DIAGNOSIS SYSTEM

DESCRIPTION

EG11Z–04

The ECU 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 EG–194) the ECU detects system malfunctions relating to the sensors or actuators.

EG

The self–diagnosis system has two modes, a normal mode and a test moode.

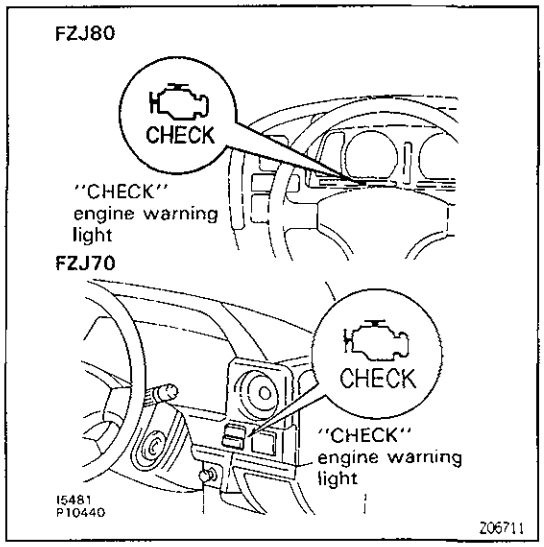
If a malfunction is detected when in the normal mode, the ECU lights up the "CHECK" Engine warning light to inform the driver of the occurrence of a malfunction. (For some codes the light does not come on.) The light goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the ECU memory. The ECU 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 check connector 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 ECU lights up the "CHECK" Engine warning light to inform the technician of the occurrence of a malfunction (except for code Nos. 43, 51 and 53). In this case, TE2 and E1 terminals on the check connector should be connected as shown later. (See page EG–192).

In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECU memory even when the ignition switch is OFF (except code Nos.43, 51 and 53). 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 check connector, 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 EG–192)



EG27N–01

"CHECK" ENGINE WARNING LIGHT

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.

EG

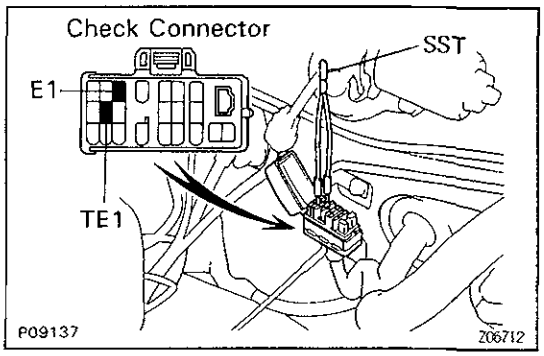
EG122–03

DIAGNOSTIC CODES OUTPUT

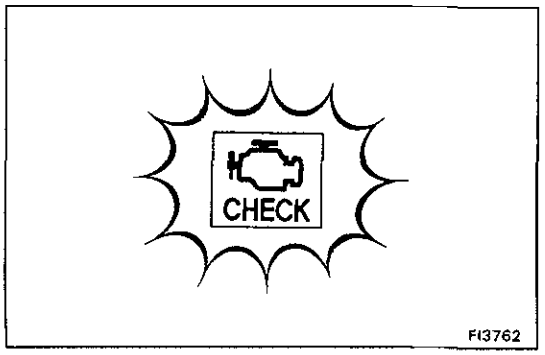
(Normal mode)

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

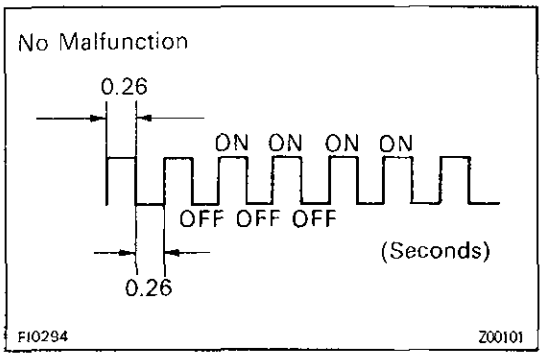
1. Initial conditions
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed (throttle position sensor IDL points closed)
(c) Transmission in neutral position
(d) Accessories switched OFF
(e) Engine at normal operating temperature
2. Turn the ignition switch ON. Do not start the engine.



