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★ **NEW INFORMATION** since last filming

Self-Diagnosis (SD), general information

The CIS-E III Ignition control unit (**J 88**) features self-diagnosis capability. If problems occur at monitored sensors or components, they are stored in memory.

Note that this system does **NOT** have a permanent memory. Fault memory content is erased (cancelled) whenever the ignition is switched **OFF**.

The Ignition control unit (**J 88**), after evaluating the information supplied to it, differentiates between 13 different faults.

Activate the fault memory with the engine running if at all possible.

This system is also equipped to perform 5 different output checks. These checks can **ONLY** be performed when the engine is **NOT** running.

The fault memory of this control unit can be interrogated and the results displayed or printed by using the **VAG 1551** Diagnostic tester in Mode 2: Blink code output.

If a **VAG 1551** Diagnostic tester is not available, the system can be activated, checked and displayed by using the **VW 1594** adaptor set and the **US 1115** LED tester.

Fault memory activation, using US 1115

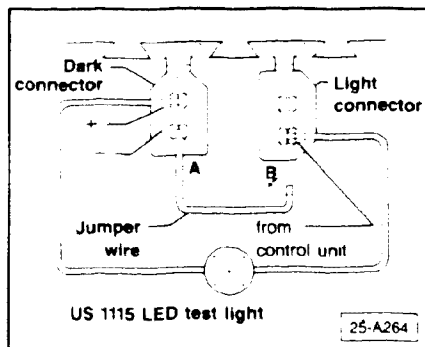
CAUTION

Starting with model year 1989:

NEW diagnostic test connectors (for fault code activation and display) have been installed in the driver's side footwell.

It will no longer be possible to activate the fault memory by means of the fuel pump relay on these vehicles.

Existing repair procedures that refer to fault code activation via the fuel pump relay **remain the same** with the exception that the **NEW** diagnostic connectors outlined on this page **MUST** be used **INSTEAD** of the fuel pump relay.



Connector **A**: contains **two** terminals; power (which is protected via fuse 21) and ground (observe the shape: angled corners on the short side).

Connector **B**: contains a **single** terminal from the control unit (observe the shape: angled corners on the long side).

Use the **NEW** connectors to display the contents of the fault memory (as well as System Output Checks, where available) by using the **US 1115** LED tester as follows:

- connect positive terminal of **US 1115** LED tester to the positive terminal in connector **A**
- connect negative terminal of **US 1115** LED tester to the (only) terminal in connector **B**
- using **VW 1594** adaptor set connect one end of a jumper wire to the negative terminal in connector **A**, touch the other end to the terminal in connector **B** for at least 4 seconds
 - fault codes will now be displayed (as blinking) by the **US 1115**

Diagnosis, Fault Memory

To advance to the next fault code in the sequence:

- touch the free end of the jumper wire to the terminal in connector **B** again for a minimum of four seconds

This procedure achieves the same result as installing a fuse in the fuel pump relay for 4 seconds as in the older fault code system.

Fault code, construction

If ignition has been switched **OFF**, fault memory will be erased. To reproduce fault and store in memory, vehicle must be restarted and driven a minimum of **five minutes** so that an engine speed and absolute boost pressure greater than 3000 RPM and 1.2 bar (17 psi) are reached. This ensures that all component operations are checked and stored in memory.

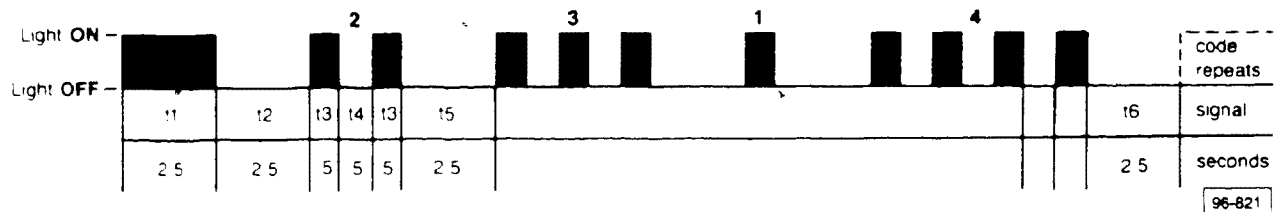
If vehicle is in no-start condition, crank engine for at least **five seconds**, leaving ignition switched **ON**. This will store information on components which might have caused condition.

Information is displayed in error codes by fault indicator light.

Diagnostic codes

When the diagnosis procedure is activated, the fault indicator light will flash a four digit code. The above diagram is an example of a diagnosis code which would be **2314**.

This flashing fault code will be repeated until the diagnosis procedure is cancelled or switched to next test step.



- t1** = start signal (beginning of code transmittal)
- t2** = pause before beginning of code
- t3** = code impulse time
- t4** = pause between code impulse
- t5** = pause between impulse groups
- t6** = pause at end of code impulse, before repeat of code impulse

Fault memory activation, using fuel pump relay

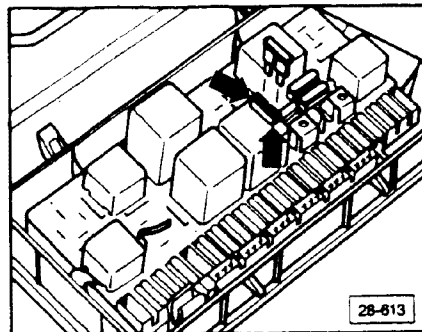
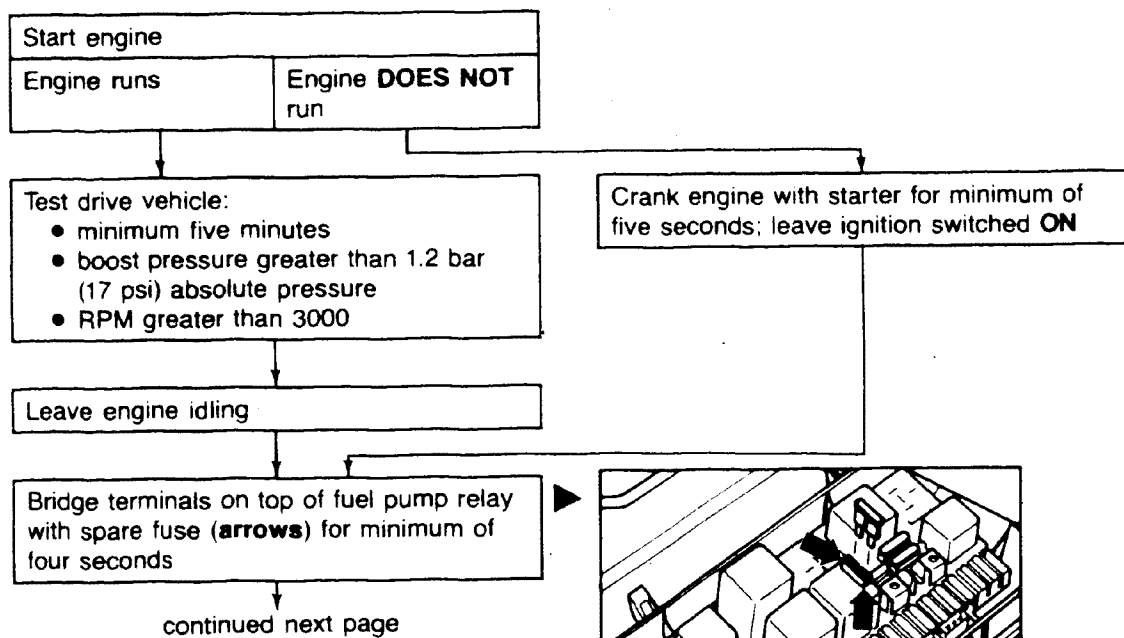
Note

This method of activating fault memory was replaced by diagnostic connectors (located in the driver's footwell) in a running change during late model year 1989.

