DTC	P2120	Throttle / Pedal Position Sensor / Switch "D" Circuit
DTC	P2122	Throttle / Pedal Position Sensor / Switch "D" Circuit Low Input
DTC	P2123	Throttle / Pedal Position Sensor / Switch "D" Circuit High Input
DTC	P2125	Throttle / Pedal Position Sensor / Switch "E" Circuit
DTC	P2127	Throttle / Pedal Position Sensor / Switch "E" Circuit Low Input
DTC	P2128	Throttle / Pedal Position Sensor / Switch "E" Circuit High Input
DTC	P2138	Throttle / Pedal Position Sensor / Switch "D" / "E" Voltage Correlation

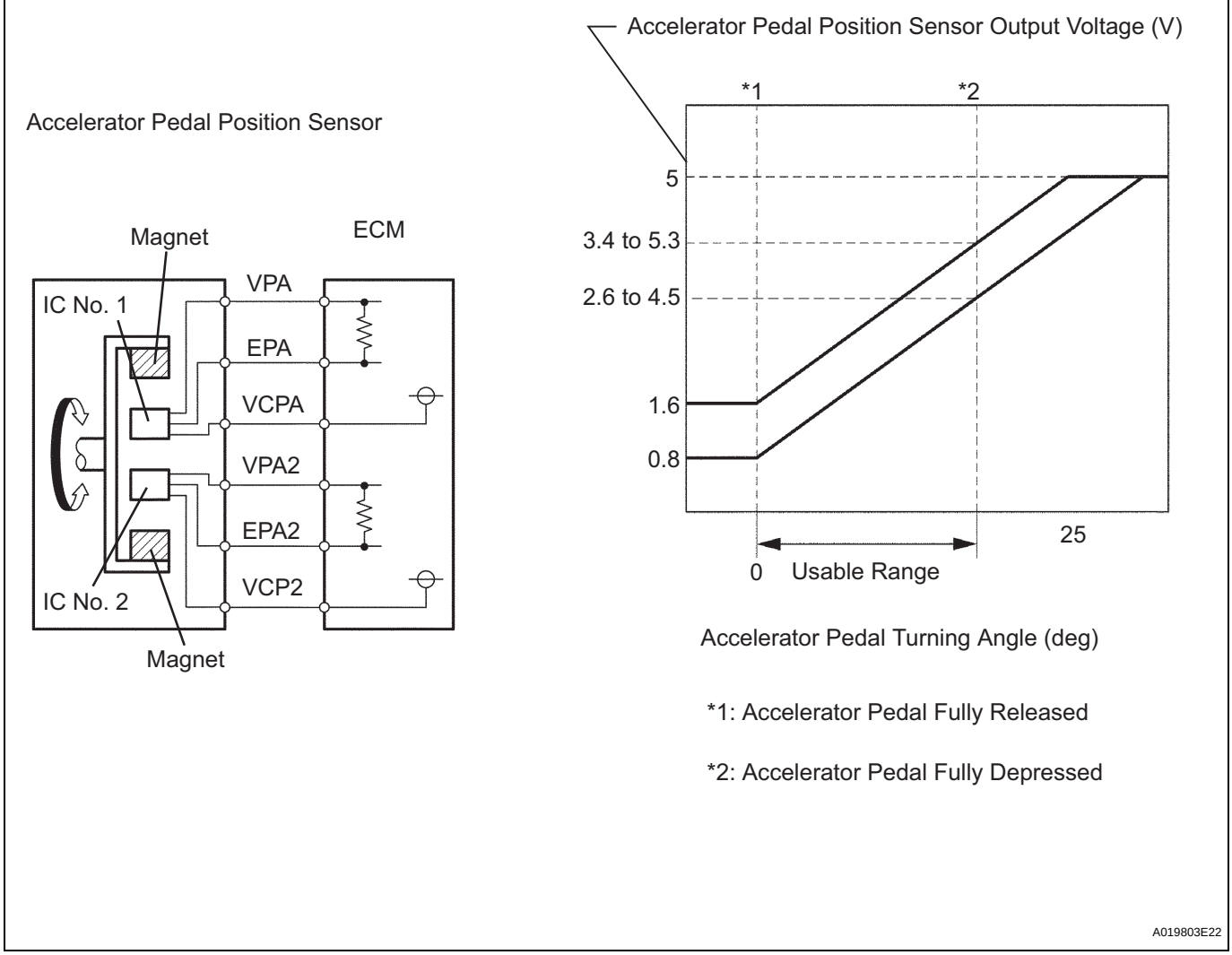
DESCRIPTION

HINT:

- This Electronic Throttle Control System (ETCS) does not use a throttle cable.
- This accelerator pedal position sensor is a non-contact type.

