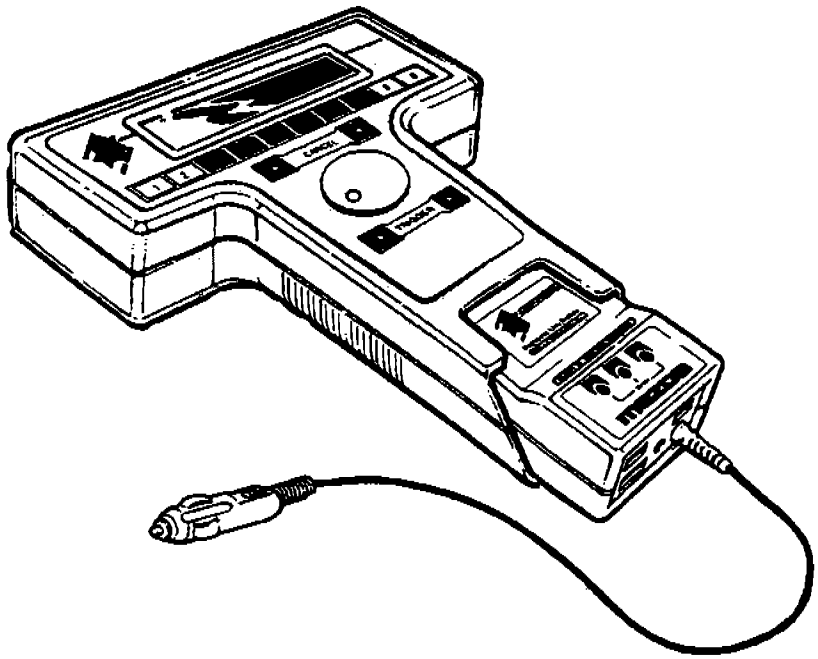
Mazda

1995,1996,1997
OBDII
Service Highlights



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OBD REGULATION

1. Overview

The OBD (On-Board Diagnostic) system regulation has been established to clean the atmosphere.
In this regulation, auto manufacturers are obliged to equip their vehicles with a self-diagnosis device (On-board Self Diagnostic System) which monitors the vehicle's emission-related components and an alarm device (Malfunction Indicator Light) which warns the driver of problems as they occur in the vehicle.
The OBD regulation prohibits the selling of vehicles that do not meet the regulation, carries out an emission survey on vehicles being used, and requires recalling of vehicles that do not satisfy the regulation.

The OBD regulation consists of two generations:

- First generation (OBD-I) approved by the State of California in 1985
- Second generation (OBD-II) revised from OBD-I with new regulation items added

2. OBD-I regulation

2.1 Application

The OBD-I regulation was approved by the California Air Resources Board (CARB) in 1985 and applies to all passenger cars and light trucks newly sold in the State of California starting from 1988.

2.2 Malfunction detection range

Malfunction detection ranges required by the OBD-I are:

- Computer-sensed emission-related components
- Fuel metering device function
- Exhaust gas recalculation (EGR) system function

2.3 Malfunction detection and warning

The self-diagnosis device constantly monitors emission-related components and functions.
If a malfunction is detected, the self-diagnosis device illuminates the Malfunction Indicator Light (MIL) to notify the driver that a problem has occurred.

2.4 Storing and retrieving malfunction data

The diagnostic Trouble Codes (DTC) system classifies the detected malfunction data in each component, encodes them, and stores them in the emission control module memory automatically.
The stored codes can be retrieved by using the special scan tool.

[MAJOR OBD I FEATURES]

Diagnosis range	➡ DIAGNOSTIC MONITOR OF: • COMPUTER SENSED COMPONENTS • FUEL METERING DEVICE FUNCTION • EGR SYSTEM FUNCTION
Alarm Storing malfunction data	➡ MALFUNCTION INDICATOR LIGHT ➡ DIAGNOSTIC TROUBLE CODES

3. OBD-II regulation

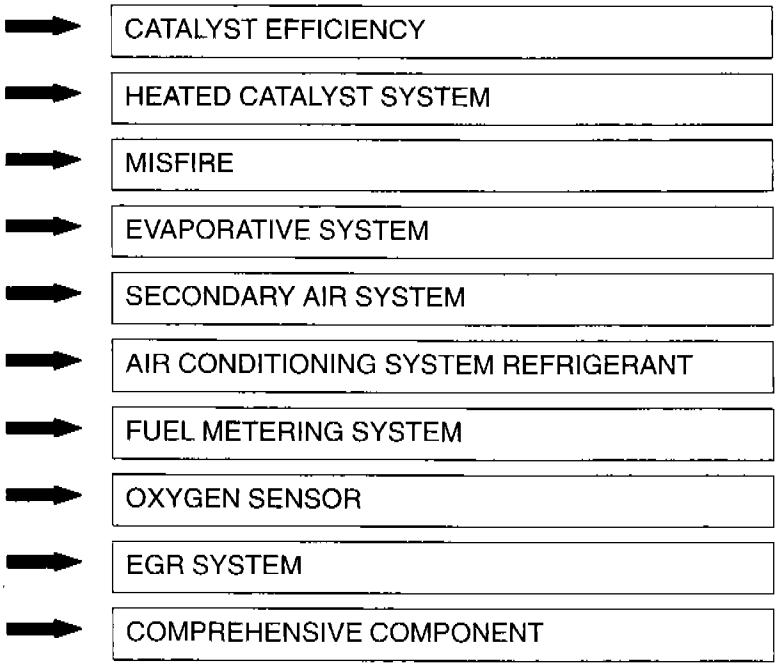
3.1 Overview

The OBD-II regulation has been established to clean the atmosphere and was phased in starting from 1994.
Based on the OBD-I, the following self-diagnosis items have been added to the OBD-II.

CATALYST EFFICIENCY, HEATED CATALYST SYSTEM, MISFIRE
EVAPORATIVE SYSTEM, SECONDARY AIR SYSTEM
AIR CONDITIONING SYSTEM REFRIGERANT, FUEL METERING SYSTEM
OXYGEN SENSOR, EGR SYSTEM, COMPREHENSIVE COMPONENT

In order to satisfy the OBD-II regulation requirements, malfunctions caused by deteriorated emission-related system and components must be detected. For this purpose, the malfunction detection range for the OBD-II has been enlarged compared with that for the OBD-I.

3.2 Malfunction detection range
The malfunction detection range required by the OBD-II are;



3.3 Malfunction detection and warning
Two detection methods ("CONTINUOUS MONITORING" and "MONITORING AT LEAST ONCE PER DRIVING CYCLE") are available. Each system will be diagnosed by using either method, suited to the system.
If a malfunction is detected, the Malfunction Indicator Light (MIL) will be flashed or illuminated to notify the driver that a problem has occurred.

3.4 Storing malfunction data
Adding to the previous Diagnostic Trouble Codes (DTC), a function that encodes and stores the basic data parameters at the time when a problem has occurred has been equipped to the diagnostic system.

3.5 Retrieving stored malfunction data
Like the OBD-I, the stored codes can be retrieved by using the special scan tool.

3.6 Communication system standardization
Due to standardization of the communication system, a general scan tool can be used to retrieve the stored codes.
- Language standardized.
- Connectors for diagnosis equipment standardized.
- Communication standardized.
- Diagnostic trouble codes
- Test procedure

[MAJOR OBD II FEATURES]

Diagnosis method	➡ CONTINUOUS MONITORING AND MONITORING AT LEAST ONCE PER DRIVING CYCLE
Dagnosis range	➡ CATALYST EFFICIENCY ➡ HEATED CATALYST SYSTEM ➡ MISFIRE ➡ EVAPORATIVE SYSTEM ➡ SECONDARY AIR SYSTEM ➡ AIR CONDITIONING SYSTEM REFRIGERANT ➡ FUEL METERING SYSTEM ➡ OXYGEN SENSOR ➡ EGR SYSTEM ➡ COMPREHENSIVE COMPONENT
Alarm	➡ NEW MALFUNCTION INDICATOR LIGHT ➡ ILLUMINATION RULES
Storing and retrieving malfunction data	➡ STANDARDIZATION ➡ • DIAGNOSTIC TROUBLE CODES ➡ • DATA LINK SYSTEM ➡ SCAN TOOL

4. OBD regulation phase-in

The contents of the OBD regulation are constantly being revised and the OBD-II regulation may be revised in the future.

	CALIFORNIA	FEDERAL
'87	NO OBD REGULATIONS	
'88		
'89		NO OBD REGULATIONS
'90		
'91	CALIFORNIA OBD-I REGULATIONS	
'92		
'93		
'94		
'95	CALIFORNIA OBD-II PHASE-IN VEHICLES WITH NEW ENGINE	FEDERAL OBD OR CALIFORNIA OBD-I & II ACCEPTED FOR FEDERAL CERTIFICATION
'96		
'97 '98	CALIFORNIA OBD-II	FEDERAL OBD OR CALIFORNIA OBD-II
'99		
	CALIFORNIA OBD-II OR FEDERAL OBD (FOR NON LEVs)	FEDERAL OBD

VEHICLE SYSTEM REVISION

1. Outline

The OBD-II regulation requires the vehicle system to detect deterioration or malfunction of the emission-related system and components and do the following:

1. Flash or illuminate the malfunction indicator light (MIL)
2. Store vehicle condition data at the time the problem occurred
3. Output information to the scan tool.
4. According to the above requests, the following revisions have been made to the vehicle system:
   An on-board diagnosis system, applicable to the diagnostic test mode, has been added.
   A monitoring system which is compatible with the OBD-II monitoring requirement has been added.

The vehicle system revision due to introduction of the OBD-II regulation is described below.

2. Diagnostic test mode

2.1 Outline

In the OBD-II regulation, auto manufacturers are obliged to equip their vehicles with an on-board diagnosis system applicable to the diagnostic test modes listed below.
Here describes each test mode and related vehicle systems.

Diagnostic test mode list

No.	Item
01	Sending diagnostic data (PID data monitor / On board system readiness tests)
02	Sending freeze frame data
03	Sending emission-related malfunction code (Diagnostic trouble codes: DTC)
04	Clearing/resetting emission-related malfunction information
05	Sending oxygen sensor monitor test results
06	Sending intermittent monitoring system monitor test results (Diagnostic monitoring result)
07	Sending continuous monitoring system monitor test results (Pending code)

2.2 Sending diagnostic data (Mode 01)

This mode is to provide the vehicle system with the following two functions.

1. Real-time confirmation of emission-related data by using the scan tool
2. Stores emission-related system monitor items and the readiness function code (RFC) that indicates whether the emission-related system inspection is complete or not in the PCM memory; retrieves monitor items and the RFC as required by using the scan tool.

2.2.1 PID data monitor

PID data monitor is a function that enables real-time monitoring of emission-related data such as analog input/output, digital input/output, and system calculation value by using the scan tool.
Items that can be monitored by the PID data monitor are listed below.

PID DATA MONITOR TABLE

Monitor item	Full names	Unit
CCNT	Diagnostic trouble cord counter	–
ECT	Engine coolant temperature	°C, °F
FUEL SYS1	Fuel system loop status/Fuel system loop status (RH)	Open: NON-F/B Close: F/B
FUEL SYS2	Fuel system loop status (LH)	Open: NON-F/B Close: F/B
IAT	Intake air temperature	°C, °F
LOAD	Engine load calculated value	%
LONGFT1	Long fuel trim/Long fuel trim (RH)	%
LONGFT2	Long fuel trim (LH)	%
MAF	Mass air flow	g/s
MAP	Intake manifold pressure	kPa, mmHg
MIL	Malfunction indicator light	ON, OFF
O2S11	Heated oxygen sensor (Front RH)	V
O2S12	Heated oxygen sensor (Middle/Rear RH)	V
O2S13	Heated oxygen sensor (Rear RH)	V
O2S21	Heated oxygen sensor (Front LH)	V
O2S22	Heated oxygen sensor (Rear LH)	V
OBD SUP	OBD support	OBD-I, OBD-II
RPM	Engine speed	rpm
SHRTFT1	Short fuel trim/Short fuel trim (RH)	%
SHRTFT2	Short fuel trim (LH)	%
SHRTFT11	Short fuel trim (Front RH)	%
SHRTFT12	Short fuel trim (Middle/Rear RH)	%
SHRTFT13	Short fuel trim (Rear RH)	%
SHRTFT21	Short fuel trim (Front LH)	%
SHRTFT22	Short fuel trim (Rear LH)	%
SPARKADV	Spark advance	BTDC
TP	Throttle position	%
VSS	Vehicle speed sensor	km/h, MPH

2.2.2 On board system readiness tests

Below are the ten emissions systems-related items that the on board system readiness tests monitor.

1. Catalyst efficiency
2. Heated catalyst system
3. Misfire
4. Evaporative system
5. Secondary air system
6. Air conditioning system refrigerant
7. Fuel metering system
8. Oxygen sensor
9. EGR system
10. Emissions-related parts (Comprehensive Component Monitor : CCM)

However, in current Mazda vehicles the three systems listed below are not monitored.

1. Heated catalyst system
2. Secondary air system
3. Air conditioning system refrigerant

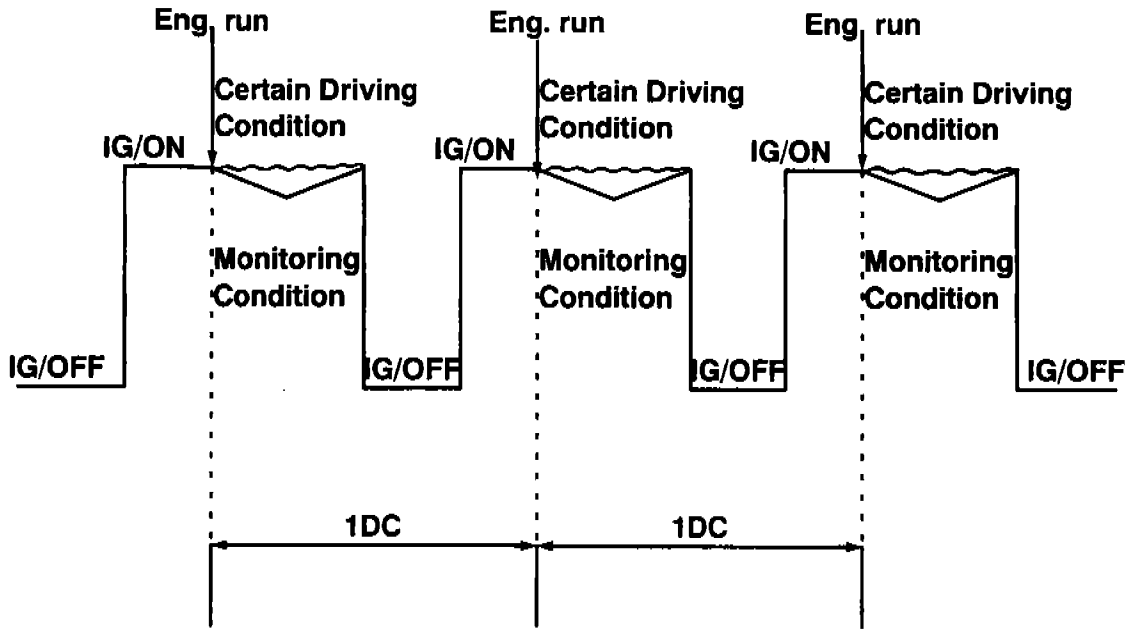
This is because (1) there are no current Mazda vehicles equipped with Heated catalyst or Secondary air systems, and (2) regulations require only vehicles that use CFC-12 refrigerant to be monitored.

Therefore, with the oxygen sensor split into two sections (Oxygen sensor and Oxygen sensor heater), the below eight items are monitored in Mazda vehicles:

1. Catalyst
2. Misfire
3. Evaporative system
4. Fuel system
5. Oxygen sensor
6. Oxygen sensor heater
7. EGR system
8. Emission-related components (Comprehensive component monitor: CCM)

As the on board system readiness tests, the display of diagnostic completion differs from the continuous monitoring system and the intermittent monitoring system.
The continuous monitoring system constantly diagnoses the monitoring items throughout a drive cycle whenever monitoring conditions are met.
A drive cycle is an operation cycle (Engine start – Ignition switch OFF – Next ignition switch ON) in which monitoring conditions are satisfied and monitoring is done. (Fig. 1)

Fig.1



Emission-related systems monitored by the continuous monitoring system are fuel system, misfire, and CCM.
The intermittent monitoring system carries out diagnosis once during a drive cycle. Diagnosis is then inhibited until the next drive cycle is begun.
Emission-related systems monitored by the intermittent monitoring system are catalyst, evaporative system, oxygen sensor, oxygen sensor heater, and EGR system.

Because continuously-monitored systems are normally being diagnosed, the display of diagnostic completion will show a CONTINUE massage. With intermittent systems, NO will be displayed if the diagnosis is not finished, and YES if it is finished.
If the diagnosis is not completed, you can assume that it is for one of the following four reasons:

1. No diagnosis has been run since the vehicle was manufactured.
2. At some point a problem with the battery cable, PCM connector or battery-PCM fuse caused the PCM memory to be erased, and no diagnosis has been run since then.
3. The PCM memory was erased with a scan tool, and no diagnosis has been run since then.
4. The malfunction was detected during the first drive cycle.

Also, in '96 MY Group-1 vehicles (including the 626 FS ATX) and all B-Series vehicles, you can or cannot confirm whether the diagnosis is finished according to the particular DTC being monitored. If you get a P1000 message while monitoring DTCs, it means that one of the systems is not completed.

Note: '96 MY Group-1 shown here refer to vehicles that were produced before the 1996 PCM change,Group-2 refer to those that were produced after.

In order to complete diagnosis of RFC systems in a short amount of time, the drive mode (RFC deletion modes) shown on the below have been established in Mazda vehicles.
Please refer to the NGS usage instructions for methods of determining whether diagnosis are complete or not.

Drive mode

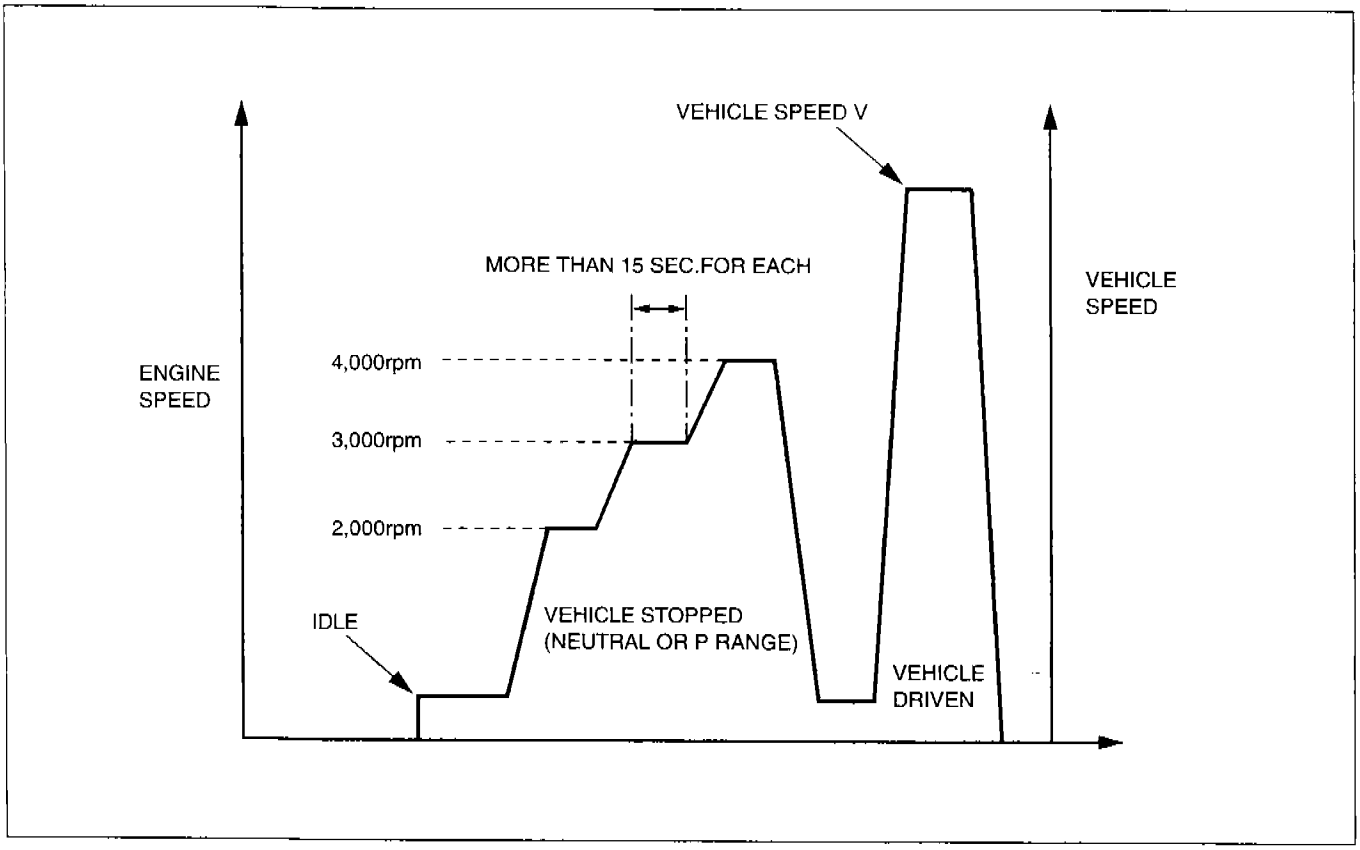
(1) '95MY vehicles (Expect B-Series)

Note

- Vehicle speed and engine speed detected by the PCM may differ from that indicated by the speedometer and the tachometer. Check the vehicle speed and engine speed during driving mode by using the **SST** (NGS).
- If the OBD-II system check is not completed while the drive mode procedure is carried out, the following cause is guessed.
  1. The OBD-II system detects the malfunction.
  2. The drive mode procedure is not completed correctly.

MODE 1–A (For protege)

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Verify that the initial ignition timing and the initial idle speed are within the specification.(Refer to Workshop Manual.)
4. If not as specified, adjust the ignition timing and the idle speed.
5. Verify that terminals TEN and GND of the data link connector are not connected.
6. Carry out no-load racing at the specified engine speed. Race the engine for more than 15 seconds at each time. Refer to the following engine speed.
7. Start the vehicle and drive it at constant speed (V) for more than 15 seconds.
8. Stop the vehicle.

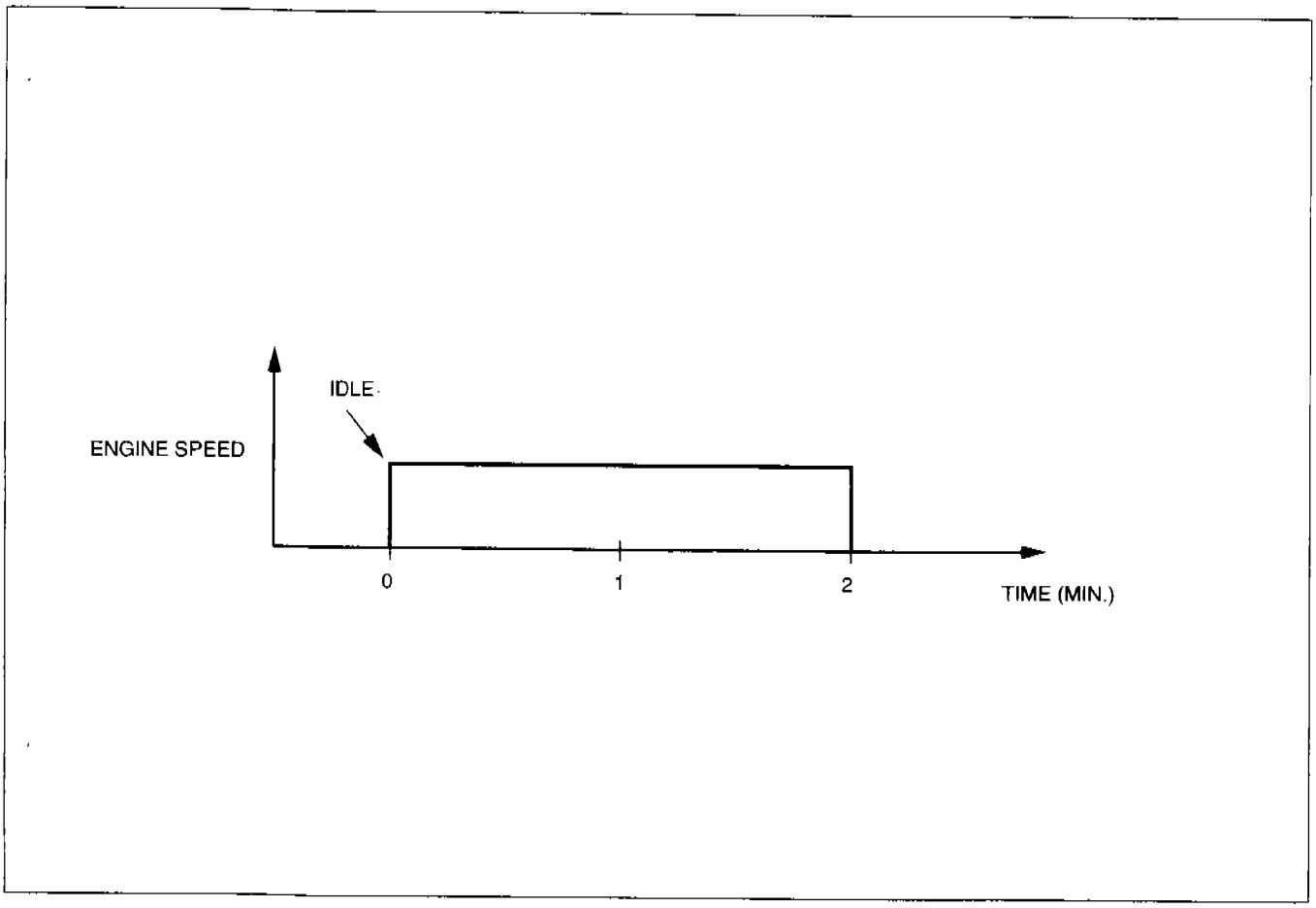


MODE 1–A Vehicle speed table

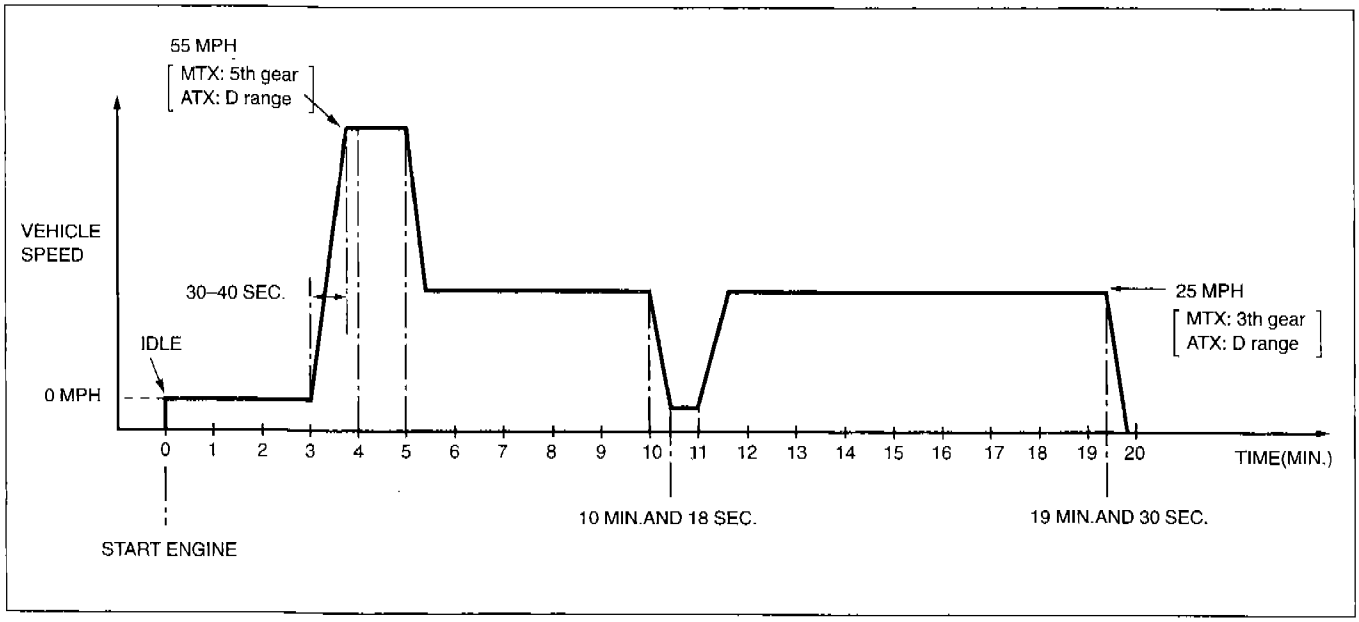
Engine	Vehicle speed (V)	Driving range
BP	104 km/h {65 mph}	MTX:5th gear, ATX:D range
Z5	85 km/h {53 mph}	MTX:2nd gear, ATX:D range

MODE 1–B (For millenia)

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Verify that the initial ignition timing and the initial idle speed are within the specification.(Refer to Workshop Manual.)
4. If not as specified, adjust the ignition timing and the idle speed.
5. Verify that terminals TEN and GND of the data link connector are not connected.
6. Carry out idling for 2 minutes.



MODE 2
(For EGR, Oxygen sensor, Catalyst, Millenia evaporative and Protege federal specification evaporative check)
1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Drive the vehicle at the specified constant speed refer to following figure.



MODE 3 (For Protege California specification evaporative check)
1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.

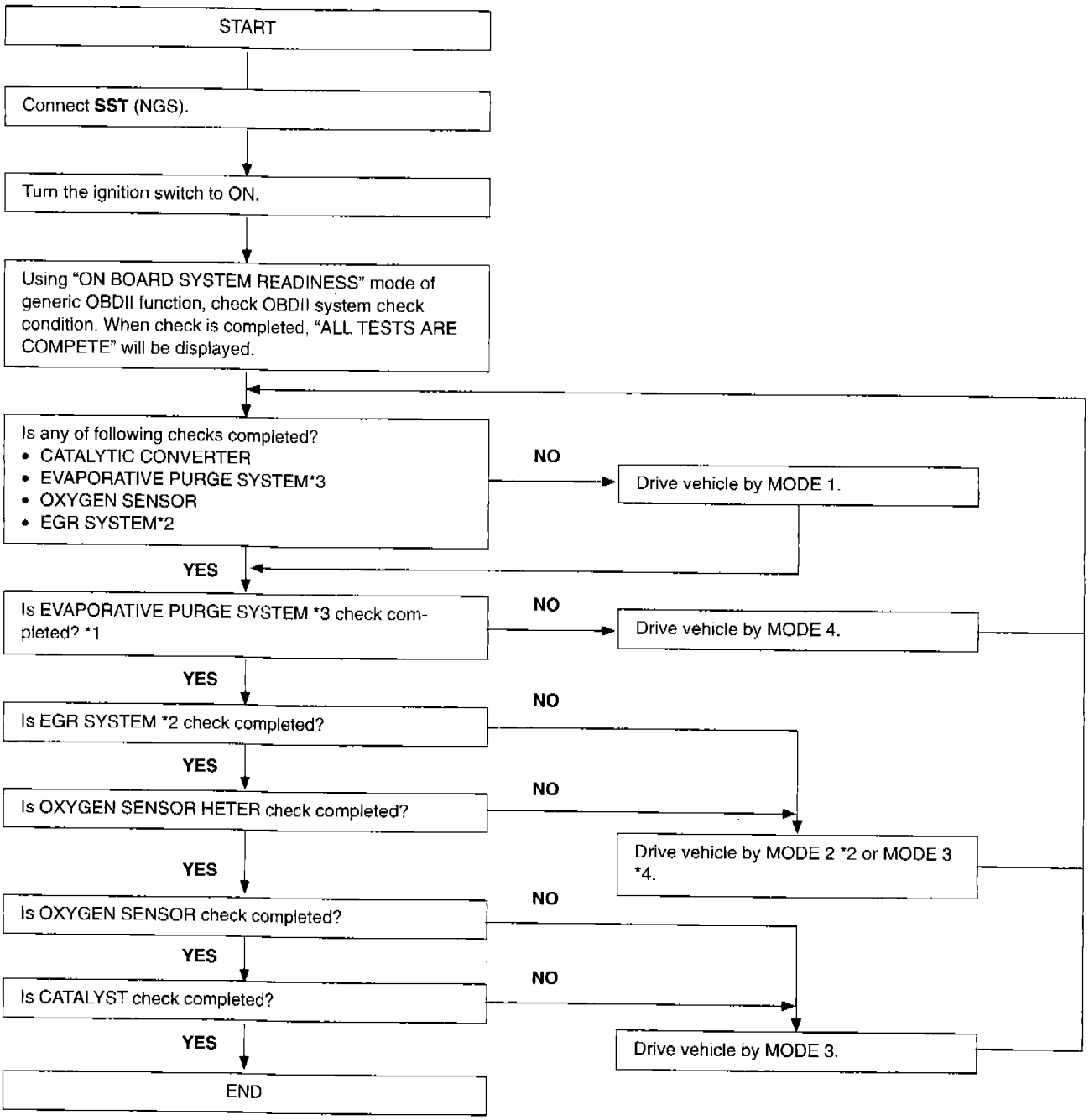
(2) '96MY vehicles (Except 626/MX-6 FS ATX and B-Series)

- Drive mode checks malfunction in the OBD II system (catalytic converter, evaporative purge system, oxygen sensor, oxygen sensor heater, and EGR system) by carrying out each drive mode.
- To complete the OBD II system inspection, the following drive mode procedure must be observed. This procedure applies only to 1996 year model vehicles.
- When this procedure is carried out, be sure to drive the vehicle at the lawful speed and pay attention to the other vehicles. When the **SST** (NGS) is used to check the vehicle speed while driving, be sure to have another worker on the passenger seat, or record the data in the tester by using the "PID/DATA MONITOR AND RECORD" function and check later.
- The ECMs (PCMs) are classified into the following two groups. The drive mode varies with the group.
- When this procedure is carried out, be sure to verify that in which group your vehicle belongs.

Vehicle	Engine	Transaxle/ Transmission	Group 1		Group 2	
			VIN (assumed)	ECM/PCM Part No.	VIN (assumed)	ECM/PCM Part No.
Protege	Z5	MTX	JM1 BB14**T0 300001–320657	Z524 18 881	JM1 BB14**T0 320658–	Z524 18 881A
				Z526 18 881		Z526 18 881A
		ATX		Z525 18 881		Z525 18 881A
				Z527 18 881		Z527 18 881A
	BP	MTX		BPM2 18 881		BPM2 18 881A
		ATX		BPM3 18 881		BPM3 18 881A
MX-3	B6	MTX	JM1 EC43**T0 500001–500301	B6GD 18 881A	JM1 EC43**T0 500302–	B6GD 18 881B
		ATX		B6GF 18 881		B6GF 18 881A
	K8	MTX/ATX		K853 18 881		K853 18 881A
626/MX-6	FS	MTX	1YV GE31**T5 500001–527871 1YV GE22**T5 500001–527678	FSB8 18 881C	1YV GE31**T5 527872– 1VY GE22**T5 527679–	FSB8 18 881D
				FSC1 18 881C		FSC1 18 881D
	KL	MTX		KLC9 18 881A		KLC9 18 881B
		ATX		KLD1 18 881A		KLD1 18 881B
MX-5 Miata	BP	MT/AT	JM1 NA353*T0 700001–706194	BPS1 18 881A	JM1 NA353*T0 706195–	BPS1 18 881B
MPV	JE	AT	JM3 LV52**T0 800001–804427	JE96 18 881A	JM3 LV52**T0 804428–	JE96 18 881B
millenia	KL	ATX	JM1 TA22**T1 200001–203599	KLG8 18 881A	JM1 TA22**T0 203600–	KLG8 18 881B
	KJ			KJ13 18 881A		KJ13 18 881B

Note

- Disconnecting the battery will reset the memory. Do not disconnect the battery during and after this procedure.
- Vehicle speed and engine speed detected by the PCM may differ from that indicated by the speedometer and the tachometer. Check the vehicle speed and engine speed during driving mode by using the **SST** (NGS).
- If the OBD II system check is not completed while the drive mode procedure is carried out, the following cause is guessed.
  1. The OBDII system detects the malfunction.
  2. The drive mode procedure is not completed correctly.



*1 Verify that all of the following condition are satisfied:
- Engine coolant temperature is 0–35 °C {32–95 °F}.
- Intake air temperature is 10–60 °C {50–140 °F}.
- Barometric pressure is 72.0 kPa [540 mmHg, 21.3 inHg] or higher.
- Fuel gauge needle points within 15–85%.

If any of these conditions is not satisfied, you can perform Drive Mode 3. Therefore, you must go to the following steps first.

*2 Except MPV

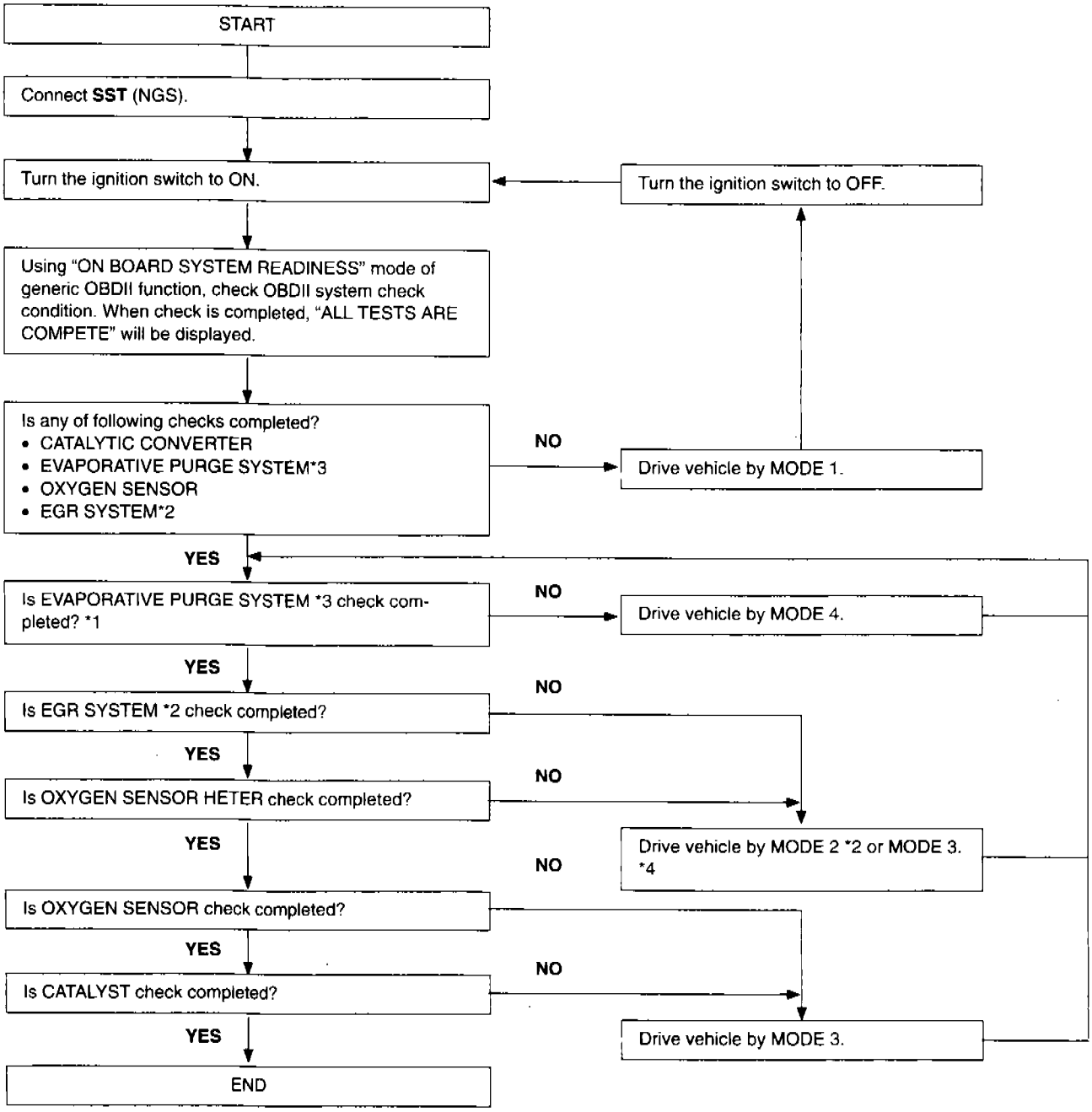
*3 Protege and MPV only

*4 MPV only

Group 2

Note

- Disconnecting the battery will reset the memory. Do not disconnect the battery during and after this procedure.
- Vehicle speed and engine speed detected by the PCM may differ from that indicated by the speedometer and the tachometer. Check the vehicle speed and engine speed during driving mode by using the **SST** (NGS).
- If the OBD II system check is not completed while the drive mode procedure is carried out, the following cause is guessed.
  1. The OBDII system detects the malfunction.
  2. The drive mode procedure is not completed correctly.



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- Fuel gauge needle points within 15–85%.

If any of these conditions is not satisfied, you can perform Drive Mode 3. Therefore, you must go to the following steps first.

*2 Except MPV

*3 Protege and MPV only

*4 MPV only

MODE 1

- In mode 1, drive mode varies with vehicle model and engine type. Select proper mode from the table below.

Drive mode selection table

Group 1

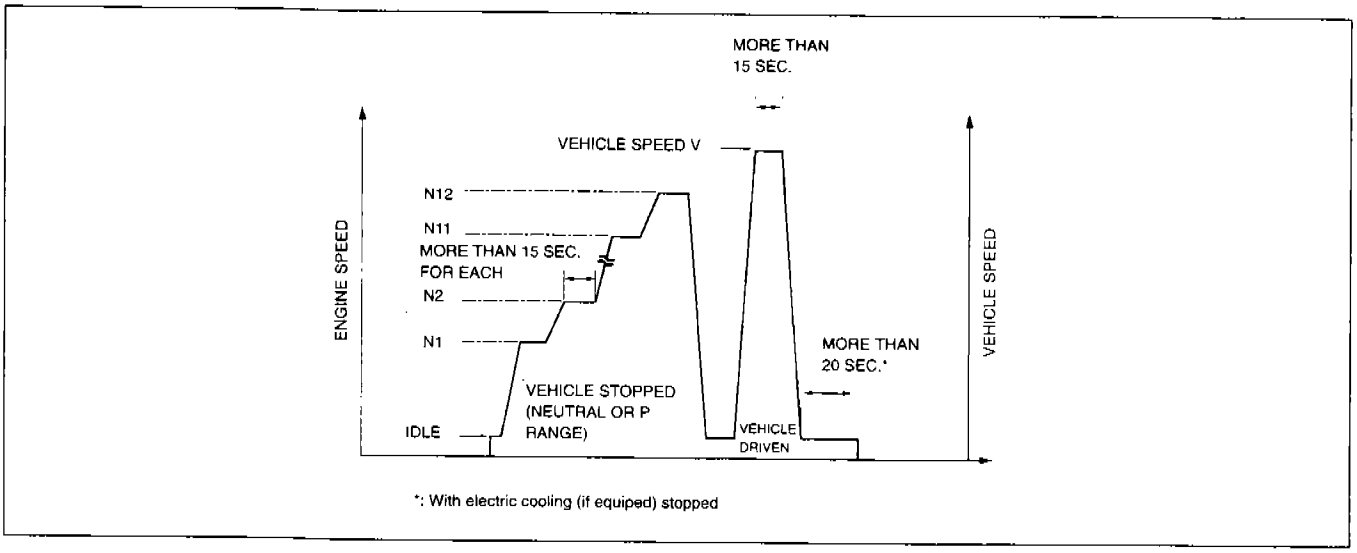
Vehicle	Engine	Driving mode	Page
Protege	Z5	1–A	18
	BP	1–A	18
MX-3	B6	1–A	18
	K8	1–A	18
626/MX-6	FS (MTX)	1–B	19
	KL	1–A	18
MX-5 Miata	BP	1–A	18
MPV	JE	1–A	18
millenia	KL	1–A	18
	KJ	1–A	18

Group 2

Vehicle	Engine	Driving mode	Page
Protege	Z5	1–C	21
	BP	1–C	21
MX-3	B6	1–C	21
	K8	1–C	21
626/MX-6	FS (MTX)	Not required	–
	KL	1–C	21
MX-5 Miata	BP	1–C	21
MPV	JE	1–C	21
millenia	KL	1–C	21
	KJ	1–C	21

MODE 1–A

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Verify that the initial ignition timing and the initial idle speed are within the specification.(Refer to Workshop Manual.)
4. If not as specified, adjust the ignition timing and the idle speed.
5. Verify that terminals TEN and GND of the data link connector are not connected.
6. Carry out no-load racing at the specified engine speed for each model. Race the engine for more than 15 seconds at each time. Refer to the following engine speed and vehicle speed table for engine speed and vehicle speed.
7. Start the vehicle and drive it at constant speed (V) for more than 15 seconds.
8. Stop the vehicle and idle the engine for more the 20 seconds with the electric cooling fan (if equipped) stopped.



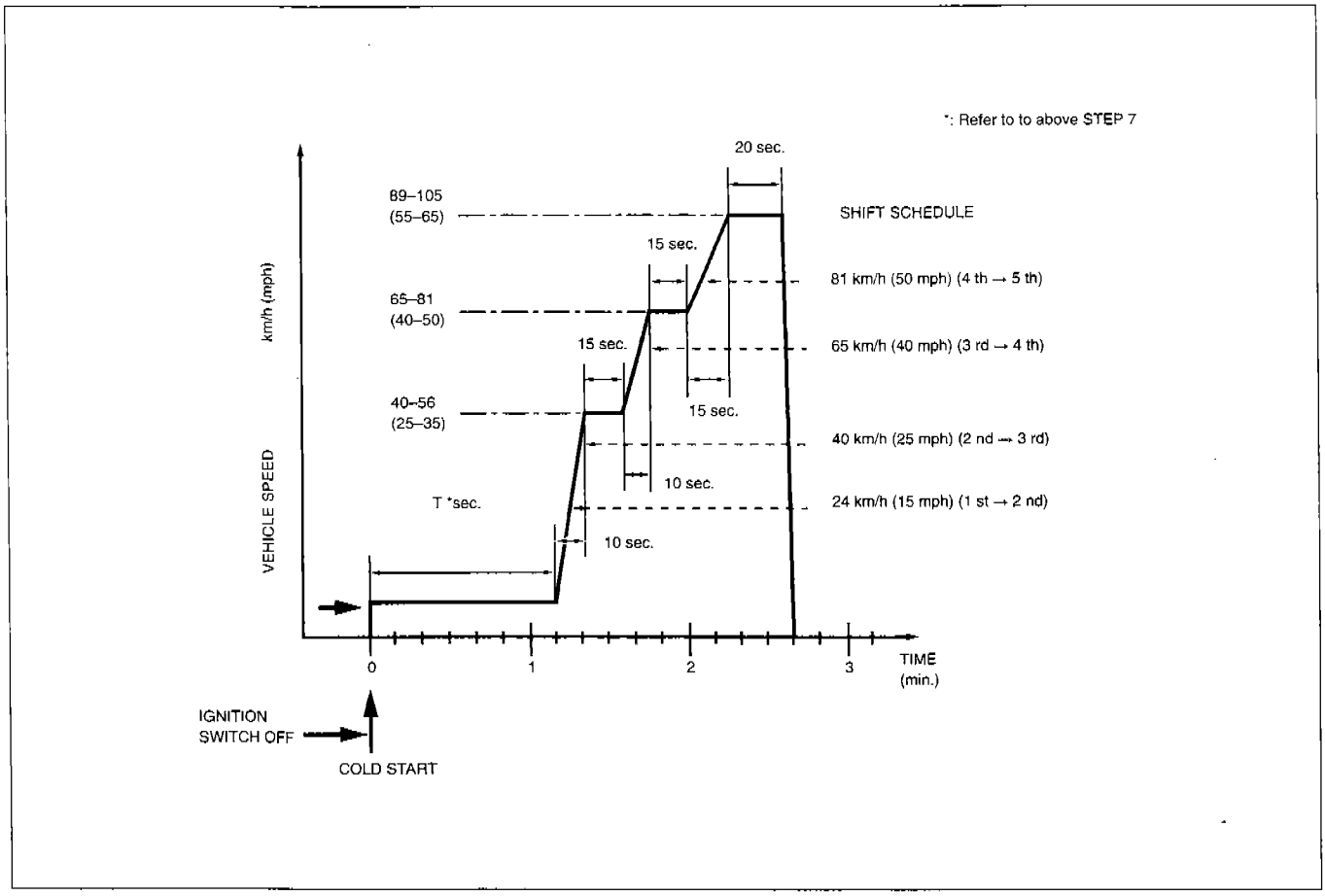
MODE 1–A Engine speed and vehicle speed table

Vehicle	Engine	N1 (rpm)	N2 (rpm)	N3 (rpm)	N4 (rpm)	V (km/h {mph})	Driving range
Protege	Z5	1,800–2,200	2,800–3,200	3,800–4,200	Not required	82–88 {51–55}	MTX:2nd gear ATX:2 range
	BP	1,800–2,200	3,800–4,200	Not required	Not required	100–104 {62–65}	MTX:5th gear ATX:D range
MX-3	B6	1,800–2,200	3,800–4,200	Not required	Not required	Not required	–
	K8	1,800–2,200	3,300–3,700	4,300–4,700	5,300–5,700	Not required	–
626/MX-6*1	KL	1,750	2,000	2,250	3,000	Not required	–
		3,500(N5)	4,000(N6)	4,250(N7)	4,500(N8)		
		4,750(N9)	5,000(N10)	5,250(N11)	5,500(N12)		
MX-5 Miata	BP	1,800–2,200	3,300–3,700	Not required	Not required	94–99 {58–62}	Any gear/ range
MPV	JE	2,000–3,000	4,000–5,000	Not required	Not required	Not required	–
millenia	KL	1,300–1,700	2,200–2,600	3,200–3,600	4,100–4,500	Not required	–
	KJ	1,600–2,000	3,000–3,400	3,800–4,000*2	Not required	100–104 {62–65}	Any gear/ range

*1: 626/MX-6 has no-load racing at the specified engine speed form N1 to N12.
*2: Possible to substitute driving at constant speed 92–98 km/h {57–61 mph}

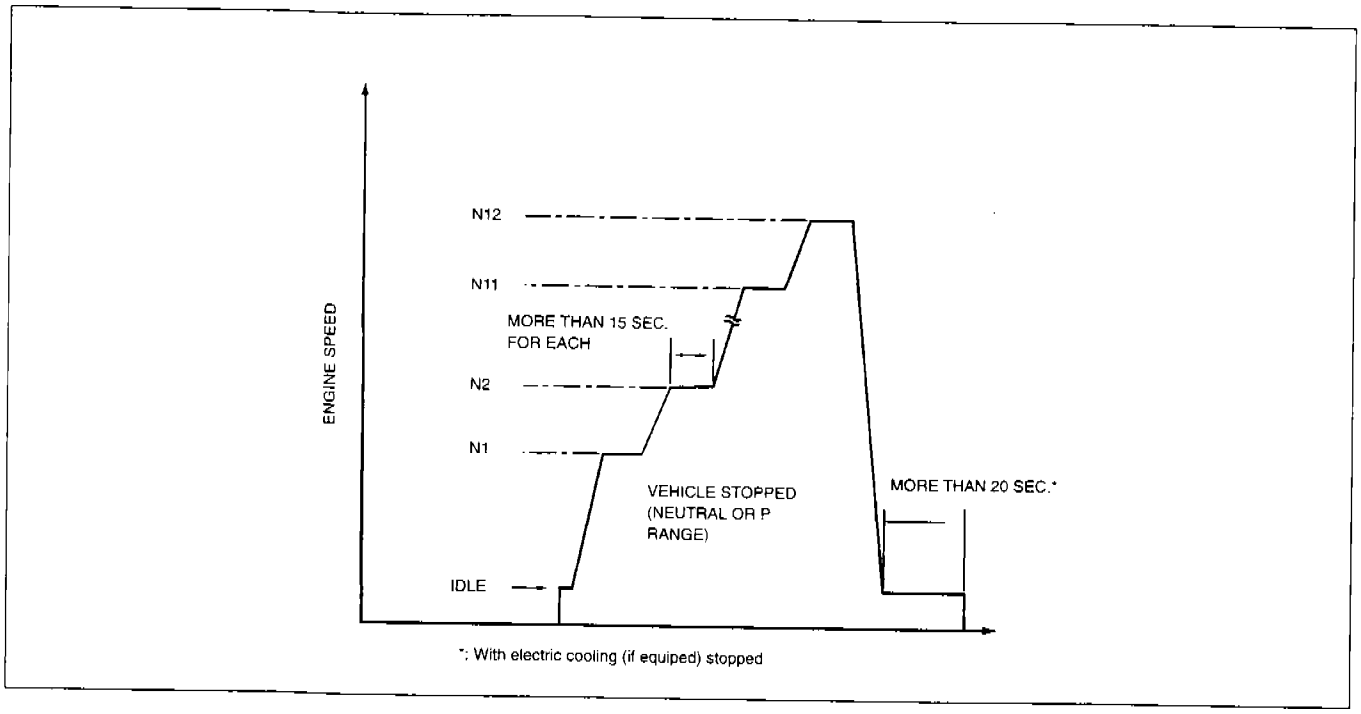
MODE 1–B

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Verify that the initial ignition timing and the initial idle speed are within the specification.(Refer to Workshop Manual.)
4. If not as specified, adjust the ignition timing and the idle speed.
5. Verify that terminals TEN and GND of the data link connector are not connected.
6. Leave the vehicle to cool the engine (coolant temperature is below 60 °C {140 °F})
7. Start the engine. When ambient temperature is 20–30 °C{68–86 °F}, let the engine idle for 70 seconds. When ambient temperature is 15–20 °C{59–68 °F}, let the engine idle for 90 seconds.
8. Start the vehicle and accelerate to 48 km/h{30 mph} in approximately 10 seconds. While accelerating, upshift from 1st gear to 2nd gear at 24 km/h{15 mph}, and from 2nd gear to 3rd gear at 40 km/h {25 mph}.
9. Drive the vehicle at the constant speed to 48 km/h {30 mph] for 15 seconds.
10. Increase the vehicle speed to 72 km/h {45 mph} in approximately 10 seconds. While accelerating, upshift from 3rd gear to 4th gear at 64 km/h {40 mph}.
11. Drive the vehicle at the constant speed of 72 km/h {45 mph} for 15 seconds.
12. Further increase the vehicle speed to 97 km/h {60 mph} in approximately 15 seconds. While accelerating, upshift from 4th gear to 5th gear at 81 km/h {50 mph}.
13. Drive the vehicle at the constant speed of 97 km/h {60 mph} for 20 seconds.



MODE 1–C

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Verify that the initial ignition timing and the initial idle speed are within the specification. (Refer to Workshop Manual).
4. If not as specified, adjust the ignition timing and idle speed.
5. Verify that terminals TEN and GND of the data link connector are not connected.
6. Carry out no-load racing at the specified speed for each model. Race the engine for more than 15 seconds at each time. Refer to the following engine speed table for engine speed.
7. Idle the engine for more than 20 seconds with the electric cooling fan (if equipped) stopped.



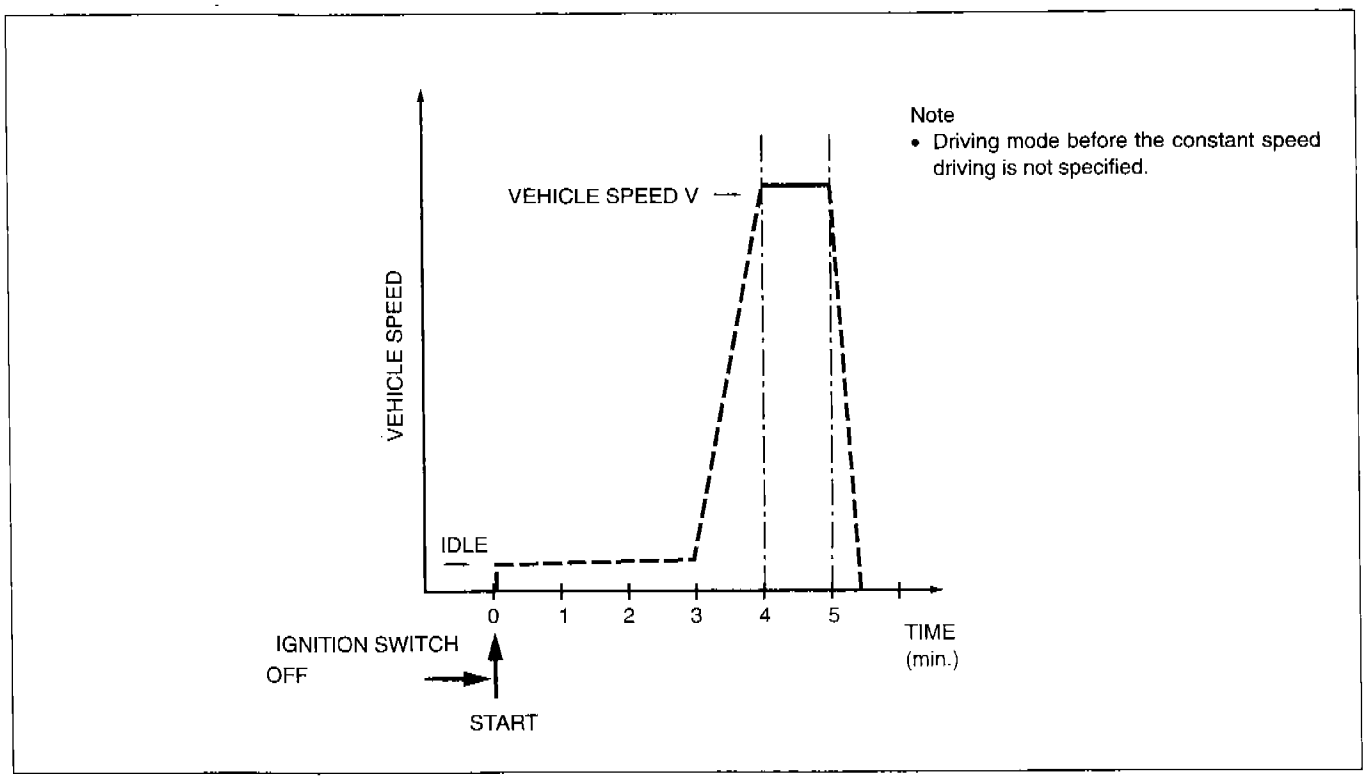
MODE 1–C Engine speed

Vehicle	Engine	N1 (rpm)	N2 (rpm)	N3 (rpm)	N4 (rpm)	N5 (rpm)	N6 (rpm)
Protege	Z5	1,800–2,200	2,800–3,200	3,800–4,200	Not required		
	BP	1,800–2,200	3,800–4,200	Not required			
MX-3	B6	1,800–2,200	3,800–4,200	Not required			
	K8	1,800–2,200	3,300–3,700	4,300–4,700	5,300–5,700	Not required	
626/MX-6*1	KL	1,750	2,000	2,250	3,000	3,500	4,000
		4,750(N7)	4,500(N8)	4,750(N9)	5,000(N10)	5,250(N11)	5,500(N12)
MX-5 Miata	BP	1,800–2,200	3,300–3,700	Not required			
MPV	JE	2,000–3,000	4,000–5,000	Not required			
millenia	KL	1,300–1,700	2,200–2,600	3,200–3,600	4,100–4,500	Not required	
	KJ	1,600–2,000	3,000–3,400	3,800–4,000*2	Not required		

*1: 626/MX-6 has no-load racing at the specified engine speed from N_1 to N_{12}.
*2: Possible to substitute driving at constant speed 92–98 km/h {57–61 mph}

MODE 2 (For EGR and Oxygen sensor heater check : Except MPV)
In mode 2, vehicle speed and driving range (gear position) vary with vehicle model and engine type. Refer to the table below to select the proper driving condition.

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Increase the vehicle speed to V (Refer to table below) in four minutes without radical acceleration.
4. Starting from four minutes after start, drive the vehicle at the constant speed (V) for one minute.

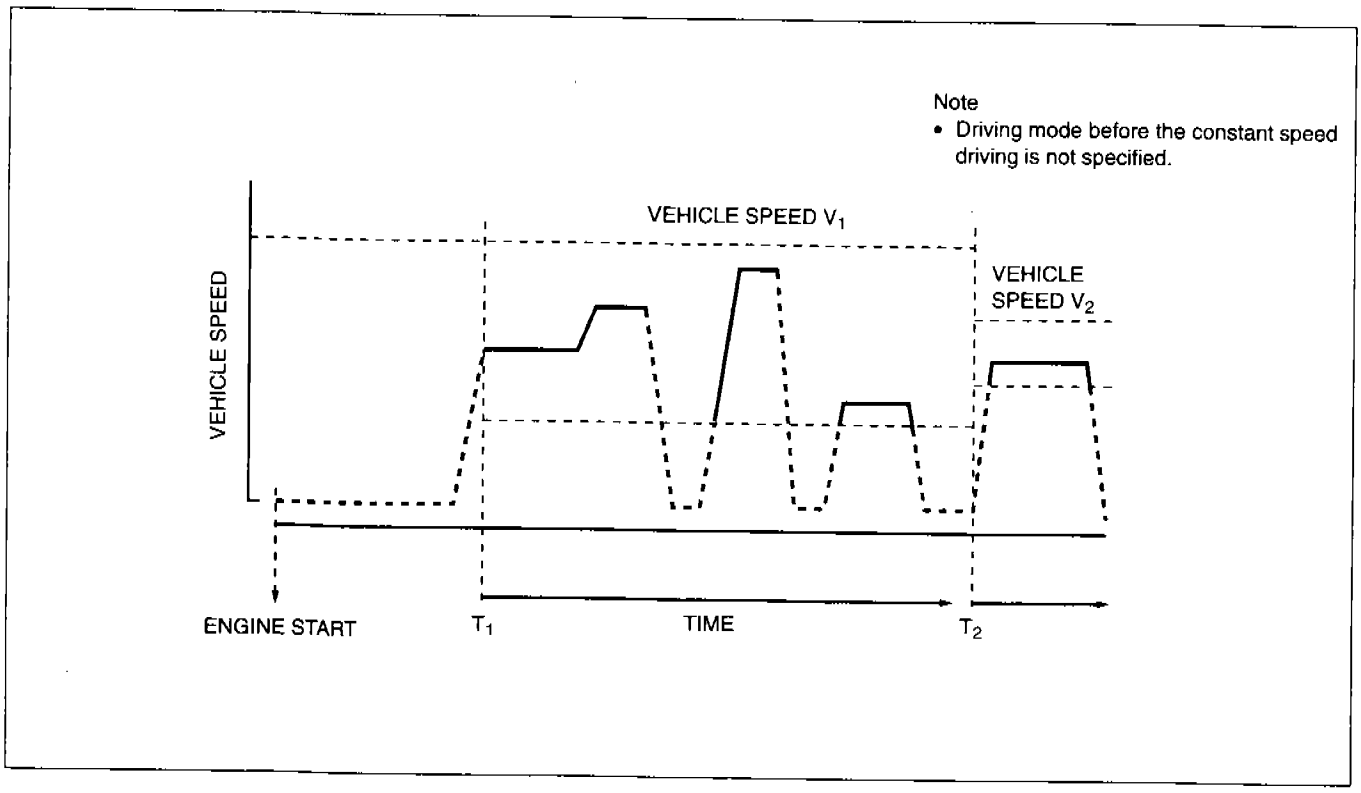


Mode 2 vehicle speed and driving range table

Vehicle	Engine	Vehicle speed V (km/h {mph})	Driving range
Portege	Z5	84–93 {52–58}	MTX: 5th gear ATX: D range
	BP	86–101 {53–63}	
MX-3	B6		
	K8		
626/MX-6	FS (MTX)	84–93 {52–58}	
	KL	86–101 {53–63}	
MX-5 Miata	BP	86–91 {53–57}	MT: 5th gear AT: D range
millenia	KL	84–93 {52–58}	D range
	KJ		

MODE 3 (For Oxygen sensor, Catalyst and MPV oxygen sensor heater check)
In mode 3, vehicle speed and driving range (gear position) vary with vehicle model and engine type.
Refer to the table below to select the proper driving condition.

1. Start the engine and warm it up completely.
2. Verify that all electrical loads are off.
3. Drive the vehicle at the constant speed (V_1) and increase the vehicle speed gradually (a quarter throttle opening) in 7 minutes between T_1 and T_2 (Decreasing the vehicle speed and idling the engine are not included.)
4. Drive the vehicle at the constant speed (V_2) for 20 seconds after T_2.

