Diagnosis - Diagnostic Trouble Code (DTC) Memory

Preliminary work: . . . . . Engine Test, Adjustment, Engines (SMS, Job No. 07-1100)

⚠ WARNING!
Risk of severe injury when touching ignition parts which produce high voltages. Do not touch igntion components.
Persons with heart pacemakers are not to perform repairs on this type of ignition system..

Electronic ignition systems produce dangerous high voltages on both the primary circuit and the secondary (ignition) circuits. Due to the high voltages produced, contact with any of the voltage carrying components can be dangerous to your health (burns, heart palpatations, cardiac arrest etc).

- Igntion must be turned OFF prior to performing any repair work on the igntion system.
- Do not come in contact or remove with any of the ignition components while the engine is cranking or idling.
- Wear rubber soled shoes.
- Disconnect connectors for CKP sensor at sensor or control module.
- If repairs require that the ignition be turned on, then dangerous voltages will be present through out the entire ignition system.
- No exposed metal connectors or sending units may be installed in the ignition wires.

⚠ WARNING!
Risk of fatal injury from being pulled into rotating vehicle parts.
Do not reach into rotating parts.
Wear closed and tight-fitting work clothes.
Protect vicinity of rotating vehicle components from unauthorized access.

⚠ WARNING!
Risk of explosion from fuel igniting, risk of poisoning from inhaling and swallowing fuel as well as risk of injury to eyes and skin from contact with fuel.
No fire, sparks, exposed flames or smoking.
Pour fuels only into suitable and appropriately marked containers.
Wear protective clothing when handling fuel.
Possible hazards
Risk of explosion, poisoning and injury
Fuels are highly inflammable and toxic if inhaled. Fuel may cause skin damage. Contact with gasoline fuel, for example, removes the natural oils on the skin. Fuel vapors are explosive, invisible and spread out at floor level. They are toxic if inhaled and have a narcotic effect in high concentrations.

Protective measures/guidelines

- Pay attention to national safety regulations and provisions.
- No fire, sparks, exposed flames or smoking.
- Ensure that the place of work is adequately ventilated.
- Never drain or pour in fuels over assembly pits.
- Store drained fuel in suitable and sealed containers.
- Immediately eliminate any fuel spills which have been spilled out of the container.

Continued on next page:

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Conducting work on a vehicle with exposed flame
(e.g. welding etc.)

- Prior to commencing such work, remove appropriate parts of the fuel system and seal open fuel lines with plugs.

First-aid measures

- Clean contaminated/exposed skin with water and soap.
- Change contaminated clothing as quickly as possible.
- If fuel gets into the eyes, rinse out eyes immediately with water, and contact a doctor, if necessary.

To Avoid Damage to the Ignition System

- To avoid damage to the engine control module, connect/disconnect the control module connectors only with the ignition: **OFF**.
- Circuit 1 of the ignition coil may not be shorted to ground, e.g. theft deterence.
- Only original equipment should be installed in the ignition system.
- Do not operate the ignition system at cranking speed unless the entire igntion harness is connected.
- Do not perform any tests (grounding of ignition cable 4 disconnecting a spark plug connector or pulling cable 4 out of the ignition coil) at cranking or idle speed.
- The high output side of the ignition system must carry at least 2 kΩ of load (spark plug connector).
- If assisting a disabled vehicle and it becomes necessary to perform an igntion spark test, perform this test only on one ignition/sark plug. Ensure a good ground connection to the spark plug.
- ME - SFI: the ignition system is to be turned OFF, when cranking engine to perform compression tests, additionally, it is necessary to disconnect connector 2 from the control module.

Engine 120 has separate ignition and fuel injection system.

⚠
Readout via the impulse counter scan tool is not possible.

Note:
Symbol for emission related malfunctions which lead to the activation of the CHECK ENGINE MIL when a certain test cycle was performed and a fault was recognized.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Note regarding diagnostic trouble code (DTC) readout:
The left (N3/11) and right engine control module (N3/12) for the ME-SFI system is equipped with diagnostic trouble code (DTC) memory. All DTC's are readable via the right control module (N3/12) only. Malfunctions are recognized and stored as DTC's and are distinguished as follows:

- Malfunctions which are constantly present,
- Intermittent contact malfunctions which have occured during a trip and have been stored.

The DTC memory remains active when the vehicle's battery is disconnected.

Malfunctions which are no longer present, are automatically erased as follows:

- After three trips the "CHECK ENGINE" MIL goes out.
- After an additional 40 warm-up periods the DTC is automatically erased.

A warm-up period or trip is defined as follows:

Warm-up period
- Engine coolant temperature at start < 35° C,
- Engine coolant temperature increases to > 80° C.

Trip
- Engine running for > 20 minutes,
- Engine temperature > – 7° C,
- Engine speed > 500 rpm,
- All emission related logic chain functions already were checked during previous trips.

