DTC	**P2120/19**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT**

DTC	**P2121/19**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”D” CIRCUIT RANGE/PERFORMANCE**

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

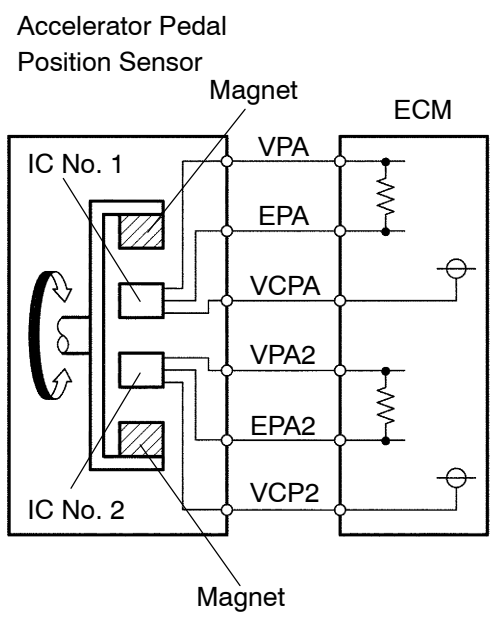
HINT:

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

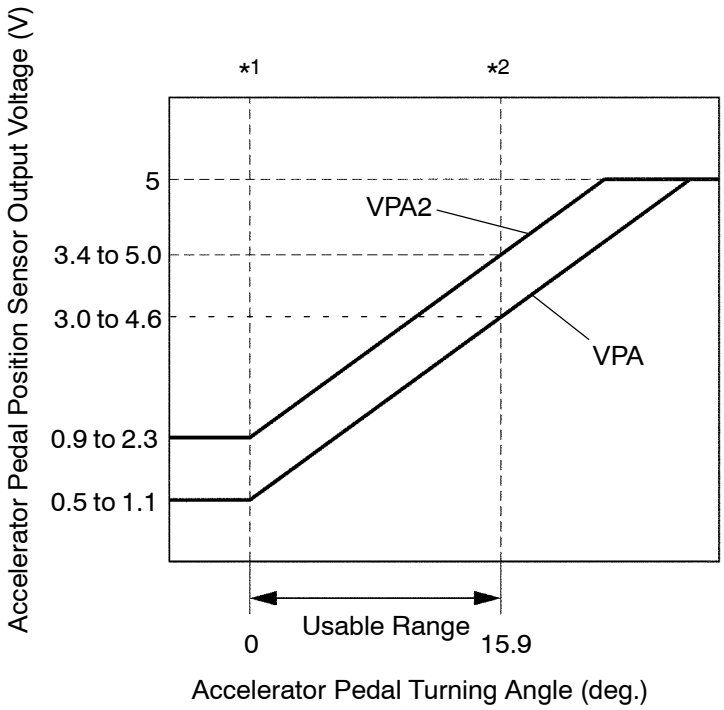
The accelerator pedal position sensor is mounted on the accelerator pedal and detects the opening angle of the accelerator pedal. Since this sensor is electronically controlled with Hall–effect elements, accurate control and reliability can be obtained. It has 2 sensors to detect the accelerator position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

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.



