DTC	P2195	Oxygen (A/F) Sensor Signal Stuck Lean (Bank 1 Sensor 1)
DTC	P2196	Oxygen (A/F) Sensor Signal Stuck Rich (Bank 1 Sensor 1)

DESCRIPTION

HINT:

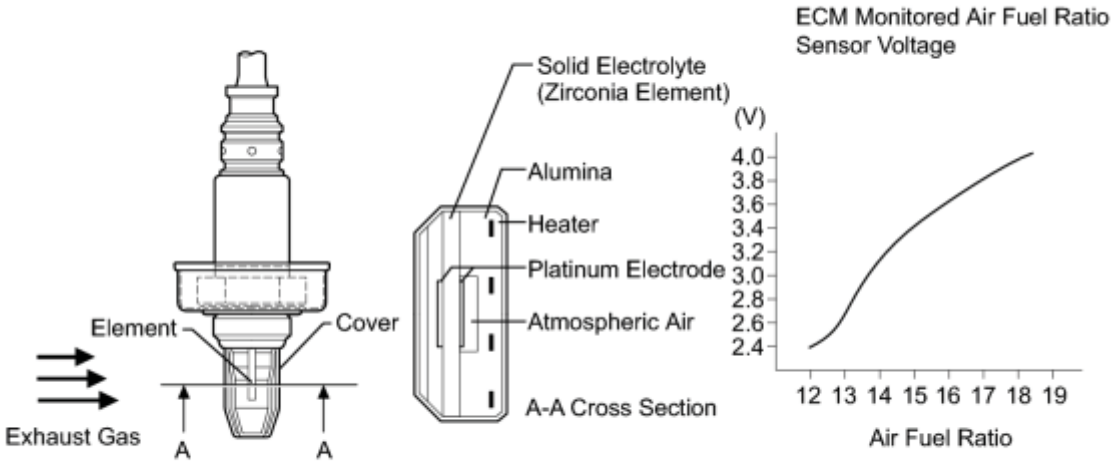
- Although the DTC titles say oxygen sensor, these DTCs relate to the air fuel ratio sensor.
- Sensor 1 refers to the sensor mounted in front of the three-way catalytic converter and located near the engine assembly.

The air fuel ratio sensor generates a voltage* that corresponds to the actual air fuel ratio. This sensor voltage is used to provide the ECM with feedback so that it can control the air fuel ratio. The ECM determines the deviation from the stoichiometric air fuel ratio level, and regulates the fuel injection time. If the air fuel ratio sensor malfunctions, the ECM is unable to control the air fuel ratio accurately.

The air fuel ratio sensor is the planar type and is integrated with the heater, which heats the solid electrolyte (zirconia element). This heater is controlled by the ECM. When the intake air volume is low (the exhaust gas temperature is low), a current flows into the heater to heat the sensor, in order to facilitate accurate oxygen concentration detection. In addition, the sensor and heater portions are the narrow type. The heat generated by the heater is conducted to the solid electrolyte through the alumina, therefore the sensor activation is accelerated.

In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxide (NOx) components in the exhaust gas, a three-way catalytic converter is used. For the most efficient use of the three-way catalytic converter, the air fuel ratio must be precisely controlled so that it is always close to the stoichiometric level.

*: Value changes inside the ECM. Since the air fuel ratio sensor is a current output element, the current is converted into a voltage inside the ECM. Any measurements taken at the air fuel ratio sensor or ECM connectors will show a constant voltage.



c

DTC No.	DTC Detection Condition	Trouble Area
P2195	Conditions (a) and (b) continue for 5 seconds or more (2 trip detection logic) • (a) Air fuel ratio sensor voltage more than 3.8 V • (b) Heated oxygen sensor voltage rises from less than 0.21 V to 0.59 V or more	• Open or short in air fuel ratio sensor (sensor 1) circuit • Air fuel ratio sensor (sensor 1) • Air fuel ratio sensor (sensor 1) heater • Air fuel ratio sensor heater circuit • Intake system • Fuel pressure • Fuel injector assembly • EGR valve assembly • ECM
	While fuel-cut operation performed (during vehicle deceleration), air fuel ratio sensor current is 3.6 mA or more for 3 seconds (2 trip detection logic)	• Air fuel ratio sensor (sensor 1) • EGR valve assembly • ECM
P2196	Conditions (a) and (b) continue for 5 seconds or more (2 trip detection logic) • (a) Air fuel ratio sensor voltage less than 2.8 V • (b) Heated oxygen sensor voltage falls from 0.59 V or more to less than 0.21 V	• Open or short in air fuel ratio sensor (sensor 1) circuit • Air fuel ratio sensor (sensor 1) • Air fuel ratio sensor (sensor 1) heater • Air fuel ratio sensor heater circuit • Intake system

DTC No.	DTC Detection Condition	Trouble Area
		• Fuel pressure • Fuel injector assembly • EGR valve assembly • ECM
	While fuel-cut operation performed (during vehicle deceleration), air fuel ratio sensor current is less than 1.0 mA for 3 seconds (2 trip detection logic)	• Air fuel ratio sensor (sensor 1) • EGR valve assembly • ECM

HINT:

- When any of these DTCs are set, check the air fuel ratio sensor voltage output by entering the following menus on the Techstream: Powertrain / Engine and ECT / Data List / All Data / AFS Voltage B1S1.
- Short-term fuel trim values can also be read using the Techstream.
- The ECM regulates the voltages at the A1A+ and A1A- terminals of the ECM to a constant level. Therefore, the air fuel ratio sensor voltage output cannot be confirmed without using the Techstream.
- If an air fuel ratio sensor malfunction is detected, the ECM sets a DTC.

