| | | |
|---|---|---|
| **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** |

# CIRCUIT DESCRIPTION

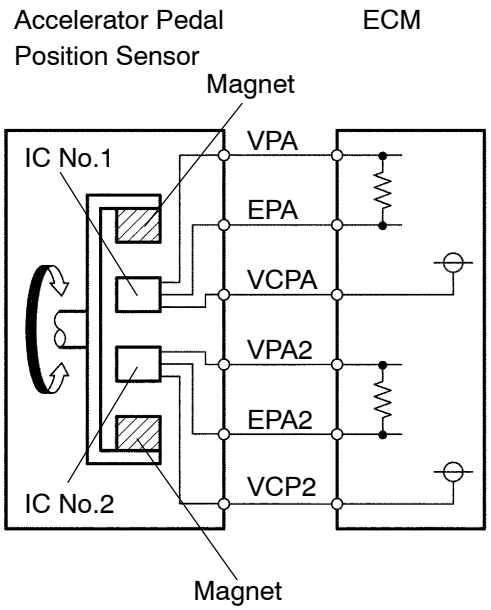
HINT:

- This is the repair procedure of the ”accelerator pedal position sensor”.
- This electrical throttle system does not use the throttle cable.
- This accelerator pedal position sensor is non–contact type.

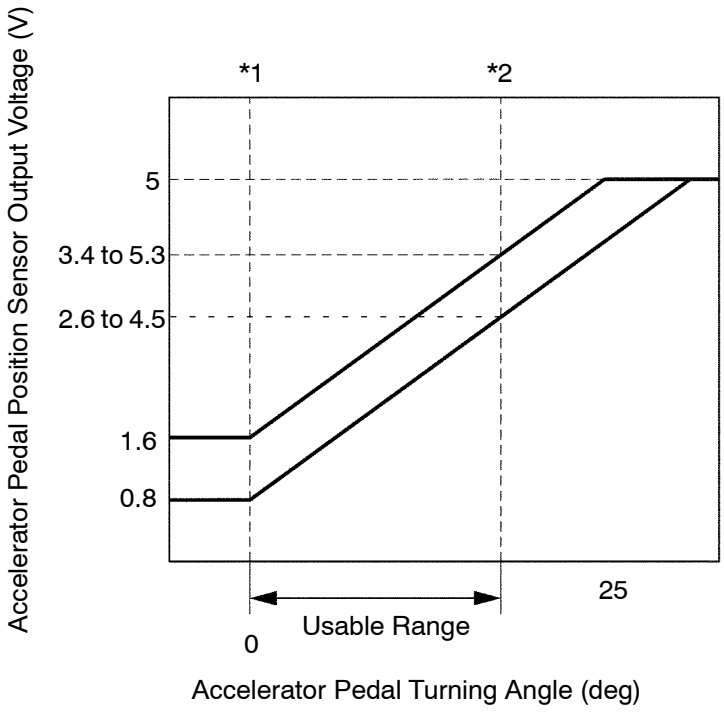
The accelerator pedal position sensor is mounted in the accelerator pedal to detect the opening angle of the accelerator pedal. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It has 2 sensors to detect the accelerator position and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

In the accelerator pedal position sensor, the voltage applied to 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 VPA1 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

