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

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

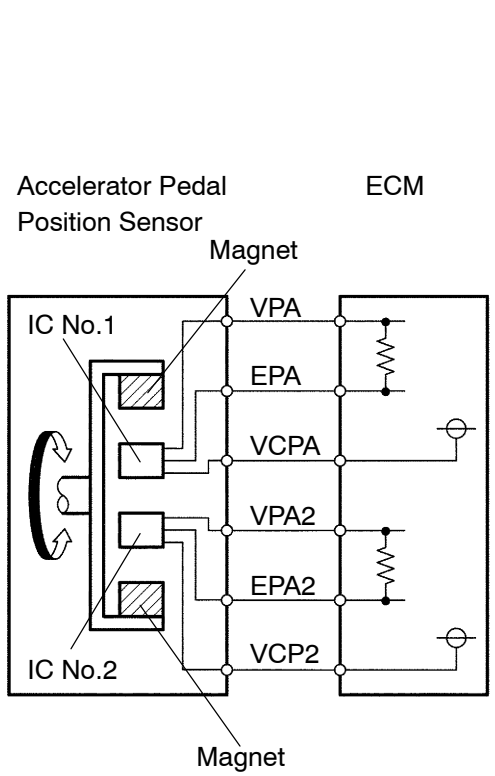
CIRCUIT DESCRIPTION

HINT:

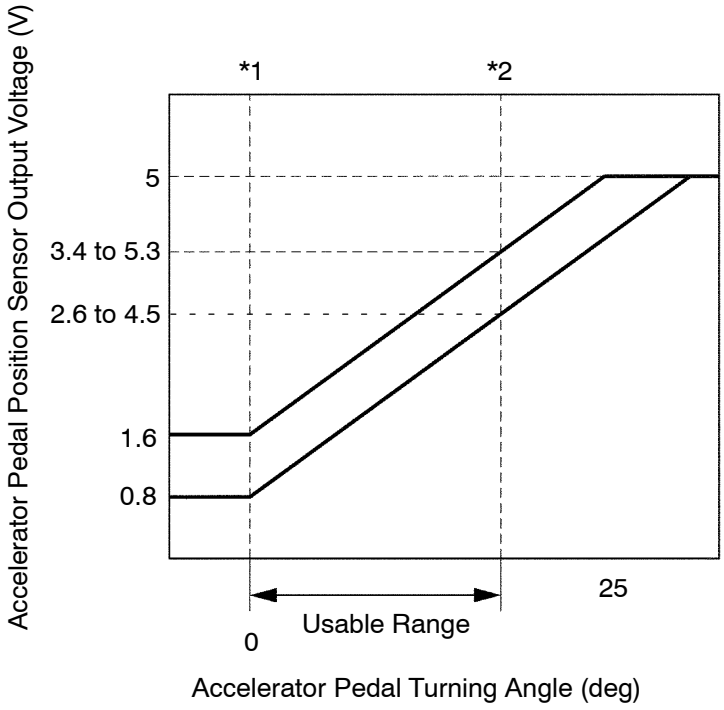
- This electrical throttle system does not use a throttle cable.
- This accelerator pedal position sensor is a non–contact type.

The accelerator pedal position sensor is mounted on the accelerator pedal and it detects the opening angle of the accelerator pedal. This sensor is electronically controlled and uses Hall–effect elements so that accurate control and reliability can be obtained. The accelerator pedal position sensor has two sensor elements and signal outputs. One element is used to detect the accelerator pedal–opening angle and the other is used to detect malfunctions of the sensor itself.

The voltage is applied to terminals VPA and VPA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the accelerator pedal. This sensor includes two signals, VPA and VPA2. VPA is used to detect the accelerator pedal opening angle and VPA2 is used to detect malfunctions in VPA. There are several checks that the ECM performs to proper operation of the accelerator pedal position sensor and VPA. 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 to make the accelerator pedal angle properly in response to driver inputs.



A19694



*1: Accelerator Pedal Fully Released
*2: Accelerator Pedal Fully Depressed

A19803

DTC No.	DTC Detection Condition	Trouble Area
P2120	Condition (a) continues for 0.5 sec. or more: (a) VPA less than 0.2V and VPA2 greater than 0.97 deg, or VPA greater than 4.8 V	• Accelerator pedal position sensor • ECM
P2122	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA less than 0.2 V (b) VPA2 greater than 0.97 deg	• Accelerator pedal position sensor • Open in VCP1 circuit • VPA circuit open or ground short • ECM
P2123	Condition (a) continues for 2.0 sec. or more: (a) VPA greater than 4.8 V	• Accelerator pedal position sensor • Open in EPA circuit • ECM
P2125	Condition (a) continues for 0.5 sec. 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 is between 0.2 V and 3.45 V)	• Accelerator pedal position sensor • ECM
P2127	Conditions (a) and (b) continue for 0.5 sec. or more: (a) VPA2 less than 0.5 V (b) VPA greater than 0.97 deg	• Accelerator pedal position sensor • Open in VCP2 circuit • VPA2 circuit open or ground short • ECM
P2128	Conditions (a) and (b) continue for 2.0 sec. or more: (a) VPA2 greater than 4.8 V (b) VPA greater than 0.2 V and VPA less than 3.45 V	• Accelerator pedal position sensor • Open in EPA2 circuit • ECM
P2138	Condition (a) or (b) continues for 2.0 sec. 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	• VPA and VPA2 circuit are short circuited • Accelerator pedal position sensor • ECM

