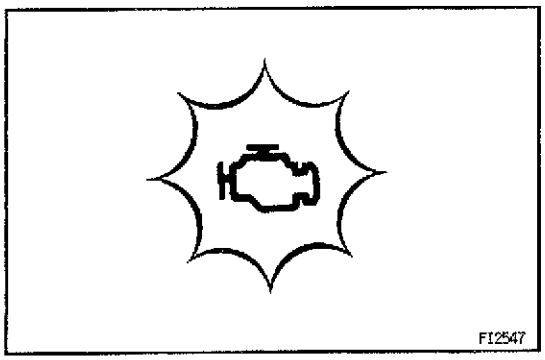
E60CH-1Y

RECOMMENDED TOOLS

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



DIAGNOSIS SYSTEM

CHECK ENGINE WARNING LIGHT CHECK E05JE-06

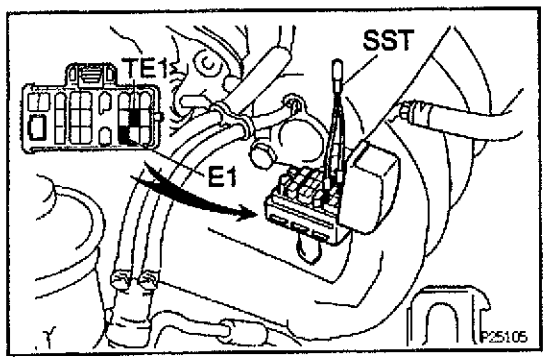
1. The check engine warning light will come on when the ignition switch is at ON and the engine is not running.
2. When the engine is started, the check engine warning light should go off. If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODES OUTPUT E0707-01

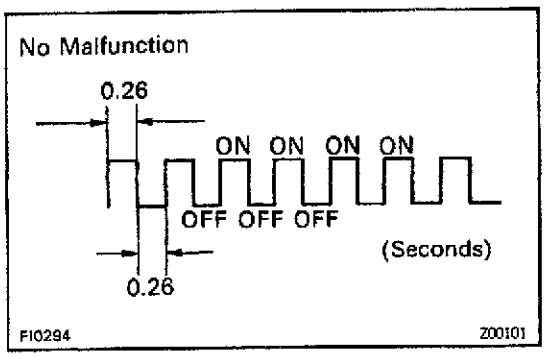
Normal mode:

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

1. Initial conditions:
(a) Battery positive voltage 11 V or more
(b) Throttle valve fully closed
(c) Accessories switched OFF

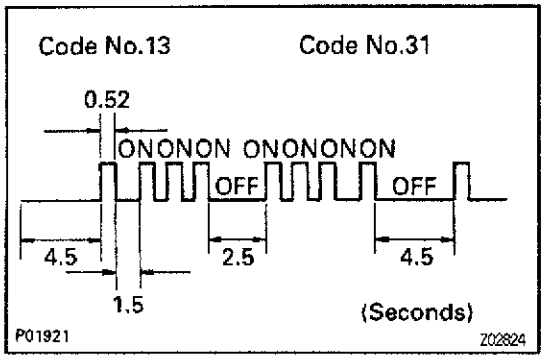


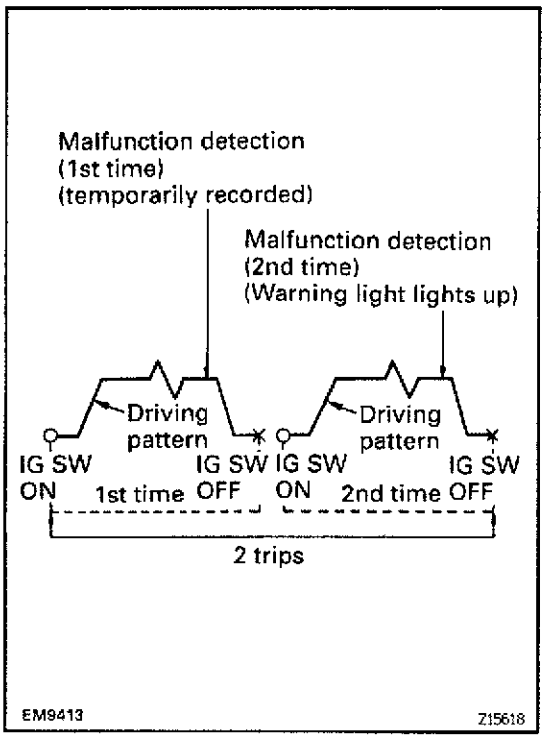
(d) Engine at normal operating temperature
2. Turn the ignition switch ON.
CAUTION: Do not start the engine.
3. Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020
4. Read the diagnostic trouble code as indicated by the number of flashes of the check engine warning light.