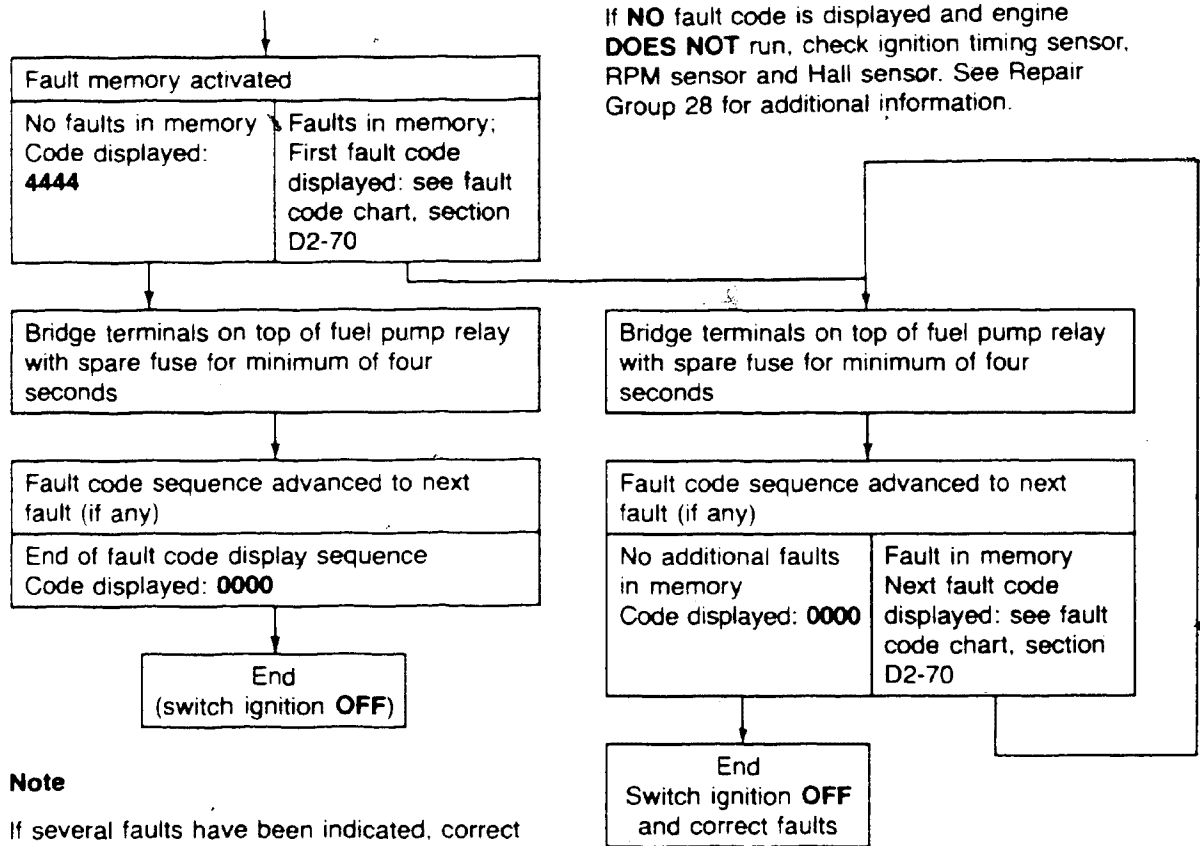
It is also possible to use the **VAG 1551** diagnostic tester to perform this function by using adaptor cable **VAG 1551/2** instead of the fuel pump relay fuse.

Check these first:

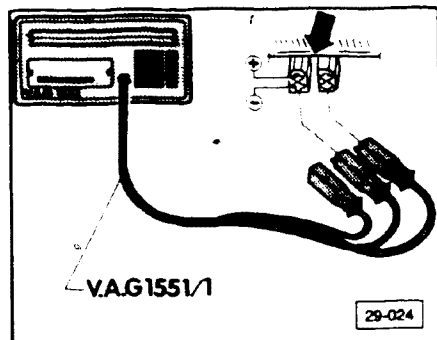
- fault indicator light **OK**
 - fuel pump relay **OK**
 - test driven for minimum five minutes, achieving minimum of 3000 RPM and 1.2 bar (17 psi) absolute boost pressure
- or
- crank engine with starter for minimum five seconds
 - ignition left switched **ON**



Diagnosis, Fault Memory



VAG 1551, connecting



- 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.

Activating fault memory using VAG 1551 Diagnostic tester

Mode 2 (Blink code output)

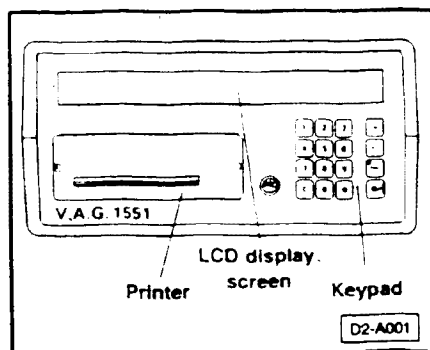
Testing requirements

- Voltage supply to control unit **OK**
- Fuel pump **OK** (Repair Group 20)
- Fuel pump relay **OK** (Repair Group 20)
- Fuses **OK** (see wiring diagram)
- Ground connections **OK** (between engine, intake manifold, output of ignition coil and components)
- A/C switched **OFF**
- test drive vehicle for at least 5 minutes
 - coolant temperature must reach 80° C (176° F) minimum
 - engine speed must exceed 3000 RPM at least once
 - boost pressure must exceed 1 bar (14.5 psi) at least once
 - wide open throttle (full throttle switch activated) must be achieved at least once
- let engine idle

Note

If engine will not start, turn engine over for at least 5 seconds then leave ignition switch in the run position. If you turn **OFF** the ignition switch, fault memory is erased!

Diagnosis, Fault Memory



- connect **VAG 1551** tester, see section D2-50

VAG — SELF-DIAGNOSIS HELP
1 — Rapid data transfer

- display should then alternate between the two displays as shown

VAG — SELF-DIAGNOSIS HELP
2 — Blink code output

Blink code output HELP
Initiate with the  button

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

*Blink code output will be initiated!

- depress  button
 - display will appear as shown

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

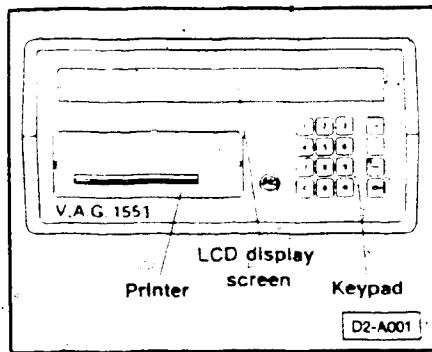
- press  button and hold until display appears as shown

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.

Diagnosis, Fault Memory



Blink code 4444 ➡
No fault recognized

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

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.

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

Blink code 2232 ➡
Air flow sensor — G70/G19

- 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.

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

Blink code 0000 ➡
Output end

Blink code output ➡
is ended!

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

- switch **OFF** ignition
- repair any of the display faults
- take vehicle for another road test (minimum of 5 minutes)
- check fault memory again to verify that **ALL** faults have been corrected

Fault code chart

- the following charts list all of the possible faults that can be detected by the CIS-E III ignition control unit (J 88). 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.
- before correcting a fault or replacing components, check the Ignition control unit (J 88) for proper ground connections.
- check engine ground connections for corrosion or damage. Replace or repair as necessary.

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
65535	1111	Control unit control defective	Fault in processor section of Ignition control unit (J 88)	—	Replace Ignition control unit (J 88)
00513	2111	Engine speed sender (G 28)	Metal chips in (G 28)	engine does not start	check distance between flywheel driving plate and sender (G 28)
			(G 28) connector loose,	—	repair as necessary
			disconnect wire or short between 3 pin connector (in engine compartment) and (G 28)	—	—
			3 pin connector for (G 28) and sender for Ignition timing point (G 4) are interchanged	—	exchange connectors
			(G 28) defective	—	replace (G 28) sender
			Ignition control unit (J 88) defective	—	replace (J 88) control unit
			Distance between (G 28) and flywheel greater than 1.25 mm	engine misfires or stalls	checking, see Repair Group 13
			broken teeth on flywheel ring gear	—	replace as necessary

Diagnosis, Fault Memory

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
00514	2112	Ignition timing point sender (G 4)	(G 4) socket loose Distance from (G 4) to pin on flywheel ring gear is greater than 1.25 mm	Fault before engine starts; engine will not start	Check distance between pin and sender
			Flywheel pin bent or broken	—	—
			Disconnection or short between 3 pin connector (in engine compartment) and G 4)	Fault after engine starts; Fault code 2112 stored	Check (G 4)
			3 pin connectors from (G 4) and (G 28) engine speed sender are interchanged	—	exchange connectors
			(G 4) defective	—	—
			Disconnection or short between (G 4) and ignition control unit (J 88)	—	—
			(J 88) Ignition control unit defective	—	—

Diagnosis, Fault Memory

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
00515	2113	Hall sender (G 40)	No voltage supply to (G 40) from (J 88) Ignition control unit	Fault before engine starts; engine will NOT start	Check (G 40)
			Ground missing to (G 40)	—	—
			Signal wire to (J 88) Ignition control unit disconnected or ground short to signal wire	—	—
			Short between terminals 25 and 27 to (J 88)	Fault after engine starts; Fault code 2113 stored	—
			Wire disconnected between 3 pin connector (in engine compartment) and (J 88) Ignition control unit	—	—
			(G 40) defective or out of adjustment	—	—
			(J 88) Ignition control unit defective	—	—
			Position of pin grom (G 4) Ignition timing point sender incorrect	—	See Repair Group 13 See Fault code 2113
			Drive belt cracked	—	See Repair Group 13

