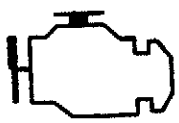
DIAGNOSIS SYSTEM

DESCRIPTION

EG43L–0A

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 codes No. 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))
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 codes No. 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))



"CHECK" Engine Warning Light

P07777

CHECK ENGINE WARNING LIGHT CHECK

EG5JE–09

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

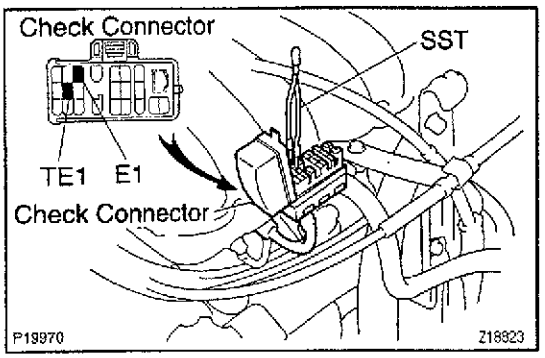
EG575–04

Normal mode:

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

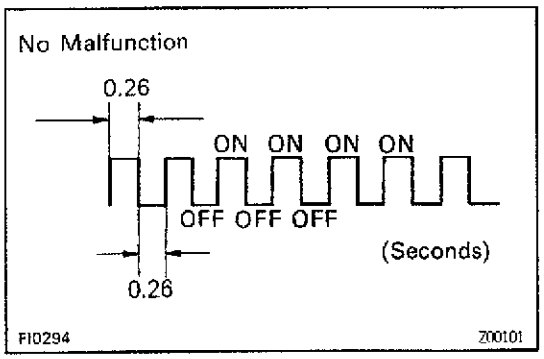
1. Initial conditions

(a) Battery voltage 11 V or more
(b) Throttle valve fully closed
(c) Accessories switched OFF



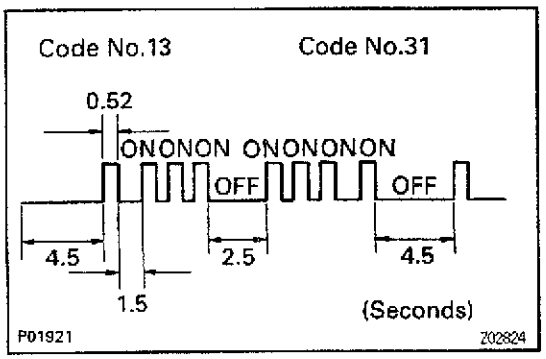
(d) Engine at normal operating temperature

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.



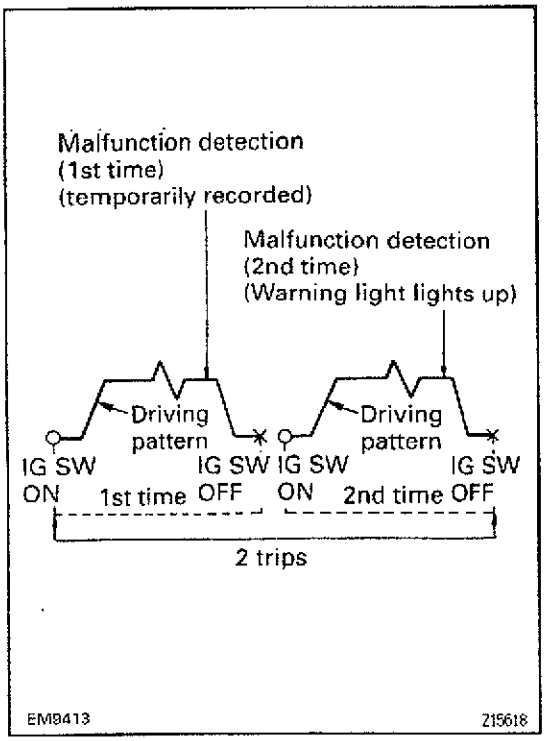
Diagnostic Codes

(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 and air conditioning 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 codes, proceed as follows:

