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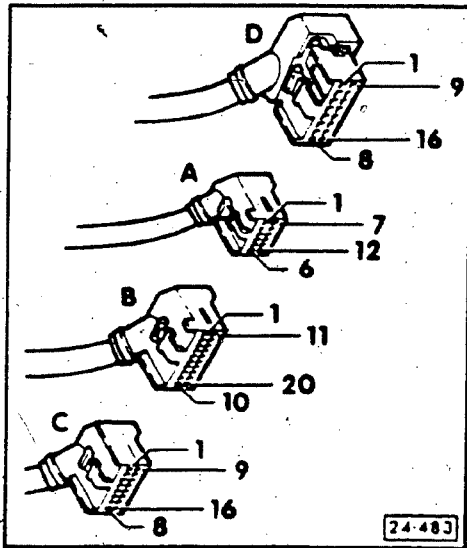
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## MPI Self Diagnosis, general information

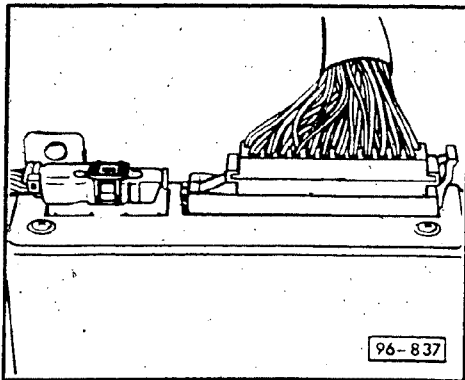
### Note

Beginning March 1990, a revised MPI control unit has been installed in vehicles equipped with the 20 valve 7A engine.

The revised control unit can be identified by its **FOUR** harness connectors in contrast to ...

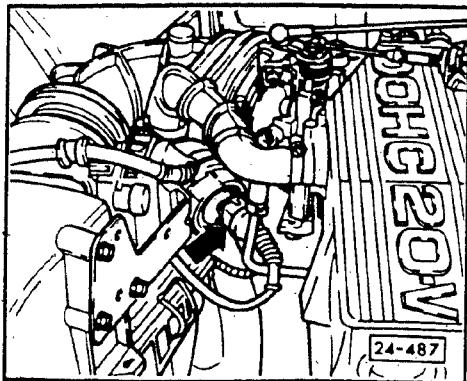


...the earlier MPI control unit which only had **TWO** harness connectors



Vehicles with the revised MPI control unit can also be identified by a new idle stabilizer valve (arrow).

The exhaust manifold has also been revised. The new manifold is made of cast iron and features a "three into one" pipe design.



## Self diagnosis, Technical Data

Control unit capabilities:	
Memory type	Permanent and sporadic Fault recognition
Data output mode	Rapid data transmission, and Blink code
Engine warning light (On Board Diagnosis)	Yes
Output checks	Yes (9 + 1 California only)
Engine Basic Adjustment	Yes
Read test value block	Yes
Read individual test values	Yes

The MPI control unit can differentiate between 30 different faults. If these faults occur, they are stored in a permanent fault memory until intentionally erased.

The MPI control unit can perform 9 different Output checks.

- Output checks can only be performed with the engine NOT running
- Fault memory should be activated with the engine running if possible

This system also recognizes sporadic (intermittent) faults.

Notes for fault recognition:

- If a fault is present for sufficient time it is stored as a static fault. If a condition appears momentarily or of insufficient time to be classified as static it will be stored in a portion of the control unit where it will receive different attention than a static fault. If within the next 50 engine starts the fault no longer appears, the fault will automatically be erased
- California version: faults which affect exhaust or emission requirements will be displayed by the engine warning light (OBD) on the instrument panel
- Fault codes displayed by the engine warning light can be found on the chart in section D2-450
- Before activating fault memory, perform output checks diagnosis and read test value block

## Engine ground connections, checking

### Requirements:

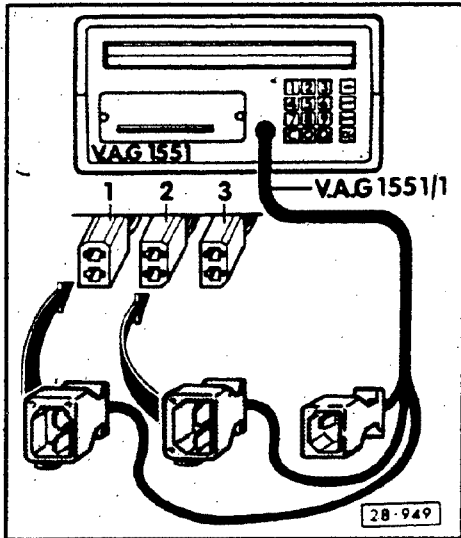
- Fuses 13, 21, 27 and 28 OK
- Fuel pump relay OK
  
- check both ground fastening points on rear of intake manifold
- check battery ground strap
- check ground strap between left engine support and long members

## Fault memory, activating/canceling

Using **VAG 1551** Diagnostic Tester in mode 1  
(Rapid data transmission).

### Note

Fault memory cannot be erased until it is first read  
(activated).



- switch **OFF** ignition
- connect **VAG 1551** Diagnostic tester to diagnostic connectors in (above pedals in drivers side footwell) using **VAG 1551/1** connector harness as follows:

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

Following display will then appear:

**VAG - SELF-DIAGNOSIS HELP**

- 1 - **Rapid data transmission\***
- 2 - **Flash code output\***

### \* Appears alternately

- turn on **VAG 1551** printer by pressing "print" button
  - indicator lamp in button lights up
- 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" to select "rapid data transmission" operating mode
  - following display will appear

**Rapid data transmission HELP**

**Input address word XX**

- press buttons 0 and 1 to select function 01:  
"engine electronics"
  - following display will appear


**Rapid data transmission Q**

**01 - engine electronics**

- enter input by pressing **Q** button
  - following display control unit identification  
(example) will appear

## 893907404 F ENGINE


coding 00

- press  button
  - following display will appear

**Control unit does NOT respond! HELP**

- press **HELP** button
  - list of possible fault causes will print
- after eliminating possible fault causes, re-enter address word **01** for "Engine electronics"
- enter by pressing **Q** button

If Control unit does NOT respond! "**HELP**" appears again

- check if control unit harness connectors are connected **OK**, properly connect if necessary
- press  button

Following display appears:

**Rapid data transmission HELP**

**Select function XX**

- press **0** and **2** buttons to select function **02** "fault memory recall"
  - following display will appear

**Rapid data transmission Q**


**02 - fault memory recall**

- enter by pressing **Q** button
  - one of the following displays will appear

**No faults registered!**


or

**X Fault(s) registered!**

- press  button
  - stored faults are displayed and printed consecutively

## Canceling Fault memory

After display and print out of the last fault:

- press  button
  - following display will appear

**Rapid Data Transmission HELP**

**Select Function XX**

- press 0 and 5 buttons
  - following display will appear

**Rapid Data Transmission Q**

**05 - cancel Fault memory**

- enter by pressing Q button
  - following display will appear

**CAUTION! Faults were not recalled from Fault memory.**

- 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 CANCELED.**

If the Fault memory is canceled, the following display appears:

**Rapid Data Transmission**

Fault memory is canceled!

