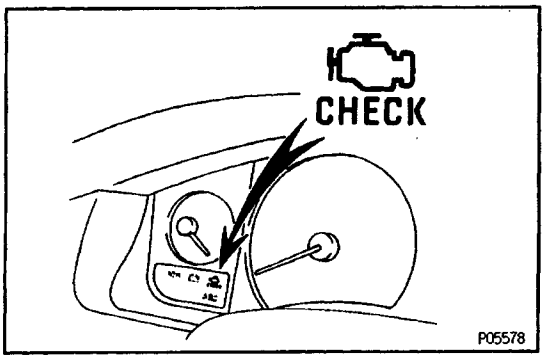
DIAGNOSIS SYSTEM

EG11Z–01

DESCRIPTION

The PCME (& T) contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and a “CHECK” engine warning light on the combination meter lights up.
By analyzing various signals as shown in the later table (See page EG2–209) the PCME (& T) detects system malfunctions relating to the sensors or actuators.
The self–diagnosis system has two modes, a normal mode and a test mode.
If a malfunction is detected when in the normal mode, the PCME (& T) lights up the “CHECK” engine warning light to inform the driver of the occurrence of a malfunction. (For some codes the light does not come on.) The light goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the PCME (& T) memory (except for code No. 16). The PCME (& T) stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch off.
The diagnostic trouble code can be read by the number of blinks of the ”CHECK” engine warning light when TE1 and E1 terminals on the data link connector 1 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.
If a malfunction is detected when in the test mode, the PCME (& T) lights up the “CHECK” engine warning light to inform the technician of the occurrence of a malfunction (except for code Nos. 42, 43 and 51). In this case, TE2 and E1 terminals on the data link connector 1 should be connected as shown later. (See page EG2–206).
In the test mode, even if the malfunction is corrected, the malfunction code is stored in the PCME (& T) memory even when the ignition switch is off (except code Nos.42, 43 and 51). This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the ”CHECK” engine warning light can be selected by connecting the TE1, TE2 and E1 terminals on the data link connector 1, as shown later.
A test mode function has been added to the functions of the self–diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self–diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page EG2–206)



”CHECK” ENGINE WARNING LIGHT CHECK

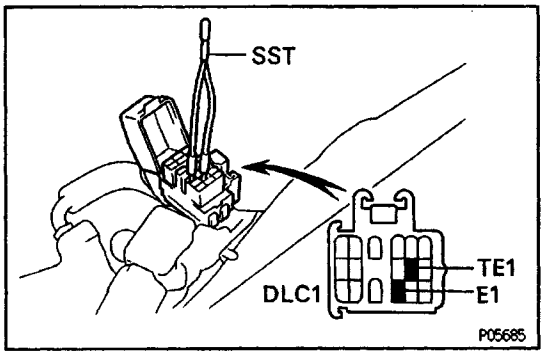
1. The “CHECK” engine warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the “ CHECK” engine warning light should go off.
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODES OUTPUT

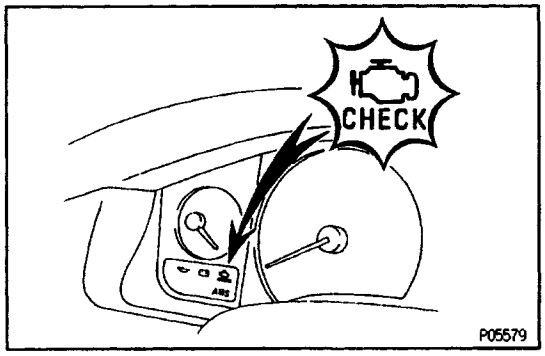
(Normal mode)

To obtain an output of diagnostic trouble codes, proceed as follows:

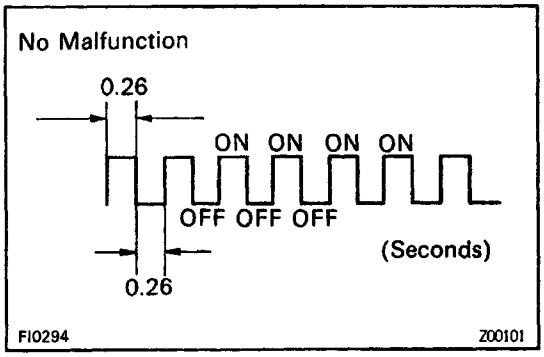
1. Initial conditions
   (a) Battery voltage 11 V or more
   (b) Throttle valve fully closed (throttle position sensor IDL points closed)
   (c) Transmission in neutral range
   (d) Accessories switched OFF
   (e) Engine at normal operating temperature
2. Turn the ignition switch ON. DO not start the engine.



