

INSTRUMENT CLUSTER

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INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

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INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

ABS INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

ABS INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATTERY

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

AIRBAG INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

AIRBAG WARNING INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATTERY

For a complete wiring diagram Refer to Section 8W.

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

BRAKE INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

BRAKE INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

CARGO LAMP INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

CARGO LAMP INDICATOR OUTPUT CIRCUIT OVERLOAD SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

CHECK GAUGES INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

CHECK GAUGES INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

DOOR AJAR INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

DOOR AJAR INDICATOR OUTPUT CIRCUIT OVERLOAD SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

ETC INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

ETC INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

FUEL INDICATOR CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

FUEL INDICATOR CIRCUIT OVERLOAD SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

HIGH BEAM INDICATOR CIRCUIT OPEN SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

HIGH BEAM INDICATOR CIRCUIT OVERLOAD OR SHORT TO BATT

For a complete wiring diagram Refer to Section 8W.

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

MIL INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

MIL INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATTERY

For a complete wiring diagram Refer to Section 8W.

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

SEATBELT INDICATOR OUTPUT CIRCUIT OVERLOAD SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

SEATBELT INDICATOR OUTPUT CIRCUIT OPEN SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

TRANS TEMP INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

TRANS TEMP INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATT

For a complete wiring diagram Refer to Section 8W.

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

WAIT TO START INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

WAIT TO START INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATTERY

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

WATER IN FUEL INDICATOR OUTPUT CIRCUIT OPEN OR SHORT TO GROUND

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

WATER IN FUEL INDICATOR OUTPUT CIRCUIT OVERLOAD OR SHORT TO BATT

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

NOTE: Diagnose and repair any PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

The Instrument Cluster indicator LEDs are not replaceable, view repair.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

ABS MESSAGES NOT RECEIVED

For a complete wiring diagram Refer to Section 8W.

- When Monitored:**
 With the ignition on.
- Set Condition:**
 The Instrument Cluster does not receive any messages from the ABS (CAB) module for at least 5 seconds.

Possible Causes
BUS MESSAGE NOT RECEIVED DTC PRESENT INSTRUMENT CLUSTER

1. BUS MESSAGE NOT RECEIVED DTC PRESENT

With the DRBIII®, attempt to communicate with the module that corresponds to the DTC that is set.

- Was the DRBIII® able to I/D or communicate with the Module in question?**
- Yes** >> Go To 2
- No** >> Refer to Communication category for the related symptom(s).
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

Cycle the ignition, wait approximately 1 minute.

With the DRBIII®, read DTCs.

- Did the DTC reset?**
- Yes** >> Replace the Instrument Cluster in accordance with the Service Information.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

ACM MESSAGES NOT RECEIVED

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The Instrument Cluster does not receive any messages from the ACM for at least 5 seconds.

Possible Causes
BUS MESSAGE NOT RECEIVED DTC PRESENT
INSTRUMENT CLUSTER

1. BUS MESSAGE NOT RECEIVED DTC PRESENT

With the DRBIII®, attempt to communicate with the module that corresponds to the DTC that is set.

Was the DRBIII® able to I/D or communicate with the Module in question?

Yes >> Go To 2

No >> Refer to Communication category for the related symptom(s).
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

Cycle the ignition, wait approximately 1 minute.

With the DRBIII®, read DTCs.

Did the DTC reset?

Yes >> Replace the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

FCM MESSAGES NOT RECEIVED

For a complete wiring diagram Refer to Section 8W.

- When Monitored:**
 With the ignition on.
- Set Condition:**
 The Instrument Cluster does not receive any messages from the FCM for at least 5 seconds.

Possible Causes
BUS MESSAGE NOT RECEIVED DTC PRESENT
INSTRUMENT CLUSTER

1. BUS MESSAGE NOT RECEIVED DTC PRESENT

With the DRBIII®, attempt to communicate with the module that corresponds to the DTC that is set.

- Was the DRBIII® able to I/D or communicate with the Module in question?
- Yes

>> Go To 2
- No

>> Refer to Communication category for the related symptom(s).
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

Cycle the ignition, wait approximately 1 minute.

With the DRBIII®, read DTCs.

- Did the DTC reset?
- Yes

>> Replace the Instrument Cluster in accordance with the Service Information.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No

>> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

SKIM MESSAGES NOT RECEIVED

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The Instrument Cluster does not receive any messages from the SKIM for at least 5 seconds.

Possible Causes
BUS MESSAGE NOT RECEIVED DTC PRESENT
INSTRUMENT CLUSTER

1. BUS MESSAGE NOT RECEIVED DTC PRESENT

With the DRBIII®, attempt to communicate with the module that corresponds to the DTC that is set.

Was the DRBIII® able to I/D or communicate with the Module in question?

Yes >> Go To 2

No >> Refer to Communication category for the related symptom(s).
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

Cycle the ignition, wait approximately 1 minute.

With the DRBIII®, read DTCs.

Did the DTC reset?

Yes >> Replace the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

TCCM MESSAGES NOT RECEIVED

For a complete wiring diagram Refer to Section 8W.

- When Monitored:**
 With the ignition on.
- Set Condition:**
 The Instrument Cluster does not receive any messages from the SKIM for at least 5 seconds.

Possible Causes
BUS MESSAGE NOT RECEIVED DTC PRESENT
INSTRUMENT CLUSTER

1. BUS MESSAGE NOT RECEIVED DTC PRESENT

With the DRBIII®, attempt to communicate with the module that corresponds to the DTC that is set.

- Was the DRBIII® able to I/D or communicate with the Module in question?
- Yes

>> Go To 2
- No

>> Refer to Communication category for the related symptom(s).
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

Cycle the ignition, wait approximately 1 minute.

With the DRBIII®, read DTCs.

- Did the DTC reset?
- Yes

>> Replace the Instrument Cluster in accordance with the Service Information.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No

>> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

TCM MESSAGES NOT RECEIVED

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The Instrument Cluster does not receive any messages from the SKIM for at least 5 seconds.

Possible Causes
BUS MESSAGE NOT RECEIVED DTC PRESENT INSTRUMENT CLUSTER

1. BUS MESSAGE NOT RECEIVED DTC PRESENT

With the DRBIII®, attempt to communicate with the module that corresponds to the DTC that is set.

Was the DRBIII® able to I/D or communicate with the Module in question?

Yes >> Go To 2

No >> Refer to Communication category for the related symptom(s).
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

Cycle the ignition, wait approximately 1 minute.

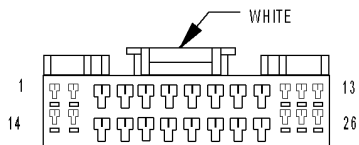
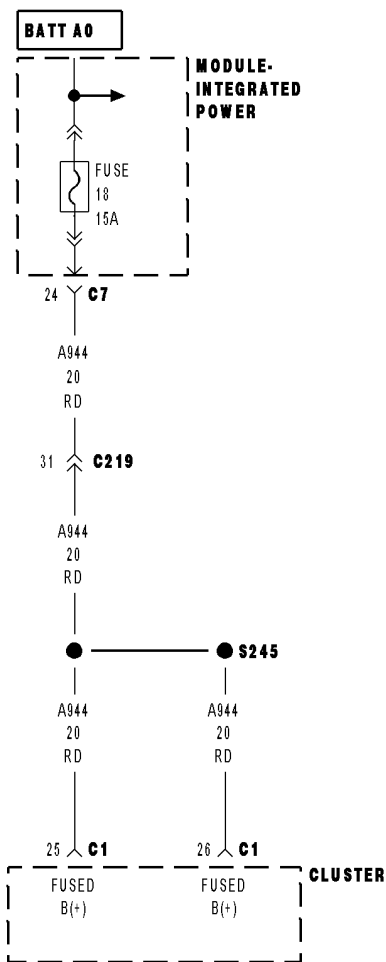
With the DRBIII®, read DTCs.

Did the DTC reset?

Yes >> Replace the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

BATTERY VOLTAGE OPEN



CLUSTER C1

BATTERY VOLTAGE OPEN (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously.

- **Set Condition:**

If the Battery Voltage Feed indicates OFF for 1 second, then fault is written directly to EEPROM. If the battery voltage feed is restored in under 36 miles, then the EEPROM is cleared.

Possible Causes
IOD FUSE NOT INSTALLED
IOD FUSE OPEN
(A944) BATTERY VOLTAGE FEED OPEN
INSTRUMENT CLUSTER

1. IOD FUSE NOT INSTALLED

Inspect the IOD Fuse.

Is the IOD fuse installed?

Yes >> Go To 2

No >> Install the IOD fuse.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. IOD FUSE OPEN

Turn the ignition off.

Inspect the IOD fuse in the PDC.

Is the IOD fuse open?

Yes >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for a short to ground condition.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

BATTERY VOLTAGE OPEN (CONTINUED)**3. CHECK THE (A944) BATTERY VOLTAGE FEED FOR AN OPEN**

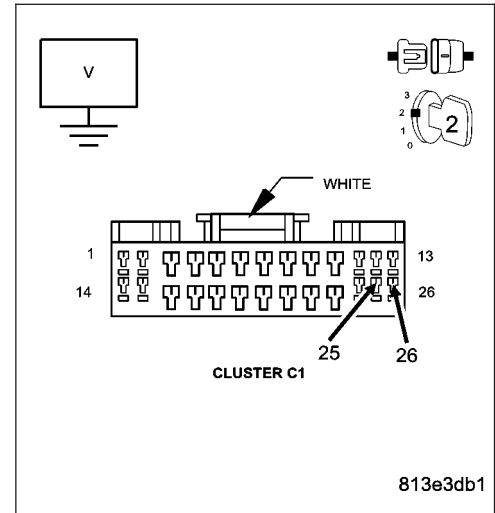
Disconnect the Instrument Cluster C1 harness connector.

Turn the ignition on.

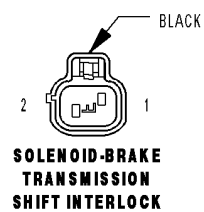
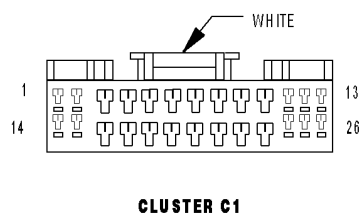
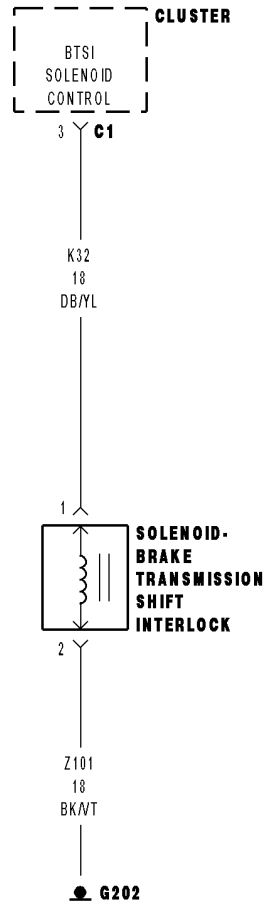
Measure the voltage of the (A944) Battery Voltage Feed circuit.

Is the voltage above 10 volts?

- Yes** >> Replace the Instrument Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Using the wiring diagram/schematic as a guide, repair the (A944) Battery Voltage feed circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



BTSI OUTPUT CIRCUIT HIGH



BTSI OUTPUT CIRCUIT HIGH (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition in the Unlock or Run position and the driver's foot applied to the brake pedal.
- **Set Condition:**
The instrument cluster detects a high value on the BTSI Solenoid Control Circuit.

Possible Causes
(K32) BTSI CONTROL CIRCUIT OPEN (Z101) BTSI GROUND CIRCUIT OPEN BTSI SOLENOID INSTRUMENT CLUSTER

1. BTSI SOLENOID

Turn the ignition on.

Disconnect the BTSI Solenoid.

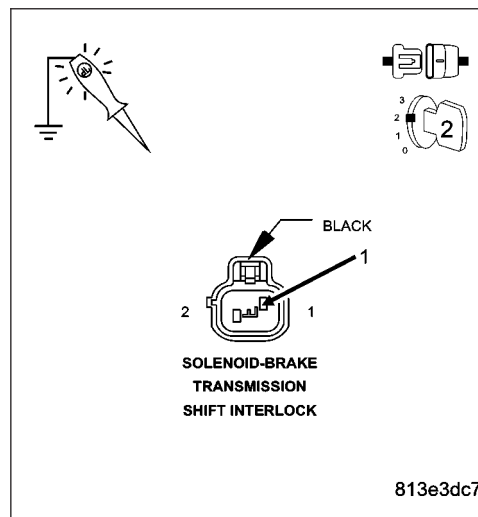
Using a 12-volt test light connected to ground, check for voltage on the (K32) BTSI Solenoid control circuit.

With the DRBIII®, actuate the BTSI Solenoid.

Does the test light illuminate brightly?

Yes >> Go To 2

No >> Go To 3



BTSI OUTPUT CIRCUIT HIGH (CONTINUED)**2. CHECK THE (Z101) BTSI GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

Connect a 12-volt test light between the (K32) BTSI Solenoid Control circuit and the (Z101) BTSI Solenoid Ground circuit.

Turn the ignition on.

With the DRBIII®, actuate the BTSI Solenoid.

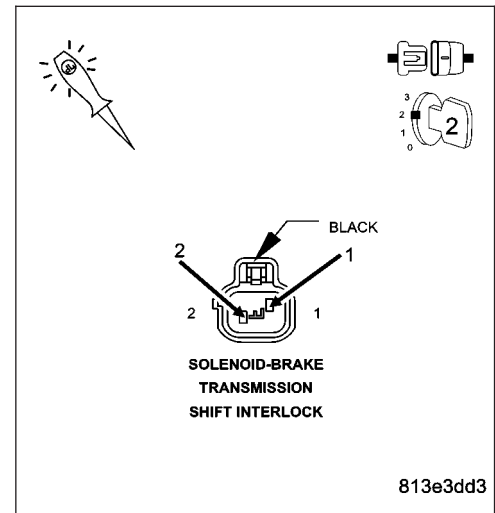
Does the test light illuminate brightly?

Yes >> Replace the BTSI Solenoid in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Repair the (Z101) BTSI Solenoid ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

**3. CHECK THE (K32) BTSI CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the BTSI Solenoid harness connector.

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance of the (K32) BTSI Solenoid control circuit between the BTSI Solenoid harness connector and the Instrument Cluster C1 harness connector.

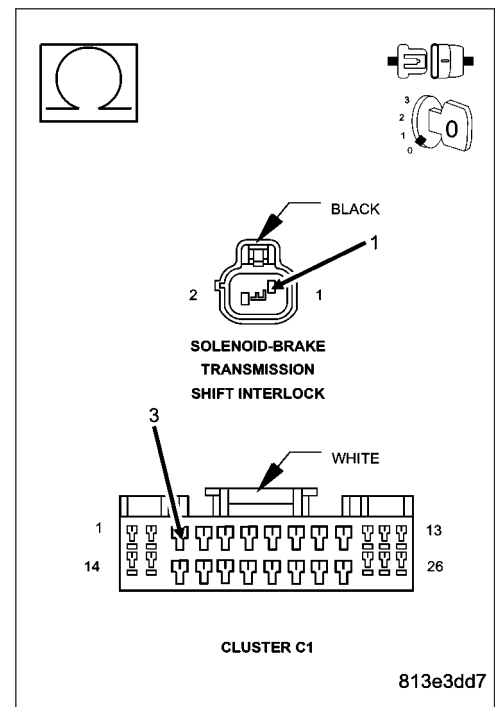
Is the resistance above 5.0 ohms?

Yes >> Repair the (K32) BTSI Solenoid control circuit for an open.

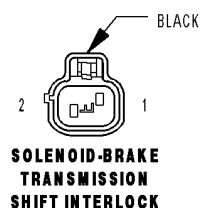
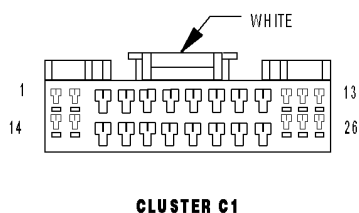
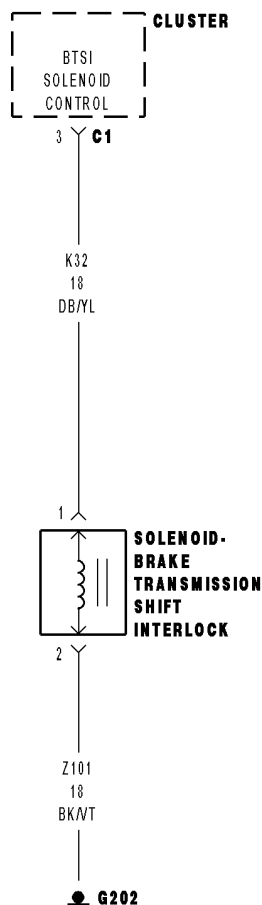
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



BTSI OUTPUT CIRCUIT SHORTED OR OPEN



BTSI OUTPUT CIRCUIT SHORTED OR OPEN (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in the Unlock or On position and the operator's foot applied to the brake pedal. (Customer Complaint: Vehicle can be shifted out of Park without pressing the brake pedal.)

- **Set Condition:**

The Instrument Cluster detects a "0" or low value on the input circuit for the BTSI when ON.

Possible Causes
(Z101) BTSI SOLENOID GROUND CIRCUIT OPEN
(K32) BTSI SOLENOID CONTROL CIRCUIT SHORTED TO THE (Z101) BTSI SOLENOID GROUND CIRCUIT
(K32) BTSI SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(K32) BTSI SOLENOID CONTROL CIRCUIT OPEN
BTSI SOLENOID
INSTRUMENT CLUSTER

Diagnostic Test**1. TCM DTC PRESENT**

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display any TCM DTCs?

Yes >> Refer to Transmission for the related symptom(s).

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 2

2. CHECK THE (Z101) BTSI SOLENOID GROUND CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the BTSI Solenoid harness connector.

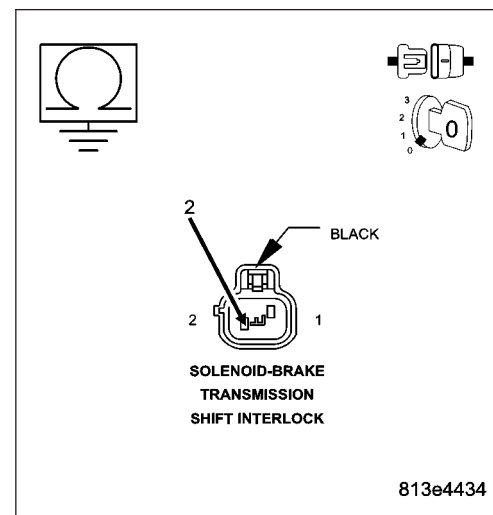
Measure the resistance between ground and the (Z101) BTSI Solenoid Ground circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (Z101) BTSI Solenoid Ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3



BTSI OUTPUT CIRCUIT SHORTED OR OPEN (CONTINUED)

3. CHECK THE (K32) BTSI SOLENOID CONTROL CIRCUIT FOR A SHORT TO THE (Z101) BTSI SOLENOID GROUND CIRCUIT

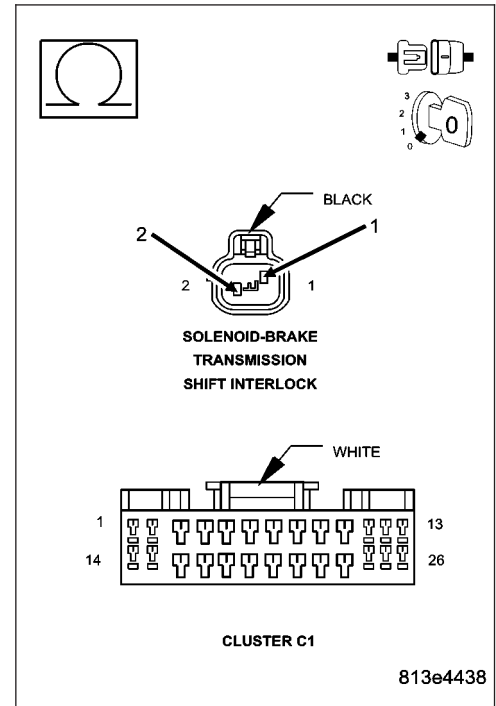
Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance between the (K32) BTSI Solenoid Control circuit and the (Z101) BTSI Solenoid Ground circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (K32) BTSI Solenoid Control circuit for a short to the (Z101) BTSI Solenoid Ground circuit.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 4



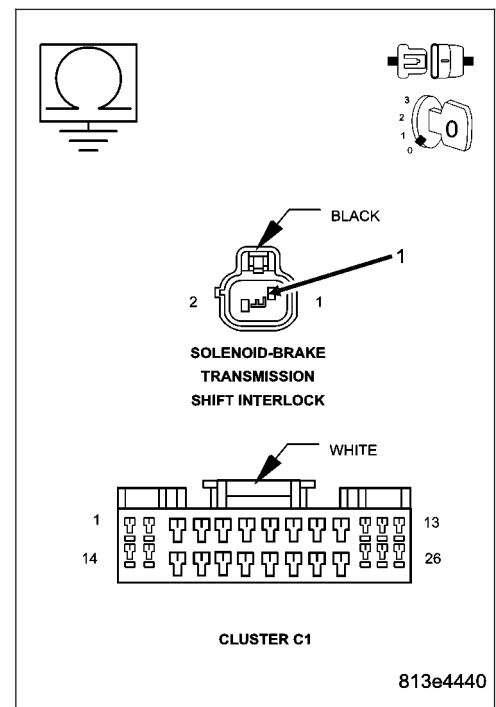
4. CHECK THE (K32) BTSI SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (K32) BTSI Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (K32) BTSI Solenoid Control circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 5



BTSI OUTPUT CIRCUIT SHORTED OR OPEN (CONTINUED)**5. CHECK THE (K32) BTSI SOLENOID CONTROL CIRCUIT FOR AN OPEN**

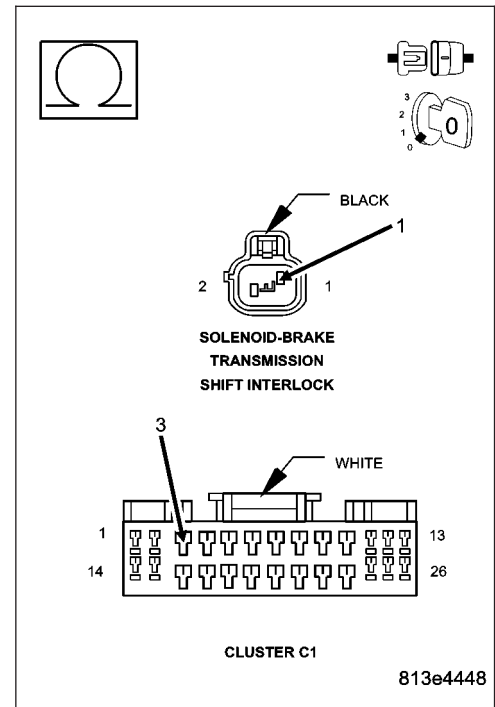
Measure the resistance of the (K32) BTSI Solenoid Control circuit between the Solenoid connector and the Instrument Cluster C1 connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (K32) BTSI Solenoid Control circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 6

**6. BTSI SOLENOID**

Reconnect the Instrument Cluster C1 harness connector.

Turn the ignition on.

With the DRBIII®, actuate the BTSI Solenoid.

Using a 12-volt test light connected to ground, check for voltage on the (K32) BTSI Solenoid Control circuit.

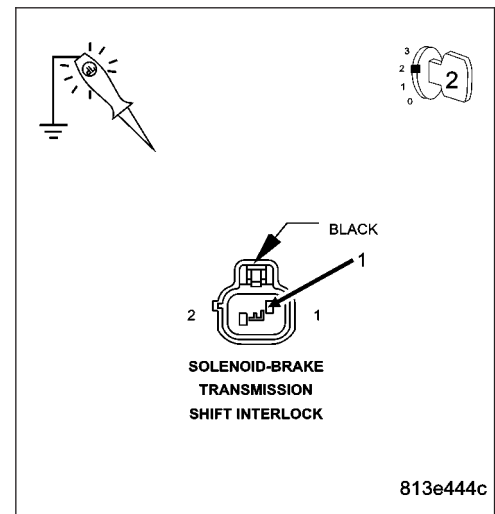
Does the test light illuminate brightly?

Yes >> Replace the BTSI Solenoid in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



IGNITION RUN-START CIRCUIT RATIONALITY CHECK

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Continuously.
- **Set Condition:**
Ignition RUN/START Voltage below 5 volts while the RUN/ACC and UNLOCK voltage status is logic high.

Possible Causes
IGNITION RUN-START FUSE OPEN (F21) IGNITION RUN-START CIRCUIT OPEN INSTRUMENT CLUSTER

Diagnostic Test

1. IGNITION RUN-START FUSE OPEN

Turn the ignition off.

Inspect the Ignition Run-Start fuse in the PDC.

Is the fuse open?

- Yes** >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for a short to ground condition.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Go To 2

2. CHECK THE (F1) IGNITION RUN-START CIRCUIT FOR AN OPEN

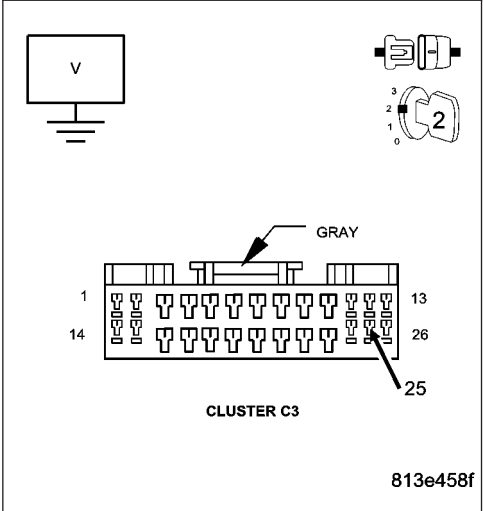
Disconnect the Instrument Cluster C3 harness connector.

Turn the ignition on.

Measure the voltage of the (F21) Ignition Run-Start circuit.

Is the voltage above 5.0 volts?

- Yes** >> Replace the Instrument Cluster in accordance with the service information.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Repair the (F21) Ignition Run-Start circuit for an open.
 Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



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IGNITION UNLOCK CIRCUIT RATIONALITY CHECK

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Continuously.
- **Set Condition:**
One second of Run/Start above 5 Volts, Unlock Status Low, and Run/ACC Status High.

Possible Causes
IGNITION UNLOCK-RUN-START FUSE OPEN (F21) IGNITION UNLOCK-RUN-START CIRCUIT OPEN INSTRUMENT CLUSTER

Diagnostic Test

1. IGNITION UNLOCK-RUN-START FUSE OPEN

Turn the ignition off.

Inspect the Ignition Unlock-Run-Start fuse in the PDC.

Is the fuse open?

Yes >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for a short to ground condition.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 2

2. INSTRUMENT CLUSTER

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Turn the ignition on.

Measure the voltage of the (F1) Ignition Unlock-Run-Start circuit.

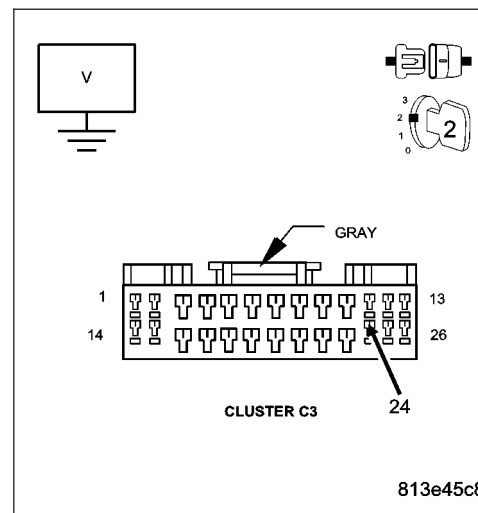
Is the voltage above 10 volts?

Yes >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Repair the (F1) Ignition Unlock-Run-Start circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



INCORRECT ODOMETER VALUE FOUND

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
During power up.
- **Set Condition:**
If the Instrument Cluster detects the odometer value memory is corrupted, this code will set. When this code is set the VF Odometer displays [- -].

Possible Causes
INSTRUMENT CLUSTER

Diagnostic Test

1. INSTRUMENT CLUSTER

CAUTION: Do not attempt to exchange or "swap" an Instrument Cluster from one vehicle to another. Module memory/configuration damage may occur. Refer to the Instrument Cluster Caution in the Service Information.

NOTE: When this code is set the VF Odometer will display dashes (- -).

NOTE: If the PCM has been replaced, program the new module with the correct VIN.

Ensure that the Instrument Cluster has not been damaged or previously installed in a different vehicle.

With the DRBIII®, erase DTCs.

Cycle the ignition.

With the DRBIII®, read DTCs.

Did this DTC reset?

- Yes** >> Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Test Complete.
-

INTERNAL MODULE BOOTLOADER FAILURE

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
At power up for the module.
- **Set Condition:**
If the checksum value does not equate to the calculated value.

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

When this code is set, the Instrument Cluster must be replaced.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

INTERNAL MODULE FLASH MEMORY CHECKSUM FAILURE

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
At power up for the module.
- **Set Condition:**
If the checksum value does not equate to the calculated value. Indicates that the Instrument Cluster internal memory is corrupted.

Possible Causes
INSTRUMENT CLUSTER

1. INSTRUMENT CLUSTER

When this code is set, the Instrument Cluster must be replaced.

Repair

Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

PCI BUS INTERNAL FAILURE

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Continuously.
- **Set Condition:**
The Instrument Cluster fails the loopback test on the PCI Bus.

Possible Causes
INSTRUMENT CLUSTER

Diagnostic Test

1. INSTRUMENT CLUSTER

NOTE: If this is an active DTC, answer yes to the question.

With the DRBIII®, erase DTCs.

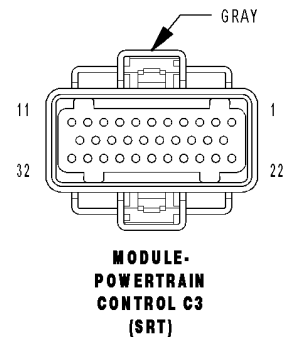
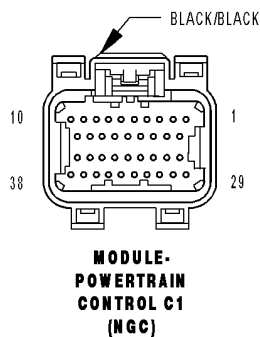
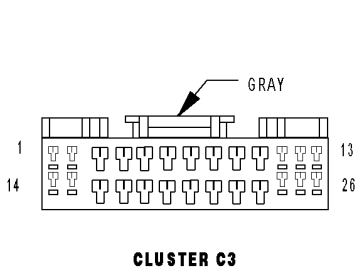
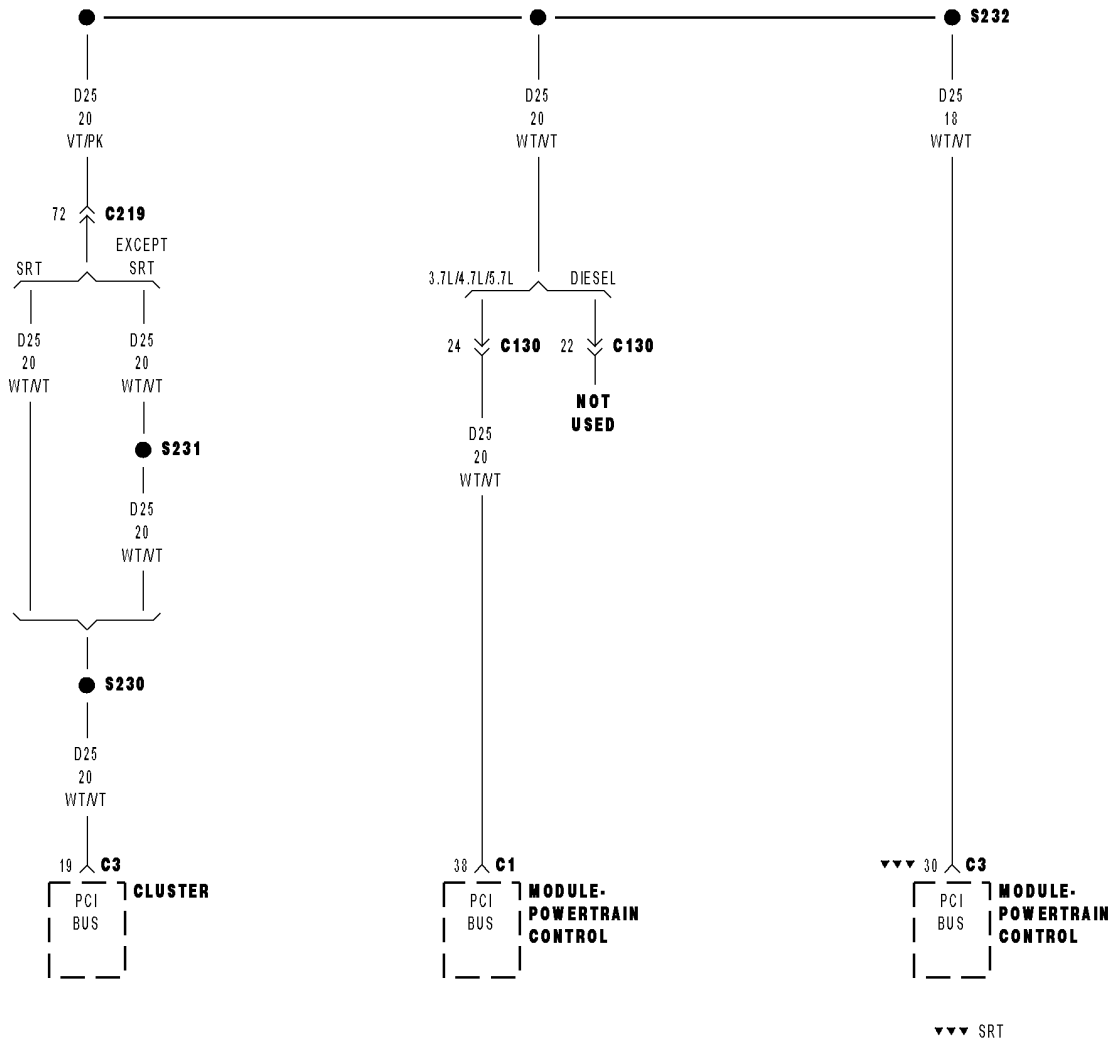
Cycle the ignition and wait approximately 1 minute.