- use fault table to find and eliminate faults that have been printed out, see section D2-450
- test drive vehicle again and recall faults from Fault memory

## Output checks, activating

Using VAG 1551 in Mode 1 (Rapid Data Transfer)

### Notes

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 can be 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 injectors. Use the **US 1115** LED tester to check injector signals. Avoid unnecessary background noise while audibly checking those components.

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

OUTPUT CHECKS occur in the following triggering sequence:

Fuel pump relay (J 17)

Fuel injector cylinder 1 (N 30)

Fuel injector cylinder 2 (N 31)

Fuel injector cylinder 3 (N 32)

Fuel injector cylinder 4 (N 33)

Fuel injector cylinder 5 (N 83)

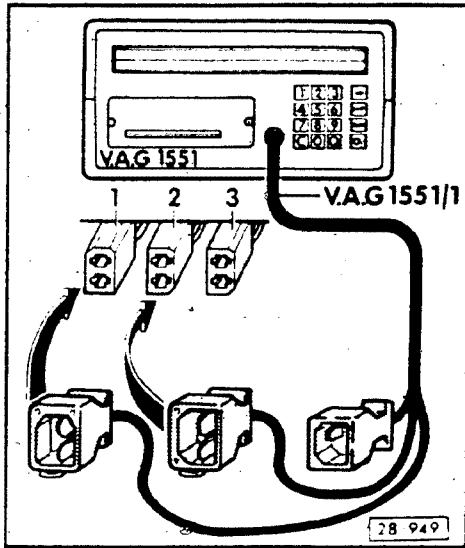
Idle stabilizer valve (N 71)

Carbon canister solenoid valve I (N 80)

Carbon canister solenoid valve II (N 115)

EGR valve (N 18) (California ONLY)





## Output check diagnosis, activation

- switch OFF ignition
- connect **VAG 1551** Diagnostic tester to diagnostic connectors (above pedals 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
- switch **ON** ignition but do **NOT** start engine
  - display should then alternate between the two following displays:

**VAG SELF-DIAGNOSIS HELP**

1 – Rapid data transmission\*

**VAG SELF-DIAGNOSIS HELP**

2 – Blink code output\*

\* appears alternately

- press button 1 of **VAG 1551** Diagnostic tester to select operating mode "rapid data transmission"
  - following display will appear

**Rapid data transmission HELP**

Input address word **XX**

- press 0 and 1 buttons to select function 01 "Engine electronics"
  - following display will appear

**Rapid data transmission Q**

01 - engine electronics

- enter input by pressing **Q** button
  - control unit identification will be displayed: for example:

**893906266D engine**

Coding 11

- press **➡** button
  - following display will appear

**Control unit does not respond! HELP**

- press **➡** button
  - following display will appear

## Rapid data transmission HELP

Select function XX

- press 0 and 3 buttons to select function 03  
"Output check diagnosis"
  - following display will appear


## Rapid data transmission Q

03 - Output check diagnosis


- enter input by pressing Q button
  - following display will appear

## Output check diagnosis

Fuel pump relay (J 17)

- press  button
  - fuel pump relay must close and fuel pump must run

If NO


- check fuel pump relay triggering
- push  button
  - following display will appear

## Output check diagnosis

Injector cylinder 1 (N 30)


- disconnect fuel injector harness connector
- connect US 1115 LED tester across harness connector terminals using VW 1594 adaptor kit
  - LED tester must light up
- briefly open throttle
  - LED tester must flicker approximately 5 times

If NO

- check fuel injectors, see section D2-450 starting with Fault code 4411
- check each of the remaining injectors by first pushing the  button which advances to the next output check in the sequence and then perform the injector electrical checks as described in the previous steps

## Note

The fuel injectors will be triggered during OUTPUT CHECKS only if the engine has been run a short time before.

- press  button
  - following display will appear

## Output check diagnosis


### Idle Stabilizer Valve (N 71)

- trigger valve by hitting  button until by pressing button following display appears

## Output check diagnosis

### Carbon canister solenoid valve 1 (N 80)


If valve does NOT trigger:

- check triggering function, see Repair Group 24
- trigger valve by hitting  button until by pressing button following display appears

## Output check diagnosis

### Carbon canister solenoid valve 2 (N 115)

If valve does NOT trigger:


- check triggering function, see Repair Group 24
- trigger valve by hitting  button until by pressing button following display appears

(This display is for California ONLY)

## Output check diagnosis

### EGR valve (N 18)

If valve does NOT trigger:

- check triggering function, see Repair Group 24
- trigger valve by hitting  button until by pressing button OUTPUT CHECKS ends

## Note

California versions end by switching to the last component; EGR valve (N 18).

To repeat OUTPUT CHECKS:

- switch OFF ignition for 20 seconds minimum
- re-select 03 function via the VAG 1551

## Note

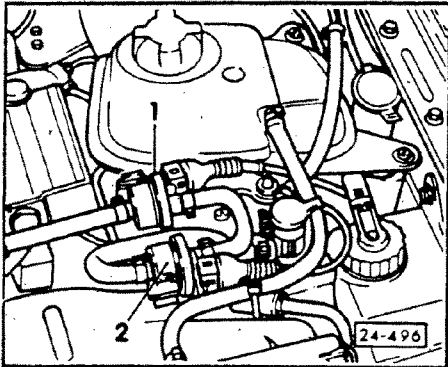
When OUTPUT CHECKS are repeated the injectors are not triggered.

## Test value block, reading

### Requirements:

- engine coolant temperature 85°C (185°F) minimum
- all electrical consumers switched OFF
- A/C switched OFF

- remove crankcase ventilation hose at engine block and plug off
- remove **(black)** harness connector from carbon canister solenoid valve 2 (**N 115**)
- start engine and let idle
- activate Fault memory, see section D2-330
  - following display will appear



### Rapid data transmission HELP

#### Select function XX

- let engine continue to idle after activating Fault memory
- press 0 and 8 buttons to select function 08 "Test block issued"
  - following display will appear

### Rapid data transmission Q

#### 08 - Read test block value

- enter input by pressing Q button
  - following display will appear:


### Read test value block

1 2 3 4 5 6 7 8 9 10

### Note

- values displayed on channels 1 to 10 are in decimal form and must be converted into physical values see section D2-360 for conversion chart
- if the specified values are not obtained for channels 4, 5, 6 or 8: perform basic engine adjustments, see section D2-380
- when switching on the printer, the displayed channel value will be printed on the paper strip

If specified values are obtained on all channels:

