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Engine code NF with CIS-E III

CIS-E III system
★ ■ electrical testing D2-325

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★ NEW INFORMATION since last filming

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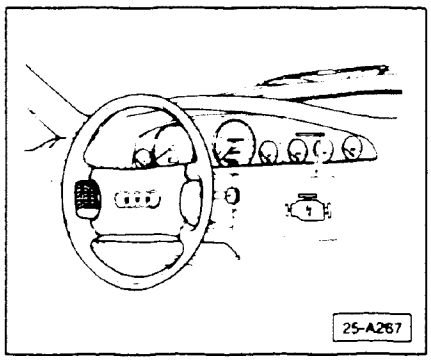

Fault diagnosis using the instrument panel warning light

General information

Note

This method of fault display was used on vehicles until early 1989. At that time diagnostic connectors for the **VAG 1551** were being installed (as a running change) in the drivers side footwell.

SOME vehicles were equipped with BOTH the warning light and the connectors. Later cars ONLY have the connectors.

This section of the Repair Group applies ONLY to those cars equipped with a warning light.

Fault memory activation should be carried out with the engine running if at all possible, or crank the engine for 5 to 6 seconds and leave the ignition switched on.

Output checks must be performed with the ignition switched **OFF**.

(Vehicles with temporary Fault memory)
When the ignition is switched **OFF**:
FAULT MEMORY IS ERASED.
If this happens unintentionally, the car must be driven again for at least five minutes to allow the faults to be sensed again and then be stored in memory.

Faults (if any) stored in the Ignition control unit fault memory are the first to be displayed, followed by faults (if any) stored in the Fuel injection control unit fault memory.

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Fault memory versions

There are **two** versions of CIS-E III fault memory:

I 49 state version

distinguishing feature:
Temporary fault storage which is erased each time the ignition is switched **OFF**.

You can identify **49 state** versions by control unit part numbers:
49 state fuel injection control unit:
443 906 264 **C**
49 state ignition control unit:
443 907 397 **C**

> **CAUTION**
>
> Do **NOT** mix these units with California control units.

II California version

distinguishing feature:
Permanent fault storage which is **NOT** erased each time the ignition is switched **OFF**.

> **CAUTION**
>
> Part numbers are for reference only. Always check with the Parts Department for the latest information.

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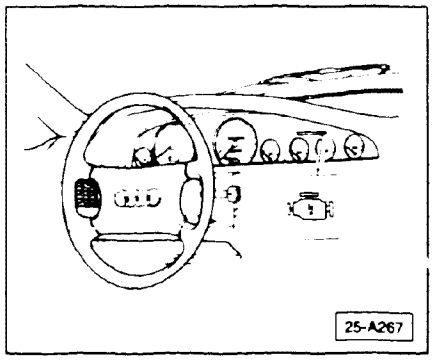

Operational characteristics:

The **California** version causes the fault warning light to come **ON** whenever an emissions related fault occurs. The light remains **ON** while you drive for as long as the fault exists.

The light will go out after the problem is repaired or no longer exists. The fault code, however, will remain in memory until intentionally erased (see section D2-250).
If **NON**-emission related faults occur, they will be stored in the fault memory, but the fault warning light will **NOT** come on until you activate the fault display.

You can identify **California** versions by control unit part numbers:
California fuel injection control unit:
443 906 264 **B**
California ignition control unit:
443 907 397 **E**

> **CAUTION**
>
> Do **NOT** mix these units with 49 state control units.

> **CAUTION**
>
> Part numbers are for reference only. Always check with the Parts Department for the latest information.

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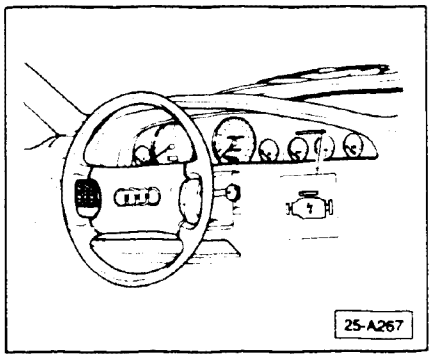

Troubleshooting tips

Before activating the Fault display
- inspect the ground connections for corrosion or broken wiring between the engine compartment and the intake manifold and between the ignition coil power output stage and its components

If the fault light blinks while driving
- see Fault codes **2141** and **2142**
  - knock regulation is at the control limit

If fault light is not lit up when ignition is switched ON and the engine will NOT start after turning over
- see Fault code **2122**, section D2-330.

If the idle speed drops sharply when the A/C is switched ON
- check the A/C compressor switching signal, see Repair Group 25

If a drop in engine speed is noticed after selecting a gear (Automatic ONLY)
- check the wiring between the selector lever and the Fuel injection control unit, see Repair Group 25

If there is a strong odor of fuel in the engine compartment
- check the carbon canister shutoff solenoid, see Repair Group 25

If idle speed is too high on a warm engine or too low on a cold engine
- check the idle switch and idle stabilizer valve, see Repair Group 25

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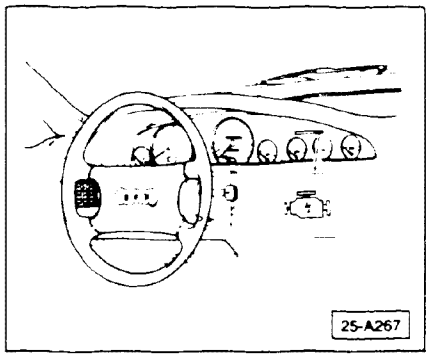

If the fault light does NOT light up with the ignition ON but only after bridging the top of the fuel pump relay terminals

- check the wiring between Ignition control unit terminal **3** and Fuel injection control unit terminal **13** according to the wiring diagram

If wiring **OK**

- connect **US 1115** LED tester between terminals **13** and **14** of the disconnected fuel injection control unit harness connector using **VW 1594** adaptor kit
- switch ignition **ON**
  - LED tester must blink approximately 3 times

If **NO**

- replace ignition control unit

If warm engine idle speed exceeds 1200 RPM but returns to spec after restart

- see Fault codes **2122** and **2232** for a possible failure from loose connectors in the wiring to the air flow sensor potentiometer or between terminal **17** of the Ignition control unit and terminal **30** of the Fuel injection control unit

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How to read a Fault code using the instrument panel warning light

A Fault code consists of **FOUR** numbers. Each number can be a value of either **1, 2, 3** or **4.**

Each of the four numbers in the Fault code is displayed by the Fault warning light as a blink or series of blinks which when added together will equal the number **1, 2, 3** or **4.**

There is a .5 second pause between the blinks that are used to construct the individual numbers.

There is a 2.5 second pause between each of the numbers that make up the code display.

When all of the Fault code displays have been completed for one or the other of the two control units **0000** will be displayed.

Code **0000** is displayed by the warning light coming on for 2.5 seconds and then shutting off for 2.5 seconds repeatedly.