With the DRBIII®, read DTCs.

Did this DTC reset?

- Yes** >> Replace the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Test Complete.
-

PCM MESSAGES NOT RECEIVED



PCM MESSAGES NOT RECEIVED (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The MIC does not receive any messages from the PCM for at least 5 seconds.

Possible Causes
(D25) PCI BUS CIRCUIT OPEN POWERTRAIN CONTROL MODULE

1. PCM MESSAGES NOT RECEIVED

Turn the ignition on.

NOTE: To proceed in this test, the DTC must be active.

With the DRB, enter SYSTEM MONITORS then J1850 MODULE SCAN.

Is the PCM active on the BUS?

- Yes** >> Check the condition of the J1850 Bus circuit wiring. Erase DTC, if DTC resets replace the Instrument Cluster in accordance with the service information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Go To 2

2. ATTEMPT TO COMMUNICATE WITH THE PCM

Turn the ignition on.

With the DRB, attempt to communicate with the PCM.

Was the DRB able to communicate with the PCM?

- Yes** >> Go To 3
- No** >> Refer to the communication category and perform the appropriate symptom.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

PCM MESSAGES NOT RECEIVED (CONTINUED)

3. CHECK THE (D25) PCI BUS CIRCUIT FOR AN OPEN

Turn the ignition off.

Disconnect the PCM harness connector.

CAUTION: If NGC, DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.

Disconnect the DRBIII® from the DLC.

Measure the resistance of the (D25) PCI Bus circuit between the PCM connector (from special tool #8815 if NGC) and the DLC.

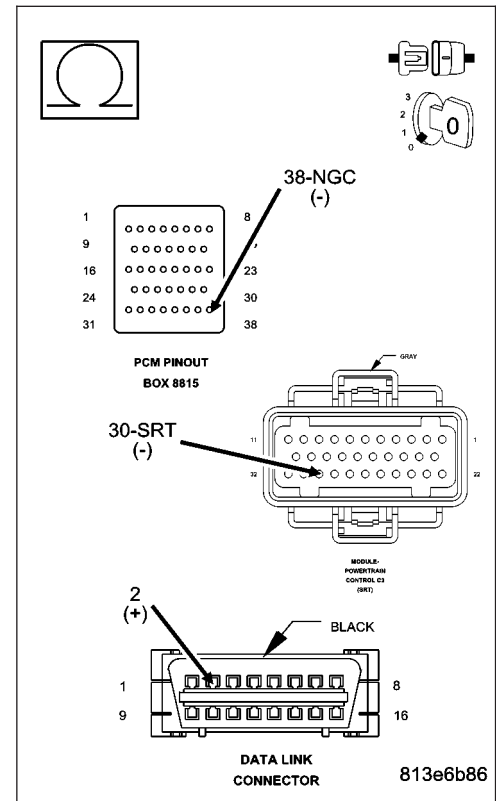
Is the resistance below 5.0 ohms?

Yes >> Replace and program the Powertrain Control Module in accordance with the service information.

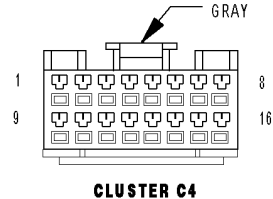
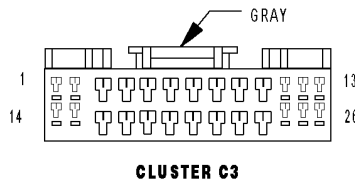
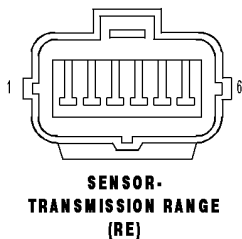
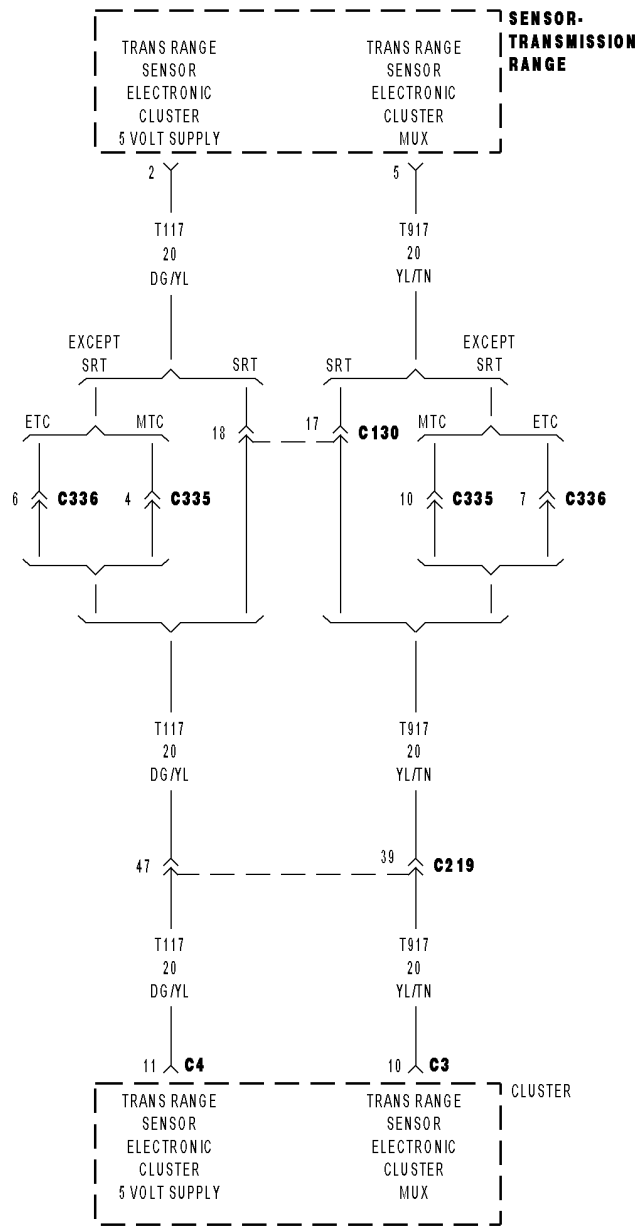
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Repair the (D25) PCI Bus circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



PRNDL SWITCH INPUT CIRCUIT OPEN (DIESEL ONLY)



PRNDL SWITCH INPUT CIRCUIT OPEN (DIESEL ONLY) (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The instrument Cluster detects that an open condition exists in the PRNDL circuit.

Possible Causes
(T917) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER MUX CIRCUIT OPEN
(T117) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER 5 VOLT SUPPLY CIRCUIT OPEN
TRANSMISSION RANGE SENSOR
INSTRUMENT CLUSTER

Diagnostic Test**1. TRANSMISSION RANGE SENSOR**

NOTE: Ensure that the correct Instrument Cluster is installed and is correctly configured for the vehicle.

Turn the ignition off.

Disconnect the Transmission Range Sensor harness connector.

Connect a jumper wire between cavity 2 and cavity 5.

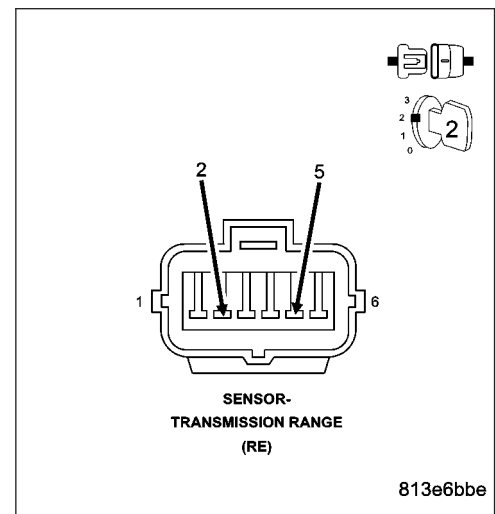
Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display PRNDL Switch Input Circuit Shorted?

Yes >> Replace the Transmission Range Sensor in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 2



PRNDL SWITCH INPUT CIRCUIT OPEN (DIESEL ONLY) (CONTINUED)**2. CHECK THE (T917) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER MUX CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Transmission Range Sensor harness connector.

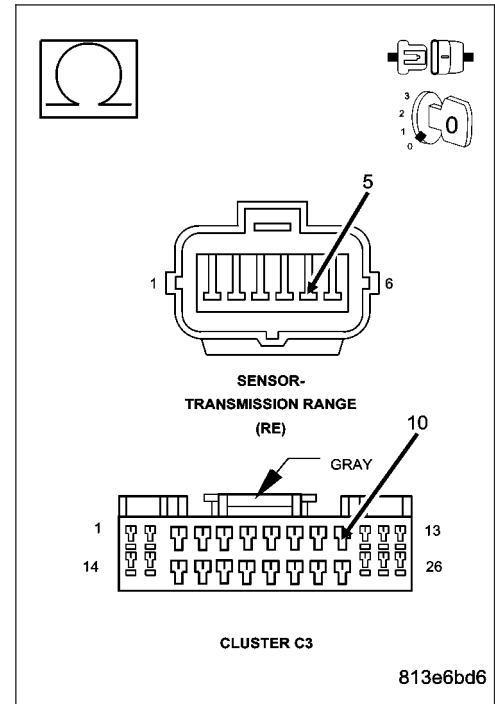
Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance of the (T917) Transmission Range Sensor Electronic Cluster MUX circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T917) Transmission Range Sensor Electronic Cluster MUX circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

**3. CHECK THE (T117) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER 5 VOLT SUPPLY CIRCUIT FOR AN OPEN**

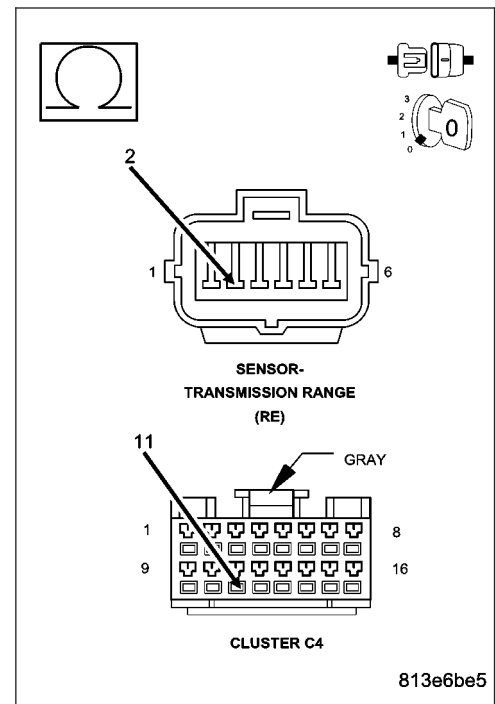
Disconnect the Instrument Cluster C4 harness connector.

Measure the resistance of the (T117) Transmission Range Sensor Electronic Cluster 5 Volt Supply circuit.

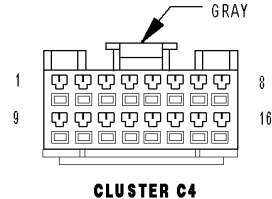
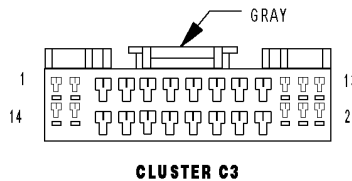
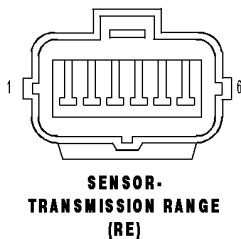
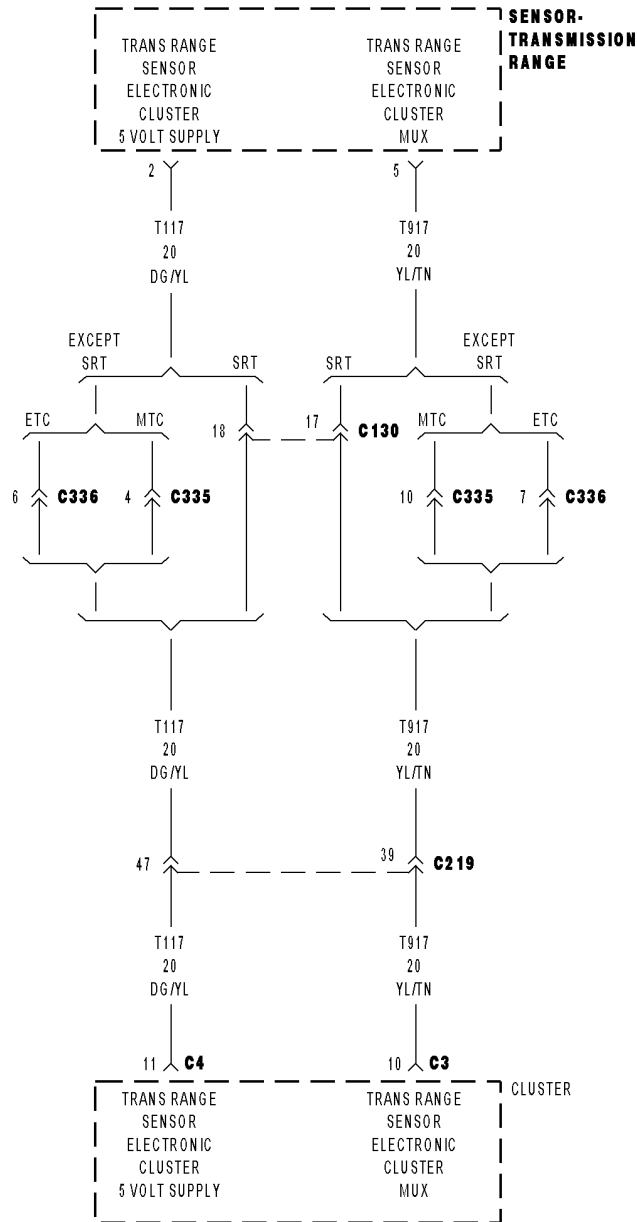
Is the resistance above 5.0 ohms?

Yes >> Repair the (T117) Transmission Range Sensor Electronic Cluster 5 Volt Supply circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



PRNDL SWITCH INPUT CIRCUIT SHORTED (DIESEL ONLY)



PRNDL SWITCH INPUT CIRCUIT SHORTED (DIESEL ONLY) (CONTINUED)

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The instrument Cluster detects that a short condition exists in the PRNDL circuit.

Possible Causes
(T117) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER 5 VOLT SUPPLY CIRCUIT SHORT TO THE (T917) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER MUX CIRCUIT (T117) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER 5 VOLT SUPPLY CIRCUIT SHORT TO GROUND TRANSMISSION RANGE SENSOR INSTRUMENT CLUSTER

Diagnostic Test**1. TRANSMISSION RANGE SENSOR**

NOTE: Ensure that the correct Instrument Cluster is installed and is correctly configured for the vehicle.

Turn the ignition off.

Disconnect the Transmission Range Sensor harness connector.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display PRNDL Input Circuit Open?

- Yes** >> Replace the Transmission Range Sensor in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Go To 2

PRNDL SWITCH INPUT CIRCUIT SHORTED (DIESEL ONLY) (CONTINUED)**2. (T117) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER 5 VOLT SUPPLY CIRCUIT SHORT TO THE (T917) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER MUX CIRCUIT**

Turn the ignition off.

Disconnect the Transmission Range Sensor harness connector.

Disconnect the Instrument Cluster C3 and C4 harness connectors.

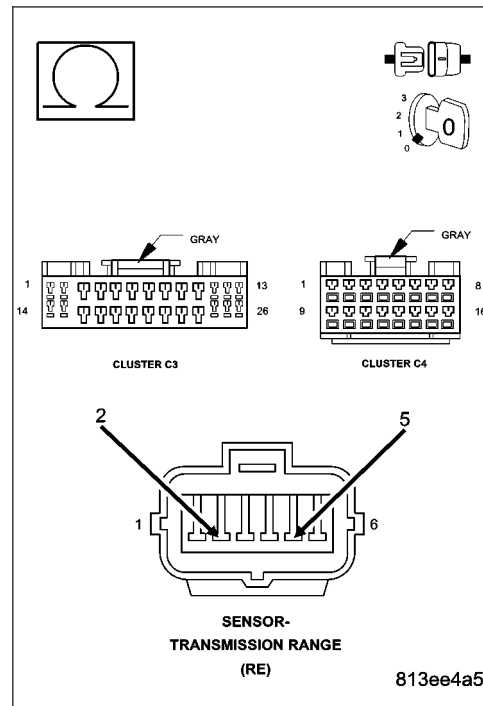
Measure the resistance between the (T117) Transmission Range Sensor Electronic Cluster 5 Volt Supply circuit and the (T917) Transmission Range Sensor Electronic Cluster MUX circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T117) Transmission Range Sensor Electronic Cluster 5 Volt Supply circuit for a short to the (T917) Transmission Range Sensor Electronic Cluster MUX circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

**3. (T117) TRANSMISSION RANGE SENSOR ELECTRONIC CLUSTER 5 VOLT SUPPLY CIRCUIT SHORT TO GROUND**

Measure the resistance between ground and the (T117) Transmission Range Sensor Electronic Cluster 5 Volt Supply circuit.

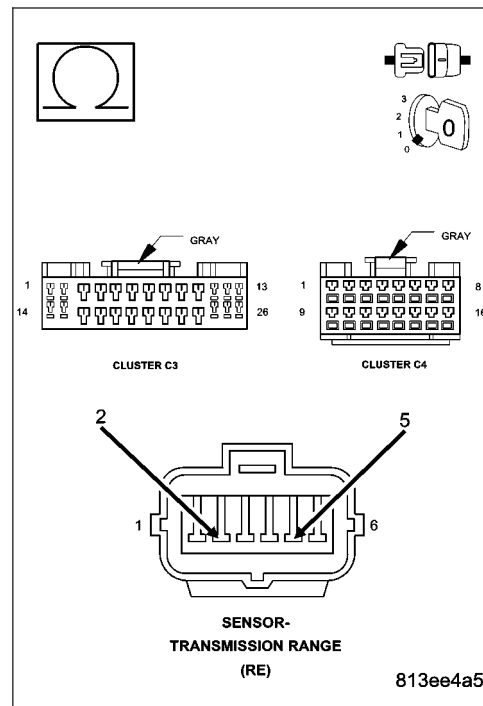
Is the resistance below 5.0 ohms?

Yes >> Repair the (T117) Transmission Range Sensor Electronic Cluster 5 Volt Supply circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



VIN CHECKSUM ERROR

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
Once the Instrument Cluster learns a valid VIN and another valid VIN is transmitted on the bus. The Instrument Cluster decodes the VIN that is transmitted on the bus by the PCM. If the VIN is valid the Instrument Cluster stores the information. If the VIN information does not equate to the encrypted value then the fault is set.

Possible Causes
POWERTRAIN CONTROL MODULE

1. POWERTRAIN CONTROL MODULE

NOTE: The V.I.N. is embedded into the Instrument Cluster memory during production and can not be modified. Do not attempt to "swap" a cluster from one vehicle to another. Refer to the Instrument Cluster Caution in the Service Information.

NOTE: This code will only be set if the PCM has been exchanged or "swapped" into this vehicle from another.

If any components have been exchanged or "swapped", reinstall the original parts.

With the DRBIII®, erase DTCs.

Cycle the ignition.

With the DRBIII®, read DTCs.

If this code resets, view repair.

Repair

Replace and program the Powertrain Control Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

VIN PREVIOUSLY STORED

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
Once the Instrument Cluster learns a valid VIN and another VIN is transmitted on the bus. This code can only be set if a PCM or MIC has been exchanged or "swapped" from another vehicle. The VIN is embedded in both the cluster and the PCM and cannot be used in any other vehicle.

Possible Causes
POWERTRAIN CONTROL MODULE

Diagnostic Test

1. POWERTRAIN CONTROL MODULE

NOTE: The V.I.N. is embedded into the Instrument Cluster memory during production and can not be modified. Do not attempt to "swap" a cluster from one vehicle to another. Refer to the Instrument Cluster Caution in the Service Information.

NOTE: This code will only be set if the PCM has been exchanged or "swapped" into this vehicle from another.

If any components have been exchanged or "swapped", reinstall the original parts.

With the DRBIII®, erase DTCs.

Cycle the ignition.

With the DRBIII®, read DTCs.

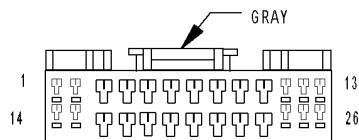
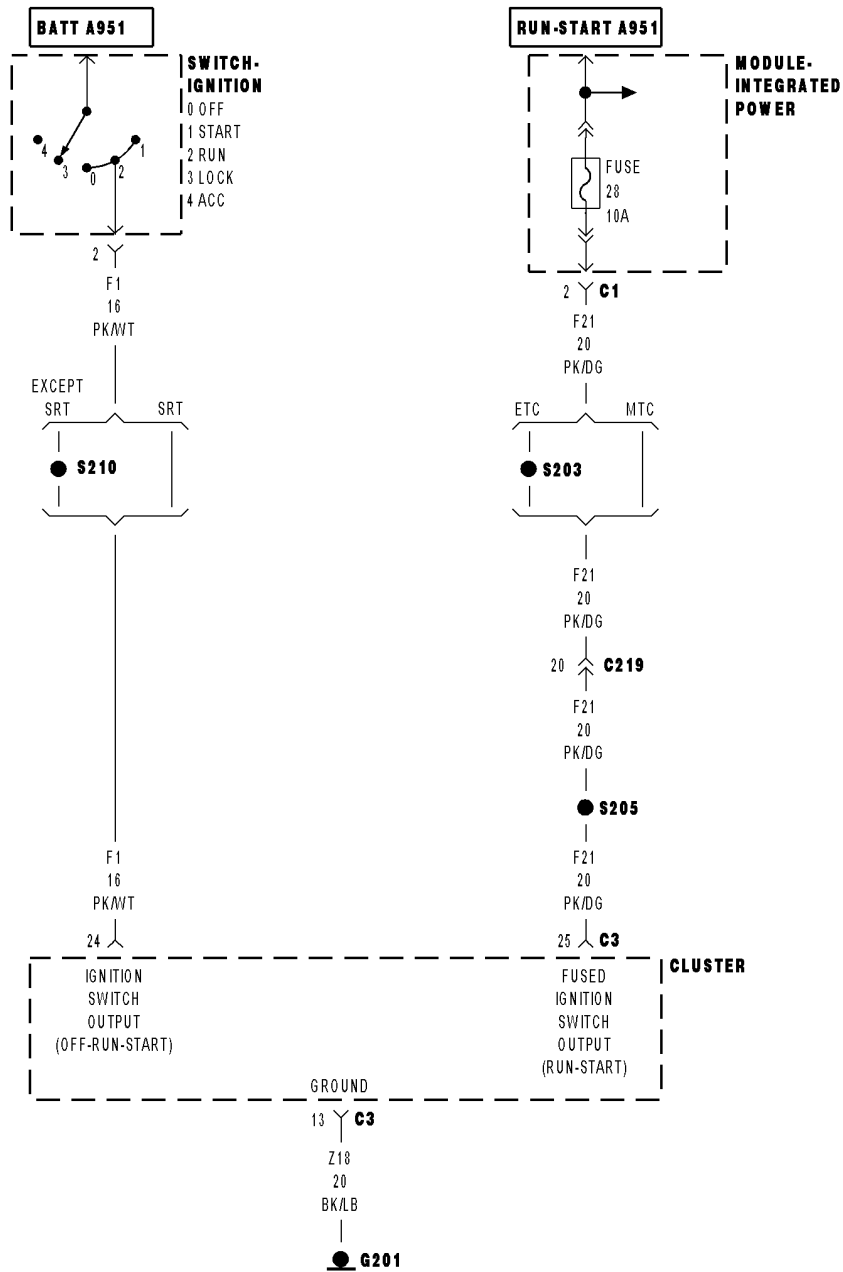
If this code resets, view repair.

Repair

Replace and program the Powertrain Control Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

*ALL GAUGES INOPERATIVE



CLUSTER C3

***ALL GAUGES INOPERATIVE (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
NO RESPONSE - PCI BUS
NO RESPONSE - PCI BUS - POWERTRAIN CONTROL MODULE
PCI BUS - INSTRUMENT CLUSTER
(F21) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT SHORT TO GROUND
(F1) FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START) CIRCUIT SHORT TO GROUND
(F21) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN
(F1) FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START) CIRCUIT OPEN
(Z18) INSTRUMENT CLUSTER GROUND CIRCUIT FOR AN OPEN
INSTRUMENT CLUSTER

Diagnostic Test**1. NO RESPONSE - PCI BUS**

NOTE: Diagnose and repair any MIC, PCM (ECM if diesel equipped), or Communication DTCs before proceeding with this test.

Turn the ignition on.

With the DRBIII®, select System Monitors, then J1850 Module Scan.

Does the DRBIII® display MIC PRESENT on the BUS?

Yes >> Go To 2

No >> Refer to the COMMUNICATION category and perform the appropriate symptom.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. NO RESPONSE - PCI BUS - POWERTRAIN CONTROL MODULE

Turn the ignition on.

With the DRBIII®, select Body, MIC, SYSTEM TESTS, PCM Monitor.

Does the DRBIII® display PCM INACTIVE on the BUS?

Yes >> Refer to the COMMUNICATION category and perform the appropriate symptom.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

3. PCI BUS - INSTRUMENT CLUSTER

Turn the ignition on.

With the DRBIII®, select Body, MIC, MODULE DISPLAY.

Does the DRBIII® display NO RESPONSE from MIC?

Yes >> Refer to the COMMUNICATION category and perform the appropriate symptom.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 4

ALL GAUGES INOPERATIVE (CONTINUED)*4. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Inspect the #20 Fuse in the PDC.

If the fuse is open, replace with proper rated fuse.

Turn the ignition on for one minute.

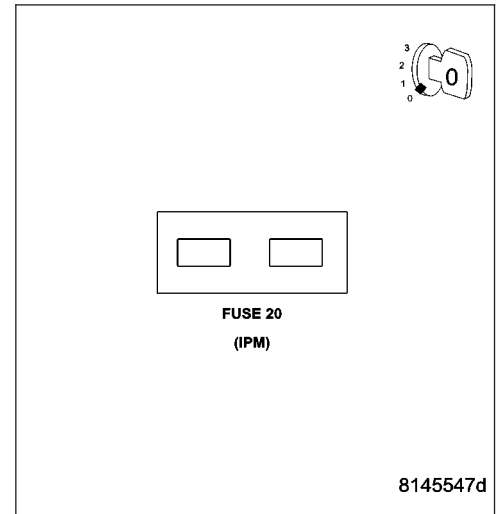
Turn the ignition off.

Inspect the #20 Fuse in the PDC.

Is the fuse open?

Yes >> Repair the (F21) Fused Ignition Switch Output (Unlock/Run) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 5

**5. CHECK THE (F1) FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Remove and inspect the #29 Fuse in the PDC.

If the fuse is open, replace with the proper rated fuse.

Turn the ignition on for 1 minute.

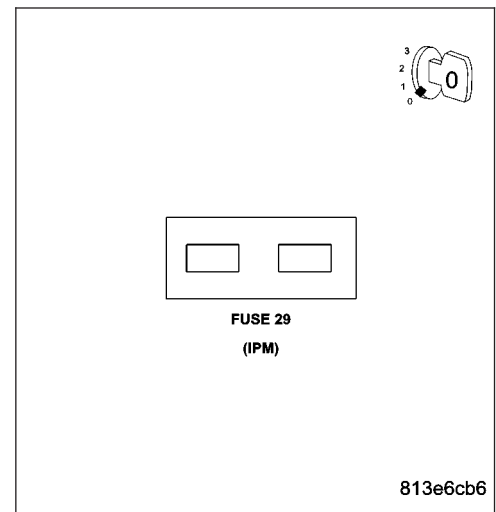
Turn the ignition off.

Remove and inspect the #29 Fuse in the PDC.

Is the fuse open?

Yes >> Repair the (F1) Fused Ignition Switch Output (Run/Start) circuit for a short to ground.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 6



ALL GAUGES INOPERATIVE (CONTINUED)*6. CHECK THE (F21) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Turn the ignition on.

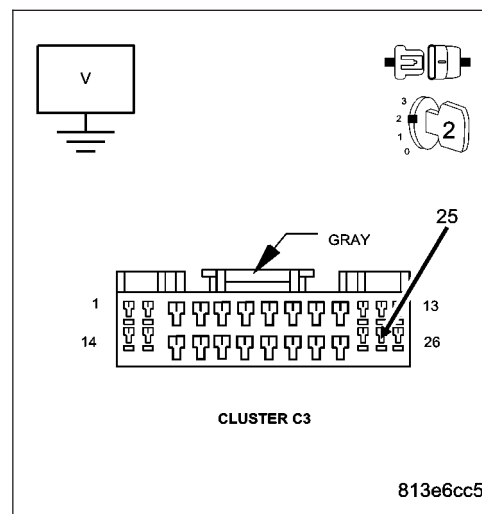
Measure the voltage between the (F21) Fused Ignition Switch Output (Run/Start) circuit and ground.

Is the voltage below 10.5 volts?

Yes >> Repair the (F21) Fused Ignition Switch Output (Run/Start) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 7

**7. CHECK THE (F1) FUSED IGNITION SWITCH OUTPUT (OFF/RUN/START) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Turn the ignition on.

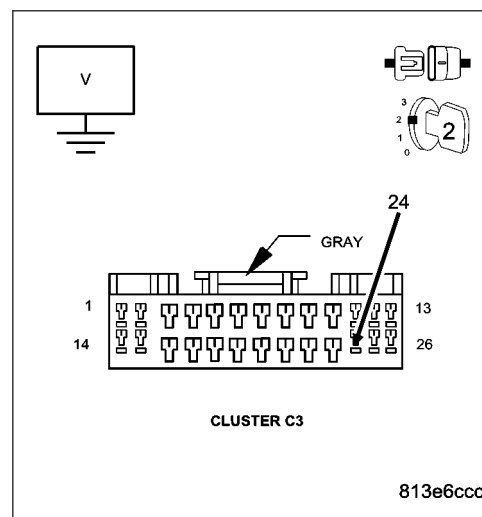
Measure the voltage between the (F1) Fused Ignition Switch Output (Off/Run/Start) circuit and ground.

Is the voltage below 10.5 volts?

Yes >> Repair the (F1) Fused Ignition Switch Output (Off/Run/Start) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 8



ALL GAUGES INOPERATIVE (CONTINUED)*8. CHECK THE (Z18) INSTRUMENT CLUSTER GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance between ground and the (Z18) Instrument Cluster Ground circuit.

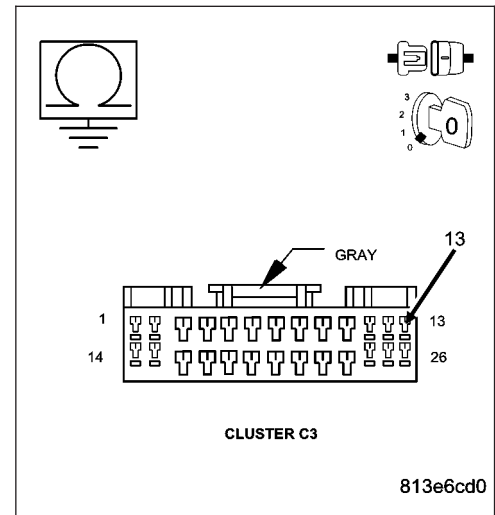
Is the resistance below 5.0 ohms?

Yes >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Repair the (Z18) Instrument Cluster Ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



***ANY PCI INDICATOR INOPERATIVE**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
NO RESPONSE - PCI BUS
NO RESPONSE - INSTRUMENT CLUSTER
INDICATOR MESSAGE NOT RECEIVED
INSTRUMENT CLUSTER

Diagnostic Test**1. NO RESPONSE - PCI BUS**

Turn the ignition on.

With the DRBIII®, select System Monitors, then J1850 Module Scan.

Does the DRBIII® display MIC PRESENT on the BUS?

Yes >> Go To 2

No >> Refer to the COMMUNICATION category and perform the appropriate symptom.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

2. NO RESPONSE - INSTRUMENT CLUSTER

With the DRBIII®, select MIC, then MODULE DISPLAY.

Does the DRBIII® display NO RESPONSE from MIC?

Yes >> Refer to the symptom list for problems related to *NO RESPONSE FROM THE INSTRUMENT CLUSTER.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

3. NO RESPONSE - PCI BUS

With the DRBIII®, select Body, MIC, MONITORS, PCI BUS MONITORS.

Does the DRBIII® display PCM INACTIVE on the BUS?

Yes >> Refer to the symptom list for problems related to *NO RESPONSE FROM THE POWERTRAIN CONTROL MODULE.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 4

***ANY PCI INDICATOR INOPERATIVE (CONTINUED)**

4. INDICATOR MESSAGE NOT RECEIVED

NOTE: NOTE: Diagnose and repair any PCM or BCM DTCs before proceeding with this test.

Perform the Instrument Cluster Self Test.

