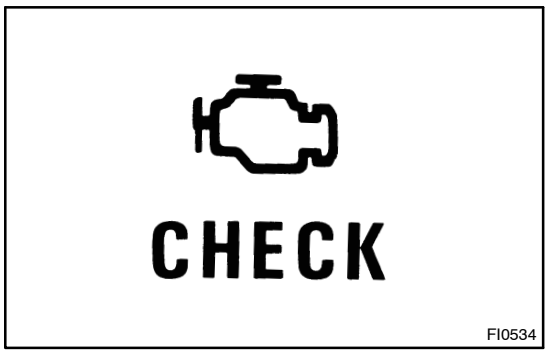
DIC2X–02

PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

(1) When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect an OBD II scan tool complying with SAE J1987 or a hand–held tester to the vehicle, and read off various data output from the vehicle's ECM.



(2) OBD II regulations require that the vehicle's on–board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in the drive system components which affect the vehicle emissions. In addition to the MIL illuminating when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page DI–398).

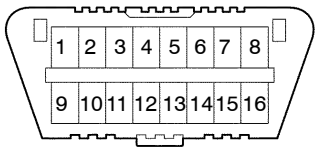
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.

(3) To check the DTCs, connect the OBD II scan tool or hand–held tester to the DLC3 of the vehicle. The OBD II scan tool or hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For instruction book).

(4) The DTCs include SAE controlled codes and Manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by a manufacturer within the prescribed limits (See the DTC chart on page DI–398).

(5) The diagnosis system operates in the normal mode during the normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (hand–held tester).

(6) *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to illuminate.



DLC3

A04550

(b) Inspect the DLC3.
The vehicle's ECM uses ISO 9141–2 for communication. The terminal arrangement of DLC3 complies with SAE J1962 and matches the ISO 9141–2 format.

Tester connection	Condition	Specified condition
7 (Bus ⊕ Line) – 5 (Signal ground)	During communication	Pulse generation
4 (Chassis Ground) – Body	Always	1 Ω or less
5 (Signal Ground) – Body	Always	1 Ω or less
16 (B+) – Body	Always	9 to 14 V

HINT:
If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or hand–held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If the communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- If the communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

(c) Inspect the battery voltage.
Battery Voltage: 11 to 14 V

If voltage is below 11 V, recharge the battery before proceeding.

(d) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not light up, troubleshoot the combination meter (See page BE–63).

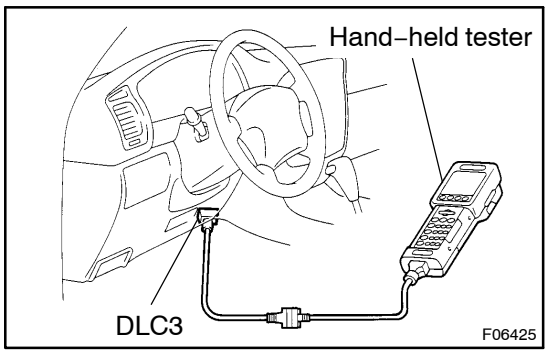
(2) When the engine is started, the MIL should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

2. Normal Mode:
DTC CHECK

NOTICE:

Hand–held tester only:

When the diagnostic system is switched from the normal mode to the check mode, all the DTCs and freeze frame data recorded in the normal mode will be erased. So before switching modes, always check the DTCs and freeze frame data, and note them down.



(a) Checking DTCs using the OBD II scan tool or hand–held tester.
  (1) Connect the OBD II scan tool or hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) Use the OBD II scan tool or hand–held tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).
  (4) See page DI–398 to confirm the details of the DTCs.

NOTICE:

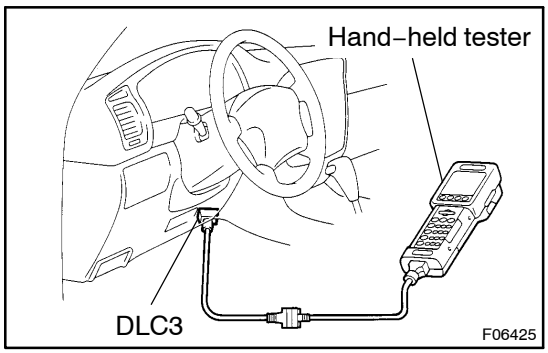
When simulating symptoms with an OBD II scan tool (excluding hand–held tester) to check the DTCs, use the normal mode. For codes on the DTCs chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL is indicated on the instrument panel and DTCs are recorded in the ECM.