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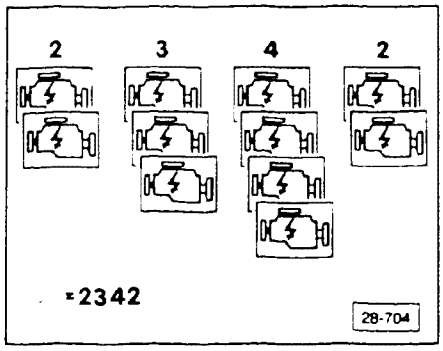


Fault code 2342, construction example

2 = .5 second light **ON**
.5 second light off
.5 second light **ON**

at this point there will be a 2.5 second pause with the light off, indicating that this number of the code is completed and a new number will be started

3 = .5 second light **ON**
.5 second light off
.5 second light **ON**
.5 second light off
.5 second light **ON**

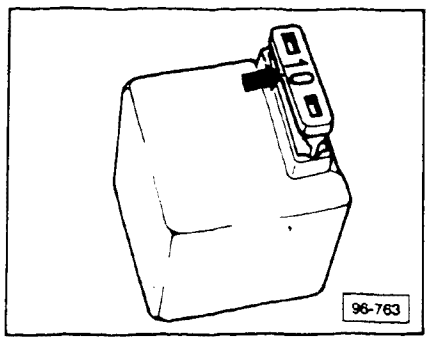
2.5 second pause (light off)

4 = .5 second light **ON**
.5 second light off
.5 second light **ON**
.5 second light off
.5 second light **ON**
.5 second light off
.5 second light **ON**

2.5 second pause (light off)

2 = .5 second light **ON**
.5 second light off
.5 second light **ON**

After the fourth number of the code has been displayed there will be another 2.5 second pause after which the whole sequence will repeat itself. This will continue indefinitely until the control unit is advanced to the next Fault code.



To advance to the next Fault code (if any)
- insert a fuse into the terminals on top of the fuel pump relay for a minimum of four seconds

For a complete run through of the entire Fault code troubleshooting procedure see the flow chart, section D2-240.

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Fault diagnosis using the instrument panel warning light, flow chart

start engine

engine runs	engine does **NOT** run

- test drive of at least 5 minutes, and engine speed greater than 3000 RPM momentarily push gas pedal down completely

crank engine at least 6 seconds with starter, do **NOT** turn ignition **OFF** afterwards

run engine at idle

bridge terminals on top of fuel pump relay with fuse for at least 4 seconds

display of ignition control unit fault memory contents

no faults stored:	faults stored:
display blink code **4444**	display of first fault code (if necessary, write code down — see Troubleshooting Chart)

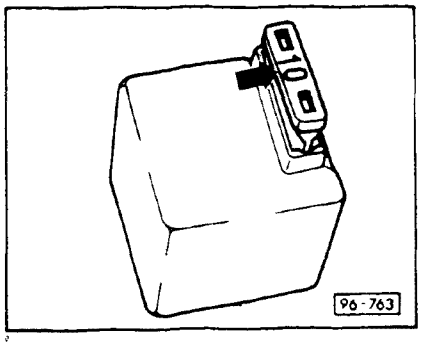
Check these first:
- warning light **OK**
- fuel pump relay **OK**
- fuses **12**, **24** and **28 OK**
- switch A/C **OFF**
- ground connections between: engine compartment, intake manifold, ignition coil power stage and components **OK**

bridge terminals on top of fuel pump relay again for minimum 4 seconds

display blink code **0000**

Go to Ⓐ

Go to Ⓑ



Note

The fault code being displayed will continue to be repeated until the fault memory is moved on to the next memory location by once again bridging the terminals on the top of the fuel pump relay.

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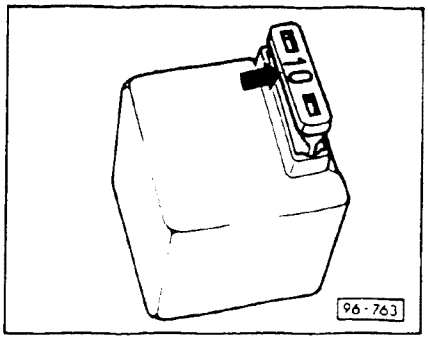
Note

The idle RPM will be raised after the fuel injection system fault display is started.

If the engine does **NOT** start, do **NOT** switch ignition off.



Ⓐ

bridge terminals on top of fuel pump relay again for minimum 4 seconds

CIS-E III fault memory content display	
no faults stored:	fault stored:
display blink code **4444**	display of first fault code (if necessary, write down fault code — see Troubleshooting Chart)

Go to Ⓒ

bridge terminals on top of fuel pump relay again for minimum 4 seconds

display blink code **0000**.

End
(switch ignition **OFF**)

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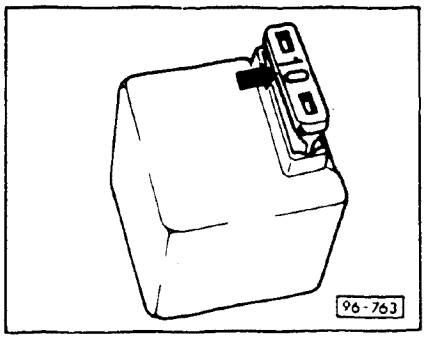

Ⓑ

bridge terminals on top of fuel pump relay for minimum 4 seconds

display of fault memory contents continues	
no more faults stored	display of next stored fault by corresponding fault code appears
display blink code **0000**	

bridge terminals on top of fuel pump relay for minimum 4 seconds

fuel injection fault memory content display	
no fault displayed:	fault displayed:
display blink code **0000**	display of first fault code (if necessary, write down fault code — see Troubleshooting Chart)

End
switch ignition **OFF**
repair fault

Go to Ⓒ

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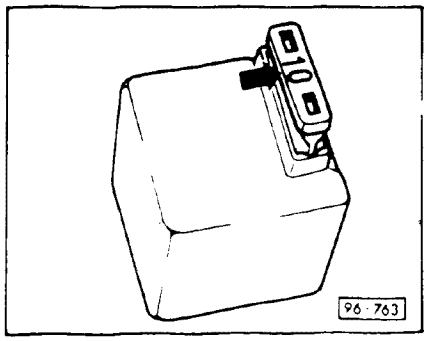
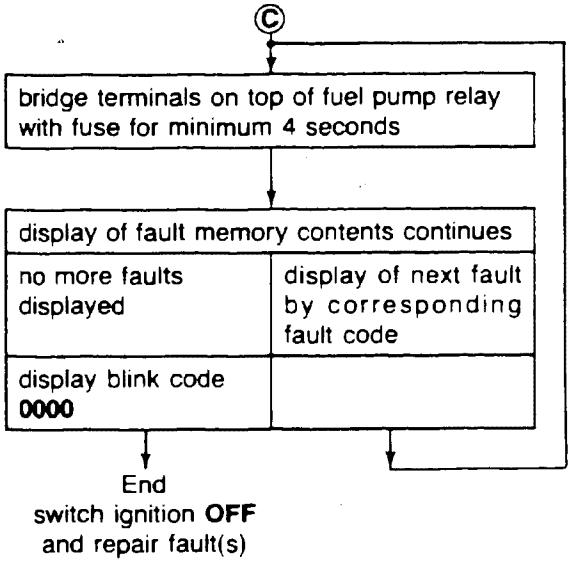
Note

If several faults are determined, troubleshooting and repair must be done **in the order that the faults are displayed**.

After repairs, take another test drive and follow with Troubleshooting again.





