

**MIL ON WITH PCM DTC P0463 AND/OR IC DTC
B1201—FUEL GAUGE DROPS TO EMPTY OR SLOW
TO UPDATE AFTER REFUELING**

TSB 05-21-3

FORD:
2002-2006 Explorer

LINCOLN:
2003-2005 Aviator

MERCURY:
2002-2006 Mountaineer

This article supersedes TSB **04-21-15** and **05-10-17** to update the Service Procedure.

ISSUE

Some 2002-2006 Explorer/Mountaineer and 2003-2005 Aviator vehicles may exhibit a customer complaint of the fuel gauge being slow to read full after refueling, the malfunction indicator lamp (MIL) on with diagnostic trouble code (DTC) P0463, instrument cluster DTC B1201, and/or the fuel gauge dropping to empty. This may be due to the fuel level sender assembly sending incorrect data to the instrument cluster and/or powertrain control module (PCM).

ACTION

Refer to the following General Information for a description of two modes of fuel gauge operation prior to following the TSB Service Procedure. This brief explanation of current fuel gauge strategy will help ensure the correct diagnosis is made. The fuel gauge on these vehicles has several distinct modes of operation. The difference in the various modes is the speed at which the fuel gauge pointer moves in relationship to fuel level input from the fuel level sender. After reviewing the General Information, refer to the TSB Service Procedure.

GENERAL INFORMATION

Fuel Gauge strategy provides several modes of operation. One being referred to as Fast Acquire Mode and another as Slosh Mode. The time for the fuel gauge pointer to move from "E" to "F" can be 2 seconds, 17 minutes or 55 minutes depending on which mode the fuel gauge is in.

Fast Acquire Mode:

The 2-second "E" to "F" mode is referred to as Fast Acquire Mode. Fast Acquire Mode strategy requires two (2) conditions to be met before the fuel gauge indications can be updated. First, at least four (4) gallons of fuel must be added to the fuel tank. Second, the Instrument Cluster must acquire a valid Key-ON fuel sender reading within 1 second of the key being put in the Run position. The Key-ON sample reading is considered valid if the fuel sender reading is between 10 and 160 ohms. If both of these conditions are not met, the fuel gauge stays in Slosh mode. If the Cluster does not go into Fast Acquire Mode after a refueling event, the system will stay in Slosh Mode. This will result in a slow to Read Full event.

Slosh Mode:

The 55-minute "E" to "F" mode is referred to as Slosh Mode. In Slosh Mode, this is 55 accumulated minutes of the key in the Run position. Unless the conditions are met to put the fuel gauge into one of the other operating modes, the default is Slosh Mode. Example: If a customer operates their vehicle 11 minutes per day, it will take 5 days to accumulate 55 minutes of run time. This means it will take 5 days for the fuel gauge to go from "E" to "F".

NOTE

SLOSH MODE STRATEGY WAS REDUCED FROM 55 MINUTES TO 17 MINUTES FOR VEHICLES BUILT AFTER 12/22/2004.

NOTE

IT IS IMPORTANT TO THOROUGHLY UNDERSTAND THE CUSTOMER CONDITION BEING REPORTED.

NOTE: The information in Technical Service Bulletins is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. It informs these technicians of conditions that may occur on some vehicles, or provides information that could assist in proper vehicle service. The procedures should not be performed by "do-it-yourselfers". Do not assume that a condition described affects your car or truck. Contact a Ford, Lincoln, or Mercury dealership to determine whether the Bulletin applies to your vehicle. Warranty Policy and Extended Service Plan documentation determine Warranty and/or Extended Service Plan coverage unless stated otherwise in the TSB article. The information in this Technical Service Bulletin (TSB) was current at the time of printing. Ford Motor Company reserves the right to supersede this information with updates. The most recent information is available through Ford Motor Company's on-line technical resources.

