

DTC	P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit
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DTC	P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input
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DTC	P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input
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DTC	P0220	Throttle/Pedal Position Sensor/Switch "B" Circuit
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DTC	P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input
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DTC	P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input
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DTC	P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correction
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CIRCUIT DESCRIPTION

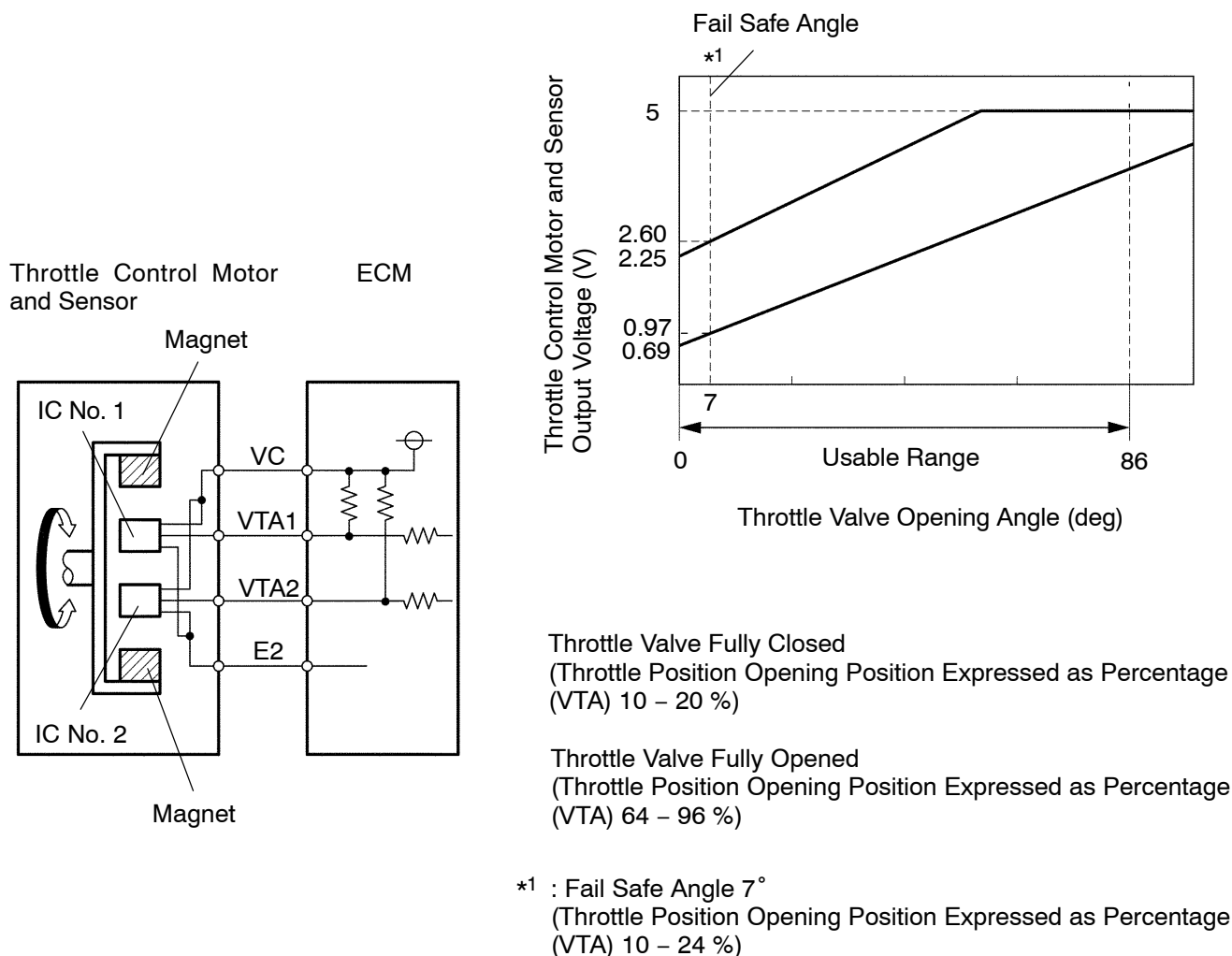
HINT:

- This is repair procedure of "throttle control motor and sensor".
- This electrical throttle system is no used throttle cable.
- This throttle control motor and sensor is non-contact type.

