

DTC	P2444	Secondary Air Injection System Pump Stuck On Bank 1
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DTC	P2445	Secondary Air Injection System Pump Stuck Off Bank 1
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CIRCUIT DESCRIPTION

Refer to DTC P0412 on page [DI-656](#).

DTC No.	DTC Detection Condition	Trouble Area
P2444	Air pump stuck ON. The secondary air pressure is more than 2.5 kPa (19 mmHg) despite the ECM ordering the air pump to turn off. (2 trip detection logic)	<ul style="list-style-type: none"> • Short in air pump circuit • Air injection driver • Pressure sensor • Open or short in pressure sensor circuit • ECM
P2445	Air pump stuck OFF or air injection volume is insufficient. The amount of air flow is below the criteria. (The secondary air pressure is less than specified value despite the ECM ordering the air pump turn ON.) (2 trip detection logic)	<ul style="list-style-type: none"> • Air pump fuse • Vacuum hose • Air pump assembly • Air injection driver • Open in air pump circuit • Air injection system piping • Pressure sensor • Open or short in pressure sensor circuit • ECM

MONITOR DESCRIPTION

P2444:

The ECM observes the pressure in the secondary air passage using the pressure sensor located on the air switching valve in the secondary air injection system. The sensor measures the pressure in the secondary air passage and sends a signal to the ECM.

If the pressure level from the sensor exceed a certain level despite the ECM turning off the air pump, the ECM interprets this as a fault in the secondary air injection system and sets a DTC.

P2445:

The ECM calculates the amount of air flow within the secondary air system based on the output values of the pressure sensor and Mas air flow meter.

The ECM determines whether the amount of air flow is normal or not according to the calculated value. When the amount of air flow is below the criteria the ECM stores the DTC and illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P2444	Air pump is stuck ON (case 1)
	P2445	Air pump is stuck OFF (case 2)
	P2445	Air flow volume is insufficient (case 3)
	P2445	Air pressure sensor is stuck (case 4)
Required sensors/components	AIR pressure sensor, AIR valve, AIR VSV (Bank 1), AIR VSV (Bank 2)	
Frequency of operation	Once per driving cycle	
Duration	Within 60 seconds	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever these DTCs are not present	See page DI-437	
Conditions for case 1, case 2 and case 3:		
Atmospheric pressure	45 kPa (338 mmHg)	–
Battery voltage	11.5 V	–
Sequence 1 to 6 are performed to monitor AIR	–	
Sequence 1	–	
AIR	In operation	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 2	–	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Idle	ON	
Sequence 3	–	
AIR pump	ON	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	ON	
AIR valve (vacuum type) bank 2	ON	
Engine RPM	–	3750 rpm
Sequence 4 (This sequence is run when AIR pressure is no change at monitor)	–	

AIR	Not operating	
AIR pump	ON	
AIR valve (Electric type)	ON	
Either of the following conditions is met:	Condition 1 or 2	
1. Both of the following conditions are met:	Condition (a) and (b)	
(a) AIR valve (vacuum type) bank 1	ON	
(b) AIR valve (vacuum type) bank 2	OFF	
2. Both of the following conditions are met:	Condition (c) and (d)	
(c) AIR valve (vacuum type) bank 1	OFF	
(d) AIR valve (vacuum type) bank 2	ON	
Engine RPM	–	3750 rpm
Sequence 5	–	
AIR	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	OFF	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	–	3750 rpm
Sequence 6	–	
AIR status	Not operating	
AIR pump	OFF	
AIR valve (Electric type)	ON	
AIR valve (vacuum type) bank 1	OFF	
AIR valve (vacuum type) bank 2	OFF	
Engine RPM	–	3750 rpm
Conditions for case 4:		
ECT at engine start	–	5°C (41°F)
IAT at engine start	–15°C (5°F)	–
Time after ECT is 80°C (176°F) or more	10 to 60 minutes	
Cumulative intake air amount	172 g/sec.	–
Monitor sequence 3 (during AIR: ON)	Completed	
One of the following condition is met:	Condition (a), (b) or (c)	
(a) Vehicle speed	49.7 mph (80 km/h)	–
(b) Engine RPM	0 rpm	–
(c) Throttle position	0 deg	–
AIR valve	OFF	
AIR VSV bank 1	OFF	
AIR VSV bank 2	OFF	
AIR pressure sensor malfunction (open circuit, out of range)	Not detected	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Thresholds for case 1	
AIR pressure during monitor sequence 6	5 kPa (37.5 mmHg) or more
Thresholds for case 2	
AIR pressure during monitor sequence 3	Less than 1 kPa (7.5 mmHg)
Thresholds for case 3	
AIR amount	100 L/min. or less
Thresholds for case 4	
AIR pressure change	5 kPa (37.5 mmHg) or more