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It is important to determine if the customer has a fuel gauge that slowly gets to full or has a fuel gauge that never gets to "F" (stuck) when the fuel tank is filled. If the fuel gauge slowly goes from "E" to "F" (in 55 minutes of key in the Run position or less), the problem is most likely not in the cluster. It is absolutely imperative that the appropriate pinpoint test(s), located in the Workshop Manual or this TSB, be completed for this customer complaint to determine root cause of the condition. Root causes may include but are not limited to: the Fuel Sender, Fuel Tank, Wiring or Instrument Cluster

SERVICE PROCEDURE - INITIAL STEPS (All Vehicles)

1. Retrieve and record PCM and the instrument cluster (IC) DTC's, from continuous and on-demand self tests.
2. If DTCs other than B1201 or P0463 are retrieved, follow normal Workshop Manual diagnostics, DO NOT CONTINUE WITH THIS TSB.
3. If IC DTC B1201 and/or PCM DTC P0463 are retrieved, perform Procedure A for 2002-2005 Model Years and Procedure B for 2006 Model Years.
4. If No DTCs are retrieved, go to Procedure C.

PROCEDURE A (2002-2005 MY)

CHECKING FUEL GAUGE OPERATION:

NOTE

WHEN PERFORMING STEPS 4A-O, FUEL GAUGE SLOSH STRATEGY REQUIRES SPECIFIC KEY ON AND KEY OFF CYCLE TIMES. THESE TIMES MUST BE OBSERVED OR THE DIAGNOSTIC RESULTS WILL NOT BE ACCURATE.

1. Key in OFF position.
2. Remove Fuse F1.15 (15 amp) from the Battery Junction Box, wait 1 minute and reinstall fuse.

NOTE

THIS IS DONE TO RESET THE CLUSTER FUEL GAUGE TIMERS. FAILURE TO COMPLETE THIS STEP MAY RESULT IN ERRONEOUS TEST RESULTS.

3. Disconnect the in-line connector to the fuel pump module (C438 for 4.6L) or (C431 for 4.0L), located on the RH frame rail.

4. On the vehicle harness side of the connector, connect one lead of an instrument gauge system tester (Rotunda # 014-R1063 or equivalent) to Circuit 1356 (LG/VT - Pin-8 in Connector C438 and C431) and the other lead to Circuit 1357 (LB/YE - Pin-5 in C438 for 4.6L or Pin-4 in C431 for 4.0L) (Figure 1).

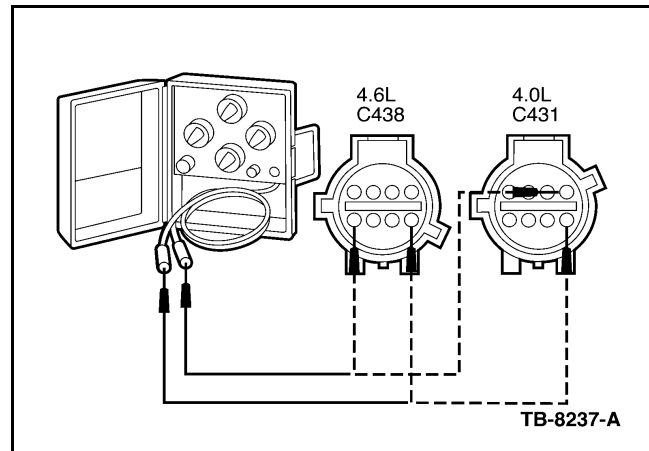


Figure 1 - Article 05-21-3

- a. With the key in the RUN position, move the shift lever from PARK to DRIVE, wait 10 seconds and then back to PARK.
- b. Wait 30 seconds with the key in the RUN position and the shift lever in PARK.
- c. Turn key to the OFF position.
- d. Set the tester to 160 ohms.
- e. Turn key to the RUN position, move the shift lever from PARK to DRIVE, wait 10 seconds and then move the shift lever back to PARK.
- f. Wait 30 seconds with the key in the RUN position and the shift lever in PARK.
- g. Turn key to OFF position and wait 30 seconds.
- h. Set the tester to 15 ohms.
- i. Turn key to RUN position, move the shift lever from PARK to DRIVE, wait 10 seconds and then move the shift lever back to PARK.
- j. Wait 30 seconds with the key in the RUN Position and the shift lever in PARK.

NOTE

THE FUEL GAUGE SHOULD READ "E" (EMPTY MARK) OR BELOW WHEN CARRYING OUT THIS TEST STEP.

- k. Turn key to OFF position and wait 30 seconds.
- l. Set the tester to 160 ohms.
- m. Turn key to ON position.

NOTE

THE FUEL GAUGE SHOULD READ "F" (FULL) OR ABOVE WHEN CARRYING OUT THIS TEST STEP.

