

DIAGNOSIS SYSTEM (4A-FE)

DESCRIPTION

The ECM contains a built-in, self-diagnosis system by which troubles with the engine signal network are detected and a malfunction indicator lamp on the combination meter lights up.

By analyzing various signals as shown in the later table (See page FI-32) the ECM detects system malfunctions relating to the sensors or actuator.

If a malfunction is detected, the ECM lights up the malfunction indicator lamp 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 ECM memory (except for code No.51). The ECM 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 malfunction indicator lamp 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.



MALFUNCTION INDICATOR LAMP CHECK

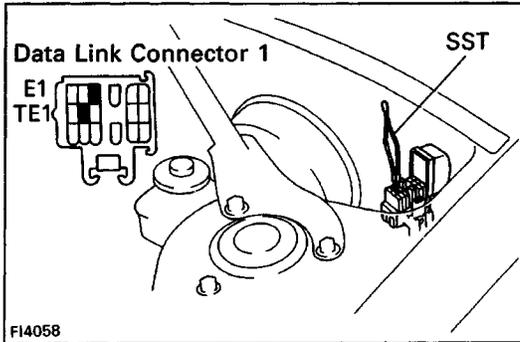
1. The malfunction indicator lamp will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the malfunction indicator lamp should go off.

If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

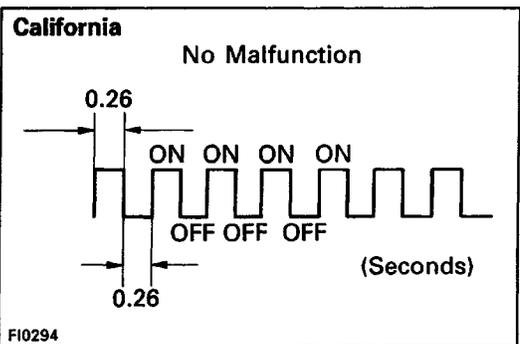
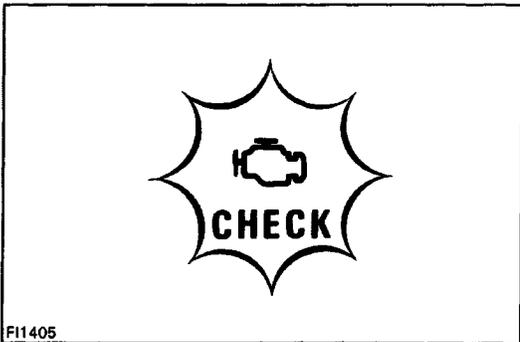
OUTPUT OF DIAGNOSTIC TROUBLE CODES

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 data link connector 1.
SST 09843-18020

