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:
This is the repair procedure for the accelerator pedal position sensor.

CIRCUIT DESCRIPTION

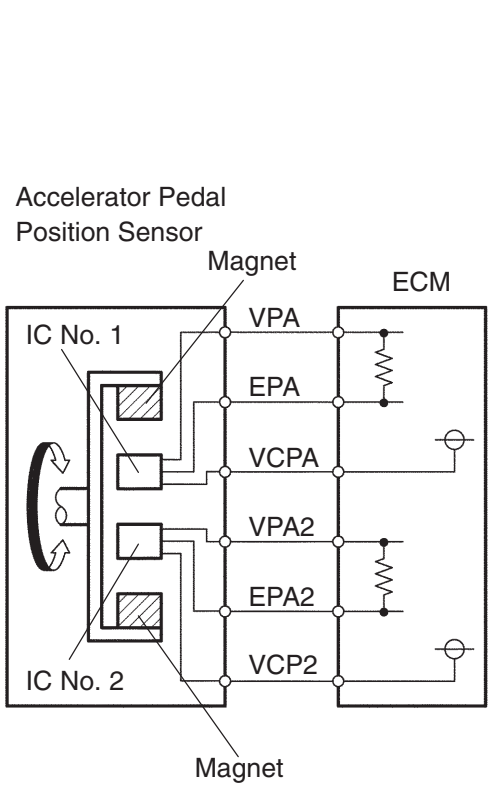
HINT:

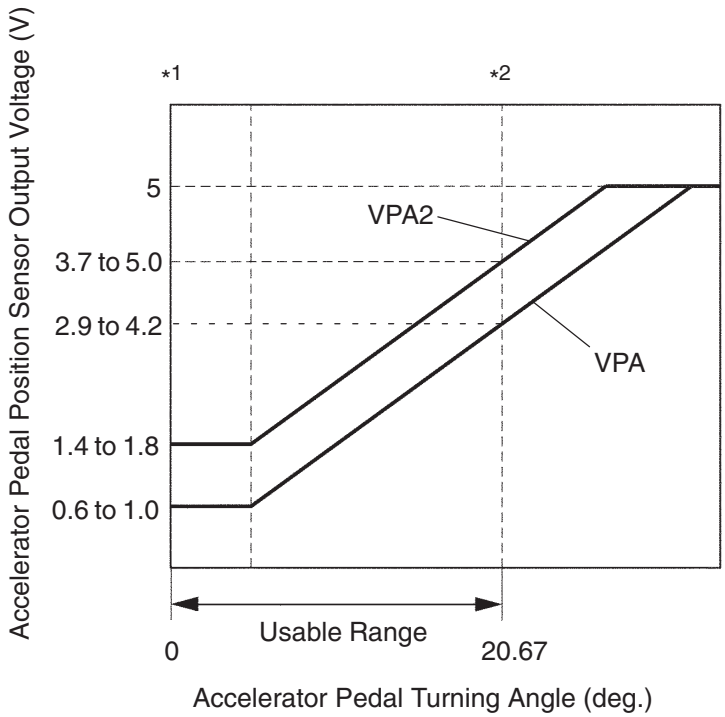
- This electrical throttle system does not use a throttle cable.
- This accelerator pedal position sensor is non–contact type.

The accelerator pedal position sensor is mounted on the accelerator pedal and detects the opening angle of the accelerator pedal. Since this sensor is electronically controlled with Hall–effect elements, accurate control and reliability can be obtained. It has 2 sensors to detect the accelerator position and a malfunction of the accelerator position sensor.