(b) When using the OBD II scan tool or hand–held tester: Clearing the DTCs.
  (1) Connect the OBD II scan tool or hand–held tester to DLC3.
  (2) Turn the ignition switch ON.
  (3) When operating an OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

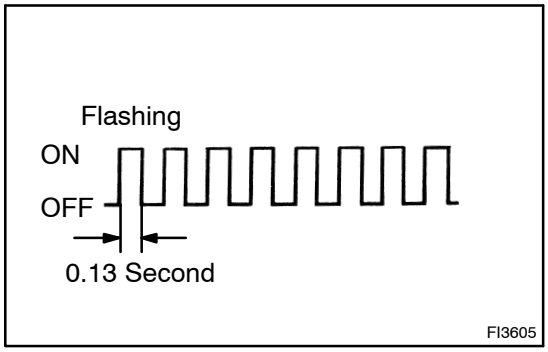
(c) When not using the OBD II scan tool or hand–held tester: Clearing the DTCs.
  (1) Disconnecting the battery terminal or remove the EFI and ETCS fuse from engine room J/B for 60 seconds or more.

3. Check Mode:
DTC CHECK

HINT:
Hand–held tester only:
Compared to the normal mode, the check mode has more sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.



(a) Procedure for Check Mode using the hand–held tester.
  (1) Check the initial conditions.
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in P or N position
    - A/C switched OFF
  (2) Turn the ignition switch OFF.
  (3) Connect the hand–held tester to the DLC3.
  (4) Turn the ignition switch ON.



  (5) Switch the hand–held tester from the normal mode to the check mode (Check that the MIL flashes).

NOTICE:
If the hand–held tester switches the ECM from the normal mode to the check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTC and freeze frame data will be erased.

  (6) Start the engine (MIL goes off after the engine starts).
  (7) Simulate the conditions of the malfunction described by the customer.

NOTICE:
Leave the ignition switch ON until you have checked the DTCs, etc.

  (8) After simulating the malfunction conditions, use the hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:
Be sure not to turn the ignition switch OFF, as turning it OFF switches the diagnosis system from the check mode to the normal mode, which erases all the DTCs, etc.

  (9) After checking the DTC, inspect the applicable circuit.

(b) When using the OBD II scan tool or hand–held tester:
Clearing the DTCs.
  (1) Connect the OBD II scan tool or hand–held tester to DLC3.
  (2) Turn the ignition switch ON.

(3) When operating an OBD II scan tool (complying with SAE J1978) or hand–held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

(c) When not using the OBD II scan tool or hand–held tester: Clearing the DTCs.

(1) Disconnecting the battery terminal or remove the EFI and ETCS fuse from engine room J/B for 60 seconds or more.

4. DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or Hand–held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one method to shorten labor time.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the OBD II scan tool or Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the "ON" button of OBD II scan tool or Hand–held tester.
(f) Select the item "/DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL (or ATM)".
(g) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • 4: 1st, 2nd, 3rd or 4th • D: 1st, 2nd, 3rd, 4th or 5th	←
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P or N: ON Except P or N: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	
4th/DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←

PATTERN SW (M)	Pattern SW (PWR) Status/ ON or OFF	Pattern SW (PWR) is; Pushed in: ON Pushed once again: OFF	←
SNOW SW	Pattern SW (2nd) Status/ ON or OFF	• IG SW ON: OFF ↓ • Pattern SW (2nd) Push: ON ↓ • Pattern SW (2nd) Push: OFF	←
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
SPD (SP2)	Counter Gear Speed display/ min.: 0 km/h (0 mph) max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph)	←
AT FLUID TEMP	ATF Temp. Sensor No. 1 Value/ min.: –40°C (–40°F) max.: 215°C (419°F)	80°C (176°F) (After Stall Test)	If the value is ”–40°C (–40°F)” or ”215°C (419°F)”, ATF temp. sensor No. 1 circuit is opened or shorted.

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the Hand–held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch OFF.
(c) Connect the Hand–held tester to the DLC3.
(d) Turn the ignition switch ON.
(e) Push the ”ON” button of Hand–held tester.
(f) Select the item ”/DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST”.
(g) According to the display on tester, perform the ”ACTIVE TEST”.