The stored DTC's can be read at the data link connector (X11/4) using the HHT only, with the ignition switched "**ON**" or with the "engine running".

Readout via an on-off ratio readout or impulse counter scan tool has been eliminated.

Note regarding mixture preparation self-adaptation:
The Lambda control system determines the fuel injection duration so precisely that the fuel/air ratio is kept constant at Lambda level 1 (equals 14.7 kg air to 1 kg fuel) under all operating conditions.
Should malfunctions occur in the form of:
- Intake air leaks,
- Injector wear or carbon build-up,
- Engine wear,
- Transition resistance in MAF sensor,
- Defective diaphragm pressure regulator,
- Defective purge control valve,

the engine control module automatically performs a mixture adjustment.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

The degree of correction is constantly calculated and permanently stored. The self-adaptation is performed additive at idle and multiplicative under partial load. The correction towards rich or lean is ± 1.0 ms (injection duration)and at partial load the factor 0.77 – 1.28. After repair work is performed, the engine control module will automatically adapt itself again .

Note regarding version coding:
The engine control module is equipped with a version coding feature. The coding must be performed with the Hand-Held Tester (automatically or manually, see Notes for HHT “Version coding“ 11/5) upon installation of a new control module.
The following vehicle version data must be determined for coding:

- Vehicle model,
- Catalytic converter (TWC),
- Non-catalytic converter (non-TWC),
- Country version.

Note regarding drive authorization system (DAS) stage 2 and (DAS) X:
Vehicles with ME-SFI are equipped with the drive authorization system (DAS) stage 2.
The activation/deactivation of the drive authorization system takes place from the RCL control module (stage 2) or from the DAS control module (stage X) via CAN data bus to the engine control module (ME-SFI). After activating the drive authorization system, the engine control module renders the fuel injection system inoperative.

On vehicles till 05/96 a drive authorization system stage 2 (DAS 2) is installed. This drive authorization system can only be activated/deactivated with the IR transmitter or the master key.

On vehicles as of 06/96 a drive authorization system stage X (DAS X) is installed. The activation or deactivation is accomplished with transponder technology via the ignition key. As soon as the ignition key is turned in the steering lock the DAS control module receives a signal and the fuel injection system is made operative via the CAN data bus.

The engine control module and the RCL or the DAS control module are “married” to one another through identification codes. The identification codes can not be erased (see HHT nominal values “DAS”, menu selection 3/7).
Therefore, swapping the engine and RCL or DAS control modules from one vehicle to another is not possible!

⚠
If an exchange engine control module is installed for test purposes, only 40 start attempts can be perfromed before the engine and RCL or DAS control modules “marry” to one another. Prior to perfroming the first start, the engine control module must be version coded using the HHT. Additionally, the code number and VIN must be entered (see HHT nominal values “DAS”, menu selection 3/7).

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes regarding automatic recognition of the mechanical end stop and wide open position of the throttle valve from the actuators:
The end stops of the throttle valves are determined by the actuators and stored in the engine control module.
After replacing one or both control modules or actuators, the mechanical end stop and wide open position must be determined and recorded.
After interrupting the voltage supply from circuit 30 (B+), the engine control module performs a self adaptation of the actuators with the ignition ON (lower mechanical end stop).

Requirements for learning process:
- Selector lever in position P/N,
- Vehicle at rest,
- Engine off,
- Engine coolant temperature between 5° C and 100° C,
- Accelerator pedal not applied.

When all requirements are met, turn **ignition ON for at least 60 seconds**, then turn **ignition OFF for at least 10 seconds**.
The learned value is stored in memory, only after the first 10 start cycles, provided the voltage supply has not been interrupted. Should the battery be disconnected after the 9th start cycle, the re-learning process must be performed again.

Notes regarding the engine control module after interruption of voltage supply, circuit 30:
If a rough running engine is noticed after a voltage interruption, the following conditions must be met:
- Engine coolant temperature approx. > 80 °C,
- Drive vehicle on dynamometer in selector lever position 4 or on the road in selector lever position 3.
- Increase engine rpm to approx. > 3500 rpm and then coast until engine rpm is approx. < 1200 rpm.
- Repeat procedure at least 3 times.

Notes regarding performance/speedometer test:
Disconnecting the ESP/ASR/ETS/ABS control modules is not allowed. The engine control module and transmission control module rely on these modules to supply the VSS data via the CAN bus.

To disable the brake and engine regulation function of the ESP/ASR/ETS/ABS control modules proceed as follows:

A. Working without HHT
- Ignition: **OFF**.
- Connect HHT adapter to data link connector (X11/4).
- Bridge sockets 1 and 6.
- Engine: **Start** (ESP/ASR/ETS/ABS MIL must illuminate!).

B. Working with HHT
- Ignition: **OFF**.
- Disconnect front axle VSS sensor connector (ESP/ASR/ETS/ABS MIL must illuminate!).

When work is completed, reconnect VSS sensor connector, erase DTC's with HHT!