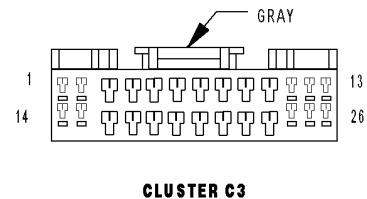
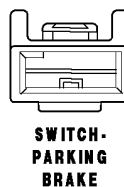
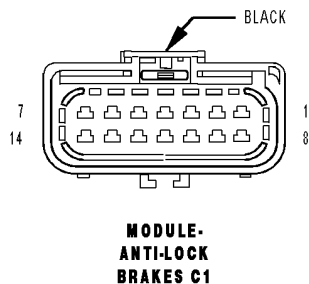
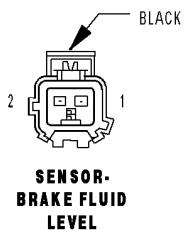
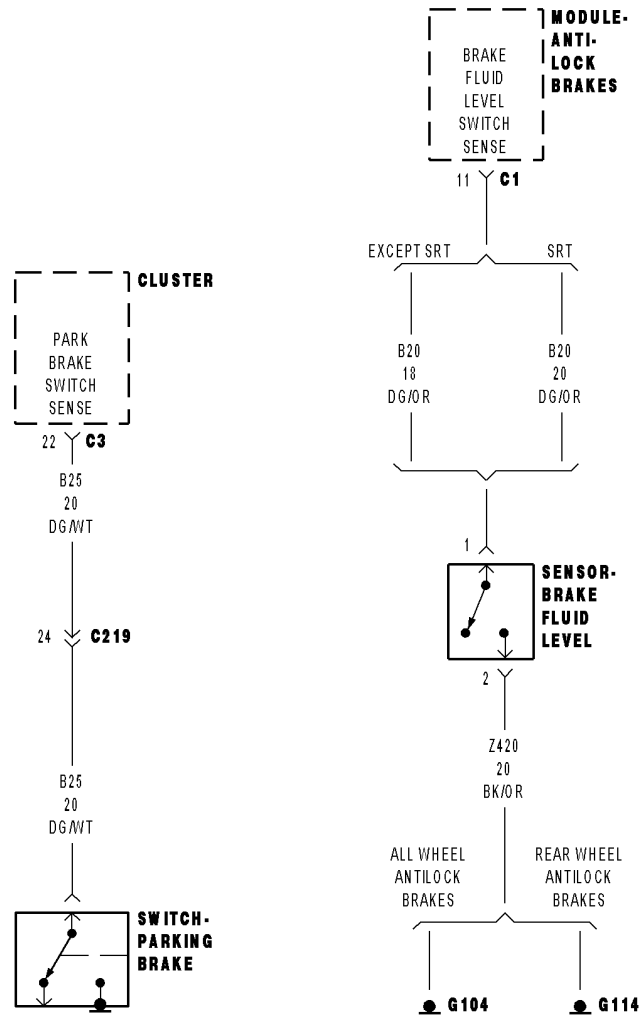
Depress and hold the Trip Odometer button while turning the ignition from the off to the on position.

Observe the indicator in question.

Did the indicator illuminate?

- Yes** >> Refer to the appropriate Service Information category to diagnose the related system.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
-

***BRAKE WARNING INDICATOR ALWAYS ON**



***BRAKE WARNING INDICATOR ALWAYS ON (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(B20) BRAKE FLUID LEVEL SENSOR SENSE CIRCUIT SHORT TO GROUND (B25) PARK BRAKE SWITCH SENSE CIRCUIT SHORT TO GROUND BRAKE FLUID LEVEL SENSOR PARK BRAKE SWITCH ANTI-LOCK BRAKES MODULE INSTRUMENT CLUSTER

Diagnostic Test**1. BRAKE FLUID LEVEL SENSOR**

NOTE: Diagnose and repair any MIC, Brake, or Communication DTCs before proceeding with this test.

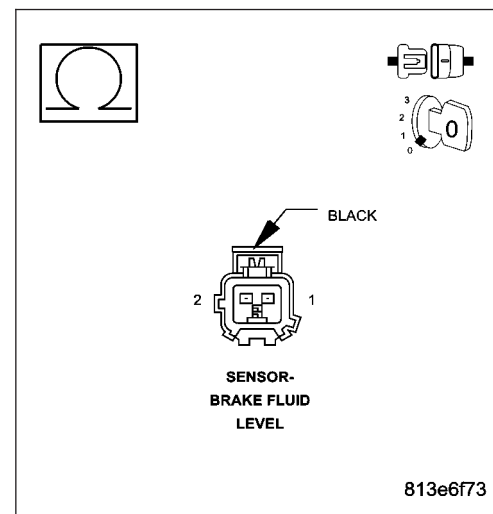
Disconnect the Brake Fluid Level Sensor harness connector.

Measure the resistance of the Brake Fluid Level Sensor between pin 1 and pin 2.

Does the resistance measure less than 900 ohms?

Yes >> Replace the Brake Fluid Level Sensor in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 2



BRAKE WARNING INDICATOR ALWAYS ON (CONTINUED)*2. (B20) BRAKE FLUID LEVEL SENSOR SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

Disconnect the Anti-lock Brakes Module harness connector.

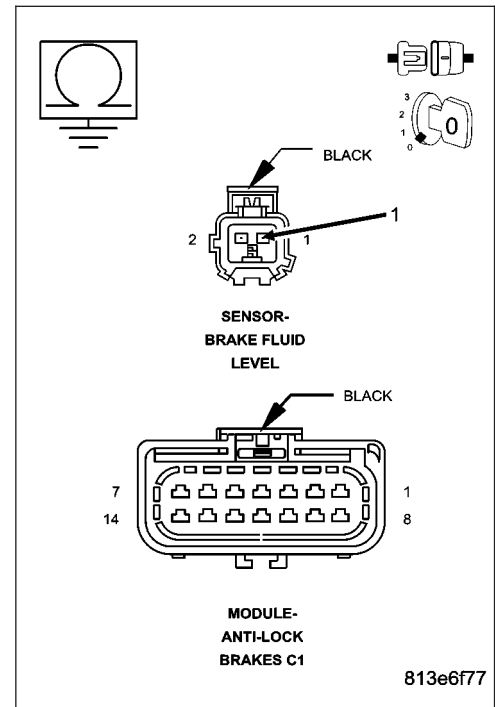
Measure the resistance between ground and the (B20) Brake Fluid Level Sensor Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (B20) Brake Fluid Level Sensor Sense circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

**3. PARK BRAKE SWITCH**

Turn the ignition off.

Disconnect the Park Brake Switch harness connector.

Turn the ignition on.

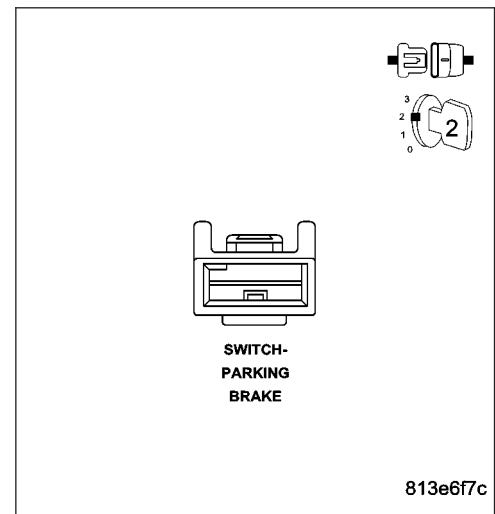
Observe the Brake warning indicator.

Did the Brake warning indicator illuminate briefly and then turn off?

Yes >> Replace the Park Brake Switch in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 4



BRAKE WARNING INDICATOR ALWAYS ON (CONTINUED)*4. (B25) PARK BRAKE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Park Brake Switch harness connector.

Disconnect the Instrument Cluster C3 harness connector.

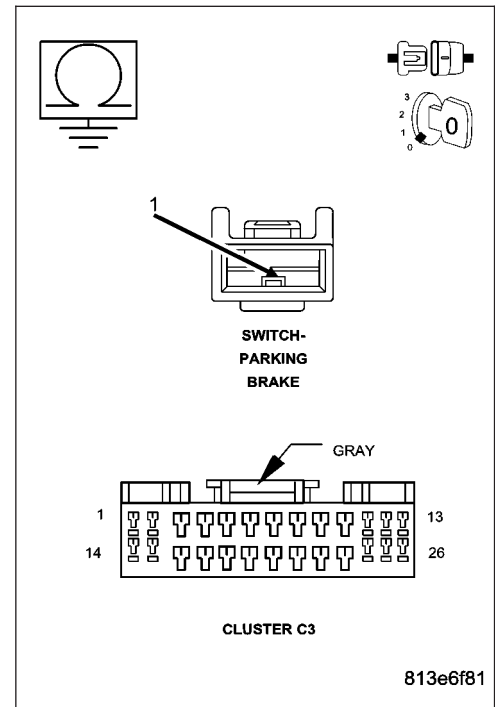
Measure the resistance between ground and the (B25) Park Brake Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (B25) Park Brake Switch Sense circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 5

**5. ANTI-LOCK BRAKES MODULE**

Turn the ignition off.

Reconnect any harness connector(s) that were previously disconnected.

Turn the ignition on.

With the DRBIII® in Inputs/Outputs, read the Brake Fluid Level Sensor state.

Does the DRBIII® display "Closed"?

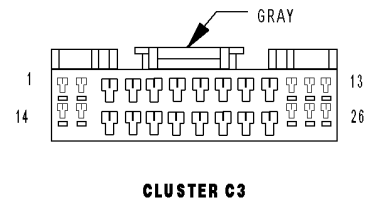
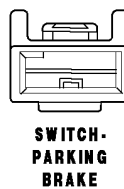
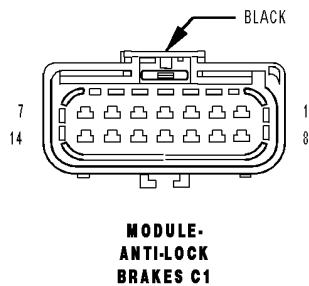
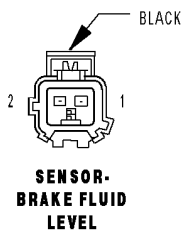
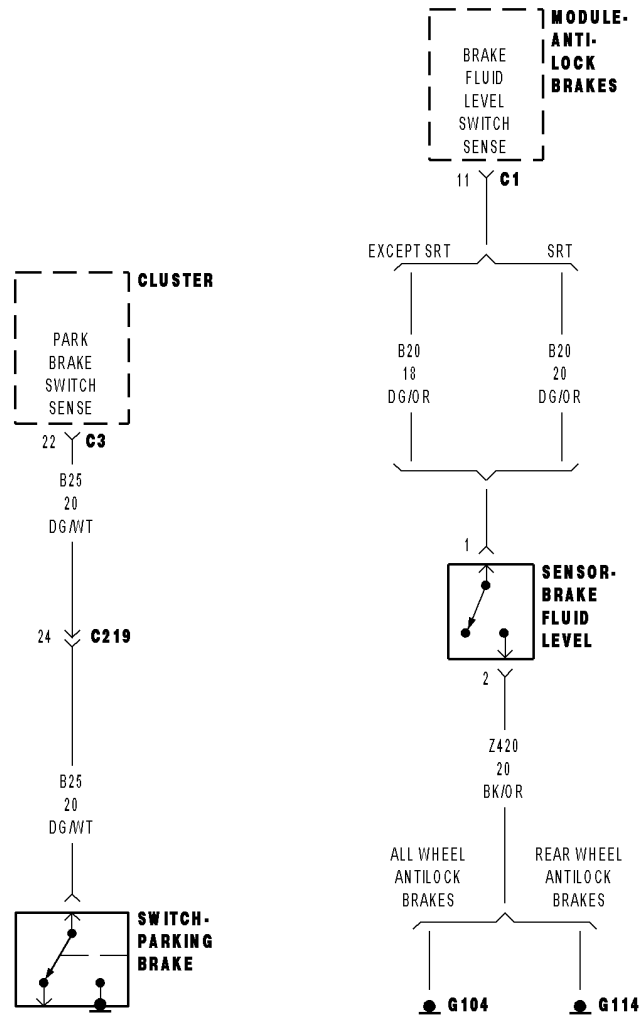
Yes >> Replace the Anti-lock Brakes Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

***BRAKE WARNING INDICATOR INOPERATIVE**



***BRAKE WARNING INDICATOR INOPERATIVE (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(Z420) BRAKE FLUID LEVEL SENSOR GROUND CIRCUIT OPEN
(B25) PARK BRAKE SWITCH SENSE CIRCUIT OPEN
(B20) BRAKE FLUID LEVEL SENSE CIRCUIT OPEN
PARK BRAKE SWITCH
BRAKE FLUID LEVEL SENSOR
ANTI-LOCK BRAKES MODULE
INSTRUMENT CLUSTER

Diagnostic Test**1. FAULT LOCATION**

NOTE: Diagnose and repair any MIC, ABS, or Communication DTCs before proceeding with this test.

Is the Brake warning indicator only inoperative using the Park Brake?

Yes >> Go To 2

No >> Go To 4

2. PARK BRAKE SWITCH

Disconnect the Park Brake Switch harness connector.

Connect a jumper wire between the (B25) Park Brake Switch Sense circuit and ground.

Turn the ignition on.

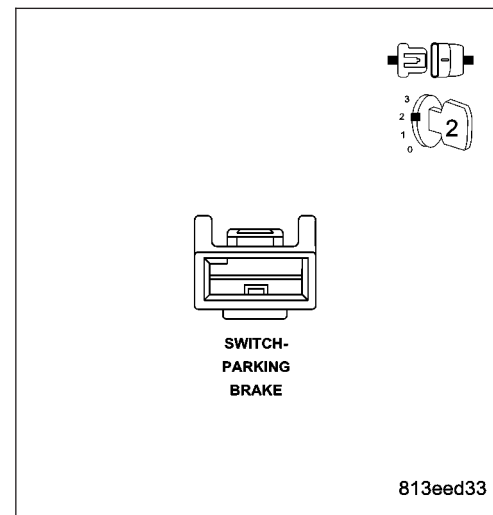
Observe the BRAKE indicator.

Did the BRAKE indicator illuminate?

Yes >> Replace the Park Brake Switch in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3



BRAKE WARNING INDICATOR INOPERATIVE (CONTINUED)*3. (B25) PARK BRAKE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off.

Disconnect the (B25) Park Brake Switch harness connector.

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance of the (B25) Park Brake Switch Sense circuit.

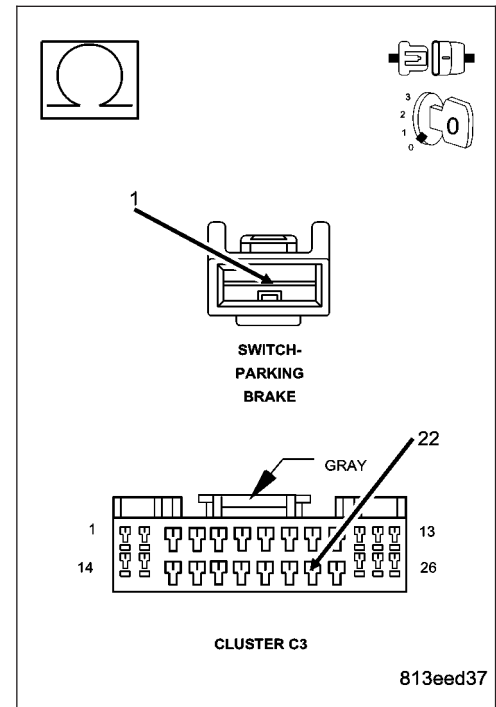
Is the resistance above 5.0 ohms?

Yes >> Repair the (B25) Park Brake Switch Sense circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

**4. BRAKE FLUID LEVEL SENSOR**

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

Connect a jumper wire between cavity 1 and cavity 2.

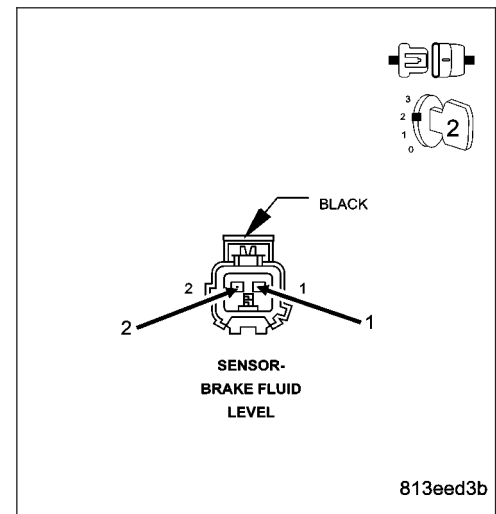
Turn the ignition on.

Does the Brake warning indicator illuminate?

Yes >> Replace the Brake Fluid Level Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 5



BRAKE WARNING INDICATOR INOPERATIVE (CONTINUED)*5. (Z420) BRAKE FLUID LEVEL SENSOR GROUND CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

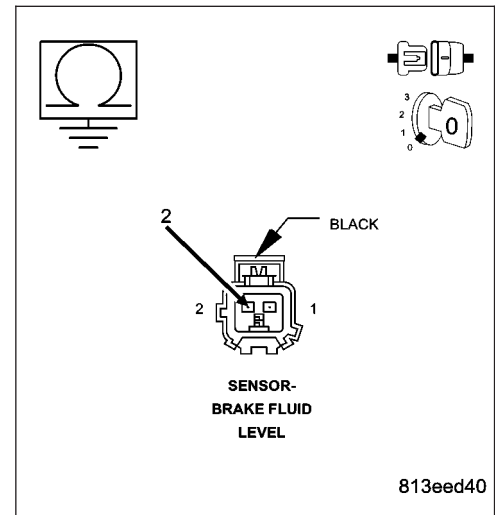
Measure the resistance between ground and the (Z420) Brake Fluid Level Sensor Ground circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (Z420) Brake Fluid Level Sensor Ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 6

**6. (B20) BRAKE FLUID LEVEL SENSE CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

Disconnect the Anti-lock Brakes Module harness connector.

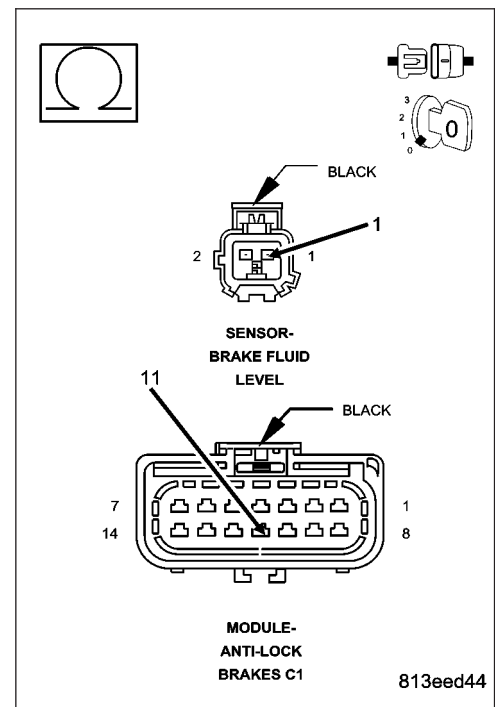
Measure the resistance of the (B20) Brake Fluid Level Sensor Sense circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (B20) Brake Fluid Level Sensor Sense circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 7



BRAKE WARNING INDICATOR INOPERATIVE (CONTINUED)*7. INSTRUMENT CLUSTER**

Turn the ignition off.

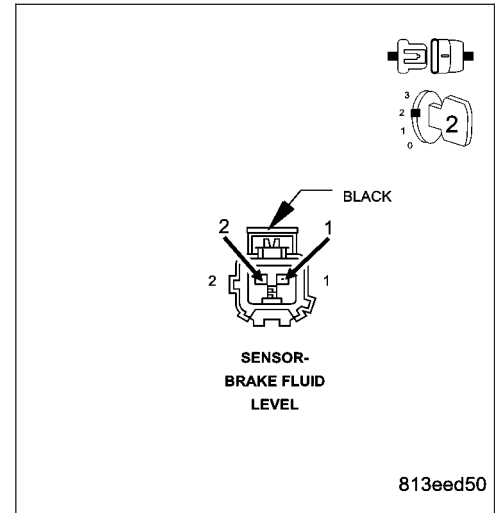
Disconnect the Anti-lock Brakes Module harness connector.

Connect a jumper wire between the (B25) Brake Fluid Level Sensor Sense circuit and ground.

With the DRBIII® in Inputs/Outputs, read the Brake Fluid Level Sensor state.

Does the DRBIII® display "Closed"?

- Yes** >> Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Replace the Anti-lock Brakes Module in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)





***FUEL GAUGE INACCURATE (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
FUEL LEVEL SENSOR WIRING INSTRUMENT CLUSTER

Diagnostic Test**1. DTC PRESENT**

NOTE: Diagnose and repair any PCI Bus problems before proceeding with this test.

Turn the ignition on.

With the DRBIII®, read the PCM DTCs.

Does the DRBIII® display any Fuel Level Sensor related DTC?

Yes >> Refer to the Powertrain Diagnostic Information for the related symptom(s).
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

No >> Go To 2

2. INSTRUMENT CLUSTER

Perform the Instrument Cluster Self Test as follows:

Turn the ignition off.

Press and hold the Trip/Reset button.

Turn the ignition on.

Observe the Fuel Gauge during the Self Test.

The Fuel Gauge pointer should pause at each of these following positions: E, 1/4, 1/2, 3/4, Full, and back to E.

Does the Fuel Gauge function as described above?

Yes >> Go To 3

No >> Replace the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

FUEL GAUGE INACCURATE (CONTINUED)*3. FUEL LEVEL SENSOR WIRING**

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Disconnect the PCM C2 and C3 harness connectors.

Measure the resistance of the (N4) Fuel Level Sensor Signal circuit between the Fuel Pump Module harness connector and the PCM harness connector.

Measure the resistance of the (K900) Sensor Ground circuit between the Fuel Pump Module harness connector and the PCM harness connector.

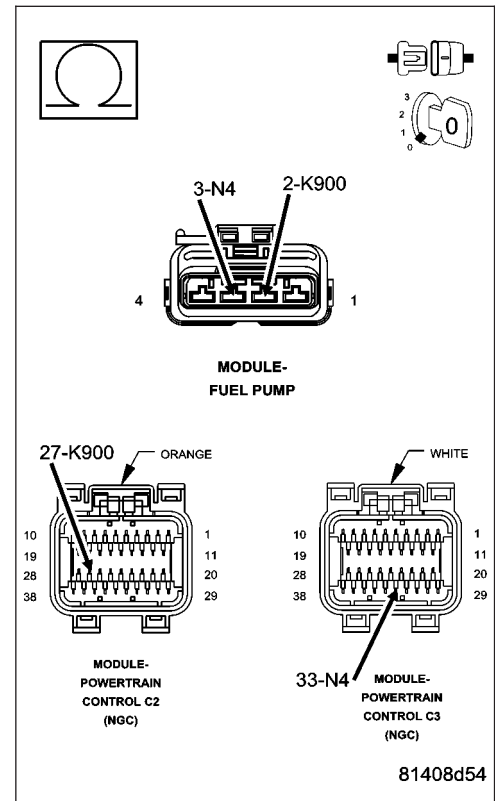
Is the resistance below 5.0 ohms on both circuits.

Yes >> Replace the Fuel Level Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Repair the circuits with a resistance above 5.0 ohms for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



*ONE GAUGE INOPERATIVE - GAS ENGINES

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
POWERTRAIN CONTROL MODULE INSTRUMENT CLUSTER

Diagnostic Test

1. POWERTRAIN CONTROL MODULE

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display any PCM DTCs?

- Yes** >> Refer to the DRIVEABILITY category and perform the appropriate symptom.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Go To 2

2. INSTRUMENT CLUSTER

Turn the ignition off.

Perform the Instrument Cluster Self Test.

NOTE: NOTE: The Self Test can be initiated manually by depressing and holding the Trip Reset button while turning the ignition on, or by using the DRBIII®.

Observe the gauge in question while the Instrument Cluster performs the Self Test.

The gauges should position at the following calibrations points:

Speedometer MPH: 0, 20, 60, 90

Tachometer Gas: 0, 1000, 3000, 6000

Fuel: E, 1/4, 1/2, 3/4, F

Coolant: Cold, 1/4, 1/2, 3/4, HI

Volts: 6, 9, 12, 15, 17

Did the gauge in question operate properly?

- Yes** >> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wire harness. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

***PRNDL NOT DISPLAYING CORRECT POSITION (EATX VEHICLES)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
DTC PRESENT
INSTRUMENT CLUSTER

Diagnostic Test**1. DTC PRESENT**

NOTE: Ensure that the correct Instrument Cluster is installed and is correctly configured for the vehicle.

NOTE: Ensure that there is communication between the Cluster and PCM before proceeding with this test.

NOTE: Diagnose and repair any DTCs before proceeding with this test.

NOTE: Ensure that the PCM passes the Shift Lever Test with the DRBIII® before proceeding with this test.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display any MIC or PCM DTCs?

Yes >> Refer to the correct symptom list for problems related to DTCs.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 2

2. INSTRUMENT CLUSTER

Perform the Instrument Cluster Self Test.

Turn the ignition off.

Press and hold the Trip/Reset button.

Turn the ignition on.

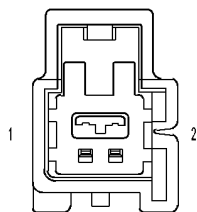
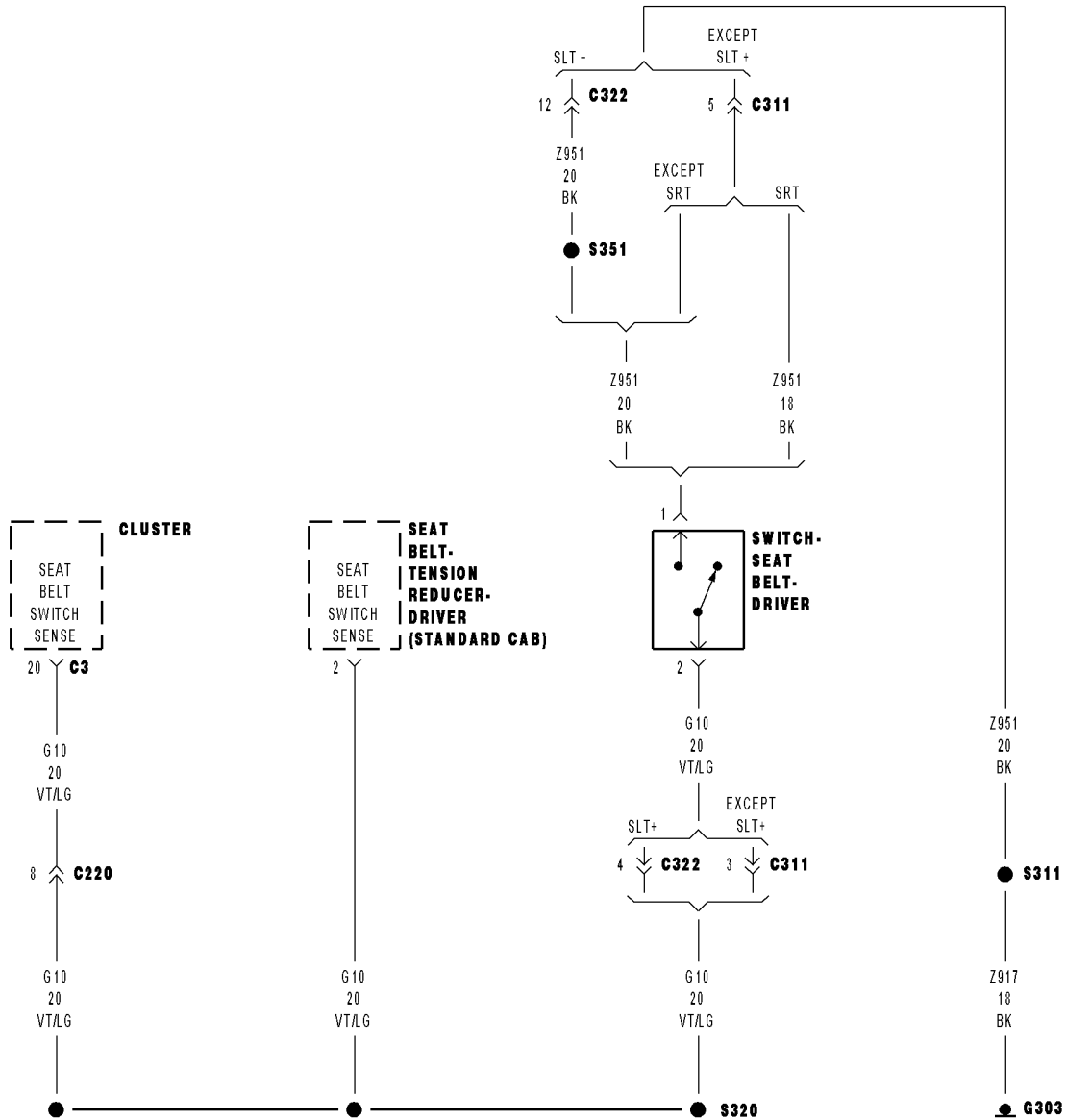
Observe the PRNDL display during the Self Test.

Did any part of the VF display fail to illuminate?

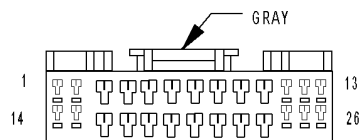
Yes >> Replace and program the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wiring harness. refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness and connector terminals.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

***SEAT BELT WARNING INDICATOR ALWAYS OFF**



SWITCH-SEAT-BELT-DRIVER



CLUSTER C3

***SEAT BELT WARNING INDICATOR ALWAYS OFF (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(G10) SEAT BELT SWITCH SENSE CIRCUIT SHORT TO GROUND INSTRUMENT CLUSTER

Diagnostic Art**1. CHECK THE (G10) SEAT BELT SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Seat Belt Switch harness connector.

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance between ground and the (G10) Seat Belt Switch Sense circuit.

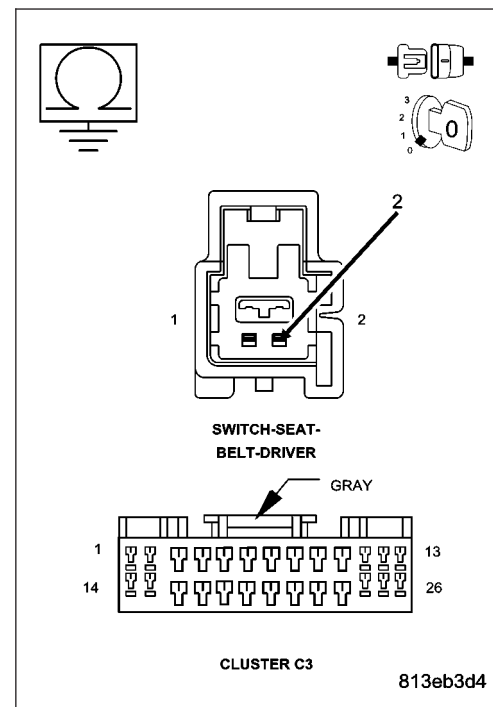
Is the resistance below 5.0 ohms?

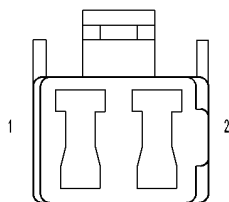
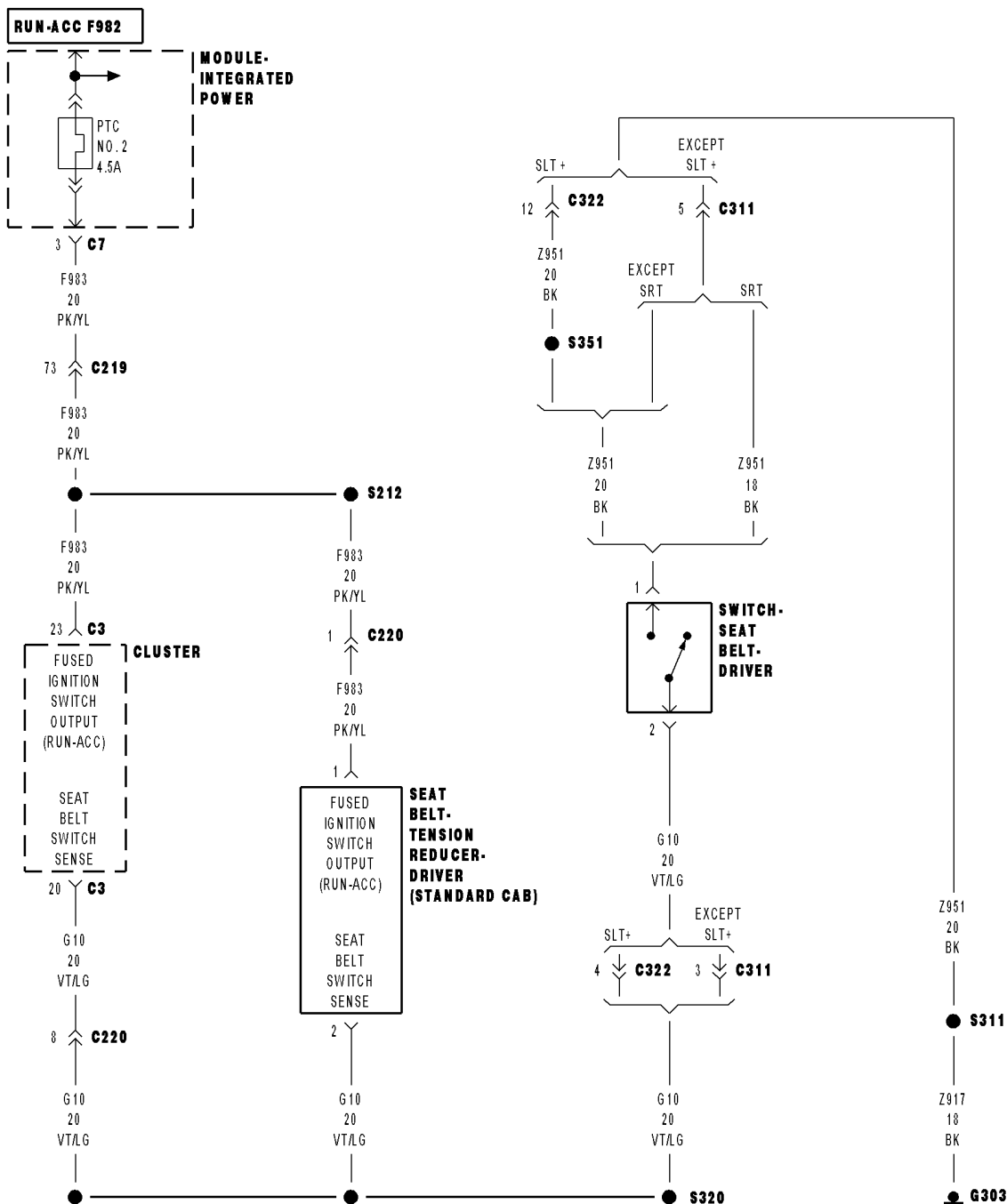
Yes >> Repair the (G10) Seat Belt Switch Sense circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

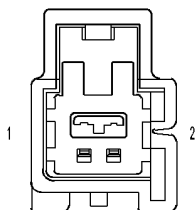
No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

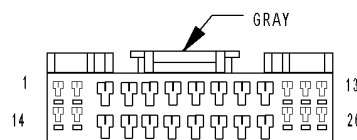


***SEAT BELT WARNING INDICATOR ALWAYS OFF - STANDARD CAB**

SEAT BELT-TENSIONER REDUCER-DRIVER (STANDARD CAB)



SWITCH-SEAT-BELT-DRIVER



CLUSTER C3

***SEAT BELT WARNING INDICATOR ALWAYS OFF - STANDARD CAB (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(G10) SEAT BELT SWITCH SENSE CIRCUIT SHORT TO GROUND INSTRUMENT CLUSTER

Diagnostic Test**1. (G10) SEAT BELT SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Seat Belt Switch harness connector.