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values. HINT: Shifting to the 5th gear is possible only when the vehicle stops or idle is ON.
LOCK UP	[Test Details] Control the shift solenoid SLU to set the ATM to the lock–up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the SLU operation.
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	–

6. DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. ”Once per driving cycle” means that the ECM detects malfunction only one time during a single driving cycle. ”Continuous” means that the ECM detects malfunction every time when enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the ”typical enabling conditions” are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. ”Immediately” means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. ”2 driving cycle” means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

7. TOYOTA/LEXUS PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

TOYOTA/LEXUS name	Definition
Toyota HCAC system, Hydrocarbon adsorptive Catalyst (HCAC) system, HC adsorptive three–way catalyst	HC adsorptive three–way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor ”A”	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No. 1, EVAP VAV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On–boad refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve

AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power–steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor ”A”, Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor ”A”	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor ”A”	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor
Input speed sensor, Input turbine speed sensor ”A”, Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti–theft system

8. The monitor will run whenever the following DTCs are not present (Monitor disablement List)

HINT:

This table indicates ECM monitoring status for the items in the upper columns if the DTCs in each line on the left are being set.

As for the ”X” mark, when the DTC on the left is stored, detection of the DTC in the upper column is not performed.

			Monitor disablement (X : disabled)																														
	DTC		P0010,P0020	P0031-0052	P0031-0052	P0037-0058	P0043-P0064	P0100-P0103	P0101	P0110-P0113	P0115-P0118	P0116	P0120-P2135	P0125	P0128	P0130-P0153	P0134-P0154	P0136,P0156	P0142,P0162	P0171-P0175	P0300,P0308	P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450,P0453
		Component/System	VVT VVS1,2	FrO2S heater sensor 1	A/F sensor heater sensor 1	FrO2S heater sensor 2	FrO2S heater sensor 3	MAF sensor	MAF sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for CL	Thermostat	O2S Sensor 1	FrO2S,A/F sensor (No Activity)	O2S Sensor 2	O2S Sensor 3	Fuel system	Misfire	Knock sensor	CKP sensor	CMP sensor	VVT sensor 1,2	Ignitor	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor
Monitor detected malfunction	P0010,P0020	VVT VVS1,2													×					×													
	P0031-0052	FrO2S heater sensor 1													×	×	×	×	×	×							×	×			×		
	P0031-0052	A/F sensor heater sensor 1													×			×	×	×							×	×			×		
	P0037-0058	FrO2S heater sensor 2																×	×												×		
	P0043-0064	FrO2S heater sensor 3																	×														
	P0100-P0103	MAF sensor										×		×	×	×	×	×	×	×	×						×	×			×	×	
	P0110-P0113	IAT sensor												×	×	×	×	×	×		×						×	×				×	
	P0115-P0118	ECT sensor							×					×	×	×	×	×	×	×	×						×	×		×	×	×	
	P0120-P2135	TP sensor							×							×	×	×	×	×	×						×	×			×	×	
	P0125	ECT sensor							×						×	×	×	×	×	×	×						×	×		×	×	×	
	P0128	Thermostat																															
	P0130-P0153	O2S Sensor 1													×		×	×	×								×	×			×		
	P0134,P0154	Closed Loop			×										×	×		×	×	×							×	×			×	×	
	P0136,P0156	O2S Sensor 2																													×		
	P0142,P0162	O2S Sensor 3																															
	P0171-P0172	Fuel system													×	×	×	×	×								×	×			×	×	
	P0300-P0308	Misfire		×											×	×	×	×	×												×	×	
	P0325-P0333	Knock sensor																			×						×	×					
	P0335	CKP sensor							×						×	×	×	×	×	×	×						×	×			×	×	
	P0340,P0341	CMP sensor							×						×	×	×	×	×	×	×						×	×			×	×	
	P0340-P0346	VVT sensor 1,2													×																		
	P0351-P0358	Ignitor													×					×							×	×			×	×	
	P0401	EGR system (closed)													×					×											×		
	P0402	EGR system (open)													×	×	×	×	×	×											×	×	
	P0405,P0409	Lift sensor																															
	P0420,P0430	Catalyst																															
	P0442-P0456	EVAP system														×	×	×	×														
	P0450,P0451	EVAP press sensor																														×	

