EG0CH-1Q

RECOMMENDED TOOLS

Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Soft brush	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	

EG

DIAGNOSIS SYSTEM

EG43L-05

DESCRIPTION

The ECU contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and the check engine warning light on the combination meter lights up.

By analyzing various signals as shown in the later table (See diagnostic codes) the ECU detects system malfunctions relating to the sensors or actuators.

The self–diagnosis system has 2 modes, a normal mode and a test mode.

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 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.

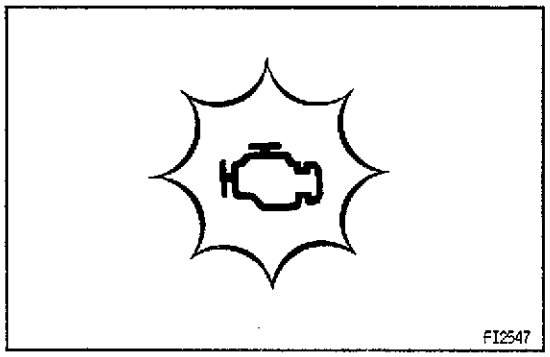
The diagnostic code can be read by the number of blinks of the check engine warning light when TE1 and E1 terminals on the check connector are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.

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. 42, 43 and 51). In this case, TE2 and E1 terminals on the check connector should be connected as shown later. (See diagnostic codes output (test mode))

EG

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. 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 check connector, as shown later. (See diagnostic codes output)

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 diagnostic codes output (test mode))


FI2547

CHECK ENGINE WARNING LIGHT CHECK

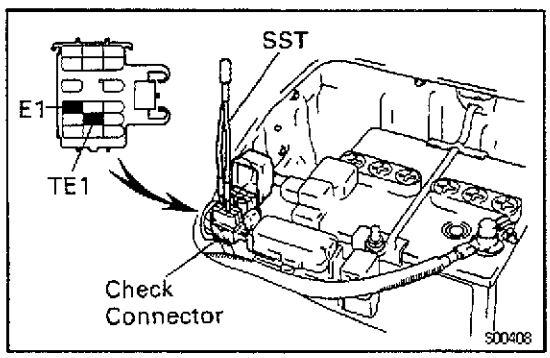
1. The check engine warning light will come on when the ignition switch is at ON and the engine is not running.
2. When the engine is started, the check engine warning light should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

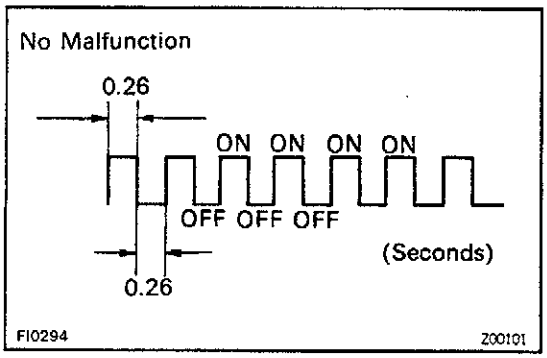
DIAGNOSTIC CODES OUTPUT

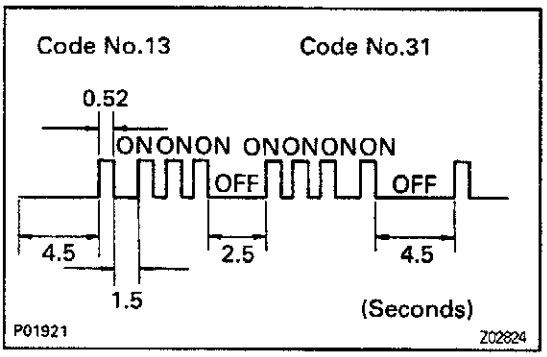
Normal mode:

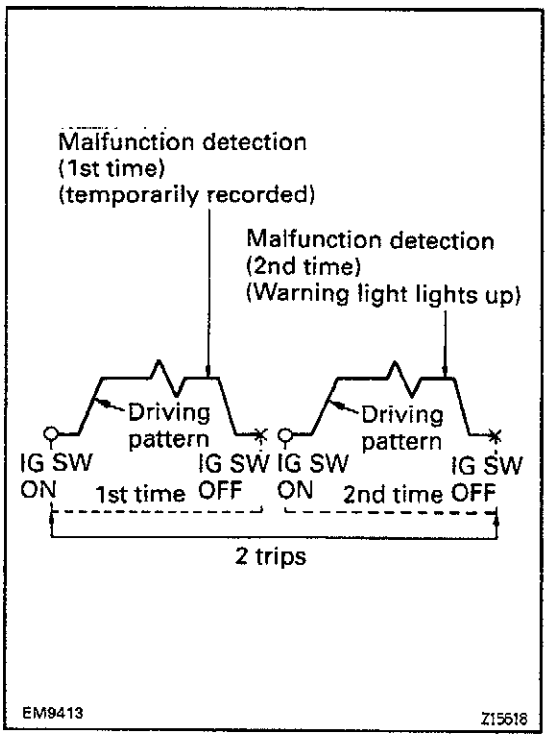
To obtain an output of diagnostic codes, proceed as follows:

1. Initial conditions:
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed
(c) Accessories switched OFF
(d) Engine at normal operating temperature
2. Turn the ignition switch ON.
CAUTION: 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.









Diagnostic Codes

(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 1st number of blinks will equal the 1st digit of a 2 digit diagnostic code, and after a 1.5 second pause, the 2nd number of blinks will equal the second digit. If there are 2 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 check connector 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 21 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 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 the SST from the check connector.

SST 09843–18020

Test mode:

HINT:

- Compared to the normal mode, the test mode has an increased sensing ability to detect malfunctions.
- It can also detect malfunctions in the starter signal circuit, air conditioning signal.

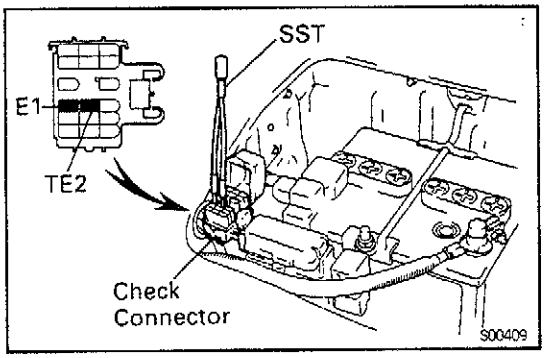
EG

EG

- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

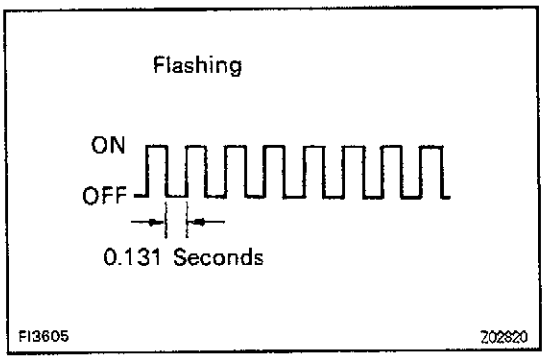
To obtain an output of diagnostic codes, proceed as follows:

1. Initial conditions:
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed
(c) Accessories switched OFF
2. Turn the ignition switch OFF.
3. First, using SST, connect terminals TE2 and E1 of the check connector.
SST 09843–18020
4. Turn the ignition switch ON to begin the diagnosis in the test mode.

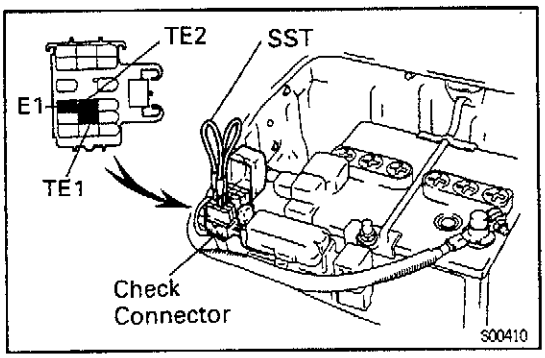


HINT: To confirm that the test mode is operating, check that the check engine warning light flashes when the ignition switch is turned ON.