- n. Wait 1 minute for the gauge to respond.
- o. Turn key to OFF position. After completing Steps 4A-O, if the fuel gauge operates correctly replace the fuel sender only (9A299). If not, refer to the Workshop Manual Section 413-01 and perform normal diagnostics.

PROCEDURE B (2006 MY)

NOTE

WHEN PERFORMING STEPS 4A-O, FUEL GAUGE SLOSH STRATEGY REQUIRES SPECIFIC KEY-ON AND KEY-OFF CYCLE TIMES. THESE TIMES MUST BE OBSERVED OR THE DIAGNOSTIC RESULTS WILL NOT BE ACCURATE.

CHECKING FUEL GAUGE OPERATION:

- 1. Key in OFF position.
- 2. Remove Fuse F24 (10 amp) from the Smart Junction Box, wait 1 minute and reinstall fuse.

NOTE

STEP 2 IS DONE TO RESET THE CLUSTER FUEL GAUGE TIMERS. FAILURE TO COMPLETE THIS STEP MAY RESULT IN ERRONEOUS TEST RESULTS.

- 3. Disconnect: Fuel Pump Gauge Sender C433.
- 4. Connect one lead of the instrument gauge system tester to the Fuel Pump Gauge Sender C433-8, Circuit VMC11 (YE/VT), harness side and the other lead to the Fuel Pump Gauge Sender C433-5, Circuit RMC32 (GN/BU), harness side. (Figure 2)

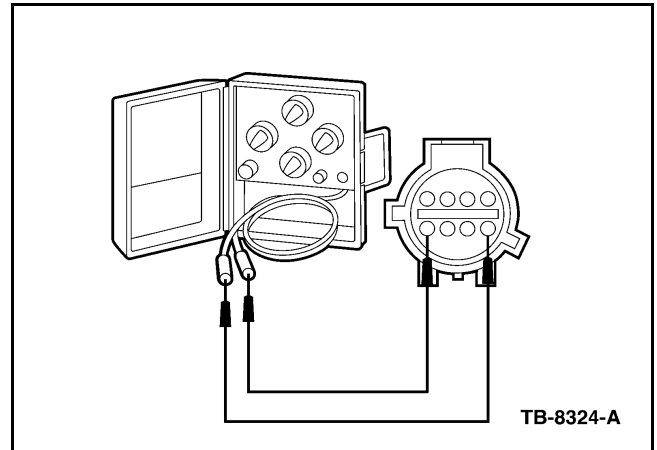


Figure 2 - Article 05-21-3

- a. With the key in the RUN position, move the shift lever from PARK to DRIVE, wait 10 seconds and then back to PARK.
- b. Wait 30 seconds with the key in the RUN position and the shift lever in PARK.
- c. Turn key to the OFF position.
- d. Set the tester to 180 ohms.
- e. Turn key to the RUN position, move the shift lever from PARK to DRIVE, wait 10 seconds and then move the shift lever back to PARK.
- f. Wait 30 seconds with the key in the RUN position and the shift lever in PARK.
- g. Turn key to OFF position and wait 30 seconds.
- h. Set the tester to 10 ohms.
- i. Turn key to RUN position, move the shift lever from PARK to DRIVE, wait 10 seconds and then move the shift lever back to PARK.
- j. Wait 30 seconds with the key in the RUN Position and the shift lever in PARK.

NOTE

THE FUEL GAUGE SHOULD READ "E" (EMPTY MARK) OR BELOW WHEN CARRYING OUT THIS TEST STEP.

- k. Turn key to OFF position and wait 30 seconds.
- l. Set the tester to 180 ohms.
- m. Turn key to ON position.

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NOTE

THE FUEL GAUGE SHOULD READ "F" (FULL) OR ABOVE WHEN CARRYING OUT THIS TEST STEP.

- n. Wait 1 minute for the gauge to respond.
- o. Turn key to OFF position. After completing Steps 4A-O, if the fuel gauge operates correctly replace the fuel sender only (9A299). If not, refer to the Workshop Manual, Section 413-01 and perform normal diagnostics.

PROCEDURE C (2002-2006 MY With No DTCs)

NOTE

TO BEGIN DIAGNOSTIC PROCEDURE, SUBJECT VEHICLE MUST HAVE BETWEEN 1/4 AND 3/4 TANK OF FUEL.