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	DTC	Component/System	Monitor disablement (X : disabled)																													
			P0010,P0020	P0031-0052	P0031-0052	P0037-0058	P0043-P0064	P0100-P0103	P0101	P0110-P0113	P0115-P0118	P0116	P0120-P2135	P0125	P0128	P0130-P0153	P0134-P0154	P0136,P0156	P0142,P0162	P0171-P0175	P0300,P0308	P0325-P0333	P0335	P0340,P0341	P0340-P0346	P0351-P0358	P0401	P0402	P0405	P0409	P0420,P0430	P0440-P0446	P0450-P0453
			VVT VVS1,2	FrO2S heater sensor 1	A/F sensor heater sensor 1	FrO2S heater sensor 2	FrO2S heater sensor 3	MAF sensor	MAF sensor	IAT sensor	ECT sensor	ECT sensor	TP sensor	Insufficient ECT for CL	Thermostat	O2S Sensor 1	FrO2S,A/F sensor (No Activity)	O2S Sensor 2	O2S Sensor 3	Fuel system	Misfire	Knock sensor	CKP sensor	CMP sensor	VVT sensor 1,2	Ignitor	EGR system (closed)	EGR system (open)	EGR Lift sensor	EGR Lift sensor	Catalyst	EVAP system	EVAP press sensor
Monitor detected malfunction	P0500	VVS													×	×	×	×	×	×	×						×	×			×	×	
	P0505,P0511	ISC valve														×																	
	P0560	Battery																															
	P0617	Starter signal																															
	P0705	Shift lever position switch																															
	P0710	Trans fluid temp sensor																															
	P0715-P0717	Output speed sensor																															
	P0715-P0717	Input speed sensor																															
	P0724	Stop lamp switch																															
	P0741-P0796	Trans solenoid (function)																															
	P0748-P0798	Trans solenoid (range)																															
	P0850	PNP switch																			×												
	P1010	OCV for VVTL													×					×													
	P2120-P2138	Accel position sensor																															
	P2120,P2103	Throttle motor																															
	P1126	Electronic magenet clutch																															
	P1129	Electronic throttle system																															
	P0011,P0012	VVT system 1,2													×					×							×	×			×	×	
	P1011,P1012	VVTL System													×					×							×	×			×	×	
	P1430	Pressure sensor (HC adsorber)																														×	×
	P2004,P2006	Intake manifold runner conrtol																															
	P2009,P2010	Intake manifold runner circuit																															
	P2014,16,17	Intake manifold runner sensor																															
	P2196,P2198	A/F sensor (rationality)													×			×	×								×	×			×		
	P2237,P2240	A/F sensor (open)													×			×	×								×	×			×		
	P2423,P2424	HC adsorption catalyst																															
	P2714-P2759	Trans solenoid (SLU-SLD)																															
	P2A00,P2A03	A/F sensor (slow response)													×			×	×								×	×			×		

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D13632

	DTC	Component/System	Monitor disablement (X : disabled)																													
			P0500	P0500	P0500	P0505,P0511	P0560	P0617	P0705	P0710	P0715-P0717	P0715-P0717	P0724	P0741-P0796	P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1120-P2138	P2120,P2103	P1126	P1129	P0011-P0012	P1011,P1012	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2196,P2198	P2237,P2240	P2423,P2424	P2714-P2759	P2A00,P2A03
			VVS (ECT2sensor)	VVS (ECT1sensor,non-ECT)	VVS (M/T)	ISC valve	Battery	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function) *1	Trans solenoid (function) *2	Trans solenoid (range)	PNP switch	VVTL	Accel position sensor	Throttle motor	Electronic magenet clutch	Electronic throttle system	VVT system 1,2	VVTL System	Pressure sensor (HC adsorber)	Intake manifold runner conrtol	Intake manifold runner circuit	Intake manifold runner sensor	A/F sensor (rationality)	A/F sensor (open)	HC adsorption catalyst	Yrans solenoid (SLU-SLD)	A/F sensor (slow response)
Monitor detected malfunction	P0010,P0020	VVT VVS1,2												X																			
	P0031-0052	FrO2S heater sensor 1				X								X																	X		
	P0031-0052	A/F sensor heater sensor 1				X																							X	X	X		X
	P0037-0058	FrO2S heater sensor 2																											X		X		
	P0043-0064	FrO2S heater sensor 3																													X		
	P0100-P0103	MAF sensor			X	X								X				X					X	X					X	X	X		X
	P0110-P0113	IAT sensor												X												X			X	X			X
	P0115-P0118	ECT sensor			X	X								X	X			X					X	X		X			X	X	X		X
	P0120-P2135	TP sensor		X		X								X															X	X	X		X
	P0125	ECT sensor			X	X								X	X			X					X						X	X	X		X
	P0128	Thermostat																															
	P0130-P0153	O2S Sensor 1				X								X																	X		
	P0134,P0154	Closed Loop				X								X															X	X	X		X
	P0136,P0156	O2S Sensor 2																											X		X		
	P0142,P0162	O2S Sensor 3																													X		
	P0171-P0172	Fuel system				X								X															X	X	X		X
	P0300-P0308	Misfire				X								X															X	X	X		X
	P0325-P0333	Knock sensor												X																			
	P0335	CKP sensor				X								X				X					X	X					X	X	X		X
	P0340,P0341	CMP sensor				X								X				X					X	X					X	X	X		X
	P0340-P0346	VVT sensor 1,2																															
	P0351-P0358	Ignitor				X								X																	X		
	P0401	EGR system (closed)												X																	X		
	P0402	EGR system (open)				X								X															X	X	X		X
	P0405,P0409	Lift sensor																															
	P0420,P0430	Catalyst																															
	P0442-P0456	EVAP system				X																							X	X			X
	P0450,P0451	EVAP press sensor																															