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes regarding activation of CHECK ENGINE MIL (only USA)

With combustion misses (e.g. ignition or fuel mixture) the CHECK ENGINE MIL is activated intermitantly (blinking). Affected are the DTC's P0 300 to P0 312.
With all other faults the MIL lights continuously.

Notes regarding CKP sensor (L5) adaption

After the replacement of the ME-SFI control module and for the uneven running engine test, the toothed wheel sensor (CKP sensor) adaption must be performed as follows:

- ECT > 70°C
- Drive vehicle with transmission selector lever in 3rd gear
- Increase engine rpm to> 3500 rpm and then coast until engine rpm attains 1200 rpm.

After the replacement of the CKP sensor (L5), the starter ring gear or the replacement of the engine, the toothed wheel sensor (CKP sensor) adaption must be first reset using the HHT, then perform the driving cycle as indicated above.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Notes for HHT

- **Fault search with HHT**
  Diagnostic trouble code (DTC) memory: Select “Current DTC’s”.
  If the actual condition changes, e.g. when wiggling a connector, the change is reported optically and acoustically so that troubleshooting can be performed directly with the HHT.

- **Loose connections**
  Loose connections are stored if they occur several times in a certain time period. Therefore, they can appear only as “Stored DTC’s” and never as “Current DTC’s”.

- **Nominal values**
  All nominal values relative to the actual values shown on the HHT are listed in the Diagnostic Manual, Engines, Volume 1, section A.

- **Actual value for engine speed**
  For engine speed, the HHT display indicates the closed throttle speed (CTP) nominal value calculated by the control module on the left, and the rpm actual value on the right. Both values should differ from each other only slightly. Permissible tolerances are not yet determined.

- **Version coding with HHT**
  a) Before replacement of the engine control module, the existing code number must be read and stored with the HHT (menu selection 5 “Version coding”). After installation of the new control module, the previously read code number must be entered.
  Note:
  If returning a new control module to a PDC, the code number must be erased.

  b) If the code number can **not** be read, the vehicle equipment/version must be determined, the corresponding code number obtained from the Spare Parts Microfiche (group 54) and manually entered with the HHT.

- **Drive authorization system (DAS)**
  Upon replacement the engine control module must be version coded using the HHT. Additionally, the code number and VIN must be entered (see HHT nominal values “DAS”, menu selection 3/7).

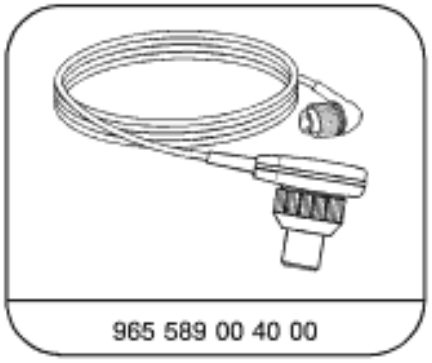
- **Correction program**
  The following corrections can be made with the HHT:
  (refer to HHT "Correction program" menu item)
  1. Correction of idle speed in selector lever position P/N.
  2. Correction of idle speed with selector lever in drive position.
  3. Make fault setting conditions for uneven running recognition less sensitive.

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Special Tools

965 589 00 01 00

Hand-Held-Tester



965 589 00 40 00

Test cable

Diagnosis - Diagnostic Trouble Code (DTC) Memory

Connection Diagram - Hand-Held Tester (HHT)