MONITOR DESCRIPTION

Sensor Voltage Detection Monitor

Under the air fuel ratio feedback control, if the air fuel ratio sensor voltage output indicates rich or lean for a certain period of time, the ECM determines that there is a malfunction in the air fuel ratio sensor. The ECM illuminates the MIL and stores a DTC.

Example:

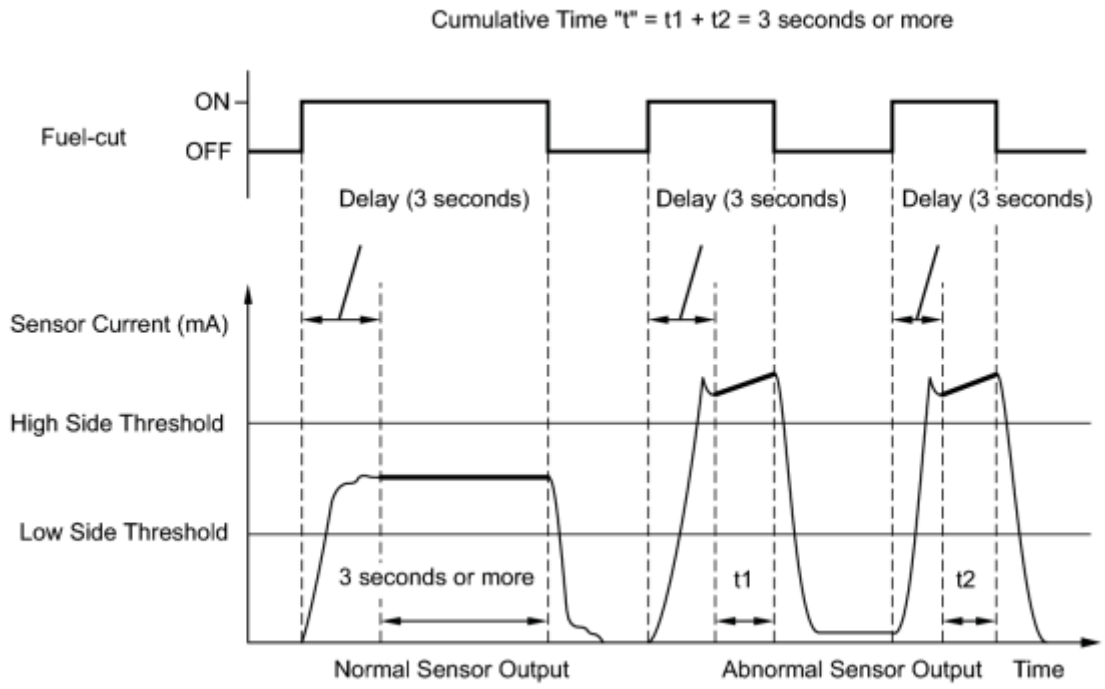
If the air fuel ratio sensor voltage output is below 2.8 V (very rich condition) and heated oxygen sensor output voltage falls from 0.59 V or more to less than 0.21 V for 5 seconds, the ECM stores DTC P2196. Alternatively, if the air fuel ratio sensor voltage output is higher than 3.8 V (very lean condition) and heated oxygen sensor output voltage rises from less than 0.21 V to 0.59 V or more for 5 seconds, DTC P2195 is stored.

Sensor Current Detection Monitor

A rich air fuel mixture causes a low air fuel ratio sensor current, and a lean air fuel mixture causes a high air fuel ratio sensor current. Therefore, the sensor output becomes low during acceleration, and it becomes high during deceleration with the throttle valve fully closed. The ECM monitors the air fuel ratio sensor current during fuel-cut and detects any abnormal current values.

If the air fuel ratio sensor output is 3.6 mA or higher for more than 3 seconds of cumulative time, the ECM interprets this as a malfunction in the air fuel ratio sensor and stores DTC P2195 (stuck on high side). If the air fuel ratio sensor output is below 1.57 mA for more than 3 seconds of cumulative time, the ECM stores DTC P2196 (stuck on low side).

Air Fuel Ratio Sensor Current Monitor



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MONITOR STRATEGY

Related DTCs	P2195: Air fuel ratio sensor (Bank 1) signal stuck lean P2196: Air fuel ratio sensor (Bank 1) signal stuck rich
Required Sensors/Components (Main)	Air fuel ratio sensor
Required Sensors/Components (Related)	Heated oxygen sensor
Frequency of Operation	Continuous
Duration	5 seconds: Sensor voltage detection monitor 3 seconds: Sensor current detection monitor
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

ALL

Monitor runs whenever following DTCs are not present	P0016 (VVT System Bank 1 - Misalignment) P0031, P0032, P101D (Air Fuel Ratio Sensor Heater - Sensor 1)

	P0102, P0103 (Mass Air Flow Meter) P0107, P0108 (Manifold Absolute Pressure) P0112, P0113 (Intake Air Temperature Sensor) P0115, P0117, P0118 (Engine Coolant Temperature Sensor) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P2135 (Throttle Position Sensor) P0125 (Insufficient Engine Coolant Temperature for Closed Loop Fuel Control) P0128 (Thermostat) P0171, P0172 (Fuel System) P0301, P0302, P0303, P0304 (Misfire) P0335 (Crankshaft Position Sensor) P0401 (EGR System (Closed)) P0451, P0452, P0453 (EVAP System) P0505 (Idle speed control)

Sensor Voltage Detection Monitor (Lean Side Malfunction P2195)

Time after engine start	30 seconds or more
Fuel system status	Closed-loop

Sensor Voltage Detection Monitor (Rich Side Malfunction P2196)

Time after engine start	30 seconds or more
Fuel system status	Closed-loop

Sensor Current Detection Monitor (P2195, P2196)

