2007 ACCESSORIES & BODY, CAB

Instrument Cluster - Five Hundred, Freestyle & Montego

DESCRIPTION AND OPERATION

INSTRUMENT CLUSTER (IC)

The instrument clusters both contain gauges, indicator lamps, warning lamps and a message center that are designed to provide the driver with system status and to alert the driver that certain conditions exist in the vehicle. Gauges provide information to the driver indicating the status of systems. The systems that use gauges include vehicle speed, fuel level, engine coolant temperature, and engine RPM. Indicator lamps provide information to the driver of conditions that exist in the vehicle. The indicator lamps include the turn signal, high beams on, and speed control. Warning indicator lamps provide information to the driver of conditions that could potentially alter vehicle performance. Examples of the warning indicators include the ABS, BRAKE, safety belt, air bag, and low oil pressure.

DIAGNOSTIC TESTS

INSTRUMENT CLUSTER (IC)

Special Tools

Illustration	Tool Name	Tool Number
ST1137-A	73III Automotive Meter	105-R0057 or equivalent
ST1320-A	Vehicle Communications Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

When installing a new instrument cluster, it is necessary to upload the module configuration information to the scan tool. Following installation of the instrument cluster, download the module configuration information from the scan tool into the new instrument cluster. Refer to **MODULE COMMUNICATIONS NETWORK** article.

The following items are configurable:

- All wheel drive (AWD)
- Compass
- Anti-lock brake system/traction control/stability assist (ABS/TC)
- Low coolant warning indicator
- Speedometer bias
- Climate control type
- Oil life threshold
- Default language

The instrument cluster contains an analog speedometer, tachometer, fuel gauge, and engine coolant temperature gauge. The instrument cluster receives the information over the controller area network (CAN) circuits. The instrument cluster carries out a display prove-out to verify that the warning/indicator lamps and monitored systems are operating correctly. When the ignition switch is turned to the ON position, the charging system, the low oil pressure, and the malfunction indicator lamps (MIL) illuminate until the engine is started and operating normally.

Each time the ignition switch is turned from off to on, the following instrument cluster warning indicators prove out:

- Air bag (6 seconds)
- ABS (3 seconds)
- Brake (3 seconds)
- Low coolant level (3 seconds)
- Low fuel (3 seconds)
- Low washer fluid (3 seconds)
- Safety belt (60 seconds or until the safety belt is buckled)
- Traction control (3 seconds)
- Anti-theft (3 seconds)
- Wrench indicator (3 seconds)
- Check fuel cap (3 seconds)

Instrument Cluster Gauges

Engine Coolant Temperature Gauge

The powertrain control module (PCM) receives the engine coolant temperature status through hardwired circuitry to the engine coolant temperature (ECT) sensor. The instrument cluster receives the engine coolant temperature data from the PCM over the communication network. The instrument cluster monitors the engine coolant temperature data received from the PCM and commands the engine coolant temperature gauge pointer.

Fuel Gauge

The fuel gauge informs the driver of the amount of fuel remaining in the tank. The fuel tank is a saddle tank design with variable resistance senders, driven by floats, that provide resistances related to fuel height, in each side of the tank, to the instrument cluster. The fuel level input is provided independently from each fuel level sensor. The fuel level sensors provide variable resistance between 15 ohms ± 2 ohms (empty tank) and 160 ohms ± 4 ohms (full tank). If the fuel level is low, the resistance in the fuel level sensor is low, causing the gauge to indicate empty (E). When the fuel level is high, the resistance in the fuel level sensor is high, and the gauge indicates full (F).

The instrument cluster uses 4 different operating modes to calculate the fuel level:

- Anti-slosh (default mode)
- Key OFF fueling
- Key ON fueling
- Recovery

After a fuel fill up, the time for the fuel gauge to move from empty (E) to full (F) ranges from 2 seconds to 55 minutes depending on which operating mode the fuel gauge is in.

The default fuel gauge mode is called the anti-slosh mode. To prevent fuel gauge changes from fuel slosh (gauge instability due to changes in fuel sender readings caused by fuel moving around in the tank), the fuel gauge takes approximately 55 minutes to go from empty (E) to full (F).

The key OFF fueling mode (2 seconds to read empty [E] to full [F]) requires 3 conditions be met:

- The key must be in the OFF position throughout the entire refueling of the vehicle.
- At least 15% of the vehicle's fuel capacity must be added to the fuel tank.
- The instrument cluster must receive a valid key ON fuel sender reading within 1 second of the key being put into the RUN position. The key ON sample readings are considered valid if the fuel sender reading is between 15 ohms ± 2 ohms and 160 ohms ± 4 ohms.

If these conditions are not met, the fuel gauge stays in the anti-slosh mode, which results in a slow to read full (F) event.

The key ON fueling mode (approximately 90 seconds to read empty [E] to full [F]) requires 3 conditions be met:

- The transmission is in PARK (P).
- The key is in the RUN position.
- At least 15% of the vehicle's fuel capacity must be added to the fuel tank.

In key ON fueling mode, a 30-second timer activates after the transmission is put into the PARK (P) position. When the 30 second time has elapsed and at least 15% of the vehicle's fuel capacity has been added, the fuel gauge response time is 90 seconds to read from empty (E) to full (F). When the transmission is shifted out of PARK (P), the fuel gauge strategy reverts to the anti-slosh mode. The key ON fueling mode prevents slow to read full events from happening if the customer refuels the vehicle with the key in the RUN position.

Recovery mode is incorporated into the instrument cluster strategy to recover from a missing fuel level input during a refueling event. Missing fuel level inputs result from intermittent opens in the fuel sender or its circuits. Recovery mode (empty [E] to full [F] approximately 20 minutes) is initiated when the following 2 conditions are met:

- The instrument cluster is in the anti-slosh (default) mode.
- The actual fuel level in the tank is greater than what is being displayed by the fuel gauge.

Speedometer

The instrument cluster receives the vehicle speed data from the ABS module over the communication network and commands the speedometer pointer appropriately.

Tachometer

The instrument cluster receives the tachometer data from the PCM over the communication network and commands the tachometer pointer between 0 and 7,000 RPM, according to the data.

Indicators

Air Bag

The air bag warning indicator is used to provide a status of the supplemental restraint system (SRS). The instrument cluster receives a message from the restraints control module (RCM) over the communication network. If an air bag system concern is detected, a diagnostic trouble code (DTC) is logged and the RCM sends a message to the instrument cluster to turn on the air bag warning indicator.

Anti-Lock Brake System (ABS)

The ABS warning indicator informs the driver of a malfunction in the ABS system. Inputs are provided by the ABS module over the communication network.

Brake System

The brake warning indicator alerts the driver if any of the following brake system conditions are present: the parking brake is set, the brake fluid level is low, the ABS module has detected a base brake system failure, there has been a loss of communication between the instrument cluster and the smart junction box (SJB), and there has been a loss of communication between the instrument cluster and the ABS module.

Charging System

The PCM constantly monitors the generator regulator output. When the PCM detects a continuous high or low output signal, or when the ignition switch is on and the engine is off, the PCM sends a message over the communication network to the instrument cluster to illuminate the charging system warning indicator. When the ignition switch is in the ON position, with the engine running, and the PCM determines that the set point for the regulator has been met, the PCM sends a message to the instrument cluster to turn off the charging system warning indicator.

Low Fuel

The low fuel warning indicator is controlled by the instrument cluster and warns the driver when the fuel level is approximately 1/8 of a tank or lower.

Low Oil Pressure

The oil pressure switch is hardwired to the SJB. When there is low or no oil pressure, the SJB sends a message over the communication network to the instrument cluster to illuminate the low oil pressure warning indicator according to engine oil pressure.

Safety Belt

The safety belt warning indicator informs the driver that the safety belt and/or the front passenger's safety belt is unbuckled. The first 65 seconds after the ignition switch transitions from OFF or ACC to RUN or START, the safety belt warning indicator and the associated chime are used as a reminder to the driver that the front row safety belts are not buckled. In this first 65 seconds the indicator illuminates when the driver and/or front passenger safety belt is unbuckled (with a person in the seat) and turns off whenever the safety belt(s) in the occupied front row seat(s) is buckled. The indicator re-illuminates if a safety belt is unbuckled after both are buckled and the 65 seconds has not yet expired. After 65 seconds, the indicator turns off regardless of the front row safety belts status.

Check Fuel Cap

The PCM monitors pressure in the fuel evaporative system and detects massive or critical losses of pressure. When a critical loss of pressure in the fuel evaporative system is detected, the PCM provides a message over the communication network and the instrument cluster illuminates the check fuel cap warning indicator.

Traction Control

The traction control indicator flashes when the traction control is in active mode and is being controlled by the ABS module or the all wheel drive control module. The instrument cluster receives the traction control signal from the ABS module or the differential electronic module (DEM) (all wheel drive control module) through the communication network. The instrument cluster monitors the traction control and the all wheel drive signal, and when the ABS module or the all wheel drive module detects a concern, the instrument cluster illuminates the traction control indicator.

Malfunction Indicator Lamp (MIL)

The MIL is illuminated when a DTC is detected by the PCM. The instrument cluster receives the MIL data from the PCM through the communication network.

Anti-Theft

The anti-theft indicator provides an indication in the ignition switch OFF position that there is an anti-theft system in the vehicle. When the ignition switch is in the ON position, the anti-theft indicator indicates whether or not a concern is detected with the anti-theft system by illuminating the indicator for 60 seconds (solid or flashing) and then flashing a fault code 10 times. The indicator is controlled by the PCM via hardwired circuits.

Door Ajar

The door ajar indicator informs the driver that one or more doors, the decklid, or the liftgate is open while the ignition switch is in RUN position. When a door, decklid, or the liftgate is ajar, the SJB sends a message to the instrument cluster to turn on the door ajar indicator.

Low Coolant Level

The low coolant warning indicator, located in the degas bottle, illuminates when a low coolant level is detected. The SJB receives the information from the low coolant level switch and sends the instrument cluster a message over the communication network to turn on the low coolant warning indicator.

Low Washer Fluid

The low washer fluid indicator, located in the windshield washer fluid reservoir, illuminates when a low washer fluid level is detected. The SJB receives the information from the low washer fluid level switch and sends the instrument cluster a message over the communication network to turn on the low washer fluid indicator.

Wrench Indicator

The instrument cluster receives the wrench warning indicator status from the powertrain control module (PCM) for the electronic throttle control (ETC) concerns and the transmission control module (TCM) for transaxle concerns over the communication network. When a system concern is detected, the PCM or the TCM sets a DTC and sends the instrument cluster a command signal to illuminate the wrench warning indicator.

Speed Control

The instrument cluster receives the speed control data from the PCM through the communication network. When the speed control is engaged, the PCM provides a signal to the instrument cluster to turn on the speed control indicator.

High Beam

When the high beams are turned on, the SJB sends a signal to the instrument cluster through the communication network to illuminate the high beam indicator.

Turn Signal

The SJB sends a message to the instrument cluster over the communication network when the multifunction switch is in the RH and LH TURN position. When the multifunction switch is in the RH or LH TURN position, the instrument cluster flashes the RH or LH turn indicators.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect the following for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical

• Engine oil level
• Fuel tank and lines
• Engine coolant level
• Washer fluid level
• Brake fluid level
	• Smart junction box (SJB) fuse(s):
	  ○ 7 (7.5A)
	  ○ 20 (7.5A)
	  ○ 23 (7.5A)
	• Bulb(s)
	• Circuitry
	• Instrument cluster

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: Make sure to use the latest scan tool software release.

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

5. If the scan tool does not communicate with the VCM:
   - Check the VCM connection to the vehicle.
   - Check the scan tool connection to the VCM.
   - Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.
6. If the scan tool does not communicate with the vehicle:
   - Verify the ignition key is in the ON position.
   - Verify the scan tool operation with a known good vehicle.
   - Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the powertrain control module (PCM).
7. Carry out the network test:
   - If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
   - If the network test passes, retrieve and record the continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.
9. If the DTCs retrieved are related to the concern, go to the Instrument Cluster Diagnostic Trouble Code (DTC) Index, the Smart Junction Box (SJB) Diagnostic Trouble Code (DTC) Index, or the Powertrain Control Module (PCM) Diagnostic Trouble Code (DTC) Index. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.
10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

INSTRUMENT CLUSTER DIAGNOSTIC TROUBLE CODE (DTC) INDEX

DTC	Description	Action
B1202	Fuel Sender Circuit Open (sender with fuel pump module)	Go to **Pinpoint Test B**.
B1204	Fuel Sender Circuit Short To Ground (sender with fuel pump module)	Go to **Pinpoint Test B**.
B1205	Instrument Cluster Switch Number 1 Assembly Circuit Failure	REFER to **INFORMATION AND MESSAGE CENTER** article.
B1342	ECU is Defective	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.
B1868	Lamp Air Bag Warning Indicator Circuit Failure	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.
B1870	Lamp Air Bag Warning Indicator Circuit Short to Battery	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.
B2143	NVM Memory Failure	CLEAR the DTCs. REPEAT the self-test. If DTC B2143 is retrieved again, INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.
B2477	Module Configuration Error	REFER to **MODULE CONFIGURATION** article.
B2627	Fuel Sender Circuit Open #2 (secondary fuel sender)	Go to **Pinpoint Test B**.
B2628	Fuel Sender Circuit Short To Ground #2 (secondary fuel sender)	Go to **Pinpoint Test B**.
B2675	Trip Reset Button Stuck	VERIFY that the instrument cluster bezel is aligned correctly and the SELECT/RESET button is not binding. REPAIR as necessary. If the switch is not binding, INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.
B2879	Fuel Tank Jet Pump Fault	Go to **Pinpoint Test B**.
U2023	Fault Received From External Node	Go to **Pinpoint Test A**.
All other DTCs	-	REFER to **MULTIFUNCTION ELECTRONIC MODULES** article.