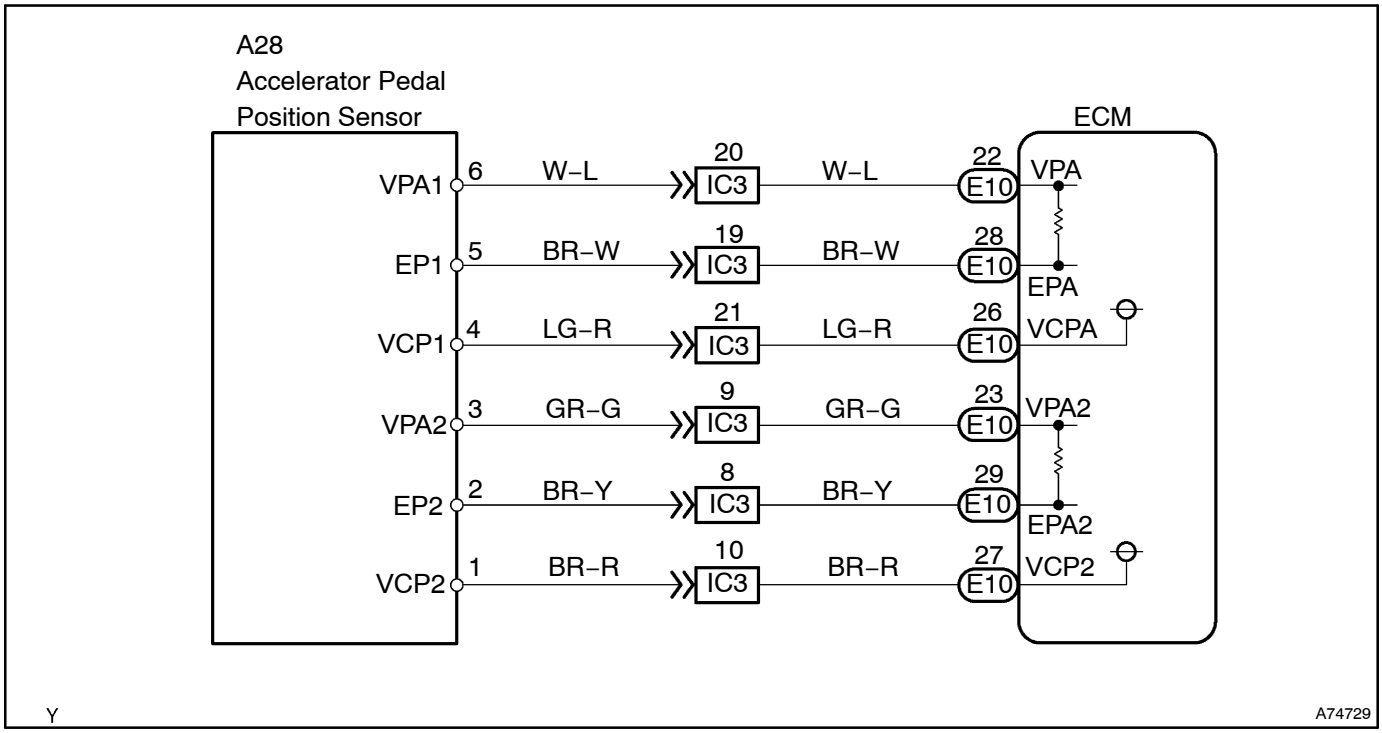
| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P2120/19 | Condition (a) continues for 0.5 sec. or more:<br>(a) VPA1 ≦ 0.2 V and VPA2 ≧ 0.97 deg, or VPA1 ≧ 4.8 V | • Accelerator pedal position sensor<br>• ECM |
| P2122/19 | Conditions (a) and (b) continue for 0.5 sec. or more:<br>(a) VPA1 ≦ 0.2 V<br>(b) VPA2 ≧ 0.97 deg | • Accelerator pedal position sensor<br>• Open in VCP1 circuit<br>• VPA1 circuit open or ground short<br>• ECM |
| P2123/19 | Condition (a) continues for 2.0 sec. or more:<br>(a) VPA1 ≧ 4.8 V | • Accelerator pedal position sensor<br>• Open in EPA1 circuit<br>• ECM |
| P2125/19 | Condition (a) continues for 0.5 sec. or more:<br>(a) (VPA2 ≦ 0.5 V and VPA1 ≧ 0.97 deg) or (VPA2 ≧ 4.8 V and 0.2 V ≦ VPA1 ≦ 3.45 V) | • Accelerator pedal position sensor<br>• ECM |
| P2127/19 | Conditions (a) and (b) continue for 0.5 sec. or more:<br>(a) VPA2 ≦ 0.5 V<br>(b) VPA1 ≧ 0.97 deg | • Accelerator pedal position sensor<br>• Open in VCP2 circuit<br>• VPA2 circuit open or ground short<br>• ECM |
| P2128/19 | Conditions (a) and (b) continue for 2.0 sec. or more:<br>(a) VPA2 ≧ 4.8 V<br>(b) 0.2 V ≦ VPA1 ≦ 3.45 V | • Accelerator pedal position sensor<br>• Open in EPA2 circuit<br>• ECM |
| P2138/19 | Condition (a) or (b) continues for 2.0 sec. or more:<br>(a) \|VPA1 – VPA2\| ≦ 0.02 V<br>(b) VPA1 ≦ 0.2 V and VPA2 ≦ 0.5 V | • VPA1 and VPA2 circuit are short circuited<br>• Accelerator pedal position sensor<br>• ECM |

