DTC	**P0120/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT**

DTC	**P0122/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT LOW INPUT**

DTC	**P0123/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A” CIRCUIT HIGH INPUT**

DTC	**P0220/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT**

DTC	**P0222/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT LOW INPUT**

DTC	**P0223/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”B” CIRCUIT HIGH INPUT**

DTC	**P2135/41**	**THROTTLE/PEDAL POSITION SENSOR/SWITCH ”A”/”B” VOLTAGE CORRELATION**

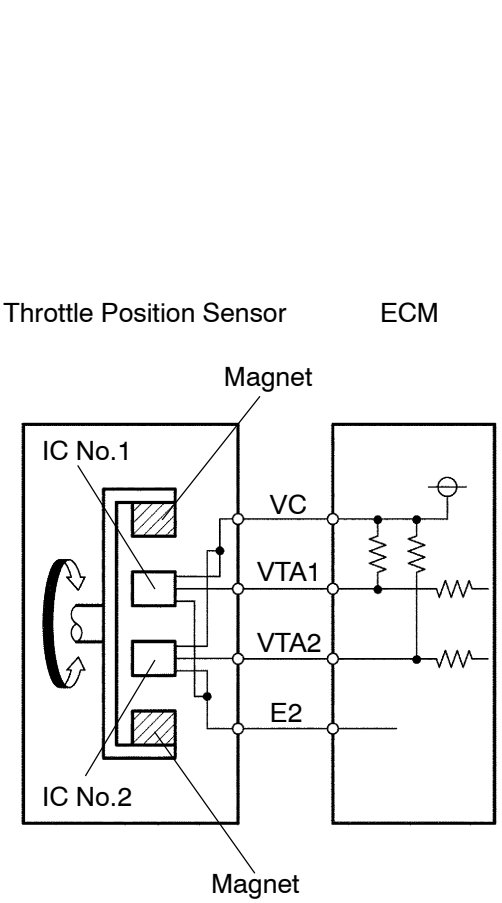
CIRCUIT DESCRIPTION

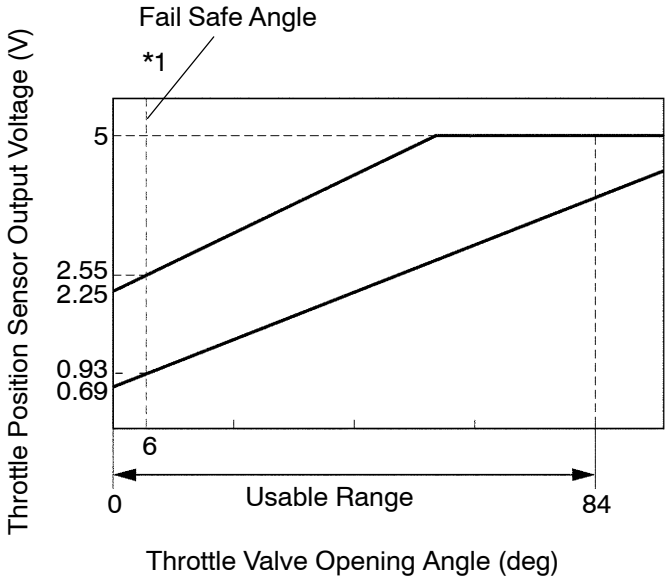
HINT:

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

The throttle position sensor is mounted on the throttle body to detect the opening angle of the throttle valve. Since this sensor is electronically controlled with hall elements, accurate control and reliability can be obtained. It has 2 sensors to detect the throttle opening angle and a malfunction of the throttle position sensor. The voltage is applied to the terminals VTA1 and VTA2 of the ECM changes between 0 V and 5 V in proportion to the opening angle of the throttle valve. The VTA1 is a signal to indicate the actual throttle valve opening angle which is used for the engine control, and the VTA2 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 throttle valve from these signals input from terminals VTA1 and VTA2, and the ECM controls the throttle motor to make the throttle valve angle properly in response to the driving condition.