SMART JUNCTION BOX (SJB) DIAGNOSTIC TROUBLE CODE (DTC) INDEX

DTC	Description	Action
B1482	Wiper Washer Fluid Level Sensor Circuit Short to Ground	Go to **Pinpoint Test V**.
B2479	Brake Park Switch Circuit Short to Ground	Go to **Pinpoint Test J**.
B2678	Low Coolant Sender Failure	Go to **Pinpoint Test W**.
C1125	Brake Fluid Level Sensor Input Circuit Failure	Go to **Pinpoint Test J**.
C1284	Oil Pressure Switch Failure	Go to **Pinpoint Test D**.
All other DTCs	-	REFER to **MULTIFUNCTION ELECTRONIC MODULES** article.

POWERTRAIN CONTROL MODULE (PCM) DIAGNOSTIC TROUBLE CODE (DTC) INDEX

DTC	Description	Action
P0457	Fuel Fill Cap Off	REFER to the **Introduction - Gasoline Engines** article.
P0460	Fuel Level Sensor A Circuit	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test B**.
P0461	Fuel Level Sensor A Circuit Range/Performance	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test B**.
P0462	Fuel Level Sensor A Circuit Low	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test B**.
P0463	Fuel Level Sensor A Circuit High	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test B**.
P2065	Fuel Level Sensor B Circuit	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test C**.
P2066	Fuel Level Sensor B Circuit Range/Performance	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint**

		Test C.
P2067	Fuel Level Sensor B Circuit Low	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test C**.
P2068	Fuel Level Sensor B Circuit High	REFER to the **Introduction - Gasoline Engines** article first. If sent here from an ENGINE PERFORMANCE article, go to **Pinpoint Test C**.
All other DTCs	-	REFER to the **Introduction - Gasoline Engines** article.

Instrument Cluster Self-Diagnostic Mode

To enter the instrument cluster self-diagnostic mode, begin with the ignition key in the OFF position. Press and hold the odometer/trip reset button (base cluster) or press and hold the message center RESET button (message center cluster). Turn the key to the RUN position and hold until the display indicates tESt (base cluster) or ENGINEERING TEST MODE (message center cluster), usually within 3 to 5 seconds. Press the RESET button once to advance through each stage of the self-test. To exit the instrument cluster self-test mode, turn the ignition to the OFF position. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

Base cluster display	Message center cluster display	Description
tESt	ENGINEERING TEST MODE	Initial entry display into the self-test mode.
GAGE	GAUGE TEST	Carries out the gauge sweep of all gauges, then displays the present gauge values. Also carries out the checksum test on ROM and EE.
All VF pixels illuminated	All VF pixels illuminated	Carries out the prove-out of all dot matrix pixels in all characters.
bulb	TELLTALE TEST	Illuminates all the micro-controlled lamps and LEDs.
PnXXXX Pn XX	PART NUMBER XXXX - XX	Return to normal operation of all micro-controlled lamps/LEDs and displays the alpha-numeric prefix and suffix of the instrument cluster.
r XXXX FAIL	ROM LEVEL $XXXX	Displays the hexadecimal ROM level and type.
nr XXXX	ROM LEVEL $XXXX	Displays the hexadecimal ROM level and type as stored in the NVM.
EE XX	NVM LEVEL $XX	Displays the hexadecimal EE

		level.
dtXXXX	MANUFACTURE DATE $XXX	Displays hexadecimal coding of the final manufacturing test date.
CF1 XX - CF3XX	B&A CONFIG BYTE 1$XX - 2$XX	Displays hexadecimal of bytes 1-3 (non-message center cluster), displays hexadecimal of bytes 1-2 (message center cluster) of module configuration settings.
dtc XXXX	CONTINUOS DTC $XXXX	Displays a 16-bit hexadecimal format. DTCs displayed are those detected in continuous operation not during self-test.
E XXX.X	VEHICLE SPD XX.X MPH	Displays the imperial speed value being inputs in tenths of mph to the instrument cluster, the speedometer indicates the present speed.
XXX.X	VEHICLE SPD XX.X KMH	Displays the metric speed value being inputs in tenths of kmh to the instrument cluster, the speedometer indicates the present speed.
t XXXX	TACHOMETER XXXX RPM	Displays the tachometer value being input in rpm to the instrument cluster, tachometer indicates the present rpm.
F1 XXX	FDM FUEL LEVEL XXX RADS	Displays the present FDM fuel level A/D input in decimal.
F1PXXX	FDM FUEL %, STATUS XXX	Displays the present FDM fuel level percent status in decimal.
F2 XXX	JPM FUEL LVL XXX RADS	Displays the present JPM fuel level percent ratio status in decimal.
F2PXXX	JPM FUEL %, STATUS XXX	Displays the present JPM fuel level A/D input in decimal.
FP XXX	FUEL LEVEL %, STATUS XXX	Displays the present weighted fuel level percent status in decimal (used by the gauge).
FiXXXX	FUEL INT STATUS XX XX	Displays the fuel reference type used at the key on in hexadecimal, followed by the FLPS value of the reference in hexadecimal.
		Displays the last temperature gauge input value from the HS-

XXX C	COOLANT TEMP XXX C	CAN in degrees C, temperature gauge indicates the present temperature.
odoXXX	ODOMETER XXX COUNTS	Displays the odometer input received via the HS-CAN, in decimal.
toXXX.X	TRIP ODO XXXX.X	Displays the trip odometer value stored in RAM in miles.
bAtXX.X	BATTERY XX.X VOLTS	Displays the present VBAT A/D reading in volts.
rS -X	RUN/START X	RUN/START sense circuit check.
rA -X	RUN/ACC X	RUN/ACC sense circuit check.
iin -X	KEY IN SW X	Displays the input status of key-in-switch.
dC XXX	DIMMING CMD XXX	Display of the SJB dimming command in decimal.
dS XX	DIMMING STEP XX	Display of the instrument cluster dimming step in decimal.
	MC SWITCH XXX A/D CNTS	Displays the present message center switch input A/D counts in decimal.
tCsXXX	TC ON/OFF SW XXX A/D CNTS	Displays the present input status of the traction control on/off switch ratio in decimal.
ACr XX	AC REQUEST X	Displays the input status of AC request switch.
	PARK INT SW XXX	Displays the present park interlock switch input A/D counts in decimal.
	COMPASS INPUT $XX	Displays the data being received over the compass network in hexadecimal.
dor XX	DOOR STATUS $XX	Displays the door ajar status received from the SJB in hexadecimal.
H t XX	HL & TURN STATUS $XX	Displays the headlamp and turn signal status received from the SJB in hexadecimal.
Ad XX	AWD DATA $XX	Displays the last AWD indicator command received from the 4x4 control module, this command shares the stability control indicator.
PCXXXX	PCM DATA $XXXX	Displays the 16-bit hexadecimal value of indicator commands and

		fuel flow received by the PCM.
trXXXX	TRANSMISSION DATA $XXXX	Displays the transmission wrench indicator, the MIL indicator as commanded by the transmission state, and the PRNDL information received from the traction control module in hexadecimal.
AbXXXX	ABS TT DATA $XXXX	Displays the status of the indicator commands received from the ABS/TC/IVD module in hexadecimal.
rC XX	RESTRAINTS CMDS $XX	Displays the status of the air bag, the safety belt indicators, and the safety belt chime commands from the RCM in hexadecimal from the input message.
tt XX	SJB TELLTALE STATUS $XX	Displays the telltale status received from the SJB in hexadecimal.
tS XX	SJB TURN SIG STATUS $XX	Displays the turn signal status received from the SJB in hexadecimal.
Ch X	LAST CHIME SOUNDED X	Displays either the chime last sounded by the instrument cluster, or the chime that is presently sounding. This excludes the trip reset button press chime used to enter the ETM or to scroll through the ETM.
PAd00-PAd09 XXXX	PORT AD00-PORT AD09 $XXXX	Displays the 10-bit hexadecimal values of the ports AD00-AD09 A/D read.
PA XX	PORT A $XX	Displays the 8-bit hexadecimal value of the port A readings.
Pb XX	PORT B $XX	Displays the 8-bit hexadecimal value of the port B readings.
PJ XX	PORT J$XX	Displays the 8-bit hexadecimal value of the port J readings.
PK XX	PORT K $XX	Displays the 8-bit hexadecimal value of the port K readings.
PL XX	PORT L $XX	Displays the 8-bit hexadecimal value of the port L readings.
Pnn XX	PORT M $XX	Displays the 8-bit hexadecimal value of the port M readings.

PP XX	PORT P $XX	Displays the 8-bit hexadecimal value of the port P readings.
PS XX	PORT S $XX	Displays the 8-bit hexadecimal value of the port S readings.
Puu XX	PORT W $XX	Displays the 8-bit hexadecimal value of the port W readings.
GAGE	GAUGE TEST	Repeats the test display cycle.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
• No communication with the instrument cluster	• Powertrain control module (PCM) • Restraint Control Module (RCM) • Anti-lock brake system (ABS) module • Transmission control module (TCM) • Smart junction box (SJB)	• REFER to **MODULE COMMUNICATIONS NETWORK** article.
• Incorrect fuel gauge indication	• Circuitry • Fuel tank and/or lines • Fuel tank transfer tube • Fuel pump module • Fuel level sensor • Instrument cluster	• Go to **Pinpoint Test B**.
• Incorrect temperature gauge indication	• PCM • Instrument cluster	• Go to **Pinpoint Test C**.
• The low oil pressure warning indicator is never/always on	• Circuitry • Oil pressure switch • SJB • Instrument cluster	• Go to **Pinpoint Test D**.
• The speedometer/odometer is inoperative	• ABS module • Instrument cluster	• Go to **Pinpoint Test E**.

• The tachometer is inoperative	• PCM • Instrument cluster	• Go to **Pinpoint Test F**.
• The low fuel warning indicator is never/always on	• Instrument cluster	• Go to **Pinpoint Test G**.
• The charging system warning indicator is never/always on	• Charging system • PCM • Instrument cluster	• Go to **Pinpoint Test H**.
• The brake warning indicator is never on	• Circuitry • Parking brake switch • Brake fluid level switch • SJB • ABS module • Instrument cluster	• Go to **Pinpoint Test I**.
• The brake warning indicator is always on	• Circuitry • Parking brake switch • Brake fluid level switch • SJB • ABS module • Instrument cluster	• Go to **Pinpoint Test J**.
• The malfunction indicator lamp (MIL) is never on	• PCM • Instrument cluster	• Go to **Pinpoint Test K**.
• The malfunction indicator lamp (MIL) is always on	• Circuitry • PCM • Instrument cluster	• REFER to the **Introduction - Gasoline Engines** article.
• The safety belt warning indicator is inoperative/does not operate correctly	• RCM • Instrument cluster	• Go to **Pinpoint Test L**.
• The air bag warning indicator is never/always on	• RCM • Instrument cluster	• Go to **Pinpoint Test M**.
• The LH turn signal indicator is never/always on	• SJB • Instrument cluster	• Go to **Pinpoint Test N**.
• The RH turn signal indicator is never/always on	• SJB • Instrument cluster	• Go to **Pinpoint Test O**.

• The high beam indicator is never/always on	• SJB • Instrument cluster	• Go to **Pinpoint Test P**.
• The traction control indicator is never/always on	• ABS module • All wheel drive (AWD) system • Instrument cluster	• Go to **Pinpoint Test Q**.
• The anti-lock brake system (ABS) warning indicator is never/always on	• ABS module • Instrument cluster	• Go to **Pinpoint Test R**.
• The speed control indicator is never/always on	• PCM • Instrument cluster	• Go to **Pinpoint Test S**.
• The wrench indicator is never/always on	• PCM • Instrument cluster	• Go to **Pinpoint Test T**.
• The check fuel cap warning indicator is never/always on	• PCM • Instrument cluster	• Go to **Pinpoint Test U**.
• The low washer fluid indicator is never/always on	• Circuitry • Washer fluid level switch • SJB • Instrument cluster	• Go to **Pinpoint Test V**.
• The low coolant level indicator is never/always on	• Circuitry • Low coolant level switch • SJB • Instrument cluster	• Go to **Pinpoint Test W**.
• The door ajar warning indicator is inoperative/does not operate correctly	• SJB • Instrument cluster	• Go to **Pinpoint Test X**.
• The instrument cluster is inoperative	• Fuse • Circuitry • Instrument cluster	• Go to **Pinpoint Test Y**.

