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20-valve (up to 03/90 prod.)

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## Fault Memory, general description

### For multipoint injection (MPI)

The MPI control unit (J 192) is equipped with a self-diagnostic system. If faults occur in monitored sensors or components, they are stored in the fault memory.

The MPI control unit differentiates faults after evaluating the information it receives and stores these in fault memory until the code is erased.

The control unit also has a self-diagnostic mode for its output circuits (see section D2-250).

The self-diagnostic system of the control unit monitors signals of the electrically-controlled engine components. If faults occur in these circuits, they are stored in the permanent long-term memory and can be called up and read via a blink code.

For 49 states vehicles, calling up and erasing codes from the fault memory and output check can be performed with LED tester **US-1115** and adaptor leads from the **VW 1594 KIT**.

On California vehicles, calling up, reading, erasing codes from fault memory and output check can be performed with the instrument cluster engine warning lamp.

As a self check, the engine warning lamp should light up every time the ignition is switched **ON**.

If the engine warning lamp does not light when ignition is switched **ON**, jumper terminals on diagnostic connectors as described, (see section D2-250).

If engine warning lamp does not light with jumpered terminals and ignition switch **ON**, check wiring according to wiring diagram.

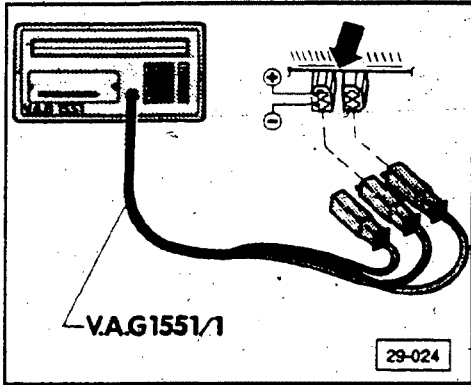
Stored codes can be read after initiation of fault display, see "Calling up faults from fault memory" (see section D2-250).

Erasing fault memory (see section D2-260).

Output checks can only be performed when engine is not running.

Fault memory can be erased only after output checks have been performed.

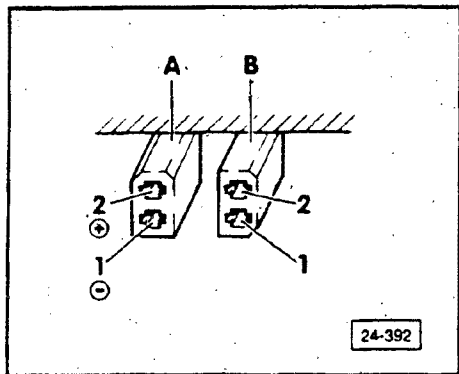
## VAG 1551 diagnostic tester, connecting



- 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

## Fault memory, display



Calling up fault memory and output checks are initiated by connecting both terminal 1s together on the diagnostic connectors.

- Diagnostic connectors **A** and **B** are located under storage area of driver's footwell

### Note

Calling up fault memory and performing output checks differ in that, the diagnostic terminal is grounded **before** ignition **ON**, for output checks, and after ignition **ON**, when recalling fault memory.

If output check or fault memory cannot be initiated check wiring from diagnostic connectors to MPI control unit, and to fuse 21 according to the wiring diagram.

If there are no faults in wiring, replace MPI control unit.

### Blink code display with test lamp US 1115 or California engine warning light

When calling up codes from fault memory, blink code can be repeated.

During output diagnosis, respective component is identified by a blink code.

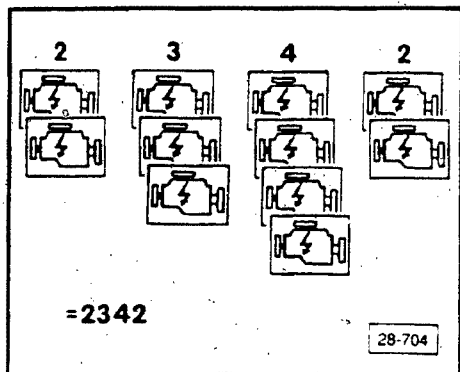
- Each code consists of 4 blink pulse groups with a maximum of 4 blink pulses each. There is a pause (light off) of about 2.5 seconds between blink pulse groups.