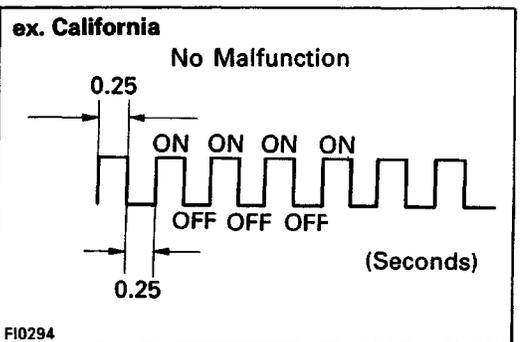


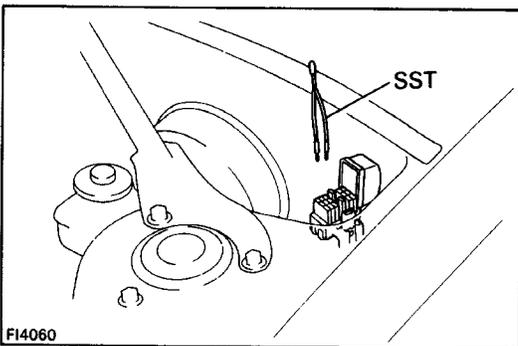
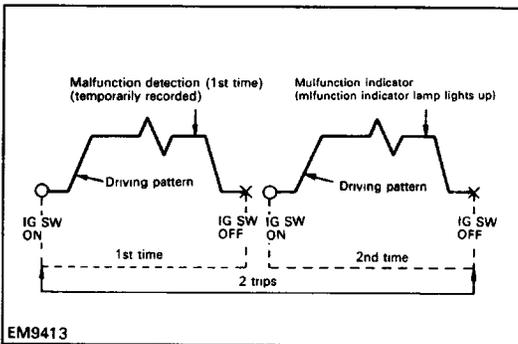
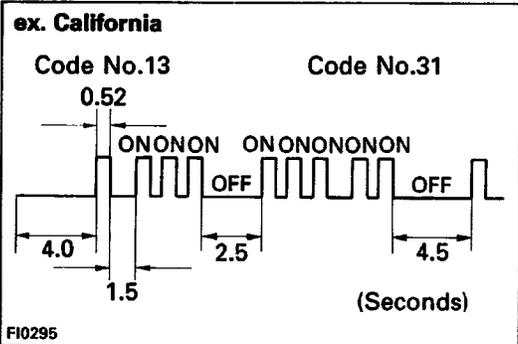
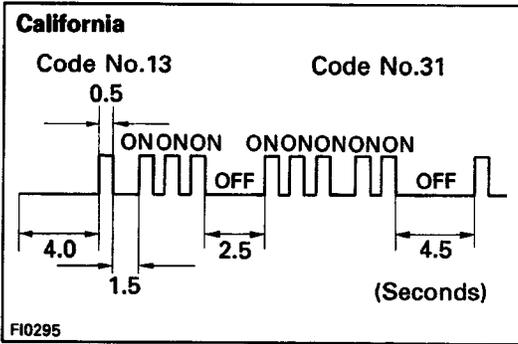
4. Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp.



Diagnostic Trouble Codes (See page [FI-32](#))

- (a) Normal System Operation (no malfunction)
 - The light will alternately blink ON and OFF approx. 2 times per second.





(b) Malfunction Code Indication

- In the event of a malfunction, the light will blink every 0.5 seconds (0.52 seconds). The first number of blinks will equal the first digit of a : digit diagnostic trouble code and, after a 1. 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.
- After all the codes have been signaled, there will be a 4.5-second pause and they will all be repeated as long as the terminals TE1 and E1 of the data link connector 1 are connected.

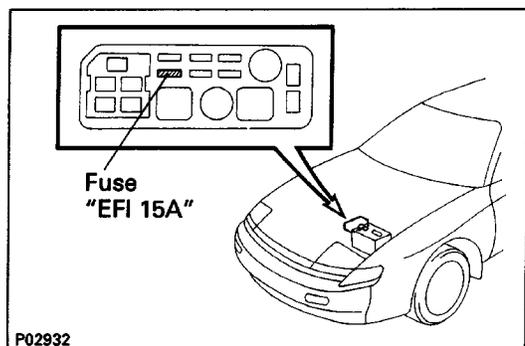
HINT: In the event of a number of trouble codes, indication will begin from the smaller value and continue to the larger in order.

(c) (2 trip detection logic)

Diagnostic trouble codes 21, 25, 26 and 71 use "2 trip detection logic". With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the malfunction indicator lamp 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).

5. After the diagnostic check, remove the SST.
SST 09843-18020



CANCELLING DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be cancelled out by removing the fuse "EFI 15A" for 60 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 H terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If the diagnostic trouble code is not cancelled out, it will be retained by the ECM 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 malfunction indicator lamp.

If the same diagnostic trouble 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 trouble codes, except code No. 51, will be retained in memory by the ECM from the time of detection until cancelled out.
3. Once the malfunction is cleared, the malfunction indicator lamp on the combination meter will go off but the diagnostic trouble code remain stored in ECM memory (except for code No. 51).

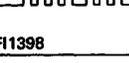
DIAGNOSTIC TROUBLE CODES

HINT:

- Parameters listed in the chart may not be exactly same as your reading due to type of the instruments or other factors.
- If a malfunction code is displayed during the diagnostic trouble code check in test mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Code No.	Number of blinks Malfunction Indicator Lamp	System	.1 Malfunction Indicator Lamp	Diagnosis	Trouble Area	*2 Memory	See Page
—	 FI1401	Normal	—	No trouble code is recorded.	—	—	—
12	 FI1389	RPM Signal	ON	No G or NE signal is input to the ECM for 2 secs. or more after STA turns ON.	<ul style="list-style-type: none"> Open or short in IIA circuit IIA Open or short in STA circuit ECM 	○	IG-4 FI-68
13	 FI1390	RPM Signal	ON	NE signal is not input to ECM for 50 msec. or more when engine speed is 1,000 rpm or more.	<ul style="list-style-type: none"> Open or short in IIA circuit IIA ECM 	○	IG-4
14	 FI1391	Ignition Signal	ON	IGF signal from igniter is not input to ECM for 4 consecutive ignition.	<ul style="list-style-type: none"> Open or short in IGF or IGT circuit from igniter to ECM Igniter ECM 	○	FI-69
21	 FI1400	Oxygen Sensor Signal	ON	At normal driving speed (below 60 mph and engine speed is above 1,900 rpm), amplitude of oxygen sensor signal (OX) is reduced to between 0.35 – 0.70 V continuously for 60 secs. or more. *6 (2 trip detection logic)	<ul style="list-style-type: none"> Oxygen or short in circuit of oxygen sensor Oxygen sensor ECM 	○	FI-72
				Open or short in heater circuit of oxygen sensor for 0.5 sec or more. (HT) (Exc.. Calif.)	<ul style="list-style-type: none"> Open or short in heater circuit of oxygen sensor Oxygen sensor heater ECM 		
22	 FI1392	Engine Coolant Temp. Sensor Signal	ON	Open or short in engine coolant temp. sensor circuit for 500 msec. or more. (THW)	<ul style="list-style-type: none"> Open or short in engine coolant temp. sensor circuit Water temp. sensor ECM 	○	FI-67
24	 FI1611	Intake Air Temp. Sensor Signal	*3 ON	Open or short in intake air temp. sensor circuit for 500 msec. or more. (THA)	<ul style="list-style-type: none"> Open or short in intake air temp. circuit Intake air temp. sensor ECM 	○	FI-66
25	 FI2562	Air-Fuel Ratio Lean Mal-function	ON	(1) Oxygen sensor output in less than 0.45 V for at least 90 secs. for Calif. or 120 secs. for others when oxygen sensor is warmed up (racing at 2,000 rpm). (only for code 25 in Calif. spec.) *4	<ul style="list-style-type: none"> 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 Vacuum sensor ECM 	○	FI-65 FI-72
				(2) When the engine speed varies by more than 50 rpm over the preceding crankshaft position period during a period of 50 secs. during idling with the engine coolant temp. 50°C (122°F) or more *6(2 trip detection logic) (1) and (2)	<ul style="list-style-type: none"> Engine ground bolt loose Open in E1 circuit Short in injector circuit Fuel line pressure (Injector leakage, etc.) Open or short in cold start injector circuit Cold start injector Open or short in oxygen sensor circuit Oxygen sensor Engine coolant temp. sensor Vacuum sensor Compression pressure ECM 		
26	 FI2563	Air-Fuel Ratio Rich Mal-function	ON			○	

DIAGNOSTIC TROUBLE CODES (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	*1 Malfunction Indicator Lamp	Diagnosis	Trouble Area	*2 Memory	See Page
31	 FI1394	Vacuum Sensor Signal	ON	Open or short detected continuously for 500 msec. or more in vacuum sensor circuit. (PIM)	<ul style="list-style-type: none"> Open or short in vacuum-sensor circuit Vacuum sensor ECM 	○	FI-64
41	 FI1396	Throttle Position Sensor Signal	*3 ON	Low PSW signal is input continuously to the ECM for 500 msec. or more at idling (IDL contact is ON).	<ul style="list-style-type: none"> Open or short in throttle-position sensor circuit Throttle position sensor ECM 	○	FI-63
42	 FI1397	Vehicle Speed Sensor Signal	OFF	SPD signal is not input to the ECM for at least 8 seconds during high load driving with engine speed between 2,600 rpm and 4,500 rpm.	<ul style="list-style-type: none"> Open or short in vehicle speed sensor circuit Vehicle speed sensor ECM 	○	—
43	 FI1398	Starter Signal	OFF	Starter signal (STA) is not input to ECM even once until engine reaches 800 rpm or more when cranking.	<ul style="list-style-type: none"> Open or short in starter signal circuit Open or short in IG SW circuit ECM 	○	FI-68
*5 71	 FI2622	EGR System Malfunction	ON	With the engine coolant temp. at 70°C (158°F) or more 50 secs. from start of EGR operation. The EGR gas temp. is less than 80°C (176°F) and the EGR gas temp. has risen less than 10°C (18°F) during the 50 secs. *6 (2 trip detection logic)	<ul style="list-style-type: none"> Open in EGR temp. sensor circuit Open in VSV circuit for EGR EGR vacuum hose disconnected, valve stuck Clogged in EGR gas passage ECM 	○	FI-73
51	 FI1399	Switch Condition Signal	OFF	Displayed when A/C is ON, IDL contact OFF or shift position in "R", "D", "2", or "1" positions with the check terminals E1 and TE1 connected.	<ul style="list-style-type: none"> A/C switch circuit Throttle position sensor IDL circuit Park/neutral position switch Accelerator pedal, cable ECM 	X	FI-63 FI-71

