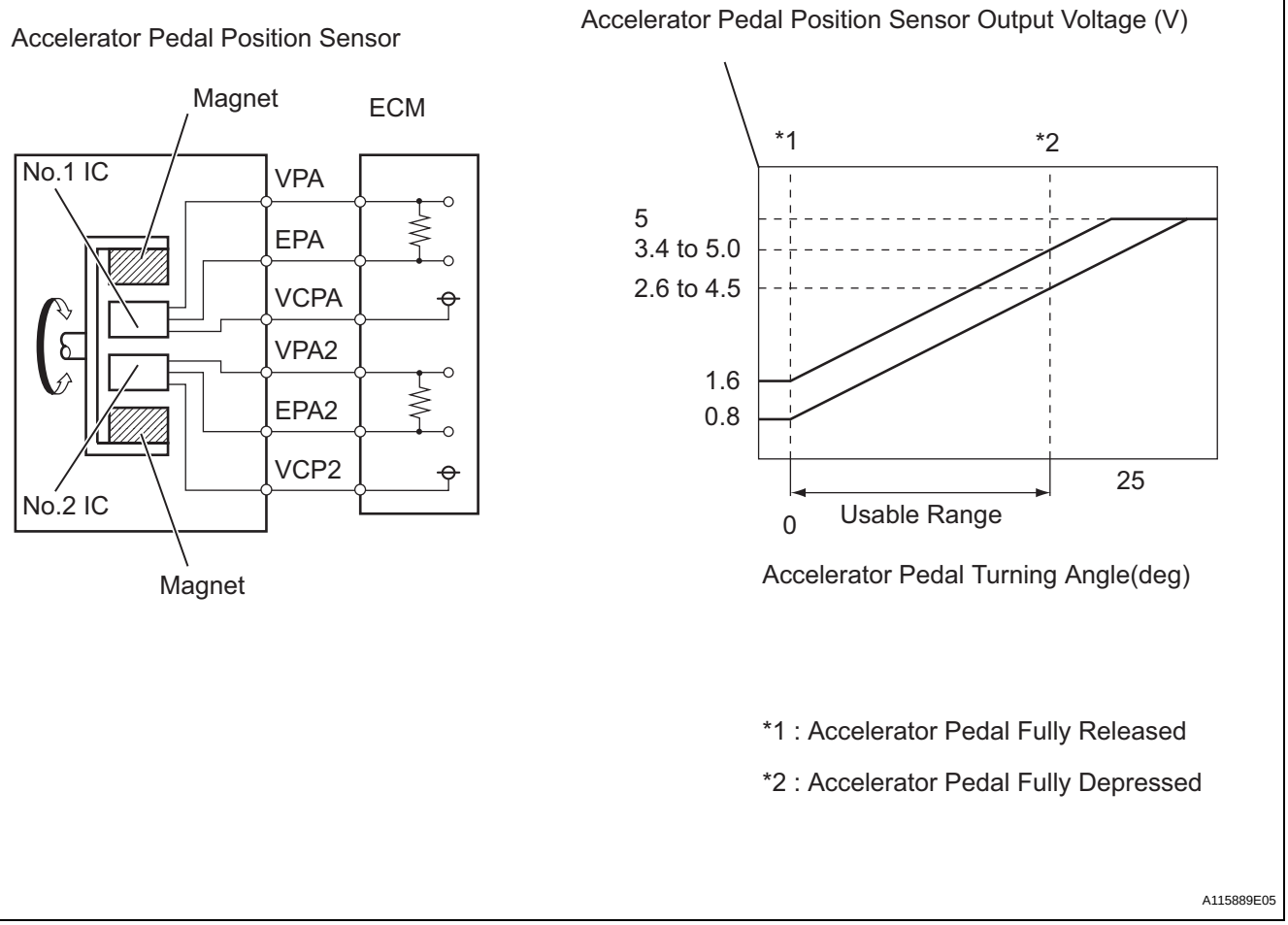
DTC	P2120	Throttle / Pedal Position Sensor / Switch "D" Circuit
DTC	P2122	Throttle / Pedal Position Sensor / Switch "D" Circuit Low Input
DTC	P2123	Throttle / Pedal Position Sensor / Switch "D" Circuit High Input
DTC	P2125	Throttle / Pedal Position Sensor / Switch "E" Circuit
DTC	P2127	Throttle / Pedal Position Sensor / Switch "E" Circuit Low Input
DTC	P2128	Throttle / Pedal Position Sensor / Switch "E" Circuit High Input
DTC	P2138	Throttle / Pedal Position Sensor / Switch "D" / "E" Voltage Correlation

HINT:
These DTCs relate to the Accelerator Pedal Position (APP) sensor.