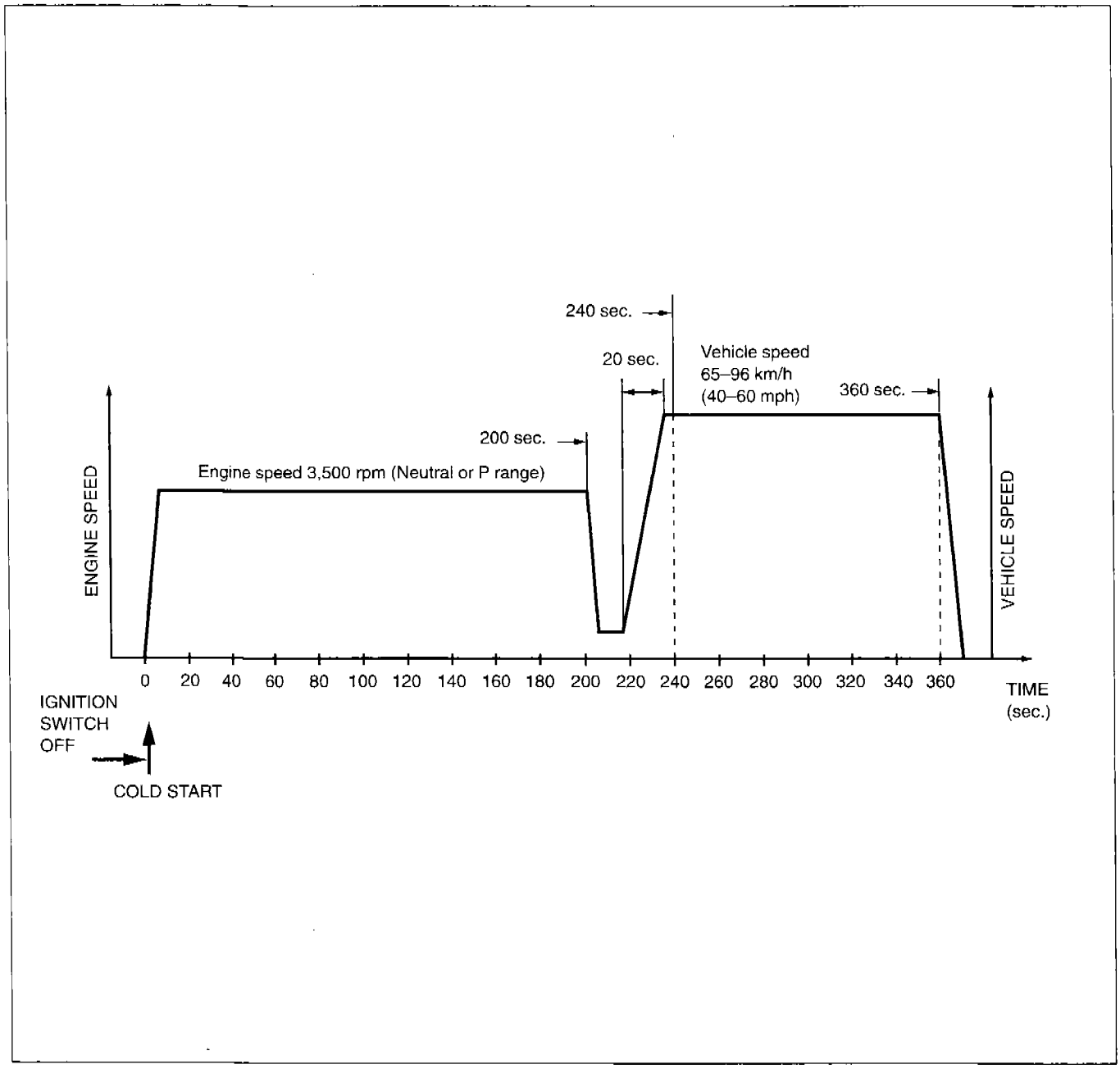


Mode 3 vehicle speed and driving range table

Vehicle	Engine	T_1 (min.)	T_2 (min.)	V_1 (km/h {mph})	Driving range	V_2 (km/h {mph})	Driving range
Protege	Z5	5.8	18.5	21–58 {13–36}	MTX:3rd or 4th gear ATX:D range	30–48 {19–30}	MTX:3rd gear ATX:D range
	BP	5.5					
MX-3	B6						
	K8						
626/MX-6	FS (MTX)	7	18	38–53 {23–33}	MTX:3rd gear	41–50 {25–31}	MTX:3rd gear
	KL (MTX)	5.5	20	21–58 {13–36}	MTX:3rd or 4th gear	28–35 {17–22}	MTX:3rd gear
	KL (ATX)		18.5		ATX:D range	30–43 {18–27}	ATX:D range
MX-5Miata	BP				MT:3rd gear AT:D range	41–48 {25–30}	MT:3rd gear AT:D rage
MPV	JE			33–58 {20–36}	AT:D range	31–48 {19–30}	AT:D range
millenia	KL				ATX:D range	36–48 {22–30}	ATX:D range
	KJ						

MODE 4 (For Protege and MPV evaporative purge system [Leak monitor] check)

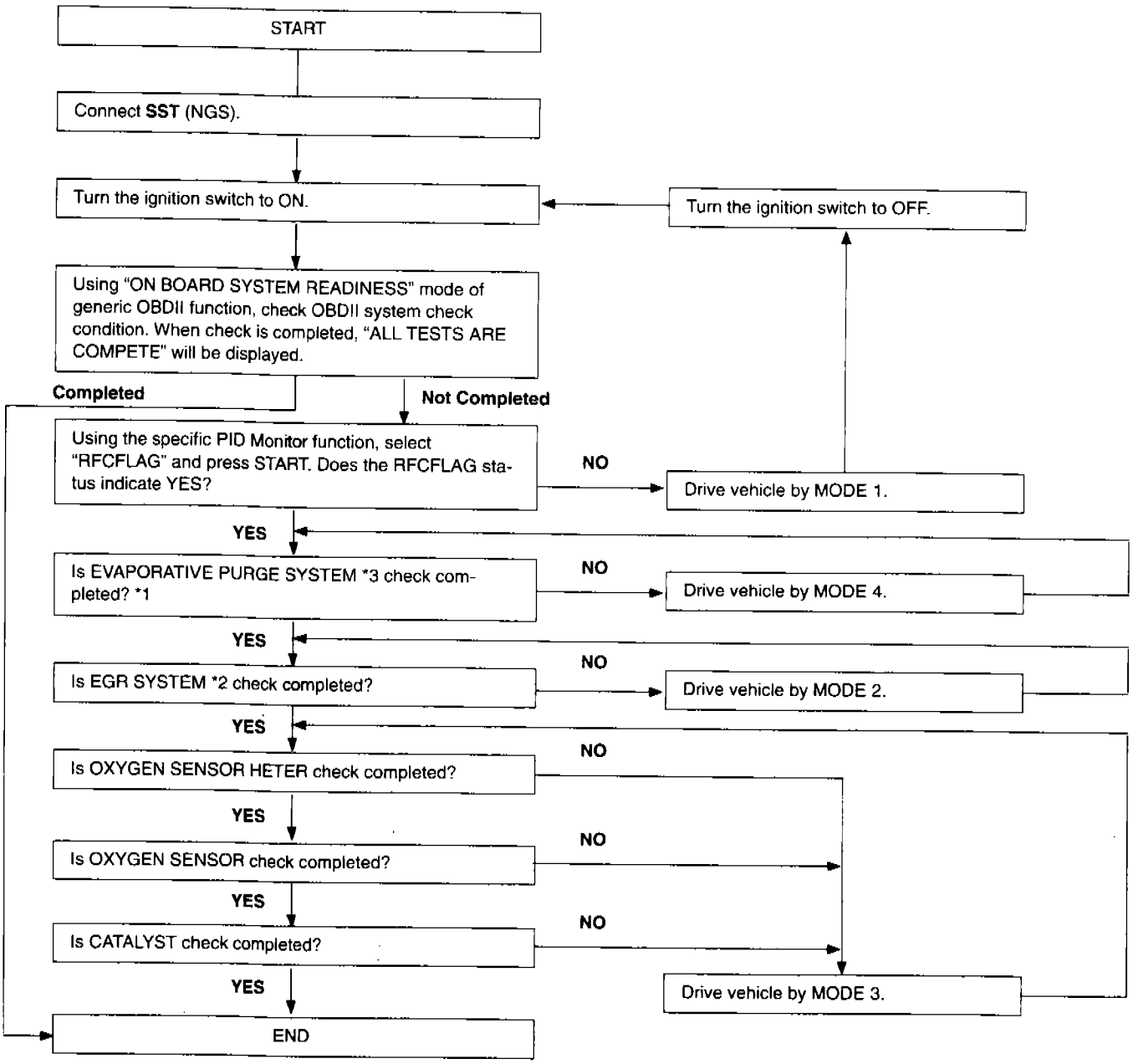
1. Verify that all following conditions are satisfied.
   - Engine coolant temperature is 0–35 °C {32–95 °F}.
   - Intake air temperature is 10–60 °C {50–140 °F}.
   - Barometric pressure is 72.0 kPa {540 mmHg, 21.3 inHg} or higher.
   - Fuel gauge needle points within 15–85%.
2. Start the engine and race it at 3,500 rpm for 200 seconds to warm it up completely.
3. Within 240 seconds after engine start, start the vehicle and accelerate to 65–96 km/h {40–60 mph} in approximately 20 seconds.
4. Drive the vehicle at the constant speed of 65–96 km/h {40–60 mph} till 360 seconds after engine start.



(3) '97MY vehicles (Except 626/MX-6 FS ATX and B-Series)

Note

- Disconnecting the battery will reset the memory. Do not disconnect the battery during and after this procedure.
- Vehicle speed and engine speed detected by the PCM may differ from that indicated by the speedometer and the tachometer. Check the vehicle speed and engine speed during driving mode by using the **SST** (NGS).
- If the OBD-II system check is not completed while the drive mode procedure is carried out, the following cause is guessed.
  1. The OBD-II system detects the malfunction.
  2. The drive mode procedure is not completed correctly.



*1 Verify that all of the following condition are satisfied:
- Engine coolant temperature is 0–35 °C {32–95 °F}.
- Intake air temperature is 10–60 °C {50–140 °F}.
- Barometric pressure is 72.0 kPa [540 mmHg, 21.3 inHg] or higher.
- Fuel gauge needle points within 15–85%.

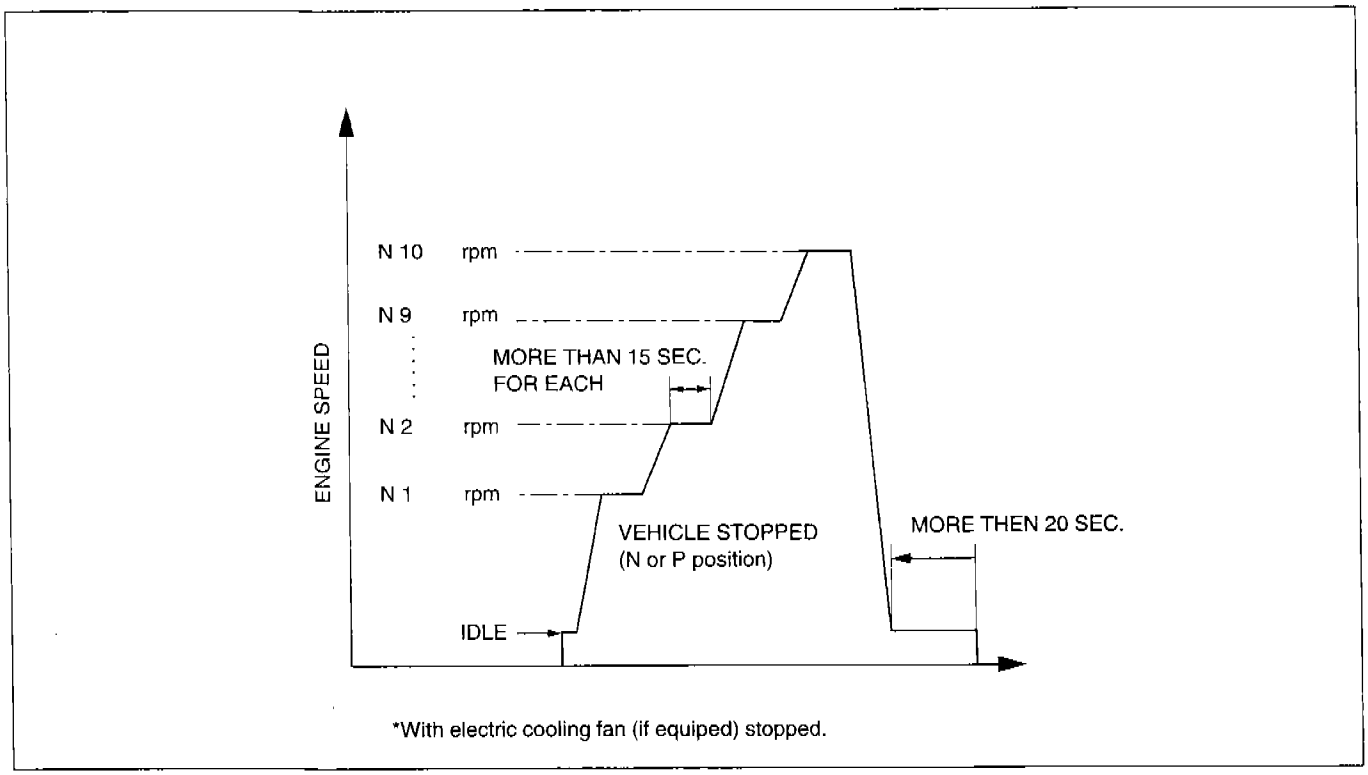
If any of these conditions is not satisfied, you can perform Drive Mode 3. Therefore, you must go to the following steps first.

*2 Except MPV

*3 Protege, millenia and MPV only

MODE 1

1. Start the engine and warm it up completely.
2. Verify that all electrical loads (head light, blower motor and rear window defroster) and A/C loads are off.
3. Verify that the initial ignition timing and the initial idle speed are within the specification. Refer to Workshop Manual).
4. Is not as specified, adjust the ignition timing and idle speed.
5. Verify that terminals TEN and GND of the data link connector are not connected.
6. Carry out no-load racing at the specified speed. Race the engine for more than 15 seconds at each time.
7. Idle the engine for more than 20 seconds with the electric cooling fan (if equipped) stopped.



MODE 1 Engine speed table

Vehicle	Engine	N1 (rpm)	N2 (rpm)	N3 (rpm)	N4 (rpm)	N5 (rpm)	N6 (rpm)
Protege	Z5	2,300–2,700	3,800–4,200	Not required			
	BP	1,800–2,200	3,800–4,200	Not required			
626/MX-6*1	FS	Not required					
	KL	1,750	2,000	2,250	3,000	3,500	4,000
		4,250(N7)	4,500(N8)	4,750(N9)	5,000(N10)	Not required	
MX-5 Miata	BP	1,800–2,200	3,300–3,700	Not required			
MPV	JE	2,000–3,000	4,000–5,000	Not required			
millenia	KL	1,300–1,700	2,200–2,600	3,200–3,600	4,100–4,500	Not required	
	KJ	1,600–2,000	3,000–3,400	3,800–4,000*2	Not required		

*1: 626/MX-6 has no-load racing at the specified engine speed form N_1 to N_{10}.

*2: Possible to substitute driving at constant speed 92–98 km/h {57–61 mph}

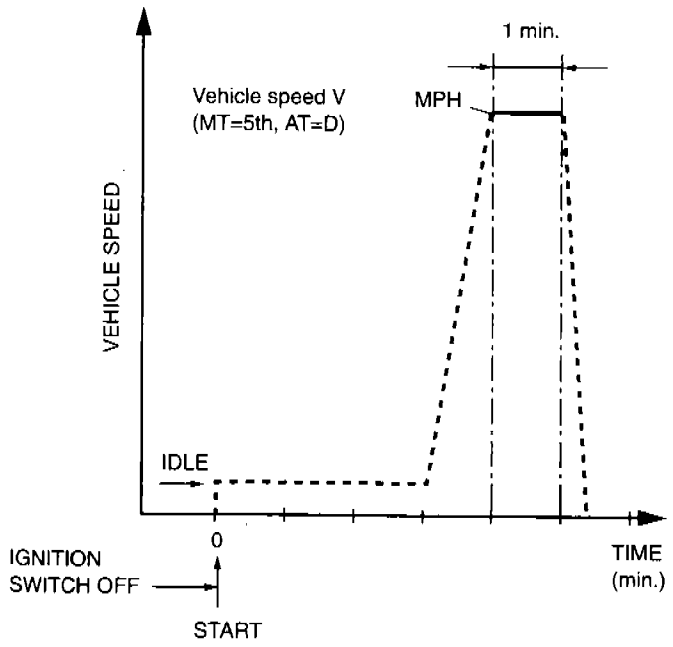
MODE 2 (For EGR system check)

1. Start the engine and warm it up completely.
2. Verify that all electrical loads (head light, blower motor and rear window defroster) and A/C load are off.

Note

- Driving mode before the constant speed driving is not specified.

3. Drive the vehicle at the constant speed (V: Refer to table below) for one minute.



Mode 2 vehicle speed and driving range table

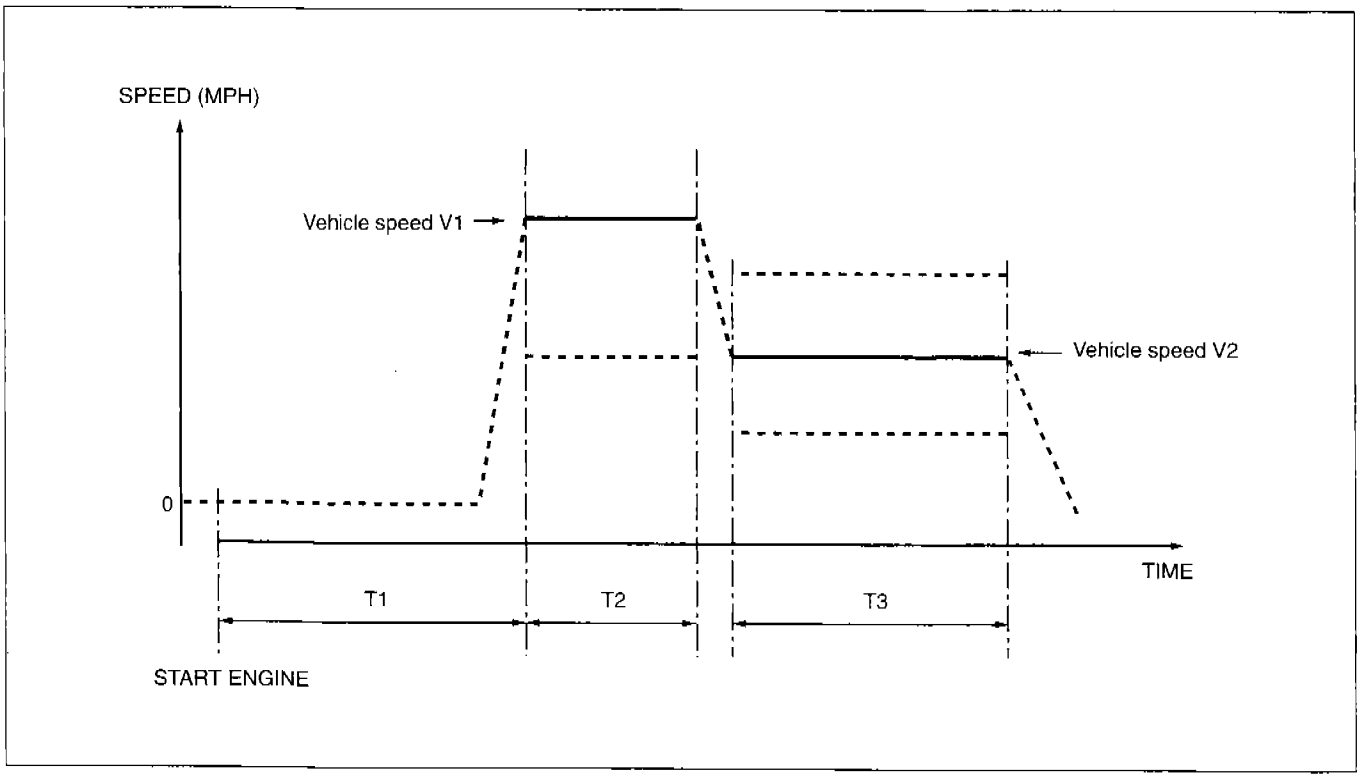
Vehicle	Engine	Vehicle speed V (km/h {mph})	Driving range
Protege	Z5	84–93 {52–58}	MTX: 5th gear ATX: D range
	BP	81–96 {50–60}	
626/MX-6	FS (MTX)	84–93 {52–58}	
	KL (MTX)	79–95 {49–59}	
	KL (ATX)	76–98 {47–61}	
MX-5 Miata	BP	84–89 {52–56}	MT: 5th gear AT: D range
millenia	KL	79–91 {49–57}	D range
	KJ	83–94 {51–59}	

MODE 3 (For Oxygen sensor heater, Oxygen sensor and Catalyst check)

1. Start the engine and warm it up completely.
2. Verify that all electrical loads (head light, blower motor and rear window defroster) and A/C load are off.
3. Drive the vehicle at the constant speed (V1: Refer to table below) for one minute after the above five minutes from engine start.
4. Drive the vehicle at the constant speed (V2:Refer to table below) for three minutes (T3).

Note

- Driving mode before the constant speed driving is not specified.

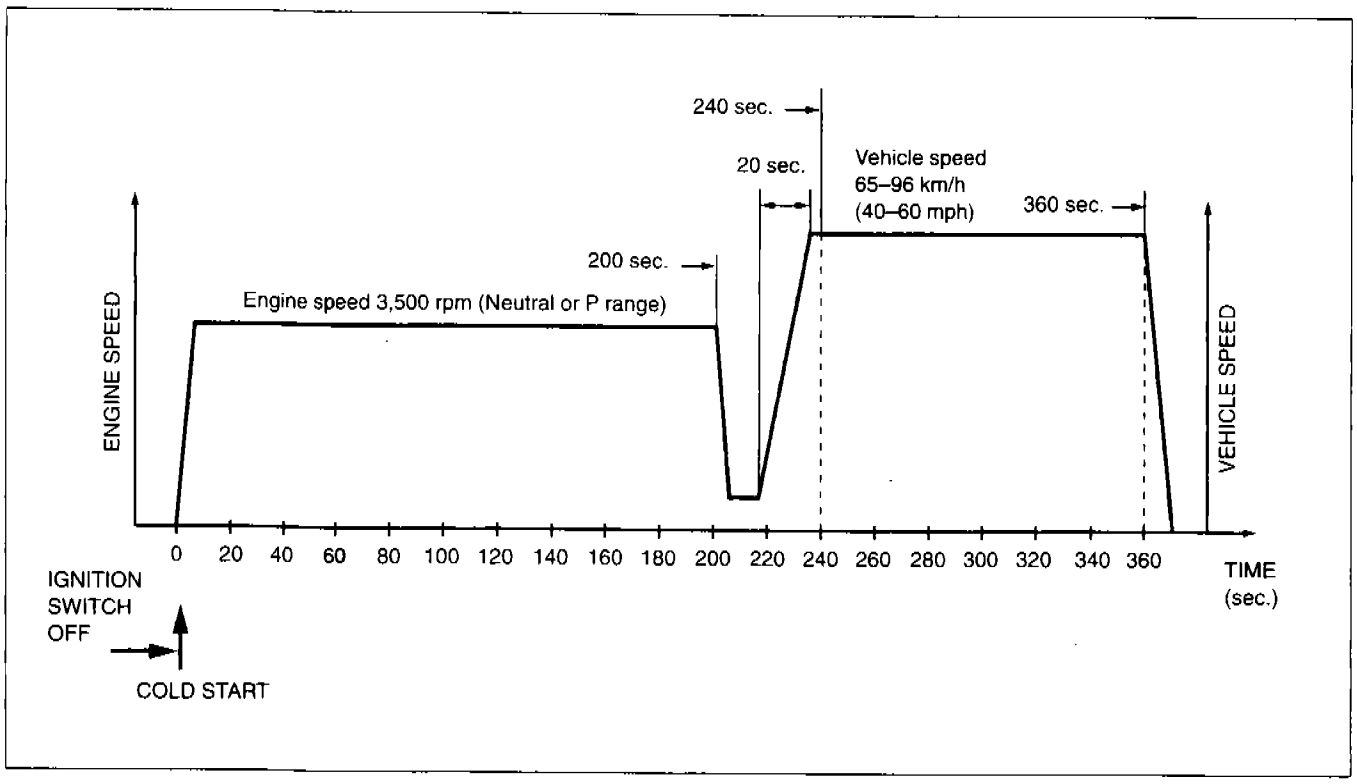


Mode 3 vehicle speed and driving range table

Vehicle	Engine	T_1 (min.)	T_2 (min.)	V_1 (km/h {mph})	Driving range		V_2 (km/h {mph})	Driving range	
					MT	AT		MT	AT
Protege	Z5	5	1	above80 {50}	4th or 5th	D range	65–96 {40–60}	5th	D range
	BP	5	1	above65 {40}			48–80 {30–50}	4th	D range
626/MX-6	FS (MTX)	5	1	above65 {40}	4th or 5th	–	65–96 {40–60}	5th	–
	KL (MTX)	5	1	above65 {40}	5th	–	67–100 {42–62}	5th	–
	KL (ATX)	5	1	above65 {40}	–	D range	73–104 {45–65}	–	D range
MX-5Miata	BP	5	1	above65 {40}	5th	D range	56–88 {35–55}	5th	D range
MPV	JE	5	1	above65 {40}	–	D range	68–84 {42.5–52.5}	–	D range
millenia	KL	5	1	above65 {40}	–	D range	65–96 {40–60}	–	D range
	KJ	5	1	above65 {40}	–		65–88 {40–55}		

MODE 4 (For Evaporative purge system [Leak monitor] check)

1. Verify that all following conditions are satisfied.
   - Engine coolant temperature is 0–35 °C {32–95 °F}.
   - Intake air temperature is 10–60 °C {50–140 °F}.
   - Barometric pressure is 72.0 kPa {540 mmHg, 21.3 inHg} or higher.
   - Fuel gauge needle points within 15–85%.
2. Start the engine and race it at 3,500 rpm for 200 seconds to warm it up completely.
3. Within 240 seconds after engine start, start the vehicle and accelerate to 65–96 km/h {40–60 MPH} in approximately 20 seconds.
4. Drive the vehicle at the constant speed of 65–96 km/h {40–60 MPH} till 360 seconds after engine start.



(4) '96MY and '97MY 626/MX-6 FS ATX

1. Start and warm the engine until the engine coolant temperature is over 82°C (180 °F)

(7) '97MY B-Series

Preparation

1. The inlet air temperature (or ambient air temperature) for all vehicle applications must be between 4–38 °C {40–100 °F} to initiate the OBD-II Drive cycle. Check the IAT PID on the scan tool.
2. Warm the vehicle up to at least an engine coolant temperature of 54 °C {130 °F}.
3. Attach a scan tool (if available) and access the On-Board Readiness Menu. The scan tool will send out a three-pulse beep when all the monitors have completed and the code P1000 is erased.

Drive Mode

Start the engine and drive the vehicle:

1. Drive in stop-and-go traffic for 20 minutes with at least 4 idle periods.
2. Drive on expressway or highway for 10 to 15 minutes. Access and monitor the IAT PID on the scan tool during the entire highway drive. Heavy accelerations, sudden decelerations or wide open throttles are not recommended on any vehicle.
3. Access the On-Board Readiness Menu on the scan tool to check monitor completion status.
4. Rerun Continuous Memory Self-Test to check code P1000 status.

Comprehensive Component Monitor Repair Verification Drive Mode

1. Refer to and complete the Preparation before initiating the following repair verification steps.
2. Start the engine and go through the entire OBD-II Drive Cycle until the Comprehensive Component Monitor shows the completion status by clearing the code P1000 on the scan tool.
3. With the ignition key ON (vehicle at idle or engine off), check for Retrieve/Clear Continuous DTCs.

EGR Monitor Repair Verification Drive Mode

1. Refer to and the Preparation before initiating the following repair verification steps.
2. Start the engine and drive the vehicle for 6 minutes.
   a. Drive in stop-and-go traffic for 5 minutes with at least two idle periods.
   b. Accelerate to 72 km/h {45 mph}. Maintain speed for 1 minute.
3. With the ignition key ON (vehicle at idle or engine off), check for Retrieve/Clear Continuous DTCs.

Catalyst Monitor Repair Verification Drive Mode

1. Refer to and complete the Preparation before initiating the following repair verification steps.
2. Start the engine and drive the vehicle for 25 minutes.
   a. Drive in stop-and-go traffic for 20 minutes, include six different constant speeds between 40–72 km/h {25–45 mph}.
   b. Drive on expressway or highway for an additional 5 minutes.
3. With the ignition key ON (vehicle at idle or engine off), check for Retrieve/Clear Continuous DTCs.

Fuel Monitor, Oxygen Sensor Monitor or Oxygen Sensor Heater Monitor Repair Verification Drive Mode

1. Refer to and complete the Preparation before initiating the following repair verification steps.
2. Start the engine and drive the vehicle for 7 minutes.
   a. Drive in stop-and-go traffic for 6 minutes, include one idle.
   b. Accelerate to 72 km/h {45 mph}. Maintain speed for 1 minute.
3. With the ignition key ON (vehicle at idle or engine off), check for Retrieve/Clear Continuous DTCs.

Misfire Monitor Repair Verification Drive Mode

1. Start the engine and drive the vehicle to a location where speeds can reach 88–105 km/h {55–65mph} and coast down to 56 km/h {35 mph} without traffic interference.
2. Perform following drive procedure three consecutive times.
   a. Accelerate on highway to 97 km/h {60 mph}. Maintain speed for 30 seconds.
   b. Coast down with foot off the accelerator pedal from 97 km/h {60 mph}
3. With the ignition key ON (vehicle at idle or engine off), check for Retrieve/Clear Continuous DTCs.

2.3 Sending freeze frame data (Mode 02)

This mode stores the vehicle and engine conditions (vehicle speed, engine coolant temperature, etc.) in the PCM memory when an emissions-related problem has occurred, and allows for the retrieval of the stored data with a scan tool when necessary.

The data that is memorized when a problem has occurred is called Freeze Frame Data (FFD).

FFD is recorded differently depending on whether it comes from the EEC system or another system. In the EEC system, FFD will be recorded whenever there is a problem with the system or one of its components (including detection of a pending code). In other systems, it will happen whenever a DTC is stored (the MIL flashes or is illuminated).

There is also an FFD priority ranking. Data from Fuel Metering System and Misfire malfunctions have a high priority, others have a low priority. If two separate problems occur, data at the time the first problem occurred is memorized. If a fuel system or misfire occurs, that data will replace the old data, unless the previous data was fuel system- or misfire-related.

Below is a chart and example showing data prioritization.

Data Prioritization

Priority	Monitor Item
High	Fuel Metering System Monitor Misfire Monitor
Low	Catalyst Efficiency Monitor Evaporative System Monitor Oxygen Sensor Monitor Oxygen sensor heater monitor EGR system monitor CCM

[Problem] [Data]

Oxygen sensor failed. ..... FFD at the time when the oxygen sensor failed is memorized.

↓

EGR system failed. ..... Data unchanged.

↓

Misfire occurred. ..... FFD at the time when misfire occurred replaces the previous data.

↓

Fuel system failed. ..... Data unchanged.

In FFD, the following data is also stored in the PCM memory.

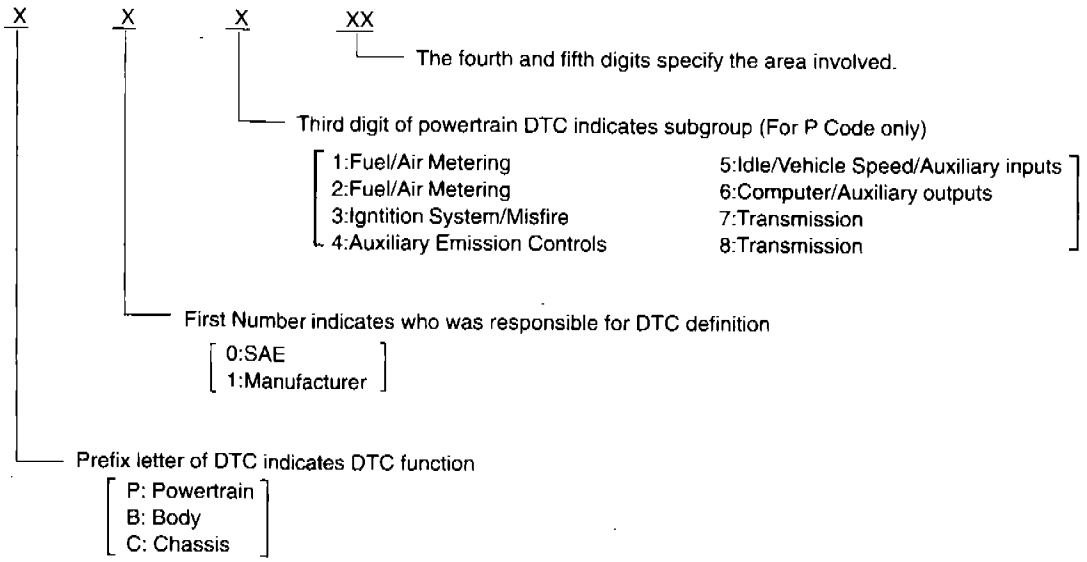
Monitor item	Full names	Unit
–	Diagnostic trouble code (DTC)	–
SHRTFT1	Short fuel trim/Short fuel trim (RH)	%
SHRTFT2	Short fuel trim (LH)	%
LONGFT1	Long fuel trim/Long fuel trim (RH)	%
LONGFT2	Long fuel trim (LH)	%
RPM	Engine speed	rpm
LOAD	Engine load calculated value	%
ECT	Engine coolant temperature	°C, °F
VSS	Vehicle speed sensor	km/h, MPH
FUELSYS1	Fuel system loop status/Fuel system loop status (RH)	Open: NON-F/B, Close: F/B
FUELSYS2	Fuel system loop status (LH)	Open: NON-F/B, Close: F/B

As for short fuel trim and long fuel trim, refer to section 3.5, Fuel system monitor.

2.4 Sending emission–related malfunction code (Mode 03)

When emission–related systems or components have failed (MIL flashed or illuminated), this mode memorizes the DTC of the failed part in the PCM memory, and allows for the retrieval of the memorized data by using the scan tool when necessary.

The DTCs are indicated in five digits. Each digit indicates the following.



Example:P1402
- P=Powertrain DTC
- 1=Manufacturer-defined DTC
- 4=Auxiliary Emission Controls Subgroup concern
- 02=EGR valve position sensor open or short

As for continuously monitored systems, some of the DTCs are stored in the memory when the problem is detected in one drive cycle, and others are stored when the problem is detected in two consecutive drive cycles.
At the same time the DTC is stored in the memory, the MIL flashes or illuminates.
When no problems are detected between three and four consecutive drive cycles after the DTC is stored, the PCM turns the MIL off when next engine starting.

With intermittent systems, the DTCs stored and the MIL illuminates and the MIL turns off differs according to model year and vehicle type. The two categories of vehicles are show below:

Type	Model Year	Vehicle Type
Type 1	'95 MY	Protege, Millenia
	'96 MY Group-1	Protege, MX-3, 626/MX-6 (Except FS ATX), MX-5 Miata, MPV, Millenia
Type 2	'96 MY Group-2	Protege, MX-3, 626/MX-6 (Except FS ATX), MX-5 Miata, MPV, Millenia
	'97 MY	Protege, 626/MX-6 (Except FS ATX), MX-5 Miata, MPV, Millenia
	'96, '97 MY	626/MX-6 FS ATX
Type 3	'95, '96, '97 MY	B-Series

For Type-1 vehicles, the DTCs are stored and the MIL is illuminated when a problem is detected over two consecutive trip cycles, except for the oxygen sensor heater monitor, which is detected over two consecutive drive cycles. Also, the MIL is turned off if the engine is started after no problems are detected between three and four consecutive trip cycles after the DTC was stored. A trip cycle is completed when all emissions-related system RFCs have completed one diagnosis each.
In Type-2 vehicles, the DTCs are stored and the MIL is illuminated when the problem is detected in two consecutive drive cycles, and the MIL is turned off when next engine starting after no problems are detected between three and four consecutive drive cycles after the DTC is stored.
In Type-3 vehicles, the DTCs are stored and the MIL is illuminated when the problem is detected in 2–6 consecutive drive cycles or two trip cycles, and the MIL is turned off when no problems are detected in three consecutive drive cycles or trip cycles after the DTC is stored.

When next engine starting after no problems are detected in 41 consecutive warm-up cycles* after the DTC is detected and the MIL is off, the PCM deletes the DTC.

* Vehicle operation by which the engine coolant temperature is raised at least 22°C {40 °F} and to exceed 71°C {160 °F} after the engine is started.

The information of DTC and MIL are as following table.

95MY and 96MY Group1 (Except 626/MX-6 FS ATX and B-Series)

MONITOR	Number of Separate Consecutive Drive Cycles or Trip Cycles to Light MIL and Store DTC	Number and Type of Drive Cycles or Trip Cycles with No Malfunction to Turn MIL OFF (Turn MIL OFF when starting engine after the below Drive Cycles or Trip Cycles)	Number of Warm-ups to Erase DTC after MIL is Extinguished (Erase DTC when starting engine after the below Warm-ups)
Catalyst Efficiency	2 Trip Cycles	3 or 4 Trip Cycles	41
Misfire (Damage the catalytic converter)	1 Drive Cycle	3 or 4 Drive Cycles (Similar Conditions)	41
Misfire (Affect emission performance)	2 Drive Cycles	3 or 4 Drive Cycles (Similar Condition)	41
Evaporative System	2 Trip Cycles	3 or 4 Trip Cycles	41
Fuel System	2 Drive Cycles	3 or 4 Drive Cycles (Similar Condition)	41
Oxygen Sensor	2 Trip Cycles	3 or 4 Trip Cycles	41
Oxygen Sensor Heater	2 Drive Cycles	3 or 4 Trip Cycles	41
Exhaust Gas Recirculation	2 Trip Cycles	3 or 4 Trip Cycles	41
Comprehensive Component	1 or 2 Drive Cycles	3 or 4 Drive Cycles	41

Similar conditions are defined as vehicle operation to reach the following conditions simultaneously:

- Engine speed within 375 rpm
- Engine load within 10%
- Engine warm-up state (cold [engine coolant temperature below 71°C {160°F}] or warmed-up)

96MY Group2 and 97MY (Except 626/MX-6 FS ATX and B-Series)

MONITOR	Number of malfunctions on Separate Drive Cycles to Set Pending DTC (Only 97MY)	Number of Separate Consecutive Drive Cycles to Light MIL and Store DTC	Number and Type of Drive Cycles with No Malfunction to Erase Pending DTC (Only 97MY)	Number and Type of Drive Cycles with No Malfunction to Turn MIL OFF (Turn MIL OFF when starting engine after the below Drive Cycles)	Number of Warm-ups to Erase DTC after MIL is Extinguished (Erase DTC when starting engine after the below Warm-ups)
Catalyst Efficiency	–	2	–	3 or 4	41
Misfire (Damage the catalytic converter)	–	1	–	3 or 4 (Similar Conditions)	41
Misfire (Affect emission performance)	1	2	1 (Similar Conditions)	3 or 4 (Similar Condition)	41
Evaporative System	–	2	–	3 or 4	41
Fuel System	1	2	1 (Similar Conditions)	3 or 4 (Similar Condition)	41
Oxygen Sensor	–	2	–	3 or 4	41
Oxygen Sensor Heater	1	2	1	3 or 4	41
Exhaust Gas Recirculation	–	2	–	3 or 4	41
Comprehensive Component	1	1 or 2	1	3 or 4	41

Similar conditions are defined as vehicle operation to reach the following conditions simultaneously:

- Engine speed within 375 rpm
- Engine load within 10%
- Engine warm-up state (cold [engine coolant temperature below 71°C {160°F}] or warmed-up)

626/MX-6 FS ATX

MONITOR	Number of malfunctions on Separate Drive Cycles to Set Pending DTC	Number of Separate Consecutive Drive Cycles to Light MIL and Store DTC	Number and Type of Drive Cycles with No Malfunction to Erase Pending DTC	Number and Type of Drive Cycles with No Malfunction to Turn MIL OFF	Number of Warm-ups to Erase DTC after MIL is Extinguished
Catalyst Efficiency	1	2	1	3	40
Misfire (Damage the catalytic converter)	–	1	–	3 (Similar Conditions)	40
Misfire (Affect emission performance)	1	2	1	3 (Similar Condition)	40
Fuel System	1	2	1	3 (Similar Condition)	40
Oxygen Sensor	1	2	1	3	40
Oxygen Sensor Heater	1	2	1	3	40
Exhaust Gas Recirculation	1	2	1	3	40
Comprehensive Component	1	2	1	3	40

Similar conditions are defined as vehicle operation to reach the following conditions simultaneously:
- Engine speed within 375 rpm
- Engine load within 10%
- Engine warm-up state (cold [engine coolant temperature below 54°C {129°F}] or warmed-up)

B-Series

MONITOR	Number of malfunctions on Separate Drive Cycles to Set Pending DTC	Number of Separate Consecutive Drive Cycles to Light MIL and Store DTC	Number and Type of Drive Cycles or Trip Cycles with No Malfunction to Erase Pending DTC	Number and Type of Drive Cycles or Trip Cycles with No Malfunction to Turn MIL OFF	Number of Warm-ups to Erase DTC after MIL is Extinguished
Catalyst Efficiency	1	3	1 Drive Cycle	3 OBD-II Drive Cycles	40
Misfire (Damage the catalytic converter)	–	1	–	3 Drive Cycles (Similar Conditions)	40
Misfire (Affect emission performance)	1	2	1 Drive Cycle	3 Drive Cycles (Similar Condition)	40
Fuel System	1	2	1	3 Drive Cycles (Similar Condition)	40
Oxygen Sensor	1	2	1 Trip Cycle	3 Trip Cycles	40
Oxygen Sensor Heater	1	2	1 Trip Cycle	3 Trip Cycles	40
Exhaust Gas Recirculation	1	2	1 Trip Cycle	3 Trip Cycles	40
Comprehensive Component	1	2	1 Drive Cycle	3 Drive Cycles	40

Similar conditions are defined as vehicle operation to reach the following conditions simultaneously:
- Engine speed within 375 rpm
- Engine load within 10%
- Engine warm-up state (cold [engine coolant temperature below 54°C {129°F}] or warmed-up)

The DTCs which apply to Mazda vehicles are as listed below.
The list below includes DTCs not included in Mode 03. MIL will not be illuminated when these DTCs are detected. These codes are unique to Mazda, established to improve serviceability, and checked by the NGS specific mode only. For some vehicle models, some of the DTCs are not used. As for vehicle models and their applicable DTCs, refer to the workshop manuals concerned.

DIAGNOSTIC TROUBLE CODES TABLE
(95MY AND 96MY GROUP 1 [EXCEPT 626/MX-6 FS ATX AND B-SERIES])

DTC No.	Condition	MIL	DC/TC	Monitor item
P0100	Mass or volume airflow circuit malfunction	Illuminate	1DC	CCM
P0105	Manifold absolute pressure/Barometric pressure circuit malfunction	Illuminate	1DC	CCM
P0110	Intake air temperature circuit malfunction	Illuminate	1DC	CCM
P0115	Engine coolant temperature circuit malfunction	Illuminate	1DC	CCM
P0120	Throttle position circuit malfunction	Illuminate	1DC	CCM
P0125	Excessive time to enter closed loop fuel control	Illuminate	2DC	CCM
P0130	Front RH O2 sensor circuit malfunction	Illuminate	2TC	O2 sensor
P0134	Front RH O2 sensor circuit no activity detected	Illuminate	2DC	CCM
P0135	Front RH O2 sensor heater circuit malfunction	Illuminate	2TC	O2 sensor heater
P0140	Rear RH/Middle O2 sensor circuit no activity detected	Illuminate	2DC	CCM
P0150	Front LH O2 sensor circuit malfunction	Illuminate	2TC	O2 sensor
P0154	Front LH O2 sensor circuit no activity detected	Illuminate	2DC	CCM
P0155	Front LH O2 sensor heater circuit malfunction	Illuminate	2TC	O2 sensor heater
P0160	Rear LH O2 sensor circuit no activity detected	Illuminate	2DC	CCM
P0170	Fuel trim/Right bank fuel trim malfunction	Illuminate	2DC	Fuel
P0173	Left bank fuel trim malfunction	Illuminate	2DC	Fuel
P0300	Random misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0301	Cylinder 1 misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0302	Cylinder 2 misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0303	Cylinder 3 misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0304	Cylinder 4 misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0305	Cylinder 5 misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0306	Cylinder 6 misfire detected	Flashing or Illuminate	1DC or 2DC	Misfire
P0325	Knock sensor 1 circuit malfunction	Illuminate	1DC	CCM
P0335	Crankshaft position sensor circuit malfunction	Illuminate	1DC	CCM
P0340	Camshaft position sensor circuit malfunction	Illuminate	1DC	CCM
P0400	Exhaust gas recirculation flow malfunction	Illuminate	2TC	EGR
P0420	Catalyst system/Right bank Catalyst system efficiency below threshold	Illuminate	2TC	Catalyst
P0430	Left bank Catalyst system efficiency below threshold	Illuminate	2TC	Catalyst
P0440	Evaporative emission control system malfunction (Flow check)	Illuminate	2DC	CCM
	Evaporative emission control system malfunction (Leak check)	Illuminate	2TC	Evaporative
P0443	Evaporative emission control system purge control valve circuit malfunction(Equip flow check)	Illuminate	2DC	CCM
	Evaporative emission control system purge control valve circuit malfunction(Equip leak check)	No illuminate	1DC	Other

DTC No.	Condition	MIL	DC/TC	Monitor item
P0450	Evaporative emission control system pressure sensor malfunction	Illuminate	2DC	CCM
P0470	Exhaust pressure sensor malfunction	Illuminate	2DC	CCM
P0500	Vehicle speed sensor malfunction	Illuminate	2DC	CCM
P0505	Idle control system malfunction	Illuminate	2DC	CCM
P0510	Closed throttle position switch malfunction	Illuminate	2DC	CCM
P0703	Brake switch input malfunction	Illuminate	2DC	CCM
P0705	Transmission range sensor circuit malfunction	Illuminate	1DC	CCM
P0710	Transmission fluid temperature sensor circuit malfunction	Illuminate	1DC	CCM
P0715	Input/turbine speed sensor circuit malfunction	Illuminate	1DC	CCM
P0720	Output speed sensor circuit malfunction	Illuminate	1DC	CCM
P0725	Engine speed input circuit malfunction	Illuminate	1DC	CCM
P0731	Gear 1 incorrect ratio (MX-5 miata)	Illuminate	2DC	CCM
	Gear 1 incorrect ratio (Except MX-5 miata)	Illuminate	1DC	CCM
P0732	Gear 2 incorrect ratio (MX-5 miata)	Illuminate	2DC	CCM
	Gear 2 incorrect ratio (Except MX-5 miata)	Illuminate	1DC	CCM
P0733	Gear 3 incorrect ratio (MX-5 miata)	Illuminate	2DC	CCM
	Gear 3 incorrect ratio (Except MX-5 miata)	Illuminate	1DC	CCM
P0734	Gear 4 incorrect ratio (MX-5 miata)	Illuminate	2DC	CCM
	Gear 4 incorrect ratio (Except MX-5 miata)	Illuminate	1DC	CCM
P0740	Torque converter clutch system malfunction (millenia KJ, MPV, MX-5 miata)	Illuminate	2DC	CCM
	Torque converter clutch system malfunction (Except millenia KJ, MPV, MX-5 miata)	Illuminate	1DC	CCM
P0745	Pressure control solenoid malfunction	No illuminate	1DC	Other
P0750	Shift solenoid A malfunction (millenia KJ, MPV)	Illuminate	2DC	CCM
	Shift solenoid A malfunction (Except millenia KJ, MPV)	Illuminate	1DC	CCM
P0755	Shift solenoid B malfunction (millenia KJ, MPV)	Illuminate	2DC	CCM
	Shift solenoid B malfunction (Except millenia KJ, MPV)	Illuminate	1DC	CCM
P0760	Shift solenoid C malfunction	Illuminate	1DC	CCM
P1000	Check of all OBD II system is not complete since last memory clear	No illuminate	–	–
P1110	Intake air temperature sensor (Dynamic chamber) open or short	Illuminate	1DC	CCM
P1113	Intake air temperature sensor (Lysholm compressor) open or short	Illuminate	1DC	CCM
P1170	Heated oxygen sensor (Front/Front RH) (Inversion)	Illuminate	2DC	CCM
P1173	Heated oxygen sensor (Front LH) (Inversion)	Illuminate	2DC	CCM
P1195	EGR boost sensor or barometric pressure circuit open or short	Illuminate	1DC	CCM
P1196	Ignition switch (Start) open or short	Illuminate	2DC	CCM
P1250	PRC solenoid valve open or short	No illuminate	1DC	Other
P1252	PRC solenoid valve No.2 open or short	No illuminate	1DC	Other
P1345	No SGC signal	Illuminate	1DC	CCM
P1402	EGR valve position sensor open or short	Illuminate	1DC	CCM
P1449	Canister drain cut valve (CDCV) open or short	No illuminate	1DC	Other
P1455	Fuel gauge sender unit circuit malfunction	Illuminate	2DC	CCM
P1485	EGR solenoid valve (vacuum) open or short	No illuminate	1DC	Other
P1486	EGR solenoid valve (vent) open or short	No illuminate	1DC	Other
P1487	EGR boost sensor solenoid valve open or short	No illuminate	1DC	Other

DTC No.	Condition	MIL	DC/TC	Monitor item
P1508	Bypass air solenoid valve No.1 open or short	Illuminate	2DC	CCM
P1509	Bypass air solenoid valve No.2 open or short	Illuminate	2DC	CCM
P1521	VRIS solenoid valve No.1 open or short (95MY)	Illuminate	2DC	CCM
	VRIS solenoid valve No.1 open or short (96MY)	No illuminate	1DC	Other
P1522	VRIS solenoid valve No.2 open or short (95MY)	Illuminate	2DC	CCM
	VRIS solenoid valve No.2 open or short (96MY)	No illuminate	1DC	Other
P1523	VICS solenoid valve open or short (95MY)	Illuminate	2DC	CCM
	VICS solenoid valve open or short (96MY)	No illuminate	1DC	Other
P1524	Charge air cooler bypass solenoid valve circuit open or short	No illuminate	1DC	Other
P1525	ABV solenoid valve (vent) open or short	Illuminate	2DC	CCM
P1526	ABV solenoid valve (vacuum) open or short	Illuminate	2DC	CCM
P1540	ABV control system malfunction	Illuminate	2DC	CCM
P1601	Communication line error (ECM-TCM) (95MY)	Illuminate	2DC	CCM
	Communication line error (ECM-TCM) (96MY)	No illuminate	1DC	Other
P1608	ECM (PCM) malfunction (CPU)	No illuminate	1DC	Other
P1609	ECM (PCM) malfunction (CPU)	No illuminate	1DC	Other
P1627	ECM-ABS/TCS control unit line communication error	No illuminate	1DC	Other
P1628	ECM-ABS/TCS control unit line (ABS) communication error	No illuminate	1DC	Other
P1720	Vehicle speedometer sensor circuit open or short (MX-5 miata)	Illuminate	2DC	CCM
	Vehicle speedometer sensor circuit open or short (Except MX-5 miata)	Illuminate	1DC	CCM
P1743	Torque converter clutch control solenoid valve	Illuminate	1DC	CCM
P1744	Torque converter clutch solenoid valve	Illuminate	1DC	CCM
P1765	3–2 timing solenoid valve	No illuminate	1DC	Other
P1770	Overrunning clutch solenoid valve open or short (millenia KJ, MPV, MX-5 miata)	Illuminate	2DC	CCM
	Overrunning clutch solenoid valve open or short (Except millenia KJ, MPV, MX-5 miata)	Illuminate	1DC	CCM
P1775	Reduce torque signal 1 open or short (95MY)	Illuminate	1DC	CCM
	Reduce torque signal 1 open or short (96MY)	No illuminate	1DC	Other
P1776	Reduce torque signal 2 open or short (95MY)	Illuminate	1DC	CCM
	Reduce torque signal 2 open or short (96MY)	No illuminate	1DC	Other
P1790	Throttle position sensor open or short	Illuminate	1DC	CCM
P1792	Barometric pressure signal circuit malfunction	Illuminate	1DC	CCM
P1794	Battery or circuit malfunction	Illuminate	1DC	CCM
P1797	P or N range or neutral/clutch switch signal open or short	Illuminate	2DC	CCM

DIAGNOSTIC TROUBLE CODES TABLE
(96MY GROUP 2 AND 97MY [EXCEPT 626/MX-6 FS ATX AND B-SERIES])

DTC No.	Condition	MIL	DC	Monitor item
P0100	Mass or volume airflow circuit malfunction	Illuminate	1	CCM
P0105	Manifold absolute pressure/Barometric pressure circuit malfunction	Illuminate	1	CCM
P0110	Intake air temperature circuit malfunction	Illuminate	1	CCM
P0115	Engine coolant temperature circuit malfunction	Illuminate	1	CCM
P0120	Throttle position circuit malfunction	Illuminate	1	CCM
P0125	Excessive time to enter closed loop fuel control	Illuminate	2	CCM
P0130	Front RH O2 sensor circuit malfunction	Illuminate	2	O2 sensor
P0134	Front RH O2 sensor circuit no activity detected	Illuminate	2	CCM
P0135	Front RH O2 sensor heater circuit malfunction	Illuminate	2	O2 sensor heater
P0136	Middle O2 sensor circuit malfunction	Illuminate	2	O2 sensor
P0140	Rear RH/Middle O2 sensor circuit no activity detected	Illuminate	2	CCM
P0141	Rear RH/Middle O2 sensor heater circuit malfunction	Illuminate	2	O2 sensor heater
P0146	Rear O2 sensor circuit no activity detected	Illuminate	2	CCM
P0147	Rear O2 sensor heater circuit malfunction	Illuminate	2	O2 sensor heater
P0150	Front LH O2 sensor circuit malfunction	Illuminate	2	O2 sensor
P0154	Front LH O2 sensor circuit no activity detected	Illuminate	2	CCM
P0155	Front LH O2 sensor heater circuit malfunction	Illuminate	2	O2 sensor heater
P0160	Rear LH O2 sensor circuit no activity detected	Illuminate	2	CCM
P0161	Rear LH O2 sensor heater circuit malfunction	Illuminate	2	O2 sensor heater
P0170	Fuel trim/Right bank fuel trim malfunction	Illuminate	2	Fuel
P0173	Left bank fuel trim malfunction	Illuminate	2	Fuel
P0300	Random misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0301	Cylinder 1 misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0302	Cylinder 2 misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0303	Cylinder 3 misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0304	Cylinder 4 misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0305	Cylinder 5 misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0306	Cylinder 6 misfire detected	Flashing or Illuminate	1 or 2	Misfire
P0325	Knock sensor 1 circuit malfunction	Illuminate	1	CCM
P0335	Crankshaft position sensor circuit malfunction	Illuminate	1	CCM
P0340	Camshaft position sensor circuit malfunction	Illuminate	1	CCM
P0400	Exhaust gas recirculation flow malfunction	Illuminate	2	EGR
P0404	Exhaust gas recirculation circuit range/performance	Illuminate	2	CCM
P0420	Catalyst system/Right bank Catalyst system efficiency below threshold	Illuminate	2	Catalyst
P0430	Left bank Catalyst system efficiency below threshold	Illuminate	2	Catalyst
P0440	Evaporative emission control system malfunction (Leak check) (96MY)	Illuminate	2	Evaporative
	Evaporative emission control system malfunction (Flow check) (96MY)	Illuminate	2	CCM

DTC No.	Condition	MIL	DC	Monitor item
P0441	Evaporative emission control system malfunction (Flow check) (97MY–)	Illuminate	2	CCM
P0442	Evaporative emission control system malfunction (Leak check) (97MY–)	Illuminate	2	Evaporative
P0443	Evaporative emission control system purge control valve circuit malfunction (Equip flow check)	Illuminate	2	CCM
	Evaporative emission control system purge control valve circuit malfunction (Equip leak check)	No illuminate	1	Other
P0446	Evaporative emission control system malfunction (vent control malfunction)	Illuminate	2	CCM
P0450	Evaporative emission control system pressure sensor malfunction	Illuminate	2	CCM
P0455	Evaporative emission control system malfunction (con. leak detected) (97MY–)	Illuminate	2	Evaporative
P0470	Exhaust pressure sensor malfunction	Illuminate	2	CCM
P0500	Vehicle speed sensor malfunction	Illuminate	2	CCM
P0505	Idle control system malfunction	Illuminate	2	CCM
P0510	Closed throttle position switch malfunction	Illuminate	2	CCM
P0703	Brake switch input malfunction	Illuminate	2	CCM
P0705	Transmission range sensor circuit malfunction	Illuminate	1	CCM
P0706	Transmission range sensor circuit malfunction (Open circuit) (millenia KJ, MPV, MX-5 miata)	Illuminate	2	CCM
	Transmission range sensor circuit malfunction (Open circuit) (Except millenia KJ, MPV, MX-5 miata)	Illuminate	1	CCM
P0710	Transmission fluid temperature sensor circuit malfunction	Illuminate	1	CCM
P0711	Transmission fluid temperature sensor circuit malfunction (stuck) (millenia KJ, MPV, MX-5 miata)	Illuminate	2	CCM
	Transmission fluid temperature sensor circuit malfunction (stuck) (Except millenia KJ, MPV, MX-5 miata)	Illuminate	1	CCM
P0715	Input/turbine speed sensor circuit malfunction	Illuminate	1	CCM
P0720	Output speed sensor circuit malfunction	Illuminate	1	CCM
P0725	Engine speed input circuit malfunction	Illuminate	1	CCM
P0731	Gear 1 incorrect ratio (MX-5 miata)	Illuminate	2	CCM
	Gear 1 incorrect ratio (Except MX-5 miata)	Illuminate	1	CCM
P0732	Gear 2 incorrect ratio (MX-5 miata)	Illuminate	2	CCM
	Gear 2 incorrect ratio (Except MX-5 miata)	Illuminate	1	CCM
P0733	Gear 3 incorrect ratio (MX-5 miata)	Illuminate	2	CCM
	Gear 3 incorrect ratio (Except MX-5 miata)	Illuminate	1	CCM
P0734	Gear 4 incorrect ratio (MX-5 miata)	Illuminate	2	CCM
	Gear 4 incorrect ratio (Except MX-5 miata)	Illuminate	1	CCM
P0740	Torque converter clutch system malfunction (millenia KJ, MPV, MX-5 miata)	Illuminate	2	CCM
	Torque converter clutch system malfunction (Except millenia KJ, MPV, MX-5 miata)	Illuminate	1	CCM
P0745	Pressure control solenoid malfunction	No illuminate	1	Other
P0750	Shift solenoid A malfunction (millenia KJ, MPV)	Illuminate	2	CCM
	Shift solenoid A malfunction (Except millenia KJ, MPV)	Illuminate	1	CCM
P0755	Shift solenoid B malfunction (millenia KJ, MPV)	Illuminate	2	CCM
	Shift solenoid B malfunction (Except millenia KJ, MPV)	Illuminate	1	CCM
P0760	Shift solenoid C malfunction	Illuminate	1	CCM

DTC No.	Condition	MIL	DC	Monitor item
P1110	Intake air temperature sensor (Dynamic chamber) open or short	Illuminate	1	CCM
P1113	Intake air temperature sensor (Lysholm compressor) open or short	Illuminate	1	CCM
P1169	Heated oxygen sensor (middle) (Inversion)	Illuminate	2	CCM
P1170	Heated oxygen sensor (Front/Front RH) (Inversion)	Illuminate	2	CCM
P1173	Heated oxygen sensor (Front LH) (Inversion)	Illuminate	2	CCM
P1195	EGR boost sensor or barometric pressure circuit open or short	Illuminate	1	CCM
P1196	Ignition switch (Start) open or short	Illuminate	2	CCM
P1250	PRC solenoid valve open or short	No illuminate	1	Other
P1252	PRC solenoid valve No.2 open or short	No illuminate	1	Other
P1345	No SGC signal	Illuminate	1	CCM
P1402	EGR valve position sensor open or short	Illuminate	1	CCM
P1449	Canister drain cut valve (CDCV) open or short	No illuminate	1	Other
P1450	Evaporative emission control system malfunction	Illuminate	2	CCM
P1455	Fuel gauge sender unit circuit malfunction	Illuminate	2	CCM
P1485	EGR solenoid valve (vacuum) open or short	No illuminate	1	Other
P1486	EGR solenoid valve (vent) open or short	No illuminate	1	Other
P1487	EGR boost sensor solenoid valve open or short	No illuminate	1	Other
P1496	EGR valve motor coil 1 open or short	No illuminate	1	Other
P1497	EGR valve motor coil 2 open or short	No illuminate	1	Other
P1498	EGR valve motor coil 3 open or short	No illuminate	1	Other
P1499	EGR valve motor coil 4 open or short	No illuminate	1	Other
P1508	Bypass air solenoid valve No.1 open or short	Illuminate	2	CCM
P1509	Bypass air solenoid valve No.2 open or short	Illuminate	2	CCM
P1521	VRIS solenoid valve No.1 open or short	No illuminate	1	Other
P1522	VRIS solenoid valve No.2 open or short	No illuminate	1	Other
P1523	VICS solenoid valve open or short	No illuminate	1	Other
P1524	Charge air cooler bypass solenoid valve circuit open or short	No illuminate	1	Other
P1525	ABV solenoid valve (vent) open or short	Illuminate	2	CCM
P1526	ABV solenoid valve (vacuum) open or short	Illuminate	2	CCM
P1527	AWS control system malfunction	Illuminate	2	CCM
P1540	ABV control system malfunction	Illuminate	2	CCM
P1601	Communication line error (ECM–TCM)	No illuminate	1	Other
P1608	ECM (PCM) malfunction (CPU)	No illuminate	1	Other
P1609	ECM (PCM) malfunction (CPU)	No illuminate	1	Other
P1627	ECM–ABS/TCS control unit line communication error	No illuminate	1	Other
P1628	ECM–ABS/TCS control unit line (ABS) communication error	No illuminate	1	Other
P1631	Generator output voltage signal no electricity	No illuminate	1	Other
P1632	Battery voltage monitor signal circuit malfunction	No illuminate	1	Other
P1633	Battery overcharge	No illuminate	1	Other
P1634	Generator terminal B circuit open	No illuminate	1	Other
P1720	Vehicle speedometer sensor circuit open or short (MX-5 miata)	Illuminate	2	CCM
	Vehicle speedometer sensor circuit open or short (Except MX-5 miata)	Illuminate	1	CCM
P1743	Torque converter clutch control solenoid valve	Illuminate	1	CCM
P1744	Torque converter clutch solenoid valve	Illuminate	1	CCM
P1765	3–2 timing solenoid valve	No illuminate	1	Other

DTC No.	Condition	MIL	DC	Monitor item
P1770	Overrunning clutch solenoid valve open or short (millenia KJ, MPV)	Illuminate	2	CCM
	Overrunning clutch solenoid valve open or short (Except millenia KJ, MPV)	Illuminate	1	CCM
P1775	Reduce torque signal 1 open or short	No illuminate	1	Other
P1776	Reduce torque signal 2 open or short	No illuminate	1	Other
P1790	Throttle position sensor open or short	Illuminate	1	CCM
P1792	Barometric pressure signal circuit malfunction	Illuminate	1	CCM
P1794	Battery or circuit malfunction	Illuminate	1	CCM
P1795	Closed throttle position switch malfunction	Illuminate	2	CCM
P1797	P or N range or neutral/clutch switch signal open or short	Illuminate	2	CCM

DIAGNOSTIC TROBLE CODES TABLE (626/MX-6 FS ATX)

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P0102	Mass air flow sensor	Circuit low input	Illuminate	2	CCM
P0103	Mass air flow sensor	Circuit high input	Illuminate	2	CCM
P0106	EGR/BARO sensor	Input signal out of self-test range	Illuminate	2	CCM
P0107	EGR/BARO sensor	Input signal less than self-test minimum	Illuminate	2	CCM
P0108	EGR/BARO sensor	Input signal greater than self-test maximum	Illuminate	2	CCM
P0112	Intake air temperature sensor	Circuit low input	Illuminate	2	CCM
P0113	Intake air temperature sensor	Circuit high input	Illuminate	2	CCM
P0117	Engine coolant temperature sensor	Circuit low input	Illuminate	2	CCM
P0118	Engine coolant temperature sensor	Circuit high input	Illuminate	2	CCM
P0121	Throttle position sensor	In-range operating circuit failure	No Illuminate	2	CCM
P0122	Throttle position sensor	Circuit low input	Illuminate	2	CCM
P0123	Throttle position sensor	Circuit high input	Illuminate	2	CCM
P0125	Engine coolant temperature sensor	Insufficient coolant temperature to enter a closed loop fuel control	Illuminate	2	CCM
P0131	Upstream heated oxygen sensor	Circuit low voltage	Illuminate	2	O2 sensor
P0133	Upstream heated oxygen sensor	Circuit low response	Illuminate	2	O2 sensor
P0135	Upstream heated oxygen sensor heater	Circuit malfunction	Illuminate	2	O2 sensor heater
P0136	Downstream heated oxygen	Circuit malfunction	Illuminate	2	O2 sensor

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P0505	Idle air control system	System malfunction	No Illuminate	2	CCM
P0603	Powertrain control module	Keep alive memory (KAM) test error	No Illuminate	2	CCM
P0605	Powertrain control module	Read only memory (ROM) test error	No Illuminate	2	CCM
P0707	TR switch	TR out of range shorted circuit or sensor	Illuminate	2	CCM
P0708	TR switch	TR circuit high or open	Illuminate	2	CCM
P0712	TFT sensor	150 °C {302 °F} indicates TFT sensor circuit grounded	No Illuminate	2	CCM
P0713	TFT sensor	–40 °C {–40 °F} indicates TFT sensor circuit open	No Illuminate	2	CCM
P0715	TSS sensor	Insufficient input from TSS sensor	Illuminate	2	CCM
P0731	SS1,SS2 or internal parts	Incorrect 1GR ratio	No Illuminate	2	CCM
P0732	SS1,SS2 or internal parts	Incorrect 2GR ratio	No Illuminate	2	CCM
P0733	SS1,SS2 or internal parts	Incorrect 3GR ratio	No Illuminate	2	CCM
P0734	SS1,SS2 or internal parts	Incorrect 4GR ratio	No Illuminate	2	CCM
P0741	TCC solenoid	TCC control engagement error	No Illuminate	2	CCM
P0743	TCC solenoid	TCC solenoid circuit failure during self-test	Illuminate	2	CCM
P0750	SS1	SS1 circuit failure	Illuminate	2	CCM
P0751	SS1	SS1 hydraulic/mechanical malfunction	Illuminate	2	CCM
P0755	SS2	SS2 circuit failure	Illuminate	2	CCM
P0756	SS2	SS2 hydraulic/mechanical malfunction	Illuminate	2	CCM
P1000	OBD-II Drive cycle	OBD-II monitor testing not complete (96MY Group-1 only)	No Illuminate	–	–
P1001	Active self-test	Standard corporate protocol communication error	No Illuminate	–	–
P1100	Mass air flow sensor	Sensor intermittent	No Illuminate	4	CCM
P1101	Mass air flow sensor	Input signal out of self-test range	No Illuminate	2	CCM
P1112	Intake air temperature sensor	Sensor intermittent	No Illuminate	4	CCM
P1116	Engine coolant temperature sensor	Input signal out of self-test range	No Illuminate	2	CCM
P1117	Engine coolant temperature sensor	Sensor intermittent	No Illuminate	4	CCM
P1120	Throttle position sensor	Out of range low	Illuminate	2	CCM
P1121	Throttle position sensor	Input signal inconsistent with MAF sensor	Illuminate	2	CCM
P1124	Throttle position sensor	Input signal out of self-test range	No Illuminate	2	CCM
P1125	Throttle position sensor	Circuit intermittent	No Illuminate	4	CCM
P1127	Heated oxygen sensor heater	Exhaust system too cool	No Illuminate	2	O2 sensor heater
P1130	Upstream heated oxygen sensor	Lack of H02S 11 switch adaptive fuel at limit	Illuminate	2	O2 sensor
P1131	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates lean	Illuminate	2	O2 sensor
P1132	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates rich	Illuminate	2	O2 sensor

