DTC	P2014	INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT (BANK 1)

DTC	P2016	INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1)

DTC	P2017	INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1)

HINT:

- These DTCs have been added to meet the requirement for Partial Zero Emission Vehicle (PZEV) (see page 05−350).
- This is the repair procedure for the Intake Manifold Runner Valve (IMRV) position sensor.

CIRCUIT DESCRIPTION

HINT:

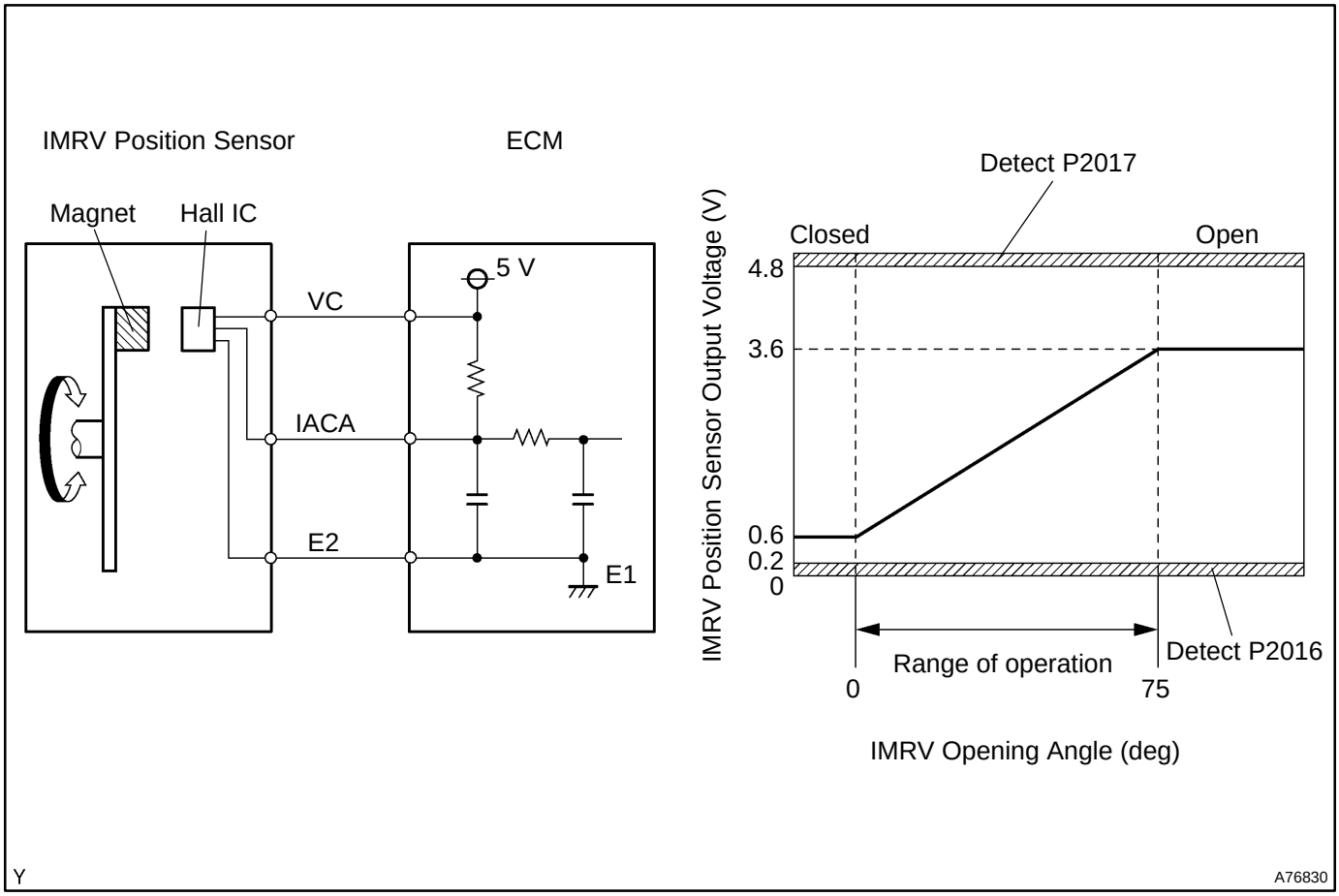
This IMRV position sensor is non−contact type.

The IMRV position sensor is mounted on the valve shaft axis (see page 05−463) and is used to measure the opening angle of the IMRV. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained.

Voltage of approximately 0.6 V is applied to terminal IACA of the ECM when the IMRV is fully closed. The voltage applied to terminal IACA increases in proportion to the IMRV opening angle, approximately 3.6 V is applied to the terminal when it is fully opened.

