Chapter 22
Mercedes

Contents

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Model	Engine code	Year	System
C180	111.920	1993 to 1997	PMS (Siemens)
190E cat	102.962	1988 to 1993	Bosch KE3 5-Jetronic
190E 2.3 cat	102.985	1989 to 1993	Bosch KE3.5-Jetronic
190E 2.5-16 & cat	102.990	1988 to 1993	Bosch KE3.1-Jetronic
190E 2.5-16 Evolution	102.991	1989 to 1992	Bosch KE3.1-Jetronic
190E 2.6	103.942	1989 to 1993	Bosch KE3.5-Jetronic
190E 2.6 cat	103.942	1987 to 1993	Bosch KE3.5-Jetronic
C200	111.941	1994 to 1997	PMS (Siemens)
E200	111.940	1992 to 1996	PMS/Motronic 6.0/6.1
200E & TE cat	102.963	1988 to 1993	Bosch KE3.5-Jetronic
C220	111.961	1993 to 1997	HFM
E220	111.960	1992 to 1997	HFM
C230 & Kompressor	-	1995 to 1997	HFM
230E, TE & CE cat	102.982	1988 to 1993	Bosch KE3.5-Jetronic
230GE	102.980	1989 to 1991	Bosch KE3 5-Jetronic
260E & cat	103.940	1989 to 1993	Bosch KE3 5-Jetronic
260E 4-Matic & cat	103.943	1988 to 1992	Bosch KE3.5-Jetronic
260SE & cat	103.941	1988 to 1992	Bosch KE3 5-Jetronic
C280	104.941	1993 to 1997	HFM
E280 cat	104.942	1992 to 1996	HFM
S280	104.944	1993 to 1997	HFM
SL280	104.943	1993 to 1997	HFM
E300	103.985	1992 to 1995	Bosch KE3.5 Jetronic
300SL, SLL & cat	103.981	1986 to 1992	Bosch KE3.5-Jetronic
300E, TE, CE & cat	103.983	1987 to 1993	Bosch KE3.5-Jetronic
300E & cat	103.985	1988 to 1993	Bosch KE3.5 Jetronic
300E-24, TE-24 & CE-24 cat	104.980	1989 to 1993	Bosch KE5.2-Jetronic/EZ-L ignition
300TE 4-Matic & cat	103.985	1988 to 1993	Bosch KE3.5-Jetronic
300SL & cat	103.984	1989 to 1995	Bosch KE5.2-Jetronic/EZ-L ignition
300SL-24 & cat	104.981	1989 to 1995	Bosch KE5.2-Jetronic/EZ-L ignition
E320	104.992	1992 to 1997	HFM
S320	104.994	1993 to 1997	HFM
SL320	104.991	1993 to 1997	HFM
400S, SE & SEL	119.971	1991 on	Bosch LH4.1 Jetronic/EZ L ignition
E420	119.975	1992 to 1995	Bosch LH4.1-Jetronic/EZ-L ignition
S420	119.971	1993 to 1997	Bosch LH4.1-Jetronic/EZ-L ignition
500E	119.974	1992 on	Bosch LH4.1-Jetronic/EZ-L ignition
500SL	119.972	1992 on	Bosch LH4.1-Jetronic/EZ-L ignition
500SE & SEL	119.970	1991 on	Bosch LH4.1-Jetronic/EZ-L ignition
500SEC	119.970	1992 on	Bosch LH4.1-Jetronic/EZ-L ignition
500SL cat	119.960	1989 to 1994	Bosch KE5.2-Jetronic/EZ-L ignition
E500	119.974	1992 to 1995	Bosch LH4.1-Jetronic/EZ-L ignition
S500	119.970	1993 to 1997	Bosch LH4.1-Jetronic/EZ-L ignition
SL500	119.972	1993 to 1997	Bosch LH4.1-Jetronic/EZ-L ignition
600SEL	120.980	1991 to 1996	Bosch LH-Jetronic/EZ-L ignition
S600 cat	120.980	1991 to 1996	Bosch LH4.1-Jetronic/EZ-L ignition
S600	120.980	1996 to 1997	Bosch LH4.1-Jetronic/EZ L ignition
SL600	120.981	1993 to 1997	Bosch LH4.1-Jetronic/EZ-L ignition

Self-Diagnosis

1 Introduction

Some Mercedes vehicles are equipped with an engine management system (EMS) that controls primary ignition, fuelling and idle functions from within the same ECM. Other Mercedes vehicles are equipped with a separate electronic ignition module that controls primary ignition, and an electronic injection module that controls fuelling and idle functions. All of these engine management, ignition and fuel systems are equipped with a self-diagnosis system capable of generating fault codes.

Engine management systems covered by this Chapter include Bosch Motronic versions MP6.0 and MP6.1, and HFM and PMS (Siemens). Electronic fuel injection systems include Bosch LH-Jetronic 4.1 and KE-Jetronic versions 3.1, 3.5, 5.2. The electronic ignition module with self-diagnosis is Bosch EZ-L.

Where the vehicle is equipped with Bosch EZ-L ignition and either the LH-Jetronic or KE-Jetronic fuel system, fault codes will be generated separately by the ignition and fuel systems. In some vehicles, one 16-pin or 38-pin SD connector is provided for both ignition and fuel code retrieval. In other vehicles, ignition and fuel system codes are retrieved via separate SD connectors. Whatever; ignition and fuel codes must be retrieved separately on systems other than Motronic, HFM and PMS.

Mercedes KE and LH-Jetronic systems are capable of generating two very different kinds of fault codes. These are 2-digit fault codes and 2-digit duty cycle codes. Fault codes are similar to those generated by most other systems. Duty cycle codes provide data on the Lambda control system and faults that have occurred very recently (within the last four engine starts).

Bosch EZ-L ignition, Bosch Motronic, HFM and PMS systems generate fault codes only.

Fault codes retrieved in conjunction with an LED light are listed in the code tables at the end of the Chapter as 2-digit flash codes. In addition, when an FCR is used to retrieve codes, the codes displayed on the FCR may be 2-digit or 3-digit; both kinds are indicated where appropriate.

Duty cycle % codes

If a fault occurs on any of the monitored circuits during a period of engine running (only a small number of circuits will generate duty cycle % codes), the ECM will increment a counter, but will not store a fault at this stage. If the fault is present at the next two engine starts, the ECM will again increment the counter each time. If the fault is still present after four consecutive engine starts, the fault is recorded in non-volatile memory. If the fault disappears before four consecutive occurrences, the counter is reset to zero. If the fault recurs, the counter will begin incrementing from the zero point. The duty cycle % routine will display this code, along with any faults that are present but have not yet been stored into memory (if the fault has occurred in less than four consecutive engine starts).

Self-Diagnosis (SD) function

Each ECM has a self-test capability that continually examines the signals from certain engine sensors and actuators, and compares each signal to a table of programmed values. If the diagnostic software determines that a fault is present, the ECM stores one or more fault codes. Codes will not be stored about components for which a code is not available, or for conditions not covered by the diagnostic software.

Limited operating strategy (LOS)

Mercedes systems featured in this Chapter utilise LOS (a function that is commonly called the "limp-home mode"). Once certain faults have been identified (not all faults will initiate LOS), the ECM will implement LOS and refer to a programmed default value rather than the sensor signal. This enables the vehicle to be safely driven to a workshop/garage for repair or testing. Once the fault has cleared, the ECM will revert to normal operation.

Adaptive or learning capability

Mercedes systems also utilise an adaptive function that will modify the basic programmed values for most effective operation during normal running, and with due regard to engine wear.