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



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

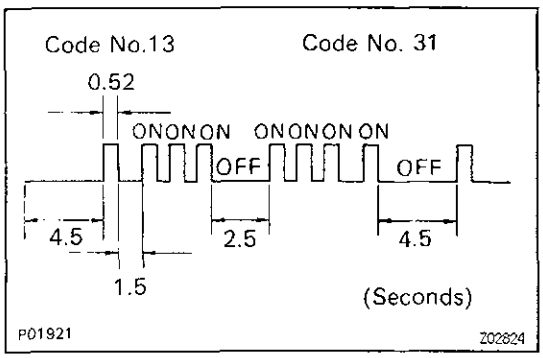


EG

Diagnostic Codes (See page EG–194)

(a) Normal System Operation (no malfunction)

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

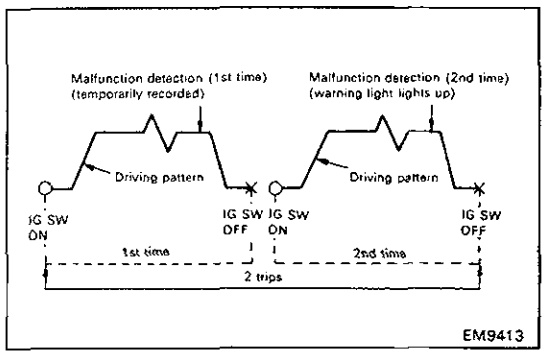


(b) Malfunction Code Indication

- 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 seconds pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5 seconds pause between each code.

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

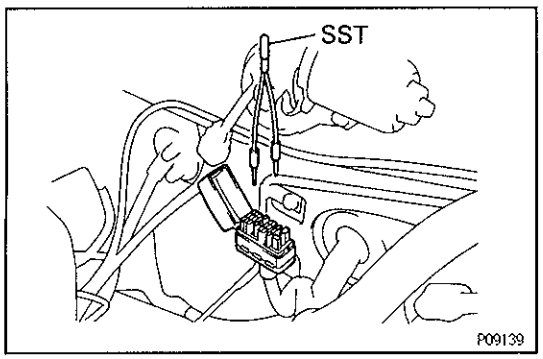
HINT: In the event of a number of trouble codes, indication will begin from the smaller value and continue to the larger.



(c) (2 Trip Detection Logic)

Diagnostic code No. 25 use "2 trip detection logic". With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECU memory. If the same case is detected again during the second drive test, this second detection causes the " CHECK" engine warning light to light up.

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



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

(Test mode)

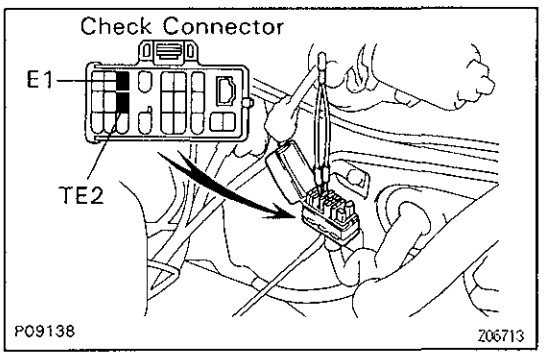
HINT:

- 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 conditioning signal and neutral start switch signal.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

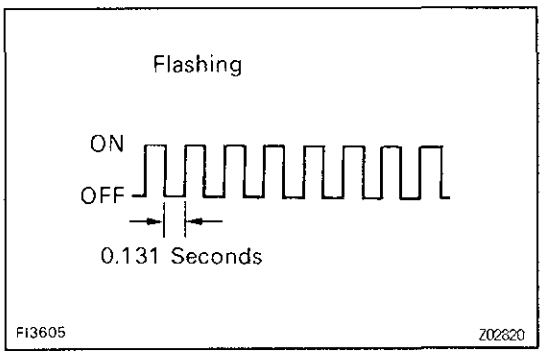
To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions

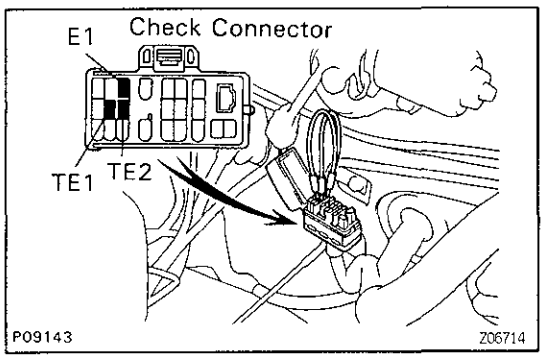
(a) Battery voltage 11 volts or more
(b) Transmission in neutral position
(c) Accessories switched OFF
(d) Engine at normal operation temperature