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P1137	Downstream heated oxygen sensor	Lack of HO2S 12 switch sensor indicates lean	No illuminate	2	O2 sensor
P1138	Downstream heated oxygen sensor	Lack of HO2S 12 switch sensor indicates rich	No illuminate	2	O2 sensor
P1250	Fuel pressure regulator control solenoid valve	Circuit malfunction	No illuminate	2	CCM
P1400	EGR valve position sensor	Circuit low voltage detected	Illuminate	2	EGR
P1401	EGR valve position sensor	Circuit high voltage detected	Illuminate	2	EGR
P1407	Exhaust Gas Recircuration (EGR) system	No flow detected (valve stuck closed or inoperative)	Illuminate	2	EGR
P1408	Exhaust Gas Recircuration (EGR) system	Flow out of self-test range	No illuminate	2	EGR
P1410	Exhaust Gas Recircuration (EGR) system	Solenoid/Sensor freeze test	No illuminate	3	EGR
P1460	Wide open throttle air conditioning cutoff	Circuit malfunction	No illuminate	2	CCM
P1464	Air conditioner (A/C)	Demand out of self-test range	No illuminate	2	CCM
P1474	Fan control system	Fan control primary circuit malfunction	No illuminate	2	CCM
P1487	EGR boost solenoid valve	Circuit malfunction	No illuminate	2	EGR
P1500	Vehicle speed sensor	Circuit intermittent	No illuminate	4	CCM
P1501	Vehicle speed sensor	Input signal out of self-test range	No illuminate	2	CCM
P1504	Idle air control (IAC) system	Circuit intermittent	Illuminate	2	CCM
P1506	Idle air control (IAC) system	Overspeed error	Illuminate	2	CCM
P1507	Idle air control (IAC) system	Underspeed error	Illuminate	2	CCM
P1650	Power steering pressure sensor	Out of self-test range	No illuminate	2	CCM
P1703	Brake switch	Out of self-test range	No illuminate	2	CCM
P1705	TR switch	TR not in PARK	No illuminate	2	CCM
P1711	TFT sensor	ATF is not at operating temperature during self-test	No illuminate	2	CCM
P1742	TCC solenoid	TCC solenoid failed on (MIL turned on)	Illuminate	2	CCM
P1743	TCC solenoid	TCC solenoid failed on (TCIL turned on)	No illuminate	2	CCM
P1744	TCC solenoid	TCC system malfunction (stuck off)	Illuminate	2	CCM
P1746	EPC solenoid	Open PCM output driver	No illuminate	2	CCM
P1747	EPC solenoid	EPC solenoid circuit failure, shorted to ground or open	Illuminate	2	CCM
P1751	SS1	SS1 circuit failure	No illuminate	2	CCM
P1756	SS2	SS2 electrical malfunction	No illuminate	2	CCM
P1780	O/D OFF switch	O/D OFF switch not cycled during self-test	No illuminate	2	CCM
P1783	TFT sensor	ATF temperature exceed 132°C {270°F}	No illuminate	2	CCM
P1788	3–2T/CCS	Circuit open or PCM drive circuit failure during self-test	No illuminate	2	CCM
P1789	3–2T/CCS	Circuit shorted during self-test	No illuminate	2	CCM

DIAGNOSTIC TROBLE CODES TABLE (B-Series)

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P0102	Mass air flow sensor	Circuit low input	Illuminate	2	CCM
P0103	Mass air flow sensor	Circuit high input	Illuminate	2	CCM
P0112	Intake air temperature sensor	Circuit low input	Illuminate	2	CCM
P0113	Intake air temperature sensor	Circuit high input	Illuminate	2	CCM
P0117	Engine coolant temperature sensor	Circuit low input	Illuminate	2	CCM
P0118	Engine coolant temperature sensor	Circuit high input	Illuminate	2	CCM
P0121	Throttle position sensor	In-range operating circuit failure	Illuminate	2	CCM
P0122	Throttle position sensor	Circuit low input	Illuminate	2	CCM
P0123	Throttle position sensor	Circuit high input	Illuminate	2	CCM
	Engine coolant temperature	Insufficient coolant tempera-			

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P0305	Ignition	Cylinder No.5 misfire detected	Illuminate	1 or 2	Misfire
P0306	Ignition	Cylinder No.6 misfire detected	Illuminate	1 or 2	Misfire
P0320	Ignition engine speed	Input circuit malfunction	Illuminate	2	CCM
P0340	Camshaft position sensor	Circuit malfunction (CID)	Illuminate	2	CCM
P0350	Ignition coil	Primary circuit malfunction	Illuminate	2	CCM
P0351	Ignition coil A	Primary circuit malfunction	Illuminate	2	CCM
P0352	Ignition coil B	Primary circuit malfunction	Illuminate	2	CCM
P0353	Ignition coil C	Primary circuit malfunction	Illuminate	2	CCM
P0400	Exhaust gas recirculation (EGR) system	Flow malfunction	Illuminate	2	EGR
P0401	Exhaust gas recirculation (EGR) system	Flow insufficient detected	Illuminate	2	EGR
P0402	Exhaust gas recirculation (EGR) system	Flow excess detected	Illuminate	2	EGR
P0420	Catalyst system	Efficiency below threshold	Illuminate	3	Catalyst
P0443	Evaporative emission control system	Purge control solenoid or valve circuit malfunction	Illuminate	2	CCM
P0500	Vehicle speed sensor	Sensor malfunction	Illuminate	2	CCM
P0503	Vehicle speed sensor	Circuit intermittent	No illuminate	4	CCM
P0505	Idle air control system	System malfunction	No illuminate	2	CCM
P0603	Powertrain control module	Keep Alive Memory (KAM) test error	No illuminate	2	CCM
P0605	Powertrain control module	Read Only Memory (ROM) test	No illuminate	2	CCM

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P0781	Transmission solenoid malfunction	1 to 2 shift error	No illuminate	2	CCM
P0782	Transmission solenoid malfunction	2 to 3 shift error	No illuminate	2	CCM
P0783	Transmission solenoid malfunction	3 to 4 shift error	No illuminate	2	CCM
P0784	Transmission solenoid malfunction	4 to 5 shift error	No illuminate	2	CCM
P1000	OBD-II Drive cycle	OBD-II monitor testing not complete	No illuminate	–	–
P1001	Data link connector(DLC)	Key on engine running self-test not able to complete or aborted	No illuminate	–	–
P1100	Mass air flow sensor	Sensor intermittent	No illuminate	4	CCM
P1101	Mass air flow sensor	Input signal out of self-test range	No illuminate	2	CCM
P1112	Intake air temperature sensor	Sensor intermittent	No illuminate	4	CCM
P1116	Engine coolant temperature sensor	Input signal out of self-test range	No illuminate	2	CCM
P1117	Engine coolant temperature sensor	Sensor intermittent	No illuminate	4	CCM
P1120	Throttle position sensor	Out of range low	Illuminate	2	CCM
P1121	Throttle position sensor	Input signal inconsistent with MAF sensor	Illuminate	2	CCM
P1124	Throttle position sensor	Input signal out of self-test range	No illuminate	2	CCM
P1125	Throttle position sensor	Circuit intermittent	No illuminate	4	CCM
P1127	Heated oxygen sensor heater	Exhaust system too cool (Bank #1)	No illuminate	2	O2 sensor
P1128	Upstream heated oxygen sensor	Swapped from bank to bank	No illuminate	2	O2 sensor
P1130	Upstream heated oxygen sensor	Lack of HO2S 11 switch adaptive fuel at limit (Bank #1)	Illuminate	2	O2 sensor
P1131	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates lean (Bank #1)	Illuminate	2	O2 sensor
P1132	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates rich (Bank #1)	Illuminate	2	O2 sensor
P1137	Downstream heated oxygen sensor	Lack of HO2S 12 switch sensor indicates lean	Illuminate	2	O2 sensor
P1138	Downstream heated oxygen sensor	Lack of HO2S 12 switch sensor indicates rich	Illuminate	2	O2 sensor
P1150	Upstream heated oxygen sensor	Lack of HO2S 21 switch adaptive fuel at limit (Bank #2)	Illuminate	2	O2 sensor
P1151	Upstream heated oxygen sensor	Lack of HO2S 21 switch sensor indicates lean (Bank #2)	Illuminate	2	O2 sensor
P1152	Upstream heated oxygen sensor	Lack of HO2S 21 switch sensor indicates rich (Back #2)	Illuminate	2	O2 sensor
P1260	–	THEFT detected-engine disabled	No illuminate	2	CCM
P1270	Over revving condition	Engine RPM or vehicle speed limiter reached	No illuminate	2	CCM
P1351	Ignition diagnostic monitor circuit	Input malfunction	Illuminate	2	CCM
P1352	Ignition coil A	Primary circuit malfunction	Illuminate	2	CCM
P1353	Ignition coil B	Primary circuit malfunction	Illuminate	2	CCM

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor Item
P1354	Ignition coil C	Primary circuit malfunction	Illuminate	2	CCM
P1358	Ignition diagnostic monitor signal	Out of self-test range	No illuminate	2	CCM
P1359	Spark output	Circuit malfunction	Illuminate	2	CCM
P1360	Ignition coil A	Secondary circuit malfunction	No illuminate	2	CCM
P1361	Ignition coil B	Secondary circuit malfunction	No illuminate	2	CCM
P1362	Ignition coil C	Secondary circuit malfunction	No illuminate	2	CCM
P1364	Ignition coil	Primary circuit malfunction	Illuminate	2	CCM
P1365	Ignition coil	Secondary circuit malfunction	No illuminate	2	CCM
P1390	Octane adjust	Out of self-test range	No illuminate	2	CCM
P1400	Differential pressure feedback electronic sensor	Circuit low voltage detected	Illuminate	2	EGR
P1401	Differential pressure feedback electronic sensor	Circuit high voltage detected	Illuminate	2	EGR
P1403	Differential pressure feedback electronic sensor	Hoses reversed	Illuminate	2	CCM
P1405	Differential pressure feedback electronic sensor	Upstream hose off or plugged	Illuminate	2	EGR
P1406	Differential pressure feedback electronic sensor	Downstream hose off or plugged	Illuminate	2	CCM
P1407	Exhaust Gas Recircuration (EGR) system	No flow detected (valve stuck closed or inoperative)	Illuminate	2	CCM
P1408	Exhaust Gas Recircuration (EGR) system	Flow out of self-test range	No illuminate	2	EGR
P1409	Electronic vacuum regulator control	Circuit malfunction	Illuminate	2	EGR
P1443	Evaporative emission control system	Vacuum system, purge control solenoid or purge control valve malfunction	Illuminate	2	CCM
P1444	Purge flow sensor	Circuit low input	Illuminate	2	CCM
P1445	Purge flow sensor	Circuit high input	Illuminate	2	CCM
P1460	Wide open throttle air conditioning cutoff	Circuit malfunction	No illuminate	2	CCM
P1464	Air conditioner (A/C)	Demand out of self-test range	No illuminate	2	CCM
P1500	Vehicle speed sensor	Circuit intermittent	No illuminate	4	CCM
P1501	Vehicle speed sensor	Input signal out of self-test range	No illuminate	2	CCM
P1504	Idle air control (IAC) system	Circuit intermittent	No illuminate	4	CCM
P1505	Idle air control (IAC) system	System at adaptive clip	Illuminate	2	CCM
P1506	Idle air control (IAC) system	Over speed error	Illuminate	2	CCM
P1507	Idle air control (IAC) system	Under speed error	Illuminate	2	CCM
P1605	Powertrain control module (PCM)	Keep Alive Memory (KAM) test error	No illuminate	2	CCM
P1650	Power steering pressure sensor	Out of self-test range	No illuminate	2	CCM
P1651	Power steering pressure sensor	Input malfunction	No illuminate	2	CCM
P1701	Transmission solenoid malfunction	Reverse engagement error	No illuminate	2	CCM
P1703	Brake On/Off switch	Out of self-test range	No illuminate	2	CCM
P1705	TR switch	Out of self-test range	No illuminate	2	CCM
P1709	Park/Neutral position switch	Out of self-test range	No illuminate	2	CCM

DTC No.	Diagnosed Circuit	Condition	MIL	DC	Monitor item
P1711	TFT sensor	ATF is not at operating temperature during self-test	No illuminate	2	CCM
P1729	4x4 low switch	Switch error	No illuminate	2	CCM
P1741	TCC control	Control error	No illuminate	2	CCM
P1742	TCC solenoid	TCC solenoid failed on (MIL turned on)	Illuminate	2	CCM
P1743	TCC solenoid	TCC solenoid failed on (TCIL turned on)	No illuminate	2	CCM
P1744	TCC solenoid	TCC system malfunction (stuck off)	Illuminate	2	CCM
P1746	EPC solenoid	Open PCM output driver	No illuminate	2	CCM
P1747	EPC solenoid	EPC solenoid circuit failure, shorted to ground or open	Illuminate	2	CCM
P1749	EPC solenoid	Failed low	No illuminate	2	CCM
P1751	SS1	SS1 circuit failure	No illuminate	2	CCM
P1754	Coast clutch solenoid	Circuit malfunction	No illuminate	2	CCM
P1756	SS2	SS2 electrical malfunction	No illuminate	2	CCM
P1761	SS3	SS3 electrical malfunction	No illuminate	2	CCM
P1780	O/D OFF switch	O/D OFF switch not cycled during self-test	No illuminate	2	CCM
P1781	4x4 low switch	Out of self-test range	No illuminate	2	CCM
P1783	TFT sensor	Over temperature condition	No illuminate	2	CCM

2.5 Clearing/resetting emission-related malfunction information (Mode 04)

This mode is to delete the DTCs stored in the PCM memory by using the scan tool.
In the OBD-I vehicles, DTCs are deleted by disconnecting the battery cables to delete all data stored in the PCM. By disconnecting the battery, however, necessary data such as learning values of the mass air flow sensor and the throttle position sensor are also deleted.
To prevent this, in the OBD-II vehicles, DTC information is deleted by using the scan tool after the problem is repaired. When the DTC is deleted, the FFD, RFC, the diagnostic monitoring test result and the pending codes also are deleted.

2.6 Sending oxygen sensor monitor test results (Mode 05)

This mode stores the oxygen sensor monitor test value in the PCM memory and allows for the retrieval of the stored data by using the scan tool when necessary.
As for '96 MY vehicles, the threshold used for the oxygen sensor inversion detection stored in the PCM can be checked by using the scan tool.
In '97 MY vehicles, a similar function is used for sending the intermittent monitoring system monitor test results as described in 2.7.

2.7 Sending intermittent monitoring system monitor test results (Mode 06)

This mode applies to '97 MY and later model vehicles. This mode stores the numerical data used for the intermittent monitoring system monitor test results (measured value or calculated value) and the threshold in the PCM memory so that they can be used to determine whether the system is normal or not by using the scan tool.
The numerical data and threshold are called the diagnostic monitoring test results.
In the intermittent monitoring system, diagnosis is carried out only once during a drive cycle and is inhibited until the next drive cycle is entered.
Systems monitored by the intermittent monitoring system are catalyst, evaporative system, oxygen sensor, oxygen sensor heater, and EGR system.
As for oxygen sensor heater, however, numerical data used for the system judgment can not be stored in the PCM memory. Monitor test results are sent in the similar method as used for the continuous monitoring system described in 2.8.
As for list of monitor test results stored using this function, refer to the generic function of the NGS tester operation instruction.

2.8 Sending continuous monitoring system monitor test results (Mode 07)

This mode applies to '97 MY and later model vehicles.
When a problem is detected in a monitored system, and the MIL is illuminated when a problem is detected in two consecutive drive cycles, in the first drive cycle, the same code as of the failed system is stored in the PCM memory so that it can be retrieved by using the scan tool when necessary.
The code stored at the first malfunction detection is called the pending code.
In the continuous monitoring system, diagnosis is carried out constantly throughout a drive cycle whenever monitoring conditions are met.
The systems monitored by the continuous monitoring system are fuel system, misfire, and CCM.
If the problem was not found in the second drive cycle, the PCM judges that the system returned to normal or the problem was mistakenly detected, and deletes the pending code.
If the problem was found in the second drive cycle too, the PCM judges that the system is failed, deletes the pending code, and illuminates the MIL and stores the DTC.
The pending codes which apply to Mazda vehicles are as listed below.

PENDING CODES TABLE (EXCEPT 626/MX-6 FS ATX & B-Series)

DTC No.	Condition
P0125	Excessive time to enter closed loop fuel control
P0134	Front RH O2 sensor circuit no activity detected
P0135	Front RH O2 sensor heater circuit malfunction
P0140	Rear RH/Middle O2 sensor circuit no activity detected
P0141	Rear RH/Middle O2 sensor heater circuit malfunction
P0146	Rear O2 sensor circuit no activity detected
P0147	Rear O2 sensor heater circuit malfunction
P0154	Front LH O2 sensor circuit no activity detected
P0155	Front LH O2 sensor heater circuit malfunction
P0160	Rear LH O2 sensor circuit no activity detected
P0161	Rear LH O2 sensor heater circuit malfunction
P0170	Fuel trim/Right bank fuel trim malfunction
P0173	Left bank fuel trim malfunction
P0300	Random misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0305	Cylinder 5 misfire detected
P0306	Cylinder 6 misfire detected
P0404	Exhaust gas recirculation circuit range/performance
P0441	Evaporative emission control system malfunction
P0443	Evaporative emission control system purge control valve circuit malfunction
P0446	Evaporative emission control system malfunction (vent control malfunction)
P0450	Evaporative emission control system pressure sensor malfunction
P0470	Exhaust pressure sensor malfunction
P0500	Vehicle speed sensor malfunction
P0505	Idle control system malfunction
P0510	Closed throttle position switch malfunction
P0703	Brake switch input malfunction
P0706	Transmission range sensor circuit malfunction (Open circuit)
P0711	Transmission fluid temperature sensor circuit malfunction (stuck)
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio

DTC No.	Condition
P0734	Gear 4 incorrect ratio
P0740	Torque converter clutch system malfunction
P0750	Shift solenoid A malfunction
P0755	Shift solenoid B malfunction
P1169	Heated oxygen sensor (middle) (Inversion)
P1170	Heated oxygen sensor (Front/Front RH) (Inversion)
P1173	Heated oxygen sensor (Front LH) (Inversion)
P1196	Ignition switch (Start) open or short
P1450	Evaporative emission control system malfunction
P1455	Fuel gauge sender unit circuit malfunction
P1508	Bypass air solenoid valve No.1 open or short
P1525	ABV solenoid valve (vent) open or short
P1526	ABV solenoid valve (vacuum) open or short
P1527	AWS control system malfunction
P1540	ABV control system malfunction
P1720	Vehicle speedometer sensor circuit open or short
P1770	Overrunning clutch solenoid valve open or short
P1795	Closed throttle position switch malfunction
P1797	P or N range or neutral/clutch switch signal open or short

PENDING CODES TABLE (626/MX-6 FS ATX)

DTC No.	Diagnosed Circuit	Condition
P0102	Mass air flow sensor	Circuit low input
P0103	Mass air flow sensor	Circuit high input
P0106	EGR/BARO sensor	Input signal out of self-test range
P0107	EGR/BARO sensor	Input signal less than self-test minimum
P0108	EGR/BARO sensor	Input signal greater than self-test maximum
P0112	Intake air temperature sensor	Circuit low input
P0113	Intake air temperature sensor	Circuit high input
P0117	Engine coolant temperature sensor	Circuit low input
P0118	Engine coolant temperature sensor	Circuit high input
P0122	Throttle position sensor	Circuit low input
P0123	Throttle position sensor	Circuit high input
P0125	Engine coolant temperature sensor	Insufficient coolant temperature to enter a closed loop fuel control
P0131	Upstream heated oxygen sensor	Circuit low voltage
P0133	Upstream heated oxygen sensor	Circuit low response
P0135	Upstream heated oxygen sensor heater	Circuit malfunction
P0136	Downstream heated oxygen sensor	Circuit malfunction
P0141	Downstream heated oxygen sensor heater	Circuit malfunction
P0171	Adaptive fuel control system	System too lean
P0172	Adaptive fuel control system	System too rich
P0300	Ignition	Random misfire detected
P0301	Ignition	Cylinder No.1 misfire detected
P0302	Ignition	Cylinder No.2 misfire detected
P0303	Ignition	Cylinder No.3 misfire detected
P0304	Ignition	Cylinder No.4 misfire detected
P0320	Ignition engine speed	Input circuit malfunction
P0340	Camshaft position sensor	Circuit malfunction (CID)
P0400	Exhaust gas recirculation (EGR)	Flow malfunction
P0421	Catalyst system	Efficiency below threshold
P0440	Evaporative emission control system	Purge control malfunction (96MY)
P0441	Evaporative emission control system	Purge control malfunction (97MY)
P0443	Evaporative emission control system	Purge control valve circuit malfunction
P0500	Vehicle speed sensor	Sensor malfunction
P0707	TR switch	TR out of range shorted circuit or sensor
P0708	TR switch	TR circuit high or open
P0715	TSS sensor	Insufficient input from TSS sensor
P0743	TCC solenoid	TCC solenoid circuit failure during self-test
P0750	SS1	SS1 circuit failure
P0751	SS1	SS1 hydraulic/mechanical malfunction
P0755	SS2	SS2 circuit failure
P0756	SS2	SS2 hydraulic/mechanical malfunction
P1120	Throttle position sensor	Out of range low
P1121	Throttle position sensor	Input signal inconsistent with MAF sensor
P1130	Upstream heated oxygen sensor	Lack of H02S 11 switch adaptive fuel at limit
P1131	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates lean
P1132	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates rich

DTC No.	Diagnosed Circuit	Condition
P1400	EGR valve position sensor	Circuit low voltage detected
P1401	EGR valve position sensor	Circuit high voltage detected
P1407	Exhaust Gas Recircuration (EGR) system	No flow detected (valve stuck closed or inoperative)
P1504	Idle air control (IAC) system	Circuit intermittent
P1506	Idle air control (IAC) system	Overspeed error
P1507	Idle air control (IAC) system	Underspeed error
P1742	TCC solenoid	TCC solenoid failed on (MIL turned on)
P1744	TCC solenoid	TCC system malfunction (stuck off)
P1747	EPC solenoid	EPC solenoid circuit failure, shorted to ground or open

PENDING CODES TABLE (B-Series)

DTC No.	Diagnosed Circuit	Condition
P0102	Mass air flow sensor	Circuit low input
P0103	Mass air flow sensor	Circuit high input
P0112	Intake air temperature sensor	Circuit low input
P0113	Intake air temperature sensor	Circuit high input
P0117	Engine coolant temperature sensor	Circuit low input
P0118	Engine coolant temperature sensor	Circuit high input
P0121	Throttle position sensor	In-range operating circuit failure
P0122	Throttle position sensor	Circuit low input
P0123	Throttle position sensor	Circuit high input
P0125	Engine coolant temperature sensor	Insufficient coolant temperature to enter a closed loop fuel control
P0126	Engine coolant temperature sensor	Insufficient coolant temperature for stable operation
P0131	Upstream heated oxygen sensor	Circuit low voltage (Bank #1)
P0132	Upstream heated oxygen sensor	Circuit high voltage (Bank #1)
P0133	Upstream heated oxygen sensor	Circuit low response (Bank #1)
P0135	Upstream heated oxygen sensor heater	Circuit malfunction (Bank #1)
P0136	Downstream heated oxygen sensor	Circuit malfunction (Bank #1)
P0138	Downstream heated oxygen sensor	Circuit high voltage (Bank #1)
P0141	Downstream heated oxygen sensor heater	Circuit malfunction (Bank #1)
P0151	Upstream heated oxygen sensor	Circuit low voltage (Bank #2)
P0152	Upstream heated oxygen sensor	Circuit high voltage (Bank #2)
P0153	Upstream heated oxygen sensor	Circuit low response (Bank #2)
P0155	Upstream heated oxygen sensor heater	Circuit malfunction (Bank #2)
P0171	Adaptive fuel control system	System too lean (Bank #1)
P0172	Adaptive fuel control system	System too rich (Bank #1)
P0174	Adaptive fuel control system	System too lean (Bank #2)
P0175	Adaptive fuel control system	System too rich (Bank #2)
P0300	Ignition	Random misfire detected
P0301	Ignition	Cylinder No.1 misfire detected
P0302	Ignition	Cylinder No.2 misfire detected
P0303	Ignition	Cylinder No.3 misfire detected
P0304	Ignition	Cylinder No.4 misfire detected
P0305	Ignition	Cylinder No.5 misfire detected
P0306	Ignition	Cylinder No.6 misfire detected
P0320	Ignition engine speed	Input circuit malfunction
P0340	Camshaft position sensor	Circuit malfunction (CID)
P0350	Ignition coil	Primary circuit malfunction
P0351	Ignition coil A	Primary circuit malfunction
P0352	Ignition coil B	Primary circuit malfunction
P0353	Ignition coil C	Primary circuit malfunction
P0400	Exhaust gas recirculation (EGR) system	Flow malfunction
P0401	Exhaust gas recirculation (EGR) system	Flow insufficient detected
P0402	Exhaust gas recirculation (EGR) system	Flow excess detected
P0420	Catalyst system	Efficiency below threshold
P0443	Evaporative emission control system	Purge control solenoid or valve circuit malfunction
P0500	Vehicle speed sensor	Sensor malfunction

DTC No.	Diagnosed Circuit	Condition
P0707	TR switch	Circuit low input
P0708	TR switch	Circuit high input
P0715	TSS sensor	Circuit malfunction
P0743	TCC solenoid	TCC solenoid circuit failure during self-test
P0750	SS1	SS1 circuit failure
P0751	SS1	SS1 hydraulic/mechanical malfunction
P0755	SS2	SS2 circuit failure
P0756	SS2	SS2 hydraulic/mechanical malfunction
P0760	SS3	SS3 circuit failure
P0761	SS3	SS3 hydraulic/mechanical malfunction
P1120	Throttle position sensor	Out of range low
P1121	Throttle position sensor	Input signal inconsistent with MAF sensor
P1130	Upstream heated oxygen sensor	Lack of HO2S 11 switch adaptive fuel at limit (Bank #1)
P1131	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates lean (Bank #1)
P1132	Upstream heated oxygen sensor	Lack of HO2S 11 switch sensor indicates rich (Bank #1)
P1137	Downstream heated oxygen sensor	Lack of HO2S 12 switch sensor indicates lean
P1138	Downstream heated oxygen sensor	Lack of HO2S 12 switch sensor indicates rich
P1150	Upstream heated oxygen sensor	Lack of HO2S 21 switch adaptive fuel at limit (Bank #2)
P1151	Upstream heated oxygen sensor	Lack of HO2S 21 switch sensor indicates lean (Bank #2)
P1152	Upstream heated oxygen sensor	Lack of HO2S 21 switch sensor indicates rich (Bank #2)
P1351	Ignition diagnostic monitor circuit	Input malfunction
P1352	Ignition coil A	Primary circuit malfunction
P1353	Ignition coil B	Primary circuit malfunction
P1354	Ignition coil C	Primary circuit malfunction
P1359	Spark output	Circuit malfunction
P1364	Ignition coil	Primary circuit malfunction
P1400	Differential pressure feedback electronic sensor	Circuit low voltage detected
P1401	Differential pressure feedback electronic sensor	Circuit high voltage detected
P1403	Differential pressure feedback electronic sensor	Hoses reversed
P1405	Differential pressure feedback electronic sensor	Upstream hose off or plugged
P1406	Differential pressure feedback electronic sensor	Downstream hose off or plugged
P1407	Exhaust Gas Recircuration (EGR) system	No flow detected (valve stuck closed or inoperative)
P1409	Electronic vacuum regulator control	Circuit malfunction
P1443	Evaporative emission control system	Vacuum system, purge control solenoid or purge control valve malfunction
P1444	Purge flow sensor	Circuit low input
P1445	Purge flow sensor	Circuit high input
P1505	Idle air control (IAC) system	System at adaptive clip
P1506	Idle air control (IAC) system	Overspeed error
P1507	Idle air control (IAC) system	Underspeed error
P1742	TCC solenoid	TCC solenoid failed on (MIL turned on)
P1744	TCC solenoid	TCC system malfunction (stuck off)
P1747	EPC solenoid	EPC solenoid circuit failure, shorted to ground or open

3. Monitoring system

3.1 Outline

Here describes the monitoring system, established to deal with OBD-II requirements, in each diagnosis item.

Monitoring items for Mazda vehicles are as follows.

1. Catalyst monitor
2. Misfire monitor
3. Evaporative system monitor
4. Fuel system monitor
5. Oxygen sensor monitor
6. Oxygen sensor heater monitor
7. EGR system monitor
8. Comprehensive component monitor (CCM)

3.2 Catalyst monitor

3.2.1 Outline

The catalyst monitor monitors the deterioration of the catalytic converter in which the exhaust gas is purged

3.2.2 Monitoring method

(1) '95 and '96 MY vehicles (Except 626/MX-6 FS ATX and B-Series)

The catalyst monitor compares the output voltages of the upstream side and the downstream side oxygen sensors to judge the deterioration of the catalytic converter. Thus, catalyst monitoring is carried out during feedback operation only.

Output voltages of the upstream oxygen sensor are integrated over a period of time, then compared to the downstream oxygen sensors integrated voltage for the same period(show in the figures below) to judge the condition of the catalytic converter.

When the catalytic converter is normal, it consumes oxygen to purge exhaust gas. As a result, the output voltage of the downstream side oxygen sensor stays on the rich side for a longer period of time (Fig. 2).

As the catalytic converter deteriorates, the period of time that the output voltage of the downstream side oxygen sensor stays on the rich side becomes shorter, and the period that the voltage stays on the lean side becomes longer accordingly (Fig. 3).

When monitoring conditions in 3.2.3 are satisfied, the PCM monitors the output voltages of the upstream side and downstream side oxygen sensors for a predetermined period, calculates the integrated voltage of each sensor, and judges if the ratio of these integrated voltages is within the threshold to determine if the converter is good or not.

If the ratio of integrated voltages exceeds the threshold in two consecutive trip cycles in '95 and '96 MY Group-1 and in two consecutive drive cycles in '96 MY Group-2 and '97 MY, the PCM judges that the catalytic converter is failed, illuminates the MIL and stores the DTC.

The DTCs associated with this monitor are DTCs P0420 and P0430.

Fig.2 Catalytic converter is normal

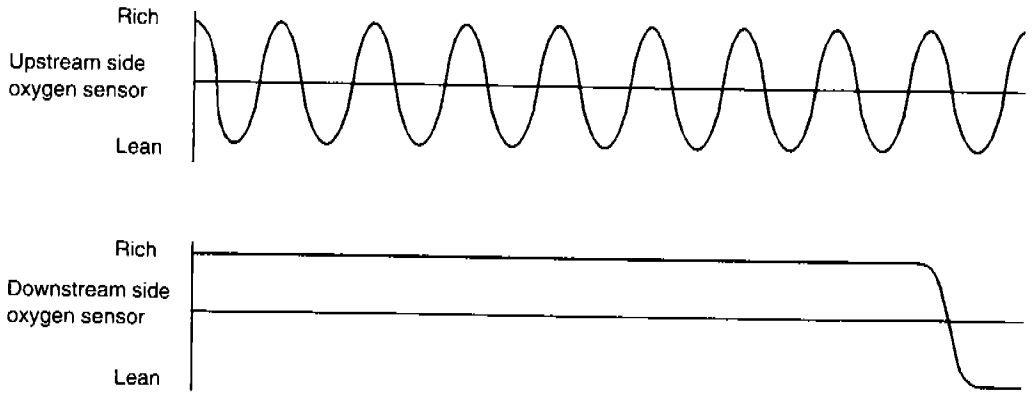
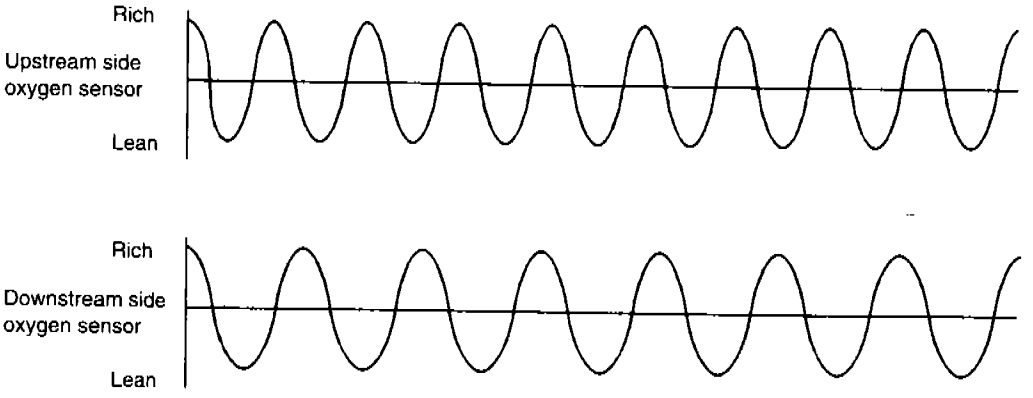


Fig.3 Catalytic converter deteriorates



(2) '97 MY vehicles (Except 626/MX-6 FS ATX & B-Series)
The catalyst monitor compares the output voltages of the upstream side and the downstream side oxygen sensors to judge the deterioration of the catalytic converter. Thus, catalyst monitoring is carried out during feedback operation only.
The number of inversions of the upstream side and the downstream side oxygen sensors are compared to judge the condition of the catalytic converter.
When the catalytic converter is normal, downstream side oxygen sensor inversions are far fewer than those of the upstream side oxygen sensor (Fig. 4).
As the catalytic converter deteriorates, downstream side oxygen sensor inversions increases and becomes closer to those of the upstream side oxygen sensor (Fig. 5).
When monitoring conditions in 3.2.3 are satisfied, the PCM monitors the number of inversions the downstream side oxygen sensor performs while the upstream side oxygen sensor inverts for a specified number of times, and judges if the inversion ratio is within the threshold to determine if the catalytic converter is good or not.
At this time, the inversion ratio is stored in the PCM memory.
If the inversion ratio exceeds the threshold in two consecutive drive cycles, the PCM judges that the catalytic converter is failed, and illuminates the MIL and stores the DTC.
The DTCs associated with this monitor are DTCs P0420 and P0430.

Fig.4 Catalytic converter is normal

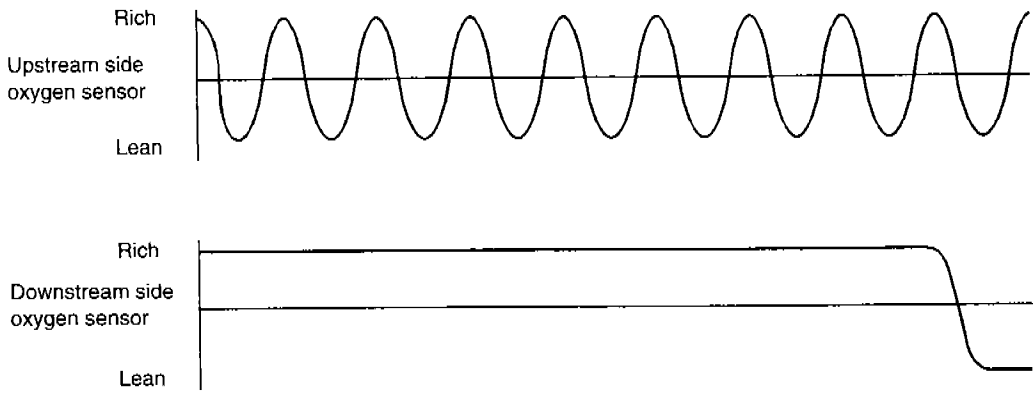
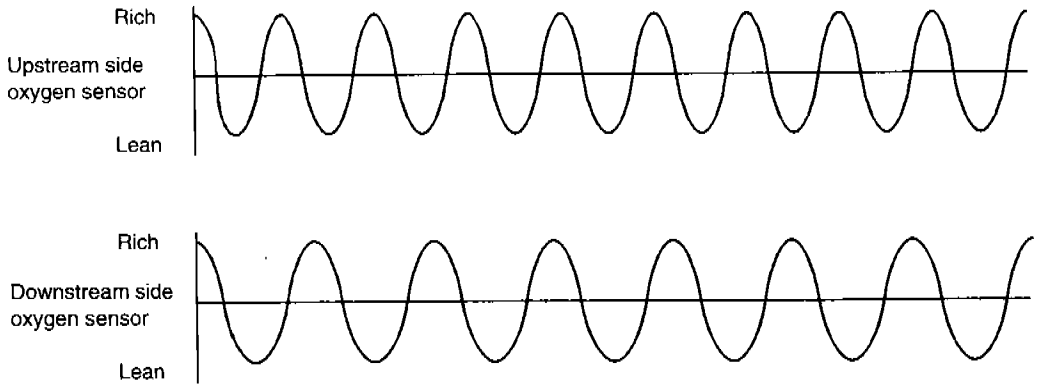


Fig.5 Catalytic converter deteriorates



(3) 626/MX-6 FS ATX

The catalyst monitor compares the output voltages of the upstream side and the downstream side oxygen sensors to judge the deterioration of the catalytic converter. Thus, catalyst monitoring is carried out during feedback operation only.

Output voltages of the upstream oxygen sensor are integrated over a period of time, then compared to the downstream oxygen sensors integrated voltage for the same period(show in the figures below) to judge the condition of the catalytic converter.

When the catalytic converter is normal, it consumes oxygen to purge exhaust gas. As a result, the output voltage of the downstream side oxygen sensor stays on the rich side for a longer period of time (Fig. 6).

As the catalytic converter deteriorates, the period of time that the output voltage of the downstream side oxygen sensor stays on the rich side becomes shorter, and the period that the voltage stays on the lean side becomes longer accordingly (Fig. 7).

When monitoring conditions are satisfied, the PCM monitors the output voltages of the upstream side and downstream side oxygen sensors for a predetermined period, calculates the integrated voltage of each sensor, and judges if the ratio of these integrated voltages is within the threshold to determine if the converter is good or not.

(4) '95MY and '96MY B-Series

The catalyst monitor compares the output voltages of the upstream side and the downstream side oxygen sensors to judge the deterioration of the catalytic converter. Thus, catalyst monitoring is carried out during feedback operation only.

The catalytic converter stores oxygen during lean engine operation (a higher oxygen concentration in the exhaust), and it uses the stored oxygen during rich engine operation (a lower oxygen concentration in the exhaust) to burn up excess hydrocarbons. The B-Series catalyst monitor mainly uses the downstream oxygen sensor to monitor the deterioration of the catalytic converter, based on the oxygen storage capacity of the catalytic converter.

When catalyst monitoring is being run, the PCM switches the signals used by feedback control from the upstream oxygen sensor to the downstream oxygen sensor. When the catalytic converter is normal, the downstream oxygen sensor's output signal draws the inversion cycle slowly because oxygen is stored inside the catalytic converter (Fig. 8). As the catalytic converter deteriorates, the output signal of the downstream oxygen sensor draws the inversion cycle more quickly (Fig. 9).

The PCM monitors the inversion cycle of the downstream oxygen sensor output for a set period when monitoring conditions are satisfied. This actual monitoring inversion cycle is called a test cycle. Next, the PCM calculates the

(5) '97MY B-Series

The catalyst monitor compares the output signals of the upstream side and the downstream side oxygen sensors to judge the deterioration of the catalytic converter. Thus, catalyst monitoring is carried out during feedback operation only.

As for the '97MY B-Series, the number of inversions of the upstream side and downstream side oxygen sensors are compared to judge the condition of the catalytic converter.

When the catalytic converter is normal, downstream side oxygen sensor inversions are far fewer than those of the upstream side oxygen sensor. (Fig.10)

As the catalytic converter deteriorates, downstream side oxygen sensor inversions increase and become closer to those of the upstream side oxygen sensor. (Fig.11)

The PCM counts the number of inversions of both the upstream and downstream side oxygen sensors, continuously performs the OBD-II drive cycle and calculates the ratio of upstream and downstream side inversions.

At this time, the inversion ratio is stored in the PCM memory.

If the inversion ratio exceeds the threshold for six consecutive drive cycles, the PCM judges that the catalytic converter has failed, illuminates the MIL and stores the DTC.

Also, the PCM stores the pending code when the inversion ratio exceeds the threshold during one drive cycle.

The DTC associated with this monitor is DTC P0420.

Fig.10 Catalytic converter is normal

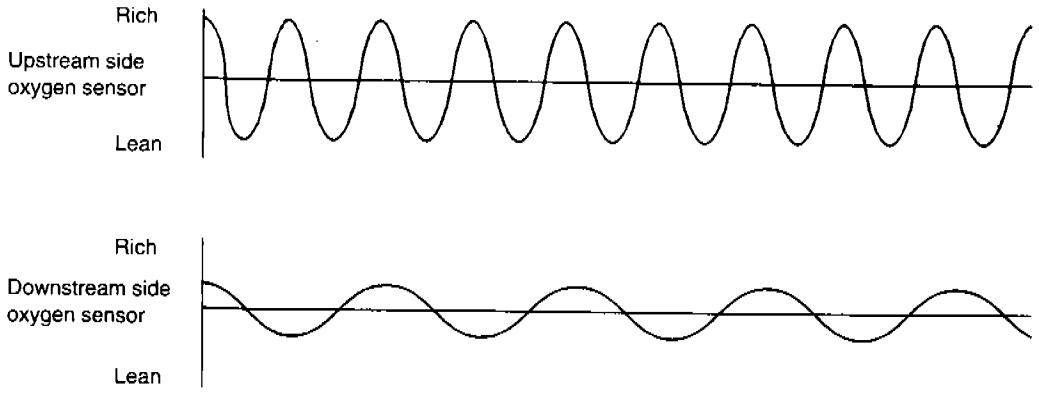
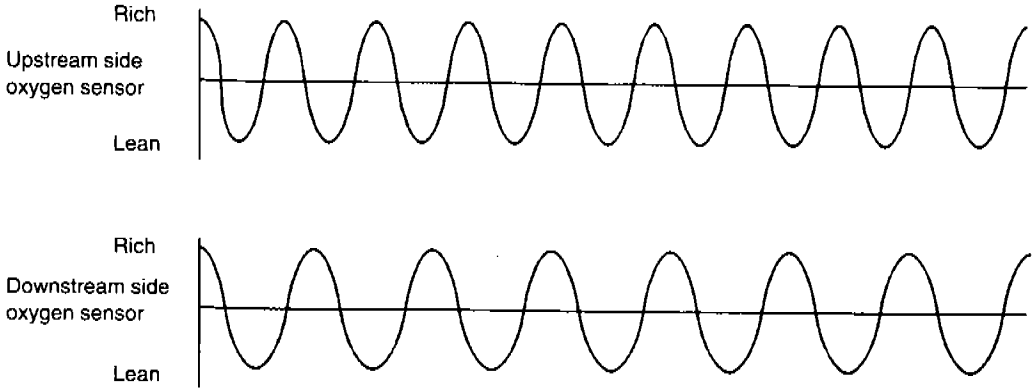


Fig.11 Catalytic converter deteriorates



3.2.3 Monitoring condition

(1) '95 and '96 MY vehicles

1 Feedback control of upstream oxygen sensor operating
2 Downstream oxygen sensor operating
3 Engine speed within the set speed
4 Change in engine speed below the set range
5 Calculated load within the set value
6 Change in calculated load below the set range
7 Throttle opening angle within the set value
8 Change in throttle position below the set range
9 Vehicle speed within the set speed
10 Period after engine starting exceeds the set time
11 Fuel learning finished
12 Upstream oxygen sensor monitoring finished

(2) '97MY vehicles

1 Feedback control of upstream oxygen sensor operating
2 Downstream oxygen sensor operating
3 Estimated catalyst temperature exceeds the set temperature
4 Engine speed within the set speed
5 Change in engine speed below the set range
6 Calculated load within the set value
7 Change in calculated load below the set range
8 Change in throttle position below the set range
9 Vehicle speed within the set speed
10 Fuel learning finished
11 Oxygen sensor for fuel control and upstream oxygen sensor monitoring finished

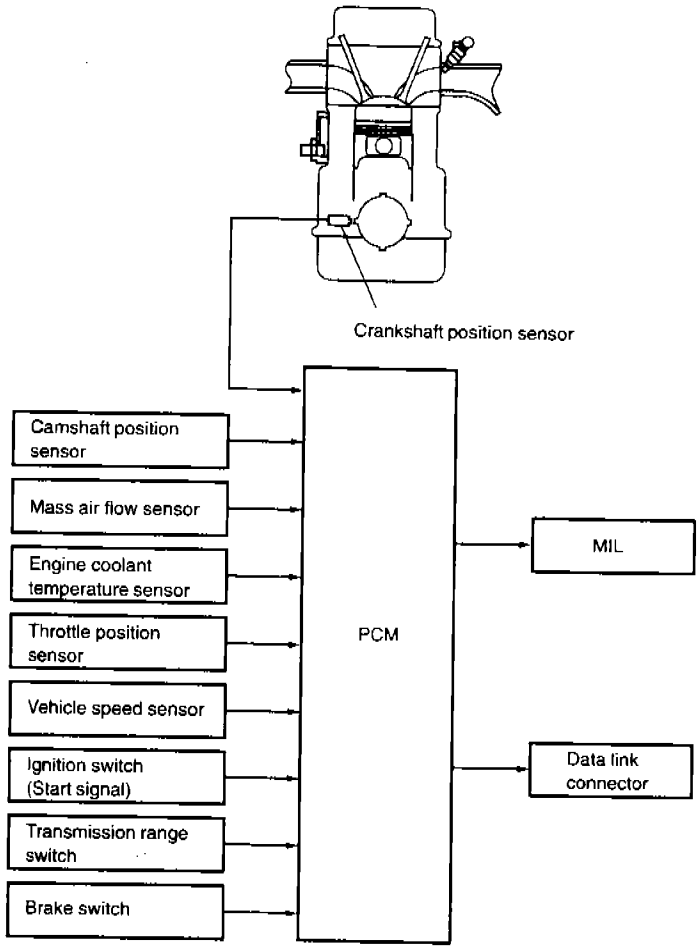
3.3 Misfire monitor

3.3.1 Outline

Misfire is the incomplete combustion in a cylinder caused by poor ignition, insufficient fuel pressure, or insufficient compression pressure.
The misfire monitor monitors this condition which can damage the catalytic converter and affect emission performance.
There are two misfire monitors. One is for misfire that can damage the catalytic converter and the other is for misfires that affect emission performance.

1. Misfires that can damage the catalytic converter
Malfunction is detected when the misfire ratio at 200 crankshaft revolutions exceeded the threshold.
2. Misfires that affect emission performance
Malfunction is detected when the misfire ratio at 1,000 crankshaft revolutions exceeded the threshold.

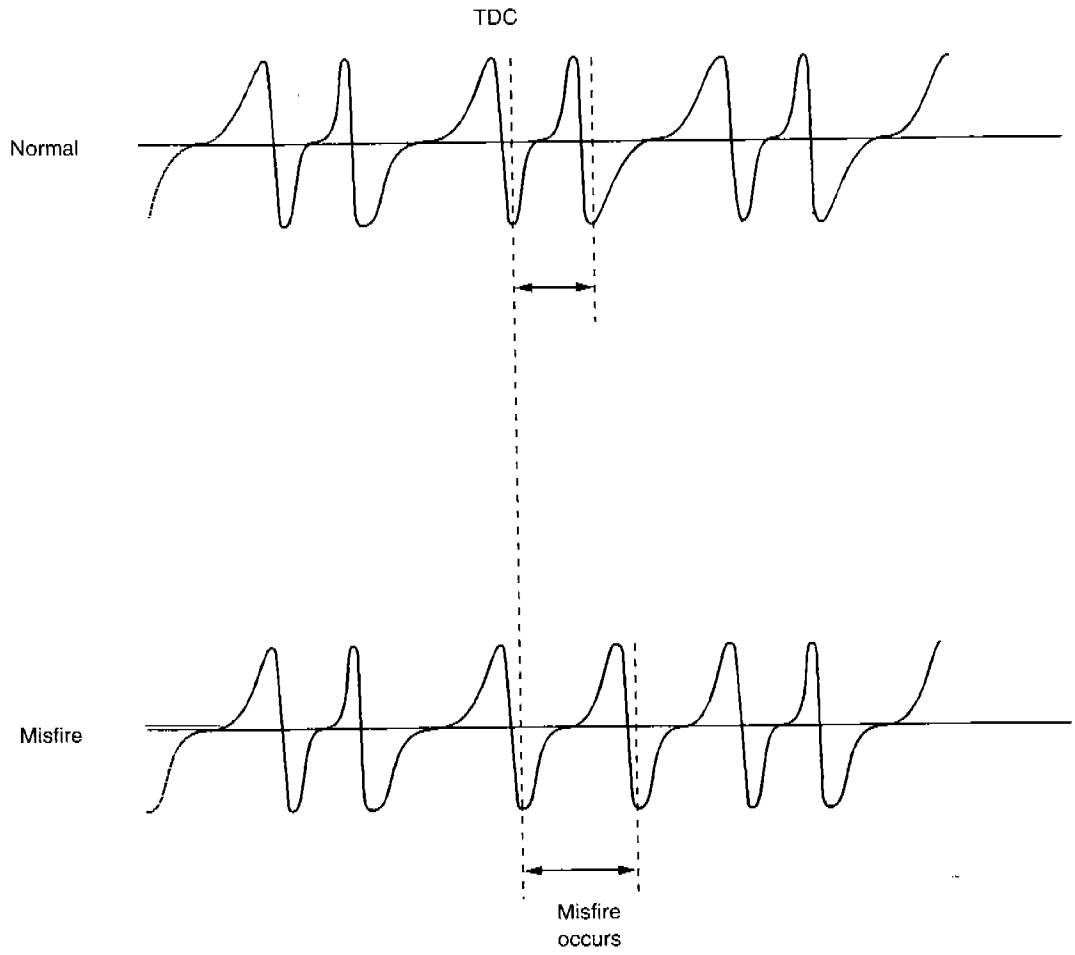
System diagram



3.3.2 Monitoring method

In the misfire monitor, a misfire is detected based on the input signal from the crankshaft position sensor.
Inside the crankshaft pulley, a plate is installed and rotates with the crankshaft pulley. The plate has four teeth in a four-cylinder engine except the EEC system vehicles, and six teeth in a six-cylinder engine except the EEC system vehicles and 32 teeth in the EEC system vehicles. Each time the crankshaft position sensor passes through the tooth of the plate, an input signal is generated.
The PCM monitors the crankshaft rotation according to this input signal and judges if a misfire occurs.
When combustion in the cylinders is normal, the crankshaft rotation speed increases and the input signal from the crankshaft position sensor has a shorter inversion time after top dead center (Fig. 12).
When a misfire occurs, the crankshaft rotation speed will not increase and the crankshaft position sensor input signal inversion time after top dead center is longer than when combustion in the cylinders is normal.
The PCM calculates the change of the crankshaft position sensor input signal inversion time at each cylinder and when the change exceeds the threshold, it detects a misfire in the corresponding cylinder.

Fig.12



Then, when monitoring conditions in 3.3.3 are satisfied, the PCM counts the number of misfires which occurred at 200 crankshaft revolutions and 1,000 crankshaft revolutions and calculates the misfire ratio at each crankshaft revolution.
As for misfires that can damage the catalytic converter, a malfunction is detected when the threshold is exceeded at the first drive cycle. The PCM flashes the MIL and stores the DTC. When the threshold is not exceeded in the second drive cycle, the PCM illuminates the MIL.
As for misfires that affect emission performance, a malfunction is detected when the threshold is exceeded in two consecutive drive cycles, the PCM illuminates the MIL and stores the DTC.
In all 626/MX-6 FS ATX, all B-Series and other '97 MY vehicles, the PCM stores the pending code when a malfunction is detected during one drive cycle.
The DTCs associated with this monitor are DTCs P0300, P0301, P0302, P0303, P0304, P0305, and P0306.

3.3.3 Monitoring condition

Monitoring conditions differ for '95 and '96 MY vehicles as opposed to '97 MY vehicles. In '95MY and '96MY vehicles, misfire are monitored in specific, limited engine revolution ranges only. In '97 MY vehicles, monitoring conditions differ for models in which misfires are monitored in specific engine revolution ranges and for models in which misfires are monitored in all engine revolution ranges.
The monitoring conditions for each vehicle model are as follows:

3.4 Evaporative system monitor

3.4.1. Outline

The evaporative system monitor was established to carry out total monitoring of the evaporative system, which can affect emissions performance. Basically, there are two types of monitoring methods, as is shown below:

1. Flow Monitoring
   Determines whether the evaporative system is okay or not by measuring the amount of evaporated gas inside the cylinders while carrying out an evaporative purge.
2. Leak Monitoring
   After having created a vacuum in the evaporative system, determines whether the evaporative system is okay or not by sealing the system and then measuring the amount of leakage.

The flow monitoring method has been used since the '95 MY and it has been part of the CCM. Leak monitoring has been used in the Protege and MPV since the '96 MY and will be incorporated into all vehicles starting in the '98 MY.

The figure below show s which vehicles use which kind of monitoring.

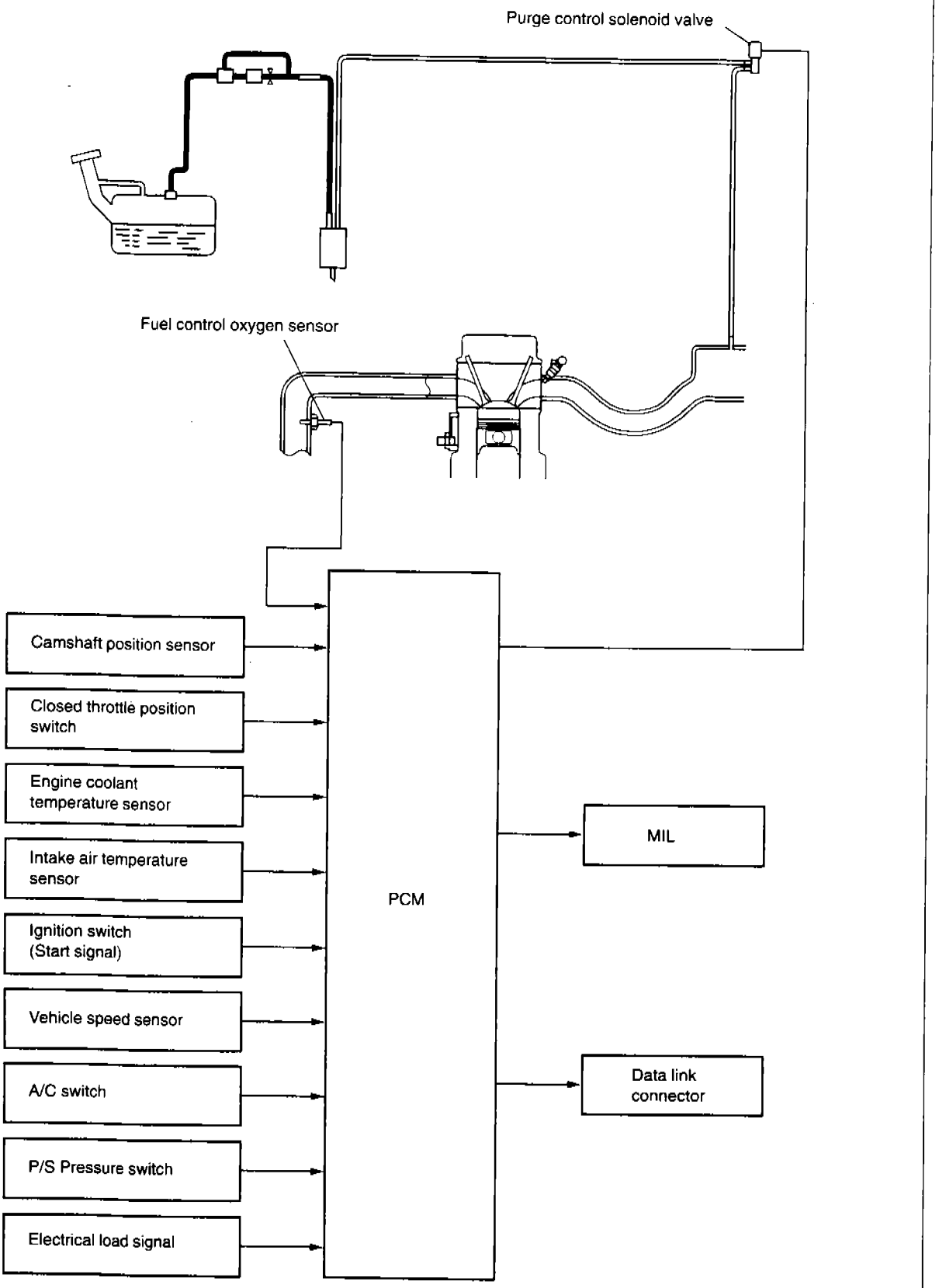
Monitoring Method	'95 MY	'96 MY	'97 MY
Flow Monitoring	Protege Millenia	Millenia 626/MX-6 MX-5 Miata MX-3	626/MX-6 MX-5 Miata
Leak Monitoring	–	Protege MPV	Protege MPV Millenia

Vehicles equipped with leak monitoring are modified from previous vehicles in the following ways:

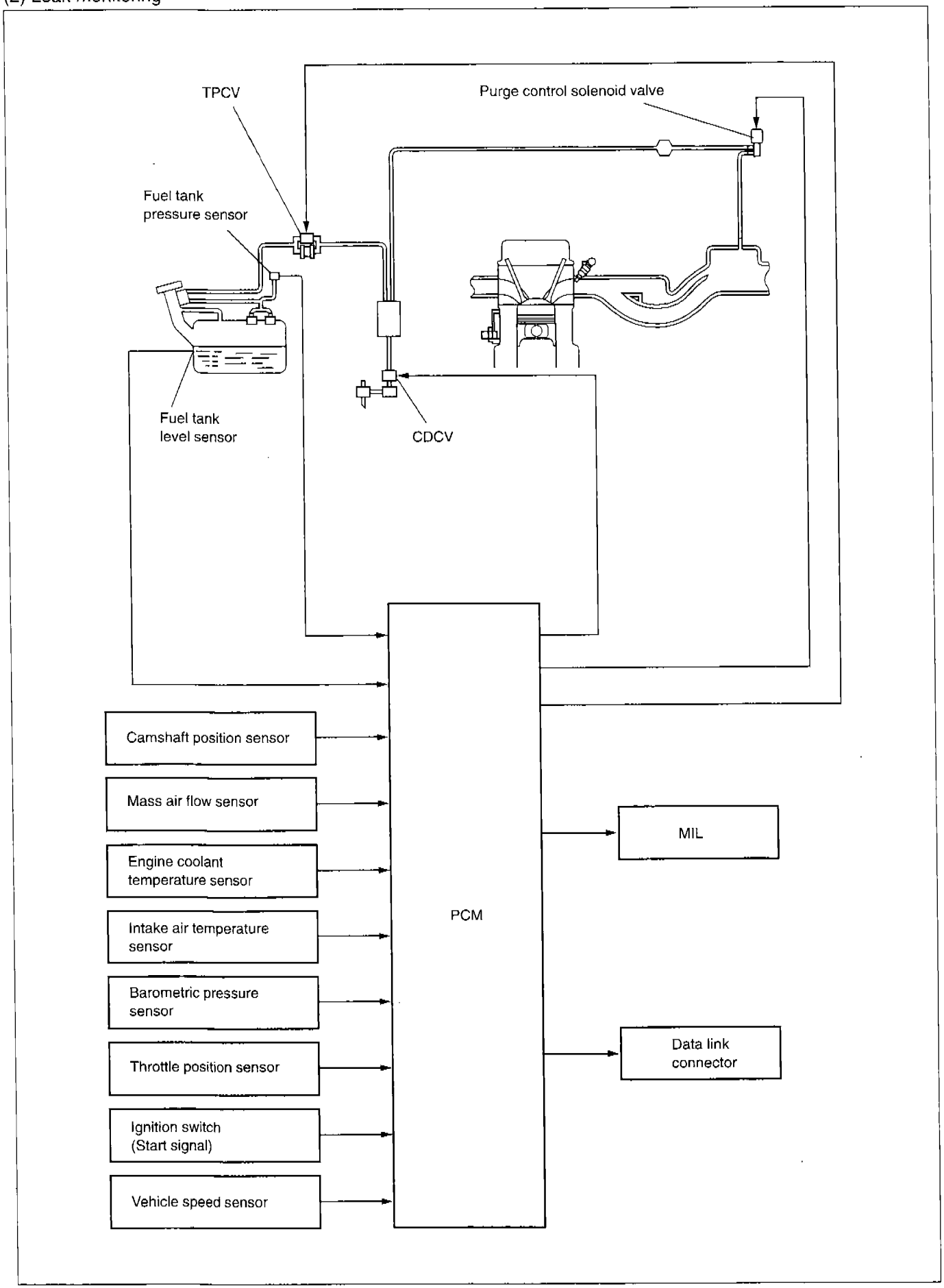
1. A fuel tank pressure sensor has been added to monitor pressure change in the evaporative system.
2. Fuel tank level sensor signal input has been added to the PCM to monitor the fuel level in the fuel tank, which affects pressure change in the evaporative system.
3. A canister drain cut valve (CDCV) that shuts off the charcoal canister atmosphere side passage has been added to seal the evap orative system during monitoring.
4. A tank pressure control valve (TPCV) has been added for direct connection between the fuel tank and the charcoal canister.

The TPCV is the check valve that adjusts the fuel tank pressure integrated with the solenoid that electrically creates bypass passage. The Protege and MPV are equipped with the TPCV.
As for the TPCV operations, refer to section 3.4.4.

System diagram
(1) Flow monitoring



(2) Leak monitoring



3.4.2 Monitoring method

(1) Flow Monitoring

Flow monitoring determines whether the evaporative system is functioning correctly by checking its ability to supply the engine with fuel vapors (hydrocarbons).

When the monitoring conditions in 3.4.3 are satisfied, the PCM detects the amount that short fuel trim changes during the time that an idle purge is being run, then uses that value to determine whether the evaporative system is functioning properly. The monitoring in question takes place over two consecutive drive cycles. If an evaporative system malfunction is detected, the PCM illuminates the MIL and stores the DTC.

In all 626/MX-6 FS ATX, all B-Series and other '97MY vehicles, the PCM stores the pending code when a malfunction is detected during one drive cycle.

The DTC associated with this monitor is DTC P0440 in '95 and '96 MY vehicles, and DTC P0441 in '97 MY vehicles.

(2) '96 MY Leak Monitoring

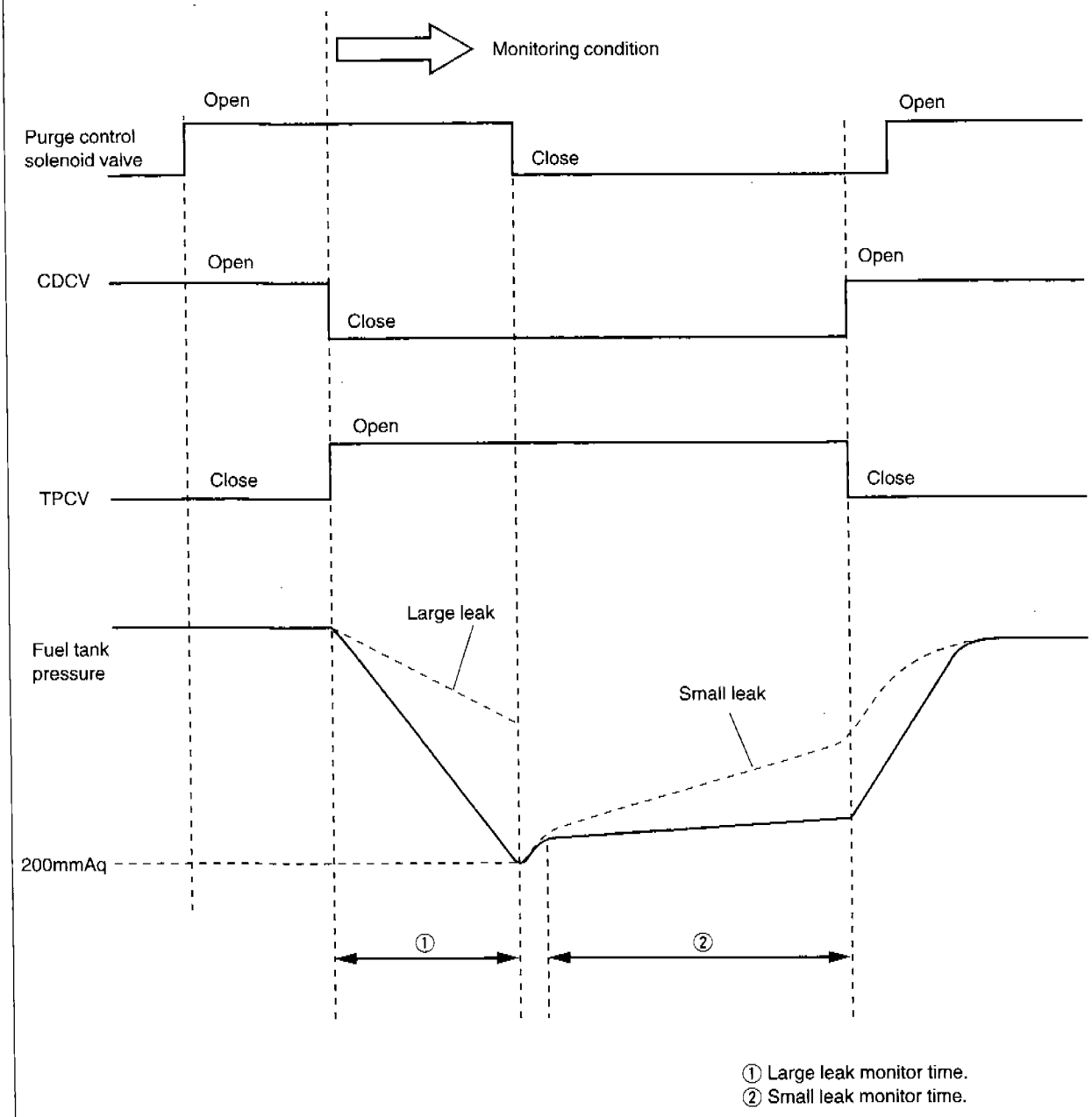
Leak monitoring used the fuel tank pressure sensor that is installed in the evaporative system to detect changes in pressure within the system. It uses the resulting values to determine whether the system is functioning properly or not. When the monitoring conditions in 3.4.3 are satisfied, the PCM performs evaporative system monitoring according to the following procedure.