REMARKS:

- *1: "ON" displayed in the diagnosis mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected.
"OFF" indicates that the Malfunction Indicator Lamp does not light up during malfunction diagnosis, even if a malfunction is detected.
- *2: "0" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECM 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: No. (2) in the diagnostic contents of codes No.25 and 26 apply to California specification vehicles only, while (1) applies to all models.
- *5: Code 71 is used only for California specifications.
- *6: "2 trip detection logic" (See page [FI-30](#).)

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: Main Oxygen Sensor Deterioration		
<p>The graph illustrates the driving pattern for detecting a Main Oxygen Sensor Deterioration. The vertical axis represents Vehicle Speed in miles per hour (mph), with marked levels at 40 mph and 50 mph. The horizontal axis represents Time, with marked intervals of 3 minutes and 1-2 minutes. The pattern consists of two cycles. The first cycle starts with an idle period (1), followed by starting the engine (2) and warming it up (3) for 3 minutes. Then, the vehicle is accelerated (4) to a speed between 40 and 50 mph, which is maintained (5) for 1 to 2 minutes. The second cycle begins with stopping the engine (6) for 3 minutes, followed by repeating steps (3), (4), and (5) to simulate the malfunction condition (7).</p>		
P02539		
<ol style="list-style-type: none"> (1) Disconnect the ER fuse (15 A) for 60 seconds or more, with ignition switch OFF. (2) Start the engine and warm the engine up with all accessory switches OFF. (3) After the engine is warmed up, let it idle for 3 minutes. (4) 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. (5) Maintain the vehicle speed at 40 – 50 mph. Keep the vehicle running for 1 to 2 minutes after starting acceleration. (6) After driving, stop at a safe place and turn the ignition switch OFF for 3 seconds or more. (7) Start the engine and perform steps (3), (4) and (5). 		
<p>HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (7)</p>		
<p>NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.</p>		

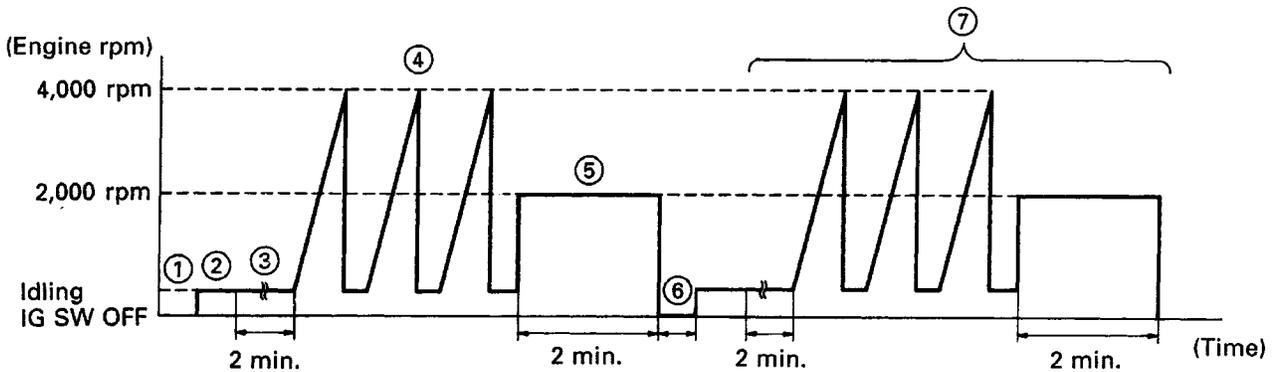
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

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 Oxygen Sensor



P02492

- (1) Disconnect the EFI fuse (15 A) for 60 seconds or more, with ignition switch OFF.
- (2) Start the engine and warm the engine up.
- (3) After the engine is warmed up, let it idle for 2 minutes.
- (4) Accelerate rapidly to 4,000 rpm three times.
- (5) Maintain at 2,000 rpm for 2 minutes.
- (6) Turn the ignition switch OFF for 10 seconds.
- (7) Start the engine and repeat steps (2), (3), (4) and (5) again.