The ECM detects a malfunction in the IMRV position sensor when its voltage output deviates from the standard range. When a malfunction is detected, the ECM fully opens the IMRV using the IMRV motor until the IMRV position sensor returns to normal.

The related DTCs are P2004 and P2006 on page 05−463, and P2009 and P2010 on page 05−463.



DTC No.	DTC Detection Condition	Trouble Area
P2014	Condition (a) continues for 0.5 seconds: (a) IMRV position sensor output voltage is ”0.2 V or less” or ”4.8 V or more”.	• Open or short in IMRV position sensor circuit • IMRV position sensor • ECM
P2016	Condition (a) continues for 0.5 seconds: (a) IMRV position sensor output voltage is 0.2 V or less.	• Same as DTC No. P2014
P2017	Condition (a) continues for 0.5 seconds: (a) IMRV position sensor output voltage is 4.8 V or more.	• Same as DTC No. P2014

HINT:

After confirming DTC P2014, P2016 or P2017, use the hand−held tester or the OBD II scan tool to confirm the IACV POSITION (IMRV position sensor output voltage) from ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL”.

IACV POSITION	Malfunction
0.2 V or less	• IACA circuit short • VC circuit open
4.8 V or more	• VC and IACA circuit short−circuited • IACA circuit open • E2 circuit open

MONITOR STRATEGY

Related DTCs	P2014: IMRC Valve Position Sensor Range Check (Chattering) P2016: IMRC Valve Position Sensor Range Check (Low Voltage) P2017: IMRC Valve Position Sensor Range Check (High Voltage)
Required sensors/ components (Main)	IMRC Valve Position Sensor
Required sensors/ components (Related)	None
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page 05−360

TYPICAL MALFUNCTION THRESHOLDS

P2014:

IMRC valve position sensor voltage	Less than 0.2 V, or More than 4.8 V

P2016:

IMRC valve position sensor voltage	Less than 0.2 V

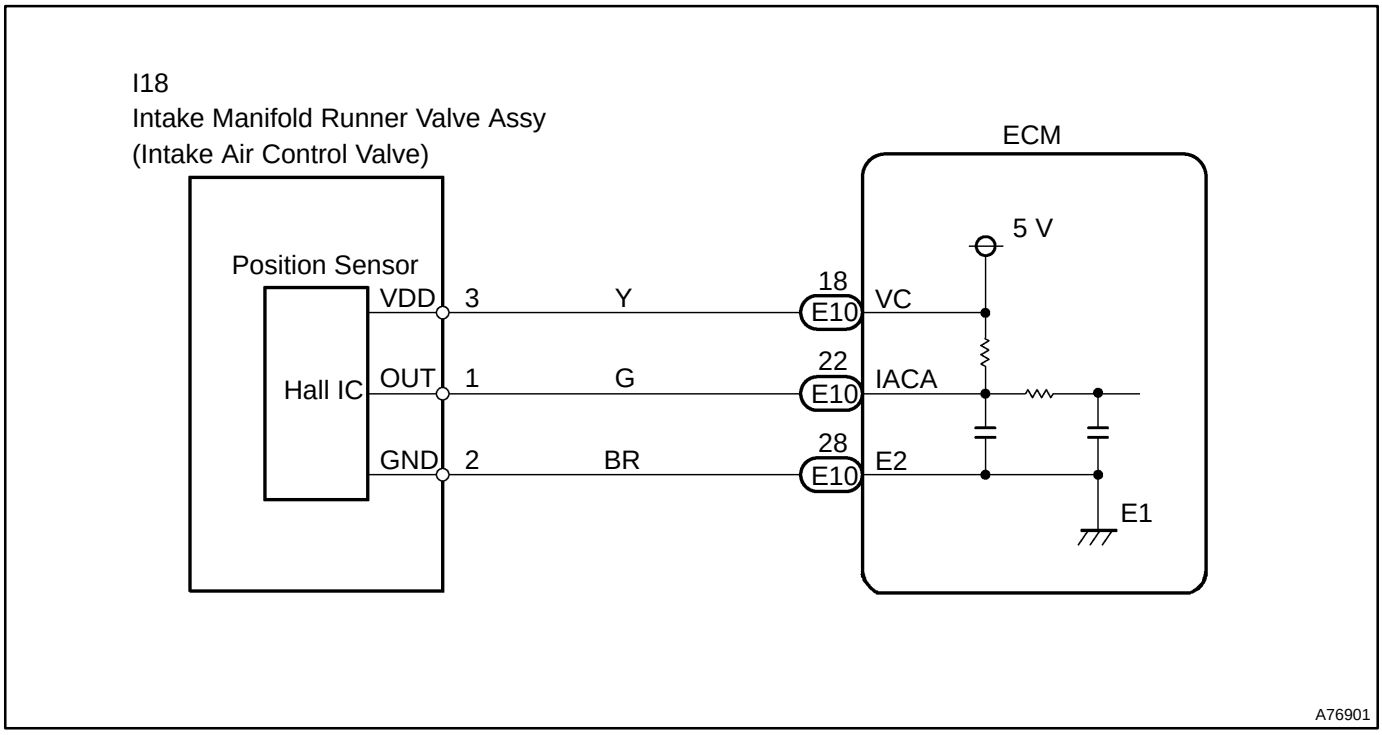
P2017:

IMRC valve position sensor voltage	Less than 4.8 V

COMPONENT OPERATING RANGE

IMRC valve position sensor voltage	0.2 to 4.8 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- Read freeze frame data using hand−held tester or the OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air−fuel ratio was lean or rich, etc. at the time of the malfunction.

Hand−held tester:

1	PERFORM ACTIVE TEST BY HAND−HELD TESTER

(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 ALL from DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / IACV MOTOR (IMRV motor).
(d) Scroll the data list by the up or down button to display IACV POSITION (IMRV position sensor).
(e) Check the voltage output of IACV POSITION while the IMRV motor is driven from full closed to full open (or from full open to full closed) using the hand−held tester.
Standard: The voltage output of IACV POSITION remains between 0.2 to 4.8 V while the IMRV motor is driven from −100 to 100 % (or from 100 to −100 %).

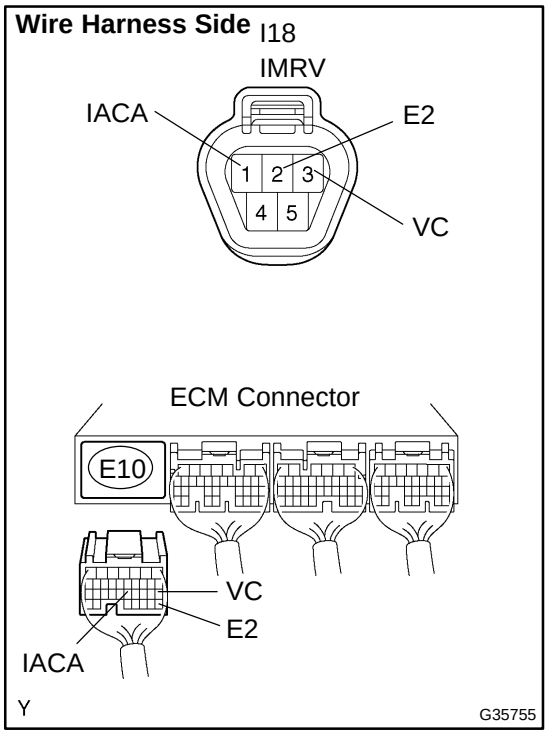
HINT:

IACV MOTOR operation	IACV POSITION (Normal)	Suspect failure area		
		• IACA circuit short • VC circuit open	• VC and IACA circuit short−circuited • IACA circuit open • E2 circuit open	• Sensor malfunction
−100 %	0.2 to 1.0 V	Remain less than 0.2 V	Remain more than 4.8 V	Other than the voltage in the next 2 columns on the left
100 %	3.2 to 4.8 V	Remain less than 0.2 V	Remain more than 4.8 V	

OK → **Go to step 5**

NG

2 CHECK WIRE HARNESS (ECM − IMRV)



(a) Disconnect the I18 IMRV connector.
(b) Disconnect the E10 ECM connector.
(c) Check the resistance of the wire harness side connectors.

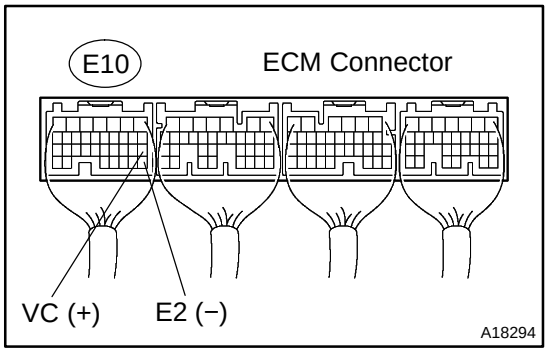
Standard:

Tester Connection	Specified Condition
I18−1 (IACA) − E10−22 (IACA) I18−3 (VC) − E10−18 (VC) I18−2 (E2) − E10−28 (E2)	Below 1 Ω
I18−1 (IACA) or E10−22 (IACA) − Body ground I18−3 (VC) or E10−18 (VC) − Body ground	10 kΩ or higher

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

OK

3 INSPECT ECM (VC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Check the voltage of the E10 ECM connector.

Standard:

Tester Connection	Specified Condition
E10−18 (VC) − E10−28 (E2)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10−9)**

OK

4 REPLACE INTAKE MANIFOLD RUNNER VALVE ASSY

GO

5	READ OUTPUT DTC (DTC P2014, P2016 AND/OR P2017 ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05−379).
(b) Start the engine.
(c) Run the engine at more than 3,000 rpm.
(d) Turn the ignition switch OFF.