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

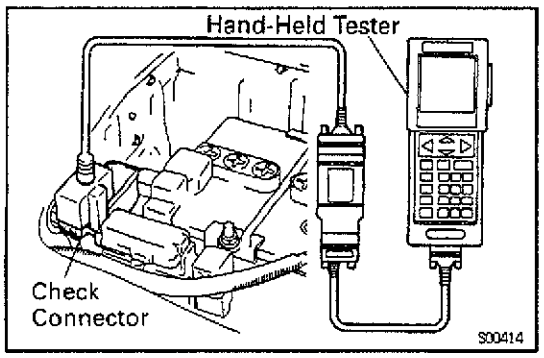


7. Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020
8. Read the diagnostic code as indicated by the number of flashes of the check engine warning light.
9. After the diagnosis check, remove the SST from the check connector.
SST 09843–18020



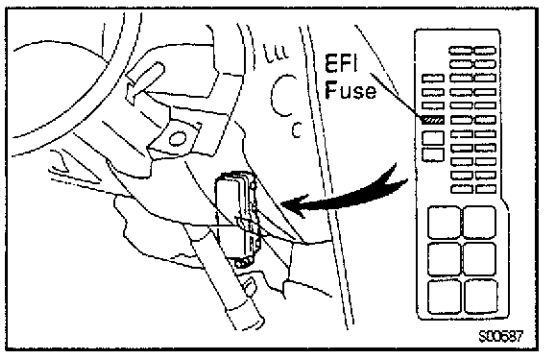
HINT:

- 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 5 is not done.
- When the air conditioning is on or when the accelerator pedal is depressed, code "51" (Switch Condition Signal) is output, but this is not abnormal.



DIAGNOSTIC CODE CHECK USING HAND-HELD TESTER

1. Hook up the hand–held tester to the check connector.
2. Read the diagnostic codes by following the prompts on the tester screen.
   Please refer to the hand – held tester operator's manual for further details.



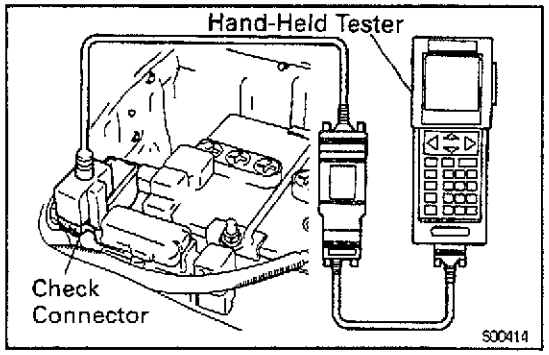
DIAGNOSTIC CODE CANCELLATION

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 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 negative (–) terminal cable from the battery, but in this case, other memory systems (clock, 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, road test 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.

DIAGNOSIS INDICATION

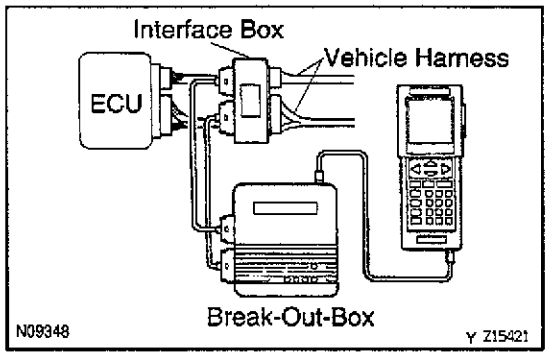
1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic codes, except code Nos. 42, 43 and 51 under the test mode will be retained in memory by the ECU from the time of detection until cancelled out.
3. Once malfunction is cleared, the check engine warning light in the combination meter will go off but the diagnostic code(s) remains stored in ECU memory.

EG



ECU DATA MONITOR USING HAND–HELD TESTER

1. Hook up the hand–held tester to the check connector.
2. Monitor the ECU data by following the prompts on the tester screen.
   HINT: Hand–held tester has a "Snapshot" function which records the monitored data.
   Please refer to the hand – held tester operator's manual for further details.



ECU TERMINAL VALUES MEASUREMENT USING BREAK–OUT–BOX AND HAND–HELD TESTER

1. Hook up the break–out–box and hand–held tester to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.
   HINT: Hand–held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.
   Please refer to the hand–held tester/break–out–box operator's manual for further details.

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.

