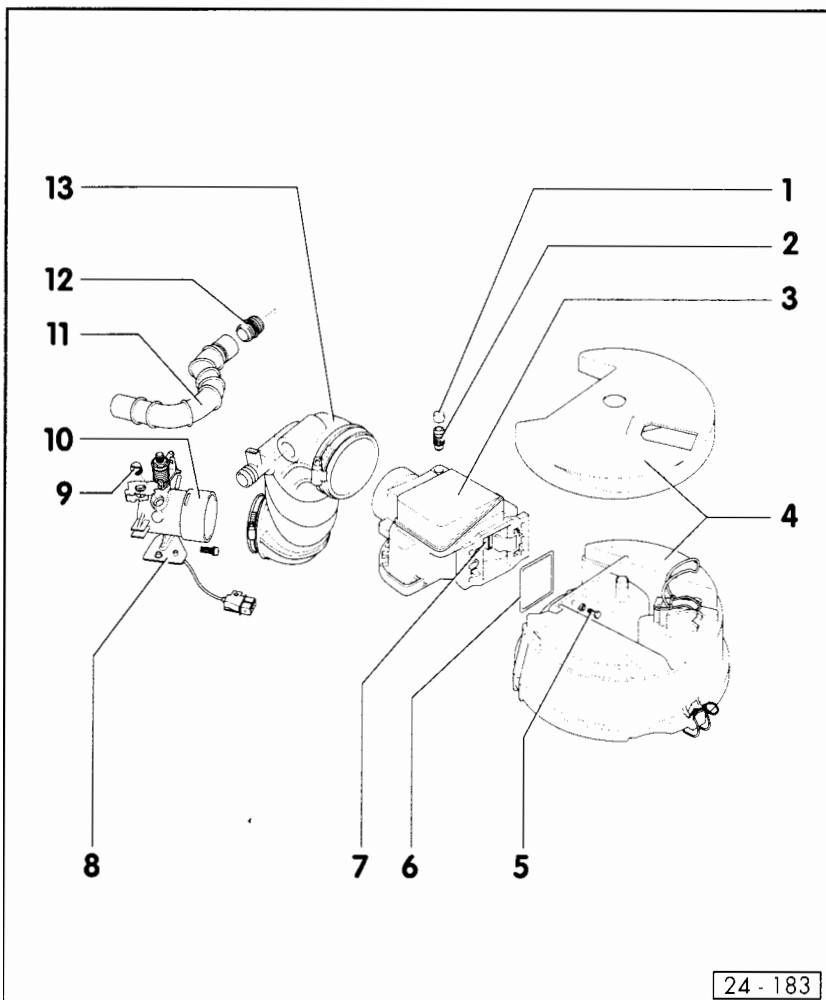


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Part II

- 1 – **Sealing plug**
 - Renew
- 2 – **CO adjusting screw**
 - Idling speed adjustment Digijet
⇒ page 24–15
 - Idling speed adjustment Digifant
⇒ page 24–18
- 3 – **Air flow meter (G19)**
 - Checking ⇒ page 24–33
- 4 – **Air filter housing**
- 5 – **5 Nm**
- 6 – **Gasket**
 - Renew if damaged
- 7 – **Air intake temperature sender (G42)**
 - Checking ⇒ page 24–33, Checking
air flow meter

24–5

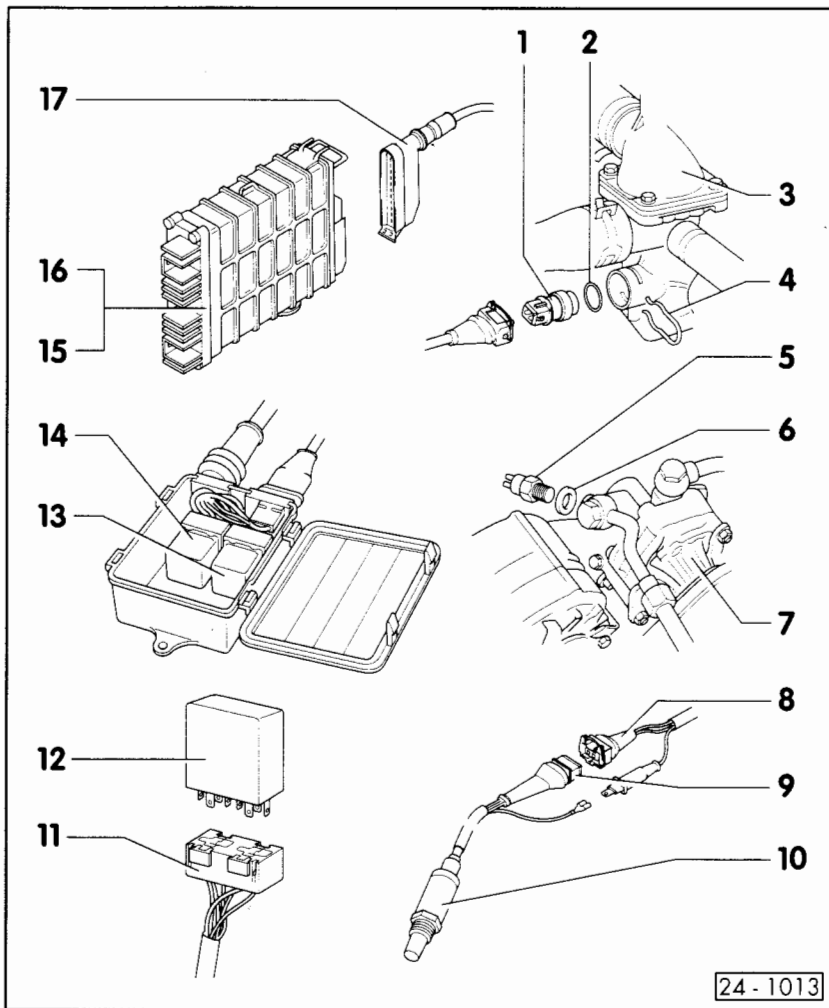


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- 8 – **Throttle valve switch (F25 or F60/81)**
 - Removing and installing
⇒ page 24–34
 - Checking and adjusting
⇒ page 24–35
 - Checking overrun cut-off and full
load enrichment ⇒ page 24–38
- 9 – **Idling speed adjustment screw**
 - Idling speed adjustment Digijet
⇒ page 24–15
 - Idling speed adjustment Digifant
⇒ page 24–18
- 10 – **Throttle valve housing**
 - Basic setting of throttle valve
⇒ page 24–39
 - Throttle valve housing for mixture
charge limiter ⇒ page 24–40
- 11 – **Hose**
- 12 – **Intermediate connector**
- 13 – **Intake air elbow**

24–6

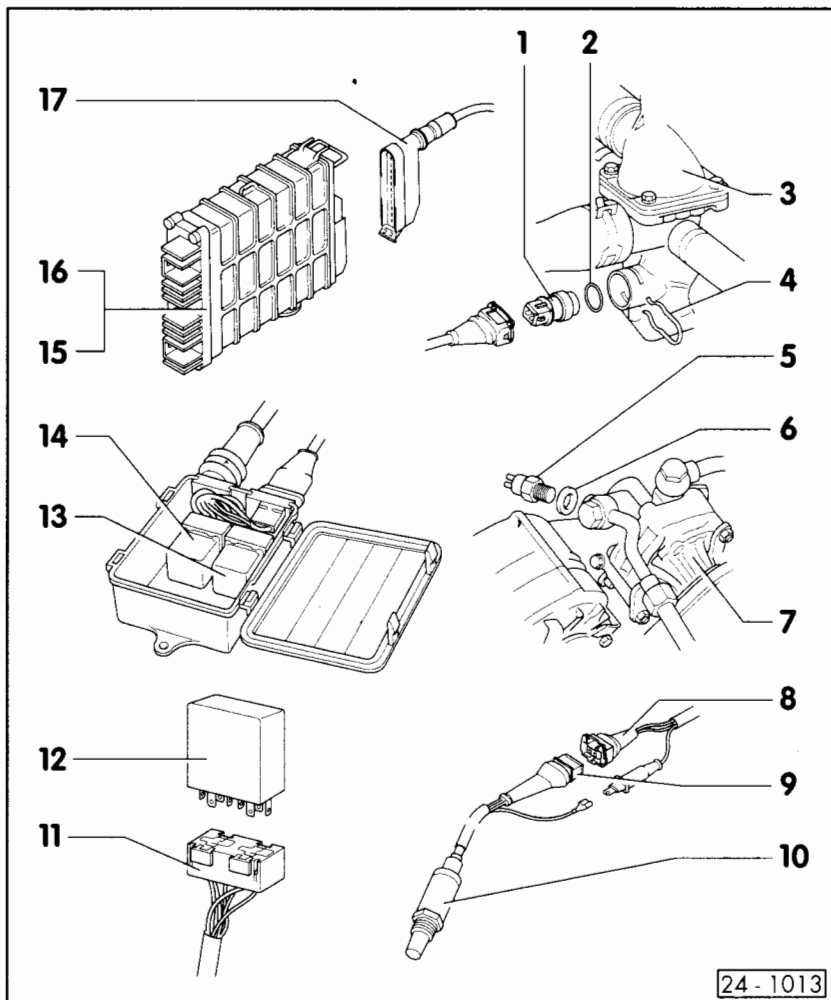
Part III



24-1013

- 1 – **Temperature sensor (G18)**
 - Resistance dependent on coolant temperature
 - Specified value ⇒ page 01–10, Fig. 1
- 2 – **O-ring**
 - Renew if damaged
- 3 – **Thermostat housing**
- 4 – **Retaining spring**
- 5 – **Servo assisted steering pressure switch (F88), 15 Nm**
 - Check resistance with engine running:
 - Steering in straight ahead position
 - Specified value: $\infty \Omega$
 - Steering turned to full lock
 - Specified value: Max. 1.5 Ω
- 6 – **Sealing ring**
 - Renew

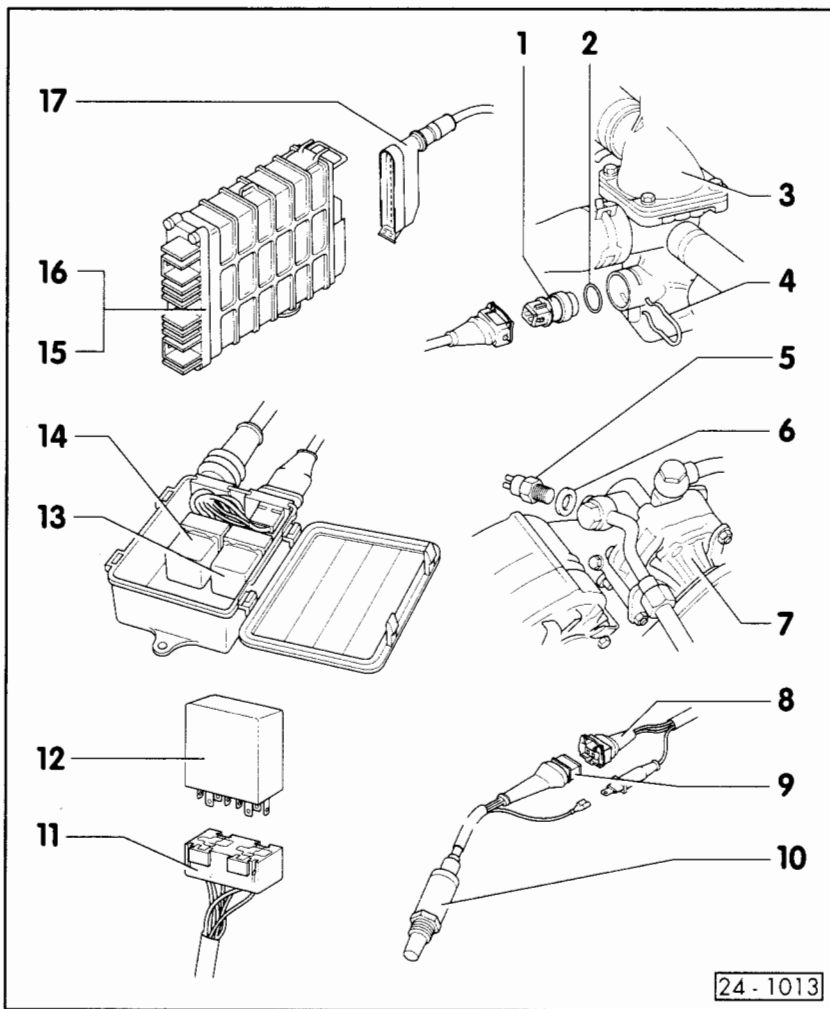
24-7



24-1013

- 7 – **Vane type pump for servo assisted steering**
- 8 – **Connector plug**
 - Only for Digifant
 - For Lambda probe heating
 - Check voltage with ignition switched on
 - Specified value: Battery voltage
- 9 – **Connector**
 - Only for Digifant
 - Check resistance for Lambda probe heating
 - Check resistance
 - Specified resistance: Max. 1.5 Ω
- 10 – **Lambda probe (G39), 50 Nm**
 - Only for Digifant
 - Installation location: Catalytic converter
 - Grease only the thread; G5 must not reach the slots of the probe body
 - Checking Lambda probe and Lambda control ⇒ page 24–26

24-8



24 - 1013

11 – Relay adapter

- Check electrical connections according to current flow diagram or test programme V.A.G 1466

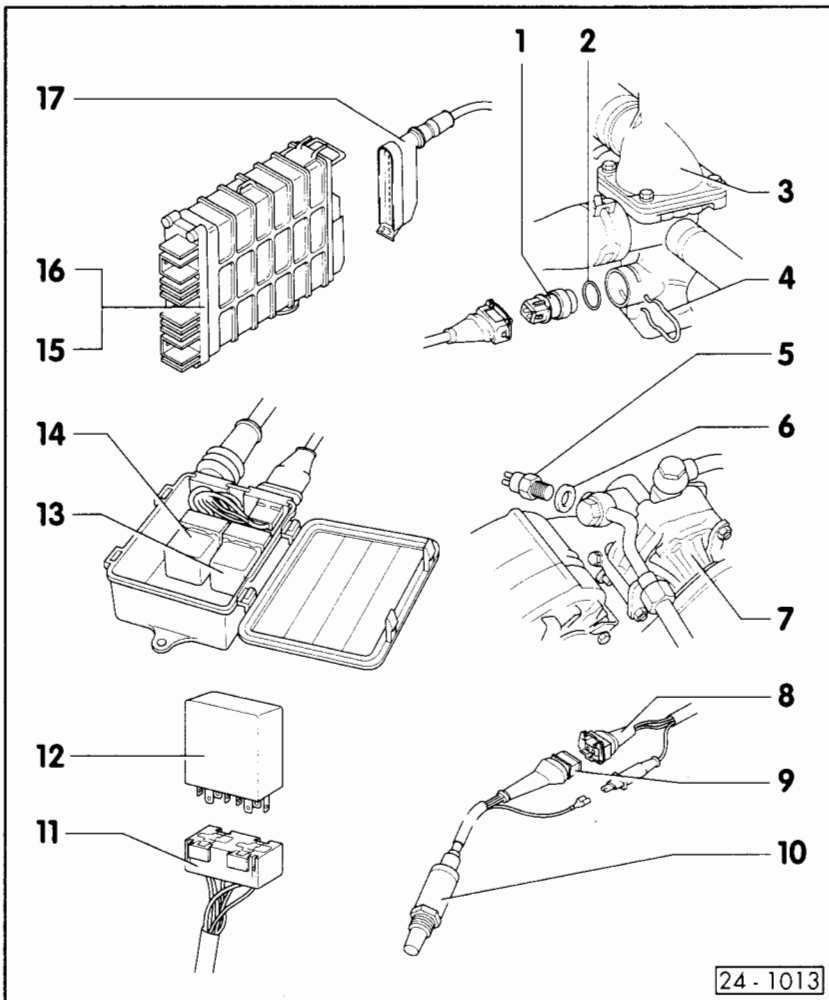
12 – Idling speed stabilization control unit (J142)

- Installation position: in front of right tail light
- Remove and install only with ignition switched off
- Checking idling speed stabilization ⇒ page 24–23

13 – Fuel pump relay (J17)

- On Digijet system to fuel pump and fuel injectors current supply
- On Digifant system to fuel pump current supply
- When switching ignition of and off the relay must be felt to switch (Prerequisite: current supply relay and Digijet or Digifant control unit is in order)

24–9



24 - 1013

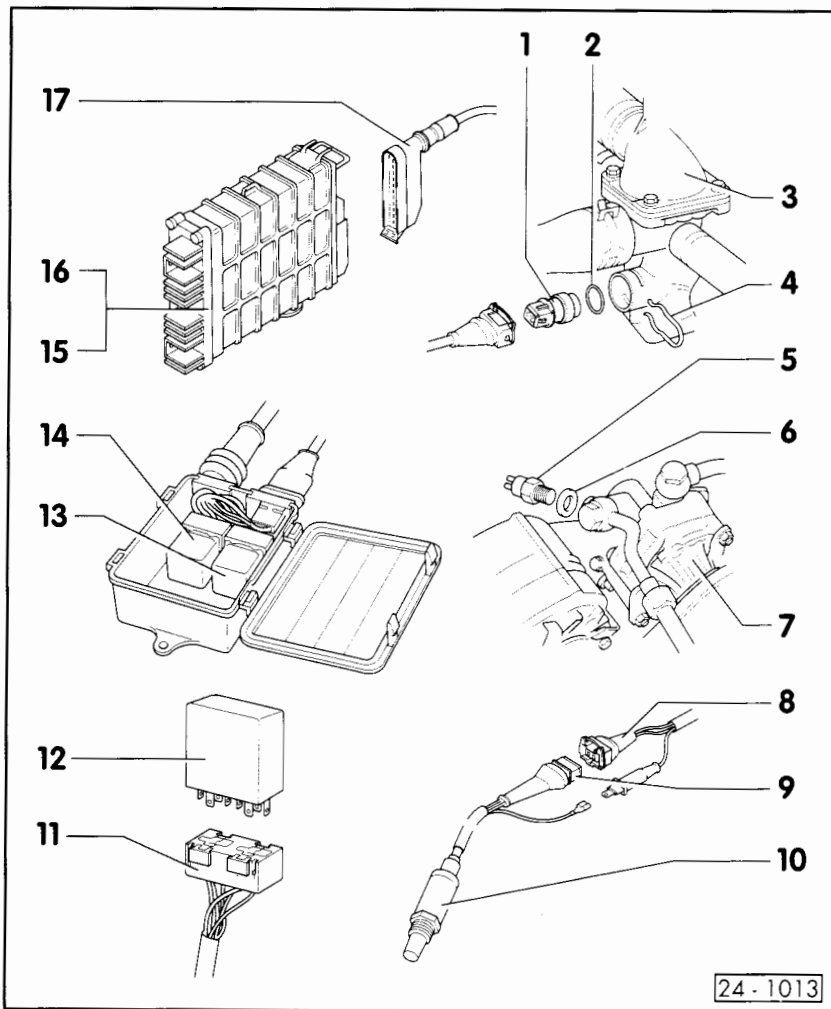
14 – Current supply relay (J167 or J176)

- On Digijet system for: Digijet control unit for idling speed stabilization and servo assisted steering pressure switch
- On Digifant system for: Digifant system control unit, idling speed stabilization control unit, Servo assisted steering pressure switch, fuel injectors, Lambda probe heating and activating fuel pump relay KI.86
- When switching ignition on and off the relay must be felt to switch
- Check connections according to current flow diagram

15 – Digijet control unit (J147)

- For fuel injection system
- To remove take off left-hand tail light

24–10



- 16 – Digifant control unit (J169)**
- For fuel injection and ignition system, Lambda control
 - Installation position: On luggage compartment floor underneath rear bench seat or in load compartment, on platform trucks in equipment locker underneath load platform

- 17 – Connector plug**
- Disconnect or connect plug with ignition switched off
 - To remove press retaining spring upwards

24-11

Safety precautions

In order to prevent injuries to persons and/or destruction of the fuel injector and ignition system, the following points should be noted:

- Do not touch or disconnect ignition cables with the engine running or during starting.
- Fuel injection and ignition system cables –also measuring equipment cables– should only be attached and detached with the ignition switched off.
- If the engine is to be rotated at starter motor speed without firing as, for instance, during compression pressure checks, disconnect plug from Hall sender (ignition distributor).