Diagnosis, Fault Memory

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
00516	2121	Idle switch (F 60)	Throttle cable adjustment incorrect	Idle speed not within specifications	See Repair Group 20
			(F 60) out of adjustment	—	Check (F 60) and adjust
			Disconnection or short in (F 60) or wiring	—	—
			Mechanical hangup of (F 60)	—	—
00517	2123	Full throttle switch (F 81)	(F 81) out of adjustment	—	Check (F 81) and adjust
			Disconnection or short in (F 81) or wiring	—	—
			Mechanical hangup of (F 81)	—	—

Diagnosis, Fault Memory

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
00535	2141	First knock regulator	Poor fuel quality or octane lower than 87 AKI	Slight loss of power	Fill with specified fuel
				Slight increase in fuel consumption	—
				High speed not attainable	—
			Abnormal engine noises	Engine runs out of balance	Check fastening of auxiliary components and engine mounts
			Disconnected shield of Knock sensor (G 61)	—	Determine disconnection per wiring diagram and eliminate
			Knock control module in (J 88) Ignition control unit defective	Increased fuel consumption	Replace (J 88) Ignition control unit
				Power loss	—

Diagnosis, Fault Memory

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
00524	2142	Knock sensor I (G 61)	(G 61) loose Disconnection or short between (G 61) and (J 88) Ignition control unit (G 61) defective (J 88) Ignition control unit	Increased fuel consumption Power deficiency — —	tightening torque 10 Nm (7 ft lb) Determine disconnection or short per wiring diagram and eliminate Replace (G 61) Replace (J 88)
00575	2221	Intake manifold	Vacuum hose between intake manifold and (J 88) Ignition control unit is removed, cracked or defective	No boost pressure control No acceleration enrichment	Check vacuum hose —
00519	2222	Intake manifold pressure sender (G 71)	Sender for intake manifold pressure (G 71) inside of (J 88) Ignition control unit is defective	No boost pressure control No acceleration enrichment	Replace (J 88) Ignition control unit
00522	2312	Coolant Temp. sender (G 61)	Disconnection or short in signal wire	Cold start difficulty at very low temps Engine runs out of balance during warmup phase	Check (G 62) —

Diagnosis, Fault Memory

Fault Code Number	Fault Code	VAG 1551 Display	Cause of Fault	Effects	Corrective Measure
00523	2322	Intake air temp. sender (G 42)	Disconnection or short in signal wire (G 42) defective	— —	Check (G 42) —
00525	2342	Oxygen sensor (G 39)	Disconnection to (J 88) Ignition control unit Sensor heating defective Fuse no. 28 (sensor heat) defective Heater resistor (internal) defective Signal wire short to shield	CO content out of spec increase fuel consumption soot on spark plug CO content before catalyst greater than 3.0 Volume % —	Check Oxygen sensor, Repair Group 25 — — — —
00000	4444	No fault recognized	If a complaint exists, fault was not recognized by Self-Diagnosis	—	—
00000	0000	End of output	—	—	—

Code	Component checked	Operating cycle
4433	Fuel pump relay	Fuel pump runs continuously
4441	Oxygen sensor frequency valve	Frequency valve operates (hums)
4442	Wastegate frequency valve	Switches ON and OFF
4443	Cold start valve	Clicks ON and OFF for a maximum of 10 seconds when Full throttle switch is closed
4343	Carbon canister shut-off solenoid	Clicks ON and OFF when Full throttle switch is closed

Output checks using fuel pump relay for activation, general information

Note

This method of activating fault memory was replaced by diagnostic connectors (located in the driver's footwell) in a running change during late model year 1989.

It is also possible to use the **VAG 1551** diagnostic tester to perform this function by using adaptor cable **VAG 1551/2** instead of the fuel pump relay fuse.

The control unit can also generate output signals to check the operation of certain components. By inserting the fuse in the top of the fuel pump relay **WITH THE IGNITION SWITCHED OFF**, the system will switch to the output checks.

The system will now generate five separate output signals, each in a separate step. **WHEN THE IGNITION IS SWITCHED ON**. If the starter is operated or the engine has been run, the system will switch to the input checks.

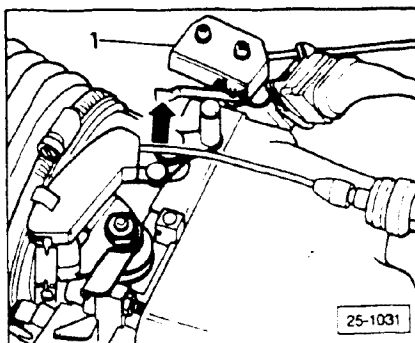
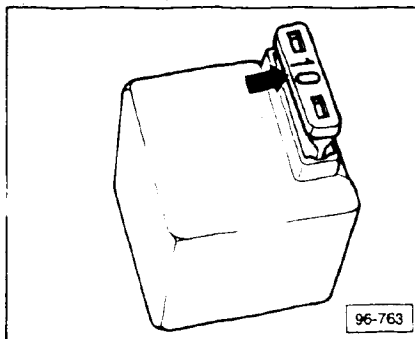
The fuse **must** be inserted before the ignition is switched **ON**.

To switch from one step to the next:

- insert spare fuse into top of fuel pump relay
 - the fault warning light will then flash a code to indicate which test step the system is in.
 - after obtaining the **4433** code, remove the fuse from the fuel pump relay; otherwise, the fuel pump will run continuously and could cause flooding

Output signals will only be generated when the full throttle switch is closed (**arrow**).

If a problem is found, first check the component using multimeter **US 1119** for an open or short circuit, then check the wiring using the wiring diagram.



Output checks activation, using fuel pump relay

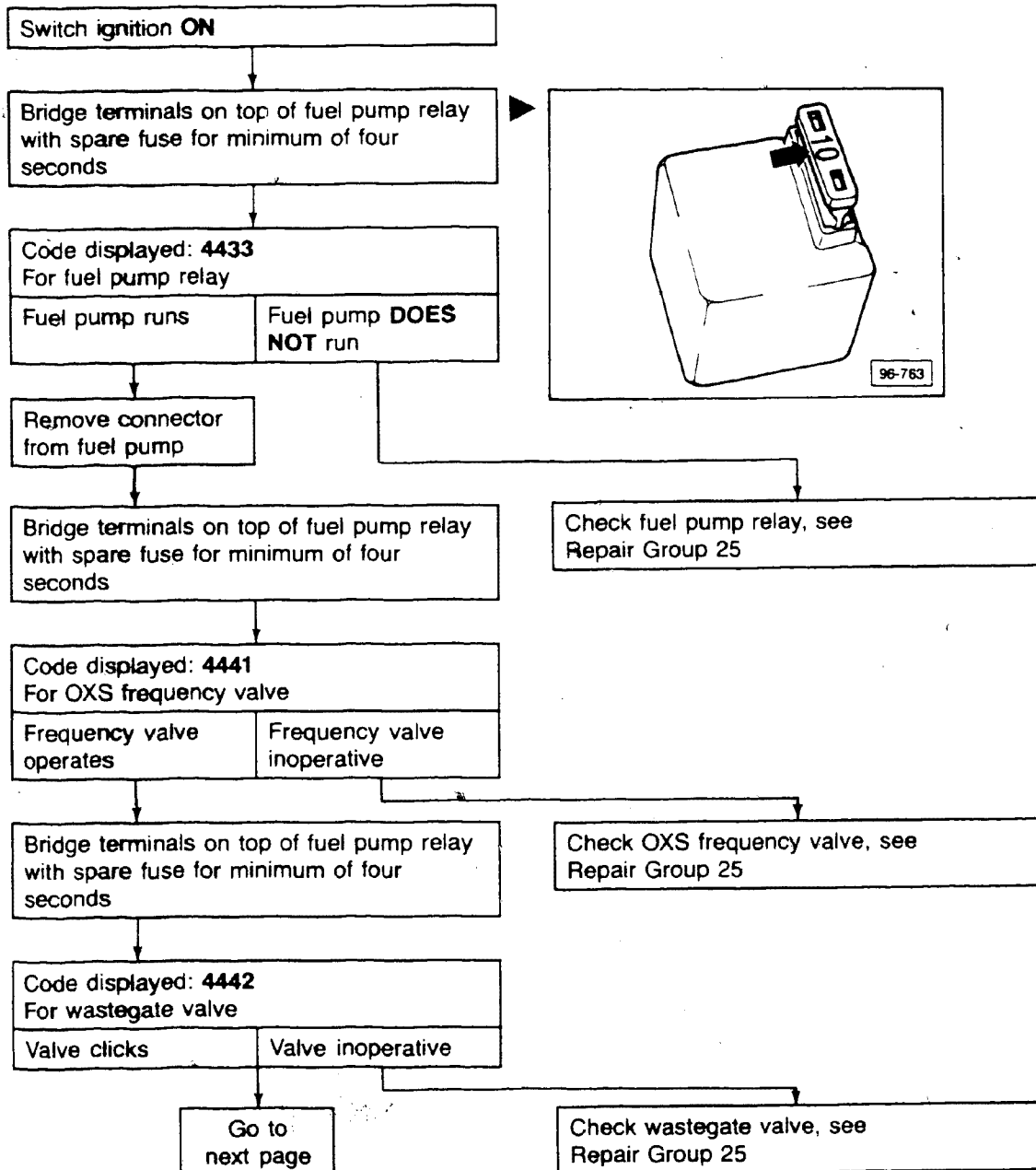
This procedure must be followed in sequence.