DESCRIPTION

HINT:

- This ETCS (Electronic Throttle Control System) does not use a throttle cable.
- The Accelerator Pedal Position (APP) sensor is mounted on the accelerator pedal bracket and has 2 sensor circuits: VPA (main) and VPA2 (sub). This sensor is a non-contact type, and uses Hall-effect elements, in order to yield accurate signals, even in extreme driving conditions, such as at high speeds as well as very low speeds. The voltage, which is applied to terminals VPA and VPA2 of the ECM, varies between 0 V and 5 V in proportion to the operating angle of the accelerator pedal (throttle valve). A signal from VPA indicates the actual accelerator pedal opening angle (throttle valve opening angle) and is used for engine control. A signal from VPA2 conveys the status of the VPA circuit and is used to check the APP sensor itself.
- The ECM monitors the actual accelerator pedal opening angle (throttle valve opening angle) through the signals from VPA and VPA2, and controls the throttle actuator according to these signals.



DTC No.	DTC Detection Conditions	Trouble Areas
P2120	VPA fluctuates rapidly beyond upper and lower malfunction thresholds for 0.5 seconds or more (1 trip detection logic)	• Accelerator Pedal Position (APP) sensor • ECM
P2122	VPA 0.4 V or less for 0.5 seconds or more when accelerator pedal fully released (1 trip detection logic)	• APP sensor • Open in VCP1 circuit • Open or ground short in VPA circuit • ECM
P2123	VPA 4.8 V or more for 2.0 seconds or more (1 trip detection logic)	• APP sensor • Open in EPA circuit • ECM
P2125	VPA2 fluctuates rapidly beyond upper and lower malfunction thresholds for 0.5 seconds or more (1 trip detection logic)	• APP sensor • ECM
P2127	VPA2 1.2 V or less for 0.5 seconds or more when accelerator pedal fully released (1 trip detection logic)	• APP sensor • Open in VCP2 circuit • Open or ground short in VPA2 circuit • ECM
P2128	Conditions (a) and (b) continue for 2.0 seconds or more (1 trip detection logic): (a) VPA2 4.8 V or more (b) VPA between 0.4 V and 3.45 V	• APP sensor • Open in EPA2 circuit • ECM

DTC No.	DTC Detection Conditions	Trouble Areas
P2138	Conditions (a) and (b) continue for 2.0 seconds or more (1 trip detection logic): (a) Difference between VPA and VPA2 0.02 V or less (b) VPA 0.4 V or less and VPA2 1.2 V or less	• Short in between VPA and VPA2 circuits • APP sensor • ECM

HINT:
When any of these DTCs are set, check the APP sensor voltage by selecting the following menu items on an intelligent tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS / ACCEL POS #1 and ACCEL POS #2.

Trouble Areas	ACCEL POS #1 When AP Released	ACCEL POS #2 When AP Released	ACCEL POS #1 When AP Depressed	ACCEL POS #2 When AP Depressed
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
Open or ground short in VPA circuit	0 to 0.2 V	1.2 to 2.0 V	0 to 0.2 V	3.4 to 5.0 V
Open or ground short in VPA2 circuit	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EPA circuit open	4.5 to 5.0 V	4.5 to 5.0 V	4.5 to 5.0 V	4.5 to 5.0 V
Normal condition	0.5 to 1.1 V	1.2 to 2.0 V	2.6 to 4.5 V	3.4 to 5.0 V

HINT:
- Accelerator pedal positions are expressed as voltages.
- AP denotes for Accelerator Pedal.

