

2008 Chevrolet Silverado 1500

2008 BRAKES Trailer Brake Controls - Cab & Chassis Sierra, Cab & Chassis Silverado, Sierra & Silverado

2008 BRAKES

Trailer Brake Controls - Cab & Chassis Sierra, Cab & Chassis Silverado, Sierra & Silverado

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Trailer Brake Control Module Bolt	9 N.m	80 lb in
Trailer Brake Control Relay Bolt	9 N.m	80 lb in

SCHEMATIC AND ROUTING DIAGRAMS

TRAILER BRAKE CONTROL SCHEMATICS

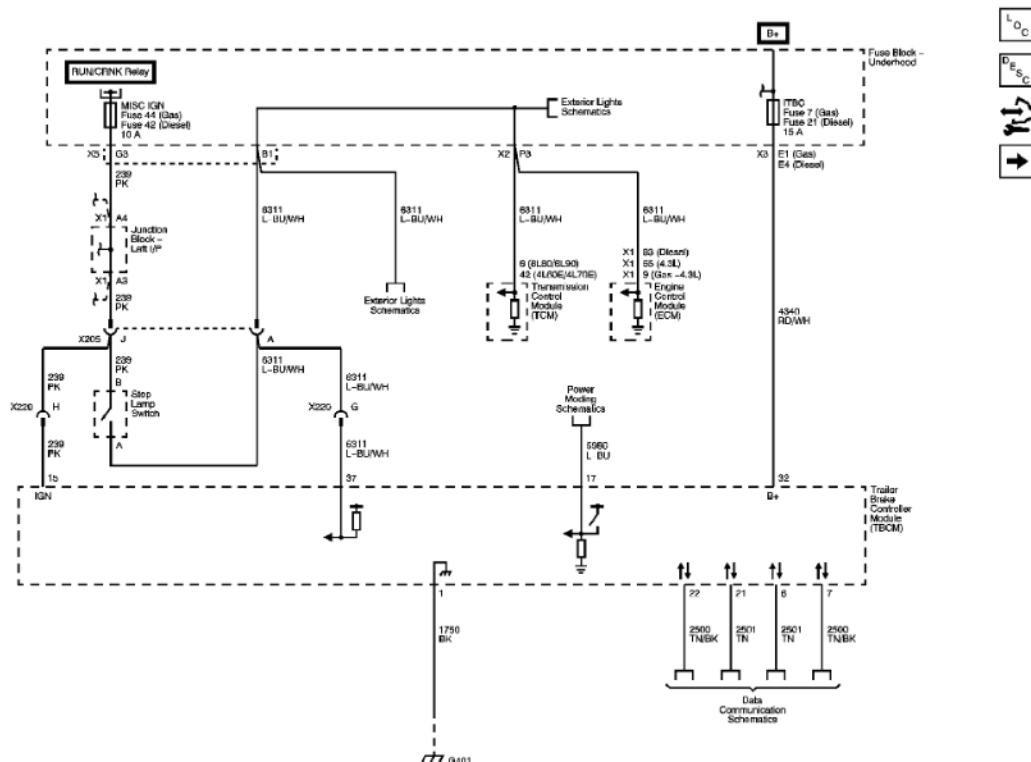


Fig. 1: Module Power and Ground
Courtesy of GENERAL MOTORS CORP.

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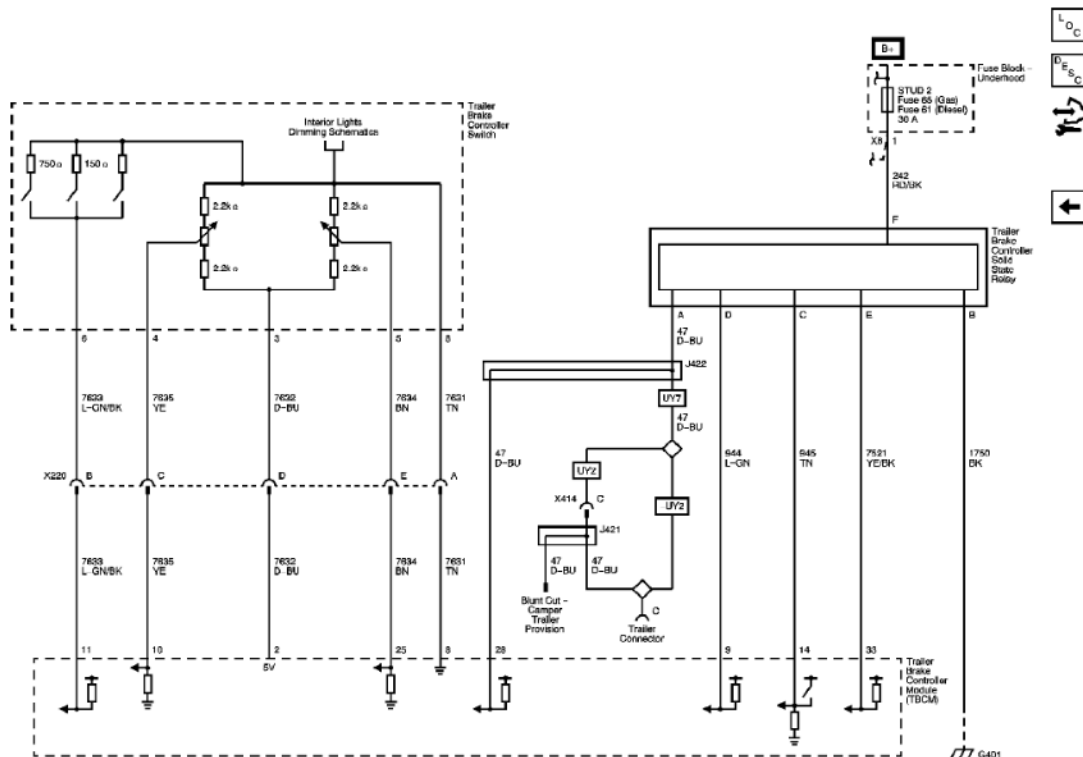


Fig. 2: Trailer Brake Controls
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B3894	B3894 5A: Stop Lamp Switch Circuit Plausibility Failure
DTC C0561	C0561 F0: System Disabled Information Stored Invalid Serial Data Received C0561 F1: System Disabled Information Stored Invalid Serial Data Received
DTC C056D or C056E	C056D 33: ECU Hardware Performance Special Memory Failure C056D 34: ECU Hardware Performance RAM Failure C056D 35: ECU Hardware Performance ROM Failure C056D 36: ECU Hardware Performance EEPROM Failure