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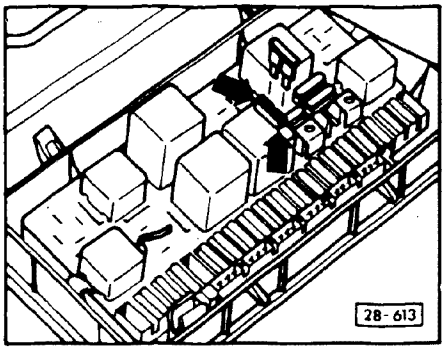

Permanent memory, erasing

To erase the contents of the fault memory on **California** version **ONLY**:

- insert fuse in top of fuel pump relay with ignition **OFF**
- turn ignition **ON**
- wait at least 4 seconds then remove fuse
- repeat this step 3 times until code **4443** appears
  - a signal should appear that comes on for 2.5 seconds and then goes off for 2.5 seconds, repeatedly
- reinsert fuse in top of fuel pump relay
- wait at least **TEN** seconds, then remove fuse
  - if the fault warning lamp now stays on continuously, you have successfully cleared the fault memory

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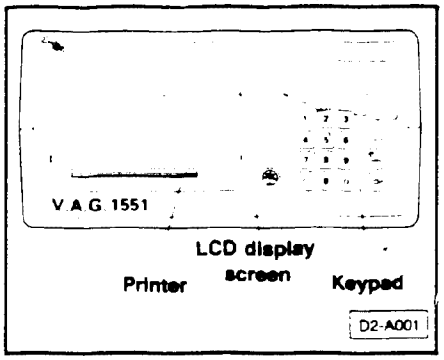
VAG 1551 tester, general information



The **VAG 1551** tester is a diagnostic tool that reads system faults recorded by control units equipped with permanent fault memories.

VAG 1551 tester, features and operation

C **Cancel (or Clear) key**

- push this key to cancel an input or to stop the program from running

Q **Q (or Enter) key**

- push this key after making inputs
- push this key anytime a **Q** is displayed in the upper right hand corner of the LCD display

Arrow (or Run) key

- push this key to advance to the next step in your sequence
- push this key anytime the ➡ is displayed in the upper right hand corner of the LCD display

HELP **Help key**

- pushing this key also selects the printer function
- push this key to obtain additional operating instructions or explanations of tester functions
- push this key to obtain hints for possible problems when the **VAG 1551** does not respond the way you think it should
- push this key to obtain a list of the Address Words and Function Words to supply the **VAG 1551** when it asks for them

PRINT **Print key**

- push this key whenever you want a printed copy of the information in the display window

Note

The printer is **ON** whenever the LED in the button is lit.

Printer paper advance key

- push this key to advance the paper **BEFORE** you tear it off of the tester

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VAG 1598 Test box, description

The **VAG 1598** test box and adaptor set was introduced in May of 1989. It consists of a main harness with test box (that universally connects to all of the adaptor harnesses) and a set of adaptor harnesses. A hardshell storage case is provided to protect the set when not in use.

The **VAG 1598** is used in conjunction with several other pieces of test equipment consisting of:

- **VAG 1526 (US 1119)** multimeter
- **VAG 1527A (US 1115)** LED tester
- **VW 1594** adaptor wire kit

Note

New adaptor harnesses will be made available for the **VAG 1598** in the future as new applications require them.

VAG 1598 advantages:

- the fragile terminals in the control unit connector no longer risk damage from test leads and probe connections. Connections formerly made on the control unit connector are now made on the **VAG 1598** test box which has large conveniently accessible terminals
- raised, highly visible numbers on the test box eliminate any uncertainty as to connector terminal numbering
- certain components (e.g. Hall sender) can now be checked dynamically (engine running)
- electrically checking miniature and unusual size terminals is now made possible regardless of terminal size
- standard size adaptors are used to make and test all connections resulting in dependable, accurate measurements

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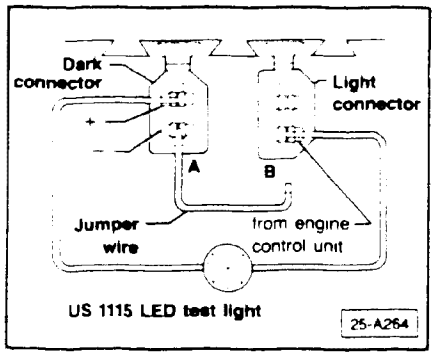
Fault code activation and display, using VAG 1551 diagnostic connectors and US 1115 LED tester



Note

This method can be used in an emergency if a **VAG 1551** Diagnostic tester is not available.

This method cannot be used for Rapid data transfer. It is suitable only for Blink code diagnosis.

Connector **A** contains two terminals:
- power, which is protected by fuse **21**
- ground

Note the shape of this connector; angled corners on the short side.

Connector **B** contains a single terminal
- from the control unit

Note the shape of this connector; angled corners on the long side.

- connect positive terminal of **US 1115** LED tester to positive terminal of connector **A**
- connect negative terminal of **US 1115** LED tester to the single terminal of connector **B**
- using **VW 1594** adaptor kit, connect one end of a jumper wire to the negative terminal of connector **A**
- touch the open end of the jumper wire to the terminal **B** connection for at least 4 seconds
  - fault memory has now been activated and **US 1115** LED tester will begin to blink, repeat this step to advance to the next Fault code in the sequence

Note

This procedure achieves the same result as installing a fuse in the fuel pump relay for 4 seconds as in the older activation method.

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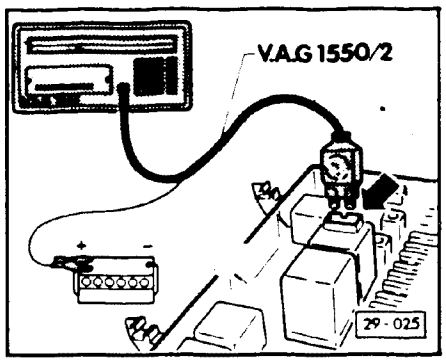
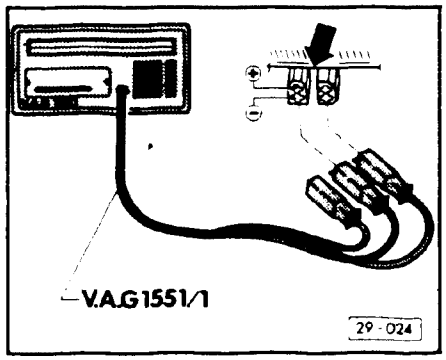
VAG 1551 diagnostic tester, connecting



Vehicles without diagnostic connectors

- remove central electric cover
- connect **VAG 1551** to fuel pump relay (**arrow**) using adaptor **VAG 1551/2**, connect single wire on adaptor to battery positive (+)



Vehicles with diagnostic connectors

- connect **VAG 1551** diagnostic tester to diagnostic connectors (above pedal (s) in drivers side footwell) using **VAG 1551/1** connector harness as follows:
  - **BLACK** wire to **BLACK** diagnostic connector
  - **WHITE** wire to **BROWN** diagnostic connector
  - **BLUE** wire — **NOT** connected

Note

Voltage supply is via fuse **21**.

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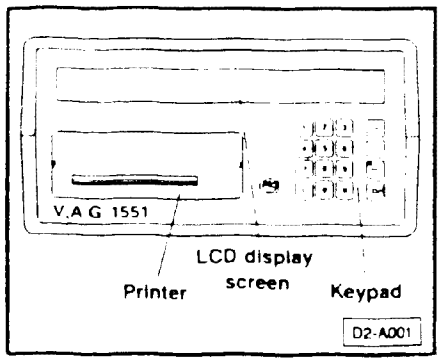
Fault memory, activating/ interrogating using VAG 1551

Requirements
- fuses **13, 21, 27,** and **28** must be **OK**
- A/C switched **OFF**
- Engine ground connection (near ignition distributor) **OK**

Note

The fault memory must first be interrogated before it can be erased.