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	DTC	Component/System	Monitor disablement (X : disabled)																												
			P0500	P0500	P0500	P0505,P0511	P0560	P0617	P0705	P0710	P0715-P0717	P0715-P0717	P0724	P0741-P0796	P0741-P0796	P0748-P0798	P0850	P1010,P1020	P1120-P2138	P2102,P2103	P1126	P1129	P0011-P0012	P1011,P1012	P1430	P2004,P2006	P2009,P2010	P2014,16,17	P2196,P2198	P2237,P2240	P2423,P2424	P2714-P2759	P2A00,P2A03
			VVS (ECT2sensor)	VVS (ECT1sensor,non-ECT)	VVS (M/T)	ISC valve	Battery	Starter signal	Shift lever position switch	Trans fluid temp sensor	Output speed sensor	Input speed sensor	Stop lamp switch	Trans solenoid (function) *1	Trans solenoid (function) *2	Trans solenoid (range)	PNP switch	VVTL	Accel position sensor	Throttle motor	Electronic magenet clutch	Electronic throttle system	VVT system 1,2	VVTL System	Pressure sensor (HC adsorber)	Intake manifold runner conrtol	Intake manifold runner circuit	Intake manifold runner sensor	A/F sensor (rationality)	A/F sensor (open)	HC adsorption catalyst	Yrans solenoid (SLU-SLD)	A/F sensor (slow response)
Monitor detected malfunction	P0500	VVS				×					×	×		×	×														×	×	×		×
	P0505,P0511	ISC valve																											×	×			×
	P0560	Battery																															
	P0617	Starter signal																															
	P0705	Shift lever position switch																															
	P0710	Trans fluid temp sensor																															
	P0715-P0717	Output speed sensor												×																			
	P0715-P0717	Input speed sensor																															
	P0724	Stop lamp switch																															
	P0741-P0796	Trans solenoid (function)																															
	P0748-P0798	Trans solenoid (range)									×	×		×	×																		
	P0850	PNP switch				×								×																			
	P1010	OCV for VVTL																															
	P2120-P2138	Accel position sensor																															
	P2102,P2103	Throttle motor																															
	P1126	Electronic magenet clutch																															
	P1129	Electronic throttle system																															
	P0011,P0012	VVT system 1,2				×																									×		
	P1011,P1012	VVTL System				×																											×
	P1430	Pressure sensor (HC adsorber)																															
	P2004,P2006	Intake manifold runner conrtol																															
	P2009,P2010	Intake manifold runner circuit																								×							
	P2014,16,17	Intake manifold runner sensor																								×							
	P2196,P2198	A/F sensor (rationality)				×								×																	×		×
	P2237,P2240	A/F sensor (open)				×								×																	×		×
	P2423,P2424	HC adsorption catalyst																															
	P2714-P2759	Trans solenoid (SLU-SLD)												×																			
	P2A00,P2A03	A/F sensor (slow response)				×								×																	×		

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9. PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transmission does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

10. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 to 80°C (122 to 176°F).

(a) D position test (NORM and PWR pattern):

Shift into the D position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.

Check that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up–shifts take place, and that the shift points conform to the automatic shift schedule (See page SS–23).

HINT:

- 5th Gear Up–shift Prohibition Control (1. Coolant temp. is 55°C (131°F) or less. 2. Vehicle speed is 51 km/h (32 mph) or less.)
- 4th Gear Up–shift Prohibition Control (1. Coolant temp. is 40°C (104°F) or less. 2. Vehicle speed is 45 km/h (28 mph) or less.)
- 5th Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60°C (140°F) or less.)
- When the 2nd start switch is on, there is no 1→2 up–shift and 2→1 down–shift.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up–shifts.

