DTC	19(1)	ACCEL. POSITION SENSOR CIRCUIT (OPEN/SHORT)

CIRCUIT DESCRIPTION

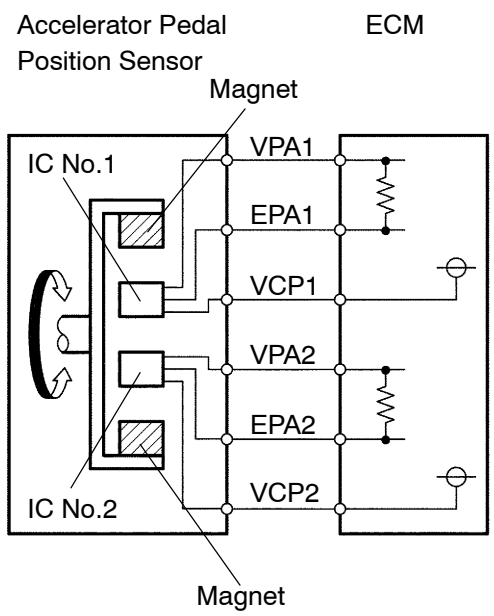
HINT:

- This is repair procedure of ”accelerator pedal position sensor”.
- This electrical throttle system is no used throttle cable.
- This accelerator pedal position sensor is non–contact type.

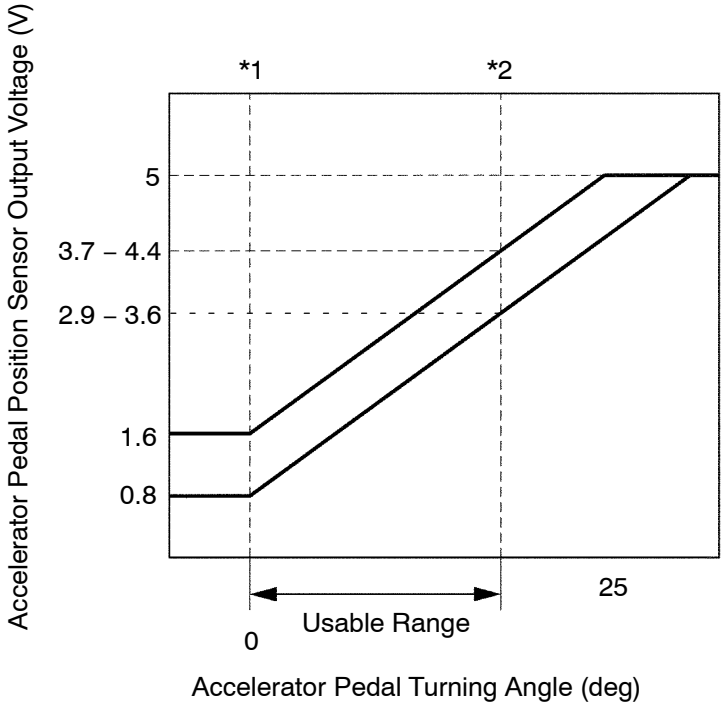
The accelerator pedal position sensor is mounted in the accelerator pedal to detect the opening angle of the accelerator pedal. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It have the 2 sensors to detect the accelerator position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