Battery voltage	11 V or more
Atmospheric pressure	76 kPa (570 mmHg) or higher
Air fuel ratio sensor status	Activated
Engine coolant temperature	75°C (167°F) or more
Continuous time of fuel cut	3 to 10 seconds
Delay time after EGR valve closed	2 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Sensor Voltage Detection Monitor (Lean Side Malfunction P2195)

Heated oxygen sensor output voltage	Rises from less than 0.21 V to 0.59 V or more
Air fuel ratio sensor voltage	More than 3.8 V

Sensor Voltage Detection Monitor (Rich Side Malfunction P2196)

Heated oxygen sensor output voltage	Falls from 0.59 V or more to less than 0.21 V
Air fuel ratio sensor voltage	Less than 2.8 V

Sensor Current Detection Monitor (High Side Malfunction P2195)

Air fuel ratio sensor current	3.6 mA or more

Sensor Current Detection Monitor (Low Side Malfunction P2196)

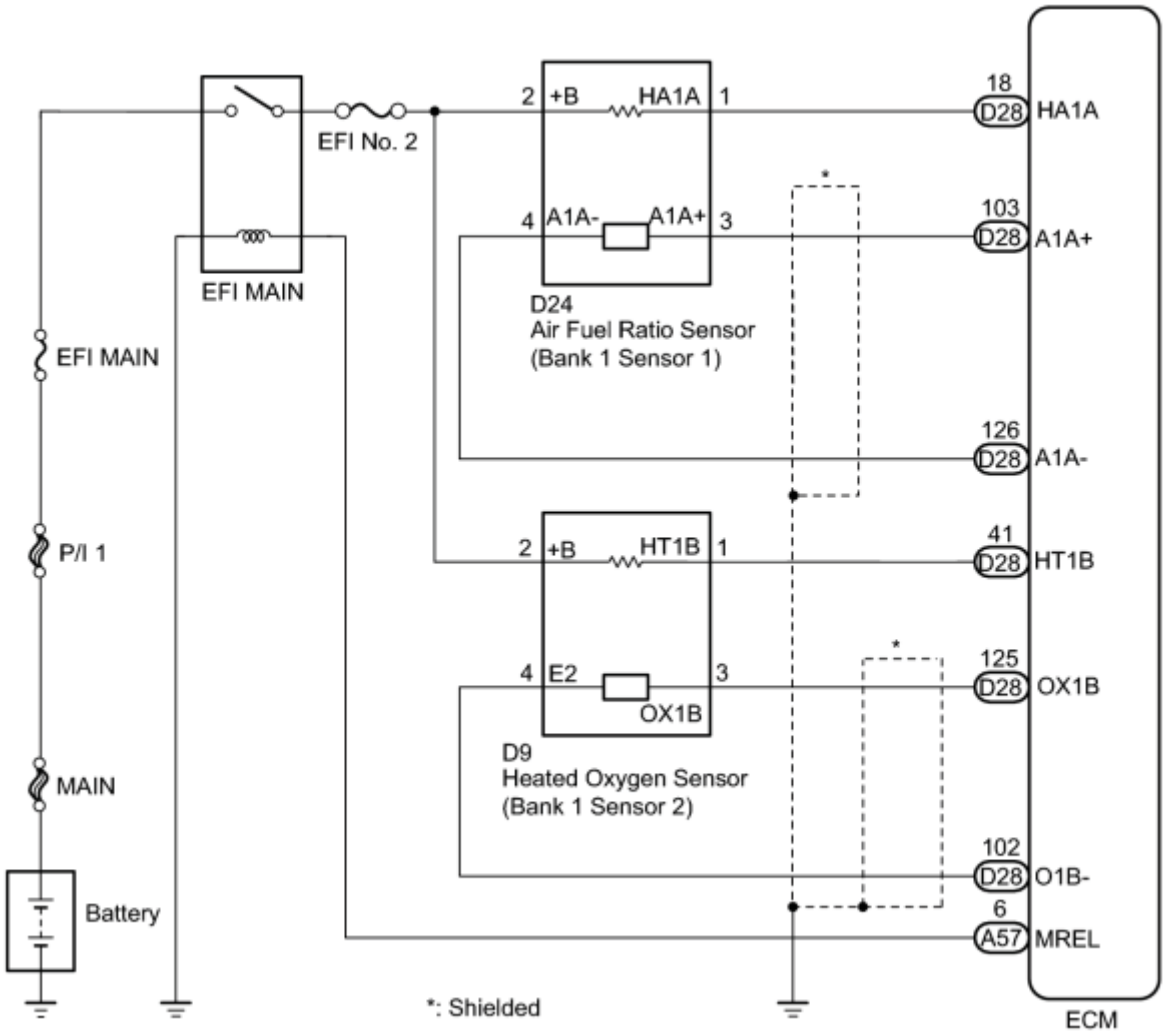
Air fuel ratio sensor current	Less than 1.57 mA

MONITOR RESULT

Refer to Checking Monitor Status 

.

