

DTC	P2120/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT
DTC	P2122/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT
DTC	P2123/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT
DTC	P2125/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT
DTC	P2127/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT
DTC	P2128/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT
DTC	P2138/19	THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION

HINT:

These DTCs are related to the accelerator pedal position sensor.

CIRCUIT DESCRIPTION

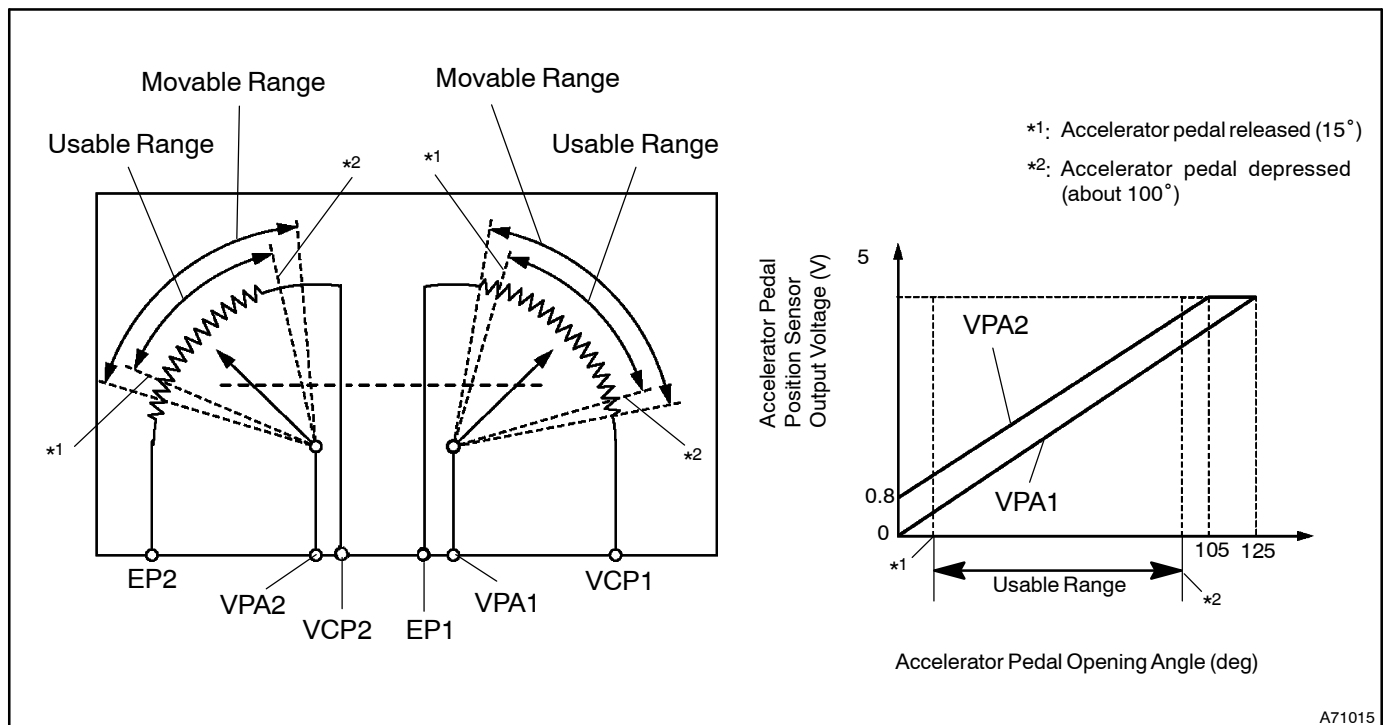
HINT:

This ETCS (Electronic Throttle Control System) does not use a throttle cable.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket and it has the 2 sensors to detect the accelerator position and malfunctions of the accelerator position sensor itself.

In the accelerator pedal position sensor, the voltage applied to pedal terminals VPA1 and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. The VPA1 is a signal to indicate the actual accelerator pedal opening angle which is used for engine control, and the VPA2 is a signal to indicate the information about the opening angle which is used for detecting a malfunction in the sensor.