3. Using SST, connect terminals TE1 and E1 of the data link connector 1.
   SST 09843–18020



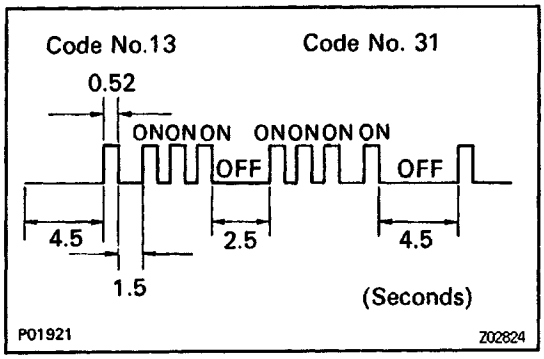
4. Read the diagnostic trouble code as indicated by the number of flashes of the “CHECK” engine warning light.



Diagnostic Trouble Codes (See page EG2–209)

(a) Normal System Operation (no malfunction)

- The light will alternately blink ON and OFF at 0.26–second intervals.

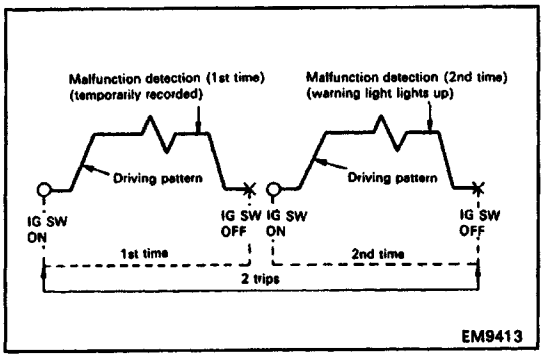


(b) Malfunction Code Indication

In the event of a malfunction, the light will blink every 0.52–seconds. The first number of blinks will equal the first digit of a 2–digit diagnostic trouble code and, after a 1.5–second pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5–second pause between each code.

After all the codes have been output, there will be a 4.5 second pause and they will all be repeated as long the terminals TE1 and E1 of the data link connector 1 are connected.

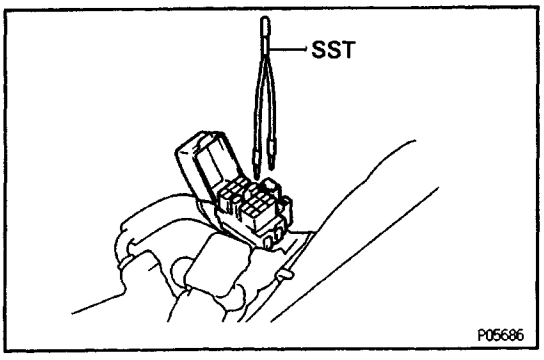
HINT: In the event of a number of trouble codes, indication will begin from the smaller value and con–tinue to the larger.



(c) (2 trip detection logic)

Diagnostic trouble codes 25, 26 27 and 71 use “2 trip detection logic”. With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the PCME (& T) memory. If the same case is detected again during the second drive test, this second de–tection causes the “CHECK” engine warning light to light up.

The 2 trip repeats the same mode a 2nd time. (How–ever, the ignition switch must be turned OFF between the 1 st time and 2nd time.) In the Test Mode, the ”CHECK” engine warning light lights up the 1 st time a malfunction is detected.



5. After the diagnosis check, remove SST.

SST 09843–18020

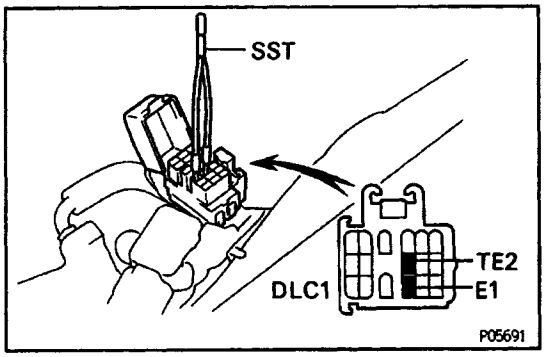
(Test mode)

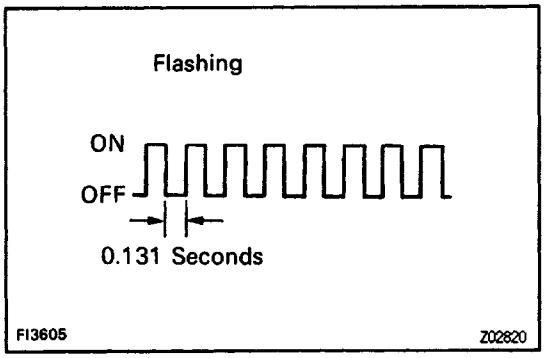
HINT:

- Compared to the normal mode, the test mode has high sensing ability to detect malfunctions.
- It can also detect malfunctions in the starter signal circuit, air conditioner signal and park/ neutral switch signal.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions
   (a) Battery voltage 11 volts or more
   (b) Throttle valve fully closed (throttle position sensor IDL points closed)
   (c) Transmission in neutral range
   (d) Accessories switched OFF
2. First, using SST, connect terminals TE2 and E1 of the data link connector 1.
   SST 09843–18020