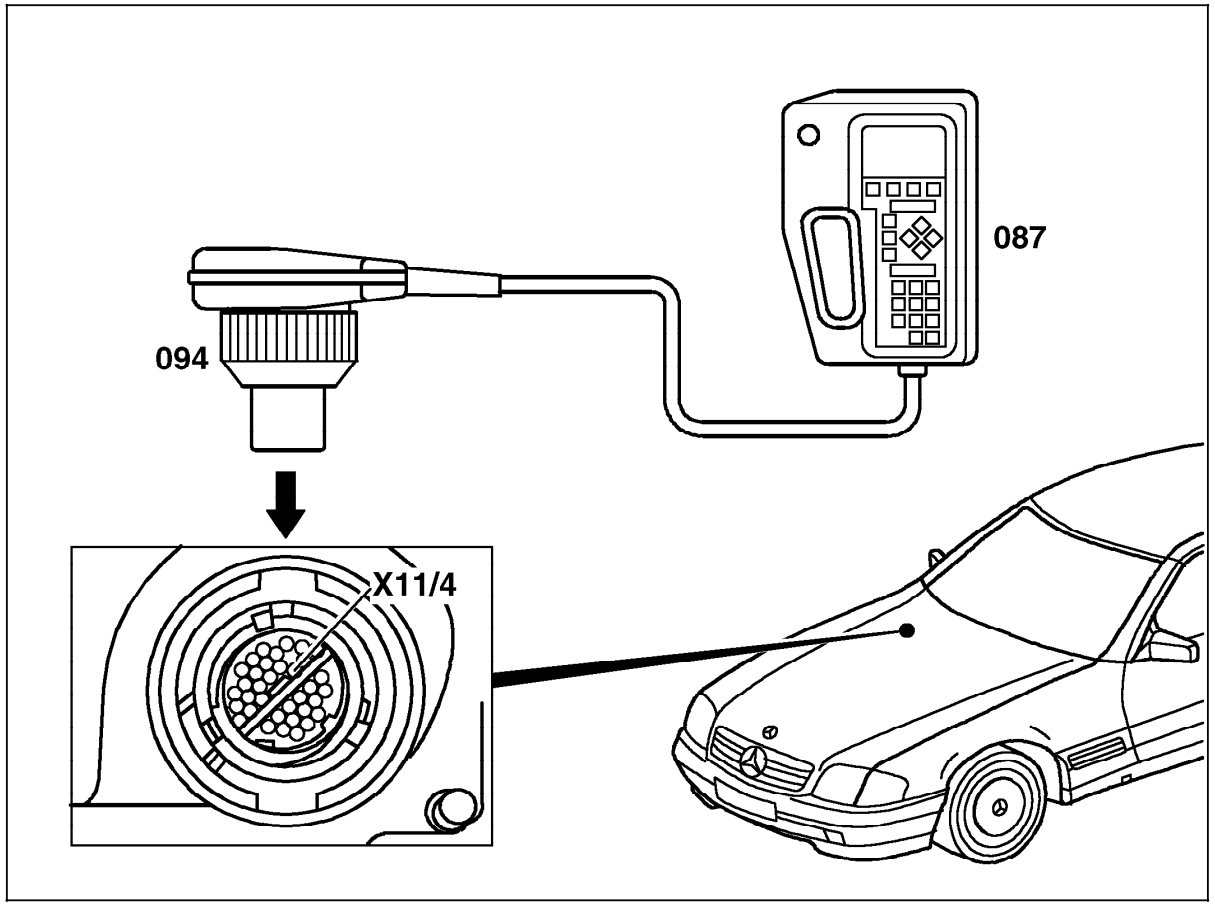
1 Connect HHT (087) with test cable (097) to data link connector (X11/4)

2. Ignition: **ON**

3. As per display in HHT:
   a) read out/erase DTC memory
   b) read out actual values
   c) perform activations
   d) program control modules

4. Disconnect HHT

Observe system specific notes, which are described in the beginning of each chapter. Erase all stored faults which come about when tests or simulations are performed, upon completion of the repairs.



P00.19-0411-06

Figure 1

087	Hand-Held Tester
094	Multiplexer cable
X11/4	Data link connector (DTC readout) (38-pole)

Diagnosis – Diagnostic Trouble Code (DTC) Memory

Prerequisites for readout of DTC memory

⚠ **WARNING!**

Risk of severe injury when touching ignition parts which produce high voltages. Do not touch igntion components.
Persons with heart pacemakers are not to perform repairs on this type of ignition system.

i

Readout via the impulse counter scan tool is not possible.

Note:

Symbol for emission related malfunctions which lead to the activation of the CHECK ENGINE MIL when a certain test cycle was performed and a fault was recognized in the prior trip cycle. The CHECK ENGINE MIL will illuminate immediately if a "TWC damaging" misfire is found.

Preparation for Test:

1. Connect HHT with test cable to data link connector (X11/4), readout DTC fault codes.
2. Review 22,
3. Review 11, 21, 23, 24, 31, 33,
4. Perform Test and adjustment of engine, see DM, Engines, Vol. 1, section B, if necessary.
5. Ignition: **ON**