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

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





*1: Accelerator Pedal Fully Released

*2: Accelerator Pedal Fully Depressed

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DTC No.	DTC Detection Condition (All of following are 1 trip detection logic)	Trouble Area
P2120/19	Condition (a) continues for 0.5 sec. or more: (a) VPA is 0.2 V or less or VPA is 4.8 V or more	• Accelerator pedal position sensor • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM
P2122/19	VPA is 0.2 V or less for 0.5 sec. or more when VPA2 output indicate accelerator pedal is opened	• Accelerator pedal position sensor • Open in VCPA circuit • VPA circuit open or ground short • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM
P2123/19	Condition (a) continues for 2.0 sec. or more: (a) VPA is 4.8 V or more	• Accelerator pedal position sensor • Open in EPA circuit • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM
P2125/19	Condition (a) continues for 0.5 sec. or more: (a) (VPA2 is 0.5 V or less) or (VPA2 is 4.8 V or more)	• Accelerator pedal position sensor • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM
P2127/19	VPA2 is 0.5 V or less for 0.5 sec. or more when VPA output indicates accelerator pedal is opened	• Accelerator pedal position sensor • Open in VCP2 circuit • VPA2 circuit open or ground short • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM
P2128/19	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 is 4.8 V or more (b) VPA is 0.2 V or more and VPA is 3.45 V or less	• Accelerator pedal position sensor • Open in EPA2 circuit • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM
P2138/19	Condition (a) or (b) continues for 2.0 sec. or more: (a) Difference between VPA and VPA2 is 0.02 V or less (b) VPA is 0.2 V or less and VPA2 is 0.5 V or less	• VPA and VPA2 circuit are short circuited • Accelerator pedal position sensor • Accelerator pedal • Accelerator pedal rod (arm) deformed • ECM

HINT:

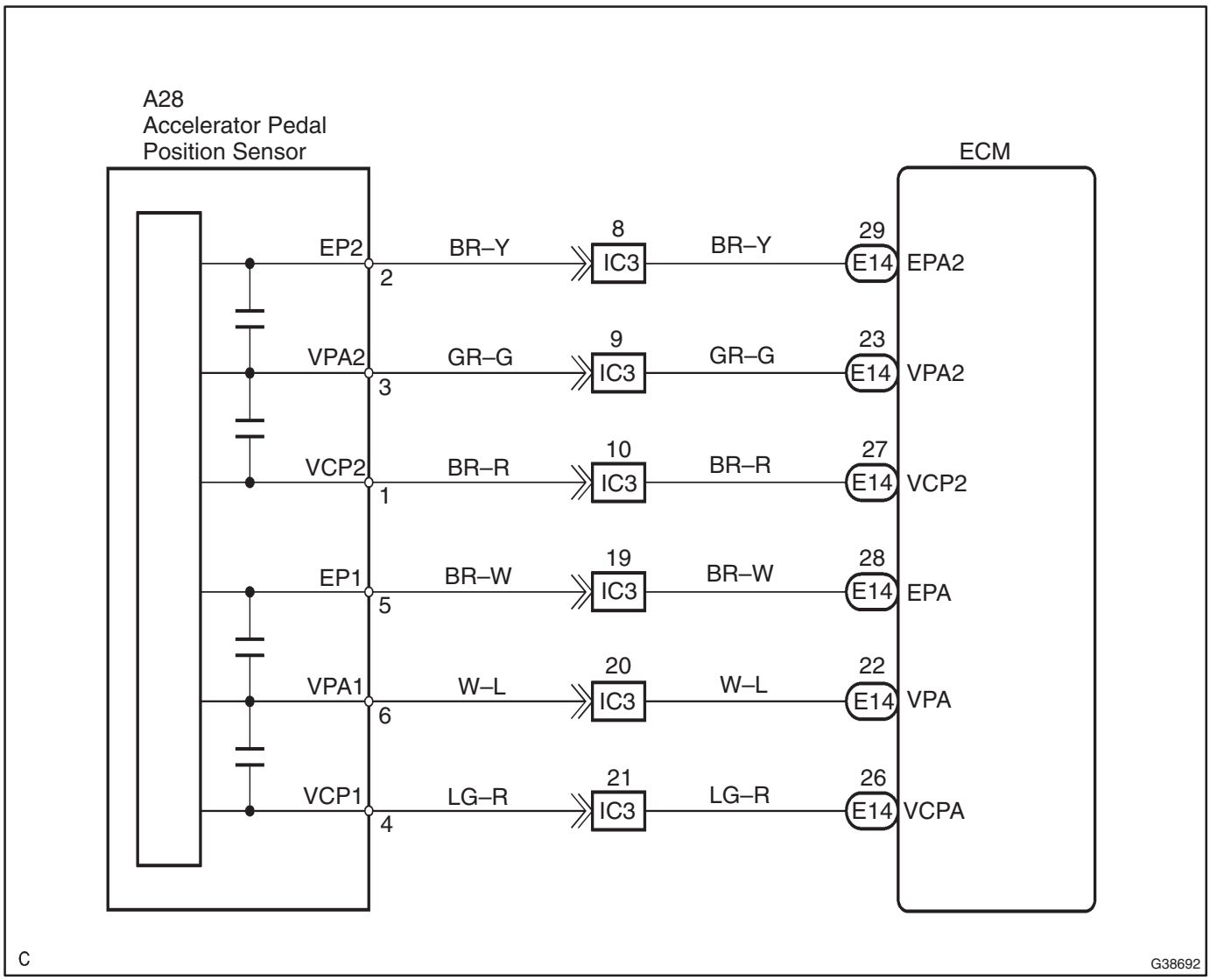
When DTC P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 or P2138/19 is detected, check the output voltage of the accelerator pedal position sensor by entering the following menus on the intelligent tester II: Powertrain / Engine / Data List / Accelerator Position No. 1 and Accelerator Position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