Rules for cleanliness

When working on the fuel injection system the following "5 Rules For Cleanliness" must be carefully observed:

- Thoroughly clean all unions and their adjacent areas before disconnecting.
- Place removed parts on a clean surface and cover. Use plastic sheeting or paper. Do not use fluffy cloths!
- Carefully cover or seal opened components if the repair work cannot be carried out immediately.
- Install only clean components.
Only unpack replacement parts immediately prior to installation.
Do not use parts that have been stored loose (for instance, in tool boxes etc.).
- When the fuel system is open:
Do not work with compressed air if this can be avoided.
Do not move the vehicle unless absolutely necessary.

24-13

Technical data

Engine code letters Version	DJ Digijet		MV, SR, SS Digifant
Idling speed adjustment ¹⁾²⁾			
Idling speed rpm	800 ± 50		880 ± 50
CO content Vol. %	2.0 ± 0.5		0.7 ± 0.4 ³⁾
Digijet or Digifant control unit	Manual gearbox 025 906 021 F	Automatic gearbox 025 906 021 E	025 906 022/022 A ⁴⁾ , 025 906 022 B ⁵⁾ , 025 906 022 D ⁶⁾
Part number			
Speed limiter rpm	5500 ... 5800		5500 ... 5800

¹⁾ Actual values:

⇒ File "Exhaust gas and idling speed test"

²⁾ Observe test and adjustment conditions ⇒ page 24-15, Idling speed adjustment Digijet fuel injection system or ⇒ page 24-18, Idling speed adjustment Digifant fuel injection and ignition system

³⁾ Sampling place on left-hand exhaust pipe

⁴⁾ For ignition coil with grey adhesive label, Replacement part: 025 906 022 D

⁵⁾ For Saudi-Arabia

⁶⁾ For ignition coil with green adhesive label

24-14

Idling speed adjustment Digijet fuel injection system

(Engine code letters DJ)

Checking and adjustment conditions

- Engine oil temperature at least 80°C.
- Electrical components switched off (radiator fan must not run when testing or adjusting).
- Ignition timing on order.
- Exhaust system not leaking.
- Throttle valve switch in order, throttle valve switch (idling speed switch) switched on.
- With ignition switched on, the idling speed stabilization valve must vibrate or buzz.
- Ignition switched off.

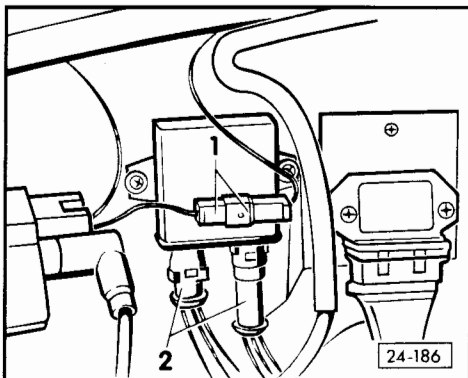
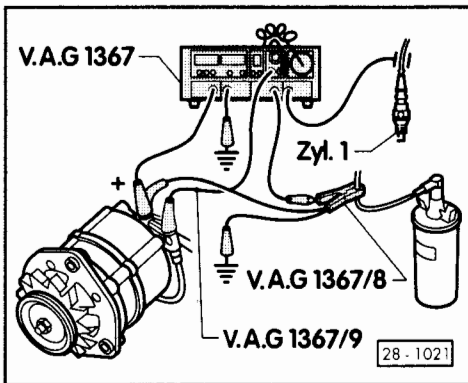
Vehicles with automatic gearbox

- Accelerator cable setting in order, checking ⇒ Repair Group 20.

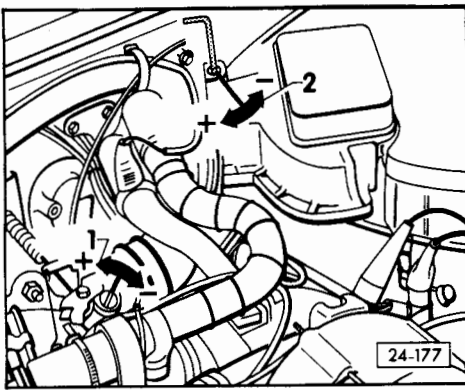
24-15

Checking and adjusting idling speed and CO content

- Disconnect crank case breather hose at oil breather and seal tightly.
 - Remove vacuum hose from distributor retard unit and seal.
 - ◀ - Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.
 - Connect CO tester V.A.G 1363A to tail pipe.
-
- ◀ - Disconnect plug connector -1- from terminal 1 (-) of ignition coil to idling speed control unit.
 - Disconnect plug -2- from DIS switch unit and bridge connection.
 - Start engine and run at idling speed.



24-16



- ◀ – Check idling speed and CO content and adjust to mean value, if necessary, by alternatively turning the idling speed adjusting screw –1– and CO adjusting screw –2–.
 Idling speed $800 \pm 50 \text{ rpm}^{1)}$
 CO content $2.0 \pm 0.5 \text{ Vol. \%}^{1)}$

¹⁾ actual values:
 ⇒ File "Exhaust gas and idling speed test".

- Connect plug to DIS switch unit.
- Connect plug for idling speed stabilization (terminal 1 (-) on ignition coil).
- Connect vacuum hose to distributor retard unit.
- When setting is correct, seal CO adjusting screw with new anti-tamper cap.

Note:

The crankcase breather hose must be reconnected after idling speed adjustment has been completed. If the CO content level rises again, this does not mean that the adjustment is incorrect but is due to enrichment from the crankcase due to oil dilution resulting from frequent stop/start operations. A long and fast drive will reduce the amount of fuel in the oil and the CO content level will return to normal. This can also be achieved by carrying out an oil change.

24-17

Idling speed adjustment Digifant fuel injection and ignition system

(Engine code letters MV, SR, SS)

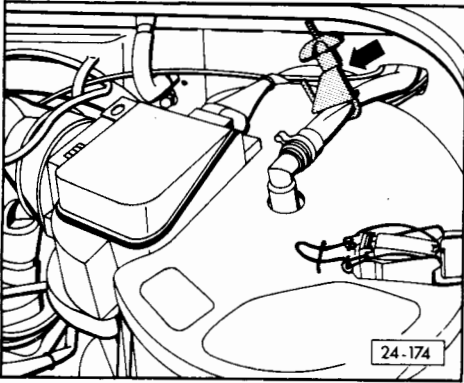
Checking and adjusting conditions

- Engine oil temperature at least 80°C.
- Electrical components switched off (radiator fan must not run when testing or adjusting).
- Ignition timing on order.
- Exhaust system not leaking.
- Throttle valve switch in order, throttle valve switch (idling speed switch) switched on.
- With engine running, the idling speed stabilization valve must vibrate or buzz.
- Ignition switched off.

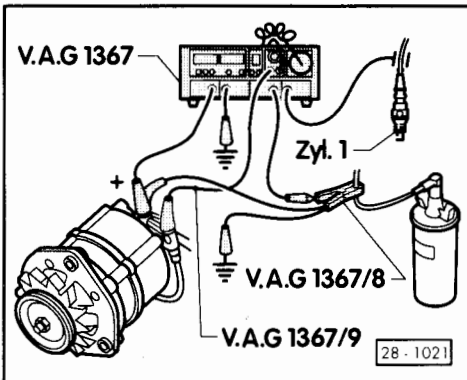
24-18

Checking and adjusting idling speed and CO content

- Remove hose from crankcase breather at oil breather and seal tightly.

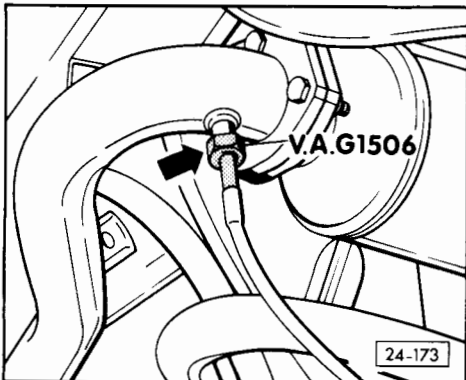


- ◀ - If activated charcoal tank is fitted, tightly clamp hose to air filter -arrow-.

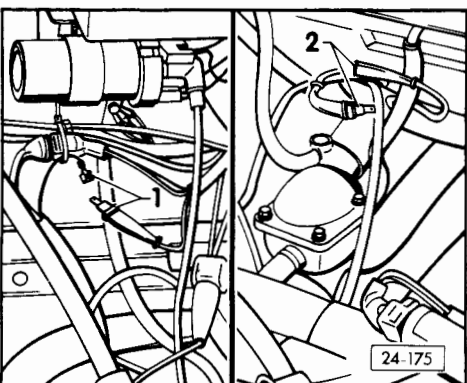


- ◀ - Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.

24-19

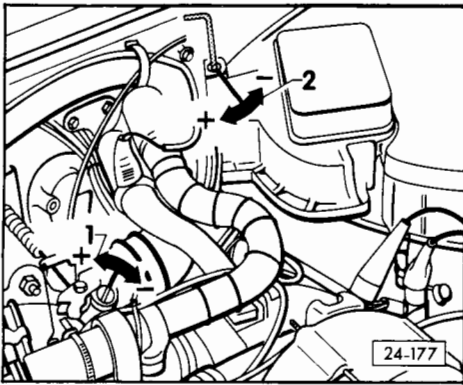


- ◀ - Connect hose from CO tester V.A.G 1363A with the screw-type connector V.A.G 1506 to the sampling point on the left-hand exhaust pipe -arrow-.



- ◀ - With ignition switched off, disconnect plug connection -1- for the Lambda probe and plug connection -2- for idling speed stabilization control unit.
- Start engine and run at idling speed.

24-20



- ◀ – Check idling speed and adjust, if necessary, at the adjusting screw –1–.
Specified setting: 880 ± 50 rpm¹⁾
- Only check CO content after idling speed has been correctly adjusted:
Specified reading: 0.3 ... 1.1 Vol. %¹⁾
- To adjust the CO content remove anti-tamper plug from CO adjustment screw.

Note:

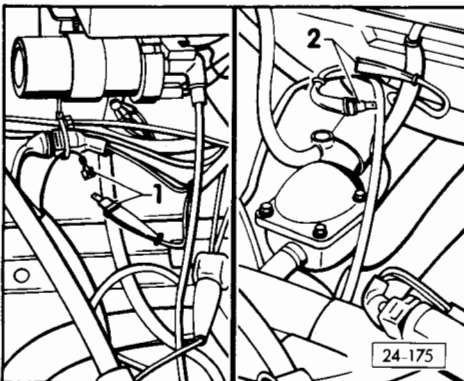
If the anti-tamper plug is made from metal, remove as follows:

Drill anti-tamper plug with $\varnothing 2.5$ drill, screw $\varnothing 3$ mm self-tapping screw into the plug and pull out anti-tamper plug with pliers.

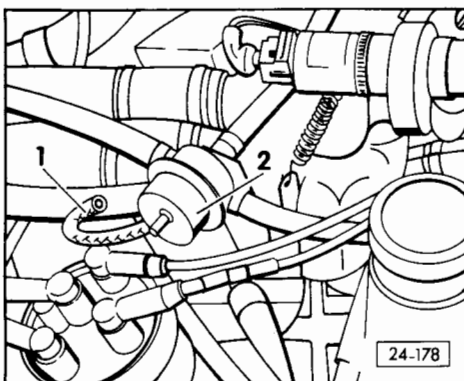
- Check idling speed and CO content and adjust to mean value by alternately turning the idling speed adjusting screw –1– and CO adjusting screw –2–.
Idling speed 880 ± 50 rpm¹⁾
CO content 0.7 ± 0.4 Vol. %¹⁾

¹⁾ actual values: \Rightarrow File "Exhaust gas and idling speed test".

24-21



- ◀ – Connect plug –1– for Lambda probe and plug –2– for idling stabilizing control unit.
- Run engine for approx. 2 minutes at idling speed. The CO content must remain between 0.3 ... 1.1 Vol. %.

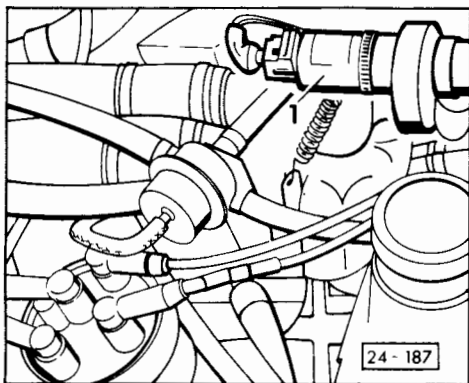


- ◀ – Check function of Lambda probe.
To do this, remove hose –1– from pressure regulator –2– and seal.
The CO content must increase briefly and then drop off again (control).
- After corrective work seal the CO adjustment screw again with new anti-tamper cap.

24-22

Checking idling stabilization

Functional test



- ▶ – Start engine and run at idling speed. The idling speed stabilization valve must vibrate and buzz.

Valve vibrates and buzzes:

- Check control:

Valve does not vibrate and buzz:

- Switch off ignition.
- Pull plug off valve –1– and measure resistance of the valve with multimeter V.A.G 1715 or V.A.G 1526 and auxiliary cables from V.A.G 1594.
Specified resistance: 2 ... 10 Ω

If the specified reading is not obtained:

- Renew valve.

If the specified reading is obtained:

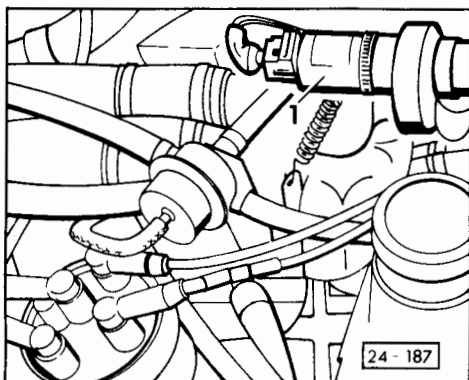
- Connect plug to valve and check electrical connections at the idling speed stabilization control unit relay adapter (J142), in front of right-hand tail light, according to the current flow diagram or test programme V.A.G 1466.

24-23

- If the electrical connections are in order, renew idling stabilization control unit.

Checking control functions

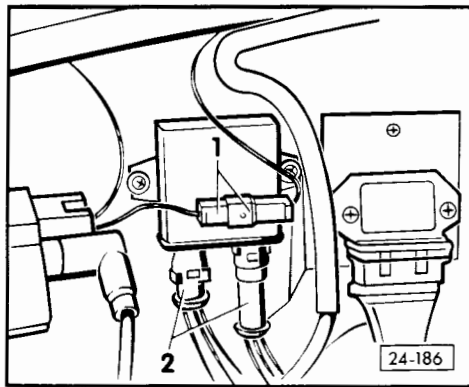
- Engine oil temperature at least 80°C.
- All electrical components switched off.
- Idling speed setting in order, checking
⇒ page 24-15 or page 24-18.
- No leaks in the exhaust system.
- Remove crankcase breather hose at oil breather and seal tightly.



- ▶ – Connect multimeter V.A.G 1715 or V.A.G 1526 with measuring cable V.A.G 1315A/2 and auxiliary cables from V.A.G 1594 to idling speed stabilization valve –1–.
- Start engine and run at idling speed.
- Measure control current with engine running at idling speed.
Specified reading: approx. 430 \pm 20 mA, fluctuating

24-24

Engine code letters DJ

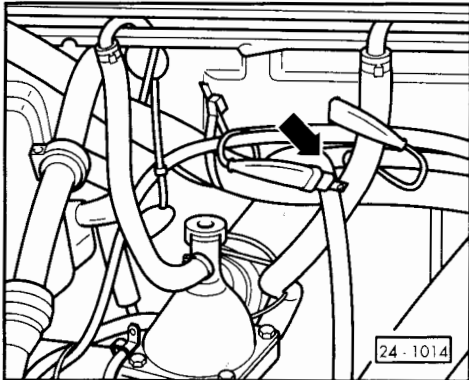


- ◀ – Disconnect plug connector –1– from terminal 1 (–) of the ignition coil to the idling speed stabilization control unit (J142).
Specified reading: approx. 430 mA constant

If the specified reading is not obtained:

- Renew idling speed stabilization control unit.

Engine code letters MV, SR, SS



- ◀ – Disconnect plug connector –arrow– for idling speed stabilization control unit (J142).
Specified reading: approx. 430 mA constant

If the specified reading is not obtained:

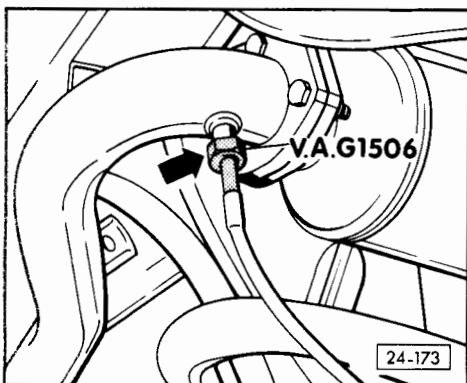
- Renew idling speed stabilization control unit.