WIRING DIAGRAM



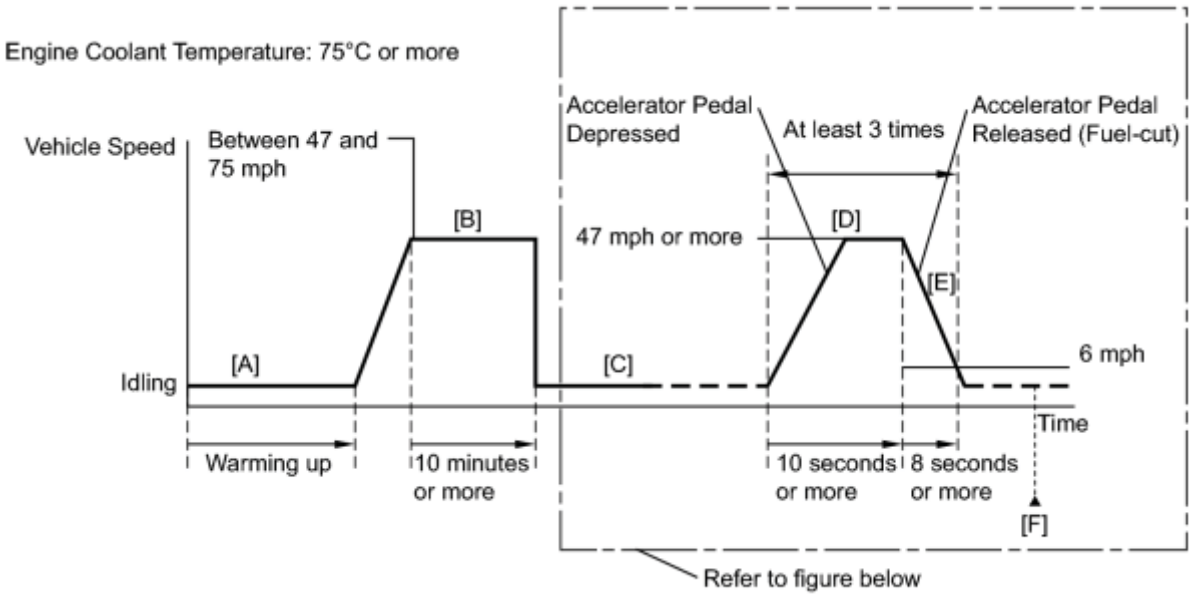
CONFIRMATION DRIVING PATTERN

CAUTION:

Strictly observe posted speed limits, traffic laws, and road conditions when performing these drive patterns.

HINT:

This confirmation driving pattern is used in the "Perform Confirmation Driving Pattern" procedure of the following diagnostic troubleshooting procedure.



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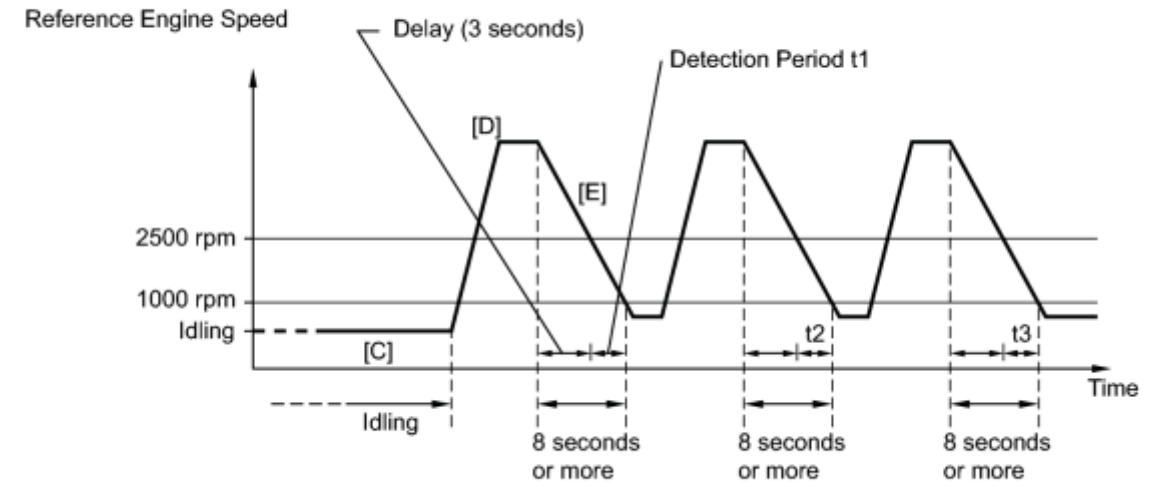
Driving Pattern Detail for [C] through [F]:

Cumulative Detection Period "t" = t1 + t2 + t3 = 3 seconds or more



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1. Connect the Techstream to the DLC3.
2. Turn the power switch on (IG).
3. Turn the Techstream on.
4. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure) INFO.
5. Turn the power switch off and wait for 30 seconds.
6. Turn the power switch on (IG) and turn the Techstream on.
7. Put the engine in inspection mode INFO.
8. Start the engine, and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [A].
9. On the Techstream, enter the following menus to check the fuel-cut status: Powertrain / Engine and ECT / Data List / All Data / Idle Fuel Cut.
10. Drive the vehicle at between 47 and 75 mph (75 and 120 km/h) for at least 10 minutes [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

11. Move the shift lever in B [C].
12. Accelerate the vehicle to 47 mph (75 km/h) or more by depressing the accelerator pedal for at least 10 seconds [D].
13. Soon after performing step [D] above, release the accelerator pedal for at least 8 seconds without depressing the brake pedal in order to execute fuel-cut control [E].

HINT:

Fuel-cut is performed when the following conditions are met:

- Accelerator pedal is fully released.
- Engine speed is 2500 rpm or more (fuel injection returns at 1000 rpm).

14. Allow the vehicle to decelerate until the vehicle speed decreases to less than 6 mph (10 km/h).
15. Repeat steps [C] through [E] above at least 3 times in one driving cycle.
16. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
17. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Pending.
18. Read the pending DTC [F].
19. If a pending DTC is output, the system is malfunctioning.

HINT:

If a pending DTC is not output, perform the following procedure.

20. Input the DTC: P2195 or P2196.
21. Check the DTC judgment result.

Techstream Display	Description
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
UNKNOWN	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows NORMAL, the system is normal.