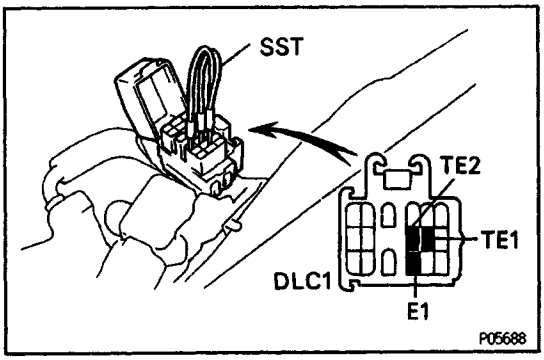




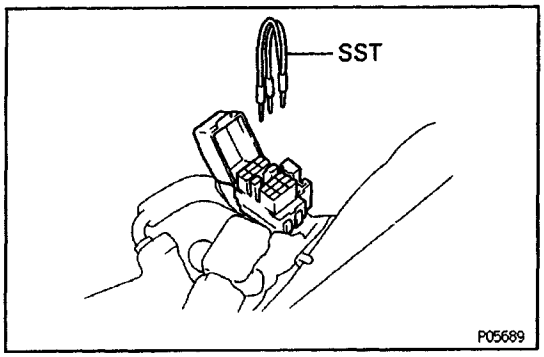
3. Turn the ignition switch ON.

HINT: To confirm that the test mode is operating, check that the “CHECK” engine warning light flashes when the ignition switch is turned ON.

4. Start the engine and drive the vehicle at a speed of 10 km/h (6 mph) or higher.
5. Simulate the conditions of the malfunction described by the customer.



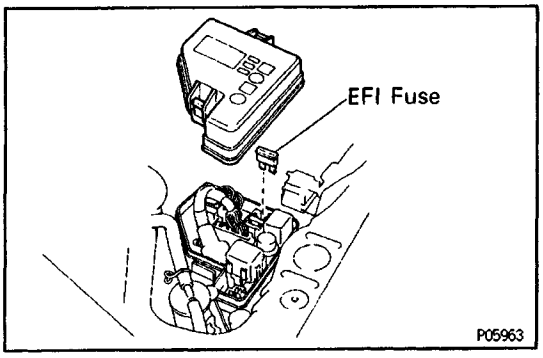
6. Using SST, connect terminals TE1 and E1 of the data link connector 1.
   SST 09843–18020
7. Read the diagnostic trouble code as indicated by the number of flashes of the “CHECK” engine warning light. (See page EG2–209)



8. After the diagnosis check, remove SST.
   SST 09843–18020

HINT:

- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned on.
- The starter signal and vehicle speed signal will be diagnosed by the PCME (& T) as malfunctions, and code Nos. 42, and 43 will be output, if the operation in step 4 is not performed.
- When the automatic transmission shift lever is in the “D”, “2”, “L” or “R” shift position, or when the air conditioner is on or when the accelerator pedal is depressed, code “51” (Switch condition signal) is output, but this is not abnormal.



DIAGNOSTIC TROUBLE CODE CANCELLATION

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the PCME (& T) must be cancelled out by removing the EFI fuse (115 A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case, other memory systems (clock, etc.) will also cancelled out.
- If the diagnostic trouble code is not cancelled out, it will be retained by the PCME (& T) and appear along with a new code in the event of future trouble.
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, perform road test of the vehicle to check that a normal code is now read on the “CHECK” engine warning light.
   If the same diagnostic trouble code appears, it indi–cates that the trouble area has not been repaired thoroughly.

EG124–01

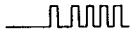
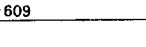
DIAGNOSIS INDICATION

1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic trouble codes, except code Nos. 43 and 53 will be retained in memory by the PCME (& T) from the time of detection until cancelled out.
3. Once malfunction is cleared, the “ CHECK” engine warning light on the combination meter will go off but the diagnostic trouble code(s) remains stored in PCME (& T) memory (except for code Nos. 43 and 51).

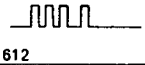
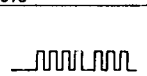
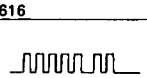
DIAGNOSTIC TROUBLE CODES

HINT:

- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks "CHECK" Engine Warning Light	System	"CHECK" *1 Engine Warning Light		Diagnosis	Trouble Area	*2 Memory	See Page
			Normal Mode	Test Mode				
–	 FI1401	Normal	—	—	No trouble code is recorded. code is recorded.	—	—	—
12	 FI1606	RPM Signal	ON	N.A.	(1) No NE signal is input to PCME (PCME & T) for 2 secs. or more after STA turns ON. (2) No G signal is input to PCME (PCME & T) for 3 secs. or more between 600 – 4,000 rpm.	• Open or short in NE, G circuit • Distributor • Open or short in STA circuit • PCME (PCME & T)	○	IG–24 EG2–228 EG2–244
13	 FI1607	RPM Signal	ON	ON	(1) NE signal is not input to PCME (PCME & T) for 0.3 secs. or more when engine speed is 1,500 rpm or more. (2) No G signal is input to PCME (PCME & T) for 4 NE signal. (Test mode only)	• Open or short in NE circuit • Distributor • PCME (PCME & T)	○	IG–24
14	 FI1608	Ignition Signal	ON	N.A.	IG signal from igniter is not input to PCME (PCME & T) for 4 – 5 consecutive ignition.	• Open or short in IGF or IGT circuit from igniter to PCME (PCME & T) • Igniter • PCME (PCME & T)	○	EG2–229 EG2–245
16 (A/T only)	 BE3931	ECT Control Signal	ON	N.A.	Normal signal is not output from PCME & T.	• PCME & T	X	—
21	 FI1609	Main Oxygen Sensor Signal	ON	N.A.	At normal driving speed (below 60 mph and engine speed is above 1,500 rpm), amplitude of oxygen sensor signal (OX) is reduced to between 0.35 – 0.70 V continuously for 60 secs. or more.	• Open or short in oxygen sensor circuit • Oxygen sensor • PCME (PCME & T)	○	EG2–232 EG2–249
22	 FI1610	Engine Coolant Temp. Sensor Signal	ON	ON	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more. (THW)	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • PCME (PCME & T)	○	EG2–227 EG2–243
24	 FI1611	Intake Air Temp. Sensor Signal	ON *3	ON	Open or short in intake air temp. sensor circuit for 0.5 sec. or more. (THA)	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • PCME (PCME & T)	○	EG2–226 EG2–242
25	FI2562	Air–Fuel Ratio Lean Malfunction	ON	ON	(1) Oxygen sensor output is less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 2,000 rpm). – only for code 25 (2) When the engine speed varies by more than 20 rpm over the preceding crank angle period during a period of 20 seconds during idling with the coolant temp. 60°C (140°F) or more. (Calif. only) *6 (2 trip detection logic) (1) and (2)	• Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Ignition system • Engine coolant temp. sensor • MAP • PCME (PCME & T)	○	EG2–26 EG2–227 EG2–232 EG2–243 EG2–249
26 *4	FI2563	Air–Fuel Ratio Lean Malfunction	ON	ON		• Engine ground bolt loose • Open in E1 circuit • Short in injection circuit • Fuel line pressure (Injector leakage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Engine coolant temp. sensor • MAP • Compression pressure • PCME (PCME & T)	○	

DIAGNOSTIC TROUBLE CODES (Cont'd)

Code No.	Number of blinks "CHECK" Engine Warning Light	System	"CHECK" *1 Engine Warning Light		Diagnosis	Trouble Area	Memory *2	See page
			Normal Mode	Test Mode				
27*4	FI3294	Sub–Oxygen Sensor Signal	ON	ON	When sub-oxygen sensor is Warmed up and full acceleration continued for 2 seconds, output of main oxygen sensor is 0.45 V or more (rich) and output of sub-oxygen sensor is 0.45 V or less (lean). (OX2) *5 (2 trip detection logic)	• Short or open in sub-oxygen sensor circuit • Sub-oxygen sensor • PCME (PCME & T)	○	EG2–232 EG2–249
31	 FI1612	Manifold Absolute Pressure sensor Signal	ON	ON	Open or short detected continuously for 0.5 sec. or more in MAP circuit. (PIM)	• Open or short in vacuum sensor circuit • MAP • PCME (PCME & T)	○	EG2–222 EG2–236
41	 FI1614	Throttle Position Sensor Signal	ON*3	ON	Open or short detected continuously for 0.5 sec. or more in throttle sensor (VTA) circuit.	• Open or short in throttle position sensor circuit • Throttle position sensor • PCME (PCME & T)	○	EG2–224 EG2–238
42	 FI1615	Vehicle Speed Pulse Generator Signal	OFF	OFF	(M/T) SPD signal is not input to PCM for at least 8 seconds during high load driving with engine speed between 2,400 rpm and 5,000 rpm. (A/T) PNS OFF and engine speed 3,000 rpm or more.	• Open or short in vehicle speed sensor circuit • Vehicle speed pulse generator • PCME (PCME & T)	○	—
43	 FI1616	Starter Signal	N.A.	OFF	No starter signal is not input to PCM even once after ignition.	• Open or short in starter signal circuit • Open or short in IG SW or MPI main relay circuit • PCME (PCME & T)	X	EG2–228 EG2–244
52	 FI1618	Knock Sensor Signal	ON	N.A.	In area of knock control signal from knock sensor is not input to PCM for 0.65 sec. (KNK)	• Open or short in knock sensor circuit • Knock sensor (looseness, etc.) • PCME (PCME & T)	○	—
71*4	 FI2622	EGR System Malfunction	ON	ON	50 seconds from start of EGR operation, EGR gas temp. is less than 70°C with coolant temp. 80°C (176°F) or more.	• Open in EGR function sensor circuit • Open in VSV circuit for EGR • EGR vacuum hose disconnected, valve stuck • Clogged in EGR gas passage • PCME (PCME & T)	○	EG2–233 EG2–249
51	 FI1617	Switch Condition signal	N.A.	OFF	Displayed when A/C is ON IDL contact OFF or shift position in "R", "D", "2", or "1" ranges with the check terminals E1 and TE1 connected.	• A/C switch circuit • Throttle position sensor IDL circuit • Park/Neutral switch circuit • Accelerator pedal, cable • PCME (PCME & T)	X	EG2–224 EG2–238