MONITOR RESULT

Refer to page [DI-445](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

Secondary air injection (AIR) system

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$71	\$E1	Multiply by 0.01 (g/s)	Test value of AIR amount insufficient	Minimum test limit	Maximum test limit
\$71	\$E2	Multiply by 0.01 (kPa)	Test value of AIR pump stuck ON	Minimum test limit	Maximum test limit
\$71	\$E3	Multiply by 0.01 (kPa)	Test value of AIR pump stuck OFF	Minimum test limit	Maximum test limit
\$71	\$E4	Multiply by 0.01 (kPa)	Test value of AIR control valve ON	Minimum test limit	Maximum test limit
\$71	\$E5	Multiply by 0.01 (kPa)	Test value of AIR control valve OFF	Minimum test limit	Maximum test limit
\$71	\$E6	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR valve	Minimum test limit	Maximum test limit
\$71	\$E7	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 1	Minimum test limit	Maximum test limit
\$71	\$E8	Multiply by 0.01 (kPa)	Test value of AIR pressure change for AIR VSV bank 2	Minimum test limit	Maximum test limit
\$71	\$E9	Multiply by 0.01 (kPa)	Test value of AIR pressure pulsation for AIR VSV when AIR pressure is low	Minimum test limit	Maximum test limit

WIRING DIAGRAM

Refer to DTC P0412 on page [DI-656](#).

INSPECTION PROCEDURE

HINT:

To check the pressure condition in the secondary air passage, the hand-held tester is available.

1	Is the DTC P2444 and P2445 being output.
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PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Enter the following menu: DIAGNOSIS/ENHANCED OBD II/DTC INFO/CURRENT CODES.

CHECK:

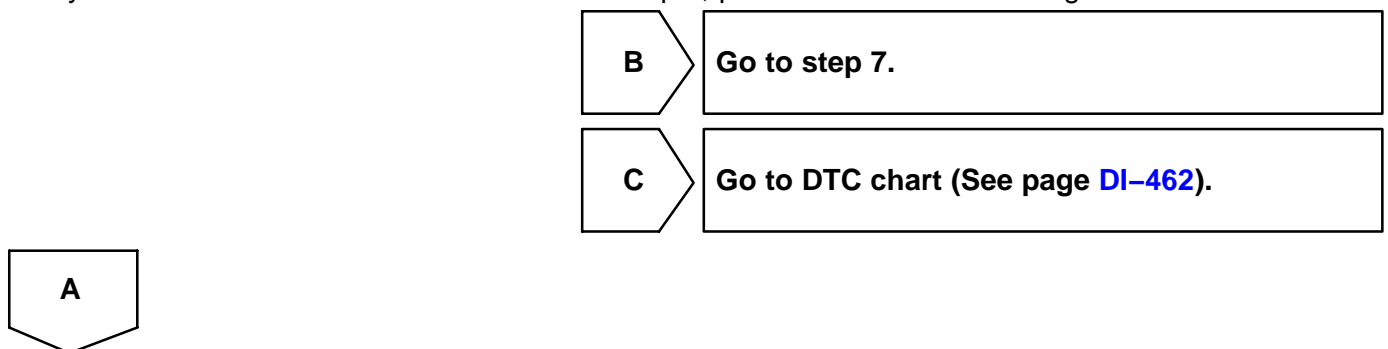
Read the DTCs.

RESULT:

Display (DTC output)	Proceed to
P2445	A
P2444	B
P2444 and P2445	B
"P2444 and P2445" and other DTCs	C

HINT:

If any other codes besides P2444 or P2445 is output, perform the troubleshooting for those DTCs first.



2**Check air injection system pressure.**

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AIR INJ CHECK
AIR PUMP.....ON
EASV .....OPEN
ASV1. ....OPEN
ASV2.....OPEN
A/F BANK1.....19.05
A/F BANK2.....14.5
PRESSURE.....17 kPa
PULSATION.....25.39 kPa
AI STATUS.....OK
Remaining Time 05 sec.