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	C056D 39: ECU Hardware Performance Internal Electronic Failure (ECU processor failure) C056E 41: ECU Software Performance Operational Software/Calibration Set Not Programmed
<u>DTC C0800</u>	C800 03: Device Power Circuit Voltage Below Threshold C800 07: Device Power Circuit Voltage Above Threshold
<u>DTC C0845</u>	C0845 03: Device Ignition 1 Circuit Voltage Below Threshold
<u>DTC C0870</u>	C0870: Device Voltage Reference Output 1 Circuit
<u>DTC C0880</u>	C0880: Device Voltage Reference Output 2 Circuit
<u>DTC C0890</u>	C0890: Device Voltage Reference Output 3 Circuit
<u>DTC C1112</u>	C1112: Trailer Brake Control Relay Low Control Circuit - Relay Control Active Low
<u>DTC C1113</u>	C1113 01: Trailer Brake Control Relay High Control Circuit Short to Battery
<u>DTC C1114</u>	C1114: Trailer Brake Control Solenoids Control Circuit-Trailer Auxiliary Supply Voltage
<u>DTC C1115</u>	C1115 08: Manual Trailer Brake Apply Request Switch Signal Invalid-Manual Apply Switch Stuck Closed C1115 5A: Manual Trailer Brake Apply Request Switch Signal Plausibility Failure
<u>DTC C1116</u>	C1116: Manual Trailer Brake Apply Request Signal 1
<u>DTC C1117</u>	C1117: Manual Trailer Brake Apply Request circuit Signal 2-Redundant Manual Apply Signal
<u>DTC C1118</u>	C1118: Trailer Brake Control Sensitivity Switch Circuit C1118 08: Trailer Brake Control Sensitivity Switch Circuit Signal Invalid
<u>DTC C1119</u>	C1119: Trailer Brake Control Relay Feedback Circuit

DIAGNOSTIC STARTING POINT - TRAILER BRAKE CONTROLS

Begin the system diagnosis with **Diagnostic System Check - Vehicle** . The Diagnostic System Check will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

The use of the Diagnostic System Check will identify the correct procedure for diagnosing the

system and where the procedure is located.

DTC B3894

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC Descriptor

DTC B3894 5A

Stop Lamp Switch Circuit Plausibility Failure

Circuit/System Description

The TCC Brake Switch signal hard wired to the TBCM is normally open and closes to battery voltage when the brake pedal is applied. A separate brake switch signal is hard wired to the Body Control Module (BCM) that is normally closed to battery voltage and opens when the brake pedal is applied. The BCM sends its brake switch information to the TBCM over GMLAN serial data. The TBCM compares the states of the two brake switch signals after a Master Cylinder Brake Pressure threshold is exceeded. If the brake switch signal states are not in agreement or if the serial data brake state is not valid, a DTC will set and the ITBC system will be disabled.

Conditions for Running the DTC

- The system voltage is in the range of 9.5-17 volts.
- The module initialization has taken place.
- The master cylinder brake pressure exceeds threshold

Conditions for Setting the DTC

The actual brake switch input to the TBCM, and the serial data information for the brake switch do not match.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- Service Trailer Brake System, will be displayed on the driver information center (DIC).

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Conditions for Clearing the MIL/DTC

Clear DTCs with a scan tool.

Diagnostic Aids

If there are any other DTCs set for the stop lamp or lighting systems, or GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

Ignition ON, press the brake pedal. The brake lights should illuminate, and scan tool data list

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Brake Switch Status should indicate ON.

Circuit/System Testing

1. Disconnect the stop lamp switch and test for short to ground between terminal A of the stop lamp switch connector and terminal 37 of the TBCM.
 - If the circuit test normal, replace the stop lamp switch.
2. Test for short to battery positive between terminal A of the stop lamp switch connector and terminal 37 of the TBCM.
 - If all circuits/connections test normal, replace the TBCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C0561

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0561 F0

System Disabled Information Stored Invalid Serial Data Received

DTC C0561 F1

System Disabled Information Stored Invalid Serial Data Received

Circuit/System Description

Diagnostics are used to determine whether or not there is a fault with the brake pressure or wheel speed data being received by the TBCM over GMLAN serial data.

The loss of serial data brake pressure diagnostic is to determine whether or not there is a fault with the brake pressure data being received over GMLAN. This diagnostic looks at the brake

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pressure signal validity and protection value signals over a period of time to determine the fault state of the brake pressure sensor.

The loss of serial data wheel speed diagnostic is to determine whether or not there is a fault with the wheel speed data being received over GMLAN. This diagnostic looks at the wheel speed signal validity and sequence number errors over a period of time to determine the fault state

Conditions for Running the DTC

- The ignition switch is in the ON position.
- Ignition voltage is in the range of 9.5-17 volts.

Conditions for Setting the DTC

- The EBCM diagnoses a fault condition in the master cylinder pressure sensor, and sends a serial data message to the TBCM.
- The EBCM diagnoses a fault condition in the wheel speed sensors, and sends a serial data message to the TBCM.
- The TBCM losses communication with the EBCM.

Action Taken When the DTC Sets

One or more of the following actions may occur:

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099 or the antilock brake control system, diagnose them first before to resolve DTCs described in this section.

Check for Brake Pressure Sensor and/or Wheel Speed Sensor DTCs in EBCM. Follow EBCM circuit repair procedure. If no DTCs are found in EBCM check for ground differential between EBCM and TBCM, loose TBCM ground, loose GMLAN signal terminal pins at TBCM or source

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of electromagnetic interference that may result from installation of aftermarket equipment

Reference Information

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Trailer Brake Control Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Trailer Brake Controls Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C056D OR C056E

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DTC Descriptor

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DTC C056D 33

ECU Hardware Performance Special Memory Failure

DTC C056D 34

ECU Hardware Performance RAM Failure

DTC C056D 35

ECU Hardware Performance ROM Failure

DTC C056D 36

ECU Hardware Performance EEPROM Failure

DTC C056D 39

ECU Hardware Performance Internal Electronic Failure (ECU processor failure)

DTC C056E 41

ECU Software Performance Operational Software/Calibration Set Not Programmed

Circuit/System Description

This diagnostic applies to internal microprocessor integrity conditions within the Trailer Brake Control Module (TBCM). This diagnostic also addresses if the TBCM is not programmed.

Conditions for Running the DTC

C056D

The Ignition is ON, and DTC C056D runs once an ignition cycle.

C056E

The ignition is ON, with the engine OFF, DTC C056D runs continuously.

Conditions for Setting the DTC

C056D

The TBCM detected a failure in its microprocessor.

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C056E

The TBCM is not programmed.

Action Taken When the DTC Sets

- The trailer brake control will be disabled at the end of the current brake apply for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Conditions for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

Ignition ON, observe the DTC information with a scan tool. DTC C056D and DTC C056E, should not set.

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- If DTC C056D failed this ignition, replace the TBCM.
- If DTC C056E failed this ignition, program the TBCM.

Circuit/System Testing

C056E

Program the TBCM. If DTC C056E sets after programming, perform the following steps:

- If DTC C056D is set, turn off the ignition, wait 30 seconds, turn ignition on, if DTC C056D failed this ignition cycle, replace the TBCM.
- If DTC C056E is set, turn off the ignition, wait 30 seconds, turn ignition on, if DTC C056E failed this ignition cycle, program the TBCM.
 - If DTC C056E sets after programming, replace the TBCM.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C0800

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC Descriptor

DTC C800 03

Device Power Circuit Voltage Below Threshold

DTC C800 07

Device Power Circuit Voltage Above Threshold

Circuit/System Description

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The trailer brake control module (TBCM) monitors the system voltage (ignition voltage) to make sure that the voltage stays within the proper range. Damage to components, and incorrect data input can occur when the voltage is out of range. The TBCM monitors the system voltage over an extended length of time. If the TBCM detects a system voltage outside an expected range, DTC C0800 will set.

Conditions for Running the DTC

- The ignition is ON.
- The engine speed is greater than 400 RPM.