Check this first:

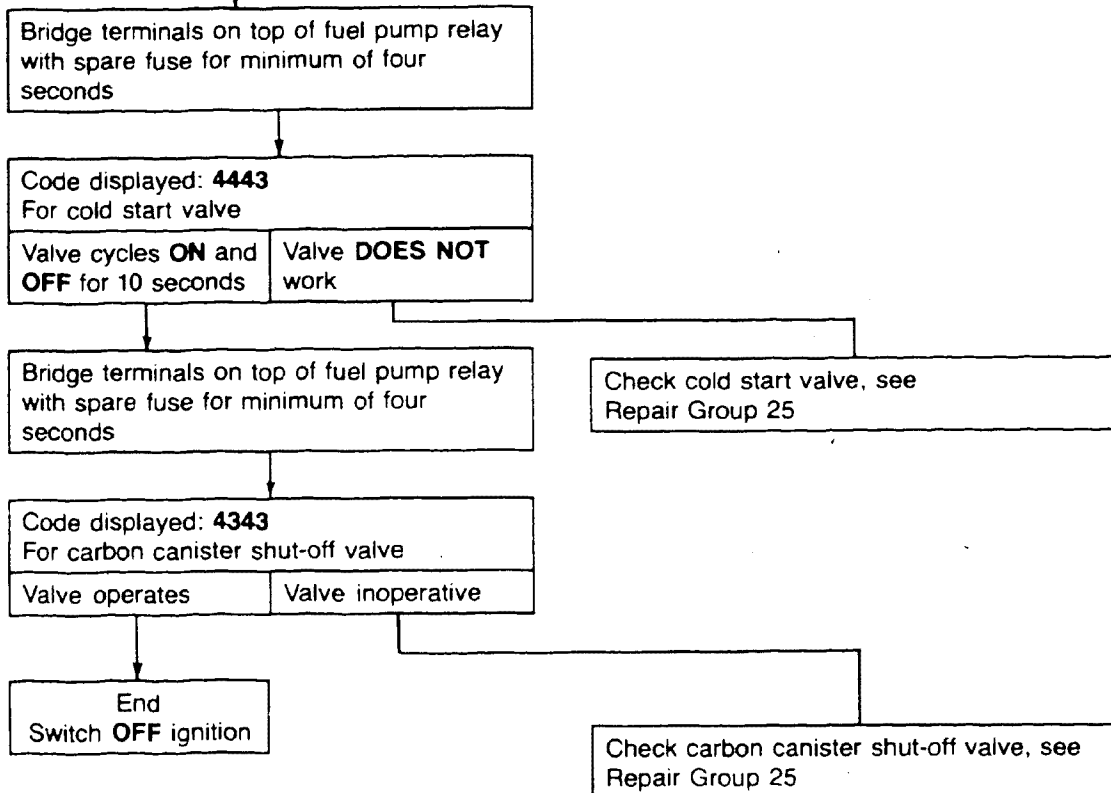
- switch ignition **OFF** to erase input signals from memory

If fuel pump relay or another component fails to operate during diagnosis, entire output diagnosis must be repeated after necessary repairs are made.

Do not crank or start the engine during the output diagnosis. This would automatically switch the system to the input tests when the diagnosis procedure is activated.



continued from previous page



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.

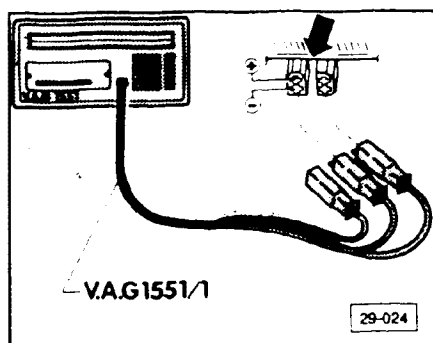
During the output check all of the components being checked will produce an audible click except for the fuel pump relay. Avoid unnecessary background noise while audibly checking these components.

If any of the components fail to click, check the component or the triggering.

Output checks occur in the following triggering sequence:

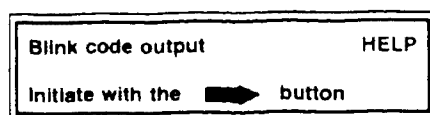
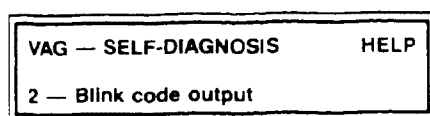
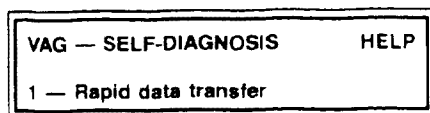
- 4433** Fuel pump relay (J 17)
- 4441** Oxygen sensor frequency valve (N 7)
- 4442** Solenoid valve for boost pressure limiting (N 75)
- 4443** Cold start valve (N 17)
- 4343** Carbon canister solenoid valve (N 80)

Diagnosis, Fault Memory



Output checks activation, using VAG 1551

- switch **OFF** ignition
- 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 USED**
 - voltage supply via fuse 21
- switch **ON** ignition but do **NOT** start engine
 - 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 will be initiated!

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

Blink code 4433
Fuel pump relay (J 17)

- depress  button
 - display will appear as shown
- press  button and hold until display appears as shown

- push  button briefly
 - display will appear as shown

- fuel pump relay must close and fuel pump must run

If fuel pump does **NOT** close

- check triggering

Note

After testing fuel pump relay (J 17) remove fuse 13.

- push  button briefly
 - each of the output check components will be triggered in sequence

Note

The Output Check components, with the exception of the Cold start valve (**N 17**), are triggered (click) until the sequence is advanced to the next component by pressing the  button.

- after the Carbon canister solenoid valve (**N 80**) has been output checked reinstall fuse 13
- switch **OFF** ignition

Self-Diagnosis (SD), general information

The CIS-E III Ignition control unit (**J 88**) features self-diagnostic capability using monitored sensors and components.

The Ignition control unit (**J 88**), after receiving signals from the monitored sensors and components, analyzes the information to create Fault codes which are then stored in fault memory until intentionally cancelled.

This control unit (**J 88**) has the capability of storing up to 17 different Fault codes.

Activate fault memory with the engine running if at all possible.

This control unit (**J 88**) is also equipped to perform 6 different **OUTPUT CHECKS**.

During **OUTPUT CHECKS** the Ignition control unit (**J 88**) provides power or signals to certain components. By checking these components for sound or vibration their operation or function can be verified.

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

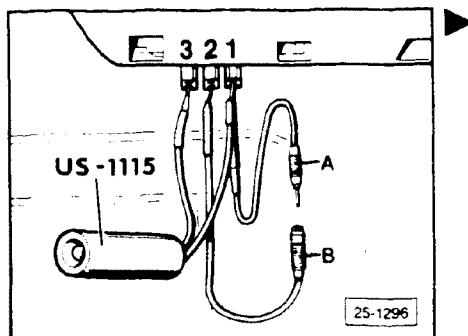
The fault memory of this control unit can be interrogated and the results displayed or printed by using the **VAG 1551** Diagnostic tester.

If a **VAG 1551** Diagnostic tester is not available; the system can be activated, checked and displayed by using the **VW 1594** adaptor set and the **US 1115** LED tester.

Fault memory activating, using US 1115

Requirement

- fuse 21 OK



For OBD vehicles, only connectors A and B are to be connected to diagnostic connectors 1 and 2.