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance between ground and the (G10) Seat Belt Switch Sense circuit.

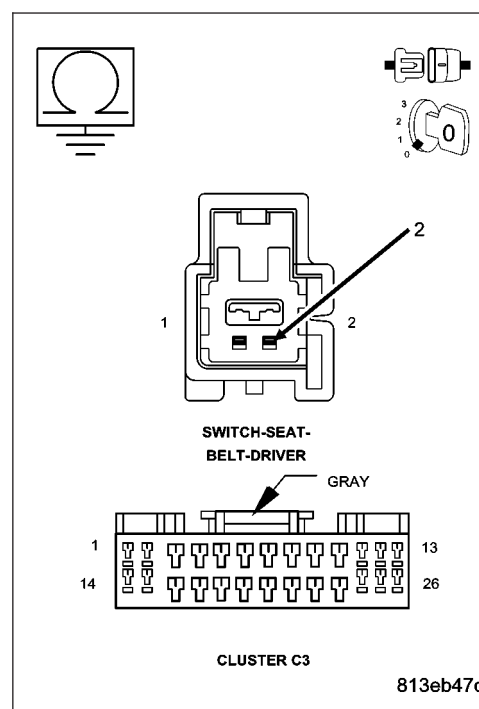
Is the resistance below 5.0 ohms?

Yes >> Repair the (G10) Seat Belt Switch Sense circuit for a short to ground.

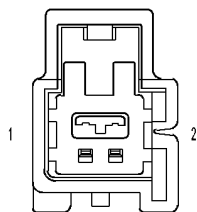
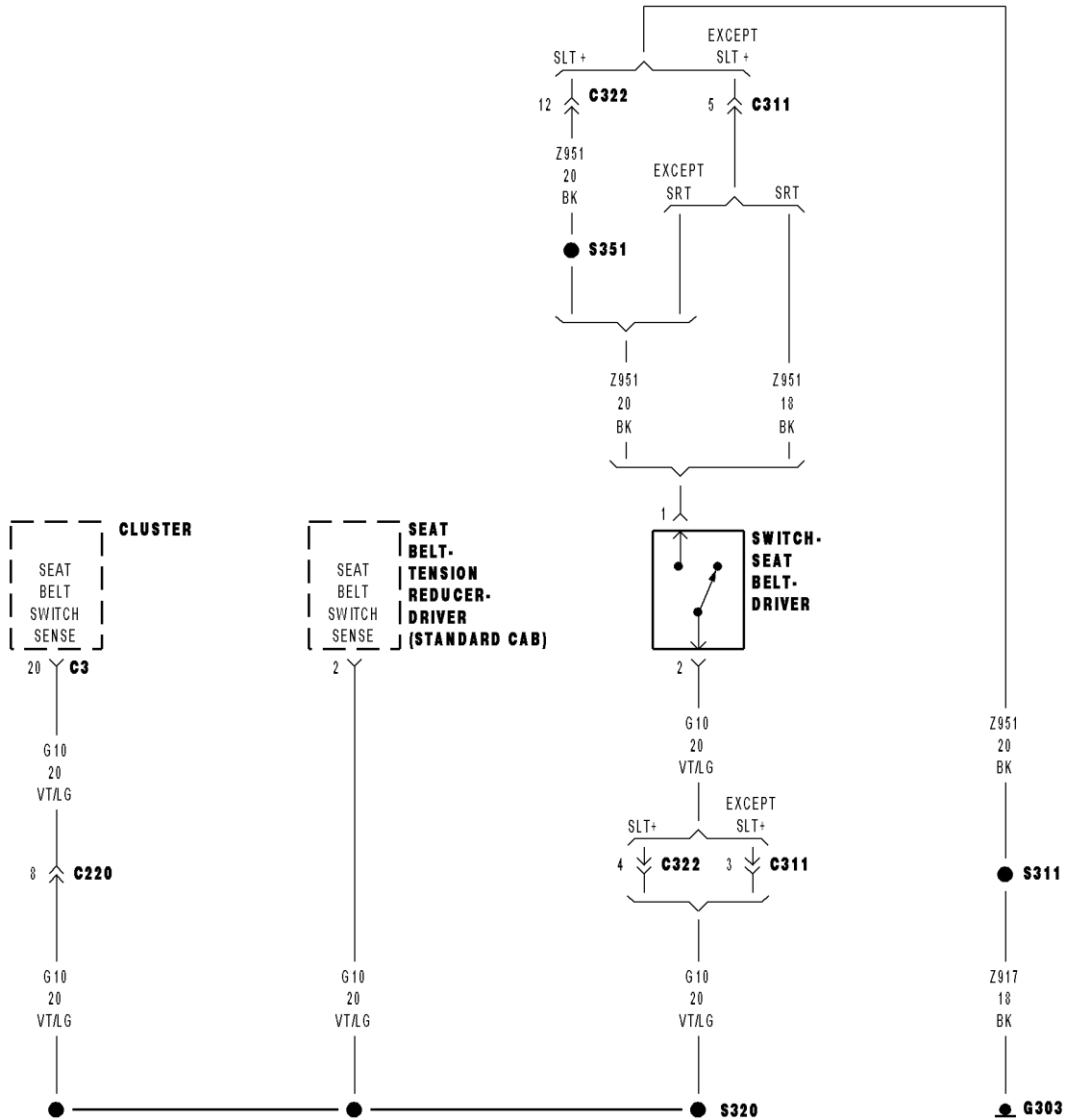
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

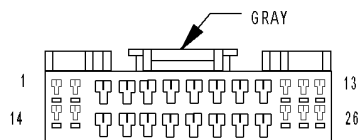
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



***SEAT BELT WARNING INDICATOR ALWAYS ON**



SWITCH-SEAT-BELT-DRIVER



CLUSTER C3

***SEAT BELT WARNING INDICATOR ALWAYS ON (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(Z951) SEAT BELT SWITCH GROUND CIRCUIT FOR AN OPEN (G10) SEAT BELT SWITCH SENSE CIRCUIT OPEN SEAT BELT SWITCH INSTRUMENT CLUSTER

Diagnostic Test**1. CHECK THE OPERATION OF THE SEAT BELT SWITCH**

Turn the ignition off.

Disconnect the Seat Belt Switch harness connector.

Connect a jumper wire between cavity 1 and cavity 2.

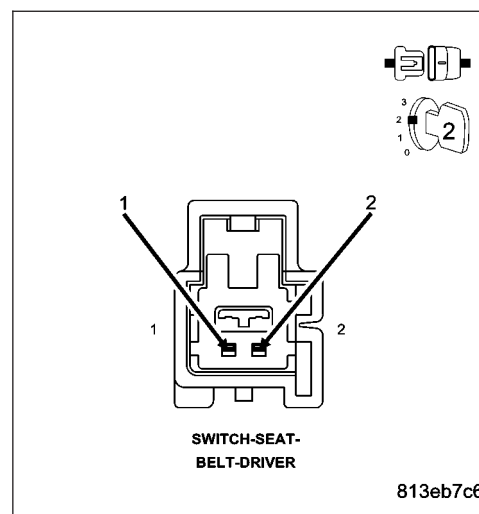
Turn the ignition on.

Observe the Seat Belt Warning Indicator.

Did the Seat Belt Warning Indicator illuminate for approximately 4 seconds and then turn off?

Yes >> Replace the Seat Belt Switch in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 2

**2. CHECK THE (Z951) SEAT BELT SWITCH GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

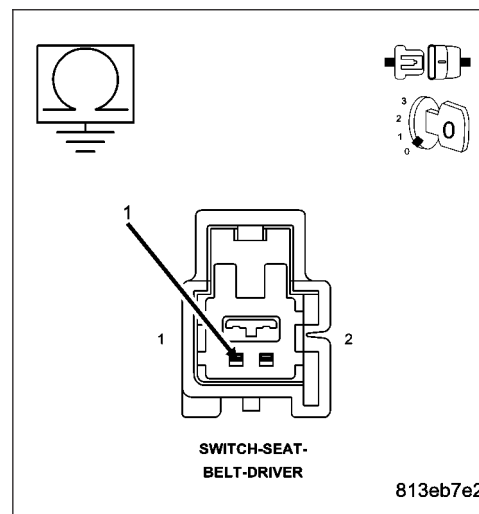
Disconnect the Seat Belt Switch harness connector.

Measure the resistance between ground and the (Z951) Seat Belt Switch Ground circuit.

Is the resistance above 5.0 ohms?

Yes >> Repair the (Z951) Seat Belt Switch Ground circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 3

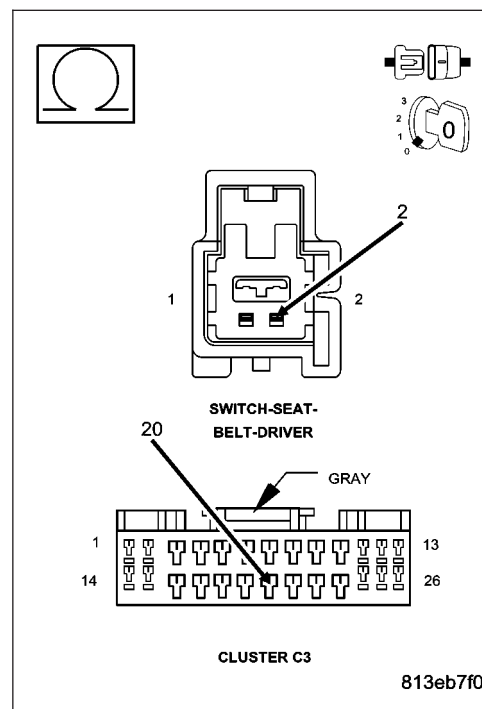


SEAT BELT WARNING INDICATOR ALWAYS ON (CONTINUED)*3. CHECK THE (G10) SEAT BELT SWITCH SENSE CIRCUIT FOR AN OPEN**

Measure the resistance of the (G10) Seat Belt Switch Sense circuit between the Seat Belt Switch connector and the Instrument Cluster C3 connector.

Is the resistance above 5.0 ohms?

- Yes** >> Repair the (G10) Seat Belt Switch Sense circuit for an open.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)
- No** >> Replace and configure the Instrument Cluster in accordance with the Service Information.
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



***SEAT BELT WARNING INDICATOR ALWAYS ON - STANDARD CAB (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(F983) FUSED IGNITION SWITCH OUTPUT (RUN-ACC) CIRCUIT OPEN
(Z951) SEAT BELT SWITCH GROUND CIRCUIT OPEN
(G10) SEAT BELT SWITCH SENSE CIRCUIT OPEN
SEAT BELT TENSIONER REDUCER
SEAT BELT SWITCH
INSTRUMENT CLUSTER

1. (F983) FUSED IGNITION SWITCH OUTPUT (RUN-ACC) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Seat Belt Tensioner Reducer harness connector.

Turn the ignition on.

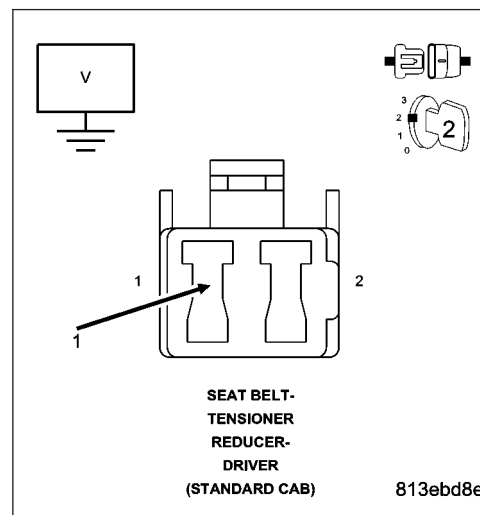
Measure the voltage between the (F983) Fused Ignition Switch Output (Run-Acc) circuit and ground in the Tensioner Reducer harness connector.

Is the voltage above 10.5 volts?

Yes >> Go To 2

No >> Repair the (F983) Fused Ignition Switch Output (Run-Acc) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



SEAT BELT WARNING INDICATOR ALWAYS ON - STANDARD CAB (CONTINUED)*2. SEAT BELT TENSIONER REDUCER**

Ensure that the Seat Belt Tensioner Reducer harness connector is connected.

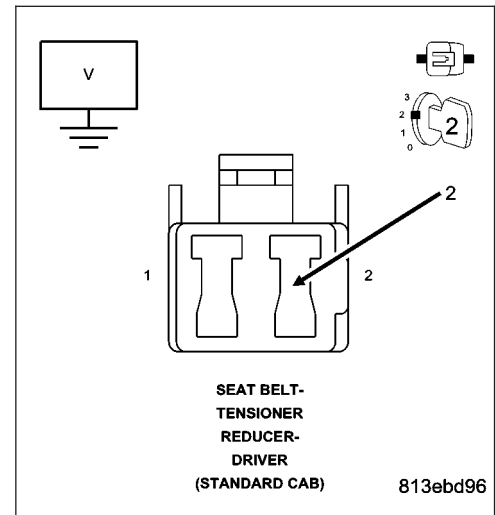
Measure the voltage between the (G10) Seat Belt Switch Sense circuit and ground in the Seat Belt Tensioner Reducer harness connector (cavity 2).

Is there any voltage present?

Yes >> Go To 3

No >> Replace the Seat Belt Tensioner Reducer in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

**3. SEAT BELT SWITCH**

Turn the ignition off.

Disconnect the Seat Belt Switch harness connector.

Connect a jumper wire between cavity 1 and cavity 2.

Turn the ignition on.

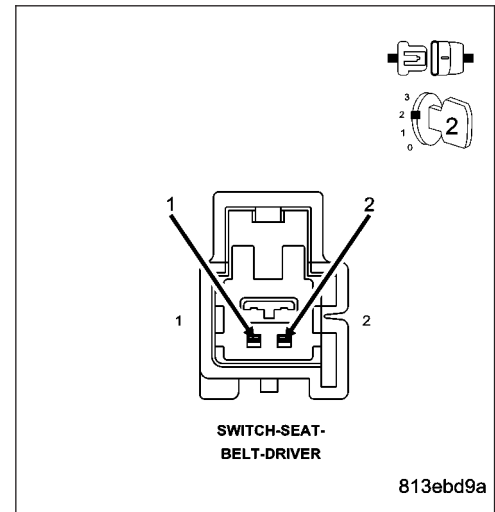
Observe the Seat Belt Warning Indicator.

Did the Seat Belt Warning Indicator illuminate?

Yes >> Replace the Seat Belt Switch in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Go To 4



SEAT BELT WARNING INDICATOR ALWAYS ON - STANDARD CAB (CONTINUED)*4. CHECK THE (Z951) SEAT BELT SWITCH GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

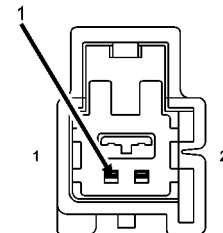
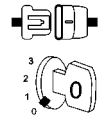
Measure the resistance between ground and the (Z951) Seat Belt Switch circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (Z951) Seat Belt Switch Ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



**SWITCH-SEAT-
BELT-DRIVER**

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5. CHECK THE (G10) SEAT BELT SWITCH SENSE CIRCUIT FOR AN OPEN

Disconnect the Instrument Cluster C3 harness connector.

Measure the resistance of the (G10) Seat Belt Switch Sense circuit between the Seat Belt Switch connector and the Instrument Cluster C3 connector.

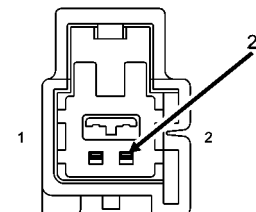
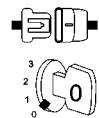
Is the resistance above 5.0 ohms?

Yes >> Repair the (G10) Seat Belt Switch Sense circuit for an open.

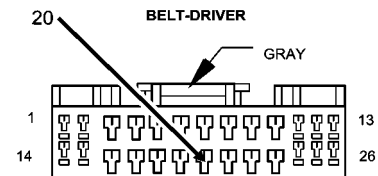
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)

No >> Replace and configure the Instrument Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1.)



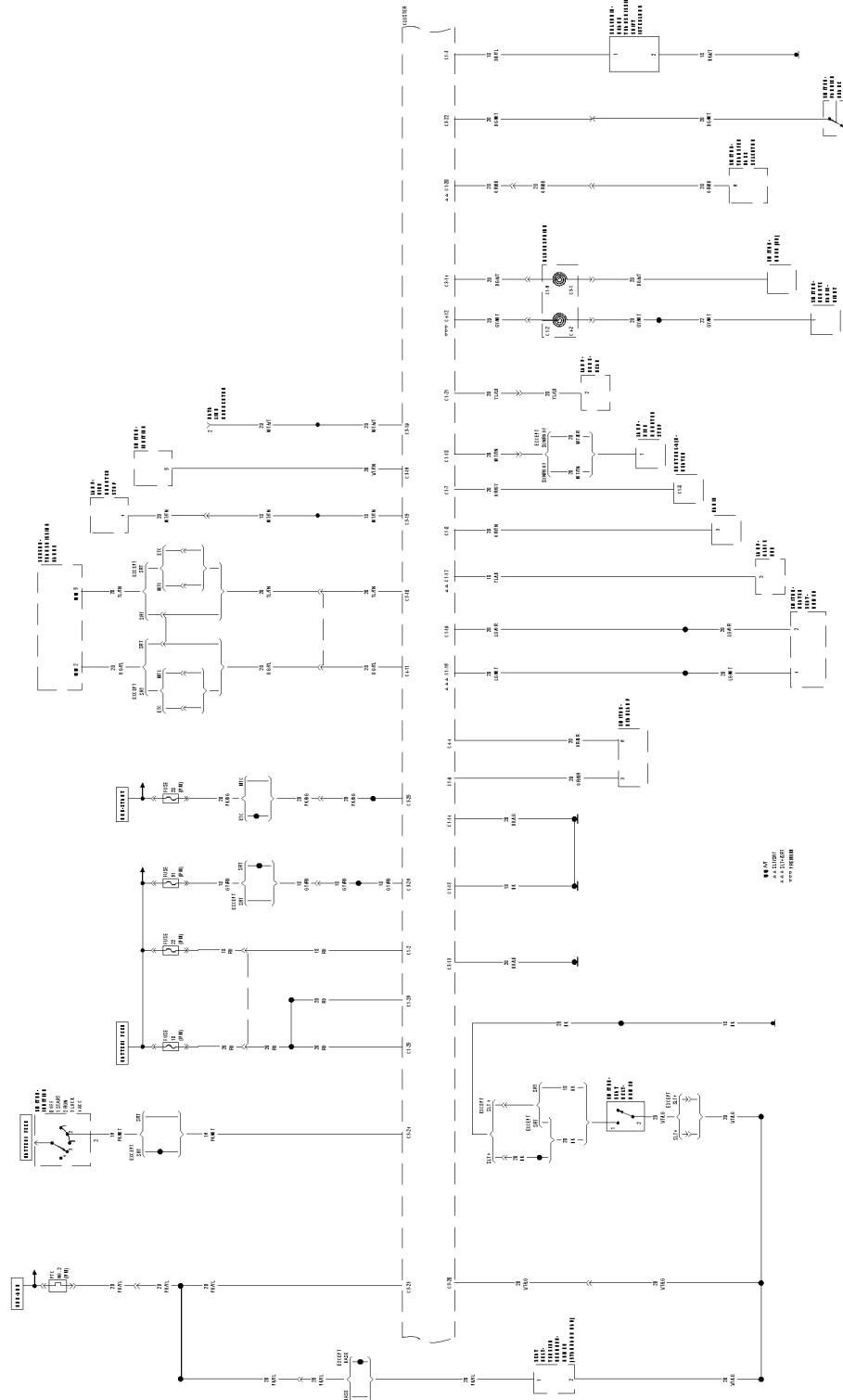
**SWITCH-SEAT-
BELT-DRIVER**



CLUSTER C3

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SCHEMATICS AND DIAGRAMS



81375164

INSTRUMENT CLUSTER SYSTEM SCHEMATIC

INSTRUMENT CLUSTER -SERVICE INFORMATION

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WASHER FLUID INDICATOR

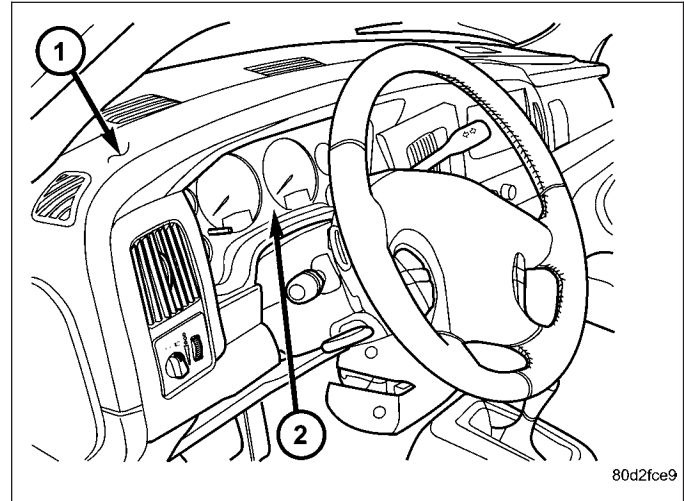
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WATER-IN-FUEL INDICATOR

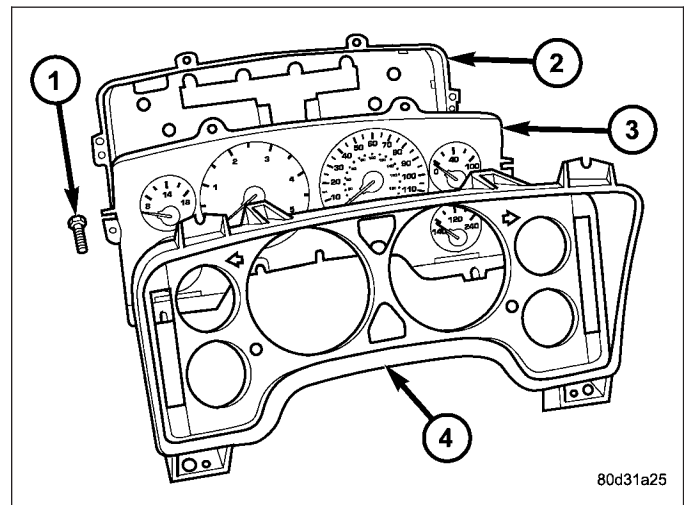
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INSTRUMENT CLUSTER -SERVICE INFORMATION**DESCRIPTION**

The instrument cluster (2) for this model is an Electro-Mechanical Instrument Cluster (EMIC) that is located in the instrument panel (1) above the steering column opening, directly in front of the driver. The remainder of the EMIC, including the mounts and the electrical connections, are concealed within the instrument panel behind the cluster bezel. Besides analog gauges and indicators, the EMIC module incorporates two blue-green digital Vacuum Fluorescent Display (VFD) units for displaying odometer/trip odometer information, engine hours, automatic transmission gear selector position (PRNDL), several warning or reminder indications and certain diagnostic information. The instrument cluster for this model also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN.



The EMIC gauges and indicators are visible through a dedicated opening in the cluster bezel on the instrument panel and are protected by a clear plastic cluster lens that is integral to a cluster lens, hood and mask unit (4). Just behind the cluster lens is the cluster hood and an integral cluster mask, which are constructed of molded black plastic. The cluster hood serves as a visor and shields the face of the cluster from ambient light and reflections to reduce glare, while the cluster mask serves to separate and define the individual gauges and indicators of the EMIC. A black plastic odometer/trip odometer switch button protrudes through dedicated holes in the cluster mask and the cluster lens, located near the lower edge of the cluster just to the left of the tachometer. The molded plastic EMIC lens, hood and mask unit has four integral mounting tabs, one each on the upper and lower outboard corners of the unit. These mounting tabs are used to secure the EMIC to the molded plastic instrument panel cluster carrier with four screws.



The rear of the cluster housing and the EMIC electronic circuitry are protected by a molded plastic rear cover (2), which is secured to the cluster housing with a single screw (1), while eight screws installed around the outside perimeter of the rear cover secure it to the cluster lens, hood and mask unit. The rear cover includes clearance holes for service access to each of the eleven incandescent bulb and bulb holder units installed on the cluster circuit board for general illumination lighting and for the cluster connector receptacles. The connector receptacles on the back of the cluster electronic circuit board connect the EMIC to the vehicle electrical system through three take outs with connectors from the instrument panel wire harness. The EMIC also has an integral interface connector on the

back of the cluster circuit board that joins it to the optional external Remote Keyless Entry (RKE) module through a connector receptacle that is integral to that unit. The rear cover includes a molded receptacle and two latch features to secure the RKE module on vehicles that are so equipped.

Sandwiched between the rear cover and the lens, hood and mask unit is the cluster housing (3). The molded plastic cluster housing serves as the carrier for the cluster circuit board and circuitry, the cluster connector receptacles, the RKE interface connector, the gauges, a Light Emitting Diode (LED) for each cluster indicator, two VFD units, an audible tone transducer, the cluster overlay, the gauge pointers, the odometer/trip odometer switch and the switch button.

The cluster overlay is a laminated plastic unit. The dark, visible, outer surface of the overlay is marked with all of the gauge dial faces and graduations, but this layer is also translucent. The darkness of this outer layer prevents the cluster from appearing cluttered or busy by concealing the cluster indicators that are not illuminated, while the translucence of this layer allows those indicators and icons that are illuminated to be readily visible. The underlying layer of the overlay is opaque and allows light from the LED for each of the various indicators and the incandescent illumination lamps behind it to be visible through the outer layer of the overlay only through predetermined stencil-like cutouts. A rectangular opening in the overlay at the base of both the speedometer and the tachometer dial faces has a smoked clear lens through which the illuminated VFD units can be viewed.

Several versions of the EMIC module are offered on this model. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle will be offered. The microprocessor-based EMIC utilizes integrated circuitry and information carried on the Programmable Communications Interface (PCI) data bus along with several hard wired analog and multiplexed inputs to monitor sensors and switches throughout the vehicle. In response to those inputs, the internal circuitry and programming of the EMIC allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the PCI data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION - PCI BUS).

Besides typical instrument cluster gauge and indicator support, the electronic functions and features that the EMIC supports or controls include the following:

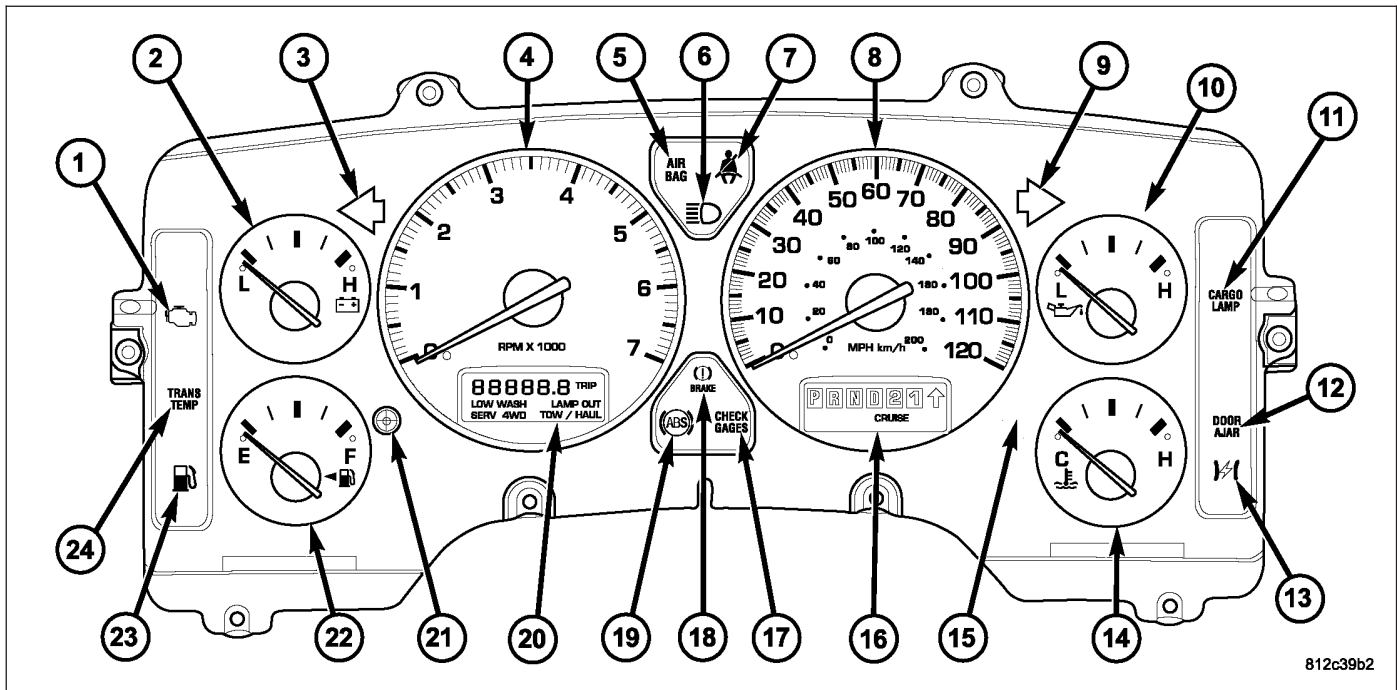
- **Audible Warnings** - The EMIC electronic circuit board is equipped with an audible tone transducer and programming that allows it to provide various audible alerts to the vehicle operator, including chime tones and beep tones. An electromechanical relay is also soldered onto the circuit board to produce audible clicks that emulate the sound of a conventional turn signal or hazard warning flasher. (Refer to 8 - ELECTRICAL/CHIME/BUZZER - DESCRIPTION).
- **Audio System Cabin Equalization** - The EMIC stores the cabin equalization curves for various optional speaker system architectures for use by the radio. The EMIC provides this information when requested by the radio over the PCI data bus. Changing the cabin equalization settings of the EMIC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.
- **Brake Lamp Control** - The EMIC provides electronic brake lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for brake lamp control, excluding control of the Center High Mounted Stop Lamp (CHMSL), which remains controlled by a direct hard wired output of the brake lamp switch.
- **Brake Transmission Shift Interlock Control** - On vehicles with an optional automatic transmission the EMIC monitors inputs from the brake lamp switch, ignition switch, and the Transmission Range Sensor (TRS), then controls a high-side driver output to operate the Brake Transmission Shift Interlock (BTSI) solenoid that locks and unlocks the automatic transmission gearshift selector lever on the steering column.
- **Cargo Lamp Control** - The EMIC provides direct control of cargo lamp operation with a load shedding (battery saver) feature which will automatically turn off the cargo lamp if it remains on after a timed interval.
- **Central Locking** - The EMIC provides support for the central locking feature of the power lock system. This feature will lock or unlock all doors based upon the input from the door cylinder lock switch on the driver side front door. A door cylinder lock switch is used only on models equipped with the optional Vehicle Theft Security System (VTSS).
- **Enhanced Accident Response** - The EMIC monitors an input from the Airbag Control Module (ACM) and, following an airbag deployment, will immediately disable the power lock output, unlock all doors by activating the power unlock output, then enables the power lock output if the power lock switch input remains inactive for two seconds. The EMIC also monitors an input from the Powertrain Control Module (PCM) to automatically turn on the interior lighting after an airbag deployment event, ten seconds after the vehicle speed is zero. The interior lighting remains illuminated until the ignition switch is turned to the Off position, at which time the inte-

rior lighting returns to normal operation and control. These Enhanced Accident Response System (EARS) features are each dependent upon a functional vehicle electrical system following the vehicle impact event.