Conditions for Setting the DTC

C0800 03

- During initialization or when the system is inactive, the system voltage is less than 10.5 volts.
- During the system operation, the system voltage is less than 9.5 volts.

C0800 07

- Ignition is in RUN.
- The system voltage is greater than 17 volts.

Action Taken When the DTC Sets

- The trailer brake control will be disabled at the end of the current brake apply for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Conditions for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for Scan Tool Information

Diagnostic Aids

If there are any other DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

C0800 03

- Test the charging system Refer to **Diagnostic System Check - Vehicle** .
- Possible causes of this DTC are the following conditions:
 - A charging system malfunction
 - An excessive battery draw
 - A weak battery
 - A faulty system ground

C0800 07

- Test the charging system Refer to **Diagnostic System Check - Vehicle** .
- A possible cause of this DTC is overcharging.

Circuit/System Verification

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With the scan tool installed, ignition ON and the engine running, observe the Battery Positive Voltage parameter in the TBCM data list. The reading should be between 9-17 volts.

Circuit/System Testing

1. If the DTC is history, refer to **Charging System Test** .
2. If the DTC is current, start the engine, and measure the voltage between the battery positive voltage circuits of the TBCM and the ground circuit.
 - If the voltage is within 9-17 volts, replace the affected module.
 - If the voltage is not within 9-17 volts, measure the voltage between the battery positive voltage circuits of the TBCM and a separate good ground.
 - If the voltage is within 9-17 volts, test the battery positive ground circuits of the TBCM for high resistance or an open, and repair as necessary.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C0845

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0845 03

Device Ignition 1 Circuit Voltage Below Threshold

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Ignition 1 Circuit	-	-	C0845 03	-	-
TCC Brake Signal Circuit	C0845 03	-	-	-	-

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Circuit/System Description

The trailer brake control module (TBCM) checks whether there is an ignition ground short fault. This diagnostic compares ignition state with the engine running state received over serial data to determine whether or not there is an ignition ground short fault.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

The engine is running, and the TBCM detects that the IGN 1 voltage is less than 9.2 volts

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Conditions for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

IMPORTANT: The ignition may need to be cycled twice, waiting 30 seconds between key cycles, to move the code from current to history

If there are any other DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before resolving DTCs described in this section.

Reference Information

Schematic Reference

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Trailer Brake Controls Description and Operation

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Electrical Information Reference

- Circuit Testing
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- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

IMPORTANT: Verify that stop lamp DTCs are not set as current or history before performing this diagnostic. If stop lamp DTCs are set as current or history, go to lighting for diagnose.

1. Ignition OFF, disconnect the harness connector of the TBCM.
2. Ignition ON, test for 11 volts or greater between the IGN 1 voltage circuit terminal 15 and ground.
 - If less than the specified voltage, test the IGN 1 voltage circuit for a short to ground or an open/high resistance. If the circuit test normal and the MISC - IGN fuse 44 is open, test the voltage circuit for a short to ground. If the circuit tests normal, test or replace the RUN/CRANK relay.
3. If all circuits test normal, and the DTC resets as current, replace the TBCM.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C0870

Diagnostic Instructions

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- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0870

Device Voltage Reference Output 1 Circuit

Circuit/System Description

The TBCM runs this diagnostics to check whether there is a fault on the internal TBCM 5 volt references used to monitor the SSR Control and Trailer Feedback circuits. This diagnostics checks if the circuits' 5 volt references is within a range for normal operation.

Conditions for Running the DTC

- The system voltage is in the range of 9.5 volts.
- The module initialization has taken place.

Conditions for Setting the DTC

The TBCM circuit reference voltage for the SSR is below 4.8 volts or above 5.2 volts.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Conditions for Clearing the DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099 or the antilock brake control system, diagnose them first before to resolve DTCs described in this section.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the solid state relay module.
2. Test for less than 5 ohms of resistance between the ground circuit terminal B and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for 4.85 - 5.2 volts between the 5-volt reference circuit terminal C and ground.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.

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4. If all circuits test normal, replace the trailer brake solid state relay.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C0880

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0880

Device Voltage Reference Output 2 Circuit

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Device Voltage Reference Output 2 Circuit	C0880	-	-	C0880	-

Circuit/System Description

The TBCM runs this diagnostics to check whether there is a fault on the internal TBCM 5 volt references used to monitor the User Gain switch circuits. This diagnostics checks if the circuits' 5 volt references is within a range for normal operation.

Conditions for Running the DTC

- The system voltage is in the range of 9.5 - 17 volts.
- The module initialization has taken place.

Conditions for Setting the DTC

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Internal TBCM circuit reference voltage for User Gain switch is below 4.8 volts or above 5.2 volts

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Conditions for Clearing the DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099 or the antilock brake control system, diagnose them first before to resolve DTCs described in this section.

Reference Information

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- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the trailer brake controller switch panel.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 8 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance. If the circuit tests normal, replace the TBCM.
3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal 6 and ground.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. If all circuits test normal, test or replace the trailer brake controller switch panel.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C0890

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DTC Descriptor

DTC C0890

Device Voltage Reference Output 3 Circuit

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Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Device Voltage Reference Output 3 Circuit	C0890	-	-	C0890	-

Circuit/System Description

The TBCM runs this diagnostics to check whether there is a fault on the internal TBCM 5 volt references used to monitor the Manual Apply switch circuits. This diagnostics checks if the circuits 5 volt references is within a range for normal operation.

Conditions for Running the DTC

- The system voltage is in the range of 9.5 - 17 volts.
- The module initialization has taken place.

Conditions for Setting the DTC

The TBCM detects voltage greater than 5.2 volts in the manual apply switch 5 volt reference circuit.

The TBCM detects voltage less than 4.8 volts in the manual apply switch 5 volt reference circuit.

Action Taken When the DTC Sets

- The trailer brake control will be disabled at the end of the current brake apply for the remainder of the ignition cycle.
- A message center or an indicator displays.

Conditions for Clearing the DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099 or the antilock brake control system, diagnose them first before to resolve DTCs described in this section.

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Reference Information

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- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the trailer brake controller switch panel.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 5 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance. If the circuit tests normal, replace the TBCM.
3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal 3 and ground.

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- If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. If all circuits test normal, test or replace the trailer brake controller switch panel.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

Control Module References for TBCM replacement, setup, and programming

DTC C1112

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1112

Trailer Brake Control Relay Low Control Circuit - Relay Control Active Low

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Relay Control Active Low Circuit	C1112	-	C1112	C1112	-
TBCM Relay Control Circuit	C1112	-	C1112	C1112	-
SSR Fuse STUD 2 Power Circuit	-	-	C1112	-	-

Circuit/System Description

The trailer brake control module (TBCM) diagnostic monitor detects faults on the solid state relay (SSR) relay control active low circuit.

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Conditions for Running the DTC

- The ignition is ON.
- The system voltage is in the range of 9.5 - 17 volts.
- The 5 volt supply for the SSR output auxiliary supply circuit is not faulted, and DTC C0870 is not set as current DTC.
- The SSR relay control circuit fault DTC C1114 is not set as current DTC.
- This DTC runs once per ignition cycle within the enabling conditions.