EG

Code No.	Number of blinks Check Engine Warning Light	System	Check Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2	See Page
			Normal Mode	Test Mode				
–	 FI1401	Normal	–	–	Output when no other code is recorded	–	–	–
12	 FI1606	RPM Signal	ON	N.A.	No NE signal is input to ECU for 2 seconds or more after STA turns ON	• Open or short in NE circuit • IIA • Open or short in STA circuit • ECU	○	–
13	 FI1607	RPM Signal	ON	N.A.	NE signal is not input to ECU for 0.3 seconds or more when engine speed is 1,500 rpm or more	• Open or short in NE circuit • IIA • ECU	○	–
14	 FI1608	Ignition Signal	ON	N.A.	IGF signal from igniter is not input to ECU for 4 – 5 consecutive ignition	• Open or short in IGF or IGT circuit from igniter to ECU • Igniter • ECU	○	–
21	 FI1609	Oxygen Sensor Circuit	OFF	ON	At normal driving speed below 100 km/h (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 seconds or more *3(2 trip detection logic)	• Open or short in oxygen sensor circuit • Oxygen sensor • ECU	○	EG-103
22	 FI1610	Water temp. Sensor Signal	ON	ON	Open or short in water temp. sensor circuit for 0.5 seconds or more (THW)	• Open or short in water temp. sensor circuit • Water temp. sensor • ECU	○	EG-99
24	 FI1611	Intake Air Temp. Sensor Signal	OFF	ON	Open or short in intake air temp. sensor circuit for 0.5 seconds or more (THA)	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECU	○	EG-98
25	 FI2562	Air-Fuel Ratio Lean Malfunction	OFF	ON	Oxygen sensor output is less than 0.45 V for at least 90 seconds or more when oxygen sensor is warmed up (racing at 2,000 rpm) *3(2 trip detection logic)	• 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	○	EG-97 EG-103
31	 FI1612	Vacuum Sensor Signal	ON	ON	Open or short detected continuously for 0.5 seconds or more in vacuum sensor circuit (PIM)	• Open or short in vacuum sensor circuit • Vacuum sensor • ECU	○	EG-96
41	 FI1614	Throttle Position Sensor Signal	N.A.	N.A.	IDL and PSW signals are output simultaneously for several seconds	• Open or short in throttle position sensor circuit • Throttle position sensor • ECU	○	EG-95
42	FI1615	Vehicle Speed Sensor Signal	ON	OFF	SPD signal is not input to ECU for at least 8 seconds when vehicle is running with below condition: • Engine speed 2,500 – 5,000 rpm • Coolant temp. More than 80°C (176°F) • Manifold vacuum 60 kPa (450 mmHg, 17.7 in. Hg) or more	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECU	○	–

V07370

Code No.	Number of blinks Check Engine Warning Light	System	Check Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2	See Page
			Normal Mode	Test Mode				
43	 FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECU when cranking with Test mode	• Open or short in starter signal circuit • Open or short in IG SW or starter relay circuit • ECU	X	EG-100
51	 FI1617	Switch Condition Signal	N.A.	OFF	Displayed when A/C is ON or IDL contact OFF and STA is OFF with check terminals TE1 and E1 connected at Test mode	• A/C switch system • Throttle position sensor IDL circuit • Accelerator Pedal, cable • ECU	X	–

V07371

EG

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

*3: "2 trip detection logic". (See step 4 (c) in trouble codes output (normal mode))