(3) Check for abnormal noises and vibration.

Drive in the D position lock–up or 5th gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

(4) Check kick–down operation.

While running in the D position, 2nd, 3rd, 4th and 5th gears, check that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2, 4 → 3 and 5th → 4 kick–downs conform to those indicated on the automatic shift schedule (See page SS–23).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D position 5th gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(b) 4 position test:

Shift into the 4 position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.

Check that the 1 → 2, 2 → 3 and 3 → 4 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–23).

HINT:

- There is no 5th up–shift in the 4 position.
- 4th Gear Lock–up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60°C (140°F) or less.)

(2) Check engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(4) Check the lock–up mechanism.
- Drive in 4 position 4th gear, at a steady speed (lock–up ON) of about 64 km/h (40 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock–up.

(c) 3 position test:
Shift into the 3 position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.
Check that the 1 → 2 and 2 → 3 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–23).

(2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(d) 2 position test:
Shift into the 2 position and fully depress the accelerator pedal and check the following points.

(1) Check up–shift operation.
Check that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–23).

HINT:
When the 2nd start switch is ON, there is no 1 → 2 up–shift and 2 → 1 down–shift.

(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.

(1) Check no up–shift.
While running in the L position, check that there is no up–shift to 2nd gear.

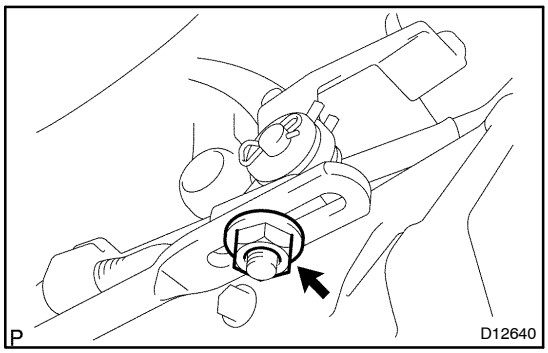
(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noises during acceleration and deceleration.

(f) R position test:
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.

CAUTION:
Before conducting this test ensure that the test area is free from people and obstruction.

(g) P position test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.



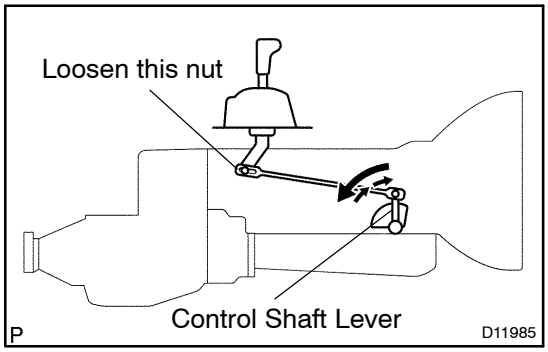
11. ADJUST SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is not aligned with the correct position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the shift lever.

(b) Push the control shaft fully rearward.

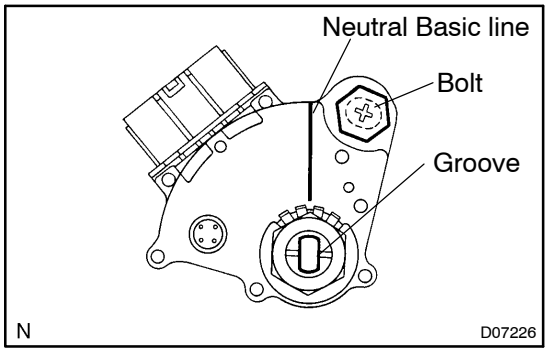


(c) Return the control shaft lever 2 notches to N position.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.



12. ADJUST PARK/NEUTRAL POSITION SWITCH

- Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If it is not as stated above, carry out the following adjustment procedures.

- Loosen the park/neutral position switch bolt and set the shift lever to the N position.
- Align the groove with neutral basic line.
- Hold in position and tighten the bolt.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- For continuity inspection of the park/neutral position switch, see page DI–402.

13. CHECK IDLE SPEED

Idle speed (In N position and air conditioner OFF): 700 ± 50 rpm

14. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the test at normal operating fluid temperature 70 to 80 °C (158 to 176 °F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock all 4 wheels.
(2) Connect an OBD II scan tool or hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressing firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,150 ± 150 rpm

(7) Do the same test in R position.