Self-Diagnosis warning light

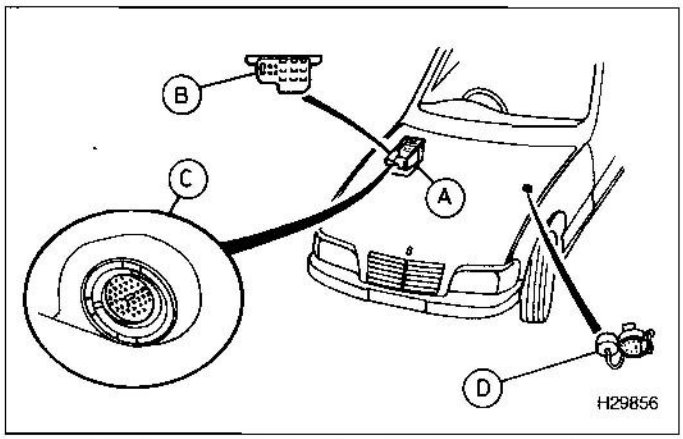
Some Mercedes models are equipped with an SD warning light located within the instrument panel, which may be used to display flash codes.

2 Self-Diagnosis connector location

Note: *All Mercedes SD connectors are provided both for retrieving flash codes and for dedicated FCR use.*

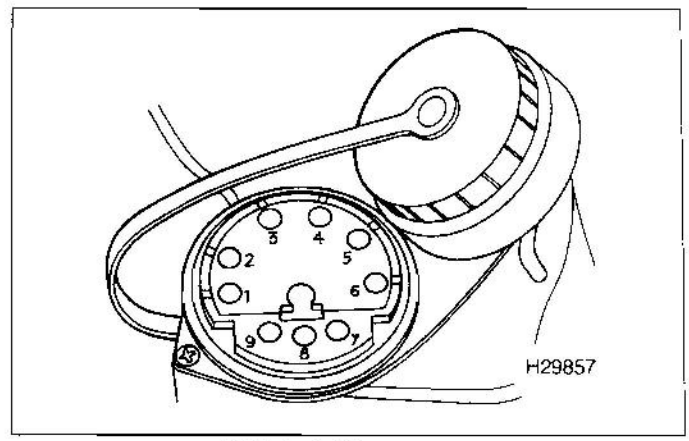
Bosch KE3.1-Jetronic

The 9-pin SD connector is located in the engine compartment on the left-hand inner wing, close to the ignition module **(see illustrations 22.1 and 22.2)**.

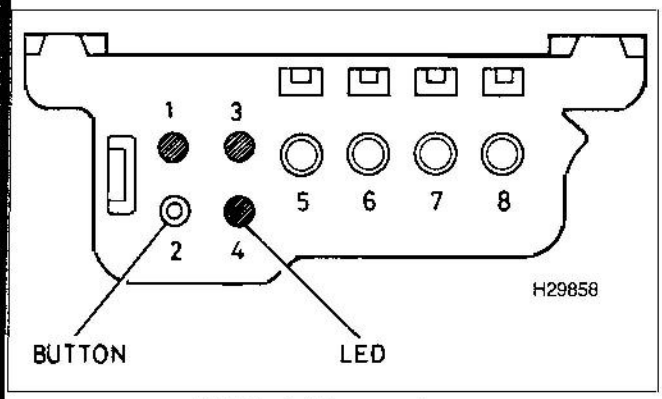


22.1 SD connector locations in Mercedes models

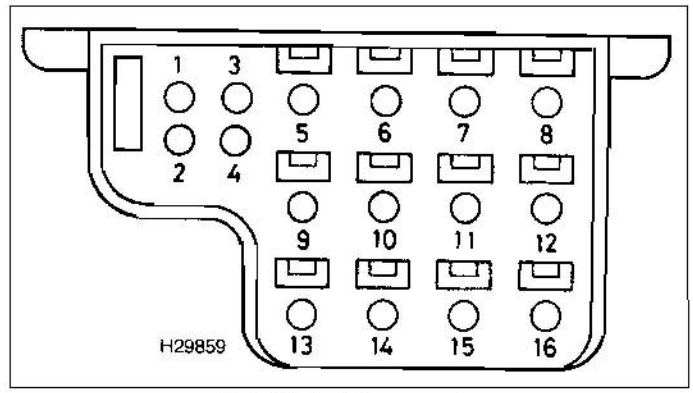
A SD connector location
B 16-pin SD connector (when fitted)
C 38-pin SD connector (when fitted)
D 9-pin SD connector (when fitted)



22.2 9-pin SD connector



22.3 8-pin SD connector



22.4 16-pin SD connector

Bosch KE3.5-Jetronic

The 8-pin SD connector is located in the engine compartment on the right-hand bulkhead **(see illustration 22.3)**.

Bosch KE5.2-Jetronic and EZ-L ignition

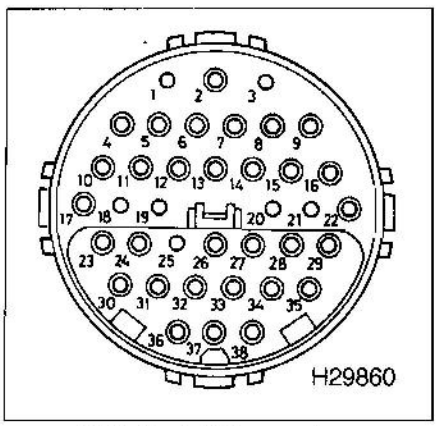
The 16-pin SD connector (2-digit fuel and ignition code retrieval) is located in the engine compartment on the right-hand bulkhead **(see illustration 22.4)**. The 9-pin SD connector (OS percentage code retrieval) is located in the engine compartment on the left-hand inner wing.

Bosch LH4.1-Jetronic and EZ-L ignition

The 38-pin SD connector (2-digit fuel and ignition code retrieval) is located in the engine compartment's electrical box on the right-hand bulkhead **(see illustration 22.5)**. The 9-pin SD connector (OS percentage code retrieval) is located in the engine compartment on the left-hand inner wing.

Bosch Motronic MP6.0/6.1, HFM and PMS

The 16-pin or 38-pin SD connector is located in the engine compartment on the right-hand bulkhead.



22.5 38-pin SD connector

3 Bosch KE3.1-Jetronic duty cycle code retrieval

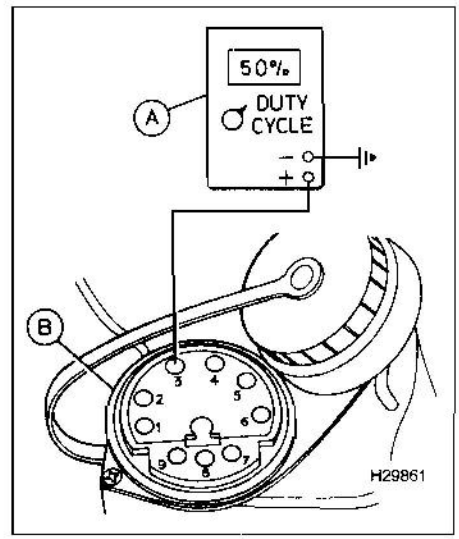
Note: *During the course of certain test procedures, it is possible for additional codes to be generated. Care must be taken that any codes generated during test routines do not mislead diagnosis. All codes must be cleared once testing is complete.*

1 Duty cycle codes alone can be retrieved from KE3.1-Jetronic.
2 Attach the positive probe of a digital multi-meter (DMM) to pin number 3 of the 9-pin SD connector. Attach the DMM negative probe to earth, and switch the meter to read duty cycle **(see illustration 22.6)**.
3 Switch on the ignition.
4 The meter should display the 2-digit duty cycle codes as a percentage.
5 Record the duty cycle percentage, and compare the value with the duty cycle % code chart at the end of this Chapter.
6 Turning off the ignition ends duty cycle code retrieval. Remove the DMM probes from the SD connector.