- If the judgment result shows INCOMPLETE or UNKNOWN, perform steps [B] through [E].

22. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
23. Check the judgment result.

    HINT:

    - If the judgment result shows ABNORMAL, the system has a malfunction.
    - If the judgment result shows NORMAL, the system is normal.

24. If the test result is INCOMPLETE or UNKNOWN and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO.

    HINT:

    - If a permanent DTC is output, the system is malfunctioning.
    - If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be identified by performing the Control the Injection Volume for A/F Sensor function provided in the Active Test. The Control the Injection Volume for A/F Sensor function can help to determine whether the air fuel ratio sensor, heated oxygen sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the Control the Injection Volume for A/F Sensor operation using the Techstream.

1. Connect the Techstream to the DLC3.
2. Turn the power switch on (IG) and turn the Techstream on.
3. Put the engine in inspection mode INFO.
4. Start the engine.
5. Turn the Techstream on.
6. Warm up the engine at an engine speed of 2500 rpm for approximately 90 seconds.
7. Enter the following menus: Powertrain / Engine and ECT / Active Test / Control the Injection Volume for A/F Sensor.
8. Perform the Active Test operation with the engine idling (press the RIGHT or LEFT button to change the fuel injection volume).
9. Monitor the output voltages of the air fuel ratio and heated oxygen sensors (AFS Voltage B1S1 and O2S B1S2) displayed on the Techstream.

HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 25%.

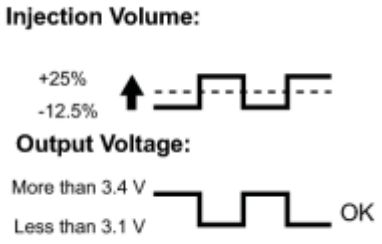
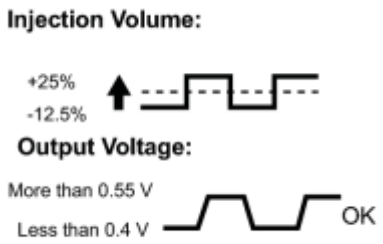
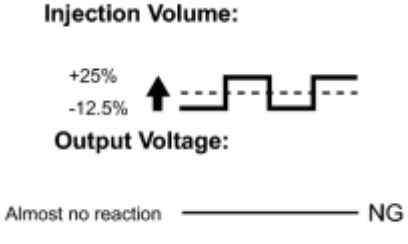
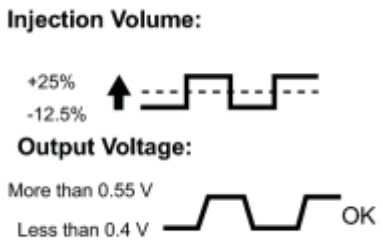
- Each sensor reacts in accordance with increases in the fuel injection volume.

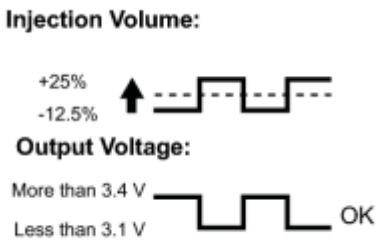
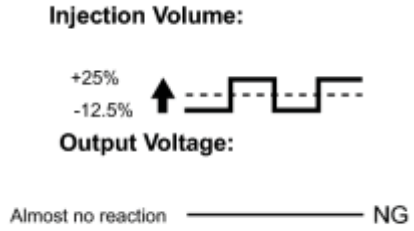
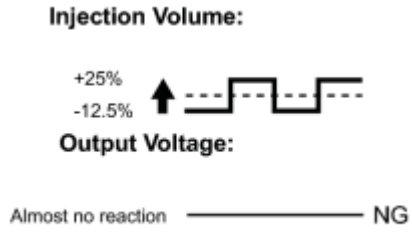
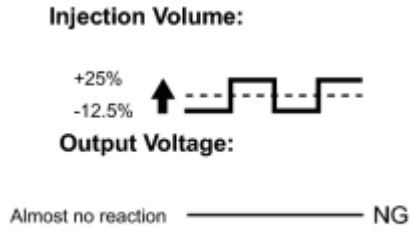
Techstream Display (Sensor)	Injection Volume	Status	Voltage

Techstream Display (Sensor)	Injection Volume	Status	Voltage
AFS Voltage B1S1 (Air fuel ratio)	+25%	Rich	Less than 3.1 V
AFS Voltage B1S1 (Air fuel ratio)	-12.5%	Lean	More than 3.4 V
O2S B1S2 (Heated oxygen)	+25%	Rich	More than 0.55 V
O2S B1S2 (Heated oxygen)	-12.5%	Lean	Less than 0.4 V

NOTICE:

The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.

Case	Air Fuel Ratio Sensor (Sensor 1) Output Voltage	Heated Oxygen Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Area
1			-
2			• Air fuel ratio sensor • Air fuel ratio sensor heater • Air fuel ratio sensor circuit
3			• Heated oxygen sensor • Heated oxygen sensor heater • Heated oxygen sensor circuit

Case	Air Fuel Ratio Sensor (Sensor 1) Output Voltage	Heated Oxygen Sensor (Sensor 2) Output Voltage	Main Suspected Trouble Area
			• Exhaust gas leaks
4			• Fuel pressure • Exhaust gas leaks (Air fuel ratio extremely lean or rich)

- Following the Control the Injection Volume for A/F Sensor procedure enables technicians to check and graph the voltage outputs of both the air fuel ratio and heated oxygen sensors.
- To display the graph, enter the following menus: Powertrain / Engine and ECT / Active Test / Control the Injection Volume for A/F Sensor / A/F Control System / AFS Voltage B1S1 and O2S B1S2.