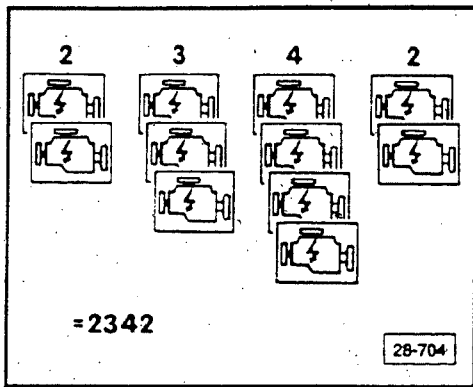
Add individual blinks (between 1 and 4) of each pulse group to determine 4 digit code being transmitted.

To diagnose faults, all blink codes are in fault table (see section D2-270).

See group 01 for blink codes related to output diagnosis.

Blink code display is as follows: After a start signal (light on) followed by a pause (light off) of 2.5 seconds each, a code sequence of 4 digits begins.





The first blink of actual code will last 0.5 seconds, a pause of 0.5 seconds. (light off) will follow if there are more blinks to add to the group. If the first digit of the code is a 2, the lamp will blink again for 0.5 seconds, (light on). This will complete the first group. A pause of 2.5 seconds will follow before transmission of the 2nd digit (pulse group) of code begins.

As the 2nd group is to represent a 3 (see 28-704) the light will blink 3 times for 0.5. each followed by 0.5 seconds light off. The 3rd blink would be followed by a pause of 2.5 seconds to indicate end of transmission for pulse group 2: Pulse group 3 and 4 will transmit their digit in a like manner.

After transmission of four blink pulse groups, there is a pause of about 2.5 seconds. The code will then repeat itself until the next storage location or component is called up during output diagnosis.

### Fault memory code output, end

The fault code **0000** (output end) is displayed by repeated blink pulses in 2.5 second intervals. Blink pulses are repeated until the ignition is switched **OFF** or engine speed is increased to over 2000 rpm.

### Fault memory code callup

#### Requirements

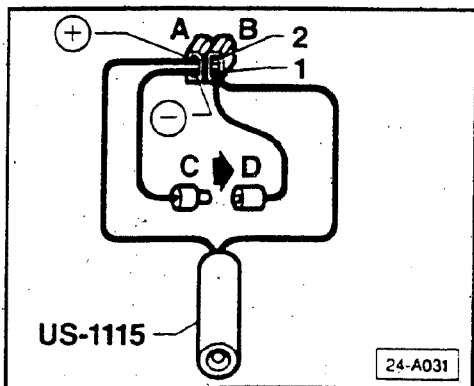
- fuel-pump relay OK
- fuses 13, 21, 27 and 28 OK
- note safety measures, and guidelines for working with fully electronic ignitions (see section D2-10).
- for California vehicles, engine warning lamp OK

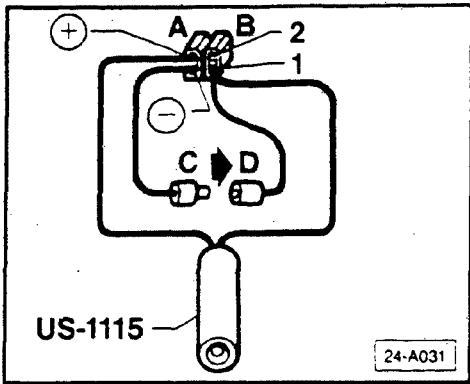
#### Note

Terminal 2 voltage supply, positive (+) of black diagnostic connector **A** is protected by fuse 21. Terminal 1 of connector **A** is connected to ground (-), diagnostic connector **B** (brown) utilizes terminal 1 only (see wiring diagram).

#### Connection of test leads for fault memory code call-up

- connect as per figure 24-A031, **DO NOT** connect jumper ends **C** and **D** at this time





## Note

For California vehicles, **VW 1594/19** adaptor wire may be used to start code callup by jumping terminal **A1** to **B1** for 4 seconds after ignition switched **ON**

- switch ignition **ON**
- connect jumper end **C** (ground) to jumper end **D** after 4 seconds, disconnect
- observe light and note blink sequence
- if no faults are stored, light will blink code **4444** (will not display on engine warning lamp)
- if transmitted code is other than **4444** refer to fault tables (see section D2-270)
- continue 4 second jumper and code output sequence until **0000** (all codes transmitted from fault memory) is displayed
  - Digit **0** is represented by four blinks, 2.5 seconds (light on) each followed by a pause (light off) of 2.5 seconds.
  - **0000** does not display on engine warning lamp
- switch ignition **OFF**.