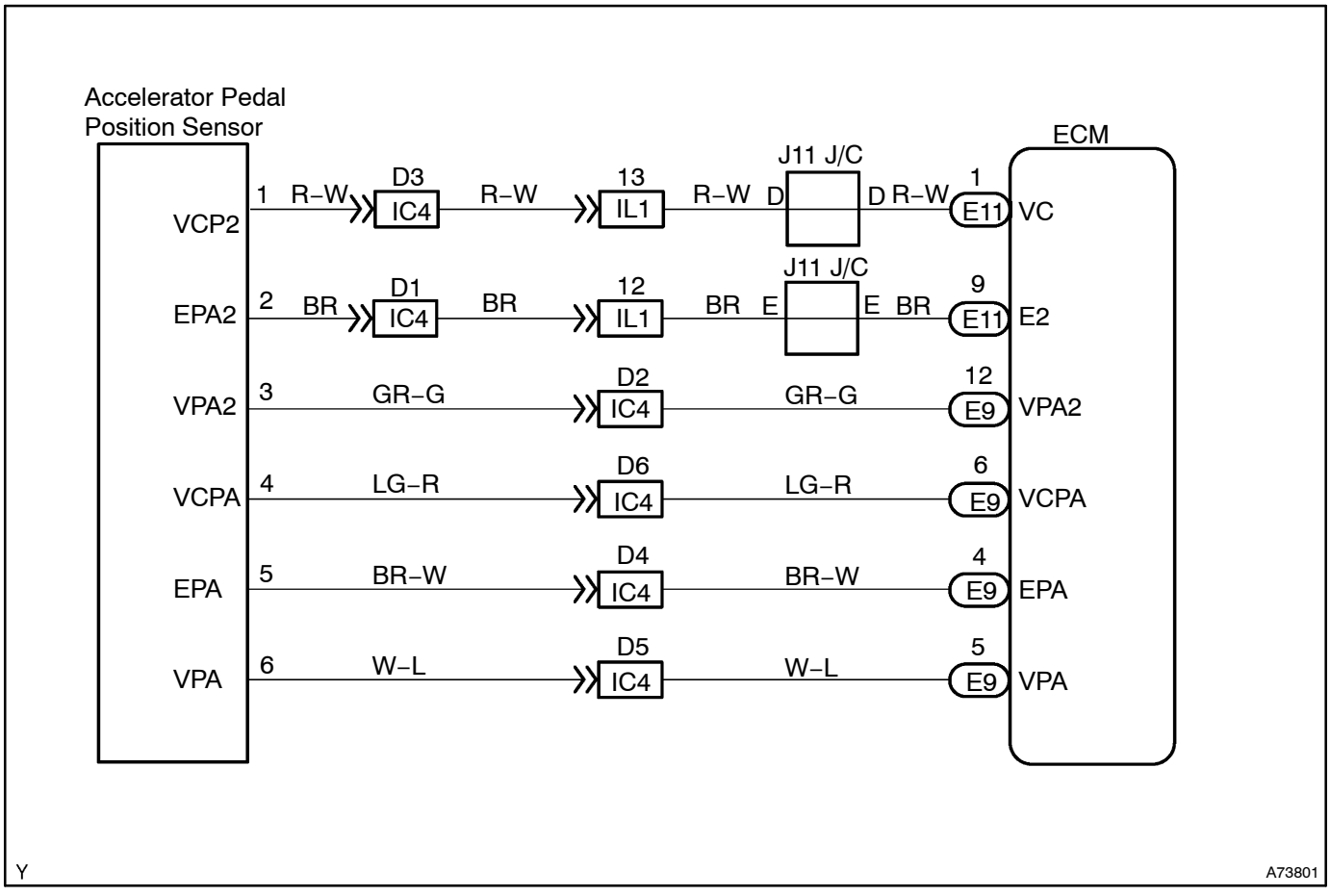
A19803

DTC No.	DTC Detecting Condition	Trouble Area
19(1)	Condition (a), (b), (c) or (d) continues for 2.0 seconds: (a) VPA1 ≦ 0.2 V and VPA2 ≦ 0.5 V (b) VPA1 ≧ 4.8 V (c) When 3.45 V ≧ VPA1 ≧ 0.2 V, and VPA2 ≧ 4.8 V (d) VPA1–VPA2 ≦ 0.02 V	• Open or short in accelerator pedal position sensor circuit • Accelerator pedal position sensor • ECM
	Condition (a) continues for 0.5 seconds: (a) VPA1 ≦ 0.2 V or VPA2 ≦ 0.5 V	

HINT:
After confirming DTC 19 (1), use the hand–held tester to confirm the throttle valve opening percentage.

Trouble area	Accelerator pedal position expressed as voltage			
	Accelerator pedal released		Accelerator pedal depressed	
	ACCEL POS #1	ACCEL POS #2	ACCEL POS #1	ACCEL POS #2
VC circuit open	0 – 0.2 V	0 – 0.2 V	0 – 0.2 V	0 – 0.2 V
VPA circuit open or ground short	0 – 0.2 V	1.2 – 2.0 V	0 – 0.2 V	3.4 – 5.3 V
VPA2 circuit open or ground short	0.5 – 1.1 V	0 – 0.2 V	2.6 – 4.5 V	0 – 0.2 V
E2 circuit open	4.5 – 5.5 V	4.5 – 5.5 V	4.5 – 5.5 V	4.5 – 5.5 V

WIRING DIAGRAM

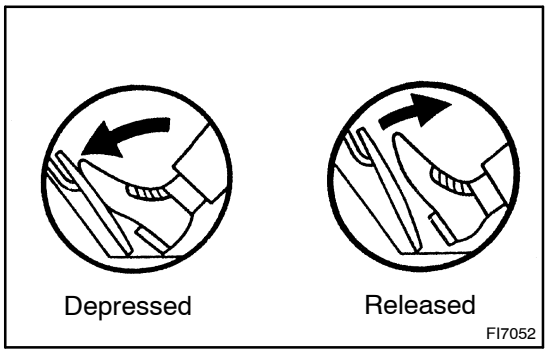


INSPECTION PROCEDURE

HINT:
Read freeze frame data using the hand–held tester, as freeze frame 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, 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) Turn the ignition switch ON.
(b) Select the item ”DIAGNOSIS/ENHANCED OBD II/DATA LIST/ETCS/ACCEL POS #1 and ACCEL POS #2” and read its value displayed on the hand–held tester.