CAUTION

Note the different shapes for the diagnostic connectors.

- connect US 1115 LED tester using VW 1594 adaptors between rear terminals of diagnostic connector 1 and diagnostic connector 3
- connect VW 1594 adaptors to lower terminals of diagnostic connector 1 and diagnostic connector 2
- start engine and let idle

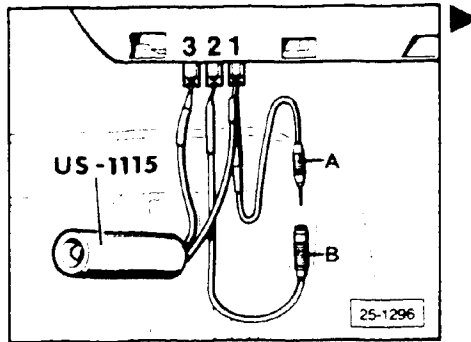
If engine will **NOT** run

- crank engine with starter, but do **NOT** turn ignition **OFF**
- bridge adaptor A (ground) with adaptor B for at least 4 seconds
 - US 1115 **MUST** light up

If US 1115 does **NOT** light up

- check wiring between diagnostic connectors 2 and 3 and engine control unit using wiring diagram, repair as necessary and/or check US 1115 test connections

Diagnosis, Fault Memory



- separate connectors **A** and **B**
 - **US 1115** (already lit) **MUST** begin flashing
- count and note flash signals on **US 1115**
- re-join connectors **A** and **B** again for at least 4 seconds, then separate
- count and note flash signals on **US 1115**
- repeat this procedure until flash code **0000** is displayed
 - **0000** is indicated by flashes in intervals of 2.5 seconds.

To make use of the fault code displays see fault code listing, section D2-140.

VAG 1551, general information

The fault memory of this control unit can be activated and cancelled by using the **VAG 1551** Diagnostic Tester. The results can then be displayed AND printed.

The **VAG 1551** Diagnostic Tester can be used in Mode 1 (Rapid Data Transfer) with this control unit.

The **VAG 1551** can be operated in the following modes:

Mode 1 — Rapid Data Transfer

Mode 2 — Blink Code Output

Mode 3 — Self Test

Mode 4 — Operating Code

If the **VAG 1551** Tester is not available; fault memory activation, Output checks, and cancelling Fault memory can be performed in Mode 2 (Blink code output) using the **VAG 1527 (US 1115)** LED tester for the display, see section D2-110.

Mode 3 (Self Test) and Mode 4 (Operating Code) only affect the **VAG 1551** Tester. Information for these modes is contained in the **VAG 1551** operating instructions.

Fault memory, activating/cancelling using VAG 1551

Note

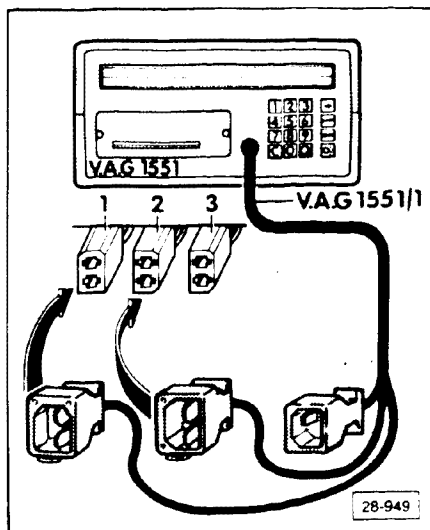
The fault memory must first be activated before it can be cancelled.

Activating

Requirements

- Voltage supply to control unit **OK**
- Fuel pump **OK** (Repair Group 20)
- Fuel pump relay **OK** (Repair Group 20)
- Fuses **13, 21 and 28 OK**
- Ground connections between engine and intake manifold **OK**
- A/C switched **OFF**
- switch **OFF** ignition
- connect **VAG 1551** with adaptor cable **VAG 1551/1** as follows:
 - connect **BLACK** wire to **BLACK** diagnostic connector 1
 - connect **WHITE** wire to **BROWN** diagnostic connector 2
 - **BLUE** wire **NOT** connected

Voltage supply is via fuse 21.



VAG — SELF-DIAGNOSIS HELP

- 1 — Rapid data transfer*
- 2 — Blink code output*

VAG 1551 Display will then show:

*appears alternately

- turn on **VAG 1551** printer by pressing "print" button
 - indicator lamp in button lights up

Diagnosis, Fault Memory

Rapid data transfer HELP
Input address word XX

- start engine, and let idle

If engine will **NOT** start

- crank engine for 5 seconds, then leave ignition switched in the **ON** position
- press button "1"
 - selects "rapid data transmission" operating mode

Display then shows:

Rapid data transfer Q
01 — engine electronics

- press buttons "0" and "1"
 - with "01" address words "engine electronics" are input

Display then shows:

893907404 F ENGINE
coding 00

- enter input by pressing "Q" button

The control unit identification appears on the display, for example:

Control unit does NOT respond!
HELP

Following display appears:

- press **HELP** button
 - list of possible fault causes will print
- after eliminating possible fault causes, re-input and enter the address word **01** for "engine electronics"

Rapid data transfer HELP
Select function XX

- press  button

Following display appears:

Rapid data transfer Q
02 — fault memory recall

- press "0" and "2" buttons
 - with "02" address, function "fault memory recall" is selected

Following display appears:

X Fault(s) registered!

- enter by pressing "Q" button

The number of stored faults or "**no faults registered!**" is displayed:

- press  button
 - stored faults are displayed and printed consecutively

Cancelling

After display and print out of the last fault

- press  button

Following display appears:

Rapid Data Transfer HELP
Select Function XX

- press "0" and "5" buttons

Following display appears:

Rapid Data Transfer Q
05 — erase fault memory

Diagnosis, Fault Memory

CAUTION!
Faults were not recalled from
fault memory

- enter by pressing "Q" button

Following display appears:

- follow work procedure sequentially, i.e. first recall faults from fault memory

CAUTION

If the ignition is switched off or the engine is run between fault memory recall and fault memory cancellation stages, **FAULT MEMORY IS NOT ERASED.**

Rapid Data Transfer
Fault memory is erased!

If the fault memory is erased, the following display appears:

- use fault code chart to find and eliminate faults that have been printed out, see section D2-140
- test drive vehicle again and recall faults from fault memory

Fault code troubleshooting chart

- the following charts list all of the possible faults that can be detected by the CIS-E III ignition control unit (J 88). 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
- check engine ground connections for corrosion or damage. Replace or repair as necessary

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
65535	1111	Control unit defective	Fault in processor section of Ignition control unit (J 88)	—	Replace Ignition control unit (J 88)
00513	2111	Engine speed sender (G 28) No signal	Metal chips in (G 28)	Engine does not start	Check distance between flywheel driving plate and sender (G 28)
			(G 28) connector loose,	—	Repair as necessary
			disconnected wire or short between 3 pin connector (in engine compartment) and (G 28)	—	—
			3 pin connector for (G 28) and sender for Ignition timing point (G 4) are interchanged	—	Exchange connectors
			(G 28) defective	—	Replace (G 28) sender
			Ignition control unit (J 88) defective	—	Replace (J 88) control unit
			Distance between (G 28) and flywheel greater than 1.25 mm	Engine misfires or stalls	Checking, see Repair Group 13
			Broken teeth on flywheel ring gear	—	Replace as necessary

Diagnosis, Fault Memory

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
00514	2112	Ignition timing point sender (G 4)	(G 4) socket loose Distance from (G 4) to pin on flywheel ring gear is greater than 1.25 mm	Fault before engine starts; engine will not start	Check distance between pin and sender
		No signal	Flywheel pin bent or broken	—	—
			Disconnection or short between 3 pin connector (in engine compartment) and (G 4)	Fault after engine starts; Fault code 2112 stored	Check (G 4)
			3 pin connectors from (G 4) and (G 28) engine speed sender are interchanged	Engine will not start	Exchange connectors
			(G 4) defective	—	—
			Disconnection or short between (G 4) and ignition control unit (J 88)	—	—
			(J 88) Ignition control unit defective	—	—

Diagnosis, Fault Memory

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
00515	2113	Hall sender (G 40)	No voltage supply to (G 40) from (J 88) Ignition control unit	Fault before engine starts; engine will NOT start	Check (G 40)
		Signal to plus	Ground missing to (G 40)	—	—
			Signal wire to (J 88) Ignition control unit disconnected or ground short to signal wire	—	—
			Short between terminals 25 and 27 to (J 88)	Fault after engine starts: Fault code 2113 stored	—
			Wire disconnected between 3 pin connector (in engine compartment) and (J 88) Ignition control unit	—	—
			(G 40) defective or out of adjustment	—	—
			(J 88) Ignition control unit defective	—	—
			Position of pin from (G 4) Ignition timing point sender incorrect	—	See Repair Group 13; See Fault code 2113
		Signal to minus	Drive belt cracked	—	See Repair Group 13

Note for Fault codes 2113:
If fault is sporadic; ignore fault indicator.