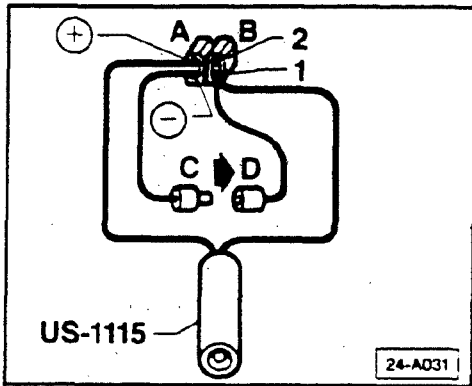
## Note

If more than 1 code has been transmitted, perform diagnosis and repairs in the same sequence as the codes were displayed.

## Note

If no faults were displayed, and engine does not run, check ignition timing reference sensor, engine-speed sensor, and Hall sender.

## Fault memory, erasing



- after call-up of fault memory, switch ignition **OFF** and perform output checks

### CAUTION

Codes in fault memory can only be erased after output check has been performed.

### Note

When jumper ends **C** and **D** are reconnected for at least 4 seconds at end of output check following a display of code **0000**, switch ignition **OFF** and fault memory codes will be erased.

## Fault code, troubleshooting table

### CAUTION

To avoid damage to tester and control unit terminals, use adaptor kit **VW 1594** for all troubleshooting connections.

### Note

Before replacing components, check wiring according to wiring diagram.

Flash Code	Fault Source	Possible Cause/ Symptom	Fault Correction
<b>1111</b>	Control unit	Microprocessor in MPI control unit is faulty	Replace MPI control unit
<b>**1231</b>	Transmission speed sensor — (G 68)	Open or short circuit in sensor wiring, transmission speed sensor faulty, instrument cluster circuit faulty	Check speed signal (see group 24)
<b>2111</b>	Engine-speed sensor (G 28*) (gray)	Open or short circuit in sensor wiring, engine-speed sensor faulty	Check engine-speed sensor (see group 24)
<b>2112</b>	Ignition reference sensor (G 4*) (black)	Open or short circuit in sensor wiring, ignition — reference sensor faulty  Engine-speed sensor exchanged with ignition-point sensor	Check ignition — reference sensor (see group 28)  Connect sensors according to wiring diagram corresponding and color coding
<b>2113</b>	Hall sensor (G 40*)	Open or short-circuit in sensor wiring, Hall sensor faulty	Check Hall sensor (see group 28)
<b>2114</b>	Ignition distributor basic	Distributor out of adjustment	Ignition distributor — adjustment (see group 28)
<b>2121</b>	Idle switch (F 60*)	Open or short-circuit, idle switch	Check idle switch (see group 24)

\*Component code in wiring diagram.

\*\*Does not display on California engine warning light



Flash Code	Fault Source	Possible Cause/ Symptom	Fault Correction
2141 or 2143	Knock control 1 Knock sensor 1 (G 61*, red) for cylinder 2	(Engine pings, knocks)	Check cylinder compression, fuel-injection system
	Knock control 2 Knock sensor 2 (G 66*, white) on cylinder 4	Fuel octane number too low (minimum 87 AKI)	Use specified fuel (recommended 91 AKI)
2142 or 2144	Knock sensor 1 (G 61*, red) on cylinder 2	Open or short-circuit in sensor wiring	Check wire routing of respective knock sensor according to wiring diagram
	Knock sensor 2 (G 66*, white) on cylinder 4	Knock sensor faulty	Replace knock sensor
2212	Throttle-valve potentiometer (G 69*)	Throttle-valve potentiometer output voltage too low or high in relation to air mass	Check throttle-valve potentiometer group and wire routing (see Group 24)
2242	CO potentiometer (G 74*)	Output voltage of CO potentiometer too high	Check air mass sensor (see Group 24)
2232	Air mass sensor (G 70*)	Output voltage of air mass sensor too low or too high in relation to rpm	Check air mass sensor and wiring (see Group 24)
2233	Air mass sensor (G 19*)	Reference voltage on air mass sensor greater than 1 Volt	Check air mass sensor wiring (see Group 24)
2234	MPI control unit supply voltage	Vehicle system voltage too low, open circuit to terminal 18 of MPI connector A or fuel-pump relay	Check supply voltage to control unit (see Group 24) Check fuel-pump relay (see Group 24)
2312	Coolant- temperature sensor (G 62*)	Open or short-circuit in sensor wiring, coolant- temperature sensor faulty	Check coolant temperature sensor (see Group 24)
2342	OXS sensor	OXS sensor has open or short-circuit	Check OXS sensor (see Group 24)

\*Component code in wiring diagram.