HINT:
As running the engine to 3,000 rpm the IMRV usually fully opened. If the ignition switch is turned OFF under this condition, the IMRV fully closed and then becomes half−opening angle.

(e) Turn the ignition switch ON 20 seconds later.
(f) Read the DTC.

Result:

Display (DTC output)	Proceed to
P2014, P2016 and/or P2017 are output again	A
No DTC output	B

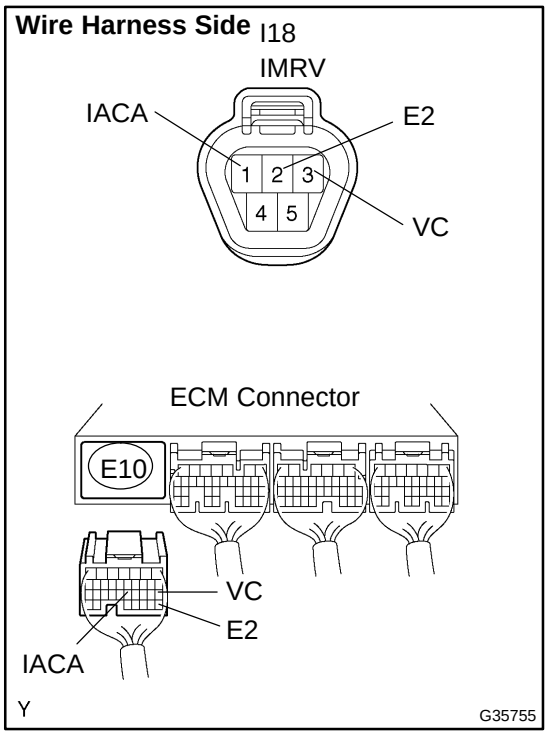
B → **SYSTEM OK**

A

REPLACE ECM (See page 01−32)

OBD II scan tool (excluding hand−held tester):

1	CHECK WIRE HARNESS (ECM − IMRV)



(a) Disconnect the I18 IMRV connector.
(b) Disconnect the E3 ECM connector.
(c) Check the resistance of the wire harness side connectors.

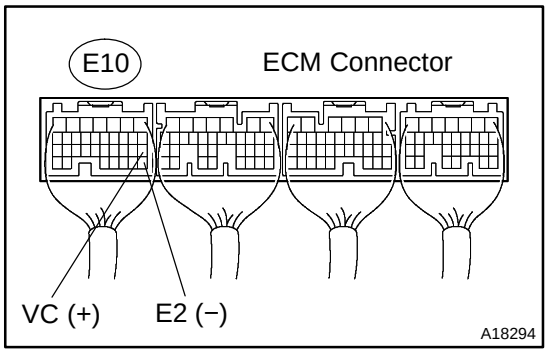
Standard:

Tester Connection	Specified Condition
I18−1 (IACA) − E10−22 (IACA) I18−3 (VC) − E10−18 (VC) I18−2 (E2) − E10−28 (E2)	Below 1 Ω
I18−1 (IACA) or E10−22 (IACA) − Body ground I18−3 (VC) or E10−18 (VC) − Body ground	10 kΩ or higher

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

OK

2 INSPECT ECM (VC VOLTAGE)



(a) Turn the ignition switch ON.
(b) Check the voltage of the E10 ECM connector.
Standard:

Tester Connection	Specified Condition
E10−18 (VC) − E10−28 (E2)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10−9)**

OK

3 REPLACE INTAKE MANIFOLD RUNNER VALVE ASSY

GO

4 READ OUTPUT DTC (DTC P2014, P2016 AND/OR P2017 ARE OUTPUT AGAIN)

(a) Clear the DTC (see page 05−379).
(b) Start the engine.
(c) Run the engine at more than 3,000 rpm.
(d) Turn the ignition switch OFF.

HINT:
As running the engine to 3,000 rpm the IMRV usually fully opened. If the ignition switch is turned OFF under this condition, the IMRV fully closed and then becomes half−opening angle.

(e) Turn the ignition switch ON 20 seconds later.
(f) Read the DTC.
Result:

Display (DTC output)	Proceed to
P2014, P2016 and/or P2017 are output again	A
No DTC output	B

B → **SYSTEM OK**

A

REPLACE ECM (See page 10−9)