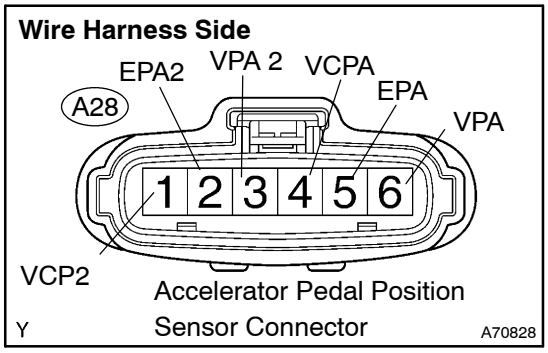
Standard:

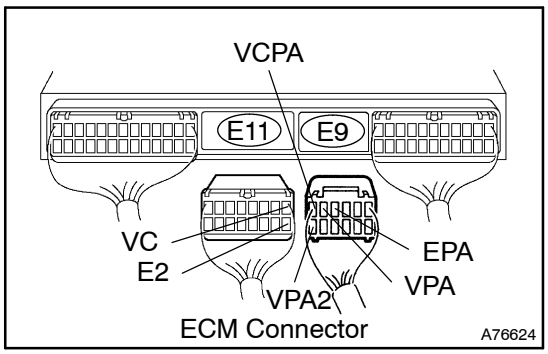
Accelerator pedal	ACCEL POS #1	ACCEL POS #2
Released	0.5 – 1.1 V	1.2 – 2.0 V
Depressed	2.6 – 4.5 V	3.4 – 5.3 V

OK ⇒ **Go to step 5**

NG

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





(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the ECM E9 and E11 connectors.
(c) Check the continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VCP2 (A28 – 1) ⇔ VC (E11 – 1)	Continuity
EPA2 (A28 – 2) ⇔ E2 (E11 – 9)	
VPA2 (A28 – 3) ⇔ VPA2 (E9 – 12)	
VCPA (A28 – 4) ⇔ VCPA (E9 – 6)	
EPA (A28 – 5) ⇔ EPA (E9 – 4)	
VPA (A28 – 6) ⇔ VPA (E9 – 5)	

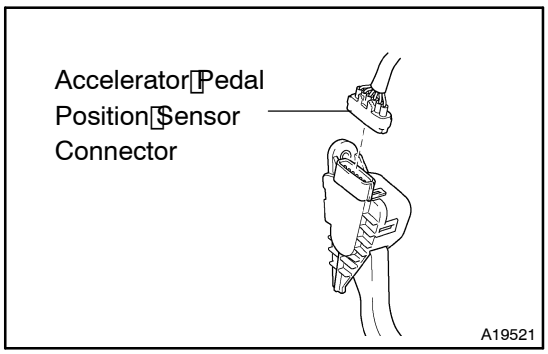
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VCP2 (A28 – 1) or VC (E11– 1) ⇔ Body ground	No continuity
EPA2 (A28 – 2) or E2 (E11 – 9) ⇔ Body ground	
VPA2 (A28 – 3) or VPA2 (E9 – 12) ⇔ Body ground	
VCPA (A28 – 4) or VCPA (E9 – 6) ⇔ Body ground	
EPA (A28 – 5) or EPA (E9 – 4) ⇔ Body ground	
VPA (A28 – 6) or VPA (E9 – 5) ⇔ Body ground	

NG ⇒ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

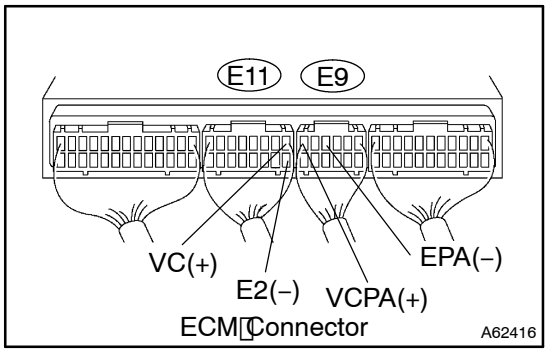
3	INSPECT ECM (VC AND VCPA VOLTAGE)



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

Standard:

Symbols (Terminal No.)	Specified condition
VC (E11 – 1) ⇔ E2 (E11 – 9)	4.5 – 5.5 V
VCPA (E9 – 6) ⇔ EPA (E9 – 4)	



NG → CHECK AND REPLACE ECM

OK

4	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–33)

GO

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

(a) Clear the DTC (See page 05–197).
(b) Start the engine.
(c) Drive the engine at idle for 15 sec. or more.
(d) Read the DTC (See page 05–197).