Diagnosis, Fault Memory

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
00516	2121	Idle switch (F 60)	Throttle cable adjustment incorrect	Idle speed not within specifications	See Repair Group 20
		Signal to plus	(F 60) out of adjustment	—	Check (F 60) and adjust
			Disconnection or short in (F 60) or wiring	—	—
			Mechanical hangup of (F 60)	—	—
00517	2123	Full throttle switch (F 81)	(F 81) out of adjustment	—	Check (F 81) and adjust
		Signal to plus	Disconnection or short in (F 81) or wiring	—	—
			Mechanical hangup of (F 81)	—	—
00535	2141	First knock regulator	Poor fuel quality or octane lower than 87 AKI	Slight loss of power	Fill with specified fuel
				Slight increase in fuel consumption	—
		Control limit exceeded		High speed not attainable	—
		Mechanical fault	Abnormal engine noises	Engine runs out of balance	Check fastening of auxiliary components and engine mounts
			Disconnected shield of Knock sensor (G 61)	—	Determine disconnection per wiring diagram and eliminate
			Knock control module in (J 88) Ignition control unit defective	Increased fuel consumption	Replace (J 88) Ignition control unit
				Power loss	—

Note for Fault codes 2141 and 2143:

The spark advance angle (ignition retard adjustment) via the knock sensor control is read on cylinders 1 and 2 by the first knock sensor (red) and on cylinders 3, 4 and 5 with the second knock sensor (white).

Diagnosis, Fault Memory

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
00524	2142	Knock sensor I (red) (G 61)	(G 61) loose (on cylinder 2)	Increased fuel consumption	Tightening torque 10 Nm (7 ft lb)
		No signal	Disconnection or short between (G 61) and (J 88) Ignition control unit	Power deficiency	Determine disconnection or short per wiring diagram and eliminate
			(G 61) defective	—	Replace (G 61)
			(J 88) Ignition control unit	—	Replace (J 88)
00536	2143	Second knock regulator	Poor fuel quality or octane lower than 87 AKI	Slight loss of power	Fill with specified fuel
				Slight increase in fuel consumption	—
		Control limit exceeded		High speed not attainable	—
		Mechanical fault	Abnormal engine noises	Engine runs out of balance	Check fastening of auxiliary components and engine mounts
			Disconnected shield of Knock sensor (G 66)	—	Determine disconnection per wiring diagram and eliminate
			Knock control module in (J 88) Ignition control unit defective	Increased fuel consumption	Replace (J 88) Ignition control unit
				Power loss	—

Note: for Fault codes 2141 and 2143:

The spark advance angle (ignition retard adjustment) via the knock sensor control is read on cylinders 1 and 2 by the first knock sensor (red) and on cylinders 3, 4 and 5 with the second knock sensor (white).

Diagnosis, Fault Memory

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
00540	2144	Knock sensor II (white) (G 66)	(G 66) loose (on cylinder 4)	Increased fuel consumption	Tightening torque 10 Nm (7 ft lb)
		No signal	Disconnection or short between (G 66) and (J 88) Ignition control unit	Power deficiency	Determine disconnection or short per wiring diagram and eliminate
			(G 66) defective	—	Replace (G 66)
			(J 88) Ignition control unit	—	Replace (J 88)
00543	2214	Upper RPM limit exceeded	Engine speed too high	Fuel pump relay (J 17) shutoff via (J 88) Ignition control unit	Inform customer
00575	2221	Intake manifold	Vacuum hose between intake manifold and (J 88) Ignition control unit is removed, cracked or defective	No boost pressure control	Check vacuum hose
		No signal		No acceleration enrichment	—
00519	2222	Intake manifold pressure sender (G 71) Signal outside of specs	Sender for intake manifold pressure (G 71) inside of (J 88) Ignition control unit is defective	No boost pressure control No acceleration enrichment	Replace (J 88) Ignition control unit

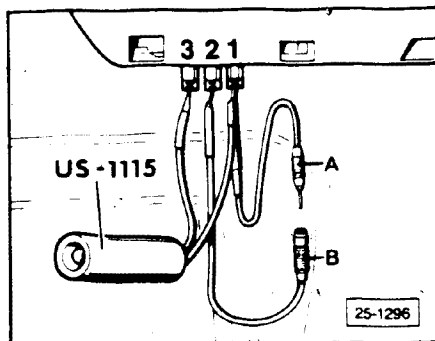
Diagnosis, Fault Memory

Fault code number	Fault code	VAG 1551 display	Cause of fault	Effects	Corrective measure
00544	2224	Engine manifold pressure	Dump valve defective Hose between dump valve and wastegate frequency valve has fallen off, cracked or become defective	Fuel pump relay (J 17) shutoff via (J 88) Ignition control unit	See Repair Group 21 Check hose, replace or repair
00522	2312	Coolant Temperature sender (G 62) Signal on - Signal on +	Disconnection or short in signal wire	Cold start difficulty at very low temperatures Engine runs out of balance during warmup phase	Check (G 62) —
00523	2322	Intake air temperature sender (G 42) Signal on - Signal on +	Disconnection or short in signal wire (G 42) defective	— —	Check (G 42) —
00525	2342	Oxygen sensor (G 39) No signal	Disconnection to (J 88) Ignition control unit Sensor heating defective Fuse no. 28 (sensor heat) defective Heater resistor (internal) defective Signal wire short to shield	CO content out of spec Increased fuel consumption Soot on spark plug CO content before catalyst greater than 3.0 Volume % —	Check Oxygen sensor, control, see Repair Group 25 — — — —
00000	4444	No fault recognized	If a complaint exists, fault was not recognized by Self-Diagnosis	—	—
00000	0000	End of output	—	—	—

Output checks activating, using US 1115

Note

- output checks can only be performed if the engine is **NOT** running
- the cold-start valve is controlled for only 10 seconds during output checks, if this check must be repeated, re-initiate the output check sequence
- output checks are terminated if the engine is started or an RPM signal is recognized



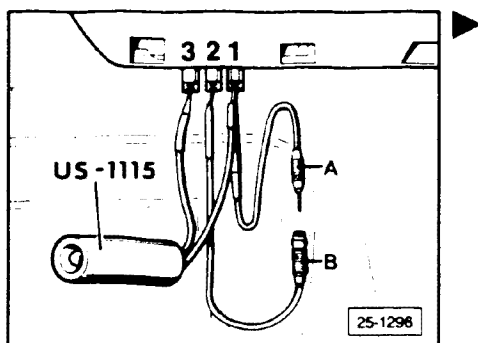
Requirement

- fuse 21 OK
- connect **US 1115** LED tester using **VW 1594** adaptors between rear terminals of diagnostic connector 1 and diagnostic connector 3
- connect **VW 1594** adaptors to front terminals of diagnostic connectors 1 and 2
- join connectors **A** (ground) and **B** using **VW 1594** adaptors
- switch **ON** ignition
 - **US 1115 MUST** light up

If **US 1115** does **NOT** light up

- check if ignition was turned **ON**
- check **US 1115** connections
- check wiring from engine control unit to diagnostic connectors 2 and 3 using wiring diagram

Diagnosis, Fault Memory



- after about 5 seconds, separate connectors A and B
 - US 1115 (already lit) **MUST** start flashing
- count flashes on US 1115 LED tester or OBD warning lamp and note code; see code display sequence below

The fuel pump relay must energize and the fuel pump must run.

After checking the fuel pump relay:

- remove fuel pump relay and fuse 13
- join connectors A and B for at least 4 seconds, then separate
- check all six output checks, one after the other, using this procedure, see code display sequence, below
- repeat this procedure until code **0000** is displayed by US 1115 flashing in intervals of 2.5 seconds

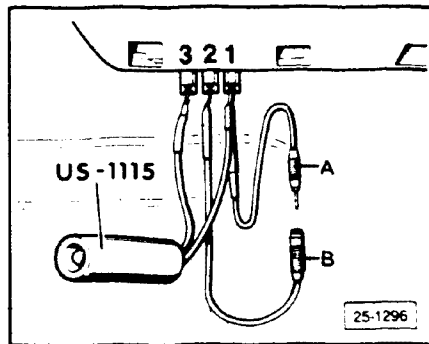
To erase the Fault memory see section D2-160.