Conditions for Setting the DTC

DTC C1112 will set as current DTC, if one of the following conditions is true:

- The TBCM detects an open in the relay control active low circuit.
- The TBCM detects short to ground in the relay control active low circuit.
- The TBCM detects short to battery positive in the relay control active low circuit.
- The TBCM detects a open power circuit from fuse 65 or 61.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls Trailer Brake Relay Status parameter. The reading should be Enabled or Disabled.
2. Ignition ON, observe the scan tool brake controls TBCM Command Duty Cycle parameter. The reading should be 0 - 100 percent.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the solid state relay.
2. Ignition ON, verify that a test lamp illuminates between the B+ circuit terminal F and ground.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance. If the circuit tests normal and the B+ circuit fuse is open, test or replace the trailer brake controller solid state relay.
3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal E and ground.

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- If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal C and ground.
- If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
5. If all circuits test normal, replace the trailer brake solid state relay.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Trailer Brake Control Module Replacement**
- **Control Module References** for TBCM replacement, setup, and programming

DTC C1113

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1113 01

Trailer Brake Control Relay High Control Circuit Short to Battery

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
SSR Relay Control Circuit	C1113 01	-	C1113 01	C1113 01	-
Trailer Auxiliary Supply	-	-	-	C1113 01	-

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Voltage Circuit					
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Circuit/System Description

The trailer brake relay control circuit high SSR enable circuit short to battery monitors for short-to-high faults on the trailer brake solid state relay (SSR) enable circuit. In general, the SSR enable short-to-high circuit diagnostic is executed whenever the SSR has been disabled for a minimum duration. Typically, the diagnosis is executed at TBCM power up. The diagnosis test passes, if TBCM detected the status is correct for consecutive 16 samples.

Conditions for Running the DTC

- The ignition is ON.
- This DTC runs once per ignition cycle within the enabling conditions.

Conditions for Setting the DTC

The TBCM detects short to battery positive in the solid state relay control circuit.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

If DTC C1114 is set as a current DTC, diagnose first before diagnosing DTC C1113. If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls Trailer Brake Relay Status parameter. The reading should be Enabled or Disabled.
2. Ignition ON, observe the scan tool brake controls TBCM Command Duty Cycle parameter. The reading should be 0 - 100 percent.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the solid state relay module.
2. Test for less than 5 ohms of resistance between the ground circuit terminal B and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for 9 - 11 volts between the 10-volt relay control circuit terminal E and ground.

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- If less than the specified range, test the 10-volt relay control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 10-volt relay control circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. Ignition OFF, reconnect the harness connector at the solid state relay module.
 5. Connect a test lamp between the control circuit terminal C of the trailer connector and the ground circuit terminal B.
 6. Command the trailer brake relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
 - If the test lamp is always OFF, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 7. If all circuits test normal, test or replace the trailer brake solid state relay (SSR).

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Trailer Brake Control Module Replacement**
- **Control Module References** for TBCM replacement, setup, and programming

DTC C1114

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1114

Trailer Brake Control Solenoids Control Circuit-Trailer Auxiliary Supply Voltage

Diagnostic Fault Information

	Short to	High		Short to	Signal
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Circuit	Ground	Resistance	Open	Voltage	Performance
Trailer Auxiliary Supply Voltage Circuit	C1114		C1114	C1114	-
SSR Relay Control Circuit	C1114	-	-	-	-
SSR Ground Circuit	-	-	C1114	-	-

Circuit/System Description

The trailer brake control module (TBCM) monitors for faults on the trailer brake solid state relay (SSR) output auxiliary supply voltage circuit for fault for a short to ground, short to battery, or open circuit.

Conditions for Running the DTC

- The system voltage is in the range of 9.5 - 17 volts.
- The 5 volt supply for the SSR output auxiliary supply circuit is not faulted and DTC C0870 is not set as current DTC.
- The SSR relay control circuit fault DTC C1112 is not set as current DTC.

Conditions for Setting the DTC

DTC C1114 will set as current DTC, if one of the following conditions is true:

- The TBCM detects an open in the trailer auxiliary supply voltage circuit.
- The TBCM detects short to ground in the trailer auxiliary supply voltage circuit.
- The TBCM detects short to battery positive in the manual apply signal circuit.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

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If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

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Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls Trailer Brake Relay Status parameter. The reading should be Enabled or Disabled.
2. Ignition ON, observe the scan tool brake controls TBCM Command Duty Cycle parameter. The reading should be 0 - 100 percent.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the solid state relay module.

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2. Test for less than 5 ohms of resistance between the ground circuit terminal B and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for 9 - 11 volts between the 10-volt control circuit terminal E and ground.
 - If less than the specified range, test the 10-volt control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 10-volt control circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. Ignition OFF, reconnect the harness connector at the solid state relay module.
5. Connect a test lamp between the control circuit terminal C of the trailer connector and the ground circuit terminal B.
6. Command the trailer brake relay ON and OFF with a scan tool. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
 - If the test lamp is always OFF, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
7. If all circuits test normal, test or replace the trailer brake solid state relay (SSR).

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Trailer Brake Control Module Replacement**
- **Control Module References** for TBCM replacement, setup, and programming

DTC C1115

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1115 08

Manual Trailer Brake Apply Request Switch Signal Invalid-Manual Apply Switch Stuck

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Closed

DTC C1115 5A

Manual Trailer Brake Apply Request Switch Signal Plausibility Failure

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
TBCM Manual Apply Signal Circuit	-	-	-	C1115 5A	C1115 08

Circuit/System Description

The manual apply switch rationality diagnostic monitors for circuit rationality faults on the manual apply switch input. The manual apply switch consists of a primary circuit, which is used as the basis for determining the trailer brake manual apply gain, and a redundant circuit that is used to rationalize performance of the primary circuit.

Manual Trailer Brake Apply Request Switch Signal Invalid" diagnostic monitors for a manual apply switch that is stuck in an applied position.

Manual Trailer Brake Apply Request Switch Signal --plausibility failure diagnostic monitors for circuit rationality faults on the manual apply switch input. The manual apply switch consists of a primary circuit, which is used as the basis for determining the trailer brake manual apply gain, and a redundant circuit that is used to rationalize performance of the primary circuit. The manual apply switch position fault is detected when the absolute value of the difference between the primary manual apply switch input and redundant inputs exceeds a threshold for a certain amount of time.

Conditions for Running the DTC

- DTC C1116 or C1117 are not set as current DTC.
- The system voltage is in the range of 9.5 - 17 volts.
- The module is powered up and completes initialization.

Conditions for Setting the DTC

C1115 08

Manual trailer brake apply request switch signal invalid fault is detected when any one of the

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following conditions is true:

- The ignition is turned from Off to On, the Manual Apply Switch is not activated, then it is detected that the Manual Apply Switch is activated for 5 minutes.
- The ignition is Off, the Manual Apply is already activated, and then turn on the ignition, and detected the Manual Apply Switch is continuing to be activated for 30 seconds.