# Diagnosis, Fault Memory

Flash Code	Fault Source	Possible Cause/ Symptom	Fault Correction
4431	Idle-stabilizer valve (N 71*)	Open or short-circuit to idle-stabilization valve	Check idle-stabilizer valve (see Group 24)
**4444	No faults stored in memory	—	—
**0000	Fault transmission completed	—	—

\*Component code in wiring diagram.

\*\*Does not display on California engine warning light

## Output checks, diagnosis

### General information

The MPI control unit is equipped with an output circuit check mode. In this mode the control unit will activate the 8 following components in sequence. When activated, the components may be checked audibly or by touch.

- a blink code has been assigned to each component, which can be displayed with test light **US 1115** at vehicle diagnostic connectors or on engine warning lamp. (California vehicles only)

		<b>Blink code</b>
1 — Fuel pump relay	(J 17*)	<b>4433</b>
2 — Fuel injector (cylinder 1)	(N 30*)	<b>4411</b>
3 — Fuel injector (cylinder 2)	(N 31*)	<b>4412</b>
4 — Fuel injector (cylinder 3)	(N 32*)	<b>4413</b>
5 — Fuel injector (cylinder 4)	(N 33*)	<b>4414</b>
6 — Fuel injector (cylinder 5)	(N 83*)	<b>4421</b>
7 — Idle stabilizer valve	(N 71*)	<b>4431</b>
8 — Carbon canister solenoid valve	(N 80*)	<b>4343</b>

\*Component code used in wiring diagrams.

### Note

Be familiar with the following points before performing output checks.

- a low level noise area is preferred when conducting output checks
- fuel pump relay check requires that fuel pump is running, (do not confuse sound of fuel pressure regulator with that of fuel pump)
- fuel injectors are pulsed 5 times each, for 1 millisecond per pulse
- idle stabilizer valve and carbon canister solenoid valve are pulsed on and off continually until next output is activated or mode is finished
- do not crank engine during output check. If this occurs, complete sequence must be repeated from start
- to repeat output check mode sequence, ignition must be switched to **OFF** and restarted briefly, (if engine is not run, fuel injectors will not pulse during next output check)
- if any component does not operate according to check sequence, repeat call-up fault memory and repair circuit as required

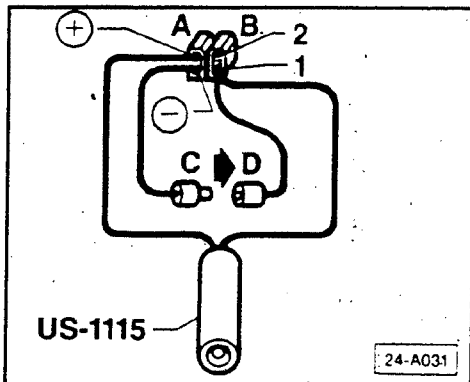
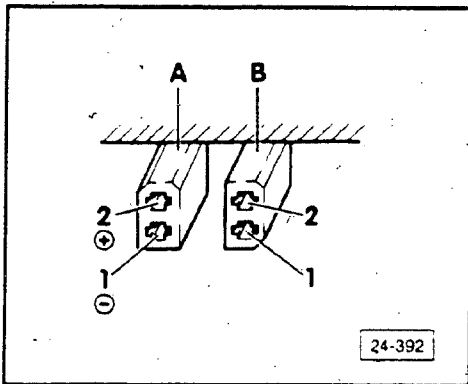
## Output check callup sequence and fault memory code erasing

### Requirements

- fuel-pump relay **OK**
- fuses 13, 21, 27 and 28 **OK**
- note safety measures, and guidelines for working with fully electronic ignitions (see section D2-10).
- for California vehicles, engine warning lamp **OK**

### Note

Terminal 2 voltage supply, positive (+) of black diagnostic connector **A** is protected by fuse 21. Terminal 1 of connector **A** is connected to ground (-) diagnostic connector **B** (brown) utilizes terminal 1 only (see wiring diagram). Both connectors are located above driver foot well.



