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

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

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

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

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

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

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

CIRCUIT DESCRIPTION

HINT:

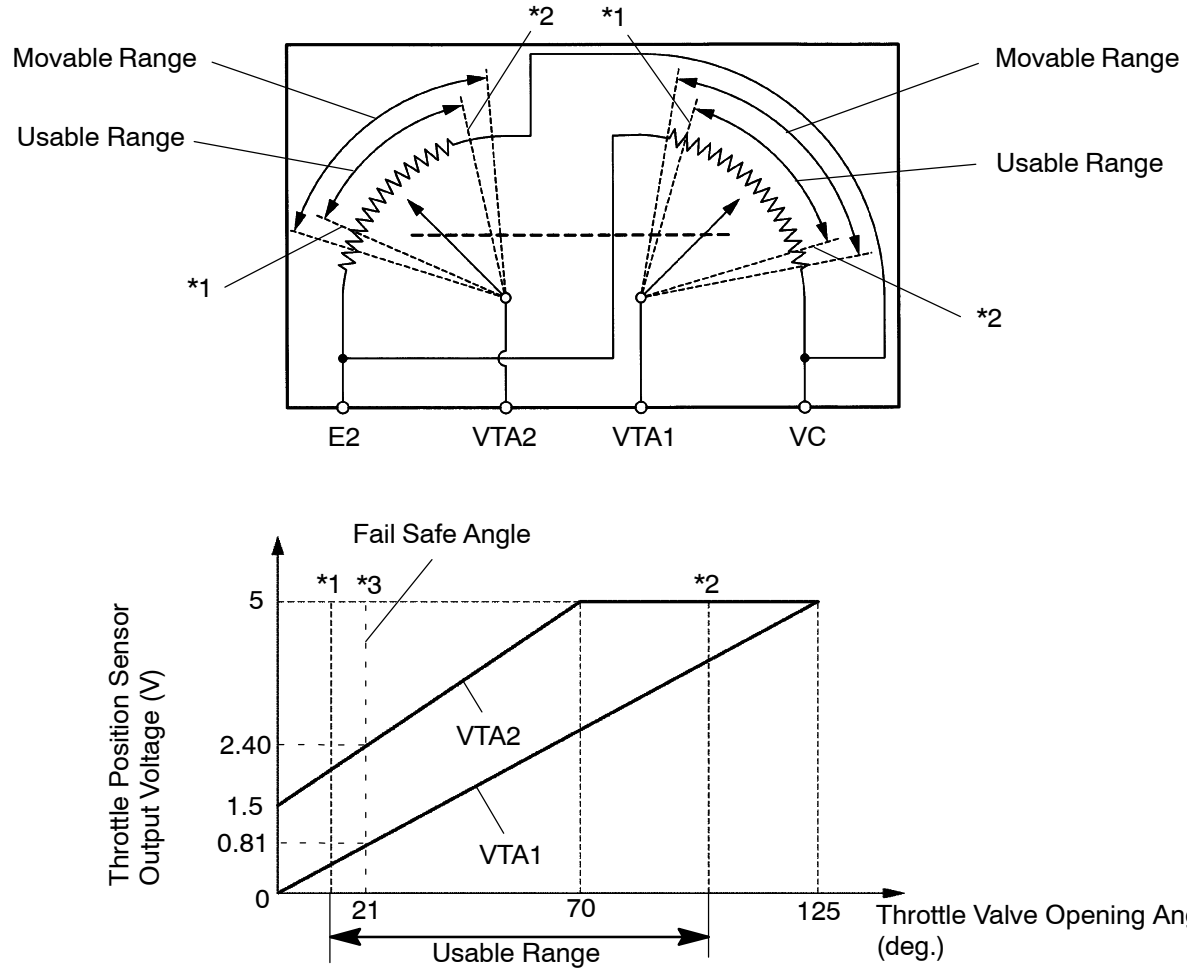
- This electrical throttle system does not use a throttle cable.
- This is procedures of throttle position sensor.

The throttle position sensor is mounted on the throttle body and it has 2 sensors to detect the throttle opening angle and a malfunction of the throttle position sensor itself.

The voltage applied to 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 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 the driving condition.

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 power switch is turned OFF.



*1: Throttle Valve Fully Closed (13.5˚), VTA1 is 0 %

*2: Throttle Valve Fully Open (97.5˚), VTA1 is approx 100 %

*3: Fail Safe Angle (16.5˚), VTA1 is 3.5 %

Note: Throttle valve opening angle detected by the sensor terminal of VTA is expressed as percentage.