HINT: If a 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.

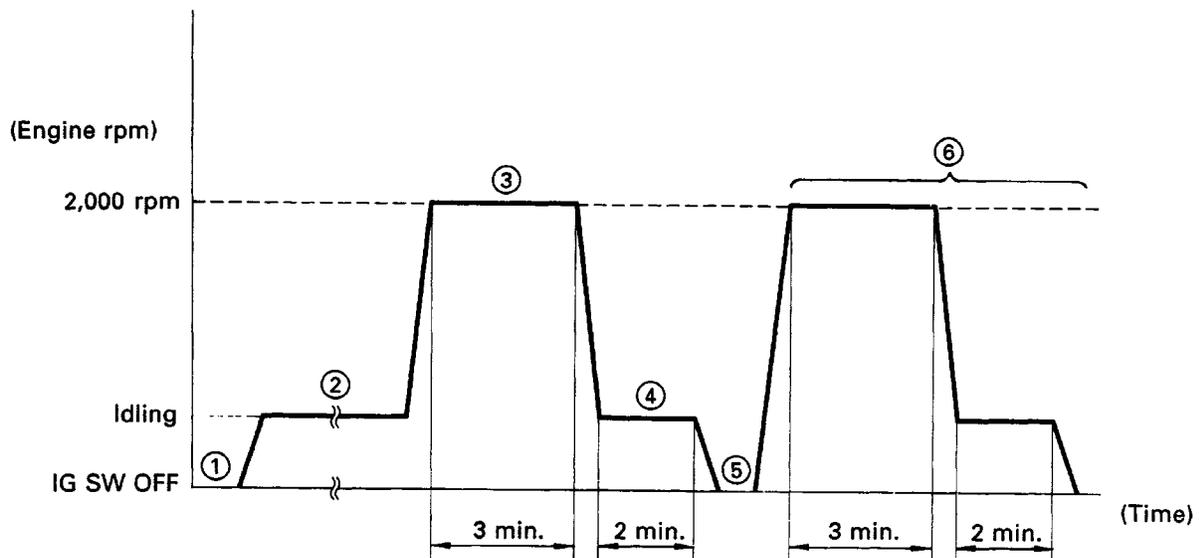
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

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 Rich Malfunction (California)

Malfunction: Open or Short in Oxygen Sensor, Open or Short in Injector Leak, Blockage, Loose E/G Earth Bolt



P02543

- (1) Disconnect the G Battery terminal for 60 seconds or more, with ignition switch OFF.
- (2) Start the engine and warm the engine up, with all accessory switches OFF.
- (3) After the engine is warmed up, maintain at 2,000 rpm for 3 minutes.
- (4) Let it idle for 2 minutes. ("D" position for A/T)
- (5) Turn the ignition switch OFF for 3 seconds or more.
- (6) Start the engine and perform steps (3) and (4) again.

HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (6).

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

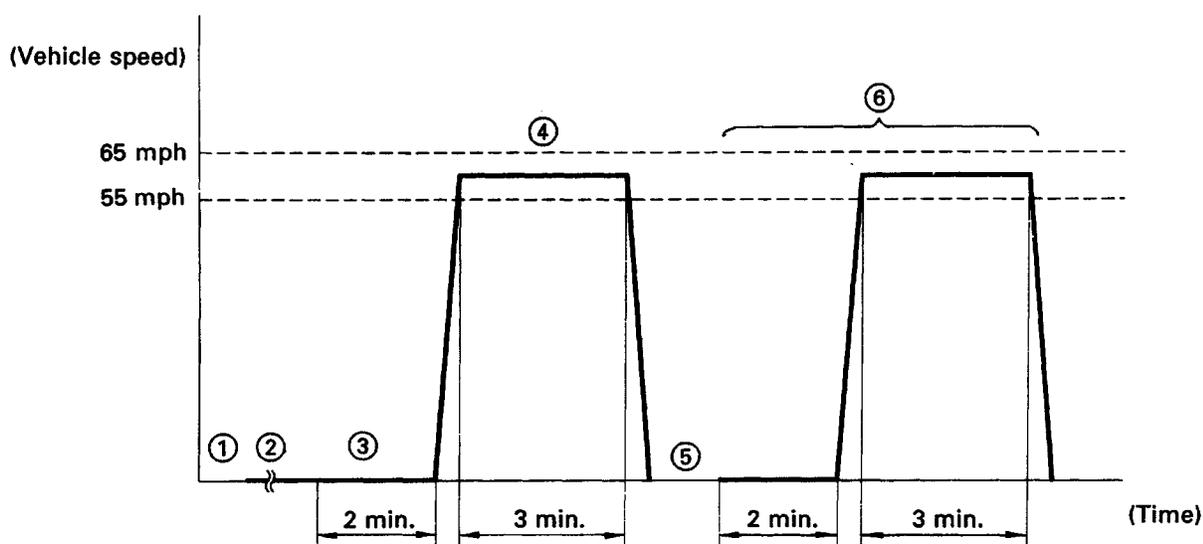
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