—	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
Trouble Area	ACCEL POS No. 1	ACCEL POS No. 2	ACCEL POS No. 1	ACCEL POS No. 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	1.4 to 1.8 V	0 to 0.2 V	3.7 to 5.0 V
VPA2 circuit open or ground short	0.6 to 1.0 V	0 to 0.2 V	2.9 to 4.2 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 positions are expressed as voltages.

WIRING DIAGRAM



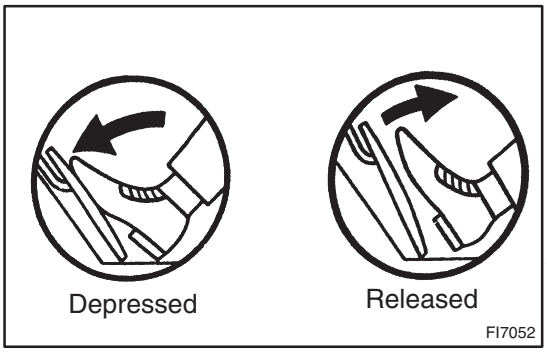
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the intelligent tester II. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, and other data from the time the malfunction occurred.

When using intelligent tester II:

1	READ DATA LIST (ACCELERATOR POSITION NO. 1, ACCELERATOR POSITION NO. 2)



(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch ON and turn the intelligent tester II ON.
(c) Enter the following menus: Powertrain / Engine / Data List / Accelerator Position No. 1 and Accelerator Position No. 2.
(d) Read the values.

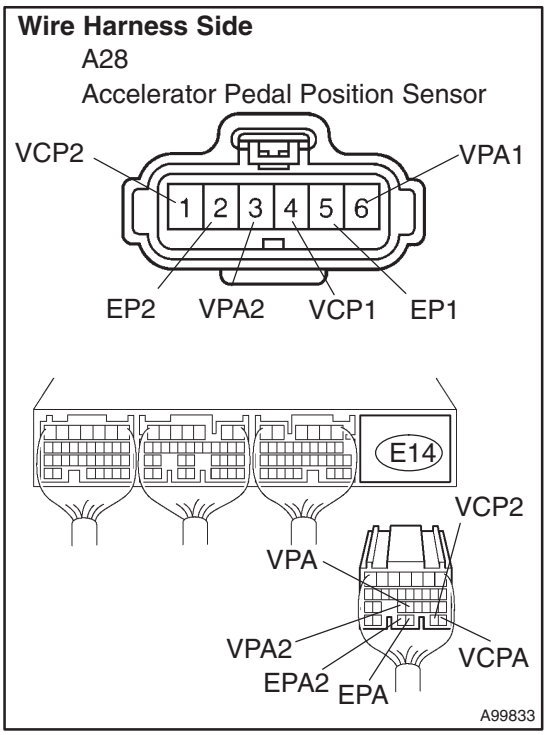
Standard:

Accelerator Pedal	Accelerator Position No. 1	Accelerator Position No. 2
Released	0.6 to 1.0 V	1.4 to 1.8 V
Depressed	2.9 to 4.2 V	3.7 to 5.0 V

OK	Go to step 5

NG

2	CHECK WIRE HARNESS (ECM – ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A28 sensor connector.
(b) Disconnect the E14 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