24–25

Checking Lambda probe and Lambda control

Engine code letters MV, SR, SS

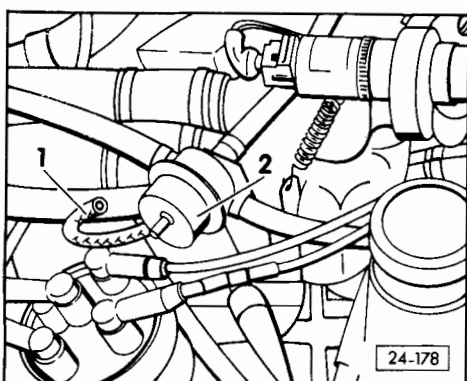
- Engine oil temperature at least 80°C.
- There must be no leaks in the exhaust system between the cylinder heads and the catalytic converter.
- ◀ – Connect hose from CO tester V.A.G 1363A with screw type connector V.A.G 1506 to the sampling point on the left-hand exhaust pipe –arrow–.



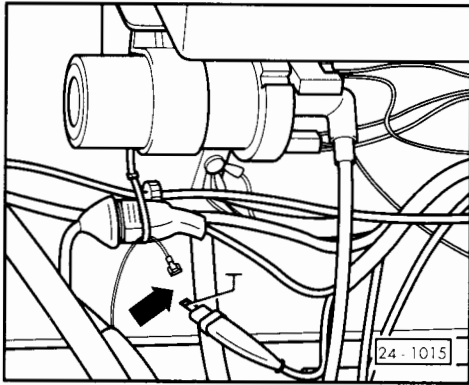
Test stage I

- Run engine for approx. 2 minutes at idling speed and note CO content.
- ◀ – Check function of Lambda control.
To do this, remove hose –1– from pressure regulator –2– and seal hose end.
The CO content must increase briefly and then drop off again (control).

Otherwise determine whether the Digifant control unit or the Lambda probe is defective by carrying out test stage II.



24–26



Test stage II

- ◀ – Disconnect plug connector –arrow– and hold control unit cable connector to earth (-). The CO content must increase.
- Connect cable connector to control unit to positive (+) connector at alternator. The CO content must drop.

If the CO content does not alter:

- Carry out electrical test, test stage 11
⇒ page 01-1, test table B and, if necessary, renew Digifant control unit (J169).

Note:

If test stage I is not in order but test stage II is, the Lambda probe is defective.

24-27

Checking fuel pressure regulator and holding pressure

- Check that fuel pump rate of delivery is in order
⇒ Repair Group 20; Removing and installing parts of the fuel system, checking fuel pump.

Note:

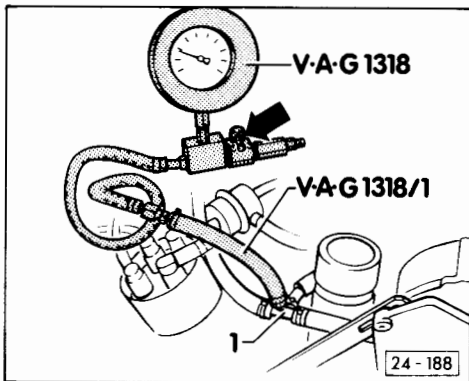
In order to prevent fuel spraying out of loosened connections, wrap a clean cloth around the relevant connection.

- ◀ – Connect pressure measuring tester V.A.G 1318 with adapter 1318/1 and hose to fuel pipe branch pipe –1–.

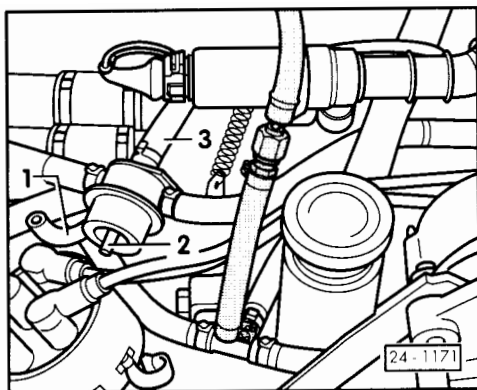
Attention!

The cut-off cock of the pressure measuring tester must be closed (lever across direction of flow –arrow–).

- Start engine and run at idling speed.
- Measure fuel pressure.
Specified pressure: approx. 2.0 bar



24-28



- ◀ – Disconnect vacuum hose –1– from connection –2–.
The fuel pressure must increase to approx. 2.5 bar.
- Switch off ignition.
- Check for leaks and holding pressure by noting possible fall at the manometer.
After 10 minutes the pressure must be at least 1.5 bar.

If the holding pressure drops below 1.5 bar:

- Start engine and run at idling speed.
- After pressure build-up switch off ignition and, at the same time, compress flow return pipe –3– tightly.
- Note drop in pressure on manometer.

If the pressure does not drop:

- Renew fuel pressure regulator.

24–29

If the pressure does drop:

- Checking fuel pump non-return valve:
⇒ Repair Group 20, removing and installing parts of the fuel system, checking fuel pump.
- Check pipe connections, fuel distributor and fuel injectors for leaks.

Note:

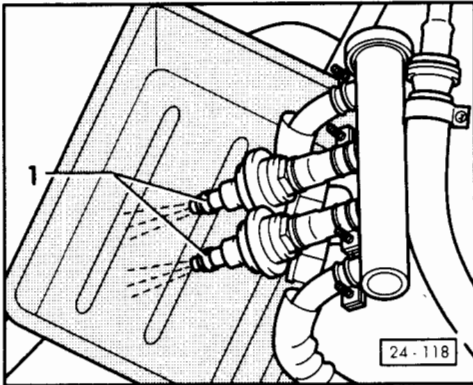
Before removing the pressure measuring tester reduce fuel pressure by opening the cut-off cock and holding a receptacle in front of the connection.

24–30

Checking injectors

Checking for leaks and spray formation

- Remove injectors (N30 ... N33) in pairs (wiring and fuel pipes remain connected).
- Disconnect plug from 2nd pair of injectors.
- ◀ - Operate starter motor briefly and check that fuel spray formation is cone-shaped.
- Disconnect plugs from all injectors.
- Switch on ignition for approx. 5 seconds.
Max. permissible leakage from each injector is 2 drops per minute.
- Remove injectors.
Before installing injectors, ensure sealing rings -1- are fitted.



24-31

Checking voltage supply

- ◀ - Disconnect all plugs from injectors (N30 ... N33) and connect light emitting diode test lamp V.A.G 1527 with auxiliary cable from V.A.G 1594 to one plug.
- Operate starter motor.
Light emitting diode must flicker.

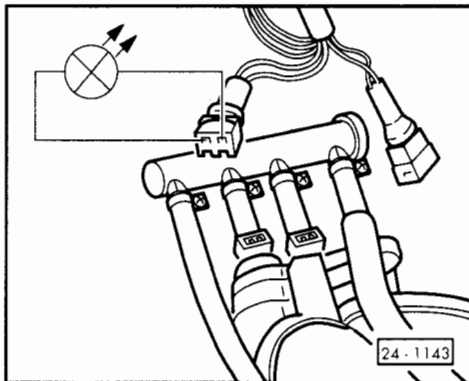
If light emitting diode does not flicker:

- Connect plugs to injectors and carry out electrical checks ⇒ page 01-1.

Digijet: Test table A
Test steps 1, 5 and 6

Digifant: Test table B
Test steps 1 and 5

or Digijet control unit (J147) or Digifant control unit (J169) is defective.



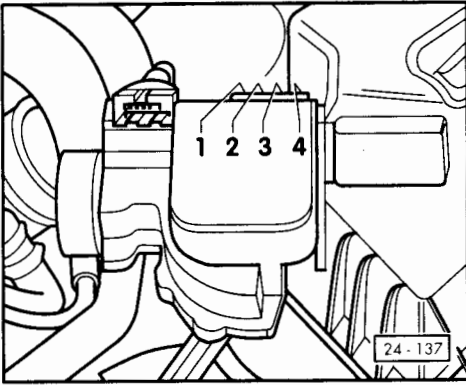
24-32

Checking air flow meter

- Disconnect plug and hose from air flow meter and carry out test with multimeter V.A.G 1715 or V.A.G 1526 and auxiliary cables from V.A.G 1594.

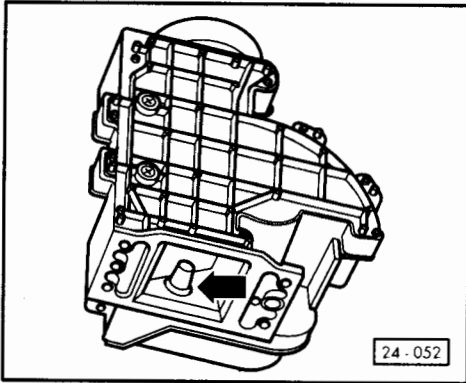
Checking potentiometer (G19)

- ◀ - Measure resistance between terminals 3 and 4.
Specified resistance: approx. 0.5 ... 1 k Ω
- Move air flow meter flap and measure resistance between terminals 2 and 3.
Specified resistance: Fluctuating



◀ Checking intake air temperature sender (G42) -arrow-

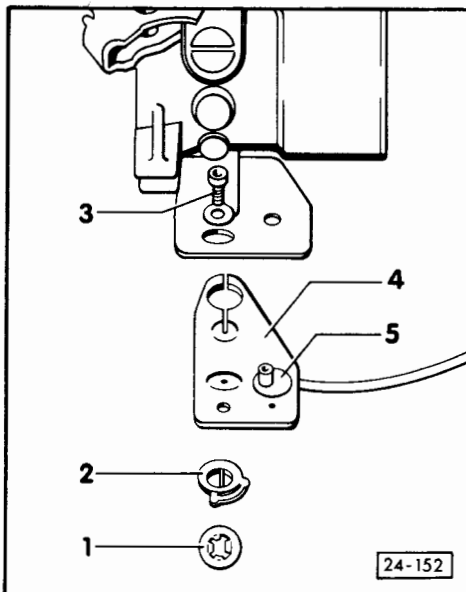
- Measure resistance between terminals 1 and 4.
Specified resistance: \Rightarrow page 01-10, Fig. 1



24-33

Removing and installing throttle valve switch

- Remove throttle valve housing.
- ◀ - Remove throttle valve switch (F25 or F60/F81)
-4- in sequence of 1 to 5.
- Before installing grease the eccentric screw
-5-.
- Installation is carried out in reverse sequence.
- Adjusting throttle valve switch \Rightarrow page 24-35, Checking and adjusting throttle valve switch.



24-34

Checking and adjusting throttle valve switch.

The throttle valve switch (F25 or F60/F81) supplies the following information to the control unit:

Throttle valve closed:

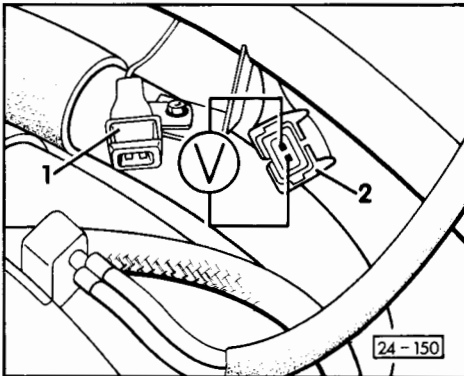
- Injection quantity for idling speed.
- Fuel cut-off for overrun cut-off.
- In addition with Digifant: Ignition timing adjustment at idling speed (DIS function).

Throttle valve fully open:

- Injection quantity for full throttle.

Checking voltage supply

- ◀ – Disconnect plug –2– from throttle valve switch connection –1–.
- Switch on ignition.
- Using multimeter V.A.G 1715 or V.A.G 1526 and auxiliary cables from V.A.G 1594 check voltage at plug –2–.
Specified reading: approx. 5 Volts



24-35

If no voltage is indicated:

- Connect plug –2– to connection –1– and carry out electrical checks ⇒ page 01-1.

Digijet: Test table A
Test step 8

Digifant: Test table B
Test step 7

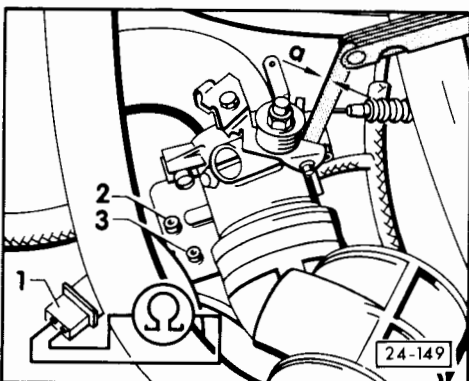
or Digijet control unit (J147) or Digifant control unit (J169) is defective.

Checking and adjusting throttle valve switch

- Disconnect plug from throttle valve switch connection –1–.
- ◀ – Using multimeter V.A.G 1715 or V.A.G 1526 and auxiliary cables from V.A.G 1594 check voltage at throttle valve switch connection –1–.
Specified resistance: Max. 1.5 Ω

Note

The specified value must only be present during idling speed and when the throttle valve lever is on the full load stop.



24-36

- Open throttle valve and close slowly, Checking operating point (max. 1.5 Ω) of switch with feeler gauge at throttle valve lever idling speed stop.

Operating point:

Gap a = 0.05 ... 0.10 mm before idling speed stop

- ◀ - If necessary adjust gap -a- with eccentric screw -3- after loosening screw -2-.

Notes:

- Correct adjustment is important!

Gap -a- too large:

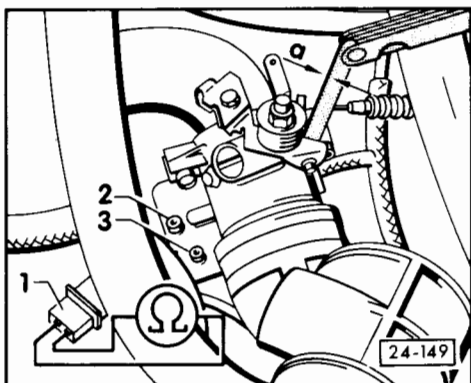
Engine surges with small throttle openings

Gap -a- too small:

Cold engine stalls when throttle is opened, warm engine has no overrun cut-off

Additionally with Digifant: no DIS function at idling speed

- The screw for basic throttle setting must not be moved. If the screw has been moved inadvertently, basic setting of the throttle valve must be carried out \Rightarrow page 24-39.



Checking overrun cut-off and full load enrichment

- Engine oil temperature at least 80°C.
- Checking that air flow meter is in order \Rightarrow page 24-33.

Note:

With this test the overrun cut-off is checked. If this is in order, the full load enrichment is also in order.

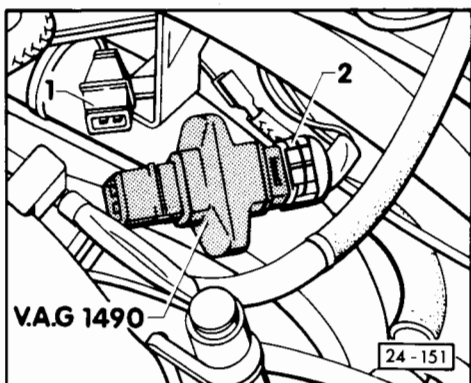
- ◀ - Disconnect plug -2- from throttle valve switch connection -1- (F25 or F60/F81).
- Bridge the contacts in plug -2- with side of adapter V.A.G 1490 marked \square or with cables from V.A.G 1594 and open throttle very slightly. Engine speed must fluctuate (surge and overrun cut-off occurs).

Note:

Do not use the 15 k Ω side of the V.A.G 1490 adapter.

Otherwise:

- Open circuit in wiring.
- Engine coolant temperature sender (G19) defective.
- Digijet control unit (J147) or Digifant control unit (J169) defective.



Basic throttle valve setting

Note:

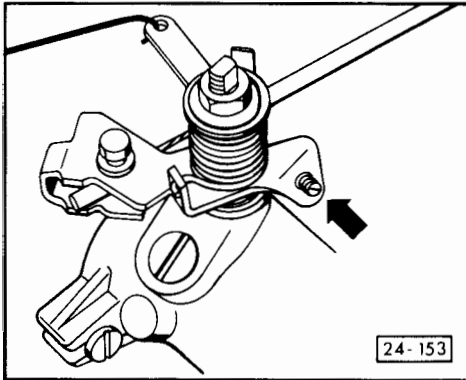
The adjustment screw is set at the factory and must not be altered. If the screw is turned inadvertently, the subsequently described setting must be carried out.

- Unscrew adjustment screw –arrow– until there is a gap between screw and stop.
- Screw adjustment screw in until it just touches the stop.

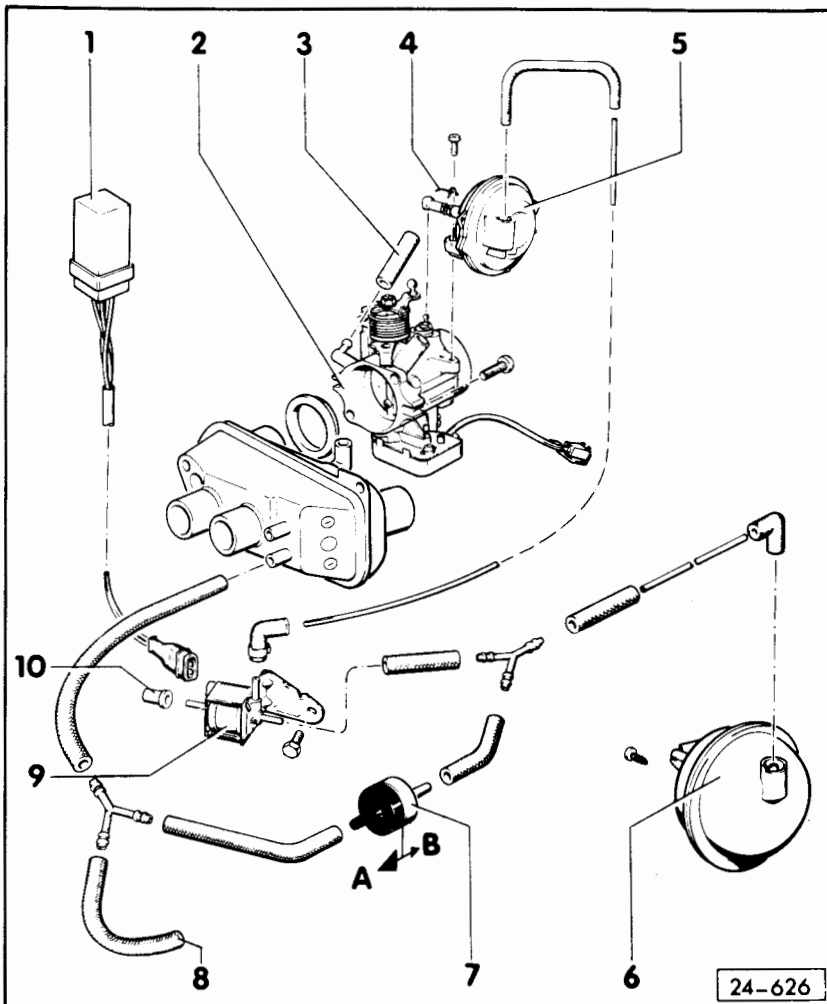
Note:

In order to find the exact point of screw contact with the stop, place a thin piece of paper between the adjusting screw and the stop. By continuously moving the paper and simultaneous screwing in of the adjustment screw the exact point of contact can be determined.