Stall speed: 2,150 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Engine stall speed low in D and R positions	• Engine output may be insufficient • Stator one–way clutch is not operating properly HINT: If the value is less than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Engine stall speed high in D position	• Line pressure too low • Clutch No. 1 (C_1) slipping • One–way clutch No.3 (F_3) not operating properly
(c) Engine stall speed high in R position	• Line pressure too low • Brake No. 4 (B_4) slipping • Clutch No. 3 (C_3) slipping • One–way clutch No.1 (F_1) not operating properly
(d) Engine stall speed high in D and R positions	• Line pressure too low • Improper fluid level

(b) Measure the time lag.
When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the clutch and brake.

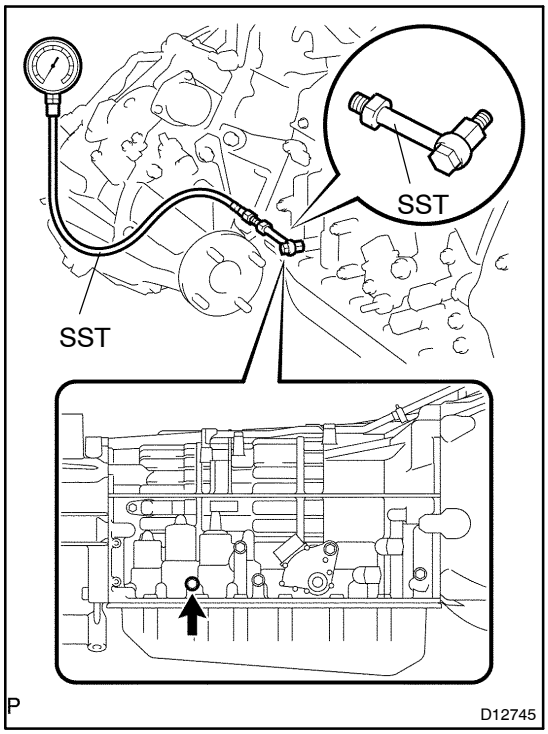
NOTICE:

- **Do the test at normal operating fluid temperature 70 to 80 °C (158 to 176 °F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.
(2) Start the engine and check idle speed.
Idle speed (In N position and air conditioner OFF): 700 ± 50 rpm.
(3) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.
Time lag:
N → D Less than 1.2 seconds
(4) In the same manner, measure the time lag for N → R.
Time lag:
N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than the specified):

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Clutch No. 1 (C_1) worn • One–way clutch No.3 (F_3) not operating properly
N → R time lag is longer	• Line pressure too low • Clutch No. 3 (C_3) worn • Brake No. 4 (B_4) worn • One–way clutch No.1 (F_1) not operating properly



15. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid temperature 70 to 80˚C (158 to 176˚F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting engine.**
- **Perform under condition that A/C is OFF.**
- **When conducting stall test, do not continue more than 10 seconds.**

(1) Warm up the ATF.

(2) Remove the test plug on the transmission case center right side and connect SST.

SST 09992–00095 (09992–00231, 09992–00271)

(3) Fully apply the parking brake and chock the 4 wheels.

(4) Start the engine and check idling speed.

(5) Keep your left foot pressing firmly on the brake pedal and shift into D position.

(6) Measure the line pressure when the engine is idling.

(7) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

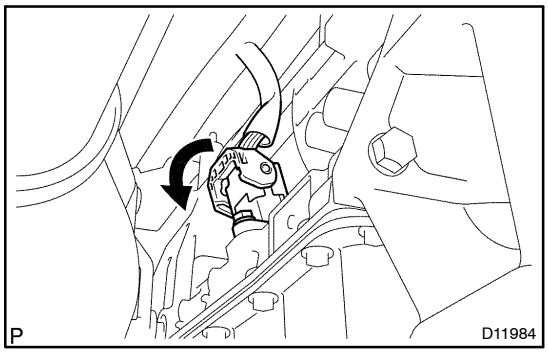
(8) In the same manner, do the test in R position.

Specified line pressure:

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	362 to 420 (3.7 to 4.2, 53 to 59)	500 to 580 (5.1 to 5.9, 73 to 84)
Stall	1,360 to 1,460 (13.8 to 14.9, 196 to 212)	1,295 to 1,415 (13.2 to 14.4, 188 to 205)

Evaluation

Problem	Possible cause
If the measured value at all positions are higher	• Shift solenoid valve SLT defective • Regulator valve defective
If the measured value at all positions are lower	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
If pressure is low in the D position only	• D position circuit fluid leakage • Clutch No. 1 (C_1) defective
If pressure is low in the R position only	• R position circuit fluid leakage • Clutch No. 3 (C_3) defective • Brake No. 4 (B_4) defective



16. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors. Disconnecting the transmission wire disables electrically–controlled automatic gear shifting. In this case, operating the shift lever is the only way to shift the transmission gear. If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem.

