

Computers and Control Systems: Pinpoint Tests

Test DV: Throttle Body Assembly ETC

PINPOINT TEST DV: THROTTLE BODY ASSEMBLY ETC

Throttle Body Assembly ETC	DV
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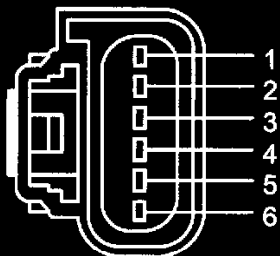
⚠ WARNING: Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from throttle mechanism when actuated.

This pinpoint test is intended to diagnose the following:

- Electronic throttle body (ETB) (9F991).
- Harness circuits: ETCRTN, ETCREF, TP1, TP2, TACM+, and TACM-.
- Powertrain control module (PCM) (12A650).

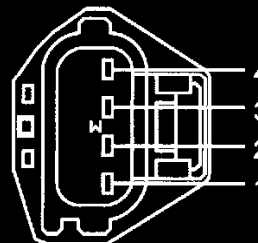
Electronic Throttle Body TPS (ETBTPS) Sensor Connector

A



A0094772

B



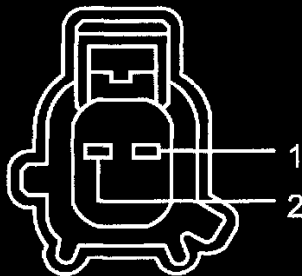
A0077519

Vehicle	Connector	Circuit	Pin
F-150 4.2L, Five Hundred, Freestyle, Montego	A	TACM+ TACM- TP2 TP1 ETCRTN ETCREF	1 2 6 3 4 5
All other vehicles	B	TP2 TP1 ETCRTN ETCREF	1 4 3 2

Throttle Body Assembly ETC

DV

Electronic Throttle Body Throttle Actuator Control Motor (ETBTACM) Motor Connector



A0077510

Circuit	Pin
TACM- (TACM-)	2
TACM+ (TACM+)	1

Powertrain Control Module (PCM) Connector

For PCM connector views or reference values, refer to Reference Values.

Vehicle	Connector	Circuit	Pin
E-Series 4.6L, E-Series 6.8L, E-Series 5.4L 4R75E, E-Series 5.4L 5R100, F-Super Duty	170 Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B16, B4, E66 B18, B6, E59 B35 B47 E51 E34 E60 E61
Expedition, F-150, Navigator	190 Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B21, B28, E66 B58, B59, E59 B51 B67 E51 E34 E60 E61

(Continued)

Throttle Body Assembly ETC

DV


Vehicle	Connector	Circuit	Pin
Explorer, Mountaineer	150 (50-50-50) Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B4, B40, E18 B41, B6, E7 B35 B47 E48 E47 E29 E19
LS, Thunderbird	150 (60-32-58) Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B20, B23, E24 B17, E15 B32 B24 E27 E35 E57 E32
Mustang	170 Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B24, B4, E66 B43, B6, E59 B35 B47 E51 E34 E60 E61
All other vehicles	150 (50-50-50) Pin	ETCREF ETCRTN VPWR PWRGND TACM- TACM+ TP2 TP1	B24, B4, E18 B41, B6, E7 B35 B47 E48 E47 E29 E19

Test Step		Results / Action to Take									
DV1	CHECK THE TP OPEN AND CLOSED VOLTAGES <ul style="list-style-type: none"> Key in ON position. Access the PCM and monitor the TP1 and TP2 PIDs. Press the accelerator pedal to the floor and release. Electronic Throttle Control Throttle Position Sensor Signal Voltages <table border="1"> <thead> <tr> <th>Accelerator Pedal Position</th> <th>TP1</th> <th>TP2</th> </tr> </thead> <tbody> <tr> <td>Pedal fully released</td> <td>3.7 - 4.7</td> <td>0.3 - 1.9</td> </tr> <tr> <td>Pedal fully applied</td> <td>0.7 - 2.9</td> <td>4.1 - 4.7</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Are both PIDs within the chart ranges? 	Accelerator Pedal Position	TP1	TP2	Pedal fully released	3.7 - 4.7	0.3 - 1.9	Pedal fully applied	0.7 - 2.9	4.1 - 4.7	Yes GO to DV11. No GO to DV2.
Accelerator Pedal Position	TP1	TP2									
Pedal fully released	3.7 - 4.7	0.3 - 1.9									
Pedal fully applied	0.7 - 2.9	4.1 - 4.7									