- From this point on turn screw in a further Ω turn.
- Check idling speed and adjust both idling speed and CO content if necessary:
 - Adjusting Digijet idling speed \Rightarrow page 24–15.
 - Adjusting Digifant idling speed \Rightarrow page 24–18.



24–39



Servicing mixture charge limiter

(Engine code letters SS)

Checking function of mixture charge limiter \Rightarrow page 24–43.

1 – Mixture charge limiter control unit (J244)

- For operation of the two-way valve for engine speed limiter (N143)
- Installation position: in relay box in engine compartment
- Checking \Rightarrow page 24–44

2 – Throttle valve housing

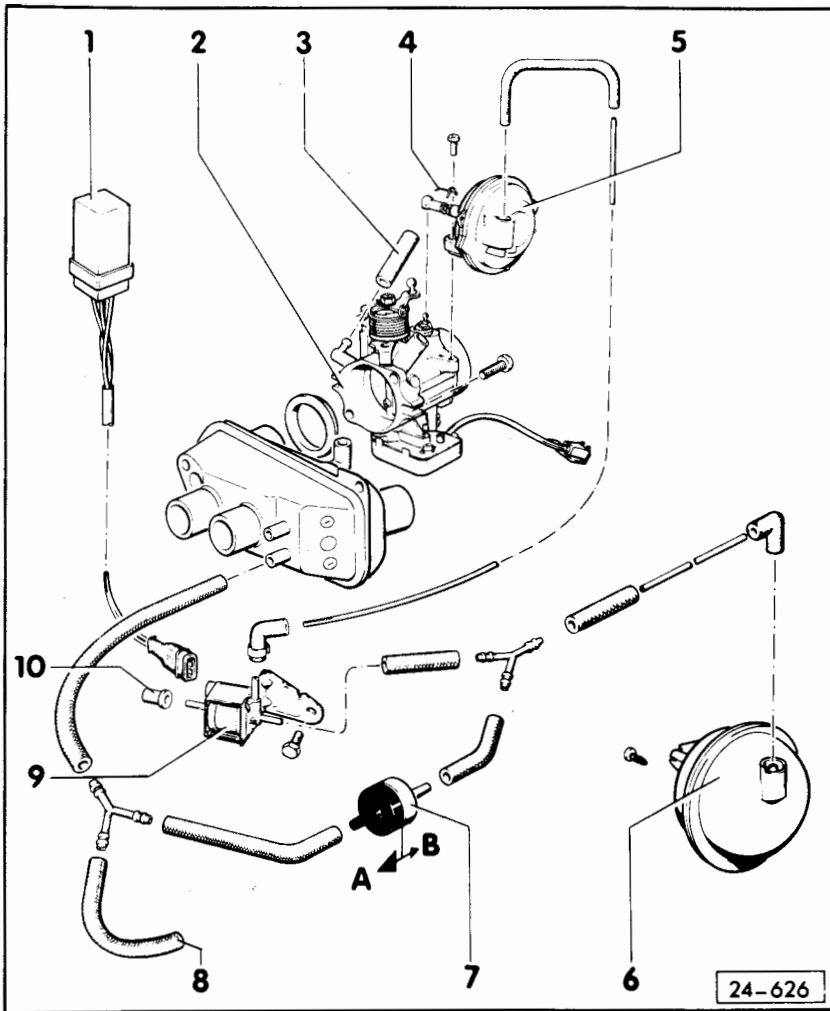
- Second throttle valve for mixture charge limiter

3 – Sealing cap or pipe

- Pipe to activated charcoal tank cut-off valve

4 – Locking clip

24–40



5 – Vacuum unit

- Checking vacuum unit and vacuum tank for leaks ⇒ page 24–45
- Adjust tension bar so that with fully retracted tension bar the throttle valve is fully open

6 – Vacuum tank

- Checking vacuum unit and vacuum tank for leaks ⇒ page 24–45

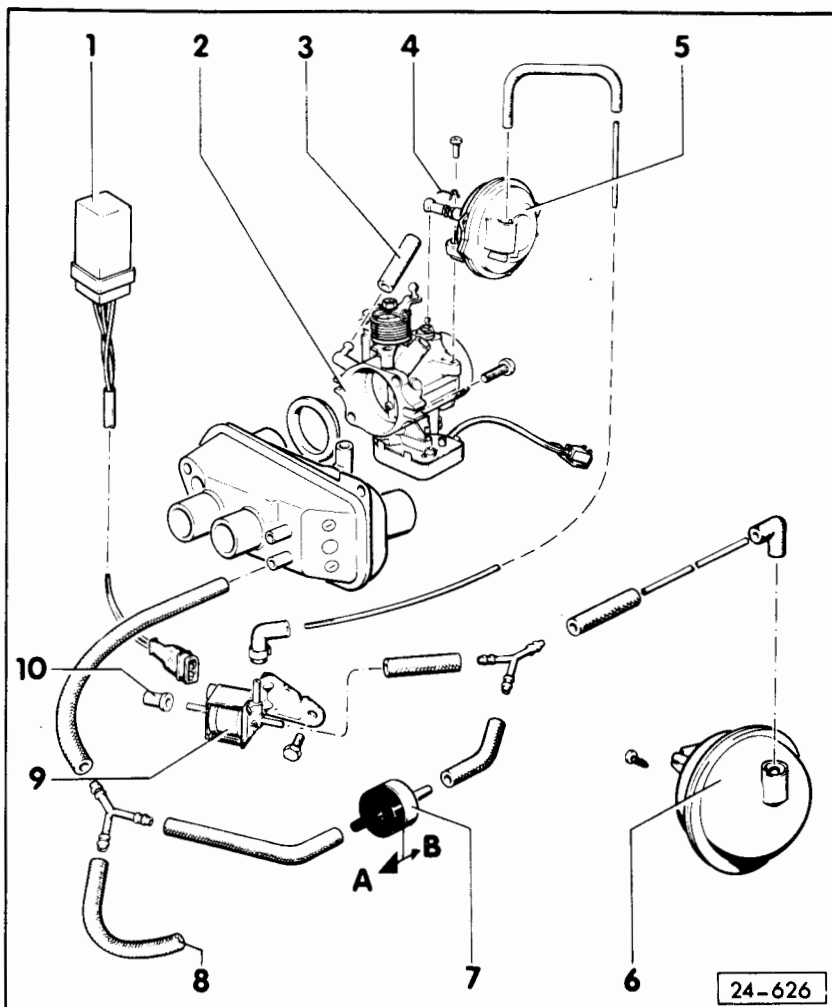
7 – Non–return valve

- Marking: Black/white
- Installation position as illustrated
- Check for operation:
Arrow A = flow condition
Arrow B = no flow condition

8 – Hose

- To fuel pressure regulator

24–41



9 – Two–way valve for engine speed limiter (N143)

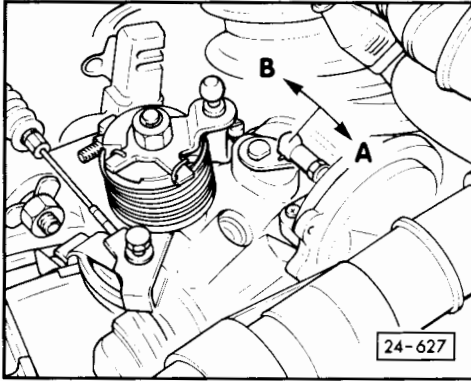
- Check for air flow at tubes
Ignition switched on:
All tubes are open
Ignition switched off:
Tube for pipe to branch pipe is not open

10 – Vent cap

24–42

Checking function of mixture charge limiter

- Start engine and run at idling speed.



- ◀ - Check position of second throttle valve.
Engine speed below approx. 4500 rpm
Throttle valve open -arrow A-
Engine speed above approx. 4500 rpm:
Throttle valve closed -arrow B-

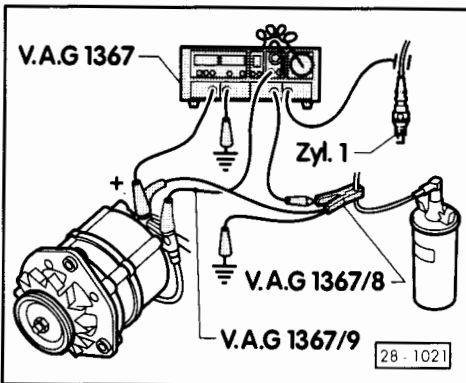
Otherwise:

- Check vacuum pipes ⇒ page 24-42.
- Check two-way valve for engine speed limiter (N143) ⇒ page 24-42, item -9-.
- Checking mixture charge limiter control unit (J244) ⇒ page 24-44.
- Checking vacuum unit and vacuum tank for leaks ⇒ page 24-45.

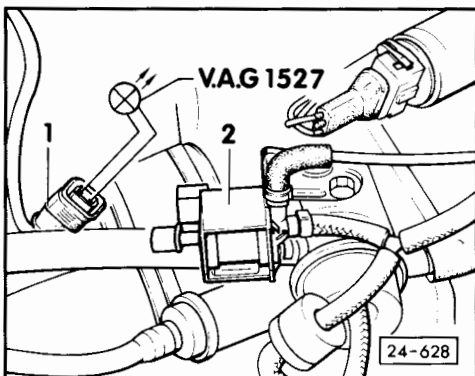
24-43

Checking mixture charge limiter control unit (J244)

- Ignition switched off.

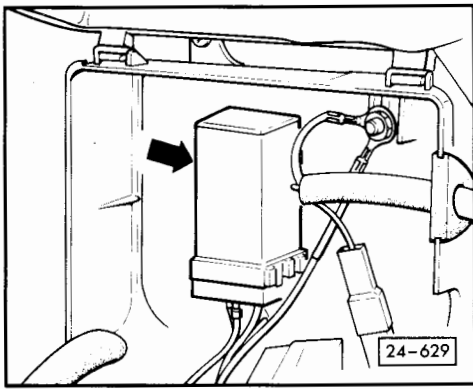


- ◀ - Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.



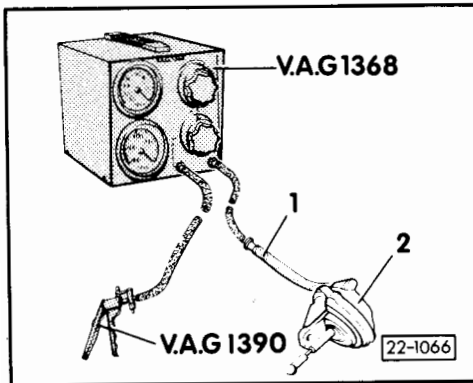
- ◀ - Disconnect plug -1- from the two-way valve for the engine speed limiter (N143) and connect light emitting diode test lamp V.A.G 1527 with auxiliary cables from V.A.G 1594 to plug.
- Switch on ignition.
Light emitting diode must light up

24-44



- ◀ - If the light emitting diode does not light up, determine fault according to current flow diagram and rectify. If everything is in order, renew mixture charge limiter control unit (J244).
- Start engine and check cut-out speed of control unit.
 Engine speed up to 4500 ± 50 rpm
 Light emitting diode must light up
 Engine speed above 4500 rpm:
 Light emitting diode must go out
- Otherwise renew mixture charge limiter control unit (J244).

Checking the vacuum unit and vacuum tank for leaks

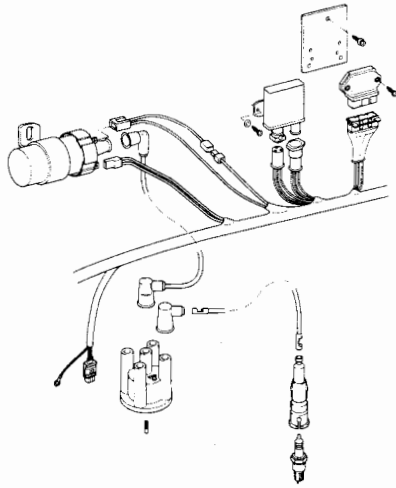


- ◀ - Connect vacuum unit -2- and vacuum pump V.A.G 1390 to vacuum tester V.A.G 1368.
- Switch vacuum tester to flow condition.

24-45

- Provide approx. 300 mbar pressure with vacuum pump.
- Switch vacuum tester so that the vacuum pressure is retained on the vacuum unit side.
- Set vacuum pressure on tester to 200 mbar. The pressure set must not drop within 2 minutes.
- Otherwise renew vacuum unit.
- Check vacuum tank in same way as vacuum unit.

24-46

I

Servicing TCI-H ignition system

(Engine code letters DJ)

Safety measures ⇒ page 28-8.

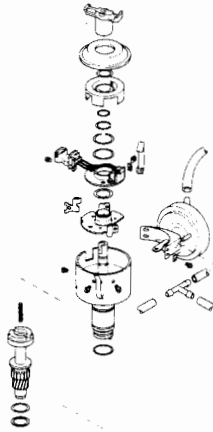
Setting data ⇒ page 28-9.

Spark plugs ⇒ page 28-10.

Distributor data ⇒ page 28-11.

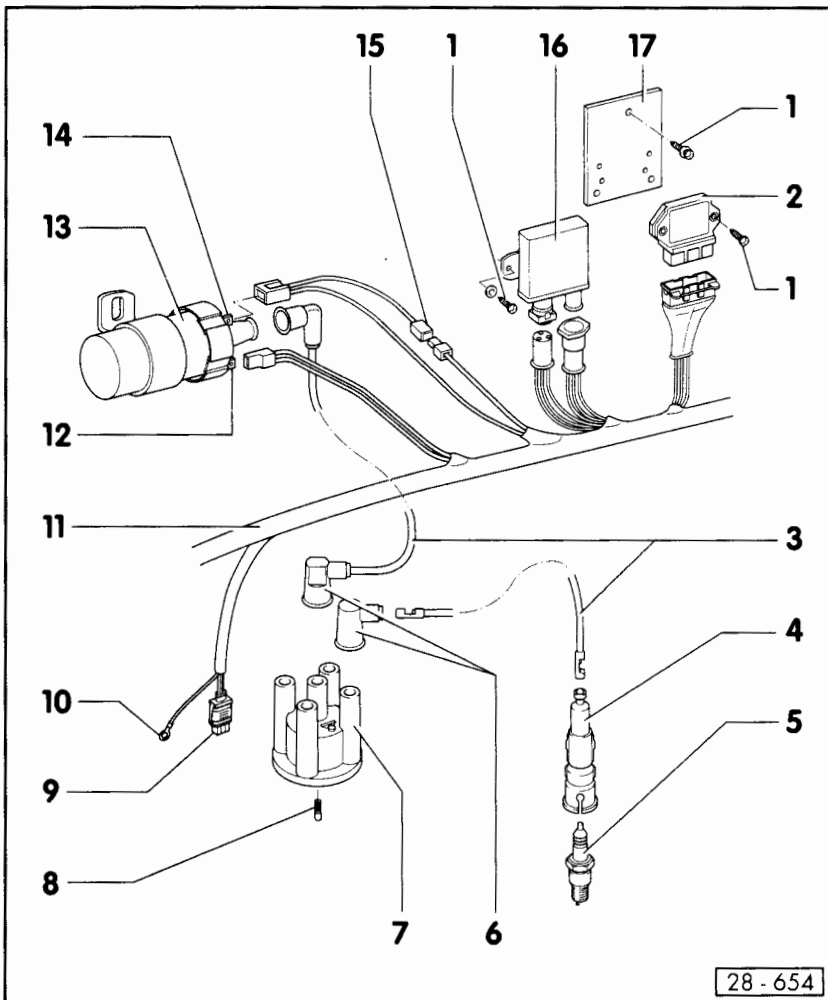
Part I ⇒ page 28-2.

Part II ⇒ page 28-5.

II

28 - 1066

28-1

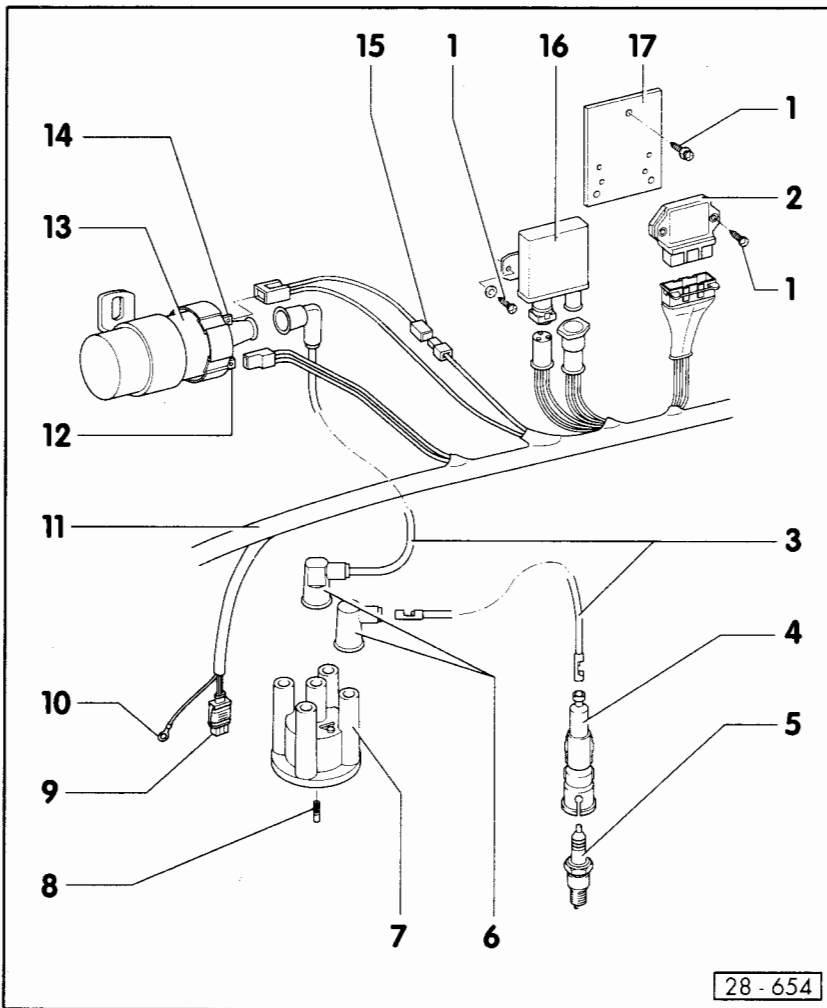


28 - 654

Part I

- 1 – Attachment bolt**
- 2 – TCI-H switch unit for transistor ignition (N41)**
 - Checking ⇒ page 28-26
- 3 – Ignition lead**
 - Check for continuity
- 4 – Spark plug connector**
 - 4 ... 6 kΩ
- 5 – Spark plug, 25 Nm**
 - Type and electrode gap ⇒ page 28-10
- 6 – Suppressed connector**
 - 0.6 ... 1.4 kΩ
- 7 – Distributor cap**
 - Check for cracks, tracking and current leakage
 - Check contacts for wear
 - Clean before installing