The ECM judges the current accelerator pedal opening angle with the signals from pedal terminals VPA1 and VPA2, and the ECM controls the throttle motor based on these signals.



DTC No.	DTC Detection Condition	Trouble Area
P2120/19	VPA1 quickly fluctuates up and down beyond upper and lower malfunction thresholds for 0.5 second	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ECM
P2122/19	Condition (a) continues for 0.5 second or more when accelerator pedal is fully released: (a) VPA1 is 0.2 V or less	<ul style="list-style-type: none"> • Accelerator pedal position sensor • Open in VCP1 circuit • Open or ground short in VPA1 circuit • ECM
P2123/19	Condition (a) continues for 2.0 seconds or more: (a) VPA1 is 4.8 V or more	<ul style="list-style-type: none"> • Accelerator pedal position sensor • Open in EPA circuit • ECM
P2125/19	Condition (a) continues for 0.5 second or more: (a) VPA2 quickly fluctuates up and down beyond upper and lower malfunction thresholds	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ECM
P2127/19	Condition (a) continues for 0.5 second or more when accelerator pedal is fully released: (a) VPA2 is 0.5 V or less	<ul style="list-style-type: none"> • Accelerator pedal position sensor • Open in VCP2 circuit • Open or ground short in VPA2 circuit • ECM
P2128/19	Conditions (a) and (b) continue for 2.0 seconds or more: (a) VPA2 is 4.8 V or more (b) VPA1 is 0.2 V or more and VPA1 is 3.45 V or less	<ul style="list-style-type: none"> • Accelerator pedal position sensor • Open in EPA2 circuit • ECM
P2138/19	Condition (a) or (b) continues for 2.0 seconds or more: (a) Difference between VPA1 and VPA2 is 0.02 V or less (b) VPA1 is 0.2 V or less and VPA2 is 0.5 V or less	<ul style="list-style-type: none"> • VPA and VPA2 circuits are short-circuited • Accelerator pedal position sensor • ECM

HINT:

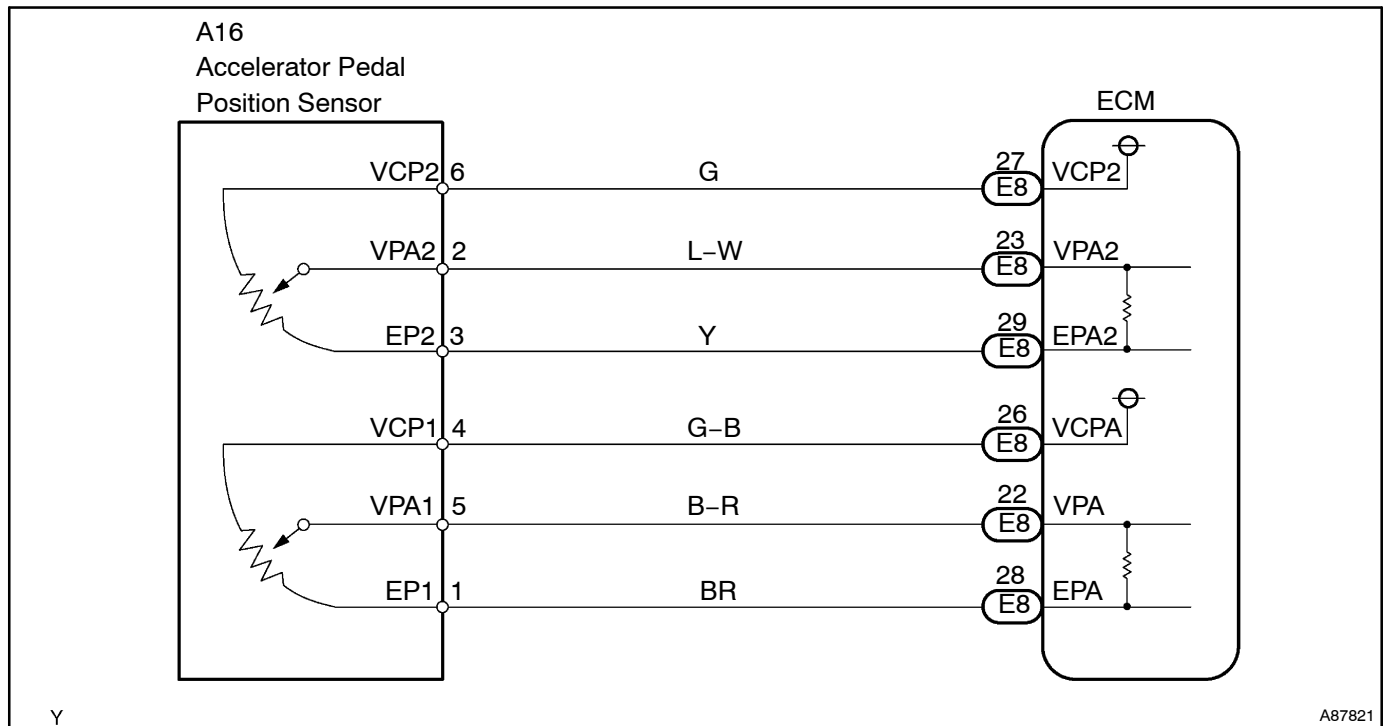
When DTC P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 and/or P2138/19 is detected, check the output voltage of the accelerator pedal position sensor by selecting Powertrain / Engine and ECT / Data List / Accelerator POS No. 1 and Accelerator POS No. 2 on the intelligent tester II.