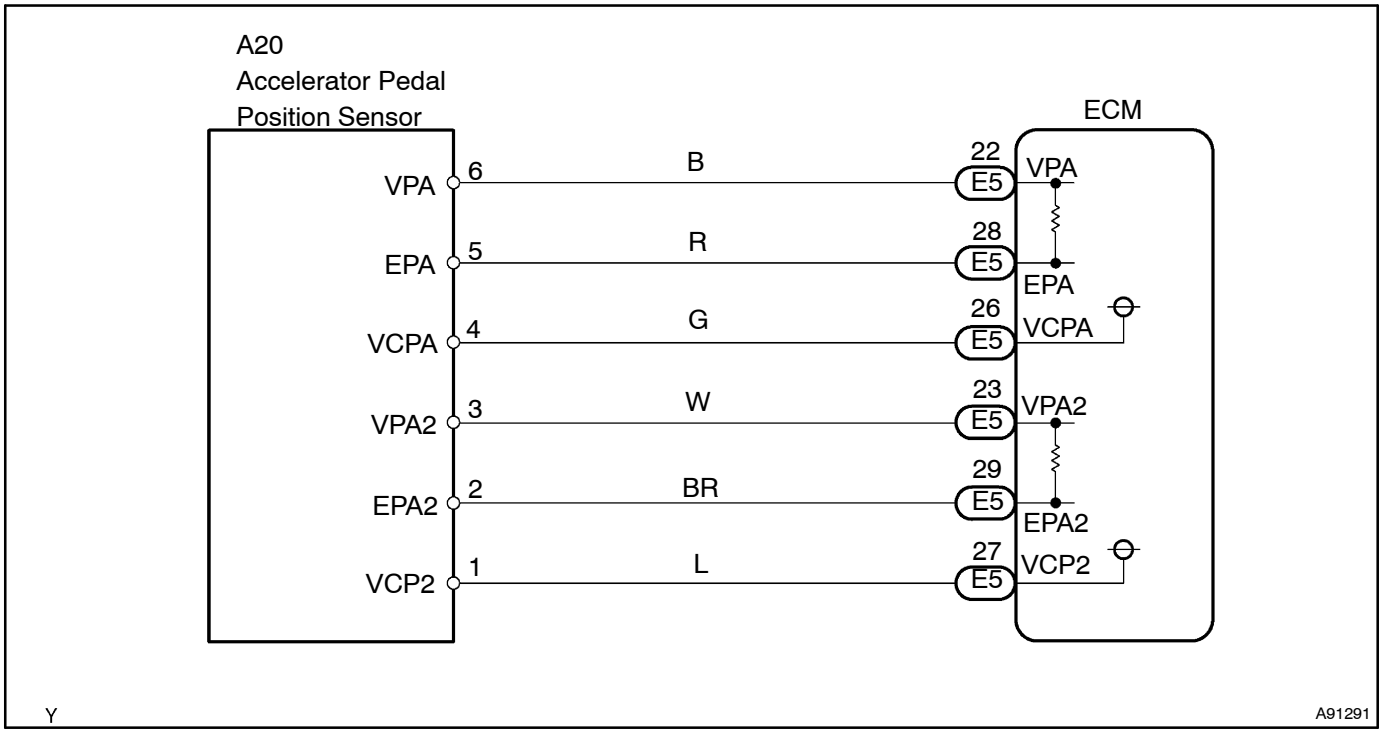
HINT:
After confirming DTC P2120, P2122, P2123, P2125, P2127, P2128 and P2138, use the hand–held tester to confirm the accelerator pedal position sensor output voltage.

	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 #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

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 limp mode. In limp 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.

WIRING DIAGRAM

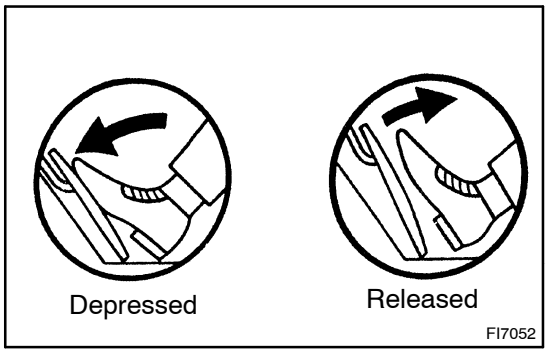


INSPECTION PROCEDURE

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.