### Connecting test leads for fault memory code call-up

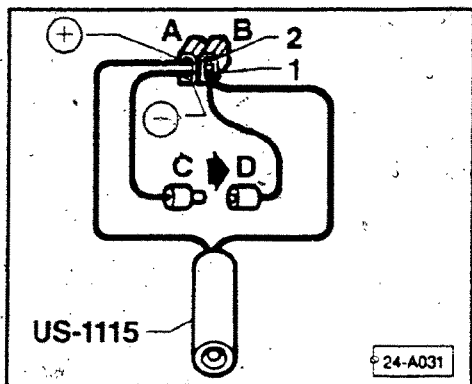
- connect as shown, **DO** connect jumper ends **C** and **D** at this time

### Note

For California vehicles, **VW 1594/19** may be used to start code call-up by jumping terminal **A1** to **B1** before ignition is switched **ON**

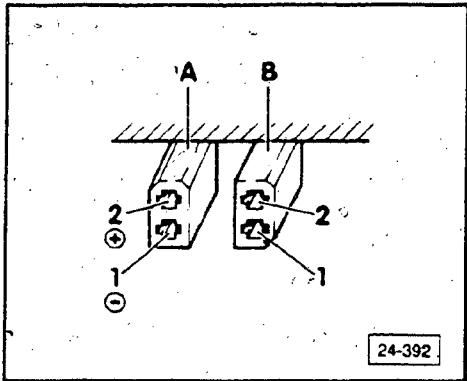
### Output check, callup

- switch ignition **ON**
- disconnect jumper ends **C** and **D** after a minimum of 4 seconds
  - blink code **4433**. (fuel pump relay, **J 17**) should appear and fuel pump should run audibly
- if blink code does not appear, check
  - control unit supply voltage (see group 24)
  - wiring and test connections of diagnostic terminals
  - repair as required
  - perform fault memory call-up



- repeat output check
- if fuel pump does not run, check fuel pump relay (see group 24)
- if fuel pump runs, connect jumper end **D** to jumper end **C** for at least 4 seconds, disconnect
- blink code **4411** cylinder 1 fuel injector (**N 30**) should appear
  
- briefly open throttle to wide open and listen for injector cylinder 1 pulse
  - this may be repeated 4 more times at cylinder 1
  
- if injector does not pulse, see group 24
- if injector does pulse, repeat output injector check for remaining cylinders
  - **4412**, cylinder 2 injector (**N 31**)
  - **4413**, cylinder 3 injector (**N 32**)
  - **4414**, cylinder 4 injector (**N 33**)
  - **4421**, cylinder 5 injector (**N 83**)
  
- connect jumper ends **D** and **C** for at least 4 seconds, disconnect
- blink code **4431**, idle stabilizer valve (**N 71**) should appear and valve should cycle on and off until next output check is initiated
- if valve **N 71** does not operate, see Group 24
- if stabilizer valve is **OK** connect jumper ends **C** and **D** for at least 4 seconds
- blink code **4343**, carbon canister solenoid valve (**N 80**) should appear and valve should activate on and off until jumper ends **C** and **D** are connected again
  - if valve does not operate see Group 24
  
- if valve **N 80** operates, reconnect jumper ends **C** and **D** for at least 4 seconds; disconnect
  - blink code **0000**, output end should appear
  
- reconnect jumper ends **C** and **D** for at least 4 seconds, disconnect
- switch ignition to **OFF**
  - fault memory is erased and output checks completed

## Diagnostic connectors wiring check

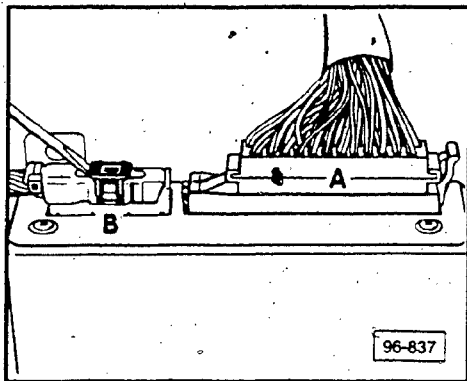


Diagnostic connectors **A** and **B** are located under the storage shelf in the driver's side foot well.

### Diagnostic connector **A** (supply voltage):

terminal **1** to ground (-)

terminal **2** supply voltage (+) (via fuse 21)



### Diagnostic connector **B** (signal lead):

#### Note

Terminal **1** to MPI control unit (**J 192**), connector **A**, terminal **22**, terminal **2** not used at time of this publication.

- remove passenger foot well cover under glove compartment
- disconnect harness **A** (25 pin) from MPI control unit
  
- verify continuity between control unit connector **A**, terminal **22** and terminal **1** of diagnostic connector **B** with multimeter **US 1119**
  - must be: approximately 0 ohm (continuity)

If continuity is **not** obtained:

- check wiring according to wiring diagram