4 Bosch KE3.5-Jetronic duty cycle and flash code retrieval

Note: *During the course of certain test procedures, it is possible for additional codes to be generated. Care must be taken that any codes generated during test routines do not mislead diagnosis. All codes must be cleared once testing is complete. If using a fault code reader, proceed to Section 9.*

1 Duty cycle codes and 2-digit fault codes can be retrieved from KE3.5-Jetronic systems. Duty cycle codes must be retrieved prior to 2-digit fault code retrieval.
2 Attach the positive probe of a digital multi-meter (DMM) to pin number 3 of the 8-pin SD connector. Attach the DMM negative probe to earth, and switch the meter to read duty cycle **(see illustration 22.7)**.
3 Start and warm-up the engine so that the coolant temperature is at least 80°C (normal operating temperature).
4 Stop the engine and switch on the ignition.
5 The meter should display the 2-digit duty cycle codes as a percentage.
6 Record the duty cycle and compare the value with the duty cycle % code chart.
7 Turning off the ignition ends duty cycle code retrieval. Remove the DMM probes from the SD connector.
8 The method of retrieving 2-digit fault codes differs according to the type of 8-pin SD connector fitted. Some 8-pin SD connectors have an LED and button, others do not.
9 If the SD connector does not contain an LED and button, attach an accessory switch between pins 3 and 1 in the SD connector. Connect an LED diode test light between the battery (+) supply and SD pin 3 as shown **(refer to illustration 22.7)**.
10 Switch on the ignition.
11 Close the accessory switch or depress the button for at least 5 seconds, and then open the switch or release the button. After approximately 2 seconds, the LED will begin to flash.



22.6 Connect a digital multi-meter (A) to the 9-pin SD connector (B) in order to retrieve percentage codes

12 The LED displays the 2-digit fault codes as a straight count. One flash is equal to one code number, so five flashes denotes fault code number 5, twenty-two flashes denotes fault code number 22, and so on. Each flash lasts for 0.5 seconds, and there is a 1-second pause between each digit.
13 Count the number of flashes, and record the code. Refer to the tables at the end of the Chapter to determine the meaning of the flash code.
14 If code number 1 is transmitted, no faults codes are stored.
15 Retrieve subsequent codes by once more closing the accessory switch or depressing the button for at least 5 seconds. Open the switch or release the button, and after approximately 2 seconds the LED will begin to flash.
16 Repeat code retrieval by turning off the ignition and repeating the whole procedure from the beginning.
17 Turning off the ignition ends fault code retrieval. Remove the accessory switch and diode light from the SD connector where these components were used.

5 Bosch KE5.2-Jetronic and EZ-L ignition module duty cycle and flash code retrieval (16-pin)

Note: *During the course of certain test procedures, it is possible for additional codes to be generated. Care must be taken that any codes generated during test routines do not mislead diagnosis. All codes must be cleared once testing is complete. If using a fault code reader, proceed to Section 9.*

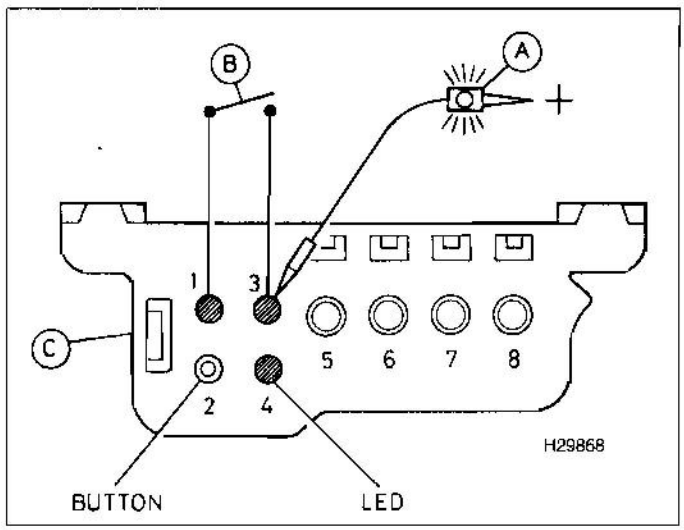
1 Duty cycle codes and 2-digit fault codes can be retrieved from KE5.2-Jetronic systems. Duty cycle codes are available either with the engine stopped (ignition on) or with the engine running at idle speed, and must be retrieved prior to 2-digit fault code retrieval. In addition, EZ-L ignition codes can be retrieved from the 16-pin SD connector.
2 Attach the positive probe of a digital multimeter (DMM) to pin number 3 of the 9-pin SD connector. Attach the DMM negative probe to earth, and switch the meter to read duty cycle **(refer to illustration 22.6).**
3 Start and warm-up the engine so that the coolant temperature is at least 80°C (normal operating temperature).
4 Stop the engine. Ensure that the air conditioning is turned off, and the automatic transmission selector (where applicable) is in "P". Switch on the ignition.
5 The meter should display the 2-digit duty cycle codes as a percentage.
6 Record the duty cycle. The displayed value will be 50% if all sensor inputs are within the pre-determined operating parameters. If the display indicates another value, refer to the duty cycle % code chart at the end of this Chapter to determine the reason.
7 Start the engine and allow it to idle. The duty cycle should fluctuate if the system is operating correctly. If the duty cycle value remains fixed at one particular figure, refer to the duty cycle % code chart to determine the reason.
8 Turning off the ignition ends duty cycle code retrieval. Remove the DMM probes from the 9-pin SD connector. All of the following fault code retrieval routines must be performed after duty cycle code retrieval.
9 Attach an accessory switch between pins 3 and 1 in the 16-pin SD connector. Connect an LED diode test light between SD pin 16 (+) and SD pin 3 (–) as shown **(see illustration 22.8).**
10 Switch on the ignition.
11 Close the accessory switch for 2 to 4 seconds, and then open the switch. After approximately 2 seconds, the LED light will begin to flash.
12 The LED light displays the 2-digit fault codes as a straight count. One flash is equal to one code number, so five flashes denotes fault code number 5, twenty-two flashes denotes fault code number 22, and so on. Each flash lasts for 0.5 seconds, and there is a 1-second pause between each digit.
13 Count the number of flashes, and record the code. Refer to the tables at the end of the Chapter to determine the meaning of the flash code.
14 If code number 1 is transmitted, no faults codes are stored.
15 Retrieve subsequent codes by closing the accessory switch once more for 2 to 4 seconds. Open the switch, and after approximately 2 seconds the LED light will begin to flash. After all stored codes have been displayed, the codes will be repeated.
16 Turning off the ignition ends KE5.2 fault code retrieval. Remove the accessory switch and diode light from the SD connector.

Engine systems control module flash code retrieval (16-pin)

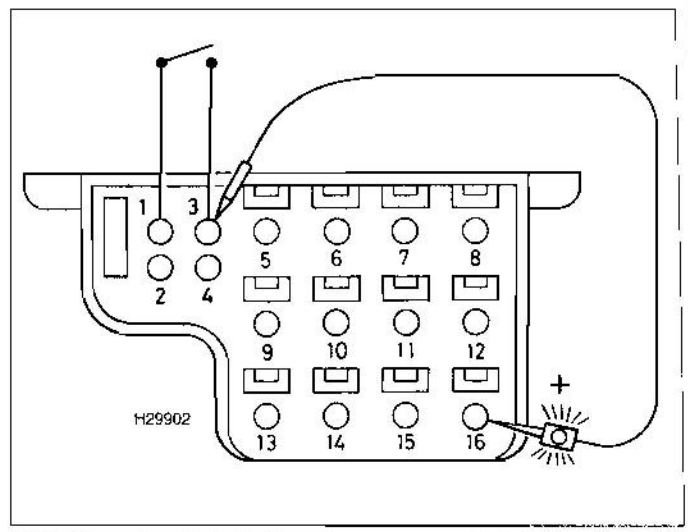
17 Fault codes from the engine systems control module can be retrieved by following the next set of routines.
18 Attach an accessory switch between pins 14 and 1 in the 16-pin SD connector. Connect an LED diode test light between SD pin 16 (+) and SD pin 14 (–) as shown **(see illustration 22.9).**
19 Switch on the ignition. The method for code retrieval is identical to that described above (paragraphs 11 to 16).
20 Retrieve ignition fault codes by following the routines described below (Bosch EZ-L).

