DTC	P1613	SECONDARY AIR INJECTION SYSTEM DRIVER

CIRCUIT DESCRIPTION

Refer to DTC P0412 on page 05–107.

DTC No.	DTC Detection Condition	Trouble Area
P1613	Either of following condition (a) or (b) is met: (a) All of the following conditions are met (1 trip detection logic): • While either of air pump or air switching valve does not operate • Diagnostic signal from Air Injection Control Driver (AID) 80% • Battery voltage 8 V or more. (b) All of the following conditions are met (1 trip detection logic): • Battery voltage 8 V or more • Diagnostic signal from AID abnormal (duty signal excluding 0, 20, 40, 80, 100%)	• AID • Open in AID ground circuit
P1613	All of following conditions are met (1 trip detection logic): (a) While Air Injection System operating (Air Switching Valve (ASV) ON and air pump ON) (b) Diagnostic signal from Air Injection Control Driver (AID) 0% (c) Battery voltage 8 V or more	• Short in diagnostic information signal circuit (AID – ECM) • Open or short in air pump and air switching valve command signal circuit (AID – ECM) • Open in AID ground circuit • AID • ECM
P1613	All of following conditions are met (1 trip detection logic): (a) Battery voltage 8 V or more (b) Diagnostic signal from Air Injection Control Driver (AID) 100%	• Open or short in AID power source circuit • Open in diagnostic information signal circuit (AID – ECM) • AID • ECM

MONITOR DESCRIPTION

After the cold engine starts and it is in the short time, the ECM transmits command signals to the Air Injection Control Driver (AID) to drive the air pump and Air Switching Valve (ASV). AID detects an open or short in the air pump and ASV circuit according to the AID terminal voltage and sends a signal as the diagnostic information to the ECM.

If the Secondary Air Injection (AI) system circuit or the AID itself has a malfunction, the AID sends a malfunction signal (duty signal) as a diagnostic signal to the ECM (when the system is normal, a system normal signal is sent). The ECM sets the DTC based on the diagnostic information from the AID.

The ECM sets the DTC based on the diagnostic information from the AID.

Example:

(1) The duty ratio of the diagnostic signal from AID is 0 or 100% (remains at 0 V or battery voltage).

(2) The duty ratio of the diagnostic signal from AID is the ratio to output the impossible (excluding 0, 20, 40, 60, 80, 100%).

(3) The AID outputs the normal signal (normal duty signal: 80%) while the system is not operating.

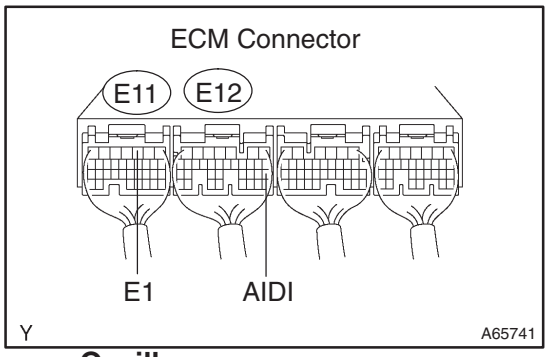
WIRING DIAGRAM

Refer to DTC P0412 on page 05–107.

INSPECTION PROCEDURE

HINT:

The diagnostic information output from AID can be confirmed by connecting an oscilloscope to the diagnostic information terminal of the AID.



(1) Connect the intelligent tester II to the DLC3.
(2) Connect an oscilloscope probe to the AIDI terminal of the ECM.
(3) Start the engine and turn the tester ON.
(4) Monitor the voltage output of the AID (duty ratio signal).