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
–		No malfunction in system		In case of complaint, perform 23, 24, 25 or 26 in its entirety.
P0 100	Mass air flow circuit malfunction, bank 1 (right)	Right hot film MAF sensor (B2/7)	13 ≫ **1**	23 ⇒ 4.0
P0 105	MAP circuit malfunction, bank 1 (right)	Right pressure sensor (B28/2)	13 ≫ **2**	23 ⇒ 5.0
P0 110	IAT circuit malfunction, bank 1 (right)	Right IAT sensor (B17/6)	13 ≫ **3**	23 ⇒ 8.0
P0 115	ECT circuit malfunction, bank 1 (right)	Right ECT sensor (B11/10)	13 ≫ **4**	23 ⇒ 7.0
P0 120	Throttle position sensor circuit malfunction, bank 1 (right)	Right EA/CC/ISC actuator (M16/3) (located on left side of engine)	13 ≫ **5**	25 ⇒ 6.0
P0 130	O2S 1 circuit malfunction, bank 1 (right)	Right O2S 1 (before TWC) (G3/4)	13 ≫ **6**	23 ⇒ 10.0
P0 133	O2S 1 circuit slow response, bank 1 (right)	A Right O2S 1 (before TWC) (G3/4), ageing correction value exceeded B Right O2S 1 (before TWC) (G3/4), ageing time period too long	13 ≫ **7**	23 ⇒ 10.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 135	O2S 1 heater circuit malfunction, bank 1 (right)	Right O2S 1 heater (before TWC) (G3/4)	13 ≫ **8**	23 ⇒ 11.0
P0 136	O2S 2 circuit malfunction, bank 1 (right)	Right O2S 2 (after TWC) (G3/6)	13 ≫ **6**	23 ⇒ 12.0
P0 140	O2S 1 heater circuit malfunction, bank 1 (right)	Right O2S 1 heater (before TWC) (G3/4)	13 ≫ **7**	23⇒ 10.0
P0 141	O2S 2 heater circuit malfunction, bank 1 (right)	Right O2S 2 heater (after TWC) (G3/6)	13 ≫ **8**	23⇒ 13.0
P0 150	O2S 1 circuit malfunction, bank 2 (left)	Left O2S 1 (before TWC) (G3/3)	13 ≫ **6**	23⇒ 10.0
P0 153	O2S 1 circuit slow response, bank 2 (left)	A Left O2S 1 (before TWC) (G3/3), ageing correction value exceeded B Left O2S 1 (before TWC) (G3/3), ageing time period too long	13 ≫ **7**	23⇒ 10.0
P0 155	O2S 1 heater circuit malfunction, bank 2 (left)	Left O2S 1 heater (before TWC) (G3/3)	13 ≫ **8**	23⇒ 11.0
P0 156	O2S 2 circuit malfunction, bank 2 (left)	Left O2S 2 (after TWC) (G3/5)	13 ≫ **6**	23⇒ 12.0
P0 160	O2S 1 heater circuit malfunction, bank 2 (left)	Left O2S 1 heater (before TWC) (G3/3)	13 ≫ **8**	23⇒ 10.0
P0 161	O2S 2 heater circuit malfunction, bank 2 (left)	Left O2S 2 heater (after TWC) (G3/5)	13 ≫ **8**	23⇒ 13.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 170	Fuel trim malfunction, bank 1 (right)	A Self adaptation of fuel mixture “partial load“ at limit from right engine control module (N3/12). B Self adaptation of fuel mixture “CTP“ at limit from right engine control module (N3/12).	13 ⩾ **9**	Intake air leak, injectors, diaphragm pressure regulator, engine wear.
P0 173	Fuel trim malfunction, bank 2 (left)	A Self adaptation of fuel mixture “partial load“ at limit from left engine control module (N3/11). B Self adaptation of fuel mixture “CTP“ at limit from left engine control module (N3/11).	13 ⩾ **9**	Intake air leak, injectors, diaphragm pressure regulator, engine wear.
P0 201	Injector circuit malfunction - cyl. 1	Injector (Y64y1) – cylinder 1	13 ⩾ **10**	23⇒ 14.0
P0 202	Injector circuit malfunction - cyl. 2	Injector (Y64y2) – cylinder 2	13 ⩾ **10**	23⇒ 15.0
P0 203	Injector circuit malfunction - cyl. 3	Injector (Y64y3) – cylinder 3	13 ⩾ **10**	23 ⇒ 16.0
P0 204	Injector circuit malfunction - cyl. 4	Injector (Y64y4) – cylinder 4	13 ⩾ **10**	23 ⇒ 17.0
P0 205	Injector circuit malfunction - cyl. 5	Injector (Y64y5) – cylinder 5	13 ⩾ **10**	23 ⇒ 18.0
P0 206	Injector circuit malfunction - cyl. 6	Injector (Y64y6) – cylinder 6	13 ⩾ **10**	23 ⇒ 19.0
P0 207	Injector circuit malfunction - cyl. 7	Injector (Y63y7) – cylinder 7	13 ⩾ **10**	23 ⇒ 14.0
P0 208	Injector circuit malfunction - cyl. 8	Injector (Y63y8) – cylinder 8	13 ⩾ **10**	23 ⇒ 15.0
P0 209	Injector circuit malfunction - cyl. 9	Injector (Y63y9) – cylinder 9	13 ⩾ **10**	23 ⇒ 16.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 210	Injector circuit malfunction - cyl. 10	Injector (Y63y10) – cylinder 10	13 ≫ **10**	23 ⇒ 17.0
P0 211	Injector circuit malfunction - cyl. 11	Injector (Y63y11) – cylinder 11	13 ≫ **10**	23 ⇒ 18.0
P0 212	Injector circuit malfunction - cyl. 12	Injector (Y63y12) – cylinder 12	13 ≫ **10**	23 ⇒ 19.0
P0 300	Random misfire detected	A Random misfire B Random misfire, TWC damaging	13 ≫ **11**	Smooth running, Sensor gear adaptation, mixture adaptation, fault freeze frame data
P0 301	Cylinder 1 misfire detected	A Cylinder 1 misfire B Cylinder 1 misfire, TWC damaging	13 ≫ **11**	24 ⇒ 18.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 302	Cylinder 2 misfire detected	A Cylinder 2 misfire B Cylinder 2 misfire, TWC damaging	13 ≫ **11**	24 ⇒ 19.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 303	Cylinder 3 misfire detected	A Cylinder 3 misfire B Cylinder 3 misfire, TWC damaging	13 ≫ **11**	24 ⇒ 20.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 304	Cylinder 4 misfire detected	A Cylinder 4 misfire B Cylinder 4 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 21.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 305	Cylinder 5 misfire detected	A Cylinder 5 misfire B Cylinder 5 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 22.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 306	Cylinder 6 misfire detected	A Cylinder 6 misfire B Cylinder 6 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 23.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 307	Cylinder 7 misfire detected	A Cylinder 7 misfire B Cylinder 7 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 18.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 308	Cylinder 8 misfire detected	A Cylinder 8 misfire B Cylinder 8 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 19.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 309	Cylinder 9 misfire detected	A Cylinder 9 misfire B Cylinder 9 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 20.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 310	Cylinder 10 misfire detected	A Cylinder 10 misfire B Cylinder 10 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 21.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 311	Cylinder 11 misfire detected	A Cylinder 11 misfire B Cylinder 11 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 22.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 312	Cylinder 12 misfire detected	A Cylinder 12 misfire B Cylinder 12 misfire, TWC damaging	13 ⩾ **11**	24 ⇒ 23.0 24 ⇒ 24.0 36 ⇒ 1.0 – 2.0 Compression pressure
P0 325	KS 1 circuit malfunction (right front)	Right KS 1 (A30g1)	13 ⩾ **12**	Wiring, connector, A30 g1
P0 330	KS 2 circuit malfunction (right rear)	Right KS 2 (A30g2)	13 ⩾ **12**	Wiring, connector, A30 g2
P0 335	CKP sensor circuit malfunction, bank 1 (right)	Right CKP sensor (L5/5)	13 ⩾ **13**	24 ⇒ 10.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 341	CMP sensor circuit range/performance, bank1 (right)	Right camshaft Hall-effect sensor (B6/3)	13 ≫ **14**	24 ⇒ 11.0
P0 410	AIR injection system malfunction	AIR system malfunction (logic chain)	13 ≫ **15**	23 ⇒ 20.0 – 21.0 Hose disconnected from actuator.
P0 422	TWC efficiency below threshold, right	Right TWC efficiency below threshold	13 ≫ **16**	Replace right TWC
P0 432	TWC efficiency below threshold, left	Left TWC efficiency below threshold	13 ≫ **16**	Replace left TWC
P0 440 **Only (USA) Model 140, Model 129 as of 09/97**	EVAP system malfunction	EVAP malfunction (logic chain)	13 ≫ **17**	23 ⇒ 24.0 – 26.0
P0 441	EVAP system incorrect purge flow	Right EVAP system malfunction	13 ≫ **18**	23 ⇒ 24.0 – 25.0
P0 442 **Only (USA) Model 140, Model 129 as of 09/97**	EVAP system leak detected (small leak)	EVAP system, small leak	13 ≫ **17**	23 ⇒ 26.0
P0 443	EVAP system purge control valve circuit malfunction, bank 1 (right)	Right purge control valve (Y58/3)	13 ≫ **19**	23 ⇒ 24.0
P0 446 **Only (USA) Model 140, Model 129 as of 09/97**	EVAP system vent control malfunction	A. Charcoal canister shut-off valve, output stage B. Charcoal canister shut-off valve (Y58/4)	13 ≫ **20**	23 ⇒ 24.0, 26.0 23 ⇒ 28.0 23 ⇒ 27.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC		Possible cause		DTC Description	Test step/Remedy [1]
		SAE nomenclature	Explanation		
P0 450	**Only USA Model 140, Model 129 as of 09/97**	EVAP system pressure sensor malfunction	Fuel tank pressure sensor (B4/3)	13 ⩾ **21**	23 ⇒ 28.0 Charcoal canister plugged.
	Only USA Model 129 up to 09/97		Purge monitoring pressure sensor (B4/4)	13 ⩾ **22**	23 ⇒ 29.0
P0 455	**Only USA Model 140, Model 129 as of 09/97**	EVAP system leak detected (large leak)	EVAP system, large leak, Fuel tank pressure sensor (B4/3)	13 ⩾ **17**	23 ⇒ 26.0 23 ⇒ 28.0
P0 462		Fuel level sensor circuit low input	Fuel tank level too low		Fill fuel tank
P0 500		VSS sensor malfunction	A VSS left front B VSS left rear	13 ⩾ **23**	25 ⇒ 8.0 25 ⇒ 9.0
P0 507		ISC rpm higher than expected	Idle control system	13 ⩾ **24**	25 ⇒ 4.0, 5.0, 10.0
P0 560		System voltage malfunction	Voltage supply to right engine control module (N3/12)	13 ⩾ **25**	23 ⇒ 1.0 – 3.0
P0 565		Cruise control switch	CC switch (S40)		26 ⇒ 1.0
P0 600		Serial communication link malfunction	CAN bus from ESP/SPS control module (N47-5)	13 ⩾ **26**	23 ⇒ 30.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 604	Internal control module random Access memory (RAM) error	A Engine control module left (N3/11) or right (N3/12) B Engine control module left (N3/11) or right (N3/12)		(N3/11) or (N3/12)
P0 605	Internal control module random Access memory (RAM) error	Engine control module left (N3/11) or right (N3/12)		(N3/11) or (N3/12)
P0 700	Transmission control system malfunction Gear unplausi, transmission leak, Command sleeve stuck in pressure pos.	Read DTC memory of transmission control module DTC description DTC description	13 ⩾ **27** 13 ⩾ **28**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 702	Transmission control system electrical Voltage supply to solenoid valves	Read DTC memory of transmission control module DTC description	13 ⩾ **29** 13 ⩾ **30**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 715	Input/turbine speed sensor circuit malfunction RPM sensor voltage supply and function	Read DTC memory of transmission control module DTC description	13 ⩾ **31**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 720	Output speed sensor circuit malfunction CAN fault recognition	Read DTC memory of transmission control module DTC description	13 ⩾ **32**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 730	Incorrect gear ratio Ratio comparison negative (numerous)	Read DTC memory of transmission control module DTC description	13 ⩾ **33**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P0 740	Torque converter clutch system malfunction	Read DTC memory of transmission control module DTC description	13 ≫ **34**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 743	Torque converter clutch system electrical	Read DTC memory of transmission control module DTC description	13 ≫ **35**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 748	Pressure control solenoid electrical Pressure control valve modulation press. Pressure control valve shift pressure	Read DTC memory of transmission control module DTC description DTC description	13 ≫ **36** 13 ≫ **37**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 753	Shift solenoid A electrical 1-2/4-5 solenoid shift valve	Read DTC memory of transmission control module DTC description	13 ≫ **38**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 758	Shift solenoid B electrical 2-3 solenoid shift valve	Read DTC memory of transmission control module DTC description	13 ≫ **39**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 763	Shift solenoid C electrical 3-4 solenoid shift valve	Read DTC memory of transmission control module DTC description	13 ≫ **40**	Test ETC, see DM, Chassis & Drivetrain, Vol. 1, section 2.
P0 809	Angle deviation between camshaft and crankshaft	Angle deviation between camshaft and crankshaft		Check basic adjustment of camshaft