C1115 5A

Manual Trailer Brake Apply Request Switch Signal plausibility failure:

- The ignition is turned from Off to On, the Manual Apply Switch is not activated, then it is detected that the Manual Apply Switch is activated for 5 minutes.
- The fault is detected if the absolute value of the difference between the primary manual apply switch input and redundant inputs exceeds a threshold for an extended amount of time.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

When the manual trailer brake apply switch is shorted to ground, shorted to battery, or open circuit, DTC C1116 Manual Apply Switch Primary input circuit fault may also be set as a current DTC. If DTC C1116 is also set as current DTC, then diagnose DTC C1116 first before to diagnosing DTC C1115 08 and C1115 5A. If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls Primary Manual Apply parameter. The reading should be between 0-100 percent and change with brake pedal input.
2. Ignition ON, observe the scan tool brake controls Redundant Manual Apply parameter. The reading should be between 0-100 percent and change with brake pedal input.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the trailer brake controller switch panel.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 8 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance. If the circuit tests normal, replace the TBCM.
3. Verify the scan tool Manual Apply Switch is less than 10 percent.

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- If greater than the specified range, test the signal circuit terminal 4 for a short to voltage. If the circuit tests normal, replace the TBCM.
- 4. If all circuits test normal, test or replace the trailer brake controller switch panel.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Control Module References** for TBCM replacement, setup, and programming
- **Trailer Brake Control Module Replacement**

DTC C1116

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1116

Manual Trailer Brake Apply Request Signal 1

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
5-Volt Reference Circuit	C1116	-	C1116	C1116	-
TBCM Manual Apply Signal Circuit	-	-	C1116	-	-
TBCM Ground Circuit	-	-	C1116	-	-

Circuit/System Description

The primary manual apply switch circuit diagnostic monitors for circuit faults on the primary manual apply switch input to the trailer brake control module (TBCM).

This DTC will also be set as current DTC when a fault is detected in 5 v reference voltage or in TBCM ground circuit.

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Conditions for Running the DTC

- The system voltage is in the range of 9.5 - 17 volts.
- The module is powered up and completes initialization.

Conditions for Setting the DTC

DTC C1116 will set as current DTC, if one of the following conditions is true:

- The TBCM detects an open in the manual apply signal circuit.
- The TBCM detects short to ground in the manual apply signal circuit.
- The TBCM detects short to battery positive in the manual apply signal circuit.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

When the manual apply switch 5-volt reference circuit or TBCM ground is open circuit, in addition to setting DTC C1116, DTC C1117 and C1118 may also be set as current DTC. In this case, diagnose the apply switch 5-volt reference circuit or TBCM ground first for open circuit fault before to diagnosing DTC C1116. If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

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Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls Primary Manual Apply parameter. The reading should be between 0-100 percent and change with brake pedal input.
2. Ignition ON, observe the scan tool brake controls Redundant Manual Apply parameter. The reading should be between 0-100 percent and change with brake pedal input.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the trailer brake controller switch panel.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 8 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance. If the circuit tests normal, replace the TBCM.
3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal 3 and ground.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.

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- If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
- 4. Install a 3A fused jumper wire between the signal circuit terminal 4 and the 5-volt reference circuit terminal 3. Verify the scan tool Manual Apply Switch is greater than 90 percent.
 - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
- 5. If all circuits test normal, test or replace the trailer brake controller switch panel.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Control Module References** for TBCM replacement, setup, and programming
- **Trailer Brake Control Module Replacement**

DTC C1117

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1117

Manual Trailer Brake Apply Request circuit Signal 2-Redundant Manual Apply Signal

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
TBCM 5-Volt Reference Circuit	C1117	-	C1117	C1117	-
Redundant Manual Apply Signal Circuit	-	-	C1117	-	-
TBCM Ground Circuit	-	-	C1117	-	-

Circuit/System Description

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The redundant manual apply switch circuit diagnostic monitors for circuit faults on the redundant manual apply switch input to the trailer brake control module (TBCM).

This DTC will also be detected when a fault is detected in the 5 v reference voltage or in TBCM ground circuit

Conditions for Running the DTC

- The system voltage is in the range of 9.5 - 17 volts.
- The module is powered up and completes initialization.

Conditions for Setting the DTC

DTC C1117 will set as current DTC, if one of the following conditions is true:

- The TBCM detects an open in the redundant manual apply signal circuit.
- The TBCM detects short to ground in the redundant manual apply signal circuit.
- The TBCM detects short to battery positive in the redundant manual apply signal circuit.

Action Taken When the DTC Sets

- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

When the manual apply switch 5-volt reference circuit or TBCM ground is open circuit, in addition to setting DTC C1116, DTC C1117 and C1118 may also be set as current DTC. In this case, diagnose the apply switch 5-volt reference circuit or TBCM ground first for open circuit fault before to diagnosing DTC C1117. If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

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Reference Information

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Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls Primary Manual Apply parameter. The reading should be between 0-100 percent and change with brake pedal input.
2. Ignition ON, observe the scan tool brake controls Redundant Manual Apply parameter. The reading should be between 0-100 percent and change with brake pedal input.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the trailer brake controller switch panel.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 8 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.

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If the circuit tests normal, replace the TBCM.

3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal 3 and ground.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. Install a 3A fused jumper wire between the signal circuit terminal 5 and the 5-volt reference circuit terminal 3. Verify the scan tool Redundant Manual Apply Switch is greater than 90 percent.
 - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
5. If all circuits test normal, test or replace the trailer brake controller switch panel.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Control Module References** for TBCM replacement, setup, and programming
- **Trailer Brake Control Module Replacement**

DTC C1118

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC Descriptor

DTC C1118

Trailer Brake Control Sensitivity Switch Circuit

DTC C1118 08

Trailer Brake Control Sensitivity Switch Circuit Signal Invalid

Diagnostic Fault Information

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Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
TBCM User Gain switch Signal Circuit	C1118	-	C1118	C1118	C1118 08
TBCM Ground Circuit	-	-	C1118	-	-

Circuit/System Description

The User Gain Switch consists of 2 control buttons: Gain Up, and Gain Down. The output signal from the trailer brake controller switch is connected, and monitored by trailer brake control module (TBCM).

The TBCM monitors the circuit fault for User Gain Switch input for faults that includes short to GND, short to battery, and open circuit. This DTC will also be reported when fault is detected in TBCM ground circuit.

The TBCM also monitors the input signal validity from the User Gain Switch.

Conditions for Running the DTC

- The system voltage is in the range of 9.5 - 17 volts.
- The module is powered up and completes initialization.

Conditions for Setting the DTC

DTC C1118 will set as current DTC, if one of the following conditions is true for more than 1 second:

- The TBCM detects an open in the user gain switch circuit.
- The TBCM detects short to ground in the user gain switch circuit.
- The TBCM detects short to battery positive in the user gain switch circuit.

DTC C1118 08 will set as current, if one of the following cases is true:

- The TBCM detects the user gain switch is stuck before the ignition is on, and continuously stuck after ignition was turn on for 30 seconds.
- The TBCM detects the user gain switch is stuck continuously after ignition was turn on for 5 minutes.