REMARKS:

*1: "ON" displayed in the diagnosis mode column indicates that the "CHECK" Engine Warning Light is lighted up when a malfunction is detected. "OFF" indicates that the "CHECK" Engine Warning Light does not,,light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2: "O" in the memory column indicates that a diagnostic code is recorded in the PCME (PCME & T) memory when a malfunction occurs. "X" indicates that a diagnostic code is not recorded in the PCME (PCME & T) memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the ignition switch ON.

*3: The "CHECK" Engine Warning Light comes on if malfunction occurs only to California specifications.

*4: Code 26, 27 and 71 is used only for California specifications.

*5: "2 trip detection logic" (See page EG2–205)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

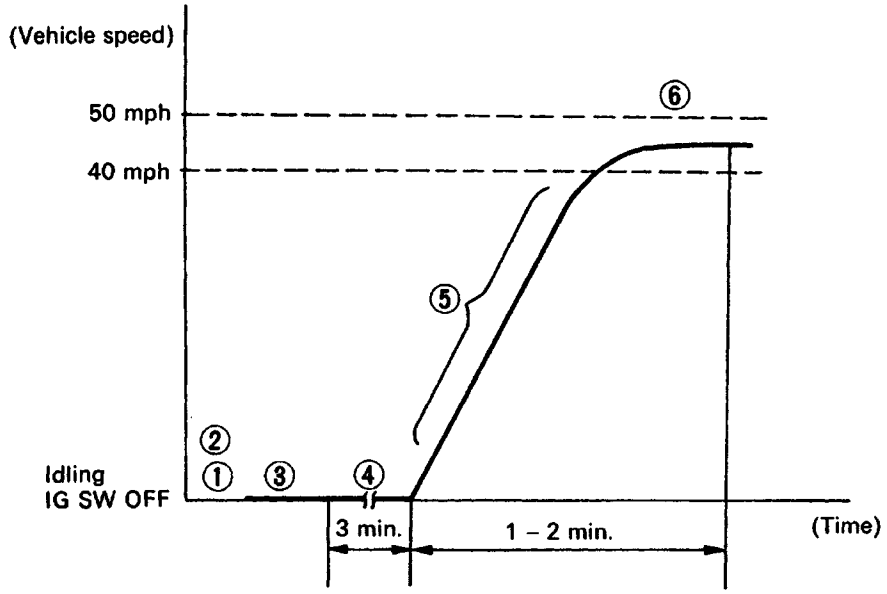
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No	21	Main Oxygen Sensor–Circuit

Malfunction: Deterioration of Main Oxygen Sensor



P01713

(1) Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF.

(2) Initiate test mode: Connect terminals TE2 and E1 of DLC1 with ignition switch OFF.

(3) Start the engine and warm the engine up with all accessory switches OFF.

(4) After the engine is warmed up, let it idle for 3 minutes.

(5) Accelerate gradually and maintain at approximately 1,500 rpm, or within the 1,300 to 1,700 rpm range. Turn the A/C on, and drive in “D” for automatic, or in case of manual transmission, upshift appropriately. Shift carefully so that the engine speed would not fall below 1,200 rpm. Depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking.

(6) Maintain the vehicle speed at 40 – 50 mph.

Keep the vehicle running for 1 – 2 minutes after staring acceleration.

HINT: If any malfunction is detected, the “CHECK” engine warning light will light up during step (6).