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 146	Mass air flow circuit malfunction, bank 2 (left) Left hot film MAF sensor (B2/6)	Left hot film MAF sensor (B2/6) DTC description	13 ≫ **1**	23 ⇒ 4.0
P1 147	ECT circuit malfunction, bank 2 (left) Left ECT sensor	Left ECT sensor (B11/9) DTC description	13 ≫ **4**	23 ⇒ 7.0
P1 148	IAT circuit malfunction, bank 2 (left) Left IAT sensor	Left IAT sensor (B17/5) DTC description	13 ≫ **3**	23 ⇒ 8.0
P1 149	MAP circuit malfunction, bank 2 (left) Left pressure sensor	Left pressure sensor (B28/1) DTC description	13 ≫ **2**	23 ⇒ 5.0
P1 162	Throttle position sensor circuit malfunction, bank 2 (left) Left EA/CC/ISC actuator actual value potentiometer	Left EA/CC/ISC actuator actual value potentiometer (M16/4r1, M16/4r2) DTC description	13 ≫ **5**	25 ⇒ 6.0
P1 163	Oil level switch	Oil level switch (S43)		23 ⇒ 31.0
P1 177	Oil temperature	Oil temperature sensor (B1)		23 ⇒ 32.0
P1 186	Fuel safety shut-off recognized	EA/CC/ISC actuator (M16/6)		25 ⇒ 6.0 – 7.0, EA/CC/ISC actuator (M16/6) sticks or jammed, Check intake system for residue.