- push  button
  - following display will appear

### Rapid data transmission Help

#### Select function XX

## Function 04, display values

Values displayed on channels 1 to 10,  
conversion of units to physical values

Indicator field	Specification value	Corresponding test value	Description and calculation into physical values
1	135 ... 160	+85°C ... 110°C	Instantaneous coolant temp., displayed value minus 50 = ___°C
2	1 ... 255		Instantaneous engine load, a displayed value of 255 = Full load (theoretical) a lower value indicates less load
3	30 ... 34	750 ... 850 rpm	Instantaneous engine speed, displayed value times 25 = ___ rpm
4	0 ... 7 or 249 ... 255	—	Idle stabilization learning value, with Manual Trans. in neutral position or with Automatic selector in position P or N (Learning value average = 0)
5	0 ... 7 or 249 ... 255	—	Learning value of idle stabilization system with Automatic in D position (Learning value average = 0)
6	126 ... 130	—	Repeat idle stabilization signal (average value = 128)
7	0 ... 120	—	See next page for a complete description of this channel.
8	118 ... 138	—	Oxygen sensor control (average value = 128)
9	254, 255 0, 1, 2	—	Ignition distributor adjustment
10	—	—	From MPI-control unit calculated spark advance angle, indicator times 1.33 = ___° from TDC.

### Note

If the displayed values do not correspond to the specified values see the troubleshooting chart in section D2-370 for additional help.

## Channel 7, interpreting

Channel 7 provides the technician with essential information that would have to be verified manually before performing the basic engine settings.

The ECU scans the system for certain conditions that must be met or for certain components that must be present or operative. It then assigns the numerical values (listed in the table below) to these conditions or components and **adds** them together to create the display value.

A value of zero will be assigned to conditions or components in the following chart that are **NOT MET** or **NOT PRESENT**.

Numerical value assigned IF:	Following condition or component is present
2	Transmission is in gear (Automatic)
4	Transmission is in P or N (Automatic)
8	Vehicle is equipped with a Manual Transmission
16	Idle switch is in closed position
32	A/C compressor is <b>ON</b>
64	A/C system is <b>ON</b>

### Note

By analyzing the value displayed in channel 7 (using simple addition or subtraction) you can easily determine if a component or a condition is present or not.

**Example:** A vehicle with a Manual transmission at idle.

8 = Manual transmission coding  
+ 16 = Idle switch is **CLOSED**  
24 = displayed value in channel 7

### Note

If the idle switch had been **OPEN** instead; the final displayed value would have been 8 because a value of zero would have been assigned to the idle switch instead of 16.

Also see section D2-370 for troubleshooting information regarding the signals that are used to construct these codes.

## Function 04 display values, specifications and troubleshooting

This chart provides the required checks to be performed when the specified value is not attained.

Channel	Units display on VAG 1551	Possible causes	Fault elimination steps
1	greater than 160 or less than 85	Open between coolant temperature sender (G 62) and MPI control unit (J 192)	Activate fault memory, see section D2-330 Check (G 62), see Repair Group 24
3	greater than 34          less than 3	Idle switch Valve is metering too much air Idle adjustment screw loose Idle stabilizer valve gate (N 71) stuck or hard to move Idle stabilizer valve (N 71) is stuck or hard to move Idle adjustment screw loose	Check idle switch, see Repair Group 24 Check valve operation, see Repair Group 24 Perform basic adjustment, see section D2-380 Perform Output checks diagnosis, see section D2-340 Perform Output checks diagnosis, see section D2-340 Perform basic adjustment, see section D2-380
4	deviating from specified value	Channel 7 indicated value deviates from specified value Idle stabilizer valve (N 71) is stuck or hard to move	See field 7, below Perform Output checks diagnosis, see section D2-340 Eliminate cause, see Repair Group 24 Perform basic adjustment see section D2-380
5	specification deviation	Channel 7 indicated value deviates from specified value Idle stabilizer valve (N 71) is stuck or hard to move Valve is metering too much air	See channel 7, below Perform Output checks diagnosis, see section D2-340 Eliminate cause, see Repair Group 24 * Perform basic adjustment see section D2-380 Check valve operation, see Repair Group 24

\*Before performing basic adjustment, wait about 2 minutes with engine running, if specified value still not attained, perform basic adjustment, see section D2-380.

### Note

The displayed value of channels 4, 5, 6 are set to their respective mean value during basic adjustment, since they influence each other.

Channel	Units display on VAG 1551	Possible causes	Fault elimination steps
7	<p>Manual trans. with display value greater than <b>24</b></p> <p>Automatic trans. with display value greater than <b>20</b></p> <p>Manual trans. with display value less than <b>24</b></p> <p>Automatic trans. with display value less than <b>20</b></p>	<p>A/C <b>ON</b>, or A/C compressor <b>ON</b></p> <p>Coding of MPI-control unit incorrect</p> <p>Engine signal to ground</p> <p>Actuate idle switch</p> <p>Coding of MPI control unit incorrect</p> <p>Idle switch activated</p> <p>Selector lever not in position</p>	<p>Shut <b>OFF</b> A/C or if <b>OFF</b> check system per Repair Group 87</p> <p>Check control unit version see section D2-400</p> <p>Eliminate ground short from terminal <b>13</b> of harness connector <b>B</b> using wiring diagram</p> <p>Check idle switch see Repair Group 24</p> <p>Check control unit version see section D2-400</p> <p>Check idle switch, see Repair Group 24</p> <p>Place selector in position <b>P</b> or <b>N</b> and check for open circuit between transmission control unit and MPI control unit, using wiring diagram</p>
8	display value less than <b>118</b>	<p>Engine too rich</p> <p>Exhaust system has leakage before catalyst</p> <p>Fuel system pressure too high</p> <p>Defective injector</p> <p>Air flow sensor (G 70) defective</p> <p>CO % content out of specification</p>	<p>Check exhaust system for leakage, replace or repair as necessary</p> <p>Check fuel system pressure see Repair Group 24</p> <p>Check fuel injectors, see Repair Group 24</p> <p>Activate Fault memory, see section D2-330</p> <p>Perform basic adjustment, see section D2-380</p> <p>*Adjust CO content, see Repair Group 24</p>

\*Before performing basic adjustment, wait about 2 minutes with engine running, if specified value still not attained, perform basic adjustment, see section D2-380.



Channel	Units display on VAG 1551	Possible causes	Fault elimination steps
8	display value greater than 138	<p>Engine too lean</p> <p>Incorrect amount of air to airflow sensor (G 70)</p> <p>Fuel system pressure too low</p> <p>Defective injector</p> <p>Air flow sensor (G 79) defective</p> <p>CO content out of specification</p>	<p>Eliminate problem, see Repair Group 24</p> <p>Check fuel system pressure, see Repair Group 24</p> <p>Check fuel injector see Repair Group 24</p> <p>Activate fault memory see section D2-330</p> <p>Perform basic adjustment see section D2-380</p> <p>*Adjust CO content see Repair Group 24</p>
9	specification deviation	Ignition distributor out of adjustment	Adjust distributor, see Repair Group 28

\*Before performing basic adjustment, wait about 2 minutes with engine running, if specified value still not attained, perform basic adjustment, see section D2-380.