Diagnostic Trouble Codes (DTC)

(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 trouble 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 trouble codes 21 and 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 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.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

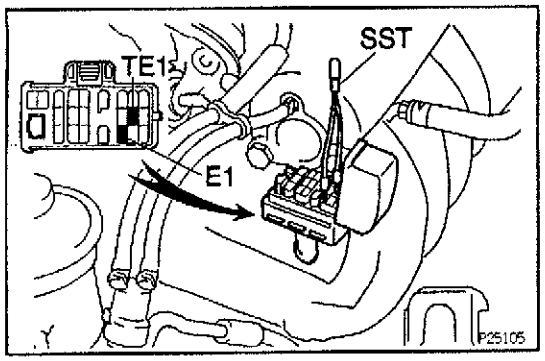
To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions:

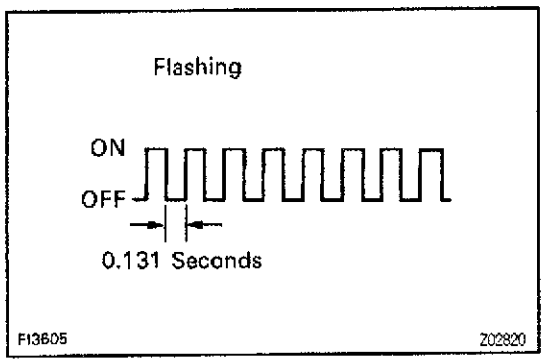
(a) Battery positive voltage 11 V or more

(b) Throttle valve fully closed

(c) Accessories switched OFF

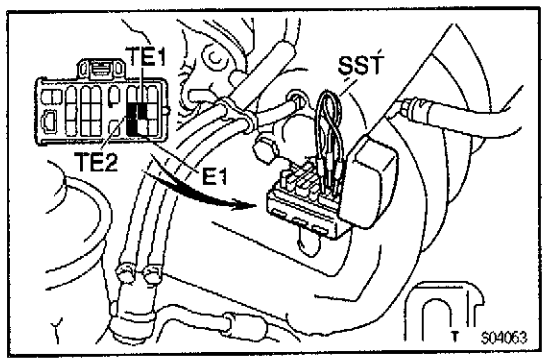


2. Turn the ignition switch OFF.
3. Using SST, connect terminals TE2 and E1 of the check connecter.
   SST 09843–18020
4. Turn the ignition switch ON to begin the diagnosis in the test mode.

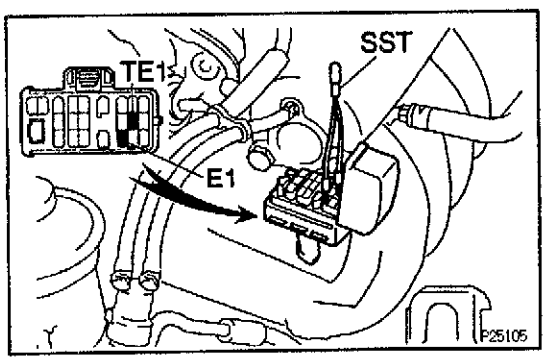


HINT: To confirm that the test mode is operating, check that the check engine warning light flashes when the ignition switch is turned ON.

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.