Trouble Area	AP No. 1 When APP Released	AP No. 2 When APP Released	AP No. 1 When APP Depressed	AP No. 2 When APP Depressed
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
Open or ground short in VPA circuit	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
Open or ground short in VPA2 circuit	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EPA circuit open	4.5 to 5.0 V	4.5 to 5.0 V	4.5 to 5.0 V	4.5 to 5.0 V

HINT:

- Accelerator pedal position is expressed in output voltage.
- AP stands for Accelerator Position, and APP stands for Accelerator Pedal Position.

WIRING DIAGRAM



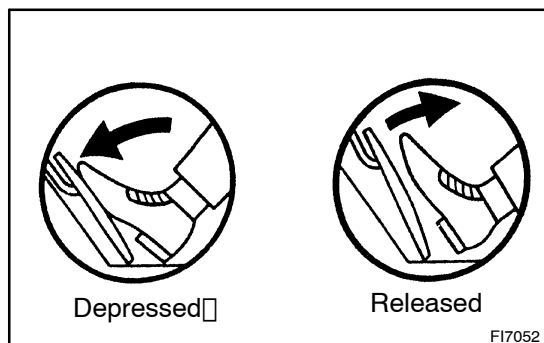
INSPECTION PROCEDURE

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.

When using Intelligent Tester II:

1 READ VALUE OF INTELLIGENT TESTER II (ACCEL POS #1 AND ACCEL POS #2)



- Connect the Intelligent Tester II to the DLC3.
- Turn the Ignition switch to ON and turn the Intelligent Tester II ON.
- Select the following menu items: Powertrain / Engine and ECT / Data List / Accelerator POS No. 1 and Accelerator POS No. 2.
- Read the values.

Standard:

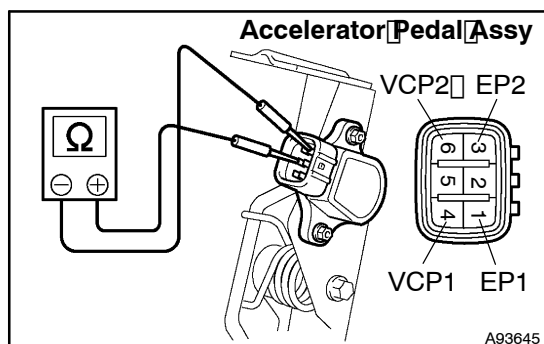
Accelerator Pedal	Accelerator POS No. 1	Accelerator POS No. 2
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.3 V

OK

Go to step 6

NG

2 INSPECT ACCELERATOR PEDAL ROD ASSY (ACCELERATOR PEDAL POSITION SENSOR)



- Disconnect the A16 accelerator pedal position sensor connector.
- Measure the resistance between the specified terminals.

