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

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

HINT:
These DTCs relate to the throttle position sensor.

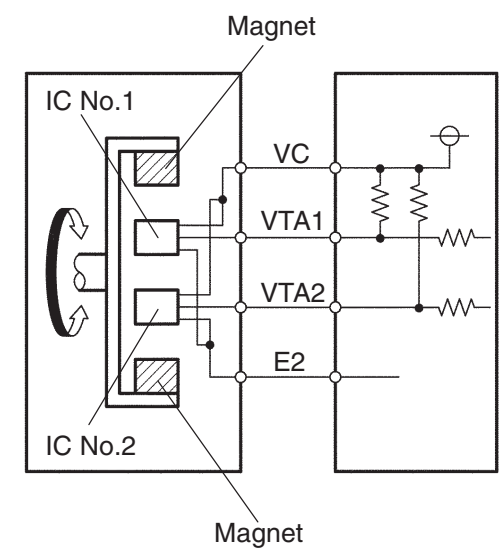
CIRCUIT DESCRIPTION

HINT:

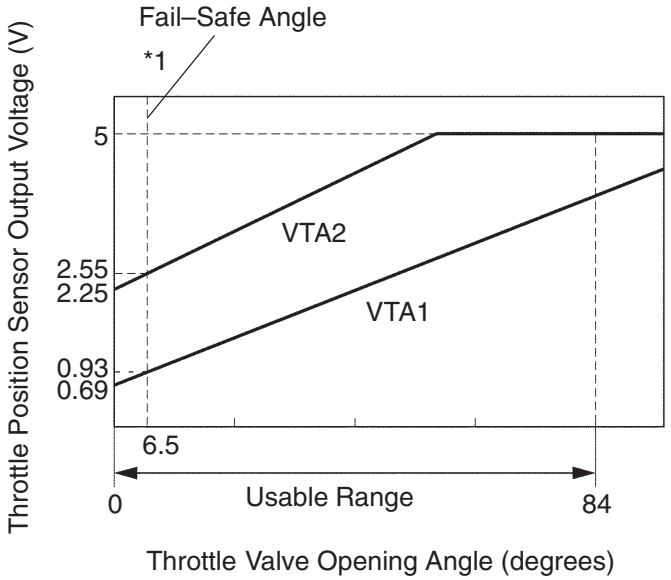
- This ETCS (Electronic Throttle Control System) does not use a throttle cable.
- This throttle position sensor is a non–contact type.

The throttle position sensor is mounted on the throttle body and it detects the opening angle of the throttle valve. This sensor is electronically controlled and uses Hall–effect elements, so that accurate control and reliability can be obtained. The throttle position sensor has 2 sensor elements and signal outputs: VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect a malfunction in VTA1. Voltage applied to VTA1 and VTA2 changes between 0V and 5V in proportion to the opening angle of the throttle valve. There are several checks that the ECM performs to confirm proper operation of the throttle position sensor and VTA1.

The ECM judges the actual 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 driver input.



A19755



Throttle Valve Fully Closed, VTA1 is 10 to 24 %

Throttle Valve Fully Open, VTA1 is 64 to 96 %

*1: Fail–Safe Angle (6.5°), VTA1 is approximately 16 %

NOTE: Throttle valve opening angle detected by the sensor terminal VTA1 is expressed as percentages.

A19802

DTC No.	DTC Detection Condition	Trouble Area
P0120/41	Output voltage of VTA1 quickly fluctuates up and down beyond lower and upper malfunction thresholds for 2 seconds (1 trip detection logic)	• Throttle position sensor (built into throttle body) • ECM
P0122/41	VTA1 is 0.2 V or less for 2 seconds (1 trip detection logic)	• Throttle position sensor (built into throttle body) • Short in VTA1 circuit • Open in VC circuit • ECM
P0123/41	VTA1 is 4.8 V or more for 2 seconds (1 trip detection logic)	• Throttle position sensor (built into throttle body) • Open in VTA1 circuit • Open in E2 circuit • VC and VTA1 circuits are short–circuited • ECM
P0220/41	Output voltages of VTA1 and VTA2 quickly fluctuate up and down beyond their respective lower and upper malfunction thresholds for 10 seconds (1 trip detection logic)	• Throttle position sensor (built into throttle body) • ECM
P0222/41	VTA2 is 0.5 V or less for 10 seconds (1 trip detection logic)	• Throttle position sensor (built into throttle body) • Short in VTA2 circuit • Open in VC circuit • ECM
P0223/41	VTA2 is 4.8 V or more, VTA1 is between 0.2 V and 1.8 V for 10 seconds (1 trip detection logic)	• Throttle position sensor (built into throttle body) • Open in VTA2 circuit • Open in E2 circuit • VC and VTA2 circuits are short–circuited • ECM
P2135/41	Condition (a) continues for 0.5 seconds or more, or condition (b) continues for 0.4 seconds or more (1 trip detection logic): (a) Difference between VTA1 and VTA2 is 0.02 V or less (b) VTA1 is 0.2 V or less and VTA2 is 0.5 V or less	• VTA1 and VTA2 circuits are short–circuited • Throttle position sensor (built into throttle 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 to OFF.