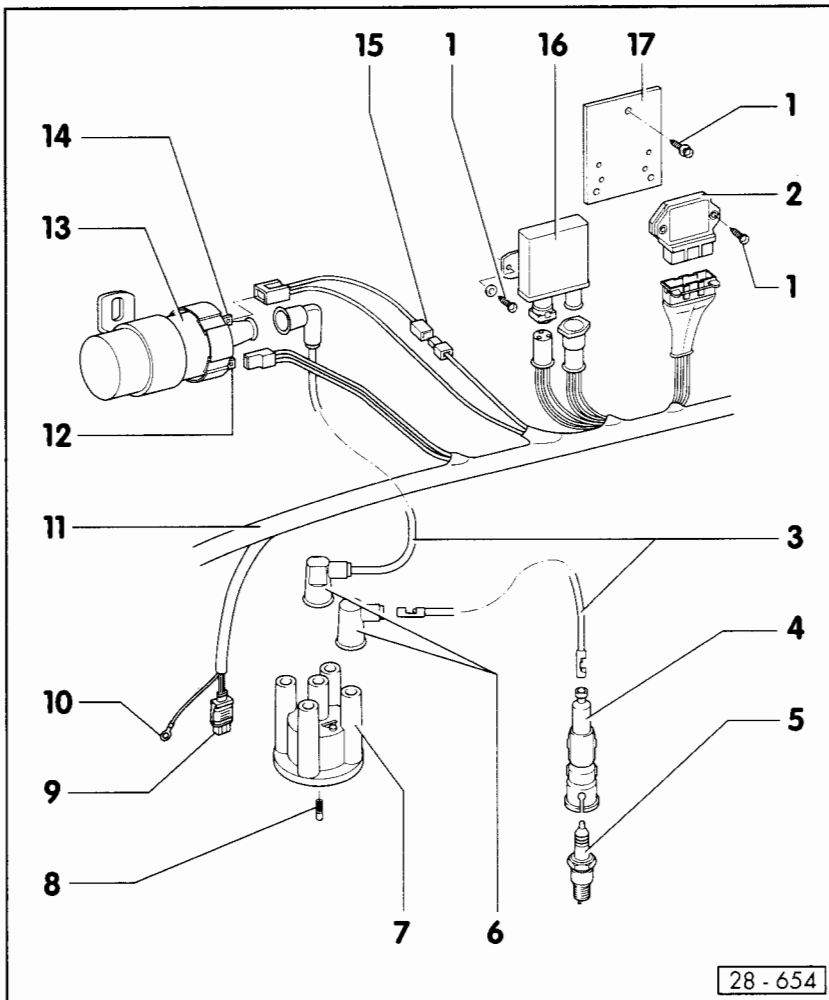
28-2



28 - 654

- 8 – Carbon brush with spring
 - Check for wear, damage and ease of movement
- 9 – Connector plug
- 10 – Earth cable (-)
- 11 – Engine wiring loom
- 12 – Terminal 15 (+)
- 13 – Ignition coil
 - Green adhesive label
Primary resistance:
0.5 ... 0.8 Ω
(between terminals 1 and 15)
Secondary resistance:
2.4 ... 3.5 kΩ
(between terminals 4 and 15)
 - Grey adhesive label
Primary resistance:
0.6 ... 0.8 Ω
(between terminals 1 and 15)
Secondary resistance:
6.9 ... 8.5 kΩ
(between terminals 4 and 15)

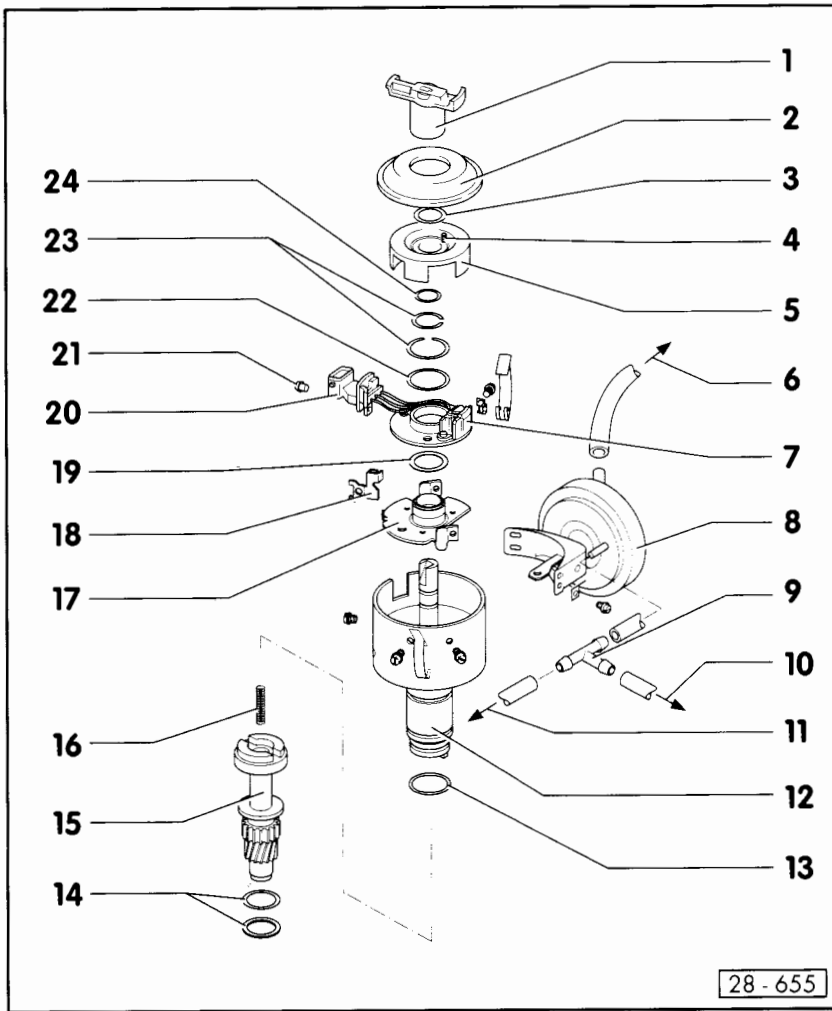
28-3



28 - 654

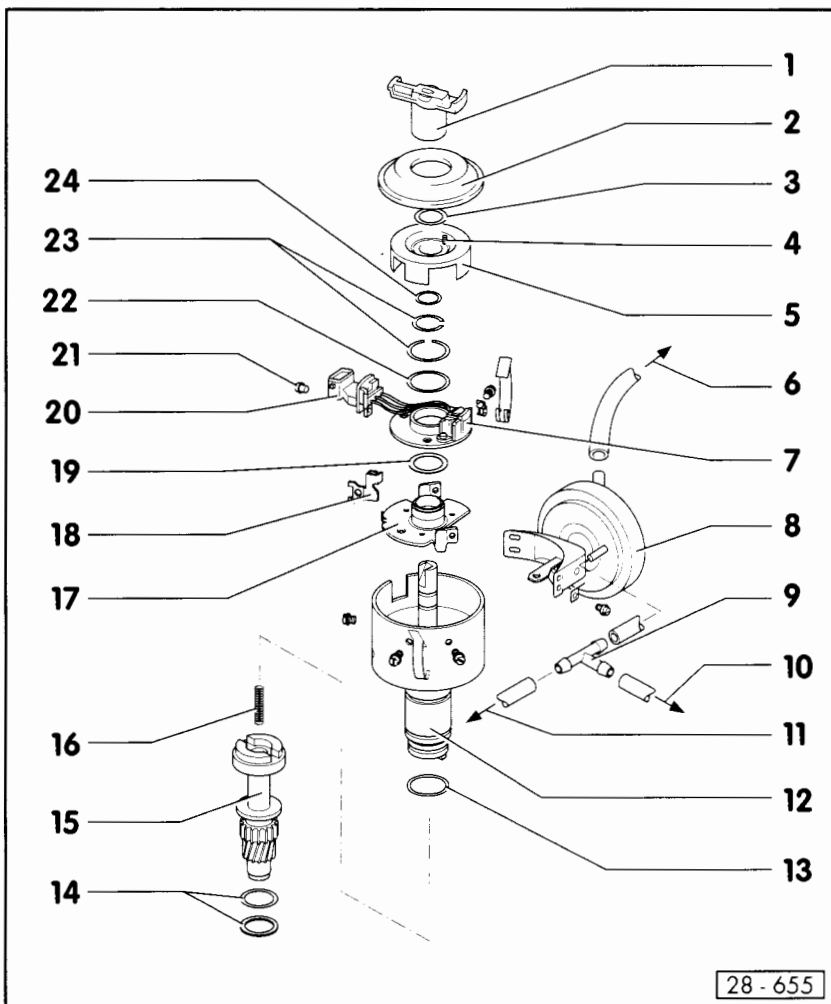
- 14 – Terminal 1 (-)
- 15 – Plug connector
 - To idling speed stabilization control unit (J142)
 - Separate plug connector before adjusting idling speed and ignition timing
- 16 – DIS switch unit for idling speed stabilization (J87)
 - Before adjusting idling speed and ignition timing disconnect plugs and connect together
 - Checking ⇒ page 28-16
- 17 – Heat deflector plate

28-4

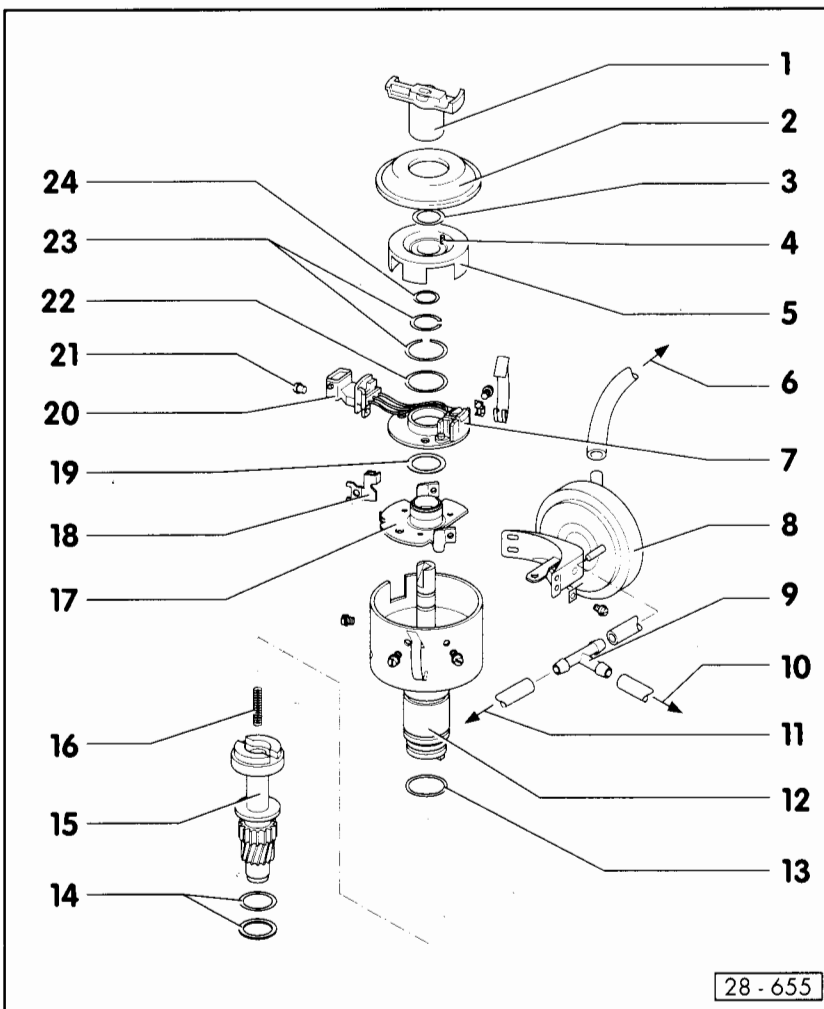


Part II

- 1 – Rotor**
 - Identification: R1
 - 0.6 ... 1.4 kΩ
- 2 – Dust cap**
- 3 – Circlip**
- 4 – Pin**
- 5 – Rotor plate**
 - Removing and installing
⇒ page 28–13
- 6 – To throttle valve housing**
- 7 – Hall sender (G40)**
 - Thinly lubricate bearing surfaces
 - Checking ⇒ page 28–29
- 8 – Vacuum unit**
 - Check for setting and leaks
⇒ page 28–17, Checking ignition timing



- 9 – Branch pipe**
- 10 – To intake air distributor**
- 11 – To fuel pressure regulator**
- 12 – Distributor**
 - Installing ⇒ page 28–13
 - Checking firing point adjustment
⇒ page 28–17
 - Checking and adjusting ignition timing
⇒ page 28–14
- 13 – O-ring**
 - Renew
- 14 – Thrust washers**
 - Insert and align with screwdriver
- 15 – Distributor drive shaft**
 - Removing and installing
⇒ page 28–12
- 16 – Spring**
- 17 – Base plate**



- 18 – Magnet
- 19 – Washer
- 20 – Connecting piece
- 21 – Retaining button
- 22 – Washer (s)
 - No of washers: Hall sender must be non-floating and easily rotated
- 23 – Circlips
- 24 – Spring washer (s)

28-7

Safety precautions

In order to prevent injuries to persons and/or destruction of the ignition system, the following points should be noted:

- Do not touch or disconnect ignition cables with the engine running or during starting.
- Ignition system cables—also measuring equipment cables— should only be attached and detached with the ignition switched off.
- If the engine is to be rotated at starter motor speed without firing as, for instance, during compression pressure checks, disconnect plug from Hall sender (distributor).
- Do not connect a condenser to terminal 1 (-).
- Do not change rotor arm 1 k Ω (identification R1) against another, also not during radio suppression work.
- When suppressing the radio, use only 1 k Ω resistances and 5 k Ω spark plug connectors on HT cables.

28-8

Setting data

Engine code letters	DJ	
Distributor		
Replacement part No.	025 905 205 N	
Ignition timing ¹⁾²⁾		
Testing	8 ... 12° before TDC	3 ... 6° before TDC ³⁾
Setting	10 ± 1° before TDC	5 – 1° before TDC ³⁾
Marking	⇒ Fig. 1	
RPM	800 ± 50 rpm	
Firing order	1–4–3–2	
Vacuum hoses	Vacuum hose disconnected from vacuum unit –retard and sealed	
Idling speed stabilization		
DIS switch unit (J87)	Plugs pulled off and joined together	
Control unit (J142)	Plug connector to terminal 1 (–) of ignition coil separated	

¹⁾ Actual values:

⇒ File "Exhaust and idling speed test"

²⁾ Checking and adjusting ⇒ page 28–14

³⁾ When using lead-free super fuel, RON 95

28–9

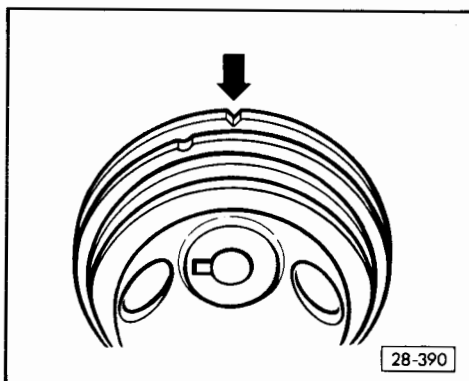
Spark plugs

Engine code letters	DJ	
Spark plugs ¹⁾		
Ignition coil adhesive labels	Green	Grey
VW/Audi	101 000 005 AB, 101 000 001 AC, 101 000 007 AB	101 000 006 AA, 101 000 002 AD, 101 000 000 AA
Manufacturer's designation	W 7 DTC, 14–7 DTU, N 7 BYC	W 5 DCO, 14–5 DUO, N 6 YCX
Electrode gap	0.7 ... 0.9 mm	0.7 ... 0.8 mm
Tightening torque	25 Nm	25 Nm

¹⁾ Actual values:

⇒ File "Exhaust and idling speed test"

◀ Fig. 1 Ignition timing marking



28–10

Distributor data

Engine code letters		DJ	
Distributor	Replacement part No.	025 905 205 N	
Centrifugal spark control ¹⁾			
Begins	rpm	1050 ... 1150	
	rpm Degrees	1300 2 ... 6	
Ends	rpm Degrees	2400 12 ... 16	
	Vacuum spark control – Advance		
Begins	mbar mmHg	165 ... 210 124 ... 158	
	Ends	mbar mmHg Degrees	320 ... 330 240 ... 248 12 ... 16
Vacuum spark control – Retard			
Begins		mbar mmHg	80 ... 180 60 ... 135
	Ends	mbar mmHg Degrees	220 ... 290 165 ... 218 9 ... 11

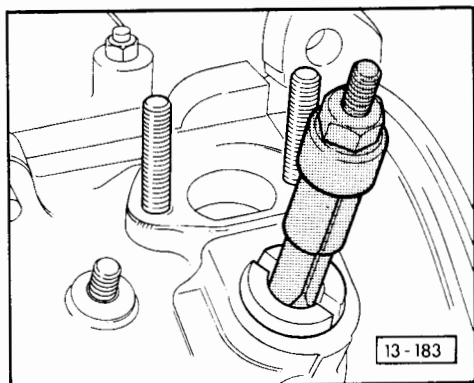
¹⁾ RPM = engine rpm

28-11

Removing and installing distributor drive shaft

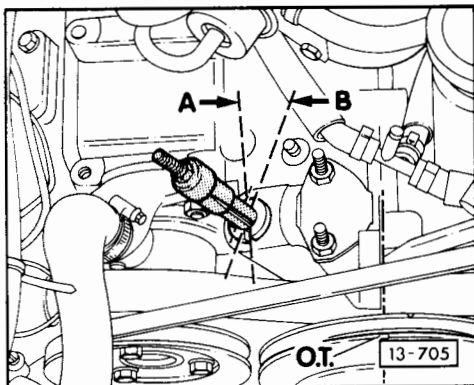
Removing

- ◀ – Remove distributor drive shaft with standard commercial internal extractor \varnothing 14.5 ... 18.5 mm (e.g. KUKKO 21/2).