Using the **VAG 1551** tester eliminates the possibility of interpretive or written errors because the faults can be both displayed and printed by the tester.



If engine **CANNOT** be started
- connect **VAG 1551** tester, section D2-290
- operate starter for about 6 seconds but do **NOT** switch ignition **OFF** afterwards
- activate fault memory, section D2-150

If engine **CAN** be started
- test drive vehicle for at least 5 minutes

During test drive
- coolant temperature must reach 80°C (176°F) minimum
- engine speed must exceed 3000 rpm
- accelerator pedal must be fully depressed at least once

- after test drive, allow engine to idle for at least 2 minutes
- switch **OFF** ignition
  - engine must **NOT** be re-started

CAUTION

A portion of the fault memory is erased when the engine is started. Adhere to the sequence in the following procedure so that ALL faults are recognized. Do **NOT** skip any of the steps.

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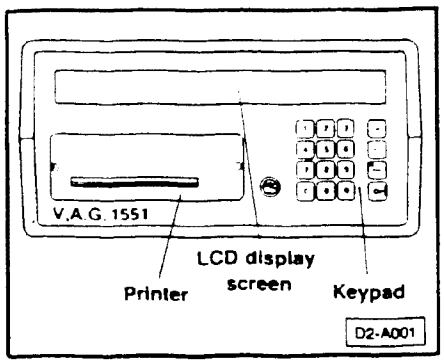

Activating fault memory

- connect **VAG 1551** tester, section D2-290

- switch **ON** ignition but do **NOT** start engine
  - display should then alternate between the two displays as shown

VAG — SELF-DIAGNOSIS	HELP
1 — Rapid data transfer	

VAG — SELF-DIAGNOSIS	HELP
2 — Blink code output	

- press **2** to select Blink code output
  - display will appear as shown

Blink code output	HELP
Initiate with the ➡ button	

- depress ➡ button
  - display will appear as shown

*Blink code output will be initiated!

- press ➡ button and hold until
  - display appears as shown

Blink code output, Continuous short circuit on permanent ground exciter wire

Note

The asterisk in the upper left hand corner of the display will now start to flash. The asterisk flashes just as LED tester **US 1115** would if it were connected to the system instead.

The **VAG 1551** will count the number of flashes and convert them into a four digit fault code.

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```
Blink code 4444
No fault recognized ➡
```

If **NO** faults are stored in the memory, the display will appear as shown

- switch **OFF** ignition but do **NOT** erase fault memory

If a fault in the system is found, the **VAG 1551** will display the appropriate fault code, a description of the fault and an alphanumeric code for the faulty component. As shown in display example.

```
Blink Code 2232 ➡
Air flow sensor — G70/G19
```

This alphanumeric code is the same code used on the wiring diagrams and in the troubleshooting tables.

- press the ➡ button to advance to the next fault (if any)
  - display will appear as shown

```
Blink code XXXX
Blink code signal is continued
```

If another fault is found it will be displayed as before.