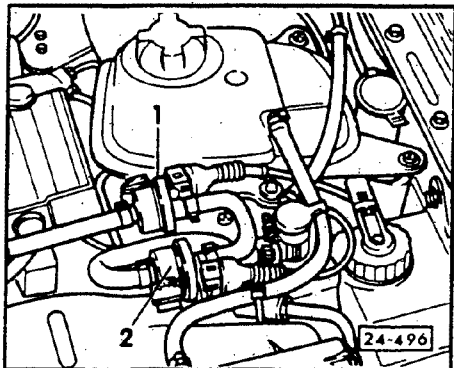
**Note**

The value of channels 4, 5, 6 are set to their respective mean value during basic adjustment, since they influence each other.

## Basic adjustment of Engine using V.A.G. 1551 Diagnostic Tester

### Requirement:

- see "Reading test value block", section D2-350



- reconnect (**black**) harness connector on carbon canister solenoid valve 2 (N 115)
- start engine and let idle
- read test value block for engine, continue to let engine idle
- perform basic adjustment of engine only if displayed values in channels 4, 5, 6 and 8 are out of tolerance
  - following display will appear

### Rapid data transfer **HELP**

#### Select Function **XX**

- push **HELP** button to print list of possible functions
- push buttons **0** and **4** to select function **04** "Basic adjustment"
  - following display will appear

### Rapid data transfer **Q**

#### 04 - perform basic adjustment

- enter input by pressing **Q** button
  - following display will appear

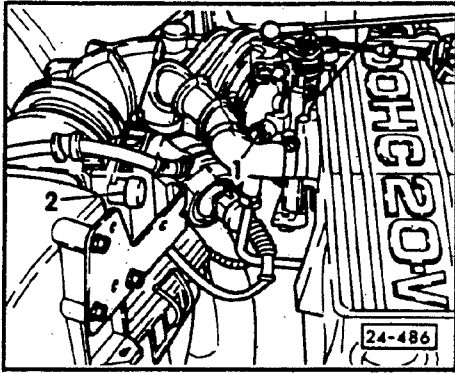
### System in basic adjustment

1 2 3 4 5 6 7 8 9 10

- enter input by pressing **Q** button

### Note

- after performing the basic adjustment the values for channels 4 and 5 are set to zero and channel 6 to 128 (in the control unit)
- during basic adjustment, channel 10 (calculated spark advance angle) displays a value of 9
- to convert the displayed channel values to physical units, see section D2-360



- turn adjustment screw 1 for idle speed on throttle valve until channel 3 display (instantaneous engine speed)
  - displays: 31...33 (775...825 rpm)

#### Note

When in function 04 (basic adjustment) **ONLY** the idle speed is adjusted. With printer switched **ON**, the displayed channel value will be the one printed on the paper strip.

- press  button on VAG 1551
  - following display will appear

#### Rapid data transfer HELP

Select function XX

#### Note

After performing basic adjustment (function 04) select function 08: "reading test value block" to see if the specified values were obtained.

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## Vehicle speed, checking using VAG 1551

### Displaying on VAG 1551

- start engine and let idle
- activate fault memory, see section D2-330
- continue to let engine idle after activating fault memory

### Note

Actual vehicle speed can be read directly on channel **15** in kilometers per hour, or as a voltage on channel **08**. See next page for additional information.

### Rapid data transmission    **HELP**

#### Select function    **XX**

- push **HELP** button for an overview of possible functions
- push buttons **0** and **9** to select function **09**  
"Reading individual test value"
  - following display will appear

### Rapid data transmission    **Q**

#### **09** – Reading individual test value

- enter input by pressing **Q** button
  - following display will appear

### Read individual test value

#### Input channel number    **XX**

### Note

See channel description at end of this section for information regarding channel **XX** choices. The following **08** insertion is only an example.

- press **0** and **8** buttons
  - following display will appear

### Read individual test value    **Q**


- enter input by pressing **Q** button

### Reading individual test value

Channel **08**    Test value **170**

### Note

The display will continue to give active data until the **→** button is pushed. If the printer button is pushed: the display for that exact moment will be printed.

- press  button
- following display will appear

**Rapid data transmission HELP**

**Select function XX**

To read alternative channel, re-select function **09** and continue as before.

**Channel XX, input choices 08 and 15**

Inputting **08** into channel **XX** will display the actual vehicle speed as a decimal number.

- calculate to a physical value in Volts with the following formula
- Volts = displayed value times 0.08

If (with engine running) an indicated value is shown that is greater than **181** or smaller than **145**

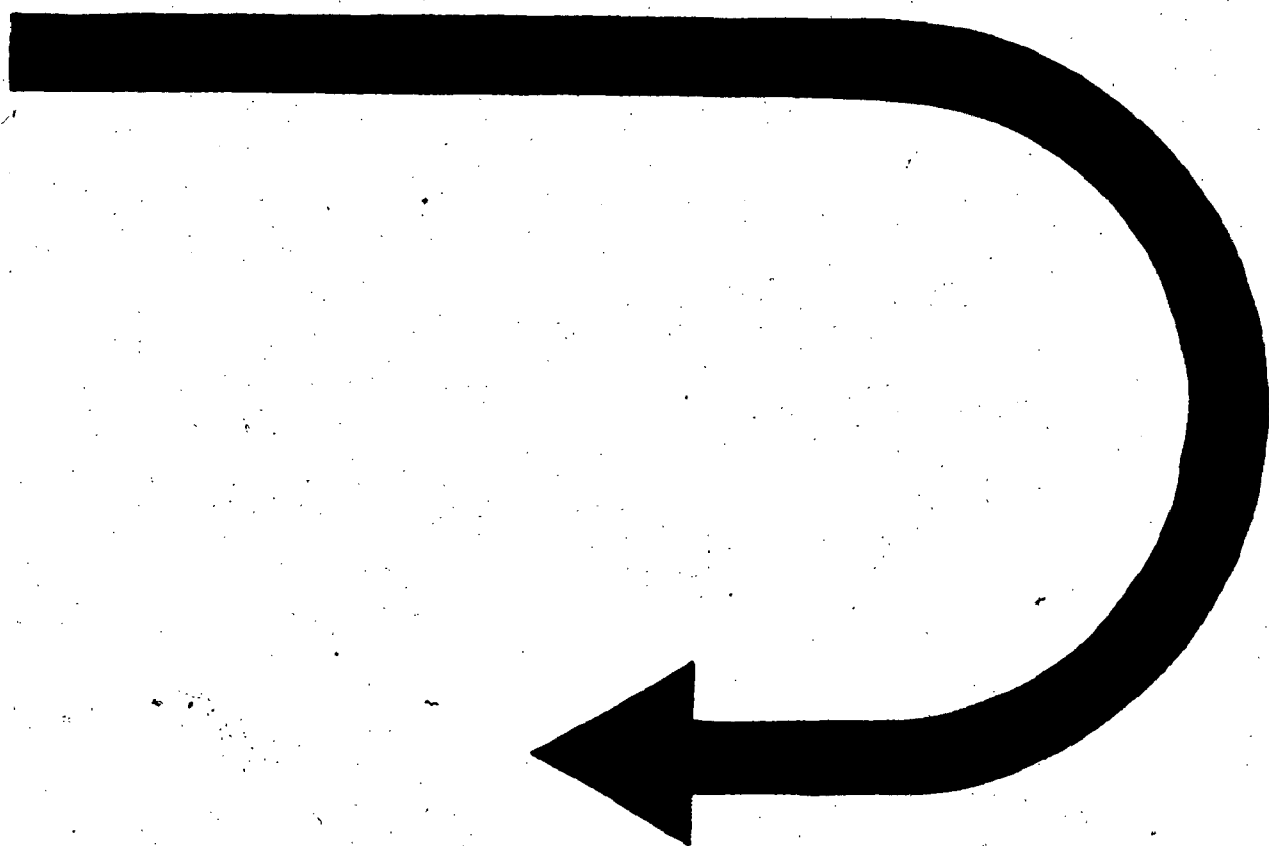
- check voltage supply to MPI unit, see Repair Group 24