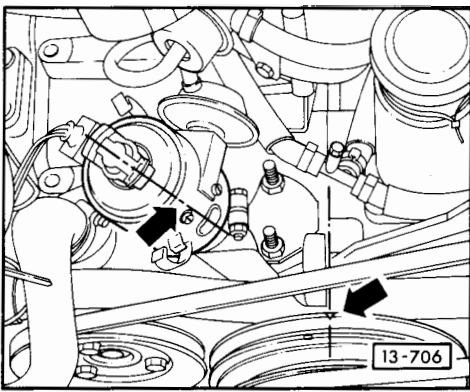


Installing

- ◀ – Set crankshaft to TDC on No. 1 cylinder.
- Set drive shaft so that the small segment points towards coolant pump.
Installation position:
Inserting – arrow A–
Installed – arrow B–

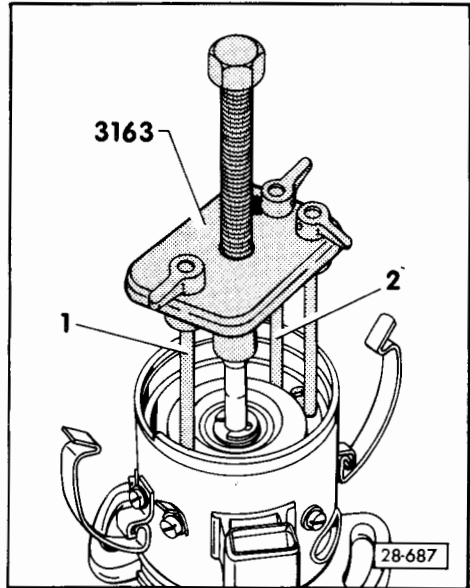


28-12



Installing distributor

- Set crankshaft to ignition timing mark for No. 1 cylinder.
- ◀ - Turn rotor arm until it is pointing to mark for No. 1 cylinder on distributor housing.
- Install rotor arm.
- Clean distributor cap, check for cracks, tracking and correct seating.
- Adjust ignition timing ⇒ page 28-14.



Removing and installing rotor plate

- ◀ - Insert claw of extractor -1- and -2- as illustrated and pull off rotor plate.

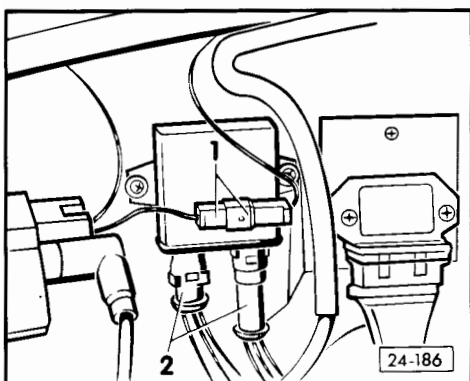
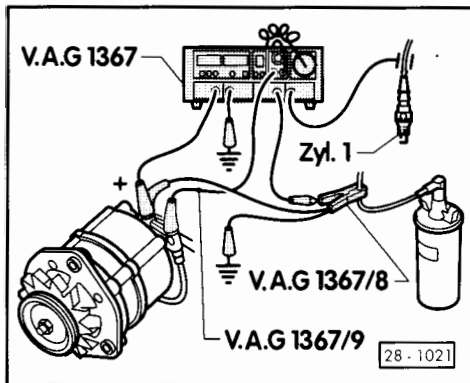
Notes:

- When removing the rotor plate ensure that the locking pin does not drop into the distributor.
- After installing, check rotor plate for freedom of movement and, if plate is bent, it must be renewed.

28-13

Checking and adjusting ignition timing

- Engine oil temperature at least 80°C.
- Idling speed correct, if not, adjust ⇒ page 24-15, Idling speed adjustment Digijet fuel injection system.
- Ignition switched off.
- ◀ - Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.
- Remove vacuum hoses from distributor vacuum unit-retard and seal.



- ◀ - Separate plug connector -1- from ignition coil terminal 1 (-) to idling speed stabilization control unit.
- Disconnect plugs -2- from DIS switch unit and join together.
- Start engine and run at idling speed.
- Check ignition timing and adjust if necessary.

28-14

Testing with TDC timing mark sender

The ignition timing mark is displayed direct on the tester.

Test value ¹⁾:

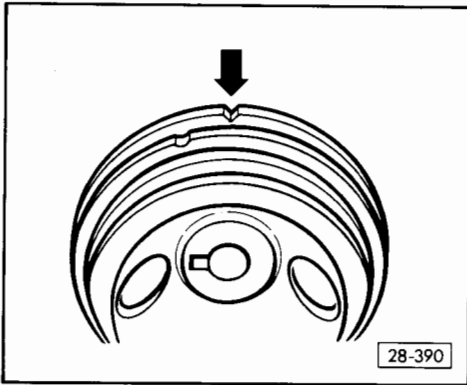
8 ... 12° before TDC or 3 ... 6° before TDC ²⁾

Setting value ¹⁾:

10 ± 1 before TDC or 5 – 1° before TDC ²⁾

¹⁾ actual values: ⇒ File "Exhaust and idling speed test"

²⁾ with use of lead-free Super fuel, RON 95



Testing with Stroboscope

◀ Notches on pulley –arrow– must align with gap in crankcase.

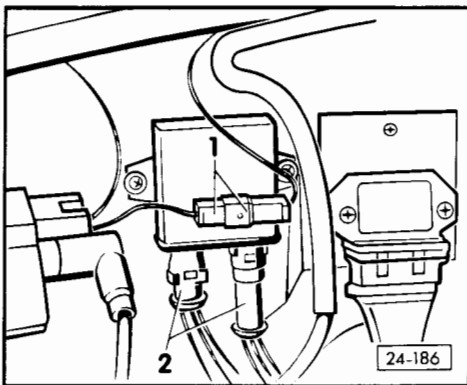
– If necessary, adjust idling speed ⇒ page 24–15.

Operational checks

- Ignition timing conditions satisfied.
- Fit vacuum hose to distributor retard vacuum unit.

Vacuum adjustment 9 ... 11° in direction of retard (approx. TDC).
RPM must drop.

28–15



◀ – Connect plug –2– to DIS switch unit.

Indication of ignition timing adjustment fluctuates in direction "Advanced".
RPM must increase again.

- Switch off ignition.
- Reconnect plugs –1–.

Checking DIS switch unit

The DIS switch unit 251 906 083 A works in the idling speed range (below 850 rpm). It may only be replaced by a switch unit with the same replacement part number.

At idling speed the ignition timing must fluctuate between 5° and 15° before TDC.

28–16

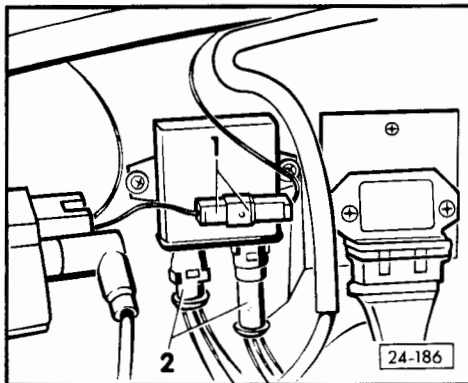
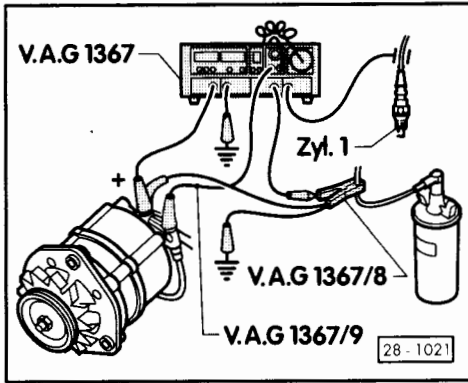
Checking spark control

- Engine oil temperature at least 80°C.
- Ignition switched off.

Check centrifugal spark control with TDC sender

Specified readings: distributor data ⇒ page 28-11

- ◀ – Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.



- ◀ – Disconnect plugs –2– from DIS switch unit and join together.
- Disconnect vacuum hoses from distributor vacuum unit.
- Start engine and run at idling speed.
- If necessary adjust idling speed to run below 1000 rpm.
- Note indicated adjustment as basic value.

28-17

- Slowly increase engine speed. Commencement of spark advance is indicated by higher degree reading.
- Compare engine speed with test value –start of adjustment–.
- Increase engine speed to next test speed.
- Read off adjustment value from tester.
- Calculate centrifugal advance angle as follows:

$$\begin{aligned} & \text{Indicated advance angle} \\ & - \text{noted basic angle} \\ \hline & = \text{Centrifugal advance angle} \end{aligned}$$

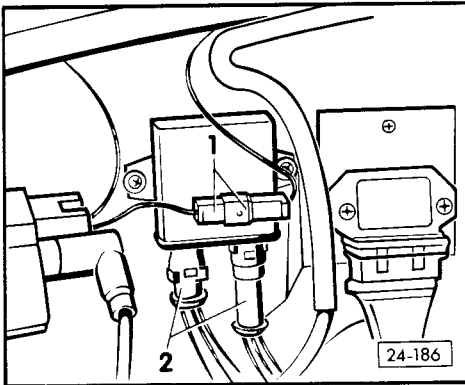
- Repeat test at other test speeds.

Checking centrifugal advance with stroboscope

Specified values: Distributor data ⇒ page 28-11

- Checking ignition timing and adjusting, if necessary ⇒ page 28-14.

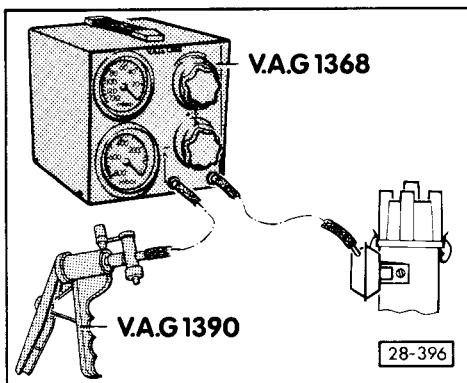
- ◀ - Disconnect plugs -2- from DIS switch unit and join together.
- Disconnect vacuum hoses from distributor vacuum unit.
- Start engine and run at idling speed.
- Engine speed below 1000 rpm, adjust if necessary.
- Flash notches on ribbed V-belt pulley and slowly increase engine speed. Commencement of adjustment is indicated by notches moving away.
- Slowly increase engine speed to next test speed, "Bring back the notches" and read off angle of advance.
- Repeat test at further test speeds.



28-19

Checking vacuum unit for leaks

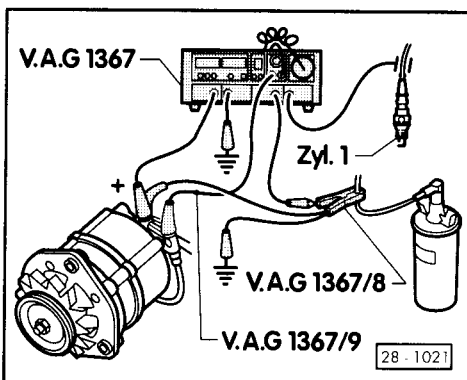
- ◀ - Connect vacuum tester V.A.G 1368 and vacuum pump V.A.G 1390 to the "advance or retard" vacuum unit.
- Switch tester to through-flow.
- Using the vacuum pump produce a vacuum of approx. 500 mbar.
- Switch tester so that the vacuum is maintained on the side of the vacuum unit.
- Adjust vacuum on tester to 450 mbar. The vacuum must not drop off in excess of 10% in one minute. Otherwise the vacuum unit and/or the hose are leaking.



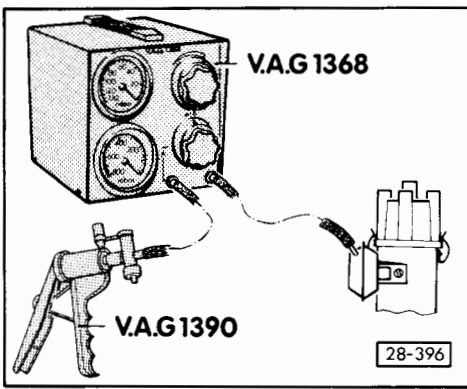
Checking vacuum control "Advance".

Specified values: Distributor data ⇒ page 28-11

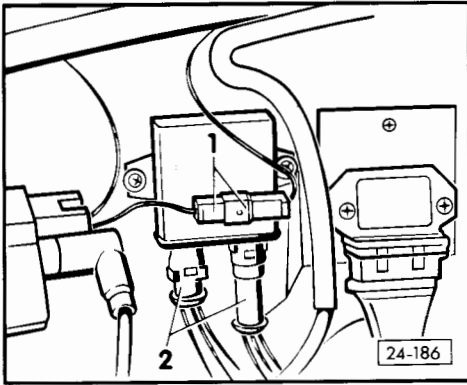
- Ignition switched off.
- ◀ - Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.



28-20



- ◀ – Connect vacuum tester V.A.G 1368 and vacuum pump V.A.G 1390 to "advance" vacuum unit.
- Switch tester to through-flow.
- Disconnect vacuum hose from "retard" vacuum unit and seal.

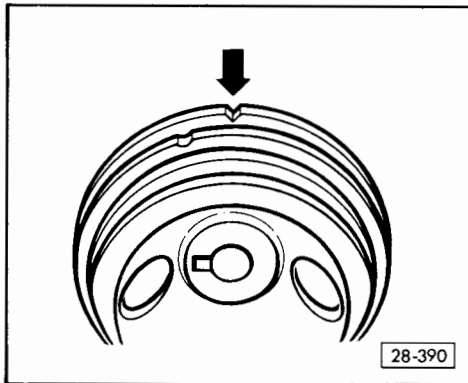


- ◀ – Disconnect plugs –2– from DIS switch unit and join together.
- Start engine and run at idling speed.
- Engine speed below 1000 rpm, adjust if necessary.

Testing with TDC sender

- Note indicated spark control value as basic value.

28-21



Testing with stroboscope

- ◀ – Bring back notches to ignition timing mark –arrow– and note indicated spark control value as basic value.

Continuation of both types of test

- Using the vacuum pump, produce a vacuum until the ignition timing point begins to move away.
- Read of vacuum value and compare with test value –commencement of advance–.
- Further increase vacuum to the test value –end of advance–.
- If necessary reduce engine speed to below 1000 rpm.

Checking with TDC sender

- Read off spark control value and calculate vacuum advance:

$$\frac{\text{Indicated advance angle} - \text{noted basic angle}}{\quad} = \underline{\underline{\text{Vacuum advance value}}}$$

- Increase vacuum still further. The ignition timing point must not move away.

28-22

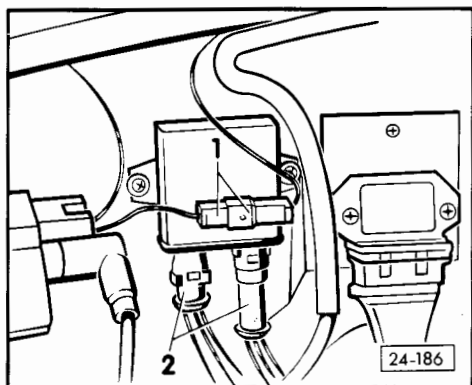
Checking with stroboscope

- Bring back notches" to ignition timing marks.
 - Indicated advance angle
 - noted basic angle
- = Vacuum advance value
- Increase vacuum still further.
The ignition timing point must not move away.

Checking vacuum retard

Specified value: distributor data ⇒ page 28-11

- Checking ignition timing and adjusting, if necessary ⇒ page 28-14.
- ◀ - Disconnect plugs -2- from DIS switch unit and join together.
- Disconnect vacuum hose from retard vacuum unit and seal.
- Start engine and run at idling speed.
- Engine speed below 1000 rpm, adjust if necessary.



28-23

Checking with TDC sender

Indication 10° before TDC.

Checking with stroboscope

- ◀ Ignition timing notches on V-belt pulley -arrow- must align with the crankcase joint.

Continuation for both tests

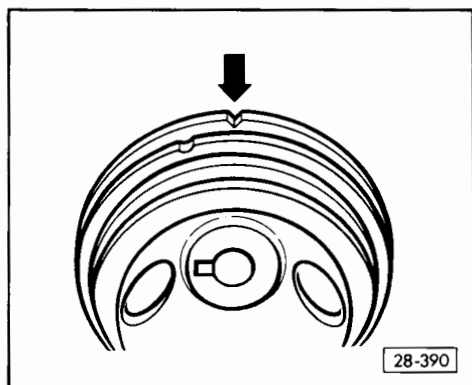
- Connect vacuum hose to retard vacuum unit and check ignition spark control.

Testing with TDC sender

Indication $0 \pm 1^\circ$.

Testing with stroboscope

TDC marking on V-belt pulley must align with crankcase joint.



28-24

Checking TCI-H switch unit and Hall sender

Checking with TCI tester V.A.G 1451

- Carry out test according to the tester operating instructions.

Checking with multimeter V.A.G 1715 or V.A.G 1526 and auxiliary cables from V.A.G 1594

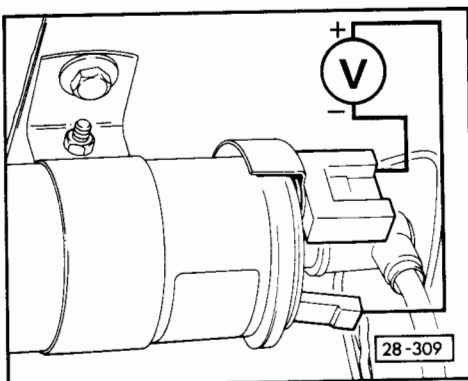
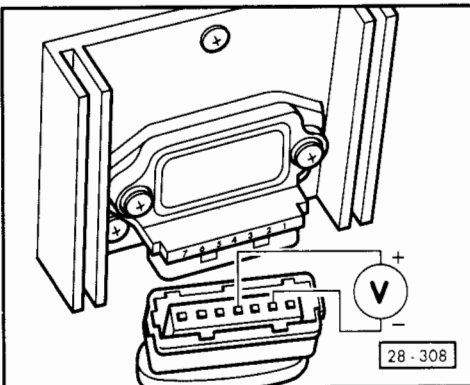
Notes:

- The indicated specified values apply to ambient temperatures from 0 to + 40° C.
- If the measured values deviate from the specified values, determine fault according to circuit diagram and rectify before changing components.
- In order to avoid destruction of electronic components select voltage range -V- on multimeter before connecting the measuring cables.

28-25

Checking TCI-H switch unit

- Ignition coil is in order, checking ⇒ page 28-3, item -13-.
- Ignition switched off.
- Disconnect connecting plug from TCI-H switch unit (N41).
- ◀ - Connect multimeter together with auxiliary cables for voltage measurement between contacts 2 and 4 on connecting plug.
- Switch on ignition.
Specified voltage: approx. battery voltage
- Otherwise determine open circuit according to current flow diagram and rectify.
- Switch off ignition.
- Reconnect connectors to TCI-H switch unit.
- Disconnect connectors of Hall sender (G40) (distributor).
- ◀ - Connect multimeter together with auxiliary cables for voltage measurement between terminals 1 (-) and 15 (+) of ignition coil.



28-26

- Switch on ignition.
Specified value:
At least 2 V, must drop to 0 after 1 to 2 seconds

- If value is not as specified, renew TCI-H switch unit and check ignition coil to see whether sealing compound has escaped, if necessary renew ignition coil as well.