Oscilloscope range:

Items	Contents
Terminals	CH1: AIDI (E12–20) – E1 (E11–3)
equipment Settings	5 V/Division, 20 to 40 ms/Division
Conditions	Idling

AID Diagnostic Signal Waveforms	ECM Commands	DTCs (ECM Output)	Suspected Trouble Area
100% Duty ratio Almost Battery Voltage +B GND	Any Air Injection (AI) System operation	**P1613**	● Open in diagnostic signal circuit ● Air Injection Control Driver (AID) ● Open in AID +B circuit (AID power source) ● Short between +B circuit and diagnostic signal circuit
0% Duty ratio +B Fix at Low Voltage GND	AI System: ON (Air pump ON, ASV ON)	**P1613**	● Open or short in air pump or Air Switching Valve (ASV) command signal circuit (ECM – AID) ● Open in AID ground circuit ● Short between diagnostic signal circuit and body ground ● AID ● ECM
	AI System: OFF (Air pump OFF, ASV OFF)	–	Normal
20% Duty ratio 20% +B GND	Air Pump: ON	**P0418**	Short between air pump drive circuit and body ground ● Harness & connector (AID – Pump) ● Air Pump ● AID ● ECM
	Air Pump: OFF	**P0418**	Open in air pump drive circuit (AID – Pump), or short between air pump drive circuit and +B ● Harness & connector (AID – Pump) ● Air Pump ● AID ● ECM
40% Duty ratio 40% +B GND	ASV: ON	**P0412**	Short between ASV drive circuit and body ground ● Harness & connector (AID – ASV) ● Air Pump ● AID ● ECM
	ASV: OFF	**P0412**	Open in ASV drive circuit (AID – ASV), or short between ASV drive circuit and +B ● Harness & connector (AID – ASV) ● Air Pump ● AID ● ECM
80% Duty ratio 80% +B GND	AI System: OFF (Air pump OFF, ASV OFF)	**P1613**	● AID ● ECM
	AI System: ON (Air pump ON, ASV ON)	–	Normal
Excluding above (excluding 0, 20, 40, 80, 100% duty)	–	**P1613**	● AID ● Open in AID ground circuit

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HINT:
Read freeze frame data using the intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1	**CHECK ANY OTHER DTCS OUTPUT(IN ADDITION TO AIR INJECTION SYSTEM DTCS)**

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the tester ON.
(c) Select the following menu items: Powertrain / Engine and ECT / DTC.
(d) Read DTCs.

Result:

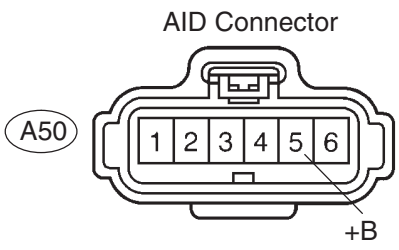
Display (DTC Output)	Proceed To
P1613	A
P1613 and other DTCs	B

HINT:
If any DTCs other than P1613 are output, troubleshoot those DTCs first.

NG → **GO TO DTC CHART (See page 05–29)**

OK

2 CHECK POWER SOURCE OF AIR INJECTION CONTROL DRIVER



(a) Disconnect the A50 AID connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

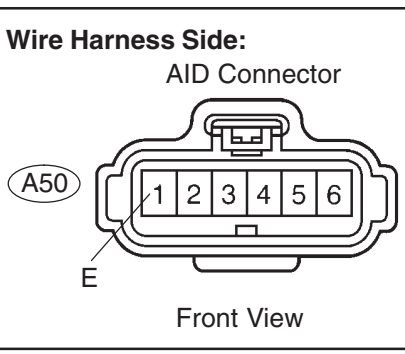
Tester Connection	Specified Condition
+B (A50–5) – Body ground	9 to 14 V (near battery voltage)

(d) Reconnect the AID connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK HARNESS AND CONNECTOR(AIR INJECTION CONTROL DRIVER – BODY GROUND)



(a) Disconnect the A50 AID connector.
(b) Measure the resistance according to the value(s) in the table below.

Standard:

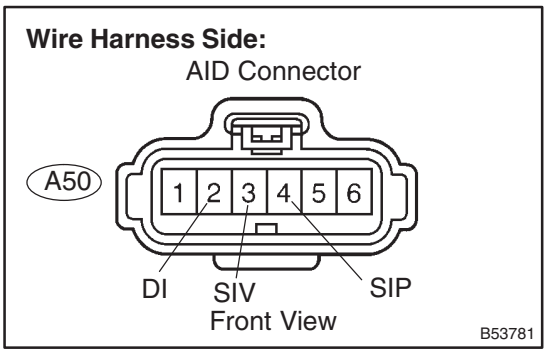
Tester Connection	Specified Condition
E (A50–1) – Body ground	Below 1 Ω