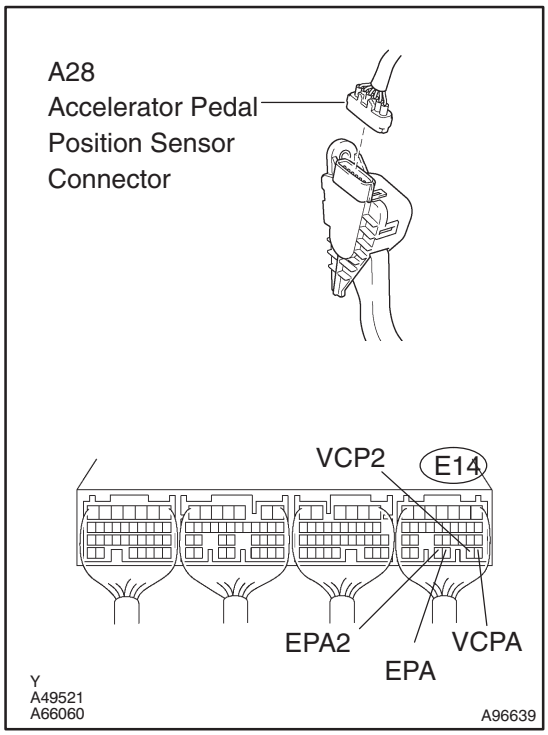
Standard:

Tester Connection	Specified Condition
A28–1 (VCP2) – E14–27 (VCP2) A28–2 (EP2) – E14–29 (EPA2) A28–3 (VPA2) – E14–23 (VPA2) A28–4 (VCP1) – E14–26 (VCPA) A28–5 (EP1) – E14–28 (EPA) A28–6 (VPA1) – E14–22 (VPA)	Below 1 Ω
A28–1 (VCP2) or E14–27 (VCP2) – Body ground A28–2 (EP2) or E14–29 (EPA2) – Body ground A28–3 (VPA2) or E14–23 (VPA2) – Body ground A28–4 (VCP1) or E14–26 (VCPA) – Body ground A28–5 (EP1) or E14–28 (EPA) – Body ground A28–6 (VPA1) or E14–22 (VPA) – Body ground	10 kΩ or higher

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3	CHECK ECM (VCPA, VCP2 VOLTAGE)



(a) Disconnect the A28 sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the ECM connector.
Standard:

Tester Connection	Specified Condition
E14–26 (VCPA) – E14–28 (EPA) E14–27 (VCP2) – E14–29 (EPA2)	4.5 to 5.0 V

NG → **REPLACE ECM (See Pub. No. RM990E, page 10–34)**

NOTICE:
After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See Pub. No. RM990E, page 10–33)

NEXT

5	READ OUTPUT DTC (ACCELERATOR PEDAL POSITION SENSOR DTC IS OUTPUT AGAIN)

(a) Clear the DTC (see page 05–466).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC (see page 05–466).
Result:

Display (DTC output)	Proceed to
P2120/19, P2121/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 or P2138/19 is output again	A
P2120/19, P2121/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 or P2138/19 is not output	B

B → **SYSTEM OK**

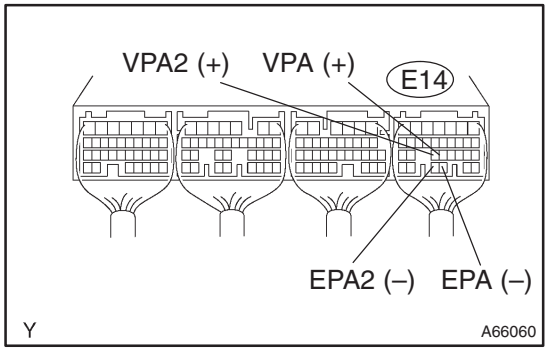
A

REPLACE ECM (See Pub. No. RM990E, page 10–34)

NOTICE:
After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.

When not using intelligent tester II:

1 CHECK ECM (VPA, VPA2 VOLTAGE)



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

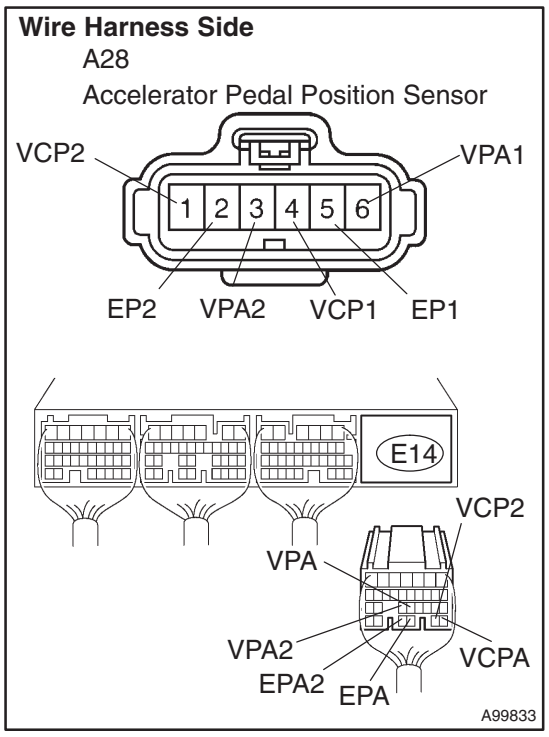
Tester Connection	Accelerator Pedal Condition	Specified Condition
E14–22 (VPA) – E14–28 (EPA)	Released	0.6 to 1.0 V
E14–22 (VPA) – E14–28 (EPA)	Depressed	2.9 to 4.2 V
E14–23 (VPA2) – E14–29 (EPA2)	Released	1.4 to 1.8 V
E14–23 (VPA2) – E14–29 (EPA2)	Depressed	3.7 to 5.0 V