The accelerator pedal position sensor is mounted on the accelerator pedal bracket. The accelerator pedal position sensor has 2 sensor elements / signal outputs: VPA1 and VPA2. VPA1 is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA1. Voltage applied to VPA1 and VPA2 changes between 0V and 5V in proportion to the accelerator pedal angle.

The ECM monitors the accelerator pedal angle from VPA1 and VPA2 signal outputs, and controls the throttle motor based on these signals.



DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 seconds or more: (a) VPA is 0.4 V or less and VPA2 is 0.04 V or more; or VPA is 4.8 V or more	• Accelerator pedal position sensor • ECM
P2122	Condition (a) continues for 0.5 seconds or more when accelerator pedal is released: (a) VPA is 0.4 V or less	• Accelerator pedal position sensor • Open in VCP1 circuit • Open or short to ground in VPA circuit • ECM
P2123	Condition (a) continues for 2.0 seconds or more: (a) VPA is 4.8 V or more	• Accelerator pedal position sensor • Open in EPA circuit • ECM
P2125	Condition (a) continues for 0.5 seconds or more: (a) VPA2 is 1.2 V or less and VPA is 0.04 V or more: or VPA2 is 4.8 V or more and VPA is between 0.4 V and 3.45 V	• Accelerator pedal position sensor • ECM
P2127	Condition (a) continues for 0.5 seconds or more when accelerator pedal is released: (a) VPA2 is 1.2 V or less	• Accelerator pedal position sensor • Open in VCP2 circuit • Open or short to ground in VPA2 circuit • ECM
P2128	Conditions (a) and (b) continue for 2.0 seconds or more: (a) VPA2 is 4.8 V or more (b) VPA is 0.4 V or more and VPA is 3.45 V or less	• Accelerator pedal position sensor • Open in EPA2 circuit • ECM

DTC No.	DTC Detection Condition	Trouble Area
P2138	Condition (a) or (b) continues for 2.0 seconds or more: (a) Difference between VPA and VPA2 is 0.02 V or less (b) VPA is 0.4 V or less and VPA2 is 1.2 V or less	• VPA and VPA2 circuits are shorted • Accelerator pedal position sensor • ECM

HINT:
After confirming DTCs P2120, P2122, P2123, P2125, P2127, P2128 and P2138, use the intelligent tester or the OBD II scan tool to confirm the accelerator pedal position sensor output voltage.

Trouble Area	Accelerator pedal position expressed as voltage output	Accelerator pedal position expressed as voltage output	Accelerator pedal position expressed as voltage output	Accelerator pedal position expressed as voltage output
	Accelerator pedal released	Accelerator pedal released	Accelerator pedal depressed	Accelerator pedal depressed
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA circuit open or ground short	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.3 V
VPA2 circuit open or ground short	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 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V

ES

MONITOR DESCRIPTION

When VPA or VPA2 deviates from the standard, or the difference between the voltage outputs of the two sensors is less than the threshold, the ECM concludes that there is a defect in the accelerator pedal position sensor. The ECM turns on the MIL and a DTC is set.
Example:
The voltage output of the VPA is below 0.4 V or exceeds 4.8 V.

FAIL-SAFE

The accelerator pedal position sensor has 2 (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the two sensor circuits and switches to fail-safe mode. In fail-safe mode, the functioning circuit is used to calculate the accelerator pedal opening angle to allow the vehicle to continue driving. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal to be fully closed. In this case, the throttle valve will remain closed as if the engine is idling.
If a "pass" condition is detected and then the ignition switch is turned OFF, the fail-safe operation will stop and the system will return to normal condition.