Chart, DV1

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take																								
DV2	CHECK FOR OBSTRUCTION OF THE THROTTLE BODY  WARNING: Substantial opening and closing torque is applied by this system. To prevent injury, be careful to keep fingers away from throttle mechanism when actuated. Note: Moving the throttle plate manually may cause DTC P2106 to set during the self-test. <ul style="list-style-type: none"> • Key in OFF position. • Remove the inlet tube from the throttle body. • Visually inspect for throttle plate obstruction. • Slowly, push the throttle plate to wide open and release. • Does the throttle plate move freely to wide open and back? 	Yes For continuous memory DTCs P0121, P0122, P0221, or P0222 alone or together, GO to DV3 . For continuous memory DTCs P2100, P2101, P2107, and P2112 together, GO to DV13 . For all other DTCs, GO to DV4 . No Key in OFF position. ISOLATE and REPAIR the obstruction.																								
DV3	CHECK THE VREF VOLTAGE TO TP <ul style="list-style-type: none"> • ETBTPS Sensor connector disconnected. • Key in ON position. • Measure the voltage between: <table border="1" data-bbox="308 856 863 978"> <thead> <tr> <th>(+) ETBTPS Sensor Connector, Harness Side</th> <th>(-) ETBTPS Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>ETCREF</td> <td>ETCRTN</td> </tr> </tbody> </table> • Is the voltage between 4 V - 6 V? 	(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side	ETCREF	ETCRTN	Yes GO to DV4 . No GO to C1 .																				
(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side																									
ETCREF	ETCRTN																									
DV4	CHECK THE FUNCTIONALITY OF TP SENSOR <ul style="list-style-type: none"> • Key in OFF position. • ETBTPS Sensor connector disconnected. • Measure the resistance between: <table border="1" data-bbox="308 1150 857 1470"> <thead> <tr> <th>(+) ETBTPS Sensor Connector, Component Side</th> <th>(-) ETBTPS Sensor Connector, Component Side</th> <th>Minimum Resistance (ohms)</th> <th>Maximum Resistance (ohms)</th> </tr> </thead> <tbody> <tr> <td>TP1</td> <td>ETCREF</td> <td>1,100</td> <td>3,500</td> </tr> <tr> <td>TP1</td> <td>ETCRTN</td> <td>2,500</td> <td>5,900</td> </tr> <tr> <td>TP2</td> <td>ETCREF</td> <td>1,800</td> <td>4,900</td> </tr> <tr> <td>TP2</td> <td>ETCRTN</td> <td>800</td> <td>2,800</td> </tr> <tr> <td>ETCREF</td> <td>ETCRTN</td> <td>1,800</td> <td>4,900</td> </tr> </tbody> </table> • Are all the resistances within specifications? 	(+) ETBTPS Sensor Connector, Component Side	(-) ETBTPS Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)	TP1	ETCREF	1,100	3,500	TP1	ETCRTN	2,500	5,900	TP2	ETCREF	1,800	4,900	TP2	ETCRTN	800	2,800	ETCREF	ETCRTN	1,800	4,900	Yes GO to DV5 . No INSTALL a new ETBTPS sensor.
(+) ETBTPS Sensor Connector, Component Side	(-) ETBTPS Sensor Connector, Component Side	Minimum Resistance (ohms)	Maximum Resistance (ohms)																							
TP1	ETCREF	1,100	3,500																							
TP1	ETCRTN	2,500	5,900																							
TP2	ETCREF	1,800	4,900																							
TP2	ETCRTN	800	2,800																							
ETCREF	ETCRTN	1,800	4,900																							