Bosch EZ-L ignition module flash code retrieval (16-pin)

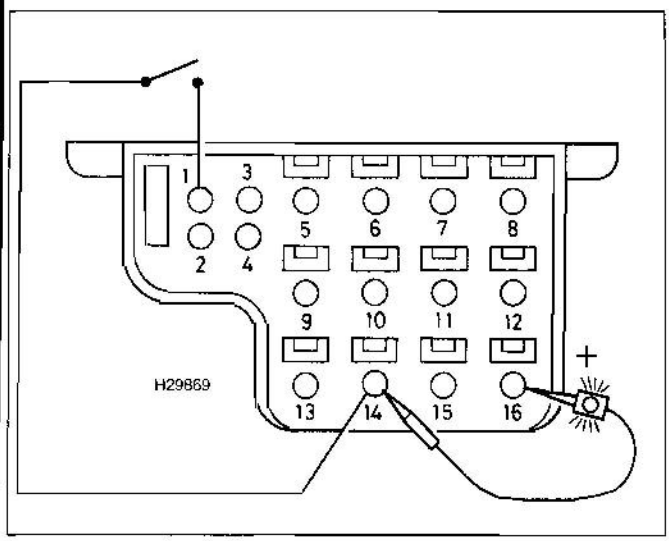
21 Only 2-digit fault codes can be retrieved from Bosch EZ-L ignition.
22 Attach the wires of an accessory switch between pins 8 and 1 in the 16-pin SD connector. Connect a diode test light between



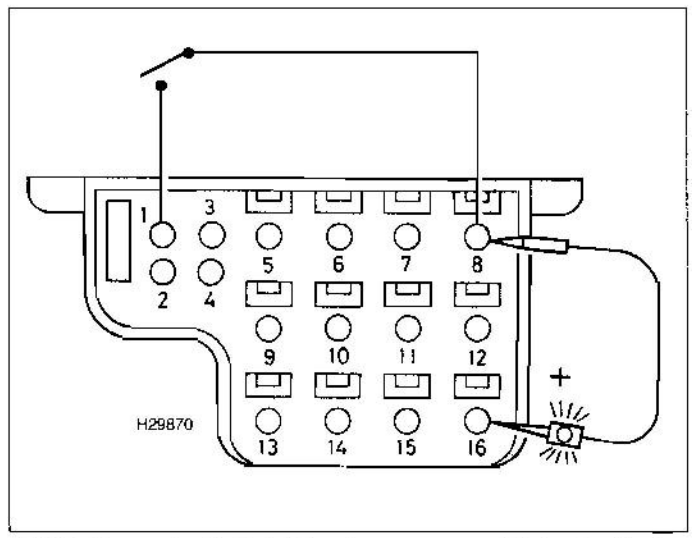
22.7 Connect a diode light (A) and accessory switch (B) to the 8-pin SD connector (C) in order to retrieve flash codes



22.8 Connect a diode light and accessory switch to the 16-pin SD connector in order to retrieve flash codes



22.9 Connect a diode light and accessory switch to the 16-pin SD connector in order to retrieve control module flash codes



22.10 Connect a diode light and accessory switch to the 16-pin SD connector in order to retrieve ignition flash codes

SD pin 16 (+) and SD pin 8 (–) as shown **(see illustration 22.10)**.

23 Start the engine and warm it to normal operating temperature.

24 Allow the engine to idle.

25 Raise the engine speed to between 3100 and 3600 rpm for approximately 8 seconds, and then allow the engine to idle once more.

26 Detach the vacuum hose from the connection on the EZ-L ignition module.

27 Move the automatic transmission selector lever from the "P" position to "D", and then back to "P".

28 Raise the engine speed to 5000 rpm for a minimum of 2 seconds, and then allow the engine to idle once more.

29 Reconnect the vacuum hose to the connection on the EZ-L ignition module.

30 Raise the engine speed to 2300 rpm, and then briefly snap the throttle fully open so that the throttle switch full-load contacts become closed. Allow the engine to idle once more.

Note: *If the ignition is turned off at any point, the whole procedure must be restarted from the beginning of the EZ-L ignition codes retrieval routine.*

31 Close the accessory switch for between 2 and 4 seconds, and then open the switch. After approximately 2 seconds, the LED light will begin to flash.

32 The LED light displays the 2-digit fault codes as a straight count. One flash is equal to one code number, so five flashes denotes fault code number 5, twenty-two flashes denotes fault code number 22, and so on. Each flash lasts for 0.5 seconds, and there is a 1-second pause between each digit.

33 Count the number of flashes, and record the code. Refer to the tables at the end of the Chapter to determine the meaning of the flash code.

34 If code number 1 is transmitted, no faults codes are stored.

35 Retrieve subsequent codes by once more closing the accessory switch for between 2 and 4 seconds. Open the switch, and after approximately 2 seconds the LED light will begin to flash.

36 Turning off the ignition ends ignition module fault code retrieval, and also clears all fault codes from memory. Fault codes are not retained in memory after the ignition has been turned off.

37 Remove the accessory switch and diode light from the SD connector.

6 Bosch LH4.1-Jetronic and EZ-L ignition module duty cycle and flash code retrieval (38-pin)

Note: *During the course of certain test procedures, it is possible for additional codes to be generated. Care must be taken that any codes generated during test routines do not mislead diagnosis. All codes must be cleared once testing is complete. If using a fault code reader, proceed to Section 9.*

1 Duty cycle codes and 2-digit fault codes can be retrieved from LH4.1-Jetronic systems. Duty cycle codes are available either with the engine stopped (ignition on) or with the engine running at idle speed, and must be retrieved prior to 2-digit fault code retrieval. In addition, EZ-L ignition codes can also be retrieved from the 38-pin SD connector.

2 Attach the positive probe of a digital multimeter (DMM) to pin number 3 of the 9-pin SD connector. Attach the DMM negative probe to earth, and switch the meter to read duty cycle **(refer to illustration 22.6)**.

3 Start and warm-up the engine so that the coolant temperature is at least 80°C (normal operating temperature).

4 Stop the engine. Ensure that the air conditioning is turned off, and the automatic transmission selector is in "P" (where applicable). Switch on the ignition.

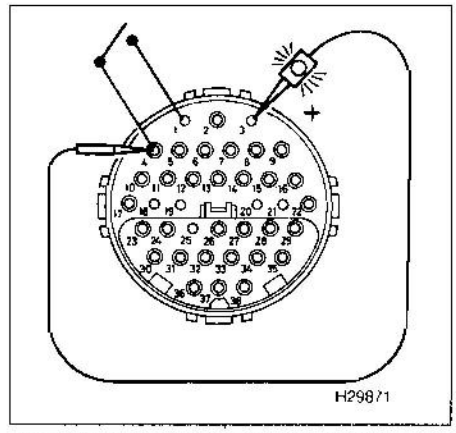
5 The meter should display the 2-digit duty cycle codes as a percentage.