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V00912

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

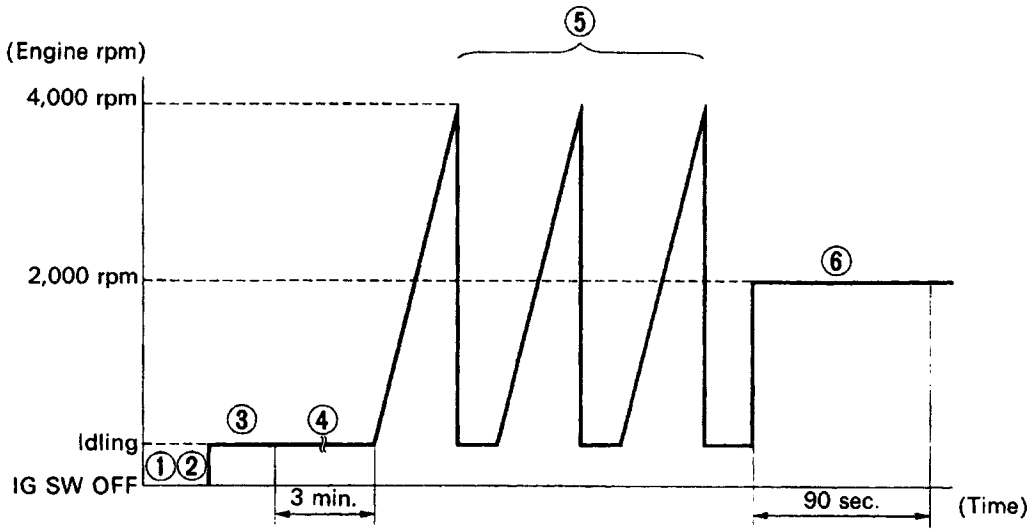
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No	25	Air–Fuel Ratio Lean Malfunction
	26	Air–Fuel Ratio Rich Malfunction

Malfunction: Open or Short in Main Oxygen Sensor



P02491

① Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF.
② Initial test mode: Connect terminal TE2 and E1 of DLC1 with ignition switch OFF.
③ Start the engine and warm the engine up, with all accessory switches OFF.
④ After the engine is warmed up, let it idle for 3 minutes.
⑤ Accelerate rapidly to 4,000 rpm three times.
⑥ Maintain at 2,000 rpm for 90 seconds.

HINT: If a malfunction is detected, the "CHECK" engine warning light will light up during step (6).
NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V00913

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

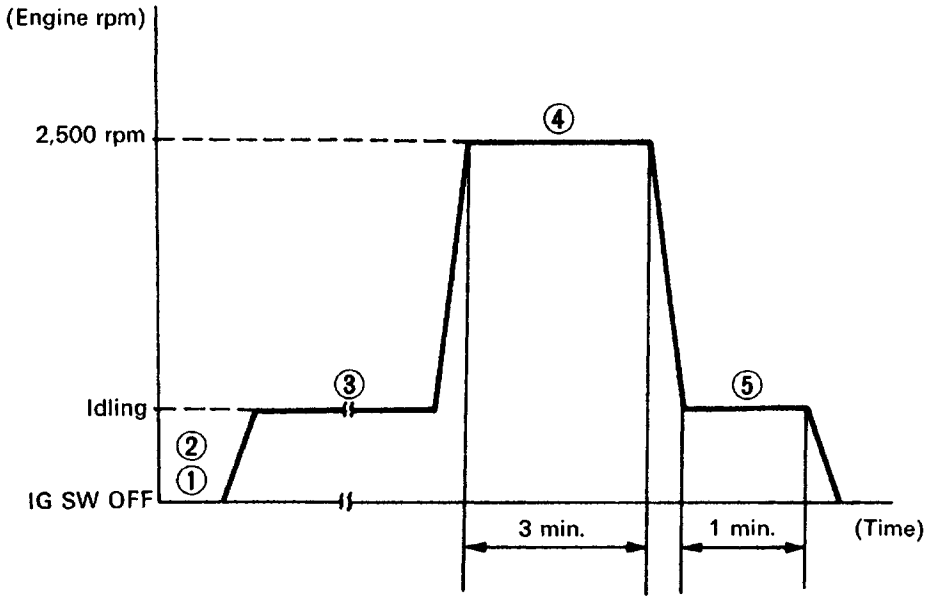
Purpose of the driving pattern.

.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No		
	25	Air–Fuel Ratio Lean Malfunction (California)
	26	Air–Fuel Ratio Lean Malfunction (California)

Malfunction: Open or Short in OXygen Sensor, Open or Short in Injector Leak, Blockage, Loose Engine Ground Bolt



P01711

HINT: Before this test, check the feedback voltage for oxygen sensor.

① Disconnect the ER fuse (15 A) for 10 seconds or more, with ignition switch OFF.
② Initiate test mode: Connect terminals TE2 and E1 of DLC1 with ignition switch OFF.
③ Start the engine and warm the engine up.
④ After the engine is warmed up, maintain at 2,500 rpm for 3 minutes.
⑤ Let it idle for 1 minute.