Inputting **15** into channel **XX** will display the actual vehicle speed (while vehicle is driven) in kilometers per hour (**km/h**).

To convert display into miles per hour (**mph**)

- multiply display by 0.62

**CONTINUED IN THE  
BEGINNING OF NEXT ROW**



## Control unit version, displaying using VAG 1551

- read test value block, see section D2-350
  - following display will appear

**Rapid data transfer HELP**

**Select Function XX**

- push **0** and **1** buttons to select function 01  
"Activating control unit version"

Following display will appear:

**Rapid data transfer Q**

**01-Activating control unit version**

- enter input using **Q** button
  - following display is an example of control unit identification and coding that can appear

**893906266D ENGINE**

**Coding 11**

- see section D2-440 for coding variants

If the control unit code being displayed is incorrect:

- replace with control unit having correct code number
- push **➡** button
  - following display will appear

**Rapid data transfer HELP**

## MPI Control Unit, removing and installing

- switch **OFF** ignition
- remove trim under glove compartment
- unscrew MPI-control unit from bracket and pull from retainer
- installation is reverse of removal

### CAUTION

Do NOT remove or install the MPI-control unit (J 192) unless the ignition is switched **OFF**.



## Test box VAG 1598, terminal numbering

### Connecting to MPI-control unit

#### CAUTION

Do NOT have any adaptor cables from **VAG 1598** Test box connected to MPI control unit when working with the **VAG 1551** Diagnostic tester.

#### CAUTION

By disconnecting the harness connector from the MPI control unit; battery supply voltage is interrupted, thereby erasing the Fault memory.

- switch **OFF** ignition
- remove MPI control unit (J 192), see section D2-410
- connect adaptor cables **VAG 1598/11** and **VAG 1598/12** between MPI control unit and control unit harness connectors

To perform checks:

- connect **VAG 1598** test box to respective adaptor cable

#### CAUTION

Always refer to the wiring diagram for the correct terminal numbering. Do NOT assume that the **VAG 1598** Test box numbers will correspond with the adaptor connections used for your troubleshooting application.

The **VAG 1598** adaptor cables have been designed to adapt to a broad range of connectors. To keep the number of necessary cables and resulting cost to a minimum, each adaptor must connect to a variety of systems.

The repair procedures in this manual will tell you when re-numbering at the Test box occurs.

# Diagnosis, Fault Memory

The following charts show the numbering correspondence between the actual terminal number used in the MPI control unit harness connector and the arbitrary number that corresponds to it in the **VAG 1598** Test box after the adaptor cable has been connected to it.

<b>MPI control unit Harness connector A Terminal numbering</b>	<b>Corresponding VAG 1598 Test box Terminal numbering (using adaptor cable VAG 1598/11)</b>
1	41
2	42
3	43
4	44
5	45
6	46
7	47
8	48
9	49
10	50
11	51
12	52

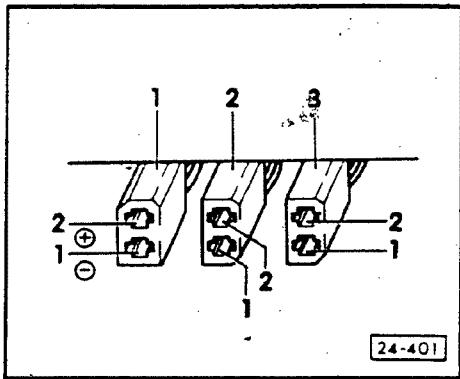
<b>MPI control unit Harness connector B Terminal numbering</b>	<b>Corresponding VAG 1598 Test box Terminal numbering (using adaptor cable VAG 1598/11)</b>
1	21
2	22
3	23
4	24
5	25
6	26
7	27
8	28
9	29
10	30
11	31
12	32
13	33
14	34
15	35
16	36
17	37
18	38
19	39
20	40

MPI control unit Harness connector C Terminal numbering	Corresponding VAG 1598 Test box Terminal numbering (using adaptor cable VAG 1598/11)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16

MPI control unit Harness connector D Terminal numbering	Corresponding VAG 1598 Test box Terminal numbering (using adaptor cable VAG 1598/12)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16

## Diagnostic connectors, checking

- diagnostic connectors are located in drivers side footwell above pedals



**BLACK** diagnostic connector 1 (voltage supply).

Terminal 1 (ground).

Terminal 2 (positive from terminal 30, protected via fuse 21).

- check continuity of connections using **US 1119** multimeter
- switch **OFF** ignition
- connect test box **VAG 1598** using adaptor cable **VAG 1598/11**

### BROWN diagnostic connector 2 (Rapid data transmission)

Diagnostic connector terminal	Control unit Harness connector C	VAG 1598 test box with VAG 1598/11 adaptor cable
1	13	13
2	12	12

### BLUE diagnostic connector 3 (Blink code output)

Diagnostic connector terminal	Control unit Harness connector C	VAG 1598 test box with VAG 1598/11 adaptor cable
1	not in use	not in use
2	14	14

## MPI-control unit (J 192), coding variants

### Note

During control unit identification there will be a two digit code displayed by the **VAG 1551**. The first digit indicates transmission type (standard or automatic). The second digit indicates whether an EGR system is installed or not.