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

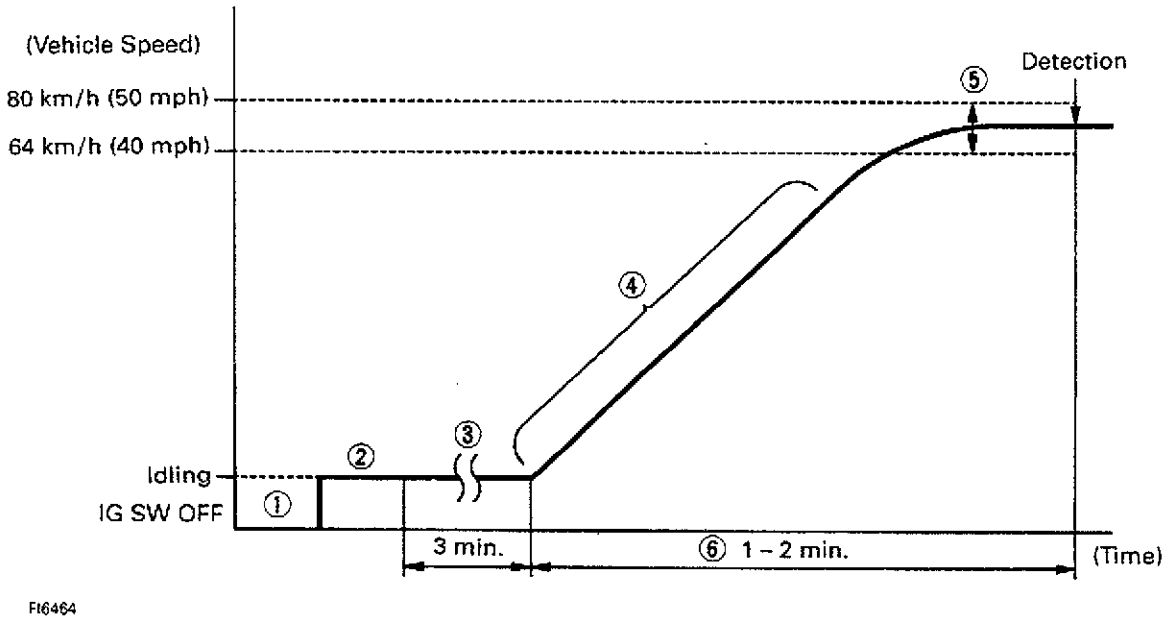
Purpose of the driving pattern

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

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

Code No.21 Oxygen Sensor Circuit

Malfunction: Deterioration of Oxygen Sensor



① Disconnect the EFI fuse (15A) for 10 seconds or more with the ignition switch OFF. Initiate test mode. (Connect terminals TE2 and E1 of the check connector with the ignition switch OFF.)

② Start the engine, and warm it up with all the accessories switched OFF.

③ Let the engine idle for 3 minuites.

④ Accelerate gradually within the range 1,300 — 1,700 rpm (centered around 1,500 rpm) with the A/C switch ON and 5th gear engaged. (Take care that the engine speed does not fall below 1,200 rpm when shifting. Gradually depress the accelerator pedal, and keep it steady so that engine braking does not occur.)

⑤ Maintain the vehicle speed at 64 — 80 km (40 — 50 mph).

⑥ Keep the vehicle running for 1 — 2 minutes after starting acceleration.
HINT: If a malfunction exists, the check engine warning light will light up after approx. 60 seconds from the start of acceleration.
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern

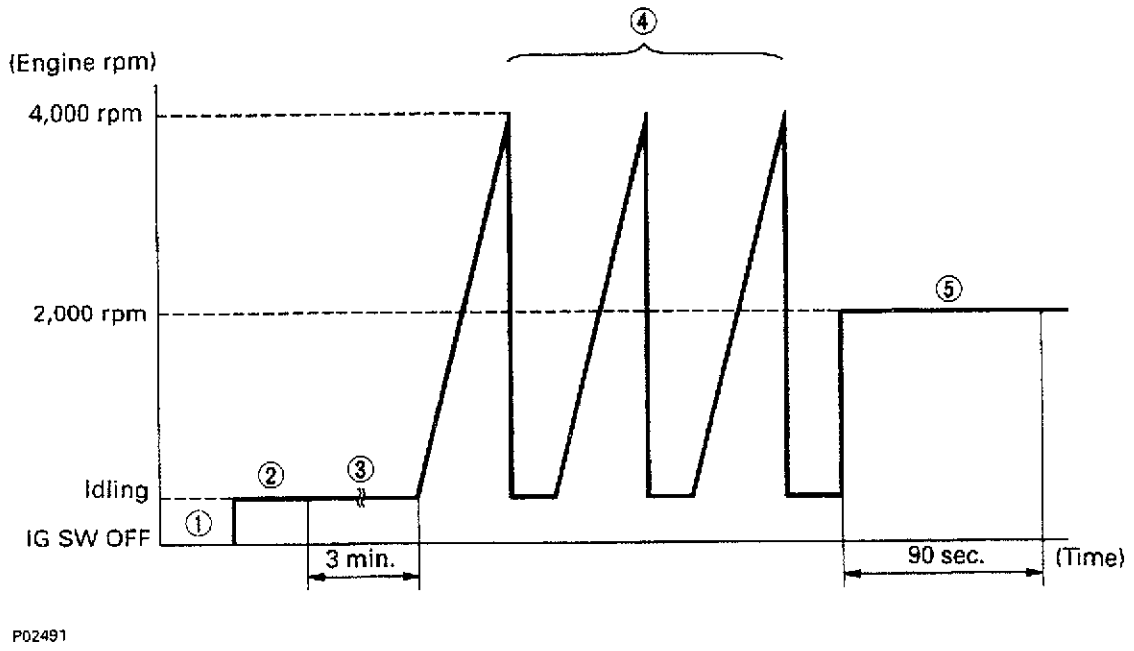
(a) To simulate diagnostic code detecting condition after diagnostic code is recorded.