(c) Reconnect the AID connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4 CHECK HARNESS AND CONNECTOR(AIR INJECTION CONTROL DRIVER – ECM)

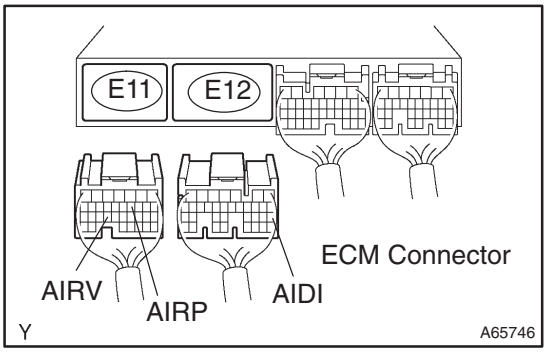


(a) Disconnect the A50 AID connector.
(b) Disconnect the E11 and E12 ECM connectors.
(c) Measure the resistance according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
DI (A50–2) – AIDI (E12–20)	Below 1 Ω
SIP (A50–4) – AIRP (E11–11)	Below 1 Ω
SIV (A50–3) – AIRV (E11–24)	Below 1 Ω

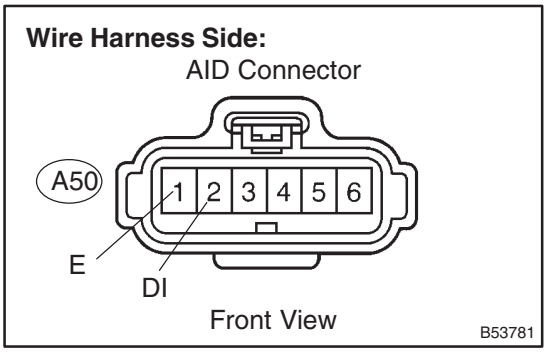
(d) Connect the AID connector.
(e) Connect the ECM connectors.



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5 INSPECT AIR INJECTION CONTROL DRIVER(DI TERMINAL VOLTAGE)



(a) Disconnect the A50 AID connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
DI (A50–2) – E (A50–1)	9 to 14 V (near battery voltage)

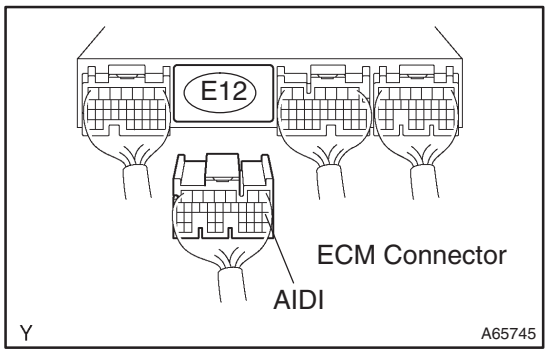
(d) Reconnect the AID connector.

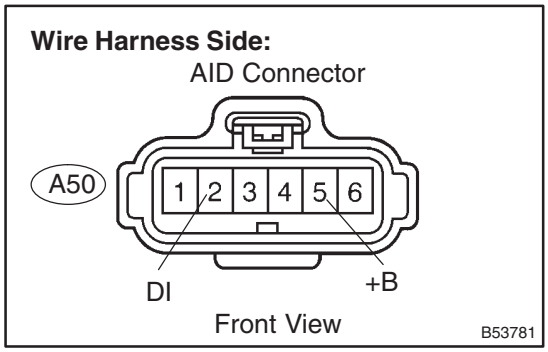
NG → **Go to step 6**

OK

REPLACE AIR INJECTION CONTROL DRIVER

6 CHECK HARNESS AND CONNECTOR(ECM – AIR INJECTION CONTROL DRIVER)





(a) Disconnect the E12 ECM connector.
(b) Disconnect the A50 AID connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard (check for open):

Tester Connection	Specified Condition
DI (A50–2) – AIDI (E12–20)	Below 1 Ω

Standard (check for short):

Tester Connection	Specified Condition
DI (A50–2) or AIDI (E12–20) – +B (A50–5)	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the AID connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM (See page 10–12)