HINT:

- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. 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.
- A low air fuel ratio sensor voltage could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A high air fuel ratio sensor voltage could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

PROCEDURE

1.	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO P2195 OR P2196)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(e) Read the DTCs.

Result:

Result	Proceed to
DTC P2195 or P2196 is output	A
DTC P2195 or P2196 and other DTCs are output	B

HINT:

If any DTCs other than P2195 and P2196 are output, troubleshoot those DTCs first.

B ▶ GO TO DTC CHART

A ▼

2.	CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST

(a) Has the vehicle run out of fuel in the past?

NO ▶ READ VALUE USING TECHSTREAM (TEST VALUE OF AIR FUEL RATIO SENSOR)

YES ▶ **DTC CAUSED BY RUNNING OUT OF FUEL**

3.	READ VALUE USING TECHSTREAM (TEST VALUE OF AIR FUEL RATIO SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs INFO.

(e) Put the engine in inspection mode INFO.

(f) Allow the vehicle to drive in accordance with the drive pattern described in the Confirmation Driving Pattern.

(g) Enter the following menus: Powertrain / Engine and ECT / Monitor / O2 Sensor / Status 2.

(h) Check that the Status 2 of O2 Sensor is Complete.

If the status is still Incomplete, perform the drive pattern increasing the vehicle speed and using the second gear to decelerate the vehicle.

(i) Enter the following menus: Powertrain / Engine and ECT / Monitor / O2 Sensor / Details / RANGE B1 S1.

(j) Check the test value of the air fuel ratio sensor output current during fuel-cut.

Result:

Result	Proceed to
Within normal range (1.57 mA or higher, and below 3.6 mA)	A
Outside normal range (Below 1.57 mA, or 3.6 mA or higher)	B

B ▶ REPLACE AIR FUEL RATIO SENSOR

A ▼

4.	READ VALUE USING TECHSTREAM (OUTPUT VOLTAGE OF AIR FUEL RATIO SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG) and turn the Techstream on.

(c) Put the engine in inspection mode INFO.

(d) Start the engine.

(e) Warm up the air fuel ratio sensor at an engine speed of 2500 rpm for 90 seconds.

(f) Enter the following menus: Powertrain / Engine and ECT / Data List / AFS Voltage B1S1 and Engine Speed, then press the Record button.

(g) Check the air fuel ratio sensor voltage 3 times, when the engine is in each of the following conditions:

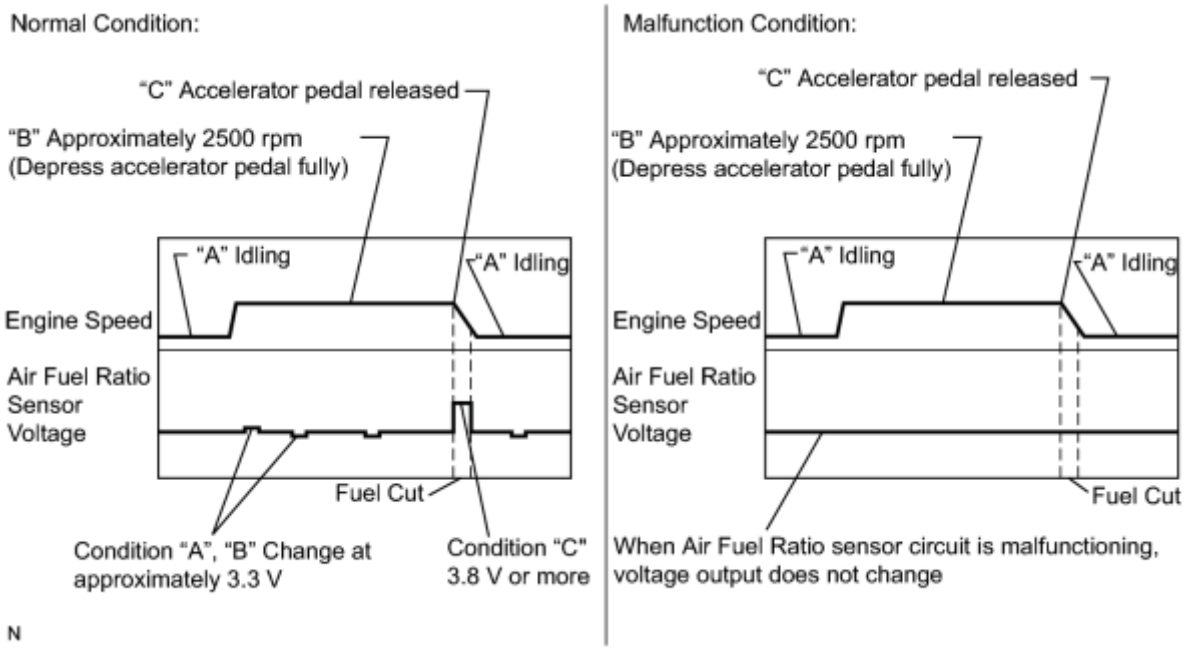
- (1) While idling (check for at least 30 seconds) (Step "A").
- (2) At an engine speed of approximately 2500 rpm (without any sudden changes in engine speed) (Step "B").
- (3) The engine speed is raised to 2500 rpm and then the accelerator pedal is quickly released so that the throttle valve is fully closed (Step "C").

Standard Voltage:

Condition	Air Fuel Ratio Sensor Voltage Variation	Reference
Steps "A" and "B"	Changes at approximately 3.3 V	Between 3.1 V and 3.4 V
Step "C"	Increases to 3.8 V or higher	This occurs during engine deceleration (when fuel-cut performed)

HINT:

For more information, see the diagrams below.