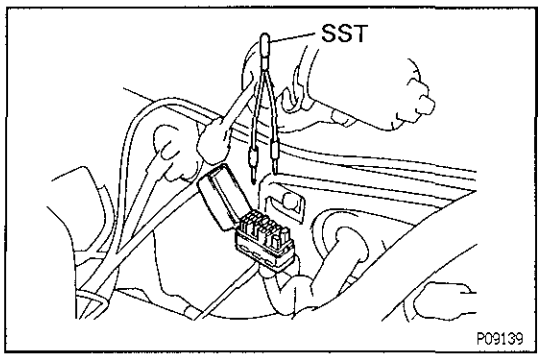
2. First using SST, connect terminals TE2 and E1 of the check connector.
SST 09843–18020



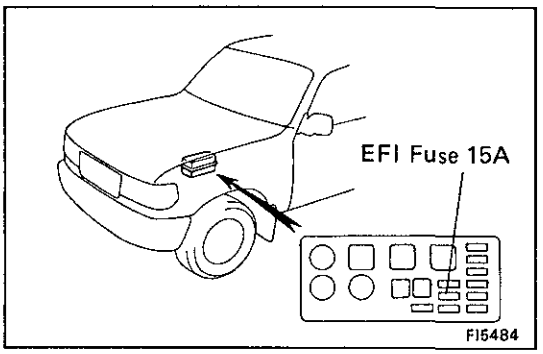
3. Turn the ignition switch ON.
HINT: To confirm that the test mode is operating, check that the "CHECK" engine warning light flashes when the ignition switch is turned ON.
4. Start the engine and drive the vehicle at a speed of 10 km/h (6 mph) or higher.
5. Simulate the conditions of the malfunction decribed by the customer.



6. Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020
7. Read the diagnostic code as indicated by the number of flashes of the "CHECK" engine warning light.
(See page EG–194)



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 ECU 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 conditioning is turn ON or when the accelerator pedal is depressed, code No.51 (Switch condition signal) is output, but this is not abnormal.



DIAGNOSTIC CODE CANCELLATION

EG123-03

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the EFI fuse (15A) for 30 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, radio ETR etc.) will also cancelled out.
   - If the diagnostic code is not cancelled out, it will be retained by the ECU 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 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 code appears, it indicates that *the trouble area has not been repaired thoroughly.*

EG124-03

DIAGNOSIS INDICATION

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

EG

EG27P-01

DIAGNOSTIC CODES

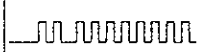
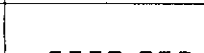
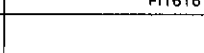
HINT:

- If a malfunction is detected during the diagnostic 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 "CHECK" engine warning light Blinks	System	"CHECK" engine warning light *1		Diagnosis	Trouble area	Memory *2
			Normal Mode	Test Mode			
–	 FI1604	Normal	–	–	No malfunctions detected.	–	–
12	 FI1606	RPM Signal	ON	N.A.	No "NE" or "G1", "G2" signal to ECM within 2 seconds after cranking the engine.	• Distributor circuit • Distributor • Starter signal circuit • ECU	○
13	 FI1607	RPM Signal	ON	ON	No "NE" signal is to ECU for 0.1 sec. or more when engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	○
14	 FI1608	Ignition Signal	ON	N.A.	No "IGF" signal to ECU 6 times in succession, and no signal input within 256 msec.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU	○
*4 21	FI1609	No.1 Oxygen Sensor Signal	ON	ON	At normal driving speed (below 100 km/h and engine speed is above 1,700 rpm), amplitude of oxygen sensor signal (OX1) is reduced to between 0.35 – 0.70 V continuously for 60 seconds or more.	• Oxygen sensor circuit • Oxygen sensor • ECU	○
		No.1 Oxygen Sensor Heater Signal			Open or short circuit in oxygen sensor heater. (HT1)	• Oxygen sensor circuit • Oxygen sensor • ECU	○
22	 FI1610	Coolant Temp. Sensor Signal	ON	ON	Open or short circuit in coolant temp. sensor signal for 0.5 sec. or more. (THW)	• Coolant temp. sensor circuit • Coolant temp. sensor • ECU	○
24	 FI1611	Intake Air Temp. Sensor Signal	*3 ON	ON	Open or short circuit in intake air temp. sensor signal for 0.5 sec. or more. (THA)	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	○

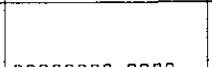
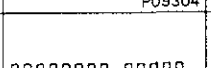
V02808