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 |
| 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 |
| E2 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



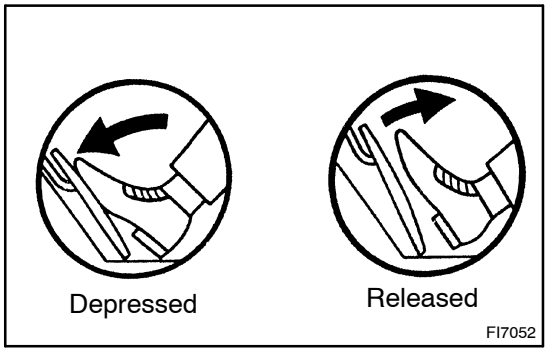

## INSPECTION PROCEDURE

HINT:

Read freeze frame data using the hand–held tester, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

### When using hand–held tester:

| 1 | READ VALUE OF HAND–HELD TESTER(ACCEL POS #1 AND ACCEL POS #2) |
|---|---|




(a) Connect the hand–held tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2” and read its value displayed on the hand–held tester.

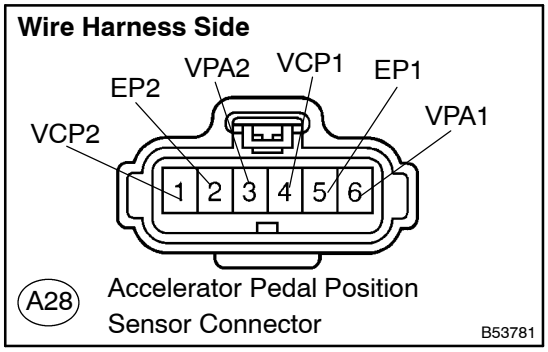
**Standard:**

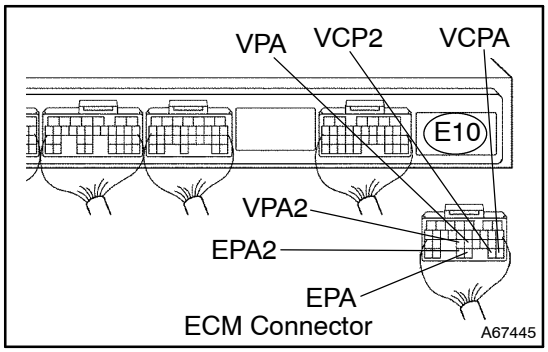
| Accelerator pedal | ACCEL POS #1 | ACCEL POS #2 |
|---|---|---|
| Released | 0.5 to 1.1 V | 1.2 to 2.0 V |
| Depressed | 2.6 to 4.5 V | 3.4 to 5.3 V |

| OK | Go to step 5 |
|---|---|

NG

## 2 CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM)




(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the ECM E10 connector.
(c) Check for continuity between the wire harness side connectors.