Throttle Valve Fully Closed
(Throttle Position expressed as percentage
(VTA1) 10 to 20 %)

Throttle Valve Fully Opened
(Throttle Position expressed as percentage
(VTA1) 64 to 96 %)

*1: Fail Safe Angle 7°
(Throttle Position expressed as percentage
(VTA1) 10 to 24 %)

A19755

A19802

DTC No.	DTC Detection Condition	Trouble Area
Condition (a) of DTC P0120/41, P0122/41, P0123/41, P0220/41, P0222/41 or P0223/41 continues for 2 sec. (Open or short in the throttle position sensor circuit)		
P0120/41	Detection conditions for DTCs P0122/41 and P0123/41 are not satisfied but condition (a) is satisfied (a) VTA1 ≦ 0.2 V or VTA1 ≧ 4.8 V	• Throttle position sensor (built in throttle w/ motor body) • ECM
P0122/41	(a) VTA1 ≦ 0.2 V	• Throttle position sensor (built in throttle w/ motor body) • Short in VTA1 circuit • Open in VC circuit • ECM
P0123/41	(a) VTA1 ≧ 4.8 V	• Throttle position sensor (built in throttle w/ motor body) • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuit are short–circuited • ECM
P0220/41	Detection conditions for DTCs P0222/41 and P0223/41 are not satisfied but condition (a) is satisfied (a) VTA2 ≦ 0.5 V or VTA2 ≧ 4.8 V and 0.2 V ≦ VTA1 ≦ 1.8 V	• Throttle position sensor (built in throttle w/ motor body) • ECM
P0222/41	(a) VTA2 ≦ 0.5 V	• Throttle position sensor (built in throttle w/ motor body) • Short in VTA2 circuit • Open in VC circuit • ECM
P0223/41	(a) VTA2 ≧ 4.8 V and 0.2 V ≦ VTA1 ≦ 1.8 V	• Throttle position sensor (built in throttle w/ motor body) • Open in VTA2 circuit • Open in E2 circuit • VC and VTA2 circuit are short–circuited • ECM
P2135/41	Condition (a) continues for 0.5 sec. or more, or condition (b) continues for 0.4 sec. or more: (a) |VTA1 – VTA2| ≦ 0.02 V (b) VTA1 ≦ 0.2 V and VTA2 ≦ 0.5 V	• VTA1 and VTA2 circuit are short–circuited • Throttle position sensor (built in throttle w/ motor body) • ECM

NOTICE:

When a malfunction is detected, the throttle valve is locked at a certain opening angle. Also, the whole electronically controlled throttle operation is cancelled until the system returns to normal and the ignition switch is turned OFF.