Example:

Standard transmission without EGR <-- 11 -->

Following combinations are possible:

01 = Automatic transmission with EGR

00 = Automatic transmission without EGR

10 = Standard transmission with EGR

11 = Standard transmission without EGR

If the coding does not correspond to the vehicle hardware:

- connect Test box **VAG 1598** to control unit harness connector **B** using adaptor cable **VAG 1598/11**
- using wiring diagram, check MPI control unit and **6-pin** coding connector next to MPI control unit as follows
  - vehicles with automatic transmission, there must be a bridge (continuity) between terminals **1** and **5** of coding connector and terminal **5** must be connected to ground
  - vehicles with standard transmission should not have a bridge (must be open) between terminal **1** and **5** of coding connector
  - vehicles with EGR: terminal **16** of control unit harness connector **B** must be connected to ground

If coding connector and wiring OK:

- replace MPI control unit

## Fault troubleshooting, chart

The following table lists all of the possible faults which can be detected by the MPI control unit (J 192) and displayed by the VAG 1551 Diagnostic tester. Problems which occur occasionally or faults which were not canceled from the fault memory are displayed as "sporadically occurring faults".

If components are displayed as faulty, using the wiring diagram, check the wiring to the components for short or open circuits.

Before correcting a fault or replacing components:

- check MPI control unit ground connections in control unit harness connector D terminals 1, 2, 3 and 16
  - must not be greater than 0.2 Ohms
- check ground connections on intake manifold for corrosion or damage
- check fuel pump relay, see Repair Group 24

Fault code description	Problem	Symptom	Repair
1111 Control unit (J 192) defective	Ground connections to (J 192) harness connector D, terminals 1, 2, 3 and 16  (J 192) defective	Engine does not start  —	Check ground connections using wiring diagram  Replace (J 192)
1231 Trans speed sender (G 68)  *No signal	Open connection between instrument cluster and (J 192)	Engine shuts off while decelerating with clutch engaged	Read individual test value channel 15  Check wiring between I/P harness connector and (J 192) for open circuit using wiring diagram

\*This display is shown in addition to the component.  
 Note for fault code 00281:  
 If this fault is indicated, check first if the speedometer is OK.  
 If speedometer is faulty; disregard fault indicator.

Fault code description	Problem	Symptom	Repair
<b>2111</b> Engine speed sender (G 28)  *No signal  *Mechanical fault	Metal chips on (G 28)	Engine does not start	Check (G28), see Repair Group 28
	(G 28), mounting base loose		Tighten base
	Distance from (G 28) to ring gear of flywheel larger than 1.2 mm	Engine misfires	Repair short or open circuit using wiring diagram
	Broken teeth on ring gear of flywheel	—	—
	Open circuit between 3 pin connector in engine compartment and (G 28)	—	—
	Open circuit between (J 192) and (G 28)	—	—
	Short circuit between Harness connector C, terminals 1, 2, 3 and (J 192) shielding or engine ground	—	—
	Open circuit in shielding of (G 28)	—	—
	3 pin connector from (G 28) and (G 4) in engine compartment reversed	Engine does not start	Reverse connections
	(G 28) faulty	—	—
Input for (G 28) in (J 192) faulty	—	—	
*One of these displays is shown in addition to the component.			

Fault code description	Problem	Symptom	Repair
<b>2112</b> Ignition reference sender (G 4)  *No change in signal	Mounting base of (G 4) loose	Fault occurs before engine start	Check (G 4) see Repair Group 24
	Distance from (G 4) to pin on flywheel greater than 1.2 mm	Engine will not start	—
	Pin on flywheel bent or damaged	—	—
	Open circuit between 3 pin connector in engine compartment and (G 4)	—	—
	Short circuit between harness connector C, terminals 4, 5, 6 and (J 192) shielding or engine ground	—	—
	Open circuit in shielding of (G 4)	—	—
	3 pin connector from (G 4) and (G 28) have interchanged harness connectors	—	Reverse harness connectors
	(G 4) defective	—	Replace (G 4)
Input for (G 4) in (J 192) defective	—	Replace (J 192)	
*This display is shown in addition to the component.			



Fault code description	Problem	Symptom	Repair
<b>2113</b> Hall sender (G 40) *Short to ground  *Disconnection/short circuit to + (plus)	No power to (G 40) from (J 192)	Engine lacking power to full load	Check (G 40), see Repair Group 28
	Signal lead to (J 192) open or short circuit to ground in signal wires of harness connector C, terminals 7, 8 and 9	—	—
	Open circuit between 3 pin connector in engine compartment and (J 192)	—	—
	Position of reference pin (G 4) incorrect	—	Repair or replace, see Repair Group 24
	(G 40) defective	—	Replace (G 40)
	Input for (G 40) in (J 192) defective	—	Replace (J 192)
*One of these displays is shown in addition to the component.			
<b>2114</b> Hall sender not on reference point.  *Mechanical fault	Belt broken		Check V-belt, see Repair Group 15
	Hall sender (G 40) out of adjustment		Read test value block channel 9 section D2-370
	Flywheel reference pin for ignition timing		Check pin (G 4), see Repair Group 28
*This display is shown in addition to the component.			

Fault code description	Problem	Symptom	Repair
<b>2121</b> Idle switch (F 60) *Short to ground *Disconnection/short circuit to + (plus)	(F 60) out of adjustment	Idle stabilization system switches to control	Read test value block, channel 7, section D2-370
	Throttle valve sticking	Idle speed too high	Adjust throttle cable. see Repair Group 20
	Floor mat pressing against accelerator pedal	—	—
	Throttle cable out of adjustment	—	—
	Open circuit between harness connector A, terminal 9 (J 192)	—	Repair circuit using wiring diagram
	Input for (F 60) in (J 192) defective	—	Replace (J 192)
	Harness connector A, terminal 9 from (J 192) short circuited to ground	—	Repair short circuit
Moisture in throttle valve harness connector	—	Dry out or replace	
*One of these displays is shown in addition to the component.			
<b>2141</b> First knock regulation *Maximum control limit exceeded	Knock regulation module in (J 192) defective or (J 192) defective	—	Replace (J 192)
	Knock sensor 1 (G 61) loose	—	Re-torque to 10 Nm (7-ft lb)
	Affects cylinders 1 and 2	—	—
	Poor fuel quality, less than 90 RON	Limited loss of power	Use fuel with at least 90 RON
	Abnormal engine noises (auxiliary units loose)	Top speed is insufficient	—
Open circuit in shielding of (G 61)	Engine running rough	Repair open circuit	
*This display is shown in addition to the component.			