HINT:

- If the output voltage of the air fuel ratio sensor remains at approximately 3.3 V (see Malfunction Condition diagram) under any conditions, including those above, the air fuel ratio sensor may have an open circuit. (This will also happen if the air fuel ratio sensor heater has an open circuit.)
- If the output voltage of the air fuel ratio sensor remains at either approximately 3.8 V or higher, or below 2.8 V (see Malfunction Condition diagram) under any conditions, including those above, the air fuel ratio sensor may have a short circuit.
- The ECM stops fuel injection (fuel cut) during engine deceleration. This causes a lean condition and results in a momentary increase in the air fuel ratio sensor output voltage.
- When the vehicle is driven:

  The output voltage of the air fuel ratio sensor may be below 2.8 V during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The air fuel ratio sensor is functioning normally.

- The air fuel ratio sensor is a current output element; therefore, the current is converted into a voltage inside the ECM. Measuring the voltage at the connectors of the air fuel ratio sensor or ECM will show a constant voltage result.

NG ▶ INSPECT AIR FUEL RATIO SENSOR (HEATER RESISTANCE)

OK ▼

5.	PERFORM CONFIRMATION DRIVING PATTERN

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs.

(e) Put the engine in inspection mode INFO.

(f) Drive the vehicle referring to the Confirmation Driving Pattern.

NEXT

6.	CHECK WHETHER DTC OUTPUT RECURS (DTC P2195 OR P2196)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Pending.

(e) Read the Pending DTCs.

Result:

Result	Proceed to
DTC P2195 or P2196 is output	A
DTC is not output	B

B CHECK FOR INTERMITTENT PROBLEMS

A

7.	REPLACE AIR FUEL RATIO SENSOR

(a) Replace the air fuel ratio sensor INFO.

NEXT

8.	PERFORM CONFIRMATION DRIVING PATTERN

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs.

(e) Put the engine in inspection mode INFO.

(f) Drive the vehicle referring to the Confirmation Driving Pattern.

NEXT

9.	CHECK WHETHER DTC OUTPUT RECURS (DTC P2195 OR P2196)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Pending.

(e) Read the Pending DTCs.

Result:

Result	Proceed to
DTC P2195 or P2196 is output	A
DTC is not output	B

B END

A

10.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE EGR STEP POSITION)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Put the engine in inspection mode INFO.

(e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or more.

HINT:

The A/C switch and all accessory switches should be off.

(f) Enter the following menus: Powertrain / Engine and ECT / Active Test / Control the EGR Step Position.

(g) Confirm the Throttle Idle Position is ON and check the engine idling condition and MAP values in the Data List while performing the Active Test.

HINT:

- Do not leave the EGR valve open for 10 seconds or more during the Active Test.
- Be sure to return the EGR valve to step 0 when the Active Test is completed.
- Do not open the EGR valve 30 steps or more during the Active Test.

OK:

MAP and idling condition change in response to EGR step position when Throttle Idle Position is ON in Data List.

Standard:

-	EGR Step Position (Active Test)	
	0 Steps	0 to 30 Steps
Idling condition	Steady idling	Idling changes from steady to rough idling
MAP (Data List)	MAP value is 20 to 40 kPa (150 to 300 mmHg) (EGR valve is fully closed)	MAP value is at least +10 kPa (75 mmHg) higher than when EGR valve is fully closed

HINT:

During Active Test, if the idling condition does not change in response to EGR step position, then there is probably a malfunction in the EGR valve.

Result:

Result	Proceed to
Outside of standard range	A
Within standard range	B

B ▶ REPLACE ECM

A ▼

11.	INSPECT EGR VALVE ASSEMBLY

(a) Remove the EGR valve assembly INFO.

(b) Check if the EGR valve is stuck open.

OK:

EGR valve is tightly closed.

(c) Reinstall the EGR valve assembly INFO.

NG ▶ REPLACE EGR VALVE ASSEMBLY

OK ▼

12.	REPLACE ECM

(a) Replace the ECM INFO.

NEXT

13.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs INFO.

(e) Turn the power switch off and wait for 30 seconds.

(f) Turn the power switch on (IG) and turn the Techstream on.

(g) Put the engine in inspection mode INFO.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

(k) Input the DTC: P2195 or P2196.

(l) Check the DTC judgment result.

NEXT **END**

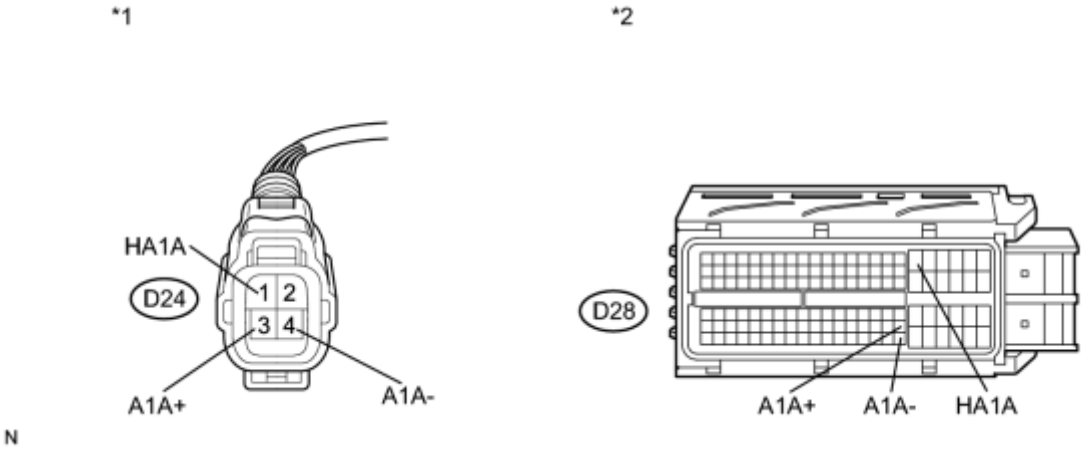
14.	INSPECT AIR FUEL RATIO SENSOR (HEATER RESISTANCE) INFO

NG REPLACE AIR FUEL RATIO SENSOR

OK

15.	CHECK HARNESS AND CONNECTOR (AIR FUEL RATIO SENSOR - ECM)

(a) Disconnect the air fuel ratio sensor connector.