Pinpoint Tests

Pinpoint Test A: DTC U2023 - Fault Received From External Node

Normal Operation

Instrument cluster DTC U2023 sets when a specific invalid message (when the ignition switch is in the RUN

position) is received from the restraints control module (RCM), the smart junction box (SJB), the powertrain control module (PCM), the anti-lock brake system (ABS) module, or the transmission control module (TCM).

Possible Causes

- TCM

PINPOINT TEST A: DTC U2023 - FAULT RECEIVED FROM EXTERNAL NODE

A1 REPEAT ON-DEMAND SELF TEST

- Key in ON position.
- Clear the instrument cluster DTCs and retrieve the continuous DTCs.
- **Is DTC U2023 retrieved again?**

  YES : Go to A2.

  NO : The system is operating correctly. The cause may have been caused by a temporary loss of communication from one of the communicating modules.

A2 CHECK FOR OTHER MODULE DTCs

- Carry out the continuous and the on-demand self-tests for the following modules:
  - RCM
  - SJB
  - PCM
  - ABS
  - TCM
- **Are any DTCs present?**

  YES : REFER to **MULTIFUNCTION ELECTRONIC MODULES** article or the **Introduction - Gasoline Engines** article for correct DTC diagnosis.

  NO : Go to A3.

A3 CHECK THE INSTRUMENT CLUSTER ILLUMINATION OPERATION

- Place the headlamp switch in the PARKING LAMPS ON position.
- While observing the instrument cluster illumination, use the dimmer switch to increase and decrease the illumination brightness.
- **Does the instrument cluster illumination operate correctly?**

  YES : Go to A4.

  NO : REFER to **INSTRUMENT CLUSTER AND PANEL ILLUMINATION** article.

A4 CHECK THE SAFETY BELT WARNING INDICATOR AND BELT MINDER OPERATION

- Verify the safety belt warning indicator and the belt minder operate correctly.
- **Do the safety belt warning indicator and belt minder operate correctly?**

  YES : Go to A5.

  NO : If the safety belt warning indicator does not operate correctly, go to **Pinpoint Test K**.

If the belt minder does not operate correctly, REFER to **WARNING DEVICES** article.

A5 CHECK THE SPEEDOMETER/ODOMETER OPERATION

- Verify the speedometer and the odometer operate correctly.
- **Do the speedometer and the odometer operate correctly?**

  YES : Go to A6.

  NO : Go to **Pinpoint Test E**.

A6 CHECK THE COOLANT TEMPERATURE GAUGE OPERATION

- Verify the coolant temperature gauge operates correctly.
- **Does the coolant temperature gauge operate correctly?**

  YES : Go to A7.

  NO : Go to **Pinpoint Test C**.

A7 CHECK FOR CORRECT TCM OPERATION

- Disconnect the TCM connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the TCM connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new TCM. REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - CONTINUOUSLY VARIABLE TRANSMISSION (CVT)** article or **AUTOMATIC TRANSAXLE/TRANSMISSION - 6 SPEED** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test B: Incorrect Fuel Gauge Indication

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or **SYSTEM WIRING DIAGRAMS** (Montego) for schematic and connector information.

NOTE: The fuel pump module is also called the fuel sender.

NOTE: The fuel level sensor is also called the remote fuel sender.

Normal Operation

The fuel tank is a saddle tank design with variable resistance senders, driven by floats, that provide resistances related to fuel height in each side to the instrument cluster. The fuel level is determined using variable resistance fuel sensor units, with an approximate resistance range between 15 ohms ± 2 ohms at empty (E) and

160 ohms ± 4 ohms at full (F). The instrument cluster sends a signal to the fuel pump module through circuit 29 (YE/WH) and returns through circuit 1843 (BK/OG). The instrument cluster sends a signal to the fuel level sensor circuit 1356 (LG/VT) and returns through circuit 1357 (LB/YE). The instrument cluster monitors the resistance readings from the fuel sensors and commands the fuel gauge with a corresponding movement of the pointer. If the instrument cluster detects the fuel level sensor circuitry is open, the fuel gauge defaults to the fuel pump module value only and the fuel gauge indicates E to 1/2 tank. If the instrument cluster detects fuel pump module circuitry is open, the fuel gauge defaults to the empty position.

Instrument Cluster DTCs

DTC B1202 - sets when the instrument cluster detects an open or a short to voltage on the fuel pump module signal circuit 29 (YE/WH) for more than 33 seconds.

DTC B1204 - sets when the instrument cluster detects a short to ground on the fuel pump module signal circuit 29 (YE/WH) for more than 33 seconds.

DTC B2627 - sets when the instrument cluster detects an open or a short to voltage on the fuel level sensor signal circuit 1356 (LG/VT) for more than 33 seconds.

DTC B2628 - sets when the instrument cluster detects a short to ground on the fuel level sensor signal circuit 1356 (LG/VT) for more than 33 seconds.

NOTE: Normal operation of the fuel delivery system allows the remote side of the fuel tank (the side opposite of the fuel filler hose) to have less fuel than the side with the fuel pump module (side with the fuel filler hose).

DTC B2879 - sets when the instrument cluster detects a large discrepancy in the amount of fuel (based on input from the fuel senders) between both sides of the fuel tank.

PCM DTCs

DTC P0460 (Fuel Level Sensor A Circuit) - sets when the PCM determines the value of the fuel level input signal is stuck, that the fuel level input signal does not change or does not correspond with the calculated fuel usage.

DTC P0461 (Fuel Level Sensor A Circuit Range/Performance) - sets when the PCM determines the fuel level input signal repeatedly moves in and out of range, exceeding the minimum or maximum allowable calibrated parameters for a specified fuel fill percentage in the fuel tank.

DTC P0462 (Fuel Level Sensor A Circuit Low) - sets in the PCM when the PCM detects a short to ground on the fuel pump module signal circuit based on the messaged input received from the instrument cluster.

DTC P0463 (Fuel Level Sensor A Circuit High) - sets in the PCM when the PCM detects an open or a short to voltage on the fuel pump module signal circuit based on the messaged input received from the instrument cluster.

DTC P2065 (Fuel Level Sensor B Circuit) - sets when the PCM determines the value of the fuel level sensor

input signal is stuck, that the fuel level input signal does not change or does not correspond with the calculated fuel usage.

DTC P2066 (Fuel Level Sensor B Circuit Range/Performance) - sets when the PCM determines the fuel level sensor input signal repeatedly moves in and out of range, exceeding the minimum or maximum allowable calibrated parameters for a specified fuel fill percentage in the fuel tank

DTC P2067 (Fuel Level Sensor B Circuit Low) - sets in the PCM when the PCM detects a short to ground on the fuel level sensor signal circuit based on the messaged input received from the instrument cluster.

DTC P2068 (Fuel Level Sensor B Circuit High) - sets in the PCM when the PCM detects a open or short to voltage on the fuel level sensor signal circuit on the messaged input received from the instrument cluster.

Possible Causes

- Circuit 29 (YE/WH) open, short to ground or voltage
- Circuit 1356 (LG/VT) open, short to ground or voltage
- Circuit 1357 (LB/YE) open or short to voltage
- Circuit 1843 (BK/OG) open or short to voltage
- Fuel pump module
- Fuel level sensor
- Fuel tank transfer tube
- Fuel lines
- Fuel tank
- Instrument cluster

PINPOINT TEST B: INCORRECT FUEL GAUGE INDICATION

CAUTION: Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(s) may damage the connector.

B1 CARRY OUT THE INSTRUMENT CLUSTER FUEL GAUGE ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Trigger the instrument cluster on-demand self-test while observing the fuel gauge.
- **Does the fuel gauge sweep from E (empty) to F (full)?**

  YES : Go to B2.

  NO : Go to B18.

B2 CHECK FOR INSTRUMENT CLUSTER DTCs

- Key in OFF position.
- Check for recorded instrument cluster DTCs from the continuous and on-demand self-tests.

- **Are any DTCs recorded?**

  YES : For DTC B1204 or B2628, go to B3 .

  For DTC B1202, go to B5 .

  For DTC B2627, go to B10 .

  For DTC B2879, go to B15 .

  NO : Go to B15.

B3 CHECK THE FUEL SENDER FOR A SHORT TO GROUND

NOTE: The fuel pump module is also called the fuel sender.

NOTE: The fuel level sensor is also called the remote fuel sender.

- Disconnect: Fuel Pump Module C3104 (DTC B1204) or Fuel Level Sensor C3270 (DTC B2628)
- Key in ON position.

NOTE: DTC B1204 or B2628 may still be present.

- Repeat the instrument cluster on-demand self-test.
- **Is DTC B1202 or B2627 retrieved?**

  YES : Go to B4.

  NO : INSTALL a new fuel sender in question. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self-test.

B4 CHECK CIRCUIT 29 (YE/WH) (DTC B1204) OR CIRCUIT 1356 (LG/VT) (DTC B2628) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: Instrument Cluster C220

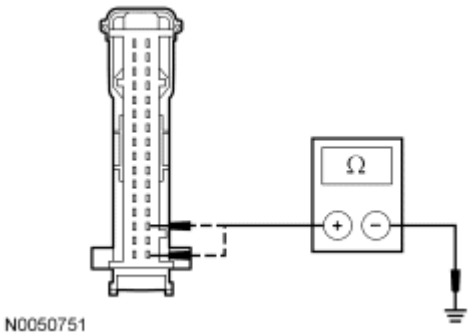


Fig. 1: Checking Circuits For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the instrument cluster C220-14 (DTC B1204), circuit 29 (YE/WH) harness side and ground; or between the instrument cluster C220-16 (DTC B2628), circuit 1356 (LG/VT) harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

  YES : Go to B18.

  NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

B5 CHECK THE FUEL PUMP MODULE CIRCUITRY FOR A SHORT TO VOLTAGE

- Disconnect: Instrument Cluster C220
- Key in ON position.

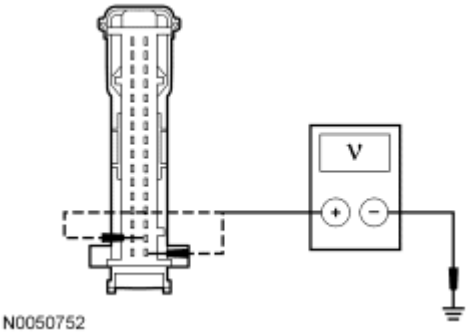


Fig. 2: Checking Circuits For Short To Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the instrument cluster C220-14, circuit 29 (YE/WH), harness side and ground; and between the instrument cluster C220-15, circuit 1843, (BK/OG), harness side and ground.
- **Is any voltage present?**

  YES : Go to B6.

  NO : Go to B7.

B6 CHECK THE FUEL PUMP MODULE FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: Fuel Pump Module C3104
- Key in ON position.

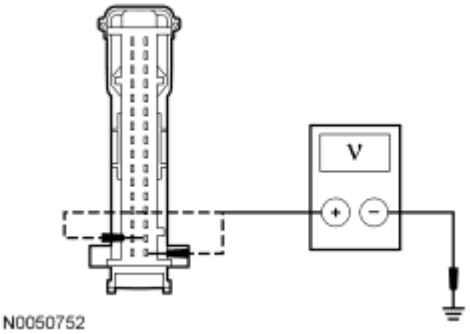


Fig. 3: Checking Circuits For Short To Voltage
Courtesy of FORD MOTOR CO.

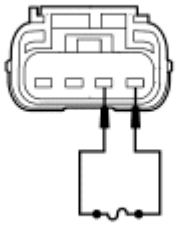
- Measure the voltage between the instrument cluster C220-14, circuit 29 (YE/WH), harness side and ground; and between the instrument cluster C220-15, circuit 1843, (BK/OG), harness side and ground.
- **Is any voltage present?**

  YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

  NO : INSTALL a new fuel pump module. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self-test.

B7 CHECK THE FUEL PUMP MODULE CIRCUITRY FOR AN OPEN

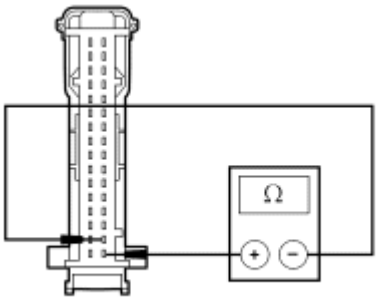
- Key in OFF position.
- Disconnect: Fuel Pump Module C3104



N0050754

Fig. 4: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the fuel pump module C3104-2, circuit 29 (YE/WH), harness side and the fuel pump module C3104-1, circuit 1843 (BK/OG), harness side.