Press [EXIT] to quit

```

A16555

PREPARATION:

- Start the engine and warm it up.
- Turn the ignition switch to OFF.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch to ON and push the hand-held tester main switch ON.
- Start the engine.

CHECK:

- Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 1 and 6

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

- Check that the PRESSURE on the hand-held tester.

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:

Tester operation	PRESSURE
Operation 1	Less than 2.5 kPa
Operation 2	5 to 8 kPa or more

NG**Go to step 4.****OK**

3 Check whether DTC output recurs.**PREPARATION:**

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and turn the tester ON.
- (e) Clear the DTCs (see page [DI-462](#)).
- (f) Start the engine.

CHECK:

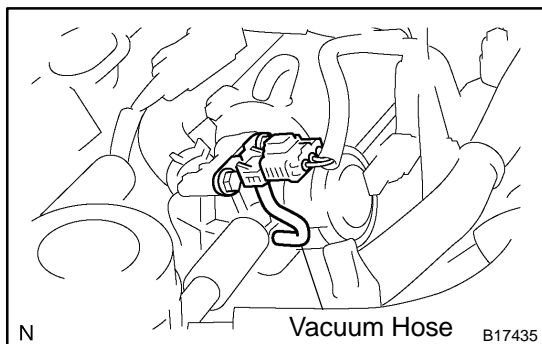
- (a) Perform ACTIVE TEST to operate the air injection system.
Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/AUTOMATIC OPERATION
- (b) After operating the secondary air injection system, confirm the pending codes for the secondary air injection system by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (c) Read DTC and check DTC.

OK:

DTC P2444 or P2445 for the secondary air injection system is not output.

NG**Go to step 4.****OK**

Check for intermittent problems
(See page [DI-430](#)).

4 Check vacuum hose.**CHECK:**

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Check the vacuum hose connection between the pressure sensor and air switching valve.

OK:

The vacuum hose is securely connected.

CHECK:

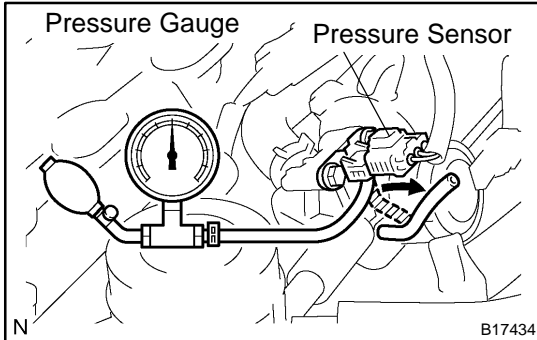
- (a) Inspect the vacuum hose for blockage or damage.

OK:

The vacuum hoses no blockages and damages.

NG**Repair or replace vacuum hose.****OK**

5 Inspect ECM (air voltage).



PREPARATION:

- Remove the intake manifold (see page [EM-36](#)).
- Connect the pressure gauge to the pressure sensor as shown in the illustration.
- Connect the hand-held tester to the DLC3 on the vehicle.
- Turn the ignition switch ON and push the hand-held tester main switch ON (Do not start engine).
- Select the following items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / AIR PUMP PRS.

CHECK:

Check that the pressure displayed on the hand-held tester fluctuates when applying the pressure to the pressure sensor with the pressure gauge.

OK:

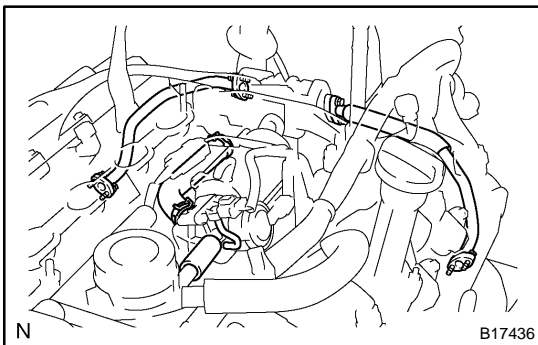
Pressure fluctuates in response to the pressure applied with pressure gauge.

NG

Replace pressure sensor.

OK

6 Check connection of all air injection system piping and hoses.



CHECK:

- Remove the intake manifold (see page [EM-36](#)).
- Check that all the pipes and hoses between the air pump and air switching valve are securely connected.

OK:

The all air injection pipes and hoses are securely connected.

CHECK:

- Check the pipe and hoses for blockage or damage.

OK:

The air injection system pipes and hoses has no blockages and damages.

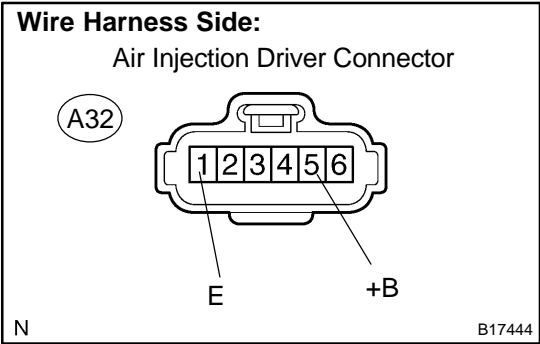
NG

Repair or replace air injection system piping.

OK

7

Inspect air injection driver power source circuit.



- PREPARATION:**
- (a) Remove the intake manifold (see page [EM-36](#)).
 - (b) Disconnect the A32 and A33 air injection driver connector.
 - (c) Turn the ignition switch to ON.

CHECK:
Measure the voltage between terminals A32-5 (+B) and A33-1 (BATT) of the air injection driver and body ground.

OK:

Standard:

Tester Connection	Specified Condition
A32-5 (+B) – Body ground	10 V or more
A33-1 (BATT) – Body ground	10 V or more

CHECK:
Measure the resistance between the terminal A32-1 (E) of the air injection driver and body ground.

OK:

Standard:

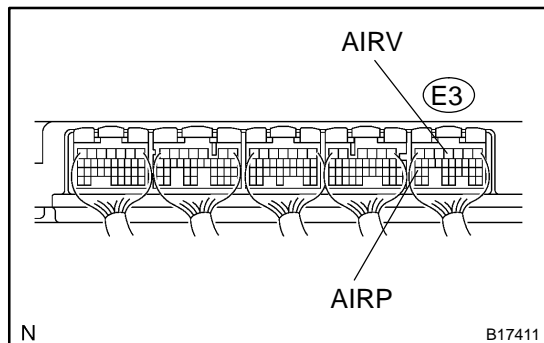
Tester Connection	Specified Condition
A32-1 (E) – Body ground	Below 1 Ω

NG

Repair or replace harness or connector.

OK

8

Check voltage between AIRP and AIRV terminal of ECM and body ground.**PREPARATION:**

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.

CHECK:

- (a) When the air pump and air switching valve are operated using hand-held tester, measure voltage between terminal E3-25 (AIRP) and E3-4 (AIRV) of the air injection driver connector and body ground.
- (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/MANUAL OPERATION/OPERATION 1 and 2

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:**Standard:**

Air pump operation	Tester Connection	Specified Condition
ON	E3-25 (AIRP) – Body ground	10 V or more
OFF	E3-25 (AIRP) – Body ground	3.5 to 7.7 V*
ASV operation (EASV)	Tester Connection	Specified Condition
OPEN	E3-4 (AIRV) – Body ground	10 V or more
CLOSE	E3-4 (AIRV) – Body ground	3.5 to 7.7 V*

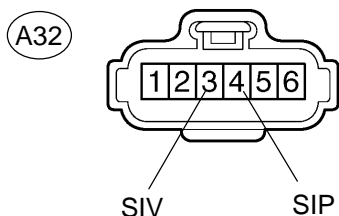
*: 35 to 55 % of the +B voltage.

NG**Replace ECM (See page [SF-82](#)).****OK**

9 Check voltage between SIV and SIP terminal of air injection driver and body ground.

Wire Harness Side:

Air Injection Driver Connector



N

B17444

PREPARATION:

- Disconnect the A32 air injection driver connector.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and turn the tester ON.

CHECK:

- When the air pump and air switching valve are operated using hand-held tester, measure voltage between terminal A32-3 (SIV) and A32-4 (SIP) of the air injection driver connector and body ground.
- Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/MANUAL OPERATION/OPERATION 1 and 2

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again.

OK:

Standard:

Air pump operation	Tester Connection	Specified Condition
ON	A32-4 (SIP) – Body ground	10 V or more
OFF	A32-4 (SIP) – Body ground	3.5 to 7.7 V*
ASV operation (EASV)	Tester Connection	Specified Condition
OPEN	A32-3 (SIV) – Body ground	10 V or more
CLOSE	A32-3 (SIV) – Body ground	3.5 to 7.7 V*

*: 35 to 55 % of the +B voltage.

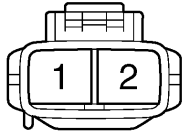
NG

Repair or replace harness or connector between air injection driver and ECM.

OK

10**Check voltage between terminal 2 of air pump and body ground.****Wire Harness Side:**

A35



Air Pump Connector

N

B17438

PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A35 air pump connector.
- (c) Connect the hand-held tester to the DLC3.
- (d) Turn the ignition switch ON and turn the tester ON.

CHECK:

- (a) When the air pump is operated using the hand-held tester, measure voltage between terminal A35-2 of the air injection driver connector and body ground.
- (b) Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/ AIR INJ CHECK/ MANUAL OPERATION/OPERATION 1 and 2

HINT:

OPERATION 1: AP:OFF, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

OPERATION 2: AP:ON, EASV:OPEN, ASV1:OPEN, ASV2:OPEN