A02395 A02396

A71013

DTC No.	DTC Detection Condition	Trouble Area
—	Conditions of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 seconds or more when Idle is ON	—
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) VTA is 0.2V or less, or 4.8 V or more	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM
P0122	VTA is 0.2 V or less	• Short in throttle position sensor circuit • Throttle position sensor • ECM
P0123	VTA is 4.8 V or more	• Open in throttle position sensor circuit • Throttle position sensor • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) and (b) are satisfied (a) VTA2 is 0.5 V or less, or VTA2 is 4.8 V or more (b) VTA is 0.2 V or more and 1.8 V or less	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM
P0222	VTA2 is 0.5 V or less	• Short in throttle position sensor circuit • Throttle position sensor • ECM
P0223	VTA2 is 4.8 V or more when VTA is 0.2 or more and 1.8 V or less	• Open in throttle position sensor circuit • Throttle position sensor • ECM
P2135	Condition (a) continues for 0.5 seconds or more, or condition (b) continues for 0.4 seconds or more: (a) Difference between VTA and VTA2 is 0.02 V or less (b) VTA is 0.2 V or less and VTA2 is 0.5 V or less	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:

DTC No.	Main Trouble Area
P0122	• Throttle position sensor • Open in VTA1 circuit • VC circuit open (when the VC circuit is open, DTCs P0222 and P2135 are also output simultaneously) • ECM
P0123	• Throttle position sensor (built in throttle body) • Open in VTA circuit • Open in E2 circuit • VC and VTA circuits are short–circuited • ECM
P0222	• Throttle position sensor • Open in VTA2 circuit • VC circuit open (when the VC circuit is open, DTCs P0122 and P2135 are also output simultaneously)
P0223	• Throttle position sensor
P2135	• VTA1 and VTA2 circuits are short–circuited • Open in VC circuit • Throttle position sensor

NOTICE:

When 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 power switch is turned OFF.

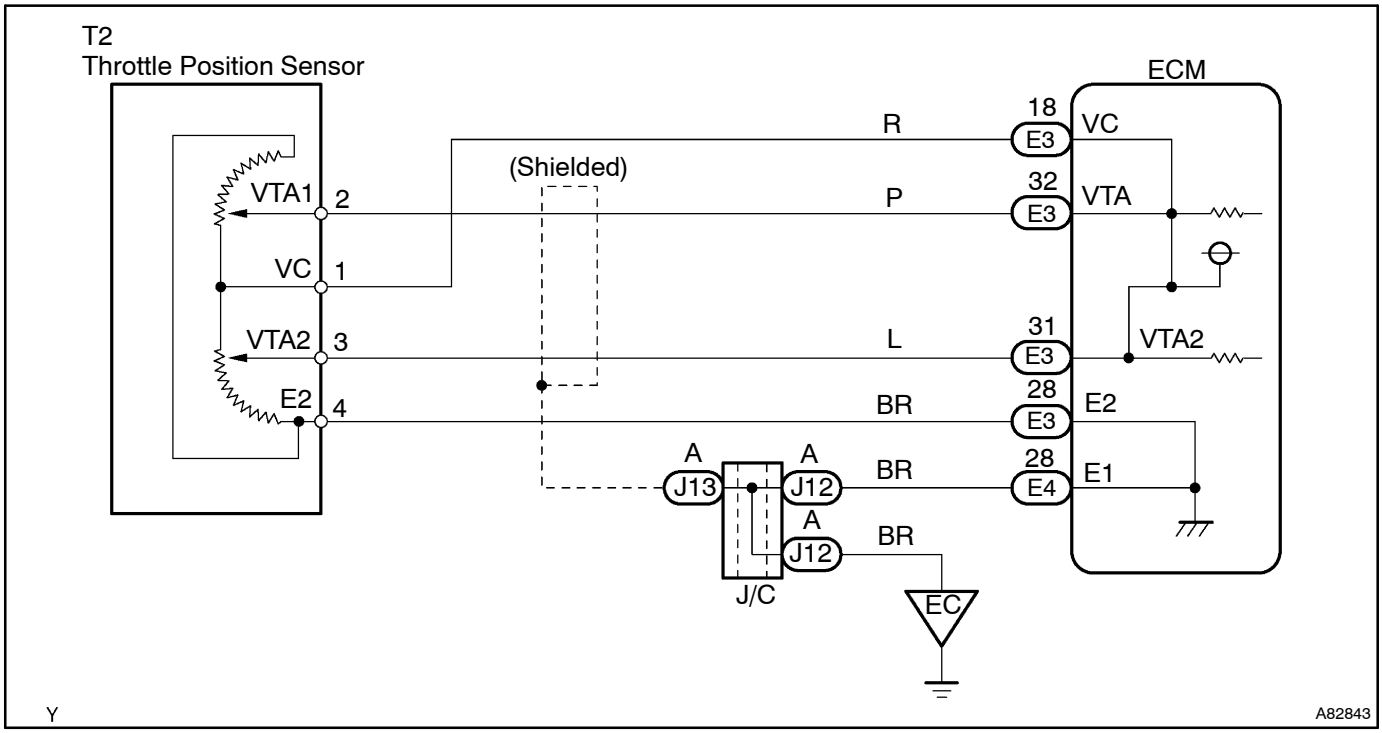
HINT:

- After confirming DTCs, confirm condition of the throttle valve opening angle (Data List/Throttle Position) and the closed throttle position switch (Data List/Throttle Position No.2) using the intelligent tester II.
- Throttle Position means the VTA1 signal (expressed as percentage), and Throttle Position No.2 means the VTA2 signal (expressed as volts.