MONITOR DESCRIPTION

When either of the voltage outputs of VPA or VPA2 deviates from the standard range, or the difference between the voltage outputs of the 2 sensor circuits is less than the threshold, the ECM determines that there is a malfunction in the APP sensor. The ECM then illuminates the MIL and sets a DTC.
Example:
When the voltage output of VPA drops below 0.4 V for more than 0.5 seconds when the accelerator pedal is fully depressed, DTC P2122 is set.
If the malfunction is not repaired successfully, a DTC is set 2 seconds after the engine is next started.

MONITOR STRATEGY

Related DTCs	P2120: Accelerator pedal position sensor 1 (VPA) range check (fluctuating) P2122: Accelerator pedal position sensor 1 (VPA) range check (low voltage) P2123: Accelerator pedal position sensor 1 (VPA) range check (high voltage) P2125: Accelerator pedal position sensor 2 (VPA2) range check (fluctuating) P2127: Accelerator pedal position sensor 2 (VPA2) range check (low voltage) P2128: Accelerator pedal position sensor 2 (VPA2) range check (high voltage) P2138: Accelerator pedal position sensor correlation range check
Required Sensors/Components (Main)	Accelerator pedal position sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds: P2120, P2122, P2125 and P2127 2 seconds: P2123, P2128 and P2138
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	None
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

P2120:

VPA voltage	0.4 V or less or 4.8 V or more

P2122:

VPA voltage	0.4 V or less (when accelerator pedal fully released)

P2123:

VPA voltage	4.8 V or more

P2125:

VPA2 voltage	1.2 V or less or 4.8 V or more

P2127:

VPA2 voltage	1.2 V or less (when accelerator pedal fully released)

P2128:

Both of following conditions met:	A & B
A. VPA voltage	0.4 V or more and 3.45 V or less
B. VPA2 voltage	4.8 V or more

P2138:

Either of following condition met	A or B
A. Difference between VPA and VPA2 voltages	0.02 V or less
B. Both following conditions are met:	(1) & (2)
(1) VPA voltage	0.4 V or less
(2) VPA2 voltage	1.2 V or less

COMPONENT OPERATING RANGE

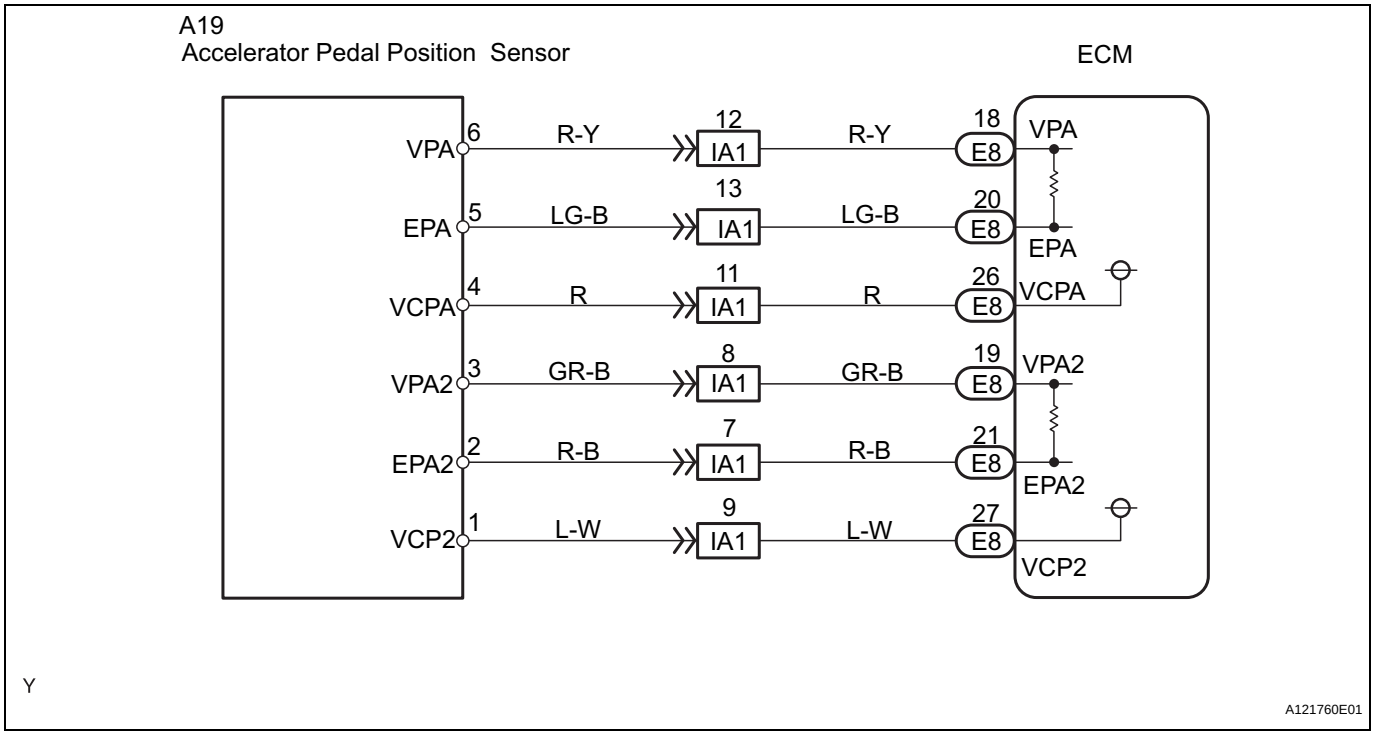
Parameter	Standard Value
VPA voltage	More than 0.4 V and less than 4.8 V
VPA2 voltage	More than 1.2 V and less than 4.8 V
Difference between VPA and VPA2 voltages	More than 0.02 V