A19694



*1: Accelerator Pedal Fully Released

*2: Accelerator Pedal Fully Depressed

A19803

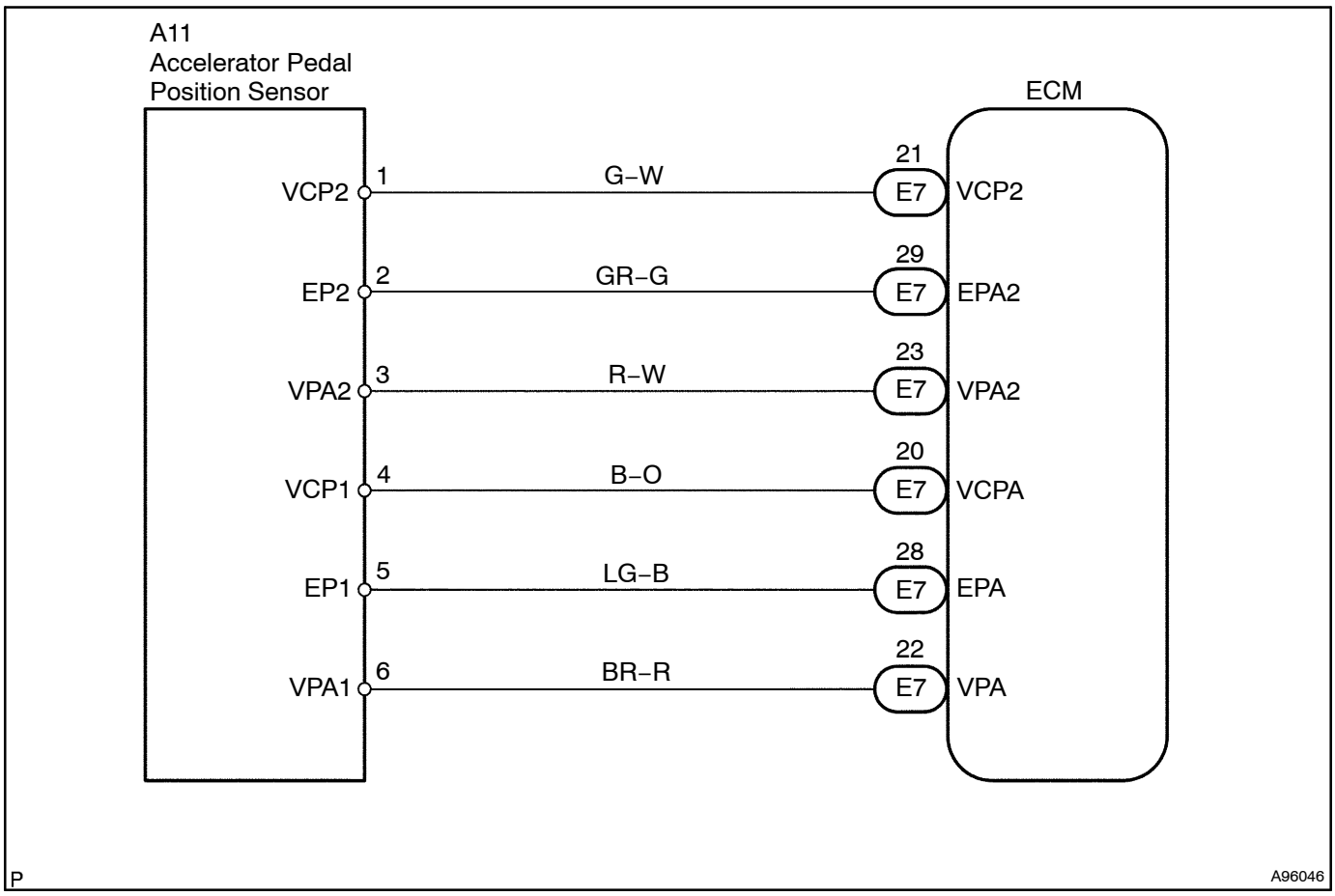
DTC No.	DTC Detecting Condition	Trouble Area
P2120/19	Condition (a) continues for 1 second or more: (a) VPA less than 0.2 V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
P2121/19	Conditions (a) and (b) continue for 1 second or more: (a) Difference between VPA and VPA2 exceeds the threshold (b) IDL is OFF	Same as DTC No. P2120/19
P2122/19	Conditions (a) and (b) continue for 1 second or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	Same as DTC No. P2120/19
P2123/19	Condition (a) continues for 2 seconds or more: (a) VPA greater than 4.8 V	Same as DTC No. P2120/19
P2125/19	Condition (a) continues for 1 second or more: (a) VPA2 less than 0.5 V and VPA greater than 0.97 deg, or VPA2 greater than 4.8 V and VPA greater than 0.2 V but less than 3.45 V	Same as DTC No. P2120/19
P2127/19	Conditions (a) and (b) continue for 1 second or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	Same as DTC No. P2120/19
P2128/19	Conditions (a) and (b) continue for 2 seconds or more: (a) VPA2 greater than 4.8 V (b) VPA greater than 0.2 V but less than 3.45 V	Same as DTC No. P2120/19
P2138/19	Condition (a) or (b) continues for 2 seconds or more: (a) Difference between VPA and VPA2 less than 0.02 V (b) VPA less than 0.2 V and VPA2 less than 0.5 V	Same as DTC No. P2120/19

HINT:

After confirming ”DTC P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 and P2138/19”, use the hand–held tester to confirm the accelerator pedal position sensor output voltage.

Trouble Area	Accelerator pedal position expressed as voltage output			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
VPA1 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	2.9 to 3.6 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

WIRING DIAGRAM



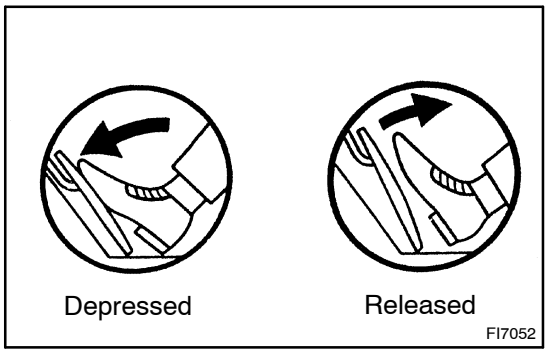
INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester. 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, if the air–fuel ratio was lean or rich, and other data from the time the malfunction occurred.