The throttle control motor and 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 control motor and sensor.

The voltage 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.

If this DTCs is stored, the throttle valve is locked at a certain opening angle.



DIAGNOSTICS – ENGINE

DTC No.	DTC Detection Condition	Main trouble
Condition (a) of DTC P0120, P0122, P0123, P0220, P0222 or P0223 continues for 2 seconds (Open or short in throttle control motor and sensor circuit)		
P0120	Detection conditions for DTCs P0122 and P0123 are not satisfied but condition (a) is satisfied (a) $V_{TA1} \leq 0.2 \text{ V}$ or $V_{TA1} \geq 4.8 \text{ V}$	• Open or short in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM
P0122	(a) $V_{TA1} \leq 0.2 \text{ V}$	• Throttle control motor and sensor • V_{TA1} circuit short • VC circuit open • ECM
P0123	(a) $V_{TA1} \geq 4.8 \text{ V}$	• Throttle control motor and sensor • V_{TA1} circuit open • E2 circuit open • VC and V_{TA1} circuit are short circuit • ECM
P0220	Detection conditions for DTCs P0222 and P0223 are not satisfied but condition (a) is satisfied (a) $V_{TA2} \leq 0.5 \text{ V}$ or $V_{TA2} \geq 4.8 \text{ V}$ and $0.2 \leq V_{TA} \leq 1.8 \text{ V}$	• Open or short in throttle control motor and sensor circuit • Throttle control motor and sensor • ECM
P0222	(a) $V_{TA2} \leq 0.5 \text{ V}$	• Throttle control motor and sensor • V_{TA2} circuit short • VC circuit open • ECM
P0223	(a) $V_{TA2} \geq 4.8 \text{ V}$ and $0.2 \leq V_{TA} \leq 1.8 \text{ V}$	• Throttle control motor and sensor • V_{TA2} circuit open • E2 circuit open • VC and V_{TA2} circuit are short circuited • ECM
P2135	Condition (a) continues for 0.5 seconds or more, or condition (b) continues for 0.4 seconds or more: (a) $ V_{TA1} - V_{TA2} \leq 0.02 \text{ V}$ (b) $V_{TA1} \leq 0.2 \text{ V}$ and $V_{TA2} \leq 0.5 \text{ V}$	• V_{TA} and V_{TA2} circuit are short-circuited • Throttle control motor and sensor • 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.