Code display sequence:

- 4433** fuel pump relay
- 4441** OXS frequency valve
- 4443** cold-start valve
- 4442** wastegate frequency valve
- 4343** carbon canister shut-off valve
- 4331** carbon canister frequency valve

- output check functions are checked by sound or by touch during the output check diagnosis
- all outputs click except for the fuel pump relay
- the cold-start valve is only controlled for 10 seconds
- the immediate environment of the vehicle must be quiet

Diagnosis, Fault Memory



Fault memory erasing, using VW 1594 and US 1115

The Fault memory of the engine control unit can be erased following the display of Fault code **0000** after performing the output checks diagnosis.

- join connectors **A** and **B** for at least 4 seconds, then separate

Note

The memory is erased when there are **NO** additional flash codes displayed on the **US 1115** LED tester or on the **OBD** warning lamp.

Output checks, using VAG 1551

Mode 1 (Rapid Data Transfer)

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 CHECKS** diagnosis, the Carbon canister solenoid valves, the Oxygen sensor frequency valve, the Boost pressure limiting valve and the Cold start valve are checked audibly or by touch. Avoid unnecessary background noise while audibly checking these components.

During the **OUTPUT CHECKS**, all of the components being checked will produce a sound or vibration except for the fuel pump relay. Avoid unnecessary background noise while audibly checking these components.

If any of the components fail to sound or vibrate, check the component or its triggering.

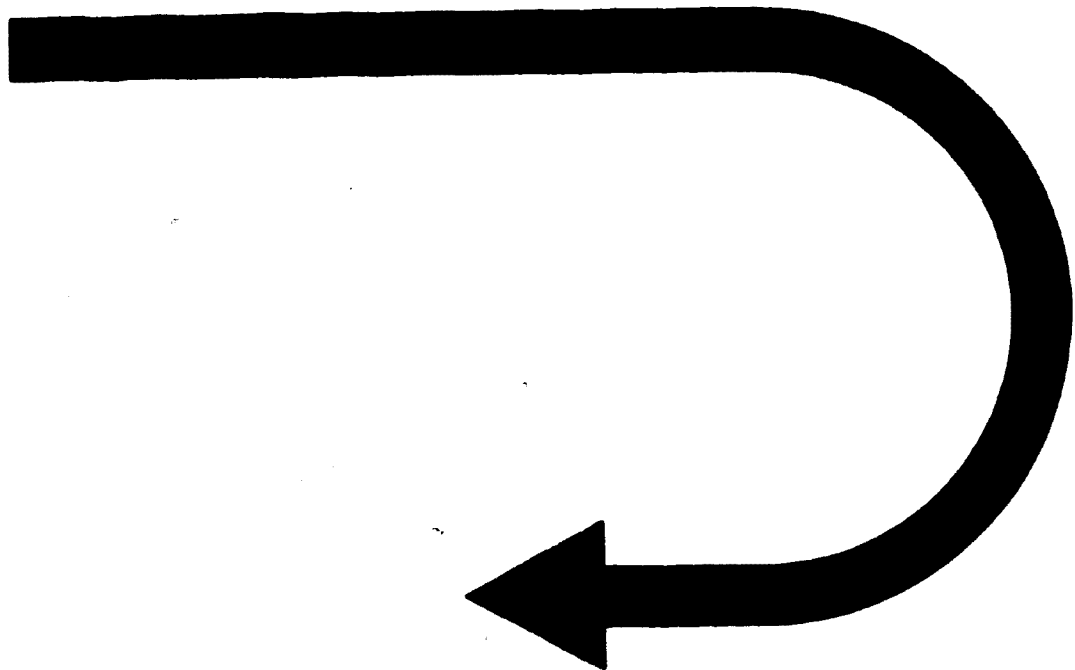
OUTPUT CHECKS occur in the following triggering sequence:

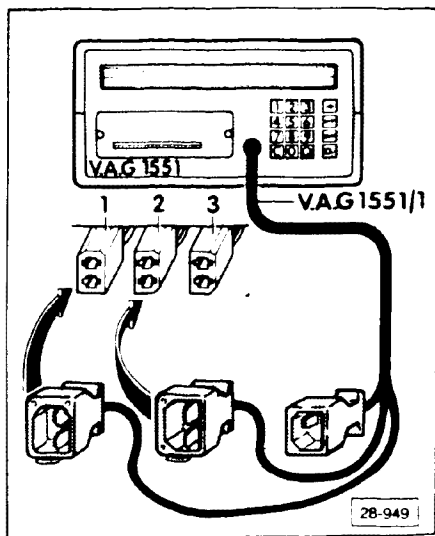
Fuel pump relay (J 17)
Oxygen sensor frequency valve (N 7)
Boost pressure limiting valve (N 75)
Cold start valve (N 17)
Carbon canister solenoid valve I (N 80)
Carbon canister solenoid valve II (N 115)

Note

During **OUTPUT CHECKS** the Cold start valve (N 17) is only actuated for 10 seconds.

CONTINUED IN THE
BEGINNING OF NEXT ROW





Output checks activation, using VAG 1551

- switch **OFF** ignition
- 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 USED**

VAG SELF-DIAGNOSIS HELP
1 — Rapid data transfer

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

VAG SELF-DIAGNOSIS HELP
2 — Flash code output

- press button **1** of **VAG 1551** diagnostic tester to select operating mode "**Rapid data transfer**"

Rapid data transfer HELP
Input address word XX

- display will appear as shown

Rapid data transfer Q
01 — engine electronics

- press "**0**" and "**1**" buttons to input address words "**engine electronics**"

- display will appear as shown

893907404 F engine

- enter input by pressing "**Q**" button

The control unit identification appears on the display. (example shown)

Diagnosis, Fault Memory

Control unit does not respond! HELP ▶

- press  button
 - display will appear as shown

Rapid data transfer HELP ▶
Select function XX

- press  button
 - display will appear as shown

Rapid data transmission Q ▶
03 — output check diagnosis

- press "O" and "3" buttons to select function "**Output check diagnosis**"
 - display will appear as shown

Output check diagnosis  ▶
Fuel pump relay (J 17)

- enter input by pressing "Q" button
 - display will appear as shown

- fuel pump relay must close and fuel pump must run

If **NO**

- check fuel pump relay triggering
- after checking fuel pump relay: remove fuse 13
- push  button to check all components included in the **OUTPUT CHECKS** in sequence

After checking "Carbon canister solenoid valve II (N 115)"

- re-insert fuse 13

The Carbon canister solenoid valve II (N 115) will continue to click until the  button is pushed which will end **OUTPUT CHECKS**.

To repeat the **OUTPUT CHECKS**

- re-select 03 function via the **VAG 1551**

Fault memory, checking/erasing

Beginning July 1990, a revised Ignition control unit (having an additional fault code) was installed in:
Audi 200, Front Wheel Drive, California vehicles.

The new fault code display(s)

00533	2231
Idle control	

Fault Code Number

Blink Code

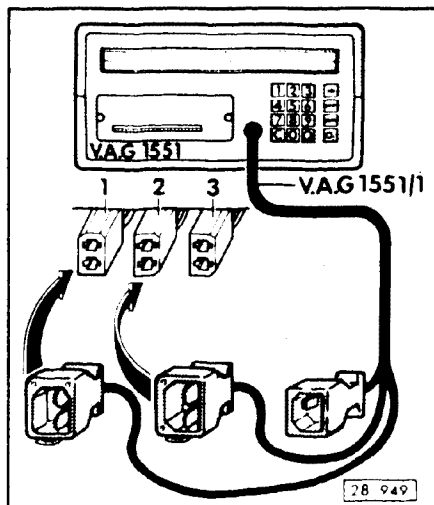
Checking/erasing fault memory using VAG 1551 Diagnostic Tester in Rapid data transfer mode

CAUTION

Fault memory **cannot** be erased until it has first been read (checked).