When using hand–held tester:

1	READ VALUE OF DATA LIST (ACCEL POS #1 AND ACCEL POS #2)



(a) Connect the hand–held tester (with 24 V VIM) to the DLC3.
(b) Turn the ignition switch ON.
(c) On the hand–held tester, enter the following menus: DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2. Read the values.

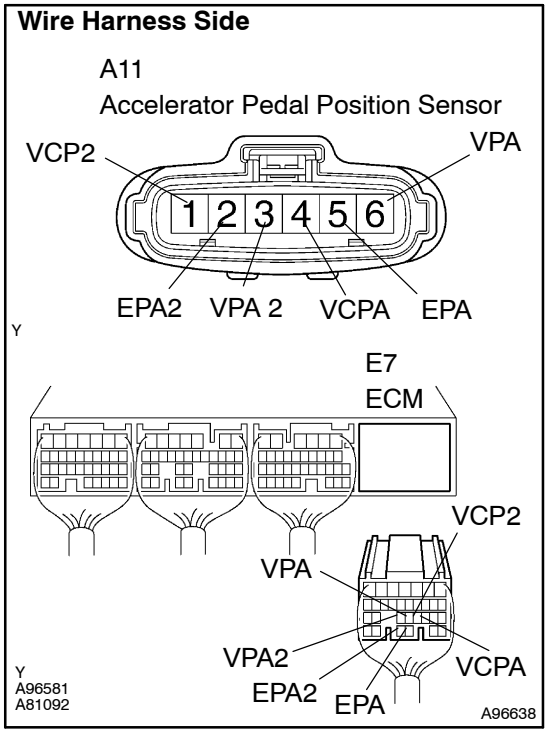
Standard:

Accelerator Pedal Condition	ACCEL POS #1	ACCEL POS #2
Released	0.5 to 1.1 V	0.9 to 2.3 V
Depressed	3.0 to 4.6 V	3.4 to 5.0 V

OK → **Go to step 5**

NG

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



(a) Disconnect the A11 sensor connector.
(b) Disconnect the E7 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

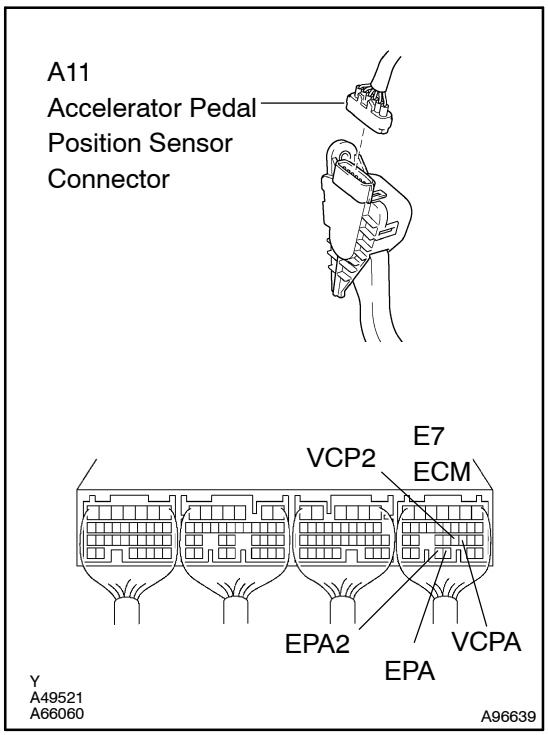
Standard:

Tester Connection	Specified Condition
A11–1 (VCP2) – E7–21 (VCP2) A11–2 (EPA2) – E7–29 (EPA2) A11–3 (VPA2) – E7–23 (VPA2) A11–4 (VCPA) – E7–20 (VCPA) A11–5 (EPA) – E7–28 (EPA) A11–6 (VPA) – E7–22 (VPA)	Below 1 Ω
A11–1 (VCP2) or E7–21 (VCP2) – Body ground A11–2 (EPA2) or E7–29 (EPA2) – Body ground A11–3 (VPA2) or E7–23 (VPA2) – Body ground A11–4 (VCPA) or E7–20 (VCPA) – Body ground A11–5 (EPA) or E7–28 (EPA) – Body ground A11–6 (VPA) or E7–22 (VPA) – Body ground	10 kΩ or higher

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

OK

3	CHECK ECM (VCPA, VCP2 VOLTAGE)



(a) Disconnect the A11 sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the ECM connector.
Standard:

Tester Connection	Specified Condition
E7–20 (VCPA) – E7–28 (EPA) E7–21 (VCP2) – E7–29 (EPA2)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–10)**

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–9)

GO

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

(a) Clear the DTC (see page 05–29).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC.
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

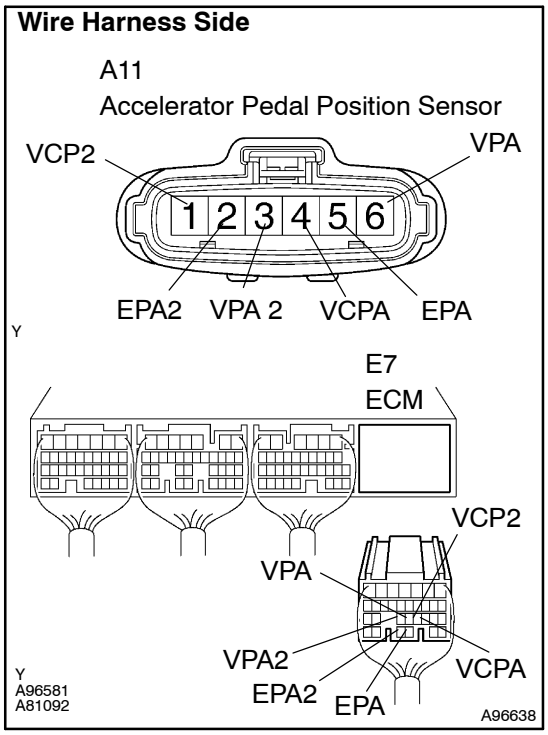
B → **SYSTEM OK**

A

REPLACE ECM (See page 10–10)

When not using hand–held tester:

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



(a) Disconnect the A11 sensor connector.
(b) Disconnect the E7 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

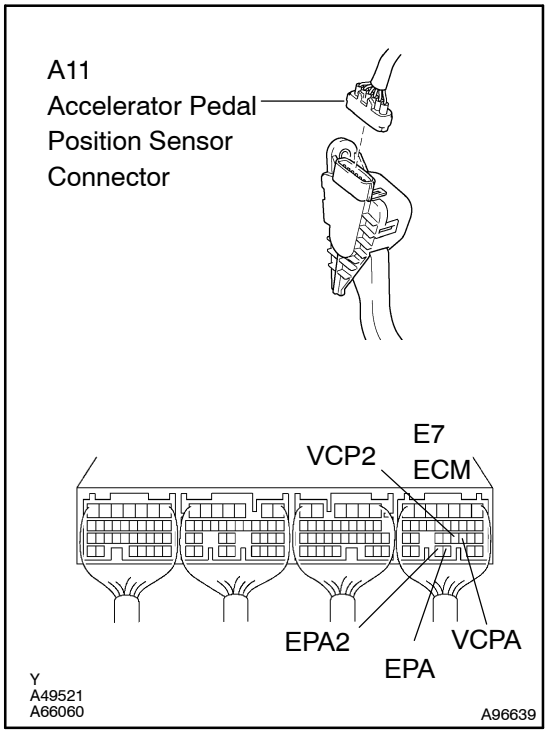
Standard:

Tester Connection	Specified Condition
A11–1 (VCP2) – E7–21 (VCP2) A11–2 (EPA2) – E7–29 (EPA2) A11–3 (VPA2) – E7–23 (VPA2) A11–4 (VCPA) – E7–20 (VCPA) A11–5 (EPA) – E7–28 (EPA) A11–6 (VPA) – E7–22 (VPA)	Below 1 Ω
A11–1 (VCP2) or E7–21 (VCP2) – Body ground A11–2 (EPA2) or E7–29 (EPA2) – Body ground A11–3 (VPA2) or E 7–23 (VPA2) – Body ground A11–4 (VCPA) or E7–20 (VCPA) – Body ground A11–5 (EPA) or E7–28 (EPA) – Body ground A11–6 (VPA) or E7–22 (VPA) – Body ground	10 kΩ or higher

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

OK

2 CHECK ECM (VCPA, VCP2 VOLTAGE)



(a) Disconnect the A11 sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the ECM connector.

Standard:

Tester Connection	Specified Condition
E7–20 (VCPA) – E7–28 (EPA) E7–21 (VCP2) – E7–29 (EPA2)	4.5 to 5.5 V

NG → **REPLACE ECM (See page 10–10)**

OK

3 REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–9)

GO

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

(a) Clear the DTC (see page 05–29).
(b) Start the engine.
(c) Drive the engine at idle for 15 seconds or more.
(d) Read the DTC.

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 page 10–10)