- ◀ - Briefly earth (-) centre lead of connector on distributor.
The indicated value must rise briefly to at least 2 V.

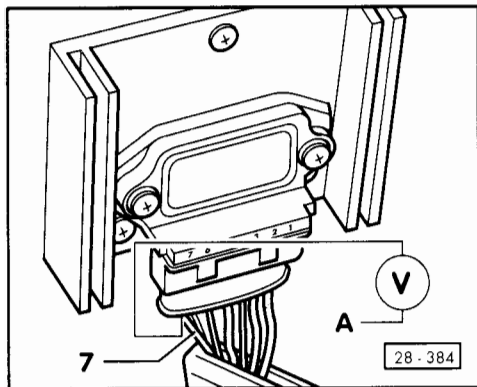
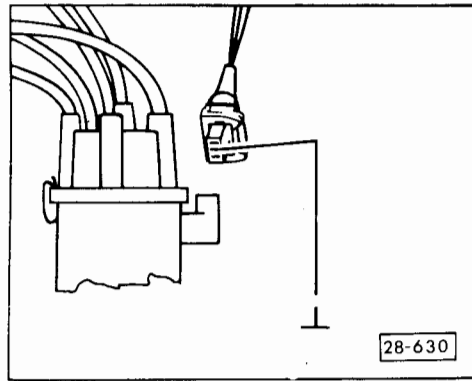
- Otherwise determine open circuit in centre lead and rectify or renew TCI-H switch unit.

- Switch off ignition.

Telefunken and Fairchild "35" switch unit

- ◀ - Connect multimeter with auxiliary cables for voltage measurement between terminals 7 and earth -A-.

- Switch on ignition.
Specified voltage: approx. battery voltage



28-27

- Briefly touch centre lead of distributor connector to earth.
Voltage must drop to below 3 V

- Switch off ignition.

Siemens, Bosch, Fairchild "33" switch unit

- ◀ - Connect multimeter with auxiliary cables for voltage measurement between terminals 7 and 15 (+) of ignition coil -A-.

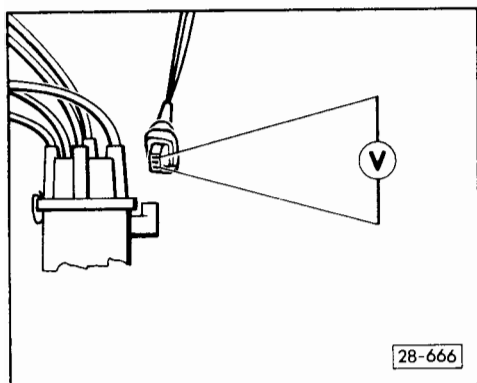
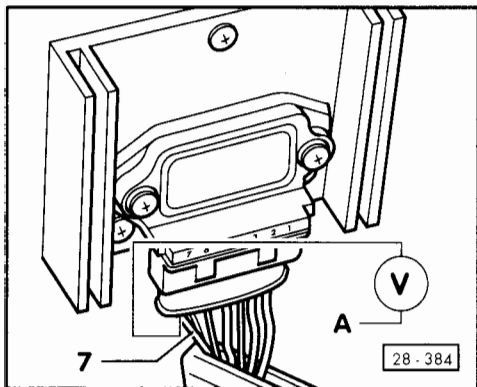
- Switch on ignition.
Specified voltage: approx. battery voltage

- Touch centre lead of distributor connector to earth (-) for at least 3 seconds.
Voltage must drop to below 3 V

- Switch off ignition.

Continuation for both tests

- ◀ - Connect multimeter with auxiliary cables for voltage measurement to the external contacts of the connector from the Hall sender (40) (distributor).



28-28

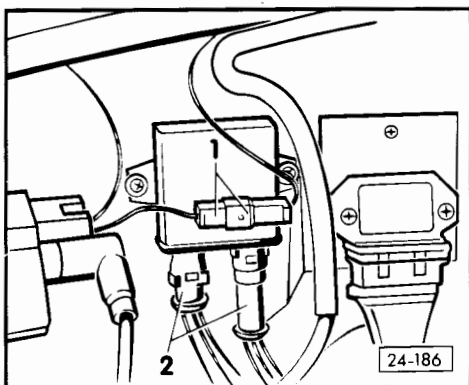
- Switch on ignition.
Specified voltage: at least 5 V

Note:

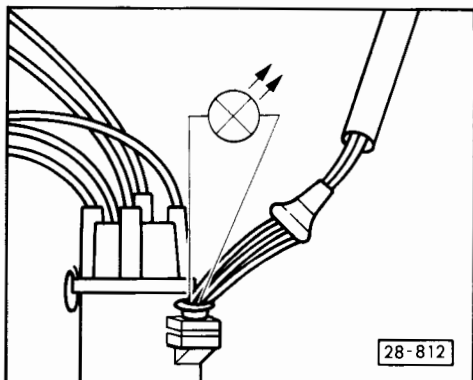
If, despite of obtaining the specified values, the fault is still apparent, renew the TCI-H switch unit, or determine open circuit between Hall sender plug and switch unit and rectify.

Checking Hall sender

- TCI-H switch unit in order, checking
⇒ page 28-26.
- Ignition coil in order, checking ⇒ page 28-3, item -13-.
- Cable between TCI-H switch unit and distributor in order.
- Plugs and connecting parts on distributor, Hall sender and TCI-H switch unit in order.
- ◀ - Disconnect plugs -2- from DIS switch unit and join together.
- Pull HT lead terminal 4 out of distributor and earth it (-). If necessary, use auxiliary cable from V.A.G 1594.

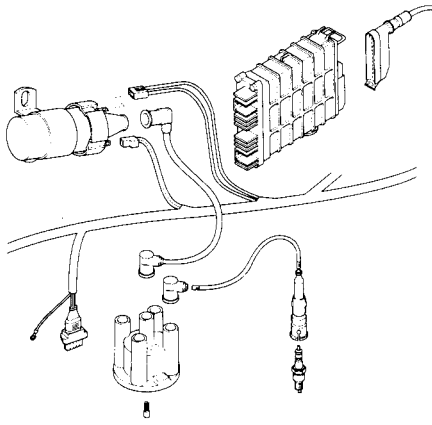


28-29



- Detach rubber grommet from Hall sender connector (G40) and attach connector to Hall sender.
- ◀ - Connect diode test lamp V.A.G 1527 to the centre and one cable of the Hall sender connector.
- Operate starter motor and check signal from Hall sender.
Light emitting diode must flicker.
- Otherwise renew Hall sender ⇒ page 28-5, item -7-.

28-30

I

Servicing Digifant fuel injection and ignition system – Ignition part

(Engine code letters MV, SR, SS)

Safety measures ⇒ page 28–37.

Setting data ⇒ page 28–38.

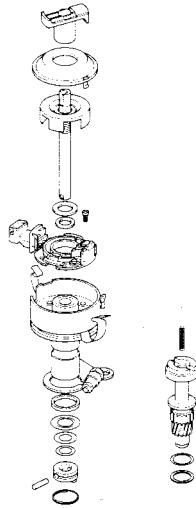
Spark plugs ⇒ page 28–39.

Servicing fuel injection system
⇒ page 24–1.

Electrical checks of Digifant fuel injection and ignition system ⇒ page 01–1, test table B.

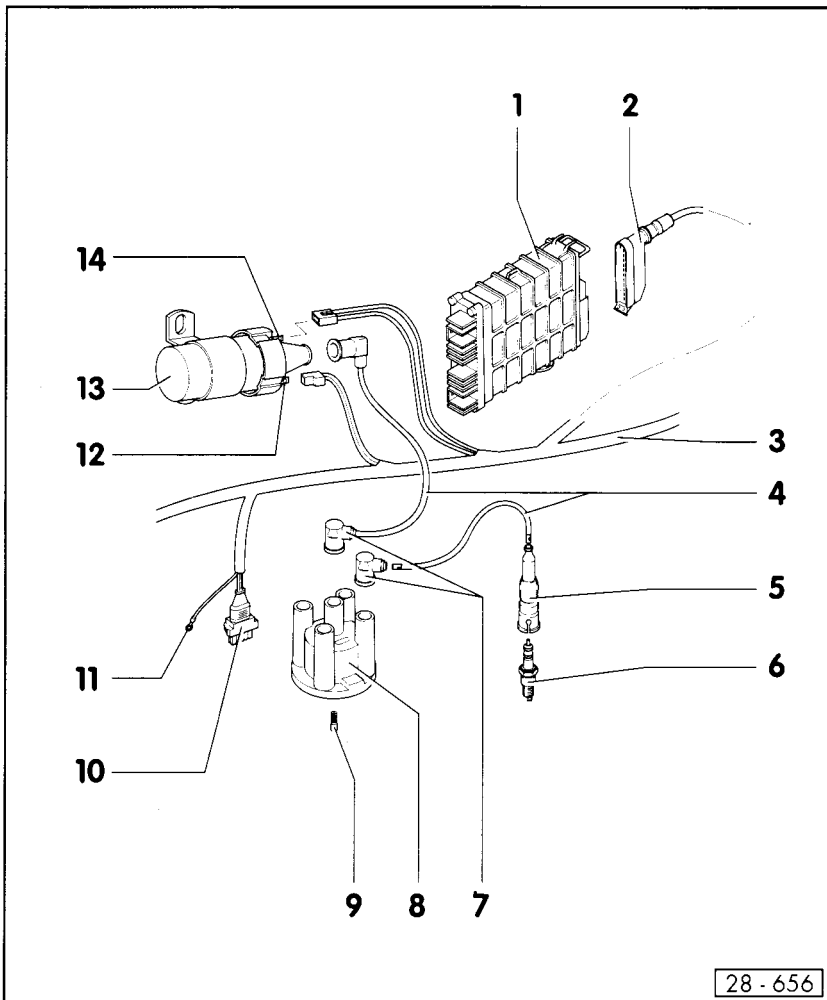
Part I ⇒ page 28–32.

Part II ⇒ page 28–35.

II

28 - 1067

28–31



28 - 656

Part I

1 – Digifant control unit (J169)

- For fuel injection and ignition system, Lambda control
- Installation position: on luggage compartment floor underneath rear bench seat or in load space, on platform trucks in equipment locker under load space
- Checking ignition timing ⇒ page 28–44
- Checking ignition and switch functions ⇒ page 28–44

2 – Connector plug

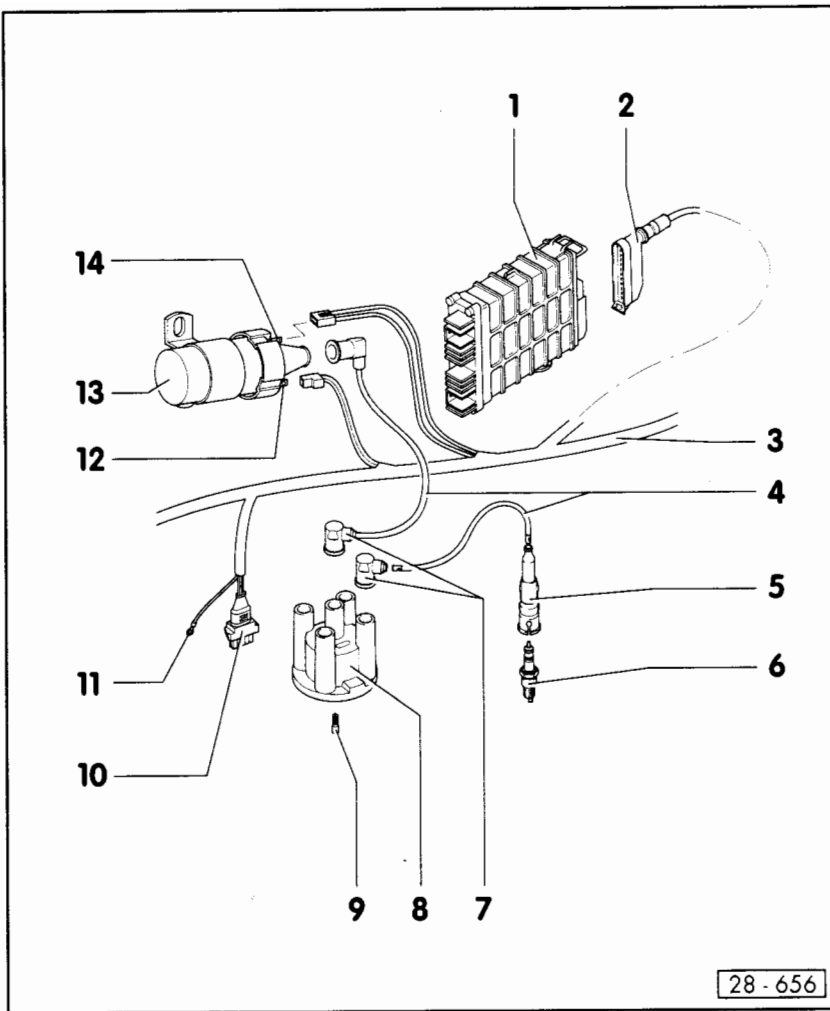
- Connect or disconnect plug only with ignition switched off
- To remove press retaining spring upwards

3 – Engine wiring loom

4 – Ignition cable

- Check for continuity

28–32



28 - 656

5 – Spark plug connector

- 4 ... 6 kΩ

6 – Spark plug, 25 Nm

- Type and electrode gap
⇒ page 28–39

7 – Suppressed connectors

- 0.6 ... 1.4 kΩ

8 – Distributor cap

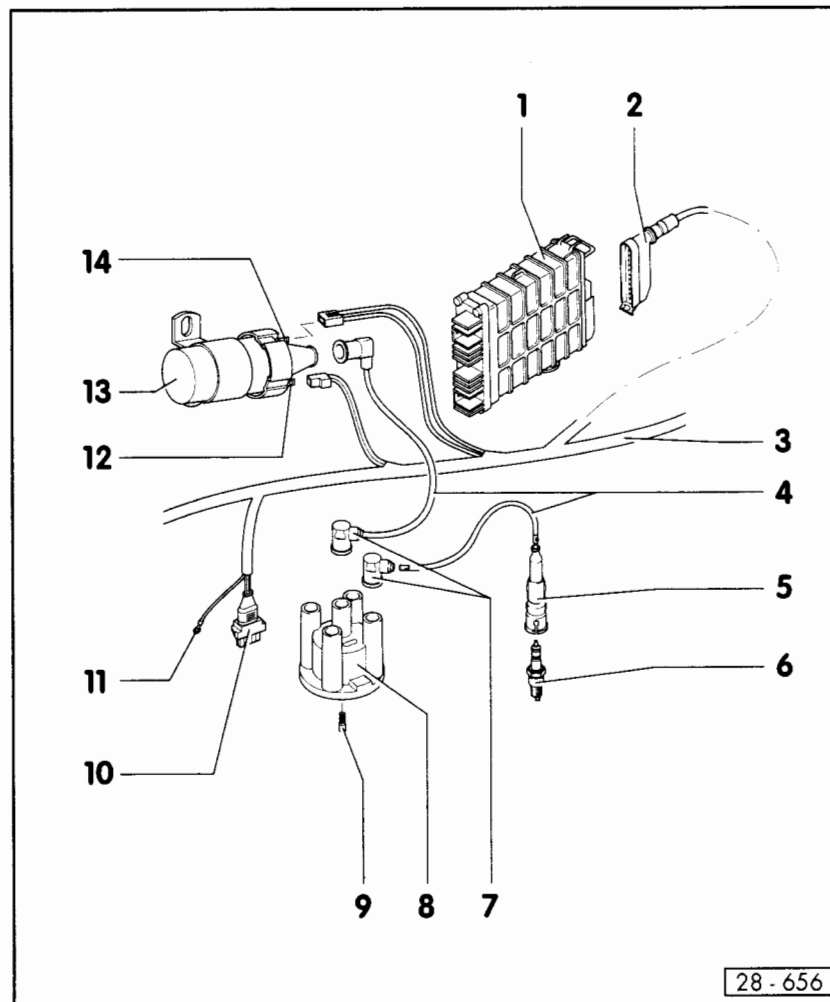
- Check for cracks and signs of tracking
- Check wear of contacts
- Clean before installing

9 – Carbon brushes with spring

- Check for wear, damage and ease of movement

10 – Connecting plug

11 – Earth (-)



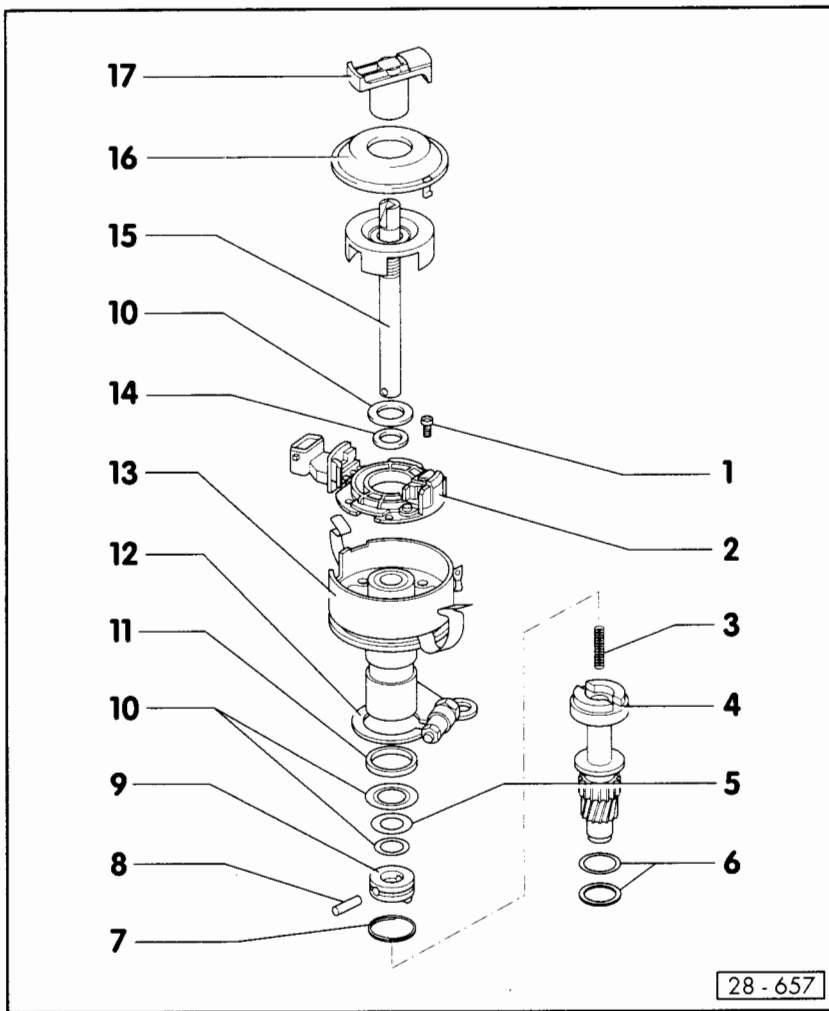
28 - 656

12 – Terminal 15 (+)