HINT: If any malfunction is detected, the "CHECK" engine warning light will light up during step (5) .
NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

V00914

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

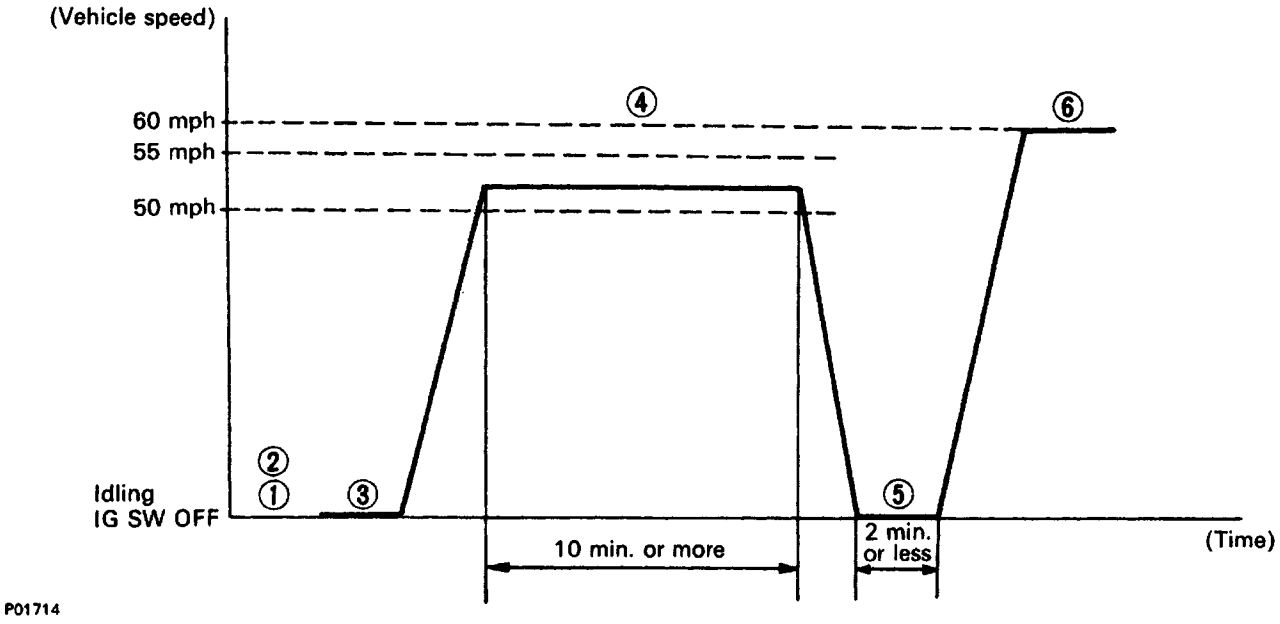
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No	27	Sub–Oxygen Sensor Circuit (California)

Malfunction: Open or Short in Sub–Oxygen Sensor



① Disconnect the EFI fuse (15 A) for 10 seconds or more, with ignition switch OFF.
② Initiate test mode: Connect terminals TE2 and E1 of DLC1 with ignition switch OFF.
③ Start the engine and warm the engine up, with all accessory switches OFF.
④ After the engine is warmed up, let it drive at 50 – 55 mph for 10 minutes or more.
⑤ After driving, stop at a safe place and perform idling for 2 minutes or less.
⑥ After performing the idling in (5) perform acceleration to 60 mph with the throttle fully open.

HINT: If any malfunction is detected, the "CHECK" engine warning light will light up during step (6).
NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

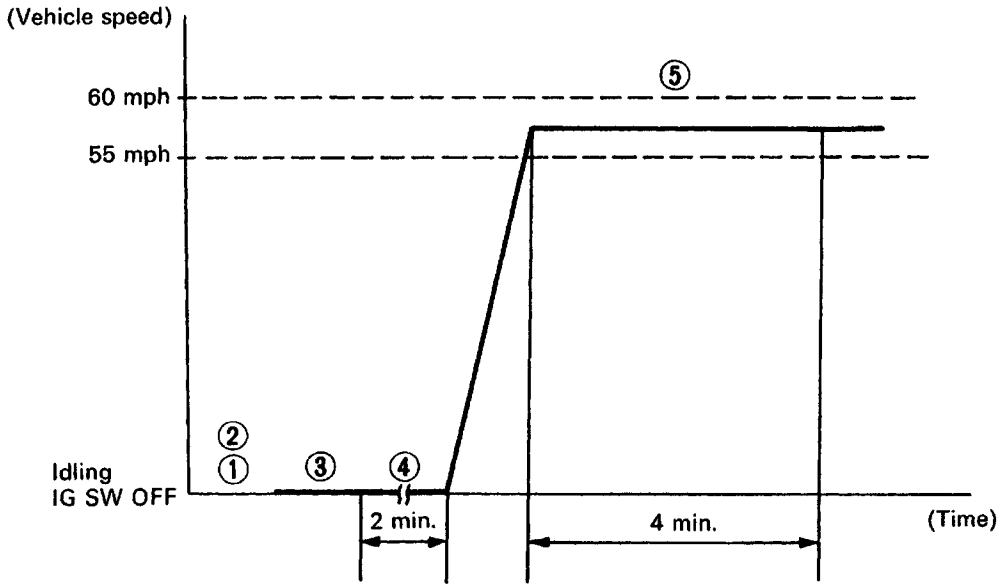
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic trouble code is no longer detected.

Code No.	71	EGR System Malfunction (California)

Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck



P01712

① Disconnect the fuse EFI (15 A) for 10 seconds or more, with ignition switch OFF.