```
Blink code 0000 ➡
Output end
```

If **NO** additional faults are found, the display will appear as shown

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If the vehicle being tested features more control units with fault memory, the blink code of the next control unit can be started by pressing the ➡ button

Blink code output is ended!

If no other control units are to be tested, the display will appear as shown

- switch **OFF** ignition
- press **C** button once
- repair the faults and then erase the fault memory, section D2-310
- take vehicles for another road test (minimum of 5 minutes)
- check fault memory again to verify that ALL faults have been corrected

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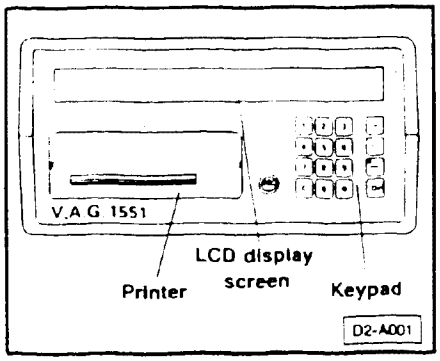
Fault memory, erasing using VAG 1551 in blink code mode



- connect **VAG 1551** tester (if not already connected, section D2-290

VAG — SELF-DIAGNOSIS HELP
1 — Rapid data transfer

VAG — SELF-DIAGNOSIS HELP
2 — Blink code output

- display should then alternate between the two displays as shown

- press **2** to select Blink code output
  - display will appear as shown

Blink code output HELP
Initiate with the ➡ button

- depress ➡ button
  - display will appear as shown

*Blink code output will be initiated!

- press ➡ button and hold until display appears as shown

Blink code output, Continuous short circuit on permanent ground exciter wire

- switch **ON** ignition and push ➡ button briefly
  - display will appear as shown

Blink code 0000
End output

- press ➡ button with ignition still switched **ON** for at least 5 seconds and **VAG 1551** connected
  - fault memory is erased

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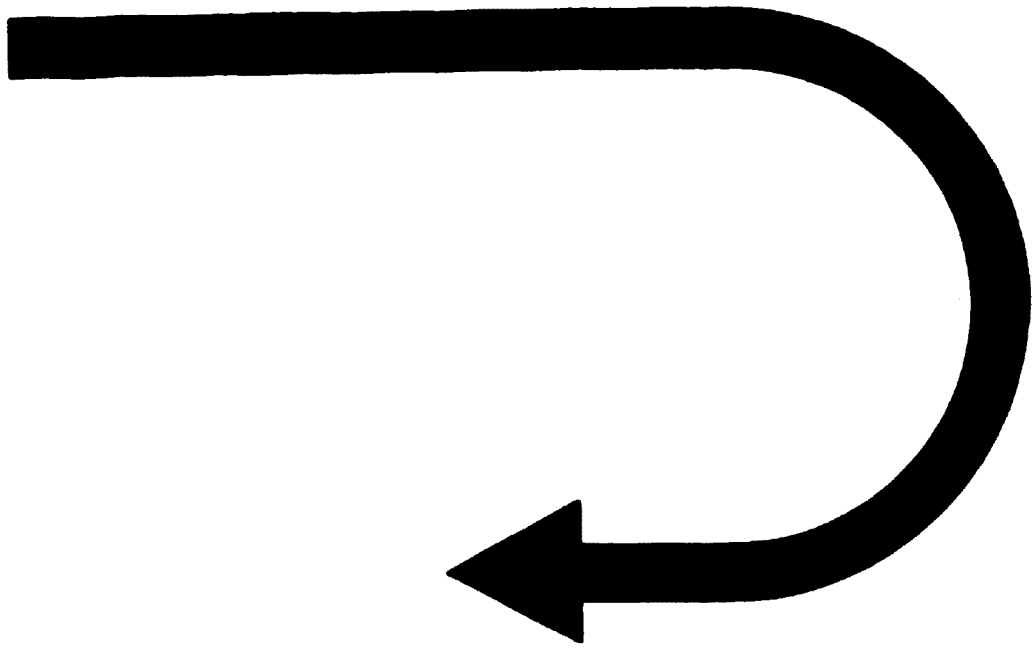
CONTINUED IN THE

BEGINNING OF NEXT ROW



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Fault code, listing

Fault code (display on VAG 1551)	Description	Fault location	
		Ignition control unit	Fuel injection control unit
1111	Control unit defective	X	X
1231	Trans speed sender (**G 68**)		X
2121	Idle switch (**F 60**)	X	X
2122	Engine speed signal missing		X
2123	Full throttle switch (**F 81**)	X	X
2141	First knock regulator Regulating limit exceeded	X	
2142	Knock sensor I (**G 61**) No signal	X	
2223	Altitude sensor (**F 96**)	X	X
2232	Air Flow Sensor (**G 70/G 19**)	X	X
2233	Air Flow Sensor Ref. Voltage (**G 70**)	X	
2312	Coolant Temperature Sensor (**G 62**)	X	X
2341	Oxygen Sensor Control Regulating limit exceeded		X
2342	Oxygen Sensor (**G 39**) No signal		X
4431	Idle Stabilizer Valve (**N 71**)		X
4444	No Fault recognized	X	X
Additional Fault codes for California Vehicles ONLY			
2132	Data Wiring Defective		X
2411	Exhaust Gas Recirculation System		X

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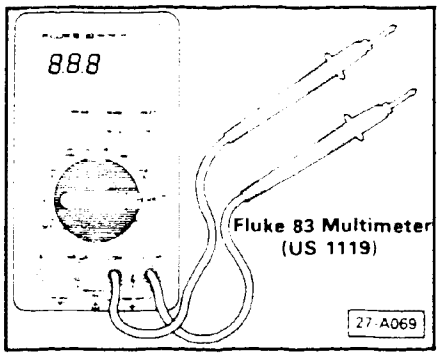
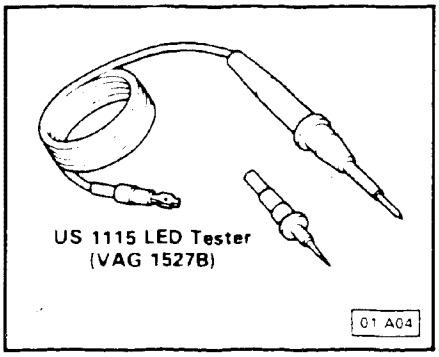
CIS-E III fuel and ignition system, electrical testing

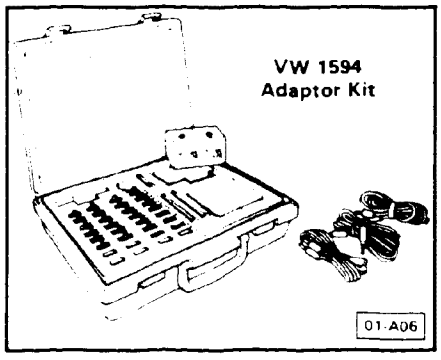


- perform all measurements using the **Fluke 83** multimeter (**US 1119**) or equivalent
  - the specified values given in the procedures are valid within a temperature range of 0° and +40°C (32° and 104°F)
  - if the measured values deviate from the specified values: check the wiring and connectors using the wiring diagram before replacing any components

> **CAUTION**
>
> Always switch the multimeter to the desired units and range of measurement (Volts, Ohms, etc.) **before** making any test connections to the system.



- use the **US 1115** LED tester (**VAG 1527B**) to indicate voltage presence as indicated in the procedures



- always use the **VW 1594** adaptor kit to make connections between the test instruments (**Fluke 83** and **US 1115** LED tester) and the test point

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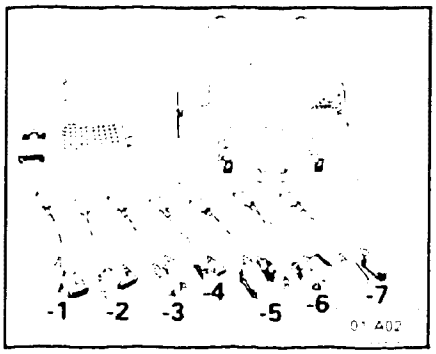

- use Test box **VAG 1598** and adaptor wire kit **VW 1594** to make all test connections to the control unit

> **CAUTION**
>
> Do **not** connect or disconnect adaptors test instruments to the **VAG 1598** Test box while the ignition is switched **ON**.

Requirements
- battery voltage **OK**
- fuses **OK**
- system grounds **OK**
- power output stage of coil disconnected

- switch **OFF** ignition
- disconnect CIS-E III fuel injection control unit (**J 21**) harness connector
- connect **VAG 1598** Test box to control unit harness connector using adaptor cable **VAG 1598/3**
  - control unit is not connected

- make connections on the **VAG 1598** Test box as indicated in the following procedures

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Note

The following checks apply to the (**J 21**) CIS-E III fuel injection control unit.

Test step	VAG 1598 terminals:	To be tested	Test conditions and additional steps (if any)	Specified value or result
1	**14 + 18**	Voltage supply to ECU (**J 21**) **14** = fuse **28** positive **18** = ground	Switch **ON** ignition	Approx. battery voltage If **NO**: check ground connection or fuse **28**, eliminate open circuit using wiring diagram
	18 + 19 California only	**18** = ground **19** = fuse **21** positive	Ignition switched **ON**	Approx. battery voltage If **NO**: check ground connection or fuse **21**, eliminate open circuit using wiring diagram
2	**33 + 35**	A/C compressor switch **ON** signal	Ignition switched **ON** A/C switched **ON** to AUTO or BI-LEV	Approx. battery voltage If **NO**: eliminate open circuit using wiring diagram
■ switch **OFF** ignition ■ switch multimeter to resistance range				
3	**7 + 18**	Wire to Oxygen sensor (**G 39**)	Disconnect Oxygen sensor and connect harness wire to ground with ignition switched **OFF**	0.5 Ohms maximum (continuity) If **NO**: eliminate open circuit using wiring diagram
Note No testing is performed on terminal **8** for the Oxygen sensor shield.				
4	**4 + 5**	Differential pressure regulator (**N 73**)	Ignition switched **OFF**	17.5 to 21.5 Ohms If **NO**: check diff. pressure regulator (Repair Group 25)
■ switch **OFF** ignition ■ substitute **US 1115** LED tester for multimeter				

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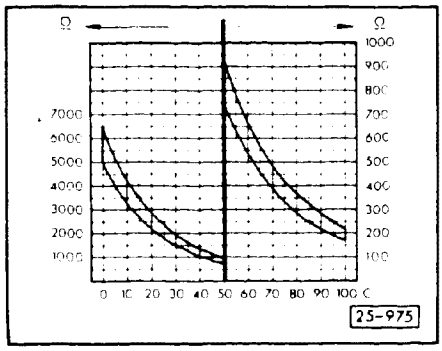
Test step	VAG 1598 terminals:	To be tested	Test conditions and additional steps (if any)	Specified value or result