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

EG

Code No.25 Air—Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Oxygen Sensor



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

① Disconnect the EFI fuse (15A) for 10 seconds or more with the ignition switch OFF.
Initiate test mode. (Connect terminals TE2 and E1 of the check connector with the ignition switch OFF.)

② Start the engine, and warm it up with all the accessories switched OFF.

③ Let the engine idle for 3 minutes.

④ Accelerate rapidly to 4,000 rpm 3 times.

⑤ Maintain 2,000 rpm for 90 seconds.

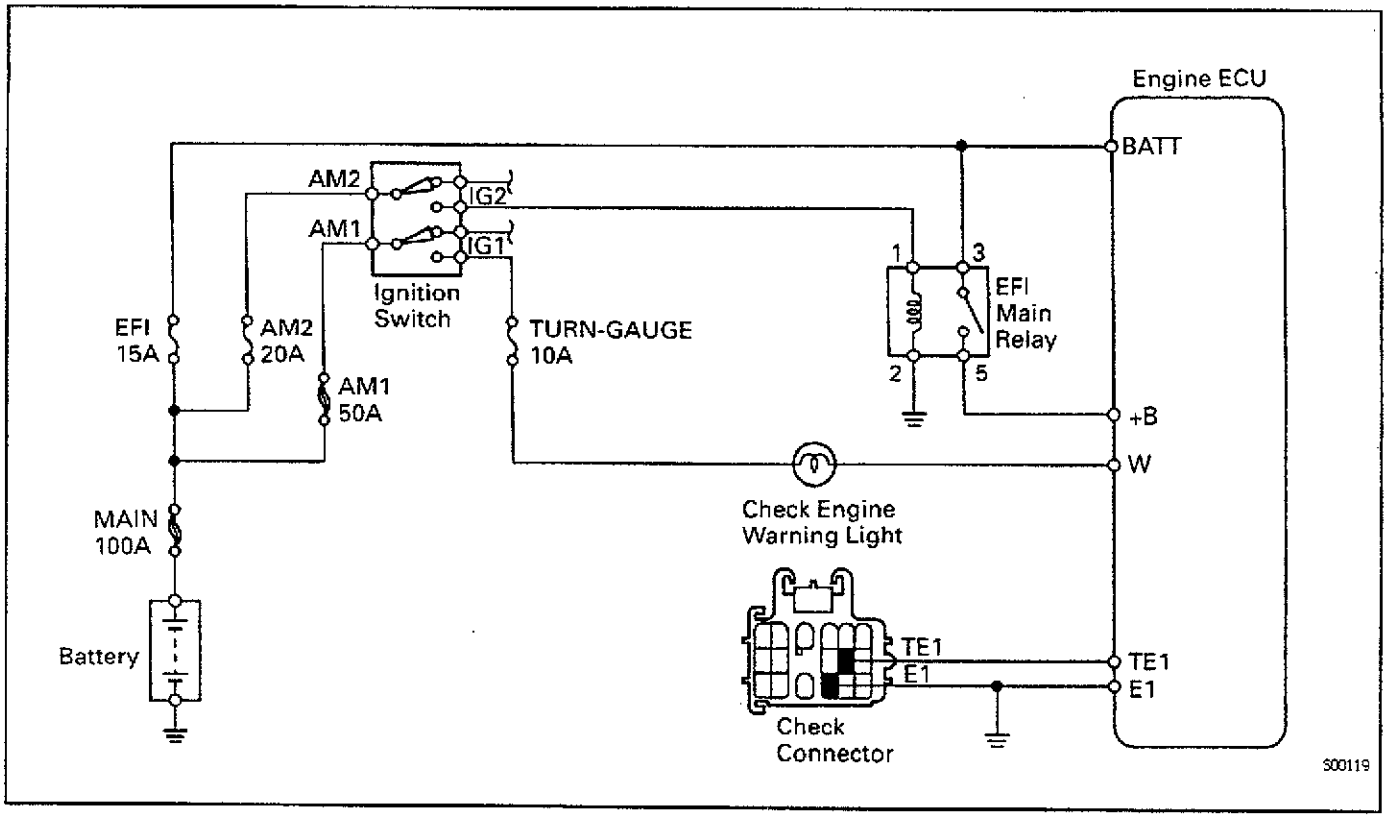
HINT: If any malfunction is detected, the check engine warning light will light up during step ⑤.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

E0577-05

DIAGNOSIS CIRCUIT INSPECTION

EG



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

V06410