(b) Disconnect the ECM connector.

(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Condition	Specified Condition
D24-1 (HA1A) - D28-18 (HA1A)	Always	Below 1 Ω
D24-3 (A1A+) - D28-103 (A1A+)		
D24-4 (A1A-) - D28-126 (A1A-)		

Standard Resistance (Check for Short):

Tester Connection	Condition	Specified Condition
D24-1 (HA1A) or D28-18 (HA1A) - Body ground	Always	10 kΩ or higher
D24-3 (A1A+) or D28-103 (A1A+) - Body ground		
D24-4 (A1A-) or D28-126 (A1A-) - Body ground		

Text in Illustration

*1	Front view of wire harness connector (to Air Fuel Ratio Sensor)	*2	Front view of wire harness connector (to ECM)

(d) Reconnect the air fuel ratio sensor connector.

(e) Reconnect the ECM connector.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR (AIR FUEL RATIO SENSOR - ECM)

OK ▼

16.	CHECK INTAKE SYSTEM

(a) Check the intake system for vacuum leaks INFO.

OK:

No leaks from the intake system.

NG ▶ REPAIR OR REPLACE INTAKE SYSTEM
OK
▼

17.	CHECK FUEL PRESSURE

(a) Check the fuel pressure INFO.

NG ▶ REPAIR OR REPLACE FUEL SYSTEM
OK
▼

18.	INSPECT FUEL INJECTOR ASSEMBLY

(a) Check the fuel injector assembly injection (whether fuel volume is high or low, and whether injection pattern is poor) INFO.

NG ▶ REPLACE FUEL INJECTOR ASSEMBLY
OK
▼

19.	REPLACE AIR FUEL RATIO SENSOR

(a) Replace the air fuel ratio sensor INFO.

NEXT
▼

20.	PERFORM CONFIRMATION DRIVING PATTERN

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs.

(e) Put the engine in inspection mode INFO.

(f) Drive the vehicle referring to the Confirmation Driving Pattern.

NEXT

21.	CHECK WHETHER DTC OUTPUT RECURS (DTC P2195 OR P2196)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Pending.

(e) Read the Pending DTCs.

Result:

Result	Proceed to
DTC P2195 or P2196 is output	A
DTC is not output	B

B ▶ END

A

22.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE EGR STEP POSITION)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Put the engine in inspection mode INFO.

(e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or more.

HINT:

The A/C switch and all accessory switches should be off.

(f) Enter the following menus: Powertrain / Engine and ECT / Active Test / Control the EGR Step Position.

(g) Confirm the Throttle Idle Position is ON and check the engine idling condition and MAP values in the Data List while performing the Active Test.

HINT:

- Do not leave the EGR valve open for 10 seconds or more during the Active Test.
- Be sure to return the EGR valve to step 0 when the Active Test is completed.
- Do not open the EGR valve 30 steps or more during the Active Test.

OK:

MAP and idling condition change in response to EGR step position when Throttle Idle Position is ON in Data List.

Standard:

-	EGR Step Position (Active Test)	
	0 Steps	0 to 30 Steps
Idling condition	Steady idling	Idling changes from steady to rough idling
MAP (Data List)	MAP value is 20 to 40 kPa (150 to 300 mmHg) (EGR valve is fully closed)	MAP value is at least +10 kPa (75 mmHg) higher than when EGR valve is fully closed

HINT:

During Active Test, if the idling condition does not change in response to EGR step position, then there is probably a malfunction in the EGR valve.

Result:

Result	Proceed to
Outside of standard range	A
Within standard range	B

B ▶ REPLACE ECM

A ▼

23.	INSPECT EGR VALVE ASSEMBLY

(a) Remove the EGR valve assembly INFO.

(b) Check if the EGR valve is stuck open.

OK:

EGR valve is tightly closed.

(c) Reinstall the EGR valve assembly INFO.

NG ▶ REPLACE EGR VALVE ASSEMBLY

OK ▼

24.	REPLACE ECM

(a) Replace the ECM INFO.

NEXT

25.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs INFO.

(e) Turn the power switch off and wait for 30 seconds.

(f) Turn the power switch on (IG) and turn the Techstream on.

(g) Put the engine in inspection mode INFO.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

(k) Input the DTC: P2195 or P2196.

(l) Check the DTC judgment result.

NEXT **END**

26.	REPLACE AIR FUEL RATIO SENSOR

(a) Replace the air fuel ratio sensor INFO.

NEXT

27.	PERFORM CONFIRMATION DRIVING PATTERN

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Clear the DTCs.

(e) Put the engine in inspection mode INFO.

(f) Drive the vehicle referring to the Confirmation Driving Pattern.

NEXT

28.	CHECK WHETHER DTC OUTPUT RECURS (DTC P2195 OR P2196)

(a) Connect the Techstream to the DLC3.

(b) Turn the power switch on (IG).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Pending.

(e) Read the Pending DTCs.

Result:

Result	Proceed to
DTC is not output	A
DTC P2195 or P2196 is output	B

B REPLACE ECM

A **CHECK FOR INTERMITTENT PROBLEMS**