13 – Ignition coil

- Green adhesive label
Primary resistance:
0.5 ... 0.8 Ω
(between terminals 1 and 15)
Secondary resistance:
2.4 ... 3.5 kΩ
(between terminals 4 and 15)
- Grey adhesive label:
Primary resistance:
0.6 ... 0.8 Ω
(between terminals 1 and 15)
Secondary resistance:
6.9 ... 8.5 kΩ
(between terminals 4 and 15)

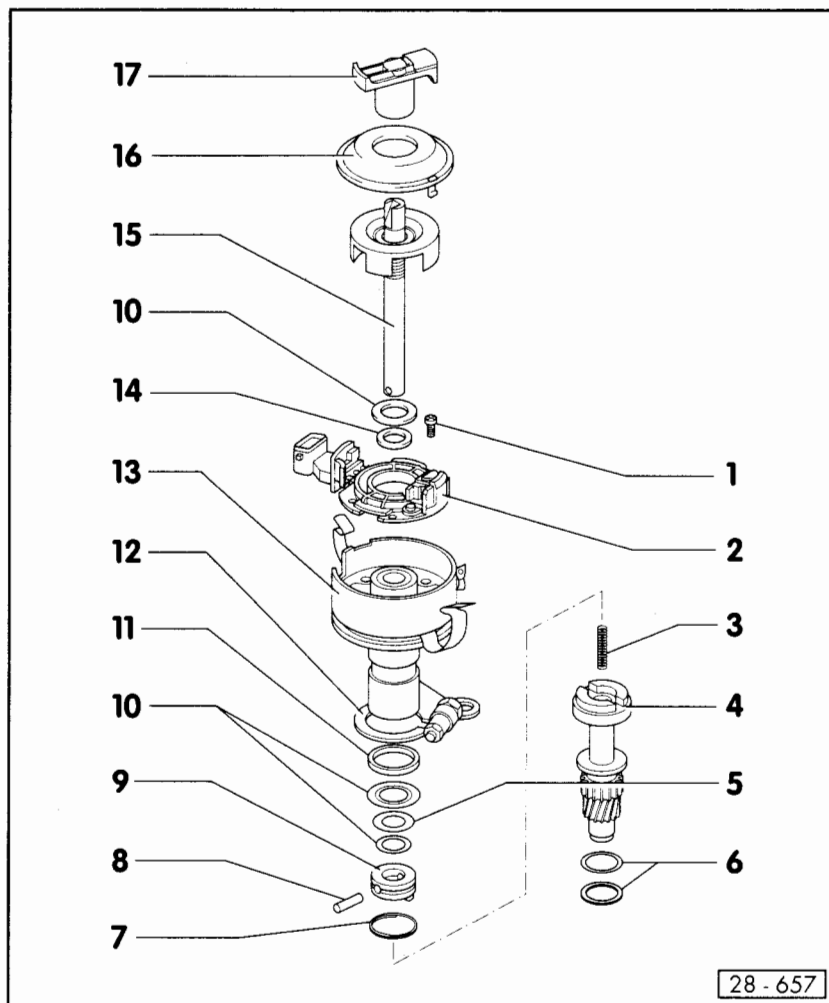
14 – Terminal 1 (-)



28 - 657

Part II

- 1 - Bolt**
- 2 - Hall sender (G40)**
 - Lightly grease contact surfaces
 - Checking ⇒ page 28-45
 - To renew remove distributor shaft
- 3 - Spring**
- 4 - Distributor drive shaft**
 - Removing and installing ⇒ page 28-40
- 5 - Plastic washer**
- 6 - Thrust washers**
 - Install and align with screwdriver
- 7 - Retaining spring**
- 8 - Pin**



28 - 657

- 9 - Clutch**
 - Installation position: Large section points to rotor notch in distributor shaft
- 10 - Shim (s)**
 - Note number of and position
- 11 - Sealing ring**
 - Renew
- 12 - Bracket**
- 13 - Distributor**
 - Installing ⇒ page 28-41
 - Checking and adjusting ignition timing ⇒ page 28-41
- 14 - Plastic washer**
- 15 - Distributor drive shaft**
- 16 - Dust cap**
- 17 - Rotor arm**
 - Identification: R1
 - 0.6 ... 1.4 kΩ

Safety precautions

To prevent injury to persons and/or damage to the ignition system, the following rules must be observed:

- Do not touch or disconnect ignition cables with the engine running or during starting.
- Ignition system cables –also measuring equipment cables– should only be attached and detached with the ignition switched off.
- If the engine is to be rotated at starter motor speed without firing as, for instance, during compression pressure checks, disconnect plug from Hall sender (distributor).
- Do not connect a condenser to terminal 1 (–).
- Do not change rotor arm 1 k Ω (identification R1) against another, also not during radio suppression work.
- When suppressing the radio, use only 1 k Ω resistances and 5 k Ω spark plug connectors on HT cables.

28–37

Setting data

Engine code letters	MV, SR, SS
Distributor	
Replacement part No.	025 905 205 M/AC/AG
Digifant control unit	
Replacement part No.	025 906 022/022 A ¹⁾ , 025 906 022 B ²⁾ , 025 906 022 D ³⁾
Ignition timing ⁴⁾⁵⁾⁶⁾	
Testing	3 ... 7° before TDC
Setting	5 ± 1° before TDC
Marking	⇒ Fig. 1
RPM	2000 ... 2500 rpm
Firing order	1–4–3–2
Ignition map ⁷⁾	
RPM	Approx. 3000
Degrees	35 ± 5

¹⁾ For ignition coils with grey adhesive label, replacement part No. 025 906 022 D

²⁾ For Saudi Arabia

³⁾ For ignition coils with green adhesive label

⁴⁾ Disconnect engine oil temperature 80°C, plug (blue) from coolant temperature sensor (G18) with engine running

⁵⁾ Actual values: ⇒ file "exhaust and idling speed test"

⁶⁾ Checking and adjusting ⇒ page 28–41

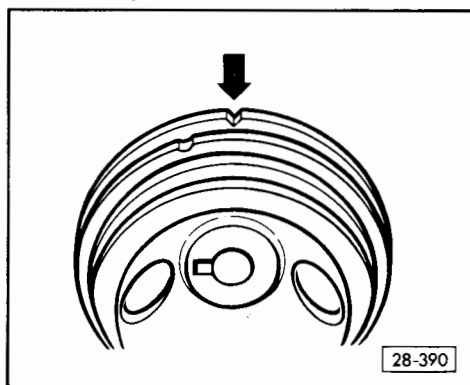
⁷⁾ Engine oil temperature 80°C, plug (blue) from temperature sensor (G18) reconnected

28–38

Spark plugs

Engine code letters	MV, SR, SS
Spark plugs ¹⁾ VW/Audi	101 000 009 AA, 101 000 012 AA, 101 000 011 AA
Manufacturer's designation	W 7 CCO 14-7 CU N 288
Electrode gap	0.6 ... 0.8 mm
Tightening torque	25 Nm

¹⁾ Actual values:
⇒ File "Exhaust and idling speed test"



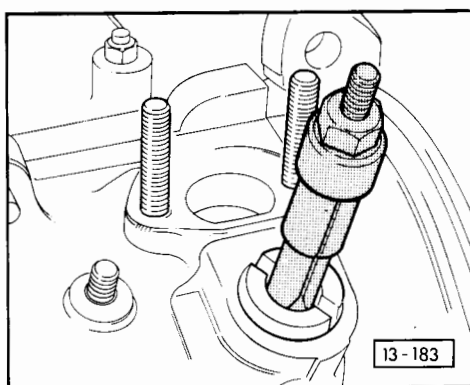
◀ Fig. 1 Ignition timing mark

28-39

Removing and installing distributor drive shaft

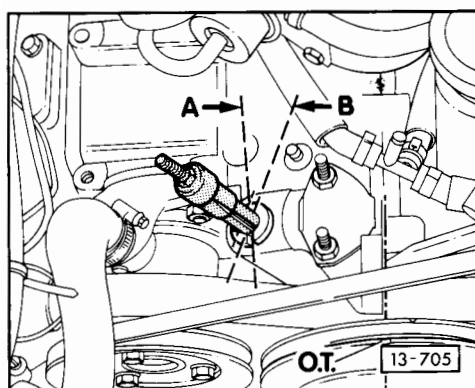
Removing

- ◀ – Remove distributor drive shaft with standard commercial internal extractor \varnothing 14.5 ... 18.5 mm (e.g. KUKKO 21/2).



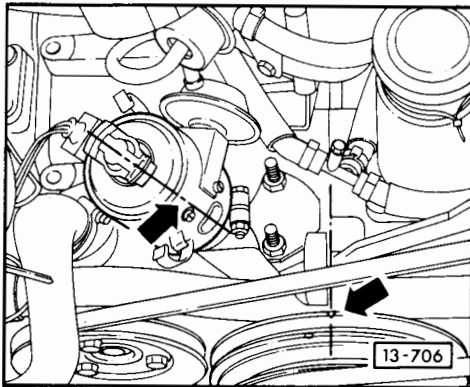
Installing

- ◀ – Set crankshaft to TDC on No. 1 cylinder.
- Set drive shaft so that the small segment points towards the coolant pump.
Installation position:
Inserting – arrow A –
Installed – arrow B –



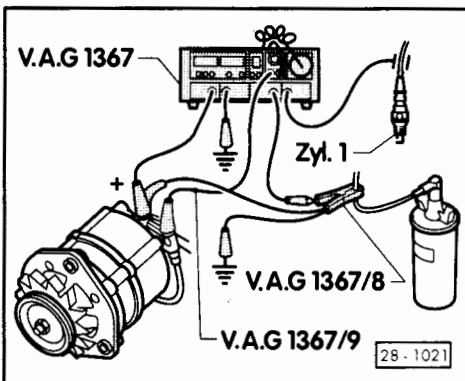
28-40

Installing distributor



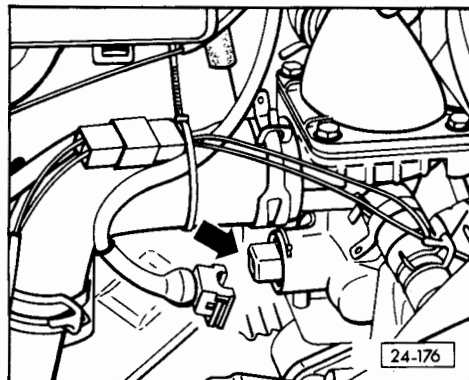
- Set crankshaft to TDC on No. 1 cylinder.
- ◀ - Turn rotor arm so that it points to marking for No. 1 cylinder on distributor housing.
- Install distributor.
- Clean distributor cap, check for cracks, signs of tracking and correct seating.
- Carry out ignition timing.

Checking and adjusting ignition timing



- Engine oil at least 80°C.
- Ignition switched off.
- ◀ - Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.
- Start engine and run at idling speed.
- Manually adjust engine speed to 2000 ... 2500 rpm.

28-41



- ◀ - Disconnect connector plug (blue) from coolant temperature sensor.

Note:

If the engine dies, reconnect the connector plug from coolant temperature sensor before restarting the engine, as the control unit will otherwise carry out an emergency programme and accurate adjustment is not possible.

- Check ignition timing at 2000 ... 2500 rpm and adjust if necessary.

Testing with TDC sender

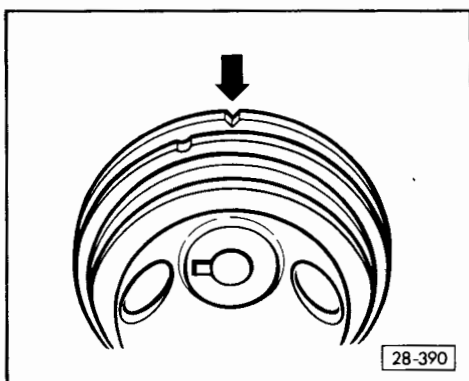
The ignition point is displayed direct on the tester.
Checking value ¹⁾: 3 ... 7° before TDC
Setting value ¹⁾: 5 ± 1° before TDC

¹⁾ Actual values: ⇒ File "Exhaust and idling speed test"

Testing with stroboscope

- ◀ Notches on the ribbed V-belt pulley –arrow– must align with the crankcase joint.

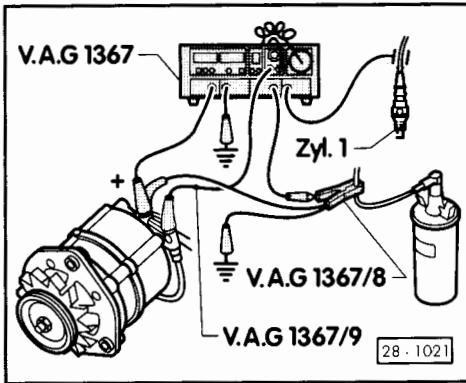
- If necessary adjust idling speed ⇒ page 24-18.



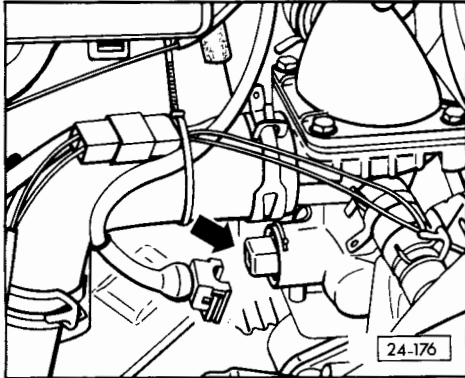
28-42

Checking spark control

- Engine oil at least 80°C.
- Ignition switched off.



- ◀ – Connect ignition tester V.A.G 1367 with crocodile clip V.A.G 1367/8 or ignition tester V.A.G 1767.
- Start engine and run at idling speed.
- Manually adjust engine speed to 2000 ... 2500 rpm.



- ◀ – Disconnect connector plug (blue) from coolant temperature sensor.

Note:

If the engine dies, reconnect the connector plug from coolant temperature sensor before restarting the engine, as the control unit will otherwise carry out an emergency programme and accurate adjustment is not possible.

- At 2000 ... 2500 rpm note ignition timing as basic value.

28-43

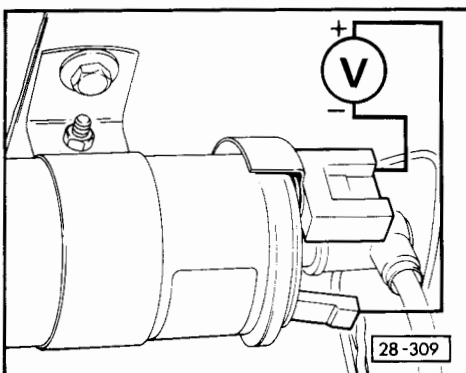
- Connect connector plug to temperature sender.
- At approx. 3000 rpm read off ignition timing and deduct basic value.
The calculated value must be $35 \pm 5^\circ$

Otherwise:

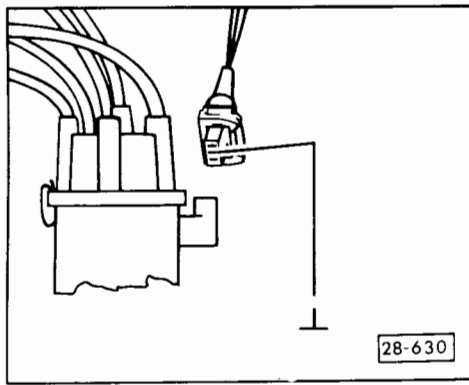
- Carry out electrical check \Rightarrow page 01-1, test table B, test steps 6, 8, 9.
- Coolant temperature sensor defective.
- Air flow meter defective.
- Digifant control unit defective.

Checking ignition and switching function of Digifant control unit

- Ignition coil in order, checking \Rightarrow page 28-34, item -13-.
- Electrical test of Digifant fuel injection and ignition system in order \Rightarrow page 01-1, test table B.
- ◀ – Connect multimeter V.A.G 1715 or V.A.G 1526 with auxiliary cables from V.A.G 1594 between terminals 1 (-) and 15 (+) of ignition coil.



28-44



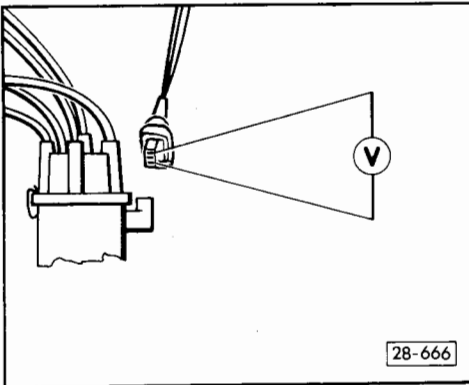
- Disconnect plug from Hall sender (G40) (distributor).
- Switch on ignition.
- ◀ - Place centre lead of distributor plug connector to earth (-) for at least 3 seconds.
The indicated voltage must rise briefly to approx. 4.5 V.
- Otherwise renew control unit (J169).

Checking Hall sender

- Electrical test of Digifant fuel injection and ignition system in order ⇒ page 01-1, test table B.

Checking voltage supply

- ◀ - Disconnect plug from Hall sender (distributor).
- Connect multimeter V.A.G 1715 or V.A.G 1526 for voltage measurement with auxiliary cables from V.A.G 1594 to the external contacts of the plug connector.
- Switch on ignition.
Specified reading: at least 10 V



28-45

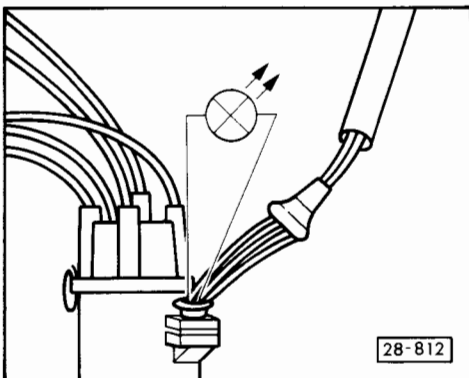
- Otherwise renew Digifant control unit (J169).
- Switch off ignition.

Operational check

Note:

Only carry out check if engine will not start.

- Pull rubber grommet of Hall Sender plug and reconnect plug to Hall sender.
- Pull HT lead terminal 4 from distributor and place to earth (-), using auxiliary cable from V.A.G 1594 if necessary.
- ◀ - Connect diode test lamp V.A.G 1527 with auxiliary cables from V.A.G 1594 to centre lead and one to outer connection on the Hall sender plug.
- Operate starter motor and check signal from Hall sender.
Light emitting diode must flicker.
- Otherwise renew Hall sender ⇒ page 28-35, item -2-.



28-46