- switch **off** ignition
- connect **VAG 1551** diagnostic tester to diagnostic connectors (above pedals in driver's side footwell) using **VAG 1551/1** harness connector as follows

- **BLACK** wire to **BLACK** connector 1
- **WHITE** wire to **BROWN** connector 2
- **BLUE** wire **NOT** used



VAG - SELF DIAGNOSIS	HELP
1- Rapid data transfer	

- displays will alternately appear as shown

VAG - SELF DIAGNOSIS	HELP
2- Blink code output	

- press the **HELP** button to obtain additional operating help from the **VAG 1551**
- press the **HELP** button to step through the program sequence
- start engine and let idle

Diagnosis, Fault Memory

If engine will not start

- crank engine for 5 seconds then leave ignition switched in the **ON** position
- switch on printer using print button
 - light in the button lights up
- press button **1** to select "**Rapid data transfer**" operating mode

Rapid data transfer HELP
Input address word XX

- display will appear as shown

- press **0** and **1** buttons to select function **01** (**engine electronics**)
 - display will appear as shown

Rapid data transfer Q
01 Engine Electronics

- enter by pressing **Q** button

447905383 M ENGINE
CODING CALIFORNIA

- display shows example of control unit identification and possible coding variants

Control unit does not respond HELP

- If display appears as shown

- push **HELP** button to print list of possible fault causes

After eliminating possible fault causes

- press **0** and **1** buttons to select function **01** (**engine electronics**)

Rapid data transfer Q
01 Engine Electronics

- display will appear as shown

- enter by pressing **Q** button
- press **→** button

Rapid data transfer HELP
Select function XX

- display will appear as shown

Note

Press the **HELP** button for an overview of the available functions.

- press **0** and **2** buttons to select function **02** "**Check fault memory**"

Diagnosis, Fault Memory

Rapid data transfer Q
02 - Check fault memory



- display will appear as shown
- enter by pressing Q button

NO FAULTS RECOGNIZED



- one of the displays shown will appear

X FAULT(s) RECOGNIZED



- press  button
- stored faults are displayed and printed consecutively, see section D2-200 for the Fault code listing

After display and print out of the last fault

- press  button

Rapid data transfer HELP
Select Function XX



- display will appear as shown
- press 0 and 5 buttons to erase fault memory

Rapid data transfer Q
05 - Erase fault memory



- display will appear as shown
- enter by pressing Q button

If the display appears as shown

CAUTION! Faults were not erased from Fault memory

It could be a result of switching off the ignition or running the engine between Fault memory checking and fault memory erasing stages, in which case Fault memory is **not** erased.

Rapid data transfer
Fault memory erased



If the fault memory is erased the display will appear as shown

- use fault code table on page D2-200 to find and eliminate faults that have been printed out
- test drive vehicle for at least 5 minutes
- check fault memory to ensure that all faults have been eliminated

Fault code chart

Display on VAG 1551		Fault causes/effects	Fault elimination
Fault Code Number	Blink Code		
00533	2231	Speed signal from ignition control unit (J 88) to idle stabilizer control unit (J 142) disconnected or shorted	Check control unit triggering for idle stabilization (J 142), see section D2-210 Perform test step 4, see section D2-210
Idle control No fault recognized		Open circuit or short between temperature sensor (N 10) and idle stabilizer control unit (J 142)	Perform test step 6, see section D2-210
		Open circuit between idle switch (F 61) and idle stabilizer control unit (J 142)	Perform test steps 2 and 3, see section D2-210
		Open circuit or short between idle stabilizer control unit (J 142) and idle stabilizer valve (N 71)	Perform test step 7, see section D2-210
		Open circuit or short between wiring for ignition control unit (J 88) and idle stabilization control unit (J 142) Faulty switch for fuel deceleration shutoff in idle stabilization control unit (J 142)	Perform test step 6, see section D2-210 Check wiring between terminal 4 of (J 88) harness connector and terminal 15 of (J 142) harness connector

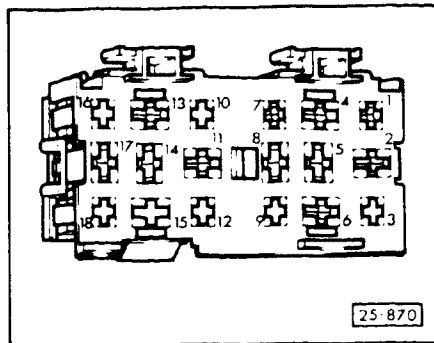
Idle stabilization system control unit triggering, checking

Requirements

- battery voltage **OK**
- ground connection on intake manifold **OK**

Note

Use the **Fluke 83** multimeter (**US 1119** or equivalent), the **US 1115** LED tester and the **VW 1594** adaptor kit to perform measurements or electrical checking.



The idle stabilization control unit is under the drivers side A-pillar cover and occupies relay positions **19** and **29**.

- switch multimeter to 20 Volt DC range
- check triggering at idle stabilizer control unit harness connector as follows

Test step	Terminal number	Function being tested	Additional steps	Specified values
1	14 + 5	Terminal 15 (supply voltage)	Ignition ON	Approximate battery voltage
2	8 + 5	Idle switch (F 60)	Ignition ON Throttle in idle position Idle switch closed	Approximate battery voltage
3	8 + 5	Idle switch (F 60)	Ignition ON Operate idle switch using throttle lever or accelerator pedal	0 Volt
■ connect US 1115 LED tester between following terminals instead of multimeter				
4	17 + 5	Speed signal from ignition control unit (J 88)	Operate starter	LED tester must flicker
5	7 + 5	Sender for speed sensor (G 22)	Switch ON ignition	LED tester must light up

Diagnosis, Fault Memory

- switch multimeter to resistance range

Test step	Terminal number	Function being tested	Additional steps	Specified values
6	13 + 5	Temperature sensor (N 10) or temperature sensor for idle stabilization (G 87)	—	Engine @ approximately 20°C (68°F): 800 to 1000 Ohms @ approximately 80°C (176 °F): 70 to 150 Ohms
7	11 + 4	Idle stabilizer valve (N 71)	Idle stabilizer valve OK and connected, see Repair Group 25	3 to 8 Ohms
■ switch multimeter to 20 Volt DC range				
8	6 + 5	+ from A/C compressor (N 25)	Ignition switched ON A/C switched ON Operating mode: AUTO Blower: HIGH Temperature range: HIGH	approximate battery voltage

If specified values **NOT** obtained

- check wiring using wiring diagram

If no open or short circuits found

- replace components and repeat test

If all specified values obtained and wiring is **OK**

- replace control unit (J 142)

Ignition system, electrical troubleshooting

Ignition control unit checking using VAG 1598 test box

Note

Before performing electrical checks, check fault memory and perform output checks.

- remove ignition control unit (J 88)

CAUTION

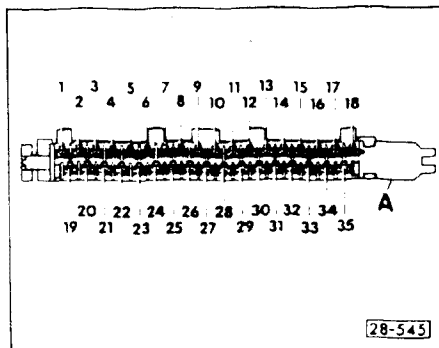
The ignition must be switched **OFF** before disconnecting or connecting the ignition control unit harness connector.

Note

The terminal numbers on the Test box are identical with the numbers on the harness connector.

Use the **Fluke 83** multimeter (**US 1119** or equivalent), the **US 1115** LED tester and the **VW 1594** adaptor kit to perform measurements or electrical checking.

- connect **VAG 1598** Test box using **VAG 1598/7** adaptor cable between the ignition control unit and the control unit harness connector **A**



Diagnosis, Fault Memory

Test step	Test box terminal number	To be tested	Test conditions or additional steps	Specifications	If specifications not obtained
1	9 + 33	Ignition control unit (J 88), voltage supply 9 = ground connection on intake manifold 33 = + from fuse 21	Ignition switched OFF	Approximate battery voltage	Find open circuit using wiring diagram Repair as necessary
2	18 + 35	Ignition control unit (J 88), voltage supply 18 = ground connection 35 = + connection	Ignition switched ON	Approximate battery voltage	Find open circuit using wiring diagram Repair as necessary
3	18 + 20	Idle switch (F 60)	Ignition switched ON Throttle in idle position	Approximate battery voltage	Idle switch requires adjustment
4	18 + 26	Full throttle switch (F 81)	Ignition switched ON Operate throttle until wide open	Approximate battery voltage	Find open circuit using wiring diagram Repair as necessary
5	23 + 33	Carbon canister solenoid valve 2 (N 115)	Start engine and let run at 1500 RPM	Approximate battery voltage	Faulty ignition control unit (J 88)
6	4 + 35	Deceleration fuel shutoff valve (N 65)	Start engine and let idle Raise engine speed to 2000 RPM	Up to approximately 1200 RPM, battery voltage must be present	Find open circuit using wiring diagram
■ disconnect multimeter and make the following check using the US 1115 LED tester					
7	3 + 33	Carbon canister solenoid valve 1	Start engine and let idle	After approximately 40 seconds, LED tester must flash	Faulty ignition control unit (J 88)

This is what's new:

Since the last filming of this fiche, we added or changed:

CIS-E system electrical checking procedures have been added to Repair Group D2 (Section D2-325).

Index -->