Standard:

Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) - VCP2 (6)	2.25 to 4.75 kΩ at 20°C (68°F)

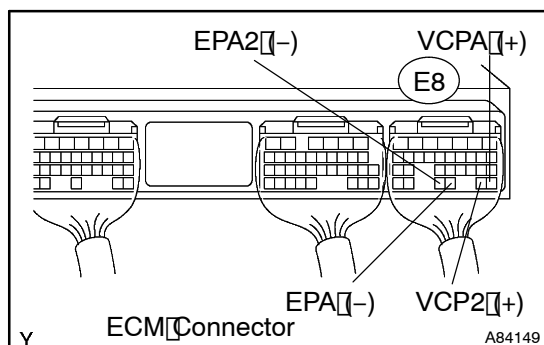
- Reconnect the accelerator pedal position sensor connector.

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REPLACE ACCELERATOR PEDAL ROD ASSY
(See page 10-29)

OK

3 INSPECT ECM (VCPA AND VCP2 VOLTAGE)



- Turn the Ignition switch to ON.
- Measure the voltage between the specified terminals of the E8 ECM connector.

Standard:

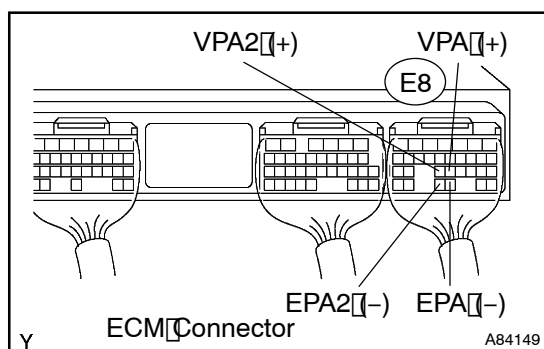
Tester Connection	Specified Condition
VCPA (E8-26) - EPA (E8-28)	4.5 to 5.5 V
VCP2 (E8-27) - EPA2 (E8-29)	4.5 to 5.5 V

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REPLACE ECM (See page 10-30)

OK

4 INSPECT ECM (VPA AND VPA2 VOLTAGE)



- Turn the ignition switch to ON.
- Measure the voltage between the specified terminals of the E8 ECM connector.

Standard:

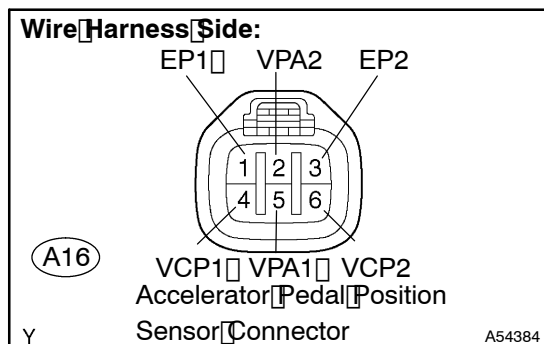
Accelerator Pedal	Tester Connection	Specified Condition
Released	VPA (E8-22) - EPA (E8-28)	0.5 to 1.1 V
Depressed	VPA (E8-22) - EPA (E8-28)	2.5 to 4.6 V
Released	VPA2 (E8-23) - EPA2 (E8-29)	1.5 to 2.9 V
Depressed	VPA2 (E8-23) - EPA2 (E8-29)	3.5 to 5.5 V

OK

REPLACE ECM (See page 10-30)

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5 CHECK HARNESS AND CONNECTOR (ACCELERATOR PEDAL POSITION SENSOR - ECM)



- Disconnect the A16 accelerator pedal position sensor connector.
- Disconnect the E8 ECM connector.
- Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A16-5) - VPA (E8-22)	Below 1 Ω
EP1 (A16-1) - EPA (E8-28)	Below 1 Ω
VCP1 (A16-4) - VCPA (E8-26)	Below 1 Ω
VPA2 (A16-2) - VPA2 (E8-23)	Below 1 Ω
EP2 (A16-3) - EPA2 (E8-29)	Below 1 Ω
VCP2 (A16-6) - VCP2 (E8-27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A16-5) or VPA (E8-22) - Body ground	10 k Ω or higher
EP1 (A16-1) or EPA (E8-28) - Body ground	10 k Ω or higher
VCP1 (A16-4) or VCPA (E8-26) - Body ground	10 k Ω or higher
VPA2 (A16-2) or VPA2 (E8-23) - Body ground	10 k Ω or higher
EP2 (A16-3) or EPA2 (E8-29) - Body ground	10 k Ω or higher
VCP2 (A16-6) or VCP2 (E8-27) - Body ground	10 k Ω or higher

- Reconnect the accelerator pedal position sensor connector.
- Reconnect the ECM connector.