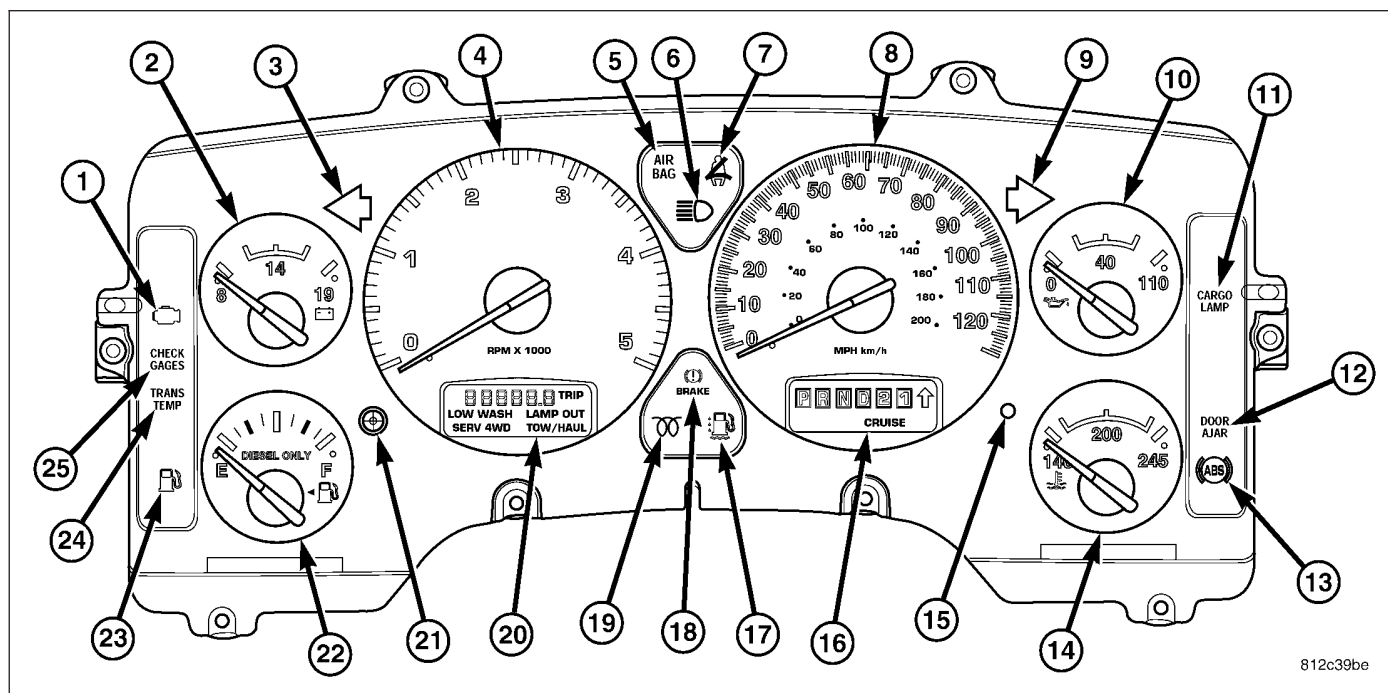
- **Exterior Lighting Control** - The EMIC provides electronic head lamp and/or park lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate exterior lamp control of standard head and park lamps, as well as optional front fog lamps. This includes support for headlamp beam selection and the optical horn feature, also known as flash-to-pass.
- **Exterior Lighting Fail-safe** - In the absence of a headlamp switch input, the EMIC will turn on the cluster illumination lamps and provide electronic headlamp low beam and park lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for default exterior lamp operation. The FCM will also provide default park lamp and headlamp low beam operation and the EMIC will turn on the cluster illumination lamps at full intensity if there is a failure of the electronic data bus communication between the EMIC and the FCM.
- **Heated Seat Control** - The EMIC monitors inputs from the ignition switch and electronic engine speed messages from the Powertrain Control Module (PCM) to control a high side driver output to the heated seat switch Light Emitting Diode (LED) indicators. This input allows the heated seat switches to wake up the heated seat module if the switch is actuated. The EMIC will de-energize the heated seat switch LED indicators, which deactivates the heated seat system, if the ignition switch is turned to any position except On or Start, or if the engine speed message indicates zero. (Refer to 8 - ELECTRICAL/HEATED SEATS - DESCRIPTION).
- **Horn Control** - The EMIC monitors an input from the horn switch and provides electronic horn request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for horn relay control. The EMIC also controls horn relay operation in this manner to provide the horn features of the optional Remote Keyless Entry (RKE) or Vehicle Theft Security System (VTSS).
- **Interior Lamp Load Shedding** - The EMIC provides a battery saver feature which will automatically turn off all interior lamps and the cargo lamps if they remain on after a timed interval of about five minutes.
- **Interior Lighting Control** - The EMIC monitors inputs from the interior lighting switch, the door ajar switches, the cargo lamp switch, the reading lamp switches, and the Remote Keyless Entry (RKE) module to provide courtesy lamp control. This includes support for timed illuminated entry with theater-style fade-to-off and courtesy illumination defeat features.
- **Lamp Out Indicator Control** - The EMIC monitors electronic lamp outage messages from the Front Control Module (FCM) located on the Integrated Power Module (IPM) in order to provide lamp out indicator control for the headlamps (low and high beams), turn signal lamps, and the brake lamps (excluding CHMSL).
- **Panel Lamps Dimming Control** - The EMIC monitors hard wired multiplexed inputs from the headlamp switch on the instrument panel, then provides a hard wired 12-volt Pulse-Width Modulated (PWM) output that synchronizes the dimming level of all panel lamps dimmer controlled lamps with that of the cluster illumination lamps.
- **Power Locks** - The EMIC monitors inputs from the power lock switches and the Remote Keyless Entry (RKE) module (optional) to provide control of the power lock motors through high side driver outputs to the motors. This includes support for rolling door locks (also known as automatic door locks), automatic door unlock, a door lock inhibit mode, and central locking (with the optional Vehicle Theft Security System only). (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION).
- **Remote Keyless Entry** - The EMIC supports the optional Remote Keyless Entry (RKE) system features, including support for the RKE Lock, Unlock (with optional driver-door-only unlock, and unlock-all-doors), Panic, audible chirp, optical chirp, illuminated entry modes, an RKE programming mode, as well as optional Vehicle Theft Security System (VTSS) arming (when the proper VTSS arming conditions are met) and disarming.
- **Remote Radio Switch Interface** - The EMIC monitors inputs from the optional remote radio switches and then provides the appropriate electronic data bus messages to the radio to select the radio operating mode, volume control, preset station scan and station seek features.
- **Turn Signal & Hazard Warning Lamp Control** - The EMIC monitors hard wired multiplexed inputs from the multi-function switch on the steering column, then provides electronic turn and hazard lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for turn and hazard lamp control. The EMIC also provides an audible click at one of two rates to emulate normal and bulb out turn or hazard flasher operation based upon electronic lamp outage messages from the FCM, and provides an audible turn signal on chime warning if a turn is signalled continuously for more than about 1.6 kilometers (one mile) and the vehicle speed remains greater than about twenty-four kilometers-per-hour (fifteen miles-per-hour).
- **Vacuum Fluorescent Display Synchronization** - The EMIC monitors hard wired multiplexed inputs from the headlamp switch on the instrument panel, then transmits electronic panel lamp dimming level messages which allows all other electronic modules on the PCI data bus with Vacuum Fluorescent Display (VFD) units to coor-

minate their illumination intensity with that of the EMIC VFD units. This includes a parade mode (also known as funeral mode) that allows all VFD units in the vehicle to be illuminated at full (daytime) intensity while driving during daylight hours with the exterior lamps turned On.

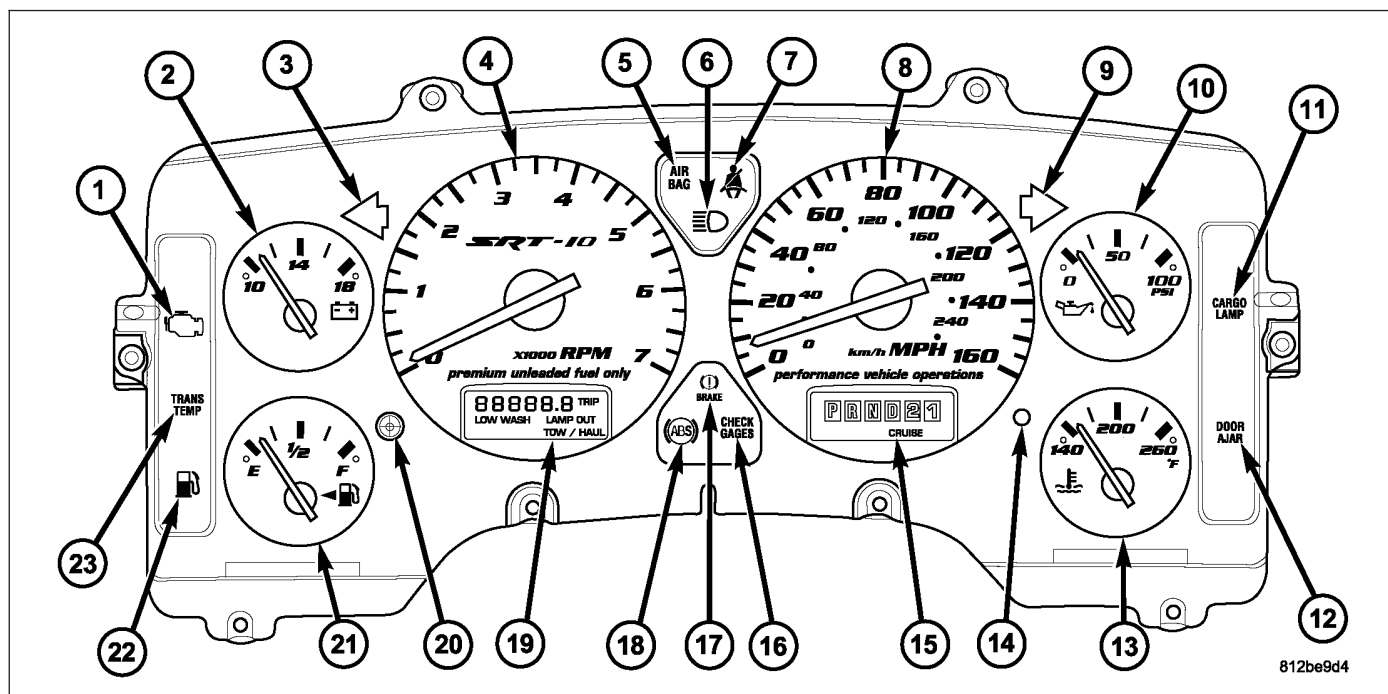
- **Vehicle Theft Security System** - The EMIC monitors inputs from the door cylinder lock switch, the door ajar switches, the ignition switch, and the Remote Keyless Entry (RKE) module, then provides electronic horn and lighting request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate VTSS alarm output features.
- **Wiper/Washer System Control** - The EMIC monitors both hard wired multiplexed inputs from the front wiper and washer switches in the multi-function switch on the steering column, then provides electronic wiper and/or washer request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate wiper and washer system features. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - DESCRIPTION).



Gasoline Engine except SRT-10



Diesel Engine



SRT-10

The EMIC houses six analog gauges and has provisions for up to twenty-three indicators. Some of the EMIC indicators are automatically configured when the EMIC is connected to the vehicle electrical system for compatibility with certain optional equipment or equipment required for regulatory purposes in certain markets. While each EMIC may have provisions for indicators to support every available option, the configurable indicators will not be functional in a vehicle that does not have the equipment that an indicator supports.

The EMIC includes the following analog gauges:

- Coolant Temperature Gauge (13 - SRT-10 or 14 - except SRT-10)
- Fuel Gauge (21 - SRT-10 or 22 - except SRT-10)
- Oil Pressure Gauge (10)
- Speedometer (8)

- **Tachometer (4)**
- **Voltage Gauge (2)**

The EMIC includes the following VFD units:

- **Gear Selector Indicator (15 - SRT-10 or 16 - except SRT-10)**
- **Odometer/Trip Odometer (19 - SRT-10 or 20 - except SRT-10)**

The EMIC includes provisions for the following indicators:

- **Airbag Indicator (with Airbag System only) (5)**
- **Antilock Brake System (ABS) Indicator (with ABS or Rear Wheel Anti-Lock [RWAL] brakes only) (13 - Diesel, 18 - SRT-10 or 19 - Gas except SRT-10)**
- **Brake Indicator (17 - SRT-10 or 18 - except SRT-10)**
- **Cargo Lamp Indicator (11)**
- **Check Gauges Indicator (16 - SRT-10, 17 - Gas except SRT-10 or 25 - Diesel)**
- **Cruise Indicator (in Gear Selector Indicator VFD)**
- **Door Ajar Indicator (12)**
- **Electronic Throttle Control (ETC) Indicator (13 - 5.7L Gasoline Engine only)**
- **High Beam Indicator (6)**
- **Lamp Out Indicator (in Odometer/Trip Odometer VFD)**
- **Low Fuel Indicator (22 - SRT-10 or 23 - except SRT-10)**
- **Malfunction Indicator Lamp (MIL) (1)**
- **Seatbelt Indicator (7)**
- **Security Indicator (with Sentry Key Immobilizer & Vehicle Theft Security Systems only) (14 - SRT-10 or 15 - except SRT-10)**
- **Service Four-Wheel Drive Indicator (with Four-Wheel Drive only) (in Odometer/Trip Odometer VFD)**
- **Tow/Haul Indicator (with Automatic Transmission only) (in Odometer/Trip Odometer VFD)**
- **Transmission Overtemp Indicator (with Automatic Transmission only) (23 - SRT-10 or 24 - except SRT-10)**
- **Turn Signal (Right and Left) Indicators (3 & 9)**
- **Upshift Indicator (with Manual Transmission only in certain markets where required) (in Gear Selector Indicator VFD)**
- **Washer Fluid Indicator (in Odometer/Trip Odometer VFD)**
- **Wait-To-Start Indicator (19 - with Diesel only)**
- **Water-In-Fuel Indicator (17 - with Diesel only)**

Each indicator in the EMIC, except those located within one of the VFD units, is illuminated by a dedicated LED that is soldered onto the EMIC electronic circuit board. The LED units are not available for service replacement and, if damaged or faulty, the entire EMIC must be replaced. Cluster illumination is accomplished by dimmable incandescent back lighting, which illuminates the gauges for visibility when the exterior lighting is turned on. Each of the incandescent bulbs is secured by an integral bulb holder to the electronic circuit board from the back of the cluster housing.

Hard wired circuitry connects the EMIC to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the EMIC through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

The EMIC modules for this model are serviced only as complete units. The EMIC module cannot be adjusted or repaired. If a gauge, an LED indicator, a VFD unit, the electronic circuit board, the circuit board hardware, the cluster overlay, or the EMIC housing are damaged or faulty, the entire EMIC module must be replaced. The cluster lens, hood and mask unit and the individual incandescent lamp bulbs with holders are available for separate service replacement.

OPERATION

The ElectroMechanical Instrument Cluster (EMIC) in this model also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN. The following information deals primarily with the instrument cluster functions of this unit. Additional details of the electronic body control functions of this unit may be found within the service information for the system or component that the EMIC controls. For example: Additional details of the audible warning functions of the EMIC are found within the Chime/Buzzer service information.

The EMIC is designed to allow the vehicle operator to monitor the conditions of many of the vehicle components and operating systems. The gauges and indicators in the EMIC provide valuable information about the various standard and optional powertrains, fuel and emissions systems, cooling systems, lighting systems, safety systems and many other convenience items. The EMIC is installed in the instrument panel so that all of these monitors can be easily viewed by the vehicle operator when driving, while still allowing relative ease of access for service.

The microprocessor-based EMIC hardware and software uses various inputs to control the gauges and indicators visible on the face of the cluster. Some of these inputs are hard wired, but most are in the form of electronic messages that are transmitted by other electronic modules over the Programmable Communications Interface (PCI) data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

The EMIC microprocessor smooths the input data using algorithms to provide gauge readings that are accurate, stable and responsive to operating conditions. These algorithms are designed to provide gauge readings during normal operation that are consistent with customer expectations. However, when abnormal conditions exist such as high coolant temperature, the algorithm can drive the gauge pointer to an extreme position and the microprocessor can sound a chime through the on-board audible tone transducer to provide distinct visual and audible indications of a problem to the vehicle operator. The EMIC may also produce audible warnings for other electronic modules in the vehicle based upon electronic tone request messages received over the PCI data bus. Each audible warning is intended to provide the vehicle operator with an audible alert to supplement a visual indication.

The EMIC circuitry operates on battery current received through a fused B(+) fuse on a non-switched fused B(+) circuit, and on battery current received through a fused ignition switch output (run-start) fuse on a fused ignition switch output (run-start) circuit. This arrangement allows the EMIC to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On or Start positions. The EMIC circuitry is grounded through a ground circuit and take out of the instrument panel wire harness with an eyelet terminal connector that is secured by a ground screw to a ground location near the center of the instrument panel structural support.

The EMIC also has a self-diagnostic actuator test capability, which will test each of the PCI bus message-controlled functions of the cluster by lighting the appropriate indicators, positioning the gauge needles at several predetermined calibration points across the gauge faces, and illuminating all segments of the odometer/trip odometer and gear selector indicator Vacuum-Fluorescent Display (VFD) units. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

GAUGES

All gauges receive battery current through the EMIC circuitry only when the ignition switch is in the On or Start positions. With the ignition switch in the Off position battery current is not supplied to any gauges, and the EMIC circuitry is programmed to move all of the gauge needles back to the low end of their respective scales. Therefore, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions.

All of the EMIC gauges are air core magnetic units. Two fixed electromagnetic coils are located within each gauge. These coils are wrapped at right angles to each other around a movable permanent magnet. The movable magnet is suspended within the coils on one end of a pivot shaft, while the gauge needle is attached to the other end of the shaft. One of the coils has a fixed current flowing through it to maintain a constant magnetic field strength. Current flow through the second coil changes, which causes changes in its magnetic field strength. The current flowing through the second coil is changed by the EMIC circuitry in response to messages received over the PCI data bus. The gauge needle moves as the movable permanent magnet aligns itself to the changing magnetic fields created around it by the electromagnets.

The gauges are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic data bus message inputs to the EMIC that control each gauge require the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific operation details for each gauge may be found elsewhere in this service information.

VACUUM-FLUORESCENT DISPLAYS

The Vacuum-Fluorescent Display (VFD) units are soldered to the EMIC electronic circuit board. With the ignition switch in the Off or Accessory positions, the odometer display is activated when the driver door is opened (Rental Car mode) and is deactivated when the driver door is closed. Otherwise, both display units are active when the ignition switch is in the On or Start positions, and inactive when the ignition switch is in the Off or Accessory positions.

The illumination intensity of the VFD units is controlled by the EMIC circuitry based upon an input from the headlamp switch and a dimming level input received from the panel dimmer switch. The EMIC synchronizes the illumination intensity of other VFD units with that of the units in the EMIC by sending electronic dimming level messages to other electronic modules in the vehicle over the PCI data bus.

The EMIC VFD units have several display capabilities including odometer, trip odometer, engine hours (except SRT-10), gear selector indication (PRNDL) for models with an automatic transmission, several warning or reminder indications, and various diagnostic information when certain fault conditions exist. An odometer/trip odometer switch on the EMIC circuit board is used to control some of the display modes. This switch is actuated manually by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just left of the tachometer. Actuating this switch momentarily with the ignition switch in the On position will toggle the VFD between the odometer and trip odometer modes. Depressing the switch button for about two seconds while the VFD is in the trip odometer mode will reset the trip odometer value to zero.

While in the odometer mode with the ignition switch in the On position and the engine not running, depressing the odometer/trip odometer switch for about six seconds will display the engine hours information. The engine hours feature is disabled for SRT-10 models. Holding this switch depressed while turning the ignition switch from the Off position to the On position will initiate the EMIC self-diagnostic actuator test. Refer to the instrument cluster diagnosis and testing service information for additional details on this cluster function. The EMIC microprocessor remembers which display mode is active when the ignition switch is turned to the Off position, and returns the VFD display to that mode when the ignition switch is turned On again.

The VFD units are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic data bus message inputs to the EMIC that control some of the VFD functions requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific operation details for the odometer, the trip odometer, the gear selector indicator and the various warning and reminder indicator functions of the VFD may be found elsewhere in this service information.

INDICATORS

Indicators are located in various positions within the EMIC and are all connected to the EMIC electronic circuit board. The cargo lamp indicator, door ajar indicator, high beam indicator, and turn signal indicators operate based upon hard wired inputs to the EMIC. The brake indicator is controlled by PCI data bus messages from the Controller Antilock Brake (CAB) as well as by hard wired park brake switch inputs to the EMIC. The seatbelt indicator is controlled by the EMIC programming, PCI data bus messages from the Airbag Control Module (ACM), and a hard wired seat belt switch input to the EMIC. The Malfunction Indicator Lamp (MIL) is normally controlled by PCI data bus messages from the Powertrain Control Module (PCM); however, if the EMIC loses PCI data bus communication, the EMIC circuitry will automatically turn the MIL on until PCI data bus communication is restored. The EMIC uses PCI data bus messages from the Front Control Module (FCM), the PCM, the diesel engine only Engine Control Module (ECM), the ACM, the CAB, and the Sentry Key Immobilizer Module (SKIM) to control all of the remaining indicators.

The various EMIC indicators are controlled by different strategies; some receive fused ignition switch output from the EMIC circuitry and have a switched ground, while others are grounded through the EMIC circuitry and have a switched battery feed. However, all indicators are completely controlled by the EMIC microprocessor based upon various hard wired and electronic message inputs. The tow/haul indicator and those located within the VFD units are dimmable. All other indicators are illuminated at a fixed intensity, which is not affected by the selected illumination intensity of the EMIC general illumination lamps. The illumination intensity of the dimmable indicators is synchronized with that of the EMIC general illumination lamps.

In addition, certain indicators in this instrument cluster are automatically configured or self-configured. This feature allows the configurable indicators to be enabled by the EMIC circuitry for compatibility with certain optional equipment. The EMIC defaults for the ABS indicator and airbag indicator are enabled, and these configuration settings must be programmatically disabled in the EMIC using a diagnostic scan tool for vehicles that do not have this equipment. The automatically configured or self-configured indicators remain latent in each EMIC at all times and will be active only when the EMIC receives the appropriate PCI message inputs for that optional system or equipment.

The hard wired indicator inputs may be diagnosed using conventional diagnostic methods. However, the EMIC circuitry and PCI bus message controlled indicators are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic message inputs to the EMIC that control an indicator requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information. Specific details of the operation for each indicator may be found elsewhere in this service information.

CLUSTER ILLUMINATION

The EMIC has several illumination lamps that are illuminated whenever the exterior lighting is turned On. The illumination intensity of these lamps is adjusted when the interior lighting thumbwheel on the headlamp switch is rotated (down to dim, up to brighten) to one of six available minor detent positions. The EMIC monitors a resistor multiplexed input from the headlamp switch on a dimmer input circuit. In response to that input, the EMIC electronic circuitry converts a fused 12-volt input it receives on a hard wired panel lamps dimmer switch signal circuit into a 12-volt Pulse Width Modulated (PWM) output.

The EMIC uses this PWM output to control the illumination intensity of the cluster illumination lamps and the VFD units on the EMIC circuit board, then provides a synchronized PWM output on the various hard wired fused panel lamps dimmer switch signal circuits to control and synchronize the illumination intensity of other incandescent illumination lamps in the vehicle. The EMIC also transmits electronic dimming level messages over the PCI data bus to other electronic modules in the vehicle to control and synchronize the illumination intensity of their VFD units to that of the EMIC VFD units.

In addition, the thumbwheel on the headlamp switch has a Parade Mode position to provide a parade or funeral mode. The EMIC monitors the request for this mode from the headlamp switch, then transmits an electronic dimming level message to illuminate all VFD units in the vehicle at full (daytime) intensity for easier visibility when driving in daylight with the exterior lighting turned on.

The hard wired headlamp switch and panel lamps dimmer inputs to and outputs from the EMIC may be diagnosed using conventional diagnostic methods. However, proper testing of the PWM processing of the EMIC and the electronic dimming level messages sent by the EMIC over the PCI data bus requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

INPUT AND OUTPUT CIRCUITS

HARD WIRED INPUTS

The hard wired inputs to the EMIC include the following:

- **Brake Lamp Switch Output**
- **Driver Cylinder Lock Switch Sense**
- **Driver Door Ajar Switch Sense**
- **Driver Door Lock Switch MUX - with Power Locks**
- **Fused B(+) - Ignition-Off Draw**
- **Fused B(+) - Power Lock Feed - with Power Locks**
- **Fused Ignition Switch Output (Accessory-Run)**
- **Fused Ignition Switch Output (Off-Run-Start)**
- **Fused Ignition Switch Output (Run-Start)**
- **Headlamp Dimmer Switch MUX**
- **Headlamp Switch MUX**
- **Horn Relay Control**
- **Key-In Ignition Switch Sense**
- **Left Rear Door Ajar Switch Sense**
- **Panel Lamps Dimmer Switch Signal**
- **Park Brake Switch Sense**
- **Passenger Door Ajar Switch Sense**
- **Passenger Door Lock Switch MUX - with Power Locks**
- **Radio Control MUX**
- **Right Rear Door Ajar Switch Sense**

- **RKE Supply - with RKE**
- **Seat Belt Switch Sense**
- **Transmission Range Sensor MUX - with Auto Trans**
- **Turn/Hazard Switch MUX**
- **Washer/Beam Select Switch MUX**
- **Wiper Switch MUX**

Refer to the appropriate wiring information for additional details.

HARD WIRED OUTPUTS

The hard wired outputs of the EMIC include the following:

- **Accessory Switch Bank Illumination Driver**
- **BTSI Driver - with Auto Trans**
- **Cargo Lamp Driver**
- **Dome/Overhead Lamp Driver**
- **Driver Door Unlock Driver - with Power Locks**
- **Headlamp Switch Illumination Driver**
- **Heated Seat Switch Indicator Driver - with Heated Seats**
- **Heater-A/C Control Illumination Driver**
- **Left Door Lock Driver - with Power Locks**
- **Left Rear Door Unlock Driver - with Power Locks**
- **Map/Glove Box Lamp Driver**
- **Oil Temperature Gauge Illumination Driver - SRT-10 only**
- **Radio Illumination Driver**
- **Right Door Lock Driver - with Power Locks**
- **Right Door Unlock Driver - with Power Locks**
- **Transfer Case Switch Illumination Driver - with Four-Wheel Drive**

Refer to the appropriate wiring information for additional details.

GROUND S

The EMIC receives and supplies a ground path to several switches and sensors through the following hard wired circuits:

- **Ground - Illumination (2 Circuits)**
- **Ground - Power Lock - with Power Locks**
- **Ground - Signal**
- **Headlamp Switch Return**
- **Multi-Function Switch Return**
- **Transmission Range Sensor Return - with Auto Trans**

Refer to the appropriate wiring information for additional details.

COMMUNICATION

The EMIC has provisions for the following communication circuits:

- **PCI Data Bus**
- **RKE Program Serial Data - with RKE**
- **RKE Transmit Serial Data - with RKE**

Refer to the appropriate wiring information for additional details.

DIAGNOSIS AND TESTING

INSTRUMENT CLUSTER

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

If all of the instrument cluster gauges and indicators are inoperative, be certain to check the instrument cluster fused B(+) fuse and the instrument cluster fused B(+) and ground circuits for shorts or opens. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

If an individual hard wired gauge or indicator is inoperative, refer to the diagnosis and testing service information for that specific gauge or indicator. If an individual Programmable Communications Interface (PCI) data bus message-controlled gauge or indicator is inoperative, perform the Actuator Test as follows:

CAUTION: Instrument clusters used in this model automatically configure themselves for compatibility with the features and optional equipment in the vehicle in which they are initially installed. The instrument cluster is programmed to do this by embedding the Vehicle Identification Number (VIN) and other information critical to proper cluster operation into electronic memory. This embedded information is learned through electronic messages received from other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus, and through certain hard wired inputs received when the cluster is connected to the vehicle electrically. Once configured, the instrument cluster memory may be irreparably damaged and certain irreversible configuration errors may occur if the cluster is connected electrically to another vehicle; or, if an electronic module from another vehicle is connected that provides data to the instrument cluster (including odometer values) that conflicts with that which was previously learned and stored. Therefore, the practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. Failure to observe this caution may result in instrument cluster damage, which is not reimbursable under the terms of the product warranty. Service replacement instrument clusters are provided with the correct VIN, and the certified odometer and engine hours values embedded into cluster memory, but will otherwise be automatically configured for compatibility with the features and optional equipment in the vehicle in which they are initially installed.

NOTE: Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If the problem being diagnosed involves improper illumination of the cruise indicator, the electronic throttle control indicator, the tow/haul indicator, the service four-wheel drive indicator, the transmission overtemp indicator, the upshift indicator, the security indicator or the gear selector indicator, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the On position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the configurable indicators accordingly.

ACTUATOR TEST

The instrument cluster actuator test will put the instrument cluster into its self-diagnostic mode. In this mode the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, and the indicators are capable of operating as designed. During the actuator test the instrument cluster circuitry will position each of the gauge needles at various calibration points, illuminate all of the segments in the Vacuum Fluorescent Display (VFD) units, turn all of the indicators on and off again, display any Diagnostic Trouble Code (DTC) information, and display the number of ignition key cycles that have occurred since the DTC was detected. It is suggested that a note pad and pencil be used to write down any fault information that is displayed during the test for reference.

Successful completion of the actuator test will confirm that the instrument cluster is operational. However, there may still be a problem with the PCI data bus, the Powertrain Control Module (PCM), the Engine Control Module (ECM), the Front Control Module (FCM), the Transmission Control Module (TCM), the Transfer Case Control Module (TCCM), the Airbag Control Module (ACM), the Controller Anti-lock Brake (CAB), or the hard wired inputs to one of these electronic control modules. Use a diagnostic scan tool to diagnose these components. Refer to the appropriate diagnostic information.

1. Begin the test with the ignition switch in the Off position.
2. Depress the odometer/trip odometer switch button.
3. While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the On position, but do not start the engine.
4. Release the odometer/trip odometer switch button.
5. The instrument cluster will simultaneously begin to illuminate all of the operational segments in both VFD units and perform a bulb check of each operational LED indicator. The VFD segments and LED indicators remain illuminated as each gauge needle is swept to several calibration points and back. If a VFD segment or an LED indicator fails to illuminate, or if a gauge needle fails to sweep through the calibration points and back during this test, the instrument cluster must be replaced. Following these tests, the actuator test will proceed as described in Step 6.
6. The text "C Code" is displayed in the odometer VFD for about three seconds. If there is no stored fault information, the display will show two pairs of zeroes in the format "00" "00", which indicate that the display of fault information is done. If there is stored fault information, two sets of two-digit alpha and alpha-numeric fault codes will appear in the odometer display for a three second interval. The first pair of digits represents a Diagnostic Trouble Code (DTC), or fault code for the instrument cluster. The second pair of digits is a counter for the number of ignition key cycles that have occurred since the displayed DTC was set. The instrument cluster will continue to display additional sets of two pairs of digits at three second intervals until all of the stored codes have been displayed, which is again signaled by a code of "00" "00". Refer to the Instrument Cluster Failure Message table for a description of each fault code that the instrument cluster displays. If an instrument cluster fault is displayed, use a diagnostic scan tool to diagnose the problem. Refer to the appropriate diagnostic information.

INSTRUMENT CLUSTER FAILURE MESSAGE		
FAULT CODE	DESCRIPTION	CORRECTION
01	Cargo lamp LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
02	Cargo lamp LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
03	Door ajar LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
04	Door ajar LED output circuit overload/ short to battery.	Refer to the appropriate diagnostic information.
05	ETC LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
06	ETC LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
07	Seatbelt LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
08	Seatbelt LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
09	Air Bag LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
0A	Air Bag LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
0B	BTSL output circuit shorted or open.	Refer to the appropriate diagnostic information.

INSTRUMENT CLUSTER FAILURE MESSAGE		
FAULT CODE	DESCRIPTION	CORRECTION
0C	PRNDL switch input circuit low.	Refer to the appropriate diagnostic information.
0D	PRNDL switch input circuit high.	Refer to the appropriate diagnostic information.
0E	DTCM switch input circuit low.	Refer to the appropriate diagnostic information.
0F	DTCM switch input circuit high.	Refer to the appropriate diagnostic information.
20	Panel dimmer input circuit low.	Refer to the appropriate diagnostic information.
21	Panel dimmer input circuit high.	Refer to the appropriate diagnostic information.
22	Headlamp switch input circuit shorted.	Refer to the appropriate diagnostic information.
23	Headlamp switch input circuit open.	Refer to the appropriate diagnostic information.
24	Turn hazard switch input circuit shorted.	Refer to the appropriate diagnostic information.
25	Turn hazard switch input circuit open.	Refer to the appropriate diagnostic information.
26	Panel illumination output circuit low/high fault.	Refer to the appropriate diagnostic information.
27	Courtesy/dome output circuit shorted or open.	Refer to the appropriate diagnostic information.
28	Glovebox/map lamp output circuit shorted or open.	Refer to the appropriate diagnostic information.
29	Cargo lamp output circuit shorted or open.	Refer to the appropriate diagnostic information.
2B	High Beam LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
2C	High Beam LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
2D	Brake LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
2E	Brake LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
2F	Check Gages LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
30	Check Gages LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
31	ABS LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
32	ABS LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
33	MIL LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
34	MIL LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.