1. To prevent atmospheric pressure from being applied to the system, closes the CDCV and open the TPCV bypass passage. Opens the purge solenoid and applies a vacuum to the evaporative system so that the pressure in the evaporative system is reduced to the specified level.
2. When the vacuum in the system has reached the specified level or when the specified purge time has passed, closes the purge solenoid to seal the system.
3. When A sec. (Refer to Note.) has passed after the system is sealed, measures the vacuum in the system. When the vacuum is below the threshold, the PCM detects a large leak (leakage from a hole larger than about 2 mm in diameter) and completes monitoring.
4. When the vacuum is over the threshold, measure and notes the vacuum after B sec. (Refer to Note).
5. Measures the vacuum after C sec. (Refer to Note.) has passed, and subtracts this value from the vacuum measured after B sec. When the pressure difference exceeds the threshold, the PCM detects a small leak (leakage from a hole smaller than about 2 mm in diameter) and completes monitoring.
6. When C sec. has passed after the system is sealed, opens the purge solenoid and CDCV, closes the TPCV bypass passage, and completes the monitoring.

Note: A, B, and C sec. vary with the vehicle model.

Figure 13 shows the changes in pressure in the evaporative system during evaporative system monitoring.

Fig.13



The monitoring in question takes place over two consecutive trip cycles in Group-1 vehicles, and two consecutive drive cycles in Group-2 vehicles. If an evaporative system malfunction is detected, the PCM illuminates the MIL and stores the DTC.
The DTC associated with this monitor is DTC P0440.

(3) '97 MY Leak Monitoring

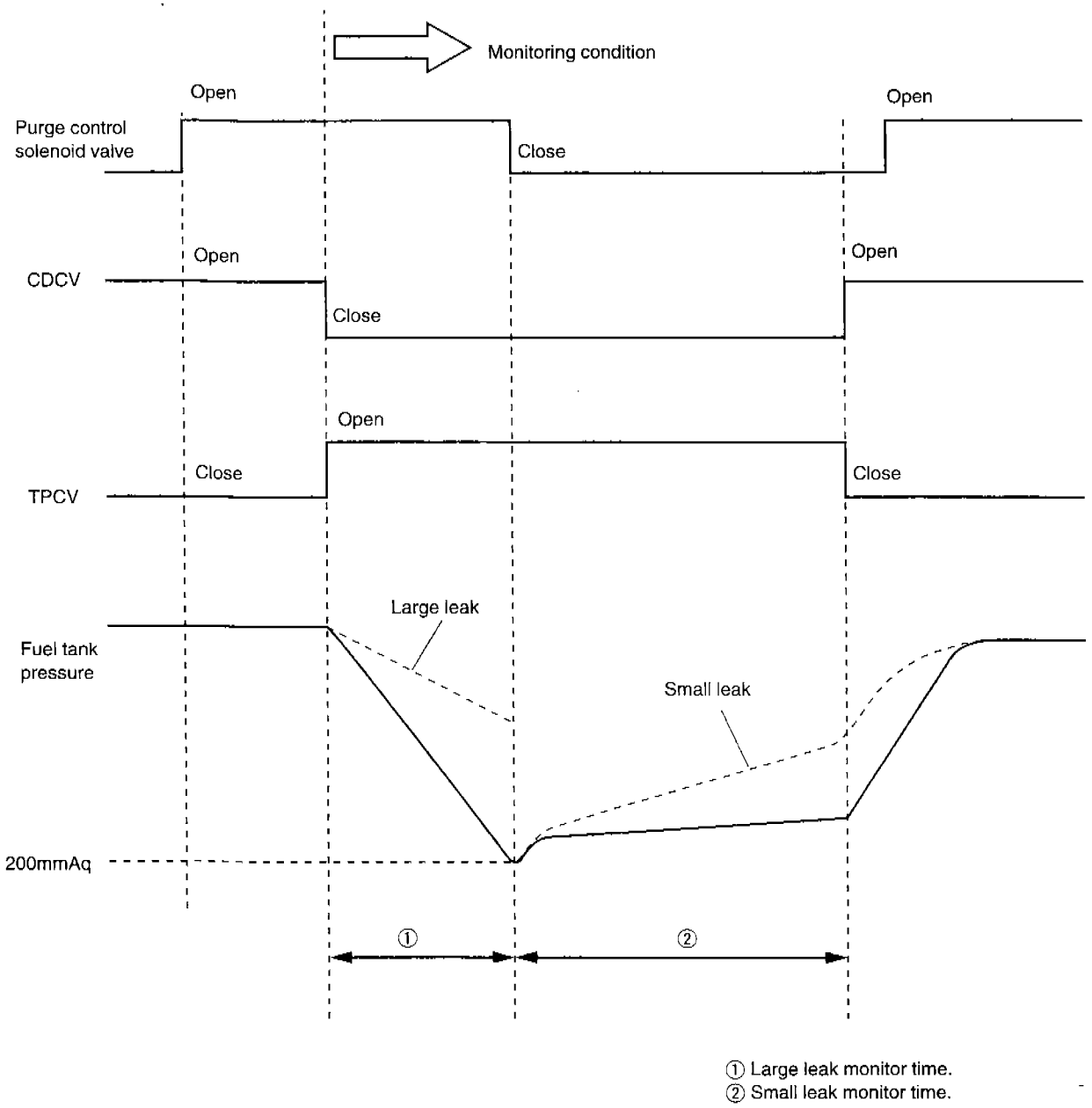
When monitoring conditions in 3.4.3 are satisfied, the PCM performs the evaporative system monitoring according to the following procedure.

1. Large leak monitoring
   To prevent atmospheric pressure from being applied to the system, closes the CDCV. When the vehicle is equipped with the TPCV, opens the TPCV bypass passage. Opens the purge solenoid and applies a vacuum to the evaporative system so that the pressure in the evaporative system is reduced to the specified level. When the vacuum in the system has reached the specified level or when the specified purge time has passed, closes the purge solenoid to seal the system. When A sec. (Refer to Note.) has passed after the system is sealed, measures the vacuum in the system. When the vacuum is below the threshold, the PCM detects a large leak (leakage from a hole larger than about 2 mm in diameter) and completes monitoring. At this time, the PCM stores the measured vacuum.
2. Small leak monitoring
   When the vacuum is over the threshold, notes the value and measures the vacuum after B sec. (Refer to Note.). Subtracts the vacuum after B sec. from the vacuum after A sec. When the pressure difference exceeds the threshold, the PCM detects a small leak (leakage from a hole smaller than about 2 mm in diameter). At this time, the PCM stores the pressure difference.

Note: A and B sec. vary with the vehicle model.

Figure 14 shows the changes in pressure in the evaporative system during evaporative system monitoring.

Fig.14



The monitoring in question takes place over two consecutive drive cycles. If an evaporative system malfunction is detected, the PCM illuminates the MIL and stores the DTC.
The DTC associated with this monitor is DTC P0442 for small leak and P0445 for large leak.

3.4.3 Monitoring condition

(1) Mechanical monitoring model

1 Period after engine starting exceeds the set time
2 Idle switch on
3 Feedback control operating
4 Engine coolant temperature within the set temperature
5 Intake air temperature below the set temperature
6 Engine speed below the set speed
7 Vehicle speed below the set speed
8 Period after changing in calculated load for the A/C operating exceeds the set time
9 Period after changing in calculated load for the power steering operating exceeds the set time
10 Period after changing in calculated load for the electrical load operating exceeds the set time
11 Short fuel trim within the set value

(2) '96MY leak monitoring model

1 Period after engine starting exceeds the set time
2 Engine coolant temperature within the set temperature
3 Throttle opening angle within the set value
4 Calculated load within the set value
5 Engine speed within the set speed
6 Vehicle speed within the set speed
7 Another condition

(3) '97MY leak monitoring model

① Large leak monitoring

1 Period after engine starting exceeds the set time
2 Difference of engine coolant temperature and intake air temperature when engine starting below the set temperature
3 Period of vehicle speed over 35 MPH exceeds the set time
4 Engine coolant temperature within the set temperature
5 Throttle opening angle within the set value
6 Calculated load within the set value
7 Engine speed within the set speed
8 Vehicle speed within the set speed
9 Purge solenoid valve open
10 Another condition

② Small leak monitoring

1 Large leak monitor finished and no decision malfunction
2 Purge solenoid valve close

3.4.4 Tank Pressure Control Valve (TPCV) Operation

The tank pressure control valve (TPCV) is integrated with the solenoid, which can electrically create a bypass passage. It exists to check the pressure inside the fuel tank. It has five actions, listed below:

1. During no operation
   a. duckbill valve is close
   b. diaphragm valve is closed (no pressure)
   c. no flow through valve (Fig. 15)

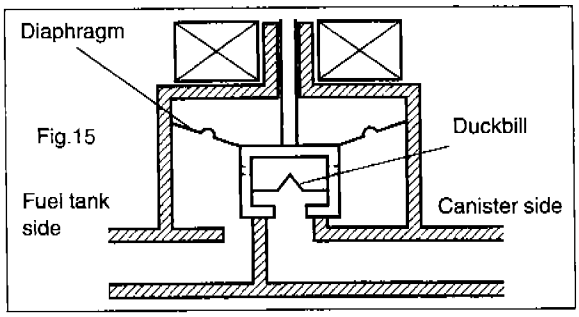


Fig.15

2. Vacuum applied by engine via canister (purge)
   a. vacuum under duckbill keeps it closed
   b. diaphragm closed no pressure on it
   c. no flow from tank to engine (Fig. 16)

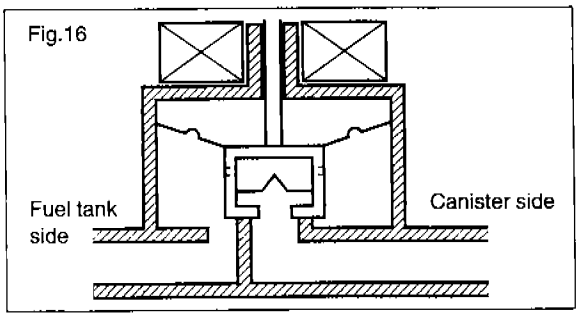


Fig.16

3. Vacuum applied from fuel tank
   a. vacuum over duckbill allows it to open
   b. vacuum against diaphragm keeps it closed
   c. tank vacuum released through duckbill (Fig. 17)

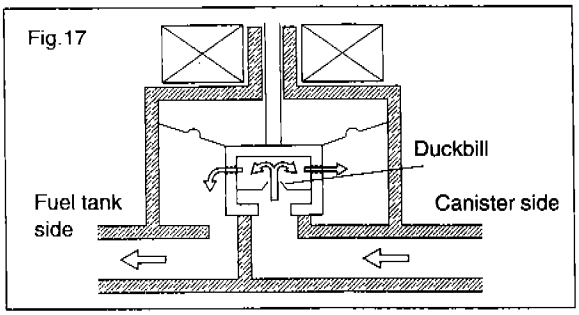


Fig.17

4. Pressure applied from fuel tank
   a. pressure from tank keeps duckbill closed
   b. pressure from tank forces diaphragm to open
   c. pressure vented from tank through TPCV (Fig. 18)

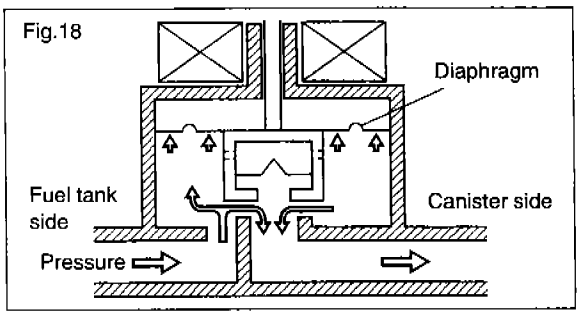


Fig.18

5. During start of leak monitoring test
   a. duckbill closed(inactive)
   b. diaphragm opened via solenoid operation
   c. vacuum at tank and canister(from engine) (Fig. 19)

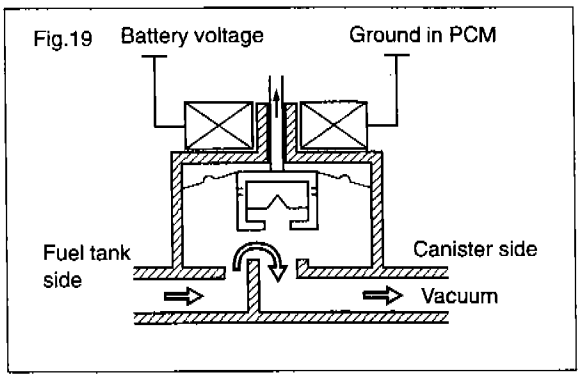


Fig.19

3.5 Fuel system monitor

3.5.1 Outline

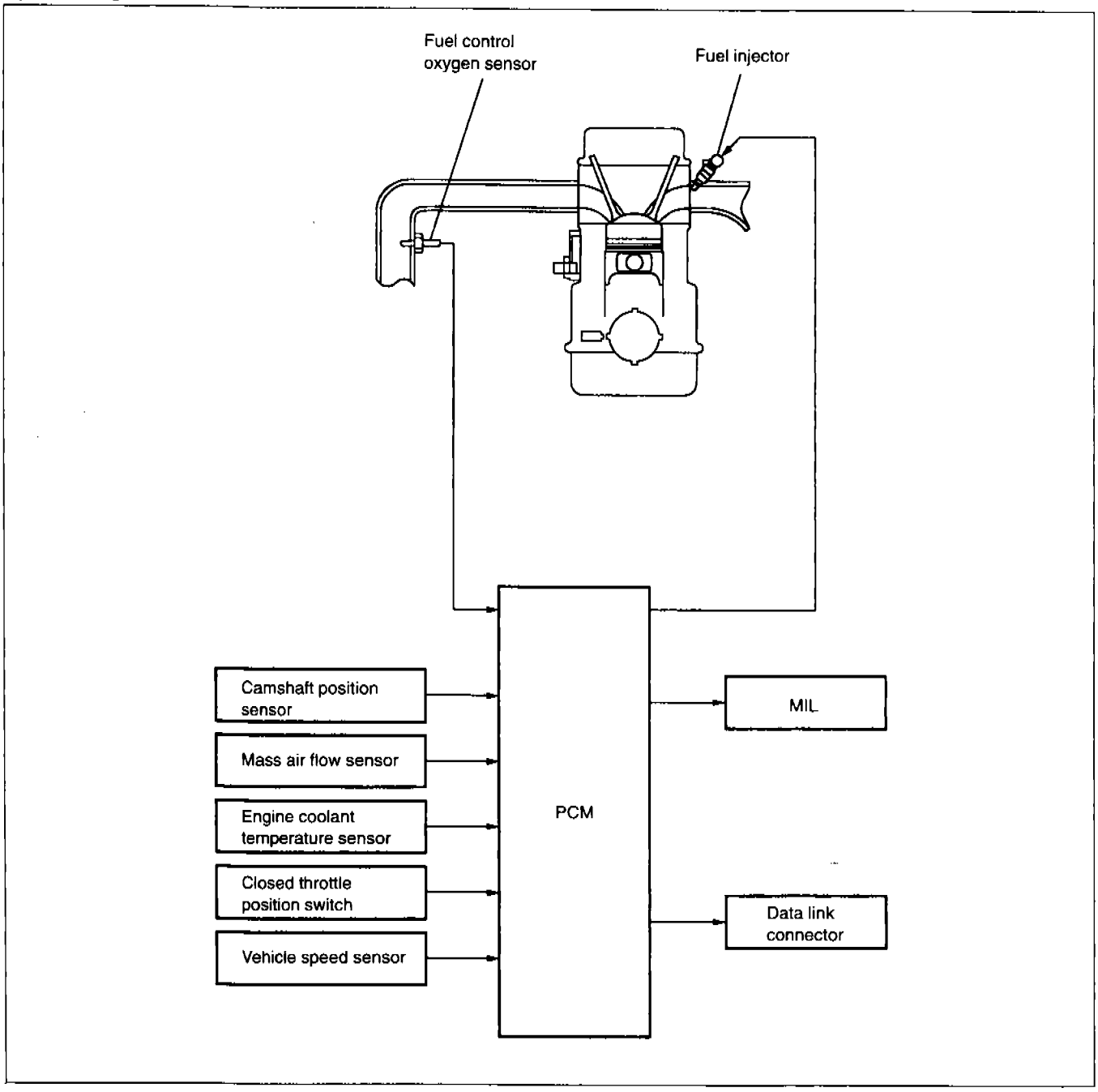
During feedback operation, the PCM constantly carries out fuel injection amount correction based on the fuel injection table stored in the PCM to maintain the air/fuel ratio to the stoichiometric ratio (approx. 14.7: 1). This correction amount is called the short fuel trim.

The PCM also averages the short fuel trims applied when the feedback control is carried out for a specified period of time. Using this value as a deviation of the sensor, which detects input signals necessary for the proper fuel injection control, the PCM carries out correction for aging of the sensor.

This correction amount is called the long fuel trim.

In the fuel system monitor, a fuel system malfunction is detected when the short fuel trim and the long fuel trim exceeds the threshold.

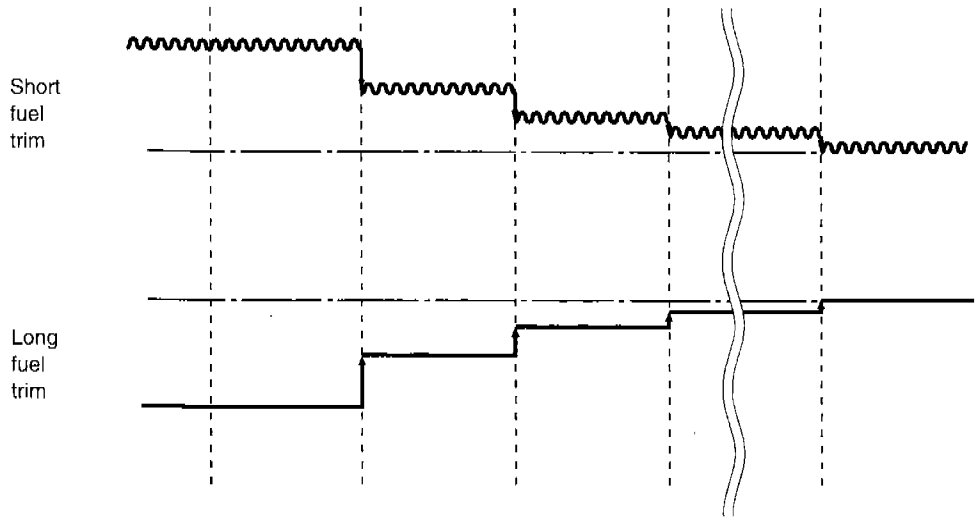
System diagram



3.5.2 Monitoring method

The fuel system correction judges if the air/fuel ratio is rich or lean according to the oxygen sensor input signal, and increases or decreases the fuel injection amount so that the air/fuel ratio is maintained to the stiochiometric ratio.
During feedback operation, the PCM controls the fuel injection amount according to the oxygen sensor input signal so that the air/fuel ratio becomes closer to the stoichiometric ratio, and monitors correction values calculated during the control as the short fuel trim and the long fuel trim.
Figure 20 shows the relationship between the short fuel trim and the long fuel trim.

Fig.20



In the PCM, feedback control calculates the average value of the short fuel trim over a set period of time. If this value is on the plus or minus side, it resets the long fuel trim at half the difference between the normal value and measured value. The PCM continues recalculating the short fuel trim's value reaches zero.
When monitoring conditions in 3.5.3 are satisfied, the PCM performs monitoring [illegible] and if

3.5.3 Monitoring condition

There are two monitoring conditions provided: During idling and during driving.

(1) Idling

1 Feedback control operating
2 Idle switch on or throttle position sensor output voltage below the set voltage
3 Fuel compensation for after engine starting 0%
4 Fuel learning finished
5 Oxygen sensor for fuel control inversion times above the set times

(2) Driving

① For BP, KL, KJ and JE engines

1 Idle switch off or throttle position sensor output voltage above the set voltage
2 Intake air amount within the set value
3 Vehicle speed within the set speed
4 Feedback control operating
5 Period after feedback starting exceeds the set time
6 Engine coolant temperature within the set temperature
7 Fuel compensation for engine starting 0%
8 Fuel learning finished
9 EGR system monitor, Catalyst monitor and Evaporative system monitor not operating
10 Change in calculated load below the set range

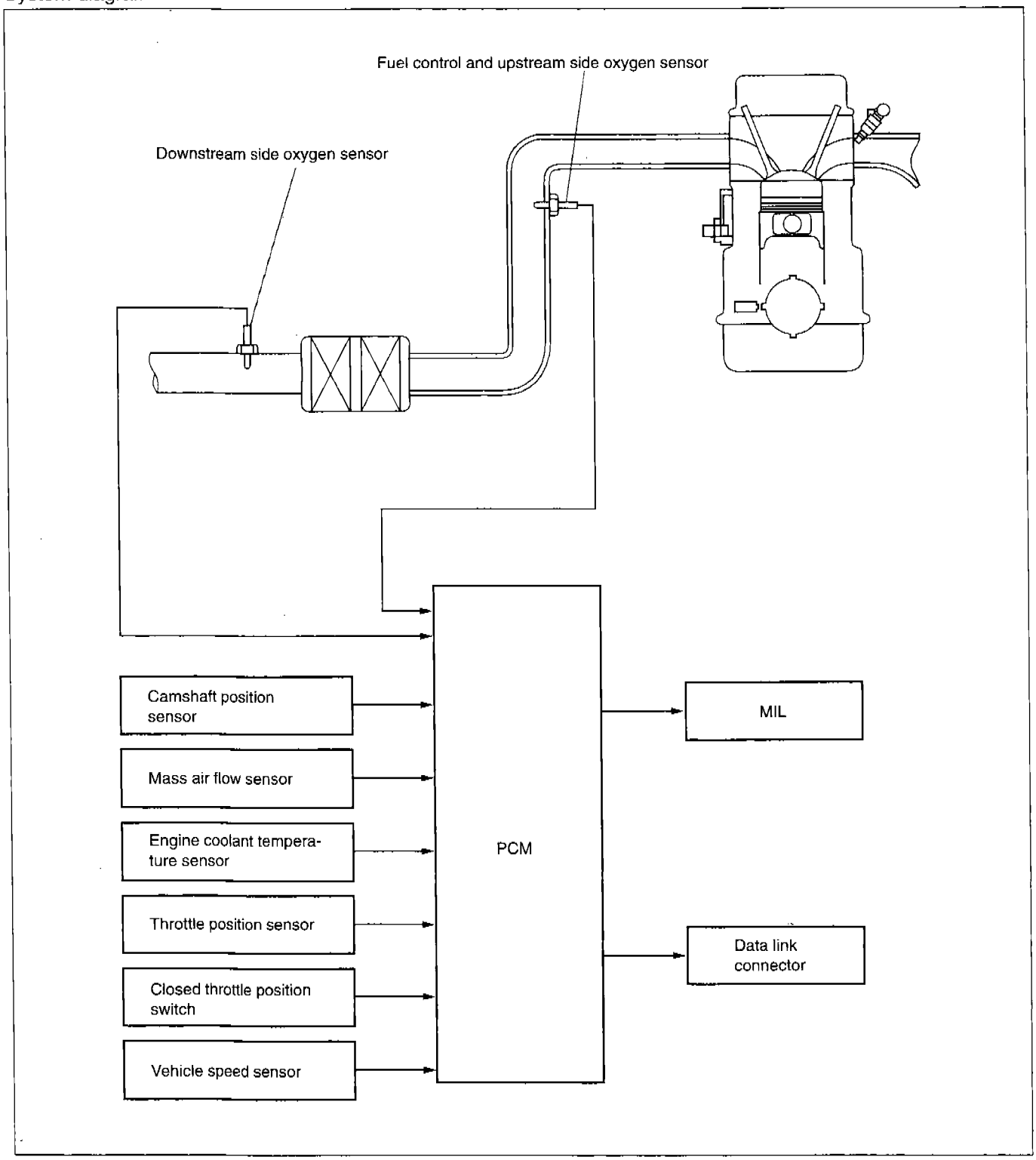
3.6 Oxygen sensor monitor

3.6.1 Outline

In the oxygen sensor monitor, malfunction and deterioration of the oxygen sensor, which affects emission performance, are monitored.

On vehicles applicable to the OBD-II regulation, two oxygen sensors, one for fuel injection control and other for catalytic converter monitoring, are equipped. The oxygen sensor monitor monitors these oxygen sensors.

System diagram



3.6.2 Monitoring method

The oxygen sensor detects the amount of oxygen contained in the exhaust gas and outputs a signal of 0 V–1 V. When the air/fuel ratio (stiochiometric ratio: approx. 14.7:1) is lean, the sensor indicates a voltage of 0–0.5 V.
When the air/fuel ratio is rich, the sensor indicates a voltage of 0.5–1 V.
In the oxygen sensor monitor, oxygen sensor operation is monitored based on the sensor's characteristics.
The oxygen sensor for the fuel injection control and the one for the catalytic converter monitoring, installed in the upstream side of the catalytic converter, are monitored for the following purposes:

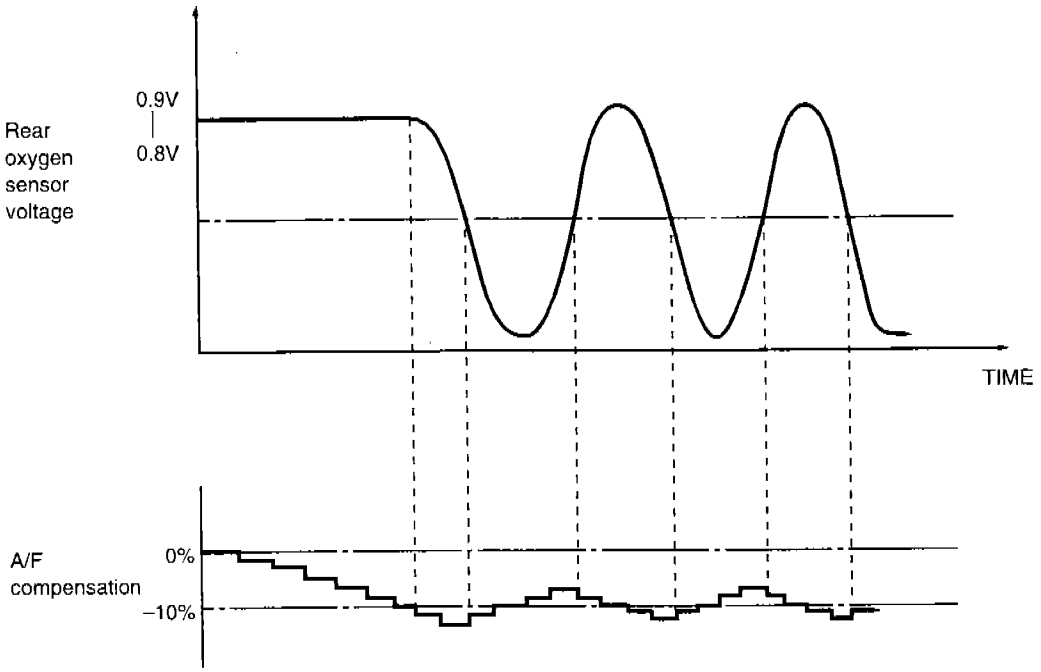
1. Judging normal activation of the sensor by the output voltage
2. Judging the deterioration condition by the inversion cycle and response parameter

The oxygen sensor for the catalytic converter monitoring, installed in the downstream side of the catalytic converter, is monitored for the normal activation of the sensor by the output voltage.

(1) Judging normal activation of the oxygen sensor by the output voltage
When the monitoring conditions in 3.6.3 are satisfied, the PCM monitors the oxygen sensor output voltage in a specified period. When the voltage does not exceed the threshold, the PCM detects the oxygen sensor malfunction.
When the malfunction is detected in two consecutive drive cycles, the PCM illuminates the MIL and stores the DTC.
In all 626/MX-6 FS ATX, all B-Series and other '97 MY vehicles, the PCM stores the pending code when the malfunction is detected during one drive cycle.
The DTCs associated with this monitor are DTCs P0134, P0140, P0146, P0154, and P0160.

(2) Judging the deterioration condition by the inversion cycle and response parameter
① '95 and '96 MY vehicles (Except 626/MX-6 FS ATX and B-Series)
After the monitoring conditions specified in 3.6.3 are satisfied, the PCM calculates the average of the inversion cycle period and the A/F compensation of the oxygen sensor for a specified amount of time. After that, by determining whether each value is within threshold, the PCM judges whether the oxygen sensor is working properly or not.
A/F compensation is a correction value that is calculated according to the oxygen concentration in the actual exhaust gas, as monitored via the output voltage of the oxygen sensor that is installed downstream of the catalytic converter. It is used to run the fuel-injection compensation that purifies exhaust gas into its ideal balance.
Generally, during feedback control, the oxygen sensor's output voltage is set between 0.8 and 0.9V or below 0.2V. This is to keep the oxygen concentration in the exhaust gas constant(oxygen is consumed when the exhaust gas upstream of the catalytic converter is rich and the oxygen concentration is kept constant when the exhaust gas upstream of the catalytic converter is lean) during the catalyst reaction in the catalytic converter.
For example, when monitoring conditions have been met as the oxygen sensor's output voltage is set between 0.8 and 0.9 V during feedback control, the PCM will gradually decrease the amount of injected fuel first (Fig. 21). This starts the inversion cycle in the signals of the oxygen sensor that is downstream of the catalytic converter. Then the PCM will increase or decrease the fuel amount for a set period of time in order to match the oxygen sensor's inversion cycle. This accomplishes A/F compensation.

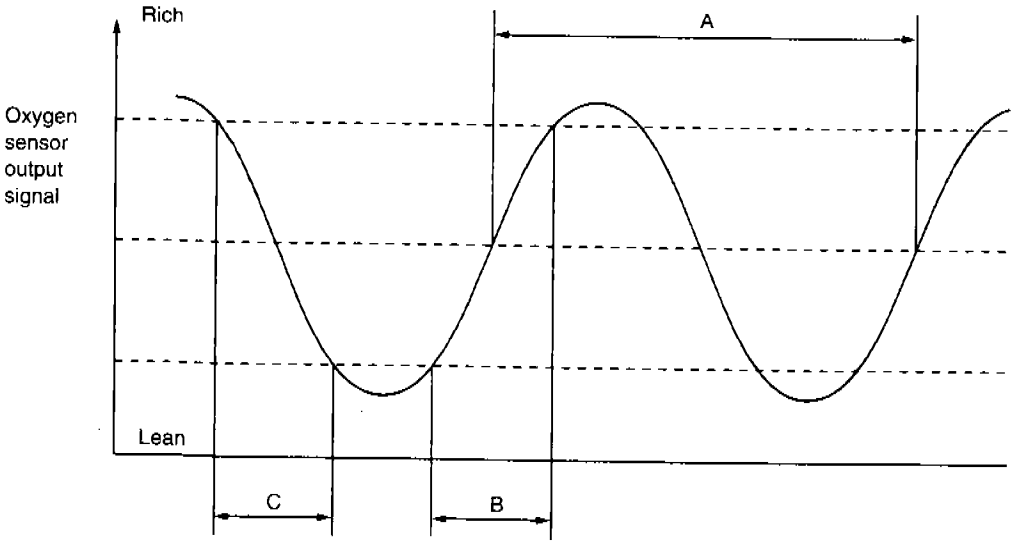
Fig.21



This monitoring differs according to vehicle. For '95 MY and '96 MY Group-1 vehicles, measurement takes place over two consecutive trip cycles. For '96 MY Group-2 and '97 MY vehicles, it takes place over two consecutive drive cycles.
If an oxygen sensor malfunction is detected, the PCM illuminates the MIL and stores the DTC.
Depending on the malfunction that is monitored, the DTC that is stored will be either P0130 or P0150.

② '97 MY vehicles (Except 626/MX-6 FS ATX and B-Series)
The PCM monitors the inversion cycle period, lean-to-rich response time and rich-to-lean response time of the oxygen sensor to judge the oxygen sensor condition (Fig. 22).
The PCM calculates the average of the inversion cycle period in 10 inversion cycles, average response time from lean to rich, and from rich to lean after monitoring conditions in 3.6.3 are satisfied.
Good/no good judgment of the oxygen sensor is made by checking if each value is within the threshold.
At this time, the PCM stores the average of the inversion cycle period, lean-to-rich response time, and rich-to-lean response time used for judgment.
When the calculated values exceed the threshold in two consecutive drive cycles, the PCM detects the oxygen sensor malfunction, illuminates the MIL, and stores the DTC.
The DTCs associated with this monitor are DTCs P0130, P0136 and P0150.

Fig.22



A: Oxgen sensor inversion cycle period
B: Oxgen sensor lean-to-rich response time
C: Oxgen sensor rich-to-lean response time

③ 626/MX-6 FS ATX and B-Series
The PCM monitors the inversion cycle period, lean-to-rich response time and rich-to-lean response time of the oxygen sensor to judge the oxygen sensor condition (Fig. 23).
The PCM calculates the average of the inversion cycle period in 10 inversion cycles, average response time from lean

3.6.3 Monitoring condition

'95MY and '96MY vehicles

(1) Judging normal activation of the fuel control oxygen sensor and upstream side oxygen sensor of catalytic converter

1 Engine speed above the set speed
2 Engine coolant temperature above the set temperature
3 Idle switch off or throttle position sensor output voltage above the set voltage

(2) Judging normal activation of the downstream side oxygen sensor of catalytic converter

1 Engine speed above the set speed
2 Engine coolant temperature above the set temperature
3 Period after engine starting within the set time
4 Idle switch off or throttle position sensor output voltage above the set voltage
5 Period after idle switch off or throttle position sensor output voltage above the set voltage within the set time

(3) Judging the deterioration condition

1 Engine speed within the set speed
2 Change in engine speed below the set range
3 Calculated load within the set value
4 Change in calculated load below the set range
5 Throttle opening angle within the set value
6 Change in throttle position below the set range
7 Vehicle speed within the set speed
8 Period after engine starting exceeds the set time
9 Fuel learning finished

'97MY vehicles

(1) Judging normal activation of the fuel control oxygen sensor and upstream side oxygen sensor of catalytic converter

1 Engine speed above the set speed
2 Engine coolant temperature above the set temperature
3 Idle switch off or throttle position sensor output voltage above the set voltage
4 Within the Feedback control zone

(2) Judging normal activation of the downstream side oxygen sensor of catalytic converter

1 Engine speed above the set speed
2 Engine coolant temperature above the set temperature
3 Idle switch off or throttle position sensor output voltage above the set voltage
4 Period after closed throttle position sensor off exceeds the set time
5 Downstream side oxygen sensor heater operating
6 Within the Feedback control zone

(3) Judging the deterioration condition for '97MY vehicles

1 Feedback control operating
2 Engine speed within the set speed
3 Change in engine speed below the set range
4 Calculated load within the set value
5 Change in calculated load below the set range
6 Change in throttle position below the set range
7 Vehicle speed above the set speed
8 Fuel learning finished

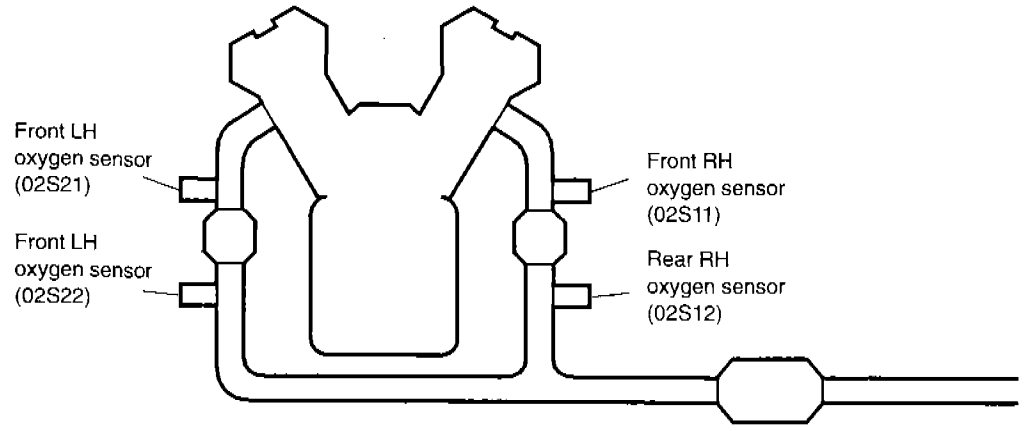
3.6.4 Oxygen sensor location

The oxygen sensor location of V6 engine are as shown below (Fig. 24). The warm-up three-way catalytic converter (pre-catalytic converter) will be eliminated starting with the '97MY KL engine. According to this change, the oxygen sensor's functions break down as follows:

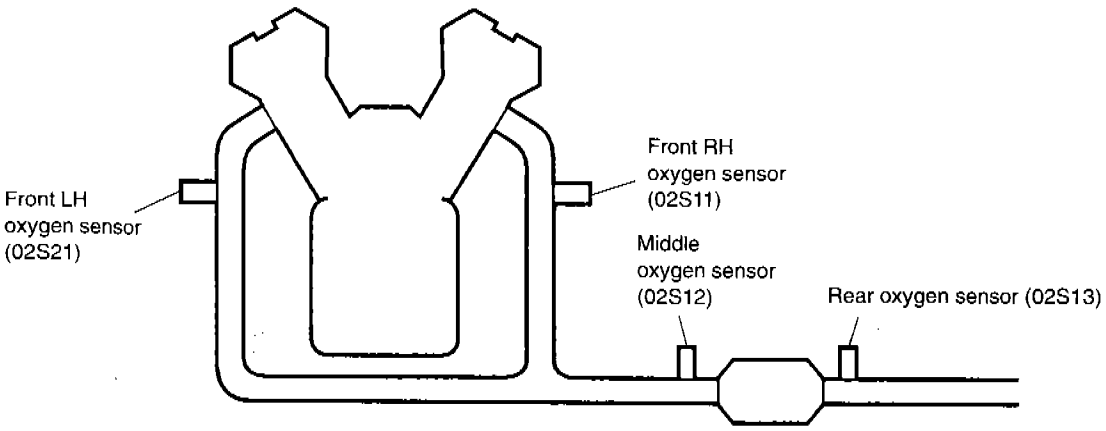
- Front oxygen sensor : detects oxygen concentration in the exhaust gas and feedback to the PCM.
- Middle oxygen sensor : detect catalytic converter deterioration. Also, detects oxygen concentration in the exhaust gas and feedback to the PCM during catalytic converter monitoring.
- Rear oxygen sensor : Detect catalytic converter deterioration.

Fig.24

'95MY, '96MY V6 2.5L



'97MY V6 2.5L

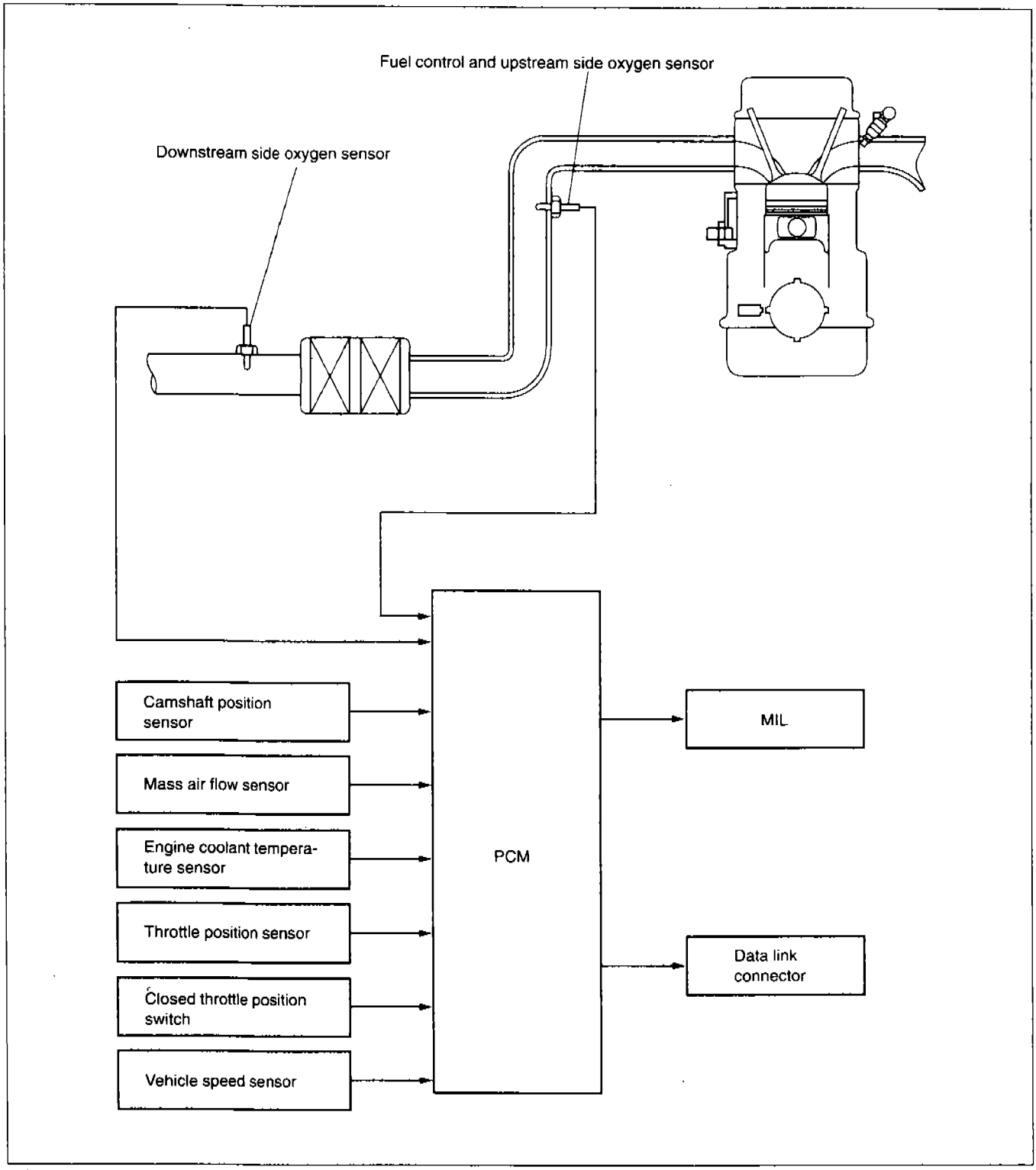


3.7 Oxygen sensor heater monitor

3.7.1 Outline

The oxygen sensor heater monitor checks if the oxygen sensor heater, equipped to quickly activate the oxygen sensor, is operating normally.
As for '96 MY vehicles, this monitor is applied to the oxygen sensor for fuel injection control only.

System diagram



3.7.2 Monitoring method

(1) Except 626/MX-6 FS ATX and B-Series

In the oxygen sensor heater monitor, current or voltage supplied to the oxygen sensor heater is monitored to judge if the heater is good or not.

The PCM monitors the current or voltage supplied to the oxygen sensor heater for a specified period after the monitoring conditions in 3.7.3 are satisfied. If the current/voltage exceeds the threshold, the PCM detects a malfunction of the heater.

This monitoring differs according to vehicle. For '95MY and '96MY Group-1 vehicles, measurement takes place over two consecutive trip cycles. For '96MY Group-2 and '97MY vehicles, it takes place over two consecutive drive cycles.

If an oxygen sensor heater malfunction is detected, the PCM illuminates the MIL and stores the DTC.

As for '97 MY vehicles, the PCM stores the pending code when the malfunction is detected during one drive cycle.

The DTCs associated with this monitor are :

'96 MY vehicles : DTCs P0135 and P0155

'97 MY vehicles : DTCs P0135, P0141, P0147, P0155, and P0161.

(2) 626/MX-6 FS ATX and B-Series

In the oxygen sensor heater monitor, current or voltage supplied to the oxygen sensor heater is monitored to judge if the heater is good or not.

The PCM monitors the current or voltage supplied to the oxygen sensor heater for a specified period after the monitoring conditions are satisfied. If the current/voltage exceeds the threshold, the PCM detects a malfunction of the heater.

This monitoring differs according to vehicle. For B-Series, measurement takes place over two consecutive trip cycles. For 626/MX-6 FS ATX, it takes place over two consecutive drive cycles. If an oxygen sensor heater malfunction is detected, the PCM illuminates the MIL and stored the DTC.

Also, the PCM stores the pending code when the malfunction is detected during one drive cycle.

The DTCs associated with this monitor are DTCs P0135, P0141 and P0155.

3.7.3 Monitoring condition

(1) For BP, KL, KJ, and JE engines

1 Period after engine staring within the set time

(2) For Z5 and FS(MTX) engines

1 Battery positive voltage within the set voltage

2 Oxygen sensor heater operating

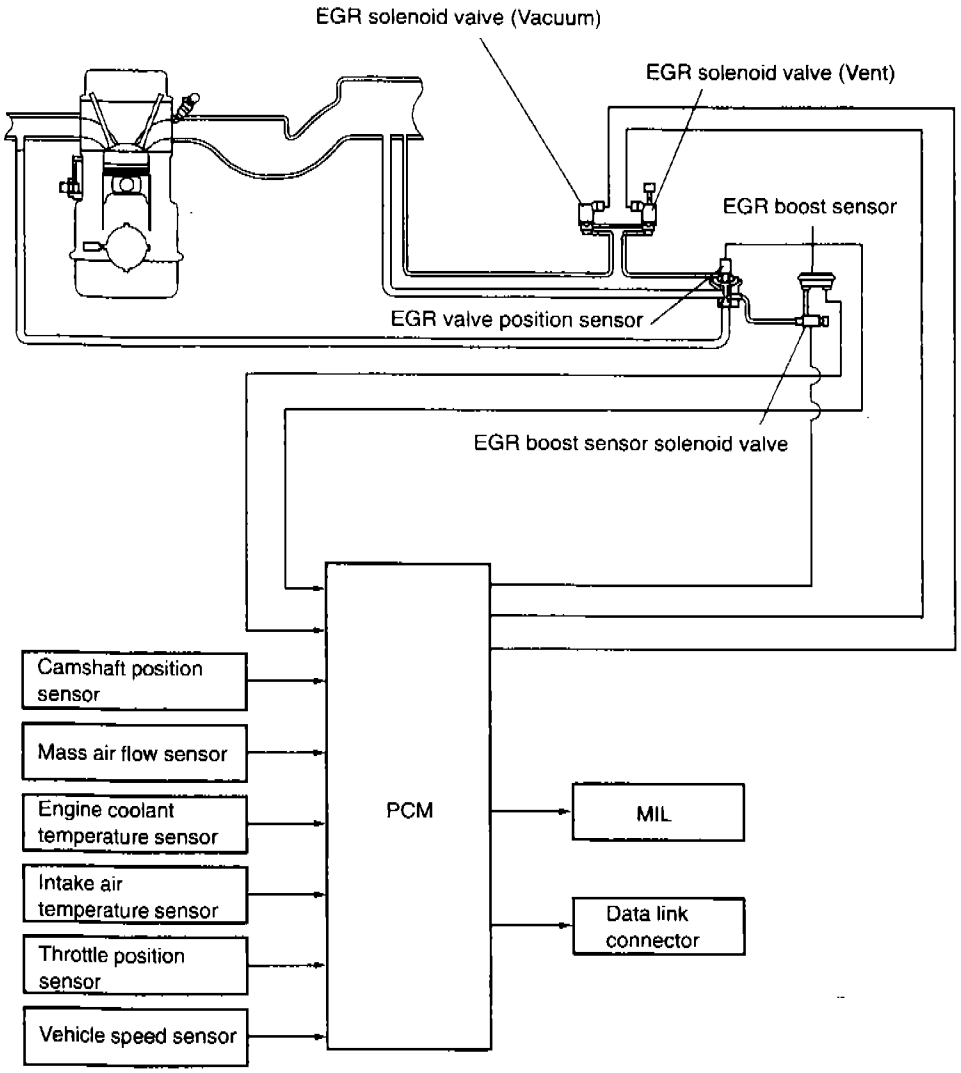
3.8 EGR system monitor

3.8.1 Outline

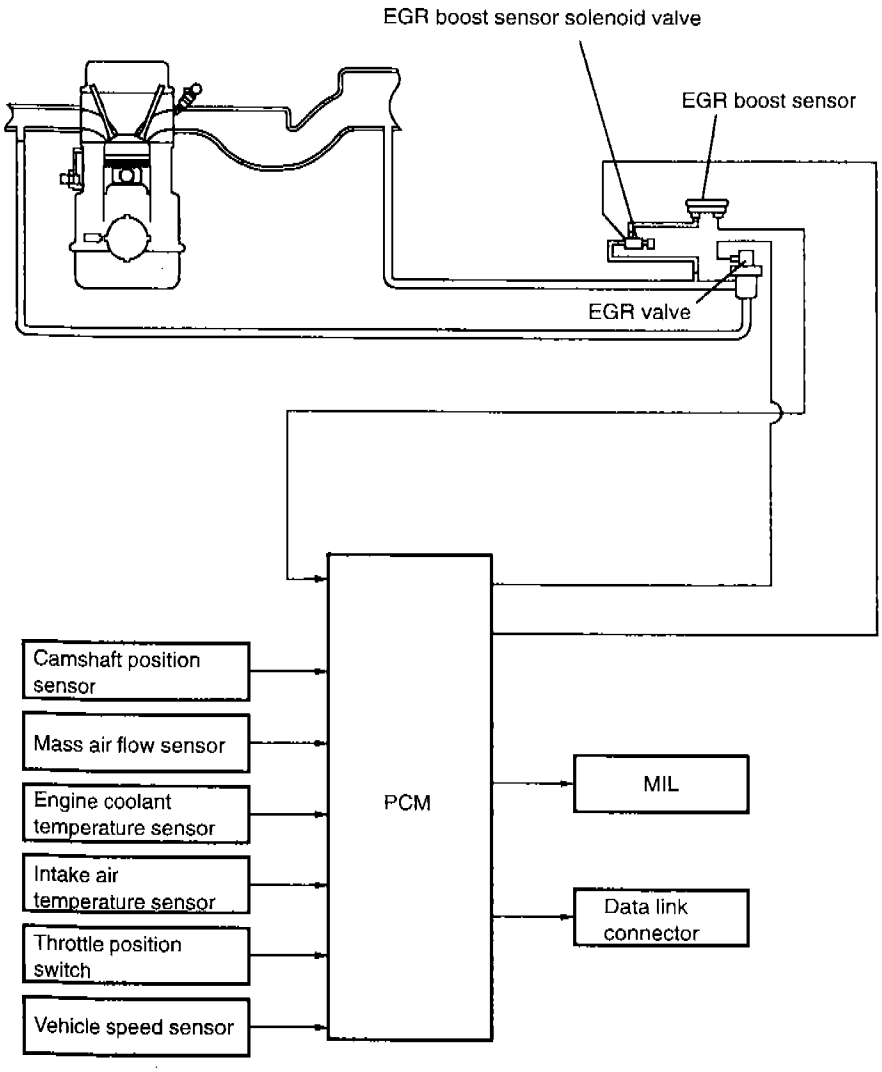
In the EGR system monitor, components and EGR volume of the EGR system, which affects emission performance, are monitored.

System diagram

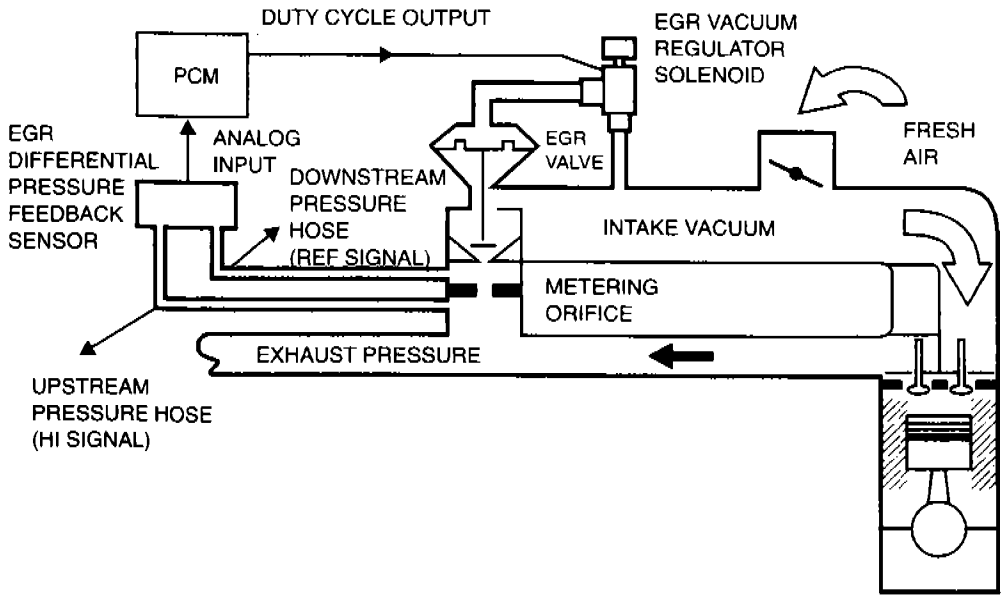
(1) Vacuum control type



(2) Stepping motor control type



(3) Differential pressure feedback type (B-Series)



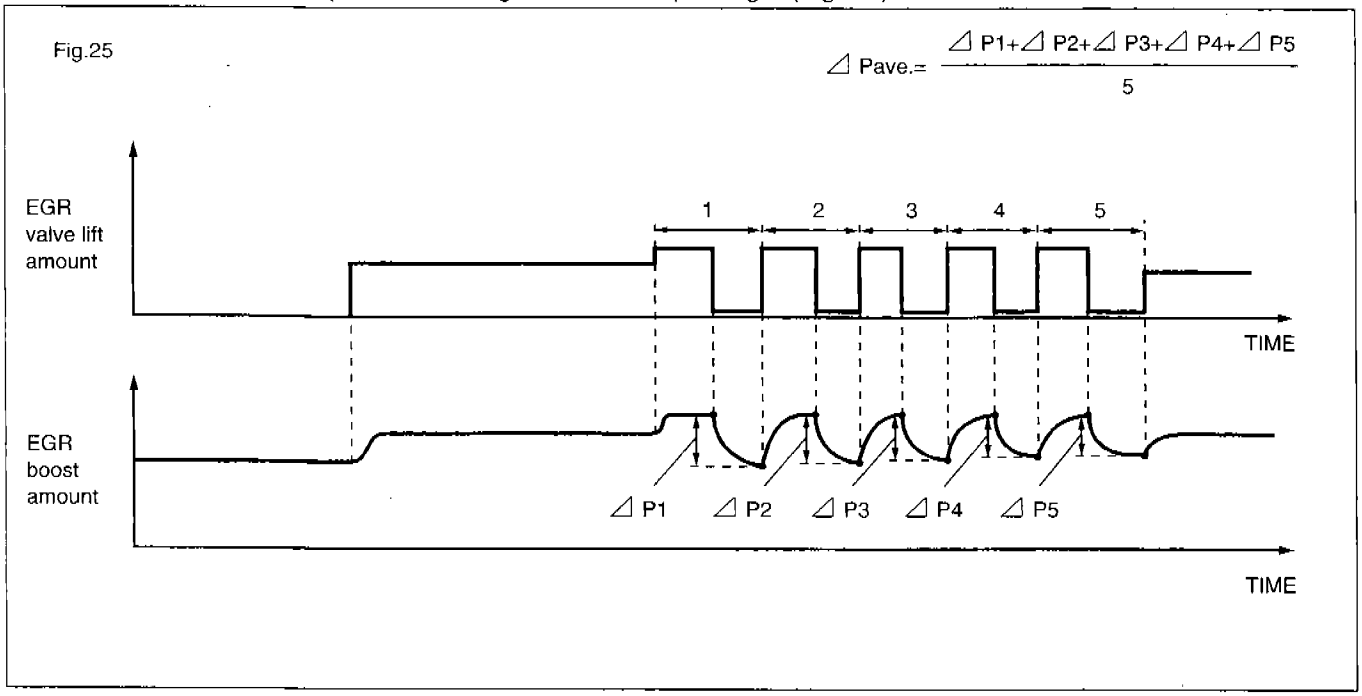
3.8.2 Monitoring method

(1) Except 626/MX-6 FS ATX and B-Series

The EGR system monitor judges if the EGR system is good or not by detecting the pressure change in the EGR passage by using the EGR boost sensor installed in the EGR passage.

When monitoring conditions in 3.8.3 are satisfied, the PCM activates/deactivates the EGR for the specified times, and monitors and averages the pressure change in the EGR passage. (Fig. 25)

Fig.25



By judging if the average pressure change is within the threshold, the PCM performs good/no good judgment of the EGR system.

As for '97 MY vehicles, the average pressure change used for judgment is stored in the PCM.

This monitoring differs according to vehicle. For '95MY and '96MY Group-1 vehicles, measurement take place over two consecutive trip cycles. For '96MY Group-2 and '97MY vehicles, it takes place over two consecutive drive cycles.

If the EGR system malfunction is detected, the MIL will illuminate and a DTC will be stored.

The DTC associated with this monitor is DTC P0400.

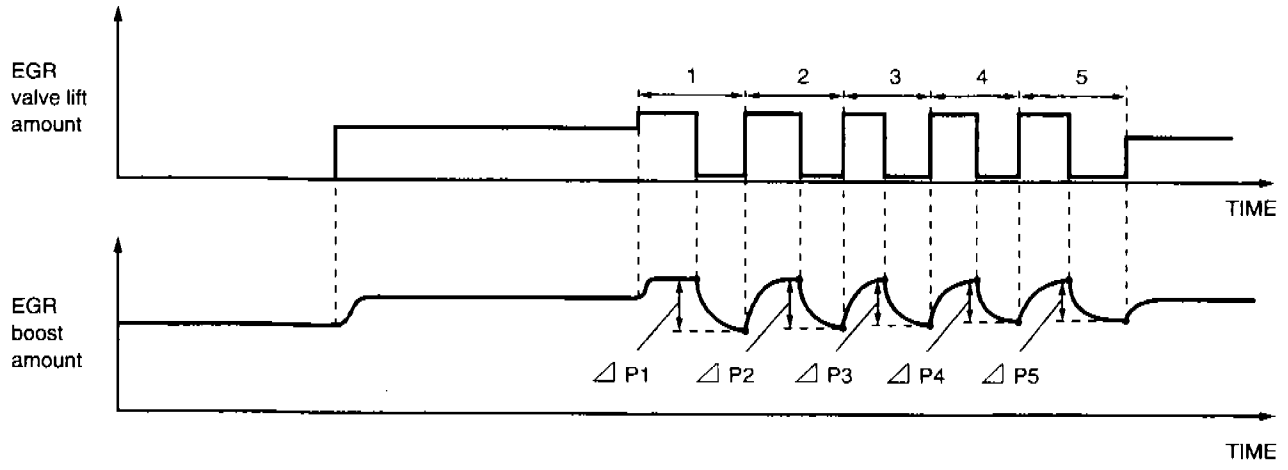
(2) 626/MX-6 FS ATX

The EGR system monitor judges if the EGR system is good or not by detecting the pressure change in the EGR passage by using the EGR boost sensor installed in the EGR passage.

When monitoring conditions are satisfied, the PCM activates/deactivates the EGR for the specified times, and monitors and averages the pressure change in the EGR passage. (Fig. 26)

Fig.26

$$\Delta Pave. = \frac{\Delta P1 + \Delta P2 + \Delta P3 + \Delta P4 + \Delta P5}{5}$$



By judging if the average pressure change is within the threshold, the PCM performs good/no good judgment of the EGR system.

As for '97 MY vehicles, the average pressure change used for judgment is stored in the PCM.

When the average pressure change exceeds the threshold in two consecutive drive cycles, the PCM detects a malfunction of the EGR system, illuminate the MIL and stores the DTC.

Also, the PCM stores the pending code when the malfunction is detected during one drive cycle.

The DTC associated with this monitor is DTC P0400.

(3) B-Series
The EGR system monitor will perform each of the tests described below.

1. The differential pressure feedback EGR sensor and circuit are continuously tested for opens and shorts. The monitor looks for the differential pressure feedback EGR circuit voltage to exceed the maximum or minimum allowable limits.
   The DTCs associated with this test are DTCs P1400 and P1401.
2. The EGR vacuum regulator solenoid is continuously tested for opens and shorts. The monitor looks for an EGR vacuum regulator circuit voltage that is inconsistent with the EGR vacuum regulator circuit commanded output state.
   The DTC associated with this test is DTC P1409.
3. The test for a stuck open EGR valve or EGR flow at idle is continuously performed whenever at idle(Throttle position sensor indicating closed throttle). The monitor compares the differential pressure feedback EGR circuit voltage at idle to the differential pressure feedback EGR circuit voltage stored during key on engine off to determine if EGR flow is present at idle.
   The DTC associated with this test is DTC P0402
4. The deferential pressure feedback EGR sensor hoses are tested once per drive cycle for disconnect and plugging. the test is performed with EGR valve closed and during a period of acceleration. The PCM will momentarily command the EGR valve closed. The monitor looks for the deferential pressure feedback EGR sensor voltage to be inconsistent for a no flow voltage. A voltage increase or decrease during acceleration while the EGR valve is closed may indicate a fault with a signal hose during this test.
   The DTCs associated with this test are DTCs P1405 and P1406.
5. The EGR flow rate test is performed during a steady state when engine speed and load are moderate and EGR vacuum regulator duty cycle is high. The monitor compares the actual differential pressure feedback EGR circuit voltage to a desired EGR flow voltage for that state to determine if EGR flow rate is acceptable or insufficient.
   The DTCs associated with this test are DTCs P0401 and P1408.
6. The MIL is activated after one of the above tests fail on two consecutive drive cycles.

3.8.3 Monitoring condition

(1) '95MY and '96MY vehicles
1 Period after engine starting within the set time
2 Engine speed within the set speed
3 Change in engine speed below the set range
4 Throttle opening angle within the set angle
5 Change in throttle position below the set range
6 Calculated load within the set value
7 Change in calculated load below the set range
8 Vehicle speed within the set speed
9 Target EGR value lift amount above the set value
10 A/C operation not changing
11 P/S operation not changing
12 Electrical load operation not changing
13 EGR position sensor circuit malfunction not occur

(2) '97MY vehicles
1 Engine speed within the set speed
2 Change in engine speed below the set range
3 Throttle opening angle within the set angle
4 Change in throttle position below the set range
5 Calculated load within the set value
6 Change in calculated load below the set range
7 Vehicle speed above the set speed
8 Target EGR valve lift amount above the set value
9 EGR pressure monitoring times above the set times

3.9 Comprehensive component monitor (CCM)

3.9.1 Outline

In the comprehensive component monitor (CCM), the following components are monitored to judge if a problem exists.

1. Input and output devices which affect emission performance when failed. Excludes the devices which are detected by another system monitor for failure.
2. Input and output devices used for the OBD-II system monitor. Includes ones which do not affect emission performance when failed.

3.9.2 Monitoring method

(1) Except 626/MX-6 FS ATX and B-Series

There are two monitoring methods; one is to detect failures in the electrical circuit (open, short) and the other is to detect stuck failures (malfunctions).

Depending on the component being monitored, these methods are applied as necessary; either one of the methods or both.

When monitoring the electrical circuit, a problem is detected when the input/output voltage or current exceeds the threshold continuously over the specified period of time.

When monitoring the stuck failure, a problem is detected when there is logical inconsistency in related input/output signals. (For example, when monitoring the mass air flow sensor, the engine rpm signal and throttle position sensor output signal are compared.)

When a problem is detected, the PCM performs as follows:

As for the components of which fail-safe data is stored in the PCM, the PCM switches engine control to control by the fail-safe data. Therefore, the PCM illuminates the MIL and stores the DTC when the problem is detected in the first drive cycle.

As for the components of which fail-safe data is not stored in the PCM, the PCM illuminates the MIL and stores the DTC when the problem is detected in two consecutive drive cycles. In this case, '97MY vehicles stores the pending code when the malfunction is detected during one drive cycle.

Items monitored by the CCM are listed on the next page.

Comprehensive component monitor table

Parts	Electrical	Stuck	Characteristics
Mass or volume airflow sensor	○	○	①
Engine coolant temperature sensor	○	○	①
EGR valve position sensor	○	–	①
Throttle position sensor	○	○	①
Knock sensor	○	○	①
Intake air temperature sensor	○	○	①
Intake air temperature sensor (D/C)	○	–	①
Intake air temperature sensor (L/C)	○	○	①
Crankshaft position sensor	–	○	②
Camshaft position sensor (SGC signal)	–	○	①
Manifold absolute pressure sensor	○	○	①
Battery voltage	○	–	①
Heated O2 sensor (No activity)	–	○	①
Heated O2 sensor (Inversion)	–	○	②
Neutral/Clutch switch	–	–	①
Brake switch	–	○	①
Vehicle speed sensor	–	○	①
Ignition switch (Start signal)	–	○	①
Closed throttle position switch	–	○	①
IAC valve	○	○	①
Bypass air solenoid valve	○	–	①
ABV	–	○	①
ABV solenoid valve	○	–	①
Barometric pressure sensor	○	○	①
EGR boost sensor	○	○	②
Camshaft position sensor (SGT)	–	○	①
Fuel tank level sensor	○	○	②
Fuel tank pressure sensor	○	–	②
Canister drain cut valve	–	○	②
Tank pressure control valve	–	○	②
Purge solenoid valve	○	○	①
AWS control valve	○	○	①
ECM–TCM communication	○	–	①
Transmission range sensor	○	○	①
Transmission fluid temperature sensor	○	○	①
Input/turbine speed sensor	–	○	①
Output speed sensor	–	○	①
Gear	–	○	①
Torque converter clutch system	–	○	①
Shift solenoid valve	○	–	①
Vehicle speedometer sensor	–	○	①
Torque converter clutch control solenoid valve	○	–	①
Torque converter clutch solenoid valve	○	–	①
Overrunning clutch solenoid valve	○	–	①

Note: Components are classified into two groups according to their characteristics.