Fault code description	Problem	Symptom	Repair
<b>2142</b> Knock sensor 1 (G 61)  *No change in signal	(G 61) loose or connector corroded	High fuel consumption	Re-torque, 10 Nm (7 ft lb)
	Open or short circuit between (G 61) and (J 192)	Power loss Impact-like power loss (like mis-firing)	Repair open or short circuit
	Short circuit between (G 61) and ground or between (G 61) and shielding	—	—
	(G 61) defective	—	Replace (G 61)
	Input for (G 61) in (J 192) defective	—	Replace (J 192)
<b>2143</b> Second knock regulation  *Maximum control limit exceeded	Poor fuel quality, less than 90 RON	Limited loss of power	Use fuel with at least 90 RON
	Affects cylinders 3, 4, and 5	Slightly higher fuel consumption	—
	(G 66) Knock sensor 2 is loose	Top speed is insufficient	Re-torque 10 Nm (7 ft lb)
	Abnormal engine noises (auxiliary units loose)	Engine running rough	Tighten loose components
	Open circuit in (G 66) shielding	—	Repair open circuit
	Knock regulation module in (J 192) defective or (J 192) defective	—	Replace (J 192)
<b>2144</b> Knock sensor 2 (G 66)  *No change in signal	(G 66) loose or connector corroded	High fuel consumption	Re-torque sensor 10 Nm (7 ft lb)
	Open or short circuit between (G 66) and (J 192)	Power loss impact-like (like misfiring)	Repair open or short circuit
	Short circuit between (G 66) and ground or between (G 66) and shielding	—	—
	(G 66) defective	—	Replace (G 66)
	Input for (G 66) in (J 192) defective or (J 192) defective	—	Replace (J 192)
*This display is shown in addition to the component.			

# Diagnosis, Fault Memory

Fault code description	Problem	Symptom	Repair	
<b>2212</b> Throttle potentiometer (G 69)	Open circuit between (G 69) and (J 192)	Power loss	Check (G 69), see Repair Group 24	
	*Disconnection/short to ground	—	—	
	*Implausible signal	(G 69) and (J 192) defective	—	Replace
		Moisture or corrosion in (G 69) harness connector	—	—
*One of these displays is shown in addition to the component.				
<b>2232</b> Air mass sensor (G 19)	Fuse (S 27) defective	Limp home mode	Check (G 70), see Repair Group 24	
	*Short circuit to + (plus)	Open circuit between (G 70) and (J 192)	—	
	*Disconnection/short to ground	Voltage supply to (G 70) open or shorted to ground	Poor fuel intake	Repair using wiring diagram
		Short circuit to plus or ground in (G 70), or open circuit between (G 70) and (J 192)	Reduced power Under certain circumstances engine quits after starting	—
	(G 70) defective	—	Replace (G 70)	
	Input for (G 70) in (J 192) defective	—	Replace (J 192)	
*One of these displays is shown in addition to the component.				
<b>2233</b> Air flow sensor reference voltage (G 70)	Open circuit between (J 192) harness connector A terminals 5 and 3	—	Check (G 70), see Repair Group 24	
	*Disconnection/short circuit to + (plus)	Short circuit between (J 192) harness connector A terminals 5 and 3 and + (plus)	—	Repair open or short circuit using wiring diagram
*This display is shown in addition to the component.				

Fault code description	Problem	Symptom	Repair
<b>2234</b> Supply voltage (Info)  *Signal too low	Supply voltage to (J 192) greater than	Permanent damage to (J 192)	Check voltage
	Alternator defective	—	Check (J 192), see Repair Group 28
	Engine started with two batteries in series	Idle speed out of range	Check charging condition of battery, see Repair Group 27
	Poor ground connection to (J 192)	Voltage below 6 volts	
	Current drain with ignition switched OFF	Engine will not start/crank	Read individual test value (channel 8) see section D2-370
	Battery discharged	—	
*This display is shown in addition to the component. Note for Fault Code 2234: Ignore fault if displayed as sporadic (intermittent). This fault may be stored if the engine is idling for a long period of time with heavy electrical consumption and a battery that is severely drained.			
<b>2242</b> CO-potentiometer (G 74)  *Disconnection/or short circuit to + (plus)	Fuse (S 27) defective	Poor acceleration	Check (G 74), see Repair Group 24
	Open circuit between (G 74) and (J 192)	Poor fuel intake	Read test value channel 8
	Short circuit to plus in (G 74) or open circuit between (G 74), and (J 192)	CO not adjustable	—
*This display is shown in addition to the component.			

# Diagnosis, Fault Memory

*Fault code description	Problem	Symptom	Repair
<b>2312</b> Coolant temp. sensor (G 62)  *Short circuit to ground  *Disconnection/short circuit to + (plus)	Short circuit to ground	Cold starting difficulties at low temps	Check (G 62), see Repair Group 24
	Moisture in (G 62) harness connector	Poor idle and acceleration during warmup	Read test value channel 1, see section D2-370
	Open circuit between (G 62) and (J 192)	—	—
	Resistance between (G 62) and (J 192)	—	—
	(G 62) defective	—	Replace (G 62)
Input from (G 62) in (J 192) defective	—	Replace (J 192)	

\*One of these displays is shown in addition to the component.

<b>2341</b> Oxygen sensor  *Control limit exceeded or underexceeded	Fuse (S 28) defective	CO before catalyst less than 0.3%	Read test value channel 8, see section D2-370
	Fuel tank empty	High fuel consumption	Fill fuel tank
	Fuel system pressure too low	—	Check fuel system pressure, see Repair Group 24
	Defective: spark plug, connectors, ignition wiring, distributor cap and rotor	—	Check components and replace if necessary
	Intake air leak after (G 70) Air mass sensor	Rich exhaust	Repair leak
	Exhaust leak in front of catalyst	Spark plug fouling	Repair leak
	Oxygen sensor faulty	CO before catalyst greater than 1%	Check Oxygen sensor, see Repair Group 24
	Solenoid valve 1 (N 80), sticking	—	Check (N 80), see Repair Group 24

\*This display is shown, in addition to the component.

Fault code description	Problem	Symptom	Repair
<b>2342</b> Oxygen sensor (G 39) *No signal *Short circuit to + (plus) *Short circuit to ground	Open circuit to (J 192)	Emissions NOT within specs	Repair open circuit
	(G 39) heater inoperative	—	Check OXS control, see Repair Group 24
	Fuse (S 28) defective	—	Read Test value channel 8 (constant 128) see section D2-370
	Heater resistor in sensor defective	—	
	Wiring in (G 39) heater defective, short circuit to ground in signal wire	—	
Short circuit in signal wire to shielding	—	—	
(G 39) defective		OXS goes to open loop	Replace (G 39)
*One of these displays is shown in addition to the component.			
<b>2411</b> EGR System *Short circuit to ground *Mechanical failure	Vacuum lines removed or bent	Poor idle and starting characteristics, shaking	Check EGR system, see Repair Group 26
	(G 98) EGR temperature sensor faulty	—	—
	Fuse (S 28) defective	—	Replace fuse
	(N 121) EGR frequency valve defective	—	—
	Open circuit between (G 98) (N 121) and (J 192)	—	Repair open circuit, using wiring diagram
*One of these displays is shown, in addition to the component. This Fault Code for California vehicles ONLY.			