OK → **REPLACE ECM (See Pub. No. RM990E, page 10–34)**

NOTICE:
After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.

NG

2 CHECK WIRE HARNESS (ECM – ACCELERATOR PEDAL POSITION SENSOR)



(a) Disconnect the A28 sensor connector.
(b) Disconnect the E14 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

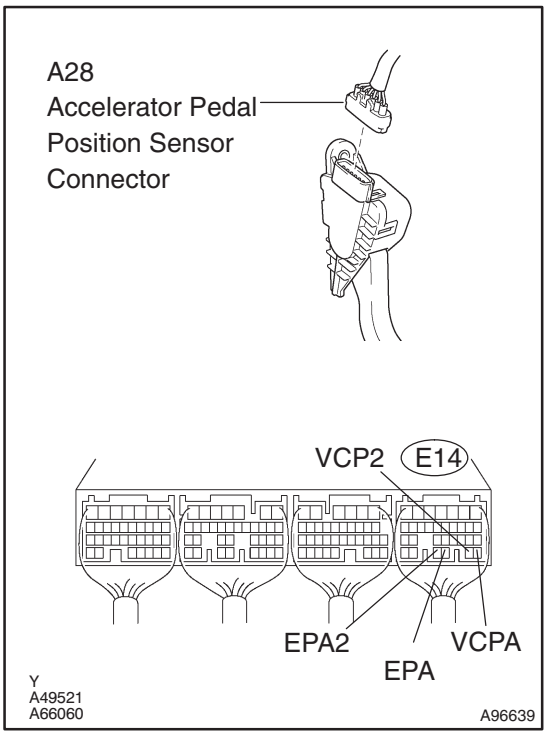
Standard:

Tester Connection	Specified Condition
A28–1 (VCP2) – E14–27 (VCP2) A28–2 (EP2) – E14–29 (EPA2) A28–3 (VPA2) – E14–23 (VPA2) A28–4 (VCP1) – E14–26 (VCPA) A28–5 (EP1) – E14–28 (EPA) A28–6 (VPA1) – E14–22 (VPA)	Below 1 Ω
A28–1 (VCP2) or E14–27 (VCP2) – Body ground A28–2 (EP2) or E14–29 (EPA2) – Body ground A28–3 (VPA2) or E14–23 (VPA2) – Body ground A28–4 (VCP1) or E14–26 (VCPA) – Body ground A28–5 (EP1) or E14–28 (EPA) – Body ground A28–6 (VPA1) or E14–22 (VPA) – Body ground	10 kΩ or higher

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

OK

3	CHECK ECM (VCPA, VCP2 VOLTAGE)



(a) Disconnect the A28 sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the ECM connector.
Standard:

Tester Connection	Specified Condition
E14–26 (VCPA) – E14–28 (EPA) E14–27 (VCP2) – E14–29 (EPA2)	4.5 to 5.0 V

NG → **REPLACE ECM (See page (See Pub. No. RM990E, page 10–34))**

NOTICE:
After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See Pub. No. RM990E, page 10–33)

NEXT

5	READ OUTPUT DTC (ACCELERATOR PEDAL POSITION SENSOR DTC IS OUTPUT AGAIN)

(a) Clear the DTC (see page 05–466).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC (see page 05–466).
Result:

Display (DTC output)	Proceed to
P2120/19, P2121/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 or P2138/19 is output again	A
P2120/19, P2121/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 or P2138/19 is not DTC output	B

B → **SYSTEM OK**

A

REPLACE ECM (See Pub. No. RM990E, page 10–34)

NOTICE:
After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.