Action Taken When the DTC Sets

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- The trailer brake control will be disabled for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center (DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

When the TBCM ground is open circuit, in addition to setting DTC C1118, DTC C1116 and C1117 may also be cause these DTC to set. In this case, diagnose the TBCM ground first for open circuit fault before to diagnosing DTC C1118. If there is an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for Scan Tool Information

Circuit/System Verification

1. Ignition ON, observe the scan tool trailer brake controls user gain parameter. The reading should be between 0-100 percent, and change with operating the gain switch up or gain switch down.
2. The reading should be between 0-100 percent, and change with operating the gain switch up or gain switch down.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the trailer brake controller switch module.
2. Test for less than 5 ohms of resistance between the ground circuit terminal 8 and ground.
 - o If greater than the specified range, test the ground circuit for an open/high resistance. If the circuit tests normal, replace the TBCM.
3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal 6 and ground.
 - o If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - o If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. If all circuits test normal, test or replace the trailer brake controller switch module.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Control Module References** for TBCM replacement, setup, and programming
- **Trailer Brake Control Module Replacement**

DTC C1119

Diagnostic Instructions

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- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C1119

Trailer Brake Control Relay Feedback Circuit

Diagnostic Fault Information

Circuit	Short to Ground	High Resistance	Open	Short to Voltage	Signal Performance
Relay Control Active Low Circuit	C1119	-	C1119	-	-
TBCM Ground Circuit	-	-	C1119	-	-

Circuit/System Description

The trailer brake control module diagnostic monitor detects faults on the solid state relay (SSR) driver module feedback circuit.

Conditions for Running the DTC

- DTCs C1114 is not set.
- The ignition is ON.
- Trailer brake is not activated.

Conditions for Setting the DTC

- The TBCM detects an open in the solid state relay control feedback circuit.
- The TBCM detects short to ground in the solid state relay control feedback circuit.
- The TBCM detects short to battery positive in the solid state relay control feedback circuit.

Action Taken When the DTC Sets

- The trailer brake control will be disabled at the end of the current brake apply for the remainder of the ignition cycle.
- The Service Trailer Brake System will be displayed on the Driver Information Center

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(DIC).

Condition for Clearing the MIL/DTC

- When the condition for the DTC is no longer present.
- The TBCM automatically clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aids

If there are any DTCs set for GMLAN communication such as U0100, U0121, U0140, or U2099, diagnose them first before to resolve DTCs described in this section.

Diagnose an open circuit in trailer brake control module ground circuit or trailer brake control relay ground circuit will also cause DTC C1119 being set as current DTC. When DTC C1119 is set as current DTC, trailer brake control module ground circuit or trailer brake control relay ground circuit should be diagnose for open circuit, before to diagnosing the trailer brake control relay current feedback circuit. If there is an aftermarket trailer brake controller, the TBCM must be disconnected. Do not power both TBCM and aftermarket controllers to control the trailer brakes at the same time.

Reference Information

Schematic Reference

Trailer Brake Control Schematics

Description and Operation

Trailer Brake Controls Description and Operation

Connector End View Reference

Component Connector End Views

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition ON, observe the scan tool brake controls TBCM Relay Feedback Signal volts parameter. The reading should be between 4.8 - 5.2 volts.
2. Ignition ON, observe the scan tool brake controls Trailer Brake Relay Command volts parameter. The reading should be battery volts.

Circuit/System Testing

IMPORTANT: All electrical components and accessories must be turned OFF and allowed to power down.

1. Ignition OFF, disconnect the harness connector at the solid state relay module.
2. Test for less than 5 ohms of resistance between the ground circuit terminal B and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for 4.8 - 5.2 volts between the 5-volt reference circuit terminal D and ground.
 - If less than the specified range, test the 5-volt reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the TBCM.
 - If greater than the specified range, test the 5-volt reference circuit for a short to voltage. If the circuit tests normal, replace the TBCM.
4. If all circuits test normal, test or replace the SSR driver module.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Trailer Brake Control Module Replacement**
- **Control Module References** for TBCM replacement, setup, and programming

SYMPTOMS - TRAILER BRAKE CONTROLS

IMPORTANT: The following steps must be completed before using the symptom tables.

1. Perform the **Brake System Vehicle Road Test** before using the Trailer Brake Controls symptom tables in order to duplicate the customer's concern.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to the following:
 - **Trailer Brake Controls Description and Operation**
 - **ABS Description and Operation (With JL4)** **ABS Description and Operation (Without JL4)**

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Trailer Brake Control system. Refer to **Checking Aftermarket Accessories** .
- For vehicles displaying a TRAILER NOT CONNECTED message with a trailer connected.
- Inspect the trailer brake connector and circuits for proper connections, perform the following steps:
 1. Verify SSR circuit 47 pin A to the trailer connector pin C for continuity.
 2. Verify SSR circuit 1750 pin B to ground and to the trailer connector pin B for continuity.
- If all circuits test normal the vehicle TBCM system is not at fault, otherwise most associated circuit faults on the vehicle side will set DTC's in the TBCM.
- Insure the trailer is equipped with electric over electric brakes - only trailers equipped with electric brakes will be recognized and function correctly with TBCM.
- If the trailer is equipped with hydraulic brakes this trailer will not be recognized by the TBCM. The vehicle chassis to trailer connector ground or the trailer ground circuits or trailer brake electric magnets are likely at fault.
- The Trailer brake connector should measure less than 2 ohms of resistance between pins A & B of the trailer side connector. Note - a minimum of one fully functioning axle of brakes is required for the TBCM system to function correctly.

Symptoms Testing

Some customers may experience an intermittent Check Trailer Wiring message in vehicles equipped with ITBC (Integrated Trailer Brake Controller) with no DTC stored. This message may be displayed each time the trailer's running lamps, turn signal lamps or brake lamps turn on - especially if the trailer is equipped with a large number of lamp loads.

Check Trailer Wiring Message on the DIC

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1. This condition is caused by insufficient grounding between the trailer and vehicle.
 - To correct this condition, perform the following procedure:
 - Inspect and clean the ground wire (white wire) connection on the trailer side of the 7-pin connector.
 - Make sure that the wires inside the trailer side connector are clean and securely fastened.
 - If an electrical junction box exists on the trailer, make sure the wires inside the junction box are clean and securely fastened.
 - Once this procedure is complete, check to see if the condition has been corrected:
 - Remove the original trailer ground wire (white wire) from the trailer side of the 7-pin trailer connector.
 - Install a ring terminal (PN 12103512 or equivalent) to this wire and fasten the ring terminal to the metal or aluminum chassis of the trailer using a M6x1x20 self tapping phosphate zinc coated screw (PN 11515925 or equivalent).
 - Pre-drill trailer chassis location with a 3/16" hole. Make sure the trailer chassis location is clean of paint or coating material prior to installation. Galvanic corrosion between dissimilar trailer and screw metals may require that this ground location be periodically cleaned.
 - Obtain a sufficient length of minimum 10 gauge (5.0 mm²) white wire and fasten with ring (PN 12103512 or equivalent) terminal to the trailer chassis at the same location as the original ground wire.
 - Install and fasten the other end of the new ground wire into the trailer side of the 7-pin trailer connector.
 - Install conduit on the original and new trailer ground wires, and secure the conduit to the existing trailer harness.
2. Verify the condition has been corrected.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