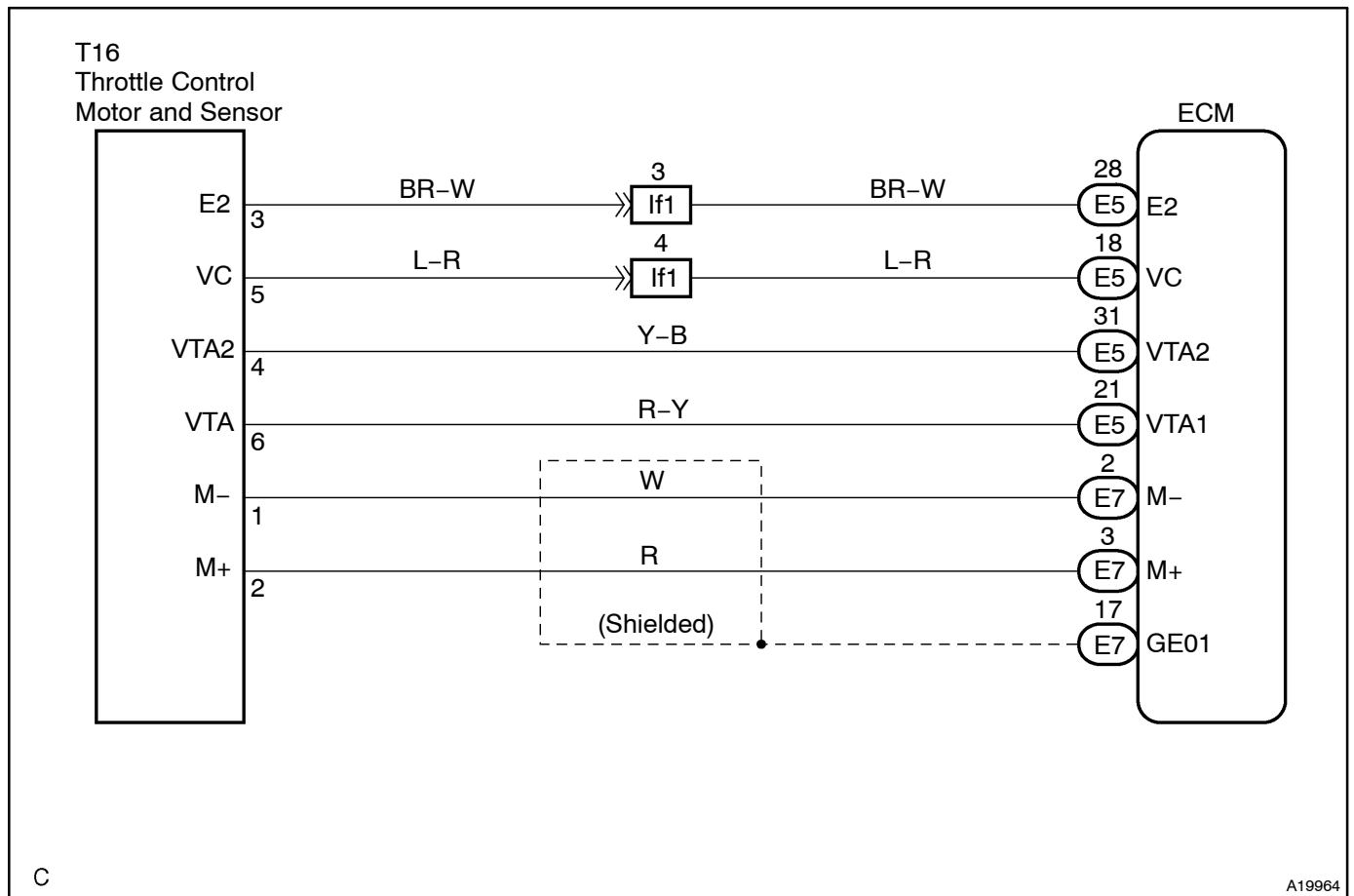
HINT:

- After confirming DTCs use the hand-held tester or the OBD II scan tool to confirm the throttle valve opening percentage and closed throttle position switch condition.
- The THROTTLE POS means V_{TA} signal as well as the THROTTLE POS #2 for the V_{TA2} signal.

Reference (Normal condition):

Tester display	Accelerator fully pedal released	Accelerator pedal fully depressed
THROTTLE POS	10 – 24 %	66 – 98 %
THROTTLE POS #2	2.1 – 3.1 V	4.5 – 5.5 V

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs P0110, P0115, P0120, P0450 and P1120 are output simultaneously, E2 (sensor ground) may be open.
- Read freeze frame data using hand-held tester or the OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, this 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.

Hand-held tester:

1	Connect hand-held tester, and read the voltage for throttle position sensor data.
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PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
 (b) Turn the ignition switch ON and push the hand-held tester main switch ON.

CHECK:

Read the voltage for the accelerator pedal position sensor data.

OK:**Result:**

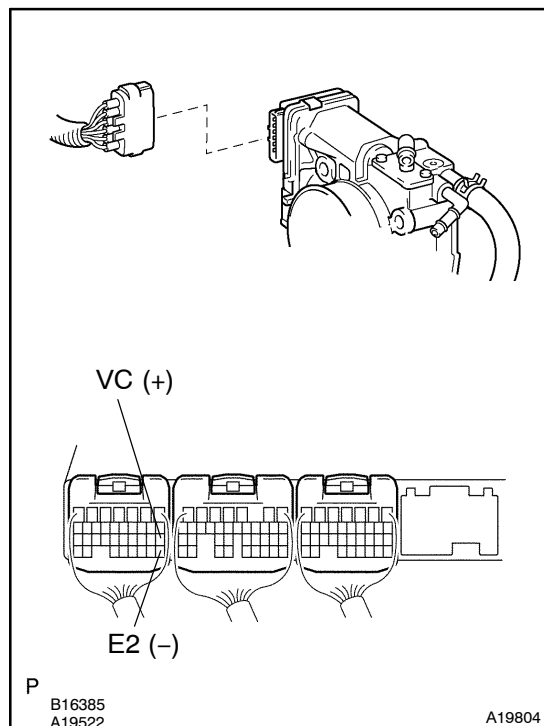
Throttle position expressed as percentage and voltage				Trouble area	Proceed to
Accelerator pedal released		Accelerator pedal depressed			
THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)	THROTTLE POS (VTA1)	THROTTLE POS #2 (VTA2)		
0 %	0 – 0.2 V	0 %	0 – 0.2 V	VC circuit open	A
100 %	4.5 – 5.5 V	100 %	4.5 – 5.5 V	E2 circuit open	
0 % or 100 %	2.15 – 3.05 V (Fail safe)	0 % or 100 %	2.15 – 3.05 V (Fail safe)	VTA circuit open or ground short	
10 – 24 % (Fail safe)	0 – 0.2 or 4.5 – 5.5 V	10 – 24 % (Fail safe)	0 – 0.2 or 4.5 – 5.5 V	VTA2 circuit open or ground short	
10 – 24 %	2.15 – 3.05 V	64 – 96 % (Does not fail safe)	4.5 – 5.5 V (Does not fail safe)	Throttle position sensor circuit is normal	B