DV2-DV4

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take												
DV5	<p>CHECK THE TP1 AND TP2 CIRCUIT(S) FOR A SHORT TO POWER IN THE HARNESS</p> <ul style="list-style-type: none"> PCM connector disconnected. Key in ON position. Measure the voltage between: <table border="1"> <thead> <tr> <th>(+) ETBTPS Sensor Connector, Harness Side</th> <th>(-)</th> </tr> </thead> <tbody> <tr> <td>TP1</td> <td>Ground</td> </tr> <tr> <td>TP2</td> <td>Ground</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Is any voltage present? 	(+) ETBTPS Sensor Connector, Harness Side	(-)	TP1	Ground	TP2	Ground	<p>Yes REPAIR the short circuit to PWR.</p> <p>No GO to DV6.</p>						
(+) ETBTPS Sensor Connector, Harness Side	(-)													
TP1	Ground													
TP2	Ground													
DV6	<p>CHECK THE TP1 AND TP2 CIRCUIT(S) FOR AN OPEN IN THE HARNESS</p> <ul style="list-style-type: none"> Key in OFF position. Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTPS Sensor Connector, Harness Side</th> <th>(-) PCM Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>TP1</td> <td>TP1</td> </tr> <tr> <td>TP2</td> <td>TP2</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Are the resistances less than 5 ohms? 	(+) ETBTPS Sensor Connector, Harness Side	(-) PCM Connector, Harness Side	TP1	TP1	TP2	TP2	<p>Yes GO to DV7.</p> <p>No REPAIR the open circuit.</p>						
(+) ETBTPS Sensor Connector, Harness Side	(-) PCM Connector, Harness Side													
TP1	TP1													
TP2	TP2													
DV7	<p>CHECK THE TP1 AND TP2 CIRCUIT(S) FOR A SHORT TO GROUND IN THE HARNESS</p> <ul style="list-style-type: none"> Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTPS Sensor Connector, Harness Side</th> <th>(-) Vehicle Battery</th> </tr> </thead> <tbody> <tr> <td>TP1</td> <td>Negative terminal</td> </tr> <tr> <td>TP2</td> <td>Negative terminal</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Are the resistances greater than 10K ohms? 	(+) ETBTPS Sensor Connector, Harness Side	(-) Vehicle Battery	TP1	Negative terminal	TP2	Negative terminal	<p>Yes GO to DV8.</p> <p>No REPAIR the short circuit to GND.</p>						
(+) ETBTPS Sensor Connector, Harness Side	(-) Vehicle Battery													
TP1	Negative terminal													
TP2	Negative terminal													
DV8	<p>CHECK THE TPS CIRCUIT FOR A SHORT TOGETHER</p> <ul style="list-style-type: none"> Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTPS Sensor Connector, Harness Side</th> <th>(-) ETBTPS Sensor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>TP1</td> <td>TP2</td> </tr> <tr> <td>TP1</td> <td>ETCREF</td> </tr> <tr> <td>TP1</td> <td>ETCRTN</td> </tr> <tr> <td>TP2</td> <td>ETCREF</td> </tr> <tr> <td>TP2</td> <td>ETCRTN</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Are the resistances greater than 10K ohms? 	(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side	TP1	TP2	TP1	ETCREF	TP1	ETCRTN	TP2	ETCREF	TP2	ETCRTN	<p>Yes GO to DV9.</p> <p>No REPAIR the short circuit.</p>
(+) ETBTPS Sensor Connector, Harness Side	(-) ETBTPS Sensor Connector, Harness Side													
TP1	TP2													
TP1	ETCREF													
TP1	ETCRTN													
TP2	ETCREF													
TP2	ETCRTN													

Throttle Body Assembly ETC**DV**

Test Step		Results / Action to Take
DV9	CHECK FOR TP2 SIGNAL HIGH VERSUS LOAD WHILE DRIVING THE VEHICLE	
	<ul style="list-style-type: none"> • ETBTPS Sensor connector connected. • PCM connector connected. • Key on engine running. • Access the PCM and monitor the TP2 and LOAD PIDs. • Drive the vehicle while exercising the throttle and ETCTP sensor and accessing the PIDS. • Is the TP2 PID greater than 2.44 volts and the LOAD PID less than 30%? 	<p>Yes LISTEN for air noise around the MAF sensor and throttle body while the engine is running. REPAIR as necessary. If no faults are found: GO to DV10.</p> <p>No GO to DV10.</p>
DV10	CHECK FOR TP2 SIGNAL LOW VERSUS LOAD WHILE DRIVING THE VEHICLE	
	<ul style="list-style-type: none"> • Key on engine running. • Drive the vehicle while exercising the throttle and ETCTP sensor and accessing the PIDS. • Is the TP2 PID less than 0.24 volt and the LOAD PID greater than 55%? 	<p>Yes If, after clearing any continuous DTCs, and driving the vehicle while exercising the throttle, continuous DTCs P0068, P0124, or P0224 are set, For continuous memory DTCs P0124 or P0224, GO to Z1. For continuous memory DTC P0068, GO to DV11.</p> <p>No GO to DV11.</p>