INSTRUMENT CLUSTER FAILURE MESSAGE		
FAULT CODE	DESCRIPTION	CORRECTION
35	Water in Fuel LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
36	Water in Fuel LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
37	Wait to Start LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
38	Wait to Start LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
39	Trans Temp LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
3A	Trans Temp LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
3B	Low Fuel LED output circuit open load/short to ground.	Refer to the appropriate diagnostic information.
3C	Low Fuel LED output circuit overload/short to battery.	Refer to the appropriate diagnostic information.
3D	BTSL output circuit high fault.	Refer to the appropriate diagnostic information.
40	Wiper switch input circuit shorted.	Refer to the appropriate diagnostic information.
41	Wiper switch input circuit open.	Refer to the appropriate diagnostic information.
42	Wash/beam input circuit shorted.	Refer to the appropriate diagnostic information.
60	Passenger door lock switch input circuit shorted.	Refer to the appropriate diagnostic information.
61	Passenger door lock switch input circuit open.	Refer to the appropriate diagnostic information.
62	Passenger door lock switch input circuit stuck.	Refer to the appropriate diagnostic information.
63	Driver door lock switch input circuit shorted.	Refer to the appropriate diagnostic information.
64	Driver door lock switch input circuit open.	Refer to the appropriate diagnostic information.
65	Driver door lock switch input circuit stuck.	Refer to the appropriate diagnostic information.
66	All door lock output circuit shorted to ground or voltage.	Refer to the appropriate diagnostic information.
67	All door unlock output circuit shorted to ground or voltage.	Refer to the appropriate diagnostic information.
68	Driver door unlock output circuit shorted to ground or voltage.	Refer to the appropriate diagnostic information.
6C	Driver cylinder lock switch input circuit shorted.	Refer to the appropriate diagnostic information.
6E	Driver cylinder lock switch input circuit stuck.	Refer to the appropriate diagnostic information.
80	Incorrect odometer value found.	Refer to the appropriate diagnostic information.

INSTRUMENT CLUSTER FAILURE MESSAGE		
FAULT CODE	DESCRIPTION	CORRECTION
81	Remote radio switch input circuit high.	Refer to the appropriate diagnostic information.
82	Remote radio switch stuck.	Refer to the appropriate diagnostic information.
A0	Internal module FLASH memory checksum failure.	Refer to the appropriate diagnostic information.
A1	Internal module bootloader failure.	Refer to the appropriate diagnostic information.
A3	Battery voltage open.	Refer to the appropriate diagnostic information.
A4	Ignition Run/Start circuit rationality.	Refer to the appropriate diagnostic information.
A5	TCCM messages not received.	Refer to the appropriate diagnostic information.
A6	Ignition Unlock circuit rationality.	Refer to the appropriate diagnostic information.
A7	VIN checksum error.	Refer to the appropriate diagnostic information.
A8	VIN previously stored.	Refer to the appropriate diagnostic information.
A9	PCI bus internal failure.	Refer to the appropriate diagnostic information.
AA	PCM messages not received.	Refer to the appropriate diagnostic information.
AB	TCM messages not received.	Refer to the appropriate diagnostic information.
AC	ABS messages not received.	Refer to the appropriate diagnostic information.
AD	FCM messages not received.	Refer to the appropriate diagnostic information.
AE	ACM messages not received.	Refer to the appropriate diagnostic information.
AF	SKIM messages not received.	Refer to the appropriate diagnostic information.
B0	RKE fob batteries low.	Refer to the appropriate diagnostic information.
B1	RKE module communication link.	Refer to the appropriate diagnostic information.
B2	Left Turn LED open circuit.	Refer to the appropriate diagnostic information.
B3	Left Turn LED short circuit/overtemp condition.	Refer to the appropriate diagnostic information.
B4	Right Turn LED open circuit.	Refer to the appropriate diagnostic information.
B5	Right Turn LED sshort circuit/overtemp condition.	Refer to the appropriate diagnostic information.
B6	Panel illumination open circuit.	Refer to the appropriate diagnostic information.

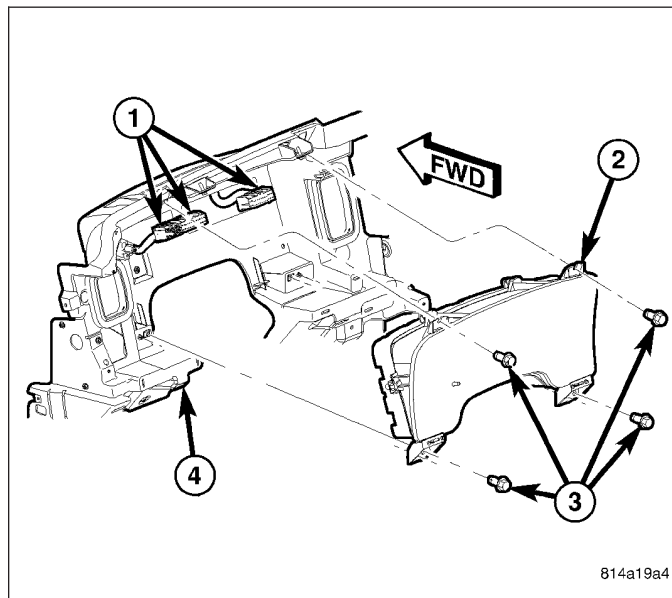
INSTRUMENT CLUSTER FAILURE MESSAGE		
FAULT CODE	DESCRIPTION	CORRECTION
B7	Dome lamp open circuit.	Refer to the appropriate diagnostic information.
B8	Cargo lamp open circuit.	Refer to the appropriate diagnostic information.
B9	Door Unlock to Lock all shorted to ground.	Refer to the appropriate diagnostic information.
00	Done	All Diagnostic Trouble Codes (DTC) have been displayed.

- The actuator test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test, if the ignition switch is turned to the Off position during the test, or if a vehicle speed message indicating that the vehicle is moving is received from the PCM over the PCI data bus during the test.
- Go back to Step 1 to repeat the test, if necessary.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

- Disconnect and isolate the battery negative cable.
- Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
- Remove the four screws (3) that secure the instrument cluster (2) to the instrument panel structural support (4).
- Pull the instrument cluster rearward far enough to access and disconnect the three instrument panel wire harness connectors (1) from the connector receptacles on the back of the cluster housing.
- Remove the instrument cluster from the instrument panel.



DISASSEMBLY

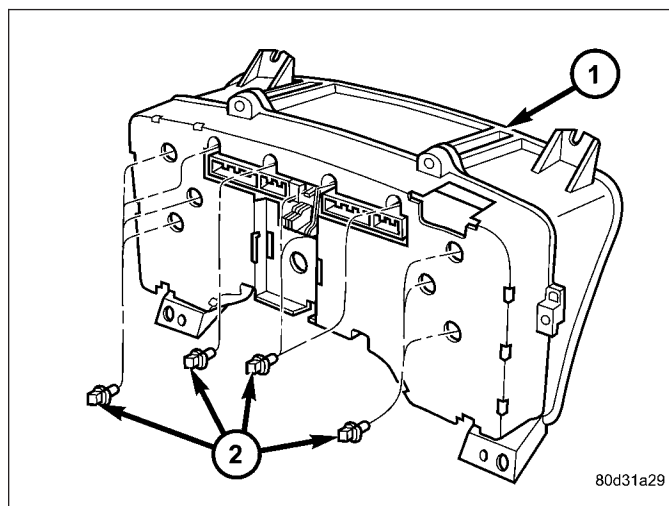
WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

NOTE: Some of the components for the instrument cluster used in this vehicle are serviced individually. The serviced components include the incandescent instrument cluster illumination lamp bulbs (including the integral bulb holders), and the cluster lens, hood and mask unit. Following are the procedures for disassembling these components from the instrument cluster.

CLUSTER BULB

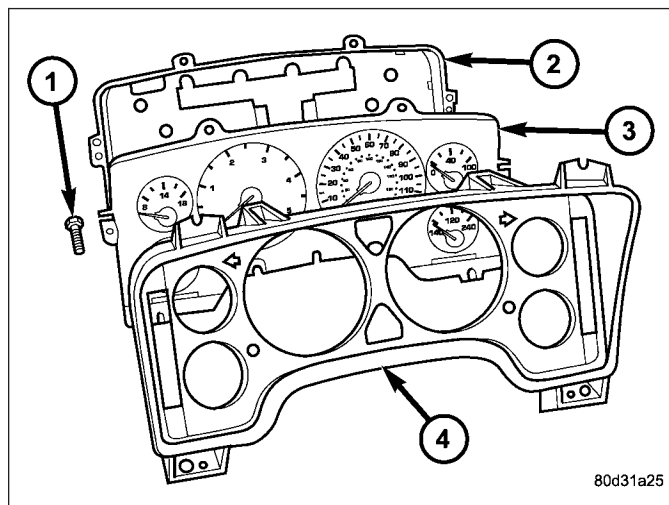
NOTE: This procedure applies to each of the incandescent cluster illumination lamp bulb and bulb holder units. If the vehicle is equipped with the optional Remote Keyless Entry (RKE) system, the RKE module must be removed from the instrument cluster rear cover to access the lower center cluster illumination lamp, which is located on the circuit board directly behind the RKE module. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY MODULE - REMOVAL).

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).
3. From the back of the instrument cluster (1), turn the bulb holder counterclockwise about 30 degrees on the cluster electronic circuit board.
4. Pull the bulb and bulb holder unit straight out from the keyed opening in the cluster electronic circuit board.



CLUSTER LENS, HOOD, AND MASK

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).
3. From the back of the instrument cluster, remove the eight screws (1) around the outer perimeter of the rear cover (2) that secure the lens, hood, and mask unit (4) to the cluster housing (3).
4. Remove the lens, hood, and mask unit from the face of the instrument cluster.



ASSEMBLY

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

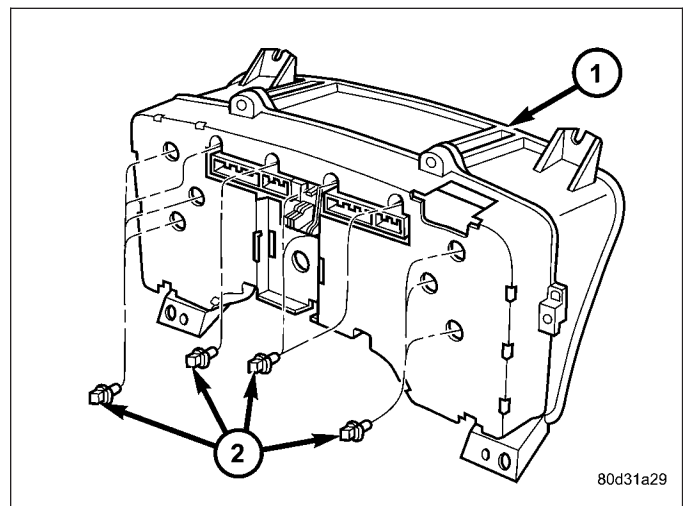
NOTE: Some of the components for the instrument cluster used in this vehicle are serviced individually. The serviced components include the incandescent instrument cluster illumination lamp bulbs (including the integral bulb holders), and the cluster lens, hood and mask unit. Following are the procedures for assembling these components to the instrument cluster.

CLUSTER BULB

CAUTION: Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the instrument cluster, the electronic circuit board and/or the gauges.

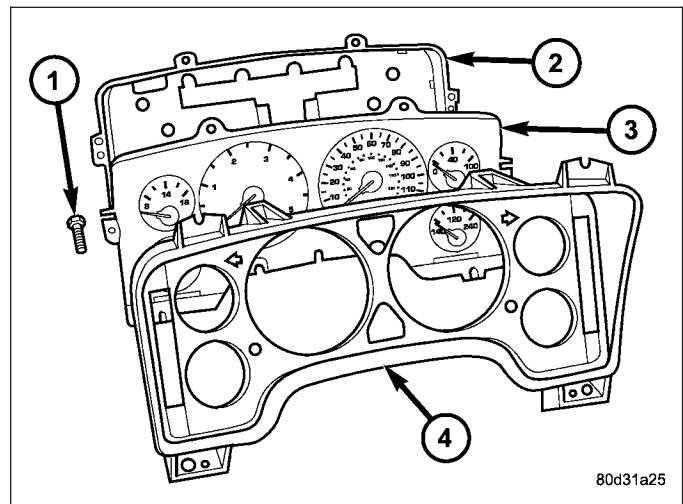
NOTE: This procedure applies to each of the incandescent cluster illumination lamp bulb and bulb holder units. If the vehicle is equipped with the optional Remote Keyless Entry (RKE) system, and the RKE receiver module was removed from the instrument cluster rear cover to access the lower center cluster illumination lamp, reinstall the RKE module after the bulb is replaced on the circuit board. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY MODULE - INSTALLATION).

1. Align the bulb and bulb holder unit with the keyed opening on the back of the cluster electronic circuit board.
2. Insert the bulb and bulb holder into the cluster electronic circuit board until the bulb holder is firmly seated.
3. Rotate the bulb holder clockwise about 30 degrees to lock it into place.
4. Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).
5. Reconnect the battery negative cable.



CLUSTER LENS, HOOD, AND MASK

1. Position the cluster lens, hood, and mask unit (4) over the face of the instrument cluster (3). Be certain that the odometer/trip odometer switch button is inserted through the proper clearance holes in the mask and the lens.
2. From the back of the instrument cluster, install and tighten the eight screws (1) around the outer perimeter of the rear cover (2) that secure the lens, hood, and mask unit to the cluster housing. Tighten the screws to 1 N·m (10 in. lbs.).
3. Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).
4. Reconnect the battery negative cable.



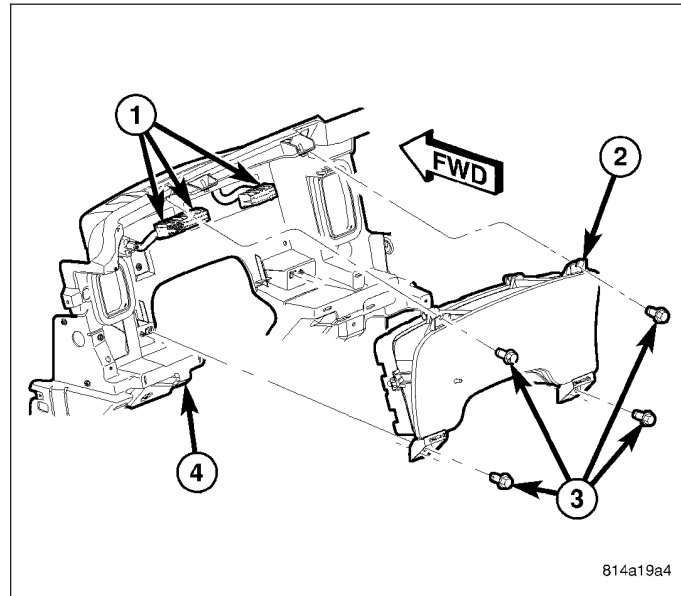
INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the instrument cluster close enough to the instrument panel to reconnect the three instrument panel wire harness connectors (1) to the connector receptacles on the back of the cluster housing (2).
2. Position the instrument cluster into the instrument panel (4).
3. Install and tighten the four screws (3) that secure the instrument cluster to the instrument panel structural support. Tighten the screws to 4 N·m (31 in. lbs.).
4. Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).
5. Reconnect the battery negative cable.

NOTE: Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If a

problem is noted that involves improper illumination of the cruise indicator, the electronic throttle control indicator, the service four-wheel drive indicator, the tow/haul indicator, the transmission overtemp indicator, the upshift indicator, the security indicator or the gear selector indicator, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the On position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the configurable indicators accordingly.



ABS INDICATOR

DESCRIPTION

An Antilock Brake System (ABS) indicator is standard equipment on all instrument clusters. However, the instrument cluster can be programmed to disable this indicator on vehicles that are not equipped with the

ABS or Rear Wheel Anti-Lock (RWAL) brake systems, which are not available in some markets. On vehicles equipped with a gasoline engine, the ABS indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer. On vehicles equipped with a diesel engine, the ABS indicator is located on the right side of the instrument cluster, to the right of the engine temperature gauge.



The ABS indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for "Failure of Anti-lock Braking System" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The ABS indicator is serviced as a unit with the instrument cluster.

OPERATION

The ABS indicator gives an indication to the vehicle operator when the ABS system is faulty or inoperative. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Programmable Communications Interface (PCI) data bus.

The ABS indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ABS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ABS indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **ABS Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the ABS indicator will be illuminated. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no lamp-on or lamp-off messages from the CAB for five consecutive message cycles, the ABS indicator is illuminated. The indicator remains illuminated until the cluster receives a valid message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the ABS indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.
- **ABS Diagnostic Test** - The ABS indicator is blinked on and off by lamp-on and lamp-off messages from the CAB during the performance of the ABS diagnostic tests.

The CAB continually monitors the ABS circuits and sensors to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ABS indicator fails to light due to an open or short in the cluster ABS indicator circuit, the cluster sends a message notifying the CAB of the condition, then the instrument cluster and the CAB will each store a DTC.

For proper diagnosis of the antilock brake system, the CAB, the PCI data bus, or the electronic message inputs to the instrument cluster that control the ABS indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

AIRBAG INDICATOR

DESCRIPTION

An airbag indicator is standard equipment on all instrument clusters. However, the instrument cluster can be programmed to disable this indicator on vehicles that are not equipped with the airbag system, which is not available in some markets. The airbag indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.

**AIR
BAG**

The airbag indicator consists of a stencil-like cutout of the words "AIR BAG" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the "AIR BAG" text to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The airbag indicator is serviced as a unit with the instrument cluster.

OPERATION

The airbag indicator gives an indication to the vehicle operator when the airbag system is faulty or inoperative. The airbag indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Airbag Control Module (ACM) over the Programmable Communications Interface (PCI) data bus.

The airbag indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the airbag indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the airbag indicator is illuminated for about six seconds. The entire bulb test is a function of the ACM.
- **ACM Lamp-On Message** - Each time the cluster receives a lamp-on message from the ACM, the airbag indicator will be illuminated. The indicator remains illuminated for about twelve seconds or until the cluster receives a lamp-off message from the ACM, whichever is longer.
- **Communication Error** - If the cluster receives no airbag messages for three consecutive seconds, the airbag indicator is illuminated. The indicator remains illuminated until the cluster receives a single lamp-off message from the ACM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the airbag indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the airbag indicator is a function of the instrument cluster.

The ACM continually monitors the airbag system circuits and sensors to decide whether the system is in good operating condition. The ACM then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the ACM sends a lamp-on message after the bulb test, it indicates that the ACM has detected a system malfunction and/or that the airbags and seat belt tensioners may not deploy when required, or may deploy when not required. The ACM will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the airbag indicator fails to illuminate due to an open or short in the cluster airbag indicator circuit, the cluster sends a message notifying the ACM of the condition, the instrument cluster and the ACM will each store a DTC, and the cluster will flash the seatbelt indicator on and off as a backup to notify the vehicle operator.

For proper diagnosis of the airbag system, the ACM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the airbag indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

BRAKE/PARK BRAKE INDICATOR

DESCRIPTION

A brake indicator is standard equipment on all instrument clusters. This indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer.



The brake indicator consists of a stencil-like cutout of the word "BRAKE" and the International Control and Display Symbol icon for "Brake Failure" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the "BRAKE" text and icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The brake indicator is serviced as a unit with the instrument cluster.

OPERATION

The brake indicator gives an indication to the vehicle operator when the parking brake is applied, when there are certain brake hydraulic system malfunctions as indicated by a low brake hydraulic fluid level condition, or when the brake fluid level switch is disconnected. The brake indicator can also give an indication when certain faults are detected in the Antilock Brake System (ABS). This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, electronic messages received by the cluster from the Controller

Antilock Brake (CAB) over the Programmable Communications Interface (PCI) data bus, and a hard wired input from the park brake switch.

The brake indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the brake indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the brake indicator is illuminated by the instrument cluster for about two seconds as a bulb test.
- **Brake Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the brake indicator will be illuminated. The CAB can also send brake lamp-on messages as feedback during ABS diagnostic procedures. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Park Brake Switch Input** - Each time the cluster detects ground on the park brake switch sense circuit (park brake switch closed = park brake applied or not fully released) while the ignition switch is in the On position, the brake indicator flashes on and off. The indicator continues to flash until the park brake switch sense input to the cluster is an open circuit (park brake switch open = park brake fully released), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the brake indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The park brake switch on the park brake pedal mechanism provides a hard wired ground input to the instrument cluster circuitry through the park brake switch sense circuit whenever the park brake is applied or not fully released. The CAB continually monitors the ABS system circuits and sensors, including the brake fluid level switch on the brake master cylinder reservoir, to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a brake hydraulic system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects.

For further diagnosis of the brake indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The park brake switch input to the instrument cluster can be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information. For proper diagnosis of the brake fluid level switch, the ABS, the CAB, the PCI data bus, or the electronic message inputs to the instrument cluster that control the brake indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

BRAKE INDICATOR

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired park brake switch input to the EMIC may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the Controller Antilock Brake (CAB), the Programmable Communications Interface (PCI) data bus, or the electronic message inputs also used by the EMIC to provide brake indicator operation. The most reliable, efficient, and accurate means to diagnose the EMIC, the CAB, the PCI data bus, and the electronic message inputs for the brake indicator operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

CARGO LAMP INDICATOR

DESCRIPTION

A cargo lamp indicator is standard equipment on all instrument clusters. The cargo lamp indicator is located on the right side of the instrument cluster, to the right of the oil pressure gauge.

**CARGO
LAMP**

The cargo lamp indicator consists of a stencil-like cutout of the words "CARGO LAMP" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the "CARGO LAMP" text to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The cargo lamp indicator is serviced as a unit with the instrument cluster.

OPERATION

The cargo lamp indicator gives an indication to the vehicle operator when the exterior cargo lamp is illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, a hard wired multiplex input received by the cluster from the panel lamps dimmer switch on the headlamp dimmer switch mux circuit, and electronic unlock request messages received from the optional Remote Keyless Entry (RKE) module.

The cargo lamp indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the cargo lamp indicator for the following reasons:

- **Cargo Lamp-On Input** - Each time the cluster detects a cargo lamp-on input from the headlamp switch on the headlamp dimmer switch mux circuit, the cargo lamp and the cargo lamp indicator will be illuminated. The cargo lamp and indicator remain illuminated until the cluster receives a cargo lamp-off input from the headlamp switch, until the cluster has completed an interior lamps load shed (about five minutes), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the cargo lamp indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the headlamp dimmer switch circuit to determine the proper interior lamps features and panel lamps illumination levels to provide. The cluster then energizes and de-energizes a low side driver circuit to control the exterior cargo lamp. Each time the instrument cluster energizes the cargo lamp driver and the ignition switch is in the On or Start positions, the cluster also turns on the cargo lamp indicator. For further diagnosis of the cargo lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the cargo lamp or the headlamp switch inputs to the instrument cluster that control the cargo lamp indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

CHECK GAUGES INDICATOR

DESCRIPTION

A check gauges indicator is standard equipment on all instrument clusters. On vehicles equipped with a gasoline engine, the check gauges indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer. On vehicles equipped

**CHECK
GAGES**

with a diesel engine, the check gauges indicator is located on the left side of the instrument cluster, to the left of the voltage gauge.

The check gauges indicator consists of a stencil-like cutout of the words "CHECK GAGES" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the "CHECK GAGES" text to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The check gauges indicator is serviced as a unit with the instrument cluster.

OPERATION

The check gauges indicator gives an indication to the vehicle operator when certain instrument cluster gauge readings reflect a condition requiring immediate attention. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles equipped with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The check gauges indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the check gauges indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the check gauges indicator is illuminated for about two seconds as a bulb test.
- **Engine Temperature High Message** - Each time the cluster receives three consecutive bus messages from the PCM or ECM indicating the engine coolant temperature of a gasoline engine is about 122° C (252° F) or higher, or of a diesel engine is about 112° C (233° F) or higher, the check gauges indicator will be illuminated and a single chime is sounded. The indicator remains illuminated until the cluster receives a message from the PCM or ECM indicating that the engine coolant temperature of a gasoline engine is below about 122° C (252° F), or of a diesel engine is below about 112° C (233° F), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Engine Oil Pressure Low Message** - Each time the cluster receives three consecutive bus messages from the PCM or ECM indicating the engine oil pressure is about 41 kPa (6 psi) or lower, the check gauges indicator will be illuminated and a single chime is sounded. The indicator remains illuminated until the cluster receives a message from the PCM or ECM indicating that the engine oil pressure is above about 41 kPa (6 psi), or until the ignition switch is turned to the Off position, whichever occurs first. The cluster will only turn the indicator on in response to an engine oil pressure low message if the engine speed is greater than zero.
- **System Voltage Low (Charge Fail) Message** - Each time the cluster receives three consecutive messages from the PCM or ECM indicating the electrical system voltage is less than about 9.0 volts (charge fail condition) or that the battery temperature sensor input is an open circuit, the check gauges indicator will be illuminated and a single chime is sounded. The indicator remains illuminated until the cluster receives a single message from the PCM or ECM indicating the electrical system voltage is greater than about 9.5 volts (but less than about 15.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **System Voltage High Message** - Each time the cluster receives three consecutive messages from the PCM or ECM indicating the electrical system voltage is greater than about 15.5 volts, the check gauges indicator will be illuminated and a single chime is sounded. The indicator remains illuminated until the cluster receives a single message from the PCM or ECM indicating the electrical system voltage is less than about 15.0 volts (but greater than about 9.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the check gauges indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the engine temperature, oil pressure, and electrical system voltage, then sends the proper messages to the instrument cluster. On vehicles with a diesel engine, the ECM continually monitors the engine temperature, oil pressure, and electrical system voltage, then sends the proper messages to the instrument cluster. For further diagnosis of the check gauges indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the check gauges indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

CRUISE INDICATOR

DESCRIPTION

A cruise indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional speed control system, this indicator is electronically disabled. The cruise indicator consists of the word "CRUISE", which appears in the lower portion of the gear selector indicator Vacuum-Fluorescent Display (VFD) unit.



CRUISE

The gear selector indicator VFD is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the speedometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated. The "CRUISE" text appears in a blue-green color and at the same lighting level as the gear selector indicator information when it is illuminated by the instrument cluster electronic circuit board. The cruise indicator is serviced as a unit with the VFD in the instrument cluster.

OPERATION

The cruise indicator gives an indication to the vehicle operator when the speed control system is turned On, regardless of whether the speed control is engaged. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus.

The cruise indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the cruise indicator for the following reasons:

- **Cruise Lamp-On Message** - Each time the cluster receives a cruise lamp-on message from the PCM indicating the speed control system has been turned On, the cruise indicator is illuminated. The indicator remains illuminated until the cluster receives a cruise lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the cruise indicator will be turned on, then off again during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors the speed control switches to determine the proper outputs to the speed control servo. The PCM then sends the proper cruise indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the cruise indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the speed control system, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the cruise indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

DOOR AJAR INDICATOR

DESCRIPTION

A door ajar indicator is standard equipment on all instrument clusters. The door ajar indicator is located on the right side of the instrument cluster, to the right of the engine temperature gauge.

DOOR
AJAR

The door ajar indicator consists of a stencil-like cutout of the words "DOOR AJAR" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the "DOOR AJAR" text to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The door ajar indicator is serviced as a unit with the instrument cluster.

OPERATION

The door ajar indicator gives an indication to the vehicle operator that one or more of the passenger compartment doors may be open or not completely latched. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and hard wired inputs received by the cluster from the door ajar switches located in each door latch unit.

The door ajar indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the door ajar indicator for the following reasons:

- **Door Ajar Switch Input** - Each time the cluster detects ground on any one of the door ajar switch sense circuits (door ajar switch closed = door is open or not completely latched) the door ajar indicator will be illuminated. The indicator remains illuminated until all of the door ajar switch sense inputs to the cluster are an open circuit (door ajar switch open = door fully closed), until the cluster has completed an interior lamps load shed (about five minutes), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the door ajar indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the door ajar switches to determine the status of the doors. For further diagnosis of the door ajar indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the door ajar switches and circuits, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DIAGNOSIS AND TESTING).

ENGINE TEMPERATURE GAUGE

DESCRIPTION

An engine coolant temperature gauge is standard equipment on all instrument clusters. The engine coolant temperature gauge is located in the lower right quadrant of the instrument cluster, below the oil pressure gauge. The engine coolant temperature gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the cluster overlay that reads left-to-right from "C" (or Cold) to "H" (or Hot) for gasoline engines except SRT-10. On SRT-10 models, the scale reads from "60"° C to "120"° C in markets where a metric instrument cluster is specified, or from "140"° F to "260"° F in all other markets. On vehicles with a diesel engine, the scale reads from "60"° C to "120"° C in markets where a metric instrument cluster



is specified, or from "140"° F to "245"° F in all other markets. An International Control and Display Symbol icon for "Engine Coolant Temperature" is located on the cluster overlay, directly below the left end of the gauge scale.

On all models except SRT-10 the engine coolant temperature gauge graphics are black against a white field except for two red graduations at the high end of the gauge scale. On SRT-10 the gauge graphics are black against a silver field except for a single red zone at the high end of the gauge scale. In either case, the gauge graphics are clearly visible within the instrument cluster in daylight.

When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the black gauge graphics appear blue-green and the red graphics still appear red. The gauge needle has internal optical illumination. Gauge illumination is provided by replaceable incandescent bulb and holder units located on the instrument cluster electronic circuit board. The engine coolant temperature gauge is serviced as a unit with the instrument cluster.

OPERATION

The engine coolant temperature gauge gives an indication to the vehicle operator of the engine coolant temperature. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles equipped with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The engine coolant temperature gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Temperature Message** - Each time the cluster receives a message from the PCM or ECM indicating the engine coolant temperature is between the low end of normal [about 54° C (130° F) for gasoline engines except SRT-10, or about 60° C (140° F) for SRT-10 and diesel engines] and the high end of normal [about 122° C (252° F) for gasoline engines, about or about 116° C (240° F) for diesel engines], the gauge needle is moved to the actual relative temperature position on the gauge scale.
- **Engine Temperature Low Message** - Each time the cluster receives a message from the PCM or ECM indicating the engine coolant temperature is below the low end of normal [about 54° C (130° F) for gasoline engines except SRT-10, or about 60° C (140° F) for SRT-10 and diesel engines], the gauge needle is held at the graduation on the far left end of the gauge scale. The gauge needle remains at the left end of the gauge scale until the cluster receives a message from the PCM or ECM indicating that the engine temperature is above about 54° C (130° F) for gasoline engines except SRT-10, or about 60° C (140° F) for SRT-10 and diesel engines, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Engine Temperature High Message** - Each time the cluster receives three consecutive bus messages from the PCM or ECM indicating the engine coolant temperature is above about 122° C (252° F) for gasoline engines, or about 116° C (240° F) for diesel engines, the gauge needle is moved into the red zone at the far right end of gauge scale, the check gauges indicator is illuminated, and a single chime tone is sounded. The gauge needle remains in the red zone and the check gauges indicator remains illuminated until the cluster receives a message from the PCM or ECM indicating that the engine temperature is below about 122° C (252° F) for gasoline engines, or about 116° C (240° F) for diesel engines, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the check gauges indicator is cycled off and then on again by the appropriate engine temperature messages from the PCM or ECM.
- **Communication Error** - If the cluster fails to receive an engine temperature message, it will hold the gauge needle at the last indication for about ten seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After ten seconds, the cluster will move the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the engine coolant temperature gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. On vehicles with a diesel engine, the ECM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM or ECM then sends the

proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine coolant temperature gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the check gauges indicator due to a high engine temperature gauge reading, it may indicate that the engine or the engine cooling system requires service.

For proper diagnosis of the engine coolant temperature sensor, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the engine coolant temperature gauge, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

ETC INDICATOR

DESCRIPTION

An Electronic Throttle Control (ETC) indicator is standard equipment on all gasoline engine instrument clusters. However, on vehicles not equipped with the optional 5.7 liter gasoline engine, this indicator is electronically disabled. The ETC indicator is located on the right side of the instrument cluster, to the right of the engine temperature gauge.



The ETC indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for "Electronic Throttle Control" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The ETC indicator is serviced as a unit with the instrument cluster.

OPERATION

The Electronic Throttle Control (ETC) indicator gives an indication to the vehicle operator when the ETC system is faulty or inoperative. The ETC indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus.

The ETC indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ETC indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ETC indicator is illuminated for about six seconds. The entire six second bulb test is a function of the PCM.
- **ETC Lamp-On Message** - Each time the cluster receives a lamp-on message from the PCM, the ETC indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. The indicator remains illuminated solid or continues to flash for about twelve seconds or until the cluster receives a lamp-off message from the PCM, whichever is longer. If the indicator is illuminated solid with the engine running the vehicle will usually remain drivable. If the indicator is flashing with the engine running the vehicle may require towing. A flashing indicator means the ETC system requires immediate service.
- **Communication Error** - If the cluster receives no ETC lamp messages for three consecutive seconds, the ETC indicator is illuminated. The indicator remains illuminated until the cluster receives a single lamp-off message from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the ETC indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the ETC indicator is a function of the PCM.

The PCM continually monitors the ETC system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the PCM sends a lamp-on message after the bulb test, it indicates that the PCM has detected a system malfunction and/or that the ETC system is inoperative. The PCM will store a Diagnostic Trouble Code (DTC) for any malfunction it

detects. Each time the ETC indicator fails to illuminate due to an open or short in the cluster ETC indicator circuit, the cluster sends a message notifying the PCM of the condition, the instrument cluster and the PCM will each store a DTC.

For proper diagnosis of the ETC system, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the ETC indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

FUEL GAUGE

DESCRIPTION

A fuel gauge is standard equipment on all instrument clusters. This gauge is located in the lower left quadrant of the instrument cluster, below the voltage gauge. The fuel gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the cluster overlay that reads left-to-right from "E" (or Empty) to "F" (or Full).



An International Control and Display Symbol icon for "Fuel" is located on the cluster overlay, directly below the right end of the gauge scale. An arrowhead pointed to the left side of the vehicle is imprinted on the cluster overlay next to the "Fuel" icon in the fuel gauge to provide the driver with a reminder as to the location of the fuel filler access. On vehicles equipped with a diesel engine, text that specifies "DIESEL ONLY" is located across the fuel gauge below the gauge scale, but above the hub of the gauge needle.