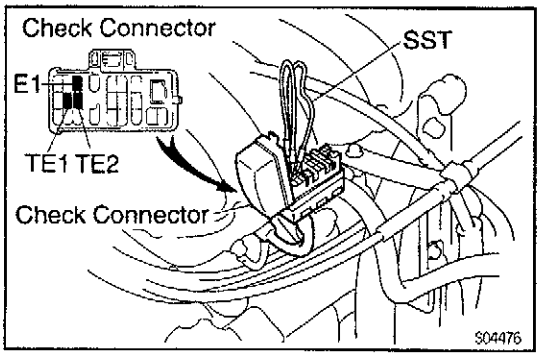
1. Initial conditions

(a) Battery voltage 11 V or more

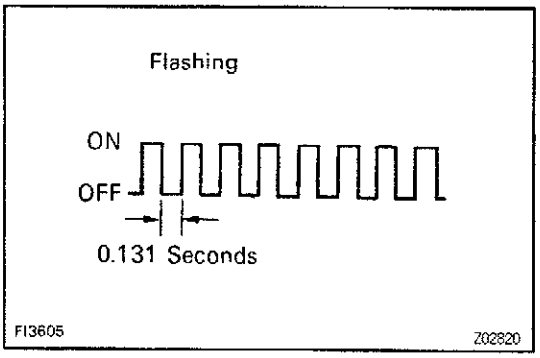
(b) Throttle valve fully closed

(c) Accessories switched OFF

2. Turn the ignition switch OFF.

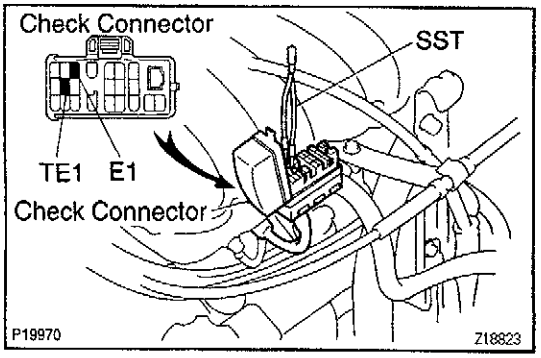


3. First, using SST, connect terminals TE2 and E1 of the check connector.
   SST 09843–18020
4. Turn the ignition switch ON to begin the diagnosis in the test mode.



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.

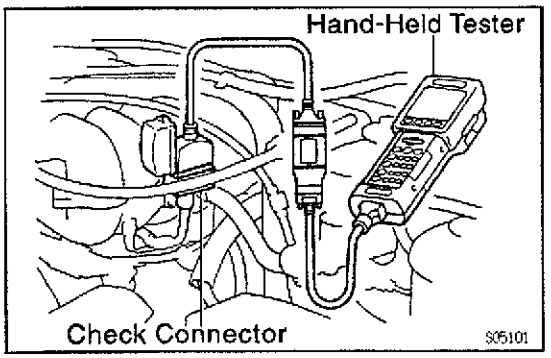


7. Using SST, connect terminals TE1 and E1 of the check connector.
   SST 09843–18020
8. Read the diagnostic code as indicated by the number of flashes of the check engine warning light.
9. After the diagnosis check, remove the SST from the check connector.
   SST 09843–18020

EG

HINT:

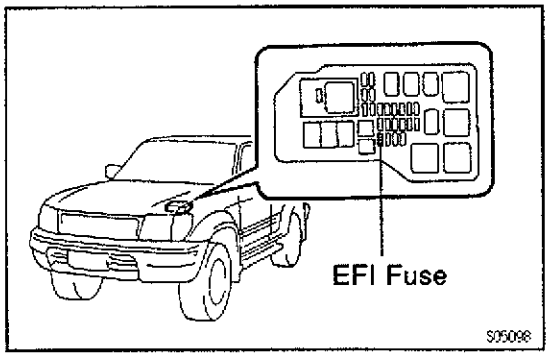
- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned ON.
- The starter signal and vehicle speed signal will be diagnosed by the ECU as malfunctions, and codes No. 42, and 43 will be output, if the operation in step 5 is not done.
- When the air conditioning 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

E030V-04

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

E042T-00

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be canceled out by removing the EFI fuse (15A) for 10 seconds or more, depending on ambient temperature (the lower the temperature it is, 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 canceled out.
   - If the diagnostic code is not canceled out, it will be retained by the ECU and appear along with a new code in the event of future trouble.