DIAGNOSTIC CODES (Cont'd)

Code No.	Number of "CHECK" engine warning light Blinks	System	"CHECK" engine warning light *1		Diagnosis	Trouble area	Memory *2
			Normal Mode	Test Mode			
*4 25	 FI2562	Air-Fuel Ratio Lean Malfunction	ON	ON	(1) Heated oxygen sensor output at 2,000 rpm is less than 0.45 V for at least 90 seconds when warmed up. Applies only to code 25 and for California models, excepting high-altitude areas. *7 (2 trip detection logic) (1) — (3)	• Engine ground bolt loose • Open in E1 circuit • Injector circuit • Injector • Fuel line pressure • VAF meter • PAIR system • Heated oxygen sensor circuits • Heated oxygen sensors • Ignition system • ECM	○
*5 28	 FI2698	No. 2 Oxygen Sensor Signal	ON	ON	At normal driving speed (below 100 km/h and engine speed is above 1,700 rpm), amplitude of heated oxygen sensor signal (OX2) is reduced to between 0.35 — 0.70 V continuously for 60 seconds or more.	• Oxygen sensor circuit • Oxygen sensor • ECU	○
		No. 2 Oxygen Sensor Heated Signal			Open or short circuit in heated oxygen sensor heater. (HT2)	• Oxygen sensor circuit • Oxygen sensor • ECU	
31	 FI1612	Air Flow Meter Signal	ON	ON	When idle contacts are closed and engine speed is 1,500 rpm or less, there is an open circuit in VC and VS signal or a short circuit between VS and E2.	• Air flow meter circuit • Air flow meter • ECU	○
32	 FI1613	Air Flow Meter Signal	ON	ON	Open circuit in E2 or short circuit between VC and VS.	• Air flow meter circuit • Air flow meter • ECU	○
35	 FI2699	Vacuum Sensor Signal	ON *3	ON	Open or short circuit in Vacuum sensor signal for 0.5 sec. or more.	• ECU	○
41	 FI1614	Throttle Position Sensor Signal	*3 ON	ON	Open or short circuit in throttle position sensor signal for 0.5 sec. or more.	• TP sensor circuit • TP sensor • ECU	○
42	 FI1615	Vehicle Speed Sensor Signal	OFF	OFF	No "SPD" signal for 8 seconds when engine speed 2,700 rpm or more and with vehicle not moving.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	○
43	 FI1616	Starter Signal	N.A.	OFF	No "STA" signal to ECU until engine speed reaches 800 rpm with vehicle not moving.	• Ignition switch circuit • Ignition switch • ECU	×
52	 BE3935	No. 1 Knock Sensor Signal (front side)	ON	N.A.	No No. 1 Knock sensor signal to ECU for 6 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• Open or short in No. 1 knock sensor circuit. • No. 1 knock sensor (looseness) • ECU	○

DIAGNOSTIC CODES (Cont'd)

EG

Code No.	Number of "CHECK" engine warning light Blinks	System	"CHECK" engine warning light *1		Diagnosis	Trouble area	*2 Memory
			Normal Mode	Test Mode			
53	 BE3935	Knock Control Signal	ON	N.A.	No knock control signal to ECU for 12 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• ECU	×
55	 BE3935	No. 2 Knock Sensor Signal (rear side)	ON	N.A.	No No. 2 knock sensor signal to ECU for 6 crank revolutions with engine speed between 1,800 rpm and 5,200 rpm.	• Open or short in No. 2 knock sensor circuit • No. 2 knock sensor (looseness) • ECU	○
81 *6	 P09304	ECT ECU Communication	ON	N.A.	Open in ECT1 circuit for 2 sec. or more.	• ECT1 circuit	○
83 *6	 P09304	ECT ECU Communication	ON	N.A.	Open in ESA1 circuit for 0.5 sec., after 0.5 sec. at idle.	• ESA1 circuit	○
84 *6	 P09304	ECT ECU Communication	ON	N.A.	Open in ESA2 circuit for 0.5 sec., after 0.5 sec. at idle.	• ESA2 circuit	○
85 *6	 P09304	ECT ECU Communication	ON	N.A.	Open in ESA3 circuit for 0.5 sec., after 0.5 sec. at idle.	• ESA3 circuit	○
51	 FI1617	Switch Condition Signal	N.A.	OFF	No "IDL" signal, "NSW" signal or "A/C" signal to ECM, with the DLC1 terminals E1 and TE1 connected.	• A/C switch circuit • A/C switch • A/C amplifire • TP sensor IDL circuit • NSW circuit • NSW • Acceleration pedal and cable • ECU	×

V02810

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" does not light up during malfunction is detected.