FAIL-SAFE

When any of DTCs P2120, P2121, P2122, P2123, P2125, P2127, P2128 and P2138 are set, the ECM enters fail-safe mode. If either of the 2 sensor circuit malfunctions, the ECM uses the remaining circuit to calculate the accelerator pedal position to allow the vehicle to continue driving. If both of the circuits malfunction, the ECM regards the accelerator pedal as being released. As a result, the throttle valve is closed and the engine idles.

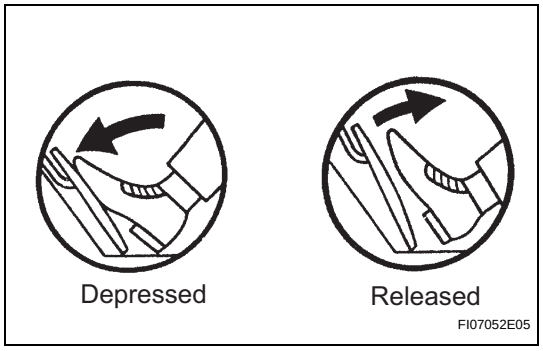
Fail-safe mode continues until a pass condition is detected, and the ignition switch is turned to OFF.

WIRING DIAGRAM



HINT:
Read freeze frame data using an intelligent tester. 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 DATA LIST (ACCEL POS #1 AND ACCEL POS #2)



(a) Connect an intelligent tester to the DLC3.
(b) Turn the ignition switch to ON and turn the tester ON.
(c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ETCS /ACCEL POS #1 and ACCEL POS #2.
(d) Read the values displayed on the tester.

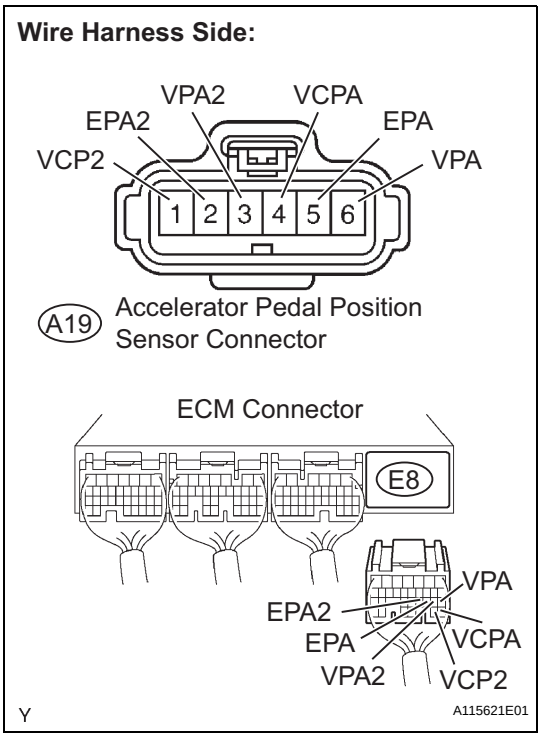
Standard Voltage

Accelerator Pedal Operations	ACCEL POS #1 (AP #1)	ACCEL POS #2 (AP #2)
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 5.0 V

OK → **Go to step 5**

NG

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



(a) Disconnect the A19 Accelerator Pedal Position (APP) sensor connector.
(b) Disconnect the E8 ECM connector.
(c) Check the resistance.