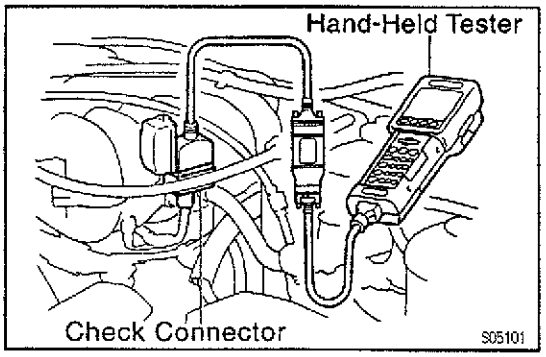
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.

2. After cancellation, do the road test 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

EG124-0H

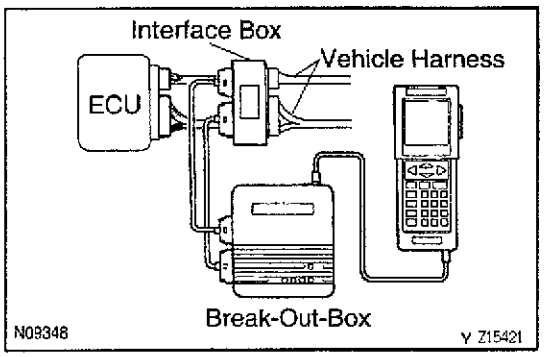
1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic codes, except codes No. 42, 43 and 51 under the test mode will be retained in memory by the ECU from the time of detection until canceled out.
3. Once malfunction is cleared, the check engine warning light in the combination meter will go off but the diagnostic code(s) remains stored in ECU memory.



ECU DATA MONITOR USING HAND–HELD TESTER

EG30X-0L

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.



EG

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

E0391-06

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.

EG6Z5-02

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.

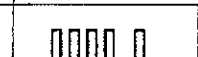
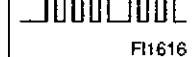
EG

DTC No.	Number of blinks of Check Engine Warning Light	System	Check Engine*1 Warking 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 G or NE signal is not input to ECU for 2 secs. or more after cranking. • No G signal is not input to ECU for 5 secs. and engine revolution is more than 600 rpm	• Open or short in crankshaft position sensor or camshaft position sensor circuit. • Crankshaft position sensor • Camshaft position sensor • Starter • ECU	○	—
13	FI1607	RPM Signal	ON	N.A	No NE signal to ECU for 1.0 sec. or more at 1,500 rpm or more.	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECU	○	—
14	FI1608	Ignition Signal	ON	N.A.	No IGF signal to ECU for 6 consecutive IGT signals during engine running.	• Open or short in IGF or IGT circuit from igniter to ECU • Igniter • ECU	○	EG-122
16	FI3600	A/T Control Signal	ON	N.A.	Fault in communications between the engine CPU and A/T CPU in the ECU.	• ECU	×	—
21	F1I609	Oxygen Sensor Signal	ON	ON	Open or short in heater circuit of oxygen sensor for 1.0 sec. or more. (HT)	• Open or short in heater circuit of oxygen sensor • Oxygen sensor • ECU	○	—
					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 below 0.3V continuously for 60 sec. or more. *3 (2 trip detection logic)	• Open or short in oxygen sensor circuit • Oxygen sensor • Open or short in vacuum sensor circuit • Vacuum sensor • ECU	○	—
22	FI1610	Water temp. Sensor Signal	ON	ON	Open or short in water temp. sensor circuit for 1.0 sec. or more.(THW)	• Open or short in water temp. sensor circuit • Water temp. sensor • ECU	○	EG-120
24	FI1611	Intake Air Temp. Sensor Signal	ON	ON	Open or short in intake air temp. sensor circuit for 1.0 sec. or more. (THA)	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECU	○	EG-119
25	FI1612	Air-Fuel Ratio Lean Malfunction	ON	ON	Oxygen sensor output in less than 0.45V for at least 90 sec. when oxygen sensor is warmed up (racing at 1,500 rpm or more). *3 (2 trip detection logic)	• Open in injector circuit • Fuel line pressure (injector leak, blockage) • Ignition system (spark plug, igniter) • Vacuum sensor (air intake) • Open or short in oxygen sensor circuit • Oxygen sensor • ECU	○	—

Y

V08161

DIAGNOSTIC CODES (Cont'd)