5	14 + 34	Activation of CIS-E III to manual trans or via auto trans selector lever	Switch **ON** ignition	LED tester must light up If **NO**: eliminate open circuit using wiring diagram
		Auto trans ONLY:	selector on **N** then **P**	LED tester must light up
			selector on any other position except **N** or **P**	LED tester must **NOT** light up
6	3 + 18	Coolant temperature sensor (**G 62**)	Ignition switched **OFF** Use chart to look up value	



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Note

The following electrical checks apply to the (**J 154**) CIS-E III ignition control unit.

Test step	VAG 1598 terminals:	To be tested	Test conditions and additional steps (if any)	Specified value or result
■ switch multimeter to 20 Volt range				
1	**6 + 20**	Voltage supply to ignition ECU (**J 154**) **6** = fuse **27** positive **18** = ground	Switch **ON** ignition	Approx. battery voltage If **NO**: check ground connection or fuses **27** and **4**, eliminate open circuit using wiring diagram
2	**6 + 22**	Voltage supply to ignition control unit (**J 154**) **6** = positive from fuse **27** **22** = ground	Operate starter briefly	8 Volts minimum If **NO**: eliminate open circuit using wiring diagram
3	**7 + 20**	Idle switch (**F 60**)	Throttle valve in idle position with ignition switched **ON** Operate throttle	Approx. battery voltage If **NO**: check throttle valve basic adjustment 0 Volts If **NO**: check/adjust idle switch (Repair Group 25) or eliminate open circuit using wiring diagram
4	**9 + 20**	Full throttle switch (**F 81**)	Throttle valve in idle position with ignition switched **ON** Operate full throttle switch	0 Volts If **NO**: check/adjust full throttle switch (Repair Group 25) Approx. battery voltage If **NO**: eliminate open circuit using wiring diagram
5	**14 + 20**	Wire **14** to fuel pump relay (**J 17**)	Ignition switched **ON**	Approx. battery voltage If **NO**: eliminate open circuit using wiring diagram

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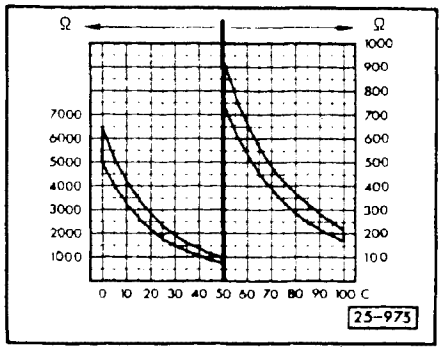
Test step	VAG 1598 terminals:	To be tested	Test conditions and additional steps (if any)	Specified value or result
6	3 + 6	Wire **3** to fuel pump relay (**J 17**)	Ignition switched **ON** with fuse installed in top of relay	Approx. battery voltage If **NO**: eliminate open circuit using wiring diagram
■ switch **OFF** ignition ■ switch multimeter to resistance range				
7	16 + 20	Wiring to power output stage of coil (**N 70**)	Ignition switched **OFF** Bridge terminal **2** (green) and terminal **3** (brown/white)	0.5 Ohms maximum Check (Repair Group 28) or eliminate open circuit using wiring diagram
CAUTION When checking the wiring between the control unit (**J 154**) and the fuel pump relay (**J 17**), Do **NOT** apply a voltage to any of the respective terminals.				
8	12 + 13	Wiring to knock sensor (**G 61**)	Disconnect knock sensor and bridge all three terminals of harness connector	0.5 Ohms maximum (continuity) If **NO**: eliminate open circuit using wiring diagram
9	4 + 10	Wiring to Hall sender (**G 40**)	Disconnect Hall sender and bridge outer terminals	0.5 Ohms maximum (continuity) If **NO**: eliminate open circuit using wiring diagram
10	10 + 24	Wiring to Hall sender (**G 40**)	Ignition switched **OFF** Hall sender disconnected Bridge outer terminal (brown/white) with center terminal (green/white)	0.5 Ohms maximum If **NO**: check Hall sender (Repair Group 28) or eliminate open circuit using wiring diagram
11	22 + 25	Coolant temperature sender (**G 62**)	Ignition switched **OFF** Use chart to look up value	

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Test step	VAG 1598 terminals:	To be tested	Test conditions and additional steps (if any)	Specified value or result
12	2 + (25) 5 + (1) 7 + (28) 8 + (21) 9 + (31) 17 + (30) 21 + (26)	Wiring between ignition control unit (**J 154**) and fuel injection control unit (**J 21**)	Ignition switched **OFF** With ignition switched **OFF** disconnect harness connector from fuel injection control unit	0.5 Ohms maximum If **NO**: eliminate open circuit using wiring diagram
Note Terminals in parentheses are for fuel injection control unit (**J 21**) harness connector.				

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Fault code, troubleshooting chart

- the following charts list all of the possible faults that can detected by the CIS-E III fuel and ignition control units. These faults are displayed directly on the **VAG 1551** diagnostic tester
- if components are indicated as faulty, first check the wiring to the component for shorts or disconnections using the wiring diagram
- ensure that **BOTH** control units have the correct part number. Do **NOT** mix 49 State control units with California units.
- before correcting a fault or replacing components, check the Fuel and Ignition control units for proper ground connections
- check engine ground connections for corrosion or damage. Replace or repair as necessary
- if Fault codes **2121, 2123** or **2223** are indicated ALONG with the fault code for a control unit; first check the wiring between that control unit and the fault coded component for a disconnection
- engine warning light will flash while driving when knock control is at control limit
- if idle speed increases in excess of 1200 rpm (engine warm) but lies within the specified range after restarting engine (see fault codes **2122** and **2232**) possible causes include loose terminals in the air flow sensor potentiometer harness connector or between terminal **17** of the Ignition control unit (**J 154**) and terminal **30** of the Fuel injection control unit (**J 21**)

CAUTION

If the ignition control unit (**J 154**) is replaced, **ALWAYS** check the ignition timing (see Repair Group 28), adjust timing if necessary.

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Fault code number	Fault code and display on VAG 1551	Problem	Repair
65535	1111 Control unit defective	Fault in processor section of Fuel injection control unit (J 21)	Replace Fuel injection control unit
		Fault in processor section of Ignition control unit (J 154)	Replace Ignition control unit
00281	1231 Trans speed sender (G 68)	Disconnected wire between instrument cluster and Fuel injection control unit Disconnected wire or short to (G 68)	Check wiring between terminal 29 of Fuel injection control unit and instrument cluster, using wiring diagram