**Standard (Check for open):**

| Symbols (Terminal No.) | Specified condition |
|---|---|
| VPA1 (A28–6) – VPA (E10–22) | Continuity |
| EP1 (A28–5) – EPA (E10–28) | |
| VCP1 (A28–4) – VCPA (E10–26) | |
| VPA2 (A28–3) – VPA2 (E10–23) | |
| EP2 (A28–2) – EPA2 (E10–29) | |
| VCP2 (A28–1) – VCP2 (E10–27) | |

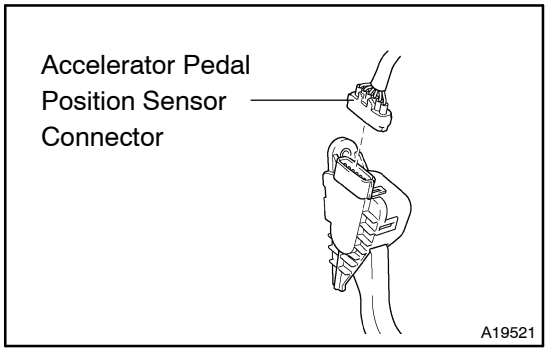
**Standard (Check for short):**

| Symbols (Terminal No.) | Specified condition |
|---|---|
| VPA1 (A28–6) or VPA (E10–22) – Body ground | No continuity |
| EP1 (A28–5) or EPA (E10–28) – Body ground | |
| VCP1 (A28–4) or VCPA (E10–26) – Body ground | |
| VPA2 (A28–3) or VPA2 (E10–23) – Body ground | |
| EP2 (A28–2) or EPA2 (E10–29) – Body ground | |
| VCP2 (A28–1) or VCP2 (E10–27) – Body ground | |

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

OK

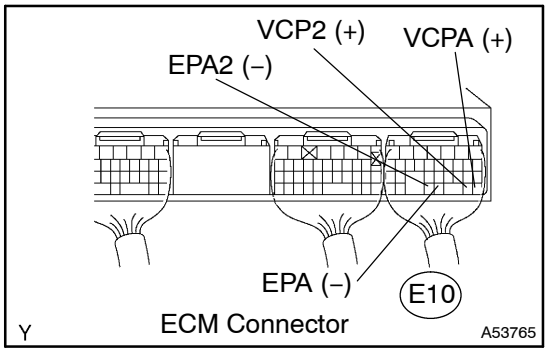
## 3 INSPECT ECM(VCPA AND VCP2 VOLTAGE)




(a) Disconnect the accelerator pedal position sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E10 ECM connector.

**Standard:**

| Symbols (Terminal No.) | Specified condition |
|---|---|
| VCPA (E10–26) – EPA (E10–28) | 4.5 to 5.5 V |
| VCP2 (E10–27) – EPA2 (E10–29) | |



NG → CHECK AND REPLACE ECM (See page 01–35)

OK

| | |
|---|---|
| 4 | REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–12) |

GO

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

(a) Clear the DTC (See page 05–7).
(b) Start the engine.
(c) Run the engine at idle for 15 sec. or more.
(d) Read the DTC (See page 05–7).

**Result:**

| Display (DTC output) | Proceed to |
|---|---|
| "P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 and/or P2138/19" are output again | A |
| No DTC output | B |

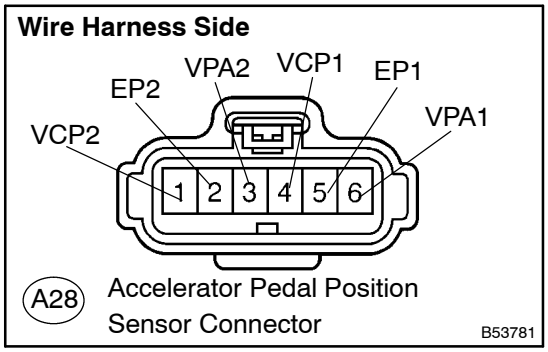
B → SYSTEM OK

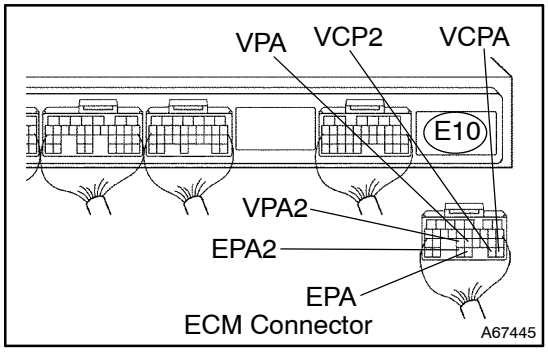
A

CHECK AND REPLACE ECM (See page 01–35)

## When not using hand–held tester:

| 1 | CHECK HARNESS AND CONNECTOR(ACCELERATOR PEDAL POSITION SENSOR – ECM) |
|---|---|




(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the ECM E10 connector.
(c) Check for continuity between the wire harness side connectors.