N0050755

Fig. 5: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the instrument cluster C220-14, circuit 29 (YE/WH), harness side and the instrument cluster C220-15, circuit 1843 (BK/OG), harness side.

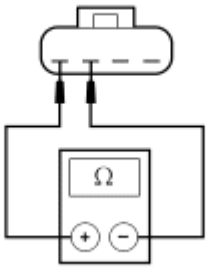
- **Is the resistance less than 5 ohms?**

  YES : REMOVE the jumper wire. Go to B8 .

  NO : REMOVE the jumper wire. Go to B9 .

B8 CHECK THE FUEL PUMP MODULE FOR AN OPEN

NOTE: The fuel sender resistance varies from 15 ± 2 ohms when empty (E) to 160 ± 4 ohms when full (F).



N0050753

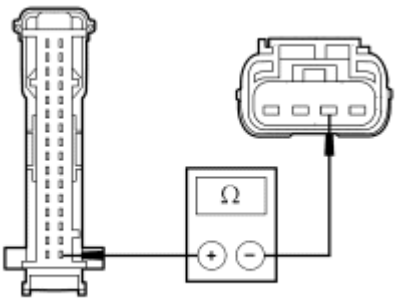
Fig. 6: Checking Fuel Pump Module For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the fuel pump module C3104 pin 1, component side and the fuel pump module C3104 pin 2, component side.
- **Is the resistance between 15 and 160 ohms?**

  YES : Go to B18.

  NO : INSTALL a new fuel pump module. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self-test.

B9 CHECK CIRCUIT 29 (YE/WH) FOR AN OPEN



N0050756

Fig. 7: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the instrument cluster C220-14, circuit 29 (YE/WH), harness side and the fuel pump module C3104-2, circuit 29 (YE/WH), harness side.

- **Is the resistance less than 5 ohms?**

  YES : REPAIR circuit 1843 (BK/OG) for an open. CLEAR the DTCs. REPEAT the self-test.

  NO : REPAIR circuit 29 (YE/WH). CLEAR the DTCs. REPEAT the self-test.

B10 CHECK THE FUEL LEVEL SENSOR CIRCUITRY FOR A SHORT TO VOLTAGE

- Disconnect: Instrument Cluster C220
- Key in ON position.

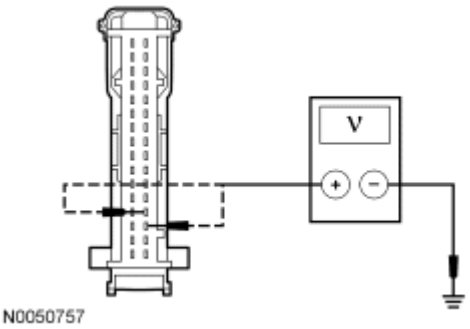


Fig. 8: Checking Circuits For Short To Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the instrument cluster C220-16, circuit 1356 (LG/VT), harness side and ground; and between the instrument cluster C220-17, circuit 1357 (LB/YE), harness side and ground.
- **Is any voltage present?**

  YES : Go to B11.

  NO : Go to B12.

B11 CHECK CIRCUIT 1356 (LG/VT) FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: Fuel Level Sensor C3270

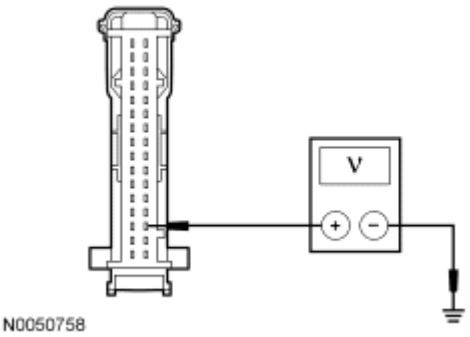


Fig. 9: Checking Circuit For Short To Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the instrument cluster C220-16, circuit 1356 (LG/VT), harness side

and ground.

- **Is any voltage present?**

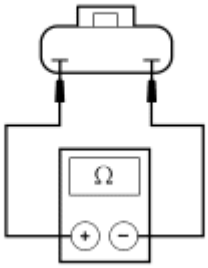
  YES : REPAIR circuit 1356 (LG/VT). CLEAR the DTCs. REPEAT the self-test.

  NO : REPAIR circuit 1357 (LB/YE) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.

B12 CHECK THE FUEL LEVEL SENSOR FOR AN OPEN

NOTE: The fuel sender resistance varies from 15 ± 2 ohms when empty (E) to 160 ± 4 ohms when full (F).

- Key in OFF position.
- Disconnect: Fuel Level Sensor C3270



N0050759

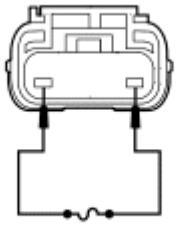
Fig. 10: Checking Fuel Level Sensor For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the fuel level sensor C3270 pin 1, component side and the fuel level sensor C3270 pin 4, component side.
- **Is the resistance between 15 and 160 ohms?**

  YES : Go to B13.

  NO : INSTALL a new fuel level sensor. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self-test.

B13 CHECK THE FUEL LEVEL SENSOR CIRCUITRY FOR AN OPEN



N0050760

Fig. 11: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the fuel level sensor C3270-4, circuit 1356 (LG/VT), harness side and the fuel level sensor C3270-1, circuit 1357 (LB/YE), harness side.

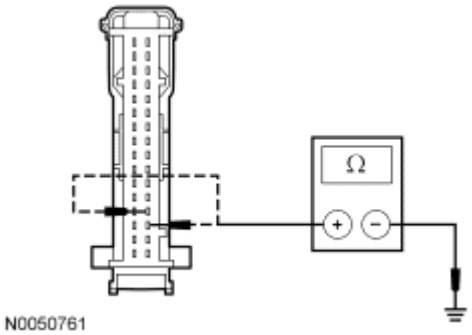


Fig. 12: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the instrument cluster C220-16, circuit 1356 (LG/VT), harness side and the instrument cluster C220-17, circuit 1357 (LB/YE), harness side.
- **Is the resistance less than 5 ohms?**

  YES : REMOVE the jumper wire. Go to B18 .

  NO : REMOVE the jumper wire. Go to B14 .

B14 CHECK CIRCUIT 1356 (LG/VT) FOR AN OPEN

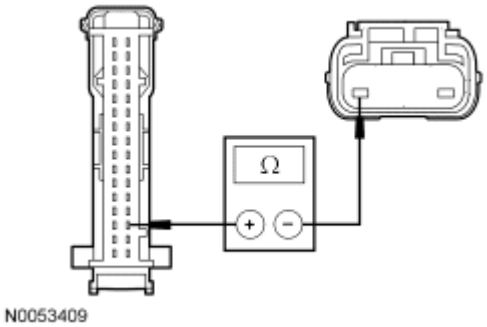


Fig. 13: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the instrument cluster C220-16, circuit 1356 (LG/VT), harness side and the fuel sender C3270-4, circuit 1356 (LG/VT), harness side.
- **Is the resistance less than 5 ohms?**

  YES : REPAIR circuit 1357 (LB/YE) for an open. CLEAR the DTCs. REPEAT the self-test.

  NO : REPAIR circuit 1356 (LG/VT). CLEAR the DTCs. REPEAT the self-test.

B15 INSPECT THE FUEL TANK

- Visually inspect the fuel tank for any damage or deformation.
- **Is the fuel tank OK?**

  YES : Go to B16.

  NO : INSTALL a new fuel tank. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self test.

B16 INSPECT THE FUEL TANK TRANSFER TUBE CONNECTIONS

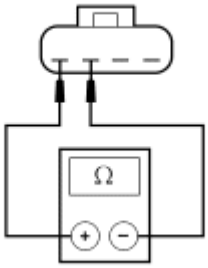
- Remove the fuel pump module and the fuel level sensor. Refer to **FUEL TANK AND LINES** article.
- Inspect the fuel tank transfer tube, connections, the fuel pump module and the fuel level sensor for any damage or deformation.
- **Are the fuel tank transfer tube, connections, the fuel pump module and the fuel level sensor OK?**

  YES : Go to B17.

  NO : INSTALL a new fuel tank transfer tube, fuel pump module or fuel level sensor as necessary. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self test.

B17 CHECK THE FUEL PUMP MODULE AND THE FUEL LEVEL SENSOR FOR CORRECT OPERATION

NOTE: The resistance varies from 15 ± 2 ohms when empty (E) to 160 ± 4 ohms when full (F).



N0050753

Fig. 14: Checking Fuel Pump Module For Open
Courtesy of FORD MOTOR CO.

- For the fuel pump module, measure the resistance between the fuel pump module C3104 pin 1, component side and the fuel pump module C3104 pin 2, component side while slowly moving the float arm from the bottom to the top of travel.

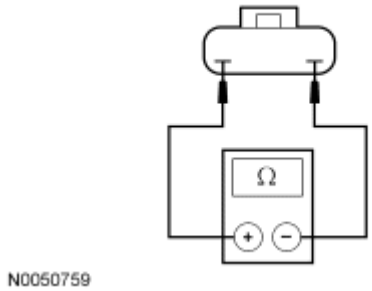


Fig. 15: Checking Fuel Level Sensor For Open
Courtesy of FORD MOTOR CO.

- For the fuel level sensor, measure the resistance between the fuel level sensor C3270 pin 1, component side and the fuel level sensor C3270 pin 4, component side while slowly moving the float arm from the bottom to the top of travel.
- **Does the resistance start at approximately 15 ohms with the float at the bottom of travel and slowly increase to approximately 160 ohms at the top of travel?**

  YES : INSTALL a new fuel tank transfer tube. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self test.

  NO : INSTALL a new fuel pump module or fuel level sensor as necessary. REFER to **FUEL TANK AND LINES** article. CLEAR the DTCs. REPEAT the self-test.

B18 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test C: Incorrect Temperature Gauge Indication

Normal Operation

The engine coolant temperature (ECT) sensor unit monitors the coolant temperature and is hardwired directly to the powertrain control module (PCM). The status of the engine coolant temperature is sent from the PCM to the instrument cluster over the communication network.

Possible Causes

- PCM
- Instrument cluster

PINPOINT TEST C: INCORRECT TEMPERATURE GAUGE INDICATION

C1 RETRIEVE THE RECORDED DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND PCM SELF-TESTS

- Check for recorded PCM DTCs from the continuous and on-demand self-tests.
- **Are any PCM DTCs recorded?**

  YES : REFER to the **Introduction - Gasoline Engines** article.

  NO : Go to C2.

C2 CARRY OUT THE INSTRUMENT CLUSTER COOLANT TEMPERATURE GAUGE ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster temperature gauge active command. Trigger the temperature gauge active command on. Observe the temperature gauge. The temperature gauge should start at cold (C) and move to full hot (H).
- **Does the temperature gauge pointer sweep correctly?**

  YES : Go to C3.

  NO : Go to C4.

C3 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

C4 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion

    - damaged pins
    - pushed-out pins
  - Connect the instrument cluster connector and make sure it seats correctly.
  - Operate the system and verify the concern is still present.
  - **Is the concern still present?**

    YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

    NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test D: The Low Oil Pressure Warning Indicator Is Never/Always On

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or **SYSTEM WIRING DIAGRAMS** (Montego) for schematic and connector information.

Normal Operation

The oil pressure switch is a normally open switch that is hardwired to the smart junction box (SJB) through circuit 1308 (BN/OG). When the oil pressure is within normal ranges, the oil pressure switch closes, grounding the signal to the SJB. The SJB then sends a command signal to the instrument cluster through the communication network, to turn off the oil pressure warning indicator. When engine oil pressure is low, the oil pressure switch opens, removing the ground to the SJB. The SJB sends a low oil pressure command to the instrument cluster through the communication network to illuminate the oil pressure warning indicator.

DTC C1284 - sets if circuit 1308 (BN/OG) is shorted to ground, with the engine off, during the self-test.

Possible Causes

- Circuit 1308 (BN/OG) open or short to ground
- Oil pressure switch
- SJB
- Instrument cluster

PINPOINT TEST D: THE LOW OIL PRESSURE WARNING INDICATOR IS NEVER/ALWAYS ON

CAUTION: Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(s) may damage the connector.

D1 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME COMMAND USING THE SCAN TOOL

NOTE: Verify the oil level is at or near the FULL level.

- Key in ON position.

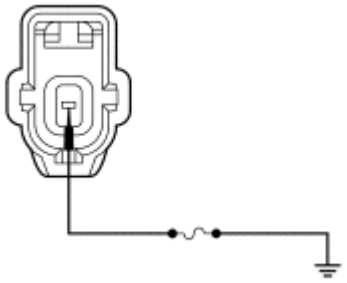
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the low oil pressure warning indicator.
- **Does the low oil pressure warning indicator illuminate when triggered on, and turn off when triggered off?**

  YES : Go to D2.