On all models except SRT-10 the fuel gauge graphics are black against a white field. On SRT-10 the gauge graphics are black against a silver field except for a single red graduation at the low end of the gauge scale. In either case, the gauge graphics are clearly visible within the instrument cluster in daylight.

When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the black gauge graphics appear blue-green and the red graphics still appear red. The gauge needle has internal optical illumination. Gauge illumination is provided by replaceable incandescent bulb and holder units located on the instrument cluster electronic circuit board. The fuel gauge is serviced as a unit with the instrument cluster.

OPERATION

The fuel gauge gives an indication to the vehicle operator of the level of fuel in the fuel tank. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles equipped with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The fuel gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Percent Tank Full Message** - Each time the cluster receives a message from the PCM or ECM indicating the percent tank full, the cluster programming applies an algorithm to calculate the proper gauge needle position, then moves the gauge needle to the proper relative position on the gauge scale. The algorithm is used to dampen gauge needle movement against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs from the fuel tank sending unit to the PCM or ECM.
- **Less Than Fifteen Percent Tank Full Message** - Each time the cluster receives messages from the PCM or ECM indicating the percent tank full is about fifteen percent or less for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, the gauge needle is moved to between the one-sixteenth and one-eighth graduations or below on the gauge scale, the low fuel indicator is illuminated, and a single chime tone is sounded. The low fuel indicator remains illuminated until the cluster receives messages from the PCM or ECM indicating that the percent tank full is greater than about fifteen percent for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds.

onds and the vehicle speed is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the low fuel indicator is cycled off and then on again by the appropriate percent tank full messages from the PCM or ECM.

- **Less Than Empty Percent Tank Full Message** - Each time the cluster receives a message from the PCM or ECM indicating the percent tank full is less than empty, the gauge needle is moved to the far left end of the gauge scale and the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM or ECM is a short circuit.
- **More Than Full Percent Tank Full Message** - Each time the cluster receives a message from the PCM or ECM indicating the percent tank full is more than full, the gauge needle is moved to the far left end of the gauge scale and the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM or ECM is an open circuit.
- **Communication Error** - If the cluster fails to receive a percent tank full message, it will hold the gauge needle at the last indication for about ten seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After ten seconds, the cluster will move the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the fuel gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

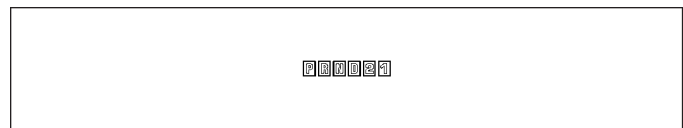
On vehicles with a gasoline engine, the PCM continually monitors the fuel tank sending unit to determine the level of the fuel in the fuel tank. On vehicles with a diesel engine, the ECM continually monitors the fuel tank sending unit to determine the level of the fuel in the fuel tank. The PCM or ECM then sends the proper fuel level messages to the instrument cluster. For further diagnosis of the fuel gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the fuel tank sending unit, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the fuel gauge, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

GEAR SELECTOR INDICATOR

DESCRIPTION

An electronic automatic transmission gear selector indicator is standard factory-installed equipment on this model. However, on vehicles not equipped with an optional automatic transmission, this indicator is electronically disabled. The gear selector indicator information is displayed in an electronic, blue-green Vacuum-Fluorescent Display (VFD) unit. The VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the speedometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated.



The gear selector indicator VFD displays the following characters from left to right: "P," "R," "N," "D," "2," and "1". Respectively, these characters represent the park, reverse, neutral, drive, second gear, and first gear positions of the transmission gear selector lever on the steering column. The VFD illuminates a rectangular box around the character that represents the currently selected lever position.

During daylight hours (exterior lamps Off) the gear selector VFD is illuminated at full brightness for clear visibility. At night (exterior lamps are On), the VFD lighting level is adjusted with the other cluster illumination lamps using the panel lamps dimmer thumbwheel on the headlamp switch. However, a "Parade" mode position of the panel lamps dimmer thumbwheel allows the VFD to be illuminated at full brightness if the exterior lamps are turned On during daylight hours. The gear selector indicator VFD is serviced as a unit with the instrument cluster.

OPERATION

The electronic gear selector indicator gives an indication to the vehicle operator of the transmission gear that has been selected with the automatic transmission gear selector lever. This indicator is controlled by the instrument cluster circuit board based upon cluster programming. The cluster circuitry automatically configures itself for the proper

transmission and automatic transmission model based upon the hard wired transmission range sensor mux circuit input to the cluster.

The gear selector indicator information is displayed by a dedicated Vacuum Fluorescent Display (VFD) unit soldered onto the instrument cluster electronic circuit board, and the VFD will not display the gear selector indicator information after the ignition switch is turned to the Off position. Each time the cluster is disconnected from battery current for more than about five minutes, it must configure itself for the automatic transmission model that is in the vehicle once it is reconnected to battery current. The instrument cluster circuitry configures the gear selector indicator VFD based upon the following inputs from the transmission range sensor:

- **Open Circuit** - If the cluster is configured for an automatic transmission and the transmission range sensor mux circuit is open, the cluster circuitry controls the gear selector indicator display based upon electronic messages received from the electronic Transmission Control Module (TCM) over the Programmable Communications Interface (PCI) data bus. If the transmission range sensor mux circuit is open and no electronic messages are received from the TCM within two seconds, the instrument cluster circuitry will not display any gear selector position until the condition is resolved or until the ignition switch is turned to the Off position, whichever occurs first.
- **Resolved Circuit** - If the transmission range sensor mux circuit is resolved, the cluster circuitry controls the gear selector indicator display based upon the resistance value of the hard wired input from the transmission range sensor. If the cluster is configured for an automatic transmission with a transmission range sensor input and detects a short to ground or an open in the transmission range sensor mux input, the instrument cluster circuitry will not display any gear selector position in the VFD. The VFD display for the short-to-ground and open circuit conditions will continue until the condition is resolved or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gear selector indicator VFD will display all of its characters at once during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

On models with a TCM, the TCM continually monitors the transmission range sensor, then sends the proper gear selector indicator position messages to the instrument cluster. On models without a TCM, the instrument cluster continually monitors the hard wired transmission range sensor multiplexed input. For further diagnosis of the gear selector indicator or the instrument cluster circuitry that controls this function, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For further diagnosis of the transmission range sensor on models without a TCM, (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RE/TRANSMISSION RANGE SENSOR - DIAGNOSIS AND TESTING) or (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 46RE/TRANSMISSION RANGE SENSOR - DIAGNOSIS AND TESTING).

On models with a TCM, for proper diagnosis of the transmission range sensor, the TCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the gear selector indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

HIGH BEAM INDICATOR

DESCRIPTION

A high beam indicator is standard equipment on all instrument clusters. This indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.



The high beam indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for "High Beam" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A blue Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in blue through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The high beam indicator is serviced as a unit with the instrument cluster.

OPERATION

The high beam indicator gives an indication to the vehicle operator whenever the headlamp high beams are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster pro-

gramming and a hard wired multiplex input received by the cluster from the headlamp beam select switch circuitry of the multi-function switch on the washer/beam select switch mux circuit.

The high beam indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the high beam indicator for the following reasons:

- **High Beam Headlamps-On Input** - Each time the cluster detects a high beam headlamps-on input from the headlamp beam select switch circuitry of the multi-function switch on the washer/beam select switch mux circuit, the headlamp high beams and the high beam indicator will be illuminated. The headlamp high beams and the high beam indicator remain illuminated until the cluster receives a high beam headlamps-off input from the multi-function switch, or until the exterior lamp load shedding (battery saver) timed interval expires, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the high beam indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the headlamp switch and the multi-function switch to determine the proper headlamp low beam and high beam control. The instrument cluster then sends the proper low beam and high beam lamp-on and lamp-off messages to the Front Control Module (FCM) over the Programmable Communications Interface (PCI) data bus and turns the high beam indicator on or off accordingly. For further diagnosis of the high beam indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the headlamps, or the headlamp switch and multi-function switch inputs to the instrument cluster that control the high beam indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

LAMP OUT INDICATOR

DESCRIPTION

A lamp out indicator is standard equipment on all instrument clusters. The lamp out indicator consists of the words "LAMP OUT", which appear in the lower portion of the odometer/trip odometer Vacuum-Fluorescent Display (VFD) unit.

LAMP OUT

The odometer/trip odometer VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the tachometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents the lamp out indicator from being clearly visible when it is not illuminated. The words "LAMP OUT" appear in an amber color and at the same lighting level as the odometer/trip odometer information when they are illuminated by the instrument cluster electronic circuit board. The lamp out indicator is serviced as a unit with the VFD in the instrument cluster.

OPERATION

The lamp out indicator gives an indication to the vehicle operator when an exterior lamp has failed. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) over the Programmable Communications Interface (PCI) data bus.

The lamp out indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the lamp out indicator for the following reasons:

- **Lamp Out Indicator Lamp-On Message** - Each time the cluster receives a lamp out indicator lamp-on message from the FCM indicating that an inoperative headlamp (low or high beam), turn signal lamp, or brake

lamp (excluding Center High Mounted Stop Lamp [CHMSL]) circuit has been detected with the ignition switch in the On position, the lamp out indicator is illuminated solid. The indicator remains illuminated until the cluster receives a lamp out indicator lamp-off message from the FCM or until the ignition switch is turned to the Off position, whichever occurs first. If the lamp-on message is received when the ignition is first turned to the On position, the lamp out indicator is flashed at a fast rate (1 Hertz) for about thirty seconds before illuminating solid.

- **Actuator Test** - Each time the cluster is put through the actuator test, the lamp out indicator will be turned on, then off again during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The FCM monitors each of the headlamp, turn signal lamp, and brake lamp (except CHMSL) circuits to determine the condition of these exterior lamps. The FCM then sends the proper lamp out indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the lamp out indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the exterior lighting system circuits, the FCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the lamp out indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

LOW FUEL INDICATOR

DESCRIPTION

A low fuel indicator is standard equipment on all instrument clusters. This indicator is located on the left side of the instrument cluster, to the left of the fuel gauge.



The low fuel indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for "Fuel" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The low fuel indicator is serviced as a unit with the instrument cluster.

OPERATION

The low fuel indicator gives an indication to the vehicle operator when the level of fuel in the fuel tank becomes low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles equipped with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The low fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the low fuel indicator is illuminated for about two seconds as a bulb test.
- **Less Than Fifteen Percent Tank Full Message** - Each time the cluster receives messages from the PCM or ECM indicating the percent tank full is about fifteen percent or less for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, the fuel gauge needle is moved to between the one-sixteenth and one-eighth graduations or below on the gauge scale, the low fuel indicator is illuminated and a single chime tone is sounded. The low fuel indicator remains illuminated until the cluster receives messages from the PCM or ECM indicating that the percent tank full is greater than about fifteen percent for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the low fuel indicator is cycled off and then on again by the appropriate percent tank full messages from the PCM or ECM.

- **Less Than Empty Percent Tank Full Message** - Each time the cluster receives a message from the PCM or ECM indicating the percent tank full is less than empty, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM or ECM is a short circuit.
- **More Than Full Percent Tank Full Message** - Each time the cluster receives a message from the PCM or ECM indicating the percent tank full is more than full, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM or ECM is an open circuit.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. On vehicles with a diesel engine, the ECM continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. The PCM or ECM then sends the proper fuel level messages to the instrument cluster. For further diagnosis of the low fuel indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the fuel tank sending unit, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the low fuel indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

MALFUNCTION INDICATOR LAMP (MIL)

DESCRIPTION

A Malfunction Indicator Lamp (MIL) is standard equipment on all instrument clusters. This indicator is located on the left side of the instrument cluster, to the left of the voltage gauge.



The MIL consists of a stencil-like cutout of the International Control and Display Symbol icon for "Engine" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The MIL is serviced as a unit with the instrument cluster.

OPERATION

The Malfunction Indicator Lamp (MIL) gives an indication to the vehicle operator when the Powertrain Control Module (PCM) on vehicles with a gasoline engine, or the Engine Control Module (ECM) on vehicles with a diesel engine has recorded a Diagnostic Trouble Code (DTC) for an On-Board Diagnostics II (OBDII) emissions-related circuit or component malfunction. The MIL is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the PCM or ECM over the Programmable Communications Interface (PCI) data bus.

The MIL Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the MIL for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the indicator is illuminated for about two seconds as a bulb test. The entire bulb test is a function of the PCM or ECM.
- **MIL Lamp-On Message** - Each time the cluster receives a MIL lamp-on message from the PCM or ECM, the indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM or ECM message. For some DTC's, if a problem does not recur, the PCM or ECM will send a lamp-off message automatically. Other DTC's may require that a fault be repaired and the PCM or ECM be reset before a lamp-off message will be sent. For more information on the PCM, the ECM, and the DTC set and reset parameters, (Refer to 25 - EMISSIONS CONTROL - OPERATION).

- **Communication Error** - If the cluster receives no messages from the PCM or ECM for about ten seconds, the MIL is illuminated by the instrument cluster to indicate a loss of bus communication. The indicator remains controlled and illuminated by the cluster until a valid message is received from the PCM or ECM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the MIL indicator will be turned on during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

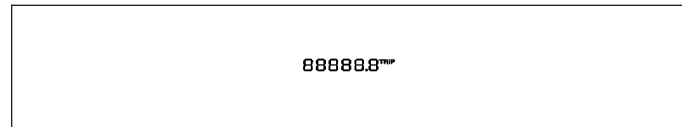
On vehicles with a gasoline engine, the PCM continually monitors the fuel and emissions system circuits and sensors to decide whether the system is in good operating condition. On vehicles with a diesel engine, the ECM continually monitors the fuel and emissions system circuits and sensors to decide whether the system is in good operating condition. The PCM or ECM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the MIL or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the MIL after the bulb test, it may indicate that a malfunction has occurred and that the fuel and emissions systems may require service.

For proper diagnosis of the fuel and emissions systems, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the MIL, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

ODOMETER

DESCRIPTION

An odometer and trip odometer are standard equipment in all instrument clusters. The odometer, trip odometer, and engine hours information are displayed in a common electronic, blue-green Vacuum-Fluorescent Display (VFD) unit. This VFD unit is soldered onto the cluster electronic circuit board and is visible through a window with a smoked lens located on the lower edge of the tachometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents it from being clearly visible when it is not illuminated.



The odometer, trip odometer, and engine hours information are not displayed simultaneously. The trip odometer reset switch on the instrument cluster circuit board toggles the display between odometer and trip odometer modes by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just left of the odometer VFD. When the trip odometer information is displayed, the word "TRIP" is also illuminated in the upper right corner of the VFD in a blue-green color and at the same lighting level as the trip odometer information. On all models except SRT-10, the engine hours information replaces the selected odometer or trip odometer information whenever the ignition switch is in the On position and the engine is not running. The engine hours feature is disabled on all SRT-10 models.

The odometer, trip odometer, and engine hours information is stored in the instrument cluster memory. This information can be increased when the proper inputs are provided to the instrument cluster, but the information cannot be decreased. The odometer can display values up to 999,999 kilometers (999,999 miles). The odometer latches at these values, and will not roll over to zero. The trip odometer can display values up to 9,999.9 kilometers (9,999.9 miles) before it rolls over to zero. Engine hours are displayed in the format, "hr9999". The cluster will accumulate values up to 9,999 hours before the display rolls over to zero.

The odometer display does not have a decimal point and will not show values less than a full unit (kilometer or mile), while the trip odometer display does have a decimal point and will show tenths of a unit (kilometer or mile). The unit of measure (kilometers or miles) for the odometer and trip odometer display is not shown in the VFD. The unit of measure for the instrument cluster odometer/trip odometer is selected at the time that it is manufactured, and cannot be changed. The odometer also has a "Rental Car" mode, which will illuminate the odometer information in the VFD whenever the driver side front door is opened with the ignition switch in the Off or Accessory positions.

During daylight hours (exterior lamps are Off) the odometer VFD is illuminated at full brightness for clear visibility. At night (exterior lamps are On), the VFD lighting level is adjusted with the other cluster illumination lamps using the panel lamps dimmer thumbwheel on the headlamp switch. However, a "Parade" mode position of the panel lamps dimmer thumbwheel allows the VFD to be illuminated at full brightness if the exterior lamps are turned On during daylight hours.

The odometer/trip odometer VFD, the trip odometer switch, and the trip odometer switch button are serviced as a unit with the instrument cluster.

OPERATION

The odometer and trip odometer give an indication to the vehicle operator of the distance the vehicle has traveled. On all models except SRT-10, the engine hours give an indication of the cumulative engine-on time. The engine hours feature is disabled on SRT-10 models. This indicator is controlled by the instrument cluster circuitry based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) or Engine Control Module (ECM) over the Programmable Communications Interface (PCI) data bus.

The odometer, trip odometer and engine hours information is displayed by the instrument cluster odometer Vacuum Fluorescent Display (VFD). The odometer VFD will display the odometer information whenever the driver side front door is opened with the ignition switch in the Off or Accessory positions, and will display the last previously selected odometer or trip odometer information when the ignition switch is turned to the On or Start positions. The instrument cluster circuitry controls the VFD and provides the following features:

- **Odometer/Trip Odometer Display Toggling** - Actuating the trip odometer reset switch button momentarily with the VFD illuminated will toggle the display between the odometer and trip odometer information. Each time the VFD is illuminated with the ignition switch in the On or Start positions, the display will automatically return to the last mode previously selected (odometer or trip odometer).
- **Engine Hours Display Toggling** - When the trip odometer reset switch button is pressed and held for longer than about six seconds with the ignition switch in the On position and the engine speed message from the PCM is zero, the trip odometer information will be momentarily displayed, then the engine hours information will be displayed. The VFD must be displaying the odometer information when the trip odometer reset switch button is pressed in order to toggle to the engine hours display. The engine hours will remain displayed for about thirty seconds, until the engine speed message is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Trip Odometer Reset** - When the trip odometer reset switch button is pressed and held for longer than about two seconds with the ignition switch in the On or Start position, the trip odometer will be reset to 0.0 kilometers (miles). The VFD must be displaying the trip odometer information in order for the trip odometer information to be reset.
- **Communication Error** - If the cluster fails to receive a distance message during normal operation, it will hold and display the last data received until the ignition switch is turned to the Off position. If the cluster does not receive a distance message within one second after the ignition switch is turned to the On position, it will display the last distance message stored in the cluster memory. If the cluster is unable to display distance information due to an error internal to the cluster, the VFD will display all dashes.
- **Actuator Test** - Each time the cluster is put through the actuator test, the odometer VFD will display all of its segments simultaneously during the VFD portion of the test to confirm the functionality of each of the VFD segments and the cluster control circuitry.

The PCM continually monitors the vehicle speed pulse information received from the vehicle speed sensor or the Controller Anti-lock Brake (CAB) and engine speed pulse information received from the crankshaft position sensor, then sends the proper distance and engine speed messages to the instrument cluster. For further diagnosis of the odometer/trip odometer or the instrument cluster circuitry that controls these functions, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the vehicle speed sensor, the crankshaft position sensor, the CAB, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the odometer/trip odometer, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

OIL PRESSURE GAUGE

DESCRIPTION

An oil pressure gauge is standard equipment on all instrument clusters. The oil pressure gauge is located in the upper right quadrant of the instrument cluster, above the coolant temperature gauge.



The oil pressure gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the cluster overlay that reads left-to-right from "L" (or Low) to "H" (or High) for gasoline engines except SRT-10. On SRT-10 models, the scale reads from "0" kPa to "700" kPa in markets where a metric instrument cluster is specified, or from "0" psi to "100" psi in all other markets. On vehicles with a diesel engine the scale reads from "0" kPa to "760" kPa in markets where a metric instrument cluster is specified, or from "0" psi to "110" psi in all other markets.

An International Control and Display Symbol icon for "Engine Oil" is located on the cluster overlay, directly below the left end of the gauge scale. On all models except SRT-10 the oil pressure gauge graphics are black against a white field except for two red graduations at the low end of the gauge scale. On SRT-10 the gauge graphics are black against a silver field except for a single red zone at the low end of the gauge scale. In either case, the gauge graphics are clearly visible within the instrument cluster in daylight.

When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the black graphics appear blue-green and the red graphics still appear red. The gauge needle has internal optical illumination. Gauge illumination is provided by replaceable incandescent bulb and holder units located on the instrument cluster electronic circuit board. The oil pressure gauge is serviced as a unit with the instrument cluster.

OPERATION

The oil pressure gauge gives an indication to the vehicle operator of the engine oil pressure. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The oil pressure gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Oil Pressure Message** - The instrument cluster circuitry restricts the oil pressure gauge needle operation in order to provide readings that are consistent with customer expectations. For all models except SRT-10, each time the cluster receives a message from the PCM or ECM indicating the engine oil pressure is above about 41 kPa (6 psi) the cluster holds the gauge needle at a point near the middle increment within the normal range on the gauge scale. For SRT-10 models, each time the cluster receives a message from the PCM indicating the engine oil pressure is above about 41 kPa (6 psi) the cluster moves the gauge needle in a linear fashion to the proper relative pressure position of the gauge scale.
- **Engine Oil Pressure Low Message** - Each time the cluster receives three consecutive bus messages from the PCM or ECM indicating the engine oil pressure is below about 41 kPa (6 psi), the gauge needle is moved to the red graduations (except SRT-10) or to the red zone (SRT-10) at the far left end of the gauge scale, the check gauges indicator is illuminated, and a single chime tone is generated. The gauge needle remains at the left end of the gauge scale and the check gauges indicator remains illuminated until the cluster receives a message from the PCM or ECM indicating that the engine oil pressure is above about 41 kPa (6 psi), or until the ignition switch is turned to the Off position, whichever occurs first. The cluster will only turn the check gauges indicator on in response to an engine oil pressure low message if the engine speed message is greater than zero.
- **Communication Error** - If the cluster fails to receive an engine oil pressure message, it will hold the gauge needle at the last indication for about ten seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After ten seconds, the cluster will move the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the oil pressure gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the engine oil pressure sensor to determine the engine oil pressure. On vehicles with a diesel engine, the ECM continually monitors the engine oil pressure sensor to determine the engine oil pressure. The PCM or ECM then sends the proper engine oil pressure messages to the instrument cluster. For further diagnosis of the oil pressure gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster

turns on the check gauges indicator due to a low oil pressure gauge reading, it may indicate that the engine or the engine oiling system requires service.

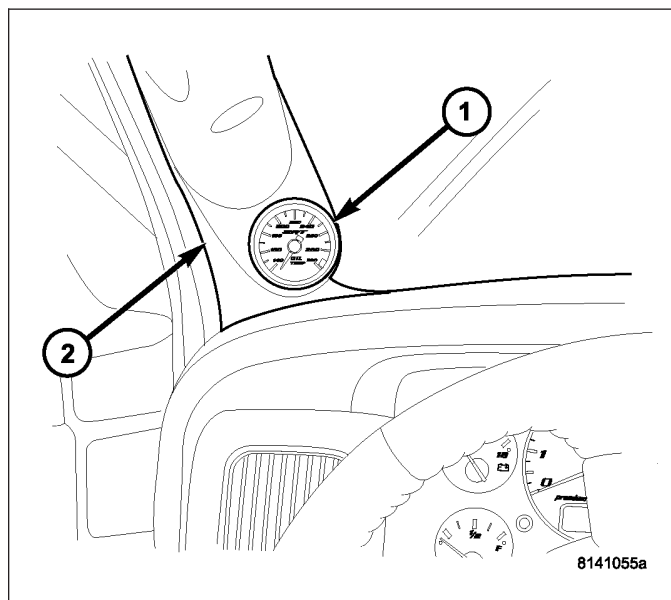
For proper diagnosis of the engine oil pressure sensor, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the oil pressure gauge, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

GAUGE-ENGINE OIL TEMPERATURE

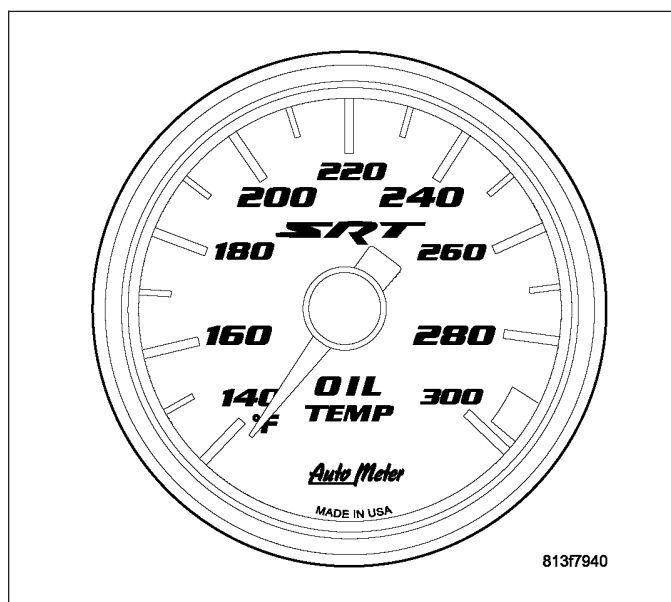
DESCRIPTION

An oil temperature gauge (1) is standard equipment on all SRT-10 models. This electronic, analog gauge is located in the lower end of the left A-pillar trim molding below the grab handle (2), in clear view of the vehicle operator. The gauge dial face is visible through a clear plastic lens, which is secured to the gauge housing with a silver anodized trim ring. The remainder of the gauge, including the mounting provisions and the electrical connections, are concealed behind the left A-pillar trim molding.

The molded plastic housing at the rear of the gauge protects the electronic circuitry of the gauge and has two mounting studs, which are secured by nuts to a molded plastic mounting bracket screwed to the back of the A-pillar trim molding. A short pigtail wire with a connector extends from the back of the gauge housing and connects the gauge to the vehicle electrical system through a take out and connector of the instrument panel wire harness.



The oil temperature gauge consists of a movable gauge needle or pointer with a 270 degree sweep that is controlled by the electronic gauge circuitry. The gauge overlay reads left-to-right from "60" to "150" with "°C" indicated directly below the low (left) end of the scale in markets where a metric instrument cluster is specified, or from "140" to "300" with "°F" indicated directly below the left end of the scale for all other markets. The text "OIL TEMP" is imprinted on the center of the gauge overlay below the hub of the gauge needle, while the text "SRT" is imprinted above the hub of the gauge needle. The gauge graphics are black against a silver field except for a single red zone at the high (right) end of the gauge scale and are clearly visible in daylight.



General illumination lighting for the gauge is provided by a Light Emitting Diode (LED) that is soldered onto the gauge circuit board. The gauge overlay is a laminated plastic unit. The dark, visible, outer surface of the overlay is marked with the gauge dial face and graduations, but this layer is also translucent. The underlying layer of the overlay is opaque and allows light from the LED on the circuit board behind it to be visible through the outer layer of the overlay only through predetermined stencil-like cutouts. When illuminated from behind by the panel lamps

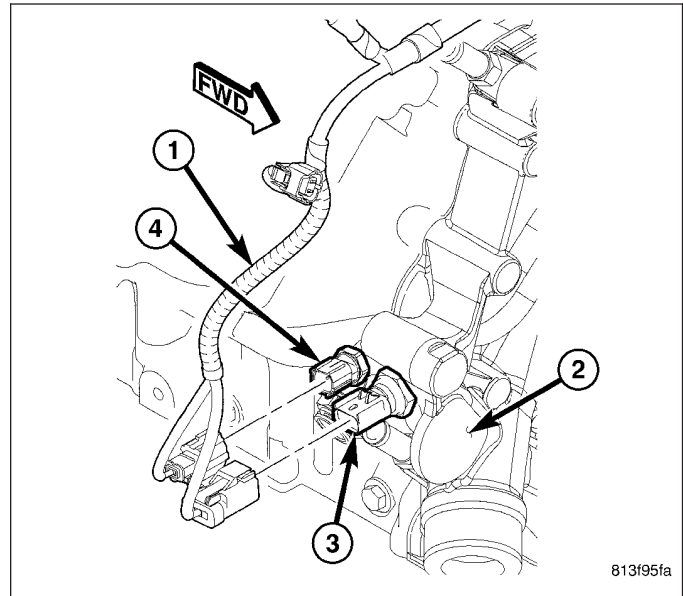
dimmer controlled gauge lighting with the exterior lamps turned On, the black graphics appear blue-green and the red graphics still appear red. The gauge needle has internal optical illumination.

The oil temperature gauge cannot be repaired or adjusted and, if damaged or faulty, it must be replaced. The gauge illumination LED unit is not available for service replacement and, if damaged or faulty, the entire gauge must be replaced.

OPERATION

The oil temperature gauge gives an indication to the vehicle operator of the engine oil temperature. This gauge is controlled by its own internal electronic circuit board based upon a hard wired input received by the gauge from an oil temperature sensor (4) installed in a tapped hole that penetrates an oil passage on the right side of the engine block (2) just behind the oil pressure sensor (3).

The oil temperature sensor is a Negative Temperature Coefficient (NTC) thermistor that changes its internal resistance with changes in temperature. The sensor has two terminals. One terminal receives a hard wired ground path through a take out and connector of the engine wire harness (1), and the second terminal provides a variable output to the gauge through the same take out and connector. As the oil temperature increases the resistance of the sensor decreases, and as the oil temperature decreases the resistance of the sensor increases.



The oil temperature gauge is an air core magnetic unit. The gauge pigtail wire and connector provides the gauge electronic circuit board with a hard wired ground path, battery current through a fused ignition switch output (run-start) circuit, a Pulse Width Modulated (PWM) panel lamps dimmer input from the instrument cluster for general illumination, and the input from the oil temperature sensor. This gauge is only operational when the ignition switch is in the On or Start positions. The gauge electronic circuit board reads the input from the oil temperature sensor, then provides linear positioning of the gauge needle on the gauge scale based upon that input. The gauge electronics will move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position.

The oil temperature gauge and the oil temperature sensor may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

OIL TEMPERATURE GAUGE

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired oil temperature gauge and gauge lighting circuits may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

NOTE: When testing the oil temperature gauge by alternately opening and shorting the oil temperature sensor signal circuit, the gauge pointer may rotate in either direction (clockwise or counterclockwise) to reach the objective point on the gauge scale. This is a normal condition as the gauge electronics are programmed to move the pointer from its current position to the objective position in the direction that provides the shortest pointer travel distance.

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL TEMPERATURE GAUGE DOES NOT ILLUMINATE WITH EXTERIOR LIGHTING TURNED ON	1. Faulty panel lamps dimmer circuit. 2. Faulty ground circuit. 3. Faulty Light Emitting Diode (LED) in gauge.	1. Test and repair open oil temperature gauge panel lamps dimmer circuit as required. 2. Test and repair open oil temperature gauge ground circuit as required. 3. Replace the faulty oil temperature gauge as required.
OIL TEMPERATURE GAUGE NEEDLE DOES NOT GIVE ANY INDICATION WITH ENGINE AT OPERATING TEMPERATURE AND IGNITION SWITCH ON.	1. Faulty signal circuit. 2. Faulty supply circuit. 3. Faulty sensor. 4. Faulty gauge.	1. Test and repair shorted oil temperature sensor signal circuit as required. 2. Test and repair open oil temperature gauge fused ignition switch output (run/start) circuit as required. 3. Test and replace faulty oil temperature sensor as required. 4. Replace the faulty oil temperature gauge as required.
OIL TEMPERATURE GAUGE NEEDLE ALWAYS INDICATES HIGH WITH IGNITION SWITCH ON.	1. Disconnected sensor. 2. Faulty signal circuit. 3. Faulty sensor ground. 4. Faulty sensor. 5. Faulty gauge.	1. Reconnect oil temperature sensor as required. 2. Test and repair open oil temperature sensor signal circuit as required. 3. Test and repair open oil temperature sensor ground circuit as required. 4. Test and replace faulty oil temperature sensor as required. 5. Replace the faulty oil temperature gauge as required.

OIL TEMPERATURE SENSOR

1. Disconnect the engine wire harness connector from the oil temperature sensor.
2. Using an ohmmeter and a test thermometer, test the resistance versus the oil temperature relationship of the sensor between the two terminals of the sensor as shown in the Oil Temperature Sensor Tests table.