B**Go to step 5.****A**

2	Check for open and short in harness and connector in VC, VTA1, VTA2 and E2 circuits between ECM and throttle control motor and sensor (See page IN-36).
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NG**Repair or replace harness and connector.****OK**

3 Check voltage between terminals VC and E2 of ECM connector.



PREPARATION:

- Remove the glove compartment door (See page [SF-60](#)).
- Turn the ignition switch ON.
- Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG

Check and replace ECM (See page [IN-36](#)).

OK

4 Replace throttle control motor and sensor (See page [SF-36](#)).

GO

5	Check if DTC output recur.
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PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Disconnect the battery terminals or remove the EFI or ECD No. 1 fuse (Clear DTCs).
- (c) Start the engine.
- (d) Drive the engine at idle for 15 seconds or more.

CHECK:

Read the DTC output.

OK:

No DTC output.

OK

System is OK.

NG

Check and replace ECM (See page [IN-36](#)).

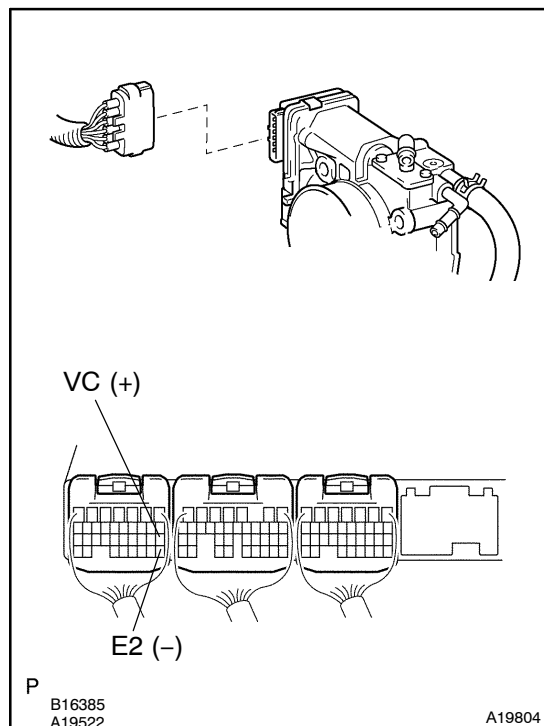
OBD II scan tool (excluding hand-held tester):

1	Check for open and short in harness and connector in VC, VTA1, VTA2 and E2 circuits between ECM and throttle control motor and sensor (See page IN-36).
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NG

Repair or replace harness and connector.

OK

2 Check voltage between terminals VC and E2 of ECM connector.**PREPARATION:**

- (a) Remove the glove compartment door (See page [SF-60](#)).
- (b) Turn the ignition switch ON.
- (c) Disconnect the throttle control motor and sensor connector.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG**Check and replace ECM (See page [IN-36](#)).****OK****3 Replace throttle control motor and sensor (See page [SF-36](#)).****GO**

4	Check if DTC output recur.
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PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Disconnect the battery terminals or remove the EFI or ECD No. 1 fuse (Clear DTCs).
- (c) Start the engine.
- (d) Drive the engine at idle for 15 seconds or more.

CHECK:

Read the DTC output.

OK:

No DTC output.

OK

System is OK.

NG

Check and replace ECM (See page [IN-36](#)).