Troubleshooting hint: If fault 1231 is indicated, first check if speedometer is OK. If speedometer is defective; repair or replace and ignore fault code If the speedometer is OK but the engine stalls during deceleration; first check the transmission speed sender (G 68) and related wiring, then check the Fuel injection control unit (J 21) and related wiring. Repair or replace as necessary			
00516	2121 Idle Switch (F 60)	Accelerator cable out of adjustment	Adjust accelerator cable, see Repair Group 20
		Idle switch (F 60) out of adjustment	Adjust Idle switch
		Idle switch (F 60) wiring shorted or disconnected	Repair as necessary
		Idle switch (F 60) hung up mechanically	Repair as necessary
00529	2122 Engine speed signal missing	Disconnection between terminal 17 of Ignition control unit (J 154) and terminal 30 of Fuel injection control unit (J 21)	Determine disconnection using wiring diagram
		No rpm signal from Ignition control unit (J 154) to fuel injection control unit via knock control	
		Hall sender (G 40) faulty	Check Hall sender, replace if necessary
		Ignition control unit (J 154) or related wiring, defective	Check control unit, repair wiring or replace control unit as necessary

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Fault code number	Fault code and display on VAG 1551	Problem	Repair
00517	**2123** Full throttle switch (**F 81**)	Full throttle switch out of adjustment	Adjust switch, see Repair Group 25
		Short or open in switch	Electrically check switch, replace or repair as necessary
		Switch hangs up mechanically	Check operation, repair or replace as necessary
00546	**2132** Data wiring defective (**Code for California ONLY**)	Disconnection between terminal **5** of Ignition control unit (**J 154**) and terminal **1** of Fuel injection control unit (**J 21**) or Disconnection between terminal **3** of Ignition control unit (**J 154**) and terminal **13** of Fuel injection control unit (**J 21**). Control unit defective	Determine disconnection using wiring diagram Determine disconnection using wiring diagram
00535	**2141** First knock regulator regulating limit exceeded	Engine knocks or makes rattling sound	Check compression pressure see Repair Group 15 Check Fuel injection system, see Repair Group 25 Check distributor ground
		Ignition timing point set wrong	Check ignition timing and adjust if necessary, see Repair Group 28
		Octane value of fuel too low • 87 AKI minimum	Replace fuel with higher octane; 91 AKI recommended
		Knock sensor shield, disconnected	Determine disconnection using wiring diagram
Troubleshooting hint: This fault code is accompanied by a slight power loss, a slight increase in fuel consumption and maximum power cannot be obtained			
00524	**2142** Knock I (**G 61**)	Disconnected wire or short between Knock sensor I (**G 61**) Ignition control unit (**J 154**)	Determine disconnected wire or short and eliminate and using wiring diagram
		Knock sensor I (**G 61**) defective	Replace Knock sensor • 20 Nm (15 ft lb)
		Ignition control unit (**J 154**) fails to recognize knock signals	Replace ignition control unit

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Fault code number	Fault code and display on VAG 1551	Problem	Repair
00528	2223 Altitude sensor (F 96)	Disconnected wire or short between Altitude sensor (F 96) and fuel injection control unit (J 21)	Check altitude sensor
		Altitude sensor defective	Replace altitude sensor
00520	2232 Air Flow sensor (G 70/G 19)	Disconnected wire or short between Fuel injection control unit (J 21) and Potentiometer (G 19)	Check Potentiometer
		Disconnected wire between terminal 21 of Fuel injection control unit (J 21) and terminal 8 of Ignition control unit (J 154)	Determine disconnected wire or short and eliminate using wiring diagram
00531	2233 Air flow sensor reference voltage (G 70)	Disconnection between terminal 26 of Fuel injection control unit (J 21) and terminal 21 of Ignition control unit (J 154)	Eliminate disconnection using wiring diagram
NOTE The reference voltage for load and altitude signals is monitored by the CIS-E III Fuel injection control unit and **NOT** as indicated on the **VAG 1551** diagnostic tester! The reference voltage is from the Air flow sensor potentiometer. **NF** engines do **NOT** have an Air mass sensor, they use a Potentiometer instead.			
00522	2312 Coolant temperature sensor (G 62)	Disconnection or short in sensor wire	Check Coolant temperature sensor
		Coolant temperature sensor (G 62) defective	Replace sensor

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Fault code number	Fault code and display on VAG 1551	Problem	Repair
00537	**2341** Oxygen sensor control regulating limit exceeded	CO content not within specified range	Check idle and CO content see Repair Group 25, adjust as necessary
		Faulty ground connection to Oxygen sensor	Check wiring, using wiring diagram
		Charcoal canister solenoid valve I always open	Perform Output checks, section D2-350
		Intake air boot and/or hoses have air leaks	Check system and hoses for air leaks
00525	**2342** Oxygen sensor (**G 39**) **NO** signal	Oxygen sensor (**G 39**) disconnected or defective	Check Oxygen sensor control, see Repair Group 25
00560	**2411** Exhaust Gas Recirculation system (California **ONLY**)	Vacuum lines disconnected, leaking or pinched	Check EGR system, see Repair Group 26
		EGR temperature sensor (**G 98**) faulty	—
		Driving fault, e.g. vibration, poor idle	—
		EGR valve faulty	—
		EGR system Frequency valve (**N 121**) faulty (poor starting)	—
		Disconnected wire between speed sensor (**G 98**) or frequency valve (**N 121**) and control unit	Check wiring using wiring diagram, replace or repair as necessary
01257	**4431** Idle Stabilizer valve (**N 71**)	Disconnected wire or short between Fuel injection control unit (**J 21**) and Idle stabilizer valve (**N 71**)	Check Idle stabilizer valve triggering using Output checks, section D2-350
00000	**4444** No fault recognized	If a fault exists, it was **NOT** recognized by self-diagnosis	—
00000	**0000** Output End	—	—

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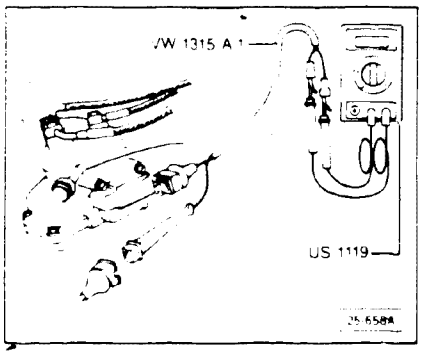
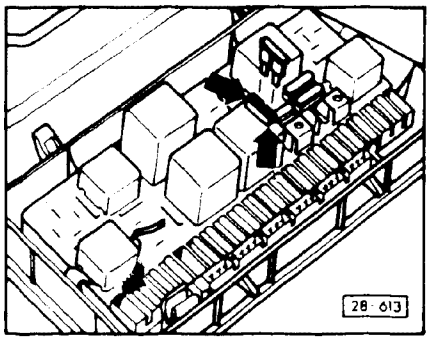
Output checks, vehicles without VAG 1551 diagnostic connectors



- connect multimeter **US 1119** to differential pressure regulator harness using adaptor **VW 1315 A/1**