DV9-DV10

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take
DV11	CHECK THE TP SENSOR OPERATION <ul style="list-style-type: none"> • Key in ON position. • Access the PCM and monitor the TP1 and TP2 PIDs. • Slowly press the accelerator pedal from fully released to fully applied while observing the voltage readings. • Use the chart as a reference. <p>TP1 and TP2 Sensor Output Voltages</p> <p>A0096020</p> <ul style="list-style-type: none"> • Do all signal values smoothly change when the accelerator is pressed? 	<p>Yes For continuous memory DTC P0068, CHECK the mass air flow (MAF) and manifold absolute pressure (MAP) sensors and connectors for damage and corrosion. REPAIR as necessary. For all others, GO to DV12.</p> <p>No INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM).</p>
DV12	CHECK THE TPS CIRCUIT FOR AN INTERMITTENT CONCERN <ul style="list-style-type: none"> • Access the PCM and monitor the TP1 and TP2 PIDs. • Wiggle, shake, and bend the harness from the TP to the PCM. • Are the voltages between 0.49 V - 4.65 V? 	<p>Yes GO to DV21.</p> <p>No REPAIR any faults found, If DTC P2100 or P2101 are present: GO to DV13.</p>
DV13	CHECK THE TACM MOTOR VISUALLY <p>Note: Make sure the TACM harness connector is properly connected.</p> <ul style="list-style-type: none"> • Key in OFF position. • Inspect the TACM for damaged housing, harness connector, and harness. • Are there any faults with the TACM hardware? 	<p>Yes INSTALL a new ETB.</p> <p>No GO to DV14.</p>

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take																		
DV14	CHECK THE TACM FOR A SHORT OR OPEN <ul style="list-style-type: none"> ETBTACM Motor connector disconnected. Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTACM Motor Connector, Component Side</th> <th>(-) ETBTACM Motor Connector, Component Side</th> </tr> </thead> <tbody> <tr> <td>TACM+ - Pin 1</td> <td>TACM- - Pin 2</td> </tr> </tbody> </table> Is the resistance between 1 ohm - 900 ohms? 	(+) ETBTACM Motor Connector, Component Side	(-) ETBTACM Motor Connector, Component Side	TACM+ - Pin 1	TACM- - Pin 2	Yes Key in OFF position. GO to DV15 . No Key in OFF position. INSTALL a new ETB.														
(+) ETBTACM Motor Connector, Component Side	(-) ETBTACM Motor Connector, Component Side																			
TACM+ - Pin 1	TACM- - Pin 2																			
DV15	CHECK THE TACM HARNESS FOR AN OPEN <ul style="list-style-type: none"> PCM connector disconnected. Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTACM Motor Connector, Harness Side</th> <th>(-) PCM Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>TACM+ - Pin 1</td> <td>TACM+</td> </tr> <tr> <td>TACM- - Pin 2</td> <td>TACM-</td> </tr> </tbody> </table> Are the resistances less than 5 ohms? 	(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+ - Pin 1	TACM+	TACM- - Pin 2	TACM-	Yes Key in OFF position. GO to DV16 . No REPAIR the open circuit.												
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side																			
TACM+ - Pin 1	TACM+																			
TACM- - Pin 2	TACM-																			
DV16	CHECK THE HARNESS FOR A SHORT TO GND, PWR, ETCREF, AND ETCRTN <ul style="list-style-type: none"> Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTACM Motor Connector, Harness Side</th> <th>(-) PCM Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>TACM+ - Pin 1</td> <td>PWRGND</td> </tr> <tr> <td>TACM+ - Pin 1</td> <td>VPWR</td> </tr> <tr> <td>TACM+ - Pin 1</td> <td>ETCRTN</td> </tr> <tr> <td>TACM+ - Pin 1</td> <td>ETCREF</td> </tr> <tr> <td>TACM- - Pin 2</td> <td>PWRGND</td> </tr> <tr> <td>TACM- - Pin 2</td> <td>ETCRTN</td> </tr> <tr> <td>TACM- - Pin 2</td> <td>VPWR</td> </tr> <tr> <td>TACM- - Pin 2</td> <td>ETCREF</td> </tr> </tbody> </table> Are the resistances greater than 10K ohms? 	(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+ - Pin 1	PWRGND	TACM+ - Pin 1	VPWR	TACM+ - Pin 1	ETCRTN	TACM+ - Pin 1	ETCREF	TACM- - Pin 2	PWRGND	TACM- - Pin 2	ETCRTN	TACM- - Pin 2	VPWR	TACM- - Pin 2	ETCREF	Yes GO to DV17 . No REPAIR the short circuit.
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side																			
TACM+ - Pin 1	PWRGND																			
TACM+ - Pin 1	VPWR																			
TACM+ - Pin 1	ETCRTN																			
TACM+ - Pin 1	ETCREF																			
TACM- - Pin 2	PWRGND																			
TACM- - Pin 2	ETCRTN																			
TACM- - Pin 2	VPWR																			
TACM- - Pin 2	ETCREF																			
DV17	CHECK FOR TACM HARNESS CIRCUITS SHORTED TOGETHER <ul style="list-style-type: none"> Measure the resistance between: <table border="1"> <thead> <tr> <th>(+) ETBTACM Motor Connector, Harness Side</th> <th>(-) ETBTACM Motor Connector, Harness Side</th> </tr> </thead> <tbody> <tr> <td>TACM+ - Pin 1</td> <td>TACM- - Pin 2</td> </tr> </tbody> </table> Is the resistance greater than 10K ohms? 	(+) ETBTACM Motor Connector, Harness Side	(-) ETBTACM Motor Connector, Harness Side	TACM+ - Pin 1	TACM- - Pin 2	Yes GO to DV18 . No REPAIR the short circuit.														
(+) ETBTACM Motor Connector, Harness Side	(-) ETBTACM Motor Connector, Harness Side																			
TACM+ - Pin 1	TACM- - Pin 2																			