*2: "○" in the memory column indicates that a diagnostic trouble code is recorded in the ECU memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECU memory even if a malfunction occurs.
Accordingly, output of diagnostic results is performed with the ignition switch ON.

*3: The malfunction indicator lamp comes on if malfunction occurs only for California specifications.

*4: Codes No.21 and 25 are used only for Europe and Australia specifications.

*5: Code No.28 is used only for Europe specifications.

*6: Codes No.81, 83, 84, 85, are used only for ECT specifications.

*7: "2 trip detection logic" (See page EG—190)

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

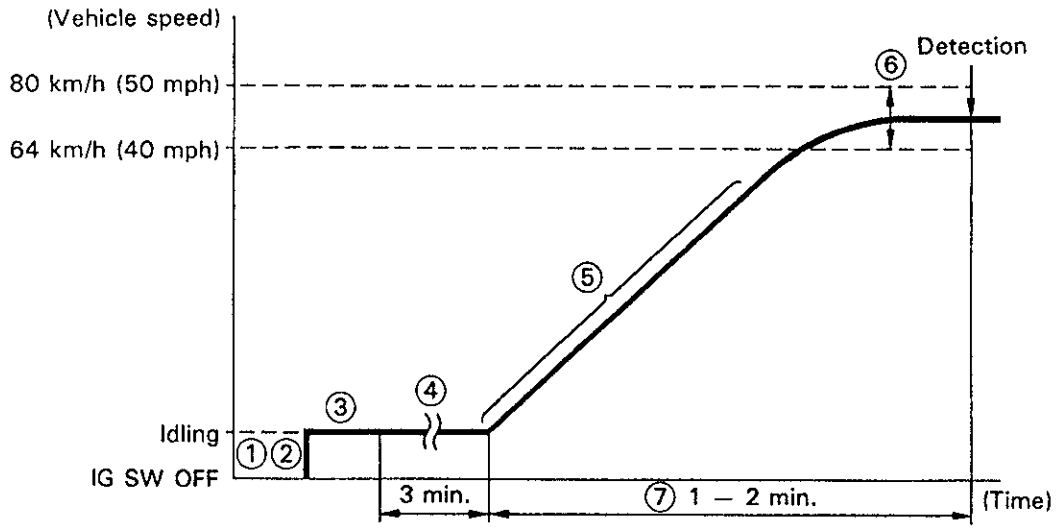
(a) To simulate diagnostic code detecting condition after diagnostic code is recorded.

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

EG

Code No.	21, 28	Oxygen Sensor Circuit

Malfunction: Deterioration of Oxygen Sensor



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

② Initiate test mode: Connect terminals TE2 and E1 or Check Connector 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", 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 64 — 80 km/h (40 — 50 mph).

⑦ Keep the vehicle running for 1 — 2 minutes after starting acceleration.

HINT: If any malfunction is detected, the malfunction indicator lamp will light up during step ⑦.

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

V02811

DIAGNOSTIC CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.

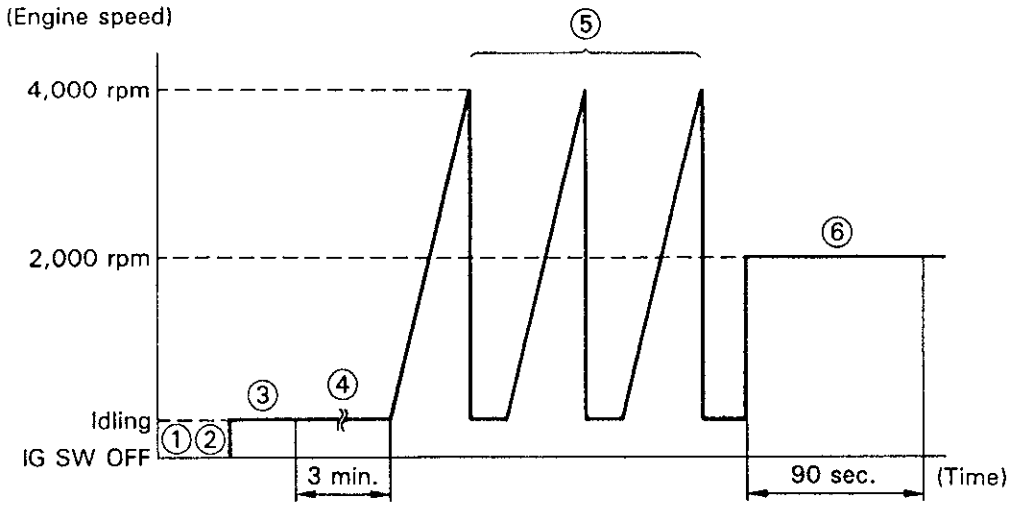
(a) To simulate diagnostic code detecting condition after diagnostic code is recorded.