MONITOR STRATEGY

Related DTCs	P2120: APP Sensor 1 Range Check (Chattering) P2122: APP Sensor 1 Range Check (Low voltage) P2123: APP Sensor 1 Range Check (High voltage) P2125: APP Sensor 2 Range Check (Chattering) P2127: APP Sensor 2 Range Check (Low voltage) P2128: APP Sensor 2 Range Check (High voltage) P2138: APP Sensor Range Check (Correlation)
Required sensors / components (Main)	APP sensor
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediate
Sequence operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

P2120:

Either of the following conditions is met:	Condition 1 or 2
1. VPA1 voltage when VPA2 is 0.04 V or more	0.4 V or less
2. VPA1 voltage	4.8 V or more

P2122:

VPA1 voltage when VPA2 is 0.04 V or more	0.4 V or less

P2123:

VPA1 voltage	4.8 V or more

P2125:

Either of the following conditions is met:	Condition 1 or 2
1. VPA2 voltage when VPA1 is 0.04 V or more	1.2 V or less
2. VPA2 voltage when VPA1 is 0.4 to 3.45 V	4.8 V or more

P2127:

VPA2 voltage when VPA1 is 0.04 V or more	1.2 V or less

P2128:

VPA2 voltage when VPA1 is 0.4 to 3.45 V	4.8 V or more

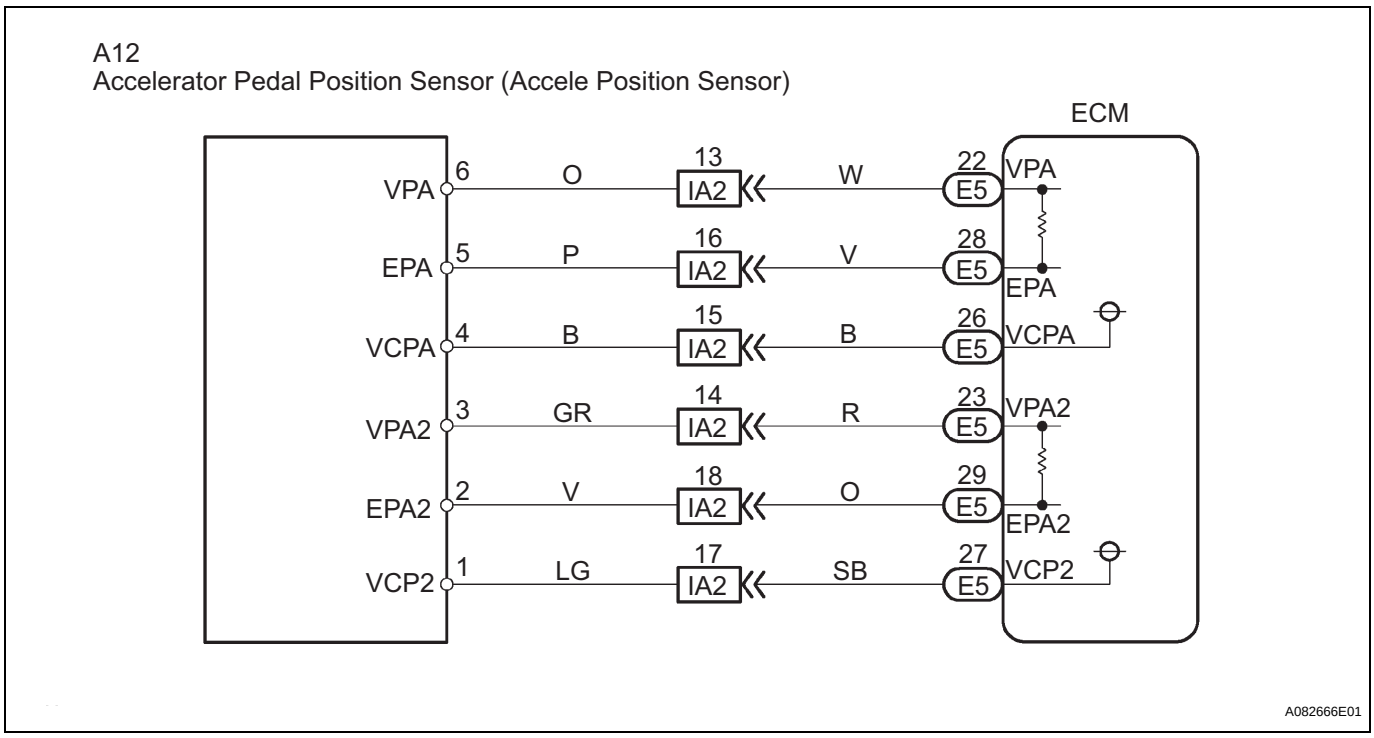
P2138:

Either of the following conditions is met:	Condition 1 or 2
Condition 1	-
Difference between VPA 1 and VPA2 voltages	0.02 V or less
Condition 2	-
VPA1 voltage	0.4 V or less
VPA2 voltage	1.2 V or less