DTC No.	Number of blinks ofCheck Engine Warning Light	System	Check Engine* Warning Light		Diagnosis	Trouble Area	Memory*2	See page
			Normal Mode	Test Mode				
31	 FI1612	Air Flow Meter Signal	ON	OFF	At engine speed is below 3,000 rpm open or short detected continuously for 5.0 sec. or more in air flow meter circuit.	• Open or short in air flow meter circuit • Air flow meter • ECU	○	EG-143
33	 BE3933	Idle Speed Control Valve	ON	ON	At idling, open or short detected continuously for 10 sec. or more in idle speed control valve circuit	• Open or short in idle speed control valve circuit • ISC valve • ECU	○	EG-150
41	 FI1614	Throttle Position Sensor Signal	ON	ON	Condition a) or b) continues: a) VTA < 0.1V, and closed throttle position switch is OFF. b) VTA > 4.9V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECU	○	EG-116
42	 FI1615	Vehicle Speed Sensor Signal	ON	ON	SPD signal is not input to ECU for at least 8 seconds when vehicle is running with below condition. • Engine speed 1,800-3,500 rpm • Coolant temp. More than 80°	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECU	○	—
43	 FI1616	Starter Signal	N.A.	ON	No starter signal to ECU.	• Open or short in starter signal circuit • Open or short in ignitionswitch or starter relay circuit • ECU	×	—
52	 FI1618	Knock Sensor 2 (Left bank) Signal	ON	ON	No knock sensor 2 signal to ECU for crank revolutions with engine speed 2,000 rpm and 5,600 rpm.	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECU	○	—
53	 FI1619	Knock Control Signal	ON	N.A.	Engine control computer malfunction (for knock control).	• ECU	×	EG-162
55	 P01923	Knock Sensor 1 (Right bank) Signal	ON	ON	No knock sensor1 signal to ECU with engine speed 1,800 rpm and 5,600 rpm	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECU	○	—
51	 FI1617	Switch Condition Signal	N.A.	ON	Display when A/C is ON or NSW is OFF and STA is OFF with the check terminals E1 and TE1 connected at Test mode.	• A/C switch system • Throttle position sensor IDL circuit • Accelerator pedal, cable • ECU	×	—

V08163

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.

*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 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

EG7CL-01

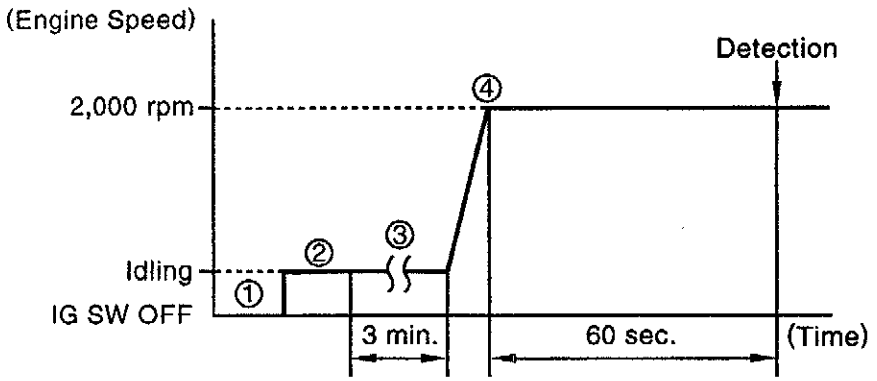
Purpose of the driving pattern

(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.

DTC No.21 Oxygen Sensor Circuit

Malfunction: Deterioration of Oxygen Sensor



V08159

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 Maintain the vehicle speed at 50 – 65 km (31 – 40 mph).

⑤ 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

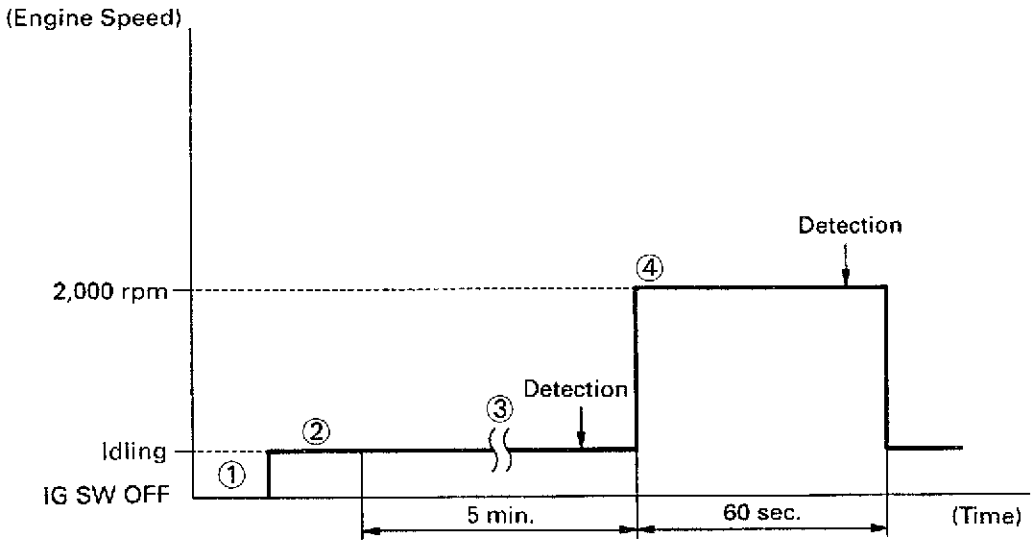
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