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

EG

Code No.	25	Air-Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Oxygen Sensor



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

② Initiate test mode: Connect terminal TE2 and E1 of Check connector 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 2,000 rpm for 90 seconds.

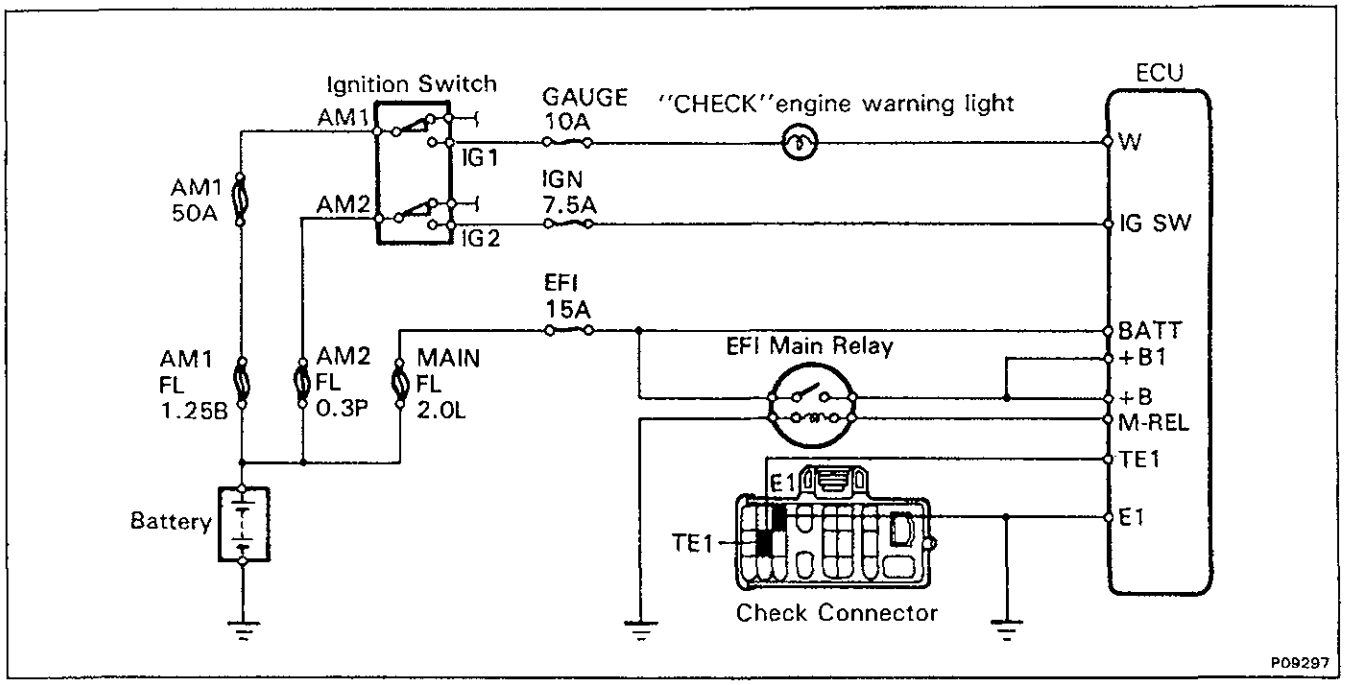
HINT: If a malfunction is detected, the "CHECK" engine warning light will light up during step ⑥.

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

V02812

EG127-03

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 ECU terminal W is grounded to the body?
     - YES → Check wiring between ECU terminal E1 and body ground.
       - OK → Try another ECU.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between ECU 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 ECU and "CHECK" engine warning light.
     - BAD → Repair.
     - OK → Is there diagnostic code output when check connector terminals TE1 and E1 connected?
       - NO → Check wiring between ECU terminal TE1 and check connector terminal TE1, and ECU terminal E1 and check connector terminal E1.
         - OK → Try another ECU.
       - YES → Does "CHECK" engine warning light go out after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK → Cancel out diagnostic code.

V02813