COMPONENT OPERATING RANGE

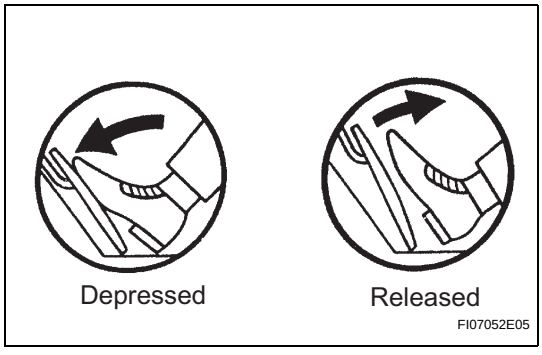
VPA1 voltage	0.5 to 4.5 V
VPA2 voltage	1.2 to 4.8 V

WIRING DIAGRAM



HINT:
Read freeze frame data using the intelligent tester or the OBD II scan tool. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, 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	READ VALUE OF INTELLIGENT TESTER (ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch ON.
(c) On the intelligent tester, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / ACCEL POS #1 and ACCEL POS #2. Read the values.

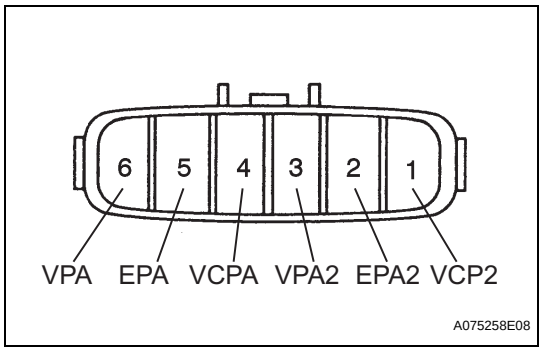
Standard voltage

Accelerator Pedal	ACCEL POS #1	ACCEL POS #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 ASSEMBLY (ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A12 sensor connector.
(b) Measure the resistance of the sensor terminals.
Standard resistance

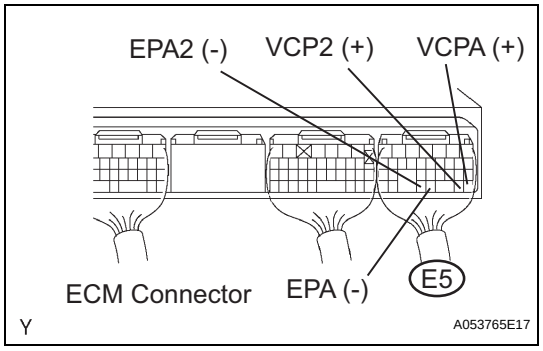
Tester Connection	Specified Condition
3 (VPA2) - 5 (EPA)	5.0 kΩ or less
6 (VPA) - 2 (EP2)	5.0 kΩ or less
4 (VCPA) - 5 (EPA)	2.25 to 4.75 kΩ
1 (VCP) - 2 (EP2)	2.25 to 4.75 kΩ

(c) Reconnect the sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSEMBLY**

OK

3 INSPECT ECM (VCPA AND VCP2 VOLTAGE)



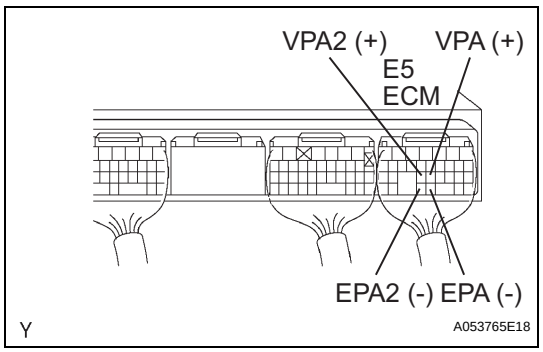
(a) Turn the ignition switch ON.
(b) Measure the voltage of the E5 ECM connector.
Standard voltage

Tester Connection	Specified Condition
E5-26 (VCPA) - E5-28 (EPA) E5-27 (VCP2) - E5-29 (EPA2)	4.5 to 5.5 V

NG → **REPLACE ECM**

OK

4 INSPECT ECM (VPA AND VPA2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage of the ECM connector.
Standard voltage