Standard Resistance (Check for open)

Tester Connections	Specified Conditions
VPA (A19-6) - VPA (E8-18)	Below 1 Ω
EPA (A19-5) - EPA (E8-20)	Below 1 Ω
VCPA (A19-4) - VCPA (E8-26)	Below 1 Ω
VPA2 (A19-3) - VPA2 (E8-19)	Below 1 Ω
EPA2 (A19-2) - EPA2 (E8-21)	Below 1 Ω
VCP2 (A19-1) - VCP2 (E8-27)	Below 1 Ω

Standard Resistance (Check for short)

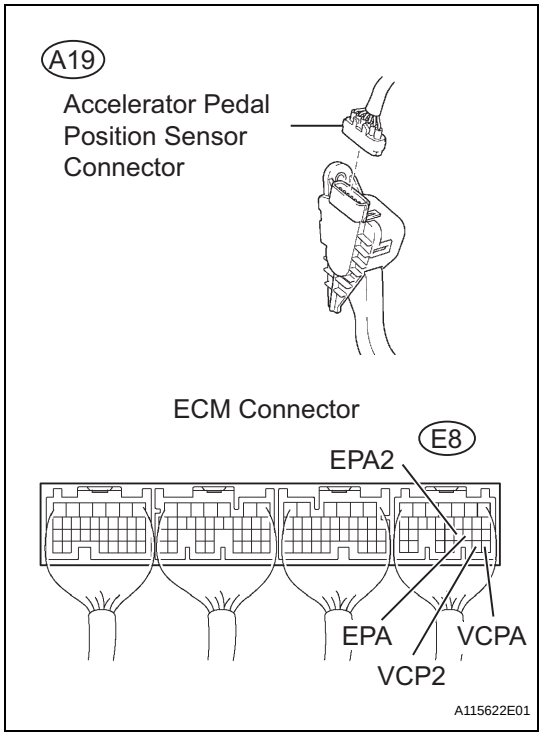
Tester Connections	Specified Conditions
VPA (A19-6) or VPA (E8-18) - Body ground	10 kΩ or higher
EPA (A19-5) or EPA (E8-20) - Body ground	10 kΩ or higher
VCPA (A19-4) or VCPA (E8-26) - Body ground	10 kΩ or higher
VPA2 (A19-3) or VPA2 (E8-19) - Body ground	10 kΩ or higher
EPA2 (A19-2) or EPA2 (E8-21) -Body ground	10 kΩ or higher
VCP2 (A19-1) or VCP2 (E8-27) - Body ground	10 kΩ or higher

(d) Reconnect the APP sensor connector.
(e) Reconnect the ECM connector.

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

OK

3 INSPECT ECM (VCPA AND VCP2 VOLTAGE)



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

Standard Voltage

Tester Connections	Specified Conditions
VCPA (E8-26) - EPA (E8-20)	4.5 to 5.0 V
VCP2 (E8-27) - EPA2 (E8-21)	4.5 to 5.0 V

(d) Reconnect the APP sensor connector.

NG → **REPLACE ECM**

OK

4 REPLACE ACCELERATOR PEDAL ROD ASSEMBLY

NEXT

5 CHECK WHETHER DTC OUTPUT RECURS (ACCELERATOR PEDAL POSITION SENSOR DTCS)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to ON and turn the tester ON.
(c) Clear DTCs (see page ES-40).
(d) Allow the engine to idle for 15 seconds.
(e) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(f) Read DTCs.

Result

Display (DTC Output)	Proceed To
P2120, P2122, P2123, P2125, P2127, P2128 and P2138	A
No output	B

B → **SYSTEM OK**

ES

A

REPLACE ECM