(a) Turn the ignition switch OFF.
(b) Disconnect the transmission wire connector.
(c) Warm up the engine.
(d) Drive the vehicle.
(e) Check the transmission operation when the shift lever is moved into 2, 3 and D ranges.

Standard:

Shift Lever	Operation
2 to 3	Shift up
3 to D	Shift up
D to 3	Shift down
3 to 2	Shift down

(f) Turn the ignition switch OFF.
(g) Connect the transmission wire connector.
(h) Clear DTCs.

HINT:
When the transmission wire is disconnected, the transmission gear will be set as listed below:

Shift Lever	Gear
P	Parking
R	Reverse
N	Neutral
D and 4	4th
3	3rd
2 and L	1st

17. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assy, engine assy or the ECM.

NOTICE:

Hand–held tester only

HINT:

The ECM memorizes the condition that the ECT controls the automatic transmission assy and engine assy according to those characteristics. Therefore, when the automatic transmission assy, engine assy, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

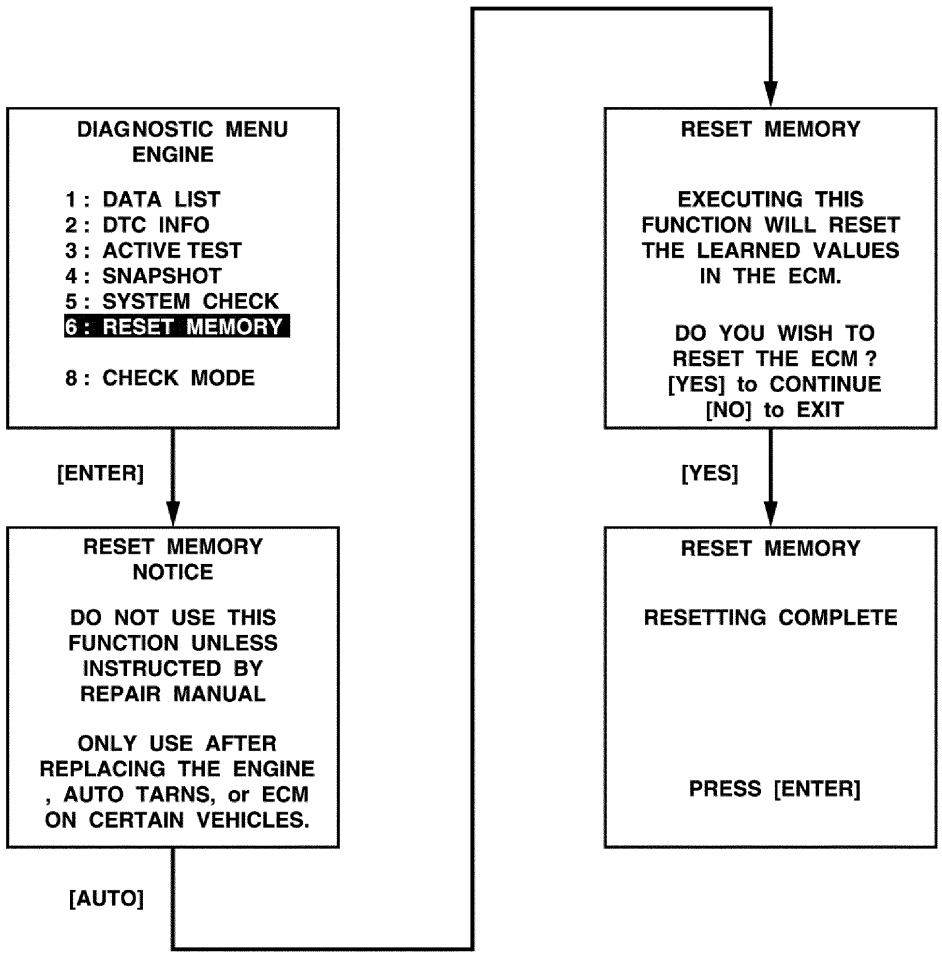
Reset procedure is as follows.

(a) Turn the ignition switch off.
(b) Connect the hand–held tester to the DLC3.
(c) Turn the ignition switch to the ON position and push the hand–held tester main switch on.
(d) Select the item ”DIAGNOSIS/ENHANCED OBD II”.
(e) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

Tester menu flow:



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MEMO

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