  NO : Go to D7.

D2 MONITOR THE SJB OIL PRESSURE PID

- Key in OFF position.
- Disconnect: Oil Pressure Switch C103
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB Oil Pressure Switch PID
- Monitor the SJB oil pressure switch PID.



A0004821

Fig. 16: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the oil pressure switch C103-1, circuit 1308 (BN/OG), harness side and ground.
- **Does the SJB oil pressure switch PID indicate NO pressure with the jumper wire removed and YES with the jumper wire connected?**

  YES : REMOVE the jumper wire. Go to D3 .

  NO : If the oil pressure indicator is never on, REMOVE the jumper wire. Go to D5 .

  If the oil pressure indicator is always on, REMOVE the jumper wire. Go to D4 .

D3 CARRY OUT THE ENGINE OIL PRESSURE TEST

- Carry out the engine oil pressure test. Refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
- **Is the engine oil pressure within specification?**

  YES : INSTALL a new oil pressure switch. REFER to **ENGINE** article. CLEAR the DTCs. REPEAT the self-test.

  NO : REFER to **ENGINE SYSTEM - GENERAL INFORMATION** article.

D4 CHECK CIRCUIT 1308 (BN/OG) FOR AN OPEN

- Key in OFF position.
- Disconnect: SJB C2280a

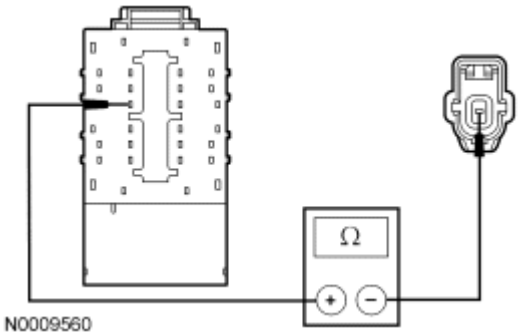


Fig. 17: Checking Fuel Level Sensor For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-18, circuit 1308 (BN/OG), harness side and the oil pressure switch C103-1, circuit 1308 (BN/OG), harness side.
- **Is the resistance less than 5 ohms?**

  YES : Go to D6.

  NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D5 CHECK CIRCUIT 1308 (BN/OG) FOR A SHORT TO GROUND

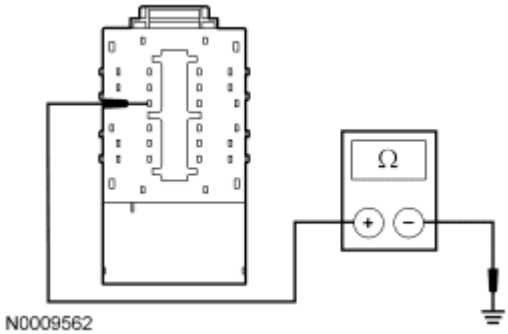


Fig. 18: Checking Circuit For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-18, circuit 1308 (BN/OG), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

  YES : Go to D6.

  NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D6 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.

- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

D7 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test E: The Speedometer/Odometer Is Inoperative

Normal Operation

Vehicle speed information is sent to the instrument cluster from the anti-lock brake system (ABS) module over the communication network.

Possible Causes

- ABS module
- Instrument cluster

PINPOINT TEST E: THE SPEEDOMETER/ODOMETER IS INOPERATIVE

E1 RETRIEVE THE RECORDED DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND ABS MODULE SELF-TESTS

- Check for recorded ABS module DTCs from the continuous and on-demand self-tests.

- **Are any ABS module DTCs recorded?**

  YES : REFER to **MULTIFUNCTION ELECTRONIC MODULES** article.

  NO : For an inoperative or inaccurate speedometer, go to E2 .

  For an inoperative odometer, go to E3 .

E2 CARRY OUT THE INSTRUMENT CLUSTER SPEEDOMETER ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster speedometer active command. Trigger the speedometer on. Observe the speedometer. The speedometer should start at 0 and move to 193 km/h (120 mph).
- **Does the speedometer pointer sweep correctly?**

  YES : Go to E5.

  NO : Go to E4.

E3 MONITOR THE MESSAGE CENTER CIRCUIT DISPLAYS

- Select the message center active command. Trigger the message center active command and illuminate the display segments.
- **Do the message center display segments illuminate correctly?**

  YES : Go to E5.

  NO : Go to E4.

E4 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

E5 CHECK FOR CORRECT ABS MODULE OPERATION

- Disconnect the ABS module connector.
- Check for:
  - corrosion
  - damaged pins

    - pushed-out pins
  - Connect the ABS module connector and make sure it seats correctly.
  - Operate the system and verify the concern is still present.
  - **Is the concern still present?**

    YES : INSTALL a new ABS module. REFER to **VEHICLE DYNAMIC SYSTEMS** article. TEST the system for normal operation.

    NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test F: The Tachometer Is Inoperative

Normal Operation

Engine RPM data is provided to the instrument cluster by the powertrain control module (PCM) through the communication network.

Possible Causes

- PCM
- Instrument cluster

PINPOINT TEST F: THE TACHOMETER IS INOPERATIVE

F1 CARRY OUT THE INSTRUMENT CLUSTER TACHOMETER ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster tachometer active command. Trigger the tachometer on. Observe the tachometer. The tachometer should start at 0 and move to 7,000 RPMs.
- **Does the tachometer pointer sweep correctly?**

  YES : Go to F2.

  NO : Go to F3.

F2 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. TEST the system for normal operation.

NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

F3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test G: The Low Fuel Warning Indicator Is Never/Always On

Normal Operation

The low fuel indicator is on when the fuel level reaches a predetermined level of approximately 1/8 tank. The low fuel level warning indicator and the fuel gauge are controlled by the instrument cluster based upon the fuel level data provided by the fuel pump module and the fuel level sender. When the instrument cluster determines there is approximately 1/8 tank of fuel left, the instrument cluster illuminates the low fuel warning indicator.

Possible Causes

- Instrument cluster

PINPOINT TEST G: THE LOW FUEL WARNING INDICATOR IS NEVER/ALWAYS ON

G1 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the low fuel warning indicator.
- **Does the low fuel warning indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to G2.

  NO : Go to G3.

G2 CHECK THE FUEL GAUGE OPERATION

- Key in ON position.
- Check the fuel gauge.
- **Does the fuel gauge operate correctly?**

  YES : Go to G3.

  NO : Go to **Pinpoint Test B**.

G3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect all the instrument cluster connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the instrument cluster connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test H: The Charging System Warning Indicator Is Never/Always On

Normal Operation

The charging system warning indicator is controlled by the instrument cluster based upon data received from the powertrain control module (PCM) over the communication network.

Possible Causes

- Charging system
- PCM
- Instrument cluster

PINPOINT TEST H: THE CHARGING SYSTEM WARNING INDICATOR IS NEVER/ALWAYS ON

H1 CHECK THE CHARGING SYSTEM

- Check the charging system operation. Refer to **CHARGING SYSTEM - GENERAL INFORMATION** article.
- **Is the charging system operating correctly?**

  YES : Go to H2.

  NO : REFER to **CHARGING SYSTEM - GENERAL INFORMATION** article.

H2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and then off. Observe the charging system warning indicator.
- **Does the charging system warning indicator illuminate with the lamps triggered on and turn off when triggered off?**

  YES : Go to H3.

  NO : Go to H4.

H3 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

H4 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test I: The Brake Warning Indicator Is Never On

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or

SYSTEM WIRING DIAGRAMS (Montego) for schematic and connector information.

Normal Operation

The instrument cluster uses 2 separate strategies to operate the brake warning indicator. When the parking brake is applied, circuit 1309 (RD/YE) to the smart junction box (SJB) is grounded by the parking brake switch through circuit 1205 (BK). The SJB receives the ground signal and sends the instrument cluster a message over the communication network to illuminate the brake warning indicator. When the brake fluid level is low or a base brake system concern is detected, the anti-lock brake system (ABS) module sends a signal to the instrument cluster over the communication network to illuminate the brake system warning indicator.

Possible Causes

- Circuit 1205 (BK) open
- Circuit 1309 (RD/YE) open
- Parking brake switch
- Brake fluid level switch
- SJB
- ABS module
- Instrument cluster

PINPOINT TEST I: THE BRAKE WARNING INDICATOR IS NEVER ON

CAUTION: Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(s) may damage the connector.

I1 CARRY OUT THE INSTRUMENT CLUSTER INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the brake warning indicator.
- **Does the brake warning indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to I2.

  NO : Go to I10.

I2 CHECK THE PARKING BRAKE SWITCH PID

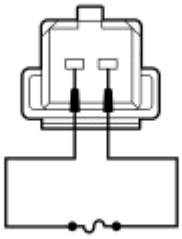
- Enter the following diagnostic mode on the diagnostic tool: SJB Parking Brake Switch PID
- Monitor the SJB parking brake switch PID while applying and releasing the parking brake.
- **Does the PID agree with the parking brake position?**

  YES : Go to I6.

  NO : Go to I3.

I3 CHECK THE PARKING BRAKE SWITCH

- Disconnect: Parking Brake Switch C306



N0002774

Fig. 19: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the parking brake switch C306-1, circuit 1309 (RD/YE), harness side and the parking brake switch C306-2, circuit 1205 (BK), harness side.
- **Does the brake warning indicator illuminate?**

  YES : INSTALL a new parking brake switch. TEST the system for normal operation.

  NO : REMOVE the jumper wire. Go to I4 .

I4 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (PARKING BRAKE SWITCH)

- Key in OFF position.

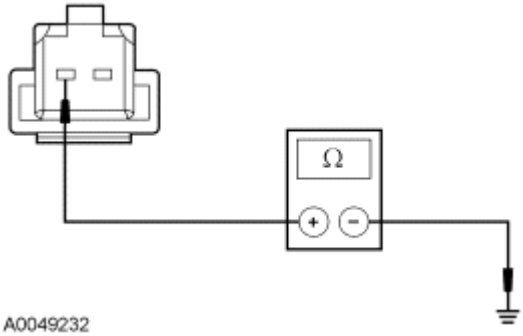


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Fig. 20: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the parking brake switch C306-2, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**

  YES : Go to I5.

  NO : REPAIR the circuit. TEST the system for normal operation.

I5 CHECK CIRCUIT 1309 (RD/YE) FOR AN OPEN

- Disconnect: SJB C2280c

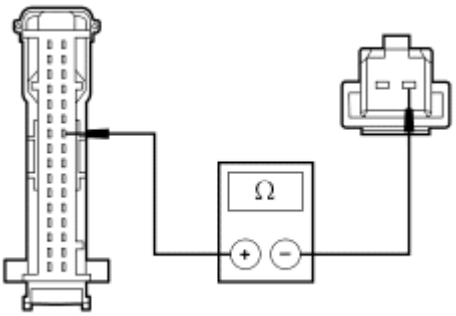

Fig. 21: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280c-23, circuit 1309 (RD/YE), harness side and the parking brake switch C306-1, circuit 1309 (RD/YE), harness side.
- **Is the resistance less than 5 ohms?**

  YES : Go to I10.

  NO : REPAIR the circuit. TEST the system for normal operation.

I6 CHECK THE BRAKE FLUID LEVEL SWITCH INPUT

- Enter the following diagnostic mode on the diagnostic tool: SJB Brake Fluid Level PID

CAUTION: Do not spill brake fluid onto painted or plastic surfaces. If spilled, wipe up immediately before damage to the painted or plastic surface occurs.

- Using a suitable tool, lightly push the brake fluid level float to the bottom of the reservoir. Monitor the SJB brake fluid PID.
- **Does the PID indicate low fluid level with the brake fluid level float pushed down?**

  YES : Go to I9.

  NO : Go to I7.

I7 CHECK THE SJB

- Disconnect: Brake Fluid Level Switch C124
- **Does the brake warning indicator illuminate**

  YES : Go to I8.

  NO : Go to I11.

I8 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (BRAKE FLUID LEVEL SWITCH)

- Key in OFF position.

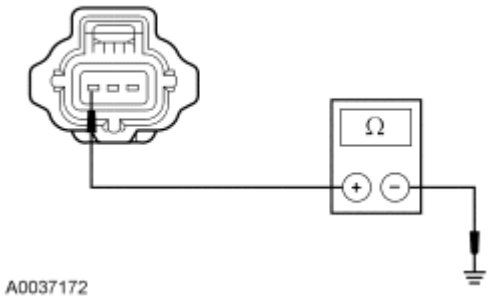

Fig. 22: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the brake fluid level switch C124-1, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**

  YES : INSTALL a new brake fluid level switch. REFER to **HYDRAULIC BRAKE ACTUATION** article. TEST the system for normal operation.

  NO : REPAIR the circuit. TEST the system for normal operation.