- set meter to 200mA scale



- insert spare fuse in top of fuel pump relay
- turn ignition **ON**, but do **NOT** start engine, remove fuse after four seconds

(Differential pressure regulator, check)

- fault indicator light will display **4341**

- close full throttle switch
  - differential pressure regulator current switches to 10mA (should be approximately 100mA with full throttle switch in open position)

If approximately 10mA is **NOT** obtained
- check differential pressure regulator

For detailed check, see Repair Group 25.

Carbon canister shutoff solenoid, check (code 4343)

- re-insert spare fuse in top of fuel pump relay for four seconds, then remove
  - fault indicator light will display **4343**

- close full throttle switch
  - shutoff solenoid clicks on and off when full throttle switch is closed

For detailed check, see Repair Group 25.

Idle stabilizer valve, check (code 4431)

- re-insert spare fuse in top of fuel pump relay for four seconds, then remove
  - fault indicator light will display **4431**

- close full throttle switch
  - idle stabilizer valve must cycle when full throttle switch is closed

For detailed check, see Repair Group 25.

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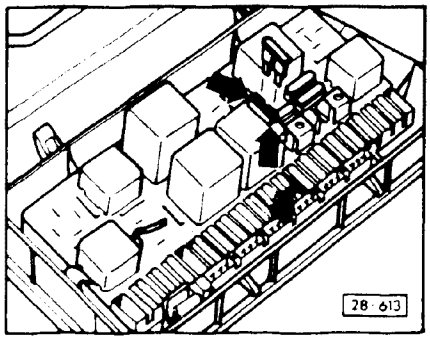

Cold start valve, check (code 4443)

- re-insert spare fuse in top of fuel pump relay for four seconds, then remove
  - fault indicator light will display **4443**
- close full throttle switch
  - cold start valve clicks on and off for a maximum of 10 seconds when full throttle switch is closed

For detailed check, see Repair Group 25.

Note

If a problem is found in any of these components, first check the component for continuity using **US 1119** multimeter.

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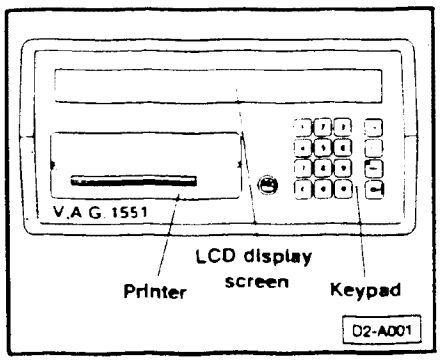

Output checks, using VAG 1551

Mode 2 (blink code output)

Note

Output checks can only be performed when the engine is **NOT** running.

Output checks will stop being transmitted if the engine is started or if a speed impulse is recognized.

During the output check diagnosis, the Carbon canister solenoid valve, the Idle stabilizer valve and the Cold start valve are checked audibly or by touch. Avoid unnecessary background noise while audibly checking these components.

The Fuel pressure regulator is checked by measuring the Differential pressure regulator current with the Full throttle switch activated.

To repeat the output checks, switch the ignition **OFF** and then switch it back **ON** but do **NOT** start the engine.

Output checks occur in the following triggering sequence:

4341 Fuel pressure regulator (**N 73**)
4343 Carbon canister solenoid valve (**N 80**)
4431 Idle stabilizer valve (**N 71**)
4443 Cold start valve (**N 17**)

Output checks requirements
- Full throttle switch **OK**
- Fuel pressure regulator prepared for checking, section D2-360

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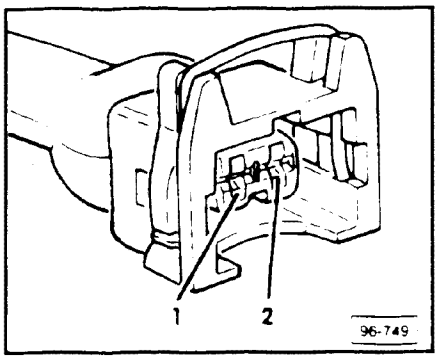
Fuel pressure regulator, preparing for output checks

- disconnect Differential pressure regulator harness connector
- switch multimeter **US 1119** to 20 volt DC range



- connect multimeter between terminal **2** of harness connector and ground using **VW 1594** adaptor kit

- switch **ON** ignition
  - must be between 4.5 and 5 volts

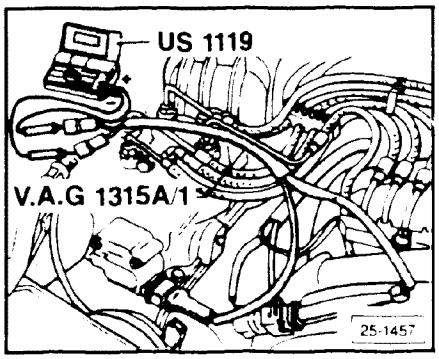
- switch **OFF** ignition
- reconnect multimeter between terminals **1** and **2** of harness connector
- switch **ON** ignition
  - must be between 4.5 and 5 volts

If voltage values are **NOT** obtained

- check Differential pressure regulator triggering circuit, using wiring diagram, replace or repair as necessary

If voltage values **ARE** obtained

- switch **OFF** ignition



- connect test adaptor **VAG 1315A/1** between Differential pressure regulator harness connector and regulator

- switch multimeter **US 1119** to 200 mA DC range
- connect multimeter to **VAG 1315A/1** adaptor using **VW 1594** adaptor kit

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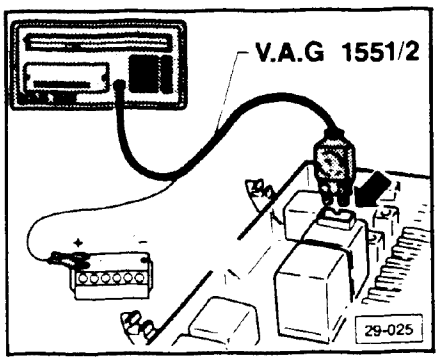
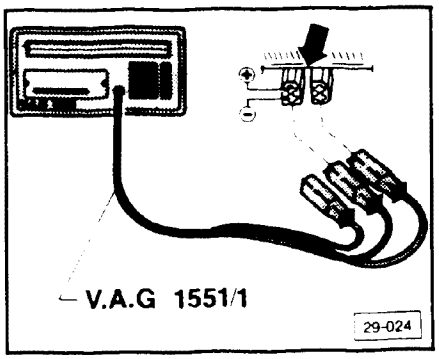
Output check activation, using VAG 1551

- switch **OFF** ignition

Vehicles without diagnostic connectors

- remove cover from fuse relay panel
- connect **VAG 1551** diagnostic tester to fuel pump relay (**arrow**) and battery (+) positive terminal using **VAG 1551/2** adaptor harness





Vehicles with diagnostic connectors

- connector **VAG 1551** diagnostic tester to diagnostic connectors in driver's side footwell (above and to left of pedals):
  - black wire to black diagnostic connector
  - white wire to brown diagnostic connector
  - blue wire **NOT USED**
  - voltage supply via fuse **21**

All vehicles:

- switch **OFF** ignition
  - display should then alternate between the two displays as shown

VAG — SELF-DIAGNOSIS	HELP
1 — Rapid data transfer	

VAG — SELF-DIAGNOSIS	HELP
2 — Blink code output	

- press **2** to select Blink code output
  - display will appear as shown

Blink code output	HELP
Initiate with the ➡ button	

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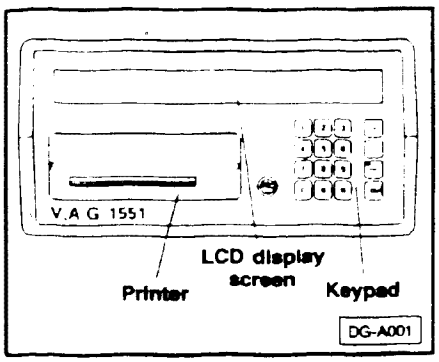

▶ ■ depress ➡ button

Blink code output will be initiated!

▶ • display will appear as shown

Blink code output, Continuous short circuit on permanent ground exciter wire

▶ ■ press ➡ button and hold until display appears as shown
■ switch ignition **ON** but do not start car

Blink code 4341

Pressure regulator N 73

▶ ■ push ➡ button briefly
• display will appear as shown

■ actuate full throttle switch and hold in position
• current must be approximately 10 mA

Note

The current value will be displayed for as long as the full throttle switch is activated.

If current value is **NOT** obtained
■ check wiring between component and control unit using wiring diagram, replace or repair as necessary

If current value is obtained
■ push ➡ button briefly
• display will appear as shown

Blink code 4343 Solenoid valve I for carbon canister N 80

▶ ■ actuate full throttle switch and hold in position
• solenoid I for charcoal canister is triggered (should vibrate and hum)

If solenoid valve is **NOT** triggered
■ check wiring between component and control unit using wiring diagram, replace or repair as necessary

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