1. Input and output devices which affect emission performance when failed. Excludes the device which are detected by another system monitor or failure.
2. Input and output devices used for the OBD-II system monitor. Includes ones which do not affect emission performance when failed.

(2) 626/MX-6 FS ATX and B-Series

There are two monitoring methods; one is to detect failures in the electrical circuit (open, short) and the other is to detect stuck failures (malfunctions).

Depending on the component being monitored, these methods are applied as necessary; either one of the methods or both.

When monitoring the electrical circuit, a problem is detected when the input/output voltage or current [illegible]

CHARACTERISTICS OF THE NGS TESTER

CHARACTERISTICS AND EFFECTIVE USAGE OF GENERIC FUNCTIONS

The characteristics and effective troubleshooting procedures of the generic functions explained in the next chapter are set forth here.

1. PID Data Monitor Function

The generic PID data monitor function shows mode 01 of the diagnostic test mode (troubleshooting data transmission). If you use this function, you can monitor the system's calculated values and the PCM's input/output signal values that are related to emissions, as defined by OBD-II regulations. All of the data is shown by units fixed by OBD-II regulations. This data, shown on the following page, is referred to as generic PID data.

This PID monitor function is used for the following purposes:
1. To check vehicle emissions.
2. To use freeze-frame data to establish the conditions necessary to run duplication tests.

1.1 About the Generic PID Data Monitor Function's Sampling Speed

When you are monitoring PID data using this function, the sampling interval will increase by 262ms for each additional sampling performed (Figure 1–1). So if you monitor several different things at the same time, it will become difficult to confirm small changes in the data because of the lengthened interval.

Sampling Number	Monitor Data Sampling Interval
1	262 ms
2	524 ms
3	786 ms
4	1048 ms
5 27	1310 ms 7074 ms

Fig. 1–1

PID	Freeze Frame	Description	Measurement Units
CCNT		Continuous DTC Counter	Unitless
ECT	○	Engine Coolant Temperature	Degrees
FUELSYS1	○	Fuel System Feedback Control Status-Bank1	Open:NON–F/B Closed:F/B
FUEL SYS2	○	Fuel System Feedback Control Status-Bank2	Open:NON–F/B Closed:F/B
IAT		Intake Air Temperature	Degrees
LOAD	○	Calculated Engine Load	Percent
LONGFT1	○	Current Bank 1 Fuel Trim Adjustment (Learning Correction Value)	Percent
LONGFT2	○	Current Bank 2 Fuel Trim Adjustment (Learning Correction Value)	Percent
MAF		Mass Air Flow Rate	mg/sec
MIL		Current MIL Status	ON/OFF
O2S11		Bank 1 Primary Oxygen Sensor	VOLTS
O2S12		Bank 1 Secondary Oxygen Sensor (Middle Oxygen Sensor Status if it's equipped)	VOLTS
O2S13		Bank 1 Secondary Oxygen Sensor	VOLTS
O2S21		Bank 2 Primary Oxygen Sensor	VOLTS

PID	Freeze Frame	Description	Measurement Units
O2S22		Bank 2 Secondary Oxygen Sensor	VOLTS
OBDSUP		Supported type of On-Board Diagnostic System	OBD2
RPM	○	Revolutions Per Minute	R/MIN
SHRTFT1	○	Current Bank 1 Fuel Trim Adjustment (Primary O2 Sensor Feedback Correction Value)	Percent
SHRTFT11		Current Bank 1 Fuel Trim Adjustment (Primary O2 Sensor Feedback Correction Value)	Percent
SHRTFT12		Current Bank 1 Fuel Trim Adjustment (Middle O2 Sensor Feedback Correction Value if it's equipped)	Percent
SHRTFT13		Current Bank 1 Fuel Trim Adjustment (Secondary O2 Sensor Feedback Correction Value)	Percent
SHRTFT21		Current Bank 2 Fuel Trim Adjustment (Primary O2 Sensor Feedback Correction Value)	Percent
SHRTFT22		Current Bank 2 Fuel Trim Adjustment (Secondary O2 Sensor Feedback Correction Value)	Percent
SHRTFT2	○	Current Bank 2 Fuel Trim Adjustment (Primary O2 Sensor Feedback Correction Value)	Percent
SPARKADV		Spark Advance Cylinder #1	Degrees
TP		Throttle Position	Percent
VSS	○	Vehicle Speed Sensor	MPH–KPH

2. Freeze Frame Data Function

The Freeze Frame Data Function shows data from the diagnosis test mode's mode 2. Freeze Frame Data allows access to emission-related values from generic PIDs. These values are stored the instant an emission-related DTC is stored in memory. This provides a snapshot of the conditions that were present when the DTC was stored. Once one set of freeze frame data is stored, this data will remain in memory even if another emission-related DTC is stored, except for Misfire or Fuel System DTCs. Once freeze frame data for Misfire or Fuel System DTC is stored, it will overwrite any previous data and the freeze frame data will not be further overwritten. When a DTC associated with the freeze frame is erased or an ECM memory reset is performed, new freeze frame data can be stored again.

2.1 Effective Use of FFD

As described in the generic PID data monitor function, freeze frame data can be used for reproducing the conditions necessary to run a duplication test.

First, confirm whether a DTC is stored in the vehicle. If so, monitor the freeze frame data and enter the contents on the repair order. Once the DTC has been erased, refer to the appropriate W/M's DTC troubleshooting procedures and confirm the three items below while idling. If the problem is continuously present, it can sometimes be detected again by checking these items.

1. MIL is not illuminated (no DTC has been memorized).
2. DIAGNOSTIC MONITORING TEST RESULTS does not read FAULTY.
3. No PENDING TROUBLE CODE is stored in the memory.

If 1–3 are all okay, select RPM, LOAD, ECT and VSS while using the generic PID data monitor function and drive the vehicle under the same conditions as indicated by the FFD, keeping them as steady and stable as possible. You also need to drive the certain drive cycle. if DTC is related to the intermittent monitoring system. After that, check 1–3 above again. If there is a problem, you can repair it quickly and efficiently by referring to the appropriate W/M's DTC troubleshooting procedures.

For example, suppose the FFD shows the data given below. If you drive at a smooth and steady 60 mph up a slope, you should be able to match the conditions recorded in the FFD.

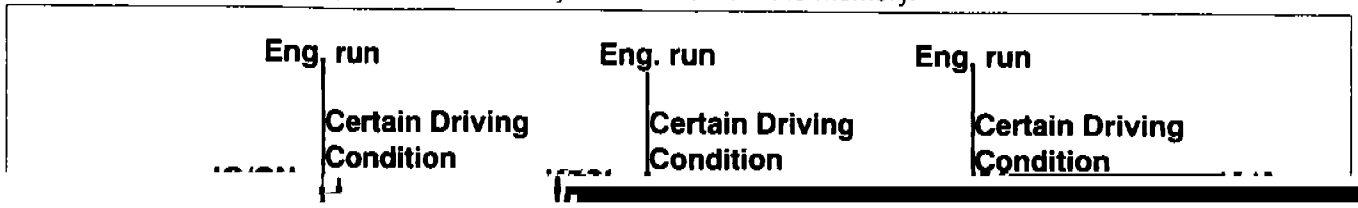
RPM: 3100
LOAD: 38%
ECT: 210 degrees F
VSS: 60 mph

3. Retrieving And Canceling DTCs Function

3.1 Detecting DTCs

Like the Self-Diagnostic tester, the NGS tester can interpret DTCs. The NGS tester, however, can also display the definitions of detected trouble codes. There are two types of DTCs. One type is stored in the PCM memory after it has been judged as a malfunction for one drive cycle. The other requires two drive cycles before it is judged as a malfunction and stored in the PCM. One "drive cycle" refers to the following series of actions: Engine start – engine running monitoring conditions are satisfied – ignition switch OFF – ignition switch ON (Fig.3–1). When a DTC has been recorded the PCM will either illuminate the MIL or flash it on and off.

The PCM is also programmed to extinguish the MIL if it decides that conditions are normal for 4–5 drive cycles after the DTC has been recorded. Furthermore, if the PCM decides that conditions are normal for 42 warm up cycles after the DTC has been recorded, it will automatically be deleted from the memory.



5. Diagnostic Monitoring Test Results

The DIAGNOSTIC MONITORING TEST RESULTS is the intermittent monitor system's technical data, which is used to determine whether the system is normal or not. It also displays the system's thresholds and a diagnostic result. The intermittent monitor system monitors the Oxygen Sensor, Evaporative Purge System, Catalyst and the EGR System. This function is established in 1997 MY vehicles. A list of these technical data and thresholds is shown below. Moreover, some of the technical data and thresholds have initial values. If the test is not completed, they display their initial values on the NGS screen. A list of initial values is shown in parentheses in the MEAS, Minimum Threshold, and Maximum Threshold columns.

However, the Catalyst will sometimes indicate an initial value even if the test is completed. This is because the new catalytic converter purifies the exhaust gas completely. As a result, the rear O2 sensor does not switch, so the following formula doesn't work.

$$\text{Ratio} = \frac{\text{The number of inversions of the Front O2 sensor}}{\text{The number of inversions of the Rear O2 sensor}} > \text{Threshold (Limit)}$$

In this case, the PCM indicates the initial value.

EX: Protege Z5D MT

TEST#	MEAS	Minimum Threshold	Maximum Threshold	Actual calculation formula Threshold × LSB + OFF Set	TEST CONTENTS
10:01:11	68 (0)		280	280 × 10 + 0 =2800 ms	Front O2 sensor switch's cycles
10:02:11	4 (0)		100	100 × 10 + 0 =1000 ms	Front O2 sensor response time
10:03:11	3 (0)		80	80 × 10 + 0 =800 ms	Front O2 sensor response time
10:04:11	92	0		92 × (1.25/256) + 0 = 0.4492v	Front O2 Rich ⇄ Lean switch's voltage
10:04:02	123	0		123 × (1.25/256) + 0 = 0.6006v	Rear O2 Rich ⇄ Lean switch's voltage
10:05:01	71	0		71 × (1.25/256) + 0 = 0.3467v	Front O2 sensor lean threshold voltage
10:06:01	112	0		112 × (1.25/256) + 0 = 0.5469v	Front O2 sensor rich side threshold voltage
10:11:11	480 (65535)	22		22 × 1/16 + 0 = 1.375	Catalyst deterioration
10:21:00	2 (0)		67~240 (65535)	(DATA) × 1700/1024 + 0 =111.2~398.4mmAq (DATA):67~240	In-take pressure Evaporative Purge System (Small leak)
10:22:00	3 (0)		433~632 (65535)	(DATA) × 1700/1024 – 850 =–131.2~199.2mmAq (DATA):433~632	In-take pressure Evaporative Purge System (Large leak)
10:41:00	10 (32768)	2 (0)	54 (65535)	<MIN> (DATA) × 950/256 + 0 =7.42~11.13mmHg (DATA):2~3 <MAX> 54 × 950/256 + 0 =200.39 mmHg	EGR pressure changing

5.1 Characteristics Of The Diagnostic Monitoring Test Results

The catalyst and oxygen sensor troubleshooting thresholds are normally set at a certain value, but the Evaporative system's values depend on atmospheric pressure and temperature. The EGR system's troubleshooting threshold values change according to changes in atmospheric pressure as well. Figure 5–1 shows a three-dimensional representation of the Evaporative system's troubleshooting threshold value changes.

EX: Protege Z5D MT

Evaporative Purge System Threshold: Tank pressure changing (Small leak)

(mmHg)					
401	425	425	425	425	
520	131.2	131.2	425	425	
638	121.2	121.2	249.2	425	
757	111.2	111.2	249.2	425	
	77	86	95	104	(°F)

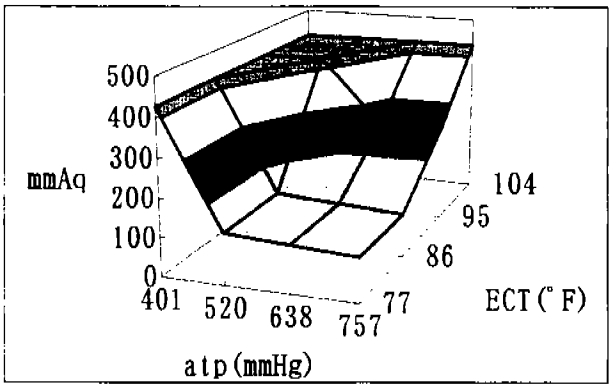


Fig. 5–1

Evaporative Purge System Threshold: Tank pressure changing (Large leak)

(mmHg)					
401	199.2	199.2	199.2	199.2	
520	–131.2	–131.2	–101.3	199.2	
638	–131.2	–131.2	–101.3	199.2	
757	–131.2	–131.2	–101.3	199.2	
	77	86	95	104	(°F)

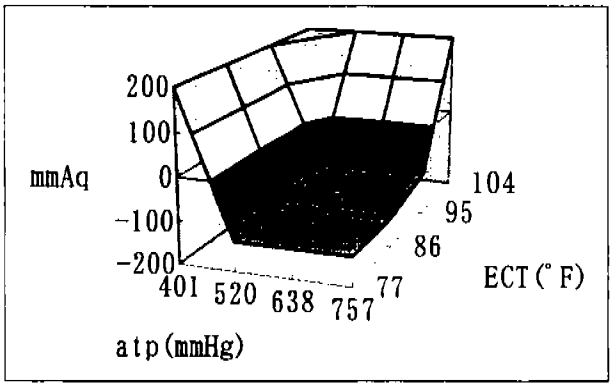


Fig. 5–2

5.2 Effective Use of DIAGNOSTIC MONITORING TEST RESULTS

As was explained in the "Effective Use of FFD" section, the DIAGNOSTIC MONITORING TEST RESULTS function is good for detecting the presence or absence of DTCs related to the intermittent monitor system after a duplication test has been run. If you use this function, you do not have to go through two drive cycles to perform a duplication test. You can confirm the results of the test after one drive cycle, and thereby determine whether the malfunction has been recreated.

Furthermore, you can check whether the drive cycle is completed or not. If you compare the diagnostic monitoring test results with the on-board system readiness test (RFC) status in accordance with next table.

1. If the diagnostic monitoring test results indicated an initial value and the result of the RFC indicated "NO", you can be sure that the drive cycle is not completed.
2. If the diagnostic monitoring test results indicated a test result which is not within limits and a result of the RFC indicated "NO", you can be sure that the drive cycle is not completed and the system is faulty.
3. If the diagnostic monitoring test results indicated a test result which is within limits and a result of the RFC indicated "YES", you can be sure that the drive cycle is completed and the system is normal.

	1	2	3
DIAGNOSTIC MONITORING TEST RESULTS	INITIAL VALUE	TEST DATA IS NOT WITHIN LIMITS	TEST DATA IS WITHIN LIMITS
RFC (1st DC)	NO	NO (MIL IS NO ILLUMINATED)	YES
RESULTS	DRIVE CYCLE IS NOT COMPLETED *Except for the catalyst diagnostic system	DRIVE CYCLE IS COMPLETED (FAULT)	DRIVE CYCLE IS COMPLETED (ALL OK)

6. Pending Trouble Code Function

6.1 Characteristics of PENDING TROUBLE CODE

This mode applies to '97 MY and later vehicle models. When a problem is detected in a monitored system, the MIL

CHARACTERISTICS AND EFFECTIVE USAGE OF SPECIFIC FUNCTIONS

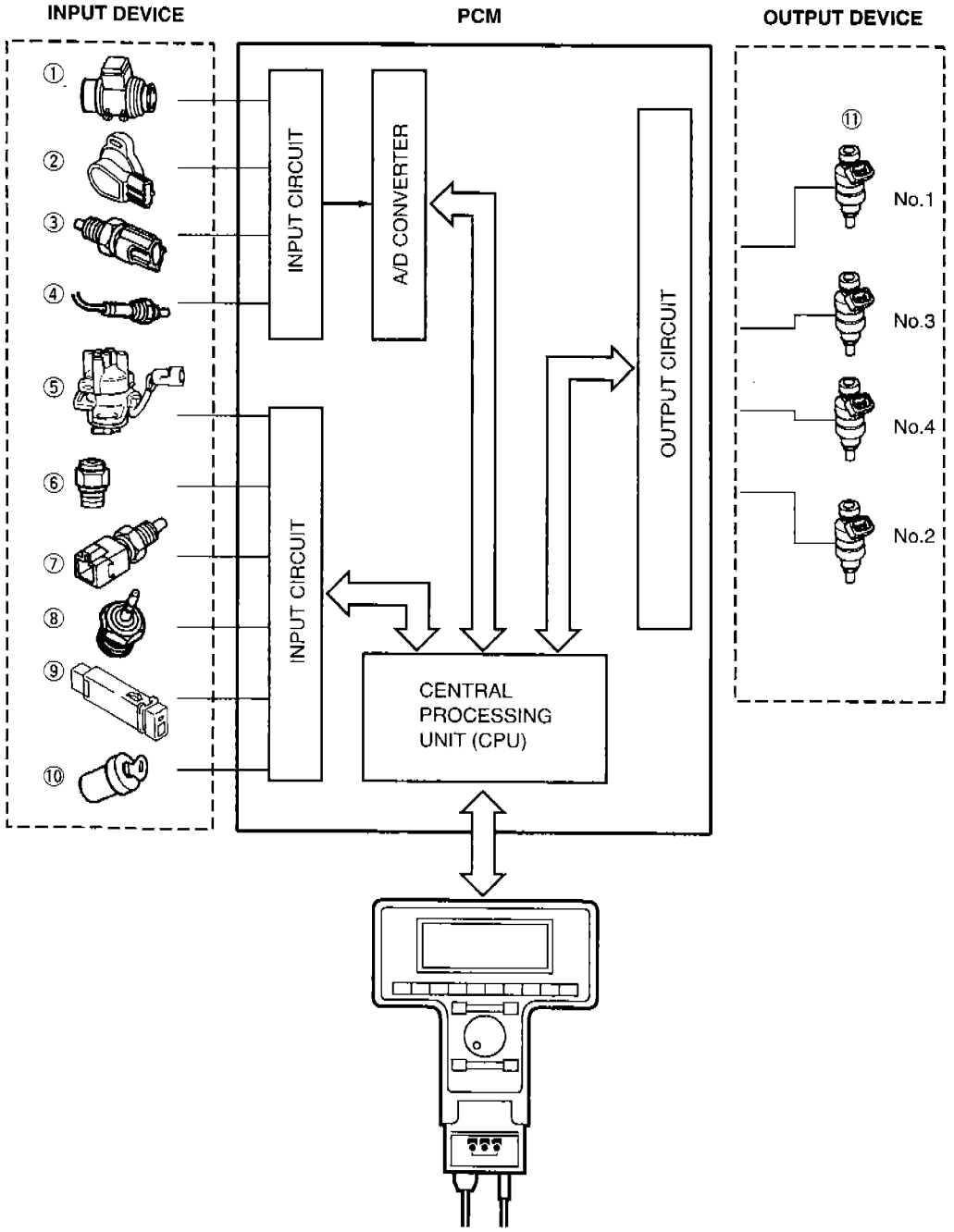
In this chapter, in order to practically and effectively use the NGS tester's specific functions in troubleshooting, each function's characteristics and effective usage are explained.

1. Specific Monitor Function

As per OBD-II regulations, the generic monitor function shows only emissions-related information. The specific moni-

1.3 Monitor function characteristics

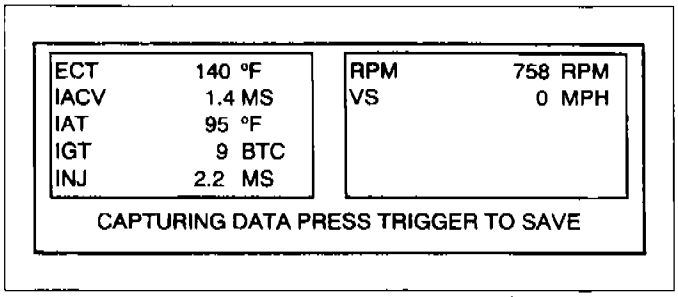
Figure 1–2 below shows a close-up of part of the CIS (Continuous Injection System). The NGS tester monitors the input device's signals as it communicates with the PCM's internal CPU. It also monitors the calculation values that precede the output signal.



① MASS AIR FLOW SENSOR and INTAKE AIR TEMPERATURE SENSOR
② THROTTLE POSITION SENSOR and CLOSED THROTTLE POSITION SWITCH
③ ENGINE COOLANT TEMPERATURE SENSOR
④ HEATED OXYGEN SENSOR
⑤ CAMSHAFT POSITION SENSOR (SGT, SGC SIGNAL)
⑥ NEUTRAL SWITCH
⑦ CLUTCH SWITCH
⑧ POWER STEERING PRESSURE SWITCH
⑨ A/C SWITCH
⑩ IGNITION SWITCH (START SIGNAL)
⑪ FUEL INJECTORS

If you use this function, you can monitor the CPU's calculations as shown below. (This could not be done with the ESM.)

1. Engine Coolant Temp. : "°"
2. Duty Signal : "ms or %"
3. Intake Air Temp. : "°"
4. Ignition Timing : "°"
5. Injection Amount : "ms"
6. R.P.M. : "RPM"
7. Vehicle Speed : "MPH"



1.4 Limitations of the NGS monitor function

There are four limitations relating to the NGS monitor function listed below. Please keep them in mind when performing diagnostic functions.

1. You cannot determine whether the output device is good or bad.
   As explained in point 1–3, the NGS tester monitors the values that are calculated prior to those values being sent to the output device. Therefore, it is impossible to confirm whether they are being sent to the output device. For example, assume the output device coupler is not connected. If input signals are being sent to the CPU normally, the monitor will still show the usual calculated values. So even if the monitor values read normal, it does not necessarily mean that the output device is functioning correctly.

2. The PCM's ground condition cannot be monitored.
   When the ESM was used, the voltages at all PCM terminals could be determined. But in the monitor function mode, the NGS tester monitors only those functions which are controlled by the CPU. Because of this, the grounds shown below cannot be monitored. (Refer to figure 1-4 on the following page.)

   a. PCM ground
   b. Injector ground
   c. Output device ground
   d. Analog ground

When checking these grounds with the NGS tester, the Digital Measurement System tester function must be used, and both voltage and harness continuity must be tested.

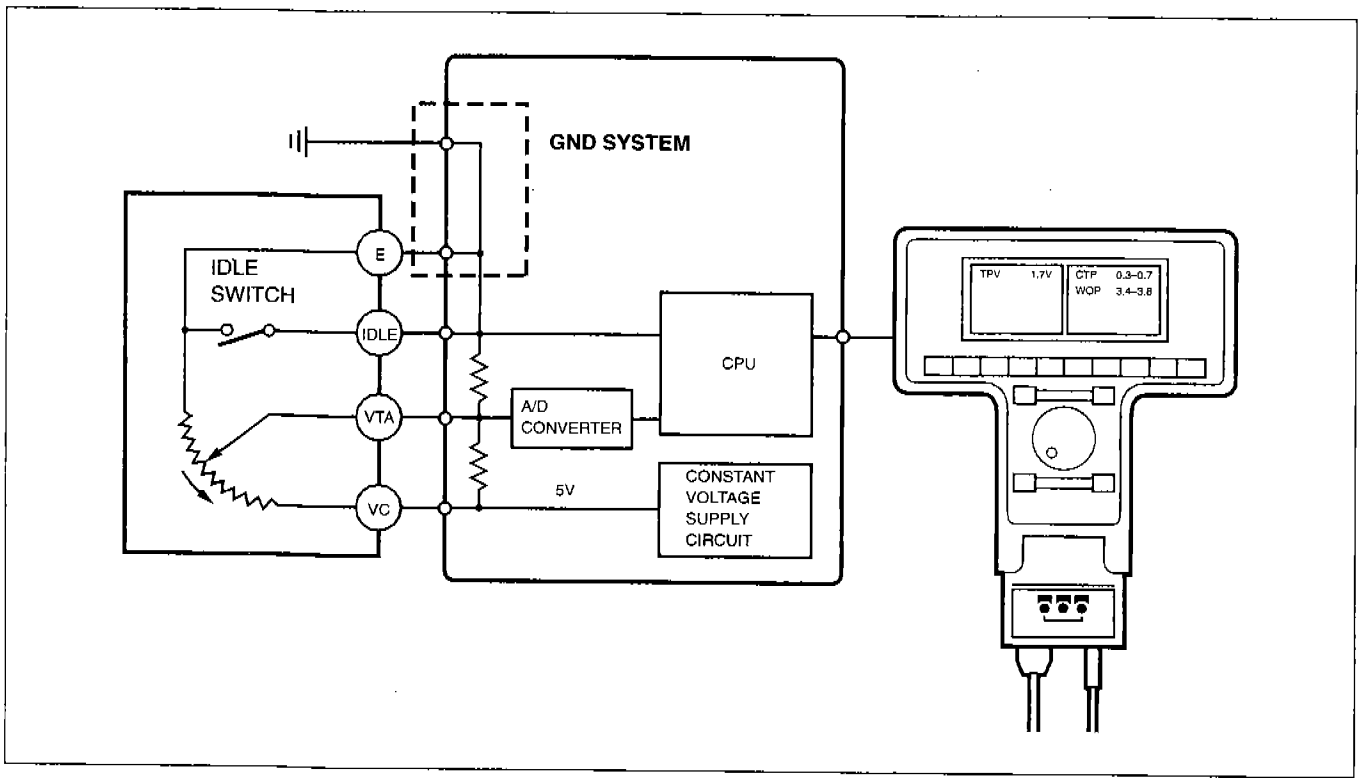


Fig. 1–4 Ground System

3. Input/output signal initial value display
   Depending on the input/output device, the CPU may contain a device with pre-set initial values that are prepared for engine start-up. If the ignition switch is in the on position, this device will cause the monitor to show values that do not reflect the actual state of the vehicle. Figure 1–5 shows the initial values and the vehicles that will display them.
   As you test the vehicles, it will be necessary to note these initial values as you proceed with testing.

Model	Device	Initial Value
Protege (BP, Z5) MX-5(BP) MX-3(B6) MPV(JEE)	IGT	–20
626/MX-6(FS)	IGT	–10
MX-3(K8) 626/MX-6(KL) Millenia (KL, KJ)	IGT	–7

Fig. 1–5 Initial Value

Figure 1–6 on the right shows a display for a Protege (BPD) with the ignition key on. The screen shows an IGT initial value of –20°.
If an NE signal is being inputted when you crank the engine, you can confirm that the ignition timing will go from –20° to 7° (the fixed ignition is being carried out), as shown in Figure 1–7.

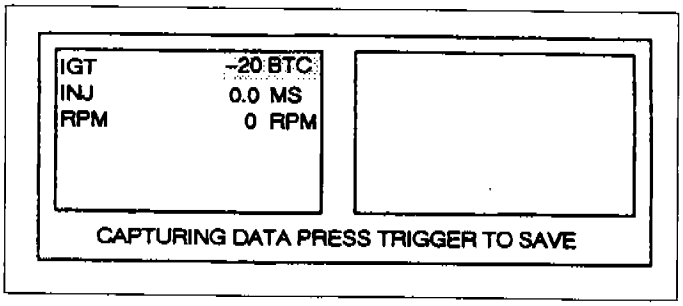


Fig. 1–6

And, in order to supply stable voltage, you should use a battery hookup adapter and connect the power supply directly to the NGS tester. (Refer to the warning in 2–2–4.)

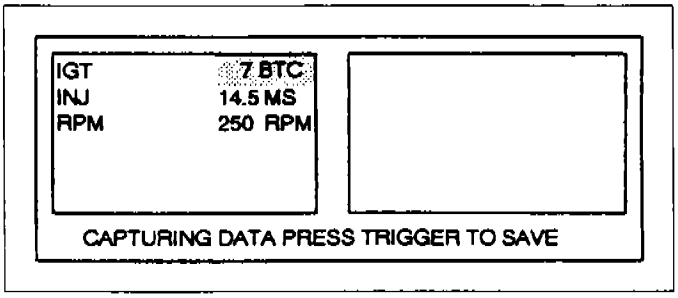


Fig. 1–7

4. Fuel injection amount

As Figure 1–8 shows, the NGS tester monitors the calculated value before the signal is distributed to each injector. When one injector has an open circuit, the PCM will increase the amount of fuel in order to maintain engine revolutions.

Due to this, the calculated values that you are monitoring will increase, but individual inspection will be necessary in order to determine which injector has the open circuit. In a V6 engine the right and left banks are calculated separately, so there are two PIDS: INJ RH and INJ LH.

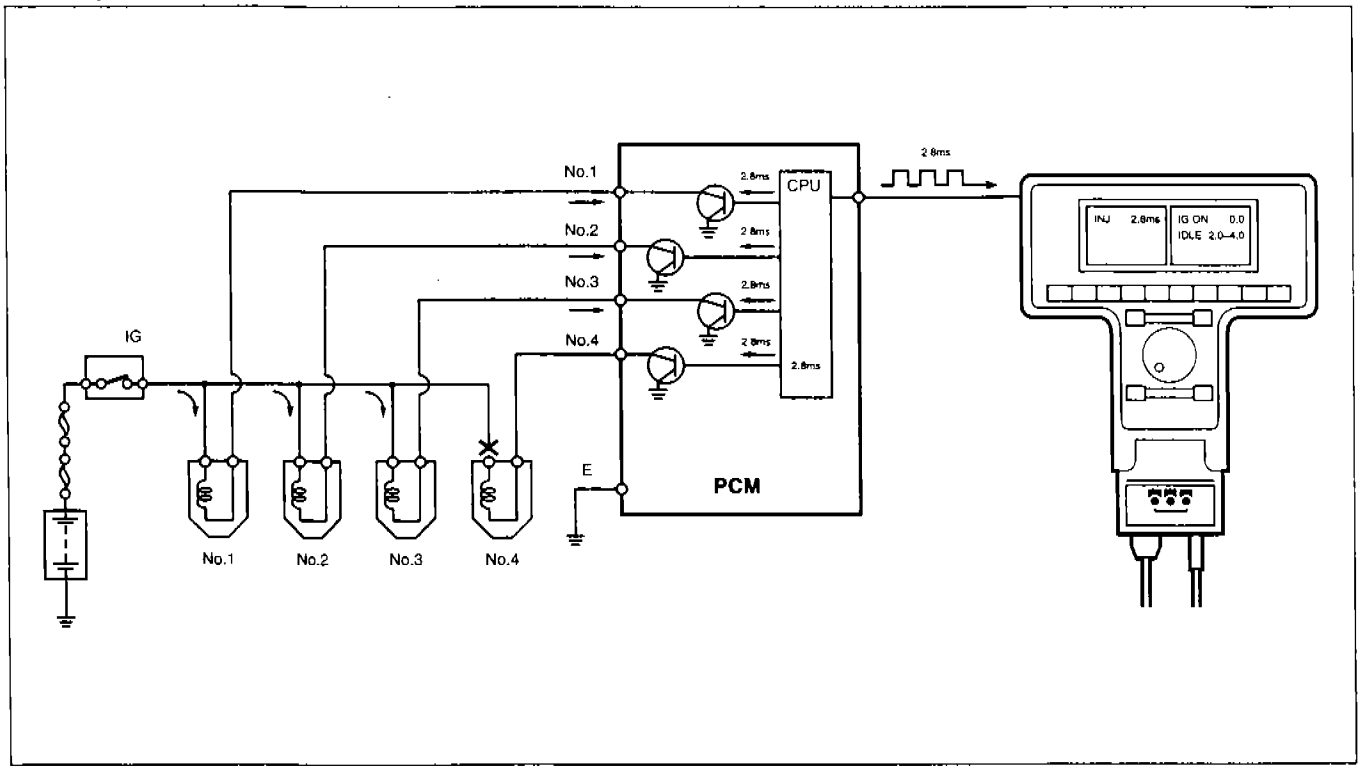


Fig. 1–8

2. Recording Function

2.1 Outline

Because the NGS tester records data at the same time it monitors it, it is very effective at diagnosing hard-to-find intermittent malfunctions. The characteristics of the recording function and effective ways of using it during troubleshooting are explained below.

2.2 Characteristics and limitations

1. Data sampling speed
   When using the NGS tester, the sampling intervals will differ between when you monitor the actual data and when you retrieve the stored data and play it back on the tester. Figure 2–1 below shows the sampling intervals for some PID data, both when it was originally monitored and when the same data was played back as a recording.

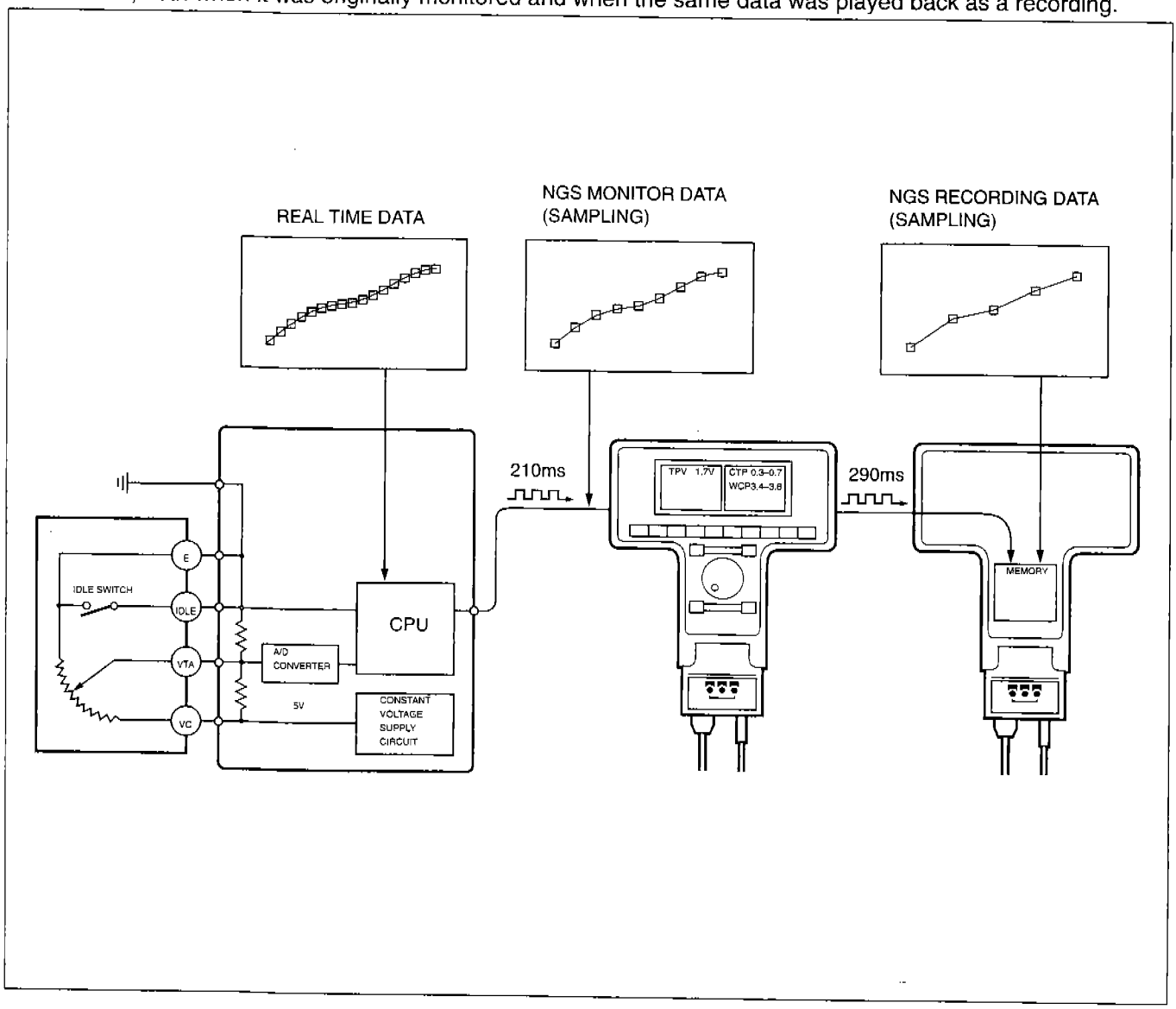


Fig. 2–1

2. Data recording capacity
The NGS tester has a maximum capacity of 16K. This is composed of pre-trigger and post-trigger recording areas, as shown in figure 2–2 on the right.

The pre-trigger recording area starts when monitoring is begun, and can record up to 8K of sampling data. If the amount goes over 8K, the tester is designed so that it will automatically start erasing the old data and recording new data in its place.

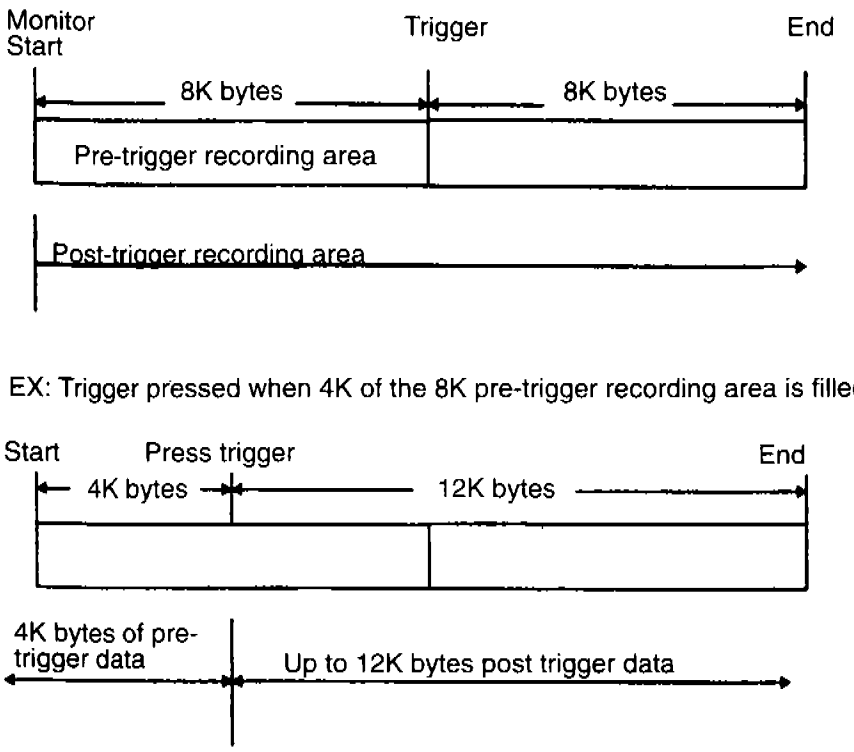


Fig. 2–2

On the other hand, post-trigger recording starts during data monitoring, from the time the trigger button is pressed, and continues until the tester's 16K capacity has been filled. In other words, post-trigger recording begins where pre-trigger recording stops and continues until the 16K capacity has been filled.

For instance, if pre-recording has taken up 2K and the trigger button is pressed, the post-trigger recording will be able to record up to 14K of information. When the post-trigger recording section becomes full, the recording will stop automatically and a "RECORDER-FULL, PRESS TRIGGER TO SAVE" message will appear on the screen, prompting you to save the recorded data.

The trigger button can be pressed anytime during post-trigger recording to stop the recording function.

3. Relation between number of items sampled, sampling speed, and recording capacity
   As Figure 2–3 shows, as the number of monitored or recorded items increases, the sampling interval will become proportionately longer.
   For example, if one or two items are being monitored or recorded, the sampling interval is extremely short, and you can confirm small fluctuations in the data. However, as the number of monitored items increases the sampling interval gets longer, making it difficult to confirm small changes in the data.
   Moreover, if one or two items are being recorded, the recording time is extremely long, and you can record a lot of testing data at once.

Number of Items Sampled	Monitored Data Sampling Interval	Recorded Data Sampling Interval	Recording Capacity (Sec.)
1	210 ms	300 ms	868.14S
2	210 ms	300 ms	433.96S
3	270 ms	420 ms	380.65S
4	270 ms	420 ms	285.42S
5	340 ms	530 ms	281.39S
6	340 ms	530 ms	234.26S
7	400 ms	650 ms	233.60S
8	400 ms	650 ms	210.53S
9	470 ms	770 ms	213.47S
10	470 ms	770 ms	191.85S

Fig. 2–3

Figure 2–4 shows a graphic display of data recorded from the O2 sensor alone. Figure 2–5 displays O2 sensor data taken after recording signals from five other devices. 2–5 shows a rougher picture than 2–4 because its sampling interval is longer. Therefore, when trying to record data from a particular source or sources, it is necessary to restrict recording to those item(s).

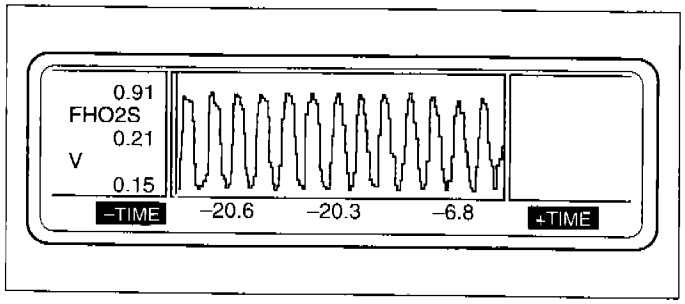


Fig. 2–4

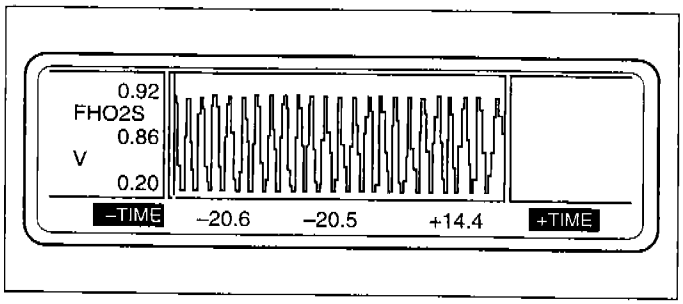


Fig. 2–5

4. Power source connection warning

There are three ways of supplying power to the NGS tester:

a: Hook the NGS tester power cable up directly to the battery using the Battery Hookup Adapter (Fig. 2–6).

b: Plug the NGS tester power cable directly into the cigarette lighter and turn the ignition key to the "ON" position (Fig. 2–7).

c: Plug the NGS tester power cable directly into the NGS OBD-II Adaptor power cable connector (Fig. 2–8)

10–14 volts are usually required to start the NGS tester, and 8 volts or more to keep it running.

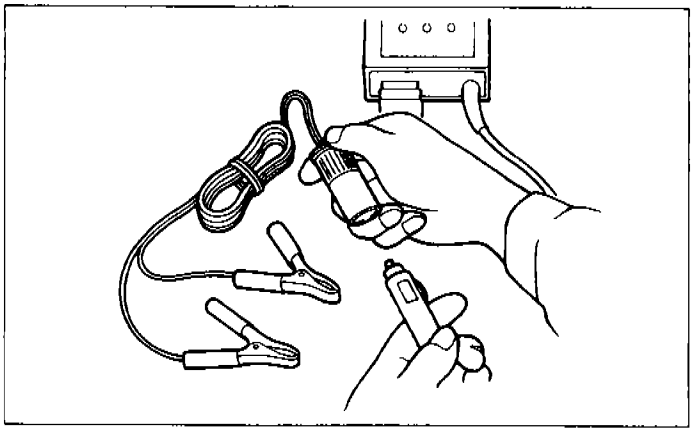


Fig. 2–6

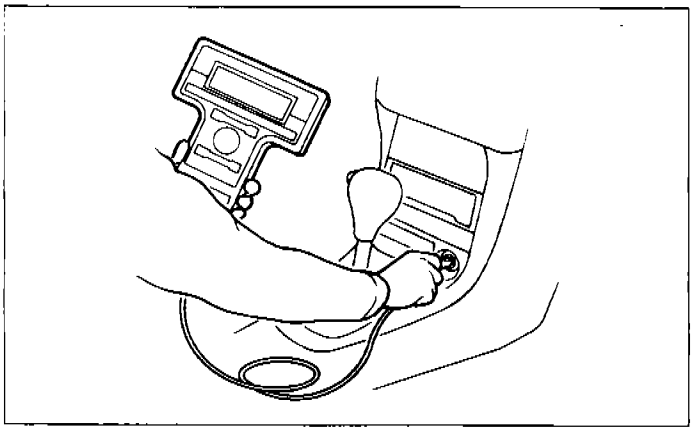


Fig. 2–7

If the power supply is set up as in "a" above, the tester can usually be given 12 volts or more as long as it does not drain the battery. However, during cranking the display may revert back to the starting screen if the voltage drops to 8 volts or below.

When the "b" method of power supply is used, on the other hand, the voltage will instantly go to zero during cranking. Consequently, the NGS display will revert to its starting screen. At the same time monitoring or recording will be interrupted, and any recorded data will be lost.
Therefore, we recommend connecting directly to the battery whenever possible when monitoring or recording data. It is particularly important to connect directly to the battery in the following two cases:

a: When the engine will not start.
b: When the problem occurs during cranking.

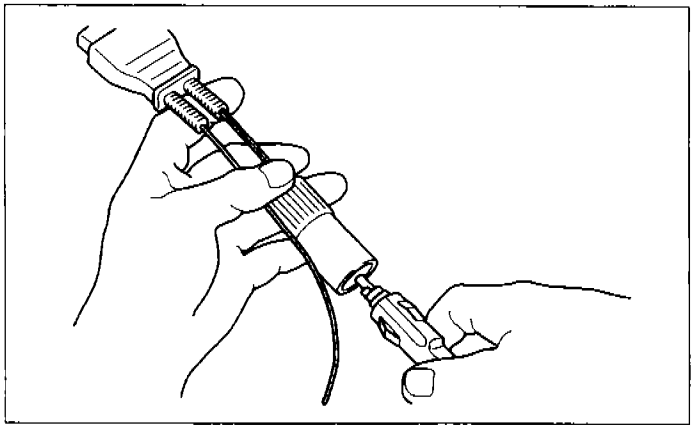


Fig. 2–8

When the "b" or "c" method of supplying power supply is used, on the other hand the voltage will instantly go to zero if the "ROOM fuse" or "CIGAR fuse" is burned out (Fig. 2–9). Consequently, the NGS tester won't operate. Therefore, we strongly recommended connecting directly to the battery whenever possible when using the NGS tester.

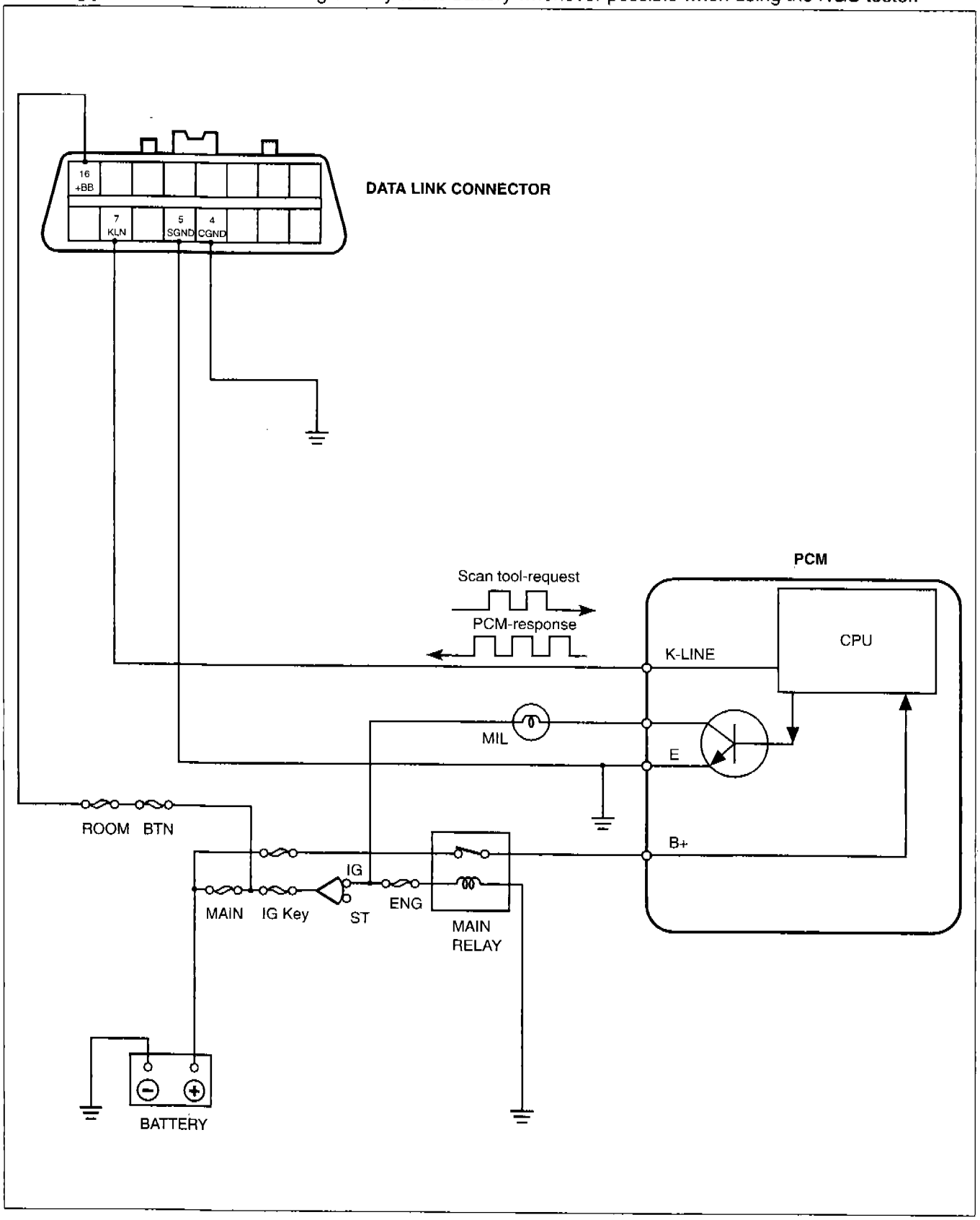


Fig. 2–9

2.3 Using the recording function effectively

When troubleshooting an intermittent problem, keep points 1–3 above in mind. Then pick out valid signals (RPM, O2, IGT, IACV, ECT, TP, AFS, etc.) according to the characteristics of the problem. While monitoring these signals

In view of this, the lines displayed on an oscilloscope (Fig. 3–2) and the NGS tester (Fig. 3–3) will be completely different even though they are showing the same data. When reading NGS graphic data, it is necessary to place the cursor over the point on the line that you want to read the correct value.

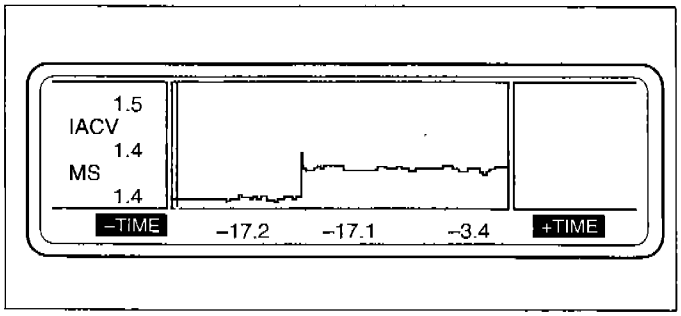


Fig. 3–3

3.2 Using the Graphic function effectively

This function is especially effective in analyzing data types 1–3 below.

1. Observing data changes per unit of time

Figure 3–4 shows changes in O2 sensor voltages per unit of time during idling. From this data it is possible to tell whether the problem occurs under rich or lean conditions. You can also check the following two items according to points Ⓐ and Ⓑ in the figure.

Ⓐ. Constant lean mixture: idling problem occurs under lean mixture conditions.
Ⓑ. Short O2 feedback: problem occurs in a specific cylinder

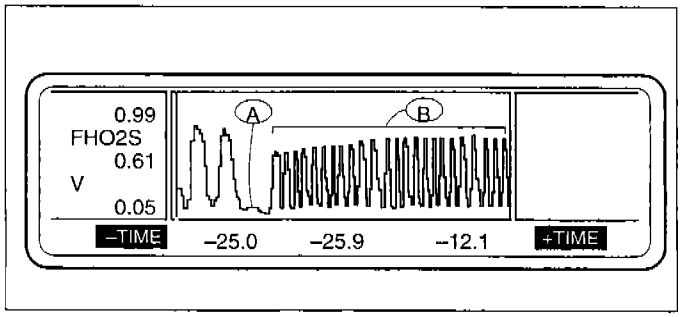


Fig. 3–4

You can judge that the problem originates in a specific cylinder under lean mixture conditions.

2. Correlating device signals and problem points

Figure 3–5 shows a graph of engine revolutions (RPM) and air-flow sensor (AFS) voltage. From this data you can determine that when the RPMs change there is a simultaneous rise in AFS voltage, even if the engine is idling.

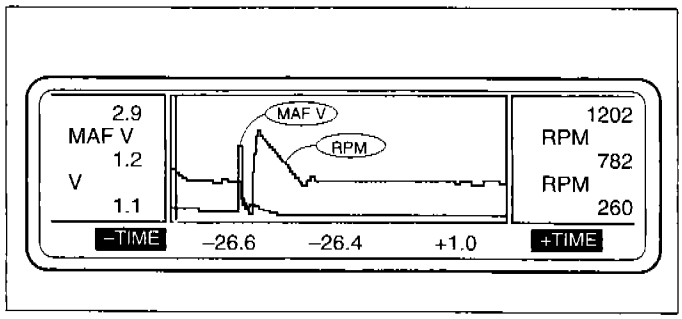


Fig. 3–5

3. Checking intermittent and minute data fluctuations

Figure 3–6 shows changes in injector fuel amounts during idling. From this graph you can tell when the amount increased. This shows the reason(s) it was necessary for the amount of fuel to be increased when RPMs dropped below the target RPMs.

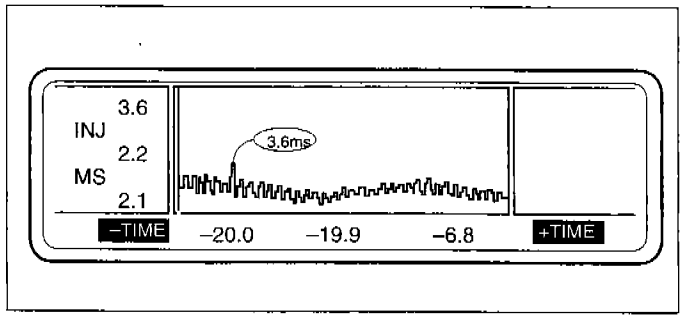


Fig. 3–6

In these situations, if you monitor the input/output signals relating to the amount of fuel and can confirm that there is no fluctuation, you can assume that the problem relates to the ignition system.

4. Simulation function

4.1 Outline

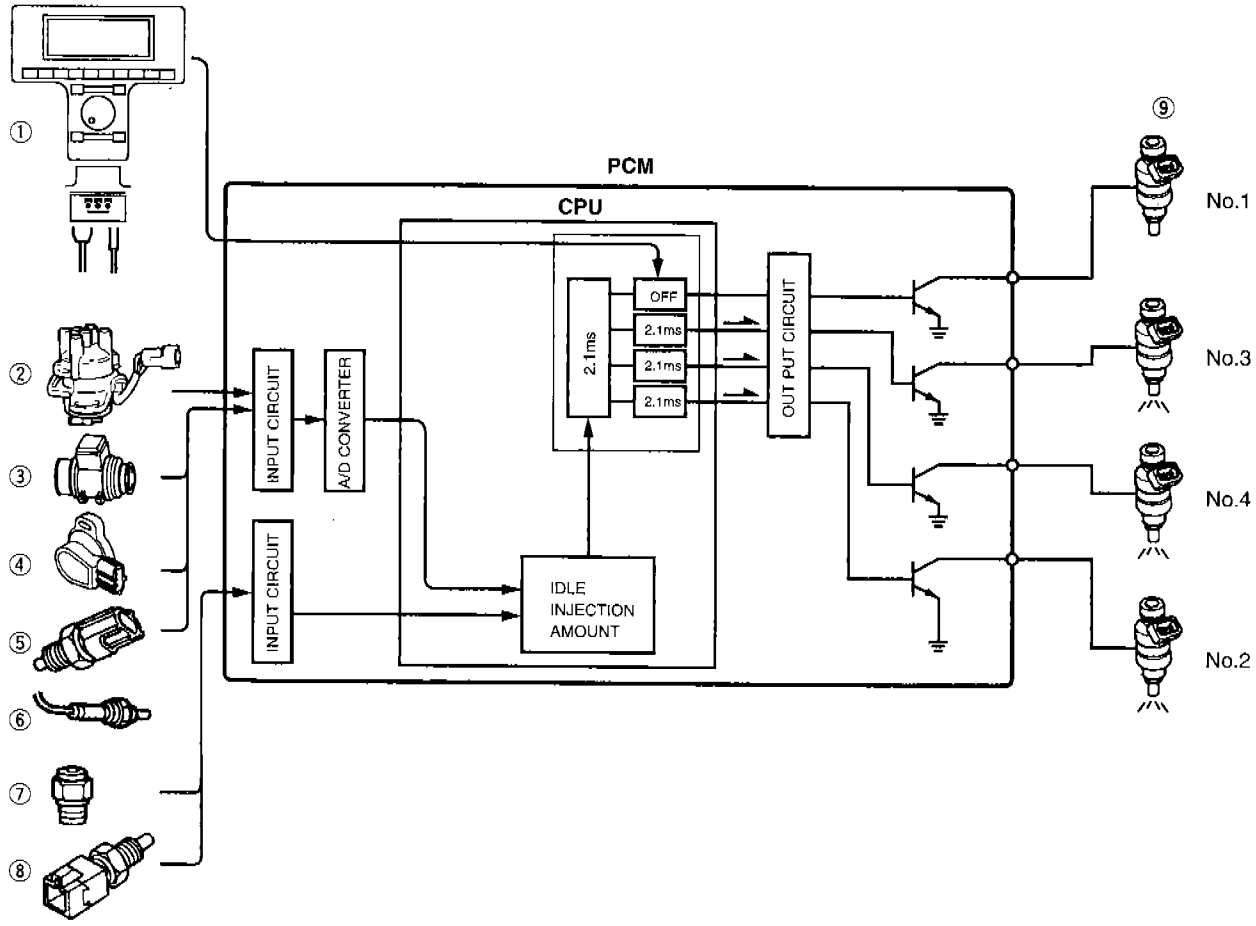
The NGS tester has a simulation function that enables it to force the output device to start and stop by means of commands issued from the tester to the CPU inside the PCM. If you use this function, you can confirm whether the PCM, the output device, and the connection between them are all working normally by checking the output device's reaction to the tester's commands.

4.2 Characteristics

This simulation test uses the K communication line to send NGS-selected commands to the PCM's internal CPU and operate the CPU output device's control program. Three seconds after the program is carried out, control will revert to the basic CPU program.

4.3 Using the simulation function effectively

For example, if you select SIMULATION TEST and "INJ #1 OFF", this will cause injector #1 to stop operating for three seconds. Pressing the NGS start button sends the command to the CPU. When the command is received, the program that controls stopping the injector inside the CPU is preempted and injector #1 is interrupted for three seconds (See Figure 4–1).



① NEW GENERATION STAR TESTER
② CAMSHAFT POSITION SENSOR (SGT, SGC SIGNAL)
③ MASS AIR FLOW SENSOR and INTAKE AIR TEMPERATURE SENSOR
④ CLOSED THROTTLE POSITION SWITCH (IN THROTTLE POSITION SENSOR)
⑤ ENGINE COOLANT TEMPERATURE SENSOR
⑥ HEATED OXYGEN SENSOR
⑦ NEUTRAL SWITCH
⑧ CLUTCH SWITCH
⑨ FUEL INJECTORS

Fig. 4–1

Executing this program enables you to confirm via idle fluctuations that

1. No. 1 injector unit
2. PCM
3. Related harnesses
4. No. 1 cylinder ignition
5. No. 1 cylinder compression

are all operating normally. And if you cannot confirm this, you can assume that the problem lies in one of these five areas.

If you use this function, you can also shut off each cylinder's injector operation one at a time during idling and confirm changes in RPMs. In this way, you can determine whether an idling problem arises in a specific cylinder or not. For instance, if you shut off the cylinders one by one, measuring the change (decrease) in RPMs each time, and discover that one cylinder has a comparatively small fluctuation, you can assume that the problem lies with that cylinder.

Because of this, the NGS tester cannot precisely determine where the signal's ON/OFF point is.

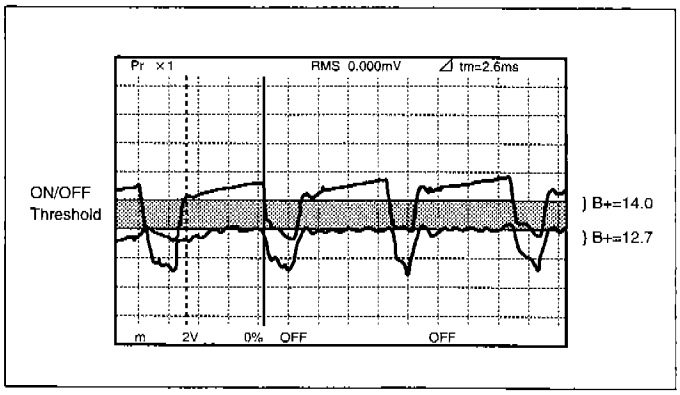


Fig. 6–2

Also, when measuring frequency, duty signals or pulse width, the ON/OFF ratio for a certain period of time is calculated inside the NGS. So if the pulse width changes suddenly and exceeds the NGS' ability to calculate, an OVER message will appear. In this way, if the tester goes into the OVER range during recording.
The data is later displayed graphically, the graph will be very rough and minute fluctuations will be impossible to confirm.
The figures on the right show actual fuel injector data. In figure 6-3 the NGS tester went into the OVER range once while recording, so the graph displayed is very approximate compared to that of figure 6–4.

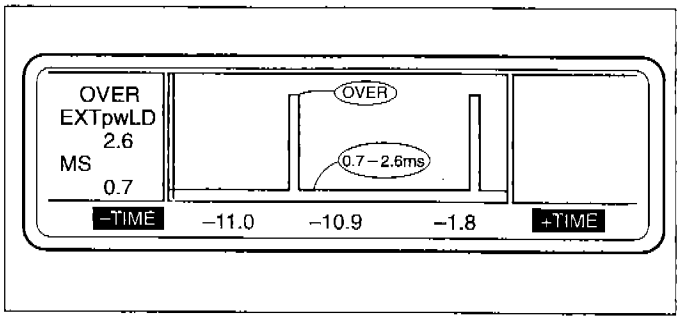


Fig. 6–3

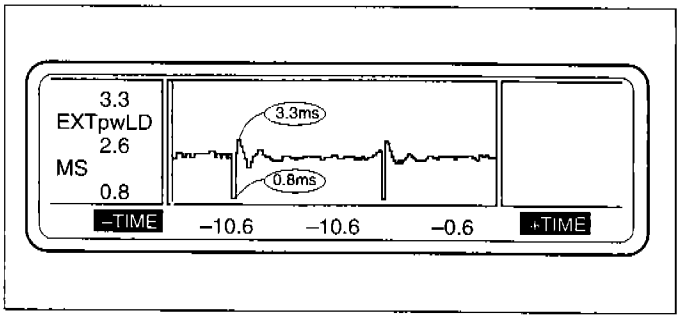


Fig. 6–4

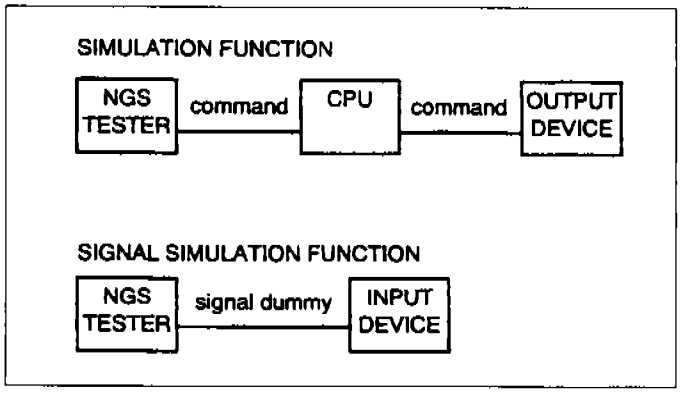
2. Signal simulation function
In this function, the NGS tester generates a dummy signal and sends it to the input device. From the device's reactions to the signal, you can determine whether it is working properly. The dummy signal is limited to the following low-frequency applications:

Voltage:	0 – 6v
Frequency:	50 – 3000Hz
Duty:	1 – 99%

In cases where (1) a signal falls outside these parameters, (2) it falls inside the parameters but nothing can be determined from the reactions, or (3) the reactions are pertinent but will take an extremely long time to inspect, this function is not suitable for performing the inspection. In addition to the igniter-distributor system inspections listed in Chapter One, the signal simulation function can also be used during speedometer sensor checks (refer to appropriate W/M).

3. The differences between the simulation test function and the signal simulation function

The biggest difference between the simulation test function and the signal simulation function is shown in the flowchart on the right.
Unlike the simulation test function, which uses programs inside the CPU to force the output device to run or stop, the signal simulation function generates a low-frequency, and dummy signal inside the NGS tester and sends it directly to the input device, then confirms the input device's reactions.

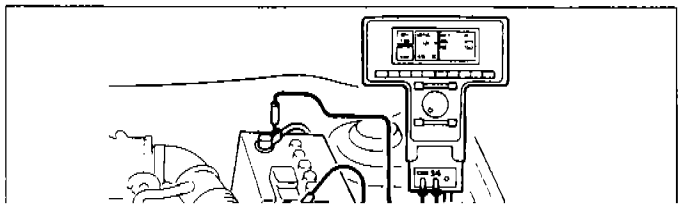


Therefore, whenever you use the signal simulation function you have to establish the appropriate signal for the device you are inspecting.

6.3 Effective use of the digital measurement system

If you use the digital measurement system's link function, you can monitor input/output values from the PCM's internal CPU while measuring signals from a device on the same screen. Using this function, if you measure values at the device's connectors and compare them to the same device's CPU signals' monitored values, you can determine whether the device's signals are inputting properly into the PCM, and also whether the PCM's signals are being outputted properly.