6 Record the duty cycle. The displayed value will be 50% if all sensor inputs are within the pre-determined operating parameters. If the display indicates another value, refer to the duty cycle % code chart to determine the reason.

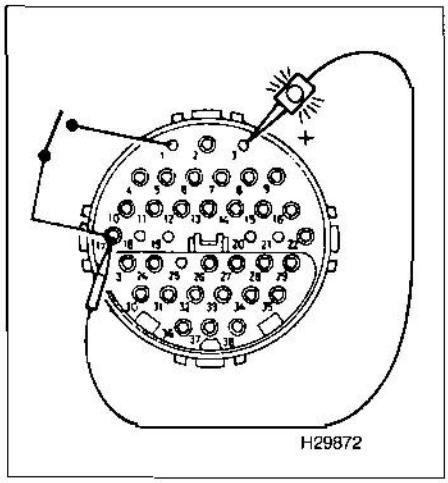
7 Start the engine and allow it to idle. The duty cycle should fluctuate if the system is operating correctly. If the duty cycle value remains fixed at one particular figure, refer to the duty cycle % code chart to determine the reason.

8 Turning off the ignition ends duty cycle code retrieval. Remove the DMM probes from the SD connector. All of the following fault code retrieval routines must be performed immediately after duty cycle code retrieval.

9 Attach the wires of an accessory switch between pins 1 and 4 in the 38-pin SD connector. Connect an LED diode test light between SD pin 3 (+) and SD pin 4 (–) as shown **(see illustration 22.11)**.

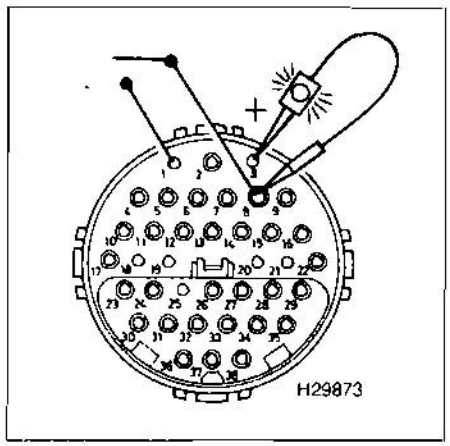


22.11 Connect a diode light and accessory switch to the 38-pin SD connector in order to retrieve flash codes



22.12 Connect a diode light and accessory switch to the 38-pin SD connector in order to retrieve ignition flash codes

10 Switch on the ignition.
11 Close the accessory switch for between 2 and 4 seconds, and then open the switch. After approximately 2-seconds the LED light will begin to flash.
12 The LED light displays the 2-digit fault codes as a straight count. One flash is equal to one code number, so five flashes denotes fault code number 5, twenty-two flashes denotes fault code number 22, and so on. Each flash lasts for 0.5 seconds, and there is a 1-second pause between each digit.
13 Count the number of flashes, and record the code. Refer to the tables at the end of the Chapter to determine the meaning of the flash code.
14 If code number 1 is transmitted, no faults codes are stored.
15 Retrieve subsequent codes by once more closing the accessory switch for at least 5 seconds. Open the switch, and after approximately 2 seconds the LED light will begin to flash. After all stored codes have been displayed, the codes will be repeated.



22.13 Connect a diode light and accessory switch to the 38-pin SD connector in order to retrieve base module flash codes

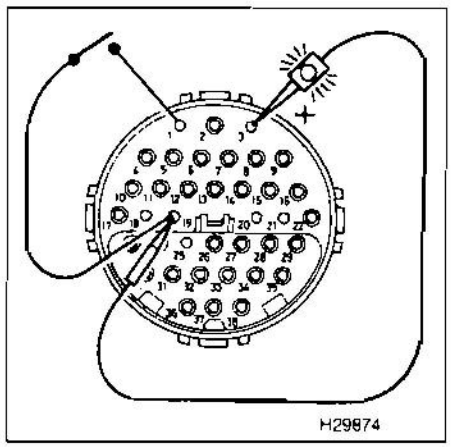
16 Turning off the ignition ends LH4.1 fault code retrieval. Remove the accessory switch and diode light from the SD connector.

Bosch EZ-L ignition module flash code retrieval (38-pin)

17 Attach the wires of an accessory switch between pins 1 and 17 in the 38-pin SD connector. Connect a diode test light between SD pin 3 (+) and SD pin 17 (–) as shown **(see illustration 22.12)**.
18 Switch on the ignition.
19 Close the accessory switch for between 2 and 4 seconds, and then open the switch. After approximately 2 seconds the LED will begin to flash.
20 The flashing of the LED light displays the 2-digit fault codes as a straight count. One flash is equal to one code number, so five flashes denotes fault code number 5, twenty-two flashes denotes fault code number 22, and so on. Each flash lasts for 0.5 seconds, and there is a 1-second pause between each digit.
21 Count the number of flashes, and record the code. Refer to the tables at the end of the Chapter to determine the meaning of the flash code.
22 If code number 1 is transmitted, no faults codes are stored.
23 Retrieve subsequent codes by once more closing the accessory switch for between 2 and 4 seconds. Open the switch, and after approximately 2 seconds the LED will begin to flash. After all stored codes have been displayed, the codes will be repeated.
24 Turning off the ignition ends ignition module fault code retrieval. Remove the accessory switch and diode light from the SD connector.

Base module flash code retrieval (38-pin)

25 Attach the wires of an accessory switch between pins 1 and 8 in the 38-pin SD connector. Connect an LED diode test light between SD pin 3 (+) and SD pin 8 (–) as shown **(see illustration 22.13)**.



22.14 Connect a diode light and accessory switch to the 38-pin SD connector in order to retrieve diagnostic module flash codes

26 Switch on the ignition. The method for code retrieval is identical to that for the EZ-L module (paragraphs 19 to 24).

Diagnostic module flash code retrieval (38-pin)

27 Attach the wires of an accessory switch between pins 1 and 19 in the 38-pin SD connector. Connect an LED diode test light between SD pin 3 (+) and SD pin 19 (–) as shown **(see illustration 22.14)**.
28 Switch on the ignition. The method for code retneval is identical to that for the EZ-L module (paragraphs 19 to 24).

7 Bosch Motronic MP6.0/6.1 and HFM/PMS flash code retrieval

Note 1: *During the course of certain test procedures, it is possible for additional codes to be generated. Care must be taken that any codes generated during test routines do not mislead diagnosis. All codes must be cleared once testing is complete. If using a fault code reader, proceed to Section 9.*
Note 2: *Flash codes retrieved using this method may be different to codes retrieved with the aid of an FCR. Refer to the fault code tables at the end of this Chapter - if following the procedures in this Section, use the column headed "Flash code".*
1 Only 2-digit codes can be retrieved from Motronic MP6.0/6.1.

Models with 16-pin SD connector

2 Attach the wires of an accessory switch between pins 1 and 3 in the 16-pin SD connector. Connect an LED diode test light between SD pin 16 (+) and SD pin 3 (–) as shown **(refer to illustration 22.8)**.

Models with 38-pin SD connector

3 Attach the wires of an accessory switch between pins 1 and 4 in the 38-pin SD connector. Connect an LED diode test light between SD pin 3 (+) and SD pin 4 (–) as shown **(refer to illustration 22.11)**.

All models

4 Switch on the ignition.
5 Close the accessory switch for between 2 and 4 seconds, and then open the switch. After approximately 2 seconds, the LED light will begin to flash.
6 The LED displays the 2-digit fault codes as a straight count. One flash is equal to one code number, so five flashes denotes fault code number 5, twenty-two flashes denotes fault code number 22, and so on. Each flash lasts for 0.5 seconds, and there is a 1-second pause between each digit.
7 Count the number of flashes, and record the code. Refer to the tables at the end of the Chapter to determine the meaning of the flash code.
8 If code number 1 is transmitted, no faults codes are stored.