I9 CHECK FOR CORRECT ABS MODULE OPERATION

- Disconnect the ABS module connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Correct the ABS module connector and make sure it seats correctly.
- Operate the system and verify that the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new ABS module. REFER to **VEHICLE DYNAMIC SYSTEMS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

I10 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect all the instrument cluster connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the instrument cluster connectors and make sure they seat correctly.
- Operate the system and verify that the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

I11 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify that the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test J: The Brake Warning Indicator Is Always On

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or **SYSTEM WIRING DIAGRAMS** (Montego) for schematic and connector information.

Normal Operation

The instrument cluster uses 2 separate strategies to operate the brake warning indicator. When the parking brake is applied, circuit 1309 (RD/YE) to the smart junction box (SJB) is grounded by the parking brake switch through circuit 1205 (BK). The SJB receives the ground signal and sends the instrument cluster a message over the communication network to illuminate the brake warning indicator. When the brake fluid level is low or a base brake system concern is detected, the anti-lock brake system (ABS) module sends a signal to the instrument cluster over the communication network to illuminate the brake system warning indicator.

DTC B2479 - sets when the SJB detects a short to ground from the parking brake switch input circuit. This DTC can only set when running the on-demand self-test.

DTC C1125 - sets when the SJB detects a short to ground from the brake fluid level switch input circuit. This DTC can only set when running the on-demand self-test.

Possible Causes

- Circuit 128 (VT/YE) open or short to ground
- Circuit 1305 (DB) open or short to ground
- Circuit 1309 (RD/YE) short to ground

- Parking brake switch
- Brake fluid level switch
- SJB
- ABS module
- Instrument cluster

PINPOINT TEST J: THE BRAKE WARNING INDICATOR IS ALWAYS ON

CAUTION: Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(s) may damage the connector.

J1 RETRIEVE THE RECORDED DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND SJB SELF-TESTS

- Key in ON position.
- Check for recorded SJB DTCs from the continuous and on-demand self-tests.
- **Are any DTCs recorded?**

  YES : For DTC C1125, go to J3 .

  For DTC B2479, go to J7 .

  For all other DTCs, REFER to **MULTIFUNCTION ELECTRONIC MODULES** article.

  NO : Go to J2.

J2 CARRY OUT THE INSTRUMENT CLUSTER INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL

- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the brake warning indicator.
- **Does the brake warning indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to J3.

  NO : Go to J10.

J3 CHECK THE BRAKE FLUID INPUT TO THE SJB

- Enter the following diagnostic mode on the diagnostic tool: SJB Brake Fluid Level PID
- Monitor the brake fluid level PID.
- **Does the PID indicate low brake fluid level is OK?**

  YES : Go to J9.

  NO : Go to J4.

J4 CHECK THE BRAKE FLUID LEVEL SWITCH

- Disconnect: Brake Fluid Level Switch C124

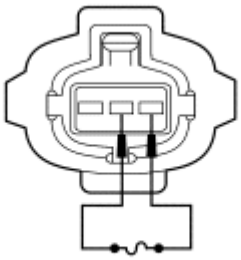

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Fig. 23: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (10A) jumper wire between the brake fluid level switch C124-3, circuit 1305 (DB), harness side and the brake fluid level switch C124-2, circuit 128 (VT/YE), harness side.
- **Does the brake warning indicator continue to illuminate?**

  YES : REMOVE the jumper wire. Go to J5 .

  NO : INSTALL a new brake fluid level switch. REFER to **HYDRAULIC BRAKE ACTUATION** article. CLEAR the DTCs. REPEAT the self-test.

J5 CHECK CIRCUITS 128 (VT/YE) AND 1305 (DB) FOR AN OPEN

- Key in OFF position.
- Disconnect: SJB C2280a

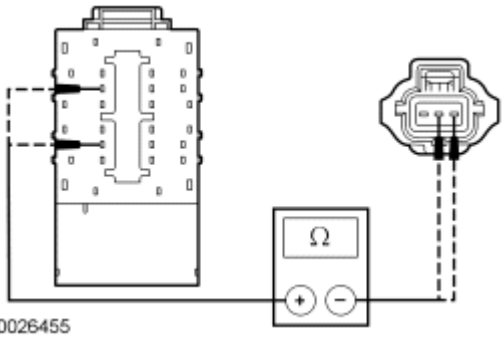

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Fig. 24: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-22, circuit 128 (VT/YE), harness side and the brake fluid level switch C124-2, circuit 128 (VT/YE), harness side; and between the SJB C2280a-10, circuit 1305 (DB), harness side and the brake fluid level switch C124-3, circuit 1305 (DB), harness side.
- **Are the resistances less than 5 ohms?**

  YES : Go to J6.

  NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

J6 CHECK CIRCUITS 128 (VT/YE) AND 1305 (DB) FOR A SHORT TO GROUND

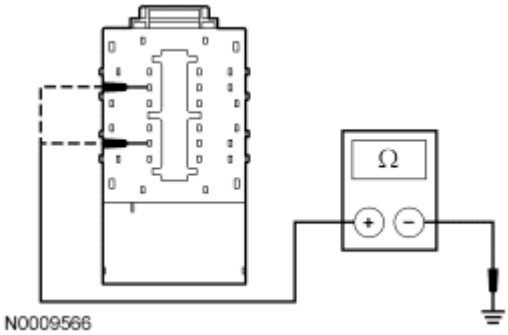


Fig. 25: Checking Circuit For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-22, circuit 128 (VT/YE), harness side and ground; and between the SJB C2280a-10, circuit 1305 (DB), harness side and ground.
- **Are the resistances greater than 10,000 ohms?**

  YES : Go to J11.

  NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

J7 CHECK THE PARKING BRAKE SWITCH

- Disconnect: Parking Brake Switch C306
- Observe the brake warning indicator.
- **Does the brake warning indicator continue to illuminate?**

  YES : Go to J8.

  NO : INSTALL a new parking brake switch. CLEAR the DTCs. REPEAT the self-test.

J8 CHECK CIRCUIT 1309 (RD/YE) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: SJB C2280c

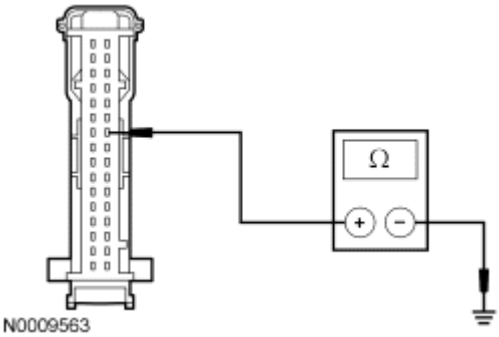


Fig. 26: Checking Circuit For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280c-23, circuit 1309 (RD/YE), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

YES : Go to J11.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

J9 CHECK FOR CORRECT ABS MODULE OPERATION

- Disconnect the ABS module connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Correct the ABS module connector and make sure it seats correctly.
- Operate the system and verify that the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new ABS module. REFER to **VEHICLE DYNAMIC SYSTEMS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

J10 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect all the instrument cluster connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the instrument cluster connectors and make sure they seat correctly.
- Operate the system and verify that the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

J11 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify that the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES**

article. TEST the system for normal operation.

NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test K: The Malfunction Indicator Lamp (MIL) Is Never On

Normal Operation

The MIL is controlled by the instrument cluster using data sent from the powertrain control module (PCM) over the communication network.

Possible Causes

- PCM
- Instrument cluster

PINPOINT TEST K: THE MALFUNCTION INDICATOR LAMP (MIL) IS NEVER ON

K1 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the MIL indicator.
- **Does the MIL indicator illuminate when triggered on?**

  YES : Go to K3.

  NO : Go to K2.

K2 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

K3 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.

- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test L: The Safety Belt Warning Indicator Is Inoperative/Does Not Operate Correctly

Normal Operation

The safety belt switch is hardwired to the restraints control module (RCM). The instrument cluster receives the safety belt switch status from the RCM through the communication network. The RCM signals the instrument cluster, when the safety belt is unfastened, to illuminate the safety belt warning indicator. A safety belt minder chime that is operating correctly indicates the RCM is monitoring and transmitting the correct operation of the safety belt status to the instrument cluster.

Possible Causes

- RCM
- Instrument cluster

PINPOINT TEST L: THE SAFETY BELT WARNING INDICATOR IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

L1 RETRIEVE THE RECORDED RCM DTCs FROM BOTH CONTINUOUS AND ON-DEMAND SELF-TESTS

- Check for recorded RCM DTCs from the continuous and on-demand self-tests.
- **Are any RCM DTCs recorded?**

  YES : REFER to **SUPPLEMENTAL RESTRAINT SYSTEM** article.

  NO : Go to L2.

L2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the safety belt warning indicator.
- **Does the safety belt warning indicator illuminate when triggered on and turn off when**

triggered off?

YES : Go to L4.

NO : Go to L3.

L3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

L4 CHECK FOR CORRECT RCM OPERATION

- Disconnect all the RCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the RCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new RCM. REFER to **SUPPLEMENTAL RESTRAINT SYSTEM** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test M: The Air Bag Warning Indicator Is Never/Always On

Normal Operation

The air bag warning indicator provides an indication that there is a restraint system concern and the air bag may be inoperable or have degraded performance. If the restraints control module (RCM) communicates with the instrument cluster over the communication network whether or not to illuminate the air bag warning indicator. If the instrument cluster loses communication with the RCM, the instrument cluster illuminates the air bag warning indicator.

Possible Causes

- RCM
- Instrument cluster

PINPOINT TEST M: THE AIR BAG WARNING INDICATOR IS NEVER/ALWAYS ON

M1 RETRIEVE THE RECORDED RCM DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND SELF-TESTS

- Check for recorded RCM DTCs from the continuous and on-demand self-tests.
- **Are any RCM DTCs recorded?**

  YES : REFER to **SUPPLEMENTAL RESTRAINT SYSTEM** article.

  NO : Go to M2.

M2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the air bag warning indicator.
- **Does the air bag warning indicator illuminate when commanded on?**

  YES : Go to M4.

  NO : Go to M3.

M3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

M4 CHECK FOR CORRECT RCM OPERATION

- Disconnect all the RCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins

- Connect all the RCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new RCM. REFER to **SUPPLEMENTAL RESTRAINT SYSTEM** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test N: The LH Turn Signal Indicator Is Never/Always On

Normal Operation

When the multifunction switch is in the LH TURN position, a message is sent to the instrument cluster from the smart junction box (SJB) through the communication network, and the LH turn signal indicator flashes on and off with the turn lamps.

Possible Causes

- SJB
- Instrument cluster

PINPOINT TEST N: THE LH TURN SIGNAL INDICATOR IS NEVER/ALWAYS ON

N1 CHECK THE LH TURN SIGNAL LAMPS

- Key in ON position.
- Observe the exterior LH turn lamps while operating the LH turn signal.
- **Do the LH turn lamps operate correctly?**

  YES : Go to N2.

  NO : REFER to **EXTERIOR LIGHTING** article.

N2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the LH turn signal indicator.
- **Does the LH turn signal indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to N4.

  NO : Go to N3.

N3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:

    - corrosion
    - damaged pins
    - pushed-out pins
  - Connect the instrument cluster connector and make sure it seats correctly.
  - Operate the system and verify the concern is still present.
  - **Is the concern still present?**

    YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

    NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

N4 CHECK FOR CORRECT SJB OPERATION

  - Disconnect all the SJB connectors.
  - Check for:
    - corrosion
    - damaged pins
    - pushed-out pins
  - Connect all the SJB connectors and make sure they seat correctly.
  - Operate the system and verify the concern is still present.
  - **Is the concern still present?**

    YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

    NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test O: The RH Turn Signal Indicator Is Never/Always On

Normal Operation

When the multifunction switch is in the RH TURN position, a message is sent to the instrument cluster from the smart junction box (SJB) through the communication network, and the RH turn indicator flashes on and off with the turn lamps.

Possible Causes

- SJB
- Instrument cluster

PINPOINT TEST O: THE RH TURN SIGNAL INDICATOR IS NEVER/ALWAYS ON

O1 CHECK THE RH TURN SIGNAL LAMPS

  - Key in ON position.
  - Observe the exterior RH turn lamps while operating the RH turn signal.

- **Do the RH turn lamps operate correctly?**

  YES : Go to O2.

  NO : REFER to **EXTERIOR LIGHTING** article.

O2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the RH turn signal indicator.
- **Does the RH turn signal indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to O4.

  NO : Go to O3.

O3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

O4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test P: The High Beam Indicator Is Never/Always On

Normal Operation

When the high beams are turned on, the smart junction box (SJB) sends a signal to the instrument cluster through the communication network to illuminate the high beam indicator.