For example, at the same time that you measure output signals at the AFS connector, you can monitor the AFS' PCM input signals and, if there is no difference in the two values, confirm that the AFS signals are being input properly into the PCM. Even when there is no difference, however, if the input



EXAMPLE 1

<Problem>
The car wouldn't accelerate at times when driving along rutted roads, and idling problems developed.

<Current condition>
When starting the engine, the RPMs increased during first idling, then slowly dropped as the engine warmed up. You tried pressing the accelerator a few times, but the RPMs increased as usual and everything seemed normal.

<Self-diagnosis system>
No trouble code appeared on the screen when you checked.

With a problem like the one in the example, select the NGS monitor function and check the input/output signals for the items below.

1. RPM: Confirm the point at which the problem occurs. Recreate the problem and confirm the point where the RPMs fall outside the acceptable range.
2. INJ: Check whether the amount of fuel increased or decreased when the symptoms were duplicated.
3. ECT: Is the problem related to the engine coolant temperature? (Cold, During warm-up, warm, hot).
4. IGT: Is the problem related to various load signals? (Check each signal's load.)
5. IACV: Is the problem related to the amount of intake air?
6. MAFV: Are input signal values within specification?
7. TPV: Are input signal values within specification? Does it change with RPM fluctuation?
8. CTP SW: With the throttle fully closed, check to see that the CTP SW is ON.
9. FHO2S: Does the problem occur during rich or lean conditions? Also, is it in a specific cylinder?

<Testing method>
Take the car to a rutted road and drive it while monitoring the signals you have selected based on the customer's information. As soon as the problem re-occurs, press the trigger button and run the duplication test for the set amount of time.

<Test results>
You started running the duplication test. When the engine experienced acceleration difficulties, you pressed the trigger button immediately.

1. The engine hesitates during accelerating, and no-load racing. Also, idling RPMs fluctuate between 400–1000.
2. Injection time lengthens during the malfunction.
3. The problem occurs when the water temperature is low and remains even when the temperature increases.
4. Ignition timing varies between 6 and 14° but there are no signs of a load being borne.
5. During idling, duty values are higher than normal and RPMs climb.
6. The input value is 3.9V. It is out of specification.
7. The input value is within specification.
8. The idle switch is on.
9. There is a rich condition during the malfunction.

<Troubleshooting results>
According to the test results above, when the problem occurs fuel injection time lengthens and a rich condition ensues even though the IAC tries to compensate. No load is borne, but the AFS voltage is extremely high. From these results you can assume that the cause of the problem is related to the AFS. The reason that the self-test did not detect this is that the AFS voltage values were within the normal self-test range (0.6V to 4.9V).

<Inferred problem>
From these results you can infer the following:

a. There is a problem with the AFS ground.
b. There is a poor connection in the AFS-PCM connector(s) or terminal(s).
c. The AFS unit itself is malfunctioning.
d. There is a break in the PCM's internal soldering.

<Finding the cause of the problem>
In order to determine which of the four possibilities above was the actual origin of the problem, you used the digital measurement system's link function and monitored both the voltage on the AFS side of the connector and the AFS voltage inside the PCM simultaneously. But because there was no difference in the signals' values, you checked the ground voltage. The result was that you discovered a ground voltage of 1.5–2.5V (approx. 0 volts is normal), and determined that a poor ground was the cause of the problem. So then you checked the ground wiring and found that when you touched the joint connector (JC–06) the ground voltage surged. Finally, when you checked the connector you found that the ground line terminal connection was a little loose.

<Repair instructions>
Repair the AFS ground line terminal.

<Completion check>
After you confirmed that the ground voltage is now zero, you tried to recreate the problem using the customer complaint sheet as a base and ran a duplication test. If the problem did not re-occur and the AFS input values were within the standard range, the malfunction has been repaired.

USING THE NGS TESTER

OUTLINE

The New Generation Star (NGS) tester is designed to interface directly with the Electronic Control Module for powertrain, body and chassis computers on many OBD-equipped vehicles, and to read serial data and Diagnostic Trouble Codes (DTCs). It also meets SAE J1978 standards for OBD-II-compatible scan tools. The tester performs many enhanced functions on MAZDA OBD-II-equipped vehicles.

The NGS tester has a generic scan tool function that is standard across the automotive industry in the United States. It also performs the manufacture's specific functions; that is, the NGS tester can perform various functions according to the vehicle and program card selected.

What are generic functions?

OBD-II regulations stipulate that you must be able to monitor on-board diagnostic system data using a scan tool for diagnostic test modes 01-07. Furthermore, it is also necessary to be able to monitor this data using a scan tool that meets the requirements of SAE J1978 standards for OBD-II-compatible scan tools, without making inquiries to the tool's manufacturer. At Mazda, these monitor functions, found even in commonly-marketed scan tools, are called "generic functions" . You can use them by selecting "GENERIC OBD-II FUNCTIONS" from the NGS tester menu screen.

What are specific functions?

"Specific functions" are original scan tool functions created by various manufacturers in order to be able to troubleshoot effectively. The specific functions that Mazda uses are shown on the NGS menus on the following pages. At Mazda, there are some specific functions that are used only with the NGS tester. In these cases, the correct vehicle model and program card must be selected.

In this chapter, we will used various information taken from the NGS tester display as charts to explain the tester set-up, the basic operation of both generic and specific functions, and what you can do with those functions. When using the tester, please following the information points written to the left of the chart.

1. Find and clear Diagnostic Trouble Codes (DTCs).

NGS TESTER MAIN MENU (HANDLING PROCEDURE)

- VEHICLE & ENGINE SELECTION
  - SELECTED VEHICLE
  - SELECTED NEW MODEL
  - DESELECT CURRENT MODEL

  → 1

- DIAGNOSTIC DATA LINK
  - PCM-POWER TRAIN CTRL MODULE
    - DIAGNOSTIC TEST MODES → 2
    - PID/DATA MONITOR AND RECORD → 3

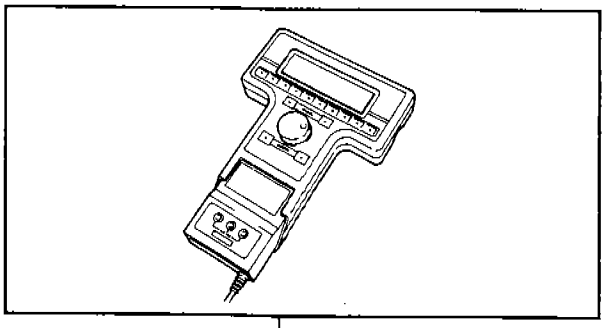
No.	Function	Ref. Page
1	It provides a list of vehicle and engine specifications. You sometimes need to select the proper model and specifications in order to get precise data on the vehicle that you are testing.	c-40,41
2	Displays diagnostic trouble codes (DTCs) related to engine control. Also, the codes stored in the CPU memory can be stored in the NGS tester. DTCs stored in the PCM memory can be cleared by selected the CLEAR button.	c-42-44
3	Real-time monitoring and recording of the status of sensors/switches/relays/solenoid that you processed in the PCM (ECM).	c-45-48
4	Operates output devices (IAC valve, injectors, etc.) by sending command signals from the NGS to the PCM (ECM).	c-51-54
5	Diagnoses each device (TPS, AFS, etc.) and displays the results.	c-55-60
6	Displays diagnostic trouble code (DTCs) related in Anti-lock brake system. Also, the codes stored in the CPU memory can be stored in the NGS tester.	——
7	Once data is stored, it can be replayed and displayed graphically or in table form, making it useful for troubleshooting tricky intermittent problems.	c-49,50
8	Once a DTC is recorded, it can be replayed.	——
9	1) Measure VOLTAGE, RESISTANCE, FREQUENCY, DUTY CYCLE, and PULSE WIDTH, and displays data in MAX and MIN valves. 2) Also real-time monitoring and recording are possible. In this case, the measurements that you took in 1)can be compared to PCM signals that are processed for that part (except the RESISTANCE).	c-61-70
10	Tests the vehicle's reaction by sending dummy input signals to the PCM (ECM).	——
11	Monitors input, output signal and calculated value in the PCM which are related to emission system.	c-9,10
12	There are some technical data which indicate engine condition at the time of the first malfunction detection.	c-17-21
13	Displays DTCs related in emission system with definitions.	c-22-25
14	Deletes DTC, PENDING TROUBLE CODE, RFC and DIAGNOSTIC MONITORING TEST RESULT.	c-22-25
15	It shows the rich to lean voltage range and also displays the thresholds in MAX and MIN.	c-26-29
16	It shows Intermittent Monitor System's technical data, which are used to determine whether the system is normal or not	c-30-33
17	Displays DTCs related in Fuel System, Misfire and CCM at the first drive cycle's detections.	c-34-39
18	It shows the OBDII system's operation condition.	c-11-16
19	There are 3 options for controlling the functions of the NGS: Adjust control of display/Select baud rate of printer/Change to ENGLISH /METRIC units.	c-71-74
20	There are 9 kinds of internal system test. They check various functions of NGS system and determine whether or not they are normal.	c-75-80

HANDS-ON INTRODUCTION TO NGS TESTER

Objectives
*To learn how to set up the NGS tester.
*To learn how to access the Main Menu.
*To learn how to check the NGS tester briefly, if it doesn't work.

NGS Set-up Procedure	Information Points

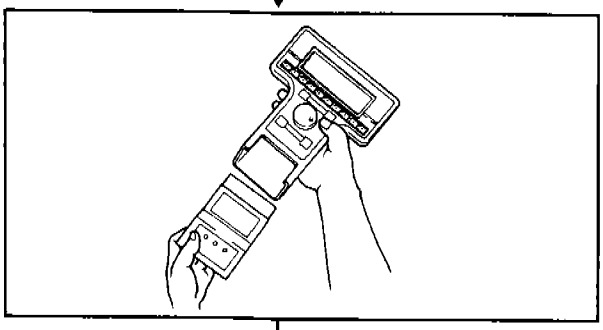
1.



If the **VEHICLE INTERFACE MODULE** and **PROGRAM CARD** are already installed into the NGS tester control unit, go to step 4.

Insert the "**VEHICLE INTERFACE MODULE**" into the "**NGS CONTROL UNIT**". Make sure it is fully seated.

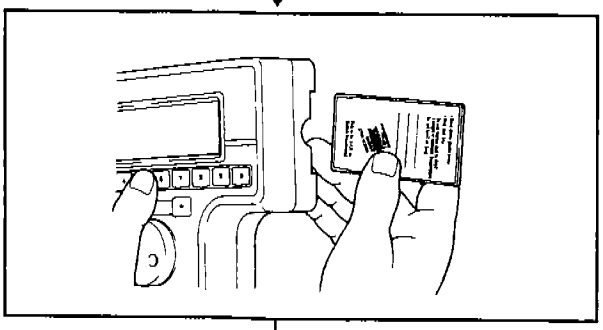
2.



To prevent the **VEHICLE INTERFACE MODULE (VIM)** from falling out of the tester and being damaged, be sure that VIM is securely inserted.

Insert the program card into the back of the NGS control unit.

3.

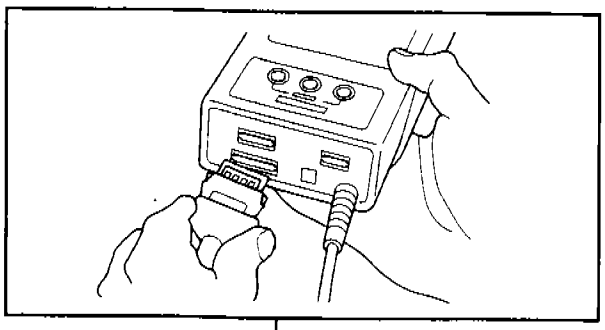


The front of the program card should face outward.

The program card can be installed smoothly and completely only if the card insertion direction is correct.

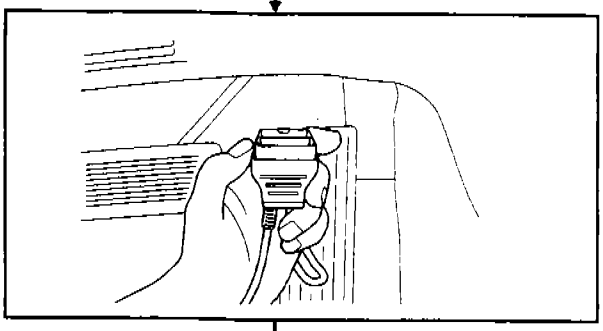
Make sure the ignition key is off.
Plug the NGS OBDII Adapter connector (with plastic shield) into the NGS VIM Link Jack.

4.



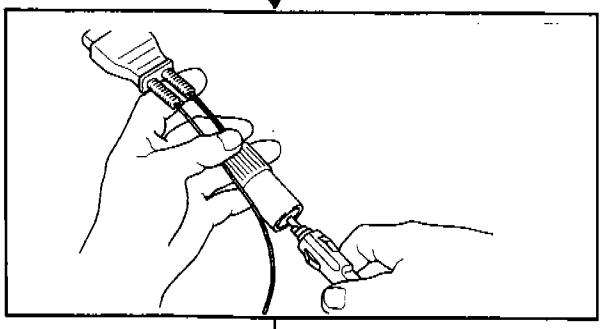
Plug the NGS OBD-II Adapter large 5-pin connector into the vehicle's Diagnostic Data Link Connector (DLC), **located under the steering wheel behind a plastic cover.**

5.



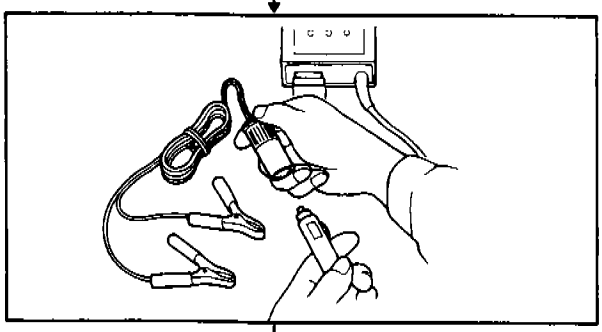
Plug the NGS tester power cable into the NGS OBD-II Adapter power cable connector or vehicle's cigarette lighter (key on).

6.



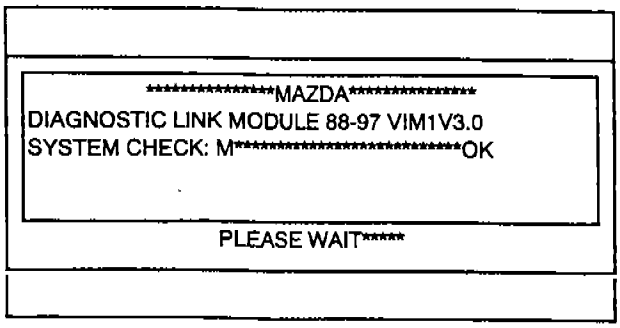
If you're using the alternative hook up, plug the NGS tester power cable into the Battery Hookup Adapter.

7.



Note:
If you plug the NGS tester power cable into the NGS OBD-II Adapter power cable connector or the vehicle's cigarette lighter, the NGS tester won't get power if the room fuse is melted.
You must use the battery hook up adapter to avoid this.

8.



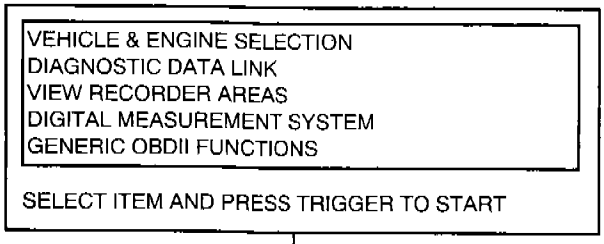
As the NGS initializes, you will hear a double beep. The display will show, (SYSTEM CHECK: M ** ********** OK).

"M **********" : indicates that the memory from the last testing session still exists.

"B **********" : indicates that the memory is blank.

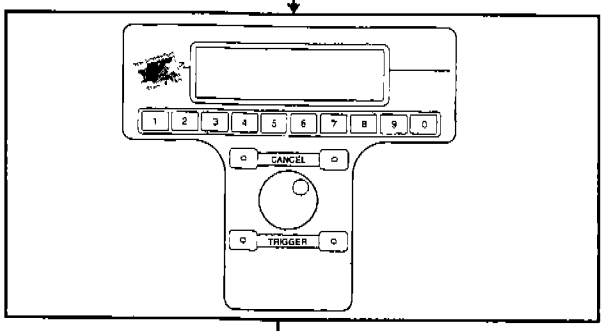
NGS Menu Selection

9.



The main menu gives five choices after "SYSTEM CHECK: M**********OK" disappears.

10.



Use the **Menu Dial** to move the highlight bar up and down:

- clockwise - down
- counterclockwise - up

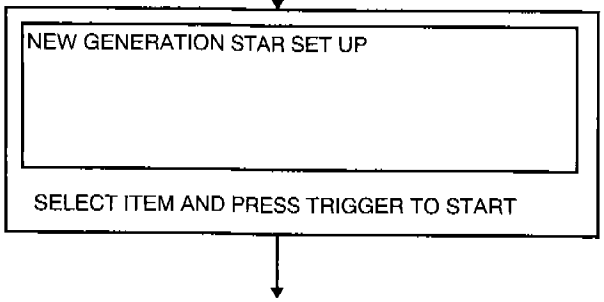
Use the **Menu Dial** to move to the next or previous screen:

- clockwise - next
- counterclockwise - previous

Or press these number keys:

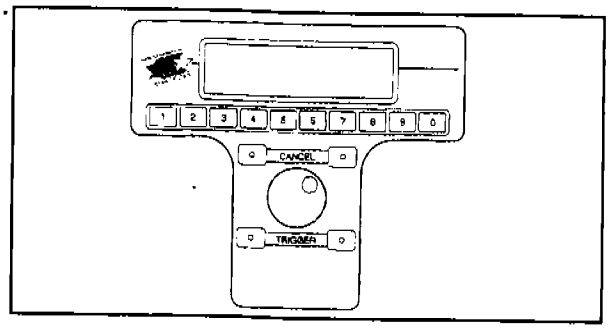
- **1** or **0** will move you to the next screen.
- **2** or **9** will take you back to the previous screen.

11.



Make sure that the main menu changes from the display in step 9 to the display in step 11 when you turn the menu dial clockwise.

12.



Press **TRIGGER** to select or begin a function.

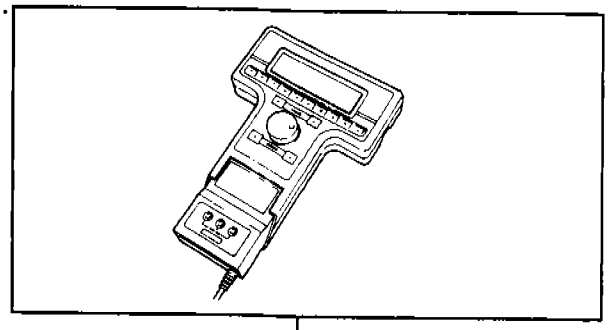
Press **CANCEL** to quit a function and to return to the previous menu.

Functions of **SCREEN BUTTON** (No.3 ~No.8) are displayed on the screen when available.

When NGS doesn't beep or show display

Information
*If the NGS doesn't give a double beep and doesn't show "System Check", check the items according to the chart below.
* If NGS beeps but the screen remains blank, it may mean that the contrast needs adjusting - refer to **NEW GENERATION STAR SET UP (SPECIFIC 8)**.

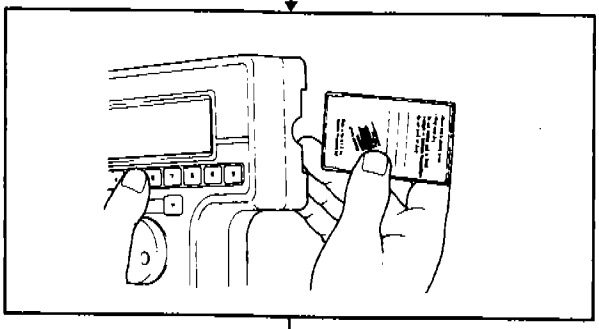
13.



Is there a 12 V power supply to NGS?

A. If the screen becomes faintly light with no display when 12 V is supplied to NGS, go to step 14.
B. If the screen remains dark even when battery source is normal, go to step 15.

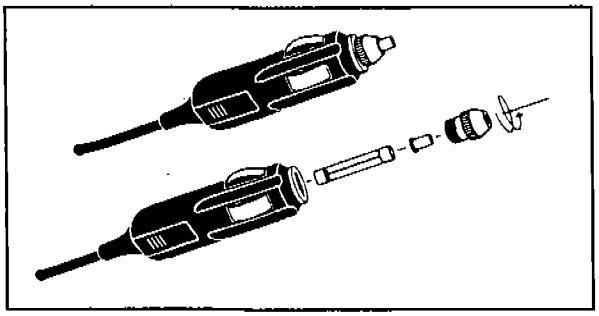
14.



Verify that the program card is

A. the correct one.
B. inserted correctly.

15.



Check the fuse located in the NGS tester power cable plug.

If you're using the NGS tester power cable that fits into the vehicle's cigarette lighter, you should also check the fuse of the cigarette lighter.
(*The fuse location depends on the vehicle model).

Or, change connector to the Battery Hookup Adapter.

If the problem is not corrected by the above steps, disconnect the NGS and call
AMERICA KOWA SEIKI, INC.
TEL (310)638-1000
FAX (310)638-3005

When NGS shows the wrong display

If the NGS tester shows the wrong display and it can't be fixed even if the program card is reinstalled properly, it may be necessary to simply go back to the beginning and "re-boot" the tester several times. If the problem is not corrected, please contact AMERICA KOWA SEIKI, INC.

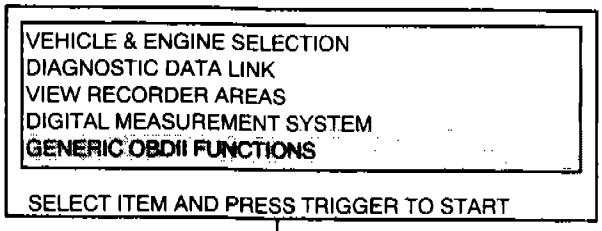
GENERIC 1: PID DATA MONITOR

Objective
*To learn how to monitor PIDs data which are related to emissions.

Preparations
*Start the engine and let it idle until it is at normal operating temperature and rpms.

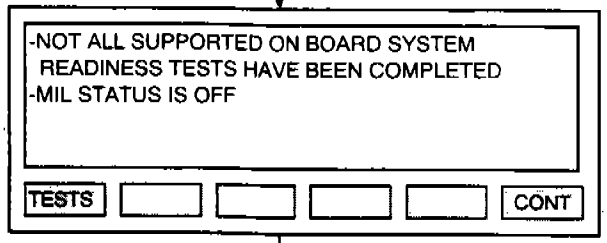
PID Data Monitoring Procedure

1.



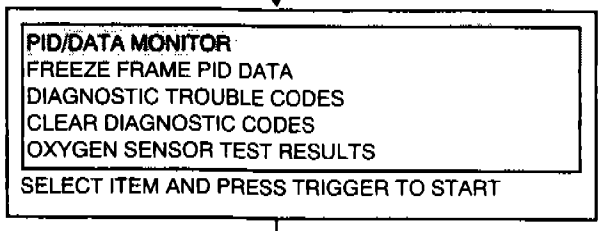
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**"

2.



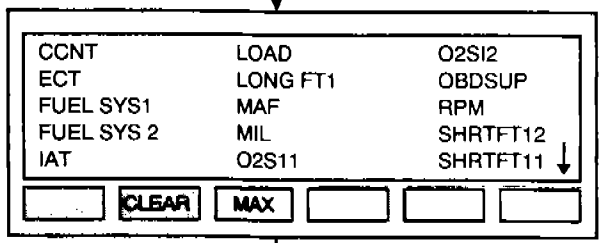
Press CONT .

3.



Select "**PID/DATA MONITOR**" and press "**TRIGGER**"

4.



Turn the menu dial clockwise .

Information Points

You can use the Generic Functions without selecting a particular vehicle.

When you select

TESTS : You can perform "**ON BOARD SYSTEM READINESS TEST**" .

CONT : You can perform any Generic Function item.
To select a desired item, place the highlight bar over the item and press TRIGGER.

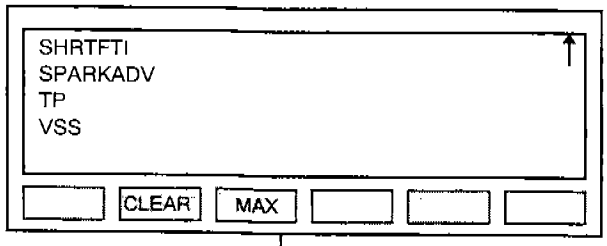
The screen will display a list of PIDs.

PID (Parameter Identification):
There are items for which the monitoring of data is possible.

A several-page list of items you may monitor is displayed on the screen.
Move the menu dial to scroll through the list.

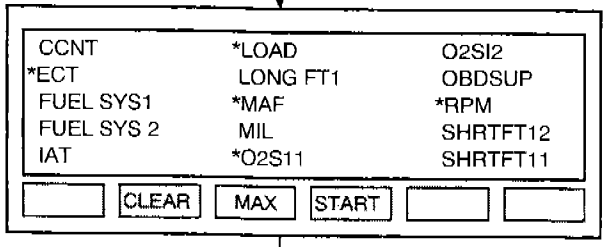
The screen displays PID abbreviations.
Verify the standard name by referring to the OBDII Service Highlight (Generic Function).

5.



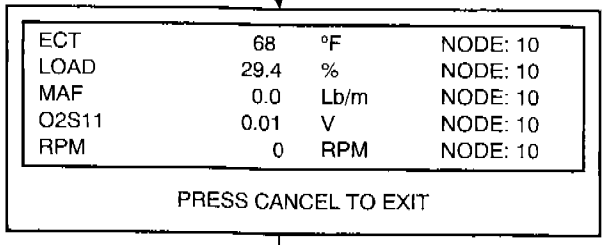
Turn the menu dial counter-clockwise until the display returns to the previous screen.
Select PIDs(ECT, LOAD, MAF, O2S11, RPM).

6.



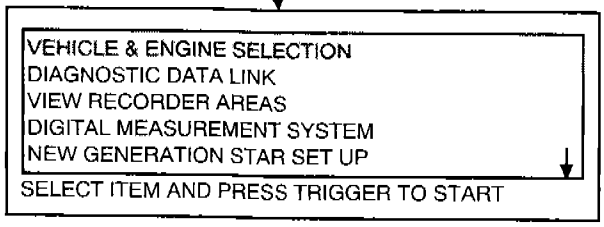
Press START to begin displaying your selected PIDs.

7.



Press "**CANCEL**" untill you get back to the main menu.

8.



To select desired PIDs, place the highlight bar over the item(s) and press **TRIGGER**. A star symbol appears next to the item when it is selected.

Press **TRIGGER** once again to deselect a PID.
Press **CLEAR** to deselect all PIDs.

You can select all PIDs when you press the MAX button.

NODE:10
It's indicating the Powertrain Control Module (PCM). In other words, "NODE:10" indicates the source of each PID.

GENERIC 2: ON BOARD SYSTEM READINESS TESTS

Pre-information

What is the "ON-BOARD SYSTEM READINESS TEST"?

It shows OBD-II systems operating status.

All OBD-II scan tools should display On-Board Systems Readiness (OSR) Tests.
The OSR will display the monitors that the vehicle supports and the status of all monitors (complete or incomplete) at that time. If any monitor is incomplete, the scan tool will identify which monitor has not been completed. Misfires, the Fuel System and Comprehensive Components (CCM) are continuous monitoring-type functions and won't display complete or incomplete.

The NGS tester will always display a "CONT" message for Misfires, the Fuel System and CCM.

Under certain driving conditions (drive cycles), the OBD-II diagnostic system will monitor the catalyst, EGR system, evaporation system and oxygen sensor (including the oxygen sensor heater) once, then display a "YES" message on the screen of the NGS tester once those system monitors are completed.

There are two possible reasons that the readiness test would not be completed:

1. The OBD-II drive cycle conditions have not been met.
2. The diagnosis system has some condition that inhibits diagnosis.

Each diagnosis system has conditions that will inhibit diagnosis. For example, the catalyst monitor judges the deterioration condition the catalyst converter based on the oxygen concentration in the exhaust gas purged by the catalytic converter. However, diagnosis is not possible when the oxygen sensor has failed. In such a case, neither normal operation judgment nor malfunction judgment are possible, and "NO" will be shown on the RFC display (refer to the diagnostic test mode for details).

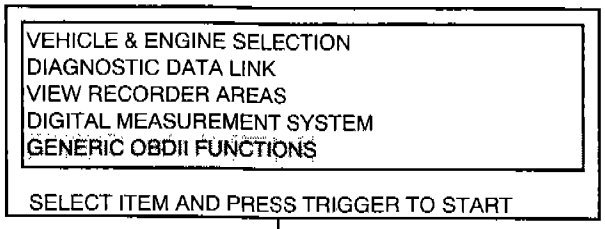
If you wont to initialize the OBD-II diagnostic system, perform the DTC cancellation procedure or disconnect the negative battery cable.

Objective
*To learn how to monitor the operating condition of the OBDII system.

Preparations
*Start the engine and let it idle until it is at normal operating temperature and rpms.

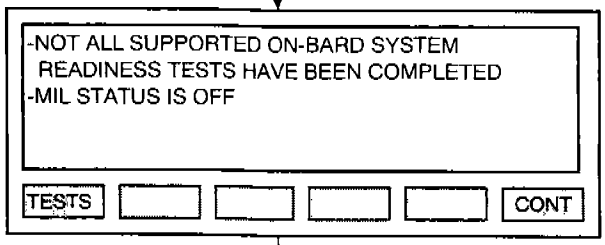
Readiness Test Procedure

1.



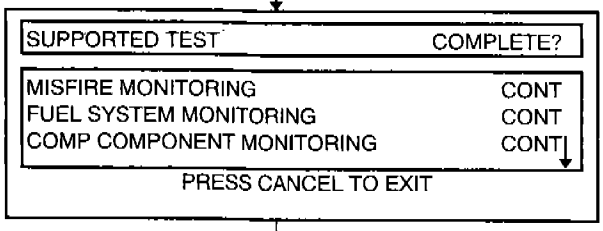
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**" .

2.



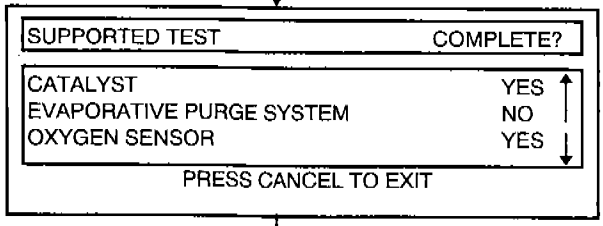
Press TEST .

3.



Turn the menu dial clockwise.

4.



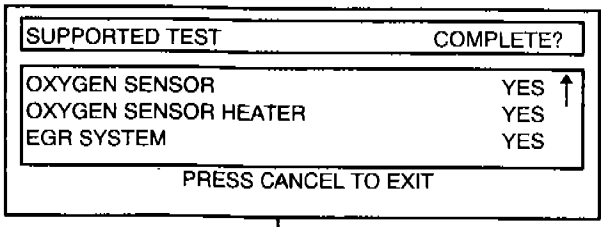
Turn the menu dial clockwise.

Information Points

"CONT" means "Continuous Monitoring system".

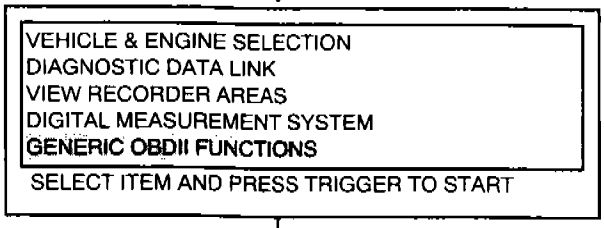
Note:
The YES/NO status of each system depends on the vehicle.

5.



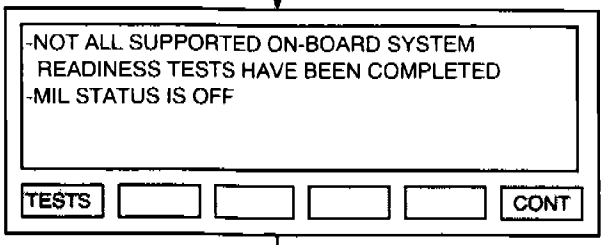
Press "**CANCEL**" until you get back to the main menu.

6.



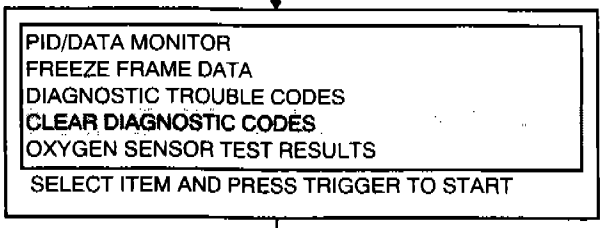
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**".

7.



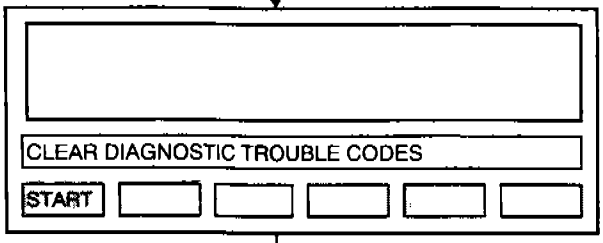
Press CONT.

8.



Select "**CLEAR DIAGNOSTIC CODES**" and press "**TRIGGER**".

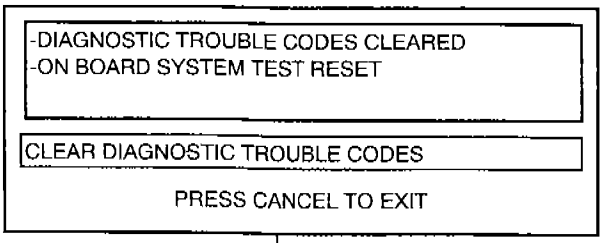
9.



Press START.

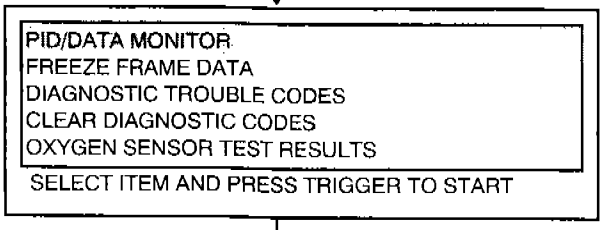
First, please carry out the "**CLEAR DIAGNOSTIC CODES**" to initialize each system's status.
Then follow the diagram's instructions.

10.



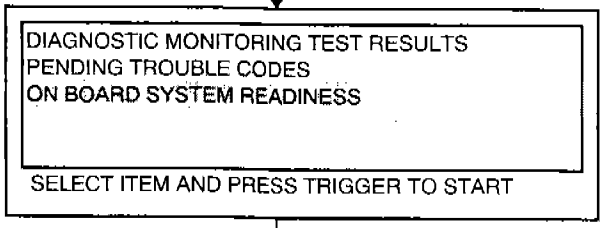
Press "**CANCEL**" once.

11.



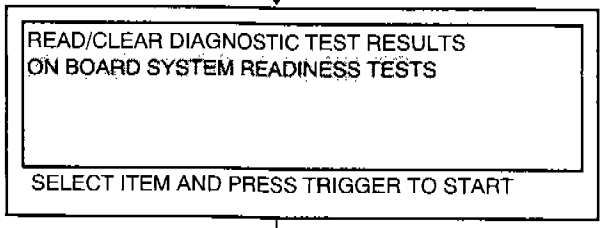
Turn the menu dial clockwise.

12.



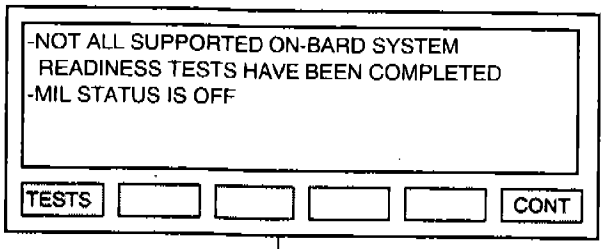
Select "**ON BOARD SYSTEM READINESS**" and press "**TRIGGER**".

13.



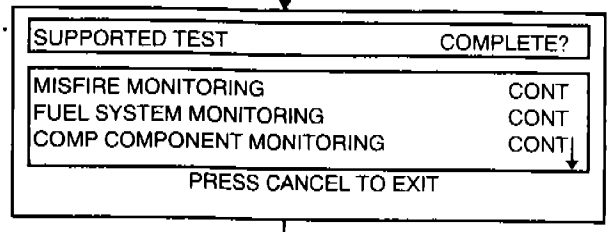
Select "**ON BOARD SYSTEM READINESS TEST**" and press "**TRIGGER**".

14.



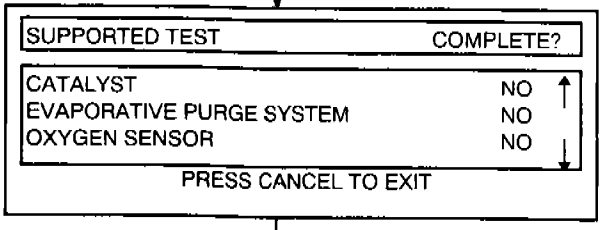
Press TEST

15.



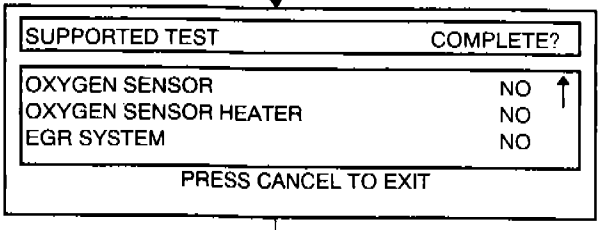
Turn the menu dial clockwise.

16.



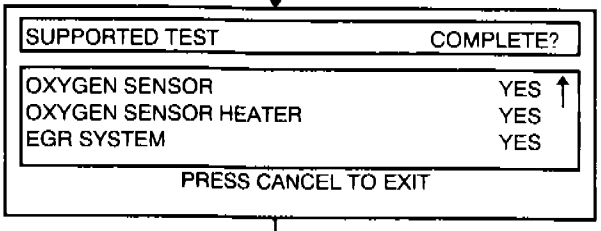
Turn the menu dial clockwise

17.



Perform the each drive mode according to the W/M in '97 MY's.

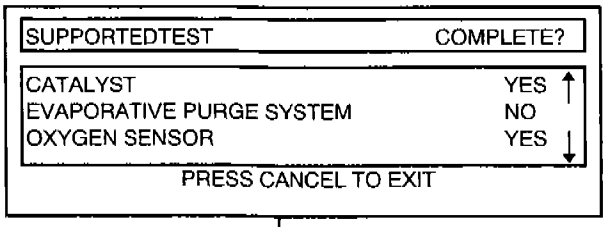
18.



When you refer to the W/M of the vehicle that you are testing and follow the OBDII drive mode, you can see the display changing from NO to YES.

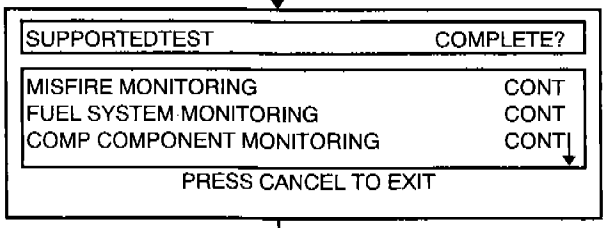
Turn the menu dial counterclockwise.

19.



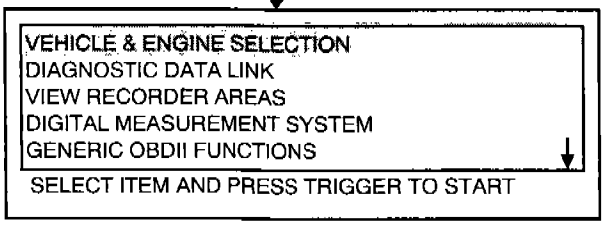
Turn the menu dial counterclockwise.

20.



Press "**CANCEL**" until you get back to the main menu.

21.



GENERIC 3: FREEZE FRAME DATA

Pre-information

What is FREEZE FRAME PID DATA?

↓

There are some technical data which indicate engine condition a the time of the first malfunction detection.

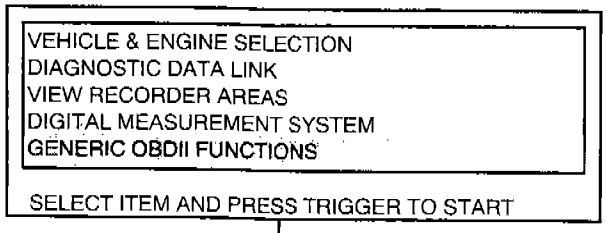
The OBDII regulations state that when the first malfunction of any emission component or system is detected, the engine operating conditions at that moment are stored in the ECM as "FREEZE FRAME" data. Once one set of freeze frame data is stored, it will remain in memory even if another emission-related DTC is stored, with the exception of Misfire or Fuel System DTCs. Once freeze frame data for Misfire or Fuel System DTC is stored, it will overwrite any previous data and the freeze frame will not be further overwritten.

If the problem that the customer noticed is not occurring when the vehicle is brought in for repair, these freeze frame data can be used for performing a duplication test.

Objective
*To learn how to access Freeze Frame Data.
*To learn how to use Freeze Frame Data.

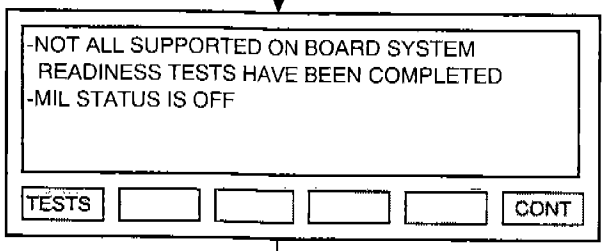
Access to Freeze Frame Data

1.



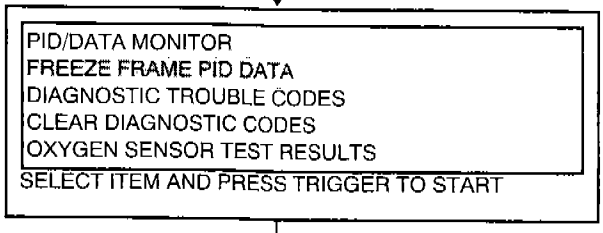
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**" .

2.



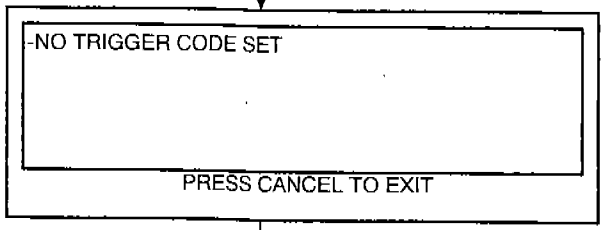
Press CONT .

3.



Select "**FREEZE FRAME DATA**" and press "**TRIGGER**" .

4.



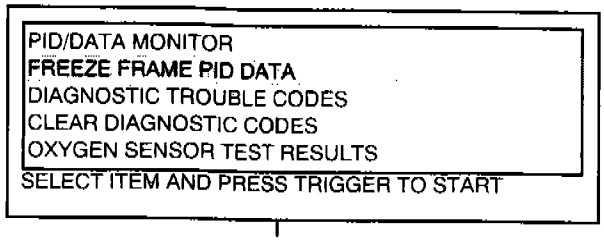
Press "**CANCEL**" and disconnect the "**THROTTLE POSITION SENSOR**" connector .

Information Points

You must start the engine before performing this procedure, and keep it running while accessing the FFD.

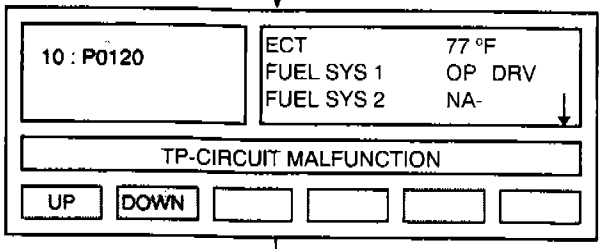
If the OBDII system did not store any DTCs, the NGS display will show "**NO TRIGGER CODE SET**" .

5.



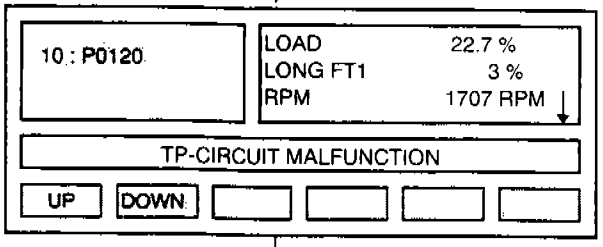
Select "**FREEZE FRAME DATA**" again and press "**TRIGGER**".

6.



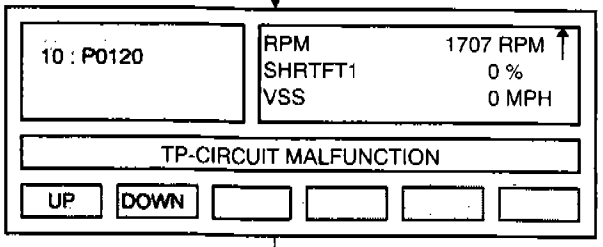
Turn the menu dial clockwise.

7.



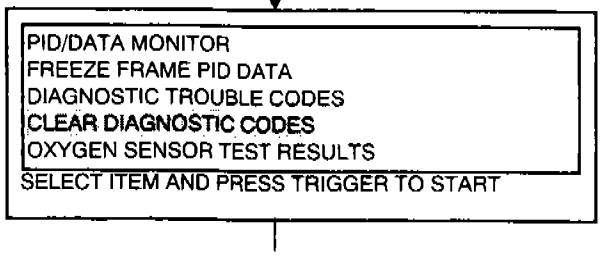
Turn the menu dial clockwise.

8.



Press "**CANCEL**" and place the highlight bar over the "**CLEAR DIAGNOSTIC CODE**".

9.



Select "**CLEAR DIAGNOSTIC CODES**" and press "**TRIGGER**"

You can assume certain conditions, when the PCM determines a malfunction's occurrence.
In the following cases:

ECT : 77 °F→Engine was cold.
FUEL SYS: OP DRV→Feedback system was not operating.
LOAD : Light engine load.
LONG FT1: PCM learned 3% enrichment compensation from the O2 sensor.
RPM : 1707 RPMs.
SHRTFT1 : Oxygen sensor feedback correction is 0% (OPEN LOOP).
VSS : 0 MPH (Neutral condition).

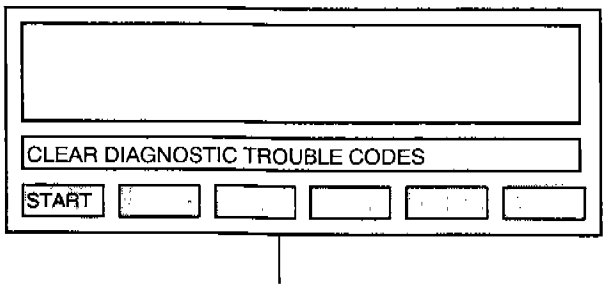
UP : These buttons don't have any function now.

DOWN

10:P0120 : "10" indicates NODE 10.

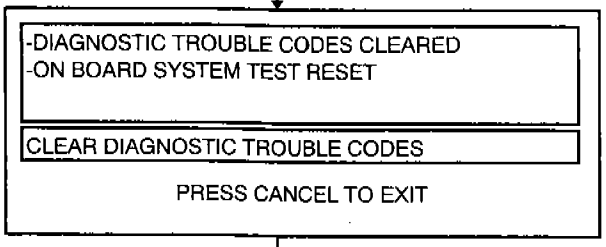
In a V6 engine the right and left bank have separate feedbacks, so there are two PIDs: LONGFT1 and LONGFT2 (SHRTFT1 and SHRTFT2).

10.



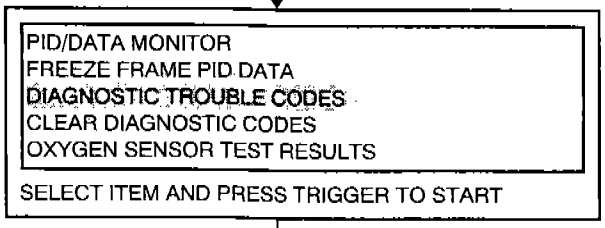
Reconnect "**THROTTLE POSITION SENSOR**" and press START.

11.



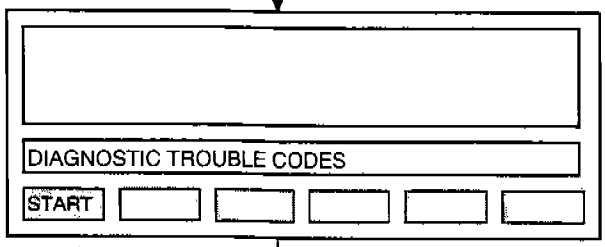
Press "**CANCEL**" and place the highlight bar over the "**DIAGNOSTIC TROUBLE CODES**".

12.



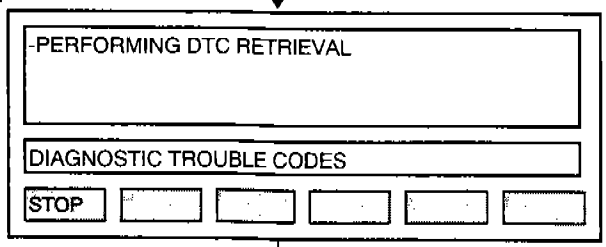
Press "**TRIGGER**".

13.

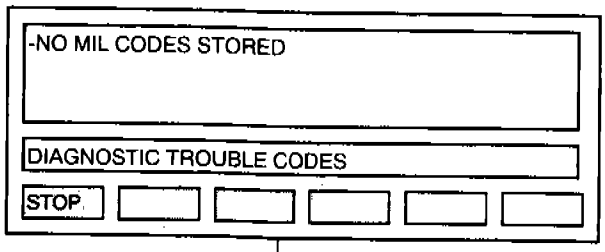


Press START.

14.

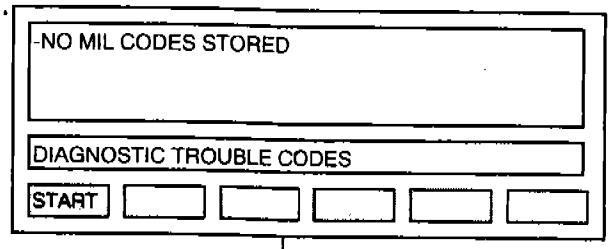


15.



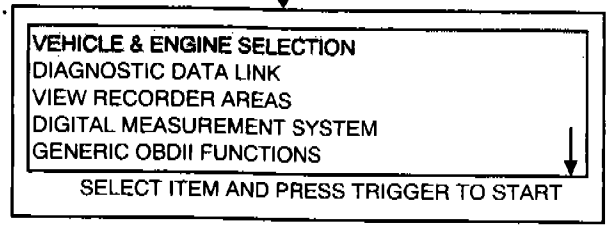
Press STOP

16.



Press "**CANCEL**" until you get back to the main menu.

17.

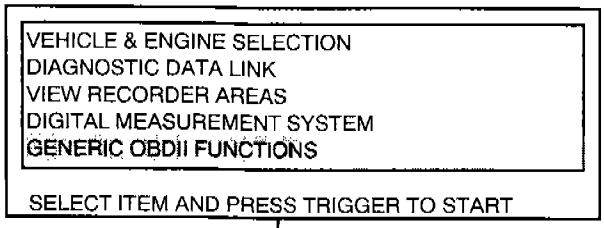


GENERIC 4: RETRIEVING AND CANCELING DTCS

Objective
*To learn how to detect and clear Diagnostic Trouble Codes (DTCs).

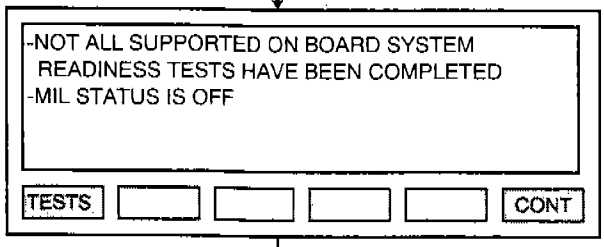
DTC Retrieval Procedure

1.



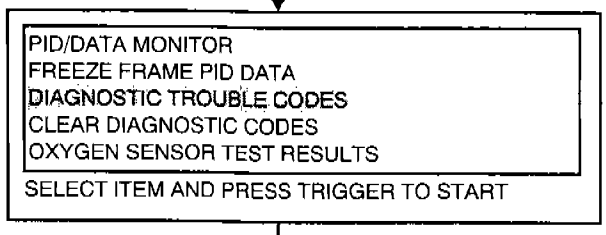
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**".

2.



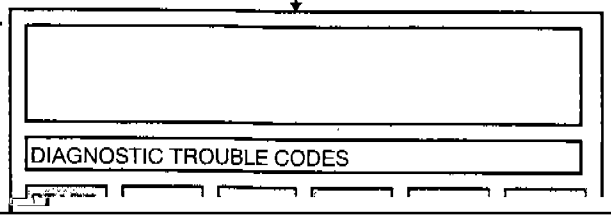
Press CONT.

3.



Select "**DIAGNOSTIC TROUBLE CODES**" and press "**TRIGGER**".

4.

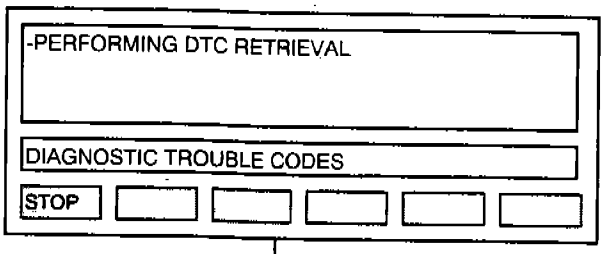


Information Points

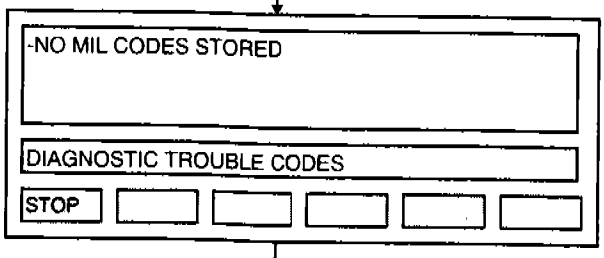
You must start the engine before performing this procedure, and keep it running while retrieving the DTC.

Retrieving and canceling Generic Function DTCs only applies to the emission control system DTCs.
The Malfunction Indicator Lamp (MIL) comes on when it's retrieving these DTCs.

5.



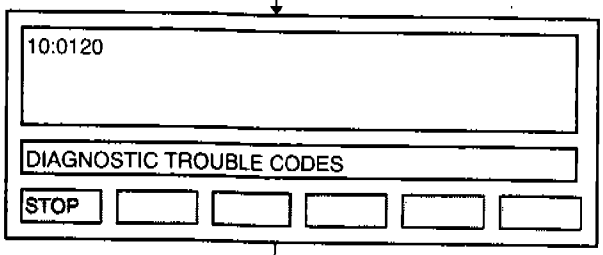
6.



If the OBDII system did not store any DTCs, the NGS display will show "NO MIL CODES STORED" .

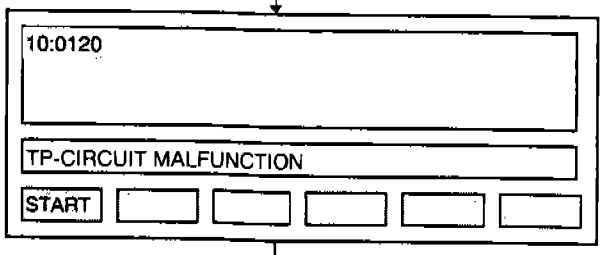
Disconnect "**THROTTLE POSITION SENSOR**" connector.

7.



Press STOP .

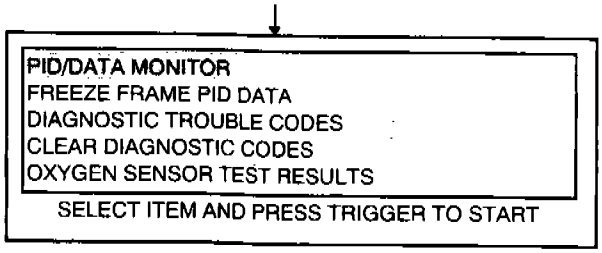
8.



For the throttle position sensor, the DTC and its definition are displayed on the screen.

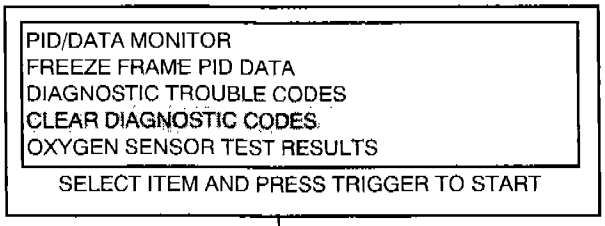
Press "CANCEL" .

9.



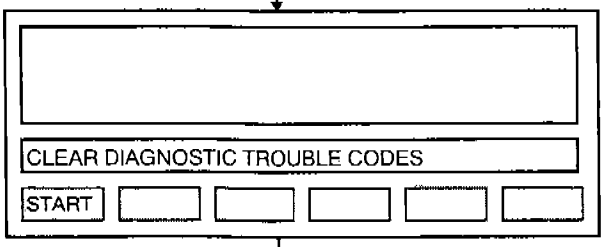
DTC Cancellation Procedure

1.



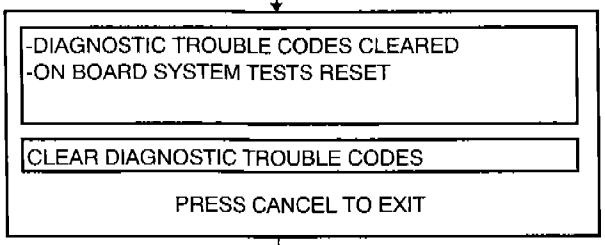
Select "**CLEAR DIAGNOSTIC CODES**" and press "**TRIGGER**" .

2.



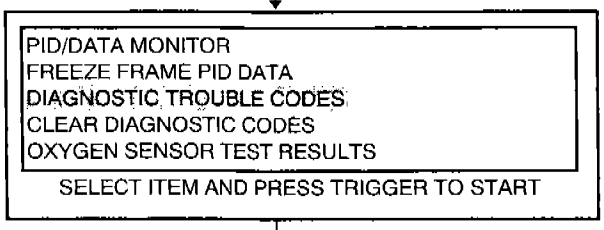
Reconnect "**THROTTLE POSITION SENSOR**" and press START .

3.



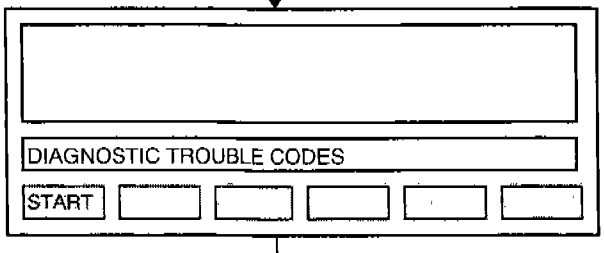
Press "**CANCEL**" and place the highlight bar over the "**DIAGNOSTIC TROUBLE CODES**" .

4.



Press "**TRIGGER**" .

5.

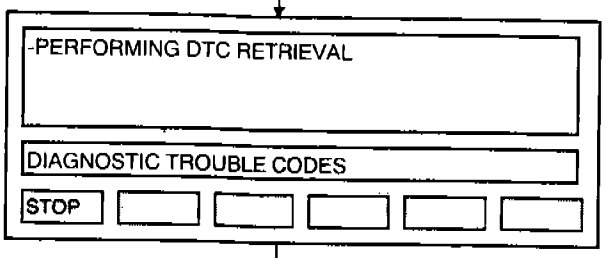


When you use these procedures, you can clear DTCs (for the Engine Control Module) without disconnecting the battery negative terminal. Moreover, you can clear or initialize the following data:

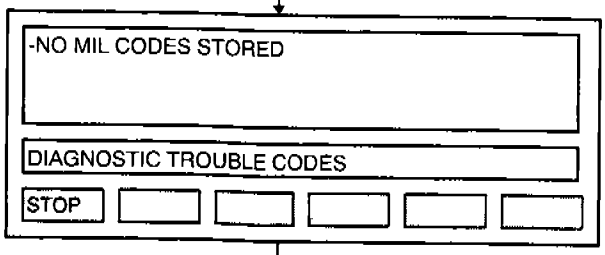
1. Freeze Frame Data
2. On-Board Readiness Test Result
3. Diagnostic Monitoring Test Result
4. Pending Trouble Code

Press START.

6.

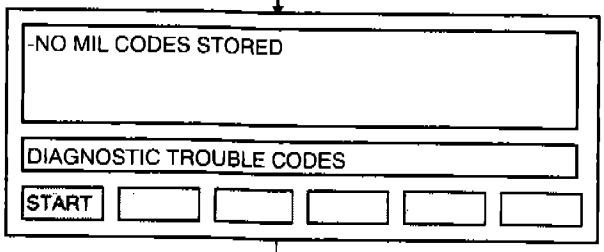


7.



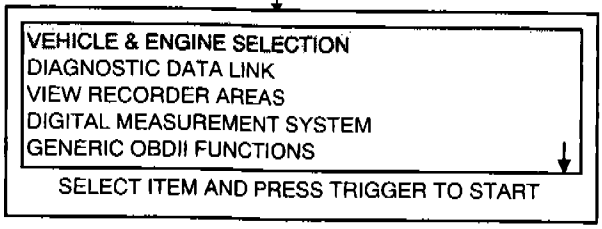
Press STOP.

8.



Press "**CANCEL**" until you get back to the main menu.

9.



GENERIC 5: OXYGEN SENSOR TEST RESULTS

Pre-information

What is OXYGEN SENSOR TEST RESULTS?

There are ten functions which are related to the O2 sensors' operation and specifications monitoring. However, only the first two functions are available as shown below.
The NGS tester will display a "NA" (not-available) message on the screen if you select other functions.

Available Functions

(1) RICH TO LEAN THRESHOLD VOLTAGE
It shows the rich to lean voltage range and also displays the thresholds in MAX and MIN voltages.

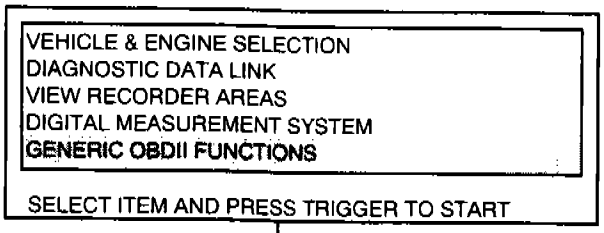
(2) LEAN TO RICH THRESHOLD VOLTAGE
It shows the lean to rich voltage range and also displays the thresholds in MAX and MIN voltages.

Objective
*To learn how to monitor the O2 sensor(s) thresholds with MAX and MIN voltages.

O2 Sensor Test Results Monitor Procedure

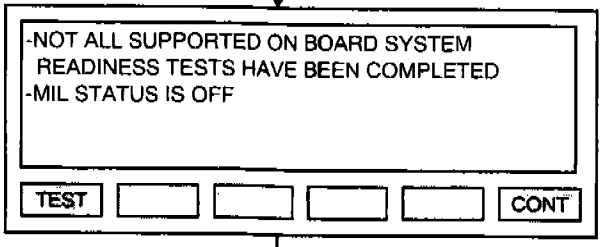
Information Points

1.



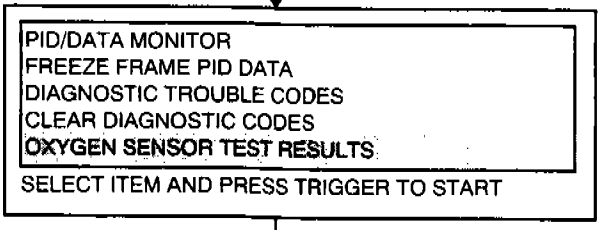
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**".

2.



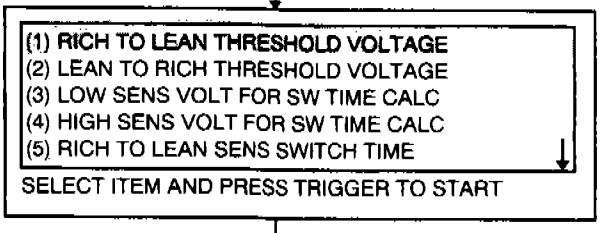
Press CONT.

3.



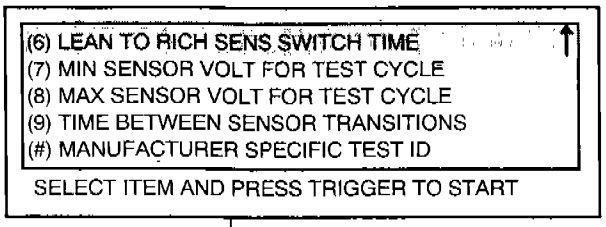
Select "**OXYGEN SENSOR TEST RESULTS**" and press "**TRIGGER**".

4.



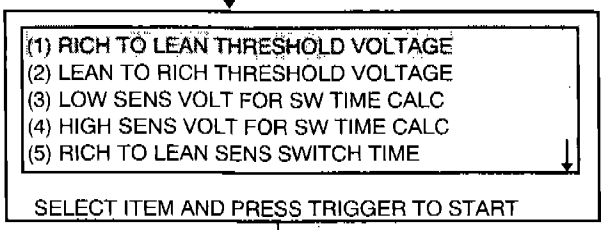
Turn the menu dial clockwise.

5.



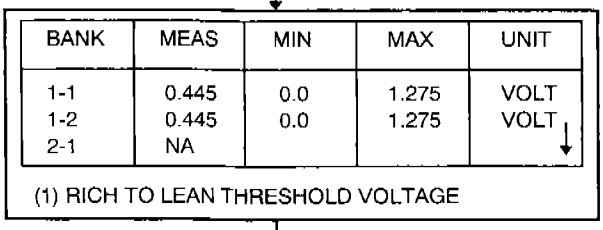
Turn the menu dial counter-clockwise until the display returns to the previous screen.