1. Engage the Instrument Cluster Self-Diagnostic Test Mode by pressing and holding the appropriate buttons for 4 seconds:
 - 2002-2006 - Base Cluster - Trip Odo Reset button
 - 2002-2005 - Message Center Cluster - INFO and RESET Message Center buttons
 - 2006 - Message Center Cluster - RESET (only) Message Center button
 - a. With the vehicle in park, turn the key to the run position key on/engine off (KOEO).
 - b. Release the button(s):
 - 2002-2005 - Base Clusters will display "tEst"
 - 2002-2005 - Message Center Clusters will display "TEST"
 - 2006 - Clusters will indicate "ENGINEERING TEST MODE"
2. Access Raw Fuel Level data also called the Unfiltered Value by pressing:
 - 2002-2005 - Base Clusters - Trip Odo reset button 15 - 20 times for - until the display shows a "F" followed by a 3-digit value (000 to 254)

NOTE

IF "ENGINEERING TEST MODE" IS NOT DISPLAYED, DEPRESS THE ODO RESET OR MESSAGE CENTER RESET BUTTON 1 OR MORE TIMES UNTIL THIS MESSAGE IS DISPLAYED.

- 2002-2005 - Message Center Clusters - Message Center Reset button 18 times until the display shows "FUEL A/D" or "FUEL LEVEL A/D"
 - 2006 Clusters - Trip Odo reset button 14 times until the display shows "FUEL LEVEL XXX INST" where XXX is a value between 000 and 254
3. Rock the vehicle front to back (not side to side) at a slow and steady rate while noting the value on the display

NOTE

THE UNFILTERED VALUE SHOULD CHANGE SMOOTHLY ALONG WITH THE FUEL SLOSH.

- a. If this unfiltered value exceeds 231 at any point during this test, there is an open circuit in the sender and/or wiring. Refer to Diagnostic Procedure A for 2002-2005 Model Years and Diagnostic Procedure B for 2006 Model Year.
- b. If the Unfiltered value drops below 28 at any point during the test, there is a shorted circuit in the sender and/or wiring. Repair as necessary.
- c. If the Unfiltered value stays between 028 - 231 during the test, the concern is intermittent. Refer to the appropriate shop manual and follow normal diagnostics.

Tips For Procedure C And Optional Diagnostics:

- If F is increasing and FP isn't - go to Cluster Diagnostic Section of Shop Manual If FP and F are increasing and fuel level isn't - go to Cluster Diagnostic Section of Shop Manual.
- If Last line (Open) values aren't 255 and 254 (MY 05 and before), or 255 (MY 06) - go to Cluster Diagnostic Section of Shop Manual.
- If Open, or if F does not represent the level of fuel as described - then go to the shop manual and look for wiring and fuel sender issues. The cluster is not at fault.

Optional Diagnostics

NOTE

THE FILTERED VALUE CAN ALSO BE DISPLAYED TO AID IN DIAGNOSIS. THE FILTERED VALUE DIRECTLY RELATES TO THE POSITION OF THE FUEL GAGE POINTER.

- 2005 - Message Center Clusters will indicate "PER XXX" on the second line of the Message Center

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- 2003-2004 & 2006 - Clusters, the Trip Reset or Message Center Reset Button must be depressed one additional time to display "FUEL LVL % XXX", "PER XXX", "FUEL STAT XXX %" or "FP XXX". (XXX is a 3-digit value that ranges from 0 to 254) this is the filtered value. Wait 90 seconds and note the position of the fuel gauge pointer, and the value on the Cluster Display. (Refer to the appropriate Figure below)

2002-2005 Units Built After 3/4/2002 - Non Flex Fuel Engine Equipped Vehicles (Figure 3)

2002-2005 Units Built After 3/4/2002 - 4.0L Flex Fuel Engine Equipped Vehicles (Figure 4)

2006 Model Year Vehicles - All Engine Applications (Figure 5)

NOTE

VALUES IN REFERENCE CHARTS ARE NOMINAL TEST VALUES. (EX. A FULL FUEL TANK FILL SHOULD INDICATE FULL, AND THE DISPLAY SHOULD INDICATE A VALUE BETWEEN 242 AND 254)

WARRANTY STATUS: Eligible Under Provisions Of New Vehicle Limited Warranty Coverage