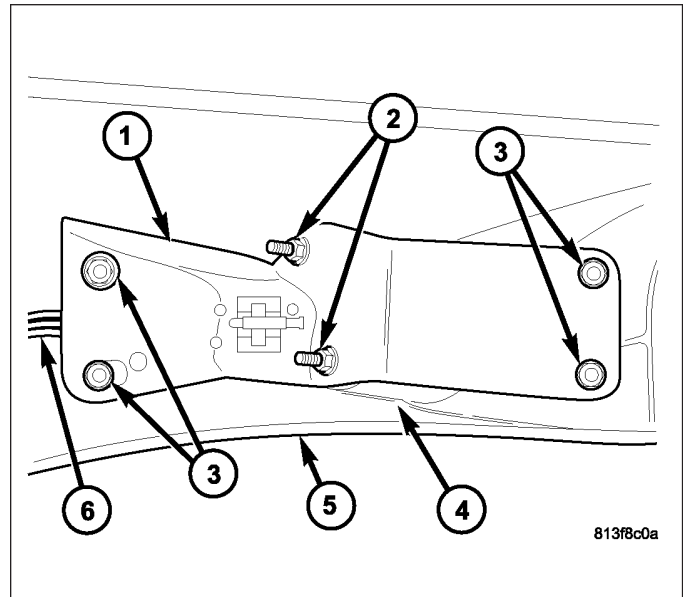
OIL TEMPERATURE SENSOR TESTS		
TEMPERATURE		RESISTANCE RANGE (KILOHMS)
°C	°F	
(40)	(40)	291.49 - 381.71
(20)	(4)	85.85 - 108.39
(10)	14	49.25 - 61.43
0	32	29.33 - 35.99
10	50	17.99 - 21.81
20	68	11.37 - 13.61
25	77	9.12 - 10.88
30	86	7.37 - 8.75
40	104	4.90 - 5.75
50	122	3.33 - 3.88
60	140	2.31 - 2.67
70	158	1.63 - 1.87
80	176	1.17 - 1.34
90	194	0.86 - 0.97
100	212	0.64 - 0.72
110	230	0.48 - 0.54
120	248	0.37 - 0.41
130	266	0.28 - 0.32

3. If the sensor fails any of these tests, replace the faulty oil temperature sensor as required.

REMOVAL

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

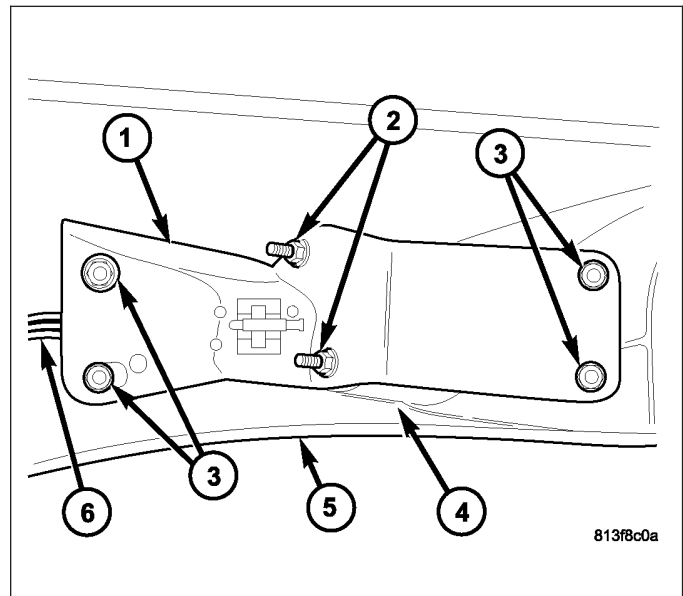
1. Disconnect and isolate the battery negative cable.
2. Remove the trim molding (5) from the inside of the left A-pillar. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
3. Remove the two nuts (2) that secure the oil temperature gauge (4) mounting studs to the mounting bracket (1) on the back of the A-pillar trim.
4. Remove the four screws (3) that secure the mounting bracket to the back of the A-pillar trim.
5. Remove the mounting bracket from the back of the A-pillar trim.
6. Push the gauge and the gauge pigtail wire (6) and connector out through the mounting hole on the face of the A-pillar trim.



INSTALLATION

WARNING: To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

1. Position the oil temperature gauge (4) into the mounting hole on the face of the A-pillar trim (5).
2. Position the mounting bracket (1) to the back of the A-pillar trim with the gauge pigtail wire (6) and connector routed between the two lower mounting bracket screw bosses on the back of the A-pillar trim.
3. Install and tighten the four screws (3) that secure the mounting bracket to the back of the A-pillar trim. Tighten the screws to 1 N·m (9 in. lbs.).
4. Align and insert the two mounting studs on the back of the gauge housing through the appropriate holes in the mounting bracket.
5. Install and tighten the two nuts that secure the gauge mounting studs to the mounting bracket. Tighten the nuts to 0.5 N·m (5 in. lbs.).
6. Reinstall the trim molding onto the inside of the left A-pillar. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).
7. Reconnect the battery negative cable.



SEATBELT INDICATOR

DESCRIPTION

A seatbelt indicator is standard equipment on all instrument clusters. The seatbelt indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer.



The seatbelt indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for “Seat Belt” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The seatbelt indicator is serviced as a unit with the instrument cluster.

OPERATION

The seatbelt indicator gives an indication to the vehicle operator of the status of the driver side front seatbelt. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input from the seatbelt switch in the driver side front seatbelt buckle through the seat belt indicator driver circuit.

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or “beltminder” feature that is enabled when the vehicle is shipped from the factory. This beltreminder feature can be disabled and enabled by the customer using a specific programming event sequence, or by the dealer using a diagnostic scan tool.

The seatbelt indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the seatbelt indicator for the following reasons:

- **Seatbelt Reminder Function** - Each time the cluster receives a battery current input on the fused ignition switch output (run-start) circuit, the indicator will be illuminated as a seatbelt reminder for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. This reminder function will occur regardless of the status of the seatbelt switch input to the cluster.
- **Driver Side Front Seatbelt Not Buckled - Beltminder Active** - Following the seatbelt reminder function, each time the cluster detects an open circuit on the seat belt indicator driver circuit (seatbelt switch open = seatbelt unbuckled) with the ignition switch in the Start or On positions, the indicator will be illuminated. In addition, if the driver side front seat belt remains unbuckled about sixty seconds after the conclusion of the seatbelt reminder function with the vehicle speed greater than about 13 kilometers-per-hour (8 miles-per-hour), the seatbelt indicator will begin to cycle between flashing on and off for five seconds, then lighting solid for three seconds. The seatbelt indicator will continue to cycle between flashing and solid illumination for twelve complete cycles, until the seat belt indicator driver input to the cluster is closed to ground (seatbelt switch closed = seatbelt buckled), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Driver Side Front Seatbelt Not Buckled - Beltminder Inactive** - Following the seatbelt reminder function, each time the cluster detects an open circuit on the seat belt indicator driver circuit (seatbelt switch open = seatbelt unbuckled) with the ignition switch in the Start or On positions, the indicator will be illuminated. The seatbelt indicator remains illuminated until the seat belt indicator driver input to the cluster is closed to ground (seatbelt switch closed = seatbelt buckled), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Airbag Indicator Backup** - If the instrument cluster detects a fault in the airbag indicator circuit it will send a message indicating the fault to the Airbag Control Module (ACM), store a Diagnostic Trouble Code (DTC) in the cluster memory, then flash the seatbelt indicator on and off. The cluster will continue to flash the seatbelt indicator until the airbag indicator circuit fault is resolved, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the seatbelt indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The seatbelt switch is connected in series between ground and the seat belt indicator driver input to the instrument cluster. The seatbelt switch input to the instrument cluster circuitry may be diagnosed using conventional diagnostic tools and methods.

For further diagnosis of the seatbelt indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

STANDARD PROCEDURE

ENHANCED SEATBELT REMINDER PROGRAMMING

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or “beltminder” feature that is enabled when the vehicle is shipped from the factory. This belt minder feature provides extended and modified visual seatbelt indicator and audible chime warning responses to an unbuckled driver side front seat belt. The belt minder feature may be disabled or enabled by the customer using the programming sequence that follows, or by the dealer using a diagnostic scan tool.

CUSTOMER PROGRAMMING SEQUENCE

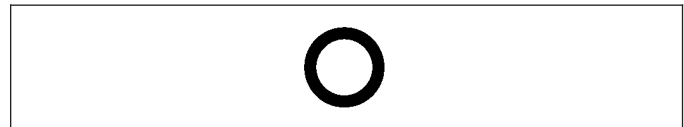
NOTE: The following sequence of events must occur within sixty (60) seconds of the ignition switch being placed in the On position in order for the programming to be completed successfully.

1. With the ignition switch in any position except On or Start, buckle the driver side front seat belt.
2. Turn the ignition switch to the On position and wait for the seatbelt indicator reminder function to conclude (about six seconds).
3. Unbuckle and buckle the driver side front seat belt three or more times, ending with the belt buckled.
4. Turn the ignition switch to any position except On or Start to toggle the belt minder feature from its current setting (from active to inactive, or from inactive to active). A single chime tone will provide an audible confirmation that the programming sequence has been successfully completed.

SECURITY INDICATOR

DESCRIPTION

A security indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional Vehicle Theft Security System (VTSS), this indicator is electronically disabled. This indicator is located in the lower right quadrant of the instrument cluster, between the speedometer and the coolant temperature gauge.



The security indicator consists of a small round cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the indicator to appear in red through the translucent outer layer of the overlay when it is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The security indicator is serviced as a unit with the instrument cluster.

OPERATION

The security indicator gives an indication to the vehicle operator when the Vehicle Theft Security System (VTSS) is arming or is armed. On models equipped with the Sentry Key Immobilizer System (SKIS), the security indicator also gives an indication to the vehicle operator of the status of the SKIS. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, hard wired inputs to the cluster from the various security system components, electronic messages received by the cluster from the Remote Keyless Entry (RKE) module over a dedicated serial bus, and electronic messages received by the cluster from the Sentry Key Immobilizer Module (SKIM) over the Programmable Communications Interface (PCI) data bus.

The security indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. Depending upon the programmed condition the indicator can be illuminated solid, flashed at a slow rate (0.5 Hertz, 12.5 percent duty cycle), or flashed at a fast rate (1 Hertz, 50 percent duty cycle). The instrument cluster will turn on the security indicator for the following reasons:

- **Bulb Test** - On vehicles equipped with the optional SKIS, each time the ignition switch is turned to the On position the SKIM tells the cluster to illuminate the security indicator for about two seconds as a bulb test.
- **VTSS Indication** - During the sixteen second VTSS arming function, the cluster will flash the security indicator on and off repeatedly at a steady, fast rate to indicate that the VTSS is in the process of arming. Following successful VTSS arming, the cluster flashes the security indicator on and off continuously at a slower rate to indicate that the VTSS is armed. The security indicator continues flashing at the slower rate until the VTSS is disarmed or triggered. The security indicator will also flash at the fast rate to indicate that the VTSS has been triggered and is currently alarming. If the VTSS has alarmed until the alarm timed out and then rearmed itself, the cluster will flash the security indicator at a steady, slow rate for about thirty seconds after the VTSS is disarmed.
- **SKIS Lamp-On Message** - Each time the cluster receives a lamp-on message from the SKIM, the security indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the SKIM message. The indicator remains illuminated solid or continues to flash until the cluster receives a SKIS lamp-off message from the SKIM, or until the ignition switch is turned to the Off position, whichever occurs first. For more information on the SKIS and the security indicator control parameters, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SENTRY KEY IMMOBILIZER SYSTEM - OPERATION).
- **Communication Error** - On vehicles equipped with the optional SKIS, if the cluster receives no SKIS lamp-on or lamp-off messages from the SKIM for twenty consecutive seconds, the security indicator is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid SKIS lamp-on or lamp-off message is received from the SKIM.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the security indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster circuitry controls the security indicator whenever the ignition switch is in the Off position and the VTSS is arming, armed, or alarming. Whenever the ignition switch is in the On or Start positions, the SKIM performs a self-test to decide whether the SKIS is in good operating condition and whether a valid key is present in the ignition lock cylinder. The SKIM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the security indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster flashes the security indicator upon ignition On, or turns on the security indicator solid after the bulb test, it indicates that a SKIS malfunction has occurred or that the SKIS is inoperative.

For proper diagnosis of the VTSS, the SKIS, the SKIM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the security indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

SERVICE 4WD INDICATOR

DESCRIPTION

A service 4WD indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional four-wheel drive system and electronically shifted transfer case, this indicator is electronically disabled. The service 4WD indicator consists of the text "SERV 4WD", which appears in the lower portion of the odometer/trip odometer Vacuum Fluorescent Display (VFD) unit.

SVC 4WD

The odometer/trip odometer VFD is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the tachometer gauge dial face of the cluster overlay. The

dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated. The text “SERV 4WD” appears in an amber color and at the same lighting level as the odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The service 4WD indicator is serviced as a unit with the VFD in the instrument cluster.

OPERATION

The service 4WD indicator gives an indication to the vehicle operator when the Transfer Case Control Module (TCCM) has recorded a Diagnostic Trouble Code (DTC) for an electronic transfer case circuit or component malfunction. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the TCCM over the Programmable Communications Interface (PCI) data bus.

The service 4WD indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the service 4WD indicator for the following reasons:

- **Service 4WD Lamp-On Message** - Each time the cluster receives a service 4WD lamp-on message from the TCCM, the indicator will be illuminated. The indicator remains illuminated until the cluster receives a service 4WD lamp-off message from the TCCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no messages from the TCCM for five seconds, the service 4WD indicator is illuminated by the instrument cluster to indicate a loss of TCCM communication. The indicator remains controlled and illuminated by the cluster until a valid message is received from the TCCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the service 4WD indicator will be turned on, then off again during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The TCCM continually monitors the electronic transfer case switch and circuits to determine the condition of the system. The TCCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the service 4WD indicator or the instrument cluster circuitry that controls the VFD, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the TCCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the service 4WD indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

SPEEDOMETER

DESCRIPTION

A speedometer is standard equipment on all instrument clusters. The speedometer is located next to the tachometer, just to the right of center in the instrument cluster. The speedometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 210 degree primary scale on the gauge dial face. For all models except SRT-10 the speedometer reads left-to-right either from “0” to “120” mph, or from “0” to “200” km/h, depending upon the market for which the vehicle is manufactured. On SRT-10 the speedometer reads left-to-right either from “0” to “160” mph, or from “0” to “280” km/h, depending upon the market for which the vehicle is manufactured. Each version also has a secondary inner scale on the gauge dial face that provides the equivalent opposite units from the primary scale.

MPH km/h

Text appearing on the cluster overlay just below the hub of the speedometer needle abbreviates the unit of measure for the primary scale (i.e.: MPH or km/h), followed by the unit of measure for the secondary scale. The speedometer graphics for all models except SRT-10 are black (primary scale) and blue (secondary scale) against a white field. On SRT-10 the gauge graphics are black (primary scale) and gray (secondary scale) against a silver field and also includes a line of text identifying this as a “Performance Vehicle Operations” product. In either case, the gauge graphics are clearly visible within the instrument cluster in daylight.

When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the black graphics appear blue-green and the blue or gray graphics appear light blue. The gauge needle has internal optical illumination. Gauge illumination is provided by replaceable incandescent bulb and holder units located on the instrument cluster electronic circuit board. The speedometer is serviced as a unit with the instrument cluster.

OPERATION

The speedometer gives an indication to the vehicle operator of the relative vehicle road speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus.

The speedometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Vehicle Speed Message** - Each time the cluster receives a vehicle speed message from the PCM it will calculate the correct vehicle speed reading and position the gauge needle at that relative speed position on the gauge scale. The cluster will receive a new vehicle speed message and reposition the gauge pointer accordingly about every 88 milliseconds. The gauge needle will continually be positioned at the relative vehicle speed position on the gauge scale until the vehicle stops moving, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive a speedometer message, it will hold the gauge needle at the last indication for about ten seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After ten seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the speedometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the vehicle speed sensor or the Controller Anti-lock Brake (CAB) to determine the vehicle road speed. The PCM then sends the proper vehicle speed messages to the instrument cluster. For further diagnosis of the speedometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the vehicle speed sensor, the CAB, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the speedometer, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TACHOMETER

DESCRIPTION

A tachometer is standard equipment on all instrument clusters. The tachometer is located to the left of the speedometer, just to the left of center in the instrument cluster. The tachometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 210 degree scale on the gauge dial face. The tachometer reads left-to-right from "0" to "7" for gasoline engines. On vehicles with a diesel engine, the scale reads from "0" to "5".

RPM X 1000

The tachometer reads left-to-right from "0" to "7" for gasoline engines. On vehicles with a diesel engine, the scale reads from "0" to "5".

On all models except SRT-10, the text "RPM X 1000" is imprinted on the cluster overlay directly below the hub of the tachometer needle. On SRT-10 models the text "X 1000 RPM" is imprinted on the cluster overlay directly below the hub of the tachometer needle. This text identifies that each number on the tachometer scale is to be multiplied by 1000 rpm.

On all models except SRT-10 the tachometer graphics are black against a white field, making them clearly visible within the instrument cluster in daylight. On SRT-10 the tachometer graphics are black against a silver field except for red graduations beginning at the "6" increment and at each 250 rpm increment to the "7" at the high end of the

scale. The SRT-10 tachometer also includes the text, "Premium Unleaded Fuel Only." In either case, the gauge graphics are clearly visible within the instrument cluster in daylight.

When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the black graphics appear blue-green and the red graphics still appear red. The gauge needle has internal optical illumination. Gauge illumination is provided by a replaceable incandescent bulb and holder unit located on the instrument cluster electronic circuit board. The tachometer is serviced as a unit with the instrument cluster.

OPERATION

The tachometer gives an indication to the vehicle operator of the engine speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The tachometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Speed Message** - Each time the cluster receives an engine speed message from the PCM or ECM it will calculate the correct engine speed reading and position the gauge needle at that relative engine speed position on the gauge scale. The cluster will receive a new engine speed message and reposition the gauge pointer accordingly about every 88 milliseconds. The gauge needle will continually be repositioned at the relative engine speed position on the gauge scale until the engine stops running, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive an engine speed message, it will hold the gauge needle at the last indication for about ten seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After ten seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the tachometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the crankshaft position sensor to determine the engine speed. On vehicles with a diesel engine, the ECM continually monitors the engine speed sensor to determine the engine speed. The PCM or ECM then sends the proper engine speed messages to the instrument cluster. For further diagnosis of the tachometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the crankshaft position sensor, the engine speed sensor, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the tachometer, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TOW/HAUL INDICATOR

DESCRIPTION

A tow/haul indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with the optional overdrive automatic transmission, this indicator is electronically disabled. The tow/haul indicator consists of the text "TOW/HAUL", which appears in the lower portion of the odometer/trip odometer indicator Vacuum Fluorescent Display (VFD) unit.

**TOW/
HAUL**

The odometer/trip odometer VFD is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the tachometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated. The text "TOW/HAUL" appears in an amber color and at the same lighting level as the odometer/trip odometer information when it

is illuminated by the instrument cluster electronic circuit board. The tow/haul indicator is serviced as a unit with the VFD in the instrument cluster.

OPERATION

The tow/haul indicator gives an indication to the vehicle operator when the Off position of the tow/haul switch has been selected, disabling the electronically controlled overdrive feature of the automatic transmission. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus.

The tow/haul indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the tow/haul indicator for the following reasons:

- **Tow/Haul Lamp-On Message** - Each time the cluster receives a tow/haul lamp-on message from the PCM indicating that the Off position of the tow/haul switch has been selected, the tow/haul indicator will be illuminated. The indicator remains illuminated until the cluster receives a tow/haul lamp-off message from the PCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the tow/haul indicator will be turned on, then off again during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors the tow/haul switch to determine the proper outputs to the automatic transmission. The PCM then sends the proper tow/haul lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the tow/haul indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the overdrive control system, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the tow/haul indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TRANS TEMP INDICATOR

DESCRIPTION

A transmission over-temperature indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with an optional automatic transmission, this indicator is electronically disabled. This indicator is located on the left side of the instrument cluster, to the left of the fuel gauge.



**TRANS
TEMP**

The transmission over-temperature indicator consists of a stencil-like cutout of the text "TRANS TEMP" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the "TRANS TEMP" text to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The transmission over-temperature indicator is serviced as a unit with the instrument cluster.

OPERATION

The transmission over-temperature indicator gives an indication to the vehicle operator when the transmission fluid temperature is excessive, which may lead to accelerated transmission component wear or failure. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus.

The transmission over-temperature indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a

battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the transmission over-temperature indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the transmission over-temperature indicator is illuminated for about two seconds as a bulb test.
- **Trans Over-Temp Lamp-On Message** - Each time the cluster receives a trans over-temp lamp-on message from the PCM indicating that the transmission fluid temperature is 135° C (275° F) or higher, the indicator will be illuminated and a single chime tone is sounded. The indicator remains illuminated until the cluster receives a trans over-temp lamp-off message from the PCM, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the transmission over-temperature indicator is cycled off and then on again by the appropriate trans over-temp messages from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the transmission over-temperature indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

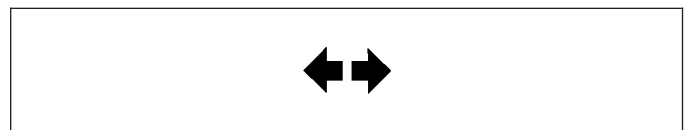
The PCM continually monitors the transmission temperature sensor to determine the transmission operating condition. The PCM then sends the proper trans over-temp lamp-on or lamp-off messages to the instrument cluster. If the instrument cluster turns on the transmission over-temperature indicator due to a high transmission oil temperature condition, it may indicate that the transmission and/or the transmission cooling system are being overloaded or that they require service. For further diagnosis of the transmission over-temperature indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the transmission temperature sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the transmission over-temperature indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

TURN SIGNAL INDICATOR

DESCRIPTION

Two turn signal indicators, one right and one left, are standard equipment on all instrument clusters. The turn signal indicators are located near the upper edge of the instrument cluster, between the speedometer and the tachometer.



Each turn signal indicator consists of a stencil-like cutout of the International Control and Display Symbol icon for "Turn Warning" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents these icons from being clearly visible when they are not illuminated. A green Light Emitting Diode (LED) behind each cutout in the opaque layer of the overlay causes the icon to appear in green through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The turn signal indicators are serviced as a unit with the instrument cluster.

OPERATION

The turn signal indicators give an indication to the vehicle operator that the turn signal (left or right indicator flashing) or hazard warning (both left and right indicators flashing) have been selected and are operating. These indicators are controlled by transistors on the instrument cluster electronic circuit board based upon the cluster programming, a hard wired multiplex input received by the cluster from the turn signal and hazard warning switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, and electronic messages received from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Programmable Communications Interface (PCI) data bus.

Each turn signal indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, each LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the turn signal indicators for the following reasons:

- **Turn Signal-On Input** - Each time the cluster detects a turn signal-on input from the turn signal switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, it sends the appropriate electronic turn signal switch status messages to the FCM over the PCI data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for either the right or left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right or left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional turn signal flasher. The turn signals and the turn signal indicators continue to flash on and off until the cluster receives a turn signal-off input from the multi-function switch, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Hazard Warning-On Input** - Each time the cluster detects a hazard warning-on input from the hazard warning switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, it sends the appropriate electronic hazard switch status messages to the FCM over the PCI data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for each of the right and left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right and left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional hazard warning flasher. The turn signals and the turn signal indicators continue to flash on and off until the cluster receives a hazard warning-off input from the multi-function switch.
- **Lamp Out Mode** - The instrument cluster also sends electronic turn signal on and off messages to the FCM over the PCI data bus, and the FCM flashes the appropriate exterior turn signal lamps. If the FCM detects an inoperative turn signal lamp or circuit, it increases the flash rate for the remaining operative turn signals and sends an electronic message back to the instrument cluster. The instrument cluster then increases the flash rate of the turn signal indicator(s) and the clicking rate of the electromechanical relay to provide an indication of the problem to the vehicle operator.
- **Actuator Test** - Each time the cluster is put through the actuator test, the turn signal indicators will be turned on, then off again during the bulb check portion of the test to confirm the functionality of each LED and the cluster control circuitry.

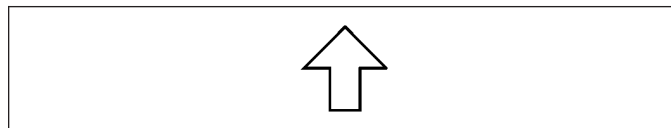
The instrument cluster continually monitors the multi-function switch and electronic messages from the FCM to determine the proper turn signal and hazard warning system control. For further diagnosis of the turn signal indicators or the instrument cluster circuitry that controls the indicators, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the turn signal and hazard warning system, the multi-function switch, the FCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the turn signal indicators, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

UPSHIFT INDICATOR

DESCRIPTION

An upshift indicator is standard equipment on all instrument clusters. However, on vehicles not equipped with a manual transmission, or on vehicles equipped with a manual transmission but sold in a market where this is not required equipment, this indicator is electronically disabled.



The upshift indicator consists of an upward pointed arrow icon, which appears on the right side of the electronic gear selector indicator Vacuum Fluorescent Display (VFD) unit. The VFD is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the speedometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated. The icon appears in a blue-green color and at the same lighting level as the odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The upshift indicator is serviced as a unit with the instrument cluster.

OPERATION

The upshift indicator gives an indication to the vehicle operator when the manual transmission should be shifted to the next highest gear in order to achieve the best fuel economy. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles with a gasoline engine, or from the Engine Control Module (ECM) on vehicles with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The upshift indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the upshift indicator for the following reasons:

- **Upshift Lamp-On Message** - Each time the cluster receives an upshift lamp-on message from the PCM or ECM indicating the engine speed and load conditions are right for a transmission upshift to occur, the upshift indicator is illuminated. The indicator remains illuminated until the cluster receives an upshift lamp-off message from the PCM or ECM, or until the ignition switch is turned to the Off position, whichever occurs first. The PCM or ECM will normally send an upshift lamp-off message three to five seconds after a lamp-on message, if an upshift is not performed. The indicator will then remain off until the vehicle stops accelerating and is brought back into the range of indicator operation, or until the transmission is shifted into another gear.
- **Actuator Test** - Each time the cluster is put through the actuator test, the upshift indicator will be turned on, then off again during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the engine speed and load conditions to determine the proper fuel and ignition requirements. On vehicles with a diesel engine, the ECM continually monitors the engine speed and load conditions to determine the proper fuel requirements. The PCM or ECM then sends the proper upshift indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the upshift indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the upshift indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

VOLTAGE GAUGE

DESCRIPTION

A voltage gauge is standard equipment on all instrument clusters. The voltage gauge is located in the upper left quadrant of the instrument cluster, above the fuel gauge.



The voltage gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the cluster overlay that reads left-to-right from "L" (or Low) to "H" (or High) for gasoline engines except SRT-10. On SRT-10 models, the scale reads from "10" to "18" volts. On vehicles with a diesel engine, the scale reads from "8" to "18" volts.

An International Control and Display Symbol icon for "Battery Charging Condition" is located on the cluster overlay, directly below the right end of the gauge scale. On all models except SRT-10 the voltage gauge graphics are black against a white field except for a single red graduation at each end of the gauge scale. On SRT-10 the gauge graphics are black against a silver field except for a single red graduation at the left end of the gauge scale and two red graduations at the right end of the gauge scale. In either case, the gauge graphics are clearly visible within the instrument cluster in daylight.

When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the black graphics appear blue-green and the red graphics still appear red. The gauge needle has internal optical illumination. Gauge illumination is provided by a replaceable incandescent bulb and holder unit located on the instrument cluster electronic circuit board. The voltage gauge is serviced as a unit with the instrument cluster.

OPERATION

The voltage gauge gives an indication to the vehicle operator of the electrical system voltage. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) on vehicles equipped with a gasoline engine, or from the Engine Control Module (ECM) on vehicles equipped with a diesel engine over the Programmable Communications Interface (PCI) data bus.

The voltage gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the left end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **System Voltage Message** - Each time the cluster receives a system voltage message from the PCM or ECM indicating the system voltage is between about 9.5 volts and about 15 volts, the gauge needle is moved to the relative voltage position on the gauge scale.
- **System Voltage Low (Charge Fail) Message** - Each time the cluster receives three consecutive messages from the PCM or ECM indicating the electrical system voltage is less than about 9 volts (charge fail condition) or that the battery temperature sensor input is an open circuit, the gauge needle is moved to the graduation on the far left end of the gauge scale and the check gauges indicator is illuminated. The gauge needle remains at the far left end of the gauge scale and the check gauges indicator remains illuminated until the cluster receives a single message from the PCM or ECM indicating the electrical system voltage is greater than about 9.5 volts (but less than about 15.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first. On vehicles equipped with the optional diesel engine, the ECM is programmed to restrict the voltage gauge needle to a position above the graduation on the far left end of the gauge scale and suppress the check engine indicator operation until after the engine intake manifold air heater has completed a pre-heat or post-heat cycle.
- **System Voltage High Message** - On all models except SRT-10, each time the cluster receives three consecutive messages from the PCM or ECM indicating the electrical system voltage is greater than about 15.5 volts, the gauge needle is moved to the graduation on the far right end of the gauge scale and the check gauges indicator is illuminated. The gauge needle remains at the right end of the gauge scale and the check gauges indicator remains illuminated until the cluster receives a message from the PCM or ECM indicating the electrical system voltage is less than about 15.0 volts (but greater than about 9.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first. On SRT-10, each time the cluster receives three consecutive messages from the PCM indicating the electrical system voltage is greater than about 15.5 volts, the gauge needle is moved to the 16 volt graduation of the gauge scale and the check gauges indicator is illuminated. The gauge needle remains at or above the 16 volt graduation of the gauge scale and the check gauges indicator remains illuminated until the cluster receives a message from the PCM indicating the electrical system voltage is less than about 15.0 volts (but greater than about 9.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive a system voltage message, it will hold the gauge needle at the last indication for about ten seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After ten seconds, the cluster will move the gauge needle to the far left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the voltage gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

On vehicles with a gasoline engine, the PCM continually monitors the system voltage to control the generator output. On vehicles with a diesel engine, the ECM continually monitors the system voltage to control the generator output. The PCM or ECM then sends the proper system voltage messages to the instrument cluster. For further diagnosis of the voltage gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the check gauges indicator due to a charge fail or voltage high condition, it may indicate that the charging system requires service.

For proper diagnosis of the charging system, the PCM, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the voltage gauge, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

WAIT-TO-START INDICATOR

DESCRIPTION

A wait-to-start indicator is only found in the instrument clusters for vehicles equipped with an optional diesel engine. The wait-to-start indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer.



The wait-to-start indicator consists of stencil-like cutout of the International Control and Display Symbol icon for “Diesel Preheat” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The wait-to-start indicator is serviced as a unit with the instrument cluster.

OPERATION

The wait-to-start indicator gives an indication to the vehicle operator when the air temperature within the diesel engine intake manifold is too cool for efficient and reliable engine starting, and that the intake air heater grids are energized in their pre-heat operating mode. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Engine Control Module (ECM) over the Programmable Communications Interface (PCI) data bus.

The wait-to-start indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the wait-to-start indicator for the following reasons:

- **Wait-To-Start Lamp-On Message** - Each time the cluster receives a wait-to-start lamp-on message from the ECM indicating that the air temperature within the intake manifold is too cool for efficient and reliable engine starting, the wait-to-start indicator will be illuminated. The indicator remains illuminated until the cluster receives a wait-to-start lamp-off message, until the ECM detects that the engine is running or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the wait-to-start indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The ECM continually monitors the engine intake air temperature sensor to determine when the intake air heater grids should be energized in their pre-heat operating mode. The ECM then sends the proper wait-to-start lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the wait-to-start indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the engine intake air temperature sensor, the intake air heater grid control circuits, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the wait-to-start indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

WASHER FLUID INDICATOR

DESCRIPTION

A washer fluid indicator is standard equipment on all instrument clusters. The washer fluid indicator consists of the text “LOW WASH”, which appears in the lower portion of the odometer Vacuum-Fluorescent Display (VFD) unit.

The odometer VFD is soldered onto the cluster electronic circuit board and is visible through a window with a smoked clear lens located on the lower edge of the tachometer gauge dial face of the cluster overlay. The dark lens over the VFD prevents the indicator from being clearly visible when it is not illuminated. The "LOW WASH" text appears in an amber color and at the same lighting level as the odometer/trip odometer information when it is illuminated by the instrument cluster electronic circuit board. The washer fluid indicator is serviced as a unit with the VFD in the instrument cluster.

OPERATION

The washer fluid indicator gives an indication to the vehicle operator that the fluid level in the washer reservoir is low. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM or Power Distribution Center/PDC) over the Programmable Communications Interface (PCI) data bus.

The washer fluid indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the washer fluid indicator for the following reasons:

- **Washer Fluid Indicator Lamp-On Message** - Each time the cluster receives a washer fluid indicator lamp-on message from the FCM indicating that a low washer condition has been detected for sixty consecutive seconds, the washer fluid indicator is illuminated and a single chime tone is sounded. The indicator remains illuminated until the cluster receives a washer fluid indicator lamp-off message for sixty consecutive seconds from the FCM or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the washer fluid indicator is cycled off and then on again by the appropriate washer fluid lamp messages from the FCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the washer fluid indicator will be turned on, then off again during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The FCM continually monitors the washer fluid level switch in the washer reservoir to determine the level of the washer fluid. The FCM then sends the proper washer fluid indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the washer fluid indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the washer fluid level switch, the FCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the washer fluid indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

WATER-IN-FUEL INDICATOR

DESCRIPTION

A water-in-fuel indicator is only found in the instrument clusters for vehicles equipped with an optional diesel engine. The water-in-fuel indicator is located near the lower edge of the instrument cluster, between the tachometer and the speedometer.



The water-in-fuel indicator consists of stencil-like cutout of the International Control and Display Symbol icon for "Water In Fuel" in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. A red Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in red through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The water-in-fuel indicator is serviced as a unit with the instrument cluster.

OPERATION

The water-in-fuel indicator gives an indication to the vehicle operator when there is excessive water in the fuel system. This indicator is controlled by a transistor on the instrument cluster circuit board based upon the cluster pro-

gramming and electronic messages received by the cluster from the Engine Control Module (ECM) over the Programmable Communications Interface (PCI) data bus.

The water-in-fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the water-in-fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the water-in-fuel indicator is illuminated for about two seconds as a bulb test.
- **Water-In-Fuel Lamp-On Message** - Each time the cluster receives a water-in-fuel lamp-on message from the ECM indicating that there is excessive water in the diesel fuel system, the water-in-fuel indicator will be illuminated. The indicator remains illuminated until the cluster receives a water-in-fuel lamp-off message, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the water-in-fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The ECM continually monitors the water-in-fuel sensor to determine whether there is excessive water in the diesel fuel system. The ECM then sends the proper water-in-fuel lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the water-in-fuel indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).

For proper diagnosis of the water-in-fuel sensor, the ECM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the water-in-fuel indicator, a diagnostic scan tool is required. Refer to the appropriate diagnostic information.