6.



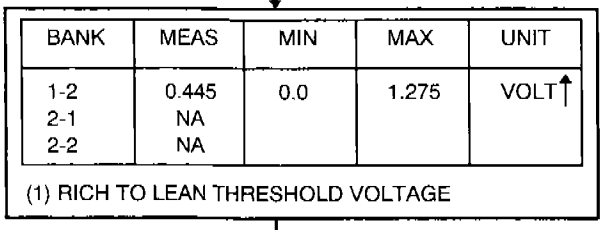
Select "**RICH TO LEAN THRESHOLD VOLTAGE**" and press "**TRIGGER**".

7.



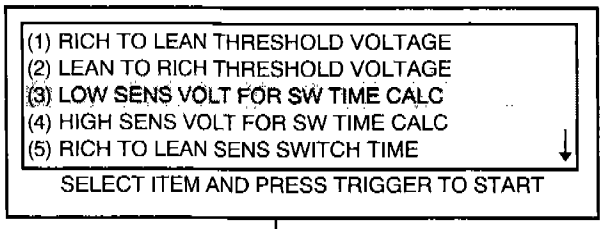
Turn the menu dial clockwise.

8.



Press "**CANCEL**".

9.



Select "**LOW SENS VOLT FOR SW TIME CALC**" and press "**TRIGGER**".

BANK 1-1 : Primary oxygen sensor (in the right bank for V6 engines)

BANK 1-2 : Secondary oxygen sensor (in the right bank for V6 engines)

BANK 2-1 : Primary oxygen sensor (in the left bank for V6 engines)

BANK 2-2: Secondary oxygen sensor (in the left bank for V6 engines)

10.

BANK	MEAS	MIN	MAX	UNIT
1-1	NA			
1-2	NA			
2-1	NA			

(3) LOW SENS VOLT FOR SW TIME CALC

Turn the menu dial clockwise.

11.

BANK	MEAS	MIN	MAX	UNIT
1-2	NA			
2-1	NA			
2-2	NA			

(3) LOW SENS VOLT FOR SW TIME CALC

Press "**CANCEL**" until you get back to the main menu.

12.

VEHICLE & ENGINE SELECTION
DIAGNOSTIC DATA LINK
VIEW RECORDER AREAS
DIGITAL MEASUREMENT SYSTEM
NEW GENERATION STAR SET UP

SELECT ITEM AND PRESS TRIGGER TO START

GENERIC 6: DIAGNOSTIC MONITORING TEST RESULTS

Pre-information

What is DIAGNOSTIC MONITORING TEST RESULTS?

These results are the intermittent monitor system's technical data, which are used to determine whether the system is normal or not.
It also displays the system's thresholds, and a diagnostic result. The intermittent monitor system monitors the Oxygen sensor, Evaporative purge system, Catalyst and the EGR system.

"What is INTERMITTENT MONITOR SYSTEM?"

↓

The Intermittent Monitor System diagnoses and determines whether the system is normal or not once per drive cycle.

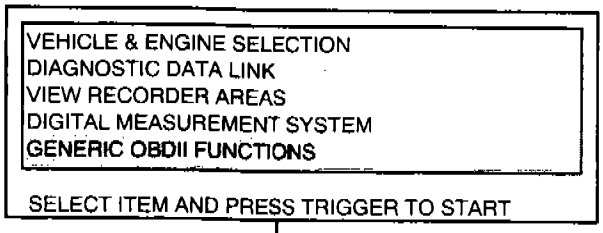
Objective
*To learn how to read diagnostic monitoring test results.
*To learn how to use diagnostic monitoring test results.

Preparations
*Turn the I/G switch to the ON position or start the engine.

Access to the Diagnostic Monitoring Test Results

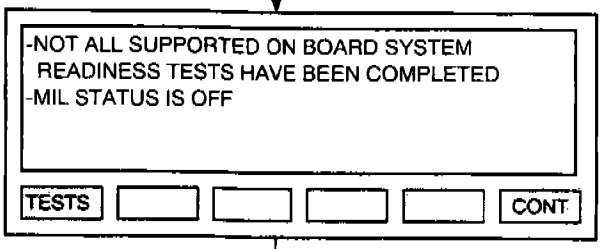
Information Points

1.



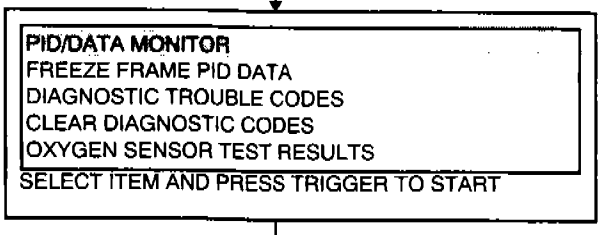
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**".

2.



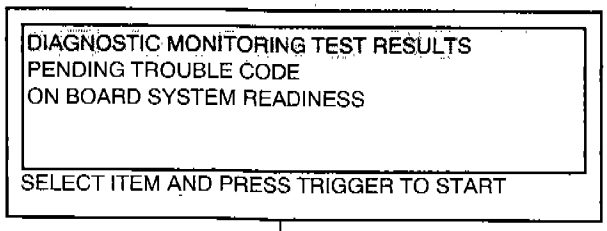
Press CONT.

3.



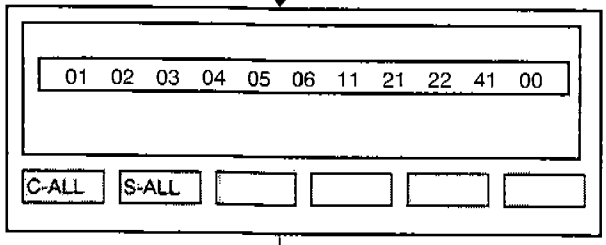
Turn the menu dial clockwise.

4.



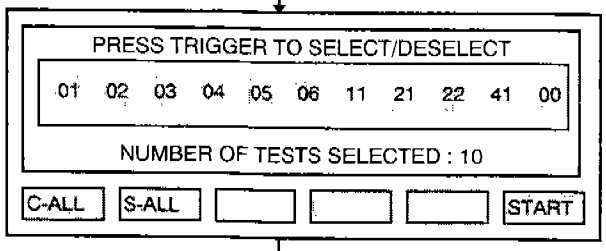
Select "**DIAGNOSTIC MONITORING TEST RESULTS**" and press "**TRIGGER**".

5.



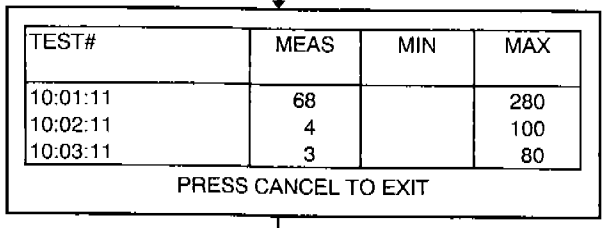
Press S-ALL.

6.



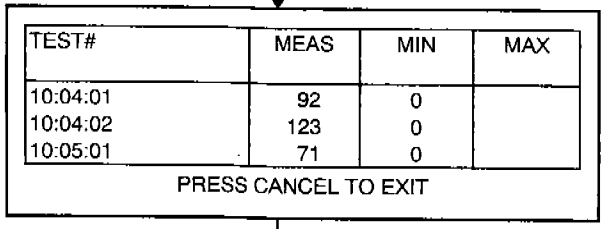
Press START.

7.



Turn the menu dial clockwise.

8.



Turn the menu dial clockwise.

When you select:

C-ALL: You can select any item. To select a desired item, place the highlight bar over the item and press START.

S-ALL: You can perform each item from the beginning.

The screen immediately displays the results of each test with thresholds.

TEST#: shows each test item (Refer to "Diagnostic Monitoring Test Results" in the "Characteristics of the NGS Tester" chapter for details.)

MEAS: MEAS stand for which displays measured values for various tests.

MIN: shows minimum thresholds.

MAX: shows maximum thresholds.

9.

TEST#	MEAS	MIN	MAX
10:06:01	112	0	
10:11:11	480	22	
10:21:00	2		67

PRESS CANCEL TO EXIT

Turn the menu dial clockwise.

10.

TEST#	MEAS	MIN	MAX
10:21:00	2		67
10:22:00	3		433
10:41:00	10	2	54

PRESS CANCEL TO EXIT

Press "**CANCEL**" until you get back to the main menu.

11.

VEHICLE & ENGINE SELECTION
DIAGNOSTIC DATA LINK
VIEW RECORDER AREAS
DIGITAL MEASUREMENT SYSTEM
GENERIC OBDII FUNCTIONS ↓

SELECT ITEM AND PRESS TRIGGER TO START

If the tests are completed normally, the screen will show these values.
If the tests are not completed, some of the MEAS, MIN. and MAX values will show their initial values, such as for the "0", "32768", and "65535".
(Refer to "Diagnostic Monitoring Test Results" of "Characteristics of the NGS Tester" chapter for details.

Note:
If the test result shows 0, 32768 or 65535, you need to drive the vehicle again in each drive mode (refer to appropriate W/M).

GENERIC 7: PENDING TROUBLE CODE

Pre-information

What is PENDING TROUBLE CODE?

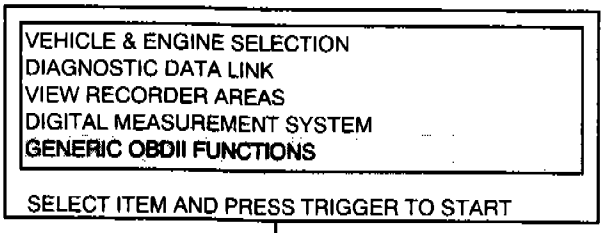
This function applies to the '96 MY for 626/MX-6 (FS/ATX), and all '97 MY and later vehicles. When a problem is detected in a monitored system, and the MIL is illuminated when a problem is detected in two consecutive DCs, in the first DC, the same code as of the failed system is stored in the PCM memory so that it can be retrieved by using the scan tool when necessary.
The code stored at the first malfunction detection is called the pending code.
In the continuous monitoring system, diagnosis is carried out constantly throughout a DC whenever monitoring conditions are met.
The systems monitored by the continuous monitoring system are fuel system, misfire, and CCM.
If the problem was not found in the second DC, the PCM judges that the system returned to normal or the problem was mistakenly detected, and deletes the pending code.
If the problem was found in the second DC too, the PCM judges that the system is failed, deletes the pending code, and illuminates the MIL and stores the DTC.

Objective
*To learn how it detects and displays pending trouble codes to the NGS tester.

Preparations
*Start the engine and let it idle until it is at normal operating temperature andrpms.

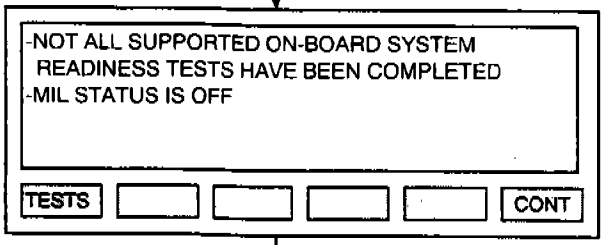
Retrieving The Pending Trouble Code

1.



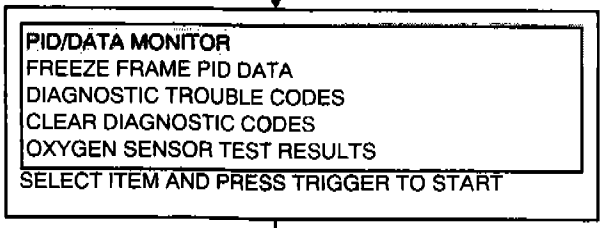
Select "**GENERIC OBDII FUNCTIONS**" and press "**TRIGGER**" .

2.



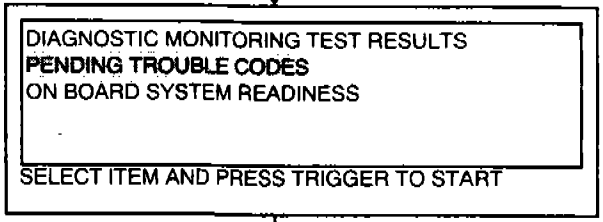
Press CONT .

3.



Turn the menu dial clockwise. place the highlight over the "**PENDING TROUBLE CODES**" .

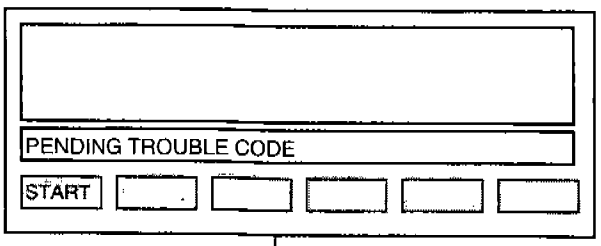
4.



Press "**TRIGGER**" .

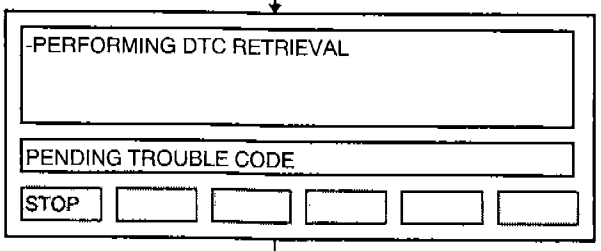
Information Points

5.

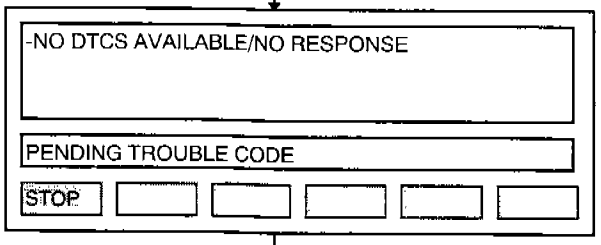


Press START .

6.

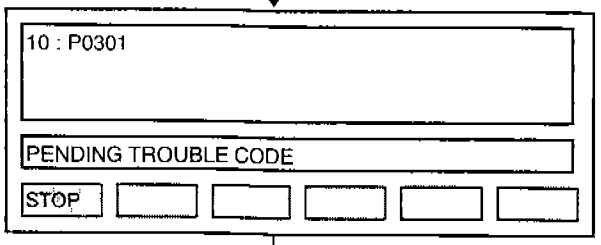


7.



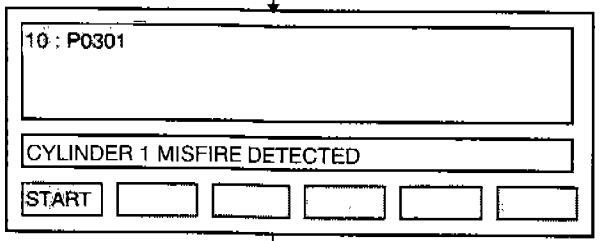
Disconnect "**INJECTOR NO.1**" connector and keep idling for at least 120 seconds.

8.



Press STOP .

9.

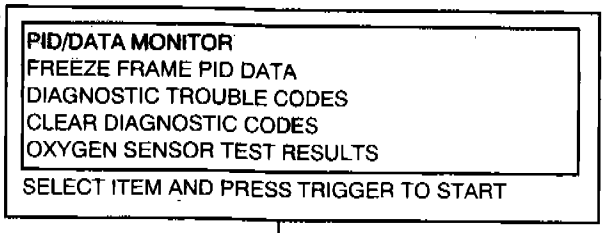


Press "**CANCEL**" .

If the "NO DTCS AVAILABLE/NO RESPONSE" message is shown on both screens, always be sure to run the PID DATA MONITOR(Refer to GENERIC 1: PID DATA MONITOR) and confirm that the "LINK COMMUNICATION ERROR. MODULE NOT RESPONDING. CHECK IGNITION STATUS AND CABLE CONNECTIONS" message dose not appear, you can assume that communication is not functioning properly. Check to make sure that the ignition switch is ON and that the cables are all connected properly. Then run the PID DATA MONITOR again, and confirm that the "LINK COMMUNICATION ERROR. MODULE NOT RESPONDING. CHECK IGNITION STATUS AND CABLE CONNECTIONS" message is gone. Then check the PENDING TROUBLE CODE.

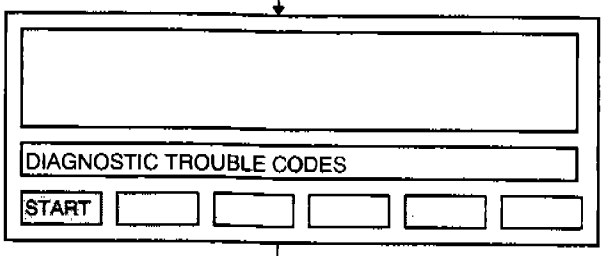
You should make sure that the engine coolant temperature (ECT) is below 193°F when you start the engine. The OBDII system won't operate if the Pressure Regulator Control System is operating (ECT above 194°F).
In this case, you need to keep idling for another 120 seconds after start.

10.



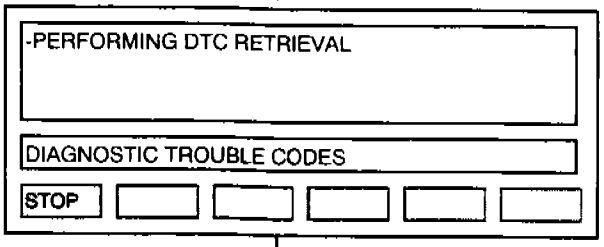
Select "**DIAGNOSTIC TROUBLE CODES**" and press "**TRIGGER**".

11.

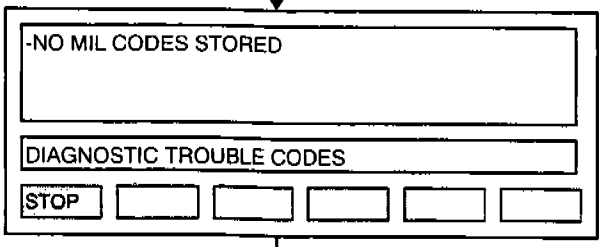


Press START.

12.

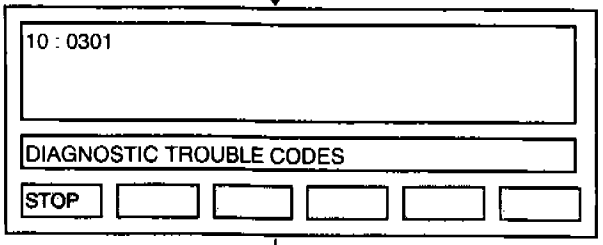


13.



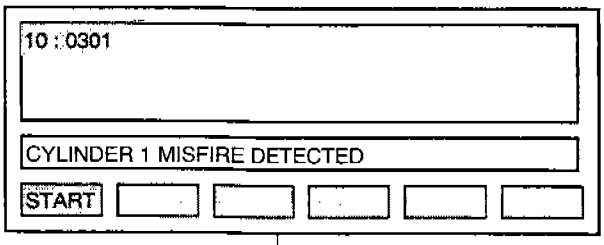
Turn the I/G switch to the OFF position. Re-start the engine. Keep idling for at least 120 seconds. If the ECT reaches at 194°F, you must keep idling for another 120 seconds.

14.



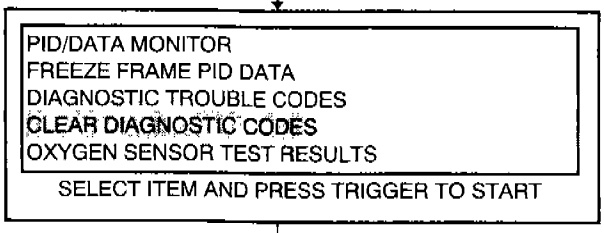
Press STOP.

15.



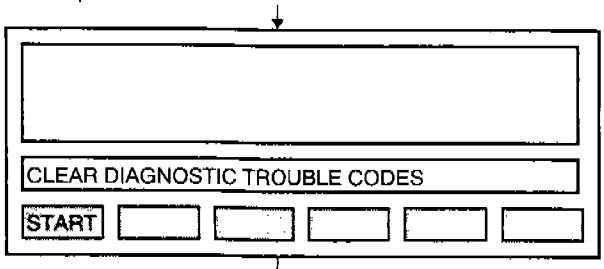
Press "**CANCEL** " .

16.



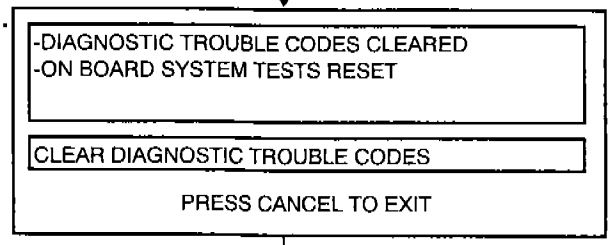
Select "**CLEAR DIAGNOSTIC CODES**" and press "**TRIGGER**" .

17.



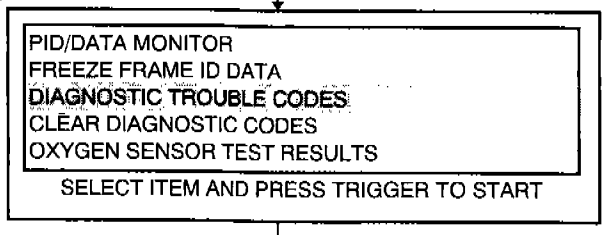
Reconnect the "**INJECTOR NO.1**" connector and press START .

18.



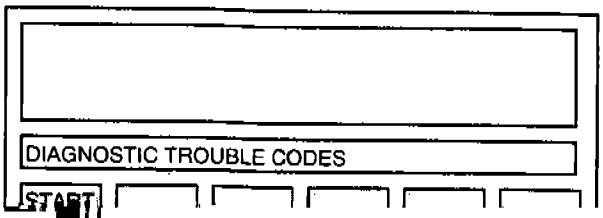
Press "**CANCEL**" once and place the highlight bar over the "**DIAGNOSTIC TROUBLE CODES**" .

19.



Press "**TRIGGER**" .

20.



SPECIFIC 1: VEHICLE AND ENGINE SELECTION

Objective

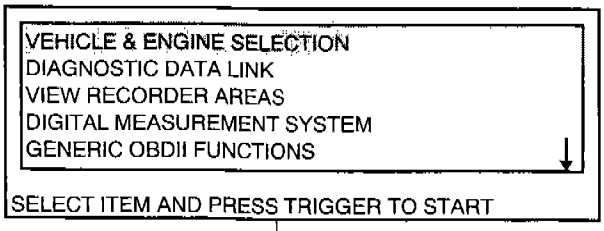
* To learn how to select the proper car model and specification.

Information

* You must select the proper car model and specifications when you use the following functions:
  - Diagnostic Data Link Function
  - Diagnostic Support Procedure Function
  - Digital Measurement System's Link Function

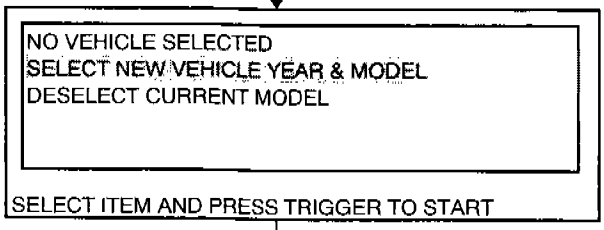
Vehicle and Engine Selection Procedure

1.



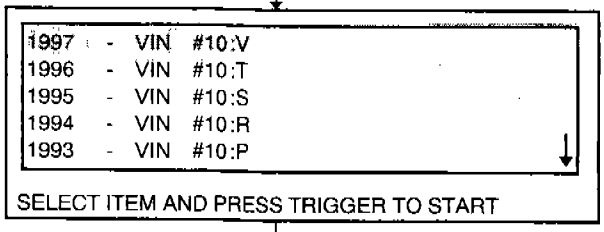
Select "**VEHICLE & ENGINE SELECTION**" and press "**TRIGGER**."

2.



Select "**NEW VEHICLE YEAR & MODEL**" and press "**TRIGGER**".

3.



Select "**MODEL YEAR**" on your testing vehicle and press "**TRIGGER**".

Information Points

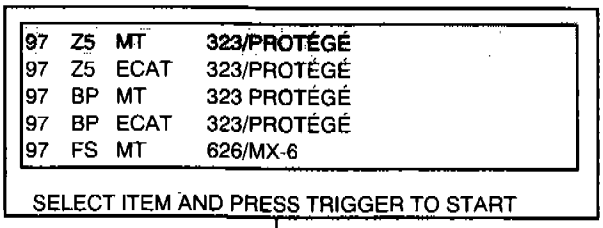
Before you select a vehicle, you must check the following points of the test vehicle:

1.Model Year

Locate the letter code in the VIN's teuth place which represents the vehicle's model year/

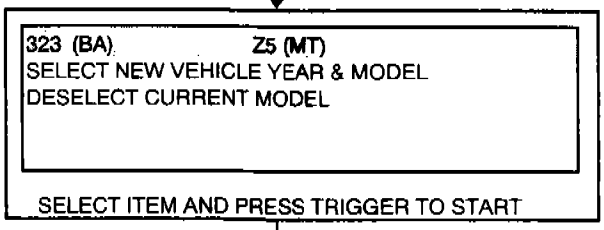
(EX)
VIN:IFTCR10AXNTA10641
VIN NO. is located on the dash board next to the windshield.

4.



Select "**SPECIFICATION**" on your testing vehicle.

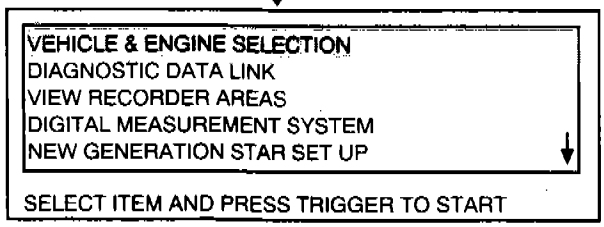
5.



The model you selected will be displayed at the top of the screen.
Press **TRIGGER** if the model is correct.
Press **CANCEL** and then reselect if that is not the model you want.

Select "**323 (BA), Z5 (MT)**" and press "**TRIGGER**"

6.



The screen should return to the main menu.

Now you're ready to begin testing.

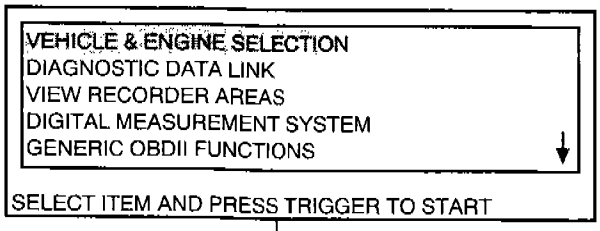
SPECIFIC 2: RETRIEVING AND CANCELING DIAGNOSTIC TROUBLE CODES

Objectives
*To learn how to detect and clear Diagnostic Trouble Codes (DTC).

Information
* When retrieving Specific Function DTCs, all DTCs (MIL and non-MIL) are output . Generally, non-MIL DTCs are for controls other than the emission system on the vehicle (i.e., VRIS or TCS faults).

Retrieving And Canceling DTC's (PCM)	Information Points

1.



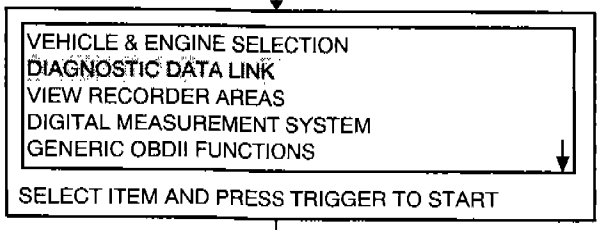
Select "**MODEL**" and "**SPECIFICATION**" of the vehicle you're testing.

You must start the engine before performing this procedure and keep it running during the procedure.

Select the **MODEL** and **SPECIFICATIONS** of the vehicle you're testing (Refer to SPECIFIC 1).

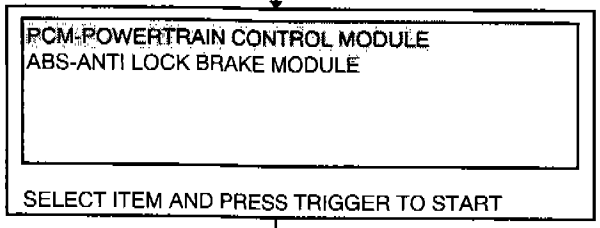
Press **TRIGGER** until display returns to the main menu.

2.



Select "**DIAGNOSTIC DATA LINK**" and press "**TRIGGER**" .

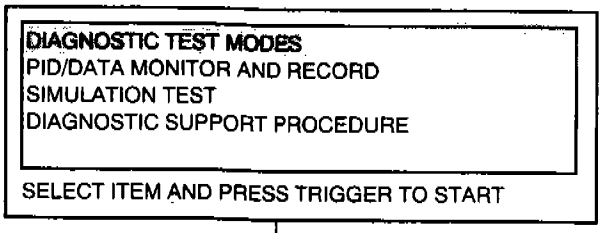
3.



The screen displays the applicable items, depending on the model specifications.

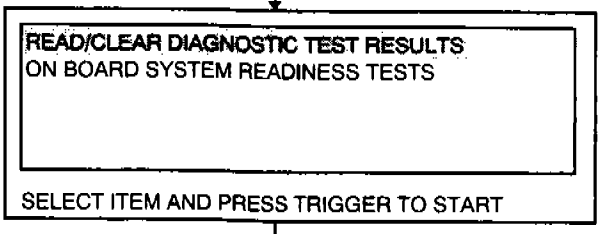
Select "**PCM-POWERTRAIN CTRL MODULE**" and press "**TRIGGER**" .

4.



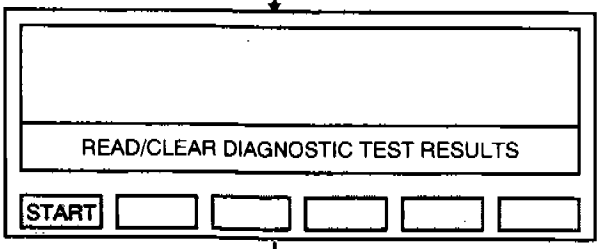
Select "**DIAGNOSTIC TEST MODES**" and press "**TRIGGER**".

5.



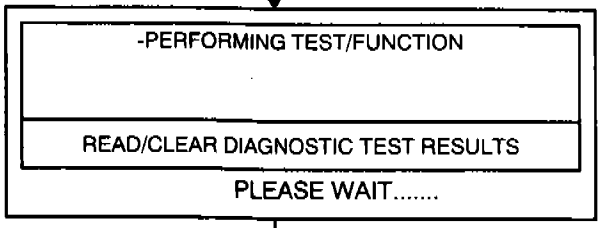
Select "**READ/CLEAR DIAGNOSTIC TEST RESULTS**" and press "**TRIGGER**".

6.

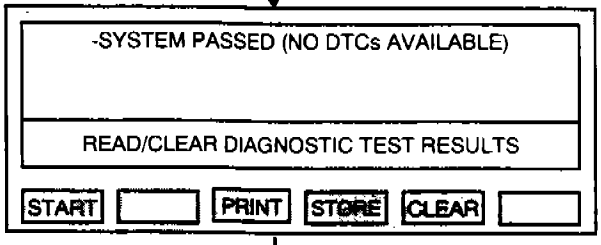


Press START.

7.



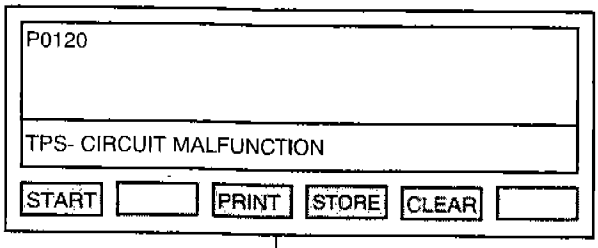
8.



Disconnect "**THROTTLE POSITION SENSOR**" connector. Press START.

If the display indicates DTCs, you must clear the DTCs by following steps 9 to 11.

9.

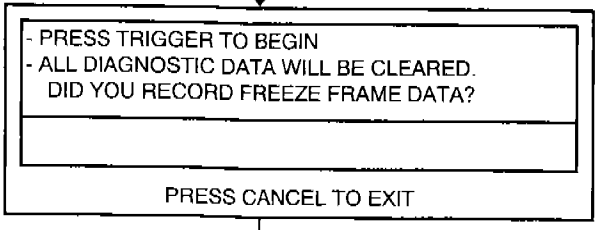


For the throttle position sensor, the DTC and its definition are displayed on the screen.

You can store the current DTC in the NGS tester by pressing the STORE button. Once you have stored the DTC, you can see it when you select **VIEW RECORDED DTCs** from the view recorded area function (Refer to SPECIFIC 4).

Reconnect "**THROTTLE POSITION SENSOR**" connector. Press CLEAR .

10.



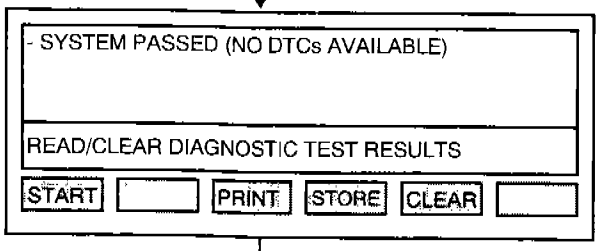
You can clear the DTCs (for Engine Control Module) without disconnecting the battery negative terminal.
Simply press CLEAR .

Moreover, you can clear or initialize the following data:

1. Freeze Frame Data
2. On-Board Readiness Test Result
3. Diagnostic Monitoring Test Result
4. Pending Trouble Code

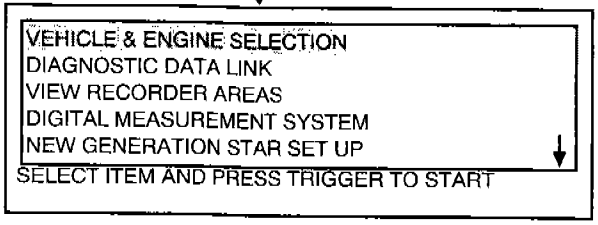
Press "**TRIGGER**" .

11.



Press "**CANCEL**" until you get back to the main menu.

12.

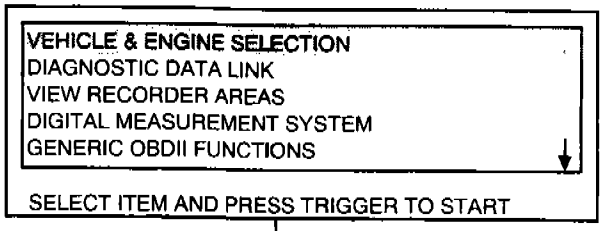
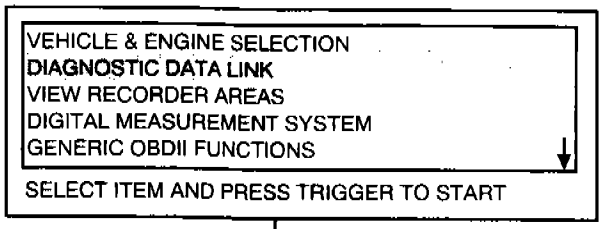
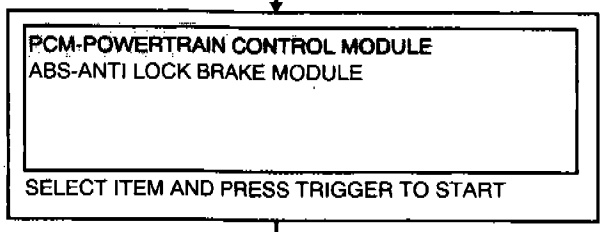


SPECIFIC 3: DATA MONITOR AND RECORDING

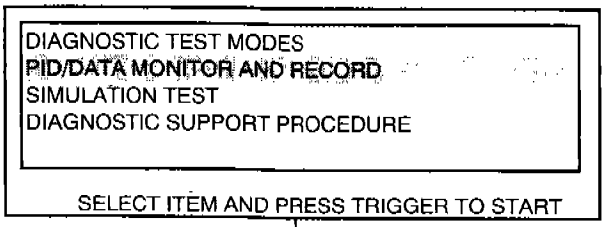
Objectives
*To learn how to monitor the input and the output signal of the Engine Control Module.
*To learn how to record the input and the output signal of the Engine Control Module.

Information
*This function is as useful as the Generic PID monitor function, however, some PIDs are added.

Preparation
*Start the engine, and let it idle until it is at normal operating temperature and rpms.

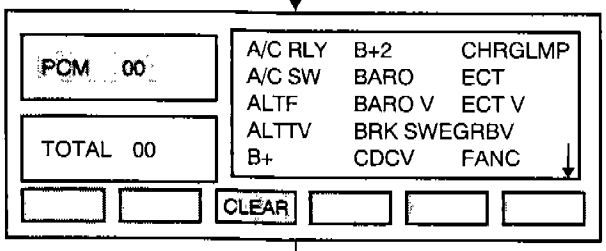
Data Monitor and Recording Procedure	Information Points
1.  Select "**MODEL**" and "**SPECIFICATION**" of the vehicle you're testing.	Select the **MODEL** and **SPECIFICATIONS** of the vehicle you're testing (refer to SPECIFIC 1). ↓ Press **TRIGGER** until display returns to the main menu.
2.  Select "**DIAGNOSTIC DATA LINK**" and press "**TRIGGER**".	
3.  Select "**PCM-POWERTRAIN CTRL MODULE**" and press "**TRIGGER**".	The screen displays the applicable items, depending on the model specifications.

4.



Select "**PID/DATA MONITOR AND RECORD**" and press "**TRIGGER**" .

5.



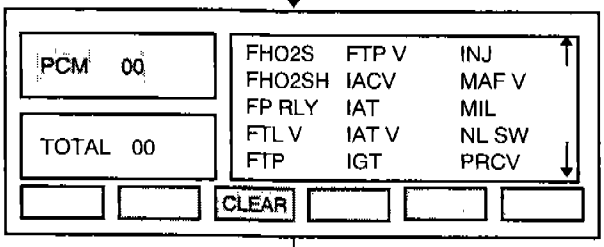
The screen will display a list of PIDs.

PID (Parameter Identification):
There are items for which the monitoring and recording of data is possible.

A several-page list of items you may monitor is displayed on the screen. Move the menu dial to scroll through the list.

Turn the menu dial until the second screen is displayed.

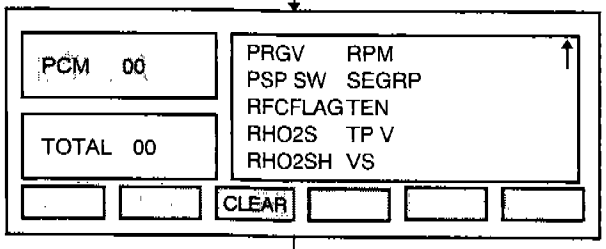
6.



The screen displays PID abbreviations. Verify the standard name by referring to the Service Highlight (S/H) of the vehicle that you are testing.
(Refer to section F: on-board diagnostic system).

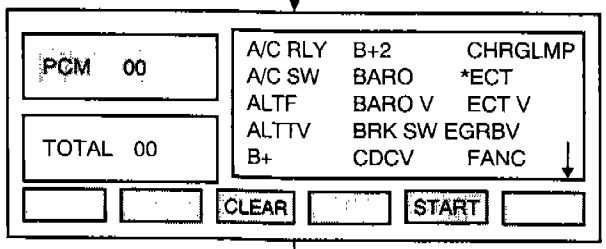
Turn the menu dial until the second screen is displayed.

7.



Select PIDs(ECT, FHO2S, IGT, MAFV, RPM, TPV), place the highlight bar over the item and press "**TRIGGER**" .

8.

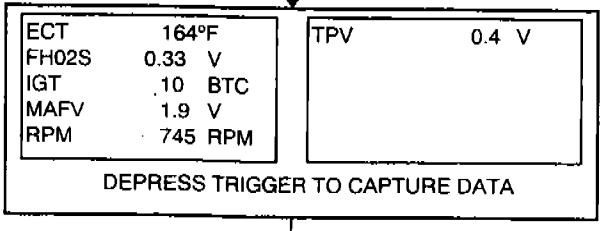


To select desired PIDs, place the highlight bar over the item(s) and press **TRIGGER**.
A star symbol appears next to the item when it is selected.

Press **TRIGGER** once again to deselect a PID.
Press **CLEAR** to deselect all PIDs.

Press [START] to begin displaying and pre-trigger recording your selected PIDs.

9.

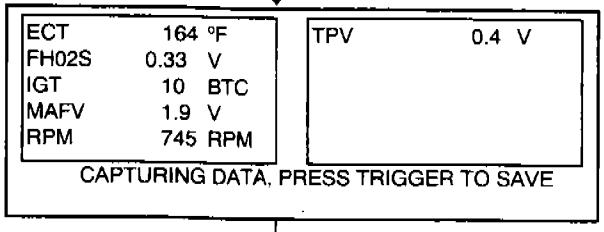


Display shows, standard value (specification) of the PID, when you select only one PID.

You can select a maximum of ten PIDs.

Press "**TRIGGER**" to begin post-trigger recording.

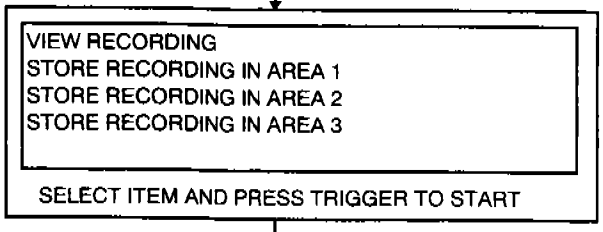
10.



If you don't press **TRIGGER**, the recording will proceed to the end of its capacity.
Then, "**RECORDER-FULL, PRESS TRIGGER TO SAVE**" will appear on the screen.

Press "**TRIGGER**" to stop recording and to input data into memory.

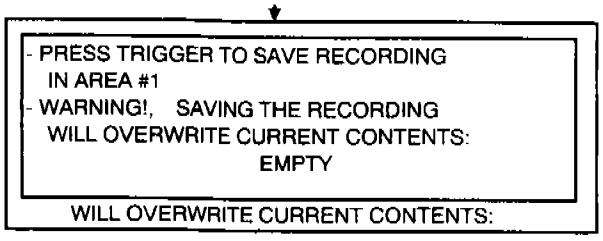
11.



To memorize the recording data, highlight a storage recording area and press **TRIGGER**.
Once data is stored, it can be replayed on the screen (refer to SPECIFIC 4).

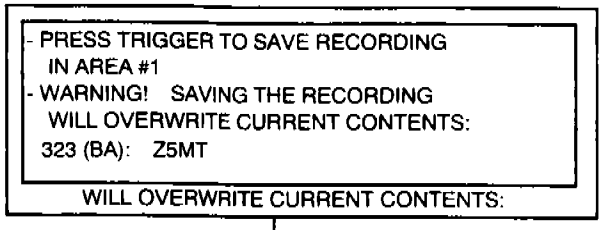
Select "**STORE RECORDING IN AREA 1**" and press "**TRIGGER**".

12.



NGS displays **EMPTY** if the storage area you selected doesn't have any data stored yet.

13.

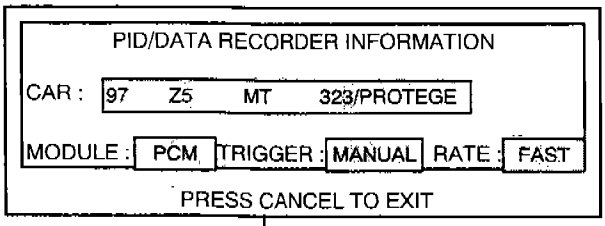


If the storage area you selected already has data stored in it, NGS displays the current data but allows you to overwrite in any storage area.

Press **TRIGGER** to STORE.
Press **CANCEL** to EXIT.

Press "**TRIGGER**" to save recording data in AREA 1.

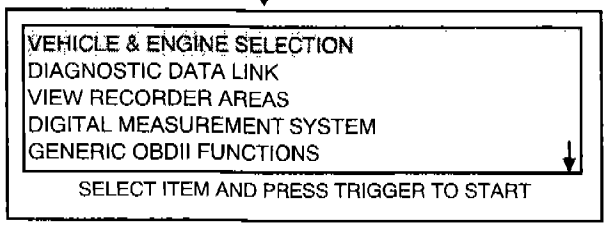
14.



Making it useful for troubleshooting tricky intermittent problems.
Once data is stored, it can be replayed and displayed graphically or in table form (Refer to SPECIFIC 4).

Press "**CANCEL**" until you get back to the main menu.

15.

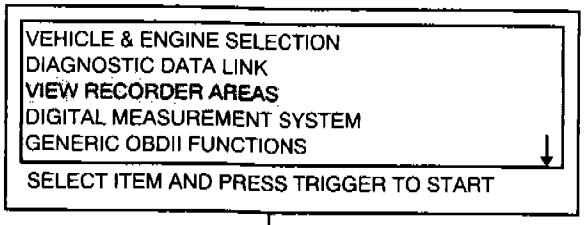


SPECIFIC 4: VIEW RECORDER AREA

Objective
*To learn how to display recorded data graphically or in table form.

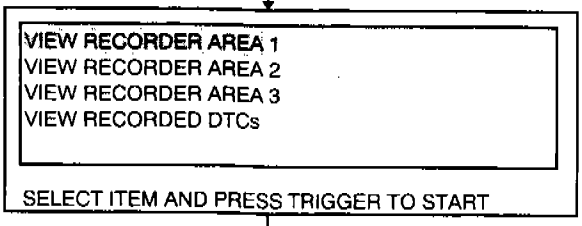
Playback Procedure

1.



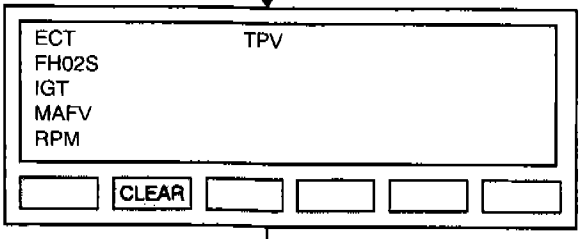
Select "**VIEW RECORDER AREAS**" and press "**TRIGGER**".

2.



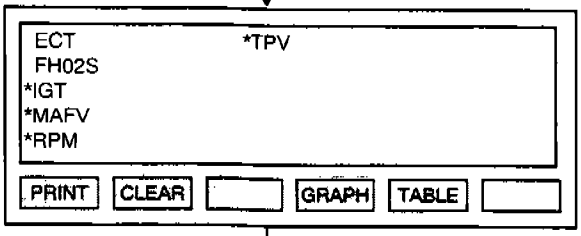
Select one of the recorder areas.

3.



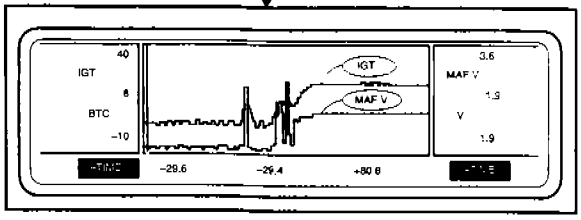
Select PIDs(IGT, MAFV, RPM, TPV) that you want to display on the screen by pressing "**TRIGGER**".

4.



Press GRAPH.

5.



Information Points

You can see the stored DTCs if you select **VIEW RECORDED DTCs**.
The **NO RECORDING AVAILABLE IN THIS SYSTEM** is shown on the screen if the recorder area doesn't have any data.

You can select a maximum of four PIDs.

How to use the GRAPH function

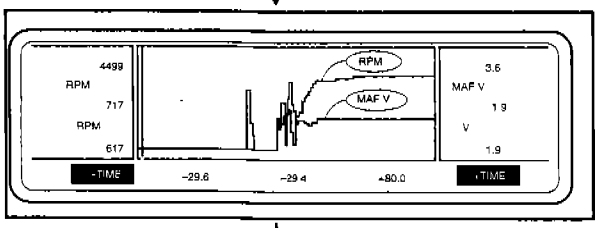
40 IGT 8 BTC -10	40: The MAX. value of Ignition Timing. 8: The Ignition Timing at cursor point -10: The MIN. value of Ignition Timing.

-TIME -29.6 T0.0 +80.8 +TIME

- The "+" indicates the time speed after trigger has been pressed.
- Indicates end of recording point
- Indicate the exact time of trigger.
- Indicates beginning of recording point.
- The "-" indicates amount of time before trigger point.

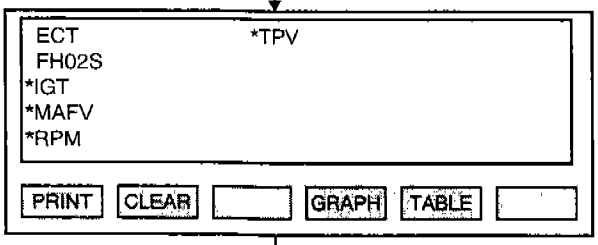
Press [2]

6.



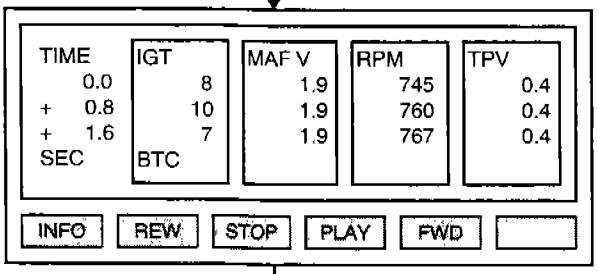
Press "**CANCEL**" .

7.



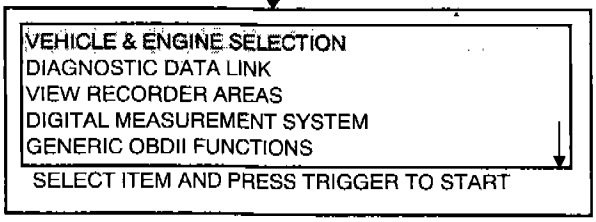
Press [TABLE].

8.



Press "**CANCEL**" until you get back to the main menu.

9.



- By moving the menu dial across the graph. you can review PID values.
- Although you can choose four PIDs for replay, you can view only two at a time on the graph. However, you can rotate through four of the PIDs you selected by pressing buttons [2] and [9].

[2] : Exchange on your left side data to other one.

[9] : Exchange on your right side data to other data.

- If the all recording data isn't displayed on the screen at once, you can see the rest of the data by pressing buttons [3] and [8].

[3] : the graphic data moves forward (right side).

[8] : the graphic data moves backward (left side).

How to use the **TABLE** function

[INFO] :Gives information about car model specifications of displayed data.

[REW] :Moves forward and backward through the recording data by pressing these buttons like a tape recorder.

[STOP]

[PLAY]

[FWD]

MENU DIAL : Move the recording data by moving the menu dial.

SPECIFIC 5: SIMULATION TEST

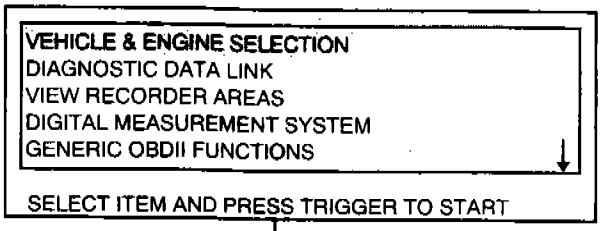
Objective
*To learn how to operate OUTPUT devices (IAC, injectors, EGR, etc.) by sending simulation command signals from the NGS to the PCM (ECM).

Information
*This function is fitted to specific mode only.

Preparation
*Start the engine, and let it idle until it is at normal operation temperature andrpms.

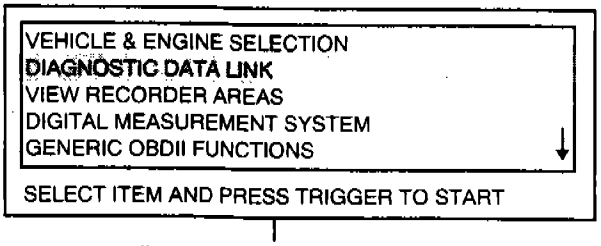
Injector No.1 Operation Checking Procedure

1.



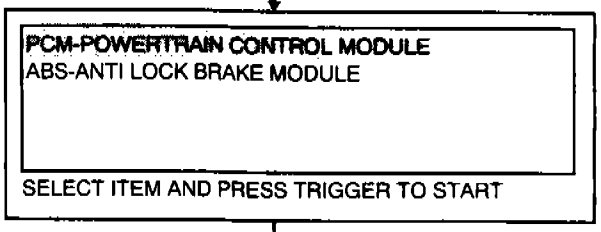
Select "**MODEL**" and "**SPECIFICATION**" of the vehicle you're testing.

2.



Select "**DIAGNOSTIC DATA LINK**" and press "**TRIGGER**".

3.



Select "**PCM-POWERTRAIN CTRL MODULE**" and press "**TRIGGER**".

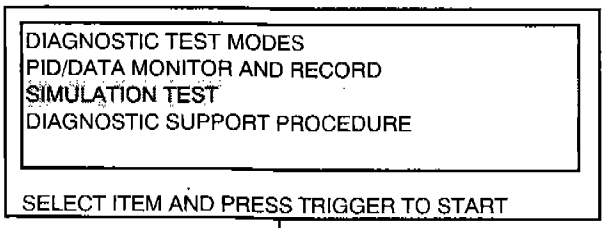
Information Points

Select the **MODEL** and **SPECIFICATIONS** of the vehicle you're testing (refer to SPECIFIC 1).

↓

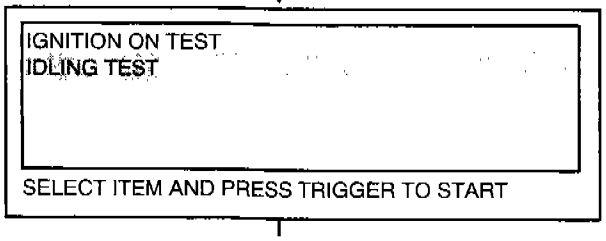
Press **TRIGGER** until display returns to the main menu.

4.



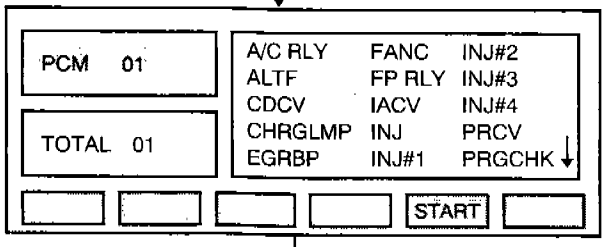
Select "**SIMULATION TEST**" and press "**TRIGGER**" .

5.



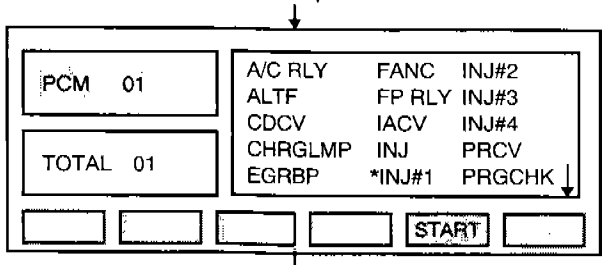
Select "**IDLING TEST**" and press "**TRIGGER**" .

6.



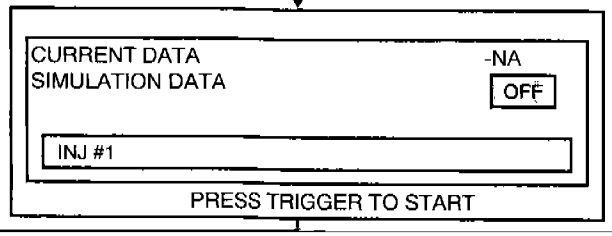
Select "**INJ#1**" and press "**TRIGGER**" .

7.



Press START.

8.



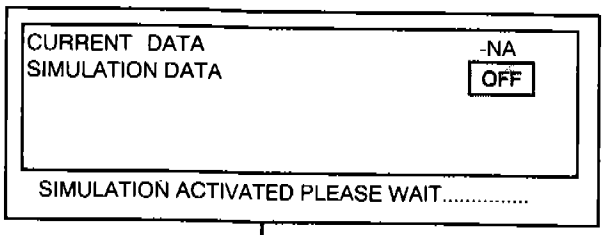
The screen displays PID abbreviations. Verify the standard name by referring to the Service Highlight (S/H) of the vehicle that you are testing.
(See section F: on-board diagnostic system)

You can select only one PID (device).

If you select **IDLING TEST**, the NGS will monitor the following three signals:
① Idle SW: ON (Equipped vehicle)
② TR SW : P or N
③ RPM : above 550

If the screen displays "**TEST CONDITION NOT CORRECT**", you have to check the three signal conditions and

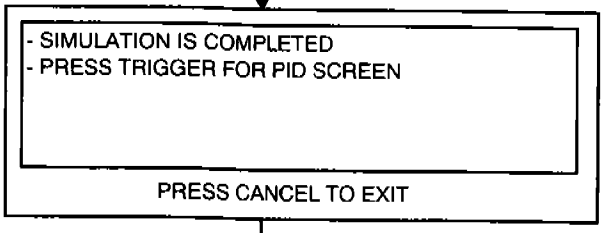
9.



The simulation is performed for 3 seconds, and "**SIMULATION ACTIVATED PLEASE WAIT**" is displayed during those 3 seconds. Then INJ#1's injection will be stopped. While the simulation is performing, you can feel the idle fluctuation. This lets you know that the injector operation is normal before the testing.

If you want to perform once again, you simply press **TRIGGER**.

10.

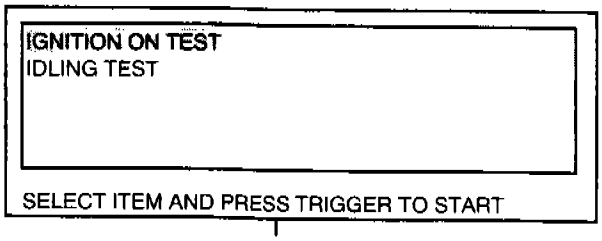


Press "**CANCEL**" once.

Fuel Pump Operation Checking Procedure

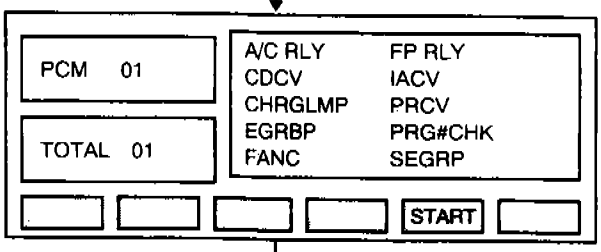
Turn ignition SW OFF, then it ON again. Set up condition as shown below in diagram (No.11).

11.



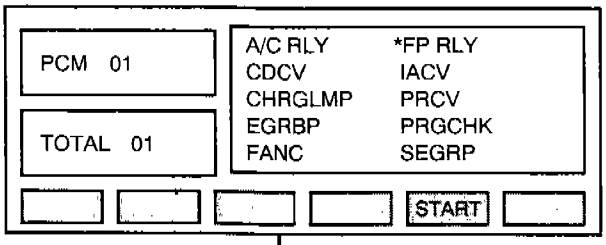
Select "**IGNITION ON TEST**" and press "**TRIGGER**"

12.



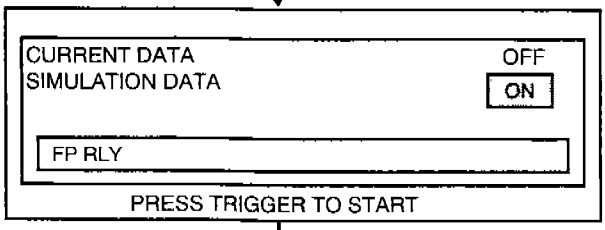
Select "**FPRLY**" and press "**TRIGGER**".

13.



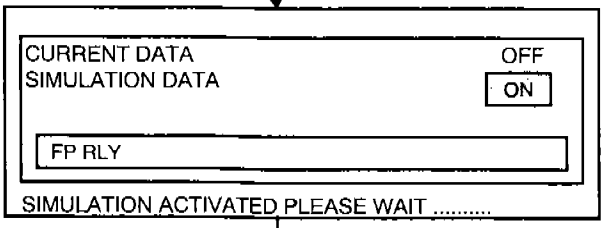
Press START.

14.

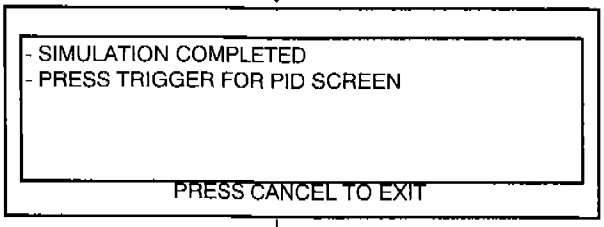


Press "**TRIGGER**".

15.

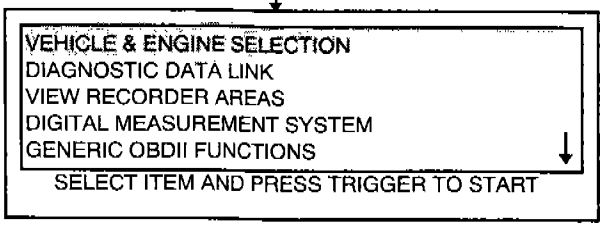


16.



Press "**CANCEL**" until you get back to the main menu.

17.



Then the fuel pump relay and the fuel pump will be operated. You can hear the fuel pump operation sound while the simulation is running. This sound lets you know that the ECM, the fuel pump and their related harnesses are all normal.

If the operation sound can't be heard, perform the FP RLY simulation again and check for the operation sound of the fuel pump relay.

If the operation sound is heard, check the following.

a. Measure the voltage at battery supply of the fuel pump connector (harness side) (Refer to wiring diagram).
b. If the voltage is correct (B+), check the following.
   - Continuity of the fuel pump
c. If the voltage is not correct (0V), check the following.
   - Wiring harnesses and correctors (open circuit) {Fuel pump relay-Fuel pump}

If the operation sound is not heard, check the following.

- Fuel pump relay
- Wiring harnesses and connectors (open circuit) {Main relay-Fuel pump relay-ECM (PCM)}

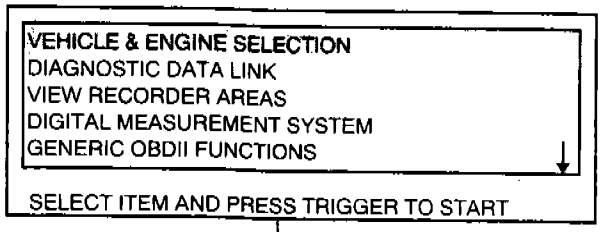
SPECIFIC 6: DIAGNOSTIC SUPPORT PROCEDURE

Objective
*To learn how to check devices (Sensors, Switches, IAC, etc.) operation condition by the NGS.

Information
*This information is fitted to specific mode only.

Diagnostic Support Procedure	Information Points

1.



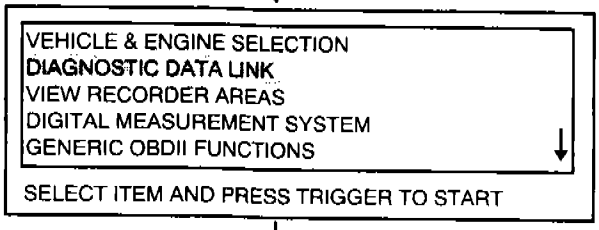
Select "**MODEL**" and "**SPECIFICATION**" of the vehicle you're testing.

Select the **MODEL** and **SPECIFICATIONS** of the vehicle you're testing (refer to SPECIFIC 1).

↓

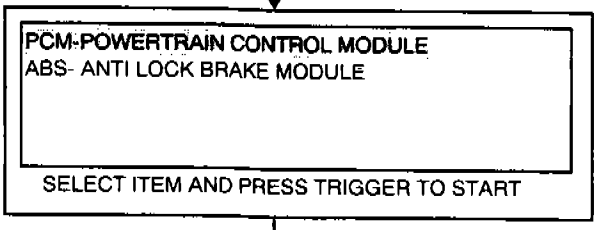
Press **TRIGGER** until display returns to the main menu.

2.



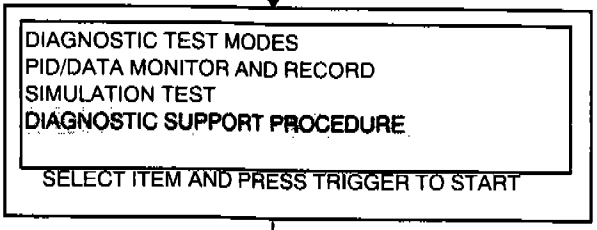
Select "**DIAGNOSTIC DATA LINK**" and press "**TRIGGER**".

3.



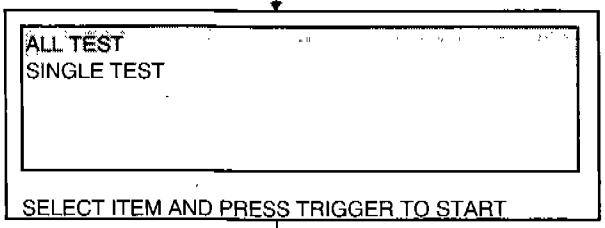
Select "**PCM-POWERTRAIN CTRL MODULE**" and press "**TRIGGER**".

4.



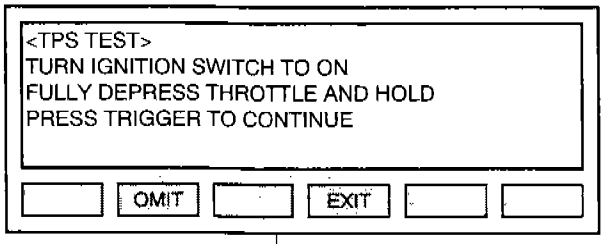
Select "**DIAGNOSTIC SUPPORT PROCEDURE**" and press "**TRIGGER**".

5.



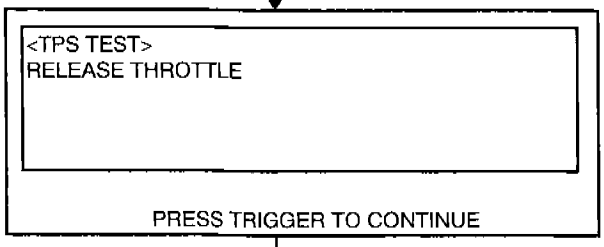
Select "**ALL TEST**" and press "**TRIGGER**".