9 Retrieve subsequent codes by once more closing the accessory switch for at least 5 seconds. Open the switch, and after approximately 2 seconds the LED light will begin to flash.
10 Repeat code retrieval by turning off the ignition and repeating the whole procedure from the beginning.
11 Turning off the ignition ends fault code retrieval. Remove the accessory switch and diode light from the SD connector.

8 Clearing fault codes without a fault code reader (FCR)

Note: *It is not possible to clear fault codes by disconnection of the battery terminals. Fault code memory in Mercedes vehicles is non-volatile, and battery power is not required to retain codes.*

16-pin Bosch EZ-L

1 Turning off the ignition ends fault code retrieval, and also clears all fault codes from memory. Fault codes are not retained in memory after the ignition has been turned off.

All systems except 16-pin Bosch EZ-L

2 Each fault code must be individually cleared as described in the following routines.
3 Carry out the procedure to retrieve the first fault code.
4 Clear the first code by depressing the accessory switch for a period of between 6 and 8 seconds.
5 Continue the process by retrieving and clearing each code in turn until all codes have been cleared.
6 In some systems, several different modules are connected to the SD connector. Each code in each module must be retrieved and then cleared one after the other until all are clear.
7 Turn off the ignition and remove the accessory switch and diode light from the SD connector.

9 Self-Diagnosis with a fault code reader (FCR)

Note: *During the course of certain test procedures, it is possible for additional fault codes to be generated. Care must be taken that any codes generated during test routines do not mislead diagnosis.*

All Mercedes models

1 Connect an FCR to the SD connector. Use the FCR for the following purposes, in strict compliance with the FCR manufacturer's instructions:

a) Retrieving fault codes.
b) Clearing fault codes.
c) Testing actuators.
d) Making service adjustments.
e) Displaying Datastream.

Note: *Not all of the above functions are available in all vehicles. Fault codes that are retrieved by FCR may be 2-digit or 3-digit. Refer to the tables at the end of this Chapter. Codes retrieved with the aid of an FCR may be different to flash codes retrieved manually.*
2 Codes must always be cleared after component testing, or after repairs involving the removal of an EMS component.

10 Guide to test procedures

1 Use an FCR to interrogate the ECM for fault codes, or gather flash codes manually.

Codes stored

2 If one or more fault codes are gathered, refer to the fault code tables at the end of this Chapter to determine their meaning.
3 If several codes are gathered, look for a common factor such as a defective earth return or supply.
4 Refer to the component test procedures in Chapter 4, where you will find a means of testing the majority of components and circuits found in the modern EMS.
5 Once the fault has been repaired, clear the codes and run the engine under various conditions to determine if the problem has cleared.
6 Check the ECM for fault codes once more. Repeat the above procedures where codes are still being stored.
7 Refer to Chapter 3 for more information on how to effectively test the EMS.

No codes stored

8 Where a running problem is experienced, but no codes are stored, the fault is outside of the parameters designed into the SD system. Refer to Chapter 3 for more information on how to effectively test the engine management system.
9 If the problem points to a specific component, refer to the test procedures in Chapter 4, where you will find a means of testing the majority of components and circuits found in the modern EMS.

Fault code tables

Bosch LH-Jetronic, LH4.1-Jetronic, KE3.5-Jetronic, KE5.2-Jetronic

Flash/ FCR code	Description
1	No faults found in the ECM. Proceed with normal diagnostic methods
2	Coolant temperature sensor (CTS) 1 or CTS circuit
2	Throttle pot sensor (TPS) or TPS circuit, full-load (KE5.2)
3	Coolant temperature sensor (CTS) 2 or CTS circuit
4	Mass airflow (MAF) sensor or MAF sensor circuit
5	Oxygen sensor (OS) or OS circuit (KE5.2)
6	CO pot or CO pot circuit
7	TN (engine speed) signal incorrect
7	Vehicle speed sensor (VSS) or VSS circuit (LH4.1, KE5.2)
8	Camshaft position sensor (CMP) or CMP circuit
8	Cylinder identification (CID) sensor or CID sensor circuit (LH4.1
8	Ignition system or circuit (KE5.2)
8	Barometric pressure sensor (BPS) or BPS circuit (KE3.5)
9	Starter signal
9	Pressure actuator (KE5.2, KE3.5)
10	Idle speed control valve (ISCV) or ISCV circuit
10	Throttle pot sensor (TPS) or TPS circuit (LH4.1, KE5.2, KE3.5)
11	Secondary air pump system
12	Mass airflow (MAF) sensor burn-off or MAF sensor circuit
12	Pressure signal from ignition system or circuit (KE5.2)
13	Air temperature sensor (ATS) or ATS circuit
14	Vehicle speed sensor (VSS) or VSS circuit (KE5.2)
15	Catalytic converter control unit (Japan only)
15	Exhaust gas recirculation (EGR) valve (LH4.1)
16	Exhaust gas recirculation (EGR) or EGR circuit
17	Throttle switch (TS), full-load switch
17	Idle speed control valve (ISCV) or ISCV circuit
17	CAN signal (LH4.1) - communication between system computers
17	Oxygen sensor (OS) or OS circuit (KE5.2)
18	Data transfer from ignition system
18	CAN signal (LH4.1) - communication between system computers
18	Idle speed control valve (ISCV) or ISCV circuit (KE5.2)
20	Electronic control module (ECM)
20	CAN signal (LH4.1) - communication between system computers

Flash/ FCR code	Description
21	Oxygen sensor (OS) or OS circuit
22	Oxygen sensor (OS) heater or OS circuit
23	Regeneration valve or circuit
23	Carbon filter solenoid valve (CFSV) or CFSV circuit (LH4.1, KE5.2)
24	Left camshaft control actuator or circuit (119 engine)
25	Right camshaft control actuator or circuit (119 engine)
25	Camshaft control actuator or circuit (104 engine)
25	Cold start valve (CSV) or CSV circuit (KE5.2)
26	Automatic transmission (AT) shift point relay or circuit
27	Injectors or injector circuit
27	Data exchange between KE and EZ control units (KE5.2)
28	Electronic control module (ECM)
28	Coolant temperature sensor (CTS) or CTS circuit (KE5.2)
29	1st gear relay (LH4.1)
29	Coolant temperature sensor (CTS) or CTS circuit (KE5.2)
30	Immobiliser system fault (LH4.1)
31	Air temperature sensor (ATS) or ATS circuit (KE5.2)
32	MKV resistor (engine coding plug, KE5.2)
34	Coolant temperature sensor (CTS) or CTS circuit (KE5.2)

Bosch LH4.1 base module

Flash/ FCR code	Description
1	No faults found in the ECM. Proceed with normal diagnostic methods
5	Maximum permissible temperature in module box exceeded
6	Electromagnetic air conditioning compressor clutch blocked
7	Poly-V-belt slipping
9	Voltage supply for electronic control module (ECM) (N3/1) interrupted
10	Voltage supply for electronic control module (ECM) (N3/1) interrupted
10	Voltage supply for fuel injectors interrupted (alternative code)
11	Voltage supply for accessory equipment control modules interrupted
12	Voltage supply for ABS (anti-lock brakes) control module (N30) or ABS/ASR (anti-lock brakes/traction control) control module (N30/1)
12	Automatic locking differential (ASD) control module (N30/2) interrupted (alternative code)
15	Voltage supply for automatic transmission kickdown valve (Y3) interrupted
16	Voltage supply for electromagnetic air conditioning compressor clutch (A9K1) interrupted
17	Voltage supply for module box blower motor (M2/2) interrupted