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

EG

DTC No.25 Air—Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Oxygen Sensor



F16463 V07540

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.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

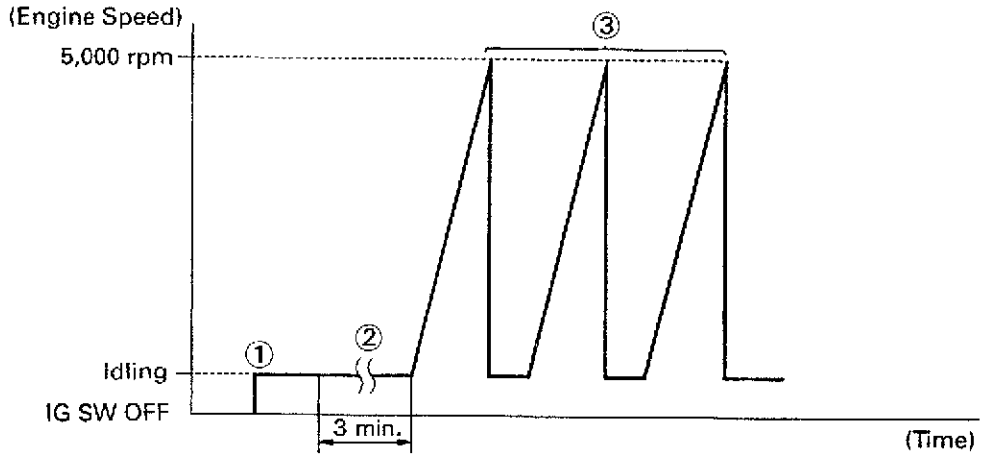
Purpose of the driving pattern

(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.

DTC No.25 Air—Fuel Ratio Lean Malfunction

Malfunction: Open or short in Injector Circuit, Injector Leak or Blockage



F16461

V07541

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.
(After the engine is started, do not depress the accelerator pedal.)

④ If the malfunction is not detected during idling, race the engine without any load at approx. 2,000 rpm for 60 seconds.
HINT: If a malfunction exists, the check warning light will light up during the 5 minutes idling period or within 60 seconds of starting racing.
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

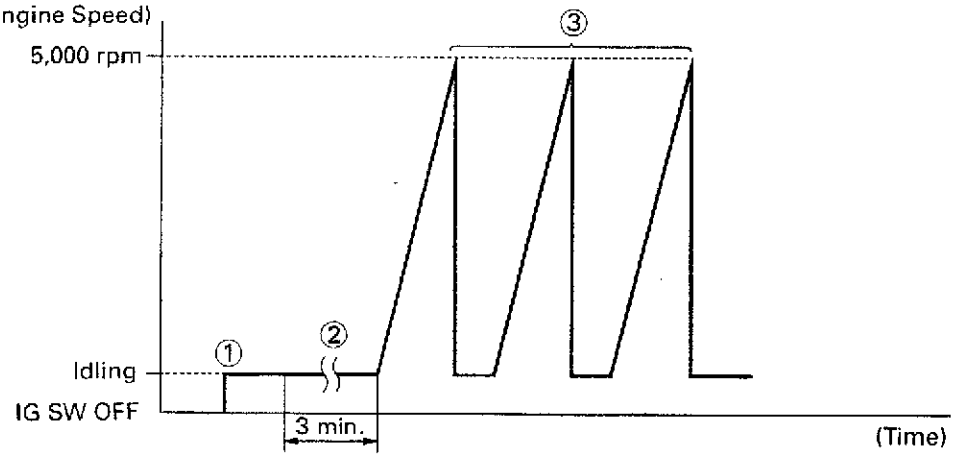
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