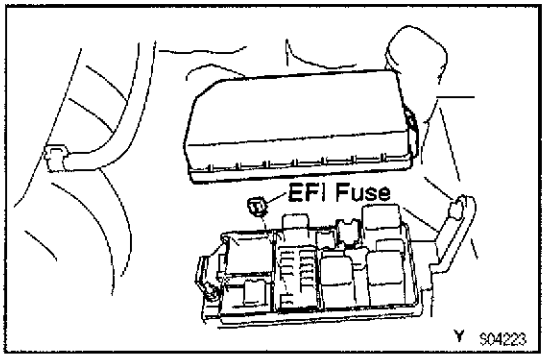


7. Using SST, connect terminals TE1 and E1 of the check connecter.
   SST 09843–18020
8. Read the diagnostic trouble code as indicated by the number of flashes of the check engine warning light.
9. After the diagnosis check, remove the SST from the check connecter.
   SST 09843–18020
   HINT:
   - The 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 TROUBLE CODE CHECK USING HAND–HELD TESTER

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



DIAGNOSTIC TROUBLE CODE CANCELLATION

EG42T-0C

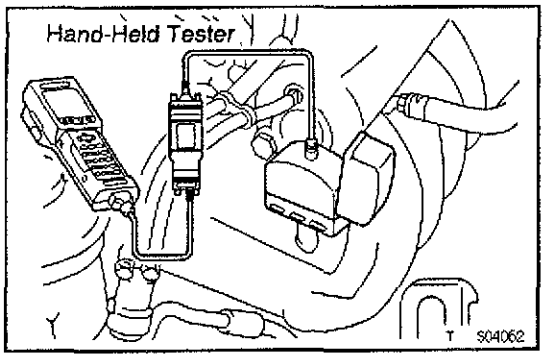
1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECU must be cancelled out by removing the EFI fuse (15A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.
   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 trouble 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 trouble 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 trouble code appears, it indicates that the trouble area has not been repaired thoroughly.

EG

DIAGNOSIS INDICATION

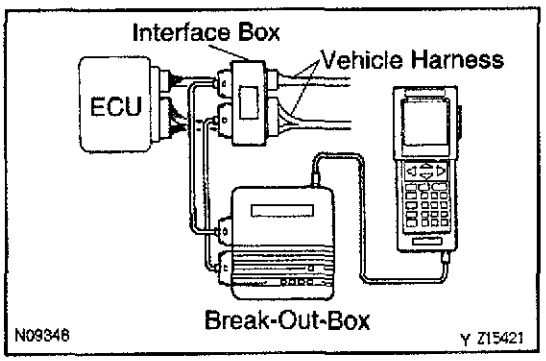
EG124-0Q

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 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 trouble code (s) remains stored in ECU memory.



ECU DATA MONITOR USING HAND–HELD TESTER

1. Hook up the hand–held tester to the check connecter.
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.

EG701–02

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.

EG

DTC No.	Number of blinks of Check Engine Warning Light	System	Check Engine Warning Light *1		Diagnosis	Trouble Area	*2 Memory	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 sec. or more after cranking • Open in G - circuit	• Open or short in G, NE circuit • Distributor • ECU	○	EG - 158
13	 FI1607	RPM Signal	N.A.	ON	No NE signal to ECU for 0.1 sec. or more at 1,000 rpm or more.	• Open or short in NE circuit • Distributor • ECU	○	EG - 158
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 - 158
21	 FI1609	Oxygen Sensor Circuit	ON	N.A.	Open or short in heater circuit of oxygen sensor for 0.5 sec. or moer. (HT)	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • ECU	○	EG - 161
				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 continuosly for 60 sec. or more. *3 (2 trip detection logic)	• Open or short in oxygen sensor circuit • Oxygen sensor • ECU		
22	 FI1610	Water Temp. Sensor Signal	ON	ON	Open or short in water temp. sensor circuit for 0.5 sec. or more. (THW)	• Open or short in water temp. sensor circuit • Water temp. sensor • ECU	○	EG - 156
24	 FI1611	Intake Air Temp. Sensor Signal	ON	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 • ECU	○	EG - 155
25	BE3932	Air-Fuel Ratio Lean Malfun - ction	ON	ON	Oxygen sensor output is less than 0.45 V for at least 90 secs. for others when oxygen sensor is warmed up (racing at 1,500 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 - 155
31	 BE3933	Air Flon Meter Signal	ON	NA	At engine speed is below 3,000 rpm open or short detected continuously for 3.0 sec. or more in air flon meter circut.	• Open or short in air flon circuit • Air flon meter • ECU	○	EG - 188
33	 BE3933	Idle Speed Control Valve	ON	ON	Idle speed control valve signal is not output more than 2,000 rpm pulse for 10 sec.	• Open or short in idle speed control valve circuit • ISC Valve • ECU	○	EG - 169