Reference (Normal condition):

Tester display	Accelerator pedal released	Accelerator pedal depressed
Data List/Throttle Position	8 to 20 %	64 to 96 %
Data List/Throttle Position No.2	1.5 to 2.9 V	3.5 to 5.5 V

WIRING DIAGRAM

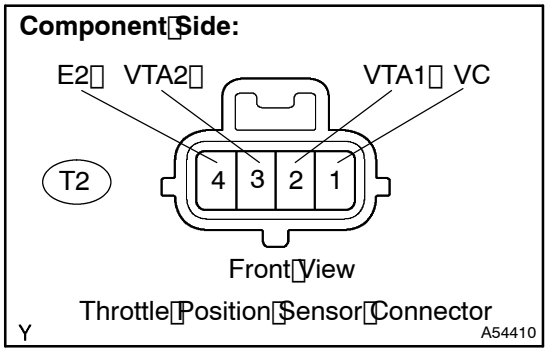


INSPECTION PROCEDURE

HINT:

- If 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 records the engine condition when 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 INSPECT THROTTLE POSITION SENSOR(RESISTANCE)



(a) Disconnect the T2 throttle position sensor connector.
(b) Measure the resistance between the terminals of the throttle position sensor.

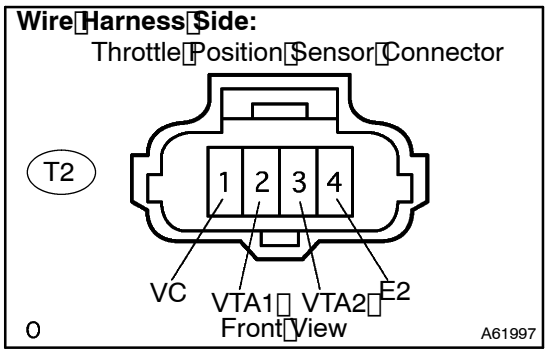
Standard:

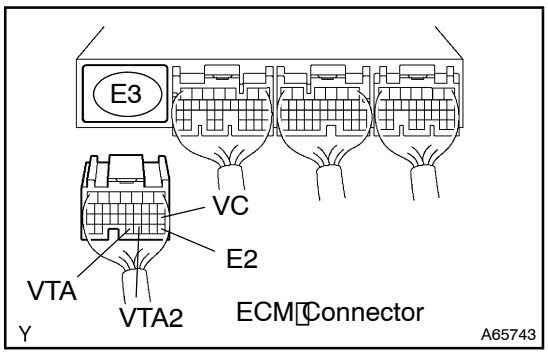
Throttle Position Sensor Terminal	Resistance
VC (1) – E2 (4)	1.2 to 3.2 kΩ at 20°C (68°F)
VTA1 (2) – E2 (4)	1.8 to 10.5 kΩ at 20°C (68°F)
VTA2 (3) – E2 (4)	1.8 to 10.5 kΩ at 20°C (68°F)

NG → **REPLACE THROTTLE W/MOTOR BODY ASSY (See page 10–13)**

OK

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





(a) Disconnect the T2 throttle position sensor connector.
(b) Disconnect the E3 ECM connector.
(c) Check the resistance between the wire harness side connectors.

Standard: Check for open

Tester Connection	Specified Condition
VC (T2–1) – VC (E3–18)	Below 1 Ω
VTA1 (T2–2) – VTA (E3–32)	Below 1 Ω
VTA2 (T2–3) – VTA2 (E3–31)	Below 1 Ω
E2 (T2–4) – E2 (E3–28)	Below 1 Ω

Standard: Check for short

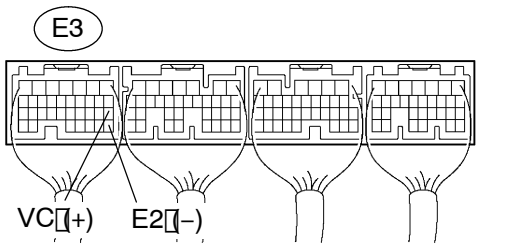
Tester Connection	Specified Condition
VC (E3–18) – E2 (E3–28)	10 kΩ or higher
VTA (E3–32) – E2 (E3–28)	10 kΩ or higher
VTA2 (E3–31) – E2 (E3–28)	10 kΩ or higher

(d) Reconnect the ECM connector.
(e) Reconnect the throttle position sensor connector.

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

OK

3	INSPECT ECM (VC – E2)



(a) Turn the power switch ON (IG).
(b) Measure the voltage between terminals VC and E2 of the ECM connector.

Standard:

Tester Connection	Specified Condition
VC (E3-18) – E2 (E3-28)	4.5 to 5.5 V

NG → REPLACE ECM (See page 10–24)

OK

REPLACE THROTTLE W/MOTOR BODY ASSY (See page 05–14)