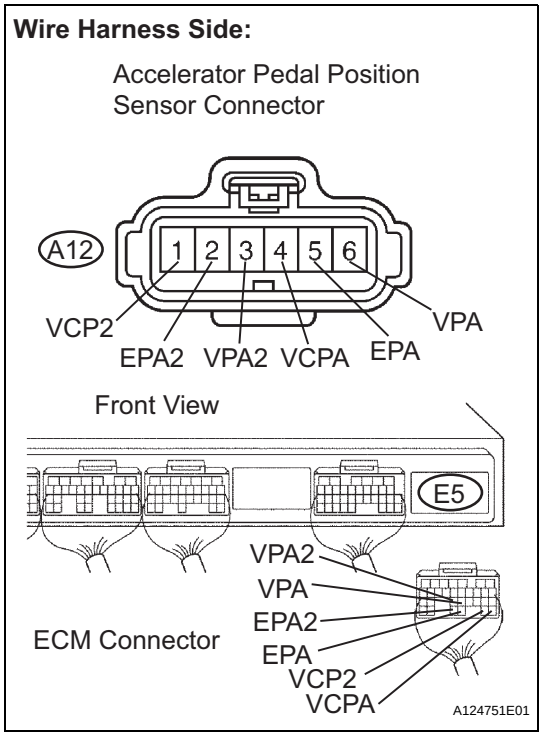
Tester Condition	Accelerator Pedal Condition	Specified Condition
E5-22 (VPA) - E5-28 (EPA)	Released	0.5 to 1.1 V
E5-22 (VPA) - E5-28 (EPA)	Depressed	2.6 to 4.5 V
E5-23 (VPA2) - E5-29 (EPA2)	Released	1.2 to 2.9 V
E5-23 (VPA2) - E5-29 (EPA2)	Depressed	3.4 to 5.5 V

OK → **REPLACE ECM**

ES

NG

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



(a) Disconnect the A12 sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
A12-6 (VCP1) - E5-26 (VCPA) A12-5 (VPA1) - E5-22 (VPA) A12-4 (VCP2) - E5-27 (VCP2) A12-3 (EP1) - E5-28 (EPA) A12-2 (VPA2) - E5-23 (VPA2) A12-1 (EP2) - E5-29 (EPA2)	Below 1 Ω
A12-6 (VCP1) or E5-26 (VCPA) - Body ground A12-5 (VPA1) or E5-22 (VPA) - Body ground A12-4 (VCP2) or E5-27 (VCP2) - Body ground A12-3 (EP1) or E5-28 (EPA) - Body ground A12-2 (VPA2) or E5-23 (VPA2) - Body ground A12-1 (EP2) or E5-29 (EPA2) - Body ground	10 kΩ or higher

(d) Reconnect the sensor connector and ECM connector.

NG → REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

6	READ OUTPUT DTC (ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (See page ES-28).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read the DTC.

Result

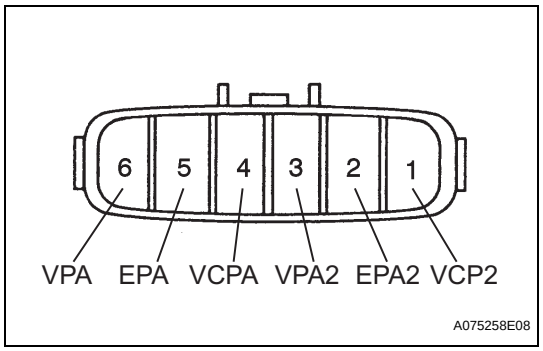
Display (DTC Output)	Proceed to
P2120, P2122, P2123, P2125, P2127, P2128 and/or P2138 are output again	A
No DTC output	B

B → SYSTEM OK

A

REPLACE ECM

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



(a) Disconnect the A12 sensor connector.
(b) Measure the resistance of the sensor terminals.
Standard resistance

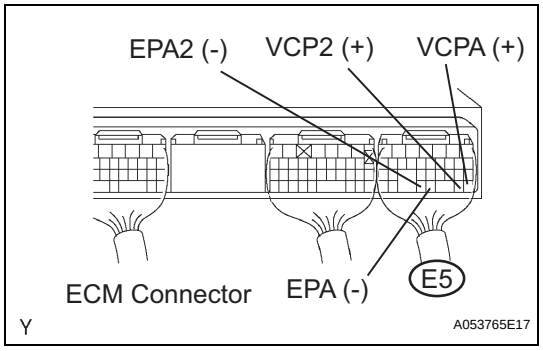
Tester Connection	Specified Condition
3 (VPA2) - 5 (EPA)	5.0 kΩ or less
6 (VPA1) - 2 (EPA2)	5.0 kΩ or less
4 (VCP1) - 5 (EPA)	2.25 to 4.75 kΩ
2 (VCP2) - 2 (EPA2)	2.25 to 4.75 kΩ

(c) Reconnect the sensor connector.