1	READ VALUE OF HAND–HELD TESTER (ACCEL POS #1, ACCEL POS #2)



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

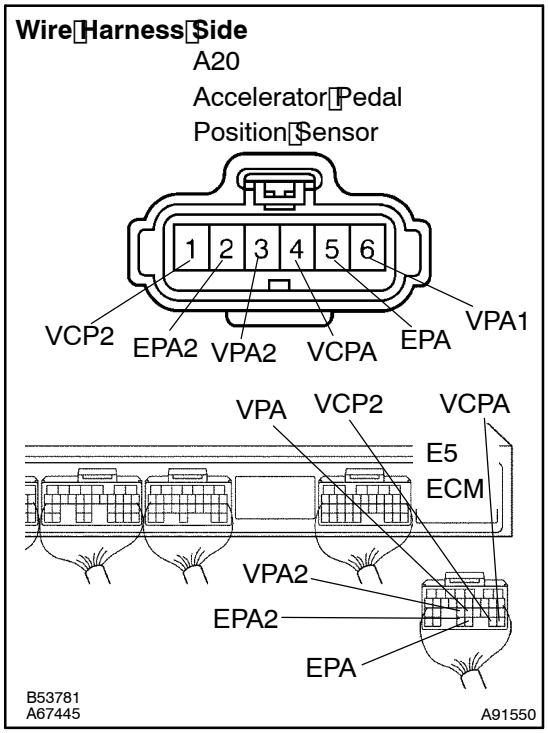
Standard:

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 CHECK WIRE HARNESS (ACCELERATOR PEDAL POSITION SENSOR – ECM)



(a) Disconnect the A20 sensor connector.
(b) Disconnect the E5 ECM connector.
(c) Check the resistance of the wire harness side connectors.

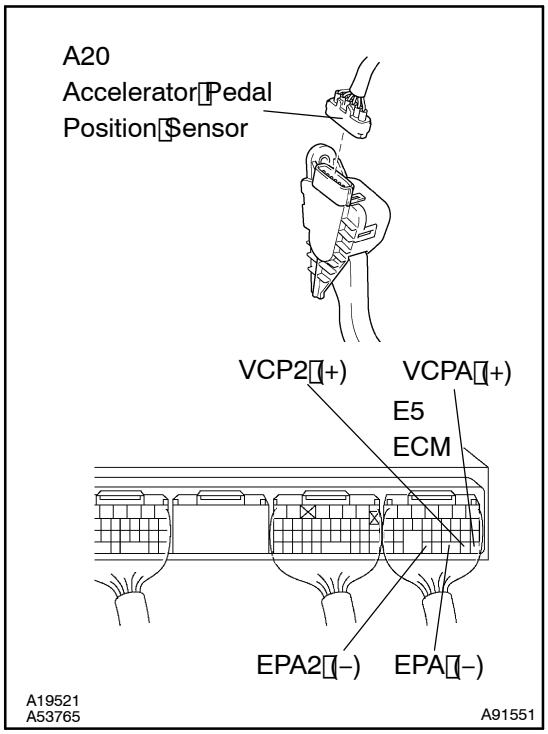
Standard:

Tester connection	Specified condition
A20–6 (VPA1) – E5–22 (VPA)	Below 1 Ω
A20–5 (EPA) – E5–28 (EPA)	
A20–4 (VCPA) – E5–26 (VCPA)	
A20–3 (VPA2) – E5–23 (VPA2)	
A20–2 (EPA2) – E5–29 (EPA2)	
A20–1 (VCP2) – E5–27 (VCP2)	
A20–6 (VPA1) or E5–22 (VPA) – Body ground	10 kΩ or higher
A20–5 (EPA) or E5–28 (EPA) – Body ground	
A20–4 (VCPA) or E5–26 (VCPA) – Body ground	
A20–3 (VPA2) or E5–23 (VPA2) – Body ground	
A20–2 (EPA2) or E5–29 (EPA2) – Body ground	
A20–1 (VCP2) or E5–27 (VCP2) – Body ground	

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

OK

3 INSPECT ECM (VCPA, VCP2 VOLTAGE)



(a) Disconnect the A20 sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the specified terminals of the E5 ECM connector.

Standard:

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 (See page 10–13)**

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–15)

GO

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

(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON. Push the hand–held tester main switch ON.
(c) Enter the following menus: DIAGNOSIS / OBD / MOBD / DTC INFO / CLEAR CODES.
(d) Clear the DTCs.
(e) Let the engine idle for 60 seconds and perform quick acceleration to 2,500 rpm for 30 seconds.
(f) Enter the following menus: DIAGNOSIS / OBD / MOBD / DTC INFO / CURRENT CODES.
(g) Read the DTCs.

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 (See page 10–13)