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REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6 CHECK IF DTC OUTPUT RECURS (ACCELERATOR PEDAL POSITION SENSOR DTCs)

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch to ON and turn the intelligent tester ON.
- (c) Clear the DTC(s) (see page 05-268).
- (d) Start the engine.
- (e) Run the engine at idle for 15 seconds or more.
- (f) Select the following menu items: Powertrain / Engine and ECT / DTC.
- (g) Read DTCs (see page 05-268).

Result:

Display (DTC Output)	Proceed To
P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 and/or P2138/19	A
No output	B

B

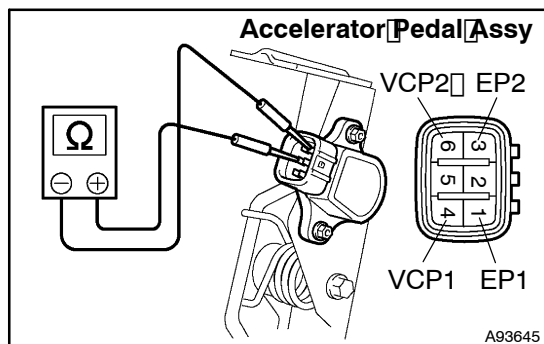
NORMAL

A

REPLACE ECM (See page 10-30)

When not using intelligent tester II:

1 INSPECT ACCELERATOR PEDAL ROD ASSY (ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A16 accelerator pedal position sensor connector.

(b) Measure the resistance between the specified terminals.
Standard:

Tester Connection	Specified Condition
EP1 (1) - VCP1 (4)	2.25 to 4.75 kΩ at 20°C (68°F)
EP2 (3) - VCP2 (6)	2.25 to 4.75 kΩ at 20°C (68°F)

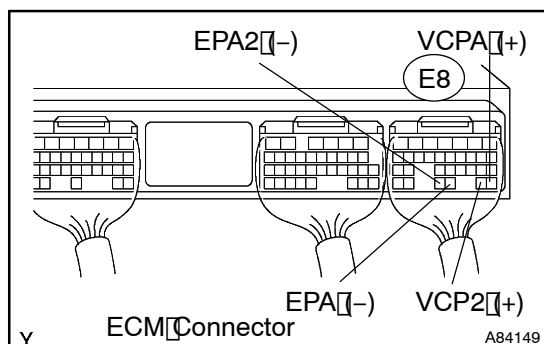
(c) Reconnect the accelerator pedal position sensor connector.

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REPLACE ACCELERATOR PEDAL ROD ASSY
(See page 10-29)

OK

2 INSPECT ECM (VCPA AND VCP2 VOLTAGE)



(a) Turn the ignition switch to ON.

(b) Measure the voltage between the specified terminals of the E8 ECM connector.

Standard:

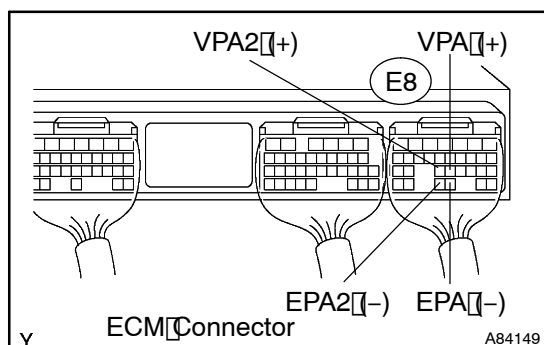
Tester Connection	Specified Condition
VCPA (E8-26) - EPA (E8-28)	4.5 to 5.5 V
VCP2 (E8-27) - EPA2 (E8-29)	4.5 to 5.5 V

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REPLACE ECM (See page 10-30)

OK

3 INSPECT ECM (VPA AND VPA2 VOLTAGE)



(a) Turn the ignition switch to ON.