NG → **REPLACE ACCELERATOR PEDAL ASSEMBLY**

OK

2 INSPECT ECM (VCPA AND VCP2 VOLTAGE)



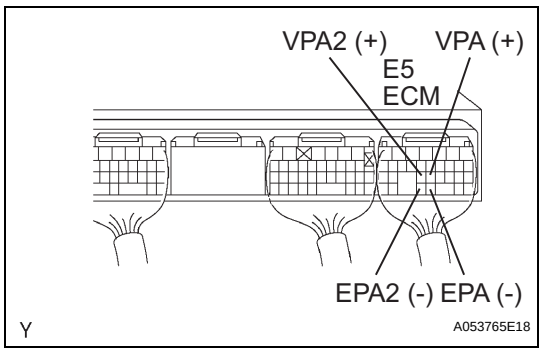
(a) Turn the ignition switch ON.
(b) Measure the voltage of the ECM connector.
Standard voltage

Tester Connection	Specified Condition
E5-26 (VCPA) - E5-28 (EPA) E5-27 (VCP2) - E5-29 (EPA2)	4.5 to 5.5 V

NG → **REPLACE ECM**

OK

3 INSPECT ECM (VPA, VPA2 VOLTAGE)



(a) Turn the ignition switch ON.
(b) Measure the voltage of the ECM connector.
Standard voltage

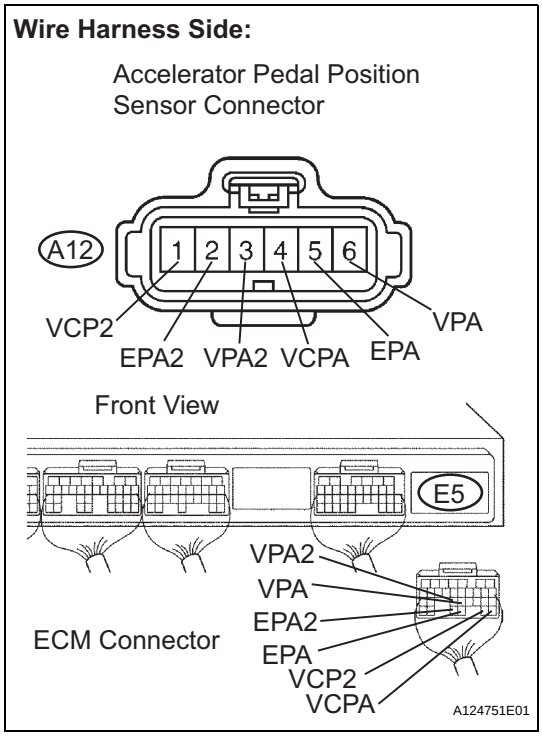
Tester Condition	Accelerator Pedal Condition	Specified Condition
E5-22 (VPA) - E5-28 (EPA)	Released	0.5 to 1.1 V
E5-22 (VPA) - E5-28 (EPA)	Depressed	2.6 to 4.5 V
E5-23 (VPA2) - E5-29 (EPA2)	Released	1.2 to 2.9 V
E5-23 (VPA2) - E5-29 (EPA2)	Depressed	3.4 to 5.5 V

OK → **REPLACE ECM**

ES

NG

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



(a) Disconnect the A12 sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Condition	Specified Condition
A12-6 (VCP1) - E5-26 (VCPA) A12-5 (VPA1) - E5-22 (VPA) A12-4 (VCP2) - E5-27 (VCP2) A12-3 (EP1) - E5-28 (EPA) A12-2 (VPA2) - E5-23 (VPA2) A12-1 (EP2) - E5-29 (EPA2)	Below 1 Ω
A12-6 (VCP1) or E5-26 (VCPA) - Body ground A12-5 (VPA1) or E5-22 (VPA) - Body ground A12-4 (VCP2) or E5-27 (VCP2) - Body ground A12-3 (EP1) or E5-28 (EPA) - Body ground A12-2 (VPA2) or E5-23 (VPA2) - Body ground A12-1 (EP2) or E5-29 (EPA2) - Body ground	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

5	READ OUTPUT DTC (ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN)

(a) Clear the DTC (See page ES-28).
(b) Start the engine.
(c) Run the engine at idle for 15 seconds or more.
(d) Read the DTC.

Result

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

B → SYSTEM OK

A

REPLACE ECM