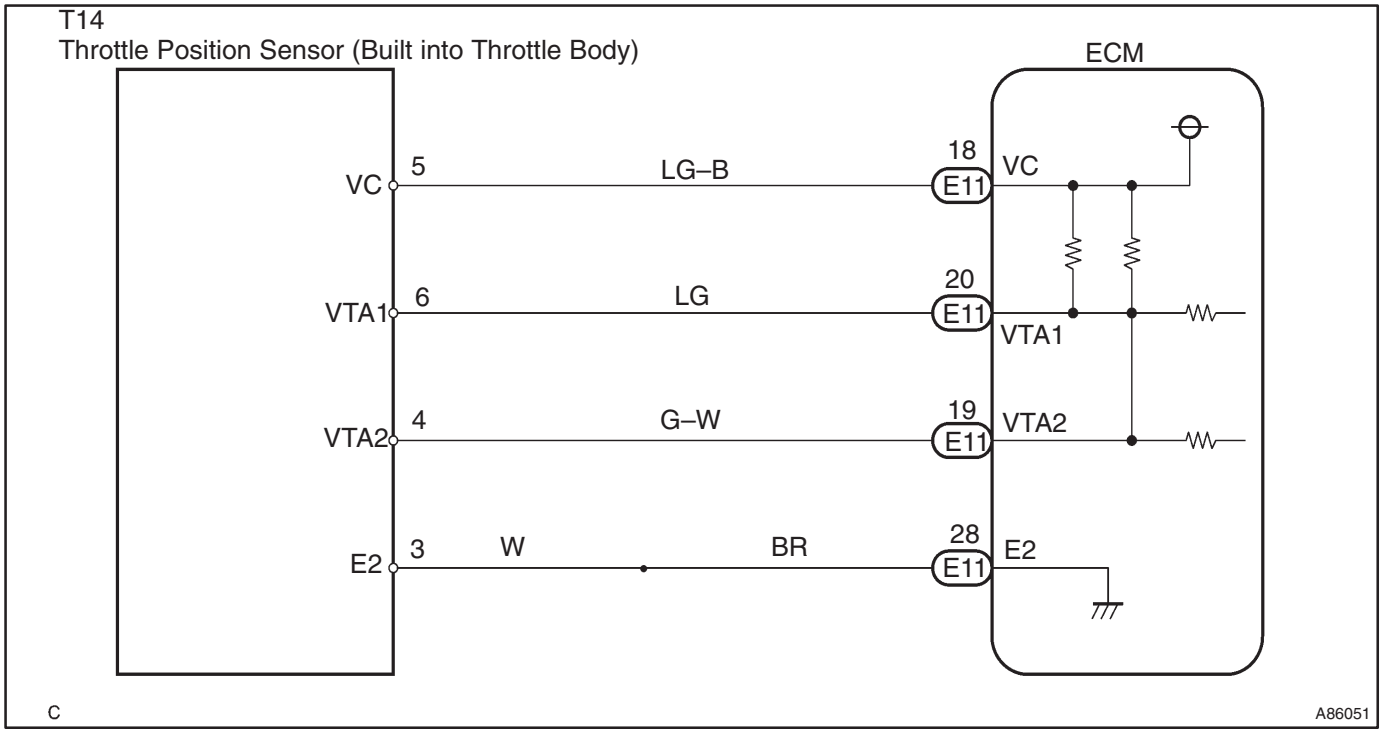
HINT:

- When any of these DTCs is detected, check the throttle valve opening angle (Throttle POS and Throttle POS #2) using the intelligent tester II.
- The Throttle POS means VTA1 signal (expressed as percentages), and Throttle POS No.2 means the VTA2 signal (expressed as voltages).

  Reference (Normal condition):

Tester Display	Accelerator Pedal Fully Released	Accelerator Pedal Fully Depressed
Throttle POS	10 to 24 %	64 to 96 %
Throttle POS #2	2.0 to 2.9 V	4.6 to 5.0 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If different DTCs related to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the intelligent tester II. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, 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 INTELLIGENT TESTER II(THROTTLE POS AND THROTTLE POS NO.2)

(a) Connect the intelligent tester II to the DLC3.
(b) Turn the ignition switch to ON and turn the intelligent tester ll ON.
(c) Select the following menu items: Powertrain / Engine and ECT / Data List / Throttle POS and Throttle POS #2.
(d) Check the values displayed on the intelligent tester II.