**Standard (Check for open):**

| Symbols (Terminal No.) | Specified condition |
|---|---|
| VPA1 (A28–6) – VPA (E10–22) | Continuity |
| EP1 (A28–5) – EPA (E10–28) | |
| VCP1 (A28–4) – VCPA (E10–26) | |
| VPA2 (A28–3) – VPA2 (E10–23) | |
| EP2 (A28–2) – EPA2 (E10–29) | |
| VCP2 (A28–1) – VCP2 (E10–27) | |

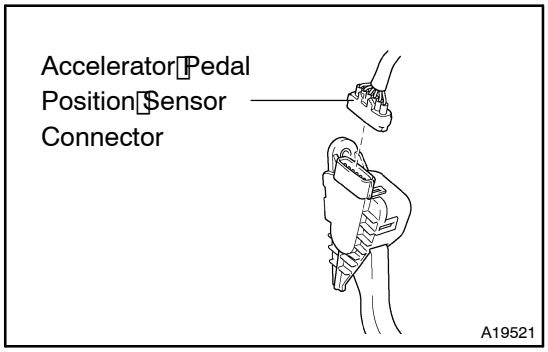
**Standard (Check for short):**

| Symbols (Terminal No.) | Specified condition |
|---|---|
| VPA1 (A28–6) or VPA (E10–22) – Body ground | No continuity |
| EP1 (A28–5) or EPA (E10–28) – Body ground | |
| VCP1 (A28–4) or VCPA (E10–26) – Body ground | |
| VPA2 (A28–3) or VPA2 (E10–23) – Body ground | |
| EP2 (A28–2) or EPA2 (E10–29) – Body ground | |
| VCP2 (A28–1) or VCP2 (E10–27) – Body ground | |

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

OK

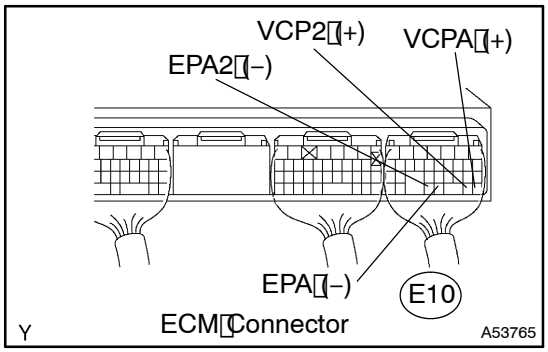
| 2 | INSPECT ECM (VCPA AND VCP2 VOLTAGE) |
|---|---|




(a) Disconnect the accelerator pedal position sensor connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E10 ECM connector.

**Standard:**

| Symbols (Terminal No.) | Specified condition |
|---|---|
| VCPA (E10–26) – EPA (E10–28) | 4.5 to 5.5 V |
| VCP2 (E10–27) – EPA2 (E10–29) | |




NG → CHECK AND REPLACE ECM (See page 01–35)

OK

| 3 | REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–12) |
|---|---|

GO

| 4 | READ OUTPUT DTC (ACCELERATOR PEDAL POSITION SENSOR DTCS ARE OUTPUT AGAIN) |
|---|---|

(a) Clear the DTC (See page 05–7).
(b) Start the engine.
(c) Run the engine at idle for 15 sec. or more.
(d) Read the DTC (See page 05–7).

**Result:**

| Display (DTC output) | Proceed to |
|---|---|
| "P2120/19, P2122/19, P2123/19, P2125/19, P2127/19, P2128/19 and/or P2138/19" are output again | A |
| No DTC output | B |

B → SYSTEM OK

A

CHECK AND REPLACE ECM (See page 01–35)