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 300	CKP sensor circuit malfunction, bank 2 (left) Left CKP sensor	Left CKP sensor (L5/4) DTC description	13 ⩾ **13**	24 ⇒ 10.0
P1 384	KS 1 circuit malfunction (left front) Left knock sensor 1	Left knock sensor 1 (A29g1) DTC description	13 ⩾ **12**	Wiring, connector, A29g1
P1 385	KS 2 circuit malfunction (left rear) Left knock sensor 2	Left knock sensor 2 (A29g2) DTC description	13 ⩾ **12**	Wiring, connector, A29g2
P1 386	Knock sensor control from ECM (N3/12) at end stop Knock sensor regulation	Knock sensor regulation from right engine control module (N3/12) hardware failure DTC description	13 ⩾ **41**	1. Increased knock tendency due to bad fuel, carbon in combustion chamber or mechanical damage. 2. Engine control module (N3/12)
P1 397	CMP sensor circuit range/performance, bank 2 (left) Left camshaft Hall-effect sensor	Left camshaft Hall-effect sensor (B6/2) DTC description	13 ⩾ **14**	24 ⇒ 11.0
P1 420	AIR pump switchover valve AIR pump switchover valve	AIR pump switchover valve (Y32) DTC description	13 ⩾ **42**	23 ⇒ 21.0
P1 443	EVAP system malfunction Left EVAP system malfunction	Left EVAP system malfunction DTC description	13 ⩾ **18**	23 ⇒ 24.0 – 25.0
P1 453	AIR relay module AIR relay module	AIR relay module (K17) DTC description	13 ⩾ **42**	23 ⇒ 20.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 463	Left AIR system malfunction Left AIR system malfunction	Left AIR system malfunction DTC description	13 ⩾ **15**	23 ⇒ 20.0 – 21.0 Hose disconnected from actuator.
P1 490	EVAP system purge control valve circuit malfunction, bank 2 (left) Left purge control valve	Left purge control valve (Y58/2) DTC description	13 ⩾ **19**	23 ⇒ 24.0
P1 519	Right adjustable camshaft timing solenoid Right adjustable camshaft timing solenoid	Right adjustable camshaft timing solenoid (Y49/2) (logic chain) DTC description	13 ⩾ **43**	23 ⇒ 22.0– 23.0
P1 522	Left adjustable camshaft timing solenoid Left adjustable camshaft timing solenoid	Left adjustable camshaft timing solenoid (Y49/1) (logic chain) DTC description	13 ⩾ **43**	23 ⇒ 22.0 – 23.0
P1 525	Right adjustable camshaft timing solenoid Right adjustable camshaft timing solenoid	Right adjustable camshaft timing solenoid (Y49/2) DTC description	13 ⩾ **44**	23 ⇒ 22.0 – 23.0
P1 533	Left adjustable camshaft timing solenoid Left adjustable camshaft timing solenoid	Left adjustable camshaft timing solenoid (Y49/1) DTC description	13 ⩾ **44**	23 ⇒ 22.0 – 23.0
P1 542	Pedal value sensor Pedal value sensor	Pedal value sensor (B37) DTC description	13 ⩾ **45**	25 ⇒ 4.0 – 5.0