Result:

TP (VTA1) When AP Released	TP #2 (VTA2) When AP Released	TP (VTA1) When AP Depressed	TP #2 (VTA2) When AP Depressed	Trouble Area	Proceed To
0 %	0 to 0.2 V	0 %	0 to 0.2 V	VC circuit open	A
100 %	4.5 to 5.0 V	100 %	4.5 to 5.0 V	E2 circuit open	A
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	A
10 to 24 % (Fail–safe)	0 to 0.2 V or 4.5 to 5.0 V	10 to 24 % (Fail–safe)	0 to 0.2 V or 4.5 to 5.0 V	VTA2 circuit open or ground short	A
10 to 24 %	2.1 to 3.1 V	64 to 96 % (Not fail–safe)	4.5 to 5.0 V (Not fail–safe)	Throttle position sensor circuit is normal	B

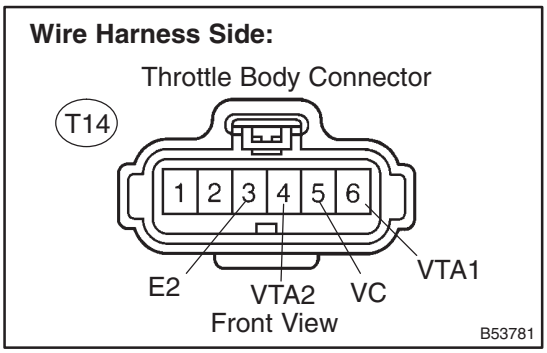
HINT:

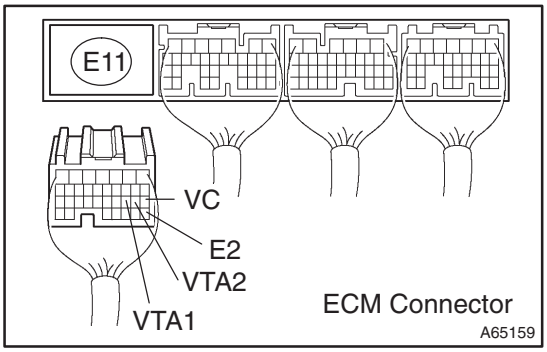
- TP stands for Throttle Position, and AP stands for Accelerator Pedal.
- VTA1 is expressed as percentages, and VTA2 is expressed as voltages.

B → **Go to step 5**

A

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





(a) Disconnect the T14 throttle body connector.
(b) Disconnect the E11 ECM connector.
(c) Measure the resistance according to the value(s) in the table below.

Standard (Check for open):

Tester Connection	Specified Condition
VC (T14–5) – VC (E11–18)	Below 1 Ω
VTA1 (T14–6) – VTA1 (E11–20)	Below 1 Ω
VTA2 (T14–4) – VTA2 (E11–19)	Below 1 Ω
E2 (T14–3) – E2 (E11–28)	Below 1 Ω

Standard (Check for short):

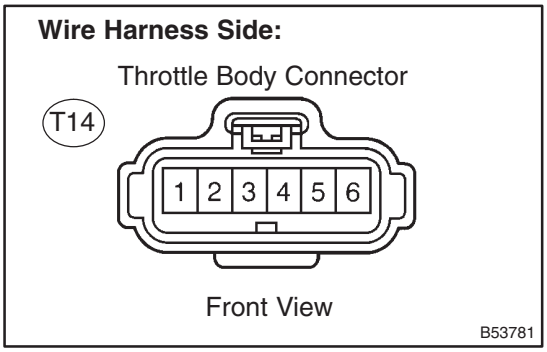
Tester Connection	Specified Condition
VC (T14–5) or VC (E11–18) – Body ground	10 kΩ or higher
VTA1 (T14–6) or VTA1 (E11–20) – Body ground	10 kΩ or higher
VTA2 (T14–4) or VTA2 (E11–19) – Body ground	10 kΩ or higher

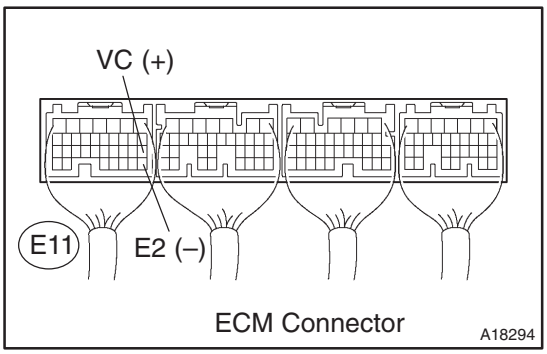
(d) Reconnect the throttle body connector.
(e) Reconnect the ECM connector.

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

OK

3 INSPECT ECM(VC VOLTAGE)





(a) Disconnect the T14 throttle body connector.
(b) Turn the ignition switch to ON and turn the intelligent tester II ON.
(c) Measure the voltage according to the value(s) in the table below.

Standard:

Tester Connection	Specified Condition
VC (E11–18) – E2 (E11–28)	4.5 to 5.5 V

(d) Reconnect the throttle body connector.

NG → **REPLACE ECM (See page 10–12)**

OK

4	REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–7)

GO

5	CHECK IF DTC OUTPUT RECURS(THROTTLE POSITION SENSOR DTCS)

(a) Clear DTCs (see page 05–18).
(b) Start the engine.
(c) Run the engine in idling for 15 seconds or more.
(d) Connect the intelligent tester II to the DLC3.
(e) Turn the ignition switch to ON and turn the intelligent tester II ON.
(f) Select the following menu items: Powertrain / Engine and ECT / DTC.
(g) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P0120, P0122, P0123, P0220, P0222, P0223 and/or P2135	A
No output	B

B → SYSTEM OK

A

REPLACE ECM (See page 10–12)