Result:

Display (DTC output)	Proceed to
DTC 19(1) is output again	A
No DTC output	B

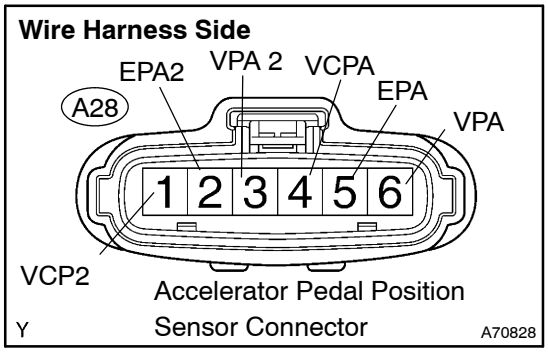
B → SYSTEM OK

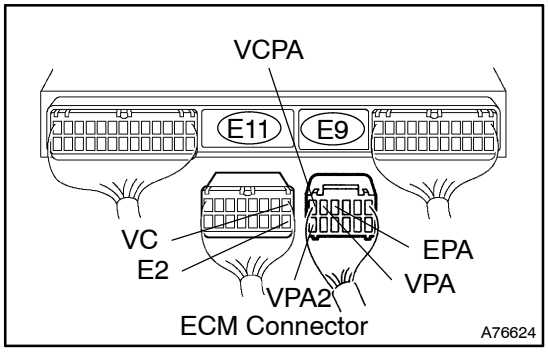
A

CHECK AND REPLACE ECM

When not using hand–held tester:

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





(a) Disconnect the accelerator pedal position sensor connector.
(b) Disconnect the ECM E9 and E11 connectors.
(c) Check the continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VCP2 (A28 – 1) ⇔ VC (E11 – 1)	Continuity
EPA2 (A28 – 2) ⇔ E2 (E11 – 9)	
VPA2 (A28 – 3) ⇔ VPA2 (E9 – 12)	
VCPA (A28 – 4) ⇔ VCPA (E9 – 6)	
EPA (A28 – 5) ⇔ EPA (E9 – 4)	
VPA (A28 – 6) ⇔ VPA (E9 – 5)	

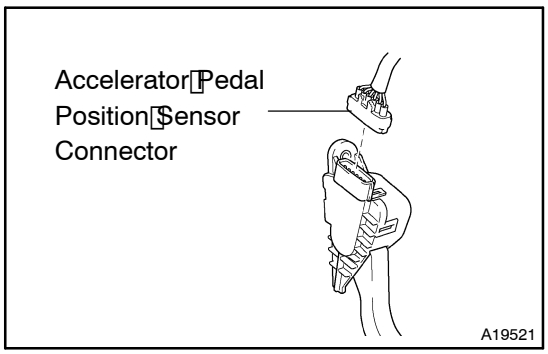
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VCP2 (A28 – 1) or VC (E11– 1) ⇔ Body ground	No continuity
EPA2 (A28 – 2) or E2 (E11 – 9) ⇔ Body ground	
VPA2 (A28 – 3) or VPA2 (E9 – 12) ⇔ Body ground	
VCPA (A28 – 4) or VCPA (E9 – 6) ⇔ Body ground	
EPA (A28 – 5) or EPA (E9 – 4) ⇔ Body ground	
VPA (A28 – 6) or VPA (E9 – 5) ⇔ Body ground	

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

OK

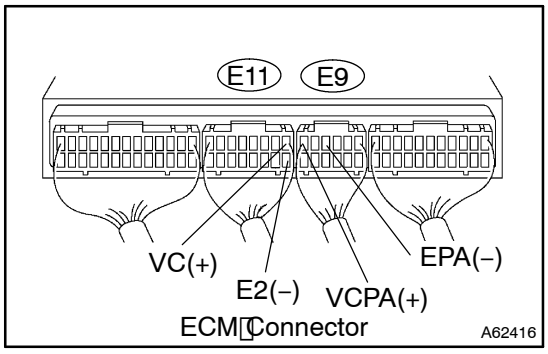
2	INSPECT ECM (VC AND VCPA VOLTAGE)



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

Standard:

Symbols (Terminal No.)	Specified condition
VC (E11 – 1) ⇔ E2 (E11 – 9)	4.5 – 5.5 V
VCPA (E9 – 6) ⇔ EPA (E9 – 4)	



NG → CHECK AND REPLACE ECM

OK

3	REPLACE ACCELERATOR PEDAL ROD ASSY (See page 10–33)

GO

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

(a) Clear the DTC (See page 05–197).
(b) Start the engine.
(c) Drive the engine at idle for 15 sec. or more.
(d) Read the DTC (See page 05–197).

Result:

Display (DTC output)	Proceed to
DTC 19(1) is output again	A
No DTC output	B

B → SYSTEM OK

A

CHECK AND REPLACE ECM