V07995

Code No.	Number of blinks of Check Engine Warning Light	System	Check Engine Warning Light *1		Diagnosis	Trouble Area	*2 Memory	See Page
			Normal Mode	Test Mode				
41	 FI1614	Throttle Position Sensor Signal	ON	ON	Open or short in throttle position sensor circuit for 0.5 sec. or more.(VTA)	• Open or short in throttle position sensor circuit • Throttle position sensor • ECU	○	EG - 52
42	 FI1614	Vehicle Speed Sensor Signal	ON	ON	M/T : No vehicle speed sensor signal to ECU for at least 8 sec. during heavy load driving with engine speed between 2,500 rpm and 5,500 rpm. M/T : SPD signal is not input to ECU for at leastg 8.0 *sec. during hight load* driving with 3,000 rpm≤NE	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECU	○	–
43	 FI1616	Starter Signal	N.A.	ON	No starter signal to ECU when cranking with test mode. (STA)	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECU	×	EG - 157
51	 BE3935	Switch Condition Signal	N.A.	ON	Displayed when A/C is ON, IDL contact OFF or shift position in "R", "D", "2", or "1" range with the check terminals E1 and TE1 connected.	• A/C switch system • Throttle position sensor IDL circuit • Neutral start switch circuit • Accelerator pedal, cable • ECU	×	–
52	 FI1618	Knock Sensor Signal	ON	N.A.	No knock sensor signal to ECU for crank revolutions with engine speed between 1,700 rpm and 5,200 rpm. (KNK1)	• Open or short in knock sensor circuit • Knock sensor (looseness) • ECU	○	EG - 194

T V07996

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 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 in normal or test mode is performed with the ignition switch ON.

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

EG7H4-01

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

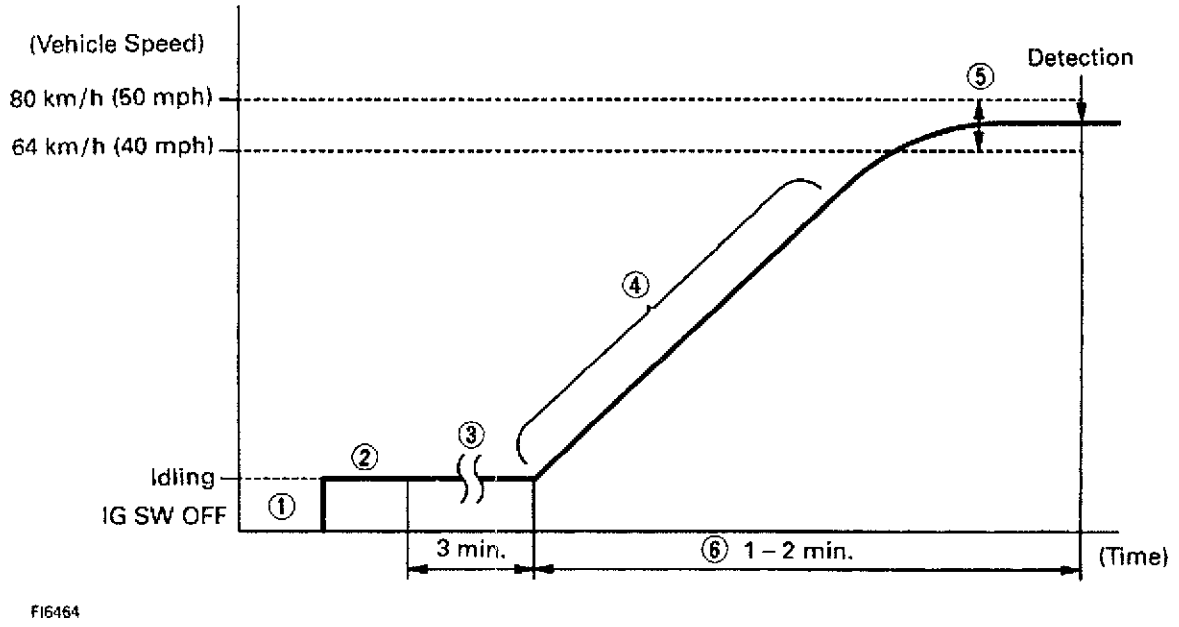
Purpose of the driving pattern

(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.