Brake Warning Indicator Malfunction

REPAIR INSTRUCTIONS

TRAILER BRAKE CONTROL SWITCH REPLACEMENT

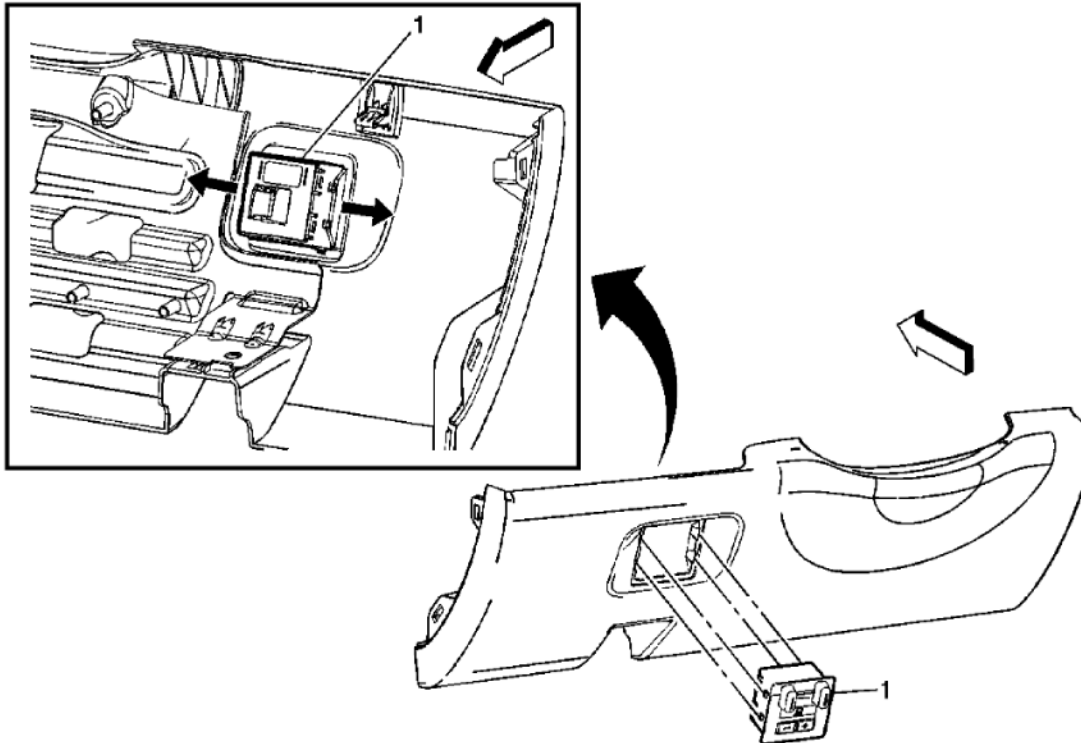


Fig. 3: View Of Trailer Brake Control Switch
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the knee bolster. Refer to <u>Knee Bolster Replacement (with RPO SLT)</u> or <u>Knee Bolster Replacement (without RPO SLT)</u>	
1	Trailer Brake Control Switch Procedure 1. Disconnect the electrical connectors. 2. Use a plastic flat bladed tool to release the switch from the knee bolster trim.

TRAILER BRAKE CONTROL MODULE REPLACEMENT

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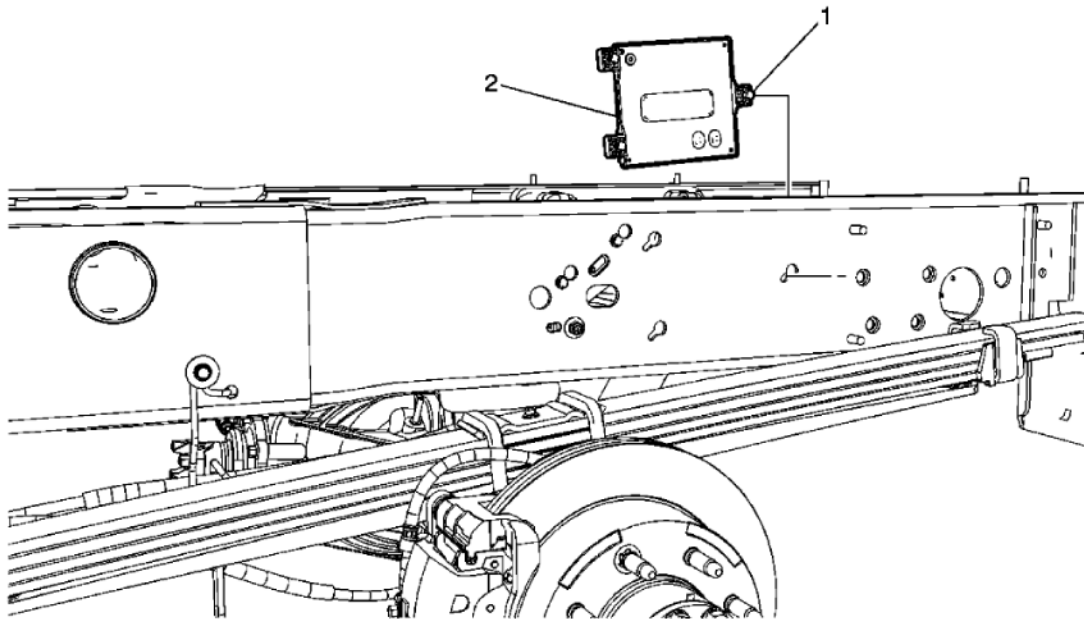


Fig. 4: View Of Trailer Brake Control Module & Bolts
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Turn the ignition switch to the OFF position. 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Trailer Brake Control Module Bolt (Qty: 3) NOTE: Refer to <u>Fastener Notice</u> . Procedure: Loosen, but do not remove the bolts. It is not necessary to completely remove the bolts. Tighten: 9 N.m (80 lb in)
	Trailer Brake Control Module Procedure

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- | | |
|---|---|
| 2 | <ol style="list-style-type: none">1. Disconnect the electrical connector.2. Slide the module upward to remove.3. If installing a new trailer brake control module, program the module.
Refer to <u>Control Module References</u> . |
|---|---|

TRAILER BRAKE CONTROL RELAY REPLACEMENT

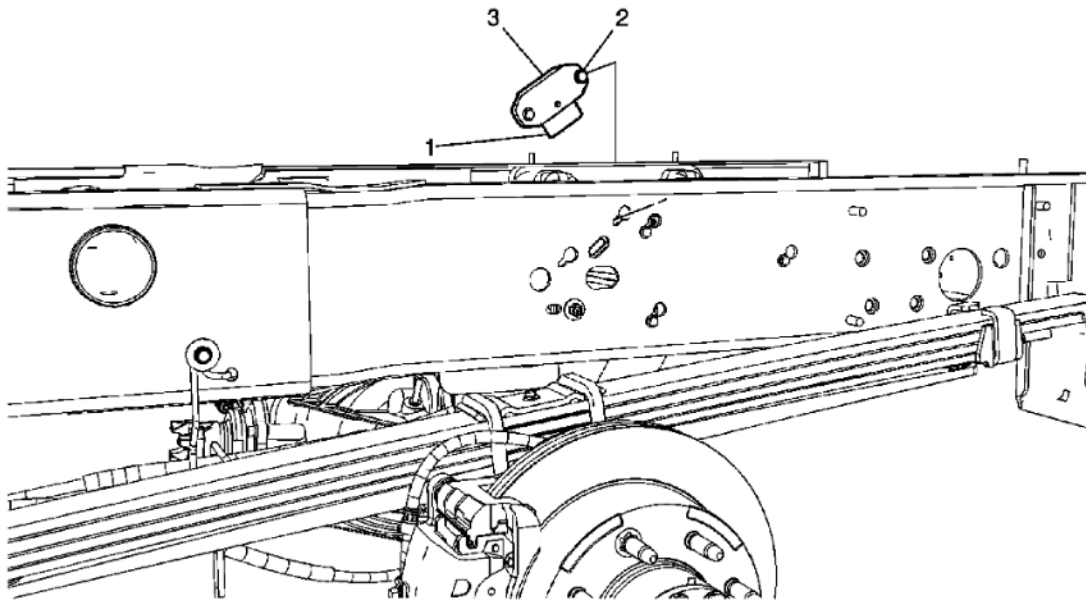


Fig. 5: View Of Trailer Brake Control Relay, Electrical Connector & Bolts
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Turn the ignition switch to the OFF position. 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Trailer Brake Control Relay Electrical Connector Procedure: Disconnect the electrical connector.
	Trailer Brake Control Relay Bolt (Qty: 2) NOTE: Refer to <u>Fastener Notice</u> .