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 570	CAN signal from DAS control module to right engine control module (N3/12)	CAN signal from DAS control module (N54/1) to right engine control module (N3/12) interrupted.		23 ⇒ 30.0
P1 580	Right EA/CC/ISC actuator Right EA/CC/ISC actuator	Right EA/CC/ISC actuator (M16/3) DTC description	13 ≫ **46**	25 ⇒ 7.0
P1 581	Left EA/CC/ISC actuator Left EA/CC/ISC actuator	Left EA/CC/ISC actuator (M16/4) DTC description	13 ≫ **46**	25 ⇒ 7.0
P1 584	Stop lamp switch	Stop lamp switch (S9/1)		26 ⇒ 1.0
P1 587	Left engine control module voltage supply Left engine control module	Left engine control module (N3/11) voltage supply DTC description	13 ≫ **25**	23 ⇒ 1.0 – 3.0
P1 588	CAN signal from RCL control module to left engine control module	CAN signal from RCL to left engine control module (N3/11)		23 ⇒ 30.0
P1 589	Knock sensor control from left engine control module at end stop Left engine control module (N3/11) hardware failure	Knock sensor regulation from left engine control module (N3/11) hardware failure DTC description	13 ≫ **41**	1. Increased knock tendency due to bad fuel, carbon in combustion chamber or mechanical damage. 2. Engine control module (N3/11)

[1] Observe Preparation for Test, see 22.

Diagnosis – Diagnostic Trouble Code (DTC) Memory

DTC	Possible cause		DTC Description	Test step/Remedy [1]
	SAE nomenclature	Explanation		
P1 605	Body acceleration sensor (up to 06/96) Body acceleration sensor	Body acceleration sensor (B24) (up to 06/96) DTC description Poor road/traction condition recognition signal (via comparison of VSS rpm signals) (as of 06/96)	13 ≫ **47**	23 ⇒ 36.0 Test ASR/ESP see DM, Chassis and Drivetrain, Vol. 3, Section 9, 10
P1 632	Engine control module	Left engine control module (N3/11)		(N3/11)
P1 641	Engine control module CAN bus interrupted	A. Right CTP signal implausible B. Left CTP signal implausible C. CAN signal to left engine control module (N3/11) interrupted DTC description	13 ≫ **26**	25 ⇒ 10.0, 25 ⇒ 10.0, 23 ⇒ 30.0
P1 747	CAN signal from ETC CAN bus interrupted	CAN signal from ETC (N15/3) DTC description	13 ≫ **26**	23 ⇒ 30.0

[1] Observe Preparation for Test, see 22.