# Diagnosis, Fault Memory

Fault code description	Problem	Symptom	Repair
<b>4312</b> EGR frequency valve (N 18)  *Implausible signal  *Open circuit/short circuit to ground	Short circuit to ground in (N 18) or open circuit between (N 18) and (J 192)	Engine runs rough	Check (N 18), see Repair Group 26
	Open circuit between (N 18) and (J 192)	—	Repair open or short circuit using wiring diagram
This Fault Code for California vehicles ONLY. *One of these displays is shown, in addition to the component.			
<b>4331</b> Carbon canister solenoid valve 2 (N 115)  *Disconnection/short circuit to + (plus)  *Disconnection/short circuit to ground	Short circuit to plus in (N 115) or open circuit between (N 115) and (J 192)	Poor response in part of load range	Check (N 115), see Repair Group 24
	Fuse (S 28) defective	Fuel odors	—
	Open circuit	—	Replace fuse  Repair open circuit using wiring diagram
*One of these displays is shown, in addition to the component.			
<b>4343</b> Carbon canister solenoid valve 1 (N 80)  *Short circuit to + (plus)  *Short circuit/open circuit to ground	Short circuit to plus in (N 80) or between (N 80) and (J 192)	Poor response in part of load range	Check (N 80), see Repair Group 24
	Short circuit to ground in (N 80) or between (N 80) and (J 192)	Fuel odors	—
	Fuse (S 28) faulty	—	—
	Open circuit	—	—
*One of these displays is shown, in addition to the component.			



# Diagnosis, Fault Memory

Fault code description	Problem	Symptom	Repair
<b>4411</b> Fuel injector cylinder 1 (N 30)  *Short to minus  *Short to plus	Short circuit to ground	Engine runs rough	Check injectors, see Repair Group 24
	(N 30) resistance incorrect	—	
	Open circuit	Possible engine stall	Repair open circuit, using wiring diagram
	Fuse (S 13) faulty	—	
	Short circuit to positive at harness connector or injector		
*One of these displays is shown, in addition to the component.			
<b>4412</b> Fuel injector cylinder 2 (N 31)  *Short to minus  *Short to plus	Short circuit to ground	Engine runs rough	Check injectors, see Repair Group 24
	(N 31) resistance incorrect	—	
	Open circuit	Possible engine stall	Repair open circuit, using wiring diagram
	Fuse (S 13) faulty	—	
	Short circuit to positive at harness connector or injector		
*One of these displays is shown, in addition to the component.			
<b>4413</b> Fuel injector cylinder 3 (N 32)  *Short to minus  *Short to plus	Short circuit to ground	Engine runs rough	Check injectors, see Repair Group 24
	(N 32) resistance incorrect	—	
	Open circuit	Possible engine stall	Repair open circuit, using wiring diagram
	Fuse (S 13) faulty	—	
	Short circuit to positive at harness connector or injector		
*One of these displays is shown, in addition to the component.			

# Diagnosis, Fault Memory

Fault code description	Problem	Symptom	Repair
<b>4414</b> Fuel injector cylinder 4 (N 33)  *Short to minus  *Short to plus	Short circuit to ground	Engine runs rough	Check injectors, see Repair Group 24
	(N 33) resistance incorrect	—	
	Open circuit	Possible engine stall	Repair open circuit, using wiring diagram
	Fuse (S 13) faulty	—	
Short circuit to positive at harness connector or injector			
*One of these displays is shown, in addition to the component.			
<b>4421</b> Fuel injector cylinder 5 (N 83)  *Short to minus  *Short to plus	Short circuit to ground	Engine runs rough	Check injectors, see Repair Group 24
	(N 83) resistance incorrect	—	
	Open circuit	Possible engine stall	Repair open circuit, using wiring diagram
	Fuse (S 13) faulty	—	
Short circuit to positive at harness connector or injector			
*One of these displays is shown, in addition to the component.			
<b>4431</b> Idle stabilizer valve (N 71)  *Short to plus  *Short to ground	Short circuit to plus in (N 71) or between (N 71) and (J 192)	Engine speed out of range at operating temp.	Check (N 71), see Repair Group 24
	Short circuit to ground in (N 71) or between (N 71) and (J 192)	Engine might die when cold	—
	Open circuit	Engine surges	—
*One of these displays is shown, in addition to the component.			

# Diagnosis, Fault Memory

Fault code description	Problem	Symptom	Repair
4444 No fault recognized	If a complaint exists, fault not recognized by self diagnosis	—	—
0000 End of output	— —	— —	— —

## MPI System, troubleshooting guide

### CAUTION

Observe safety precautions in Repair Groups 24 and 28.

#### Requirements:

- customer questioned using "Check list"
- voltage supply **OK** (alternator battery)
- starter turns over **OK**
- engine mechanics **OK**  
(Especially compression pressures, valve timing)
- electrical wiring and connections **OK**  
(Not corroded, terminals not pushed back)
- vacuum hoses **OK**  
(Not disconnected or leaking)

#### If complaint "Unsatisfactory performance" is given; also check for:

- tire sizes / Tire type per manufacturer's recommendation
- no speed reducing accessories installed  
(Roof rack etc.)
- break in completed
- wheels freely to rotate (Brakes, wheel bearings **OK**)

Symptom

<b>1 ENGINE DOES NOT START/HARD TO START</b>								
<b>2 POOR DRIVEABILITY DURING COLD/WARM UP PHASE</b>								
<b>3 IDLING SPEEDS DEFECTS</b>								
<b>4 POOR PERFORMANCE, INCREASED FUEL CONSUMPTION</b>								
<b>5 UNEVEN RUNNING THROUGHOUT SPEED RANGE</b>								
<b>6 EXCESSIVE FUEL CONSUMPTION</b>								
						<b>Checking and Adjusting Operations</b>	<b>See:</b>	
X	X	X	X	X	X	First interrogate Fault memory and eliminate displayed faults before further fault finding	Repair Group D2	
X	X	X	X	X	X	Perform output checks		
	X	X	X	X	X	Basic adjustment of engine with <b>VAG 1551</b>		
			X			Check basic mechanical settings of engine	Repair Group 13	
X						Insufficient fuel in tank, minimum amount 10 ltr. (2-1/2 gallons)	Repair Group 20	
X	X	X		X		Check fuel pump	Repair Group 24	
X						Check fuse17		
X	X	X	X	X	X	Check intake air system for leaks		
X			X		X	Check system and residual pressures		
X						Check MPI control unit voltage supply		
		X				Check carbon canister system		
			X		X	Check 2 stage inlet manifold change-over		
		X				Check exhaust gas recirculation		Repair Group 24 and/or 26
X	X		X		X	Check spark plugs		Repair Group 28
X	X		X		X	Check spark plug connectors and high tension cables		
X	X		X			Check ignition coils and power output stages		