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2	Procedure: Loosen, but do not remove the bolts. It is not necessary to completely remove the bolts. Tighten: 9 N.m (80 lb in)
3	Trailer Brake Control Relay Procedure: Slide the relay upward to remove.

DESCRIPTION AND OPERATION

TRAILER BRAKE CONTROLS DESCRIPTION AND OPERATION

This vehicle may be equipped with a Trailer Brake Control (TBCM) system for electric trailer brakes. The power output to the trailer brakes is based on the amount of brake pressure being applied in the vehicle's brake system. The available power output to the trailer brakes can be adjusted to a wide range of trailering situations.

IMPORTANT: Connecting a trailer that is not compatible with the ITBC system may result in reduced or complete loss of trailer braking. There may be an increase in stopping distance or trailer instability which could result in personal injury or damage to your vehicle, trailer, or other property. An aftermarket controller may be available for use with trailers with surge, air or electric-over-hydraulic trailer brake systems. To determine the type of brakes on your trailer and the availability of controllers, check with your trailer manufacturer or dealer.

IMPORTANT: If your vehicle is equipped with an ITBC, the blunt cuts exist, but are not connected further in the harness. If you install an aftermarket trailer brake controller, the ITBC must be disconnected. Do not power both ITBC and aftermarket controllers to control the trailer brakes at the same time.

The vehicle is equipped with the following trailer braking components:

- Manual Trailer Brake Apply
- Trailer Gain Adjustment

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- Trailer Brake Control Panel
- Trailer Brake DIC Display

Manual Trailer Brake Apply

The Manual Trailer Brake Apply Lever is located on the Trailer Brake Control Panel, and is used to apply the trailer's electric brakes independent of your vehicle's brakes. This lever is used in the Trailer Gain Adjustment Procedure to properly adjust the power output to the trailer brakes. Sliding the lever to the left will apply only the trailer brakes. The power output to the trailer is indicated in the Trailer Brake Display Page in the DIC. If your vehicle's service brakes are applied while using the Manual Trailer Brake Apply Lever, the trailer output power will be the greater of the two.

The trailer and the vehicle's brake lamps will come on when either vehicle braking or manual trailer brakes are applied.

Trailer Gain Adjustment

Trailer Gain should be set for a specific trailering condition, and must be adjusted any time vehicle loading, trailer loading or road surface conditions change.

Setting the Trailer Gain properly is needed for the best trailer stopping performance. A trailer that is over-gained may result in locked trailer brakes. A trailer that is under-gained may result in not enough trailer braking. Both of these conditions may result in poorer stopping and stability of the vehicle and trailer.

After the electrical connection is made to a trailer equipped with electric brakes, the TRAILER CONNECTED message will be momentarily displayed on the DIC. The Trailer Brake Display Page will appear on the DIC showing TRAILER GAIN and OUTPUT, after all vehicle related service messages are acknowledged by the driver. The dashed lines in the TRAILER OUTPUT display signifies a disconnected trailer or TBCM fault condition, and will disappear only when the TBCM fault condition is not present.

Trailer Gain Adjustment

- Adjust trailer gain in 0.5 step increments up to 10 gain setting by using the gain adjustment +/- buttons on the trailer brake control panel switch. Pressing and holding a gain button will cause the trailer gain to continuously increment or decrement. To turn the output to the trailer off, set the gain to zero.
- Drive the tow vehicle and trailer combination on a level road surface representative of the towing condition, and free of traffic at approximately 32-40 km/h (20-25 mph) and fully

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apply the manual trailer brake apply lever mechanism located on the trailer brake control panel switch. Adjusting trailer gain at slower speeds may result in an incorrect gain setting.

- Adjust the trailer gain to just below the threshold of trailer wheel lock-up. Important trailer wheel lock-up may not occur if towing a heavily loaded trailer. In this case, adjust the trailer gain to the highest allowable setting for the towing condition.

IMPORTANT: Re-adjust trailer gain any time tow vehicle and trailer loading or road surface conditions change or if you notice trailer wheel lock-up at any time while you are towing.

Trailer Brake Control Panel

The TBCM system has a control panel with the trailer gain and manual apply switches, and is located on the instrument panel to the left of the steering column. See Instrument Panel Overview for more information on location. The control panel and switches allows you to adjust the amount of output, referred to as trailer gain, available to the electric trailer brakes and allows you to manually apply the trailer brakes. The Trailer Brake Control Panel, and switches is used along with the Trailer Brake Display Page on the DIC to adjust and display power output to the trailer brakes.

Driver Information Indicators and Messages

The following indicators are used to inform the driver of several different factors.

TRAILER CONNECTED

This message will be briefly displayed when a trailer with electric brakes is first connected to the vehicle. This message will automatically turn off in about ten seconds. The driver can also acknowledge this message before it automatically turns off

CHECK TRAILER WIRING and TRAILER NOT CONNECTED

This message will be displayed if:

- The ITBC system first determines connection to a trailer with electric brakes, and then if the trailer harness becomes disconnected from the vehicle. If a trailer connection is made initially and the vehicle or trailer wiring connections is not correct the TRAILER NOT CONNECTED message will display during key up as if there is no trailer connected. If the TBCM trailer connection is recognized initially and the disconnect occurs while the vehicle is stationary, this message will automatically turn off in about thirty seconds. This message will also turn off if the driver acknowledges this message off or if the trailer harness is re-connected. If the disconnect occurs while the vehicle is moving, the CHECK TRAILER

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WIRING message will continue until the ignition is turned off. This message will also turn off if the driver acknowledges this message off or if the trailer harness is re-connected or repairs completed.

- There is an electrical fault in the wiring to the electric trailer brakes. The CHECK TRAILER WIRING message will continue as long as there is an electrical fault in the trailer wiring. This message will also turn off if the driver acknowledges this message off. To determine if the electrical fault is on the vehicle side or trailer side of the trailer wiring harness connection, do the following:

SERVICE TRAILER BRAKE SYSTEM

This message will be displayed when there is a problem with the TBCM system. If this message persists over multiple ignition cycles there is problem with the TBCM system. Take your vehicle to an authorized GM dealer to have the TBCM system diagnosed and repaired.

TRAILER GAIN and OUTPUT Display

This display menu can be accessed by scrolling through the DIC vehicle Information menu, or any time the trailer gain +/- button is depressed, or the manual trailer brake apply lever is actuated. The trailer gain display is 0 to 10 in 0.5 step increments, and indicates the current user setting of the trailer output gain. The trailer output is 0 to 10 bars in 1 bar increments, and indicates the output power provided to the trailer brakes, relative to the gain setting.