Bosch LH4.1 diagnostic module

Flash/ FCR code	Description
1	No faults found in the ECM. Proceed with normal diagnostic methods.
2	Oxygen sensor (OS) or OS circuit, inoperative
3	Oxygen sensor (OS) or OS circuit, inoperative
4	Secondary air injection, inoperative
5	Exhaust gas recirculation (EGR) valve or EGR circuit, inoperative
6	Idle speed control valve (ISCV) or ISCV circuit, inoperative
7	Ignition system defective
8	Coolant temperature sensor (CTS) or CTS circuit, open/short-circuit
9	Air temperature sensor (ATS) or ATS circuit, open/short-circuit
10	Mass airflow (MAF) sensor or MAF sensor circuit, voltage too high/low
11	TN (engine speed) signal defective
12	Oxygen sensor (OS) or OS circuit, open/short-circuit
13	Camshaft position sensor (CMP) or CMP circuit, signal defective
14	Variable induction solenoid valve (VISV) or VISV circuit, pressure too low
15	Wide-open throttle, information defective
16	Closed throttle, information defective
17	Data exchange malfunction between individual control modules
18	Adjustable camshaft timing solenoid, open/short-circuit
19	Fuel injectors open/short-circuit or emission control system adaption at limit
20	Speed signal missing
21	Purge switchover valve, open/short-circuit
22	Camshaft position sensor (CMP) or CMP circuit, signal defective
23	Variable induction solenoid valve (VISV) or VISV circuit, pressure with engine running too low
24	Starter ring gear segments defective
25	Knock sensor (KS) or KS circuit
26	Upshift delay switchover valve, open short-circuit
27	Coolant temperature sensor (CTS) or CTS circuit
28	Coolant temperature sensor (CTS) or CTS circuit

Bosch KE5.2 control module

Flash/ FCR code	Description
1	No faults found in the ECM. Proceed with normal diagnostic methods
2	Fuel pump relay or circuit
3	TN (engine speed) signal interrupted
4	Oxygen sensor (OS) or OS circuit
5	Output for secondary air injection pump control defective
6	Output for kickdown switch control defective
9	Oxygen sensor (OS) heater or OS circuit, open
11	Air conditioning (AC) compressor engagement signal missing
12	Output for air conditioning (AC) compressor control defective
13	Excessive air conditioning compressor belt slippage
14	Speed signal implausible
15	Short-circuit detected in fuel pump circuit

Bosch EZ-L ignition

Flash/ FCR code	Description
01	No faults found in the ECM. Proceed with normal diagnostic methods
02	Knock sensor (KS) or KS circuit
03	Coolant temperature sensor (CTS) or CTS circuit
04	Manifold absolute pressure (MAP) sensor or MAP sensor circuit
05	Knock sensor (KS) or KS circuit
06	Camshaft position sensor (CMP) or CMP circuit
07	Knock sensor (KS) or KS circuit
08	Automatic transmission
09	Automatic transmission
10	Data exchange between KE and EZ control units
11	Ignition control
12	Vehicle speed sensor (VSS) or VSS circuit
13	Throttle pot sensor (TPS) or TPS circuit

Flash/ FCR code	Description
14	Throttle pot sensor (TPS) or TPS circuit
15	Ignition end stage fault
16	Ignition end stage fault
17	Vehicle speed sensor (VSS) or VSS circuit
18	Crank angle sensor (CAS) or CAS circuit
20	Electronic control module (ECM) or ECM circuit
21	Manifold absolute pressure (MAP) sensor or MAP sensor circuit
26	Data exchange between LH and EZ control units
27	Data exchange between LH and EZ control units
34	Ignition fault No.1 cylinder
35	Ignition fault No.5 cylinder
36	Ignition fault No.4 cylinder
37	Ignition fault No.8 cylinder
38	Ignition fault No.6 cylinder
39	Ignition fault No.3 cylinder
40	Ignition fault No.7 cylinder
41	Ignition fault No.2 cylinder

Bosch Motronic 6.0/6.1

Flash/ FCR code	Description
1	No faults found in the ECM. Proceed with normal diagnostic methods
2	Coolant temperature sensor (CTS) or CTS circuit
3	Air temperature sensor (ATS) or ATS circuit
4	Manifold absolute pressure (MAP) sensor or MAP sensor circuit
5	Throttle switch (TS) or TS circuit
6	Throttle pot sensor (TPS) or TPS circuit
7	Throttle pot sensor (TPS) or TPS circuit
8	Idle speed control valve (ISCV) or ISCV circuit
9	Oxygen sensor (OS) or OS circuit
11	Oxygen sensor (OS) or OS circuit
13	Oxygen sensor (OS) or OS circuit
14	Injectors 4 cylinder Nos. 1 and 4
15	Injectors 4 cylinder Nos. 2 and 3
20	Oxygen sensor (OS) or OS circuit
21	Ignition primary circuit, cylinders 1 and 4
22	Ignition primary circuit, cylinders 2 and 3
24	Engine speed signal or circuit
26	Octane encoding or circuit
27	Engine speed signal or circuit
28	Vehicle speed sensor (VSS) or VSS circuit
29	Variable induction solenoid valve (VISV) or VISV circuit, preheating relay or circuit
30	Fuel pump circuit
31	CO adjuster or CO circuit
36	Carbon filter solenoid valve (CFSV) or CFSV circuit
37	Automatic transmission (AT)
49	Electronic control module (ECM)

PMS (Siemens)

Flash code	FCR code	Description
01	-	No faults found in the ECM. Proceed with normal diagnostic methods
02	02	Coolant temperature sensor (CTS) or CTS circuit
02	00	Coolant temperature sensor (CTS) or CTS circuit
02	01	Coolant temperature sensor (CTS) or CTS circuit
03	03	Air temperature sensor (ATS) or ATS circuit
03	04	Air temperature sensor (ATS) or ATS circuit
04	06	Manifold absolute pressure (MAP) sensor or MAP sensor circuit
04	05	Manifold absolute pressure (MAP) sensor or MAP sensor circuit
05	07	Throttle pot sensor (TPS) or TPS circuit
06	13	Throttle pot sensor (TPS) or TPS circuit
06	14	Throttle pot sensor (TPS) or TPS circuit
07	15	Idle speed control valve (ISCV) or ISCV circuit
07	16	Idle speed control valve (ISCV) or ISCV circuit
08	17	Idle speed control valve (ISCV) or ISCV circuit
08	20	Idle speed control valve (ISCV) or ISCV circuit
08	21	Idle speed control valve (ISCV) or ISCV circuit
09	22	Oxygen sensor (OS) or OS circuit
09	23	Oxygen sensor (OS) or OS circuit
11	30	Oxygen sensor (OS) or OS circuit
11	32	Oxygen sensor (OS) or OS circuit
11	31	Oxygen sensor (OS) or OS circuit
13	37	Oxygen sensor (OS) or OS circuit
13	36	Oxygen sensor (OS) or OS circuit
14	42	Injectors (4-cylinder) numbers 2 and 3
14	40	Injectors (4-cylinder) numbers 1 and 4
14	41	Injectors (4-cylinder) numbers 1 and 3
15	43	Injectors (4-cylinder) numbers 2 and 4
20	54	Oxygen sensor (OS) or OS circuit
20	55	Oxygen sensor (OS) or OS circuit
20	57	Oxygen sensor (OS) or OS circuit
20	56	Oxygen sensor (OS) or OS circuit
21	64	Ignition primary circuit - cylinders 1 and 4
21	62	Ignition primary circuit - cylinders 1 and 4
21	63	Ignition primary circuit - cylinders 1 and 4
22	65	Ignition primary circuit - cylinders 2 and 3
22	67	Ignition primary circuit - cylinders 2 and 3
22	66	Ignition primary circuit - cylinders 2 and 3
24	73	Engine speed sensor or circuit
24	75	Engine speed sensor or circuit
26	77	MKV (engine coding plug)
26	80	MKV (engine coding plug)
27	81	Tachometer circuit
27	82	Tachometer circuit
28	83	Vehicle speed sensor (VSS) or VSS circuit
28	84	Vehicle speed sensor (VSS) or VSS circuit
29	86	Variable induction solenoid valve (VISV) or VISV circuit, preheating relay
29	85	Variable induction solenoid valve (VISV) or VISV circuit, preheating relay
30	00	Fuel pump circuit
30	87	Fuel pump circuit
36	A4	Carbon filter solenoid valve (CFSV) or CFSV circuit
36	A3	Carbon filter solenoid valve (CFSV) or CFSV circuit
37	A5	Automatic transmission (AT)
49	E6	Electronic control module (ECM)