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



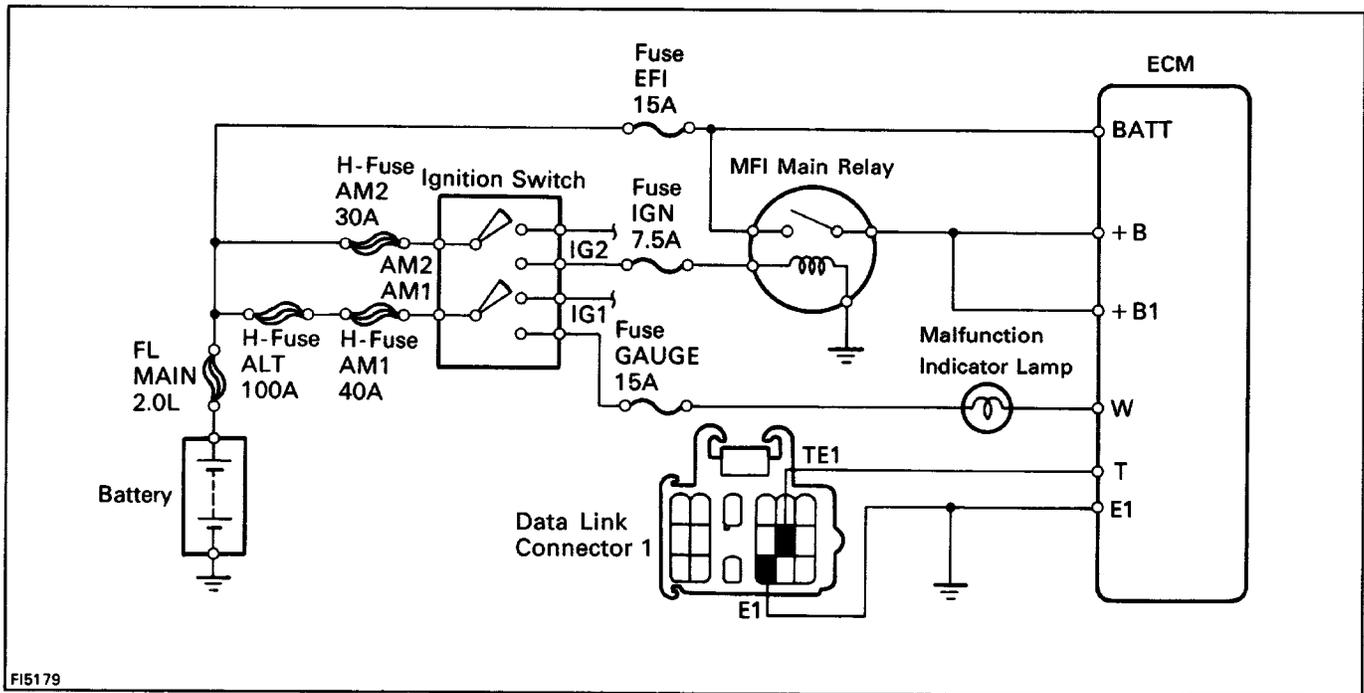
P02538

- (1) Disconnect the fuse EFI (15 A) for 60 seconds or more, with ignition switch OFF.
- (2) Start the engine and warm the engine up with all accessory switches OFF.
- (3) After the engine is warmed up, let it idle for 2 minutes.
- (4) With the transmission in 5th gear ("D" position and O/D ON for AM, drive at 55 – 65 mph for 3 minutes.
- (5) Stop at a safe place and turn the ignition switch OFF for 3 – 10 seconds.
- (6) Start the engine and perform steps (3) and (4).

HINT: If a malfunction is detected, the malfunction indicator lamp will light up during step (6).

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

INSPECTION OF DIAGNOSIS CIRCUIT



FI5179