Possible Causes

- SJB
- Instrument cluster

PINPOINT TEST P: THE HIGH BEAM INDICATOR IS NEVER/ALWAYS ON

P1 CHECK THE HIGH BEAM HEADLAMPS

- Key in ON position.
- Place the multifunction switch in the FLASH-TO-PASS position and observe the high beam headlamps.
- **Do the high beam headlamps operate correctly?**

  YES : Go to P2.

  NO : REFER to **EXTERIOR LIGHTING** article.

P2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the high beam indicator.
- **Does the high beam indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to P4.

  NO : Go to P3.

P3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

P4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test Q: The Traction Control Indicator Is Never/Always On

Normal Operation

The traction control indicator flashes when the traction control is in an active mode. The traction control indicator remains constantly illuminated (not flashing) if there is a malfunction of the traction control or the all wheel drive (AWD) system. The instrument cluster receives and monitors the traction control signal from the anti-lock brake system (ABS) module or the differential electronic module (DEM) through the communication network. When the ABS module or the DEM detects a concern, the instrument cluster illuminates the traction control indicator.

Possible Causes

- ABS module
- AWD system
- Instrument cluster

PINPOINT TEST Q: THE TRACTION CONTROL INDICATOR IS NEVER/ALWAYS ON

Q1 CARRY OUT THE INSTRUMENT CLUSTER INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the traction control indicator.
- **Does the traction control indicator illuminate when triggered on and turn off when triggered off?**

YES : Go to Q2.

NO : Go to Q4.

Q2 CHECK COMMUNICATION WITH THE ABS MODULE AND THE DEM (IF EQUIPPED)

- Verify the ABS module and the DEM (if equipped) with the scan tool.
- **Does the ABS module and the DEM (if equipped) communicate with the scan tool?**

  YES : Go to Q3.

  NO : For ABS module DTCs, REFER to **VEHICLE DYNAMIC SYSTEMS** article.

  For DEM DTCs, REFER to **DRIVELINE SYSTEM - GENERAL INFORMATION** article.

Q3 RETRIEVE THE RECORDED ABS MODULE AND DEM (ALL WHEEL DRIVE MODULE) DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND SELF-TESTS

- Check for recorded ABS and DEM DTCs from the continuous and on-demand self-tests.
- **Are any DTCs recorded?**

  YES : For ABS module DTCs, REFER to **VEHICLE DYNAMIC SYSTEMS** article.

  For DEM DTCs, REFER to **DRIVELINE SYSTEM - GENERAL INFORMATION** article.

  NO : Go to Q4.

Q4 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test R: The Anti-Lock Brake System (ABS) Warning Indicator Is Never/Always On

Normal Operation

The status of the ABS system is sent to the instrument cluster from the ABS module over the communication network. The instrument cluster monitors the ABS input and illuminates the ABS warning indicator when a concern is present.

Possible Causes

- ABS module
- Instrument cluster

PINPOINT TEST R: THE ANTI-LOCK BRAKE SYSTEM (ABS) WARNING INDICATOR IS NEVER/ALWAYS ON

R1 VERIFY THE OPERATION OF THE ABS

- Road test the vehicle and verify the ABS is functioning correctly.
- **Is the ABS functioning correctly?**

  YES : Go to R2.

  NO : REFER to **VEHICLE DYNAMIC SYSTEMS** article.

R2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the ABS warning indicator.
- **Does the ABS warning indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to R4.

  NO : Go to R3.

R3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

R4 CHECK FOR CORRECT ABS MODULE OPERATION

- Disconnect the ABS module connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins

- Connect the ABS module connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new ABS module. REFER to **VEHICLE DYNAMIC SYSTEMS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test S: The Speed Control Indicator Is Never/Always On

Normal Operation

The speed control status information is sent to the instrument cluster from the powertrain control module (PCM) over the communication network.

Possible Causes

- PCM
- Instrument cluster

PINPOINT TEST S: THE SPEED CONTROL INDICATOR IS NEVER/ALWAYS ON

S1 CHECK THE SPEED CONTROL OPERATION

- Test drive the vehicle and operate the speed control.
- **Does the speed control operate correctly?**

  YES : Go to S2.

  NO : REFER to **SPEED CONTROL** article.

S2 CARRY OUT THE INSTRUMENT CLUSTER SPEED CONTROL ACTIVE COMMAND USING THE SCAN TOOL

- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the speed control indicator.
- **Does the speed control indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to S4.

  NO : Go to S3.

S3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins

- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

S4 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test T: The Wrench Indicator is Never/Always On

Normal Operation

The instrument cluster receives the wrench warning indicator status from the powertrain control module (PCM) for the electronic throttle control (ETC) concerns and the transmission control module (TCM) for transaxle concerns over the communication network. When a system concern is detected, the PCM or the TCM sets a DTC and sends the instrument cluster a command signal to illuminate the wrench warning indicator.

Possible Causes

- PCM
- Instrument cluster

PINPOINT TEST T: THE WRENCH INDICATOR IS NEVER/ALWAYS ON

T1 CARRY OUT THE INSTRUMENT CLUSTER INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps

active command on and off again. Observe the wrench indicator.

- **Does the wrench indicator illuminate when triggered on and turn of when triggered off?**

  YES : Go to T2.

  NO : Go to T3.

T2 RETRIEVE THE RECORDED PCM AND TCM DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND SELF-TESTS

- Check for recorded PCM and TCM DTCs from the continuous and on-demand self-tests.
- **Are any DTCs recorded?**

  YES : For PCM DTCs, REFER to the **Introduction - Gasoline Engines** article.

  For TCM DTCs, REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6 SPEED** article.

  NO : Go to T3.

T3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test U: The Check Fuel Cap Warning Indicator Is Never/Always On

Normal Operation

The powertrain control module (PCM) monitors the fuel tank evaporative emission system for significant leaks that occur following refueling of the vehicle. If a fuel tank pressure change greater than -23.7 kPa (-7 in-Hg) of vacuum within 30 seconds after refueling occurs, or there is an excessive purge (fuel vapor) flow of greater than 454 g (1.0 lb) per minute, the PCM sets DTC P0457 and sends a message to the instrument cluster over the communication network to illuminate the check fuel cap indicator.

Possible Causes

- PCM
- Instrument cluster

PINPOINT TEST U: THE CHECK FUEL CAP WARNING INDICATOR IS NEVER/ALWAYS ON

U1 RETRIEVE THE RECORDED DTCs FROM BOTH CONTINUOUS AND ON-DEMAND PCM SELF-TESTS

- Check for recorded PCM DTCs from the continuous and on-demand self-tests.
- **Are any PCM DTCs recorded?**

  YES : REFER to the **Introduction - Gasoline Engines** article.

  NO : Go to U2.

U2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the check fuel cap indicator.
- **Does the check fuel cap indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to U4.

  NO : Go to U3.

U3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

U4 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.

- **Is the concern still present?**

  YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test V: The Low Washer Fluid Indicator Is Never/Always On

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or **SYSTEM WIRING DIAGRAMS** (Montego) for schematic and connector information.

Normal Operation

The washer fluid level switch is hardwired to the smart junction box (SJB) through circuit 81 (RD/LG) and grounded through circuit 1205 (BK). The SJB monitors the washer fluid level and sends the washer fluid level data to the instrument cluster over the communication network.

DTC B1482 - sets when the SJB detects a short to ground from the low washer fluid level input circuit. This DTC can only set when running the on-demand self-test.

Possible Causes

- Circuit 81 (RD/LG) open or short to ground
- Circuit 1205 (BK) open
- Washer fluid level switch
- SJB
- Instrument cluster

PINPOINT TEST V: THE LOW WASHER FLUID LEVEL INDICATOR IS NEVER/ALWAYS ON

CAUTION: Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(s) may damage the connector.

V1 CARRY OUT THE INSTRUMENT CLUSTER INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the low washer fluid indicator.
- **Does the low washer fluid indicator illuminate when triggered on and turn off when triggered off?**

  YES : Go to V2.

  NO : Go to V9.

V2 RETRIEVE THE RECORDED DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND SJB SELF-TESTS

- Check for recorded SJB DTCs from the continuous and on-demand self-tests.
- **Are any DTCs recorded?**

  YES : For DTC B1482, go to V3 .

  For all other DTCs, REFER to **MULTIFUNCTION ELECTRONIC MODULES** article.

  NO : Go to V5.

V3 CHECK THE WASHER FLUID LEVEL SWITCH

- Disconnect: Washer Fluid Level Switch C138
- **Does the low washer indicator continue to illuminate?**

  YES : Go to V4.

  NO : INSTALL a new washer fluid level switch. REFER to **WIPERS AND WASHERS** article. CLEAR the DTCs. REPEAT the self-test.

V4 CHECK CIRCUIT 81 (RD/LG) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: SJB C2280a

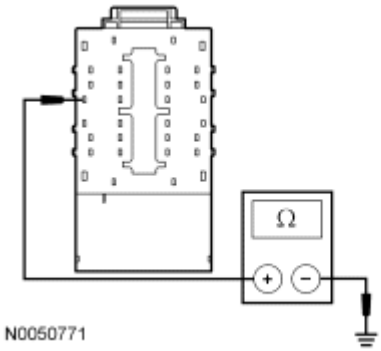


Fig. 27: Checking Circuit For Short To Ground
Courtesy of FORD MOTOR CO.

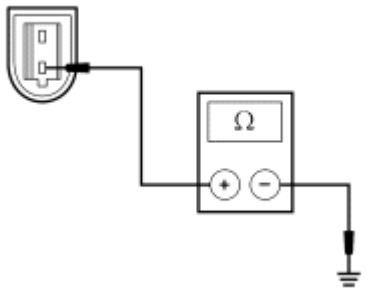
- Measure the resistance between the SJB C2280a-17, circuit 81 (RD/LG), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

  YES : Go to V8.

  NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

V5 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Key in OFF position.
- Disconnect: Washer Fluid Level Switch C138



N0025510

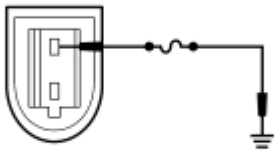
Fig. 28: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the washer fluid level switch C138-2, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**

  YES : Go to V6.

  NO : REPAIR the circuit. TEST the system for normal operation.

V6 CHECK THE WASHER FLUID LEVEL SWITCH



N0025508

Fig. 29: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (10A) jumper wire between the washer fluid level switch C138-1, circuit 81 (RD/LG), harness side and ground.
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB Washer Fluid Level PID
- Select and monitor the SJB washer fluid level PID.
- **Does the PID read indicate low washer fluid level?**

  YES : INSTALL a new washer fluid level switch. REFER to **WIPERS AND WASHERS** article. TEST the system for normal operation.

  NO : REMOVE the jumper wire. Go to V7 .

V7 CHECK THE WASHER FLUID LEVEL SWITCH CIRCUIT 81 (RD/LG) FOR AN OPEN

- Key in OFF position.

- Disconnect: SJB C2280a

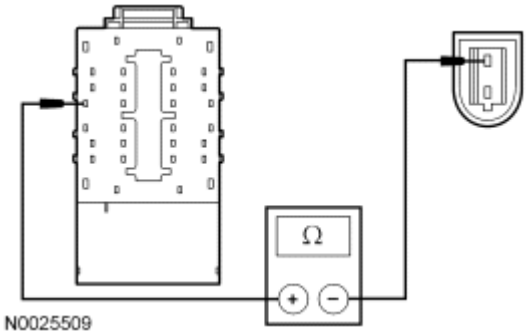


Fig. 30: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-17, circuit 81 (RD/LG), harness side and the washer fluid level switch C138-1, circuit 81 (RD/LG), harness side.
- **Is the resistance less than 5 ohms?**

  YES : Go to V8.

  NO : REPAIR the circuit. TEST the system for normal operation.

V8 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

V9 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.

- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test W: The Low Coolant Level Indicator Is Never/Always On

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or **SYSTEM WIRING DIAGRAMS** (Montego) for schematic and connector information.

Normal Operation

The low coolant level switch is hardwired to the smart junction box (SJB) through circuit 794 (LB) and grounded through circuit 1205 (BK). The SJB monitors the coolant level and sends the coolant level data to the instrument cluster over the communication network.

DTC B2678 - sets when the SJB detects an open on the low coolant level input circuit. This DTC can only set when running the on-demand self-test.

Possible Causes

- Circuit 794 (LB) open or short to ground
- Circuit 1205 (BK) open
- Low coolant level switch
- SJB
- Instrument cluster

PINPOINT TEST W: THE LOW COOLANT LEVEL INDICATOR IS NEVER/ALWAYS ON

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

W1 CARRY OUT THE INSTRUMENT CLUSTER INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on and off. Observe the low coolant level indicator.
- **Does the low coolant level indicator illuminate when triggered on and turn off when triggered off?**

  YES : If the low coolant level indicator is never on, go to W6.

  If the low coolant level indicator is always on, go to W2.

NO : Go to W9.