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

EG

DTC Nos.52, 53, 55 Knock Sensor Circuit

Malfunction: Open or short in Knock Sensor



F16461

V07541

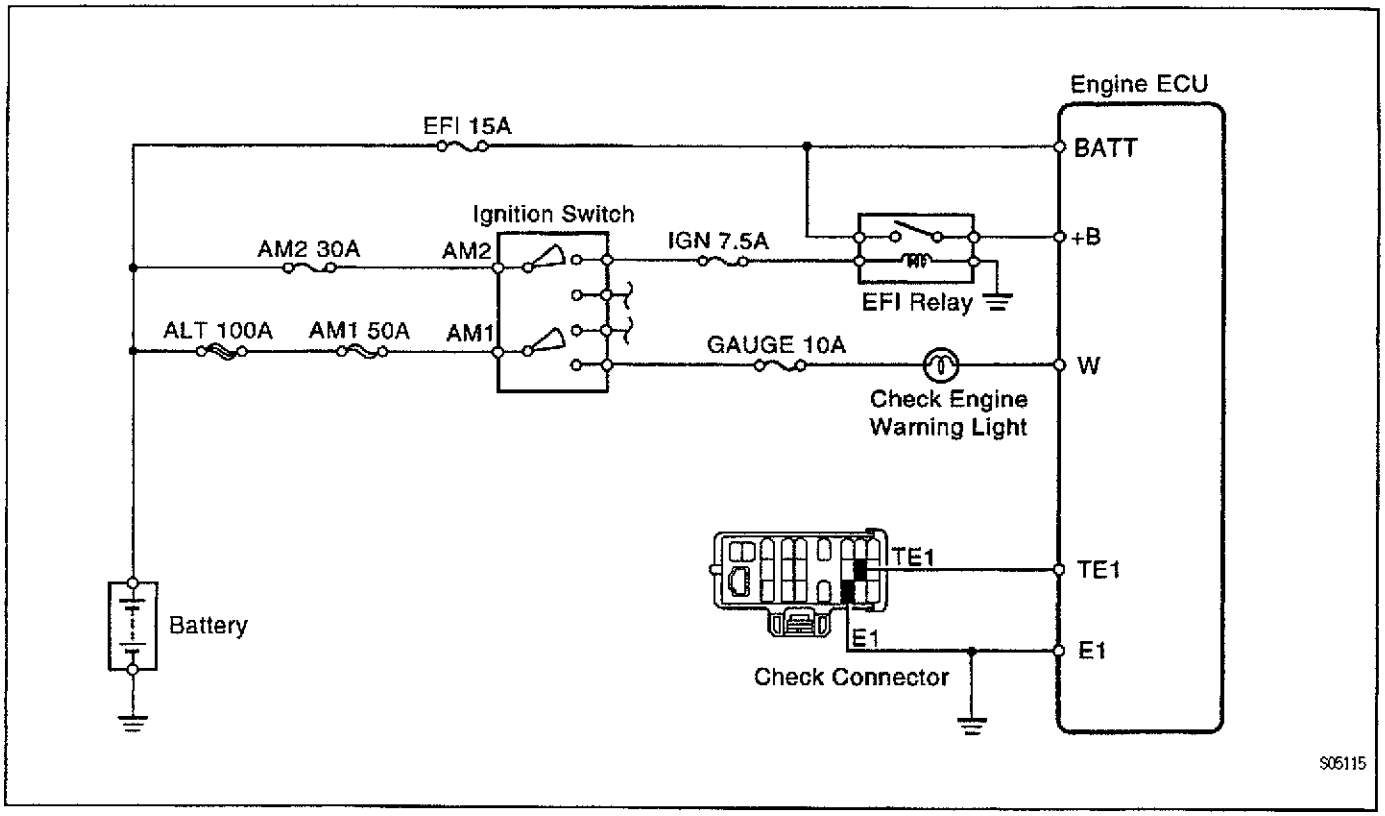
① Start the engine, and warm it up.

② Let the engine idle for 3 minutes.

③ With the A/C ON, quickly race the engine to 5,000 rpm 3 times.
(Replay depress the accelerator pedal and suddenly release it.)
HINT: If a malfunction exists, the check engine warning light will light up when the engine quickly raced.
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

EG577-0A

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 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