(b) Measure the voltage between the specified terminals of the E8 ECM connector.

Standard:

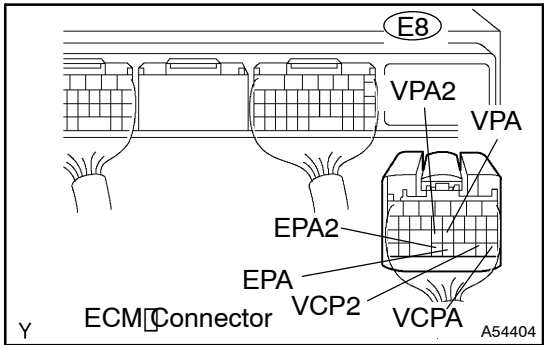
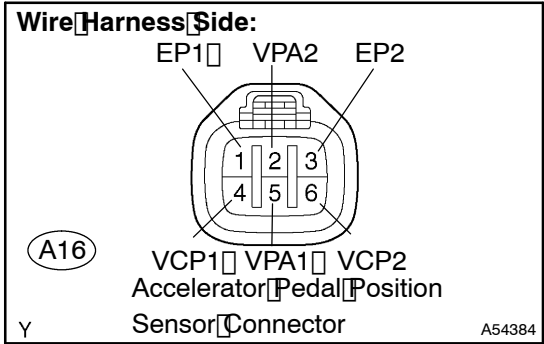
Accelerator Pedal	Tester Connection	Specified Condition
Released	VPA (E8-22) - EPA (E8-28)	0.5 to 1.1 V
Depressed	VPA (E8-22) - EPA (E8-28)	2.5 to 4.6 V
Released	VPA2 (E8-23) - EPA2 (E8-29)	1.5 to 2.9 V
Depressed	VPA2 (E8-23) - EPA2 (E8-29)	3.5 to 5.5 V

OK

REPLACE ECM (See page 10-30)

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4 CHECK HARNESS AND CONNECTOR (ACCELERATOR PEDAL POSITION SENSOR - ECM)



- (a) Disconnect the A16 accelerator pedal position sensor connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance.

Standard (Check for open):

Tester Connection	Specified Condition
VPA1 (A16-5) - VPA (E8-22)	Below 1 Ω
EP1 (A16-1) - EPA (E8-28)	Below 1 Ω
VCP1 (A16-4) - VCPA (E8-26)	Below 1 Ω
VPA2 (A16-2) - VPA2 (E8-23)	Below 1 Ω
EP2 (A16-3) - EPA2 (E8-29)	Below 1 Ω
VCP2 (A16-6) - VCP2 (E8-27)	Below 1 Ω

Standard (Check for short):

Tester Connection	Specified Condition
VPA1 (A16-5) or VPA (E8-22) - Body ground	10 k Ω or higher
EP1 (A16-1) or EPA (E8-28) - Body ground	10 k Ω or higher
VCP1 (A16-4) or VCPA (E8-26) - Body ground	10 k Ω or higher
VPA2 (A16-2) or VPA2 (E8-23) - Body ground	10 k Ω or higher
EP2 (A16-3) or EPA2 (E8-29) - Body ground	10 k Ω or higher
VCP2 (A16-6) or VCP2 (E8-27) - Body ground	10 k Ω or higher

- (d) Reconnect the accelerator pedal position sensor connector.
(e) Reconnect the ECM connector.

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REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

5

CHECK IF DTC OUTPUT RECURS (ACCELERATOR PEDAL POSITION SENSOR DTCs)

- (a) Clear the DTC(s) (see page 05-268).
- (b) Start the engine.
- (c) Run the engine at idle for 15 seconds or more.
- (d) Read DTCs (see page 05-268).

Result:

Display (DTC Output)	Proceed To
P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 and/or P2138/19	A
No output	B

B

NORMAL

A

REPLACE ECM (See page 10-30)