W2 RETRIEVE THE RECORDED SMART JUNCTION BOX (SJB) DTCs FROM BOTH THE CONTINUOUS AND ON-DEMAND SELF-TESTS

NOTE: Verify that the coolant level is full before proceeding with the diagnostics.

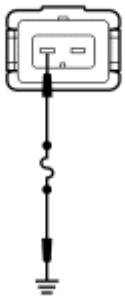
- Check for recorded SJB DTCs from the continuous and on-demand self-tests.
- **Are any DTCs recorded?**

  YES : If DTC B2678 is retrieved, go to W3.

  NO : Go to W8.

W3 CHECK THE COOLANT LEVEL SWITCH

- Key in OFF position.
- Disconnect: Low Coolant Level Switch C1069



N0009569

Fig. 31: Connecting Fused Jumper Wire
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the low coolant level switch C1069-2, circuit 794 (LB), harness side and ground.
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB PID

  Select and monitor the SJB low coolant level switch PID with the jumper wire connected.

- **Does the PID read OK with the fused jumper wire connected?**

  YES : REMOVE the jumper wire. Go to W4.

  NO : REMOVE the jumper wire. Go to W5.

W4 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

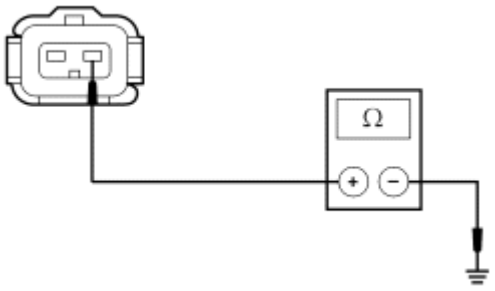


Fig. 32: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the low coolant level switch C1069-1, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**

  YES : INSTALL a new low coolant level switch. REFER to **ENGINE COOLING** article. CLEAR the DTCs. REPEAT the self-test.

  NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

W5 CHECK CIRCUIT 794 (LB) FOR AN OPEN

- Key in OFF position.
- Disconnect: SJB C2280a

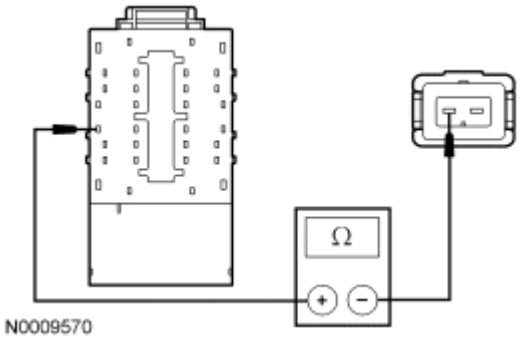


Fig. 33: Checking Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-13, circuit 794 (LB), harness side and the low coolant level switch C1069-2, circuit 794 (LB), harness side.
- **Is the resistance less than 5 ohms?**

  YES : Go to W8.

  NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

W6 CHECK THE LOW COOLANT LEVEL INDICATOR WITH THE COOLANT LEVEL SWITCH DISCONNECTED

- Key in OFF position.
- Disconnect: Low Coolant Level Switch C1069

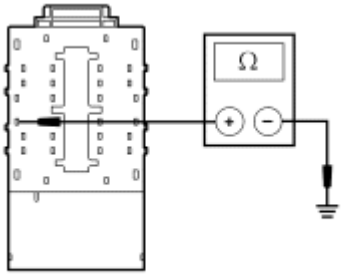
- Key in ON position.
- Wait 30 seconds and observe the low coolant level indicator.
- **Is the low coolant level indicator illuminated?**

  YES : INSTALL a new low coolant level switch. REFER to **ENGINE COOLING** article. CLEAR the DTCs. REPEAT the self-test.

  NO : Go to W7.

W7 CHECK CIRCUIT 794 (LB) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: SJB C2280a



N0058824

Fig. 34: Checking Circuit For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280a-13, circuit 794 (LB), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

  YES : Go to W8.

  NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

W8 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

W9 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test X: The Door Ajar Indicator Is Inoperative/Does Not Operate Correctly

Normal Operation

The door ajar indicator informs the driver if any of the 4 doors or liftgate is open or not completely closed. The door ajar indicator information is sent from the smart junction box (SJB) to the instrument cluster. A door ajar chime that is operating correctly indicates the SJB is monitoring and transmitting the correct operation of the door ajar switches to the instrument cluster.

Possible Causes

- SJB
- Instrument cluster

PINPOINT TEST X: THE DOOR AJAR INDICATOR IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

X1 CHECK THE OPERATION OF THE INTERIOR LAMPS

- Open and close each door and monitor the interior lamps.
- **Do the interior lamps operate correctly?**

  YES : Go to X2.

  NO : REFER to **INTERIOR LIGHTING** article.

X2 CARRY OUT THE INSTRUMENT CLUSTER WARNING LAMPS AND CHIME ACTIVE COMMAND USING THE SCAN TOOL

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: Instrument Cluster Active Command
- Select the instrument cluster warning lamps and chime active command. Trigger the all lamps active command on. Observe the door ajar warning indicator.
- **Does the door ajar warning indicator illuminate when triggered on?**

  YES : Go to X4.

NO : Go to X3.

X3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

X4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test Y: The Instrument Cluster Is Inoperative

Refer to **SYSTEM WIRING DIAGRAMS** (Five Hundred), **SYSTEM WIRING DIAGRAMS** (Freestyle) or **SYSTEM WIRING DIAGRAMS** (Montego) for schematic and connector information.

Normal Operation

With the ignition switch in the START/RUN positions, the instrument cluster receives voltage from the smart junction box (SJB) through circuit 1566 (RD/YE). When the ignition switch is in the RUN/ACC positions, voltage is received from the SJB through circuit 295 (LB/PK). With the ignition switch in the OFF position, the instrument cluster receives its keep-alive voltage from the SJB through circuit 483 (RD). The instrument cluster grounding is provided through circuits 1203 (BK/LB) and 1205 (BK).

Possible Causes

- Fuse
- Circuit 295 (LB/PK) open
- Circuit 483 (RD) open
- Circuit 1203 (BK/LB) open
- Circuit 1205 (BK) open
- Circuit 1566 (RD/YE) open
- Instrument cluster

PINPOINT TEST Y: THE INSTRUMENT CLUSTER IS INOPERATIVE

CAUTION: Use the correct probe adaptor(s) when making measurements. Failure to use the correct probe adaptor(s) may damage the connector.

Y1 CHECK THE INSTRUMENT CLUSTER VOLTAGE SUPPLY

- Key in OFF position.
- Disconnect: Instrument Cluster C220
- Key in ON position.
- Measure the voltage between the instrument cluster, harness side and ground as follows:

Connector-Pin	Circuit
C220-1	1566 (RD/YE)
C220-3	483 (RD)
C220-5	295 (LB/PK)

- **Are the voltages greater than 10 volts?**

  YES : Go to Y2.

  NO : VERIFY the SJB fuses 7 (7.5A), 20 (7.5A), and 23 (7.5A) are OK. If OK, REPAIR the circuit in question. TEST the system for normal operation.

Y2 CHECK THE INSTRUMENT CLUSTER GROUND CIRCUITS

- Key in OFF position.
- Measure the resistance between the instrument cluster, harness side and ground as follows:

Connector-Pin	Circuit
C220-2	1203

	(BK/LB)
C220-4	1205 (BK)

- **Are the resistances less than 5 ohms?**

  YES : Go to Y3.

  NO : REPAIR the circuit in question. TEST the system for normal operation.

Y3 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Disconnect the instrument cluster connector.
- Check for:
  - corrosion
  - damaged pins
  - pushed-out pins
- Connect the instrument cluster connector and make sure it seats correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

  YES : INSTALL a new instrument cluster. REFER to **Instrument Cluster (IC)**. TEST the system for normal operation.

  NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

REMOVAL AND INSTALLATION

INSTRUMENT CLUSTER (IC)

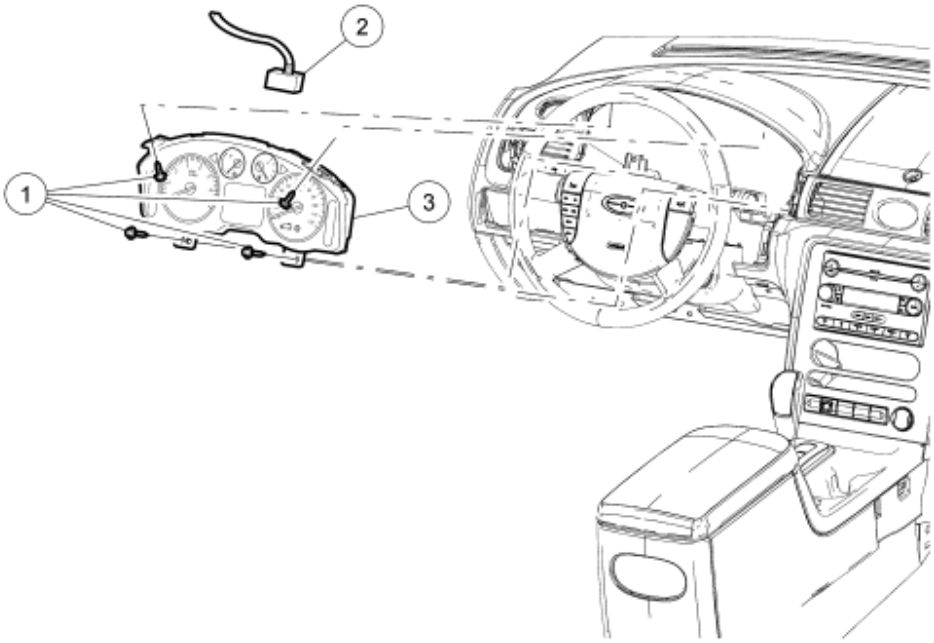


Fig. 35: Exploded View Of Instrument Cluster (IC)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W707628	Instrument cluster screws (4 required)
2	-	Instrument cluster electrical connector (part of 14401)
3	10849	Instrument cluster

REMOVAL AND INSTALLATION

NOTE: Prior to removal of the instrument cluster, it is necessary to upload the instrument cluster configuration information to the scan tool. For additional information, refer to MODULE CONFIGURATION article.

1. Depower the supplemental restraint system (SRS). For additional information, refer to **SUPPLEMENTAL RESTRAINT SYSTEM** article.
2. Remove the instrument cluster finish panel. For additional information, refer to **INSTRUMENT PANEL AND CONSOLE** article.
3. Remove the 4 screws and the instrument cluster.
   - Disconnect the electrical connector.
4. To install, reverse the removal procedure.
   - Download the instrument cluster configuration information from the scan tool into the new instrument cluster. For additional information, refer to **MODULE CONFIGURATION** article.

INSTRUMENT CLUSTER (IC) LENS

REMOVAL AND INSTALLATION

1. Remove the instrument cluster. For additional information, refer to **Instrument Cluster (IC)**.
2. Release the retaining tabs and remove the instrument cluster lens.

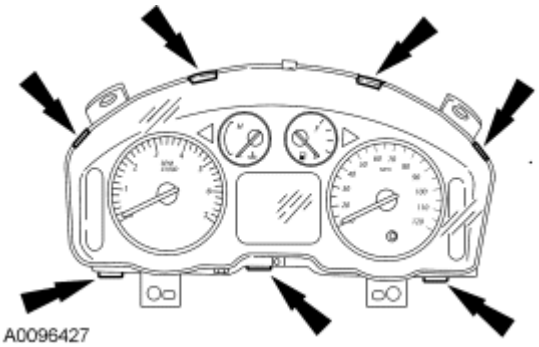


Fig. 36: Locating Instrument Cluster Lens Retaining Tabs
Courtesy of FORD MOTOR CO.

3. To install, reverse the removal procedure.

WARNING INDICATOR BULB

REMOVAL AND INSTALLATION

1. Remove the instrument cluster. For additional information, refer to **Instrument Cluster (IC)**.

NOTE: **To remove the warning indicator bulb, rotate the bulb one quarter turn counterclockwise and lift it out from the instrument cluster.**

2. Remove the warning indicator bulb(s) in question.

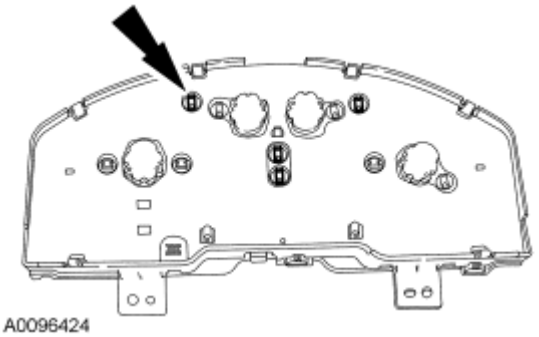


Fig. 37: Identifying Warning Indicator Bulb
Courtesy of FORD MOTOR CO.

3. To install, reverse the removal procedure.