6.



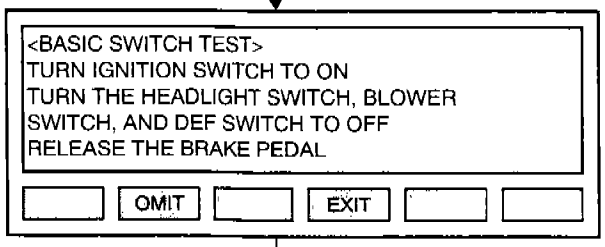
Follow the message and press **"TRIGGER"**.

7.



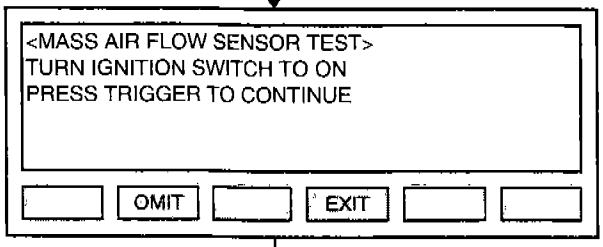
Release throttle and press **"TRIGGER"**.

8.



Press OMIT to skip **"BASIC SWITCH TEST"**.

9.



Turn ignition SW ON and press **"TRIGGER"**.

When you select

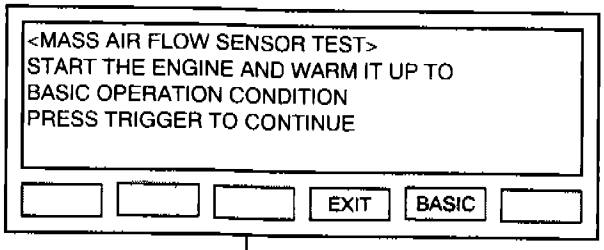
ALL TEST : You can perform each item from the beginning.

SINGLE TEST : You can select any item. To select a desired item, place the highlight bar over the item and press **TRIGGER**.

If you carry out **BASIC SWITCH TEST**, you can check the operation condition of the following items:

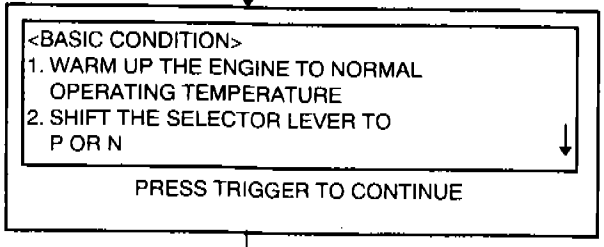
1. Headlight SW
2. Power Steering SW
3. Blower SW
4. A/C SW
5. Rear DEF SW
6. Brake SW

10.



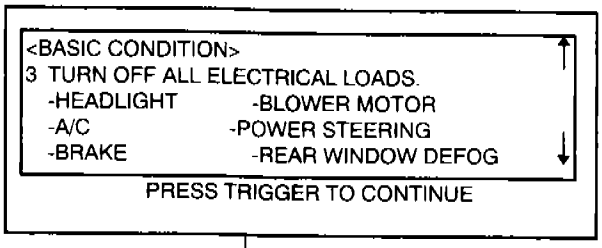
Press [BASIC] and set up condition as shown bellow in messages (No.11-No.13).

11.



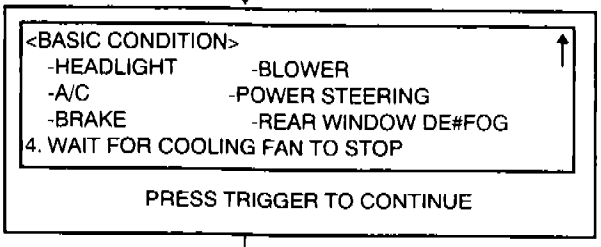
Turn the menu dial until the screen shows the below message.

12.



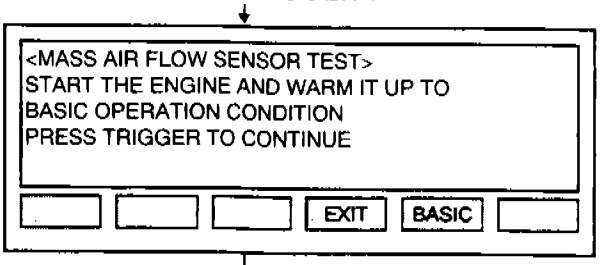
Turn the menu dial until the screen shows the below message.

13.



Press **"TRIGGER"**.

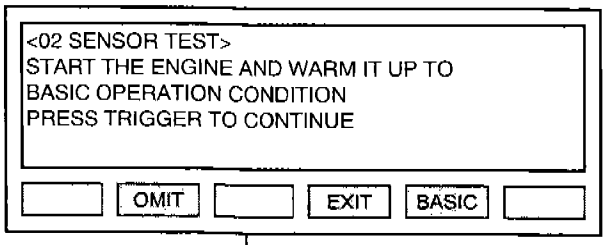
14.



Press **"TRIGGER"**.

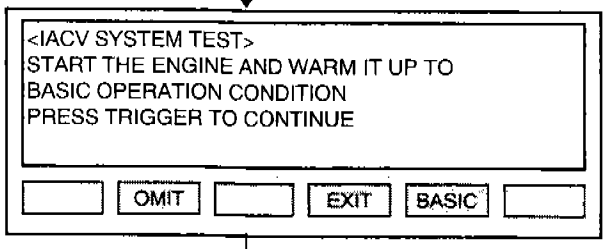
Before you carry out **MASS AIR FLOW SENSOR TEST**, you must set up the basic condition on your test vehicle in order to get exact test data.

15.



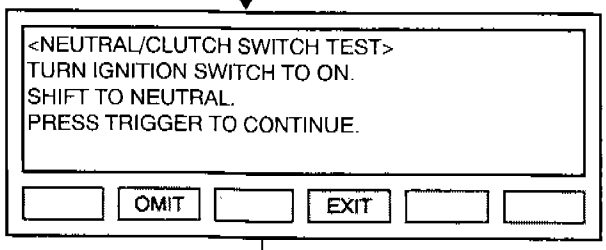
Press OMIT to skip **"O2 SENSOR TEST"**.

16.



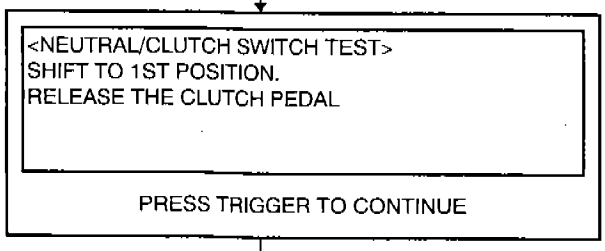
Press OMIT to skip **"IACV SYSTEM TEST"**.

17.



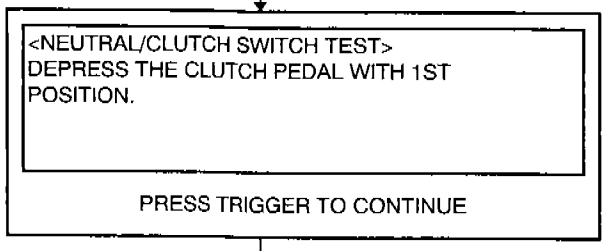
Turn ignition SW OFF, then turn it ON again.
Shift to Neutral and press **"TRIGGER"**.

18.



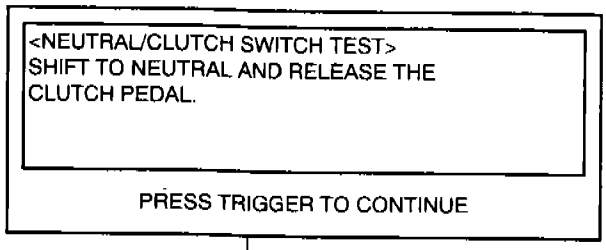
Follow the message and press **"TRIGGER"**.

19.



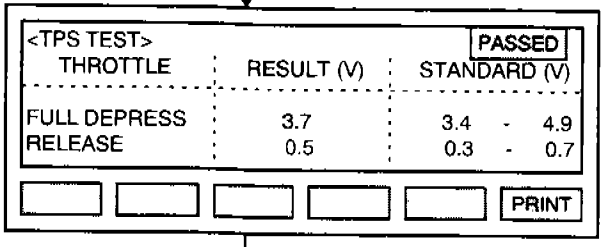
If you carry out **IACV SYSTEM TEST**, you can check the Idle Air Control Valve operation condition.

20.



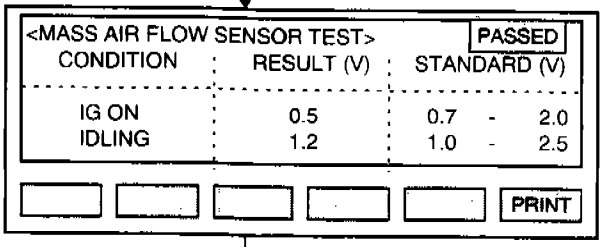
Follow the message and press **"TRIGGER"**.

21.



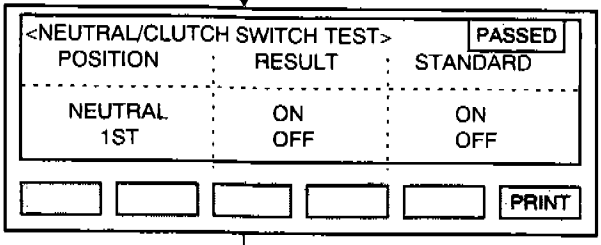
Turn the menu dial until the screen shows the below message.

22.



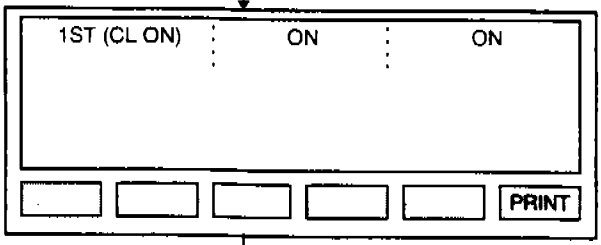
Turn the menu dial until the screen shows the below message. Press **"CANCEL"** until you get back to the main menu.

23.



Turn the menu dial until the screen shows the below message.

24.



The screen immediately displays the result of each test when you carry out all of the items.

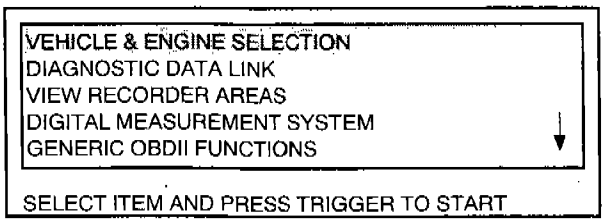
The result of each test is indicated in the upper right-hand corner, and compared with a standard valve.

If the screen shows PASSED , the system operates correctly.

If the screen shows FAULTY , the system operates incorrectly. Therefore, you have to check the device in question and its related harness as per the appropriate W/M.

The results of these tests can be printed out with the NGS printer. Then you can show them to customers as proof of repair completion.

25.

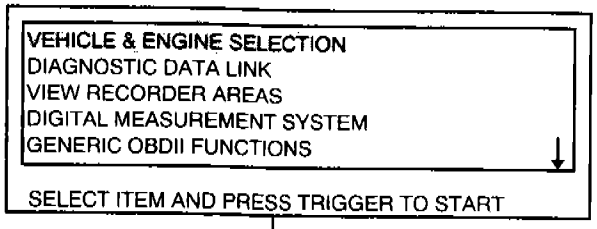

VEHICLE & ENGINE SELECTION
DIAGNOSTIC DATA LINK
VIEW RECORDER AREAS
DIGITAL MEASUREMENT SYSTEM
GENERIC OBDII FUNCTIONS
SELECT ITEM AND PRESS TRIGGER TO START

SPECIFIC 7–1 DIGITAL MEASUREMENT SYSTEM

Objective
*To learn how to measure VOLTAGE(V), RESISTANCE(Ω), FREQUENCY(Hz), DUTY CYCLE (%) AND PULSE WIDTH (ms) by using the NGS tester.
*To learn how to monitor the input and output signals, of the Engine Control Module.

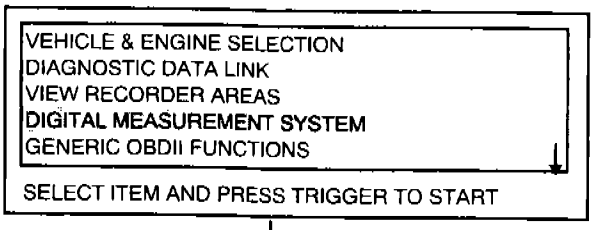
Voltage Measurement and Monitoring Procedure

1.



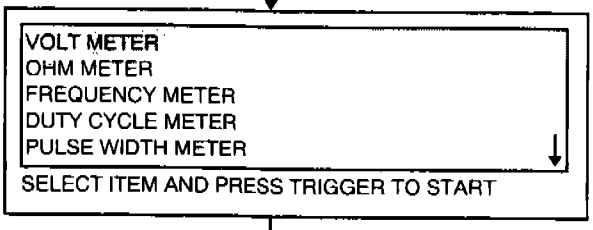
Select "**MODEL**" and "**SPECIFICATION**" of the vehicle you're testing.

2.



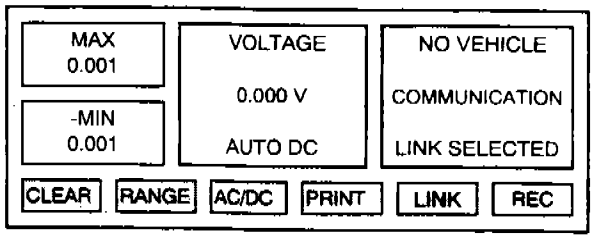
Select "**DIGITAL MEASUREMENT SYSTEM**" and press "**TRIGGER**".

3.



Select "**VOLT METER**" and press "**TRIGGER**".

4.



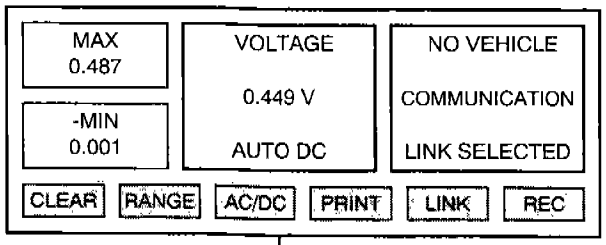
Connect test leads (RED→SIG, BLACK→COM)
Turn the ignition key to the ON position, if necessary.
Measure the Throttle Position Sensor(RED→TVO, BLACK→GND)

Information Points

Select the **MODEL** and **SPECIFICATIONS** of the vehicle you're testing (Refer to SPECIFIC 1) if you are monitoring the input and output signals of the engine control module (for link function).

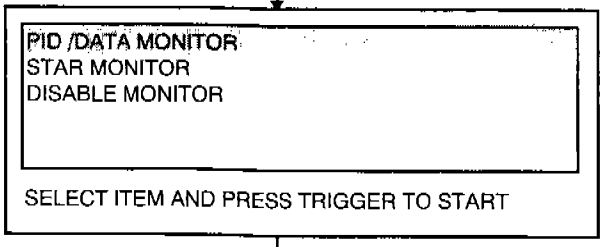
You can measure **VOLTAGE** like a digital circuit tester, and display the data in MAX and MIN values.

5.



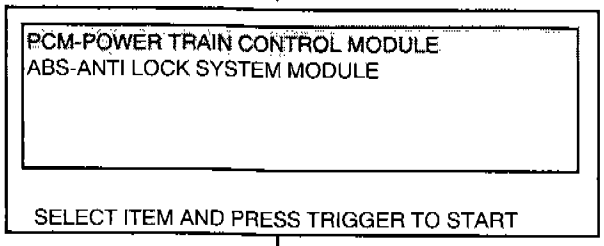
Press LINK .

6.



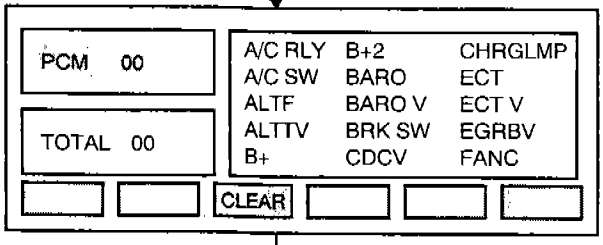
Select **"PID/DATA MONITOR"** and press **"TRIGGER"**.

7.



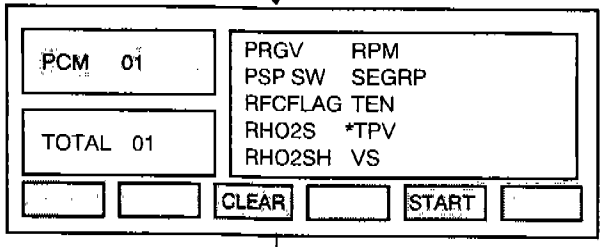
Select **"PCM-POWERTRAIN CONTROL MODULE"** and press **"TRIGGER"**.

8.



Select PIDs (TP V), place the highlight bar over the item and press **"TRIGGER"** .

9.



Press START .

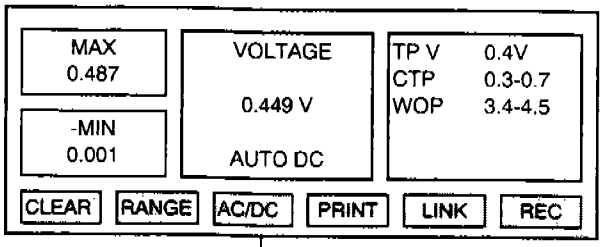
Specification

Measuring condition	Voltage(V)
Closed throttle position	0.3 -0.7
Wide open throttle	3.4 - 4.5
Closed throttle position→Wide open throttle	Increases smoothly

The screen will display a list of PIDs.
PID (Parameter Identification):
These are items for which the monitoring and recording of data is possible.
A several-page list of items you may monitor is displayed on the screen.
Move the menu dial to scroll through the list.

The screen displays PID abbreviations. Verify the standard name by referring to the Service Highlight (S/H) of the vehicle that you are testing. (Refer to Section F: on-board diagnostic system.)

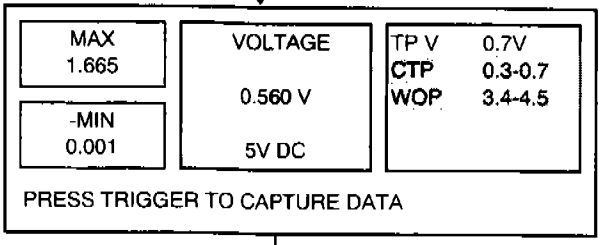
10.



Press [REC]

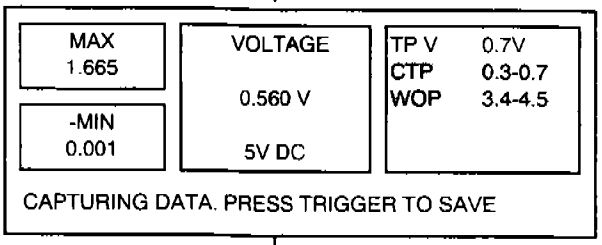
Open / Close throttle valve repeatedly

11.



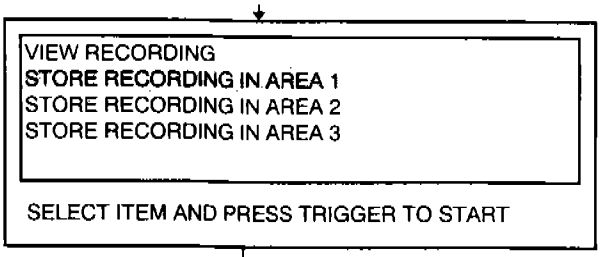
Press **"TRIGGER"**

12.



Press **"TRIGGER"**

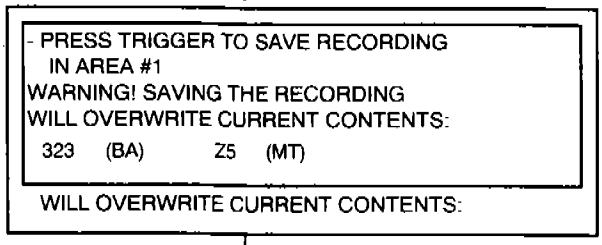
13.



Select **"STORE RECORDING IN AREA 1"**

and press **"TRIGGER"**.

14.

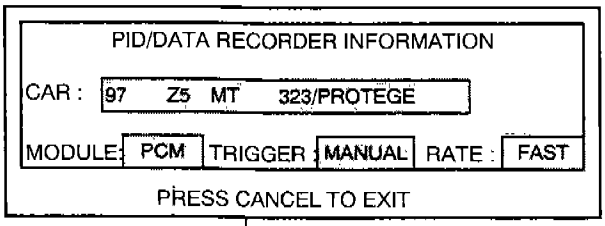


Press **"TRIGGER"** .

The PIDs that you selected are displayed on the right side of the screen.
There is a difference between "**Measured voltage**" and "**Monitored voltage**" because of the impedance and ground conditions are different.
This indicates that the sensor output and the ECM received voltage are normal.
If the screen shows a big difference, you can verify the malfunctioning point by using this function.
You can store both of these current (measuring and monitoring) data by pressing the [REC] button. Once data is stored, it can be replayed and displayed graphically or in table form when you access the **VIEW RECORDER AREA** function (Refer to SPECIFIC 4).

To memorize the recorded data, highlight a storage recording area and press **TRIGGER**.

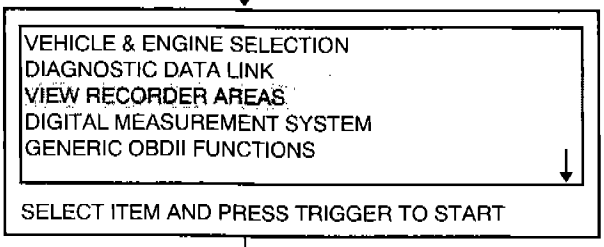
15.



The memory banks and recorder areas store data for 48 hours after the NGS is turned off.

Press "**CANCEL**" until you get back to the main menu.

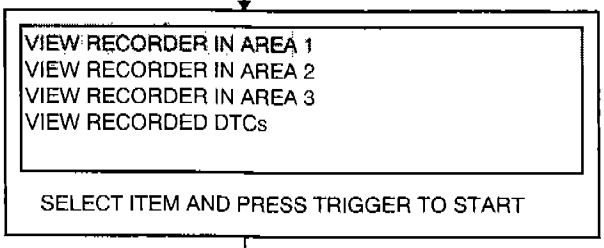
16.



Steps 16 to 20 describe the **VIEW RECORDER AREA** function. The procedure is completely the same as for SPECIFIC 4.

Select **"VIEW RECORDER AREA"** and press **"TRIGGER"** .

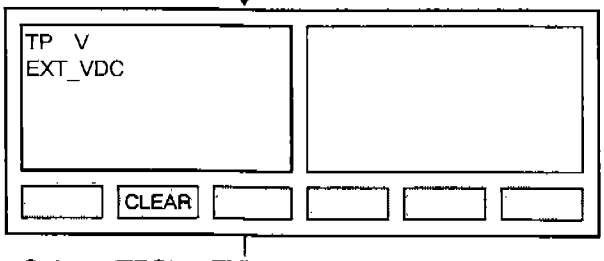
17.



The "EXT_VDC" indicates the measured value of the TPS.

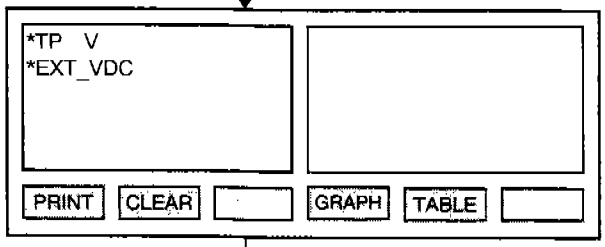
Select **"VIEW RECORDER IN AREA 1"** and press **"TRIGGER"**.

18.



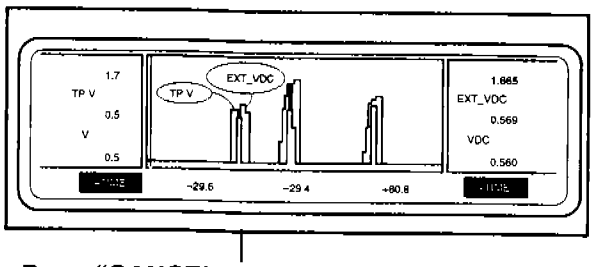
Select **"TPS"**, **"EXT_VDC"** and press **"TRIGGER"**.

19.



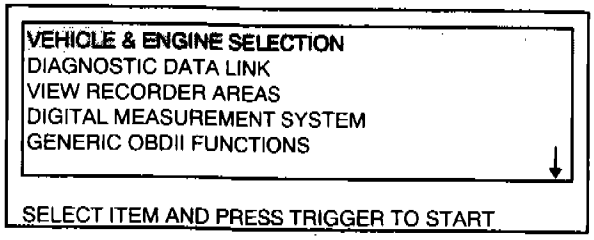
Press GRAPH.

20.

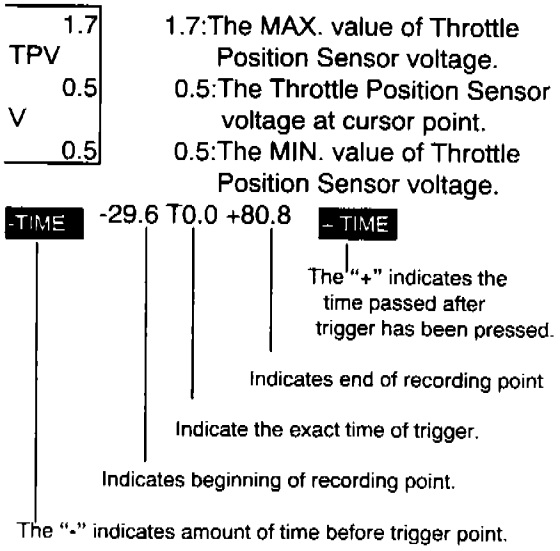


Press **"CANCEL"** until you get back to the main menu.

21.



How to use the **GRAPH** function



- By moving the cursor across the graph, you can review PID valves.
- Although you can choose four PIDs for reply, you can view only two at a time on the graph. However, you can rotate through four of the PIDs you selected by pressing buttons [2] and [9] .

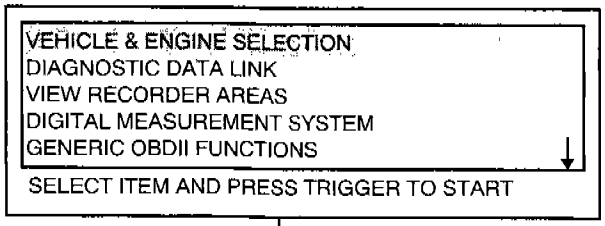
[2] : Exchange on your left side data to other one.
[9] : Exchange on your right side data to other one.

SPECIFIC 7–2 DIGITAL MEASUREMENT SYSTEM

Objective
*To learn how to measure VOLTAGE(V), RESISTANCE(Ω), FREQUENCY(Hz), DUTY CYCLE (%) AND PULSE WIDTH (ms) by using the NGS tester.
*To learn how to monitor the input and output signals, of the Powertrain Control Module.
*To learn how to simulate the input signals.

Pulse Width Measurement and Monitoring Procedure	Information Points

1.

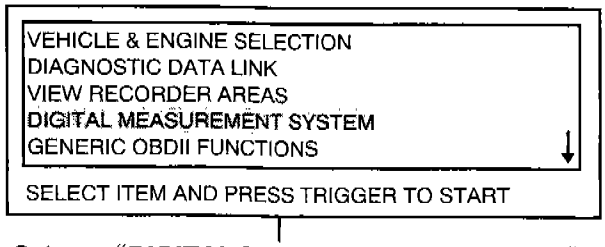


Select "**MODEL**" and "**SPECIFICATION**" of the vehicle you're testing.

Before performing this procedure,you must start the engine until it is at normal operating temperature.

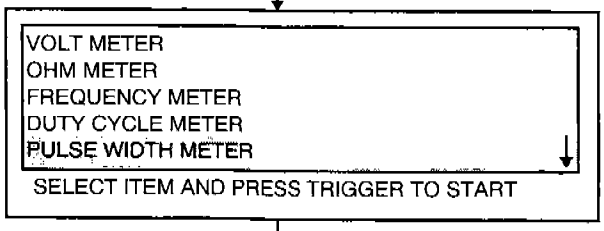
Select the **MODEL** and **SPECIFICATIONS** of the vehicle you're testing (Refer to SPECIFIC 1) if you are monitoring the input and output signals of the engine control module (for link function).

2.



Select "**DIGITAL MEASUREMENT SYSTEM**" and press "**TRIGGER**".

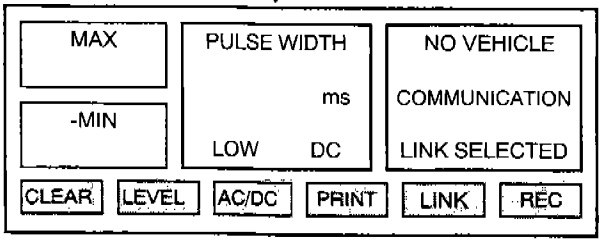
3.



Select "**PULSE WIDTH METER**" and press "**TRIGGER**".

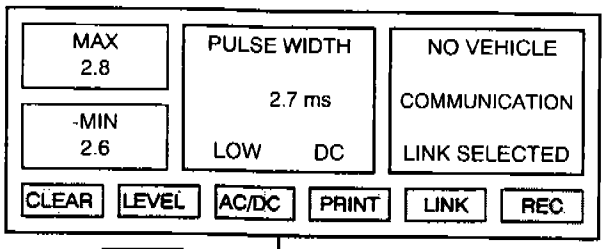
You can measure **PULSE WIDTH(ms)**, and display the data in MAX and MIN values.

4.



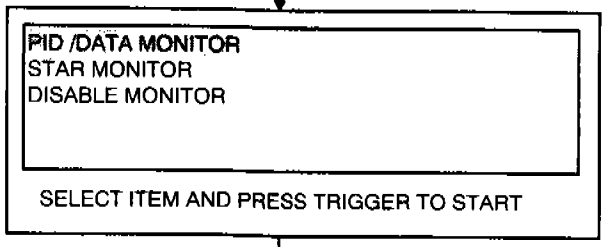
Connect test leads (RED→SIG, BLACK→COM).
Measure the No.1 INJECTOR
(RED→Y/B, BLACK→BATTERY negative).

5.



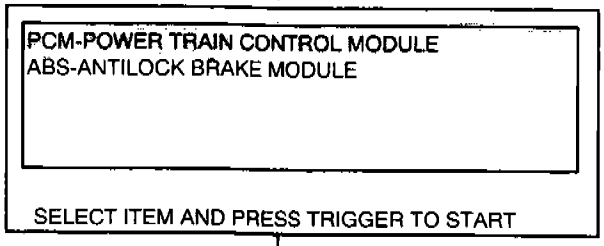
Select [LINK] and press "**TRIGGER**".

6.



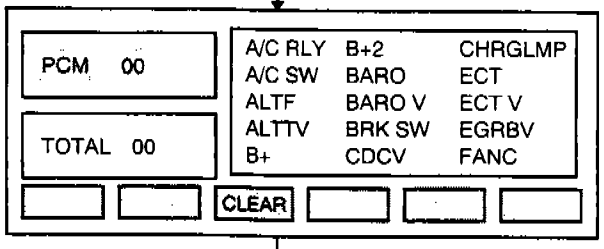
Select **"PID/DATA MONITOR"** and press **"TRIGGER"**.

7.



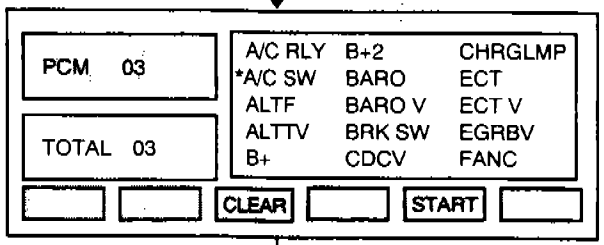
Select **"PCM-POWERTRAIN CTRL MODULE"** and press **"TRIGGER"**.

8.



Select **PIDs (A/C, INJ, RPM),** place the highlight bar over the item and press **"TRIGGER"**.

9.

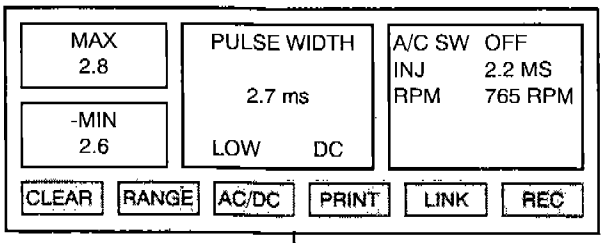


Press [START] .

The screen will display a list of PIDs.
PID (Parameter Identification):
These are items for which the monitoring and recording of data is possible.
A several-page list of items you may monitor is displayed on the screen.
Move the menu dial to scroll through the list.

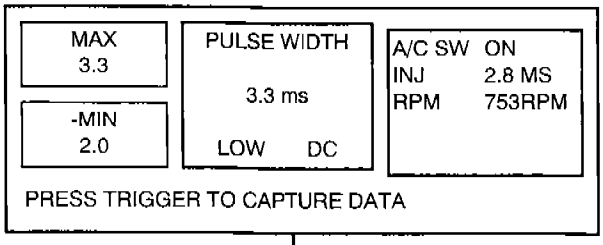
The screen displays PID abbreviations. Verify the standard name by referring to the Service Highlight (S/H) of the vehicle that you are testing. (Refer to Section F: on-board diagnostic system.)

10.



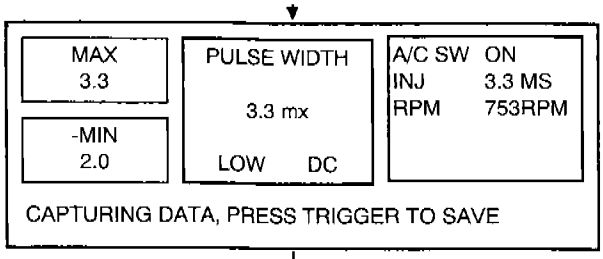
Press [REC]. Turn the BLOWER SW ON at 1st or 2nd position, then turn the A/C SW ON and OFF repeatedly.

11.



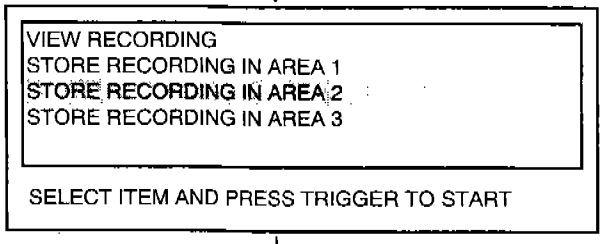
Press **"TRIGGER"**

12.



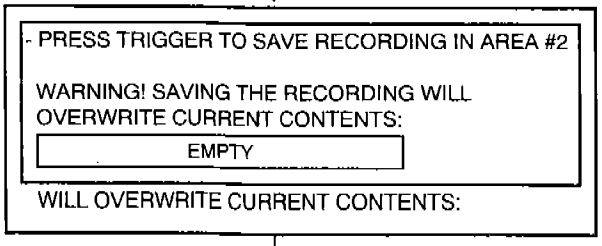
Press **"TRIGGER".**

13.



Select **"STORE RECORDING IN AREA 2"** and press **"TRIGGER".**

14.



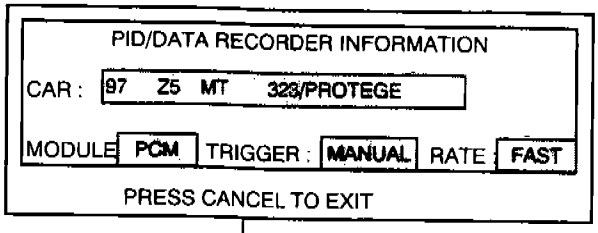
Press "**TRIGGER**".

The PIDs that you selected are displayed on the right side of the screen.
There is a difference between "**Measured pulse**" and "**Monitored pulse**" because their impedance and ground conditions are different. Moreover, "**Measured pulse**" includes ineffective injection time.
This indicates that the sensor input and the ECM out put are normal. If the screen shows a big difference, you can verify the malfunctioning point by using this function.
You can store both of these current (measuring and monitoring) data by pressing the [REC] button.
Once data is stored, it can be replayed and displayed graphically or in table form when you access the **VIEW RECORDER AREA** function (Refer to SPECIFIC 4).

For measured pulse, the NGS calculates the average ON times for a certain period. If the injection pulse width changes rapidly, the NGS cannot calculate the average ON times and display "**OVER**" on the screen.

To memorize the recorded data, highlight a storage recording area and press **TRIGGER**.

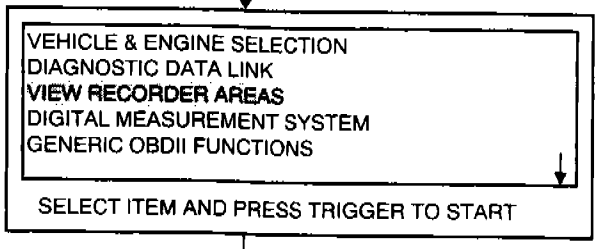
15.



The memory banks and recorder areas store data for 48 hours after the NGS is turned off.

Press "**CANCEL**" until you get back to the main menu.

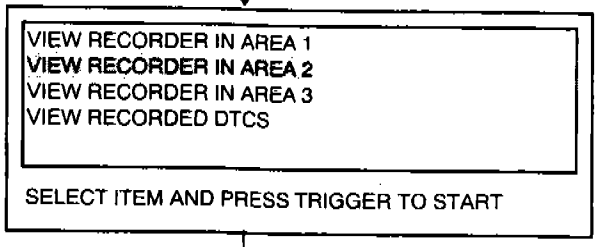
16.



Steps 16 to 20 describe the **VIEW RECORDER AREA** function. The procedure is completely the same as for SPECIFIC 4.

Select **"VIEW RECORDER AREA"** and press **"TRIGGER"** .

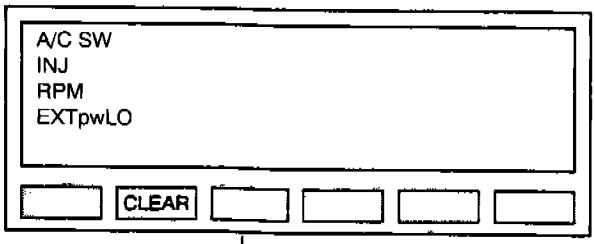
17.



The "EXT pw LO" indicates the measured value of the INJ. You can select a maximum of four PIDs.

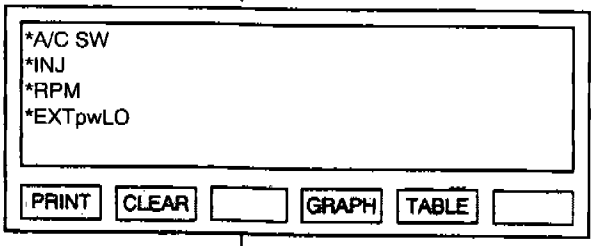
Select **"VIEW RECORDER IN AREA 2"** and press **"TRIGGER"** .

18.



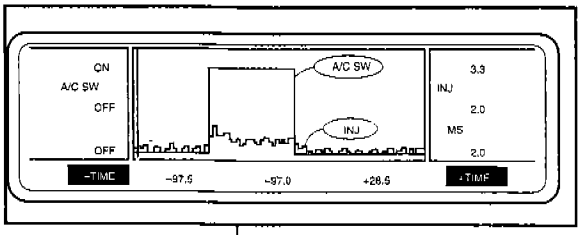
Select **A/C SW, INJ, RPM, EXIT-ms DC** and press **"TRIGGER"** .

19.



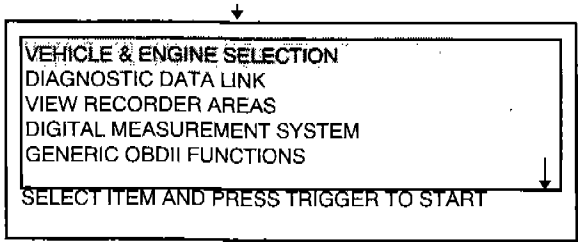
Press GRAPH

20.



Press **"CANCEL"** until you get back to the main menu.

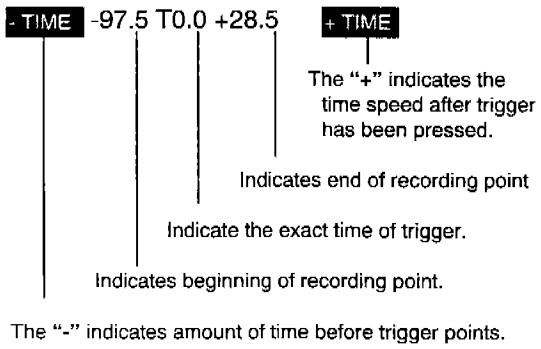
21.



How to use the **GRAPH** function

INJ
3.3:The MAX. value of Injection amount.
2.0:The Injection amount at cursor point.

MS
2.0:The MIN. value of Injection amount



- By moving the cursor across the graph, you can review PID valves.
- Although you can choose four PIDs for reply, you can view only two at a time on the graph. However, you can rotate through four of the PIDs you selected by pressing buttons [2] and [9].

[2] : Exchange on your left side data to other one.

[9] : Exchange on your right side data to other one.

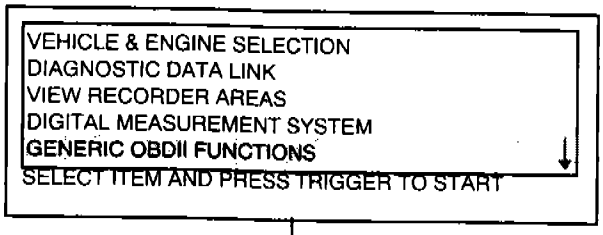
SPECIFIC 8: NEW GENERATION STAR SET UP

Objectives
* To learn how to adjust NGS contrast.
* To lean how to select printing speeds.
* To learn how to select S/I or English units.

Contrast Adjustment Procedure

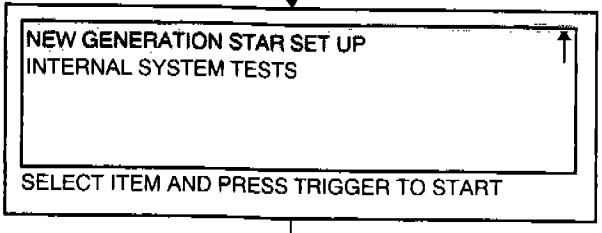
Information Points

1.



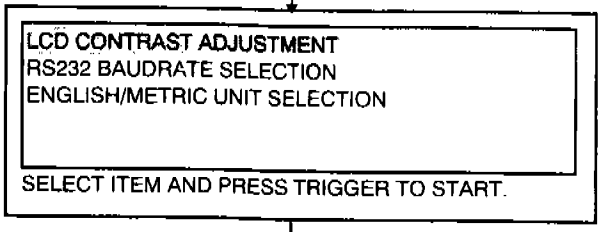
Turn the scroll dial clockwise.

2.



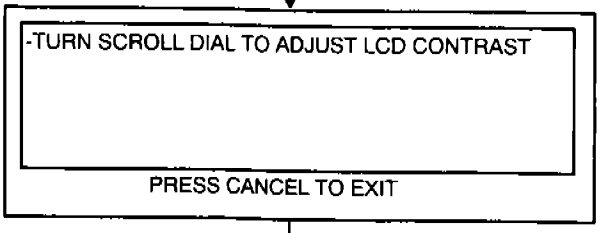
Select "**NEW GENERATION STAR SET UP**" and press "**TRIGGER**."

3.



Select "**LCD CONTRAST ADJUSTMENT**" and press "**TRIGGER**."

4.

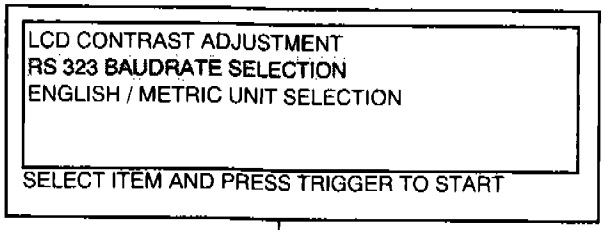


Turn the scroll dial clockwise.

5. [redacted] The screen gets darker as you turn the

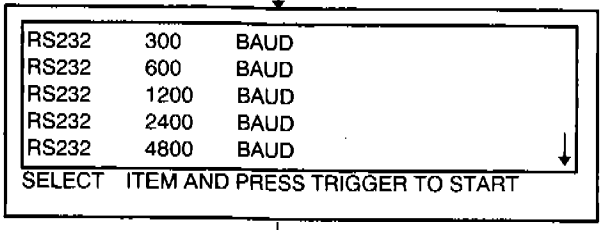
Printing Speed Selection

1.



Select "**RS232 BAUDRATE SELECTION**" and press "**TRIGGER**".

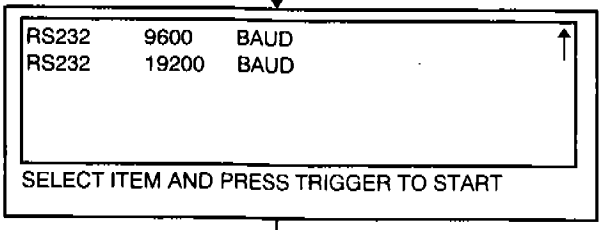
2.



You can select baudrate in accordance with your own printer.

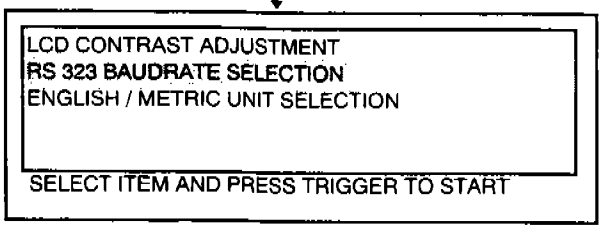
Turn the scroll dial until the second screen is displayed.

3.



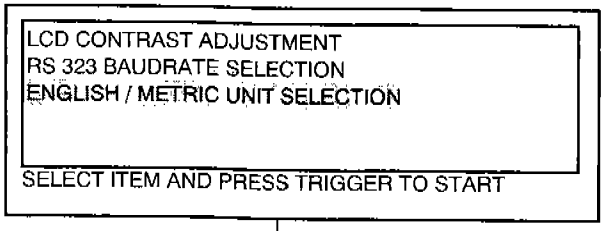
Select the proper "**BAUD**" for your printer and press "**TRIGGER.**"

4.



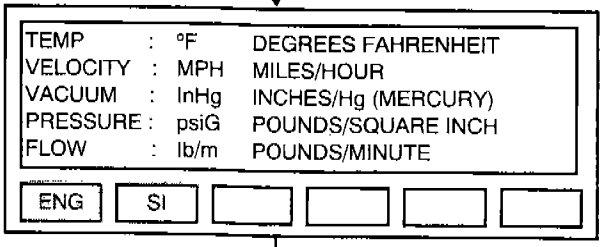
English/Metric Units Selection

1.



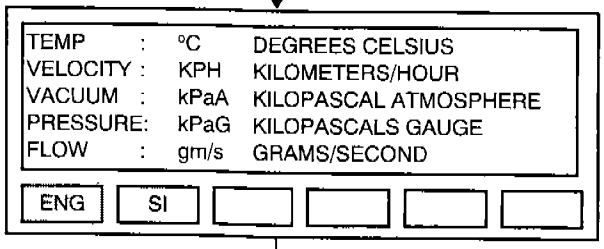
Select "**ENGLISH/METRIC UNIT SELECTION**" and press "**TRIGGER**."

2.



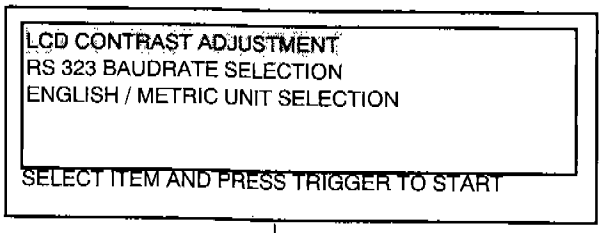
Press SI

3.



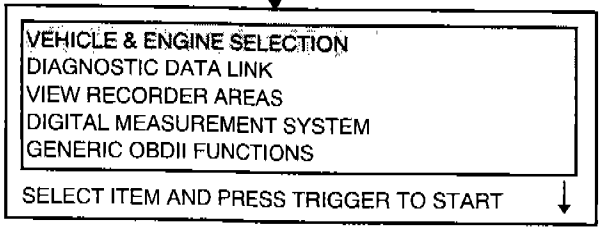
Press "**CANCEL**" to EXIT.

4.



Press "**CANCEL**" until you get back to the main menu.

5.

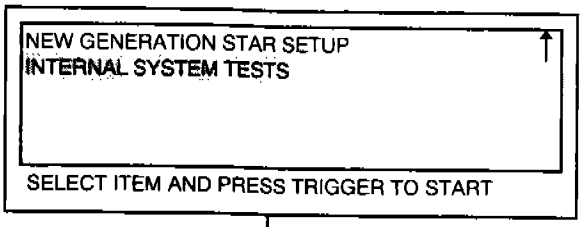


SPECIFIC 9: NGS INTERNAL SYSTEM TESTS

Objective
*To learn how to access the Internal System Test Function.
*To learn how to conduct the test.

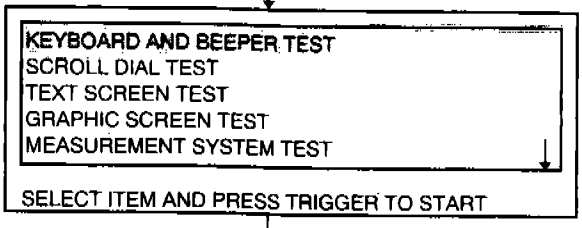
Internal System Tests Procedure

1.



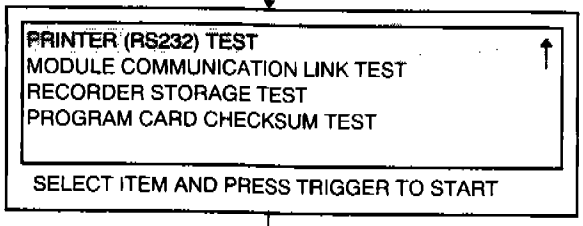
Select "**INTERNAL SYSTEM TESTS**" and press "**TRIGGER**".

2.



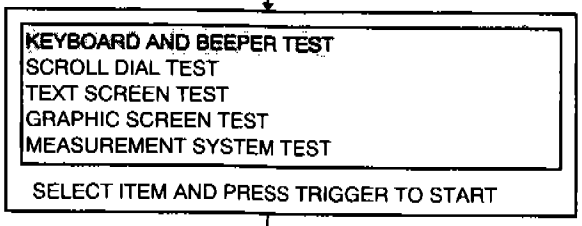
Turn the menu dial until the next screen appears.

3.



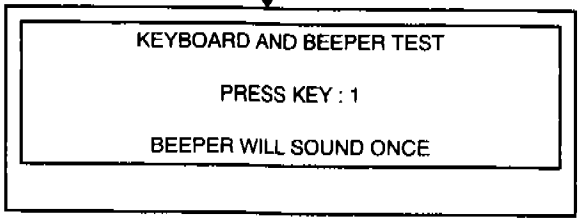
Select "KEYBOARD AND BEEPER TEST" and press "**TRIGGER**".

4.



Press "**TRIGGER**".

5.



Information Points

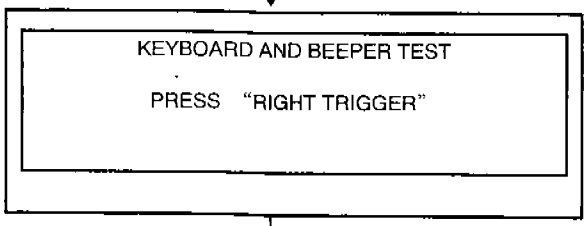
There are nine kinds of internal system tests. They check various functions of the NGS system, and determine whether or not they are normal.
If the test yields abnormal results, you should also check the power cable connections and the fuse condition.
If NGS still doesn't operate, contact AMERICA KOWA SEIKI (Refer to 5/5 page of the HANDS-ON INTRODUCTION TO NGS TESTER).

The **KEYBOARD AND BEEPER TEST** checks the keyboard and beeper sound condition.

The beeper sounds once for each time you press the button according to the instructions on the display.

Press key [0]

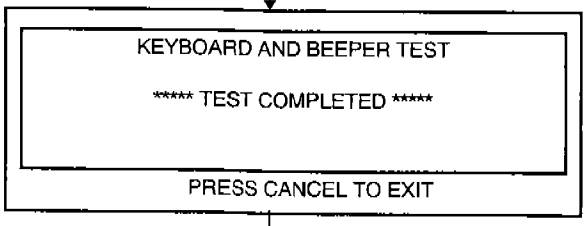
6.



Process
KEY [1] ~ [0] → TRIGGER RIGHT~ LEFT → CANCEL RIGHT ~ LEFT

Press "**LEFT CANCEL**"

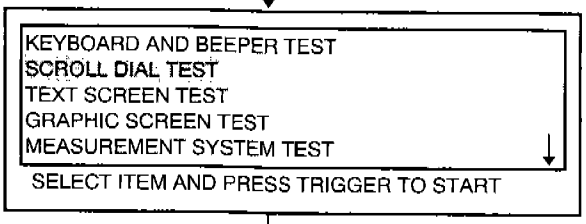
7.



"***** TEST COMPLETED *****" appears after you conduct the test according to the instructions on the display and conclude the test.

Press "**CANCEL**"

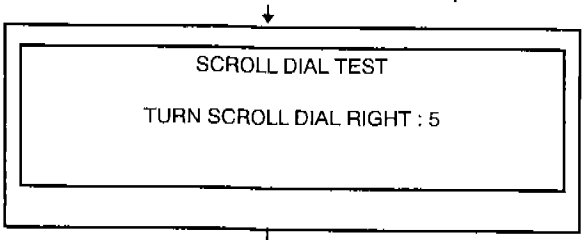
8.



The **SCROLL DIAL TEST** checks the menu dial's condition.

Select "**SCROLL DIAL TEST**" and press "**TRIGGER**".

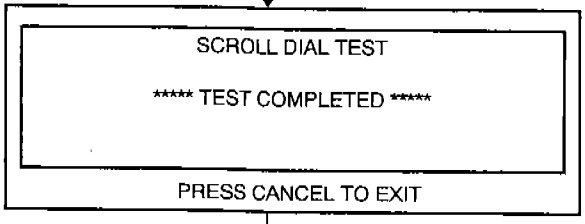
9.



The **SCROLL DIAL TEST** checks the menu dial's condition. Then beeper sounds once for each time you turn the menu dial according to the instructions on the display.

Turn scroll dial left : 5 clicks.

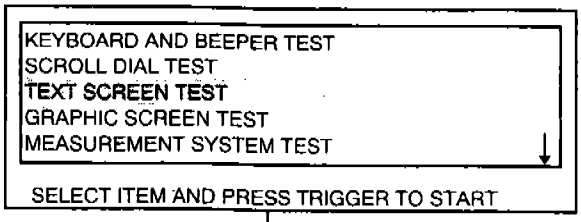
10.



"***** TEST COMPLETED *****" is displayed when you conclude the test.

Press "**CANCEL**"

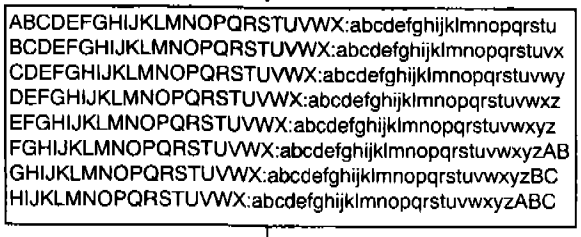
11.



The **TEXT SCREEN TEST** checks the letter display condition.

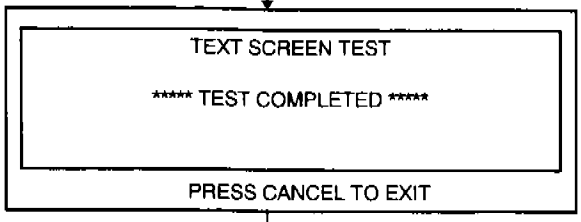
Select "**TEXT SCREEN TEST**" and press "**TRIGGER**".

12.



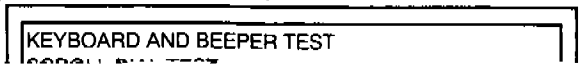
Roman letters and ******* TEST COMPLETED ******* are displayed repeatedly during this test.

13.



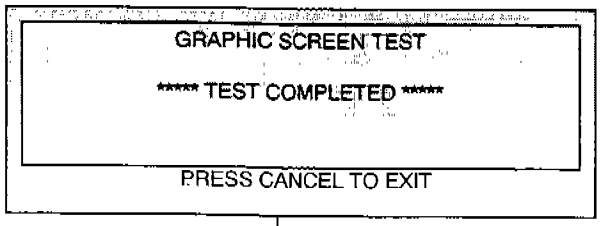
Press "**CANCEL**"

14.



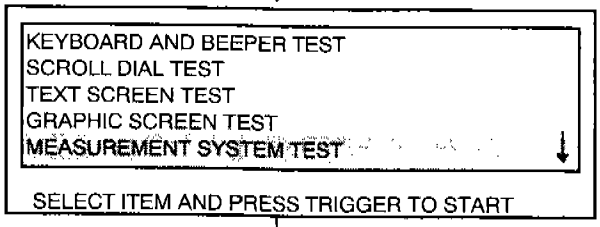
The **GRAPHIC SCREEN TEST** checks the graphical display condition.

17.



Press "**CANCEL**"

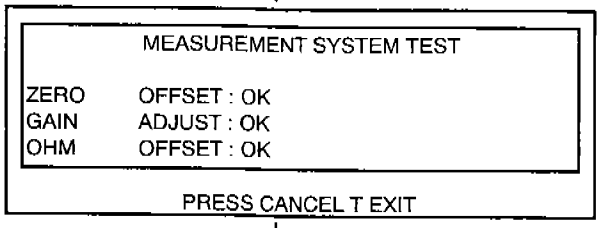
18.



Select "**MEASUREMENT SYSTEM TEST**" and press "**TRIGGER**" .

The **MEASUREMENT SYSTEM TEST** checks the **ZERO OFFSET, OHM OFFSET** and **GAIN ADJUST**.

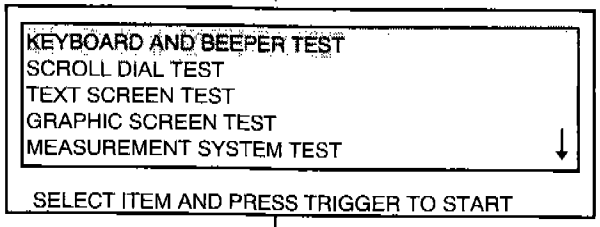
19.



Press "**CANCEL**"

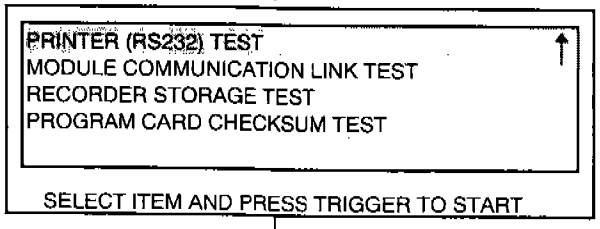
OK appears on the screen when the test is completed.

20.



Turn the menu dial until the second screen appears.

21.

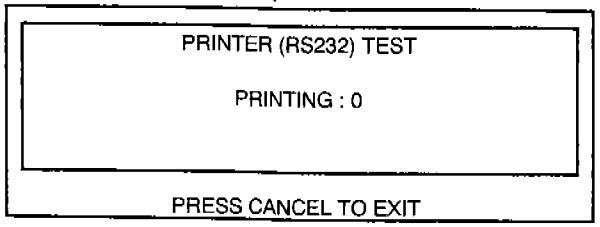


Select "**PRINTER (RS232) TEST**" and press "**TRIGGER**" .

The **PRINTER (RS232) TEST** checks the interface between the printer and NGS unit.
Connect the printer and NGS tester, when you carry out this test.

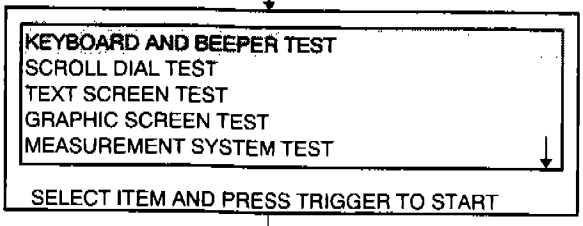
During this test, the data that is transmitted to the printer. It is displayed on the NGS screen and is printed out.
Press TRIGGER again when you want to stop this test.
If you don't connect NGS tester to printer and carry out this test. The NGS will display "PRINTING : 0" .

22.



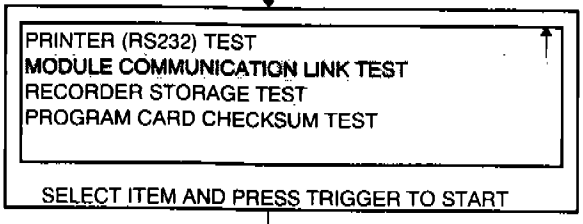
Press "**CANCEL**"

23.



Turn the menu dial until the second screen appears.

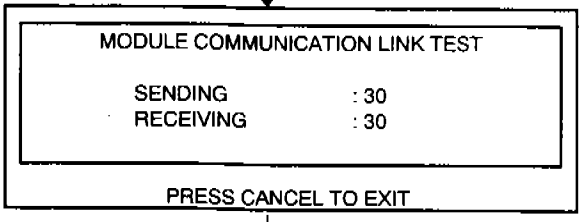
24.



The **MODULE COMMUNICATION LINK TEST** checks the communication link condition.
This test is performed to check the sending and receiving of signals.

Select "**MODULE COMMUNICATION LINK**" and press "**TRIGGER**".

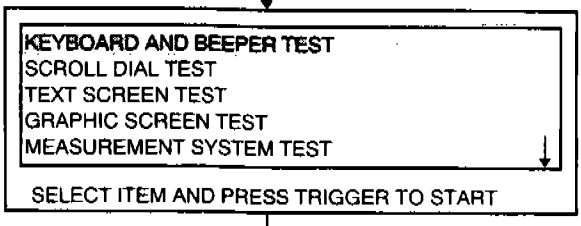
25.



During this test, 0 to 250 is continuously displayed in increments of 10 when a signal is correct.

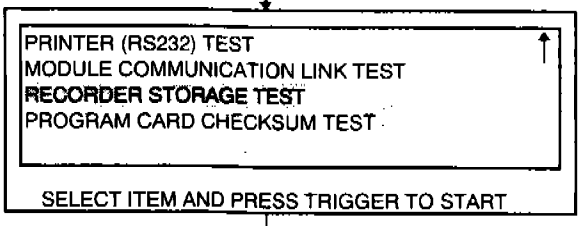
Press "**CANCEL**"

26.



Turn the menu dial until the second screen appears.

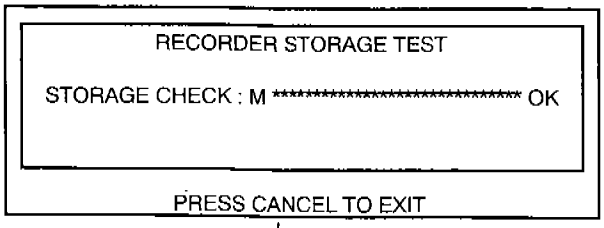
27.



The **RECORDER STORAGE TEST** checks the memory function.
STORAGE CHECK : ***************** OK** is displayed when the test is completed.

Select "**RECORDER STORAGE TEST**" and press "**TRIGGER**".

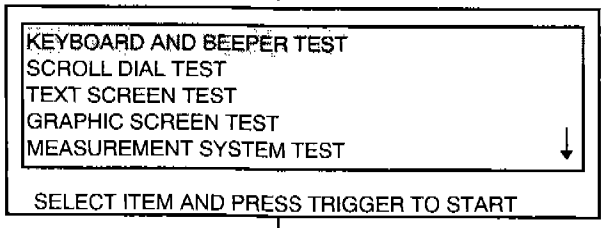
28.



STORAGE CHECK : ******** OK** is displayed when the test is completed.

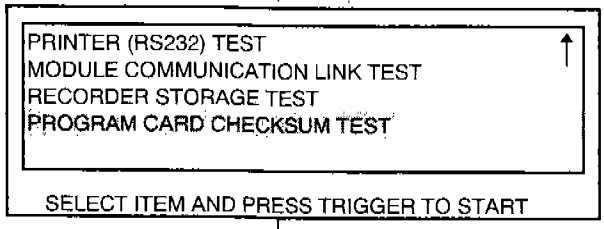
Press "**CANCEL**"

29.



Turn the menu dial until the second screen appears.

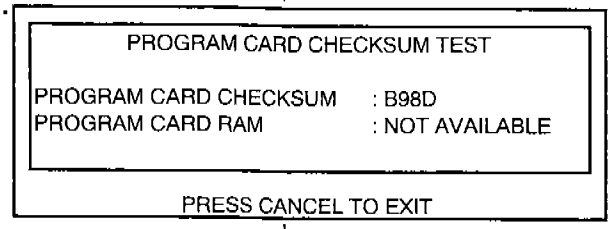
30.



The **PROGRAM CARD CHECKSUM TEST** checks the program card condition.

Select "**PROGRAM CARD CHECKSUM TEST**" and press "**TRIGGER**" .

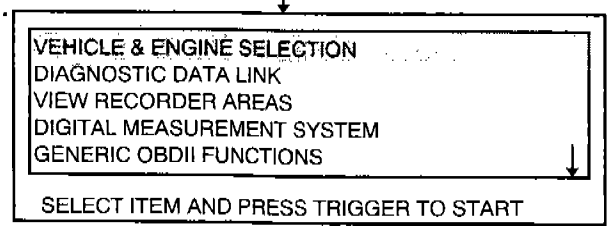
31.



CHECKSUM: FA40 and **RAM: NOT AVAILABLE** are displayed when the test is completed (Version 2.02).

Press "**CANCEL**" until you get back to the main menu.

32.



Notes

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