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:**Standard:**

Air pump operation	Tester Connection	Specified Condition
ON	A35-2 – Body ground	10 V or more
OFF	A35-2 – Body ground	Below 1.0 V

NG**Go to step 14.****OK**

11	Check for open in harness and connector between air pump and body ground.
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Wire Harness Side:

A35



Air Pump Connector

N

B17438

PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A35 air pump connector.

CHECK:

Measure the resistance between the wire harness side connectors and body ground.

OK:

Standard:

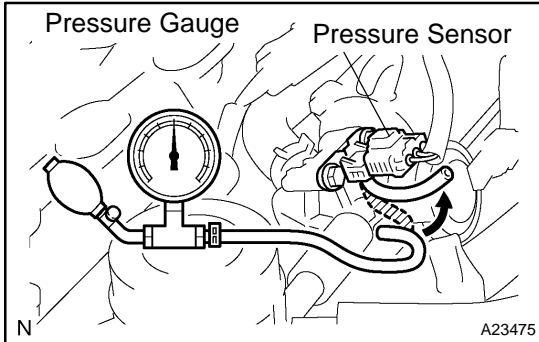
Tester Connection	Specified Condition
A35-1 – Body ground	Below 1 Ω

NG

Repair or replace harness or connector.

OK

12

Check air pump operation.**PREPARATION:**

- Connect the pressure gauge to the air switching valve as shown in the illustration.
- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST/AIR INJ CHECK/MANUAL OPERATION/OPERATION 3

CHECK:

- When the air pump is operated using the hand-held tester, measure the air injection system pressure.

HINT:

OPERATION 2: AP:ON, EASV:CLOSE, ASV1:CLOSE, ASV2:CLOSE

NOTICE:

This test only allows technicians to operate the AI system for 5 seconds. Furthermore, the test can be performed 4 times a trip. If the test is repeated, intervals of at least 30 seconds are required between tests.

While the AI system operation using the hand-held tester is prohibited, the tester displays the prohibition (WAIT or ERROR). If the ERROR (AI STATUS NG) is displayed on the tester, stop the engine for 10 minutes and then try again..

OK:**Standard:**

25 to 30 kPa or more

NG**Replace air pump.****OK**

13	Check whether DTC output recurs.
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PREPARATION:

- (a) Start the engine and warm it up.
- (b) Turn the ignition switch OFF.
- (c) Connect a hand-held tester to the DLC3.
- (d) Turn the ignition switch to ON and turn the tester ON.
- (e) Clear the DTCs (see page [DI-462](#)).
- (f) Start the engine.

CHECK:

- (a) Perform ACTIVE TEST to operate the air injection system.
Select the following menu items: DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/AIR INJ CHECK/AUTOMATIC OPERATION
- (b) After operating secondary air injection system, confirm the pending codes of the secondary air injection system by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
- (c) Read DTC and check no DTC.

OK:

DTC P2444 or P2445 for the secondary air injection system is not output.

NG

Check for intermittent problems
(See page [DI-430](#)).

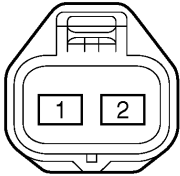
OK**END**

14 Check for open and short in harness and connector between air injection driver and air pump.

Wire Harness Side:

Air Injection Driver Connector

A33



N

B17443

PREPARATION:

- (a) Remove the intake manifold (see page [EM-36](#)).
- (b) Disconnect the A33 air injection driver connector.
- (c) Disconnect the A35 air pump connector.

CHECK:

Measure the resistance between the wire harness side connectors.

OK:

Standard:

Tester Connection	Specified Condition
VP (A33-2) – A35-2	Below 1 Ω
VP (A33-2) or A35-2 – Body ground	10 k Ω or higher

Wire Harness Side:

A35



Air Pump Connector

N

B17438

NG

Repair or replace harness or connector.

OK

Replace air injection driver.