DTC No.21 Oxygen Sensor Circuit

Malfunction: Deterioration of Oxygen Sensor



FI6464

V07368

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 connecter.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 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

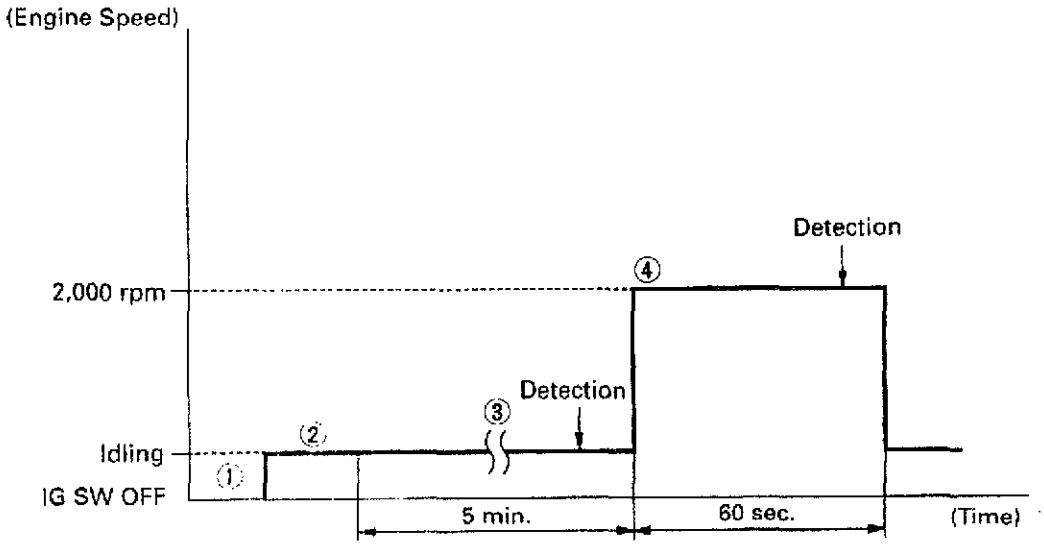
(a) *To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.*

(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 Injector Circuit, Injector Leak or Blockage



F16463

V07540

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)

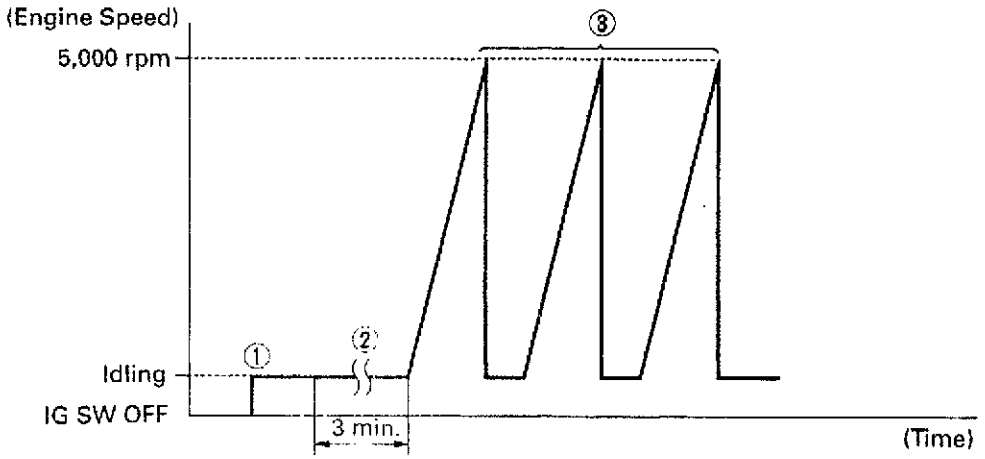
Purpose of the driving pattern

(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.