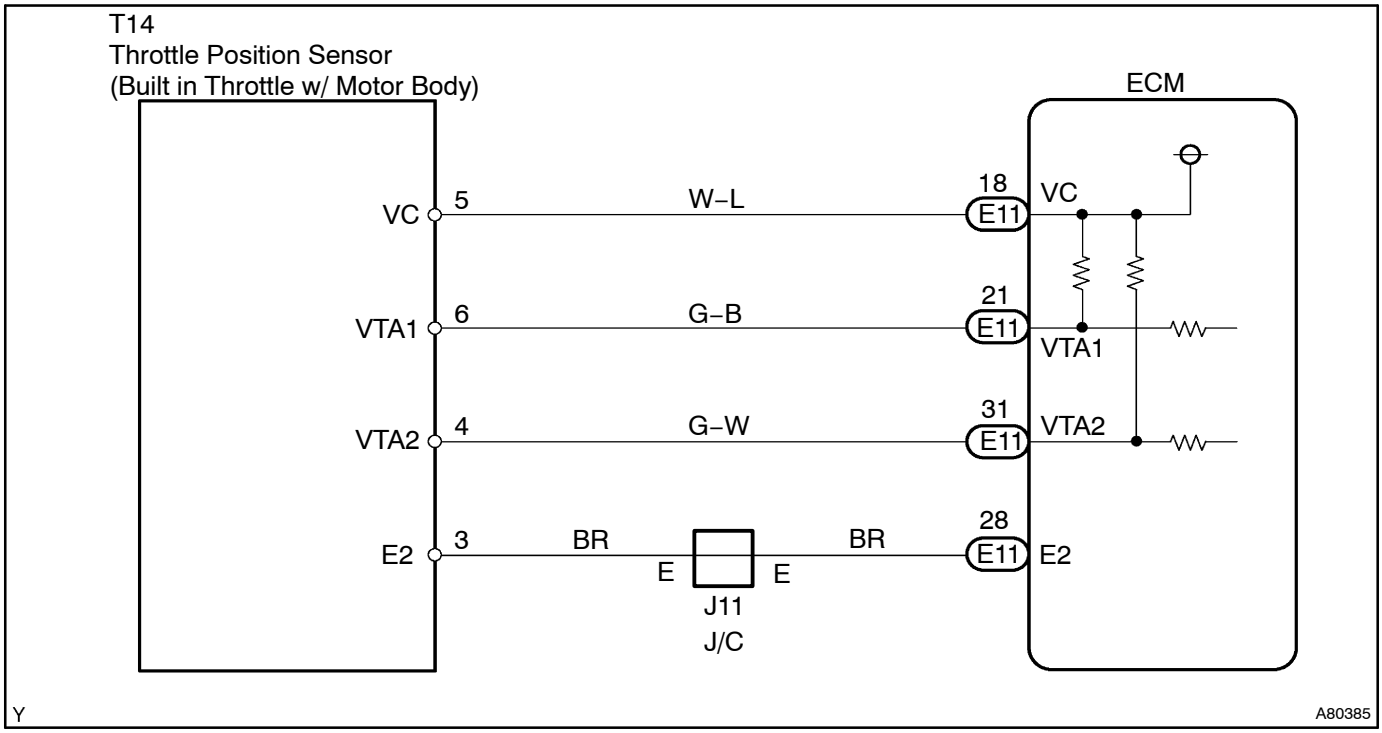
HINT:

- After confirming DTCs, use the hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.
- The THROTTLE POS means VTA1 signal as well as the THROTTLE POS #2 for the VTA2 signal.

Reference (Normal condition):

Tester display	Accelerator pedal fully released	Accelerator pedal fully depressed
THROTTLE POS	10 to 24 %	64 to 96 %
THROTTLE POS #2	2.1 to 3.1 V	4.5 to 5.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs that are related to a different system are output simultaneously while terminal E2 is used as a ground terminal, terminal E2 may be open.
- 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(THROTTLE POS AND THROTTLE POS #2)**

(a) Select the item ”DIAGNOSIS / OBD/MOBD / DATA LIST / ETCS / THROTTLE POS and THROTTLE POS #2” and read its value displayed on the hand–held tester.

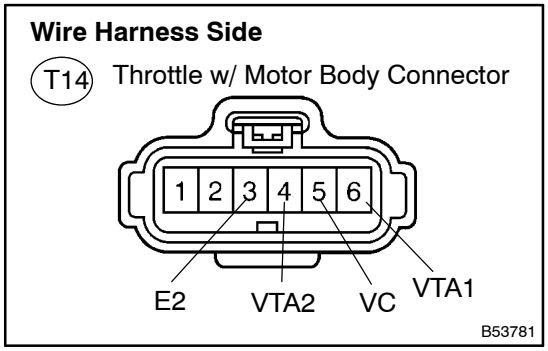
Result:

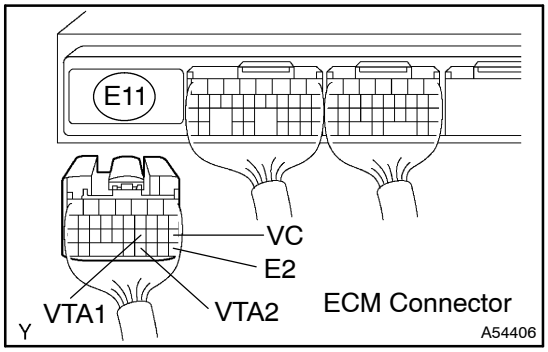
Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.5 V	100 %	4.5 to 5.5 V	E2 circuit open	
0 % or 100 %	2.1 to 3.1 V (Fail safe)	0 % or 100 %	2.1 to 3.1 V (Fail safe)	VTA1 circuit open or ground short	
10 to 24 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	10 to 24 % (Fail safe)	0 to 0.2 or 4.5 to 5.5 V	VTA2 circuit open or ground short	
10 to 24 %	2.1 to 3.1 V	64 to 96 % (Does not fail safe)	4.5 to 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	B

B	Go to step 5

A

2 CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)





(a) Disconnect the throttle w/ motor body connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (5) – VC (E11–18)	Continuity
VTA1 (6) – VTA1 (E11–21)	
VTA2 (4) – VTA2 (E11–31)	
E2 (3) – E2 (E11–28)	

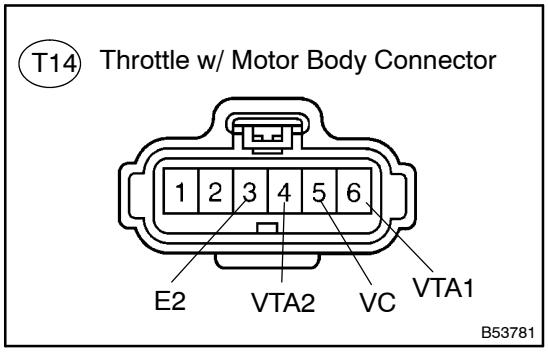
Standard (Check for short):

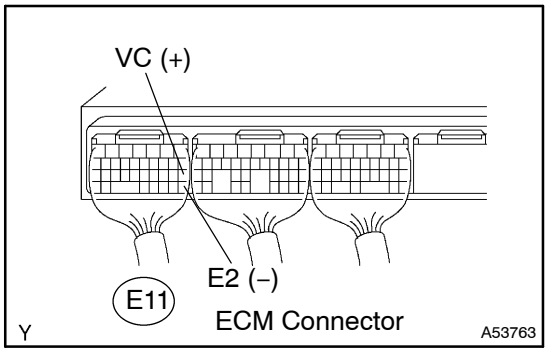
Symbols (Terminal No.)	Specified condition
VC (5) or VC (E11–18) – Body ground	No continuity
VTA1 (6) or VTA1 (E11–21) – Body ground	
VTA2 (4) or VTA2 (E11–31) – Body ground	

NG	REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3 INSPECT ECM(VC VOLTAGE)





(a) Disconnect the throttle w/ motor body connector.
(b) Measure the voltage between the terminals of the E11 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
VC (E11–18) – E2 (E11–28)	4.5 to 5.5 V

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

OK

4	REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)

GO

5	READ OUTPUT DTC(THROTTLE POSITION SENSOR DTCS ARE OUTPUT AGAIN)

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

Result:

Display (DTC output)	Proceed to
"P0120/41, P0122/41, P0123/41, P0220/41, P0222/41, P0223/41 and/or P2135/41" are output again	A
No DTC output	B