② Initiate test mode: Connect terminals TE2 and E1 of DLC1 with ignition switch OFF.

③ Start engine and warm engine up.

④ After engine is warmed up, let it idle for 3 minutes.

⑤ With the A/C switch OFF and transmission in 5th gear ("D" range for A/T), drive at 55 – 60 mph for 4 minutes.

HINT: If any malfunction is detected, the "CHECK" engine warning light will light up during step (5) .

NOTICE; If this procedure is not strictly followed, you cannot detect the malfunction.

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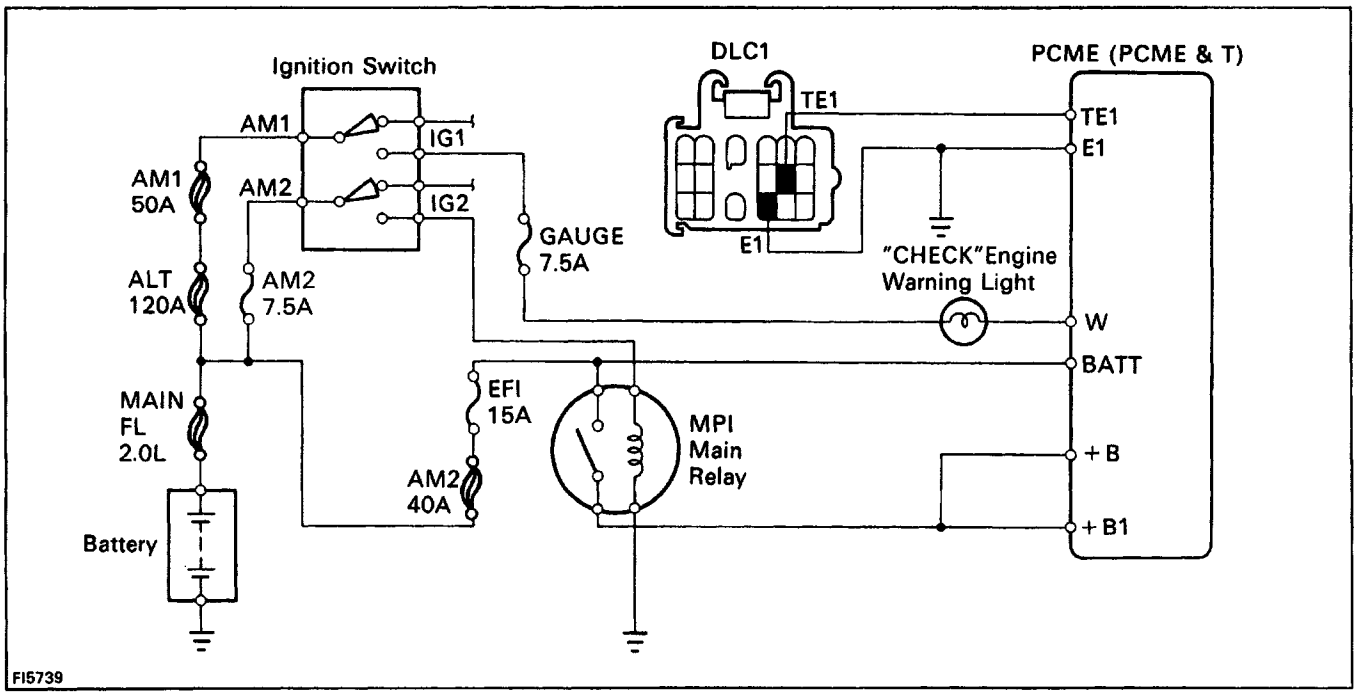
DIAGNOSIS CIRCUIT INSPECTION



1.

Does “CHECK” engine warning light come on when ignition switch is at ON ?
- YES → System normal.
- NO → Does “CHECK” engine warning light come on when PCME (PCME & T) terminal W is grounded to the body ?
  - YES → Check wiring between PCME (PCME & T) terminal E1 and body ground.
    - OK → Try another PCME (PCME & T).
    - BAD → Repair or replace.
  - NO → Check bulb, fuse and wiring between PCME (PCME & T) and ignition switch.
    - BAD → Repair or replace.

2.

Does “CHECK” engine warning light go off when the engine is started ?
- YES → System normal.
- NO → Check wiring between PCME (PCME & T) and ”CHECK” engine warning light.
  - BAD → Repair.
  - NO → Is there diagnostic code output when DLC1 terminals TE1 and E1 connected ?
    - NO → Check wiring between PCME (PCME & T) terminal TE1 and DLC1 terminal TE1, and PCME (PCME & T) terminal E1 and DLC1 terminal E1.
      - OK → Try another PCME (PCME & T).
    - YES → Does “CHECK” engine warning light go off after repair according to malfunction code ?
      - NO → Further repair required.
      - YES → System OK → Cancel out diagnostic trouble code.

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