DTC Nos.52 Knock Sensor Circuit

Malfunction: Open or short in Knock Sensor



F16461

V07541

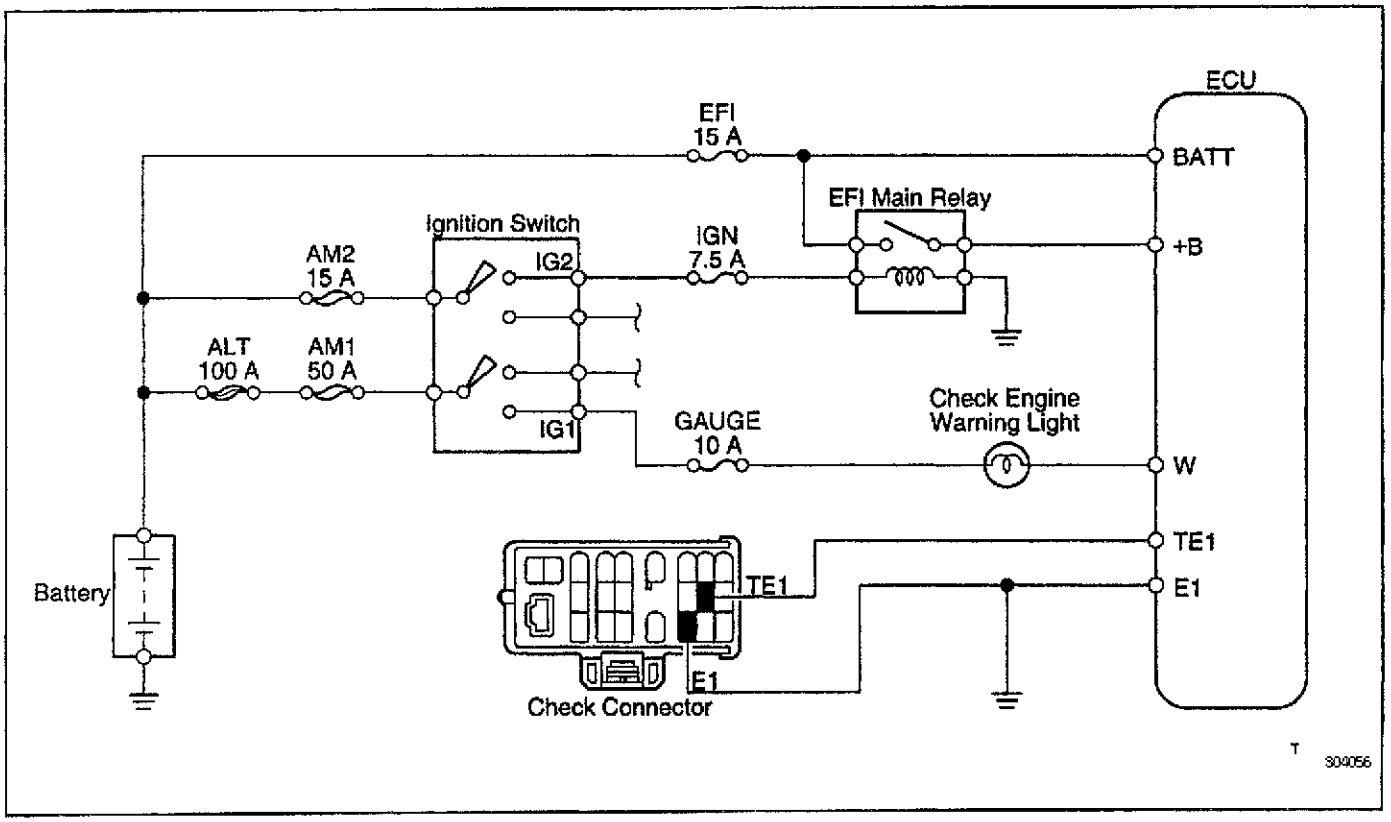
① Start the engine, and warm it up.

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.

EG877-00

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