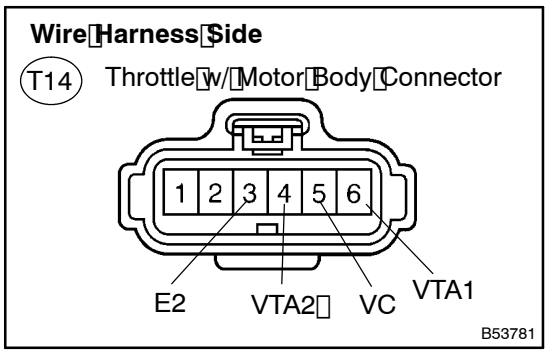
B	SYSTEM OK

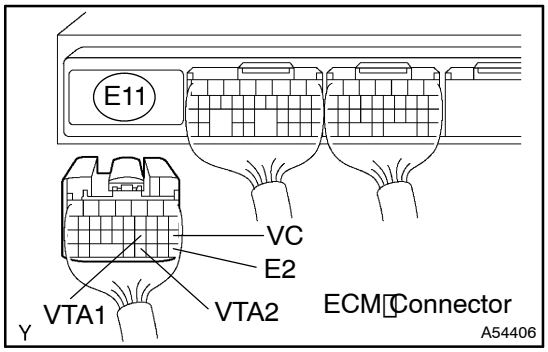
A

CHECK AND REPLACE ECM (See page 01–35)

When not using hand–held tester:

1	CHECK HARNESS AND CONNECTOR(THROTTLE POSITION SENSOR – ECM)





(a) Disconnect the throttle w/ motor body connector.
(b) Disconnect the E11 ECM connector.
(c) Check for continuity between the wire harness side connectors.

Standard (Check for open):

Symbols (Terminal No.)	Specified condition
VC (5) – VC (E11–18)	Continuity
VTA1 (6) – VTA1 (E11–21)	
VTA2 (4) – VTA2 (E11–31)	
E2 (3) – E2 (E11–28)	

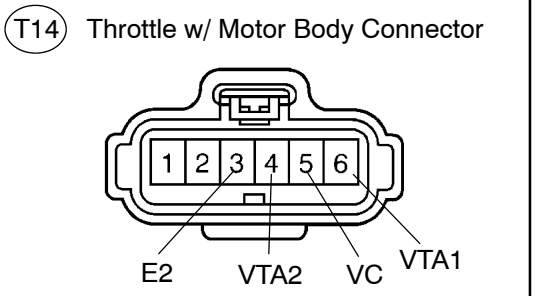
Standard (Check for short):

Symbols (Terminal No.)	Specified condition
VC (5) or VC (E11–18) – Body ground	No continuity
VTA1 (6) or VTA1 (E11–21) – Body ground	
VTA2 (4) or VTA2 (E11–31) – Body ground	

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

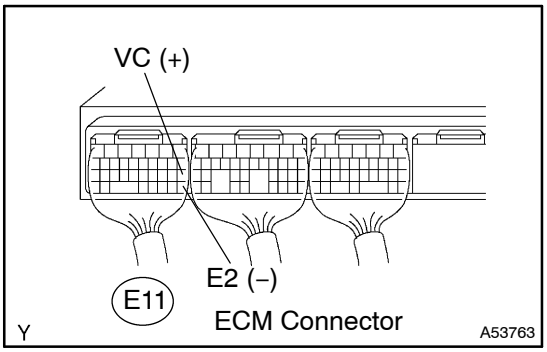
2 INSPECT ECM(VC VOLTAGE)



(a) Disconnect the throttle w/ motor body connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage between the terminals of the E11 ECM connector.

Standard:

Symbols (Terminal No.)	Specified condition
VC (E11–18) – E2 (E11–28)	4.5 to 5.5 V



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

OK

3 REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–6)

GO

4 READ OUTPUT DTC(THROTTLE POSITION SENSOR DTCS ARE OUTPUT AGAIN)

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

Result:

Display (DTC output)	Proceed to
”P0120/41, P0122/41, P0123/41, P0220/41, P0222/41, P0223/41 and/or P2135/41” are output again	A
No DTC output	B

B → SYSTEM OK

A

CHECK AND REPLACE ECM (See page 01–35)