DV14-DV17

Throttle Body Assembly ETC

DV

Test Step		Results / Action to Take				
DV18	CHECK FOR SELF-TEST CODES	Yes GO to DV19 . No GO to DV21 .				
<ul style="list-style-type: none"> ETBTACM Motor connector connected. PCM connector connected. Key in ON position. Carry out the self-test. Is DTC P2101 present? 						
DV19	CHECK FOR PROPER TACM+ WIRING IN THE HARNESS CONNECTOR					
<ul style="list-style-type: none"> Key in OFF position. ETBTACM Motor connector disconnected. PCM connector disconnected. Measure the resistance between: <table border="1" data-bbox="305 688 862 806"> <tr> <td>(+) ETBTACM Motor Connector, Harness Side</td> <td>(-) PCM Connector, Harness Side</td> </tr> <tr> <td>TACM+ - Pin 1</td> <td>TACM+</td> </tr> </table> <ul style="list-style-type: none"> Is the resistance less than 5 ohms? 		(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM+ - Pin 1	TACM+	Yes GO to DV20 . No REPAIR the open circuit. Properly wire the TACM harness connector per the TACM and PCM connector diagrams.
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side					
TACM+ - Pin 1	TACM+					
DV20	CHECK FOR PROPER TACM- WIRING IN THE HARNESS CONNECTOR					
<ul style="list-style-type: none"> Measure the resistance between: <table border="1" data-bbox="305 957 862 1075"> <tr> <td>(+) ETBTACM Motor Connector, Harness Side</td> <td>(-) PCM Connector, Harness Side</td> </tr> <tr> <td>TACM- - Pin 2</td> <td>TACM-</td> </tr> </table> <ul style="list-style-type: none"> Is the resistance less than 5 ohms? 		(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side	TACM- - Pin 2	TACM-	Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to DV21 .
(+) ETBTACM Motor Connector, Harness Side	(-) PCM Connector, Harness Side					
TACM- - Pin 2	TACM-					
DV21	CHECK THE REPAIR THROUGH PROCEDURE					
<ul style="list-style-type: none"> Key in ON position. Record and clear the DTCs. Cycle the accelerator pedal to the floor and back several times. Check for self-test DTCs: Are any ETC system related DTCs present? 		Yes INSTALL a new PCM. REFER to Diagnostic Methods, Flash Electrically Erasable Programmable Read Only Memory (EEPROM). No GO to Z1 .				

DV18-DV21