HFM

Flash code	FCR code	Description
1	-	No faults found in the ECM. Proceed with normal diagnostic methods
2	002	Coolant temperature sensor (CTS) or CTS circuit, short-circuit
2	003	Coolant temperature sensor (CTS) or CTS circuit, open-circuit
2	004	Coolant temperature sensor (CTS) or CTS circuit, implausible signal
2	005	Coolant temperature sensor (CTS) or CTS circuit, loose contact
3	006	Air temperature sensor (ATS) or ATS circuit, short-circuit
3	007	Air temperature sensor (ATS) or ATS circuit, open-circuit

Flash code	FCR code	Description
3	008	Air temperature sensor (ATS) or ATS circuit, loose contact
4	009	Mass airflow (MAF) sensor or MAF sensor circuit, implausibly high signal
4	010	Mass airflow (MAF) sensor or MAF sensor circuit, open-circuit
5	011	Throttle switch (TS)
5	012	Throttle switch (TS), closed
5	013	Throttle switch (TS), loose contact
6	014	Throttle pot sensor (TPS) or TPS circuit, implausibly high signal
6	015	Throttle pot sensor (TPS) or TPS circuit, implausibly low signal
6	016	Throttle pot sensor (TPS) or TPS circuit, loose contact
7	017	Throttle pot sensor (TPS) or TPS circuit, implausibly high signal
7	018	Throttle pot sensor (TPS) or TPS circuit, implausibly low signal
7	019	Throttle pot sensor (TPS) or TPS circuit, loose contact
8	020	Idle speed control valve (ISCV) or ISCV circuit, bottom control stop
8	021	Idle speed control valve (ISCV) or ISCV circuit, top control stop
9	023	Oxygen sensor (OS) or OS circuit, voltage high
9	024	Oxygen sensor (OS) or OS circuit, cold or open-circuit
9	025	Oxygen sensor (OS) or OS circuit, sensor voltage implausible
11	029	Oxygen sensor (OS) or OS circuit, heater current low
11	030	Oxygen sensor (OS) or OS circuit, heater current high
11	031	Oxygen sensor (OS) or OS circuit, heater short-circuit
13	035	Oxygen sensor (OS) or OS circuit, mixture lean
13	036	Oxygen sensor (OS) or OS circuit, mixture rich
14	037	Injector No. 1, short-circuit
14	038	Injector No. 1, open/short-circuit
15	039	Injector No. 2, short-circuit to positive
15	040	Injector No. 2, open/short-circuit to earth
16	041	Injector No. 3, short-circuit to positive
16	042	Injector No. 3, open/short-circuit to positive
17	043	Injector No. 4, short-circuit to positive
17	044	Injector No. 4, open/short-circuit to positive
20	049	Oxygen sensor (OS) or OS circuit
20	050	Oxygen sensor (OS) or OS circuit
20	051	Oxygen sensor (OS) or OS circuit
20	052	Oxygen sensor (OS) or OS circuit
20	053	Oxygen sensor (OS) or OS circuit
20	054	Oxygen sensor (OS) or OS circuit
22	055	Ignition coil, No. 1 cylinder misfire or circuit
22	056	Ignition coil, No. 4 cylinder misfire or circuit
22	057	Ignition coil or circuit, current not reached
23	058	Ignition coil, No. 2 cylinder misfire or circuit
23	059	Ignition coil, No. 3 cylinder misfire or circuit
23	060	Ignition coil or circuit, current not reached
24	064	Crank angle sensor (CAS) or CAS circuit
24	065	Crank angle sensor (CAS) or CAS circuit
24	066	Crank angle sensor (CAS) or CAS circuit
25	067	Camshaft position (CMP) sensor or CMP sensor circuit
26	068	Electronic control module (ECM)
26	069	Electronic control module (ECM)
27	070	RPM sensor or circuit
27	071	RPM sensor or circuit
28	072	Vehicle speed sensor (VSS) or VSS circuit, signal not recognised
28	073	Vehicle speed sensor (VSS) or VSS circuit, signal implausibly high
29	074	Variable induction solenoid valve (VISV) or VISV circuit, heater relay or circuit
29	075	Variable induction solenoid valve (VISV) or VISV circuit, heater relay or circuit
30	076	Fuel pump relay or circuit
32	079	Knock sensor (KS) 1 or circuit
32	080	Knock sensor (KS) 2 or circuit
33	081	Ignition timing, maximum retardation at No. 1 cylinder
33	082	Ignition timing, variation in cylinder firing point greater than 6°
34	083	Knock sensor (KS) control circuit in ECM
34	084	Oxygen sensor (OS) or OS circuit
36	086	Carbon filter solenoid valve (CFSV) or CFSV circuit
36	087	Carbon filter solenoid valve (CFSV) or CFSV circuit
37	088	Automatic transmission (AT) or AT circuit
38	089	Camshaft timing actuator, short-circuit to positive
38	090	Camshaft timing actuator, open/short-circuit to earth
43	101	No starter signal, terminal 50
-	107	Dwell angle control at ignition output stage
49	110	Electronic control module (ECM), supply voltage implausible
49	111	Electronic control module (ECM), supply voltage low
50	112	Electronic control module (ECM)
-	113	Electronic control module (ECM)
-	114	Incorrect electronic control module (ECM) coding, from 01/94
-	115	Incorrect electronic control module (ECM) coding, from 01/94
-	116	Infra-red control unit signal from 12/94
-	117	Attempt to start when infra-red locking system locked, from 12/94

Bosch KE3.1-Jetronic, KE3.5-Jetronic, KE5.2-Jetronic, LH4.1-Jetronic

Duty cycle %	Description
0%	Oxygen sensor (OS) or OS circuit
0%	Self-Diagnosis connector (non-cat vehicles)
10%	Throttle pot sensor (TPS) or TPS circuit
20%	Throttle pot sensor (TPS) or TPS circuit
20%	Injectors or injectors circuit (LH4.1)
30%	Coolant temperature sensor (CTS) or CTS circuit
40%	Airflow sensor (AFS) or AFS circuit
50%	Oxygen sensor signal (cat vehicles)
50%	Input signals ok
60%	Vehicle speed sensor (VSS) or VSS circuit
60%	Camshaft position sensor (CMP) or CMP circuit
70%	Engine speed signal
80%	Air temperature sensor (ATS) or ATS circuit
80%	Barometric pressure sensor (BPS) or BPS circuit (KE3.5)
80%	Drive engaged (KE5.2)
80%	CAN signal (LH4.1) - communication between system computers
90%	Pressure actuator (KE5.2)
90%	Safety fuel cut-off active (LH4.1)
100%	Oxygen sensor (OS) or OS circuit
100%	Electronic control module (ECM) (non-cat vehicles)