DEALER CODING

BASIC PART NO.
9A299

CONDITION
CODE
28

OASIS CODES: 204000, 204100, 204200, 206000, 404000, 698298

2002 – 2005 UNITS BUILT AFTER 3/4/2002 – NON FLEX FUEL ENGINE EQUIPPED VEHICLES					
FUEL LEVEL	NOMINAL SENDER RESISTANCE (OHMS)	CLUSTER TEST MODE DESIGNATION FP	CLUSTER TEST MODE DESIGNATION F	POINTER TOLERANCE	ADVERTISED CAPACITY %
SHORT	<5.3	255	10		
ES	15	0	28		=<6
E	22.4	12	41	+/- 1 PW	8
¼	53.4	70	92	+/-2 PW	31
½	84.1	127	137	+/- 2 PW	54
¾	114.6	185	178	+/- 2 PW	77
F	145	242	215	+/- 2 PW	95
FS	160	254	231		100
OPEN	>180	255	254		

CHART DEFINITIONS:
 FP = ENGINEERING TEST MODE DISPLAY FOR FILTERED FUEL SIGNAL DATA THAT THE CLUSTER USES TO DRIVE THE POINTER.
 F = ENGINEERING TEST MODE DISPLAY FOR RAW INPUT FUEL SIGNAL DATA TO THE CLUSTER – WILL FLUCTUATE AS FUEL SLOSHES
 ES = EMPTY STOP ON SENDER
 FS = FULL STOP ON SENDER
 PW = POINTER WIDTH

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Figure 3 - Article 05-21-3

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2002 – 2005 UNITS BUILT AFTER 3/4/2002 – 4.0L FLEX FUEL ENGINE EQUIPPED VEHICLES

FUEL LEVEL	NOMINAL SENDER RESISTANCE (OHMS)	CLUSTER TEST MODE DESIGNATION FP	CLUSTER TEST MODE DESIGNATION F	POINTER TOLERANCE	ADVERTISED CAPACITY %
SHORT	<5.3	255	10		
ES	7	0	28		=<6
E	13.5	12	41	+/- 1 PW	8
¼	41.3	70	92	+/-2 PW	31
½	68.9	127	137	+/- 2 PW	54
¾	96.5	185	178	+/- 2 PW	77
F	123.2	242	215	+/- 2 PW	95
FS	138	254	231		100
OPEN	>180	255	254		

CHART DEFINITIONS:

FP = ENGINEERING TEST MODE DISPLAY FOR FILTERED FUEL SIGNAL DATA THAT THE CLUSTER USES TO DRIVE THE POINTER.

F = ENGINEERING TEST MODE DISPLAY FOR RAW INPUT FUEL SIGNAL DATA TO THE CLUSTER – WILL FLUCTUATE AS FUEL SLOSHES

ES = EMPTY STOP ON SENDER

FS = FULL STOP ON SENDER

PW = POINTER WIDTH

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Figure 4 - Article 05-21-3

2006 MODEL YEAR VEHICLES – ALL ENGINE APPLICATIONS

FUEL LEVEL	NOMINAL SENDER RESISTANCE (OHMS)	CLUSTER TEST MODE DESIGNATION FP	CLUSTER TEST MODE DESIGNATION F	POINTER TOLERANCE	ADVERTISED CAPACITY %
SHORT	<=5.0	255	10		
ES	180	0	28		=<6
E	160	12	41	+/- 1 PW	8
¼	90	70	92	+/-2 PW	31
½	55	127	137	+/- 2 PW	54
¾	30	185	178	+/- 2 PW	77
F	15	242	215	+/- 2 PW	95
FS	10	254	231		100
OPEN	>=198	255	254		

CHART DEFINITIONS:

FP = ENGINEERING TEST MODE DISPLAY FOR FILTERED FUEL SIGNAL DATA THAT THE CLUSTER USES TO DRIVE THE POINTER.

F = ENGINEERING TEST MODE DISPLAY FOR RAW INPUT FUEL SIGNAL DATA TO THE CLUSTER – WILL FLUCTUATE AS FUEL SLOSHES

ES = EMPTY STOP ON SENDER

FS = FULL STOP ON SENDER

PW = POINTER WIDTH

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Figure 5 - Article 05-21-3